RFSW1012

BROADBAND SPDT SWITCH

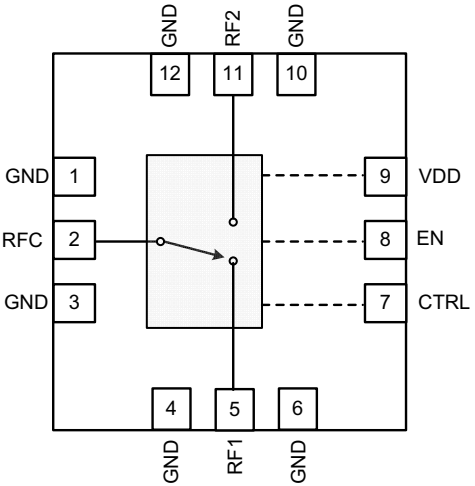
Package: QFN, 12-Pin, 2mm x 2mm x 0.55mm

Features

- 5MHz to 6000MHz Operation
- 50Ω or 75Ω Applications
- Low Insertion Loss: 0.30dB at 1980MHz
- High Isolation: 37dB at 2GHz
- High IP3: >75dBm at 2GHz
- Compatible with Low Voltage Logic (V_{HIGH} Minimum = 1.3V)
- No External DC Blocking Capacitors Required on RF Paths Unless DC is Applied Externally
- 2000V HBM ESD Rating on All Ports
- CTB/CSO: >100dBc (41dBmV/ch., 137 Channels)

Applications

- Cellular BTS
- CATV, SATV Applications
- Post PA Switching
- General Purpose Switching Applications



Functional Block Diagram

Product Description

The RFSW1012 is a single-pole double-throw (SPDT) switch designed for applications requiring very low insertion loss and high power handling capability. The excellent linearity performance of the RFSW1012 makes it ideal for use in Cellular BTS applications. This switch is ideally suited for use in CATV and SATV applications. The RFSW1012 is packaged in a compact 2mm x 2mm x 0.55mm, 12-pin, QFN package.

Ordering Information

RFSW1012SQ	25-Piece sample bag
RFSW1012SR	7" Sample reel with 100 pieces
RFSW1012TR7	7" Reel with 2500 pieces
RFSW1012PCK-411	50Ω PCBA with 5-piece sample bag
RFSW1012PCK-410	75Ω PCBA with 5-piece sample bag

Optimum Technology Matching® Applied

☐ GaAs HBT	☐ SiGe BiCMOS	☐ GaAs pHEMT	☐ GaN HEMT
☐ GaAs MESFET	☐ Si BiCMOS	☑ Si CMOS	☐ BiFET HBT
☐ InGaP HBT	☐ SiGe HBT	☐ Si BJT	☐ SOI

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Absolute Maximum Ratings

Parameter	Rating	Unit
Maximum V_{DD}	6.0	V
Maximum EN	3.0	V
Maximum CTRL	3.0	V
Hot-Switching Max Input Power (50Ω load)	20	dBm
Max Input Power	31dBm: 5MHz to 25MHz, 50Ω load 34dBm: 25MHz to 500MHz, 50Ω load 37dBm: >500MHz, 50Ω load 36dBm: >500MHz, 6:1 VSWR	dBm
Operating Temperature (T_{CASE})	-40 to +85	°C
Storage Temperature	-40 to +150	°C
ESD Rating (HBM)	Class 2	
Moisture Sensitivity Level	MSL-2	

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 2011/65/EU (at time of this document revision).

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RFMD Green: RoHS compliant per EU Directive 2011/65/EU, halogen free per IEC 61249-2-21, < 1000 ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
50Ω Performance Using SW1012-411(A) EVB					Nominal Test Conditions Unless Otherwise Stated: V_{DD} = 3V, T = 25 °C, All RF ports terminated in 50Ω
Operational Frequency Range	5		6000	MHz	
Insertion Loss (RFC to RF1/RF2)		0.25	0.40	dB	915MHz
		0.30	0.45	dB	1980MHz
		0.40		dB	2650MHz
		0.75		dB	5850MHz
Isolation (RFC to RF1/RF2)	38	45		dB	915MHz
	33	37		dB	1980MHz
	29	33		dB	2650MHz
		21		dB	5850MHz
Isolation (RF1 to RF2)	37	42		dB	915MHz
	31	35		dB	1980MHz
	28	32		dB	2650MHz
		21		dB	5850MHz
Return Loss (On-State)		>15		dB	5MHz to 6GHz
Input IP3		75		dBm	2.2GHz, 24dBm per tone, 1MHz spacing
Input IP2		129		dBm	Tone 1: 836.5MHz at +26dBm; Tone 2: 1718MHz at -20dBm; Rx Freq: 881.5MHz
		129		dBm	Tone 1: 1880MHz at +26dBm; Tone 2: 3840MHz at -20dBm; Rx Freq: 1960MHz
Spurious Output		<-105		dBm	Freq >5MHz, all ports terminated, no RF Inputs
		<-100		dBm	Freq <5MHz, all ports terminated, no RF Inputs
900MHz Second Harmonic		-95	-75	dBc	P_{IN} = 35dBm
900MHz Third Harmonic		-90	-75	dBc	
1800MHz Second Harmonic		-95	-75	dBc	P_{IN} = 33dBm
1800MHz Third Harmonic		-90	-75	dBc	
Max Operational Input Power			30	dBm	5MHz to 25MHz, 50Ω load
			33	dBm	25MHz to 500MHz, 50Ω load
			36	dBm	>500MHz, 50Ω load

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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
75Ω Performance Using SW1012-410(A) EVB					Nominal Test Conditions Unless Otherwise Stated: V_{DD} = 3V, T = 25°C, All RF ports terminated in 75Ω
Operational Frequency Range	5		2500	MHz	
Insertion Loss (RFC to RF1/RF2)		0.15		dB	5MHz
		0.20		dB	200MHz
		0.30	0.45	dB	915MHz
		0.35	0.50	dB	1980MHz
		0.40			2200MHz
Isolation (RFC to RF1/RF2)		70		dB	5MHz
		50		dB	200MHz
		36		dB	915MHz
		28		dB	1980MHz
		26		dB	2200MHz
Isolation (RF1 to RF2)		>70		dB	5MHz
		>70		dB	200MHz
		48		dB	915MHz
		34		dB	1980MHz
		32		dB	2200MHz
Return Loss (On-State)		>15		dB	Freq <1200MHz
		>13		dB	1200MHz < Freq < 2500MHz
CSO		>100		dBc	41dBmV/ch, 137 channels)
CTB		>100		dBc	
XMOD		>90		dBc	
Max Operational Input Power			30	dBm	5MHz to 25MHz, 75Ω load
			33	dBm	25MHz to 500MHz, 75Ω load
			36	dBm	>500MHz, 75Ω load
Power Supply					
Device Voltage, V_{DD}	2.7	3	4.6	V	
Leakage Current, I_{DD}		100	200	µA	EN = High
		14	20	µA	EN = Low
Control Voltage (EN, CTRL)	1.3	1.8	2.7	V	
		0	0.45	V	
Control Current		2.5	5	µA	CTRL = High, EN = High
		1	3	µA	CTRL = Low, EN = High
Switching Speed (T_{ON}, T_{OFF})		2	5	µs	50% Control to 10/90% RF

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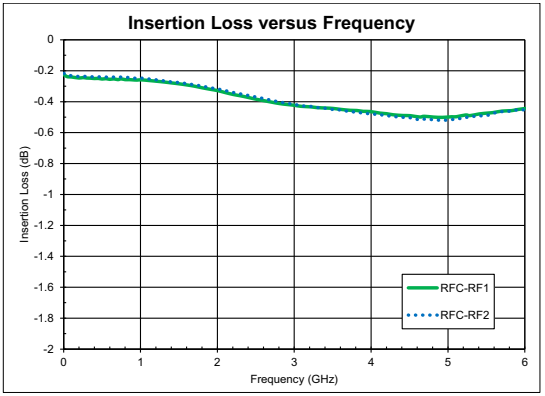
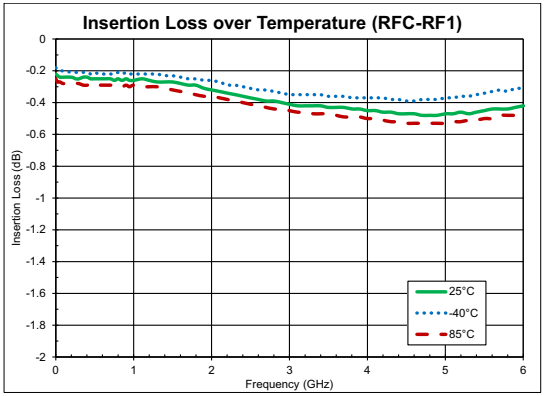
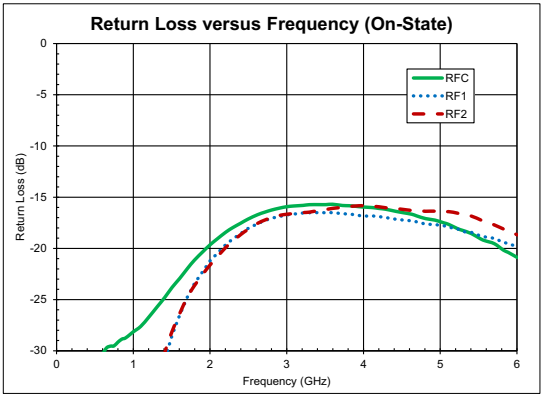
Power Up / Power Down and Operational Controls

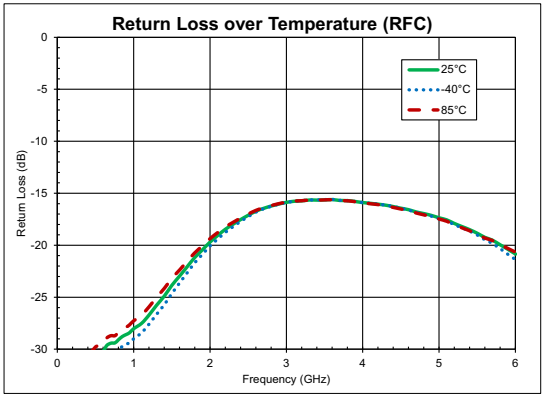
	Description
Scenario 1	Sequence for power up and power down from the phone battery or supply that is connected to RFSW1012 VBATT Pin.
Power Up	Turn on VBATT (supply), then EN, the CTRL. Then (20μS or greater), apply RF signal
Power Down	Turn off RF signal, then CTRL, then EN, turn off VBATT (supply)
Scenario 2	Sequence for going in and out of a shutdown mode, keeping the VBATT or supply on, but disabling / enabling the RFSW1012 by the EN pin
Power Up	Turn on EN (enable), then CTRL, then (5μS or greater), turn on RF Signal
Power Down	Turn off RF signal, then CTRL, then EN (disable)
Scenario 3	When changing switch positions between RF1 and RF2, no RF signal should be applied to any RF port while the CTRL is changing states
Switching Ports	Turn on RF signal, then change CTRL state, then (5μS or greater), turn off RF signal

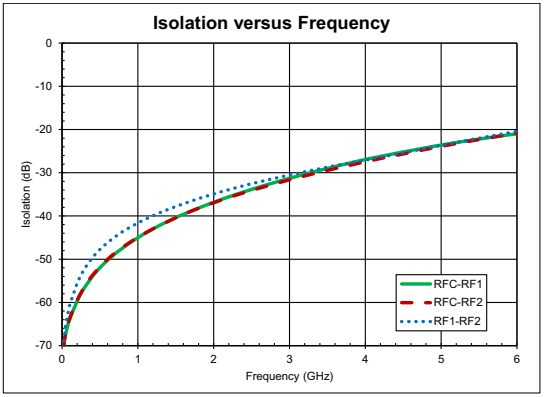
Typical Performance: 50Ω Evaluation Board

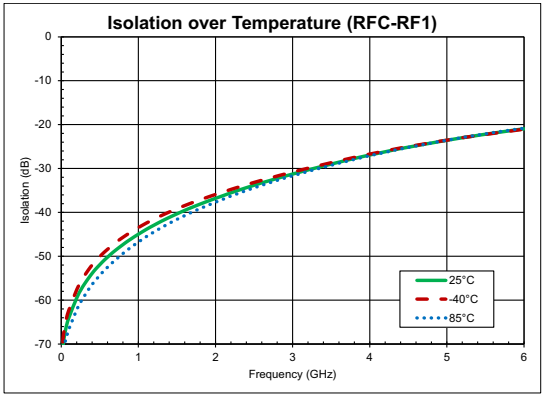












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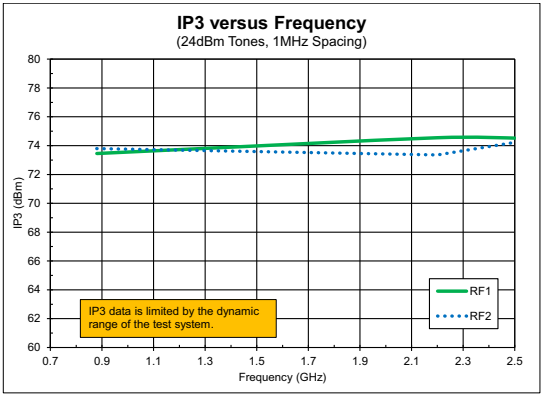

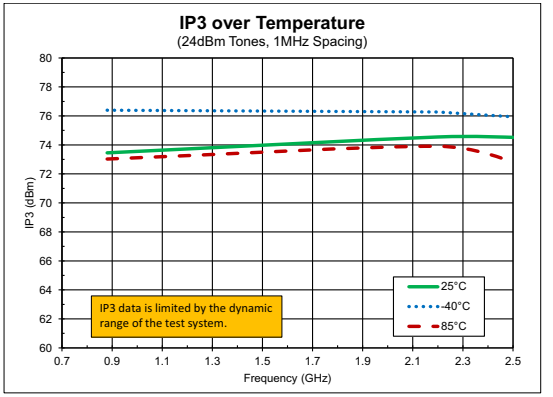

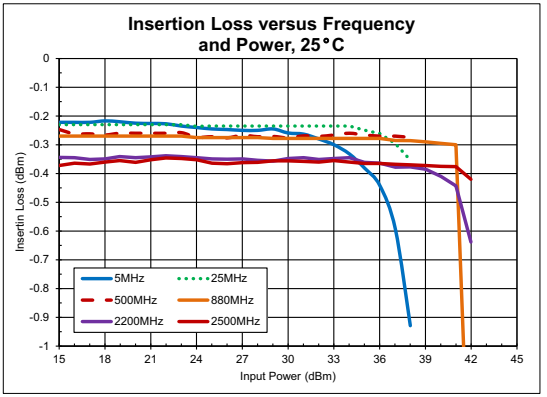

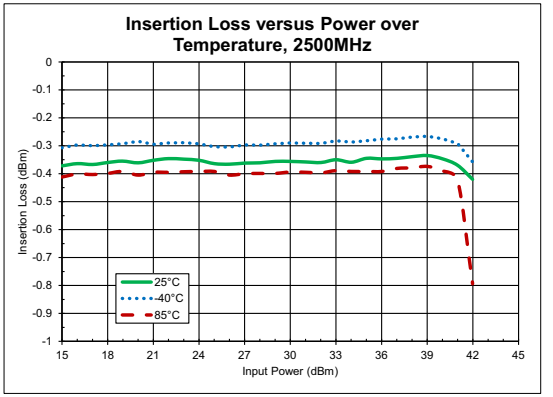

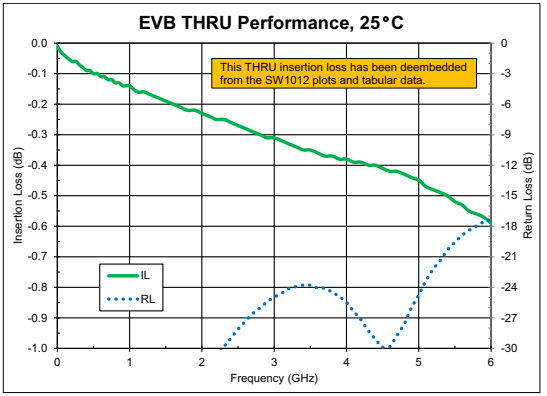

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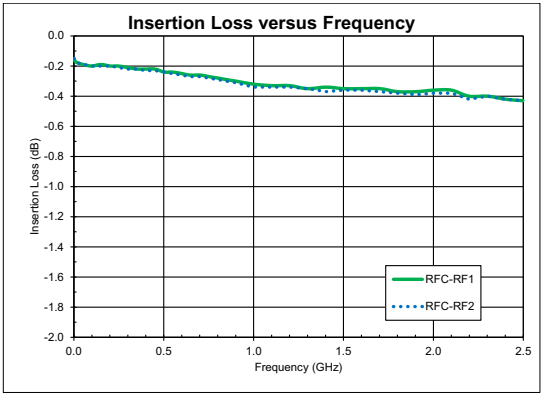
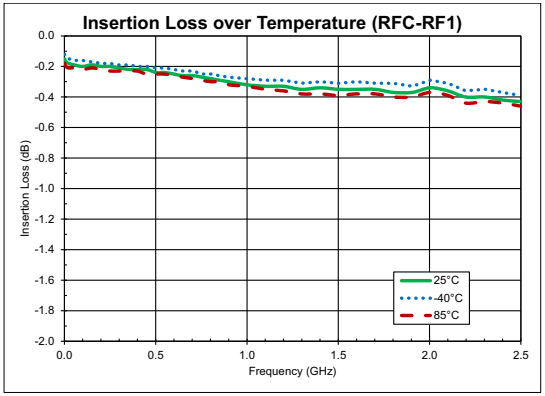
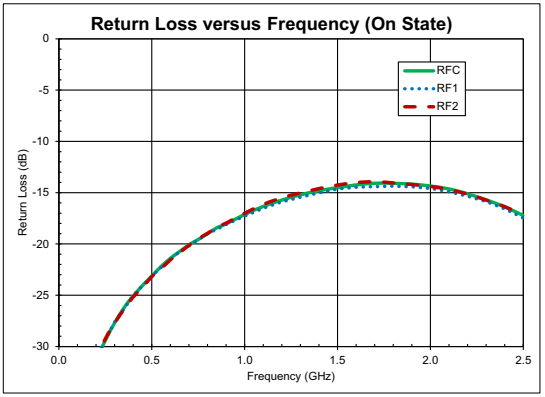
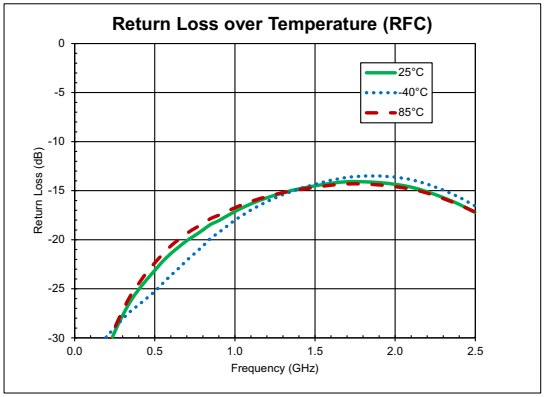
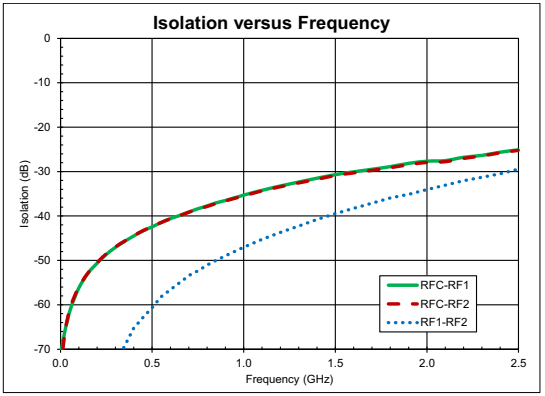
Typical Performance: 75Ω Evaluation Board

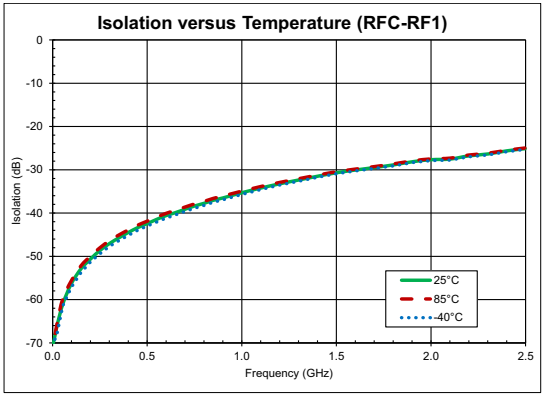












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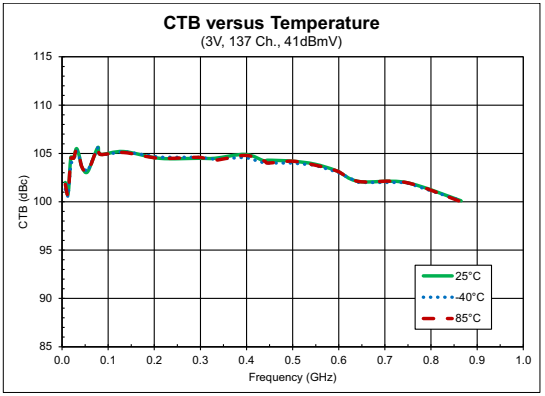

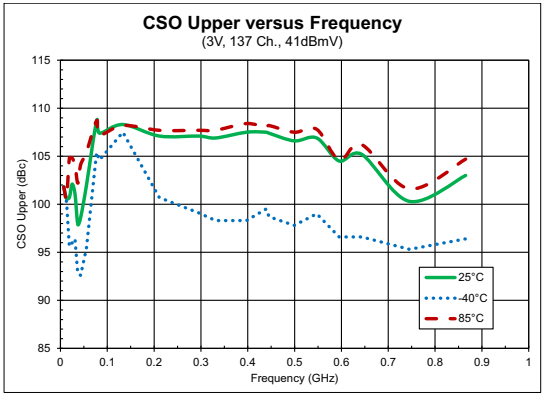

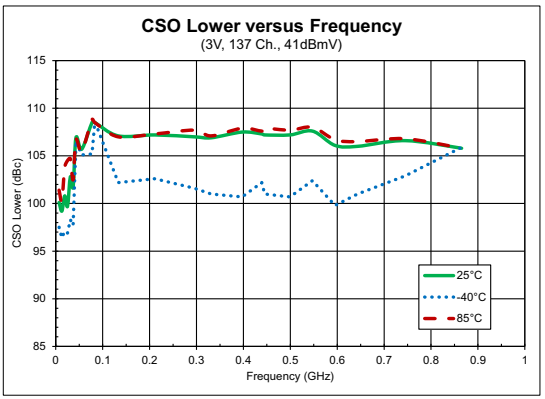

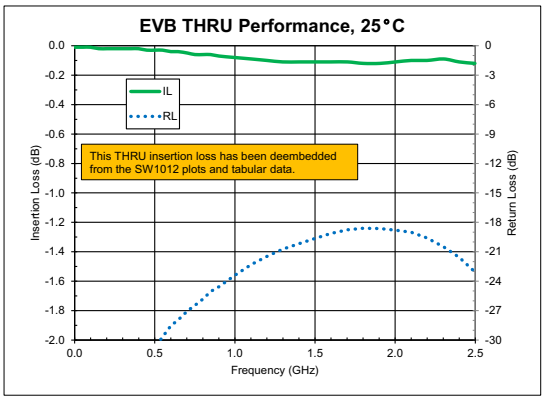

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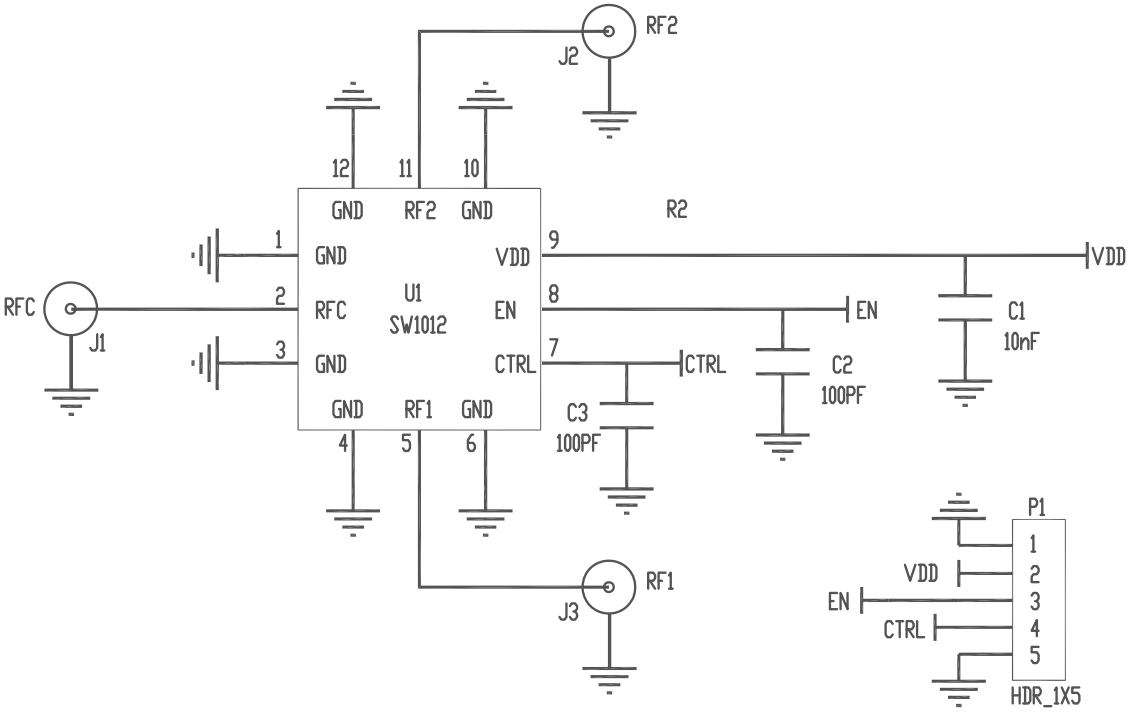
Evaluation Board Schematic



Evaluation Board Bill of Materials (BOM)

Description	Reference Designator	Manufacturer	Manufacturer's P/N
50Ω PCB, SW1012-411			SW1012-411(A)
CAP, 10000pF, 10%, 25V, X7R, 0402	C1	Murata Electronics	GRM155R71E103KA01D
CAP, 100pF, 5%, 50V, C0G, 0402	C2-C3	Taiyo Yuden (USA), Inc.	RM UMK105CG101JV-F
CONN, SMA, END LNCH, MINI, FLT, 0.068"	J1-J3	Emerson Network Power	142-0741-851
CONN, HDR, ST, PLRZD, 5-PIN, 0.100"	P1	ITW Pancon	MPSS100-5-C
SPDT MMIC Switch	U1	RFMD	
For 75Ω applications use the following PCB and RF connector:			
75Ω PCB, SW1012-410			SW1012-410(A)
CONN, F, FEM EDGE MOUNT, 75Ω, 0.068"	J1- J3	Millimeter Wave Technologies	MW-846-C-DD-75

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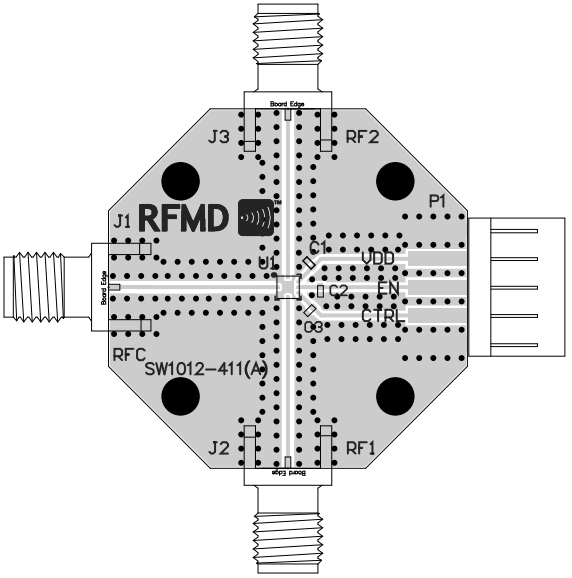
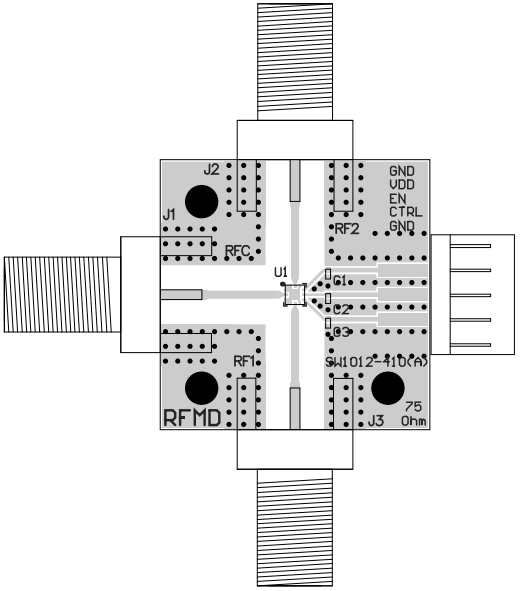
50Ω Evaluation Board Assembly Drawing



75Ω Evaluation Board Assembly Drawing



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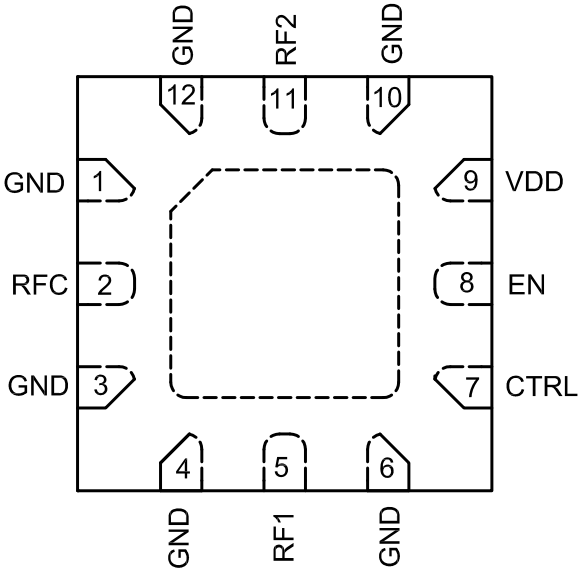
Control Logic for Valid Operational States

State	V_{DD}	CTRL	EN	RF Path
1	2.7V to 4.6V	V_{HIGH}	V_{HIGH}	ANT-RF2
2	2.7V to 4.6V	V_{LOW}	V_{HIGH}	ANT-RF1
Shutdown	2.7V to 4.6V	Don't Care	V_{LOW}	Shutdown

Pin Names and Descriptions

Pin	Name	Description
1	GND	No-connect internal, recommend GND at the EVB level.
2	RFC	Single-ended RF port.
3	GND	No-connect internal, recommend GND at the EVB level.
4	GND	Ground.
5	RF1	Single-ended RF port.
6	GND	Ground.
7	CTRL	Switch logic control input.
8	EN	Shutdown logic control input.
9	VDD	Supply voltage.
10	GND	Ground.
11	RF2	Single-ended RF port.
12	GND	Ground.
EPAD	GND	Ground. Must be soldered to EVB GND over one or more vias.

Pin Out



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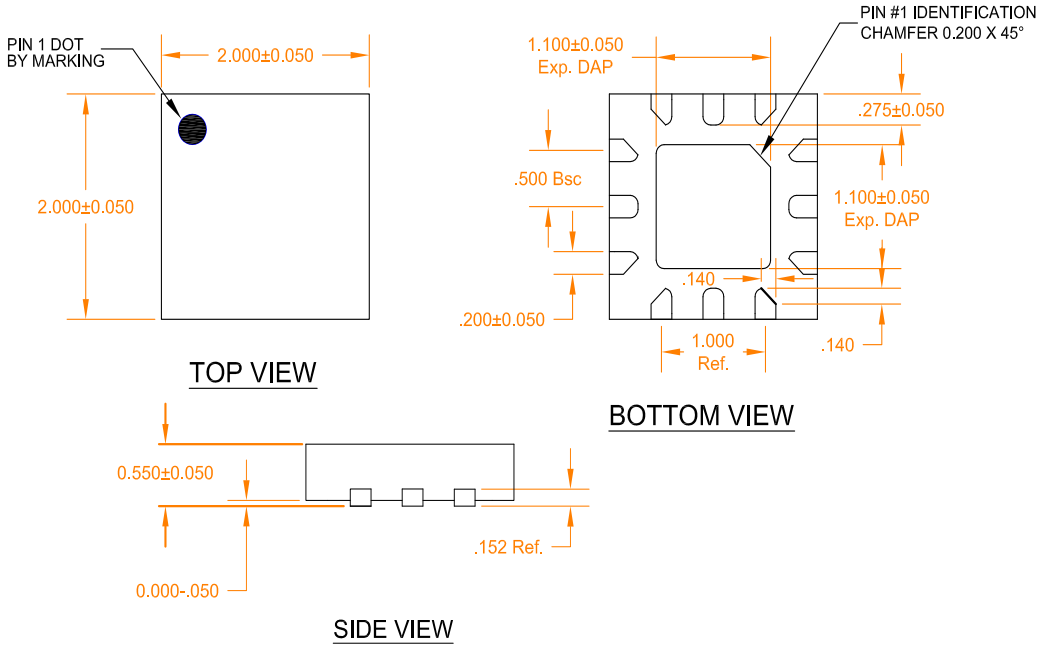
Package Drawing

(Dimensions in millimeters)



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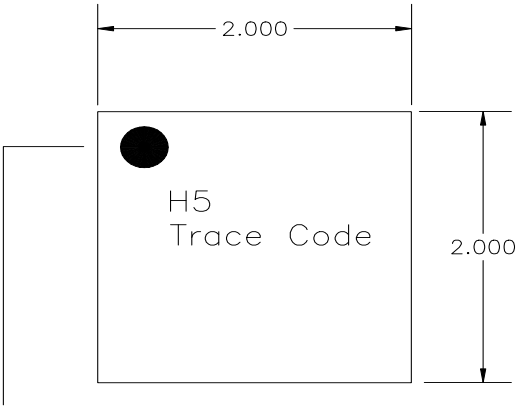
Branding Diagram

(Dimensions in millimeters)



Pin 1 Indicator
Trace Code to be assigned by SubCon

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