WLSC

Wire-bondable vertical Low-profile Si Capacitors down to 100 µm

Rev 2.4

Key features

- Ultra low profile 100 µm.
- Low leakage current.
- High stability (temperature and voltage).
- Negligible capacitance loss through aging.
- Compatible with standard wire bonding assembly (ball and wedge).

(please refer to our Assembly Application Note for more details)

Key applications

- Any demanding applications such as radar, wireless infrastructure communication, data broadcasting...
- Standard wire bonding approach (top & bottom gold metallization), thanks to a perfect pad flatness.
- Decoupling / DC noise and harmonic filtering / Matching networks (e.g: GaN power amplifier, LDMOS).
- High reliability applications.
- Downsizing. Low profile applications (100 µm).
- Fully compatible with single layer ceramic capacitors and Metal Oxide Semiconductor.

The WLSC (100 µm thick) capacitors target **RF High Power applications** for wireless communication (e.g: 5G), radar and data broadcasting systems. The WLSC capacitors are suitable for **DC decoupling, matching network, and harmonic / noise filtering functions**. The unique technology of integrated passive devices in silicon developed by Murata Integrated Passive Solutions, can **solve most of the problems encountered** in demanding applications. These Si capacitors in ultra–deep trenches have been developed with a semiconductor process which enables the integration of **high capacitance density** from 1.55 nF/mm² to 250 nF/mm² (with a breakdown voltage of respectively **450 V** to 11 V).

Our SiCap technology features **high reliability** - up to 10 times better than alternative capacitors technologies - thanks to a full control of the production process with **high temperature curing** (above 900°C) generating a highly pure oxide. This technology provides **industry-leading performance** particularly in terms of capacitor stability over the full operating DC voltage & temperature range. In addition, intrinsic properties of the silicon show a low dielectric absorption and a low to zero piezo electric effect resulting **in no memory effect**. This Silicon based technology is ROHS compliant.

Electrical specifications

Part number	Capacitance	BV	Case size	Thickness
935146528247-xxT	47 pF	150 V	0201	100 µm
935146522310-xxT	100 pF	150 V	0101	100 µm
935146521310-xxT	100 pF	150 V	0202	100 µm
935146049310-xxT	100 pF	450 V	015015	100 µm
935146529315-xxT	150 pF	150 V	015015	100 µm
935146632322-xxT	220 pF	50 V	0101	100 µm
935146632327-xxT	270 pF	50 V	0101	100 µm
935146632347-xxT	470 pF	50 V	0101	100 µm
935146045347-xxT	470 pF	450 V	0302	100 µm
935146832410-xxT	1 nF	30 V	0101	100 µm
935146632410-xxT	1 nF	50 V	0101+	100 µm
935146521410-xxT	1 nF	150 V	0202	100 µm
935246520427-xxT	2.7 nF	150 V	0205	100 µm
935246521437-xxT	3.7 nF	150 V	02065	100 µm
935246522447-xxT	4.7 nF	150 V	0208	100 µm
935146831510-xxT	10 nF	30 V	0202	100 µm
935146630510-xxT	10 nF	50 V	0303	100 µm
935146050510-xxT	10 nF	100 V	0303	100 µm
935146837522-xxT	22 nF	30 V	0402	100 µm
935146634522-xxT	22 nF	50 V	0504	100 µm

Parameter	Value
Capacitance range	47 pF to 22 nF(*)
Capacitance tolerances	±15 % (*)
Operating temperature range	-55 °C to 150°C (*)
Storage temperature range	-70°C to 165°C(**)
Temperature coefficient	+60 ppm/K
Breakdown Voltage (BV)	11 V, 30 V, 50 V, 100 V, 150 V, 450 V(*)
Capacitance variation versus RVDC	0.02 %/V (from 0 to RVDC)
Equivalent Series Inductance (ESL)	Typ 50 pH @ SRF (***)
Equivalent Series Resistance (ESR)	Max 50 mΩ (***)
Insulation resistance	10 GΩ @ RVDC @ 25°C t>120s for 10 nF
Ageing	Negligible, < 0.001 % / 1000 h
Reliability	FIT<0.017 parts / billions hours
Capacitor thickness	100 µm(*)

(*) Other values on request (**) w/o packing
(***) with wire-bonding de-embedded

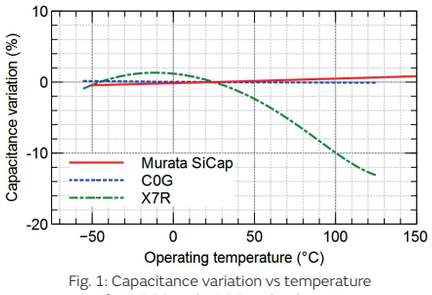


Fig. 1: Capacitance variation vs temperature (for WLSC and MLCC technologies)

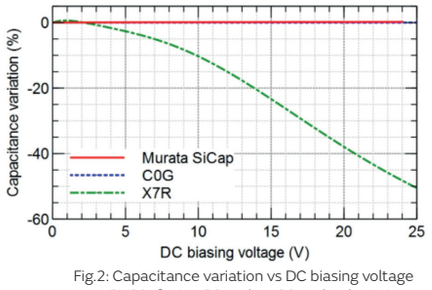


Fig.2: Capacitance variation vs DC biasing voltage @ BV30 (for WLSC and MLCC technologies)

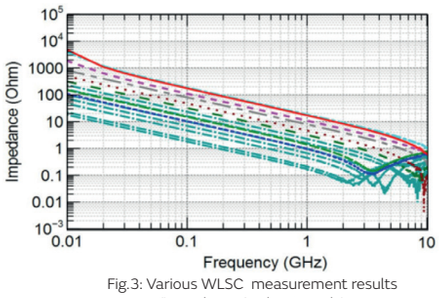
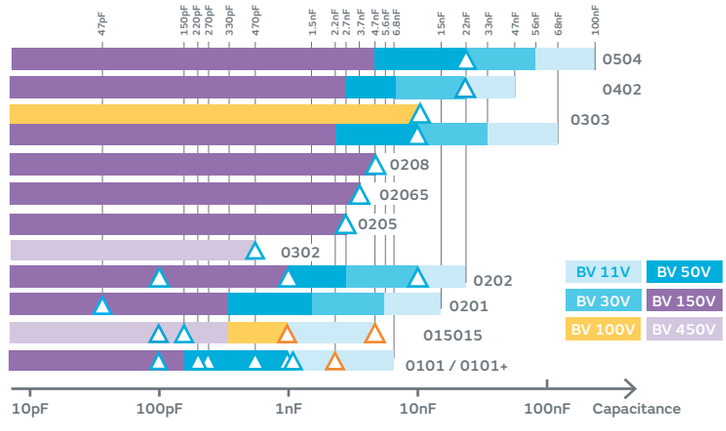


Fig.3: Various WLSC measurement results (Impedance in shunt mode) with capacitance value from 47pF to 1nF

Capacitance range



Available parts.
For other values, contact your Murata sales representative.

Under development.

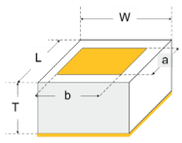
0101+ available as 1 nF-BV50 only.

Termination

Can be directly mounted on the PCB using die bonding and wire bonding(s). Bottom electrode in Ti/Ni/Au and top electrode in Gold (TiWAu). Other top finishings available on request (ex: Aluminum). Compatible with standard wire bonding assembly (ball and wedge).

Package Outline

	Pad dimension mm		Case size mm (typ ±0.02 mm)		
	a	b	L	W	T
0101	>0.15	>0.15	0.25	0.25	0.10
0101+	>0.15	>0.15	0.294(*)	0.294(*)	
015015	>0.281	>0.281	0.381	0.381	
0201	>0.40	>0.15	0.50	0.25	
0202	>0.40	>0.40	0.50	0.50	
0302	>0.7	>0.4	0.8	0.5	
0303	>0.70	>0.70	0.80	0.80	
0402	>0.9	>0.4	1.00	0.50	
0504	>1.15	>0.9	1.25	1.00	
0205	0.39	1.09	0.5	1.25	
02065	0.39	1.52	0.5	1.63	
0208	0.39	1.90	0.5	2	



(*) Only for 1nF / BV50 case size = 0.294x0.294mm

Packaging

Tape & reel (up to 0202 case size included), waffle pack, film frame carrier or raw wafer delivery.

Assembly by Soldering

The attachment techniques recommended by Murata for the WLSC capacitors on the customers substrates are fully detailed in specific documents available on our website. To assure the correct use and proper functioning of Murata Silicon capacitors **please download the assembly instructions on www.murata.com and read them carefully.**

For the assembly instructions, please go to :

www.murata.com/ and follow the sections :
- ➲Products
  - ➲Capacitor
    - ➲Silicon Capacitor
      - ➲**WLSC Series**

Download the pdf file called :
'Assembly Note WBSC / WTSC / WXSC / WLSC'

https://www.murata.com/en-eu/products/capacitor/siliconcapacitors/wlsc

Scan us, and visit our official Website to get more details

Application Notes references

For the application instructions, please refer to our documents:

- Storage and Shelf Life Conditions
- Recommendation to handle bare dies
- Nozzle recommendation

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