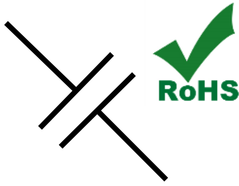

Wire Bonding Silicon Capacitor WBSC521.410 (1nF/0202/BV150V)

Rev 2.2 TD

General description

The aim of this document is to give a description of Murata(*)'s Wire Bonding Silicon Capacitor (WBSC) characteristics for Chip On Board (COB) assembly solutions.

The WBSC Capacitor targets power supplies decoupling and filtering of active devices. This version is a single 1nF capacitor in 0.5x0.5mm package size. Other capacitance values and other package size are available as a single die or capacitor array, please feel free to contact us.

The WBSC Capacitor is based on PICS Integrated Passive technology.

WBSC capacitors are directly mounted on the PCB application using die bonding and wire bonding.

WBSC capacitors have the bottom electrode in Ti (0.1 µm)/Ni (0.3µm)/Au (0.2µm) and top electrode in Gold, other top finishings are available on request as well 3um Aluminum (Al/Si/Cu: 98.96%/1%/0.04%)

Assembly: Please refer to our assembly Application note for further recommendations.

Key features

- **Full compatible Monolithic ceramic capacitors for replacement**
- **Ultra high stability of capacitance value:**
  - **Temperature 60ppm/°C** (-55°C to +150°C)
  - **Voltage <0.02%/Volts**
  - **Negligible capacitance loss through ageing**
- **Low profile 0.25mm (standard),** but lower thickness is possible on request (e.g 0.10mm).
- **Small size 0.5x 0.5 mm** (0202 case size)
- **Low leakage current**
- **High reliability**
- **Compatible with high temperature cycling during manufacturing operations**
- **Applicable for standard wire bonding approach** (ball and wedge)

Key applications

- **Any demanding applications, such as medical, aerospace, automotive industrial…**
- **Supply decoupling / filtering of active device**
- **High reliability applications**
- **Devices with battery operations**
- **High temperature applications**
- **Volume limited applications**

(*) Murata Integrated Passive Solutions

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Functional diagram

The next figure provides implementation set-up of the 1nF WBSC Capacitor (2 connections).

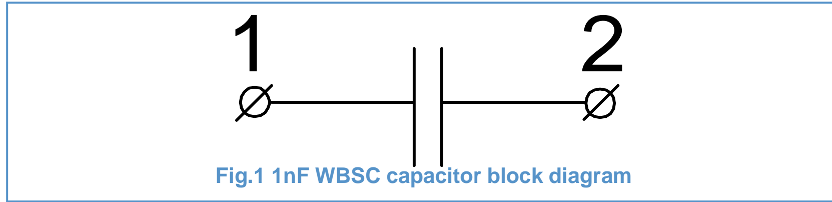


Fig.1 1nF WBSC capacitor block diagram

Electrical performances

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
C	Capacitance value		-	1	-	nF
ΔC_P	Capacitance tolerance(***)		-15	-	+15	%
T_{OP}	Operating temperature		-55	20	150	°C
T_{STG}	Storage temperature(****)		-70	-	165	°C
ΔC_T	Capacitance temperature variation	-55°C to 150°C	-	60	-	ppm/°C
RV_{DC}	Rated voltage		-	50	68(*) 61(**)	V_{DC}
BV	Breakdown Voltage	@25°C	150	-	-	V
ΔC_{RVDC}	Capacitance voltage variation	From 0V to RV_{DC}	-	-	0.02	%/V_{DC}
IR	Insulation resistor		10	-	-	GΩ
ESL	Equivalent Serial Inductor(*****)	@SRF	-	8	-	pH
ESR	Equivalent Serial Resistor(*****)	@ 10MHz	-	10	-	mΩ

Table1: 1nF WBSC capacitor performances

(*) >10 years of intrinsic life time predictions at 100°C
(**) >10 years of intrinsic life time predictions at 150°C
(***) Other capacitance tolerances upon request.
(****) component without packing.
(*****) with wire bounding de-embedded

Pinning definition

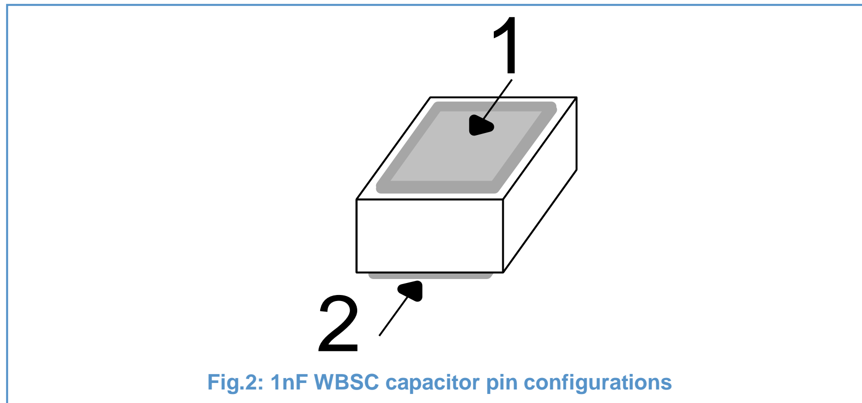


Fig.2: 1nF WBSC capacitor pin configurations

pin #	Symbol	Side	Description
1	Signal	Top side (wire bond)	Signal
2	GND	Back side (die bond)	Ground

Table2: 1nF WBSC capacitor pining description

Ordering information

Type number	Package			
	Product Name	Die Name	Description	Version
935 142 521 410	WBSC521.410	-	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm(*) x 0.25mm	1
935 146 521 410	WLSC521.410	-	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm(*) x 0.10mm	1

Table 3: Ordering die

(*): Die size after sawing = 0.5 x 0.5mm, assuming 40µm of scribe line and die (saw lane=80µm) and seal ring die size = 0.46 x 0.0.46mm.

Type number	Package			
	Packaging	Finishing	Description	Version
935 142 521 410-F1A	6" film frame carrier	Al(***)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.25mm	1
935 142 521 410-F1T	6" film frame carrier	Au(****)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.25mm	1
935 142 521 410-T3A	T&R 1 000units	Al(***)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.25mm	1
935 142 521 410-T3T	T&R 1 000units	Au(****)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.25mm	1
935 142 521 410-W0A	WP 400units	Al(***)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.25mm	1
935 142 521 410-W0T	WP 400units	Au(****)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.25mm	1
935 146 521 410-F1A	6" film frame carrier	Al(***)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.10mm	1
935 146 521 410-F1T	6" film frame carrier	Au(****)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.10mm	1
935 146 521 410-T3A	T&R 1 000units	Al(***)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.10mm	1
935 146 521 410-T3T	T&R 1 000units	Au(****)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.10mm	1
935 146 521 410-W0A	WP 400units	Al(***)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.10mm	1
935 146 521 410-W0T	WP 400units	Au(****)	1nF/0202 – 1 bondpad – 0.5mm x 0.5mm x 0.10mm	1

Table 4: Packaging ordering information

(***) Al = Min 3µm Al/Si/Cu: 98.96%/1%/0.04%

(****) Au = TiW (0.3µm) / Au (3µm)

Test and Quality inspection

The Murata manufacturing center is certified:

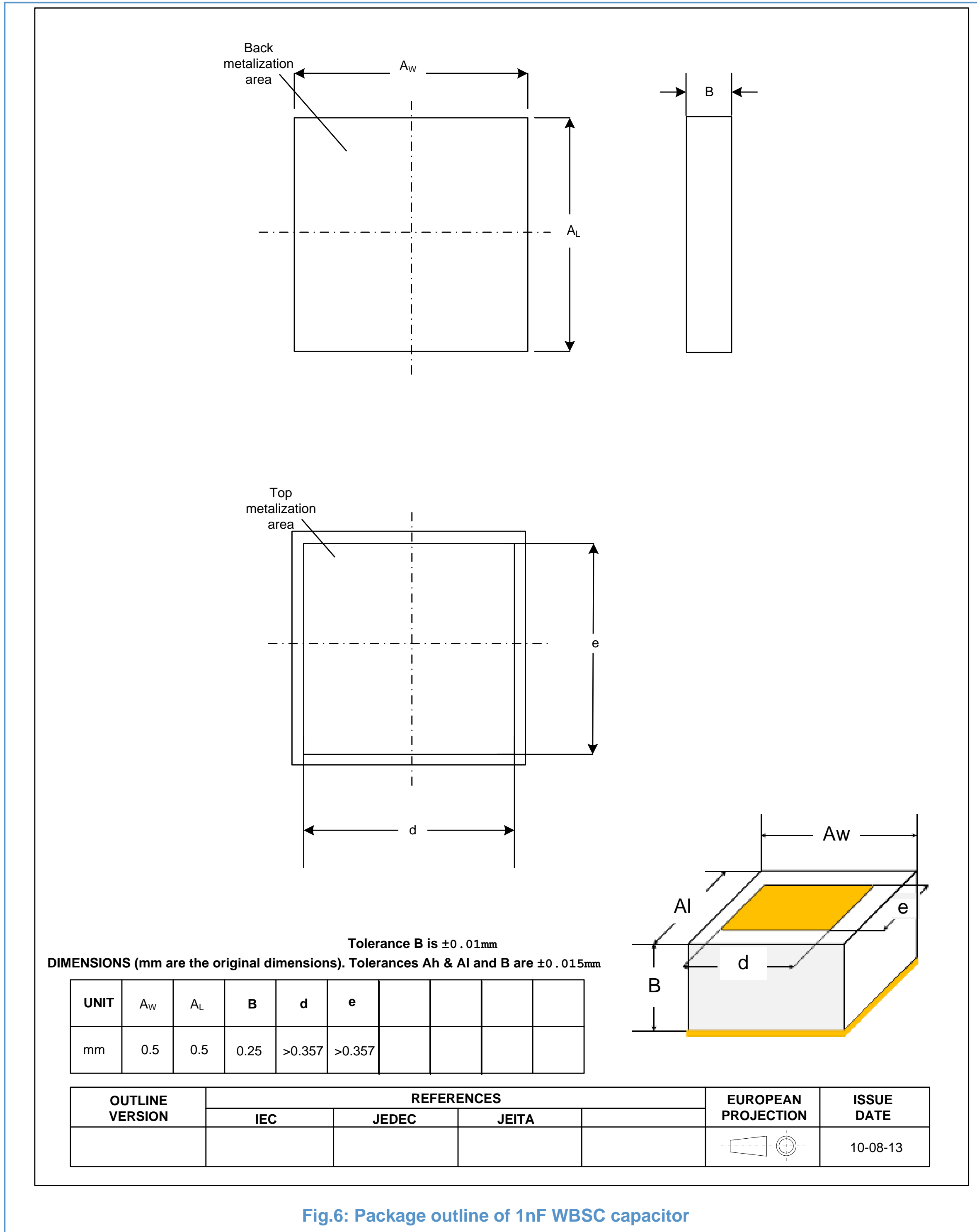
- ISO-9001
- ISO-14001
- ISO-TS16949
- OHSAS-18001

Murata is RoHS compliant.

Package outline

The WBSC521.410 capacitor is delivered as a naked.

Fig.5 Micro photography of a 1nF WBSC capacitor



Tolerance B is ±0.01mm

DIMENSIONS (mm are the original dimensions). Tolerances Ah & Al and B are ±0.015mm

UNIT	A_W	A_L	B	d	e				
mm	0.5	0.5	0.25	>0.357	>0.357				

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
						10-08-13

Fig.6: Package outline of 1nF WBSC capacitor

Assembly consideration

The attachment techniques recommended by Murata for the WBSC 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 Murata capacitors please download the assembly instructions on www.ipdia.com/assembly and read them carefully.**

Murata Silicon Capacitors –
WBSC / WTSC / WXSC 250 µm / WLSC 100 µm
Assembly by Wirebonding

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For WBSC assembly instructions @ 100 & 250 µm, please go to www.ipdia.com/assembly and download the pdf file called **Murata Silicon Capacitors – WBSC / WTSC / WXSC 250 µm / WLSC 100 µm - Assembly by Wirebonding'.**

Packing format

Tape and Reel format definition:

Tape Ref	Cavity dimensions			Carrier Tape width	Carrier Tape pitch	Reel size	Qty per reel
	Ao	Bo	Ko				
YJ194	0.56mm	0.56mm	0.31mm	8 mm	4mm	7"	1 000

Table 5: Tape & Reel references

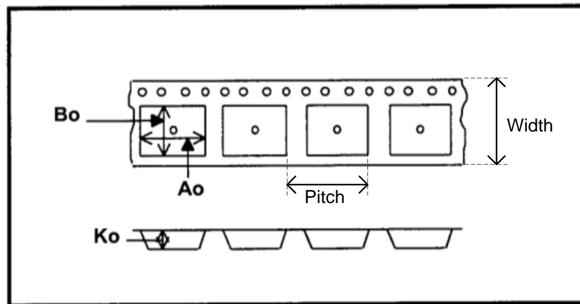


Fig. 7: Tape & Reel dimensions

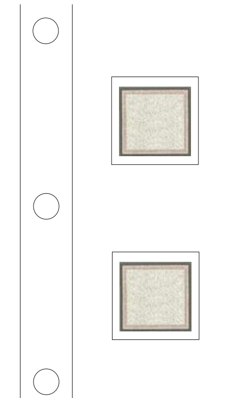


Fig. 8: Die orientation (No flip) within the carrier (Pocket) related to tape and reel orientation

Tape Width	A Diameter	C	D (min)	N Hub	W1	W2 (max)
8mm	178 mm +/- 1.0	13.5 mm ± 0.5	20.2 mm	60 mm + 0.1 -0.0	93mm ± 0.5	11.5

Table 6: Reel references used for tape width 8mm

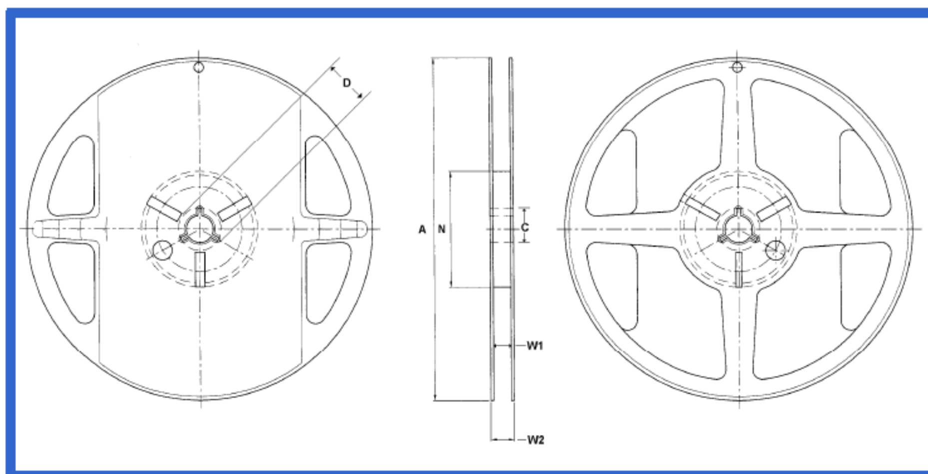


Fig. 9: Reel references and dimensions used for tape width 8mm

<u>Film frame carrier format definition</u>: Ref: FF070 (Perfection products)

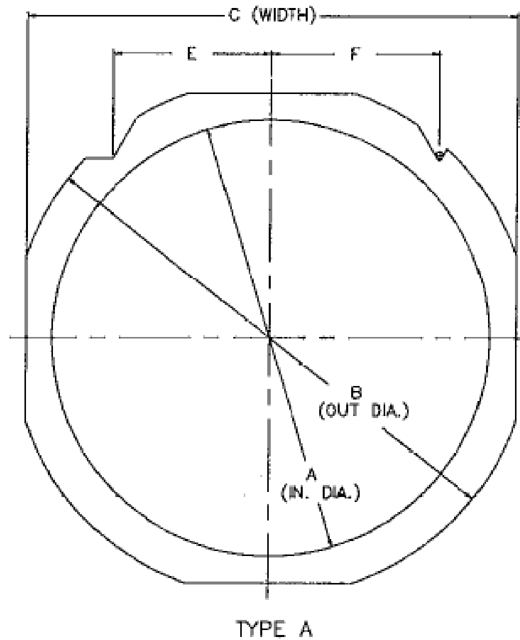


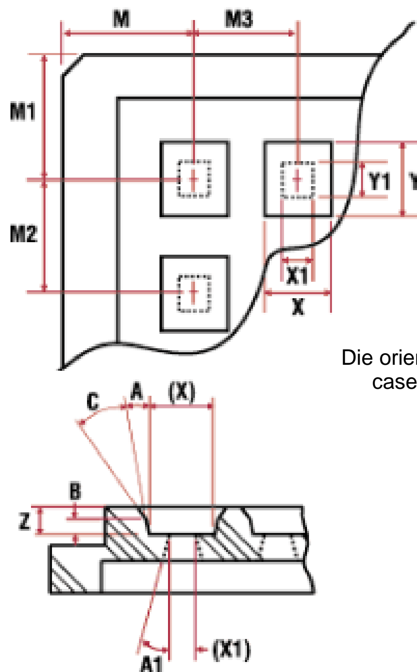
Fig.10: Dimension of film frame carrier

Wafer diameter (***)	Frame type	Inside diameter (A)	Outside diameter (B)	Width (C)	Thickness (D)	Pin location (E)	Pin location (F)	Frame style	Weight(lbs) (stainless)
6.0" (150mm)	Type A	7.639"	8.976"	8.346"	0.048	2.370"	2.500"	DTF-2-6-1	0.21

(***) other size and type on request.

Table 7: Details of film frame carrier

<u>Waffle pack format definition</u>: Ref: H20-025-14-66CO2(Entegris)



Die orientation (No flip) within the case related to waffle pack orientation

Fig.11: Dimensions of waffle pack

POCKET LOCATIONS	
M	= 4.65mm ±0.08mm
M1	= 4.65mm ±0.08mm
M2	= 2.18mm ±0.05mm
M3	= 2.18mm ±0.05mm
Array	= 20x20 (400)
POCKET DETAILS	
X	= 0.64mm ±0.05mm *pocket size*
Y	= 0.64mm ±0.05mm *pocket size*
Z	= 0.36mm ±0.05mm *pocket depth*
A	= 15° ±1/2° *pocket draft angle*
	No Cross Slots
OVERALL TRAY SIZE	
Size	= 50.80mm ±0.10mm
Height	= 3.96mm +0.05mm -0.08mm
Flatness	= 0.10mm

Table 8: Details of waffle pack

<u>Waffle pack format definition</u>: Ref: H20-023-11-66CO2 (Entegris) for 100µm thick

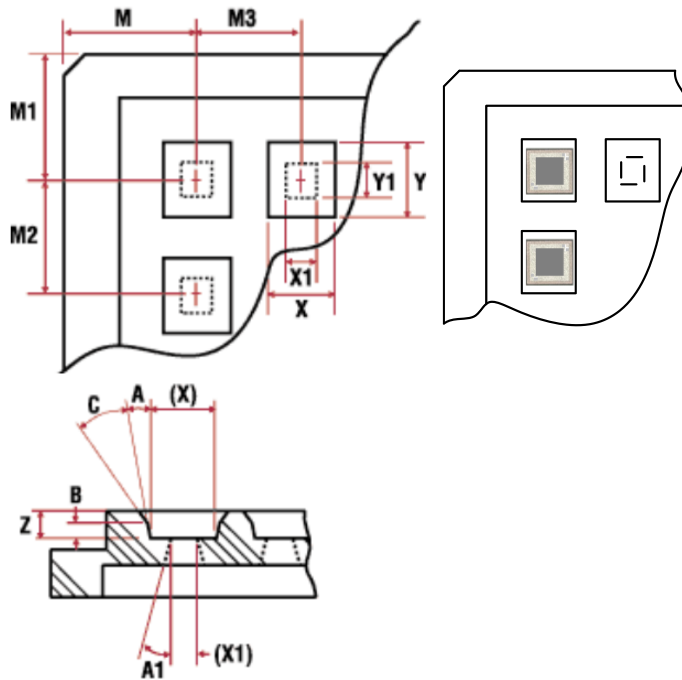


Fig.12: Dimensions of waffle pack

POCKET LOCATIONS	
M	= **4.89mm ±0.08mm**
M1	= **4.89mm ±0.08mm**
M2	= **2.16mm ±0.05mm**
M3	= **2.16mm ±0.05mm**
Array	= 20x20 (400)
POCKET DETAILS	
X	= **0.58mm ±0.05mm** *pocket size*
Y	= **0.58mm ±0.05mm** *pocket size*
Z	= **0.28mm ±0.05mm** *pocket depth*
A	= **18° ±1/2°** *pocket draft angle*
	No Cross Slots
OVERALL TRAY SIZE	
Size	= **50.80mm ±0.10mm**
Height	= **3.96mm +0.05mm -0.08mm**
Flatness	= **0.10mm**

Table 9: Details of waffle pack

Designation	Part number	Material / Standard
Waffle pack for 250µm thick	H20-025-14-66C02	ChipSentry® (Black Conductive Polycarbonate) Pocket Dimensions: 0.64mm x 0.64mm x 0.36mm Capacity: 20x20 (400)
Waffle pack for 100µm thick	H20-023-11-66C02	ChipSentry® (Black Conductive Polycarbonate) Pocket Dimensions: 0.58mm x 0.58mm x 0.28mm Capacity: 20x20 (400)
Pair of Waffle pack clip	H20-04-61C02	STAT-PRO 100 (Polypropylene with carbon powder
Cover	H20-02-66C02	ChipSentry® (Black Conductive Polycarbonate)
Visual inspection	Condition B	Standard MIL-STD-883J

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	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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 Characteristics 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
Release 1.0	**2014 May 12th**	**Creation**	**OGA**
Release 1.1	**2014 June 11th**	**Packing update**	**OGA**
Release 1.2	**2014 September 13th**	**RoHs logo update + WLSC version added**	**OGA**
Release 1.3	**2015 July 1st**	**Update**	**OGA**
Release 1.4-1.5	**2015 Sept -Oct**	**Waffle packing update**	**OGA**
Release 1.6	**2016 Jan 18th**	**New Finishing**	**OGA**
Release 1.7	**2016 May 10th**	**Minor updates**	**OGA**
Release 1.8	**2016 Oct. 11th**	**Minor updates**	**OGA**
Release 1.9	**2017 Feb 22th**	**Minor updates**	**OGA**
Release 2.0	**2017 April 26th**	**Murata version**	**OGA**
Release 2.1	**2017 June 9th**	**Rated voltage and assembly note update**	**OGA**
Release 2.2	**2017 July 12th**	**Update**	**OGA**

Life Support Applications

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