Nickel Barrier

Multilayer Ceramic Capacitors

Features:

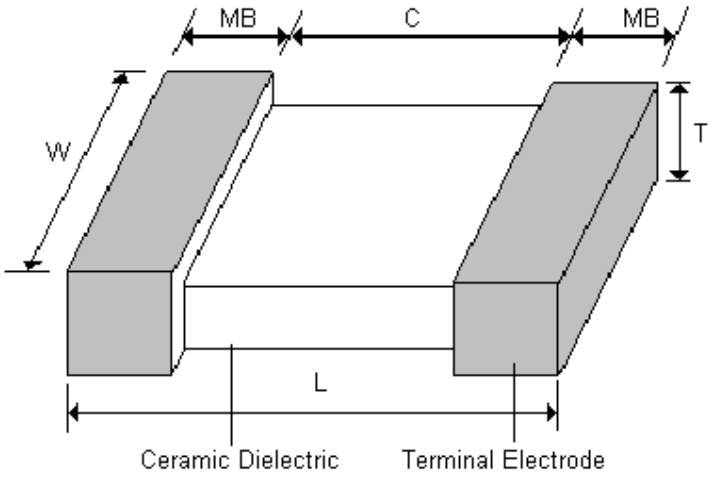
- Multilayer ceramic chip capacitor.
- Nickel barrier termination.
- High performance and reliability.
- 0603, 0805, and 1206 case size.

Rated Voltage

Code	Rated Voltage
A	100
B	16
T	25
U	50

Part Dimension

Dimensions						
Length (L)	**Width (W)**	**Maximum Thickness (T)**	**Minimum MB**	**Minimum G**	**Voltage (V)**	**Type**
1.6 ±0.1	0.8 ±0.1		0.20	0.40	6.3 ~ 50	0603
2.0 ±0.2	1.25 ±0.1	1.40	0.25	0.70	6.3 ~ 500	0805
3.2 ±0.2	1.60 ±0.2	1.52		1.40	6.3 ~ 1000	1206



Temperature Characteristics Code

Code	Temperature Coefficient	Operation Temperature (°C)	Capacitance Change
C	NPO (Class I)	-55°C ~ +125	0 ±30ppm/°C
R	X7R (Class II)		±15%
F	Y5V (Class II)	30°C ~ +85	+22% ~ -82%

Capacitance Code

Code	Capacitance (pF)
010	1*
1R5	1.5
100	10*
101	100*
102	1000*
103	10000*
222	2200*
472	4700*

Tolerance Code

Code	Tolerance (%)
J	±5
K	±10
Z	+80/-20

PS:

- * -- Two significant digits followed by number of zeros.
- Temperature coefficient (T.C.) vs. Proper tolerance applied:
  NPO: For all tolerance
  X7R+X5R: K+M Tolerance
  Y5V+Z5U: M+Z Tolerance

Termination Code

Code	N
Termination Type	Nickel

Packaging Code

Code	B	T
Packaging Type	Bulk	Tape and Reel

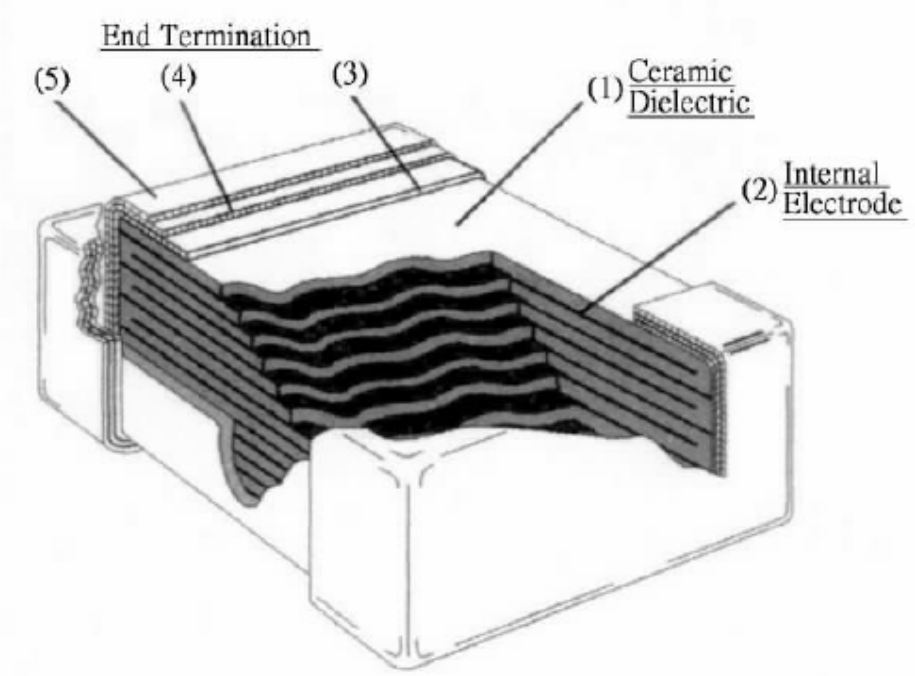
Standard Test Conditions

Tests shall, unless otherwise specified, be carried out at 15 to 35°C and RH 45 to 75%.If any doubt and argument has been encounter in judgement, the final test shall be done at 25 ±2°C, RH45 to 55% and 860 ~ 1060mbar. (Based on JIS standard).

Disposition

If question to the measuring result in judgement, take the capacitor under a specified temperature for 30 minutes at least before measurement.

Structure



Ag/Pd Series

Number	Specifications	Material	Minimum Termination Plating Thickness (μ m)
1	Ceramic Dielectric	Ceramic	
2	Internal Electrode	Ag-Pd	
3	End Terminal	Ag layer	40
4		Ni layer	1.5 - 3.5
5		Sn-Pb layer or Sn layer	3 - 8

BME Series

Number	Specifications	Material	Minimum Termination Plating Thickness (μ m)
1	Ceramic Dielectric	Ceramic	
2	Internal Electrode	Ni	
3	End Termination	Cu layer	40
4		Ni layer	1.5 - 3.5
5		Sn-Pb layer or Sn layer	3 - 8

Storing Condition And Term

Recommends the storing of products within 6 months at temperature 15 ~ 35°C and humidity 70%RH maximum. If the product stored over 6 months, please reconfirm its solderability before use.

Performance

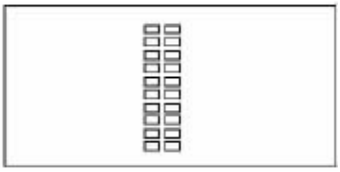
<table>
<tr><th>Item</th><th>Performance</th><th>Test or Inspection Method</th></tr>
<tr><td>External Appearance</td><td>No defects which may affect performance</td><td>Visual inspection and dimension measurement</td></tr>
<tr><td>Voltage Proof</td><td>Withstand test voltage without insulation breakdown or other damage</td><td>DC Tested voltage shall be applied for 1 ~ 5 second. Charge/discharge current shall not exceed 50mA (PS : Ra - Rated Voltage)
<table>
<tr><th rowspan="2">Code</th><th colspan="3">Temperature Coefficient</th></tr>
<tr><th>NPO</th><th>X7R/X5R</th><th>Y5V</th></tr>
<tr><td>≤200V</td><td colspan="3">2.5Ra</td></tr>
<tr><td>250V</td><td colspan="3">2.0Ra</td></tr>
<tr><td>500V/630V</td><td colspan="3">1.5Ra</td></tr>
<tr><td>≥1KV</td><td>1.5Ra</td><td>1.25Ra</td><td>-</td></tr>
</table></td></tr>
<tr><td>Insulation Resistance</td><td>NPO:
100,000MΩ minimum or R x C ≥1000Ω x F (Which ever is smaller)
X7R, X5R, Y5V, Z5U:
10,000MΩ minimum or R x C ≥ 1000Ω x F (Which ever is smaller)</td><td>
<table>
<tr><th>Rated Voltage</th><th>DC Tested Voltage</th></tr>
<tr><td><1KV</td><td>1.0 Ra</td></tr>
<tr><td>≥1KV</td><td>1KV</td></tr>
</table>
Apply DC tested voltage for 60 ±5 minute.
(PS : Ra - Rated Voltage)</td></tr>
<tr><td>Capacitance (Cap.)</td><td>Within the specified tolerance</td><td rowspan="2">Measuring Frequency:
Z5U,Y5V, X7R, X5R : 1KHz ±50Hz
NPO:
>1000pF:1KHz ±50Hz.
≤1000pF:1MHz 100KHz.
Measuring Voltage:
Z5U:0.5$V_{rms.}$
NPO:
X7R, X5R, Y5V:1.0 ±0.2$V_{rms.}$</td></tr>
<tr><td>Dissipation Factor (D.F)</td><td>NPO:
≥30pF: Q ≥ 1000
<30pF: Q ≥ 400 + 20C
PS:C: Nominal Capacitance (pF)
X7R, X5R, Y5V, and Z5U : (Maximum Value)
<table>
<tr><th>T.C.</th><th>≥ 50V</th><th>25V</th><th>16V</th><th>≤10V</th></tr>
<tr><td>X7R/ X5R</td><td>2.5%</td><td>3.0%</td><td>3.5%</td><td>5.0%</td></tr>
<tr><td>Z5U</td><td>4.0%</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Y5V</td><td>5.0%</td><td>7.5%</td><td>9.0%</td><td>12.5%</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Item</th><th>Performance</th><th>Test or Inspection Method</th></tr>
<tr><td>Temperature Characteristic of Capacitance</td><td>Temperatures Coefficient
<table><tr><th>TC</th><th>Operating Temperature</th><th>Capacitance Change (DC)</th></tr><tr><td>NPO</td><td>-55 ~ +125°C</td><td>0 ±30 (ppm/°C)</td></tr><tr><td>X7R</td><td>-55 ~ +125°C</td><td>±15%</td></tr><tr><td>X5R</td><td>-55 ~ +85°C</td><td>±15%</td></tr><tr><td>Y5V</td><td>-55 ~ +125°C</td><td>+22% ~ -82%</td></tr><tr><td>Z5U</td><td>-55 ~ +125°C</td><td>+22% ~ -56%</td></tr></table></td><td>The temperature coefficient is determined using the capacitance measured in step 3 as a reference. Test the specimen from step 1through step 5, the capacitance shall be within the specified tolerance for the capacitance coefficient and capacitance change as left table.
<table><tr><th>Code</th><th>Temperature Coefficient</th></tr><tr><td>1</td><td>Base Temperature (25°C) ±2°C</td></tr><tr><td>2</td><td>Minimum Operation Temperature ±2°C</td></tr><tr><td>3</td><td>Base Temperature (25°C) ±2°C</td></tr><tr><td>4</td><td>Minimum Operation Temperature ±2°C</td></tr><tr><td>5</td><td>Base Temperature (25°C) ±2°C</td></tr></table></td></tr>
<tr><td>Solderabiliy</td><td rowspan="2">New solder to over 95% of termination</td><td>Completely soak both terminal electrodes in solder at specified temperature for 3 ±0.5 second
a. For Tin-Lead Sn/Pb) Termination product: 235 ±5°C.
b. For Lead-free (Pure Sn) Termination product: 245 ±5°C.</td></tr>
<tr><td>Leaching</td><td>Completely soak both terminal electrodes in solder at 270 ±5°C for 40 ±1second.</td></tr>
<tr><td rowspan="4">Soldering to heat</td><td>External Appearance</td><td>No mechanical Damage</td><td rowspan="4">Completely immerse both terminations in solder at 270 ±5°C for 10 ±3 second.

Leave the capacitors in ambient condition for 2 4 ±2 hours before measurement.

*Preconditioning: F(only for Class 2):
Perform a heat treatment at 150 +0-10°C for one hour and then let sit for 24 ±2 hours at room temperature.
Perform the initial measurement.</td></tr>
<tr><td>Capacitance Change (Δ C/C)</td><td>NPO: ±2.5% or ±0.25 pF maximum (Whichever is larger)
X7R/X5R: ±7.5%
Z5U: ±20%
Y5V: ±20%</td></tr>
<tr><td>DF</td><td>NPO: C ≥30pF : Q ≥ 1000
C<30pF:Q ≥ 400 + 20°C
PS: C : Nominal Capacitance (pF)
X7R, X5R, Y5V, Z5U : (Maximum Value)
<table><tr><th>T.C.</th><th>≥ 50V</th><th>25V</th><th>16V</th><th>≤10V</th></tr><tr><td>X7R/ X5R</td><td>2.5%</td><td>3.0%</td><td>3.5%</td><td>5.0%</td></tr><tr><td>Z5U</td><td>4.0%</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Y5V</td><td>5.0%</td><td>7.5%</td><td>9.0%</td><td>12.5%</td></tr></table></td></tr>
<tr><td></td><td>IR</td><td>NPO:
100,000MW minimum or R x C ≥1000W x F (Whichever is smaller)
X7R, X5R, Y5V, Z5U:
10,000MW minimum or R x C ≥1000W x F (Whichever is smaller)</td></tr>
</table>

Item		Performance	Test or Inspection Method
Humidity (Steady State) and Humidity Load	External Appearance	No mechanical damage	Humidity load: (Not apply for the product with rated voltage ≥250V): Apply the rated voltage at temperature 40 ±2°C and humidity 90 to 95%RH for 1000+48/-0 hours. Leave the capacitors in ambient condition for the following time before measurement. Class 1: 1~2 hours. Class 2: 24 ±2 hours. Charge / discharge current shall not exceed 50 mA. Preconditioning: (only for class 2): Apply the rated DC voltage for 1hour at 40 ±2°C. Remove and let sit for 48 ±4 hours at room temperature. Perform initial measurement. Humidity (steady state): The test procedure is same as that in Humidity load but only without rated voltage applied.
	Capacitance Change (Δ C/C)	NPO: ±5% or ±0.5 pF maximum (Whichever is larger) X7R/X5R: ±12.5% Y5V: ±30% Z5U: ±30%	
	DF	NPO: C ≥30pF: Q ≥ 350 10pF≤C<30pF: Q≥100+2.5°C C<10pF: 200+10°C PS: C: Nominal Capacitance (pF) C<30pF:Q ≥ 400 + 20°C PS: C : Nominal capacitance (pF) X7R, X5R: Less than 2 times of initial value Y5V and Z5U: Less than 1.5 times of initial value	
	IR	500MΩ minimum or 25Ω *F (Which ever is smaller)	
Load Life	External Appearance	No mechanical damage	Apply 2 x rated voltage at maximum operating temperature ±2°C for 1000 +48/-10 hours. Leave the capacitors in ambient condition for the following time before measurement. Class I: 1~2 hours Class II: 24 ±2 hours Charge / discharge current shall. not exceed 50 mA. Preconditioning: (only for class 2): Apply 200% of the rated DC voltage for 1 hour at the maximum operating temperature ±3°C. Remove and let sit for 24 ±2 hours at room temperature. Perform initial measurement.
	Capacitance Change (Δ C/C)	NPO: ±3% or ±0.3 pF maximum (Whichever is larger) X7R/X5R: ±12.5% Y5V: ±30% Z5U: ±30%	
	DF	NPO: C ≥30pF : Q ≥ 350 30pF>:C ≥10pF: Q ≥ 275 +205°C C<10pF: Q ≥ 200 + 10°C PS: C : Nominal capacitance (pF) X7R, X5R: Less than 2 times of initial value Y5V and Z5U : Less than 1.5 times of initial value	
	IR	1000MΩ minimum or 50Ω *F (Whichever is smaller)	

<table>
<tr><th colspan="2">Item</th><th>Performance</th><th>Test or Inspection Method</th></tr>
<tr><td rowspan="3">Vibration</td><td>External Appearance</td><td>Without distinct Damage</td><td rowspan="3">(Not apply for 0402 product)
Solder the capacitors to the test jig as shown in figure below with IR-Reflow method. The capacitor shall be subjected to a simple harmonic motion with the entire frequency range, from 10 to 55 Hz and return to 10 Hz ,shall be transverse in 1 min.
Amplitude (total excursion): 1.5mm
Amplitude tolerance: ± 15%
This motion shall be applied for a period of 2 hours in each of 3 mutually perpendicular directions (a total of 6 hours)
  </td></tr>
<tr><td>Capacitance Change (Δ C/C)</td><td>NPO: ±2.5% or ±0.25 pF maximum (Whichever is larger)
X7R/X5R: ±7.5%
Y5V, Z5U: ±20%</td></tr>
<tr><td>DF or Q</td><td>NPO: C ≥30pF : Q ≥ 1000
C<30pF:Q ≥ 400 + 20°C
PS: C : Nominal capacitance (pF)
X7R, X5R, Y5V, Z5U : (Maximum Value)
<table>
<tr><th>T.C.</th><th>≥ 50V</th><th>25V</th><th>16V</th><th>≤10V</th></tr>
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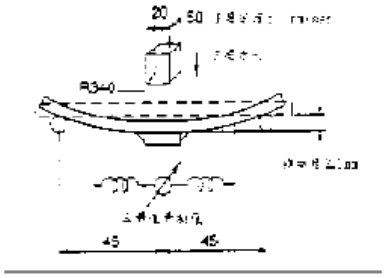
<tr><td>Z5U</td><td>4.0%</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Y5V</td><td>5.0%</td><td>7.5%</td><td>9.0%</td><td>12.5%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Deflection</td><td>External Appearance</td><td>No mechanical Damage</td><td rowspan="3">  </td></tr>
<tr><td>Bending Strength</td><td>Flexure ≥ 1mm</td></tr>
<tr><td>Capacitance Change (Δ C/C)</td><td>NPO: ±5% or ±0.5 pF maximum (Whichever is larger)
X7R/X5R: ±12.5%
Y5V: ±30%</td></tr>
<tr><td rowspan="4">Temperature Cycle</td><td>External Appearance</td><td>No mechanical Damage</td><td rowspan="4">(Not apply for 0402 product)
The capacitor shall be subject 5 cycles according to four heat treatments listed in the following table.
Then leave the capacitors in ambient condition for the following time before measurement.
Class II: 2~24 hours
<table>
<tr><th>Step</th><th>Temperature (°C)</th><th>Duration (Minutes)</th></tr>
<tr><td>1</td><td>Minimum Operation Temperature ±3</td><td>30 ±3</td></tr>
<tr><td>2</td><td>Room Temperature (25°C)</td><td>2 ~ 5</td></tr>
<tr><td>3</td><td>Minimum Operation Temperature ±3</td><td>30 ±3</td></tr>
<tr><td>4</td><td>Room Temperature (25°C)</td><td>2 ~ 5</td></tr>
</table>
Preconditioning: (only for class 2):
Perform a heat treatment at 150+0-10°C for one hour and then let sit for 24 ±2 hours at room temperature.
Perform initial measurement.</td></tr>
<tr><td>Capacitance Change (Δ C/C)</td><td>NPO: ±2.5% or ±0.25 pF maximum (Whichever is larger)
X7R/X5R: ±7.5%
Y5V: ±20%</td></tr>
<tr><td>DF</td><td>NPO: C ≥30pF : Q ≥ 1000
C<30pF: Q ≥ 400 + 20°C
X7R, X5R, Y5V and Z5U (Maximum value)
<table>
<tr><th>T.C.</th><th>≥ 50V</th><th>25V</th><th>16V</th><th>≤10V</th></tr>
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<tr><td>Z5U</td><td>4.0%</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Y5V</td><td>5.0%</td><td>7.5%</td><td>9.0%</td><td>12.5%</td></tr>
</table></td></tr>
<tr><td>IR</td><td>1000MΩ minimum or 50Ω *F (Whichever is smaller)</td></tr>
</table>

Precaution For Handling

The multi-layer ceramic chip capacitors, may fall in a short circuit mode or in an open-circuit mode when subjected to severe conditions of electrical, environmental and/or mechanical stress beyond the specified “Ratings” and specified “Condition” in the Catalog and the Specifications, resulting in burnout, flaming or glowing in the worst case. So some common sense of application by customer is necessary. Here the following article are some key points that need to take attention in application for customer reference only:

Operating Conditions and Circuit Design

Operating temperature range

The specified “Operating Temperature Range” in the catalog is absolute maximum and minimum temperature rating. So in any case, each the Capacitor shall be operated within the specified “Operating Temperature Range”.

Design of Voltage applications

The capacitors shall not be operated exceeding the specified “Rated Voltage” in the catalog. If voltage ratings are exceeded the Capacitors could result in failure of damage. In case of application of DC and AC voltage to the capacitors, the designed peak voltage shall be within the specified “Rated Voltage”.

Charging and Discharging Current

The capacitors shall not be operated beyond the specified “Maximum Charging / Discharging Current Rated” in the specification, Application to a low impedance circuit such as a “secondary power circuit” are not recommended for safety.

Temperature Rise by Dielectric Loss of the capacitor

The “Operating Temperature Range” mentioned above shall include a maximum surface temperature rise of 20°C, which is caused by the Dielectric loss of the Capacitor and applied electrical stress (such as voltage, frequency and wave form etc.)
It is recommended to measure and check “Surface temperature of the Capacitor” in your equipment at your estimated / designed maximum ambient temperature.

Restriction on Environmental Conditions

The Capacitors shall not be operated and / or stored under following environmental conditions:
(a) To be exposed directly to water or salt water.
(b) To be exposed directly to sunlight.
(c) Under conditions of dew formation.
(d) Under conditions of corrosive atmosphere such as hydrogen sulfas, sulphurous acid, chlorine, or ammonia etc.
(e) Under severe condition of vibrations or shock beyond the specified conditions in the Specifications.

Secular change in Capacitance

(1) Peculiar characteristics of “Secular Changes in Capacitance” are observed in the Capacitors (Class 2 High Dielectric Constant Temperature Characteristics “X7R” and “Y5V”. The “secular change” shall be considered in your circuit design.
(2) The Capacitance change, due to the individual characteristics of ceramic dielectric materials applied, can be recovered to the each initial values at shipping by a heat treatment (140 to 150°C for 1 hour).

Design of Printed Circuit Board

Selection of Printed Circuit Boards

When the Capacitors are mounted and soldered on an “Aluminium’s Substrate has influences on Capacitor’s reliability against “Temperatures Cycles” and “Heat shock” because of difference of thermal expansion dose not deterioration the characteristics of the Capacitors.
There are some thermal expansion factor for different kink of PC board material as follows

PC Board Material	Thermal Expansion Factor (mm/°C)
Glass Epoxy	1.4×10^{-5}
Paper Phenol	2.2×10^{-5}
Composite	
Alumina	6.5×10^{-6}

Design of Land Pattern
Recommended Dimensions of Lands. As shown in Table 1 and Figure 1.
Note: * Too large land required excess amount of solder.
** The Dimensions shall be symmetrical.

Figure 1 Recommended Land Dimensions:

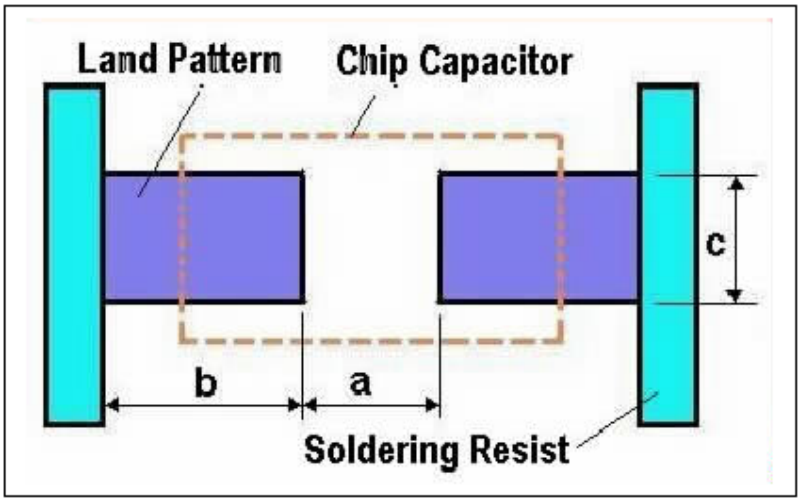


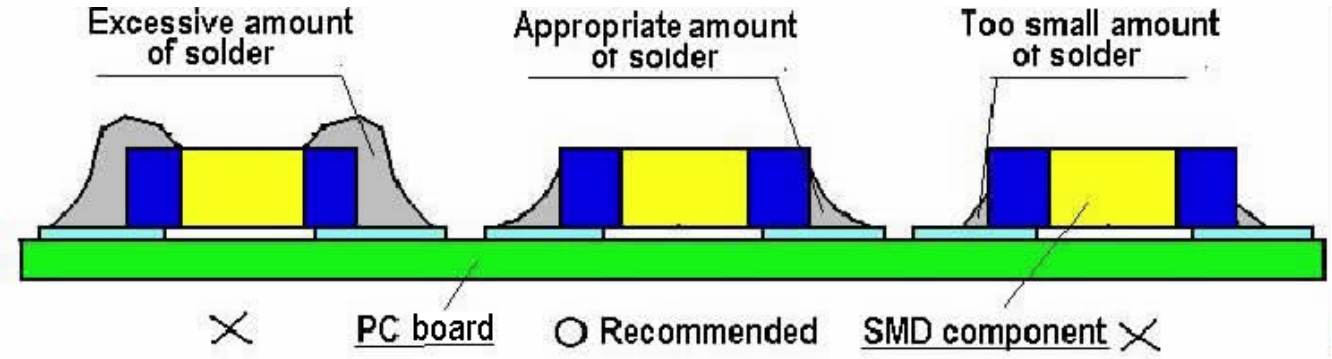
Table 1

Size	Chip Dimensions		Land Dimension		
	Length (L)	Width (W)	a	b	c
0603	1.6	0.8	0.70 ~ 1.00	0.80 ~ 1.00	0.60 ~ 0.80
0805	2.0	1.25	1.00 ~ 1.30	1.00 ~ 1.20	0.80 ~ 1.10
1206	3.2	1.6	2.10 ~ 2.50	1.10 ~ 1.30	1.10 ~ 1.30

Dimensions: Millimetres

Recommend amount of solder:
Recommended amount of solder: As shown in Figure2. Excess amount of solder gives large mechanical stresses to the capacitors / Components.

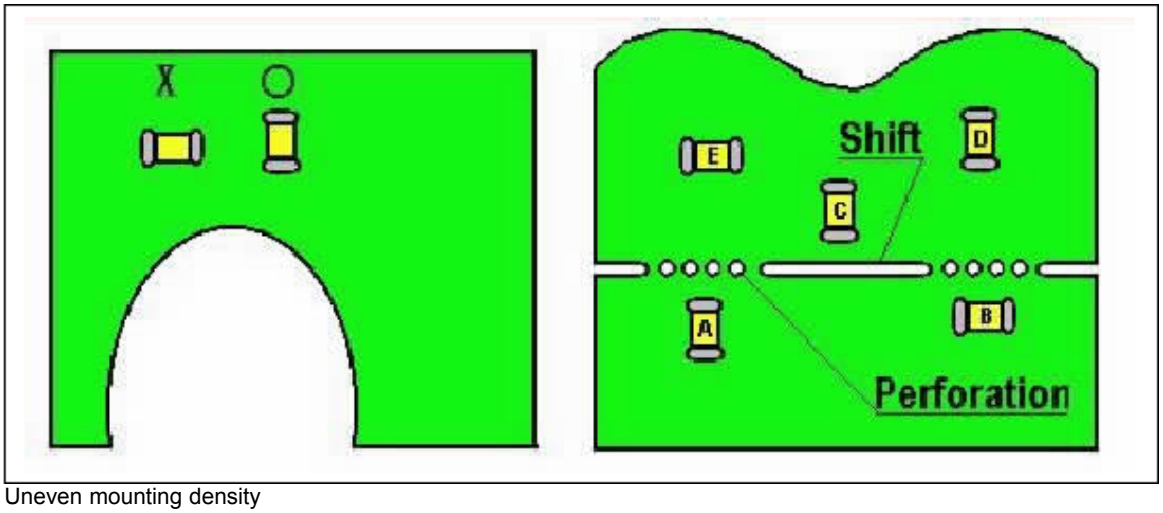
Figure 2: Recommended amount of solder



Component Layout

When placing / mounting the capacitors / components near an area which is apt to bend or a grid groove on the PC board. It is advisable to have both electrodes subjected to uniform stresses, or to position the component electrodes at right angles to the grid groove or bending line.

Figure 3 Component Layout



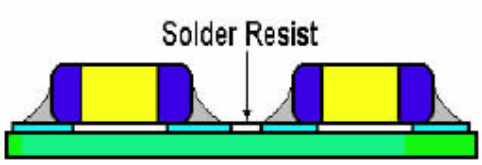
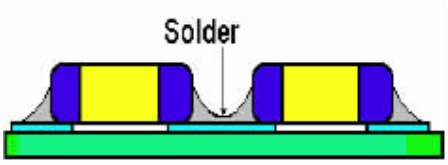
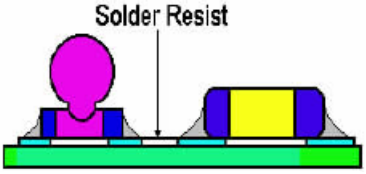
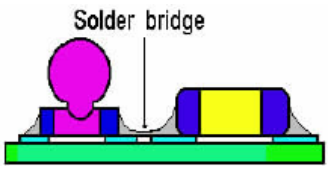
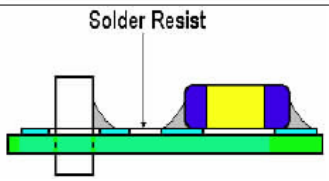
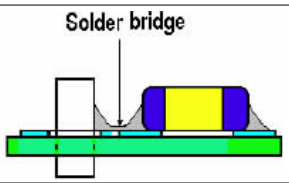
Uneven mounting density
O: Proper X: Improper
Probability at which the chip capacitor is broken by the stress on PC board break
A > B = C >D > E

Mounting Density and Spaces

Placements in too narrow spaces between components may cause " Solder Bridges" during soldering. The minimum space between components shall be 0.5mm in view of the positioning tolerances of the mounting machines and the dimensional tolerances of the components and PC boards.

Applications of Solder Resist

Application of Solder Resist are effective to prevent solder bridges and to control amounts of solder on PC boards (As shown in Table 2).

	Recommended Application Examples	Examples of Solder Bridges
Narrow Spacing between Chip Components		
Radial Components are directly connected to Chip Components		
Common lands are close to Chip Components		

Precautions for Assembly

Adhesives for Mounting

(1) Selection of adhesives

a. The viscosity of an adhesive for mountings shall be such that the adhesive dose not flow off on the land during its curing.

b. If the adhesive is too low in its viscosity, mounted components may be out of alignment after or during soldering.

c. The adhesives shall not be corrosive or chemically active to the mounted components and the PC boards.

d. The amount of adhesive shall be such that the adhesive does not flow off or be out of alignment.

e. Adhesives for mountings can be cured by ultraviolet or infrared radiation. In order to prevent the terminal electrodes of the Capacitors the curing shall be done at conditions of 180°C maximum, for 2 minutes maximum.

Chip Mounting consideration

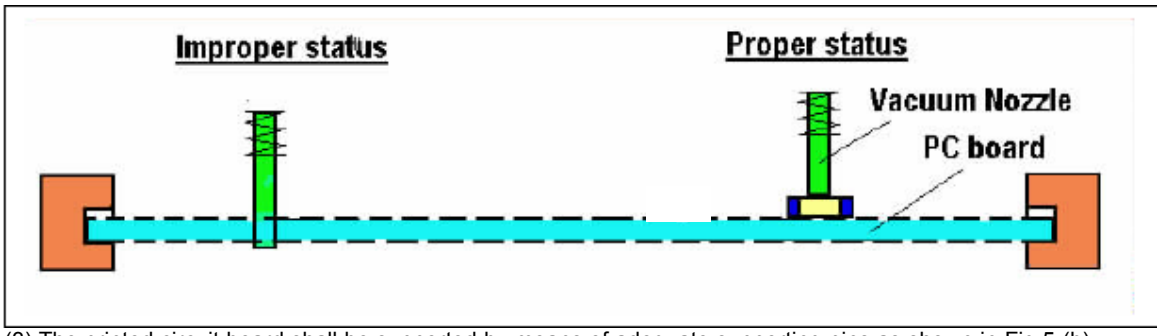
In mounting the Capacitors / components on a printed circuit board, any bending and expanding force against them shall be kept minimum to prevent them from being damaged or cracked.

Following precautions and recommendation shall be observed carefully in the process:

(1) Maximum stroke of the vacuum nozzle shall be adjusted so that the pushing force to the printed circuit board shall be limited to a static of 1 to 3 N (100 to 300 gf) (See Figure4).

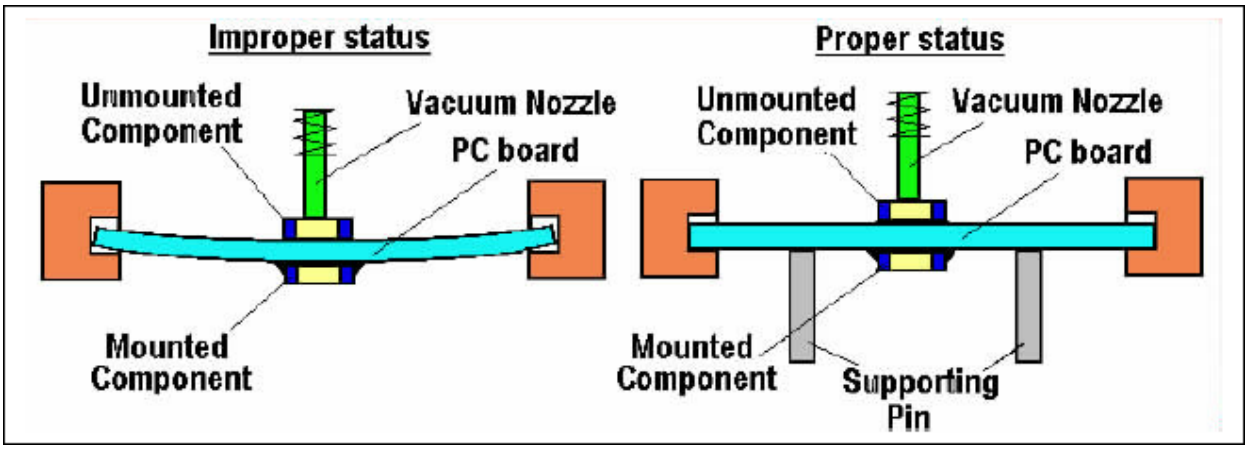
(2) Maximum stroke of the nozzle shall be adjusted so that the maximum bending of printed circuit board dose not exceeded 0.5mm (See Figure 4)

Figure 4



(3) The printed circuit board shall be supported by means of adequate supporting pins as shown in Fig.5-(b)

Figure 5



Soldering Flux and Solder

(1) Solder Flux:

a. The content of halogen in the soldering shall be 0.2 wt% or less.

b. Rosin-based and non-activated soldering flux is recommended.

(2) Water soluble type Soldering Flux:

In case of water soluble type soldering flux being applied, the flux residue on the surface of PC boards may have influences on the reliability of the components and cause deterioration and failures of them.

(3) Solder:

An eutectic solder (Sn63:Pb37) is recommended.

Soldering

Since a multilayer ceramic chip capacitor comes into direct contact with melted solder during soldering. It is exposed to potentially damaging mechanical stress caused by the sudden temperature change. The capacitor may also be subject to silver migration, and to contamination by the flux. Because of these factors, soldering technique is critical. Adhere to the following guidelines.

Hand soldering

In hand soldering of the Capacitors, large temperature gradient between preheated the capacitors and the tip of soldering iron may cause electrical failures and mechanical damages such as cracking of breaking of the devices. The soldering shall be carefully controlled and carried out so that the temperature gradient is kept minimum with following recommended conditions for hand soldering.

Recommended Soldering Conditions:

(1) Solder:

ϕ1mm Thread eutectic solder (Sn63:Pb37) with soldering flux *in the core.

*Rosin-based, and mom-activated flux is recommended.

(2) Preheating:

The capacitors shall be preheated so that “Temperature Gradient” between the devices and the tip of soldering iron is 150°C or below.

(3) Soldering iron:

Rated Power of 20W Max with 3mm soldering tip in diameter.

Temperature of soldering iron tip: 300°C maximum.

(The required amount of solder shall be melted in advance on the soldering tip.)

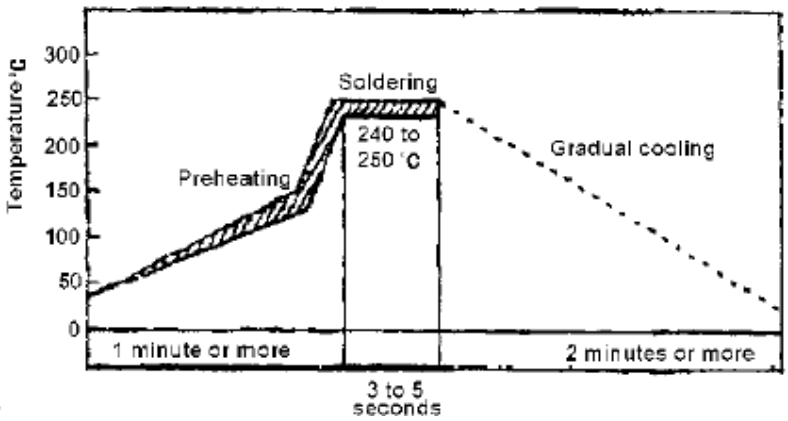
(4)Cooling:

After soldering, the Capacitors shall cooled gradually at room ambient temperature.

Flow Soldering

In flow soldering process, abnormal and thermal and mechanical stresses, caused by “Temperature Gradient” between the mounted Capacitors, resulting in failures and damages of the capacitors. So it is essential that the soldering process shall controlled to the following recommended conditions and precautions. (See Figure 6)

Figure 6 Recommended Soldering Temperature Time Profile (Flow soldering)



(1) Application of Flux:
The soldering flux(3.3) shall applied to the mounted Capacitors thinly and uniformly by forming method.
(2) Preheating:
The mounted Capacitors / Components shall be preheated sufficiently so that the " Temperature Gradient" between the Capacitors / Components and the melted solder shall be 150°C or below.
(3) Immersion to Soldering Bath:
The Capacitors shall be immersed into a soldering bath of 240 to 250°C for 3 to 5 seconds.
(4)Cooling:
The Capacitors shall be cooled gradually to room ambient temperature with the cooling temperature rates of 8°C/s maximum from 250°C to 170°C and 4°C/s maximum from 170°C to 130°C.
(5) Flux Cleaning:
When the Capacitors are immersed into cleaning solvent, it shall be confirmed that the surface temperature of devices do not exceed 100°C (See 3.5).

Reflow soldering.

I n reflow soldering process, the mounted Capacitors / Components are generally heated and Soldering by a thermal conduction system such as an "Infrared radiation and hot blast soldering system" or a "Vapour Phase Soldering System (VPS)", Large temperature gradients such as a rapid heating and cooling in the process may cause electrical and mechanical damages if the device. It is essential that the soldering process shall be controlled by following recommended conditions and precaution. (See Figure7)

For Tin-Lead (Sn/Pb) Termination component:
(1) Preheating 1.
The mounted Capacitors / Components shall be preheated sufficiently, for 60 to 90 seconds so that the surface temperature of them to be 140 to 150°C.
(2) Preheating 2.
After "Preheating 1", the mounted Capacitors / Components shall be the elevated temperature of 150 to 200°C for 2 to 6 Seconds.
(3) Soldering:
The mounted Capacitors / Components shall be heated under the specified heating conditions (200 to 240 to 200°C for total 20 to 40 seconds, See Figure7) and shall be soldered at the maximum temperature of 240°C for 10 seconds of less.
(4)Cooling:
After the soldering, the mounted Capacitors / Components shall be gradually cooled to room ambient temperature for preventing mechanical damages such as cracking of the devices.
(5) Flux Cleaning:
When the mounted Capacitors / Components are immersed into cleaning solvent, it shall be confirmed the surfaces temperatures of them do not exceeding 100°C.
Note: If the mounted Capacitors / Components are partially heated in the soldering process, the devices may be separated form the printed circuit board by the surface tension of partially melted solder, and stand up like a "Tomb Stone".

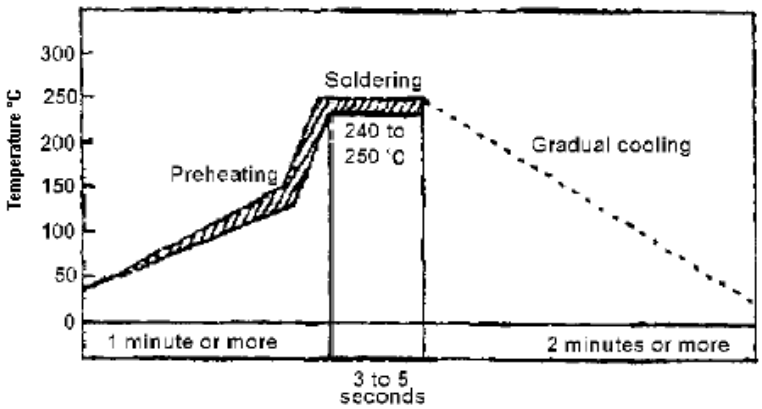


Figure 7 Recommended Soldering Temperature Time Profile for Tin-Lead component (Reflow Soldering)

For Lead-free (Pure Tin plating termination) Termination component

Essentially, the soldering temperature for Lead-free component is a little higher than that for Tin-Lead component, but need to take consideration of the thermal effect for all other components mounting on board at the same time. The below picture is a recommended soldering profile for Lead-free component

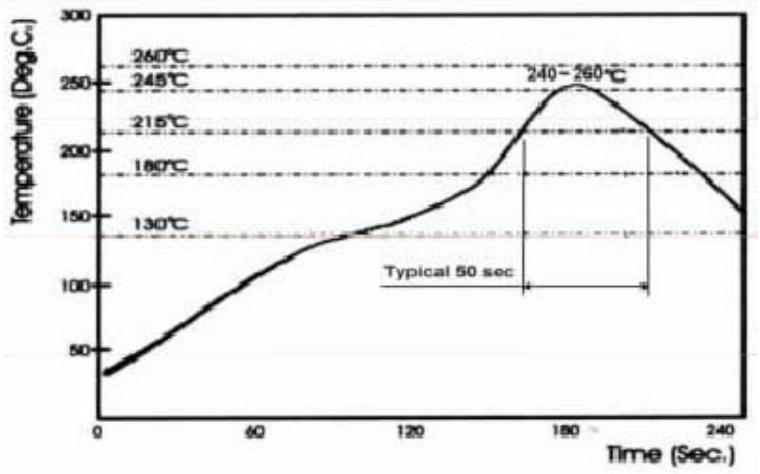


Figure 8 Recommended Soldering Temperature Time Profile for Lead-free component (Reflow Soldering)

Post soldering Cleaning

(1)Residues of corrosive soldering fluxes on the PC board after cleaning may greatly have influences on the electrical characteristics and the reliability, (such as humidity resistance) of the Capacitors, which have been mounted on the board. It shall be confirmed that the characteristic and reliability at the devices are no effected by applied cleaning conditions.

(2) Solubility of alternative cleaning solvent such as alcohol etc., is inferior to that of Freon cleaning solvent in the flux cleaning. So in case of alternative cleaning solvents, fresh cleaning solvent shall be used, and sufficient rinsing and drying shall carried out.

(3) When an ultrasonic cleaning is applied to the mounted Capacitors on PC board, following conditions energy and the recommended for preventing failures or damages of the devices due to the large vibration energy and the resonant caused by the ultrasonic waves.

Frequency :29KHz maximum.
Radiated Power :20 W/litre maximum.
Period :5 minutes maximum.

Process Inspection

When the mounted printed circuit are inspected with measuring terminal pins, abnormal and excess mechanical stresses shall not be applied to the PC board mounted components, to prevent failure or damages of the devices.

(1) The mounted PC board shall be supported a same adequate supporting pins prevent their banding.

(2) It shall be confirmed that the measuring pin have the right tip in shape, equal in height and are set in the tight positions.

(3) The amount of adhesive shall be such that the adhesive dose flow off or be out of alignment.

Protective Coating

When the surface of a printed board on which the Capacitors has been mounted is coated with Resin to protect against moisture and dust, it shall be confirmed that the protective coat dose not have influences on reliability of the capacitors in the actual equipment.

(1) Coating materials, such as being corrosive and chemically active, shall not be applied to the capacitors and other components.

(2) Coating materials with a large expansively shall not be applied to the Capacitors for preventing failures or damages (such as cracking) of the devices in the curing process.

Dividing / Breaking of PC Boards

(1) Abnormal and excessive mechanical stresses, such as bending or expanding force on the components on the printed circuit board, shall be kept minimum in the dividing / breaking.

(2) Dividing / Breaking of the PC board shall be done carefully at moderate speed using a Jig boards from mechanical damages.

Long Term Storage

The Capacitors shall not be stored under severe conditions of high temperatures and high humidity. Store them under 40°C maximum and 75%RH maximum Use them within 6 months and check the solderability before use.

Part Number Table

Type	Voltage (V)	Temperature Characteristics Code	Part Number
0603	10	F	N0603F474ZCT
			N0603F474ZNT
	16	R	B0603R104KCT
			B0603R104KNT
	25		T0603R223KCT
			T0603R473KCT
			T0603R223KNT
			T0603R473KNT
		F	T0603F104ZCT
			T0603F104ZNT
	50	C	U0603C220JCT
			U0603C101JCT
			U0603C221JCT
			U0603C102JCT
			U0603C100JNT
			U0603C220JNT
			U0603C470JNT
			U0603C101JNT
			U0603C221JNT
			U0603C331JNT
			U0603C471JNT
			U0603C102JNT
		R	U0603R102KCT
			U0603R103KCT
			U0603R471KNT
			U0603R102KNT
			U0603R222KNT
			U0603R332KNT
			U0603R472KNT
			U0603R103KNT
		F	U0603F103ZNT
			U0603F473ZNT

Part Number Table

Type	Voltage (V)	Temperature Characteristics Code	Part Number
0805	10	R	N0805R105KCT
			N0805R105KNT
	16		B0805R224KCT
			B0805R334KCT
			B0805R474KCT
			B0805R224KNT
			B0805R334KNT
			B0805R474KNT
	25	F	T0805F105ZCT
			T0805F105ZNT
	50	C	U0805C102JCT
			U0805C222JCT
			U0805C102JNT
			U0805C222JNT
		R	U0805R102KCT
			U0805R103KCT
			U0805R223KCT
			U0805R473KCT
			U0805R104KCT
			U0805R102KNT
			U0805R222KNT
			U0805R472KNT
			U0805R103KNT
			U0805R223KNT
			U0805R473KNT
			U0805R104KNT
		F	U0805F104ZCT
			U0805F104ZNT
	100	C	A0805C100JCT
			A0805C220JCT
			A0805C330JCT
			A0805C470JCT
			A0805C101JCT
			A0805C221JCT
			A0805C471JCT
			A0805C100JNT
			A0805C220JNT
			A0805C330JNT

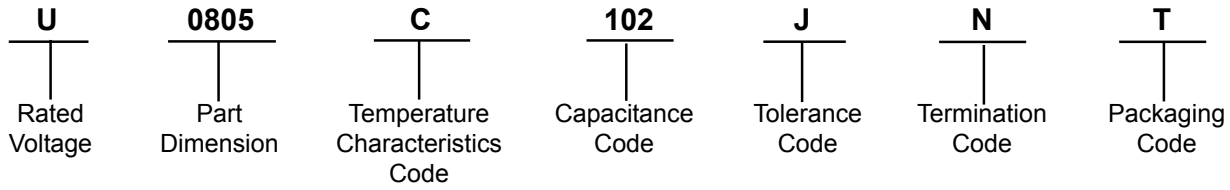
Part Number Table

Type	Voltage (V)	Temperature Characteristics Code	Part Number
0805	100	C	A0805C470JNT
			A0805C101JNT
			A0805C221JNT
			A0805C331JNT
			A0805C471JNT
1206	10	R	N1206R225KCT
			N1206R225KNT
	16		B1206R105KCT
			B1206R105KNT
		F	B1206F225ZCT
			B1206F225ZNT
	25	C	T1206C472JCT
			T1206C103JCT
			T1206C472JNT
			T1206C103JNT
		R	T1206R334KCT
			T1206R474KCT
			T1206R334KNT
			T1206R474KNT
	50		U1206R103KCT
			U1206R104KCT
			U1206R102KNT
			U1206R222KNT
			U1206R332KNT
			U1206R472KNT
			U1206R103KNT
			U1206R223KNT
			U1206R333KNT
			U1206R473KNT
			U1206R104KNT
		F	B1206F475ZCT
			B1206F475ZNT
	100	C	A1206C100JCT
			A1206C220JCT
			A1206C101JCT
			A1206C221JCT
			A1206C331JCT

Part Number Table

Type	Voltage (V)	Temperature Characteristics Code	Part Number
1206	100	C	A1206C471JCT
			A1206C102JCT
			A1206C100JNT
			A1206C220JNT
			A1206C330JNT
			A1206C470JNT
			A1206C101JNT
			A1206C221JNT
			A1206C331JNT
			A1206C471JNT
			A1206C102JNT

Part Number Explanation



Rated Voltage : A, B, T and U.
Part Dimension : 0603, 0805 and 1206.
Temperature Characteristics Code : C, R and F.
Capacitance Code : 100, 101, 102, 103 and 472.
Tolerance Code : J, K and Z.
Termination Code : Termination Type.
Packaging Code : Packaging Type.

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