

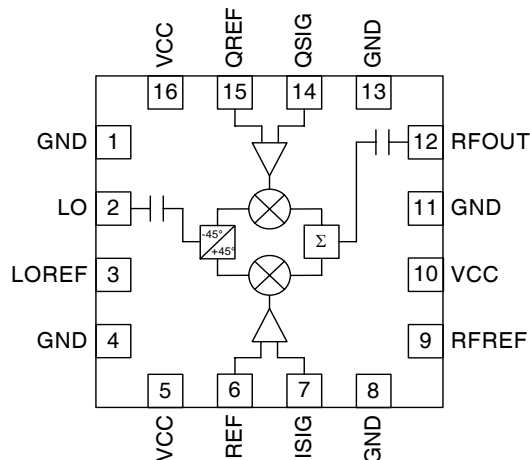
RoHS Compliant & Pb-Free Product  
Package Style: QFN, 16-Pin, 4x4

**Features**

- Typical Carrier Suppression >40dBc
- Typical Sideband Suppression >40dBc
- Noise Floor better than -158dBm/Hz
- Single 5V Power Supply

**Applications**

- UMTS Base Stations
- CDMA Base Stations
- GSM-EDGE/EGSM Base Stations
- WLAN and WLL Systems
- GMSK, QPSK, DQPSK, QAM Modulation



Functional Block Diagram

**Product Description**

The RF2850 is a direct quadrature modulator for use in base stations and other communications systems. RF2850 supports PCS, GSM, EDGE, CDMA2000, and UMTS standards. This device features a narrow-band operation at 1700MHz to 2500MHz with excellent carrier and sideband suppression and ultra low noise floor. The device is manufactured on an advanced GaAs HBT process. The RF2850 operates from a single 5V supply and is packaged in a low cost 4mmx4mm 16-pin leadless package.

**Ordering Information**

RF2850                      Direct Quadrature Modulator  
RF2850PCBA-41X        Fully Assembled Evaluation Board

**Optimum Technology Matching® Applied**

- |  |                                      |                                     |                                   |
|--|--------------------------------------|-------------------------------------|-----------------------------------|
| <input checked="" type="checkbox"/> GaAs HBT | <input type="checkbox"/> SiGe BiCMOS | <input type="checkbox"/> GaAs pHEMT | <input type="checkbox"/> GaN HEMT |
| <input type="checkbox"/> GaAs MESFET         | <input type="checkbox"/> Si BiCMOS   | <input type="checkbox"/> Si CMOS    |                                   |
| <input type="checkbox"/> InGaP HBT           | <input type="checkbox"/> SiGe HBT    | <input type="checkbox"/> Si BJT     |                                   |

RF MICRO DEVICES®, RFMD®, Optimum Technology Matching®, Enabling Wireless Connectivity™, PowerStar®, POLARIS™ TOTAL RADIO™ and UltimateBlue™ are trademarks of RFMD, LLC. BLUETOOTH is a trademark owned by Bluetooth SIG, Inc., U.S.A. and licensed for use by RFMD. All other trade names, trademarks and registered trademarks are the property of their respective owners. ©2006, RF Micro Devices, Inc.

## Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	-0.5 to +5.3	V
LO Input	+10	dBm
Operating Temperature	-40 to +85	°C
Storage Temperature	-65 to +150	°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.

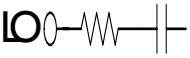
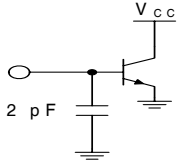
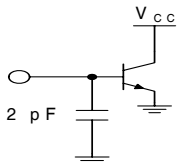
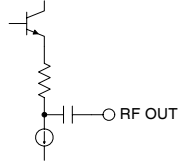
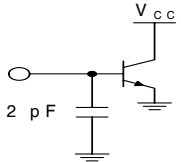
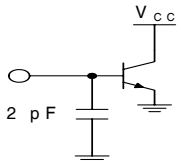
RoHS status based on EU Directive 2002/95/EC (at time of this document revision).

The information in this publication is believed to be accurate and reliable. However, no responsibility is assumed by RF Micro Devices, Inc. ("RFMD") for its use, nor for any infringement of patents, or other rights of third parties, resulting from its use. No license is granted by implication or otherwise under any patent or patent rights of RFMD. RFMD reserves the right to change component circuitry, recommended application circuitry and specifications at any time without prior notice.

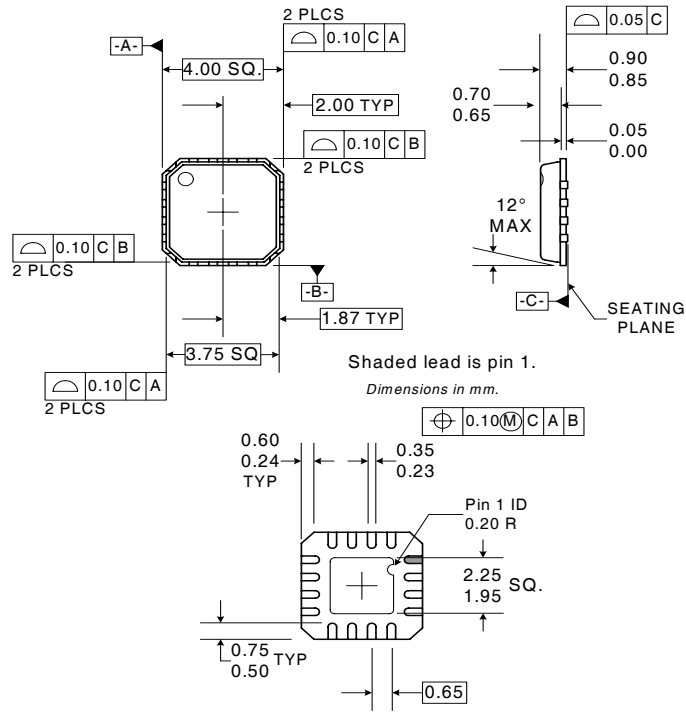
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>High Band Performance (1900MHz) with CW Baseband Inputs</b>					
<b>LO Input Port</b>					
LO Drive Level		-5		dBm	
LO Input Impedance		50		$\Omega$	
LO Port Return Loss		13		dB	
<b>Modulation Input</b>					
Frequency Range	DC		250	MHz	
Reference Voltage		2.05		V	Baseband common mode voltage
Baseband Input Level		0.25		V <sub>p,p</sub>	0.25V <sub>p,p</sub> per pin, 500mV V <sub>p,p</sub> differential, I/Q in quadrature
I/Q Signal		200		kHz	CW baseband signal
Input Impedance		40		k $\Omega$	Measured at DC
Bandwidth (-1dB)		130		MHz	500mV V <sub>p,p</sub> differential, I/Q at 2.05V DC
Input Bias Current			40	$\mu$ A	
<b>I/Q Modulator Output</b>					
RF Frequency Range	1700		2500	MHz	T = 25 °C, V <sub>CC</sub> = 5V
RF Output Power		-6		dBm	
RF Output Return Loss		15		dB	
RF Output P1dB	4	5		dBm	
Carrier Suppression	20	25		dBc	Unadjusted (see note)
Carrier Suppression	35	55		dBc	Adjusted. T = -40 °C to +85 °C
Sideband Suppression	30	45		dBc	Unadjusted
IM3 Suppression		52		dBc	Two tone baseband input @ 500mV <sub>p,p</sub> differential per tone
Output IP3	15	20		dBm	
Broadband Noise Floor		-158	-156	dBm/Hz	20MHz offset from LO, all IQ input at bias of 2.05V
<b>DC Parameters</b>					
Supply Voltage		5.0		V	Specification
	4.75		5.25	V	Operating limits
Supply Current		60		mA	

**Note:** 20dBc limit for unadjusted carrier suppression is applicable for differential I and Q inputs only.

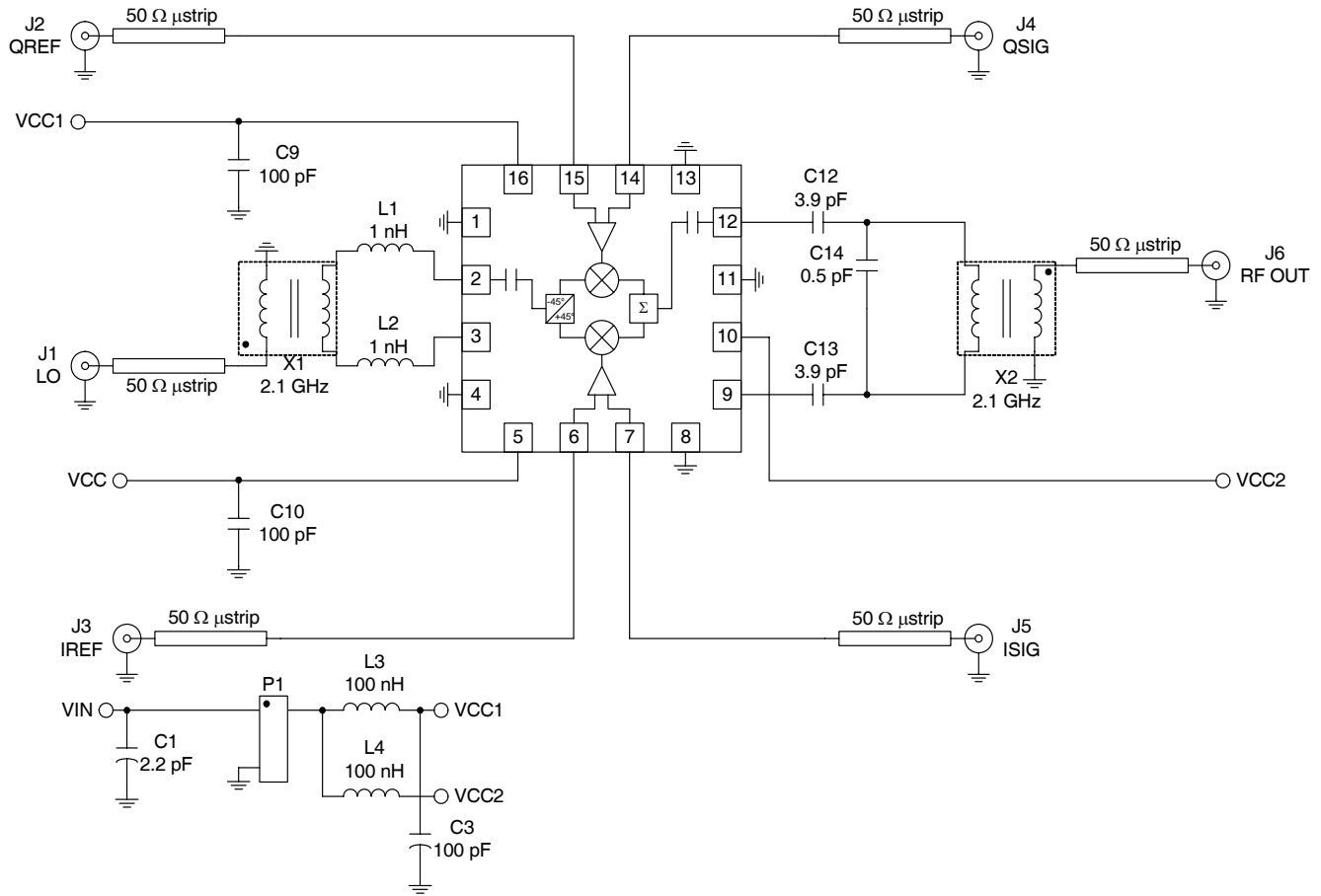
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>High Band Performance with PCS CDMA and W-CDMA Baseband Inputs</b>					
<b>W-CDMA 3GPP</b>					
Channel Power		-13		dBm	3.84MHz integrated bandwidth, ESG-D with LPF
ACPR @ 1960MHz		-68	-62	dBc	
SNR @ 1960MHz		-74	-70	dBc	
ACPR @ 2140MHz		-65	-62	dBc	
SNR @ 2140MHz		-74	-70	dBc	
Noise Floor @ 20MHz Offset		-156	-155	dBm/Hz	20MHz offset from LO
<b>PCS CDMA</b>					
Channel Power		-13		dBm	1.2288MHz integrated bandwidth
ACPR @ 1960MHz		-72	-70	dBc	30kHz integrated bandwidth
<b>W-CDMA 1MHz BW</b>					
Channel Power		-14		dBm	1MHz integrated bandwidth at adjacent channel
ACPR @ 2140MHz		-74	-71	dBc	
SNR @ 2140MHz		-85	-82	dBc	
Noise Floor @ 20MHz Offset		-157	-156	dBm/Hz	20MHz offset from LO

Pin	Function	Description	Interface Schematic
1	GND	Ground connection.	
2	LO	LO input signal. This pin has an internal DC-blocking capacitor. This port is voltage-driven so matching at different frequencies is generally not required.	
3	LOREF	The reference end of local oscillator.	
4	GND	Ground connection.	
5	VCC	Power supply. An external capacitor is required.	
6	I REF	Reference voltage for the I mixer. The DC voltage should be the same as the DC supplied to I SIG (pin 7). See pin 7 for more information.  The SIG and REF inputs are inputs of a differential amplifier. Therefore, the REF and SIG inputs are interchangeable. If swapping the I SIG and I REF pins, the Q SIG and Q REF also need to be swapped to maintain the correct phase. It is also possible to drive the SIG and REF inputs in a differential mode which will increase gain.	
7	I SIG	Baseband input to the I mixer. This pin is DC-coupled. The input drive level determines output power and linearity performance. For better carrier/sideband suppression and dynamic range, the drive level should be as high as possible to meet the required linearity performance. The recommended DC level for this pin is 2.05V.	
8	GND	Ground connection.	
9	RFREF	The reference end of RF input.	
10	VCC	Power supply. An external capacitor is required.	
11	GND	Ground connection.	
12	RF OUT	RF Output. This pin has an internal DC-blocking capacitor. At some frequencies, external matching may be needed to optimize output power.	
13	GND	Ground connection.	
14	Q SIG	Baseband input to the Q mixer. This pin is DC-coupled. The input drive level determines the output power and linearity performance. For better carrier/sideband suppression and dynamic range, the drive level should be as high as possible to meet the required linearity performance. The recommended DC level for this pin is 2.05V.	
15	Q REF	Reference voltage for the Q mixer. See pin 14 for more information.	
16	VCC	Power supply. An external capacitor is required.	
Pkg Base	GND	Ground connection.	

Package Drawing



## Evaluation Board Schematic 1700MHz to 2500MHz (Differential Drive)



**Evaluation Board Layout**  
**Board Size 2.00" x 2.00"**

**Board Thickness 0.042" (±10%), Board Material FR-4**

