



# HITANO ENTERPRISE CORP.

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SPECIFICATION FOR

OPEN MODE GREEN TYPE MEDIUM VOLTAGE CAPACITORS

Series : OP Series

Description: Open Mode, 0805 to 1812 Size, X7R, 100V~500V,

ROHS Compliant

<u>DRAWN BY</u>	<u>CHECKED BY</u>	<u>APPROVED BY</u>
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## 1. INTRODUCTION

HITANO open-mode series MLCC is designed by a special internal electrode pattern, which can reduce voltage concentrations by distributing voltage gradients throughout the entire capacitor. This special design also affords open-mode pattern to prevent circuit leakage when focused to failure in a board flex situation.

## 2. FEATURES

- High voltage in a given case size.
- Circuit open during product cracking.
- High stability and reliability.

## 3. APPLICATIONS

- High current applications.
- Power supply and related industries
- The other mechanical stress concerned products.

## 4. HOW TO ORDER

<b>OP</b>	<b>0805</b>	<b>N</b>	<b>100</b>	<b>J</b>	<b>202</b>	<b>L</b>	<b>T</b>
<u>Series</u>	<u>Size</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Termination</u>	<u>Packaging</u>
OP=Open-mode	0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point.  eg.: 102=10x10 <sup>2</sup> =1000pF	K=±10% M=±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point.  101=100 VDC 201=200 VDC 251=250 VDC 501=500 VDC	L=Ag/Ni/Sn C=Cu/Ni/Sn (Note 1)	T=7" reeled G=13" reeled

Note 1: Please see below product range to find right termination code.

## 5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)	Remark	M <sub>B</sub> (mm)
0805 (2012)	2.00±0.15	1.25±0.10	0.80±0.10	B	0.40±0.20
			1.25±0.10	D	
1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	0.50±0.20
			0.95±0.10	C	
			1.25±0.10	D	
			1.60±0.20	G	
1210 (3225)	3.20±0.20	1.60±0.20	0.95±0.10	C	0.50±0.25
			1.25±0.10	D	
			1.60±0.20	G	
			2.50±0.30	M	
1812 (4532)	4.50±0.40	3.20±0.30	1.25±0.10	D	0.60±0.25
			2.00±0.20	K	

# Reflow soldering only is recommended.

## 6. GENERAL ELECTRICAL DATA

Dielectric	X7R
Size	0805, 1206, 1210, 1812
Capacitance*	100pF to 1μF
Capacitance tolerance	K (±10%), M (±20%)
Rated voltage (WVDC)	100V, 200V, 250V, 500V
Tan δ*	≤2.5%
Insulation resistance at U <sub>r</sub>	≥10GΩ or R <sub>x</sub> C≥500Ω·F whichever is smaller
Dielectric strength	100V: ≥2.5 x WVDC 200V and 250V: ≥2 x WVDC 500V: ≥1.5 x WVDC
Operating temperature	-55 to +125 °C
Capacitance characteristic	±15%
Termination	Ni/Sn (lead-free termination)

\* Measured at 25 °C ambient temperature and 30-70% related humidity. Apply 1.0±0.2V<sub>rms</sub>, 1.0kHz±10%.

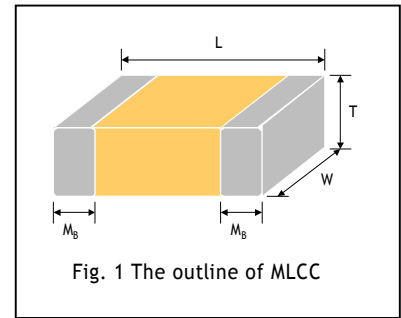


Fig. 1 The outline of MLCC

## 7. CAPACITANCE RANGE

DIELECTRIC SIZE	X7R															
	0805				1206				1210				1812			
RATED VOLTAGE (VDC)	100	200	250	500	100	200	250	500	100	200	250	500	100	200	250	500
100pF (101)	B	B	B	B												
120pF (121)	B	B	B	B												
150pF (151)	B	B	B	B	B	D	D	D								
180pF (181)	B	B	B	B	B	D	D	D								
220pF (221)	B	B	B	B	B	D	D	D								
270pF (271)	B	B	B	B	B	D	D	D								
330pF (331)	B	B	B	B	B	D	D	D								
390pF (391)	B	B	B	B	B	D	D	D								
470pF (471)	B	B	B	B	B	D	D	D								
560pF (561)	B	B	B	B	B	D	D	D								
680pF (681)	B	B	B	B	B	D	D	D								
820pF (821)	B	B	B	B	B	D	D	D								
1,000pF (102)	B	B	B	B	B	D	D	D	C	C	C	C	D	D	D	D
1,200pF (122)	B	B	B	B	B	D	D	D	C	C	C	C	D	D	D	D
1,500pF (152)	B	B	B	B	B	D	D	D	C	C	C	C	D	D	D	D
1,800pF (182)	B	B	B	B	B	D	D	D	C	C	C	C	D	D	D	D
2,200pF (222)	B	B	B	B	B	D	D	D	C	C	C	C	D	D	D	D
2,700pF (272)	B	B	B	B	B	D	D	D	C	C	C	C	D	D	D	D
3,300pF (332)	B	B	B	B	B	D	D	D	C	C	C	C	D	D	D	D
3,900pF (392)	B	B	B		B	D	D	D	C	C	C	C	D	D	D	D
4,700pF (472)	B	B	B		B	D	D	D	C	C	C	C	D	D	D	D
5,600pF (562)	B	D	D		B	D	D	D	C	C	C	C	D	D	D	D
6,800pF (682)	B	D	D		B	D	D	D	C	C	C	C	D	D	D	D
8,200pF (822)	B	D	D		B	D	D	D	C	C	C	C	D	D	D	D
0.010μF (103)	B	D	D		B	D	D	D	C	C	C	C	D	D	D	D
0.012μF (123)	B	D	D		B	D	D	D	C	C	C	C	D	D	D	D
0.015μF (153)	B	D	D		B	D	D	D	C	C	C	C	D	D	D	D
0.018μF (183)	B	D	D		B	D	D	D	C	C	C	C	D	D	D	D
0.022μF (223)	B	D	D		B	D	D	G	C	C	C	D	D	D	D	D
0.027μF (273)	D				B	D	D	G	C	C	C	G	D	D	D	D
0.033μF (333)	D				B	G	G	G	C	C	C	G	D	D	D	D
0.039μF (393)	D				B	G	G		C	C	C	G	D	D	D	D
0.047μF (473)	D				B	G	G		C	D	D	G	D	D	D	D
0.056μF (563)					B	G	G		C	D	D	G	D	D	D	K
0.068μF (683)					B	G	G		C	G	G		D	D	D	K
0.082μF (823)					B	G	G		C	G	G		D	D	D	K
0.10μF (104)					D	G	G		C	G	G		D	D	D	K
0.12μF (124)					D				C	G	G		D	D	D	
0.15μF (154)					G				D	M	M		D	K	K	
0.18μF (184)					G				D	M	M		D	K	K	
0.22μF (224)					G				D	M	M		D	K	K	
0.27μF (274)									G				D	K	K	
0.33μF (334)									G				D	K	K	
0.39μF (394)									M				D	K	K	
0.47μF (474)									M				K	K	K	
0.56μF (564)									M				K			
0.68μF (684)													K			
0.82μF (824)													K			
1.0μF (105)													K			

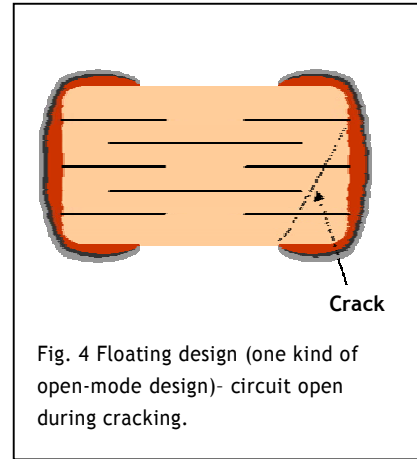
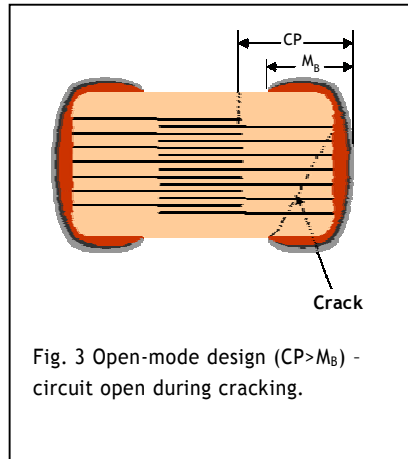
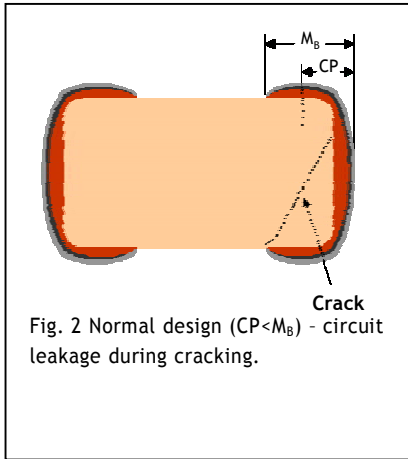
1. The cell with red color mark is expressed product with Ag/Ni/Sn terminations.

## 8. PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
0805	0.80±0.10	4k	15k	-	-
	1.25±0.10	-	-	3k	10k
1206	0.80±0.10	4k	15k	-	-
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
1210	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
	2.50 ± 0.30	-	-	1k	-
1812	1.25±0.10	-	-	1k	-
	2.00±0.20	-	-	1k	-

Unit: pieces

## 9. INNER CONSTRUCTION OF OPEN-MODE DESIGN



## 10. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements															
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.															
2.	Capacitance	1.0±0.2Vrms, 1kHz±10%	* Shall not exceed the limits given in the detailed spec.															
3.	Q/ D.F. (Dissipation Factor)		X7R: D.F. ≤2.5%															
4.	Dielectric Strength	* To apply voltage (≤50V) 250%. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA. * To apply voltage: 100V ≥3 times VDC 200V-300V ≥2 times VDC 500V ≥1.5 times VDC * Cut-off, set at 10mA * TEST= 15 sec. * RAMP=0	* No evidence of damage or flash over during test.															
5.	Insulation Resistance	To apply rated voltage for 60 sec.	≥10GΩ or RxC≥100Ω-F whichever is smaller.															
6.	Temperature Coefficient	With no electrical load. Operating temperature: -55-125°C at 25°C	Within ±15%.															
7.	Adhesive Strength of Termination	* Pressurizing force : 5N (≤0603) and 10N (>0603) * Test time: 10±1 sec.	* No remarkable damage or removal of the terminations.															
8.	Vibration Resistance	* Vibration frequency: 10-55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.															
9.	Solderability	* Solder temperature: 235±5°C * Dipping time: 2±0.5 sec.	95% min. coverage of all metalized area.															
10.	Bending Test	* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec. * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap change: X7R: within ±12.5% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)															
11.	Resistance to Soldering Heat	* Solder temperature: 270±5°C * Dipping time: 10±1 sec * Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. * Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Measurement to be made after keeping at room temp. for 48±4 hrs.	* No remarkable damage. * Cap change: X7R: within ±7.5% * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge.															
12.	Temperature Cycle	* Conduct the five cycles according to the temperatures and time. <table border="1" data-bbox="284 1720 767 1863"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2-3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2-3</td> </tr> </tbody> </table> * Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Measurement to be made after keeping at room temp. for 48±4 hrs.	Step	Temp. (°C)	Time (min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2-3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2-3	* No remarkable damage. * Cap change : X7R: within ±7.5% * Q/D.F., I.R. and dielectric strength: To meet initial requirements.
Step	Temp. (°C)	Time (min.)																
1	Min. operating temp. +0/-3	30±3																
2	Room temp.	2-3																
3	Max. operating temp. +3/-0	30±3																
4	Room temp.	2-3																

No.	Item	Test Condition	Requirements
13.	Humidity (Damp Heat) Steady State	<ul style="list-style-type: none"> <li>* Test temp.: 40±2°C</li> <li>* Humidity: 90-95% RH</li> <li>* Test time: 500+24/-0hrs.</li> <li>* Measurement to be made after keeping at room temp. for 48±4 hrs. (Class II).</li> </ul>	<ul style="list-style-type: none"> <li>* No remarkable damage.</li> <li>* Cap change: X7R: within ±12.5%</li> <li>* Q/D.F. value: X7R: D.F. ≤3.0%</li> <li>* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.</li> </ul>
14.	Humidity (Damp Heat) Load	<ul style="list-style-type: none"> <li>* Test temp.: 40±2°C</li> <li>* Humidity: 90-95%RH</li> <li>* Test time: 500+24/-0 hrs.</li> <li>* To apply voltage : rated voltage.</li> <li>* Measurement to be made after keeping at room temp. for 48±4 hrs.</li> </ul>	<ul style="list-style-type: none"> <li>* No remarkable damage.</li> <li>* Cap change: X7R: within ±12.5%</li> <li>* Q/D.F. value: X7R: D.F. ≤3.0%</li> <li>* I.R.: ≥500MΩ or RxC≥25Ω-F whichever is smaller.</li> </ul>
15.	High Temperature Load (Endurance)	<ul style="list-style-type: none"> <li>* Test temp.: X7R: 125±3°C</li> <li>* To apply voltage:</li> <li>(1) V&lt;500V: 200% of rated voltage.</li> <li>(2) 500V: 150% of rated voltage.</li> <li>* Test time: 1000+24/-0 hrs.</li> <li>* Measurement to be made after keeping at room temp. for 48±4 hrs.</li> </ul>	<ul style="list-style-type: none"> <li>* No remarkable damage.</li> <li>* Cap change: X7R: within ±12.5%</li> <li>* Q/D.F. value: X7R: D.F. ≤3.0%</li> <li>* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.</li> </ul>