ANALOG DEVICES

HMC511LP5/511LP5E

v06.0114

MMIC VCO WITH HALF FREQUENCY OUTPUT
9.05 - 10.15 GHz

RoHS✓
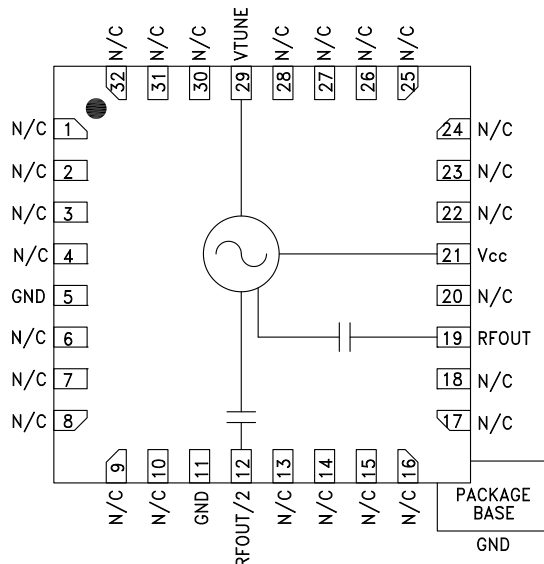EARTH FRIENDLY

Typical Applications

Low noise MMIC VCO w/Half Frequency, for:

• VSAT Radio

• Point to Point/Multi-Point Radio

• Test Equipment & Industrial Controls

• Military End-Use

Features

Dual Output: Fo = 9.05 - 10.15 GHz
Fo/2 = 4.525 - 5.075 GHz

Pout: +13 dBm

Phase Noise: -115 dBc/Hz @100 kHz Typ.

No External Resonator Needed

32 Lead 5x5mm SMT Package: 25mm²

Functional Diagram

General Description

The HMC511LP5 & HMC511LP5E are GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCOs. The HMC511LP5 & HMC511LP5E integrate resonators, negative resistance devices, varactor diodes and feature a half frequency output. The VCO's phase noise performance is excellent over temperature, shock, and process due to the oscillator's monolithic structure. Power output is +13 dBm typical from a +5V supply. The voltage controlled oscillator is packaged in a leadless QFN 5x5 mm surface mount package, and requires no external matching components.

Electrical Specifications, T_A = +25° C, Vcc = +5V

Parameter		Min.	Typ.	Max.	Units
Frequency Range	Fo		9.05 - 10.15		GHz
	Fo/2		4.525 - 5.075		GHz
Power Output	RFOUT	+9		+16	dBm
	RFOUT/2	+5		+11	dBm
SSB Phase Noise @ 100 kHz Offset, Vtune= +5V @ RFOUT			-115		dBc/Hz
Tune Voltage	Vtune	2		13	V
Supply Current (Icc) (Vcc = +5.0V)		200	265	300	mA
Tune Port Leakage Current (Vtune= 13V)				10	µA
Output Return Loss			2		dB
Harmonics/Subharmonics	1/2		38		dBc
	2nd		15		dBc
	3rd		30		dBc
Pulling (into a 2.0:1 VSWR)			8		MHz pp
Pushing @ Vtune= 5V			15		MHz/V
Frequency Drift Rate			0.9		MHz/°C

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VCOS WITH FO/2 OUTPUT - SMT

Frequency vs. Tuning Voltage

Legend: +25 C, +85 C, -40 C

Frequency vs. Tuning Voltage, T = 25C

Legend: Vcc= +4.75V, Vcc= +5.0V, Vcc= +5.25V

Sensitivity vs. Tuning Voltage

Legend: +25 C, +85 C, -40 C

Output Power vs. Tuning Voltage

Legend: +25 C, +85 C, -40 C
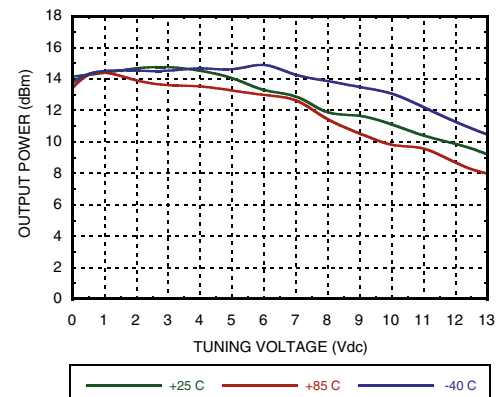
SSB Phase Noise vs. Tuning Voltage

Legend: 10kHz offset, 100kHz offset

SSB Phase Noise @ Vtune = +5V

Legend: +25 C, +85 C, -40 C

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VCOS WITH FO/2 OUTPUT - SMT
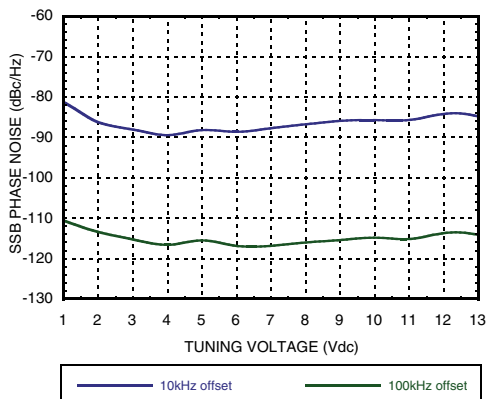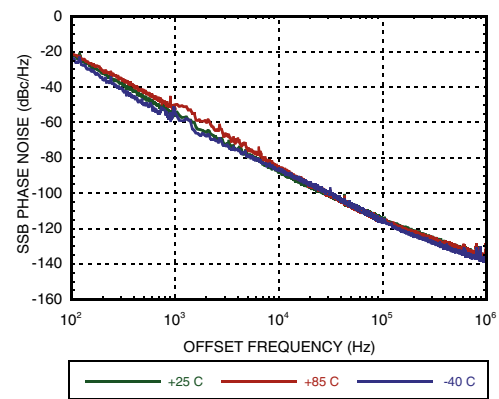
RFOUT/2 Frequency vs. Tuning Voltage
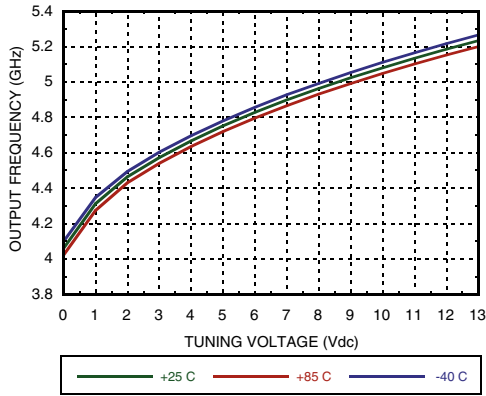
RFOUT/2 Output Power vs. Tuning Voltage
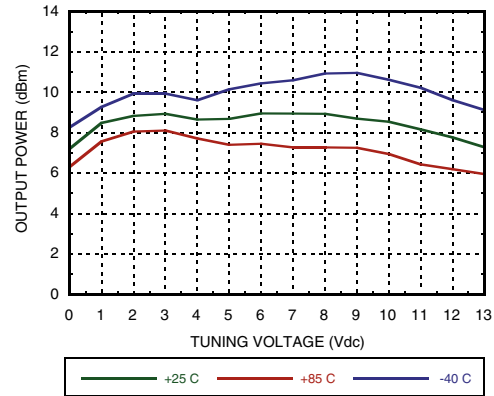
Absolute Maximum Ratings

Vcc	+5.5 Vdc
Vtune	0 to +15V
Storage Temperature	-65 to +150 °C
ESD Sensitivity (HBM)	Class 1A

⚠ ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Reliability Information

Junction Temperature To Maintain 1 Million Hour MTTF	135 °C
Nominal Junction Temperature (T = +85 °C	126.9 °C
Thermal Resistance (junction to ground paddle)	31.6 °C/W
Operating Temperature	-40 to +85 °C

Typical Supply Current vs. Vcc

Vcc (V)	Icc (mA)
4.75	245
5.0	265
5.25	285

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

For price, delivery, and to place orders: Analog Devices, Inc.,
One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

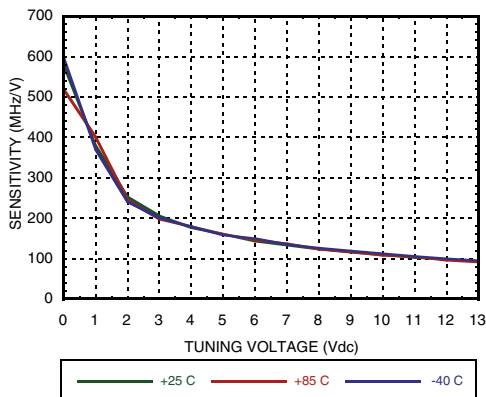## MMIC VCO WITH HALF FREQUENCY OUTPUT
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Outline Drawing

TOP VIEW

.201 / .193 [5.10 / 4.90]

32   25
1
24
5.10 / 4.90
.201 / .193
8
17
9   16 — LOT NUMBER

HNNN XXXX

.039 / .031 [1.00 / 0.80]

.002 / .000 [0.05 / 0.00]

SEATING PLANE

-C-

.003[0.08] C

BOTTOM VIEW

.012 / .007 [0.30 / 0.18]

.016 [0.40] REF
.008 [0.20] MIN

3.56 / 3.44

.140 / .135

PIN 1

.022 / .017 [0.56 / 0.44]

.156 / .144 [3.95 / 3.65] SQUARE

Exposed ground paddle must be connected to RF/DC ground
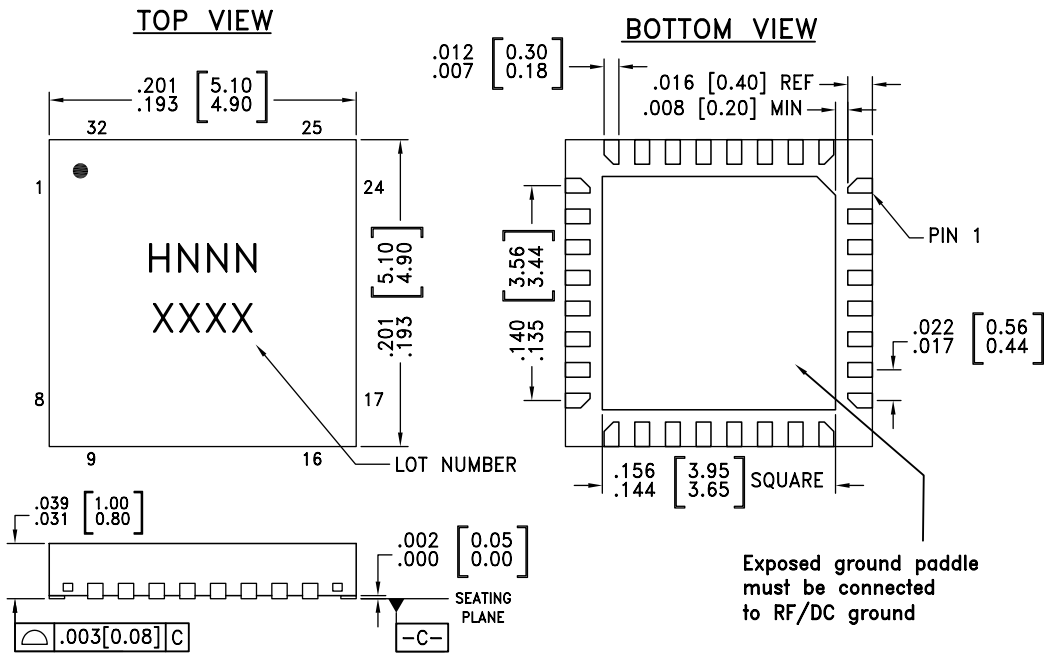
NOTES:
1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM.
   PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
7. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED LAND PATTERN.

Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC511LP5	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL3 [1]	H511 XXXX
HMC511LP5E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL3 [2]	H511 XXXX

[1] Max peak reflow temperature of 235 °C
[2] Max peak reflow temperature of 260 °C
[3] 4-Digit lot number XXXX

VCOS WITH FO/2 OUTPUT - SMT

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1 - 4, 6 - 10, 13 - 18, 20, 22 - 28, 30 - 32	N/C	No Connection. These pins may be connected to RF/DC ground. Performance will not be affected.	
12	RFOUT/2	Half frequency output (AC coupled).	RFOUT/2
19	RFOUT	RF output (AC coupled).	RFOUT
21	Vcc	Supply Voltage, +5V	Vcc, 14pF
29	VTUNE	Control Voltage Input. Modulation port bandwidth dependent on drive source impedance.	VTUNE, 20Ω, 3nH, 4pF, 58pF
5, 11 Paddle	GND	Package bottom has an exposed metal paddle that must be connected to RF/DC ground.	GND