



MMIC VCO w/ BUFFER AMPLIFIER, 2.25 - 2.5 GHz

Typical Applications

Low noise MMIC VCO w/Buffer Amplifier for:

- Wireless Infrastructure
- Industrial Controls
- Test Equipment
- Military

Features

Pout: +4.5 dBm

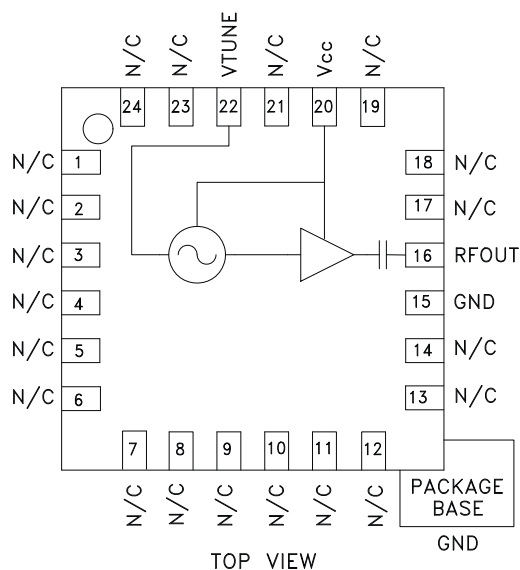
Phase Noise: -115 dBc/Hz @100 KHz

No External Resonator Needed

Single Supply: 3V @ 35 mA

QFN Leadless SMT Package, 16 mm²

Functional Diagram



General Description

The HMC385LP4 & HMC385LP4E are GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCOs with integrated resonators, negative resistance devices, varactor diodes, and buffer amplifiers. Covering 2.25 to 2.5 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 @ 35mA. The voltage controlled oscillator is packaged in a low cost leadless QFN 4x4 mm surface mount package.

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

| Parameter | Min. | Typ. | Max. | Units |
|--|------|------------|------|-----------------|
| Frequency Range | | 2.25 - 2.5 | | GHz |
| Power Output | 1.5 | 4.5 | | dBm |
| SSB Phase Noise @ 100 kHz Offset, $V_{tune} = +5V$ @ RF Output | | -115 | | dBc/Hz |
| Tune Voltage (V_{tune}) | 0 | | 10 | V |
| Supply Current (I_{CC}) ($V_{CC} = +3.0V$) | | 35 | | mA |
| Tune Port Leakage Current | | | 10 | μA |
| Output Return Loss | | 9 | | dB |
| Harmonics | | | | |
| 2nd | | -7 | | dBc |
| 3rd | | -23 | | dBc |
| Pulling (into a 2.0:1 VSWR) | | 2.0 | | MHz pp |
| Pushing @ $V_{tune} = +5V$ | | -2 | | MHz/V |
| Frequency Drift Rate | | 0.25 | | MHz/ $^\circ C$ |

HMC385* PRODUCT PAGE QUICK LINKS

Last Content Update: 02/23/2017

COMPARABLE PARTS

View a parametric search of comparable parts.

EVALUATION KITS

- HMC385LP4 Evaluation Board

DOCUMENTATION

Data Sheet

- HMC385 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

- HMC385 Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

DISCUSSIONS

View all HMC385 EngineerZone Discussions.

SAMPLE AND BUY

Visit the product page to see pricing options.

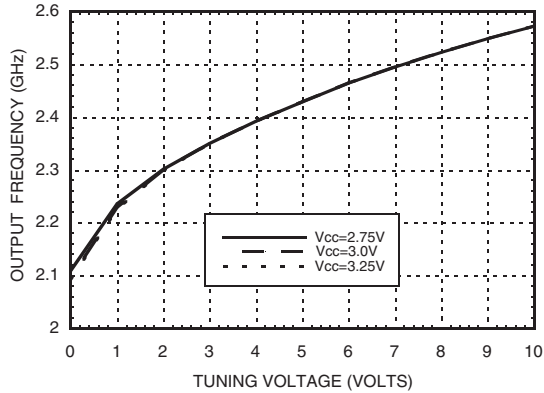
TECHNICAL SUPPORT

Submit a technical question or find your regional support number.

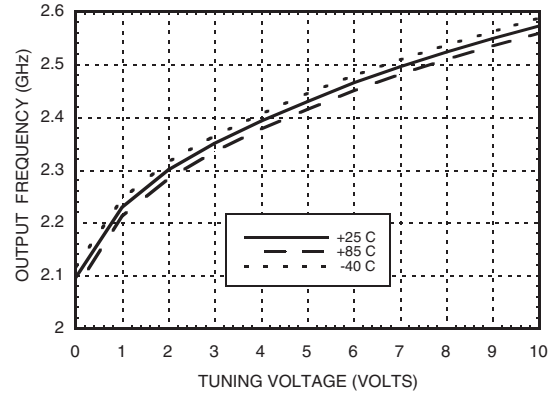
DOCUMENT FEEDBACK

Submit feedback for this data sheet.

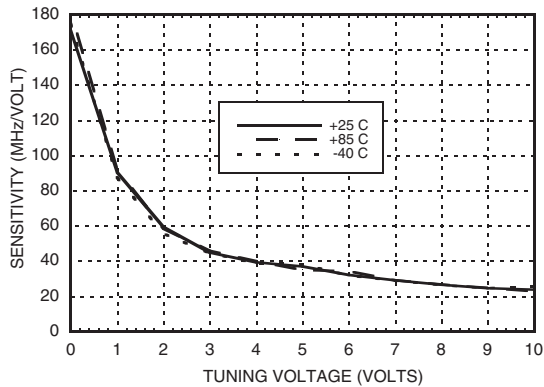
Frequency vs. Tuning Voltage, $T = 25^\circ\text{C}$



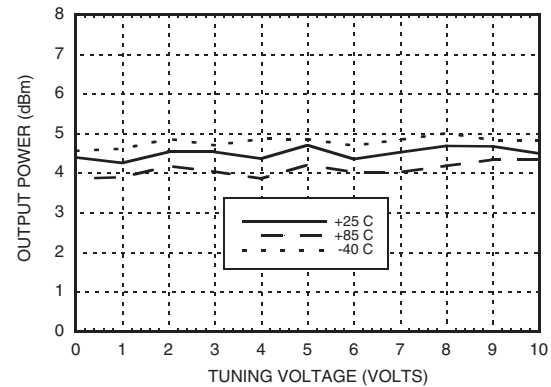
Frequency vs. Tuning Voltage, $V_{cc} = +3V$



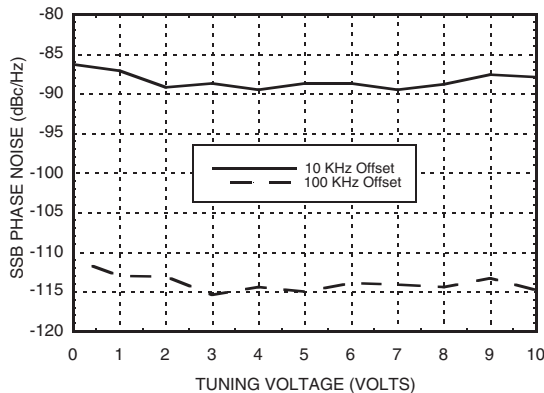
Sensitivity vs. Tuning Voltage, $V_{cc} = +3V$



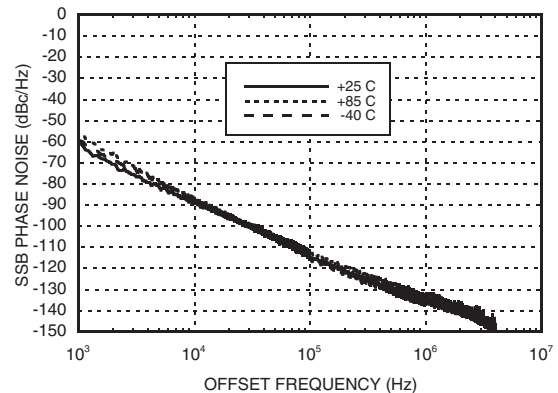
**Output Power vs.
Tuning Voltage, $V_{cc} = +3V$**



Phase Noise vs. Tuning Voltage



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





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Absolute Maximum Ratings

| | |
|---|----------------|
| Vcc | +3.5 Vdc |
| Vtune | 0 to +11V |
| Channel Temperature | 135 °C |
| Continuous Pdiss (T = 85°C) (derate 6.28 mW/°C above 85°C) | 565 W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

Typical Supply Current vs. Vcc

| Vcc (V) | Icc (mA) |
|---------|----------|
| 2.75 | 28 |
| 3.0 | 35 |
| 3.25 | 41 |

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

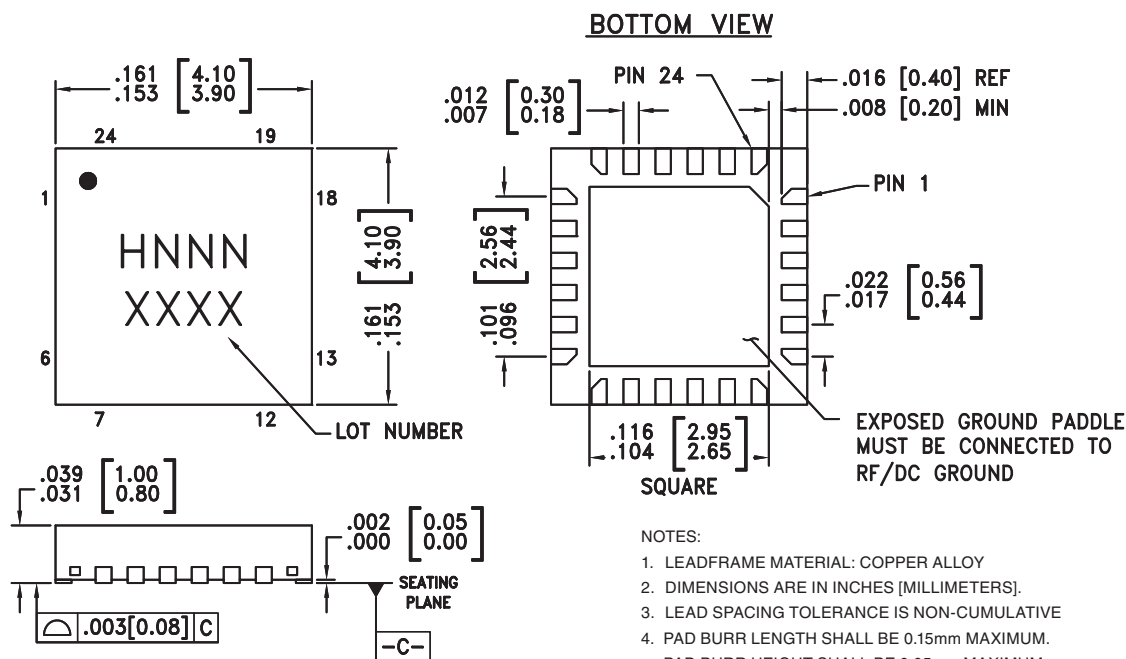


ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

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VCOs & PLOs - SMT

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] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC385LP4 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 ^[1] | H385 XXXX |
| HMC385LP4E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | H385 XXXX |

[1] Max peak reflow temperature of 235 °C


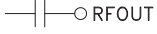
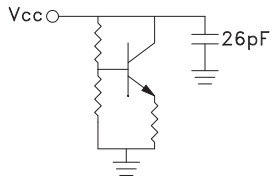
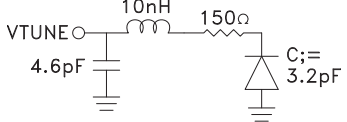

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

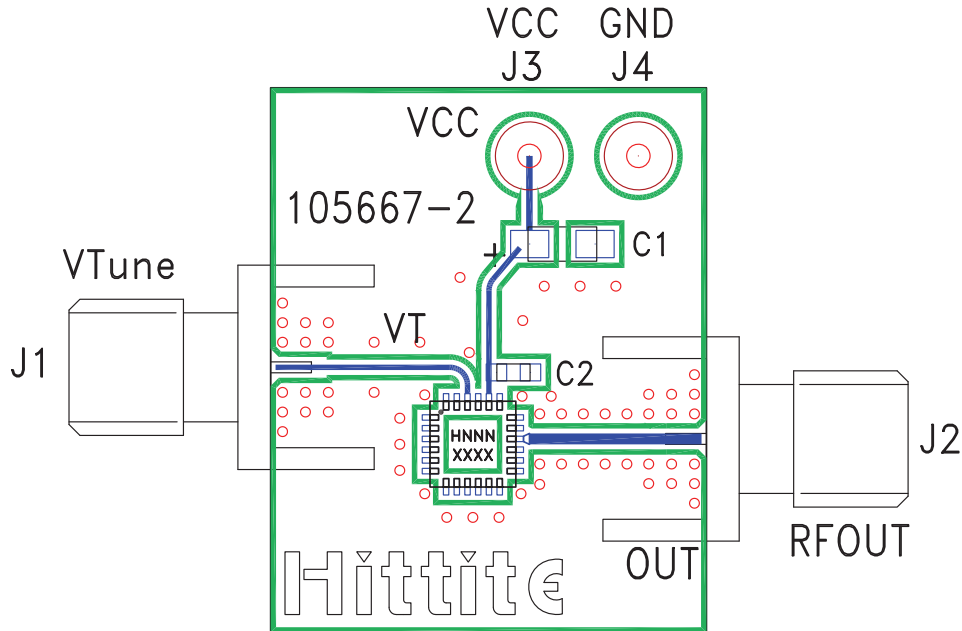
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Pin Descriptions

| 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. |  |
| 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 | HMC385LP4 / HMC385LP4E 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.



Notes:

v02.0705

HMC385LP4 / 385LP4E

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AMPLIFIER, 2.25 - 2.5 GHz**

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VCOs & PLOs - SMT

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