



# MULTILAYER CERAMIC CHIP CAPACITORS



## **C Series High Temperature Application**

Type: C1005 [EIA CC0402]  
C1608 [EIA CC0603]  
C2012 [EIA CC0805]  
C3216 [EIA CC1206]  
C3225 [EIA CC1210]

Issue date: April 2011



**TDK MLCC  
US Catalog**

Version B11

## REMINDERS

Please read before using this product

### SAFETY REMINDERS



### REMINDERS

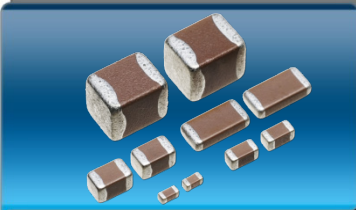
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## C Series

### High Temperature Application

Type: C1005, C1608, C2012, C3216, C3225



#### Features

- These products have no polarity.
- Their electrostatic capacity temperature response is stable at 15% even in high temperature ranges (up to 150°C).

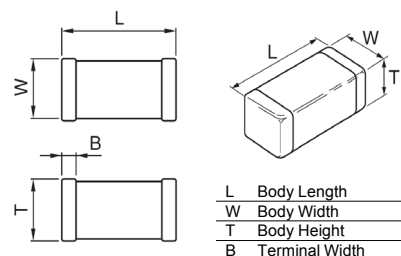
Parameters	Specifications
Temperature	-55 to +150°C
Characteristics	$\Delta C/C = \pm 15\%$
Operating Temperature	-55 to +150°C
Dissipation Factor	3% maximum
Insulation Resistance	10 G $\Omega$ or 500 M $\Omega$ • $\mu$ F minimum
Voltage Proof	2.5 • rated voltage for 1 to 5 seconds Charge/Discharge $\leq$ 50 mA

#### Applications



- Automotive (underhood)
- Measurement instruments used at high temperature environments
- LCD display
- Sensor Module

#### Shape & Dimensions



Dimensions in mm

#### Part Number Construction

Series Name	C	3225	X8R	1E	335	K	T	XXXX
Dimensions L x W (mm)	Case Code	Length	Width	Temperature Characteristic	Rated Voltage (DC)	Internal Codes	Packaging Style	Capacitance Tolerance
	C1005	1.00 ± 0.05	0.50 ± 0.05	X8R	1E	T	Tape & Reel	K
	C1608	1.60 ± 0.10	0.80 ± 0.10					± 10%
	C2012	2.00 ± 0.20	1.25 ± 0.20					
	C3216	3.20 ± 0.20	1.60 ± 0.20					
	C3225	3.20 ± 0.40	2.50 ± 0.30					
				Temperature Characteristics	Voltage Code	Capacitance Code	Capacitance	
				X8R	1E	0R5	0.5pF	
					1H	010	1pF	
					2A	102	1,000pF (1nF)	
						105	1,000,000pF (1 $\mu$ F)	

#### Internal Codes

#### Packaging Style

Packaging Code	Style
T	Tape & Reel

#### Capacitance Tolerance

Tolerance Code	Tolerance
K	± 10%

#### Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1 $\mu$ F)



## Capacitance Range Chart

## C1005 [EIA CC0402]

### Capacitance Range Chart

Temperature Characteristics: X8R ( $\pm 15\%$ )  
 Rated Voltage: 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R	
			1H (50V)	1E (25V)
150	151	K: $\pm 10\%$		
220	221			
330	331			
470	471			
680	681			
1,000	102			
1,500	152			
2,200	222			
3,300	332			
4,700	472			
6,800	682			
10,000	103			

Standard Thickness  
 0.50 mm



## Capacitance Range Table

## C1005 [EIA CC0402]

### Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to +150°C,  $\pm 15\%$ )

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005X8R1E682K	X8R	25V	6,800	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1E103K	X8R	25V	10,000	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H151K	X8R	50V	150	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H221K	X8R	50V	220	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H331K	X8R	50V	330	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H471K	X8R	50V	470	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H681K	X8R	50V	680	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H102K	X8R	50V	1,000	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H152K	X8R	50V	1,500	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H222K	X8R	50V	2,200	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H332K	X8R	50V	3,300	$\pm 10\%$	0.50 $\pm$ 0.05
C1005X8R1H472K	X8R	50V	4,700	$\pm 10\%$	0.50 $\pm$ 0.05



## Capacitance Range Chart

## C1608 [EIA CC0603]

### Capacitance Range Chart

Temperature Characteristics: X8R ( $\pm 15\%$ )  
 Rated Voltage: 100V (2A), 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R		
			2A (100V)	1H (50V)	1E (25V)
1,000	102	K: $\pm 10\%$	█	█	
1,500	152			█	
2,200	222				
3,300	332				
4,700	472				
6,800	682				
10,000	103				
15,000	153				
22,000	223				
33,000	333				
47,000	473				
68,000	683				
100,000	104				█

Standard Thickness  
 0.80 mm



## Capacitance Range Table

## C1608 [EIA CC0603]

### Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to +150°C,  $\pm 15\%$ )

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X8R1E683K	X8R	25V	68,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1E104K	X8R	25V	100,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H102K	X8R	50V	1,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H152K	X8R	50V	1,500	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H222K	X8R	50V	2,200	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H332K	X8R	50V	3,300	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H472K	X8R	50V	4,700	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H682K	X8R	50V	6,800	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H103K	X8R	50V	10,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H153K	X8R	50V	15,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H223K	X8R	50V	22,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H333K	X8R	50V	33,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H473K	X8R	50V	47,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A102K	X8R	100V	1,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A152K	X8R	100V	1,500	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A222K	X8R	100V	2,200	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A332K	X8R	100V	3,300	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A472K	X8R	100V	4,700	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A682K	X8R	100V	6,800	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A103K	X8R	100V	10,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A153K	X8R	100V	15,000	$\pm 10\%$	0.80 $\pm$ 0.10



## Capacitance Range Chart

## C2012 [EIA CC0805]

### Capacitance Range Chart

Temperature Characteristics: X8R ( $\pm 15\%$ )  
 Rated Voltage: 100V (2A), 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R		
			2A (100V)	1H (50V)	1E (25V)
22,000	223	K: $\pm 10\%$			
68,000	683				
100,000	104				
150,000	154				
220,000	224				
330,000	334				

#### Standard Thickness

	0.85 mm
	1.25 mm



## Capacitance Range Table

## C2012 [EIA CC0805]

### Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to +150°C,  $\pm 15\%$ )

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X8R1E154K/0.85	X8R	25V	150,000	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X8R1E224K	X8R	25V	220,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X8R1E334K	X8R	25V	330,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X8R1H683K	X8R	50V	68,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X8R1H104K	X8R	50V	100,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X8R2A223K	X8R	100V	22,000	$\pm 10\%$	1.25 $\pm$ 0.20



## Capacitance Range Chart

## C3216 [EIA CC1206]

### Capacitance Range Chart

Temperature Characteristics: X8R ( $\pm 15\%$ )  
 Rated Voltage: 100V (2A), 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R		
			2A (100V)	1H (50V)	1E (25V)
33,000	333	K: $\pm 10\%$			
47,000	473				
68,000	683				
100,000	104				
150,000	154				
220,000	224				
330,000	334				
470,000	474				
680,000	684				
1,000,000	105				

#### Standard Thickness

- 0.85 mm
- 1.15 mm
- 1.60 mm



## Capacitance Range Table

## C3216 [EIA CC1206]

### Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to +150°C,  $\pm 15\%$ )

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X8R1E334K	X8R	25V	330,000	$\pm 10\%$	0.85 $\pm$ 0.10
C3216X8R1E474K	X8R	25V	470,000	$\pm 10\%$	0.85 $\pm$ 0.10
C3216X8R1E684K	X8R	25V	680,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X8R1E105K	X8R	25V	1,000,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X8R1H154K	X8R	50V	150,000	$\pm 10\%$	0.85 $\pm$ 0.10
C3216X8R1H224K	X8R	50V	220,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X8R1H334K	X8R	50V	330,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X8R1H474K	X8R	50V	470,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X8R2A333K	X8R	100V	33,000	$\pm 10\%$	0.85 $\pm$ 0.10
C3216X8R2A473K	X8R	100V	47,000	$\pm 10\%$	0.85 $\pm$ 0.10
C3216X8R2A683K	X8R	100V	68,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X8R2A104K	X8R	100V	100,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X8R2A154K	X8R	100V	150,000	$\pm 10\%$	1.60 $\pm$ 0.30



## Capacitance Range Chart

## C3225 [EIA CC1210]

### Capacitance Range Chart

Temperature Characteristics: X8R ( $\pm 15\%$ )  
 Rated Voltage: 100V (2A), 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R		
			2A (100V)	1H (50V)	1E (25V)
1,500,000	155	K: $\pm 10\%$			
2,200,000	225				
3,300,000	335				

### Standard Thickness

	1.60 mm
	2.00 mm
	2.50 mm



## Capacitance Range Table

## C3225 [EIA CC1210]

### Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to +150°C,  $\pm 15\%$ )

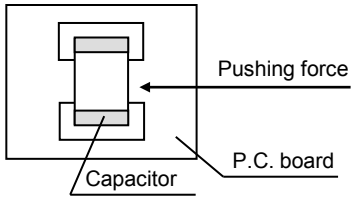
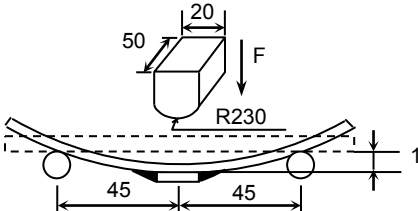
TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225X8R1E155K	X8R	25V	1,500,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3225X8R1E225K	X8R	25V	2,200,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X8R1E335K	X8R	25V	3,300,000	$\pm 10\%$	2.50 $\pm$ 0.30





## General Specifications

# C Series – High Temperature Application

No.	Item	Performance	Test or Inspection Method										
1	<b>External Appearance</b>	No defects which may affect performance.	Inspect with magnifying glass (3×).										
2	<b>Insulation Resistance</b>	10,000MΩ or 500 MΩ · μF min.	Apply rated voltage for 60s.										
3	<b>Voltage Proof</b>	Withstand test voltage without insulation breakdown or other damage.	2.5 x VDC rated voltage shall be applied for 1~5s. Charge / discharge current shall not exceed 50mA.										
4	<b>Capacitance</b>	Within the specified tolerance.	<table border="1"> <thead> <tr> <th>Measuring Frequency</th> <th>Measuring Voltage</th> </tr> </thead> <tbody> <tr> <td>1kHz±10%</td> <td>1.0±0.2V<sub>rms</sub></td> </tr> </tbody> </table>	Measuring Frequency	Measuring Voltage	1kHz±10%	1.0±0.2V <sub>rms</sub>						
			Measuring Frequency	Measuring Voltage									
1kHz±10%	1.0±0.2V <sub>rms</sub>												
5	<b>Dissipation Factor</b>	<table border="1"> <thead> <tr> <th>T.C.</th> <th>D.F.</th> </tr> </thead> <tbody> <tr> <td>X8R</td> <td>0.03 max.</td> </tr> </tbody> </table>	T.C.	D.F.	X8R	0.03 max.	See No.4 in this table for measuring condition.						
T.C.	D.F.												
X8R	0.03 max.												
6	<b>Temperature Characteristics of Capacitance</b>	Capacitance Change (%)	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP3 reading <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Reference temp. ± 2</td> </tr> <tr> <td>2</td> <td>Min. operating temp. ± 2</td> </tr> <tr> <td>3</td> <td>Reference temp. ± 2</td> </tr> <tr> <td>4</td> <td>Max. operating temp. ± 2</td> </tr> </tbody> </table>	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 2	3	Reference temp. ± 2	4	Max. operating temp. ± 2
		Step		Temperature (°C)									
1	Reference temp. ± 2												
2	Min. operating temp. ± 2												
3	Reference temp. ± 2												
4	Max. operating temp. ± 2												
	<b>No Voltage Applied</b>	X8R: ± 15%											
7	<b>Robustness of Terminations</b>	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitor on a P.C. board (shown in Appendix 1) and apply a pushing force of 5N (C1608, C2012, C3216, C3225 type) and 2N (C1005 type) for 10±1s. 										
8	<b>Bending</b>	No mechanical damage.	Reflow solder the capacitor on a P.C. board (shown in Appendix 2) and bend 1mm as illustrated: 										

Unit: mm



## C Series – High Temperature Application

No.	Item	Performance	Test or Inspection Method	
9	<b>Solderability</b>	New solder to cover over 75% of termination.	Completely soak both terminations in solder at $235 \pm 5^\circ\text{C}$ for $2 \pm 0.5\text{s}$ .	
		25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of "A sections" shall not be exposed due to melting or shifting of termination material.	Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.	
		<p>A section</p>		
10	<b>Resistance to solder heat</b>		Completely soak both terminations in solder at $260 \pm 5^\circ\text{C}$ for $5 \pm 1\text{s}$ .	
	External appearance	No cracks are allowed and terminations shall be covered at least 60% with new solder.	Preheating condition Temp. : $150 \pm 10^\circ\text{C}$ Time : 1~2min.	
	Capacitance	<b>Characteristics</b>	<b>Change from the value before test</b>	Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.
		Class 2	X8R	
	D.F. (Class 2)	Meet the initial spec.	Solder: H63A(JIS Z 3282)	
	Insulation Resistance	Meet the initial spec.	Leave the capacitor in ambient conditions for $48 \pm 4\text{h}$ before measurement.	
Voltage Proof	No insulation breakdown or other damage.			
11	<b>Vibration</b>		Reflow solder the capacitor on a P.C. board (shown in Appendix 1) before testing.	
	External appearance	No mechanical damage.	Vibrate the capacitor with amplitude of 1.5mm P-P sweeping the frequencies from 10Hz to 55Hz and back to 10Hz in after 1min.	
	Capacitance	<b>Characteristics</b>	<b>Change from the value before test</b>	Repeat this for 2h each in 3 perpendicular directions.
		Class 2	X8R	
D.F. (Class 2)	Meet the initial spec.			

## C Series – High Temperature Application

No.	Item	Performance	Test or Inspection Method															
12	<b>Temperature cycle</b>																	
	External appearance	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1) before testing. Expose the capacitor in the condition step 1 through 4, and repeat 5 times consecutively.															
	Capacitance	<table border="1"> <thead> <tr> <th colspan="2">Characteristics</th> <th>Change from the value before test</th> </tr> </thead> <tbody> <tr> <td>Class 2</td> <td>X8R</td> <td>± 7.5 %</td> </tr> </tbody> </table>		Characteristics		Change from the value before test	Class 2	X8R	± 7.5 %	Leave the capacitors in ambient conditions for 48±4h before measurement.								
		Characteristics		Change from the value before test														
	Class 2	X8R	± 7.5 %															
	D.F. (Class 2)	Meet the initial spec.																
Insulation Resistance	Meet the initial spec.		<table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. ±3</td> <td>30 ± 3</td> </tr> <tr> <td>2</td> <td>Reference Temp.</td> <td>2 – 5</td> </tr> <tr> <td>3</td> <td>Max. operating temp. ± 2</td> <td>30 ± 2</td> </tr> <tr> <td>4</td> <td>Reference Temp.</td> <td>2 - 5</td> </tr> </tbody> </table>	Step	Temperature (°C)	Time (min.)	1	Min. operating temp. ±3	30 ± 3	2	Reference Temp.	2 – 5	3	Max. operating temp. ± 2	30 ± 2	4	Reference Temp.	2 - 5
Step	Temperature (°C)	Time (min.)																
1	Min. operating temp. ±3	30 ± 3																
2	Reference Temp.	2 – 5																
3	Max. operating temp. ± 2	30 ± 2																
4	Reference Temp.	2 - 5																
Voltage Proof	No insulation breakdown or other damage.																	
13	<b>Moisture Resistance (Steady State)</b>																	
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing. Leave at temperature 40±2°C, 90 to 95%RH for 500+24,0h.															
	Capacitance	<table border="1"> <thead> <tr> <th colspan="2">Characteristics</th> <th>Change from the value before test</th> </tr> </thead> <tbody> <tr> <td>Class 2</td> <td>X8R</td> <td>± 12.5 %</td> </tr> </tbody> </table>		Characteristics		Change from the value before test	Class 2	X8R	± 12.5 %	Leave the capacitor in ambient conditions for 48±4h before measurement.								
		Characteristics		Change from the value before test														
	Class 2	X8R	± 12.5 %															
D.F. (Class 2)	200% of initial spec max.																	
Insulation Resistance	1,000MΩ or 50 MΩ · μF min.																	
14	<b>Moisture Resistance</b>																	
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing. Apply the rated voltage at temperature 40±2°C and 90 to 95%RH for 500+24,0h.															
	Capacitance	<table border="1"> <thead> <tr> <th colspan="2">Characteristics</th> <th>Change from the value before test</th> </tr> </thead> <tbody> <tr> <td>Class 2</td> <td>X8R</td> <td>± 12.5 %</td> </tr> </tbody> </table>		Characteristics		Change from the value before test	Class 2	X8R	± 12.5 %	Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 48±4h before measurement.								
		Characteristics		Change from the value before test														
	Class 2	X8R	± 12.5 %															
D.F. (Class 2)	200% of initial spec max.																	
Insulation Resistance	500MΩ or 25 MΩ · μF min.		Voltage conditioning: Voltage treats the capacitor under testing temperature and voltage for 1 hour. Leave the capacitor in ambient condition for 48±4h before measurement.															
			Use this measurement for initial value.															



General Specifications

# C Series – High Temperature Application

No.	Item	Performance	Test or Inspection Method							
15	Life									
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing. Apply 2× rated voltage at maximum operating temperature ±3°C for 1,000 +48.0h.							
	Capacitance	<table border="1"> <thead> <tr> <th colspan="2">Characteristics</th> <th>Change from the value before test</th> </tr> </thead> <tbody> <tr> <td>Class 2</td> <td>X8R</td> <td>± 15 %</td> </tr> </tbody> </table>		Characteristics		Change from the value before test	Class 2	X8R	± 15 %	Charge/discharge current shall not exceed 50mA.
		Characteristics		Change from the value before test						
	Class 2	X8R	± 15 %							
D.F. (Class 2)	Characteristics X8R: 200% of initial spec. max		Leave the capacitor in ambient conditions for 48±4h before measurement. Voltage conditioning : Voltage treats the capacitor under testing temperature and voltage for 1 hour.							
Insulation Resistance	1,000MΩ or 50 MΩ · μF min.		Leave the capacitor in ambient conditions for 48±4h before measurement. Use this measurement for initial value.							

**\*As for the initial measurement of capacitors on number 6,10,11,12 and 13, leave capacitor at 150 –10, 0°C for 1h and measure the value after leaving the capacitor for 48±4h in ambient conditions.**



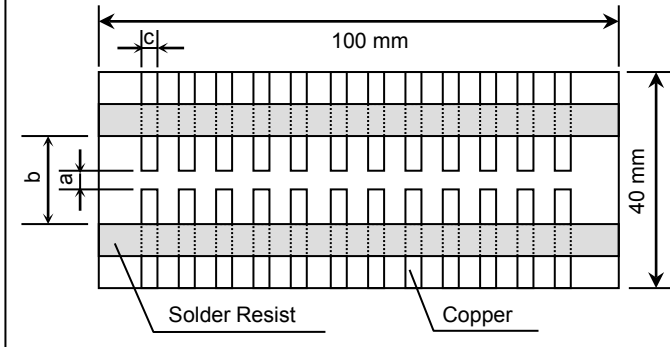
## General Specifications

# C Series – High Temperature Application

### Appendix - 1a

#### P.C. Board for reliability test

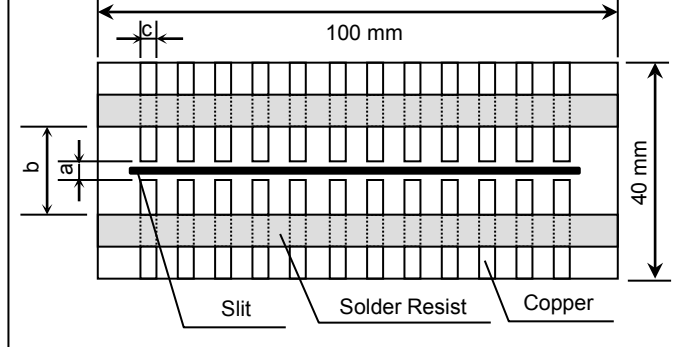
Applied for C1005, C1608, C2012, C3216



### Appendix - 1b

#### P.C. Board for reliability test

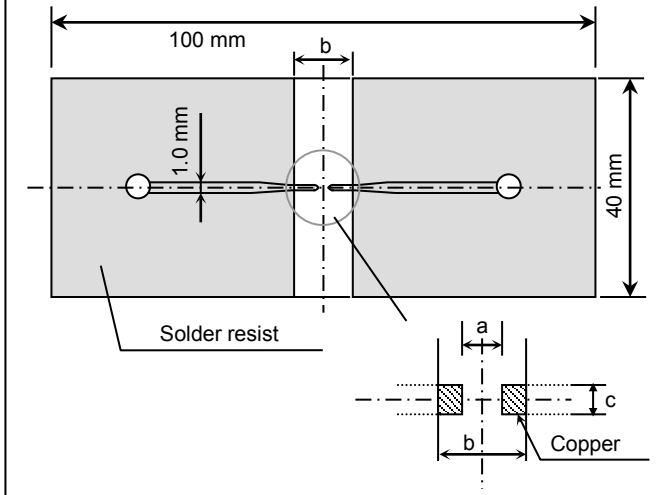
Applied for C3225



### Appendix - 2a

#### P.C. Board for bending test

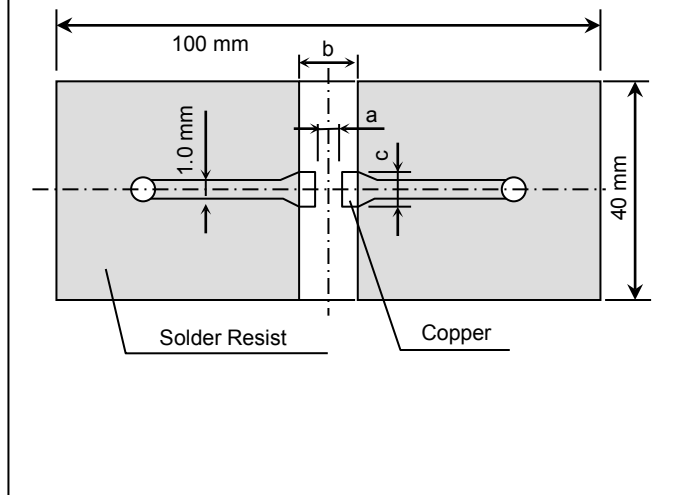
Applied for C1005



### Appendix - 2b

#### P.C. Board for bending test

Applied for C1608, C2012, C3216, C3225



Material : Glass Epoxy (As per JIS C6484 GE4)

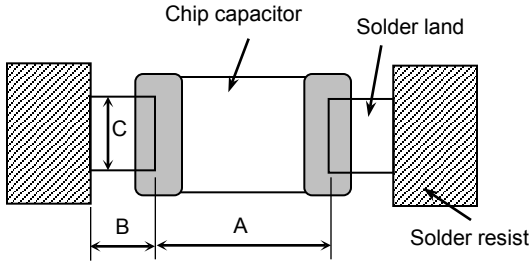
P.C. Board thickness : Appendix-2a                      0.8mm  
    Appendix-1a, 1b, 2b                      1.6mm

- Copper (thickness 0.035mm)
- Solder resist

Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C1005	CC0402	0.4	1.5	0.5
C1608	CC0603	1.0	3.0	1.2
C2012	CC0805	1.2	4.0	1.65
C3216	CC1206	2.2	5.0	2.0
C3225	CC1210	2.2	5.0	2.9

## C Series – High Temperature Application

### Recommended Soldering Land Pattern

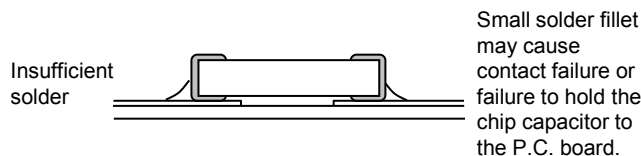
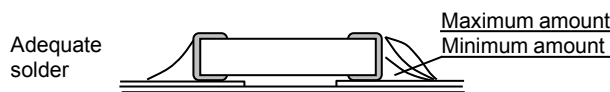
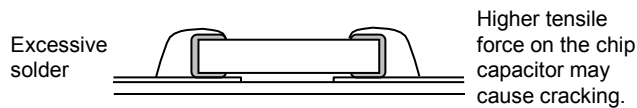


Wave Soldering		Unit: mm		
Type	C1608 [CC0603]	C2012 [CC0805]	C3216 [CC1206]	
Symbol				
A	0.7 - 1.0	1.0 - 1.3	2.1 - 2.5	
B	0.8 - 1.0	1.0 - 1.2	1.1 - 1.3	
C	0.6 - 0.8	0.8 - 1.1	1.0 - 1.3	

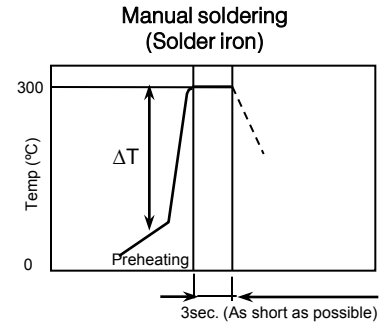
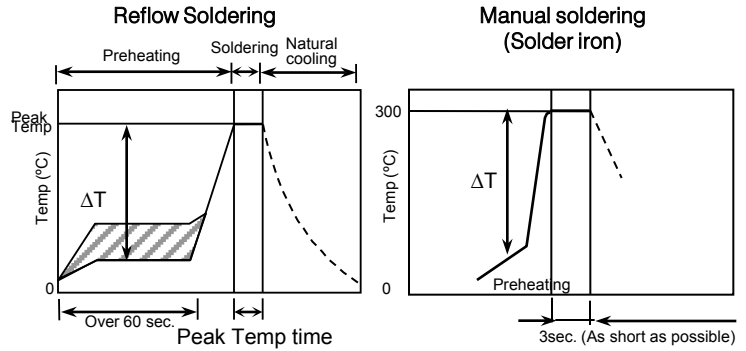
Reflow Soldering		Unit: mm		
Type	C1005 [CC0402]	C1608 [CC0603]	C2012 [CC0805]	
Symbol				
A	0.3 - 0.5	0.6 - 0.8	0.9 - 1.2	
B	0.35 - 0.45	0.6 - 0.8	0.7 - 0.9	
C	0.4 - 0.6	0.6 - 0.8	0.9 - 1.2	

Reflow Soldering		Unit: mm	
Type	C3216 [CC1206]	C3225 [CC1210]	
Symbol			
A	2.0 - 2.4	2.0 - 2.4	
B	1.0 - 1.2	1.0 - 1.2	
C	1.1 - 1.6	1.9 - 2.5	

### Recommended Solder Amount



### Recommended Soldering Profile



### Recommended soldering duration

Solder	Temp./Dura.	Wave Soldering		Reflow Soldering	
		Peak temp (°C)	Duration (sec.)	Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		250 max.	3 max.	230 max.	20 max.
Lead-Free Solder		260 max.	5 max.	260 max.	10 max.

### Recommended solder compositions

- Sn-37Pb (Sn-Pb solder)
- Sn-3.0Ag-0.5Cu (Lead Free Solder)

### Preheating Condition

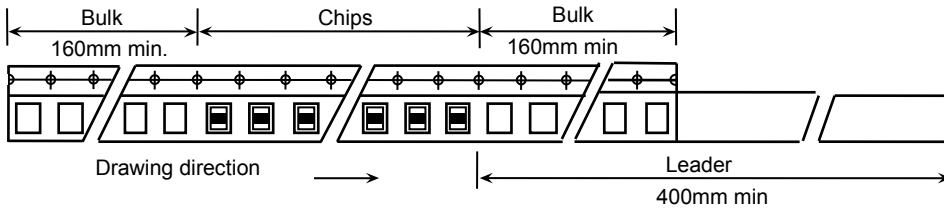
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
Reflow soldering	C1005(CC0402), C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210)	$\Delta T \leq 130$
Manual soldering	C1005(CC0402), C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210)	$\Delta T \leq 130$



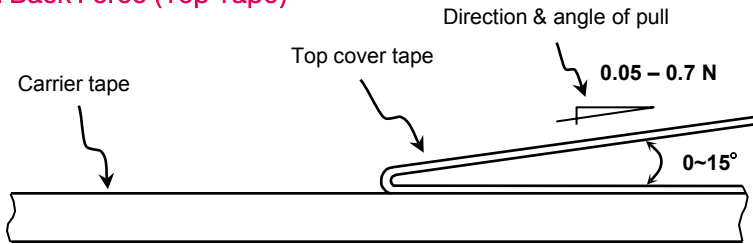
## Packaging Information

# C Series – High Temperature Application

### Carrier Tape Configuration

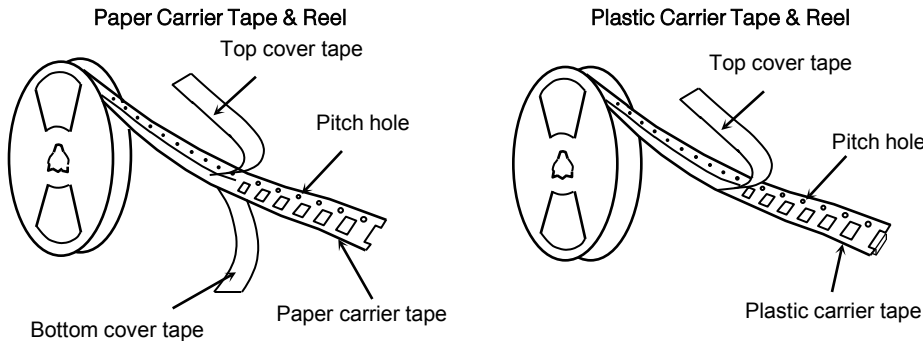


### Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

### Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)



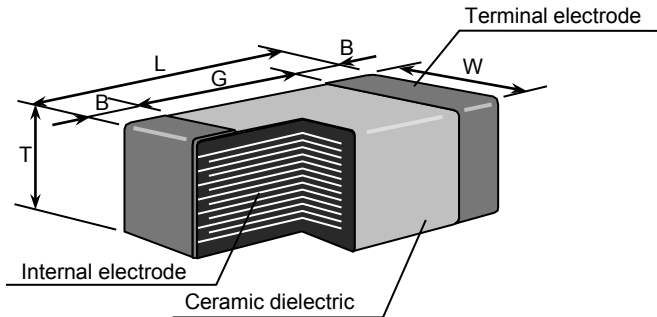
Case Code		Chip Thickness	Taping Material	Chip quantity (pcs.)	
JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
C1005	CC0402	0.50 mm	Paper	10,000	50,000
C1608	CC0603	0.80 mm	Paper	4,000	10,000
C2012	CC0805	0.85 mm	Paper	4,000	10,000
		1.25 mm	Plastic	2,000	
C3216	CC1206	0.85 mm	Paper	4,000	10,000
		1.15 mm	Plastic	2,000	
		1.60 mm			8,000
C3225	CC1210	1.60 mm	Plastic	2,000	8,000
		2.00 mm		1,000	5,000
		2.50 mm			



## Additional Information

# C Series – High Temperature Application

### • Shape & Dimensions



### • Environmental Information

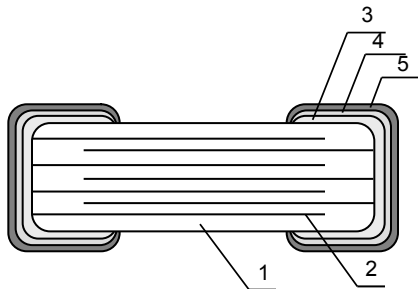
TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive<sup>1</sup> enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive<sup>2</sup>.

1. - Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.  
 For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.  
 For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.

Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C1005	CC0402	1.00	0.50	0.50	0.25	0.35 min.
C1608	CC0603	1.60	0.80	0.80	0.20 min.	0.30 min.
C2012	CC0805	2.00	1.20	0.85	0.20 min.	0.50 min.
				1.25		
C3216	CC1206	3.20	1.60	0.85	0.20 min.	1.00 min.
				1.15		
				1.60		
C3225	CC1210	3.20	2.50	1.60	0.20 min.	1.00 min
				2.00		
				2.50		

### • Inside Structure & Material System



No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO <sub>3</sub>	BaTiO <sub>3</sub>
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	