

Miniature ceramic plate capacitors

Class 1, 500 V (DC) (flanged types)

FEATURES

- Professional circuits
- High-frequency circuits
- Temperature compensating
- High stability
- Space saving
- High reliability.

APPLICATIONS

In a great variety of electronic circuits, e.g. in filters and tuning circuits where high stability and/or temperature compensation are a requirement. Because of their small size the capacitors are suitable for use in circuitry with high component density.

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 narrow tolerance on capacitance (± 0.25 pF or 2%), high stability and, owing to the absence of silver, an extremely good DC behaviour.

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Capacitance range (E12 series)	0.47 to 330 pF
Rated DC voltage	500 V
Tolerance on capacitance	$\pm 2\%$ or ± 0.25 pF
Temperature coefficients	P100, NP0, N150, N750 and N1500
Sectional specification	IEC 384-8
Climatic category (IEC 68)	55/085/21 (N150, N750); 55/150/56 (P100, NP0, N1500)

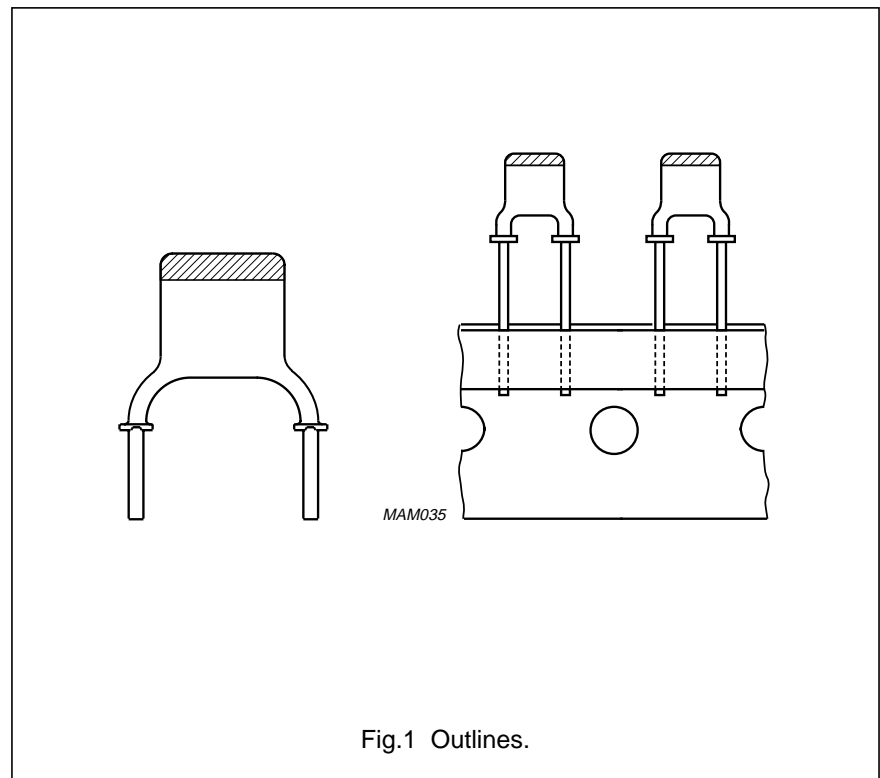
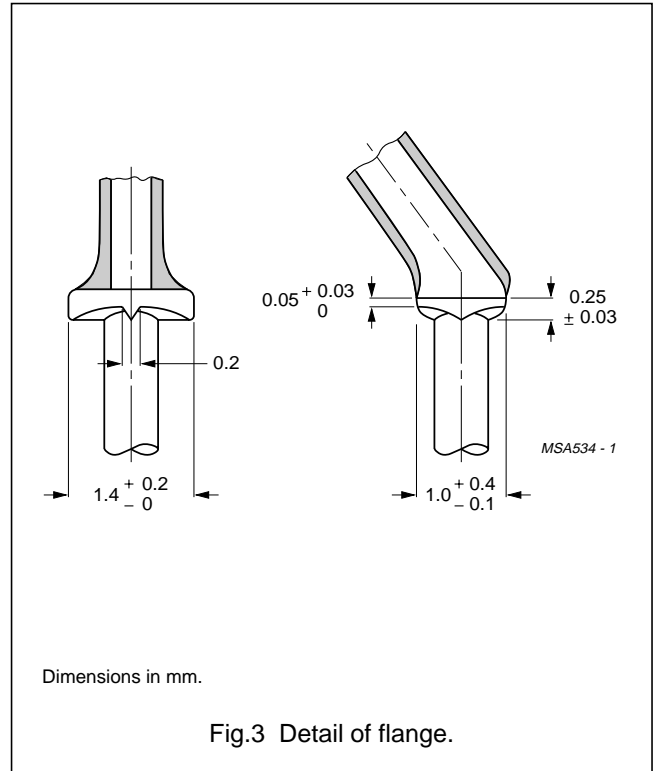
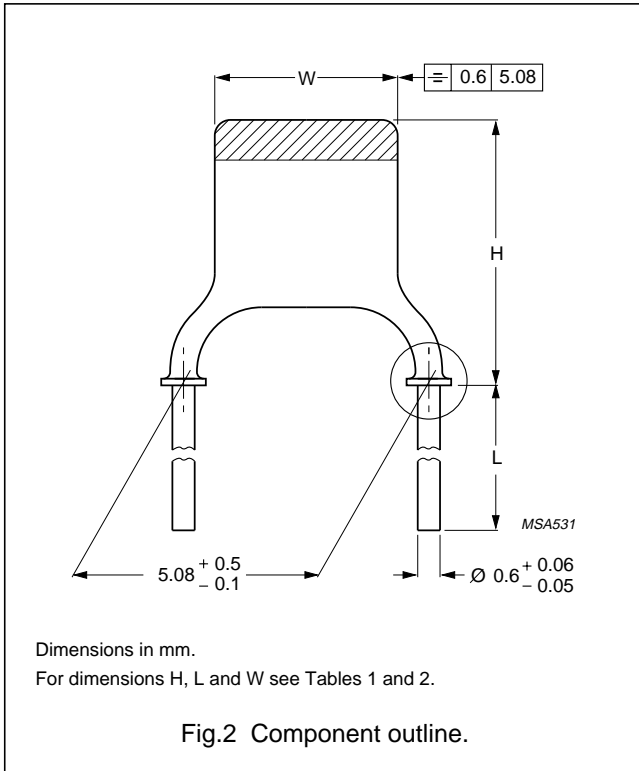


Fig.1 Outlines.

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MECHANICAL DATA



Marking

The body of the capacitors is coloured grey. The temperature coefficient is indicated by a colour code in accordance with IEC and EIA recommendations. Capacitance value and voltage are indicated by a marking code in a contrasting colour on the body. Refer to Tables 3 to 12, for marking codes and colours.

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)
I	3.6 (-1.1)	6.3 (-1.8)	≈0.14
IIA	3.9 (-1.4)	6.7 (-2.0)	≈0.15
IIB	4.5 (-1.8)	7.3 (-2.4)	≈0.15
III	5.3 (-1.8)	8.1 (-2.6)	≈0.17
IV	6.2 (-2.0)	9.0 (-2.7)	≈0.20
V	6.2 (-2.0)	11.2 (-3.1)	≈0.23

Notes

1. Unless indicated in Tables 4 to 12, the thickness of the capacitors does not exceed 2.3 mm.
2. Tolerances are given between parentheses.

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PACKAGING

For details refer to this handbook, Chapter "Miniature ceramic plate capacitors", Section "General data".

ORDERING INFORMATION**Table 2** Catalogue numbers

PITCH P	LEAD DIAMETER d	CATALOGUE NUMBERS ⁽¹⁾			
		BULK PACKED		ON TAPE (REEL)	ON TAPE ⁽²⁾ (AMMOPACK)
		L ≥ 13 mm	L = 4 ±0.5 mm		
5.08 mm (0.2 inch)	0.6 mm (0.024 inch)	2222 652	2222 653	2222 654	2222 691

Notes

1. Catalogue numbers to be completed by adding the 5-digit suffix for required capacitance value, see Tables 4 to 12.
2. $H_0 = 18.25$ mm.

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(flanged types)**Table 3** Conditions for Table 4; capacitors with temperature coefficient **P100 (M7G)**

DESCRIPTION	VALUE
Capacitance range	0.47 to 33 pF (E12 series)
Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$	$100 \times 10^{-6}/K$
Tolerance on the temperature coefficient	$\pm 30 \times 10^{-6}/K$
Marking colour of the temperature coefficient	red/violet
Climatic category (IEC 68)	55/150/56

Table 4 Preferred capacitance range, temperature coefficient **P100 (M7G)**

CAPACITANCE VALUE ⁽¹⁾ (pF)	TOLERANCE	SIZE (see Table 1)	MARKING CODE		SUFFIX OF CATALOGUE NUMBER (see Table 2)
			VALUE	VOLTAGE ⁽³⁾ (V)	
0.47	±0.25 pF	I ⁽²⁾	p47	500	03477
0.56	±0.25 pF	I ⁽²⁾	p56	500	03567
0.68	±0.25 pF	I ⁽²⁾	p68	500	03687
0.82	±0.25 pF	I	p82	500	03827
1.0	±0.25 pF	I	1p0	500	03108
1.2	±0.25 pF	I	1p2	500	03128
1.5	±0.25 pF	I ⁽²⁾	1p5	500	03158
1.8	±0.25 pF	I	1p8	500	03188
2.2	±0.25 pF	I	2p2	500	03228
2.7	±0.25 pF	I	2p7	500	03278
3.3	±0.25 pF	I	3p3	500	03338
3.9	±0.25 pF	I	3p9	500	03398
4.7	±0.25 pF	IIA	4p7	500	03478
5.6	±0.25 pF	IIA	5p6	500	03568
6.8	±0.25 pF	IIB	6p8	500	03688
8.2	±0.25 pF	IIB	8p2	500	03828
10	±2%	III	10p	500	04109
12	±2%	III	12p	500	04129
15	±2%	III	15p	500	04159
18	±2%	IV	18p	500	04189
22	±2%	IV	22p	500	04229
27	±2%	V	27p	500	04279
33	±2%	V	33p	500	04339

Notes

1. Other capacitance values and tolerances are available on request.
2. Maximum thickness 2.5 mm.
3. The voltage code may be marked on the front or rear side of the capacitor.

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Class 1, 500 V (DC)
(flanged types)**Table 5** Conditions for Table 6; capacitors with temperature coefficient **NP0 (C0G)**

DESCRIPTION	VALUE
Capacitance range	0.82 to 150 pF (E12 series)
Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$	$0 \times 10^{-6}/K$
Tolerance on the temperature coefficient	$\pm 30 \times 10^{-6}/K$
Marking colour of the temperature coefficient	black
Climatic category (IEC 68)	55/150/56

Miniature ceramic plate capacitors

Class 1, 500 V (DC)
(flanged types)**Table 6 Preferred capacitance range, temperature coefficient NP0 (C0G)**

CAPACITANCE VALUE ⁽¹⁾ (pF)	TOLERANCE	SIZE (see Table 1)	MARKING CODE		SUFFIX OF CATALOGUE NUMBER (see Table 2)
			VALUE	VOLTAGE ⁽⁴⁾ (V)	
0.82	±0.25 pF	I ⁽²⁾	p82	500	09827
1.0	±0.25 pF	I ⁽³⁾	1p0	500	09108
1.2	±0.25 pF	I ⁽³⁾	1p2	500	09128
1.5	±0.25 pF	I	1p5	500	09158
1.8	±0.25 pF	I	1p8	500	09188
2.2	±0.25 pF	I	2p2	500	09228
2.7	±0.25 pF	I	2p7	500	09278
3.3	±0.25 pF	I	3p3	500	09338
3.9	±0.25 pF	I	3p9	500	09398
4.7	±0.25 pF	I	4p7	500	09478
5.6	±0.25 pF	I	5p6	500	09568
6.8	±0.25 pF	I	6p8	500	09688
8.2	±0.25 pF	I	8p2	500	09828
10	±2%	I	10p	500	10109
12	±2%	I	12p	500	10129
15	±2%	IIA	15p	500	10159
18	±2%	IIA	18p	500	10189
22	±2%	IIA	22p	500	10229
27	±2%	IIB	27p	500	10279
33	±2%	IIB	33p	500	10339
39	±2%	IIB	39p	500	10399
47	±2%	III	47p	500	10479
56	±2%	III	56p	500	10569
68	±2%	IV	68p	500	10689
82	±2%	IV	82p	500	10829
100	±2%	IV	n10	500	10101
120	±2%	V	n12	500	10121
150	±2%	V	n15	500	10151

Notes

1. Other capacitance values and tolerances are available on request.
2. Maximum thickness 2.7 mm.
3. Maximum thickness 2.5 mm.
4. The voltage code may be marked on the front or rear side of the capacitor.

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Class 1, 500 V (DC)
(flanged types)**Table 7** Conditions for Table 8; capacitors with temperature coefficient **N150 (P2G)**

DESCRIPTION	VALUE
Capacitance range	2.2 to 150 pF (E12 series)
Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$	$-150 \times 10^{-6}/K$
Tolerance on the temperature coefficient	$\pm 30 \times 10^{-6}/K$
Marking colour of the temperature coefficient	orange
Climatic category (IEC 68)	55/085/21

Table 8 Preferred capacitance range, temperature coefficient **N150 (P2G)**

CAPACITANCE VALUE ⁽¹⁾ (pF)	TOLERANCE	SIZE (see Table 1)	MARKING CODE		SUFFIX OF CATALOGUE NUMBER (see Table 2)
			VALUE	VOLTAGE ⁽³⁾ (V)	
2.2	±0.25 pF	I ⁽²⁾	2p2	500	33228
2.7	±0.25 pF	I ⁽²⁾	2p7	500	33278
3.3	±0.25 pF	I	3p3	500	33338
3.9	±0.25 pF	I	3p9	500	33398
4.7	±0.25 pF	I	4p7	500	33478
5.6	±0.25 pF	I	5p6	500	33568
6.8	±0.25 pF	I	6p8	500	33688
8.2	±0.25 pF	I	8p2	500	33828
10	±2%	I	10p	500	34109
12	±2%	I	12p	500	34129
15	±2%	IIA	15p	500	34159
18	±2%	IIA	18p	500	34189
22	±2%	IIA	22p	500	34229
27	±2%	IIB	27p	500	34279
33	±2%	IIB	33p	500	34339
39	±2%	IIB	39p	500	34399
47	±2%	III	47p	500	34479
56	±2%	III	56p	500	34569
68	±2%	IV	68p	500	34689
82	±2%	IV	82p	500	34829
100	±2%	IV	n10	500	34101
120	±2%	V	n12	500	34121
150	±2%	V	n15	500	34151

Notes

1. Other capacitance values and tolerances are available on request.
2. Maximum thickness 2.5 mm.
3. The voltage code may be marked on the front or rear side of the capacitor.

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Class 1, 500 V (DC)
(flanged types)**Table 9** Conditions for Table 10; capacitors with temperature coefficient **N750 (U2J)**

DESCRIPTION	VALUE
Capacitance range	1.8 to 120 pF (E12 series)
Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$	$-750 \times 10^{-6}/K$
Tolerance on the temperature coefficient	$\pm 120 \times 10^{-6}/K$
Marking colour of the temperature coefficient	violet
Climatic category (IEC 68)	55/085/21

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Class 1, 500 V (DC)
(flanged types)**Table 10 Preferred** capacitance range, temperature coefficient **N750 (U2J)**

CAPACITANCE VALUE ⁽¹⁾ (pF)	TOLERANCE	SIZE (see Table 1)	MARKING CODE		SUFFIX OF CATALOGUE NUMBER (see Table 2)
			VALUE	VOLTAGE ⁽⁵⁾ (V)	
1.8	±0.25 pF	I ⁽²⁾	1p8	500	57188
2.2	±0.25 pF	I ⁽³⁾	2p2	500	57228
2.7	±0.25 pF	I	2p7	500	57278
3.3	±0.25 pF	I	3p3	500	57338
3.9	±0.25 pF	I	3p9	500	57398
4.7	±0.25 pF	I ⁽⁴⁾	4p7	500	57478
5.6	±0.25 pF	I	5p6	500	57568
6.8	±0.25 pF	I	6p8	500	57688
8.2	±0.25 pF	I	8p2	500	57828
10	±2%	I	10p	500	58109
12	±2%	I	12p	500	58129
15	±2%	I	15p	500	58159
18	±2%	IIA	18p	500	58189
22	±2%	IIA	22p	500	58229
27	±2%	IIB	27p	500	58279
33	±2%	IIB	33p	500	58339
39	±2%	IIB	39p	500	58399
47	±2%	III	47p	500	58479
56	±2%	III	56p	500	58569
68	±2%	IV	68p	500	58689
82	±2%	IV	82p	500	58829
100	±2%	IV	n10	500	58101
120	±2%	V	n12	500	58121
150	±2%	V	n15	500	58151

Notes

1. Other capacitance values and tolerances are available on request.
2. Maximum thickness 3.0 mm.
3. Maximum thickness 2.5 mm.
4. Maximum thickness 2.7 mm.
5. The voltage code may be marked on the front or rear side of the capacitor.

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Class 1, 500 V (DC)
(flanged types)**Table 11** Conditions for Table 12; capacitors with temperature coefficient **N1500 (P3K)**

DESCRIPTION	VALUE
Capacitance range	8.2 to 270 pF (E12 series)
Temperature coefficient of the capacitance $\left(\frac{\Delta C}{C \Delta T}\right)$	$-1500 \times 10^{-6}/K$
Tolerance on the temperature coefficient	$(-0 + 500) \times 10^{-6}/K$
Marking colour of the temperature coefficient	orange/orange
Climatic category (IEC 68)	55/150/56

Table 12 Preferred capacitance range, temperature coefficient **N1500 (P3K)**

CAPACITANCE VALUE ⁽¹⁾ (pF)	TOLERANCE	SIZE (see Table 1)	MARKING CODE		SUFFIX OF CATALOGUE NUMBER (see Table 2)
			VALUE	VOLTAGE ⁽⁴⁾ (V)	
8.2	±0.25 pF	I ⁽²⁾	8p2	500	69828
10	±2%	I ⁽³⁾	10p	500	70109
12	±2%	I ⁽³⁾	12p	500	70129
15	±2%	I	15p	500	70159
18	±2%	I	18p	500	70189
22	±2%	I	22p	500	70229
27	±2%	I	27p	500	70279
33	±2%	IIA	33p	500	70339
39	±2%	IIA	39p	500	70399
47	±2%	IIA	47p	500	70479
56	±2%	IIB	56p	500	70569
68	±2%	IIB	68p	500	70689
82	±2%	IIB	82p	500	70829
100	±2%	III	n10	500	70101
120	±2%	III	n12	500	70121
150	±2%	IV	n15	500	70151
180	±2%	IV	n18	500	70181
220	±2%	IV	n22	500	70221
270	±2%	V	n27	500	70271
330	±2%	V	n33	500	70331

Notes

1. Other capacitance values and tolerances are available on request.
2. Maximum thickness 3.0 mm.
3. Maximum thickness 2.5 mm.
4. The voltage code may be marked on the front or rear side of the capacitor.

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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 Tables 4 to 12
Rated DC voltage	500 V
DC test voltage; duration 1 minute	1250 V
DC test voltage of coating; duration 1 minute	1250 V
Insulation resistance at 500 V (DC) after 1 minute	>10000 MΩ
Tan δ (note 1) measured at 1 MHz, ≤5 V: C ≤ 50 pF C > 50 pF	$\leq 15 \left(\frac{15}{C} + 0.7 \right) \times 10^{-4}$ $\leq 15 \times 10^{-4}$
Category temperature range	-55 to +85 °C (N150, N750); -55 to +150 °C (P100, NP0, N1500)
Storage temperature range	-55 to +85 °C

Note

- Including 2 mm per connecting lead.

