MULTILAYER CERAMIC CAPACITORS

General Purpose Capacitors

1. DESCRIPTION

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

WTC's MLCC is made by NP0, X7R and Y5V dielectric material and which provides product with high electrical precision, stability and reliability.

2. FEATURES

a. A wide selection of sizes is available (0402 to 1812).
b. High capacitance in given case size.
c. Capacitor with lead-free termination (pure Tin).

3. APPLICATIONS

a. For general digital circuit.
b. For power supply bypass capacitors.
c. For consumer electronics.
d. For telecommunication.

4. HOW TO ORDER

1206	F	104	Z	500	C	T
Size	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging style**
Inch (mm) **0402** (1005) **0603** (1608) **0805** (2012) **1206** (3216) **1210** (3225) **1812** (4532)	**N**=NP0 (C0G) **B**=X7R **F**=Y5V	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: R47=4.7pF 0R5=0.5pF 1R0=1.0pF 104=10x10^4 =100nF	**B**=±0.1pF **C**=±0.25pF **D**=±0.5pF **F**=±1% **G**=±2% **J**=±5% **K**=±10% **M**=±20% **Z**=-20/+80%	Two significant digits followed by no. of zeros. And R is in place of decimal point. **100**=10 VDC **160**=16 VDC **250**=25 VDC **500**=50 VDC **101**=100 VDC	**L**=Ag/Ni/Sn (for NPO dielectric) **C**=Cu/Ni/Sn (for X7R,Y5V dielectric)	**T**=7" reeled **R**=7" reeled (2mm pitch for 0603 size; paper tape) **G**=13" reeled

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M_B (mm)
0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	#	0.25 +0.05/-0.10
0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S		0.40±0.15
	1.60 +0.15/-0.10	0.80 +0.15/-0.10	0.80 +0.15/-0.10	X		
0805 (2012)	2.00±0.15	1.25±0.10	0.60±0.10	A		0.50±0.20
			0.80±0.10	B		
			1.25±0.10	D	#	
1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B		0.60±0.20
			0.95±0.10	C		
			1.15±0.15	J	#	
			1.25±0.10	D	#	
	3.20±0.20	1.60±0.20	1.60±0.20	G	#	
	3.20+0.3/-0.1	1.60+0.3/-0.1	1.60+0.30/-0.10	P	#	
1210 (3225)	3.20±0.30	2.50±0.20	0.95±0.10	C	#	0.75±0.25
			1.25±0.10	D	#	
	3.20±0.40	2.50±0.30	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	#	0.75±0.25
			2.00±0.20	K	#	

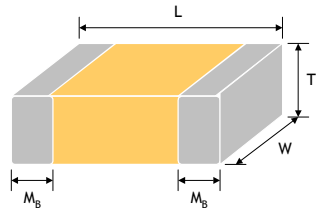


Fig. 1 The outline of MLCC

Reflow soldering only is recommended.

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	Y5V
Size	0402, 0603, 0805, 1206, 1210, 1812		
Capacitance range*	0.5pF to 0.039uF	100pF to1.0uF	10nF to 680nF
Capacitance tolerance**	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	M (±20%), Z (-20/+80%)
Rated voltage (WVDC)	16V, 25V, 50V, 100V	10V, 16V, 25V, 50V, 100V	
Tan δ*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1	
Insulation resistance at Ur	≥10GΩ or RxC≥500ΩxF whichever is less		
Operating temperature	-55 to +125°C		-25 to +85°C
Capacitance characteristic	±30ppm	±15%	+30/-80%
Termination	Ni/Sn (lead-free termination)		

* Measured at the condition of 30~70% related humidity.

NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature

X7R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.

Y5V: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 20°C ambient temperature.

** 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.

Note 1:

X7R/X5R

Rated vol.	D.F.	Exception of D.F.	
≥50V	≤2.5%	≤3%	0603≥0.047μF; 0805≥0.18μF, 1206≥0.47μF
25V	≤3.5%	≤5%	0805≥1μF;
		≤7%	0603≥0.33μF
		10%	0402≧0.10μF;0603≧0.68μF
16V	≤3.5%	≤5%	0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF;
		≤10%	0603≧0.68μF
10V	≤5.0%	≤10%	0603≥0.33μF;

Y5V

Rated vol.	D.F.	Exception of D.F.	
≥50V	≤5.0%	7.0%	0603≧0.1μF; 0805≧0.47μF
25V	≤5.0%	≤7%	0402≧0.047μF; 0603≥0.1μF; 0805≥0.33μF; 1206≥1μF
		≤9%	0402≥0.068μF; 0603≧0.47μF
16V (C<1.0μF)	≤7.0%	≤9%	0402≥0.068μF; 0603≥0.68μF
16V (C≥1.0μF)	≤9.0%	---	-
10V	≤12.5%	---	0402≧0.47μF

7. CAPACITANCE RANGE (NP0 Dielectric - Noble Metal Electrode)

7-1 0402, 0603, 0805 Sizes

DIELECTRIC		NP0														
SIZE		0402					0603					0805				
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.5pF (0R5)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.6pF (0R6)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.7pF (0R7)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.8pF (0R8)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.9pF (0R9)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.0pF (1R0)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.2pF (1R2)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.5pF (1R5)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.8pF (1R8)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.2pF (2R2)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.7pF (2R7)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.3pF (3R3)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.9pF (3R9)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.7pF (4R7)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.6pF (5R6)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.8pF (6R8)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.2pF (8R2)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	10pF (100)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	12pF (120)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	15pF (150)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	18pF (180)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	22pF (220)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	27pF (270)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	33pF (330)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	39pF (390)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	47pF (470)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	56pF (560)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	68pF (680)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	82pF (820)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	100pF (101)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	120pF (121)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	150pF (151)	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	180pF (181)	N	N	N	N		S	S	S	S	S	A	A	A	A	A
	220pF (221)	N	N	N	N		S	S	S	S	S	A	A	A	A	A
	270pF (271)	N	N	N			S	S	S	S	S	A	A	A	A	A
	330pF (331)	N	N				S	S	S	S	S	A	A	A	A	A
	390pF (391)	N	N				S	S	S	S	S	B	B	B	B	B
	470pF (471)	N	N				S	S	S	S	S	B	B	B	B	B
	560pF (561)						S	S	S	S	S	B	B	B	B	B
	680pF (681)						S	S	S	S	S	B	B	B	B	B
	820pF (821)						S	S	S	S		B	B	B	B	B
	1,000pF (102)						S	S	S	S		B	B	B	B	B

1. The letter in cell is expressed the symbol of product thickness.

7-1 0402, 0603, 0805 Sizes (Continued)

DIELECTRIC		NP0														
SIZE		0402					0603					0805				
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	1,200pF (122)						S	S				B	B	B	B	B
	1,500pF (152)						S	S				B	B	B	B	B
	1,800pF (182)						S	S				B	B	B	B	B
	2,200pF (222)						S	S				B	B	B	B	B
	2,700pF (272)						S	S				D	D	D	D	D
	3,300pF (332)						S	S				D	D	D	D	D
	3,900pF (392)											D	D	D	D	D
	4,700pF (472)											D	D	D	D	
	5,600pF (562)											D	D			
	6,800pF (682)											D	D			
	8,200pF (822)											D	D			
	0.010μF (103)											D	D			
	0.012μF (123)											D	D			

1. The letter in cell is expressed the symbol of product thickness.

7-2 1206, 1210, 1812 Sizes

DIELECTRIC		NP0												
SIZE		1206					1210					1812		
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	16	50	100
Capacitance	1.0pF (1R0)													
	1.2pF (1R2)													
	1.5pF (1R5)	B	B	B	B	B								
	1.8pF (1R8)	B	B	B	B	B								
	2.2pF (2R2)	B	B	B	B	B								
	2.7pF (2R7)	B	B	B	B	B								
	3.3pF (3R3)	B	B	B	B	B								
	3.9pF (3R9)	B	B	B	B	B								
	4.7pF (4R7)	B	B	B	B	B								
	5.6pF (5R6)	B	B	B	B	B								
	6.8pF (6R8)	B	B	B	B	B								
	8.2pF (8R2)	B	B	B	B	B								
	10pF (100)	B	B	B	B	B					C			D
	12pF (120)	B	B	B	B	B					C			D
	15pF (150)	B	B	B	B	B					C			D
	18pF (180)	B	B	B	B	B					C			D
	22pF (220)	B	B	B	B	B	C	C	C	C	C			D
	27pF (270)	B	B	B	B	B	C	C	C	C	C			D
	33pF (330)	B	B	B	B	B	C	C	C	C	C			D
	39pF (390)	B	B	B	B	B	C	C	C	C	C			D
	47pF (470)	B	B	B	B	B	C	C	C	C	C			D
	56pF (560)	B	B	B	B	B	C	C	C	C	C			D
	68pF (680)	B	B	B	B	B	C	C	C	C	C			D
	82pF (820)	B	B	B	B	B	C	C	C	C	C			D
	100pF (101)	B	B	B	B	B	C	C	C	C	C			D

1. The letter in cell is expressed the symbol of product thickness.

7-2 1206, 1210, 1812 Sizes (Continued)

DIELECTRIC		NP0														
SIZE		1206					1210					1812				
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	120pF (121)	B	B	B	B	B	C	C	C	C	C					D
	150pF (151)	B	B	B	B	B	C	C	C	C	C					D
	180pF (181)	B	B	B	B	B	C	C	C	C	C					D
	220pF (221)	B	B	B	B	B	C	C	C	C	C					D
	270pF (271)	B	B	B	B	B	C	C	C	C	C					D
	330pF (331)	B	B	B	B	B	C	C	C	C	C					D
	390pF (391)	B	B	B	B	B	C	C	C	C	C					D
	470pF (471)	B	B	B	B	B	C	C	C	C	C					D
	560pF (561)	B	B	B	B	B	C	C	C	C	C					D
	680pF (681)	B	B	B	B	B	C	C	C	C	C					D
	820pF (821)	B	B	B	B	B	C	C	C	C	C					D
	1,000pF (102)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,200pF (122)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,500pF (152)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,800pF (182)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	2,200pF (222)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	2,700pF (272)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	3,300pF (332)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	3,900pF (392)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	4,700pF (472)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	5,600pF (562)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	6,800pF (682)	C	C	C	C	C	C	C	C	C	C	D	D	D	D	D
	8,200pF (822)	D	D	D	D	D	C	C	C	C	C	D	D	D	D	D
	0.010μF (103)	D	D	D	D		C	C	C	C	C	D	D	D	D	D
	0.012μF (123)	D	D				C	C	D	D	D	D	D	D	D	D
	0.015μF (153)	D	D				C	C	D	D	D	D	D	D	D	D
	0.018μF (183)	D	D									D	D	D	D	D
	0.022μF (223)	D	D									D	D	D	D	D
	0.027μF (273)	D	D									D	D	D	D	D
	0.033μF (333)	D	D									D	D	D	D	D
	0.039μF (393)	G	G													

1. The letter in cell is expressed the symbol of product thickness.

2. For more information about products with special capacitance or other data, please contact WTC local representative.

8. CAPACITANCE RANGE (X7R Dielectric - Based Metal Electrode)

8-1 0402, 0603, 0805 Sizes

DIELECTRIC		X7R													
SIZE		0402				0603					0805				
RATED VOLTAGE (VDC)		10	16	25	50	10	16	25	50	100	10	16	25	50	100
Capacitance	100pF (101)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	120pF (121)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	150pF (151)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	180pF (181)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	220pF (221)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	270pF (271)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	330pF (331)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	390pF (391)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	470pF (471)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	560pF (561)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	680pF (681)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	820pF (821)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	1,000pF (102)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	1,200pF (122)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	1,500pF (152)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	1,800pF (182)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	2,200pF (222)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	2,700pF (272)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	3,300pF (332)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	3,900pF (392)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	4,700pF (472)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	5,600pF (562)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	6,800pF (682)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	8,200pF (822)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	0.010μF (103)	N	N	N	N	S	S	S	S	S	B	B	B	B	B
	0.012μF (123)	N	N	N		S	S	S	S		B	B	B	B	B
	0.015μF (153)	N	N	N		S	S	S	S		B	B	B	B	B
	0.018μF (183)	N	N	N		S	S	S	S		B	B	B	B	B
	0.022μF (223)	N	N	N		S	S	S	S		B	B	B	B	B
	0.027μF (273)	N	N			S	S	S	S		B	B	B	B	D
	0.033μF (333)	N	N			S	S	S	X		B	B	B	B	D
	0.039μF (393)	N	N			S	S	S	X		B	B	B	B	D
	0.047μF (473)	N	N			S	S	S	X		B	B	B	B	D
	0.056μF (563)	N				S	S	S	X		B	B	B	B	D
	0.068μF (683)	N	N			S	S	S	X		B	B	B	B	D
	0.082μF (823)	N				S	S	S	X		B	B	B	B	D
	0.10μF (104)	N	N								B	B	B	B	D
	0.12μF (124)										B	B	B	D	
	0.15μF (154)										D	D	D	D	
	0.18μF (184)										D	D	D	D	
	0.22μF (224)										D	D	D	D	
	0.27μF (274)										D	D	D		
	0.33μF (334)										D	D	D		
	0.39μF (394)										D	D	D		
	0.47μF (474)										D	D	D		
	0.56μF (564)										D	D	D		
	0.68μF (684)										D	D	D		
	0.82μF (824)										D	D	D		
	1.0uF (105)										D	D	D		

1. The letter in cell is expressed the symbol of product thickness.

8-2 1206, 1210, 1812 Sizes

DIELECTRIC		X7R														
SIZE		1206					1210					1812				
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	100pF (101)															
	120pF (121)															
	150pF (151)	B	B	B	B	B										
	180pF (181)	B	B	B	B	B										
	220pF (221)	B	B	B	B	B										
	270pF (271)	B	B	B	B	B										
	330pF (331)	B	B	B	B	B										
	390pF (391)	B	B	B	B	B										
	470pF (471)	B	B	B	B	B										
	560pF (561)	B	B	B	B	B										
	680pF (681)	B	B	B	B	B										
	820pF (821)	B	B	B	B	B										
	1,000pF (102)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,200pF (122)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,500pF (152)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	1,800pF (182)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	2,200pF (222)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	2,700pF (272)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	3,300pF (332)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	3,900pF (392)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	4,700pF (472)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	5,600pF (562)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	6,800pF (682)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	8,200pF (822)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.010μF (103)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.012μF (123)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.015μF (153)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.018μF (183)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.022μF (223)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.027μF (273)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.033μF (333)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.039μF (393)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.047μF (473)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.056μF (563)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.068μF (683)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.082μF (823)	B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
	0.10μF (104)	B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
	0.12μF (124)	B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
	0.15μF (154)	C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
	0.18μF (184)	C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
	0.22μF (224)	C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
	0.27μF (274)	C	C	C	D		C	C	C	C	G	D	D	D	D	D
	0.33μF (334)	C	C	C	D		C	C	C	D	G	D	D	D	D	D
	0.39μF (394)	C	C	J	P		C	C	C	D	M	D	D	D	D	D
	0.47μF (474)	J	J	J	P		C	C	C	D	M	D	D	D	D	K
	0.56μF (564)	J	J	J	P		D	D	D	D	M	D	D	D	D	K
	0.68μF (684)	J	J	J	P		D	D	D	D	k	D	D	D	K	K
	0.82μF (824)	J	J	J	P		D	D	D	D	k	D	D	D	K	K
	1.0uF (105)										k					K

1. The letter in cell is expressed the symbol of product thickness.

2. For more information about products with special capacitance or other data, please contact WTC local representative.

3. [^] means the said item is made by NME (Noble Metal Electrode) process.

9. CAPACITANCE RANGE (Y5V Dielectric - Based Metal Electrode)

9-1 0402, 0603, 0805 Sizes

DIELECTRIC		Y5V														
SIZE		0402					0603					0805				
RATED VOLTAGE (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	10	16	25	50	100
Capacitance	0.010μF (103)		N	N	N	N		S	S	S	S	A	A	A	A	B
	0.015μF (153)		N	N	N	N		S	S	S	S	A	A	A	A	B
	0.022μF (223)		N	N	N	N		S	S	S	S	A	A	A	A	B
	0.033μF (333)		N	N	N	N		S	S	S	S	A	A	A	A	B
	0.047μF (473)		N	N	N			S	S	S	S	A	A	A	A	B
	0.068μF (683)		N	N	N			S	S	S	S	A	A	A	A	B
	0.10μF (104)		N	N	N			S	S	S	S	A	A	A	A	B
	0.15μF (154)		N					S	S	S	S	A	A	A	A	
	0.22μF (224)	N	N				S	S	S	S	S	A	A	A	A	
	0.33μF (334)	N	N					S	S	S		B	B	B	B	
	0.47μF (474)	N	N					S	S			B	B	B	B	
	0.68μF (684)	N						S	X			B	B	D	D	

9-2 1206, 1210, 1812 Sizes

DIELECTRIC		Y5V														
SIZE		1206					1210					1812				
RATED		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.010μF (103)	B	B	B	B	B					C					D
	0.015μF (153)	B	B	B	B	B					C					D
	0.022μF (223)	B	B	B	B	B					C					D
	0.033μF (333)	B	B	B	B	B					C					D
	0.047μF (473)	B	B	B	B	B					C					D
	0.068μF (683)	B	B	B	B	B					C					D
	0.10μF (104)	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
	0.15μF (154)	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D
	0.22μF (224)	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D
	0.33μF (334)	B	B	B	B		C	C	C	C	C	D	D	D	D	D
	0.47μF (474)	B	B	B	B		C	C	C	C		D	D	D	D	D
	0.68μF (684)	B	B	B	B		C	C	C	C		D	D	D	D	D

1. The letter in cell is expressed the symbol of product thickness.

2. For more information about products with special capacitance or other data, please contact WTC local representative.

10. PACKAGING STYLE AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0402 (1005)	0.50±0.05	N	10k	50k	-	-
0603 (1608)	0.80±0.07	S	4k	15k	-	-
	0.80+0.15/-0.10	X	4k	15k	-	-
0805 (2012)	0.60±0.10	A	4k	15k	-	-
	0.80±0.10	B	4k	15k	-	-
	1.25±0.10	D	-	-	3k	10k
1206 (3216)	0.80±0.10	B	4k	15k	-	-
	0.95±0.10	C	-	-	3k	10k
	1.15±0.15	J	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	-
	1.60+0.30/-0.10	P	-	-	2k	-
1210 (3225)	0.95±0.10	C	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	-
	2.50±0.30	M	-	-	1K	-
1812 (4532)	1.25±0.10	D	-	-	1k	-
	2.00±0.20	K	-	-	1k	-

Unit: pieces

11. APPENDIXES

◙ Tape & reel dimensions

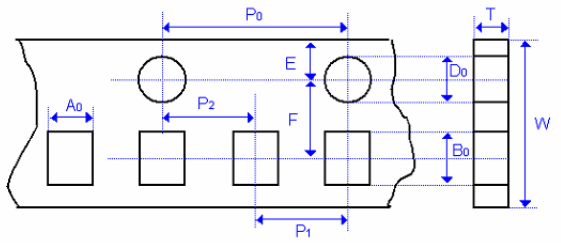


Fig. 2 The dimension of paper tape

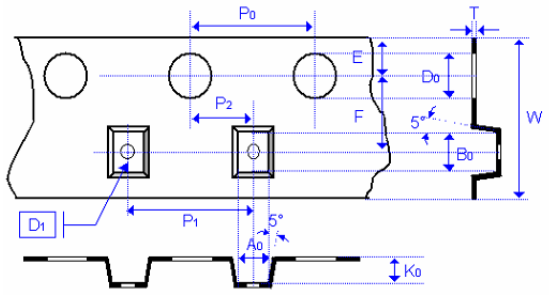


Fig. 3 The dimension of plastic tape

Size	0402	0603	0805			1206			1210		1812
Thickness	N	S, X	A	B	C, D, I	B	C, J, D	G	C, D, G	M	D, K
A_0	0.62±0.05	1.02±0.05	1.50±0.10	1.50±0.10	<1.57	2.00±0.10	<1.85	<1.95	<2.97	<2.97	<3.81
B_0	1.12±0.05	1.80±0.05	2.30±0.10	2.30±0.10	<2.40	3.50±0.10	<3.46	<3.67	<3.73	<3.73	<5.30
T	0.60±0.05	0.95±0.05	0.75±0.05	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	<3.00	<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	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±0.10	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	40.0±0.10	40.0±0.10	40.0±0.10
P_1	2.00±0.05	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	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	2.00±0.05	2.00±0.05	2.00±0.05
D_0	1.55±0.05	1.55±0.05	1.55±0.05	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±0.05	1.75±0.05	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	3.50±0.05	3.50±0.05	3.50±0.05	5.50±0.05

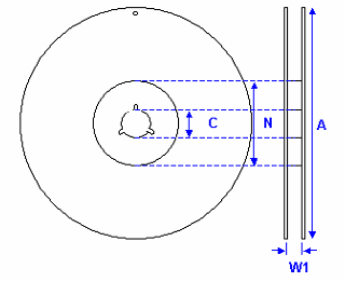
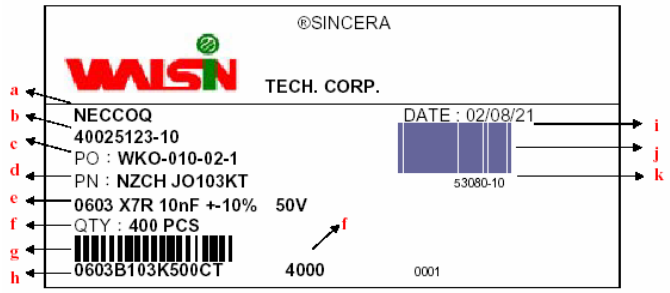


Fig. 4 The dimension of reel

Size	0402, 0603, 0805, 1206, 1210			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

◙ 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		NP0	X7R, X5R, Y5V
①	Ceramic material		$BaTiO_3$ based	
②	Inner electrode		AgPd alloy	Ni
③	Termination	Inner layer	Ag	Cu
④		Middle layer	Ni	
⑤		Outer layer	Sn	

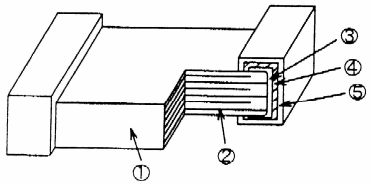


Fig. 5 The construction of MLCC

◙ 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.

◙ 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.

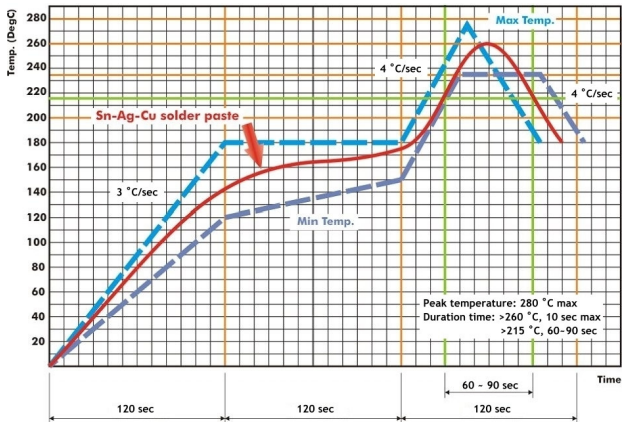


Fig. 6 Recommended IR reflow soldering profile for SMT process with SnAgCu series solder paste.

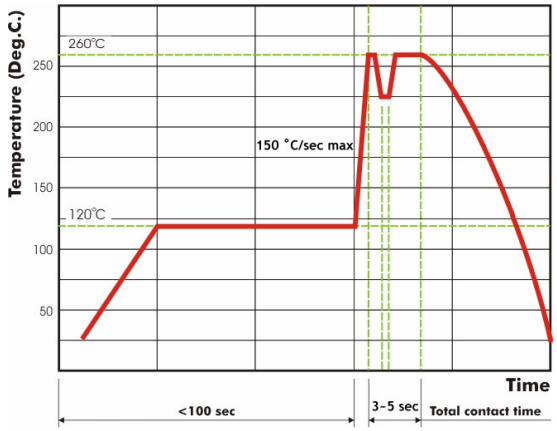


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.

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