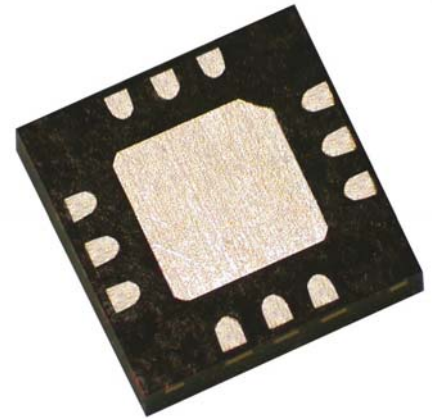


# HRF-SW1000

## SPDT Absorptive RF Switch DC To 4GHz Operation

The Honeywell HRF-SW1000 is a high performance single pole double throw (SPDT) absorptive RF switch ideal for use in wireless basestation and handset applications that require minimum power and minimum insertion loss.

The HRF-SW1000 is manufactured with Honeywell's patented Silicon On Insulator (SOI) CMOS technology, which provides the performance of GaAs with the economy and integration capabilities of conventional CMOS technology. These switches are DC coupled to improve lower operating frequency, frequency response and reduce the number of DC bias points required.



*HRF-SW1000 in VQFN Package*

### FEATURES

- Typical High Isolation Of > 42 dB @ 2 GHz
- Typical Low Insertion Loss Of 1.2dB @ 2 GHz
- Integrated CMOS Control Logic
- DC-coupled, bi-directional RF Path
- Single Positive Supply Voltage
- Ultra Small VQFN Packaging
- Impedance matched for 50 Ohm systems
- Lead-free, RoHS compliant and Green

### RF ELECTRICAL SPECIFICATIONS @ + 25°C

Results @  $V_{DD} = 5.0 \pm 10\%$ ,  $V_{SS} = 0$  unless otherwise stated,  $Z_0 = 50$  Ohms  
Contact Honeywell for relative performance at other supply configurations

Parameter	Test Condition	Frequency	Minimum	Typical	Maximum	Units
Insertion Loss		0.5 GHz		0.9	1.4	dB
		2.0 GHz		1.2	1.6	dB
		3.0 GHz		1.7	2.2	dB
Isolation		0.5 GHz	52	55		dB
		2.0 GHz	42	45		dB
		3.0 GHz	36	41		dB
Return Loss			-15	-20		dB
Input P1dB	$V_{SS} = Gnd$ $V_{SS} = -5V$	1.0 GHz		17		dBm
		1.0 GHz		27		dBm
Input IP3	Two-Tone Inputs, up to + 5 dBm $V_{SS} = Gnd$ $V_{SS} = -5V$	2.0 GHz		35		dBm
		2.0 GHz		37		dBm
Trise, Tfall Ton, Toff	10% To 90%			10		ns
	50% Cntl To 90% / 10%RF			20		ns

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## DC ELECTRICAL SPECIFICATIONS @ + 25°C

Parameter	Minimum	Typical	Maximum	Units
V <sub>DD</sub>	3.3 <sup>1</sup>	5.0	5.5	V
V <sub>SS</sub>	-5.0			V
I <sub>DD</sub>		<5	35	uA
CMOS Logic Level (0)	0		0.8	V
CMOS Logic Level (1)	V <sub>DD</sub> - 0.8		V <sub>DD</sub>	V
Input Leakage Current			10	uA

Note 1, the performance curves are for V<sub>DD</sub> = +5.0 +/- 10%

## ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

Parameter	Absolute Maximum	Units
V <sub>DD</sub>	+6.0	V
V <sub>SS</sub>	-5.5	V
Vin Digital Logic 0	-0.6	V
Vin Digital Logic 1	V <sub>DD</sub> + 0.6	V
Input Power	> 35	dBm
ESD Voltage <sup>2</sup>	400	V
Moisture Sensitivity Level	Level 3 @ 260°C	
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-65 to +125	°C

Note 1 - Operation of this device beyond any of these parameters may cause permanent damage.

Note 2 - Although the HRF-SW1000 contains ESD protection circuitry on all digital inputs, precautions should be taken to ensure that the Absolute Maximum Ratings are not exceeded.

**Latch-Up:** Unlike conventional CMOS digital switches, Honeywell's HRF-SW1000 is immune to latch-up.

## TRUTH TABLE

Switch Control	RF Output 1	RF Output 2
0	RF INPUT	
1		RF INPUT

"0" = CMOS Low, "1" = CMOS High

## PIN CONFIGURATIONS

Pin	Function	Pin	Function
1	GROUND	7	GROUND
2	RF OUT 2	8	RF OUT 1
3	GROUND	9	GROUND
4	VDD	10	GROUND
5	SWITCH CONTROL	11	RF IN
6	VSS	12	GROUND

**Note:** Bottom ground plate must be grounded for proper RF performance.

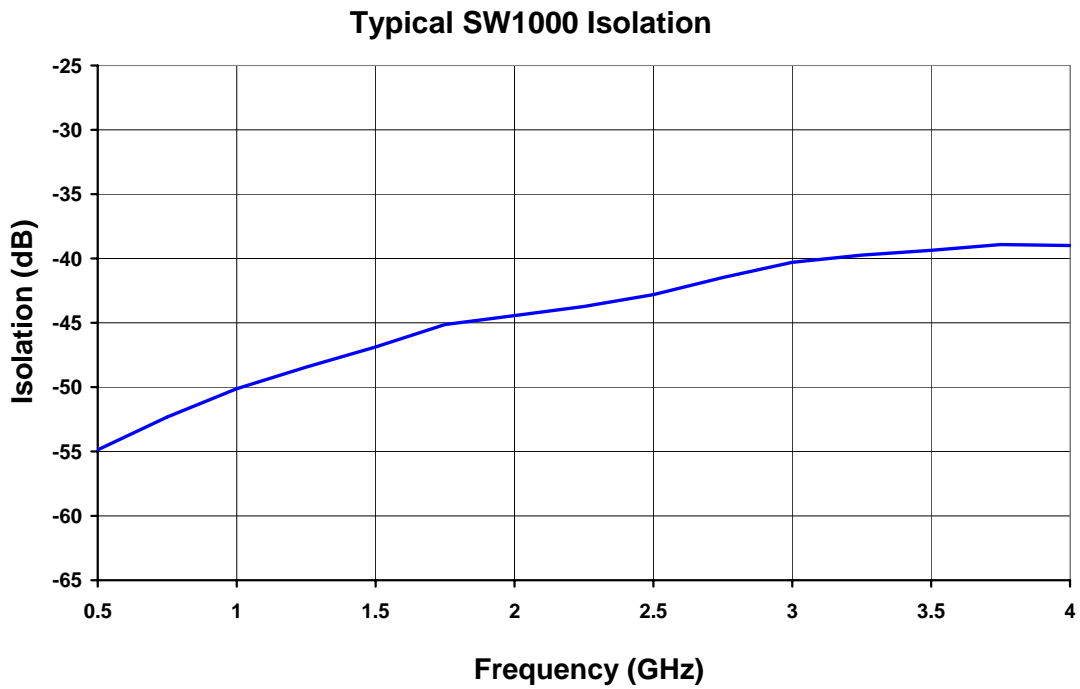
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## PERFORMANCE CURVES

### Insertion Loss

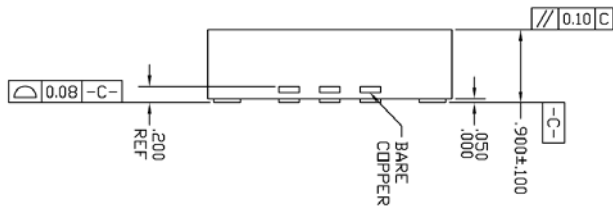
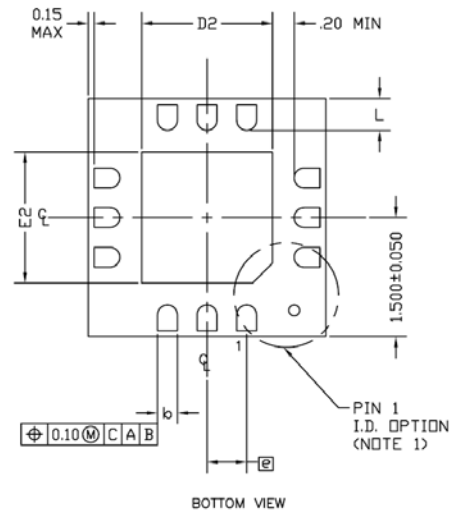
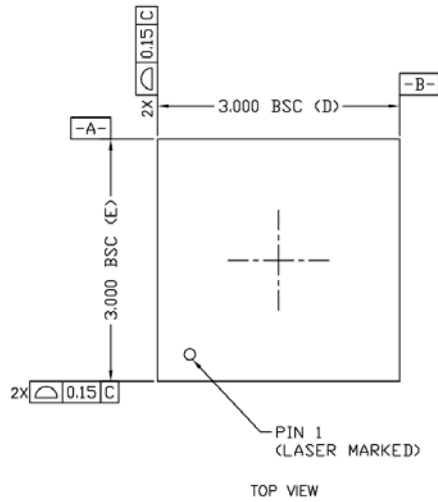


### Isolation



# HRF-SW1000

## PACKAGE OUTLINE DRAWING



SYMBOL	MIN	NOM	MAX
e	0.50 BSC		
b	0.18	0.25	0.30
E2	1.55	1.65	1.75
D2	1.55	1.65	1.75
L	0.35	0.40	0.45
INTERNAL FEATURE	FUSE LEAD		

### Notes

1. Pin 1 identifier can be a combination or a dot and/or chamfer.
2. Dimensions are in millimeters.

## GREEN MATERIAL SET

The -GR switches have a Green material set that can withstand a maximum soldering temperature of 260°C.

## LEAD FINISH

The package leads are Nickel Palladium Gold (NiPdAu). The configuration being manufactured and delivered today is lead-free RoHS compliant. Compliant packages have half-etch leadframes and have date codes of 0300 or greater.

## LEAD FREE QFN SURFACE MOUNT APPLICATION

Please see Application Note AN310 for assembly process recommendations. The maximum soldering temperature of the -GR is 260°C (-AU switches are 250 °C). Application Notes can be found at our website: [www.honeywell.com/microwave](http://www.honeywell.com/microwave)

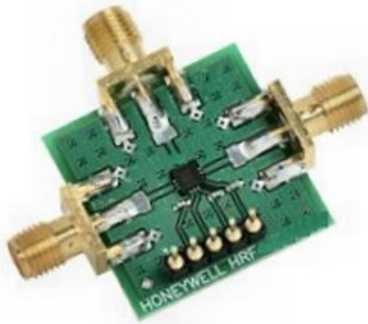
## CIRCUIT APPLICATION INFORMATION

These switches require a DC reference to ground. They may not operate properly when AC coupled on both the RF input and output without a DC ground reference provided as part of the circuit. See Application Note AN311.

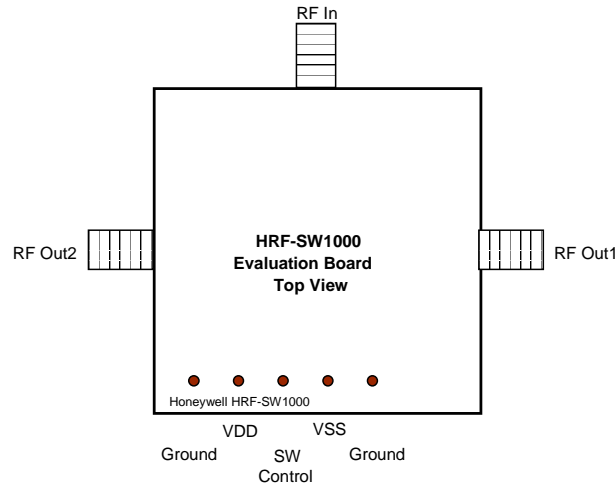
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## EVALUATION CIRCUIT BOARD

Honeywell's evaluation board provides an easy to use method of evaluating the RF performance of our switch. Simply connect power; DC and RF signals to be measuring switch performance in less than 10 minutes.



**HRF-SW1000 Evaluation Board**



## EVALUATION CIRCUIT BOARD LAYOUT DESIGN DETAILS

Item	Description
PCB	Impedance Matched Multi-Layer FR4
Switch	HRF-SW1000 RF Switch
Chip Capacitor	Panasonic Model ECU-E1C103KBQ Capacitor, .01uf 0402 10% 16V
RF Connector	Johnson Connectors Model 142-0701-801 SMA RF Coaxial Connector
DC Pin	Mil-Max Model 800-10-064-10-001 Header Pins

## ORDERING INFORMATION

Ordering Number	Delivery Method	Units Per Shipment
HRF-SW1000-GR-TR	Tape & Reel	2500 Units per Reel
HRF-SW1000-GR-T	Tape	< 2500
HRF-SW1000-E	Evaluation Board	One Board Per Box

The -AU switches are obsolete. The new -GR switches will replace and are fully back-compatible with the -AU switches.

## FIND OUT MORE

For more information on Honeywell's Microwave Products visit us online at [www.honeywell.com/microwave](http://www.honeywell.com/microwave) or contact us at 800-323-8295 (763-954-2474 internationally).

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