



SBB3089Z

50MHz to 6000MHz Gain Block

Product Overview

The SBB3089Z is a high performance InGaP HBT MMIC amplifier utilizing a Darlington configuration with an active bias network. The active bias network provides stable current over temperature and process Beta variations. The SBB3089Z product is designed for high linearity 5V gain block applications that require excellent gain flatness, small size, and minimal external components. It is internally matched to 50Ω.

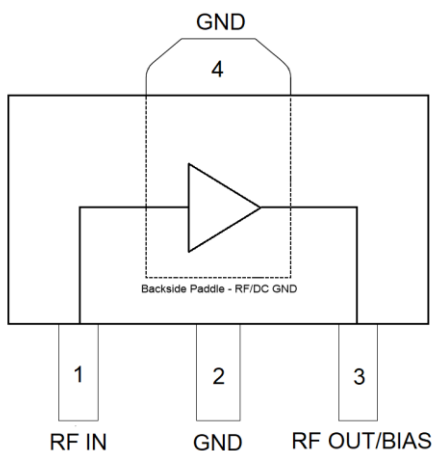


3-pin SOT-89 Package

Key Features

- 50MHz – 6000MHz Operational Frequency
- Patented Thermal Design and Self Bias Circuit
- Gain = 16.4dB at 1950MHz
- P1dB = +15.2dBm at 1950MHz
- OIP3 = +29.5dBm at 1950MHz
- Single Fixed 5V Supply
- Robust 1000V ESD, Class 1C HBM

Functional Block Diagram



Top View

Applications

- PA Driver Amplifier
- Cellular, PCS, GSM, UMTS
- IF Amplifier
- Wireless Data, Satellite
- Wideband Instrumentation

Ordering Information

Part No.	Description
SBB3089Z	7" Reel with 1000 pieces
SBB3089ZPCK1	500MHz to 3500MHz PCBA with 5-piece sample bag

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-55 to 150 °C
RF Input Power, CW, 50 Ω, T=+25 °C	+20 dBm
Device Voltage (V _{CC})	+6 V
Device Current (I _{CC})	100 mA
Junction Temperature (T _J)	+150 °C

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
T _{CASE}	-40		+85	°C

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions. Application of conditions to the device outside the Recommended Operating Conditions may reduce device reliability and performance.

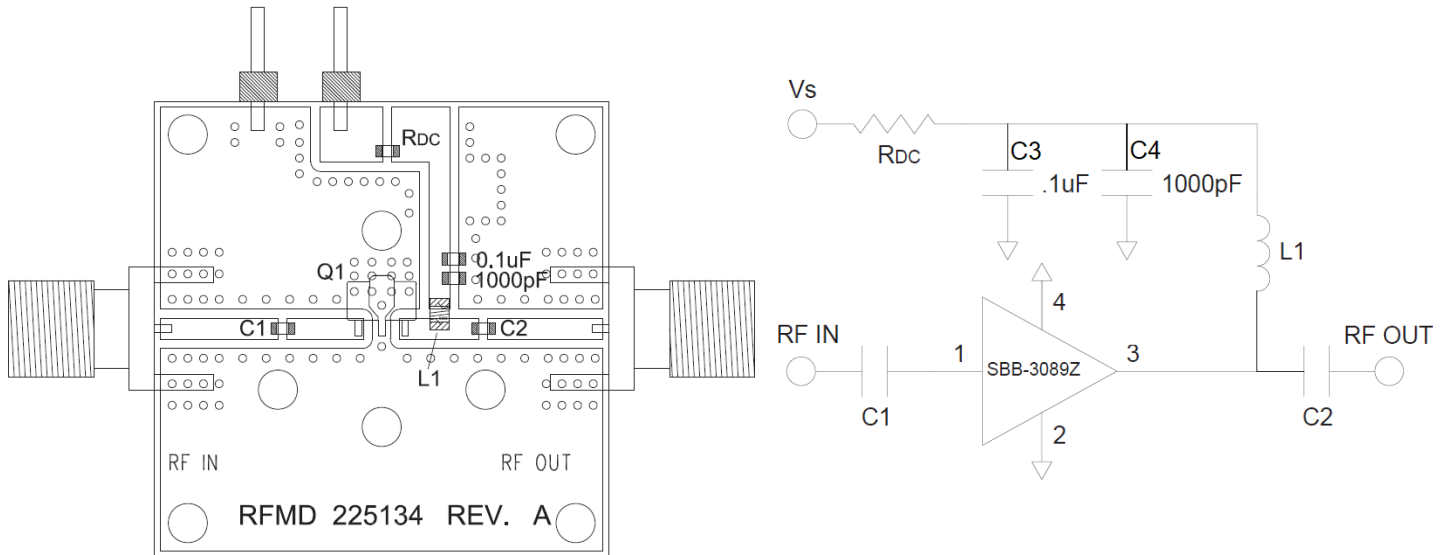
Electrical Specifications

Parameter	Conditions ⁽¹⁾	Min	Typ	Max	Units
Operational Frequency Range		50		6000	MHz
Gain	850MHz	15.1	16.6	18.1	dB
	1950MHz	14.9	16.4	17.9	dB
	2400MHz		16.3		dB
Input Return Loss	1950MHz	16	21		dB
Output Return Loss	1950MHz	19	25.5		dB
Output P1dB	850MHz		+15.6		dBm
	1950MHz	+14.2	+15.2		dBm
	2400MHz		+15.4		dBm
Output IP3	P _{out} = -5 dBm/tone, Δf = 1 MHz, Center Freq.= 850MHz		+30		dBm
	P _{out} = -5 dBm/tone, Δf = 1 MHz, Center Freq.= 1950MHz	+27.5	+29.5		dBm
	P _{out} = -5 dBm/tone, Δf = 1 MHz, Center Freq.= 2400MHz		+29.5		dBm
Noise Figure	1950MHz		3.9	4.9	dB
Device Operating Voltage (V _{CC})	R _{DC} =20Ω, V _S =+5.0V		4.2	4.3	V
Device Operating Current (I _{CC})	R _{DC} =20Ω, V _S =+5.0V	38	42	46	mA
Thermal Resistance, θ _{JC}	Junction to case		80		°C/W

Notes:

1. Test conditions unless otherwise noted: V_S= +5.0V, V_{CC} = +4.2 V, I_{CC} = 42mA, R_{DC}=20Ω, Temp= +25 °C , 50 Ω system.
2. Supply voltage (V_S) and bias resistor (R_{DC}) values are related by: R_{DC}=(V_S-V_{CC})/I_{CC}

Evaluation Board



Bill of Material

Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board	Qorvo	
Q1	n/a	HBT Gain Block Amplifier	Qorvo	SBB3089Z
C1, C4	1000 pF	CAP, 0603, 10%, 50V, X7R	various	
C2	68 pF	CAP, 0603, 5%, 50V, C0G	various	
C3	0.1 uF	CAP, 0805, 10%, 50V, X7R	various	
L1	48 nH	IND, 0805, 5%, W/W	Coilcraft	0805HQ-48NXJRC
R _{DC}	20 Ω	RES, 0805, 5%, 1/10W	various	

Recommended R_{DC} Resistor Values for I_{CC}=42mA

Supply Voltage (V _S)	5V	6V	8V	10V	12V
R _{DC}	20Ω	43Ω	91Ω	139Ω	187Ω

Notes:

1. Supply voltage (V_S) and bias resistor (R_{DC}) values are related by: $R_{DC} = (V_S - V_{CC}) / I_{CC}$

Typical Performance – with Bias Tee

Test conditions unless otherwise noted: $V_S = +5.0V$, $V_{CC} = +4.2V$, $I_{CC} = 42mA$, $R_{DC} = 20\Omega$, Temp = $+25^\circ C$, 50Ω system.

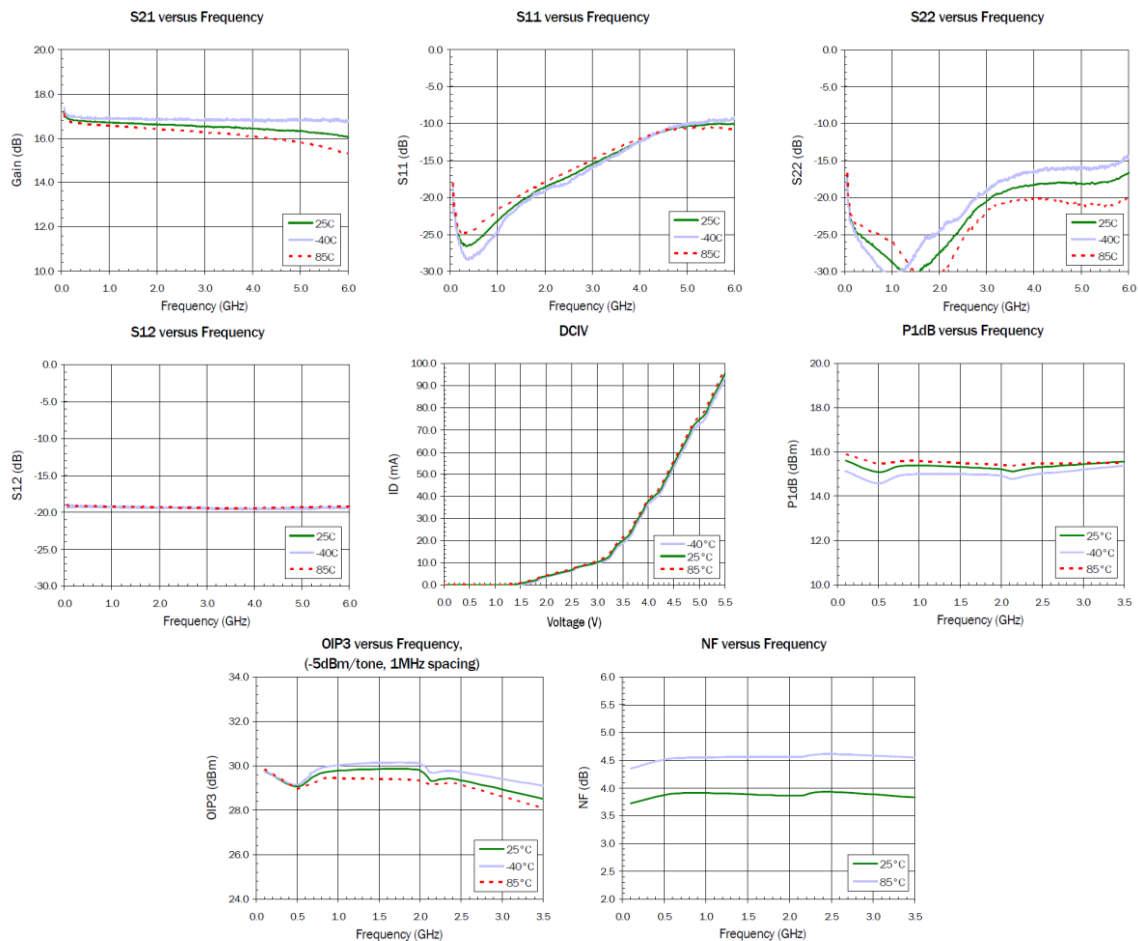
Parameter	Typical Value							Units
Frequency	100	500	850	1950	2140	2400	3500	MHz
Gain	16.9	16.6	16.6	16.4	16.4	16.3	16.1	dB
Input Return Loss	24	26.5	24.5	21	20.5	20	15.5	dB
Output Return Loss	21.5	26	26	25.5	25.5	27.5	21	dB
Reverse Isolation	19.5	19	19.5	19.5	19.5	19.5	19.5	dB
Output P1dB	+15.6	+16	+15.6	+15.2	+15	+15.4	+15.2	dBm
OIP3 ⁽¹⁾	+29.5	+30.5	+30	+29.5	+29	+29.5	+27	dBm
Noise Figure	3.7	3.9	3.9	3.9	3.9	3.9	4	dB

Notes:

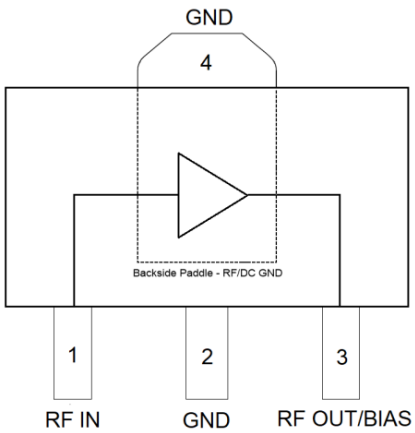
1. $P_{out} = -5$ dBm/tone, $\Delta f = 1$ MHz

Performance Plots – with Bias Tee

Test conditions unless otherwise noted: $V_S = +5.0V$, $V_{CC} = +4.2V$, $I_{CC} = 42mA$, $R_{DC} = 20\Omega$, Temp = $+25^\circ C$, 50Ω system.



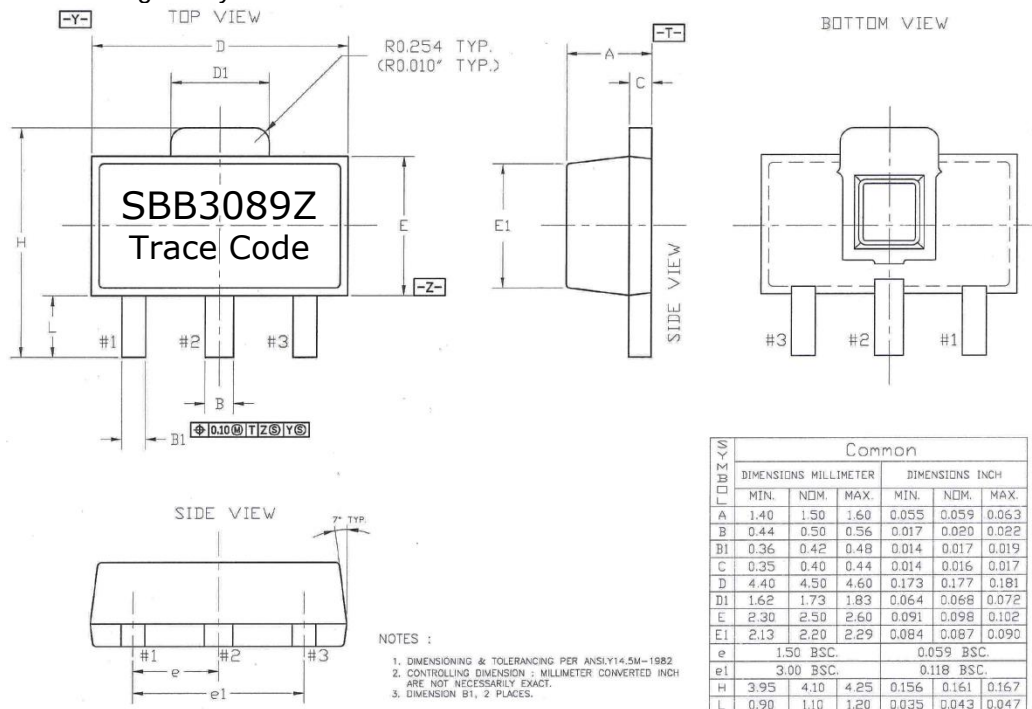
Pin Configuration and Description



Pin No.	Label	Description
1	RF IN	RF input. External DC Block capacitor required.
2, 4	GND	RF/DC ground. Use recommended via hole pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern for suggested footprint.
3	RF OUT / BIAS	RF output and DC Supply input. External DC Block capacitor and bias voltage required.

Package Marking and Dimensions

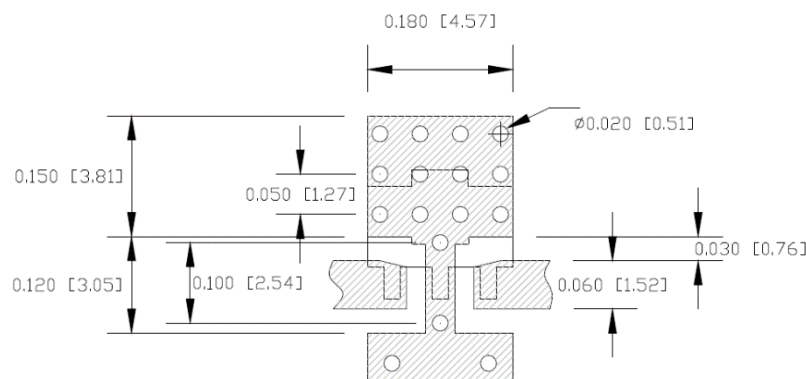
Marking: Part Identifier – SBB3089Z
Trace Code – Assigned by sub-contractor



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

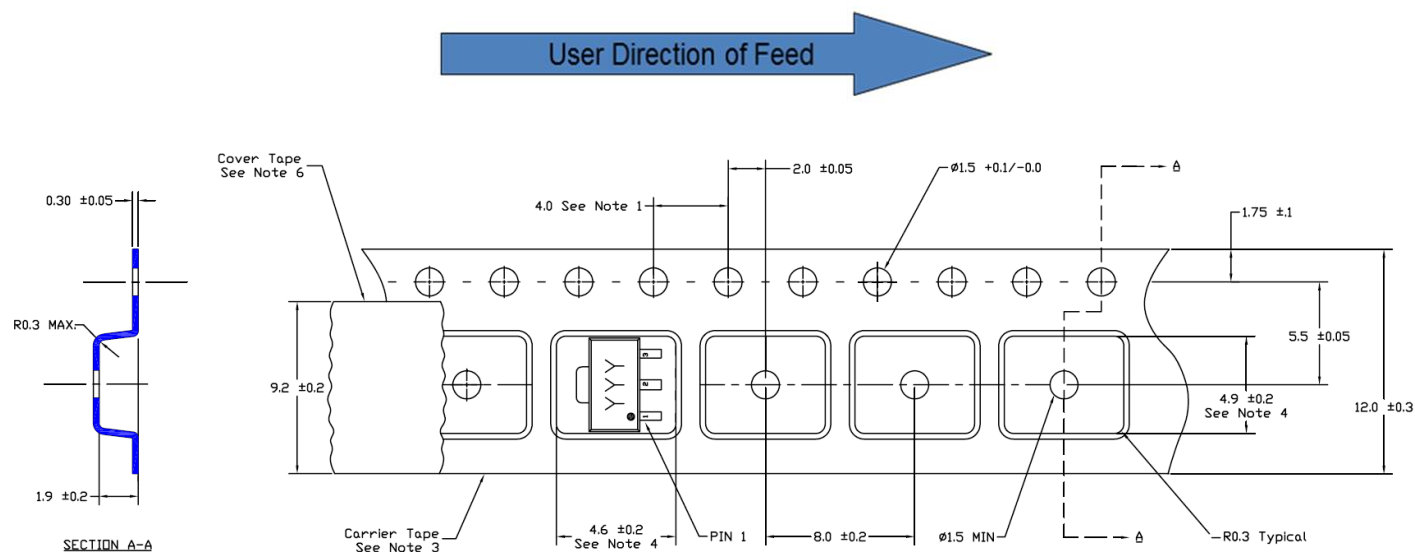
PCB Mounting Pattern



NOTES:

1. All dimensions are in millimeters [inches]. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25mm (0.01").
4. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

Tape and Reel Information – Carrier and Cover Tape Dimensions

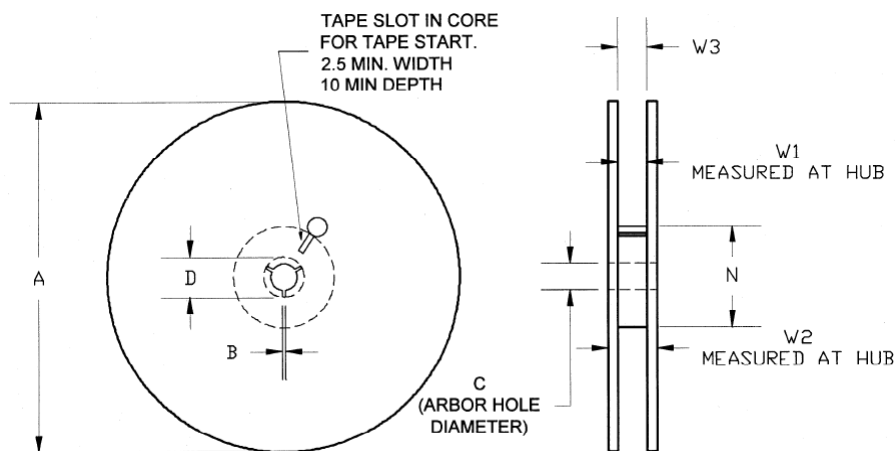


1. 10 sprocket hole pitch cumulative tolerance
2. Camber not to exceed 1mm in 100mm
3. Material: Black Conductive Polystyrene
4. Measured on a plane 0.3mm above the bottom of the pocket.
5. Measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Material: Antistatic Polyester Film

Feature	Measure	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.181	4.60
	Width	B0	0.193	4.90
	Depth	K0	0.075	1.90
	Pitch	P1	0.315	8.00
Centerline Distance	Cavity to Perforation - Length Direction	P2	0.079	2.00
	Cavity to Perforation - Width Direction	F	0.217	5.50
Cover Tape	Width	C	0.362	9.20
Carrier Tape	Width	W	0.472	12.0

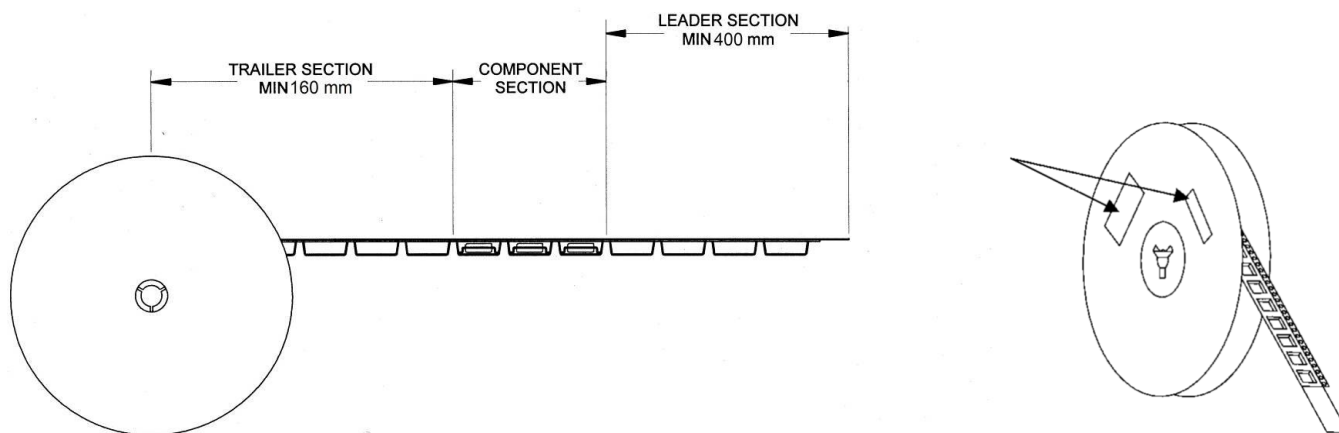
Tape and Reel Information – Reel Dimensions

Standard T/R size = 1,000 pieces on a 7" reel.



Feature	Measure	Symbol	Size (in)	Size (mm)
Flange	Diameter	A	6.969	177.0
	Thickness	W2	0.717	18.2
	Space Between Flange	W1	0.504	12.8
Hub	Outer Diameter	N	2.283	58.0
	Arbor Hole Diameter	C	0.512	13.0
	Key Slit Width	B	0.079	2.0
	Key Slit Diameter	D	0.787	20.0

Tape and Reel Information – Tape Length and Label Placement



Notes:

1. Empty part cavities at the trailing and leading ends are sealed with cover tape. See EIA 481-1-A.
2. Labels are placed on the flange opposite the sprockets in the carrier tape.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1C	ESDA / JEDEC JESDC22-A114
MSL – Moisture Sensitivity Level	Level 3	IPC/JEDEC J-STD-020



Caution!
ESD-Sensitive Device

Solderability

Compatible with both lead-free (260°C max. reflow temp.) and tin/lead (245°C max. reflow temp.) soldering processes.
Solder profiles available upon request.

Contact plating: NiPdAu

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free



Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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