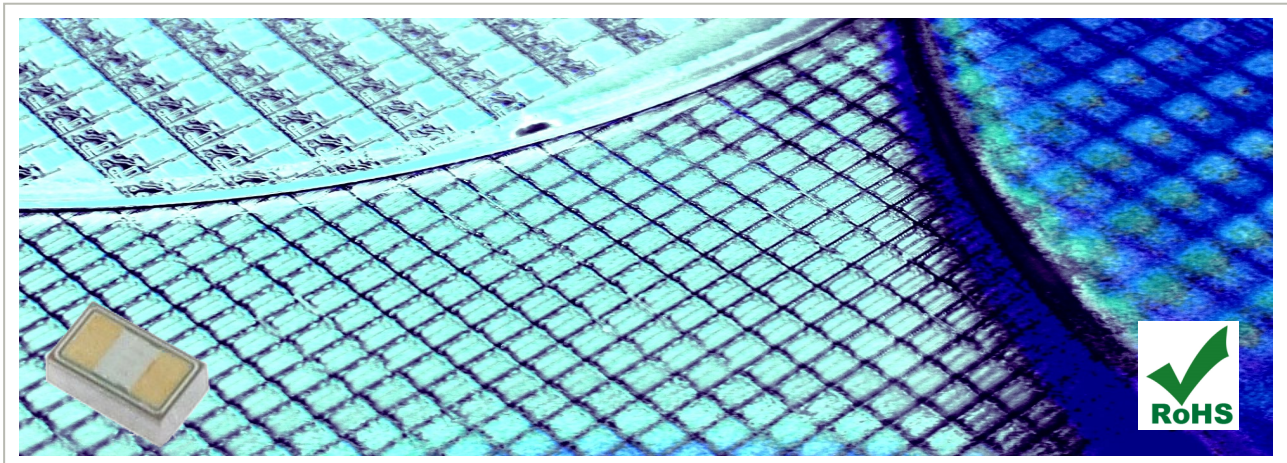


# UBSC/BBSC/ULSC – 60<sup>+</sup>/40/20 GHz Ultra Broadband Silicon Capacitors – Surface Mounted

Rev 3.0



## Key Features

- Ultra broadband performance up to 60 GHz+
- Ultra low insertion loss with excellent return loss
- Resonance free
- Phase stability
- Ultra high stability of capacitance value over:
  - Temperature < **50 ppm/°C** (-55°C to +150°C)
  - Voltage < 0.1 %/V
  - Aging < 0.001 %/1000 hours
- Low ESL
- High reliability (FIT < 0.017 parts/billion hours)
- 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)

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 IPDiA offers **low insertion loss, low reflection and high phase stability** from 16 kHz 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 (50 ppm/°C).

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 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. The case sizes available for the UBSC/BBSC series are 0201M, 0201 and 0402. The case sizes available for the ULSC series are 0201M, 0201, 0402 and 0603. These capacitors are RoHS-compliant and are available either with ENIG terminations or lead-free prebumping depending on the case size.

## UBSC 60 GHz+ Electrical Specifications

Part number	Product description	Case Size	Thickness
<b>UBSC.xxx</b>	Surface Mount Ultra Broad Band Silicon Capacitor from -55 to 150°C, 60 GHz with ENIG termination		
935 152 492 510 <sup>(*)</sup>	Ultra Broadband Si Cap 10 nF 60 GHz+100 µm, BV>11 V	0201M	100 µm
935 151 723 510	Ultra Broadband Si Cap 10 nF 60 GHz+ 400 µm, BV>30 V	0201	400 µm
935 152 723 510	Ultra Broadband Si Cap 10 nF 60 GHz+ 100 µm, BV>30 V	0201	100 µm
935 151 424 610	Ultra Broadband Si Cap 100 nF 60 GHz+ 400 µm, BV>11 V	0402	400 µm
935 152 424 610	Ultra Broadband Si Cap 100 nF 60 GHz+ 100 µm, BV>11 V	0402	100 µm

(\*) Only leadfree pre-bumped version available

(\*\*) Other values on request

(\*\*\*) e.g. 10 nF/0201M/BV 11V

Parameters	Value
<b>Capacitance range</b>	10 nF to 100 nF <sup>(***)</sup>
<b>Capacitance tolerance</b>	± 15 % <sup>(***)</sup>
<b>Operating temperature range</b>	-55 °C to 150 °C
<b>Storage temperature</b>	-70 °C to 165 °C
<b>Temperature coefficient</b>	50 ppm/°C (from -55 °C to +150 °C)
<b>Breakdown voltage (BV)</b>	11, 30 V <sup>(***)</sup>
<b>Capacitance variation versus RVDC</b>	0.1 %/V (from 0 V to RVDC)
<b>Insertion loss (IL) up to 60 GHz+</b>	< 0.4 dB <sup>(***)</sup>
<b>Return loss (RL) up to 60 GHz+</b>	> 20 dB <sup>(***)</sup>
<b>Equivalent Series Inductance (ESL)</b>	100 pH <sup>(***)</sup>
<b>Equivalent Series Resistance (ESR)</b>	300 mΩ <sup>(***)</sup>
<b>Insulation resistance</b>	100 GΩ min @ RVDC & +25°C
<b>Aging</b>	Negligible, < 0.001 % / 1000h
<b>Reliability</b>	FIT<0.017 parts / billion hours
<b>Capacitor height</b>	Max 400 µm or 100 µm

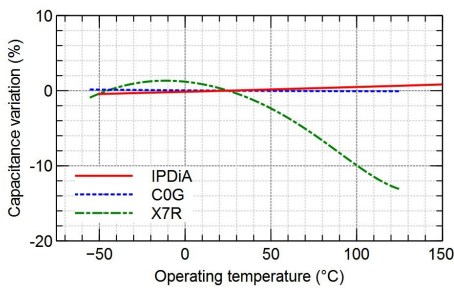


Fig.1: Capacitance variation vs temperature (for UBSC and MLCC technologies)

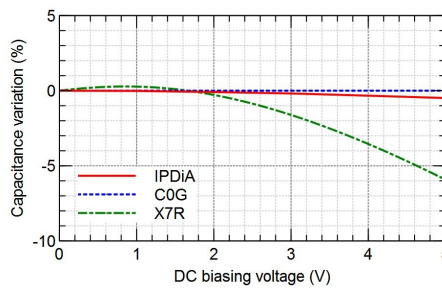


Fig.2: Capacitance variation vs DC biasing voltage (for UBSC and MLCC technologies)

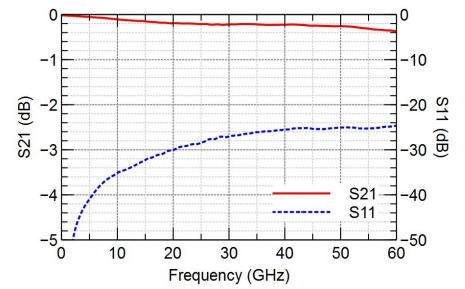
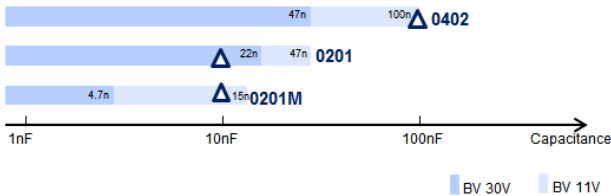


Fig.3: 10 nF/0201M UBSC<sup>(\*\*\*)</sup> measurement results (S-parameters in transmission mode)



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

## UBSC 60 GHz+ Capacitance Range

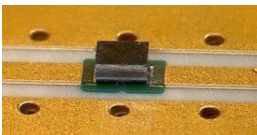


△ Available parts – see table above  
For other values, contact your IPDiA sales representative.

## UBSC 60 GHz+ Termination and Outline

### Termination

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

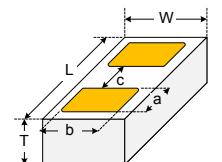


### Package Outline

For landing pad dimensions on your PCB layout, please refer to IPDiA assembly application note.

(mm)	Pad dimensions			Case size (typ. ±0.01 mm)		
	a	b	c	L	W	T <sup>(****)</sup>
0201M	0.1	0.15	0.2	0.60	0.30	0.1
0201	0.15	0.40	0.30	0.80	0.60	0.40 (standard profile) or 0.10 (low profile)
0402	0.30	0.50	0.40	1.20	0.70	

(\*\*\*\*) Thickness excluding bump height



## UBSC 60 GHz+ Packaging

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

## BBSC 40 GHz Electrical Specifications

Part number	Product description	Case Size	Thickness
<b>BBSC.xxx</b>	Surface Mount Broad Band Silicon Capacitor from -55 to 150°C, 40 GHz with ENIG termination		
939 114 492 510 <sup>(*)</sup>	Broadband Si Cap 10 nF 40 GHz 100 μm, BV>11 V	0201M	100 μm
939 113 723 510	Broadband Si Cap 10 nF 40 GHz 400 μm, BV>30 V	0201	400 μm
939 114 723 510	Broadband Si Cap 10 nF 40 GHz 100 μm, BV>30 V	0201	100 μm
939 113 424 610	Broadband Si Cap 100 nF 40 GHz 400 μm, BV>11 V	0402	400 μm
939 114 424 610	Broadband Si Cap 100 nF 40 GHz 100 μm, BV>11 V	0402	100 μm

(\*) Only leadfree pre-bumped version available

(\*\*) Other values on request

(\*\*\*) e.g. 10 nF/0201/BV 30 V

Parameters	Value
<b>Capacitance range</b>	10 nF to 100 nF <sup>(**)</sup>
<b>Capacitance tolerance</b>	± 15 % <sup>(**)</sup>
<b>Operating temperature range</b>	-55 °C to 150 °C
<b>Storage temperature</b>	-70 °C to 165 °C
<b>Temperature coefficient</b>	50 ppm/°C (from -55 °C to +150 °C)
<b>Breakdown voltage (BV)</b>	11, 30 V <sup>(**)</sup>
<b>Capacitance variation versus RVDC</b>	0.1 %/V (from 0 V to RVDC)
<b>Insertion loss (IL) up to 40 GHz</b>	<0.4 dB <sup>(***)</sup>
<b>Return loss (RL) up to 40 GHz</b>	>15 dB <sup>(***)</sup>
<b>Equivalent Series Inductance (ESL)</b>	100 pH <sup>(***)</sup>
<b>Equivalent Series Resistance (ESR)</b>	500 mΩ <sup>(***)</sup>
<b>Insulation resistance</b>	100 GΩ min @ RVDC & +25°C
<b>Aging</b>	Negligible, < 0.001 % / 1000h
<b>Reliability</b>	FIT<0.017 parts / billion hours
<b>Capacitor height</b>	Max 400 μm or 100 μm

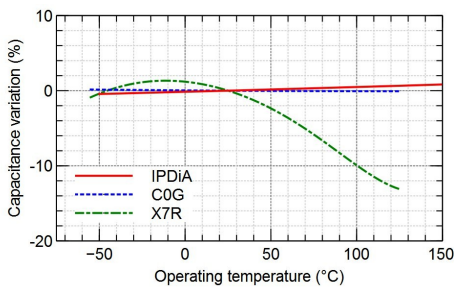


Fig.1: Capacitance variation vs temperature (for BBSC and MLCC technologies)

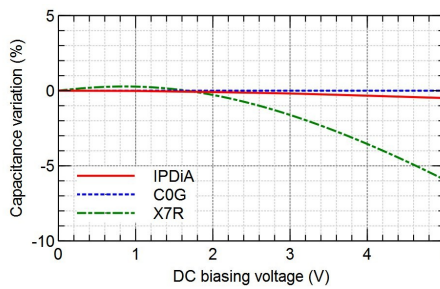


Fig.2: Capacitance variation vs DC biasing voltage (for BBSC and MLCC technologies)

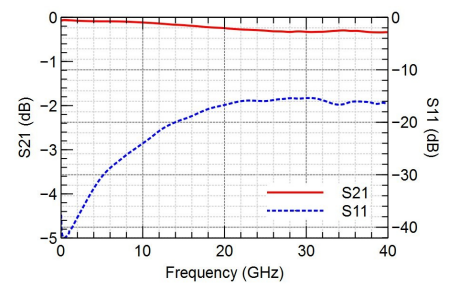
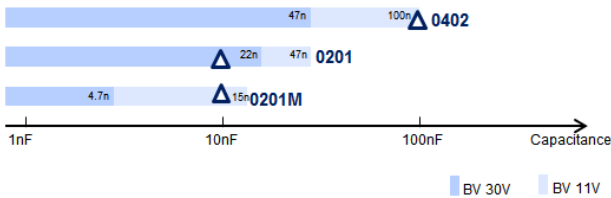


Fig.3: 10 nF/0201 BBSC<sup>(\*\*\*)</sup> measurement results (S-parameters in transmission mode)



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

## BBSC 40 GHz Capacitance Range

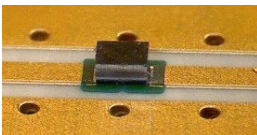


△ Available parts – see table above  
For other values, contact your IPDiA sales representative.

## BBSC 40 GHz Termination and Outline

### Termination

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

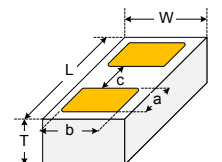


### Package Outline

For landing pad dimensions on your PCB layout, please refer to IPDiA assembly application note.

(mm)	Pad dimensions			Case size (typ. ±0.01 mm)		
	a	b	c	L	W	T <sup>(****)</sup>
0201M	0.1	0.15	0.2	0.60	0.30	0.1
0201	0.15	0.40	0.30	0.80	0.60	0.40 (standard profile) or 0.10 (low profile)
0402	0.30	0.50	0.40	1.20	0.70	

(\*\*\*\*) Thickness excluding bump height



## BBSC 40 GHz Packaging

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



## ULSC 20 GHz Electrical Specifications

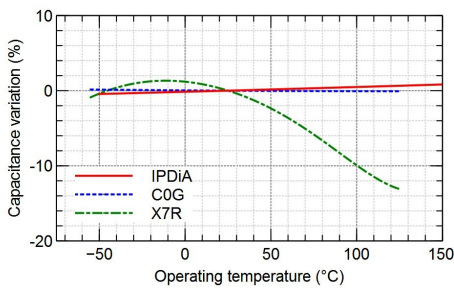
Part number	Product description	Case Size	Thickness
<b>ULSC.xxx</b>	Surface Mount Ultra Large band Silicon Capacitor from -55 to 150°C, 20 GHz with ENIG termination		
935 156 492 510	Ultra Large band Si Cap 10 nF 20 GHz 100 µm, BV>11V	0201M	100 µm
935 155 723 510	Ultra Large band Si Cap 10 nF 20 GHz 400 µm, BV>30V	0201	400 µm
935 156 723 510	Ultra Large band Si Cap 10 nF 20 GHz 100 µm, BV>30V	0201	100 µm
935 155 424 610	Ultra Large band Si Cap 100 nF 20 GHz 400 µm, BV>11V	0402	400 µm
935 156 424 610	Ultra Large band Si Cap 100nF 20 GHz 100 µm, BV>11V	0402	100 µm
935 155 425 610	Ultra Large band Si Cap 100nF 20 GHz 400 µm, BV>11V	0603	400 µm
935 156 425 610	Ultra Large band Si Cap 100nF 20 GHz 100 µm, BV>11V	0603	100 µm

(\*) Only leadfree pre-bumped version available

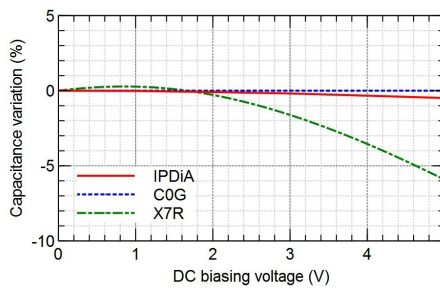
(\*\*) Other values on request

(\*\*\*) e.g. 100 nF/0402/BV 11 V

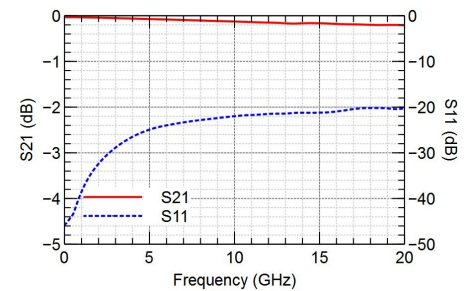
Parameters	Value
<b>Capacitance range</b>	10 nF to 100 nF <sup>(**)</sup>
<b>Capacitance tolerance</b>	± 15 % <sup>(**)</sup>
<b>Operating temperature range</b>	-55 °C to 150 °C
<b>Storage temperature</b>	-70 °C to 165 °C
<b>Temperature coefficient</b>	50 ppm/°C (from -55 °C to +150 °C)
<b>Breakdown voltage (BV)</b>	11, 30 V <sup>(**)</sup>
<b>Capacitance variation versus RVDC</b>	0.1 %/V (from 0 V to RVDC)
<b>Insertion loss (IL) up to 20 GHz</b>	< 0.2 dB <sup>(***)</sup>
<b>Return loss (RL) up to 20 GHz</b>	> 20 dB <sup>(***)</sup>
<b>Equivalent Series Inductance (ESL)</b>	100 pH <sup>(***)</sup>
<b>Equivalent Series Resistance (ESR)</b>	400 mΩ <sup>(***)</sup>
<b>Insulation resistance</b>	100 GΩ min @ RVDC & +25°C
<b>Aging</b>	Negligible, < 0.001 % / 1000h
<b>Reliability</b>	FIT<0.017 parts / billion hours
<b>Capacitor height</b>	Max 400 µm or 100 µm



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



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

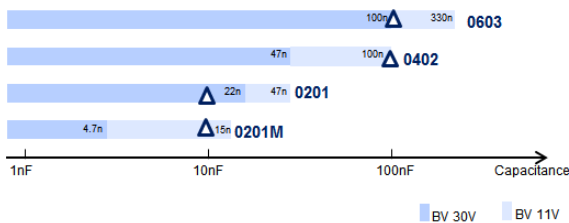


**Fig.3:** 100 nF/0402 ULSC<sup>(\*\*\*)</sup> measurement results (S-parameters in transmission mode)



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

## ULSC 20 GHz Capacitance Range

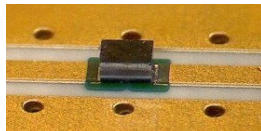


▲ Available parts – see table above  
For other values, contact your IPDiA sales representative.

## ULSC 20 GHz Termination and Outline

### Termination

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

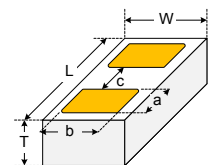


### Package Outline

For landing pad dimensions on your PCB layout, please refer to IPDiA assembly application note.

(mm)	Pad dimensions			Case size (typ. ±0.01 mm)		
	a	b	c	L	W	T <sup>(****)</sup>
0201M	0.1	0.15	0.2	0.60	0.30	0.1
0201	0.15	0.40	0.30	0.80	0.60	0.40 (standard profile) or 0.10 (low profile)
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

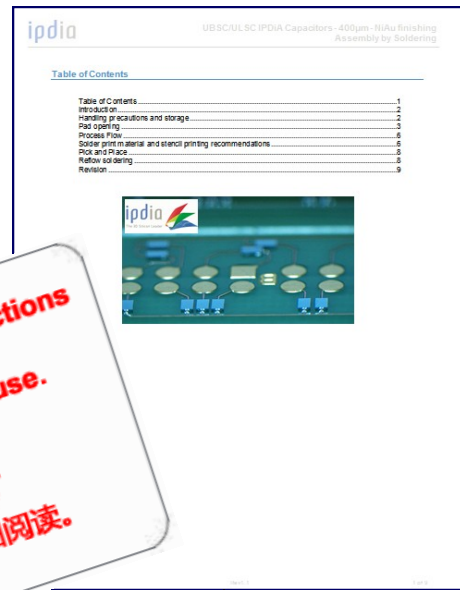
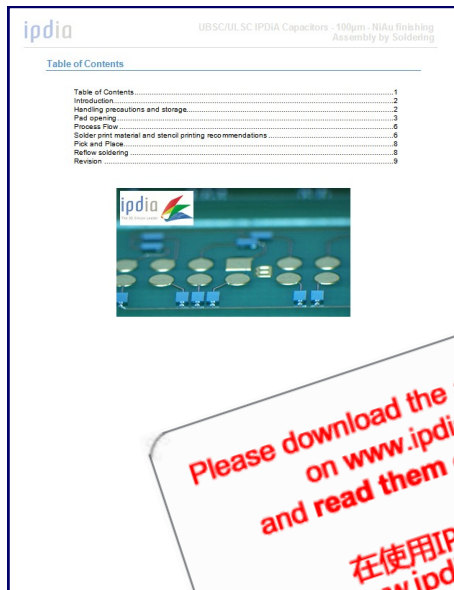


## ULSC 20 GHz Packaging

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

## Assembly by Soldering

The attachment techniques recommended by IPDiA for the UBSC/BBSC/ULSC capacitors silicon capacitors on the customers substrates are fully detailed in specific documents available on our website. To assure the correct use and proper functioning of IPDiA capacitors **please download the assembly instructions on [www.ipdia.com/assembly](http://www.ipdia.com/assembly) and read them carefully.**



**Please download the assembly instructions  
 on [www.ipdia.com/assembly](http://www.ipdia.com/assembly)  
 and read them carefully before use.**  
**在使用IPDiA电容之前请从  
[www.ipdia.com/assembly](http://www.ipdia.com/assembly)  
 网站上下载电容安装说明并仔细阅读。**

For UBSC/ULSC assembly instructions @ **100 µm**, please go to [www.ipdia.com/assembly](http://www.ipdia.com/assembly) and download the pdf file called 'UBSC/ULSC 100 µm Capacitors - Assembly by Soldering'

For UBSC/ULSC assembly instructions @ **400 µm**, please go to [www.ipdia.com/assembly](http://www.ipdia.com/assembly) and download the pdf file called 'UBSC/ULSC 400 µm Capacitors - Assembly by Soldering'