

XBSC / UBSC / BBSC / ULSC - 100+/60+/40/20 GHz Ultra Broadband Surface Mounted Silicon Capacitors



Rev 1.4

Key features

- Ultra broadband performance up to 110 GHz
- Resonance free allowing ultra low group delay variation
- Ultra low insertion loss thanks to an excellent impedance matching in transmission mode
- Low ESL and low ESR in bypass grounding mode
- High stability of capacitance value over temperature, voltage and aging
- High reliability
- Compatible with lead free reflow soldering

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

Key applications

- Optoelectronics/high-speed data
- Trans-Impedance Amplifiers (TIA)
- Receive-and-Transmit Optical Sub-Assembly (ROSA/TOSA)
- Synchronous Optical Networking (SONET)
- High speed digital logic
- Broadband test equipment
- Broadband microwave/millimeter wave
- Replacement of X7R and NP0 capacitors
- Low profile applications (400 or 100 μm)

The XBSC/UBSC/BBSC/ULSC Capacitors target **optical communication systems** (ROSA/TOSA,SONET and all optoelectronics) as well as **high speed data systems** or products. These capacitors are designed for DC blocking, coupling and bypass grounding applications. The unique technology of integrated passive devices in silicon developed by Murata Integrated Passive Solutions offers **low insertion loss, low reflection and high phase stability** from 16 kHz*, and respectively optimized up to 110 GHz for the XBSC serie, up to 67 GHz for the UBSC serie, up to 40 GHz for the BBSC serie and up to 20 GHz for the ULSC range. These deep trench silicon capacitors have been developed with a semiconductor MOS process. They provide **very high reliability** and capacitance stability over voltage (0.1%/V) and temperature (60 ppm/K).

They have an extended operating temperature range from -55 to 150°C. **Reliable and repeatable performances** are obtained thanks to a fully controlled production line with high temperature curing (above 900°C) generating a highly pure oxide. The XBSC/UBSC/BBSC/ULSC series are compliant with standard JEDEC assembly rules, making the product fully compatible with high speed automated pick-and-place manufacturing operations. These capacitors are RoHS-compliant and are available either with ENIG terminations or lead-free prebumping depending on the case size.

*Cut off frequency at 3dB based on 100nF capacitance value



XBSC 100 GHz+ electrical specifications

Part number	Capacitance	BV	Case size	Thickness
939118722456-xxS	5.6 nF	30 V	0201M	100 μm
939118492510-xxS	10 nF	11 V	0201M	100 μm

Parameter	Value
Capacitance range	5.6 nF to 10 nF(*)
Capacitance tolerance	±15 %(*)
Operating temperature range	-55 °C to 150 °C
Storage temperature	- 70 °C to 165 °C(**)
Temperature coefficient	+60 ppm/K
Breakdown voltage (BV)	11 VDC or 30 VDC
Capacitance variation versus RVDC	0.1 %/V (from 0 V to RVDC)
Insertion loss (IL) up to 100 GHz+	<1.2 dB(***)
Return Loss (RL) up to 100 GHz+	>20 dB(***)
Equivalent Series Inductance (ESL)	Typ. 100 pH(***) @ SRF
Equivalent Series Resistance (ESR)	Typ. 300 mΩ (***)
Insulation resistance	10 GΩ @ RVDC, @25°C, t>120s, for 10nF
Ageing	Negligible, < 0.001% / 1000 h
Reliability	FIT<0.017 parts / billion hours
Capacitor height	100 μm

(*) Other values on request (**) w/o packing (***) e.g. 10nF/0201M/BV 11V

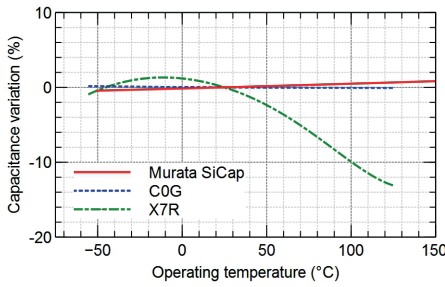


Fig. 1: Capacitance variation vs temperature (for XBSC and MLCC technologies)

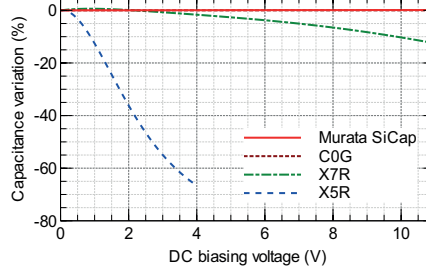


Fig. 2: Capacitance variation vs DC biasing voltage @ BV 30 (for XBSC and MLCC technologies)

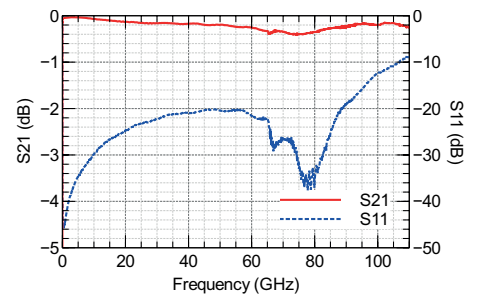
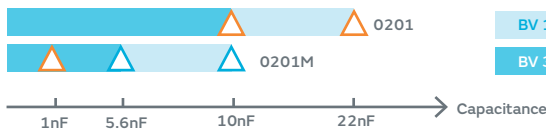


Fig. 3: 10 nF/0201M XBSC @ BV11 measurement results (S-parameters in transmission mode)

FREE S-Parameters-Based Linear Simulation Models for ADS: <http://www.modelithics.com>

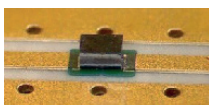
XBSC 100 GHz+ capacitance range



- ▲ Available parts. For other values, contact your Murata sales representative.
- ▲ Under development.

XBSC 100 GHz+ termination

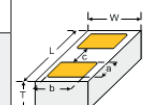
Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.



XBSC 100 GHz+ package outline

	Pad dimensions (mm)			Case size (typ. +/-0.02mm)		
	a	b	c	L	W	T(****)
0201M	0.10	0.15	0.20	0.60	0.30	0.10

(****) thickness excluding bump height
For landing pad dimensions on your PCB layout, please refer to our assembly application note



XBSC 100 GHz+ packaging

Tape & reel, film frame carrier or raw wafer delivery.



UBSC 60 GHz+ electrical specifications

Part number	Capacitance	BV	Case size	Thickness
935152722410-xxS(*)	1 nF	30 V	0201M	100 μm
935152722456-xxS(*)	5.6 nF	30 V	0201M	100 μm
935152492510-xxS(*)	10 nF	11 V	0201M	100 μm
935152723410-xxN	1 nF	30 V	0201	100 μm
935151723410-xxN	1 nF	30 V	0201	400 μm
935152723510-xxN	10 nF	30 V	0201	100 μm
935151723510-xxN	10 nF	30 V	0201	400 μm
935152783522-xxN	22 nF	30 V	0201	100 μm
935151783522-xxN	22 nF	30 V	0201	400 μm
935152493547-xxN	47 nF	11 V	0201	100 μm
935151493547-xxN	47 nF	11 V	0201	400 μm
935152724547-xxN	47 nF	30 V	0402	100 μm
935151724547-xxN	47 nF	30 V	0402	400 μm
935152424610-xxN	100 nF	11 V	0402	100 μm
935151424610-xxN	100 nF	11 V	0402	400 μm

(*) only leadfree pre-bumped version available

Parameter	Value
Capacitance range	1 nF to 100 nF(**)
Capacitance tolerance	±15 %(**)
Operating temperature range	-55 °C to 150 °C
Storage temperature	-70 °C to 165 °C(***)
Temperature coefficient	+60 ppm/K
Breakdown voltage (BV)	11 VDC or 30 VDC
Capacitance variation versus RVDC	0.1%/V (from 0 to RVDC)
Insertion loss (IL) up to 60 GHz+	<0.4 dB(****)
Return Loss (RL) up to 60 GHz+	>20 dB(****)
Equivalent Series Inductance (ESL)	Typ. 100 pH(****) @ SRF
Equivalent Series Resistance (ESR)	Typ. 300 mΩ(****)
Insulation resistance	100 GΩ @ RVDC, @25°C, t>120s for 100nF
Aging	Negligible, < 0.001% / 1000 h
Reliability	FIT<0.017 parts / billion hours
Capacitor height	400 μm or 100 μm

(**) Other values on request (***) w/o packing (****) e.g. 5.6 nF/0201M/BV 30V

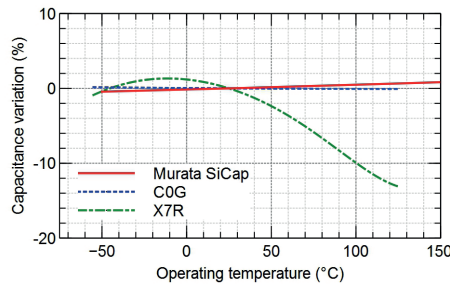


Fig. 1: Capacitance variation vs temperature (for UBSC and MLCC technologies)

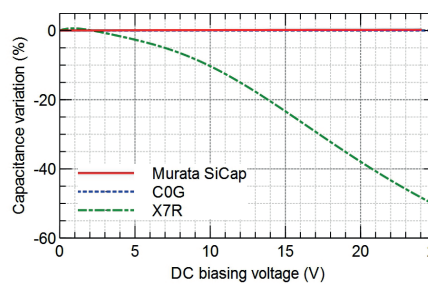


Fig. 2: Capacitance variation vs DC biasing voltage @ BV 30 (for UBSC and MLCC technologies)

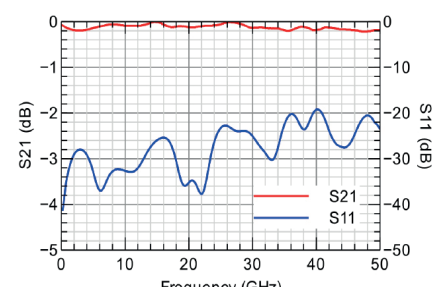
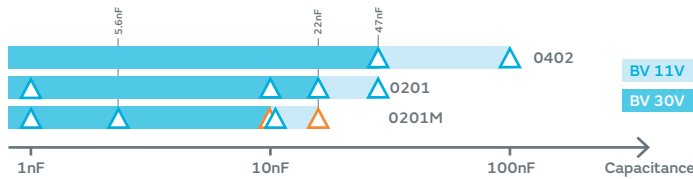


Fig. 3: 5.6 nF/0201M UBSC @ BV30 measurement results (S-parameters in transmission mode)

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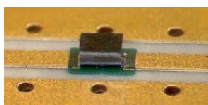
UBSC 60 GHz+ capacitance range



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

UBSC 60 GHz+ termination

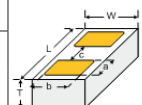
Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.



UBSC 60 GHz+ package outline

	Pad dimensions (mm)			Case size (typ. +/-0.04mm)		
	a	b	c	L	W	T(****)
0201M	0.10	0.15	0.20	0.60	0.30	0.10
0201	0.15	0.40	0.30	0.80	0.60	0.40 or 0.10
0402	0.30	0.50	0.40	1.20	0.70	

(****) thickness excluding bump height
For landing pad dimensions on your PCB layout, please refer to our assembly application note



UBSC 60 GHz+ packaging

Tape & reel, waffle pack, film frame carrier or raw wafer delivery.



BBSC 40 GHz electrical specifications

Part number	Capacitance	BV	Case size	Thickness
939114722410-xxS(*)	1 nF	30 V	0201M	100 μm
939114722456-xxS(*)	5.6 nF	30 V	0201M	100 μm
939114492510-xxS(*)	10 nF	11 V	0201M	100 μm
939114723410-xxN	1 nF	30 V	0201	100 μm
939113723410-xxN	1 nF	30 V	0201	400 μm
939114733510-xxN	10 nF	30 V	0201	100 μm
939113733510-xxN	10 nF	30 V	0201	400 μm
939114793522-xxN	22 nF	30 V	0201	100 μm
939113793522-xxN	22 nF	30 V	0201	400 μm
939114493547-xxN	47 nF	11 V	0201	100 μm
939113493547-xxN	47 nF	11 V	0201	400 μm
939114724547-xxN	47 nF	30 V	0402	100 μm
939113724547-xxN	47 nF	30 V	0402	400 μm
939114424610-xxN	100 nF	11 V	0402	100 μm
939113424610-xxN	100 nF	11 V	0402	400 μm

(*) only leadfree pre-bumped version available

Parameter	Value
Capacitance range	1 nF to 100 nF(**)
Capacitance tolerance	±15 %(**)
Operating temperature range	-55 °C to 150 °C
Storage temperature	-70 °C to 165 °C(***)
Temperature coefficient	+60 ppm/K
Breakdown voltage (BV)	11 VDC or 30 VDC
Capacitance variation versus RVDC	0.1%/V (from 0 to RVDC)
Insertion loss (IL) up to 40 GHz	<0.4 dB(****)
Return Loss (RL) up to 40 GHz	>15 dB(****)
Equivalent Series Inductance (ESL)	Typ. 100 pH(****) @ SRF
Equivalent Series Resistance (ESR)	Typ. 500 mΩ(****)
Insulation resistance	100 GΩ @ RVDC, @25°C, t>120s for 100nF
Aging	Negligible, < 0.001% / 1000 h
Reliability	FIT<0.017 parts / billion hours
Capacitor height	400 μm or 100 μm

(**) Other values on request (***) w/o packing (****) e.g. 10 nF/0201/BV 30V

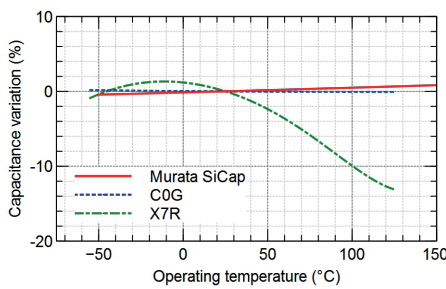


Fig. 1: Capacitance variation vs temperature (for BBSC and MLCC technologies)

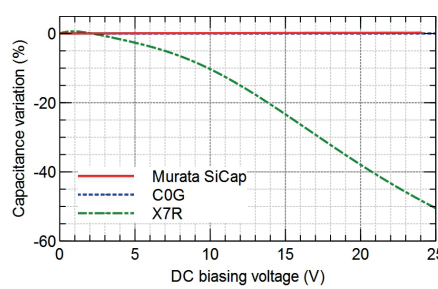


Fig. 2: Capacitance variation vs DC biasing voltage @ BV30 (for BBSC and MLCC technologies)

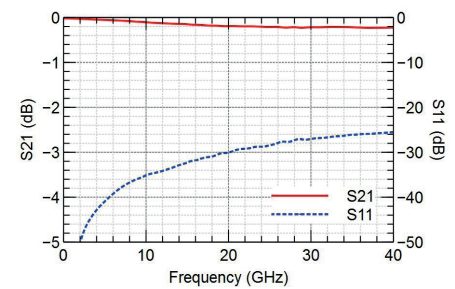
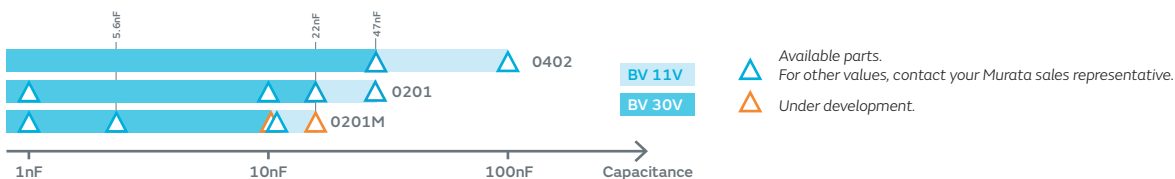


Fig. 3: 10 nF/0201 BBSC @ BV30 measurement results (S-parameters in transmission mode)

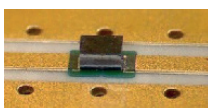
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FREE S-Parameters-Based Linear Simulation Models for ADS. <http://www.modelithics.com>

BBSC 40 GHz capacitance range



BBSC 40 GHz termination

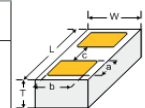
Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.



BBSC 40 GHz package outline

	Pad dimensions (mm)			Case size (typ. +/-0.04mm)		
	a	b	c	L	W	T(****)
0201M	0.10	0.15	0.20	0.60	0.30	0.10
0201	0.15	0.40	0.30	0.80	0.60	0.40 or 0.10
0402	0.30	0.50	0.40	1.20	0.70	

(****) thickness excluding bump height
For landing pad dimensions on your PCB layout, please refer to our assembly application note



BBSC 40 GHz packaging

Tape & reel, waffle pack, film frame carrier or raw wafer delivery.



ULSC 20 GHz electrical specifications

Part number	Capacitance	BV	Case size	Thickness
935156722410-xxx(*)	1 nF	30 V	0201M	100 µm
935156722456-xxx(*)	5.6 nF	30 V	0201M	100 µm
935156492510-xxx(*)	10 nF	11 V	0201M	100 µm
935156723410-xxN	1 nF	30 V	0201	100 µm
935155723410-xxN	1 nF	30 V	0201	400 µm
935156733510-xxN	10 nF	30 V	0201	100 µm
935155733510-xxN	10 nF	30 V	0201	400 µm
935156793522-xxN	22 nF	30 V	0201	100 µm
935155793522-xxN	22 nF	30 V	0201	400 µm
935156493547-xxN	47 nF	11 V	0201	100 µm
935155493547-xxN	47 nF	11 V	0201	400 µm
935156724547-xxN	47 nF	30 V	0402	100 µm
935155724547-xxN	47 nF	30 V	0402	400 µm
935156424610-xxN	100 nF	11 V	0402	100 µm
935155424610-xxN	100 nF	11 V	0402	400 µm
935156425610-xxN	100 nF	11 V	0603	100 µm
935155425610-xxN	100 nF	11 V	0603	400 µm

(*) only leadfree pre-bumped version available

Parameter	Value
Capacitance range	1 nF to 100 nF(**)
Capacitance tolerance	±15 %(**)
Operating temperature range	-55 °C to 150 °C
Storage temperature	-70 °C to 165 °C(***)
Temperature coefficient	+60 pmm/K
Breakdown voltage (BV)	11 VDC or 30 VDC
Capacitance variation versus RVDC	0.1%/V (from 0 to RVDC)
Insertion loss (IL) up to 20 GHz	<0.2 dB(****)
Return Loss (RL) up to 20 GHz	>20 dB(****)
Equivalent Series Inductance (ESL)	Typ. 100 pH(****) @ SRF
Equivalent Series Resistance (ESR)	Typ. 500 mΩ (****)
Insulation resistance	100 GΩ @ RVDC, @25°C, t>120s for 100nF
Aging	Negligible, < 0.001% / 1000 h
Reliability	FIT<0.017 parts / billion hours
Capacitor height	400 µm or 100 µm

(**) Other values on request (***) w/o packing (****) e.g. 100 nF/0402/BV 11V

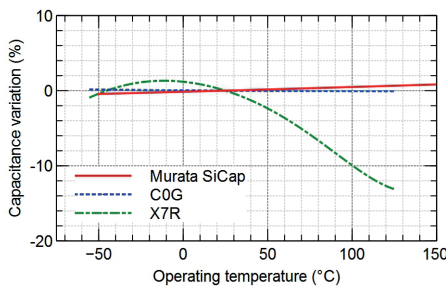


Fig. 1: Capacitance variation vs temperature (for ULSC and MLCC technologies)

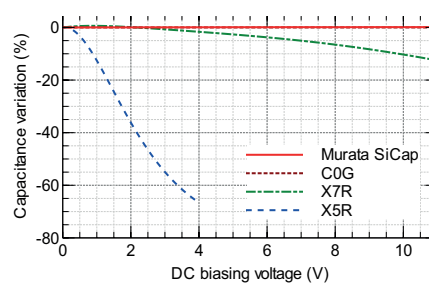


Fig. 2: Capacitance variation vs DC biasing voltage @ BV 30 (for ULSC and MLCC technologies)

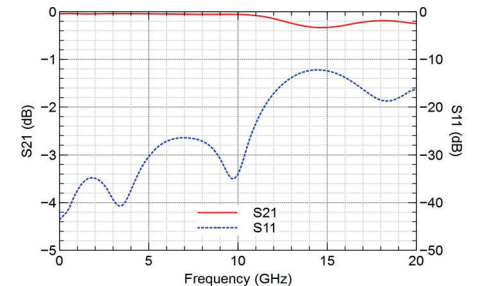
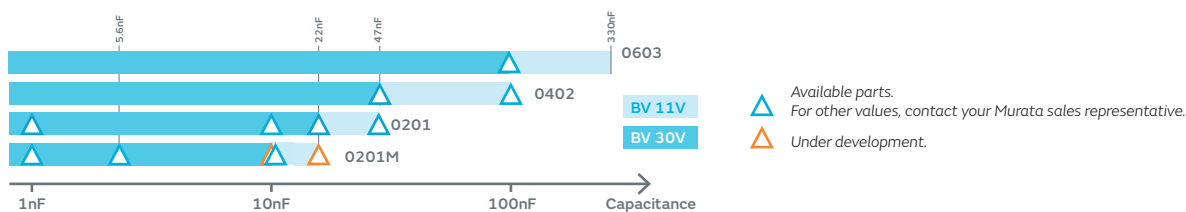


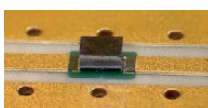
Fig. 3: 100 nF/0402 ULSC @ BV11 measurement results (S-parameters in transmission mode)
 Modelithics® FREE S-Parameters-Based Linear Simulation Models for ADS: <http://www.modelithics.com>

ULSC 20 GHz capacitance range



ULSC 20 GHz termination

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



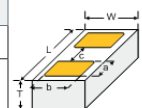
ULSC 20 GHz packaging

Tape & reel, waffle pack, film frame carrier or raw wafer delivery.

ULSC 20 GHz package outline

	Pad dimensions (mm)			Case size (typ. +/-0.04mm)		
	a	b	c	L	W	T(****)
0201M	0.10	0.15	0.20	0.60	0.30	0.1
0201	0.15	0.40	0.30	0.80	0.60	0.40 or 0.10
0402	0.30	0.50	0.40	1.20	0.70	
0603	0.40	0.90	0.80	1.80	1.10	

(****) thickness excluding bump height
 For landing pad dimensions on your PCB layout, please refer to our assembly application note





Assembly by Soldering

The attachment techniques recommended by Murata for the XBSC/UBSC/BBSC/ULSC 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.**



Please download the **assembly instructions** on www.murata.com and **read them carefully before use.**

在使用MURATA电容之前请从 www.murata.com 网站上下载电容安装说明并仔细阅读。

For the assembly instructions, please go to :

www.murata.com/ and follow the sections :

- Products
- Capacitor
- Silicon Capacitor
- XBSC / UBSC / BBSC / ULSC Series

Download the pdf file called :

'Assembly Note UBSC / BBSC / ULSC'

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



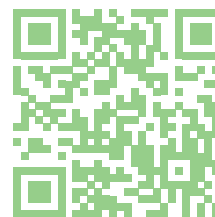
https://www.murata.com/en-eu/products/capacitor/siliconcapacitors/xbsc_ubsc_bbsc_ulsc

Application Notes references

For the application instructions, please refer to our documents:

- Storage and Shelf Life Conditions
- Recommendation to handle bare dies
- Nozzle recommendation
- Design guidelines for transmission line of UBB Sicaps

Try me and simulated your own SiCap!



<https://sicapmatchedline.com/sicapmatchedline.php>

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