

### 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

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

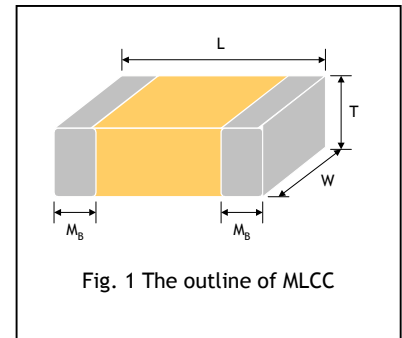
# MULTILAYER CERAMIC CAPACITORS

## General Purpose



### 5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M <sub>B</sub> (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	#	
			1.60±0.20	G	#	
			3.20+0.3/-0.1	1.60+0.3/-0.1	1.60±0.30/-0.10	
	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	#	
1812 (4532)	4.50±0.40	3.20±0.30	1.25±0.10	D	#	0.75±0.25
			2.00±0.20	K	#	



# Reflow soldering only is recommended.

### 6. GENERAL ELECTRICAL DATA

Dielectric	NPO	X7R	Y5V
Size	0402, 0603, 0805, 1206, 1210, 1812		
Capacitance range*	0.5pF to 100nF	100pF to 820nF	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%)	J (±5%), K (±10%)	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	≥10GΩ or RxC≥500QxH 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.

NPO: 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.

Note 1:

X7R Dielectric			
Ur.	DF	Exception of DF	
≥50V	≤2.5%	≤3.0%	0603, ≥47nF; 0805, ≥180nF; 1206, ≥470nF
25V	≤3.5%	≤5.0%	-
16V	≤3.5%	≤5.0%	0402, ≥33nF; 0603, ≥150nF; 0805, ≥680nF
10V	≤5.0%	-	-

Y5V Dielectric			
Ur.	DF	Exception of DF	
≥50V	≤5.0%	-	-
25V	≤5.0%	≤7.0%	0603, ≥100nF; 0805, ≥330nF
16V	≤7.0%	≤9.0%	0402, ≥68nF
10V	≤12.5%	-	-

# MULTILAYER CERAMIC CAPACITORS

## General Purpose



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

#### 7-1 0402, 0603, 0805 Sizes

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

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

# MULTILAYER CERAMIC CAPACITORS

## General Purpose



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

DIELECTRIC		NP0										
SIZE		0402				0603			0805			
RATED VOLTAGE (VDC)		16	25	50	100	16	50	100	16	25	50	100
Capacitance	1,200pF (122)					S					B	B
	1,500pF (152)					S					B	B
	1,800pF (182)					S					B	B
	2,200pF (222)					S					B	B
	2,700pF (272)					S					D	D
	3,300pF (332)					S					D	D
	3,900pF (392)										D	D
	4,700pF (472)									D		
	5,600pF (562)								D			
	6,800pF (682)								D			
	8,200pF (822)								D			
	0.010μF (103)								D			
	0.012μF (123)								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)		16	50	100	16	50	100	16	50	100
Capacitance	1.0pF (1R0)									
	1.2pF (1R2)									
	1.5pF (1R5)		B	B						
	1.8pF (1R8)		B	B						
	2.2pF (2R2)		B	B						
	2.7pF (2R7)		B	B						
	3.3pF (3R3)		B	B						
	3.9pF (3R9)		B	B						
	4.7pF (4R7)		B	B						
	5.6pF (5R6)		B	B						
	6.8pF (6R8)		B	B						
	8.2pF (8R2)		B	B						
	10pF (100)		B	B			C			D
	12pF (120)		B	B			C			D
	15pF (150)		B	B			C			D
	18pF (180)		B	B			C			D
	22pF (220)		B	B		C	C			D
	27pF (270)		B	B		C	C			D
	33pF (330)		B	B		C	C			D
	39pF (390)		B	B		C	C			D
	47pF (470)		B	B		C	C			D
	56pF (560)		B	B		C	C			D
	68pF (680)		B	B		C	C			D
	82pF (820)		B	B		C	C			D
	100pF (101)		B	B		C	C			D

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

# MULTILAYER CERAMIC CAPACITORS

## General Purpose



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

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

# MULTILAYER CERAMIC CAPACITORS

## General Purpose



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

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

# MULTILAYER CERAMIC CAPACITORS

## General Purpose



### 8-2 1206, 1210, 1812 Sizes

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

# MULTILAYER CERAMIC CAPACITORS

## General Purpose



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

#### 9-1 0402, 0603, 0805 Sizes

DIELECTRIC		Y5V											
SIZE		0402				0603				0805			
RATED VOLTAGE (VDC)		10	16	25	50	10	16	25	50	16	25	50	100
Capacitance	0.010μF (103)			N	N			S	S		A	A	B
	0.015μF (153)			N	N			S	S		A	A	B
	0.022μF (223)			N	N			S	S		A	A	B
	0.033μF (333)			N	N			S	S		A	A	B
	0.047μF (473)			N				S	S		A	A	B
	0.068μF (683)		N					S	S		A	A	B
	0.10μF (104)		N					S	S		A	A	B
	0.15μF (154)	N						S	S		A	A	B
	0.22μF (224)	N						S			A	A	
	0.33μF (334)							S			B	B	
	0.47μF (474)						S				B		
	0.68μF (684)					S	X			B	D		
	1.0μF (105)					S	X			B	D		

#### 9-2 1206, 1210, 1812 Sizes

DIELECTRIC		Y5V								
SIZE		1206			1210			1812		
RATED		25	50	100	25	50	100	25	50	100
Capacitance	0.010μF (103)	B	B	B			C			D
	0.015μF (153)	B	B	B			C			D
	0.022μF (223)	B	B	B			C			D
	0.033μF (333)	B	B	B			C			D
	0.047μF (473)	B	B	B			C			D
	0.068μF (683)	B	B	B			C			D
	0.10μF (104)	B	B	B	C	C	C	D	D	D
	0.15μF (154)	B	B	C	C	C	C	D	D	D
	0.22μF (224)	B	B	C	C	C	C	D	D	D
	0.33μF (334)	B	B		C	C	C	D	D	D
	0.47μF (474)	B	B		C	C		D	D	D
	0.68μF (684)	B	B		C	C		D	D	D
	1.0μF (105)	B	B		C	C		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
1812 (4532)	1.25±0.10	D	-	-	1k	-
	2.00±0.20	K	-	-	1k	-

Unit: pieces

### APPENDIXES

#### ▣ Constructions

No.	Name	NP0	X7R, X5R, Y5V
①	Ceramic material	BaTiO <sub>3</sub> based	
②	Inner electrode	AgPd alloy	Ni
③	Termination	Inner layer	Ag
④		Middle layer	Ni
⑤		Outer layer	Sn

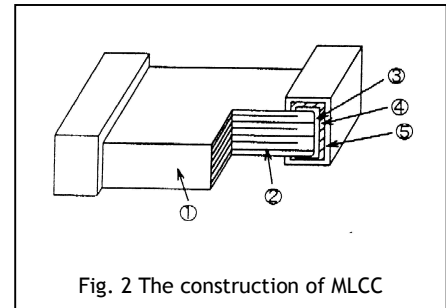


Fig. 2 The construction of MLCC

#### ▣ 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:

- Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidation of electrode, which easily be resulted in poor soldering.
- To store products on the shelf and avoid exposure to moisture.
- 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<sub>2</sub> within oven are recommended.

