

DATA SHEET

NP0 and X7R size 0201
1 pF to 3.3 nF
Surface-mount ceramic
multilayer capacitors

Product specification
Supersedes data of 10th July 2001

2002 Feb 08 Rev.7

Surface-mount ceramic multilayer capacitors

NP0 and X7R size 0201 1 pF to 3.3 nF

FEATURES

- High capacitance per unit volume
- Supplied in bulk case or in tape on reel.

APPLICATIONS

- Mobile phones
- Digital cameras
- Camcorders
- Tuners.

DESCRIPTION

The capacitor 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). A cross section of the structure is shown in Fig.1.

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Rated voltage U_R (DC): NP0 dielectric X7R dielectric	25 V and 50 V 16 V, 25 V and 50 V
Capacitance range (E12 series): NP0 (CG) X7R (2R1)	1 pF to 100 pF 47 pF to 3.3 nF
Tolerance on capacitance at $T_{amb} = 20\text{ }^\circ\text{C}$: NP0 (CG): $C < 5\text{ pF}$ $5\text{ pF} \leq C < 10\text{ pF}$ $C \geq 10\text{ pF}$ X7R (2R1)	$\pm 0.25\text{ pF}$ $\pm 0.50\text{ pF}, \pm 0.25\text{ pF}$ $\pm 5\%, \pm 2\%$ $\pm 10\%, \pm 5\%$
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

Note

1. On request, 1 pF to 10 pF NP0 50 V also available in E24.

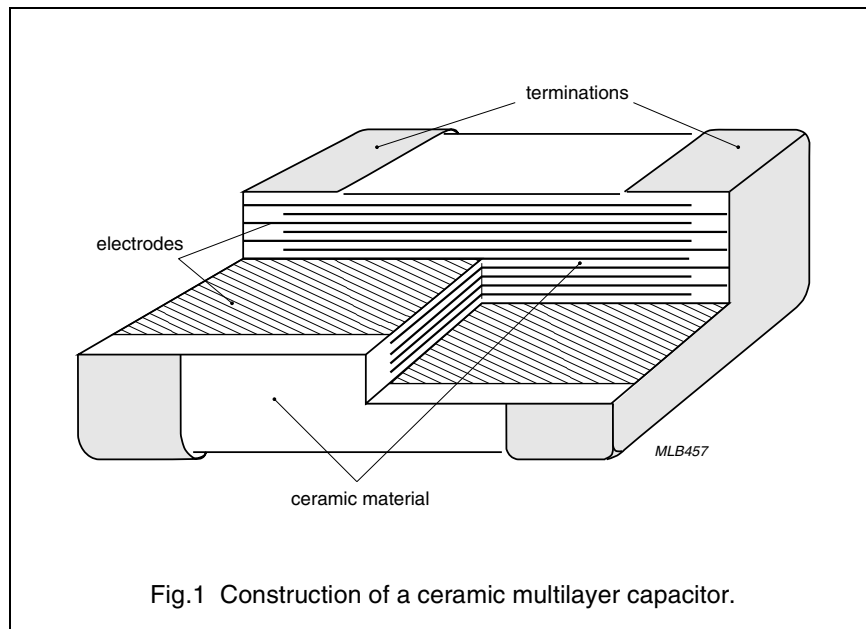
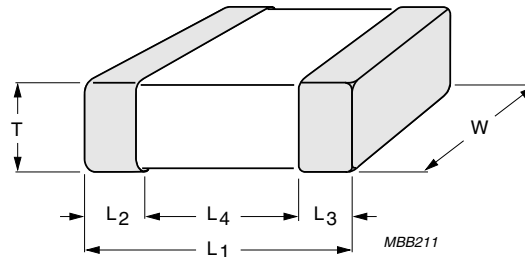


Fig.1 Construction of a ceramic multilayer capacitor.

Surface-mount ceramic multilayer capacitors

NP0 and X7R size 0201
1 pF to 3.3 nF

MECHANICAL DATA



For dimensions see Table 1.

Fig.2 Component outline.

Physical dimensions

Table 1 Capacitor dimensions

CASE SIZE	L ₁	W	T	L ₂ and L ₃	L ₄ MIN.
Dimensions in millimetres					
0201	0.6 ±0.03	0.3 ±0.03	0.3 ±0.03	0.15 ±0.05	0.20
Dimensions in inches					
0201	0.024 ±0.001	0.012 ±0.001	0.012 ±0.001	0.006 ±0.002	0.008

Surface-mount ceramic
multilayer capacitors

NP0 25 V size 0201
27 pF to 100 pF

SELECTION CHART FOR NP0 25 V

C (pF)	LAST TWO DIGITS OF 12NC	NP0 25 V
		0201
27	28	
33	29	
39	31	
47	32	0.3 ±0.03
56	33	
68	34	
82	35	
100	36	

Note

1. Values in shaded cells indicate thickness class.

Thickness classification and packing quantities

THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH QUANTITY PER REEL		QUANTITY PER BULK CASE
	Ø180 mm; 7"	Ø330 mm; 13"	
	PAPER	PAPER	0201
0.3 ±0.03	15000	t.b.d.	t.b.d.

Surface-mount ceramic
multilayer capacitors

NP0 25 V size 0201
27 pF to 100 pF

ORDERING INFORMATION FOR NP0 25 V

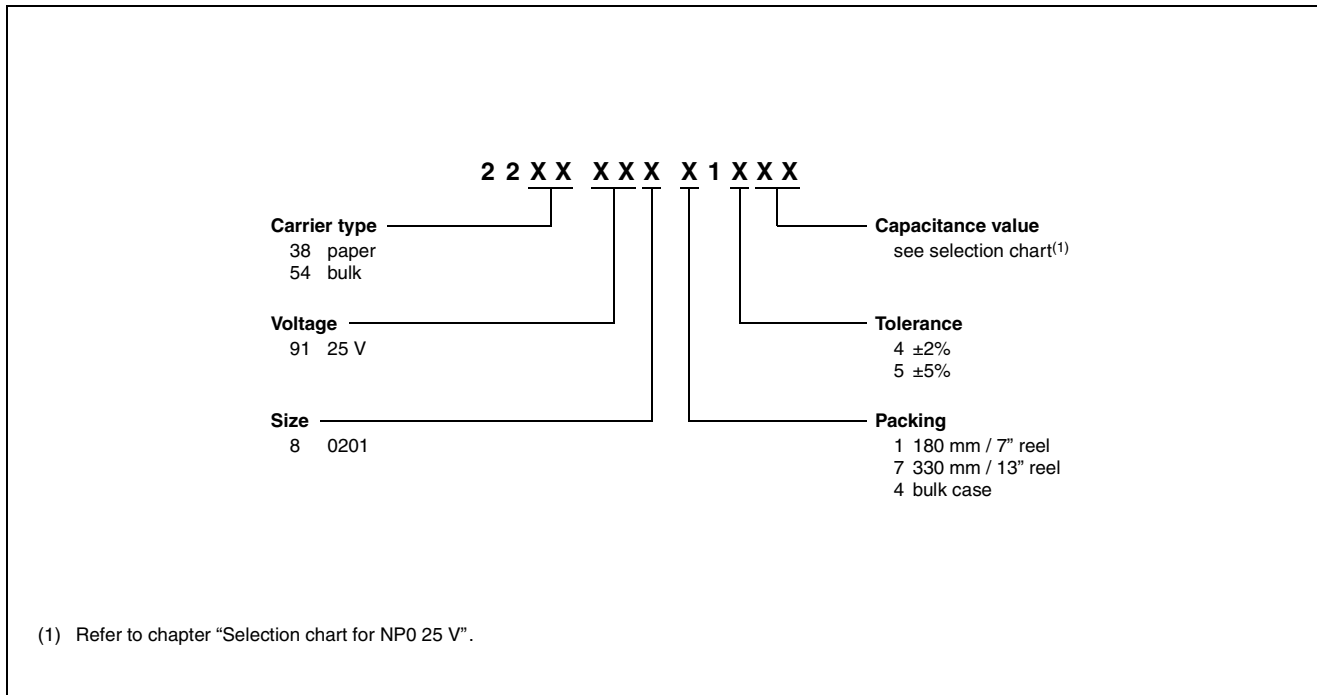
Components may be ordered by using either a simple 15-digit clear text code or Phycomp's unique 12NC.

Clear text code

EXAMPLE: 0201CG101J8B200

SIZE CODE	TEMP. CHAR.	CAPACITANCE	TOL.	VOLTAGE	TERMINATION	PACKING	MARKING	SERIES
0201	CG = NP0	101 = 100 pF; the third digit signifies the multiplying factor: 1 = × 10 2 = × 100 3 = × 1000	G = ±2% J = ±5%	8 = 25 V	B = NiSn	2 = 180 mm; 7" paper 3 = 330 mm; 13" paper P = bulk case	0 = no marking	0 = conv. ceramic

Ordering code 12NC



Surface-mount ceramic
multilayer capacitors

NP0 50 V size 0201
1 pF to 22 pF

SELECTION CHART FOR NP0 50 V

C (pF)	LAST THREE DIGITS OF 12NC	NP0 50 V
		0201
1.0	108	
1.2	128	
1.5	158	
1.8	188	
2.2	228	
2.7	278	
3.3	338	
3.9	398	
4.7	478	0.3 ±0.03
5.6	568	
6.8	688	
8.2	828	
10	109	
12	129	
15	159	
18	189	
22	229	

Note

1. Values in shaded cells indicate thickness class.
2. On request, 1 pF to 10 pF also available in E24.

Thickness classification and packing quantities

THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH QUANTITY PER REEL		QUANTITY PER BULK CASE
	Ø180 mm; 7"	Ø330 mm; 13"	
	PAPER	PAPER	0201
0.3 ±0.03	15000	t.b.d.	t.b.d.

Surface-mount ceramic multilayer capacitors

NP0 50 V size 0201 1 pF to 22 pF

ORDERING INFORMATION FOR NP0 50 V

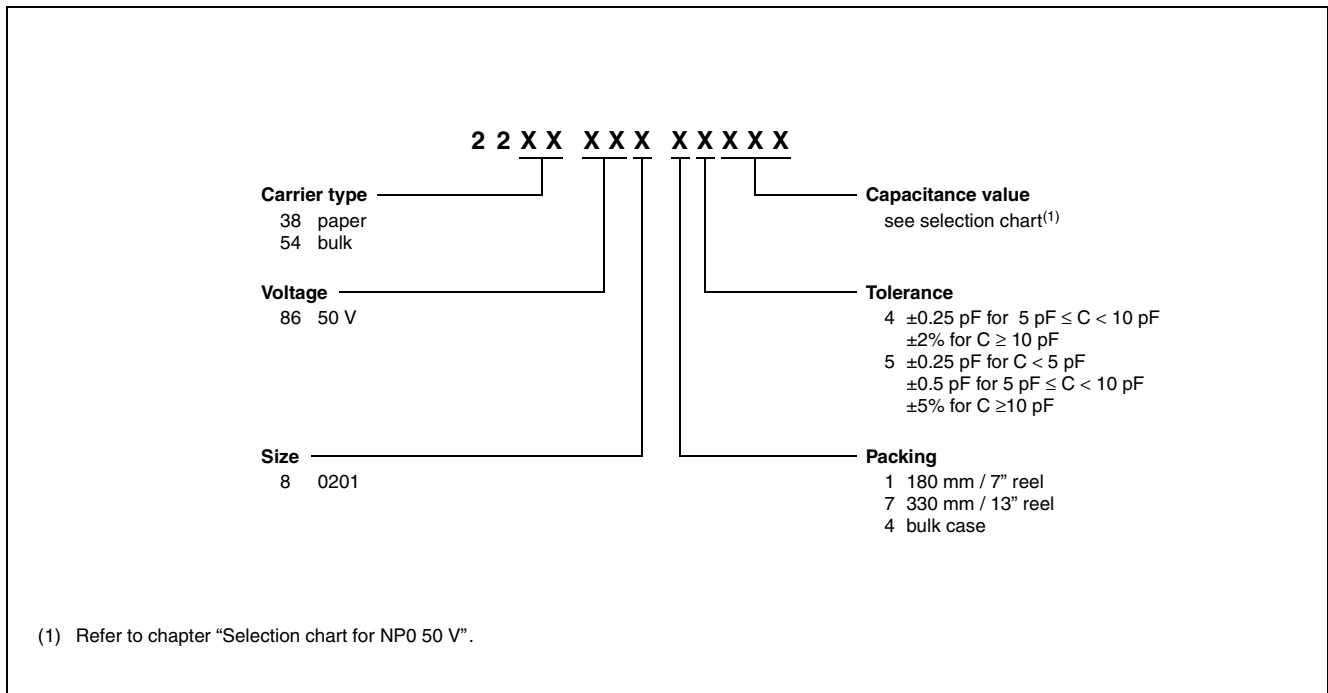
Components may be ordered by using either a simple 15-digit clear text code or Phycomp's unique 12NC.

Clear text code

EXAMPLE: 0201CG109J9B200

SIZE CODE	TEMP. CHAR.	CAPACITANCE	TOL.	VOLTAGE	TERMINATION	PACKING	MARKING	SERIES
0201	CG = NP0	109 = 1.0 pF; the third digit signifies the multiplying factor: 0 = × 1 9 = × 0.1	G = ±2% J = ±5% C = ±0.25 pF D = ±0.5 pF	9 = 50 V	B = NiSn	2 = 180 mm; 7" paper 3 = 330 mm; 13" paper P = bulk case	0 = no marking	0 = conv. ceramic

Ordering code 12NC



Surface-mount ceramic multilayer capacitors

NP0 25 V and 50 V size 0201
1 pF to 100 pF

ELECTRICAL CHARACTERISTICS

Class 1 capacitors; NP0 dielectric; NiSn terminations

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

DESCRIPTION	VALUE
Capacitance range (E12 series)	1 pF to 100 pF
Tolerance on capacitance at $T_{amb} = 20$ °C: $C < 5$ pF $5 \text{ pF} \leq C < 10$ pF $C \geq 10$ pF	± 0.25 pF ± 0.50 pF, ± 0.25 pF $\pm 5\%$, $\pm 2\%$
Tan δ : $C < 10$ pF $C \geq 10$ pF	$\leq 10 \left(\frac{3}{C} + 0.7 \right) \times 10^{-4}$ or 30×10^{-4} , whichever is smallest $\leq 10 \times 10^{-4}$
Insulation resistance after 1 minute at U_R (DC)	$R_{ins} > 100 \text{ G}\Omega$
Temperature coefficient	$(0 \pm 30) \times 10^{-6}/\text{K}$

Surface-mount ceramic multilayer capacitors

NP0 25 V and 50 V size 0201 1 pF to 100 pF

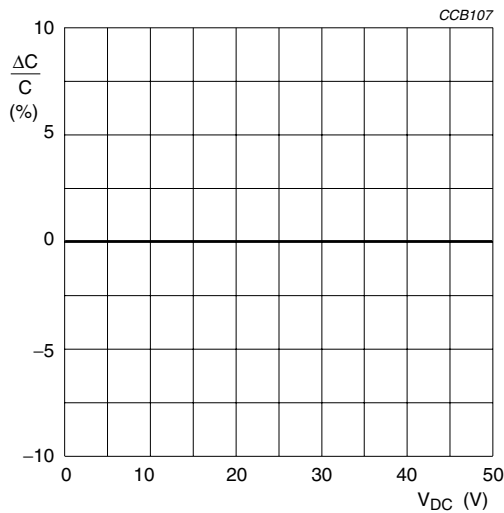


Fig.3 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage.

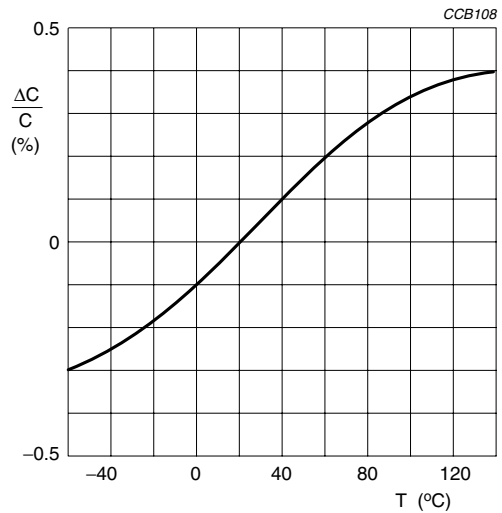


Fig.4 Typical capacitance change as a function of temperature.

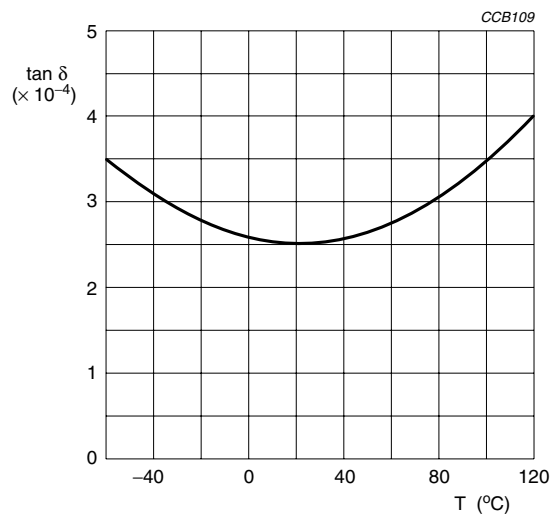


Fig.5 Typical $\tan \delta$ as a function of temperature.

Surface-mount ceramic
multilayer capacitors

X7R 16 V, 25 V and 50 V size 0201
47 pF to 3.3 nF

SELECTION CHART FOR X7R 16 V, 25 V AND 50 V

C (pF)	LAST TWO DIGITS OF 12NC	X7R 16 V	X7R 25 V	X7R 50 V
		0201		
47	05			
56	06			
68	07			
82	08			
100	09			
120	11			
150	12			0.3 ±0.03
180	13			
220	14			
270	15			
330	16			
390	17			
470	18			
560	19			
680	21			
820	22		0.3 ±0.03	
1000	23			
1200	24			
1500	25			
1800	26			
2200	27	0.3 ±0.03		
2700	28			
3300	29			

Note

1. Values in shaded cells indicate thickness class.

Thickness classification and packing quantities

THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH QUANTITY PER REEL		QUANTITY PER BULK CASE
	Ø180 mm; 7"	Ø330 mm; 13"	
	PAPER	PAPER	0201
0.3 ±0.03	15000	t.b.d.	t.b.d.

Surface-mount ceramic multilayer capacitors

X7R 16 V, 25 V and 50 V size 0201 47 pF to 3.3 nF

ORDERING INFORMATION FOR X7R 16 V, 25 V AND 50 V

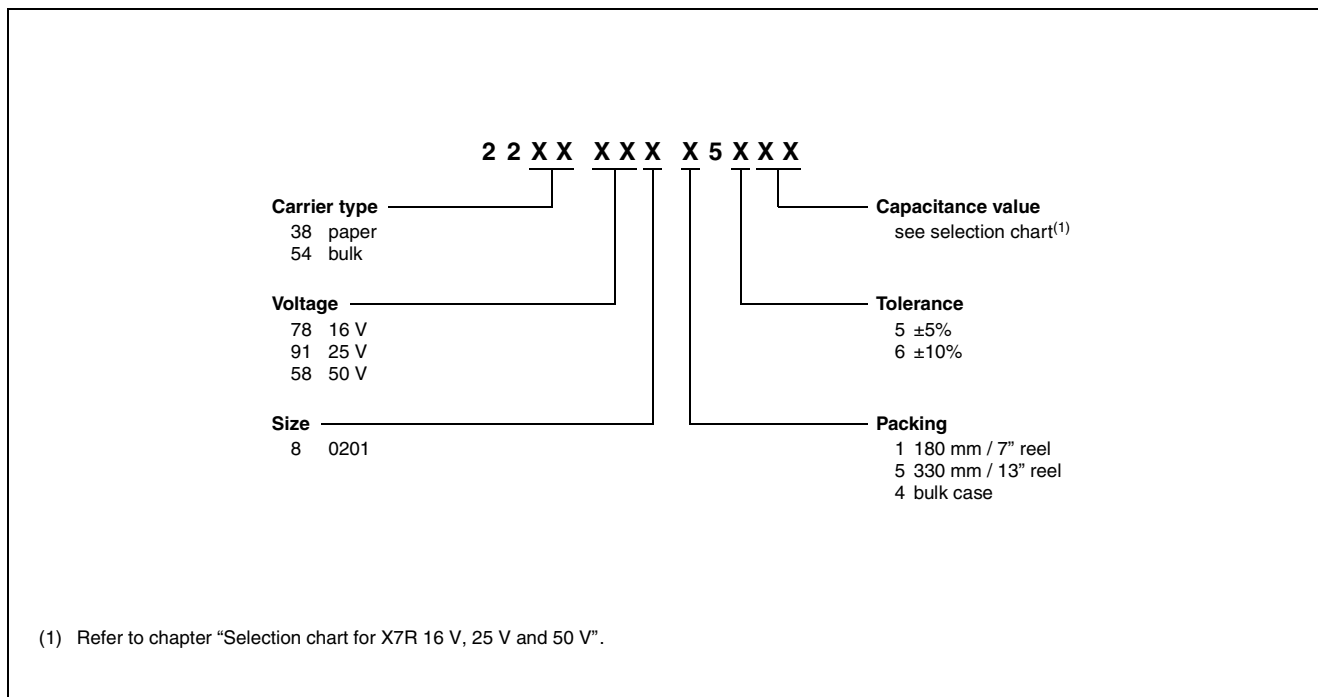
Components may be ordered by using either a simple 15-digit clear text code or Phycomp's unique 12NC.

Clear text code

EXAMPLE: 02012R102J8B20D

SIZE CODE	TEMP. CHAR.	CAPACITANCE	TOL.	VOLTAGE	TERMINATION	PACKING	MARKING	SERIES
0201	2R = X7R	102 = 1000 pF; the third digit signifies the multiplying factor: 0 = × 0 1 = × 10 2 = × 100	J = ±5% K = ±10%	7 = 16 V 8 = 25 V 9 = 50 V	B = NiSn	2 = 180 mm; 7" paper 3 = 330 mm; 13" paper P = bulk case	0 = no marking	D = BME

Ordering code 12NC



Surface-mount ceramic
multilayer capacitors

X7R 16 V, 25 V and 50 V size 0201
47 pF to 3.3 nF

ELECTRICAL CHARACTERISTICS

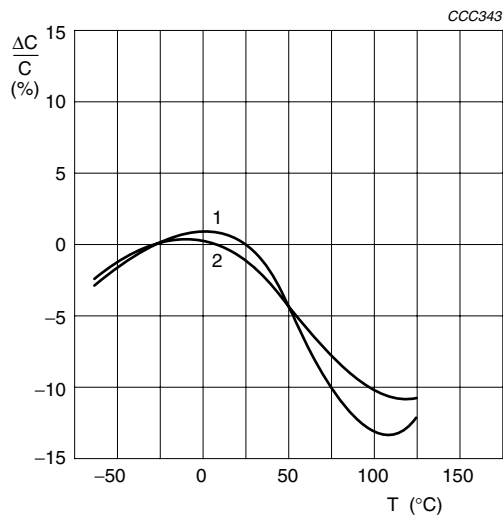
Class 2 capacitors; X7R dielectric; NiSn terminations

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

DESCRIPTION	VALUE
Capacitance range (E12 series)	47 pF to 3.3 nF
Tolerance on capacitance after 1000 hours	$\pm 20\%$, $\pm 5\%$
Tan δ : 50 V and 25 V 16 V	250×10^{-4} 350×10^{-4}
Insulation resistance after 1 minute at U_R (DC)	$R_{ins} > 100 \text{ G}\Omega$
Test voltage (DC) for 1 minute	$2.5 \times U_R$
Ageing	typical 1.5%

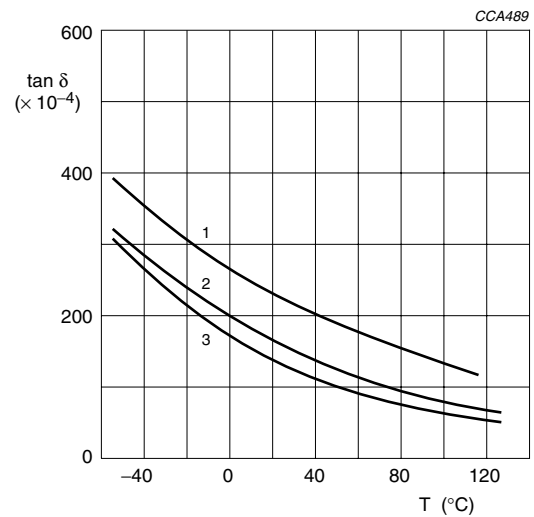
Surface-mount ceramic multilayer capacitors

X7R 16 V, 25 V and 50 V size 0201 47 pF to 3.3 nF



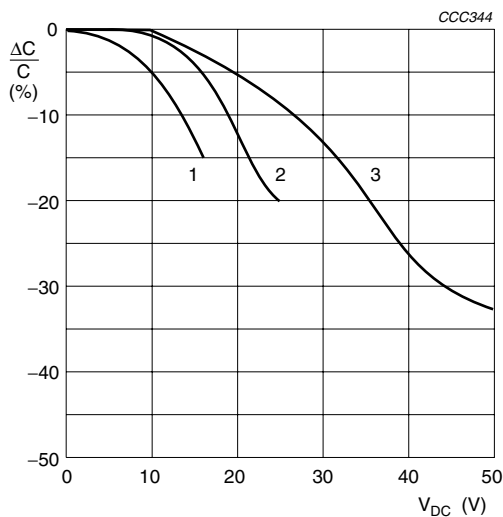
Curve 1 = 16 V product.
Curve 2 = 25 V and 50 V products.

Fig.6 Typical capacitance change as a function of temperature.



Curve 1 = 16 V product.
Curve 2 = 25 V product.
Curve 3 = 50 V product.

Fig.7 Typical tan δ as a function of temperature.



Curve 1 = 16 V product.
Curve 2 = 25 V product.
Curve 3 = 50 V product.

Fig.8 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage at 20 °C.

Surface-mount ceramic multilayer capacitors

NP0 and X7R size 0201 1 pF to 3.3 nF

PACKING

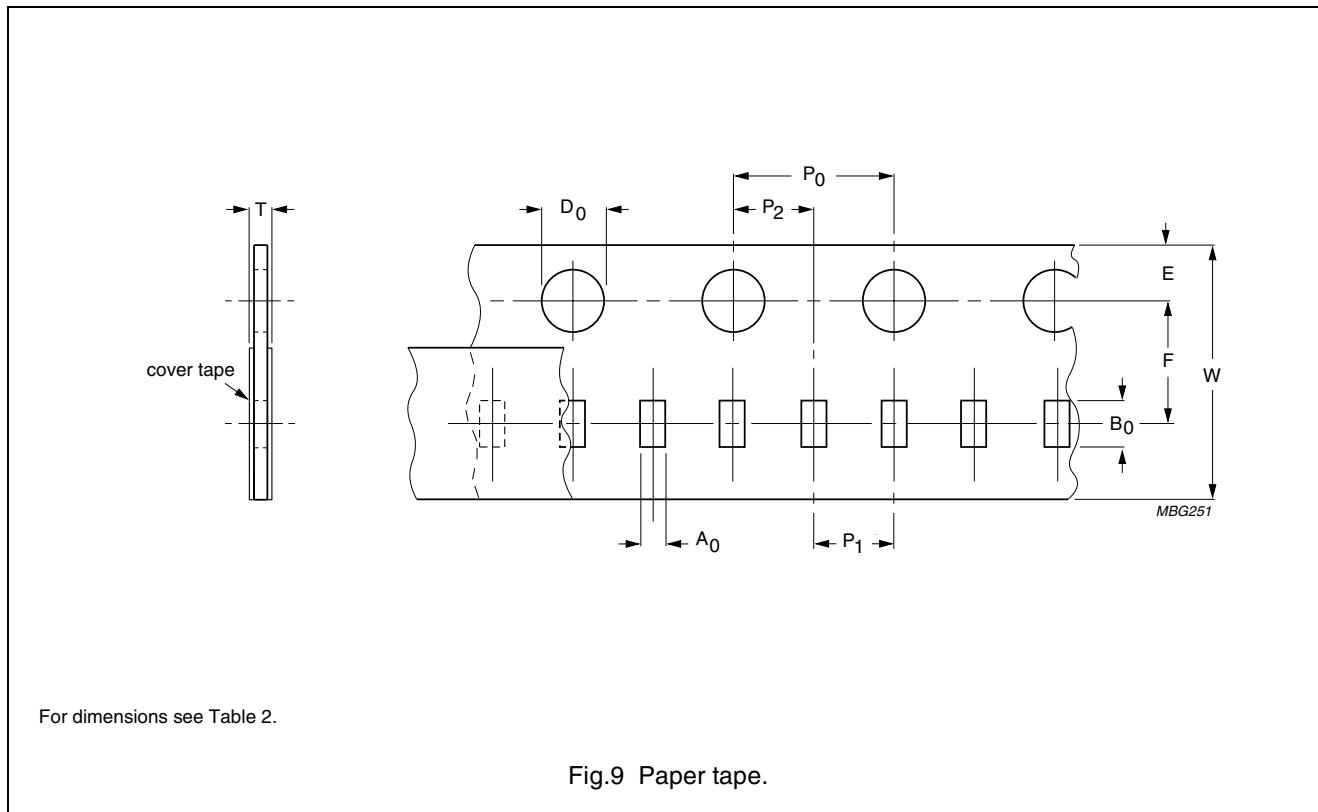


Table 2 Dimensions of paper tape for relevant product size; see Fig.9

SYMBOL	PRODUCT SIZE CODE 0201		UNIT
	SIZE	TOL.	
A ₀	0.37	±0.03	mm
B ₀	0.67	±0.03	mm
W	8.0	±0.2	mm
E	1.75	±0.1	mm
F	3.5	±0.05	mm
D ₀	1.5	+0.1/-0	mm
P ₀ ; note 1	4.0	±0.1	mm
P ₁	2.0	±0.05	mm
P ₂	2.0	±0.05	mm
T _{max}	0.37	±0.02	mm

Note

1. P₀ pitch tolerance over any 10 pitches is ±0.2 mm.

Surface-mount ceramic
multilayer capacitors

NP0 and X7R size 0201
1 pF to 3.3 nF

DIMENSIONS OF SOLDER LANDS

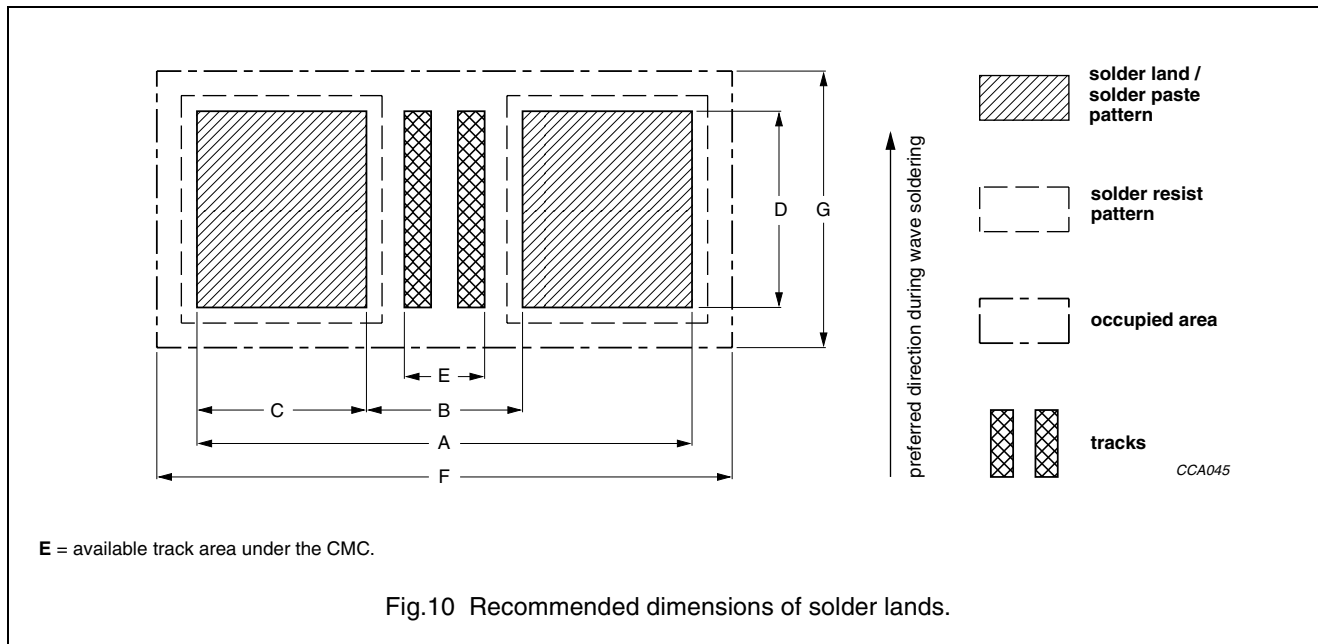


Table 3 Reflow soldering; for dimensions also see Fig.10

SIZE CODE	FOOTPRINT DIMENSIONS (mm)							PROCESSING REMARKS	PLACEMENT ACCURACY (mm)
	A	B	C	D	E	F	G		
0201	0.65	0.23	0.21	0.30	N/A	0.90	0.60	IR or hot plate soldering	t.b.d.

**Surface-mount ceramic
multilayer capacitors**

**NP0 and X7R size 0201
1 pF to 3.3 nF**

REVISION HISTORY

Revision	Date	Change Notification	Description
Rev.5	2001 Apr 18	–	- Converted to Phycomp brand - NP0 50 V: 0.47 pF to 0.82 pF no longer supported - X7R 50 V: 39 pF no longer supported - X7R: conventional ceramic changed into BME
Rev.6	2001 Jul 10	–	- Ordering code 12NC on page 5: conflicting tolerance values corrected
Rev.7	2002 Feb 08	–	- NP0 25 V added