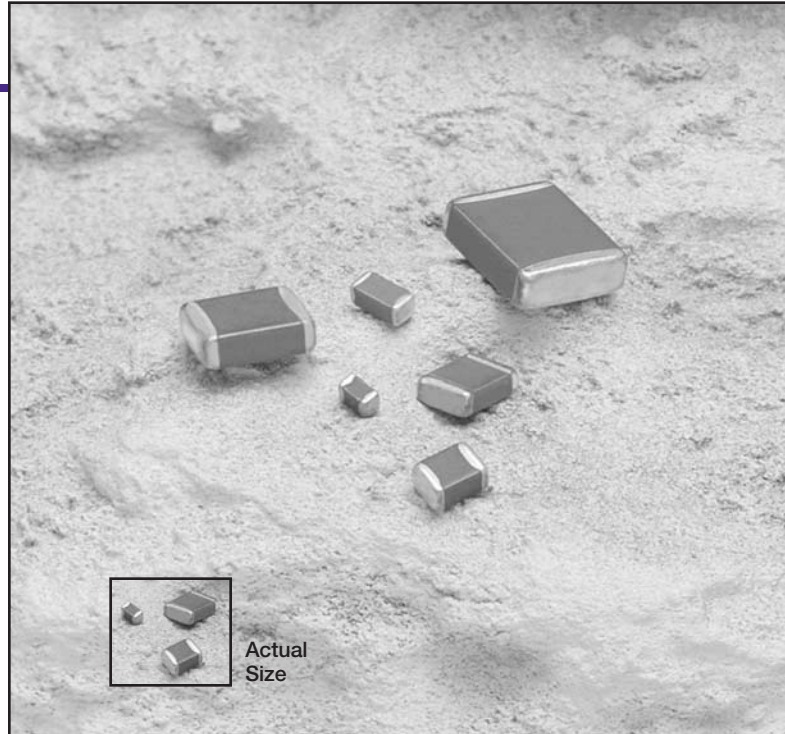


- **Y5U Ceramic**
- **Surface Mount**
- **High CV**
- **Low ESR**
- **High Rated Ripple Current**
- **+125°C Maximum Temperature**



The THC series is a very high CV value multilayer ceramic chip capacitor series that is designed for use in DC-DC converters, switching power supplies, bypass or decoupling circuits, or as a noise suppressor for various types of equipment. These surface mount chips have a wide capacitance range, low impedance and a Y5U temperature coefficient which allows for the high CV values. The THC series also has excellent high frequency characteristics due to low ESR, high ripple current capability, superior humidity tolerance, and a life expectancy of 1,000 hours at +125°C. The voltage range has been upgraded to include new 200 volt products. All of the THC capacitors are available with either silver termination or nickel barrier solder or tin plating termination.

## Summary of Specifications

- **Surface mount lead terminals.**
- **Capacitance range: 0.047 to 47 $\mu$ F.**
- **Voltage range: 25 to 200VDC.**
- **Category temperature range: -55°C to +125°C.**
- **Standard capacitance tolerance:  $\pm$ 20% or -20% to +80%**
- **Nominal case size (L x W x H): 2.0 x 1.25 x 1.25mm to 7.5 x 6.3 x 3.0mm.**
- **Rated lifetime: 1,000 hours at +125°C.**

## THC Specifications

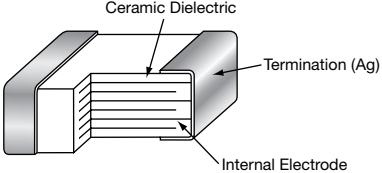
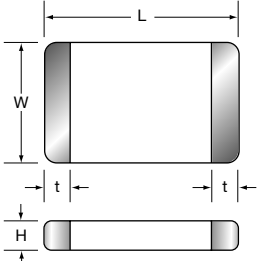
Item	Characteristics															
Category Temperature Range	-55 to +125°C															
Rated Voltage Range	25 to 200VDC															
Capacitance Range	0.047 to 47μF															
Capacitance Tolerance	±20% (M) or -20% to +80% (Z) at +20±2°C, 1±0.1kHz, and 1±0.2Vrms															
Dissipation Factor (Tan δ)	5% maximum at +20±2°C, 1±0.1kHz, and 1±0.2Vrms															
Rated Ripple Current	At +125°C, the rated ripple current at 10kHz-1MHz is specified in the Ratings Tables. Note: Ripple voltage Vp shall be less than the rated voltage.															
Withstand Voltage	No abnormality after applying 250% of the DC rated voltage for 5 seconds at +20±2°C.															
Insulation Resistance	1,000 ÷ C <sub>R</sub> * = MΩ or 10,000MΩ, whichever is less, after applying the DC rated voltage for 60±5 seconds at +20±2°C.															
Solderability	Using eutectic solder containing Ag 2.5-3wt% at a solder temperature of +235±5°C and a dip time of 2±0.5 seconds, a minimum of 75% of the surface of the terminals shall be covered with new solder.															
Soldering Heat Resistance	Using eutectic solder containing Ag 2.5-3wt% at a solder temperature of +260±5°C and a dip time of 2±0.5 seconds, the following specifications shall be satisfied when the capacitors are restored to +20°C. Appearance : no visible damage Capacitance change : ≤ ±15% of initial measured value Tan δ (DF) : ≤ initial specified value Insulation resistance : 1,000 ÷ C <sub>R</sub> * = MΩ or 10,000MΩ, whichever is less (initial specification) Withstand voltage : no abnormality															
Temperature Cycle	The following specifications shall be satisfied when the capacitors are restored to +20°C after exposing the capacitors to the four-step temperature cycle shown below for 5 cycles without voltage applied. <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. Category Temperature: -55±3°C</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room Temperature</td> <td>3 max.</td> </tr> <tr> <td>3</td> <td>Max. Category Temperature: +125±2°C</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room Temperature</td> <td>3 max.</td> </tr> </tbody> </table> Appearance : no visible damage Capacitance change : ≤ ±15% of initial measured value Tan δ (DF) : ≤ initial specified value Insulation resistance : 1,000 ÷ C <sub>R</sub> * = MΩ or 10,000MΩ, whichever is less (initial specification) Withstand voltage : no abnormality	Step	Temperature (°C)	Time (minutes)	1	Min. Category Temperature: -55±3°C	30±3	2	Room Temperature	3 max.	3	Max. Category Temperature: +125±2°C	30±3	4	Room Temperature	3 max.
Step	Temperature (°C)	Time (minutes)														
1	Min. Category Temperature: -55±3°C	30±3														
2	Room Temperature	3 max.														
3	Max. Category Temperature: +125±2°C	30±3														
4	Room Temperature	3 max.														
Humidity Load Life	The following specifications shall be satisfied when the capacitors are restored to +20°C after applying the DC rated voltage for 500+24,-0 hours at +40±2°C, 90-95% RH. Appearance : no abnormality Capacitance change : ≤ ±20% of initial measured value Tan δ (DF) : ≤ 7% Insulation resistance : 50 ÷ C <sub>R</sub> * = MΩ or 1,000MΩ, whichever is less Withstand voltage : no abnormality															
Endurance (Load Life)	The following specifications shall be satisfied when the capacitors are restored to +20°C after applying 200% of the DC rated voltage for 1,000+48,-0 hours at +85±2°C, or 1,000+48,-0 hours at +125±3°C with the initial DC rated voltage applied. Appearance : no abnormality Capacitance change : ≤ ±20% of initial measured value Tan δ (DF) : ≤ 7% Insulation resistance : 100 ÷ C <sub>R</sub> * = MΩ or 1,000MΩ, whichever is less Withstand voltage : no abnormality															

\*C<sub>R</sub> = Rated Capacitance in μF

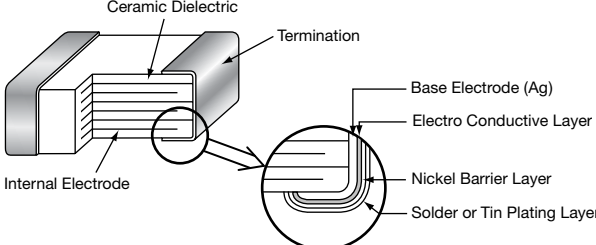
## Construction and Diagram of Dimensions

### Multilayer Ceramic Chips

#### THCR - Silver Termination

### THCS - Solder or Tin Plating Termination



Unit: mm

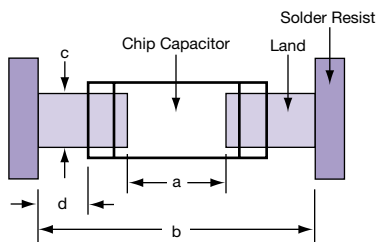
#### Case Dimensions

Case Code	L	W	H max.	t
20	2.0±0.2	1.25±0.2	1.25	0.3±0.2
30	3.2±0.2	1.6±0.2	1.6	0.5±0.3
40	3.2±0.2	2.5±0.2	2.0 or 2.5	0.6±0.3
50	4.5±0.3	3.2±0.2	2.2 or 3.0	0.6±0.3
60	5.7±0.4	5.0±0.4	2.2 or 3.0	0.8±0.5
70	7.5±0.5	6.3±0.5	2.5 or 3.0	0.8±0.5

THC  
MULTILAYER CERAMIC

## Soldering Conditions

### Recommended Soldering Land Design



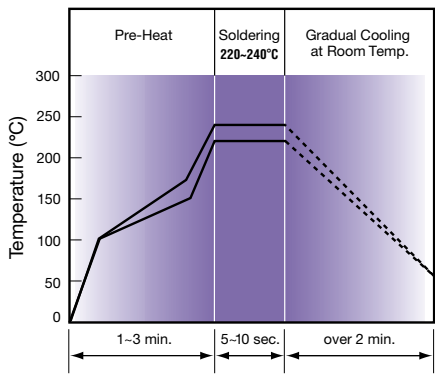
### Soldering Land Pattern Dimensions

Case Code	a	b	c	d
20	1.0 - 1.4	3.0 - 4.6	0.9 - 1.2	0.3 - 0.6
30	1.8 - 2.5	4.2 - 5.8	1.2 - 1.6	0.4 - 0.8
40	1.8 - 2.5	4.2 - 5.8	1.8 - 2.5	0.5 - 1.0
50	2.5 - 3.5	5.5 - 6.1	2.3 - 3.2	0.6 - 1.1
60	2.7 - 4.7	6.7 - 8.3	3.5 - 5.0	0.7 - 1.2
70	3.8 - 5.0	8.8 - 10.8	4.7 - 6.3	0.8 - 1.3

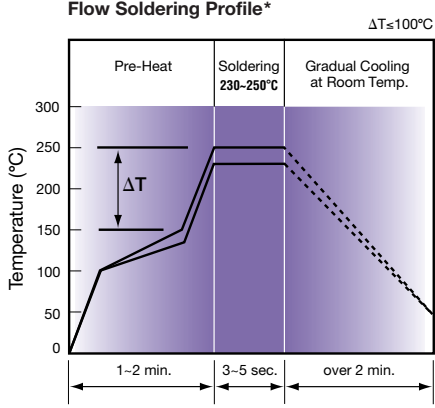
Unit: mm

### Recommended Soldering Temperature Profiles

#### Reflow Soldering Profile



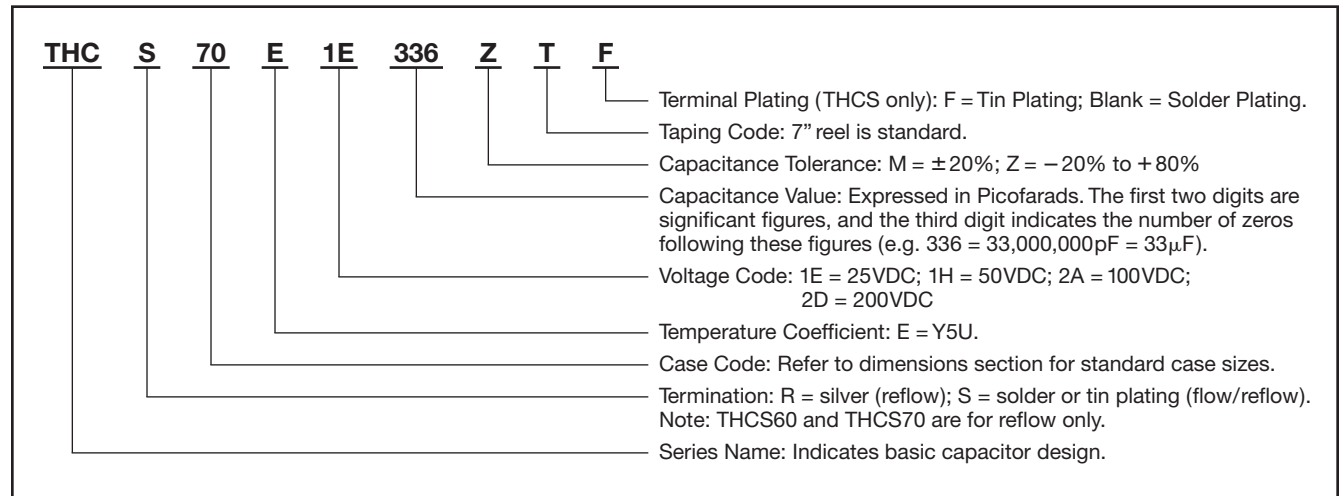
#### Flow Soldering Profile\*



\*Flow soldering for THCS case codes 20, 30, 40, 50 only.

## Part Numbering System for THC Series

When ordering, always specify complete catalog number for THC Series.



## Standard Voltage Ratings - Multilayer Ceramic Chips

Rated Voltage (WVDC)	Capacitance (μF)	Catalog Part Number †	Nominal Case Size* L×W×H (mm)	Case Code	Rated Ripple Current (A rms) at +125°C, 10kHz-1MHz
25 Volts	0.33	THCR20E1E334MT	2.0 × 1.25 × 1.25	20	0.2
	0.47	THCR20E1E474MT	2.0 × 1.25 × 1.25	20	0.2
	0.68	THCR20E1E684MT	2.0 × 1.25 × 1.25	20	0.2
	1.0	THCR30E1E105MT	3.2 × 1.6 × 1.6	30	0.3
	1.5	THCR30E1E155MT	3.2 × 1.6 × 1.6	30	0.3
	2.2	THCR30E1E225MT	3.2 × 1.6 × 1.6	30	0.3
	3.3	THCR40E1E335MT	3.2 × 2.5 × 2.0	40	0.5
	4.7	THCR40E1E475MT	3.2 × 2.5 × 2.0	40	0.5
	6.8	THCR50E1E685MT	4.5 × 3.2 × 2.2	50	1.0
	10	THCR50E1E106MT	4.5 × 3.2 × 2.2	50	1.0
	15	THCR50E1E156MT	4.5 × 3.2 × 3.0	50	1.0
	22	THCR60E1E226MT	5.7 × 5.0 × 2.2	60	2.0
33	THCR60E1E336MT	5.7 × 5.0 × 3.0	60	2.0	
47	THCR70E1E476MT	7.5 × 6.3 × 3.0	70	3.0	
50 Volts	0.10	THCR20E1H104MT	2.0 × 1.25 × 1.25	20	0.2
	0.15	THCR20E1H154MT	2.0 × 1.25 × 1.25	20	0.2
	0.22	THCR20E1H224MT	2.0 × 1.25 × 1.25	20	0.2
	0.33	THCR30E1H334MT	3.2 × 1.6 × 1.6	30	0.3
	0.47	THCR30E1H474MT	3.2 × 1.6 × 1.6	30	0.3
	0.68	THCR30E1H684MT	3.2 × 1.6 × 1.6	30	0.3
	1.0	THCR40E1H105MT	3.2 × 2.5 × 2.0	40	0.5
	1.5	THCR40E1H155MT	3.2 × 2.5 × 2.0	40	0.5
	2.2	THCR40E1H225MT	3.2 × 2.5 × 2.5	40	0.5
	3.3	THCR50E1H335MT	4.5 × 3.2 × 2.2	50	1.0
	4.7	THCR50E1H475MT	4.5 × 3.2 × 3.0	50	1.0
	6.8	THCR60E1H685MT	5.7 × 5.0 × 2.2	60	2.0
	10	THCR60E1H106MT	5.7 × 5.0 × 2.2	60	2.0
	15	THCR60E1H156MT	5.7 × 5.0 × 3.0	60	2.0
22	THCR70E1H226MT	7.5 × 6.3 × 2.5	70	3.0	
100 Volts	0.047	THCR20E2A473MT	2.0 × 1.25 × 1.25	20	0.2
	0.068	THCR20E2A683MT	2.0 × 1.25 × 1.25	20	0.2
	0.10	THCR30E2A104MT	3.2 × 1.6 × 1.6	30	0.3
	0.15	THCR30E2A154MT	3.2 × 1.6 × 1.6	30	0.3
	0.22	THCR30E2A224MT	3.2 × 1.6 × 1.6	30	0.3

† R indicates silver termination. Substitute code letter S for solder or tin plating termination. Add an F after taping code T to specify tin plating.

M indicates ±20% capacitance tolerance. Substitute code letter Z for -20%, +80% capacitance tolerance.

\* Refer to diagram for detailed case size dimensions.

## Standard Voltage Ratings - Multilayer Ceramic Chips

Rated Voltage (WVDC)	Capacitance (μF)	Catalog Part Number†	Nominal Case Size* L×W×H (mm)	Case Code	Rated Ripple Current (A rms) at +125°C, 10kHz-1MHz
100 Volts	0.33	THCR40E2A334MT	3.2 × 2.5 × 2.0	40	0.5
	0.47	THCR40E2A474MT	3.2 × 2.5 × 2.0	40	0.5
	0.68	THCR40E2A684MT	3.2 × 2.5 × 2.5	40	0.5
	1.0	THCR50E2A105MT	4.5 × 3.2 × 2.2	50	1.0
	1.5	THCR50E2A155MT	4.5 × 3.2 × 2.2	50	1.0
	2.2	THCR50E2A225MT	4.5 × 3.2 × 3.0	50	1.0
	3.3	THCR60E2A335MT	5.7 × 5.0 × 2.2	60	2.0
	4.7	THCR60E2A475MT	5.7 × 5.0 × 3.0	60	2.0
6.8	THCR70E2A685MT	7.5 × 6.3 × 3.0	70	3.0	
200 Volts	0.047	THCR30E2D473MT	3.2 × 1.6 × 1.6	30	0.3
	0.068	THCR30E2D683MT	3.2 × 1.6 × 1.6	30	0.3
	0.10	THCR40E2D104MT	3.2 × 2.5 × 2.0	40	0.5
	0.15	THCR40E2D154MT	3.2 × 2.5 × 2.0	40	0.5
	0.22	THCR40E2D224MT	3.2 × 2.5 × 2.5	40	0.5
	0.33	THCR50E2D334MT	4.5 × 3.2 × 2.2	50	1.0
	0.47	THCR50E2D474MT	4.5 × 3.2 × 3.0	50	1.0
	0.68	THCR60E2D684MT	5.7 × 5.0 × 2.2	60	2.0
	1.0	THCR60E2D105MT	5.7 × 5.0 × 3.0	60	2.0
	1.5	THCR70E2D155MT	7.5 × 6.3 × 2.5	70	3.0
2.2	THCR70E2D225MT	7.5 × 6.3 × 3.0	70	3.0	

† R indicates silver termination. Substitute code letter S for solder or tin plating termination. Add an F after taping code T to specify tin plating.

M indicates ±20% capacitance tolerance. Substitute code letter Z for -20%, +80% capacitance tolerance.

\* Refer to diagram for detailed case size dimensions.

## Tape and Reel Specifications

### Multilayer Ceramic Chips

Unit: mm

#### Taping

#### Taping Dimensions

Dimension	Case Code					
	20	30	40	50	60	70
A ±0.1	1.45	1.9	2.8	3.65	5.5	6.85
B ±0.1	2.5	3.5	3.5	4.95	6.25	8.05
W ±0.3	8.0	8.0	8.0	12.0	12.0	16.0
E ±0.1	1.75	1.75	1.75	1.75	1.75	1.75
F ±0.05	3.5	3.5	3.5	5.5	5.5	7.5
P1 ±0.1	4.0	4.0	4.0	8.0	8.0	12.0
P2 ±0.05	2.0	2.0	2.0	2.0	2.0	2.0
P0 ±0.1	4.0	4.0	4.0	4.0	4.0	4.0
OD ±0.1	1.5	1.5	1.5	1.5	1.5	1.5
T1 max.	0.6	0.6	0.6	0.6	0.6	0.6
T2 max.	1.5	1.5	2.5	2.8	2.8	3.0

#### Reel

#### Reel Dimensions and Quantity Per Reel

Dimension	Case Code					
	20	30	40	50	60	70
OA ±2	178	178	178	178	178	178
OB min.	50	50	50	50	50	50
OC ±0.5	13	13	13	13	13	13
OD ±0.8	21	21	21	21	21	21
E ±0.5	2	2	2	2	2	2
W ±0.5	9	9	9	13	13	17
T ±0.5	1	1	1	1	1	1
R	1.0	1.0	1.0	1.0	1.0	1.0
Pieces Per Reel*	3,000	3,000	1,600	800	800	500

\*Specified quantity may vary for rating of capacitor.