

# ROHS V

#### HMC962LC4

v03.0223

#### **Typical Applications**

This HMC962LC4 is ideal for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios

Functional Diagram

N/C

24

GND

GND

RFIN

GND

N/C

N/C

1

2

3

4

5

6

Vdd1

23

00

N/C

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N/C

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N/C

10

N/C

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N/C

(2)

N/C

N/C

22

Vdd2

2

N/C

19

(18

(17

16

(15

(14

(13

GND

GND

RFOUT

GND

N/C

N/C

PACKAGE BASE

GND

N/C

20

- Military & Space
- Test Instrumentation

#### GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 7.5 - 26.5 GHz

#### Features

Low Noise Figure: 2.5 dB Gain: 13 dB P1dB Output Power: 13 dBm Single Supply Voltage: +3.5V @ 70mA Output IP3: +23 dBm 50 Ohm matched Input/Output 24 Lead 4x4 mm SMT Package: 16mm<sup>2</sup>

#### **General Description**

The HMC962LC4 is a self-biased GaAs MMIC Low Noise Amplifier housed in a leadless 4x4 mm ceramic surface mount package. The amplifier operates between 7.5 and 26.5 GHz, providing 13 dB of small signal gain, 2.5 dB noise figure, and output IP3 of +23 dBm, while requiring only 70 mA from a +3.5 V supply. The P1dB output power of +13 dBm enables the LNA to function as a LO driver for balanced, I/Q or image reject mixers. The HMC962LC4 also features I/Os that are DC blocked and internally matched to 50 Ohms, making it ideal for high capacity microwave radios and VSAT applications.

#### Electrical Specifications, T = 125° C Vdd1 = Vdd2 = 125V Idd = 70 mA

$rectifical Specifications, T_A = +25 C, voot = vooz = +3.5v, too = 70 mA$										
Parameter	Min.	Тур.	Max.	Min.	Тур.	Max.	Min.	Тур.	Max.	Units
Frequency Range	7.5 - 10		10 - 24		24 - 26.5			GHz		
Gain	10	12		10	13		8	10		dB
Gain Variation over Temperature		0.027			0.024			0.024		dB / °C
Noise Figure <sup>[1]</sup>		2.5	3.7		2.5	3		2.7	3.7	dB
Input Return Loss		13			10			7		dB
Output Return Loss		10			12			11		dB
Output Power for 1 dB Compression		10			12			13		dBm
Saturated Output Power (Psat)		14			15			15		dBm
Output Third Order Intercept (IP3)		22			23			25		dBm
Supply Current (Idd) (Vdd = 3.5V)		70	95		70	95		70	95	mA

[1] Board loss subtracted out.

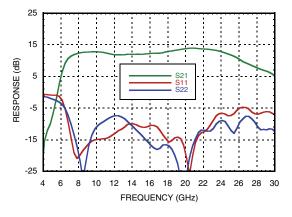
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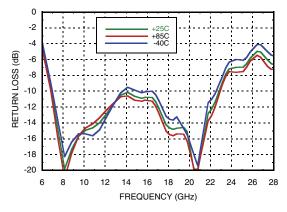
## HMC962LC4



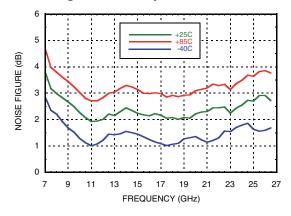
#### Broadband Gain & Return Loss



Input Return Loss vs. Temperature



Noise Figure vs. Temperature [1]



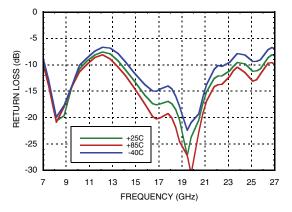
[1] Board loss subtracted out.

GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 7.5 - 26.5 GHz

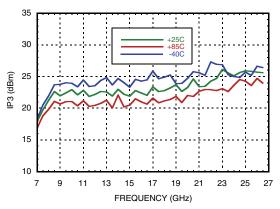
#### 18 16 14 GAIN (dB) 12 10 8 +850 40C 6 9 19 21 25 27 11 13 15 17 23 7 FREQUENCY (GHz)

Gain vs. Temperature

#### Output Return Loss vs. Temperature



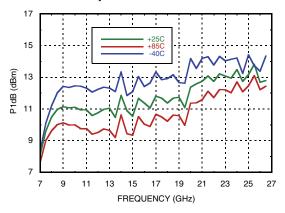
#### Output IP3 vs. Temperature



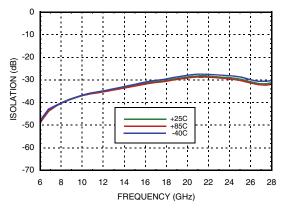




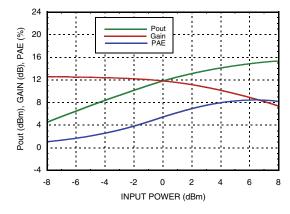
#### P1dB vs. Temperature



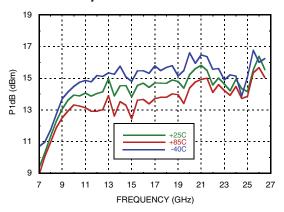
**Reverse Isolation vs. Temperature** 



Power Compression @ 17 GHz



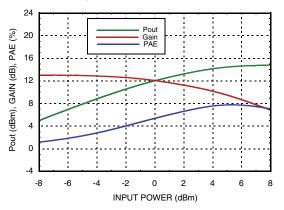
Psat vs. Temperature



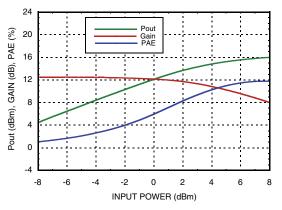
GaAs pHEMT MMIC LOW NOISE

AMPLIFIER, 7.5 - 26.5 GHz

#### Power Compression @ 10 GHz



Power Compression @ 24 GHz



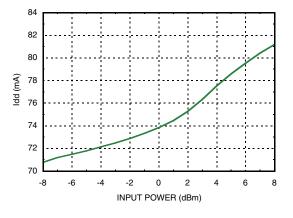
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**Outline Drawing** 



#### Current vs. Input Power @ 17 GHz



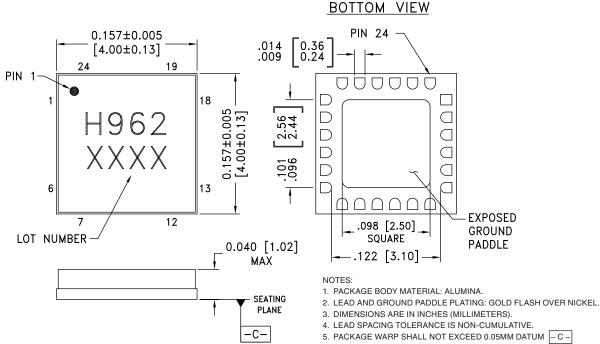
#### GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 7.5 - 26.5 GHz

#### Absolute Maximum Ratings

Drain Bias Voltage	+4V	
RF Input Power	+10 dBm	
Channel Temperature	150 °C	
Continuous Pdiss (T = 85 °C) (derate 5.97 mW/°C above 85 °C)	0.39 W	
Thermal Resistance (Channel to ground paddle)	167.6 °C/W	
Storage Temperature	-65 to +150 °C	
Operating Temperature	-40 to +85 °C	
ESD Sensitivity (HBM)	Class 1A	



ELECTROSTATIC SENSITIVE DEVICE OBSERVE HANDLING PRECAUTIONS



#### 6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

#### **Package Information**

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking <sup>[2]</sup>	
HMC962LC4	Alumina, White	Gold over Nickel	MSL3 <sup>[1]</sup>	H962 XXXX	
[1] Max peak reflow te	mperature of 260 °C				

[2] 4-Digit lot number XXXX

# AMPLIFIERS - LOW NOISE - SM1

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# HMC962LC4

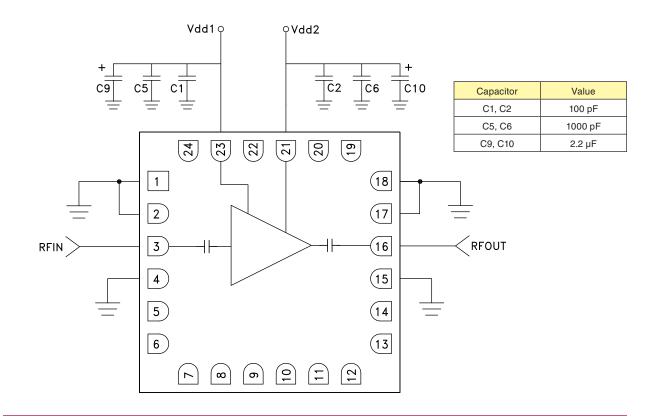


#### GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 7.5 - 26.5 GHz

#### **Pin Descriptions**

Pin Number	Function	Description	Interface Schematic
1, 2, 4, 15, 17, 18	GND	These pins and package bottom must be connected to RF/DC ground.	
3	RFIN	This pin AC coupled and matched to 50 Ohms	
5 - 14, 19, 20, 22, 24	N/C	No connection necessary. These pins may be connected to RF/DC ground. Performance will not be affected.	
16	RFOUT	This pin AC coupled and matched to 50 Ohms	
21, 23	Vdd1, Vdd2	Power supply voltages for the amplifier. Bypass capacitors are required. See application circuit herein.	Vdd1,2

#### **Application Circuit**



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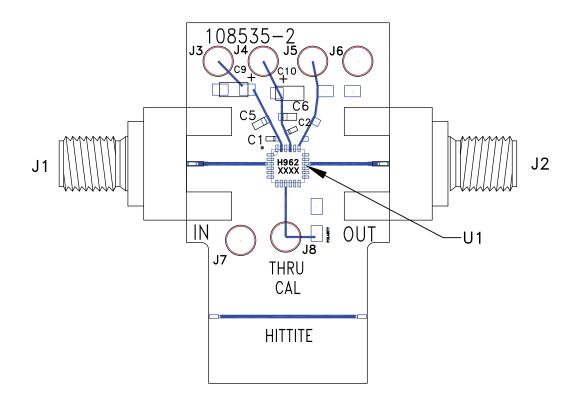


## HMC962LC4

#### GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 7.5 - 26.5 GHz



#### **Evaluation PCB**



#### List of Material for Evaluation PCB EVAL01-HMC962LC4 [1]

Item	Description
J1, J2	2.92 mm Connectors
J3 - J8	DC Pin
C1, C2	100 pF Capacitor, 0402 Pkg.
C5, C6	1000 pF Capacitor, 0603 Pkg.
C9, C10	2.2 µF Capacitor, Tantalum
U1	HMC962LC4 Amplifier
PCB [2]	108535 Evaluation PCB

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350 or Arlon 25FR

The circuit board used in this application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Analog Devices upon request.