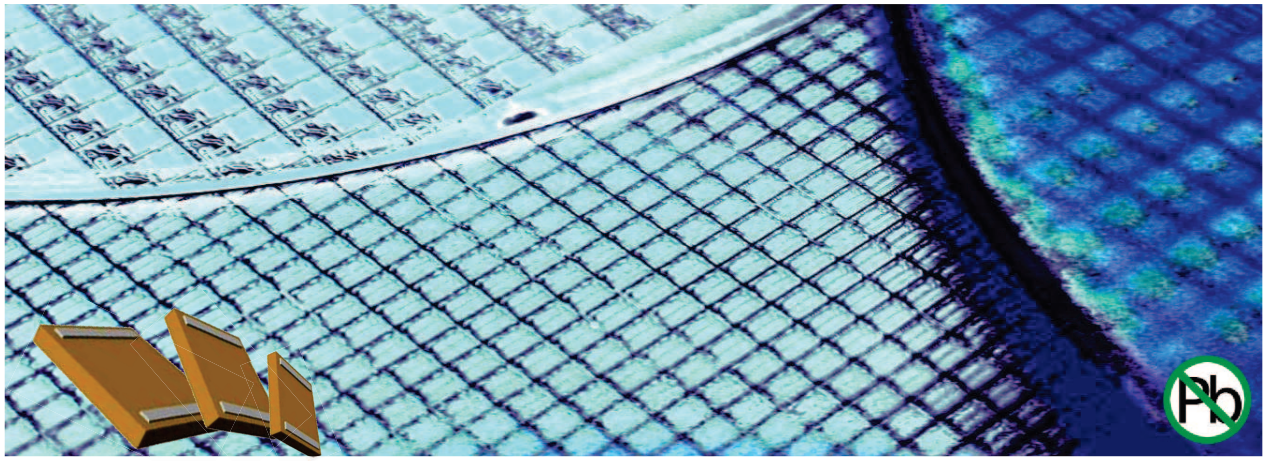
HSSC424.xxx - 0402 High Stability Silicon Capacitor

Rev 3.2



Key features

- **Ultra high stability :**
  - **Temperature <±0.5% (-55 °C to +150 °C)**
  - **Voltage <0.1 %/V**
  - **Negligible aging <0.001% /1000hours**
- **Unique high capacitance in EIA/0402 package size, up to 100 nF**
- **High reliability (FIT <0.017 parts / billion hours)**
- **Low leakage current down to 100 pA**
- **Low ESL and Low ESR**
- **Suitable with lead free reflow-soldering** *Please refer to our assembly Application Note for further recommendations

Key applications

- **All demanding applications, such as medical, aerospace, automotive industry**
- **High stability applications**
- **Decoupling / Filtering / Charge pump (i.e.: Pacemakers / defibrillators)**
- **Devices with battery operations**
- **Replacement of X7R and NP0**
- **Downsizing**

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

High **S**tability **S**ilicon **C**apacitors are dedicated to applications where **Reliability** is the main parameter thanks to our end of production Burn-in.

HSSC avoid the need to oversize the capacitor value for sensitive capacitive circuitry and offers a **higher DC voltage stability**.

This technology provides industry leading performances relative to the **capacitor stability** over the full **operating voltage & temperature range.**

The very high and stable insulation resistance of silicon capacitors can enhance up to 30 % the **battery lifetime** in mobile applications.

The IPDiA technology features a capacitor integration capability (up to 250nF/mm^2) which allows a **smaller case size** than existing solutions to answer high volume constraints. 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.

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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	100 pF: 935.131.424.310	150 pF: 935.131.424.315	220 pF: 935.131.424.322	330 pF: 935.131.424.333	470 pF: 935.131.424.347	680 pF: 935.131.424.368
	0.1 nF	1 nF: 935.131.424.410	1.5 nF: 935.131.424.415	2.2 nF: 935.131.424.422	3.3 nF: 935.131.424.433	4.7 nF: 935.131.424.447	6.8 nF: 935.131.424.468
	1 nF	10 nF: 935.131.424.510	15 nF: 935.131.424.515	22 nF: 935.131.424.522	33 nF: 935.131.424.533	47 nF: 935.131.424.547 935.131.724.547	Contact IPDIA Sales
	10 nF	100 nF: 935.131.424.610					

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

(**) Extended temperature range (up to +250 °C) available, see Xtreme Temperature Silicon Capacitor product: XTSC

(***) Other values on request.

Parameters	Value
Capacitance range	*100 pF to 100 nF(***)*
Capacitance tolerances	*±15 %(***)*
Operating temperature range	*-55 °C to 150 °C (**)*
Storage temperatures	*- 70 °C to 165 °C*
Temperature coefficient	*<±0.5 %, from -55 °C to +150 °C*
Breakdown voltage (BV)	*11, 30 V(***)*
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(***)*
Insulation resistance	*100GΩ min @ 3V,from -55°C to +150°C*
Ageing	*Negligible, < 0.001 % / 1000h*
Reliability	*FIT<0.017 parts / billion hours,*
Capacitor height	*Max 400 µm (*)*

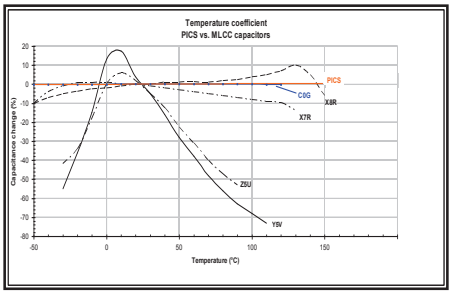


Fig.1 Capacitance change versus temperature variation compared with alternative dielectrics

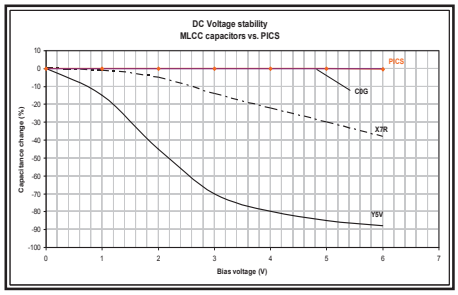


Fig.2 Capacitance change versus voltage variation compared with alternative dielectrics

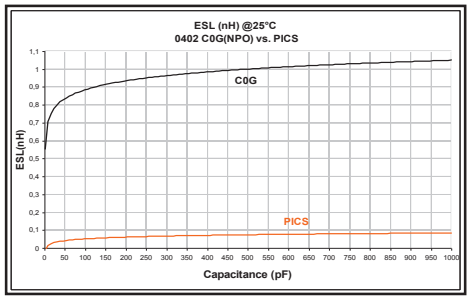


Fig.3 ESL versus capacitance value compared with alternative dielectrics

Part Number

935.131. **B.2** **S.** **U** **XX** → Value (E6)

Breakdown Voltage
4 = 11V
7 = 30V

Size
4 = 0402

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 u

Value (E6)
10
15
22
33
47
68

i.e.: 100 nF/0402 case (HSSC type)
→ 935.131.424.610

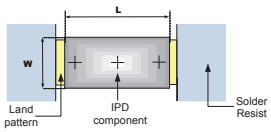
Termination and Outline

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

Typical dimensions, all dimensions in mm.

Package outline

Typ.		0402
Comp. size	L	1.16±0.05
	W	0.66±0.05



(0402 PCB footprint)

Packaging

Tape and reel, tray, waffle pack or wafer delivery.

For more information, please visit: http://www.ipdia.com
To contact us, email to: sales@ipdia.com

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IPD Capacitor Assembly Set Up

Rev 1.0

Application Note

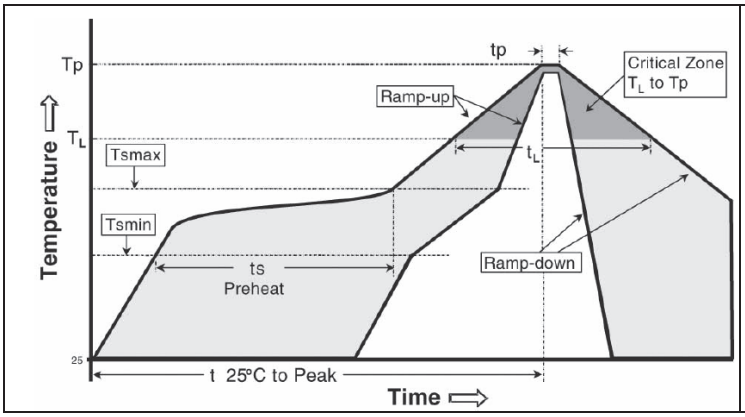
Outline

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.



	Lead	Leadfree
	Tp: 235 °C	Tp: 260 °C
	TL: 183 °C	TL: 217 °C
	Ts min: 100 °C	Ts min: 150 °C
	Ts max: 150 °C	Ts max: 200 °C
	tL: 60-150 s	tL: 60-150 s

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

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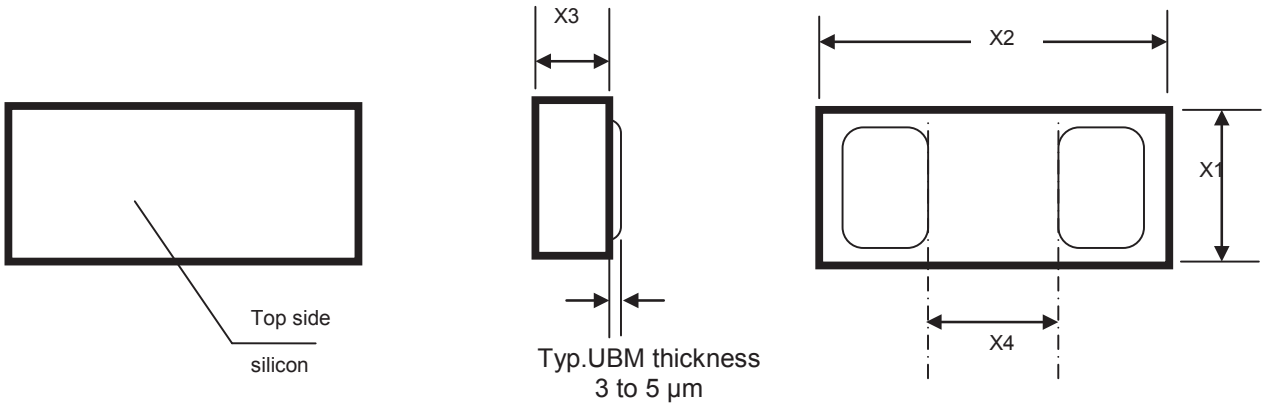
Pad recommendation

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 1µF and 1812 3,3µF

Process steps:

- On substrate, form the solder meniscus on each land pattern targeting 100 µm 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).

Mouser Electronics

Authorized Distributor

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IPDiA:

935131424410-T3N 935131424510-T3N 935131424533-T3N 935131424610-T3N 935131424310-T3A 935131424310-T3N 935131424347-T3N 935131424522-T1N 935131424522-T3N 935131424547-T1N 935131424547-T3N 935131424610-T3A 935131724547-T3N 935131424347-T1N 935131424310-T1N 935131724547-T1N