

DATA SHEET

**4-C array: Class 1, NP0 50 V
10 pF to 1 nF, size 0612**
Surface-mount ceramic
multilayer capacitors

Product specification
Supersedes data of 30th May 2001

2001 Dec 19 Rev.5

Surface-mount ceramic multilayer capacitors

4-C array: Class 1, NP0 50 V 10 pF to 1 nF, size 0612

FEATURES

- 4 × 0603 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
- 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 (IEC)
Capacitance range (E12 series)	10 pF to 1 nF
Tolerance on capacitance	±5%; ±10%
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

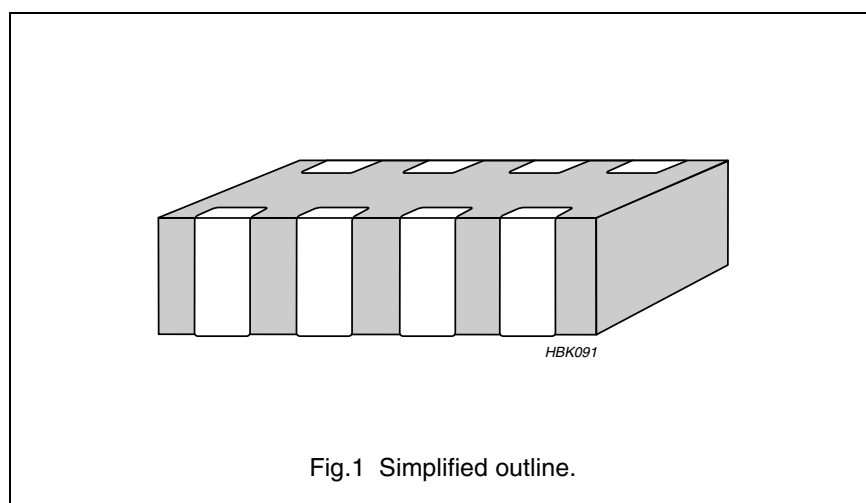
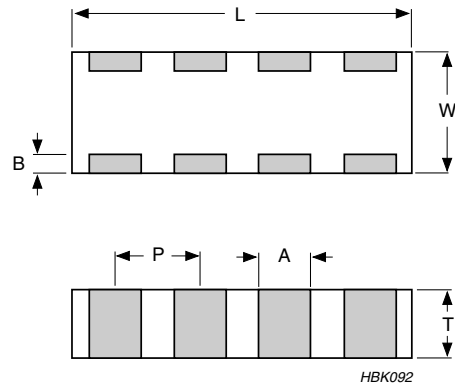


Fig.1 Simplified outline.

Surface-mount ceramic multilayer capacitors

4-C array: Class 1, NP0 50 V 10 pF to 1 nF, size 0612

MECHANICAL DATA



For dimensions see Table 1.

Fig.2 Dimensional outline.

Physical dimensions

Table 1 Capacitor dimensions; see Fig.2

CASE SIZE	L	W	T	A	B	P
Dimensions in millimetres						
0612 (4 × 0603)	3.20 ±0.15	1.60 ±0.15	0.80 ±0.10	0.40 ±0.10	0.30 ±0.20	0.80 ±0.10
Dimensions in inches						
0612 (4 × 0603)	0.126 ±0.006	0.063 ±0.006	0.032 ±0.004	0.016 ±0.004	0.012 ±0.008	0.031 ±0.004

Surface-mount ceramic multilayer capacitors

4-C array: Class 1, NP0 50 V
10 pF to 1 nF, size 0612

DIMENSIONS OF SOLDER LANDS

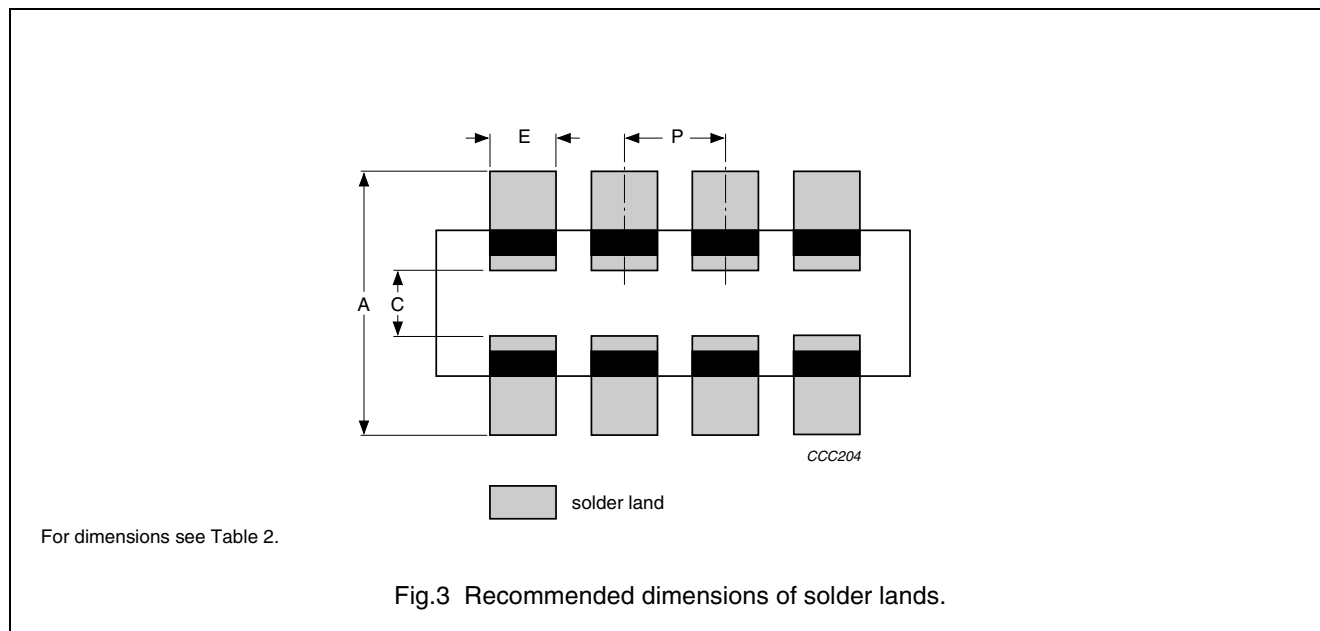


Table 2 Solder land dimensions; see Fig.3

CASE SIZE	FOOTPRINT DIMENSIONS (mm)				
	A	B	C	D	E
0612 (4 × 0603)	2.54 ±0.15	0.89 ±0.10	0.76 ±0.10	0.80 ±0.10	0.45 ±0.10

Surface-mount ceramic
multilayer capacitors

4-C array: Class 1, NP0 50 V
10 pF to 1 nF, size 0612

SELECTION CHART

C (pF)	LAST TWO DIGITS OF 12NC	50 V
		0612 (4 × 0603)
10	23	
12	24	
15	25	
18	26	
22	27	
27	28	
33	29	
39	31	
47	32	
56	33	
68	34	
82	35	0.8 ±0.1
100	36	
120	37	
150	38	
180	39	
220	41	
270	42	
330	43	
390	44	
470	45	
560	46	
680	47	
820	48	
1000	49	

Note

- Value in shaded cells indicates thickness class.

Thickness classification and packing quantities

THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH QUANTITY PER REEL
	Ø180 mm; 7"
	PAPER
0.8 ±0.1	4000

Surface-mount ceramic multilayer capacitors

4-C array: Class 1, NP0 50 V 10 pF to 1 nF, size 0612

ORDERING INFORMATION

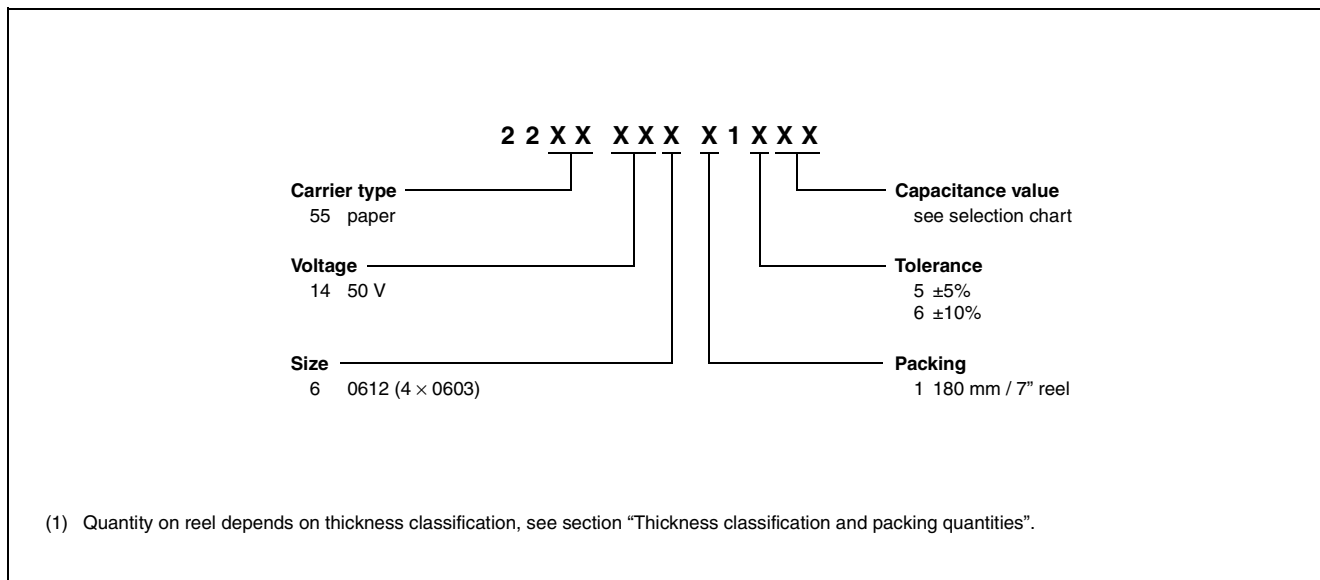
Components may be ordered by using either a simple 15-digit clear text code or Phycomp's unique 12NC.

Clear text code

EXAMPLE: 0612CG102J9B200

SIZE CODE	TEMP. CHAR.	CAPACITANCE	TOL.	VOLTAGE	TERMINATION	PACKING	MARKING	SERIES
0612 (4 × 0603)	CG = NP0	102 = 1000 pF; the third digit signifies the multiplying factor: 0 = × 1 1 = × 10 2 = × 100	J = ±5% K = ±10%	9 = 50 V	B = NiSn	2 = 180 mm; 7" paper	0 = no marking	0 = conv. ceramic

Ordering code 12NC



Surface-mount ceramic
multilayer capacitors

4-C array: Class 1, NP0 50 V
10 pF to 1 nF, size 0612

ELECTRICAL CHARACTERISTICS FOR CLASS 1, CAPACITORS

Class 1 capacitors; NP0 dielectric; NiSn terminations

Unless otherwise stated all electrical values apply at an ambient temperature of 23 ± 3 °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 1 nF
Tolerance on capacitance after 1000 hours	$\pm 5\%$; $\pm 10\%$
Tan δ ; note 1	$\leq 0.1\%$
Test voltage (DC) for 1 minute	$2.5 \times U_R$
Insulation resistance after 1 minute at U_R (DC)	$> 100000 \text{ M}\Omega$
Temperature coefficient	$(0 \pm 30) \times 10^{-6}/\text{K}$

Note

1. Measured at 1 V, 1 MHz for $C \leq 1000$ pF and at 1 V, 1 kHz for $C > 1000$ pF, using a four-gauge method.

Surface-mount ceramic multilayer capacitors

4-C array: Class 1, NP0 50 V 10 pF to 1 nF, size 0612

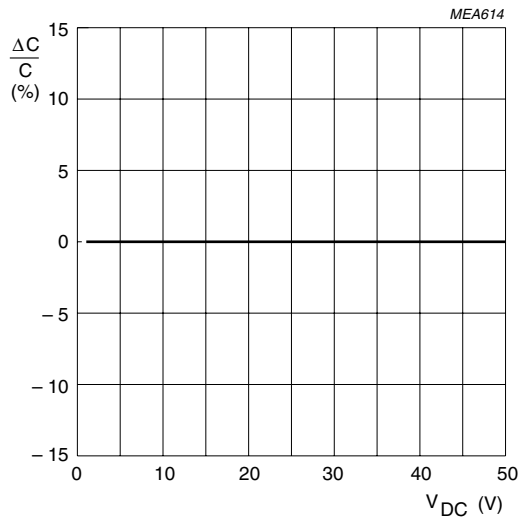


Fig.4 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage.

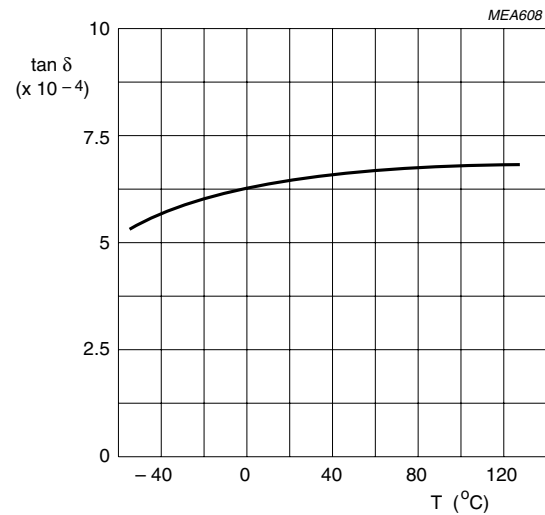


Fig.5 Typical tan δ as a function of temperature.

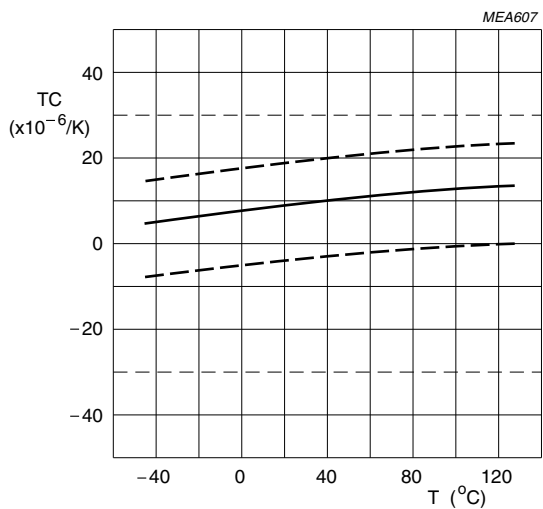
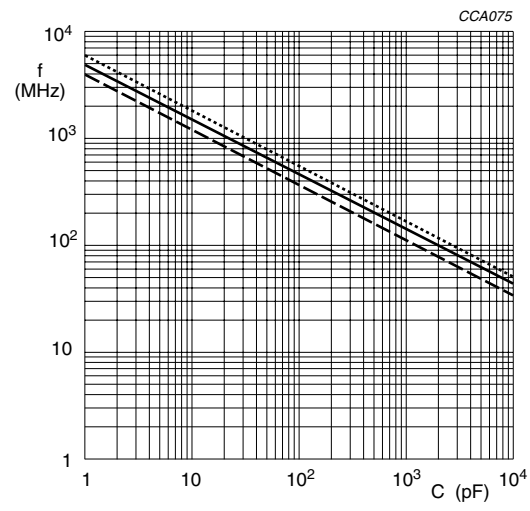


Fig.6 Typical temperature coefficient as a function of temperature.

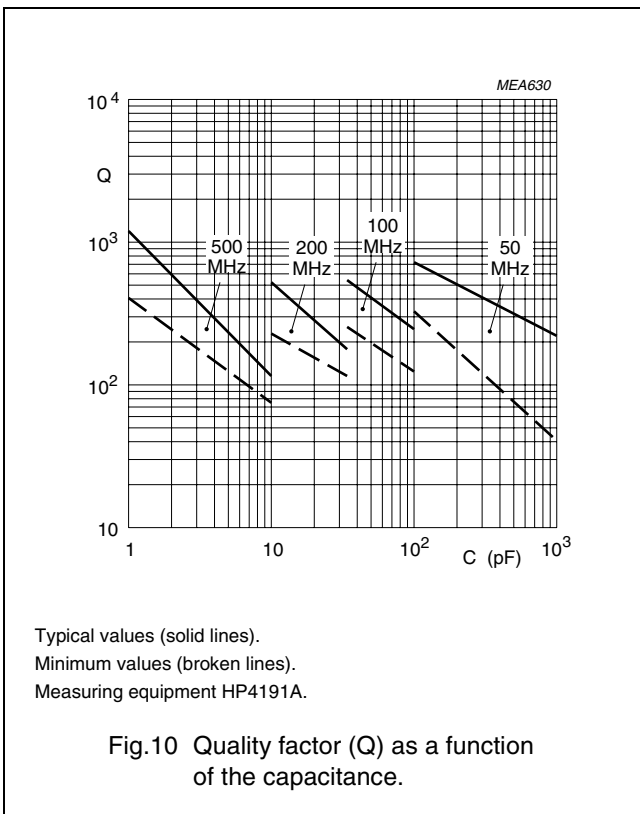
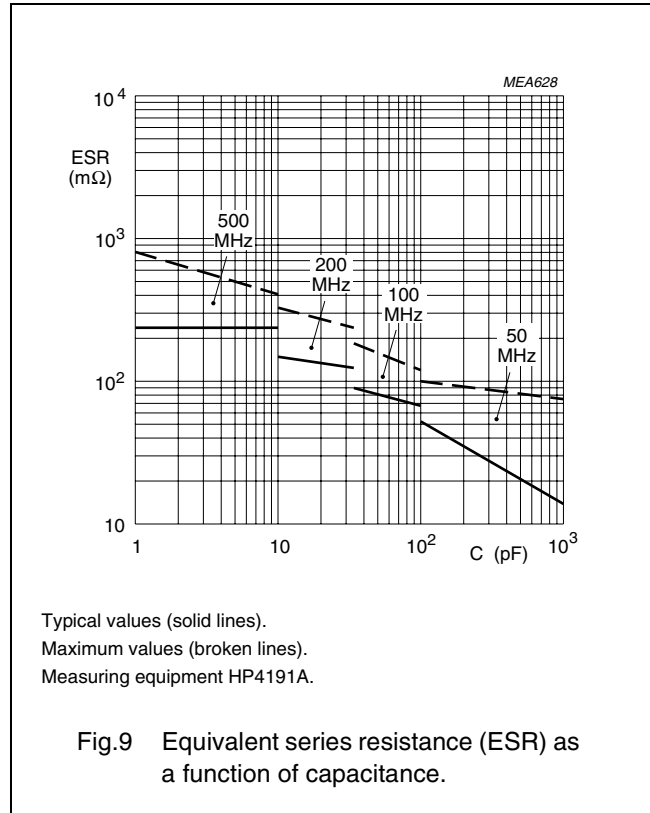
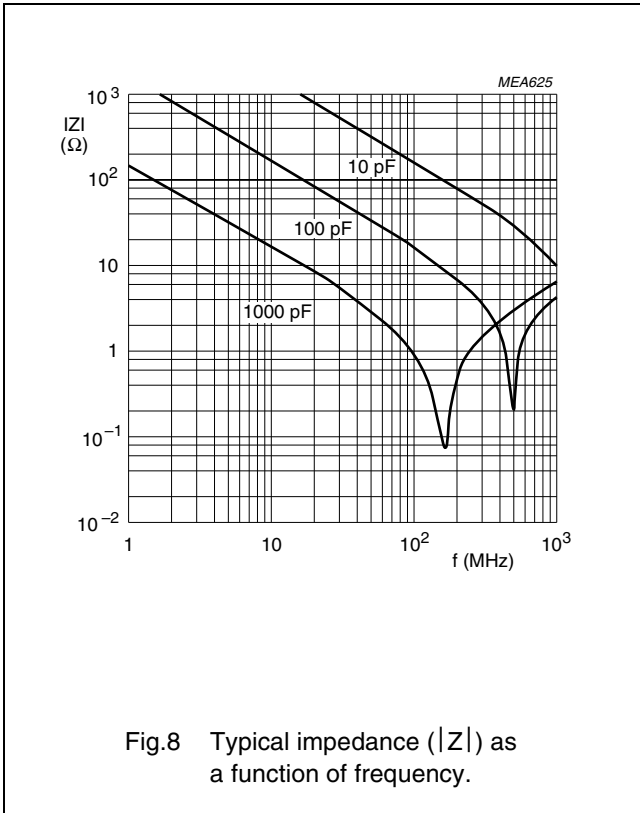


L = 0.6 nH (dotted line).
L = 1 nH (solid line).
L = 1.5 nH (broken line).

Fig.7 Series resonance frequency as a function of capacitance.

Surface-mount ceramic multilayer capacitors

4-C array: Class 1, NP0 50 V
10 pF to 1 nF, size 0612



Surface-mount ceramic multilayer capacitors

4-C array: Class 1, NP0 50 V 10 pF to 1 nF, size 0612

TESTS AND REQUIREMENTS

Table 3 Test procedures and requirements

IEC 60384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.4		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 (measured 1000 hours after date of manufacture)	$f = 1$ kHz; measuring voltage $1 V_{\text{rms}}$ at 20°C	within specified tolerance
4.6.2		$\tan \delta$	$f = 1$ kHz; measuring voltage $1 V_{\text{rms}}$ at 20°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 characteristic	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 IEC 60384 10, paragraph 4.4 conditions: bending 1 mm at a rate of 1 mm/s, radius jig 340 mm	no visible damage $\Delta C/C: \pm 10\%$
4.10	Tb	resistance to soldering heat; jig clamps to the second component in the longitudinal line	$260 \pm 5^\circ\text{C}$ for 10 ± 0.5 s in a static solder bath	the terminations shall be well tinned after recovery $\Delta C/C: \pm 10\%$
		resistance to leaching; jig clamps to the second component in the longitudinal line	$260 \pm 5^\circ\text{C}$ for 30 ± 1 s in a static solder bath	using visual enlargement of $\times 10$, dissolution of the terminations shall not exceed 10%

Surface-mount ceramic
multilayer capacitors

4-C array: Class 1, NP0 50 V
10 pF to 1 nF, size 0612

IEC 60384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.11	Ta	solderability; jig clamps to the second component in the longitudinal line	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: between minimum and maximum temperature, 5 cycles	no visible damage after 24 hours recovery: $\Delta C/C: \leq 15\%$
4.14	Ca	damp heat	preconditioning: 56 days at 40 °C; 90 to 95% RH; U_R applied	after 48 hours recovery: $\Delta C/C: \pm 15\%$ $\tan \delta: 7\%$ $R_{ins}: 1000 \text{ M}\Omega$ or $R_1 C_R \geq 25 \text{ s}$, whichever is less
4.15		endurance	preconditioning: $2 \times U_R$ at 125 °C for 1 000 hours, recovery 48 ± 4 hours at room temperature	after 48 hours recovery: $\Delta C/C: \pm 20\%$ $\tan \delta: 7\%$ $R_{ins}: 2000 \text{ M}\Omega$ or $R_1 C_R \geq 50 \text{ s}$, whichever is less

Surface-mount ceramic
multilayer capacitors

4-C array: Class 1, NP0 50 V
10 pF to 1 nF, size 0612

REVISION HISTORY

Revision	Date	Change Notification	Description
Rev.4	2001 May 30	–	- Converted to Phycomp brand
Rev.5	2001 Dec 19	–	- Minor corrections - Paper tape on 180 mm reel only