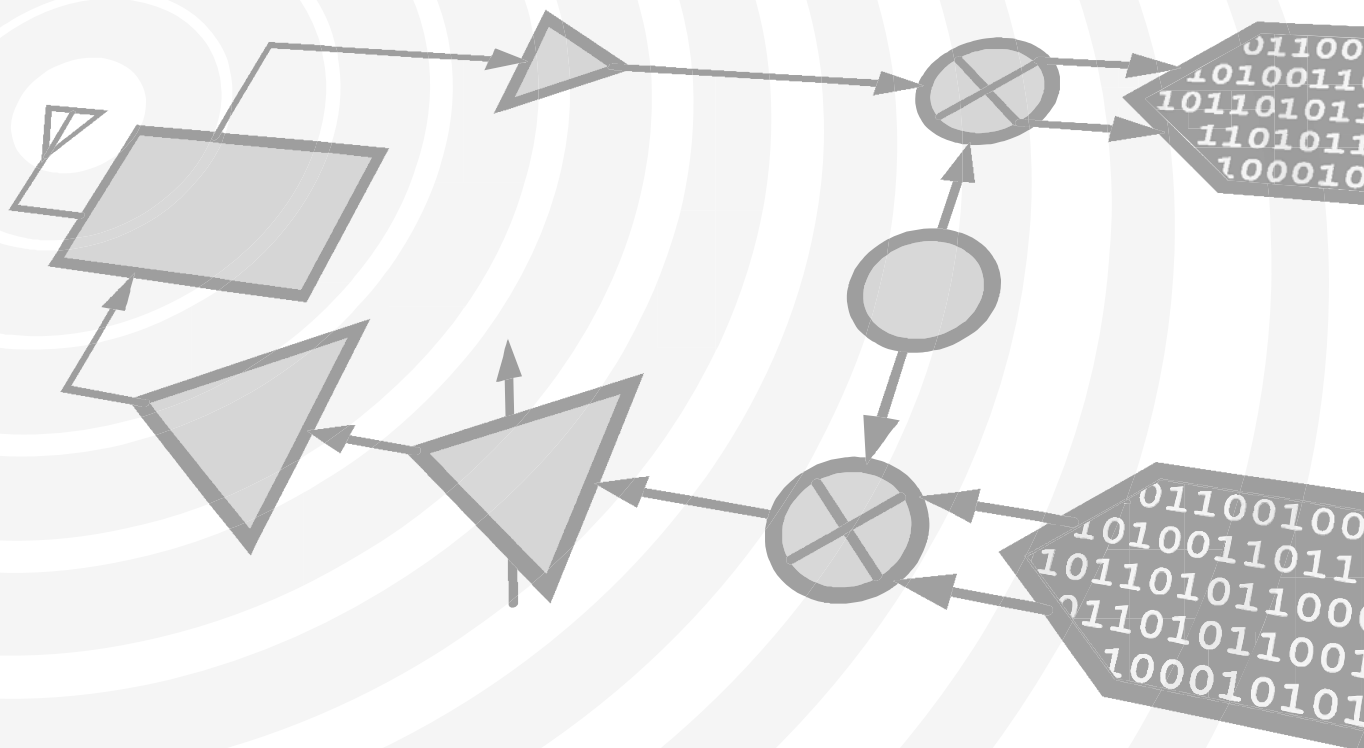




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HMC506LP4 / 506LP4E

MMIC VCO w/ BUFFER AMPLIFIER, 7.8 - 8.7 GHz

Typical Applications

Low noise MMIC VCO w/Buffer Amplifier for:

- VSAT Radio
- Point to Point/Multipoint Radio
- Test Equipment & Industrial Controls
- Military End-Use

Features

Pout: +14 dBm

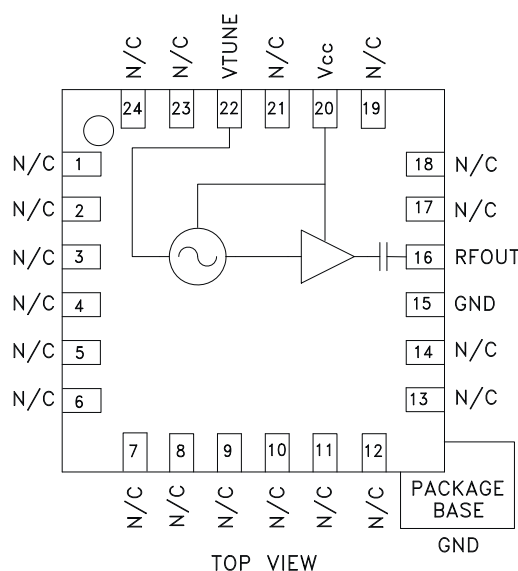
Phase Noise: -103 dBc/Hz @100 KHz

No External Resonator Needed

Single Supply: +3V @ 77 mA

QFN Leadless SMT Package, 16 mm²

Functional Diagram



General Description

The HMC506LP4 & HMC506LP4E are GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCOs with integrated resonators, negative resistance devices, varactor diodes, and buffer amplifiers. Covering 7.8 to 8.7 GHz, the VCO's phase noise performance is excellent over temperature, shock and vibration due to the oscillator's monolithic structure. Power output is +14 dBm typical from a single supply of +3.0V @ 77 mA. The voltage controlled oscillator is packaged in a leadless QFN 4 x 4 mm surface mount package.

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

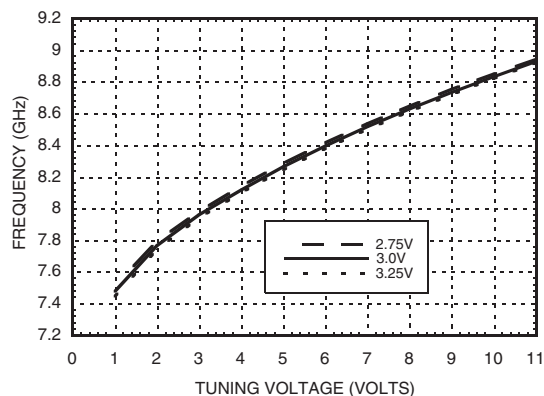
Parameter	Min.	Typ.	Max.	Units
Frequency Range		7.8 - 8.7		GHz
Power Output	11.0	14.0		dBm
SSB Phase Noise @ 100 kHz Offset, $V_{tune} = +5V$ @ RF Output		-103		dBc/Hz
Tune Voltage (V_{tune})	1		11	V
Supply Current (I_{CC}) ($V_{CC} = +3.0V$)		77		mA
Tune Port Leakage Current			10	μA
Output Return Loss		7		dB
Harmonics				
2nd		-16		dBc
3rd		-28		dBc
Pulling (into a 2.0:1 VSWR)		28		MHz pp
Pushing @ $V_{tune} = +5V$		78		MHz/V
Frequency Drift Rate		0.85		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
Order On-line at www.hittite.com

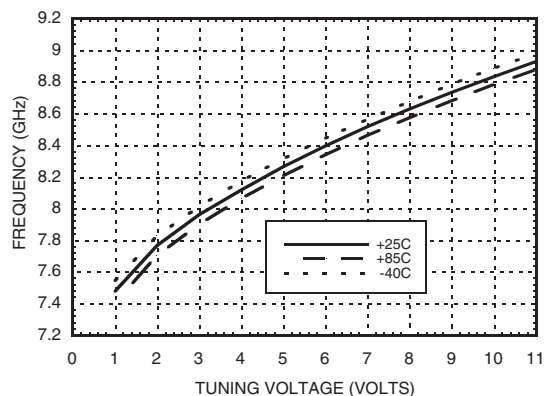
HMC506LP4 / 506LP4E

MMIC VCO w/ BUFFER AMPLIFIER, 7.8 - 8.7 GHz

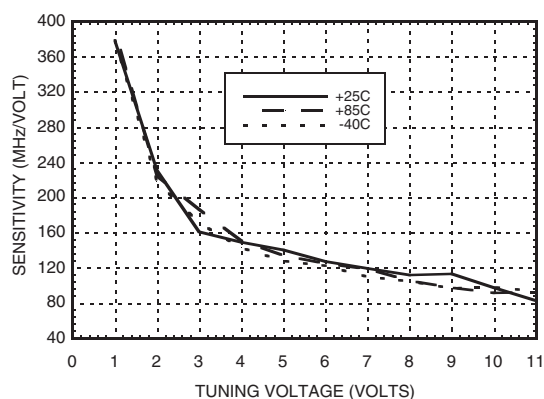
Frequency vs. Tuning Voltage, $T = 25^{\circ}\text{C}$



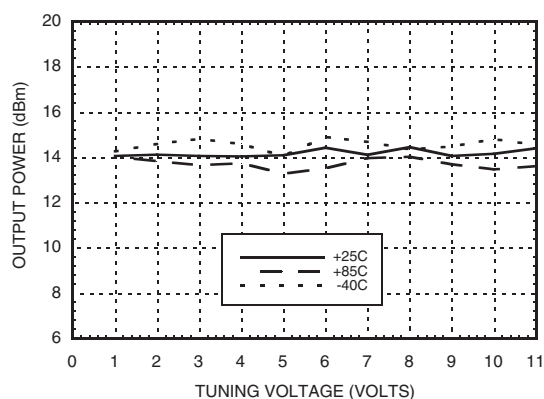
Frequency vs. Tuning Voltage, $V_{cc} = +3\text{V}$



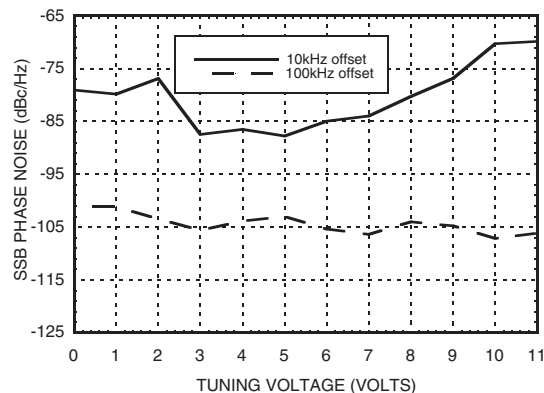
Sensitivity vs. Tuning Voltage, $V_{cc} = +3\text{V}$



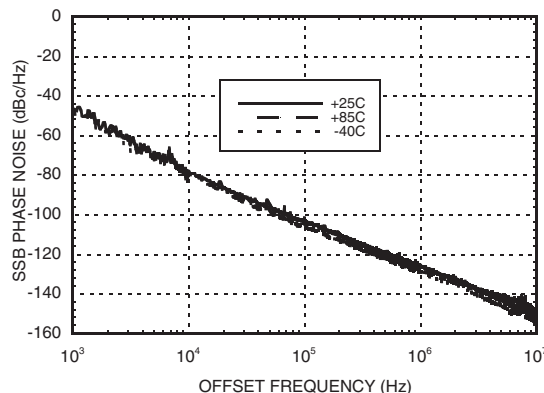
**Output Power vs.
Tuning Voltage, $V_{cc} = +3\text{V}$**



Phase Noise vs. Tuning Voltage



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



Vcc	+3.5 Vdc
Vtune	0 to +11V
Channel Temperature	135 °C
Continuous Pdiss (T = 85°C) (derate 6.07 mW/°C above 85°C)	303 mW
Thermal Resistance (junction to ground paddle)	165 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

V _{CC} (V)	I _{CC} (mA)
2.75	66
3.0	77
3.25	88

11

Technical drawing of a square leadframe showing top, side, and detail views with dimensions in inches and millimeters.

Top View:

- Overall width: $.161$ [4.10]
- Overall height: $.161$ [4.10]
- Pin 24 location: $.012$ [0.30] from top edge, $.007$ [0.18] from side edge.
- Pin 1 location: $.016$ [0.40] from top edge, $.008$ [0.20] from side edge.
- Exposed ground paddle location: $.022$ [0.56] from top edge, $.017$ [0.44] from side edge.
- Internal dimensions: $.116$ [2.95] and $.104$ [2.65] for the central square area.
- Lead dimensions: $.101$ [2.56] and $.096$ [2.44] for the top and bottom leads.
- Lot number area: $.161$ [4.10] and $.153$ [3.90] for the text "HNNN XXXX".

Side View:

- Lead thickness: $.039$ [1.00] and $.031$ [0.80] for the top and bottom leads.
- Seating plane: $.002$ [0.05] and $.000$ [0.00] for the top and bottom leads.
- Lead width: $.003$ [0.08] [C] for the top and bottom leads.
- Seating plane: $.003$ [0.08] [C] for the top and bottom leads.

Detail View:

- Lead thickness: $.039$ [1.00] and $.031$ [0.80] for the top and bottom leads.
- Seating plane: $.002$ [0.05] and $.000$ [0.00] for the top and bottom leads.
- Lead width: $.003$ [0.08] [C] for the top and bottom leads.
- Seating plane: $.003$ [0.08] [C] for the top and bottom leads.

NOTES:

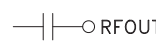
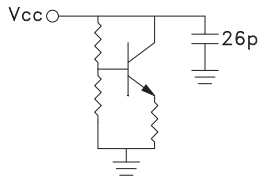
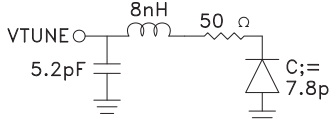
- LEADFRAME MATERIAL: COPPER ALLOY
- DIMENSIONS ARE IN INCHES [MILLIMETERS]
- LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
- PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM.

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking ^[3]
HMC506LP4	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 ^[1]	H506 XXXX
HMC506LP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 ^[2]	<u>H506</u> XXXX

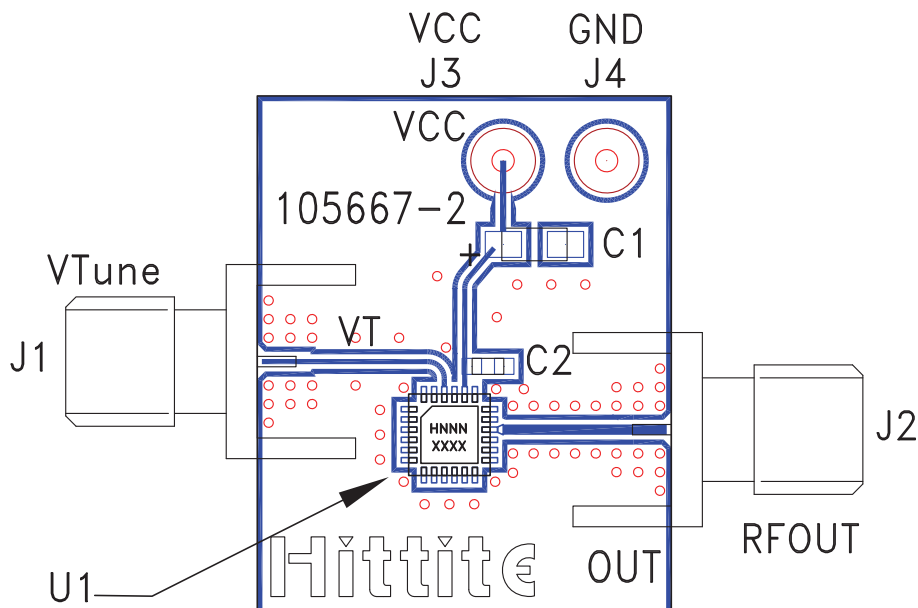
[3] 4-Digit lot number XXXX

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20 Alpha Road, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
Order On-line at www.hittite.com*

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.	
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.	

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 μ F Tantalum Capacitor
C2	10,000 pF Capacitor, 0603 Pkg.
U1	HMC506LP4 / HMC506LP4E 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.



HMC506LP4 / 506LP4E

**MMIC VCO w/ BUFFER
AMPLIFIER, 7.8 - 8.7 GHz**

Notes: