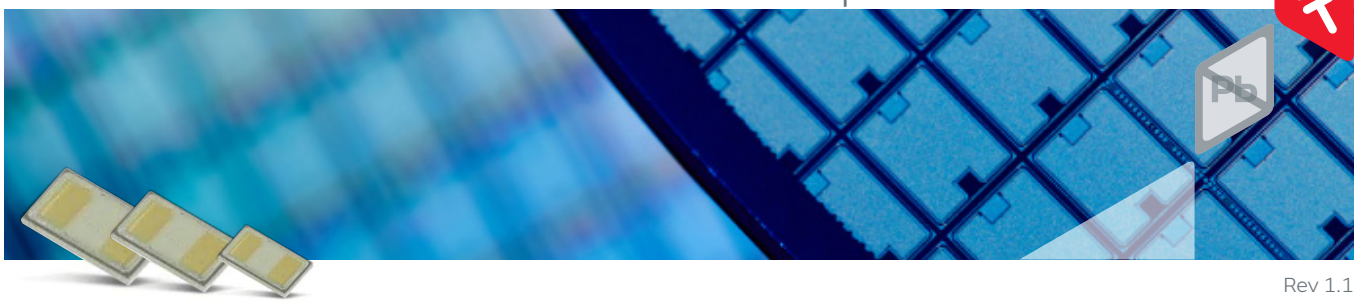
XBSC / UBSC / BBSC / ULSC - 100+/60+/40/20 GHz
Ultra Broadband Surface Mounted Silicon Capacitors



Rev 1.1

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* offers **low insertion loss, low reflection and high phase stability** from 16 kHz up to more than 100 GHz for the XBSC, up to more than 60 GHz for the UBSC, up to 40 GHz for the BBSC and up to 20 GHz for the ULSC. 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.

*Murata Integrated Passive Solutions

XBSC 100 GHz+ electrical specifications

Part number	Product description	Case size	Thickness
XBSC.xxx	Surface Mount Xtrem Broadband Si Cap from -55 to 150°C, 100 GHz+ with SAC305 pre-bump		
939118492510-xxS	Xtrem Broadband Si Cap 10 nF 100 GHz+ BV>11	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 60 GHz+	<1.2 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	10 GΩ @ RVDC, @25°C, t>120s, for 10nF
Aging	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. 5.6 nF/0201M/BV 30V	

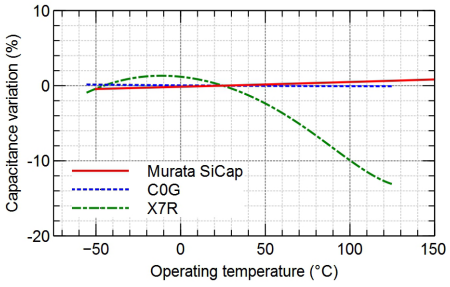


Fig. 1: Capacitance variation vs temperature (for XBSC and MLCC technologies)

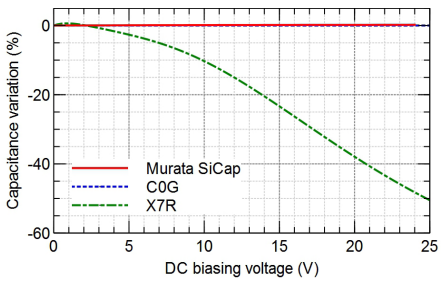


Fig.2: Capacitance variation vs DC biasing voltage @ BV 30 (for XBSC and MLCC technologies)

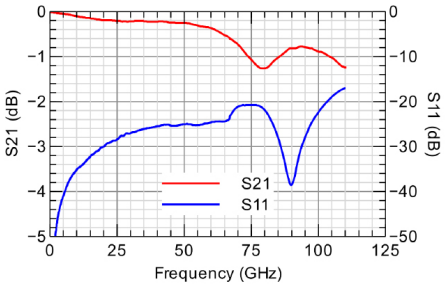
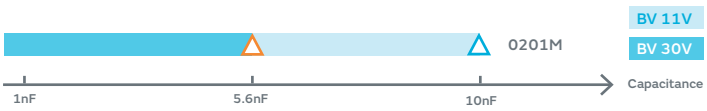


Fig.3: 10 nF/0201M XBSC @ BV11 measurement results (S-parameters in transmission mode)

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

XBSC 100 GHz+ capacitance range

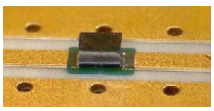


Available parts.
For other values, contact your Murata sales representative.

Under development.

XBSC 100 GHz+ termination

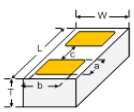
Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.



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	Product description	Case size	Thickness
UBSC.xxx	Surface Mount Ultra Broadband Si Capacitor from -55 to 150°C, 60 GHz+ with ENIG termination		
935152492510-xxS(*)	Ultra Broadband Si Cap 10 nF 60 GHz+ BV>11 V	0201M	100 µm
935152722410-xxS(*)	Ultra Broadband Si Cap 1 nF 60 GHz+ BV>30 V	0201M	100 µm
935152722456-xxS(*)	Ultra Broadband Si Cap 5.6 nF 60 GHz+ BV>30 V	0201M	100 µm
935151723410-xxN	Ultra Broadband Si Cap 1 nF 60 GHz+ BV>30 V	0201	400 µm
935152723410-xxN	Ultra Broadband Si Cap 1 nF 60 GHz+ BV>30 V	0201	100 µm
935151723510-xxN	Ultra Broadband Si Cap 10 nF 60 GHz+ BV>30 V	0201	400 µm
935152723510-xxN	Ultra Broadband Si Cap 10 nF 60 GHz+ BV>30 V	0201	100 µm
935151793522-xxN	Ultra Broadband Si Cap 22 nF 60 GHz+ BV>30 V	0201	400 µm
935152793522-xxN	Ultra Broadband Si Cap 22 nF 60 GHz+ BV>30 V	0201	100 µm
935151424610-xxN	Ultra Broadband Si Cap 100 nF 60 GHz+ BV>11 V	0402	400 µm
935152424610-xxN	Ultra Broadband Si Cap 100 nF 60 GHz+ BV>11 V	0402	100 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	

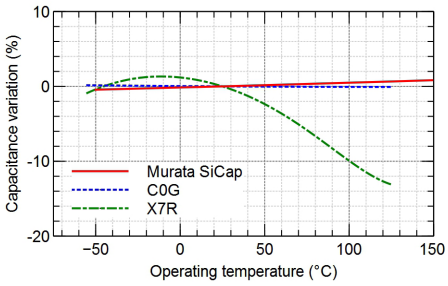


Fig. 1: Capacitance variation vs temperature (for UBSC and MLCC technologies)

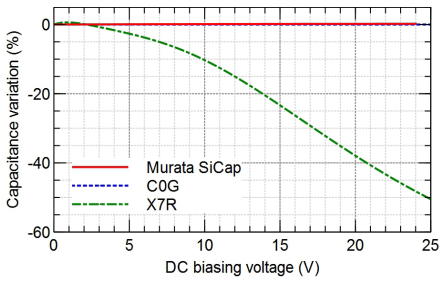


Fig.2: Capacitance variation vs DC biasing voltage @ BV 30 (for UBSC and MLCC technologies)

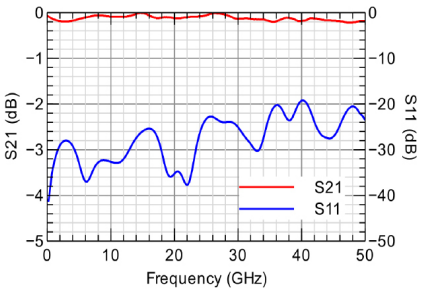
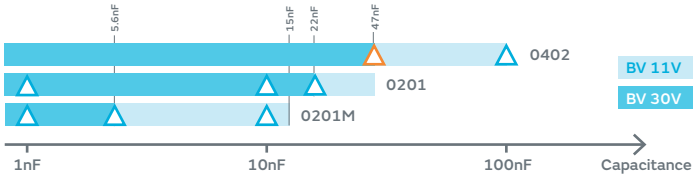


Fig.3: 5.6 nF/0201M UBSC @ BV30 measurement results (S-parameters in transmission mode)

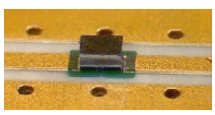
Modelithics FREE S-Parameters-Based Linear Simulation Models for ADS: http://www.modelithics.com

UBSC 60 GHz+ capacitance range



UBSC 60 GHz+ termination

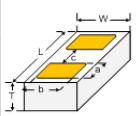
Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual.



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	Product description	Case size	Thickness
BBSC.xxx	Surface Mount Broadband Silicon Capacitor from -55 to 150°C, 40 GHz with ENIG termination		
939114492510-xxS(*)	Broadband Si Cap 10 nF 40 GHz BV>11 V	0201M	100 µm
939114722410-xxS(*)	Broadband Si Cap 1 nF 40 GHz BV>30 V	0201M	100 µm
939114722456-xxS(*)	Broadband Si Cap 5.6 nF 40 GHz BV>30 V	0201M	100 µm
939113733510-xxN	Broadband Si Cap 10 nF 40 GHz BV>30 V	0201	400 µm
939114733510-xxN	Broadband Si Cap 10 nF 40 GHz BV>30 V	0201	100 µm
939113424610-xxN	Broadband Si Cap 100 nF 40 GHz BV>11 V	0402	400 µm
939114424610-xxN	Broadband Si Cap 100 nF 40 GHz BV>11 V	0402	100 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	

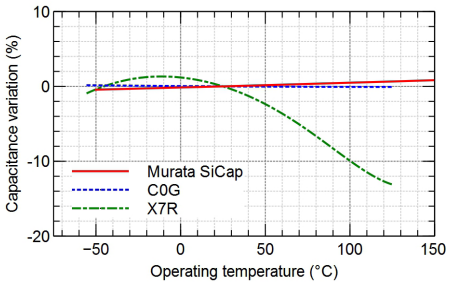


Fig. 1: Capacitance variation vs temperature (for BBSC and MLCC technologies)

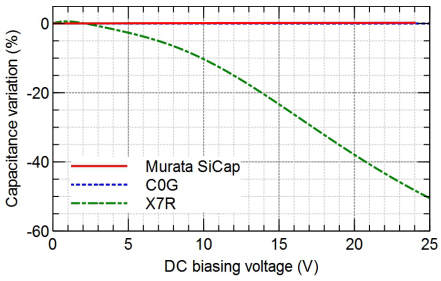


Fig.2: Capacitance variation vs DC biasing voltage @ BV30 (for BBSC and MLCC technologies)

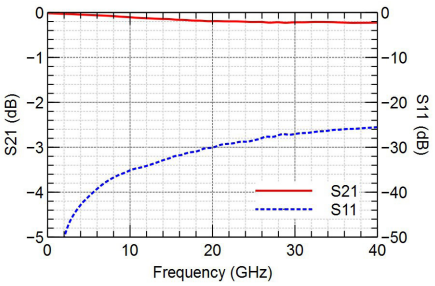
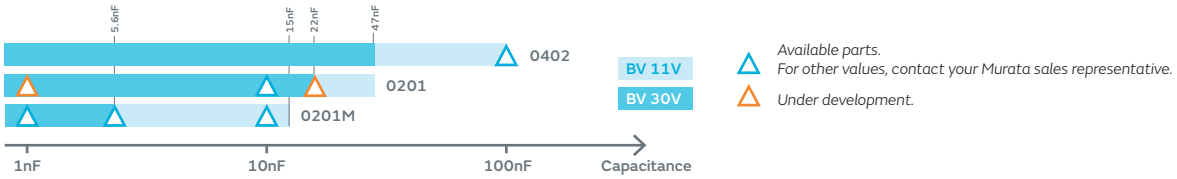


Fig.3: 10 nF/0201 BBSC @ BV30 measurement results (S-parameters in transmission mode)

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BBSC 40 GHz capacitance range

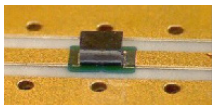


Available parts.
For other values, contact your Murata sales representative.

Under development.

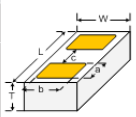
BBSC 40 GHz termination

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	Product description	Case size	Thickness
ULSC.xxx	Surface Mount Ultra Large band Silicon Capacitor from -55 to 150°C, 20 GHz with ENIG termination		
935156492510-xxS(*)	Ultra Large band Si Cap 10 nF 20 GHz BV>11 V	0201M	100 µm
935156722410-xxS(*)	Ultra Large band Si Cap 1 nF 20 GHz BV>30 V	0201M	100 µm
935156722456-xxS(*)	Ultra Large band Si Cap 5.6 nF 20 GHz BV>30 V	0201M	100 µm
935155733510-xxN	Ultra Large band Si Cap 10 nF 20 GHz BV>30 V	0201	400 µm
935156733510-xxN	Ultra Large band Si Cap 10 nF 20 GHz BV>30 V	0201	100 µm
935155424610-xxN	Ultra Large band Si Cap 100 nF 20 GHz BV>11 V	0402	400 µm
935156424610-xxN	Ultra Large band Si Cap 100 nF 20 GHz BV>11 V	0402	100 µm
935155425610-xxN	Ultra Large band Si Cap 100 nF 20 GHz BV>11 V	0603	400 µm
935156425610-xxN	Ultra Large band Si Cap 100 nF 20 GHz BV>11 V	0603	100 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	

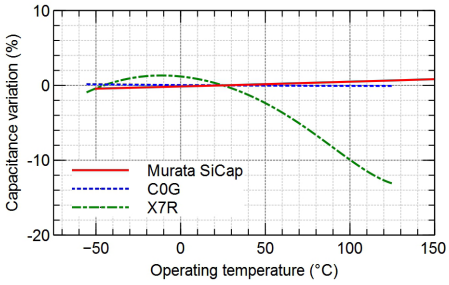


Fig. 1: Capacitance variation vs temperature (for ULSC and MLCC technologies)

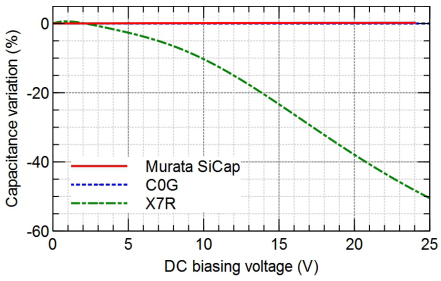


Fig.2: Capacitance variation vs DC biasing voltage @ BV 30 (for ULSC and MLCC technologies)

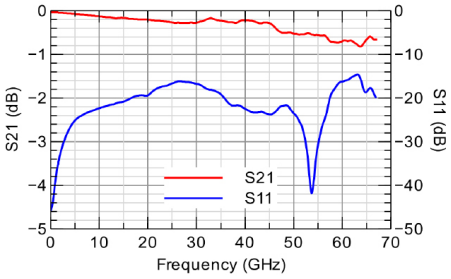
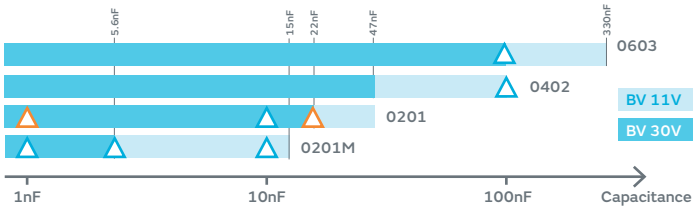


Fig.3: 100 nF/0402 ULSC @ BV11 measurement results (S-parameters in transmission mode)

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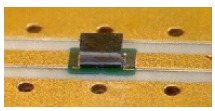
ULSC 20 GHz capacitance range



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

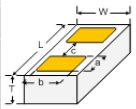
ULSC 20 GHz termination

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.ipdia.com/assembly and read them carefully.**



For XBSC/UBSC/BBSC/ULSC assembly instructions, please go to www.ipdia.com/assembly and download the pdf file called:
'UBSC / BBSC / ULSC Capacitors 100 µm & 400 µm - Assembly by Soldering'

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mis@murata.com