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Multilayer Ceramic Capacitors

Array

C0G and X7R

Ordering code system

															
B37830	R	0	101	K	0	2 1									
						Packaging 1 ≙ cardboard tape, 180-mm reel 3 ≙ cardboard tape, 330-mm reel									
						2 ≙ 2-fold array 4 ≙ 4-fold array									
						Internal coding: 0 or decimal place for cap. values < 10 pF									
						Capacitance tolerance J ≙ ± 5 % K ≙ ± 10 % (standard for C0G) M ≙ ± 20 % (standard for X7R)									
						Capacitance, coded (example) 100 ≙ 10 · 10⁰ pF = 10 pF 101 ≙ 10 · 10¹ pF = 100 pF 220 ≙ 22 · 10⁰ pF = 22 pF									
						<table><tr><td rowspan="2">Rated voltage</td><td>Rated voltage [VDC]</td><td>16</td><td>25</td><td>50</td></tr><tr><td>Code</td><td>9</td><td>0</td><td>5</td></tr></table>	Rated voltage	Rated voltage [VDC]	16	25	50	Code	9	0	5
Rated voltage	Rated voltage [VDC]	16	25	50											
	Code	9	0	5											
						Termination Standard: R ≙ nickel barrier for all case sizes "R" also indicates array capacitor									

Type and size

Chip size (inch / mm)	Temperature characteristic	
	C0G	X7R
0405 / 1012	B37830	B37831
0508 / 1220	B37940	B37941
0612 / 1632	B37871	B37872



Multilayer Ceramic Capacitors

Array

X7R

SMD

Features

- Reduction of mounting time and mounting costs
- Space saving on the PCB

Applications

- Suitable for electronic circuits with parallel line layout
- Decoupling
- Coupling
- Blocking
- Interference suppression



Termination

- For soldering: Nickel-barrier terminations (Ni)

Options

- Alternative capacitance tolerances available on request

Delivery mode

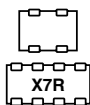
- Cardboard tape, 180-mm and 330-mm reel available

Electrical data

Temperature characteristic		X7R	
Climatic category (IEC 60068-1)		55/125/56	
Standard		EIA	
Dielectric		Class 2	
Rated voltage ¹⁾	V_R	16, 25, 50	VDC
Test voltage	V_{test}	$2,5 \cdot V_R/5 \text{ s}$	VDC
Capacitance range	C_R	1 nF ... 22 nF	
Max. relative capacitance change	$\Delta C/C$	± 15	%
Dissipation factor (limit value)	$\tan \delta$	$< 25 \cdot 10^{-3}$ $< 35 \cdot 10^{-3}$ for 16V	
Insulation resistance ²⁾ at + 25 °C	R_{ins}	$> 10^5$	M Ω
Insulation resistance ²⁾ at +125 °C	R_{ins}	$> 10^4$	M Ω
Time constant ²⁾ at + 25 °C	τ	> 1000	s
Time constant ²⁾ at +125 °C	τ	> 100	s
Operating temperature range	T_{op}	-55 ... +125	°C
Ageing ³⁾		yes	

1) Note: No operation on AC line.

2) For $C_R > 10 \text{ nF}$ the time constant $\tau = C \cdot R_{\text{ins}}$ is given.



Multilayer Ceramic Capacitors

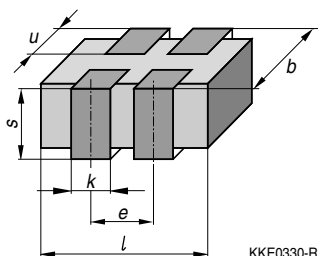
X7R

Capacitance tolerances

Code letter	K	M (standard)
Tolerance	$\pm 10\%$	$\pm 20\%$

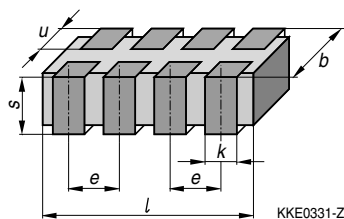
Dimensional drawing

2-fold array (case size 0405)



KKE0330-R

4-fold array (case sizes 0508 and 0612)



KKE0331-Z

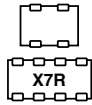
Dimensions (mm)

	2-fold array	4-fold array	
Case size (inch) (mm)	0405 1012	0508 1220	0612 1632
<i>l</i>	$1,37 \pm 0,15$	$2,0 \pm 0,2$	$3,2 \pm 0,2$
<i>b</i>	$1,0 +0/-0,15$	$1,25 \pm 0,15$	$1,6 \pm 0,2$
<i>s</i>	0,70 max.	$0,85 \pm 0,1$	$0,85 \pm 0,1$
<i>k</i>	$0,36 \pm 0,1$	$0,3 \pm 0,1$	$0,4 \pm 0,15$
<i>e</i>	0,64	$0,5 \pm 0,1$	$0,8 \pm 0,15$
<i>u</i>	$0,2 \pm 0,1$	$0,2 +0,3/-0,1$	$0,2 +0,3/-0,1$

Tolerances to CECC 32101-801

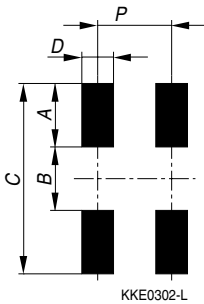
Multilayer Ceramic Capacitors

X7R

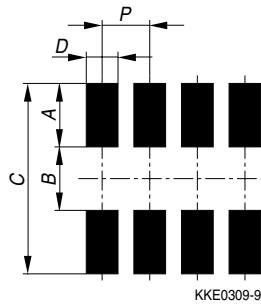


Recommended solder pad

2-fold array (case size 0405)



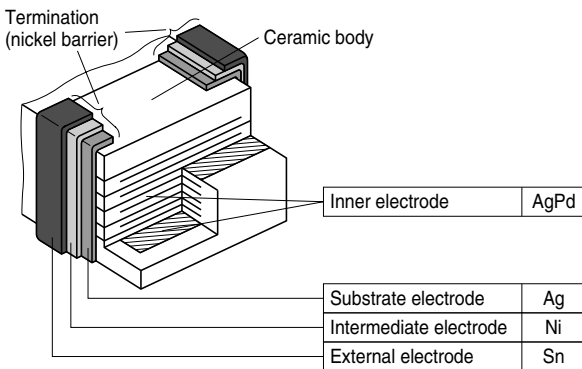
4-fold array (case sizes 0508 and 0612)



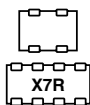
Maximum dimensions (mm)

Case size	(inch/mm)	Type	A	B	C	D	P
0405/1012		2-fold array	0,55	0,28	1,38	0,40	0,64
0508/1220		4-fold array	0,90	0,40	2,20	0,35	0,50
0612/1632		4-fold array	1,00	1,10	3,10	0,45	0,90

Termination



KKE0366-S-E

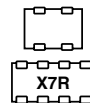


Multilayer Ceramic Capacitors

X7R

Product range array capacitors

	X7R					
	2-fold arrays			4-fold arrays		
Size ¹⁾	0405			0508		0612
inch	1012			1220		1632
mm						
Type	B37831			B37941		B37872
V_R (VDC)	16			25		50
C_R						
1,0 nF						
1,5 nF						
2,2 nF						
3,3 nF						
4,7 nF						
6,8 nF						
10 nF						
15 nF						
22 nF						



Multilayer Ceramic Capacitors

X7R; 0405 to 0612

Ordering codes and packing for X7R, 16, 25 and 50 VDC, nickel-barrier terminations

$C_R^{1)}$	Ordering code ²⁾	Chip thickness mm	Cardboard tape, Ø 180-mm reel	Cardboard tape, Ø 330-mm reel
			* $\triangleq$ 1	* $\triangleq$ 3
			pcs/reel	pcs/reel

Case size 0405, 16 VDC, 2-fold arrays

1,0 nF	B37831R9102M02*	0,6 ± 0,1	5000	20000
2,2 nF	B37831R9222M02*	0,6 ± 0,1	5000	20000
4,7 nF	B37831R9472M02*	0,6 ± 0,1	5000	20000
10 nF	B37831R9103M02*	0,6 ± 0,1	5000	20000

Case size 0508, 25 VDC, 4-fold arrays

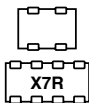
1,0 nF	B37941R0102M04*	0,85 ± 0,1	4000	16000
2,2 nF	B37941R0222M04*	0,85 ± 0,1	4000	16000
4,7 nF	B37941R0472M04*	0,85 ± 0,1	4000	16000
10 nF	B37941R0103M04*	0,85 ± 0,1	4000	16000

Case size 0612, 50 VDC, 4-fold arrays

1,0 nF	B37872R5102M04*	0,85 ± 0,1	4000	16000
1,5 nF	B37872R5152M04*	0,85 ± 0,1	4000	16000
2,2 nF	B37872R5222M04*	0,85 ± 0,1	4000	16000
3,3 nF	B37872R5332M04*	0,85 ± 0,1	4000	16000
4,7 nF	B37872R5472M04*	0,85 ± 0,1	4000	16000
6,8 nF	B37872R5682M04*	0,85 ± 0,1	4000	16000
10 nF	B37872R5103M04*	0,85 ± 0,1	4000	16000
15 nF	B37872R5153M04*	0,85 ± 0,1	4000	16000
22 nF	B37872R5223M04*	0,85 ± 0,1	4000	16000

1) Other capacitance values on request.

2) The table contains the ordering codes for the standard capacitance tolerance.

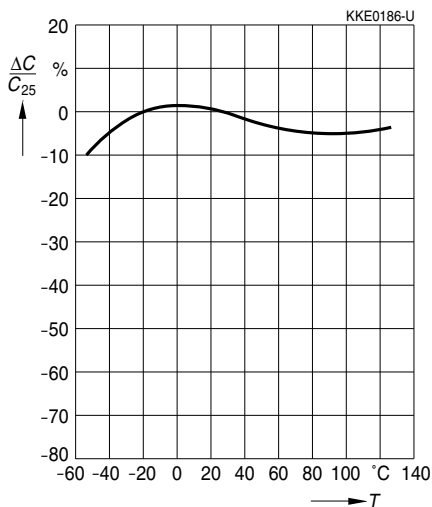


Multilayer Ceramic Capacitors

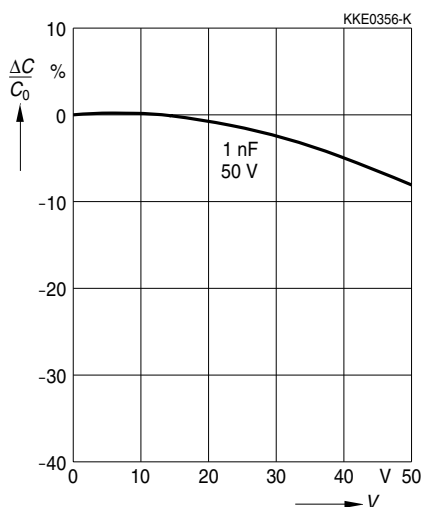
X7R

Typical characteristics

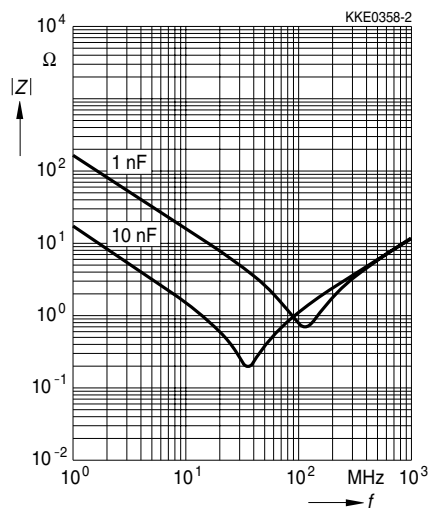
Capacitance change $\Delta C/C_{25}$ versus temperature T



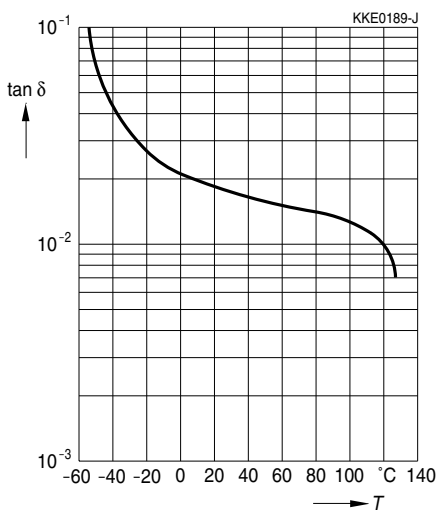
Capacitance change $\Delta C/C_0$ versus superimposed DC voltage V

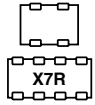


Impedance $|Z|$ versus frequency f



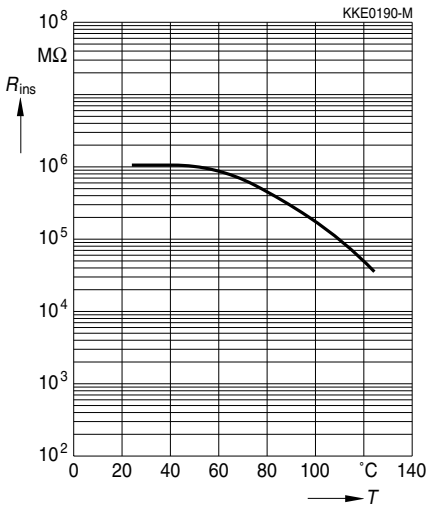
Dissipation factor $\tan \delta$ versus temperature T



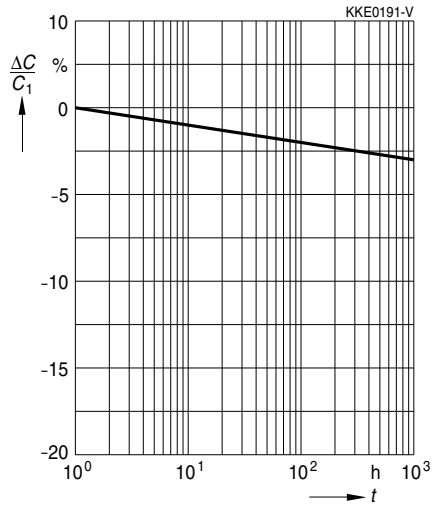


Typical characteristics

Insulation resistance R_{ins} versus temperature T



Capacitance change $\Delta C/C_1$ versus time t



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