RFMD
rfmd.com

SGC-6386Z

50MHz to 4000MHz SILICON GERMANIUM CASCADABLE GAIN BLOCK

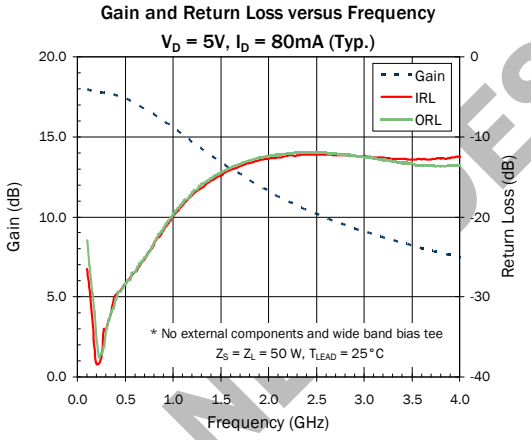
Package: SOT-86

Product Description

RFMD's SGC-6386Z is a high performance SiGe 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. Designed to run directly from a 5V supply, the SGC-6386Z does not require a drop resistor as compared to typical Darlington amplifiers. The SGC-6386Z product is designed for high linearity 5V gain block applications that require small size and minimal external components. It is internally matched to 50Ω.

Optimum Technology Matching® Applied

- ☐ GaAs HBT
- ☐ GaAs MESFET
- ☐ InGaP HBT
- ☐ SiGe BiCMOS
- ☐ Si BiCMOS
- ✓ SiGe HBT
- ☐ GaAs pHEMT
- ☐ Si CMOS
- ☐ Si BJT
- ☐ GaN HEMT
- ☐ InP HBT
- ☐ RF MEMS
- ☐ LDMOS



Features

- Single Fixed 5V Supply
- Supply Drop Resistor Not Required
- Patented Self Bias Circuitry
- P_{1dB} = 18.3dBm at 1950MHz
- IP_3 = 34.3dBm at 1950MHz
- Robust 1000V ESD, Class 1C HBM

Applications

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

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Small Signal Gain	14.8	16.3	17.8	dB	850MHz
	10.8	11.9	13.8	dB	1950MHz
Output Power at 1dB Compression		19.3		dBm	850MHz
	17.4	18.4		dBm	1950MHz
Output Third Order Intercept Point		35.5		dBm	850MHz
	32.0	34.0		dBm	1950MHz
Input Return Loss	9	13		dB	1950MHz
Output Return Loss	9	13		dB	1950MHz
Noise Figure		3.8	4.8	dB	1930MHz
Device Operating Voltage		5		V	
Device Operating Current	74	84	94	mA	
Thermal Resistance		106		°C/W	(junction to lead)

Test Conditions: V_D=5.0V, I_D=84mA Typ., T_L=25°C, OIP3 Tone Spacing=1MHz, Bias Tee Data, Z_S=Z_L=50Ω, P_{OUT} per tone=0dBm

7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.

RFMD
rfmd.com

Absolute Maximum Ratings

Parameter	Rating	Unit
Device Current (I_{CE})	120	mA
Device Voltage (V_{CE})	6.5	V
RF Input Power* (See Note)	18	dBm
Junction Temp (T_J)	+150	°C
Operating Temp Range (T_L)	-40 to +85	°C
Storage Temp	+150	°C
ESD Rating - Human Body Model (HBM)	1C	Class
Moisture Sensitivity Level	1	MSL

*Note: Load condition $Z_L = 50\Omega$

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

Bias Conditions should also satisfy the following expression:
$I_D V_D < (T_J - T_L)/R_{TH}$, j-l and $T_L = T_{LEAD}$

Caution! ESD sensitive device.

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. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

RoHS status based on EUDirective2002/95/EC (at time of this document revision).

Typical RF Performance at Key Operating Frequencies (Application Circuit) 100MHz to 1000MHz App. Circuit

Parameter	Unit	100	500	850
Small Signal Gain (G)	dB	17.5	17.3	16.2
Output Third Order Intercept Point (OIP_3)	dBm	35.8	36.2	35.6
Output Power at 1dB Compression (P_{1dB})	dBm	19.4	19.7	19.3
Input Return Loss (IRL)	dB	10.0	35.0	21.0
Output Return Loss (ORL)	dB	12.0	20.0	22.0
Reverse Isolation (S_{12})	dB	21.0	21.0	21.0
Noise Figure (NF)	dB	3.1	3.3	3.4

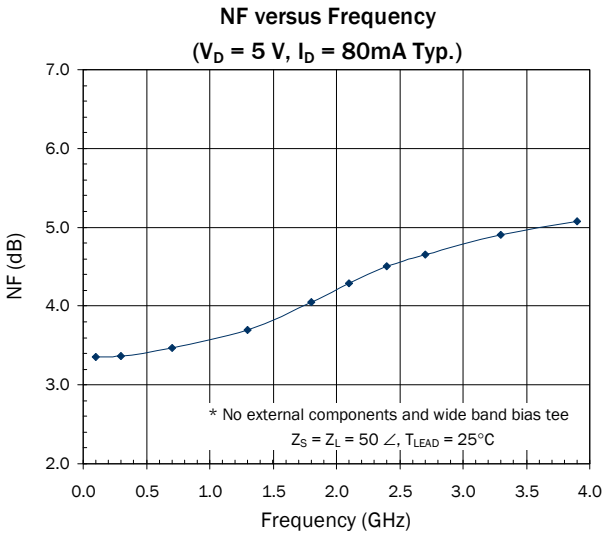
Test Conditions: $V_D = 5V$ $I_D = 80mA$ Typ. OIP_3 Tone Spacing = 1MHz, P_{OUT} per tone = 0dBm
$T_L = 25°C$ $Z_S = Z_L = 50\Omega$

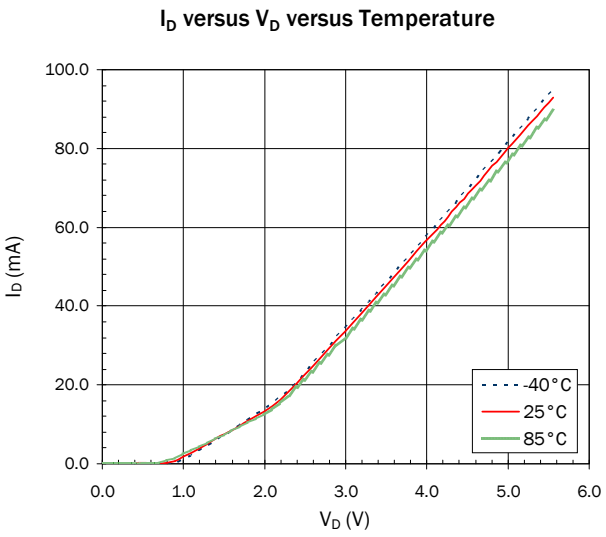
Typical RF Performance at Key Operating Frequencies (Application Circuit) 1000MHz to 2200MHz App. Circuit

Parameter	Unit	1000	1950	2200
Small Signal Gain (G)	dB	15.1	11.9	11.1
Output Third Order Intercept Point (OIP_3)	dBm	34.9	34.3	33.6
Output Power at 1dB Compression (P_{1dB})	dBm	18.9	18.3	18.0
Input Return Loss (IRL)	dB	12.0	18.0	16.0
Output Return Loss (ORL)	dB	15.0	17.0	15.0
Reverse Isolation (S_{12})	dB	21.0	19.0	18.0
Noise Figure (NF)	dB	3.5	4.2	4.3

Test Conditions: $V_D = 5V$ $I_D = 80mA$ Typ. OIP_3 Tone Spacing = 1MHz, P_{OUT} per tone = 0dBm
$T_L = 25°C$ $Z_S = Z_L = 50\Omega$

7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.

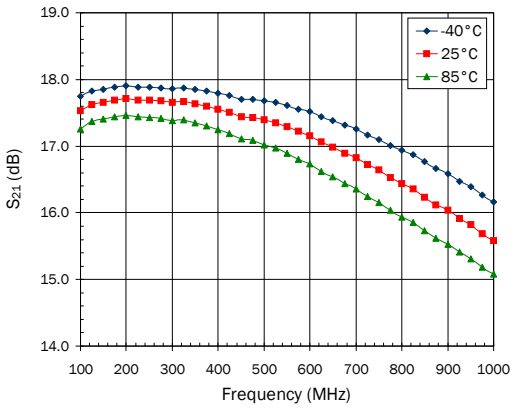




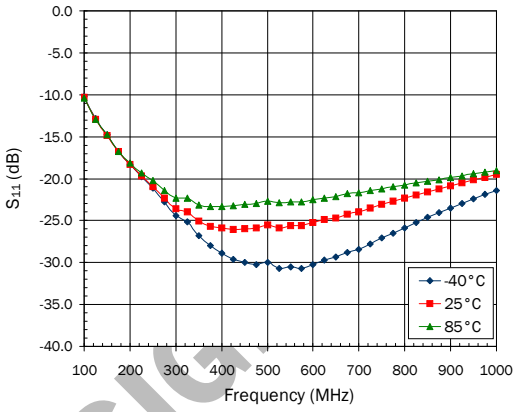
RFMD
rfmd.com

Typical RF Performance, 100MHz to 1000MHz Application Circuit (Bias: V_D=5V, I_D=80mA Typ.)

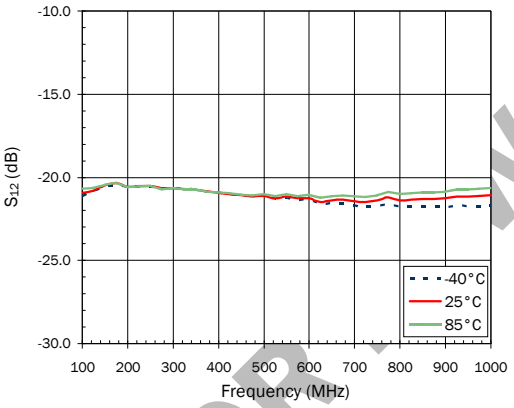
S_{21} versus Frequency



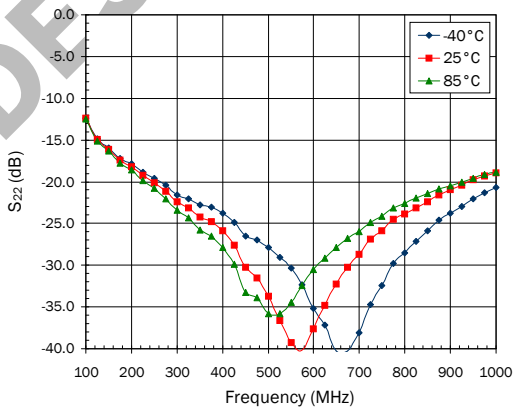
S_{11} versus Frequency



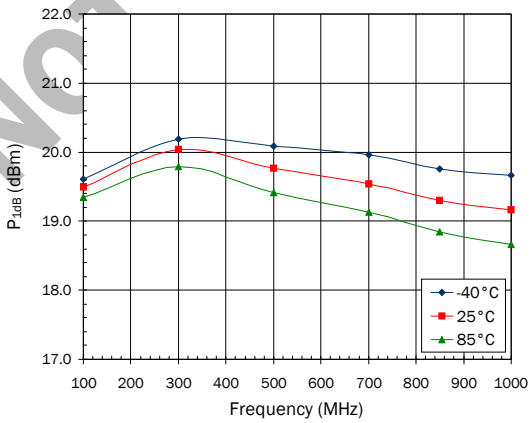
S_{12} versus Frequency



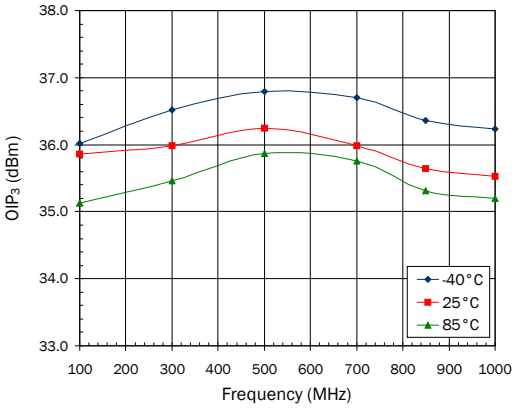
S_{22} versus Frequency



P_{1dB} versus Frequency



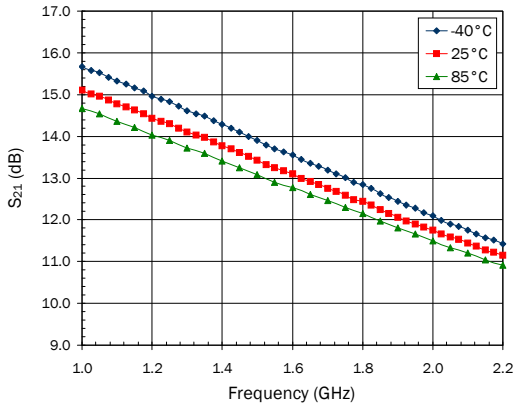
OIP_3 versus Frequency



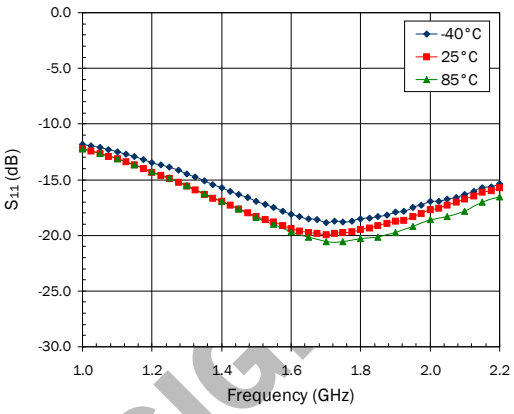
7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.

Typical RF Performance, 100MHz to 2200MHz Application Circuit (Bias: V_D=5V, I_D=80mA Typ.)

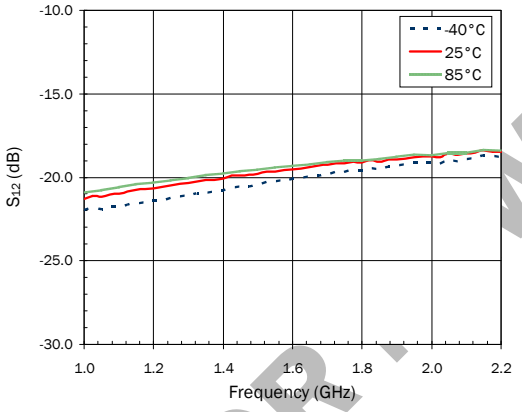
S_{21} versus Frequency



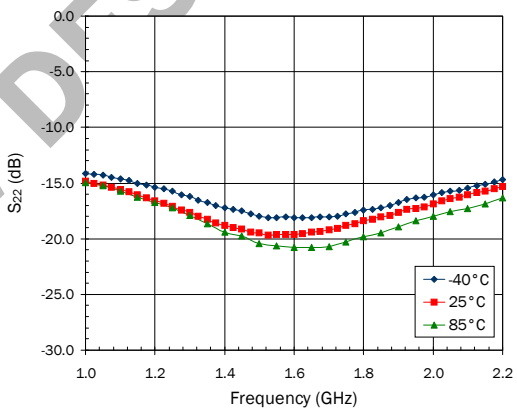
S_{11} versus Frequency



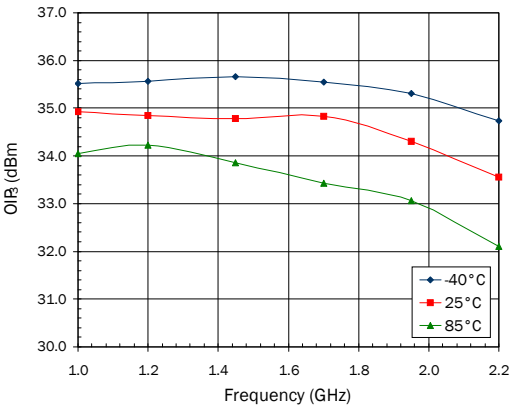
S_{12} versus Frequency



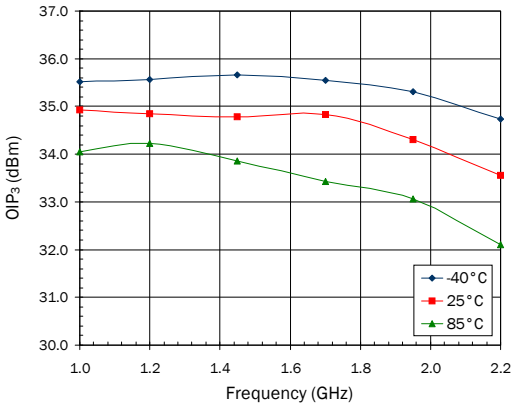
S_{22} versus Frequency



OIP_3 versus Frequency

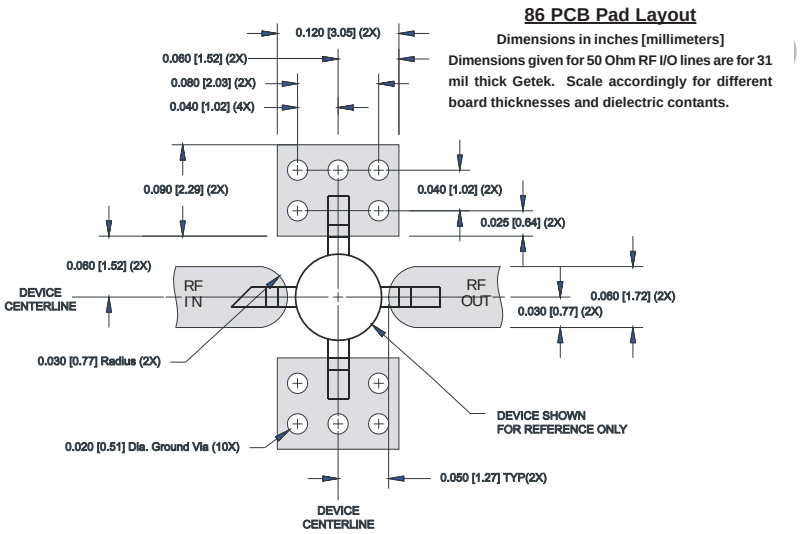


OIP_3 versus Frequency



Pin	Function	Description
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
2, 4	GND	Connection to ground. Use via holes as close to the device ground leads as possible to reduce ground inductance and achieve optimum RF performance.
3	RF OUT/DC BIAS	RF output and bias pin. This pin requires the use of as external DC blocking capacitor chosen for the frequency of operation.

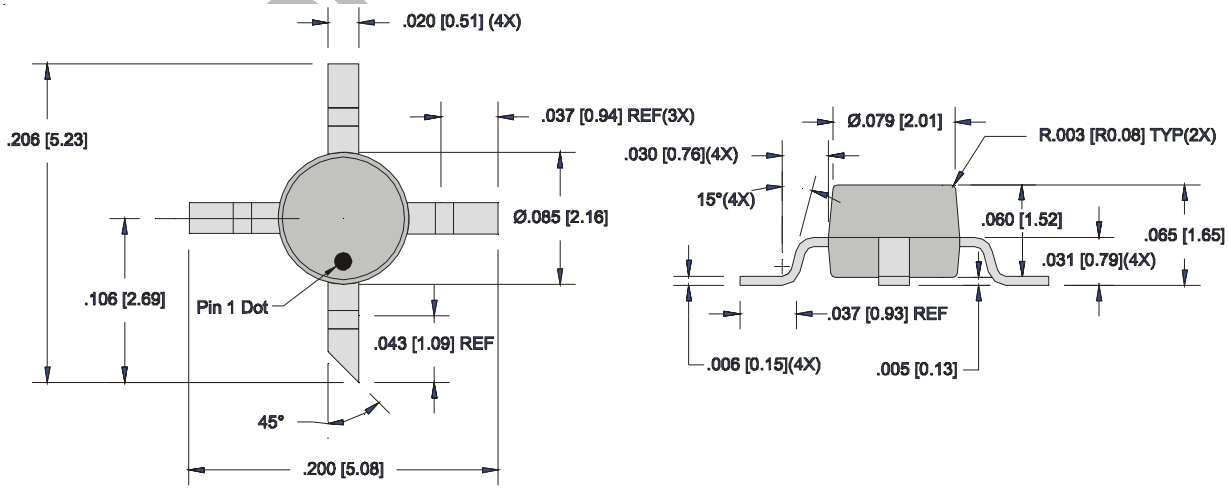
86 PCB Pad Layout



Package Drawing

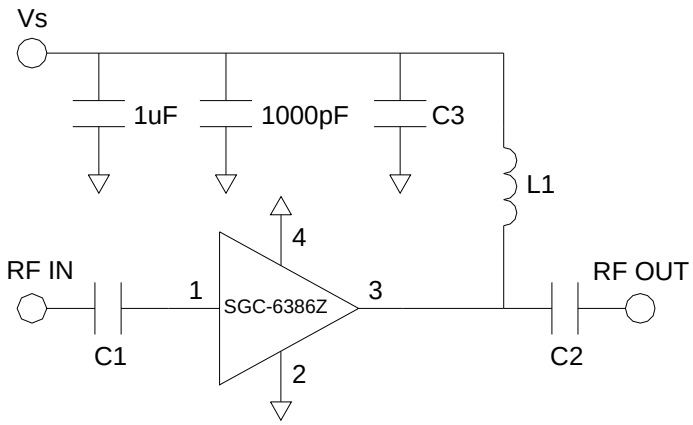
Dimensions in inches (millimeters)

Refer to drawing posted at www.rfmd.com for tolerances.



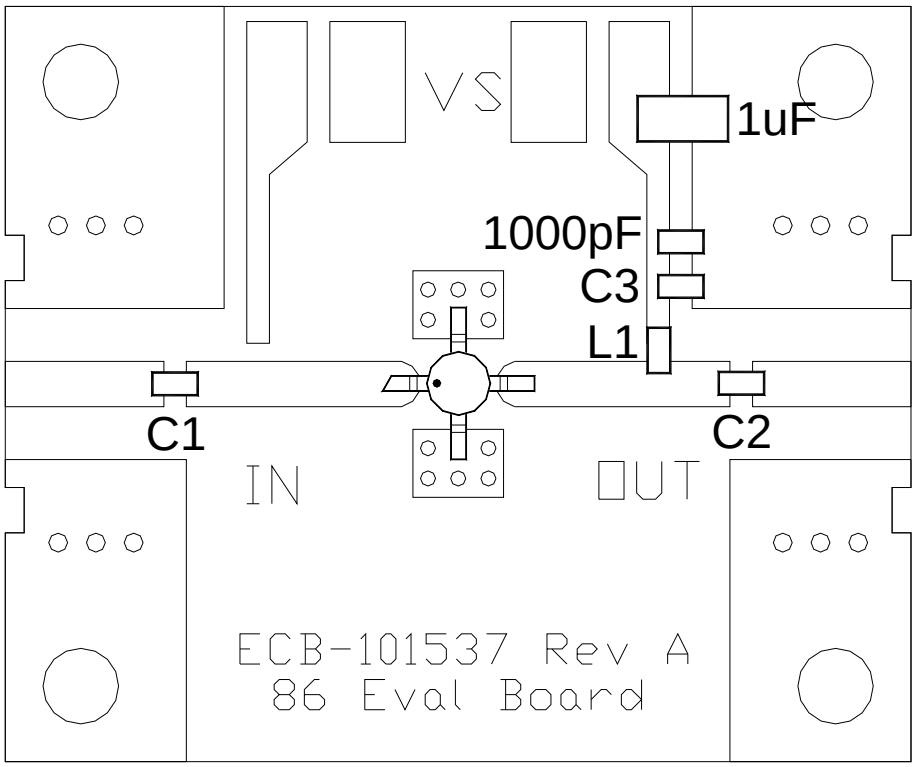
7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.

Application Schematic



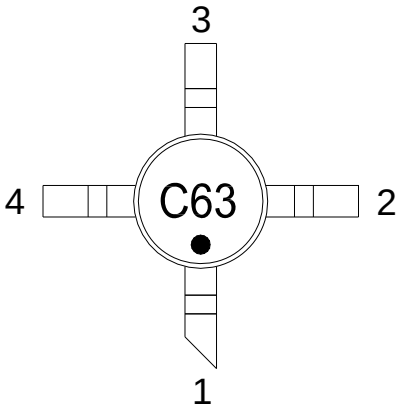
Application Circuit Element Values		
Reference Designator	100-1000MHz	1000-2200MHz
C1	1000pF	6.8pF
C2	100pF	6.8pF
C3	100pF	6.8pF
L1	100nH	39nH

Evaluation Board Layout



RFMD
rfmd.com

Part Identification



Ordering Information

Part Number	Package / Lead Composition	Reel Size	Devices / Reel
SGC-6386Z	Lead Free, RoHS Compliant	13"	3000
SGC-6386Z-EVB1	100-1000 MHz Evaluation Board	N/A	N/A
SGC-6386Z-EVB2	1000-2200 MHz Evaluation Board	N/A	N/A

7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.