THE NEW VALUE FRONTIER

KYOCERA

Electronic Components & Devices 2006

AVX

A Kyocera Group Company

CONTENTS

1. Capacitors 1

Trimmer Capacitors 2

2. Resistors 5

Thick Film Chip Resistors

- Chip Resistor Arrays 6
- Chip Resistor Networks 8
- Attenuators 9
- Low Resistance Chip Resistors 10
- Test Conditions and Standards 11
- Packaging/Recommended Land Patterns /Precautions 13

3. EMC Components 16

EMI Filters

- KNF Series (Signal Lines) 17
- KNA Series (Array type) 19
- KNH Series (Power Lines) 21

4. Timing Devices 22

Timing Devices Selection Guide 23

Ceramic Resonators

- PRTC Series 24
- SSR Series 25
- PBRC•PRQC/PBRV•PRQV Series 26

SAW Resonators 31

Crystal Units (Consumer Applications)

- CX2520SB (CX-2520SB) 34
- CX3225SB (CX-2520SB) 36
- CX4025SB (CX-4025S) 38
- CX5032SB (CX-96F) 39
- CX5032GB (CX-53F) 40
- CX8045GB (CX-8045G) 41
- CXB855GB (CX-5FD) 42
- CXH49SFB (HC-49/U-S) 43
- CXZ49GFB (CX-49G) 44

Crystal Units (Automotive)

- CX5032GA (CX-53G) 45
- CX8045JA (CX-17F) 46
- CXB855GA (CX-5FW) 47
- CXH49SFA (HC-49/U-S) 48
- CXZ49FFA (CX-49F) 49
- CXZ49LFA (CX-49L) 50

Handling Notes for Crystal Units 51

Characteristics of Crystal Units/ Oscillation Circuits 52

Packaging for Crystal Units 60

Crystal Oscillators (CMOS Output)

- KC2520A-C1 (KC2520) 61
- KC2520A-C2 (KC2520) 62
- KC2520A-C3 (KC2520) 63
- KC3225A-C2 (K25-2C) 64
- KC3225A-C3 (K25-3C) 65
- KC5032C-C1 (K30-1C) 66
- KC5032C-C2 (K30-2C) 67
- KC5032C-C3 (K30-3C) 68
- KC5032C-C3 (K30-3C Heavy Load Type) 69
- KC5032C-C5 (K30-HC) 70
- KC5032D (FXO-61F2) 71
- KC5032D (FXO-64F2) 72
- KC5032H (MFO-208F) 73
- KC7050A-C1 (K53-1C) 74
- KC7050A-C2 (K53-2C) 75
- KC7050A-C3 (K53-3C) 76
- KC7050A-C5 (K53-HC) 77
- KC7050H-C3 (K50H-3C) 78
- KC7050S-C1 (FSO-2B) 79
- KC7050S-C2 (FSO-2C) 80
- KC7050S-C3 (FSO-2D) 81
- KC7050B (FXO-31F) 82
- KC7050B (FXO-37F,N) 83
- KC7050B (FXO-34F) 84
- KC7050C-C3 (K50-3C) 85
- KC7050C-C5 (K50-HC) 86
- KCJXO (JXO) 87
- KCEX03 (EXO-3) 88

Crystal Oscillators (LV-PECL Output)

- KC5032P-P2 89
- KC5032P-P3 90
- KC7050P-P2 91
- KC7050P-P3 92
- KC7050S-P2 (FSO-1C) 93
- KC7050S-P3 (FSO-1D) 94

Crystal Oscillators (LVDS Output)

- KC5032P-L2 95
- KC5032P-L3 96
- KC7050P-L2 97
- KC7050P-L3 98

Voltage Controlled Oscillators

- KV5032A (VC-FXO-65F) 99
- KV7050A (VC-FXO-35F) 100
- KV7050L-C (VCXO-7050/7050L) 101
- KV7050W-P3 (K50V-3P) 102
- KV7050S-P3 (VC-FSO-1D) 103

Temperature Compensated Crystal Oscillators (TCXO)

- KT2520Y 104
- KT3225 (KT21) for GPS 105
- KT3225 (KT21) 106
- KT5032 (KT18B, (VC)-TCXO-208Cx) 107

CONTENTS

High Precision Oscillators
- (VC-) DTCXO-12A 108
- (VC-) DTCXO-13A 109
- DTCXO-15A 110
- OCVCXO-120A 111
- MCXO-094B 112

Handling Notes for Crystal Oscillators 113
Packaging for Crystal Oscillators 116

5. Crystal Applied Products 117
Synthetic Quartz Crystals 118
Crystal Blanks 121
Optical Devices
- Crystal Optical Low Pass Filters 122
- IR-cut Filters 123
- Phase Plates 124
- Phase Plates for LCD Projectors 125
- Quartz Crystal Plates for LCD Projectors 126

6. Filters 127
SAW Filters
- SF Series 128
- SF3030B190M00B04MA00 (W-CDMA) 132
- SF3838B190M00B04MA00 (W-CDMA) 132
- SF5032B190M00B03MA02 (W-CDMA) 133
- SF5032B380M00B03MA00 (W-CDMA) 133
- SF6035B183M60C01MA00 (CDMA) 134
- SF7050C110M00C01MA00 (cdmaOne) 135
- SF9148B085M38C01MA00 (cdmaOne) 136
- SF7050B204M00C600A00 (SCDMA) 137
- SF7050C083M16C026A00 (AMPS) 138
- SF7050C085M38C026A01 (AMPS) 138
- SF7050C183M60C022B00 (AMPS) 139
- SF3838B315M00C300A00 (RKE) 140
- SF3838B315M00B200A00 (RKE) 140
- SF3838B433M92C300A00 (RKE) 141
- SF3838B433M92B200A00 (RKE) 141
- PAFC433.92 (RKE) 142
- SF5050B868M30C600A00 (RKE) 143
- SF3030B428M00T04MA02 (Radio Communications) 144
- SF3535B426M54B800A00 (Radio Communications) 145
- SF3838B426M07C080A00 (Radio Communications) 145
- SF3535B429M55B800A00 (Radio Communications) 145
- SF3838B429M17C080A00 (Radio Communications) 145
- SF3838B440M20B400A00 (Radio Communications) 145
- SF7050B469M18B01MA00 (Radio Communications) 145
- PAFA (PHS) 146
- SF3535B243M95B220A00 (PHS) 147
- SF3838B243M95B220A00 (PHS) 148
- SF3838B248M45B220A00 (PHS) 148
- PAFC243B (PHS) 149
- SF9148B155M52C155A00 (Fiber Optics) 151
- SF9148B622M08C622A00 (Fiber Optics) 151

Monolithic Crystal Filters (MCF)
- FP2 152
- FP4 153
- 49/U 154

Characteristic Diagram and Terms of MCF 155
Packaging for Filters 156

7. RF Modules 157
Antenna Switch Modules 158
Bluetooth™ Modules 163

8. Others 166
- Shock Sensors 167
- Piezo Ceramic Elements 168
- Piezo Buzzers 170

Manufacturing Plants 171
Kyocera Network in Japan 172
Sales Offices 173
Notes for Using the Catalog 175

THE NEW VALUE FRONTIER

KYOCERA

Capacitors

Trimmer Capacitors

AVX

Features

- SMD small & thin package
- Wide capacitance range
- Washable and non-washable types available
- Plus slot(+) suitable for auto-adjustment

Applications

- AV Equipment
- Cellular Phone
- Cordless Phone
- TCXO
- Keyless Entry

How to Order

CTZ3 S - 05 A - W 1 - P F
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①Series

CTZ3	CTZ3 Series
CTZ2	CTZ2 Series

②Type

S	Reflow non washable type
E	Reflow washable type

③Maximum Capacitance

03	3pF	**30**	30pF
05	5pF	**40**	40pF
10	10pF	**50**	50pF
20	20pF		

④Temparature Coefficient (ppm/°C)

A	NPO±500	**C**	N750±500
B	N400±500		

⑤Packaging

W	W Direction Taping
X	X Direction Taping
B	Bulk

⑥Taping Quantity (Unit : pcs)

1	1,000	CTZ3 Series
2	2,000	CTZ2 Series

⑦Pin Head Type

P	Plus Slot

⑧Lead Specification

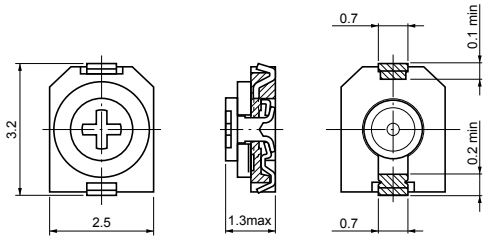
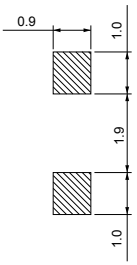
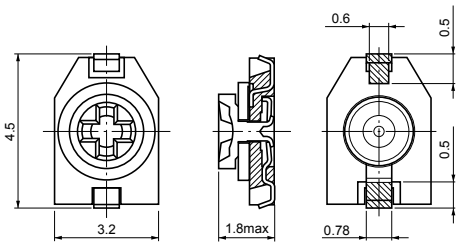
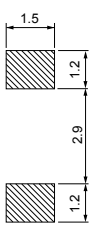
F	Lead Forming Type (CTZ3 type)

∗ ⑧ is denoted by space for CTZ2 series.

Specifications

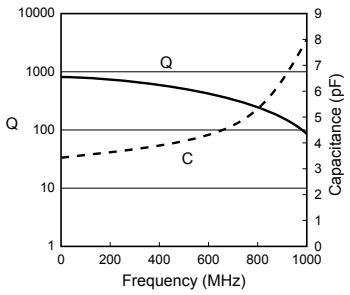
Part No.		Capacitance(pF) Cmax.	Capacitance(pF) Cmin.	Q 1±0.1 (MHz)	Temperature Coefficient (ppm/°C)
CTZ2 S/E	**03A**	3 +100% −0%	2.0max.	≥150	NPO±500
	05A	5 +100% −0%	3.0max.	≥150	NPO±500
	10A	10 +100% −0%	3.0max.	≥150	NPO±500
	20C	20 +100% −0%	5.5max.	≥150	N750±500
CTZ3 S/E	**03A**	3 +100% −0%	1.0max.	≥300	NPO±500
	05A	5 +100% −0%	1.5max.	≥300	NPO±500
	10A	10 +100% −0%	2.5max.	≥300	NPO±500
	10B	10 +100% −0%	1.5max.	≥300	N400±500
	20C	20 +100% −0%	4.5max.	≥300	N750±500
	30C	30 +100% −0%	4.5max.	≥300	N750±500
	40C	40 +100% −0%	4.5max.	≥300	N750±500
	50C	50 +100% −0%	4.5max.	≥200	N750±500

Series	Rated Voltage (V•DC)	Temperature Range (°C)	Insulation Resistance (MΩ)	Torque (g•cm)
CTZ2S/E	25	–40 to +85	$\geq 10^4$	10 to 150
CTZ3S/E	25	–40 to +85	$\geq 10^4$	10 to 150

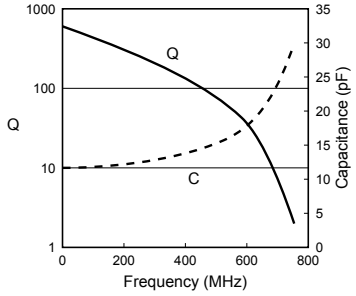
Series	Dimensions (Unit : mm)	Recommended Land Pattern (Unit: mm)
CTZ2 Series 		
CTZ3 Series 		

Frequency Characteristics

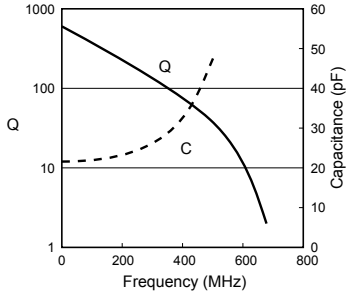
CTZ2-03A-P



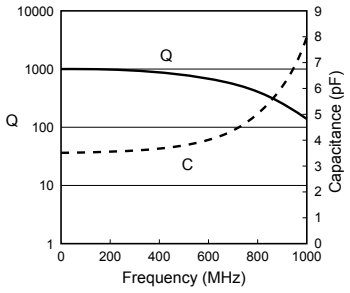
CTZ2-10A-P



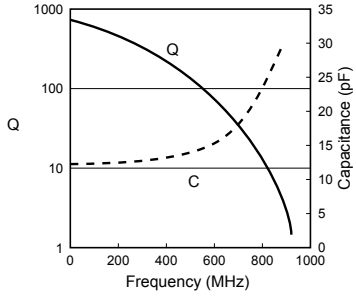
CTZ2-20C-P



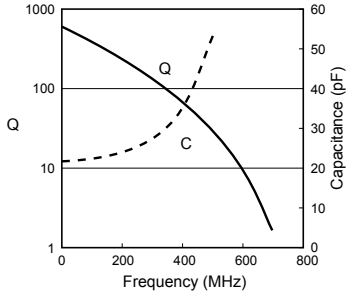
CTZ3-03A-PF



CTZ3-10A-PF

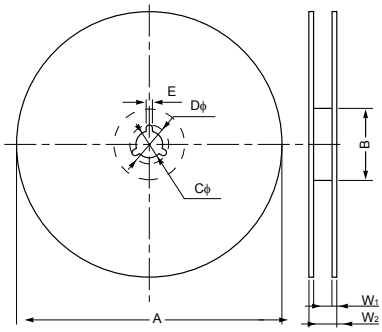


CTZ3-20C-PF



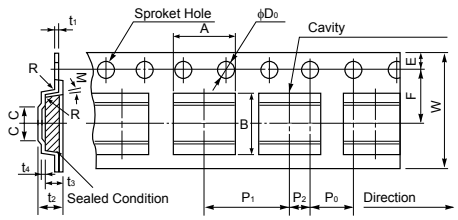
Tape & Reel

• Reel



• Carrier Tape

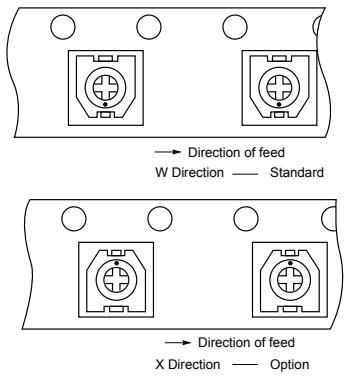
(Unit : mm)



• Tape Loading

W Direction —— Standard

X Direction —— Option



	CTZ2 Series	CTZ3 Series
A	2.7±0.1	3.35±0.1
B	3.2±0.1	$4.6^{+0.2}_{-0.0}$
W	12.0±0.3	12.0±0.3
F	5.5±0.05	5.5±0.05
E	1.75±0.1	1.75±0.1
P0	4.0±0.1	4.0±0.1
P1	4.0±0.1	8.0±0.1
P2	2.0±0.05	2.0±0.05
ϕD0	$1.5^{+0.1}_{-0.0}$	$1.5^{+0.1}_{-0.0}$
t1	0.3±0.1	0.3±0.1
t2	1.9±0.1	2.5±0.1
t3	$1.3^{+0.15}_{-0.0}$	2.0±0.1
t4	0.3±0.1	0.3±0.05
C	2.06±0.1	2.7±0.1

(Unit : mm)

	A	B	C	D	E	W_1	W_2
CTZ2 Series (2,000pcs.)	$180^{+0.0}_{-3.0}$	$60.0^{+1.0}_{-0.0}$	13.0±0.2	21.0±0.8	2.0±0.5	13.0±0.3	15.4±1.0
CTZ3 Series (1,000pcs.)							

PCB Mounting

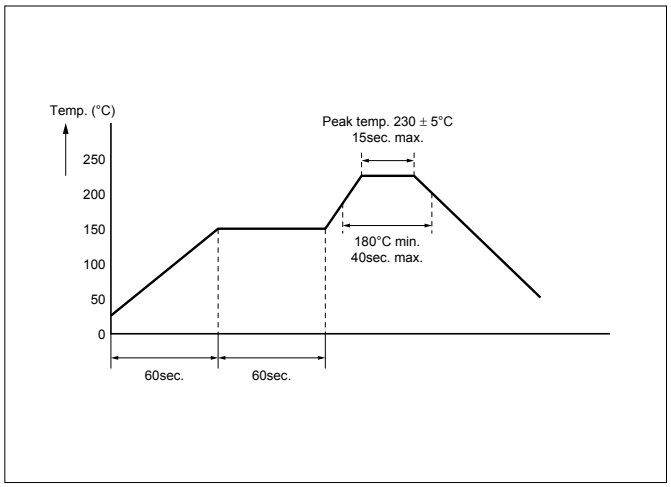
• When our recommended landpattern is not used, please check mounting alignment.

• When mounting on PCB, please do not apply pressure to trimmer capacitors over 500g.f.

Soldering

• When using soldering iron, adjust iron tip to 280°C. max.

• Please find below recommended solder profile.



Storage Conditions

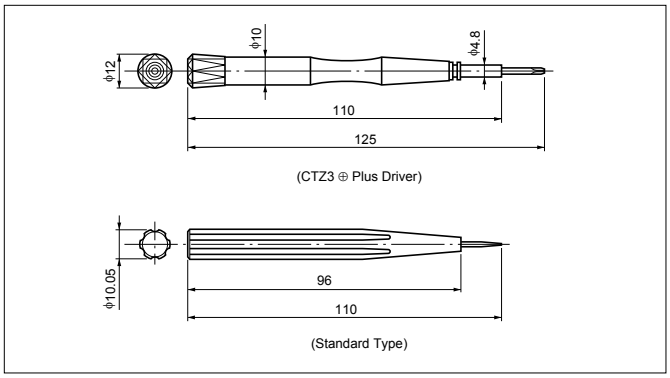
1) Do not store components in corrosive condition such as chloric or sulfuric environment.
2) Components before use should be stored under the condition with temperature of 5 to 40 degrees Celsius and humidity of 20 to 70% RH.
3) It is recommended to use components within 6 months of incoming.
4) Do not open the minimal package until right before the use.
5) Do not store components under direct sunlight or dewy environment.

Screwdrivers

Please use proper screwdriver for adjustment of the capacitor.
Kyocera can supply suitable ceramic type screwdrivers specially designed for the use of CTZ series. Please contact your local AVX office for the details.

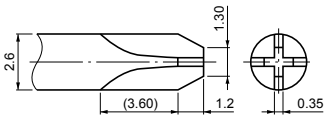
CTZ-3
Pin Head
⊕: CTZ-3 Plus Ceramic Driver

CTZ-2
Pin Head
⊕: CTZ-2 Plus Ceramic Driver

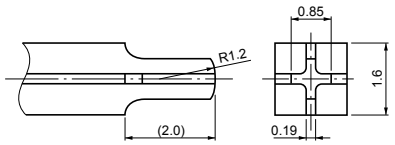


Driver Head Type

(CTZ3 Plus)



(CTZ2 Plus)



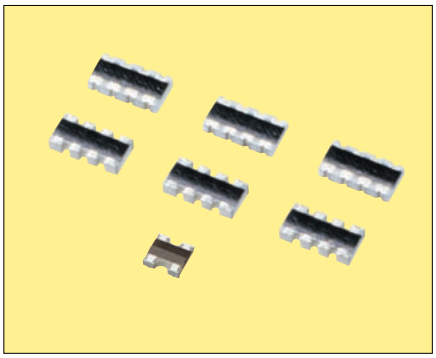
THE NEW VALUE FRONTIER

KYOCERA

Resistors

Chip Resistor Arrays
Chip Resistor Networks
Attenuators
Low Resistance Chip Resistors

AVX



RoHS Compliant

Miniature chip resistor arrays have 4 and 2 resistor elements integrated as a single component.

Features

- Miniture (2.0×1.0mm) Resistor Arrays
  Max 60% space saving compared with the use of standard chip array (3.2×1.6mm)
- 0.5mm Termination pitch (Same as IC lead-pin pitch)
  Easy designing of pattern layout and improve electrical characteristics for curcuit

＊Please consult combination of different resistance type.

How to Order

CRB2A 4E 103 J T
① ② ③ ④ ⑤

①Series(CRB2A: 2.0×1.0mm, concave termination, 4elements)
(CRC2A: 2.0×1.0mm, convex termination, 4elements)
(CRC11A: 1.0×1.0mm, convex termination, 2elements)
②Number of elements(4E: 4 elements)
(2E: 2 elements)
③Resistance Value(3 digits numbering)
472 = 4.7kΩ, 103 = 10kΩ
000 = 0Ω(Chip Jumper Array)
④Tolerance

J	±5%	**Blank**	Chip Jumper Array

⑤Packaging

Code	**Style**	**Form**	**Material**	**Packing unit**
H	**CRC11A**	Taping	Paper	10000pcs/reel
T	CRB2A/CRC2A	Taping	Paper	10000pcs/reel

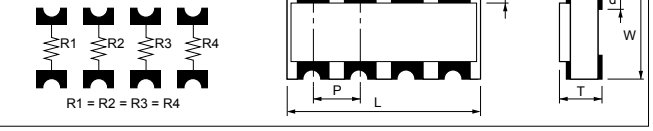
(*2mm pitch taping)

• 4 element chip Resistors Array — CRB2A4E series (Concave Termination) / CRC2A4E series (Convex Termination)
• 2 element chip Resistors Array — CRC11A2E series (Convex Termination)

Dimensions

(Unit : mm)

CRB2A4E series

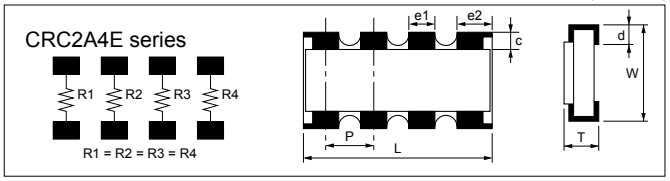


Code	L	W	T	P	b
Dimensions	2.0 $^{+0.10}_{-0.10}$	1.0 $^{+0.10}_{-0.10}$	0.4 $^{+0.10}_{-0.10}$	0.5typ	ϕ0.15typ
Code	**c**	**d**	**e**		
Dimensions	0.2 $^{+0.15}_{-0.15}$	0.25 $^{+0.15}_{-0.15}$	0.25typ		

• Non-marking on chips

(Unit : mm)

CRC2A4E series

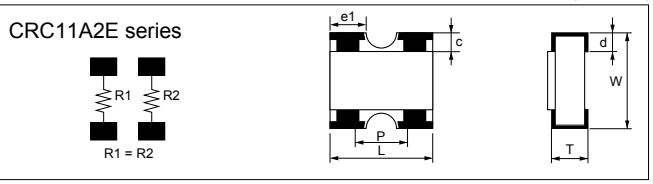


Code	L	W	T	P
Dimensions	2.0 $^{+0.10}_{-0.10}$	1.0 $^{+0.10}_{-0.10}$	0.4 $^{+0.10}_{-0.10}$	0.5typ
Code	**c**	**d**	**e1**	**e2**
Dimensions	0.15 $^{+0.15}_{-0.15}$	0.25 $^{+0.15}_{-0.15}$	0.3 $^{+0.10}_{-0.10}$	0.4 $^{+0.10}_{-0.10}$

• Non-marking on chips

(Unit : mm)

CRC11A2E series



Code	L	W	T	P
Dimensions	1.00 $^{+0.10}_{-0.10}$	1.00 $^{+0.10}_{-0.10}$	0.35 $^{+0.05}_{-0.05}$	0.65typ
Code	**c**	**d**	**e1**	
Dimensions	0.20 $^{+0.15}_{-0.15}$	0.20 $^{+0.15}_{-0.15}$	0.33 $^{+0.10}_{-0.10}$	

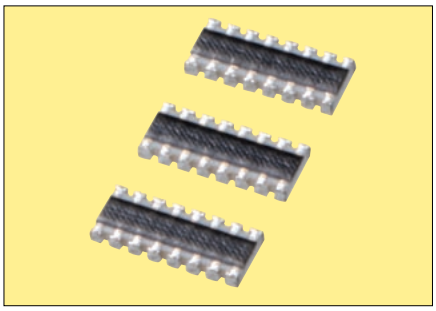
• Non-marking on chips

Rating

Chip resistor arrays		Chip jumper array	
Item	**Rating**	**Item**	**Rating**
Rated power(70°C)	1/32W/element	**Rated current**	1A
Max working ＊ voltage	25V		
Max Over-load voltage	50V		
Resistance value	10Ω to 1MΩ	**Conductive resistance value**	50mΩmax
Tolerance	J : ±5%		
Working Temperature	−55 to +125°C		
Number of elements	4E : 4Elements, 2E : 2Elements		

＊ Rated Voltage : $\sqrt{\text{Rated power} \times \text{Resistance value}}$, whichever is less.
＊ Standard Resistance Value: E-6 Series
＊ Please contact sales engineer for any other requirements of the nominal resistance value and the tolerance.

8 element chip Resistor Array / CRC4A8E series (Convex Termination)



RoHS Compliant

Features

- 0.5mm termination pitch(same as IC lead-pin pitch).
  Easy designing of pattern layout and improve electrical characteristics for circuit.
  3.8mm length of the chip makes the assembly of the next chip possible without changing the pattern pitch.

How to Order

CRC4A ① 8E ② 103 ③ J ④ T ⑤

①Series CRC4A
②Number of elements
8E = 8 elements
③Resistance value
3 digits numbering
④Tolerance

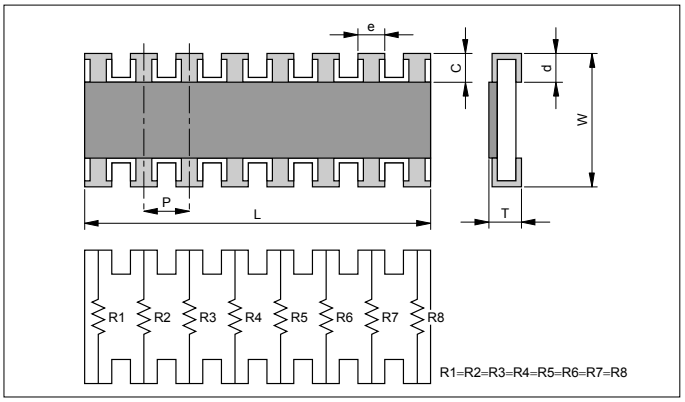
J	±5%

⑤Packaging

T	Taping paper 5,000pcs/reel

Dimensions

(Unit : mm)



Code	Dimensions
L	3.8±0.1
W	1.6±0.1
T	0.45±0.1
P	0.5typ
c	0.3±0.2
d	0.3±0.15
e	0.3±0.1

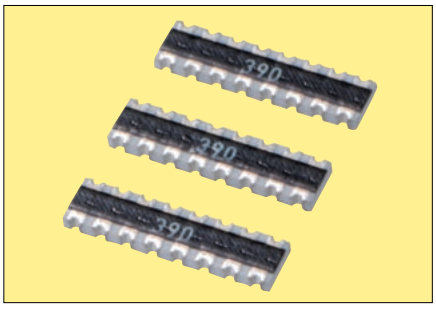
• No marking on chips.

Rating

Chip Resistor Arrays	
Item	**Rating**
Rated power (70°C)	1/16W/element 1/4W/packege
Max working voltage*	25V
Max over-load voltage	50V
Resistance value	10Ω to 1MΩ
Torerance	J:±5%
Working temperature	−55 to +125°C
Number of elements	8E:8elements

* Rated Voltage : $\sqrt{\text{Rated power} \times \text{Resistance value}}$, whichever is less.
* Standard Resistance Value: E-6 Series
* Please contact sales engineer for any other requirements of the nominal resistance value and the tolerance.

8 element chip Resistor Array / CRB6A8E series (Concave Termination)



RoHS Compliant

Features

- Equal length conductors can be traced out from 0.8mm pitch termination.

How to Order

CRB6A ① 8E ② 390 ③ G ④ U ⑤

①Series CRB6A
②Number of elements
8E = 8 elements
③Resistance value
3 digits numbering
④Tolerance

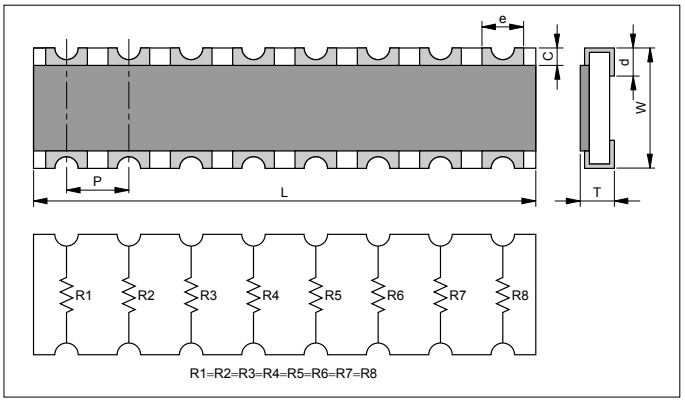
G	±2%	J	±5%

⑤Packaging

U	Taping plastic 4,000pcs/reel

Dimensions

(Unit : mm)

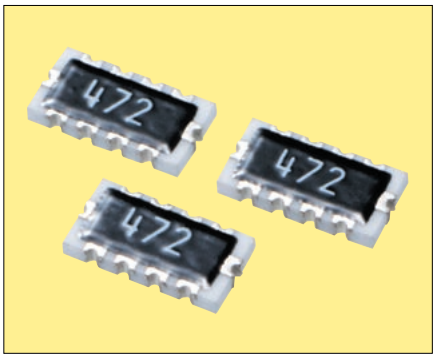


Code	Dimensions
L	6.4±0.2
W	1.6±0.2
T	0.6±0.1
P	0.8typ
c	0.3±0.2
d	0.4±0.15
e (Top side)	0.5±0.1
e (Bottom side)	0.4±0.15

Rating

Chip Resistor Arrays	
Item	**Rating**
Rated power (70°C)	1/16W/element
Max working voltage*	50V
Max over-load voltage	100V
Resistance value	10Ω to 1MΩ
Torerance	G:±2%, J:±5%
Working temperature	−55 to +125°C
Number of elements	8E:8elements

* Rated Voltage : $\sqrt{\text{Rated power} \times \text{Resistance value}}$, whichever is less.
* Standard Resistance Value: E-6 Series
* Please contact sales engineer for any other requirements of the nominal resistance value and the tolerance.



RoHS Compliant

Features

- Reduction in mounting costs & Process
- Save PCB space
- Eight resistors in one SMD package
- Reduction of inventory control costs

Applications

- Lap Top Computer
- Printer
- CD ROM
- Notebook Computer
- Hard Disk Drive
- Facsimile

How to Order

RNA4A 8E 103 J U
① ② ③ ④ ⑤

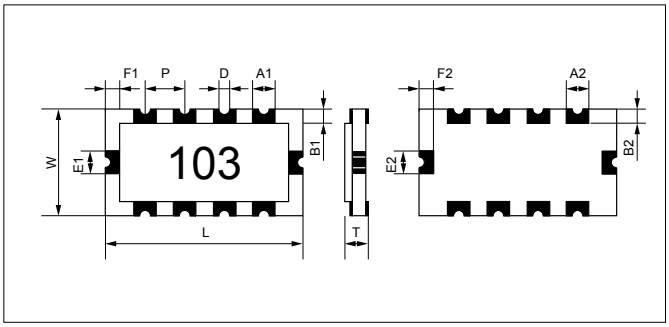
①Series
②Number of elements (8E : 8 elements)
③Resistance code (3 digits)
④Resistance tolerance (J : ±5%)
⑤Packaging

U	Plastic Taping, 4,000pcs/reel

∗ Taping Qty: 4000pcs/7 inch reel (4mm pitch)
Carrier Tape: plastic

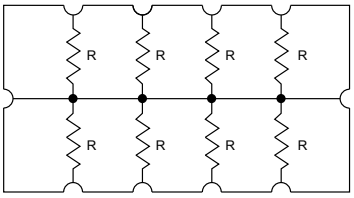
Shape and Dimensions

(Unit : mm)



Code	L	W	T	A1	B1
Dimensions	4.0±0.15	2.1±0.15	0.6±0.1	0.5±0.1	0.25±0.15
Code	**E1**	**F1**	**D**	**P**	**A2**
Dimensions	0.5±0.1	0.3±0.15	0.3typ	0.8typ	0.4±0.1
Code	**B2**	**E2**	**F2**		
Dimensions	0.4±0.15	0.5±0.1	0.35±0.15		

Circuit Diagram

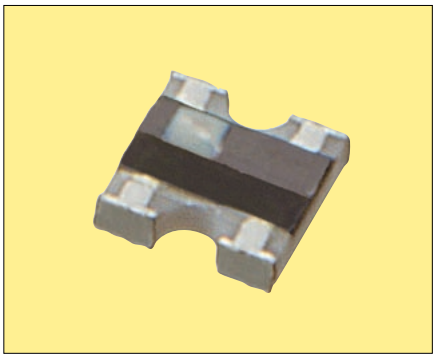


∗ nominal resistance value is all the same.

Specifications

Item	Rating
Rated power (70°C)	1/16W(0.0625W)/Element
Max working voltage*	25V
Max over-load voltage	50V
Resistance value	100Ω to 220KΩ
Tolerance	J:±5%
Number of elements	8E:8 Elements
Working temperature	−55 to +125°C

∗ Rated Voltage: $\sqrt{\text{Rated power} \times \text{Resistance value}}$, whichever is less.
∗ Standard Resistance Value: E-6 Series
∗ If resistance value under 100Ω is needed, please contact sales.



RoHS Compliant

Features

- Compared with three past in the chip resistor use, reduction in mounting costs and process, save PCB space

How to Order

ATC 1A 2 C H
① ② ③ ④ ⑤

①Series
②Size (1A : 1.0×1.0mm)
③Attenuation (1 digit numbering)
1: 1dB, 2: 2dB, 3: 3dB, 4: 4dB, 5: 5dB
6: 6dB, 7: 7dB, 8: 8dB, 9: 9dB, A: 10dB
④Attenuation tolerance

C	±0.3dB	**D**	±0.5dB

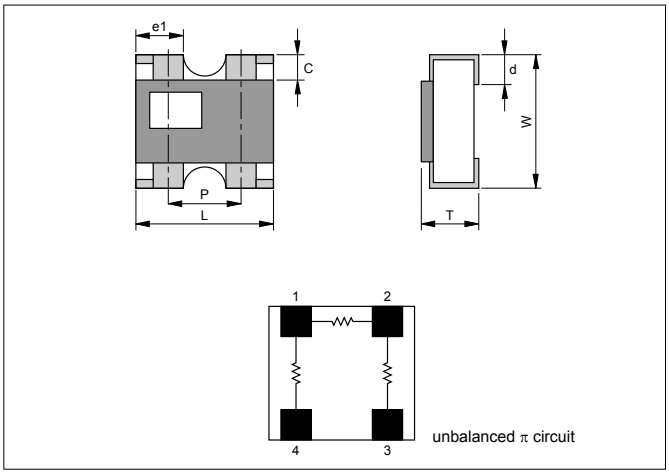
⑤Packaging

Code	Form	Material	Packing unit
H	Taping	Paper	10000pcs/reel

∗ 2mm pitch taping

Dimensions

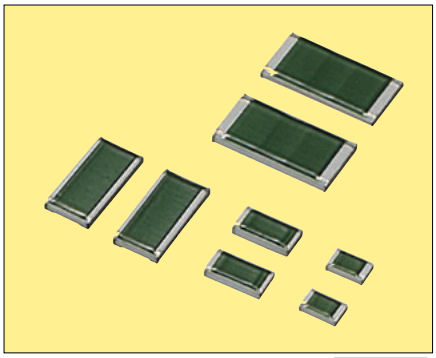
(Unit : mm)



Code	L	W	T	P	c
Dimensions	1.00±0.10	1.00±0.10	0.35±0.05	0.65typ	0.20±0.15
Code	**d**	**e1**			
Dimensions	0.20±0.15	0.33±0.10			

Rating

Chip attenuators	
Item	**Rating**
Impedance	50Ω
Attenuation	1dB, 2dB, 3dB, 4dB, 5dB 6dB, 7dB, 8dB, 9dB, 10dB
Attenuation tolerance	±0.3dB: 1dB to 5dB ±0.5dB: 6dB to 10dB
Rated power	40mW/package
Applicable frequency	DC to 2GHz
VSWR	1.3 max
Working temperature	–55 to +125°C



RoHS Compliant

Features

- Suitable for voltage detector circuit of mobile computing device and cellular phone.

How to Order

LR 21 - R100 F - T
① ② ③ ④ ⑤

①Series LR
②Size (EIA)

21	0805	**50**	1020
32	1206	**63**	2512

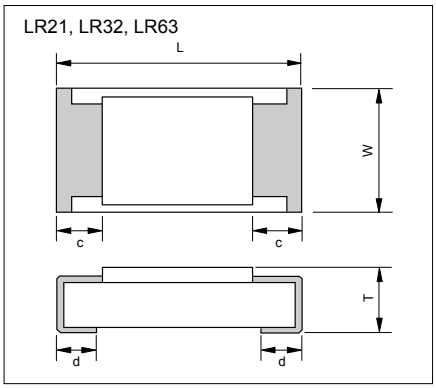
③Resistance Value (4 digits)
R047 = 47mΩ
R330 = 330mΩ
1R00 = 1000mΩ
④Tolerance

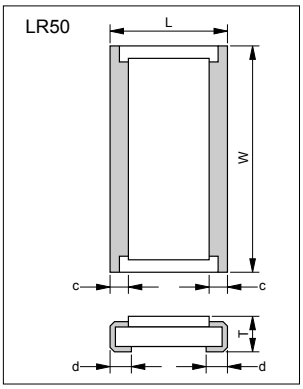
K	±10%
F	±1%

⑤Packaging

T	Paper Taping(LR21, LR32), 5,000pcs/7"reel
U	Plastic Taping(LR50, LR63), 4,000pcs/7"reel

Dimensions





*No marking

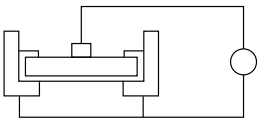
(Unit : mm)

	W	L	c	d	T
LR21 (0805)	$1.25^{+0.15}_{-0.10}$	2.00±0.10	0.25±0.20	0.40±0.20	0.55±0.10
LR32 (1206)	$1.55^{+0.15}_{-0.10}$	3.10±0.10	0.25±0.20	0.45±0.20	$0.55^{+0.10}_{-0.05}$
LR50 (1020)	5.00±0.20	2.50±0.20	0.20±0.15	0.50±0.20	0.60±0.10
LR63 (2512)	3.20±0.20	6.30±0.20	0.45±0.20	0.45±0.20	0.60±0.10

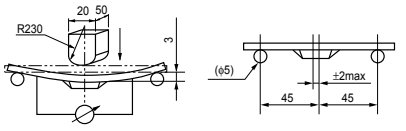
Specifications

Item / Series	Rated power	Max working voltage	Resistance tolerance	Resistance value	Working temperature	Temperature characteristics
LR21 (0805)	0.25W (1/4W)	287mV	F: ±1%	100 to 149mΩ	–55 to +125°C	±150ppm/°C
				150 to 330mΩ		±100ppm/°C
LR32 (1206)	0.5W (1/2W)	707mV	K: ±10%	20 to 50mΩ	–55 to +125°C	±3000ppm/°C
			F: ±1%	100 to 149mΩ		±150ppm/°C
				150 to 1000mΩ		±100ppm/°C
LR50 (1020)	1W	316mV	F: ±1%	20 to 29mΩ	–55 to +125°C	±150ppm/°C
				30 to 100mΩ		±100ppm/°C
LR63 (2512)	1W	1000mV	F: ±1%	100 to 1000mΩ	–55 to +125°C	±100ppm/°C

Electrical Characteristics

<table>
<tr><th colspan="2" rowspan="2">Item</th><th colspan="2">Standard</th><th colspan="2">Test Conditions</th></tr>
<tr><th>Resistor</th><th>Jumper</th><th>Resistor</th><th>Jumper</th></tr>
<tr><td colspan="2">DC Resistance</td><td>Within Initial Tolerance</td><td>50mΩmax</td><td colspan="2">Power Contdition A
(20°C, 65%RH)</td></tr>
<tr><td colspan="2">Temperature Characteristics</td><td><table><tr><th>Resistance(Ω)</th><th>TCR(ppm/°C)</th></tr><tr><td>R <10
10≤ R ≤1M
1M< R</td><td>–100 to +600
–250 to +250
–500 to +300</td></tr></table></td><td></td><td>Test Temperature: 25,125(°C)
$\Delta R/R=R_2–R_1/R_1\times1/T_2–T_1\times10^6$
ΔR/R: Temp. Coefficient (ppm/°C)
T_1: 25(°C)
T_2: 125(°C)
R_1: T_1 Resistance at (Ω)
R_2: T_2 Resistance at (Ω)</td><td></td></tr>
<tr><td rowspan="2">Short-time Overload</td><td>ΔR/R</td><td>±(2.0%+0.10Ω)max
of the intial value</td><td>50mΩmax</td><td>(1) Apply 2.5×rated voltage for 5sec.
(2) Wait 30minutes
(3) Measure resistance</td><td>(1) 2A for 5sec.
(2) Wait 30minutes
(3) Measure resistance</td></tr>
<tr><td>Visual</td><td colspan="2">No evidence of mechanical damage
intermittent overload</td></tr>
<tr><td rowspan="2">Intermittent Overload</td><td>ΔR/R</td><td>±(5%+0.1Ω)max
of the intial value</td><td>50mΩmax</td><td>(1) Perform 10000voltage cycles as follows:
ON (2.5×rated voltage) 1sec.
OFF 25sec.
(2) Stabilization time 30min without loading
(3) Measure resistance</td><td>(1) Perform 10000 current cycles as follows:
ON (2A) 1sec.
OFF 25sec.
(2) Wait 30minutes
(3) Measure resistance</td></tr>
<tr><td>Visual</td><td colspan="2">No evidence of mechanical damage</td></tr>
<tr><td colspan="2">Dielectric Withstanding Voltage</td><td colspan="2">No evidence of mechanical damage</td><td colspan="2" rowspan="2">Apply 300VAC for 1sec
 
Apply 100V DC.</td></tr>
<tr><td colspan="2">Insulation Resistance</td><td colspan="2">10^8Ωmin</td></tr>
</table>

Mechanical Characteristics

Item		Standard		Test Conditions	
		Resistor	Jumper	Resistor	Jumper
Terminal Strength	ΔR/R	±(1%+0.05Ω)max of the intial value	50mΩmax	Apply the load as show: Measure resistance during load application Unit: mm Bending in 10seconds  PC board: Glass epoxy t=1.6	
	Visual	No evidence of mechanical damage after loading			
Soldering Heat Resistance	ΔR/R	±(1%+0.05Ω)max of the intial value	50mΩmax	Immerse into molten solder at 260±5°C for 10±1sec. Stabillize component at room temperature for 1hr. Measure resistance.	
	Visual	No evidence of leaching			
Solderability		Coverage ≥95% each termination end		Immerse in Rogin Flux for 2±0.5 sec. and in SN62 solder at 235±5°C for 2±0.5 sec.	
Anti-Vibration Test	ΔR/R	±(1%+0.1Ω)max of the intial value	50mΩmax	2 hrs. each in X, Y and Z axis. (TTL 6hrs.)10 to 55 Hz sweep in 1min.at 1.5mm amplitude.	
	Visual	No evidence of mechanical damage			
Solvent Resistance	ΔR/R	±(0.5%+0.05Ω)max of the intial value	50mΩmax	Immerse in static state butyl acetate at 20°C to 25°C for 30±5sec. Stabillize component at room temperature for 30min then measure Value.	
	Visual	No evidence of mechanical damage			

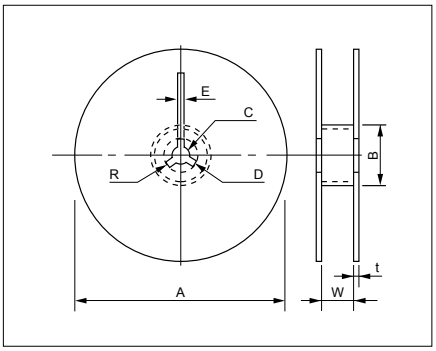
Environmental Characteristics

Item		Standard		Test Conditions	
		Resistor	Jumper	Resistor	Jumper
Temperature Cycle	ΔR/R	±(1%+0.05Ω)max of the intial value	50mΩmax	1) Run 5cycles as follows: –55±3°C for 30min. 125±3°C for 30min. Room temp for 10-15min. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
Low Temperature Storage	ΔR/R	±(2%+0.1Ω)max of the intial value	50mΩmax	1) Dwell in –55°C chamber without loading for 1000^{+48}_{0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
High Temperature Storage	ΔR/R	±(3%+0.1Ω)max of the intial value	50mΩmax	1) Dwell in 125°C chamber without loading for 1000^{+48}_{0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
Moisture Resistance	ΔR/R	±(3%+0.1Ω)max of the intial value	50mΩmax	1) Dwell in temp: 65°C RH90 to 95%RH chamber without loading for 1000^{+48}_{0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
Life Test	ΔR/R	±(3%+0.1Ω)max of the intial value	50mΩmax	1) Temp: 70±3°C Voltage: (rated voltage) on 90 min off 30min. Duration: 1000^{+48}_{0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
Loading Life in Moisture	ΔR/R	±(3%+0.1Ω)max of the intial value	50mΩmax	1) Temp: 40±2°C RH: 90-95% Voltage Cycle: on 90 min(rated voltage) off 30min. Duration: 1000^{+48}_{0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			

Tape & Reel

• Reel

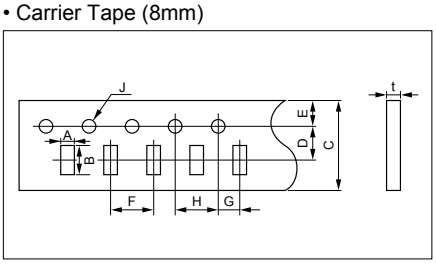
(Unit : mm)



Code	A	B	C	D	E	W	t	R
Width: 8mm	ϕ178±2.0	ϕ50min.	ϕ13.0±0.5	ϕ21.0±0.8	2.0±0.5	10.0±1.5	2.5MAX.	1.0
Width: 12mm						13.0±1.5		

• Carrier Tape (8mm)

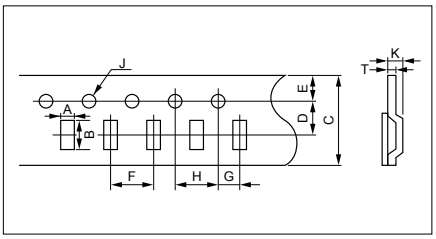
(Unit : mm)



TYPE \ Dimension Code	A	B	C	D	E	F	G	H	J	t
0404	1.2±0.1	1.2±0.1	8.0±0.2	3.5±0.05	1.75±0.1	2.0±0.1	2.0±0.05	4.0±0.1	ϕ1.5 $^{+0.1}_{-0}$	0.6max.
0804	1.25±0.2	2.25±0.2								1.1max.
0805	1.65±.0.2	2.4±.0.2				4.0±0.1				
1206	2.0±.0.2	3.6±.0.2								
1506	1.9±.0.2	4.1±.0.2								

• Carrier Tape (12mm)

(Unit : mm)



TYPE \ Dimension Code	A	B	C	D	E	F	G	H	J	T	K
1020	2.9±0.2	5.3±0.2	12.0±0.3	5.5±0.05	1.75±0.1	4.0±0.1	2.0±0.1	4.0±0.1	ϕ1.5 $^{+0.1}_{-0}$	0.6max.	1.4max.
1608	2.5±0.2	4.4±0.2									
2512	3.5±0.2	6.7±0.2									
2506	2.0±0.2	6.9±0.2									

• Taping Quantity per reel

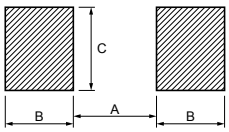
(Unit : pcs)

TYPE	Series	Paper (ϕ178 reel)
0404	CRC11A2E, ATC1A	10000 (2mm pitch)
0804	CRB2A4E, CRC2A4E	10000 (2mm pitch)
0805	LR21	5000 (4mm pitch)
1206	LR32	5000 (4mm pitch)
1506	CRC4A8E	5000 (4mm pitch)
1020	LR50	4000 (4mm pitch)
1608	RNA4A	4000 (4mm pitch)
2512	LR63	4000 (4mm pitch)
2506	CRB6A8E	4000 (4mm pitch)

Recommended Land Patterns

Chip Type

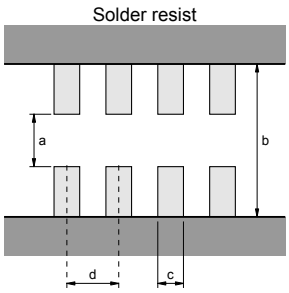
(Unit : mm)



EIA Size	A	B	C
0805	1.0	0.8	1.2
1206	2.2	0.9	1.5
1020	1.4	1.0	5.0
2512	5.0	1.0	3.0

Array Type

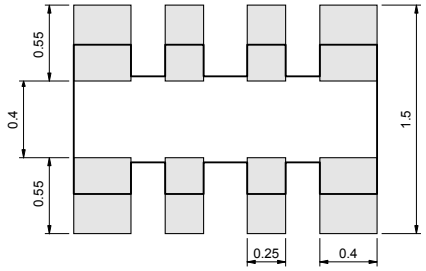
(Unit : mm)



Series	a	b	c	d
CRB2A4E	0.4	1.5	0.25	0.5
CRC11A2E	0.5	1.5	0.4	0.65
CRC4A8E	0.8	2.4	0.3	0.5
CRB6A8E	0.7	2.3	0.4	0.8
ATC1A	0.5	1.5	0.4	0.65

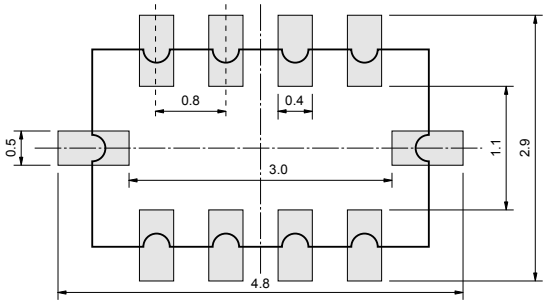
(Unit : mm)

CRC2A4E Series



(Unit : mm)

RNA4A8E Series



Circuit design

1) Once application and assembly environments have been checked, the resistors may be used in conformance with the catalog and the specifications.

2) Please consult the manufacturer in advance when the resistors is used in devices such as: devices which deal with human life, I.e. medical devices; devices which are highy public orientated; and devices which demand a high standerd of liability.

3) Please use the resistors in conformance with the operating temperature provided in both the catalog and the specifications.

4) Please keep voltage under the rated voltage which is applied to the resistor.

5) Do not use the resistor in an environment where it might easily exceed the respective provisions concerning shock and vibration specified in the catalog and specifications.

6) Please do not use the resistor in the following environments.
①State that water, oil, and solvent hang in resistor
②State where poisonous gas (sulfur and chlorine, etc.) exists
③State that direct sunshine, radiation, and ultraviolet, etc. are irradiated

7) There is a thing that resistance changes according to the stuff of the resin when the coating with the resin is given.
Please use resin coating after confirming the characteristic.

8) There is a thing that resistance changes according to flux and cleaner.
Please use flux and cleaner after confirming the characteristic.

9) Please consult about a lead free products.

Storage

1) Keep storage place temperature +5 to +35°C, humidity 45 to 75% RH.

2) Please keep parts out of poisonous gas such as sulfur or chlorine in the air, and out of salty moisture. Or they may cause rust of terminal, and poor solderability. and, please consider the above-mentioned item after mounting your company.

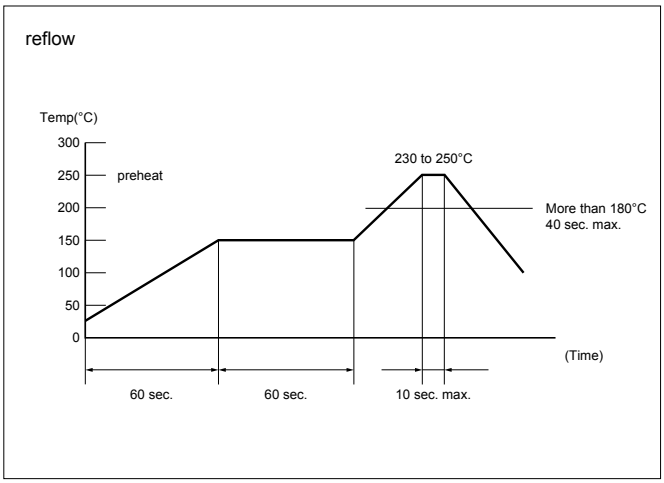
3) Soldering iron

Temperature	soldering iron 300±5°C *
Time	3 sec. max. *

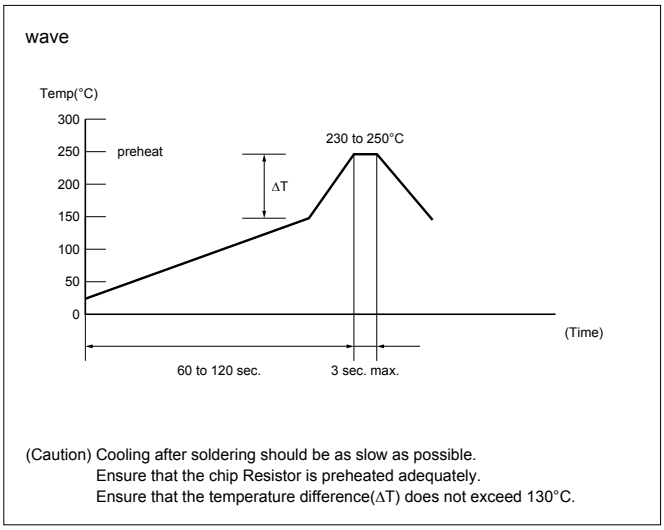
*Do not place the soldering iron on the chip. Soldering iron is 30W max.

Soldering method

1) Recommendable temperature profile

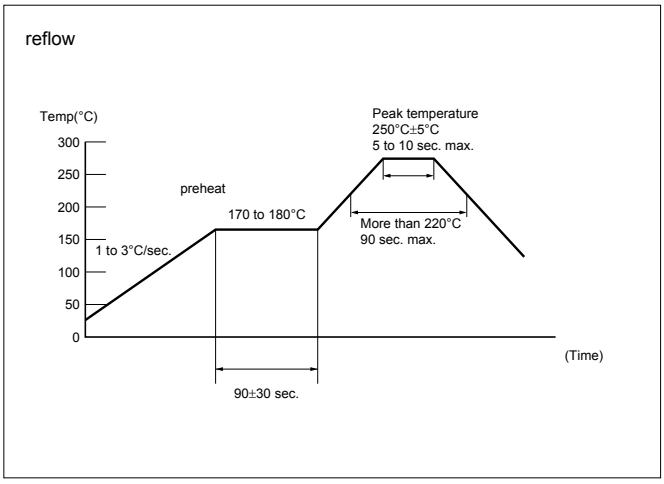


2) Recommendable temperature profile



(Caution) Cooling after soldering should be as slow as possible.
Ensure that the chip Resistor is preheated adequately.
Ensure that the temperature difference(ΔT) does not exceed 130°C.

3) pb-free recommendable temperature profile



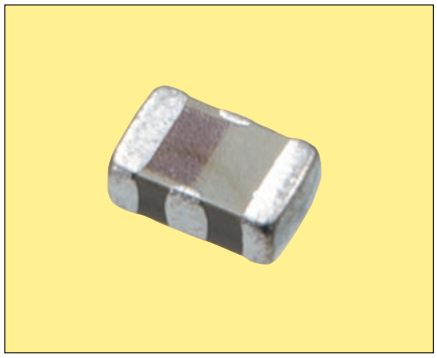
THE NEW VALUE FRONTIER

KYOCERA

EMC Components

EMI Filters

AVX



RoHS Compliant

Features

- Distributed constant type LC filter. Prevents ringing caused by circuit impedance. Suitable for high speed digital circuits and video signal lines.
- Stable noise attenuation over wide frequency ranges.
- Low profile (T=0.95mm max.) suitable for miniature electronic equipments.
- First class auto-placement

Applications

- PCs, Laser Printers, Cellular Phone, Clock Data Lines for LCD Display
- High Speed Video Signal Circuits and Interface Circuits
- High Speed Digital Circuits
- Anti-Noise Solution
  Achieves Effective Noise Suppression in Noisy High Speed Circuits without Signal Waveform Distortion

How to Order

KNF ① 21 ② 050 ③ - W ④ 3 ⑤

①Series
②Size EIA (EIAJ)
21 :0805 (2012)
③Frequency

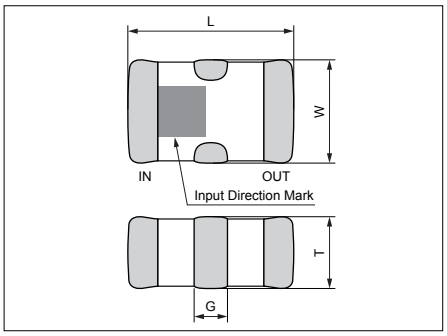
025	25MHz	**200**	200MHz
050	50MHz	**400**	400MHz
100	100MHz		

④Taping Direction (See Fig 1)
W: Standard
⑤Quantity per Reel

3	3000pcs.

Dimensions

(Unit : mm)

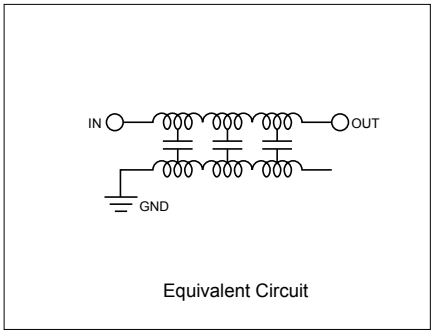


	KNF21
L	2.0±0.2
W	1.25±0.2
T	0.8±0.15
G	0.4±0.3

Specifications

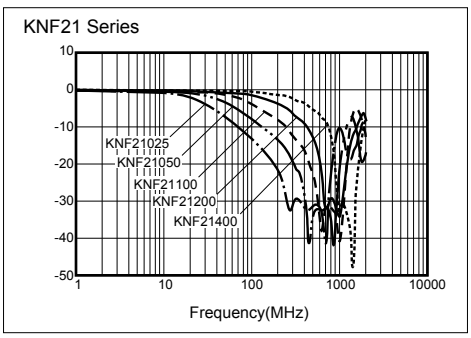
Part Number	Cut off Freq. (MHz)	Capacitance (+50/-20%) (pF)	20dB Attenuation (Typical)	Rated current(mA)	Rated voltage(VDC)
KNF21025	25MHz	235pF	200– 600MHz	150mA	25VDC
KNF21050	50MHz	130pF	350– 850MHz		
KNF21100	100MHz	65pF	450– 950MHz		
KNF21200	200MHz	33pF	700–1200MHz		
KNF21400	400MHz	17pF	900–1400MHz		

∗Cut off Frequency at Attenuation typical 3dB, max. 6dB
Operating Temperature: -25 to 85(°C)



Equivalent Circuit

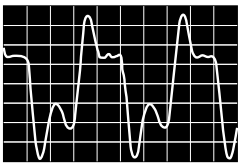
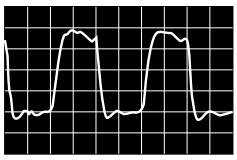
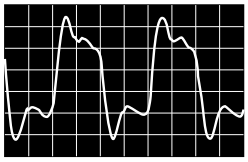
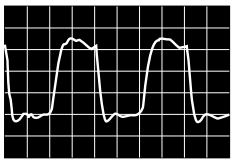
Frequency Characteristics



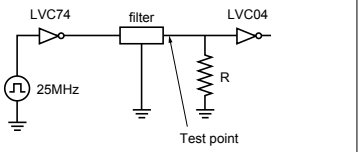
<Impedance Matching Free>

- Stable attenuation against impedance change
- Good impedance matching without ringing on distortion even at the time of IC ON/OFF and pattern layout change

Output Waveform (Clock frequency 25MHz)

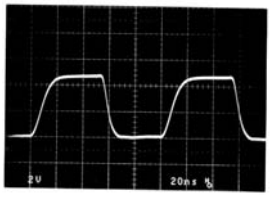
R	LC filter	KNF21100
1MΩ		
300Ω		

Test circuit

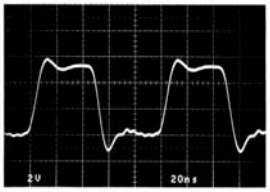


<No Ringing>
Excellent Impedance Matching

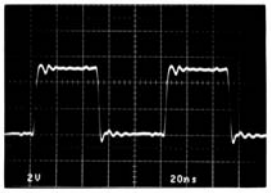
KNF series
Output waveform



LC filter
Output waveform



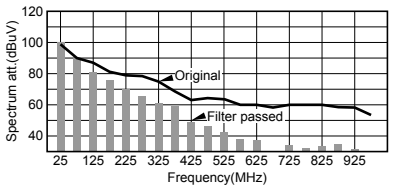
No filter
Output waveform



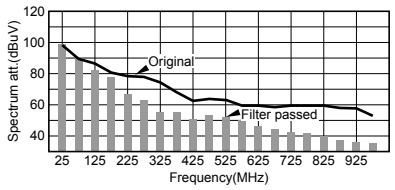
- Wide attenuation up to high frequency range without distortion

Wide Attenuation Bandwidth

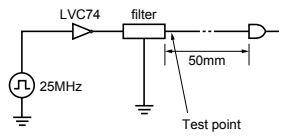
KNF21100



LC Filter (T-Type)

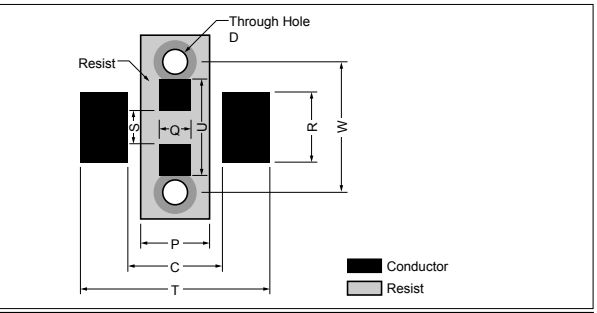


Test Circuit



Recommended Land Pattern

(Unit : mm)

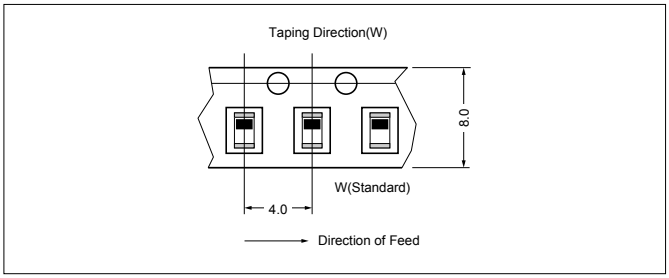


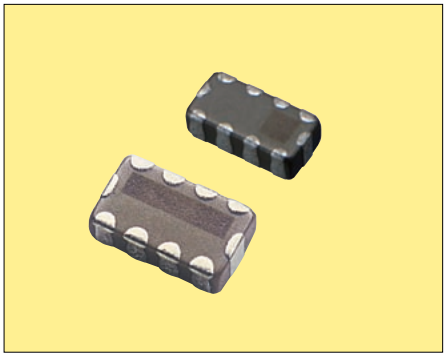
	T	W	R	C	P	Q	S	D	U
KNF21	3.20	2.30	1.00	1.20	0.80	0.40	0.60	0.3-0.4	2.00

Packaging Specification (Fig.1)

- Taping (3,000/reel)

(Unit : mm)





RoHS Compliant

Features

- Distributed constant type LC filter. Prevents ringing caused by circuit impedance. Suitable for high speed digital circuits and video signal lines.
- Stable noise attenuation over wide frequency ranges.
- Small and low profile.

Applications

- Data Lines for Mobile Phones (LCD Lines, Video Lines, Bus Lines)
- Bus Lines for Digital Equipment

How to Order

KNA ① 16 ② 300 ③ - W ④ 3 ⑤

①Series

②Size

	EIA	EIAJ
16	0603	1608
21	0805	2012

③Frequency

300(KNA16)	300MHz
400(KNA21)	400MHz

*Frequency at Attenuation typical 3dB, max. 6dB

④Taping Direction
W: Standard

⑤Quantity per Reel

3	3000pcs.	KNA21 : std.
4	4000pcs.	KNA16 : option
5	5000pcs.	KNA16 : std.

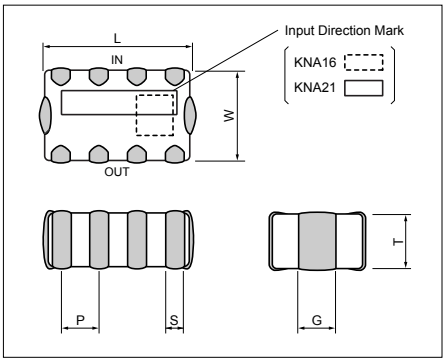
Specifications

Part Number	Cut off Freq. (MHz)	Capacitance (+25/-20%) (pF)	Attenuation (Typical)	Rated current(mA)	Rated voltage(VDC)
KNA16300	300MHz	16pF	800-1000MHz@−25dB	35mA	25VDC
KNA21301	300MHz	15pF	800-2000MHz@−20dB	35mA	25VDC
KNA21400	400MHz	18pF	800-1000MHz@−20dB	50mA	25VDC

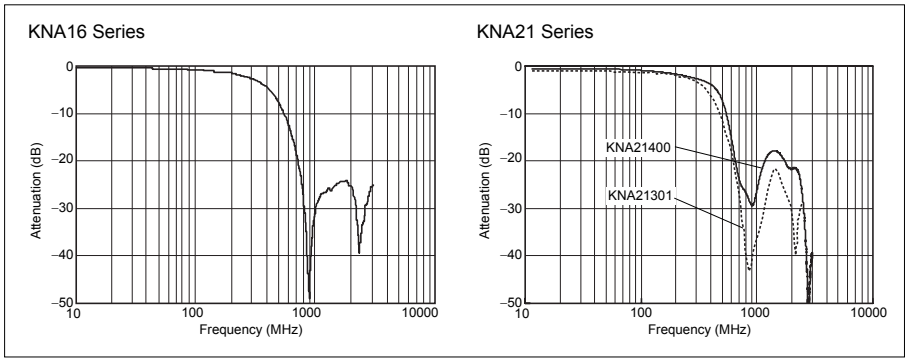
Operating Temperature: −25 to 85(°C)

Dimensions

(Unit : mm)



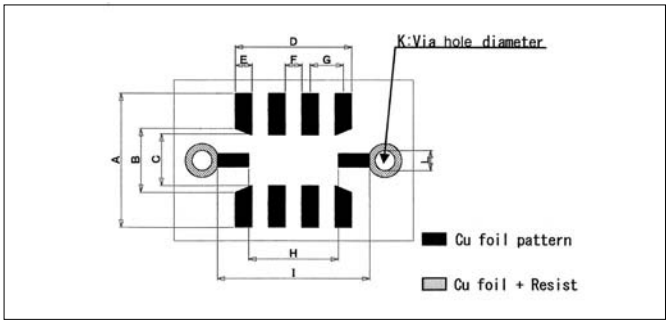
Frequency Characteristics



	L	W	T	P	S	G
KNA16	1.60±0.08	0.8±0.08	0.50±0.1	0.40	0.20±0.075	0.20±0.075
KNA21	2.0±0.2	1.25±0.2	0.7±0.15	0.50	0.25±0.1	0.40±0.15

Recommended Land Pattern

(Unit : mm)

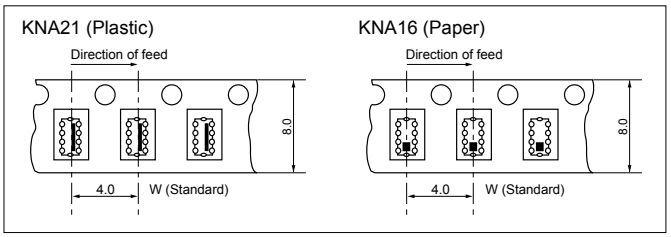


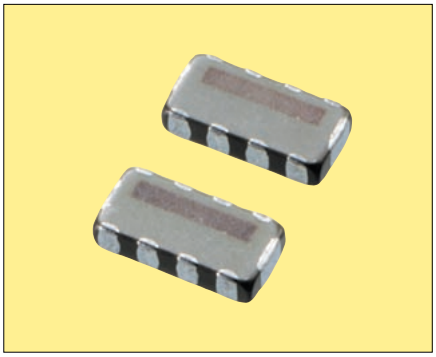
CODE	A	B	C	D	E	F	G	H	I	K	L
KNA16	1.10	0.60	0.50	1.40	0.20	0.20	0.40	1.30	1.80	0.20	0.20
KNA21	2.00	0.95	0.75	1.75	0.25	0.25	0.50	1.35	2.45	0.30	0.20

Packaging Specification

•Taping (KNA16 : 5,000/reel : STD. / 4,000/reel : Opt. / KNA21 : 3,000/reel : STD.)

(Unit : mm)





RoHS Compliant

Features

- Distributed constant type LC filter.
  Prevents ringing caused by circuit impedance.
  Suitable for high speed digital circuits and video signal lines.
- Stable noise attenuation over wide frequency ranges.
- Low profile (H=0.85mm max.) suitable for miniature electronic equipments.
- First class auto-placement

Applications

- PCs, Laser Printers, Cellular Phone, Clock Data Lines for LCD Display
- High Speed Video Signal Circuits and Interface Circuits
- High Speed Digital Circuits
- Anti-Noise Solution
  Achieves Effective Noise Suppression in Noisy High Speed Circuits without Signal Waveform Distortion

How to Order

KNA 32 050 - W 3
① ② ③ ④ ⑤

①Series
②Size EIA (EIAJ)
32 :1206 (3216)
③Frequency

050	50MHz	**200**	200MHz
100	100MHz		

*Frequency at Attenuation typical 3dB, max. 6dB

④Taping Direction (See Fig.1)
W: Standard
⑤Quantity per Reel

3	3000pcs.

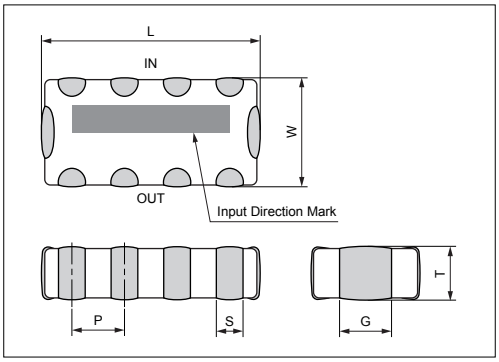
Specifications

Part Number	Cut off Freq. (MHz)	Capacitance (+25/-20%) (pF)	20dB Attenuation (Typecal)	Rated current(mA)	Rated voltage(VDC)
KNA32050	50MHz	115pF	350 – 850MHz	100mA	25VDC
KNA32075	75MHz	82pF	400 – 900MHz	100mA	25VDC
KNA32100	100MHz	65pF	450 – 950MHz	100mA	25VDC
KNA32150	150MHz	45pF	600–1100MHz	100mA	25VDC
KNA32200	200MHz	35pF	700–1200MHz	100mA	25VDC

Operating Temperature: –25 to 85(°C)

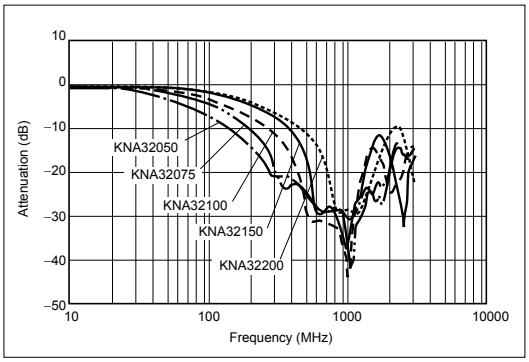
Dimensions

(Unit : mm)



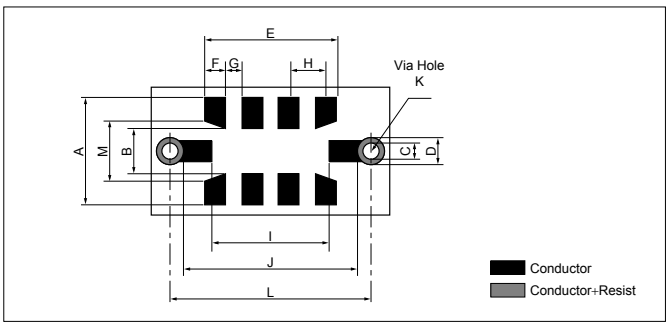
	KNA32
L	3.2±0.2
W	1.6±0.2
T	0.75±0.1
P	0.8
S	0.35±0.15
G	0.80±0.20

Frequency Characteristics



Recommended Land Pattern

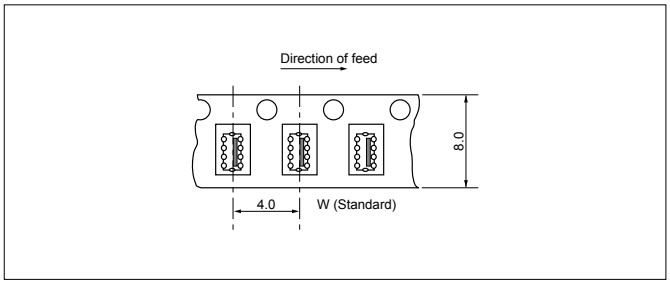
(Unit : mm)



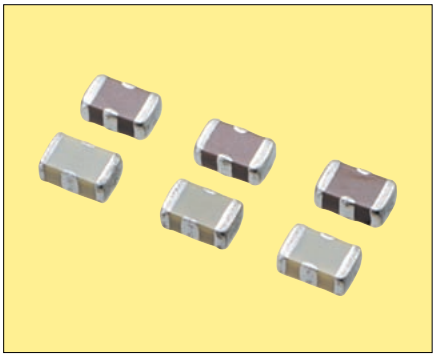
Packaging Specification (Fig.1)

• Taping (3,000/reel)

(Unit : mm)



CODE	A	B	C	D	E	F	G	H	I	J	K	L	M
DIMENSION	2.2	1.0	0.4	0.6	2.8	0.4	0.4	0.8	2.6	3.8	0.3 to 0.4	4.2	1.3



Pb Free RoHS Compliant

Features

- 0805 Size. Rated current up to 2A.
- Effective for filtering noise on power (Vcc) lines.

Applications

- PCs, Laser Printers, Cellular Phone, Power/Signal Lines for LCD Display, Office Equipments
- AV Power Supply/Signal Line, TV, VCR, etc.
- High Current Signal Lines

How to Order

KNH ① 21 ② 104 ③ - 3 ④ AA ⑤

①Series
②Size EIA (EIAJ)
21: 0805 (2012)
③Capacitance Value

104	100nF	**101**	100pF
473	47nF	**470**	47pF
471	470pF	**220**	22pF
221	220pF		

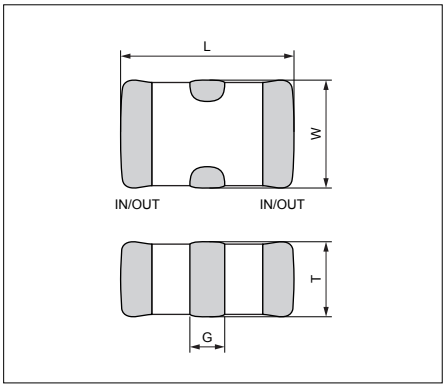
④Quantity per Reel

3	3000pcs.

⑤Code (AA : STD)

Dimensions

(Unit : mm)



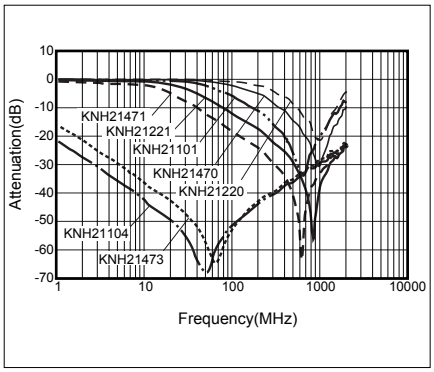
	KNH21
L	2.0±0.2
W	1.25±0.2
T	0.85±0.15
G	0.40±0.30

Specifications

Type	Capacitance Value(pF) (+50/-20%)	Rated Current (A)	Rated Voltage (VDC)	Direct-current resistance(Ω)
KNH21104	100,000	2.0	25	≤0.02
KNH21473	47,000	2.0	50	≤0.02
KNH21471	470	1.0	50	≤0.08
KNH21221	220	1.0	50	≤0.08
KNH21101	100	1.0	50	≤0.08
KNH21470	47	1.0	50	≤0.08
KNH21220	22	1.0	50	≤0.08

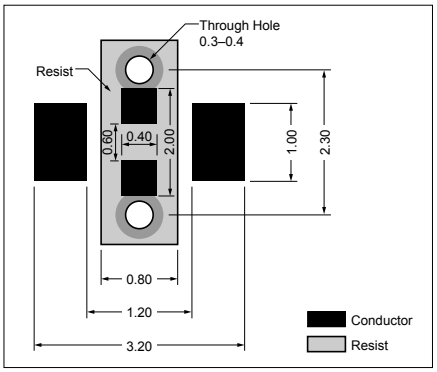
Operating Temperature: -25 to 85(°C)

Attenuation Characteristics



Recommended Land Pattern

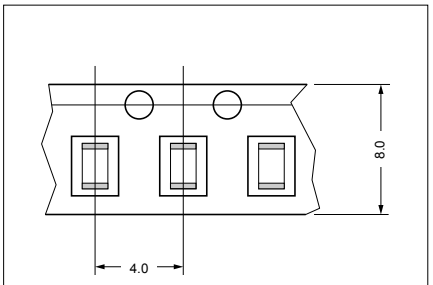
(Unit : mm)



Packaging specifications

• Taping (3000/reel)

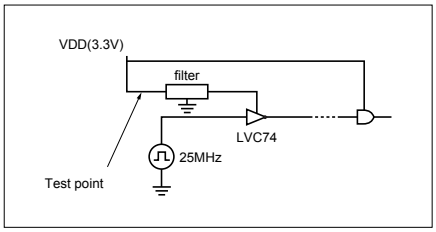
(Unit : mm)



<Electrical Characteristics>

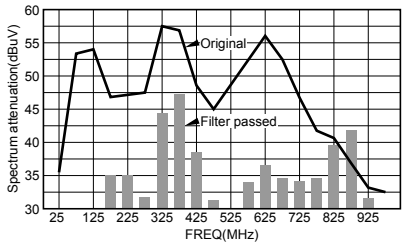
• Wide attenuation range including surrounding circuit.

Test Circuit

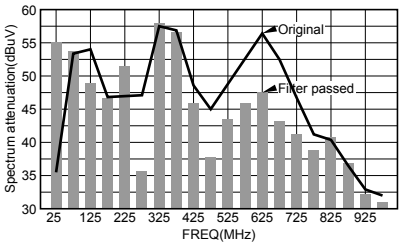


Attenuation Effect of Power Supply Noise

KNH series



LC filter



THE NEW VALUE FRONTIER

KYOCERA

Timing Devices

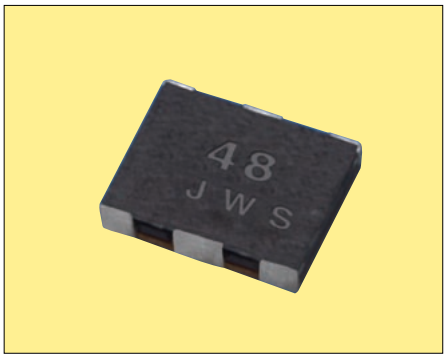
Ceramic Resonators
SAW Resonators
Crystal Units
Crystal Oscillators
Voltage Controlled Oscillators
Temperature Compensated Crystal Oscillators (TCXO)
High Precision Oscillators

AVX

Products		Dimensions (mm)			Applications					Frequency Range (MHz)	Conditions of Use				Lead-free Status	RoHS Compliant
		L	W	T	Digital Electronics OA, PC Peripherals Amusement	Car Electronics ITS Car Audio Car Navigation	Car Electronics (ECU, Air Bag, ABS, TPMS etc.)	Mobile Comm. Wireless LAN Dedicated Short Range Comm. (DSRC)	Industrial Use (Broadcast, Medical, Base Station etc.)	1 10 50 100 300 ~ 400	Solder: Manual	Solder: Reflow	Solder: Flow	Washable	A: Lead-free Products B: Products with Lead-free Terminations C: Non Lead-free	
Ceramic Resonators	PRTC	2.5	2.0	0.8 max.	○	○		○		25 ---------- 60	Yes	Yes	No	No	B	Yes
	SSR-B	3.2	2.1	1.5	○	○		○		16 ---------- 60	Yes	Yes	No	No	B	Yes
	PBRC-G/H	7.4	3.4	2.0 max.	○	○			○	2 ---------- 20	Yes	Yes	No	Yes	B	Yes
	PBRC-L/M	4.5	2.0	1.2 max.	○	○			○	3.68 ---------- 20	Yes	Yes	No	Yes	B	Yes
	PRQC	3.2	1.3	1.3	○	○			○	8 ------ 20	Yes	Yes	No	Yes	B	Yes
	PBRV-H	7.4	3.4	2.0 max.		○	○			4 ---------- 20	Yes	Yes	No	Yes	B	Yes
	PBRV-M	4.5	2.0	1.2 max.		○	○			4 ---------- 20	Yes	Yes	No	Yes	B	Yes
	PPQV	3.2	1.3	1.3		○	○			8 ------ 20	Yes	Yes	No	Yes	B	Yes
SAW Resonators	PARM	3.0	3.0	1.5 max.	○	○		○	○	300--479	Yes	Yes	No	Yes	A	Yes
	PARS	5.5	3.8	1.5 max.		○		○	○	300--479	Yes	Yes	No	Yes	A	Yes
	PARV	5.5	3.8	1.5 max.			○			300--479	Yes	Yes	No	Yes	A	Yes
Crystal Units	CX2520SB(CX-2520SB)	2.5	2.0	0.45	○	○		○		13.56 ---------- 60	Yes	Yes	No	Yes	A	Yes
	CX3225SB(CX-101F)	3.2	2.5	0.6 max.	○	○		○		12 ---------- 54	Yes	Yes	No	Yes	A	Yes
	CX4025SB(CX-4025S)	4.0	2.5	0.75	○	○		○		12---------- 40	Yes	Yes	No	Yes	A	Yes
	CX5032SB(CX-96F)	4.9	3.1	0.7	○	○		○		9.84375 ---------- 120	Yes	Yes	No	Yes	A	Yes
	CX5032GB(CX-53F)	5.0	3.2	1.0	○	○				9.84375 ---- 54	Yes	Yes	No	Yes	B	Yes
	CX8045JA(CX-17F)	8.0	4.5	1.9			○			8 ---------- 30	Yes	Yes	No	Yes	B	Yes
	CX8045GB(CX-8045G)	8.0	4.5	1.8	○	○				7.2 ---------- 48	Yes	Yes	No	Yes	B	Yes
	CX5032GA(CX-53G)	5.0	3.2	1.3			○			9.84375 ------- 40	Yes	Yes	No	Yes	B	Yes
	CXB855GA(CX-5FW)	11.8	5.5	2.5			○			3.5---------- 20	Yes	Yes	No	Yes	B	Yes
	CXB855GB(CX-5FD)	11.8	5.5	1.8	○	○				3.5---------- 60	Yes	Yes	No	Yes	B	Yes
	CXF49FFA(CX-49F)	11.4	5.0	5		○	○			3.2 ---------- 20	Yes	Yes	No	Yes	A	Yes
	CXZ49GFB(CX-49G)	12.3	4.8	4.5 max.	○	○				3.2 ---------- 60	Yes	Yes	No	Yes	A	Yes
	CXZ49CPA(CX-49L)	11.05	4.65	5.08 max.			○			3.2 ---------- 20	Yes	Yes	No	Yes	C	No
	CXH49SFB(HC-49/U-S)	11.0	5.0	3.5 max.	○	○				3.2 ---------- 60	Yes	No	Yes	Yes	A	Yes
	CXH49SFA(HC-49/U-S)(Automotive)	11.0	5.0	3.5 max.		○	○			3.2 ---------- 20	Yes	No	Yes	Yes	A	Yes
Oscillators	KC2520A-C1/C2/C3	2.5	2.0	0.8	○	○		○		2 ---------- 50	Yes	Yes	No	No	A	Yes
	KC3225A-C2/C3(K25-2C/3C)	3.2	2.5	1.0 max.	○	○		○		1 ---------- 125	Yes	Yes	No	Yes	A	Yes
	KC5032C-C1(K30-1C)	5.0	3.2	1.2 max.	○	○				1.8---------- 39.99	Yes	Yes	No	Yes	A	Yes
	KC5032C-C2(K30-2C)	5.0	3.2	1.2 max.	○	○				1.8---------- 125	Yes	Yes	No	Yes	A	Yes
	KC5032C-C3(K30-3C)	5.0	3.2	1.2 max.	○	○				1.8---------- 160	Yes	Yes	No	Yes	A	Yes
	KC5032C-C3(K30-3C Heavy Load Type)	5.0	3.2	1.2 max.	○	○				14 ------ 32	Yes	Yes	No	Yes	A	Yes
	KC5032C-C5(K30-HC)	5.0	3.2	1.2 max.	○	○				1.8---------- 50	Yes	Yes	No	Yes	A	Yes
	KC5032P-P2	5.0	3.2	1.2 max.	○				○	75 ---------- 170	Yes	Yes	No	Yes	A	Yes
	KC5032P-P3	5.0	3.2	1.2 max.	○				○	75 ---------- 190	Yes	Yes	No	Yes	A	Yes
	KC5032D(FXO-61F2)	5.0	3.2	1.2 max.	○	○				1.8---------- 50	Yes	Yes	No	No	A	Yes
	KC5032D(FXO-64F2)	5.0	3.2	1.2 max.	○	○				1.8---------- 50	Yes	Yes	No	No	A	Yes
	KC5032H(MFO-208F)	5.0	3.2	1.35	○	○		○	○	1.5---------- 50	TBA	Yes	No	No	A	Yes
	KC7050A-C1(K53-1C)	7.0	5.0	1.8 max.	○	○				1.8---------- 39.99	Yes	Yes	No	Yes	A	Yes
	KC7050A-C2(K53-2C)	7.0	5.0	1.8 max.	○	○				1.8---------- 125	Yes	Yes	No	Yes	A	Yes
	KC7050A-C3(K53-3C)	7.0	5.0	1.8 max.	○	○				1.8---------- 160	Yes	Yes	No	Yes	A	Yes
	KC7050A-C5(K53-HC)	7.0	5.0	1.8 max.	○	○				1.8---------- 50	Yes	Yes	No	Yes	A	Yes
	KC7050B(FXO-31F)	7.0	5.0	1.8	○	○				1.8---------- 50	Yes	Yes	No	No	A	Yes
	KC7050B(FXO-37F,N)	7.0	5.0	1.8	○	○				80 ------ 125	Yes	Yes	No	No	A	Yes
	KC7050B(FXO-34F)	7.0	5.0	1.8	○	○				1.8----------40	Yes	Yes	No	No	A	Yes
	KC7050H-C3(K50H-3C)	7.0	5.0	1.8 max.	○					50 ---------- 170	Yes	Yes	No	Yes	A	Yes
	KC5032P-L2/L3	5.0	3.2	1.2 max.	○				○	75 ---------- 170	Yes	Yes	No	Yes	A	Yes
	KC7050P-P2	7.0	5.0	1.8 max.	○				○	75 ---------- 170	Yes	Yes	No	Yes	A	Yes
	KC7050P-P3	7.0	5.0	1.8 max.	○				○	75 ---------- 190	Yes	Yes	No	Yes	A	Yes
	KC7050P-L2/L3	7.0	5.0	1.8 max.	○				○	75 ---------- 170	Yes	Yes	No	Yes	A	Yes
	KC7050S-C1(FSO-2B)	7.0	5.0	2.0 max.	○				○	100--170	Yes	Yes	No	Yes*	A	Yes
	KC7050S-C2(FSO-2C)	7.0	5.0	2.0 max.	○				○	100---200	Yes	Yes	No	Yes*	A	Yes
	KC7050S-C3(FSO-2D)	7.0	5.0	2.0 max.	○				○	100---200	Yes	Yes	No	Yes*	A	Yes
	KCJXO(JXO)	11.0	5.0	3.6 max.	○					1---------- 70	Yes	Yes	Yes	No	A	Yes
	KCEX03(EXO-3)	12.8	7.0	5.08 max.	○					11.0592 --- 24.576	Yes	No	Yes	No	A	Yes
	KC7050S-P2/P3(FSO-1C, FSO-1D)	7.0	5.0	2.0 max.	○				○	50 ---------- 700	Yes	Yes	No	Yes*	A	Yes
	KV5032A(VC-FXO-65F)	5.0	3.2	1.2 max.	○	○				8 ---------- 40	Yes	Yes	No	No	A	Yes
	KV7050A(VC-FXO-35F)	7.0	5.0	1.8	○	○				8 ---------- 40	Yes	Yes	No	No	A	Yes
	KV7050L(VCXO-7050/7050L)	7.0	5.0	1.8	○					7.2---------- 50	Yes	Yes	No	No	A	Yes
	KV7050W-P3(K50V-3P)	7.0	5.0	1.8	○				○	155.52	Yes	Yes	No	Yes	A	Yes
	KV7050S-P3(VC-FSO-1D)	7.0	5.0	2.0 max.	○				○	600--700	Yes	Yes	No	Yes*	A	Yes
	KT2520Y	2.5	2.0	0.9 max.				○		12.6 ------- 40	TBA	Yes	No	No	A	Yes
	KT33225(KT21)	3.2	2.5	1.0 max.		○		○		12.6------- 38.4	TBA	Yes	No	No	A	Yes
	KT5032(KT18B,VC-TCXO-208Cx)	5.0	3.2	1.5 max.		○		○		13----26	TBA	Yes	No	No	A	Yes
	(VC-)DTCXO-12A	30.0	30.0	10.0 max.					○	1---------- 32	Yes	No	TBA	No	C	No
	(VC-)DTCXO-13A	40.0	40.0	10.0 max.					○	30 ---------- 320	Yes	No	TBA	No	C	No
	(VC-)DTCXO-15A	14.0	11.5	8.0					○	10 ---------- 40	Yes	No	TBA	No	B	No
	OCVCXO-120A	36.1	27.2	19.5 max.					○	10	Yes	No	TBA	No	C	No
	MCXO-094B	480	450	99					○	10	—	—	—	—	—	—

*No ultrasonic washing

MHz Band Ceramic Resonators (SMD)
PRTC Series
2.5×2.0×0.8mm



RoHS Compliant

Ultra-miniature chip resonator with 0.8mm maximum height
Best suited for compact and low profile electronic devices

Features

- Ultra-miniature (2.5×2.0×0.8mm) SMD type
- High precision type is available for full speed USB

Applications

- CD-R/W
- HDD
- DVD-ROM
- MD
- Printer
- Cellular (CDMA/PCS)
- Portable Electronic Equipment
- Memory Card
- USB

How to Order

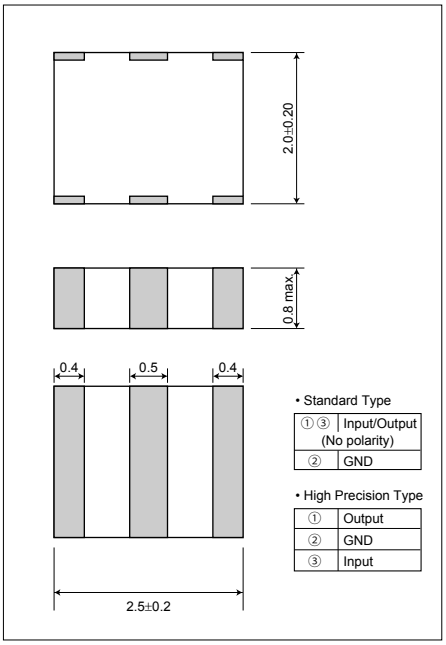
PRTC 25.00 T R 50 10 W 000
① ② ③④ ⑤ ⑥ ⑦ ⑧

①Series
②Oscillating Frequency (MHz)
③Oscillating Mode
④Packaging : Tape & Reel
4000pcs./Reel
⑤Initial Frequency Tolerance (0.5%)
⑥Load Capacitance
⑦Operating Temperature (–20°C to 80°C)
⑧Unique Code

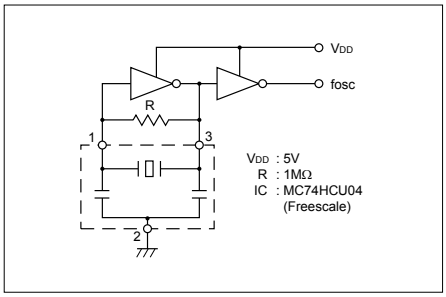
Notice

- Non Washable

Dimensions (Unit : mm)



Test Circuit



Specifications

• Standard Type

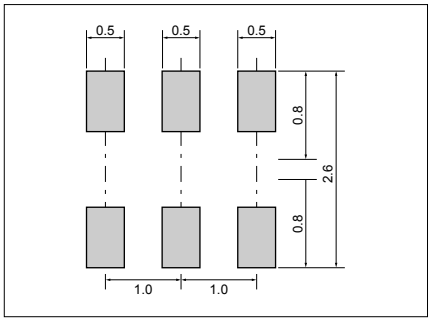
Frequency Range	Frequency Tolerance (25°C)	Temperature Stability (–20 to 80°C)	IC	Standard Frequency (MHz)
25.0 to 60.0MHz	±0.5%	±0.2%	MC74HCU04 (Freescale)	25.0, 30.0, 33.86, 40.0

Please contact your local sales office for IC matching.

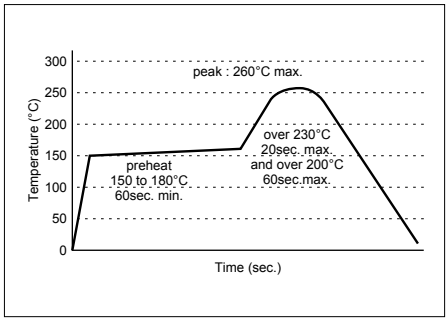
• High Precision Type

Frequency Range	Frequency Tolerance (25°C)	Temperature Stability (–20 to 70°C)	Aging (10 years)	IC	Standard Frequency (MHz)
25.0 to 60.0MHz	±0.16%	±0.08%	±0.01%	MC74HCU04 (Freescale)	48.0

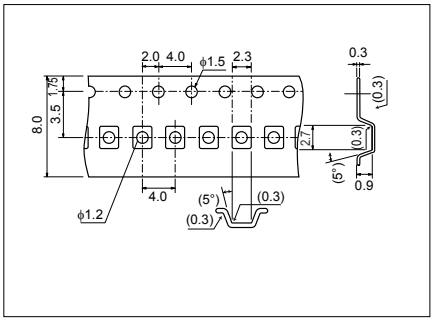
Recommended Land Pattern (Unit : mm)



Recommended Reflow Profile

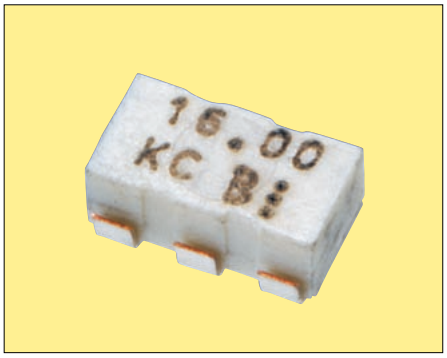


Packaging : Taping (Unit : mm)



MHz Band Ceramic Resonators (SMD)
SSR-B / SSR-F Series

3.2×2.1×1.5mm



RoHS Compliant

Features

- Miniature size (3.2×2.1×1.5 mm)
- Wide frequency range
- High precision type is available for full speed USB

Applications

- CD-ROM
- HDD
- DVD-ROM
- MD
- Printer
- Cellular (CDMA/PCS)
- Portable Electronic Equipment
- USB

How to Order

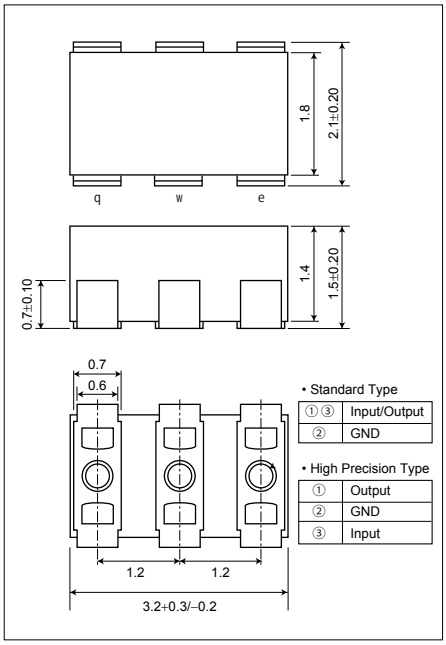
SSR 33.86 B R
① ② ③ ④

①Series
②Oscillating Frequency (MHz)
③Type B: 3rd-Overtone Mode Built-in Capacitor
F: Fundamental Mode Built-in Capacitor
④Packaging : Tape & Reel
2000pcs./Reel

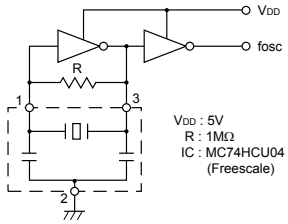
Notice

- Non Washable
- Operating Temperature –20°C to +80°C

Dimensions (Unit : mm)



Test Circuit



Specifications

• Standard Type

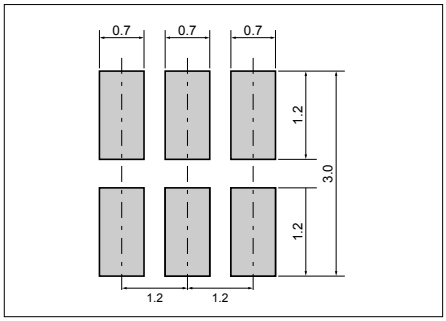
	Frequency Range	Frequency Tolerance (25°C)	Temperature Stability (–20 to 80°C)	IC	Main Frequency (MHz)
B	16.0 to 60.0MHz (3rd-overtone)	±0.5%	±0.3%	MC74HCU04 (Freescale)	16.93, 20.0, 27.0, 33.86, 50.8
F	16.0 to 20.0MHz (Fundamental)				16.93

Please contact your local AVX office for IC matching.

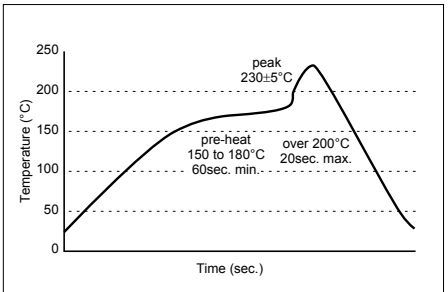
• High Precision Type

	Frequency Range	Frequency Tolerance (25°C)	Temperature Stability (–20 to 70°C)	Aging (10 years)	IC	Main Frequency (MHz)
B	16.0 to 60.0MHz (3rd-overtone)	±0.18% (Option ±0.08%)	±0.06%	±0.01%	MC74HCU04 (Freescale)	48.0

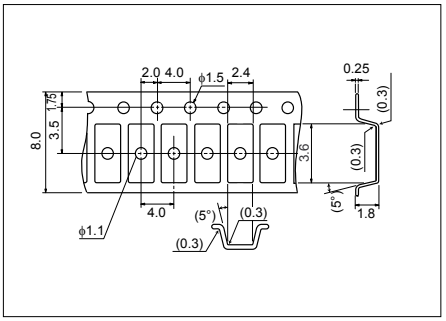
Recommended Land Pattern (Unit : mm)



Recommended Reflow Profile



Packaging : Taping (Unit : mm)



RoHS Compliant

Features

- High reliability, high temperature withstanding ceramic case
- Rectangular shape allows easy pick and placement
- Small & low profile
- Reflow solderable
- Excellent solderability (Nickel barrier+Au flash terminations)

How to Order

PBRC ① 15.00 ② G ③ R ④ 50 ⑤ Y ⑥ 000 ⑦

①Series
②Frequency (MHz)
③Type (G,L)
④Packing _ Bulk (Null)
R Reel (G: 2k/reel, L: 3k/reel)

⑤Frequency Tolerance at 25°C

10	±0.1%	**20**	±0.2%
30	±0.3%	**40**	±0.4%
50	±0.5%	**70**	±0.7%

⑥Operating Temperature

X	–40°C to 85°C	**Y**	–40°C to 125°C
Z	–40°C to 150°C		

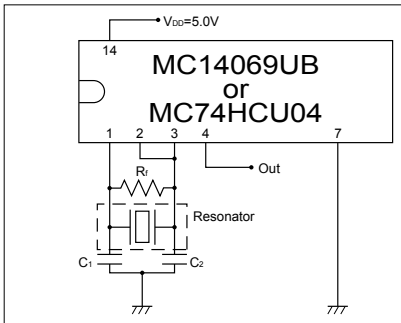
⑦Unique Code

Specifications

Series	Frequency Range(MHz)	Frequency Tolerance(25°C)	Temperature Stability
PBRC-G	2.00 to 8.00	±0.5% (op. ±0.3%)	±0.5% (–40 to 85°C)
	8.01 to 20.0	±0.7% (op. ±0.5%)	±0.1% (–40 to 85°C)
PBRC-L	4.00 to 8.00	±0.5% (op. ±0.3%)	±0.5% (–40 to 85°C)
	8.01 to 20.0	±0.7% (op. ±0.5%)	±0.1% (–40 to 85°C)

* Aging for 10 years is within ±0.3% from the initial frequency at 25°C.

Test Circuit



PBRC-G Type
Rf=1MΩ
C1=C2=30pF (2.00 to 8.00MHz) IC: MC14069UB
C1=C2=10pF (8.01 to 20.0MHz) IC: MC74HCU04

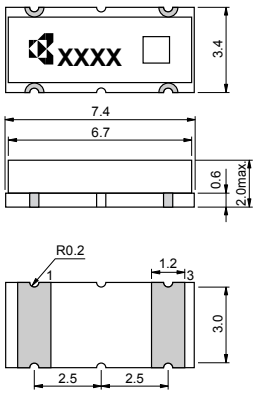
PBRC-G Type
Rf=1MΩ
C1=C2=15pF (3.68 to 8.00MHz) IC: MC14069UB
C1=C2=10pF (8.01 to 20.0MHz) IC: MC74HCU04

Note)
- Values of C1, C2 and Rf are evaluated with IC, MC14069UB, and evaluation of circuit is necessary when using other IC's.
- IC circuit matching may be referenced with
  1) IC data books
  2) List of Recommended circuits in Kyocera website.
- Please contact IC manufacturer or Kyocera when there are difficulties in finding recommended circuits.

Dimensions

(Unit : mm)

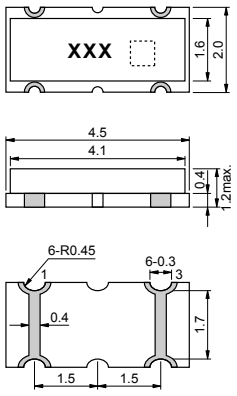
PBRC-G Type



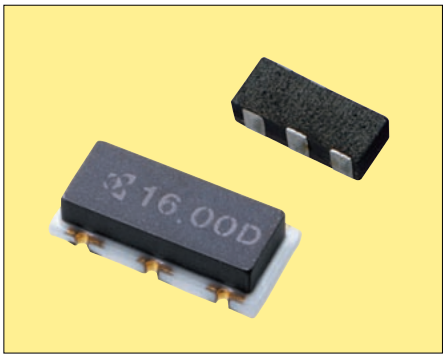
Standard Tol. : ±0.3
Termination : Ni+Au Flash Plating
1. 3 Input, Output (No polarity)

(Unit : mm)

PBRC-L Type



Standard Tol. : ±0.2



RoHS Compliant

Features

- High reliability, high temperature withstanding ceramic case
- Rectangular shape allows easy pick and placement
- Small & low profile
- Reflow solderable
- Excellent solderability (Nickel barrier+Au flash terminations)

How to Order (PBRC-H,PBRC-M)

PBRC 15.00 H R 50 Y 000
① ② ③ ④ ⑤ ⑥ ⑦

①Series
②Frequency (MHz)
③Type (H,M)
④Packing _ Bulk
(Null)
R Reel (H: 2k/reel, M: 3k/reel)
⑤Frequency Tolerance at 25°C

10	±0.1%	**20**	±0.2%
30	±0.3%	**40**	±0.4%
50	±0.5%	**70**	±0.7%

⑥Operating Temperature

X	–40°C to 85°C	**Y**	–40°C to 125°C
Z	–40°C to 150°C		

⑦Unique Code

How to Order (PRQC)

PRQC 8.00 S R 50 10 X 000
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①Series
②Frequency (MHz)
③Type (S)
④Packing _ Bulk
(Null)
R Reel (3k/reel)
⑤Frequency Tolerance at 25°C

10	±0.1%	**20**	±0.2%
30	±0.3%	**40**	±0.4%
50	±0.5%	**70**	±0.7%

⑥Built-in Capacitance 10pF : 10
⑦Operating Temperature

W	–20°C to 80°C	**Y**	–40°C to 125°C
X	–40°C to 85°C	**Z**	–40°C to 150°C

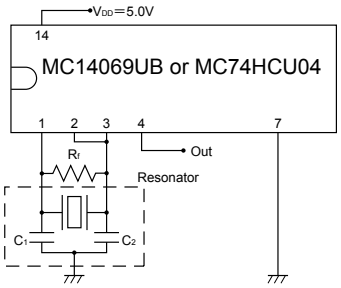
⑧Unique Code

Specifications

Series	Frequency Range(MHz)	Frequency Tolerance(25°C)	Temperature Stability
PBRC-H	2.00 to 8.00	±0.5% (op. ±0.3%)	±0.5% (–40 to 85°C)
	8.01 to 20.0	±0.7% (op. ±0.5%)	±0.1% (–40 to 85°C)
PBRC-M	4.00 to 8.00	±0.5% (op. ±0.3%)	±0.5% (–40 to 85°C)
	8.01 to 20.0	±0.7% (op. ±0.5%)	±0.1% (–40 to 85°C)
PRQC	8.00 to 20.0	±0.5% (op. ±0.3%)	±0.5% (–40 to 85°C)

* Aging for 10 years is within ±0.3% from the initial frequency at 25°C.

Test Circuit



PBRC-H Type
Rf=1MΩ
C1=C2=30pF (2.00 to 8.00MHz) IC: MC14069UB
C1=C2=10pF (8.01 to 20.0MHz) IC: MC74HCU04

PBRC-M Type
Rf=1MΩ
C1=C2=15pF (3.68 to 8.00MHz) IC: MC14069UB
C1=C2=10pF (8.01 to 20.0MHz) IC: MC74HCU04

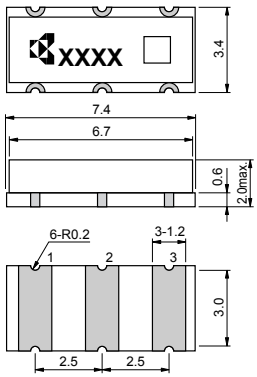
PRQC Type
Rf=1MΩ
C1=C2=10pF (8.00 to 20.0MHz) IC: MC74HCU04
* C1, C2 are for Reference.

Note)
- This product includes built-in capacitors, but values may not be the most appropriate depending on IC's.
- Evaluation of circuit with IC is necessary. IC circuit matching may be referenced with
  1) IC data books
  2) List of Recommended circuits in Kyocera website.
- Please contact IC manufacturer or Kyocera when there are difficulties in finding recommended circuits.

Dimensions

(Unit : mm)

PBRC-H Type

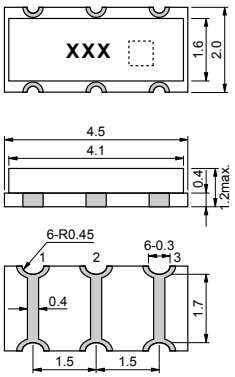


Standard Tol. : ±0.3
Termination : Ni+Au Flash Plating
1. 3 Input, Output (No polarity)

#	Pin #
1	Input
2	Ground
3	Output

(Unit : mm)

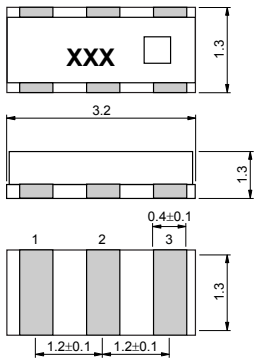
PBRC-M Type



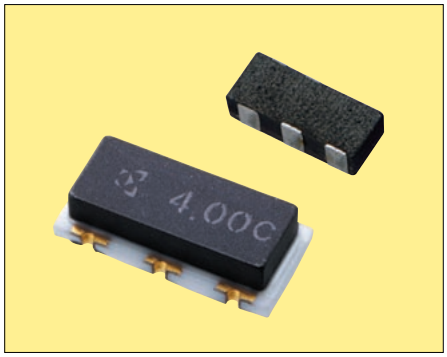
Standard Tol. : ±0.2
Termination : Ni+Au Flash Plating
1. 3 Input, Output (No polarity)

(Unit : mm)

PRQC Type



Standard Tol. : ±0.15
Termination : Sn Plating



RoHS Compliant

Features

- Miniature & low profile
- Rectangular shape allows easy pick and placement
- Component cost and space saving
- High density mounting possible
- Reflow solderable & washable
- High reliability, high temperature operating with ceramic case

Applications

- Automotive
- ABS
- ECU
- Air-Bag System

Specifications

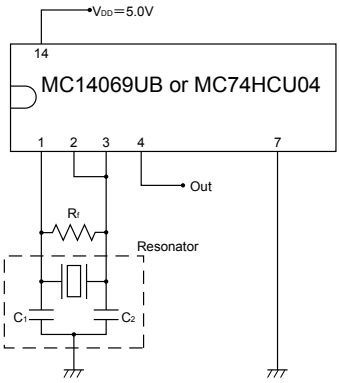
Series	Frequency Range(MHz)	Frequency Tolerance(25°C)	Temperature Stability
PBRV-H	4.00 to 8.00	±0.5% (op. ±0.3%)	Y : ±0.5%(–40 to +125°C) Z : ±0.5%(–40 to +150°C)
PBRV-M	8.01 to 20.00	±0.7% (op. ±0.5%)	Y : ±0.1%(–40 to +125°C) Z : ±0.2%(–40 to +150°C)
PRQV	8.00 to 20.00	±0.5% (op. ±0.3%)	Y : ±0.5%(–40 to +125°C) Z : ±0.5%(–40 to +150°C)

* Aging for 10 years is within ±0.3% from the initial frequency at 25°C.
* Please contact us for products without built-in capacitors.

Note)

- This product includes built-in capacitors, but values may not be the most appropriate depending on IC's.
- Evaluation of circuit with IC is necessary. IC circuit matching may be referenced with
  1) IC data books
  2) List of Recommended circuits in Kyocera website.
- Please contact IC manufacturer or Kyocera when there are difficulties in finding recommended circuits.

Test Circuit



PBRV-H Type
Rf=1MΩ
C1=C2=30pF (4.00 to 8.00MHz) IC: MC14069UB
C1=C2=10pF (8.01 to 20.0MHz) IC: MC74HCU04

PBRV-M Type
Rf=1MΩ
C1=C2=15pF (4.00 to 8.00MHz) IC: MC14069UB
C1=C2=10pF (8.01 to 20.0MHz) IC: MC74HCU04

PRQV Type
Rf=1MΩ
C1=C2=10pF (8.00 to 20.0MHz) IC: MC74HCU04
* C1, C2 are for Reference.

How to Order (PBRV-H,PBRV-M)

PBRV ① 15.00 ② H ③ R ④ 50 ⑤ Y ⑥ 000 ⑦

①Series (PBRV: Automotive)
②Frequency (MHz)
③Type (H,M)
④Packing _ Bulk
(Null)
R Reel (H: 2k/reel, M: 3k/reel)
⑤Frequency Tolerance at 25°C

10	±0.1%	20	±0.2%
30	±0.3%	40	±0.4%
50	±0.5%	70	±0.7%

⑥Operating Temperature

X	–40°C to 85°C	Y	–40°C to 125°C
Z	–40°C to 150°C		

⑦Unique Code

How to Order (PRQV)

PRQV ① 8.00 ② S ③ R ④ 50 ⑤ 10 ⑥ Y ⑦ 000 ⑧

①Series (PRQV: Automotive)
②Frequency (MHz)
③Type (S)
④Packing _ Bulk
(Null)
R Reel (3k/reel)
⑤Frequency Tolerance at 25°C

10	±0.1%	20	±0.2%
30	±0.3%	40	±0.4%
50	±0.5%	70	±0.7%

⑥Built-in Capacitance 10pF : 10
⑦Operating Temperature

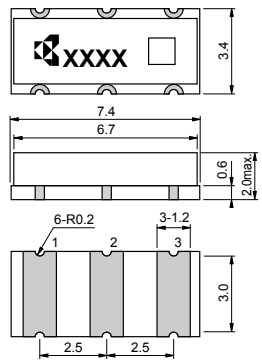
X	–40°C to 85°C	Y	–40°C to 125°C
Z	–40°C to 150°C		

⑧Unique Code

Dimensions

(Unit : mm)

PBRV-H Type

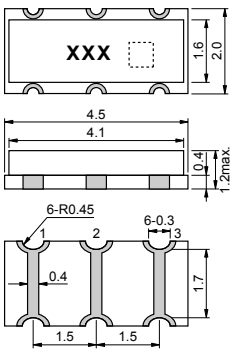


Standard Tol. : ±0.3
Termination : Ni+Au Flash Plating
1. 3 Input, Output (No polarity)

#	Pin #
1	Input
2	Ground
3	Output

(Unit : mm)

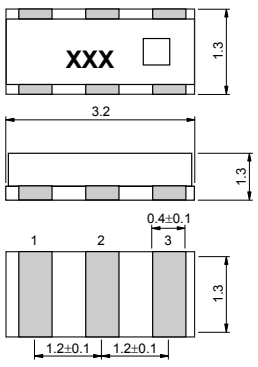
PBRV-M Type



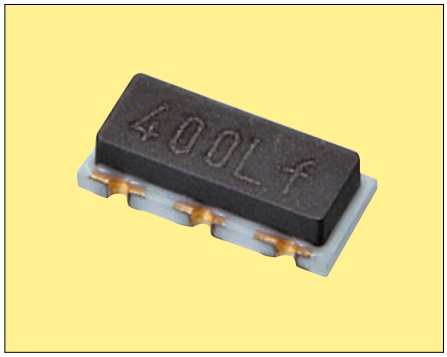
Standard Tol. : ±0.2
Termination : Ni+Au Flash Plating
1. 3 Input, Output (No polarity)

(Unit : mm)

PRQV Type



Standard Tol. : ±0.15
Termination : Sn Plating



RoHS Compliant

Features

- Improved frequency tolerance for CANBUS application of automotive

How to Order (PBRV)

PBRV ① 15.00 ② H ③ R ④ 10 ⑤ Y ⑥ 000 ⑦

①Series (PBRV: Automotive)
②Frequency (MHz)
③Type (H,M)
④Packing _ Bulk
(Null)
R Reel (H: 2k/reel, M: 3k/reel)
⑤Frequency Tolerance at 25°C

10	±0.1%

⑥Operating Temperature

X	–40°C to 85°C	Y	–40°C to 125°C
Z	–40°C to 150°C		

⑦Unique Code

How to Order (PRQV)

PRQV ① 8.00 ② S ③ R ④ 10 ⑤ 10 ⑥ Y ⑦ 000 ⑧

①Series (PRQV: Automotive)
②Frequency (MHz)
③Type (S)
④Packing _ Bulk
(Null)
R Reel (3k/reel)
⑤Frequency Tolerance at 25°C

10	±0.1%

⑥Built-in Capacitance 10pF : 10
⑦Operating Temperature

X	–40°C to 85°C	Y	–40°C to 125°C
Z	–40°C to 150°C		

⑧Unique Code

Specifications

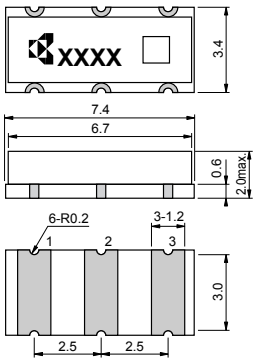
Series		PBRV-HR/MR	PBRV-HR/MR	PRQV-S
Part Number		PBRV-HR/MR 10Y□□□	PBRV-HR/MR 10Y□□□	PRQV-SR□10Y□□□
Operating Temperature Range		–40 to +125°C	–40 to +125°C	–40 to +125°C
Frequency Range		4.0 to 7.9MHz	8.0 to 20.0MHz	8.0 to 20.0MHz
Frequency Tolerance	Initial+Temperature	±0.3%	±0.2%	±0.25%
	Aging	±0.1%	±0.1%	±0.05%
Total Frequency Tolerance		±0.4%	±0.3%	±0.3%

* Please refer to the specification sheet of each product for information including detail dimensions.
* Aging characteristics is specified at 25°C, and for the period of 10 years.

Dimensions

(Unit : mm)

PBRV-H Type

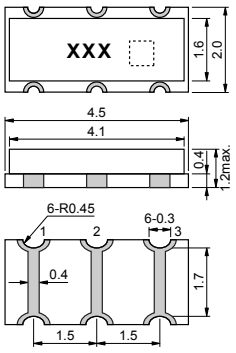


Standard Tol. : ±0.3
Termination : Ni+Au Flash Plating
1. 3 Input, Output (No polarity)

#	Pin #
1	Input
2	Ground
3	Output

(Unit : mm)

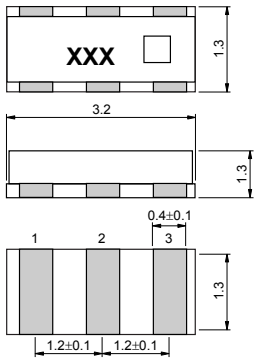
PBRV-M Type



Standard Tol. : ±0.2
Termination : Ni+Au Flash Plating
1. 3 Input, Output (No polarity)

(Unit : mm)

PRQV Type

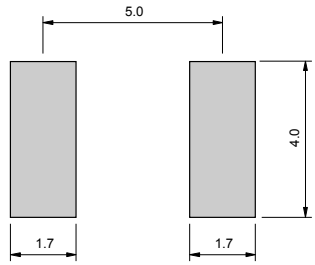


Standard Tol. : ±0.15
Termination : Sn Plating

Recommended Land Pattern

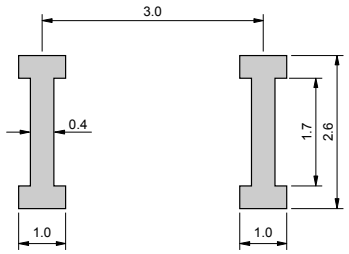
(Unit : mm)

PBRC-G Type



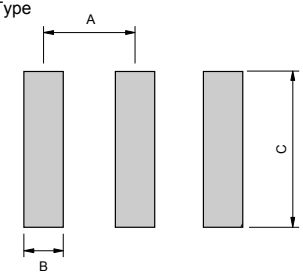
(Unit : mm)

PBRC-L Type



(Unit : mm)

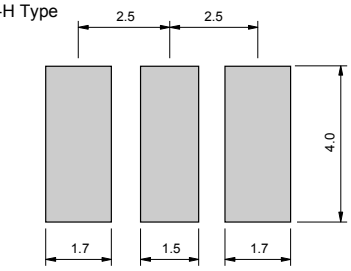
PRQC Type
PRQV Type



A: 8.0 to 12.5MHz 1.2±0.1
12.51 to 20.0MHz 0.95±0.1
B: 8.0 to 12.5MHz 0.4±0.1
12.51 to 20.0MHz 0.3±0.1
C: 8.0 to 12.5MHz 2.0
12.51 to 20.0MHz 1.6

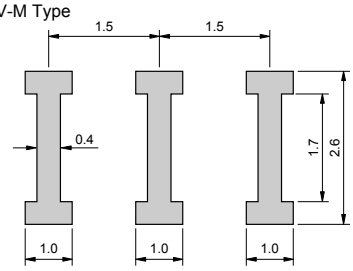
(Unit : mm)

PBRC-H Type
PBRV-H Type



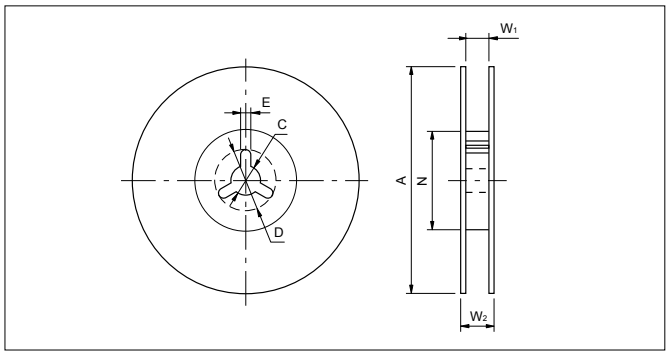
(Unit : mm)

PBRC-M Type
PBRV-M Type

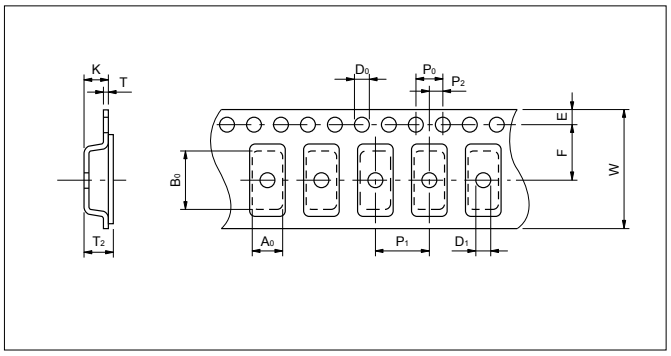


Packaging

Reel



Taping



Code	A	N	W_1	W_2	C	D	E
7.4×3.4×2.0mm	250±2.0	80±2.0	$16.5^{+1.1}_{-0.0}$	23.6max.	13.0±0.5	21.0±0.8	2.0±0.5
4.5×2.0×1.2mm	180^{+0}_{-3}	60^{+1}_{-0}	13.0±0.3	15.4±1	13.0±0.2	21.0±0.8	2.0±0.5
3.2×1.3×1.3mm	180±2	60^{+1}_{-0}	$9.0^{+1.0}_{-1.5}$	140min.	13.0±0.2	21.0±0.8	2.0±0.5

Code	A_0	B_0	W	F	E	P_1	P_2	P_0	D_0	D_1	T	T_2	K
7.4×3.4 ×2.0mm	3.80±0.1	7.80±0.1	16.00±0.3	7.50±0.1	1.75±0.1	8.00±0.1	2.0±0.1	4.00±0.1	$1.50^{+0.1}_{-0.0}$	$1.50^{+0.1}_{-0.0}$	0.30±0.05	2.45±0.2	2.40±0.2
4.5×2.0 ×1.2mm	2.20±0.1	4.70±0.1	12.00±0.2	5.5±0.05	1.75±0.1	4.00±0.1	2.0±0.05	4.00±0.1	$1.50^{+0.1}_{-0.0}$	1.0±0.1	0.30±0.05	1.85max.	1.80max.
3.2×1.3 ×1.3mm	1.50±0.1	3.40±0.1	8.00±0.2	3.50±0.05	1.75±0.1	4.00±0.1	2.0±0.05	4.00±0.1	$1.50^{+0.1}_{-0.0}$	$1.0^{+0.2}_{-0.0}$	0.25±0.05	1.30max.	0.90±0.1

∗ 7.4×3.4×2.0mm=PBRC-G, PBRC-H, PBRV-G, PBRV-H 2000pcs./Reel
4.5×2.0×1.2mm=PBRC-L, PBRC-M, PBRV-L, PBRV-M 3000pcs./Reel
3.2×1.3×1.3mm=PRQC-S, PRQV-S 3000pcs./Reel

Pb Free RoHS Compliant

Features

- Frequency range 300 to 480MHz
- 1 port type SMD resonator
- Small size (5.5×3.8mm)
- Low profile (1.5mm max.)
- SMT ceramic package
- High reliability sealing
- Excellent temperature characteristics
- +100ppm to −250ppm (−40°C to 85°C)

Applications

- Keyless Entry Systems
- Garage Openers
- Security Systems

How to Order

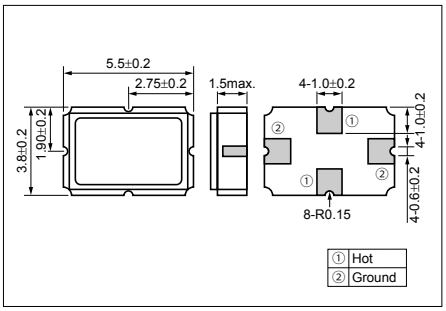
PARS 315.00 K 00 R
① ② ③ ④ ⑤

①Series
②Resonant Frequency (MHz)
③Marking Code
④Frequency Tolerance or Custom Spec.

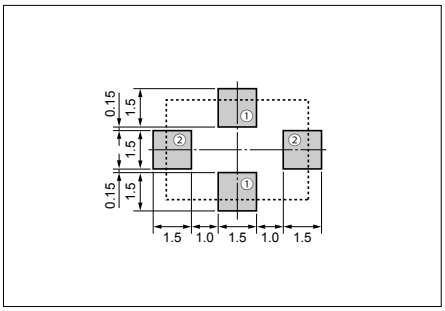
00	±250kHz	**03**	±100kHz
01	±200kHz	**04**	±75kHz
02	±150kHz	**11≤**	Custom Spec.

⑤Packaging
R : Tape & Reel (2000pcs./Reel)

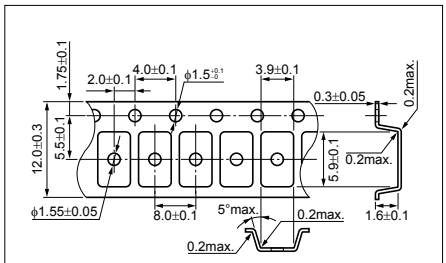
Dimensions (Unit : mm)



Recommended Land Pattern (Unit : mm)



Packaging (Unit : mm)

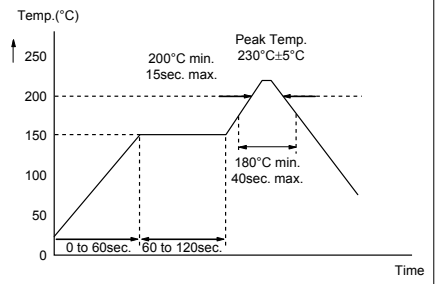


Specifications

Part Number	Resonant Frequency(MHz)	Resonant Loss(dB)	Parallel Capacitance(pF)	Temperature Characteristics (ppm/°C)
PARS303.00N04R	303.000±0.075	2.5 max.	4.0 max.	±8 max.
PARS303.33L04R	303.330±0.075			
PARS303.82M04R	303.825±0.075			
PARS303.87K04R	303.875±0.075			
PARS304.30K04R	304.300±0.075			
PARS304.45L04R	304.450±0.075			
PARS310.00K04R	310.000±0.075			
PARS314.00K04R	314.000±0.075		3.2 max.	
PARS314.50L04R	314.500±0.075			
PARS315.00K04R	315.000±0.075			
PARS320.65K04R	320.650±0.075			
PARS345.00K04R	345.000±0.075			
PARS418.00K04R	418.000±0.075			
PARS423.22K04R	423.220±0.075			
PARS432.92K04R	432.920±0.075			
PARS433.42L04R	433.420±0.075			
PARS433.92K04R	433.920±0.075			
PARS479.50K04R	479.500±0.075		2.3 max.	

∗Please contact your local sales office for custom frequency.

Recommended Temperature IR Reflow



Pb Free RoHS Compliant

Surface Acoustic Wave Resonator for Remote Keyless Entry System (RKE)

Features

- Ultra-miniature size
- 1 port type SMD resonator
- High reliability
- Excellent temperature characteristics

Applications

- Remote Keyless Entry System (RKE)
- Garage Openers
- Security Systems

How to Order

PARM 315.00 K 04 R
① ② ③ ④ ⑤

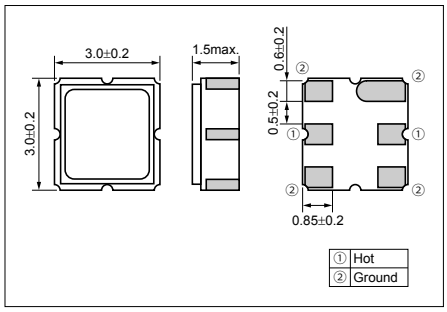
①Series
②Resonant Frequency (MHz)
③Marking Code
④Frequency Tolerance or Custom Spec.

00	±250kHz	**03**	±100kHz
01	±200kHz	**04**	±75kHz
02	±150kHz	**11≤**	Custom spec.

⑤Type

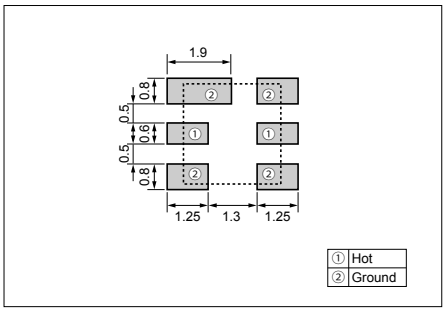
Dimensions

(Unit : mm)



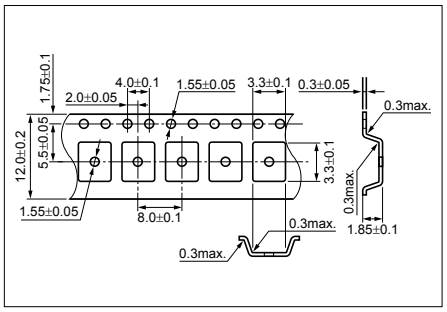
Recommended Land Pattern

(Unit : mm)



Packaging

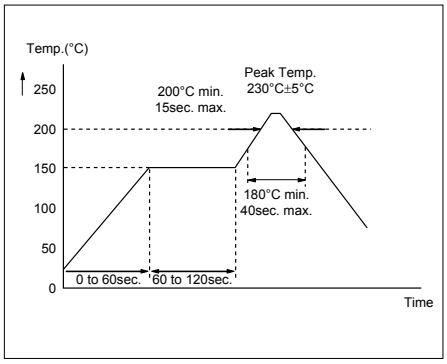
(Unit : mm)



Specifications

Part Number	Resonant Frequency(MHz)	Resonant Loss(dB)	Parallel Capacitance(pF)	Temperature Characteristics(ppm/°C)	Operating Temperature(°C)	Storage Temperature(°C)
PARM315.00K04R	315.000±0.075	2.5 max.	4.0 max.	±8 max.	–40 to 85	–40 to 85
PARM433.92K04R	433.920±0.075					

Recommended Temperature IR Reflow



Pb Free RoHS Compliant

Surface Acoustic Wave Resonator for TPMS

Features

- Low profile
- 1 port type SMD resonator
- High reliability
- Excellent temperature characteristics

Applications

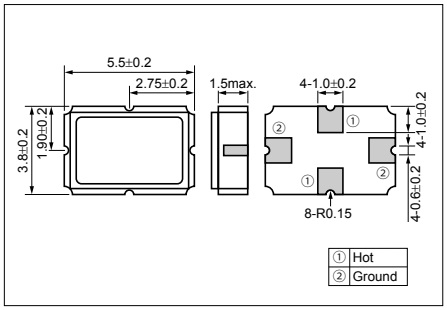
- TPMS

How to Order

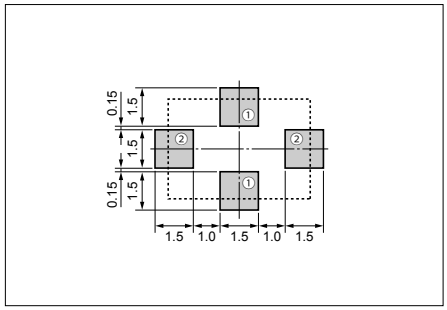
PARV 315000 A
① ② ③

①Series
②Resonant Frequency (MHz)
③Type

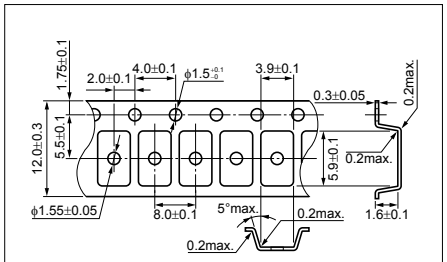
Dimensions (Unit : mm)



Recommended Land Pattern (Unit : mm)



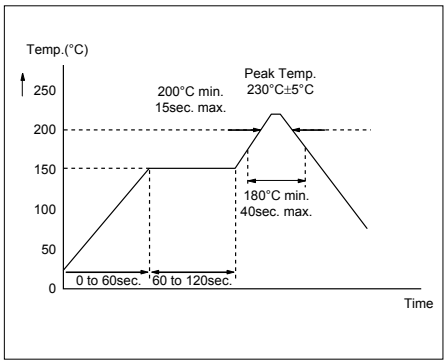
Packaging (Unit : mm)

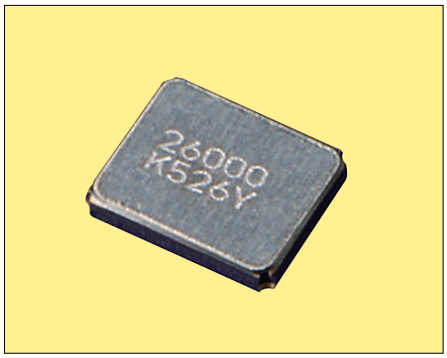


Specifications

Part Number	Resonant Frequency(MHz)	Resonant Loss(dB)	Parallel Capacitance(pF)	Operating Temperature(°C)	Storage Temperature(°C)
PARV315000A	315.000±0.100	2.0 max.	3.2 max.	–40 to 120	–40 to 120
PARV433920A	433.920±0.100	2.0 max.	3.2 max.	–40 to 120	–40 to 120

Recommended Temperature IR Reflow





Pb Free RoHS Compliant

Features

- Crystal unit for audio-visual, office equipment
- Ultra-miniature and low profile (2.5x2.0x0.45mm)
- Ceramic package
- A lead free product
- Reflow compatible

Applications

- Digital Electronics
- Audio-Visual, Office Equipment

How to Order

CX2520SB 27000 D0 P E S ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
13560	13560.000	**30000**	30000.000
16000	16000.000	**32000**	32000.000
18000	18000.000	**33000**	33000.000
20000	20000.000	**33333**	33333.000
24000	24000.000	**40000**	40000.000
26000	26000.000	**48000**	48000.000
27000	27000.000	**54000**	54000.000
27120	27120.000		

*Please inquire about frequencies other than the above.

③Load Capacitance

D0	8pF

④Frequency Stability

P	$\pm 50\times10^{-6}$

⑤Operating Temperature Range

E	−10°C to +70°C

⑥Frequency Temperature Stability

S	$\pm 50\times10^{-6}$

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	13560 to 60000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±50	$\times10^{-6}$	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±50	$\times10^{-6}$	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	8	pF	
Operating Temp. Range	T_{use}	−10 to +70	°C	
Storage Temp. Range	T_{stg}	−40 to +85	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

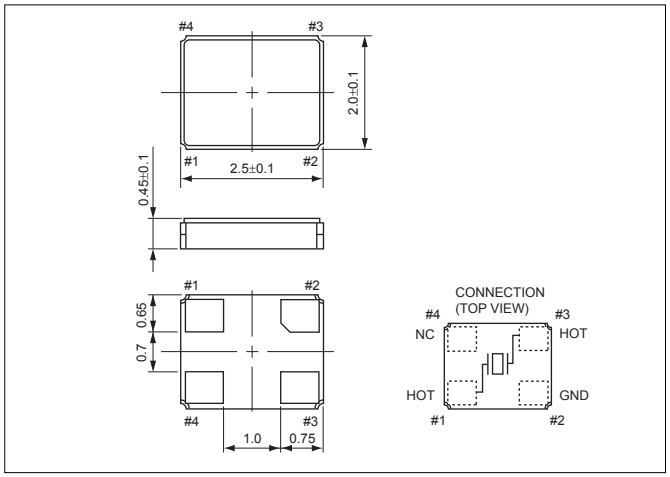
Frequency Range	Motional Series Resistance	Units
13560 to 15999kHz	300	ohm
16000 to 19999kHz	150	
20000 to 39999kHz	100	
40000 to 60000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
13560 to 60000kHz	10 (100 max.)	μW

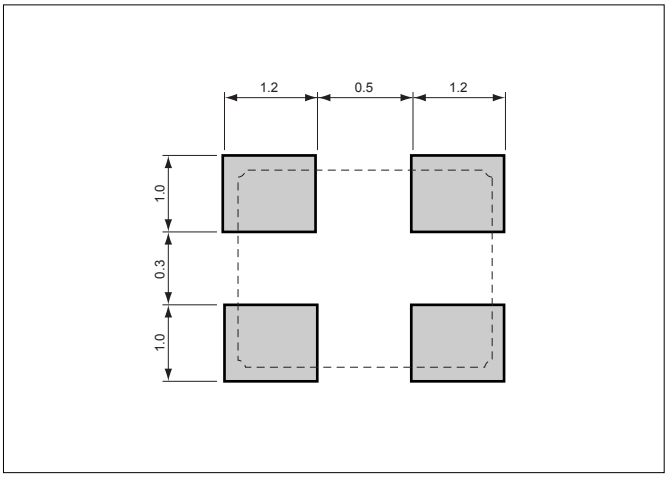
Dimensions

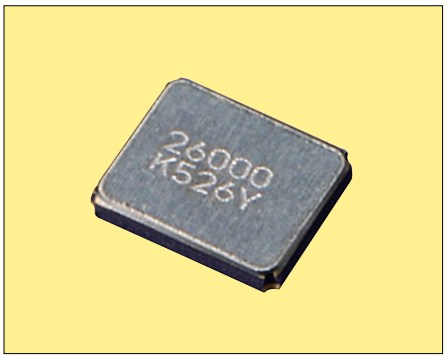
(Unit : mm)



Recommended Land Pattern

(Unit : mm)





Pb Free RoHS Compliant

Features

- Reference frequency for telecommunication systems
- Reflow compatible
- Using ceramic package resulting in high reliability
- Small and low profile

Applications

- Mobile Communications, Bluetooth, Wireless LAN

How to Order

CX2520SB 32000 D0 F L J ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
13560	13560.000	**27120**	27120.000
16000	16000.000	**32000**	32000.000
18000	18000.000	**38400**	38400.000
19200	19200.000	**40000**	40000.000
24000	24000.000	**44000**	44000.000
26000	26000.000		

*Please inquire about frequencies other than the above.

③Load Capacitance

D0	8pF

④Frequency Stability

F	±10×10^{-6}

⑤Operating Temperature Range

L	–30°C to +85°C

⑥Frequency Temperature Stability

J	±15×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	13560 to 60000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±10	×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±15	×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	8	pF	
Operating Temp. Range	T_{use}	–30 to +85	°C	
Storage Temp. Range	T_{stg}	–40 to +85	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

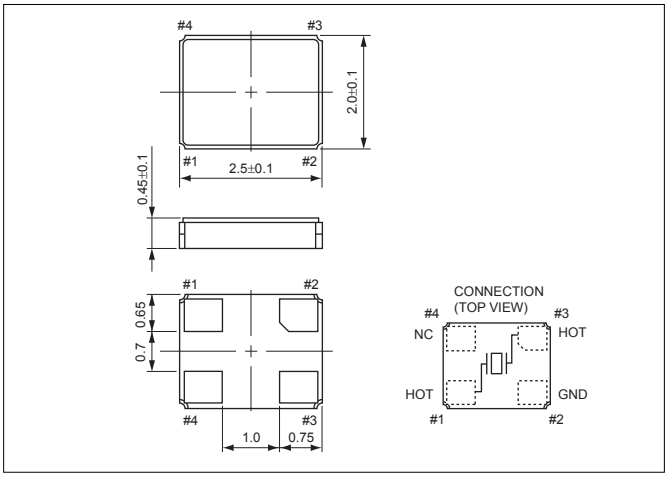
Frequency Range	Motional Series Resistance	Units
13560 to 15999kHz	300	ohm
16000 to 19999kHz	150	
20000 to 39999kHz	100	
40000 to 60000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
13560 to 60000kHz	10 (100 max.)	μW

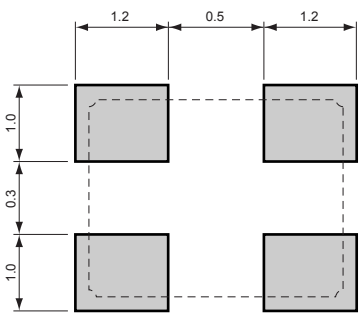
Dimensions

(Unit : mm)



Recommended Land Pattern

(Unit : mm)



Crystal Units
Surface Mount Type CX3225SB (CX-101F)
3.2×2.5mm for Audio & Visual, Office Equipment

Pb Free RoHS Compliant

Features
- Crystal unit for audio-visual, office equipment
- Miniature and low profile (3.2x2.5x0.55mm)
- Ceramic package
- A lead free product
- Reflow compatible

Applications
- Digital Electronics
- Audio-Visual, Office Equipment

How to Order
CX3225SB 24000 D0 P E S ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
12000	12000.000	**25000**	25000.000
13560	13560.000	**26000**	26000.000
14318	14318.180	**27000**	27000.000
14745	14745.600	**27120**	27120.000
16000	16000.000	**30000**	30000.000
18432	18432.000	**33000**	33000.000
20000	20000.000	**33333**	33333.000
22579	22579.000	**40000**	40000.000
24000	24000.000	**48000**	48000.000
24576	24576.000	**54000**	54000.000

*Please inquire about frequencies other than the above.

③Load Capacitance

D0	8pF

④Frequency Stability

P	±50×10^{-6}

⑤Operating Temperature Range

E	−10°C to +70°C

⑥Frequency Temperature Stability

S	±50×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_nom	12000 to 54000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_tol	±50	×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_tem	±50	×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	8	pF	
Operating Temp. Range	T_use	−10 to +70	°C	
Storage Temp. Range	T_stg	−40 to +85	°C	

* Please inqurie about specifications other than the above.

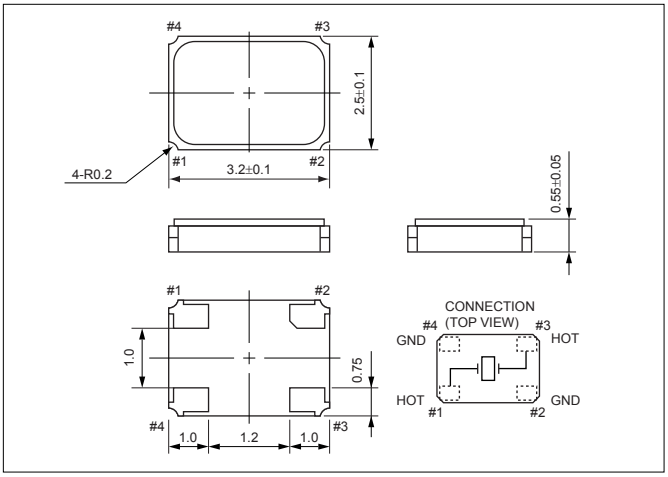
Table1 Motional Series Resistances

Frequency Range	Motional Series Resistance	Units
12000 to 13999kHz	300	ohm
14000 to 15999kHz	200	
16000 to 26999kHz	100	
27000 to 54000kHz	50	

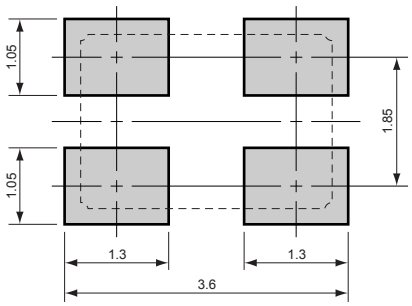
Table2 Level of Drive

Frequency Range	Level of Drive	Units
12000 to 54000kHz	10 (100 max.)	μW

Dimensions (Unit : mm)



Recommended Land Pattern (Unit : mm)



Pb Free RoHS Compliant

Features

- Reference frequency for telecommunication systems
- Reflow compatible
- Using ceramic package resulting in high reliability
- Small and low profile

Applications

- Mobile Communications, Bluetooth, Wireless LAN

How to Order

CX3225SB 26000 D0 F L J ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
12000	12000.000	**20000**	20000.000
13000	13000.000	**26000**	26000.000
13560	13560.000	**32000**	32000.000
16000	16000.000	**38400**	38400.000
19200	19200.000	**40000**	40000.000

*Please inquire about frequencies other than the above.

③Load Capacitance

D0	8pF

④Frequency Stability

F	±10×10^{-6}

⑤Operating Temperature Range

L	–30°C to +85°C

⑥Frequency Temperature Stability

J	±15×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_nom	12000 to 54000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_tol	±10	×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_tem	±15	×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	8	pF	
Operating Temp. Range	T_use	–30 to +85	°C	
Storage Temp. Range	T_stg	–40 to +85	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

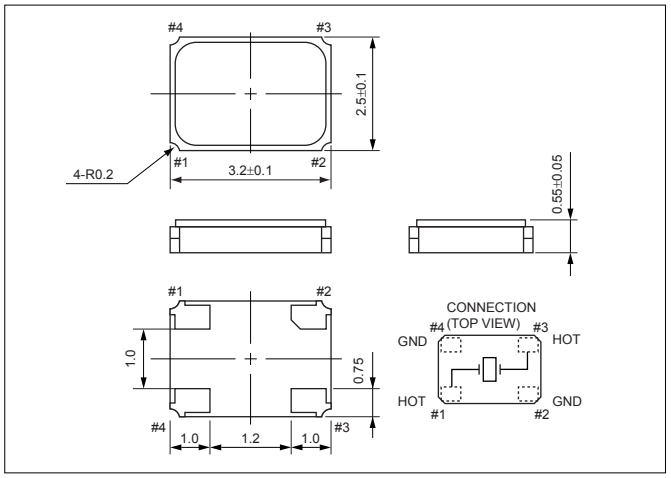
Frequency Range	Motional Series Resistance	Units
12000 to 13999kHz	300	ohm
14000 to 15999kHz	200	
16000 to 26999kHz	100	
27000 to 54000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
12000 to 54000kHz	10 (100 max.)	μW

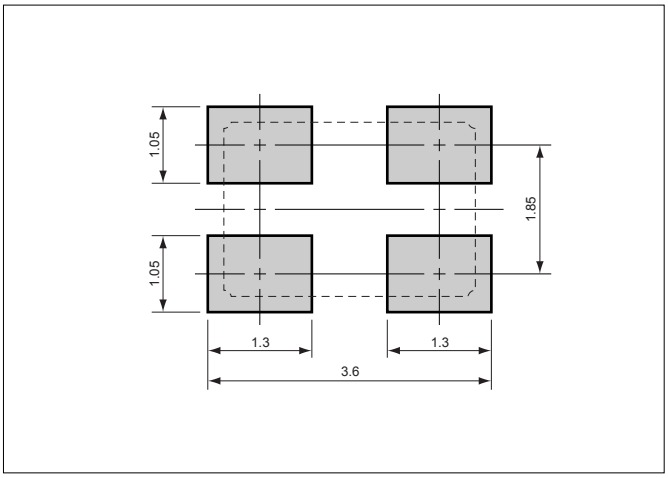
Dimensions

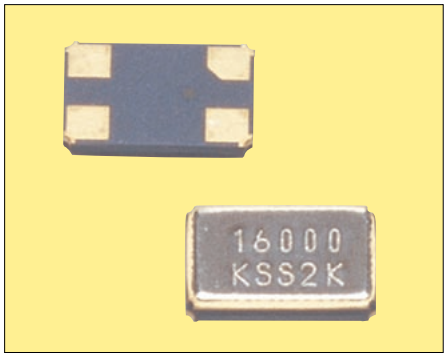
(Unit : mm)



Recommended Land Pattern

(Unit : mm)





Pb Free RoHS Compliant

Features

- Reference frequency for telecommunication systems
- Reflow compatible
- Using ceramic package resulting in high reliability
- Small and low profile

Applications

- Mobile Communications, Bluetooth, Wireless LAN

How to Order

CX4025SB 26000 F0 F L J ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
12000	12000.000	**26000**	26000.000
13000	13000.000	**32000**	32000.000
16000	16000.000	**40000**	40000.000
20000	20000.000		

*Please inquire about frequencies other than the above.

③Load Capacitance

F0	10pF

④Frequency Stability

F	$\pm 10\times10^{-6}$

⑤Operating Temperature Range

L	–30°C to +85°C

⑥Frequency Temperature Stability

J	$\pm 15\times10^{-6}$

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	12000 to 40000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±10	$\times10^{-6}$	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±15	$\times10^{-6}$	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	10	pF	
Operating Temp. Range	T_{use}	–30 to +85	°C	
Storage Temp. Range	T_{stg}	–40 to +85	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

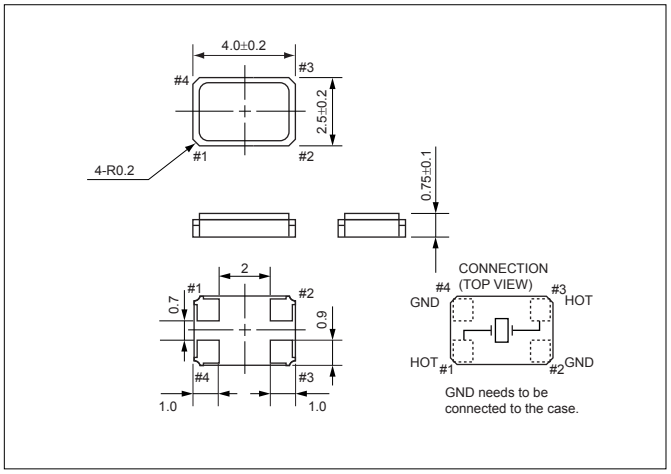
Frequency Range	Motional Series Resistance	Units
12000 to 19999kHz	80	ohm
20000 to 40000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
12000 to 40000kHz	10 (100 max.)	μW

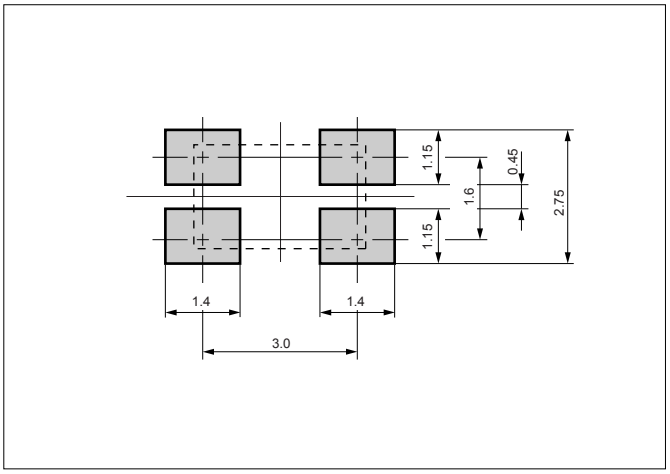
Dimensions

(Unit : mm)

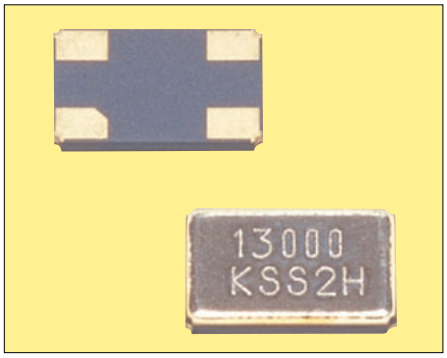


Recommended Land Pattern

(Unit : mm)



Crystal Units
Surface Mount Type CX5032SB (CX-96F)
5.0×3.2mm for Mobile Communications, SRWI



Pb Free RoHS Compliant

Features

- Reference frequency for telecommunication systems
- Reflow compatible
- Using ceramic package resulting in high reliability
- Small and low profile

Applications

- Mobile Communications, Bluetooth, Wireless LAN

How to Order

CX5032SB 26000 F0 F L J ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
12000	12000.000	**19200**	19200.000
12800	12800.000	**26000**	26000.000
13000	13000.000	**32000**	32000.000
14400	14400.000	**40000**	40000.000
16000	16000.000	**48000**	48000.000

*Please inquire about frequencies other than the above.

③Load Capacitance

F0	10pF

④Frequency Stability

F	±10×10^{-6}

⑤Operating Temperature Range

L	–30°C to +85°C

⑥Frequency Temperature Stability

J	±15×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	9843.75 to 49999	50 to 120(MHz)	kHz	
Overtone Order	OT	Fundamental	3rd Overtone	——	
Frequency Tolerance	f_{tol}	±10		×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±15		×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1		ohm	
Level of Drive	DL	Table 2		μW	
Load Capacitance	CL	10		pF	
Operating Temp. Range	T_{use}	–30 to +85		°C	
Storage Temp. Range	T_{stg}	–40 to +85		°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

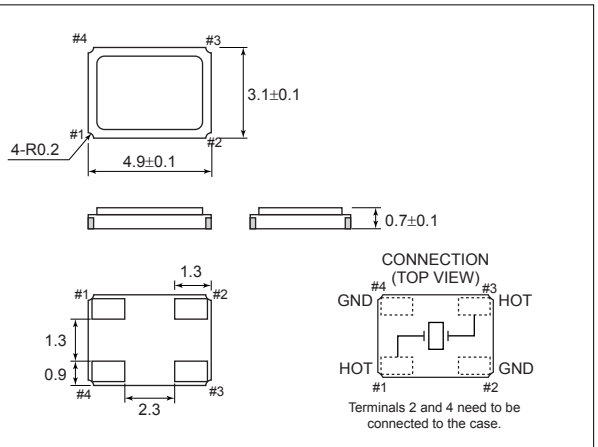
Frequency Range	Motional Series Resistance	Units
9843.75 to 9999kHz	150	ohm
10000 to 11999kHz	80	
12000 to 25999kHz	50	
26000 to 49999kHz	40	
50 to 120(MHz)	80	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
9843.75 to 49999kHz	10 (100 max.)	μW
50 to 120(MHz)(3rdO.T)	10 (100 max.)	

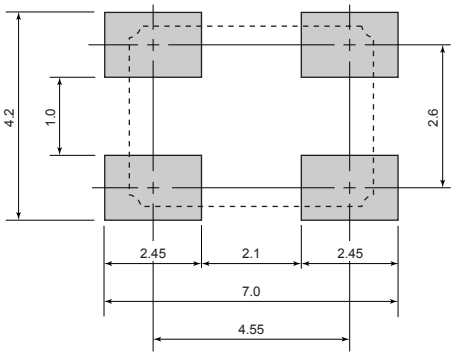
Dimensions

(Unit : mm)

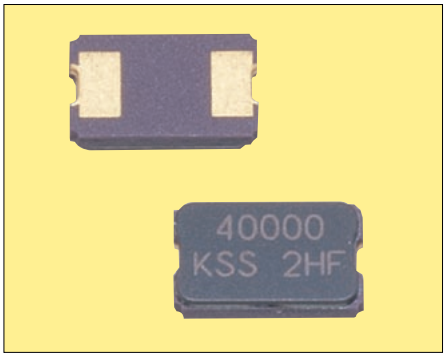


Recommended Land Pattern

(Unit : mm)



Crystal Units
Surface Mount Type CX5032GB (CX-53F)
5.0×3.2mm for Audio & Visual, Office Equipment



RoHS Compliant

Features

- Crystal unit for audio-visual, office equipment
- Small and low profile (5.0x3.2x1.0mm)
- Ceramic package
- Product with lead free terminations
- Reflow compatible

Applications

- Digital Electronics
- Audio-Visual, Office Equipment

How to Order

CX5032GB ① 48000 ② H0 ③ P ④ E ⑤ S ⑥ ZZ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
10000	10000.000	**24000**	24000.000
12000	12000.000	**24545**	24545.450
14318	14318.180	**24576**	24576.000
14745	14745.600	**27000**	27000.000
16934	16934.400	**36000**	36000.000
18432	18432.000	**48000**	48000.000
22579	22579.200	**54000**	54000.000

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

P	±50×10^{-6}

⑤Operating Temperature Range

E	−10°C to +70°C

⑥Frequency Temperature Stability

S	±50×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	9843.75 to 54000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±50	×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±50	×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	−10 to +70	°C	
Storage Temp. Range	T_{stg}	−40 to +85	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

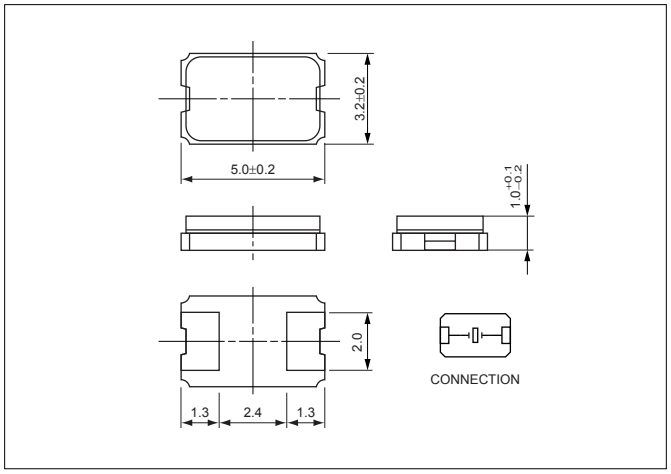
Frequency Range	Motional Series Resistance	Units
9843.75 to 11999kHz	200	ohm
12000 to 13999kHz	150	
14000 to 29999kHz	100	
30000 to 54000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
9843.75 to 15999kHz	10 (500 max.)	μW
16000 to 24999kHz	10 (300 max.)	
25000 to 54000kHz	10 (100 max.)	

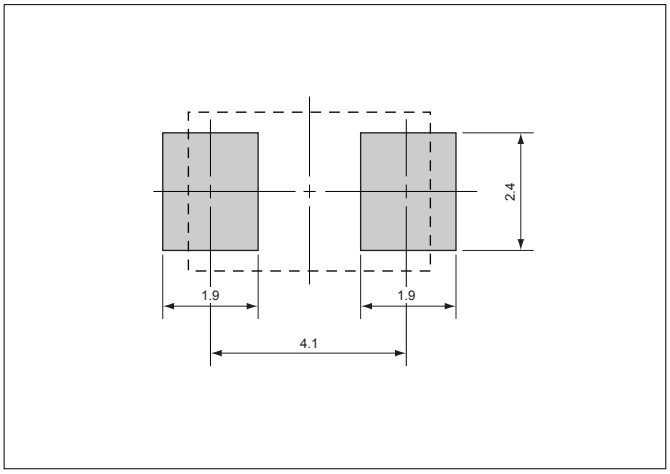
Dimensions

(Unit : mm)

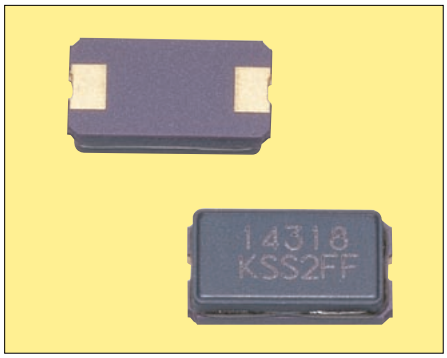


Recommended Land Pattern

(Unit : mm)



Crystal Units
Surface Mount Type CX8045GB (CX-8045G)
8.0×4.5mm for Audio & Visual, Office Equipment



RoHS Compliant

Features

- Crystal unit for audio-visual, office equipment
- Small and low profile (8.0x4.5x1.8mm)
- Ceramic package
- Product with lead free terminations
- Reflow compatible

Applications

- Audio-Visual, Office Equipment

How to Order

CX8045GB 30000 H0 P E S ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
14318	14318.180	**24576**	24576.000
16000	16000.000	**27000**	27000.000
16384	16384.000	**28636**	28636.000
16934	16934.400	**30000**	30000.000
19660	19660.800	**32000**	32000.000
20000	20000.000	**36000**	36000.000
21477	21477.720	**40000**	40000.000
24000	24000.000		

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

P	±50×10^{-6}

⑤Operating Temperature Range

E	−10°C to +70°C

⑥Frequency Temperature Stability

S	±50×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	7200 to 48000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±50	×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±50	×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	−10 to +70	°C	
Storage Temp. Range	T_{stg}	−40 to +85	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

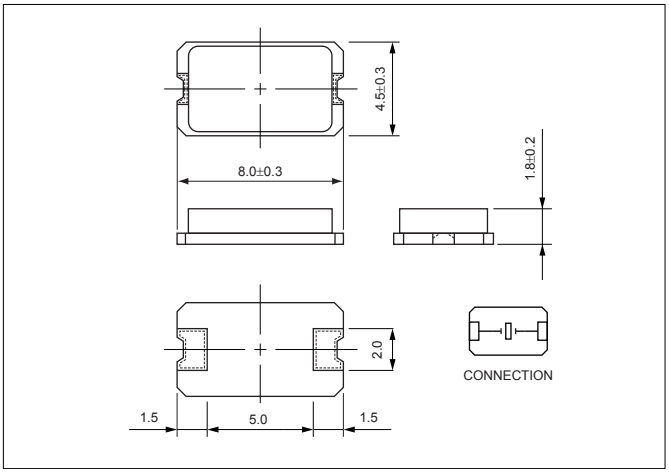
Frequency Range	Motional Series Resistance	Units
7200 to 9999kHz	200	ohm
10000 to 11999kHz	150	
12000 to 48000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
7200 to 9999kHz	10 (500 max.)	μW
16000 to 24999kHz	10 (300 max.)	
25000 to 48000kHz	10 (100 max.)	

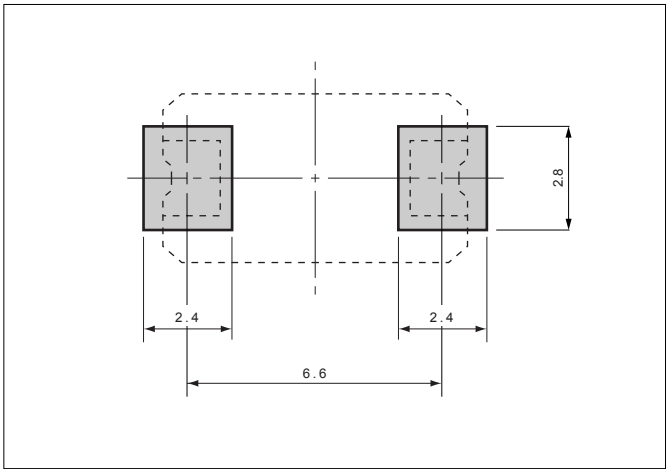
Dimensions

(Unit : mm)

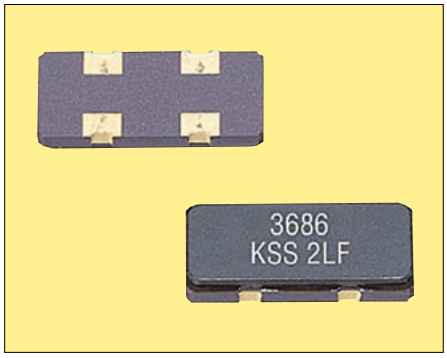


Recommended Land Pattern

(Unit : mm)



Crystal Units
Surface Mount Type CXB855GB (CX-5FD)
11.8×5.5mm for Audio & Visual, Office Equipment



RoHS Compliant

Features
- Crystal unit for audio-visual, office equipment
- Small and low profile (11.8x5.5x1.8mm)
- Ceramic package
- Product with lead free terminations
- Reflow compatible

Applications
- Digital Electronics
- Audio-Visual, Office Equipment

How to Order

CXB855GB 03579 H0 P E S ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
03579	3579.545	**14318**	14318.180
03686	3686.400	**16000**	16000.000
04000	4000.000	**16934**	16934.400
06000	6000.000	**19660**	19660.800
08000	8000.000	**20000**	20000.000
12000	12000.000		

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

P	±50×10^{-6}

⑤Operating Temperature Range

E	−10°C to +70°C

⑥Frequency Temperature Stability

S	±50×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification		Units	Remarks
Frequency Range	f_{nom}	3500 to 28999	29 to 60(MHz)	kHz	
Overtone Order	OT	Fundamental	3rd Overtone	——	
Frequency Tolerance	f_{tol}	±50		×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±50		×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1		ohm	
Level of Drive	DL	Table 2		μW	
Load Capacitance	CL	12		pF	
Operating Temp. Range	T_{use}	−10 to +70		°C	
Storage Temp. Range	T_{stg}	−40 to +85		°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

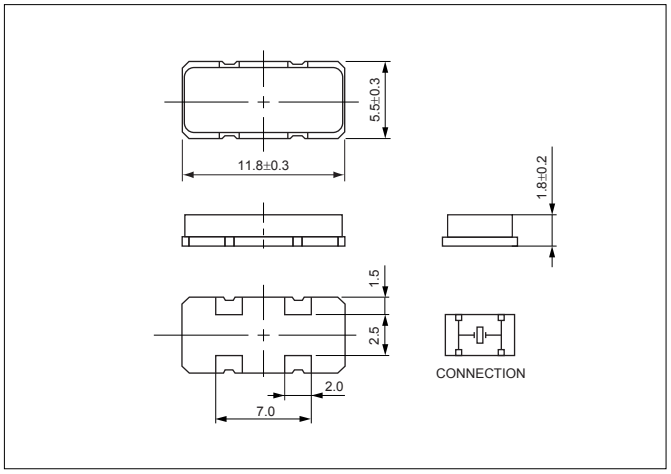
Frequency Range	Motional Series Resistance	Units
3500 to 3999kHz	300	ohm
4000 to 7999kHz	200	
8000 to 11999kHz	120	
12000 to 28999kHz	100	
29 to 60MHz	150	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
3500 to 15999kHz	10 (500 max.)	μW
16000 to 28999kHz	10 (300 max.)	
29 to 60MHz	10 (300 max.)	

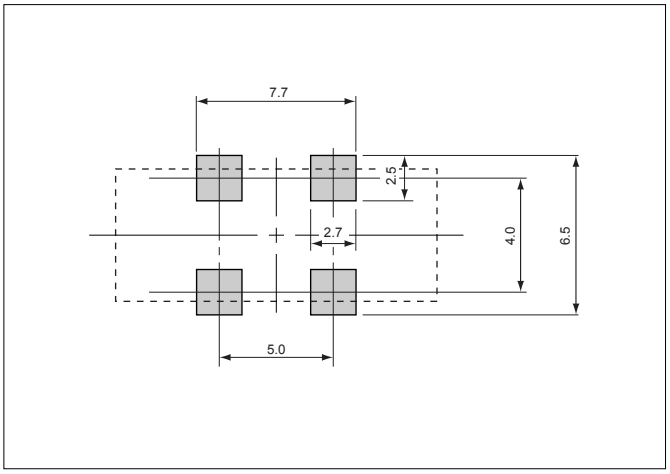
Dimensions

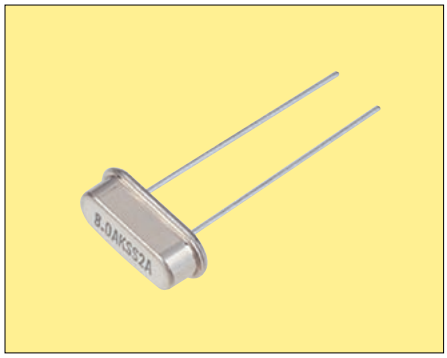
(Unit : mm)



Recommended Land Pattern

(Unit : mm)





Pb Free RoHS Compliant

Features

- Crystal unit for audio-visual, office equipment
- Metal package, leaded type
- A resistance weld hermetic sealed type
- Suitable for high density assembly and mass production

Applications

- Digital Electronics
- Audio-Visual, Office Equipment

How to Order

CXH49SFB 03579 H0 P E S ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code
②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
03200	3200.000	**11000**	11000.000
03579	3579.545	**11059**	11059.200
03686	3686.400	**12000**	12000.000
04000	4000.000	**12288**	12288.000
04194	4194.304	**13500**	13500.000
04332	4332.000	**14318**	14318.180
04433	4433.619	**16000**	16000.000
04500	4500.000	**16934**	16934.400
04915	4915.200	**17280**	17280.000
06000	6000.000	**17734**	17734.476
06144	6144.000	**20000**	20000.000
07200	7200.000	**21477**	21477.270
07372	7372.800	**24000**	24000.000
08000	8000.000	**24576**	24576.000
10000	10000.000	**25000**	25000.000
10240	10240.000	**27000**	27000.000
10738	10738.635		

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

P	±50×10^{-6}

⑤Operating Temperature Range

E	−10°C to +70°C

⑥Frequency Temperature Stability

S	±50×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	3200 to 33999, 30 to 60(MHz)	kHz	
Overtone Order	OT	Fundamental, 3rd Overtone	——	
Frequency Tolerance	f_{tol}	±50	×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±50	×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	−10 to +70	°C	
Storage Temp. Range	T_{stg}	−40 to +85	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

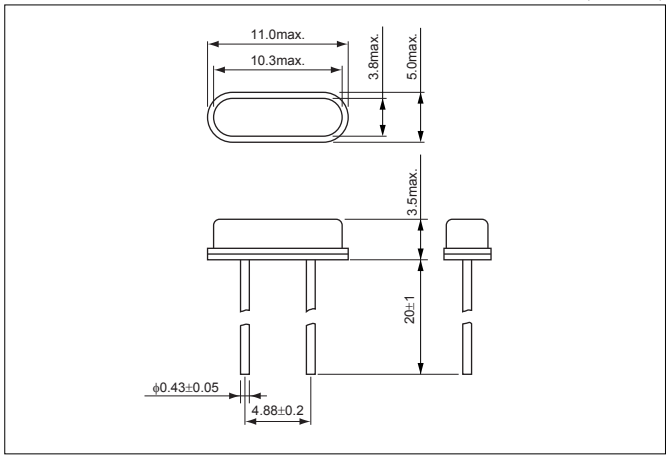
Frequency Range	Motional Series Resistance	Units
3200 to 3499kHz	300	ohm
3500 to 4099kHz	150	
4100 to 4799kHz	120	
4800 to 5999kHz	100	
6000 to 11999kHz	90	
12000 to 13499kHz	70	
13500 to 33999kHz	50	
30 to 60MHz	150	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
3200 to 15999kHz	10 (500 max.)	μW
16000 to 24999kHz	10 (300 max.)	
25000 to 33999kHz	10 (100 max.)	
30 to 60MHz	10 (300 max.)	

Recommended Land Pattern

(Unit : mm)



Pb Free RoHS Compliant

Features

- Crystal unit for audio-visual, office equipment
- Metal package, leaded type
- A resistance weld hermetic sealed type
- Suitable for high density assembly and mass production

Applications

- Digital Electronics
- Audio-Visual, Office Equipment

How to Order

CXZ49GFB 03579 H0 P E S ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code
②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
03200	3200.000	**11000**	11000.000
03579	3579.545	**11059**	11059.200
03686	3686.400	**12000**	12000.000
04000	4000.000	**12288**	12288.000
04194	4194.304	**13500**	13500.000
04332	4332.000	**14318**	14318.180
04433	4433.619	**16000**	16000.000
04500	4500.000	**16934**	16934.400
04915	4915.200	**17280**	17280.000
06000	6000.000	**17734**	17734.476
06144	6144.000	**20000**	20000.000
07200	7200.000	**21477**	21477.270
07372	7372.800	**24000**	24000.000
08000	8000.000	**24576**	24576.000
10000	10000.000	**25000**	25000.000
10240	10240.000	**27000**	27000.000
10738	10738.635		

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

P	±50×10^{-6}

⑤Operating Temperature Range

E	−10°C to +70°C

⑥Frequency Temperature Stability

S	±50×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	3200 to 33999, 30 to 60(MHz)	kHz	
Overtone Order	OT	Fundamental, 3rd Overtone	——	
Frequency Tolerance	f_{tol}	±50	×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±50	×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	−10 to +70	°C	
Storage Temp. Range	T_{stg}	−40 to +85	°C	

* Please inqurie about specifications other than the above.

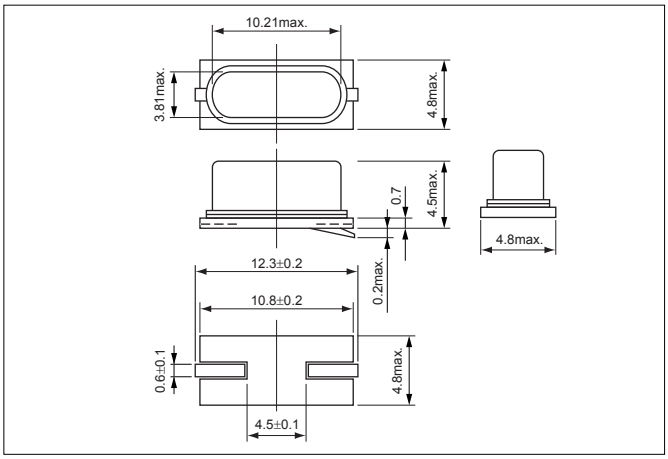
Table1 Motional Series Resistances

Frequency Range	Motional Series Resistance	Units
3200 to 3499kHz	300	ohm
3500 to 4099kHz	150	
4100 to 4799kHz	120	
4800 to 5999kHz	100	
6000 to 11999kHz	90	
12000 to 13499kHz	70	
13500 to 33999kHz	50	
30 to 60MHz	150	

Table2 Level of Drive

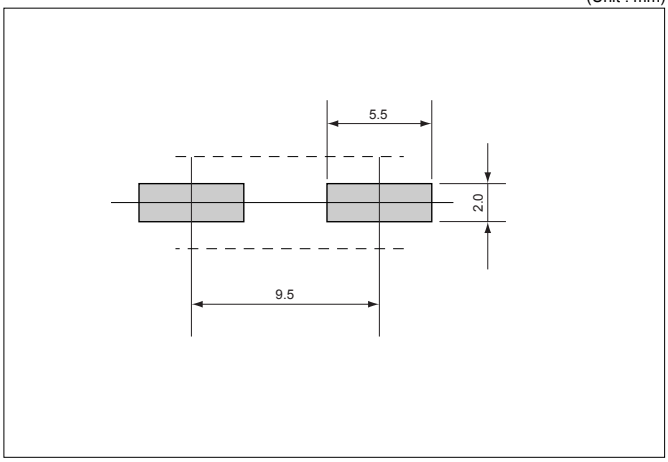
Frequency Range	Level of Drive	Units
3200 to 15999kHz	10 (500 max.)	μW
16000 to 24999kHz	10 (300 max.)	
25000 to 33999kHz	10 (100 max.)	
30 to 60MHz	10 (300 max.)	

Dimensions



Recommended Land Pattern

(Unit : mm)



RoHS Compliant

Features

- Crystal unit for automotive electronics
- Small and low profile (5.0x3.2x1.3mm)
- Ceramic package
- Product with lead free terminations
- Reflow compatible

Applications

- Engine Control

How to Order

CX5032GA 16000 H0 Q S W ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
10000	10000.000	**18000**	18000.000
12000	12000.000	**20000**	20000.000
15000	15000.000	**24000**	24000.000
16000	16000.000	**25000**	25000.000

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

Q	$\pm100\times10^{-6}$

⑤Operating Temperature Range

S	–40°C to +125°C

⑥Frequency Temperature Stability

W	$\pm200\times10^{-6}$

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	9843.75 to 40000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±100	$\times10^{-6}$	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±200	$\times10^{-6}$	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	–40 to +125	°C	
Storage Temp. Range	T_{stg}	–40 to +150	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

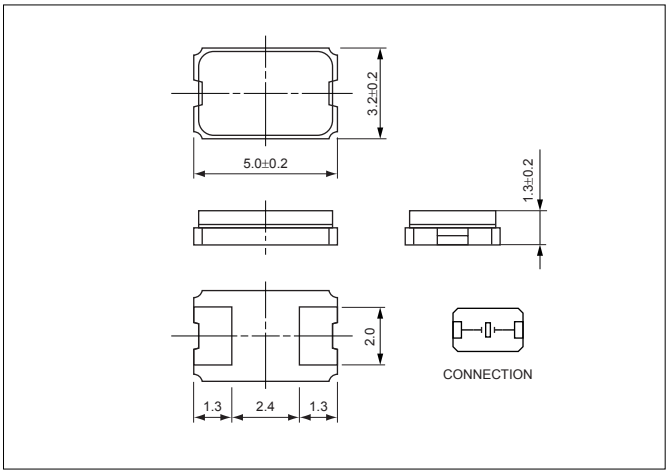
Frequency Range	Motional Series Resistance	Units
9843.75 to 11999kHz	200	ohm
12000 to 13999kHz	150	
14000 to 29999kHz	100	
30000 to 40000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
9843.75 to 15999kHz	10 (500 max.)	μW
16000 to 24999kHz	10 (300 max.)	
25000 to 40000kHz	10 (100 max.)	

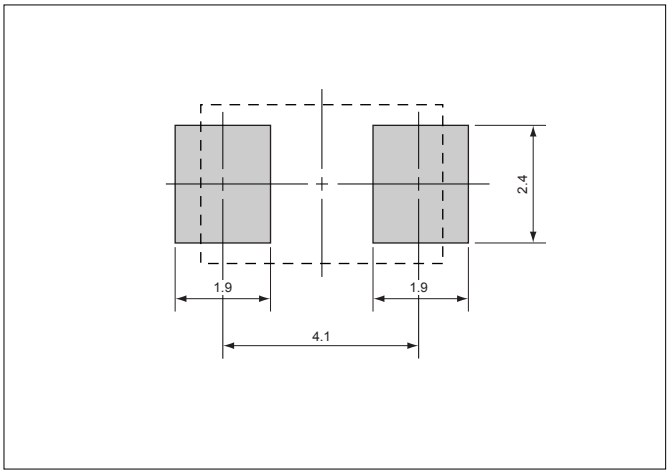
Dimensions

(Unit : mm)



Recommended Land Pattern

(Unit : mm)



RoHS Compliant

Features

- Crystal unit for automotive electronics
- Small and low profile (8.0x4.5x1.9mm)
- Ceramic package, J lead type
- Product with lead free terminations
- Reflow compatible

Applications

- Engine Control, TPMS

How to Order

CX8045JA 08000 H0 Q S W ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
08000	8000.000	**16000**	16000.000
09843	9843.750	**18000**	18000.000
10000	10000.000	**20000**	20000.000
12000	12000.000	**24000**	24000.000
13560	13560.000	**25000**	25000.000
14000	14000.000	**30000**	30000.000

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

Q	±100×10^{-6}

⑤Operating Temperature Range

S	–40°C to +125°C

⑥Frequency Temperature Stability

W	±200×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	8000 to 30000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±100	×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±200	×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	–40 to +125	°C	
Storage Temp. Range	T_{stg}	–40 to +150	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

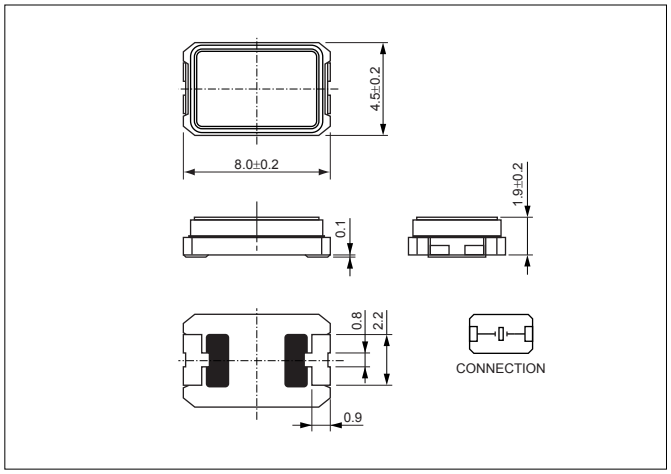
Frequency Range	Motional Series Resistance	Units
8000 to 9999kHz	200	ohm
10000 to 11999kHz	150	
12000 to 30000kHz	100	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
8000 to 15999kHz	10 (500 max.)	μW
16000 to 24999kHz	10 (300 max.)	
25000 to 30000kHz	10 (100 max.)	

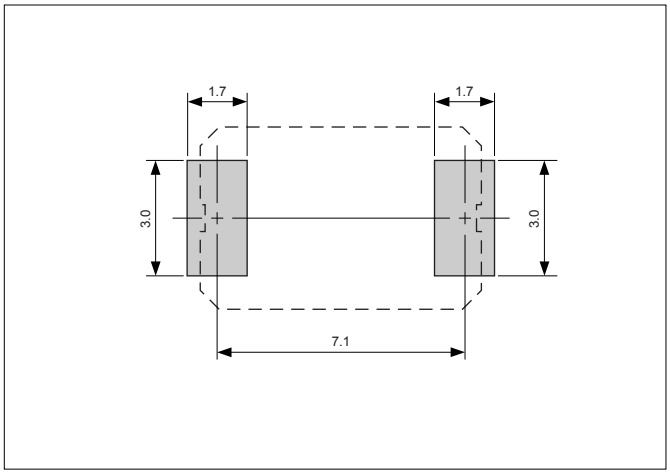
Dimensions

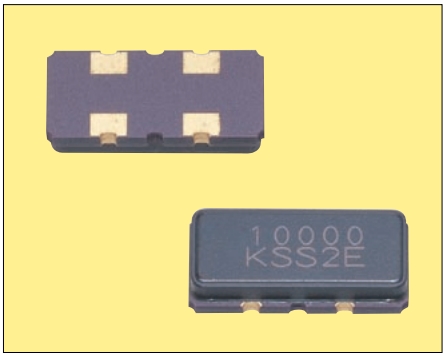
(Unit : mm)



Recommended Land Pattern

(Unit : mm)





RoHS Compliant

Features

- Crystal unit for automotive electronics
- Small and low profile (11.8×5.5×2.5mm)
- Ceramic package
- Product with lead free terminations
- Reflow compatible

Applications

- Engine Control

How to Order

CXB855GA 06000 H0 Q S W ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
04000	4000.000	**12000**	12000.000
05000	5000.000	**16000**	16000.000
06000	6000.000	**18000**	18000.000
08000	8000.000	**20000**	20000.000
10000	10000.000		

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

Q	±100×10^{-6}

⑤Operating Temperature Range

S	–40°C to +125°C

⑥Frequency Temperature Stability

W	±200×10^{-6}

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	3500 to 20000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±100	×10^{-6}	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±200	×10^{-6}	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	–40 to +125	°C	
Storage Temp. Range	T_{stg}	–40 to +125	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

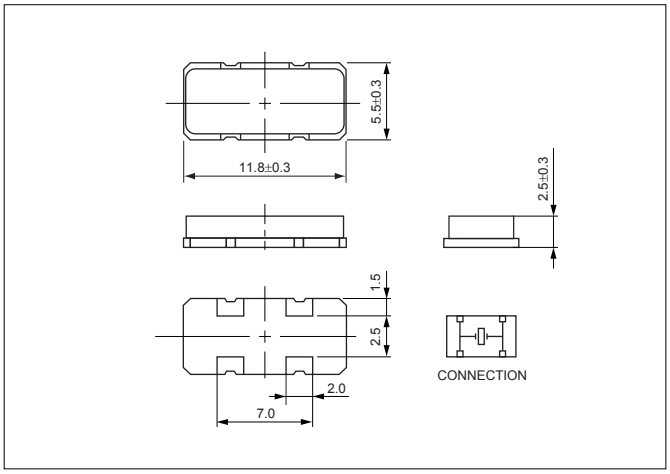
Frequency Range	Motional Series Resistance	Units
3500 to 3999kHz	300	ohm
4000 to 7999kHz	200	
8000 to 11999kHz	120	
12000 to 20000kHz	100	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
3500 to 15999kHz	10 (500 max.)	μW
16000 to 20000kHz	10 (300 max.)	

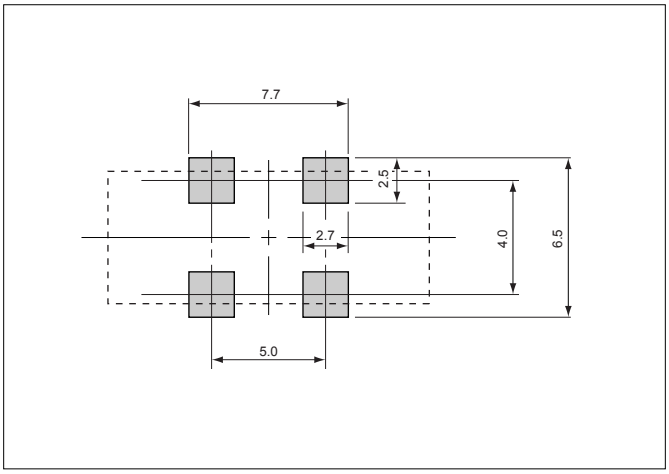
Dimensions

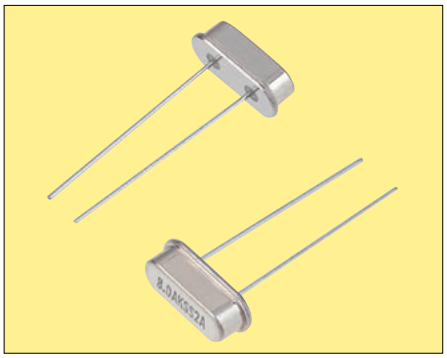
(Unit : mm)



Recommended Land Pattern

(Unit : mm)





Pb Free RoHS Compliant

Features

- Crystal unit for automotive electronics
- Metal package, leaded type
- A resistance weld hermetic sealed type
- Suitable for high density assembly and mass production

Applications

- Engine Control

How to Order

CXH49SFA 06000 H0 Q S W ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
04000	4000.000	**12000**	12000.000
05000	5000.000	**16000**	16000.000
06000	6000.000	**18000**	18000.000
08000	8000.000	**20000**	20000.000
10000	10000.000		

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

Q	$\pm 100 \times 10^{-6}$

⑤Operating Temperature Range

S	–40°C to +125°C

⑥Frequency Temperature Stability

W	$\pm 200 \times 10^{-6}$

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	3200 to 20000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±100	$\times 10^{-6}$	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±200	$\times 10^{-6}$	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	–40 to +125	°C	
Storage Temp. Range	T_{stg}	–40 to +125	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

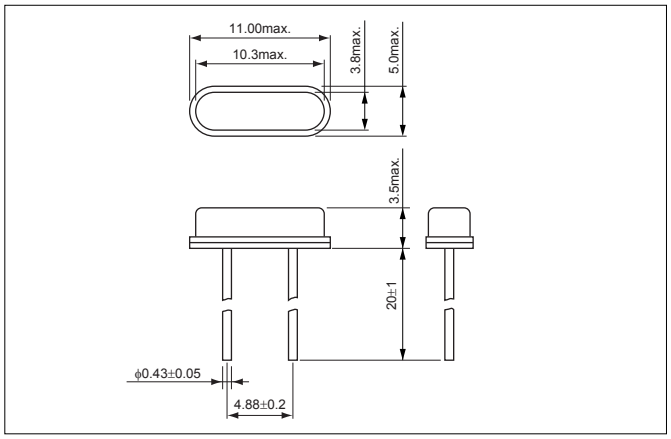
Frequency Range	Motional Series Resistance	Units
3200 to 3499kHz	300	ohm
3500 to 4099kHz	150	
4100 to 4799kHz	120	
4800 to 5999kHz	100	
6000 to 11999kHz	90	
12000 to 13499kHz	70	
13500 to 20000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
3200 to 15999kHz	10 (500 max.)	μW
16000 to 20000kHz	10 (300 max.)	

Dimensions

(Unit : mm)



Crystal Units
Surface Mount Leaded Type CXZ49FFA (CX-49F)
for Automotive

Pb Free RoHS Compliant

Features

- Crystal unit for automotive electronics
- Metal package, leaded type
- A resistance weld hermetic sealed type
- Suitable for high density assembly and mass production

Applications

- Engine Control

How to Order

CXZ49FFA 06000 H0 Q S W ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
04000	4000.000	**12000**	12000.000
05000	5000.000	**16000**	16000.000
06000	6000.000	**18000**	18000.000
08000	8000.000	**20000**	20000.000
10000	10000.000		

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

Q	$\pm 100 \times 10^{-6}$

⑤Operating Temperature Range

S	–40°C to +125°C

⑥Frequency Temperature Stability

W	$\pm 200 \times 10^{-6}$

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	3200 to 20000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±100	$\times 10^{-6}$	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±200	$\times 10^{-6}$	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	–40 to +125	°C	
Storage Temp. Range	T_{stg}	–40 to +125	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

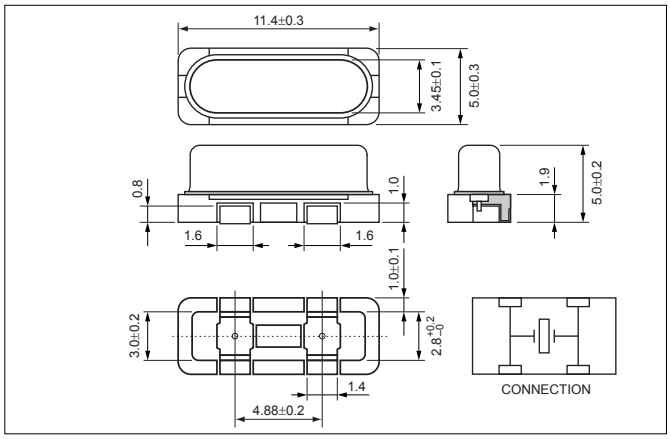
Frequency Range	Motional Series Resistance	Units
3200 to 3499kHz	300	ohm
3500 to 4099kHz	150	
4100 to 4799kHz	120	
4800 to 5999kHz	100	
6000 to 11999kHz	90	
12000 to 13499kHz	70	
13500 to 20000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
3200 to 15999kHz	10 (500 max.)	μW
16000 to 20000kHz	10 (300 max.)	

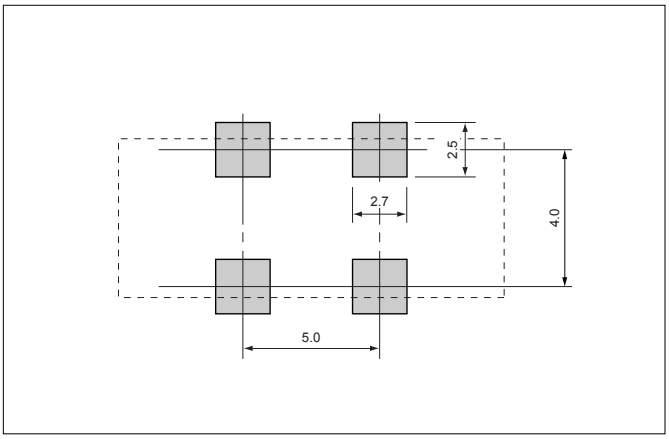
Dimensions

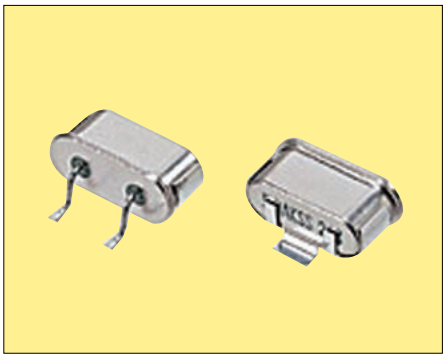
(Unit : mm)



Recommended Land Pattern

(Unit : mm)





Features

- Crystal unit for automotive electronics
- Metal package, leaded type
- A resistance weld hermetic sealed type
- Suitable for high density assembly and mass production

Applications

- Engine Control

How to Order

CXZ49LFA 06000 H0 Q S W ZZ
① ② ③ ④ ⑤ ⑥ ⑦

①Code

②Typical Frequencies

Code	Freq.(kHz)	Code	Freq.(kHz)
04000	4000.000	**12000**	12000.000
05000	5000.000	**16000**	16000.000
06000	6000.000	**18000**	18000.000
08000	8000.000	**20000**	20000.000
10000	10000.000		

*Please inquire about frequencies other than the above.

③Load Capacitance

H0	12pF

④Frequency Stability

Q	$\pm 100 \times 10^{-6}$

⑤Operating Temperature Range

S	–40°C to +125°C

⑥Frequency Temperature Stability

W	$\pm 200 \times 10^{-6}$

⑦Special

ZZ	Custom Specification

Specifications

Items	Symbol	Specification	Units	Remarks
Frequency Range	f_{nom}	3200 to 20000	kHz	
Overtone Order	OT	Fundamental	——	
Frequency Tolerance	f_{tol}	±100	$\times 10^{-6}$	@ 25°C
Frequency Temp. Characteristics	f_{tem}	±200	$\times 10^{-6}$	ref.@ 25°C Over Operating Temp. Range
Motional Series Resistance	R1	Table 1	ohm	
Level of Drive	DL	Table 2	μW	
Load Capacitance	CL	12	pF	
Operating Temp. Range	T_{use}	–40 to +125	°C	
Storage Temp. Range	T_{stg}	–40 to +125	°C	

* Please inqurie about specifications other than the above.

Table1 Motional Series Resistances

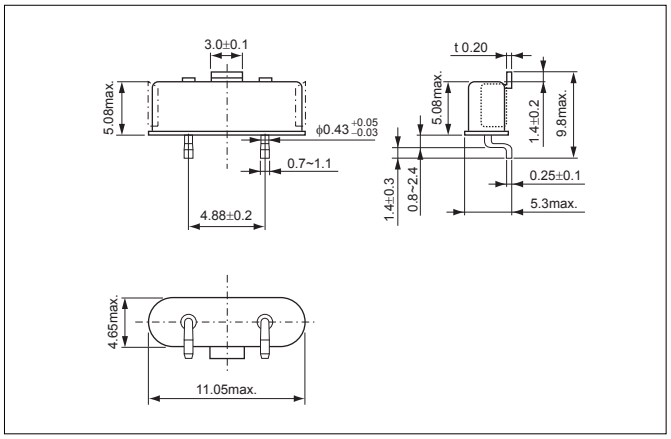
Frequency Range	Motional Series Resistance	Units
3200 to 3499kHz	300	ohm
3500 to 4099kHz	150	
4100 to 4799kHz	120	
4800 to 5999kHz	100	
6000 to 11999kHz	90	
12000 to 13499kHz	70	
13500 to 20000kHz	50	

Table2 Level of Drive

Frequency Range	Level of Drive	Units
3200 to 15999kHz	10 (500 max.)	μW
16000 to 20000kHz	10 (300 max.)	

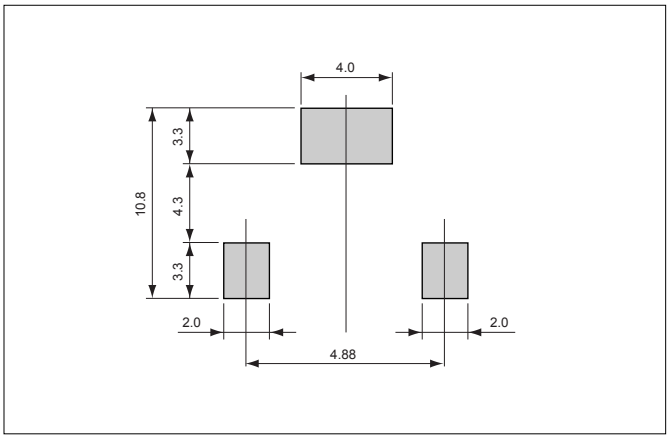
Dimensions

(Unit : mm)



Recommended Land Pattern

(Unit : mm)



1. Shock & Drop • Vibration

Do not inflict excessive shock and mechanical vibration that exceeds the norm, such as hitting or mistakenly dropping, when transporting and mounting on a board. There are cases when pieces of crystal break, and pieces that are used become damaged, and become inoperable. When a shock or vibration that exceeds the norm has been inflicted, make sure to check the characteristics.

2. Cleaning

Since a crystal piece can be broken by resonance when a crystal device is cleaned by ultrasonic cleaning. Be careful when carrying out ultrasonic cleaning.

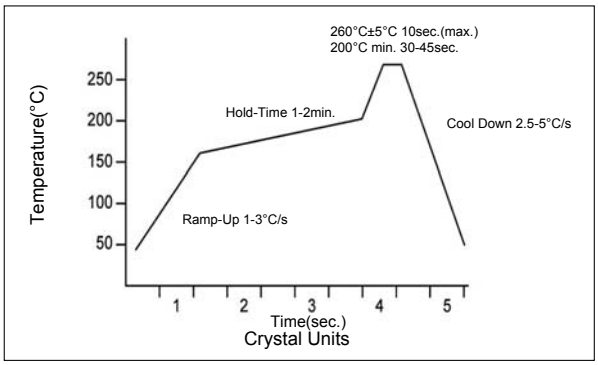
3. Soldering conditions

To maintain the product reliability, please follow recommended conditions.

Standard soldering iron conditions

	Crystal Units
Soldering iron	280°C to 340°C
Time	3+1/–0sec. max.

Reflow conditions (Example)



Recommended reflow Conditions vary depending upon products.
Please check with the respective specification for details.

4. Mounting Precautions

Leaded Devices

The special glass, located where the lead of the retainer base comes out, is aligned with the coefficient of thermal expansion of the lead, If the glass is damaged and cracks appear, there may be cases in which performance deteriorates and it fails to operate.

Consequently, when making the device adhere closely and applying solder, align the gap of the hole of the board with the gap of the lead and insert without excessive force.

When making the device adhere closely to a through hole board and applying solder, be careful that the solder does not get into the metal part of the retainer base and cause a short. Putting in an insulation spacer is one more method of preventing a short circuit.

When the lead is mounted floating, fix it as far as possible so that contact with other parts and the breakage due to the fatigue, and the mechanical resonance of the lead will not occur.

When the lead is bent and used, do not bend the lead directly from the base, separate it 0.5mm or more and then bend it. When bending, before attaching to the board, fix the place where the lead comes out in advance and attach it after bending so that a crack does not occur in the glass part.

Surface Mount Devices

The lead of the device and the pattern of the board is soldered on the surface. Since extreme deformation of the board tears off the pattern, tears off the lead metal, cracks the solder and damages the sealed part of the device and there are cases in which performance deteriorates and operation fails, use it within the stipulated bending conditions. Due to the small cracks in the board resulting from mounting, please pay sufficient attention when attaching a device at the position where the warping of the board is great.

When using an automatic loading machine, as far as possible, select a type that has a small impact and use it while confirming that there is no damage.

Surface mount devices are NOT flow soldering compatible.

5. Storage Condition

Since the long hour high temperature and low temperature storage, as well as the storage at high humidity are causes of deterioration in frequency accuracy and solderability.

Parts should be stored in temperature range of -5 to +40°C, humidity 40 to 60% RH, and avoid direct sunlight. Then use within 6 months.

For Proper Use of Crystal Units

1. Characteristics of crystal units

The thickness of crystal vibrator of the AT cut crystal unit as described in the previous page differs depending on the overtone mode.

(1) Relationship between thickness of crystal blank and oscillation frequency

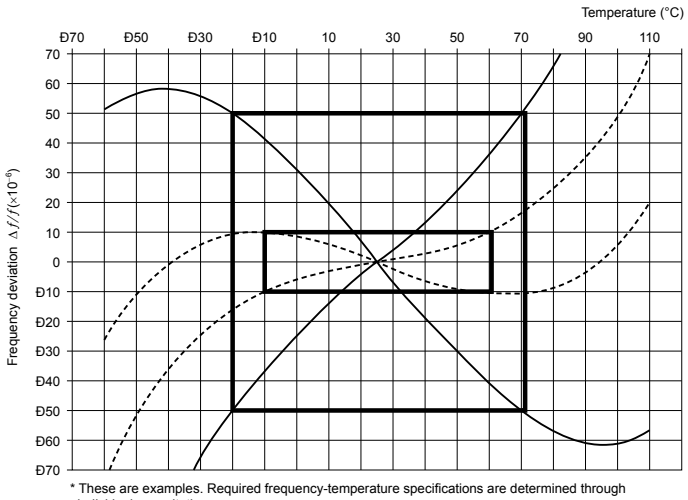
Cut angle/mode overtone	Frequency range (MHz)	Formula of thickness of crystal blank
AT/Fundamental mode	3.5 to 33	1.67/f
AT/3'rd O. T	33 to 100	5.01/f
AT/5'th O. T	100 to 150	8.35/f
AT/7'th O. T	150 to 200	11.69/f

f : Series resonance frequency (MHz)

In case of calculating the thickness of AT-cut 16MHz
t=1.67/16=0.104(mm)

(2) Examples of specifications for frequency-temperature characteristics

The frequency-temperature characteristics of the AT cut crystal unit are tertiary curves.
The diagram below shows examples of the tertiary curves that pass temperature range and frequency deviation specifications.
The range enclosed by the smaller rectangular satisfies the following specification:
±10×10^{-6} (-10 to 60: 25°C)
The range enclosed by the larger rectangular satisfies the following specification:
±50×10^{-6} (-20 to 70: 25°C)



* These are examples. Required frequency-temperature specifications are determined through individual consultations.

(3) Equivalent electric circuit and equivalent constant of crystal unit

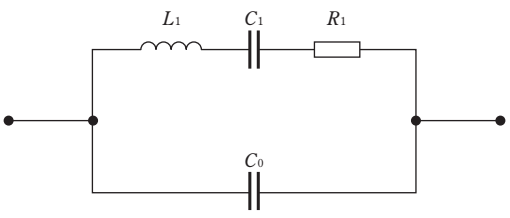
The following equivalent constants are used near the resonance frequency.

L_1 : Motional inductance in the equivalent electric circuit

C_1 : Motional capacitance in the equivalent electric circuit

R : Motional resistance in the equivalent electric circuit

C_0 : Parallel capacitance in the equivalent electric circuit



Equivalent electric circuit of a quarts crystal unit

(4) Items calculated by equivalent constants and load capacitance

f_s: Series resonance frequency $\quad f_s = \dfrac{1}{2\pi\sqrt{L1 \cdot C1}}$

f_p: Parallel resonance frequency $\quad f_p = \dfrac{1}{2\pi\sqrt{L_1 \dfrac{C_0 \cdot C_1}{C_0 + C_1}}}$

γ : Capacitance ratio $\quad \gamma = \dfrac{C_0}{C_1}$

f_L : Load resonance frequency $\quad f_L = f_s\left(\dfrac{C_1}{2\cdot(C_0+C_L)}+1\right)$

R_L : Load resistance $\quad R_L = R_1\left(1+\dfrac{C_0}{C_L}\right)^2$

C_L : Load capacitance $\quad C_L = \dfrac{C_1}{2}\cdot\dfrac{1}{(f_L/f_s)-1} - C_0$

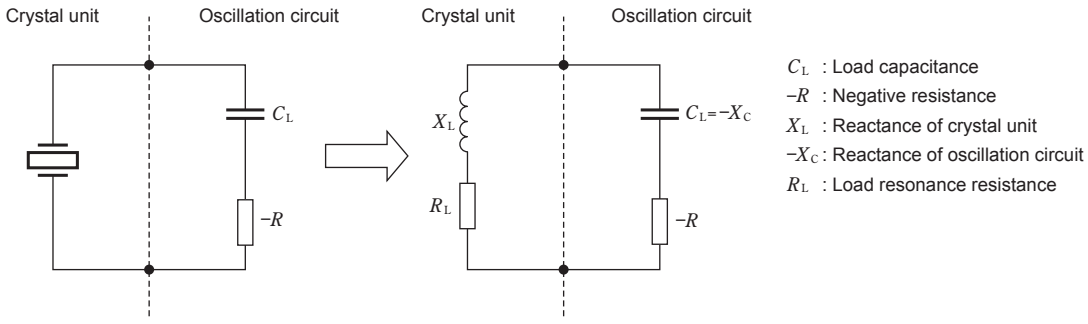
Q : Quality factor $\quad Q = \dfrac{2\pi\cdot f_s\cdot L_1}{R_1} = \dfrac{1}{2\pi\cdot f_s\cdot C_1\cdot R_1}$

The equation f_L shows that f_L varies as load capacitance C_L connected to the crystal unit changes and that f_L becomes larger as C_L becomes smaller.
The equation R_L shows the change in impedance with a load capacitance connected. The impedance of crystal unit becomes larger as C_L becomes smaller.

2. Oscillation circuit and crystal unit

(1) Equivalent circuit of oscillation circuit and oscillation conditions

A simplified equivalent circuit is shown below.



The oscillation start-up conditions are described as

$$R_L \leq |-R|$$

and in order to oscillate the crystal unit accurately, it must be designed such that the negative resistance of the oscillation circuit becomes bigger comparing with the resonance resistance value at the time of loading. This ratio is called oscillation margin degree M_{OSC} and it is one of critical factors when designing the oscillation circuit and is described as below.
For oscillation circuit designing conditions, it is recommended that an oscillation circuit be designed using a negative resistance of a value five to ten times or more larger than RL calculated from the resonance resistance specification value.

$$M_{OSC} = |-R| / R_L \geq 5$$

In a steady oscillation state, the load resonance resistance is given as follows:

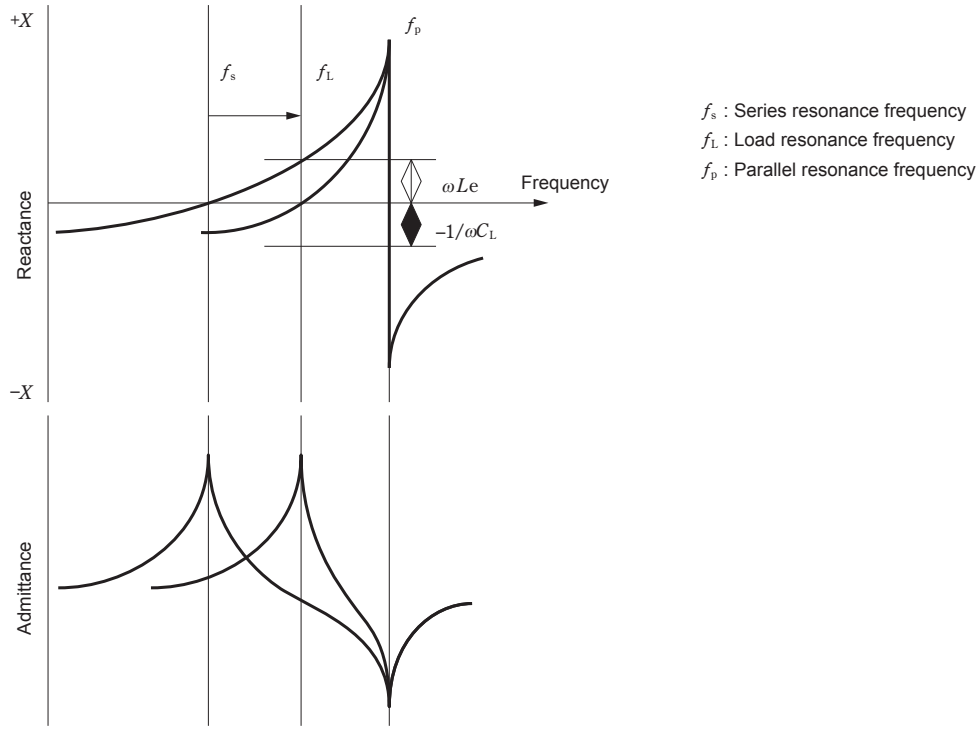
$$R_L = |-R|$$

The mutual conductance of the oscillation circuit decreases after the oscillation has started to continuously compensate for the power loss due to the load resonance resistance of the crystal unit, which continues oscillation.

The frequency condition is given as follows:

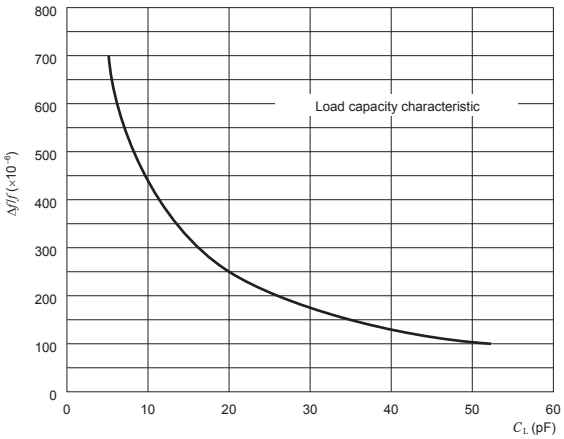
$$X_L = X_C,\ X_L - X_C = 0$$

As shown in the following figure, the reactance of the crystal unit varies to a value matching the load capacitance of the oscillation circuit $C_L = X_C$. Thus an oscillation frequency is determined.



(2) Changes of load capacitance and oscillation frequency

As shown above, the series resonance frequency of the crystal unit changes with load capacitance C_L of the oscillation circuit. In the actual oscillation circuit, however, fine adjustments of oscillation frequencies are carried out by varying C_L by the trimmer capacitor or the like. The following figure shows an example of load capacitance characteristics. The slope of the characteristics varies depending on the frequency, shape, the number of overtone mode, etc.



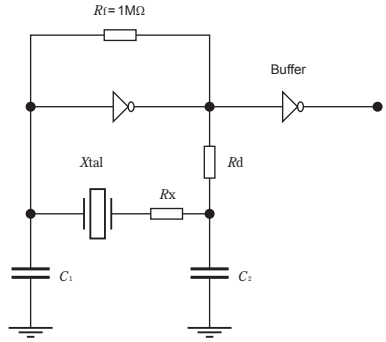
3. Crystal oscillation circuit

(1) CMOS fundamental crystal oscillation circuit

As shown above, the series resonance frequency of the crystal The figure on the right shows a standard CMOS inverter crystal oscillation circuit for oscillating crystal unit with fundamental mode.

* *Rx* is an element to reduce excitation current of the crystal unit preventing frequency fluctuation, but Rx is not used in some cases.

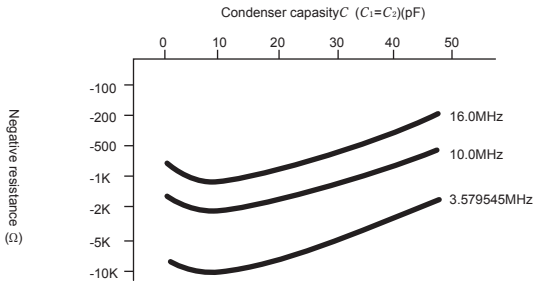
CMOS fundamental crystal oscillation circuit



Characteristics of the circuit when load capacitances C_1 and C_2 are changed under the condition of C_1 = C_2 are shown in the figure on the right.

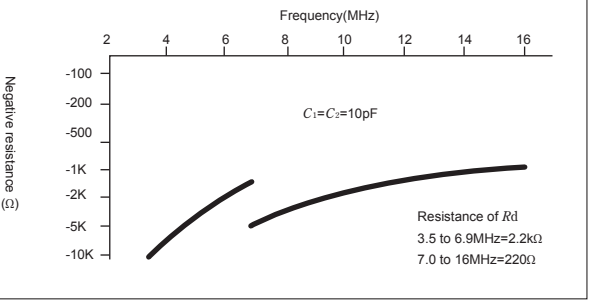
It is not desirable that the excessive increase of the value of condenser leads to a decrease of the negative resistance resulting in increasing the possibility of oscillation failure.

Variation of negative resistance with condenser capacity



Rd mainly adjusts frequency characteristics of the negative resistance and is used to prevent oscillating by third Overtone mode. In case of a bigger circuit of the negative resistance, there is a case it is used to prevent the abnormal oscillation.

Frequency characteristics of negative resistance



Selection of ICs and circuit constants by frequency bands

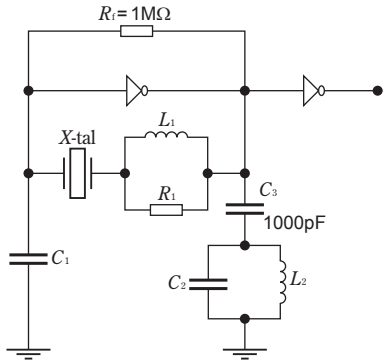
Frequency		3 to 4.9(MHz)	5 to 6.9(MHz)	7 to 9.9(MHz)	10 to 19.9(MHz)	20 to 30(MHz)
IC		TC4069UB TC4SU69F			TC74HCU04A TC7SU04F TC7WU04FU	TC74VHCU04 TC7SHU04F TC7WHU04FU
Rf		1MΩ				
Rd	*1	1500(Ω)	470(Ω)	0(Ω)	0(Ω)	0(Ω)
Rx	*2	0 to 1500Ω				
C_1, C_2	*3	6 to 22(pF)			6 to 15(pF)	6 to 15(pF)

*1: Necessary for preventing overtone oscillation and must be changed depending on the frequency band or the C_1 and C_2 values.
*2: Used to reduce excitation current of the crystal unit. Necessary for stable operation of small-sized crystal units.
*3: The optimum value differs with the values of load capacitance and Rd.

(2) CMOS overtone crystal oscillation circuit

This figure shows a standard CMOS inverter crystal oscillation circuit to oscillate a crystal unit using the overtone mode.

CMOS overtone crystal oscillation circuit



There are same cases when L_1 and R_1 are matched to the value of load capacitance.

(3) Selection of ICs and circuit constants by frequency bands

Frequency range	20 to 60(MHz)
IC	TC74VHCU04 TC7SHU04F TC7WHU04FU
C_1	3 to 10pF
C_2	10 to 22pF

(4) Method of selecting circuit constants and functions of elements

C_1 : Forms load capacitance of the circuit together with C_2, L_1 and L_2. A value of approx. 5pF is used.

C_2 : Forms load capacitance of the circuit together with C_1, L_1 and L_2. Prevents fundamental wave oscillation. Shall be selected so that C_2 comes between the third overtone frequency at which resonance frequency with L_2 is to make oscillation and 1/3 of the third overtone frequency. A value of 10 to 22pF is used.

C_3 : A bypath capacitor

L_1 : A coil to adjust load capacitance of the oscillation circuit to a value near the series. A value of several μH is used.

L_2 : Forms load capacitance of the circuit together with C_1, C_2 and L1. Prevents fundamental wave oscillation. Shall be selected so that L2 comes between the third overtone frequency at which resonance frequency with C_2 is to make oscillation and 1/3 of the third overtone frequency. A value of 10 to 22pF is used.

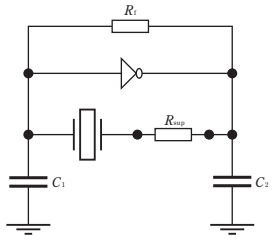
R_1 : A Q dump resistor for L_1 . As an element for preventing self-excited oscillation, A value of several kΩ to several tens of kΩ is used.

* L_1 and R_1 might not be used.

(5) Method of checking oscillation circuit

①Some ICs have a low upper-limit value of usable frequency, so refer to individual IC catalog to make sure that the IC can oscillate a crystal unit with an adequate negative resistance.

②The following figure shows an example of a CMOS oscillation circuit. Check resistance Rsup is connected in series with the crystal unit to check the negative resistance. Use 3 to 22pF for C_1 and C_2, and see the table below for values of check resistance.



Frequency range	Values of check resistance
3.5 to 4.5MHz	1.5kΩ
4.6 to 6.0MHz	1.0kΩ
6.1 to 10.0MHz	800Ω
10.1 to 14.0MHz	500Ω
14.1 to 20.0MHz	400Ω

③Using a spectrum analyzer or oscilloscope, check that every oscillation is normally activated while turning the power on and off several times. For oscillation circuits with no power regulator ICs, carefully check changes in the negative resistance against supply voltage and in frequencies.

④When oscillation is normal, remove the check resistance before using the crystal circuit.

⑤If oscillation is unstable or is not generated, gradually decrease the values of C_1 and C_2 until normal oscillation is obtained.

⑥If normal oscillation cannot be generated near 10MHz or near 20MHz, replace the IC with a new one suitable for higher frequencies.

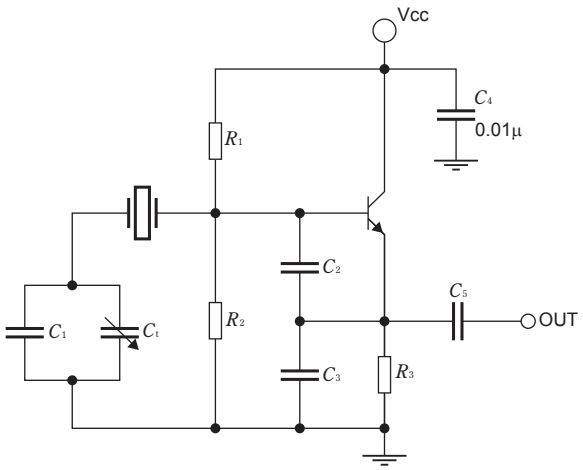
(6) Load capacitance and oscillation frequency of transistor/fundamental crystal oscillation circuit

Viewed from the connection terminals of a crystal unit, the load capacitance C_L of an oscillation circuit is generally comprised of C_1, C_t, C_2, and C_3 if stray capacitance of the circuit and the capacitance between base and emitter of the transistor are ignored. Since trimmer capacitor is adjusted to C_T = MIN. to MAX. for zero adjustment of the oscillation frequency, the value of C_L at this time can be obtained from the following equation.

$$C_L\text{MIN.} = \left(\frac{1}{C_1+C_T}+\frac{1}{C_2}+\frac{1}{C_3}\right)^{-1} \text{ to } C_L\text{MAX.} = \left(\frac{1}{C_1+C_T}+\frac{1}{C_2}+\frac{1}{C_3}\right)^{-1}$$

When these calculation results are substituted for the following equation for load resonance frequency, the oscillation frequency can be obtained.

$$f_L = f_s\left(\frac{C_1}{2\cdot(C_0+C_L)}+1\right)$$



Select each circuit constant so that the adjustment ranges of upper and lower frequencies of this circuit are even on the basis of the frequency of a single crystal unit measured using a specified load capacity, and that the margin of ±8 to 10 $\times 10^{-6}$ of the room temperature deviation of the crystal unit can be reserved.

To prevent the decrease in the negative resistance, always connect the crystal unit to the base of the transistor. For transistors used for oscillation circuits, hfe and fT are important.
To obtain the large negative resistance with small current consumption, select a transistor for high frequency amplification with hfe of over 250 and f_T of 1GHz or more.

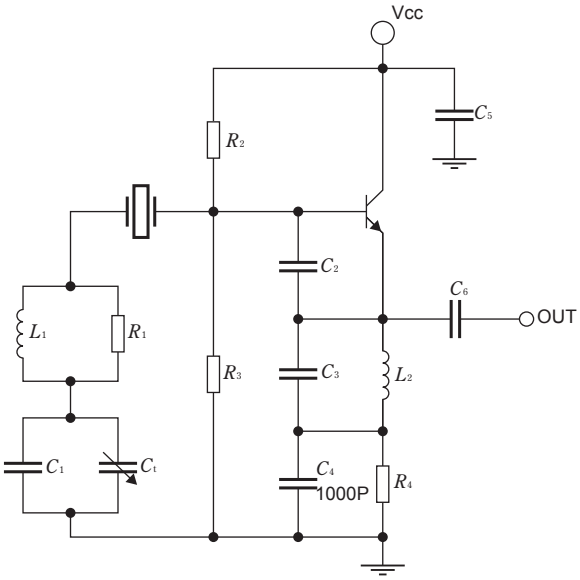
(7) Transistor third overtone oscillation circuit

①The resonance circuit comprised of L_2 and C_3 is required on the emitter side for preventing fundamental mode crystal oscillation. Set the resonance frequency to a value higher than the intermediate between fundamental wave frequency and third overtone frequency.

②Use L_1, referred to as an elongation coil, to connect the load capacitance of the oscillation circuit in series. R_1 prevents self-excited oscillation by L_1. Since it is difficult in general to design the oscillation circuit having adequate negative resistance in the overtone oscillation frequency band, there are no other effective means of obtaining adequate oscillation margin except for preventing the increase of load resonance resistance R_L of the crystal unit.

R_L in the equation of load resonance resistance can be made equal to R_S by connecting C_L in series, or making it infinite, which prevents increase in the load resonance resistance.

$$R_L = R_1\left(1+\frac{C_0}{C_L}\right)^2$$



To prevent decrease in the negative resistance, connect the crystal unit to the base of the transistor as in the fundamental mode crystal oscillation circuit. To use the crystal circuit for both oscillation and multiplication, connect a parallel resonance circuit having multiplication frequency as resonance frequency to the collector of the transistor.
When selecting circuit constants for zero adjustment range by trimmer capacitor, set the constants to values obtained by adding approx. ±12 to 15×10^{-6} to the room temperature deviation of the crystal unit, centering the value obtained by measuring the crystal unit with load capacitances in series. (When the room temperature deviation specification of the crystal unit is $\pm10\times10^{-6}$)

(8) Excitation power of oscillation circuit

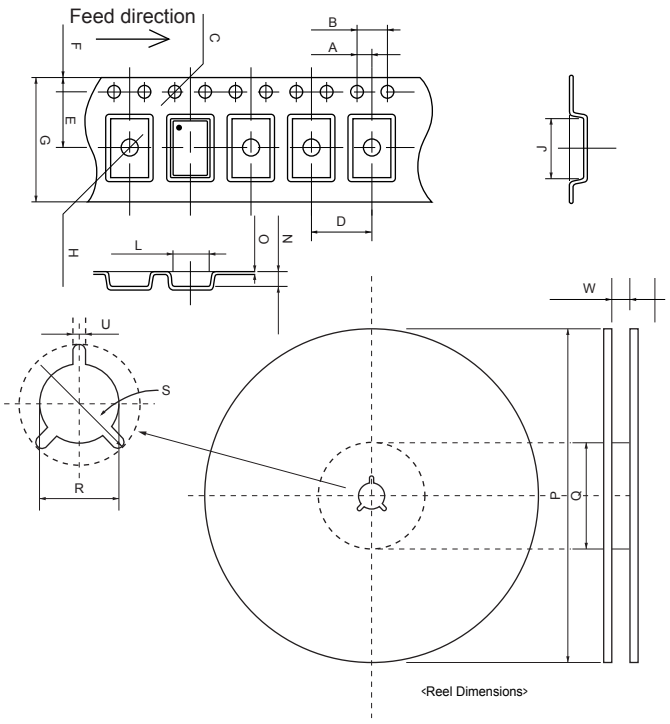
Normal operation of crystal units is not assured when excitation power is raised. The allowable excitation power varies depending on the shape of the crystal unit or the stability of targeted frequency. When highly accurate oscillation is required, however, it is recommended to use an oscillation circuit with an excitation power of 5 to 50 μW or less. For other cases, refer to individual relevant crystal units on the pages of the catalog.

(9) Precautions for designing printed circuit board

Be sure to design printed circuit board patterns that connect a crystal unit with other oscillation elements so that the lengths of such patterns become shortest possible to prevent deterioration of characteristics due to stray capacitances and wiring inductance. For multi-layer circuit boards, it is important not to wire the ground and other signal patterns right beneath the oscillation circuit.

Tape & Reel Specifications

■Crystal Units



<Reel Dimensions>

		CX2520SB (CX-2520SB)	CX3225SB (CX-101F)	CX4025SB (CX-4025S)	CX5032SB (CX-96F)	CX5032GB (CX-53F)	CX8045GB (CX-8045G) CX8045JA (CX-17F)	CXZ49FFA (CX-49F)	CX855GA (CX-5FW) CXB855GB (CX-5FD)	CXZ9LPA (CX-49L)
TAPE	A	2.0±0.05	2.0±0.05	2.0±0.1	2.0±0.1	2.0±0.1	2.0±0.1	2.0±0.1	2.0±0.1	2.0±0.1
	B	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1
	C	ϕ1.55±0.05	ϕ1.55±0.05	ϕ1.55±0.05	ϕ1.5±0.1	ϕ1.55±0.1	ϕ1.5±0.1	ϕ1.55±0.05	ϕ1.55±0.05	ϕ1.5±0.1
	D	4.0±0.05	4.0±0.05	4.0±0.1	8.0±0.1	8.0±0.1	8.0±0.1	8.0±0.1	12.0±0.1	16.0±0.1
	E	3.5±0.05	3.5±0.05	5.5±0.1	5.5±0.1	5.5±0.1	7.5±0.1	11.5±0.1	11.5±0.1	11.5±0.1
	F	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
	G	8.0±0.2	8.0±0.2	12.0±0.3	12.0±0.3	12.0±0.2	16.0±0.3	24.0±0.3	24.0±0.3	24.0±0.3
	H	ϕ1.05±0.1	ϕ1.05±0.1	ϕ1.05±0.1	ϕ1.5±0.1	ϕ1.55±0.1	ϕ1.55±0.05	ϕ2.05±0.05	ϕ2.05±0.05	ϕ2.2±0.1
	J	3.5±0.1	3.5±0.1	4.2±0.1	5.5±0.1	5.4±0.1	8.4±0.1	11.5±0.1	12.2±0.1	—
	L	2.8±0.1	2.8±0.1	2.7±0.1	3.7±0.1	3.6±0.1	4.9±0.1	5.4±0.1	5.85±0.1	—
	N	0.85±0.1	0.85±0.1	0.95±0.05	1.4±0.1	1.7±0.1	2.1±0.1	5.5±0.1	2.8±0.1	6.5±0.1
	O	0.25±0.05	0.25±0.05	0.2±0.05	0.3±0.05	0.25±0.05	0.3±0.05	0.3±0.05	0.3±0.05	0.5±0.05
REEL	P	ϕ180+0/-3	ϕ180+0/-3	ϕ180+0/-3	ϕ330±2/ϕ178±2	ϕ330±2/ϕ254±2	ϕ330±2/ϕ254±2	ϕ330±2	ϕ330±2	ϕ330±2
	Q	ϕ60+1/-0	ϕ60+1/-0	ϕ60+1/-0	ϕ80±2/ϕ100±1	ϕ100±1	ϕ80±1	ϕ100±1	ϕ100±1	ϕ100±1
	R	ϕ13±0.2	ϕ13±0.2	ϕ13±0.2	ϕ13±0.2	ϕ13±0.2	ϕ13±0.2	ϕ13±0.5	ϕ13±0.5	ϕ13±0.5
	S	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.5	ϕ21±0.5	—
	U	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.2	2.0±0.5	—
	W	9±1	9±1	13±1	13.5+1/-0.5	13.4+2/-0	16.0+2/-0	25.5±0.5	24.4+2/-0	25.5+1/-0.5
Qty		3000/1000	3000/1000	3000/1000	5000/1000	3000/1000	3000/1000	1000	1000	600

Clock Oscillators Surface Mount Type
KC2520A-C1 Series (KC2520 Series)

CMOS / 1.8V / 2.5×2.0mm

KYOCERA

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =1.8V
  Lower voltage available

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC2520A 25.0000 C 1 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (2.5×2.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (1.8V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function
(45/55%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 2000pcs./reel)

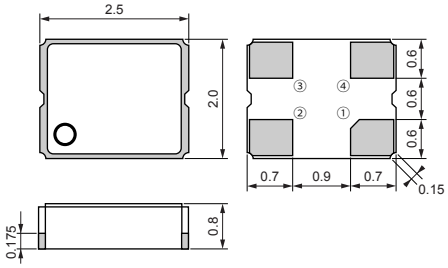
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.5	50	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10⁻⁶
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7.0	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		1.62	1.98	V
		Freq. Tol.Code: U, G		1.71	1.89	
Current Consumption (Maximum Loaded)	I_{DD}	1.5≤Fo≤24MHz		—	3	mA
		24<Fo≤40MHz		—	4	
		40<Fo≤50MHz		—	5	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.8≤Fo≤26MHz		—	9	nS
		26<Fo≤50MHz		—	7	
Output Voltage-"L"	V_{OL}	I_{OL}=2mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−2mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	100	nS
Enable Time	—			—	3	mS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



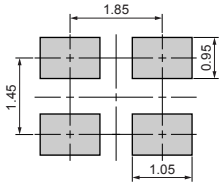
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

AVX

Pb-free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =2.5V
  Lower voltage available

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC2520A 25.0000 C 2 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (2.5×2.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (2.5V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function
(45/55%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 2000pcs./reel)

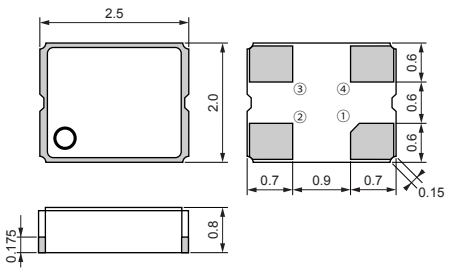
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.5	50	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10⁻⁶
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7.0	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.25	2.75	V
		Freq. Tol.Code: U, G		2.38	2.63	
Current Consumption (Maximum Loaded)	I_{DD}	1.5≤Fo≤24MHz		—	4	mA
		24<Fo≤40MHz		—	5	
		40<Fo≤50MHz		—	6	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.8≤Fo≤26MHz		—	8	nS
		26<Fo≤50MHz		—	6	
Output Voltage-"L"	V_{OL}	I_{OL}=5mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−5mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	100	nS
Enable Time	—			—	3	mS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



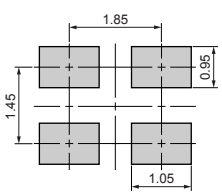
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Pb-free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =3.3V

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC2520A 25.0000 C 3 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (2.5×2.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 2000pcs./reel)

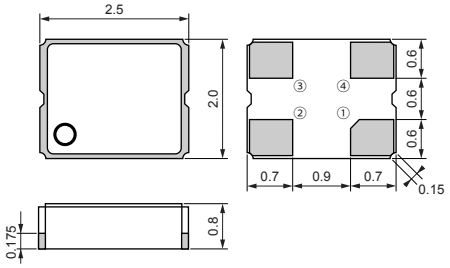
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.5	50	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10⁻⁶
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7.0	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.97	3.63	V
		Freq. Tol.Code: U, G		3.14	3.46	
Current Consumption (Maximum Loaded)	I_{DD}	1.5≤Fo≤24MHz		—	5	mA
		24<Fo≤40MHz		—	6	
		40<Fo≤50MHz		—	8	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.8≤Fo≤26MHz		—	8	nS
		26<Fo≤50MHz		—	6	
Output Voltage-"L"	V_{OL}	I_{OL}=6mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−6mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	100	nS
Enable Time	—			—	3	mS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



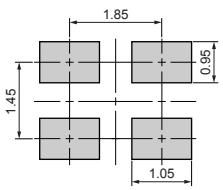
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

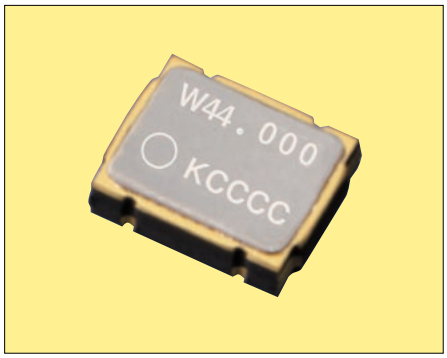
(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Clock Oscillators Surface Mount Type
KC3225A-C2 Series (K25-2C Series)

CMOS / 2.5V / 3.2×2.5mm



Pb-free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =2.5V
  Lower voltage available
- $\pm 25\times10^{-6}$ available

Table 1

Freq. Tol. Code	Freq. Tol. $\times 10^{-6}$	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC3225A 25.0000 C 2 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (3.2×2.5mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (2.5V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function
(45/55%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 2000pcs./reel)

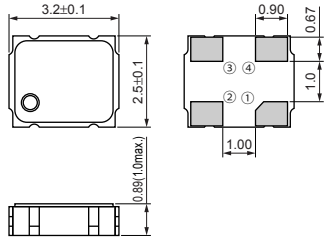
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.5	125	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	$\times10^{-6}$
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7.0	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.25	2.75	V
		Freq. Tol.Code: U, G		2.38	2.63	
Current Consumption (Maximum Loaded)	I_{DD}	1.5≤Fo≤26MHz		—	4	mA
		26<Fo≤50MHz		—	6	
		50<Fo≤68MHz		—	9	
		68<Fo≤90MHz		—	12	
		90<Fo≤125MHz			18	
Stand-by Current	I_std			—	10	μA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.5≤Fo≤68MHz		—	6	nS
		68<Fo≤90MHz		—	5	
		90<Fo≤125MHz		—	4	
Output Voltage-"L"	V_{OL}	I_{OL}=4mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−4mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



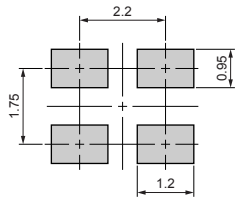
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

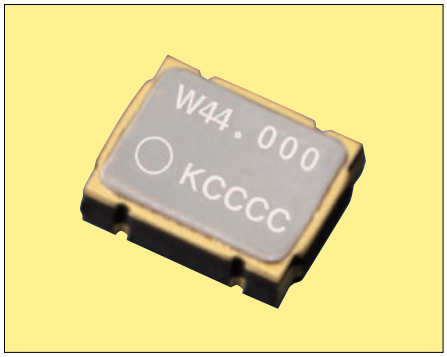
(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Clock Oscillators Surface Mount Type
KC3225A-C3 Series (K25-3C Series)

CMOS / 3.3V / 3.2×2.5mm



Pb-free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =3.3V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. ×10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC3225A 25.0000 C 3 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (3.2×2.5mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 2000pcs./reel)

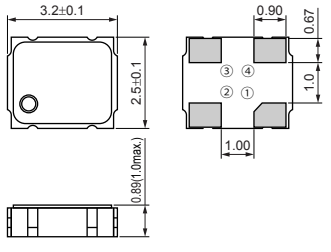
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.5	125	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7.0	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.97	3.63	V
		Freq. Tol.Code: U, G		3.14	3.46	
Current Consumption (Maximum Loaded)	I_{DD}	1.5≤Fo≤26MHz		—	6	mA
		26<Fo≤50MHz		—	8	
		50<Fo≤68MHz		—	12	
		68<Fo≤90MHz		—	18	
		90<Fo≤125MHz			25	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.5≤Fo≤68MHz		—	5	nS
		68<Fo≤90MHz		—	4	
		90<Fo≤125MHz		—	3	
Output Voltage-"L"	V_{OL}	I_{OL}=4mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−4mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



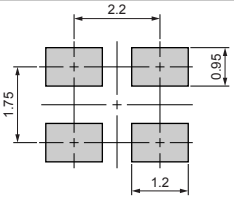
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =1.8V
  Lower voltage available
- $\pm25\times10^{-6}$, $\pm20\times10^{-6}$ available

Table 1

Freq. Tol. Code	Freq. Tol. $\times10^{-6}$	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
W	± 20		
F	±100	−40 to +85	
G	± 50		

How to Order

KC5032C 25.0000 C 1 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (5.0×3.2mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (1.8V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function
(45/55%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

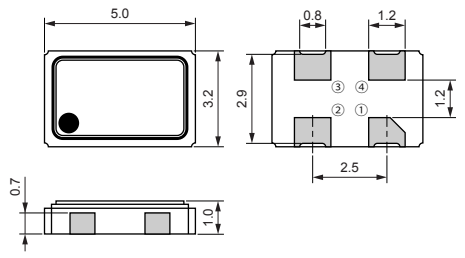
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.8	39.99	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10⁻⁶
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
			Op. Temp.: −10 to +70°C	−20	+20	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+3.6	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		1.71	1.89	V
		Freq. Tol.Code: U, G, W		1.75	1.85	
Current Consumption (Maximum Loaded)	I_{DD}	1.8≤Fo≤25MHz		—	3	mA
		25<Fo≤39.99MHz		—	4	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf			—	9	nS
Output Voltage-"L"	V_{OL}	I_{OL}=2.8mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−2.8mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



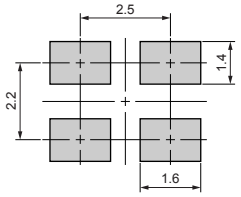
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =2.5V
  Lower voltage available
- $\pm25\times10^{-6}$, $\pm20\times10^{-6}$ available

Table 1

Freq. Tol. Code	Freq. Tol. $\times10^{-6}$	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
W	± 20		
F	±100	−40 to +85	
G	± 50		

How to Order

KC5032C 25.0000 C 2 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (5.0×3.2mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (2.5V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function
(45/55%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

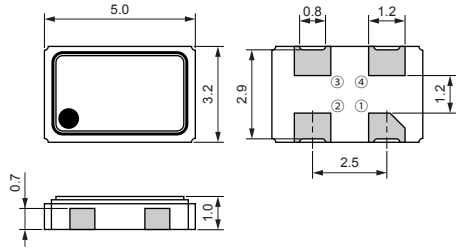
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.8	125	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10⁻⁶
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
			Op. Temp.: −10 to +70°C	−20	+20	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7.0	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.25	2.75	V
		Freq. Tol.Code: U, G		2.38	2.62	
		Freq. Tol.Code: W		2.43	2.57	
Current Consumption (Maximum Loaded)	I_{DD}	1.8≤Fo≤20MHz		—	5	mA
		20<Fo≤40MHz		—	10	
		40<Fo≤60MHz		—	15	
		60<Fo≤85MHz		—	20	
		85<Fo≤100MHz		—	22	
		100<Fo≤125MHz		—	27	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.8≤Fo≤40MHz		—	7	nS
		40<Fo≤85MHz		—	4	
		85<Fo≤125MHz		—	3	
Output Voltage-"L"	V_{OL}	I_{OL}=4mA/8mA (40MHz<Fo)		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−4mA/−8mA (40MHz<Fo)		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



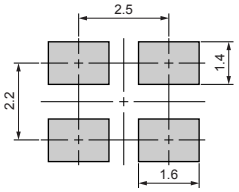
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Clock Oscillators Surface Mount Type
KC5032C-C3 Series (K30-3C Series)

CMOS / 3.3V / 5.0×3.2mm

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =3.3V
- $\pm 25\times10^{-6}$, $\pm 20\times10^{-6}$ available

Table 1

Freq. Tol. Code	Freq. Tol. $\times 10^{-6}$	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
W	± 20		
F	±100	−40 to +85	
G	± 50		

How to Order

KC5032C 25.0000 C 3 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (5.0×3.2mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

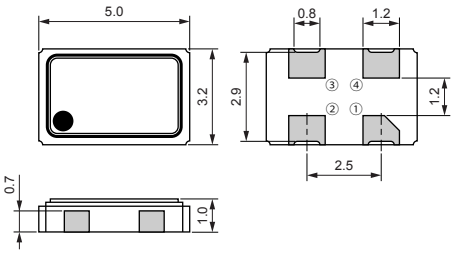
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.8	160	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	$\times10^{-6}$
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
			Op. Temp.: −10 to +70°C	−20	+20	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7.0	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.97	3.63	V
		Freq. Tol.Code: U, G		3.14	3.46	
		Freq. Tol.Code: W		3.20	3.40	
Current Consumption (Maximum Loaded)	I_{DD}	1.8≤Fo≤20MHz		—	10	mA
		20<Fo≤40MHz		—	15	
		40<Fo≤60MHz		—	30	
		60<Fo≤100MHz		—	35	
		100<Fo≤135MHz		—	45	
		135<Fo≤160MHz		—	60	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.8≤Fo≤26MHz		—	10	nS
		26<Fo≤45MHz		—	8	
		45<Fo≤100MHz		—	5	
		100<Fo≤160MHz		—	2.5	
Output Voltage-"L"	V_{OL}	I_{OL}=8mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−8mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



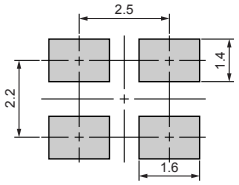
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Clock Oscillators Surface Mount Type
KC5032C-C3 Series (K30-3C Series) Heavy Load Type
CMOS / 3.3V / 5.0×3.2mm

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output CL=50pF max available
- Supply voltage V_{DD} =3.3V

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies

How to Order

KC5032C 25.0000 C 3 0 E HL
① ② ③④⑤⑥⑦

①Type (5.0×3.2mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function
(45/55%, Stand-by)
⑦Heavy Load Type
HL : CL =50pF max.

Packaging (Tape & Reel 1000pcs./reel)

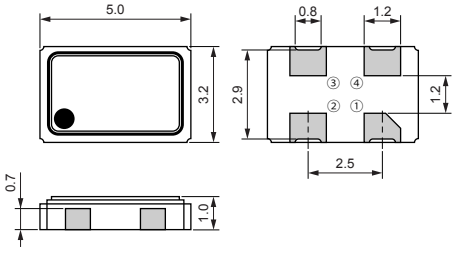
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			14	30	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration		−50	+50	×10⁻⁶
				−30	+30	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use			−10	+70	°C
Max. Supply Voltage	—			−0.5	+7.0	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S		2.97	3.63	V
Current Consumption (Maximum Loaded)	I_{DD}	CL=15pF		—	10	mA
		CL=50pF		—	15	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}	CL=15pF	45	55	%
			CL=50pF	40	60	
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	CL=15pF		—	5	nS
		CL=50pF		—	8	
Output Voltage-"L"	V_{OL}	I_{OL}=8mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−8mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	50	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



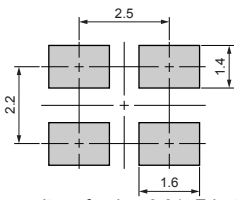
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =5.0V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. ×10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC5032C 25.0000 C 5 0 D 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (5.0×3.2mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (5.0V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Disable)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

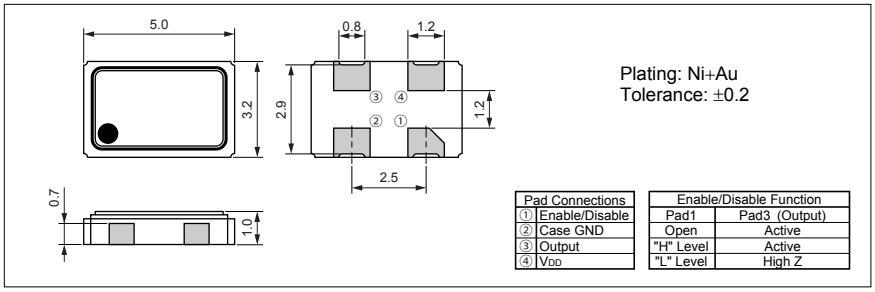
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.8	50	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7.0	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		4.5	5.5	V
		Freq. Tol.Code: U, G		4.75	5.25	
Current Consumption (Maximum Loaded)	I_{DD}	1.8≤Fo≤20MHz		—	25	mA
		20<Fo≤40MHz		—	35	
		40<Fo≤50MHz		—	50	
Disable Current	I_dis			—	30	mA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.8≤Fo≤26MHz		—	10	nS
		26<Fo≤50MHz		—	8	
Output Voltage-"L"	V_{OL}	I_{OL}=16mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−16mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	50	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	0.8	V
Input Voltage-"H"	V_{IH}			2.2	—	V
Disable Time	—			—	100	nS
Enable Time	—			—	100	nS
Start-up Time	ST	@ Minimum operation voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



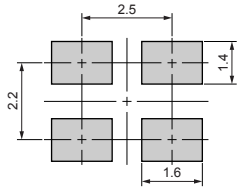
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z

Recommended Land Pattern

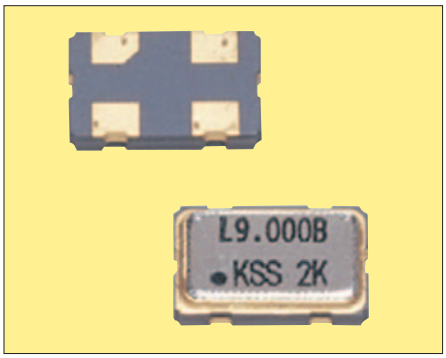
(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Clock Crystal Oscillators Surface Mount Type
KC5032D Series (FXO-61F2 Series)

CMOS / 3.3V / 5.0V / 5.0×3.2mm



Pb Free RoHS Compliant

Features

- Compact and low profile (5×3.2×1.2mm)
- Surface mount type suitable for auto pick-and-place
- Reflow soldering compatible
- CMOS, TTL IC direct drive is possible
- With tri-state function
- Supply voltage V_{DD}=3.3 / 5.0V available

How to Order

KC5032D 25.0000 C 3 0 A 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type
②Output Frequency
③Output Type (CMOS)
④Supply Voltage 5=5.0V, 3=3.3V
⑤Frequency Tolerance (See table at left)
⑥Symmetry/Enable Function (40/60%, INH)
⑦Customer Special Model Suffix
(STD Specification is "00")

Frequency Tolerance (Overall)

Freq.Tol. Code	Freq.Tol. ×10⁻⁶	Operating Temperature Range(°C)	Notes
1	± 100	−10 to +70 (standard)	1.8 to 40MHz
0	± 50		
S	± 30		1.8 to 50MHz

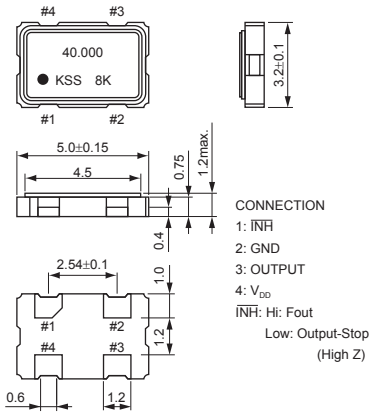
Specifications

Items	Symbol	Specifications		Units
		KC5032Dxx.xxxxC5xA00 (FXO-61F2)	KC5032Dxx.xxxxC3xA00 (FXO-61FL2)	
Output Frequency Range	F_0	1.8 to 50		MHz
Frequency Tolerance (Overall)	$F_{\_tol}$	±30 (to 40MHz)		×10⁻⁶
		±50 (to 50MHz)		
		±100		
Storage Temperature Range	$T_{\_stg}$	−40 to +85		°C
Operating Temperature Range	$T_{\_use}$	−10 to +70		°C
Max. Supply Voltage	–	7 Max.		V
Supply Voltage	V_{DD}	5±0.5	3.3±0.3	V
Current Consumption	I_{DD}	25 Max.	18 Max. (1.8 to 39.9MHz)	mA
			25 Max. (40 to 50MHz)	
Stand-by Current	$I_{\_std}$	10 Max.		µA
Symmetry	SYM	40 to 60@50%V_{DD}		%
Rise / Fall Time	Tr/Tf	10 Max.		nS
Output Voltage-"L"	V_{OL}	10% V_{DD} Max.		V
Output Voltage-"H"	V_{OH}	90% V_{DD} Min.		V
Output Load	CL	15 Max.	20 Max.	pF
Input Voltage Range	V_{IN}	0 to V_{DD}	0 to V_{DD}	V
Input Voltage-"L"	V_{IL}	0.8 Max.	0.3 Max.	V
Input Voltage-"H"	V_{IH}	2.2 Min.	2.2 Min.	V
Disable Time	–	150 Max.		nS
Enable Time	–	5 Max.		mS
Start-up Time	ST	10 Max.		mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

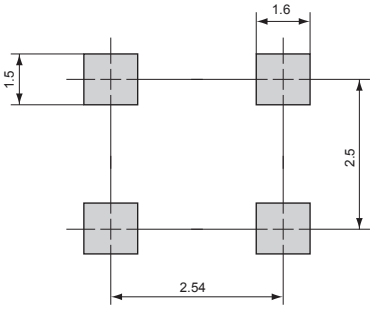
Dimensions

(Unit : mm)

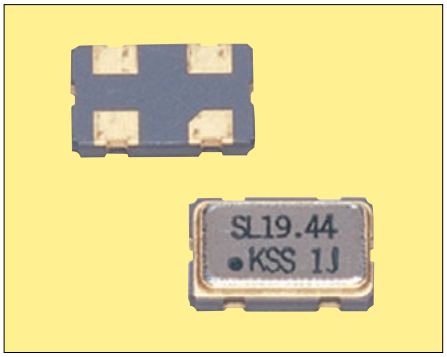


Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.



Pb Free RoHS Compliant

Features

- A built-in high-precision CMOS IC suitable for a wide range of temperature
- Ideal for base stations and DSC, DVC, car navigation and PHS systems etc.
- Lower noise and lower current for reduced power consumption
- Supply voltage V_{DD}=3.3/5.0V available

Frequency Tolerance (Overall)

Freq.Tol. Code	Freq.Tol. ×10⁻⁶	Operating Temperature Range(°C)	Notes
P	± 100	−30 to +85 (Standard)	1.8 to 40MHz
Q	± 50		
R	± 30		

How to Order

KC5032D 15.3600 C 3 Q A 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type
②Output Frequency
③Output Type (CMOS)
④Supply Voltage 5=5.0V, 3=3.3V
⑤Frequency Tolerance
⑥Symmetry/Enable Function (40/60%, INH)
⑦Customer Special Model Suffix
(STD Specification is "00")

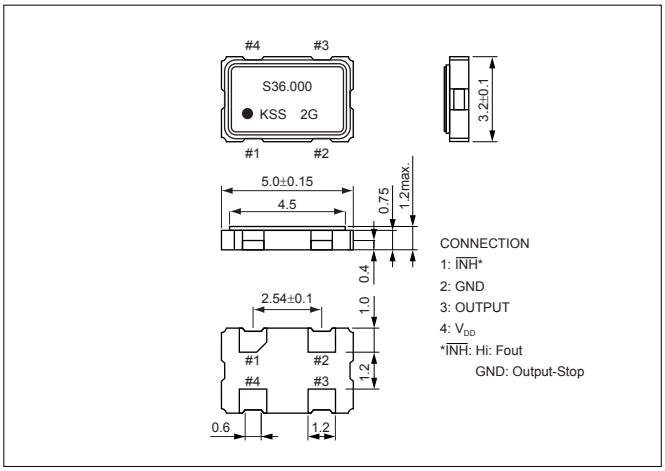
Specifications

Items	Symbol	Specifications		Units
		KC5032Dxx.xxxxC5xA00 (FXO-64F2)	KC5032Dxx.xxxxC3xA00 (FXO-64FL2)	
Output Frequency Range	F_0	1.8 to 40		MHz
Frequency Tolerance (Overall)	$F_{\_tol}$	±30		×10⁻⁶
		±50		
		±100		
Storage Temperature Range	$T_{\_stg}$	−40 to +85		°C
Operating Temperature Range	$T_{\_use}$	−30 to +85		°C
Max. Supply Voltage	–	7 Max.		V
Supply Voltage	V_{DD}	5±5%	3.3±5%	V
Current Consumption	I_{DD}	12 Max.	10 Max.	mA
Stand-by Current	$I_{\_std}$	8 Max.		μA
Symmetry	SYM	40 to 60@50%V_{DD}		%
Rise / Fall Time	Tr/Tf	12 Max.	16 Max.	nS
Output Voltage-"L"	V_{OL}	10% V_{DD} Max.		V
Output Voltage-"H"	V_{OH}	90% V_{DD} Min.		V
Output Load	CL	15 Max.		pF
Input Voltage Range	V_{IN}	0 to V_{DD}	0 to V_{DD}	V
Input Voltage-"L"	V_{IL}	0.8 Max.	0.3 Max.	V
Input Voltage-"H"	V_{IH}	2.2 Min.	2.2 Min.	V
Disable Time	–	150 Max.		nS
Enable Time	–	5 Max.		mS
Start-up Time	ST	10 Max.		mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

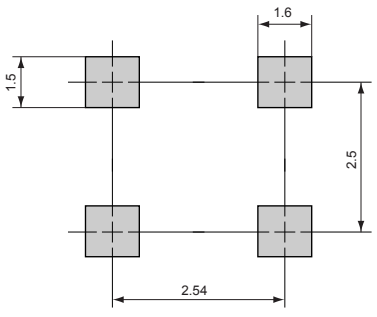
Dimensions

(Unit : mm)



Recommended Land Pattern

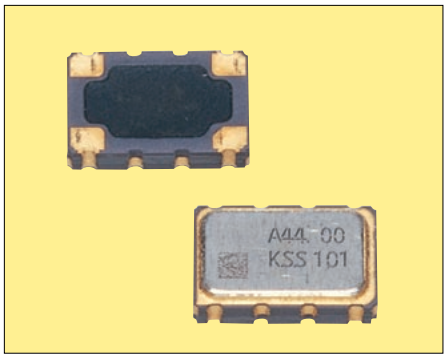
(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Clock Crystal Oscillators Surface Mount Type
KC5032H (MFO-208F)

CMOS / 2.8V / 5.0×3.2mm



Pb Free RoHS Compliant

Features

- "H" type leadless ceramic package (Reflow soldering compatible)
- With tri-state function (High Z)
- ±15×10^{-6}/–40 to +85°C available

Applications

- High Stability Clock Oscillation Wireless LAN (Standerd Frequency 44, 40, 22, 20MHz)

How to Order

KC5032H 40.0000 C 3 L D 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (2.7 to 5.5V)
⑤Frequency Tolerance (TC=±15×10^{-6})
⑥Symmetry/Enable Function (45/55%, INH)
⑦Customer Special Model Suffix
(STD Specification is "00")

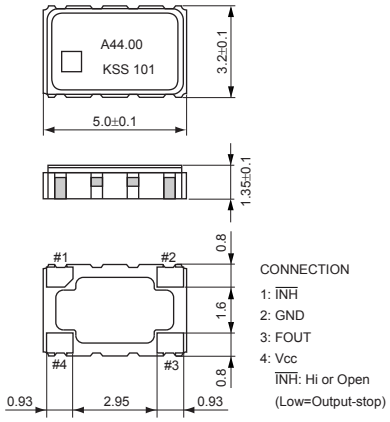
Specifications

Items	Symbol	Conditions	Specifications		Units
			Min.	Max.	
Output Frequency Range	F_0		1.5	50	MHz
Frequency Tolerance (Overall)	F_tol		–15	+15	×10^{-6}
Storage Temperature Range	T_stg		–55	+125	°C
Operating Temperature Range	T_use		–40	+85	°C
Max. Supply Voltage	–		–0.6	6	V
Supply Voltage	V_{DD}		2.7	5.5	V
Current Consumption	I_{DD}	1.5 to 25MHz	–	7	mA
		25 to 55MHz	–	10	
Stand-by Current	I_std		–	50	µA
Symmetry	SYM	@50% V_{DD}	45	55	%
Rise / Fall Time	Tr/Tf		–	6	nS
Output Voltage-"L"	V_{OL}		–	10% V_{DD}	V
Output Voltage-"H"	V_{OH}		90% V_{DD}	–	V
Output Load	CL		–	15	pF
Input Voltage Range	V_{IN}		0	V_{DD}	V
Input Voltage-"L"	V_{IL}		70% V_{DD}	–	V
Input Voltage-"H"	V_{IH}		–	30% V_{DD}	V
Start-up Time	ST	1.5 to 25MHz	–	1.5	mS
		25 to 55MHz	–	1	

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

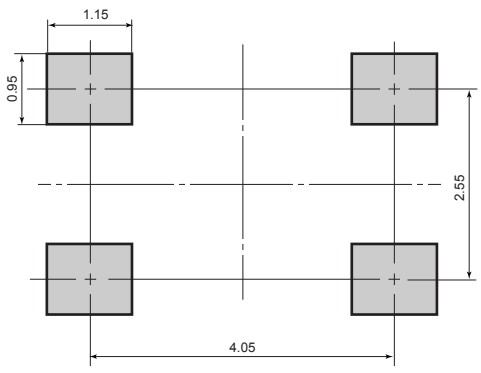
Dimensions

(Unit : mm)



Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Clock Oscillators Surface Mount Type
KC7050A-C1 Series (K53-1C Series)

CMOS / 1.8V / 7.0×5.0mm

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =1.8V
  Lower voltage available
- $\pm25\times10^{-6}$, $\pm20\times10^{-6}$ available

Table 1

Stability		Operating Temperature Range (°C)	Note
Code	× 10^{-6}		
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
W	± 20		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050A 25.0000 C 1 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (1.8V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function
(45/55%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

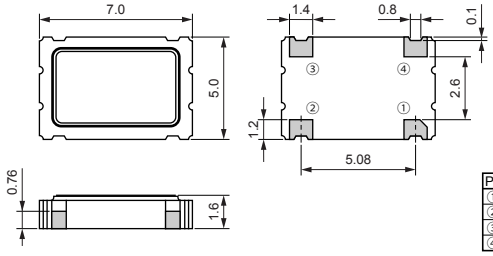
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.8	39.99	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
			Op. Temp.: −10 to +70°C	−20	+20	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+3.6	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		1.71	1.89	V
		Freq. Tol.Code: U, G, W		1.75	1.85	
Current Consumption (Maximum Loaded)	I_{DD}	1.8≤Fo≤25MHz		—	3	mA
		25<Fo≤39.99MHz		—	4	
Stand-by Current	I_std			—	10	μA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf			—	9	nS
Output Voltage-"L"	V_{OL}	I_{OL}=2.8mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−2.8mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



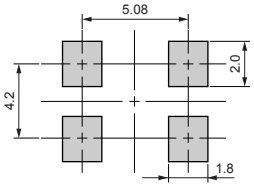
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD} =2.5V
  Lower voltage available
- $\pm 25\times10^{-6}$, $\pm 20\times10^{-6}$ available

Table 1

Stability		Operating Temperature Range (°C)	Note
Code	× 10^{-6}		
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
W	± 20		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050A 25.0000 C 2 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

1. Type (7.0×5.0mm SMD)
2. Output Frequency
3. Output Type (CMOS)
4. Supply Voltage (2.5V)
5. Frequency Tolerance (See Table 1)
6. Symmetry/Enable Function
   (45/55%, Stand-by)
7. Customer Special Model Suffix
   (STD Specification is "00")

   Packaging (Tape & Reel 1000pcs./reel)

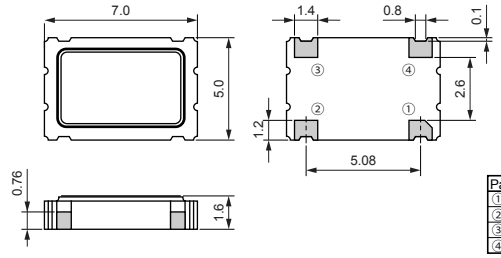
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.8	125	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
			Op. Temp.: −10 to +70°C	−20	+20	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.25	2.75	V
		Freq. Tol.Code: U, G		2.38	2.62	
		Freq. Tol.Code: W		2.43	2.57	
Current Consumption (Maximum Loaded)	I_{DD}	1.8≤Fo≤20MHz		—	5	mA
		20<Fo≤40MHz		—	10	
		40<Fo≤60MHz		—	15	
		60<Fo≤85MHz		—	20	
		85<Fo≤100MHz		—	22	
		100<Fo≤125MHz		—	27	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.8≤Fo≤40MHz		—	7	nS
		40<Fo≤85MHz		—	4	
		85<Fo≤125MHz			3	
Output Volatage-"L"	V_{OL}	I_{OL}=4mA/ 8mA (40<Fo)		—	10% V_{DD}	V
Output Volatage-"H"	V_{OH}	I_{OH}=−4mA/ −8mA (40<Fo)		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS		—	15	pF
Input Volatage Range	V_{IN}			0	V_{DD}	V
Input Volatage-"L"	V_{IL}			—	30% V_{DD}	V
Input Volatage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



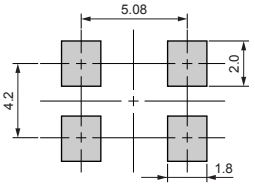
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections
① Enable/Disable
② Case GND
③ Output
④ V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Clock Oscillators Surface Mount Type
KC7050A-C3 Series (K53-3C Series)

CMOS / 3.3V / 7.0×5.0mm

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD}=3.3V
- $\pm25\times10^{-6}$, $\pm20\times10^{-6}$ available

Table 1

Stability		Operating Temperature Range (°C)	Note
Code	$\times10^{-6}$		
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
W	± 20		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050A 25.0000 C 3 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

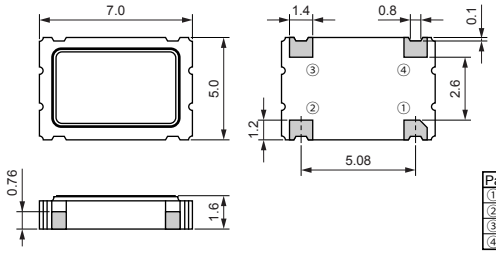
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.8	160	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10⁻⁶
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
			Op. Temp.: −10 to +70°C	−20	+20	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.97	3.63	V
		Freq. Tol.Code: U, G		3.14	3.46	
		Freq. Tol.Code: W		3.20	3.40	
Current Consumption (Maximum Loaded)	I_{DD}	1.8≤Fo≤20MHz		—	10	mA
		20<Fo≤40MHz		—	15	
		40<Fo≤60MHz		—	30	
		60<Fo≤100MHz		—	35	
		100<Fo≤135MHz		—	45	
		135<Fo≤160MHz		—	60	
Stand-by Current	I_std			—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.8≤Fo≤26MHz		—	10	nS
		26<Fo≤45MHz		—	8	
		45<Fo≤100MHz			5	
		100<Fo≤160MHz			2.5	
Output Voltage-"L"	V_{OL}	I_{OL}=8mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−8mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



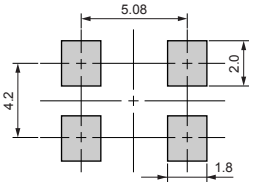
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z (No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Clock Oscillators Surface Mount Type
KC7050A-C5 Series (K53-HC Series)

CMOS / 5.0V / 7.0×5.0mm

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD}=5.0V

Table 1

Stability		Operating Temperature Range (°C)	Note
Code	×10⁻⁶		
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050A 25.0000 C 5 0 D 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (5.0V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Disable)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

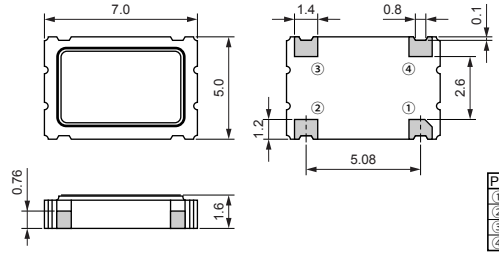
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.8	50	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10⁻⁶
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		4.5	5.5	V
		Freq. Tol.Code: U, G		4.75	5.25	
Current Consumption (Maximum Loaded)	I_{DD}	1.8≤Fo≤20MHz		—	25	mA
		20<Fo≤40MHz		—	35	
		40<Fo≤50MHz		—	50	
Disable Current	I_dis			—	30	mA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.8≤Fo≤26MHz		—	10	nS
		26<Fo≤50MHz		—	8	
Output Voltage-"L"	V_{OL}	I_{OL}=16mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−16mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	50	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	0.8	V
Input Voltage-"H"	V_{IH}			2.2	—	V
Disable Time	—			—	100	nS
Enable Time	—			—	100	nS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



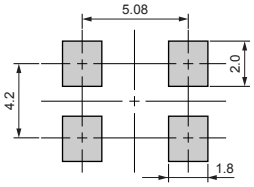
Plating:Ni+Au
Tolernce:±0.2

Pad Connections	
①	Enable/Disable
②	Case GND
③	Output
④	V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Clock Oscillators Surface Mount Type
KC7050H-C3 Series (K50H-3C Series)

CMOS / 3.3V / 7.0×5.0mm

KYOCERA

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD}=3.3V
- With built-in by-pass capacitor

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050H 125.000 C 3 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

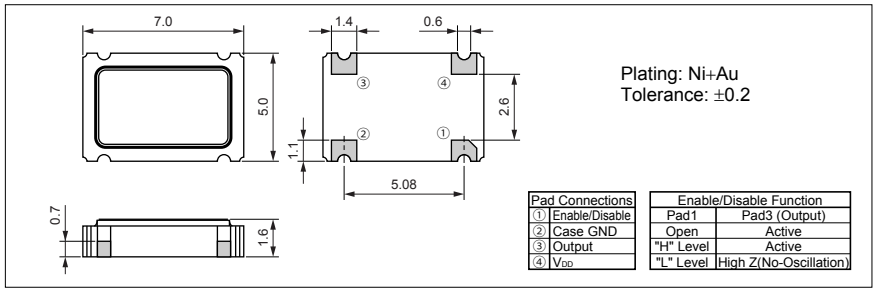
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			80	170	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10⁻⁶
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.97	3.63	V
		Freq. Tol.Code: U, G		3.14	3.46	
Current Consumption (Maximum Loaded)	I_{DD}	80≤Fo≤100MHz		—	40	mA
		100<Fo≤135MHz		—	50	
		135<Fo≤170MHz		—	60	
Stand-by Current	I_std	80≤Fo≤125MHz		—	10	µA
		125<Fo≤170MHz			150	
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	80≤Fo<100MHz	20% V_{DD} to 80% V_{DD} Maximum Loaded	—	3.5	nS
			10% V_{DD} to 90% V_{DD} Maximum Loaded	—	5	
		100≤Fo≤170MHz	20% V_{DD} to 80% V_{DD} Maximum Loaded	—	1.5	
			10% V_{DD} to 90% V_{DD} Maximum Loaded	—	2	
Output Voltage-"L"	V_{OL}	I_{OL}=8mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−8mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VISI6.3.1*		—	2	pS
1Sigma Jitter	1sigma			—	4	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

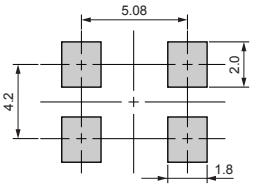
Dimensions

(Unit : mm)



Recommended Land Pattern

(Unit : mm)



Note: By-pass capacitor of 0.01µF is built-in between V_{DD} and GND for KC7050H-C3 series.

AVX

SAW Clock Oscillators
Surface Mount Type KC7050S-C1 Series (FSO-2B Series)

CMOS / 1.8V / 7.0×5.0mm

Pb Free RoHS Compliant

Features

- Low voltage 1.8V
- Low jitter
- LV-CMOS output
- Operation at fundamental high frequency

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
1	±100	0 to +70	Standard specifications

How to Order

KC7050S 155.520 C 1 1 B 00
① ② ③④⑤⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (1.8V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (40/60%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

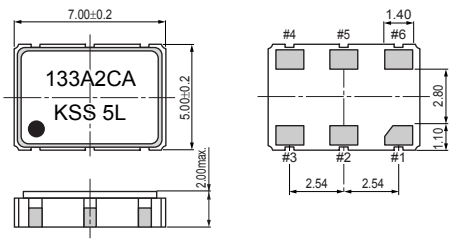
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			100	170	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: 0 to +70°C	−100	+100	×10⁻⁶
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		0	+70	°C
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	V_{DD}			1.62	1.98	V
Current Consumption (Standard Loaded)	I_{DD}			—	50	mA
Symmetry	SYM			40	60	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Standard Loaded)	Tr/Tf			—	2	nS
Output Voltage-"L"	V_{OL}			—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}			90% V_{DD}	—	V
Output Load (CMOS)	L_CMOS				15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	2	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VIS / 6.3.1*		0.2 typ.		ps
1 Sigma Jitter	1 Sigma			3 typ.		ps
Peak to Peak Jitter	Pk-Pk			20 typ.		ps

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



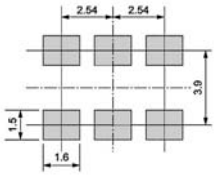
Pad Connections	
①	Enable/Disable
②	NC
③	Case GND
④	Output
⑤	NC
⑥	V_{DD}

Plating: Ni+Au

Enable/Disable Function	
Pad1	Pad4 (Output)
OPEN	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

SAW Clock Oscillators
Surface Mount Type KC7050S-C2 Series (FSO-2C Series)

CMOS / 2.5V / 7.0×5.0mm

Pb Free RoHS Compliant

Features

- Low voltage 2.5V
- Low jitter
- LV-CMOS output
- Operation at fundamental high frequency

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
1	±100	0 to +70	Standard specifications

How to Order

KC7050S 155.520 C 2 1 B 00
① ② ③④⑤⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (2.5V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (40/60%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

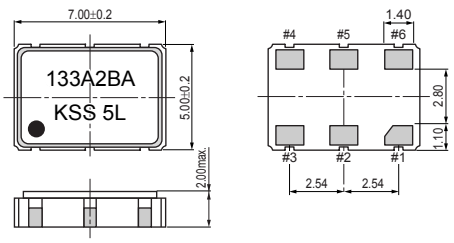
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			100	200	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.:0 to +70°C	−100	+100	×10⁻⁶
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	VDD			2.38	2.62	V
Current Consumption (Standard Loaded)	IDD			—	50	mA
Symmetry	SYM			40	60	%
Rise/ Fall Time (10% VDD to 90% VDD Standard Loaded)	Tr/Tf			—	2	nS
Output Voltage-"L"	VOL			—	10% VDD	V
Output Voltage-"H"	VOH			90% VDD	—	V
Output Load (CMOS)	L_CMOS				15	pF
Input Voltage Range	VIN			0	VDD	V
Input Voltage-"L"	VIL			—	30% VDD	V
Input Voltage-"H"	VIH			70% VDD	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	2	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VIS / 6.3.1*		0.2 typ.		ps
1 Sigma Jitter	1 Sigma			3 typ.		ps
Peak to Peak Jitter	Pk-Pk			20 typ.		ps

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



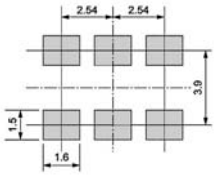
Pad Connections	
①	Enable/Disable
②	NC
③	Case GND
④	Output
⑤	NC
⑥	VDD

Plating: Ni+Au

Enable/Disable Function	
Pad1	Pad4 (Output)
OPEN	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

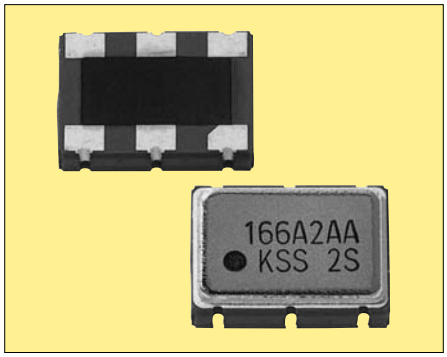
(Unit : mm)



Note: A capacitor of value 0.01μF between VDD and GND is recommended.

SAW Clock Oscillators
Surface Mount Type KC7050S-C3 Series (FSO-2D Series)

CMOS / 3.3V / 7.0×5.0mm



Pb Free RoHS Compliant

Features

- CMOS output 3.3V
- Low jitter
- Operation at fundamental high frequency

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
1	±100	0 to +70	Standard specifications

How to Order

KC7050S 155.520 C 3 1 B 00
① ② ③④⑤⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (40/60%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

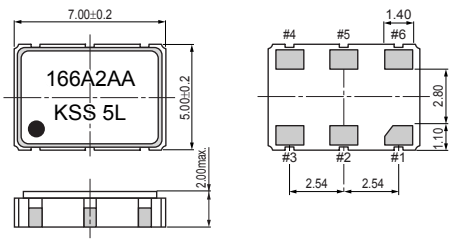
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			100	200	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: 0 to +70°C	−100	+100	×10⁻⁶
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		0	+70	°C
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	V_{DD}			3.14	3.46	V
Current Consumption (Standard Loaded)	I_{DD}			—	60	mA
Symmetry	SYM			40	60	%
Rise/ Fall Time (10% V_{DD} to 90% V_{DD} Standard Loaded)	Tr/Tf			—	2	nS
Output Voltage-"L"	V_{OL}			—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}			90% V_{DD}	—	V
Output Load (CMOS)	L_CMOS				15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	2	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VIS / 6.3.1*		0.2 typ.		ps
1 Sigma Jitter	1 Sigma			3 typ.		ps
Peak to Peak Jitter	Pk-Pk			20 typ.		ps

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



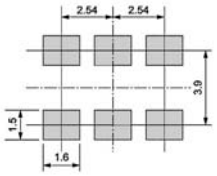
Plating: Ni+Au

Pad Connections	
①	Enable/Disable
②	NC
③	Case GND
④	Output
⑤	NC
⑥	V_{DD}

Enable/Disable Function	
Pad1	Pad4 (Output)
OPEN	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

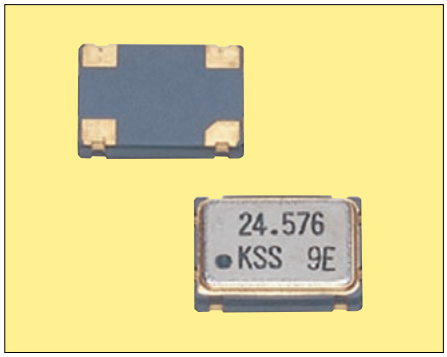
(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Clock Crystal Oscillators Surface Mount Type
KC7050B Series (FXO-31F Series)

CMOS / 3.3V / 5.0V / 7.0×5.0mm



Pb Free RoHS Compliant

Features

- Surface mount type suitable for auto pick-and-place
- Reflow soldering compatible
- CMOS, TTL IC direct drive is possible
- With tri-state function
- Broad frequency range from 1.8MHz to 50MHz
- Supply voltage V_{DD}=3.3/5.0V available

Frequency Tolerance (Overall)

Freq.Tol. Code	Freq.Tol. ×10⁻⁶	Operating Temperature Range(°C)	Notes
1	± 100	−10 to +70 (standard)	1.8 to 50MHz
0	± 50		
S	± 30		

How to Order

KC7050B 25.0000 C 3 0 A 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type
②Output Frequency
③Output Type (CMOS)
④Supply Voltage 5=5.0V, 3=3.3V
⑤Frequency Tolerance (See Table at Left)
⑥Symmetry/Enable Function (40/60%, INH)
⑦Customer Special Model Suffix
(STD Specification is "00")

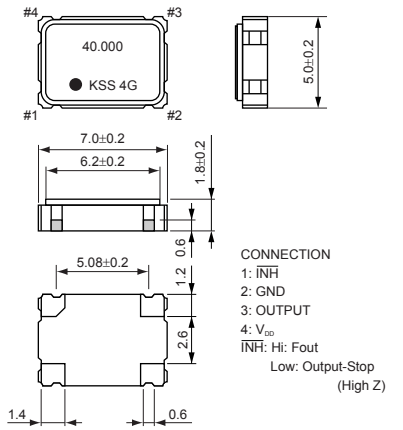
Specifications

Items	Symbol	Specifications		Units
		KC7050Bxx.xxxxC5xA00 (FXO-31FH)	KC7050Bxx.xxxxC3xA00 (FXO-31FL)	
Output Ffrequency Range	F_0	1.8 to 50		MHz
Frequency Tolerance (Overall)	$F_{\_tol}$	±30		×10⁻⁶
		±50		
		±100		
Storage Temperature, Range	$T_{\_stg}$	−40 to +85		°C
Operating Temperature, Range	$T_{\_use}$	−10 to +70		°C
Max. Supply Voltage	–	7 Max.		V
Supply Voltage	V_{DD}	5±0.5	3.3±0.3	V
Current Consumption	I_{DD}	25 Max. (1.8 to 15MHz)	18 Max. (1.8 to 39.9MHz)	mA
		30 Max. (15.1 to 32MHz)		
		45 Max. (32.1 to 50MHz)	25 Max. (40 to 50MHz)	
Stand-by Current	$I_{\_std}$	10 Max.		µA
Symmetry	SYM	40 to 60@50%V_{DD}		%
Rise / Fall Time	Tr/Tf	10 Max.		nS
Output Voltage-"L"	V_{OL}	10% V_{DD} Max.		V
Output Voltage-"H"	V_{OH}	90% V_{DD} Min.		V
Output Load	CL	50 Max.	20 Max.	pF
Input Voltage Range	V_{IN}	0 to V_{DD}	0 to V_{DD}	V
Input Voltage-"L"	V_{IL}	0.8 Max.	0.3 Max.	V
Input Voltage-"H"	V_{IH}	2.2 Min.	2.2 Min.	V
Disable Time	–	150 Max.		nS
Enable Time	–	5 Max.		mS
Start-up Time	ST	10 Max.		mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

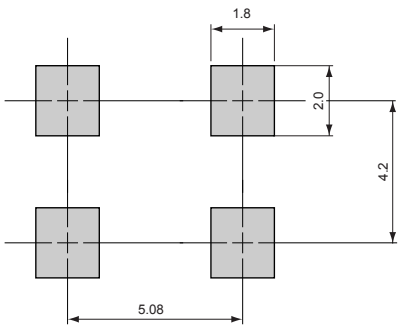
Dimensions

(Unit : mm)

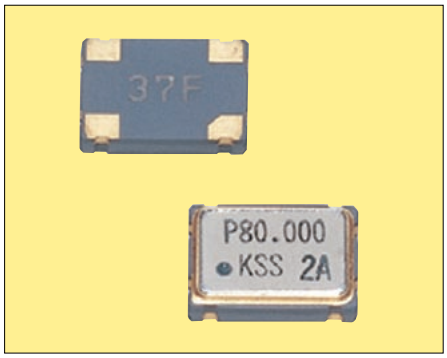


Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.



Pb Free RoHS Compliant

Features

- Surface mount type suitable for auto pick-and-place
- Reflow compatible
- CMOS, TTL IC direct drive is possible
- With tri-state function
- Broad frequency range from 80MHz to 125MHz, (PLL circuit is built in)
- Supply voltage V_{DD}=3.3/5.0V available

How to Order

KC7050B 80.0000 C 3 0 A 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type
②Output Frequency
③Output Type (CMOS)
④Supply Voltage 5=5.0V, 3=3.3V
⑤Frequency Tolerance (See Table at Left)
⑥Symmetry/Enable Function (40/60%, INH)
⑦Customer Special Model Suffix
(STD Specification is "00")

Frequency Tolerance (Overall)

Freq.Tol. Code	Freq.Tol. $\times10^{-6}$	Operating Temperature Range(°C)	Notes
1	± 100	0 to +70 (standard)	80 to 125MHz
0	± 50		

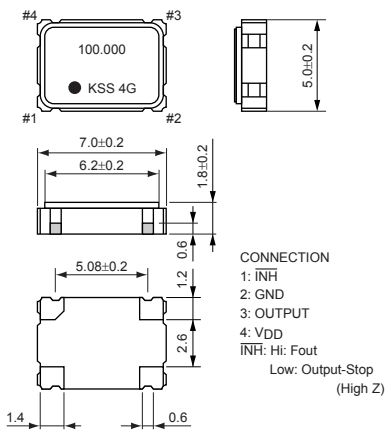
Specifications

Items	Symbol	Conditions	Specifications Min.	Specifications Max.	Units
Output Frequency Range	F_0		80	125	MHz
Frequency Tolerance (Overall)	F_tol		−50	+50	$\times10^{-6}$
			−100	+100	
Storage Temperature, Range	T_stg		−20	+80	°C
Operating Temperature, Range	T_use		0	+70	°C
Max. Supply Voltage	–		–	6	V
Supply Voltage	V_{DD}	3.3V Type	3.135	3.465	V
		5.5V Type	4.75	5.25	
Current Consumption	I_{DD}		–	70	mA
Stand-by Current	I_std		–	60	μA
Symmetry	SYM	@50% V_{DD}	40	60	%
Rise / Fall Time	Tr/Tf		–	7	nS
Output Voltage-"L"	V_{OL}		–	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	@3.3V	2.8	–	V
		@5.0V	4	–	
Output Load	CL		–	15	pF
Input Voltage Range	V_{IN}		V_{SS}	V_{DD}	V
Input Voltage-"L"	V_{IL}		–	30% V_{DD}	V
Input Voltage-"H"	V_{IH}		70% V_{DD}	–	V
Disable Time	–		–	1	mS
Enable Time	–			3	mS
Start-up Time	ST		–	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

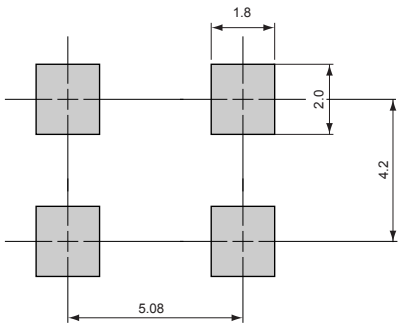
Dimensions

(Unit : mm)



Recommended Land Pattern

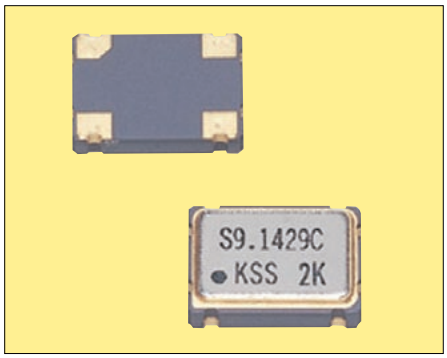
(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Clock Crystal Oscillators Surface Mount Type
KC7050B Series (FXO-34F Series)

CMOS / 3.3V / 5.0V / 7.0×5.0mm



Pb Free RoHS Compliant

Features

- This crystal oscillator has a built-in high-precision CMOS IC suitable for a wide range of temperature
- Lower noise and lower current for reduced power consumption
- Supply voltage V_{DD}=3.3/5.0V available

Frequency Tolerance (Overall)

Freq.Tol. Code	Freq.Tol. ×10⁻⁶	Operating Temperature Range (°C)	Notes
P	± 100	−30 to +85 (Standard)	1.8 to 40MHz
Q	± 50		
R	± 30		

How to Order

KC7050B 25.0000 C 3 Q A 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type
②Output Frequency
③Output Type (CMOS)
④Supply Voltage 5=5.0V, 3=3.3V
⑤Frequency Tolerance (See Table at Left)
⑥Symmetry/Enable Function (40/60%, INH)
⑦Customer Special Model Suffix
(STD Specification is "00")

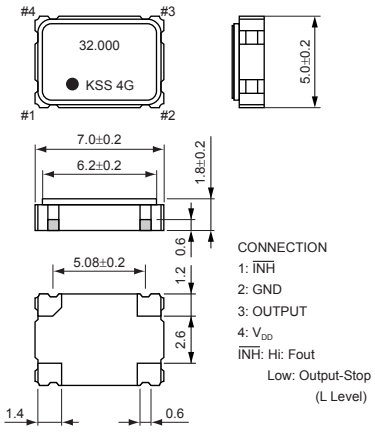
Specifications

Items	Symbol	Specifications		Units
		KC7050Bxx.xxxxC5xA00 (FXO-34F)	KC7050Bxx.xxxxC3xA00 (FXO-34FL)	
Output Frequency Range	F_0	1.8 to 40		MHz
Frequency Tolerance (Overall)	$F_{\_tol}$	±30		×10⁻⁶
		±50		
		±100		
Storage Temperature, Range	$T_{\_stg}$	−40 to +85		°C
Operating Temperature, Range	$T_{\_use}$	−30 to +85		°C
Max. Supply Voltage	–	7 Max.		V
Supply Voltage	V_{DD}	5±5%	3.3±5%	V
Current Consumption	I_{DD}	12 Max.	10 Max.	mA
Stand-by Current	$I_{\_std}$	8 Max.		μA
Symmetry	SYM	40 to 60@50%V_{DD}		%
Rise / Fall Time	Tr/Tf	12 Max.	16 Max.	nS
Output Voltage-"L"	V_{OL}	10% V_{DD} Max.		V
Output Voltage-"H"	V_{OH}	90% V_{DD} Min.		V
Output Load	CL	15 Max.		pF
Input Voltage Range	V_{IN}	0 to V_{DD}	0 to V_{DD}	V
Input Voltage-"L"	V_{IL}	0.8 Max.	0.3 Max.	V
Input Voltage-"H"	V_{IH}	2.2 Min.	2.2 Min.	V
Disable Time	–	150 Max.		nS
Enable Time	–	5 Max.		mS
Start-up Time	ST	10 Max.		mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

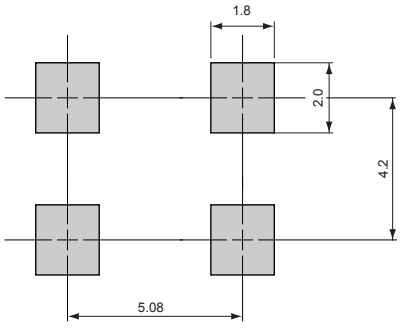
Dimensions

(Unit : mm)

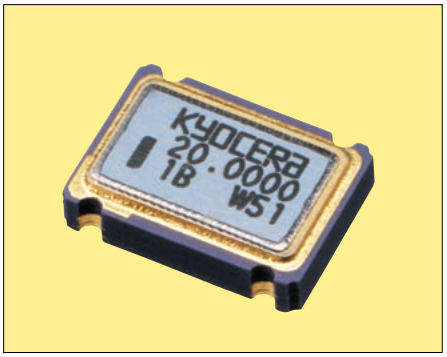


Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.



Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD}=3.3V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. × 10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050C 25.0000 C 3 0 E 00
① ② ③④⑤⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function
(E: 45/55%, Stand-by) (D: 45/55%, Disable)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

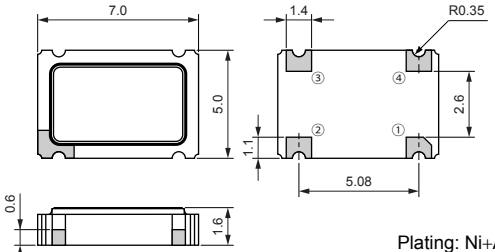
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.5	80	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.97	3.63	V
		Freq. Tol.Code: U, G		3.14	3.46	
Current Consumption (Maximum Loaded)	I_{DD}	1.5≤Fo≤20MHz		—	10	mA
		20<Fo≤40MHz		—	15	
		40<Fo≤60MHz		—	20	
		60<Fo≤80MHz		—	30	
Stand-by/Disable Current	I_std/I_dis	1.5≤Fo≤32MHz (Stand-by Function)		—	10	µA
		32<Fo≤50MHz (Disable Function)		—	15	mA
		50<Fo≤80MHz (Stand-by Function)		—	10	µA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.5≤Fo≤26MHz		—	10	nS
		26<Fo≤45MHz		—	8	
		45<Fo≤80MHz		—	5	
Output Voltage-"L"	V_{OL}	I_{OL}=8mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−8mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output		—	15	pF
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—	1.5≤Fo≤32MHz (Stand-by Function)		—	5	mS
		32<Fo≤50MHz (Disable Function)		—	150	nS
		50<Fo≤80MHz (Stand-by Function)		—	5	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



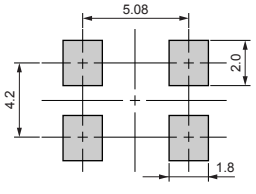
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections
① Enable/Disable
② Case GND
③ Output
④ V_{DD}

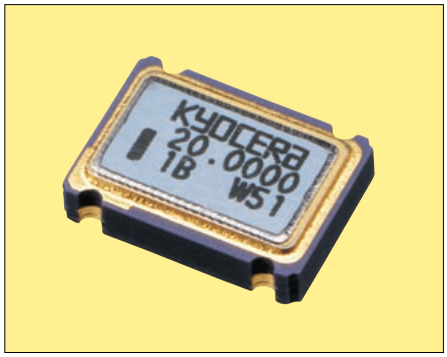
Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.



Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- CMOS output
- Supply voltage V_{DD}=5.0V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. ×10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050C 25.0000 C 5 0 D 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (5.0V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Disable)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

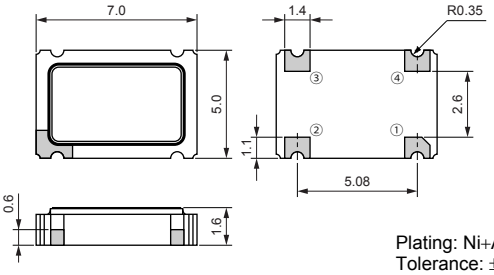
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			1.5	68	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		−10	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		4.5	5.5	V
		Freq. Tol.Code: U, G		4.75	5.25	
Current Consumption (Maximum Loaded)	I_{DD}	1.5≤Fo≤20MHz		—	25	mA
		20<Fo≤40MHz		—	35	
		40<Fo≤68MHz		—	50	
Disable Current	I_dis			—	30	mA
Symmetry	SYM	@50% V_{DD}		45	55	%
Rise/Fall Time (10% V_{DD} to 90% V_{DD} Maximum Loaded)	Tr/Tf	1.5≤Fo≤26MHz		—	10	nS
		26<Fo≤50MHz		—	8	
		50<Fo≤68MHz		—	5	
Output Voltage-"L"	V_{OL}	I_{OL}=16mA		—	10% V_{DD}	V
Output Voltage-"H"	V_{OH}	I_{OH}=−16mA		90% V_{DD}	—	V
Output Load	L_CMOS	CMOS Output	1.5≤Fo≤50MHz	—	50	pF
			50<Fo≤68MHz	—	15	
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	0.8	V
Input Voltage-"H"	V_{IH}			2.2	—	V
Disable Time	—			—	100	nS
Enable Time	—			—	100	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



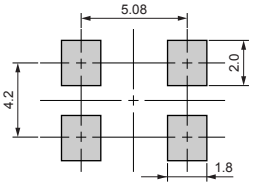
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections
① Enable/Disable
② Case GND
③ Output
④ V_{DD}

Enable/Disable Function	
Pad1	Pad3 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z

Recommended Land Pattern

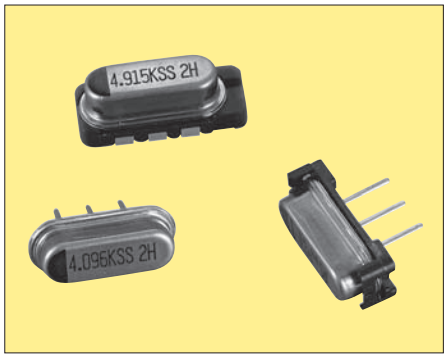
(Unit : mm)



Note: A capacitor of value 0.01µF between V_{DD} and GND is recommended.

Clock Crystal Oscillators
KCJXO Series (JXO Series)

CMOS / 5.0V



Pb Free RoHS Compliant

Features

- Compact oscillator with a CMOS IC built in that is the same shape (height 3.5mm) as a crystal device
- It is a hermetic sealed type with a metal case
- The case comes with a grounding terminal
- It is also possible to attach a stand-off (option)
- It is provided with multiple standard frequencies

Applications

- Amusement

How to Order

KCJXOx- 20.0000 C 5 1 C 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (KCJXO5 or KCJXO7)
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (5.0V)
⑤Frequency Tolerance
⑥Symmetry/Enable Function (40/60%)
⑦Customer Special Model Suffix
"00" for Standard Specifications
"S0" for Stand-off Type
"F0" for SMD Type

Specifications

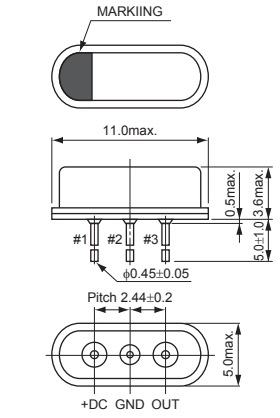
Items	Symbol	Conditions	Specifications		Units
			Min.	Max.	
Output Frequency Range	F_0	KCJXO5 Type	1	20	MHz
		KCJXO7 Type	20.1	70	
Frequency Tolerance (Overall)	F_{tol}		−100	+100	$\times10^{-6}$
Storage Temperature Range	T_{stg}		−20	+80	°C
Operating Temperature Range	T_{use}		−10	+70	°C
Supply Voltage	V_{DD}		4.5	5.5	V
Current Consumption	I_{DD}	KCJXO5 Type (1 to 20MHz)	–	20	mA
		KCJXO7 Type (20.1 to 50MHz)	–	25	
		KCJXO7 Type (50.1 to 70MHz)	–	50	
Symmetry	SYM	@50% V_{DD}	40	60	%
Rise / Fall Time	Tr/Tf	KCJXO5 Type (1 to 20MHz)	–	20	nS
		KCJXO7 Type (20.1 to 50MHz)	–	15	
		KCJXO7 Type (50.1 to 70MHz)	–	10	
Output Voltage-"L"	V_{OL}		–	10% V_{DD}	V
Output Voltage-"H"	V_{OH}		90% V_{DD}	–	V
Output Load	CL	KCJXO5 Type (1 to 20MHz)	–	50	pF
		KCJXO7 Type (20.1 to 70MHz)	–	15	
Start-up Time	ST	KCJXO5 Type (1 to 20MHz)	–	3	mS
		KCJXO7 Type (20.1 to 70MHz)	–	10	

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

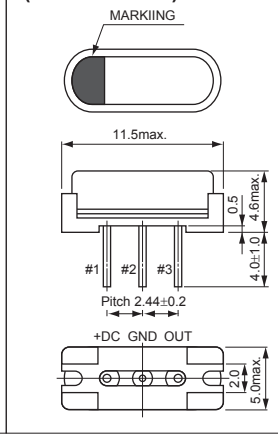
Dimensions

(Unit : mm)

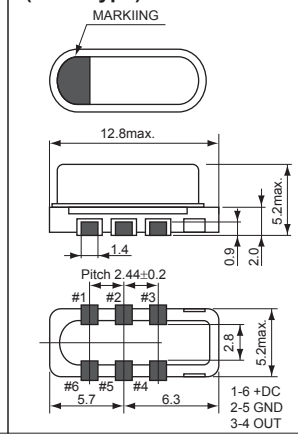
KCJXO5 KCJXO7 (Standard)



KCJXO5 KCJXO7 (with Stand off)

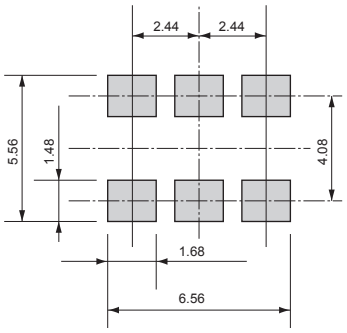


KCJXO5 KCJXO7 (SMD Type)

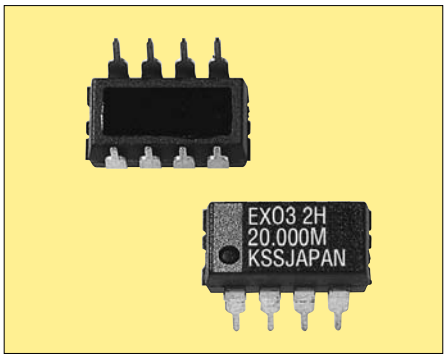


Recommended Land Pattern (Unit : mm)

KCJXO SMD Type



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.



Pb Free RoHS Compliant

Features

- Since it has a frequency deviding function, it is able to obtain a frequency devision of 1/2-1/2^8 (1/256)
- The symmetry of frequency devided output is within 50±2%
- The oscillation start time has the fast starting characteristic of being 1.5msec.or less
- The pin arrangement is DIP 8PIN
- Supply voltage V_{DD}=5.0V

Applications

- Amusement

How to Order

KCEXO3- 20.0000 C 5 1 B 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type
②Output Frequency
③Output Type (CMOS)
④Supply Voltage (5.0V)
⑤Frequency Tolerance
⑥Symmetry/EnableFunction (40/60%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

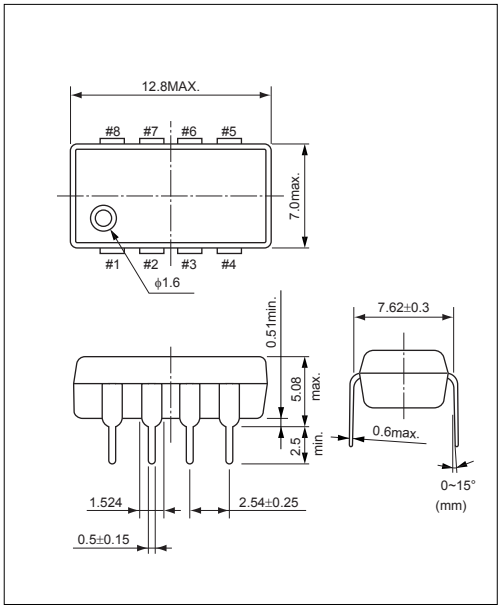
Specifications

Item	Symbol	Conditions	Specifications		Units
			Min.	Max.	
Output Frequency Range	F_0		11.0592	24.576	MHz
Frequency Tolerance (Overall)	F_tol		−100	+100	$\times10^{-6}$
Storage Temperature Range	T_stg		−40	+85	°C
Operating Temperature Range	T_use		−10	+70	°C
Supply Voltage	V_{DD}		4.5	5.5	V
Current Consumption	I_{DD}		–	20	mA
Symmetry	SYM	@50% V_{DD}	40	60	%
Rise / Fall Time	Tr/Tf		–	15	nS
Output Voltage-"L"	V_{OL}		–	10% V_{DD}	V
Output Voltage-"H"	V_{OH}		90% V_{DD}	–	V
Output Load	CL		–	50	pF
Start-up Time	ST		–	1.5	mS

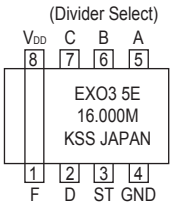
Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



Settings of the frequency devision output



1.F Outputs the original frequency (fo) of the internal quartz crystal.
2.D Outputs the frequency of programmed dividing ratio (fo/2^n).
3.ST Possible to be oscillated when set to HIGH level and stopped in oscillation when set to LOW level. when this function is not needed, be sure to set the STANDBY pin to the HIGH level.
4.GND
5.A
6.B } Used to program the dividing ratio for the original frequency.
7.C
8.V_{DD} Supply voltage

Pin connection

Input				Output	
Select			ST	F Original Frequency	D Divided Wave form
C	B	A			
L	L	L	H	fo clock	fo · 1/2 clock
L	L	H	H	fo clock	fo · 1/2^2 clock
L	H	L	H	fo clock	fo · 1/2^3 clock
L	H	H	H	fo clock	fo · 1/2^4 clock
H	L	L	H	fo clock	fo · 1/2^5 clock
H	L	H	H	fo clock	fo · 1/2^6 clock
H	H	L	H	fo clock	fo · 1/2^7 clock
H	H	H	H	fo clock	fo · 1/2^8 clock
–	–	–	L	L	L

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- LV-PECL output
- Supply voltage V_{DD}=2.5V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. × 10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	0 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	–40 to +85	
G	± 50		

How to Order

KC5032P 125.000 P 2 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (5.0×3.2mm SMD)
②Output Frequency
③Output Type (LV-PECL)
④Supply Voltage (2.5V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

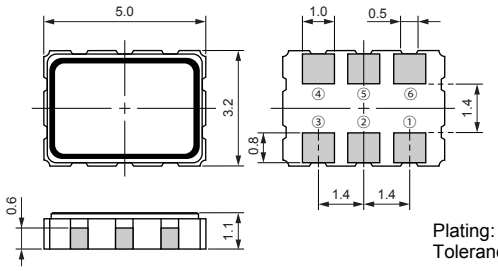
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	F_O			75	170	MHz
Frequency Tolerance	$F_{\_tol}$	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: –40 to +85°C	–100	+100	×10^{-6}
			Op. Temp.: 0 to +70°C/ –40 to +85°C	–50	+50	
			Op. Temp.: 0 to +70°C/ –40 to +85°C	–30	+30	
			Op. Temp.: 0 to +70°C	–25	+25	
Storage Temperature Range	$T_{\_stg}$			–55	+125	°C
Operating Temperature Range	$T_{\_use}$	Standard Specifications		0	+70	°C
		Extend (Option)		–40	+85	
Max. Supply Voltage	—			–0.5	+5	V
Supply Voltage	V_{DD}			2.375	2.625	V
Current Consumption	I_{DD}			—	90	mA
Stand-by Current	$I_{\_std}$			—	30	µA
Symmetry	SYM	50 ohm @50% Output Swing		45	55	%
Rise/Fall Time (20% V_{DD} to 80% V_{DD})	Tr/Tf	50 ohm		—	0.6	nS
Output Voltage-"L"	V_{OL}	Op. Temp.: 0 to +85°C/ Typ. 0.800V		V_{DD}–1.810	V_{DD}–1.405	V
		Op. Temp.: –40 to 0°C/ Typ. 0.805V		V_{DD}–1.830	V_{DD}–1.305	
Output Voltage-"H"	V_{OH}	Op. Temp.: 0 to +85°C/ Typ. 1.550V		V_{DD}–1.025	V_{DD}–0.740	V
		Op. Temp.: –40 to 0°C/ Typ. 1.495V		V_{DD}–1.085	V_{DD}–0.880	
Output Load	L_ECL	LV–PECL Output		50		ohm
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VISI 6.3.1*		—	2	pS
1Sigma jitter	1sigma			—	4	pS
Peak to Peak Jitter	Pk-Pk			—	30	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



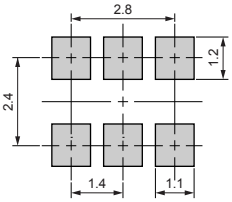
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections	
①	Enable/Disable
②	NC
③	Case GND
④	Output
⑤	Complementary Output
⑥	V_{DD}

Enable/Disable Function	
Pad1	Pad4/pad5 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF and 10µF between V_{DD} and GND is recommended.

Clock Oscillators
Surface Mount Type KC5032P-P3 Series
LV-PECL / 3.3V / 5.0×3.2mm

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- LV-PECL output
- Supply voltage V_{DD}=3.3V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. × 10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	0 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	–40 to +85	
G	± 50		

How to Order

KC5032P 125.000 P 3 0 E 00
① ② ③④⑤⑥ ⑦

①Type (5.0×3.2mm SMD)
②Output Frequency
③Output Type (LV-PECL)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

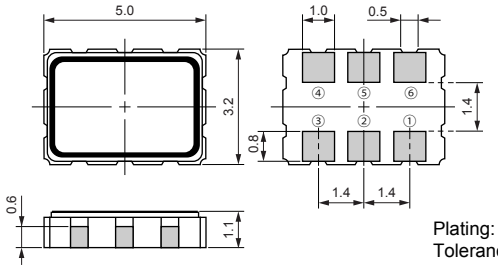
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	F_O			75	190	MHz
Frequency Tolerance	F_{tol}	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: –40 to +85°C	–100	+100	×10^{-6}
			Op. Temp.: 0 to +70°C/ –40 to +85°C	–50	+50	
			Op. Temp.: 0 to +70°C/ –40 to +85°C	–30	+30	
			Op. Temp.: 0 to +70°C	–25	+25	
Storage Temperature Range	T_{stg}			–55	+125	°C
Operating Temperature Range	T_{use}	Standard Specifications		0	+70	°C
		Extend (Option)		–40	+85	
Max. Supply Voltage	—			–0.5	+5	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.97	3.63	V
		Freq. Tol.Code: U, G		3.14	3.46	
Current Consumption	I_{DD}			—	90	mA
Stand-by Current	I_{std}			—	30	µA
Symmetry	SYM	50 ohm @50% Output Swing		45	55	%
Rise/Fall Time (20% V_{CC} to 80% V_{CC})	Tr/Tf	50 ohm		—	0.6	nS
Output Voltage-"L"	V_{OL}	Op. Temp.: 0 to +85°C/ Typ. 1.600V		V_{DD}–1.810	V_{DD}–1.620	V
		Op. Temp.: –40 to 0°C/ Typ. 1.605V		V_{DD}–1.830	V_{DD}–1.555	
Output Voltage-"H"	V_{OH}	Op. Temp.: 0 to +85°C/ Typ. 2.350V		V_{DD}–1.025	V_{DD}–0.880	V
		Op. Temp.: –40 to 0°C/ Typ. 2.295V		V_{DD}–1.085	V_{DD}–0.900	
Output Load	L_ECL	LV–PECL Output		50		ohm
Input Voltage Range	V_{IN}			0	V_{CC}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VISI 6.3.1*		—	2	pS
1Sigma jitter	1sigma			—	4	pS
Peak to Peak Jitter	Pk-Pk			—	30	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



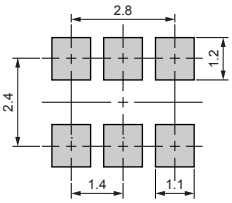
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections	
①	Enable/Disable
②	NC
③	Case GND
④	Output
⑤	Complementary Output
⑥	V_{DD}

Enable/Disable Function	
Pad1	Pad4/pad5 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF and 10µF between V_{DD} and GND is recommended.

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- LV-PECL output
- Supply voltage V_{DD}=2.5V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. × 10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	0 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	–40 to +85	
G	± 50		

How to Order

KC7050P 125.000 P 2 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (LV-PECL)
④Supply Voltage (2.5V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

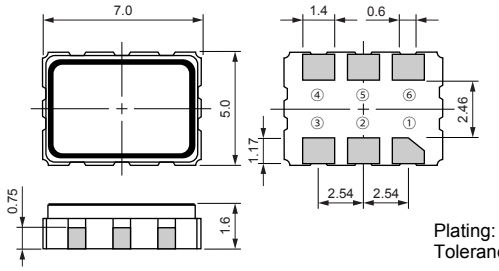
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	F_O			75	170	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: –40 to +85°C	–100	+100	×10^{-6}
			Op. Temp.: 0 to +70°C/ –40 to +85°C	–50	+50	
			Op. Temp.: 0 to +70°C/ –40 to +85°C	–30	+30	
			Op. Temp.: 0 to +70°C	–25	+25	
Storage Temperature Range	T_stg			–55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		0	+70	°C
		Extend (Option)		–40	+85	
Max. Supply Voltage	—			–0.5	+5	V
Supply Voltage	V_{DD}			2.375	2.625	V
Current Consumption	I_{DD}			—	90	mA
Stand-by Current	I_std			—	30	μA
Symmetry	SYM	50 ohm @50% Output Swing		45	55	%
Rise/Fall Time (20% V_{DD} to 80% V_{DD})	Tr/Tf	50 ohm		—	0.6	nS
Output Voltage-"L"	V_{OL}	Op. Temp.: 0 to +85°C/ Typ. 0.800V		V_{DD}–1.810	V_{DD}–1.405	V
		Op. Temp.: –40 to 0°C/ Typ. 0.805V		V_{DD}–1.830	V_{DD}–1.305	
Output Voltage-"H"	V_{OH}	Op. Temp.: 0 to +85°C/ Typ. 1.550V		V_{DD}–1.025	V_{DD}–0.740	V
		Op. Temp.: –40 to 0°C/ Typ. 1.495V		V_{DD}–1.085	V_{DD}–0.800	
Output Load	L_ECL	LV–PECL Output		50		ohm
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VISI 6.3.1*		—	2	pS
1Sigma jitter	1sigma			—	4	pS
Peak to Peak Jitter	Pk-Pk			—	30	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



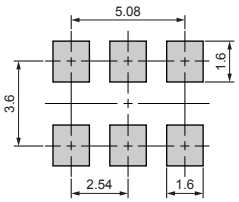
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections
① Enable/Disable
② NC
③ Case GND
④ Output
⑤ Complementary Output
⑥ V_{DD}

Enable/Disable Function	
Pad1	Pad4/pad5 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF and 10μF between V_{DD} and GND is recommended.

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- LV-PECL output
- Supply voltage V_{DD}=3.3V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. × 10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	0 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050P 125.000 P 3 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (LV-PECL)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

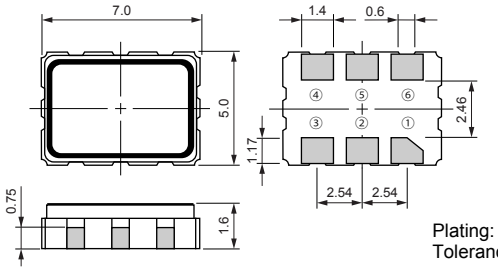
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	F_O			75	190	MHz
Frequency Tolerance	$F_{\_tol}$	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: 0 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: 0 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: 0 to +70°C	−25	+25	
Storage Temperature Range	$T_{\_stg}$			−55	+125	°C
Operating Temperature Range	$T_{\_use}$	Standard Specifications		0	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	V_{DD}	Freq. Tol.Code: 0, S, F		2.97	3.63	V
		Freq. Tol.Code: U, G		3.14	3.46	
Current Consumption	I_{DD}			—	90	mA
Stand-by Current	$I_{\_std}$			—	30	µA
Symmetry	SYM	50 ohm @50% Output Swing		45	55	%
Rise/Fall Time (20% Vcc to 80% Vcc)	Tr/Tf	50 ohm		—	0.6	nS
Output Voltage-"L"	V_{OL}	Op. Temp.: 0 to +85°C/ Typ. 1.600V		V_{DD}−1.810	V_{DD}−1.620	V
		Op. Temp.: −40 to 0°C/ Typ. 1.605V		V_{DD}−1.830	V_{DD}−1.555	
Output Voltage-"H"	V_{OH}	Op. Temp.: 0 to +85°C/ Typ. 2.350V		V_{DD}−1.025	V_{DD}−0.880	V
		Op. Temp.: −40 to 0°C/ Typ. 2.295V		V_{DD}−1.085	V_{DD}−0.900	
Output Load	L_ECL	LV−PECL Output		50		ohm
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	150	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VISI 6.3.1*		—	2	pS
1Sigma jitter	1sigma			—	4	pS
Peak to Peak Jitter	Pk-Pk			—	30	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



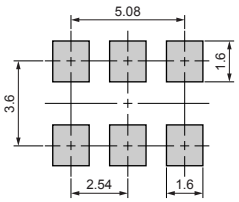
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections	
①	Enable/Disable
②	NC
③	Case GND
④	Output
⑤	Complementary Output
⑥	V_{DD}

Enable/Disable Function	
Pad1	Pad4/pad5 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF and 10µF between V_{DD} and GND is recommended.

SAW Clock Oscillators
Surface Mount Type KC7050S-P2 Series (FSO-1C Series)

LV-PECL / 2.5V / 7.0×5.0mm

Pb Free RoHS Compliant

Features

- Low voltage 2.5V
- Low jitter
- LV-PECL output
- Operation at fundamental high frequency

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
1	±100	0 to +70	Standard specifications

How to Order

KC7050S 155.520 P 2 1 E 00
① ② ③④⑤⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (PECL)
④Supply Voltage (2.5V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

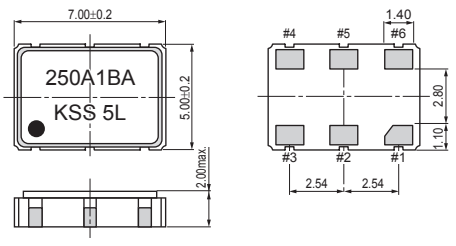
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			50	700	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: 0 to +70°C	−100	+100	×10⁻⁶
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		0	+70	°C
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	Vcc			2.38	2.62	V
Current Consumption (Standard Loaded)	Icc			—	60	mA
Symmetry	SYM	50MHz≤Fo≤350MHz		45	55	%
		350MHz<Fo≤700MHz		40	60	
Rise/ Fall Time (20% Vcc to 80% Vcc Standard Loaded)	Tr/Tf	50MHz≤Fo≤400MHz		—	600	pS
		400MHz<Fo≤700MHz		—	400	
Output Voltage-"L"	VOL			—	1.195	V
Output Voltage-"H"	VOH			1.415	—	V
Output Load (PECL)	L_ECL	PECL 50Ω @Terminated Vcc−2V		49.5	50.5	ohm
Input Voltage Range	VIN			0	Vcc	V
Input Voltage-"L"	VIL			—	30% Vcc	V
Input Voltage-"H"	VIH			70% Vcc	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	2	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VIS / 6.3.1*		0.2 typ.		ps
1 Sigma Jitter	1 Sigma			3 typ.		ps
Peak to Peak Jitter	Pk-Pk			20 typ.		ps

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



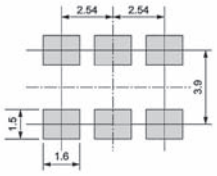
Plating: Ni+Au

Pad Connections	
①	Enable/Disable
②	NC
③	Case GND
④	Output
⑤	Complementary Output
⑥	Vcc

Enable/Disable Function	
Pad1	Pad4 (Output)
OPEN	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

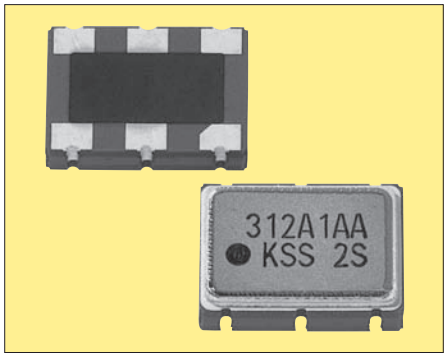
(Unit : mm)



Note: A capacitor of value 0.01μF between VDD and GND is recommended.

SAW Clock Oscillators
Surface Mount Type KC7050S-P3 Series (FSO-1D Series)

LV-PECL / 3.3V / 7.0×5.0mm



Pb Free RoHS Compliant

Features

- Low jitter
- Complementary LV-PECL outputs
- Operation at fundamental high frequency

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
1	±100	0 to +70	Standard specifications

How to Order

KC7050S 312.500 P 3 1 E 00
① ② ③④⑤⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (PECL)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Stand-by)
⑦CustomerSpecial Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

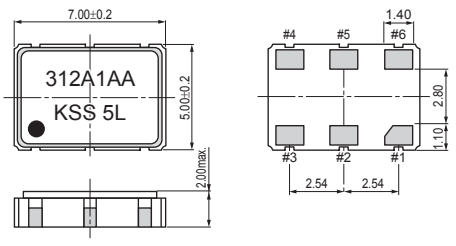
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			50	700	MHz
Frequency Tolerance	F_tol	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: 0 to +70°C	−100	+100	×10⁻⁶
Storage Temperature Range	T_stg			−55	+125	°C
Operating Temperature Range	T_use	Standard Specifications		0	+70	°C
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	Vcc			3.14	3.46	V
Current Consumption (Standard Loaded)	Icc			—	60	mA
Symmetry	SYM	50MHz≤Fo≤350MHz		45	55	%
		350MHz<Fo≤700MHz		40	60	
Rise/ Fall Time (20% Vcc to 80% Vcc Standard Loaded)	Tr/Tf	50MHz≤Fo≤400MHz		—	600	pS
		400MHz<Fo≤700MHz		—	400	
Output Voltage-"L"	VOL			—	1.68	V
Output Voltage-"H"	VOH			2.275	—	V
Output Load (PECL)	L_ECL	PECL 50Ω @Terminated Vcc−2V		49.5	50.5	ohm
Input Voltage Range	VIN			0	Vcc	V
Input Voltage-"L"	VIL			—	30% Vcc	V
Input Voltage-"H"	VIH			70% Vcc	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	2	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VIS / 6.3.1*		0.2 typ.		ps
1 Sigma Jitter	1 Sigma			3 typ.		ps
Peak to Peak Jitter	Pk-Pk			20 typ.		ps

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



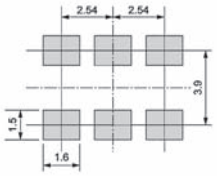
Plating: Ni+Au

Pad Connections
① Enable/Disable
② NC
③ Case GND
④ Output
⑤ Complementary Output
⑥ Vcc

Enable/Disable Function	
Pad1	Pad4 (Output)
OPEN	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF between VDD and GND is recommended.

Clock Oscillators
Surface Mount Type KC5032P-L2 Series
LVDS / 2.5V / 5.0×3.2mm

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- LVDS output
- Supply voltage V_{DD}=2.5V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. × 10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC5032P 125.000 L 2 0 E 00
① ② ③④⑤⑥ ⑦

①Type (5.0×3.2mm SMD)
②Output Frequency
③Output Type (LVDS)
④Supply Voltage (2.5V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

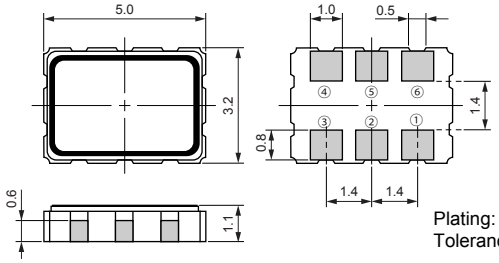
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	F_O			75	170	MHz
Frequency Tolerance	$F_{\_tol}$	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	$T_{\_stg}$			−55	+125	°C
Operating Temperature Range	$T_{\_use}$	Standard Specifications		0	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	V_{DD}			2.375	2.625	V
Current Consumption	I_{DD}			—	70	mA
Stand-by Current	$I_{\_std}$			—	30	µA
Symmetry	SYM	100 ohm @50% Output Swing		45	55	%
Rise/Fall Time (20% Vcc to 80% Vcc)	Tr/Tf	100 ohm		—	0.6	nS
Output Voltage-"L"	V_{OL}	Typ. 1.1V		0.9	—	V
Output Voltage-"H"	V_{OH}	Typ. 1.43V		—	1.6	V
Diffrentical Output Voltage	V_{OD}	Typ. 330mV		247	454	mV
Diffrentical Output Voltage Error	dV_{OD}	$dV_{OD}=\|V_{OD1}-V_{OD2}\|$		—	50	mV
Offset Voltage	V_{OS}	Typ. 1.25V		1.125	1.375	V
Offset Voltage Error	dV_{OS}	$dV_{OS}=\|V_{OS1}-V_{OS2}\|$		—	50	mV
Output Load	L_LVDS	LVDS Output		100		ohm
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VISI 6.3.1*		—	2	pS
1Sigma jitter	1sigma			—	4	pS
Peak to Peak Jitter	Pk-Pk			—	30	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



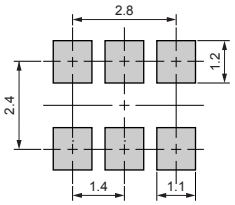
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections	
①	Enable/Disable
②	NC
③	Case GND
④	Output
⑤	Complementary Output
⑥	V_{DD}

Enable/Disable Function	
Pad1	Pad4/pad5 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF and 10µF Between V_{DD} and GND is recommended.

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- LVDS output
- Supply voltage V_{DD}=3.3V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. × 10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC5032P 125.000 L 3 0 E 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (5.0×3.2mm SMD)
②Output Frequency
③Output Type (LVDS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

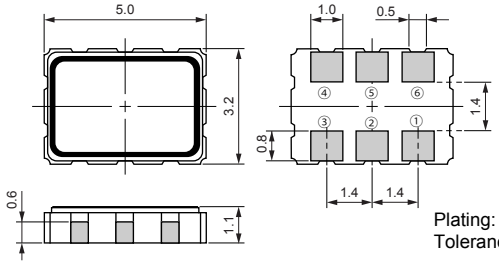
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	F_O			75	170	MHz
Frequency Tolerance	$F_{\_tol}$	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	$T_{\_stg}$			−55	+125	°C
Operating Temperature Range	$T_{\_use}$	Standard Specifications		0	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	V_{DD}	Freq. Tol. Code: 0, S, F		2.97	3.63	V
		Freq. Tol. Code: U, G		3.14	3.46	
Current Consumption	I_{DD}			—	70	mA
Stand-by Current	$I_{\_std}$			—	30	µA
Symmetry	SYM	100 ohm @50% Output Swing		45	55	%
Rise/Fall Time (20% Vcc to 80% Vcc)	Tr/Tf	100 ohm		—	0.6	nS
Output Voltage-"L"	V_{OL}	Typ. 1.1V		0.9	—	V
Output Voltage-"H"	V_{OH}	Typ. 1.43V		—	1.6	V
Diffrentical Output Voltage	V_{OD}	Typ. 330mV		247	454	mV
Diffrentical Output Voltage Error	dV_{OD}	$dV_{OD}=\|V_{OD1}-V_{OD2}\|$		—	50	mV
Offset Voltage	V_{OS}	Typ. 1.25V		1.125	1.375	V
Offset Voltage Error	dV_{OS}	$dV_{OS}=\|V_{OS1}-V_{OS2}\|$		—	50	mV
Output Load	L_LVDS	LVDS Output		100		ohm
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VISI 6.3.1*		—	2	pS
1Sigma jitter	1sigma			—	4	pS
Peak to Peak Jitter	Pk-Pk			—	30	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



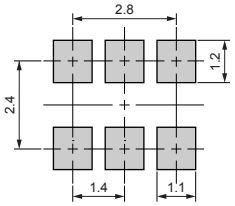
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections
① Enable/Disable
② NC
③ Case GND
④ Output
⑤ Complementary Output
⑥ V_{DD}

Enable/Disable Function	
Pad1	Pad4/pad5 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01µF and 10µF Between V_{DD} and GND is recommended.

Clock Oscillators
Surface Mount Type KC7050P-L2 Series
LVDS / 2.5V / 7.0×5.0mm

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- LVDS output
- Supply voltage V_{DD}=2.5V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. × 10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050P 125.000 L 2 0 E 00
① ② ③④⑤⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (LVDS)
④Supply Voltage (2.5V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

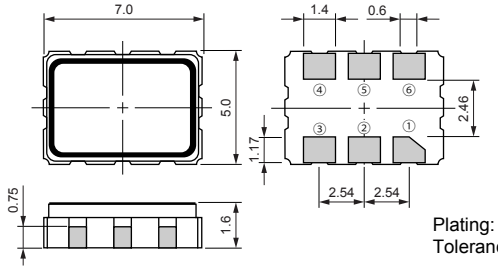
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	F_O			75	170	MHz
Frequency Tolerance	$F_{\_tol}$	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	$T_{\_stg}$			−55	+125	°C
Operating Temperature Range	$T_{\_use}$	Standard Specifications		0	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	V_{DD}			2.375	2.625	V
Current Consumption	I_{DD}			—	70	mA
Stand-by Current	$I_{\_std}$			—	30	μA
Symmetry	SYM	100 ohm @50% Output Swing		45	55	%
Rise/Fall Time (20% Vcc to 80% Vcc)	Tr/Tf	100 ohm		—	0.6	nS
Output Voltage-"L"	V_{OL}	Typ. 1.1V		0.9	—	V
Output Voltage-"H"	V_{OH}	Typ. 1.43V		—	1.6	V
Diffrentical Output Voltage	V_{OD}	Typ. 330mV		247	454	mV
Diffrentical Output Voltage Error	dV_{OD}	dV_{OD}=|V_{OD1}−V_{OD2}|		—	50	mV
Offset Voltage	V_{OS}	Typ. 1.25V		1.125	1.375	V
Offset Voltage Error	dV_{OS}	dV_{OS}=|V_{OS1}−V_{OS2}|		—	50	mV
Output Load	L_LVDS	LVDS Output		100		ohm
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VISI 6.3.1*		—	2	pS
1Sigma jitter	1sigma			—	4	pS
Peak to Peak Jitter	Pk-Pk			—	30	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



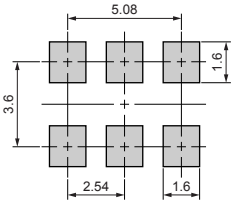
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections
① Enable/Disable
② NC
③ Case GND
④ Output
⑤ Complementary Output
⑥ V_{DD}

Enable/Disable Function	
Pad1	Pad4/pad5 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF and 10μF Between V_{DD} and GND is recommended.

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- LVDS output
- Supply voltage V_{DD}=3.3V
- ±25×10^{-6} available

Table 1

Freq. Tol. Code	Freq. Tol. × 10^{-6}	Operating Temperature Range (°C)	Note
0	± 50	−10 to +70	Standard specifications
S	± 30		With only certain frequencies
U	± 25		
F	±100	−40 to +85	
G	± 50		

How to Order

KC7050P 125.000 L 3 0 E 00
① ② ③④⑤⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (LVDS)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

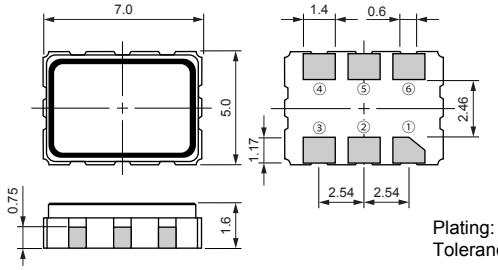
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	F_O			75	170	MHz
Frequency Tolerance	$F_{\_tol}$	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10^{-6}
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−50	+50	
			Op. Temp.: −10 to +70°C/ −40 to +85°C	−30	+30	
			Op. Temp.: −10 to +70°C	−25	+25	
Storage Temperature Range	$T_{\_stg}$			−55	+125	°C
Operating Temperature Range	$T_{\_use}$	Standard Specifications		0	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+5	V
Supply Voltage	V_{DD}	Freq. Tol. Code: 0, S, F		2.97	3.63	V
		Freq. Tol. Code: U, G		3.14	3.46	
Current Consumption	I_{DD}			—	70	mA
Stand-by Current	$I_{\_std}$			—	30	µA
Symmetry	SYM	100 ohm @50% Output Swing		45	55	%
Rise/Fall Time (20% Vcc to 80% Vcc)	Tr/Tf	100 ohm		—	0.6	nS
Output Voltage-"L"	V_{OL}	Typ. 1.1V		0.9	—	V
Output Voltage-"H"	V_{OH}	Typ. 1.43V		—	1.6	V
Diffrentical Output Voltage	V_{OD}	Typ. 330mV		247	454	mV
Diffrentical Output Voltage Error	dV_{OD}	$dV_{OD}=\|V_{OD1}-V_{OD2}\|$		—	50	mV
Offset Voltage	V_{OS}	Typ. 1.25V		1.125	1.375	V
Offset Voltage Error	dV_{OS}	$dV_{OS}=\|V_{OS1}-V_{OS2}\|$		—	50	mV
Output Load	L_LVDS	LVDS Output		100		ohm
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	5	mS
Start-up Time	ST	@Minimum Operation Voltage to be 0 sec.		—	10	mS
Deterministic Jitter (DJ)	DJ	Measured with Wavecrest DTS-2079 *VISI 6.3.1*		—	2	pS
1Sigma jitter	1sigma			—	4	pS
Peak to Peak Jitter	Pk-Pk			—	30	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



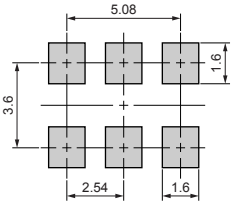
Plating: Ni+Au
Tolerance: ±0.1

Pad Connections
① Enable/Disable
② NC
③ Case GND
④ Output
⑤ Complementary Output
⑥ V_{DD}

Enable/Disable Function	
Pad1	Pad4/pad5 (Output)
Open	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

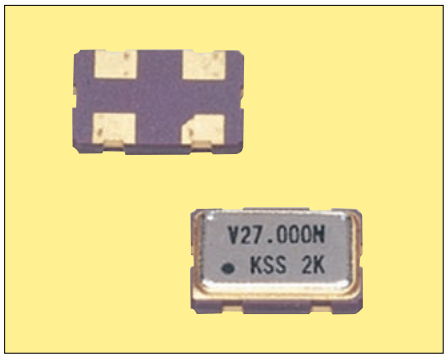
(Unit : mm)



Note: A capacitor of value 0.01µF and 10µF Between V_{DD} and GND is recommended.

Voltage Controlled Crystal Oscillators (VCXO)
Surface Mount Type KV5032A Series (VC-FXO-65F Series)

CMOS / 3.3V / 5.0V / 5.0×3.2mm



Pb Free RoHS Compliant

Features

- Surface mount type suitable for auto pick-and-place.
- Reflow soldering compatible.
- Supply voltage V_{DD}=3.3/5.0V available

Applications

- DTV, DVD

How to Order

KV5032A 27.0000 C 3 S C 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type
②Output Frequency
③Output Type (CMOS)
④Supply Voltage 5=5.0V, 3=3.3V
⑤Frequency Tolerance (S=±30×10^{-6})
⑥Symmetry/Enable Function (40/60%)
⑦Customer Special Model Suffix (STD Specification is "00")

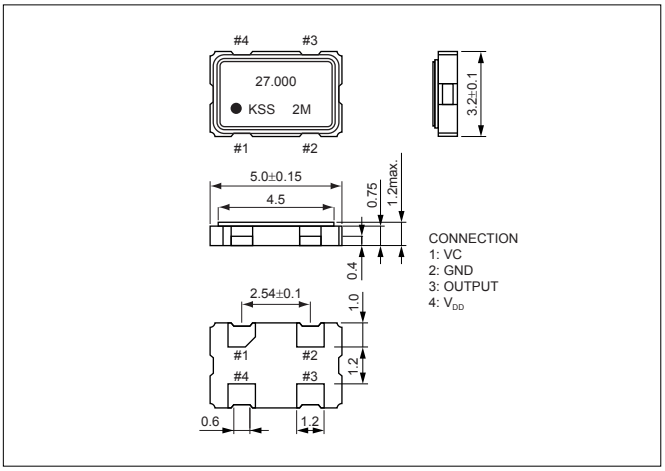
Specifications

Items	Symbol	Specifications		Units
		KV5032Axx.xxxxC5SC00 (VC-FXO-65F)	KV5032Axx.xxxxC3SC00 (VC-FXO-65FL)	
Output Frequency	F_0	8 to 40		MHz
Frequency Tolerance (Overall)	$F_{\_tol}$	±30		×10^{-6}
Storage Temperature Range	$T_{\_stg}$	−35 to +85		°C
Operating Temperature Range	$T_{\_use}$	−10 to +70		°C
Max. Supply Voltage	–	7 Max.		V
Supply Voltage	V_{DD}	5±5%	3.3±5%	V
Current Consumption	I_{DD}	20 Max.	15 Max.	mA
Symmetry	SYM	40 to 60@50%V_{DD}		%
Rise / Fall Time	Tr/Tf	10 Max.	15 Max.	nS
Output Voltage-"L"	V_{OL}	0.5 Max.		V
Output Voltage-"H"	V_{OH}	90% V_{DD} Min.		V
Output Load	CL	15		pF
Start-up Time	ST	10 Max.		mS
Voltage Control Range	Δf/V	±50 Min.	±50 Min.	10^{-6}
Frequency Deviation	Δf/V	2.5V±2.0V	1.65V±1.65V	V

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

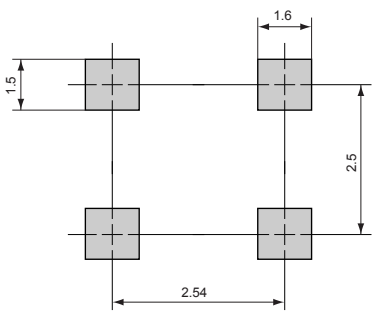
Dimensions

(Unit : mm)



Recommended Land Pattern

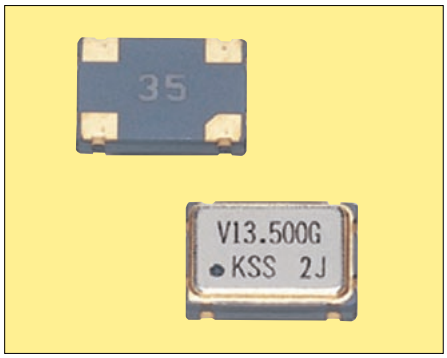
(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Voltage Controlled Crystal Oscillators (VCXO)
Surface Mount Type KV7050A Series (VC-FXO-35F Series)

CMOS / 3.3V / 5.0V / 7.0×5.0mm



Pb Free RoHS Compliant

Features

- Surface mount type suitable for auto pick-and-place.
- Reflow soldering compatible.
- Supply voltage V_{DD}=3.3/5.0V available

Applications

- DTV, DVD

How to Order

KV7050A 27.0000 C 3 S C 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type
②Output Frequency
③Output Type (CMOS)
④Supply Voltage 5=5.0V, 3=3.3V
⑤Frequency Tolerance (S=±30x10^{-6})
⑥Symmetry/Enable Function (40/60%)
⑦Customer Special Model Suffix (STD Specification is "00")

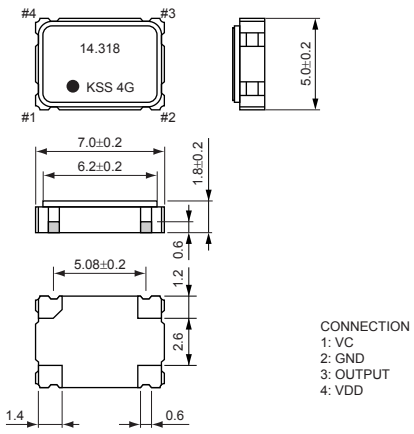
Specifications

Items	Symbol	Specifications		Units
		KV7050Axx.xxxxC5SC00 (VC-FXO-35F)	KV7050Axx.xxxxC3SC00 (VC-FXO-35FL)	
Output Frequency	F_0	8 to 40	8 to 35	MHz
Frequency Tolerance (Overall)	F_tol	±30		×10^{-6}
Storage Temperature Range	T_stg	−35 to +85		°C
Operating Temperature Range	T_use	−10 to +70		°C
Max. Supply Voltage	–	7 Max.		V
Supply Voltage	V_{DD}	5±5%	3.3±5%	V
Current Consumption	I_{DD}	25 Max.	20 Max.	mA
Symmetry	SYM	40 to 60@50%V_{DD}		%
Rise / Fall Time	Tr/Tf	10 Max.	15 Max.	nS
Output Voltage-"L"	V_{OL}	0.5 Max.		V
Output Voltage-"H"	V_{OH}	90% V_{DD} Min.		V
Output Load	CL	15		pF
Start-up Time	ST	10 Max.		mS
Voltage Control Range	Δf/V	±50 Min.	±50 Min.	10^{-6}
Frequency Deviation	Δf/V	2.5V±2.0V	1.65V±1.65V	V

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

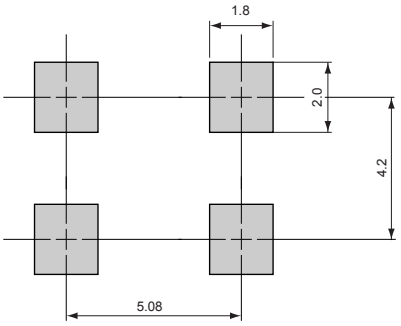
Dimensions

(Unit : mm)



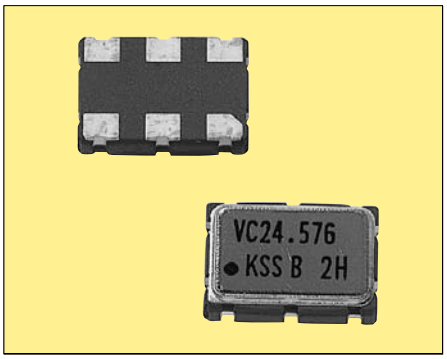
Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Voltage Controlled Crystal Oscillators (VCXO)
Surface Mount Type
KV7050L-C Series (VCXO-7050 / 7050L)



Pb Free RoHS Compliant

Features

- "Small size", 0.063cc (5×7×1.8mm)
- Using 1 chip HCMOS IC
- 3-state devices are available
- APR (Absolute Pull Range) up to $\pm 50\times10^{-6}$ or $\pm 100\times10^{-6}$

Applications

- Digital Switching System
- ATM SDH
- SONET
- xDSL

How to Order

KV7050L 25.0000 C 3 0 A 00
① ② ③ ④ ⑤ ⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③CMOS Output
④Supply Voltage: 3→3.3V, 5→5V
⑤Frequency Tolerance
F→$\pm 100\times10^{-6}$, G→$\pm 50\times10^{-6}$
⑥Enable / Symmetry 40 to 60%
⑦Individual Specification

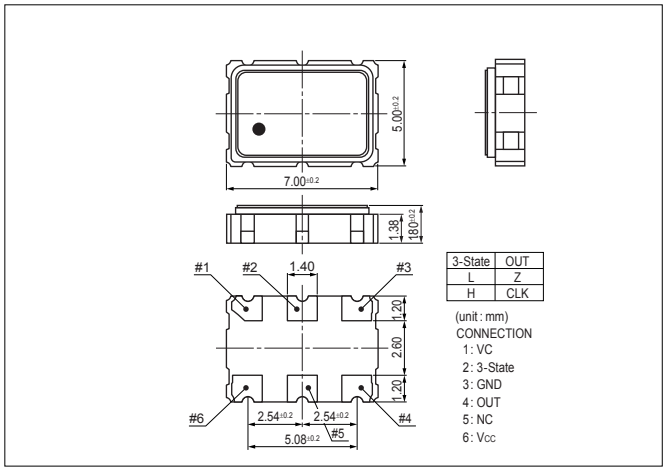
Specifications

Item	Symbol	Conditions	Specification		Units
			KV7050	KV7050L	
Output Frequency Range	F_O		7.2 to 50		MHz
Storage Temperature Range	$T_{\_stg}$		−40 to +90		°C
Operating Temperature Range	$T_{\_use}$		−40 to +85		°C
Absolute Pull Range (APR)	APR	Included 20years Aging (at +25°C)	±50/±100*1(VC=0.5 to 4.5V)	±50/±100*1(VC=0.3 to 3.0V)	$\times10^{-6}$
Max. Supply Voltage	—		−0.5 to 7		V
Supply Voltage	V_{CC}		5 ±10%	3.3 ±10%	V
Current Consumption	I_{CC}		15 Max.		mA
Control Voltage	VC		2.5 ±2.0	1.65 ±1.35	V
Symmetry	SYM	50% V_{DD}	40 to 60		%
Rise Time / Fall Time	tr / tf		10 Max.		nS
Output Voltage-"L"	V_{OL}		10% V_{CC} Max.		V
Output Voltage-"H"	V_{OH}		90% V_{CC} Min.		V
Output Load	CL		15 ±10%		pF

*1 For 100×10^{-6}, 7.2MHz to 30MHz
• APR=Absolute Pull Range is the minimum guaranteed (voltage controlled) frequency shift ($\Delta f/f$ N_{OM})

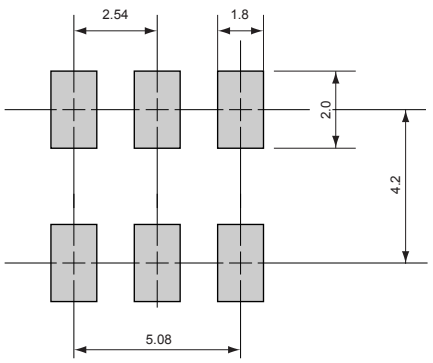
Dimensions

(Unit : mm)



Recommended Land Pattern

(Unit : mm)



Voltage Controlled Crystal Oscillators (VCXO)
Surface Mount Type KV7050W-P3 Series (K50V-3P Series)

LV-PECL / 3.3V / 7.0×5.0mm

Pb Free RoHS Compliant

Features

- Miniature ceramic package
- Highly reliable with seam welding
- LV-PECL output
- Supply voltage V_{DD}=3.3V
- With built-in by-pass capacitor
- Low jitter

Table 1

Freq. Tol. Code	Freq. Tol. ×10⁻⁶	Operating Temperature Range (°C)	Note
0	± 50	0 to +70	Standard specifications
F	±100	−40 to +85	With only certain frequencies
G	± 50		

How to Order

KV7050W 155.520 P 3 0 D 00
① ② ③④⑤⑥⑦

①Type (7.0×5.0mm SMD VCXO)
②Output Frequency
③Output Type (LV-PECL)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/ Enable Function (45/55%, Disable)
⑦Customer Special Model Suffix (STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

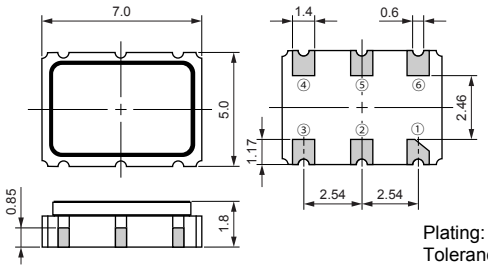
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	F_O			80	200	MHz
Frequency Tolerance	$F_{\_tol}$	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.: −40 to +85°C	−100	+100	×10⁻⁶
			Op. Temp.: 0 to +70°C/ −40 to +85°C	−50	+50	
Aging	Aging	@25°C 20years		+15	−15	x10-6
Absolute Pull Range	APR			±100	—	x10-6
Linearity	Lin			−10	+10	%
Control Voltage	V_C			0	3.3	
Storage Temperature Range	$T_{\_stg}$			−55	+90	°C
Operating Temperature Range	$T_{\_use}$	Standard Specifications		0	+70	°C
		Extend (Option)		−40	+85	
Max. Supply Voltage	—			−0.5	+7	V
Supply Voltage	V_{DD}			2.97	3.63	V
Current Consumption	I_{DD}	50 ohm		—	70	mA
Disable Current	$I_{\_dis}$			—	15	mA
Symmetry	SYM	50 ohm @50% Output Swing		45	55	%
Rise/Fall Time (20% V_{DD} to 80% V_{DD})	Tr/Tf	50 ohm		—	0.6	nS
Output Voltage-"L"	V_{OL}	Op. Temp.: 0 to +85°C/ Typ. 1.600V		V_{DD}−1.810	V_{DD}−1.620	V
		Op. Temp.: −40 to 0°C/ Typ. 1.605V		V_{DD}−1.830	V_{DD}−1.555	
Output Voltage-"H"	V_{OH}	Op. Temp.: 0 to +85°C/ Typ. 2.350V		V_{DD}−1.025	V_{DD}−0.880	V
		Op. Temp.: −40 to 0°C/ Typ. 2.295V		V_{DD}−1.085	V_{DD}−0.900	
Output Load	L_ECL	LV−PECL		50		ohm
Input Voltage Range	V_{IN}			0	V_{DD}	V
Input Voltage-"L"	V_{IL}			—	30% V_{DD}	V
Input Voltage-"H"	V_{IH}			70% V_{DD}	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	200	nS
Start-up Time	ST	@Minimum Operation Voltage to be 0 sec.		—	10	mS
Phase jitter	—	12KHz to 20MHz @155.52MHz		—	1	pS
Phase Noise @155.52MHz	—	−60(@10Hz offset) −90(@100Hz offset) −120(@1KHz offset) −140(@10KHz offset) −147(@100KHz offset) −147(@1Hz offset) −147(@10Hz offset)				dBc/Hz

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



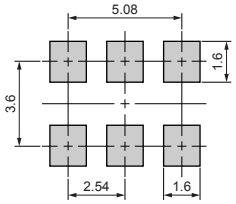
Plating: Ni+Au
Tolerance: ±0.2

Pad Connections	
①	Vc
②	Enable/Disable
③	Case GND
④	Output
⑤	Complementary Output
⑥	V_{DD}

Enable/Disable Function	
Pad2	Pad4/Pad5(Output)
Open	Active
"H" Level	Active
"L" Level	High Z

Recommended Land Pattern

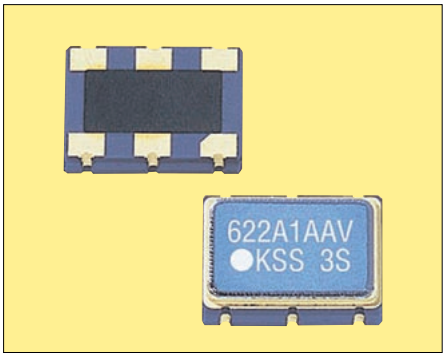
(Unit : mm)



Note: By-pass capacitor of 0.01μF is built-in between V_{DD} and GND for KV7050W series.

Voltage Controlled SAW Oscillators
Surface Mount Type KV7050S-P3 Series (VS-FSO-1D Series)

LV-PECL / 3.3V / 7.0×5.0mm



Pb Free RoHS Compliant

Features

- Low Jitter
- Differential LV-PECL outputs
- Wide pull range APR±100×10^{-6}
- Operation at high frequency fundamental mode

Table 1

APR		Operating Temperature Range (°C)	Note
Code	×10^{-6}		
1	±100	–40 to +85	Standard specifications

How to Order

KV7050S 622.080 P 3 1 E 00
① ② ③④⑤⑥ ⑦

①Type (7.0×5.0mm SMD)
②Output Frequency
③Output Type (PECL)
④Supply Voltage (3.3V)
⑤Frequency Tolerance (See Table 1)
⑥Symmetry/Enable Function (45/55%, Stand-by)
⑦Customer Special Model Suffix
(STD Specification is "00")

Packaging (Tape & Reel 1000pcs./reel)

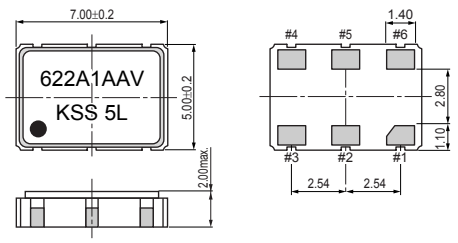
Specifications

Item	Symbol	Conditions		Min.	Max.	Units
Output Frequency Range	Fo			600	700	MHz
Absolute Pull Range	APR	Initial tolerance, Operating temperature range, Rated power supply voltage change, Load change, Aging (1year @25°C), Shock and vibration	Op. Temp.:–40 to +85°C	–100	+100	×10^{-6}
Control Voltage Range	V_{CON}			0	3.3	V
Control Voltage Input Impedance	—			100 Typ.		KΩ
Transfer Slope	—			Positive		
Storage Temperature Range	T_{stg}			–55	+125	°C
Operating Temperature Range	T_{use}	Standard Specifications		–45	+85	°C
Max. Supply Voltage	—			–0.5	+5	V
Supply Voltage	V_{CC}			3.14	3.46	V
Current Consumption (Standard Loaded)	I_{CC}			—	80	mA
Symmetry	SYM			45	55	%
Rise/ Fall Time (20% V_{CC} to 80% V_{CC} Standard Loaded)	Tr/Tf			—	400	pS
Output Voltage-"L"	V_{OL}			—	1.68	V
Output Voltage-"H"	V_{OH}			2.275	—	V
Output Load (PECL)	L_ECL	PECL 50Ω @Terminated V_{CC}–2V		49.5	50.5	ohm
Input Voltage Range	V_{IN}			0	V_{CC}	V
Input Voltage-"L"	V_{IL}			—	30% V_{CC}	V
Input Voltage-"H"	V_{IH}			70% V_{CC}	—	V
Disable Time	—			—	200	nS
Enable Time	—			—	2	mS
Start-up Time	ST	@ Minimum Operation Voltage to be 0 sec.		—	10	mS
Phase Jitter	—	Off set Frequency: 50kHz to 80MHz			1	pS

Note: All electrical characteristics are defined at the maximum load and operating temperature range.
Please contact us for inquires about operating temperature range, available frequencies and other conditions.

Dimensions

(Unit : mm)



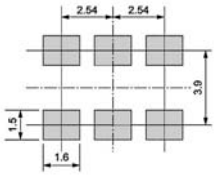
Pad Connections
① Enable/Disable
② NC
③ Case GND
④ Output
⑤ NC
⑥ Vcc

Plating: Ni+Au

Enable/Disable Function	
Pad1	Pad4 (Output)
OPEN	Active
"H" Level	Active
"L" Level	High Z(No-Oscillation)

Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Temperature Compensated Crystal Oscillators (TCXO)
Surface Mount Type TCXO (LSI Type) KT2520Y Series

2.5×2.0mm

Pb Free RoHS Compliant

Features

- Ultra-miniature SMD type (2.5×2.0×0.9mm)
- AFC function available
- Frequency stability : $\pm2.0\times10^{-6}$/–30 to +85°C
- 2.3 to 3.5V drive available
- Reflow compatible

Applications

- 3G (CDMA, W-CDMA), GPRS, GSM

How to Order

KT2520Y 26000 D C W 28 T AA

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①Series
②Output Frequency
③Frequency Tolerance

B	$\pm1.0\times10^{-6}$
C	$\pm1.5\times10^{-6}$
D	$\pm2.0\times10^{-6}$

④Lower Operating Temp.

C	–30°C
E	–20°C
G	–10°C

⑤Upper Operating Temp.

W	+85°C
V	+80°C
U	+75°C

⑥Supply Voltage

28	2.8V	30	3.0V

⑦Voltage Control Range

TCXO	T
VCTCXO	Customer Spec

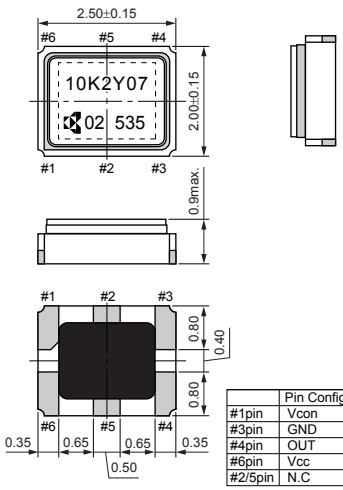
⑧Option Code

Specifications

Item	Symbol	Conditions	Min.	Max.	Units
Output Frequency	Fo		12.6	40	MHz
Frequency Tolerance	F_{tol}	vs Temperature	–2	+2	$\times10^{-6}$
		vs Load	–0.2	+0.2	
		vs Voltage	–0.3	+0.3	
Frequency Aging	F_{aging}	Per Year	–1	+1	$\times10^{-6}$
Storage Temperature Range	T_{stg}		–40	+85	°C
Operating Temperature Range	T_{use}		–30	+85	°C
Voltage Control Range	Δf/V	Positive	±8	±15	$\times10^{-6}$
Supply Voltage	Vcc		2.3	3.5	V
Output Level	Vpp	10k ohm // 10pF	0.8	—	Vp-p
Current Consumption	I_{DD}		—	2	mA
Symmetry	SYM	@50% V_{DD}	40	60	%
Harmonics	—		—	–5	dBc

Dimensions

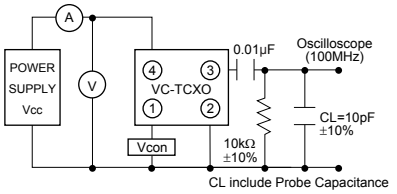
(Unit : mm)



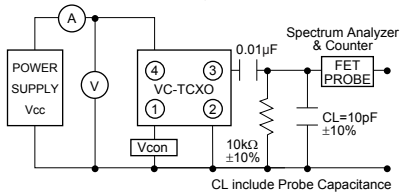
	Pin Configuration
#1pin	Vcon
#3pin	GND
#4pin	OUT
#6pin	Vcc
#2/5pin	N.C

Test Circuit

Test circuit 1
(Amplitude)

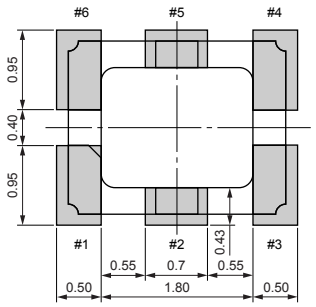


Test circuit 2
(Harmonics & Frequency)



Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Temperature Compensated Crystal Oscillators (TCXO)
Surface Mount Type TCXO (LSI Type)　KT3225 Series for GPS
3.2×2.5mm

Pb Free　RoHS Compliant

Features
- Ultra-miniature SMD type (3.2×2.5×1.0mm)
- AFC function available
- Frequency stability : ±0.5×10^{-6}/–30 to +85°C
- 2.3 to 3.5V drive available
- Reflow compatible

Applications
- GPS

How to Order

KT3225F　16367　A　C　V　28　T　AA
①　②　③　④　⑤　⑥　⑦　⑧

①Series
②Output Frequency
③Frequency Tolerance

A	±0.5×10^{-6}

④Lower Operating Temp.

C	–30°C
E	–20°C
G	–10°C

⑤Upper Operating Temp.

W	+85°C
V	+80°C
U	+75°C

⑥Supply Voltage

28	2.8V	**30**	3.0V

⑦Voltage Control Range

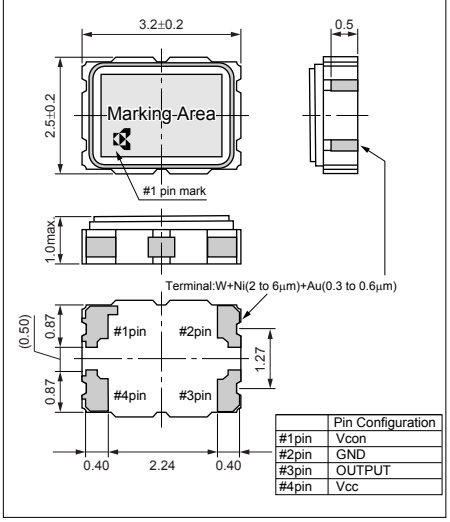
TCXO	T

⑧Option Code

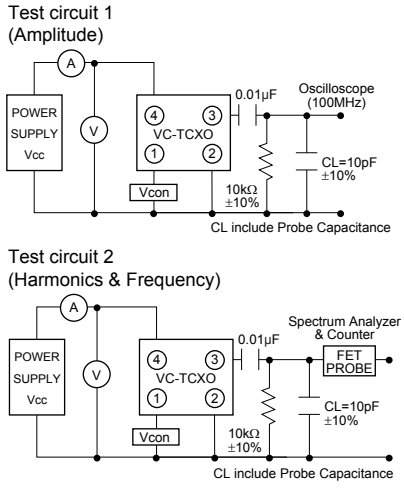
Specifications

Item	Symbol	Conditions	Min.	Max.	Units
Output Frequency	Fo		12.6	40	MHz
Frequency Tolerance	F_tol	vs Temperature	–0.5	+0.5	×10^{-6}
		vs Load	–0.2	+0.2	
		vs Voltage	–0.3	+0.3	
Frequency Aging	F_aging	Per Year	–1	+1	×10^{-6}
Storage Temperature Range	T_stg		–40	+85	°C
Operating Temperature Range	T_use		–30	+85	°C
Supply Voltage	Vcc		2.3	3.5	V
Output Level	Vpp	10k ohm // 10pF	0.8	—	Vp-p
Current Consumption	I_{DD}		—	2	mA
Symmetry	SYM	@50% V_{DD}	40	60	%
Harmonics	—		—	–5	dBc

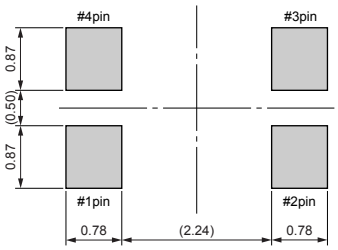
Dimensions (Unit : mm)



Test Circuit



Recommended Land Pattern (Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Temperature Compensated Crystal Oscillators (TCXO)
Surface Mount Type TCXO (LSI Type) KT3225 Series

3.2×2.5mm

Pb Free RoHS Compliant

Features

- Ultra-miniature SMD type (3.2×2.5×1.0mm)
- Reflow compatible
- AFC function available
- 2.3 to 3.5V drive available
- Frequency stability : ±2.0×10^{-6}/–30 to +85°C

Applications

- 3G (CDHA, W-CDHA) GPRS, GSH

How to Order

KT3225P 26000 D C W 28 T AA
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①Series
②Output Frequency
③Frequency Tolerance

B	±1.0×10^{-6}
C	±1.5×10^{-6}
D	±2.0×10^{-6}

④Lower Operating Temp.

C	–30°C
E	–20°C
G	–10°C

⑤Upper Operating Temp.

W	+85°C
V	+80°C
U	+75°C

⑥Supply Voltage

28	2.8V	30	3.0V

⑦Voltage Control Range

TCXO	T
VCTCXO	Customer Spec

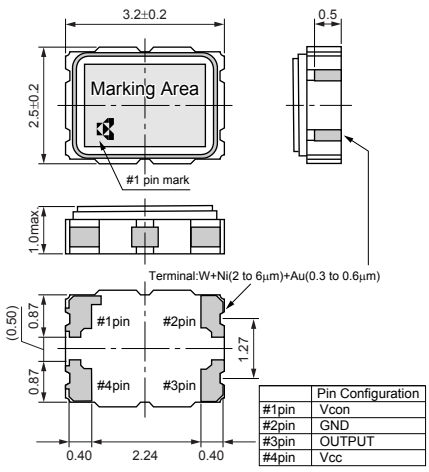
⑧Option Code

Specifications

Item	Symbol	Conditions	Min.	Max.	Units
Output Frequency	Fo		12.6	40	MHz
Frequency Tolerance	F_tol	vs Temperature	–2	+2	×10^{-6}
		vs Load	–0.2	+0.2	
		vs Voltage	–0.3	+0.3	
Frequency Aging	F_aging	Per Year	–1	+1	×10^{-6}
Storage Temperature Range	T_stg		–40	+85	°C
Operating Temperature Range	T_use		–30	+85	°C
Voltage Control Range	Δf/V	Positive	±8	±15	×10^{-6}
Supply Voltage	Vcc		2.3	3.5	V
Output Level	Vpp	10k ohm // 10pF	0.8	—	Vp-p
Current Consumption	I_{DD}		—	2	mA
Symmetry	SYM	@50% V_{DD}	40	60	%
Harmonics	—		—	–5	dBc

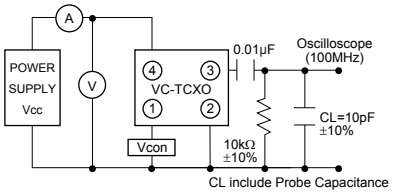
Dimensions

(Unit : mm)

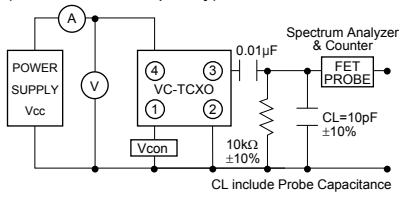


Test Circuit

Test circuit 1
(Amplitude)

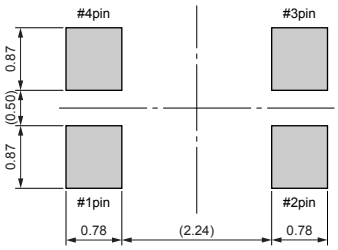


Test circuit 2
(Harmonics & Frequency)

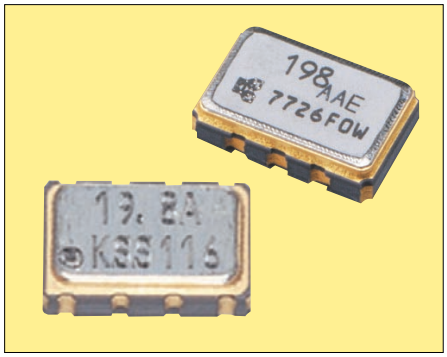


Recommended Land Pattern

(Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.



Pb Free RoHS Compliant

Features

- Ultra-miniature SMD type (5.0×3.2×1.5mm)
- Reflow compatible
- AFC function available
- 2.3 to 5.5V drive available
- Frequency stability : ±2.0×10^{-6}/–30 to +85°C

Applications

- PDC, GSM, CDMA

How to Order

KT5032N 26000 D C W 28 T AA
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①Series
②Output Frequency
③Frequency Tolerance

B	±1.0×10^{-6}
C	±1.5×10^{-6}
D	±2.0×10^{-6}

④Lower Operating Temp.

C	–30°C
E	–20°C
G	–10°C

⑤Upper Operating Temp.

W	+85°C
V	+80°C
U	+75°C

⑥Supply Voltage

28	2.8V	30	3.0V

⑦Voltage Control Range

TCXO	T
VCTCXO	Customer Spec

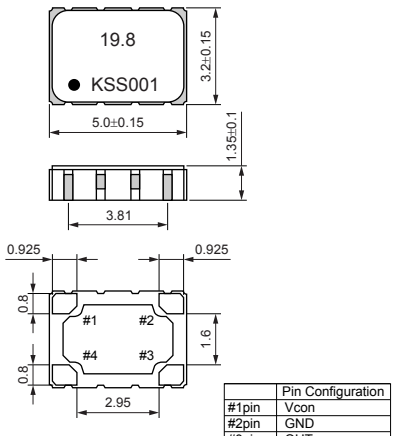
⑧Option Code

Specifications

Item	Symbol	Conditions	Min.	Max.	Units
Output Frequency	Fo		12.6	40	MHz
Frequency Tolerance	F_tol	vs Temperature	–2	+2	×10^{-6}
		vs Load	–0.2	+0.2	
		vs Voltage	–0.3	+0.3	
Frequency Aging	F_aging	Per Year	–1	+1	×10^{-6}
Storage Temperature Range	T_stg		–40	+85	°C
Operating Temperature Range	T_use		–30	+85	°C
Voltage Control Range	Δf/V	Positive	±8	±15	×10^{-6}
Supply Voltage	Vcc		2.3	5.5	V
Output Level	Vpp	10k ohm // 10pF	0.8	—	Vp-p
Current Consumption	I_{DD}		—	2	mA
Symmetry	SYM	@50% V_{DD}	40	60	%
Harmonics	—		—	–5	dBc

Dimensions (Unit : mm)

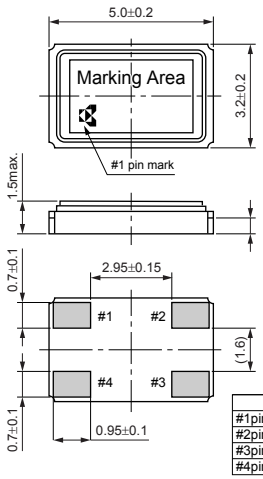
KT5032N



	Pin Configuration
#1pin	Vcon
#2pin	GND
#3pin	OUT
#4pin	Vcc

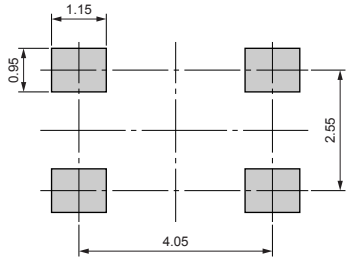
Dimensions (Unit : mm)

KT5032P



	Pin Configuration
#1pin	Vcon
#2pin	GND
#3pin	OUT
#4pin	Vcc

Recommended Land Pattern (Unit : mm)



Note: A capacitor of value 0.01μF between V_{DD} and GND is recommended.

Features

- Digital processing temperature compensated crystal oscillator
- Excellent frequency temperature characteristics and frequency aging
- CMOS output

Applications

- Reference Oscillator
- PLL Oscillator

How to Order

DO ① 20.000000000 ② M ③ 00001 ④

①Function
DO→DTCXO, DV→VC-DTCXO
②Output Frequency
③Frequency Unit
M→MHz, K→kHz
④Individual Specification

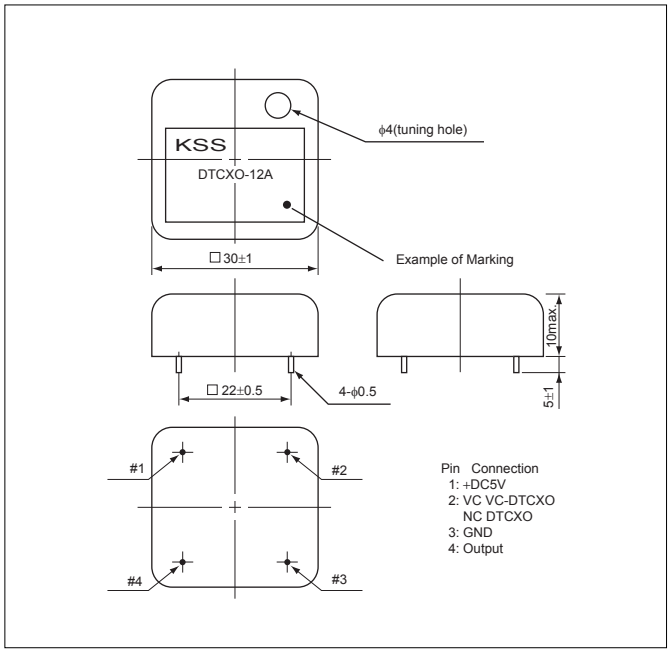
Specifications

Item	Symbol	Conditions	Min.	Max.	Units
Output Frequency Range	F_O		1	32	MHz
Frequency Tolerance	$F_{\_tol}$	vs Temperature DTCXO-12A/VC-DTCXO-12A : VC=Open	–0.1	+0.1	$\times10^{-6}$
		vs Voltage	–0.05	+0.05	
Storage Temperature Range	$T_{\_stg}$		–40	+85	°C
Operating Temperature Range	$T_{\_use}$		–35	+85	°C
Supply Voltage	V_{CC}		4.75	5.25	V
Current Consumption	I_{CC}		—	30	mA
Frequency Tuning Range	Δf tuning	Internal Trimmer	–0.7	0.7	$\times10^{-6}$
Frequency Aging	ΔF aging	Per Year (at +25°C)	–0.5	0.5	$\times10^{-6}$
Frequency Deviation	Δf/V	VC-DTCXO-12A Only	–2	2	$\times10^{-6}$
Control Voltage	VC	VC-DTCXO-12A Only	0.5	4.5	V
Symmetry	SYM	@50% V_{CC} 1 to 15MHz	45	55	%
		@50% V_{CC} 15 to 32MHz	30	70	
Output Voltage-"L"	V_{OL}		—	0.5	V
Output Voltage-"H"	V_{OH}		4.5	—	V
Load	CL		15	15	pF
Sub Harmonics			—	–80	dB

Note: All electrical characteristics are defined at the maximum load and operating temperature range.

Dimensions

(Unit : mm)



Features

- Digital processing temperature compensated crystal oscillator
- Output 50Ω
- Wide frequency range

Applications

- Reference Oscillator
- PLL Oscillator

How to Order

DO ① 20.000000000 ② M ③ 00001 ④

①Function
DO→DTCXO, DV→VC-DTCXO
②Output Frequency
③Frequency Unit
M→MHz, K→kHz
④Individual Specification

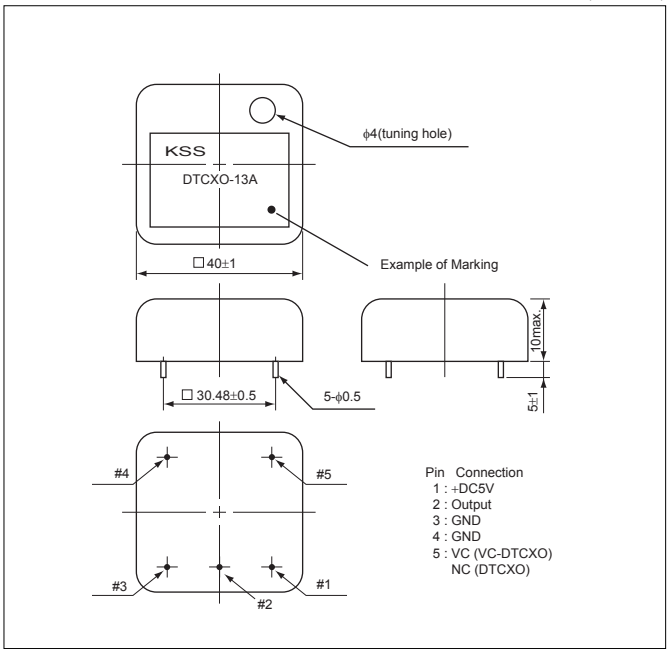
Specifications

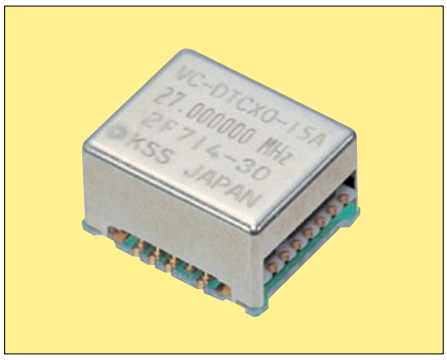
Item	Symbol	Conditions	Min.	Max.	Units
Output Frequency Range	Fo		30	320	MHz
Frequency Tolerance	F_tol	vs Temperature DTCXO-13A/VC-DTCXO-13A: VC=Open	–0.1	+0.1	$\times10^{-6}$
		vs Voltage	–0.05	+0.05	
Storage Temperature Range	T_stg		–40	+85	°C
Operating Temperature Range	T_use		–20	+70	°C
Supply Voltage	Vcc		4.75	5.25	V
Current Consumption	Icc		—	40	mA
Frequency Tuning Range	Δf tuning	Internal Trimmer	–0.7	0.7	$\times10^{-6}$
Frequency Aging	ΔF aging	Per Year (at +25°C)	–0.5	0.5	$\times10^{-6}$
Frequency Deviation	Δf/V	VC-DTCXO-13A Only	–2	2	$\times10^{-6}$
Control Voltage	VC	VC-DTCXO-13A Only	0.5	4.5	V
Output Level	Vpp	50 ohm	0	—	dBm
Sub Harmonics			—	–40	dB

Note: All electrical characteristics are defined at the maximum load and operating temperature range.

Dimensions

(Unit : mm)





Features

- Small size (14.0×11.5×8.0mm), lead-less type (SMD)
- Supply voltage of 3.3V or 5.0V is available
- Digital processing temperature compensated crystal oscillator
- High stability (±0.5×10^{-6}max./–30 to 80:)

Applications

- Reference Oscillator
- PLL Oscillator

How to Order

DO ① 20.000000000 ② M ③ 00001 ④

①Function
DO→DTCXO, DV→VC-DTCXO
②Output Frequency
③Frequency Unit
M→MHz, K→kHz
④Individual Specification

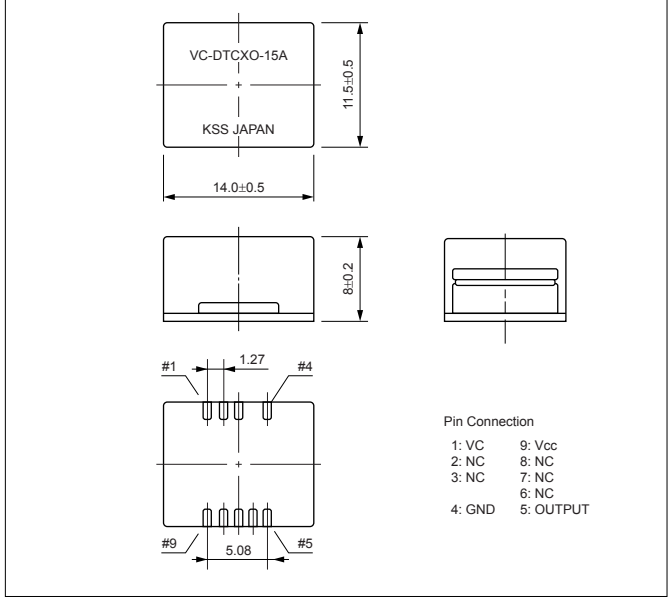
Specifications

Item	Symbol	Conditions	Min.	Max.	Units
Output Frequency Range	F_O		10	40	MHz
Frequency Tolerance	F_{tol}	vs Temperature VC=Open	–0.5	+0.5	×10^{-6}
		vs Voltage	–0.05	+0.05	
Storage Temperature Range	T_{stg}		–40	+85	°C
Operating Temperature Range	T_{use}		–30	+80	°C
Supply Voltage	V_{CC}		3.14	3.46	V
Current Consumption	I_{CC}		—	15	mA
Frequency Aging	ΔF aging	Per Year (at +25°C)	–0.7	0.7	×10^{-6}
Frequency Deviation	Δf/V		–10	10	×10^{-6}
Control Voltage	VC		0.5	2.5	V
Symmetry	SYM	50% V_{CC}	30	70	%
Output Voltage-"L"	V_{OL}		—	0.3	V
Output Voltage-"H"	V_{OH}		3	—	V
Load	CL		15	15	pF

Note: All electrical characteristics are defined at the maximum load and operating temperature range.

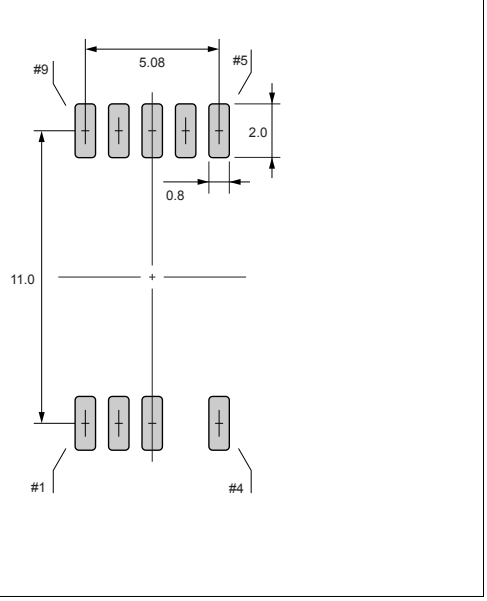
Dimensions

(Unit : mm)



Recommended Land Pattern

(Unit : mm)



Features

- Compact OCVCXO (36.1×27.2×20.2mm)
- High stability
- Solder sealing type

Applications

- Standard Oscillator

Standard Frequencies

- 10MHz

How to Order

OV ① 10.000000000 ② M ③ 00001 ④

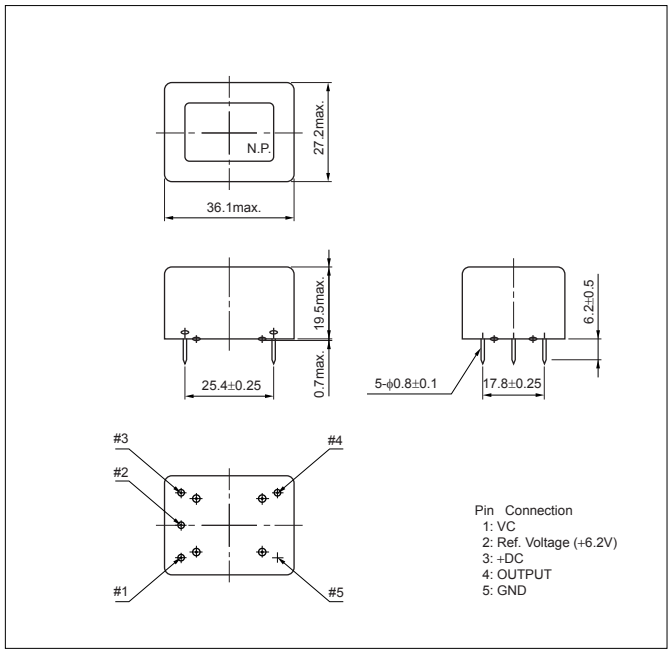
①Function
OV→OCVCXO, OO→OCXO
②Output Frequency
③Frequency Unit
M→MHz
④Individual Specification

Specifications

Item	Symbol	Conditions	Min.	Max.	Units
Output Frequency Range	Fo		10	10	MHz
Frequency Tolerance	F_tol	vs Temperature	–0.03	+0.03	×10^{-6}
		vs Voltage	–0.002	+0.002	
Storage Temperature Range	T_stg		–20	+80	°C
Operating Temperature Range	T_use		–10	+60	°C
Supply Voltage	Vcc		11.4	12.6	V
Current Consumption	Icc		—	450	mA
Frequency Aging	ΔF aging	Per Year	–0.05	0.05	×10^{-6}
Frequency Deviation	Δf/V		–0.5	0.5	×10^{-6}
Control Voltage	VC		0	6	V
Output Level	Vpp	50 ohm	3	—	dBm
Sub Harmonics			—	–20	dB

Dimensions

(Unit : mm)



Features

- Frequency control function by GPS
- Highly stable and accurate reference frequency by Rb atom oscillator
- Superior long term stability
- 10MHz-8 output standard
- DC/AC power supply automatic changeover (built-in back-up battery)

Applications

- Digital TV Broadcasting Station and Transmitter
- Accurate Frequency Reference Oscillator for Laboratory and Factory
- Base Station for Stratum1

How to Order

MO ① 10.000000000 ② M ③ 00001 ④

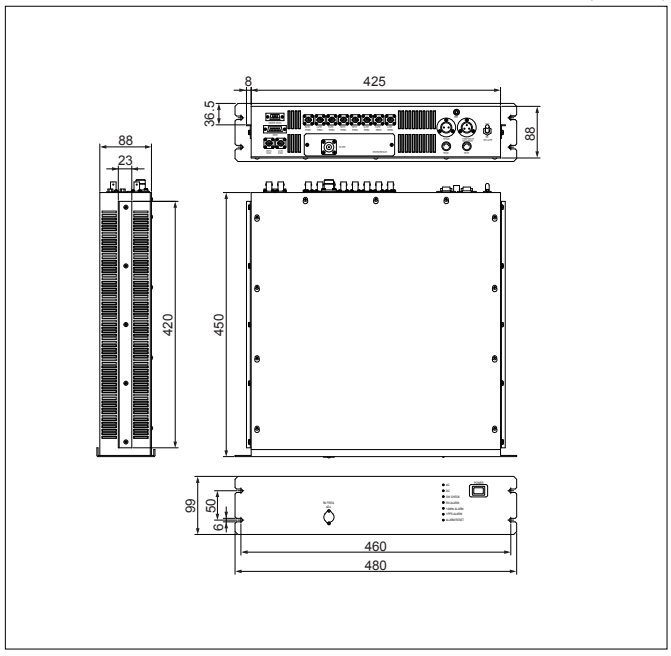
①Function
MO→MCXO
②Output Frequency
③Frequency Unit
M→MHz
④Individual Specification

Specifications

Item	Symbol	Conditions	Min.	Max.	Units
Output Frequency Range	F_{OUT}	8 Output	10	10	MHz
Frequency Stability	F_{SBY}	GPS Locked / The Temperature Slope is Less than 10 C/hour	–3	3	$\times10^{-11}$
Operable Temperature Range	$T_{\_stg}$		–20	+60	°C
Operating Temperature Range	T_{OPR}		–10	+45	°C
Supply Voltage (AC)	V_{CC}		90	110	V
			180	220	
Supply Voltage ADC			22.8	25.2	V
Power Consumption (Warm-up Condition)		DC +25°C	—	100	W
Power Consumption (Normal Condition)		DC +25°C	—	50	W
Frequency Aging	Δf aging	Per Year (GPS Locked $\pm2\times10^{-12}$/24h Average)	–5	5	$\times10^{-10}$
Output Level	Vout	50 ohm	0	3	dBm

Dimensions

(Unit : mm)



1. Shock & Drop • Vibration

Do not inflict excessive shock and mechanical vibration that exceeds the norm, such as hitting or mistakenly dropping, when transporting and mounting on a board. There are cases when pieces of crystal break, and pieces that are used become damaged, and become inoperable. When a shock or vibration that exceeds the norm has been inflicted, make sure to check the characteristics.

2. Cleaning

Since a crystal piece can be broken by resonance when a crystal device is cleaned by ultrasonic cleaning. Be careful when carrying out ultrasonic cleaning.

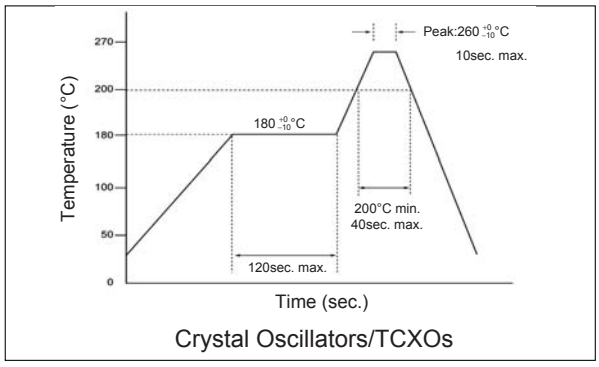
3. Soldering conditions

To maintain the product reliability, please follow recommended conditions.

Standard soldering iron conditions

	Crystal Oscillators
Soldering iron	280°C to 340°C
Time	3+1/−0sec. max.

Reflow conditions (Example)



Crystal Oscillators/TCXOs

Recommended reflow Conditions vary depending upon products.
Please check with the respective specification for details.

4. Mounting Precautions

Leaded Devices

The special glass, located where the lead of the retainer base comes out, is aligned with the coefficient of thermal expansion of the lead, If the glass is damaged and cracks appear, there may be cases in which performance deteriorates and it fails to operate.

Consequently, when making the device adhere closely and applying solder, align the gap of the hole of the board with the gap of the lead and insert without excessive force.

When making the device adhere closely to a through hole board and applying solder, be careful that the solder does not get into the metal part of the retainer base and cause a short. Putting in an insulation spacer is one more method of preventing a short circuit.

When the lead is mounted floating, fix it as far as possible so that contact with other parts and the breakage due to the fatigue, and the mechanical resonance of the lead will not occur.

When the lead is bent and used, do not bend the lead directly from the base, separate it 0.5mm or more and then bend it. When bending, before attaching to the board, fix the place where the lead comes out in advance and attach it after bending so that a crack does not occur in the glass part.

Surface Mount Devices

The lead of the device and the pattern of the board is soldered on the surface. Since extreme deformation of the board tears off the pattern, tears off the lead metal, cracks the solder and damages the sealed part of the device and there are cases in which performance deteriorates and operation fails, use it within the stipulated bending conditions. Due to the small cracks in the board resulting from mounting, please pay sufficient attention when attaching a device at the position where the warping of the board is great.

When using an automatic loading machine, as far as possible, select a type that has a small impact and use it while confirming that there is no damage.

Surface mount devices are NOT flow soldering compatible.

5. Storage Condition

Since the long hour high temperature and low temperature storage, as well as the storage at high humidity are causes of deterioration in frequency accuracy and solderability.

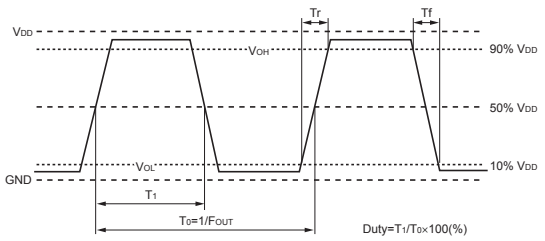
Parts should be stored in temperature range of −5 to +40°C, humidity 40 to 60% RH, and avoid direct sunlight. Then use within 6 months.

6. In order to use crystal oscillators

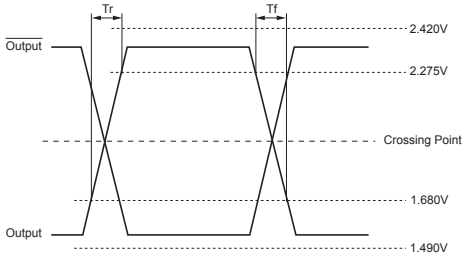
(1) The minlature crystal oscillator for the clock utillzes a CMOS IC and incorporates a protective circuit against static electricity. However, exerclse care in the same manner as for a normal CMOS IC.
(2) Internal capacitor is not provided in the power supply section (+DC–GND). *
To serve as overimpressed voltage and overcurrent protective device, place a bypass capacitor (0.01μF) as near as possible to the (+DC–GND) terminal. However, the capacitance value is meant as a guideline. Depending on the capacitor type, frequency characteristics vary. Accordingly, use a capacitor that matches the frequency characteristics.
* KC7050H (K50H) / KC7050S (FSO) series has Bypass Capacitior between V_{DD} and GND.
(3) Applying reverse voltage could result in damage to internal parts. Take care not to connect terminals incorrectly.
(4) Please do not use oscillators under unfavorable condition such as beyond specified range in catalog or specification sheet.
(5) Please keep oscillators away from water, salt water or harmful gas.
(6) KC7050H (K50H) / KC7050S (FSO) series should be stored in humidity-controlled area after the package is unsealed, in temperature +25±5°C, under humidity of 65%RH, and should be mounted on PCB within 7 days.

Clock Timing Chart

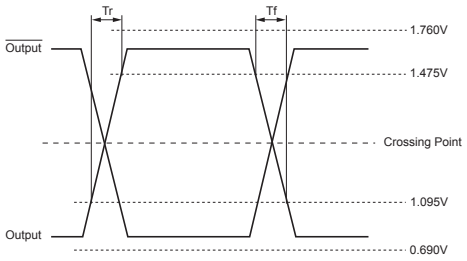
[CMOS Output]



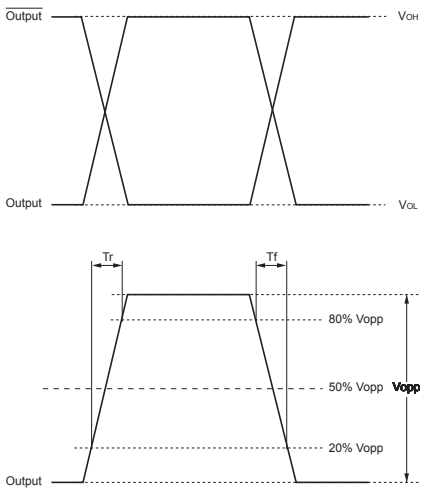
[LV-PECL (3.3V) Output]



[LV-PECL (2.5V) Output]

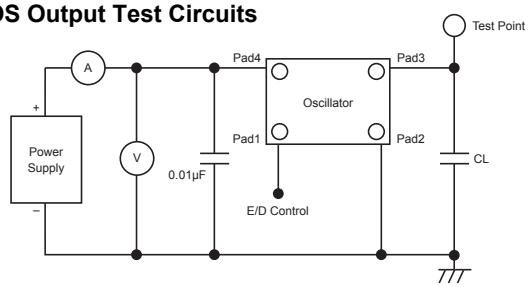


[LVDS Output]



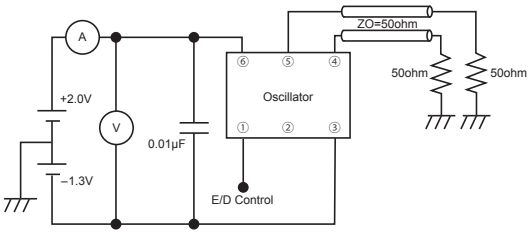
Test Circuits

CMOS Output Test Circuits

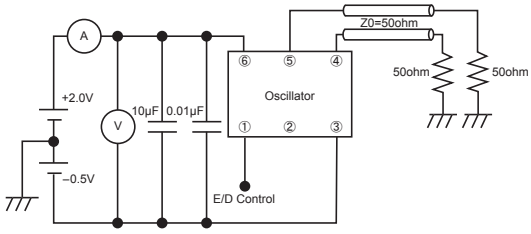


Note) Maximum load (Includes capacitances of fixture and probe)

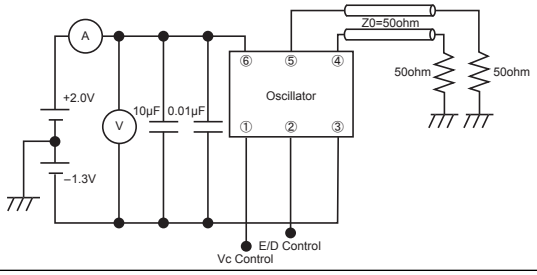
LV-PECL (3.3V/XO) Output Test Circuits



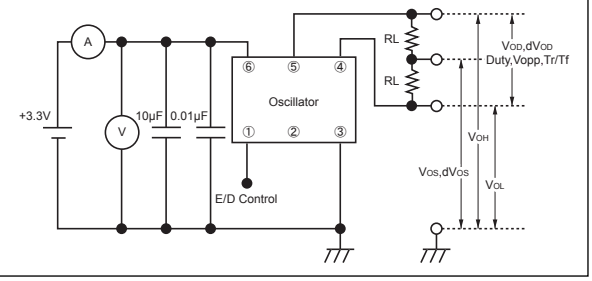
LV-PECL (2.5V/XO) Output Test Circuits



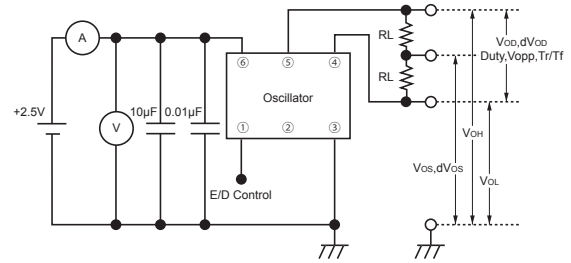
LV-PECL (3.3V/VCXO) Output Test Circuits



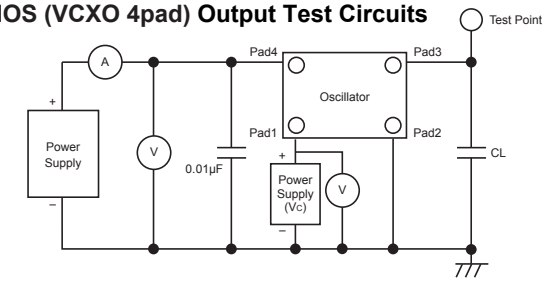
LVDS (3.3V/XO) Output Test Circuits



LVDS (2.5V/XO) Output Test Circuits

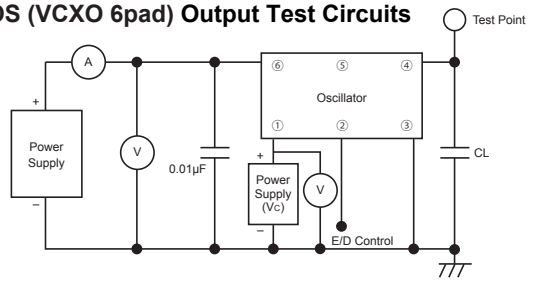


CMOS (VCXO 4pad) Output Test Circuits



Note) Maximum load (Includes capacitances of fixture and probe)

CMOS (VCXO 6pad) Output Test Circuits

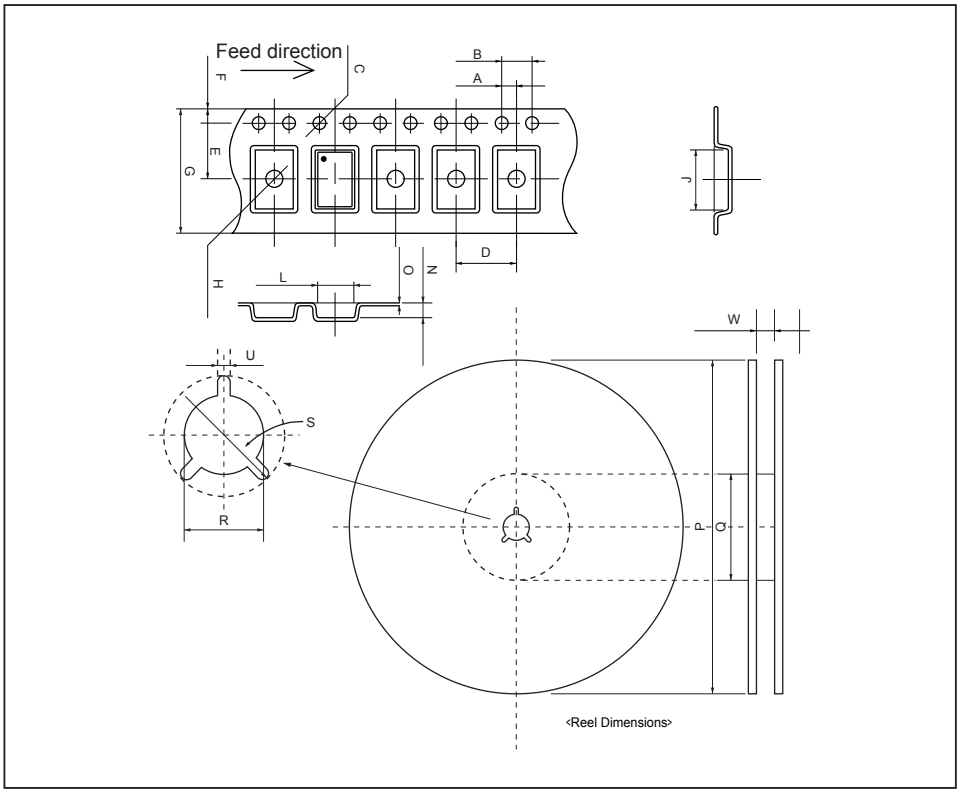


Note) Maximum load (Includes capacitances of fixture and probe)

Tape & Reel Specifications

■Crystal Oscillators

		KC2520A	KC3225A
TAPE	A	2.0±0.05	2.0±0.05
	B	4.0±0.1	4.0±0.1
	C	ϕ1.5+0.1/-0	ϕ1.5+0.1/-0
	D	4.0±0.1	4.0±0.1
	E	3.5±0.05	3.5±0.05
	F	1.75±0.1	1.75±0.1
	G	8.0±0.2	8.0±0.2
	H	ϕ1.1±0.1	ϕ1.5+0.1/0
	J	2.7±0.1	3.5±0.05
	L	2.2±0.1	2.8±0.05
	N	1.0±0.1	1.1±0.05
	O	0.2±0.05	0.25±0.05
REEL	P	ϕ180+0/-3	ϕ180+0/-3
	Q	ϕ60+1/-0	ϕ60+1/-0
	R	ϕ13±0.2	ϕ13±0.2
	S	ϕ21±0.8	ϕ21±0.8
	U	2.0±0.5	2.0±0.5
	W	9.0+0.3/-0	9.0±0.3
Qty		2000	2000



<Reel Dimensions>

		KC5032A KC5032P	KC5032D KV5032A	KC7050S KV7050S	KC7050B KV7050A KV7050L	KC7050A KC7050C KC7050H KC7050P KC7050W	KT3225	KC5032H	KT2520Y	KT5032
TAPE	A	1.5+0.1/-0	2.0±0.1	2.0±0.1	2.0±0.1	2.0±0.1	2.0±0.05	2.0±0.1	2.0±0.05	2.0±0.1
	B	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1
	C	ϕ1.5+0.1/-0	ϕ1.55±0.1	ϕ1.55±0.1	ϕ1.55±0.1	ϕ1.5±0.1	ϕ1.5+0.1/-0	ϕ1.5+0.1/-0	ϕ1.5+0.1/-0	ϕ1.5+0.1/-0
	D	8.0±0.1	8.0±0.1	8.0±0.1	8.0±0.1	8.0±0.1	4.0±0.1	8.0±0.1	4.0±0.1	8.0±0.1
	E	5.5±0.05	5.5±0.1	7.5±0.1	7.5±0.1	7.5±0.1	3.5±0.05	5.5±0.1	3.5±0.05	5.5±0.1
	F	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
	G	12.0±0.3	12.0±0.3	16.0±0.3	16.0±0.3	16.0±0.2	8.0±0.3	12.0±0.3	8.0±0.2	12.0±0.3
	H	ϕ1.5+0.1/0	ϕ1.55±0.1	ϕ1.55	ϕ1.55	ϕ1.55±0.1	ϕ1.5+0.1/-0	ϕ1.5+0.1/-0	ϕ1.1±0.1	ϕ1.5+0.1/-0
	J	5.5±0.1	5.4±0.1	8.18	8.18	7.4±0.1	3.5±0.1	5.5±0.1	2.7±0.1	5.5±0.1
	L	3.7±0.1	3.6±0.1	5.56	5.56	5.4±0.1	2.8±0.1	3.7±0.1	2.2±0.1	3.7±0.1
	N	1.4±0.1	1.7±0.1	2.16±0.1	2.16±0.1	2.0±0.1	1.1±0.1	1.6±0.1	1.0±0.1	1.6±0.1
	O	0.3±0.05	0.3±0.05	0.3±0.05	0.3±0.05	0.3±0.05	0.25±0.05	0.3±0.05	0.2±0.05	0.3±0.05
REEL	P	ϕ180+0/-3	ϕ254±2	ϕ330±2/ϕ254±2	ϕ254±2	ϕ180+0/-3	ϕ180±2	ϕ330±1	ϕ180+0/-1.5	ϕ330±1
	Q	ϕ60+1/-0	ϕ100±1	ϕ100±1	ϕ100±1	ϕ60+1/-0	ϕ60+1/-0	ϕ100±1/ϕ60	ϕ60+1/-0	ϕ100±1
	R	ϕ13±0.2	ϕ13±0.5	ϕ13±0.3	ϕ13±0.3	ϕ13±0.2	ϕ13±0.2	ϕ13±0.2	ϕ13±0.2	ϕ13±0.2
	S	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8
	U	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.5	2.0±0.5
	W	13.0±0.3	13.4+2/-0	16.4	17.5±0.5/16.4	17±0.2	9.0±0.1	13.5±1	9.0+0.3/-0	13.5±1
Qty		1000	1000	3000/1000	1000	1000	2000	4000/2000	2000	4000/2000

THE NEW VALUE FRONTIER

KYOCERA

Crystal Applied Products

Synthetic Quartz Crystals
Crystal Blanks
Optical Devices

AVX

1. Quartz Crystals... What?

The quartz crystal is a single crystal of silicon dioxide and used in important electronic components of digital equipment such as mobile communications, optic communications, video equipment and PCs as a precise source of electrical signal.

2. Quartz Crystals... Why?

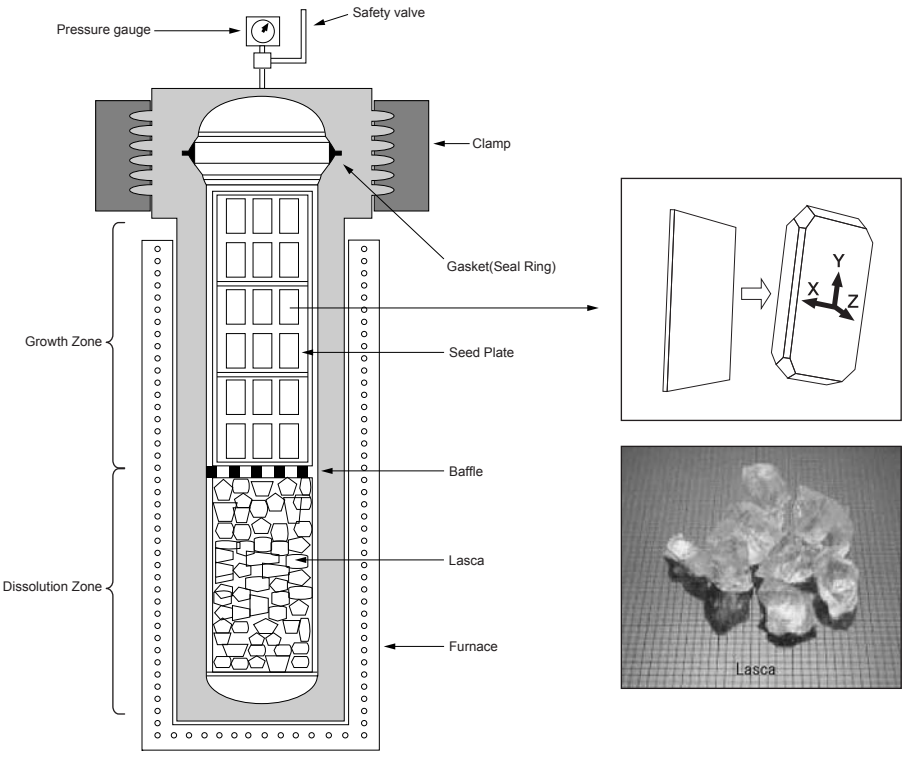
The quartz crystal has a character when the compression is applied to the direction of the crystal axis (x axis), the electric change) generates on the quartz crystal plate, and on the contrary, when the electricity is applied to the quartz crystal plate, the distortion occurs inside the crystal plate. The phenomenon is called the piezo electric effect or piezo electric reverse effect.

3. Synthetic Quartz Crystals... How?

The synthetic quartz crystal is grown by the hydrothermal method using the pressured container called the autoclave. The crystal is insoluble to most of the solution under the normal temperature and pressure but becomes soluble by the hydrothermal reaction in the high temperature and high pressure. The growth of the synthetic quartz crystal is taking advantage of this reaction. The high pressure necessary for growing is obtained by filling the alkaline solution up to the approximate 70-85% of the capacity of the autoclave and applying the temperature. The ordinary growing temperature is approximately 350-360¼C and the growing pressure is approximately 90-145Mpa.

The autoclave, upper growing area and lower dissolution area is partitioned by the perforated panel called the baffle. Hang the seed crystal in the upper growing area and place the raw material, Lasca, a fragment of the natural quartz crystal in the lower dissolution area. By maintaining the temperature in the growing area lower than the solution area, the raw material in a saturated state in the dissolution area will rise to the growing area by the heat conviction provided by the temperature difference. Since the growing area is lower than the dissolution area in temperature, the solution will become a super-saturation and re-crystalize the surface of the seed crystal.

The growing speed is approximately 0.4-0.6mm per day and the growing number of day is from about 40 days to more than 200 days depending on the applications. With the strict temperature and pressure control for a long period of time, you will get approximately 1,500-2,000kg of high quality synthetic quartz crystals in one growth process.



Autoclave

Lumbered P-bar

Type	Orientation (ϕ)	Dimensions (mm)			Weight (g)
		X±0.2	Z±0.2	Y±5	
LP0918MS	0°	9.0	18.0	200	85
LP1020MS	0°	10.0	20.0	200	105

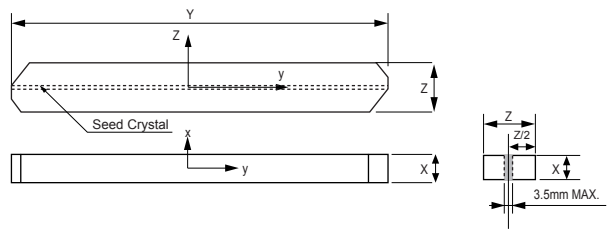
Lumbered Z-bar

Type	Orientation (ϕ)	Dimensions (mm)			Weight (g)
		X±0.2	Z±0.2	Y±5	
LZ3118MS	0°	31.0	18.0	210	303
LZ3119MS	0°	31.0	19.0	210	319
LZ3120MS	0°	31.0	20.0	210	336
LZ3122MS	0°	31.0	22.0	210	369
LZ6518MS	0°	65.0	18.0	210	602
LZ6519MS	0°	65.0	19.0	210	636
LZ6520MS	0°	65.0	20.0	210	670
LZ6522MS	0°	65.0	22.0	210	738
LZ6532MS	0°	65.0	32.0	200	950
LZ6534MS	0°	65.0	34.0	200	1079
LZ6538MS	0°	65.0	38.0	200	1160
LZ6540MS	0°	65.0	40.0	200	1220

Dimensions

(Unit : mm)

Lumbered P-bar

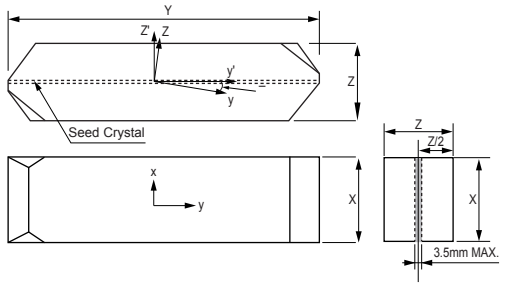


*Please inquire about dimension other than the above.

Dimensions

(Unit : mm)

Lumbered Z-bar



Specifications

• Kind of crystal : Right hand crystal unless otherwise specified.
• Twinning : No electrical or optical twinning is included.

Infra-red quality indication α (3500cm^{-1})

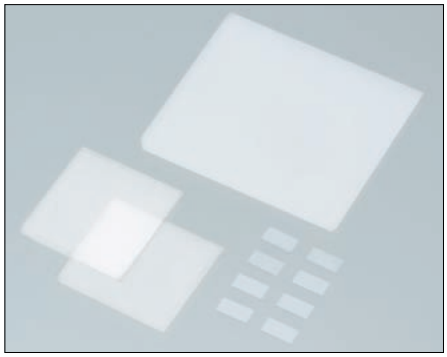
Grades	α Maxima
Aa	0.026
A	0.033
B	0.045
C	0.060
D	0.080
E	0.120

Inclusion density

Grades	Inclusion density (/cm^3)			
	10-30(μm)	30-70(μm)	70-100(μm)	>100(μm)
Ⅰa	2	1	0	0
Ⅱb	3	2	1	1
Ⅰ	6	4	2	2
Ⅱ	9	5	4	3
Ⅲ	12	8	6	4

Etch channel density ρ

Grades	Etch channel density ρ(/cm^2)
1	10
2	30
3	100
4	300
5	600



Features

• Manufactures blanks for fine and miniature crytal units.

Applications

• Blanks for crystal units.

Wafers for blanks

(Unit : mm)

Model	Basic Frequency	Dimensions	Thickness	Surface Finish	Main Face Angle
1" Rectangular plate	———	25.4×25.4	0.045MIN	#4000	Angle Specified±15"
2" Rectangular plate	———	50.8×50.8	0.085MIN	#4000	Angle Specified±15"
3" Rectangular plate	———	76.2×76.2	0.200MIN	#4000	Angle Specified±60"

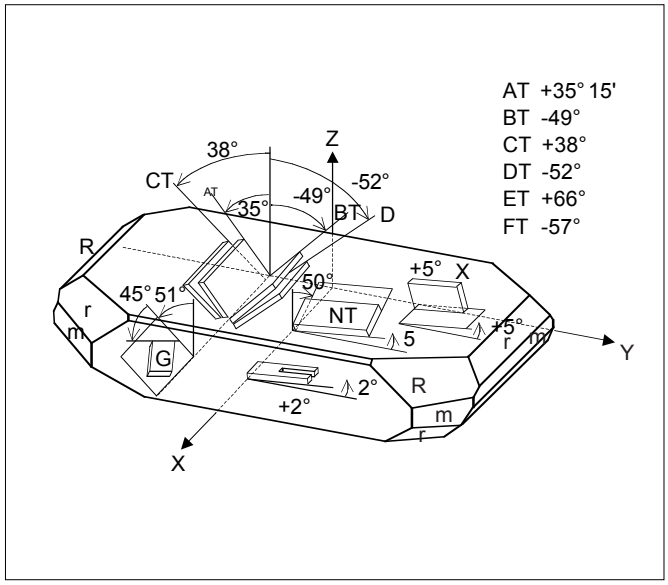
Blanks

(Unit : mm)

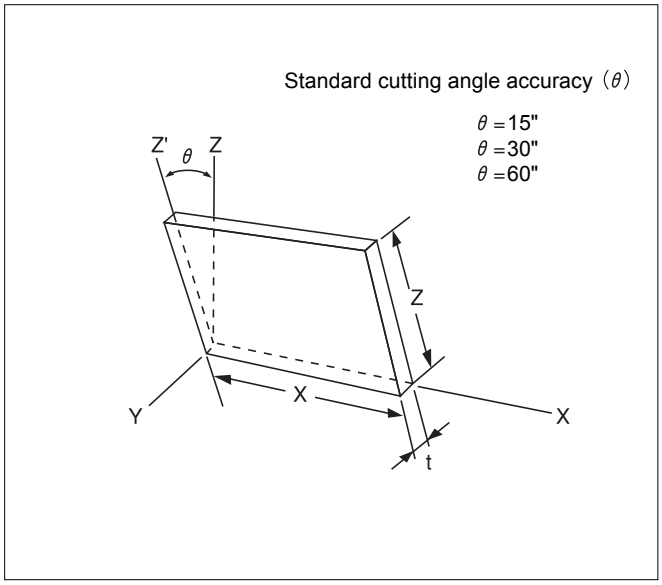
Model	Basic Frequency	Dimensions	Surface Finish	Main Face Angle	Contour Finish
L2.0 Blank	12MHz ~ 55MHz	Long Side 2.0	#4000	Angle Specified±15"	#4000
L3.5 Blank	10MHz ~ 55MHz	Long Side 3.5	#4000	Angle Specified±15"	#4000

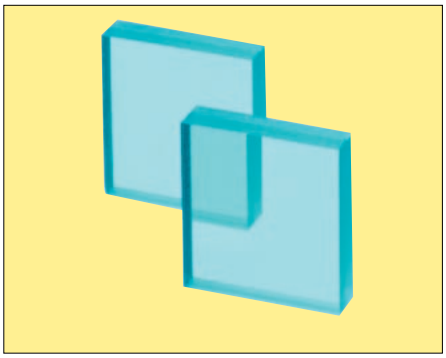
*Size and thickness other than above shall be studied upon request

Cut Angle of Crystal Blank



AT Cut Plate





Features

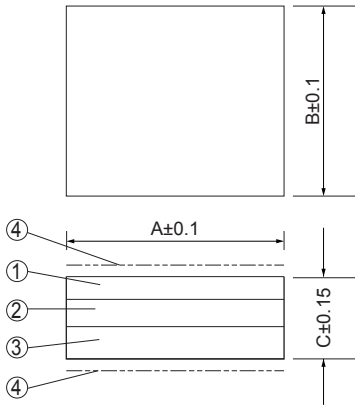
- Made of high quality synthetic quartz crystal for optical device.
- Available for requirement of various spectrum by infrared absorption glass or infrared-cut coating.
- Available with ultra violet cut coating or ultra violet-cut coating + infrared cut coating
- Available with large size aperture used for single lens reflex digital still camera.
- Flexible design depending on each separation pattern.

Applications

- Digital video camera.
- Security camera.
- Digital still camera.

Dimensions

(Unit : mm)



OLPF Structure (one example)

1. Double refractive crystal element
2. Infrared cut filter glass
3. Double refractive crystal element
4. AR coating

Specifications

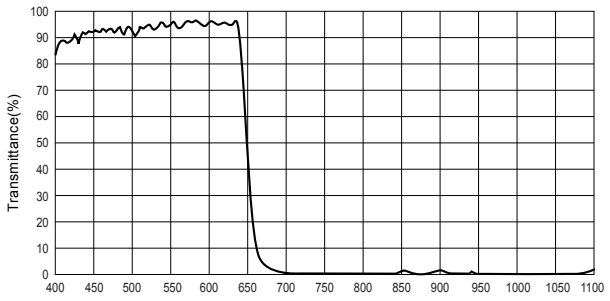
Item	Specification
Outline dimensions	5~30mmϕ
Separation direction	On discussion
Optic axis tolerance	±60' MAX.
Flatness	Within 5 Newton rings
Defect limit	30μm MAX.
Composition	1~7pieces
Transmittance	On discussion

* Please consult us if you require about specification other than above.

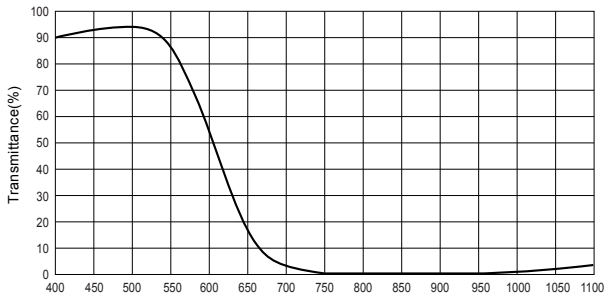
Standard Dimensions

	1/2 inch size	1/3 inch size	1/4 inch size	1/5 inch size
A	12mm	8.8mm	7.8mm	5.5mm
B	11mm	8.2mm	7.3mm	5.0mm
C	Determined in accordance with CCD image sensor			

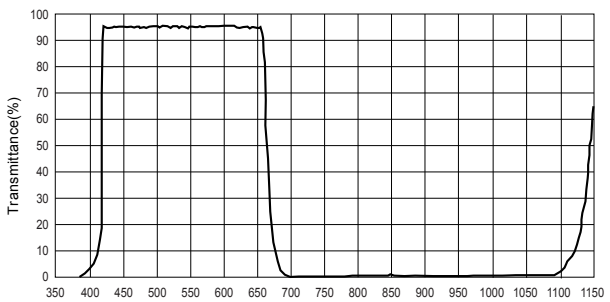
Spectral Transmittance Characteristics (Example)



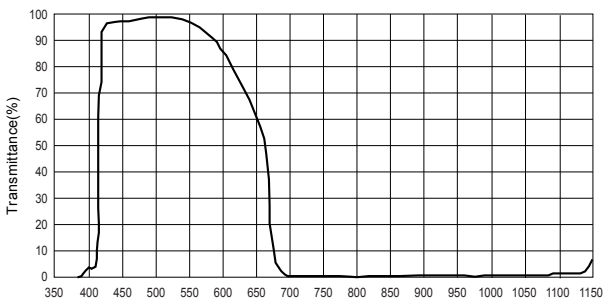
IR-cut coating type



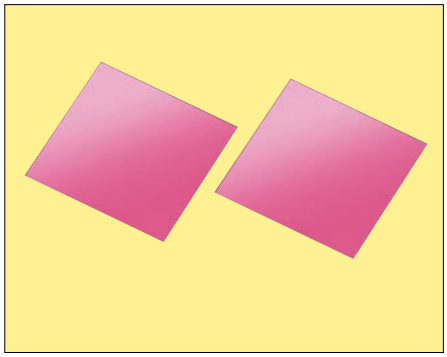
IR-cut filter glass type



UV-IR-cut coating type



IR-cut filter glass+UV-IR-cut coating type



Features

• Made of high quality glass for optical device.
• Available for requirement of various spectrum by infrared cut coating.

Applications

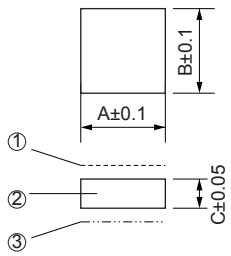
• Camera module for mobile phones.

Specifications

Item	Specifications
Outline dimensions	3~10mm
Flatness	Within 3 Newton rings
Defect limit	30μm MAX.
Transmittance	On discussion

* Please consult us if you require about specification other than above.

Dimensions

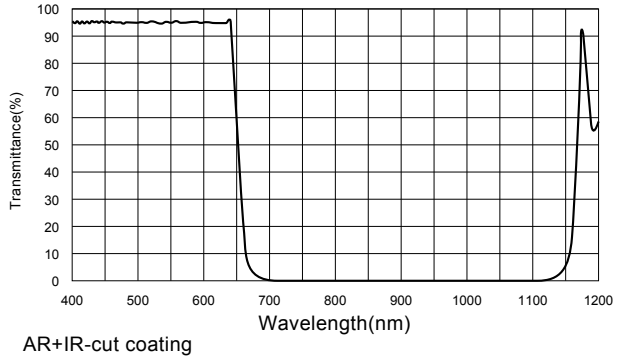


	Dimensions
A	3~10mm
B	3~10mm
C	0.3~0.5mm

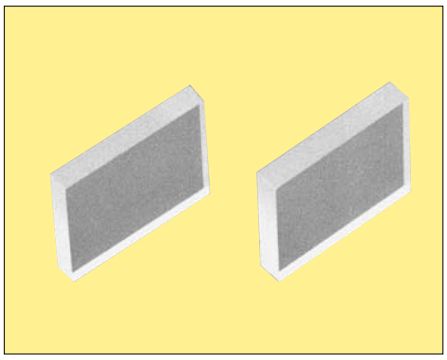
* Material : Optical glass or Quartz Crystal

① Infrared cut coating
② Optical glass or Quartz Crystal
③ AR coating

Spectral Transmittance Characteristics (Example)



AR+IR-cut coating



Features

- Made of high quality synthetic quartz crystal for optical device.
- Available with anti-reflactive coating for various range of wavelength.

Applications

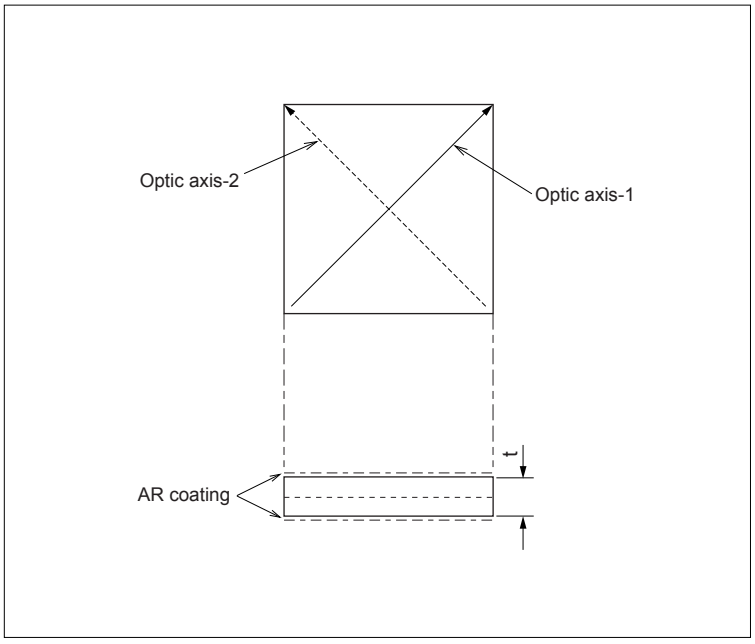
- CD-RW, DVD-RW.

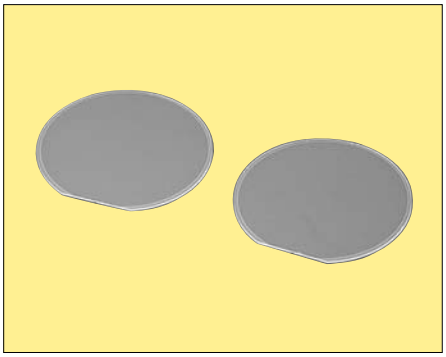
Specifications

Type / Specifications	Single layer		Double layers	
	1/4Wave	1/2Wave	1/4Wave	1/2Wave
Phase retardation	90°	180°	90°	180°
Phase retardation tolerance	±3°(at center wavelength)			
Crystal plate azimuth	Rotated Z-cut *1		Y-cut or X-cut	
Center wavelength	400nm~800nm			
Optic axis tolerance	±1°			
Outline dimensions(mm)	3 x 3 ~ 6±0.1			
Thickness(mm)	0.4±0.1	0.8±0.1	1.0±0.1	
Angle of incidence	Vertical			
Transmittance	More than 98% (AR coating on both surface)			
Wave front aberration (Transmission)	On discussion			

*1 Please consult us about influence of optical rotating power.

Dimensions





Features

• Made of high quality synthetic quartz crystal for optical device.
• Available with large size aperture.

Applications

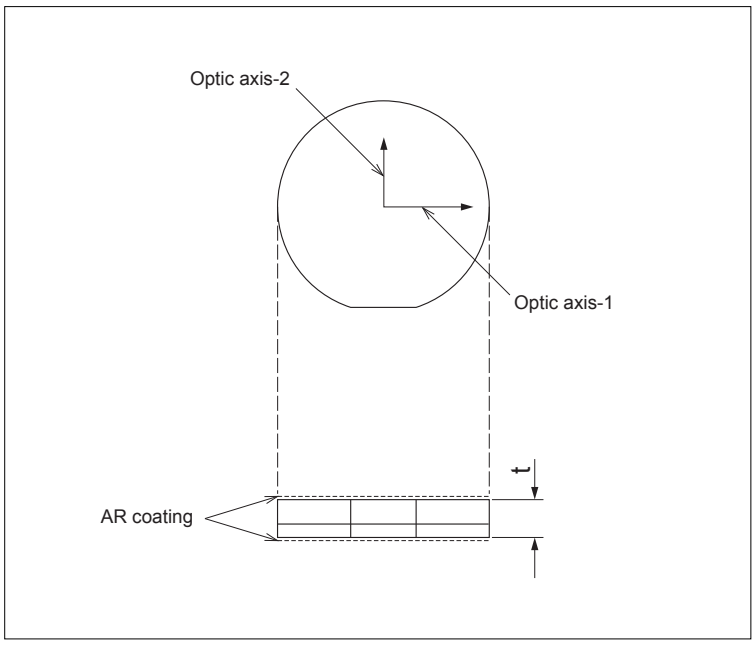
• Liquid crystal projector.

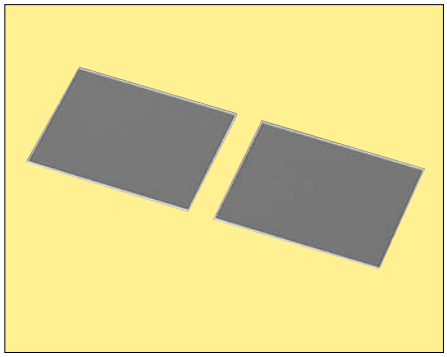
Specifications

Specification / Type	Double Layers Quarter Wave Plates
Phase retardation	90°±5°(at center wavelength)
Crystal plate azimuth	Y-cut or X-cut
Wave length	420nm~680nm
Optic axis tolerance	±1°
Outline dimensions(mm)	ϕ20 x 20~30 x 30*1
Thickness(mm)	0.4~1.0
Angle of incident	Vertical
Transmittance	More than 98% (AR coating on both surface)
Wave front aberration (Transmission)	On discussion

*1 Please consult us if you require about specification other than above.

Dimensions





Features

• Excellent thermal radiation characteristics.

Applications

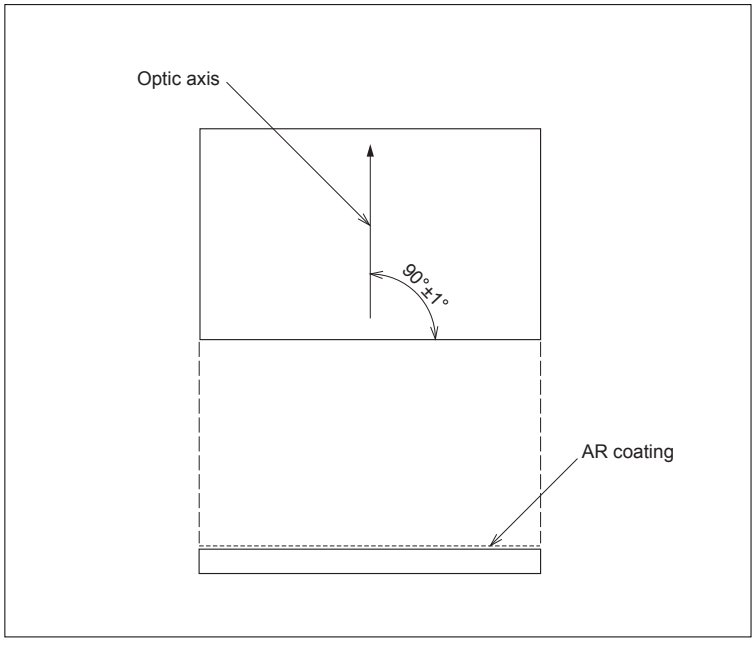
• Liquid crystal projector.

Specifications

Center wave length	420nm~680nm
Outline dimensions(mm)	50 x 50MAX.
Thickness(mm)	0.4~1.0±0.1
Reflectance	Less than 0.5% (One side)
Optic axis tolerance	90°±1°

* Crystal element without AR coating is possible.

Dimensions



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KYOCERA

Filters

SAW Filters
Monolithic Crystal Filters (MCF)

AVX

Pb Free RoHS Compliant

Features

- Small and low profile
- Low insertion loss
- High selectivity
- Withstanding high voltage

Applications

- PCS
- GPS

How to Order

SF ① 14 ② - 0906 ③ M ④ 4 ⑤ UU ⑥ 01 ⑦

①Series
②Package Size
③Frequency
④Application
⑤Terminals
⑥Input/Output Condition
⑦Custom Specification

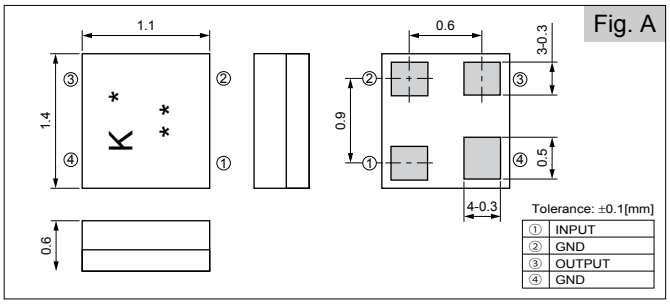
Specifications

Parts No.	Application		Pass Band Frequency	Pass Band Insertion Loss	Pass Band Variation	Pass Band VSWR	Absolute Rejection						Operating Temperature	Storage Temperature	Dimensions	Test Circuit	Recommended Land Pattern	Recommended Land Pattern
SF14-0906M4UU01	JCDMA	Tx	887MHz - 925MHz	3.2dB max.	1.7dB max.	2.2 max.	10MHz - 596MHz	720MHz - 761MHz	832MHz - 870MHz	942MHz	1774MHz - 1850MHz	2661MHz - 2775MHz	−30 to +85°C	−40 to +85°C	Fig. A	Fig. E	Fig. I	Dimensions 1
							45dB min.	50dB min.		23dB min.	38dB min.	30dB min.						
SF14-2642M5UU01	DMB	Rx	2629MHz - 2656MHz	2.0dB max.	1.0dB max.	1.7 max.	0.3 - 2455MHz	2455MHz	2830MHz	2830MHz - 3447.5MHz	3447.5MHz	3447.5MHz - 6000MHz			Fig. B	Fig. F	Fig. J	Dimensions 1
							30dB min.	35dB min.	35dB min.	34dB min.	34dB min.	20dB min.						
SF16-0881M5UB01	Cell	Differential	869MHz - 894MHz	3.0dB max.	1.5dB max.	2.5 max.	0MHz - 824MHz	824MHz - 849MHz	915MHz - 960MHz	960MHz - 3000MHz					Fig. D	Fig. G	Fig. L	Dimensions 2
							35dB min.	30dB min.	23dB min.	40dB min.								
SF16-1575F4UU01	GPS	Front End	1573.92MHz - 1576.92MHz	1.8dB max.	1.0dB max.	2.0 max.	810MHz - 960MHz	1429MHz - 1501MHz	1893MHz - 2170MHz						Fig. C	Fig. E	Fig. K	Dimensions 2
							27dB min.	37dB min.	35dB min.									
SF16-1575M4UU01	GPS	Inter Stage	1573.92MHz - 1576.92MHz	1.8dB max.	1.0dB max.	2.5 max.	810MHz - 960MHz	1208.22MHz	1207MHz - 1210MHz	1522.42MHz	1628.42MHz	1850MHz - 1910MHz			Fig. C	Fig. E	Fig. K	Dimensions 2
							35dB min.	45dB min.	45dB min.	25dB min.	35dB min.	30dB min.						
SF16-1960M5UB01	PCS	Differential	1930MHz - 1990MHz	4.1dB max.	2.0dB max.	2.5 max.	0MHz - 1850MHz	1850MHz - 1910MHz	2040MHz - 2200MHz	2200MHz - 2800MHz	2800MHz - 3400MHz	3400MHz - 6000MHz			Fig. D	Fig. G	Fig. L	Dimensions 2
							30dB min.	15dB min.	25dB min.	30dB min.	30dB min.	20dB min.						

Dimensions

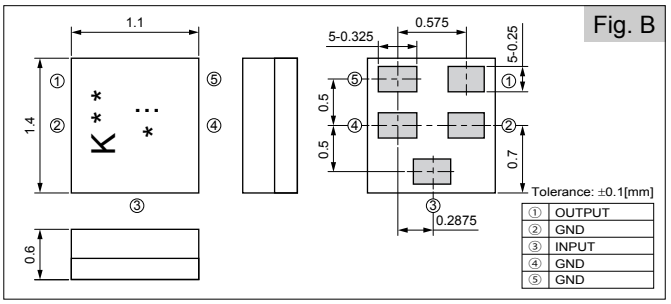
(Unit : mm)

Fig. A



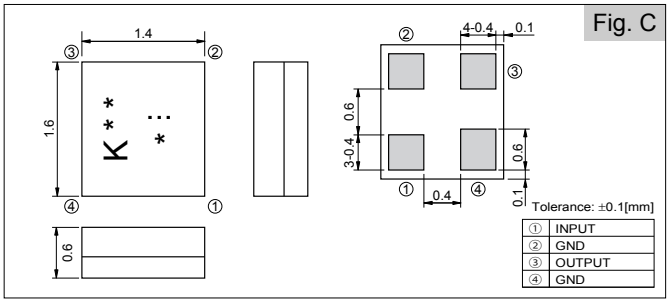
(Unit : mm)

Fig. B



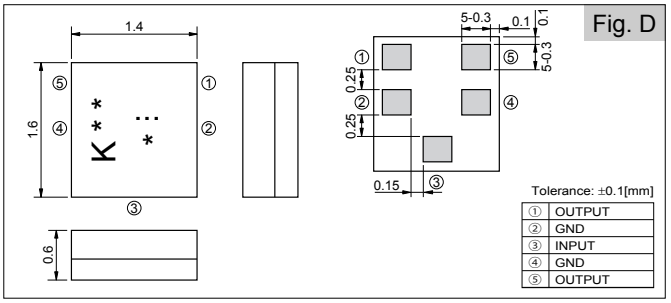
(Unit : mm)

Fig. C



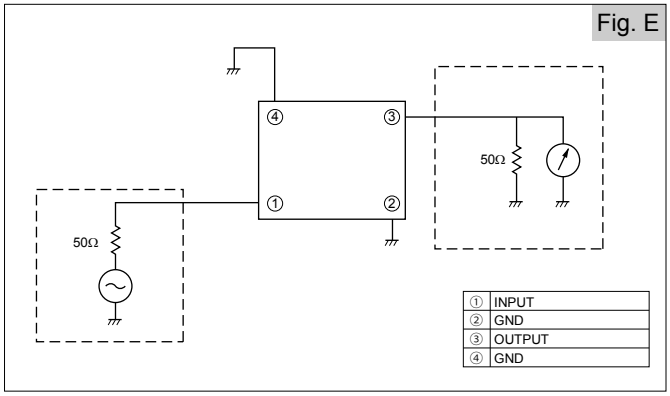
(Unit : mm)

Fig. D



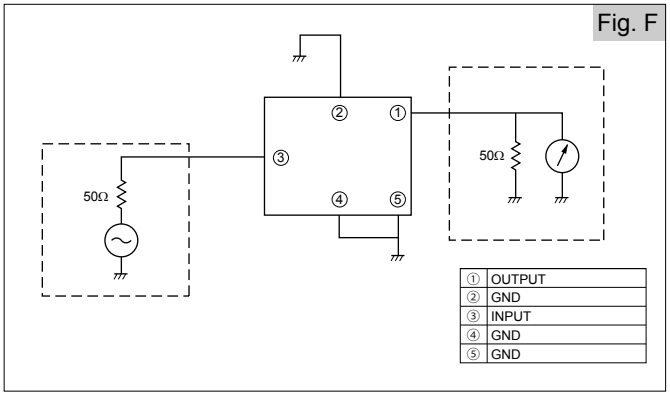
Test Circuit

Fig. E



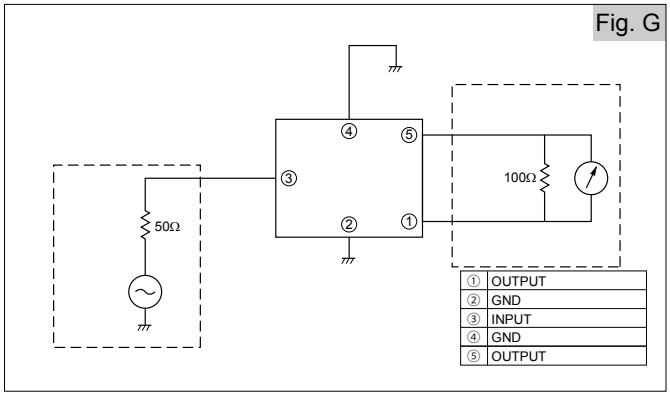
①	INPUT
②	GND
③	OUTPUT
④	GND

Fig. F



①	OUTPUT
②	GND
③	INPUT
④	GND
⑤	GND

Fig. G

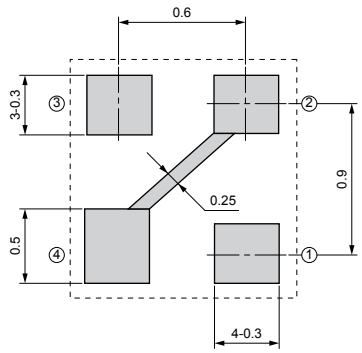


①	OUTPUT
②	GND
③	INPUT
④	GND
⑤	OUTPUT

Recommended Land Pattern

(Unit : mm)

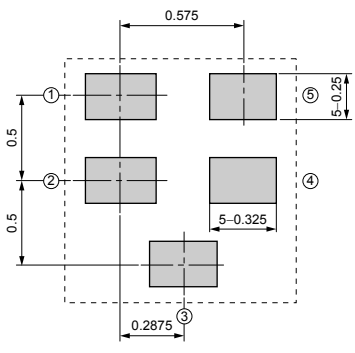
Fig. I



①	INPUT
②	GND
③	OUTPUT
④	GND

(Unit : mm)

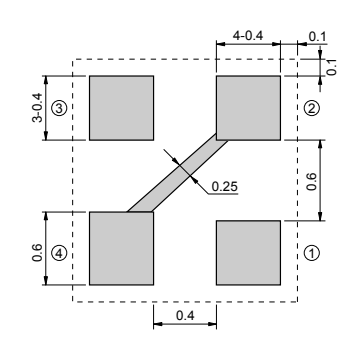
Fig. J



①	OUTPUT
②	GND
③	INPUT
④	GND
⑤	GND

(Unit : mm)

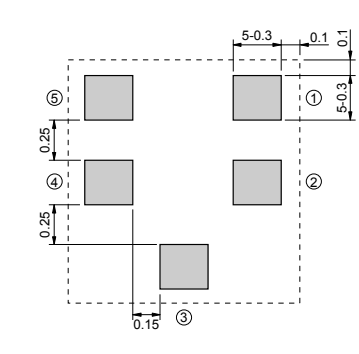
Fig. K



①	INPUT
②	OUTPUT
③	GND
④	OUTPUT

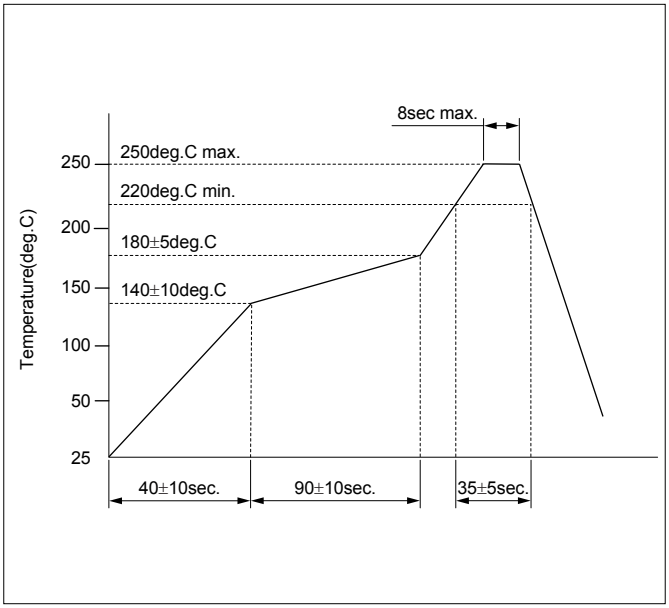
(Unit : mm)

Fig. L



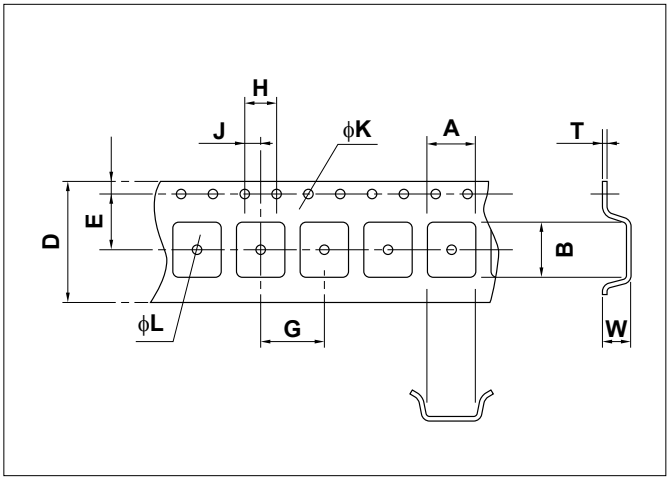
①	OUTPUT
②	GND
③	INPUT
④	GND
⑤	OUTPUT

Recommended Temperature Profile IR Reflow



Taping Dimensions

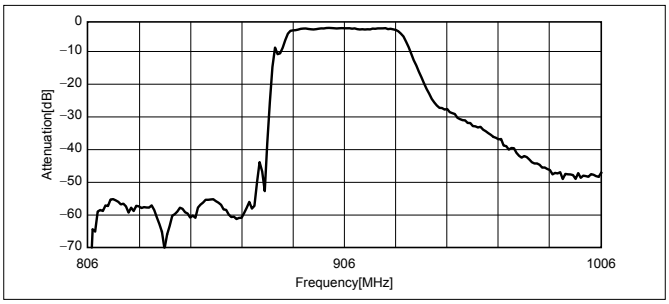
(Unit : mm)



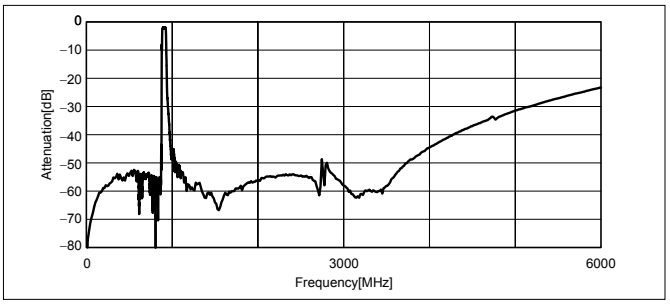
Code	A	B	D	E	G	H	J	K	L	T	W
Dimensions1	1.4	1.7	8.0	3.5	4.0	4.0	2.0	1.50	0.5	0.2	0.8
Dimensions2	1.85	1.9	8.0	3.5	4.0	4.0	2.0	1.50	1.10	0.25	0.95

Characteristics

<JCDMA>Parts No. : SF14-0906M4UU01

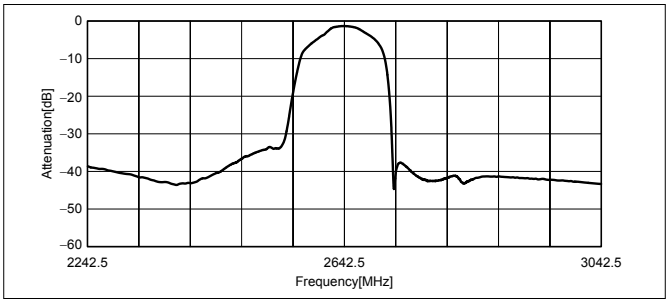


Pass Band Characteristics

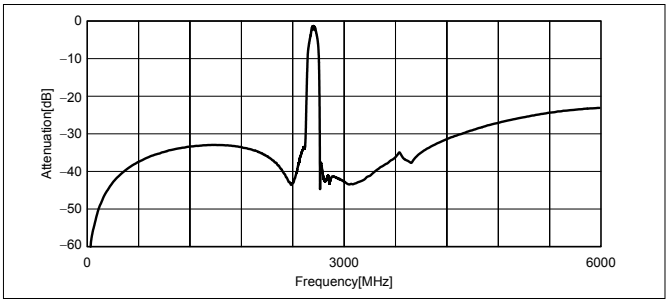


Spurious Characteristics

<DMB>Parts No. : SF14-2642M4UU01



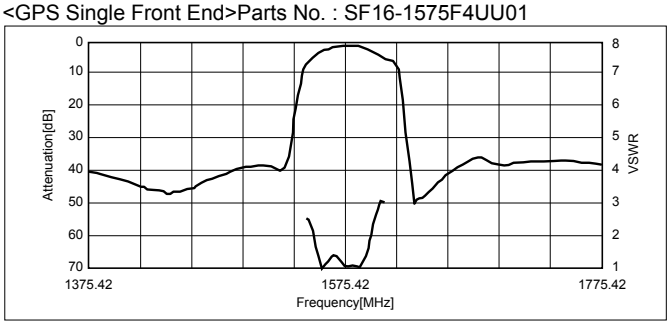
Pass Band Characteristics



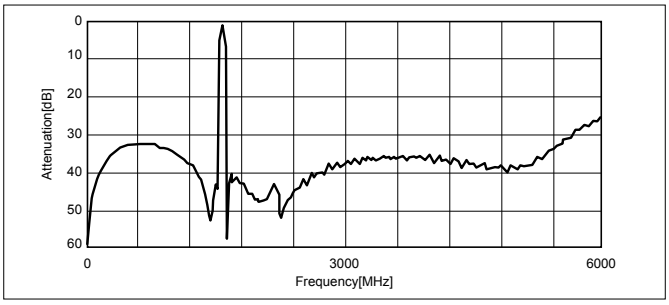
Spurious Characteristics

Characteristics

<GPS Single Front End>Parts No. : SF16-1575F4UU01

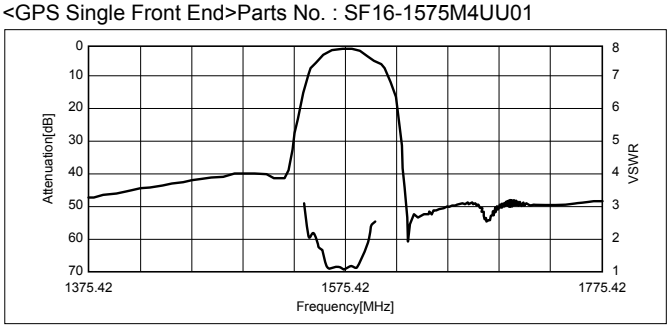


Pass Band Characteristics

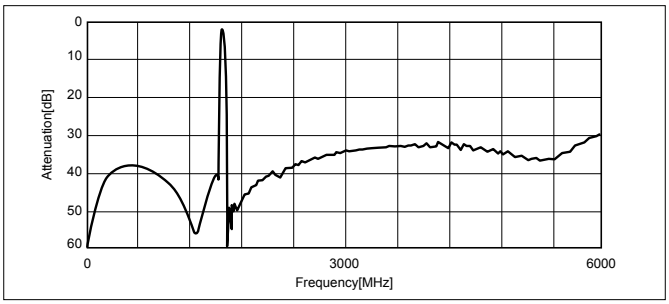


Spurious Characteristics

<GPS Single Front End>Parts No. : SF16-1575M4UU01



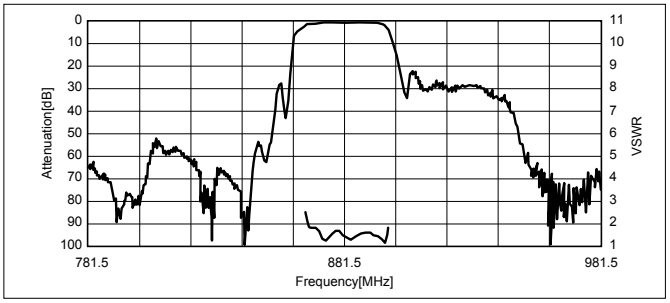
Pass Band Characteristics



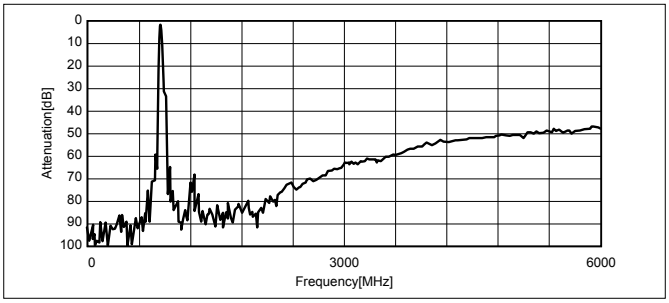
Spurious Characteristics

Characteristics

<Cellular Rx>Parts No. : SF16-0881M5UB01

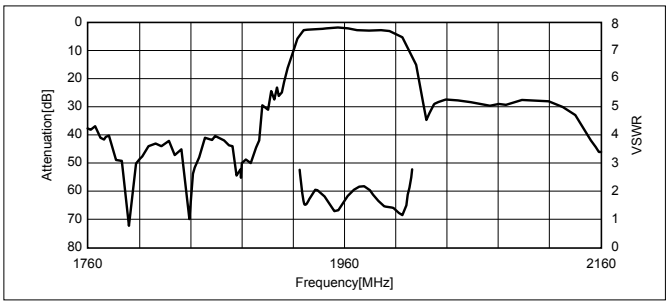


Pass Band Characteristics

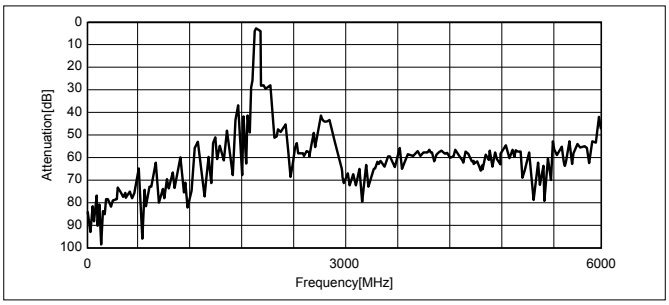


Spurious Characteristics

<PCS Rx>Parts No. : SF16-1960M5UB01

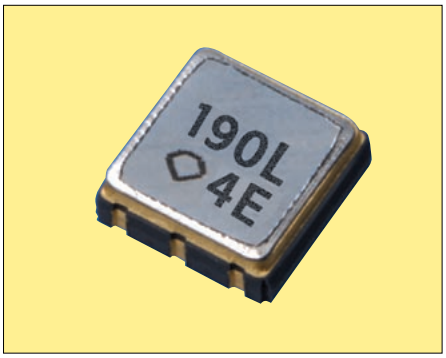


Pass Band Characteristics



Spurious Characteristics

Surface Acoustic Wave (SAW) Filters
IF SAW Filters for W-CDMA
SF3030B190M00B04MA00/ SF3838B190M00B04MA00



Pb Free RoHS Compliant

Features

- Wide-band IF filter
- Miniature size and light weight
- Excellent phase characteristics
- Balance connection is available

Standard Frequency

- 190.0MHz

How to Order

SF 3030 B 190M00 B 04M A00
① ② ③ ④ ⑤ ⑥ ⑦

①Type of Product (SAW Filter)
②Package Size (3.0×3.0mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (190.00MHz)
⑤Material ($Li_2B_4O_7$)
⑥Pass Bandwidth (4MHz)
⑦Customer Special Model Suffix (STD)

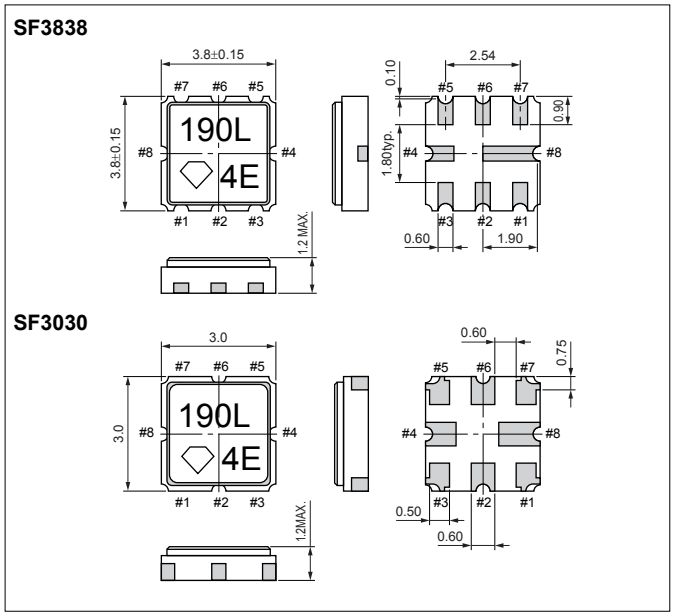
New Part Number	Old Part Number
SF3030B190M00B04MA00	LSFB71-190-004M0
SF3838B190M00B04MA00	LSFB70-190-004M0

Specifications

Type		SF3030B190M00B04MA00/ SF3838B190M00B04MA00	
Item	**Unit**	**Conditions**	**Specifications**
Nominal Frequency (Fo)	MHz	———	190.000
Operating Temperature Range	°C	–20 to +85°C	———
Storage Temperature Range	°C	–40 to +85°C	———
Pass Bandwidth	MHz	–3dB	Fo±2.3MHz MIN.
Ripple	dB	Fo±2.3MHz	2 MAX.
Insertion Loss	dB	Fo	7 MAX.
Guaranteed Attenuation	dB	Fo±5 to ±7.5MHz	10 MIN.
		Fo±7.5 to ±12.5MHz	25 MIN.
		Fo±12.5 to ±100MHz	40 MIN.
Group Delay Deviation	ns	Fo±2MHz	100 MAX.

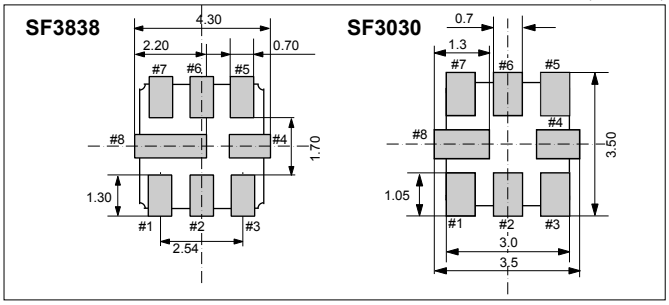
Dimensions

(Unit : mm)

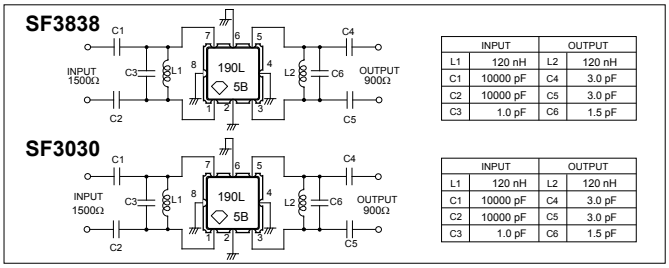


Recommended Land Pattern

(Unit : mm)

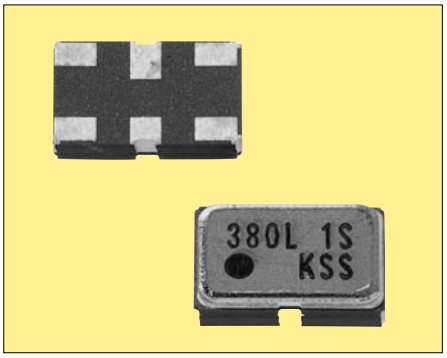


Test Circuit



	INPUT		OUTPUT
L1	120 nH	L2	120 nH
C1	10000 pF	C4	3.0 pF
C2	10000 pF	C5	3.0 pF
C3	1.0 pF	C6	1.5 pF

Surface Acoustic Wave (SAW) Filters
IF SAW Filters for W-CDMA
SF5032B380M00B03MA00/ SF5032B190M00B03MA02



Pb Free RoHS Compliant

Features

- Wide-band IF filter for W-CDMA
- Miniature size and light weight
- Excellent phase characteristics
- Balance connection is available

Standard Frequency

- 380MHz
- 190MHz

How to Order

SF ① 5032 ② B ③ 380M00 ④ B ⑤ 03M ⑥ A00 ⑦

①Type of Product (SAW Filter)
②Package Size (5.0×3.2mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (380MHz)
⑤Material ($Li_2B_4O_7$)
⑥Pass Bandwidth (3.84MHz)
⑦Customer Special Model Suffix (STD)

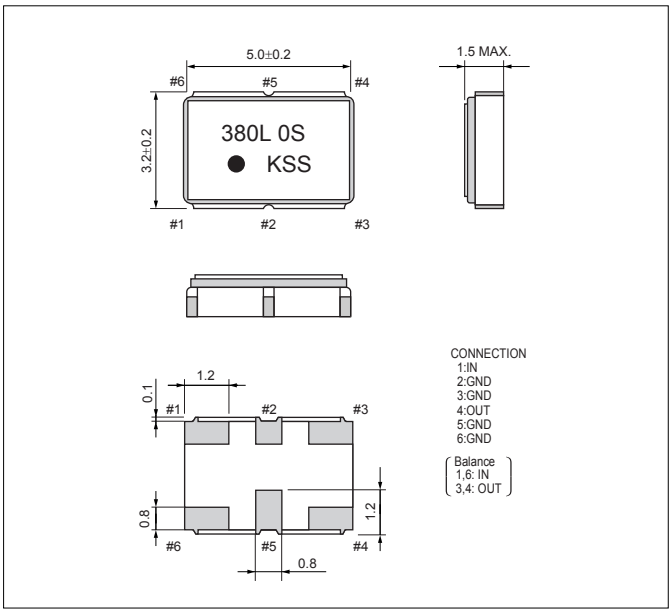
New Part Number	Old Part Number
SF5032B380M00B03MA00	LSFB54-380-004M0
SF5032B190M00B03MA02	LSFB54-190-004M2

Specifications

Type		SF5032B190M00B03MA02		SF5032B380M00B03MA00	
Item	**Unit**	**Conditions**	**Specifications**	**Conditions**	**Specifications**
Nominal Frequency (Fo)	MHz	———	190.000	———	380.000
Operating Temperature Range	°C	–20 to +75°C	———	–20 to +75°C	———
Storage Temperature Range	°C	–40 to +80°C	———	–40 to +80°C	———
Pass Bandwidth	MHz	–3dB	Fo±1.92MHz MIN.	–3dB	Fo±1.92MHz MIN.
Ripple	dB	±1.92MHz	1.5 MAX.	±1.92MHz	2 MAX.
Insertion Loss	dB	Minimum Loss	9 MAX.	Maximum Loss (±1.92MHz)	10 MAX.
Guaranteed Attenuation	dB	Fo± 5MHz	20 MIN.	Fo±5MHz	25 MIN.
		Fo±10MHz	40 MIN.	Fo± 10MHz	30 MIN.
Group Delay Deviation	ns	Fo±1.92MHz	140 MAX.	Fo± 1.92MHz	300 MAX.

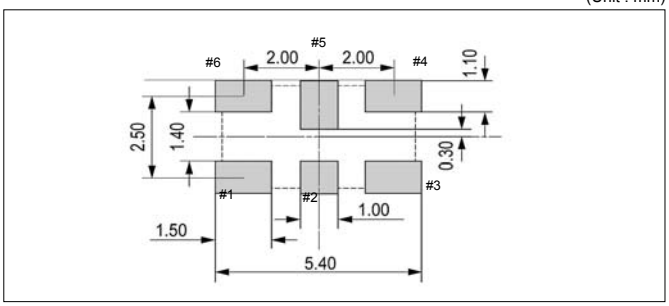
Dimensions

(Unit : mm)

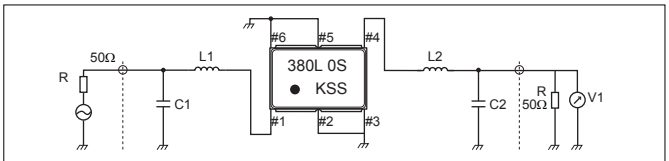


Recommended Land Pattern

(Unit : mm)



Test Circuit

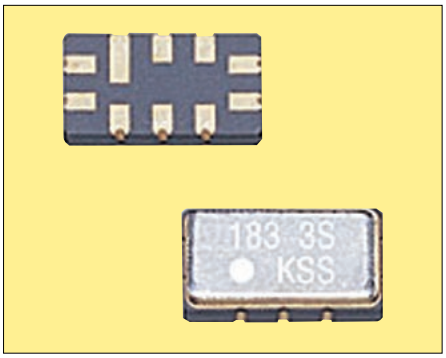


SF5032B190M00B03MA02

INPUT		OUTPUT	
L1	120nH	L2	160nH
C1	18pF	C2	16pF

SF5032B380M00B03MA00

INPUT		OUTPUT	
L1	39nH	L2	43nH
C1	43pF	C2	13pF



Pb Free RoHS Compliant

Features

- Miniature size and light weight
- Wide-Band IF filter for CDMA
- Excellent group delay distortion
- Balance connection is available

Standard Frequency

- 183.6MHz

How to Order

SF 6035 B 183M60 C 01M A00
① ② ③ ④ ⑤ ⑥ ⑦

①Type of Product (SAW Filter)
②Package Size (6.0×3.5mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (183.6MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (1.23MHz)
⑦Customer Special Model Suffix (STD)

New Part Number	Old Part Number
SF6035B183M60C01MA00	MSFB55-183-001M0

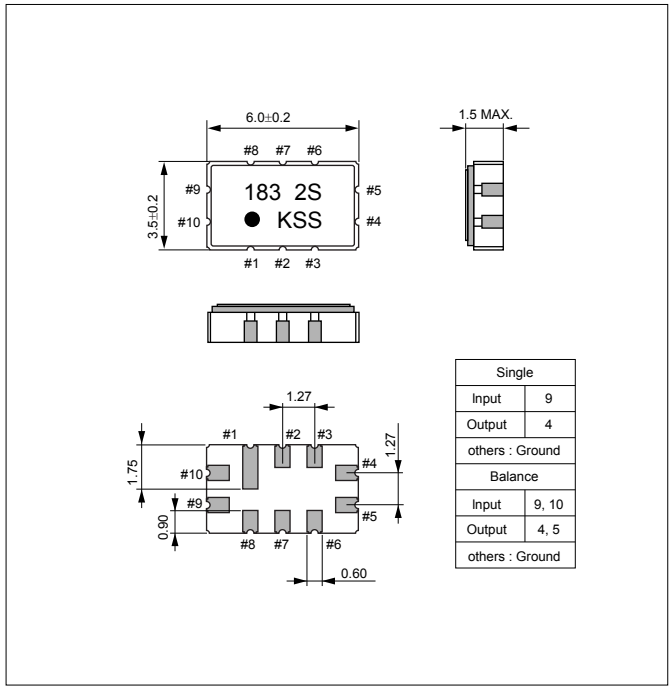
Specifications

Item	Unit	Conditions	Specifications	
Nominal Frequency (Fo)	MHz	———	183.6	
Operating Temperature Range	°C	−30 to +80	———	
Storage Temperature Range	°C	−40 to +85	———	
Pass Bandwidth	kHz	−5dB	±650*	±615 MIN.
Ripple	dB	Fo±300kHz	0.3*	1.0 MAX.
Insertion Loss	dB	Minimum Loss	8.0*	10.5 MAX.
Guaranteed Attenuation	dB	Fo±900kHz	−900/40*	33 MIN.
			+900/40*	33 MIN.
		Fo±1.25MHz	−1.25/39*	33 MIN.
			+1.25/40*	33 MIN.
Group Delay Deviation	ns	Fo±300kHz	250*	500 MAX.

* : Typ.

Dimensions

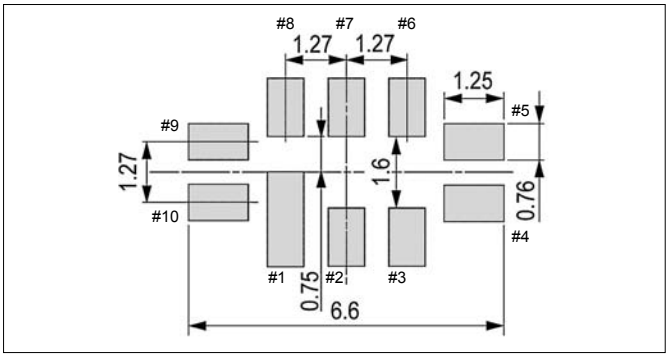
(Unit : mm)



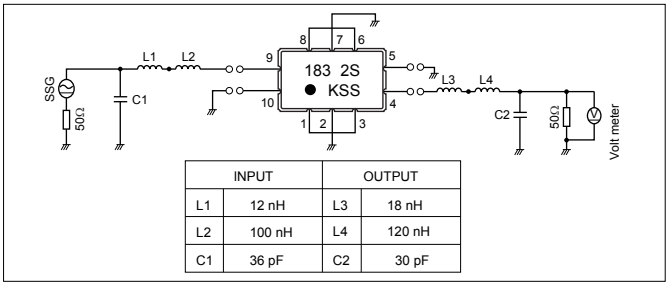
Single	
Input	9
Output	4
others : Ground	
Balance	
Input	9, 10
Output	4, 5
others : Ground	

Recommended Land Pattern

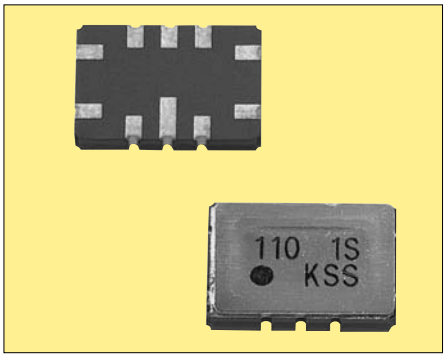
(Unit : mm)



Test Circuit



INPUT		OUTPUT	
L1	12 nH	L3	18 nH
L2	100 nH	L4	120 nH
C1	36 pF	C2	30 pF



Please contact us about Pb free status.

Features

- Wide-band IF filter for cdmaOne
- Excellent phase characteristics
- Balance connection is available

Standard Frequency

- 110.0MHz

How to Order

SF 7050 C 110M00 C 01M A00
① ② ③ ④ ⑤ ⑥ ⑦

①Type of Product (SAW Filter)
②Package Size (7.0×5.0mm)
③Sealing Type (Solder Weld Type)
④Nominal Frequency (110MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (1.24MHz)
⑦Customer Special Model Suffix (STD)

New Part Number	Old Part Number
SF7050C110M00C01MA00	MSFC30-110-001M0

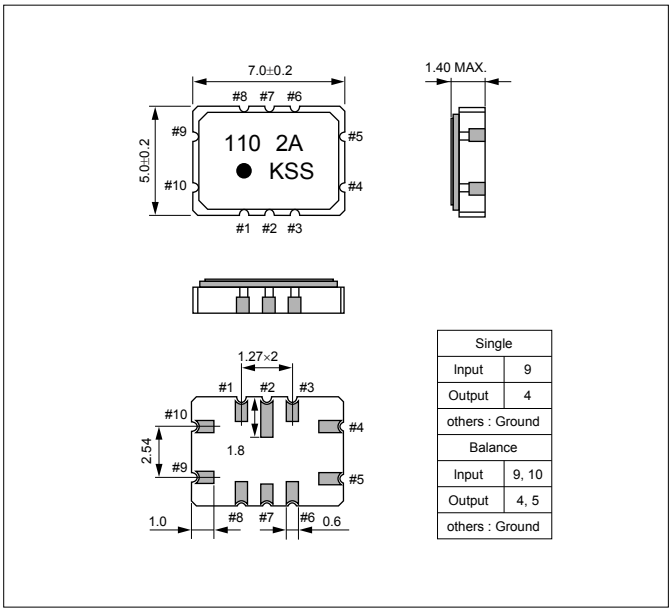
Specifications

Item	Unit	Conditions	Specifications	
Nominal Frequency (Fo)	MHz	———	110.00	
Operating Temperature Range	°C	−30 to +80	———	
Storage Temperature Range	°C	−40 to +85	———	
Pass Bandwidth	kHz	−5dB	−645* / +670*	±620 MIN.
Ripple	dB	Fo±300kHz	0.2*	1 MAX.
Insertion Loss	dB	Minimum Loss	9.4*	12 MAX.
Guaranteed Attenuation	dB	Fo±900kHz	−900/43* / +900/40*	33 MIN.
		Fo±1.7MHz	−1.7/43* / +1.7/38*	33 MIN.
Group Delay Deviation	ns	Fo±300kHz	280*	500 MAX.

* : Typ.

Dimensions

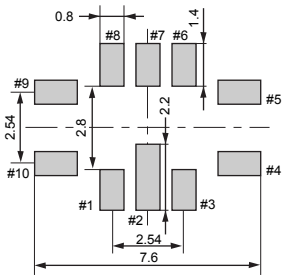
(Unit : mm)



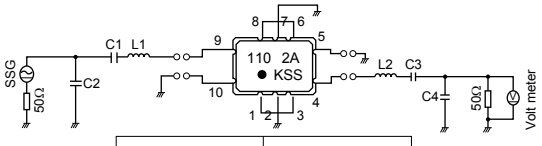
Single	
Input	9
Output	4
others : Ground	
Balance	
Input	9, 10
Output	4, 5
others : Ground	

Recommended Land Pattern

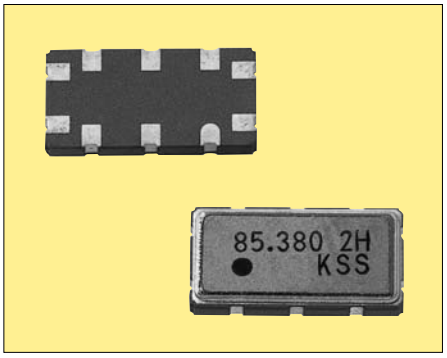
(Unit : mm)



Test Circuit



INPUT		OUTPUT	
L1	220 nH	L2	330 nH
C1	120 pF	C3	22 pF
C2	56 pF	C4	51 pF



Pb Free RoHS Compliant

Features

- Wide-band IF filter for cdmaOne
- Miniature size and light weight
- Excellent phase characteristics
- Balance connection is available

Standard Frequency

- 85.380MHz

How to Order

SF 9148 B 085M38 C 01M A00
① ② ③ ④ ⑤ ⑥ ⑦

①Type of Product (SAW Filter)
②Package Size (9.1×4.8mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (85.380MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (1.24MHz)
⑦Customer Special Model Suffix (STD)

New Part Number	Old Part Number
SF9148B085M38C01MA00	MSFB43-85-001M0

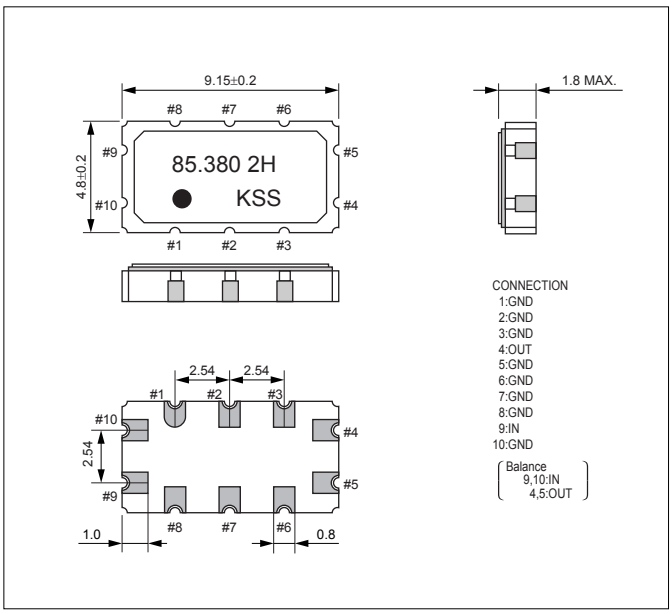
Specifications

Item	Unit	Conditions	Specifications	
Nominal Frequency (Fo)	MHz	———	85.38	
Operating Temperature Range	°C	−30 to +80	———	
Storage Temperature Range	°C	−40 to +85	———	
Pass Bandwidth	kHz	−5dB	−640*	±620 MIN.
			+650*	
Ripple	dB	Fo±300kHz	0.4*	1 MAX.
Insertion Loss	dB	Fo	9.1*	12 MAX.
Guaranteed Attenuation	dB	Fo±900kHz	−900/48*	33 MIN.
			+900/42*	
Group Delay Deviation	ns	Fo±300kHz	270*	500 MAX.

* : Typ.

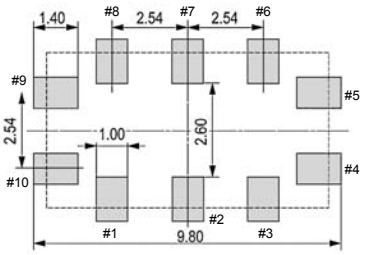
Dimensions

(Unit : mm)

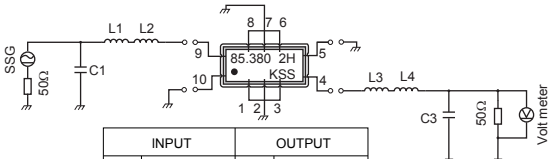


Recommended Land Pattern

(Unit : mm)



Test Circuit



INPUT		OUTPUT	
L1	39 nH	L3	390 nH
L2	330 nH	L4	82 nH
C1	75 pF	C3	56 pF

Pb Free RoHS Compliant

Features

- IF filter for SCDMA
- Miniature size and light weight
- Excellent phase characteristics
- Balance connection is available

Standard Frequency

- 204MHz

How to Order

SF 7050 B 204M00 C 600 A00
① ② ③ ④ ⑤ ⑥ ⑦

①Type of Product (SAW Filter)
②Package Size (7.0×5.0mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (204.00MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (600kHz)
⑦Customer Special Model Suffix (STD)

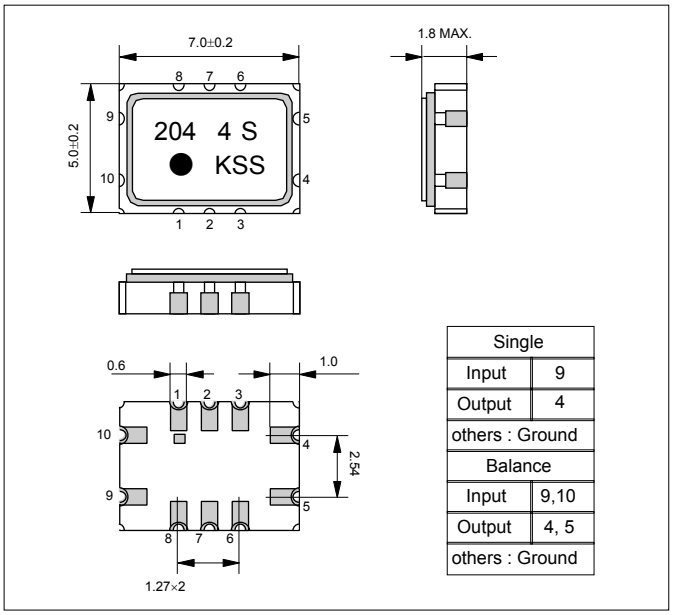
New Part Number	Old Part Number
SF7050B204M00C600A00	MSFB30-204-600K0

Specifications

Item	Unit	Conditions	Specifications
Nominal Frequency (Fo)	MHz	———	204.000
Operating Temperature Range	°C	–20 to +70°C	———
Storage Temperature Range	°C	–40 to +85°C	———
Pass Bandwidth	kHz	–1dB	Fo±225
Insertion Loss	dB	Fo	8.8 MAX.
Guaranteed Attenuation	dB	Fo±1MHz	30 MIN.
		Fo±2MHz	40 MIN.
Group Delay Deviation	ns	Fo±225kHz	300 MAX.

Dimensions

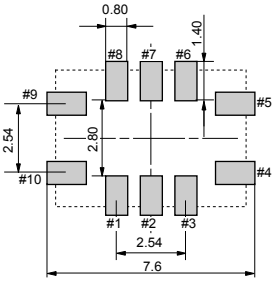
(Unit : mm)

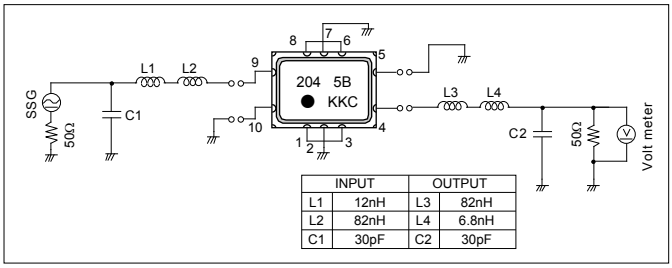


Single	
Input	9
Output	4
others : Ground	
Balance	
Input	9,10
Output	4, 5
others : Ground	

Recommended Land Pattern

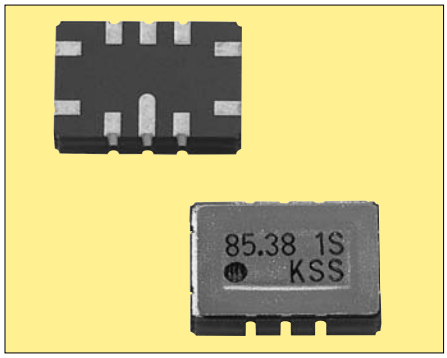
(Unit : mm)





INPUT		OUTPUT	
L1	12nH	L3	82nH
L2	82nH	L4	6.8nH
C1	30pF	C2	30pF

Surface Acoustic Wave (SAW) Filters
IF SAW Filters for AMPS
SF7050C083M16C026A00/ SF7050C085M38C026A01



Please contact us about Pb free status.

Features

- Narrow-band IF filter for AMPS
- Miniature size and light weight
- Excellent group delay distortion

Standard Frequency

- 83.16MHz
- 85.38MHz

How to Order

SF ① 7050 ② C ③ 083M16 ④ C ⑤ 026 ⑥ A00 ⑦

①Type of Product (SAW Filter)
②Package Size (7.0×5.0mm)
③Sealing Type (Solder Weld Type)
④Nominal Frequency (83.16MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (26kHz)
⑦Customer Special Model Suffix (STD)

New Part Number	Old Part Number
SF7050C083M16C026A00	MSFC12-83-026K0
SF7050C085M38C026A01	MSFC12-85-026K1

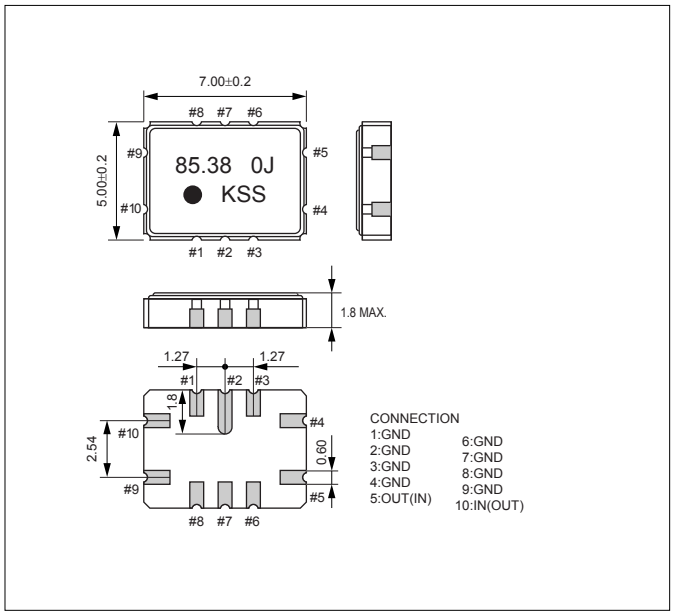
Specifications

Type		SF7050C083M16C026A00			SF7050C085M38C026A01		
Item	**Unit**	**Conditions**	**Specifications**		**Conditions**	**Specifications**	
Nominal Frequency (Fo)	MHz	———	83.16		———	85.38	
Operating Temperature Range	°C	–25 to +75	———		–30 to +80	———	
Storage Temperature Range	°C	–35 to +85	———		–40 to +85	———	
Pass Bandwidth	kHz	–3dB	Fo±13 MIN.		–3dB	Fo±13 MIN.	
Ripple	dB	Fo±13kHz	0*	1.5 MAX.	Fo±10kHz	0*	1.5 MAX.
Insertion Loss	dB	Minimum Loss	3.5*	5 MAX.	Minimum Loss	3.5*	5 MAX.
Guaranteed Attenuation	dB	Fo–120kHz	64*	50 MIN.	Fo–120kHz	59*	40 MIN.
		Fo±60kHz	35*	25 MIN.	Fo±60kHz	33*	25 MIN.
		Fo+120kHz	60*	50 MIN.	Fo+120kHz	65*	40 MIN.
Group Delay Deviation	µS	Fo±13kHz	6*	10 MAX.	Fo±10kHz	5*	12 MAX.
Terminating Impedance	Ω//pF	———	810//–1.5		MSFC12	980//–1.2	

* : Typ. * : Typ.

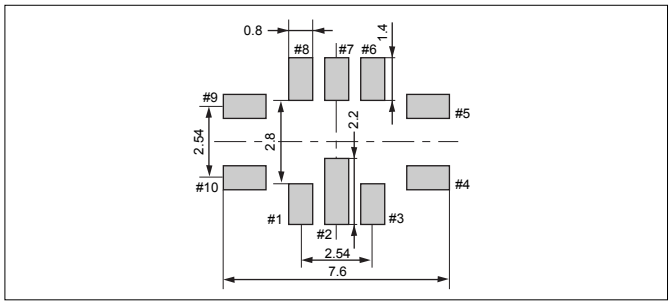
Dimensions

(Unit : mm)

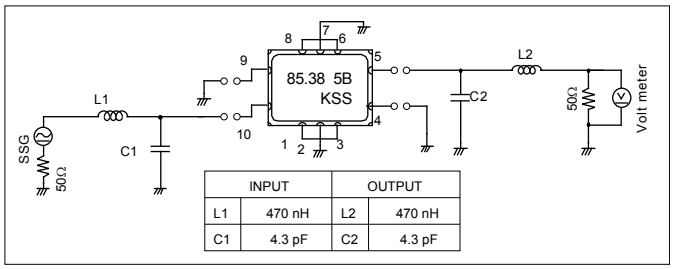


Recommended Land Pattern

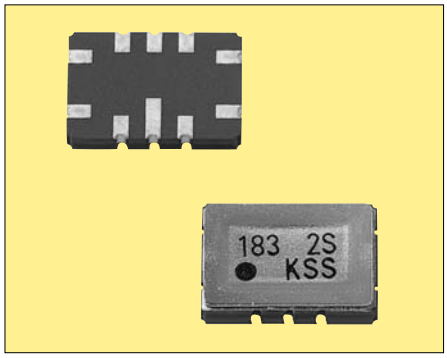
(Unit : mm)



Test Circuit



INPUT		OUTPUT	
L1	470 nH	L2	470 nH
C1	4.3 pF	C2	4.3 pF



Please contact us about Pb free status.

Features

- Narrow-band IF filter for AMPS
- Miniature size and light weight
- Excellent group delay distortion

Standard Frequency

- 183.6MHz

How to Order

SF 7050 C 183M60 C 022 B00
① ② ③ ④ ⑤ ⑥ ⑦

①Type of Product (SAW Filter)
②Package Size (7.0×5.0mm)
③Sealing Type (Solder Weld Type)
④Nominal Frequency (183.6MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (22kHz)
⑦Customer Special Model Suffix (STD)

New Part Number	Old Part Number
SF7050C183M60C22B00	MSFC30-183-022K0

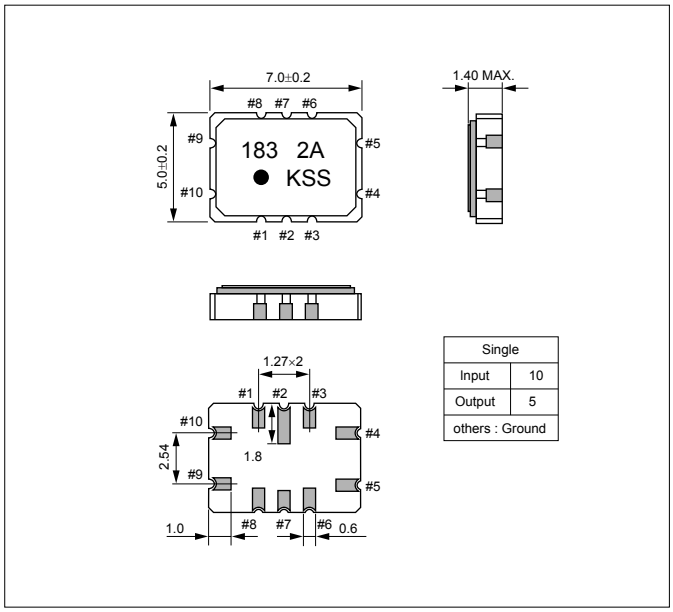
Specifications

Item	Unit	Conditions	Specifications	
Nominal Frequency (Fo)	MHz	———	183.6	
Operating Temperature Range	°C	−25 to +75	———	
Storage Temperature Range	°C	−35 to +85	———	
Pass Bandwidth	kHz	−3dB	±11 MIN.	
Ripple	dB	Fo±11kHz	0*	1.5 MAX.
Insertion Loss	dB	Minimum Loss	4.5*	5.5 MAX.
Guaranteed Attenuation	dB	Fo±60kHz	−60/27	11 MIN.
			+60/21	
		Fo±120kHz	−120/51	40 MIN.
			+120/49	
Group Delay Deviation	µs	Fo±11kHz	1.2*	15 MAX.

* : Typ.

Dimensions

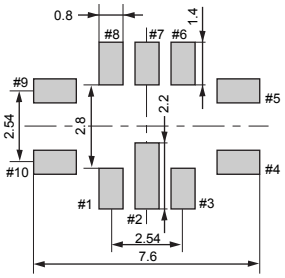
(Unit : mm)



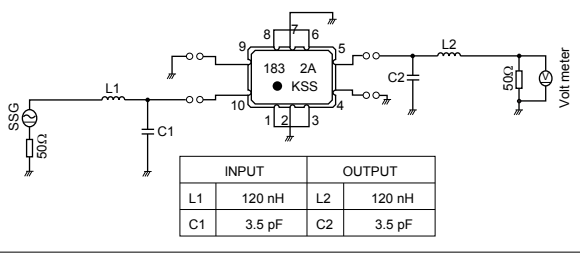
Single	
Input	10
Output	5
others : Ground	

Recommended Land Pattern

(Unit : mm)

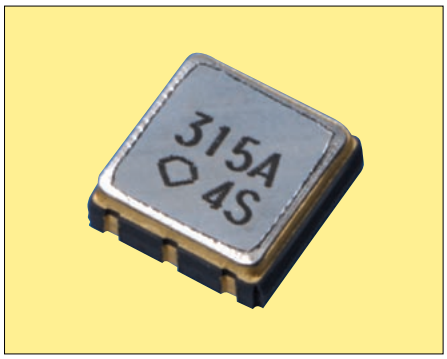


Test Circuit



INPUT		OUTPUT	
L1	120 nH	L2	120 nH
C1	3.5 pF	C2	3.5 pF

Surface Acoustic Wave (SAW) Filters
300MHz Band SAW Filters for RKE
SF3838B315M00C300A00/ SF3838B315M00B200A00



Pb Free RoHS Compliant

Features

- RF filter for RKE (Remote Keyless Entry)
- Miniature size and light weight
- Excellent temperature characteristics (SF3838B315M00C300A00)
- Excellent attenuation (SF3838B315M00B200A00)

Standard Frequency

- 315MHz

How to Order

SF	3838	B	315M00	C	300	A00
①	②	③	④	⑤	⑥	⑦

①Type of Product (SAW Filter)
②Package Size (3.8×3.8mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (315.00MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (300kHz)
⑦Customer Special Model Suffix (STD)

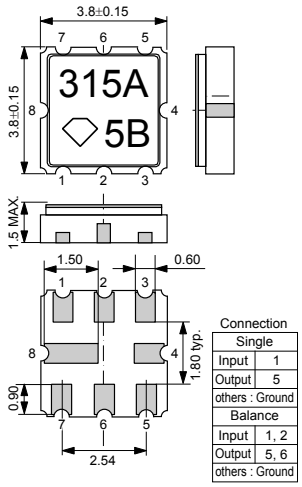
Specifications

Type		SF3838B315M00C300A00		SF3838B315M00B200A00	
Item	**Unit**	**Conditions**	**Specifications**	**Conditions**	**Specifications**
Nominal Frequency	MHz	———	315.000	———	315.000
Operating Temperature Range	°C	–40 to +105°C	———	–40 to +85°C	———
Storage Temperature Range	°C	–40 to +105°C	———	–40 to +85°C	———
Pass Bandwidth	kHz	–3dB	Fo±150 MIN.	–3dB	Fo±100 MIN.
Insertion Loss	dB	MIN.	2.5 MAX.	MIN.	3 MAX.
Guaranteed Attenuation	dB	10 to 303.5MHz	45 MIN.	Fo±5MHz	40 MIN.
		303.5 to 311MHz	25 MIN.	Fo±10MHz	55 MIN.
		———	———	Fo±21.4MHz	60 MIN.
		325 to 600MHz	35 MIN.	———	———
		600 to 1000MHz	60 MIN.	———	———
Ripple	dB	———	1dB MAX.	———	———

Dimensions

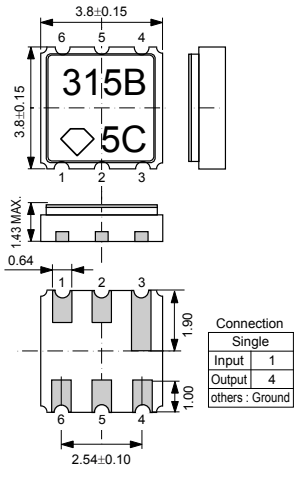
(Unit : mm)

SF3838B315M00C300A00



Connection	
Single	
Input	1
Output	5
others : Ground	
Balance	
Input	1, 2
Output	5, 6
others : Ground	

SF3838B315M00B200A00

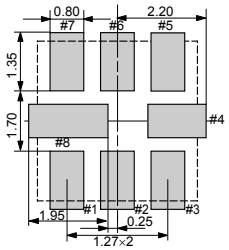


Connection	
Single	
Input	1
Output	4
others : Ground	

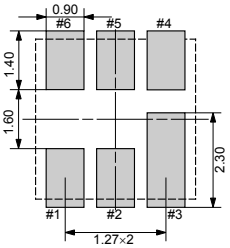
Recommended Land Pattern

(Unit : mm)

SF3838B315M00C300A00

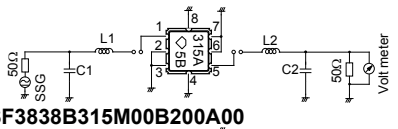


SF3838B315M00B200A00



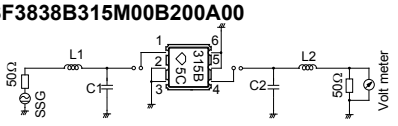
Test Circuit

SF3838B315M00C300A00



INPUT		OUTPUT	
L1	56 nH	L2	56 nH
C1	———	C2	———

SF3838B315M00B200A00



INPUT		OUTPUT	
L1	100 nH	L2	100 nH
C1	1 pF	C2	1 pF

Surface Acoustic Wave (SAW) Filters
400MHz Band SAW Filters for RKE
SF3838B433M92C300A00/ SF3838B433M92B200A00

Pb Free RoHS Compliant

Features

- RF filter for RKE (Remote Keyless Entry)
- Miniature size and light weight
- Excellent temperature characteristics (SF3838B433M92C300A00)
- Excellent attenuation (SF3838B433M92B200A00)

Standard Frequency

- 433.92MHz

How to Order

SF	3838	B	433M92	C	300	A00
①	②	③	④	⑤	⑥	⑦

①Type of Product (SAW Filter)
②Package Size (3.8×3.8mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (433.92MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (300kHz)
⑦Customer Special Model Suffix (STD)

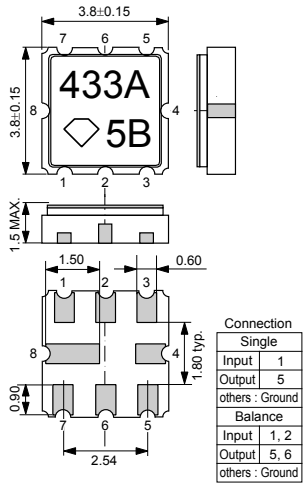
Specifications

Type		SF3838B433M92C300A00		SF3838B433M92B200A00	
Item	**Unit**	**Conditions**	**Specifications**	**Conditions**	**Specifications**
Nominal Frequency	MHz	———	433.920	———	433.920
Operating Temperature Range	°C	−40 to +105°C	———	−40 to +85°C	———
Storage Temperature Range	°C	−40 to +105°C	———	−40 to +85°C	———
Pass Bandwidth	kHz	−3dB	Fo±150 MIN.	−3dB	Fo±100 MIN.
Insertion Loss	dB	MIN.	2.5 MAX.	MIN.	3 MAX.
Guaranteed Attenuation	dB	10 to 424MHz	45 MIN.	Fo±5MHz	40 MIN.
		424 to 432MHz	25 MIN.	Fo±10.7MHz	55 MIN.
		445 to 800MHz	45 MIN.	Fo±21.4MHz	60 MIN.
		800 to 1000MHz	60 MIN.	———	———
Ripple	dB	———	1dB MAX.	———	———

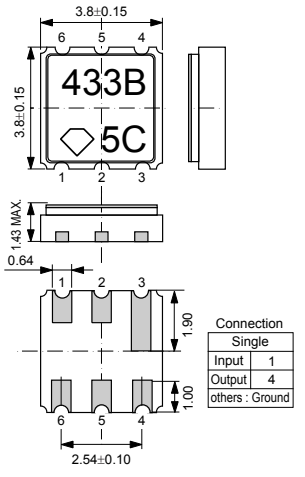
Dimensions

(Unit : mm)

SF3838B433M92C300A00



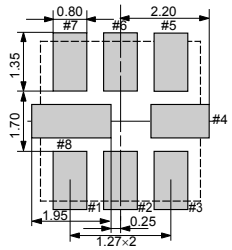
SF3838B433M92B200A00



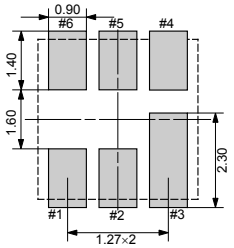
Recommended Land Pattern

(Unit : mm)

SF3838B433M92C300A00

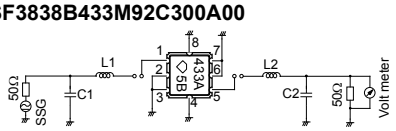


SF3838B433M92B200A00



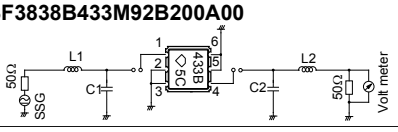
Test Circuit

SF3838B433M92C300A00

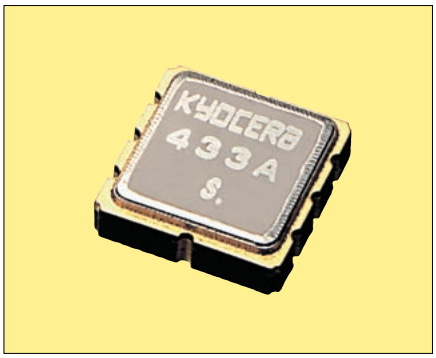


INPUT		OUTPUT	
L1	47 nH	L2	47 nH
C1	3.0 pF	C2	3.0 pF

SF3838B433M92B200A00



INPUT		OUTPUT	
L1	62 nH	L2	62 nH
C1	0.5 pF	C2	0.5 pF



Pb Free RoHS Compliant

Features

- Small and low profile
- Flat pass band characteristics
- Low insertion loss
- Excellent temperature stability

Application

- Remote Keyless Entry

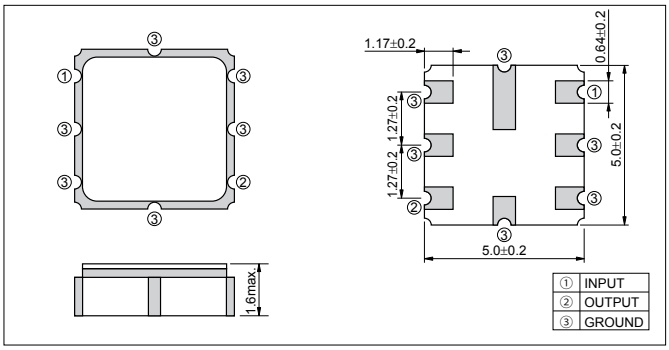
How to Order

PAFC 433.92 AR 00
① ② ③ ④

①Series
②Center Frequency
③Type
④Option

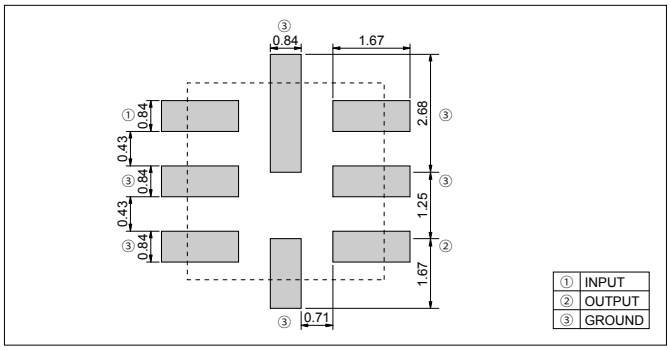
Dimensions

(Unit : mm)



Recommended Land Pattern

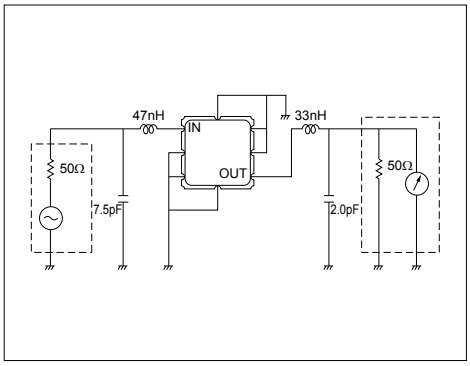
(Unit : mm)



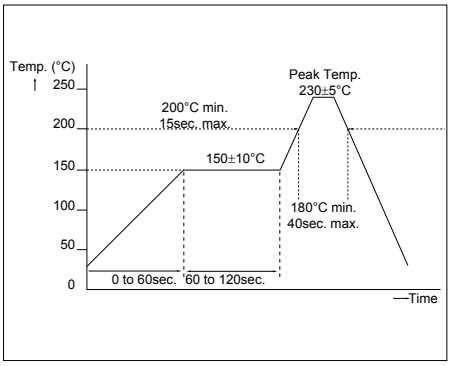
Specifications

Parts No.	Nominal Center Frequency (fn)	Insertion Loss	Pass Band Width (at 3dB)	Stop Band Attenuation						Operating Temperature	Storage Temperature
				10MHz - 414MHz	414MHz - 428MHz	428MHz - 432.92MHz	434.92MHz - 442MHz	442MHz - 550MHz	550MHz - 1000MHz		
PAFC433.92AR00	433.920 MHz	4.0dB max.	Fn±200kHz min.	42dB min.	35dB min.	15dB min.	10dB min.	35dB min.	40dB min.	–40 to 85°C	–40 to 85°C

Test Circuit

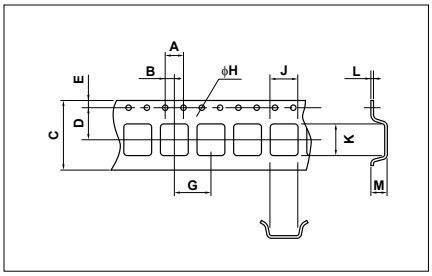


Recommended Temperature IR Reflow



Taping Dimensions

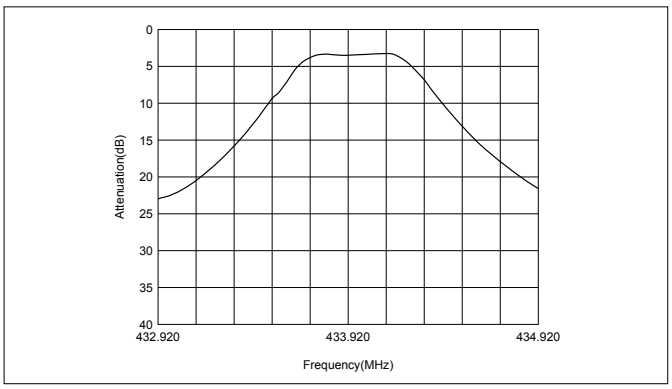
(Unit : mm)



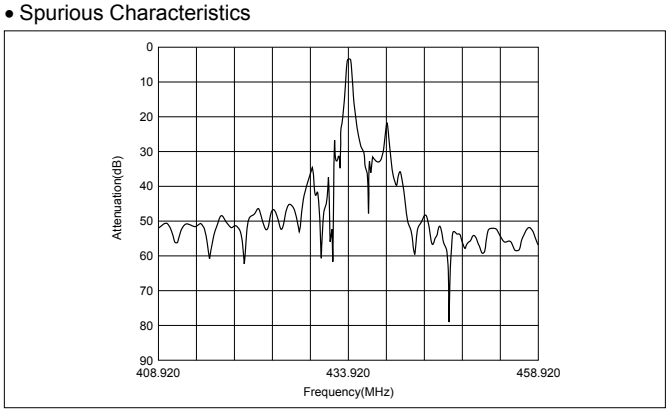
Code	A	B	C	D	G	H	J	K	L	M
Dimensions	4.0	2.0	12.0	5.5	8.0	1.55	5.3	5.3	0.3	2.10

Characteristics

• Pass Band Characteristics



• Spurious Characteristics



Surface Acoustic Wave (SAW) Filters
800MHz Band SAW Filters for RKE
SF5050B868M30C600A00

Pb Free RoHS Compliant

Features

- Miniature size and light weight
- For European remote keyless entry system

Standard Frequency

- 868.3MHz

How to Order

SF 5050 B 868M30 C 600 A00
① ② ③ ④ ⑤ ⑥ ⑦

①Type of Product (SAW Filter)
②Package Size (5.0×5.0mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (868.3MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (600kHz)
⑦Customer Special Model Suffix (STD)

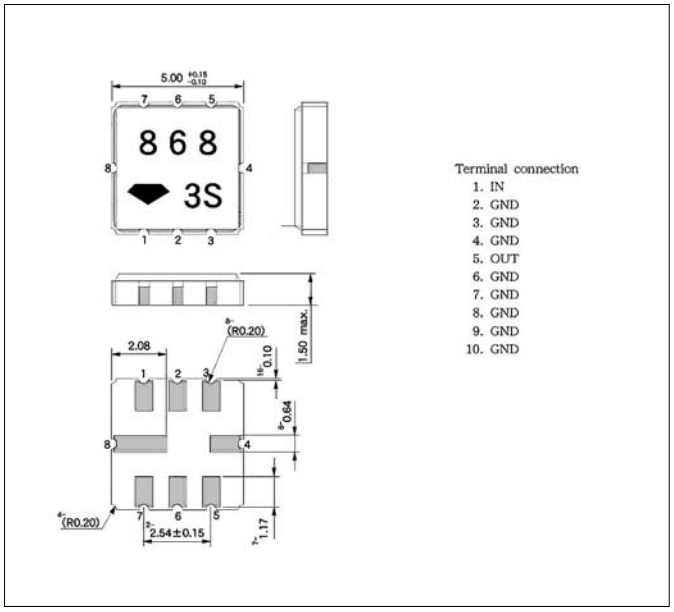
New Part Number	Old Part Number
SF5050B868M30C600A00	MSFB47-868-600K0

Specifications

Item	Unit	Conditions	Specifications
Nominal Frequency (Fo)	MHz	———	868.3
Operating Temperature Range	°C	–45 to +90	———
Storage Temperature Range	°C	–45 to +90	———
Pass Bandwidth	kHz	–3dB	±300 MIN.
Ripple	dB	Fo±300kHz	1.5 MAX.
Insertion Loss	dB	Minimum Loss	4.2 MAX.
Guaranteed Attenuation	dB	–168.3MHz to –38.3MHz	35 MIN.
		–38.3MHz to –18.3MHz	32 MIN.
		–18.3MHz to –3.3MHz	25 MIN.
		+2.7MHz to +6.2MHz	11 MIN.
		+6.2MHz to +14.7MHz	22 MIN.
		+14.7MHz to +31.7MHz	30 MIN.
		+31.7MHz to +131.7MHz	35 MIN.
Terminating Impedance	Ω//pF	———	315//–1.1

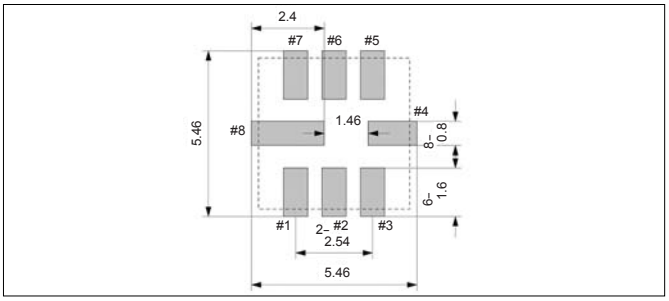
Dimensions

(Unit : mm)

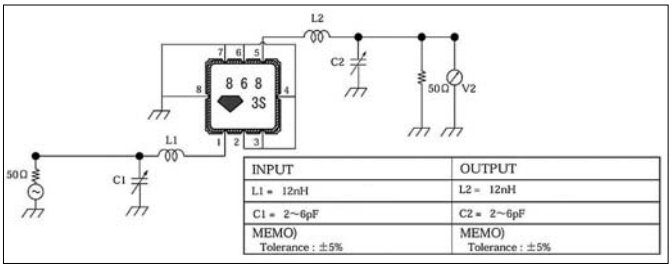


Recommended Land Pattern

(Unit : mm)



Test Circuit



Surface Acoustic Wave (SAW) Filters
400MHz Band SAW Filters for Low Power Radio Communications
SF3030B428M00T04MA02

Pb Free RoHS Compliant

Features
- RF filter for transmitter and receiver
- For low power radio communications
- Miniature size and light weight

Standard Frequency
- 428.00MHz

How to Order

SF	3030	B	428M00	T	04M	A02
①	②	③	④	⑤	⑥	⑦

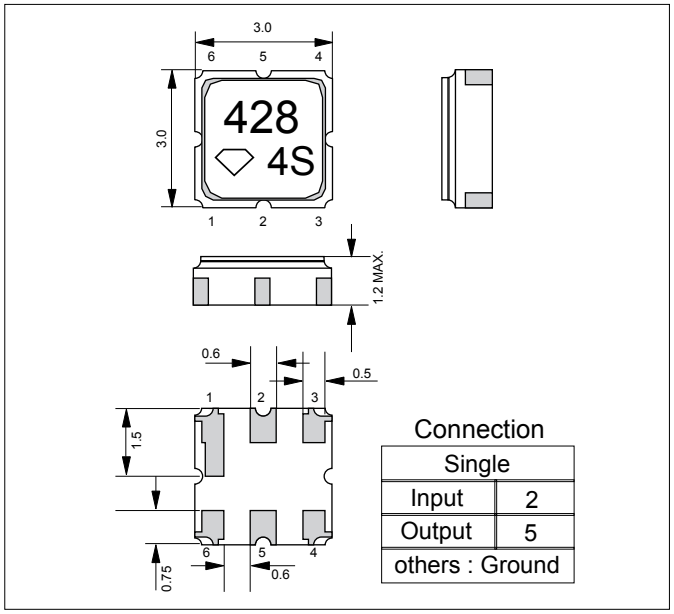
①Type of Product (SAW Filter)
②Package Size (3.0×3.0mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (428.00MHz)
⑤Material ($LiTaO_3$)
⑥Pass Bandwidth (4MHz)
⑦Customer Special Model Suffix (STD)

New Part Number	Old Part Number
SF3030B428M00T04MA02	TSFB-428-004M2

Specifications

Item	Unit	Conditions	Specifications
Nominal Frequency (Fo)	MHz	———	428.000
Operating Temperature Range	°C	–20 to +85°C	———
Storage Temperature Range	°C	–40 to +85°C	———
Ripple	dB	Fo±2MHz	1.5dB MAX.
Insertion Loss	dB	MAX.	3 MAX.
Guaranteed Attenuation	dB	383 to 389MHz	50 MIN.
Terminating Impedance	Ω	———	50

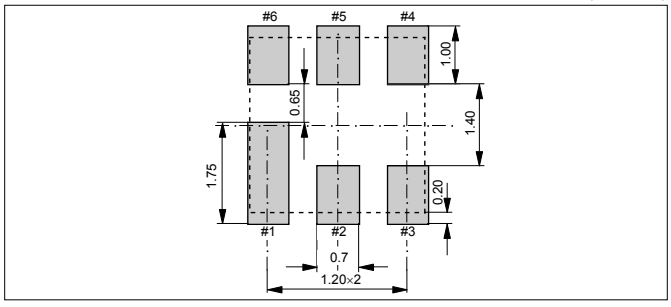
Dimensions
(Unit : mm)



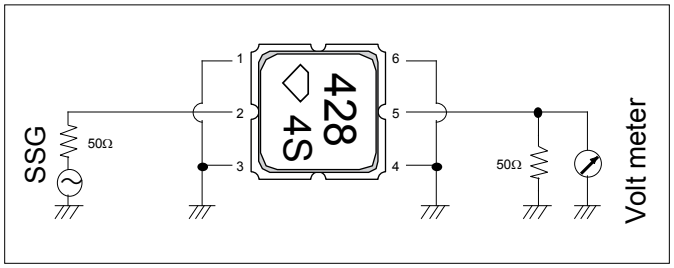
Connection

Single	
Input	2
Output	5
others : Ground	

Recommended Land Pattern
(Unit : mm)

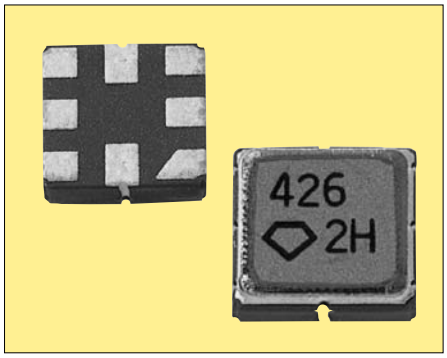


Test Circuit



Surface Acoustic Wave (SAW) Filters
400MHz Band SAW Filters for Low Power Radio Communications

SF3535B426M54B800A00/ SF3535B429M55B800A00/ SF7050B469M18B01MA00/ SF3838B426M07C080A00/ SF3838B429M17C080A00/ SF3838B440M20B400A00



Pb Free RoHS Compliant

Features
- RF filter for transmitter and receiver
- For low power radio communications
- Miniature size and light weight

Standard Frequency
- 426.54MHz
- 429.55MHz
- 440.2MHz
- 469.1875MHz

How to Order

SF	3535	B	426M54	B	800	A00
①	②	③	④	⑤	⑥	⑦

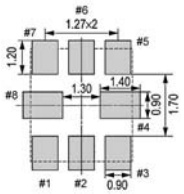
①Type of Product (SAW Filter)
②Package Size (3.5×3.5mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (426.54MHz)
⑤Material ($Li_2B_4O_7$)
⑥Pass Bandwidth (800kHz)
⑦Customer Special Model Suffix (STD)

Standard Frequency

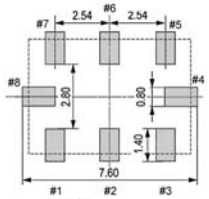
Nominal Frequency (MHz)	New Part Number	Old Part Number	Remarks
426.54	SF3535B426M54B800A00	LSFB44-426-800K0	Midle Band Width
	SF3838B426M07C080A00	MSFB19-426-080K0	Ultra Narrow Band Width
429.55	SF3535B429M55B800A00	LSFB44-429-800K0	Midle Band Width
	SF3838B429M17C080A00	MSFB19-429-080K0	Ultra Narrow Band Width
440.2	SF3838B440M20B400A00	LSFB19-440-440K0	———
469.1875	SF7050B469M18B01MA00	LSFB20-469-001M0	———

Recommended Land Pattern (Unit : mm)

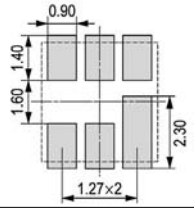
SF3535



SF7050



SF3838



Specifications (Example)

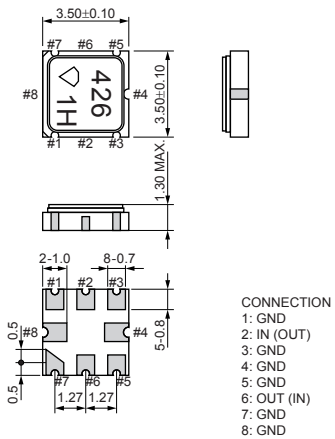
Item	Unit	Conditions	SF3535B426M54B800A00 Specifications	
Nominal Frequency (Fo)	MHz	———	426.54	
Operating Temperature Range	°C	−10 to +60	———	
Storage Temperature Range	°C	−30 to +70	———	
Ripple	dB	Fo±400kHz	0.4*	1.5 MAX.
Insertion Loss	dB	Fo±400kHz	2.8*	3.5 MAX.
Guaranteed Attenuation	dB	(F−21.4)±400kHz	60*	50 MIN.
Terminating Impedance	Ω	———	50 Typical	

* : Typ.

Dimensions

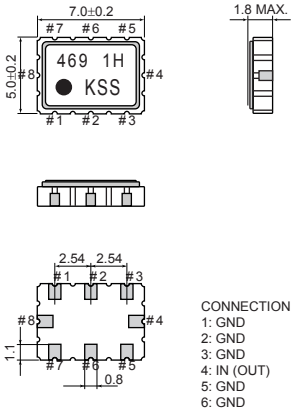
(Unit : mm)

SF3535



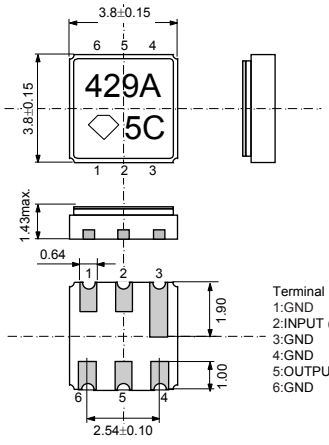
CONNECTION
1: GND
2: IN (OUT)
3: GND
4: GND
5: GND
6: OUT (IN)
7: GND
8: GND

SF7050



CONNECTION
1: GND
2: GND
3: GND
4: IN (OUT)
5: GND
6: GND
7: GND
8: OUT (IN)

SF3838



Terminal Connection
1:GND
2:INPUT (OUTPUT)
3:GND
4:GND
5:OUTPUT (INPUT)
6:GND

Pb Free RoHS Compliant

Features

- Small size(3.0x3.0x1.5mm max.)
- Ceramic package type
- Flat pass band characteristics
- Low insertion loss
- Circuit simplification

Standard Frequencies

- PHS

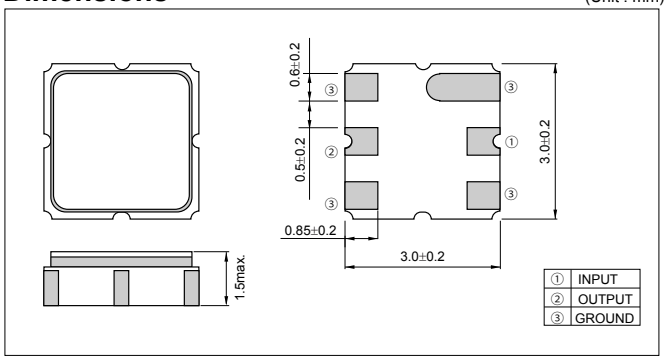
How to Order

PAFA 243 A R 01
① ② ③ ④ ⑤

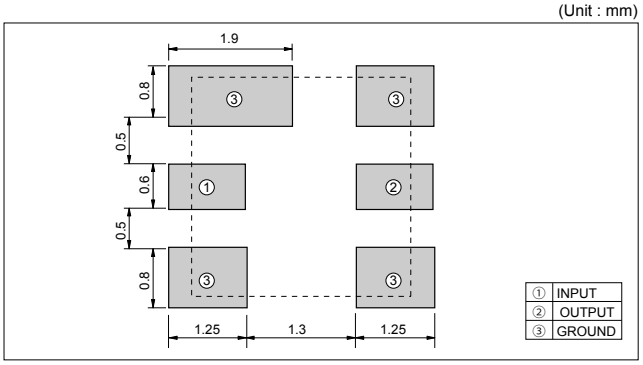
①Series
②Center Frequency
③Marking code
④Packaging
⑤Frequency tolerance or Custom spec

Dimensions

(Unit : mm)



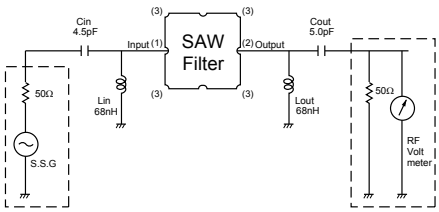
(Unit : mm)



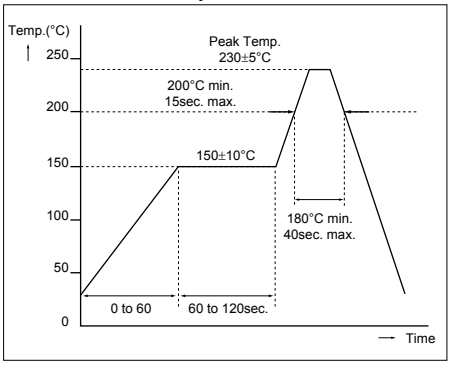
Specifications

Parts No.	Nominal Center Frequency (fn)	Insertion Loss	Pass Band Width (at 3dB)	Stop Band Attenuation			Ripple (fn±110kHz)	Group Delay Time (fn±110kHz)	Operating Temperature	Storage Temperature
				fn±600kHz	fn±1.2MHz	fn±fa MHz(*)				
PAFA243AR01	243.95MHz	≤4.5dB	±130kHz min.	30dB min.	40dB min.	60dB min.	1.5dB max.	1.2μs max.	–10 to 60 °C	–20 to 80 °C

Test Circuit

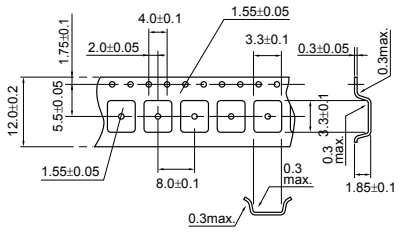


Recommended Temperature IR Reflow

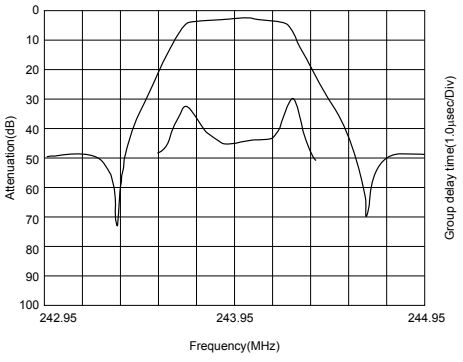


Packaging

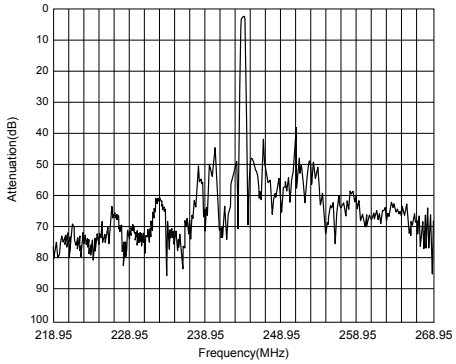
(Unit : mm)



Characteristics

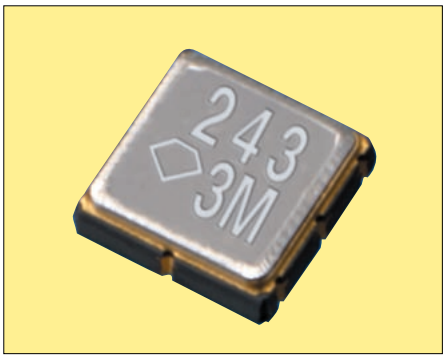


Pass Band Characteristics



Spurious Characteristics

Surface Acoustic Wave (SAW) Filters
200MHz Band SAW Filters for PHS
SF3535B243M95B220A00



Pb Free RoHS Compliant

Features
- IF filter for PHS
- Miniature size and light weight

Standard Frequency
- 243.95MHz

How to Order

SF 3535 B 243M95 B 220 A00
① ② ③ ④ ⑤ ⑥ ⑦

①Type of Product (SAW Filter)
②Package Size (3.5×3.5mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (243.95MHz)
⑤Material ($Li_2B_4O_7$)
⑥Pass Bandwidth (220kHz)
⑦Customer Special Model Suffix (STD)

New Part Number	Old Part Number
SF5353B243M95B220A00	LSFB44-243-220K0

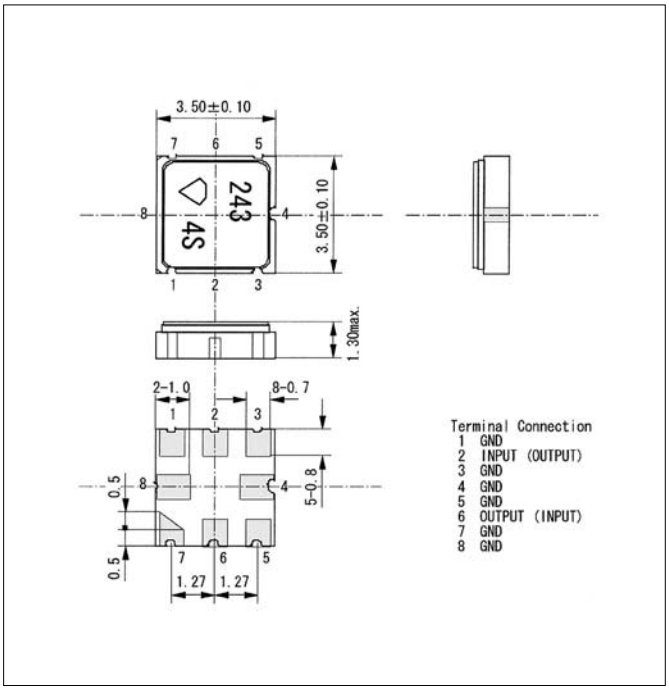
Specifications

Item	Unit	Conditions	Specifications	
Nominal Frequency (Fo)	MHz	———	243.95	
Operating Temperature Range	°C	−10 to +60	———	
Storage Temperature Range	°C	−35 to +85	———	
Ripple	dB	Fo±110kHz	0.5*	1.5 MAX.
Insertion Loss	dB	Minimum Loss	2.7*	5 MAX.
Guaranteed Attenuation	dB	Fo±0.6MHz	−0.6/40*	25 MIN.
			+0.6/35*	
		Fo±1.2MHz	−1.2/45*	40 MIN.
			+1.2/42*	
		Fo−21.6MHz	70*	60 MIN.
Group Delay Deviation	μsec	Fo±110kHz	0.4*	1.2 MAX.

* : Typ.

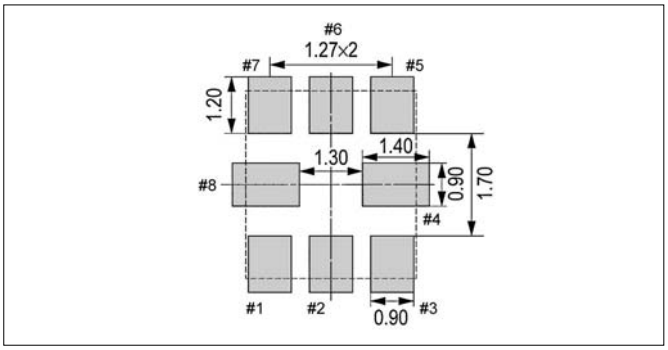
Dimensions

(Unit : mm)

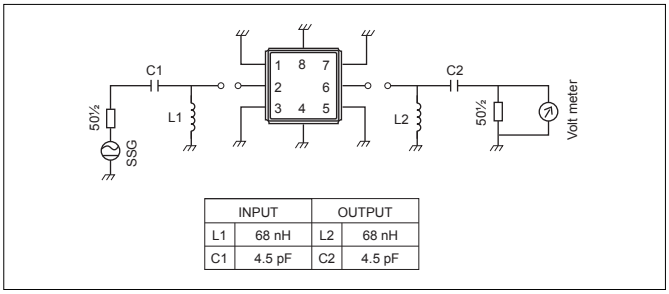


Recommended Land Pattern

(Unit : mm)

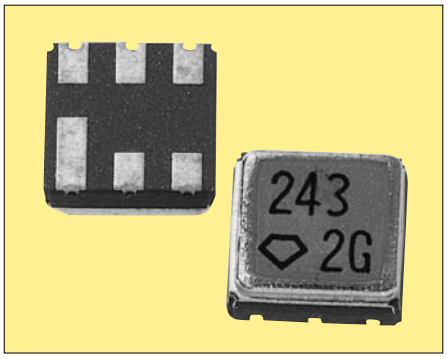


Test Circuit



INPUT		OUTPUT	
L1	68 nH	L2	68 nH
C1	4.5 pF	C2	4.5 pF

Surface Acoustic Wave (SAW) Filters
200MHz Band SAW Filters for PHS
SF3838B243M95B220A00/ SF3838B248M45B220A00



Pb Free RoHS Compliant

Features
- IF filter for PHS
- Miniature size and light weight

Standard Frequency
- 243.95MHz
- 248.45MHz

How to Order

SF 3838 B 243M95 B 220 A00
① ② ③ ④ ⑤ ⑥ ⑦

①Type of Product (SAW Filter)
②Package Size (3.8×3.8mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (243.95MHz)
⑤Material ($Li_2B_4O_7$)
⑥Pass Bandwidth (220kHz)
⑦Customer Special Model Suffix (STD)

New Part Number	Old Part Number
SF3838B243M95B220A00	LSFB19-243-220K0
SF3838B248M45B220A00	LSFB19-248-220K0

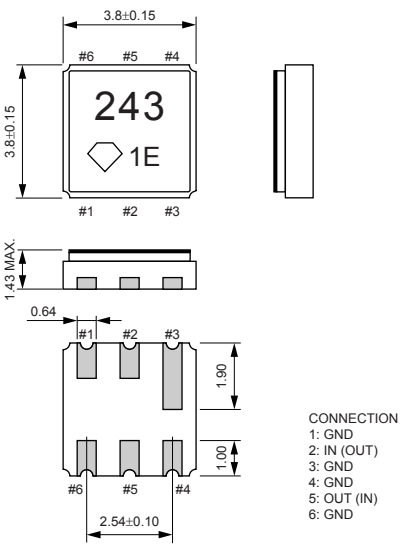
Specifications

Item	Unit	Conditions	SF3838B243M95B220A00 Specifications		SF3838B248M45B220K0 Specifications	
Nominal Frequency (Fo)	MHz	———	243.95		248.45	
Operating Temperature Range	°C	−10 to +60	———		———	
Storage Temperature Range	°C	−35 to +85	———		———	
Ripple	dB	Fo±110kHz	0.5*	1.5 MAX.	0.5*	1.5 MAX.
Insertion Loss	dB	Minimum Loss	2.6*	5 MAX.	2.6*	5 MAX.
Guaranteed Attenuation	dB	Fo±0.6MHz	−0.6/52* +0.6/34*	25 MIN.	−0.6/55* +0.6/36*	25 MIN.
		Fo±1.2MHz	−1.2/47* +1.2/43*	40 MIN.	−1.2/55* +1.2/43*	35 MIN.
		Fo−21.6MHz	70*	60 MIN.	65*	60 MIN.
Group Delay Deviation	µsec	Fo±110kHz	0.5*	1.2 MAX.	0.3*	1.2 MAX.

* : Typ. * : Typ.

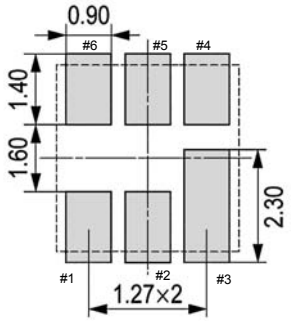
Dimensions

(Unit : mm)

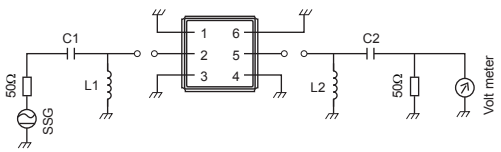


Recommended Land Pattern

(Unit : mm)



Test Circuit



INPUT		OUTPUT	
L1	68 nH	L2	68 nH
C1	4.5 pF	C2	4.5 pF

Pb Free RoHS Compliant

Features

- Small and low profile
- Ceramic package type
- Flat pass band characteristics
- Low insertion loss
- Circuit simplification

How to Order

PAFC 243 B
① ② ③

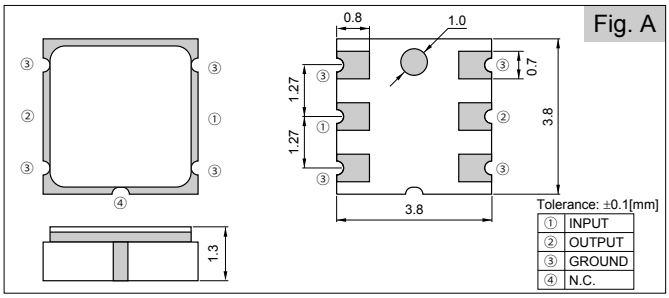
①Series
②Center Frequency
③Type

Application

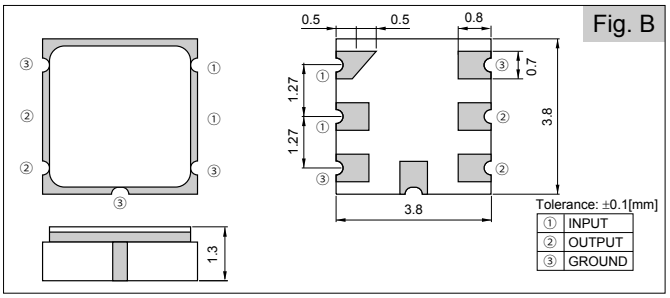
- PHS

Dimensions

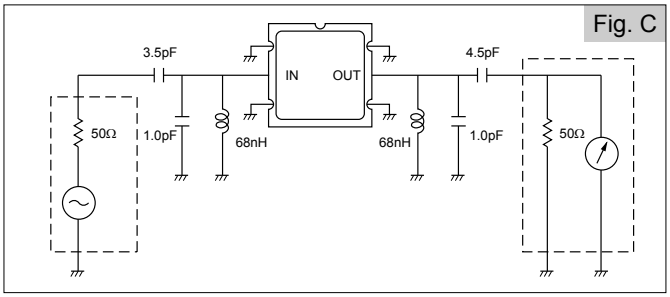
(Unit : mm)

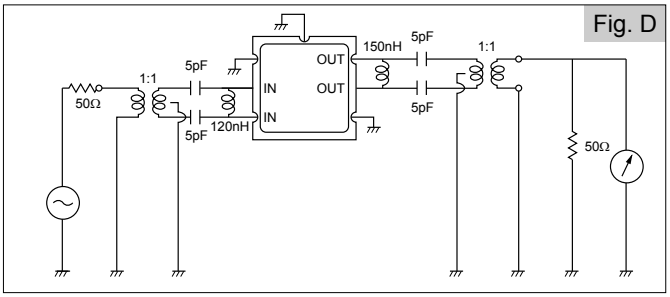


(Unit : mm)



Test Circuit





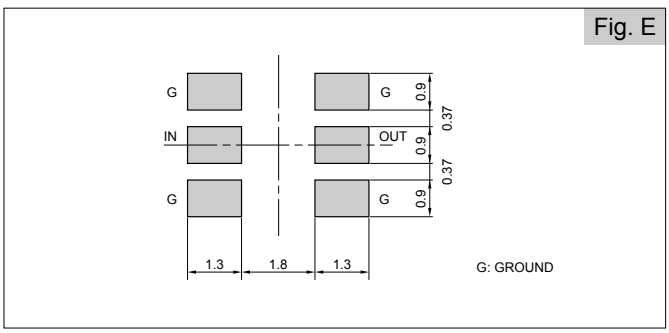
Specifications

Parts No.	Nominal Center Frequency (fn)	Insertion Loss	Pass Band Width (at 3dB)	Stop Band Attenuation			Ripple (fn±110kHz)	Group Delay Time (fn±110kHz)	Operating Temperature	Storage Temperature	Dimensions	Test Circuit	Recommended Land Pattern	Taping Dimensions
				fn±600kHz	fn±1.2MHz	fn±fa MHz(*)								
PAFC243B	243.95MHz	4.0dB max.	±130kHz min.	30dB min.	40dB min.	60dB min.	1.5dB max.	1.2μs max.	−10 to 60°C	−20 to 80°C	Fig. A	Fig. C	Fig. E	Fig. G
PAFC248C	248.45MHz	4.5dB max.	±130kHz min.	30dB min.	35dB min.	60dB min.	1.5dB max.	1.2μs max.			Fig. B	Fig. D	Fig. F	Fig. G

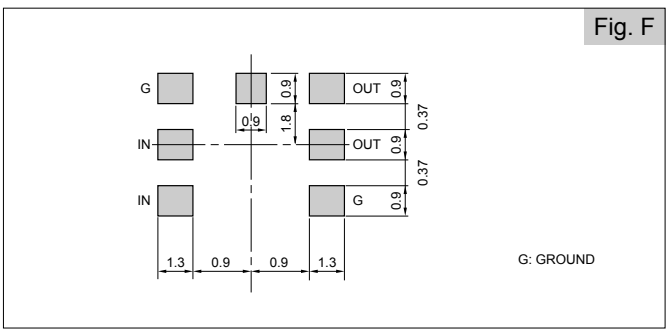
* Note PAFC248C : fa=21.5MHz
PAFC243B : fa=21.6MHz

Recommended Land Pattern

(Unit : mm)



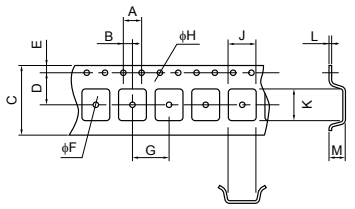
(Unit : mm)



Taping Dimensions

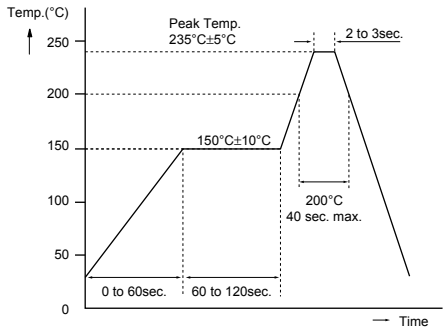
(Unit : mm)

Fig. G



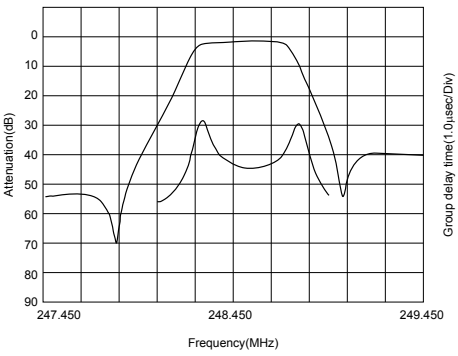
Code	A	B	C	D	E	F	G	H	J	K	L	M
Dimension	4.0	2.0	12.0	5.5	1.75	1.55	8.0	1.55	4.3	4.3	0.3	2.05

Recommended Temperature Profile IR Reflow

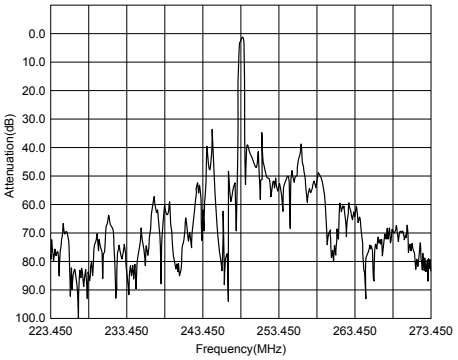


Characteristics

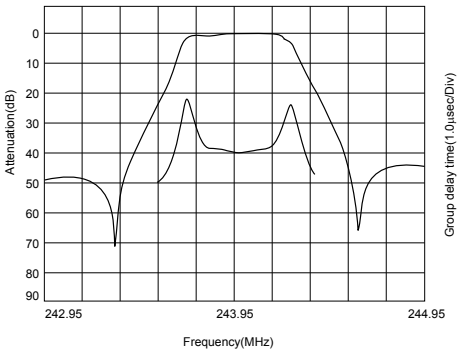
PAFC248C (Pass Band Characteristics)



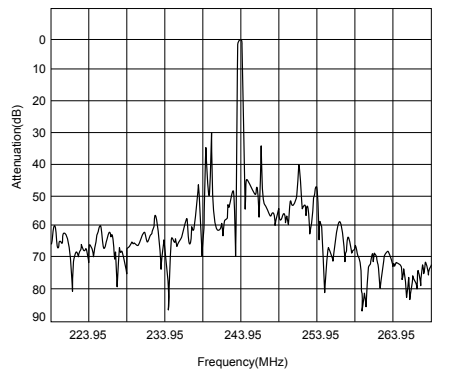
PAFC248C (Spurious Characteristics)



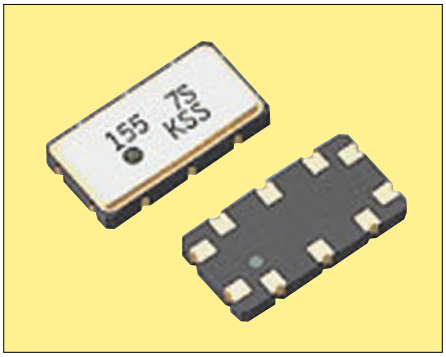
PAFC243B (Pass Band Characteristics)



PAFC243B (Spurious Characteristics)



Surface Acoustic Wave (SAW) Filters
IF SAW Filters for Fiber Optic Communications
SF9148B155M52C155A00/ SF9148B622M08C622A00



Pb Free RoHS Compliant

Features

- For Fiber optic communications
- Miniature size and light weight

Standard Frequency

- 155.520MHz
- 622.080MHz

How to Order

SF ① 9148 ② B ③ 155M52 ④ C ⑤ 155 ⑥ A00 ⑦

①Type of Product (SAW Filter)
②Package Size (9.1×4.8mm)
③Sealing Type (Seam Weld Type)
④Nominal Frequency (155.520MHz)
⑤Material (Quartz Crystal)
⑥Pass Bandwidth (155kHz)
⑦Customer Special Model Suffix (STD)

New Part Number	Old Part Number
SF9148B155M52C155A00	MSFB22-155-155K0
SF9148B622M08C622A00	MSFB22-622-622K0

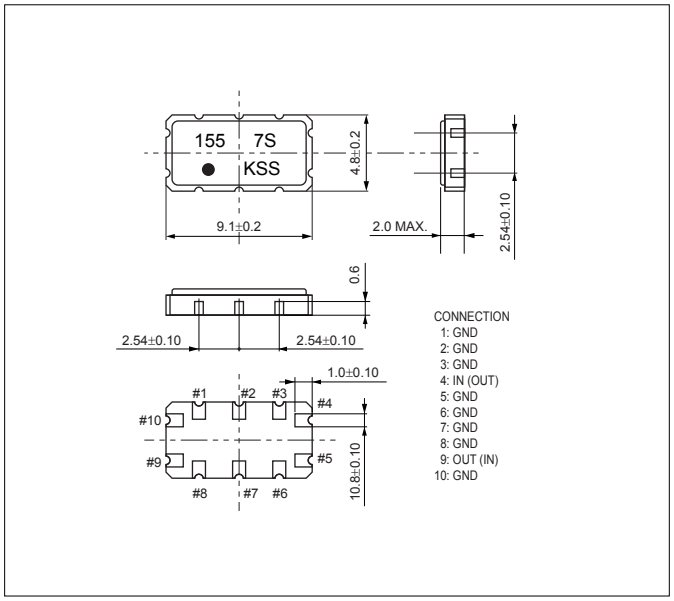
Specifications

Type		SF9148B155M52C155A00		SF9148B622M08C622A00	
Item	**Unit**	**Conditions**	**Specifications**	**Conditions**	**Specifications**
Nominal Frequency	MHz	———	155.52	———	622.08
Operating Temperature Range	°C	–20 to +75	———	–20 to +75	———
Storage Temperature Range	°C	–40 to +85	———	–40 to +85	———
Q Value		600 < Q < 1000	910*	600 < Q < 1000	830*
Insertion Loss	dB	Minimum Loss	8 MAX.*	Minimum Loss	7.2 MAX.*
Guaranteed Attenuation	dB	DC to 152MHz	30 MIN.	DC to 606MHz	30 MIN.
		159 to 312MHz	30 MIN.	699 to 1245MHz	25 MIN.
Group Delay Deviation	Ω	———	50	———	50

* : Typ. * : Typ.

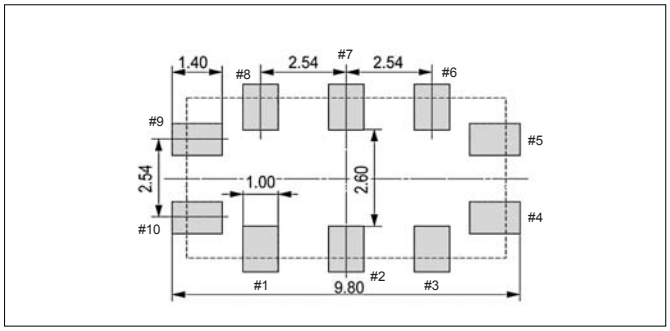
Dimensions

(Unit : mm)

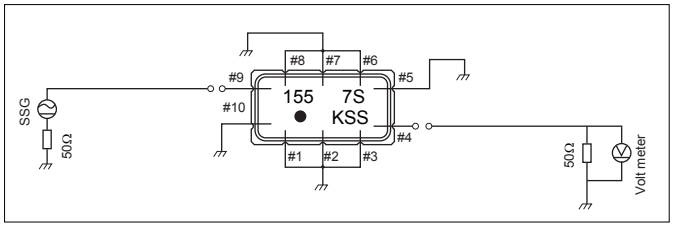


Recommended Land Pattern

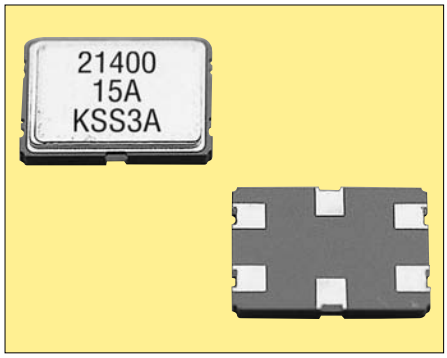
(Unit : mm)



Test Circuit



Monolithic Crystal Filters (MCF)
Surface Mount Type FP2 (21.4/21.7/45/55MHz)
MF4050A021400F15.0A0 (MXF21.4-15A-FP2)



Pb Free RoHS Compliant

Features

- Compact and low profile (H=1.3mm)
- Excellent vibration resistance and shock resistance
- Reflow soldering

Applications

- Mobile communication

How to Order

MF	7050	A	021400	F	15.0	A	0
①	②	③	④	⑤	⑥	⑦	⑧

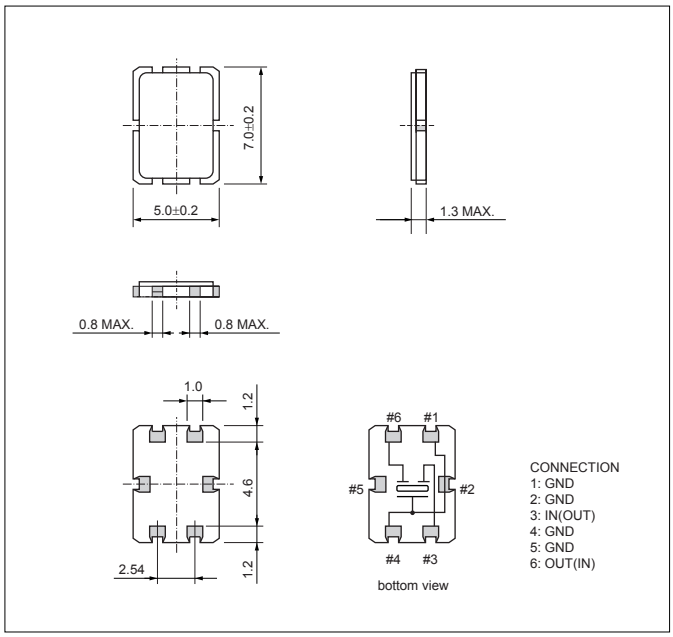
①Type of Product (Monolithic Crystal Filter)
②Package Size (7.0×5.0mm)
③Number of Poles (2-Pole)
④Nominal Freq. (21.400MHz)
⑤Vibration Mode (Fundamental Mode)
⑥Pass Bandwidth (15.0kHz(±7.5kHz))
⑦Specification 1 (FP2 Package)
⑧Specification 2 (Version 0)

Specifications

Type (Current type)	Number of Poles	Pass Bandwidth		Ripple	Insertion Attenuation	Stop Bandwidth		Terminating Impedance	Operating Temp. Range
		dB	kHz min.	dB max.	dB max.	dB	kHz max.	Ω//pF	°C
MF7050A021400F15.0A0 (MXF21.4-15A-FP2)	2	3	±7.5	0.5	1.5	18	±25	1.5k//2.5	-20 to +70
MF7050A021700F08.0A0 (MXF21.7-8A-FP2)	2	3	±3.5	1	2	16	±12.5	1.5k//6	-20 to +70
MF7050A045000F15.0A0 (MXF45-15AF-FP2)	2	3	±7.5	1	2.5	14	±25	550//3	-20 to +70
MF7050A045000F30.0A0 (MXF45-30AF-FP2)	2	3	±15	1	2	15	±50	1.2k//1.5	-20 to +70
MF7050A055000F26.0A0 (MXF55-26AF-FP2)	2	3	±13	1	3	27	±100	750//2.7	-20 to +70

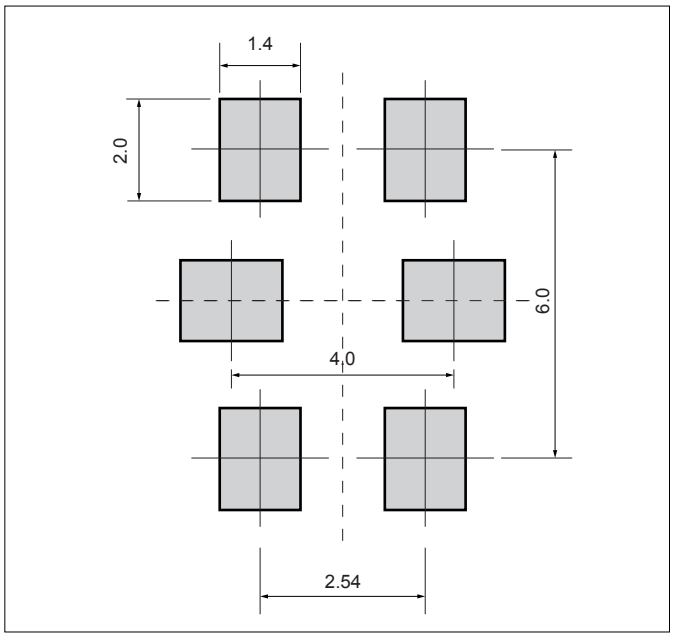
Dimensions

(Unit : mm)

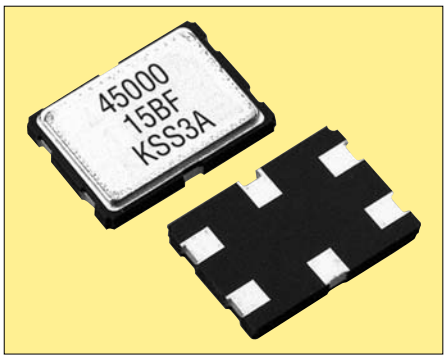


Recommended Land Pattern

(Unit : mm)



Monolithic Crystal Filters (MCF)
Surface Mount Type FP4 (45MHz)
MF7050B045000F07.5B0 (MXF45-7.5B-FP4)



Pb Free RoHS Compliant

Features

- Compact size (7x5mm, 4-Pole)
- Excellent vibration resistance and shock resistance
- Reflow soldering

Applications

- Mobile communication

How to Order

MF ① 7050 ② B ③ 045000 ④ F ⑤ 07.5 ⑥ B ⑦ 0 ⑧

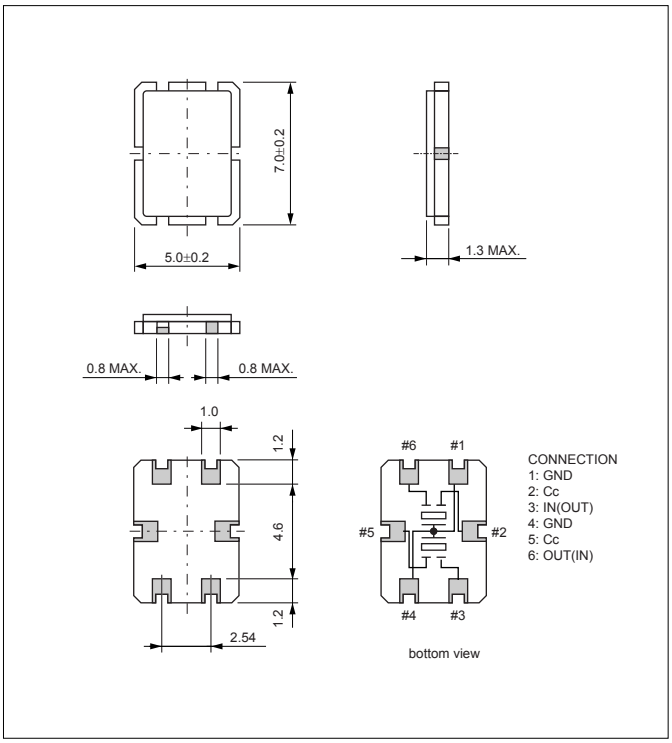
①Type of Product (Monolithic Crystal Filter)
②Package Size (7.0×5.0mm)
③Number of Poles (4-Pole)
④Nominal Freq. (45.000MHz)
⑤Vibration Mode (Fundamental Mode)
⑥Pass Bandwidth (7.5kHz(±3.75kHz))
⑦Specification 1 (FP4 Package)
⑧Specification 2 (Version 0)

Specifications

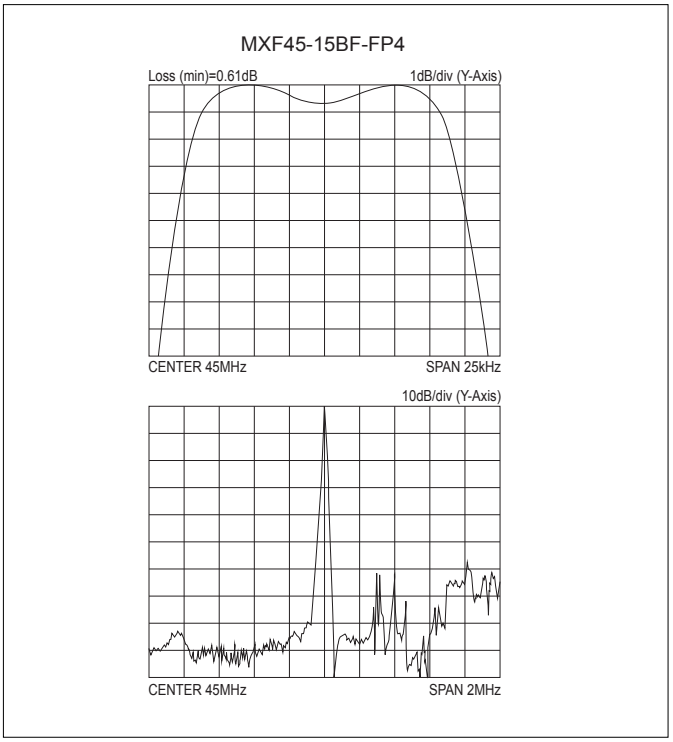
Type (Current type)	Number of Poles	Pass Bandwidth		Ripple	Insertion Attenuation	Stop Bandwidth		Terminating Impedance	Operating Temp. Range
		dB	kHz min.	dB max.	dB max.	dB	kHz max.	Ω//pF	°C
MF7050B045000F07.5B0 (MXF45-7.5BF-FP4)	4	3	±3.75	1	4	30	±15	500//4.5 (Cc=13pF)	−20 to +70
MF7050B045000F15.0B0 (MXF45-15BF-FP4)	4	3	±7.5	1.5	2	30	±25	600//2.3 (Cc=7.5pF)	−20 to +70
MF7050B045000F30.0B0 (MXF45-30BF-FP4)	4	3	±15	1	3	30	±40	1.2k//1.0 (Cc=2.5pF)	−20 to +70

Dimensions

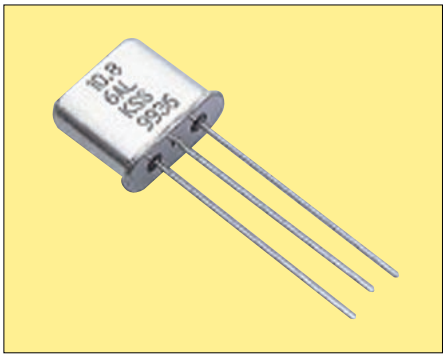
(Unit : mm)



Electrical Characteristics



Monolithic Crystal Filters (MCF)
Leaded Type 49UZ, 49UL (10.7/10.8MHz)
MF49UZ010700F06.0N0 (MXF10.7-6A)



Pb Free RoHS Compliant

Features
- Compact and light weight
- Excellent vibration resistance and shock resistance
- Stable temperature characteristics

Applications
- Car audio

How to Order

MF	49UZ	A	010700	F	06.0	N	0
①	②	③	④	⑤	⑥	⑦	⑧

①Type of Product (Monolithic Crystal Filter)
②Package Size (49UZ:HC-49/U-11 (H=11.5mm))
(49UL:HC-49/U-9 (H=9.5mm))
③Number of Poles (2-Pole)
④Nominal Freq. (10.700MHz)
⑤Vibration Mode (Fundamental Mode)
⑥Pass Bandwidth (6.0kHz(±3.0kHz))
⑦Specification 1 (Not Cutoff Lead)
⑧Specification 2 (Version 0)

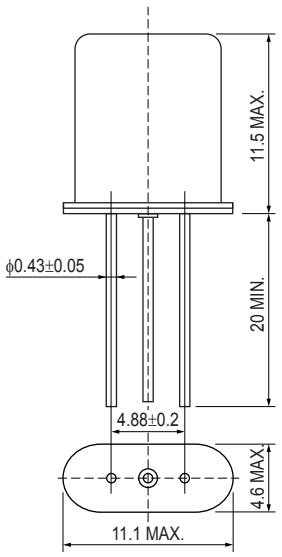
Specifications

Type (Current type)	Number of Poles	Pass Bandwidth		Ripple	Insertion Attenuation	Stop Bandwidth		Terminating Impedance	Operating Temp. Range
		dB	kHz	dB max.	dB max.	dB	kHz max.	Ω//pF	°C
MF49UZA017000F06.0N0 (MXF107-6A)	2	3	±(2.5~3.5)	1	1.5	30	55	1.5k//3	−40 to +85
MF49ULA017000F06.0N0 (MXF10.7-6AL)	2	3	±(2.5~3.5)	1	3	30	55	1.5k//3	−40 to +85
MF49UZA017000F07.5N0 (MXF10.7-7.5A)	2	3	±3.75 min.	0.5	1.5	20	±18	1.8k//5	−40 to +85
MF49ULA017000F07.5N0 (MXF10.7-7.5AL)	2	3	±3.75 min.	0.5	3	20	±18	1.8k//5	−40 to +85
MF49UZA018000F06.0N0 (MXF10.8-6A)	2	3	±(2.5~3.5)	1	1.5	30	55	1.5k//3	−40 to +85
MF49ULA018000F06.0N0 (MXF10.8-6AL)	2	3	±(2.5~3.5)	1	3	30	55	1.5k//3	−40 to +85
MF49ULA018000F16.0N0 (MXF10.8-16AL)	2	3	±(7.5~8.5)	1	3	20	55	2.2k//2.5	−40 to +85

Dimensions

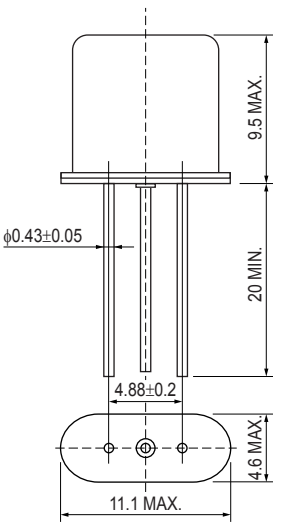
(Unit : mm)

MF49UZ

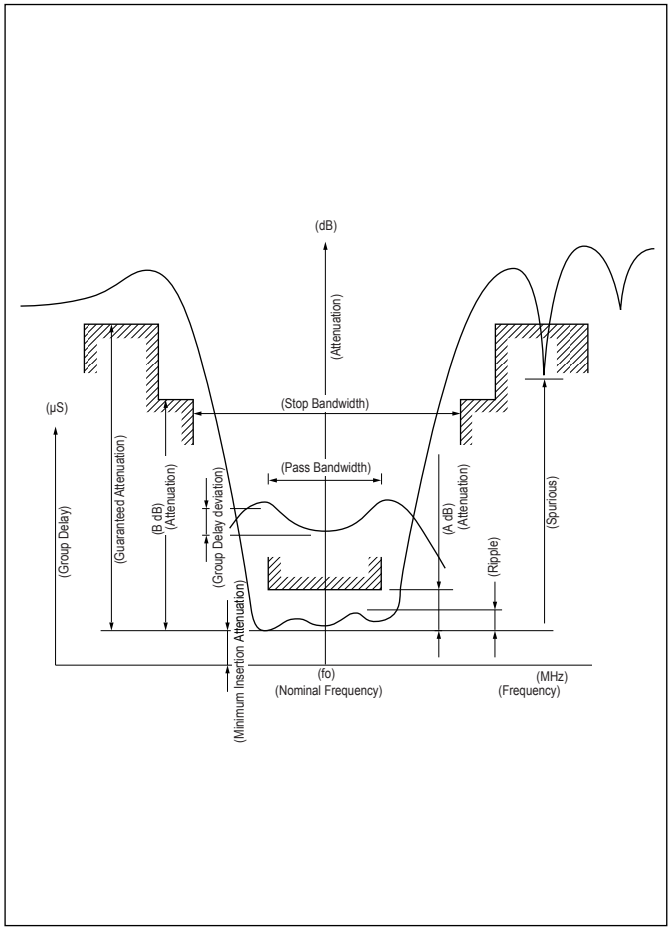


(Unit : mm)

MF49UL



Characteristic diagram and terms of crystal filters



■Nominal Frequency
This is the nominal value of the center frequency (fo) and is used as the reference frequency of related standards.

■Pass Bandwidth
This is the frequency interval in which the relative attenuation (the attenuation from the minimum insertion attenation) is equal to the specified value “A dB” (Usually 3dB).

■Insertion Attenation (Insertion Loss)
This is the difference of attenuation when a filter is and isn’t inserted. The minimum insertion attenuation is the minimum value of insertion attenuation and becomes as the reference level of attenuation characteristics specification.

■Ripple
This is the maxinum value of the difference between the peak value of attenuation in the pass band and the minimum insertion loss.

■Stop Bandwidth
This is the frequency interval in which the relative attenuation is equal to the specified value “B dB”.

■Guaranteed Attenuation
This is the relative attenuation guaranteed in the specified range within attenuation band scope.

■Spurious Response
This is the value of relative attenuation generated by the secondary vibration in the specified range within attenuation band scope.

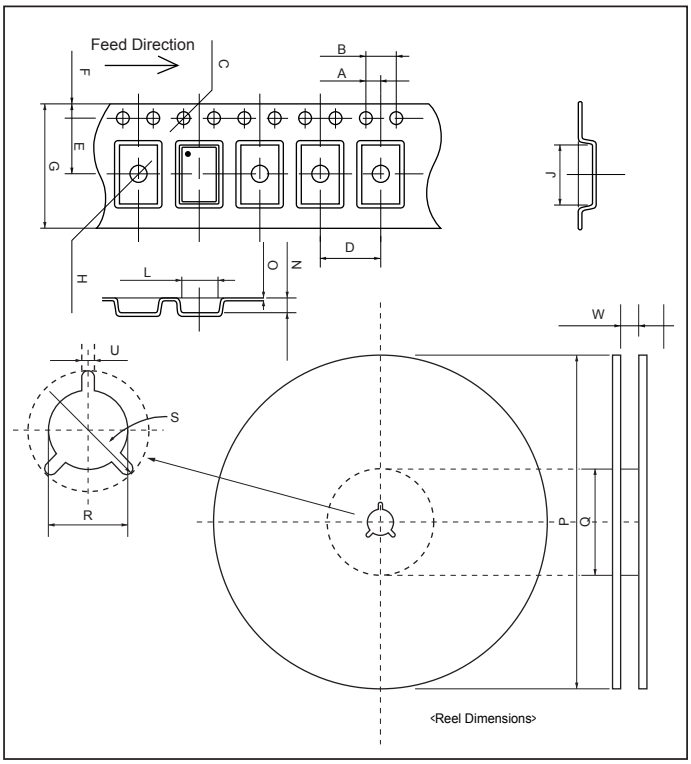
■Group Delay Deviation
This is the difference between the maximum and the minimum value of the group delay in the specified range of the pass band.

■Terminating Impedance
This is the impedance value terminated to the input and the output side of filter and is indicated by the resistance portion and the parallel capacity portion including the floating capacity.

Tape & Reel Specifications

■SAW FILTERS / MCFs

		SAW FILTERS			
		SF14	SF16	PAFA	PAFC243B
TAPE	A	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.05
	B	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1
	C	ϕ1.5±0.1	ϕ1.5±0.1	ϕ1.5+0.1/–0	ϕ1.5+0.1/–0
	D	4.0±0.1	4.0±0.1	8.0±0.1	8.0±0.1
	E	3.5±0.05	3.5±0.05	5.5±0.05	5.5±0.05
	F	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
	G	8.0±0.2	8.0±0.2	12.0±0.2	12.0±0.2
	H	ϕ0.5±0.05	ϕ1.1±0.1	ϕ1.55±0.1	ϕ1.55±0.1
	J	1.7±0.1	1.9±0.1	3.3±0.1	4.3±0.1
	L	1.4±0.1	1.85±0.1	3.3±0.1	4.3±0.1
	N	0.8±0.1	0.95±0.1	1.85±0.1	2.05±0.1
	O	0.2±0.05	0.25±0.05	0.3±0.05	0.3±0.05
REEL	P	ϕ178±2	ϕ178±2	ϕ255±2	ϕ255±2
	Q	ϕ60±2	ϕ60±2	ϕ100±2	ϕ100±2
	R	ϕ13±0.2	ϕ13±0.2	ϕ13±0.2	ϕ13±0.2
	S	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8	ϕ21±0.8
	U	2±0.5	2±0.5	2±0.5	2±0.5
	W	9.5±1	9.5±1	13.5±1	13.5±1
Qty		3000	3000	2000	2000



		SAW FILTERS								MCF
		PAFC433.92A	SF5032	SF9148	SF3838	SF7050	SF3535	SF3030	SF6035	MF7050
TAPE	A	2.0±0.05	2.0±0.10	2.0±0.10	2.0±0.05	2.0±0.10	2.0±0.10	2.0±0.05	2.0±0.1	2.0±0.1
	B	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1
	C	ϕ1.5+0.1/–0	ϕ1.55±0.05	ϕ1.55±0.05	ϕ1.55±0.05	ϕ1.55±0.05	ϕ1.55±0.05	ϕ1.5+0.1/–0	ϕ1.55±0.05	ϕ1.55±0.05
	D	8.0±0.1	8.0±0.1	8.0±0.1	8.0±0.1	8.0±0.1	8.0±0.1	4.0±0.1	8.0±0.1	8.0±0.1
	E	5.5±0.05	5.5±0.1	7.5±0.1	5.5±0.05	7.5±0.1	5.5±0.05	5.5±0.05	7.5±0.1	7.5±0.1
	F	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
	G	12.0±0.3	12.0±0.3	16.0±0.3	12.0±0.15	16.0±0.3	12.0±0.2	12.0±0.2	16.0±0.3	16.0±0.3
	H	ϕ1.55±0.1	ϕ1.5+0.05–0	ϕ1.55±0.05	ϕ1.55±0.05	ϕ1.55±0.05	ϕ1.55±0.05	1.7±0.1	1.55±0.05	ϕ1.55±0.05
	J	5.3±0.1	5.25±0.1	9.4±0.1	4.2±0.1	7.6±0.1	3.95±0.2	3.25±0.1	6.35±0.1	7.5±0.1
	L	5.3±0.1	3.45±0.1	5.1±0.1	4.2±0.1	5.6±0.1	3.95±0.2	3.25±0.1	3.85±0.1	5.5±0.1
	N	2.1±0.1	1.5+0.1/–0	2.0±0.1	1.8±0.1	1.94±0.1	1.35±0.1	1.35±0.1	1.8±0.1	1.8±0.1
	O	0.3±0.05	0.3±0.1	0.3±0.05	0.3±0.05	0.3±0.05	0.2±0.05	0.25±0.05	3.0±0.05	0.3±0.05
REEL	P	ϕ255±2	ϕ330±1	ϕ330±1	ϕ178±2	ϕ330±1	ϕ178±2	ϕ178±2	ϕ330±2	ϕ178±2
	Q	ϕ100±2	ϕ100±1	ϕ100±1	ϕ80±1	ϕ100±1	ϕ80±1	ϕ80±1	ϕ100±1	ϕ80±2
	R	ϕ13±0.2	ϕ13±0.3	ϕ13±0.3	ϕ13±0.5	ϕ13±0.3	ϕ13±0.5	ϕ13±0.5	ϕ13±0.3	ϕ13±0.5
	S	ϕ21±0.8	ϕ21±0.5	ϕ21±0.5	ϕ21±0.5	ϕ21±0.5	ϕ21±0.5	ϕ21±0.5	ϕ21±0.5	ϕ21±0.8
	U	2±0.5	2±0.5	2±0.5	2±0.5	2±0.5	2±0.5	2±0.5	2±0.5	2±0.5
	W	13.5±1	12.4+2/–0	16.4±0.5	13.5+2/–0	16.4±0.5	13.5+2/–0	13.5+2/–0	16.4±0.5	17.5+1/–0.5
Qty		2000	3000	3000	1000	3000	1000	1000	3000	1000

THE NEW VALUE FRONTIER

KYOCERA

RF Modules

Antenna Switch Modules
Bluetooth™ Modules

AVX

Pb Free RoHS Compliant

Features

- Small size
- Low loss
- Built-in 2LPF for receiver

Applications

- GSM900/DCS

How to Order

LM - D 5 18 S2 - 2□
① ② ③ ④ ⑤ ⑥

①Series
②Circuit

D	Dual

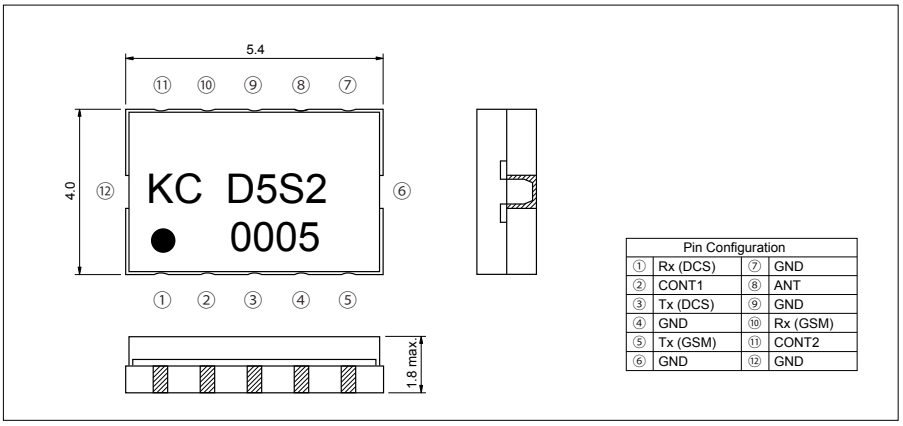
③Type
④Height

18	1.8mm max.

⑤S2: GSM900/DCS
⑥Custom Specification

Dimensions

(Unit : mm)



Pin Configuration			
①	Rx (DCS)	⑦	GND
②	CONT1	⑧	ANT
③	Tx (DCS)	⑨	GND
④	GND	⑩	Rx (GSM)
⑤	Tx (GSM)	⑪	CONT2
⑥	GND	⑫	GND

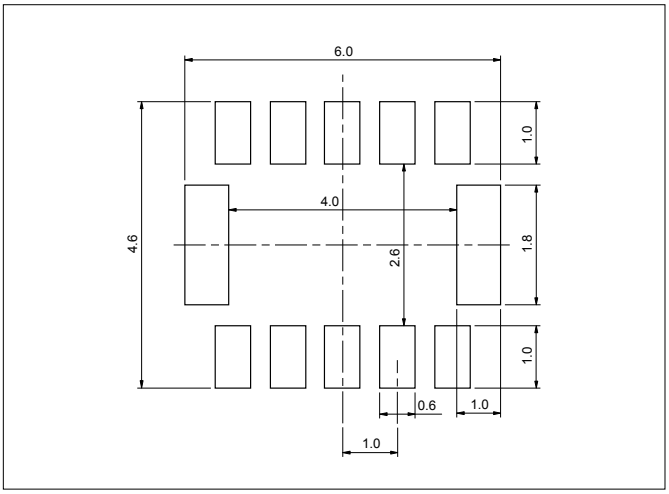
Specifications

(at 25°C)

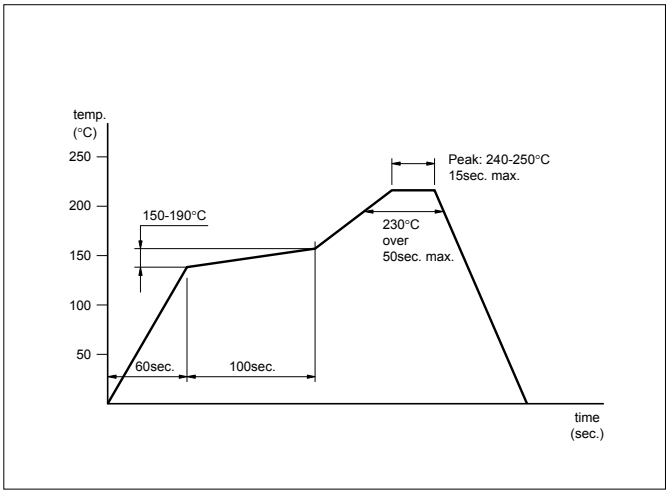
Part No.	GSM					DCS				
	TX			RX		TX			RX	
	Freq. (MHz)	Ins. Loss (dB)	Att. (2*f0, 3*f0) (dB)	Freq. (MHz)	Ins. Loss (dB)	Freq. (MHz)	Ins. Loss (dB)	Att. (2*f0, 3*f0) (dB)	Freq. (MHz)	Ins. Loss (dB)
LM-D518S2-2	880 to 915	≤1.1	≥30	925 to 960	≤1	1710 to 1785	≤1.3	≥25	1805 to 1880	≤1.2

Recommended Land Pattern

(Unit : mm)



Recommended Reflow Profile



Pb Free RoHS Compliant

Features

- Small and low profile
- Low loss
- Built-in 2LPF for receiver
- Excellent shock-resistant
- Support multiple bands (GSM850/GSM900/ DCS (GSM1800)/ PCS (GSM1900)

Applications

- GSM850/ GSM900/ DCS/ PCS for Dual Band

How to Order

LM - D 6 15 S3
① ② ③ ④ ⑤

①Series
②Circuit

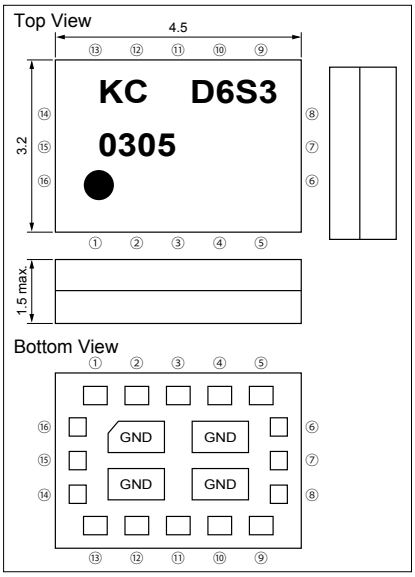
D	Dual

③Type
④Height

15	1.5mm max.

⑤Custom Specification

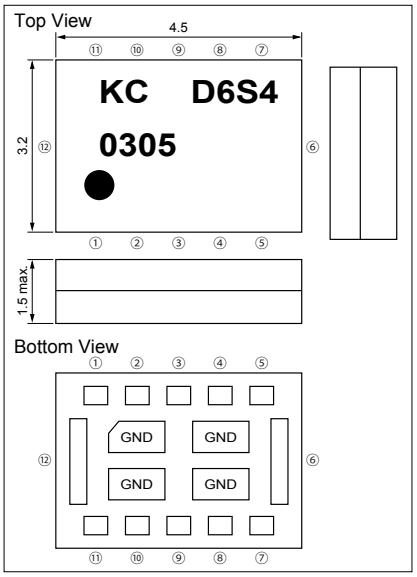
Dimensions (LM-D615S3) (Unit : mm)



Pin Assingment (LM-D615S3)

①	GND
②	TX1 (GSM850/900)
③	GND
④	N.C
⑤	RX2 (DCS/PCS)
⑥	N.C
⑦	RX1 (GSM850/900)
⑧	N.C
⑨	N.C
⑩	VCont1
⑪	GND
⑫	ANT
⑬	GND
⑭	VCont2
⑮	GND
⑯	TX2 (DCS/PCS)

Dimensions (LM-D615S4) (Unit : mm)



Pin Assingment (LM-D615S4)

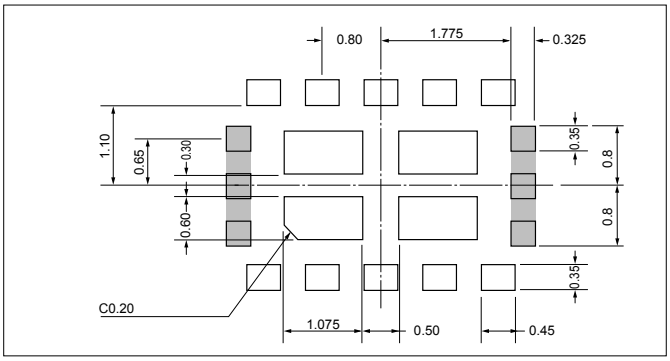
①	RX2 (DCS/PCS)
②	VCont1
③	TX2 (DCS/PCS)
④	GND
⑤	TX1 (GSM850/900)
⑥	GND
⑦	GND
⑧	ANT
⑨	GND
⑩	RX1(GSM850/900)
⑪	VCont2
⑫	GND

Specifications

(at 25°C)

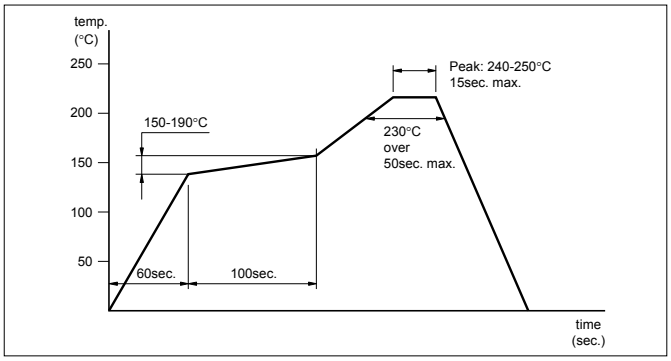
Part No.	GSM (850/900)					DCS/PCS				
	TX			RX		TX			RX	
	Freq. (MHz)	Ins. Loss (dB)	Att. (2*f0, 3*f0) (dB)	Freq. (MHz)	Ins. Loss (dB)	Freq. (MHz)	Ins. Loss (dB)	Att. (2*f0, 3*f0) (dB)	Freq. (MHz)	Ins. Loss (dB)
LM-D615S3	824 to 849	≤1.2	≥35(2*f0), ≥30(3*f0)	869 to 894	≤1.1	1710 to 1785	≤1.4	≥30	1805 to 1880	≤1.3
	880 to 915			925 to 960		1850 to 1910			1930 to 1990	
LM-D615S4	824 to 849	≤1.2	≥35(2*f0), ≥30(3*f0)	869 to 894	≤1	1710 to 1785	≤1.4	≥25	1805 to 1880	≤1.2
	880 to 915			925 to 960		1850 to 1910			1930 to 1990	

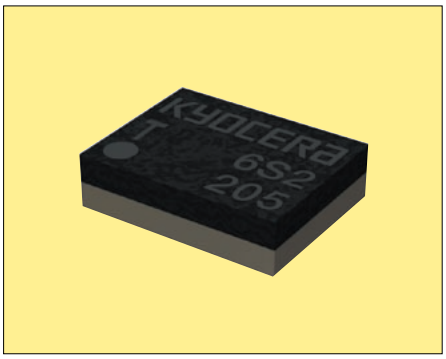
Recommended Land Pattern (Unit : mm)



Shaded land area for LM-D615S4.

Recommended Reflow Profile





Pb Free RoHS Compliant

Features

- Small and low profile
- Low loss
- Built-in 2LPF for receiver
- Excellent shock-resistant
- Support multiple bands (GSM850/GSM900/ DCS (GSM1800)/ PCS (GSM1900)

Applications

- GSM850/ GSM900/ DCS/ PCS for Triple Band

How to Order

LM - T 6 15 S3
① ② ③ ④ ⑤

①Series
②Circuit

T	Triple

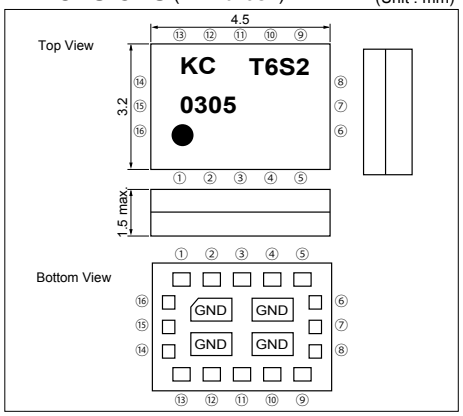
③Type
④Height

15	1.5mm max.

⑤Custom Specification

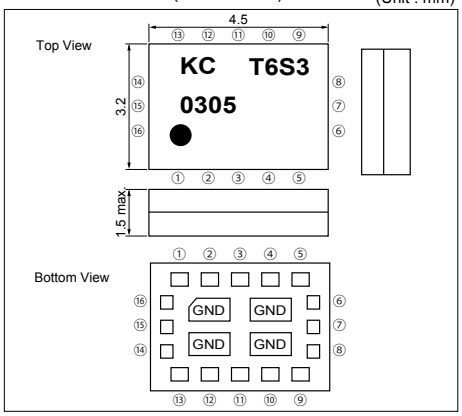
Dimensions (LM-T615S2)

(Unit : mm)



Dimensions (LM-T615S3)

(Unit : mm)



Pin Assingment (LM-T615S2)

①	GND	⑨	GND
②	N.C	⑩	ANT
③	RX1 (GSM850/900)	⑪	N.C
④	RX2 (DCS)	⑫	GND
⑤	RX3 (PCS)	⑬	GND
⑥	VCont1	⑭	TX2 (DCS/PCS)
⑦	VCont2	⑮	GND
⑧	VCont3	⑯	TX1 (GSM850/900)

Pin Assingment (LM-T615S3)

①	GND	⑨	N.C
②	TX1 (GSM850/900)	⑩	VCont1
③	GND	⑪	GND
④	RX3 (PCS)	⑫	ANT
⑤	RX2 (DCS)	⑬	GND
⑥	N.C	⑭	VCont2
⑦	RX1 (GSM850/900)	⑮	GND
⑧	N.C	⑯	TX2 (DCS/PCS)

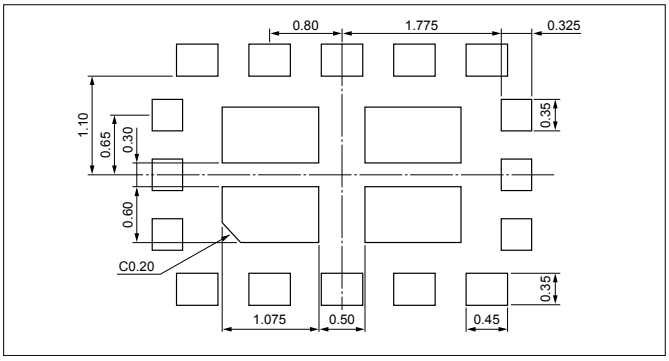
Specifications

(at 25°C)

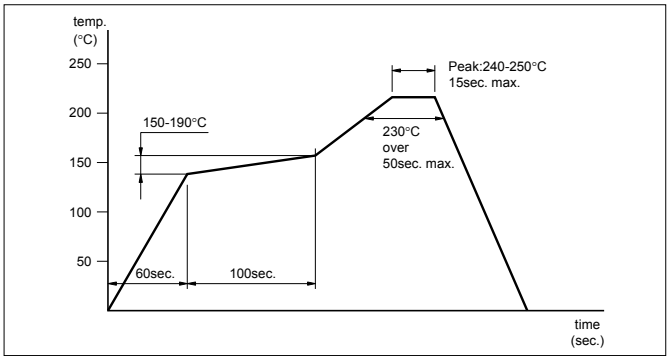
Part No.	GSM (850/900)					DCS/PCS				
	TX			RX		TX			RX	
	Freq. (MHz)	Ins. Loss (dB)	Att. (2*f0, 3*f0) (dB)	Freq. (MHz)	Ins. Loss (dB)	Freq. (MHz)	Ins. Loss (dB)	Att. (2*f0, 3*f0) (dB)	Freq. (MHz)	Ins. Loss (dB)
LM-T615S2	824 to 849	≤1.2	≥30(2*f0), ≥30(3*f0)	869 to 894	≤1	1710 to 1785	≤1.5	≥30 (2*f0, 3*f0)	1805 to 1880	≤1.4
	880 to 915			925 to 960		1850 to 1910			1930 to 1990	
LM-T615S3	824 to 849	≤1.2	≥30(2*f0), ≥30(3*f0)	869 to 894	≤1	1710 to 1785	≤1.5	≥30 (2*f0, 3*f0)	1805 to 1880	≤1.4
	880 to 915			925 to 960		1850 to 1910			1930 to 1990	

Recommended Land Pattern

(Unit : mm)



Recommended Reflow Profile



Pb Free RoHS Compliant

Features

- Small and low profile
- Low current consumption
- Built-in 2LPF for receiver
- Built-in ESD protection circuit
- Excellent shock-resistant
- Support multiple bands (GSM850/GSM900/ DCS (GSM1800)/ PCS (GSM1900)
- Include ESD protection

Applications

- GSM/ Quad System

How to Order

LX - Q 6 14 S2 E
① ② ③ ④ ⑤ ⑥

①Series
②Circuit

Q	Quad

③Type
④Height

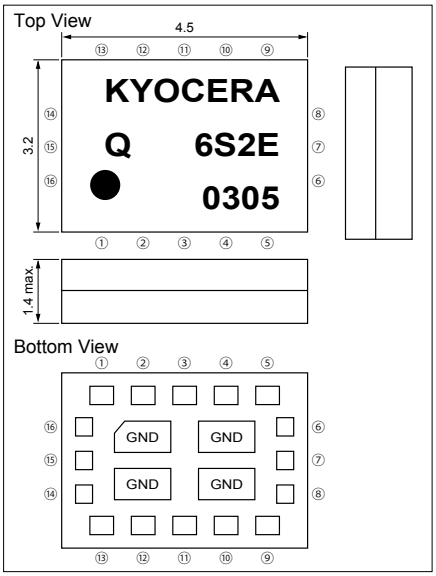
15	1.4mm max.

⑤Custom Specification
⑥ESD Protection

E	Built-in ESD Protection Circuit

Dimensions

(Unit : mm)



Pin Assingment

①	GND	⑨	GND
②	RX1 (GSM850)	⑩	ANT
③	RX2 (GSM900)	⑪	V_{DD}
④	RX3 (DCS)	⑫	GND
⑤	RX4 (PCS)	⑬	GND
⑥	VCont1	⑭	TX2 (DCS/PCS)
⑦	VCont2	⑮	GND
⑧	VCont3	⑯	TX1 (GSM850/900)

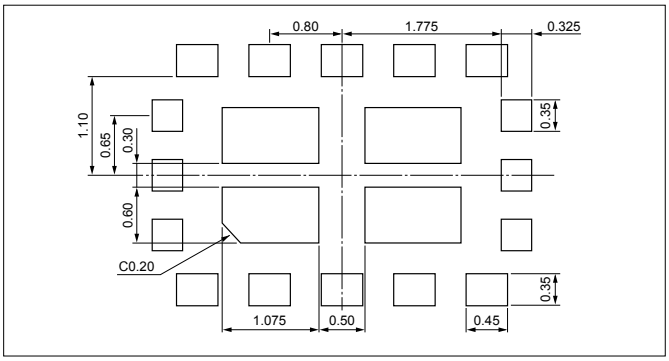
Specifications

(at 25°C)

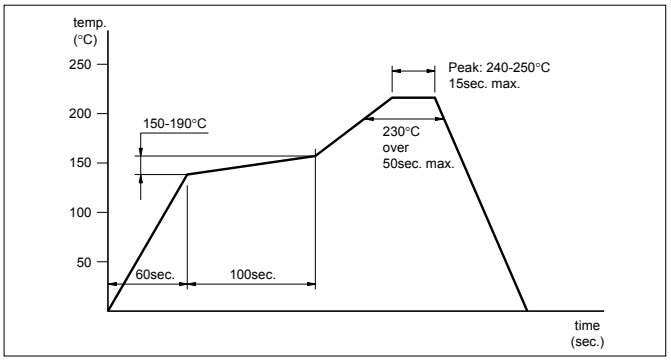
Part No.	GSM (850/900)					DCS/PCS				
	TX			RX		TX			RX	
	Freq. (MHz)	Ins. Loss (dB)	Att. (2*f0, 3*f0) (dB)	Freq. (MHz)	Ins. Loss (dB)	Freq. (MHz)	Ins. Loss (dB)	Att. (2*f0, 3*f0) (dB)	Freq. (MHz)	Ins. Loss (dB)
LX-Q614S2E	824 to 849	≤1.45	≥30 (2*f_0, 3*f_0)	869 to 894	≤1.5	1710 to 1785	≤1.55	≥30 (2*f_0, 3*f_0)	1805 to 1880	≤1.5
	880 to 915			925 to 960		1850 to 1910			1930 to 1990	

Recommended Land Pattern

(Unit : mm)



Recommended Reflow Profile



Pb Free

RoHS Compliant

Features

- Low loss and low current consumption with GaAs switch
- Excellent insertion loss of UMTS pass with typical 0.6dB
- Excellent isolation to Rx DCS with minimum of 32dB
- Rx terminal is compatible with GSM850/ 900/ 1800/ 1900MHz

Applications

- GSM/ Quad + UMTS Single

How to Order

LX - P 6 12 S2
① ② ③ ④ ⑤

①Series
②Circuit

P	GSM Quad + UMTS single

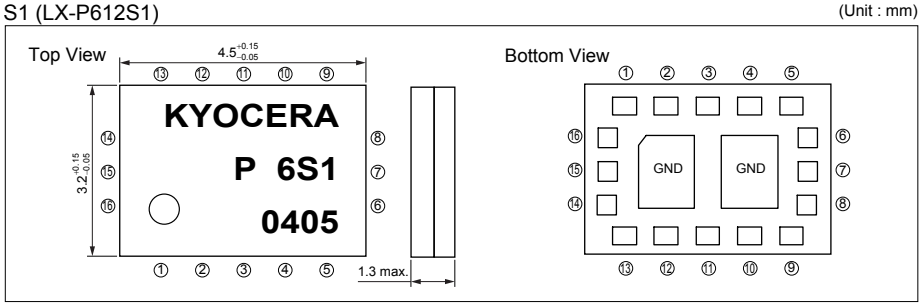
③Type
④Height

15	1.3mm max.

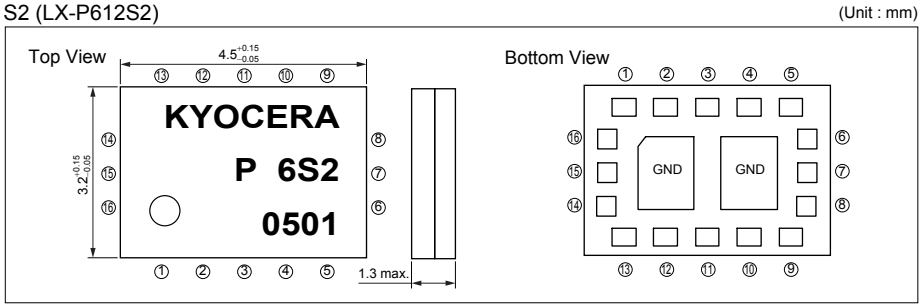
⑤Custom Specification

Dimensions

S1 (LX-P612S1) (Unit : mm)



S2 (LX-P612S2) (Unit : mm)



Pin Assingment

(LX-P612S1)

①	RX2(GSM850/900/DCS/PCS)	⑨	GND
②	RX3(GSM850/900/DCS/PCS)	⑩	ANT
③	RX4(GSM850/900/DCS/PCS)	⑪	GND
④	RX1(GSM850/900/DCS/PCS)	⑫	TRX (UMTS)
⑤	GND	⑬	Vdd
⑥	TX2(DCS/PCS)	⑫	Vc1
⑦	GND	⑮	Vc2
⑧	TX1(GSM850/900)	⑯	Vc3

(LX-P612S2)

①	RX2(GSM850/900/DCS/PCS)	⑨	TRX (UMTS)
②	RX3(GSM850/900/DCS/PCS)	⑩	Vdd
③	RX4(GSM850/900/DCS/PCS)	⑪	GND
④	RX1(GSM850/900/DCS/PCS)	⑫	ANT
⑤	GND	⑬	GND
⑥	TX2 (DCS/PCS)	⑭	Vc1
⑦	GND	⑮	Vc2
⑧	TX1 (GSM850/900)	⑯	Vc3

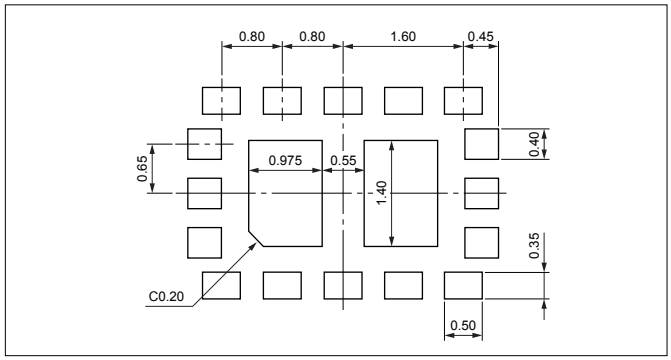
Specifications

(at 25°C)

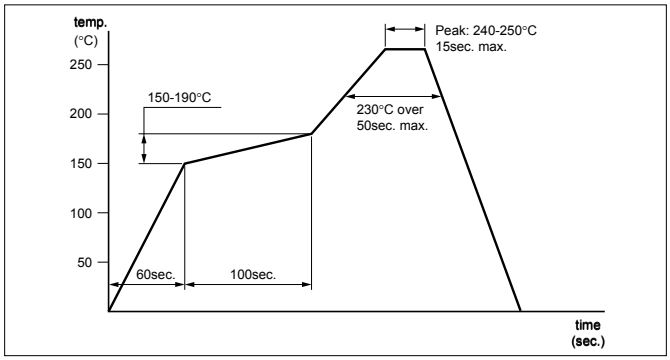
Part No.	GSM (850/900)					DCS/PCS					UMTS		
	TX			RX		TX			RX		TX		
	Freq. (MHz)	Ins. Loss (dB)	Att. (dB)	Freq. (MHz)	Ins. Loss (dB)	Freq. (MHz)	Ins. Loss (dB)	Att. (dB)	Freq. (MHz)	Ins. Loss (dB)	Freq. (MHz)	Ins. Loss (dB)	Att. (dB)
LX-P612S1	824 to 849 880 to 915	≤1.2	≥67 (2*f0, 3*f0)	869 to 894 925 to 960	≤1.05	1710 to 1785 1850 to 1910	≤1.4	≥65 (2*f0, 3*f0)	1805 to 1880 1930 to 1990	≤1.3	1710 to 1785 1850 to 1910	≤0.85	≥65(2*f0, 3*f0)
LX-P612S2	824 to 849 880 to 915	≤1.2	≥67 (2*f0, 3*f0)	869 to 894 925 to 960	≤1.05	1710 to 1785 1850 to 1910	≤1.4	≥65 (2*f0, 3*f0)	1805 to 1880 1930 to 1990	≤1.3	1710 to 1785 1850 to 1910	≤0.85	≥65(2*f0, 3*f0)

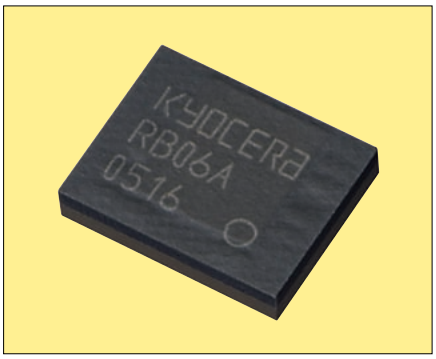
Recommended Land Pattern

(Unit : mm)



Recommended Reflow Profile





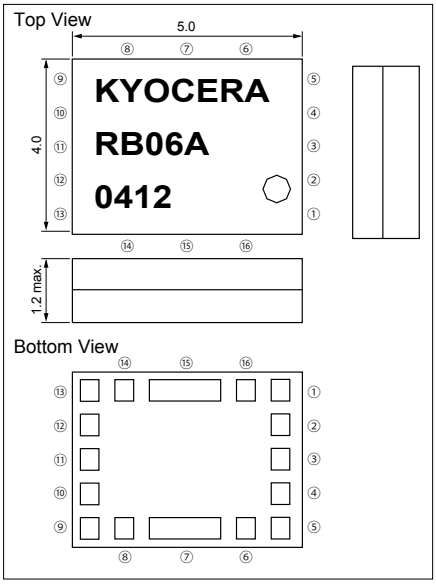
Pb Free RoHS Compliant

Features

- Best solution for CDMA cell phone with bluetooth function
- Miniature size of 5.0 × 4.0 × 1.1mm
- Improved reception sensitivity (–88dBm typ)
- Low power consumption (Tx: 36mA typ, Rx: 38mA typ)
- Wide operating temperature range of –30 to +85°C

Dimensions

(Unit : mm)



Pin Assigments

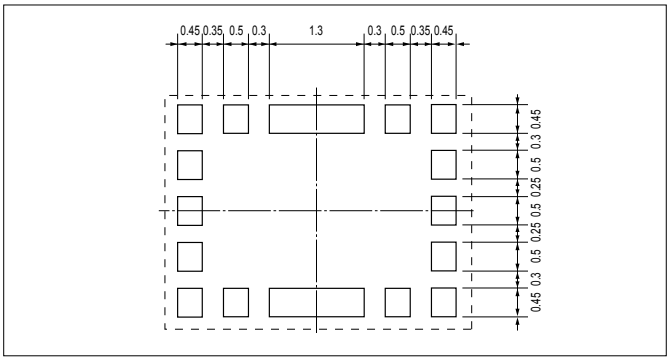
①	GND	⑨	CLK_REF
②	LDO1	⑩	SBCK
③	LDO2	⑪	SBDT
④	XTAL_IN	⑫	VDD_MSM
⑤	SYNC_DET/TX_EN	⑬	N.C
⑥	SBST	⑭	VDD_A
⑦	GND	⑮	GND
⑧	RX_BB/TX_BB	⑯	ANT

Specifications

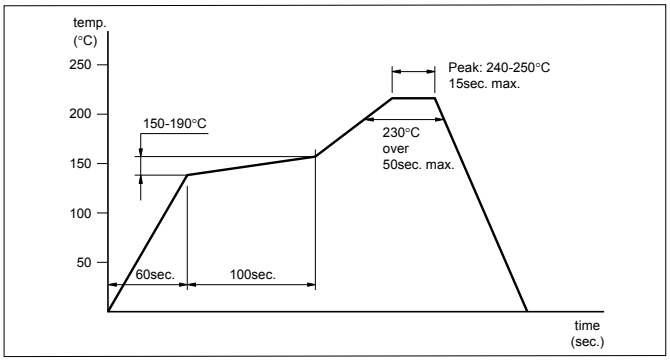
	Unit	min.	typ	max.
Power Supply VDD_MSM	**V**	2.5	2.7	2.9
Current Cosumption				
Receive Mode	mA	–	37	40
Transmit Mode	mA	–	36	40
Standby Mode	µA	–	20	50
Ambient Temperature	°C	–30	25	85
Receiver RF Specifications				
RCV/CA/02/C (Sensitivity-Multi Slot Packets)				
DH5	dBm	–	–88	–81
Transmitter RF Specifications				
TRM/CA/01/C (Output Power)				
Class 2 Pave	dBm	–2	–	3

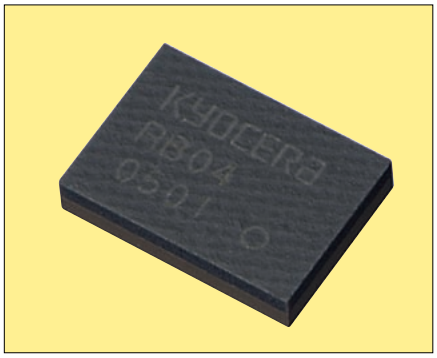
Recommended Land Pattern

(Unit : mm)



Recommended Reflow Profile





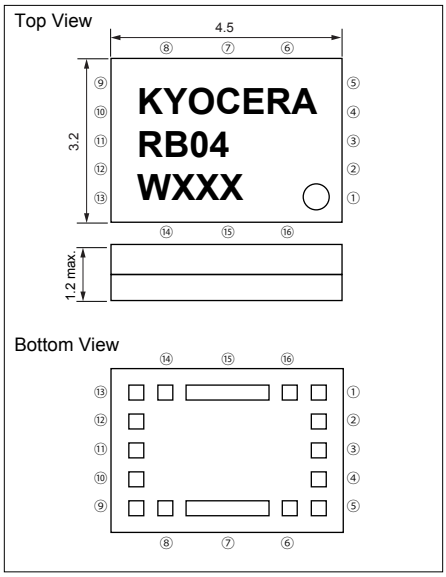
Pb Free RoHS Compliant

Features

- Best solution for CDMA cell phone with bluetooth function
- Miniature size of 4.5 × 3.2 × 1.1mm
- Improved reception sensitivity (–88dBm typ)
- Low power consumption (Tx: 36mA typ, Rx: 38mA typ)
- Wide operating temperature range of –30 to +85°C

Dimensions

(Unit : mm)



Pin Assigments

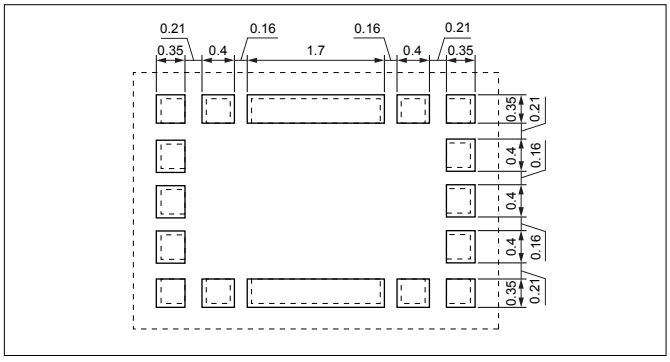
①	GND	⑨	CLK_REF
②	LDO1	⑩	SBCK
③	LDO2	⑪	SBDT
④	XTAL_IN	⑫	VDD_MSM
⑤	SYNC_DET/TX_EN	⑬	N.C
⑥	SBST	⑭	VDD_A
⑦	GND	⑮	GND
⑧	RX_BB/TX_BB	⑯	ANT

Specifications

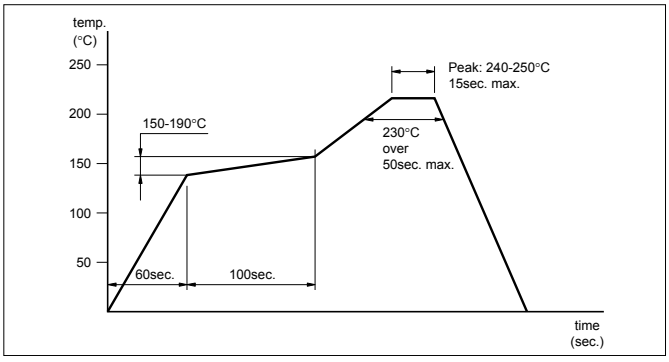
	Unit	min.	typ	max.
Power Supply VDD_MSM	**V**	2.5	2.7	2.9
Current Cosumption				
Receive Mode	mA	–	37	40
Transmit Mode	mA	–	36	40
Standby Mode	µA	–	20	50
Ambient Temperature	°C	–30	25	85
Receiver RF Specifications				
RCV/CA/02/C (Sensitivity-Multi Slot Packets)				
DH5	dBm	–	–88	–81
Transmitter RF Specifications				
TRM/CA/01/C (Output Power)				
Class 2 Pave	dBm	–2	–	3

Recommended Land Pattern

(Unit : mm)



Recommended Reflow Profile



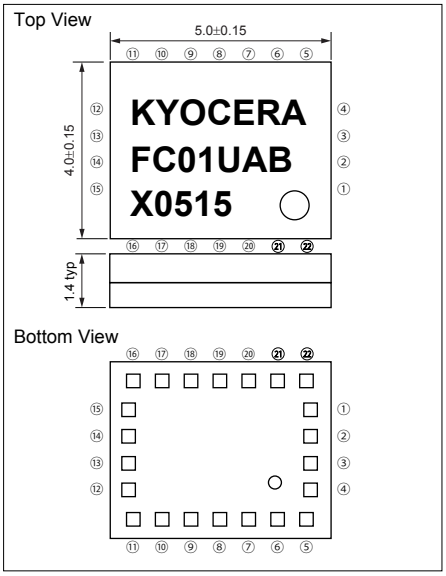
Pb Free RoHS Compliant

Features

- Bluetooth HCI module
- Ultra-miniature size of 5.0 × 4.0 × 1.4mm
- Wide operating temperature range of –20 to +70°C
- Memory and clock unit are need to be attached
- Ver 1.2 compatible
- Class 2

Dimensions

(Unit : mm)



Pin Assigments

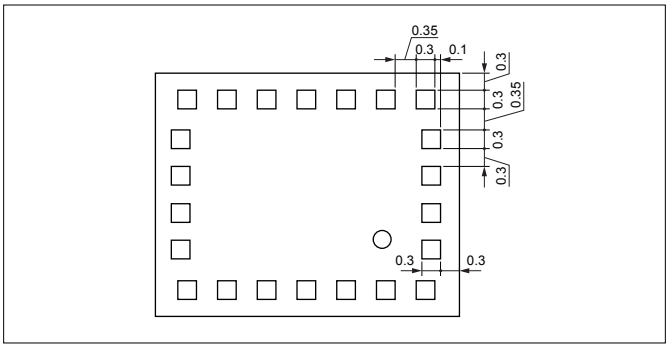
①	GND	⑫	GND
②	CAP	⑬	CLK
③	GND	⑭	GND
④	PCM	⑮	PIO
⑤	PCM	⑯	PIO
⑥	PCM	⑰	V IO
⑦	PCM	⑱	VDD
⑧	UART	⑲	GND
⑨	UART	⑳	RST
⑩	UART	㉑	GND
⑪	UART	㉒	ANT

Specifications

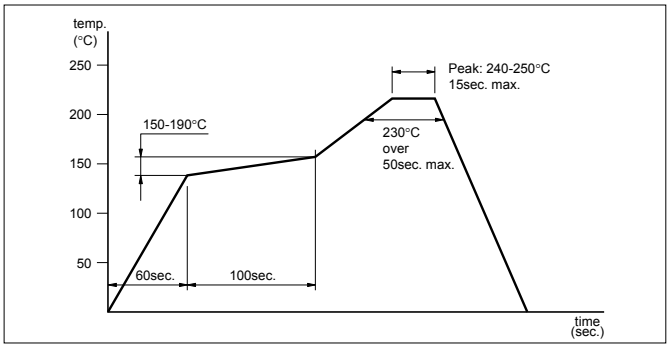
	Unit	min.	typ	max.
Power Supply VDD_MSM	**V**	2.2	–	3.6
Ambient Temperature	°C	–20	25	70
Receiver RF Specifications **RCV/CA/02/C (Sensitivity-Multi Slot Packets)** DH5	dBm	–	–80	–72
Transmitter RF Specifications **TRM/CA/01/C (Output Power)** Class 2 Pave	dBm	–6	–	4

Recommended Land Pattern

(Unit : mm)



Recommended Reflow Profile



THE NEW VALUE FRONTIER

KYOCERA

Others

Shock Sensors
Piezo Ceramic Elements
Piezo Buzzers

AVX

RoHS Compliant

Features

- Charge sensitivity type shock sensor
- 0 and 25 degree inclined angle available
- Small size, low profile, high sensitivity
- Tape and reel packaging available
- Reflow solderable

Applications

- Data Protection for Disc Media such as HDD, DVD, CD-R/RW etc.
- Shock Detection for Air Bag System

How To Order

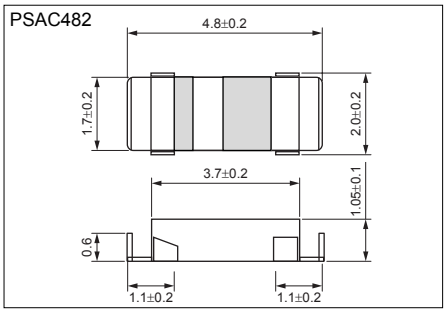
PSAC 38 0 A - R
① ② ③ ④ ⑤

①Series
②Size
③Inclined Angle (0: 0°, 2: 25°)
④Type
⑤Packaging (R: Tape and Reel)

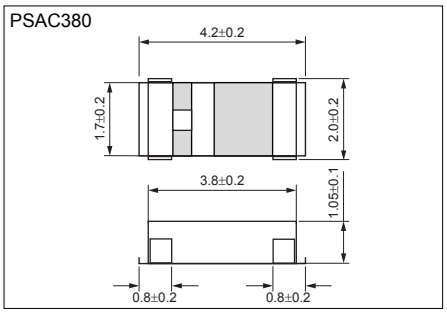
Dimensions

(Unit : mm)

PSAC482

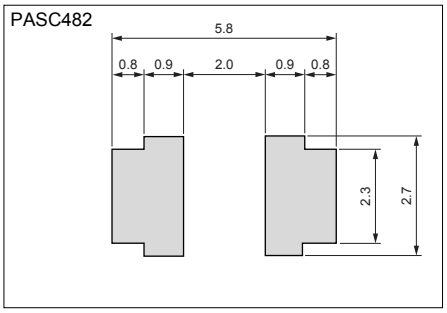


PSAC380

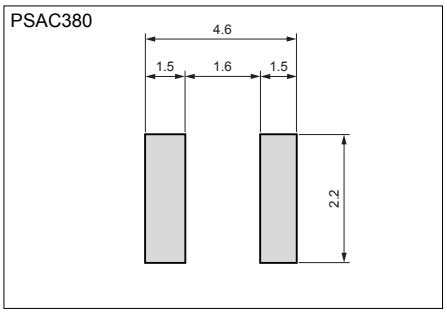


Recommended Land Pattern

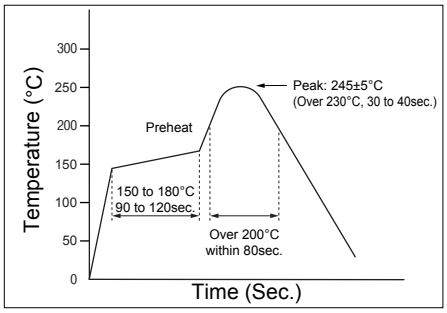
PASC482



PSAC380



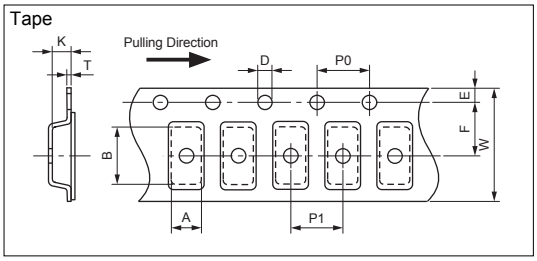
Recommended Reflow Profile



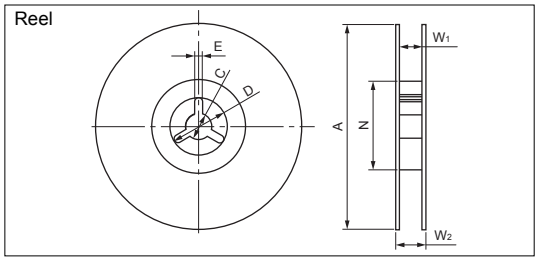
Packaging

(Unit : mm)

Tape



Reel



Part No.	Symbol	A	B	W	E	F
PSAC482	Dimension	2.5±0.1	5.1±0.1	12.0±0.2	1.75±0.1	5.5±0.1
PSAC380		2.3±0.1	4.8±0.1			

Parts No.	Symbol	P0	P1	D	K	T
PSAC482	Dimension	4.0±0.1	4.0±0.1	1.5+0.1/-0	1.25±0.1	0.3±0.05
PSAC380					1.3±0.1	

Symbol	A	N	W_1	W_2
Dimension	180±5.0	60 min.	12.5 +2.0/−0.0	20.5 max.

Symbol	C	D	E
Dimension	13.0±0.2	21.0±0.8	2.0±0.5

Specifications

Item / Part No.	Inclined Angle (degree)	Capacitance (pF)	Charge Sensitivity (pC/G)	Resonant Frequency (kHz)	Isolated Resistance (GΩ)	Non-linearity (%)
PSAC482S-R	25±3	315±30%	0.25±30%	23±30%	0.5 min.	5 max.
PSAC380A-R	0±3	400±30%	0.15±30%	30±30%	0.5 min.	5 max.

Features

- Wide variety of tones by connecting to IC
- Low current consumption, thin and light design
- High reliability and no contact noise

Applications

- Clocks, Electronic Calculators, Pagers, Cameras
- Equipment Using Microcontrollers (Microwave Ovens, TVs, Stereos, Automobiles, etc.)
- Telecommunications (Facsimile Machines, Telephones)
- Electronic Medical Instruments

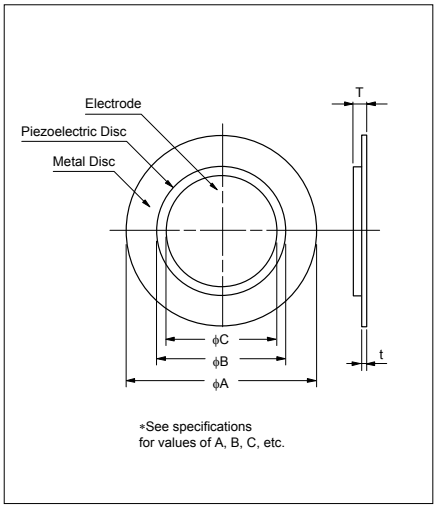
How to Order

KBS - 20 DA - 7 A □ -1
① ② ③ ④ ⑤ ⑥ ⑦

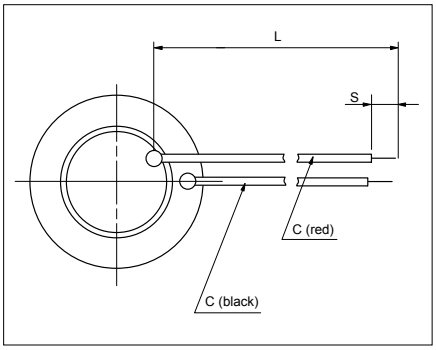
①Series
②Diameter (mm)
③Appearance (Disc-Shaped Buzzer)
④Resonant Frequency
⑤2-Electrode Type
(A: Element Only, C: With Lead)
⑥Metal (Blank: Brass)
⑦Option Spec (Lead-wire Spec etc.)

Dimensions

(Unit : mm)



Standard Leads

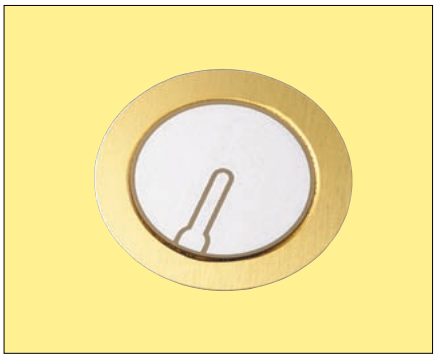


W: Thickness	AWG-32 UL-1571
L: Length (mm)	50±5, 75±5, 100±10
S: Strip (mm)	3±1
C: Color	red, black

Specifications (A type)

Part Number	Resonant Frequency [kHz]	Resonant Impedance [Ω]	Capacitance [pF]	Dimensions (mm)					Metal Disc Material
				Metal Disc (ϕA)	Ceramic Disc (ϕB)	Electrode (ϕC)	Total Thickness (T)	Metal Disc Thickness (t)	
KBS-13DA-12A	12.0±1.2	700	5,000±30%	13.4±0.1	10.0±0.3	(9.0)	0.36±0.1	0.15±0.03	Brass
KBS-15DA-9A-2	10.5±3.0	600	8,000±30%	15.0±0.1	12.0±0.3	(11.0)	0.42±0.1	0.20±0.03	Brass
KBS-20DA-7A	6.6±1.0	300	10,000±30%	20.0±0.1	14.2±0.3	(13.0)	0.45±0.1	0.20±0.03	Brass
KBS-23DA-4A	4.0±1.0	600	12,000±30%	22.8±0.1	15.0±0.3	(14.0)	0.41±0.1	0.15±0.03	Brass
KBS-27DA-5A	4.6±0.5	200	20,000±30%	27.0±0.1	20.2±0.3	(19.0)	0.53±0.1	0.25±0.03	Brass
KBS-30DA-1A	1.4±0.5	500	∗48,000±30%	30.0±0.1	20.2±0.3	(19.0)	0.23±0.1	0.10±0.03	Brass
KBS-35DA-3A	2.9±0.5	200	30,000±30%	35.0±0.1	25.0±0.5	(23.5)	0.53±0.1	0.25±0.03	Brass

∗ Measured at 120Hz, all others at 1kHz



Features

- High sound pressure level and clear sound by connecting to a self oscillating circuit
- Thin and light design
- High reliability and no contact noise

Applications

- Smoke Detectors, Security Alarms and Other Warning Devices
- Pagers, Electronic Calculators, Alarm Signals
- Telephones

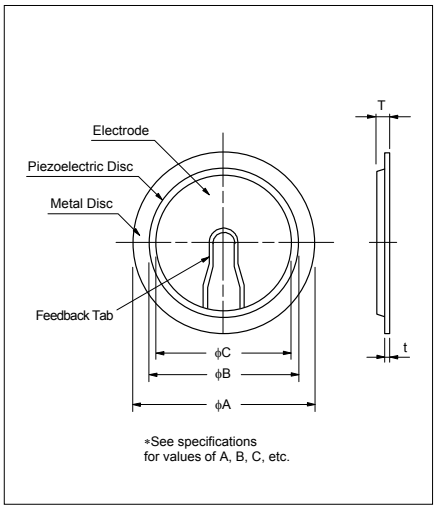
How to Order

KBS - 35 DA - 3 G □ - 3
① ② ③ ④ ⑤ ⑥ ⑦

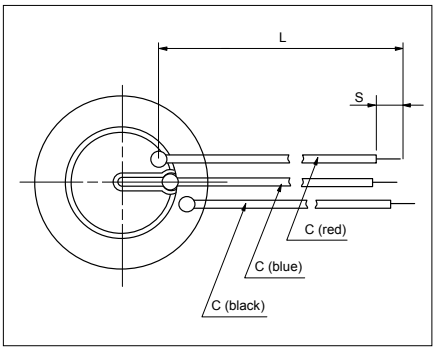
①Series
②Diameter (mm)
③Appearance (Disc-Shaped Buzzer)
④Resonant Frequency
⑤3-Electrode Type
(G: G-Pattern, GC: G-Pattern with Leads)
⑥Metal (Blank: Brass)
⑦Option Spec (Lead-wire Spec etc.)

Dimensions

(Unit : mm)



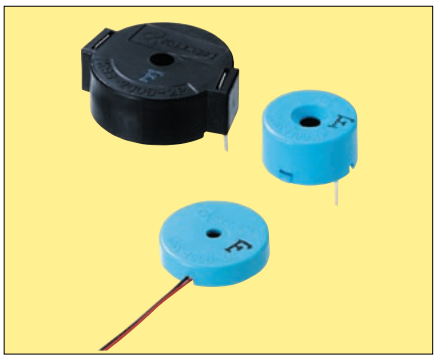
Standard Leads



W: Thickness	AWG-32 UL-1571
L: Length (mm)	50±5, 75±5, 100±10
S: Strip (mm)	3±1
C: Color	red, black, blue

Specifications (G type)

Part Number	Resonant Frequency [kHz]	Resonant Impedance [Ω]	Capacitance [pF]	Dimensions (mm)					Metal Disc Material
				Metal Disc (ϕA)	Ceramic Disc (ϕB)	Electrode (ϕC)	Total Thickness (T)	Metal Disc Thickness (t)	
KBS-27DA-5G	4.6±0.5	200	16,000±30%	27.0±0.1	20.2±0.3	(19.0)	0.53±0.1	0.25±0.03	Brass
KBS-35DA-3G	2.9±0.5	200	25,000±30%	35.0±0.1	25.0±0.3	(23.6)	0.53±0.1	0.25±0.03	Brass



Features

- Low current consumption - high sound pressure
- Compact, light design
- High reliability and no contact noise
- Easy-mounting
- Wide variety of tones can be made by cavity designing
- Functions over a wide range of Input voltage

How to Order

KBS - 27 DB - 3 A
① ② ③ ④ ⑤

①Series
②Diameter (mm)
③Appearance (Buzzer with Casing)
④Resonant Frequency
⑤Type of Terminals
(A: With Lead, P: Round Pin)

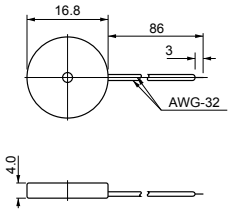
Applications

- Confirmation Tone for Various Office Automation Equipment
- Automobiles, Microwave Ovens, Refrigerators
- Clocks, Toys, Game Machines

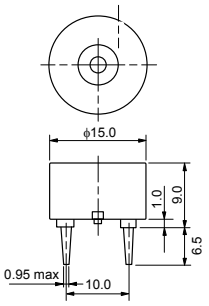
Dimensions

(Unit : mm)

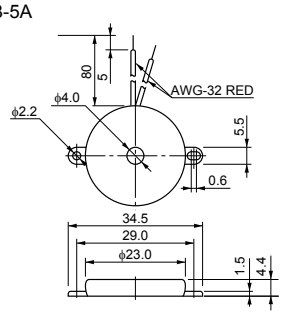
KBS-15DB-4A



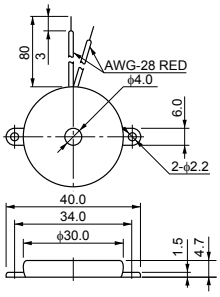
KBS-13DB-4P-2



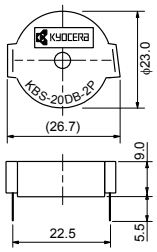
KBS-20DB-5A



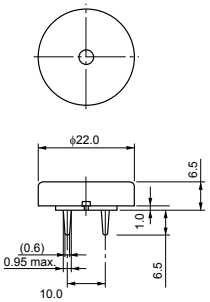
KBS-27DB-3A



KBS-20DB-2P-0



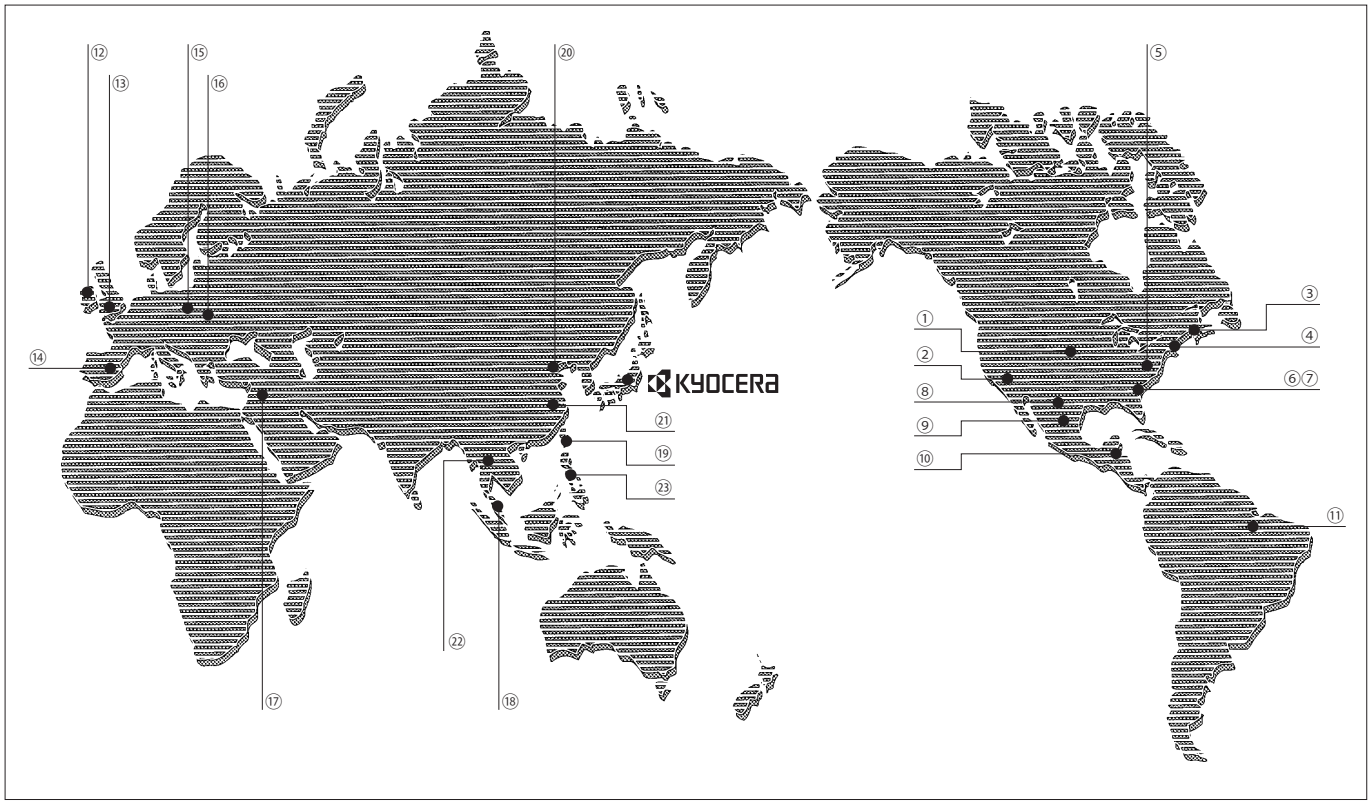
KBS-20DB-4P-0



Specifications

Part Number	Sound Pressure Level	Capacitance
KBS-13DB-4P-2	73db min. 4.096kHz 10Vp-p SQ 30cm	10nF±30%
KBS-20DB-2P-0	75db min. 2.048kHz 10Vp-p SQ 30cm	24nF±30%
KBS-20DB-4P-0	77db min. 4.096kHz 10Vp-p SQ 30cm	14nF±30%
KBS-15DB-4A	72db min. 4.096kHz 10Vp-p SQ 30cm	9.5nF±30%
KBS-20DB-5A	75db min. 5.0kHz 10Vp-p SQ 30cm	10nF±30%
KBS-27DB-3A	75db min. 3.0kHz 10Vp-p SQ 30cm	20nF±30%

■Manufacturing Plants (Kyocera & AVX Group)



North America	
Plant	Location
① Colorado	U.S.A
② Sun Valley	
③ Biddeford	
④ Olean	
⑤ Raleigh	
⑥ Conway	
⑦ Myrtle Beach	

Central, South America	
Plant	Location
⑧ Juarez	Mexico
⑨ Chihuahua	
⑩ El Salvador	El Salvador
⑪ Manaus	Brazil

Europe	
Plant	Location
⑫ Coleraine	Ireland
⑬ Paignton	U.K.
⑭ Dijon	France
⑮ Lanskroun	Czech
⑯ Üherskê	

Middle East	
Plant	Location
⑰ Jerusalem	Israel

Asia	
Plant	Location
⑱ Penang	Malaysia
⑲ Taiwan	Taiwan
⑳ Tianjin	P.R.C

KYOCERA Plant	
Plant	Location
㉑ SKE	Shanghai

KYOCERA KINSEKI Plant	
Plant	Location
㉒ KYOCERA KINSEKI ELECTRONICS (Thailand)	Thailand
㉓ KYOCERA KINSEKI PHILIPPINES	Philippines

■Kyocera Network in Japan

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KYOCERA KINSEKI Headquarters

KYOCERA KINSEKI
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KYOCERA KINSEKI
Yamagata Corporation

KYOCERA KINSEKI
Chiba Corporation

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KYOCERA / KYOCERA KINSEKI
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Beijing, P.R. China 100016
Phone: (86)-(10)-8458-3385 / 3386 Fax: (86)-(10)-8458-3382

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2. Contents in this catalog are subject to change without notice. It is recommended to confirm the latest information at the time of usage. Also, Kyocera Electronic Components Catalog is revised once a year. We may not be able to accept requests based on old catalogs.
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4. Even though we strive for improvements of quality and reliability of products, it is requested to design with enough safety margin in equipment or systems in order not to threaten human lives directly or damage human bodies or properties by an accidental result of products.
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