

# DATA SHEET

## SURFACE-MOUNT CERAMIC MULTILAYER CAPACITORS

C-Array: Class 1, NP0  
50 V

size 0508 (4 × 0402)



## Surface-mount ceramic multilayer capacitors

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### FEATURES

- 4 × 0402 capacitors (of the same capacitance value) per array
- Less than 50% board space of an equivalent discrete component
- High volumetric efficiency
- Dense dielectric layers
- Supplied in tape on reel or loose in bag
- Increased throughput by time saved in mounting
- Cost savings on manufacturing time.

### APPLICATIONS

- Professional electronics
- High density consumer electronics
- Automotive.

### DESCRIPTION

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

The inner electrodes are connected to the two terminations, silver dipped with a barrier layer of plated nickel and finally covered with a layer of plated tin (NiSn). An outline of the structure is shown in Fig.1.

### QUICK REFERENCE DATA

DESCRIPTION	VALUE
Rated voltage $U_R$ (DC)	50 V
Capacitance range (E12 series)	10 pF to 270 pF
Tolerance on capacitance	$\pm 5\%$ , $\pm 10\%$
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
Climatic category (IEC 60068)	55/125/56

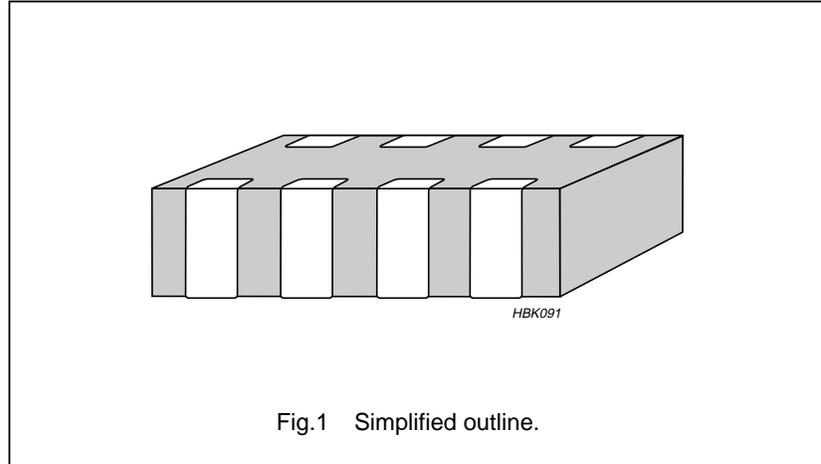
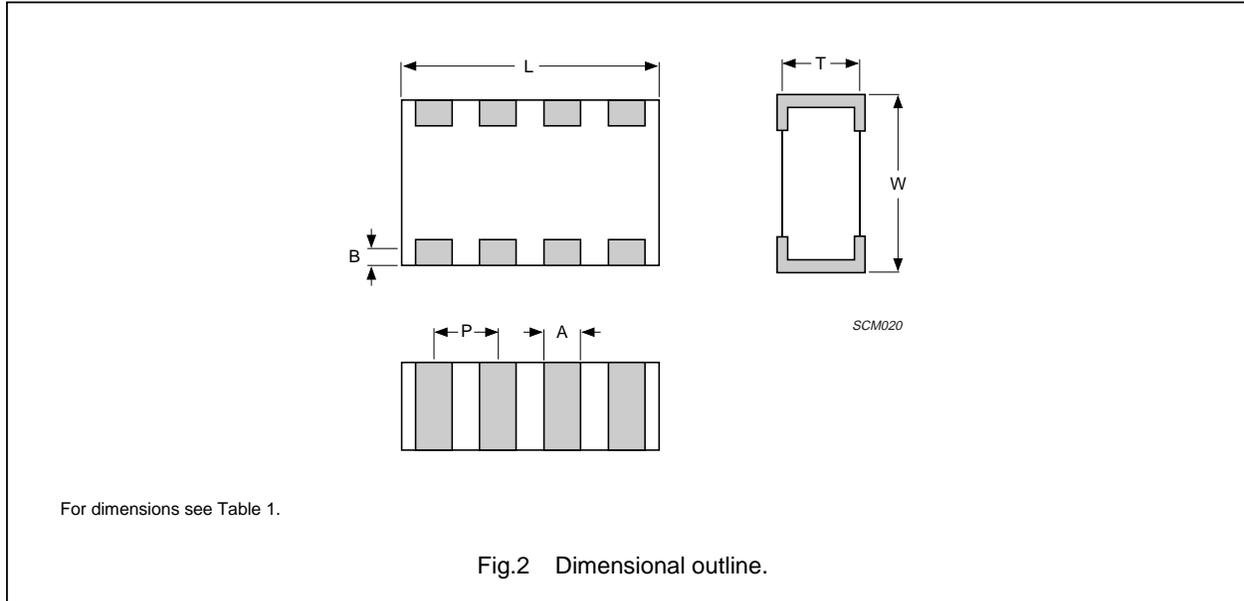


Fig.1 Simplified outline.

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### MECHANICAL DATA



### Physical dimensions

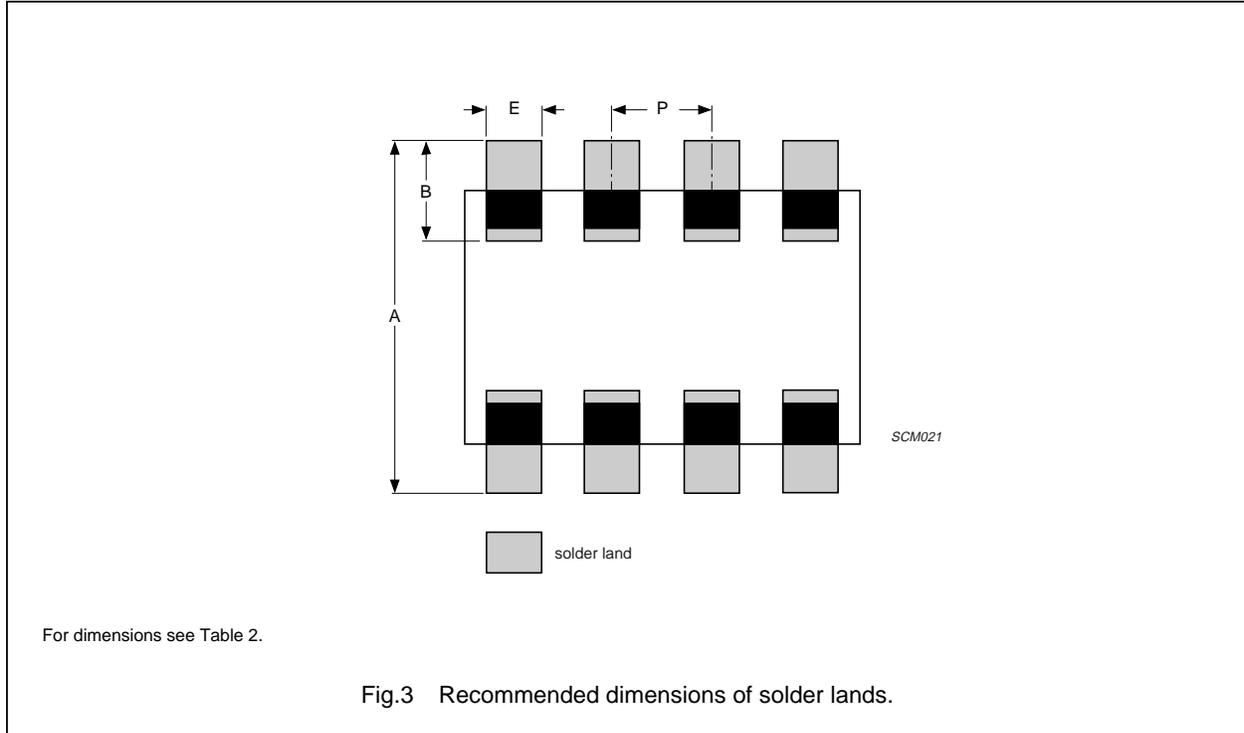
**Table 1** Capacitor dimensions for product size 0508 (4 × 0402)

CASE SIZE	L	W	T	A	B	P
<b>Dimensions in millimetres</b>						
0508 (4 × 0402)	2.0 ±0.15	1.25 ±0.15	0.60 ±0.10	0.28 ±0.10	0.2 ±0.10	0.50 ±0.10

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### DIMENSIONS OF SOLDER LANDS



**Table 2** Solder land dimensions; see Fig.3

CASE SIZE	FOOTPRINT DIMENSIONS (mm)			
	A	B	P	E
0508 (4 × 0402)	2.0 +0.40/-0.20	0.31 ±0.10	0.50±0.10	0.30 +0.02/-0.05

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**SELECTION CHART FOR 50 V**

C (pF)	LAST TWO DIGITS OF 12NC	50 V
		0508 (4 × 0402)
10	23	
12	24	
15	25	
18	26	
22	27	
27	28	
33	29	
39	31	
47	32	0.6 ±0.1
56	33	
68	34	
82	35	
100	36	
120	37	
150	38	
180	39	
220	41	
270	42	

**Note**

1. Values in shaded cells indicate thickness class.

**Thickness classification and packing quantities**

THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH QUANTITY PER REEL
	Ø180 mm; 7"
	PAPER
0.6 ±0.1	4 000

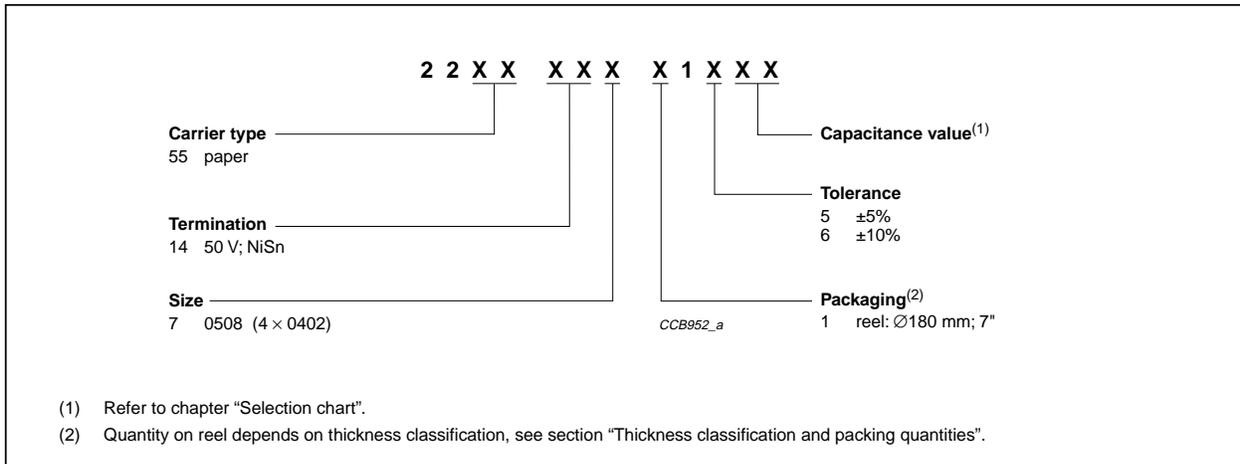
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### ORDERING INFORMATION

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: 0508CG820J9B100

Size Code	Temp. Char.	Capacitance	Tol.	Vol.	Termination	Packing	Marking	Series
0508 (4 × 0402)	CG = NP0	820 = 82 pF; the third digit signifies the multiplying factor: 0 = × 1 1 = × 10	J = ±5% K = ±10%	9 = 50 V	B = NiSn	2 = 180 mm; 7" paper	0 = no marking	0 = conv. ceramic

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### ELECTRICAL CHARACTERISTICS

#### Class 1 capacitors; NP0 dielectric; NiSn terminations

Unless otherwise stated all electrical values apply at an ambient temperature of  $20 \pm 1$  °C, an atmospheric pressure of 86 to 106 kPa, and a relative humidity of 63 to 67%.

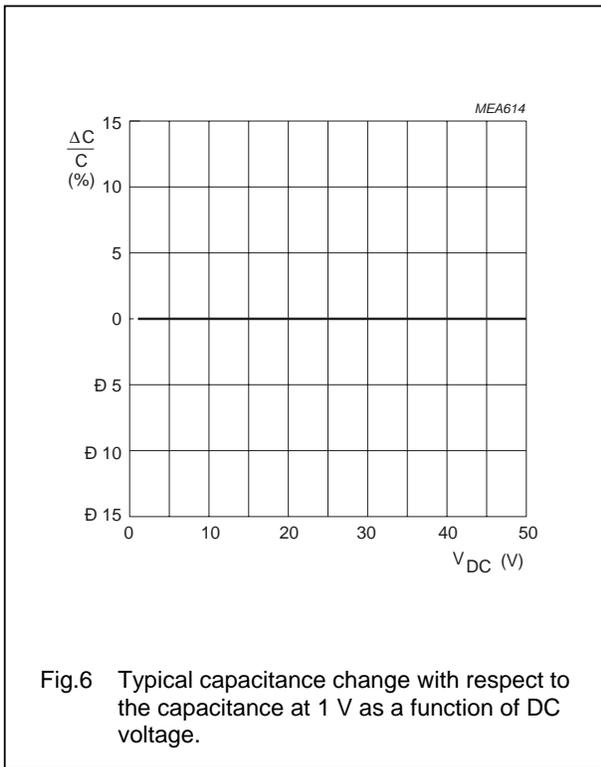
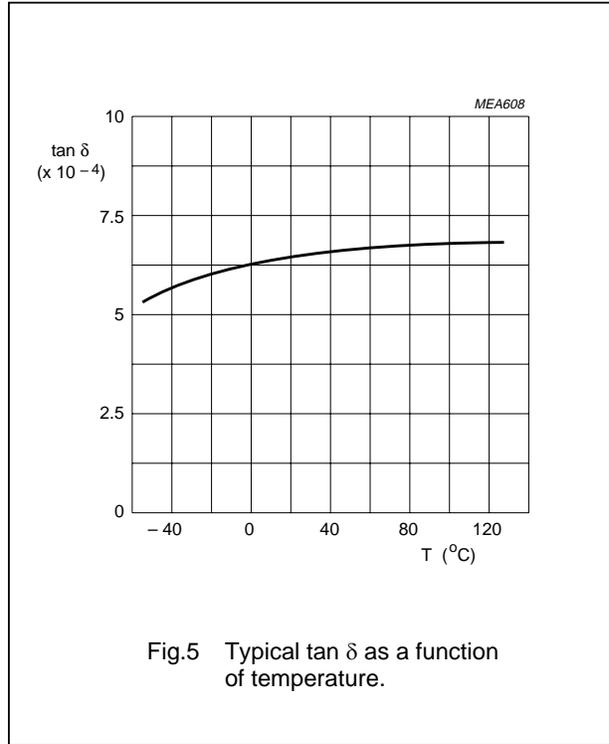
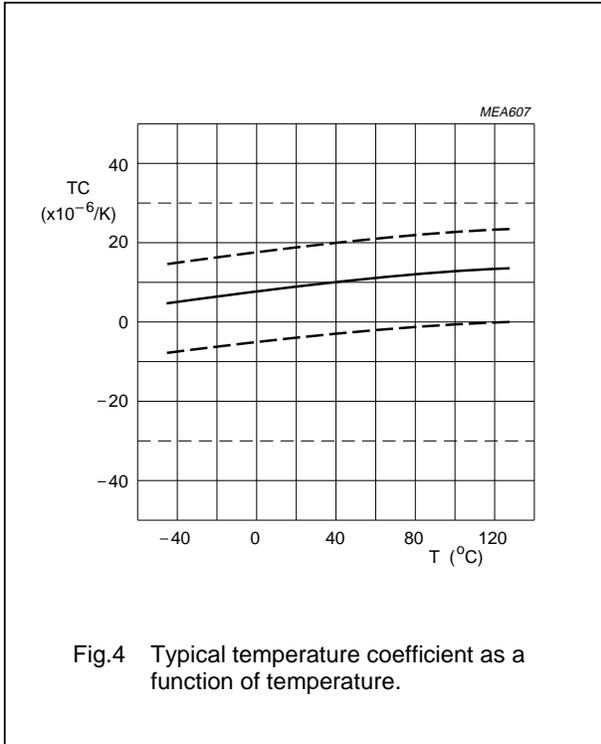
DESCRIPTION	VALUE
Capacitance range (E12 series); note 1	10 pF to 270 pF
Tolerance on capacitance after 1000 hours	$\pm 5\%$ ; $\pm 10\%$
Test voltage (DC) for 1 minute	$2.5 \times U_R$
Tan $\delta$ ; note 1	$\leq 0.1\%$
Insulation resistance after 1 minute at $U_R$ (DC):	$R_{ins} \geq 100 \text{ G}\Omega$
Temperature coefficient	$(0 \pm 30) \times 10^{-6}/\text{K}$
Resistance to soldering heat	260 °C; 10 seconds

#### Note

1. Measured at 1 V, 1 MHz 20 °C, using a four-gauge method.

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### TESTS AND REQUIREMENTS

**Table 3** Test procedures and requirements

IEC 60384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.5		visual inspection and dimension check	any applicable method using $\times 10$ magnification	in accordance with specification
4.6.1		capacitance	$f = 1$ MHz; measuring voltage $1 V_{\text{rms}}$ at $20^\circ\text{C}$	within specified tolerance
4.6.2		$\tan \delta$	$f = 1$ MHz; measuring voltage $1 V_{\text{rms}}$ at $20^\circ\text{C}$	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	$\Delta C/C: \pm 10\%$
4.10	Tb	resistance to soldering heat; jig clamps to the second component along the longitudinal direction	$270 \pm 5^\circ\text{C}$ for $10 \pm 0.5$ s in a static solder bath	the terminations shall be well tinned after recovery $\Delta C/C$ : within $\pm 0.5\%$ or 0.5 pF, whichever is greater
		resistance to soldering heat; jig clamps to the second component along the longitudinal direction	$260 \pm 5^\circ\text{C}$ for $30 \pm 1$ s in a static solder bath	using visual enlargement of $\times 10$ , dissolution of the terminations shall not exceed 10%
4.11	Ta	solderability; jig clamps to the second component along the longitudinal direction	zero hour test, and test after storage (20 to 24 months) in original packing in normal atmosphere; unmounted chips completely immersed for $3 \pm 0.5$ s in a solder bath at $215 \pm 5^\circ\text{C}$	the terminations shall be well tinned

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IEC 60384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.12	Na	rapid change of temperature	-55 °C to +125 °C; 5 cycles	no visible damage after 24 hours recovery; $\Delta C/C$ : within $\pm 1\%$ or 1 pF
4.14	Ca	damp heat	56 days at 40 °C; 90 to 95% RH; $U_R$ applied	no visible damage after 24 hours recovery; $\Delta C/C$ : within $\pm 2\%$ or 1 pF, whichever is greater $\tan \delta$ : 2 x specified value $R_{ins}$ : 2500 M $\Omega$ or $R_i C_R \geq 25$ s, whichever is less
4.15		endurance	1000 hours at maximum temperature at $2 \times U_R$	after 24 hours recovery: $\Delta C/C$ : within $\pm 2\%$ or 1 pF, whichever is greater $\tan \delta$ : 2 x specified value $R_{ins}$ : 4000 M $\Omega$ or $R_i C_R \geq 40$ s, whichever is less

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<b>Revision</b>	<b>Date</b>	<b>Change Notification</b>	<b>Description</b>
Rev.4	2001 May 30	-	- Converted to Phycomp brand
Rev.5	2003 Mar 13	-	- Updated company logo
Rev.6	2003 Jul 18	-	- Cover page revised
Rev.7	2003 Oct 29	-	- Physical dimension revised on size B