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 otpimised 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	

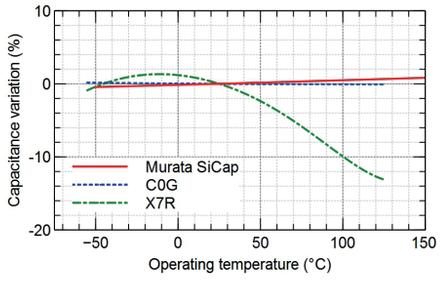


Fig. 1: Capacitance variation vs temperature (for XBSC and MLCC technologies)

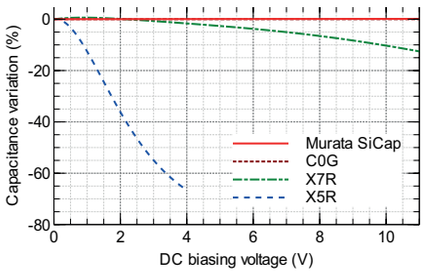


Fig.2: Capacitance variation vs DC biasing voltage @ BV 30 (for XBSC and MLCC technologies)

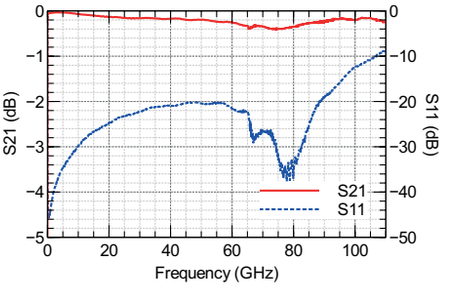
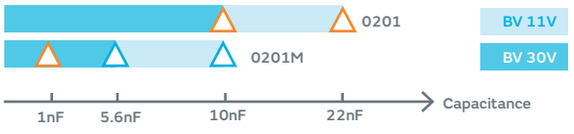


Fig.3: 10 nF/0201M XBSC @ BV11 measurement results (S-parameters in transmission mode)

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

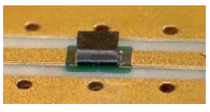
XBSC 100 GHz+ capacitance range



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

XBSC 100 GHz+ termination

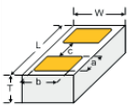
Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.



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 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 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	

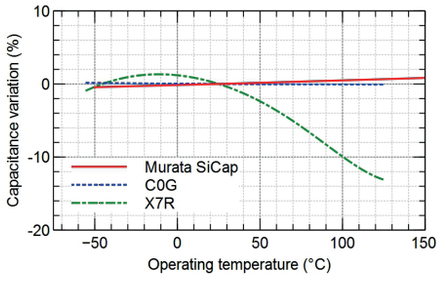


Fig. 1: Capacitance variation vs temperature (for UBSC and MLCC technologies)

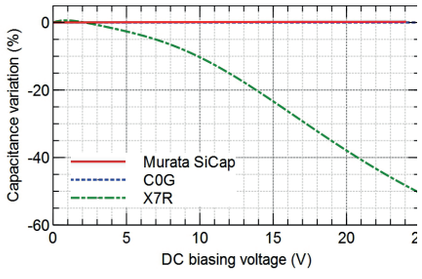


Fig.2: Capacitance variation vs DC biasing voltage @ BV 30 (for UBSC and MLCC technologies)

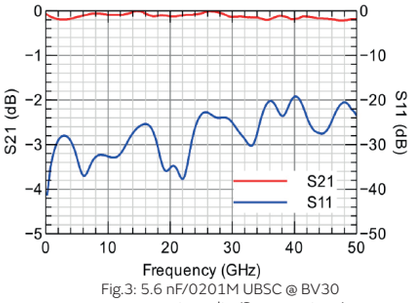
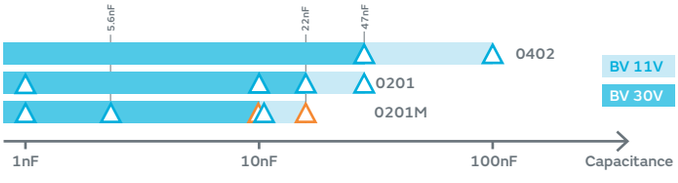


Fig.3: 5.6 nF/0201M UBSC @ BV30 measurement results (S-parameters in transmission mode)

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

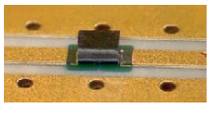
UBSC 60 GHz+ capacitance range



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

UBSC 60 GHz+ termination

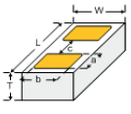
Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.



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 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 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	

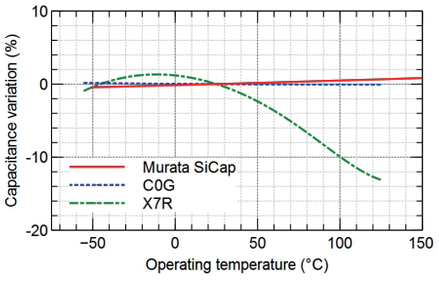


Fig. 1: Capacitance variation vs temperature (for BBSC and MLCC technologies)

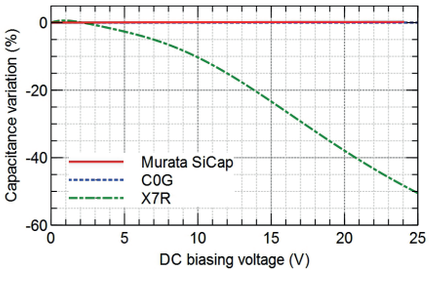


Fig.2: Capacitance variation vs DC biasing voltage @ BV30 (for BBSC and MLCC technologies)

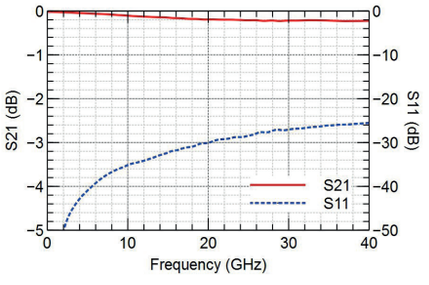
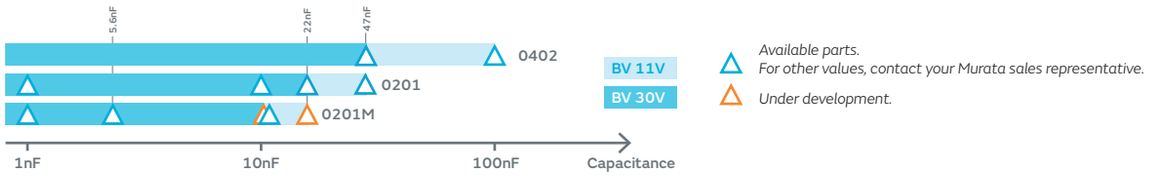


Fig.3: 10 nF/0201 BBSC @ BV30 measurement results (S-parameters in transmission mode)

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

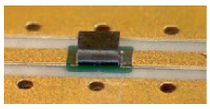
BBSC 40 GHz capacitance range



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

BBSC 40 GHz termination

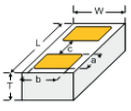
Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.



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	

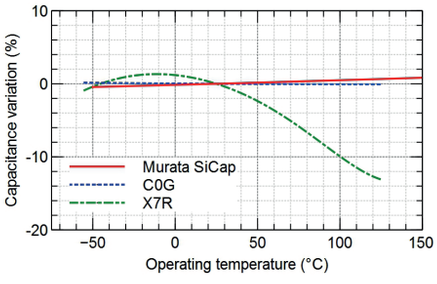


Fig. 1: Capacitance variation vs temperature (for ULSC and MLCC technologies)

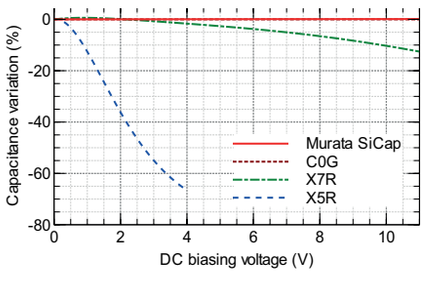


Fig.2: Capacitance variation vs DC biasing voltage @ BV 30 (for ULSC and MLCC technologies)

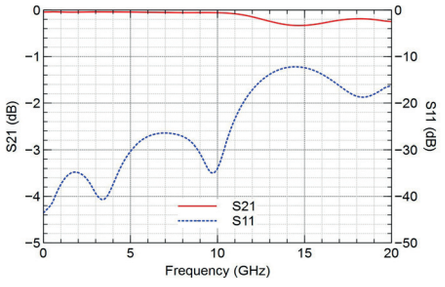
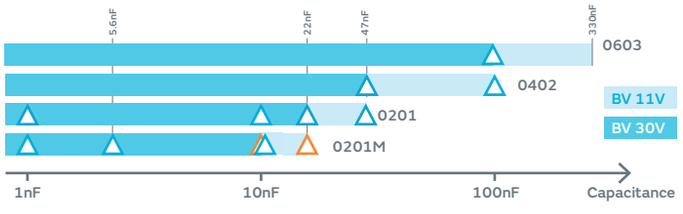


Fig.3: 100 nF/0402 ULSC @ BV11 measurement results (S-parameters in transmission mode)

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

ULSC 20 GHz capacitance range

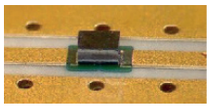


Available parts.
For other values, contact your Murata sales representative.

Under development.

ULSC 20 GHz termination

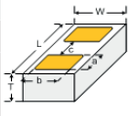
Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.



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

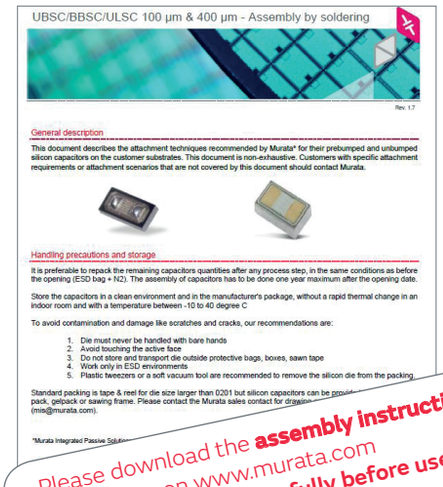


ULSC 20 GHz packaging

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

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.**


UBSC/BBSC/ULSC 100 µm & 400 µm - Assembly by soldering

Rev. 1.7

General description

This document describes the attachment techniques recommended by Murata* for their prebumped and unbumped silicon capacitors on the customer substrates. This document is non-exhaustive. Customers with specific attachment requirements or attachment scenarios that are not covered by this document should contact Murata.

Handling precautions and storage

It is preferable to repack the remaining capacitors quantities after any process step, in the same conditions as before the opening (ESD bag + N2). The assembly of capacitors has to be done one year maximum after the opening date.

Store the capacitors in a clean environment and in the manufacturer's package, without a rapid thermal change in an indoor room and with a temperature between -10 to 40 degree C

To avoid contamination and damage like scratches and cracks, our recommendations are:

1. Die must never be handled with bare hands
2. Avoid touching the active face
3. Do not store and transport die outside protective bags, boxes, sawn tape
4. Work only in ESD environments
5. Plastic tweezers or a soft vacuum tool are recommended to remove the silicon die from the packing

Standard packing is tape & reel for die size larger than 0201 but silicon capacitors can be provid... pack, gelpack or sawing frame. Please contact the Murata sales contact for drawing... (mis@murata.com).

*Murata Integrated Passive Solu...

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 transimission line of UBB Sicaps

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