ANALOG DEVICES

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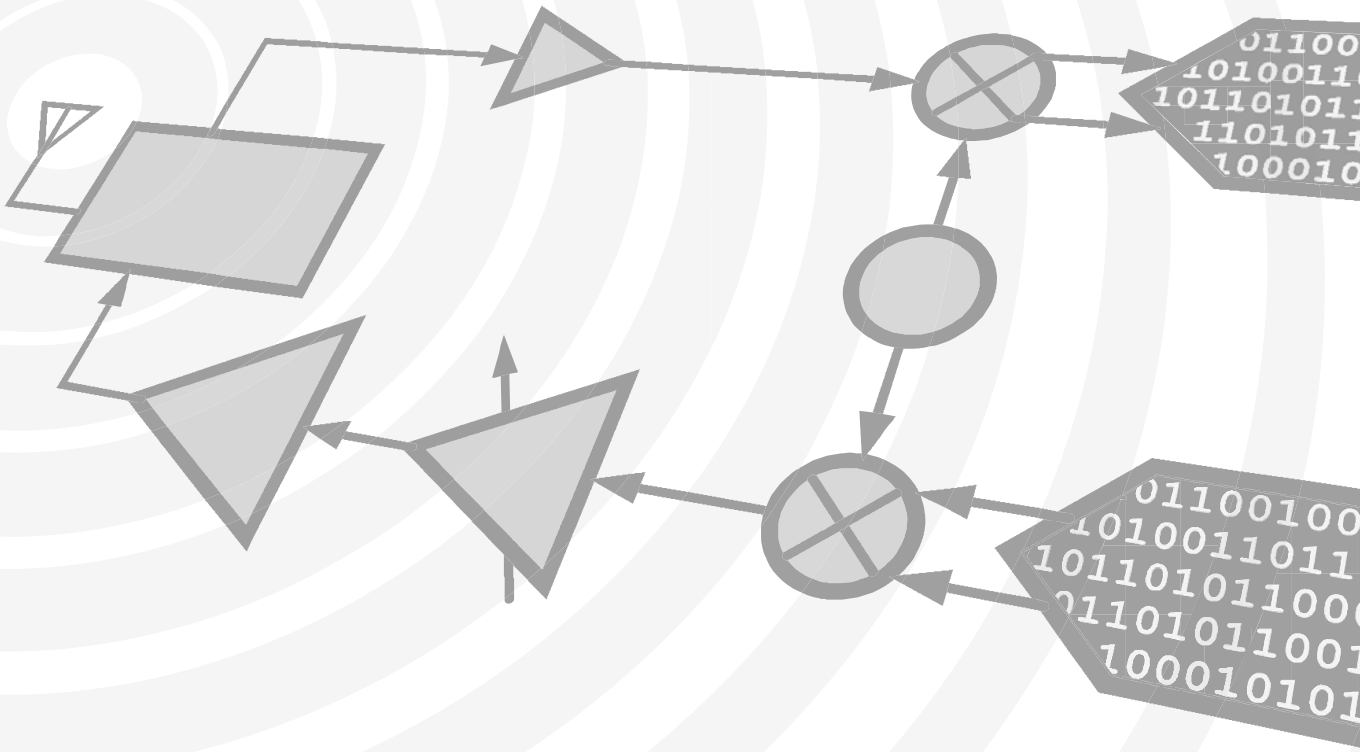
Analog Devices Welcomes Hittite Microwave Corporation

NO CONTENT ON THE ATTACHED DOCUMENT HAS CHANGED



www.analog.com

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HMC391* Product Page Quick Links

Last Content Update: 08/30/2016

Comparable Parts

View a parametric search of comparable parts

Evaluation Kits

- HMC391LP4 Evaluation Board

Documentation

Data Sheet

- HMC391 Data Sheet

Reference Materials

Quality Documentation

- Package/Assembly Qualification Test Report: LP4, LP4B, LP4C, LP4K (QTR: 2013-00487 REV: 04)
- Package/Assembly Qualification Test Report: Plastic Encapsulated QFN (QTR: 05006 REV: 02)
- Semiconductor Qualification Test Report: GaAs HBT-A (QTR: 2013-00228)

Design Resources

- HMC391 Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

Discussions

View all HMC391 EngineerZone Discussions

Sample and Buy

Visit the product page to see pricing options

Technical Support

Submit a technical question or find your regional support number

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HMC391LP4 / 391LP4E

MMIC VCO w/ BUFFER AMPLIFIER, 3.9 - 4.45 GHz

Typical Applications

Low noise MMIC VCO w/Buffer Amplifier for:

- VSAT & Microwave Radio
- Radio Altimetry
- Test Equipment & Industrial Controls
- Military

Features

Pout: +5.0 dBm

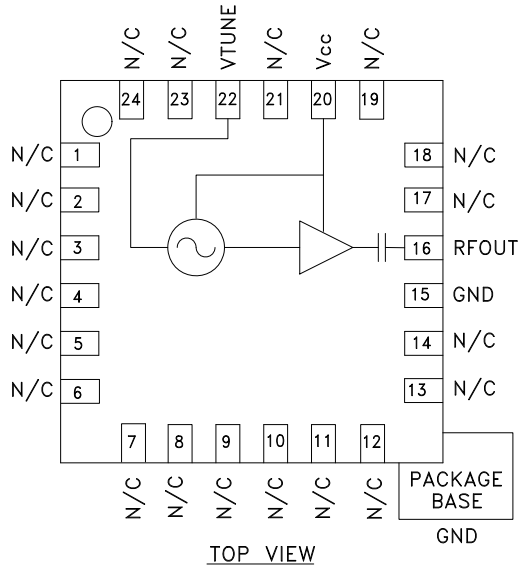
Phase Noise: -106 dBc/Hz @100 KHz

No External Resonator Needed

Single Supply: +3V @ 30 mA

24 Lead 4x4mm QFN Package: 9 mm^2

Functional Diagram



General Description

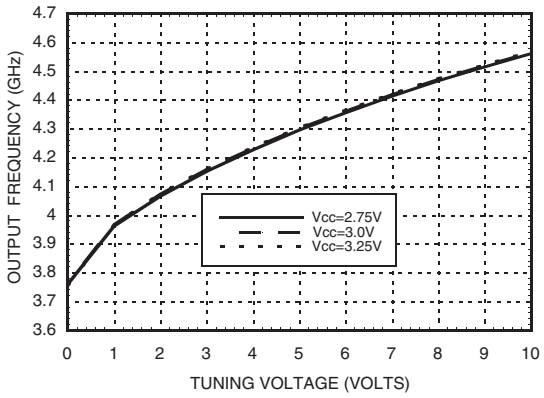
The HMC391LP4 & HMC391LP4E are GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCOs with integrated resonators, negative resistance devices, varactor diodes, and buffer amplifiers. Covering 3.9 to 4.45 GHz, the VCO's phase noise performance is excellent over temperature, shock, vibration and process due to the oscillator's monolithic structure. Power output is 5.0 dBm typical from a single supply of +3V @ 30 mA. The voltage controlled oscillator is packaged in a low cost leadless QFN 4 x 4 mm surface mount package.

Electrical Specifications, T_A = +25° C, Vcc = +3V

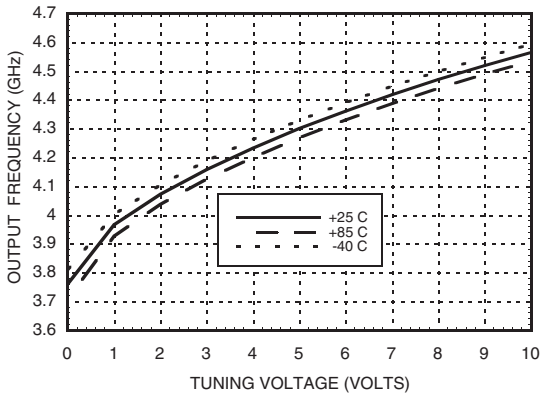
Parameter	Min.	Typ.	Max.	Units
Frequency Range		3.9 - 4.45		GHz
Power Output	1.5	5.0		dBm
SSB Phase Noise @ 100 kHz Offset, Vtune= +5V @ RF Output		-106		dBc/Hz
Tune Voltage (Vtune)	0		10	V
Supply Current (Icc) (Vcc = +3V)		30	40	mA
Tune Port Leakage Current			10	µA
Output Return Loss		7		dB
Harmonics 2nd 3rd		 -9 -23		 dBc dBc
Pulling (into a 2.0:1 VSWR)		8.0		MHz pp
Pushing @ Vtune= +5V		16		MHz/V
Frequency Drift Rate		0.5		MHz/°C

For price, delivery, and to place orders, please contact Hittite Microwave Corporation:
20 Alpha Road, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
Order On-line at www.hittite.com

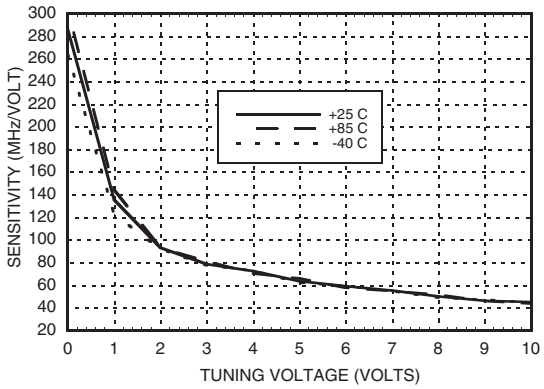
Frequency vs. Tuning Voltage, T= 25°C



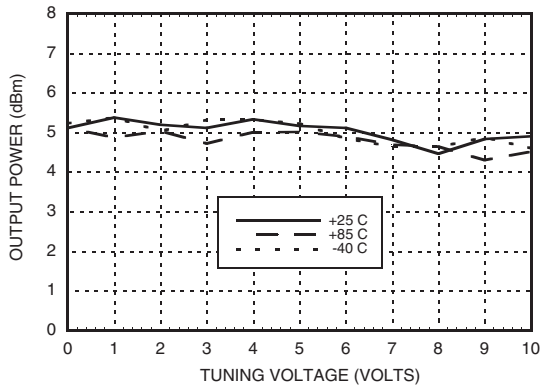
Frequency vs. Tuning Voltage, Vcc= +3V



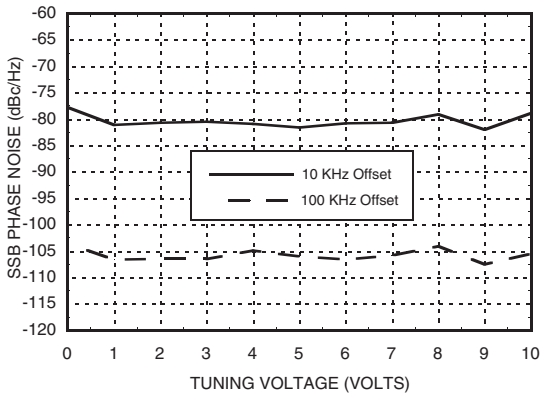
Sensitivity vs. Tuning Voltage, Vcc= +3V



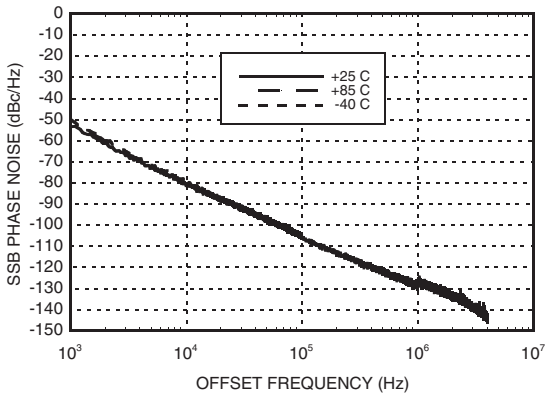
Output Power vs. Tuning Voltage, Vcc= +3V



Phase Noise vs. Tuning Voltage



Typical SSB Phase Noise @ Vtune= +5V



Absolute Maximum Ratings

Vcc	+3.5 Vdc
Vtune	0 to +11V
Channel Temperature	135 °C
Continuous Pdiss (T = 85°C) (derate 3 mW/°C above 85°C)	150 mW
Thermal Resistance (junction to ground paddle)	333 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

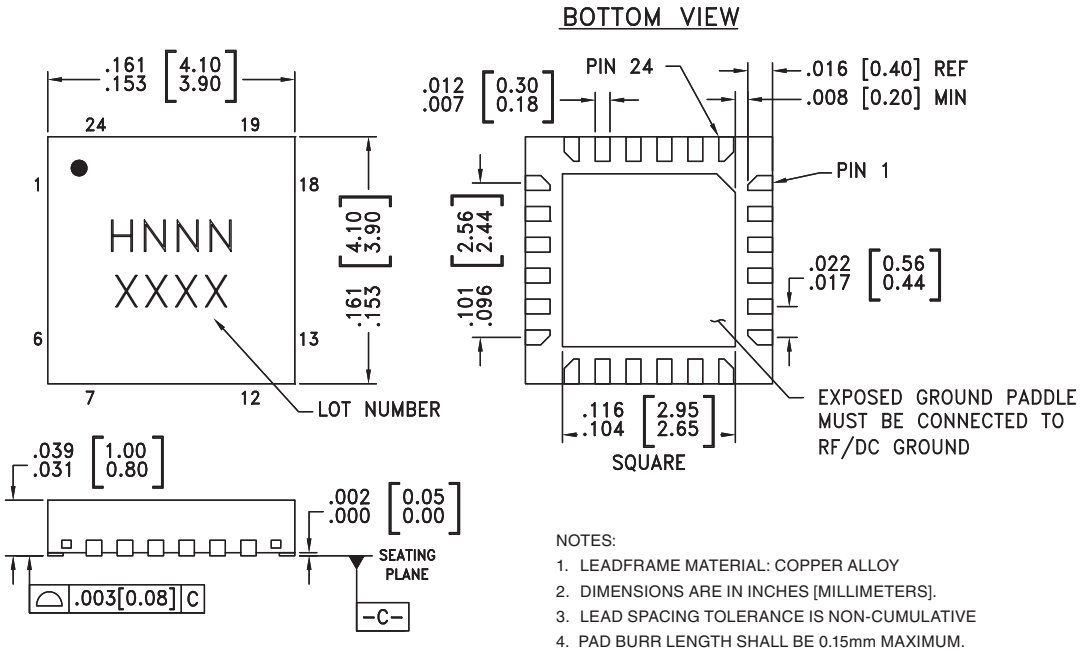
Typical Supply Current vs. Vcc

Vcc (V)	Icc (mA)
2.75	22
3.0	30
3.25	39

Note: VCO will operate over full voltage range shown above.

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 SOLERED 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]
HMC391LP4	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	H391 XXXX
HMC391LP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	H391 XXXX

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

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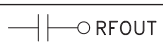
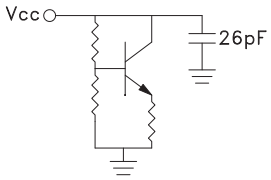
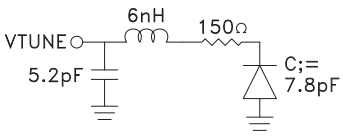
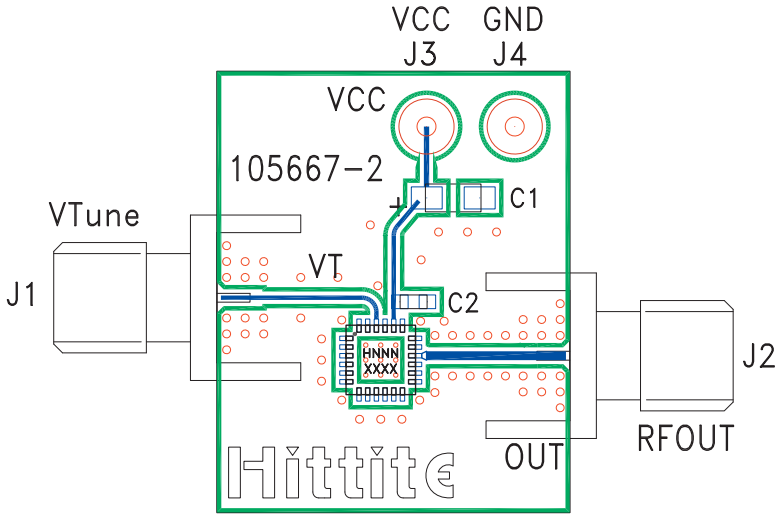
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1- 14, 17 - 19, 21, 23, 24	N/C	No Connection	
15	GND	This pin must be connected to RF & DC ground. Package bottom has an exposed metal paddle that must be RF & DC grounded.	
16	RFOUT	RF output (AC coupled)	
20	Vcc	Supply Voltage Vcc= 3V	
22	VTUNE	Control Voltage Input. Modulation port bandwidth dependent on drive source impedance.	

Evaluation PCB



List of Materials for Evaluation PCB 105706 [1]

Item	Description
J1 - J2	PCB Mount SMA RF Connector
J3 - J4	DC Pin
C1	4.7 µF Tantalum Capacitor
C2	10,000 pF Capacitor, 0603 Pkg.
U1	HMC391LP4 / HMC391LP4E VCO
PCB [2]	105667 Eval Board

[1] Reference this number when ordering complete evaluation 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.