

CE/CN Series

High Temperature Chips Capacitors



FEATURES

- Multilayer Chips Ceramic Capacitors for operating temperature up to 250°C
- Size 0603 to 3040
- NPO and X7R dielectrics
- Capacitance range: 1pF to 8.2μF
- Voltage range at 20°C: 16 V_{DC} to 100 V_{DC}

PHYSICAL CHARACTERISTICS

CONSTRUCTION

Bare chips capacitors for surface mounting with optional nickel barrier and tinning.

MARKING (clear or coded)

Capacitance value (not available on sizes 0603).

ELECTRICAL SPECIFICATIONS

Description	NPO	X7R
Operating temperature	–55°C to +250°C	–55°C to +250°C
Rated voltage at 20°C	16 V _{DC} to 100 V _{DC}	16 V _{DC} to 100 V _{DC}
Dielectric withstanding voltage at 20°C	2.5 U _{RC} for U _{RC} < 500 V _{DC} 1.5 U _{RC} for U _{RC} = 500 V _{DC}	2.5 U _{RC} for U _{RC} < 500 V _{DC} 1.5 U _{RC} for U _{RC} = 500 V _{DC}
Capacitance	at 1MHz for C ≤ 1,000pF at 1kHz for C > 1,000pF	at 1MHz for C ≤ 100pF at 1kHz for C > 100pF
Dissipation factor at 20°C	≤ 0.015 (150/C + 7)% at 1MHz for C ≤ 50pF ≤ 0.15% at 1MHz for 50pF < C ≤ 1,000pF ≤ 0.15% at 1kHz for C > 1,000pF	≤ 2.5% at 1MHz for C ≤ 100pF ≤ 2.5% at 1kHz for C > 100pF
Dissipation factor at 200°C	≤ 0.03 (150/C + 7)% at 1MHz for C ≤ 50pF ≤ 0.3% at 1MHz for 50pF < C ≤ 1,000pF ≤ 0.3% at 1kHz for C > 1,000pF	≤ 1.5% at 1MHz for C ≤ 100pF ≤ 1.5% at 1kHz for C > 100pF
Dissipation factor at 220°C	≤ 0.03 (150/C + 7)% at 1MHz for C ≤ 50pF ≤ 0.3% at 1MHz for 50pF < C ≤ 1,000pF ≤ 0.3% at 1kHz for C > 1,000pF	≤ 0.5% at 1MHz for C ≤ 100pF ≤ 0.5% at 1kHz for C > 100pF
Dissipation factor at 250°C	≤ 0.03 (150/C + 7)% at 1MHz for C ≤ 50pF ≤ 0.3% at 1MHz for 50pF < C ≤ 1,000pF ≤ 0.3% at 1kHz for C > 1,000pF	≤ 0.5% at 1MHz for C ≤ 100pF ≤ 0.5% at 1kHz for C > 100pF
Insulation resistance at 20°C under U _{RC}	≥ 100,000MΩ or ≥ 1,000MΩ.μF (whichever is less)	≥ 100,000MΩ or ≥ 1,000MΩ.μF (whichever is less)
Insulation resistance at 200°C under U _{RC}	≥ 1,000MΩ or ≥ 20MΩ.μF (whichever is less)	≥ 1,000MΩ or ≥ 10MΩ.μF (whichever is less)
Insulation resistance at 220°C under U _{RC}	≥ 800MΩ or ≥ 8MΩ.μF (whichever is less)	≥ 200MΩ or ≥ 4MΩ.μF (whichever is less)
Insulation resistance at 250°C under U _{RC}	≥ 200MΩ or ≥ 2MΩ.μF (whichever is less)	≥ 100MΩ or ≥ 1MΩ.μF (whichever is less)
Ageing	None	≤ 2.5% per decade hour

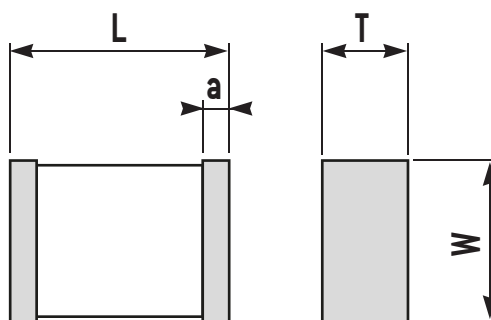
HOW TO ORDER

CNC	2	11	C	M	47nF	10%	100 V	S8
CN	2X	0805						
CN	5X	0805						
Series	Exxelia size code		Terminations	Marking	Capacitance	Tolerance	Rated voltage at 20°C	Packaging
Operating temperature Up to 200°C CEC2 = NPO CNC2 = X7R Up to 220°C CE2X = NPO CN2X = X7R Up to 250°C CE5X = NPO CN5X = X7R	14 = 0603 03 = 0805 08 = 1206 11 = 1210 20 = 1812 28 = 1825 30 = 2220 25 = 2225 33 = 3030 40 = 3040		W = RoHS compliant For working temperature up to 250°C For all sizes - Ag/Pd/Pt W Ag/Pd/Pt For working temperature up to 200°C Up to size 1210 for X7R and 2220 for NPO C Ag + Ni + electrolytic Sn/Pb 95/5 CW Ag + Ni + electrolytic Sn G Ag + Ni + Au GW Ag + Ni + Au D Ag + Ni* + electrolytic Sn/Pb 60/40 For working temperature up to 180°C Up to size 3030 YC Ag + Polymer + Ni + Sn/Pb 95/5 YCW Ag + Polymer + Ni + Sn YG Ag + Polymer + Ni + Au YGW Ag + Polymer + Ni + Au *Only 0603 to 1210 sizes (other sizes on demand)	- = no marking M = Marking: capacitance value clear or coded (not available on sizes 0603)	Capacitance value in clear	NPO: cap. value ≤ 12pF ±0.25pF cap. value ≤ 8.2pF ±0.5pF ±1pF cap. value > 22pF ±1% cap. value > 12pF ±2% cap. value > 8.2pF ±5% ±10% cap. value > 3.9pF ±20% X7R: ±10% ±20%	16V 25 V 50 V 100 V	- = Exxelia packaging S8 = available for 0402 to 1210 sizes. S12 = available for 1812 to 2220 sizes. BA = available for 0402 to 2220 sizes. See page 13

High Temperature Chips Capacitors

CE/CN Series

DIMENSIONS in inches (mm)



STANDARD RATINGS

Standard size					0603		0805		1206		1210		1812							
Excellia size code					14		03		08		11		20							
Dimensions inches (mm)	L				0.063 ± 0.006 (1.6 ± 0.15)		0.079 ± 0.012 (2 ± 0.3)		0.126 ± 0.01 (3.2 ± 0.25)		0.126 ± 0.016 (3.2 ± 0.4)		0.177 ± 0.02 (4.5 ± 0.5)							
	W				0.032 ± 0.006 (0.8 ± 0.15)		0.049 ± 0.008 (1.25 ± 0.2)		0.063 ± 0.006 (1.6 ± 0.15)		0.098 ± 0.012 (2.5 ± 0.3)		0.126 ± 0.016 (3.2 ± 0.4)							
	a				0.012 ± 0.008 (0.3 ± 0.2)		0.02 ± 0.012 (0.5 ± 0.3)		0.02 ± 0.012 (0.5 ± 0.3)		0.024 ± 0.016 (0.6 ± 0.4)		0.024 ± 0.016 (0.6 ± 0.4)							
	T max.				0.04 (1)		0.052 (1.3)		0.063 (1.6)		0.071 (1.8)		0.071 (1.8)							
Dielectric					NPO		X7R		NPO		X7R		NPO		X7R					
Min. Capa. value					1pF		10pF		1pF		100pF		10pF		180pF		47pF		470pF	
Rated voltage (U _{RL})	20°C	200°C	220°C	250°C																
	16V	8V	5V	3V	2.7nF	120nF	12nF	470nF	22nF	1.2μF	56nF	2.2μF	100nF	4.7μF						
	25V	12V	8V	5V	1.8nF	56nF	6.8nF	220nF	15nF	680nF	39nF	1μF	47nF	2.2μF						
	50V	25V	16V	10V	820pF	33nF	3.3nF	120nF	8.2nF	270nF	18nF	560nF	27nF	1.2μF						
	100V	50V	25V	16V	330pF	12nF	1.5nF	39nF	3.9nF	120nF	8.2nF	220nF	15nF	470nF						

Standard size					1825		2220		2225		3030		3040											
Excella size code					28		30		25		33		40											
Dimensions inches (mm)	L				0.177 ± 0.020 (4.5 ± 0.5)		0.224 ± 0.02 (5.7 ± 0.5)		0.224 ± 0.02 (5.7 ± 0.5)		0.299 ± 0.02 (7.6 ± 0.5)		0.299 ± 0.02 (7.6 ± 0.5)											
	W				0.250 ± 0.020 (6.35 ± 0.5)		0.197 ± 0.02 (5 ± 0.5)		0.250 ± 0.020 (6.35 ± 0.5)		0.299 ± 0.02 (7.6 ± 0.5)		0.4 ± 0.02 (10.16 ± 0.5)											
	a				0.024 ± 0.020 (0.6 ± 0.4)		0.024 ± 0.016 (0.6 ± 0.4)		0.024 ± 0.020 (0.6 ± 0.4)		0.024 ± 0.016 (0.6 ± 0.4)		0.024 ± 0.016 (0.6 ± 0.4)											
	T max.				0.071 (1.8)		0.071 (1.8)		0.079 (2)		0.079 (2)		0.079 (2)											
Dielectric					NPO		X7R		NPO		X7R		NPO		X7R									
Min. Capa. value					100pF		1nF		100pF		1.2nF		150pF		1.5npF		390pF		4.7nF		680pF		8.2nF	
Rated voltage (U _{RL})	20°C	200°C	220°C	250°C																				
	16V	8V	5V	3V	150nF	2.7μF	180nF	10μF	180nF	4.7μF	330nF	6.8μF	470nF	8.2μF										
	25V	12V	8V	5V	82nF	2.2μF	82nF	4.7μF	100nF	3.9μF	180nF	3.9μF	270nF	5.6μF										
	50V	25V	16V	10V	56nF	1.5μF	56nF	2.7μF	68nF	2.2μF	120nF	2.7μF	150nF	3.9μF										
	100V	50V	25V	16V	22nF	820nF	33nF	1μF	33nF	1.2μF	56nF	1.5μF	82nF	2.2μF										

Available capacitance values:

NPO: E6, E12, E24, E48, E96 (see page 14). Specific values upon request.

X7R: E6, E12, E24 (see page 14). Specific values upon request.

The above table defines the standard products, other components may be built upon request.

SCT Series

High Temperature Stacked Capacitors



FEATURES

- Multilayer stacked ceramic capacitors
- Dielectric type II
- Capacitance range: 47nf to 390 μ F
- Voltage range: 50 V_{DC} to 500 V_{DC}

TERMINATIONS

- Ag 100% termination developed for high temperature up to 215°C. Less sensitive to thermal shocks and compatible with high melting point solder containing lead.
- DIL type J, L or N are available.

MARKING

Size	Marking codes	Example
	«TA» logo	TA
All sizes	Cap code + Tolerance code	105M
	Rated voltage value	100 V

ELECTRICAL SPECIFICATIONS

Description	«X» Series (type II)
CECC	2R1
EIA	X7R
Exxelia Temex Code	X
Operating temperature range	-55°C to +215°C
Maximum Δ C/°C over Temperature range without voltage applied	$\pm 15\%$
Ageing	$\leq 2.5\%$ per decade hour
Dissipation Factor (DF)	$\leq 2.5\%$
Voltage proof	$U_R \leq 200$ V: $2.5 \times U_R$ $U_R > 200$ V: $2.0 \times U_R$
Insulation Resistance (IR) at 25°C under U_R	100G Ω or 1000 Ω .F whichever is the less
Insulation Resistance (IR) at 125°C under U_R	10G Ω or 100 Ω .F whichever is the less
Measurement Conditions for C and DF at 20°C	≤ 100 pF: 1MHz / 1Vrms (no bias) > 100 pF: 1KHz / 1Vrms (no bias)
Capacitance versus applied Voltage and Temperature	See page 99

PACKAGING

«Blister» boxes:

For all products, special «blister» boxes are used to optimize the protection of the parts during the carriage and the storage. Depending upon the termination (with or without connection) and the size, the number of the parts in each box is defined. Please, consult us for more details.

HOW TO ORDER

201	SCT	01	X	105	K	R				-	-RoHS
Rated voltage	Series	Exxelia size code	Dielectric code	Capacitance	Tolerance	Termination				Coating	RoHS Compliant
500: 50 V 101: 100 V 201: 200 V 501: 500 V	SCT	00 01 02 04 05 06 07 10 12	X = X7R	1 st two digits represent significant figures; last digit specifies the number of zeros to follow. Examples: 104: 0.1µF 335: 3.3µF 156: 15µF 107: 10µF	K = ±10% M = ±20%	DN	DIL N type	RoHS = HMP tinned phosphor bronze, non magnetic.	- = uncoated and no marking U = uncoated and marked	Non-RoHS not available	
						DJ	DIL J type				
						DL	DIL L type				

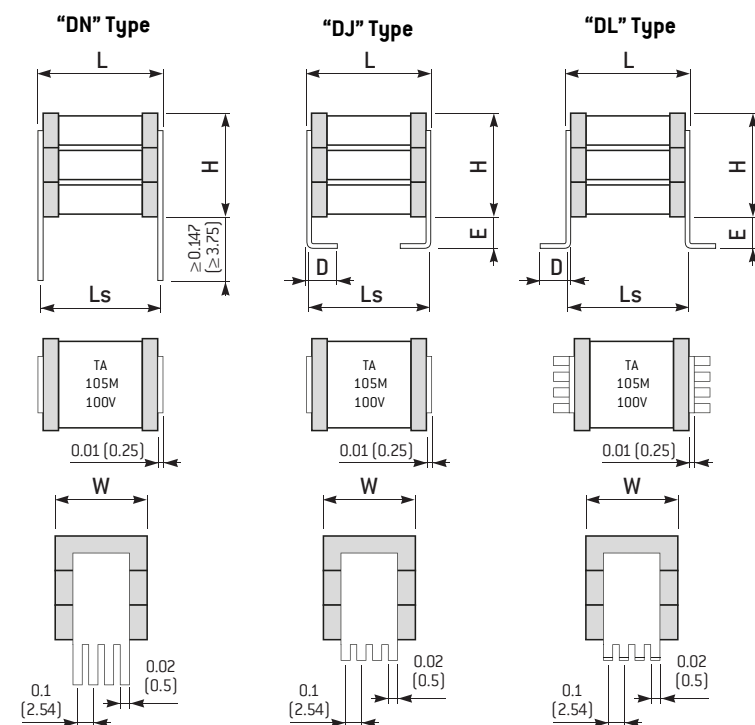
High Temperature Stacked Capacitors

SCT Series

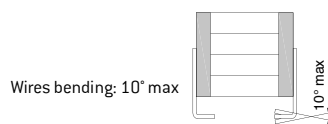
DIMENSIONS in inches (mm)

SC SERIES

Dual In Line DIL termination



Note: the marking shown here is just given as an example



Size	L max.	W max.	LS ± 0.02* [±0.5]*	E ± 0.012 [±0.5]**	D ± 0.02 [±0.5]	Number of leads per side	H max.
SCT00	0.300 (7.62)	0.276 (7)	0.250 (6.35)	0.071 (1.8)	0.079 (2)	3	Please, consult the tables of standard ratings
SCT01	0.402 (10.2)	0.378 (9.6)	0.300 (7.62)	0.059 (1.5)	0.098 (2.5)	3	
SCT02	0.469 (11.9)	0.449 (11.4)	0.400 (10.16)	0.059 (1.5)	0.098 (2.5)	4	
SCT04	0.650 (16.5)	0.552 (14)	0.539 (13.7)	0.059 (1.5)	0.098 (2.5)	5	
SCT05	0.729 (18.5)	0.670 (17)	0.700 (17.78)	0.059 (1.5)	0.098 (2.5)	6	
SCT06	0.701 (17.8)	0.851 (21.6)	0.600 (15.24)	0.059 (1.5)	0.098 (2.5)	7	
SCT07	0.894 (22.7)	0.654 (16.6)	0.800 (20.32)	0.059 (1.5)	0.098 (2.5)	6	
SCT10	0.520 (13.2)	1.083 (27.5)	0.453 (11.5)	0.083 (2.1)	0.102 (2.6)	10	
SCT12	0.945 (24)	1.598 (40.6)	0.800 (20.32)	0.098 (2.5)	0.098 (2.5)	14	

* Except for the SCT07, tolerance = ± 0.032 in (±0.8mm).

** For the SCT12, tolerance = ± 0.012 in (±0.3mm).

DERATING RULES

The given voltages in the below capacitance range are the nominal voltages at 125°C.

For higher operating temperatures, the derating rules to be applied on the voltage versus temperature are defined as per the following table :

125°C	200°C	215°C
500V	200V	100V
200V	100V	50V
100V	50V	25V
50V	25V	16V

SCT Series

High Temperature Stacked Capacitors

STANDARD RATINGS

Exxelia size code	2225				3033				3740				5550				Cap. code
	SCT00				SCT01				SCT02				SCT04				
U _R	50 V	100 V	200 V	500 V	50 V	100 V	200 V	500 V	50 V	100 V	200 V	500 V	50 V	100 V	200 V	500 V	
47nf	0.118 (3)				0.083 (2.1)												473
56	0.118 (3)				0.083 (2.1)												563
68	0.118 (3)				0.083 (2.1)												683
82	0.118 (3)				0.083 (2.1)												823
100			0.039 (1.8)	0.118 (3)			0.083 (2.1)	0.098 (2.5)					0.118 (3)				104
120			0.039 (1.8)	0.118 (3)			0.083 (2.1)	0.098 (2.5)					0.118 (3)				124
150			0.079 (2)	0.252 (6.4)			0.083 (2.1)	0.098 (2.5)					0.118 (3)				154
180	0.039 (1.8)	0.039 (1.8)	0.079 (2)	0.252 (6.4)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.126 (3.2)					0.083 (2.1)	0.118 (3)			184
220	0.039 (1.8)	0.039 (1.8)	0.098 (2.5)	0.252 (6.4)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.126 (3.2)					0.083 (2.1)	0.118 (3)			224
270	0.039 (1.8)	0.039 (1.8)	0.098 (2.5)	0.378 (9.6)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.138 (3.5)					0.083 (2.1)	0.118 (3)	0.098 (2.5)		274
330	0.039 (1.8)	0.039 (1.8)	0.118 (3)	0.378 (9.6)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.241 (6.1)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.130 (3.3)			0.098 (2.5)		334
390	0.039 (1.8)	0.039 (1.8)	0.118 (3)	0.504 (12.8)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.241 (6.1)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.138 (3.5)			0.098 (2.5)		394
470	0.039 (1.8)	0.039 (1.8)	0.213 (5.4)	0.504 (12.8)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.272 (6.9)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.157 (4)			0.118 (3)		474
560	0.079 (2)	0.079 (2)	0.232 (5.9)	0.551 (14)	0.083 (2.1)	0.083 (2.1)	0.098 (2.5)	0.414 (10.5)	0.083 (2.1)	0.083 (2.1)	0.083 (2.1)	0.169 (4.3)			0.118 (3)		564
680	0.079 (2)	0.079 (2)	0.252 (6.4)	0.630 (16)	0.083 (2.1)	0.083 (2.1)	0.118 (3)	0.414 (10.5)	0.083 (2.1)	0.083 (2.1)	0.098 (2.5)	0.276 (7)			0.118 (3)		684
820	0.079 (2)	0.079 (2)	0.319 (8.1)	0.709 (18)	0.083 (2.1)	0.083 (2.1)	0.138 (3.5)	0.548 (13.9)	0.083 (2.1)	0.083 (2.1)	0.098 (2.5)	0.390 (9.9)			0.118 (3)	0.138 (3.5)	824
1 µF	0.087 (2.2)	0.087 (2.2)	0.378 (9.6)		0.098 (2.5)	0.098 (2.5)	0.174 (4.4)	0.583 (14.8)	0.083 (2.1)	0.083 (2.1)	0.118 (3)	0.406 (10.3)			0.118 (3)	0.165 (4.2)	105
1.2	0.098 (2.5)	0.098 (2.5)	0.504 (12.8)		0.098 (2.5)	0.098 (2.5)	0.213 (5.4)	0.669 (17.6)	0.083 (2.1)	0.083 (2.1)	0.138 (3.5)	0.552 (14)			0.118 (3)	0.252 (6.4)	125
1.5	0.118 (3)	0.118 (3)	0.551 (14)		0.110 (2.8)	0.110 (2.8)	0.260 (6.6)		0.083 (2.1)	0.083 (2.1)	0.157 (4)	0.630 (16)			0.118 (3)	0.378 (9.6)	155
1.8	0.173 (4.4)	0.173 (4.4)	0.630 (16.4)		0.110 (2.8)	0.110 (2.8)	0.347 (8.8)		0.098 (2.5)	0.098 (2.5)	0.233 (5.9)	0.709 (18)	0.098 (2.5)	0.098 (2.5)	0.118 (3)	0.378 (9.6)	185
2.2	0.197 (5.1)	0.197 (5.1)	0.630 (16.4)		0.110 (2.8)	0.110 (2.8)	0.426 (10.8)		0.098 (2.5)	0.098 (2.5)	0.252 (6.4)	0.709 (18)	0.098 (2.5)	0.098 (2.5)	0.118 (3)	0.378 (9.6)	225
2.7	0.232 (5.9)	0.232 (5.9)			0.130 (3.3)	0.130 (3.3)	0.552 (14)		0.110 (2.8)	0.110 (2.8)	0.252 (6.4)		0.098 (2.5)	0.098 (2.5)	0.138 (3.5)	0.504 (12.8)	275
3.3	0.296 (7.5)	0.296 (7.5)			0.150 (3.8)	0.150 (3.8)	0.591 (15)		0.110 (2.8)	0.110 (2.8)	0.378 (9.6)		0.098 (2.5)	0.098 (2.5)	0.157 (4)	0.583 (14.8)	335
3.9	0.339 (8.6)	0.339 (8.6)			0.237 (6)	0.244 (6.2)			0.130 (3.3)	0.130 (3.3)	0.378 (9.6)		0.098 (2.5)	0.098 (2.5)	0.252 (6.4)	0.662 (16.8)	395
4.7	0.378 (9.6)	0.378 (9.6)			0.237 (6)	0.252 (6.4)			0.138 (3.5)	0.138 (3.5)	0.504 (12.8)		0.118 (3)	0.118 (3)	0.378 (9.6)		475
5.6	0.484 (12.3)	0.484 (12.3)			0.276 (7)	0.283 (7.2)			0.142 (3.6)	0.142 (3.6)	0.630 (16)		0.118 (3)	0.118 (3)	0.378 (9.6)		565
6.8	0.504 (12.8)	0.504 (12.8)			0.315 (8)	0.323 (8.2)			0.185 (4.7)	0.185 (4.7)	0.709 (18)		0.118 (3)	0.118 (3)	0.434 (11)		685
8.2	0.630 (16)	0.630 (16)			0.434 (11)	0.441 (11.2)			0.284 (7.2)	0.354 (9)			0.138 (3.5)	0.138 (3.5)	0.438 (11.1)		825
10					0.473 (12)	0.480 (12.2)			0.292 (7.4)	0.354 (9)			0.150 (3.8)	0.150 (3.8)	0.497 (12.6)		106
12					0.552 (14)	0.559 (14.4)			0.414 (10.5)	0.472 (12)			0.252 (6.4)	0.252 (6.4)	0.630 (16)		126
15									0.438 (11.1)	0.492 (12.5)			0.284 (7.2)	0.319 (8.1)			156
18									0.583 (14.8)	0.591 (15)			0.304 (7.7)	0.394 (10.8)			186
22									0.598 (15.2)	0.598 (15.2)			0.315 (8)	0.504 (12.8)			226
27													0.461 (11.7)	0.504 (12.8)			276
33													0.473 (12)	0.583 (14.8)			336
39													0.630 (16)	0.662 (16.8)			396

* Consult us - The height Hmax in inches (in mm) for the SCT Series is indicated in the cells.

High Temperature Stacked Capacitors

SCT Series

STANDARD RATINGS

Exxelia size code	6560				6080 / 8060				45107				45214				Cap. code	
	SCT05				SCT06 / SCT07				SCT10				SCT11					
	U _R	50 V	100 V	200 V	500 V	50 V	100 V	200 V	500 V	50 V	100 V	200 V	500 V	50 V	100 V	200 V		500 V
270nf	0.098 (2.5)																274	
330	0.098 (2.5)																334	
390	0.098 (2.5)																394	
470	0.098 (2.5)				0.118 (3)												474	
560	0.098 (2.5) 0.098 (2.5)				0.118 (3)												564	
680	0.098 (2.5) 0.098 (2.5)				0.118 (3)								0.138 (3.5)				684	
820	0.098 (2.5) 0.118 (3)				0.118 (3)				0.118 (3) 0.138 (3.5)								824	
1 µF	0.098 (2.5)	0.098 (2.5)	0.098 (2.5)	0.118 (3)	0.118 (3)				0.118 (3)	0.118 (3)	0.118 (3)	0.150 (3.8)					105	
1.2	0.098 (2.5)	0.098 (2.5)	0.098 (2.5)	0.138 (3.5)	0.138 (3.5)				0.118 (3)	0.118 (3)	0.118 (3)	0.150 (3.8)					125	
1.5	0.098 (2.5)	0.098 (2.5)	0.098 (2.5)	0.157 (4)	0.118 (3) 0.157 (4)				0.118 (3)	0.118 (3)	0.118 (3)	0.252 (6.4)					155	
1.8	0.098 (2.5)	0.098 (2.5)	0.098 (2.5)	0.177 (4.5)	0.118 (3) 0.177 (4.5)				0.118 (3)	0.118 (3)	0.118 (3)	0.252 (6.4)					185	
2.2	0.098 (2.5)	0.098 (2.5)	0.098 (2.5)	0.272 (6.9)	0.118 (3) 0.272 (6.9)				0.118 (3)	0.118 (3)	0.138 (3.5)	0.252 (6.4)					225	
2.7	0.098 (2.5)	0.098 (2.5)	0.118 (3)	0.312 (7.9)	0.118 (3) 0.378 (9.6)				0.118 (3)	0.118 (3)	0.150 (3.8)	0.292 (7.4)	*		275			
3.3	0.098 (2.5)	0.098 (2.5)	0.118 (3)	0.331 (8.4)	0.118 (3) 0.398 (10.1)				0.118 (3)	0.118 (3)	0.157 (4)	0.378 (9.6)	*		335			
3.9	0.098 (2.5)	0.098 (2.5)	0.138 (3.5)	0.438 (11.1)	0.118 (3)	0.118 (3)	0.138 (3.5)	0.504 (12.8)	0.118 (3)	0.118 (3)	0.213 (5.4)	0.504 (12.8)	*		395			
4.7	0.098 (2.5)	0.098 (2.5)	0.157 (4)	0.497 (12.6)	0.118 (3)	0.118 (3)	0.157 (4)	0.583 (14.8)	0.118 (3)	0.118 (3)	0.233 (5.9)	0.583 (14.8)	*		475			
5.6	0.098 (2.5)	0.098 (2.5)	0.233 (5.9)	0.662 (16.8)	0.118 (3)	0.118 (3)	0.252 (6.4)	0.583 (14.8)	0.118 (3)	0.118 (3)	0.252 (6.4)	0.583 (14.8)	*		565			
6.8	0.098 (2.5)	0.098 (2.5)	0.252 (6.4)	0.819 (20.8)	0.118 (3)	0.118 (3)	0.252 (6.4)	0.661 (16.8)	0.118 (3)	0.118 (3)	0.319 (8.1)	0.662 (16.8)	*		685			
8.2	0.118 (3)	0.118 (3)	0.359 (9.1)		0.118 (3)	0.118 (3)	0.378 (9.6)	0.740 (18.8)	0.118 (3)	0.118 (3)	0.378 (9.6)			*	*	825		
10	0.118 (3)	0.118 (3)	0.378 (9.6)		0.138 (3.5)	0.138 (3.5)	0.378 (9.6)		0.138 (3.5)	0.138 (3.5)	0.378 (9.6)			*	*	106		
12	0.138 (3.5)	0.138 (3.5)	0.504 (12.8)		0.138 (3.5)	0.138 (3.5)	0.504 (12.8)		0.138 (3.5)	0.138 (3.5)	0.504 (12.8)			*	*	*	126	
15	0.157 (4)	0.157 (4)	0.583 (14.8)		0.138 (3.5)	0.138 (3.5)	0.504 (12.8)		0.252 (6.4)	0.252 (6.4)	0.504 (12.8)			*	*		156	
18	0.252 (6.4)	0.252 (6.4)			0.146 (3.7)	0.146 (3.7)	0.630 (16)		0.252 (6.4)	0.252 (6.4)	0.661 (16.8)			*	*		186	
22	0.252 (6.4)	0.252 (6.4)			0.252 (6.4)	0.291 (7.4)	0.740 (18.8)		0.378 (9.6)	0.378 (9.6)				*	*		226	
27	0.312 (7.9)	0.378 (9.6)			0.252 (6.4)	0.323 (8.2)	0.740 (18.8)		0.378 (9.6)	0.378 (9.6)			*	*	*		276	
33	0.331 (8.4)	0.378 (9.6)			0.280 (7.1)	0.413 (10.5)			0.504 (12.8)	0.504 (12.8)			*	*	*		336	
39	0.457 (11.6)	0.504 (12.8)			0.378 (9.6)	0.441 (11.2)			0.504 (12.8)	0.504 (12.8)			*	*			396	
47	0.497 (12.6)	0.504 (12.8)			0.378 (9.6)	0.465 (11.8)			0.591 (15)	0.591 (15)			*	*			476	
56	0.662 (16.8)	0.669 (17)			0.457 (11.6)	0.472 (12)			0.591 (15)	0.591 (15)			*	*			566	
68					0.583 (14.8)	0.591 (15)							*		*		686	
82													*					826
100													*					107
120													*					127

* Consult us - The height Hmax in inches (in mm) for the SCT Series is indicated in the cells.

Selection Guide

Main Characteristic	Model	Size range	Dielectric	Voltage range	Capacitance range	Temperature range	Coating					Leads				Mounting		Main Applications	Page
							Uncoated	Varnished	Conformal coated	Molded	Self protected	DIL	Ribbon	Axial	Radial	SMD	Through hole		
HIGH CAPACITANCE	R SERIES (CHIPS) High Capacitance Chips Capacitors 	2225 to 45107	X7R	50V to 500V	47nF to 27µF	-55°C to +125°C	•									•		Switch Mode Power Supply, filtering, smoothing, decoupling. • aerospace • space • defence	79
	R SERIES (LEADED) Radial Leaded Conformal Coated Capacitors 	-	X7R	50V to 500V	47nF to 27µF	-55°C to +125°C		•							•		•		83
	TEF SERIES Radial Leaded Conformal Coated Capacitors 	-	NPO	63V to 500V	10nF to 680nF	-55°C to +125°C			•						•		•		86
	SV / SC SERIES High Capacitance Stacked Capacitors 	2225 to 125205	X7R	50V to 500V	47nF to 390µF	-55°C to +125°C	•	•				•	•			•	•		87
	CNC3X SERIES High Capacitance Stacked Capacitors 	2220 to 4040	X7R	16V to 25V	1.2µF to 68µF	-55°C to +125°C	•	•				•				•	•		94
	CEC5X SERIES High Capacitance Stacked Capacitors 	3033 to 80150	NPO	63V to 500V	10nF to 6.8µF	-55°C to +125°C	•	•				•				•	•		96
	TEP / TEV SERIES High Capacitance Stacked Capacitors 	-	NPO	63V to 500V	10nF to 6.8µF	-55°C to +125°C		•							•		•		99
HIGH TEMPERATURE	TCN8X SERIES High Capacitance Molded Stacked Capacitors 	-	X7R	63V to 500V	0.47µF to 120µF	-55°C to +125°C				•					•		•	Oil drilling, motor control, braking systems.	101
	CE / CN SERIES High Temperature Chips Capacitors 	0402 to 3040	NPO X7R	16V to 100V	1pF to 8.2µF	-55°C to +250°C	•									•			106
	SCT SERIES High Temperature Stacked Capacitors 	2225 to 125205	X7R	50V to 500V	47nF to 390µF	-55°C to +215°C	•	•				•				•	•		108
	TCE / TCN MOLDED SERIES HT High Temperature Molded Capacitors 	-	NPO X7R	16V to 100V	1pF to 10µF	-55°C to +220°C				•				•	•		•		113
	TCE / TCN SELF-PROTECTED SERIES High Temperature Self-Protected Capacitors 	-	NPO X7R	25V to 500V	10pF to 3.9µF	-55°C to +250°C					•			•	•		•		115
FEED-THRU	TCH SERIES High Temperature High Voltage Capacitors 	-	NPO X7R	200V to 10kV	10pF to 15µF	-55°C to +250°C	•								•		•	Very low ESL	117
	TBC SERIES Discoidal Capacitors 	-	NPO X7R	25V to 1kV	10pF to 12µF	-55°C to +125°C	•									•			121
	BPM SERIES Planar Array 	-	X7R	25V to 200V	330pF to 68nF	-55°C to +125°C	•									•		Very low ESL, miniaturisation	123

Selection Guide

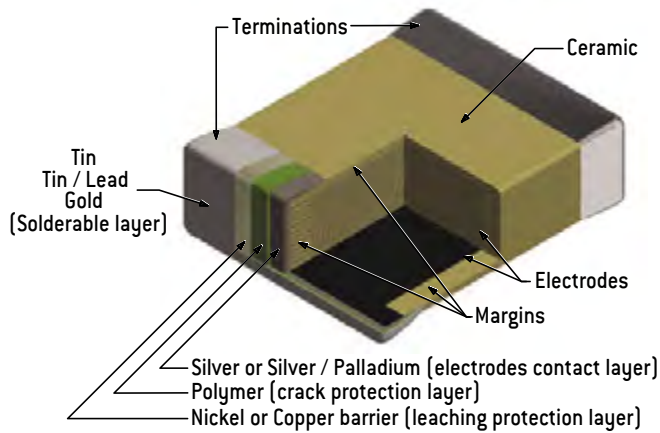
Main Characteristic	Model	Size range	Dielectric	Voltage range	Capacitance range	Temperature range	Coating					Leads				Mounting		Main Applications	Page
							Uncoated	Varnished	Conformal coated	Molded	Self protected	DIL	Ribbon	Axial	Radial	SMD	Through hole		
HIGH Q	XBL SERIES Broadband 	0402	X7R	16V	100nF	−55°C to +125°C	●									●		DC Blocking, Coupling, Bypassing	144
	UBL SERIES Broadband 	0402	X7R	16V	100nF	−55°C to +125°C	●									●			146
	UBZ SERIES Broadband 	0201	X5R X6T	10V	100nF	−55°C to +105°C	●									●			148
	CH SERIES Classic HiQ 	0505 1111	P100	50V to 1.5kV	0.1pF to 1nF	−55°C to +175°C	●						●		●	●		Cellular base station amplifier, MRI.	150
	SH SERIES Super HiQ 	0402 to 1210	NPO	25V to 1.5kV	0.2pF to 1nF	−55°C to +150°C	●						●		●	●		Cellular base station equipment Broadband Point to point/ multi-point radios RF generators	153
	SHD / SHR SERIES Reverse Geometry 	0709 0711	NPO	500V	0.5pF to 100pF	−55°C to +175°C	●									●			156
	NHB SERIES High Self Resonant Frequency 	1111	NPO	500V	0.3pF to 100pF	−55°C to +175°C	●									●			158
	CP SERIES High Power 	2225 4040	P100	200V to 7kV	1pF to 10nF	−55°C to +125°C	●		●				●	●	●	●	●	RF power amplifier Plasma chamber MRI coils	160
	CL SERIES High Power 	2225 to 7065	NPO	200V to 7kV	1pF to 10nF	−55°C to +125°C	●		●				●	●	●	●	●	RF power amplifier Plasma chamber MRI coils	164

ADDITIONAL AVAILABLE RANGES (consult our website)

STANDARD	TCE1X Series		-	NPO	63V to 100V	0,5pF to 10nF	-55°C to +125°C			Precision, stability, decoupling	-
	TCN19 Series		-	2C1	63V to 250V	10pF to 1µF	-55°C to +125°C			Decoupling	-
	TCN3X Series		-	2C1	50V to 100V	100pF to 1,8µF	-55°C to +125°C				-
	LA6 Series		-	2C1	25V to 63V	100pF to 1µF	-55°C to +125°C				-
HIGH VOLT.	H Series		0805 to 6560	NPO X7R	1kV to 10kV	2pF to 390nF	-55°C to +125°C			Power supply, voltage multiplier, radars.	-
HIGH CAPACITANCE	CNC5X Series		3033 to 80150	X7R	63V to 500V	0,1µF to 180µF	-55°C to +125°C			Switch Mode Power Supply, filtering, smoothing, decoupling. • aerospace • space • defence	-
	CNC8X Series (chips)		3033 to 33110	X7R	63V to 400V	47nF to 27µF	-55°C to +125°C				-
	CNC8X Series (DIL)		3333 to 80150	X7R	63V to 400V	47nF to 180µF	-55°C to +125°C				-
	TCP / TCV8X Series		3333 to 80150	X7R	63V to 400V	47nF to 180µF	-55°C to +125°C				-
	TCP / TCV5X Series		3033 to 80150	X7R	63V to 500V	0,1µF to 180µF	-55°C to +125°C				-
	TCF Series		-	X7R	63V to 500V	0,1µF to 18µF	-55°C to +125°C				-
HIGH TEMP.	CNC25X Series		3033 to 5550	X7R	50V	1µF to 33µF	-55°C to +200°C			Oil drilling, motor control, braking systems.	-
HIGH Q	CNW Series		-	X7R	100V to 300V	10nF to 1µF	-55°C to +125°C			Power amplifier	-
	SPT519 / CAW CEW Series		-	NPO	100V to 300V	10nF to 1µF	-55°C to +125°C				-

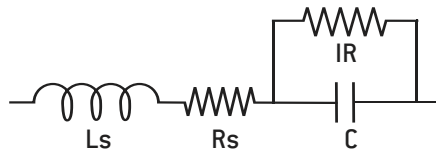
Ceramic Capacitors Technology

MLCC STRUCTURE



EQUIVALENT CIRCUIT

Capacitor is a complex component combining resistive, inductive and capacitive phenomena. A simplified schematic for the equivalent circuit is:



DIELECTRIC CHARACTERISTICS

Insulation Resistance (IR) is the resistance measured under DC voltage across the terminals of the capacitor and consists principally of the parallel resistance shown in the equivalent circuit. As capacitance values and hence the area of dielectric increases, the IR decreases and hence the product $[C \times IR]$ is often specified in $\Omega \cdot F$ or $M\Omega \cdot \mu F$.

The Equivalent Series Resistance (ESR) is the sum of the resistive terms which generate heating when capacitor is used under AC voltage at a given frequency f .

Dissipation factor (DF) is the ration of the apparent power input will turn to heat in the capacitor:

$$DF = 2\pi f C ESR$$

When a capacitor works under AC voltage, **heat power loss (P)**, expressed in Watt, is equal to:

$$P = 2\pi f C V_{rms}^2 DF$$

The series inductance (Ls) is due to the currents running through the electrodes. It can distort the operation of the capacitor at high frequency where the **impedance (Z)** is given as:

$$Z = R_s + j [L_s \omega - 1/(C \omega)] \text{ with } \omega = 2\pi f$$

When frequency rises, the capacitive component of capacitors is gradually canceled up to the resonance frequency, where :

$$Z = R_s \text{ and } L_s C \omega^2 = 1$$

Above this frequency the capacitor behaves like an inductor.

	P100	NPO	N2200 (C4xx)	BX	2C1	X7R
Dielectric material	Porcelain	Magnesium titanate or Neodymium baryum titanate	Barium zirconate titanate	Baryum titanate (BaTiO ₃)		
Dielectric constant	15 – 18	20 – 85	450	2,000 – 5,000		
Electrode technology	PME (Precious Metal Electrodes): Ag/Pd					
Capacitance variation between –55°C and +125/°C without DC voltage	(100±30)ppm/°C	(0±30)ppm/°C	[–2,200±500] ppm/°C	±15%	±20%	±15%
Capacitance variation between –55°C and +125/°C with DC rated voltage			0 -15%	15% –25%	20% –30%	Not applicable
Piezo-electric effect	None		None	Yes		
Dielectric absorption	None		Few %	Few %		
Thermal shock sensitive	+		+	++		

Ceramic Capacitors Technology

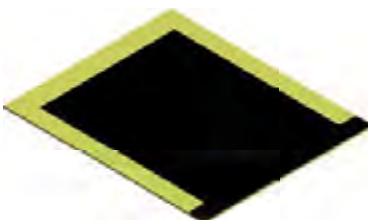
MANUFACTURING STEPS

SLIP CASTING



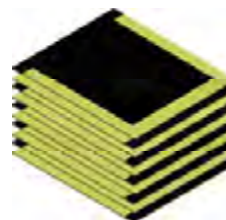
A slurry, a mix of ceramic powder, binder and solvents, is poured onto conveyor belt inside a drying oven, resulting in a dry ceramic sheet.

ELECTRODE SCREEN PRINTING



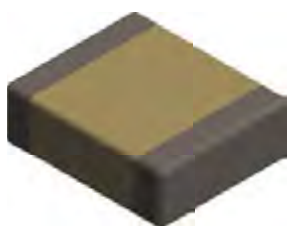
The electrode ink, made from a metal powder mixed with solvents, is printed onto the ceramic sheets using a screen printing process.

STACKING



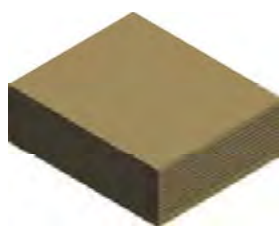
The sheets with electrode printed are stacked to create a multilayer structure.

TERMINATIONS



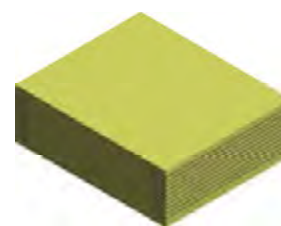
Each terminal of the capacitor is dipped in the termination ink, mix of metal powder, solvents and glass frit and the parts are fired in an oven.

SINTERING



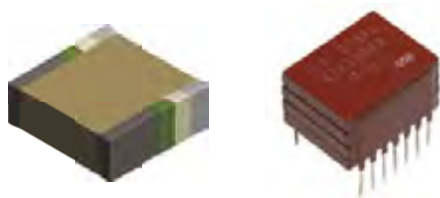
The parts are sintered in an oven with a precise temperature profile which is very important to the characteristics of the capacitors.

PRESSING



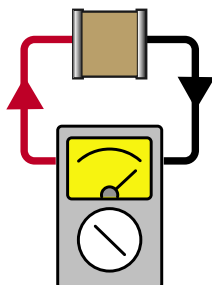
Pressure is applied to the stack to fuse all the separate layers, this created a monolithic structure.

TERMINATIONS PLATING



Stacking + leads soldering + encapsulation
[see pages 10-11]

FINAL TESTING



PACKAGING



User Guide

SMD TERMINATIONS

NON RoHS COMPLIANT	Code	RoHS COMPLIANT	Code	Recommended mounting process							Storage (months)*
Magnetic	Epoxy bonding	Iron soldering	Wave soldering	Vapor phase soldering	Infrared soldering	Wire bonding					
Ag	Q	Ag	QW / P	No	●	●	●	●			18
Ag/Pd/Pt	-	Ag/Pd/Pt	W / A	No	●	●	●				24
Ag/Pd/Pt + dipped Sn/Pb 60/40	H	Ag/Pd/Pt + dipped Sn	HW	No		●					24
Ag + Ni + electrolytic Sn/Pb 95/5	C	Ag + Ni + electrolytic Sn	CW / S	Yes		●	●	●	●		18
Ag + Ni + electrolytic Sn/Pb 60/40	D	-	-	Yes		●	●	●	●		18
-	-	Ag + Cu + electrolytic Sn	C**	No		●	●	●	●		18
Ag + Ni + dipped Sn/Pb 60/40	E	-	-	Yes		●	●				24
Ag + Ni + Au	G	Ag + Ni + Au	GW	Yes	●	●	●	●	●	●	36
Ag + Polymer + Ni + Sn/Pb 95/5	YC	Ag + Polymer + Ni + Sn	YCW	Yes		●	●	●	●		18
Ag + Polymer + Ni + Sn/Pb 60/40	YD	-	-	Yes		●	●	●	●		18
Ag + Polymer + Ni + Au	YG	Ag + Polymer + Ni + Au	YGW	Yes	●	●	●	●	●	●	36

Nickel (Ni) or Copper (Cu) barriers amplify thermal shock and are not recommended for chip sizes larger than 3030.

* Storage must be in a dry environment at a temperature of 20°C with a relative humidity below 50%, or preferably in a package enclosing a desiccant.

** Non magnetic chips series only.

SMD ENVIRONMENTAL TESTS

Ceramic chip capacitors for SMD are designed to meet test requirements of **CECC 32100** and **NF C 93133** standards as specified below in compliance with **NF C 20700** and **IEC 68** standards:

- Solderability: **NF C 20758**, 260°C, bath 62/36/2.
- Adherence: 5N force.
- Vibration fatigue test: **NF C 20706**, 20 g, 10 Hz to 2,000 Hz, 12 cycles of 20 minutes each.
- Rapid temperature change: **NF C 20714**, -55°C to + 125°C, 5 cycles.
- Combined climatic test: **IEC 68-2-38**.
- Damp heat: **NF C 20703**, 93 %, H.R., 40°C.
- Endurance test: 1,000 hours, 1.5 U_{RC}, 125°C.

STORAGE OF CHIP CAPACITORS

TINNED OR NON TINNED CHIP CAPACITORS

Storage must be in a dry environment at a temperature of 20°C with a relative humidity below 50 %, or preferably in a packaging enclosing a desiccant.

STORAGE IN INDUSTRIAL ENVIRONMENT:

- 2 years for tin dipped chip capacitors,
- 18 months for tin electroplated chip capacitors,
- 2 years for non tinned chip capacitors,
- 3 years for gold plated chip capacitors.

STORAGE IN CONTROLLED NEUTRAL NITROGEN ENVIRONMENT:

- 4 years for tin dipped or electroplated chip capacitors,
- 4 years for non tinned chip capacitors,
- 5 years for gold plated chip capacitors.

Storage duration should be considered from delivery date and not from batch manufacture date. The tests carried out at final acceptance stage (solderability, susceptibility to solder heat) enable to assess the compatibility to surface mounting of the chips.

User Guide

LEAD STYLES

SURFACE MOUNTING

DIL LEADS

P style



PL style



L style



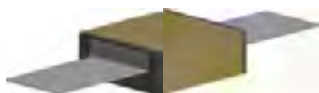
J style



RIBBON LEADS

Micro-strip (type 1)
Short Micro-strip (type 1S)

Axial (Type 2)



Radial (Type 3)



R style



RX style



RJ style



Please contact Exxelia sales for any lead configuration not shown.

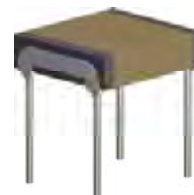
TROUGH-HOLE MOUNTING

AXIAL AND RADIAL

Radial leads (Type 6)



Radial leads (4 leads)



Axial leads (Type 7)



DIL leads: N style



ENCAPSULATION STYLES

Ceramic encapsulation
(selfprotected)

Varnish



Conformal coating

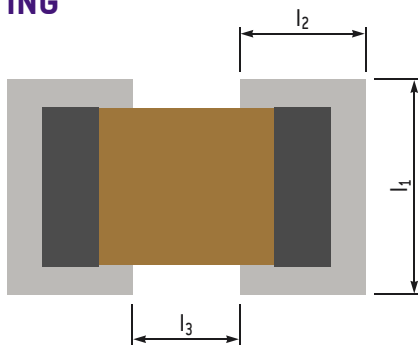


Molding



User Guide

SOLDERING ADVICES FOR REFLOW SOLDERING



Large chips above size 2225 are not recommended to be mounted on epoxy board due to thermal expansion coefficient mismatch between ceramic capacitor and epoxy. Where larger sizes are required, it is recommended to use components with ribbon or other adapted leads so as to absorb thermo-mechanical strains.

Dimensions in inches (in mm)	Reflow soldering						Wave soldering					
	l ₁		l ₂		l ₃		l ₁		l ₂		l ₃	
0402	0.043	(1.1)	0.035	(0.9)	0.012	(0.3)	0.043	(1.1)	0.047	(1.2)	0.012	(0.3)
0403	0.055	(1.4)	0.035	(0.9)	0.012	(0.3)	0.055	(1.4)	0.047	(1.2)	0.012	(0.3)
0504	0.063	(1.6)	0.051	(1.3)	0.016	(0.4)	0.063	(1.6)	0.063	(1.6)	0.016	(0.4)
0603	0.055	(1.4)	0.059	(1.5)	0.02	(0.5)	0.055	(1.4)	0.071	(1.8)	0.02	(0.5)
0805	0.073	(1.85)	0.065	(1.65)	0.024	(0.6)	0.073	(1.85)	0.077	(1.95)	0.024	(0.6)
0907	0.094	(2.4)	0.065	(1.65)	0.035	(0.9)	0.094	(2.4)	0.077	(1.95)	0.035	(0.9)
1005	0.073	(1.85)	0.067	(1.7)	0.039	(1)	0.073	(1.85)	0.079	(2)	0.039	(1)
1206	0.083	(2.1)	0.067	(1.7)	0.059	(1.5)	0.083	(2.1)	0.079	(2)	0.059	(1.5)
1210	0.118	(3)	0.069	(1.75)	0.059	(1.5)	0.118	(3)	0.081	(2.05)	0.059	(1.5)
1605	0.073	(1.85)	0.071	(1.8)	0.087	(2.2)	0.073	(1.85)	0.083	(2.1)	0.087	(2.2)
1806	0.087	(2.2)	0.073	(1.85)	0.102	(2.6)	0.087	(2.2)	0.085	(2.15)	0.102	(2.6)
1812	0.152	(3.85)	0.073	(1.85)	0.102	(2.6)	0.152	(3.85)	0.085	(2.15)	0.102	(2.6)
1825	0.281	(7.15)	0.073	(1.85)	0.102	(2.6)	0.281	(7.15)	0.085	(2.15)	0.102	(2.6)
2210	0.13	(3.3)	0.079	(2)	0.146	(3.7)	0.13	(3.3)	0.091	(2.3)	0.146	(3.7)
2220	0.228	(5.8)	0.079	(2)	0.146	(3.7)	0.228	(5.8)	0.091	(2.3)	0.146	(3.7)
2225	0.281	(7.15)	0.079	(2)	0.146	(3.7)	0.281	(7.15)	0.091	(2.3)	0.146	(3.7)

RECOMMENDED FOOTPRINT FOR SMD CAPACITORS

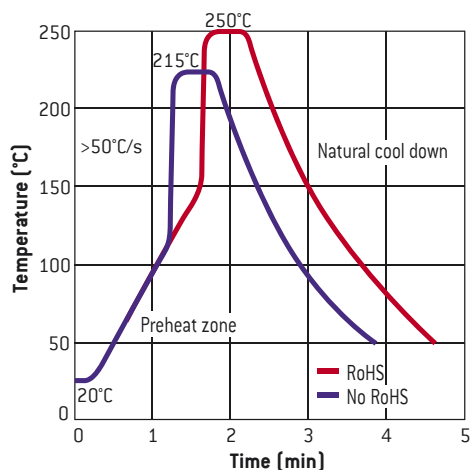
Ceramic is by nature a material which is sensitive both thermally and mechanically. Stresses caused by the physical and thermal properties of the capacitors, substrates and solders are attenuated by the leads.

Wave soldering is unsuitable for sizes larger than 2220 and for the higher ends of capacitance ranges due to possible thermal shock (capacitance values given upon request).

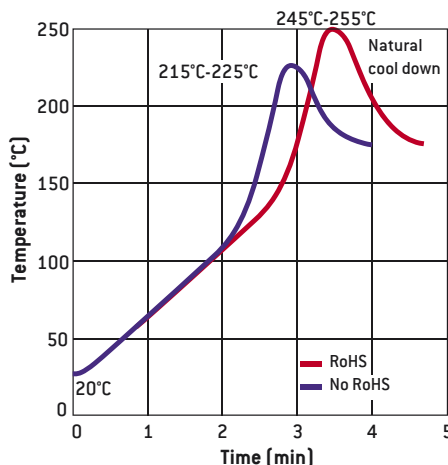
Infrared and vapor phase reflow, are preferred for high reliability applications as inherent thermo-mechanical strains are lower than those inherent to wave soldering.

Whatever the soldering process is, it is highly recommended to apply a thermal cycle, see hereafter our recommended soldering profile:

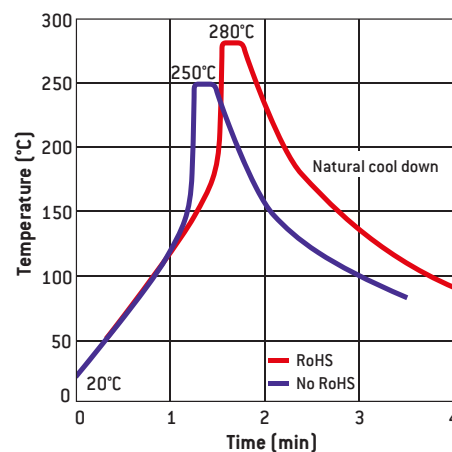
RECOMMENDED VAPOR PHASE REFLOW PROFILE



RECOMMENDED IR REFLOW PROFILE



RECOMMENDED WAVE SOLDERING PROFILE



SOLDERING ADVICES FOR IRON SOLDERING

Attachment with a soldering iron is discouraged due to ceramic brittleness and the process control limitations. In the event that a soldering iron must be used, the following precautions should be observed:

- Use a substrate with chip footprints big enough to allow putting side by side one end of the capacitor and the iron tip without any contact between this tip and the component,
- place the capacitor on this footprint,

- heat the substrate until the capacitor's temperature reaches 150°C minimum (preheating step, maximum 1°C per second),
- place the hot iron tip (a flat tip is preferred) on the footprint **without touching the capacitor**. Use a regulated iron with a 30 watts maximum power. The recommended temperature of the iron is 270 ±10°C. The temperature gap between the capacitor and the iron tip must not exceed 120°C,

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- leave the tip on the footprint for a few seconds in order to increase locally the footprint's temperature,
- use a cored wire solder and put it down on the iron tip. In a preferred way use Sn/Pb/Ag 62/36/2 alloy,
- wait until the solder fillet is formed on the capacitor's termination,
- take away iron and wire solder,
- wait a few minutes so that the substrate and capacitor come back down to

the preheating temperature,

- solder the second termination using the same procedure as the first,
- let the soldered component cool down slowly to avoid any thermal shock.

PACKAGING

TAPE AND REEL

The films used on the reels correspond to standard IEC 60286-3. Films are delivered on reels in compliance with document IEC 286-3 dated 1991.

Minimum quantity is 250 chips.

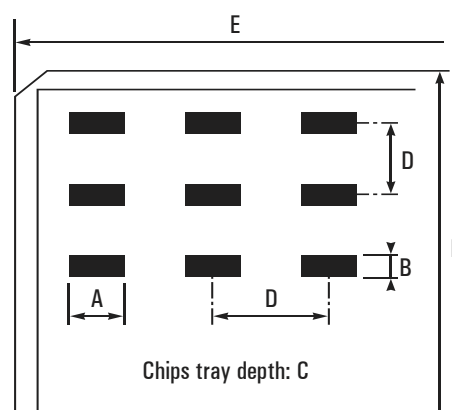
Maximum quantities per reel are as follows:

- Super 8 reel - Ø 180: 2,500 chips.
- Super 8 reel - Ø 330: 10,000 chips.
- Super 12 reel - Ø 180: 1,000 chips.

Reel marking complies with CECC 32100 standard:

- Model.
- Rated capacitance.
- Capacitance tolerance.
- Rated voltage.
- Batch number.

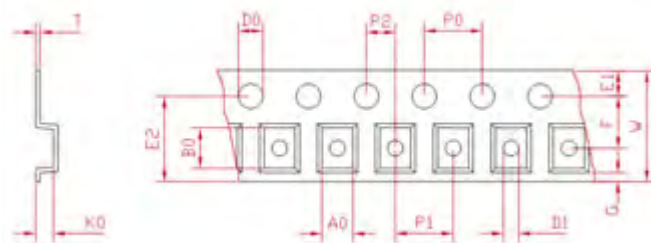
TRAY PACKAGES



DIMENSIONAL CHARACTERISTICS OF CHIPS TRAY PACKAGES

Sizes	Nr. of chips/ package	Oriented chips	Dimensions in inches (in mm)				
			A	B	C	D	E
0402	100	No	0.112 (0.302)		0.065 (1.65)	0.167 (4.24)	2 (50.8)
0403	100	No	0.112 (0.302)		0.065 (1.65)	0.167 (4.24)	2 (50.8)
0504	100	Yes	0.059 (1.5)	0.045 (1.14)	0.035 (0.89)	0.167 (4.24)	2 (50.8)
0603	340	Yes	0.1 (2.54)	0.06 (1.52)	0.045 (1.14)	0.167 (4.24)	2 (50.8)
0805	100	Yes	0.1 (2.54)	0.06 (1.52)	0.045 (1.14)	0.167 (4.24)	2 (50.8)
1206	100	No	0.14 (3.56)	0.14 (3.56)	0.06 (1.52)	0.167 (4.24)	2 (50.8)
1210	100	Yes	0.14 (3.56)	0.14 (3.56)	0.06 (1.52)	0.167 (4.24)	2 (50.8)
1812	100	No	0.25 (6.35)	0.25 (6.35)	0.13 (3.3)	0.345 (8.76)	4 (101.6)
2220	25	Yes	0.24 (6.1)	0.265 (6.73)	0.07 (1.78)	0.345 (8.76)	2 (50.8)
	100	Yes	0.25 (6.35)	0.25 (6.35)	0.13 (3.3)	0.345 (8.76)	4 (101.6)
	25	Yes	0.24 (6.1)	0.265 (6.73)	0.07 (1.78)	0.345 (8.76)	2 (50.8)

HIGH Q CAPACITORS TAPE AND REEL PACKAGING SPECIFICATIONS



Sizes	Type (1)	W±0.3 inches (mm)	F ±0.05 inches (mm)	P1 ±0.1 inches (mm)	T max. inches (mm)	Reel Size inches (mm)	Quantity per Reel
A (0505)	H	0,315 (8)	0,138 (3.5)	0,157 (4)	0,010 (0,25)	7,087 (180)	3'000
A (0505)	V	0,315 (8)	0,138 (3.5)	0,157 (4)	0,010 (0,25)	7,087 (180)	3'000
S (0603)	H	0,315 (8)	0,138 (3.5)	0,157 (4)	0,016 (0,4)	7,087 (180)	4'000
F (0805)	H	0,315 (8)	0,138 (3.5)	0,157 (4)	0,016 (0,4)	7,087 (180)	4'000
B (1111)	H	0,315 (8)	0,138 (3.5)	0,157 (4)	0,012 (0,3)	7,087 (180)	1'000
B (1111)	V	0,315 (8)	0,138 (3.5)	0,157 (4)	0,010 (0,25)	7,087 (180)	1'000
X (2225)	H	0,472 (12)	0,138 (5.5)	0,472 (12)	0,018 (0,45)	12,992 (330)	500
E (4040)	H	0,945 (24)	0,453±0,004 (11.5±0.1)	0,630 (16)	0,018 (0,45)	12,992 (330)	700
E (4040)	V	1,260 (32)	0,559±0,004 (14.2±0.1)	0,945 (24)	0,022 (0,55)	15 (381)	350

(1): Horizontal (H) or Vertical (V) orientation in cavities.

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EIA STANDARD CAPACITANCE VALUES

Following EIA standard, the values and multiples that are indicated in the chart below can be ordered. E48, E96 series and intermediary values are available upon request.

E6 (± 20%)	E12 (± 10%)	E24 (± 5%)
10	10	10
	12	11
		12
15	15	13
		15
	18	16
22	22	18
		20
	27	22
33	33	24
		27
	39	30
47	47	33
		36
	56	39
68	68	43
		47
	82	51
		56
		62
		68
		75
		82
		91

Voltage (V)	Code	Letter code
25	250	A
40	400	B
50	500	C
63	630	D
100	101	E
200	201	G
250	251	H
400	401	K
500	501	L
1,000	102	M
2,000	202	P
3,000	302	R
4,000	402	S
5,000	502	T
7,500	752	U
10,000	103	W

EIA CAPACITANCE CODE

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits are significant figures of the capacitance value and the third digit identifies the multiplier.

For capacitance value < 10pF, R designates a decimal point.

See examples below:

EIA code	Capacitance value		
	in pF	in nF	in µF
2R2	2.2	0.0022	0.0000022
6R8	6.8	0.0068	0.0000068
220	22	0.022	0.000022
470	47	0.047	0.000047
181	180	0.18	0.00018
221	220	0.22	0.00022
102	1,000	1	0.001
272	2,700	2.7	0.0027
123	12,000	12	0.012
683	68,000	68	0.068
124	120,000	120	0.12
564	560,000	560	0.56
335	3,300,000	3,300	3.3
825	8,200,000	8,200	8.2
156	15,000,000	15,000	15
686	68,000,000	68,000	68
107	100,000,000	100,000	100
227	220,000,000	220,000	220

PART MARKING TOLERANCE CODES

Use the following tolerance code chart for part markings:

Tolerance	Letter code
±0.25pF	CU
±0.5pF	DU
±1pF	FU
±1%	F
±2%	G
±5%	J
±10%	K
±20%	M

PART MARKING VOLTAGE CODES

Use the following voltage code chart for part markings: