

## MMIC VCO w/ HALF FREQUENCY OUTPUT 14.5 - 15.0 GHz



### Typical Applications

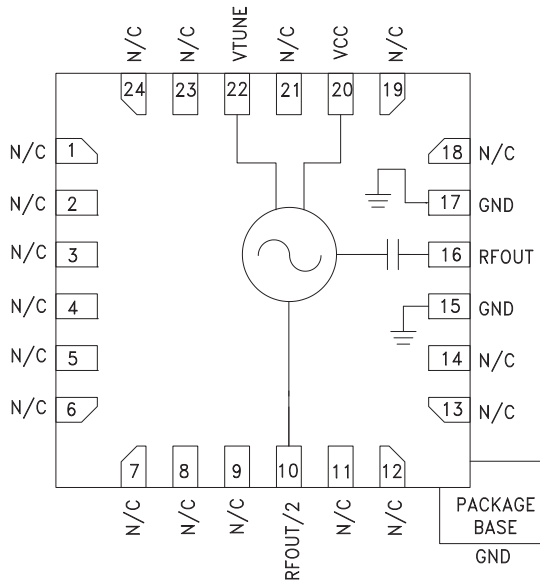
The HMC736LP4(E) is ideal for:

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

### Features

- Dual Output:  $F_o = 14.5 - 15.0$  GHz  
 $F_o/2 = 7.25 - 7.5$  GHz
- Pout: +9 dBm
- Phase Noise: -105 dBc/Hz @ 100 kHz
- No External Resonator Needed
- 24 Lead 4x4mm SMT Package: 16mm<sup>2</sup>

### Functional Diagram



### General Description

The HMC736LP4(E) is a GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCO. The HMC736LP4(E) integrates a resonator, negative resistance device, varactor diode and feature 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 +9 dBm typical from a +4.2V supply voltage. The voltage controlled oscillator is packaged in a leadless QFN 4x4 mm surface mount package, and requires no external matching components.

### Electrical Specifications, $T_A = +25^\circ\text{C}$ , $V_{CC} = +4.2\text{V}$

Parameter	Min.	Typ.	Max.	Units	
Frequency Range	$F_o$	14.5 - 15.0		GHz	
	$F_o/2$	7.25 - 7.5		GHz	
Power Output	RFOUT	6	9	13	dBm
	RFOUT/2	-8	-3	2	dBm
SSB Phase Noise @ 100 kHz Offset, Vtune= +5V @ RFOUT		-105		dBc/Hz	
Tune Voltage	Vtune	1	13	V	
Supply Current		120	150	180	mA
Tune Port Leakage Current (Vtune= 13V)			10	$\mu\text{A}$	
Output Return Loss		2.5		dB	
Harmonics/Subharmonics	1/2	-45		dBc	
	3/2	-42		dBc	
Pulling (into a 2.0:1 VSWR)		12		MHz pp	
Pushing @ Vtune= 5V		24		MHz/V	
Frequency Drift Rate		1.2		MHz/ $^\circ\text{C}$	

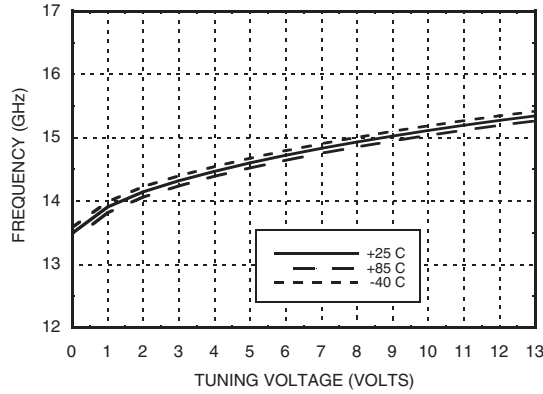
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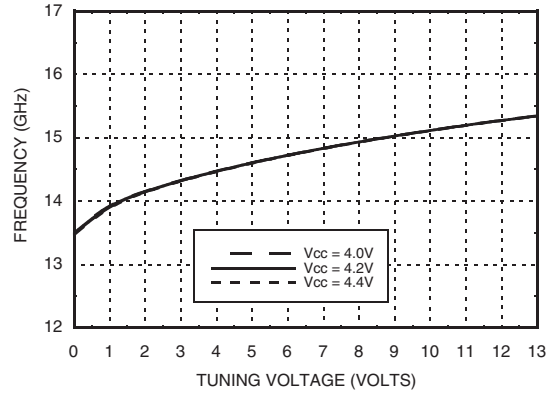


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14.5 - 15.0 GHz**

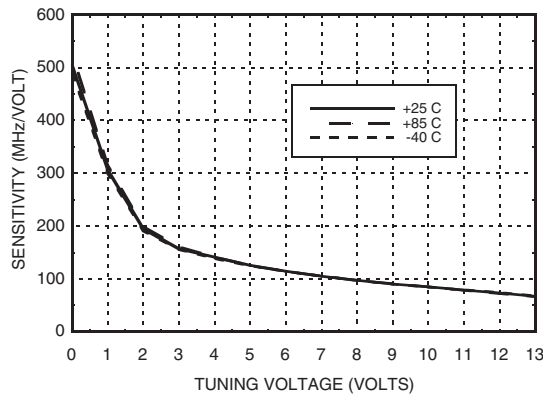
**Frequency vs. Tuning Voltage, Vcc = +4.2V**



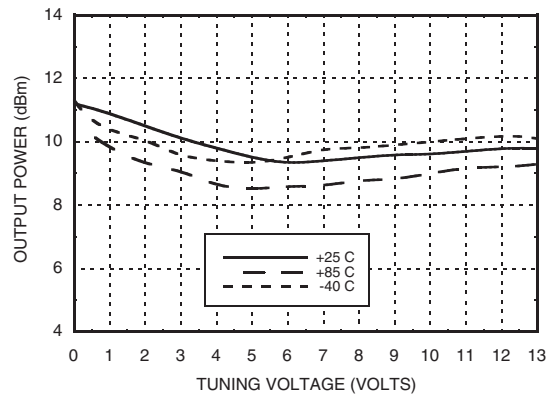
**Frequency vs. Tuning Voltage, T = 25°C**



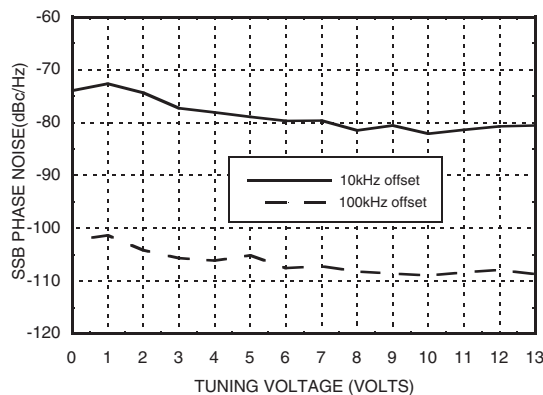
**Sensitivity vs. Tuning Voltage, Vcc = +4.2V**



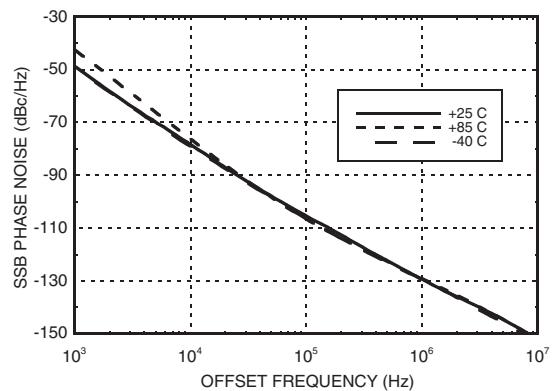
**Output Power vs. Tuning Voltage, Vcc = +4.2V**



**SSB Phase Noise vs. Tuning Voltage**



**SSB Phase Noise @ Vtune = +5V**



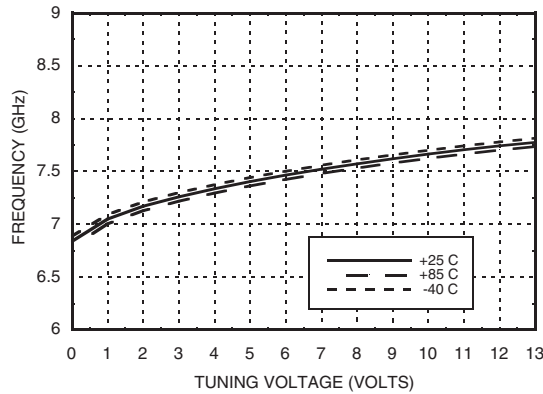
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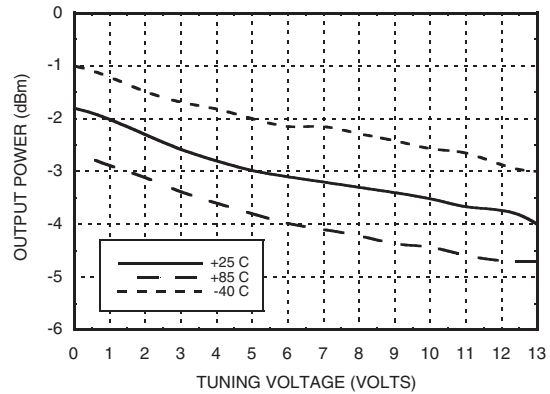
## MMIC VCO w/ HALF FREQUENCY OUTPUT 14.5 - 15.0 GHz



**RFOUT/2 Frequency vs. Tuning Voltage, Vcc = +4.2V**



**RFOUT/2 Output Power vs. Tuning Voltage, Vcc = +4.2V**



### Absolute Maximum Ratings

Vcc	+5.5V
Vtune	0 to 15V
Junction Temperature	135 °C
Continuous Pdiss (T=85 °C) (derate 19.6 mW/C above 85 °C)	1 W
Thermal Resistance (junction to ground paddle)	51 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

### Typical Supply Current vs. Vcc

Vcc (V)	Icc (mA)
4.0	140
4.2	150
4.4	160

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



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

### Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking <sup>[3]</sup>
HMC736LP4	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 <sup>[1]</sup>	H736 XXXX
HMC736LP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 <sup>[2]</sup>	H736 XXXX

[1] Max peak reflow temperature of 235 °C

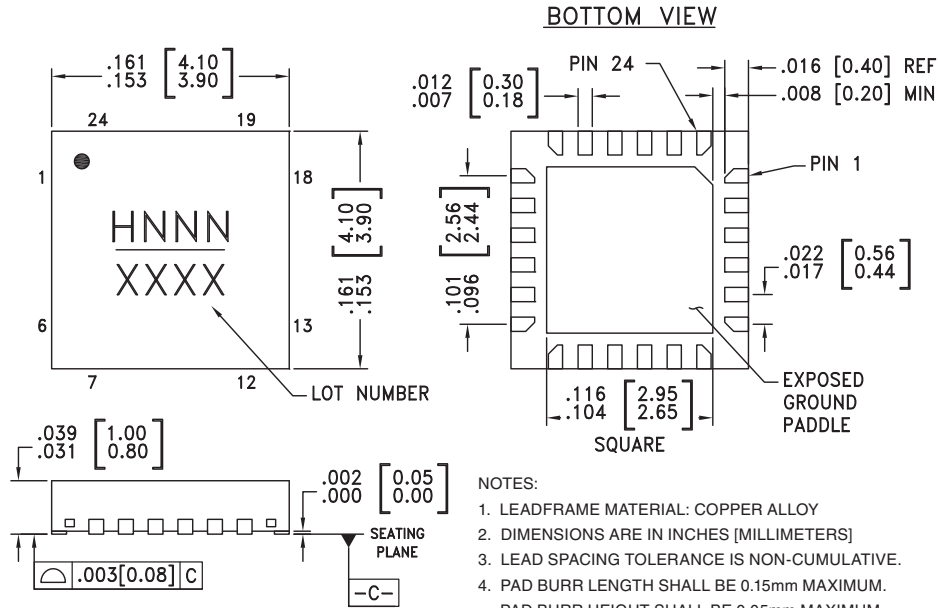
[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

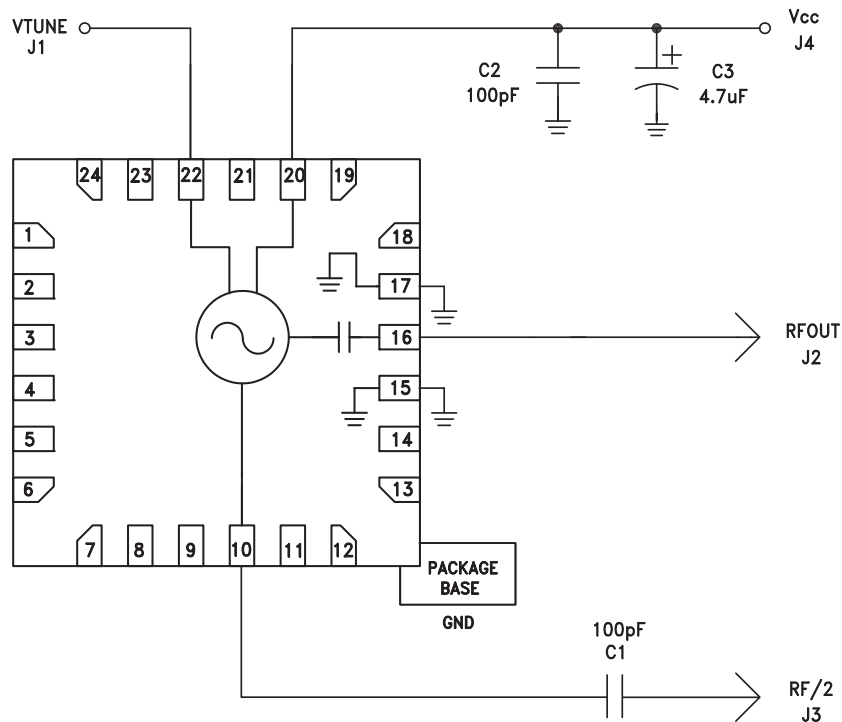
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**Outline Drawing**



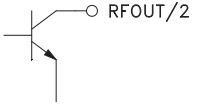
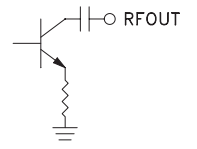
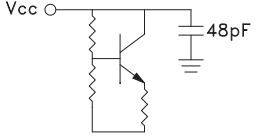
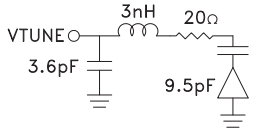
**Application Circuit**



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**Pin Descriptions**

Pin Number	Function	Description	Interface Schematic
1 - 9, 11 - 14, 18, 19, 21, 23, 24	N/C	No Connection. These pins may be connected to RF/DC ground. Performance will not be affected.	
10	RFOUT/2	Half frequency output (AC coupled). Requires external AC coupling capacitor.	
16	RFOUT	RF output (AC coupled).	
20	Vcc	Supply Voltage, +4.2V	
22	VTUNE	Control voltage and modulation input. Modulation bandwidth dependent on drive source impedance. See "Determining the FM Bandwidth of a Wideband Varactor Tuned VCO" application note.	
15, 17, Paddle	GND	Package bottom has an exposed metal paddle that must be connected to RF/DC ground.	