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SGA-8343(Z)

LOW NOISE, HIGH GAIN SiGe HBT

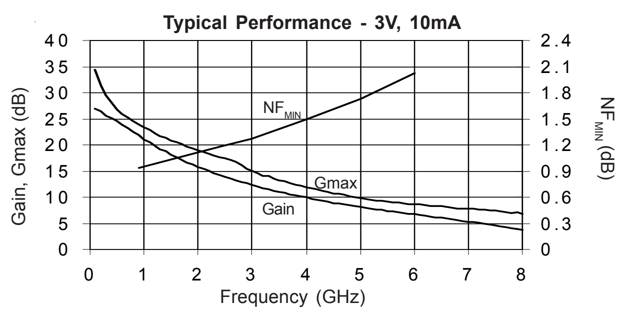
Package: SOT-343

Product Description

RFMD's SGA-8343 is a high performance Silicon Germanium Heterostructure Bipolar Transistor (SiGe HBT) designed for operation from DC to 6GHz. The SGA-8343 is optimized for 3V operation but can be biased at 2V for low-voltage battery operated systems. The device provides high gain, low NF, and excellent linearity at a low cost. It can be operated at very low bias currents in applications where high linearity is not required. The matte tin finish on the lead-free package utilizes a post annealing process to mitigate tin whisker formation and is RoHS compliant per EU Directive 2002/95. This package is also manufactured with green molding compounds that contain no antimony trioxide nor halogenated fire retardants.

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

- Available in Lead Free, RoHS Compliant, and Green Packaging (Z Part Number)
- DC to 6GHz Operation
- 0.9dB NF_{MIN} at 0.9GHz
- 24dB GMAX at 0.9GHz
- |GOPT|=0.10 at 0.9GHz
- OIP3=+28dBm, P1dB=+9dBm
- Low Cost, High Performance, Versatility

Applications

- Analog and Digital Wireless Systems
- 3G, Cellular, PCS, RFID
- Fixed Wireless, Pager Systems
- Driver Stage for Low Power Applications
- Oscillators

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Maximum Available Gain		23.9		dB	0.9GHz, $Z_S=Z_S^*$, $Z_L=Z_L^*$
		19.3		dB	1.9GHz
		17.7		dB	2.4GHz
Minimum Noise Figure		0.94		dB	0.9GHz, $Z_S=Gamma_{OPT}$, $Z_L=Z_L^*$
		1.10		dB	1.9GHz
		1.18		dB	2.4GHz
Insertion Gain	21.0	22.0	23.0	dB	0.9GHz, $Z_S=Z_L=50\Omega$ [1]
Noise Figure		1.40	1.75	dB	1.9GHz, LNA Application Circuit Board[2]
Gain	15.5	16.5	17.5	dB	1.9GHz, LNA Application Circuit Board[2]
Output Third Order Intercept Point	25.8	27.8		dBm	1.9GHz, LNA Application Circuit Board[2]
Output 1dB Compression Point	7.5	9.0		dBm	1.9GHz, LNA Application Circuit Board[2]
DC Current Gain	120	180	300		
Breakdown Voltage	5.7	6.0		V	collector - emitter
Thermal Resistance		200		°C/W	junction - lead
Operating Voltage			4.0	V	collector - emitter
Operating Current			50	mA	collector - emitter

Test Conditions$_{CE}$=3V, I_{CQ}=10mA, 25°C (unless otherwise noted), [1] 100% tested - Insertion gain tested using a 50W contact board (no matching circuitry) during final production test. [2] Sample tested - Samples pulled from each wafer/package lot. Sample test specifications are based on statistical data from sample test measurements. The test fixture is an engineering application circuit board (parts are pressed down on the board). The application circuit represents a trade-off between the optimal noise match and input return loss.

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Absolute Maximum Ratings

Parameter	Rating	Unit
Collector Current (ICE)	72	mA
Base Current (IB)	1	mA
Collector - Emitter Voltage (VCE)	5	V
Collector - Base Voltage (VCB)	12	V
Emitter - Base Voltage (VEB)	4.5	V
RF Input Power (PIN)	5	dBm
Storage Temperature Range (TSTOR)	-40 to +150	°C
Power Dissipation (PDISS)	350	mW
operating Junction Temperature (TJ)	+150	°C

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.

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 EU Directive 2002/95/EC (at time of this document revision).

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Typical Performance - Engineering Application Circuits

Freq (GHz)	VS (V)	VCE (V)	ICQ (mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3[1] (dBm)	S11 (dB)	S22 (dB)	Comments
0.90	53.0	3.0	12	1.25	18.2	9	27.3	-16	-18	series feedback
1.575	3.3	2.7	10	1.25	15.7	6.8	26.5	-10	-25	
1.90	5.0	3.0	12	1.4	16.5	9	27.8	-9	-24	
2.40	3.3	2.7	10	1.6	14.4	9	27.5	-13	-24	

[3] POUT=0dBm per tone, 1MHz tone spacing.
Refer to the application note for additional RF data, PCB layouts, BOMs, biasing instructions, and other key issue to be considered.

Peak Performance Under Optimum Matching Conditions

Freq (GHz)	VCE (V)	ICQ (mA)	NF (dB)[2]	GMAX (dB)	P1dB (dBm)[4]	OIP3 (dBm)[4]
0.90	2	10	0.90	23.7	10	25
0.90	3	10	0.94	23.9	13	29
1.90	2	10	1.05	19.1	10	25
1.90	3	10	1.10	19.3	13	29
2.40	2	10	1.15	17.4	10	25
2.40	3	10	1.18	17.7	13	29

[2] $Z_S=\Gamma_{OPT}$, $Z_L=Z_L^*$, The input matching circuit loss have been de-embedded.
[3] $Z_S=Z_{SOPT}$, $Z_L=Z_{LOPT}$, where Z_{SOPT} and Z_{LOPT} have been tuned for max P1dB (current allowed to drive-up with constant VCE).
[4] $Z_S=Z_{SOPT}$, $Z_L=Z_{LOPT}$, where Z_{SOPT} and Z_{LOPT} have been tuned for max OIP3.
Note: Optimum NF, P1dB, and OIP3 performance cannot be achieved simultaneously.

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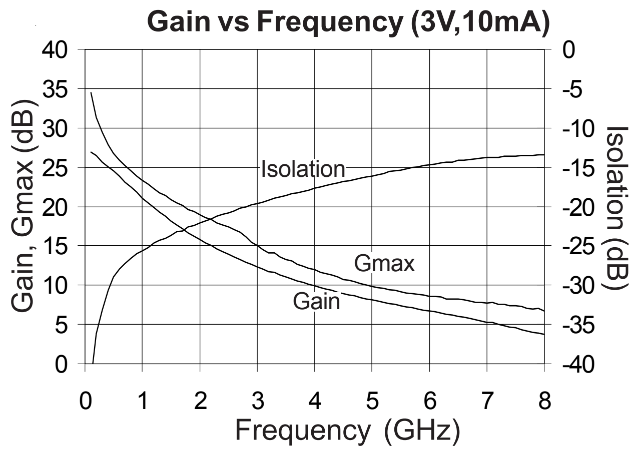
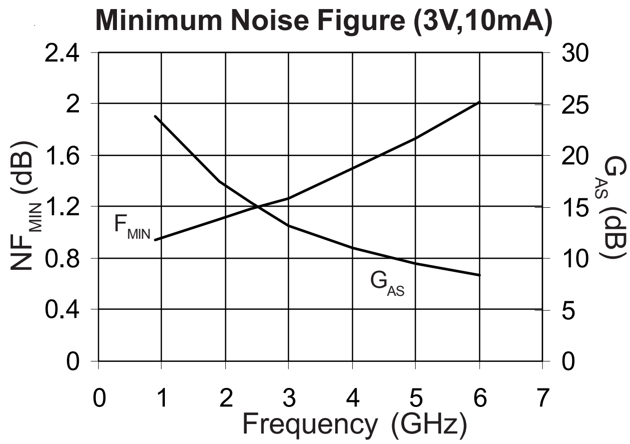
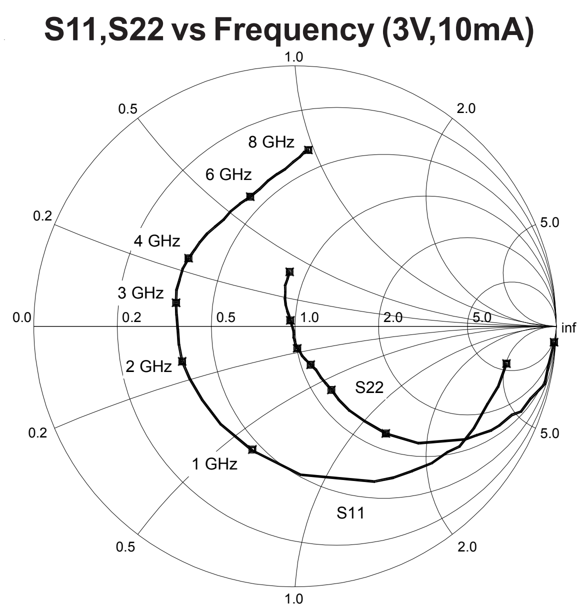
Typical Performance - De-embedded S-Parameters

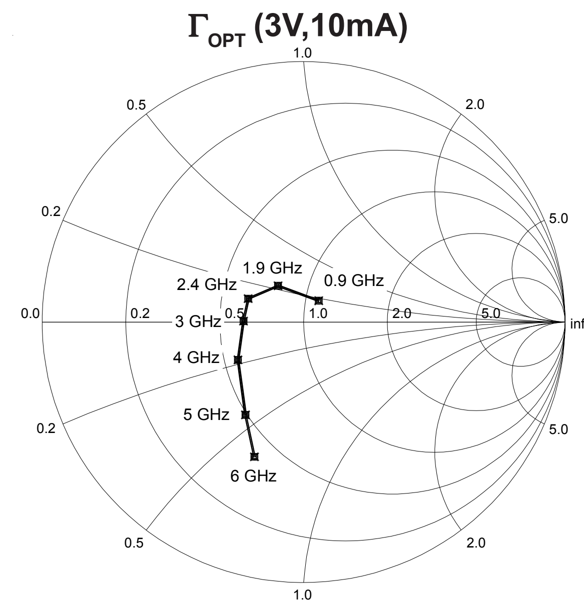




S11 versus Frequency



S22 versus Frequency



Note:

S-parameters are de-embedded to the device leads with ZS=ZL=50Ω. De-embedded S-parameters can be downloaded from our website (www.rfmd.com)

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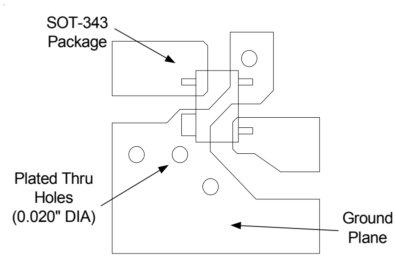
Typical Performance - Noise Parameters - 3V, 10mA

Frequency (GHz)	NFMIN (dB)[5]	Γ_{OPT} Mag<Ang	r_n (Ω)	GMAX (dB)
0.9	0.94	0.10<55	0.11	23.88
1.9	1.1	0.71<125	0.10	19.33
2.4	1.18	0.25<157	0.09	17.66
3	1.27	0.23<179	0.09	15.01
4	1.5	0.29<-150	0.12	11.94
5	1.73	0.42<-122	0.18	9.84
6	2.02	0.55<-110	0.24	8.62

[5] $Z_S=\Gamma_{OPT}$, $Z_L=Z_L^*$, NF_{MIN} is a noise parameter for which the input matching circuit losses have been de-embedded. The noise parameters were measured using a Maury Microwave Automated Tuner System. The device was mounted on a 0.010" PCB with plated-thru holes close to pins 2 and 4.

Pin	Function	Description
1	BASE	RF input/base pin.
2, 4	EMITTER	Connection to ground. Use multiple via holes to reduce emitter inductance.
3	COLLECTOR	RF output/collector bias.

Recommended PCB Layout



Use multiple plated-thru via holes located close to the package pins to ensure a good RF ground connection to a continuous groundplane on the backside of the board.

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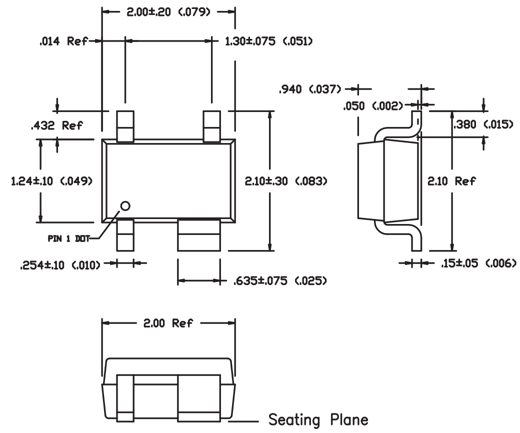
Package Drawing

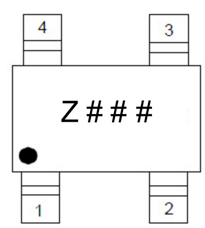
Dimensions in inches (millimeters)
Refer to drawing posted at www.rfmd.com for tolerances.



Scale (mm) 1:2

Notes:
1. Lead Base Metal - Copper Olin 194
2. Lead Finish
   Std PN - Sn/Pb Sn => 80%
   Z Option - 100% Matte Sn - .010 (.0004) min thk

Part Identification



LotXref trace code begins with “Z”.

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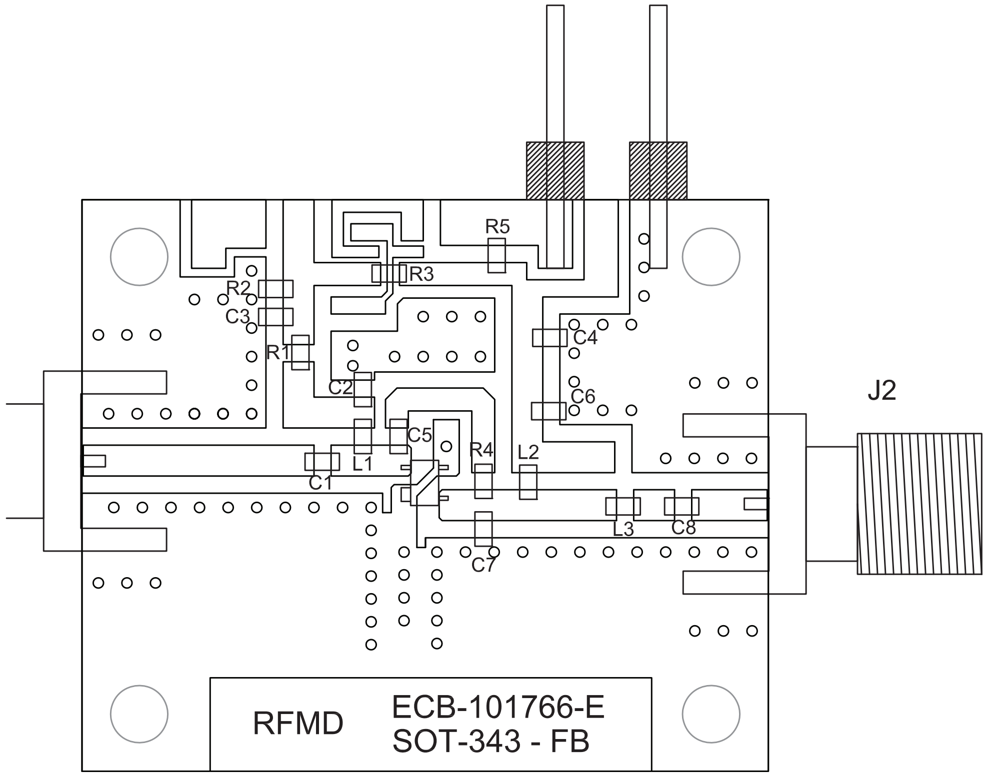
SGA-8343(Z)-EVB1 800MHz to 1000MHz Evaluation Board



Ref. Des	Part Number	Value
C1, 2, 6, 8	ROHM MCH185A390J	39pF
C7	ROHM MCH185A0R5C	0.5pF
C3, 4, 5	Samsung CL 10B104KONC	0.1uF
L1	TOKO LL 1608-FS18NJ	18nH
L2	TOKO LL 1608-FSR12J	120nH
L3	TOKO LL 1608-FS6N8J	6.8nH
R1	ROHM MCR03J5R1	5.1Ω
R2	ROHM MCR03J911	910Ω
R3, 4	ROHM MCR03J242	2.4KΩ
R5	ROHM MCR0.J161	160Ω
Z1	non-critical	50Ω
Z2	4.0 degrees at 900MHz	50Ω
Z3	11.5 degrees at 900MHz	63Ω
Z4	5.0 degrees at 900MHz	50Ω
Z5	3.6 degrees at 900MHz	50Ω
Z6	3.7 degrees at 900MHz	50Ω
Z7	7.1 degrees at 900MHz	50Ω
Z8	non-critical	50Ω

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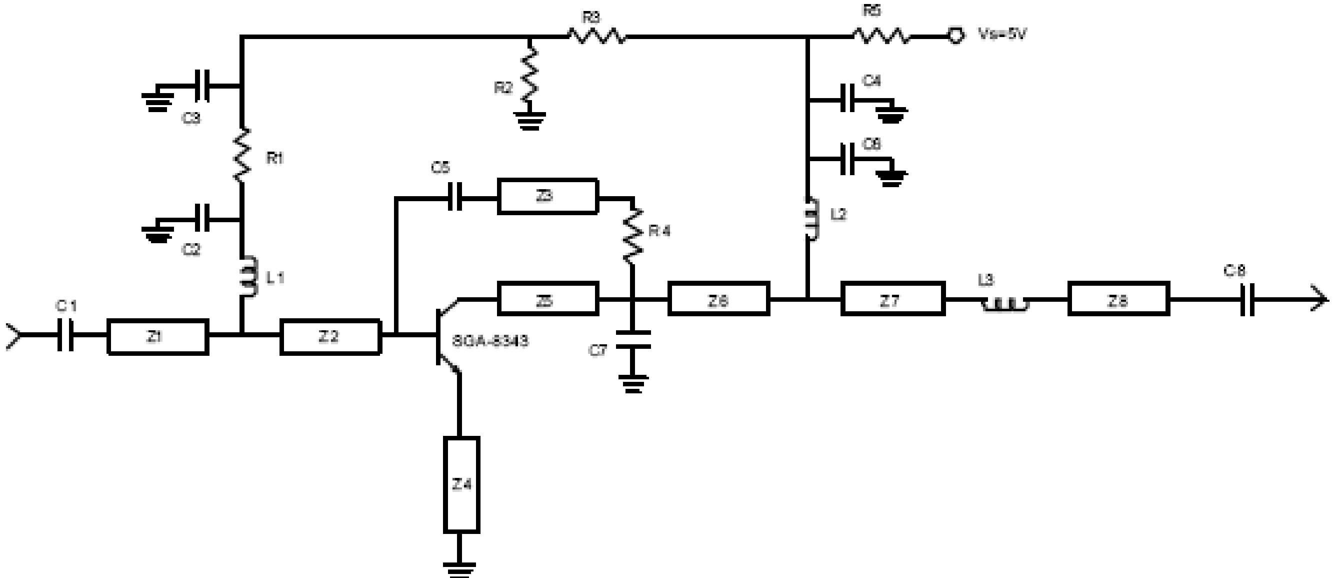
SGA-8343(Z)-EVB1 800 MHz to 1000 MHz Application Schematic



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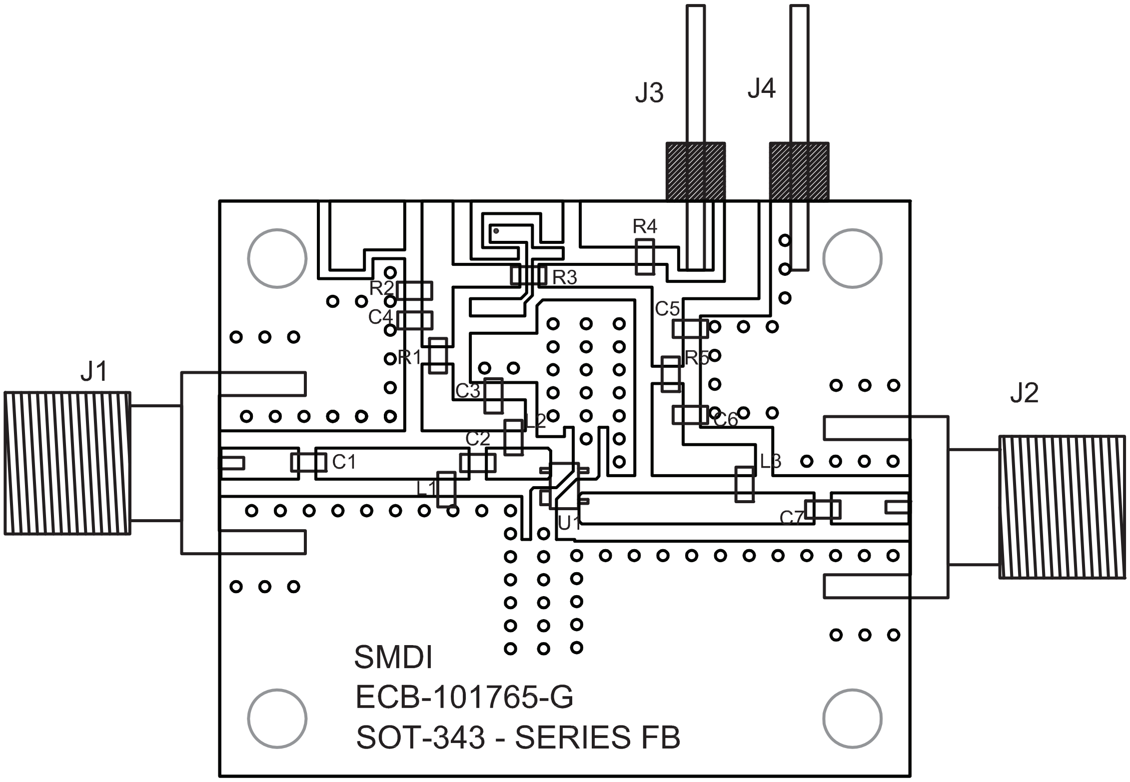
SGA-8343(Z)-EVB2 1800MHz to 2000MHz Evaluation Board



Ref. Des	Part Number	Value
C1, 7	ROHM MCH185A390J	39pF
C2	ROHM MCH185A2R2C	2.2pF
C3, 6	Samsung CL 10B104KONC	0.1uF
L1	TOKO LL 1608-FS3N9S	3.9nH
L2	TOKO LL 1608-FS18NJ	18nH
L3	TOKO LL 1608-FS3N3S	3.3nH
R1, 5	ROHM MCR03J5R1	5.1Ω
R2	ROHM MCR03J911	910Ω
R3	ROHM MCR03J242	2.4KΩ
R4	ROHM MCR0.J161	160Ω
Z1	non-critical	50Ω
Z2	3.9 degrees at 1900MHz	50Ω
Z3	4.7 degrees at 1900MHz	50Ω
Z4	6.4 degrees at 900MHz	50Ω
Z5	9.8 degrees at 1900MHz	50Ω
Z6	9.8 degrees at 1900MHz	50Ω
Z7	28.7 degrees at 1900MHz	50Ω
Z8	non-critical	50Ω

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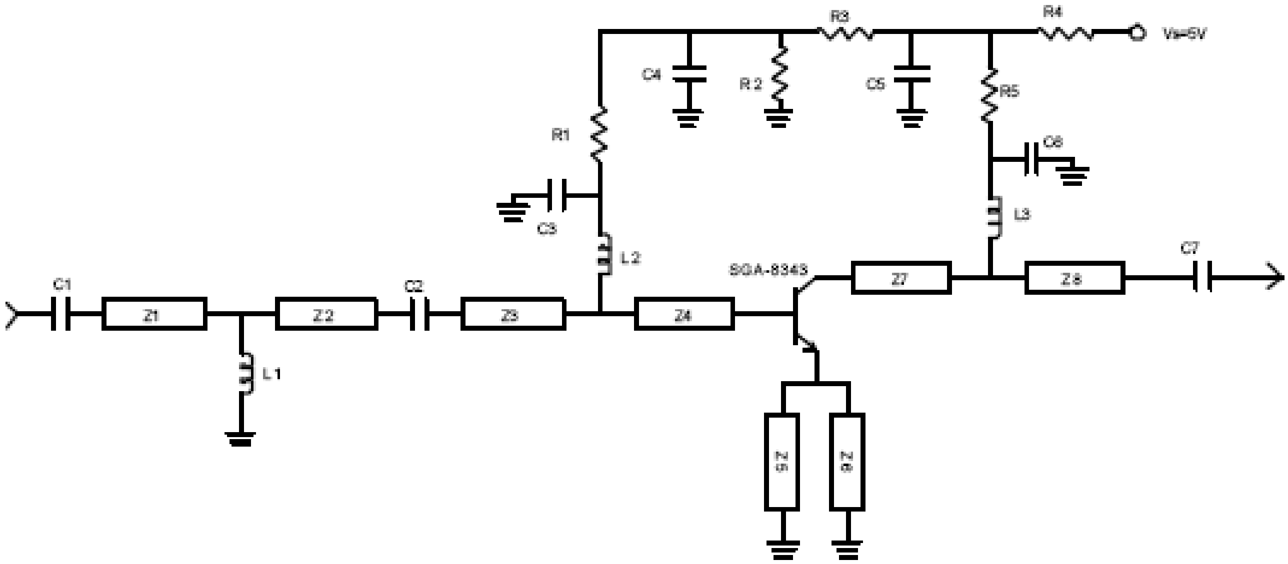
SGA-8343(Z)-EVB2 1800 MHz to 2000 MHz Application Schematic



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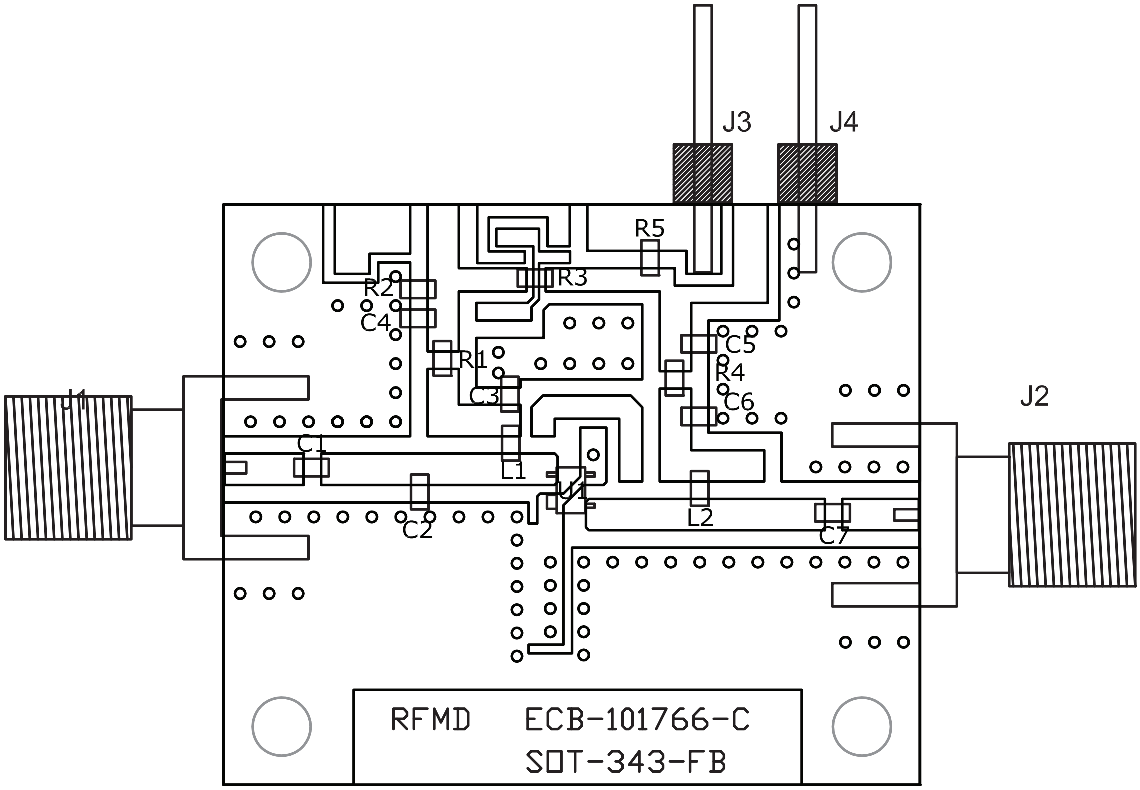
SGA-8343(Z)-EVB3 2400MHz to 2500MHz Evaluation Board



Ref. Des	Part Number	Value
C1, 3, 6, 7	ROHM MCH185A5R6D	5.6pF
C2	ROHM MCH185A010C	1.0pF
C4. 5	Samsung CL 10B104KONC	0.1uF
L1	TOKO LL 1608-FS10NJ	10nH
L2	TOKO LL 1608-FS2N7S	2.7nH
R1, 4	ROHM MCR03J100	10Ω
R2	ROHM MCR03J102	1KΩ
R3	ROHM MCR03J222	2.2KΩ
R5	ROHM MCR50J620	62Ω
Z1	non-critical	50Ω
Z2	8.2 degrees at 2440MHz	50Ω
Z3	21.7 degrees at 2440MHz	50Ω
Z4	6.2 degrees at 2440MHz	50Ω
Z5	6.2 degrees at 2440MHz	50Ω
Z6	23.8 degrees at 2440MHz	50Ω
Z7	non-critical	50Ω

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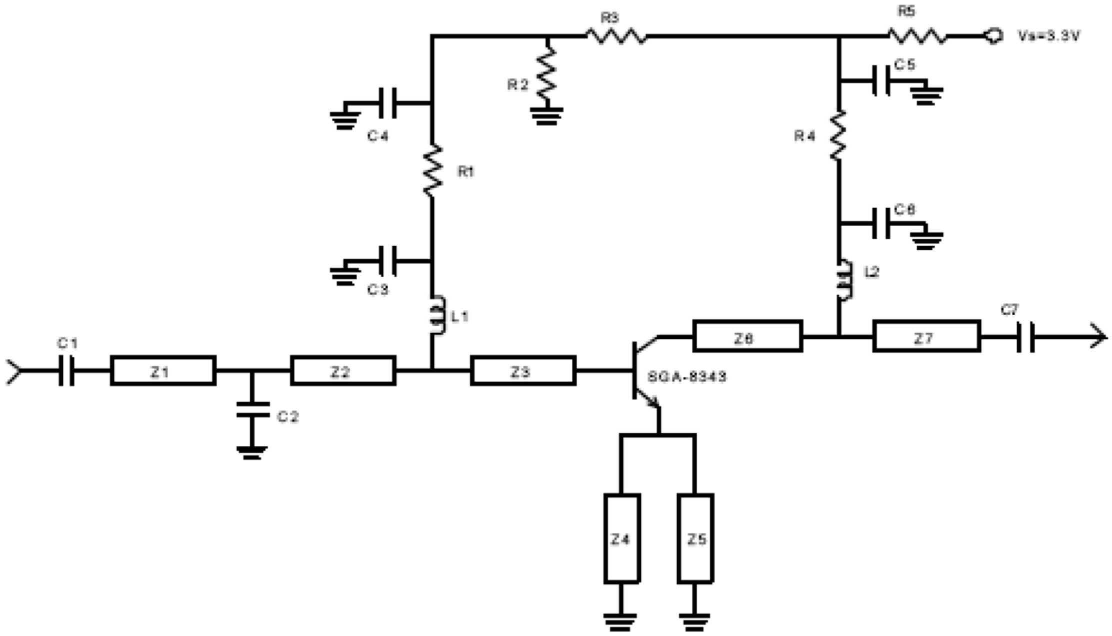
SGA-8343(Z)-EVB3 2400 MHz to 2500 MHz Application Schematic



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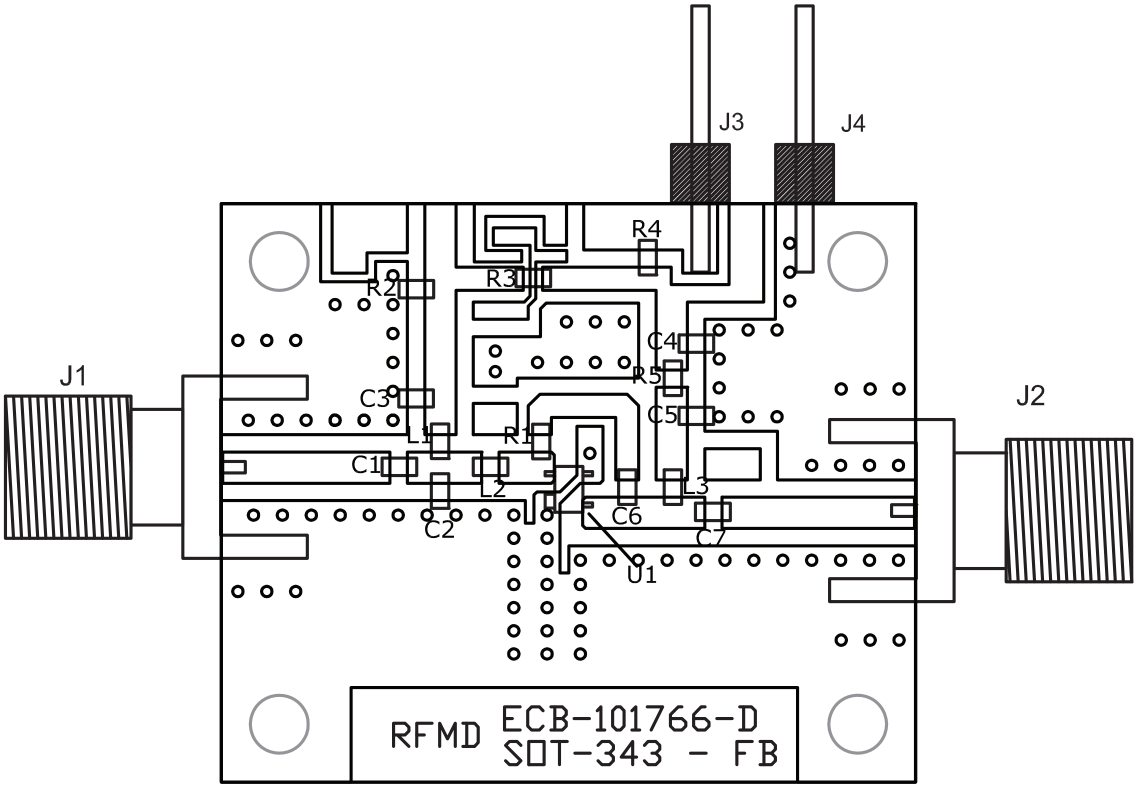
SGA-8343(Z)-EVB4 1575 MHz Evaluation Board



Ref. Des	Part Number	Value
C1, 5, 7	ROHM MCH185A150J	15 pF
C2	ROHM MCH185A1R2C	1.2 pF
C3, 4, 6	Samsung CL 10B104KONC	0.1 uF
L1	TOKO LL 1608-FS39NJ	39 nH
L2	TOKO LL 1608-FS1N8S	1.8 nH
L3	TOKO LL 1608-FS3N9S	3.9 nH
R1, 3	ROHM MCR03J222	2.2KΩ
R2	ROHM MCR03J102	1.0KΩ
R4	ROHM MCR03J620	62Ω
R5	ROHM MCR03J100	10Ω
Z1	non-critical	50Ω
Z2	6.5 degrees at 1575 MHz	50Ω
Z3	7.8 degrees at 1575 MHz	50Ω
Z4	6.4 degrees at 1575 MHz	50Ω
Z5	6.4 degrees at 1575 MHz	50Ω
Z6	non-critical	50Ω
Z7	11.1 degrees at 1575 MHz	50Ω
Z8	6.3 degrees at 1575 MHz	50Ω
Z9	26.0 degrees at 1575 MHz	60Ω

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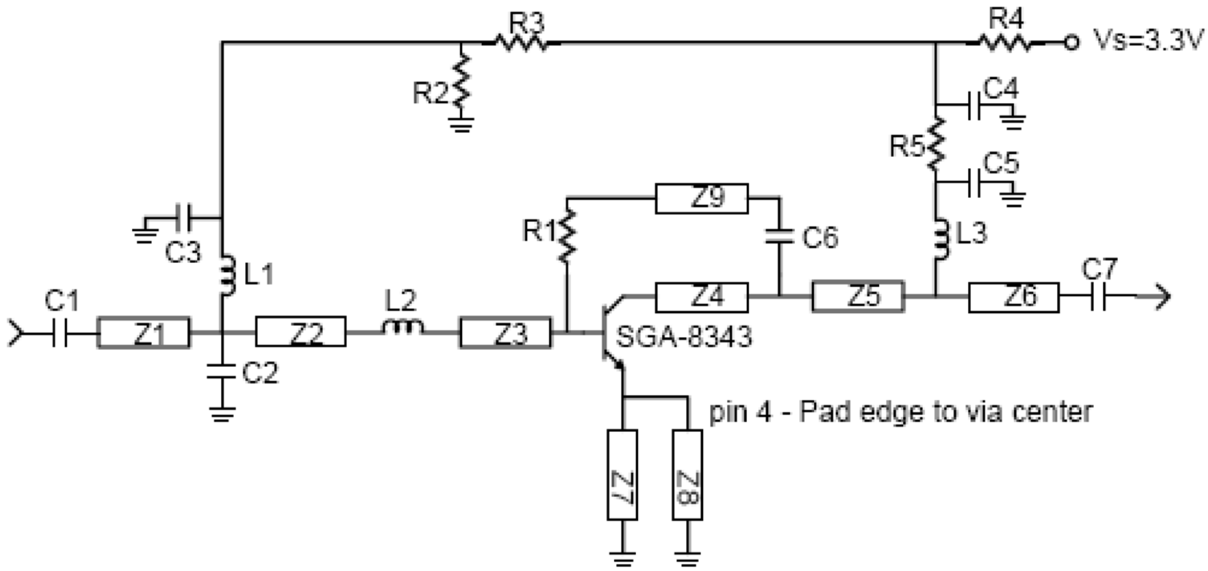
SGA-8343(Z)-EVB4 1575 MHz Application Schematic



Ordering Information

Part Number	Description	Reel Size	Devices/Reel
SGA8343Z	Lead Free RoHS Compliant	13”	3000
SGA8343ZPCK-EVB1	Fully assembled evaluation board tuned for 800 to 1000 MHz and 5 piece loose samples	N/A	N/A
SGA8343ZPCK-EVB2	Fully assembled evaluation board tuned for 1800 to 2000 MHz and 5 piece loose samples	N/A	N/A
SGA8343ZPCK-EVB3	Fully assembled evaluation board tuned for 2400 to 2500 MHz and 5 piece loose samples	N/A	N/A
SGA8343ZPCK-EVB4	Fully assembled evaluation board tuned for 1575 MHz and 5 piece loose samples	N/A	N/A

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