EYANG

Medium-High voltage Multilayer Ceramic Chip Capacitors

C0402X7R221K101NTB【0402,X7R,220 pF,DC 100 V】

1. Scope

This specification applies to the Medium-High Voltage (≥100V dc) Multilayer Ceramic Chip Capacitors (MLCCs).

Application Scope: These components are specifically intended for high-voltage modules in household appliances, security systems, power supplies, and related fields.

2. Part Number System

C	0402	X7R	221	K	101	N	T	B
①	②	③	④	⑤	⑥	⑦	Ⓑ	⑨
Series Code	Size Code	Temperature Characteristics	Nominal Capacitance	Capacitance Tolerance	Rated Voltage	Termination Type	Packaging Code	Thickness Code

① **Series Code** C-Multilayer Ceramic Chip Capacitors for General Purpose

② **Size Code** (Unit: mm)

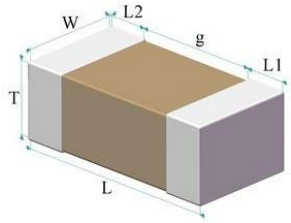


Fig.1: Structure & Dimension

Size Code	L	W	L1,L2	g	T	⑨ **Thickness Code**
0402	1.00 ± 0.05	0.50 ± 0.05	0.15-0.35	0.30 min	0.50 ± 0.05	**B**

③ **Temperature Characteristics**

Temperature Characteristics	Operating Temp. Range	Temperature Characteristics		
		Temp. coeff. or Cap. Change	Temp. Range	Ref. Temp.
X7R	-55 ℃-125 ℃	±15%	-55 ℃-125 ℃	25 ℃

④ **Nominal Capacitance**

Code	Nominal Capacitance
221	220 pF

⑤ **Capacitance Tolerance**

Code	Capacitance Tolerance
K	±10%

⑥ **Rated Voltage**

Code	Voltage Values
101	DC 100V

⑦ **Termination Type**

Code	Terminal Electrodes	Plating Material
N	Cu	Ni/Sn

Ⓑ **Packaging Code**

Packaging Code	Square Hole Spacing	Disc Size	Carrier Tape	QTY (Kpcs)
T	2 mm	7〃	Paper	10

3. Technical Specifications and Test Methods

1. Operating Environment

Temp. Characteristics	Temp. Range	Relative Humidity	Atmospheric Pressure
X7R	-55 ℃-125 ℃	≤95% (25 ℃)	86 Kpa-106 KPa

3.2 Reliablility Test Specifications and Methods

Unless otherwise specified, the test methods in Table 1 are based on: GB/T 21041 and GB/T 21042 (IDT IEC 6038)

Table 1: Specifications and Methods

No.	Item	Specification	Test Method
1	Appearance	No obvious defects on ceramic body and termination.	Visual examination under a microscope
2	Size Code	See Fig.1 and ② Size Code	Measuring by gages which precision is not less than 0.01 mm.
3	Capacitance	Within the specified tolerance	Measurement Temperature 18 ℃-28 ℃ Relative Humidity ≤80% RH Measurement Frequency See Table 1-2 Measurement Voltage See Table 1-2 Post-treatment When the capacitor initial capacitance is lower than its tolerance value, the test sample need to perform a heat treatment at (150 + 0/-10) ℃ for 1 h and then sit for (24 ± 2) h at room temperature, then measure.
4	Dissipation Factor (DF)	See Table 1-2	
5	Insulation Resistance (IR)	See Table 1-2	Measurement Temperature 18 ℃-28 ℃ Relative Humidity ≤80% RH Measurement Voltage U_R < 500V: Apply U_R U_R ≥ 500V: Apply (500 ± 50)V Charging Time 1 min Charge/discharge current ≤50 mA
6	Voltage proof	No defects or abnormalities.	Test Voltage ≥2.5 × U_R Applied Time t = 1 -5 s Charge/discharge current ≤50 mA
7	Temprature characteristic of capacitance	X7R: ΔC/C ≤ ± 15%	Pre-treatment Perform heat treatment at (150 +0/－10) ℃ for 1 h, then soak at room temperature for (24 ± 2) h, then measure. Measure the capacitance separately in 25 ℃, θ1, 25 ℃, θ2, 25 ℃, should satisfied relatived Temperature Coefficient of Capacitance . X7R θ1 = - 55 ℃, θ2 = 125 ℃ T.C. Measurement Voltage ≤1.0 Vrms ※ [※ Please contact our technical support staff for more information.]

Table 1: Specifications and Methods

No.	Item	Specification		Test Method	
8	Resistance to soldering heat	Appearance	No visible damage and terminations uncovered shall be less than 25%.	Pre-treatment	Perform heat treatment at (150 +0/－10) ℃ for 1 h, then soak at room temperature for (24 ± 2) h, then measure.
				Pre-heating	1206 size max: Temp. 120 ℃-150 ℃,Time: 60 s
		Cap. Change	See Table 1-3		1210 size min: Temp. 100℃-120℃, Time: 60s and Temp. 170 ℃-200 ℃,Time: 60 s
		IR	Initial specification	Test Method	Solder bath method
		DF	Initial specification	Solder alloy	Sn-Ag-Cu (Lead Free Solder)
		Voltage proof	No defects or abnormalities.	Temperature	(270 ± 5) ℃
				Duration of immersion	(10±1) s
				Depth of immersion	10 mm
				Post-treatment	Let sit for (24 ± 2) h at room temperature, then measure.
9	Solderability	Appearance	95% of the terminations is to be soldered evenly and continuously	Pre-heating	80 ℃-120 ℃,Time: 10-30 s
				Test Method	Solder bath
				Flux	Solution of rosin ethanol
				Solder alloy	Sn-Ag-Cu (Lead Free Solder)
				Temperature	(245 ± 5) ℃
				Duration of immersion	(2.0 ± 0.5) s
				Depth of immersion	10 mm
10	Substrate bending test	Appearance	No defects or abnormalities	Mounting method	Solder the capacitor on the test substrate as shown in Fig 2
		Cap. Change	See Table 1-3	Pressurization Method	as shown in Fig 3
				Flexure	1 mm
				Holding Time	(5 ± 1) s
				then measure the capacitance	

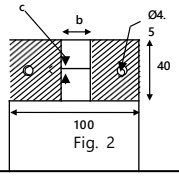


Fig. 2

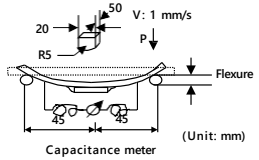


Fig. 3

Table 1: Specifications and Methods

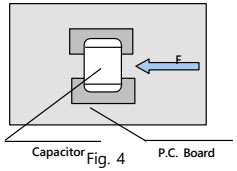
<table>
<tr><th>No.</th><th>Item</th><th colspan="2">Specification</th><th colspan="2">Test Method</th></tr>
<tr><td>11</td><td>Adhesive strength of termination</td><td>Appearance</td><td>No defects or abnormalities</td><td>Mounting method
Holding Time
Pushing force</td><td>Solder the capacitor to the test substrate and apply the normal force F indicated in Fig. 4
t = (10 ± 1) s
0402: F = 5 N
 

Fig. 4</td></tr>
<tr><td>12</td><td>Vibration</td><td>Appearance
Cap. Change
IR
DF</td><td>No defects or abnormalities
See Table 1-3
Initial specification
Initial specification</td><td>Mounting method
Amplitude
Kind of Vibration
Frequency
Vibration Time
Repeat this for 2 hours each in 3 perpendicular directions X, Y, Z, total 6 hours.</td><td>Solder the capacitor on the test substrate
1.5 mm
A simple harmonic motion
10 Hz-55 Hz-10 Hz
1 min</td></tr>
<tr><td>13</td><td>Rapid change of temperature</td><td>Appearance
Cap. Change
IR
DF
Voltage proof</td><td>No defects or abnormalities
See Table 1-3
Initial specification
Initial specification
No defects or abnormalities.</td><td>Pre-treatment
Mounting method
The number of cycles
Temperature Step

Post-treatment</td><td>Perform heat treatment at (150 +0/−10) ℃ for 1 h, then soak at room temperature for (24 ± 2) h, then measure.
Solder the capacitor on the test substrate
5 cycles
<table><tr><th>Step</th><th>Temp.(℃)</th><th>Time (min)</th></tr><tr><td>1</td><td>-55</td><td>30 ± 3</td></tr><tr><td>2</td><td>25</td><td>2-5</td></tr><tr><td>3</td><td>125</td><td>30 ± 3</td></tr><tr><td>4</td><td>25</td><td>2-5</td></tr></table>Let sit for (24 ± 2) h at room temperature, then measure.</td></tr>
<tr><td>14</td><td>Damp heat, steady state</td><td>Appearance
Cap. Change
IR
DF</td><td>No defects or abnormalities
See Table 1-3
See Table 1-3
See Table 1-3</td><td>Pre-treatment
Mounting method
Test Temperature
Test Humidity
Test Time
Post-treatment</td><td>Perform heat treatment at (150 +0/−10) ℃ for 1 h, then soak at room temperature for (24 ± 2) h, then measure.
Solder the capacitor on the test substrate
(40 ± 2) ℃
90%–95% RH
(500 ± 12) h
Let sit for (24 ± 2) h at room temperature, then measure.</td></tr>
</table>

Table 1: Specifications and Methods

No.	Item	Specification		Test Method	
15	High temperature high humidity (steady)	Appearance	No defects or abnormalities	Pre-treatment	Perform heat treatment at (150 +0/－10) ℃ for 1 h, then soak at room temperature for (24 ± 2) h, then measure.
		Cap. Change	See Table 1-3	Mounting method	Solder the capacitor on the test substrate
		IR	See Table 1-3	Test Temperature	(40 ± 2) ℃
		DF	See Table 1-3	Test Humidity	90%–95% RH
				Test Voltage	1.0 × U_R
				Test Time	(500 ± 12) h
				Charge/discharge curren	≤ 50 mA
				Post-treatment	Perform heat treatment at (150 +0/－10) ℃ for 1 h, then soak at room temperature for (24 ± 2) h, then measure.
16	Endurance	Appearance	No defects or abnormalities	Pre-treatment	Perform heat treatment at (150 +0/－10) ℃ for 1 h, then soak at room temperature for (24 ± 2) h, then measure.
		Cap. Change	See Table 1-3	Mounting method	Solder the capacitor on the test substrate
		IR	See Table 1-3	Test Temperature	125 ℃ ± 3 ℃
		DF	See Table 1-3	Test Voltage	1.5 × U_R
				Test Time	(1000 ± 12) h
				Charge/discharge curren	≤ 50 mA
				Post-treatment	Perform heat treatment at (150 +0/－10) ℃ for 1 h, then soak at room temperature for (24 ± 2) h, then measure.

Table 1-2: Electrical tests

Series	Size	Temp. Chara.	UR (DC)	Thickness Code	Cap.	Electrical tests			
						DF [max]	IR [min]	Measurement Frequency	Measurement Voltage [Vrms]
C	0402	X7R	100 V	B	220 pF	0.025	10000 Mfi	1.0±0.1KHz	1.0±0.2

Table 1-3: Cap.¥ D.F¥ IR changes after test

Series	Size	Temp. Chara.	UR (DC)	Thickness Code	Cap.	Resistance to soldering heat	Substrate bending test	Vibration	Rapid change of temperature	Damp heat, steady state			High temperature high humidity (steady)			Endurance		
						Cap. Change [ΔC/C≤±%]	Cap. Change [ΔC/C≤±%]	Cap. Change [ΔC/C≤±%]	Cap. Change [ΔC/C≤±%]	Cap. Change [ΔC/C≤±%]	DF [max]	IR [min]	Cap. Change [ΔC/C≤±%]	DF [max]	IR [min]	Cap. Change [ΔC/C≤±%]	DF [max]	IR [min]
C	0402	X7R	100 V	B	220 pF	10	12.5	7.5	15	12.5	0.05	500 Mfi	12.5	0.05	500 Mfi	15	0.05	1000 Mfi

4. Packaging,Shipment and storage

4.1 Packaging

4.1.1 packaging type

Reel Packaging (standard carrier tape disc packaging), single disc smallest package see Ⓑ Packaging Code

First packaging: Each multi-disc material is packed into a box.

The second packaging: the first packaged packaging box is loaded into the paper packaging box,and the remaining space in the box is filled with light auxiliary materials.

The above packaging forms can also be packaged according to user needs.

4.1.2 Carrier Tape size

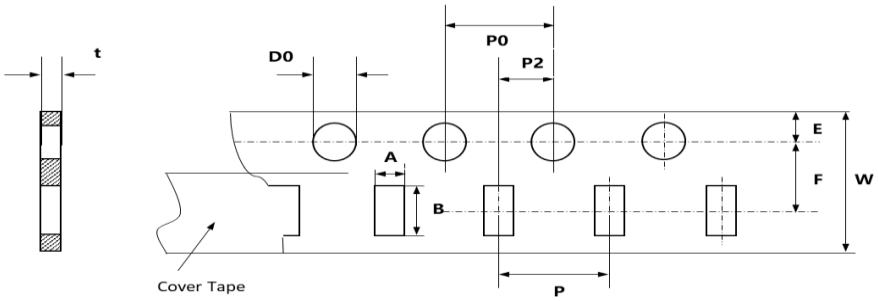


Fig. 5-1 0603, 0805, 1206, 1210 (Paper tape)

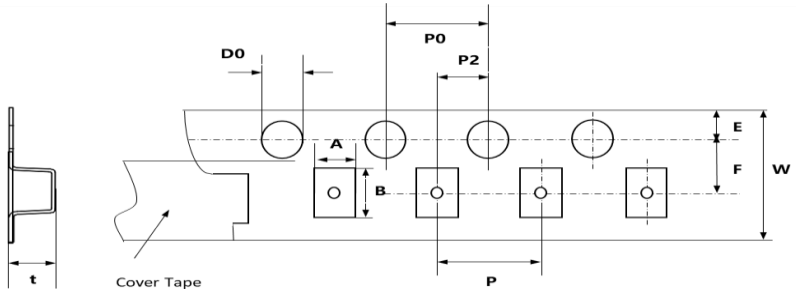


Fig. 5-2 0603,0805,1206,1210 (Plastic tape)

Table 2-1: Carrier size (Size Code:0603, 0805, 1206, 1210, 2220) (Unit:mm)

Size Code	Thickness code	Carrier Tape Type	Packaging Code	A	B	F	P	E	D0	P2	K	W	P0	t
0603	D	Paper	T	1.00 ± 0.10	1.80 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0603	D	Paper	A	1.00 ± 0.10	1.80 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0603	D	Plastic	O	1.00 ± 0.10	1.80 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0603	D	Paper	W	1.00 ± 0.10	1.80 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0603	K	Paper	T	1.10 ± 0.10	1.90 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0603	K	Paper	A	1.10 ± 0.10	1.90 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0603	K	Plastic	O	1.10 ± 0.10	1.90 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0603	K	Paper	W	1.10 ± 0.10	1.90 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0603	K	Plastic	Q	1.10 ± 0.10	1.90 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0603	K	Plastic	R	1.10 ± 0.10	1.90 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0805	C	Paper	T	1.45 ± 0.10	2.20 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	0.9 max
0805	C	Plastic	R	1.45 ± 0.10	2.20 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	0.9 max

Table 2-1: Carrier size (Size Code:0603, 0805, 1206, 1210, 2220) (Unit:mm)

Size Code	Thickness code	Carrier Tape Type	Packaging Code	A	B	F	P	E	D0	P2	K	W	P0	t
0805	K	Paper	T	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0805	K	Plastic	R	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0805	K	Plastic	E	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0805	Y	Paper	T	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0805	Y	Plastic	E	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0805	Y	Plastic	P	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0805	Y	Plastic	R	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
0805	G	Plastic	R	1.45 ± 0.10	2.20 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.75 max
0805	G	Plastic	P	1.45 ± 0.10	2.20 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.75 max
0805	G	Plastic	O	1.45 ± 0.10	2.20 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.75 max
0805	H	Plastic	R	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.00 max
0805	H	Plastic	P	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.00 max
0805	H	Plastic	O	1.45 ± 0.20	2.20 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.00 max
1206	E	Plastic	R	1.80 ± 0.20	3.40 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
1206	E	Plastic	P	1.80 ± 0.20	3.40 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.15 max
1206	O	Plastic	R	1.80 ± 0.20	3.40 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.45 max
1206	O	Plastic	P	1.80 ± 0.20	3.40 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	1.45 max
1206	L	Plastic	P	1.80 ± 0.20	3.40 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.50 max
1206	L	Plastic	R	1.80 ± 0.20	3.40 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.50 max
1206	L	Plastic	E	1.80 ± 0.20	3.40 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.50 max
1206	P	Plastic	P	1.90 ± 0.20	3.50 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.50 max
1210	L	Plastic	P	2.70 ± 0.20	3.50 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.00 max
1210	Q	Plastic	F	2.70 ± 0.20	3.50 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.50 max
1210	Q	Plastic	S	2.70 ± 0.20	3.50 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.50 max
1210	Q	Plastic	Z	2.70 ± 0.20	3.50 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.50 max
1210	Q	Plastic	P	2.70 ± 0.20	3.50 ± 0.20	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	2.50 max
1210	R	Plastic	Z	2.70 ± 0.20	3.50 ± 0.30	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	3.00 max
1210	R	Plastic	S	2.70 ± 0.20	3.50 ± 0.30	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	3.00 max
1210	3	Plastic	Z	2.70 ± 0.20	3.50 ± 0.40	3.50 ± 0.05	4.00 ± 0.10	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.20	4.00 ± 0.10	3.10 max
2220	R	Plastic	S	5.50 ± 0.20	6.20 ± 0.20	7.50 ± 0.10	8.00 ± 0.10	1.75 ± 0.10	1.50 ± 0.10	2.00 ± 0.10	/	16.00 ± 0.30	4.00 ± 0.10	3.50 max
2220	I	Plastic	A	5.50 ± 0.20	6.20 ± 0.20	7.50 ± 0.10	8.00 ± 0.10	1.75 ± 0.10	1.50 ± 0.10	2.00 ± 0.10	/	16.00 ± 0.30	4.00 ± 0.10	4.00 max

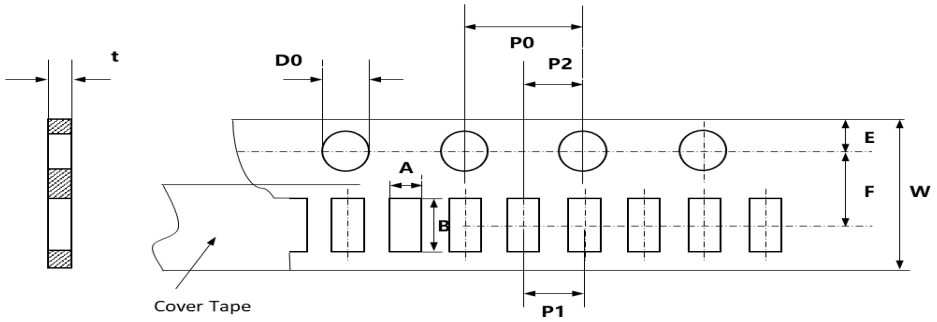


Fig. 5-3 0402 (Paper tape/ 2 mm pitch)

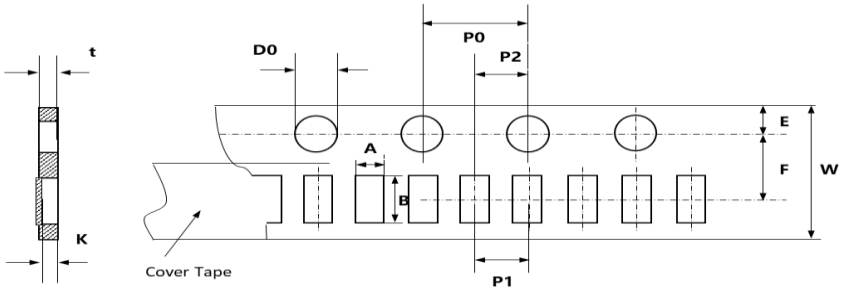


Fig. 5-4 0105, 0201 (Paper tape/ 2 mm pitch)

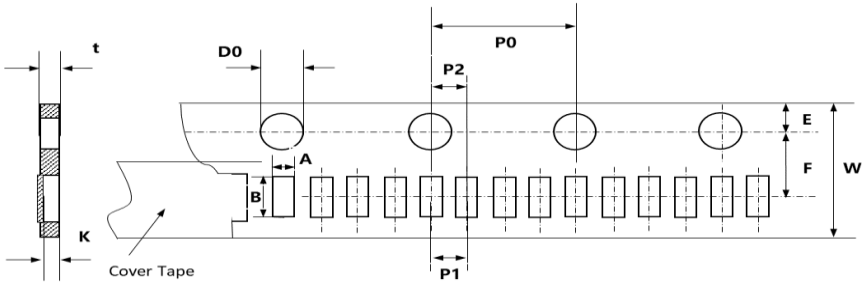


Fig. 5-5 0201 (Paper tape/ 1 mm pitch)

Table 2-2: Carrier size (Size Code:0201,0402) (Unit:mm)

Size Code	Thickness code	Carrier Tape Type	Packaging Code	A	B	F	P1	E	D0	P2	K	W	P0	t
0201	A	Paper	T	0.38 ± 0.03	0.68 ± 0.03	3.50 ± 0.05	2.00 ± 0.05	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	0.36 ± 0.02	8.00 ± 0.10	4.00 ± 0.10	0.5 max
0201	A	Paper	J	0.38 ± 0.03	0.68 ± 0.03	3.50 ± 0.05	2.00 ± 0.05	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	0.36 ± 0.02	8.00 ± 0.10	4.00 ± 0.10	0.5 max
0201	A	Paper	D	0.38 ± 0.03	0.68 ± 0.03	3.50 ± 0.05	1.00 ± 0.05	1.75 ± 0.10	1.55 ± 0.05	1.00 ± 0.05	0.36 ± 0.02	8.00 ± 0.10	4.00 ± 0.10	0.5 max
0201	A	Paper	A	0.38 ± 0.03	0.68 ± 0.03	3.50 ± 0.05	1.00 ± 0.05	1.75 ± 0.10	1.55 ± 0.05	1.00 ± 0.05	0.36 ± 0.02	8.00 ± 0.10	4.00 ± 0.10	0.5 max
0201	A	Paper	M	0.38 ± 0.03	0.68 ± 0.03	3.50 ± 0.05	2.00 ± 0.05	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	0.36 ± 0.02	8.00 ± 0.10	4.00 ± 0.10	0.5 max
0201	A	Paper	H	0.38 ± 0.03	0.68 ± 0.03	3.50 ± 0.05	2.00 ± 0.05	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	0.36 ± 0.02	8.00 ± 0.10	4.00 ± 0.10	0.5 max
0201	A	Paper	L	0.38 ± 0.03	0.68 ± 0.03	3.50 ± 0.05	1.00 ± 0.05	1.75 ± 0.10	1.55 ± 0.05	1.00 ± 0.05	0.36 ± 0.02	8.00 ± 0.10	4.00 ± 0.10	0.5 max
0402	B	Paper	T	0.63 ± 0.05	1.13 ± 0.05	3.50 ± 0.05	2.00 ± 0.05	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.10	4.00 ± 0.10	0.8 max
0402	B	Paper	J	0.63 ± 0.05	1.13 ± 0.05	3.50 ± 0.05	2.00 ± 0.05	1.75 ± 0.10	1.55 ± 0.05	2.00 ± 0.05	/	8.00 ± 0.10	4.00 ± 0.10	0.8 max

4.1.3 Disc size

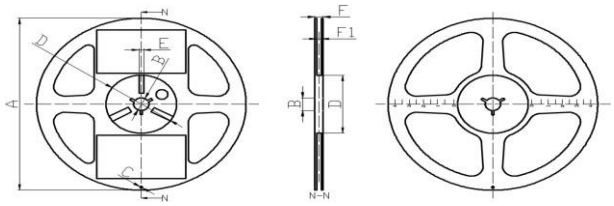


Fig. 6-1 Disc (Width of carrier-8 mm)

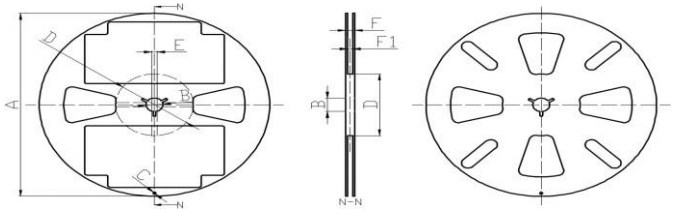


Fig. 6-2 Disc (Width of carrier-16 mm)

Table 3: Disc size (Unit:mm)

Disc size	Width of carrier	A	B	C	D	E	F	F1	Size Code
7″	8.00 ± 0.10	Φ178 ± 2.0	Φ13 ± 1.0	Φ4.0 ± 0.5	Φ60 ± 2.0	4.0 ± 1.0	11.5 ± 1.0	10.0 ± 2.0	All
13″	8.00 ± 0.10	Φ330 ± 2.0	Φ13 ± 1.0	Φ4.0 ± 0.5	Φ108 ± 2.0	4.0 ± 1.0	13.5 ± 2.0	10.0 ± 2.0	All
13″	16.00 ± 0.30	Φ330 ± 2.0	Φ13 ± 1.0	/	Φ100 ± 2.0	5.0 ± 1.0	16.0 ± 2.0	19.0 ± 2.0	2220

4.1.4 Carrier Tape specifications

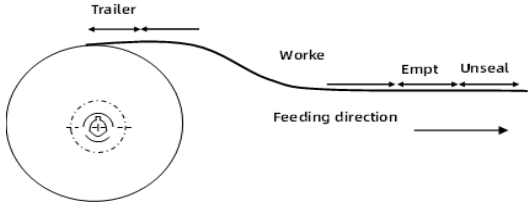


Fig. 7 Carrier

Packaging	The minimum length of the reserved spaces		
Carrier	Trailer	Empty	Unseal
	60 mm	200 mm	160 mm

4.1.5 Performance of Carrier Taping

4.1.5.1 Strength of Carrier Tape and Top Cover Tape

a. Carrier Tape

When a tensile force 1.02 kgf is applied in the direction to unreel the tape, the tape shall withstand this force.

b. Top cover Tape

When a tensile force 1.02 kgf is applied to the tape, the tape shall withstand this force.

4.1.5.2 Peeling Strength of Top Cover Tape

Unless otherwise specified, the peeling strength of top cover tape shall be within 10.2 gf to 71.4 gf when the top cover tape is pulled at a speed of 300 mm/min with the angle of 0° to 15° (see Fig.8).

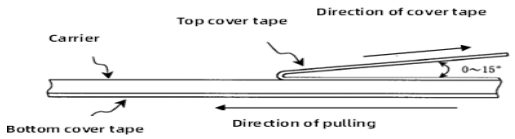


Fig.8 Cover tape peel-off force

2. Shipment

Transport packaging products to adapt to the modern means of transport, but the product in the process of transport to prevent rain and acid and alkali corrosion, shall not be whipped extrusion casting and gravity.

3. Storage

1. Storage conditions:

   The recommended temperature is less than 30 ℃.

   A temperature is 5 ℃ to 40 ℃ and a relative humidity is 20% to 70% as a standard condition.(MSL Level 1)

   MLCC may be affected by the storage conditions. Please use them promptly after delivery.

   High temperature and humidity conditions and/or prolonged storage may cause deterioration of the packaging materials.

   If more than one year has elapsed since delivery, also check the solderability before use.

2. Corrosive gas can react with the termination (external) electrodes or lead wires of capacitors, and result in poor solderability.

   Do not store the capacitors in an atmosphere consisting of corrosive gas (e.g.,hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)

5. MLCC Application of Technical Requirements

5.1 Circuit Design

5.1.1 Operating Temperature

a. Do not use capacitor above the maximum allowable operating temperature.

b. Surface temperature including self-heating should be below maximum operating temperature.

5.1.2 Operating Voltage

The operating voltage for capacitors must always be lower than their rated voltage.

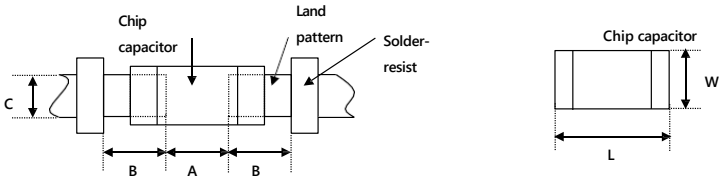
5.2 PCB Design

5.2.1 Design of Land-patterns

When the capacitors are mounted on a PCB, the amount of solder at the terminations has a direct effect on the performance of the capacitors.

The greater the amount of solder, the higher the stress on the capacitor. Therefore, when designing land-patterns, it is necessary to consider the appropriate size and configuration of the solder pads.

Size and recommended land dimensions are shown in the following figure and table.

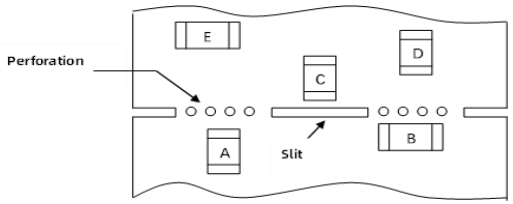


Recommended land dimensions for reflow-soldering (unit: mm)

Size Code	Length	Width	Tolerance	A	B	C
0201	0.6	0.3	±0.03	0.20-0.25	0.20-0.30	0.20-0.35
0201	0.6	0.3	±0.05	0.20-0.25	0.25-0.35	0.30-0.40
0201	0.6	0.3	±0.09,±0.1	0.23-0.30	0.25-0.35	0.30-0.40
0402	1.0	0.5	±0.05	0.30-0.50	0.35-0.45	0.40-0.60
0402	1.0	0.5	±0.15, ±0.20	0.40-0.60	0.40-0.50	0.50-0.70
0402	1.0	0.5	±0.30	0.40-0.60	0.40-0.50	0.50-0.80
0603	1.6	0.8	±0.10	0.60-0.80	0.60-0.70	0.60-0.80
0603	1.6	0.8	±0.20	0.70-0.90	0.70-0.80	0.80-1.00
0603	1.6	0.8	±0.25, ±0.30	0.70-0.90	0.70-0.90	0.80-1.10
0805	2.0	1.25	±0.10,±0.15, ±0.20	1.00-1.40	0.60-0.80	1.20-1.40
0805	2.0	1.25	±0.25	1.00-1.40	0.70-0.90	1.35-1.55
1206	3.2	1.6	±0.15, ±0.20	1.80-2.00	0.90-1.20	1.50-1.70
1206	3.2	1.6	± 0.30	1.90-2.10	1.00-1.30	1.60-1.90
1210	3.2	2.5	±0.20	2.00-2.40	1.00-1.20	2.50-2.70
1210	3.2	2.5	±0.30	2.00-2.40	1.10-1.30	2.50-2.80
2220	5.7	2.5	±0.20	4.10-4.80	1.20-1.40	2.50-2.70
2220	5.7	5.0	±0.40	4.10-4.80	1.20-1.40	4.00-5.00

5.2.2 Capacitor Layout on PC Board

Mechanical stress varies according to the location of capacitors on PC board. The recommendation for better design is as follows

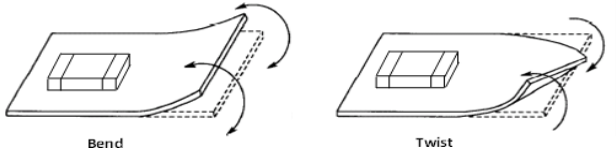


The stress in capacitors is in the following order: A > B = C > D > E

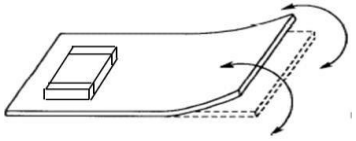
Pay attention not to bend or distort the PC board otherwise the capacitor may crack.

Please refer to the following examples of good and bad capacitors layout.

a. Not recommended

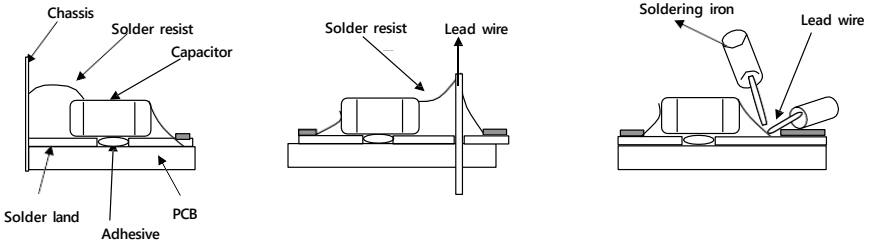


b.Recommended

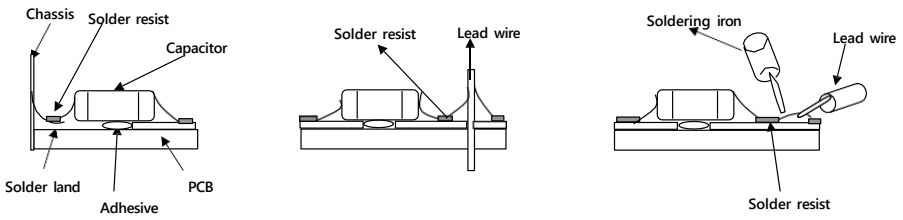


5.2.3 Solder Buildup and Soldering

a.Examples of soldering method not recommended



b.Examples of soldering method recommended



5.3 Consideration for Automatic Placement

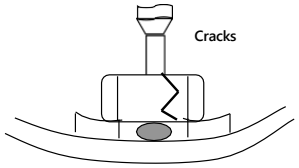
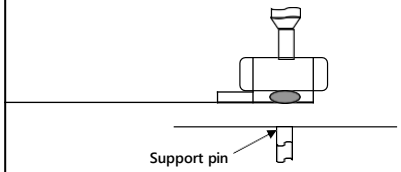
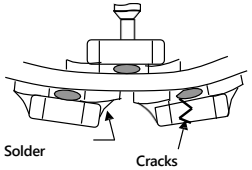
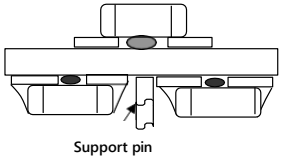
If the mounting head is adjusted too low, it may induce excessive stress in the chip capacitor to result in cracking. Please take following precautions

a. Adjust the bottom dead center of the mounting head to reach on the PC board surface and not press it ;

b. Adjust the mounting head pressure to be 1N to 3N of static weight ;

c. To minimize the impact energy from mounting head, it is important to provide support from the bottom side of the PC board.

Please refer to the following samples

Mounting	Not recommended	Recommended
Singel-sided Mounting		
Double-sided Mounting		

4. Soldering

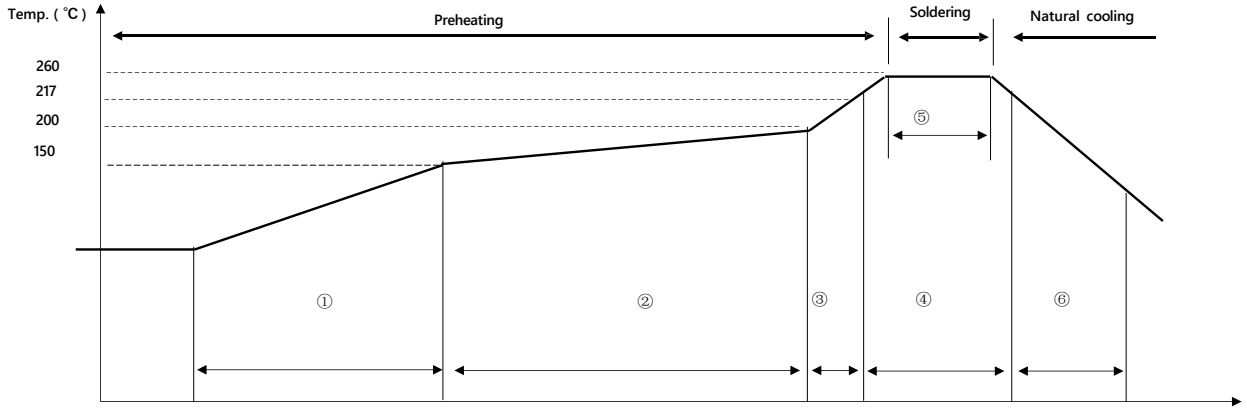
1. Flux Selection

a. It is recommended to use a mildly activated rosin flux (less than 0.1wt% chlorine). Strong flux is not recommended.

b. Please provide proper amount of flux. Excessive flux must be avoided.

c. When water-soluble flux is used, enough washing is necessary.

5.4.2 Recommended Soldering Profile



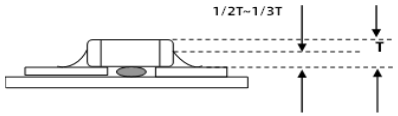
5.4.2.1 Reflow Soldering Condition

NO.	Reflow Soldering zone	Reflow Soldering Condition
①	Preheating 1	≤3 ℃/s, ≥60 s
②	Constant temperature	150℃- 200℃, 60 s-120 s, ≤1 ℃/s
③	Preheating 1	1-5 ℃/s
④	Soldering 1	Above 217 ℃, 60-150 s
⑤	Soldering 1	Above 260 ℃,over 10 s
⑥	Natural cooling	≤6 ℃/s

Caution

a. Excessive solder will induce higher tensile force in chip capacitor when temperature changes and result in cracking. Insufficient solder may detach the capacitor from the PC board.

The ideal condition is to have solder mass controlled to 1/2 to 1/3 of the thickness of the capacitors.



b. Soldering duration should be kept as close to recommended times as possible, because excessive duration can detrimentally affect solderability.

c. The peak temperature of reflow soldering is 245 ℃ ± 15 ℃.

6. All products in this specification comply with the EU RoHS directive

The EU RoHS Directive refers to the "Directive 2011/65/EU on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment" stipulated by the European Union.

ORIGINAL MFG PART No.: **C0402X7R221K101NTB**

Image shown is a representation only.
Exact specifications should be obtained from the product dimension

PRODUCT NAME:	MLCC For General Purpose C Series SMD 0402 X7R 220pF ±10% 100V
REVISION:	A3
NEXTGEN ORDER PART CODE*:	C0402B221K101B
CROSS REF. PART NO.:	
ORIGINAL MFG PART NO.:	C0402X7R221K101NTB
ORIGINAL MANUFACTURER:	EYang Technology/Eyang MLCC

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RFQ
Request For Quotation

CODE	NAME	KEY SPECIFICATION OPTION
C	Series Code	C: Multilayer Ceramic Chip Capacitors For General Purpose
0402	Case Size	0105 : L0.40*W0.20mm; 0201 : L0.60*W0.30mm; 0402 : L1.00*W0.50mm; 0603 : L1.60*W0.80mm 0805 : L2.00*W1.25mm; 1206 : L3.20*W1.60mm; 1210 : L3.20*W2.50mm
B	Temperature Characteristics	N: NP0 (C0G); B: X7R; W: X5R; S: X6S; Y: Y5V; T: X7S; R: X7T
221	Capacitance	Two significant digits followed by number of Zero, The 3rd digit signifies the multiplying factor, and letter R is decimal point. 1R0: 1pF; 300: 30pF; 104: 100nF; 680: 68pF; 221: 220pF; 475: 4.7μF
K	Capacitance Tolerance	A: ±0.05pF; B: ±0.1pF; C: ±0.25pF; D: ±0.5pF; F: ±1%; G: ±2%; J: ±5%; K: ±10% L: ±15%; M: ±20%; N: ±30%; P: ±0.02pF; X: ±40%; S: 50%/-20%; Y: 150%/-20% Z: 80%/-20%
101	Rated Voltage	Two significant digits followed by No. of zeros. “R” is in place of decimal point. 6R3: 6.3VDC; 160: 16 VDC; 250: 25 VDC; 100: 10 VDC; 500: 50 VDC; 101: 100VDC
B	Case Thickness	B: 0.8mm Max, See Page 8 (T’s Symbol) for Different part code
XX	Internal Control Code	Blank: N/A; XX: Letter A~Z, a~z or digits (0~9) for Special/Custom Parameters

IMPORTANT NOTES AND DISCLAIMER

1. ROHS COMPLIANCE: The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU RoHS Directive (EU) 2015/863 EC (RoHS3). RoHS Test Report for this product can be obtained can be obtained at Download Center.
2. REACH COMPLIANCE: REACH substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, REACH Test Report for this product can be obtained can be obtained at Download Center.
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