SBB5089Z

50MHz-6000MHz, Cascadable Amplifier

Product Overview

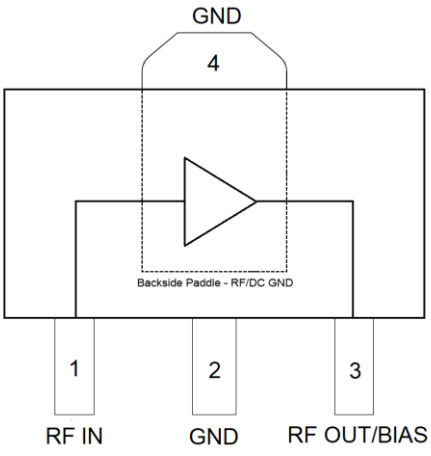
The SBB5089Z is a high performance InGaP HBT MMIC amplifier utilizing a Darlington configuration with an active bias circuitry. The active bias circuitry provides stable current over temperature and process variations. The SBB5089Z designed to run directly from a 5V supply, does not require a dropping resistor as compared to typical Darlington amplifiers. The SBB5089Z is a high linearity gain block for applications that require small in size with minimal number of external components. It is internally matched to 50 Ω at input and output.

3 Pin SOT-89 Package

Key Features

- 50 MHz – 6000 MHz
- ±1.1 dB Wideband Flat Gain up to 4000 MHz
- +20.4 dBm P1dB at 1950 MHz
- +5 V Single Fixed Supply
- 1000V, HBM Class 1C Robust ESD
- Patented Thermal Design and Bias Circuitry
- Low Thermal Resistance

Functional Block Diagram



Top View

Applications

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

Ordering Information

Part No.	Description
SBB5089Z	1,000 pieces on a 7” reel (standard)
SBB5089Z PCK1	500 – 3500 MHz Evaluation Board with a 5-piece sample bag

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	−55 to +150 °C
RF Input Power, CW, 50 Ω, T=25 °C	+24 dBm
Device Voltage (V_C)	+5.5 V
Device Current (I_C)	100 mA
Dissipated Power (P_{DISS})	0.55 W
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. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Device Voltage (V_C)	+4.75	+5	+5.25	V
T_{CASE}	−55		+105	°C

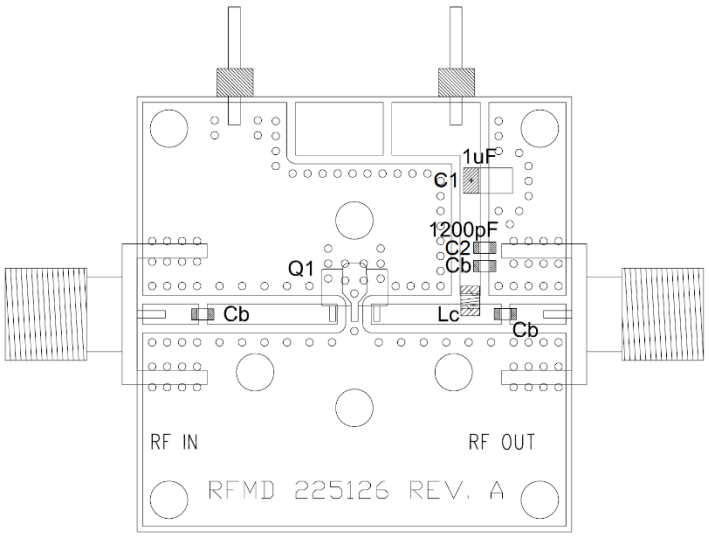
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

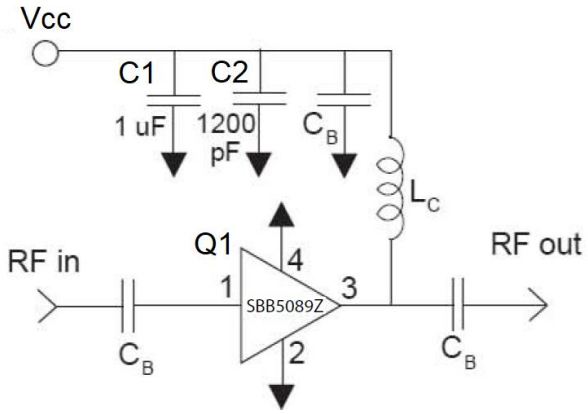
Electrical Specifications

Parameter	Conditions (1)	Min	Typ	Max	Units
Operational Frequency Range		50		6000	MHz
Gain, Small Signal	850 MHz	19.0	20.5	22.0	dB
	1950 MHz	18.3	19.0	21.5	dB
	6000 MHz	14.5	15.5	17.5	dB
Input Return Loss	1950 MHz	10	13		dB
Output Return Loss		10	14		dB
Output P1dB	850 MHz		20.5		dBm
	1950 MHz	19.0	20.0		dBm
Output IP3 (2)	850 MHz		38.5		dBm
	1950 MHz	33.0	35.0		dBm
Bandwidth	Minimum 10 dB typical return loss		3000		MHz
Reverse Isolation	1950 MHz		23.3		dB
Noise Figure			3.9	4.9	dB
Device Operating Current, I_C	Pin 3	60	75	92	mA
Thermal Resistance, θ_{jc}	Junction to case		69.9		°C/W

Notes:
1. Test conditions unless otherwise noted: V_C = +5.0 V, I_C = 75 mA, Temp = +25 °C, 50 Ω test system, Tested with Bias Tees
2. P_{OUT} = 0 dBm/tone, Δf = 1 MHz

500 – 3500 MHz Evaluation Board – SBB5089ZPCK1





Bill of Material – SBB5089ZPCK1

Reference Des.	Value	Description	Manuf.	Part Number
PCB	-	Printed Circuit Board	Qorvo	
Q1	-	SBB5089Z Amplifier, SOT-89 pkg.	Qorvo	SBB5089Z
C1	1 µF	CAP, 1 µF, 20%, 20V, TANT, 1206	various	
C2	1200 pF	CAP, 1200 pF, 10%, 50V, X7R, 0603	various	
C_B	68 pF	CAP, 68 pF, 5%, 50V. NPO/C0G, 0603	various	
L_C	82 nH	IND, 82 nH, 5%, W/W, 0805	Coilcraft	0805CS-330XJLB

Note for < 500 MHz: C_B 1.0 µF, 10%, 160, X7R, 0603; L_C 330 nH, 5%, 0805

Typical Performance – SBB5089ZPCK1

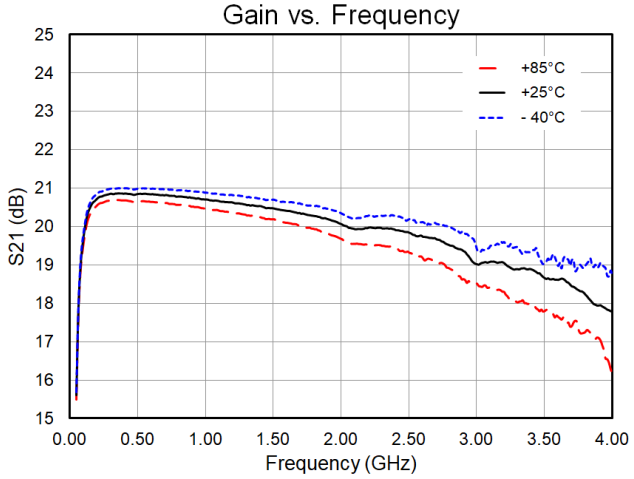
Parameter (1)	Typical Value									Units
Frequency	50	100	200	500	850	1950	2500	3500	4000	MHz
Gain, Small Signal	21.1	20.9	20.8	20.8	20.8	20.1	19.8	18.7	17.8	dB
Input Return Loss	11.3	17.4	24.3	27.2	22.7	14.6	12.9	10.6	11.6	dB
Output Return Loss	15.9	21.7	30.4	31.8	21.5	13.5	12.0	13.5	27.5	dB
Reverse Isolation	17.4	17.5	17.5	22.7	22.8	23.4	23.7	24.7	25.7	dB
Output P1dB	19.4	19.7	20.0	20.5	20.4	20.4	19.4	16.9	14.7	dBm
OIP3 (2)	36.0	37.8	37.5	38.6	39.2	34.9	32.8	29.4	26.8	dBm
Noise Figure	4.4	4.4	4.3	3.8	3.8	4.1	4.1	4.3	4.6	dB

Notes:
1. Test conditions unless otherwise noted: V_{CC} = +5V, I_C = 75 mA , 50 Ω test system, Temp.=+25 °C
2. Pout= 0 dBm/tone, Δf=1 MHz

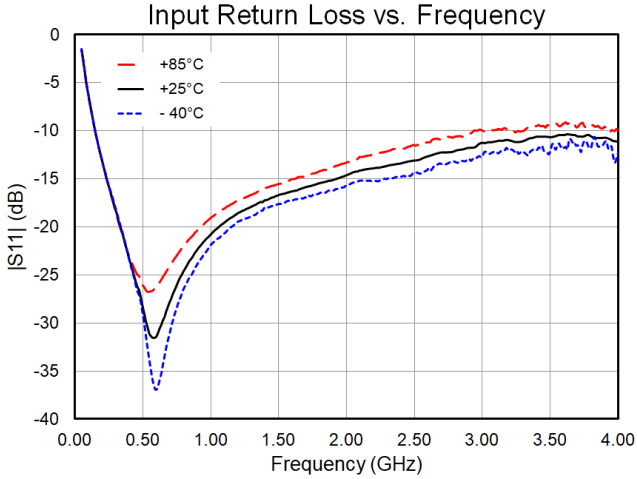
Performance Plots – SBB5089ZPCK1

Test conditions unless otherwise noted: V_{CC} = +5V, I_C = 75 mA, 50 Ω test system, Temp.=+25 °C

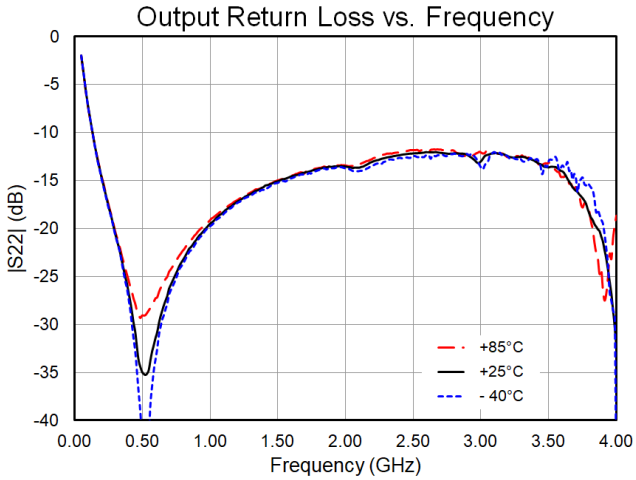
Gain vs. Frequency



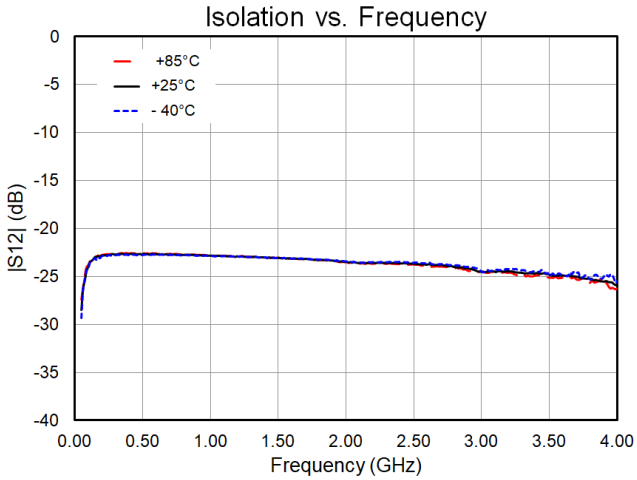
Input Return Loss vs. Frequency



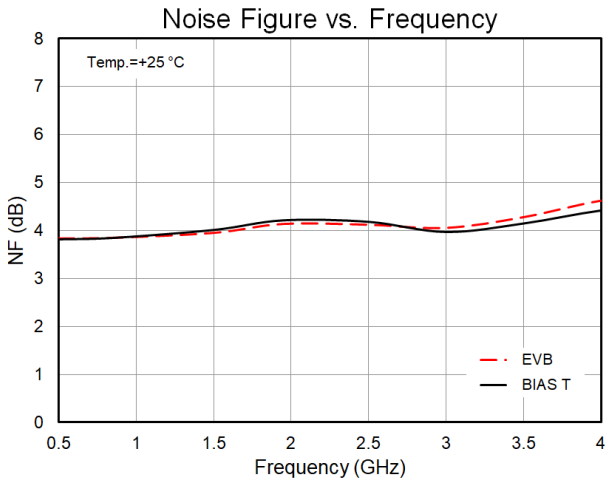
Output Return Loss vs. Frequency



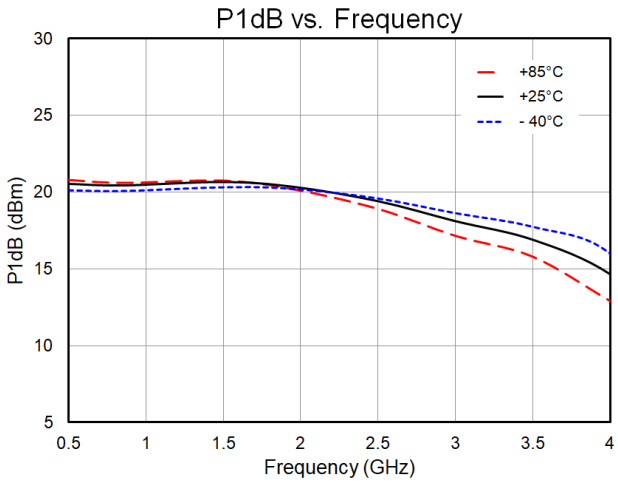
Isolation vs. Frequency



Noise Figure vs. Frequency

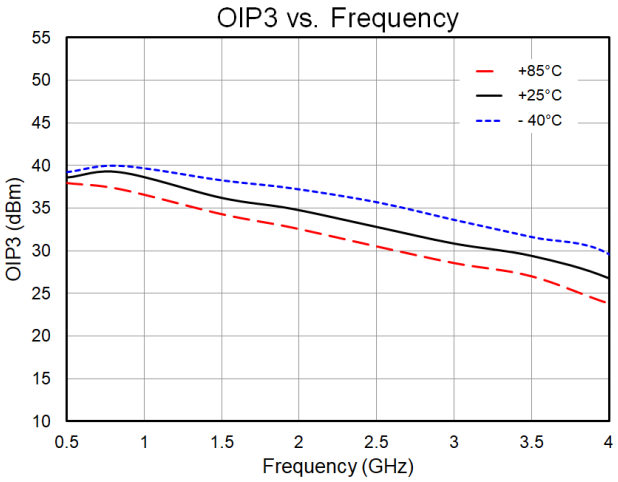


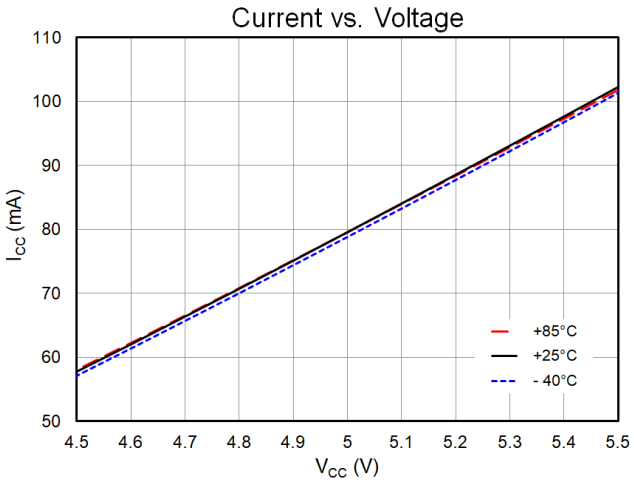
P1dB vs. Frequency

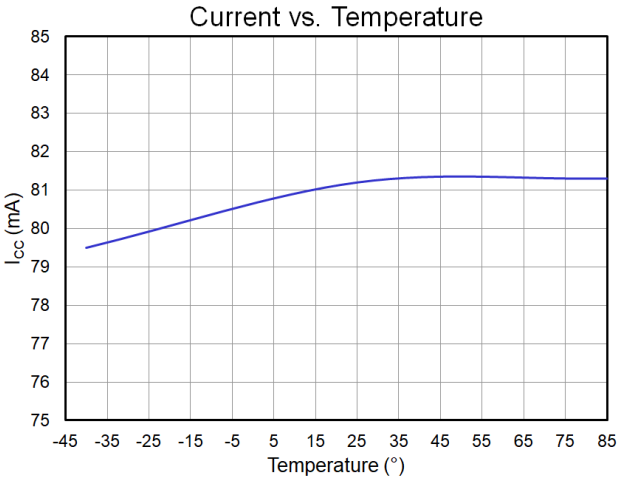


Performance Plots – SBB5089ZPCK1 (continued)

Test conditions unless otherwise noted: V_{CC} = +5V, I_C = 75 mA, 50 Ω test system, Temp.=+25 °C

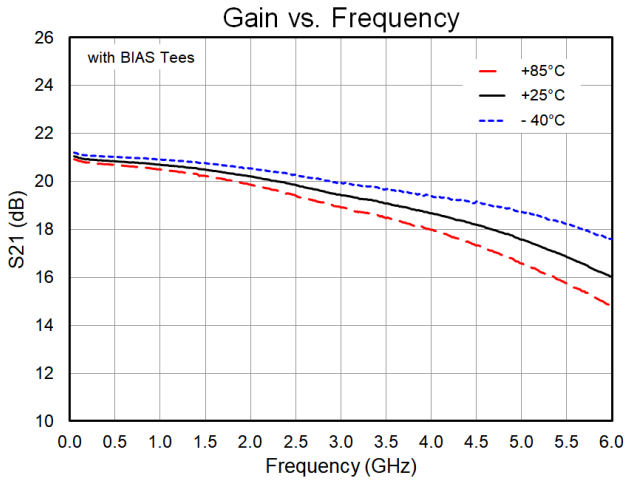


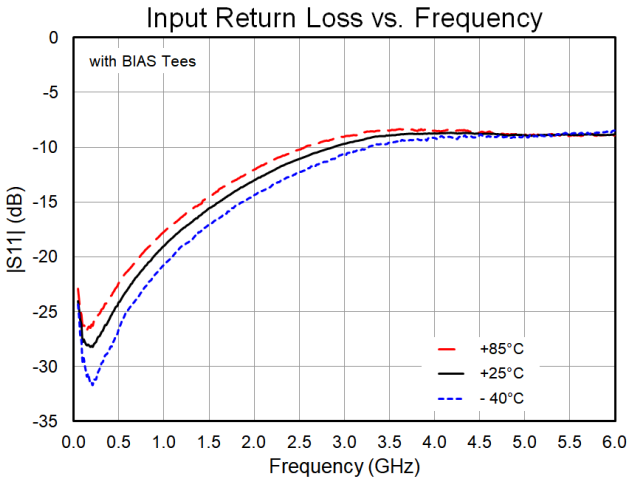


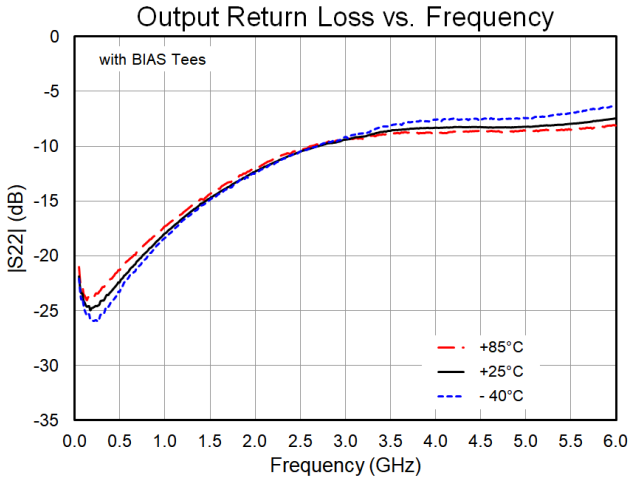


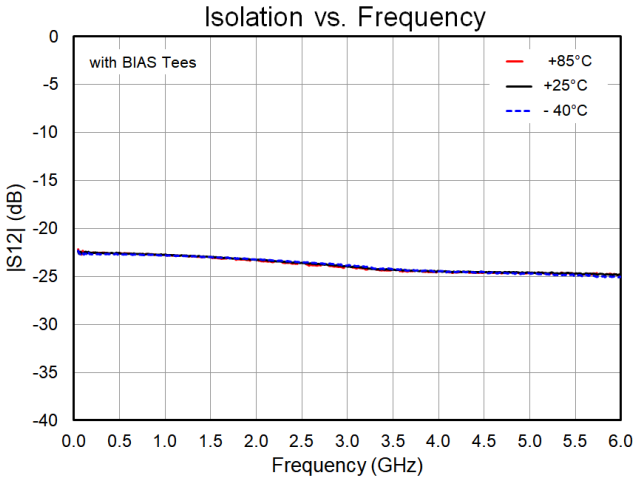
Performance Plots – with BIAS Tees

Test conditions unless otherwise noted: V_C = +5V, I_C = 75 mA, 50 Ω test system, Temp.=+25 °C, with BIAS Tees

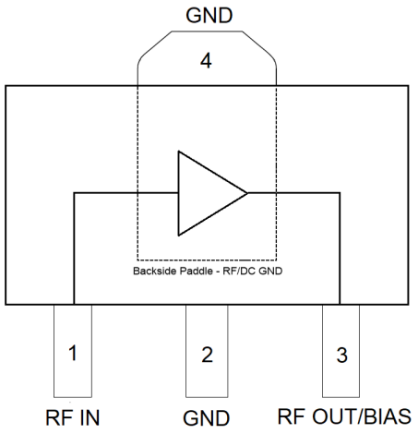








Pad Configuration and Description

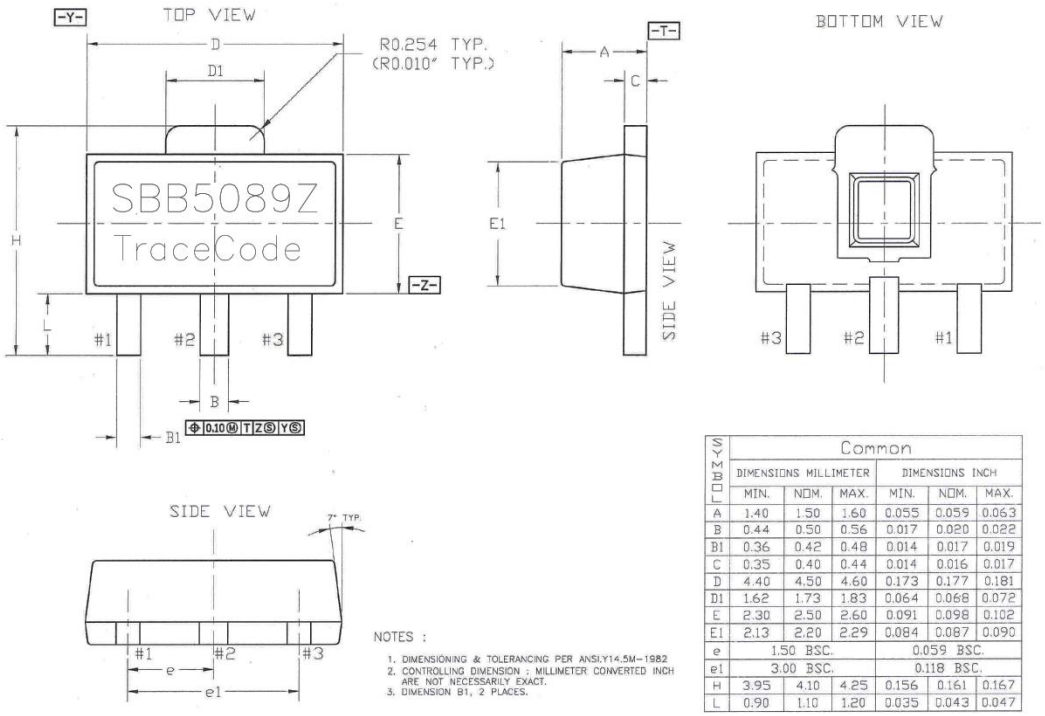


Top View

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

Package Marking and Dimensions

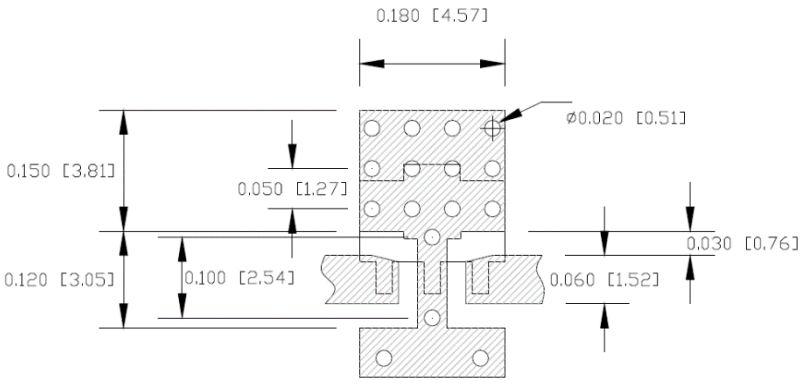
Marking: Part Number – SBB5089Z
Trace Code – Assigned by sub-contractor



SYMBOL	Common					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.40	1.50	1.60	0.055	0.059	0.063
B	0.44	0.50	0.56	0.017	0.020	0.022
B1	0.36	0.42	0.48	0.014	0.017	0.019
C	0.35	0.40	0.44	0.014	0.016	0.017
D	4.40	4.50	4.60	0.173	0.177	0.181
D1	1.62	1.73	1.83	0.064	0.068	0.072
E	2.30	2.50	2.60	0.091	0.098	0.102
E1	2.13	2.20	2.29	0.084	0.087	0.090
e	1.50 BSC.			0.059 BSC.		
e1	3.00 BSC.			0.118 BSC.		
H	3.95	4.10	4.25	0.156	0.161	0.167
L	0.90	1.10	1.20	0.035	0.043	0.047

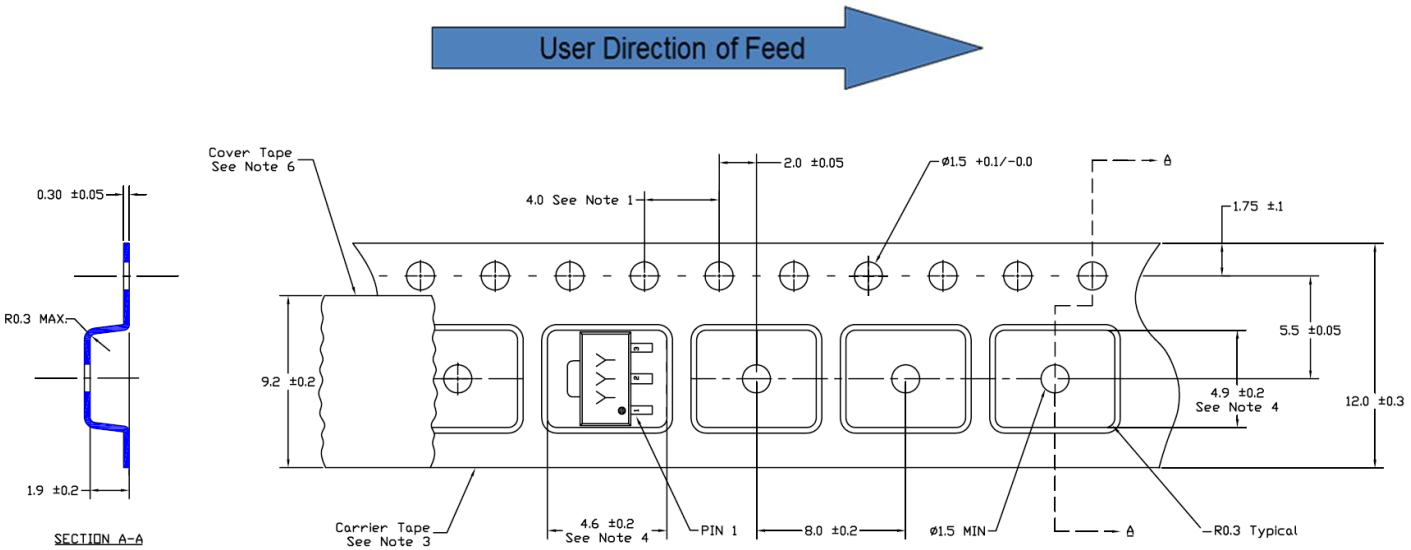
Notes:
1. All dimensions are in millimeters. Angles are in degrees.
2. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

PCB Mounting Pattern



Notes:
1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Via holes 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 0.25 mm (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

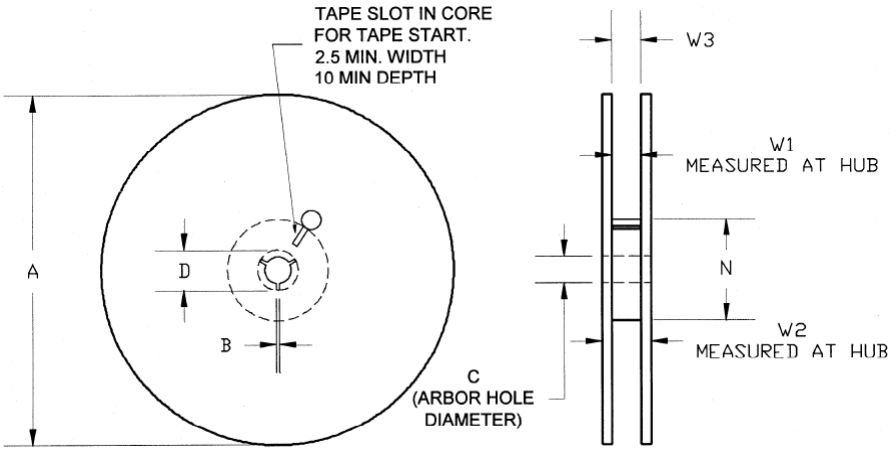


1. 10 sprocket hole pitch cumulative tolerance
2. Camber not to exceed 1mm in 100mm
3. Material: Black Conductive Polystyrene
4. Measured on a plane 0.3mm above the bottom of the pocket.
5. Measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Material: Antistatic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

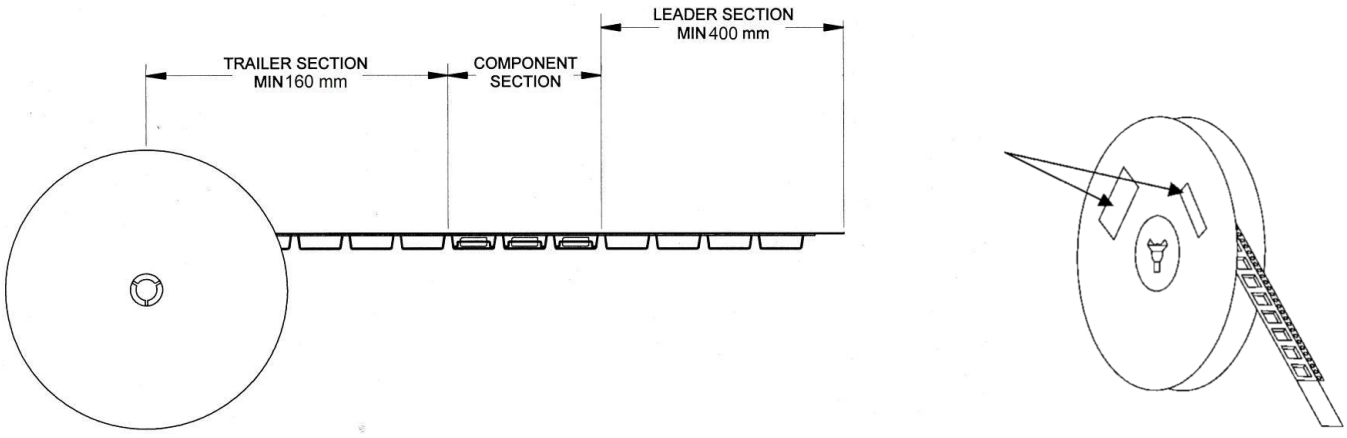
Tape and Reel Information – Reel Dimensions

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 JS-001-2012
MSL – Moisture Sensitivity Level	MSL5a	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 ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Contact Information

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

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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