



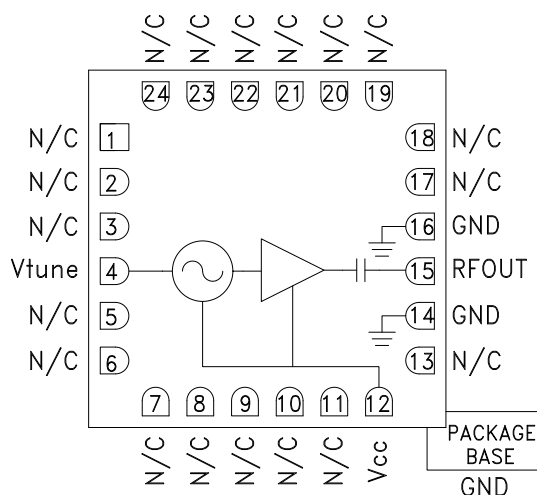
WIDEBAND MMIC VCO w/ BUFFER AMPLIFIER, 10 - 20 GHz

Typical Applications

Low Noise wideband MMIC VCO is ideal for:

- Industrial/Medical Equipment
- Test & Measurement Equipment
- Military Radar, EW & ECM

Functional Diagram



Features

- Wide Tuning Bandwidth
- Pout: +3 dBm
- Low SSB Phase Noise: -90 dBc/Hz @100 kHz
- No External Resonator Needed
- Single Positive Supply: +5V @ 70 mA
- RoHS Compliant 4 x 4 mm SMT Package

General Description

The HMC733LC4B is a wideband MMIC Voltage Controlled Oscillator which incorporates the resonator, negative resistance device, and varactor diode. Output power and phase noise performance are excellent over temperature due to the oscillator's monolithic construction. The Vtune port accepts an analog tuning voltage from 0 to +22V. The HMC733LC4B VCO operates from a single +5V supply, consumes only 70 mA of current, and is housed in a RoHS compliant SMT package. This wideband VCO uniquely combines the attributes of ultra small size, low phase noise, low power consumption, and wide tuning range.

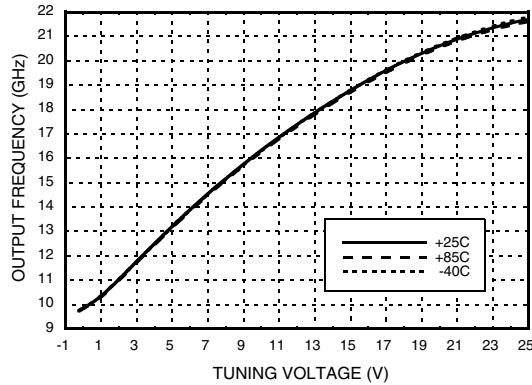
Electrical Specifications, $T_A = +25^\circ\text{C}$, $V_{CC} = +5\text{V}$

| Parameter | Min. | Typ. | Max. | Units |
|--|---------|-------|------|-----------------------|
| Frequency Range | 10 - 20 | | | GHz |
| Power Output | | 3 | | dBm |
| SSB Phase Noise @ 10 kHz Offset | | -60 | | dBc/Hz |
| SSB Phase Noise @ 100 kHz Offset | | -90 | | dBc/Hz |
| Tune Voltage (Vtune) | -0.25 | | 23 | V |
| Supply Current (Icc) (Vcc = +5V) | | 70 | | mA |
| Tune Port Leakage Current (Vtune = +23V) | | 25 | | μA |
| Output Return Loss | | 10 | | dB |
| 2nd Harmonic | | -20 | | dBc |
| Pulling (into a 2.0:1 VSWR) | | 15 | | MHz pp |
| Vcc Pushing, Vtune = +20V, F = 20 GHz | | -90 | | MHz/V |
| Frequency Drift Rate @ 10 GHz | | -0.25 | | MHz/ $^\circ\text{C}$ |
| Frequency Drift Rate @ 20 GHz | | -0.80 | | MHz/ $^\circ\text{C}$ |

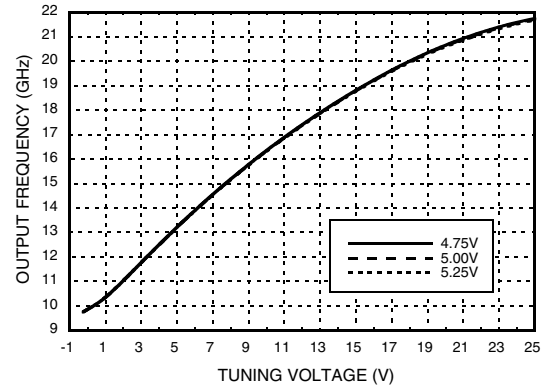


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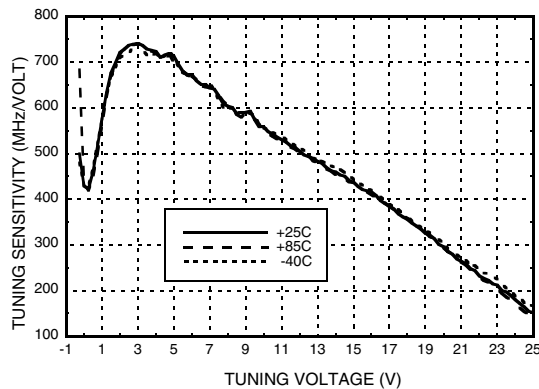
Frequency vs. Tuning Voltage, $V_{CC} = +5V$



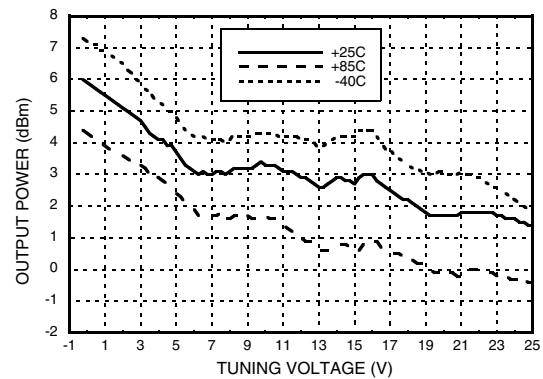
Frequency vs. Tuning Voltage, $T = +25^{\circ}C$



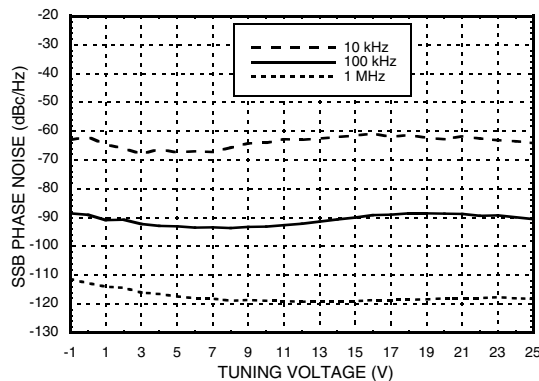
**Sensitivity vs. Tuning Voltage,
 $V_{CC} = +5V$, $T = +25^{\circ}C$**



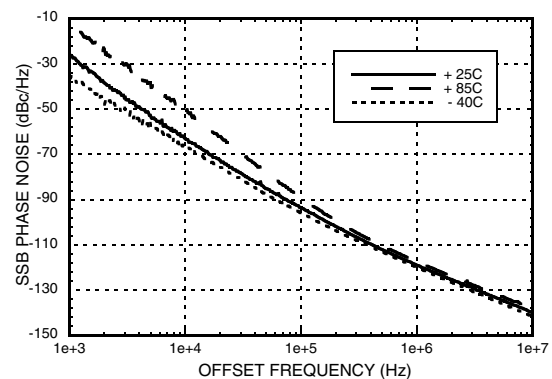
**Output Power vs.
Tuning Voltage, $V_{CC} = +5V$**



**SSB Phase Noise vs. Tuning Voltage,
 $T = +25^{\circ}C$**



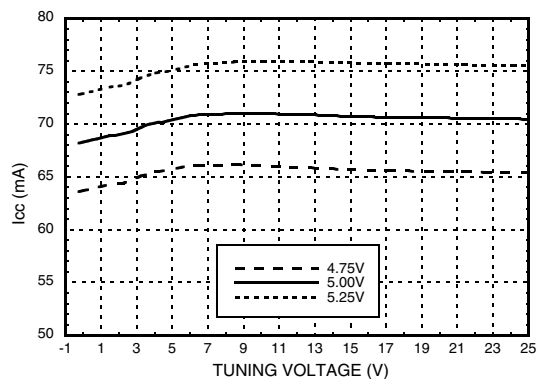
**Typical SSB Phase Noise vs. Temperature
 $V_{tune} = +10V$**





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Supply Current vs. Vcc, T = +25 °C



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

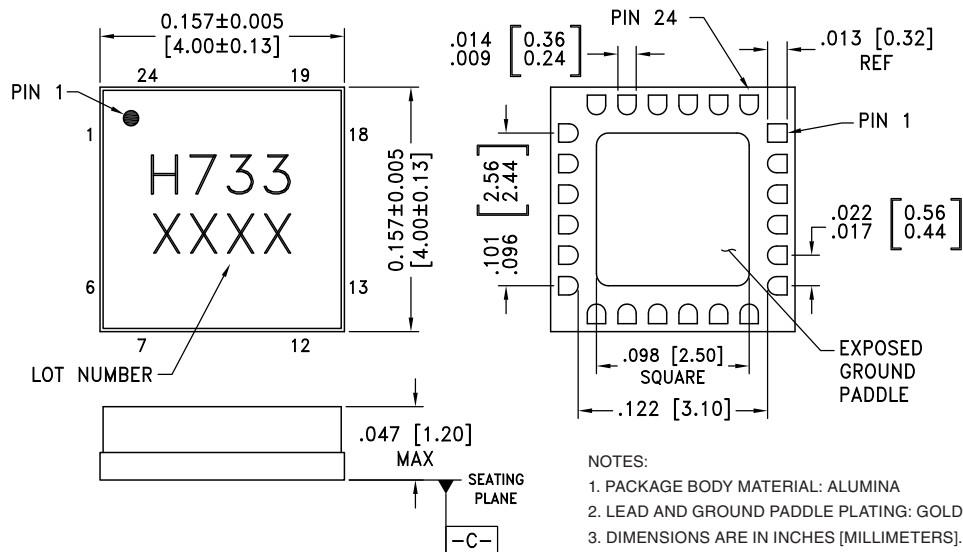
Absolute Maximum Ratings

| | |
|-----------------------|----------------|
| Vcc | +5.5 Vdc |
| Vtune | -1.0 to +25V |
| Storage Temperature | -65 to +150 °C |
| ESD Sensitivity (HBM) | Class 1A |

Reliability Information

| | |
|---|------------------|
| Junction Temperature To Maintain 1 Million Hour MTTF | 135 °C |
| Nominal Junction Temperature (T = 85 °C) | 119 °C |
| Thermal Resistance (Junction to GND paddle, 5V supply) | 97 °C/W |
| Operating Temperature | -40 °C to +85 °C |

Outline Drawing



NOTES:

1. PACKAGE BODY MATERIAL: ALUMINA
2. LEAD AND GROUND PADDLE PLATING: GOLD FLASH OVER NI.
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM -C-
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[2] |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC733LC4B | Alumina, White | Gold over Nickel | MSL3 ^[1] | H733 XXXX |

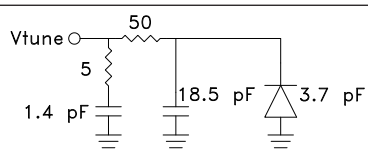
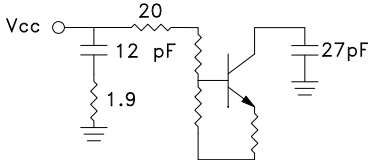

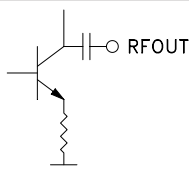
[1] Max peak reflow temperature of 260 °C

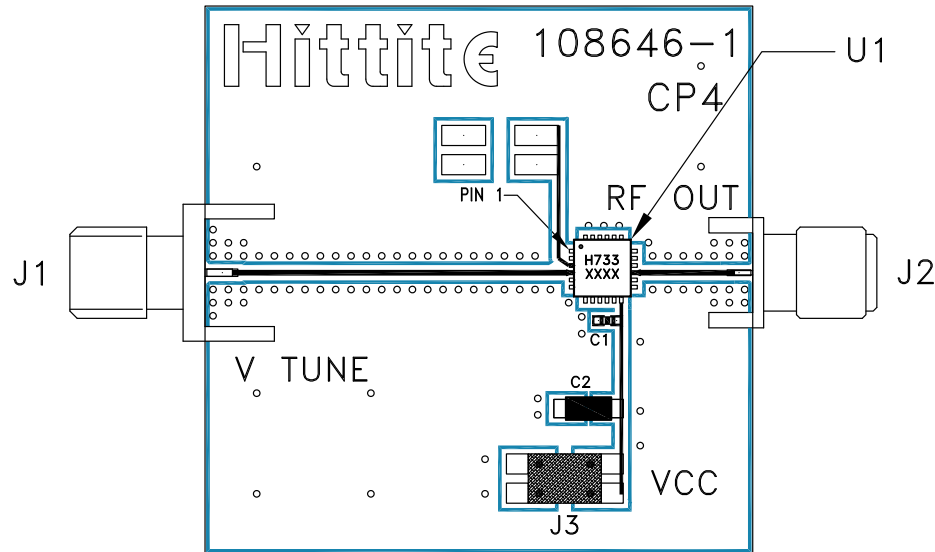
[2] 4-Digit lot number XXXX

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Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|----------------------------|----------|---|--|
| 1 - 3, 5 - 11, 13, 17 - 24 | N/C | No Connection. These pins may be connected to RF/DC ground. Performance will not be affected. | |
| 4 | Vtune | Control Voltage and Modulation Input. Modulation bandwidth dependent on drive source impedance. |  |
| 12 | Vcc | Supply Voltage Vcc= +5V |  |
| 14, 16 | GND | Package bottom has an exposed metal paddle that must also be RF & DC grounded. |  |
| 15 | RFOUT | RF output (AC coupled) |  |


**WIDEBAND MMIC VCO w/ BUFFER
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Evaluation PCB

List of Materials for Evaluation PCB 108648 ^[1]

| Item | Description |
|--------------------|-------------------------------------|
| J1 | PCB Mount SMA RF Connector, Johnson |
| J2 | PCB Mount SMA Connector, SRI |
| J3 | DC Header |
| C1 | 1000 pF Capacitor, 0402 Pkg. |
| C2 | 4.7 μ F Capacitor, Tantalum |
| U1 | HMC733LC4B VCO |
| PCB ^[2] | 108646 Eval Board |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed ground 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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Электрон
Связь**

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