

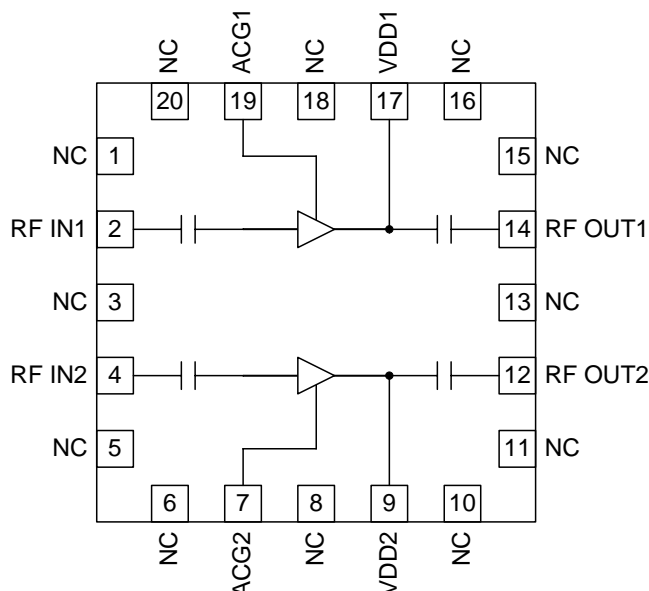


### Features

- Dual-Channel
- Low Noise and High Intercept Point
- Adjustable Bias Current for Enhanced IP3
- Single 2.5V to 6.0V Power Supply
- 700MHz to 3800MHz Operation
- Small QFN20 5mmx5mm Package

### Applications

- GSM900, CDMA, PCS, DCS, UMTS LNA\Driver
- WLAN LNA
- General Purpose Amplification



Functional Block Diagram

### Product Description

The RF3867 is a dual-channel version of the RF3863 with a low noise amplifier and a high output IP3. The amplifier is self-biased from a single voltage supply with 50Ω input and output ports. The useful frequency range is from 700MHz to 3800MHz. A 0.8dB noise figure and 36dBm OIP3 performance is achieved with a 5V  $V_{DD}$ , 180mA. Current can be increased to raise OIP3 while having minimal effect on noise figure. The IC is featured in a standard QFN, 20-pin, 5mmx5mm package.

### Ordering Information

RF3867	Dual-Channel, Wide Bandwidth, High Linearity Low Noise Amplifier
RF3867PCK-410	Fully Assembled Evaluation Board with 5 Sample Parts 1.5GHz to 2.7 GHz

### Optimum Technology Matching® Applied

<input type="checkbox"/> GaAs HBT	<input type="checkbox"/> SiGe BiCMOS	<input checked="" 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"/> RF MEMS
<input type="checkbox"/> InGaP HBT	<input type="checkbox"/> SiGe HBT	<input type="checkbox"/> Si BJT	<input type="checkbox"/> LDMOS

## Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	6V	V <sub>DC</sub>
Input RF Level	+10	dBm
Current Drain, I <sub>DD</sub>	150 per Channel	mA
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C

Note 1: Max continuous RF IN is +10dBm. The max transient RF IN is +20dBm.



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).

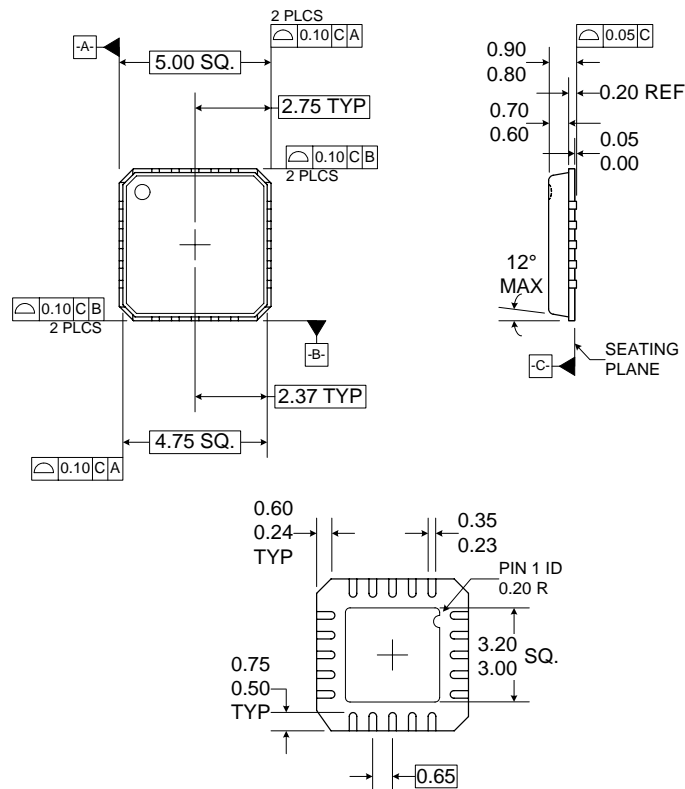
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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
High Band					
Frequency	3.3		3.8	GHz	
Current		180		mA	V <sub>DD</sub> =5V
Gain		10		dB	Temp=+25°C, V <sub>DD</sub> =5V, I <sub>DD</sub> =180mA, 3500MHz unless specified
Noise Figure		0.8		dB	
OIP3		36		dBm	f <sub>1</sub> =3500MHz, f <sub>2</sub> =3501MHz
OP1dB		21		dBm	
S11		-10		dB	
S22		-12		dB	
Mid Band					
Frequency	1500		2700	MHz	
Current		180		mA	V <sub>DD</sub> =5V
Gain	13.5	15.0	16.5	dB	+25°C, V <sub>DD</sub> =5V, I <sub>DD</sub> =180mA, 2000MHz unless specified
Noise Figure		0.8	1.1	dB	
OIP3	33.0	35.5		dBm	f <sub>1</sub> =2000MHz, f <sub>2</sub> =2001MHz
OP1dB	21.0	22.5	25.0	dBm	
S11		-10		dB	
S22		-14		dB	
Low Band					
Frequency	700		1100	MHz	
Current		180		mA	V <sub>DD</sub> =5V
Gain		18.5		dB	+25°C, V <sub>DD</sub> =5V, I <sub>DD</sub> =180mA, 850MHz unless specified
Noise Figure		1		dB	
OIP3		35		dBm	f <sub>1</sub> =850MHz, f <sub>2</sub> =851MHz
OP1dB		22		dBm	
S11		-10		dB	
S22		-10		dB	

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Thermal					
Theta <sub>JC</sub>		30		°C/W	Dissipated power=V <sub>DD</sub> *(I <sub>DD1</sub> + I <sub>DD2</sub> )
Power Supply					
Device Operating Voltage	2.5	5.0	6.0	V	
Operating Current	130	180	220	mA	V <sub>DD</sub> =5V, R2/R3=open

Pin	Function	Description	Interface Schematic
1	NC	Not connected.	
2	RF IN1	Channel 1 RF input pin. 50 $\Omega$ matched. This pin is DC-blocked.	
3	NC	Not connected.	
4	RF IN2	Channel 2 RF input pin. 50 $\Omega$ matched. This pin is DC-blocked.	
5	NC	Not connected.	
6	NC	Not connected.	
7	ACG2	Channel 2 AC ground. Shunt cap may be added for tuning. Shunt resistor may be added to increase I <sub>DD</sub> /IP3.	
8	NC	Not connected.	
9	VDD2	Channel 2 bias voltage. 2.5V to 6.0V applied through bias inductor.	
10	NC	Not connected.	
11	NC	Not connected.	
12	RF OUT2	Channel 2 RF output pin. 50 $\Omega$ matched. This pin is DC-blocked.	
13	NC	Not connected.	
14	RF OUT1	Channel 1 RF output pin. 50 $\Omega$ matched. This pin is DC-blocked.	
15	NC	Not connected.	
16	NC	Not connected.	
17	VDD1	Channel 1 bias voltage. 2.5V to 6.0V applied through bias inductor.	
18	NC	Not connected.	
19	ACG1	Channel 1 AC ground. Shunt cap may be added for tuning. Shunt resistor may be added to increase I <sub>DD</sub> /IP3.	
20	NC	Not connected.	
Pkg Base	GND	Ground connection.	

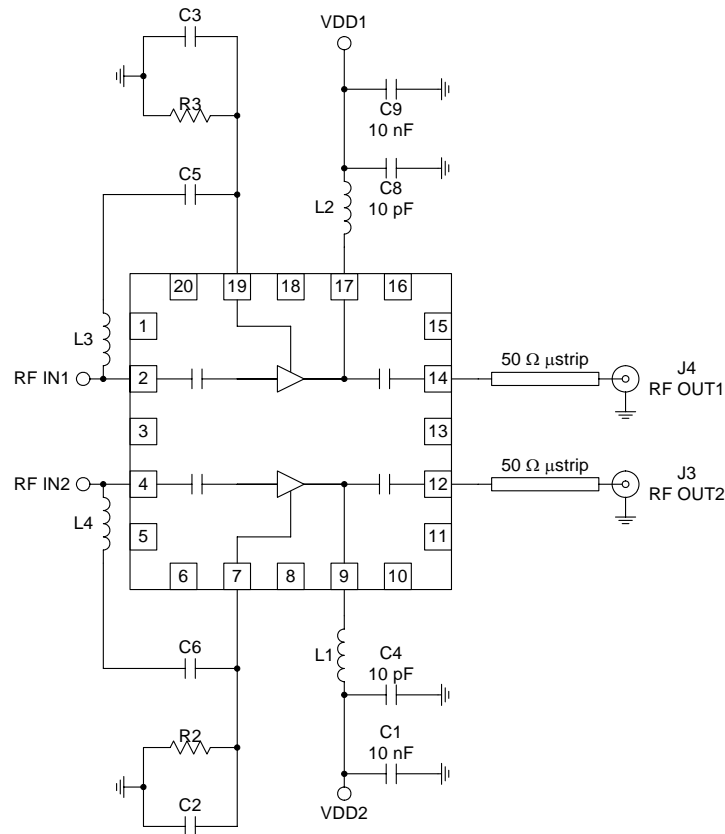
## Package Drawing



Dimensions in mm.

## Evaluation Board Schematic

700MHz to 1100MHz, 1500MHz to 2700MHz, and 3300MHz to 3800MHz



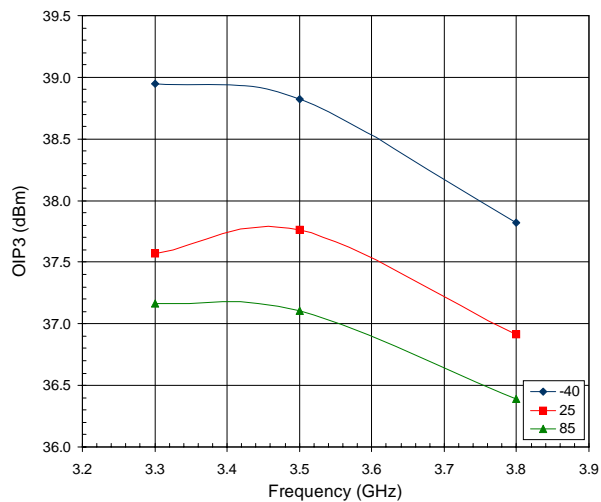
Component	High Band 3300 MHz to 3800 MHz	Mid Band 1500 MHz to 2700 MHz	Low Band 700 MHz to 1100 MHz
L1, L2 (nH)	1.5	12	56
L4, L3 (nH)	100 pF	100 pF	22
C5, C6 (pF)	12 nH	4.7 nH	100
C2, C3 (pF)	DNP	12	6.8
R2, R3 ( $\Omega$ )	DNP	DNP	DNP
R1 ( $\Omega$ )	0	0	0
			See note 1

R2 and R3 are DNP for typical 90 mA per channel current draw. If R2 or R3 is added, the channel  $I_{DD}$  will increase. A 20  $\Omega$  R2 or R3 will raise the current of a channel to achieve higher linearity.

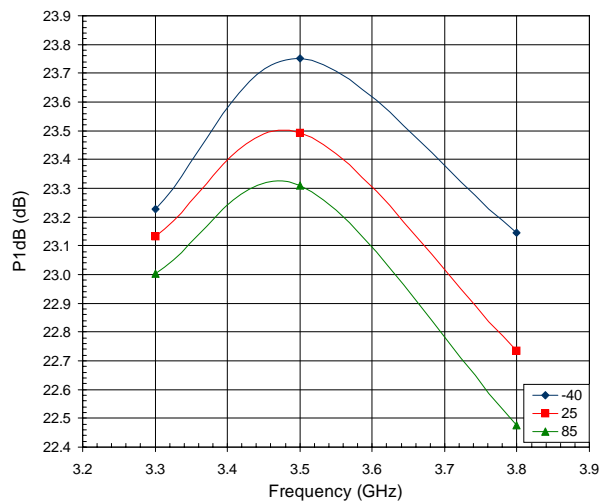
Note 1: For low band add a series 6.8 nH inductor on RF IN, and a shunt 15 nH inductor on RF OUT. Inductors should be placed as close as possible to the part.

Note 2: The topology of L3, L4, C5, and C6 in the mid and high bands. They must be as shown in the table.

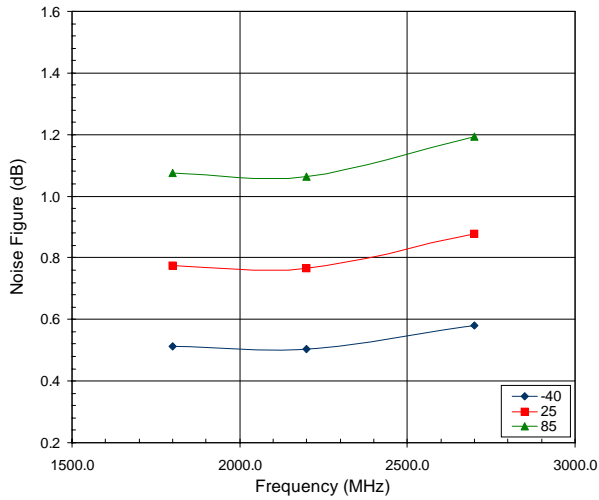
**5V OIP3 versus Temperature**



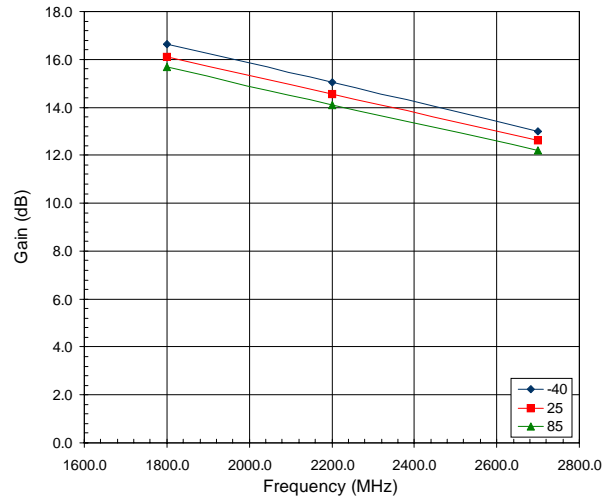
**5V P1dB versus Temperature**



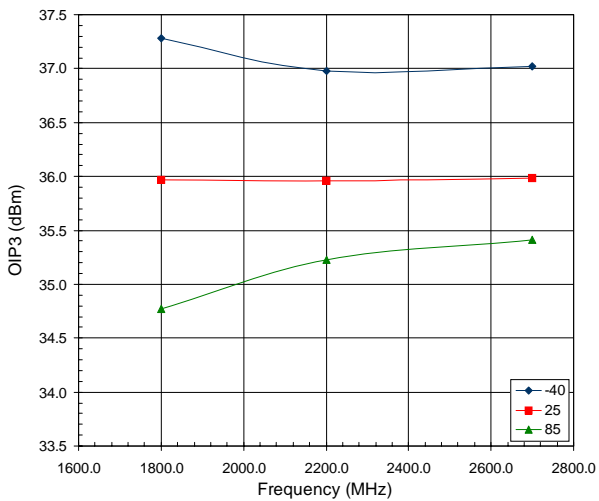
**5V Noise Figure versus Temperature**



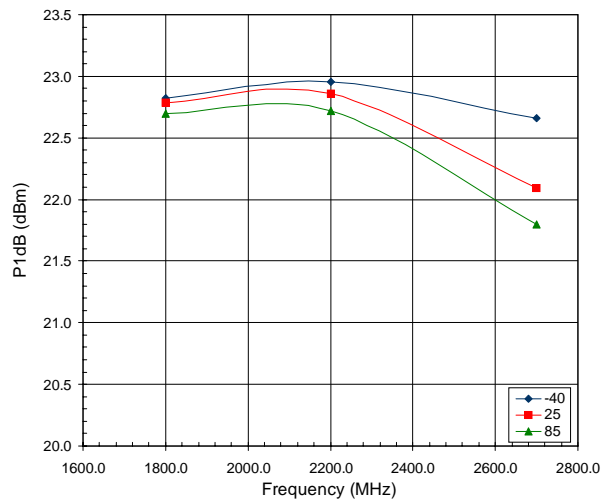
**5V Gain versus Temperature**



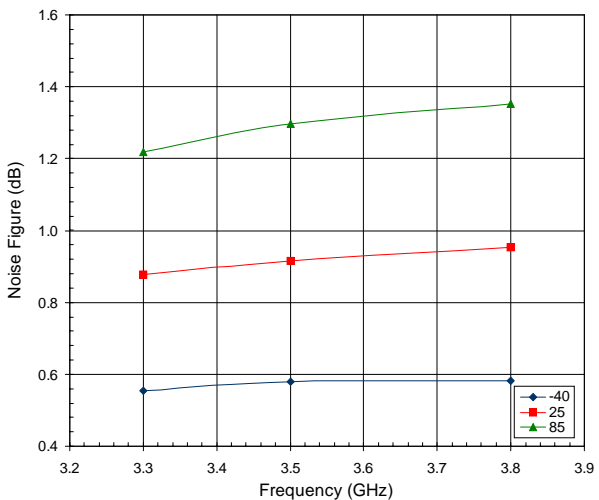
**5V OIP3 versus Temperature**



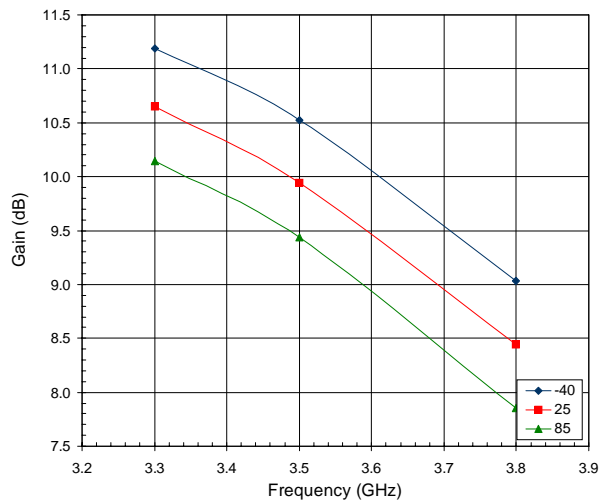
**5V P1dB versus Temperature**



**5V Noise Figure versus Temperature**



**5V Gain versus Temperature**





## Theory of Operation

Low noise figure/high IP3 make the RF3867 ideal for use as a dual channel receive LNA/transmit driver for cellular/DCS/PCS/UMTS and WiMax platforms in addition to many other general purpose applications. Standard evaluation boards cover 700MHz to 1100MHz, 1500MHz to 2700MHz, and 3300MHz to 3800MHz. RF3867 functions as a dual channel RF3863 equivalent.

Viewing the data sheet evaluation board schematic, refer to below for purpose/function of external components as they apply to each channel/path:

- L3/C5/C3 (L4/C6/C2): Placed to optimize input match and enhance out of band low frequency stability.
- R2 (R3): Optionally placed to increase bias current and IP3. 20 $\Omega$  value is found to be the best case (see graph section of the RF3863 data sheet).
- L2/C8 (L1/C4): Influence output return loss.

RF3867 has internal DC-blocking capacitors at the RFin/RFout. In addition, impedance has been shown to be seen looking out at pins 17/19 (7/9) influence response. As a result, two port s-parameters become non-applicable. In the event matching is desired for frequency bands outside of those provided with standard evaluation boards, the following approach can be used:

- Start with matching seen for standard evaluation board closest to desired band of operation.
- Optimize values at L3/C3/L2/C8 (L4/C2/L1/C4) to obtain response/performance.

