

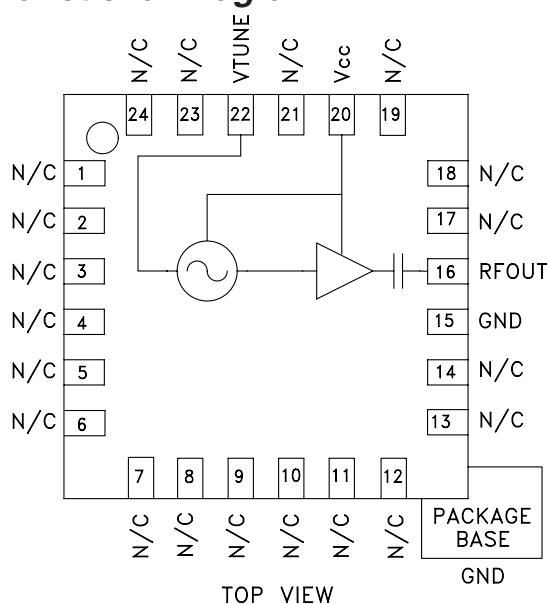
## MMIC VCO w/ BUFFER AMPLIFIER, 2.6 - 2.8 GHz

### Typical Applications

Low noise MMIC VCO w/Buffer Amplifier for:

- Wireless Infrastructure
- Industrial Controls
- Test Equipment
- Military

### Functional Diagram



### Features

Pout: +5 dBm

Phase Noise: -114 dBc/Hz @100 kHz

No External Resonator Needed

Single Supply: 3V @ 35 mA

QFN Leadless SMT Package, 16 mm<sup>2</sup>

### General Description

The HMC386LP4 is a GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCO with integrated resonator, negative resistance device, varactor diode, and buffer amplifier. Covering 2.6 to 2.8 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 dBm typical from a single supply of 3V @ 35mA. The voltage controlled oscillator is packaged in a low cost leadless QFN 4 x 4 mm surface mount package.

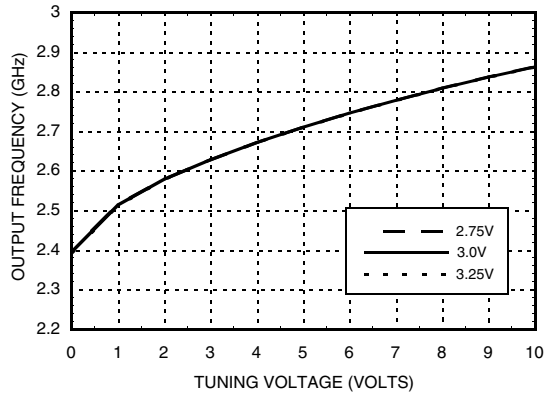
### Electrical Specifications, $T_A = +25^\circ\text{C}$ , $V_{CC} = +3V$

| Parameter                                                      | Min.      | Typ.      | Max. | Units                 |
|----------------------------------------------------------------|-----------|-----------|------|-----------------------|
| Frequency Range                                                | 2.6 - 2.8 |           |      | GHz                   |
| Power Output                                                   | 2         | 5         |      | dBm                   |
| SSB Phase Noise @ 100 kHz Offset, $V_{tune} = +5V$ @ RF Output |           | -114      |      | dBc/Hz                |
| Tune Voltage ( $V_{tune}$ )                                    | 0         |           | 10   | V                     |
| Supply Current ( $I_{CC}$ ) ( $V_{CC} = +3.0V$ )               |           | 35        |      | mA                    |
| Tune Port Leakage Current                                      |           |           | 10   | $\mu\text{A}$         |
| Output Return Loss                                             |           | 9         |      | dB                    |
| Harmonics<br>2nd<br>3rd                                        |           | -5<br>-15 |      | dBc<br>dBc            |
| Pulling (into a 2.0:1 VSWR)                                    |           | 3         |      | MHz pp                |
| Pushing @ $V_{tune} = +5V$                                     |           | 2         |      | MHz/V                 |
| Frequency Drift Rate                                           |           | 0.3       |      | MHz/ $^\circ\text{C}$ |

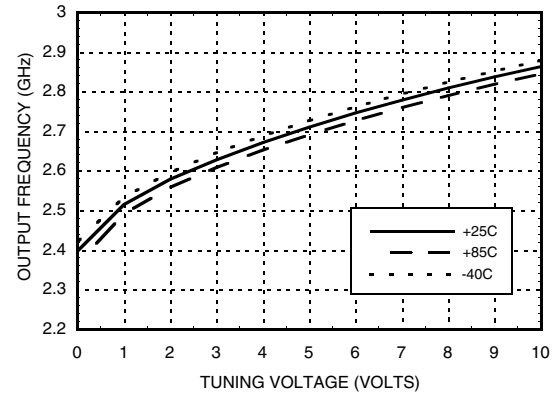
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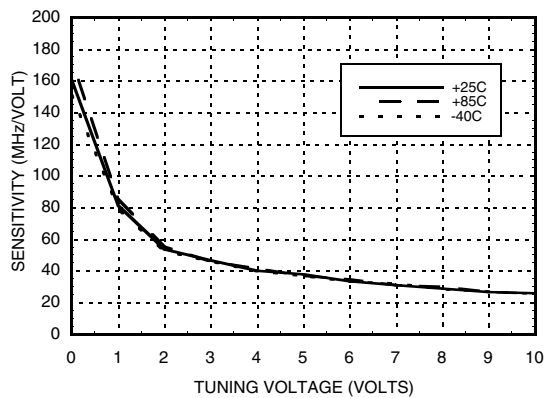
**Frequency vs. Tuning Voltage,  $T = 25^{\circ}\text{C}$**



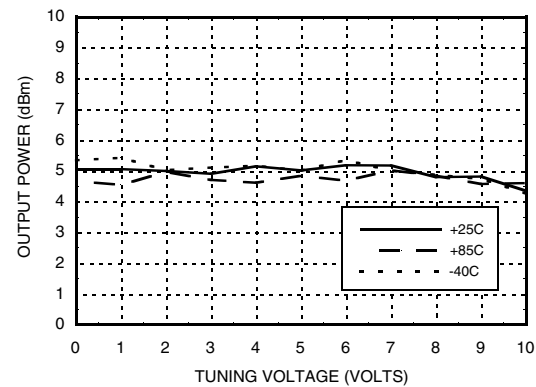
**Frequency vs. Tuning Voltage,  $V_{cc} = +3V$**



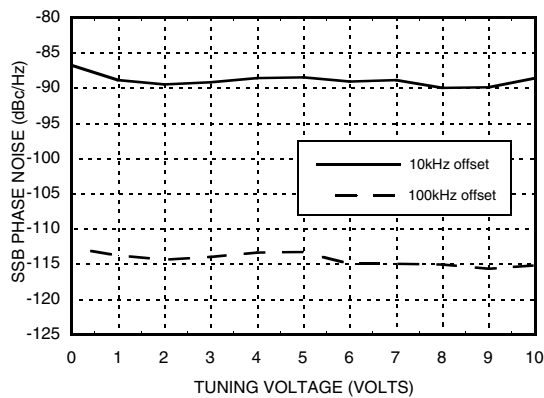
**Sensitivity vs. Tuning Voltage,  $V_{cc} = +3V$**



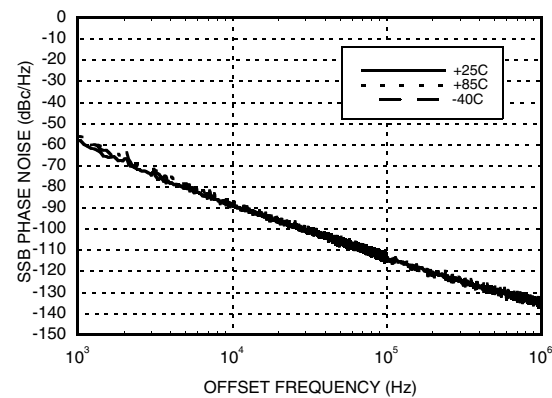
**Output Power vs.  
Tuning Voltage,  $V_{cc} = +3V$**



**Phase Noise vs. Tuning Voltage**



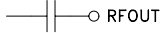
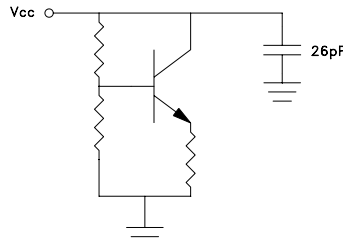
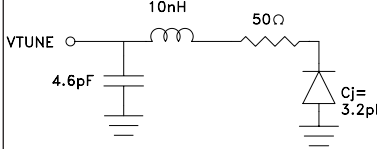
**Typical SSB Phase Noise @  $V_{tune} = +5V$**





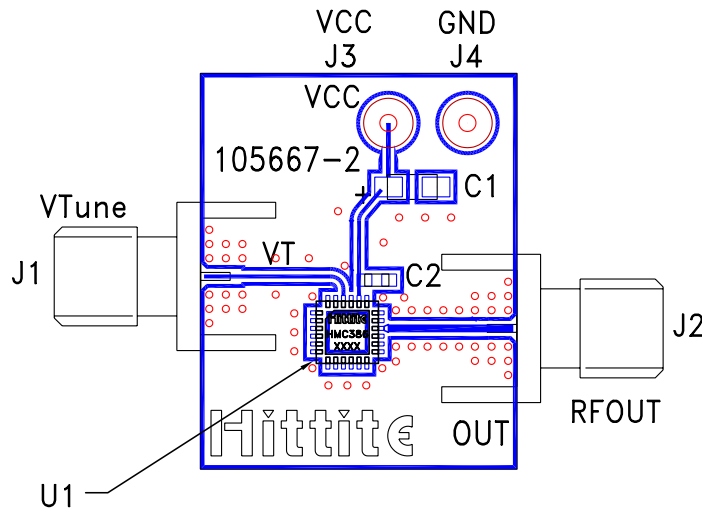
## MMIC VCO w/ BUFFER AMPLIFIER, 2.6 - 2.8 GHz

### Pin Descriptions

| Pin Number                    | Function | Description                                                                                   | Interface Schematic                                                                   |
|-------------------------------|----------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1- 14, 17 - 19,<br>21, 23, 24 | N/C      | No Connection. These pins may be connected to RF ground.<br>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<br>dependent on drive source impedance.      |  |
|                               | GND      | Package bottom has an exposed metal paddle that<br>must be RF & DC grounded.                  |  |

## MMIC VCO w/ BUFFER AMPLIFIER, 2.6 - 2.8 GHz

### Evaluation PCB



### List of Materials

| Item                                  | Description                    |
|---------------------------------------|--------------------------------|
| J1 - J2                               | PC Mount SMA RF Connector      |
| J3 - J4                               | DC Pin                         |
| C1                                    | 4.7 $\mu$ F Tantalum Capacitor |
| C2                                    | 10,000 pF Capacitor, 0603 Pkg. |
| U1                                    | HMC386LP4 VCO                  |
| PCB*                                  | 105667 Eval Board              |
| * 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.

## *MMIC VCO w/ BUFFER AMPLIFIER, 2.6 - 2.8 GHz*

### **Notes:**