

MMIC VCO w/ HALF FREQUENCY OUTPUT & DIVIDE-BY-4, 11.17 - 12.02 GHz



Typical Applications

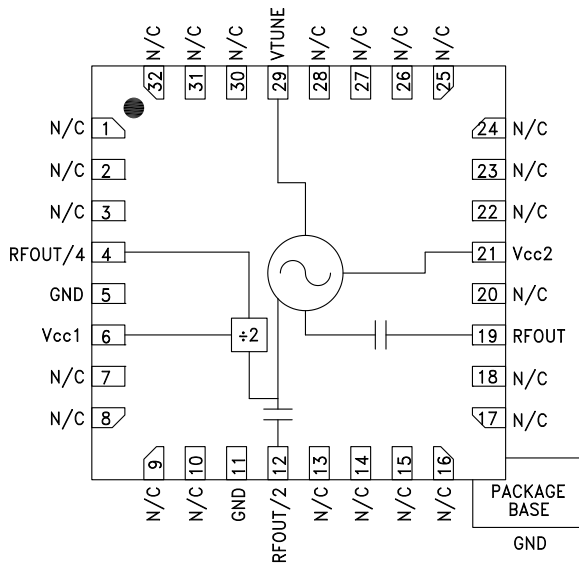
Low noise MMIC VCO w/Half Frequency, Divide-by-4 Outputs for:

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

Features

- Dual Output: Fo = 11.17 - 12.02 GHz
Fo/2 = 5.58 - 6.01 GHz
- Pout: +7 dBm
- Phase Noise: -110 dBc/Hz @100 KHz Typ.
- No External Resonator Needed
- 32 Lead 5x5mm SMT Package: 25mm²

Functional Diagram



General Description

The HMC514LP5 & HMC514LP5E are GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCOs. The HMC514LP5 & HMC514LP5E integrate resonators, negative resistance devices, varactor diodes and feature half frequency and divide-by-4 outputs. The VCO's phase noise performance is excellent over temperature, shock, and process due to the oscillator's monolithic structure. Power output is +7 dBm typical from a +3V supply voltage. The prescaler function can be disabled to conserve current if not required. 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, Vcc1, Vcc2 = +3V

Parameter	Min.	Typ.	Max.	Units	
Frequency Range	Fo	11.17 - 12.02		GHz	
	Fo/2	5.585 - 6.01		GHz	
Power Output	RFOUT	+5	+10	dBm	
	RFOUT/2	+5	+11	dBm	
	RFOUT/4	-10	-4	dBm	
SSB Phase Noise @ 100 kHz Offset, Vtune= +5V @ RFOUT		-110		dBc/Hz	
Tune Voltage	Vtune	2	13	V	
Supply Current	Icc1 & Icc2	240	275	290	mA
Tune Port Leakage Current (Vtune= 13V)			10	µA	
Output Return Loss		2		dB	
Harmonics/Subharmonics	1/2	30		dBc	
	3/2	24		dBc	
	2nd	17		dBc	
	3rd	28		dBc	
Pulling (into a 2.0:1 VSWR)		4		MHz/pp	
Pushing @ Vtune= 5V		18		MHz/V	
Frequency Drift Rate		1.2		MHz/°C	

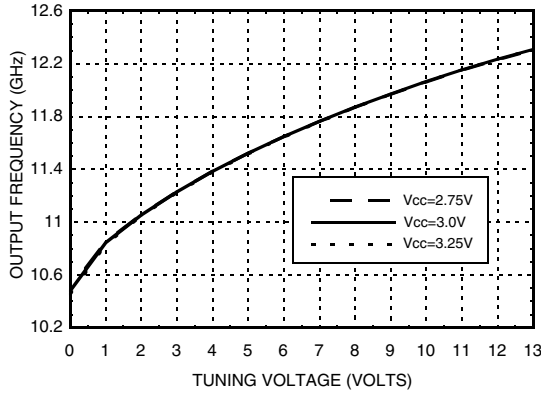
Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

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

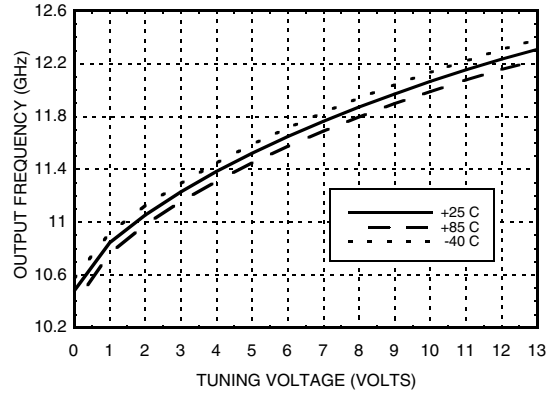


MMIC VCO w/ HALF FREQUENCY OUTPUT & DIVIDE-BY-4, 11.17 - 12.02 GHz

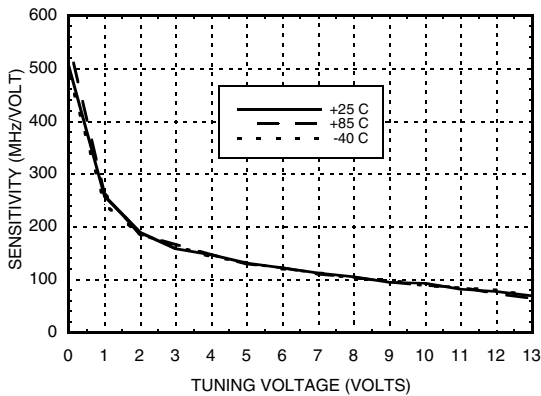
Frequency vs. Tuning Voltage, $T = 25^{\circ}\text{C}$



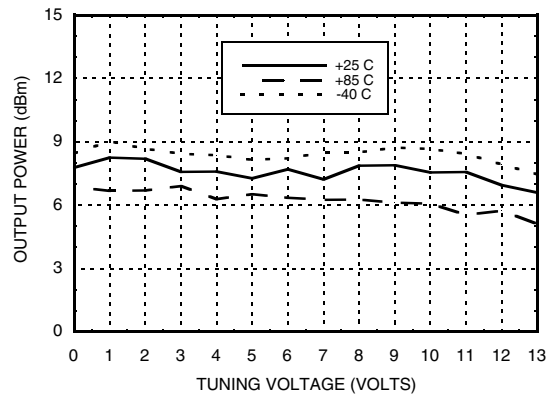
Frequency vs. Tuning Voltage, $V_{cc} = +3V$



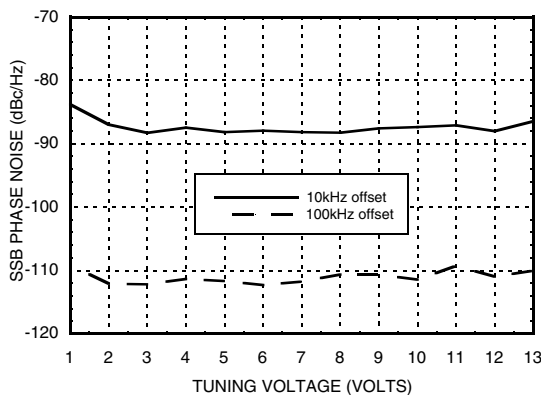
Sensitivity vs. Tuning Voltage, $V_{cc} = +3V$



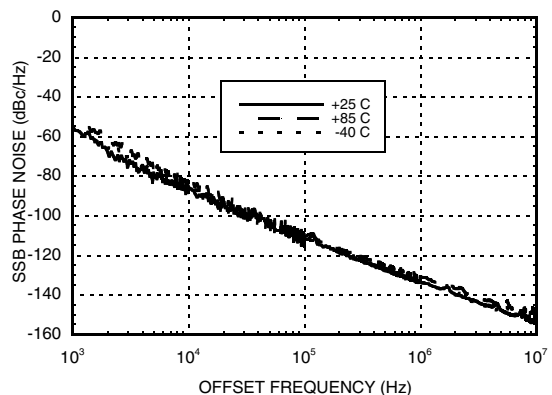
Output Power vs. Tuning Voltage, $V_{cc} = +3V$



SSB Phase Noise vs. Tuning Voltage



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



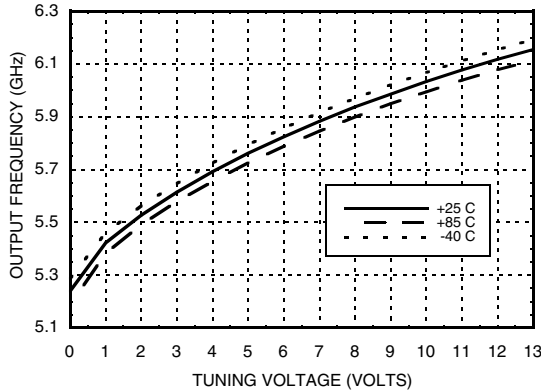
Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

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

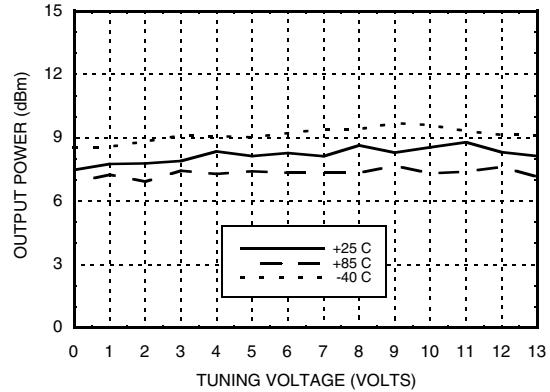


MMIC VCO w/ HALF FREQUENCY OUTPUT & DIVIDE-BY-4, 11.17 - 12.02 GHz

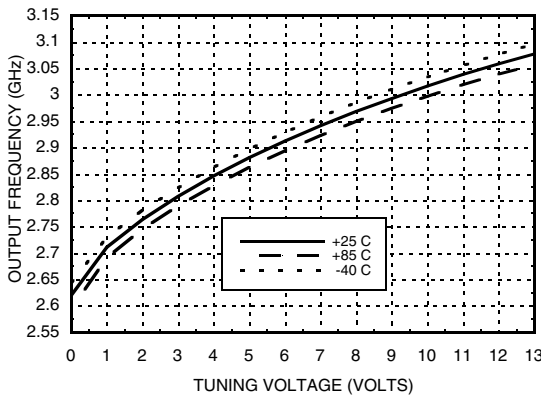
RFOUT/2 Frequency vs. Tuning Voltage, Vcc= +3V



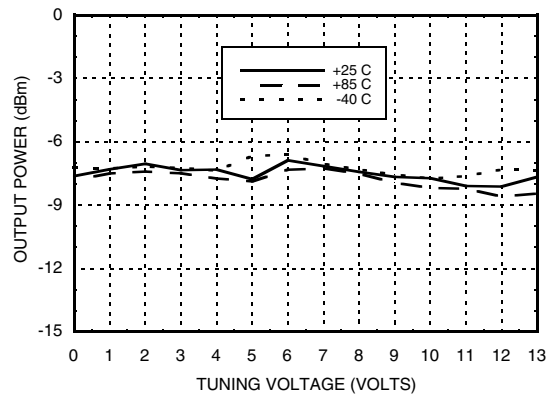
RFOUT/2 Output Power vs. Tuning Voltage, Vcc= +3V



Divide-by-4 Frequency vs. Tuning Voltage, Vcc= +3V



Divide-by-4 Output Power vs. Tuning Voltage, Vcc= +3V



Absolute Maximum Ratings

Vcc1, Vcc2	+3.5 Vdc
Vtune	0 to +15V
Junction Temperature	135 °C
Continuous P _{diss} (T=85 °C) (derate 27 mW/C above 85 °C)	1.3 W
Thermal Resistance (junction to ground paddle)	37.5 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

Typical Supply Current vs. Vcc

Vcc (V)	I _{cc} (mA)
2.75	230
3.0	275
3.25	320

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

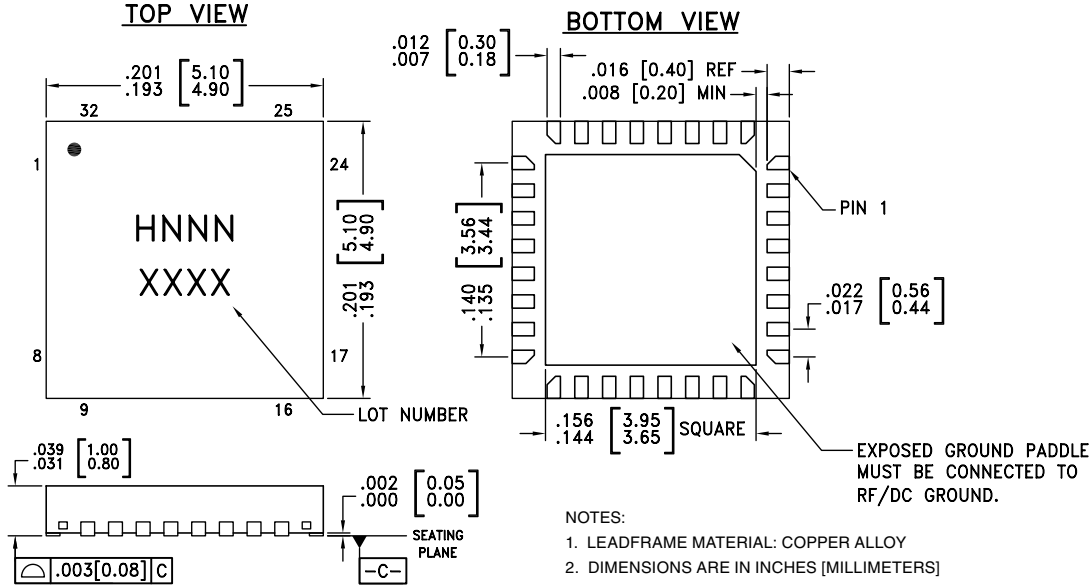


**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

MMIC VCO w/ HALF FREQUENCY OUTPUT & DIVIDE-BY-4, 11.17 - 12.02 GHz



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 LAND PATTERN.

Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking ^[3]
HMC514LP5	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL3 ^[1]	H514 XXXX
HMC514LP5E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL3 ^[2]	H514 XXXX

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

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1 - 3, 7 - 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.	
4	RFOUT/4	Divide-by-4 Output.	
6	VCC1	Supply Voltage for prescaler. If prescaler is not required, this pin may be left open to conserve 40 mA of current.	

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

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

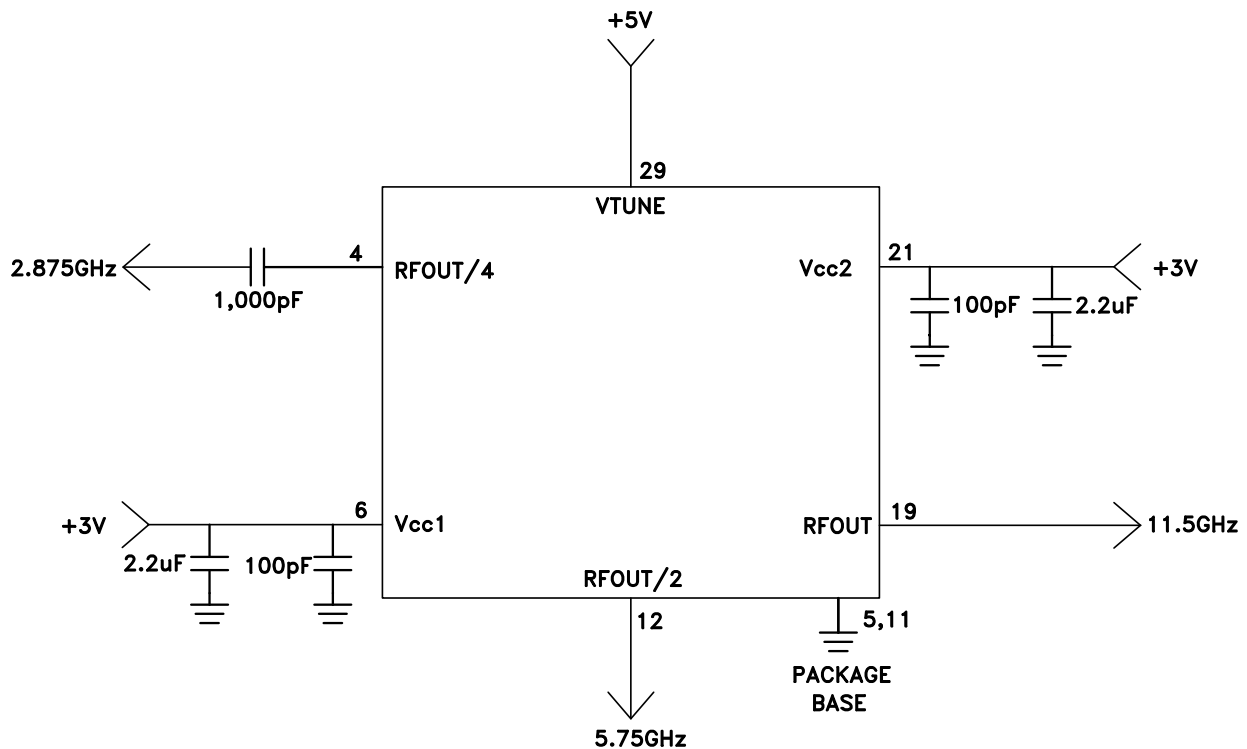


MMIC VCO w/ HALF FREQUENCY OUTPUT & DIVIDE-BY-4, 11.17 - 12.02 GHz

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
12	RFOUT/2	Half frequency output (AC coupled).	
19	RF OUT	RF output (AC coupled).	
21	VCC2	Supply Voltage, +3V	
29	VTUNE	Control Voltage Input. Modulation port bandwidth dependent on drive source impedance.	
5, 11, Paddle	GND	Package bottom has an exposed metal paddle that must be connected to RF/DC ground.	

Typical Application Circuit



Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

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