

The outline of MLCC

## Features:

- Small size with high capacitance.
- Capacitor with lead-free termination (pure Tin).

## Description

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

WTC high capacitance MLCC offers low ESR and excellent frequency characteristics to be suited for coupling and decoupling applications in circuit. The high dielectric constant material X7R, X5R and Y5V are used for this series product.

## Applications

Digital circuit coupling or decoupling applications.  
 For high frequency and high-density type power suppliers.  
 For bypassing.

## External Dimensions

Size Inch (mm)	L (mm)	W (mm)	T/Symbol (mm)		Remark	M <sub>B</sub> (mm)
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	0.80 ±0.10	B		0.50 ±0.20
			1.25 ±0.10	D	#	
	2.00 ±0.20	1.25 ±0.20	1.25 ±0.20	I	#	

# Reflow soldering only is recommended.

# Multilayer Ceramic Capacitors



## General Electrical Data

Dielectric	X7R	X5R	Y5V
Size	0603, 0805		
Capacitance Range*	100nF to 40µF	27nF to 22µF	150nF to 100µF
Capacitance tolerance**	K (±10%, M (±20%))		
Rated voltage (WVDC)	6.3V, 10V, 16V, 25V, 50V		
Tan δ*	Note 1		
Insulation resistance at Ur	R x C ≥ 500Ω x F		
Operating temperature	-55 to +125°C	-55 to +85°C	-25 to +85°C
Capacitance characteristic	±15%		+30/-80%
Termination	Ni/Sn (lead-free termination)		

\* Measured at 1.0 ±0.2Vrms, 1.0kHz ±10% for CG10µF; 0.5 ±0.2Vrms, 120Hz ±20% for C>10µF, 30 to 70% related humidity, 25°C ambient temperature for X7R, X5R and at 20°C for Y5V.

\*\* 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
		≤5%	0805 ≥1µF
25V	≤3.5%	≤7%	0603 ≥0.33µF
		≤10%	0603 ≥0.047µF; 0805 ≥2.2µF
16V	≤3.5%	≤5%	0603 ≥0.15µF; 0805 ≥0.68µF
		≤10%	0603 ≥0.68µF; 0805 ≥2.2µF
10V	≤5.0%	≤10%	0603 ≥0.33µF; 0805 ≥2.2µF
6.3V	≤10%	≤15.0%	0603 ≥10µF; 0805 ≥4.7µF

# Multilayer Ceramic Capacitors



## Y5V

Rated Vol.	D.F.	Exception of D.F.	
≥50V	≤5.0%	≤7%	0603 ≥0.1μF; 0805 ≥0.47μF
35V	≤7%	-	-
25V	≤5.0%	≤7%	0603 ≥0.1μF; 0805 ≥0.33μF
		≤9%	0603 ≥0.47μF
16V (c<1.0μF)	≤7.0%	≤9%	0603 ≥0.68μF
16V (c≥1.0μF)	≤9.0%	≤9%	0805 ≥3.3μF
10V	≤12.5%	≤12.5%	-
6.3V	≤2.0%	-	-

## Capacitance Range

### 7-1 X7R Dielectric

Capacitance	Dielectric	X7R						
	Size	0603				0805		
	Rated Voltage (V dc)	10	16	25	50	10	16	25
0.10μF (104)	S	S	S	X				
0.15μF (154)	S	S						
0.22μF (224)	S	S						
0.33μF (334)	X							
0.47μF (474)	X							
0.68μF (684)	X							
1.0μF (105)	X					D	D	D
1.5μF (155)								
2.2μF (225)						I	I	I
3.3μF (335)								
4.7μF (475)								
10μF (106)								

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

# Multilayer Ceramic Capacitors



## Capacitance Range

### 7-2 X5R Dielectric

Dielectric		X5R							
Size		0603				0805			
Rated Voltage (V dc)		6.3	10	16	25	6.3	10	16	25
Capacitance	0.027μF (273)								
	0.033μF (333)								
	0.039μF (393)								
	0.047μF (473)								
	0.056μF (563)								
	0.068μF (683)								
	0.082μF (823)								
	0.10μF (104)								
	0.15μF (154)								
	0.22μF (224)				X				
	0.33μF (334)		X	X	X				
	0.47μF (474)		X	X	X				
	0.68μF (684)		X	X	X				
	1.0μF (105)	X	X	X	X				
	1.5μF (155)	X				I	I		
	2.2μF (225)	X				I	I	I	I
	3.3μF (335)					I	I		
	4.7μF (475)					I	I	I	I
	6.8μF (685)								
	10μF (106)					I			
22μF (226)									

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

# Multilayer Ceramic Capacitors



## Capacitance Range

### 7-3 Y5V Dielectric

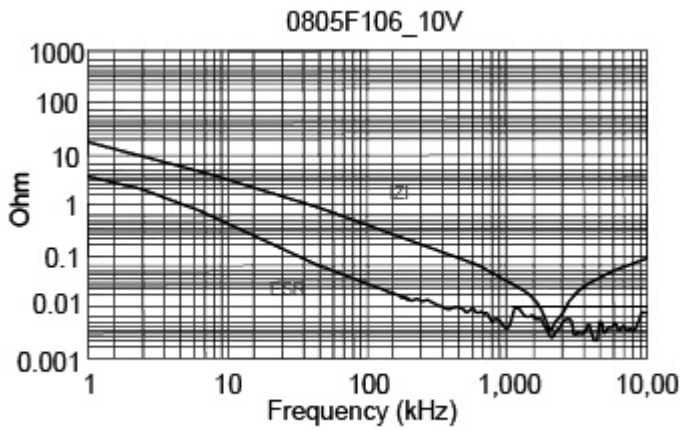
Dielectric		Y5V							
Size		0603				0805			
Rated Voltage (V dc)		10	16	25V	50	10	16	25	50
Capacitance	0.15µF (154)	S	S	S	S				
	0.22µF (224)	S	S	S					
	0.33µF (334)	S	S	S					
	0.47µF (474)	S	S						
	0.68µF (684)	S	X						
	1.0µF (105)	S	X			B	B	D	D
	1.5µF (155)	S				D	D		
	2.2µF (225)	S				D	D		
	3.3µF (335)					D	D		
	4.7µF (475)					D	D		
	6.8µF (685)					I			
	10µF (106)					I			
22µF (226)									

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

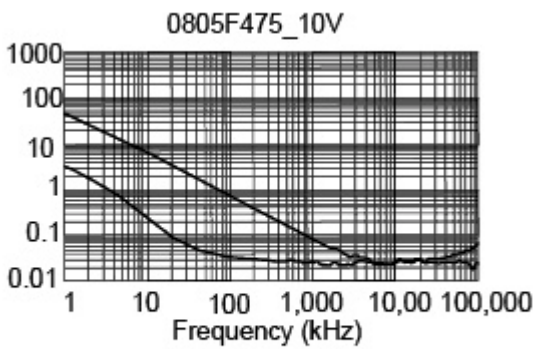
## Packaging Style and Quantity

Size	Thickness/Symbol (mm)		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0603 (1005)	0.80 ±0.07	S	4k	15k	-	-
	0.80 + 0.15/-0.10	X			-	-
	0.80 ±0.10	B			-	-
0805 (2012)	1.25 ±0.10	D	-	-	3k	10k
	1.25 ±0.20	I	-	-		

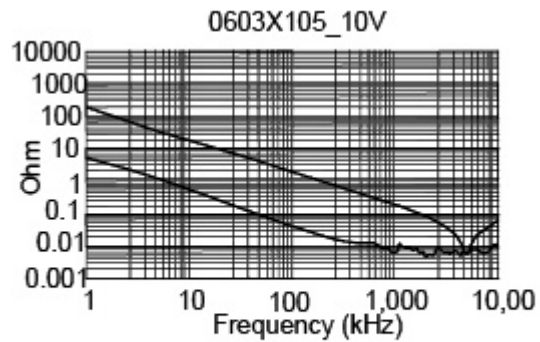
## Electrical Characteristics



ESR and IZI vs. frequency (0805F106\_10V)



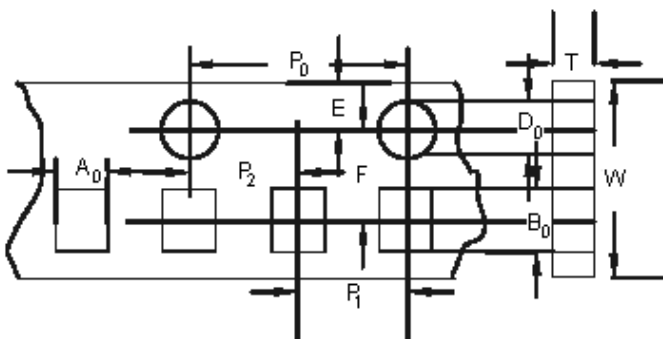
ESR and IZI vs. frequency (0805F475\_10V)



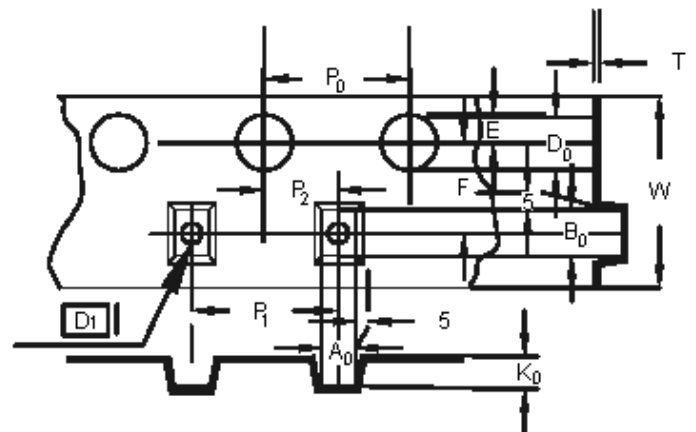
ESR and IZI vs. frequency (0603X105\_10V)

### Appendix

#### Tape and real dimensions



The dimension of paper tape

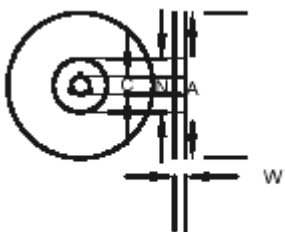


The dimension of plastic tape

# Multilayer Ceramic Capacitors

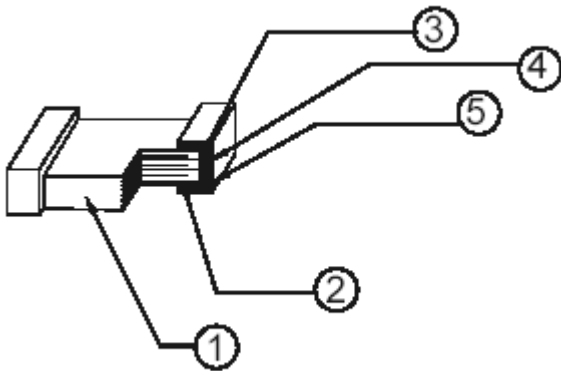


Size	0603	0805		
Thickness	S, X	A	B	C, D, I
A <sub>0</sub>	1.02 ±0.05	1.50 ±0.10	1.50 ±0.10	<1.57
B <sub>0</sub>	1.80 ±0.05	2.30 ±0.10	2.30 ±0.10	<2.40
T	0.95 ±0.05	0.75 ±0.05	0.95 ±0.05	0.23 ±0.05
K <sub>0</sub>	-	-	-	<2.50
w	8.00 ±0.10	8.00 ±0.10	8.00 ±0.10	8.00 ±0.10
P <sub>0</sub>	4.00 ±0.10	4.00 ±0.10	4.00 ±0.10	4.00 ±0.10
10xP <sub>0</sub>				
P <sub>1</sub>				
P <sub>2</sub>	2.00 ±0.05	2.00 ±0.05	2.00 ±0.05	2.00 ±0.05
D <sub>0</sub>	1.55 ±0.05	1.55 ±0.05	1.55 ±0.05	1.55 ±0.05
D <sub>1</sub>	-	-	-	1.00 ±0.10
E	1.75 ±0.05	1.75 ±0.05	1.75 ±0.05	1.75 ±0.10
F	3.50 ±0.05	3.50 ±0.05	3.50 ±0.05	3.50 ±0.05



The dimension of reel

Size	0603, 0805		
Reel size	7"	10"	13"
C	13.0 + 0.5/ - 0.2	13.0 + 0.5/ - 0.2	13.0 + 0.5/ - 0.2
W1	8.4 + 1.5/ - 0	8.4 + 1.5/ - 0	8.4 + 1.5/ - 0
A	178.0 ±0.10	250.0 ±0.10	330.0 ±1.0
N	60.5 ±1.0	100.0 ±1.0	100 ±1.0



## Constructions

No.	Name		X7R, X5R, Y5V
1	Ceramic material		BaTiO <sub>3</sub> based
2	Inner electrode		Ni
3	Termination	Inner layer	Cu
4		Middle layer	Ni
5		Outer layer	Sn (Matt)

## 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:

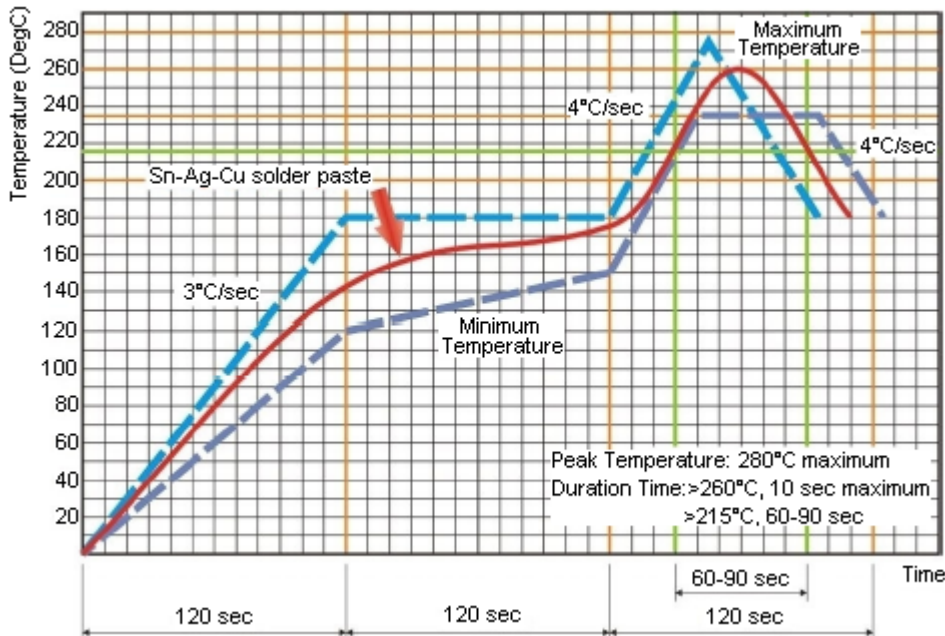
- a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering.
- b. To store products on the shelf and avoid exposure to moisture.
- c. Don't expose products to excessive shock, vibration,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

## Recommended soldering conditions

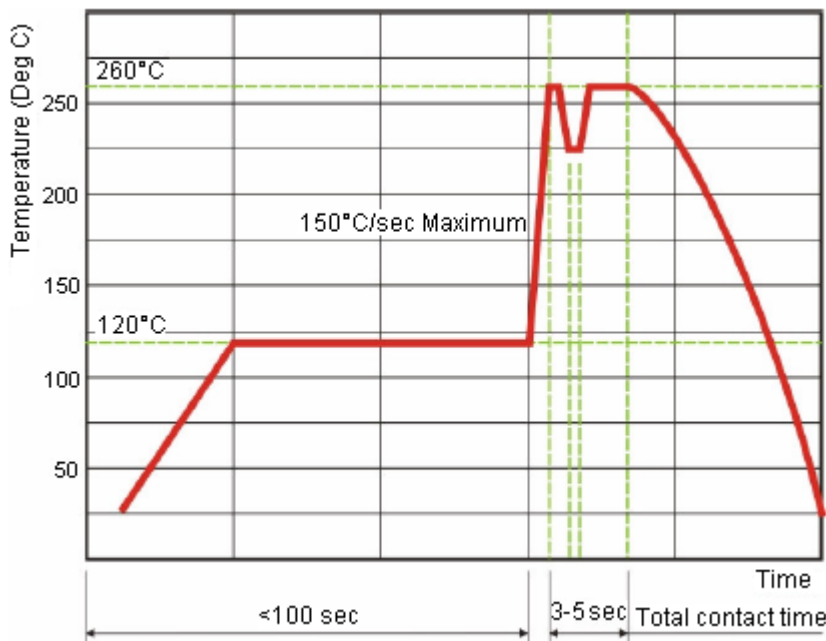
The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N<sub>2</sub> within oven are recommended.



# Multilayer Ceramic Capacitors



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



Recommended wave soldering profile for SMT Process with SnAgCu series solder.

