HMC533LP4 / 533LP4E

v00.0405

MMIC VCO w/ DIVIDE-BY-16, 23.8 - 24.8 GHz

Typical Applications

Low noise MMIC VCO w/Divide-by-16 for:

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

Features

Pout: +12 dBm

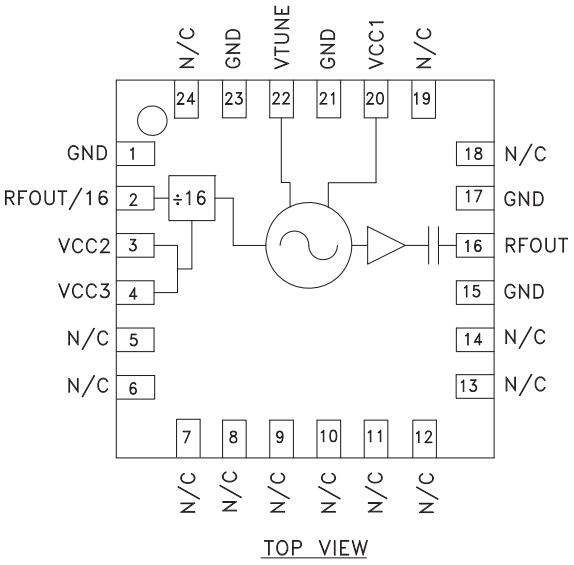
Phase Noise: -95 dBc/Hz @100 KHz Typ.

No External Resonator Needed

Single Supply: +5V @ 220 mA

24 Lead 4x4mm QFN Package: 9 mm^2

Functional Diagram



TOP VIEW

General Description

The HMC533LP4 & HMC533LP4E are GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCOs. The HMC533LP4 & HMC533LP4E integrate resonators, negative resistance devices, varactor diodes and feature a divide-by-16 output. T he VCO's phase noise performance is excellent over temperature, shock, and process due to the oscillator's monolithic structure. Power output is +12 dBm typical from a +5V supply voltage. Prescaler function can be disabled to conserve current if not required. The voltage controlled oscillator is packaged in a leadless QFN 4 x 4 mm surface mount package.

Electrical Specifications, T_A = +25° C, Vcc1, Vcc2, Vcc3 = +5V

Parameter		Min.	Typ.	Max.	Units
Frequency Range			23.8 - 24.8		GHz
Power Output	RFOUT RFOUT/16	+9 -7	+12 -4	+15 -1	dBm dBm
SSB Phase Noise @ 100 kHz Offset, Vtune= +5V @ RFOUT			-95		dBc/Hz
Tune Voltage	Vtune	2		13	V
Supply Current	Icc	180	220	260	mA
Tune Port Leakage Current (Vtune= 13V)				10	µA
Output Return Loss			3		dB
Harmonics/Subharmonics	1/2 3/2		26 37		dBc dBc
Pulling (into a 2.0:1 VSWR)			13		MHz pp
Pushing @ Vtune= 5V			80		MHz/V
Frequency Drift Rate			2.3		MHz/°C

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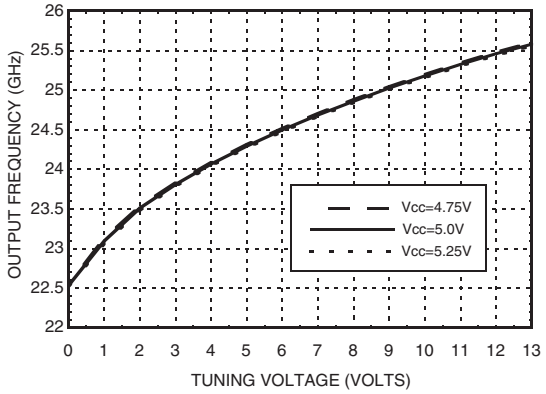
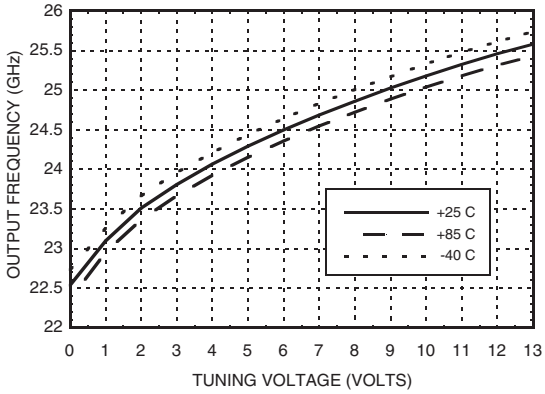
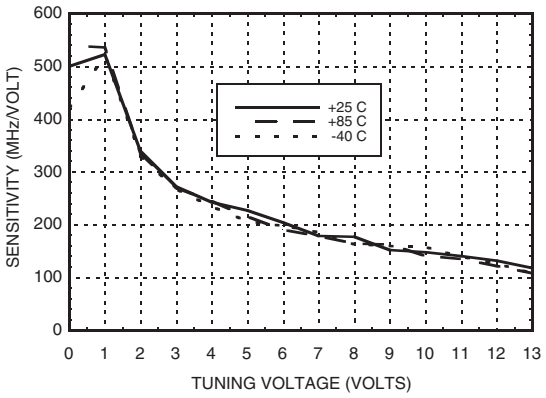
Frequency vs. Tuning Voltage, T= 25°C



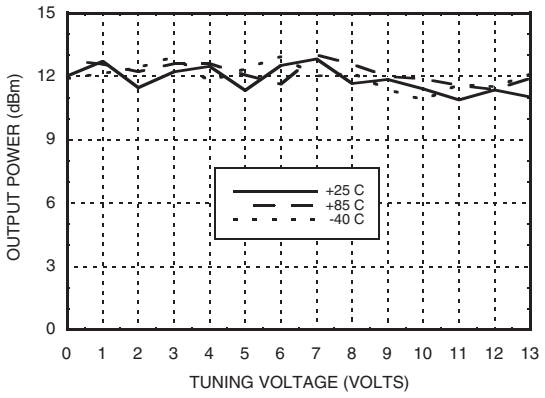
Frequency vs. Tuning Voltage, Vcc= +5V



Sensitivity vs. Tuning Voltage, Vcc= +5V



Output Power vs. Tuning Voltage, Vcc= +5V



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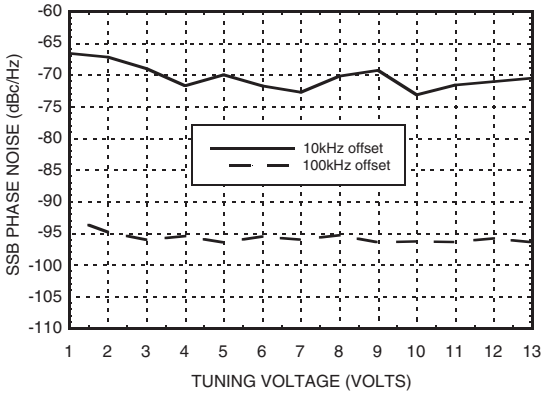
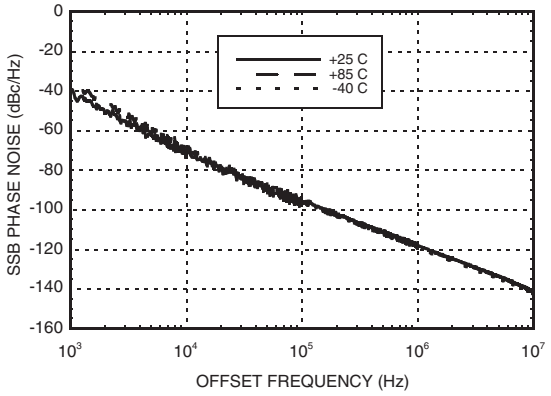
RoHS✓ EARTH FRIENDLY

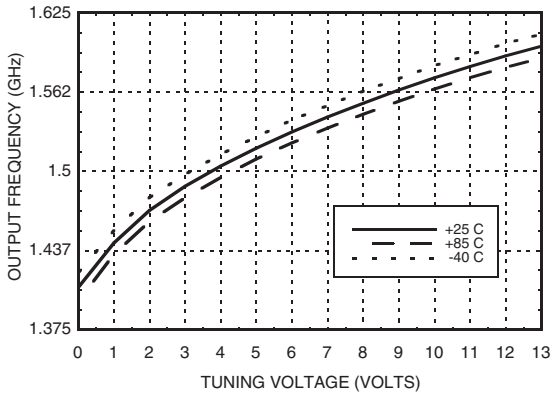
SSB Phase Noise vs. Tuning Voltage



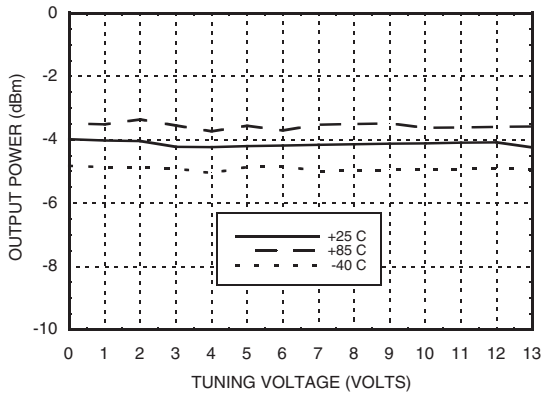
SSB Phase Noise @ Vtune= +5V



Divide-by-16 Frequency vs. Tuning Voltage, Vcc= +5V



Divide-by-16 Output Power vs. Tuning Voltage, Vcc= +5V



Absolute Maximum Ratings

Vcc1, Vcc2	5.5 V
Vtune	0 to 15V Max.
Junction Temperature	135 °C
Continuous Pdiss (T=85 °C) (derate 28 mW/C above 85 °C	1.4 W
Thermal Resistance	36 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 1A

Typical Supply Current vs. Vcc

Vcc (V)	Icc (mA)
4.75	200
5.0	220
5.25	240

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

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

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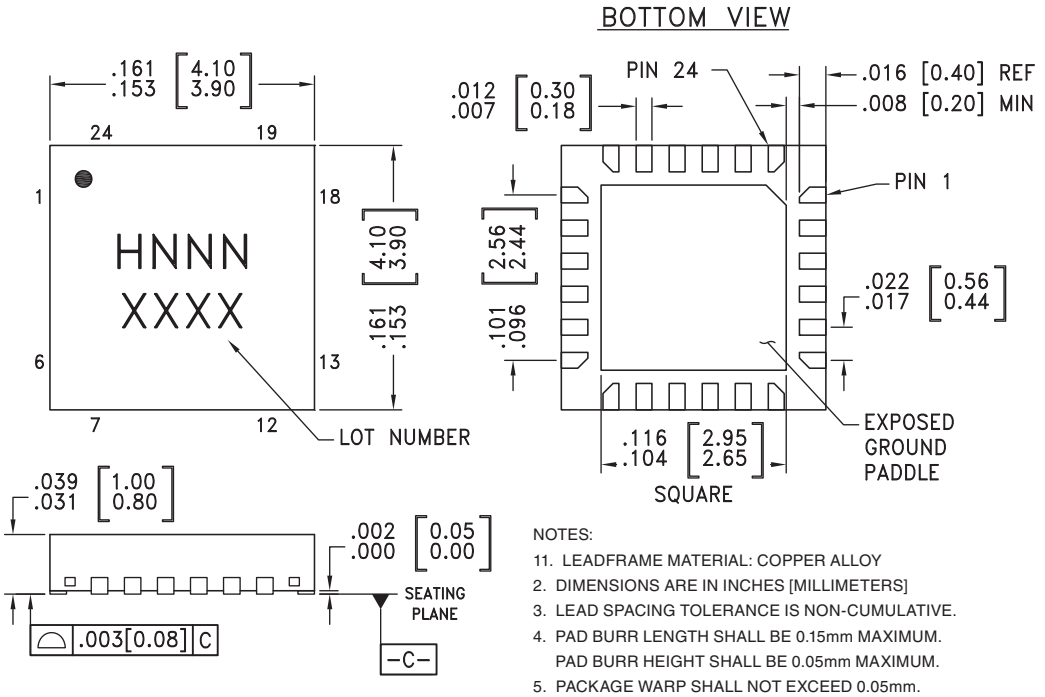
Outline Drawing



NOTES:

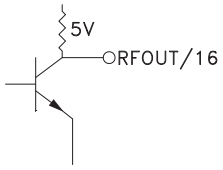
11. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED 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]
HMC533LP4	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	H533 XXXX
HMC533LP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	H533 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, 15, 17, 21, 23	GND	Package bottom has an exposed metal paddle that must also be connected to RF/DC ground.	
2	RFOUT/16	Divided-by-16 Output	

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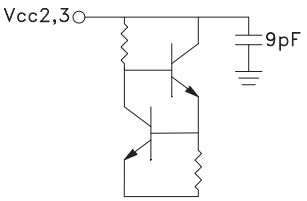
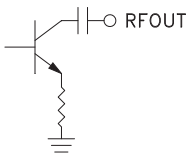
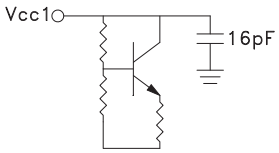
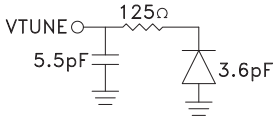
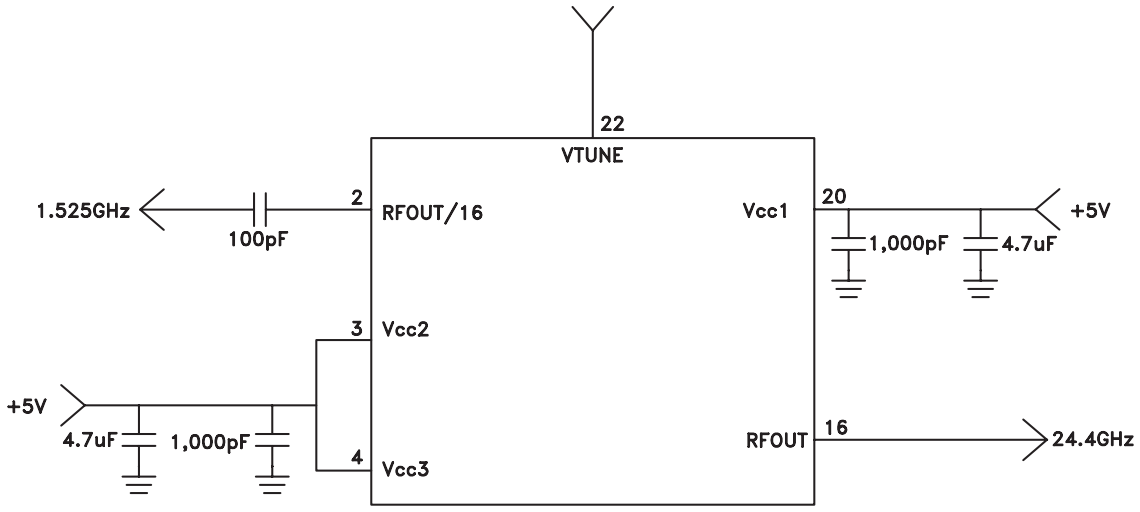
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
3, 4	VCC2, VCC3	Supply voltage for prescaler. If prescaler is not required, these pins may be left open to conserve 100 mA of current	
5-14, 18, 19, 24	N/C	No Connection. These pins may be connected to RF/ DC ground. Performance will not be affected.	
16	RFOUT	RF output (AC coupled).	
20	VCC1	Supply Voltage, +5V	
22	VTUNE	Control Voltage Input. Modulation port bandwidth dependent on drive source impedance.	

Typical Application Circuit



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