

# Safety Certified MLCC

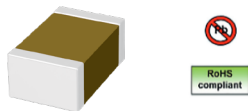
X1/Y2 et X2 Class



**SRT**  
MICROCÉRAMIQUE  
MLCC CAPACITORS

## DESCRIPTION

Safety certified capacitors are designed for surge or lightning immunity in modern facsimile and other equipments. The capacitors of FK series are class X1/Y2 compliant, and the capacitors of FH series are class X2 compliant respectively. The green type capacitors in FK/FH series are manufactured by using environmentally friendly materials without lead or cadmium. The terminations are composed of plated nickel and pure tin to feature the superiority of leaching resistance during soldering.



## APPLICATIONS

- Modem
- Facsimile
- Telephone
- Other electronic equipment for lighting or surge protection and isolation

## FEATURES

- High reliability and stability.
- Small size and high capacitance
- Safety standard approval by :
  - EN 60384-14 : 2013/A1 : 2016
  - IEC60384-14:2013/AMD1:2016
  - UL 60384-14(Ed 2.0)UL 62368-1 (2nd Edition)
- Certificate number :
  - R 50041666 & R 50359148 by TUV.
  - E346791(FOWX2/8) by UL, E231248 by UL
  - CQC20001247849 by CQC (FK series)
  - CQC20001247848 by CQC (FH series)
- Licenses :
  - ENEC-03020 (FK series)
  - ENEC-03021 (FH series)
- RoHS and HALOGEN compliant
- Manufactured by PDC

## ELECTRICAL PARAMETERS

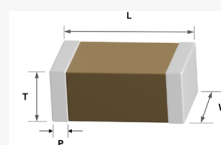
DIELECTRIC	COG	X7R
Size	1808, 1812 2211	1808, 1812, 2211, 2220
Rated Voltage	250 Vac	
Capacitance Range	X1/Y2 Class (Impulse 6KV) : 4pF - 100pF X1/Y2 Class (Impulse 5KV) : 3pF - 720pF X2 Class : 3pF - 1000pF	X1/Y2 Class : 100pF-4700pF X2 Class : 56000pF
Capacitance Tolerance	Cap.<10pF : D (±0.5pF) 10pF≤Cap : F (±1%), G (±2%), J (±5%),K (±10%), M (±20%)	J (±5%) K (±10%) M (±20%)
DF	Cap.<30pF : Q≥400+20C Cap.≥30pF : Q≥1000	≤2.5%
Capacitance & DF- Test Condition	Measured at the condition of 30-70% related humidity.	
	For 25°C at ambient temperature	Preconditioning for Class II MLCC : Perform a heat treatment at 150 ±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement
Insulation Resistance	≥100GΩ or RxC≥1000Ω-F, whichever is smaller	≥10GΩ or RxC≥5000Ω-F, whichever is smaller
Operating Temperature	-55°C to +125°C	
Temperature coefficient	±30ppm/°C	±15%
Termination	Cu or Ag/Ni/Sn (lead-free termination)	

## ORDERING INFORMATION

FK	0805	Y	103	K	502	B	G
SERIES	SIZE	DIELECTRIC	CAPACITANCE	TOLERANCE	VOLTAGE	PACKAGING	SPECIAL
FK = Safety X1 & Y2 Series FH = Safety X2 Series	1206 1808 1812 2211 2220	A = COG Y = X7R	Expressed in picofarads (pF). The first two digits are significant, the third digit gives the number of noughts. Example : 102 = 1 000pF	D = ± 0.50pF F = ± 1% G = ± 2% J = ± 5% K = ± 10% M = ± 20%	T = 2.5KV L = 5KV 6 = 6KV	B = Reel V = Bulk	G = RoHS Compliant H = High Reliability Q = Anti-Arcing E = Anti Bending Z = Anti-Arcing + Anti-Bending Dxx = Reliability spec Exx = Sorting spec

## DIMENSIONS IN MILLIMETERS

		1206	1808	1812	2211	2220
Length (L)		3.30 ±0.40	4.50 +0.6/-0.3	4.50 +0.6/-0.3	5.70 ±0.50	5.70 ±0.50
Width (W)		1.60 ±0.20	2.00 ±0.30	3.20 ±0.40	2.80 ±0.40	5.00 ±0.50
Thickness max (T)		1.35	2.20	2.80	3.10	3.10
Termination (P)	Min	0.25	0.25	0.25	0.30	0.30
	Max	0.75	0.75	0.75	0.90	0.90



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## CAPACITANCE RANGE

Class		X1/Y2 (FK series)										X2 (FH series)					Code	Thickness (mm)		
Rated Voltage		250Vac																		
Certificated		TUV / UL / CQC (IEC 60384-14)															IEC 62368-1			
Dielectric		COG				X7R				COG		X7R			X7R					
Size		1808	1812	2211	2211	1808	1812	2211	2220	1808	1812	1808	1812	2220	1206					
Impulse		5KV			6KV		5KV				2.5KV					2.5KV				
Code	Cap																			
3R0	3.0 pF	R																	P	1.25±0.10
3R3	3.3 pF	R																	R	1.40±0.15
4R0	4.0 pF	R		W	W														T	1.60±0.20
4R7	4.7 pF	R		W	W														W	2.00±0.20
5R0	5.0 pF	R		W	W														Y	2.50±0.30
5R6	5.6 pF	R		W	W														Z	2.80±0.30
6R0	6.0 pF	R		W	W															
6R8	6.8 pF	R		W	W															
7R0	7.0 pF	R		W	W															
8R0	8.0 pF	R		W	W															
8R2	8.2 pF	R		W	W															
9R0	9.0 pF	R																		
100	10 pF	R	P	W	W															
120	12 pF	R	P	W	W															
150	15 pF	R	P	W	W															
180	18 pF	R	P	W	W															
220	22 pF	R	P	W	W															
270	27 pF	R	P	W	W															
330	33 pF	R	P	W	W															
390	39 pF	T	P	W	W															
470	47 pF	T	P	W	W															
560	56 pF	T	P	W	W															
680	68 pF	T	P	W	Y															
820	82 pF	T	P	W	Y															
101	100 pF	W	P	W	Z	T*		T*											P	
121	120 pF	W	P	Y		T*		T*											P	
131	130 pF	W	P					T*											P	
151	150 pF	W	P	Y		T*	T*	T*											P	
161	160 pF	W	P	Y		T*			W*										P	
181	180 pF	W	P	Y		T*	T*	T*	W*										P	
221	220 pF	W	W	Y		T*	T*	T*	W*										P	
271	270 pF	W	W	Y		W*	T*		W*										P	
301	300 pF		W																P	
331	330 pF		W	Y		W*	T*	T*	W*										P	
391	390 pF		W	Y		W*	T*	T*	W*										P	
471	470 pF		W	Y		W*	T*	W*	W*										P	
561	560 pF			Y		W*	T*	W*	W*										P	
681	680 pF			Y		W*	W*	W*	W*										P	
721	720 pF								W*										P	
821	820 pF					W*	W*	W*	W*										P	
102	1.0 nF					W*	Y*	Y*	W*										P	
122	1.2 nF							Y*	Y*											
152	1.5 nF							Y*	Y*											
182	1.8 nF							Y*	Y*											
222	2.2 nF							Y*	Y*											
272	2.7 nF							Z*	Y*											
332	3.3 nF								Y*											
392	3.9 nF								Y*											
472	4.7 nF								Y*											
562	5.6 nF																			
682	6.8 nF																			
822	8.2 nF																			
103	10 nF																			
123	12 nF																			
153	15 nF																			
183	18 nF																			
223	22 nF																			
273	27 nF																			
333	33 nF																			
393	39 nF																			
473	47 nF																			
563	56 nF																			

\* : Surface coating only

## 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.

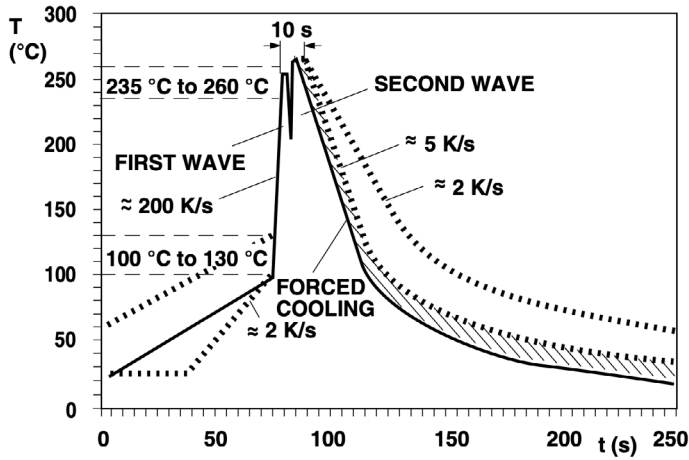
## CLEANING

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.

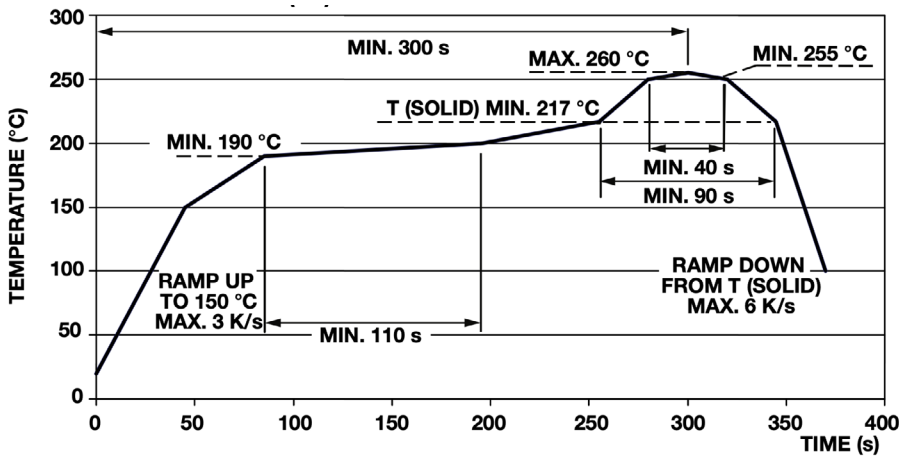
## SOLDERING CONDITIONS

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

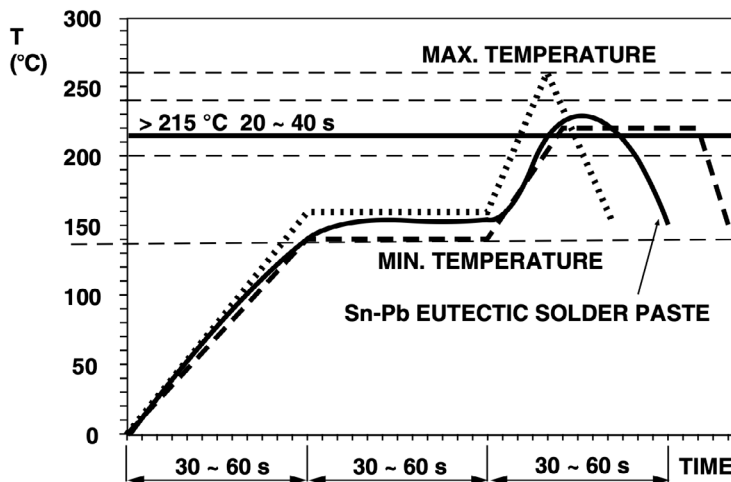
**WAVE SOLDERING PROFILE**



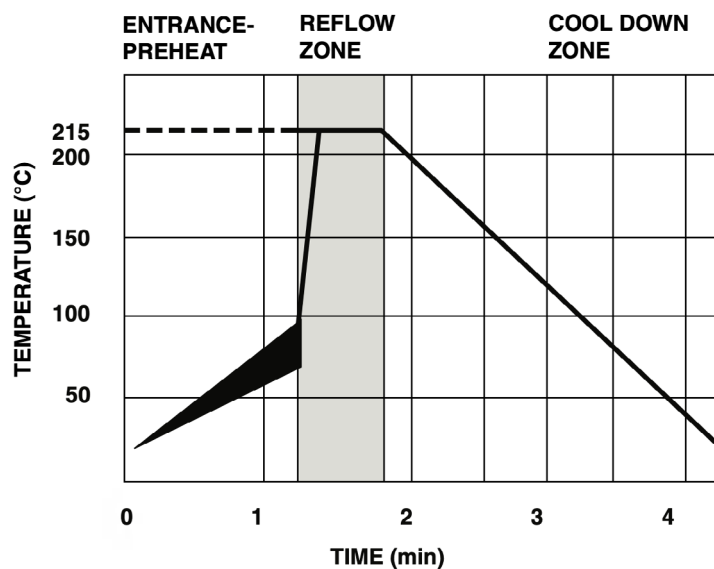
**LEADFREE REFLOW SOLDERING PROFILE**



**SNI**



## VAPOUR PHASE REFLOW PROFILE



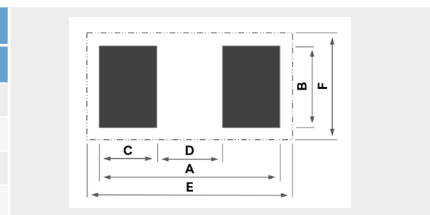
## HAND SOLDERING

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

- Soldering iron tip diameter  $\leq 3.0$  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  $\leq 280$ °C and should'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.

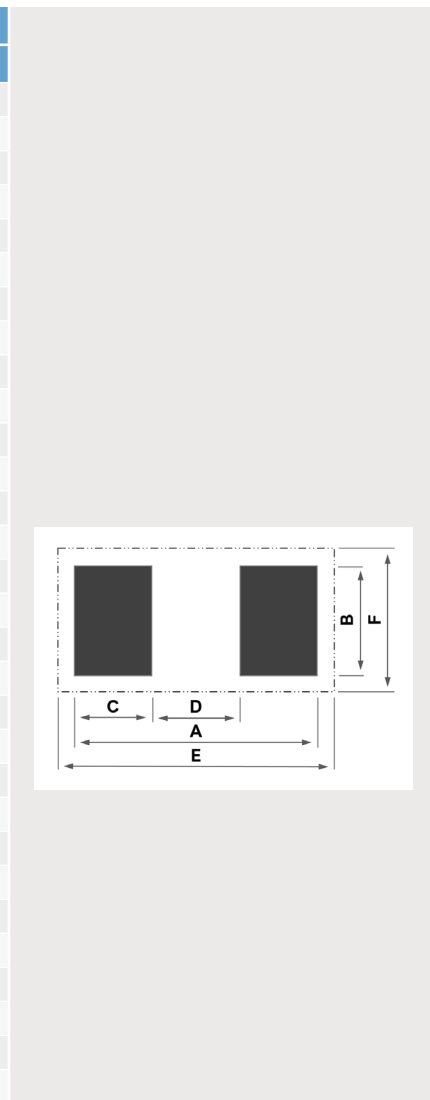
## TYPICAL SMD FOOTPRINT WAVE SOLDERING

SIZE	FOOTPRINT DIMENSIONS IN MM					
	A	B	C	D	E	F
0603	2.40	0.80	0.70	1.00	3.10	1.40
0805	3.20	1.30	0.90	1.40	4.10	1.85
1206	4.80	1.70	1.25	2.30	5.90	2.25
1210	4.80	2.60	1.25	2.30	5.90	3.15



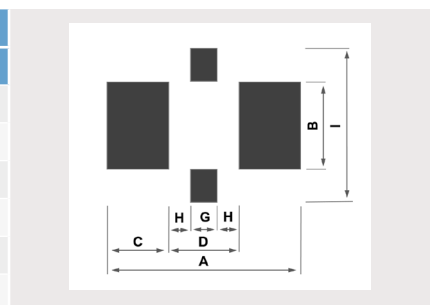
## TYPICAL SMD FOOTPRINT REFLOW SOLDERING

SIZE	FOOTPRINT DIMENSIONS IN mm					
	A	B	C	D	E	F
0201	0.65	0.30	0.21	0.23	0.90	0.60
0204	1.00	1.00	0.30	0.40	1.25	1.45
0402	1.50	0.50	0.40	0.70	1.75	0.95
0306	1.30	1.60	0.40	0.50	1.55	2.05
0404	1.50	1.00	0.40	0.70	1.75	1.45
0504	1.90	1.00	0.40	1.10	2.15	1.45
0505	1.90	1.30	0.50	0.80	2.15	1.75
0508	1.90	2.00	0.50	0.90	2.15	2.55
0603	2.30	0.80	0.60	1.10	2.55	1.35
0612	2.30	3.20	0.60	1.10	2.55	3.75
0805	2.90	1.25	0.90	1.10	3.15	1.80
1206	4.10	1.60	0.90	2.30	4.35	2.25
1210	4.10	2.50	1.00	2.10	4.35	3.15
1808	5.50	2.10	1.20	3.10	5.75	2.75
1812	5.50	3.30	1.20	3.10	5.75	3.95
1825	5.50	6.55	1.20	3.10	5.75	7.20
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	10.70	2.35	5.85	10.80	11.50
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



## TYPICAL FILTER FOOTPRINT REFLOW SOLDERING

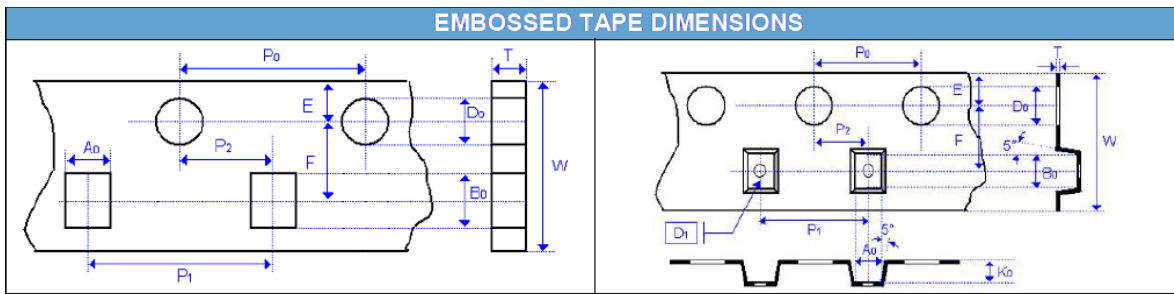
SIZE	FOOTPRINT DIMENSIONS IN mm						
	A	B	C	D	G	H	I
0603	2.30	0.80	0.45	1.40	0.60	0.40	1.50
0805	2.90	1.25	0.90	1.80	0.80	0.50	2.00
1206	4.10	1.60	0.90	2.40	1.00	0.70	3.00
1806	5.50	1.60	1.20	3.20	1.00	1.10	3.00
1812	5.50	3.30	1.20	3.90	1.50	1.20	4.80
2220	6.80	5.40	1.40	4.50	1.50	1.50	7.00



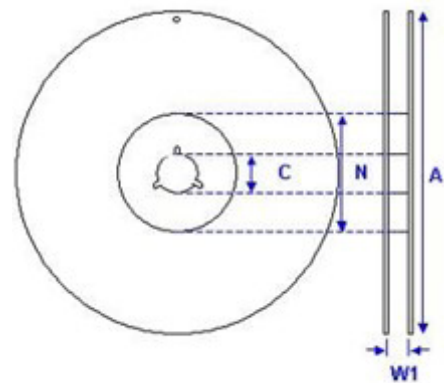
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## PACKAGE DIMENSION AND QUANTITY

SIZE	THICKNESS	PAPER TAPE		PLASTIC TAPE	
		7" REEL	13" REEL	7" REEL	13" REEL
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



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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## RELIABILITY PRINCIPLES OVERVIEW

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.

## TESTING

### Tests conducted during each batch

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		AEC-Q200-5	internal component integrity
5/lot	Dimension	CECC-32100-4.5	AEC-Q200-5	according to datasheet
5/lot	Resistance to soldering heat	CECC-32100-4.10	AEC-Q200-15	
5/lot	Solderability	CECC-32100-4.11	AEC-Q200-18	
10/lot	Voltage proof	CECC-32100-4.6.4		
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	High Temperature Exposure (Storage)	MIL-STD-202 Method 108	AEC-Q200-3	1,000 hours at 150°C with 0V. Measurement at 24 ± 2 hours after test conclusion
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 <sup>-3</sup>	±2%	10% initial limit
N2T	≤ 6 10 <sup>-3</sup>	±4%	10% initial limit
X7R	≤ 0.035	±15%	10% initial limit



## 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) phtalate (DEHP) Benzyl butyl phtalate (BBP)
- Dibutyl phtalate (DBP) Diisobutyl phtalate (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.