

MULTILAYER CERAMIC CAPACITORS

Open-Mode Series (OP)



1. INTRODUCTION

WTC 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

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

3. APPLICATIONS

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

4. HOW TO ORDER

<u>OP</u>	<u>42</u>	<u>B</u>	<u>100</u>	<u>J</u>	<u>202</u>	<u>L</u>	<u>T</u>
<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	21=0805 (2012) 31=1206 (3216) 32=1210 (3225) 43=1812 (4532)	B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 102=10x10 ² =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.

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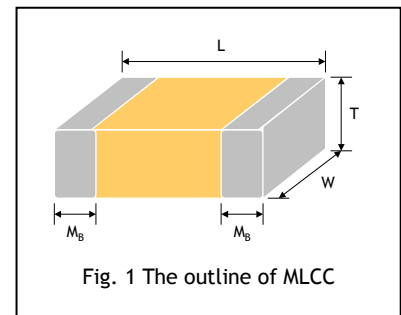
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5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M _B (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±0.30	2.50±0.20	0.95±0.10	C	#	0.50±0.25
			1.25±0.10	D	#	
			1.60±0.20	G	#	
1812 (4532)	4.50+0.5/-0.3	3.20±0.30	1.25±0.10	D	#	0.60±0.25
			2.00±0.20	K	#	
			2.50±0.30	M	#	

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 Ur	≥10GΩ or RxC≥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±0.2Vrms, 1.0kHz±10%.

** Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement.

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7. CAPACITANCE RANGE

DIELECTRIC		X7R															
SIZE		0805				1206				1210				1812			
RATED VOLTAGE (VDC)		100	200	250	500	100	200	250	500	100	200	250	500	100	200	250	500
Capacitance	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)					D	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 letter in cell is expressed the symbol of product thickness.

2. The letter in cell with “^” mark is expressed product with Ag/Ni/Sn terminations.

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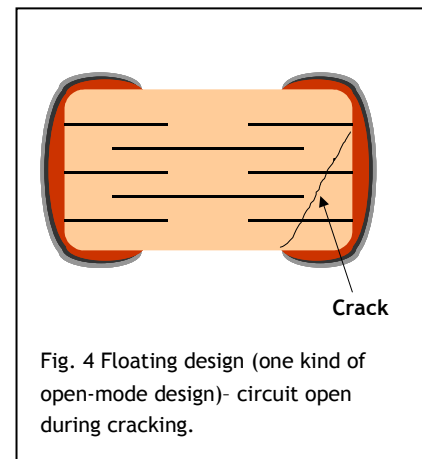
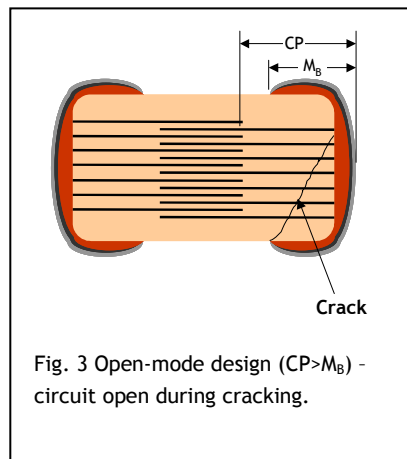
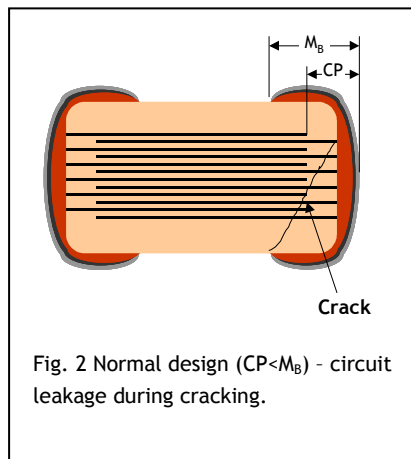


8. PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0805	0.80±0.10	B	4k	15k	-	-
	1.25±0.10	D	-	-	3k	10k
1206	0.80±0.10	B	4k	15k	-	-
	0.95±0.10	C	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	-
1210	0.95±0.10	C	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	-
1812	1.25±0.10	D	-	-	1k	-
	2.00±0.20	K	-	-	1k	-
	2.50±0.30	M	-	-	0.5k	-

Unit: pieces

9. INNER CONSTRUCTION OF OPEN-MODE DESIGN



10. APPENDIXES

■ Tape & reel dimensions

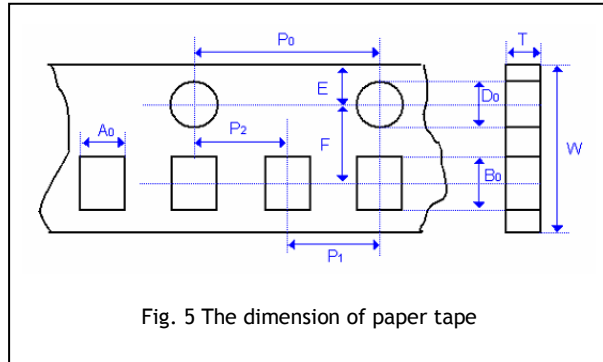


Fig. 5 The dimension of paper tape

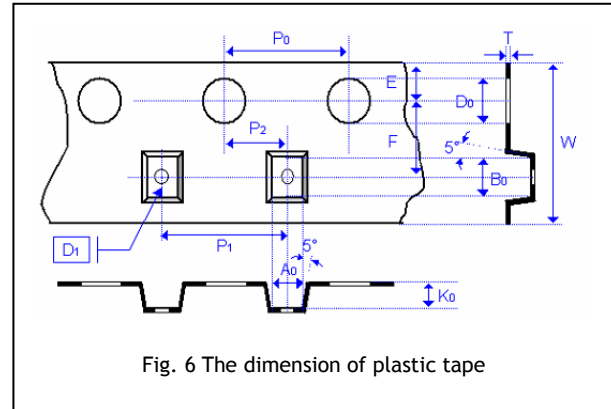


Fig. 6 The dimension of plastic tape

Size	0805		1206			1210		1812
Thickness	B	C, D, I	B	C, D	G	C, D	G	D, K, M
A ₀	1.50±0.10	<1.57	2.00±0.10	<1.85	<1.95	<2.97	<2.97	<3.81
B ₀	2.30±0.10	<2.40	3.50±0.10	<3.46	<3.67	<3.73	<3.73	<5.30
T	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.25±0.05
K ₀	-	<2.50	-	<2.50	<2.50	<2.50	<2.50	<2.50
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	12.0±0.20
P ₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.100	4.00±0.10	4.00±0.10
10xP ₀	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10
P ₁	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	8.00±0.10
P ₂	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D ₀	1.55±0.05	1.50±0.05	1.50±0.05	1.50±0.05	1.50±0.05	1.50±0.05	1.50±0.05	1.50±0.05
D ₁	-	1.00±0.10	-	1.00±0.10	1.00±0.10	1.00±0.10	1.00±0.10	1.50±0.10
E	1.75±0.05	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	5.50±0.05

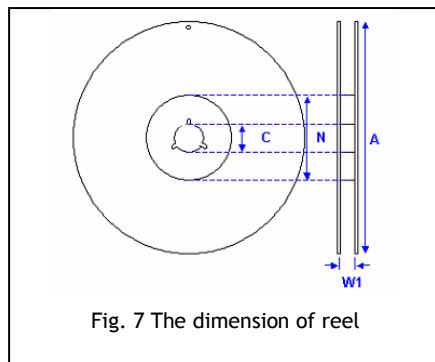


Fig. 7 The dimension of reel

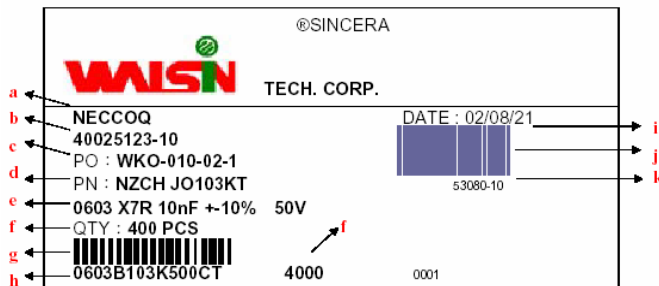
Size	0603, 0805, 1206, 1210			1808, 1812
Reel size	7"	10"	13"	7"
C	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2
W ₁	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±0.10	250.0±1.0	330.0±1.0	178.0±0.10
N	60.5±1.0	100.0±1.0	100±1.0	60.5±1.0

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Description of customer label



- a. Customer name
- b. WTC order series and item number
- c. Customer P/O
- d. Customer P/N
- e. Description of product
- f. Quantity
- g. Bar code including quantity & WTC P/N or customer
- h. WTC P/N
- i. Shipping date
- j. Order bar code including series and item numbers
- k. Serial number of label

Constructions

No.	Name	X7R
①	Ceramic material	BaTiO ₃ based
②	Inner electrode	AgPd alloy or Ni
③	Termination	Inner layer
④		Middle layer
⑤		Outer layer
		Ag or Cu
		Ni
		Sn (Matt)

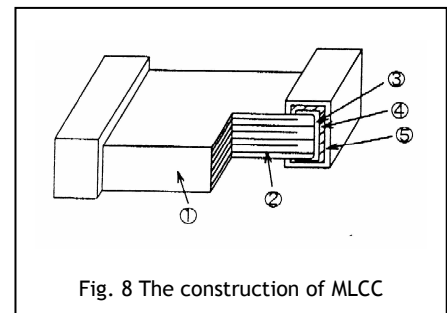


Fig. 8 The construction of MLCC

Storage and handling conditions

- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

- a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering.
- b. To store products on the shelf and avoid exposure to moisture.
- c. Don't expose products to excessive shock, vibration, direct sunlight and so on.

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Recommended soldering conditions

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N_2 within oven are recommended.

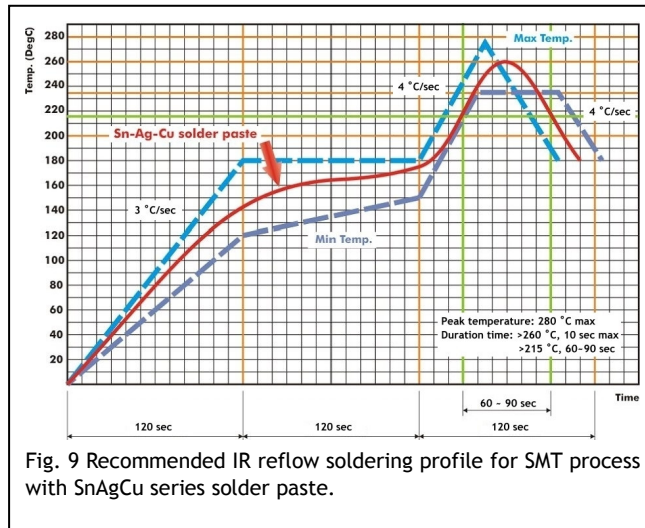


Fig. 9 Recommended IR reflow soldering profile for SMT process with SnAgCu series solder paste.

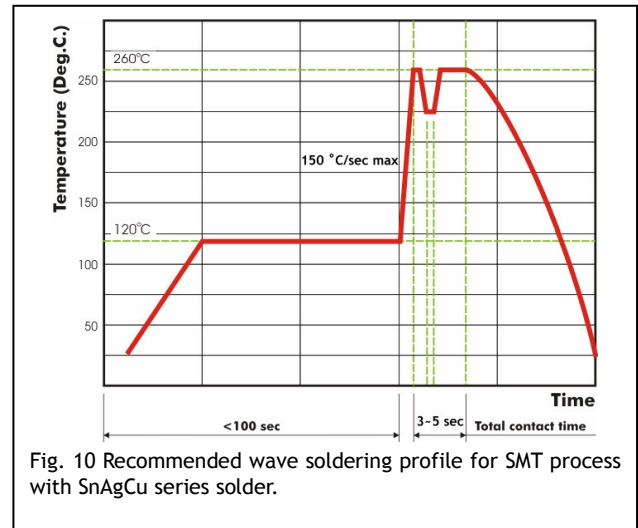


Fig. 10 Recommended wave soldering profile for SMT process with SnAgCu series solder.