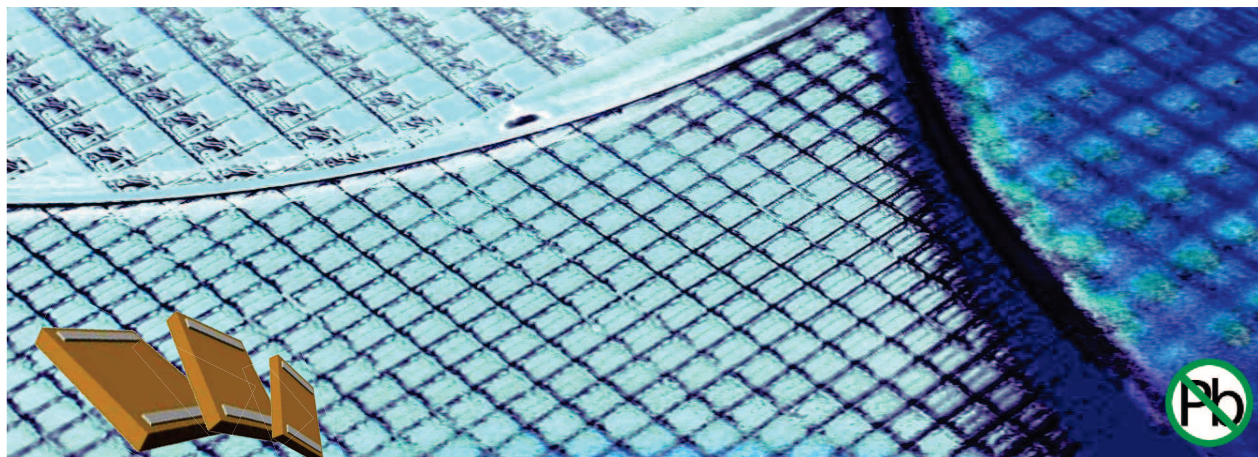




# XTSC423.xxx - 0201 Extreme Temperature Silicon Capacitor

Rev 3.1



## Key features

- Ultra High temperature up to 250°C:
  - ◆ Temperature Coeff :  $<\pm 1.5\%$  (-55 °C to +250°C)
  - ◆ Voltage  $<0.1\%$  /V
  - ◆ Negligible capacitance loss through aging
- Unique high capacitance in EIA/0201 package size, up to 10 nF
- High reliability (FIT  $<0.017$  parts / billion hours)
- Low leakage current down to 100 pA
- Low ESL and Low ESR
- Suitable for lead free reflow-soldering \*Please refer to our assembly Application Note for further recommendations

Thanks to the unique IPDiA Silicon capacitor technology, most of the problems encountered in demanding applications can be solved.

**EXtreme Temperature Silicon Capacitors** are appropriate for applications used in extreme operating temperature range (up to **250°C**).

XTSC industry leading performances allow to propose a **10nF in 0201** with a **TC $<\pm 1.5\%$**  over the full -55°C/+250°C temperature range.

This technology also offers a **negligible ageing** and a stable insulation resistance, even at very high temperature, as well as a stable capacitor value over the full operating.

## Key applications

- 250°C requirements, High temperature applications, such as military, aerospace, automotive and downhole industries.
- High reliability applications
- Replacement of X8R and C0G dielectrics
- Decoupling / Filtering / Charge pump (i.e.: pressure sensor, motor management)
- Downsizing

The IPDiA technology features a capacitor integration capability (up to 250nF/mm<sup>2</sup>) which allows a capacitance value similar to X8R dielectric, but with better electrical performances than C0G/NP0 dielectrics.

This technology also offers **high reliability**, up to 10 times better than alternative capacitor technologies, such as Tantalum or MLCC, and eliminates cracking phenomena.

This Silicon based technology is RoHS compliant and compatible with lead free reflow soldering process.

## Electrical specification

Unit	Capacitance value					
	10	15	22	33	47	68
1 pF	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales
10 pF	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales
0.1 nF	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales	Contact IPDIA Sales
1 nF	10nF: 935.133.423.510 935.133.723.510					

(\*) Thinner thickness (as low as 100 µm thick) available, see Low Profile Silicon Capacitor product: LPSC

(\*\*) Other values on request.

Parameters	Value
Capacitance range	10 nF <sup>(*)</sup>
Capacitance tolerances	±15 % <sup>(**)</sup>
Operating temperature range	-55 °C to 250 °C
Storage temperatures	-70 °C to 265 °C
Temperature coefficient	<±1.5 %, from -55 °C to +250 °C
Breakdown voltage (BV)	11 VDC, 30VDC
Capacitance variation versus RVDC	0.1 % /V (from 0 V to RVDC)
Equivalent Serial Inductor (ESL)	Max 100 pH
Equivalent Serial Resistor (ESR)	Max 400mΩ <sup>(*)</sup>
Insulation resistance	50GΩ min @ 3V, 25°C 10GΩ min @ 3V, 250°C
Ageing	Negligible, < 0.001 % / 1000 h
Reliability	FIT<0.017 parts / billion hours,
Capacitor height	Max 400 µm <sup>(*)</sup>

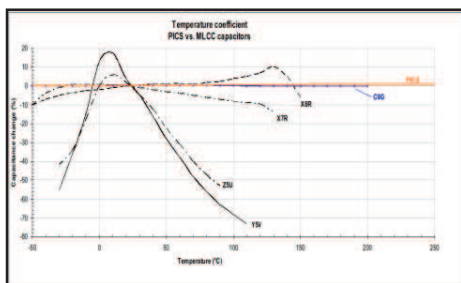


Fig.1 Capacitance change versus temperature variation compared with alternative dielectrics

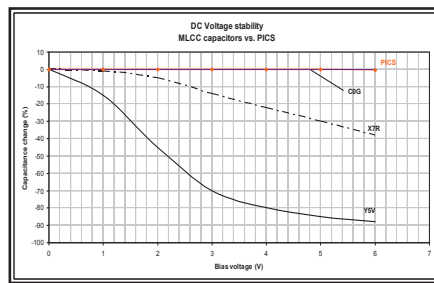


Fig.2 Capacitance change versus voltage variation compared with alternative dielectrics

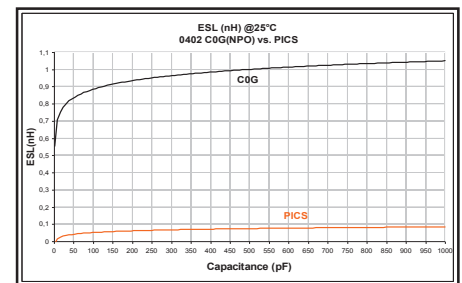


Fig.3 ESL versus capacitance value compared with alternative dielectrics

## Part Number

<b>935.133.</b>	<b>B.2</b>	<b>S.</b>	<b>U</b>	<b>XX</b>	<b>Value (E6)</b>
	Breakdown Voltage 4 = 11V 7 = 30V	Size 3 = 0201	Unit 0 = 10 f 1 = 0.1 p 2 = 1 p 3 = 10 p 4 = 0.1 n 5 = 1 n 6 = 10 n 7 = 0.1 µ 8 = 1 µ 9 = 10 µ		10 15 22 33 47 68
i.e.: 10 nF/0201 case (XTSC type) → 935.133.423.510					

## Termination and Outline

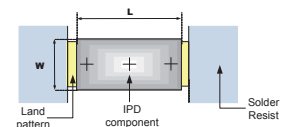
### Termination

Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.

Typical dimensions, all dimensions in mm.

### Package outline

Typ.		0201
Comp. size	L	0.8±0.03
	W	0.60±0.03



(0201 PCB footprint)

## Packaging

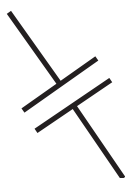
Tape and reel, tray, waffle pack or wafer delivery

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# IPD Capacitor Assembly Set Up

Rev 1.0

Application Note

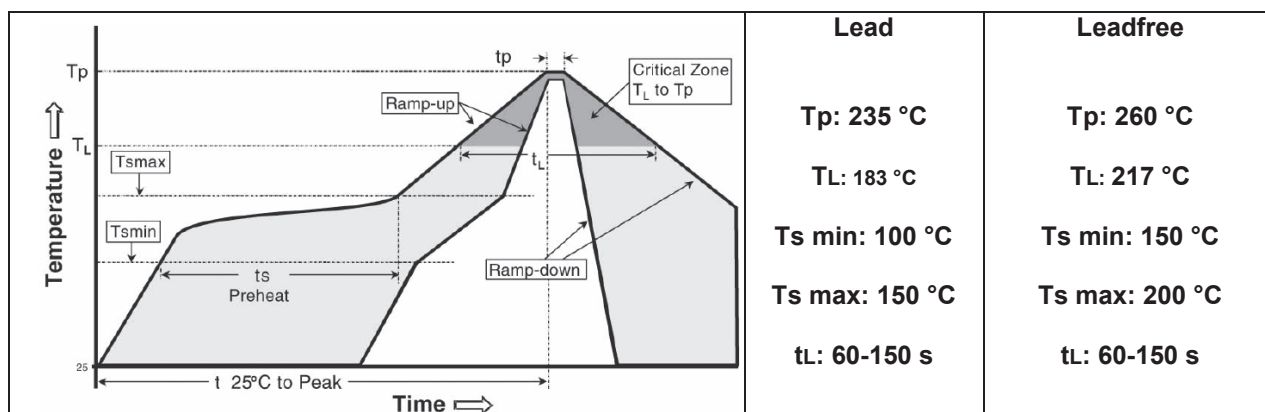
## Outline

Silicon Capacitor for surface mounting device (SMD) assembly is a Wafer Level Chip Scale Packaging with the following features:

- Package dedicated to solve tombstoning effect of small SMD package;
- Package compatible with SMD assembly;
- Package without underfilling step;
- Interconnect available with various optional finishing for specific assembly.

## Assembly consideration

- Standard pick & place equipment dedicated to WLCSP down to 400µm pitch.
- Solder paste type 3 in most cases of EIA size.
- Reflow has to be done with standard lead-free profile (for SAC alloys) or according to JEDEC recommendations J-STD 020D-01.



## Process recommendation

After soldering, no solder paste should touch the side of the capacitor die as that might results in leakage currents due to remaining flux.

In order to use IPDiA standard capacitors within the JEDEC format and recommendation, the solder flux must be cleaned after reflow soldering step.

Notes: for a proper flux cleaning process, "rosin" flux type (R) or "water soluble" flux type (WS) is recommended for the solder printing material. "No clean" flux (NC) solder paste is not recommended.

In case the flux is not cleaned after the reflow soldering, the standard JEDEC would probably not be appropriate and the solder volume must be controlled:

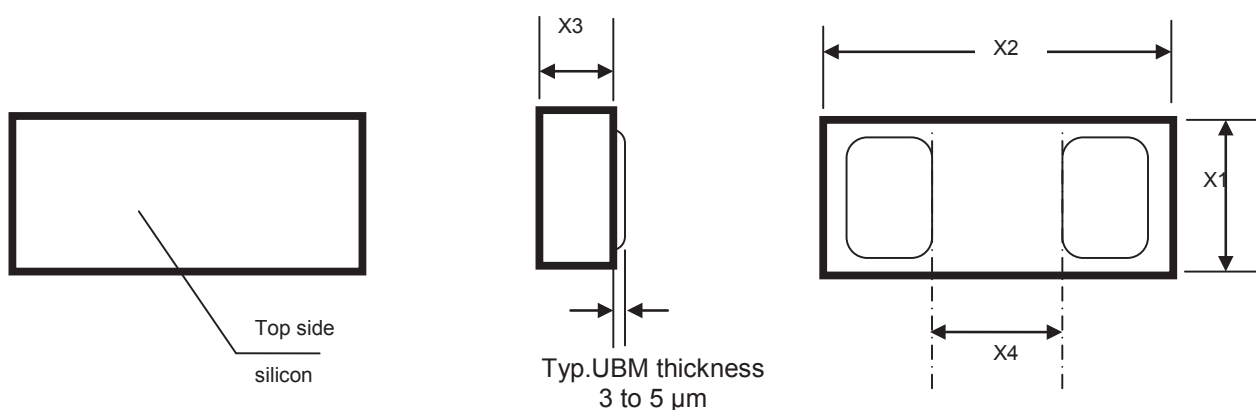
- using smallest aperture design for the stencil, and using finer solder paste type 4 or 5 for a proper printing process.
- Mirroring pads would be the best recommendation

## Pad recommendation

The capacitor is compatible with generic requirements for flip chip design (IPC7094).  
Standard IPDiA 3D package can be compliant with established EIA size (0201, 0402, 0603, ...).

Die size and land pattern dimensions is set up according to following range :

EIA size	0201	0402	0603	0805	1206	1812
Dimension max(X1 x X2) mm	0.86x0.66	1.26x0.76	1.86x1.16	2.26x1.46	3.46x1.86	4.76x3.66
Typical . die thickness X3 (mm)	0.1 or 0.4					
Typical pad size* (mm)	0.15x0.40	0.30x0.50	0.40x0.90	0.50x1.20	0.60x1.60	0.90x3.40
Typical pad separation (X4 mm)	0.3	0.4	0.8	1	2	2.7



After soldering, no solder paste should touch the side of the capacitor die as that might result in leakage currents due to remaining flux.

## Manual Handling Considerations

These capacitors are designed to be mounted with a standard SMT line, using solder printing step, pick and place machine and a final reflow soldering step. In case of manual handling and mounting conditions, please follow below recommendations:

- Minimize mechanical pressure on the capacitors (use of a vacuum nozzle is recommended).
- Use of organic tip instead of metal tip for the nozzle.
- Minimize temperature shocks (Substrate pre-heating is recommended).
- No wire bonding on 0402 47nF, 0402 100nF, 1206 1 $\mu$ F and 1812 3,3 $\mu$ F

Process steps:

- On substrate, form the solder meniscus on each land pattern targeting 100  $\mu$ m height after reflow (screen printing, dispensing solder paste or by wire soldering).
- Pick the capacitor from the tape & reel or the Gel Pack keeping backside visible using a vacuum nozzle and organic tip.
- Temporary place the capacitor on land pattern assuming the solder paste (Flux) will stick and maintain the capacitor.
- Reflow the assembly module with a dedicated thermal profile (see reflow recommendation profile).

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