HMC597LP4 / 597LP4E

SiGe WIDEBAND DIRECT DEMODULATOR RFIC, 100 - 4000 MHz

Typical Applications

The HMC597LP4 / HMC597LP4E is suitable for various modulation systems:

- Cellular/PCS/3G
- Base Stations & Repeaters
- GSM/GPRS, WCDMA & TD-SCDMA
- WiMAX, WiBro & Fixed Wireless

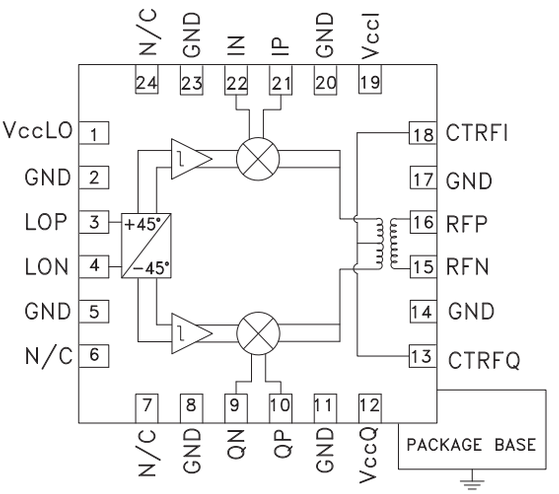
Features

High Linearity: +25 dBm IIP3 & +60 dBm IIP2

Low Noise Figure: 15 dB

High Integration: On-Chip RF Balun

Functional Diagram



General Description

The HMC597LP4(E) are highly integrated SiGe wideband direct conversion I/Q Demodulator RFICs which are ideal for high dynamic range receivers operating from 100 - 4000 MHz in cellular and broadband wireless infrastructure applications. Providing a very high level of integration compared with discrete solutions, the HMC597LP4(E) features an on-chip RF balun which allows for singled ended RF input. An off-chip capacitor allows the reconfiguration of the RF port to operate over the whole 100 - 4000 MHz band without additional off-chip components. Also ideal for software radio and other multi-band receivers, the HMC597LP4(E) demodulator is housed in a compact 4 x 4 mm SMT QFN package and delivers exceptionally high dynamic range. The LO requires -6 to +6 dBm and can be driven in single-ended mode. The I and Q output ports are differential with an output impedance of 400 Ohms, allowing direct connection to channel filters and ADCs. This device is optimized for a supply voltage of +4.5V to +5.5V and consumes 200 mA @ +5V supply.

Electrical Specifications, *See Test Conditions on following page herein.*

Parameter	Min.	Typ.	Max.	Units
RF Input Frequency (Direct LO)		0.1 - 4.0		GHz
Input P1dB		12		dBm
SSB Noise Figure		15		dB
Input IP3		+25		dBm
Input IP2		+60		dBm
Conversion Gain		-3.5		dB
LO to RF Leakage @ +3 dBm LO		-66		dBm
IF Port Bandwidth		600		MHz
IF Output Impedance (Diff.)		400		Ohms
LO Input Power		-6 to +6		dBm
LO/RF Return Loss		12/12		dB
Total Supply Current		200	230	mA

DC Test Conditions [1]

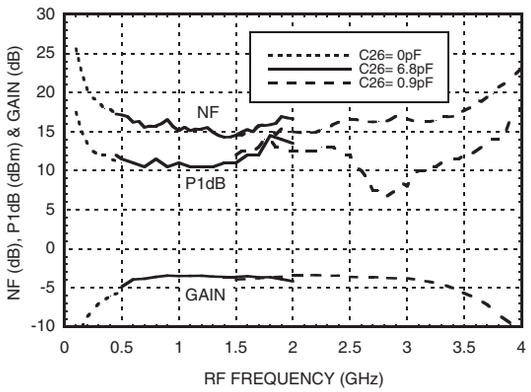
Parameter	Condition
Temperature	25 °C
Supply	200mA @ +5V

[1} Unless otherwise specified, the following test conditions were used. Please refer to the HMC597LP4(E) application schematic.

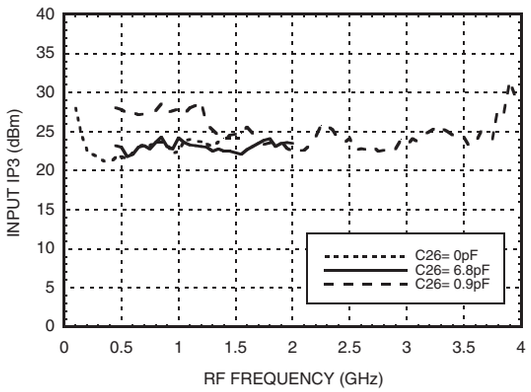
AC Test Conditions [1]

Parameter	Condition
RF Input Frequency	1970 MHz
RF Input Frequency for IIP3	1970 & 1971 MHz
RF Input Power for IIP3	0 dBm per Tone
LO Frequency	1960 MHz
LO Input Power	0 dBm single ended through LOP

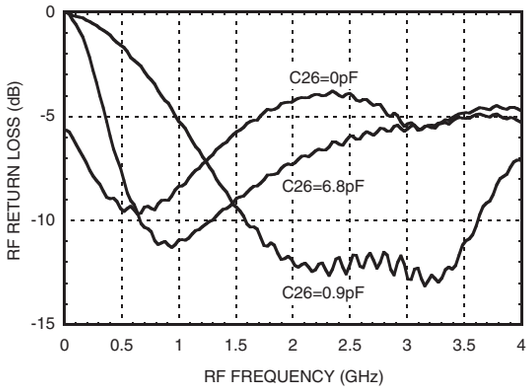
P1dB, Noise Figure, Gain vs. Frequency [1]



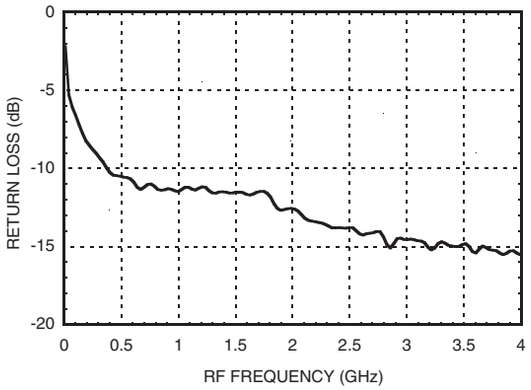
Input IP3 vs. Frequency [1]



RF Return Loss vs. Frequency

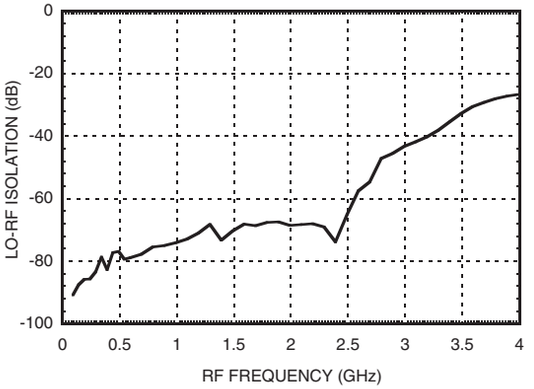


LO & Return Loss vs. Frequency

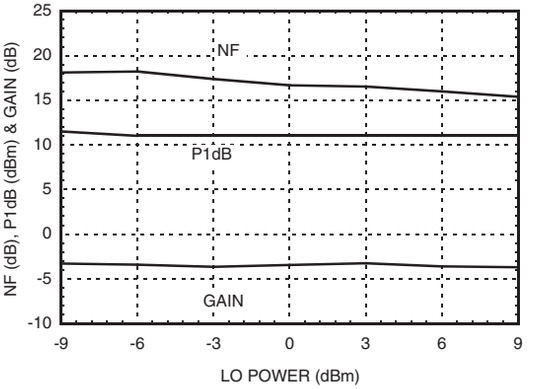


[1] IF Frequency= 10 MHz

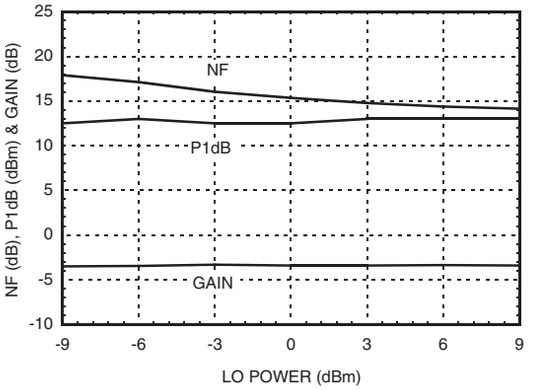
LO - RF Isolation vs. Frequency



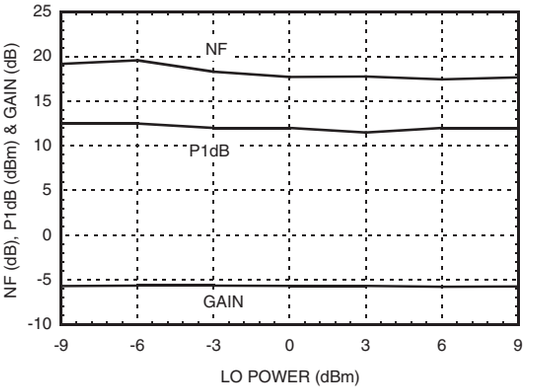
Noise Figure, P1dB, Gain @ 900 MHz vs. LO Power [1]



Noise Figure, P1dB, Gain @ 1970 MHz vs. LO Power [1]



Noise Figure, P1dB, Gain @ 3500 MHz vs. LO Power [1]



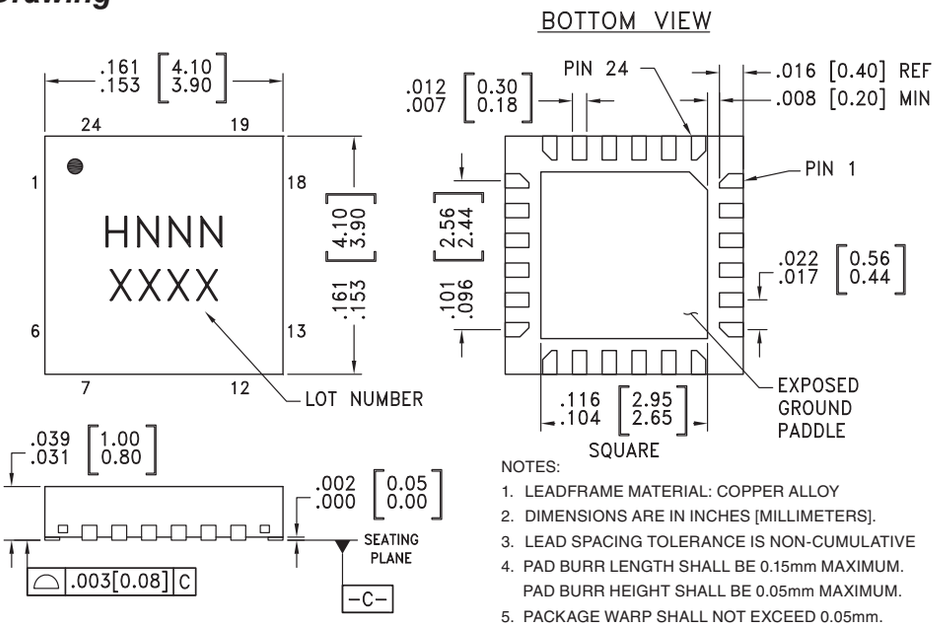
[1] IF Frequency= 10 MHz

Absolute Maximum Ratings

Vcc1, Vcc2	+6V
LO Input Power	+12 dBm
Channel Temperature	150 °C
Continuous Pdiss (T = 85°C) (Derate 30 mW/°C above 85°C)	2 Watts
Thermal Resistance (R_{th}) (junction to lead)	36
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:

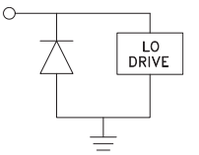
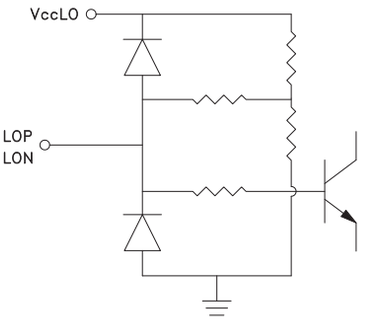
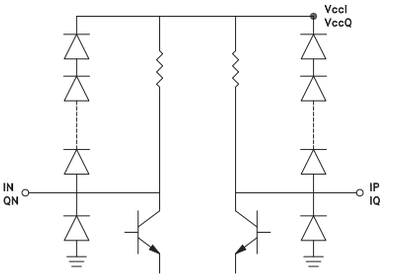
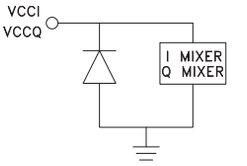
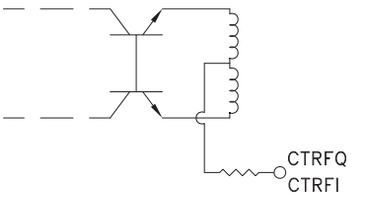
1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS].
3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
7. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED PCB LAND PATTERN.

Package Information

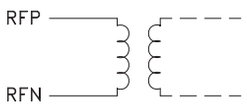
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC597LP4	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	H597 XXXX
HMC597LP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	H597 XXXX

[1] Max peak reflow temperature of 235 °C
[2] Max peak reflow temperature of 260 °C
[3] 4-Digit lot number XXXX

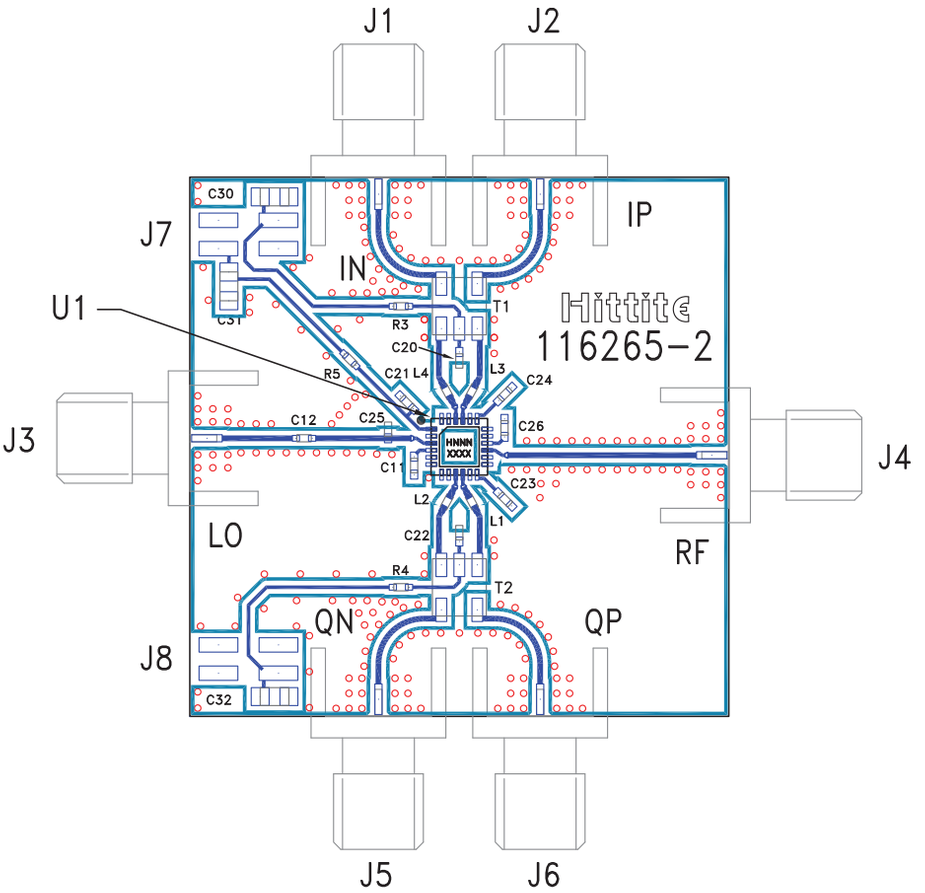
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1	VccLO	Supply for LO Amplifier. Typically draws 109mA @ 2.8V.	
2, 5, 8, 11, 12, 14, 17, 19, 20, 23	GND	These pins and the ground paddle should be connected to a high quality RF/DC ground.	
3	LOP	LO input. Need a DC decoupling capacitor. Typically at 1.5 - 1.8 VDC.	
4	LON	This pin should be AC grounded. Also can be used to optimize the IP2 performances	
6, 7, 24	N/C	Not Connected	
9, 10 21, 22	QN, QP IP, IN	Differential baseband outputs. 400 Ohms differential output impedance. Each port should draw 38 mA @ 3.5V.	
12, 19	VccQ, VccI	Decoupling for the Q and I mixer stages.	
13, 18	CTRFQ, CTRFI	Center tap of the RF transformer. Should be connected to a high quality RF/DC ground.	

Pin Descriptions (Continued)

Pin Number	Function	Description	Interface Schematic
15	RFN	RF Input.	
16	RFP	Can be DC or RF grounded. This pin is used to match the RF port over the desired frequency range. Also can be used to drive the RF port differentially if needed.	

Evaluation PCB



Evaluation PCB 115775 [1][2]

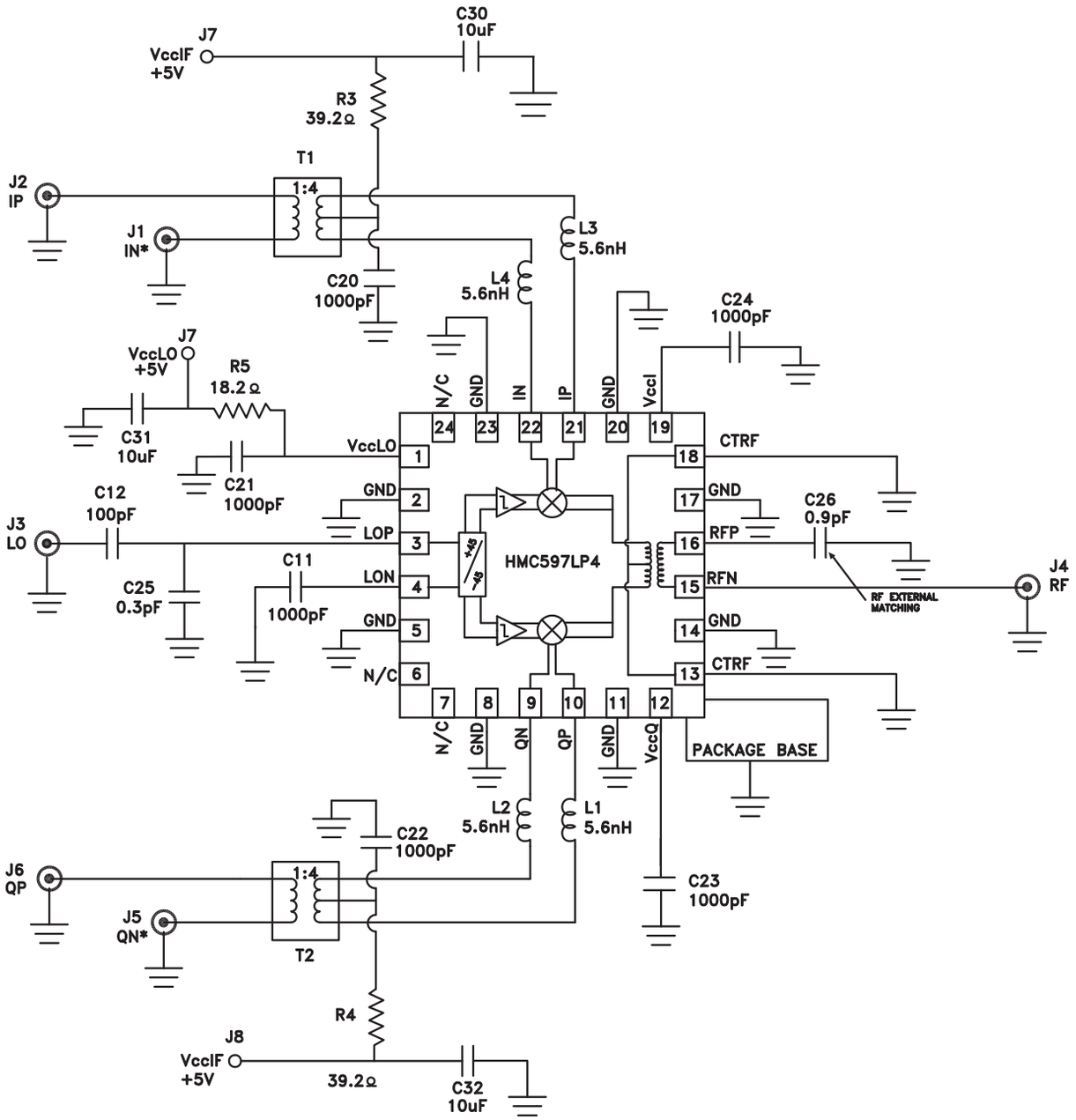
Item	Description
J1 - J6	PCB Mount SMA Connector
J7, J8	2 mm DC Header
C11, C20 - C24	1000 pF Capacitor, 0402 Pkg.
C12	100 pF Capacitor, 0402 Pkg.
C25	0.3 pF Capacitor, 0402 Pkg.
C26	0.9 pF Capacitor, 0402 Pkg.
C30 - C32	0.1 µF Capacitor, 0805 Pkg.
R3, R4	39.2 Ohm Resistor, 0402 Pkg.
R5	18.2 Ohm Resistor, 0402 Pkg.
L1 - L4	5.6 nH Inductor, 0402 Pkg.
T1, T2	2 - 800 MHz Balun
U1	HMC597LP3 / HMC597LP3E Direct Demodulator
PCB [2]	116265 Evaluation PCB

[1] Reference this number when ordering complete evaluaiton PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the final 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 circuit board shown is available from Hittite upon request.

Application & Evaluation PCB Schematic



* Short to ground for single ended mode.