Miniature ceramic plate capacitors

Precision capacitors NP0

FEATURES

- High-frequency circuits
- High reliability
- High stability
- Space saving.

APPLICATIONS

In a great variety of electronic circuits, e.g. in filters, tuning circuits and other professional applications where high stability, precision, reliability and low losses are a requirement. Because of their small size the capacitors are suitable for use in circuitry with high component density. The high reliability even in most demanding environmental conditions make the product suitable for automotive, telecommunications and other electronic circuits used at high temperatures.

DESCRIPTION

The capacitors consist of a thin rectangular ceramic plate, both sides of which are metallized, and tinned connecting leads are secured using a high melting point solder. The capacitors are encapsulated in epoxy lacquer, which is resistant to all commonly used cleaning solvents. They have small dimensions and narrow tolerances on the lead spacing. The leads are provided with a flange, which guarantees that the leads are free of lacquer, and its shape allows soldering gasses to escape freely, ensuring excellent solderability. This makes the capacitors suitable for both hand mounting and automatic insertion. The electrical properties are characterized by low losses, a very narrow tolerance on capacitance (±0.1 pF or 1%), high stability and, owing to the absence of silver, an extremely good DC behaviour.

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range	1 pF to 240 pF (E24 series)
Rated DC voltage	100 V; note 1
Tolerance on capacitance	C ≤ 10 pF: ±0.1 pF C > 10 pF: ±1%
Sectional specification	IEC 384-8
Climatic category (IEC 68)	55/125/56

Note

1. 500 V available on request.

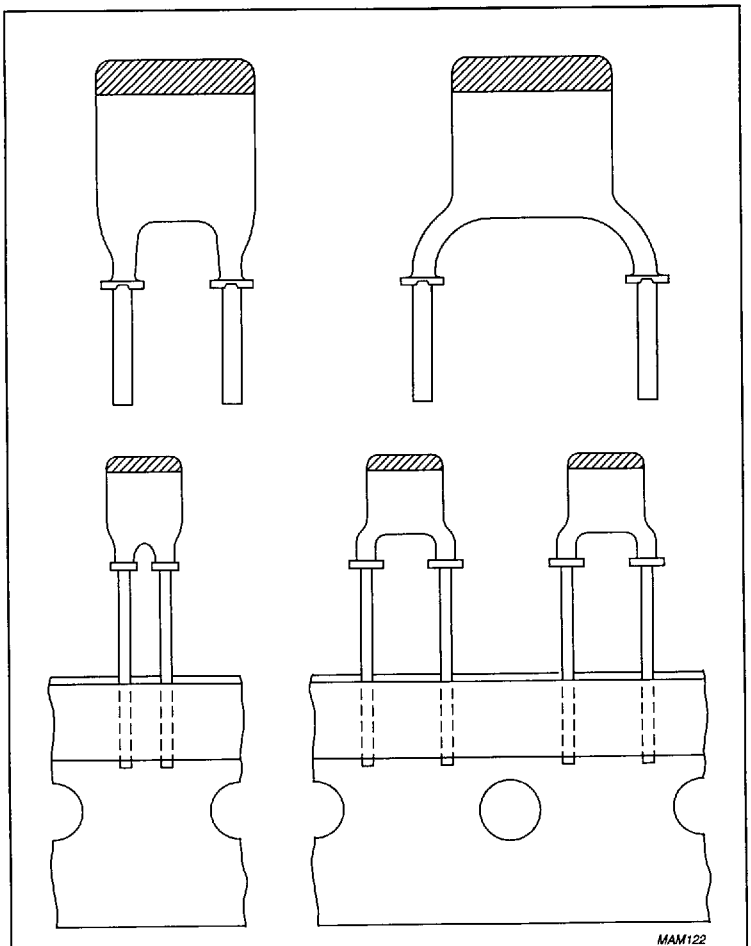
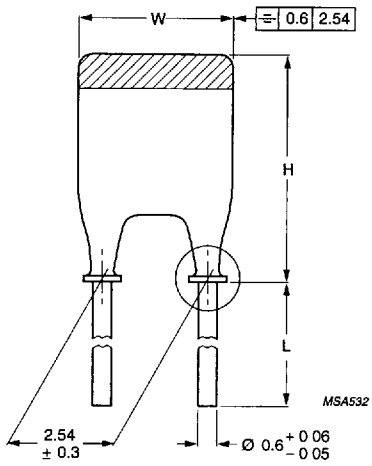


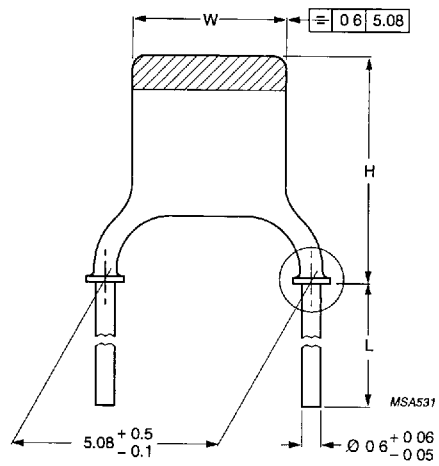
Fig.1 Outlines.

MECHANICAL DATA



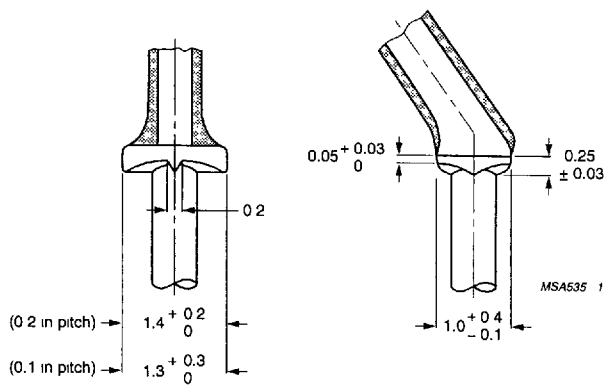
Dimensions in mm.
For dimensions H, L and W see Tables 1 and 2

Fig.2 Component outline style 1.



Dimensions in mm.
For dimensions H, L and W see Tables 1 and 2

Fig.3 Component outline style 2.



Dimensions in mm.

Fig.4 Detail of flange.

Marking

The temperature coefficient is indicated by a colour code in accordance with IEC and EIA recommendations. Capacitance value is indicated by a marking code in a contrasting colour on the body. Refer to Table 4, for marking codes.

Mounting

When bending, cutting or flattening, the leads should be relieved of the applied load by supporting them at the capacitor body.

Soldering conditions:

max. 265 °C, max. 10 s.

The capacitors are suitable for mounting on printed-circuit boards (hand mounting or automatic insertion).

Physical dimensions

Table 1 Capacitor dimensions and mass.

SIZE(1)	W(2) (mm)	H(2) (mm)		MASS (g)
		STYLE 1	STYLE 2	
I	3.6 (–1.1)	5.0 (–1.5)	6.3 (–1.8)	≈0.14
IIA	3.9 (–1.4)	5.3 (–1.7)	6.7 (–2.0)	≈0.15
IIB	4.5 (–1.8)	6.0 (–2.1)	7.3 (–2.4)	≈0.15
III	5.3 (–1.8)	6.8 (–2.3)	8.1 (–2.6)	≈0.17
IV	6.2 (–2.0)	7.7 (–2.4)	9.0 (–2.7)	≈0.20
V	6.2 (–2.0)	10.3 (–2.8)	11.2 (–3.1)	≈0.23

Notes

1. Unless indicated in Table 4, the thickness of the capacitors does not exceed 2.3 mm.
2. Tolerances are given between parentheses.

PACKAGING

For details refer to the Chapter *"Miniature ceramic plate capacitors"*, Section *"General data"*.

ORDERING INFORMATION

Table 2 Catalogue numbers.

PITCH P	LEAD DIAMETER d	STYLE	CATALOGUE NUMBERS(1)				
			BULK PACKED		ON TAPE(3) (REEL)	ON TAPE(2) (AMMOPACK)	ON TAPE(3) (AMMOPACK)
			L ≥ 13 mm	L = 4 ±0.5 mm			
2.54 mm (0.1 in)	0.6 mm (0.024 in)	1	2222 680	2222 682	2222 678	2222 686	2222 688 .....
5.08 mm (0.2 in)	0.6 mm (0.024 in)	2	2222 681	2222 683	2222 679	2222 687	2222 689 .....

Notes

1. Catalogue number to be completed by adding the last 5 digits for required capacitance value, see Table 4.
2. H_0 = 16 mm.
3. H_0 = 18.25 mm.

Table 3 Conditions for Table 4; precision capacitors with temperature coefficient NP0, rated voltage 100 V (DC).

DESCRIPTION	VALUE
Capacitance range	1 to 240 pF (E24 series)
Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C\Delta T}\right)$	0×10^{-6}/K
Tolerance on the temperature coefficient	$\pm 30 \times 10^{-6}$/K
Marking colour of the temperature coefficient	black

Table 4 Precision capacitance range, temperature coefficient NP0.

CAPACITANCE VALUE[1] (pF)	TOLERANCE[1]	SIZE (see Table 1)	MARKING	SUFFIX OF CATALOGUE NUMBER (see Table 2)
1.0	±0.1 pF	I[2]	1p0	90108
1.1	±0.1 pF	I	1p1	90118
1.2	±0.1 pF	I	1p2	90128
1.3	±0.1 pF	I	1p3	90138
1.5	±0.1 pF	I	1p5	90158
1.6	±0.1 pF	I	1p6	90168
1.8	±0.1 pF	I	1p8	90188
2.0	±0.1 pF	I	2p0	90208
2.2	±0.1 pF	I	2p2	90228
2.4	±0.1 pF	I	2p4	90248
2.7	±0.1 pF	I	2p7	90278
3.0	±0.1 pF	I	3p0	90308
3.3	±0.1 pF	I	3p3	90338
3.6	±0.1 pF	I	3p6	90368
3.9	±0.1 pF	I	3p9	90398
4.3	±0.1 pF	I	4p3	90438
4.7	±0.1 pF	I	4p7	90478
5.1	±0.1 pF	I	5p1	90518
5.6	±0.1 pF	I	5p6	90568
6.2	±0.1 pF	I	6p2	90628
6.8	±0.1 pF	I	6p8	90688
7.5	±0.1 pF	I	7p5	90758
8.2	±0.1 pF	I	8p2	90828
10	±0.1 pF	I	10p	90109
11	±1%	I	11p	90119
12	±1%	I	12p	90129
13	±1%	I	13p	90139
15	±1%	I	15p	90159
16	±1%	I	16p	90169

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CAPACITANCE VALUE[1] (pF)	TOLERANCE[1]	SIZE (see Table 1)	MARKING	SUFFIX OF CATALOGUE NUMBER (see Table 2)
18	±1%	I	18p	90189
20	±1%	I	20p	90209
22	±1%	I	22p	90229
24	±1%	I	24p	90249
27	±1%	I	27p	90279
30	±1%	I	30p	90309
33	±1%	I	33p	90339
36	±1%	IIA	36p	90369
39	±1%	IIA	39p	90399
43	±1%	IIA	43p	90439
47	±1%	IIA	47p	90479
51	±1%	IIA	51p	90519
56	±1%	IIA	56p	90569
62	±1%	IIB	62p	90629
68	±1%	IIB	68p	90689
75	±1%	IIB	75p	90759
82	±1%	IIB	82p	90829
100	±1%	III	n10	90101
110	±1%	III	n11	90111
120	±1%	III	n12	90121
130	±1%	IV	n13	90131
150	±1%	IV	n15	90151
160	±1%	IV	n16	90161
180	±1%	IV	n18	90181
200	±1%	V	n20	90201
220	±1%	V	n22	90221
240	±1%	V	n24	90241

Notes

1. Other capacitance values and tolerances are available on request.
2. Maximum thickness 2.5 mm.

ELECTRICAL CHARACTERISTICS

The capacitors meet the essential requirements of *"IEC 384-8"*. Unless stated otherwise 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 values (note 1) measured at 1 MHz, ≤5 V	see Table 4
Rated DC voltage	100 V
DC test voltage; duration 1 minute	300 V
DC test voltage of coating; duration 1 minute	300 V
Insulation resistance at 100 V (DC) after 1 minute	≥10000 MΩ
Tan δ (note 1) measured at 1 MHz, ≤5 V:	
$C \leq 50$ pF	$\leq 10\left(\frac{15}{C}+0.7\right)\times 10^{-4}$; $<20\times 10^{-4}$
$C > 50$ pF	$\leq 10\times 10^{-4}$
Category temperature range	−55 to +125 °C
Climatic category (IEC 68)	55/125/56

Note

1. Including 2 mm per connecting lead.

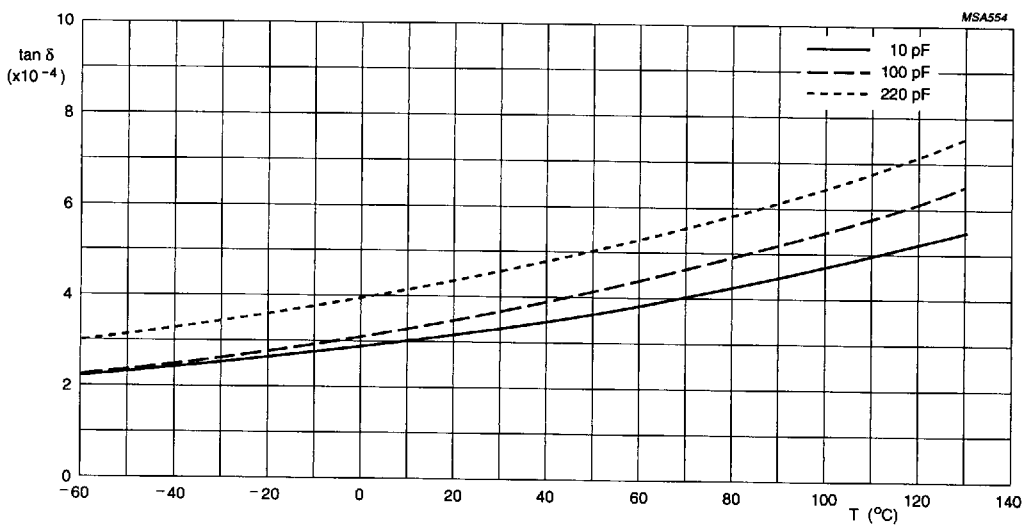
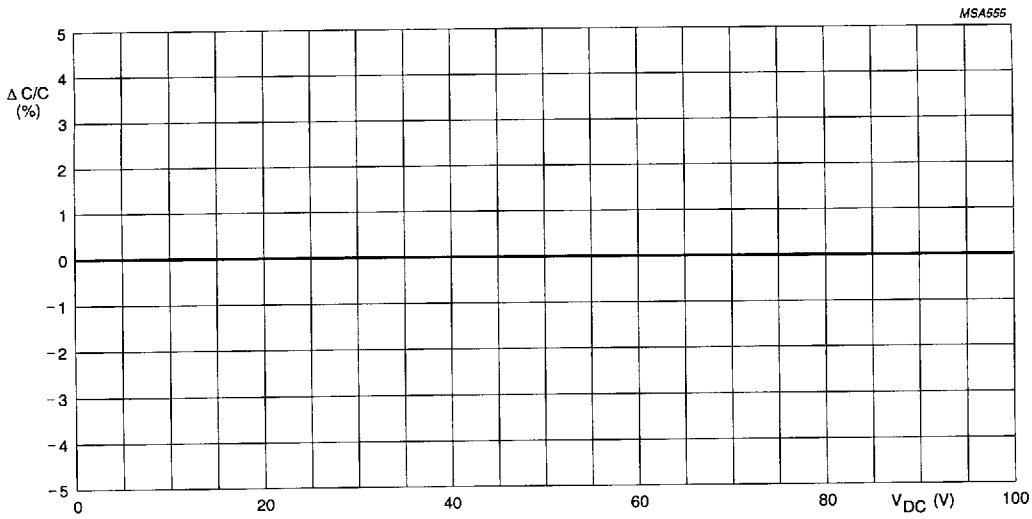


Fig.5 Typical tan δ as a function of temperature.



Reference values at 1 MHz.
Measurements made at 1 V, including 2 mm per connecting lead.

Fig.6 Typical capacitance change as function of DC voltage.

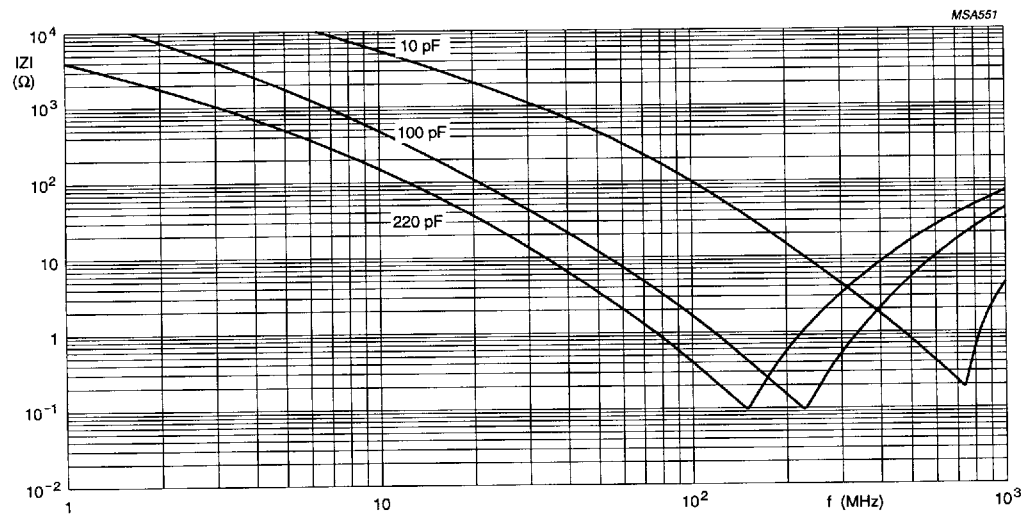
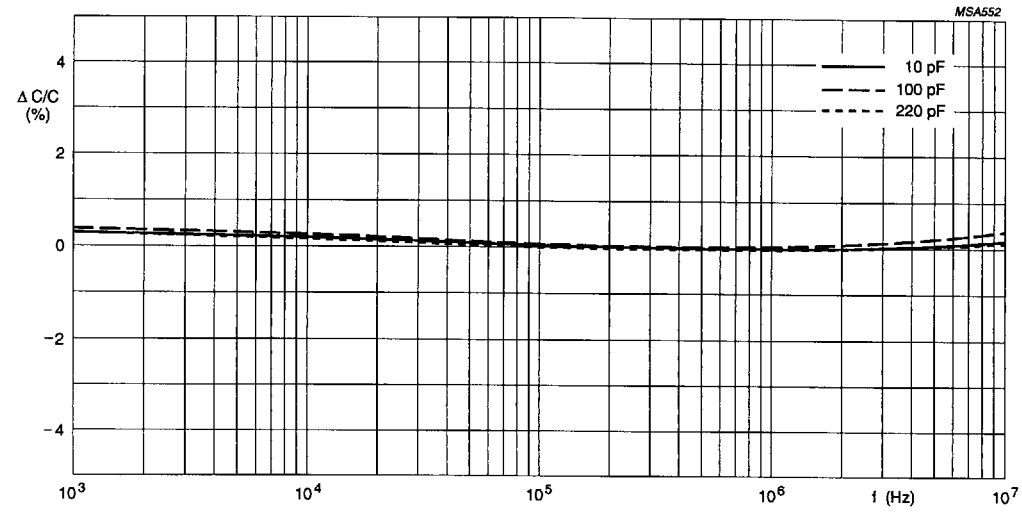


Fig.7 Typical impedance |Z| as a function of frequency.



Reference values at 1 MHz.
Measurements made at 1 V, including 2 mm per connecting lead.

Fig.8 Typical capacitance change as function of frequency.

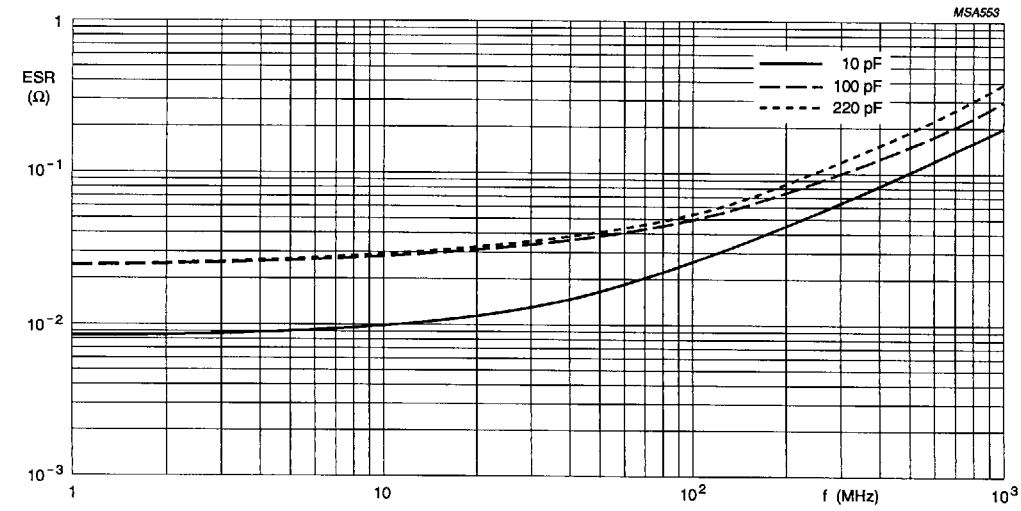


Fig.9 Equivalent series resistance (ESR) as a function of frequency.