MMDT2227

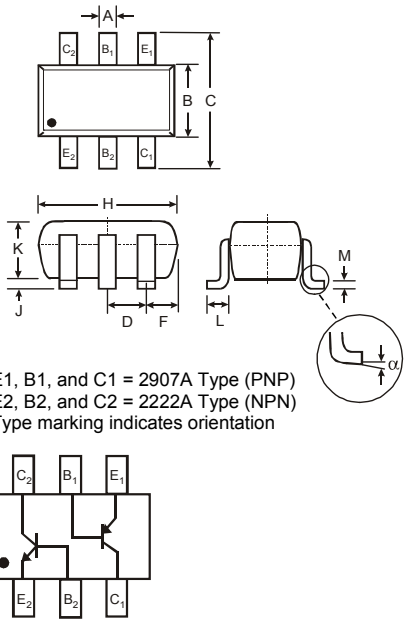
COMPLEMENTARY NPN / PNP
SMALL SIGNAL SURFACE MOUNT TRANSISTOR

Features

- Complementary Pairs One 2222A Type (NPN)
  One 2907A Type (PNP)
- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- **Lead Free/RoHS Compliant (Note 2)**
- **"Green" Device (Note 3 and 4)**

Mechanical Data

- Case: SOT-363
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminals: Solderable per MIL-STD-202, Method 208
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe)
- Terminal Connections: See Diagram
- Ordering & Date Code Information: See Page 4
- Marking Information: K27, See Page 4
- Weight: 0.006 grams (approximate)



Note: E1, B1, and C1 = 2907A Type (PNP)
E2, B2, and C2 = 2222A Type (NPN)
Type marking indicates orientation

SOT-363		
Dim	**Min**	**Max**
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Nominal	
F	0.30	0.40
H	1.80	2.20
J	—	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.25
α	8°	
All Dimensions in mm		

Maximum Ratings, Total Device @T_A = 25°C unless otherwise specified

Characteristic		Symbol	Value	Unit
Total Power Dissipation	(Note 1)	P_d	200	mW
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	625	°C/W
Operating and Storage Temperature Range		T_j, T_{STG}	-55 to +150	°C

Maximum Ratings, 2222A Type (NPN) @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	75	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6.0	V
Collector Current - Continuous	I_C	600	mA

Maximum Ratings, 2907A Type (PNP) @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-60	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-5.0	V
Collector Current - Continuous	I_C	-600	mA

Notes:
1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
2. No purposefully added lead.
3. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com/products/lead_free/index.php.
4. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or Sb2O3 Fire Retardants.

Electrical Characteristics, 2222A Type (NPN) @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 5)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	75	—	V	I_C = 10μA, I_E = 0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	I_C = 10mA, I_B = 0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6.0	—	V	I_E = 10μA, I_C = 0
Collector Cutoff Current	I_{CBO}	—	10	nA μA	V_{CB} = 60V, I_E = 0 V_{CB} = 60V, I_E = 0, T_A = 150°C
Collector Cutoff Current	I_{CEX}	—	10	nA	V_{CE} = 60V, $V_{EB(OFF)}$ = 3.0V
Emitter Cutoff Current	I_{EBO}	—	10	nA	V_{EB} = 3.0V, I_C = 0
Base Cutoff Current	I_{BL}	—	20	nA	V_{CE} = 60V, $V_{EB(OFF)}$ = 3.0V
ON CHARACTERISTICS (Note 5)					
DC Current Gain	h_{FE}	35 50 75 100 40 50 35	— — — 300 — — —	—	I_C = 100μA, V_{CE} = 10V I_C = 1.0mA, V_{CE} = 10V I_C = 10mA, V_{CE} = 10V I_C = 150mA, V_{CE} = 10V I_C = 500mA, V_{CE} = 10V I_C = 10mA, V_{CE} = 10V, T_A = -55°C I_C = 150mA, V_{CE} = 1.0V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.3 1.0	V	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	0.6 —	1.2 2.0	V	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	8	pF	V_{CB} = 10V, f = 1.0MHz, I_E = 0
Input Capacitance	C_{ibo}	—	25	pF	V_{EB} = 0.5V, f = 1.0MHz, I_C = 0
Current Gain-Bandwidth Product	f_T	300	—	MHz	V_{CE} = 20V, I_C = 20mA, f = 100MHz
Noise Figure	NF	—	4.0	dB	V_{CE} = 10V, I_C = 100μA, R_S = 1.0kΩ, f = 1.0kHz
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	10	ns	V_{CC} = 30V, I_C = 150mA, $V_{BE(off)}$ = - 0.5V, I_{B1} = 15mA
Rise Time	t_r	—	25	ns	
Storage Time	t_s	—	225	ns	V_{CC} = 30V, I_C = 150mA, I_{B1} = I_{B2} = 15mA
Fall Time	t_f	—	60	ns	

Note: 5. Pulse test: Pulse width ≤ 300μs, duty cycle ≤ 2%.

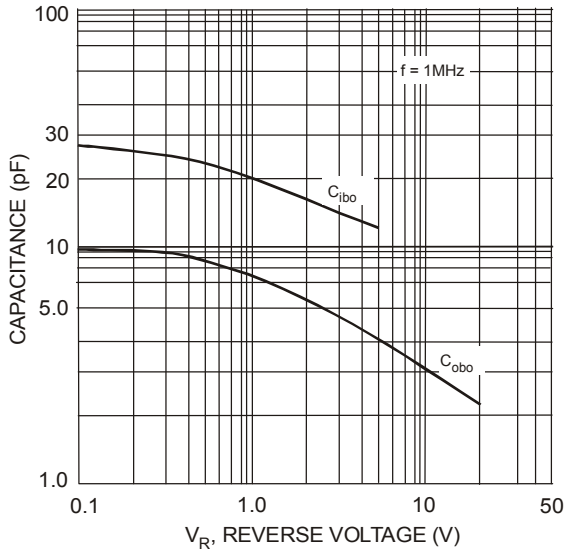


Fig. 1 (2222A) Typical Capacitance

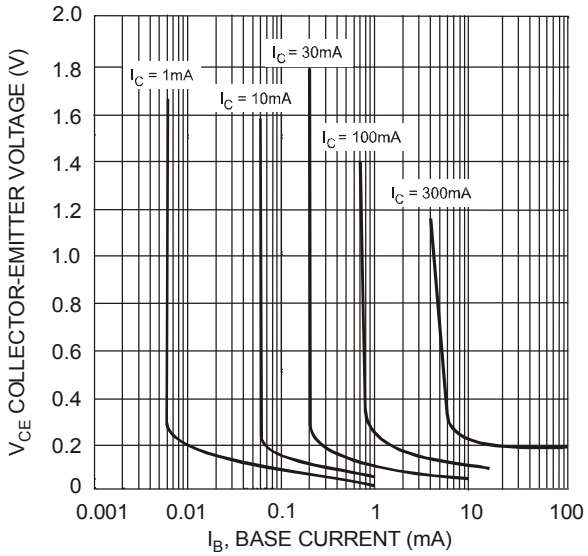


Fig. 2 Typical Collector Saturation Region (2222A Type - NPN)

Electrical Characteristics, 2907A Type (PNP) @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-60	—	V	I_C = -10μA, I_E = 0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-60	—	V	I_C = -10mA, I_B = 0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5.0	—	V	I_E = -10μA, I_C = 0
Collector Cutoff Current	I_{CBO}	—	-10	nA μA	V_{CB} = -50V, I_E = 0 V_{CB} = -50V, I_E = 0, T_A = 125°C
Collector Cutoff Current	I_{CEX}	—	-50	nA	V_{CE} = -30V, $V_{EB(OFF)}$ = -0.5V
Base Cutoff Current	I_{BL}	—	-50	nA	V_{CE} = -30V, $V_{EB(OFF)}$ = -0.5V
ON CHARACTERISTICS (Note 6)					
DC Current Gain	h_{FE}	75 100 100 100 50	— — — 300 —	—	I_C = -100μA, V_{CE} = -10V I_C = -1.0mA, V_{CE} = -10V I_C = -10mA, V_{CE} = -10V I_C = -150mA, V_{CE} = -10V I_C = -500mA, V_{CE} = -10V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	-0.4 -1.6	V	I_C = -150mA, I_B = -15mA I_C = -500mA, I_B = -50mA
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	—	-1.3 -2.6	V	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	8.0	pF	V_{CB} = -10V, f = 1.0MHz, I_E = 0
Input Capacitance	C_{ibo}	—	30	pF	V_{EB} = -2.0V, f = 1.0MHz, I_C = 0
Current Gain-Bandwidth Product	f_T	200	—	MHz	V_{CE} = -20V, I_C = -50mA, f = 100MHz
SWITCHING CHARACTERISTICS					
Turn-On Time	t_{on}	—	45	ns	—
Delay Time	t_d	—	10	ns	V_{CC} = -30V, I_C = -150mA, I_{B1} = -15mA
Rise Time	t_r	—	40	ns	
Turn-Off Time	t_{off}	—	100	ns	—
Storage Time	t_s	—	80	ns	V_{CC} = -6.0V, I_C = -150mA, I_{B1} = I_{B2} = -15mA
Fall Time	t_f	—	30	ns	

Notes: 6. Short duration pulse test used to minimize self-heating effect.

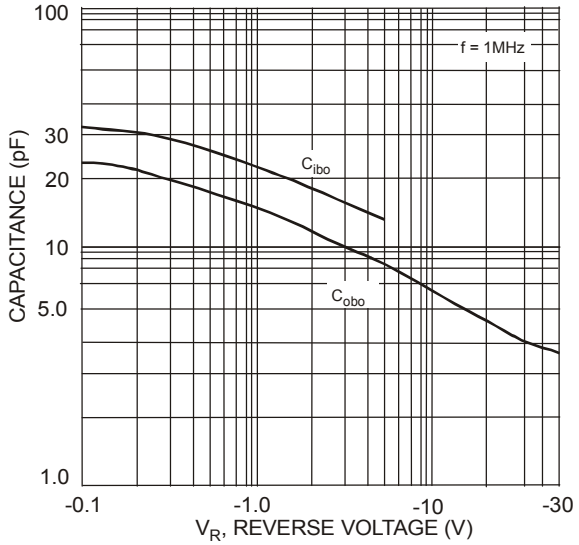


Fig. 3 (2907A) Typical Capacitance

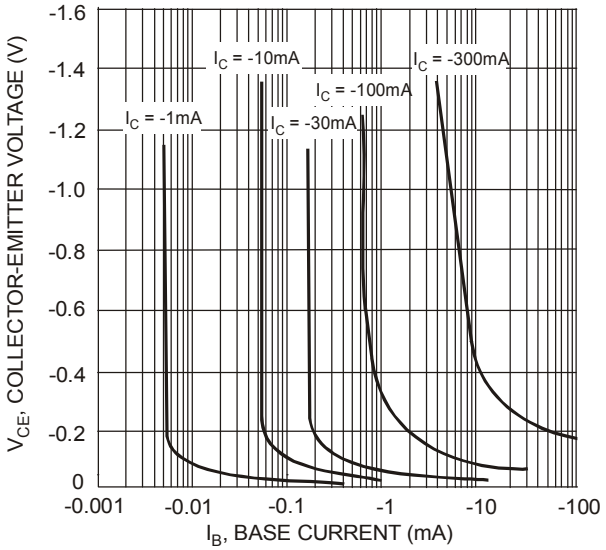


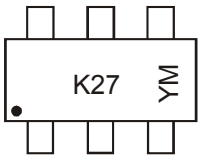
Fig. 4 Typical Collector Saturation Region (2907A Type - PNP)

Ordering Information (Note 7)

Device	Packaging	Shipping
MMDT2227-7-F	SOT-363	3000/Tape & Reel

Notes: 7. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

Marking Information



K27 = Product Type Marking Code
YM = Date Code Marking
Y = Year ex: N = 2002
M = Month ex: 9 = September

Date Code Key

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Code	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D