

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



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 :

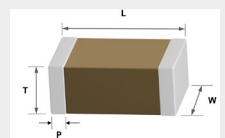
2.5Un for 5s with 50mA max charging current

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
2.5V											22µF					47µF		330µF
4V	1.0µF	2.2µF		2.2µF		10µF	22µF	22µF	10µF			47µF		22µF			100µF	100µF
6.3V	1.0µF		4.7µF	2.2µF		4.7µF	10µF	22µF	10µF		10µF	22µF	47µF	22µF			47µF	100µF
10V		1.0µF		2.2µF	2.2µF	4.7µF	4.7µF	10µF	10µF		10µF	10µF	22µF	10µF	22µF	22µF	47µF	100µF
16V			2.2µF			2.2µF	2.2µF	4.7µF	2.2µF	4.7µF		10µF	22µF	10µF			22µF	22µF
25V							1.0µF	2.2µF	2.2µF	2.2µF		10µF	10µF	4.7µF	10µF		10µF	22µF
35V								2.2µF	1.0µF			2.2µF	10µF	4.7µF			10µF	10µF
50V								1.0µF	1.0µF				2.2µF	4.7µF			4.7µF	10µF
100V											1.0µF			1.0µF	1.0µF	2.2µF	4.7µF	10µF

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	0.25	0.30	0.40	0.40
	Max	0.20	0.30	0.55	0.70	0.80	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.

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
10V	≤5%	≤10%	0603<10μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥22μF
		≤15%	0201, 0402, 0603≥10μF
6.3V	≤10%	≤15%	0201, 0402<2.2μF, 0603≥10μF, 0805≥4.7μF, 1206≥47μF, 1210≥100μF
		≤20%	0402≥2.2μF
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

SIZE		0402		0603						0805						1206						1210							
CODE	CAP	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	P	P	P	P	Q	Q	O	O	O	T	T	T	T	P	P	P	Y	W	Y	Y
155	1.5 μF									Q	Q	Q	Q	Q		O	O	O	T	T	T	T	T	T	T	T	Y	Y	Y
225	2.2 μF	J	J	J	J	J	J			Q	Q	Q	Q	Q		O	O	O	T	T	T	T	T	T	T	Y	Y	Y	Y
335	3.3 μF									Q	Q	Q	Q	Q		T	T	T	T	T	T	T	T	T	T	Y	Y	Y	Y
475	4.7 μF			J	J					Q	Q	Q	Q	Q		T	T	T	T	T	T	T	W	W	W	Y	Y	Y	Y
685	6.8 μF															T	T	T	T	T	T		W	W	W	Y	Y	Y	Y
106	10 μF			J	J					Q	Q	Q				T	T	T	T	T	T		W	W	W	Y	Y	Y	Y
226	22 μF									Q						T	T	T					Y	Y	Y	Y	Y		
476	47 μF																						Y	Y					
107	100 μF																												

Yellow : AECQ-200, White : Industrial

X7S

SIZE		0201		0402		0603			0805			1206		1210	
CODE	CAP	4V	6.3V	6.3V	10V	10V	16V	25V	10V	25V	100V	6.3V	16V	6.3V	10V
105	1.0 µF	C ⁸⁰⁰	C ⁸⁰⁰												
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														
226	22 µF														
476	47 µF														
107	100 µF														
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													
155	1.5 µF													
225	2.2 µF													
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													

X6S

SIZE		0201		0402						0603						0805						1206						1210							
CODE	CAP	4V	10V	4V	6.3V	10V	16V	25V	35V	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 ⁸⁰⁰						G ⁸⁰⁰	G ⁸⁰⁰							K ⁸⁰⁰																			
155	1.5 μF																																		
225	2.2 μF	C ⁸⁰⁰						G ⁸⁰⁰	G ⁸⁰⁰							K ⁸⁰⁰																G ⁸⁰⁰			
335	3.3 μF																																		
475	4.7 μF				G ⁸⁰⁰	G ⁸⁰⁰								K ⁸⁰⁰								G ⁸⁰⁰	O ⁸⁰⁰								U ⁸⁰⁰				
685	6.8 μF																																		
106	10 μF				G ⁸⁰⁰							K ⁸⁰⁰	K ⁸⁰⁰	K ⁸⁰⁰						O ⁸⁰⁰	O ⁸⁰⁰	O ⁸⁰⁰						G ⁸⁰⁰	U ⁸⁰⁰						
226	22 μF		G ⁸⁰⁰																											U ⁸⁰⁰	U ⁸⁰⁰				
476	47 μF									K ⁸⁰⁰																								Y ⁸⁰⁰	Y ⁸⁰⁰
107	100 μF																O ⁸⁰⁰		O ⁸⁰⁰																
227	220 μF																																	Y ⁸⁰⁰	
330	330 μF																																Y ⁸⁰⁰		

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	6.3V	10V	16V	25V	35V	50V	4V	6.3V	10V	16V	25V	50V	
105	1.0 µF	C ⁸⁰⁰	C ⁸⁰⁰	C ⁸⁰⁰	G [°]	G [°]	G ⁸⁰⁰	E [°]	E [°]	E ⁸⁰⁰	G ⁸⁰⁰																			
155	1.5 µF																													
225	2.2 µF			C ⁸⁰⁰	T [°]	T [°]	E ⁸⁰⁰	G ⁸⁰⁰	G ⁸⁰⁰	G ⁸⁰⁰				G ⁸⁰⁰	E ⁸⁰⁰															
335	3.3 µF																													
475	4.7 µF	C ⁸⁰⁰					G ⁸⁰⁰	G ⁸⁰⁰						G ⁸⁰⁰	E ⁸⁰⁰								G ⁸⁰⁰	E ⁸⁰⁰						
685	6.8 µF																													
106	10 µF						G ⁸⁰⁰						K ⁸⁰⁰	K ⁸⁰⁰	E ⁸⁰⁰	K ⁸⁰⁰			G ⁸⁰⁰				O ⁸⁰⁰						Y ⁸⁰	
226	22 µF					G ⁸⁰⁰	G ⁸⁰⁰					K ⁸⁰⁰	K ⁸⁰⁰	K ⁸⁰⁰								O ⁸⁰⁰	O ⁸⁰⁰	O ⁸⁰⁰			U ⁸⁰⁰	U ⁸⁰⁰	U ⁸⁰⁰	
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 prevent the damage of solderability of terminations, the following storage conditions are recommended :

Indoors under 5 ~ 40°C and 20% ~ 70% RH.

No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.

Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as possible. Taped products should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The product is recommended to be used within 24 months after shipment. Extended shelf life over this period require a solderability check before use.

HANDLING

Chip capacitors are dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chip Capacitors should be handled with care to avoid contamination or damage. To use vacuum or plastic tweezers to pick up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

PREHEAT

In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required.

The rate of preheat should not exceed 3°C per second.

SOLDERING FLUX

Use mildly activated rosin RA and RMA fluxes, but do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate.

SOLDERING TYPE

Lead containing solders, such as Sn60, Sn62 or Sn63 and lead free solders, such as SnAgCu, can all be used with our MLCCs.

In case of non-magnetic termination code C, use lead containing or lead (Pb)-free SAC305 solders.

SOLDERING HEIGHT

The solder climbing minimum height is suggesting to 25% of chip thickness or 500um whichever is less.

(Reference from IPC-610E)

COOLING

After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint.

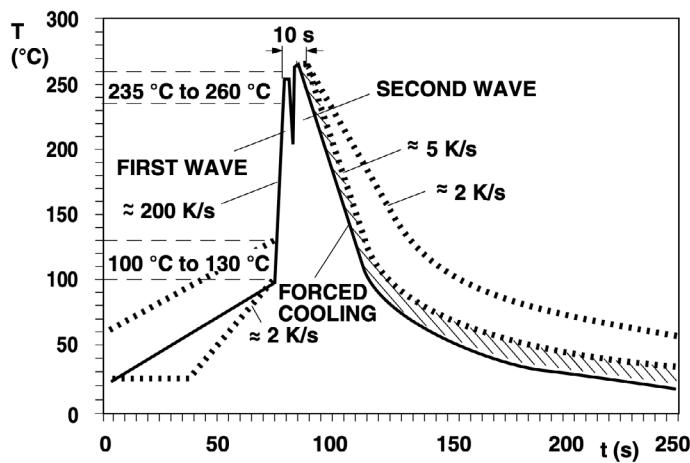
CLEANING

All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.

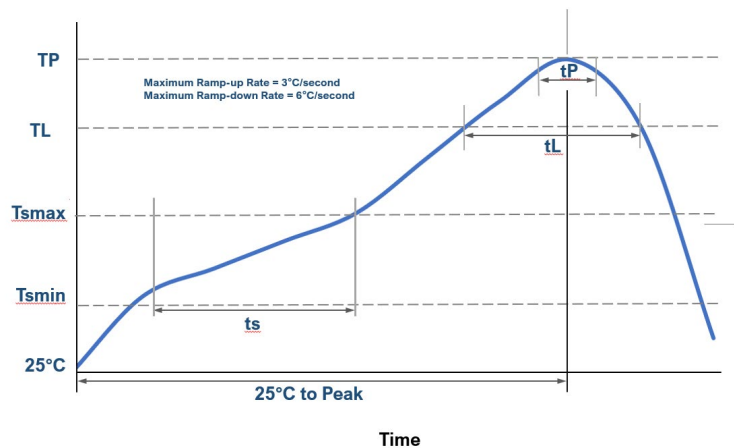
SOLDERING CONDITIONS

SIZE	THICKNESS	WAVE	REFLOW
0201	All	0	0
0402	All	0	0
0505	All	0	0
0603	All	0	0
0805	< 1.25mm	0	0
0805	≥ 1.25mm		0
1111	< 1.25mm	0	0
1111	≥ 1.25mm		0
1206	< 1.25mm	0	0
1206	≥ 1.25mm		0
1210	< 1.25mm	0	0
1210	≥ 1.25mm		0
larger than 1210	All		0
High compact	All		0

WAVE SOLDERING PROFILE

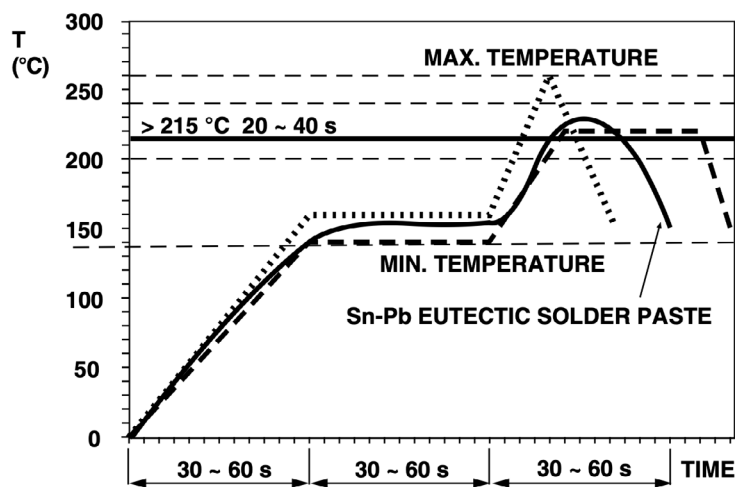


LEADFREE REFLOW SOLDERING PROFILE

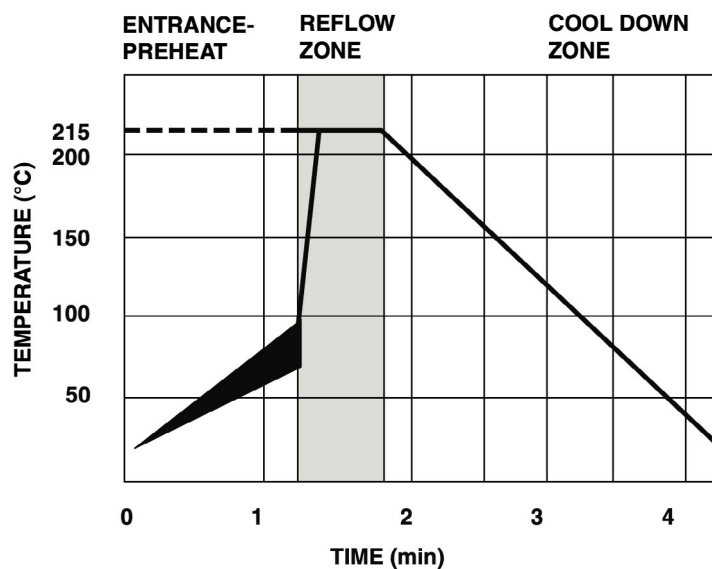


PROFILE FEATURE	LEAD FREE (SAC 305)
Tsmin	150°C
Tsmax	190°C
Time from Tsmin to Tsmax	60 - 120 seconds
Ramp-up Rate	3°C/second max
Liquidous Temperature	217°C
Time above Liquidous	60 - 120 seconds
Peak Temperature	250°C
Time within 5°C of maximum	10 seconds max
Peak Temperature	250°C
Ramp-down Rate	6°C/second max
Time 25°C to Peak	8min max

SNPB REFLOW SOLDERING PROFILE



VAPOUR PHASE REFLOW PROFILE



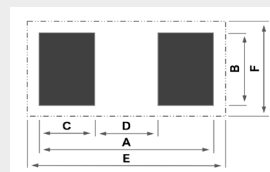
HAND SOLDERING

Hand soldering is not recommended as the thermal shock may cause a crack, hot air pencil use is advised, however if used the following recommendations should be taken :

- Soldering iron tip diameter ≤ 3.0 mm and wattage max. 20W.
- The Capacitors shall be pre-heated to 150°C and that the temperature gradient between the devices and the tip of the soldering iron.
- Tip temperature $\leq 280^\circ\text{C}$ and shouldn't be applied for more than 5 seconds.
- The required amount of solder shall be melted on the soldering tip.
- The tip of iron should not contact the ceramic body directly.
- The Capacitors shall be cooled gradually at room temperature after soldering.
- Forced air cooling is not allowed.

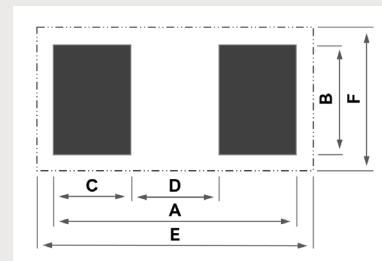
TYPICAL SMD FOOTPRINT WAVE SOLDERING

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



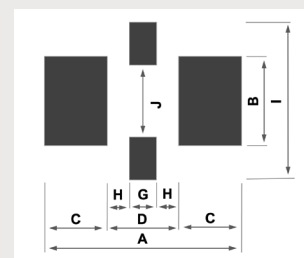
TYPICAL SMD FOOTPRINT REFLOW SOLDERING

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	11.60	4.60	2.35	6.90	11.85	5.40
4017	11.60	5.45	2.35	6.90	11.85	6.25
4020	11.60	10.70	2.35	6.90	11.85	11.50
4040	11.60	26.20	2.35	6.90	11.85	27.00
40100	15.50	13.20	2.35	10.80	15.75	14.00
5550	16.70	20.80	2.35	12.00	16.95	21.60
6080	18.30	15.70	2.35	13.60	18.55	16.50
6660	21.90	15.70	2.35	17.20	22.15	16.50
8060	21.90	38.90	2.35	17.20	22.15	39.70
80150	4.15	2.60	1.15	1.75	5.05	3.30
HIGH COMPACT 1210	5.75	3.40	1.35	2.70	6.70	4.20
HIGH COMPACT 1812	6.80	5.50	1.70	2.80	7.70	6.30
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





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	- = Sn lead/lead frame	-	-	-	-	-	B = Reel	-
FK	H = High	0204	A = NP0	picofarads (pF)	B = ± 0.1pF	Y = 4V	X = Nickel Tin	J	020	2 to 10	I = Conformal-	1	V = Bulk	BM = BME
FH	Temp	0402	P = N2T	The first two digits	C = ± 0.25pF	R = 6.3V	F = Palladium-Silver	L	030	B	Coating	2	T = Tray	Dxx = Reliability
SREV		0303	X = BX	are significant,	D = ± 0.5pF	Q = 10V	P = Polymer Tin (Flex)	D	040		H = Epoxy		Package	spec
MCF		0306	Y=X7R	the third digit gives the	E = ± 0.1%	J = 16V	C = Copper Tin (Non	M	050		Coating		W = Waffle	Exx = Sorting spec
M2F		0404	BY=2C1	number of noughts	F = ± 1%	X = 25V	magnetic)	T = 2	060		M = Marked		Pack	
MPF		0504	S = X5R	Example : 102 = 1	G = ± 2%	Z = 35V	CP = Copper Polymer Tin	leads	070		R = Resistor			
SRMC		0505	T = X7S	000pF	J = ± 5%	A = 50V	(Non magnetic)	U = 4	080					
SRTV		0508	R = X6S		K = ± 10%	U = 63V	W = Nickel Gold Flash	leads	090					
SR		0603	W = X7T	For special values	M = ± 20%	B = 100V	G = Nickel Gold Thick	JP =	100					
SA		0612	U = Z5U	R is used as decimal	Z = -20% +80%	N = 150V	HP = Dipped SnPb Polymer	plain J	110					
SF		0805	V = Y5V	separator		C = 200V	H = Dipped SnPb	Lead	120					
		1206		Example 12R7 = 12.7pF		P = 250V	S = Dipped SAC		130					
		1210		1340R0 = 1340pF		D = 300V	SP = Polymer Dipped SAC		140					
		1808				E = 500V	I = Electrolytic SnPb		160					
		1812				F = 630V	IP = Polymer Electrolytic		180					
		1825				G = 1000V	SnPb							
		2211				1K2 = 1200V	Q = Solderable Silver							
		2220				1K4 = 1400V	M = Microstrip							
		2225				O = 1500V	A = Axial Ribbon							
		2325				1K7 = 1700V	R = Radial Ribbon							
		2525				1K8 = 1800V	U = Axial Wire							
		2825				H = 2000V	V = Radial Wire							
		3033				T = 2500V	CM = Microstrip (Non							
		3640				I = 3000V	magnetic)							
		4040				M = 3600V	CA = Axial Ribbon (Non							
		40100				K = 4000V	magnetic)							
		5550				L = 5000V	CR = Radia Ribbon (Non							
		6080				6 = 6000V	magnetic)							
		6560				S = 7200V	CU = Axial Wire (Non							
		6660				7K5 = 7500V	magnetic)							
		7274				8 = 8000V	CV = Radial Wire (Non							
		7565				10 = 10000V	magnetic)							
		8060				12 = 12000V								
		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

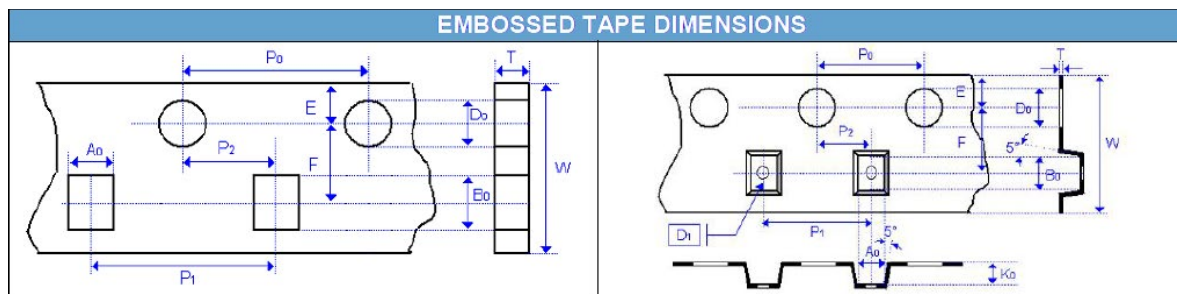
OPTIONAL CODE	SORTING DETAIL
E01	2 cells sorting 0 to +2,5 & +2,5 to +5 (% or pF according to value)
E02	4 cells sorting -5 to -2,5 ; -2,5 to 0 ; 0 to +2,5 & +2,5 to 5 (% or pF according to value)
E21	2% cells



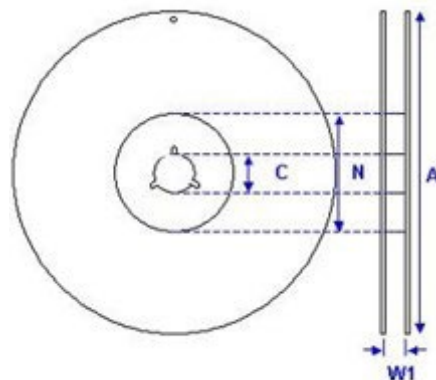
PACKAGE DIMENSION AND QUANTITY

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





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	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 SUBGROUP 1	LAT	On request	On request	On request	Flying Part	Flying part	Flying part	Flying part	On request	On request
	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				40 serialized pcs on PCB	20 serialized pcs on PCB	20 serialized pcs on PCB	20 serialized pcs on PCB		
	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 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.

This document is subject to change without notice.

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-Prgh4,7		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

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)

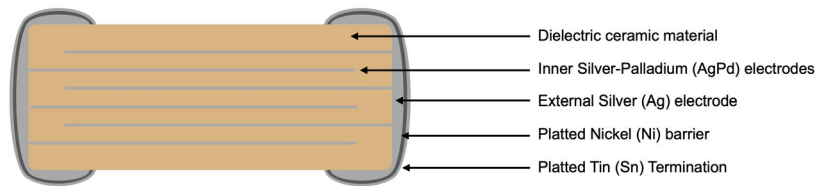
AEQ-200	CLASS 1	CLASS 2	CLASS 3	CATEGORY	TEST TYPE	SAMPLE	PROCEDURE
Yes	X	X	X	Evaluation	Construction Analysis	5	ESCC21001
Yes	X	X	X	Evaluation	Temperature characterization	5	ESCC3009 8.10
Yes	X			Evaluation	Life Test 2000h	40	ESCC3009 8.6 + 8.9
Yes	X			Screening	Complete screening	100%	ESCC3009 chart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

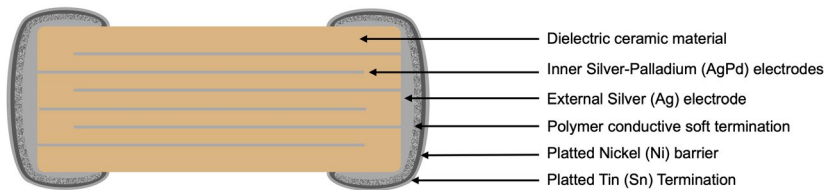
All component for space application can be proposed with dipped SnPb termination (Sn62 Pb36 Ag2) or SAC 305 (Sn96.5 Ag3 Cu0.5) for maximum reliability and whiskers avoidance.

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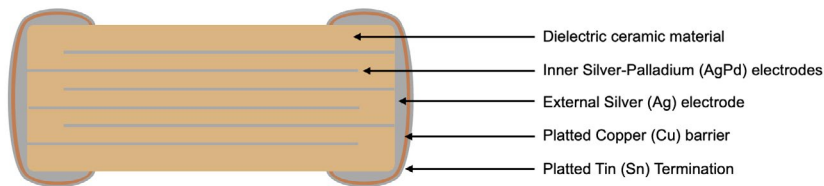
PME (Precious Metal Electrodes)



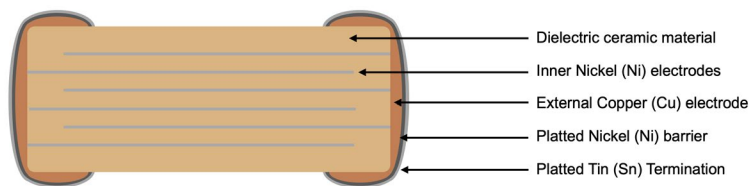
PME (Precious Metal Electrodes) Polymer Soft Termination



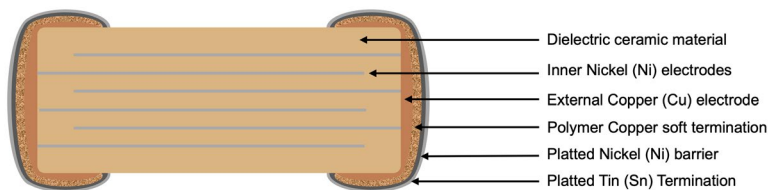
PME (Precious Metal Electrodes) Non Magnetic



BME (Basis Metal Electrodes) code BM



BME (Basis Metal Electrodes) code BM Polymer Soft Termination



REACH Compliance

- SRT-Microcéramique delivers non-chemical articles only.
- These contain no substances which are intended to be released under normal or reasonably foreseeable conditions of use according to Reach article 7(1).

SRT-Microcéramique confirms hereby that our products contain none of the substances which are listed in the present candidate list of the European Chemicals Agency (ECHA), above a concentration of 0.1% by weight of the whole component.

Candidate list of substances (European Chemicals Agency ECHA) :
<http://echa.europa.eu/fr/candidate-list-table>

ROHS COMPLIANCE

SRT-Microcéramique herewith confirms that RoHS-compliant SRT-microcéramique products are conforming to the following EU directives:
EU directive 2015/863/EU EU directive 2011/65/EU EU directive 2003/11/EC

Following restricted materials are not used and do not exceed the legal limits: Lead (Pb, see exemptions),

- Mercury (Hg)
- Cadmium (Cd)
- Chromium (Cr VI)
- Polybrominated biphenyls (PBB) Polybrominated diphenyl ethers (PBDE) Bis(2-Ethylhexyl) phthalate (DEHP) Benzyl butyl phthalate (BBP)
- Dibutyl phthalate (DBP) Diisobutyl phthalate (DIBP)

Exemptions: The following exemptions according to the RoHS annexe are applicable:

Identity 7(a) :

- Lead in high melting temperature type solders (i.e lead-based alloys containing 85% by weight or more lead).

Identity 7(c)-I :

- Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound.

The components are suitable for a lead-free process according to EN 60068-2-58 and in accordance with the IPC/JEDEC standard J-Std-020D.
The lead free process has been tested using solder alloy Sn96.5Ag3Cu0.5

Export controls and dual-use regulations

Some SRT-Microcéramique components fall under 'dual-use' items under international export controls definition - those that can be used for civil or military purposes which meet certain specified technical standards.

The defining criteria for a dual use component is one with a voltage rating of >750Vdc and a capacitance value of >250nF when measured at 750Vdc and a series inductance <10nH. Components defined as dual-use under the above criteria may require a licence for export across international borders. Please contact us for further information on specific part numbers.

ISO9001:2015

In their design, research and development as well as the manufacturing of MLCC capacitors, customer service and distribution SRT-Microcéramique uses and maintains a Management System audited and certified in accordance to : **ISO9001:2015**

You may contact us for any inquiry regarding the regulations and compliance listed above.