

Wire bonding Vertical Silicon Capacitor WBSC / WLSC 0402 22nF BV30



Rev.2.05

General description

WBSC / WLSC Capacitors target power supplies decoupling and filtering of active devices. They are based on PICS Integrated Passive technology.

This product is a single 22nF capacitor in 0402 package size (1.00 x 0.50 mm). Other capacitance values and other package size are available as a single die or capacitor array; please feel free to contact us.

WBSC/WLSC capacitors are directly mounted on the PCB application using die bonding and wire bonding processes. Standard FR4 PCB can be used. The bottom electrode is in TiNiAu and the top electrode is in TiWAu. Other top finishings such as Aluminum are available on request.

Key features

- Full compatible Monolithic ceramic capacitors for replacement
- Ultra-high stability of capacitance value:
- Temperature 70ppm/K (-55 °C to +150 °C)
- Voltage < -0.02%/Volt
- Negligible capacitance loss through ageing
- Low profile 0.25mm (standard), but lower thickness is possible (i.e 0.10mm) on request
- Small size 1.00 x 0.50 mm (0402 format)
- Break down voltage : 30V
- Low leakage current
- High reliability
- High operating temperature (up to 150 °C)
- Compatible with high temperature cycling during manufacturing operations (exceeding 300 °C)
- Compatible with EIA 0402 footprint
- Applicable for standard wire bonding assembly (ball and wedge)

Key applications

- Any demanding applications, such as medical, aerospace, automotive industrial...
- Supply decoupling / filtering of active device
- High reliability applications
- High temperature applications
- High volumetric efficiency (i.e. *capacitance per unit volume*)



Functional diagram

The next figure provides implementation set-up diagram.

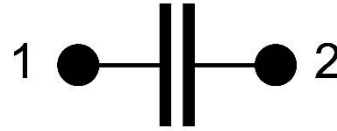


Figure 1 Block Diagram

Electrical performances

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
C	Capacitance value	@+25°C	-	22	-	nF
ΔC_P	Capacitance tolerance ⁽¹⁾	@+25°C	-15	-	+15	%
T _{OP}	Operating temperature		-55	20	150	°C
T _{STG}	Storage temperature ⁽²⁾		-70	-	165	°C
ΔC_T	Capacitance temperature variation	-55°C to 150°C		70		ppm/K
RV _{DC}	Rated voltage ⁽³⁾		-		16.0 ⁽⁴⁾ 14.7 ⁽⁵⁾	V _{DC}
BV	Breakdown voltage	@+25°C	30	-	-	V _{DC}
ΔC_{RVDC}	DC Capacitance voltage variation	From 0V to RV _{DC} , @25°C	-	-	-0.02	%/V _{DC}
IR	Insulation resistance	@ RV _{DC} , +25°C, 120s	-	10	-	GΩ
ESL	Equivalent Series Inductance	@+25°C, SRF shunt mode	-	3	-	pH
ESD	HBM stress ⁽⁶⁾	JS-001-2017	2	-	-	kV

Table 1 - Electrical performances

(1): other tolerance available upon request

(2): without packaging

(3): Lifetime is voltage and temperature dependent, please refer to application note 'Lifetime of 3D capacitors'

(4): 10 years of intrinsic life time prediction at 100°C continuous operation

(5): 10 years of intrinsic life time prediction at 150°C continuous operation

(6): please refer to application note 'ESD Challenge in 3D Murata Integrated Passive technology'

For extended frequency range (up to 26GHz), see Ultra large band Wire bonding vertical Silicon Capacitor (UWSC).

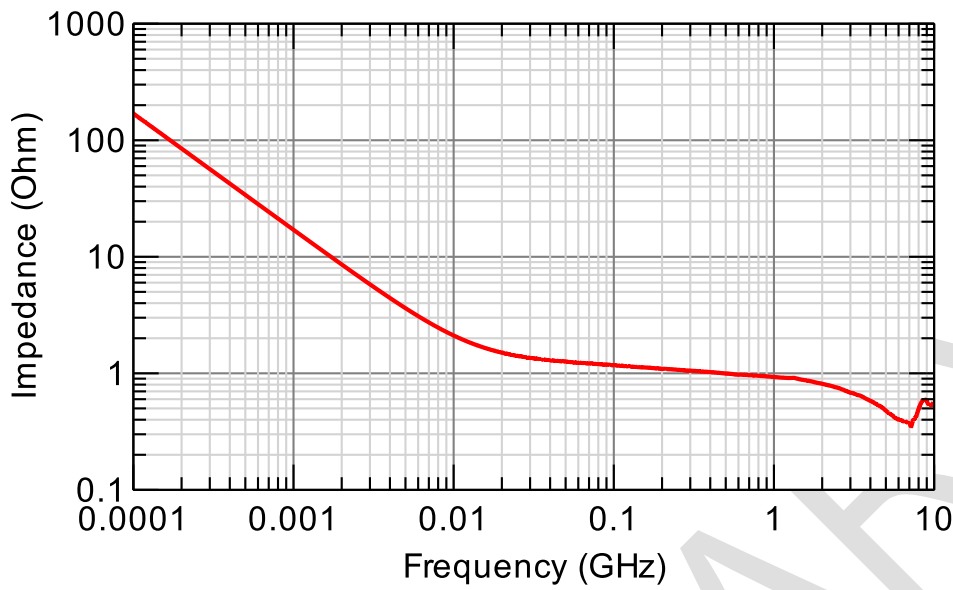


Figure 2 Impedance characteristic versus Frequency in shunt mode

Schematic of 22nF WBSC in Shunt mode

Example of mounted 0202

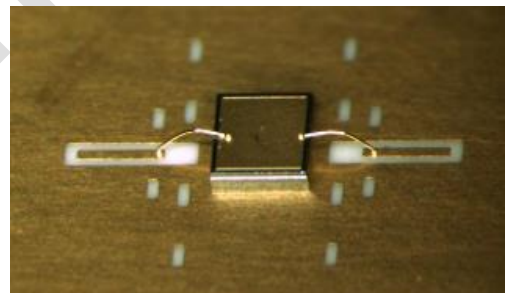
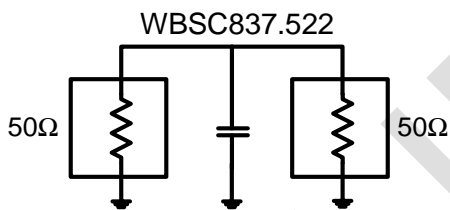


Figure 3 - 22nF WBSC measurement schematic

Figure 4 – micro picture of mounted 0202 WBSC



Pinning definition

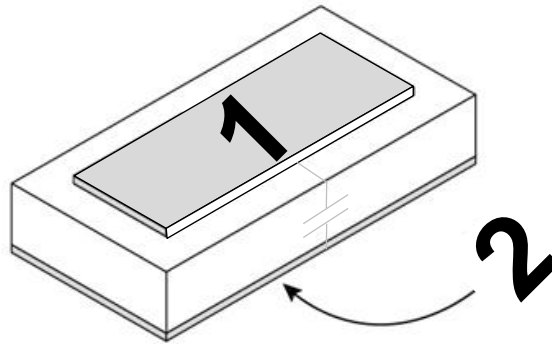


Figure 5 Pinning definition

pin #	Symbol	Coordinates X / Y
1	Signal	0.0 / 0.0
2	GND	Backside

Table 2 - Pinning description. Reference (0,0) located at the centre of the die.

Ordering Information

Murata Integrated Passive Devices delivers products with AQL level II (0.65). Tighter quality levels are available upon request.

Part number	Package			Die Name
	Packaging	Finishing	Description	
935142837522-F1T	6" FFC ⁽¹⁾	Au ⁽²⁾	WBSC 22nF/0402/BV30 1 bondpad 1.00 x 0.50mm x 0.25mm ⁽³⁾	WR0402522
935142837522-F2T	8" FFC ⁽¹⁾	Au ⁽²⁾		
935142837522-E1T	6" Grip Ring ⁽¹⁾	Au ⁽²⁾		
935142837522-T3T	T&R 1Kunits ⁽⁴⁾	Au ⁽²⁾		
935142837522-W0T	Waffle pack 400units	Au ⁽²⁾		
935146837522-F1T	6" FFC ⁽¹⁾	Au ⁽²⁾	WLSC 22nF/0402/BV30 1 bondpad 1.00 x 0.50mm x 0.10mm ⁽³⁾	WR0402522
935146837522-F2T	8" FFC ⁽¹⁾	Au ⁽²⁾		
935146837522-E1T	6" Grip Ring ⁽¹⁾	Au ⁽²⁾		
935146837522-T3T	T&R 1Kunits ⁽⁴⁾	Au ⁽²⁾		
935146837522-W0T	Waffle pack 400units	Au ⁽²⁾		

Table 3 - Packaging and ordering information

(1) Other film frame carrier are possible on request
 (2) Au= TiWAu (0.3µm) / Au (3µm)
 (3) Refer to Package outline
 (4) missing capacitors can reach 0.5%



Pad Metallization

The wire bondable capacitor like WBSC / WLSC is delivered as standard with the bottom electrode in TiNiAu ($Ti=0.1\mu m$; $Ni=0.3\mu m$; $Au=0.2\mu m$) and top electrode in TiWAu ($0.3\mu m$) / Au ($3\mu m$).

Other Metallization, such as Thick Gold or Aluminum pads are possible on request.

Silicon dies are not sensitive to humidity, please refer to applications notes 'Assembly Notes' section 'Handling precautions and storage'.

Material regulation

This product is RoHS compliant at the time of publication. For further information about regulation compliancy, please ask your sales representative.

Package outline

The product is delivered as a bare silicon die.

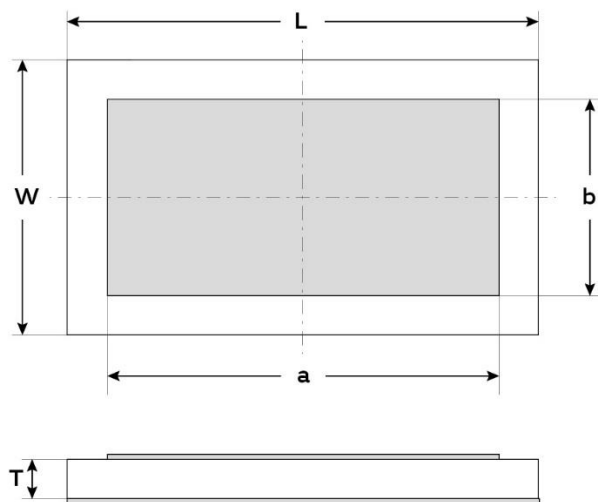


Figure 6 - Package outline drawing

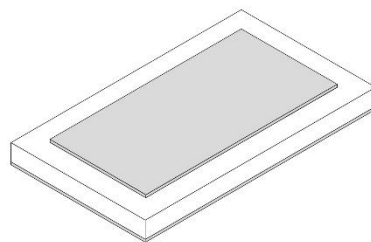


Figure 7 - Package isometric view



L (mm)	W (mm)	T (mm)	a (mm)	b (mm)
1.00 ± 0.03	0.50 ± 0.03	0.25 or 0.10 ± 0.015	0.818	0.318

Table 4 - Dimensions and tolerances

Assembly

The attachment techniques recommended by Murata on the customer's substrates are fully detailed in specific documents available on our website. To assure the correct use and proper functioning of Murata capacitors **please download the assembly instructions on <https://www.murata.com/en-us/products/capacitor/siliconcapacitors> and read them carefully.**



Figure 8 Scan this QR Code to access the Murata Silicon Capacitor web page

Packaging format

Please refer to application note 'Products Storage Conditions and Shelf Life'.

Tape and Reel:

Dies are flipped in the tape cavity (bump down) with die ID located near the driving holes of the tape.

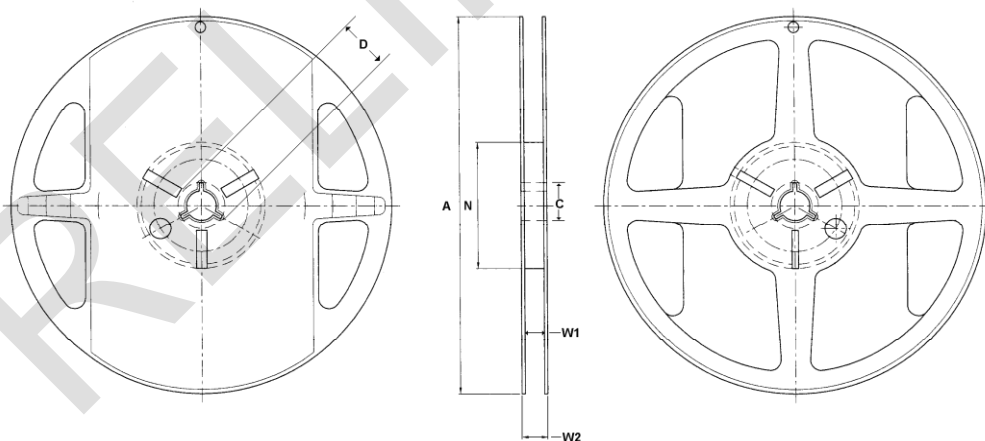


Figure 9 - Reel drawing



Tape Width	Diameter A	C	D	Hub N	W1	W2
8	178 (7 inches)	13.5	20.2	60	9.3	11.5

Table 5 – Reel dimensions (mm)

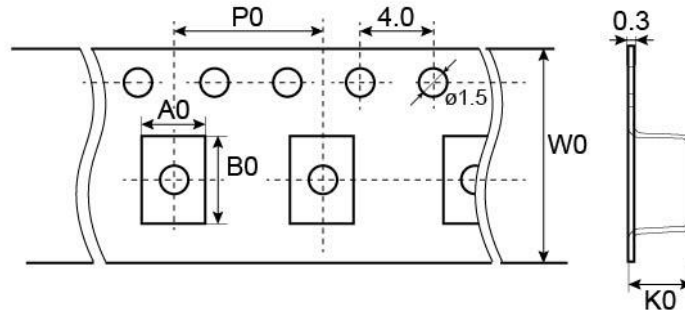


Figure 10 - Tape drawing

Cavity dimensions			Carrier tape width W0	Carrier tape pitch P0	Reel Capacity
Ao	Bo	Ko			
0.59	1.09	0.20	8	4	1000
0.65	1.14	0.33	8	4	1000

Table 6 - Tape dimensions (mm)



Film frame carrier:

With UV curable dicing tape (UV performed).

Good dies are identified using the SINF electronic mapping format. No ink is added on wafer to label other dies.

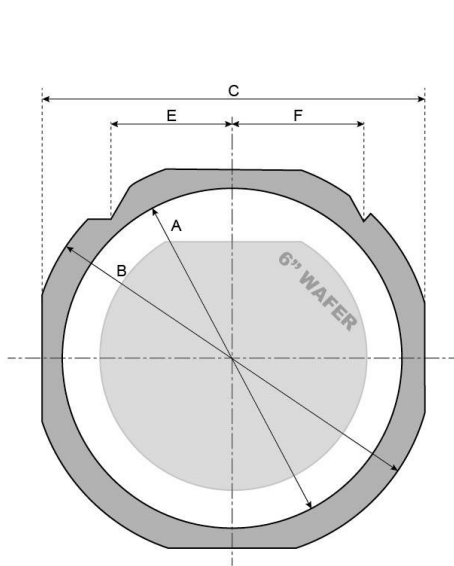


Figure 11 FF070 Frame with a 6" wafer

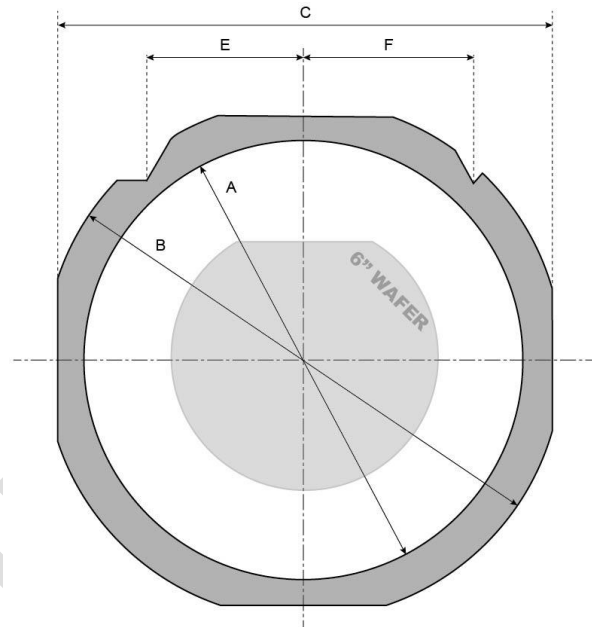


Figure 12 FF108 Frame with a 6" wafer

Frame Reference	Frame Style	Inside diameter A	Outside diameter B	Width C	Thickness	Pin location E	Pin location F
FF070 (1)	DTF-2-6-1	7.638"	8.976"	8.346"	0.048"	2.370"	2.5"
FF108 (1)	DTF-2-8-1	9.842"	11.653"	10.866"	0.048"	2.381"	2.5"

Table 7 - Frame dimensions (inches)

(1) or equivalent



Waffle pack:

Please refer to application note 'Waffle Pack Chip Carrier Handling & Opening Procedure'. Dies are not flipped in the waffle pack cavity (wire bond pad up).

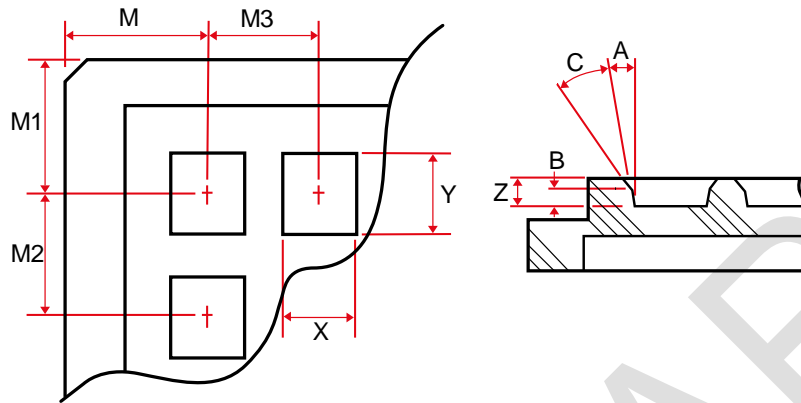


Table 8 - Waffle pack drawing

Supplier reference	External dimensions	Max. capacity	Pocket length X	Pocket width Y	Pocket depth Z
(*)	2 inches	20 x 20	tbd	tbd	tbd

Table 9 - Waffle pack dimensions (mm) for 250µm thick product

(*) or equivalent

M	M1	M2	M3	A
tbd	tbd	tbd	tbd	tbd

Table 10 - Waffle pack dimensions (mm) for 250µm thick product

Supplier reference	External dimensions	Max. capacity	Pocket length X	Pocket width Y	Pocket depth Z
(*)	2 inches	20 x 20	tbd	tbd	tbd

Table 11 Waffle pack dimensions (mm) for 100µm thick product

M	M1	M2	M3	A
tbd	tbd	tbd	tbd	tbd

Table 12: Waffle pack dimensions (mm) for 100µm thick product



Expander Grip Ring 6" diameter:

With UV curable dicing tape (UV performed)

Good dies are identified using the SINF electronic mapping format.

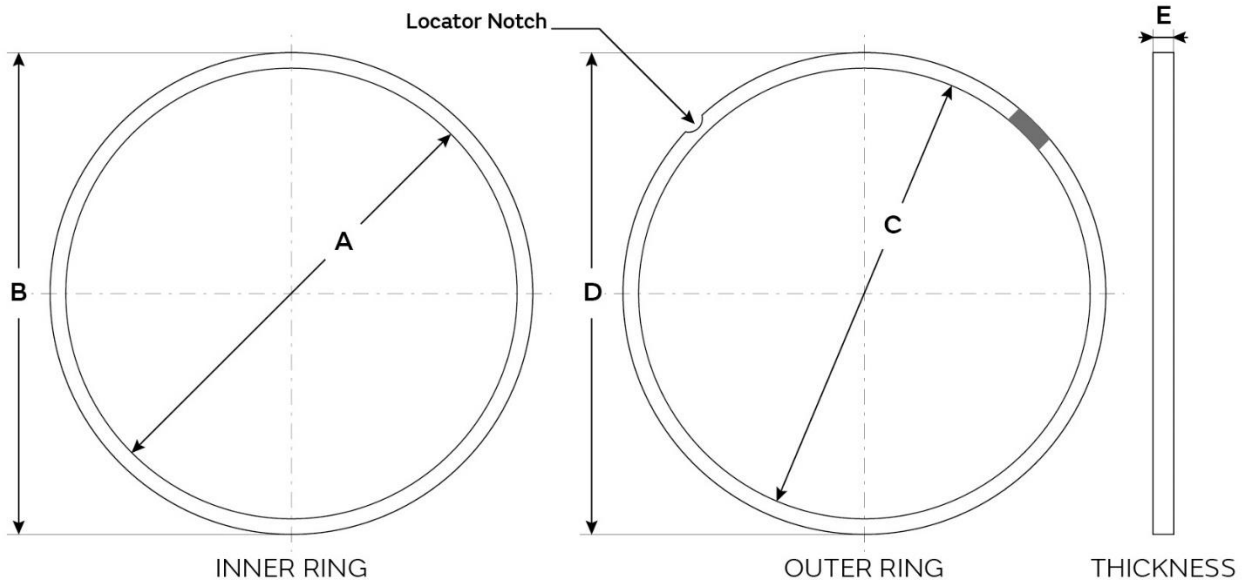


Figure 13 – Grip Ring drawing

Grip Ring Style	A	B	C	D	E	Locator Notch
GRP-2620-6 ^(*)	7.670"	7.973"	7.975"	8.280"	0.236"	None

Table 13 - Frame dimensions (inches)

(*) or equivalent



Definitions

Data sheet status

Objective specification: This data sheet contains target or goal specifications for product development.

Preliminary specification: This data sheet contains preliminary data; supplementary data may be published later.

Product specification: This data sheet contains final product specifications.

Limiting values

Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those given in the Electrical performances sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information

Where application information is given, it is advisory and does not form part of the specification.

Revision history

Revision	Date	Description	Author
Rev 1.00	2010 August 13th	Creation	OGA
Rev 2.04	2020 Sept. 7th	General update	OGA
Rev.2.05	2021 Feb. 24 th	Layout and content update	CG/OGA

Disclaimer / Life support applications

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