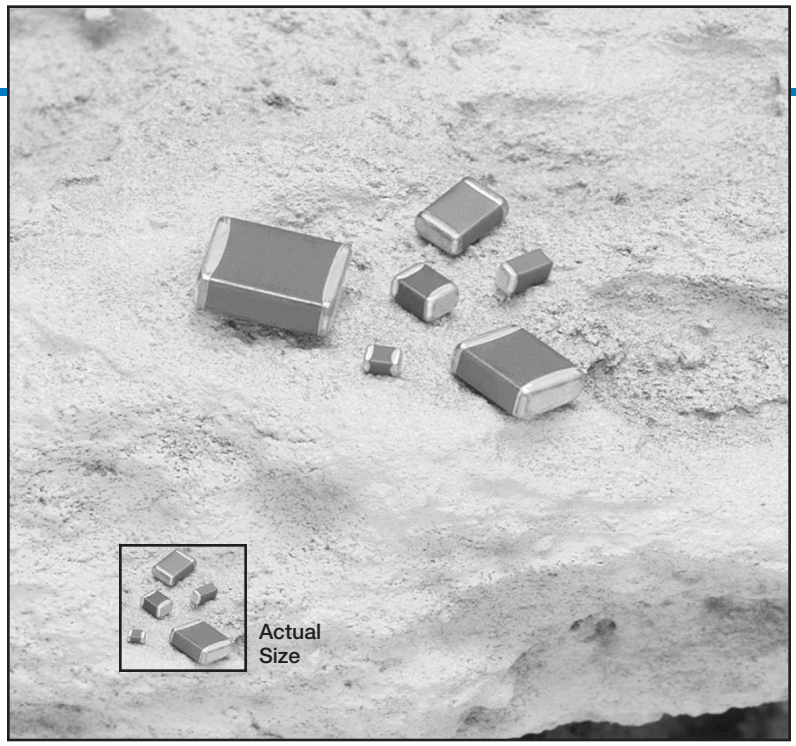
TCC Series

UNITED CHEMI-CON

- Y5U Ceramic
- Surface Mount
- +125°C Maximum Temperature



The TCC series capacitors are the standard surface mount ceramic chips from UCC/NCC. With a high voltage rating of 200 volts, these capacitors are ideal for use in DC-DC converters, small switching power supplies, along with computer modems. The Y5U temperature coefficient allows for higher capacitance values compared to ceramic chips with other temperature coefficients. All of these capacitors are available with either silver or nickel barrier end terminations.

Refer to Mini-Glossary at the end of the multilayer ceramic capacitors section for additional technical information and specifications.

Summary of Specifications

- **Surface mount terminals.**
- **Capacitance range: 0.01 to 18μF.**
- **Voltage range: 20 to 200VDC.**
- **Operating temperature range: −55°C to +125°C.**
- **Standard capacitance tolerance: ±20%**
- **Nominal case size (L×W×H): 2.0×1.25×1.25mm to 7.5×6.3×2.5mm.**
- **Rated lifetime: 1,000 hours at +125°C.**

TCC Series

TCC Specifications

Item	Characteristics
Operating Temperature Range	−55 to +125°C
Rated Voltage Range	20 to 200VDC
Capacitance Range	0.01 to 18μF
Capacitance Tolerance	±20% (M) at +20±2°C, 1±0.1kHz, and 1±0.2Vrms
Dissipation Factor (Tan δ)	2.5% maximum at +20±2°C, 1±0.1kHz, and 1±0.2Vrms
Ripple Current	At +125°C, the maximum ripple current at 10kHz-1MHz is specified in the Ratings Tables.
Withstand Voltage	No abnormality after applying 250% of the DC rated voltage for 1 to 5 seconds at +20±2°C.
Insulation Resistance	1,000 Ω•F 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 3% 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 3% at a solder temperature of +270±5°C and a dip time of 3±0.5 seconds, the following specifications shall be satisfied when the capacitors are restored to +20°C. Appearance : no abnormality Capacitance change : ≤ ±15% of initial measured value Tan δ (DF) : ≤ 2.5%
Humidity Load Life Test	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. After the initial load test, the withstand voltage shall be tested by applying 250% of the DC rated voltage for 5 seconds. Appearance : no abnormality Capacitance change : ≤ ±20% of initial measured value Tan δ (DF) : ≤ 5% Insulation resistance : 50 Ω•F or 1,000MΩ, whichever is less
Load Life Test	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. After the initial load test, the withstand voltage shall be tested by applying 250% of the DC rated voltage for 5 seconds. Appearance : no abnormality Capacitance change : ≤ ±20% of initial measured value Tan δ (DF) : ≤ 5% Insulation resistance : 100 Ω•F or 1,000MΩ, whichever is less

Part Numbering System for TCC Series

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

TCC R 40 E 2D 473 M T

- T — Taping Code: 7" reel is standard.
- M — Capacitance Tolerance: M = ±20%
- 473 — Capacitance Value: Expressed in picofarads. The first two digits are significant figures, and the third digit indicates the number of zeros following these figures (e.g. 473 = 47,000pF = 0.047μF).
- 2D — Voltage Code: 1D = 20VDC; 1E = 25VDC; 1H = 50VDC; 2A = 100VDC; 2D = 200VDC.
- E — Temperature Coefficient: E = Y5U.
- 40 — Case Code: Refer to dimensions section for standard case sizes.
- R — Termination: R = silver (reflow); S = nickel barrier (flow/reflow).
- TCC — Series Name: Indicates basic capacitor design.

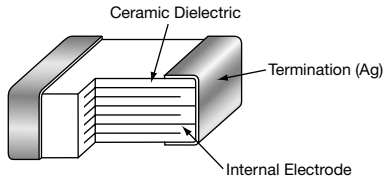
TCC Series

Construction and Diagram of Dimensions

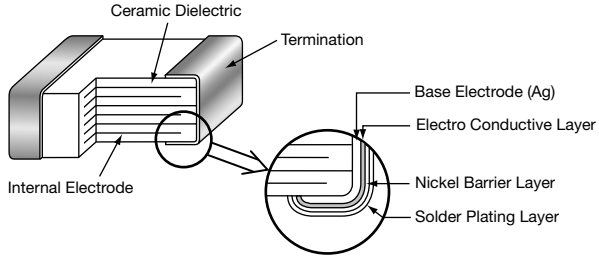
Multilayer Ceramic Chips

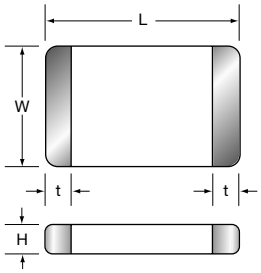
Unit: mm

TCCR - Silver Termination



TCCS - Nickel Barrier Termination





Case Dimensions

UCC Case Code	EIA Case Code	L	W	H max.	t
20	0805	2.0±0.2	1.25±0.2	1.25	0.3±0.2
30	1206	3.2±0.2	1.6±0.2	1.5	0.5±0.3
40	1210	3.2±0.2	2.5±0.2	1.8	0.6±0.3
50	1812	4.5±0.3	3.2±0.2	2.0	0.6±0.3
60	2220	5.7±0.4	5.0±0.4	2.2	0.8±0.5
70	3025	7.5±0.5	6.3±0.5	2.5	0.8±0.5

Standard Voltage Ratings - Multilayer Ceramic Chips

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number†	UCC Case Code*	EIA Case Code*	Maximum Ripple Current (A rms) at +125°C, 10kHz-1MHz
20 Volts	1.5	TCCR40E1D155MT	40	1210	0.3
	2.2	TCCR40E1D225MT	40	1210	0.3
	3.3	TCCR50E1D335MT	50	1812	0.8
	4.7	TCCR50E1D475MT	50	1812	0.8
	6.8	TCCR60E1D685MT	60	2220	1.0
	10	TCCR60E1D106MT	60	2220	1.0
	15	TCCR70E1D156MT	70	3025	1.5
	18	TCCR70E1D186MT	70	3025	1.5
25 Volts	0.1	TCCR20E1E104MT	20	0805	0.05
	0.15	TCCR20E1E154MT	20	0805	0.08
	0.22	TCCR30E1E224MT	30	1206	0.12
	0.33	TCCR30E1E334MT	30	1206	0.18
	0.47	TCCR30E1E474MT	30	1206	0.2
	0.68	TCCR40E1E684MT	40	1210	0.3
	1.0	TCCR40E1E105MT	40	1210	0.3
	1.5	TCCR50E1E155MT	50	1812	0.8
	2.2	TCCR50E1E225MT	50	1812	0.8
	3.3	TCCR60E1E335MT	60	2220	1.0
	4.7	TCCR60E1E475MT	60	2220	1.0
	6.8	TCCR70E1E685MT	70	3025	1.5
	10	TCCR70E1E106MT	70	3025	1.5

† R indicates silver termination. Substitute code letter S in part number for nickel barrier termination.
* Refer to diagram of dimensions for actual case sizes.

Standard Voltage Ratings - Multilayer Ceramic Chips

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number†	UCC Case Code*	EIA Case Code*	Maximum Ripple Current (A rms) at +125°C, 10kHz-1MHz
50 Volts	0.047	TCCR20E1H473MT	20	0805	0.05
	0.068	TCCR20E1H683MT	20	0805	0.07
	0.1	TCCR30E1H104MT	30	1206	0.11
	0.15	TCCR30E1H154MT	30	1206	0.16
	0.22	TCCR30E1H224MT	30	1206	0.2
	0.33	TCCR40E1H334MT	40	1210	0.3
	0.47	TCCR40E1H474MT	40	1210	0.3
	0.68	TCCR50E1H684MT	50	1812	0.75
	1.0	TCCR50E1H105MT	50	1812	0.8
	1.5	TCCR60E1H155MT	60	2220	1.0
	2.2	TCCR60E1H225MT	60	2220	1.0
	3.3	TCCR60E1H335MT	60	2220	1.0
	4.7	TCCR70E1H475MT	70	3025	1.5
	6.8	TCCR70E1H685MT	70	3025	1.5
100 Volts	0.022	TCCR20E2A223MT	20	0805	0.04
	0.033	TCCR20E2A333MT	20	0805	0.07
	0.047	TCCR30E2A473MT	30	1206	0.1
	0.068	TCCR30E2A683MT	30	1206	0.15
	0.1	TCCR40E2A104MT	40	1210	0.22
	0.15	TCCR40E2A154MT	40	1210	0.3
	0.22	TCCR40E2A224MT	40	1210	0.3
	0.33	TCCR50E2A334MT	50	1812	0.73
	0.47	TCCR50E2A474MT	50	1812	0.8
	0.68	TCCR60E2A684MT	60	2220	1.0
	1.0	TCCR60E2A105MT	60	2220	1.0
	1.5	TCCR60E2A155MT	60	2220	1.0
	2.2	TCCR70E2A225MT	70	3025	1.5
	3.3	TCCR70E2A335MT	70	3025	1.5
200 Volts	0.01	TCCR30E2D103MT	30	1206	0.04
	0.015	TCCR30E2D153MT	30	1206	0.06
	0.022	TCCR30E2D223MT	30	1206	0.09
	0.033	TCCR40E2D333MT	40	1210	0.14
	0.047	TCCR40E2D473MT	40	1210	0.2
	0.068	TCCR40E2D683MT	40	1210	0.3
	0.1	TCCR50E2D104MT	50	1812	0.44
	0.15	TCCR50E2D154MT	50	1812	0.66
	0.22	TCCR60E2D224MT	60	2220	0.97
	0.33	TCCR60E2D334MT	60	2220	1.0
	0.47	TCCR60E2D474MT	60	2220	1.0
	0.68	TCCR70E2D684MT	70	3025	1.5
	1.0	TCCR70E2D105MT	70	3025	1.5

† R indicates silver termination. Substitute code letter S in part number for nickel barrier termination.
*** Refer to diagram of dimensions for actual case sizes.**

Soldering Guidelines

1. To maintain good solderability, capacitors should be stored under the following conditions:
   a. Avoid high temperature and high humidity. Storage temperature and humidity should not exceed +40°C, 70% RH.
   b. Do not store in a chlorine or sulfur contaminated area.
   c. Store capacitors with a desiccator after opening a package.

2. Use Sn/Pb eutectic solder with Ag 2 to 5%.

3. Use a rosin-based flux. Do not use a strong acid.

4. Due to the properties of ceramic, radical temperature changes or improper pre-heating before soldering may crack ceramic capacitors. Follow the recommended soldering conditions to avoid capacitor damage.

5. Minimize the soldering temperature and time to prevent the leaching of silver into the solder when using the reflow soldering method for the silver termination products.

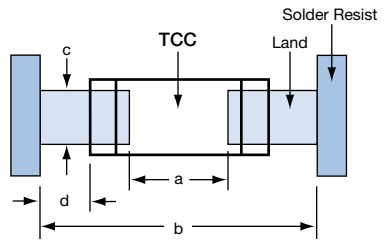
6. Use isopropyl alcohol or trichloroethane cleaning solvent. For ultrasonic wave cleaning, the time should be 1 minute maximum.

TCC Series

Soldering Conditions

Recommended Soldering Land Design

Unit: mm

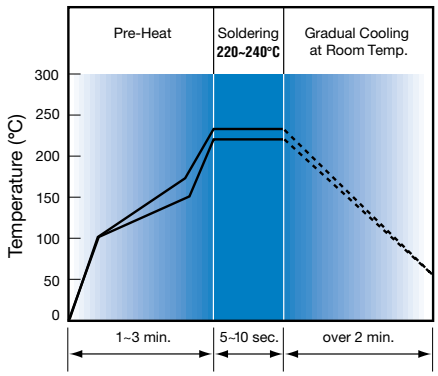


Soldering Land Dimensions

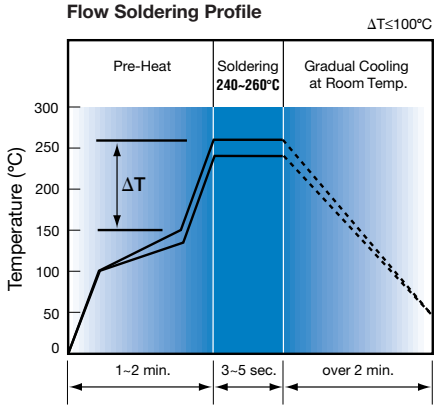
UCC Case Code	EIA Case Code	a	b	c	d
20	0805	1.0 – 1.4	3.0 – 4.6	0.9 – 1.2	0.3 – 0.6
30	1206	1.8 – 2.5	4.2 – 5.8	1.2 – 1.6	0.4 – 0.8
40	1210	1.8 – 2.5	4.2 – 5.8	1.8 – 2.5	0.5 – 1.0
50	1812	2.5 – 3.5	5.5 – 6.1	2.3 – 3.2	0.6 – 1.1
60	2220	2.7 – 4.7	6.7 – 8.3	3.5 – 5.0	0.7 – 1.2
70	3025	3.8 – 5.0	8.8 – 10.8	4.7 – 6.3	0.8 – 1.3

Recommended Soldering Temperature Profiles

Reflow Soldering Profile



Flow Soldering Profile



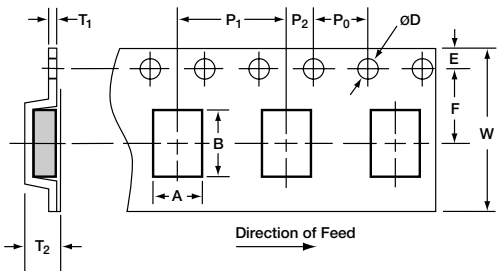
Tape and Reel Specifications

Multilayer Ceramic Chips

Tape and Reel Specifications Conform to JIS-C-0806

Unit: mm

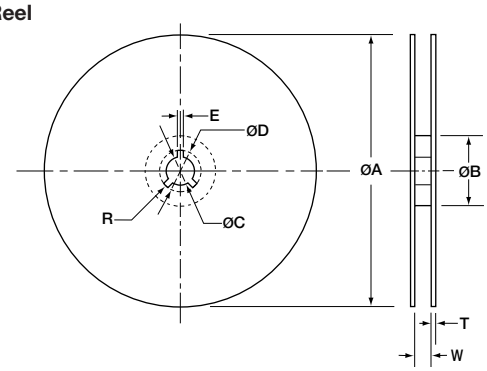
Taping



Taping Dimensions

UCC Case Code (EIA Case Code)	20 (0805)	30 (1206)	40 (1210)	50 (1812)	60 (2220)	70 (3025)
A±0.1	1.6	2.0	2.8	3.6	5.4	6.7
B±0.1	2.3	3.6	3.6	4.9	6.1	7.9
W±0.3	8.0	8.0	8.0	12.0	12.0	16.0
F±0.05	3.5	3.5	3.5	5.5	5.5	7.5
E±0.1	1.75	1.75	1.75	1.75	1.75	1.75
P_1±0.1	4.0	4.0	4.0	8.0	8.0	12.0
P_2±0.05	2.0	2.0	2.0	2.0	2.0	2.0
P_0±0.1	4.0	4.0	4.0	4.0	4.0	4.0
øD±0.1	1.5	1.5	1.5	1.5	1.5	1.5
T_1 max.	0.6	0.6	0.6	0.6	0.6	0.6
T_2 max.	1.5	1.5	2.5	2.5	2.5	3.0

Reel



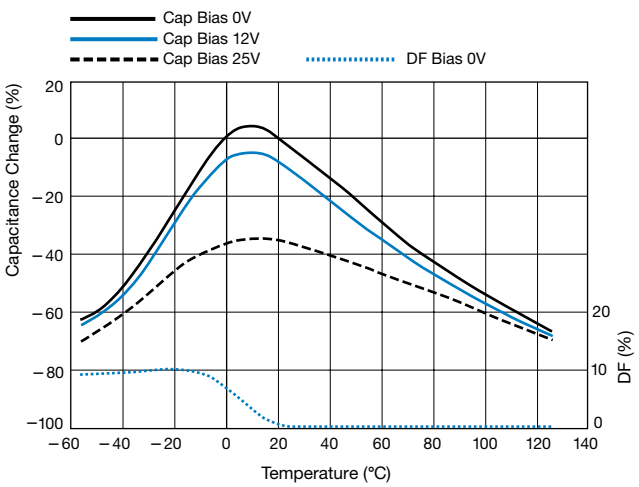
Reel Dimensions and Quantity Per Reel

UCC Case Code (EIA Case Code)	20 (0805)	30 (1206)	40 (1210)	50 (1812)	60 (2220)	70 (3025)
øA±2	178	178	178	178	178	178
øB min.	50	50	50	50	50	50
øC±0.5	13	13	13	13	13	13
øD±0.8	21	21	21	21	21	21
E±0.5	2	2	2	2	2	2
W±0.5	10	10	10	14	14	18
T±0.5	2	2	2	2	2	2
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

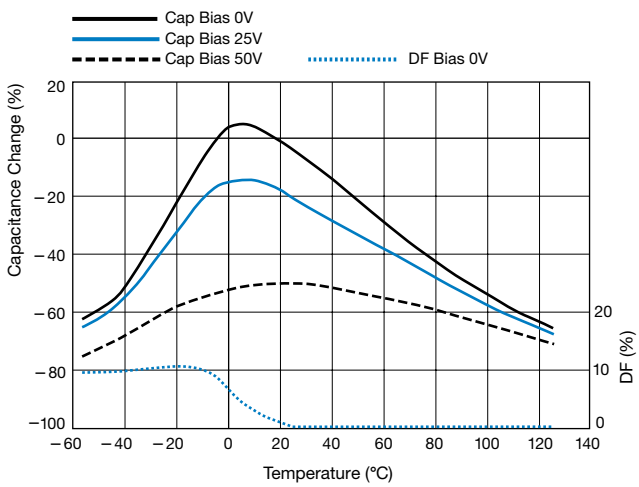
*Specified quantity may vary for rating of capacitor.

Capacitance and DF Variation with Temperature and Applied DC Voltage

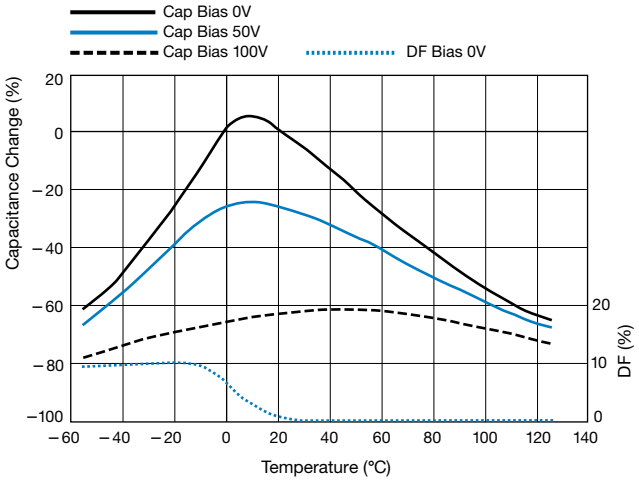
TCC 25V, 10μF



TCC 50V, 1.5μF



TCC 100V, 1μF



TCC 200V, 0.68μF