

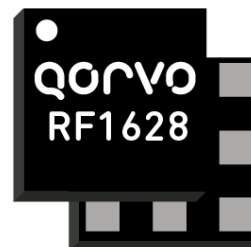


# RF1628

## SP3T Switch for 4G Routing & Diversity Applications

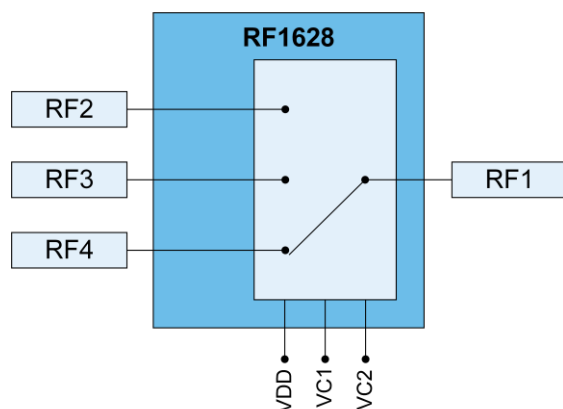
### Product Overview

The RF1628 is a low loss, high isolation SP3T switch with performance optimized for 4G routing and diversity applications. The RF1628 is compatible with +1.35 V control logic which is a key requirement for most cellular transceivers. The part is packaged in a compact 1.1 mm x 1.1 mm, 9 pin package, which allows for a small solution size and no need for external DC blocking capacitors unless DC is applied externally.



Package: 9 pin, 1.1 mm x 1.1 mm x 0.775 mm

### Functional Block Diagram



Functional Block Diagram

### Key Features

- Broadband performance suitable for all cellular modulation schemes up to 2.7 GHz
- Excellent insertion loss and isolation performance
- 0.5 dB Typ IL @ 2.7 GHz
- Exceptional linearity performance ideal for CDMA, WCDMA applications
- Very low current consumption
- Very compact 1.1 mm x 1.1 mm module
- No external DC blocking capacitors required on RF paths unless DC is applied externally

### Applications

- 4G Routing and Diversity applications

### Ordering Information

Part Number	Description
RF1628SB	Sample Bag with 5 pcs
RF1628SR	Sample Reel with 100 pcs
RF1628TR13	Standard 13" Reel with 5,000 pcs
RF1628PCK-410	Evaluation Board Kit

## Absolute Maximum Ratings

Parameter	Rating	Unit
Power Supply ( $V_{DD}$ )	5.0	V
Control Voltage ( $V_{C1}$ , $V_{C2}$ )	3.0	V
Maximum Input Power		
Momentary Infrequent Occurrence	+33.5 in 50 $\Omega$ , 25 °C	dBm
	+33.0 in 50 $\Omega$ , 90 °C	
	+28.5 in 6:1, 90 °C	
Continuous Operation (CW/Peak)	+32.0 in 50 $\Omega$ , 25 °C	dBm
	+31.5 in 50 $\Omega$ , 90 °C	
	+27.0 in 6:1, 90 °C	
Operating Temperature	-30 to +90	°C
Storage Temperature	-30 to +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. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

## Nominal Operating Parameters

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					Nominal conditions unless otherwise stated. $V_{DD} = 2.65$ V, $V_{CTL}$ High = 1.8 V, $V_{CTL}$ Low = 0 V, Temp = 25 °C, 50 $\Omega$ . All unused ports = 50 $\Omega$ terminated
UMTS – Low Band					
Frequency Range					
	824		960	MHz	
Insertion Loss					
RF2 to RF1		0.30	0.42	dB	Frequency 824 MHz to 960 MHz
RF3 to RF1		0.30	0.42	dB	Frequency 824 MHz to 960 MHz
RF4 to RF1		0.30	0.42	dB	Frequency 824 MHz to 960 MHz
Isolation					
RF2 to RF3, RF2 to RF4, RF3 to RF4	28	38		dB	Frequency 824 MHz to 960 MHz; RF1 to RF4 active
RF2 to RF3, RF2 to RF4, RF3 to RF4	20	39		dB	Frequency 824 MHz to 960 MHz; RF1 to RF3 active
RF2 to RF3, RF2 to RF4, RF3 to RF4	31	38		dB	Frequency 824 MHz to 960 MHz; RF1 to RF2 active

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max		
Overall					Nominal conditions unless otherwise stated. V <sub>DD</sub> = 2.65 V, V <sub>CTL</sub> High = 1.8 V, V <sub>CTL</sub> Low = 0 V, Temp = 25 °C, 50 Ω. All unused ports = 50 Ω terminated
UMTS – Low Band (Continued)					
<b>Harmonics</b>					
RF2, RF3 or RF4 – RF1, 2F <sub>0</sub>		-78	-65	dBm	Pin = +26 dBm, CW; Frequency 824 MHz to 915 MHz
RF2, RF3 or RF4 – RF1, 3F <sub>0</sub>		-73	-60	dBm	Pin = +26 dBm, CW; Frequency 824 MHz to 915 MHz
RF2, RF3 or RF4 – RF1, up to 12.75 GHz		-78	-69	dBm	Pin = +26 dBm, CW; Frequency 824 MHz to 915 MHz
<b>VSWR</b>					
RF2, RF3 or RF4		1.3	1.5		Frequency 824 MHz to 960 MHz
RF1		1.3	1.5		Frequency 824 MHz to 960 MHz
UMTS – High Band					
<b>Frequency Range</b>					
	1710		2170	MHz	
<b>Insertion Loss</b>					
RF2 – RF1		0.45	0.57	dB	Frequency 1710 MHz to 2170 MHz
RF3 – RF1		0.45	0.57	dB	Frequency 1710 MHz to 2170 MHz
RF4 – RF1		0.45	0.57	dB	Frequency 1710 MHz to 2170 MHz
<b>Isolation</b>					
RF2 to RF3, RF2 to RF4, RF3 to RF4	21	38		dB	Frequency 1710 MHz to 2170 MHz; RF1 to RF4 active
RF2 to RF3, RF2 to RF4, RF3 to RF4	13	29		dB	Frequency 1710 MHz to 2170 MHz; RF1 to RF3 active
RF2 to RF3, RF2 to RF4, RF3 to RF4	24	29		dB	Frequency 1710 MHz to 2170 MHz; RF1 to RF2 active
<b>Harmonics</b>					
RF2, RF3 or RF4 – RF1, 2F <sub>0</sub>		-77	-63	dBm	Pin = +26 dBm, CW; Frequency 1710 MHz to 1980 MHz
RF2, RF3 or RF4 – RF1, 3F <sub>0</sub>		-67	-55	dBm	Pin = +26 dBm, CW; Frequency 1710 MHz to 1980 MHz
RF2, RF3 or RF4 – RF1, up to 12.75 GHz		-81	-72	dBm	Pin = +26 dBm, CW; Frequency 1710 MHz to 1980 MHz
<b>VSWR</b>					
RF2, RF3 or RF4		1.3	1.5		Frequency 1710 MHz to 2170 MHz
RF1		1.3	1.5		Frequency 1710 MHz to 2170 MHz

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					Nominal conditions unless otherwise stated. V <sub>DD</sub> = 2.65 V, V <sub>CTL</sub> High = 1.8 V, V <sub>CTL</sub> Low = 0 V, Temp = 25 °C, 50 Ω. All unused ports = 50 Ω terminated
LTE – Low Band					
Frequency Range					
	704		787	MHz	B13/17
Insertion Loss					
RF2 to RF1		0.30	0.40	dB	Frequency 704 MHz to 787 MHz
RF3 to RF1		0.30	0.40	dB	Frequency 704 MHz to 787 MHz
RF4 to RF1		0.30	0.40	dB	Frequency 704 MHz to 787 MHz
Isolation					
RF2 to RF3, RF2 to RF4, RF3 to RF4	29	39		dB	Frequency 704 MHz to 787 MHz; RF4 to RF1 active
RF2 to RF3, RF2 to RF4, RF3 to RF4	21	41		dB	Frequency 704 MHz to 787 MHz; RF3 to RF1 active
RF2 to RF3, RF2 to RF4, RF3 to RF4	33	39		dB	Frequency 704 MHz to 787 MHz; RF2 to RF1 active
Harmonics					
RF2, RF3 or RF4 – RF1, 2F <sub>0</sub>		-78	-66	dBm	Pin = +26 dBm, CW; Frequency 704 MHz to 787 MHz
RF2, RF3 or RF4 – RF1, 3F <sub>0</sub>		-73	-62	dBm	Pin = +26 dBm, CW; Frequency 704 MHz to 787 MHz
RF2, RF3 or RF4 – RF1, up to 12.75 GHz		-78	-70	dBm	Pin = +26 dBm, CW; Frequency 704 MHz to 787 MHz
VSWR					
RF2, RF3 or RF4		1.2	1.4		Frequency 704 MHz to 787 MHz
RF1		1.2	1.4		Frequency 704 MHz to 787 MHz
LTE – High Band					
Frequency Range					
	2300		2690	MHz	
Insertion Loss					
RF2 to RF1		0.50	0.70	dB	Frequency 2300 MHz to 2690 MHz
RF3 to RF1		0.50	0.70	dB	Frequency 2300 MHz to 2690 MHz
RF4 to RF1		0.50	0.70	dB	Frequency 2300 MHz to 2690 MHz
Isolation					
RF2 to RF3, RF2 to RF4, RF3 to RF4	18	24		dB	Frequency 2300 MHz to 2690 MHz; RF4 to RF1 active
RF2 to RF3, RF2 to RF4, RF3 to RF4	12	26		dB	Frequency 2300 MHz to 2690 MHz; RF3 to RF1 active
RF2 to RF3, RF2 to RF4, RF3 to RF4	22	26		dB	Frequency 2300 MHz to 2690 MHz; RF2 to RF1 active
Harmonics					
RF2, RF3 or RF4 – RF1, 2F <sub>0</sub>		-78	-64	dBm	Pin = +26 dBm, CW, 2570 MHz

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					Nominal conditions unless otherwise stated. V <sub>DD</sub> = 2.65 V, V <sub>CTL</sub> High = 1.8 V, V <sub>CTL</sub> Low = 0 V, Temp = 25 °C, 50 Ω. All unused ports = 50 Ω terminated
LTE – High Band (Continued)					
RF2, RF3 or RF4 – RF1, 3F <sub>o</sub>		-67	-54	dBm	Pin = +26 dBm, CW, 2570 MHz
RF2, RF3 or RF4 – RF1, up to 12.75 GHz		-78	-67	dBm	Pin = +26 dBm, CW, 2570 MHz
<b>VSWR</b>					
RF2, RF3 or RF4		1.5	1.6		2300 MHz to 2690 MHz
RF1		1.5	1.6		2300 MHz to 2690 MHz
IMD2 (ANT to RF1/2/3/4)					
Low Band (B8)		-120	-116	dBm	F1 = 897.5 MHz at +21 dBm, F2 = 1840 MHz at -15 dBm, Rx = 942.5 MHz
High Band (B2)		-120	-116	dBm	F1 = 1880 MHz at +21 dBm, F2 = 3840 MHz at -15 dBm, Rx = 1960 MHz
Low Band (C2K, B5)		-118	-115	dBm	F1 = 824 MHz at +21 dBm, F2 = 1693 MHz at -15 dBm, Rx = 869 MHz
High Band (C2K)		-120	-116	dBm	F1 = 1850 MHz at +21 dBm, F2 = 3780 MHz at -15 dBm, Rx = 1930 MHz
IMD3 (ANT to RF1/2/3/4)					
Low Band (B8)		-120	-115	dBm	F1 = 897.5 MHz at +21 dBm, F2 = 852.5 MHz at -15 dBm, Rx = 942.5 MHz
High Band (B2)		-118	-113	dBm	F1 = 1880 MHz at +21 dBm, F2 = 1800 MHz at -15 dBm, Rx = 1960 MHz
DC Control and Electrical Spec					
V <sub>DD</sub> – Switch Supply Voltage	2.5	2.65	4.0	V	
V <sub>DD</sub> Supply Current		83	130	μA	Active Mode
V <sub>C1</sub> , V <sub>C2</sub> (Control Voltage) High	1.35	1.8	2.8	V	
V <sub>C1</sub> , V <sub>C2</sub> (Control Voltage) Low	0	0	0.45	V	
V <sub>C1</sub> , V <sub>C2</sub> Current		0.5	1.0	μA	
Switching Speed		2	5	μs	10% to 90% RF
LTE – Ultra High Band					
<b>Frequency Range</b>					
	3000		3800	MHz	
<b>Insertion Loss</b>					
RF2 to RF1		0.63	0.90	dB	Frequency 3000 MHz to 3800 MHz
RF3 to RF1		0.65	0.90	dB	Frequency 3000 MHz to 3800 MHz
RF4 to RF1		0.66	0.90	dB	Frequency 3000 MHz to 3800 MHz
<b>Isolation</b>					
RF2 to RF4, RF3 to RF4	18	23		dB	Frequency 3000 MHz to 3800 MHz; RF4 to RF1 active
RF2 to RF3, RF3 to RF4	22	28		dB	Frequency 3000 MHz to 3800 MHz; RF3 to RF1 active
RF2 to RF3, RF2 to RF4	18	24		dB	Frequency 3000 MHz to 3800 MHz; RF2 to RF1 active

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					Nominal conditions unless otherwise stated. $V_{DD} = 2.65\text{ V}$ , $V_{CTL\text{ High}} = 1.8\text{ V}$ , $V_{CTL\text{ Low}} = 0\text{ V}$ , Temp = 25 °C, 50 $\Omega$ . All unused ports = 50 $\Omega$ terminated
LTE-U					
<b>Frequency Range</b>					
	5000		6000	MHz	
<b>Insertion Loss</b>					
RF2 to RF1		0.88	1.30	dB	Frequency 5000 MHz to 6000 MHz
RF3 to RF1		0.82	1.30	dB	Frequency 5000 MHz to 6000 MHz
RF4 to RF1		0.86	1.30	dB	Frequency 5000 MHz to 6000 MHz
<b>Isolation</b>					
RF2 to RF4, RF3 to RF4	11	17		dB	Frequency 5000 MHz to 6000 MHz; RF1 to RF4 active
RF2 to RF3, RF3 to RF4	13	20		dB	Frequency 5000 MHz to 6000 MHz; RF1 to RF3 active
RF2 to RF3, RF2 to RF4	11	18		dB	Frequency 5000 MHz to 6000 MHz; RF1 to RF2 active

## Control Logic

Mode	V <sub>C1</sub>	V <sub>C2</sub>
RF1 – RF3	0	1
RF1 – RF2	1	0
RF1 – RF4	1	1

## Power-Up, Power-Down Sequence

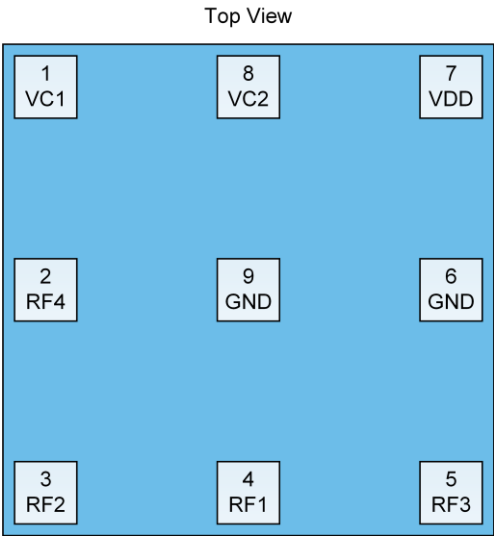
### Power-Up Sequence –

1. Apply V<sub>DD</sub>
2. Apply V<sub>C1</sub>, V<sub>C2</sub>
3. Apply RF

**Power-Down Sequence –** The Power-down sequence is in the opposite order of the Power-up sequence.

**Not Following the power ON/OFF sequence could cause damage to the switch and may affect the long-term reliability of the device.**

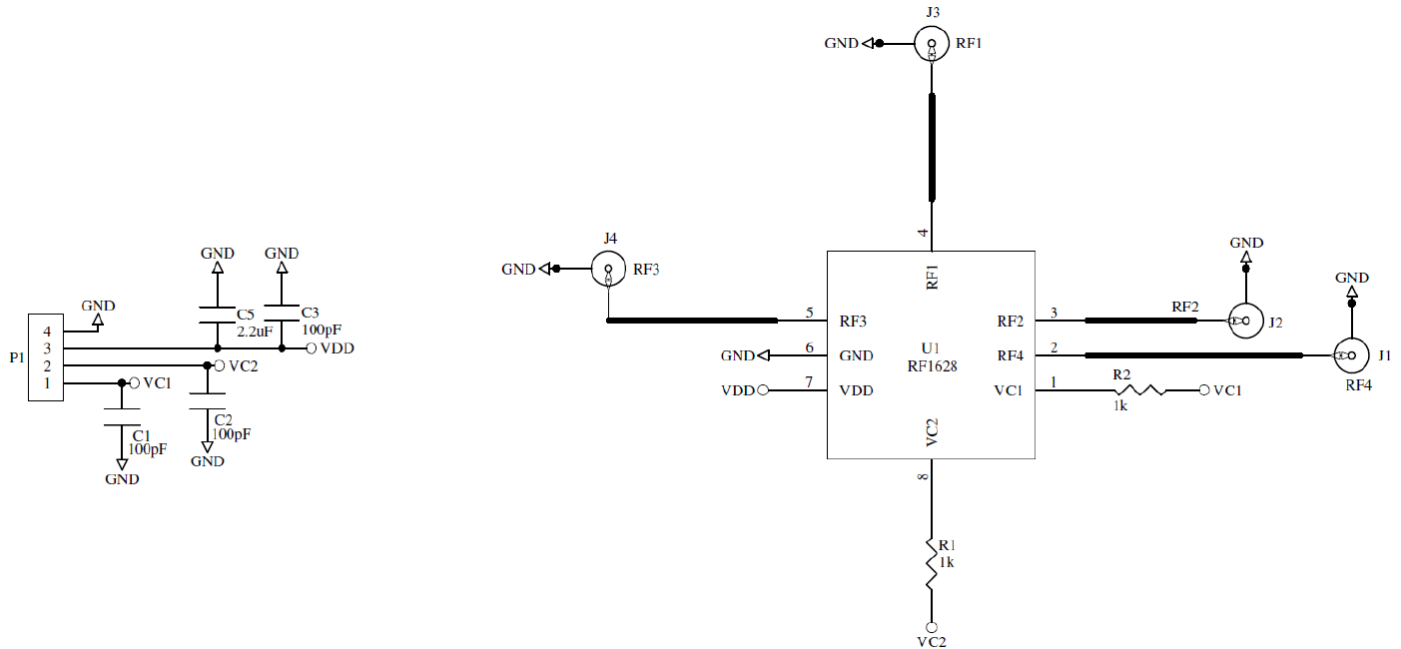
Pin Out



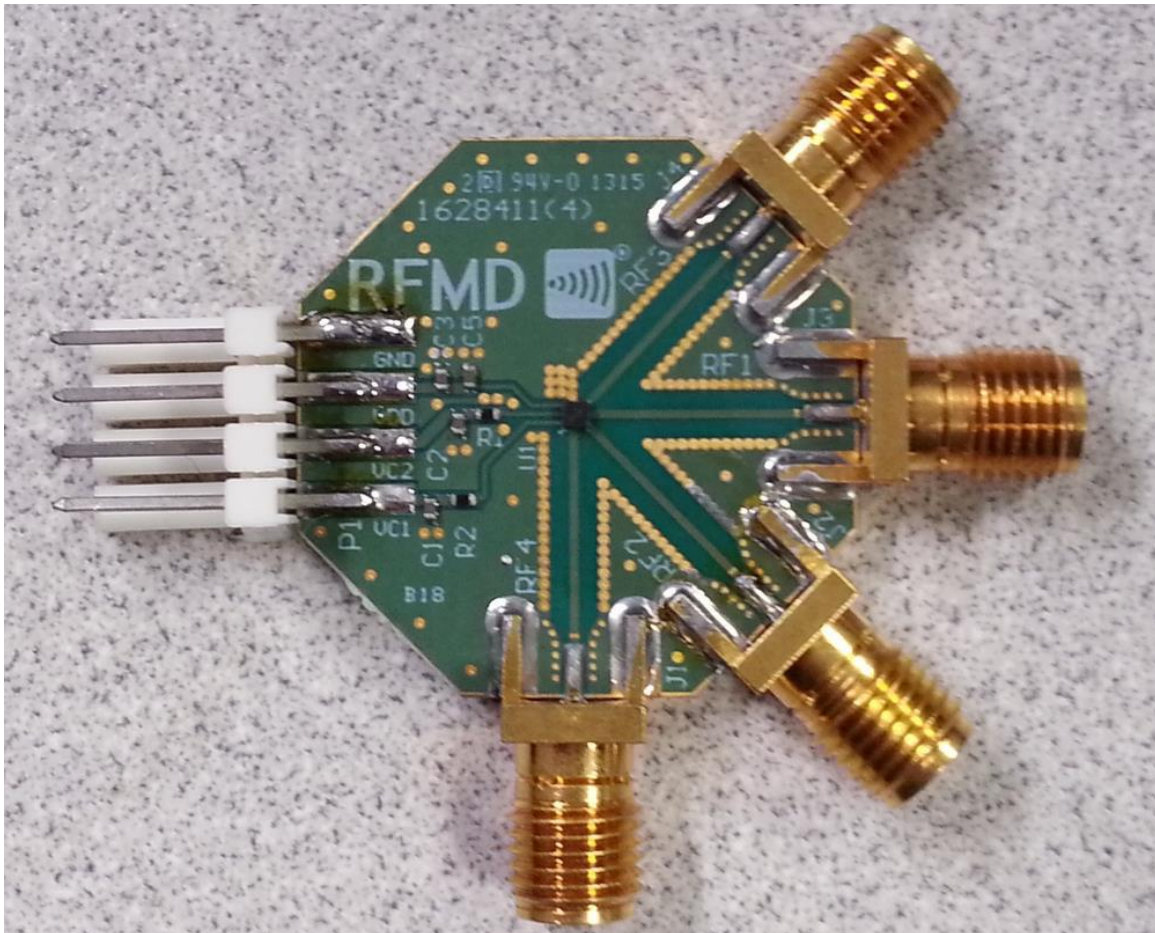
Pin-Out Description

Pin	Function	Description
1	VC1	Switch logic control input
2	RF4	RF port
3	RF2	RF port
4	RF1	Antenna (Common port)
5	RF3	RF port
6	GND	Ground
7	VDD	Supply Voltage
8	VC2	Switch logic control input
9	GND	Ground

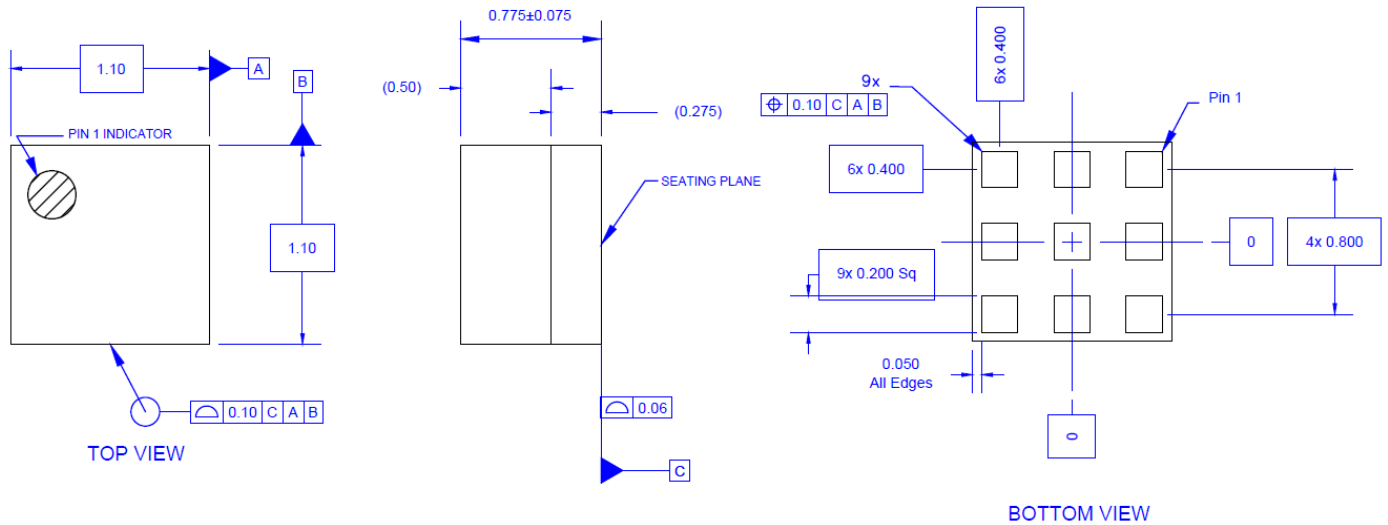
## Evaluation Board Schematic



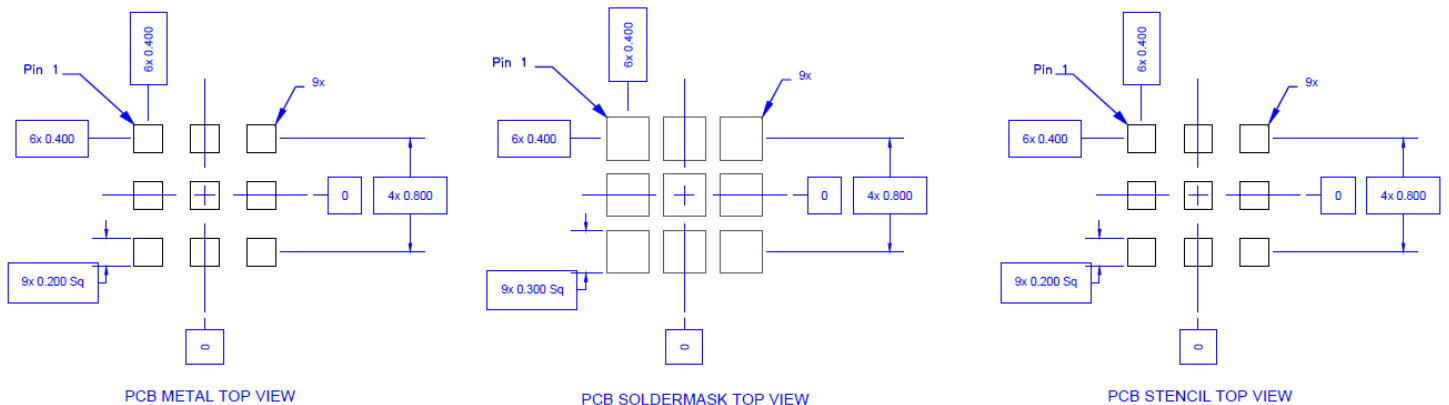
**Evaluation Board**



## Package Outline



## PCB Metal, Solder, and Stencil Patterns



## RoHS Compliance

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This part is compliant with the 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
- SVHC Free



## REVISION HISTORY

Revision	Description
DS131205	Initial release.
DS140916	Update package outline drawing, schematic for higher resolution.
DS20141118	Updated isolation line items: removed isolation data for isolation between two RF inputs that are both not being utilized (Example: RF2 – RF4 for when the on path is RF1 – RF3. Replaced text “up to 12.75 GHz” with text “ $\geq 4F_0$ up to 12.75 GHz” to clarify harmonic line items. Decreased upper limit for harmonics based on characterization and production test data. Added word “Module” on page 1 to package description.
DS20161117	Update to Qorvo template
DS20170814	Added 3 – 3.8GHz and 5 – 6GHz isolation and insertion loss data
Rev L	Updated Absolute Max Supply Voltage from 4.5V to 5.0V
Rev M	Added “Not For New Designs” marks
Rev N	Removed “Not For New Designs” marks

## Contact Information

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

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