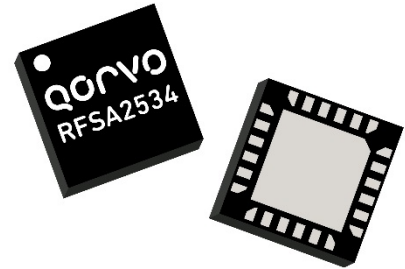


RFSA2534

50 MHz to 4000 MHz, Digital Step Attenuator

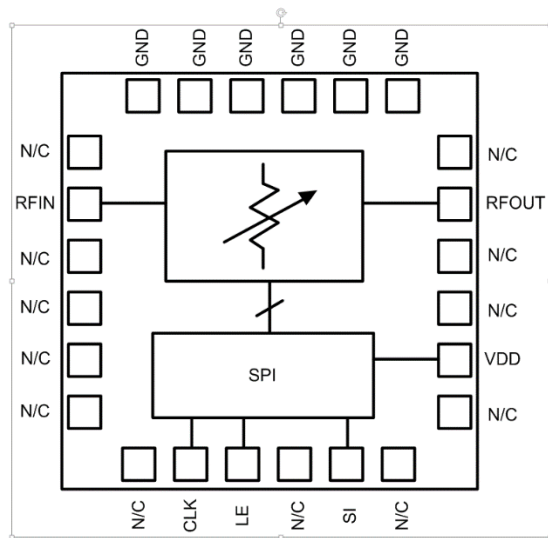
The RFSA2534 is a 5-bit digital step attenuator (DSA) that features high linearity over the entire 15.5dB gain control range with 0.5dB steps and uses a serial control interface. It has a low insertion loss of 1.3dB at 2GHz. Patented circuit architecture provides Overshoot-free transient switching performance. The RFSA2534 is available in a 4.2mm x 4.2mm laminate package that is footprint compatible with a 4mm x 4mm QFN 24 lead package.



Package: MCM, 24-pin,
4.2 mm x 4.2 mm x 0.975 mm

Features

- 5-Bit, 15.5 dB, 0.5 dB Step
- Patented Circuit Architecture
- Overshoot-free Transient Switching Performance
- Frequency Range 50 MHz to 4000 MHz
- High Linearity, IIP3 = +52 dBm
- Serial Control Interface
- Fast Switching Speed, 200 ns Typical
- Single Supply 3 V to 5 V Operation



Functional Block Diagram

Applications

- 2G through 4G Base Stations
- Point-to-Point
- Wi-Fi
- Test Equipment

Ordering Information

RFSA2534SQ	Sample bag with 25 pieces
RFSA2534SR	7" Reel with 100 pieces
RFSA2534TR13	13" Reel with 2500 pieces
RFSA2534PCK-410	50 MHz to 4000 MHz PCBA w/ 5-piece sample bag

RFSA2534

Absolute Maximum Ratings

Parameter	Rating	Units
Supply Voltage (V_{DD})	-0.5 to +6.0	V
All Other DC and Logic Pins (When V_{DD} Is Applied Prior to Any Other Pin Voltages)	-0.5 to +6.0	V
Maximum Input Power at RFIN Pins	+30	dBm
Maximum Input Power at RFOUT Pins	+27	dBm
Storage Temperature Range	-40 to +150	°C
ESD Rating - Human Body Model (HBM)	1000	V
Moisture Sensitivity Level	MSL3	



Caution! ESD sensitive device.



RFMD Green: RoHS status based on EU Directive 2011/65/EU (at time of this document revision), halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

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.

Recommended Operating Condition

Parameter	Specification			Units
	Min	Typ	Max	
Operating Temperature Range (Derate RF Input Power Handling Above 85 °C)	-40		+105	°C
Operating Junction Temperature			+125	°C
Supply Voltage ¹	+2.7		+5.5	V

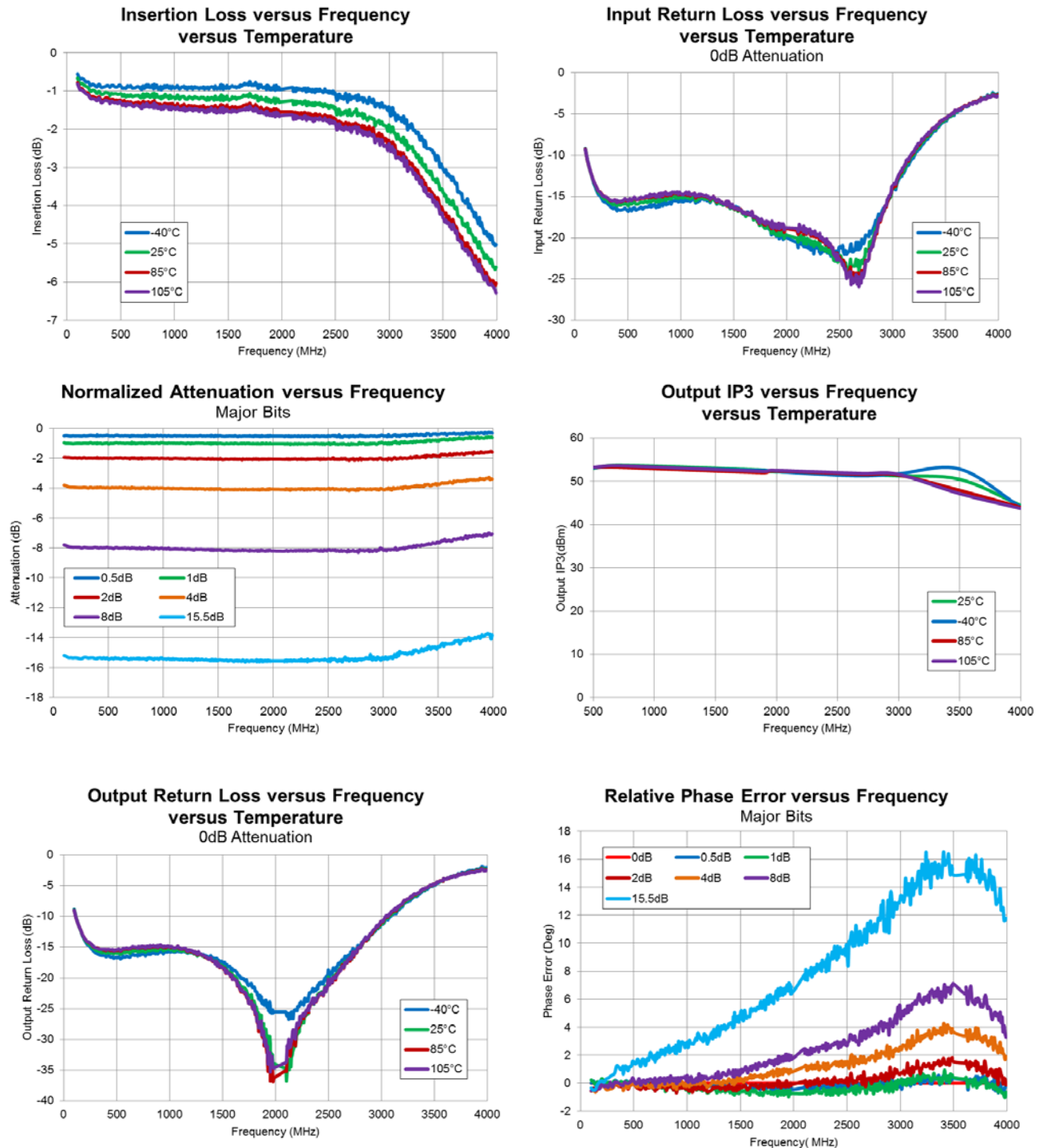
Note 1: Device performance is constant over this range, LDO on chip

Electrical Specifications

Parameter	Specification			Units	Condition
	Min	Typ	Max		
General Performance					
Supply Current		230		μA	Steady state operation, current draw during attenuation state transitions is higher
Thermal Resistance		78		°C/W	At maximum attenuation state with RF power applied to the ATTIN pin
RF Input Power at RFIN Pin			+27	dBm	Continuous operation at +85 °C case temperature
RF Performance					
Frequency Range	50		4000	MHz	
Insertion Loss		1.3		dB	2000 MHz, 0 dB attenuation
Attenuation Range		15.5		dB	0.5 dB step size
Absolute Attenuation Error	0.2 ± 4%			dB	
Input IP3		+52		dBm	
Input P0.1dB		+30		dBm	
Return Loss		15		dB	50MHz to 4000MHz, RFin and RFout pins, all attenuation states
Return Loss		18		dB	700MHz to 2300MHz, RFin and RFout pins, all attenuation states
Return Loss		22		dB	2300MHz to 2700MHz, RFin and RFout pins, all attenuation states
Input and Output Impedance		2		Ω	
Switching Speed		200		nsec	50% control to 10% / 90% RF
Successive Step Phase Delta		3		Deg	2000MHz
Control					
Digital Logic Low			+0.08	V	
Digital Logic High	+2.0			V	

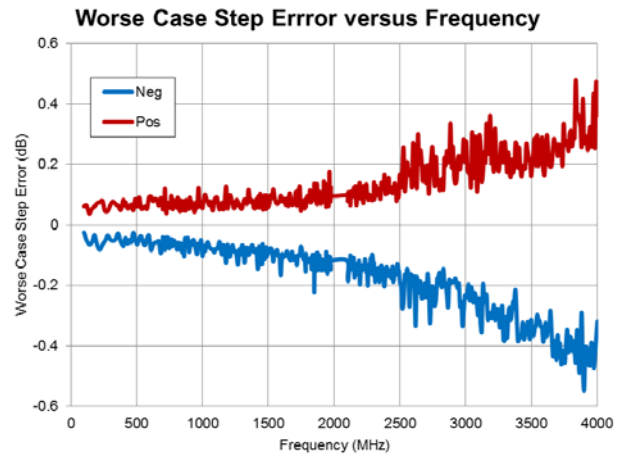
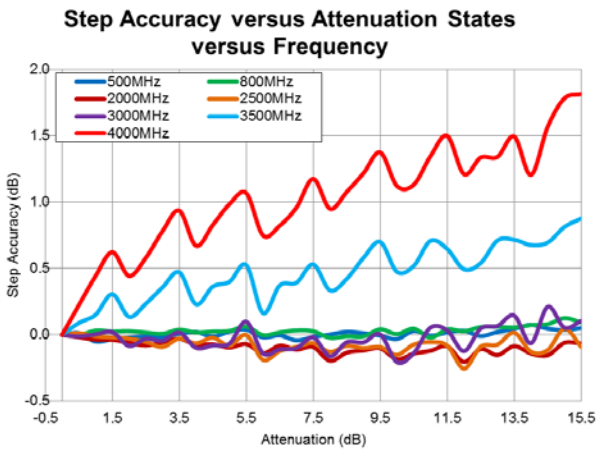
RFSA2534

RF Performance Plots: T = 25°C, V_{DD} = 5V unless otherwise noted



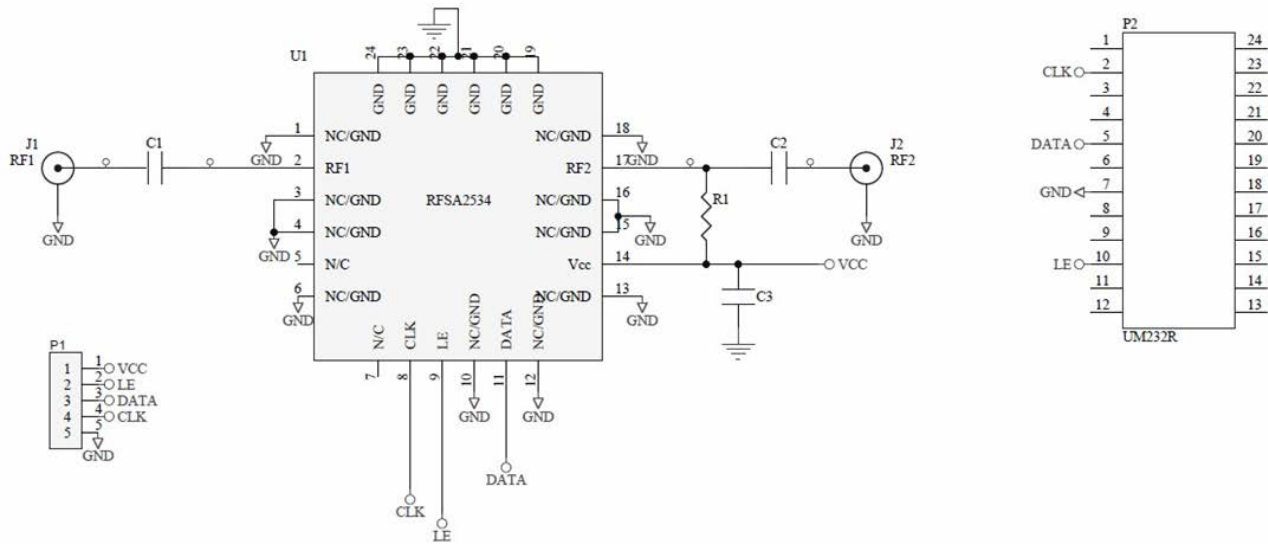
RFSA2534

RF Performance Plots: $T = 25^{\circ}\text{C}$, $V_{DD} = 5\text{V}$ unless otherwise noted



RFSA2534

Evaluation Board Schematic - 50MHz to 4000MHz Application Circuit



Evaluation Board Bill of Materials (BOM)

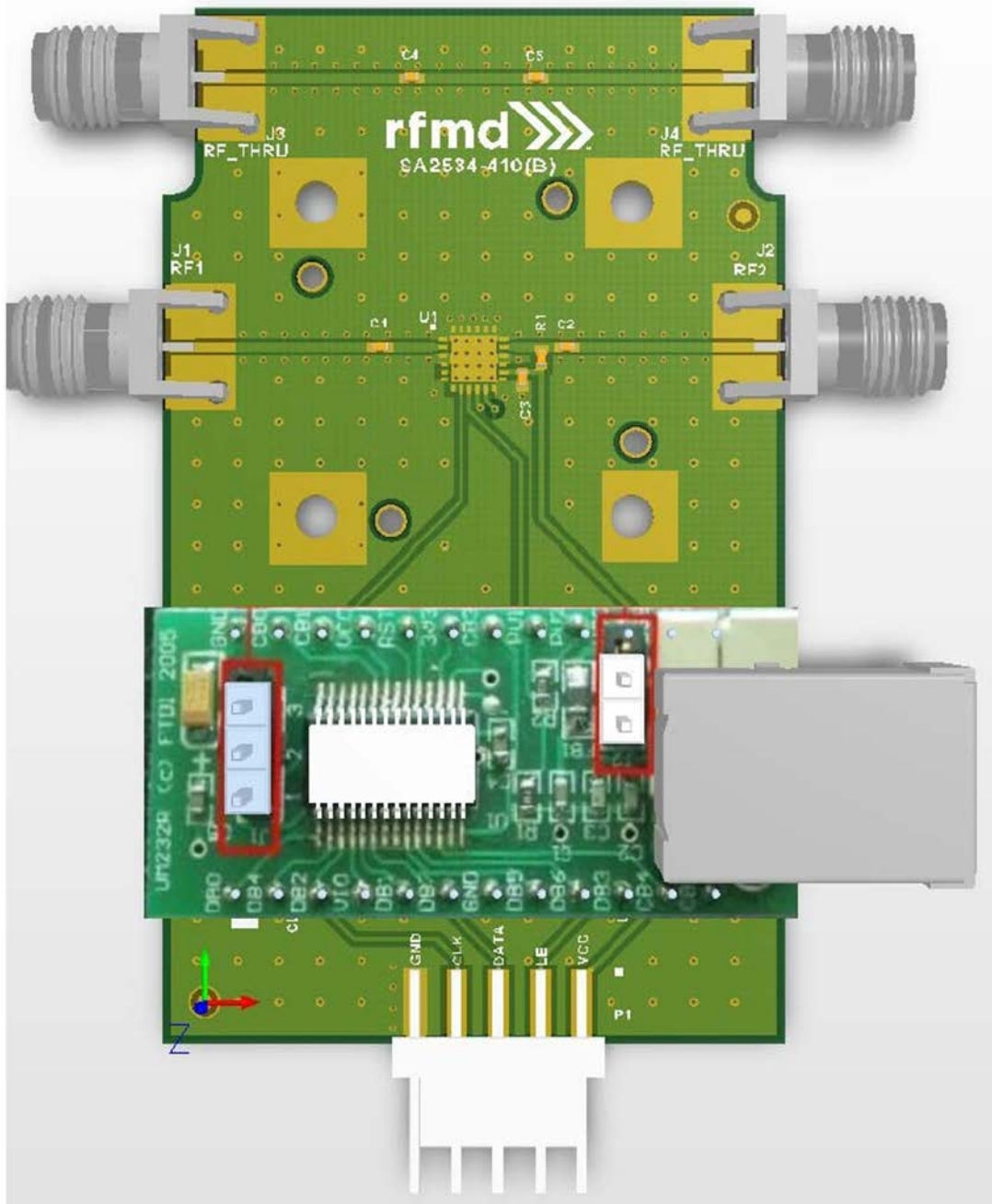
Description	Reference Designator	Manufacturer	Manufacturer's P/N
Evaluation Board		Performance Micro International Pt	RFSA2534-410(B)
RFSA2534 Module	U1	RFMD	RFSA2534
CAP, 100pF, 5%, 50V, C0G, 0402	C1-C2	Taiyo Yuden (USA), Inc.	RM UMK105 CG101JV-F
CAP, 10000pF, 10%, 16V, X7R, 0402	C3	Taiyo Yuden (USA), Inc.	RM EMK105 BJ103KV-F
CONN, SMA, END LNCH, UNIV, HYB MNT, FLT	J1-J2	Heilind Electronics	142-0751-841
CONN, HDR, ST, PLRZD, 5-PIN, 0.100"	P1	AMP	640454-5
CONN, SKT, 24-PIN DIP, 0.600", T/H	P2	Aries Electronics Inc.	24-6518-10

Notes:

1. M1 should be mounted into P2 with respect to the Pin 1 alignment of M1 and P2.

RFSA2534

Evaluation Board Assembly Drawing - 50MHz to 4000MHz Application Circuit



RFSA2534

Evaluation Board Programming Using USB Interface

Serial Mode

Refer to the Control Bit Generator (CBG) Software Reference Manual within the CBG download for detailed instructions on how to setup the software for use. Apply the supply voltage to P1. Select RFSA2534 from the RFMD/Qorvo Parts List of the CBG user interface. Set the attenuation value using the CBG user interface. The attenuator is set to the desired state and measurements can be taken.

Evaluation Board Programming Using External Bus

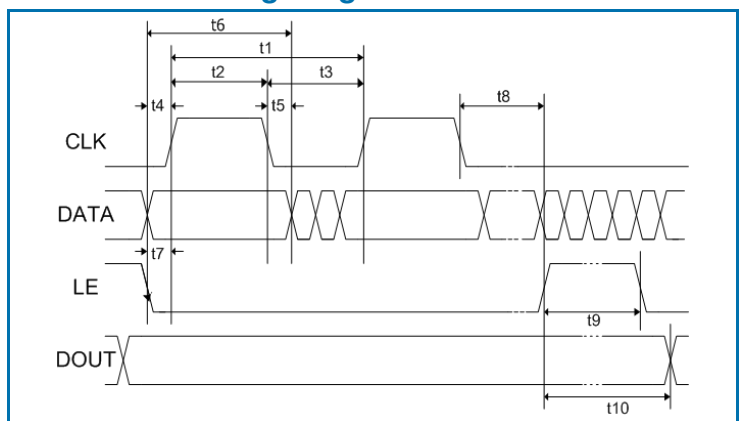
Serial Mode

This configuration allows the user to control the attenuator through the P1 connector using an external harness. Remove the USB interface board if it is currently installed on the evaluation board. Connect a user-supplied harness to the P1 connector. Send the appropriate signals onto the serial bus lines in accordance with the Serial Mode Timing Diagram. The attenuator is set to the desired state and measurements can be taken.

Serial Bus Timing Specifications

Parameter	Limit	Units	Comment
t1	25	MHz max	CLK Frequency
t2	20	ns min	CLK High
t3	20	ns min	CLK Low
t4	5	ns min	DATA to CLK Setup Time
t5	5	ns min	DATA to CLK Hold Time
t6	30	ns min	DATA Valid
t7	5	ns min	LE to CLK Setup Time
t8	5	ns min	CLK to LE Setup Time
t9	10	ns min	LE Pulse Width
t10	20	ns max	Output Set

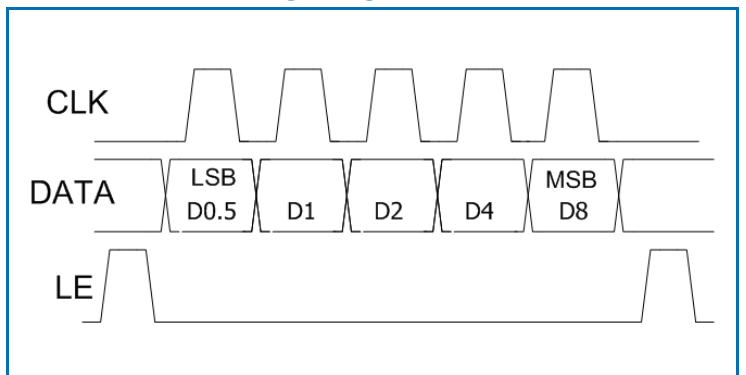
Serial Bus Timing Diagram



Serial Mode Attenuation Word Truth Table

Attenuation Word					Attenuation State (dB)
D0.5	D1	D2	D4	D8	
H	H	H	H	H	0dB / Reference Insertion Loss
L	H	H	H	H	0.5 dB
H	L	H	H	H	1 dB
H	H	L	H	H	2 dB
H	H	H	L	H	4 dB
H	H	H	H	L	8 dB
L	L	L	L	L	15.5 dB

Serial Mode Timing Diagram



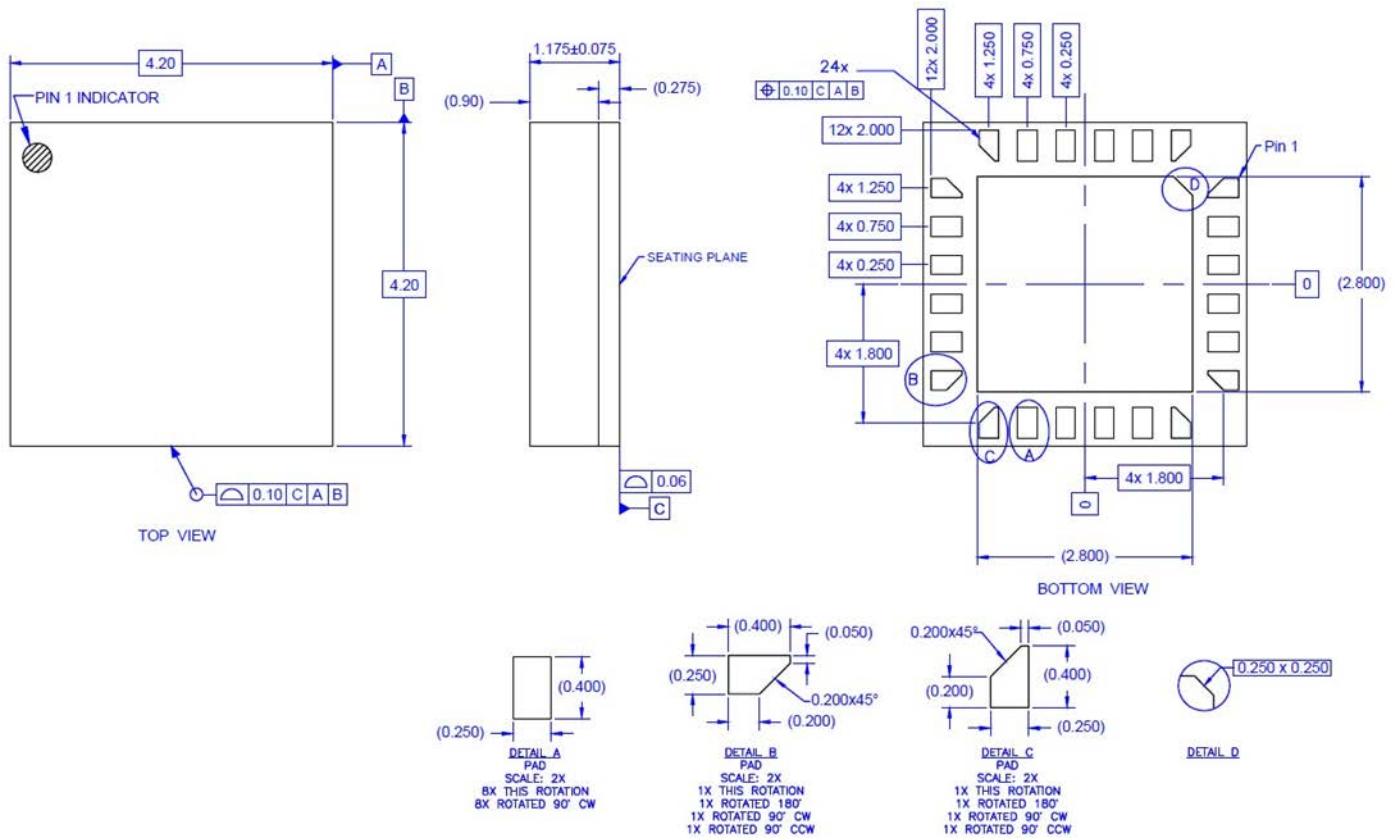
RFSA2534

Pin Names and Descriptions

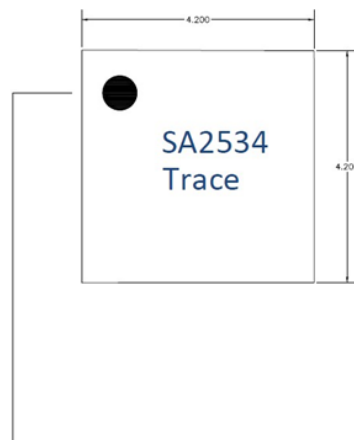
Pin	Name	Description
1	NC	No Internal Connection
2	RF IN	RF Input: Incident RF power must enter this pin for rated thermal performance and reliability. Do not apply DC power to this pin. Pin may be DC grounded externally and is grounded thru resistors internal to the part.
3	NC	No Internal Connection
4	NC	No Internal Connection
5	NC	No Internal Connection
6	NC	No Internal Connection
7	NC	No Internal Connection
8	CLK	Serial Clock Input
9	LE	Latch Enable: The leading edge of signal on LE causes the attenuator to change state
10	NC	No Internal Connection
11	SI	Serial Data Input
12	NC	No Internal Connection
13	NC	No Internal Connection
14	VDD	Supply Voltage for DSA and Logic Circuitry
15	NC	No Internal Connection
16	NC	No Internal Connection
17	RF OUT	RF Output: Incident RF power must enter this pin for rated thermal performance and reliability. Do not apply DC power to this pin. Pin may be DC grounded externally and is grounded thru resistors internal to the part.
18	NC	No Internal Connection
19	GND	Ground this pin on the PCB
20	GND	Ground this pin on the PCB
21	GND	Ground this pin on the PCB
22	GND	Ground this pin on the PCB
23	GND	Ground this pin on the PCB
24	GND	Ground this pin on the PCB

RFSA2534

Package Outline (Dimensions in Millimeters)



Branding Diagram (Dimensions in Millimeters)



Pin 1 Indicator

Trace Code to be assigned by SubCon

RFSA2534

Contact Information

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

Web: www.rfmd.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

For information about the merger of RFMD and TriQuint as Qorvo:

Web: www.qorvo.com

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