

High Capacitance capacitors

X7R X7S X6S X5R X7T Series



SRT
MICROCÉRAMIQUE
MLCC CAPACITORS

APPLICATIONS

- Digital circuit coupling/decoupling
- High frequency & high-density type power suppliers
- For bypassing
- Ideal for smoothing circuits
- Suitable for DC-DC converter, personal computer and peripherals, telecommunication and general electronic equipment



RoHS compliant



FEATURES

- Realize high capacitance in small sizes
- Basis Metal Electrode
- RoHS and HALOGEN compliant
- Surface mount suited for wave and reflow soldering
- High reliability and no polarity
- Excellent in high frequency characteristics
- Various termination available
- AEC-Q200 range can be proposed in High Reliability

ELECTRICAL PARAMETERS

ELECTRICAL CHARACTERISTICS :
at + 25°C unless otherwise specified

OPERATING TEMPERATURE :
X7R, X7S, X7T : - 55°C, + 125°C
X6S : - 55°C, + 105°C
X5R : - 55°C, + 85°C

TEMPERATURE COEFFICIENT :
X7R : ±15% with 0Vdc applied
X7S : ±22% with 0Vdc applied
X7T : +22% -33% with 0Vdc applied
X6S : ±22% with 0Vdc applied
X5R : ±15% with 0Vdc applied

DISSIPATION FACTOR :
cf Table

INSULATION RESISTANCE (IR) :
25°C/Un 10⁴ MOhm or 500 Ohm-Farad whichever is less
Except ° table 25°C/Un 10⁴ MOhm or 100 Ohm-Farad whichever is less
Except ° table 50 Ohm-Farad

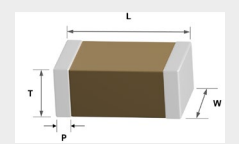
DIELECTRIC STRENGTH TEST :
2.5Un for 5s with 50mA max charging current

QUICK REFERENCE DATA (MAX)

	0201			0402			0603			0805			1206				1210											
	X7S	X6S	X5R	X7R	X7S	X7T	X6S	X5R	X7R	X7S	X7T	X6S	X5R	X7R	X7S	X7T	X6S	X5R	X7R	X7S	X6S	X5R	X7R	X7S	X7T	X6S	X5R	
2.5V											22µF				47µF													330µF
4V	1.0µF	2.2µF		2.2µF		10µF	22µF	22µF	10µF			47µF		22µF			100µF	100µF	22µF		220µF	220µF	47µF				220µF	330µF
6.3V	1.0µF		4.7µF	2.2µF		4.7µF	10µF	22µF	10µF		10µF	22µF	47µF	22µF			47µF	100µF	22µF	47µF	47µF	220µF	47µF	100µF	100µF	100µF	220µF	
10V		1.0µF		2.2µF	2.2µF	4.7µF	4.7µF	10µF	10µF		10µF	10µF	22µF	10µF	22µF	22µF	22µF	47µF	22µF		47µF	100µF	47µF	47µF			47µF	100µF
16V			2.2µF			2.2µF	2.2µF	4.7µF	2.2µF	4.7µF		10µF	22µF	10µF			22µF	22µF	22µF	22µF	22µF	47µF	22µF				47µF	100µF
25V						1.0µF	2.2µF	2.2µF	2.2µF		10µF	10µF	4.7µF	10µF			10µF	22µF	10µF		22µF	22µF	22µF					47µF
35V							2.2µF	1.0µF				2.2µF	10µF	4.7µF			10µF	22µF	10µF		10µF	10µF	10µF					
50V								1.0µF	1.0µF				2.2µF	4.7µF			4.7µF	10µF			4.7µF	10µF	10µF					
100V											1.0µF			1.0µF	1.0µF	2.2µF					4.7µF							

DIMENSIONS IN MILLIMETERS

	0201	0402	0603	0805	1206	1210
Length (L)	0.60 ± 0.05 (0.09 C>1.0µF)	1.00 ± 0.10	1.60 ± 0.20	2.00 ± 0.20	3.20 ± 0.20	3.20 ± 0.30
Width (W)	0.30 ± 0.05 (0.09 C>1.0µF)	0.5 ± 0.10	0.80 ± 0.20	1.25 ± 0.20	1.60 ± 0.20	2.50 ± 0.30
Thickness max (T)	0.33	0.70	0.95	1.45	1.90	2.80
Termination (P)	Min	0.10	0.15	0.30	0.40	0.40
	Max	0.20	0.30	0.55	0.70	1.10



ORDERING INFORMATION

0805	T	475	M	X	X	B	BM	
SIZE	DIELECTRIC	CAPACITANCE	TOLERANCE	VOLTAGE	TERMINATION	PACKAGING	BME	SPECIAL PARAMETERS
0201 0402 0603 0805 1206 1210	Y = X7R T = X7S W = X7T R = X6S S = X5R	Expressed in picofarads (pF). The first two digits are significant, the third digit gives the number of noughts. Example : 102 = 1 000pF	K = ±10 % M = ±20 %	V = 2.5V Y = 4V R = 6.3V Q = 10V J = 16V X = 25V Z = 35V A = 50V B = 100V	X = Nickel Tin P = Polymer W = Nickel Gold Flash G = Nickel Gold Thick H = Dipped SnPb S = Dipped SAC I = Electrolytic SnPb Q = Solderable Silver	B = Taping Reel V = Bulk	BM = BME	- Dxx = Reliability spec D20 = AEC-Q200

This document is subject to change without notice.

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DF TABLE : X7R/X7S/X7T/X6S/X5R

Rated	D.F.≤	Exception of D.F.≤	
100V	≤2.5%		
50V	≤2.5%	≤3.5%	1206<2.2μF, 1210≥2.2μF, 1812≥4.7μF
		≤5%	0201, 1210≥4.7μF
		≤10%	0402, 0603, 0805, 1206≥2.2μF, 1210≥10μF
35V	≤10%		
25V	≤3.5%	≤5%	0805, 1210≥10μF
		≤10%	0201, 0603, 0805≥2.2μF, 1206≥2.2μF, 1210≥22μF
		≤12.5%	0402
16V	≤3.5%	≤5%	0805<2.2μF, 1206≥2.2μF, 1210≥4.7μF
		≤10%	0201, 0402, 0603, 0805≥2.2μF, 1206≥4.7μF, 1210≥22μF
		≤15%	0603<10μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥22μF
10V	≤5%	≤10%	0201, 0402, 0603≥10μF
		≤15%	
		≤20%	0201, 0402<2.2μF, 0603≥10μF, 0805≥4.7μF, 1206≥4.7μF, 1210≥100μF
6.3V	≤10%		
4V	≤15%		

THICKNESS CODE :

Code	Thickness (mm)
C	0.30±0.04
E	0.50±0.05
G	0.50±0.20
J	0.80±0.07
K	0.80±0.10
M	0.95±0.10
O	1.15±0.15
P	1.25±0.10
Q	1.25±0.20
T	1.60±0.20
U	1.70±0.20
W	2.00±0.20
X	2.25±0.25
Y	2.50±0.30

X7R

CODE	SIZE	CAP	0402		0603					0805					1206					1210										
			4V	10V	6.3V	10V	16V	25V	35V	50V	6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	35V	50V	100V	6.3V	10V	16V	25V	50V	63V	100V
105	1.0 μF	J	J	J	J	J	J	J	J	J	P	P	P	P	O	O	O	O	T	T	T	T	P	P	P	Y	W	Y	Y	
155	1.5 μF										O	O	O	O	O	O	O	O	T	T	T	T	T	T	T	T	Y	Y	Y	
225	2.2 μF	J	J	J	J	J	J				O	O	O	O	O	O	O	O	T	T	T	T	T	T	T	Y	Y	Y	Y	
335	3.3 μF										O	O	O	O	O	O	O	O	T	T	T	T	T	T	T	Y	Y	Y	Y	
475	4.7 μF			J	J						O	O	O	O	O	O	O	O	T	T	T	T	T	T	W	W	W	Y	Y	Y
685	6.8 μF			J	J						O	O	O	O	O	O	O	O	T	T	T	T	T	T	W	W	W	Y	Y	Y
106	10 μF			J	J						O	O	O						T	T	T	T	T		W	W	W	Y	Y	Y
226	22 μF										O								T	T	T				Y	Y	Y	Y	Y	
476	47 μF																							Y	Y					
107	100 μF																													

Yellow : AECQ-200, White : Industrial

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X7S

SIZE	0201		0402		0603			0805			1206		1210	
	CODE	CAP	4V	6.3V	10V	16V	25V	10V	25V	100V	6.3V	16V	6.3V	10V
105	1.0 µF	C ^{***}	C ^{***}							G [°]				
155	1.5 µF													
225	2.2 µF			G [°]	G [°]		K [°]	K [°]						
335	3.3 µF													
475	4.7 µF					K [°]	K [°]							
685	6.8 µF													
106	10 µF								G [°]					
226	22 µF									O [°]		U ^{***}		
476	47 µF										U ^{***}		Y ^{***}	
107	100 µF												Y ^{***}	
227	220 µF													

Yellow : AECQ-200, White : Industrial

* : tolerance M only, ° : RC≥10⁴ MOhm or 100 Ω/F whichever is less, °° : RC≥50 Ω/F

X7T

SIZE	0402		0603				0805			1210					
	CODE	CAP	4V	6.3V	10V	16V	2.5V	6.3V	10V	50V	100V	2.5V	10V	100V	6.3V
105	1.0 µF									K [°]	K [°]				
155	1.5 µF														
225	2.2 µF													G [°]	
335	3.3 µF														
475	4.7 µF														
685	6.8 µF														
106	10 µF									G [°]		K [°]	K [°]		O [°]
226	22 µF											K [°]			
476	47 µF														O [°]
107	100 µF														
227	220 µF														Y ^{***}

X6S

SIZE	0201		0402				0603					0805					1206					1210										
	CODE	CAP	4V	10V	4V	6.3V	10V	16V	25V	35V	50V	4V	6.3V	10V	16V	25V	35V	50V	4V	6.3V	10V	16V	25V	35V	50V	2.5V	4V	6.3V	10V	16V		
105	1.0 µF		C ^{***}																													
155	1.5 µF																															
225	2.2 µF		C [°]																													
335	3.3 µF																															
475	4.7 µF					G [°]	G [°]																									
685	6.8 µF																															
106	10 µF																															
226	22 µF					G [°]																										
476	47 µF																															
107	100 µF																															
227	220 µF																															
330	330 µF																															

Yellow : AECQ-200, White : Industrial

* : tolerance M only, ° : RC≥10⁴ MOhm or 100 Ω/F whichever is less, °° : RC≥50 Ω/F

X5R

SIZE	0201		0402					0603					0805					1206					1210									
	CODE	CAP	6.3V	10V	16V	4V	6.3V	10V	16V	25V	35V	50V	6.3V	10V	16V	25V	35V	50V	4V	6.3V	10V	16V	25V	35V	50V	4V	6.3V	10V	16V	25V	50V	
105	1.0 µF		C ^{***}	C ^{***}	C ^{***}	G [°]	G [°]	G [°]	E [°]	E [°]	E [°]	G [°]																				
155	1.5 µF																															
225	2.2 µF				C ^{***}	T [°]	T [°]	E ^{***}	G ^{***}	G ^{***}	G ^{***}																					
335	3.3 µF																															
475	4.7 µF																															
685	6.8 µF																															
106	10 µF																															
226	22 µF																															
476	47 µF																															
107	100 µF																															
227	220 µF																															
330	330 µF																															

Yellow : AECQ-200, White : Industrial

* : tolerance M only, ° : RC≥10⁴ MOhm or 100 Ω/F whichever is less, °° : RC≥50 Ω/F

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 depaneling, 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 : $\leq 3^\circ\text{C/s}$.
- Fragile profile ramp-up rate : $\leq 2^\circ\text{C/s}$.
- The preheat plateau (T_{min} to T_{max} for reflow; T_{pre} 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 $\leq 215^\circ\text{C}$.
- Lead-free SAC305 (Sn96.5/Ag3.0/Cu0.5) and equivalent standard for Sn terminations (codes X). Peak $\leq 245^\circ\text{C}$.
- High-Ag SnPb ($\geq 2\%$ 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 N₂ 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 (N₂, O₂ ≤ 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 $\geq 2\%$ Ag content. N₂ 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) — N₂ atmosphere is recommended to limit gold dissolution in the solder and the growth of brittle AuSn₄ intermetallics. Time above liquidus must be minimized.
- Microflex polymer terminations — N₂ 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 : $\leq 6^{\circ}\text{C/s}$ for SnPb reflow, $\leq 4^{\circ}\text{C/s}$ for lead-free reflow.
- Fragile profile ramp-down rate : $\leq 2^{\circ}\text{C/s}$.
- 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 : $\Delta T \leq 100^{\circ}\text{C}$.
- 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

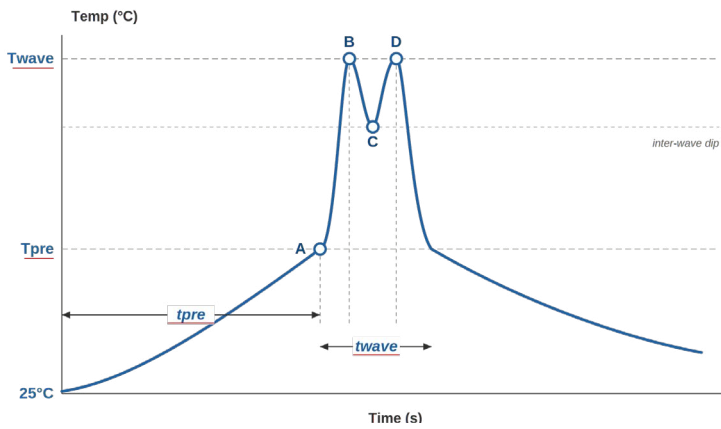
Product family	wave	Reflow standard	Reflow fragile	Hand soldering ¹
Chip MLCC 0201, 0402, 0505, 0603	✓	✓		✓
Chip MLCC 0805, 1111, 1206, 1210 – $t < 1.25$ mm	✓	✓		✓
Chip MLCC 0805, 1111, 1206, 1210 – $t \geq 1.25$ mm		✓		✓
Chip MLCC 1812, 2220		✓	recommended	✓
Chip MLCC ≥ 2225 (3640 to 80150)			required	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.

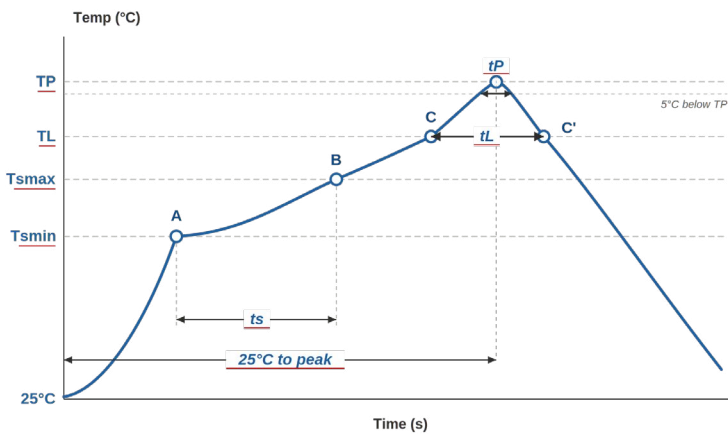
³ Mandatory part preheat to 150°C minimum; for HV radials, within 50°C of iron temperature.

WAVE SOLDERING PROFILE



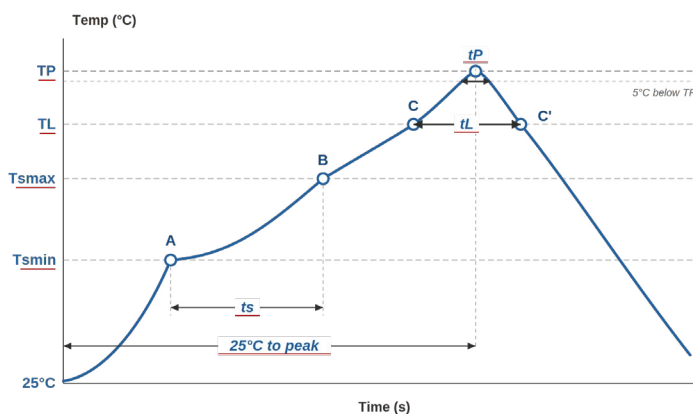
Parameter	Standard
Tpre (A) – bottom-side preheat	100–130°C
Ramp-up to A	≤ 3°C/s
tpre – preheat dwell	60–120 s
Twave (B / D) – wave temperature	235–260°C
Number of waves	2 (turbulent + laminar)
Contact time per wave	1–3 s
twave – total contact time	≤ 10 s
Inter-wave dip (C)	≥ 200°C
Ramp-down rate (forced 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)



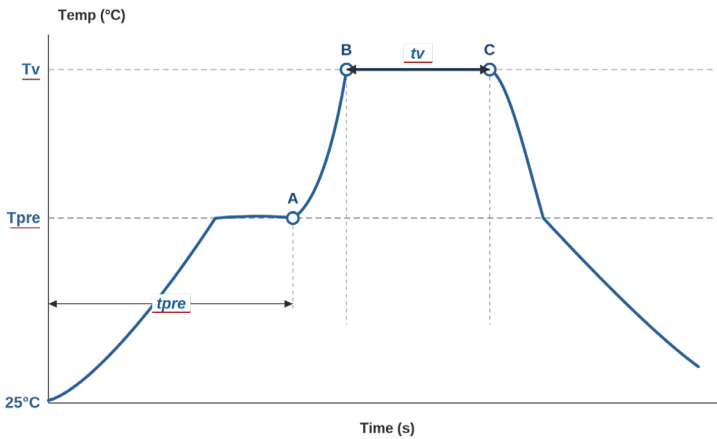
Parameter	Standard	Fragile
Tsmmin (A)	150°C	150°C
Tsmmax (B)	190°C	190°C
ts (A→B)	60–120 s	≥ 120 s
Ramp-up rate	≤ 3°C/s	≤ 2°C/s
TL (C)	217°C	217°C
tL (C→C')	40–90 s	30–60 s
TP	245°C max	240°C max
tP (within 5°C of TP)	≤ 10 s	≤ 10 s
Ramp-down rate	≤ 4°C/s	≤ 2°C/s
25°C to peak	≤ 8 min	≤ 8 min
Max reflow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

SNPB REFLOW SOLDERING PROFILE



Parameter	Standard	Fragile
Tsmmin (A)	100°C	100°C
Tsmmax (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 :

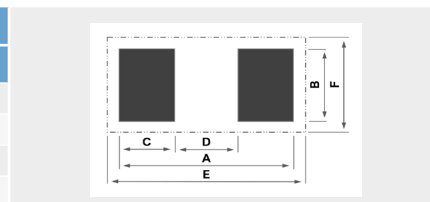
- Preheat the PCB underside to within 100°C of the wave temperature.
- Wave temperature : 235–260°C; total contact time ≤ 10 s.
- Two waves (turbulent + laminar) typically applied.

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.

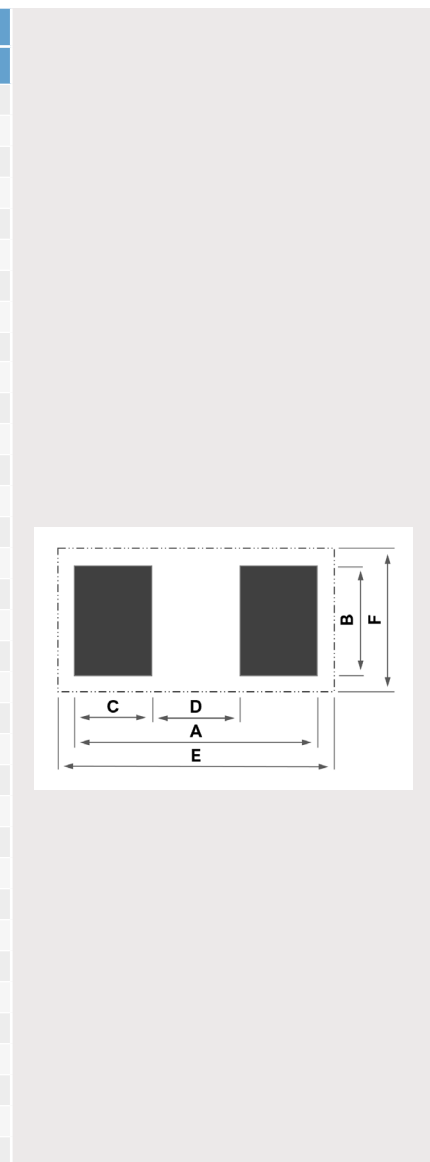
TYPICAL SMD FOOTPRINT WAVE SOLDERING

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



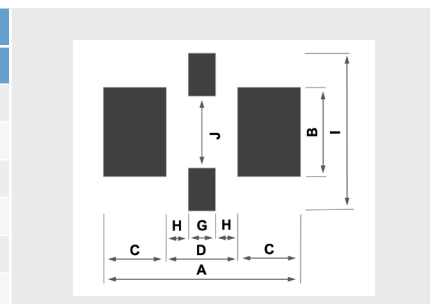
TYPICAL SMD FOOTPRINT REFLOW SOLDERING

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
-	-	0201	Q = High Q	Expressed in	A = ± 0.05pF/0.5%	V = 2.5V	X = Nickel Tin	-	-	-	-	-	B = Reel	-
FK	H = High	0204	A = NP0	picofarads (pF)	B = ± 0.1pF	Y = 4V	F = Palladium-Silver	J	020	-	-	-	V = Bulk	BM = BME
FH	Temp	0402	P = N2T	The first two digits	C = ± 0.25pF	R = 6.3V	P = Polymer Tin (Flex)	L	030	2 to 10	I = Conformal-	1	T = Tray	Dxx = Reliability
SREV		0303	X = BX	are significant,	D = ± 0.5pF	Q = 10V	C = Copper Tin (Non	D	040	B	Coating	2	Package	spec
MCF		0306	Y=X7R	the third digit gives the	E = ± 0.1%	J = 16V	magnetic)	M	050		H = Epoxy		W = Waffle	Exx = Sorting spec
M2F		0404	BY=2C1	number of noughts	F = ± 1%	X = 25V	CP = Copper Polymer Tin	T = 2	070		Coating		Pack	
MPF		0504	S = X5R	Example : 102 = 1	G = ± 2%	Z = 35V	(Non magnetic)	leads	080		M = Marked			
SRMC		0505	T = X7S	000pF	J = ± 5%	A = 50V	W = Nickel Gold Flash	U = 4	090		R = Resistor			
SRHS		0508	R = X6S		K = ± 10%	U = 63V	G = Nickel Gold Thick	leads	100					
SRHD		0603	W = X7T	For special values	M = ± 20%	B = 100V	HP = Dipped SnPb Polymer	JP =	110					
SRTV		0612	U = Z5U	R is used as decimal	Z = -20% +80%	N = 150V	H = Dipped SnPb	plain J	120					
SR		0805	V = Y5V	separator		C = 200V	S = Dipped SAC	Lead	130					
SA		1206		Example 12R7 = 12.7pF		P = 250V	SP = Polymer Dipped SAC		140					
SF		1210		1340R0 = 1340pF		D = 300V	I = Electrolytic SnPb		160					
		1808				E = 500V	IP = Polymer Electrolytical		180					
		1812				F = 630V	SnPb							
		1825				G = 1000V	Q = Solderable Silver							
		2211				1K2 = 1200V	- = Tin Plated Lead Frame							
		2220				1K4 = 1400V	N = SnPb Plated Lea Frame							
		2225				O = 1500V	M = Microstrip							
		2325				1K7 = 1700V	A = Axial Ribbon							
		2525				1K8 = 1800V	R = Radial Ribbon							
		2825				H = 2000V	U = Axial Wire							
		3033				T = 2500V	V = Radial Wire							
		3640				I = 3000V	CM = Microstrip (Non							
		4040				M = 3600V	magnetic)							
		40100				K = 4000V	CA = Axial Ribbon (Non							
		5550				L = 5000V	magnetic)							
		6080				6 = 6000V	CR = Radia Ribbon (Non							
		6560				S = 7200V	magnetic)							
		6660				7K5 = 7500V	CU = Axial Wire (Non							
		7274				8 = 8000V	magnetic)							
		7565				10 = 10000V	CV = Radial Wire (Non							
		8060				12 = 12000V	magnetic)							
		80150				15 = 15000V								
		15080												
		40 to 94												

RELIABILITY/SCREENING LEVEL

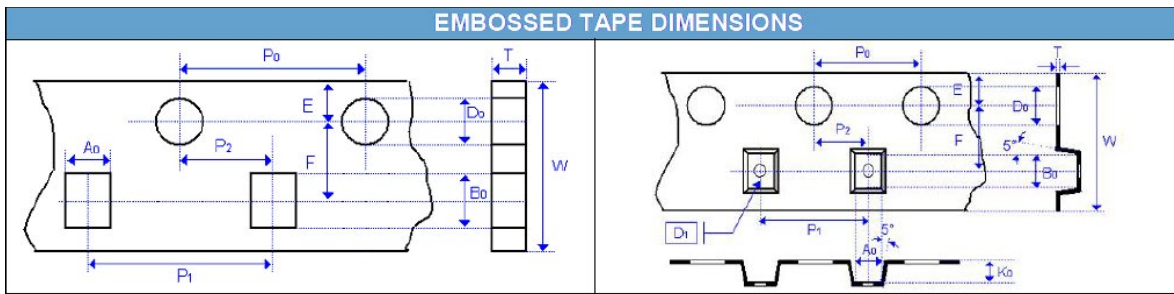
OPTIONAL CODE	TESTING DETAIL
D20	Generic AECQ-200
D55681	DPA & 100% Burn-In Per Group A of MIL-PRF-55681
D123	Group A & B Per MIL-PRF-123
D3009	DPA & 100% Burn-In according to ECSS-3009 for space application
COTS1	Class 1 COTS+ according to ECSS-Q-ST-60-13C-Rev1
COTS2	Class 2 COTS+ according to ECSS-Q-ST-60-13C-Rev1
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

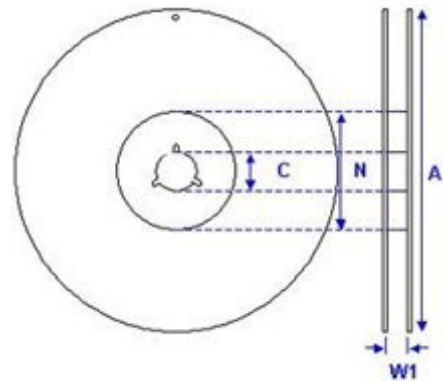
OPTIONAL CODE	SORTING DETAIL
E01	2 cells sorting 0 to +2,5 & +2,5 to +5 (% or pF accoding to value)
E02	4 cells sorting -5 to -2,5 ; -2,5 to 0 ; 0 to +2,5 & +2,5 to 5 (% or pF accoding to value)
E21	2% cells

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



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



PRODUCTION CONTROL

Comparison 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	5 pcs/lot	6 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	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	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					
LAT SUBGROUP 2A	Criteria				No visual/electrical default					
	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		
LAT SUBGROUP 2B	Criteria				No visual/electrical default	No visual/electrical default	No visual/electrical default	No visual/electrical default		
	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				
LAT SUBGROUP 3	Criteria				No visual/electrical default	No visual/electrical default				
	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 available 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 (preferred) 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 restrictive 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 applied 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

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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 programmes 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
		Operational Life	ESCC3009 Chart F4, IEC No. 60384-1 clause 4.23.	1000h ±24 125°C (optional 2000h) 2U U<500V 1.5U 500≤U<1000 1.2U 1000≤U≤2000 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 included 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)

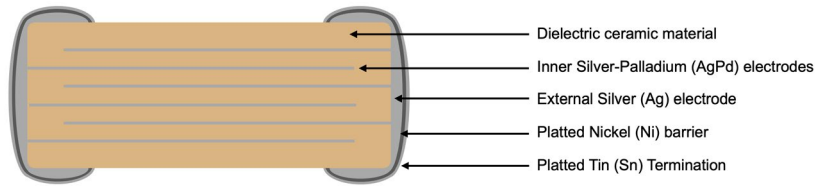
AECQ-200	CLASS 1	CLASS 2	CLASS 3	CATEGORY	TEST TYPE	SAMPLE	PROCEDURE
Yes	X	X	X	Evaluation	Construction Analysis	5	ESCC21001
Yes	X	X	X	Evaluation	Temperature characterization	5	ESCC3009 8.10
Yes	X			Evaluation	Life Test 2000h	40	ESCC3009 8.6 + 8.9
Yes	X			Screening	Complete screening	100%	ESCC3009 chart 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

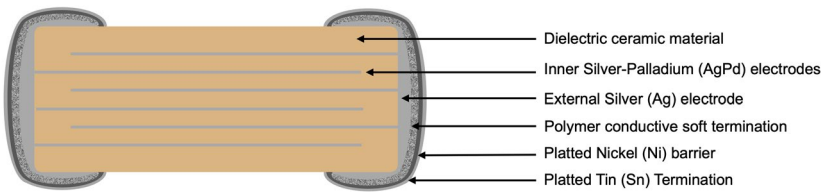
All component for space application can be proposed with dipped SnPb termination (Sn62 Pb36 Ag2) or SAC 305 (Sn96.5 Ag3 Cu0.5) for maximum reliability and whiskers avoidance.

This document is subject to change without notice.

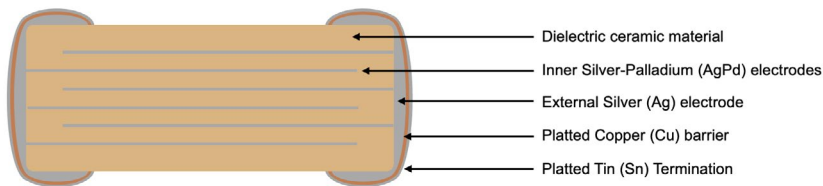
PME (Precious Metal Electrodes)



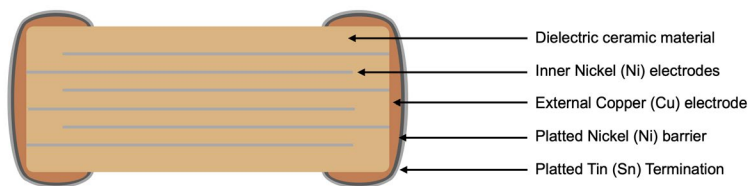
PME (Precious Metal Electrodes) Polymer Soft Termination



PME (Precious Metal Electrodes) Non Magnetic



BME (Basis Metal Electrodes) code BM



BME (Basis Metal Electrodes) code BM Polymer Soft Termination

