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RF1236

BROADBAND MEDIUM POWER DIFFERENTIAL SP3T SWITCH

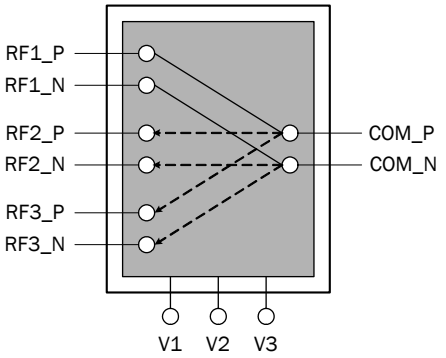
Package Style: QFN, 12-Pin, 2.0mmx2.0mmx0.55mm

Features

- Broadband Frequency Performance
  Low Frequency - 3.5GHz
- Very Low Insertion Loss:
  0.3dB Typ. at 0.90GHz
  0.55dB Typ. at 1.90GHz
- Excellent Linearity Performance:
  IIP2 Typ. 103dBm at 0.90GHz
  IIP2 Typ. 100dBm at 1.90GHz
- 1.8V Capable for Low Power Applications

Applications

- Cellular Handset Applications
- IEEE802.11b/g WLAN Applications
- Multi-Mode GSM, W-CDMA Applications
- WLAN Applications
- SAW Filter Switching



Functional Block Diagram

Product Description

The RF1236 is a single-pole three-throw (SP3T) differential switch designed for general purpose switching applications which require very low insertion loss and low power signal routing applications. The RF1236 features low insertion loss, high linearity, and very good harmonic characteristics. The switch is operable from 1.8V to 3.6V control voltage. It is fabricated with 0.5µm GaAs pHEMT process and is packaged in a very compact 2.0mmx2.0mm, 12-pin, leadless QFN package.

Ordering Information

RF1236	Broadband Medium Power Differential SP3T Switch
RF1236PCBA-410	Fully Assembled Evaluation Board

Optimum Technology Matching® Applied

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

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Absolute Maximum Ratings

Parameter	Rating	Unit
V1, V2, V3	6.0	V
Maximum Input Power (DC to 3.5GHz, 1.8V Control)	31	dBm
Operating Temperature	-30 to +85	°C
Storage Temperature	-65 to +100	°C

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).

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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall - $V_{control_high}$=3V					V1, V2, V3=High=3.0V, V1, V2, V3=Low=0V. Temp=25°C.
Operating Frequency	600		3500	MHz	
DC Supply	1.8	3.0	3.6	V	V1, V2, V3 (H)
	0.00		0.40	V	V1, V2, V3 (L)
Control Current		0.4	6	uA	
Insertion Loss					
COM_P - RF1P, RF2P, RF3P COM_N - RF1N, RF2N, RF3N		0.30	0.47	dB	RF ON, 824MHz to 960MHz;
		0.55	0.70	dB	RF ON, 1850MHz to 1990MHz
		0.64	1.2	dB	RF ON, 2170MHz to 2500MHz
		0.73	1.35	dB	RF ON, 2500MHz to 3500MHz
Isolation					
RF1P - RF2P, RF3P RF1N - RF2N, RF3N	25.5	27.0		dB	RF ON, 824MHz to 960MHz
	20	21		dB	RF ON, 1850MHz to 1990MHz
	18.0	19.5		dB	RF ON, 2170MHz to 2500MHz
	15.5	18.0		dB	RF ON, 2500MHz to 3500MHz
COM_P - RF2P RF3P COM_N - RFIN, RF2N, RF3N	25	27		dB	RF ON, 824MHz to 960MHz
	19.5	21.0		dB	RF ON, 1850MHz to 1990MHz
	18	19		dB	RF ON, 2170MHz to 2500MHz
	15.0	17.5		dB	RF ON, 2500MHz to 3500MHz
RF Port Return Loss			1.5:1		VSWR
Second Harmonic	62	93		dBc	P_{IN}=16dBm; F_0=880MHz
	62	88		dBc	P_{IN}=16dBm; F_0=1880MHz
	62	84		dBc	P_{IN}=16dBm; F_0=2500MHz
Third Harmonic	62	97.5		dBc	P_{IN}=16dBm; F_0=880MHz
	62	97		dBc	P_{IN}=16dBm; F_0=1880MHz
	62	94		dBc	P_{IN}=16dBm; F_0=2500MHz

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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall - $V_{control_high}$=3V (continued)					V1, V2, V3=High=3.0V, V1, V2, V3=Low=0V. Temp=25°C.
IIP2					
RF1, RF2, RF3-COM (Cell)		103		dBm	Tone 1: 836.5MHz at 16dBm, Tone 2: 1718MHz at -20dBm, Receive Freq: 881.5MHz
RF1, RF2, RF3-COM (AWS)		100		dBm	Tone 1: 1732.5MHz at 16dBm, Tone 2: 3865MHz at -20dBm, Receive Freq: 2132.5MHz
RF2, RF3-COM (PCS)		100		dBm	Tone 1: 1880MHz at 16dBm, Tone 2: 3840MHz at -20dBm, Receive Freq: 1960MHzRF1,
IIP3					
RF1, RF2, RF3-COM (Cell)		68		dBm	Tone 1: 836.5MHz at 16dBm, Tone 2: 791.5MHz at -20dBm, Receive Freq: 881.5MHz
RF1, RF2, RF3-COM (IMT)		66		dBm	Tone 1: 1950MHz at 16dBm, Tone 2: 1760MHz at -20dBm, Receive Freq: 2140MHz
IP0.1 dB		26		dBm	
Switching Speed		0.27		µs	50% control to 90% RFON
		0.40		µs	50% control to 10% RFOFF
Overall - $V_{control_low}$=1.8V					V1, V2, V3=High=1.8V, V1, V2, V3=Low=0V. Temp=25°C.
Operating Frequency	600		3500	MHz	
Insertion Loss					
COM_P - RF1P, RF2P, RF3P COM_N - RF1N, RF2N, RF3N		0.30	0.45	dB	RF ON, 824MHz to 960MHz
		0.57	0.73	dB	RF ON, 1850Mhz to 1990MHz
		0.65	1.2	dB	RF ON, 2170MHz to 2500MHz
		0.75	1.35	dB	RF ON, 2500MHz to 3500MHz
Isolation					
RF1P - RF2P, RF3P RF1N - RF2N, RF3N	25	27		dB	RF ON, 824MHz to 960MHz
	19.5	21.0		dB	RF ON, 1850MHz to 1990MHz
	18	19		dB	RF ON, 2170MHz to 2500MHz
	15.5	17.5		dB	RF ON, 2500MHz to 3500MHz
COM_P - RF1P, RF2P, RF3P COM_N - RF1N, RF2N, RF3N	25.0	26.5		dB	RF ON, 824MHz to 960MHz
	19.0	20.5		dB	RF ON, 1850MHz to 1990MHz
	18	19		dB	RF ON, 2170MHz to 2500MHz
	15.0	17.5		dB	RF ON, 2500MHz to 3500MHz
RF Port Return Loss			1.5:1		VSWR

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall - $V_{control_low}$=1.8V (continued)					V1, V2, V3=High=1.8V, V1, V2, V3=Low=0V. Temp=25°C.
Second Harmonic	62	78		dBc	P_{IN}=16dBm; F_0=880MHz
	62	78		dBc	P_{IN}=16dBm; F_0=1880MHz
	62	74		dBc	P_{IN}=16dBm; F_0=2500MHz
Third Harmonic	62	68		dBc	P_{IN}=16dBm; F_0=880MHz
	62	75		dBc	P_{IN}=16dBm; F_0=1880MHz
	62	68		dBc	P_{IN}=16dBm; F_0=2500MHz
IIP2					
RF1, RF2, RF3-COM (Cell)		83		dBm	Tone 1: 836.5MHz at 16dBm, Tone 2: 1718MHz at -20dBm, Receive Freq: 881.5MHz
RF1, RF2, RF3-COM (AWS)		82		dBm	Tone 1: 1732.5MHz at 16dBm, Tone 2: 3865MHz at -20dBm, Receive Freq: 2132.5MHz
RF1, RF2, RF3-COM (PCS)		83		dBm	Tone 1: 1880MHz at 16dBm, Tone 2: 3840MHz at -20dBm, Receive Freq: 1960MHz
IIP3					
RF1, RF2, RF3-COM (Cell)		46		dBm	Tone 1: 836.5MHz at 16dBm, Tone 2: 791.5MHz at -20dBm, Receive Freq: 881.5MHz
RF1, RF2, RF3-COM (IMT)		46		dBm	Tone 1: 1950MHz at 16dBm, Tone 2: 1760MHz at -20dBm, Receive Freq: 2140MHz
IP0.1dB		19.5		dBm	
Switching Speed		0.34		µs	50% Control to 90% RFON
		1.16		µs	50% Control to 90% RFOFF

Control Logic

	Control Signals			Signal Paths		
	VC1	VC2	VC3	RF1N - COM_N RF1P - COM_P	RF2P - COM_P, RF2P - COM_P	RF3N - COM_N, RF3P - COM_P
Valid States	1	0	0	ON	OFF	OFF
	0	1	0	OFF	ON	OFF
	0	0	1	OFF	OFF	ON
Invalid States	0	0	0	Indeterminate State*		
	0	1	1	Indeterminate State*		
	1	0	1	Indeterminate State*		
	1	1	0	Indeterminate State*		
	1	1	1	Indeterminate State*		

0: Logic level low, 0V~0.4V

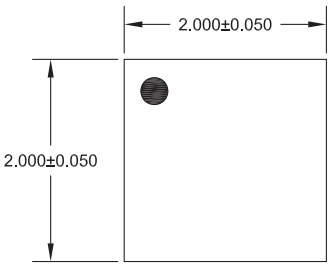
1: Logic level high, 1.6V~3.6V

Note: In indeterminate states, both signal paths are ON with degraded performance.

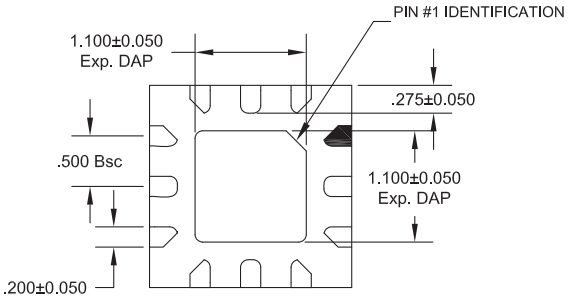
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Pin	Function	Description
1	RF1_P	Positive RF Port 1.
2	RF1_N	Negative RF Port 1.
3	VC1	Voltage Control 1.
4	VC3	Voltage Control 3.
5	RF3_N	Negative RF Port 3.
6	RF3_P	Positive RF Port 3.
7	VC2	Voltage Control 2.
8	RF2_N	Negative RF Port 2.
9	RF2_P	Positive RF Port 2.
10	COM_P	Positive Common Port.
11	GND	Ground.
12	COM_N	Negative Common Port.

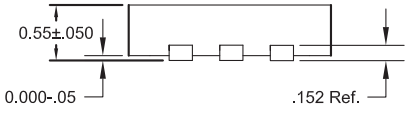
Package Drawing



TOP VIEW



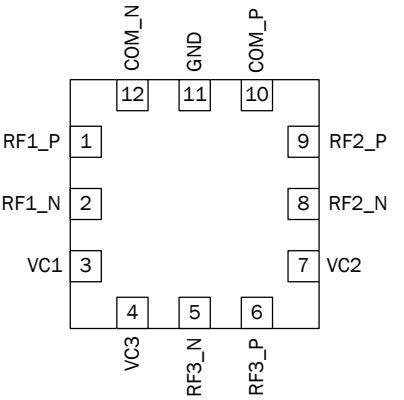
BOTTOM VIEW



SIDE VIEW

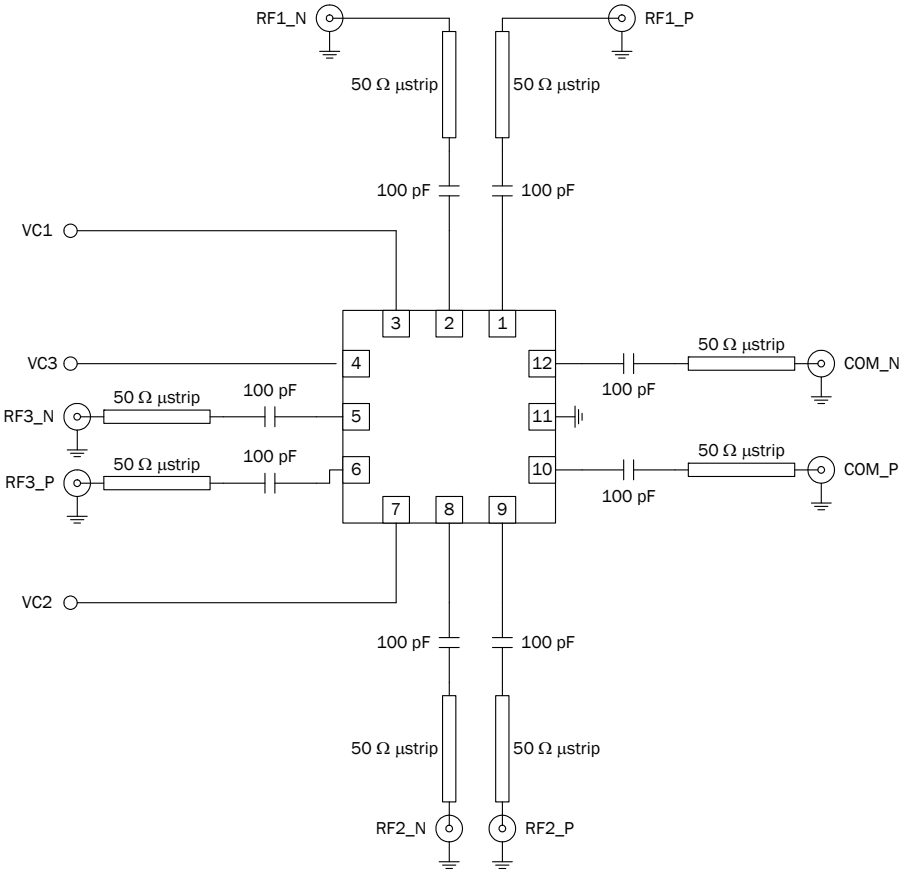
Notes:
1) Pin 1 Shaded Area

Pin Out



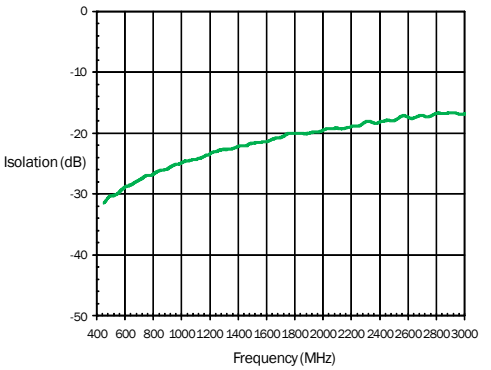
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Application Schematic

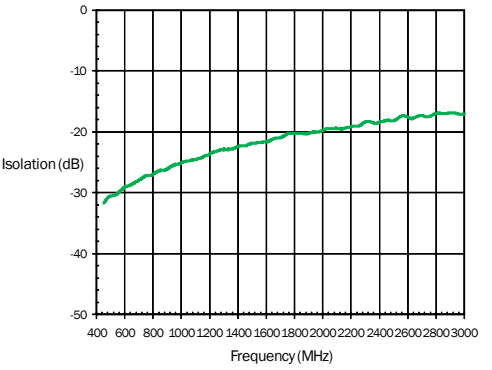


Typical Performance

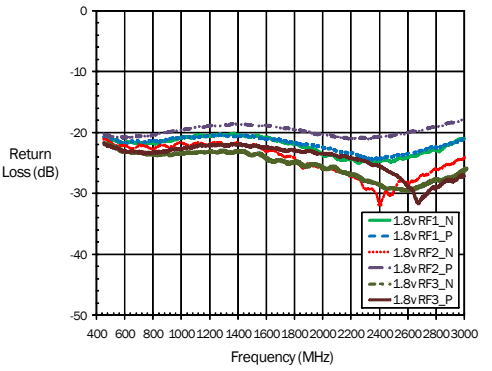
Isolation
(Temp=25°C, VRF=1.8V)



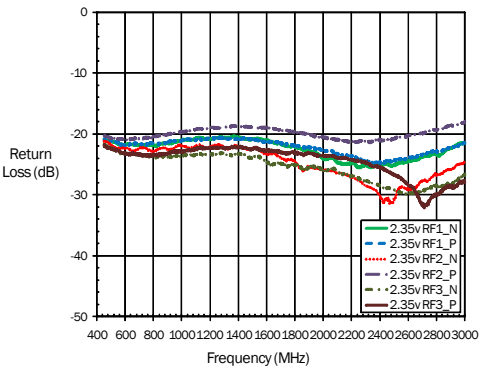
Isolation
(Temp=25°C, VRF=2.35V)



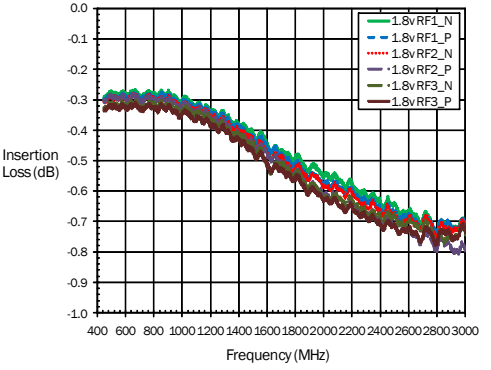
Ant Port Return Loss
(Temp=25°C, VRF=1.8V)



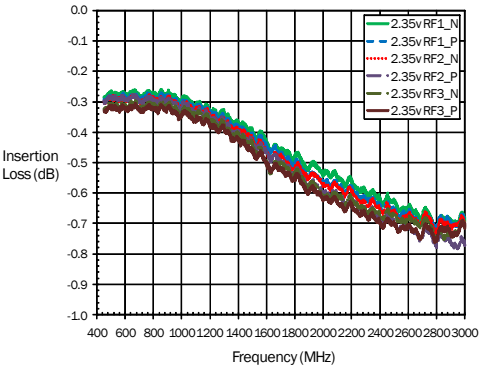
Ant Port Return Loss
(Temp=25°C, VRF=2.35V)



Max Insertion Loss
(Temp=25°C, VRF=1.8V)



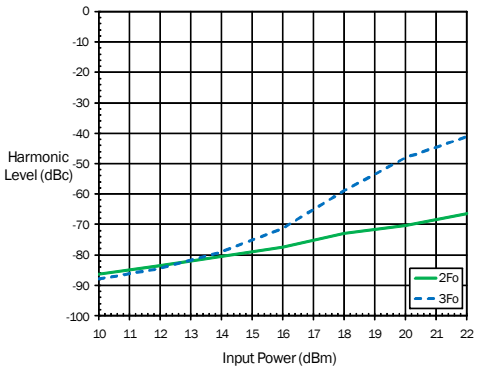
Max Insertion Loss
(Temp=25°C, VRF=2.35V)



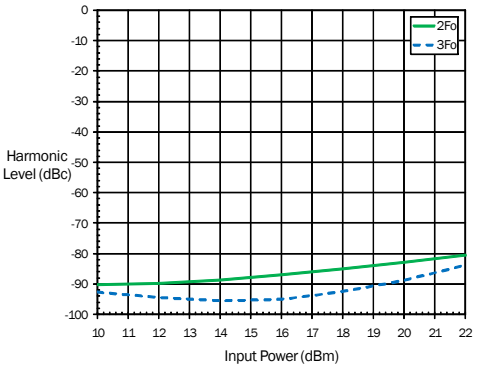
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Typical Performance

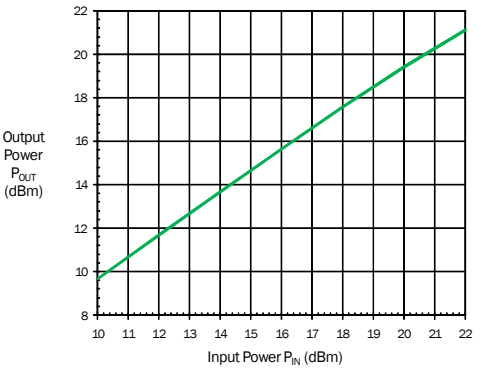
Harmonics
(Temp=25°C, F_0=1880MHz, VRF=1.8V)



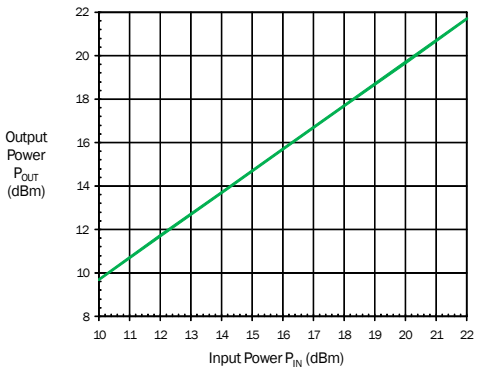
Harmonics
(Temp=25°C, F_0=1880MHz, VRF=2.35V)



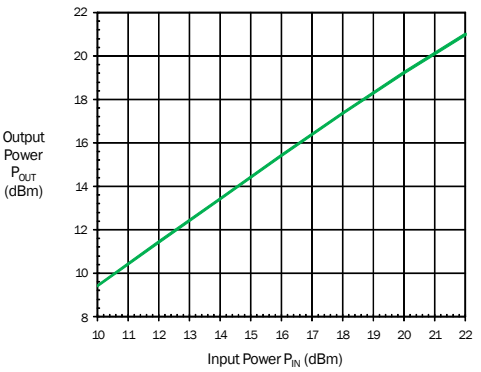
Output Power versus Input Power
(Temperature=25°C, Frequency=880MHz, VRF=1.8V)



Output Power versus Input Power
(Temperature=25°C, Frequency=880MHz, VRF=2.35V)



Output Power versus Input Power
(Temperature=25°C, Frequency=1880MHz, VRF=1.8V)



Output Power versus Input Power
(Temperature=25°C, Frequency=1880MHz, VRF=2.35V)

