

# High Capacitance capacitors

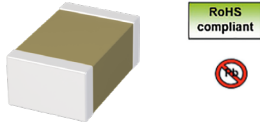
FS Series X7S X6S X5R Y5V



**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

- Realizes high capacitance in small sizes
- Capacitor with lead-free termination (pure Tin)
- Basis Metal Electrode
- RoHS and HALOGEN compliant
- Manufactured in Taiwan
- Surface mount suited for wave and reflow soldering
- High reliability and no polarity
- Excellent in high frequency characteristic

## ELECTRICAL PARAMETERS

**ELECTRICAL CHARACTERISTICS :**  
at + 25°C unless otherwise specified

**OPERATING TEMPERATURE :**

X7S : - 55°C, + 125°C  
X6S : - 55°C, + 105°C  
X5R : - 55°C, + 85°C  
Y5V : - 25°C, + 85°C

**TEMPERATURE COEFFICIENT :**

X7S : ±22% with 0Vdc applied  
X6S : ±22% with 0Vdc applied  
X5R : - ±15% with 0Vdc applied  
Y5V : - +30% -80% with 0Vdc applied

**DISSIPATION FACTOR :**

cf Table

**INSULATION RESISTANCE (IR) :**

25°C/Un 10<sup>4</sup> MOhm or 500 Ohm-Farad whichever is less  
Except ° table 25°C/Un 10<sup>4</sup> MOhm or 100 Ohm-Farad whichever is less  
Except ° table 50 Ohm-Farad

**DIELECTRIC STRENGTH TEST :**

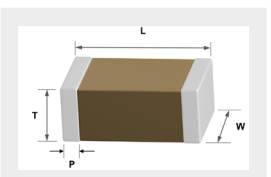
Performed per method 103 of EIA 198-2-E  
2.5Un for 5s with 50mA max charging current

## QUICK REFERENCE DATA

	0201		0402			0603				0805				1206				1210					1812
	X7S	X5R	X7S	X6S	X5R	X7S	X6S	X5R	Y5V	X7S	X6S	X5R	Y5V	X7S	X6S	X5R	Y5V	X7S	X6S	X5R	Y5V	Y5V	
min	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF	1.0µF
4V	1.0µF				10µF			47µF				100µF	100µF			220µF							
6.3V	1.0µF	2.2µF	2.2µF	10µF	10µF		22µF	47µF	22µF		47µF	100µF		47µF	47µF	47µF		100µF	100µF	220µF	100µF	100µF	10µF
10V		1.0µF	2.2µF	4.7µF	4.7µF		10µF	22µF	22µF		22µF	47µF			22µF	47µF	10µF		100µF	100µF	47µF		
16V		1.0µF		2.2µF	2.2µF	4.7µF	10µF	10µF	10µF	10µF	22µF	22µF		22µF	22µF	47µF	10µF		47µF	100µF	22µF	47µF	
25V				1.0µF	1.0µF	2.2µF	2.2µF	10µF		10µF	4.7µF	22µF			10µF	22µF			4.7µF		22µF	47µF	10µF
35V																			4.7µF		22µF	10µF	
50V								2.2µF				4.7µF				4.7µF	1.0µF				10µF	4.7µF	10µF
100V										1.0µF									4.7µF				

## DIMENSIONS IN MILLIMETERS

	0201	0402	0603	0805	1206	1210	1812
Length (L)	0.60 ± 0.05 (0.09 C>1.0µF)	1.00 ± 0.20	1.60 ± 0.15	2.00 ± 0.20	3.20 ± 0.20	3.20 ± 0.30	4.50 ± 0.40
Width (W)	0.30 ± 0.05 (0.09 C>1.0µF)	1.00 ± 0.20	0.80 ± 0.20	1.25 ± 0.20	1.60 ± 0.20	2.50 ± 0.30	3.20 ± 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

FS	0805	T	103	K	P	B	
SERIES	SIZE	DIELECTRIC	CAPACITANCE	TOLERANCE	VOLTAGE	PACKAGING	SPECIAL PARAMETERS
FS	0201 0402 0603 0805 1206 1210 1808 1812	T = X7S S = X5R R = X6S V = Y5V	Expressed in picofarads (pF). The first two digits are significant, the third digit gives the number of noughts. Example : 102 = 1 000pF	K = ±10 % (X7S, X5R, X6S) M = ±20 % (X7S, X5R, X6S) Z = -20% +80% (Y5V)	Y = 4V R = 6.3V Q = 10V J = 16V X = 25V Z = 35V A = 50V B = 100V	B = Taping Reel V = Bulk T = Tray Package	- Dxx = Reliability spec

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# High Capacitance capacitors

FS Series X7S X6S X5R Y5V



**SRT**  
MICROCÉRAMIQUE  
MLCC CAPACITORS

## DF TABLE : X7S/X6S/X5R

Rated	D.F.≤	Exception of D.F.≤	
100V	≤10%		
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
		≤10%	0603<10μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥22μF
10V	≤5%	≤10%	0201, 0402, 0603≥10μF
		≤15%	
		≤15%	0201, 0402<2.2μF, 0603≥10μF, 0805≥4.7μF, 1206≥47μF, 1210≥100μF
6.3V	≤10%	≤15%	
		≤20%	0402≥2.2μF
4V	≤15%		

## DF TABLE : Y5V

Rated	D.F.≤	Exception of D.F.≤	
50V	≤5%	≤7%	0603, 0805, 1206≥4.7μF
		≤12.5%	1210≥6.8μF
35V	≤7%		
25V	≤5%	≤7%	0805, 1206, 1210≥4.7μF
		≤9%	0402, 0603, 1206≥4.7μF, 1210≥22μF
16V (C<1.0μF)	≤7%	≤9%	0603
		≤12.5%	0402
16V (C≥1.0μF)	≤9%	≤12.5%	0603≥2.2μF, 0805≥3.3μF, 1206≥10μF, 1210≥22μF,
		≤12.5%	1812≥47μF
10V	≤12.5%	≤20%	0402
6.3V	≤20%		

## 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

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## 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 requires a solderability check before use.

## HANDLING

Chip capacitors are made of dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chips Capacitors should be handled with care to avoid contamination or damage. The use of 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 process 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

Leads 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 leads 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.

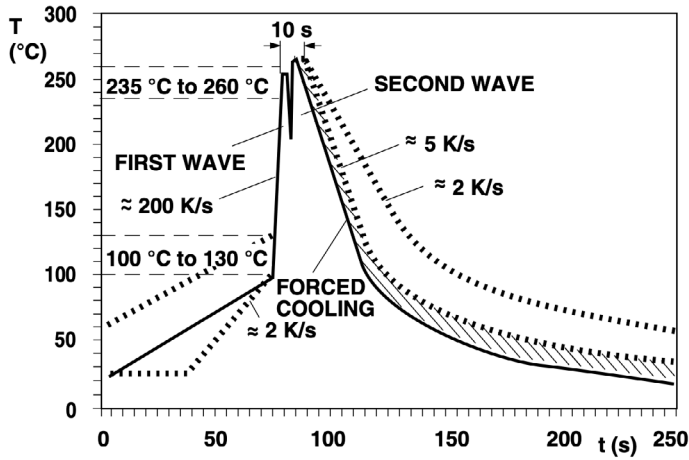
## CLEANING

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 solvents. The choice of the proper system depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability for the cleaning system to remove flux residues and contamination from under the chips is of paramount importance.

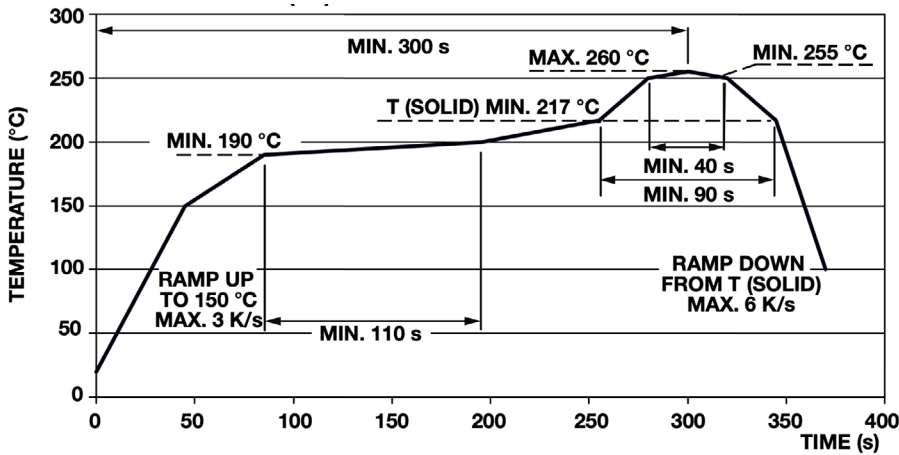
## SOLDERING CONDITIONS

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
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

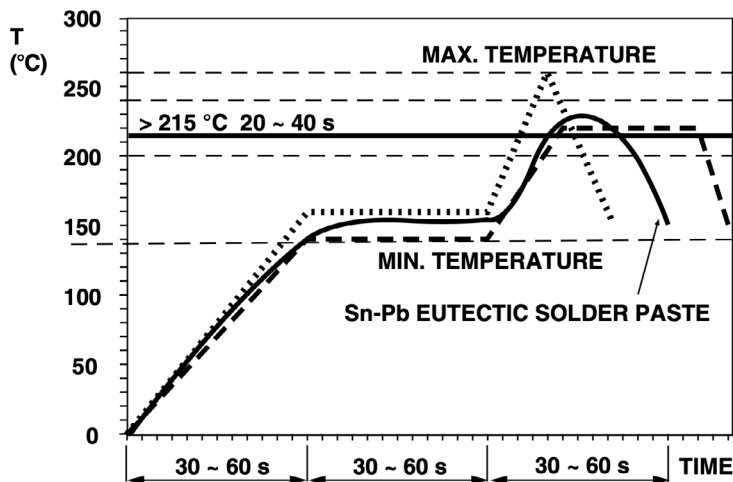
## WAVE SOLDERING PROFILE



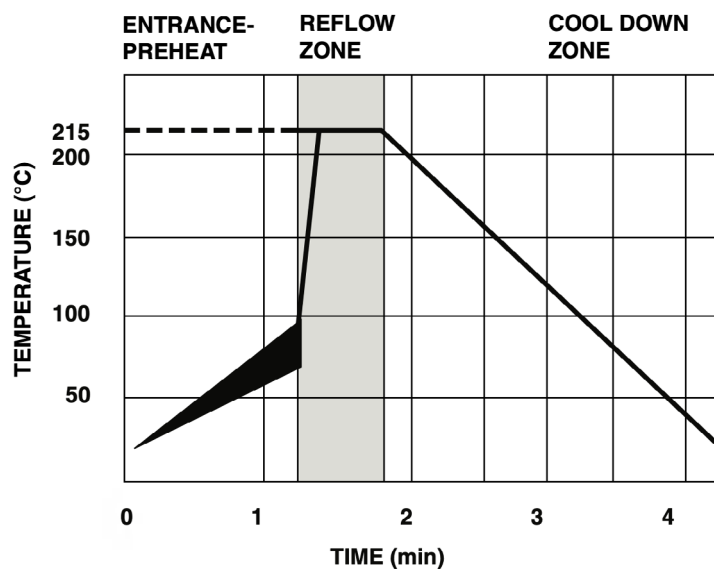
## LEADFREE REFLOW SOLDERING PROFILE



## SNPB REFLOW SOLDERING PROFILE



## VAPOUR PHASE REFLOW PROFILE



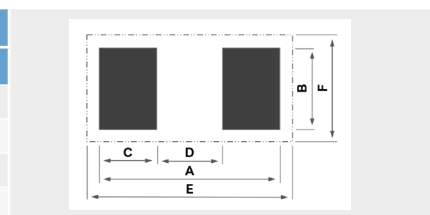
## HAND SOLDERING

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 the temperature gradient between the devices and the tip of the soldering iron.
- Tip temperature should be  $\leq 280$ °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.

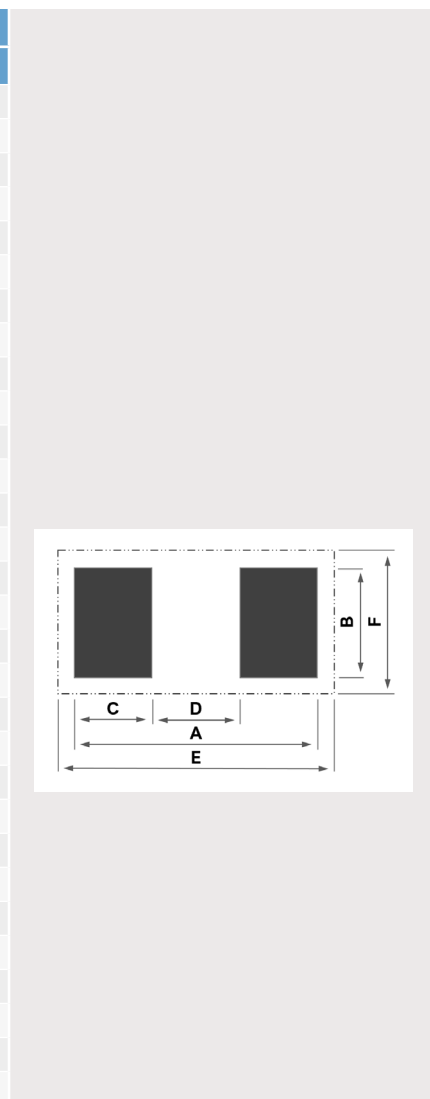
## TYPICAL SMD FOOTPRINT WAVE SOLDERING

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



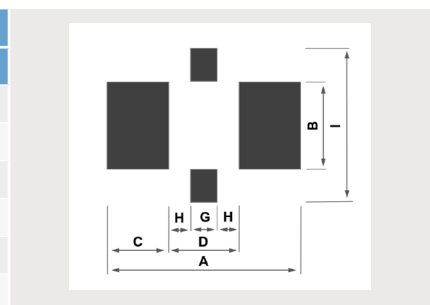
## TYPICAL SMD FOOTPRINT REFLOW SOLDERING

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

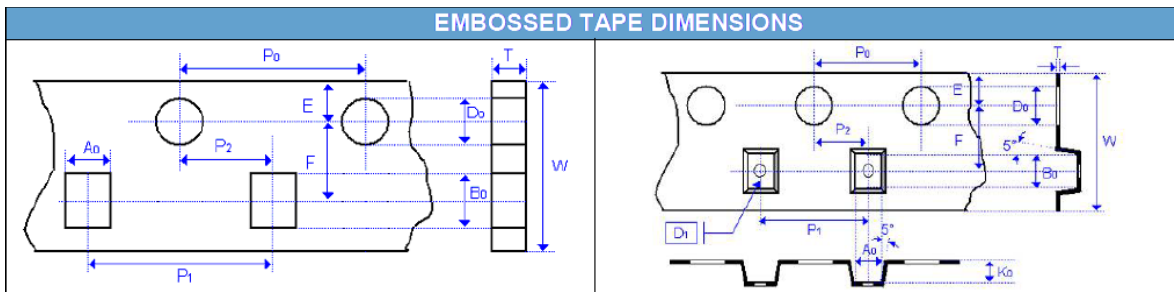
SIZE	FOOTPRINT DIMENSIONS IN mm						
	A	B	C	D	G	H	I
0603	2.30	0.80	0.45	1.40	0.60	0.40	1.50
0805	2.90	1.25	0.90	1.80	0.80	0.50	2.00
1206	4.10	1.60	0.90	2.40	1.00	0.70	3.00
1806	5.50	1.60	1.20	3.20	1.00	1.10	3.00
1812	5.50	3.30	1.20	3.90	1.50	1.20	4.80
2220	6.80	5.40	1.40	4.50	1.50	1.50	7.00



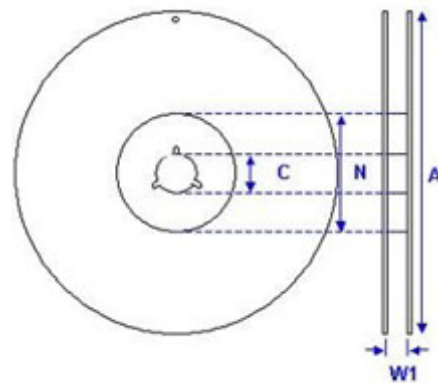
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## PACKAGE DIMENSION AND QUANTITY

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, in which the 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 deepen 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/batch	DPA		AEC-Q200-5	internal component integrity
5/batch	Dimension	CECC-32100-4.5	AEC-Q200-5	according to datasheet
5/batch	Resistance to soldering heat	CECC-32100-4.10	AEC-Q200-15	
5/batch	Solderability	CECC-32100-4.11	AEC-Q200-18	
10/batch	Voltage proof	CECC-32100-4.6.4		
1/ceramic batch	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

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## 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 appendit 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 **Sn 96.5 Ag 3 Cu 0.5**

## 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.