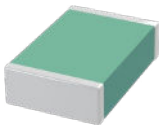
SMD High Voltage Class I

1KV - 15KV

APPLICATIONS

- **Typical uses : timing, precision circuitry, filtering**



RoHS compliant

FEATURES

- **Ultra stable temperature compensating class I ceramic**
- **Custom voltage, package size, capacitance value on request**
- **Tested in accordance to CECC 32100 and AEC-Q200**
- **CECC 30600 et NFC 83-131 compliant**
- **Available in stack or radial**
- **Surface coating can be necessary to prevent surface arcing**

ELECTRICAL PARAMETERS

ELECTRICAL CHARACTERISTICS :
at + 25°C unless otherwise specified

OPERATING TEMPERATURE :
- 55°C, + 125°C

TEMPERATURE COEFFICIENT :
± 30ppm with 0Vdc applied

DISSIPATION FACTOR :
≤ 1.10-3 at 1Vrms and 1MHz for values ≤ 1000pF
≤ 1.10-3 at 1Vrms and 1KHz for values > 1000pF

INSULATION RESISTANCE (IR) :
25°C/Un 10^5 MOhm or 1000 Ohm-Farad whichever is less
125°C/Un 10^4 MOhm or 100 Ohm-Farad whichever is less

DIELECTRIC STRENGTH TEST :
1.2Un for 5s with 50mA max charging current

QUICK REFERENCE DATA

	0805	1206	1210	1808	1812	1825	2220	2225	2825	3640	4040	5440	5550	6660	8060	80150	15080
Min	0.1 pF	0.4 pF	0.4 pF	1.0 pF	1.0 pF	1.0 pF	1.0 pF	1.0 pF	4.7 pF	10 pF	10 pF	10 pF	10 pF	10 pF	10 pF	22 pF	22 pF
1KV	820 pF	2.7 nF	6.8 nF	6.8 nF	15 nF	33 nF	39 nF	47 nF	56 nF	120 nF	120 nF	180 nF	220 nF	330 nF	390 nF	1.0 µF	1.0 µF
1.5KV	330 pF	1.0 nF	2.7 nF	2.7 nF	8.2 nF	18 nF	18 nF	27 nF	33 nF	68 nF	68 nF	100 nF	120 nF	180 nF	220 nF	560 nF	560 nF
2KV	150 pF	560 pF	1.5 nF	1.2 nF	3.9 nF	10 nF	12 nF	15 nF	18 nF	39 nF	47 nF	56 nF	82 nF	120 nF	120 nF	330 nF	330 nF
3KV		180 pF	470 pF	470 pF	1.2 nF	2.7 nF	2.7 nF	3.9 nF	4.7 nF	10 nF	12 nF	15 nF	18 nF	27 nF	33 nF	82 nF	82 nF
4KV		82 pF	220 pF	220 pF	680 pF	1.8 nF	1.8 nF	2.2 nF	3.3 nF	6.8 nF	8.2 nF	10 nF	12 nF	18 nF	22 nF	56 nF	56 nF
5KV				150 pF	390 pF	1.0 nF	1.2 nF	1.8 nF	2.2 nF	4.7 nF	5.6 nF	6.8 nF	8.2 nF	12 nF	15 nF	39 nF	39 nF
8KV				47 pF	120 pF	330 pF	330 pF	390 pF	470 pF	1.0 nF	1.2 nF	1.8 nF	2.2 nF	3.3 nF	3.9 nF	10 nF	10 nF
10KV				22 pF	82 pF	180 pF	220 pF	270 pF	330 pF	680 pF	820 pF	1.2 nF	1.5 nF	2.2 nF	2.7 nF	6.8 nF	6.8 nF
12KV										470 pF	560 pF	820 pF	1.0 nF	1.5 nF	1.8 nF	4.7 nF	4.7 nF
15KV										270 pF	330 pF	470 pF	680 pF	820 pF	1.0 nF	2.7 nF	2.7 nF

ORDERING INFORMATION

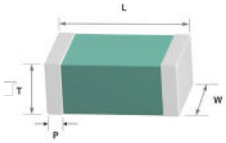
5440	A	101	K	H	X	B	-
SIZE	**DIELECTRIC**	**CAPACITANCE**	**TOLERANCE**	**VOLTAGE**	**TERMINATION**	**PACKAGING**	**SPECIAL PARAMETERS**
0805 1206 1210 1808 1812 1825 2220 2225 2825 3033 3640 4040 4055 5440 5550 6660 8060 80150 15080	A = NPO	Expressed in picofarads (pF). The first two digits are significant, the third digit gives the number of noughts. Example : 102 = 1 000pF For special values R is used as decimal separator Example 12R7 = 12.7pF 1340R0 = 1340pF	A = ±0,05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF/ ±0.5% E = ±0.1% F = ± 1% G = ± 2% J = ± 5% K = ± 10%	G = 1KV Q = 1.5KV H =2KV T = 2.5KV I = 3KV K = 4KV L = 5KV 6 = 6KV 8 = 8KV 10 = 10KV 12 = 12KV 15 = 15KV	X = Nickel Tin F = Palladium-Silver P = Polymer Tin C = Copper Tin W = Nickel Gold Q = Solderable Silver	B = Reel V = Bulk	- BM = BME Dxx = Reliability spec Exx = Sorting spec

For other sizes, voltage, tolerance contact us

DIMENSIONS IN MILLIMETERS

		0805	1206	1210	1808	1812	1825	2220	2225	2825	3640	4040	5440	5550	6660	8060	80150	15080
Length (L)		2.00 ± 0.2	3.20 ± 0.2	3.20 ± 0.2	4.60 ± 0.3	4.60 ± 0.3	4.60 ± 0.4	5.60 ± 0.4	5.60 ± 0.4	7.10 ± 0.4	9.15 ± 0.8	10.20 ± 0.8	13.70 ± 1.0	14.00 ± 1.0	16.80 ± 1.0	20.30 ± 1.0	20.30 ± 1.0	20.30 ± 1.0
Width (W)		1.25 ± 0.2	1.60 ± 0.2	2.50 ± 0.2	2.00 ± 0.2	3.20 ± 0.2	6.35 ± 0.3	5.10 ± 0.4	6.35 ± 0.4	6.35 ± 0.4	10.20 ± 0.8	10.20 ± 0.8	10.20 ± 1.0	12.70 ± 1.0	15.20 ± 1.0	15.20 ± 1.0	38.10 ± 1.0	38.10 ± 1.0
Thickness max (T)		1.40	1.70	2.50	2.20	3.30	3.60	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30
Termination (P)	Min	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
	Max	0.70	0.70	0.80	0.80	0.80	0.80	0.80	1.00	1.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

For P termination (Polymer type) add 0.10mm to Length (L) and 0.05 to Width (W)



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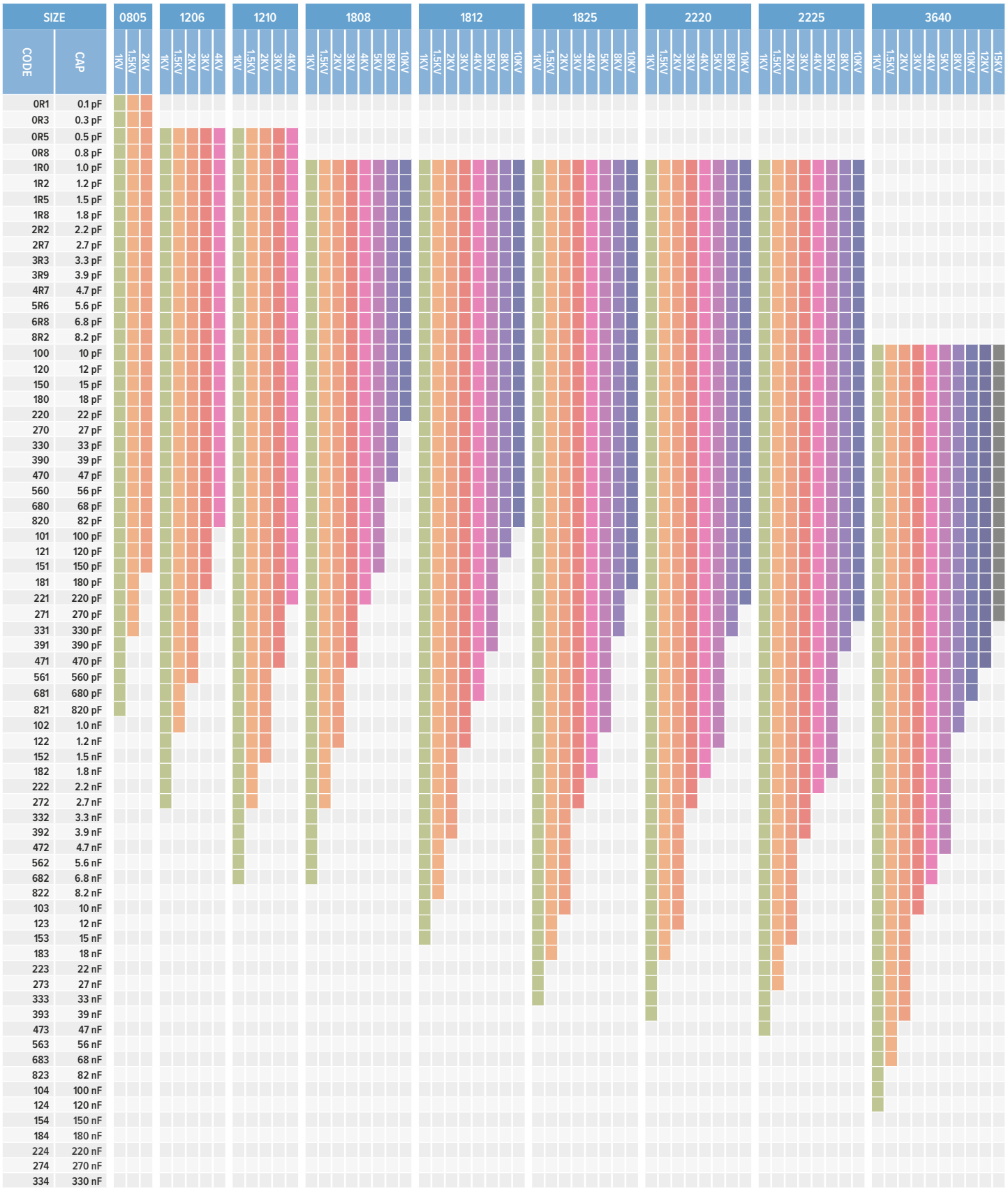
STANDARD SIZE : 0805 to 3640

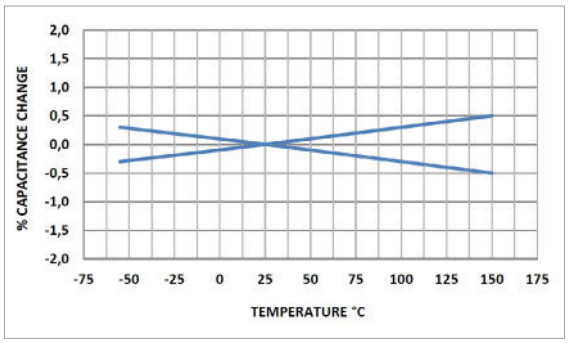


STANDARD SIZE : 4040 to 80150

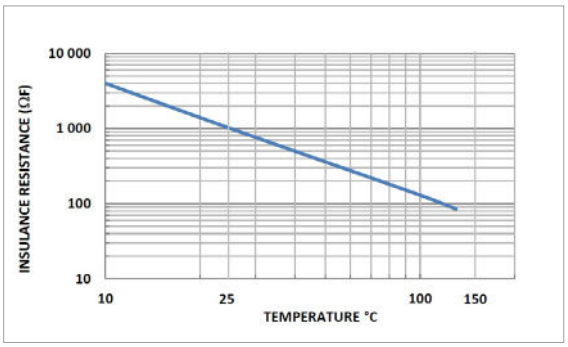
SIZE		4040									5440									5550									6660									8060									80150									SIZE	
CODE	CAP	1KV	1.5KV	2KV	3KV	4KV	5KV	8KV	10KV	12KV	15KV	1KV	1.5KV	2KV	3KV	4KV	5KV	8KV	10KV	12KV	15KV	1KV	1.5KV	2KV	3KV	4KV	5KV	8KV	10KV	12KV	15KV	1KV	1.5KV	2KV	3KV	4KV	5KV	8KV	10KV	12KV	15KV	1KV	1.5KV	2KV	3KV	4KV	5KV	8KV	10KV	12KV	15KV	CAP	CODE
1R2	1.2 pF																																																				1.2 pF	1R2
1R5	1.5 pF																																																				1.5 pF	1R5
1R8	1.8 pF																																																				1.8 pF	1R8
2R2	2.2 pF																																																				2.2 pF	2R2
2R7	2.7 pF																																																				2.7 pF	2R7
3R3	3.3 pF																																																				3.3 pF	3R3
3R9	3.9 pF																																																				3.9 pF	3R9
4R7	4.7 pF																																																				4.7 pF	4R7
5R6	5.6 pF																																																				5.6 pF	5R6
6R8	6.8 pF																																																				6.8 pF	6R8
8R2	8.2 pF																																																				8.2 pF	8R2
100	10 pF																																																				10 pF	100
120	12 pF																																																				12 pF	120
150	15 pF																																																				15 pF	150
180	18 pF																																																				18 pF	180
220	22 pF																																																				22 pF	220
270	27 pF																																																				27 pF	270
330	33 pF																																																				33 pF	330
390	39 pF																																																				39 pF	390
470	47 pF																																																				47 pF	470
560	56 pF																																																				56 pF	560
680	68 pF																																																				68 pF	680
820	82 pF																																																				82 pF	820
101	100 pF																																																				100 pF	101
121	120 pF																																																				120 pF	121
151	150 pF																																																				150 pF	151
181	180 pF																																																				180 pF	181
221	220 pF																																																				220 pF	221
271	270 pF																																																				270 pF	271
331	330 pF																																																				330 pF	331
391	390 pF																																																				390 pF	391
471	470 pF																																																				470 pF	471
561	560 pF																																																				560 pF	561
681	680 pF																																																				680 pF	681
821	820 pF																																																				820 pF	821
102	1.0 nF																																																				1.0 nF	102
122	1.2 nF																																																				1.2 nF	122
152	1.5 nF																																																				1.5 nF	152
182	1.8 nF																																																				1.8 nF	182
222	2.2 nF																																																				2.2 nF	222
272	2.7 nF																																																				2.7 nF	272
332	3.3 nF																																																				3.3 nF	332
392	3.9 nF																																																				3.9 nF	392
472	4.7 nF																																																				4.7 nF	472
562	5.6 nF																																																				5.6 nF	562
682	6.8 nF																																																				6.8 nF	682
822	8.2 nF																																																				8.2 nF	822
103	10 nF																																																				10 nF	103
123	12 nF																																																				12 nF	123
153	15 nF																																																				15 nF	153
183	18 nF																																																				18 nF	183
223	22 nF																																																				22 nF	223
273	27 nF																																																				27 nF	273
333	33 nF																																																				33 nF	333
393	39 nF																																																				39 nF	393
473	47 nF																																																				47 nF	473
563	56 nF																																																				56 nF	563
683	68 nF																																																				68 nF	683
823	82 nF																																																				82 nF	823
104	100 nF																																																				100 nF	104
124	120 nF																																																				120 nF	124
154	150 nF																																																				150 nF	154
184	180 nF																																																				180 nF	184
224	220 nF																																																				220 nF	224
274	270 nF																																																				270 nF	274
334	330 nF																																																				330 nF	334
394	390 nF																																																				390 nF	394
474	470 nF																																																				470 nF	474
564	560 nF																																																				560 nF	564
684	680 nF																																																				680 nF	684
824	820 nF																																																				820 nF	824
105	1.0 µF																																																					

TYPICAL CHARACTERISTICS

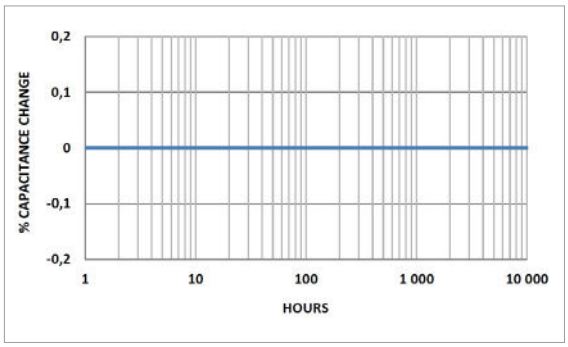
NPO Temperature coefficient of capacitance



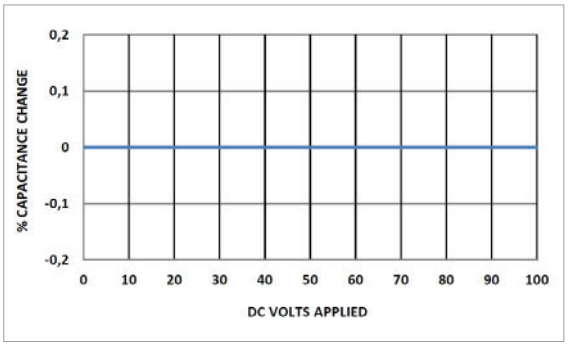
NPO Insulation resistance vs. temperature



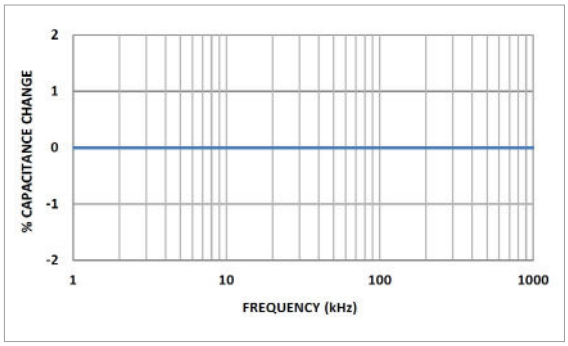
NPO Aging rate



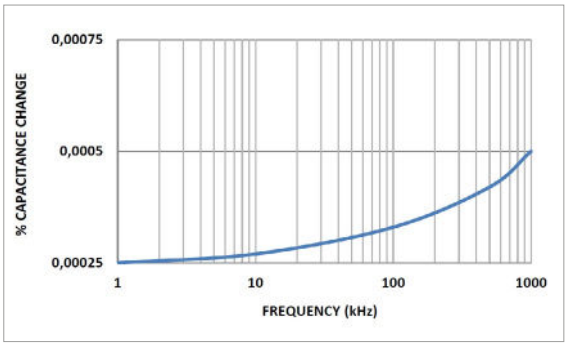
NPO Voltage coefficient of capacitance



NPO Change of Capacitance with Frequency



NPO Dissipation factor vs. frequency



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STORAGE

To preserve the solderability of terminations, observe the following storage conditions :

- Indoors at 5–40°C and 20–70% relative humidity.
- Free from harmful gases (sulfuric acid, ammonia, hydrogen sulfide, chlorine).
- Original sealed packaging until use; re-seal opened packs as soon as possible.

Tape-and-reel products must be stored away from direct sunlight, which can degrade the carrier tape or the cover adhesive.
Use within 12 months from shipment. For longer storage, perform a solderability check before mounting (terminal Sn dipping test per IPC J-STD-002).

HANDLING

MLCCs are dense, hard, brittle ceramic bodies, abrasive against soft materials. They are sensitive to mechanical shock and to PCB bending stress after assembly. Handle with care to avoid cracks, chips, and metallization damage :

- Use plastic or vacuum tweezers. Metal tweezers can scratch the terminations or chip the ceramic edge.
- Do not stack loose parts in trays — chip-against-chip contact during transport produces micro-cracks.
- Tape-and-reel packaging is suitable for automatic pick-and-place equipment.
- For SMD stacks, large case sizes, and radial leaded parts, single-piece handling and dedicated trays are recommended.

After mounting, avoid board flexing during depanelling, tightening, or testing. Chip cracks induced by board bending remain the dominant failure mode in service.

PREHEAT

Preheat brings the entire assembly to a uniform intermediate temperature before solder melting, limiting the thermal gradient at the moment the solder reaches liquidus. The temperature differential between the solder and the component surface (ΔT) must be kept as small as possible.

- Standard ramp-up rate : ≤ 3°C/s.
- Fragile profile ramp-up rate : ≤ 2°C/s.
- The preheat plateau (Tsmin to Tsmax for reflow; Tpre for wave and vapour phase) must be held long enough for the component body to reach equilibrium with the board.

Refer to the applicable profile graph and parameter table.

SOLDERING FLUX

Use mildly activated rosin (RMA) or no-clean (RA without active halides) fluxes. Avoid strongly activated or water-soluble fluxes, which leave corrosive residues incompatible with high-reliability applications.

- Halide content < 0.2 wt% (chlorine equivalent).
- Rosin-based, pH-neutral residues.
- For AgPd terminations (code F), use fluxes free of strong organic acids to limit silver leaching during the time above liquidus.

Solder volume must be controlled to avoid stress between the solder fillet, the component, and the substrate. Excessive solder height transmits board flex directly to the ceramic body and is the most frequent cause of installation cracks.

SOLDERING TYPE

The following solder alloys are compatible with SRT MLCCs:

- SnPb eutectic (Sn63/Pb37, Sn62/Pb36/Ag2) — standard for SnPb terminations (code S). Peak ≤ 215°C.
- Lead-free SAC305 (Sn96.5/Ag3.0/Cu0.5) and equivalent standard for Sn terminations (codes X). Peak ≤ 245°C.
- High-Ag SnPb (≥ 2% Ag) — recommended for AgPd terminations (code F) to limit silver leaching.
- Au-Sn eutectic (Au80/Sn20) — required for bonding gold terminations (code G). Reflow under N_2 atmosphere is mandatory.

For non-magnetic terminations (code C), use SnPb or lead-free SAC305 only.

SOLDERING ATMOSPHERE

SRT MLCCs reflow normally in air. Nitrogen atmosphere (N_2, O_2 ≤ 1000 ppm) is not required but is common practice in high-reliability assembly (space, defense, medical) where it improves solder wetting and limits oxidation, especially in lead-free reflow at high temperatures. Specific termination considerations:

- AgPd terminations (code F) — silver leaching is the primary concern. SRT recommends SnPb solder with ≥ 2% Ag content. N_2 atmosphere is helpful but does not eliminate leaching. For applications requiring no soldering stress, conductive silver epoxy is the preferred attachment method.
- Gold terminations (code G/W) — N_2 atmosphere is recommended to limit gold dissolution in the solder and the growth of brittle $AuSn_4$ intermetallics. Time above liquidus must be minimized.
- Microflex polymer terminations — N_2 recommended to preserve the polymer matrix at peak temperature.

SOLDERING HEIGHT

Solder fillet height must comply with IPC-A-610 (Class 2 or 3 per application) :

- Minimum solder climb on the termination : 25% of chip thickness or 500 µm, whichever is less.
- Maximum solder climb : 100% of chip thickness, not exceeding the top metallization wrap.
- For SMD stacks and radial leaded parts, refer to the part-specific datasheet for recommended footprint dimensions and fillet geometry.

Excessive fillet height transmits PCB bending forces to the ceramic body and is the leading cause of in-service crack failures.

COOLING

After soldering, cool the assembly gradually to room temperature :

- Standard ramp-down rate : ≤ 6°C/s for SnPb reflow, ≤ 4°C/s for lead-free reflow.
- Fragile profile ramp-down rate : ≤ 2°C/s.
- Natural cooling in still air is recommended.
- Forced cooling, immediate fluid immersion, or direct contact with cold surfaces are prohibited — the resulting thermal shock causes ceramic and solder joint cracks.

CLEANING

When a cleaning step is used, all flux residues must be removed to prevent surface electrolytic corrosion. Compatible cleaning processes :

- Vapour-phase or spray cleaning with electronic-grade solvents (semi-aqueous, modified alcohol, or fluorinated).
- Ultrasonic cleaning is acceptable for chip MLCCs, but must be avoided for SMD stacks and radial leaded parts — mechanical resonance of the lead-frame or leadwires can fatigue the solder joint.
- Temperature differential between the assembly and the cleaning fluid : ΔT ≤ 100°C.
- Immersion time ≤ 5 min for vapour solvents, ≤ 2 min for ultrasonic.

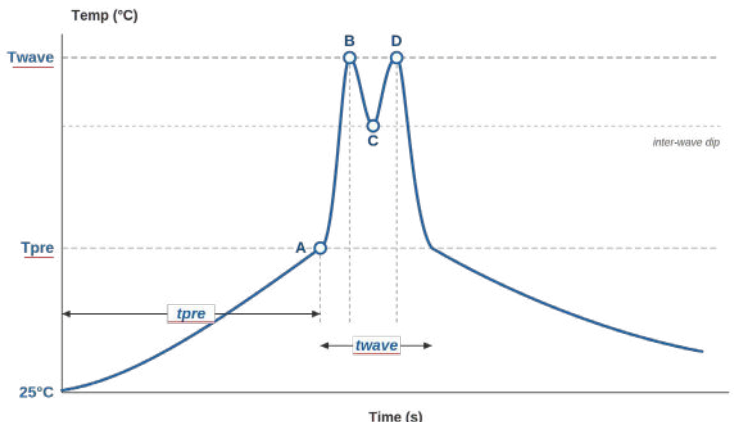
No-clean fluxes leave benign residues and do not require cleaning, provided the chosen flux is qualified for the application's reliability requirements.

SOLDERING CONDITIONS

Product family	wave	Reflow standard	Reflow fragile	Hand soldering [1]
Chip MLCC 0201, 0402, 0505, 0603	✓	✓		✓
Chip MLCC 0805, 1111, 1206, 1210 — t < 1.25 mm	✓	✓		✓
Chip MLCC 0805, 1111, 1206, 1210 — t ≥ 1.25 mm		✓		✓
Chip MLCC 1812, 2220		✓	recommended	✓
Chip MLCC ≥ 2225 (3640 to 80150)			required	with extreme care
EMI filters (≤ 2220)		✓		✓
High compact and SRMC/SRTV stacks ≤ 2220		✓	recommended	✓
SRMC/SRTV stacks > 2220			required	with extreme care
Radial leaded (through-hole)	✓ [2]			✓ [3]

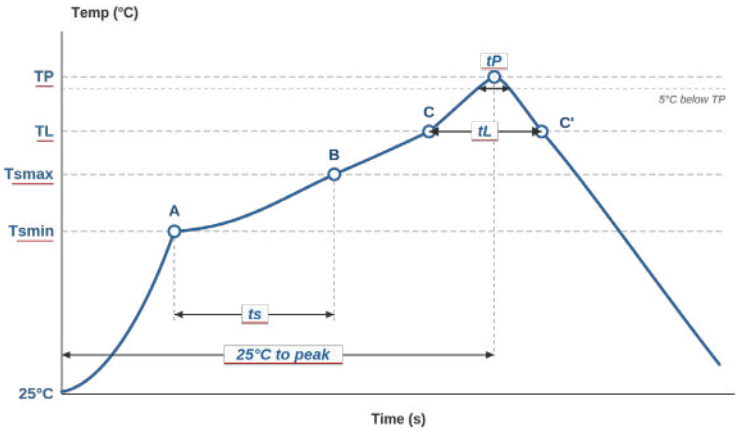
[1] Hand soldering is always a last resort; refer to the Hand soldering section.
[2] Wave possible only for standard radial sizes; preheat to within 100°C of wave temperature.
[3] Mandatory part preheat to 150°C minimum; for HV radials, within 50°C of iron temperature.

WAVE SOLDERING PROFILE



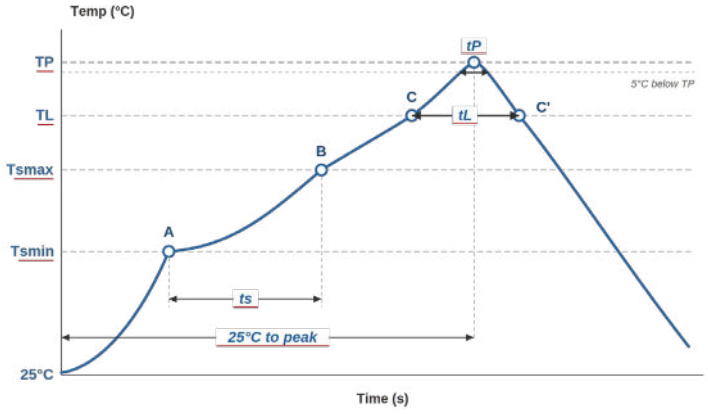
Parameter	Standard
Tpre (A) – bottom-side preheat	100–130°C
Ramp-up to A	≤ 3°C/s
tpre – preheat dwell	60–120 s
Twave (B / D) – wave temperature	235–260°C
Number of waves	2 (turbulent + laminar)
Contact time per wave	1–3 s
twave – total contact time	≤ 10 s
Inter-wave dip (C)	≥ 200°C
Ramp-down rate (forced air)	≤ 4°C/s
Max passes	2
Atmosphere	N_2 recommended for AgPd terminations
Note	Not applicable to fragile parts. Refer to reflow profile.

LEADFREE REFLOW SOLDERING PROFILE (SAC305)



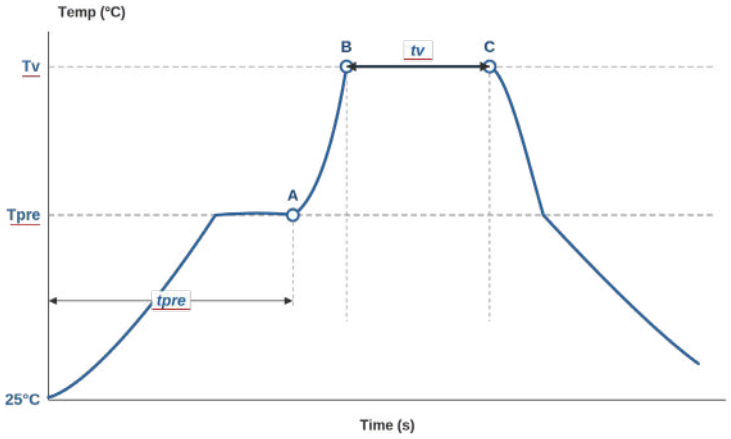
Parameter	Standard	Fragile
Tsmin (A)	150°C	150°C
Tsmax (B)	190°C	190°C
ts (A→B)	60–120 s	≥ 120 s
Ramp-up rate	≤ 3°C/s	≤ 2°C/s
TL (C)	217°C	217°C
tL (C→C')	40–90 s	30–60 s
TP	245°C max	240°C max
tP (within 5°C of TP)	≤ 10 s	≤ 10 s
Ramp-down rate	≤ 4°C/s	≤ 2°C/s
25°C to peak	≤ 8 min	≤ 8 min
Max reflow passes	3	2
Atmosphere	air or N_2	N_2 recommended

SNPB REFLOW SOLDERING PROFILE



Parameter	Standard	Fragile
Tsmin (A)	100°C	100°C
Tsmax (B)	150°C	150°C
ts (A→B)	60–120 s	≥ 120 s
Ramp-up rate	≤ 3°C/s	≤ 2°C/s
TL (C)	183°C	183°C
tL (C→C')	60–90 s	30–60 s
TP	215°C max	215°C max
tP (within 5°C of TP)	≤ 10 s	≤ 10 s
Ramp-down rate	≤ 6°C/s	≤ 2°C/s
25°C to peak	≤ 6 min	≤ 6 min
Max reflow passes	3	2
Atmosphere	air or N_2	N_2 recommended

VAPOUR PHASE REFLOW PROFILE



Parameter	Standard	Fragile
Tpre (A) – preheat plateau	100–130°C	100–130°C
Ramp-up to A	≤ 3°C/s	≤ 2°C/s
tpre – preheat dwell	60–120 s	≥ 120 s
Tv (B / C) – vapor temperature	215°C (SnPb) or 230°C (SAC305)	215°C (SnPb) or 230°C (SAC305)
tv (B→C) – time in vapor	30–60 s	30–45 s
Ramp-down rate (after C)	≤ 4°C/s	≤ 2°C/s
Max reflow passes	3	2
Atmosphere	process vapor (inert)	process vapor (inert)

HAND SOLDERING

Hand soldering is not recommended; localized thermal shock can crack the ceramic body. Hot-air pencil reflow is preferred for rework. When a soldering iron must be used, observe the following procedure :

- Soldering iron tip diameter ≤ 3.0 mm; wattage ≤ 20 W.
- Pre-heat the component to 150°C minimum before iron contact.
- Iron tip temperature ≤ 280°C; contact time ≤ 5 s per termination.
- Pre-tin the iron tip with the required volume of solder; do not feed solder wire onto the part.
- Do not touch the ceramic body directly with the iron tip — apply heat to the termination metallization only.
- After soldering, allow the part to cool gradually at room temperature.
- Forced cooling is not allowed.

For fragile parts (SMD stacks > 2220, case sizes ≥ 2225, radial leaded HV, AgPd or gold terminations), additional precautions apply :

- Preheat the part to within 50°C of the iron tip temperature.
- Total iron contact time ≤ 3 s per termination.
- Single hand-soldering operation only; rework requires part replacement.

RADIAL LEADED SOLDERING

Through-hole radial leaded capacitors are soldered by wave or by hand. Reflow is not applicable to leaded parts — no surface pads are available for solder paste deposition.

For wave soldering of standard radial sizes :

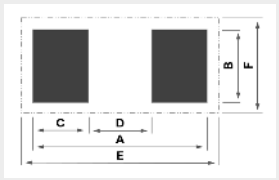
- Preheat the PCB underside to within 100°C of the wave temperature.
- Wave temperature : 235–260°C; total contact time ≤ 10 s.
- Two waves (turbulent + laminar) typically applied.

For high-voltage radials and large lead diameters, wave soldering **is not recommended**. Use hand soldering with the procedure above, including :

- Part preheat to within 50°C of the iron tip temperature.
- Iron contact time ≤ 5 s per lead.
- Allow each lead to cool before soldering the next.

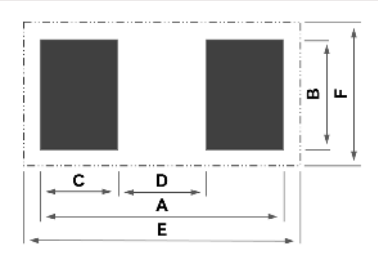
TYPICAL SMD FOOTPRINT WAVE SOLDERING

SIZE	FOOTPRINT DIMENSIONS IN MM					
	A	B	C	D	E	F
0603	2.40	1.00	0.70	1.00	3.10	1.40
0805	3.20	1.30	0.90	1.40	4.10	1.85
1206	4.80	1.80	1.25	2.30	5.90	2.25
1210	4.80	2.70	1.25	2.30	5.90	3.15



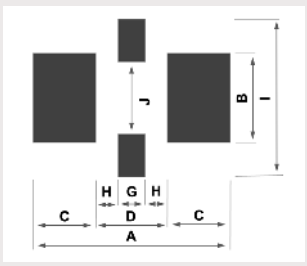
TYPICAL SMD FOOTPRINT REFLOW SOLDERING

SIZE	FOOTPRINT DIMENSIONS IN mm					
	A	B	C	D	E	F
0201	1.00	0.40	0.30	0.40	1.25	0.85
0204	1.00	1.20	0.30	0.40	1.25	1.65
0402	1.50	0.60	0.40	0.70	1.75	1.05
0306	1.30	1.80	0.40	0.50	1.55	2.25
0404	1.50	1.20	0.40	0.70	1.75	1.65
0504	1.90	1.20	0.40	1.10	2.15	1.65
0505	1.90	1.50	0.50	0.90	2.15	1.95
0508	1.90	2.20	0.50	0.90	2.15	2.75
0603	2.30	1.00	0.60	1.10	2.55	1.55
0612	2.30	3.40	0.60	1.10	2.55	3.95
0805	2.90	1.45	0.90	1.10	3.15	2.00
1206	4.10	1.80	0.90	2.30	4.35	2.45
1210	4.10	2.70	1.00	2.10	4.35	3.35
1808	5.50	2.20	1.20	3.10	5.75	2.85
1812	5.50	3.40	1.20	3.10	5.75	4.05
1825	5.50	6.70	1.20	3.10	5.75	7.35
2211	6.80	3.00	1.40	4.00	7.05	3.65
2220	6.80	5.40	1.40	4.00	7.05	6.05
2225	6.80	6.70	1.65	3.50	7.05	7.50
2525	7.70	6.75	1.65	4.40	7.95	7.55
2825	8.40	6.70	1.65	5.10	8.65	7.50
3033	9.00	8.80	1.95	5.10	9.25	9.60
3640	10.55	10.60	2.25	6.05	10.80	11.40
4017	11.60	4.60	2.35	6.90	11.85	5.40
4020	11.60	5.45	2.35	6.90	11.85	6.25
4040	11.60	10.70	2.35	6.90	11.85	11.50
40100	11.60	26.20	2.35	6.90	11.85	27.00
5550	15.50	13.20	2.35	10.80	15.75	14.00
6080	16.70	20.80	2.35	12.00	16.95	21.60
6660	18.30	15.70	2.35	13.60	18.55	16.50
8060	21.90	15.70	2.35	17.20	22.15	16.50
80150	21.90	38.90	2.35	17.20	22.15	39.70
HIGH COMPACT 1210	4.15	2.60	1.15	1.75	5.05	3.30
HIGH COMPACT 1812	5.75	3.40	1.35	2.70	6.70	4.20
HIGH COMPACT 2220	6.80	5.50	1.70	2.80	7.70	6.30



TYPICAL FILTER FOOTPRINT REFLOW SOLDERING

SIZE	FOOTPRINT DIMENSIONS IN mm							
	A	B	C	D	G	H	I	J
0603	2.30	1.00	0.55	1.20	0.60	0.30	1.40	0.60
0805	2.90	1.45	0.70	1.50	0.80	0.35	1.85	1.05
1206	4.10	1.80	0.95	2.20	1.00	0.60	2.20	1.40
1806	5.50	1.80	1.15	3.20	1.50	0.85	2.20	1.40
1812	5.50	3.40	1.15	3.20	1.50	0.85	3.90	3.00
2220	6.80	5.40	1.25	4.30	2.00	1.15	7.20	5.00



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ORDERING INFORMATION

SRMC	-	0603	Y	102	J	A	-	L	040	-	-	-	B	-
SERIE	HT	SIZE	DIELECTRIC	CAPACITANCE	TOLERANCE	VOLTAGE	TERMINAISON	FORM	HEIGHT	LEADS	COATING/ MARKING	CUR-RENT	PACKAGING	SPECIAL
- FK FH SREV MCF M2F MPF SRMC SRHS SRHD SRTV SR SA SF	- H = High Temp	0201 0204 0402 0303 0306 0404 0504 0505 0508 0603 0612 0805 1206 1210 1808 1812 1825 2211 2220 2225 2325 2525 2825 3033 3640 4040 40100 5550 6080 6560 6660 7274 7565 8060 80150 15080 40 to 94	Q = High Q A = NP0 P = N2T X = BX Y=X7R BY=2C1 S = X5R T = X7S R = X6S W = X7T U = Z5U V = Y5V	Expressed in picofarads (pF) The first two digits are significant, the third digit gives the number of noughts Example : 102 = 1 000pF For special values R is used as decimal separator Example 12R7 = 12.7pF 1340R0 = 1340pF	A = ± 0.05pF B = ± 0.1pF C = ± 0,25pF D = ± 0,5pF/0.5% E = ± 0.1% F = ± 1% G = ± 2% J = ± 5% K = ± 10% M = ± 20% Z = -20% +80%	V = 2.5V Y = 4V R = 6.3V Q = 10V J = 16V X = 25V Z = 35V A = 50V U = 63V B = 100V N = 150V C = 200V P = 250V D = 300V E = 500V F = 630V G = 1000V 1K2 = 1200V 1K4 = 1400V O = 1500V 1K7 = 1700V 1K8 = 1800V H = 2000V T = 2500V I = 3000V M = 3600V K = 4000V L= 5000V 6 = 6000V S = 7200V 7K5 = 7500V 8 = 8000V 10 = 10000V 12 =12000V 15 = 15000V	X = Nickel Tin F = Palladium-Silver P = Polymer Tin (Flex) C = Copper Tin (Non magnetic) CP = Copper Polymer Tin (Non magnetic) W = Nickel Gold Flash G = Nickel Gold Thick HP = Dipped SnPb Polymer H = Dipped SnPb S = Dipped SAC SP = Polymer Dipped SAC I = Electrolytic SnPb IP = Polymer Eletrolytical SnPb Q = Solderable Silver - = Tin Plated Lead Frame N = SnPb Plated Lea Frame M = Microstrip A = Axial Ribbon R = Radial Ribbon U = Axial Wire V = Radial Wire CM = Microstrip (Non magnetic) CA = Axial Ribbon (Non magnetic) CR = Radia Ribbon (Non magnetic) CU = Axial Wire (Non magnetic) CV = Radial Wire (Non magnetic)	- J L D M T = 2 leads U = 4 leads JP = plain J Lead	- 020 030 040 050 060 070 080 090 100 110 120 130 140 160 180	- 2 to 10 B	- I = Conformal-Coating H = Epoxy Coating M = Marked R = Resistor	- 1 2	B = Reel V = Bulk T = Tray Package W = Waffle Pack	- BM = BME Dxx = Reliability spec Exx = Sorting spec

RELIABILITY/SCREENING LEVEL

OPTIONAL CODE	TESTING DETAIL
D20	Generic AECQ-200
D55681	DPA & 100% Burn-In Per Group A of MIL-PRF-55681
D123	Group A & B Per MIL-PRF-123
D3009	DPA & 100% Burn-In according to ECSS-3009 for space application
COTS1	Class 1 COTS+ according to ECSS-Q-ST-60-13C-Rev1
COTS2	Class 2 COTS+ according to ECSS-Q-ST-60-13C-Rev1
COTS3	Class 3 COTS+ according to ECSS-Q-ST-60-13C-Rev1
D03	High Temperature application Burn-In 100% 125° 168H 2Un, 6.5% AQL
D05	Burn-In 100% 125° 168H 2Un, less than 5% default allowed VRT CEI 68-2-14 10 cycles 0V -55°C/+125°C, less than 5% default allowed 20 pieces life test 125°C, 1.5Un, 1 default allowed

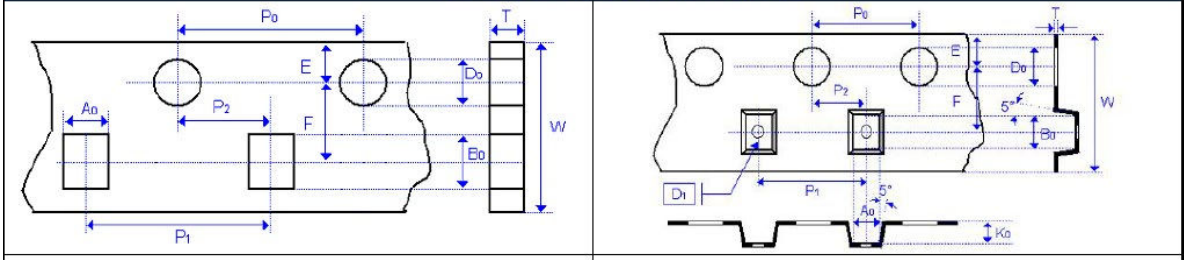
SORTING

OPTIONAL CODE	SORTING DETAIL
E01	2 cells sorting 0 to +2,5 & +2,5 to +5 (% or pF accoding to value)
E02	4 cells sorting -5 to –2,5 ; -2,5 to 0 ; 0 to +2,5 & +2,5 to 5 (% or pF accoding to value)
E21	2% cells

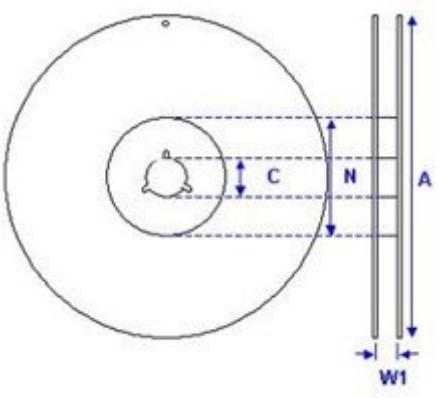
PACKAGE DIMENSION AND QUANTITY

SIZE	THICKNESS	PAPER TAPE		PLASTIC TAPE	
		7 REEL	13 REEL	7' REEL	13 REEL
0201	0.3 ± 0.05	10 K	50 K		
0402	0.5 ± 0.05	10 K	50 K		
0504	0.6 ± 0.05			4K	15K
	0.9 ± 0.05			4K	15K
0603	0.7 ± 0.07	4K		4K	15K
	0.9 ± 0.07	4K	15K	4K	15K
	0.9 ± 0.07			4K	15K
	1.1 ± 0.07			4K	15K
0805	0.8 ± 0.07	4K	15K	4K	15K
	0.9 ± 0.07			4K	10K
	1.1 ± 0.07			3K	10K
	1.3 ± 0.07			3K	10K
1206	1.1 ± 0.1			3K	10K
	1.4 ± 0.1			3K	8K
	1.8 ± 0.1			2K	8K
1210	1.4 ± 0.1			3K	8K
	1.8 ± 0.1			1K	6K
1808	1.4 ± 0.1			3K	8K
1812	1.6 ± 0.1			2K	8K
	2.1 ± 0.1			1K	6K
	2.8 ± 0.1			1K	6K
2220	1.8 ± 0.1			1K	6K
	3.0 ± 0.1			0.5K	2K
2225	3.0 ± 0.1			0.5K	2K
3033	3.0 ± 0.1			0.5K	2K
3640	3.0 ± 0.1			0.5K	2K
5440	3.9 ± 0.1				0.5K - 1K
HIGH COMPACT 1210				1K	6K
HIGH COMPACT 1812				1K	6K
HIGH COMPACT 2220				0.5K	2K

EMBOSSED TAPE DIMENSIONS



REEL SIZE	7	7	13
C	13.0 +0.5/-0.2	13.0 +0.5/-0.2	13.0 +0.7/-0.3
W1	8.4 +1.5/-0	12.4 +2.0/-0	8.4 +2.0/-0
A	178.0 ±0.10	178.0 ±0.10	330.0 ±1.0
N	60.0 ±1.0	80.0 ±1.0	100 ±1.0



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PRODUCTION CONTROL

Comparaison of the Screening/Testing of the standard and High Reliability SRT-Microcéramique components

	TEST/STRESS	STANDARD SMD	STACKS SRMC RADIALS	HIGH TEMPERATURE	IAW ESA-ESCC3009	COTS1	COTS2	COTS3	IAW MIL-PRF-55681 GROUP A	IAW MIL-PRF-123 GROUP A
	CODE			D03	D3009	COTS1	COTS2	COTS3	D55681	D123
	SCOPE	**PME MLCC X7R, BX, NPO, N2T, High Q**	**Encapsulated, Dipped radial and Stacks SRMC**	**Type 1, Type 2 Chips**	**SRT PME BME, Radials, Stacks, X7R, BX, N2T, NPO, High Q**	**Class 1 BME Chips**	**Class 2 BME Chips**	**Class 3 BME Chips**	**SRT PME BME X7R, NPO, BX, N2T, High Q**	**SRT PME BME X7R, BX, NPO, N2T, High Q**
PROCESS / SCREENING	**Burn-In**		100% Chips 24H +Stack 48H Tmax 2Un PDA 6.5%	100% 168H Tmax 2Un PDA 6.5%	100% 96H Tmax 2Un PDA 5%	100% 96H Tmax 2Un PDA 5%	100% 96H Tmax 2Un PDA 5% for non AEC-Q200	100% 96H Tmax 2Un PDA 5% for non AEC-Q200	100% 100H Min Tmax 2Un PDA 8%	100% 168H Min 0.1%/1pc last 48H 125°C 2Un PDA 5%
	Capa, DF, IR, VP (25°C)	100%	100%	100%	100%	100%	100%	100%	100%	100%
	IR (125°C)								Sample	Sample
	Voltage Breakdown	10 pcs/lot	10 pcs/lot	10 pcs/lot	10 pcs/lot	10 pcs/lot	10 pcs/lot	10 pcs/lot	10 pcs/lot	10 pcs/lot
	Dimension	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot
	DPA	per lot	per lot	per lot	per lot	per lot	per lot	per lot	per lot	per lot
	Visual	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Solderability	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot
	Leaching	5 pcs/lot	5 pcs/lot	5 pcs/lot	6 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot
	Termination thickness	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot	5 pcs/lot
	TC	per ceramic lot	per ceramic lot	per ceramic lot	per ceramic lot and in LAT	in LAT	in LAT	in LAT	per ceramic lot	per ceramic lot
	LAT	**On request**	**On request**	**On request**	**Flying Part**	**Flying part**	**Flying part**	**Flying part**	**On request**	**On request**
LAT SUBGROUP 1	**Mounting**				20 serialized pcs on PCB					
	Thermal Shock				10 Cycles 30mn/1mn					
	Humidity				For Un<500V 1000h 85/85					
	Criteria				No visual/electrical default					
LAT SUBGROUP 2A	**Mounting**				20 serialized pcs on PCB	20 serialized pcs on PCB	20 serialized pcs on PCB	20 serialized pcs on PCB for non AEC-Q200		
	Operationnal Life				1000h ±24 125°C 2Un Un<500V 1.5Un Un=500V 1.3Un 500V<Un≤1250V 1Un Un>1250V	1000h ±24 max T° 2Un Un<500V 1.5Un Un=500V 1.3Un 500V<Un≤1250V 1Un Un>1250V	1000h ±24 max T° 2Un Un<500V 1.5Un Un=500V 1.3Un 500V<Un≤1250V 1Un Un>1250V	1000h ±24 Max T° 2Un Un<500V 1.5Un Un=500V 1.3Un 500V<Un≤1250V 1Un Un>1250V		
	Criteria				No visual/electrical default	No visual/electrical default	No visual/electrical default	No visual/electrical default		
LAT SUBGROUP 2B	Mounting				6 serialized pcs on PCB	6 serialized pcs on PCB non AEC-Q200				
	TC				IR at 125°C Cp at -55°C/20°C+125°C	IR at 125°C Cp at -55°C/20°C+125°C				
	Shear Test				5N 10s	5N 10s				
	Criteria				No visual/electrical default	No visual/electrical default				
LAT SUBGROUP 3	Mounting				6 pcs serialized	6 pcs serialized				
	Solderability				Solder bath 235°C 5s included in screening	Solder bath 235°C 5s included in screening				
	Permanence of Marking				ESCC24800 when applicable	ESCC24800 when applicable				
	Criteria				No visual/electrical default	No visual/electrical default				
	Thermal Cycle (optional)									
	Ultrasonic, Xray (optional)									

- **All components components can be proposed with SbPb termination (electrolytical I or Dipped H) with 5% min Pb for whisker mitigation**
- **Standard NiSn Termination is qualified according to JDEC JESD201A regarding whisker mitigation**
- **Other termination availabe Silver Palladium F, Solderable Silver Q, Thick Gold G, Flash Gold W, Non Magnetic Copper C, Polymer option P**
- **ECSS COTS framework is used to propose space ready components Class 1 to 3 based on SRT or customer chosen BME chips either AEC-Q200 (prefered) or non AEC-Q200. Size can start from 0201 and resistors can also be proposed and termination be changed.**
- **Specific High Reliability programs can be established to fit customer requirement for medical, defense, space, high stress applications.**

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RELIABILITY PRINCIPLES OVERVIEW GENERAL PRODUCTION

In order to guarantee highly reliable products to their customers, SRT-Microcéramique follows a strict quality policy which is explained below :

- According to AECQ philosophy, each component belongs to a family, which most restrictives members (four corners) have been fully qualified.
- PME components are produced in our Vendôme facility, with very stable process and equipments, in order to ensure Reliability and reproductibility.
- Reliability is based on batch tests, new product or equipment-specific qualifications and periodic requalifications.
- In addition to those regular tests, our quality departement launches regular accelerated tests to further deepens our reliability datas.
- Tests and qualifications of our standard products are based on AECQ methodology and are qualified according to the following limits.
- In accordance to AECQ methodology, specifics tests and limits can be adapted to fit our clients' needs.
- A whole range of stricter reliability tests can be offered for high Reliability products (burn-in, shocks, pulses...) for medical, space and defense applications.
- Based on our reliability database, FIT datas can be provided if necessary.

PRODUCTION CONTROL

Test conducted on each lot according to AECQ-200 framework

FREQUENCY	TEST/STRESS	REFERENCE	AEC-Q	DETAIL
100%	Capa, DF, IR	CECC-32100-4.6		according to datasheet
100%	Visual	CECC-32100-4.5	AEC-Q200-9	no visual defects
50/lot	DPA	SRT QC1302	AEC-Q200-5	internal component integrity
5/lot	Dimension	CECC-32100-4.5	AEC-Q200-5	according to datasheet
5/lot	Solderability	CECC-32100-4.11	AEC-Q200-18	0 fail
5/lot	Leaching	SRT QC1105		0 fail
5/lot	Termination Thickness	SRT QC1108		0 fail
10/lot	Voltage Breakdown	CECC-32100-4.6.4		0 fail
1/ceramic lot	Temperature coefficient	CECC 32100-Prgph4,7		according to datasheet

QUALIFICATIONS

Each component family has been qualified according to CECC and AECQ tests methodology, which are renewed on a periodic basis.

FREQUENCY	TEST/STRESS	REFERENCE	AEC-Q	DETAIL
Qualif	Electrical Characterization	CECC-32100-4.6 4.7	AEC-Q200-19	measure before test according to datasheet and after test according to post environmental limits
Qualif	Temperature Cycling	JESD22 Method-JA method 104	AEC-Q200-4	1,000 cycles -55°C to +125°C Measurement at 24 ± 2 hours after test conclusion
Qualif	Biased Humidity	MIL-STD-202 Method 103	AEC-Q200-7	1,000 hours 85°C/85%RH. Rated voltage. Measurement at 24 ± 2 hours after test conclusion
Qualif	Operational Life	MIL-STD-202 Method 108 condition D	AEC-Q200-8	1,000 hours at 125°C with apllied Voltage : 2xRV RV≤500V, 1.2xRV 500V<RV≤1250V, RV RV>1250V
Qualif	Terminal Strength	CECC-32100-4.8	AEC-Q200-6	1.8kg 60 seconds
Qualif	Vibration	MIL-STD-202 Method 204	AEC-Q200-14	5g 20min 12cycles 3 orientations 10-2000Hz
Qualif	Board Flex	CEC 32100-4.9	AEC-Q200-21	3mm Type 1, 2mm Type 2, Measurement at 24 ± 2 hours after test conclusion

POST ENVIRONMENTAL STRESS LIMIT

DIELECTRIC	DISSIPATION FACTOR (MAXIMUM)	CAPACITANCE SHIFT	INSULATION RESISTANCE
NPO	≤ 4 10-3	±2%	10% initial limit
N2T	≤ 6 10-3	±4%	10% initial limit
X7R	≤ 0.035	±15%	10% initial limit

SPACE LEVEL COMPONENT SCREENED AND QUALIFIED ACCORDING TO ESCC-3009

SRT-Microcéramique can propose a wide range of BME and PME component from its catalog qualified and tested according to ESCC-3009 Revision 5 specifications for space applications. Both for development en evaluation and flight ready with full lot validation and ESCC standard documentation. Specific qualification programms can be included to meet final customer requirement.
SRT manufactured PME with standard production control or requalified source BME components directly or after termination change or mounting enter the following screening process :

SCREENING D3009

FREQUENCY	TEST/STRESS	REFERENCE	DETAIL
100%	Voltage conditioning	IEC Publication No. 60384-1 clause 4.23	100% 96H Tmax 2Un PDA 5%
100%	Capa, DF, IR, VP (25°C)	ESCC3009 Chart F3	According to datasheet
5/Lot	High and Low Temperatures Electri-	ESCC3009 Chart F3	According to datasheet, 0 fail or 100%
5/lot	Dimension	ESCC Basic Specification No. 20500	According to datasheet (done in manufacturing, requalification process)
5/lot	DPA	ESCC Basic Specification No. 23400	Internal component integrity
100%	Visual	ESCC Basic Specification Nos. 20400 and 20500	No defect
5/lot	Solderability	IEC Publication No. 60068-2-58	0 fail

LOT VALIDATION D3009

GROUP	NB PCS	TEST/STRESS	REFERENCE	DETAIL
SUBGROUP 1	20	**Mounting**	ESCC3009 8.6	20 serialized pcs on PCB
		Thermal Shock	ESCC3009 8.7, IEC No. 60068-2-14	10 Cycles 30mn/1mn
		Humidity	ESCC3009 8.2	For Un<500V 1000h 85/85 Un≥500V not applicable
		Criteria	ESCC3009	No visual/electrical default
SUBGROUP 2A	40	**Mounting**	ESCC3009 8.6	40 serialized pcs on PCB
		Operationnal Life	ESCC3009 Chart F4, IEC No. 60384-1 clause 4.23.	1000h ±24 125°C (optionnal 2000h) 2U U<500V I 1.5U 500≤U<1000 I 1.2U 1000≤U≤2000 I 1U U>2000
		Criteria	ESCC3009	No visual/electrical default
SUBGROUP 2B	6	Mounting	ESCC3009 8.6	6 serialized pcs on PCB
		TC	ESCC3009 8.10	IR at 125°C, CP at -55°C/25°C/125°C
		Shear Test	ESCC3009 8.7, IEC No. 60384-1	5N 10s
		Criteria	ESCC3009	No visual/electrical default
SUBGROUP 3	6	Solderability	ESCC3009 8.11, IEC No. 60068-2-58	Solder bath 235°C 5s ncluded in screening
		Permanence of Marking	ESCC3009 8.12	ESCC24800 when applicable
		Criteria	ESCC3009	No visual/electrical default

LAT3=LVT3 = Subgroup 3/LAT2=LVT2 = Subgroup 2A + Subgroup 2B + Subgroup 3/LAT1=LVT1 = Subgroup 1 + Subgroup 2A + Subgroup 2B + Subgroup 3

SPACE LEVEL COMPONENT SCREENED ACCORDING TO COTS+ ECSS-Q-ST-60-13C-REV1

SRT-Microcéramique can apply the COTS+ qualification framework to any suitable component AEQ-200 or not, with or without termination change, to make them fly ready, offering a wide range of possibilities at competitive cost, either in Class 1 (COTS1), Class 2 (COTS2) or Class 3 (COTS3).

EVALUATION/SCREENING/LAT COTS1/COTS2/COTS3

Class 1 (COTS1), Class 2 (COTS2), Class 3 (COTS3)

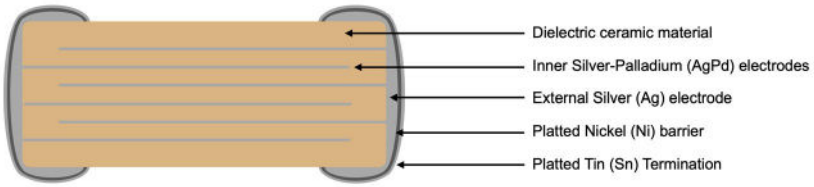
AECQ-200	CLASS 1	CLASS 2	CLASS 3	CATEGORY	TEST TYPE	SAMPLE	PROCEDURE
Yes	X	X	X	Evaluation	Construction Analysis	5	ESCC21001
Yes	X	X	X	Evaluation	Temperature characterization	5	ESCC3009 8.10
Yes	X			Evaluation	Life Test 2000h	40	ESCC3009 8.6 + 8.9
Yes	X			Screening	Complete screening	100%	ESCC3009 chart F3
Yes	X	X	X	LAT	DPA	3	ESCC21001
Yes	X	X		LAT	Life Test 1000h	20	ESCC3009 8.6 + 8.9
No	X	X	X	Evaluation	Construction Analysis	5	ESCC21001
No	X	X	X	Evaluation	Temperature characterization	5	ESCC 3009 8.10
No	X	X		Evaluation	Complete evaluation	72	ESCC 3009 chart F4
No			X	Evaluation	Life Test 1000h	40	ESCC3009 8.6 + 8.9
No	X	X	X	Screening	Complete screening	100%	ESCC3009 chart F3
No	X	X	X	LAT	DPA	3	ESCC21001
No	X			LAT	Complete LAT	52	ESCC 3009 chart F4
No		X	X	LAT	Life Test 1000h	20	ESCC3009 8.6 + 8.9

TINNING

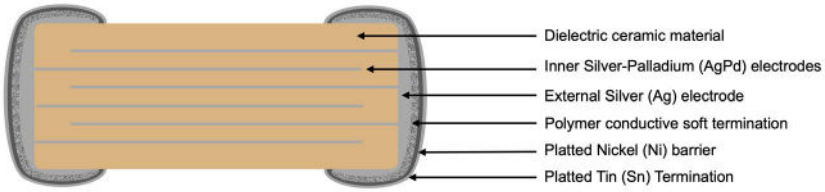
All component for space application can be proposed with dipped SnPb termination (Sn62 Pb36 Ag2) or SAC 305 (Sn96.5 Ag3 Cu0.5) for maximum reliability and whiskers avoidance.

This document is subject to change without notice.

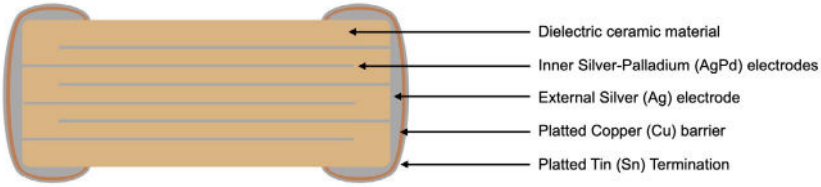
PME (Precious Metal Electrodes)



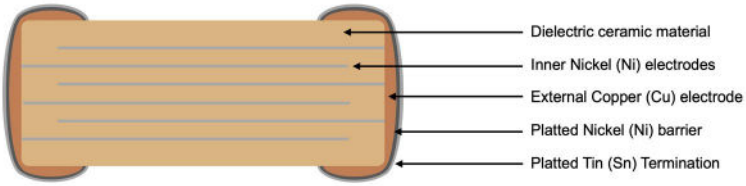
PME (Precious Metal Electrodes) Polymer Soft Termination



PME (Precious Metal Electrodes) Non Magnetic



BME (Basis Metal Electrodes) code BM



BME (Basis Metal Electrodes) code BM Polymer Soft Termination