

DATA SHEET

SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

Class 2, Y5V
6.3/10 V



Surface-mount ceramic multilayer capacitors

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FEATURES

- Six standard sizes
- High capacitance per unit volume
- Supplied in tape on reel or in bulk case
- NiSn terminations.

APPLICATIONS

- Consumer electronics, for example:
 - Tuners
 - Television receivers
 - Video recorders
 - All types of cameras.

DESCRIPTION

The capacitor consists of a rectangular block of ceramic dielectric in which a number of interleaved metal electrodes are contained. This structure gives rise to a high capacitance per unit volume.

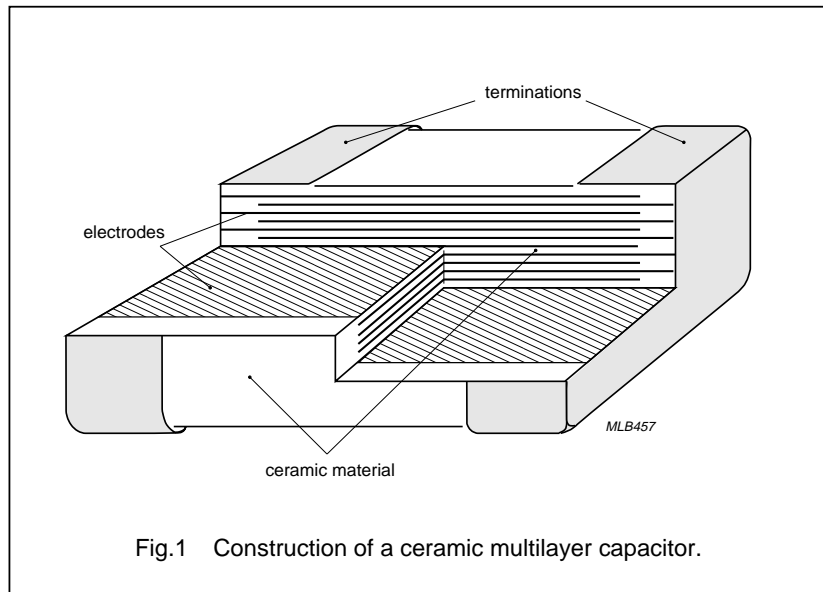
The inner electrodes are connected to the two terminations and finally covered with a layer of plated tin (NiSn). A cross section of the structure is shown in Fig.1.

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Rated voltage U_r (DC)	6.3 V, 10 V
Capacitance range (E3 series)	100 nF to 47 μ F; note 1
Tolerance on capacitance	-20% to +80%
Test voltage (DC) for 1 minute:	$2.5 \times U_r$
Sectional specifications	IEC 60384-10, second edition 1989-04; also based on CECC 32 100
Detailed specification	based on CECC 32 101-801
End terminations	NiSn
Climatic category (IEC 60 68)	25/85/21

Note

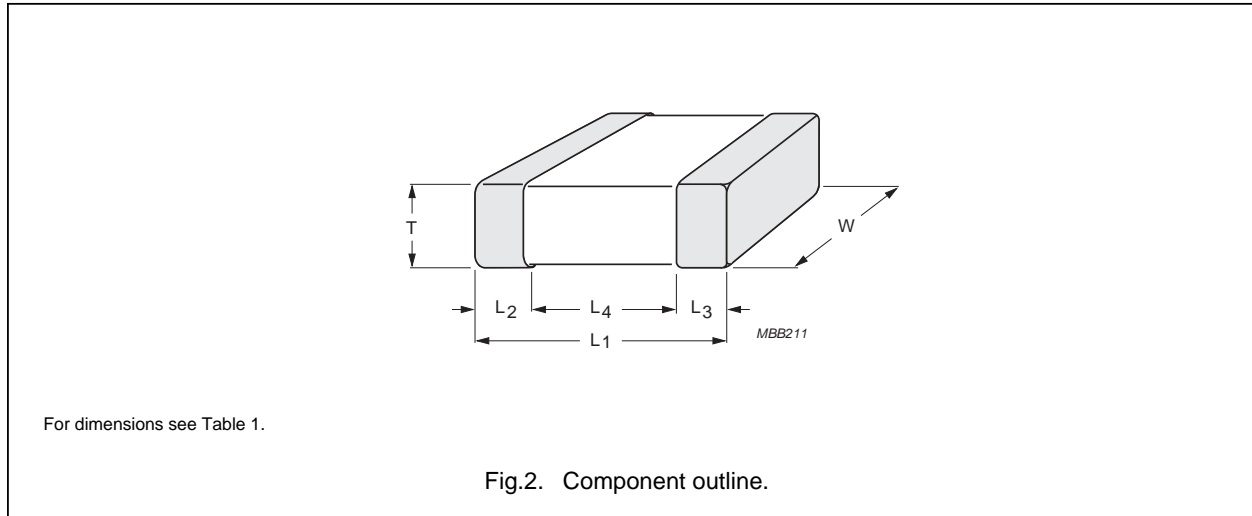
1. Measured at 25 °C, 1 V, 1 kHz for $C < 22 \mu\text{F}$ and 0.5 V, 120 Hz for $C \geq 22 \mu\text{F}$, using a four-gauge method.



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MECHANICAL DATA



Physical dimensions

Table 1 Capacitor dimensions; see Fig.2

CASE SIZE	L ₁	W	T		L ₂ and L ₃		L ₄ MIN.
			MIN.	MAX.	MIN.	MAX.	
Dimensions in millimetres							
0402	1.0 ±0.05	0.50 ±0.05	0.45	0.55	0.15	0.30	0.40
0603	1.6 ±0.10	0.8 ±0.07	0.73	0.87	0.25	0.65	0.40
0805	2.0 ±0.10	1.25 ±0.10	1.15	1.35	0.25	0.75	0.55
1206	3.2 ±0.20	1.6 ±0.15	1.45	1.75	0.25	0.75	1.40
1210	3.2 ±0.20	2.5 ±0.20	1.70	2.20	0.25	0.75	1.40
1812	4.5 ±0.20	3.2 ±0.20	2.30	2.70	0.25	0.75	2.20
Dimensions in inches							
0402	0.040 ±0.002	0.020 ±0.002	0.018	0.022	0.008	0.012	0.016
0603	0.063 ±0.004	0.032 ±0.003	0.029	0.035	0.010	0.026	0.016
0805	0.079 ±0.004	0.049 ±0.004	0.020	0.053	0.010	0.030	0.022
1206	0.126 ±0.008	0.063 ±0.006	0.020	0.069	0.010	0.030	0.056
1210	0.126 ±0.008	0.098 ±0.006	0.067	0.087	0.010	0.030	0.056
1812	0.177 ±0.006	0.126 ±0.006	0.091	0.106	0.010	0.030	0.087

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SELECTION CHART FOR 6.3 V

C (nF)	LAST TWO DIGITS OF 12NC	6.3 V				
		0402	0603	0805	1206	1210
470	58	0.5 ±0.05				
680	–					
1,000	63	0.5 ±0.05				
1,500	65					
2,200	67		0.8 ±0.07			
3,300	69					
4,700	72					
6,800	74				1.15 ±0.10	
10,000	76			1.25 ±0.10		
15,000	78					
22,000	81				1.6 ±0.15	
47,000	85					2.0 ±0.2

Note

1. Values in shaded cells indicate thickness class.

SELECTION CHART FOR 10 V

C (nF)	LAST TWO DIGITS OF 12NC	10 V					
		0402	0603	0805	1206	1210	1812
100	49						
150	52	0.5 ±0.05					
220	54						
330	–						
470	58		0.8 ±0.07				
680	–						
1,000	63			0.85 ±0.10			
1,500	65						
2,200	67		0.8 ±0.07				
3,300	69			1.25 ±0.10			
4,700	72				1.15 ±0.10		
6,800	74						
10,000	76			1.25 ±0.10		1.9 ±0.2	
15,000	78				1.6 ±0.15		
22,000	81					1.5 ±0.10	
47,000	85						2.5 ±0.2

Note

1. Values in shaded cells indicate thickness class.

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Thickness classification and packing quantities

THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH QUANTITY PER REEL				12 MM TAPE WIDTH QUANTITY PER REEL	QUANTITY PER BULK CASE			
	Ø180 mm; 7"		Ø330 mm; 13"		Ø180 mm; 7" BLISTER				
	PAPER	BLISTER	PAPER	BLISTER	1812	0402	0603	0805	
0.5 ±0.05	10,000	–	50,000	–	–	50,000	50,000	–	
0.8 ±0.07	4,000	–	15,000	–	–	–	15,000	–	
0.85 ±0.10	4,000	–	15,000	–	–	–	–	–	
1.15 ±0.10	–	3,000	–	10,000	–	–	–	–	
1.25 ±0.10	–	3,000	–	10,000	–	–	–	5,000	
1.5 ±0.10	–	2,000	–	–	–	–	–	–	
1.6 ±0.15	–	2,500	–	7,000	–	–	–	–	
1.9 ±0.2	–	2,000	–	–	–	–	–	–	
2.0 ±0.2	–	1,000	–	–	–	–	–	–	
2.5 ±0.2	–	–	–	–	500	–	–	–	

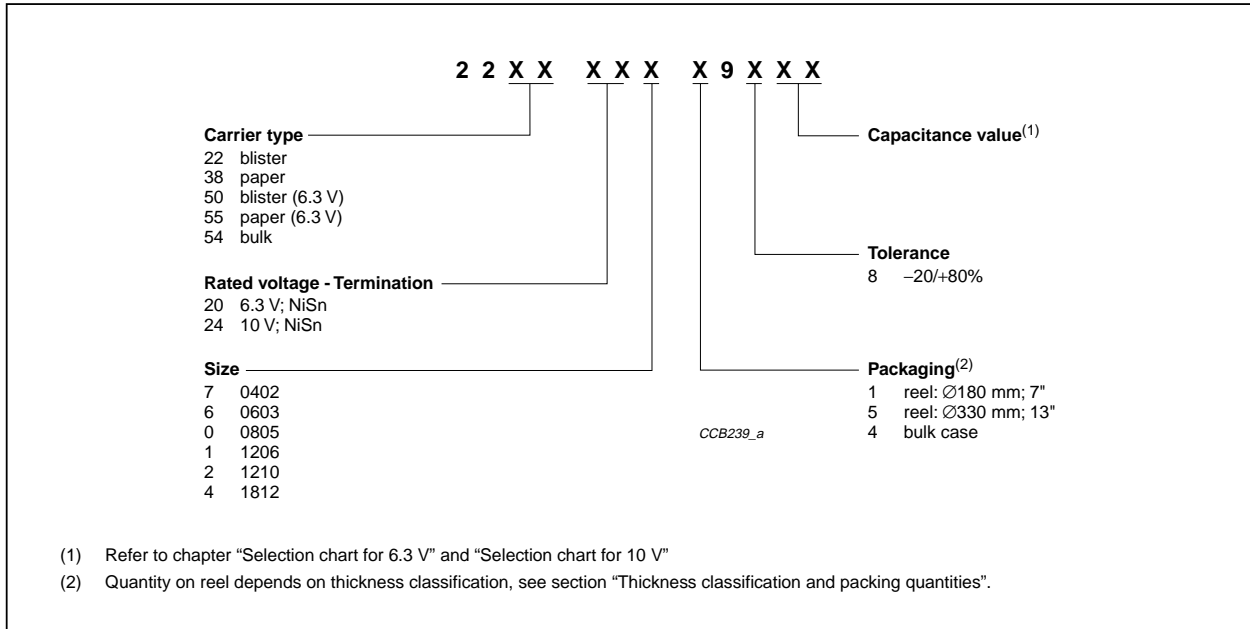
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ORDERING INFORMATION

Components may be ordered by using either a Phycomp's unique 12NC or simple 15-digit clear text code.

Ordering code 12NC (preferred)



Clear text code

EXAMPLE: 06032F105Z24BB0D

Size Code	Temp. Char.	Capacitance	Tol.	Vol.	Termination	Packing	Marking	Series
0402 0603 0805 1206 1210 1812	2F = Y5V	105 = 1000000 pF; the third digit signifies the multiplying factor: 5 = × 100,000 6 = × 1,000,000	Z = -20 /+80%	5 = 6.3 V 6 = 10 V	B = NiSn	2 = 180 mm; 7" paper 3 = 330 mm; 13" paper B = 180 mm; 7" blister F = 330 mm; 13" blister P = bulk case	0 = no marking	D = BME

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ELECTRICAL CHARACTERISTICS

Class 1 capacitors; Y5V dielectric; NiSn terminations

Unless otherwise stated all electrical values apply at an ambient temperature of 25 ± 1 °C, an atmospheric pressure of 86 to 105 kPa, and a relative humidity of 63 to 67%.

DESCRIPTION	VALUE
Capacitance range (E6 series); note 1	100 nF to 47 μ F
Tolerance on capacitance after 1,000 hours	-20% to +80% (Z)
Tan δ ; note 1 All 10 V (except 0402 and 220nF, 1210 and 22 μ F; 1812 and 47 μ F) 6.3 V: 1210 and 22 μ F, 1812 and 47 μ F 10 V: 0402 and 220 nF	$\leq 12.5\%$ $\leq 15\%$ $\leq 15\%$
Insulation resistance after 1 minute at U_r (DC)	$R_{ins} \times C \geq 500$ seconds
Ageing	typical 7% per time decade
Resistance to soldering heat	260 °C; 10 seconds

Note

1. Measured at 25 °C, 1 V, 1 kHz for $C < 22$ μ F and 0.5 V, 120 Hz for $C \geq 22$ μ F, using a four-gauge method.

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TESTS AND REQUIREMENTS

Table 2 Test procedures and requirements

IEC 60384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.4		mounting	the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying wave soldering, reflow soldering (including vapour phase soldering) or conductive adhesive	no visible damage
4.5		visual inspection and dimension check	any applicable method using $\times 10$ magnification	in accordance with specification
4.6.1		capacitance	at 25 °C $C < 22 \mu\text{F}$, $f = 1 \text{ kHz}$, $1 V_{\text{rms}}$ $C \geq 22 \mu\text{F}$, $f = 120 \text{ Hz}$, $0.5 V_{\text{rms}}$	within specified tolerance
4.6.2		$\tan \delta$	at 25 °C $C < 22 \mu\text{F}$, $f = 1 \text{ kHz}$, $1 V_{\text{rms}}$ $C \geq 22 \mu\text{F}$, $f = 120 \text{ Hz}$, $0.5 V_{\text{rms}}$	in accordance with specification
4.6.3		insulation resistance	at U_r (DC) for 1 minute	in accordance with specification
4.6.4		voltage proof	$2.5 \times U_r$ for 1 minute	no breakdown or flashover
4.7.1		temperature coefficient	between minimum and maximum temperature	in accordance with specification
4.8		adhesion	a force of 5 N applied for 10 s to the line joining the terminations and in a plane parallel to the substrate	no visible damage
4.9		bond strength of plating on end face	mounted in accordance with CECC 32 100, paragraph 4.4	no visible damage
			conditions: bending 1 mm at a rate of 1 mm/s, radius jig 340 mm	
4.10	Tb	resistance to soldering heat	preconditioning: 120 to 150 °C during 1 minute; 260 \pm 5 °C for 10 \pm 0.5 s in a static solder bath	the terminations shall be well tinned after recovery $I\Delta C/CI: \pm 20\%$ $\tan \delta$: original specification R_{ins} : original specification
		resistance to leaching	260 \pm 5 °C for 30 \pm 1 s in a static solder bath	using visual enlargement of $\times 10$, dissolution of the terminations shall not exceed 10%

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IEC 60384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.11	Ta	solderability	zero hour test, and test after storage (20 to 24 months) in original packing in normal atmosphere; unmounted chips completely immersed for 2 ± 0.5 s in a solder bath at 235 ± 5 °C	the terminations shall be well tinned
4.12	Na	rapid change of temperature	preconditioning: -25 to +85 °C; 5 cycles	no visible damage after 48 hours recovery: $ \Delta C/C : \leq 20\%$
4.14	Ca	damp heat	preconditioning: (thermal treatment): 500 \pm 12 hours at 40 °C; 90 to 95% RH;	no visible damage after 48 hours recovery: $ \Delta C/C : +30\%/-40\%$ $\tan \delta: \leq 15\%$ $R_{ins}: 500 M\Omega$ or $R_i C_R \geq 25$ s, whichever is less
		damp heat; with U_r load	initialization: 48 hours after U_r at 40 °C; for 1 hour (for initial value measurement); 500 \pm 12 hours at 40 °C; 90 to 95% RH; U_r applied	pretreatment: U_r at 40 °C for 1 hour, after 48 hours recovery: $ \Delta C/C : +30\%/-40\%$ $\tan \delta: \leq 15\%$ $R_{ins}: 500 M\Omega$ or $R_i C_R \geq 25$ s, whichever is less
4.15		endurance	initialization: $2 \times U_r$ at 85 °C for 1 hour, (initial value measurement after 48 hours, recovery at room temperature) ; 1,000 hours at 85 °C and $2 \times U_r$ applied	pretreatment: U_r at 40 °C for 1 hour, after 48 hours recovery: $ \Delta C/C : +30\%/-40\%$ $\tan \delta: \leq 15\%$ $R_{ins}: 1000 M\Omega$ or $R_i C_R \geq 50$ s, whichever is less

**Surface-mount ceramic
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Revision	Date	Change Notification	Description
Rev.5	2001 May 30	-	- Converted to Phycomp brand.
Rev.6	2003 Jun 26	-	- Updated company logo. - Combined 6.3 V and 10 V data sheets. - Capacitance range changed, refer to selection chart.
Rev.7	2003 Sep 26	-	- Size 1206, 1210 L1 dimensions revised. - Tan δ 6.3 V, 10 V amended.
Rev. 8	2004 Apr 05	-	- Thickness for Y5V 1210 22uF 10V revised