



HMC416LP4 / 416LP4E

MMIC VCO w/ BUFFER AMPLIFIER, 2.75 - 3.0 GHz



Typical Applications

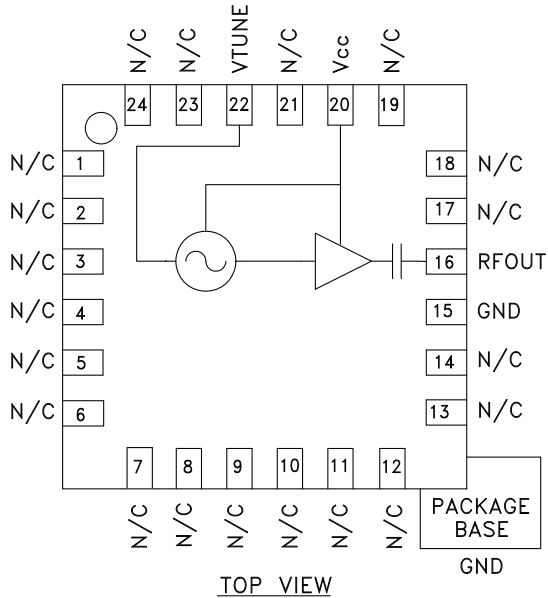
Low noise MMIC VCO w/Buffer Amplifier for:

- Wireless Infrastructure
- Industrial Controls
- Test Equipment
- Military

Features

- Pout: +4.5 dBm
- Phase Noise: -114 dBc/Hz @100 k Hz
- No External Resonator Needed
- Single Supply: 3V @ 37 mA
- QFN Leadless SMT Package, 16 mm²

Functional Diagram



General Description

The HMC416LP4 & HMC416LP4E are GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCOs with integrated resonators, negative resistance devices, varactor diodes, and buffer amplifiers. Covering 2.75 to 3.0 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 4.5 dBm typical from a single supply of 3V @ 37 mA. The voltage controlled oscillator is packaged in a low cost leadless QFN 4 x 4 mm surface mount package.

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VCOs & PLOS - SMT

Electrical Specifications, $T_A = +25^\circ C$, $V_{cc} = +3V$

Parameter	Min.	Typ.	Max.	Units
Frequency Range		2.75 - 3.0		GHz
Power Output	1.5	4.5		dBm
SSB Phase Noise @ 100 kHz Offset, Vtune= +5V @ RF Output		-114		dBc/Hz
Tune Voltage (Vtune)	0		10	V
Supply Current (Icc) (Vcc = +3.0V)		37		mA
Tune Port Leakage Current			10	μA
Output Return Loss		9		dB
Harmonics				
2nd		-5		dBc
3rd		-16		dBc
Pulling (into a 2.0:1 VSWR)		3		MHz pp
Pushing @ Vtune= +5V		-1		MHz/V
Frequency Drift Rate		0.3		MHz/ $^\circ C$

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

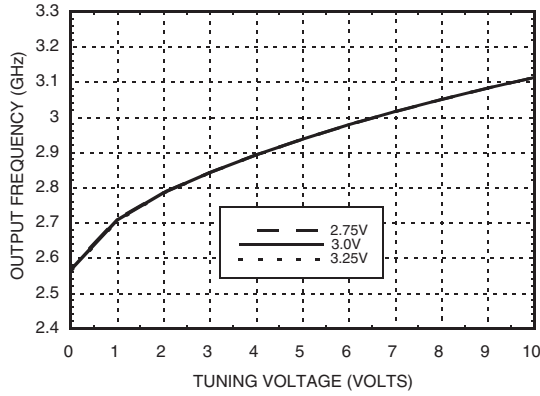
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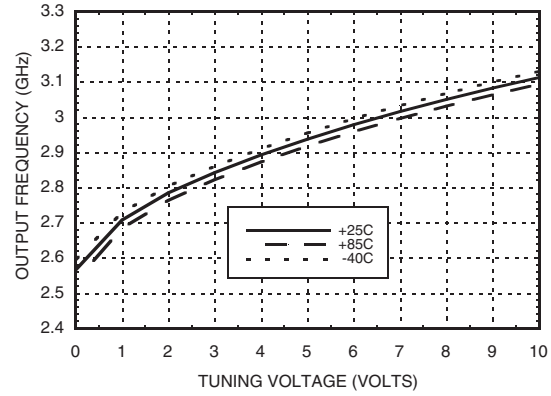
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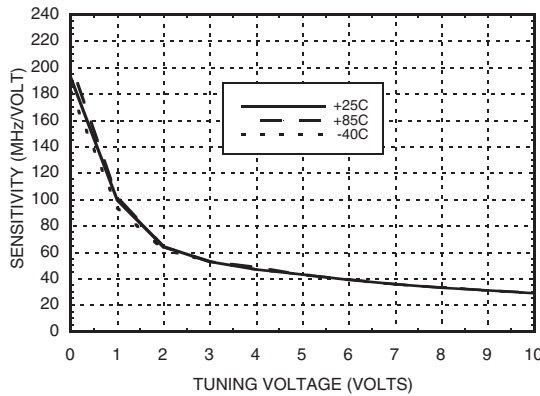
Frequency vs. Tuning Voltage, $T = 25^{\circ}\text{C}$



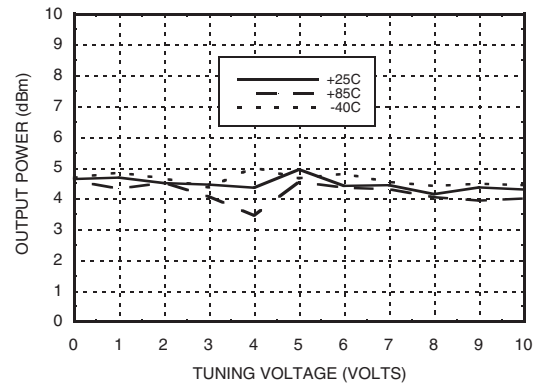
Frequency vs. Tuning Voltage, $V_{cc} = +3V$



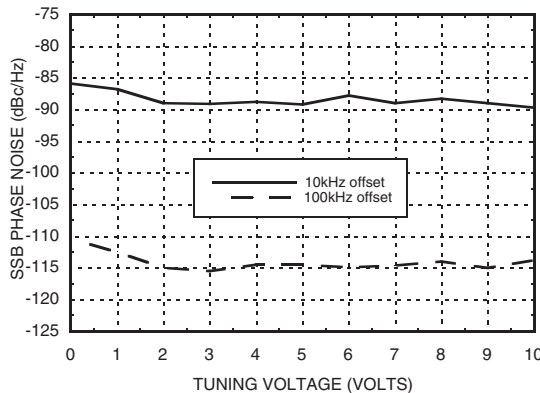
Sensitivity vs. Tuning Voltage, $V_{cc} = +3V$



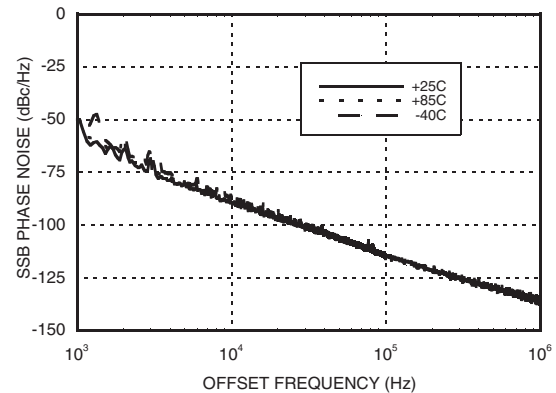
Output Power vs. Tuning Voltage, $V_{cc} = +3V$



Phase Noise vs. Tuning Voltage



Typical SSB Phase Noise @ $V_{tune} = +5V$



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Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1- 14, 17 - 19, 21, 23, 24	N/C	No Connection. These pins may be connected to RF ground. Performance will not be affected.	
15	GND	This pin must be connected to RF & DC ground.	
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.	
	GND	Package bottom has an exposed metal paddle that must be RF & DC grounded.	

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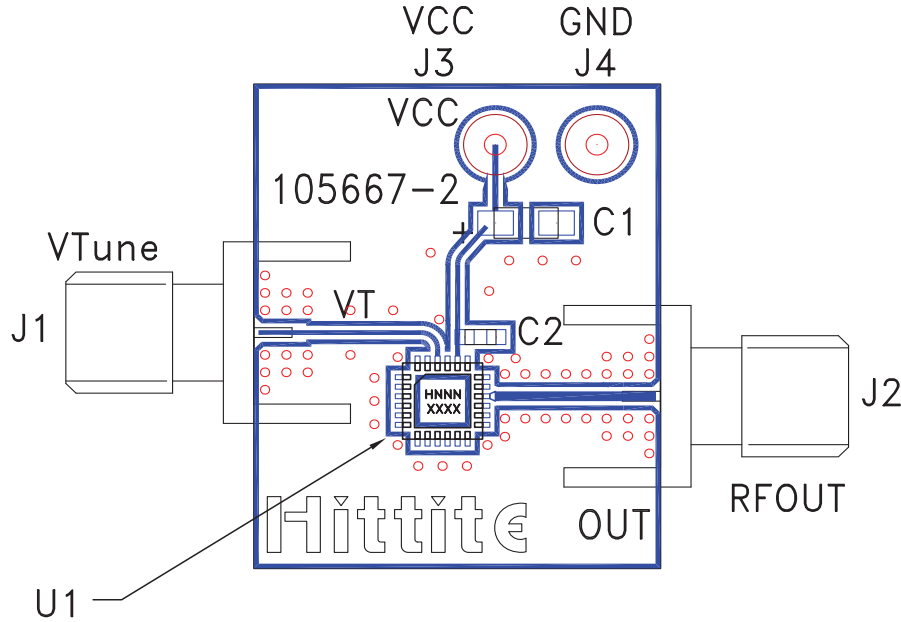


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Evaluation PCB



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VCOs & PLOs - SMT

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	HMC416LP4 / HMC416LP4E 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.

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