



## SMT GaAs HBT MMIC x4 ACTIVE FREQUENCY MULTIPLIER, 9.8 - 11.2 GHz OUTPUT

### Typical Applications

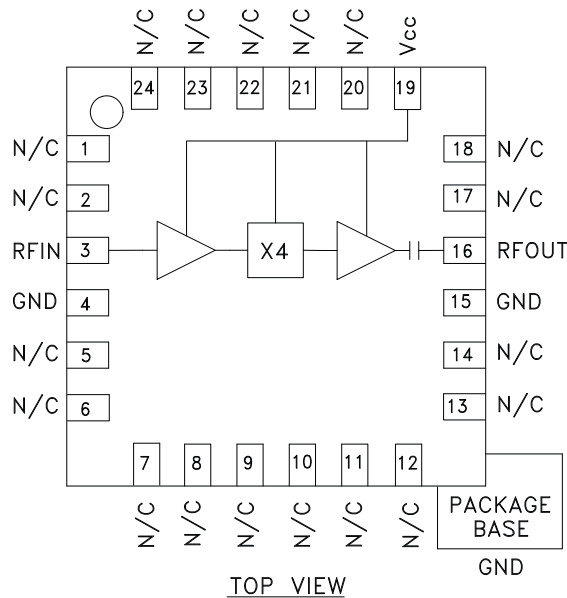
Active Multiplier for X Band Applications:

- Fiber Optic
- Point-to-Point Radios
- Military Radar

### Features

- Output Power: +4 dBm
- Sub-Harmonic Suppression: >25 dBc
- SSB Phase Noise: -142 dBc/Hz
- Single Supply: 5V@ 52 mA
- 24 Lead 4x4 mm SMT Package: 16 mm<sup>2</sup>

### Functional Diagram



### General Description

The HMC443LP4 & HMC443LP4E are active miniature x4 frequency multipliers utilizing InGaP GaAs HBT technology in 4x4 mm leadless surface mount packages. Power output is +4 dBm typical from a 5V supply voltage and varies little vs. input power, temperature and supply voltage. Suppression of undesired fundamental and sub-harmonics is >25 dBc typical with respect to output signal level. The low additive SSB phase noise of -142 dBc/Hz at 100 kHz offset helps the user maintain good system noise performance. The HMC443LP4 & HMC443LP4E are ideal for use in LO multiplier chains allowing reduced parts count vs. traditional approaches.

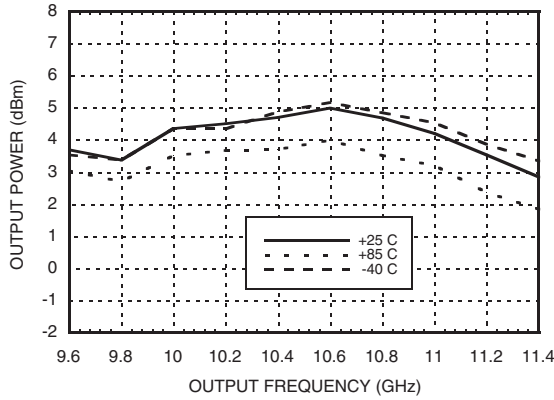
### Electrical Specifications, $T_A = +25^\circ C$ , $V_{CC} = 5V$

Parameter	Min.	Typ.	Max.	Units
Frequency Range, Input	2.45 - 2.80			GHz
Frequency Range, Output	9.8 - 11.2			GHz
Input Power Range	-15		+5	dBm
Output Power	1	4		dBm
Sub-Harmonic Suppression		25		dBc
Input Return Loss		15		dB
Output Return Loss		8		dB
SSB Phase Noise (100 kHz Offset)	Pin = 0 dBm			dBc/Hz
Supply Current (I <sub>CC</sub> )		52	69	mA

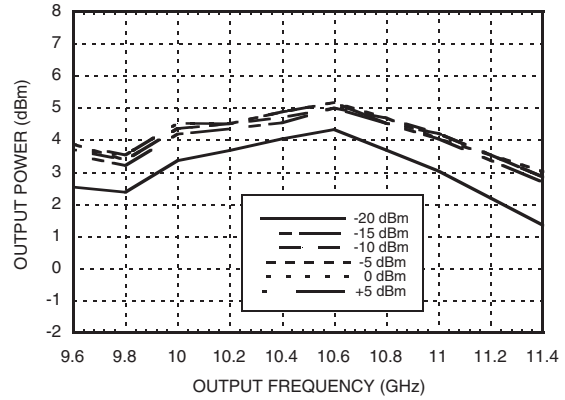


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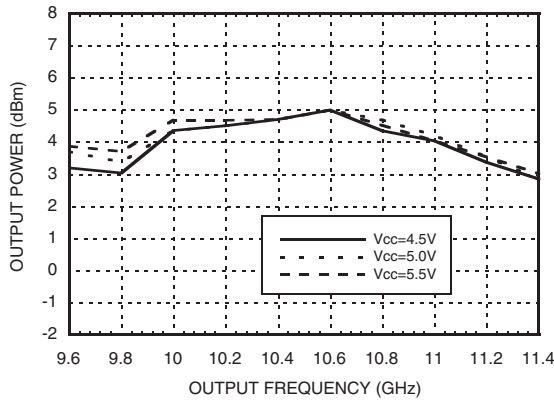
**Output Power vs.  
Temperature @ -10 dBm Drive Level**



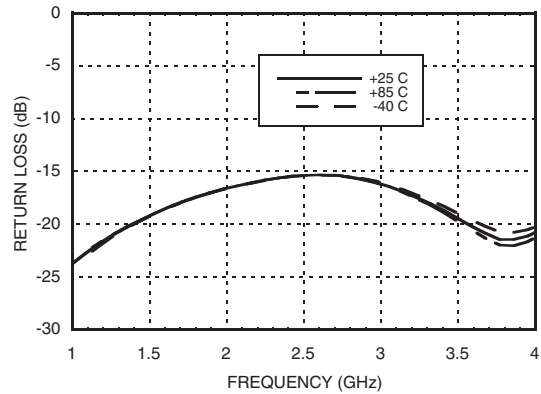
**Output Power vs. Drive Level**



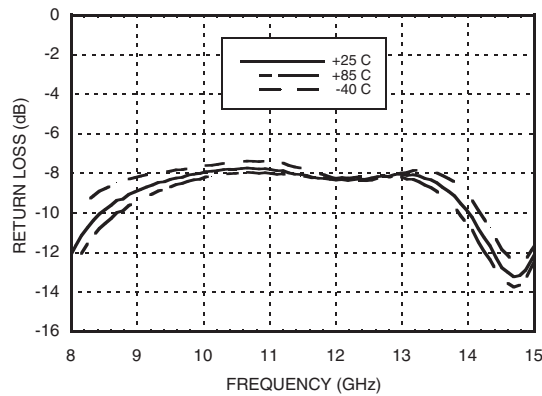
**Output Power vs.  
Supply Voltage @ -10 dBm Drive Level**



**Input Return Loss vs. Temperature**



**Output Return Loss vs. Temperature**



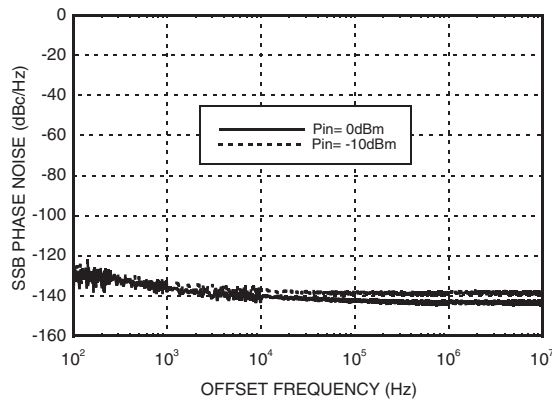
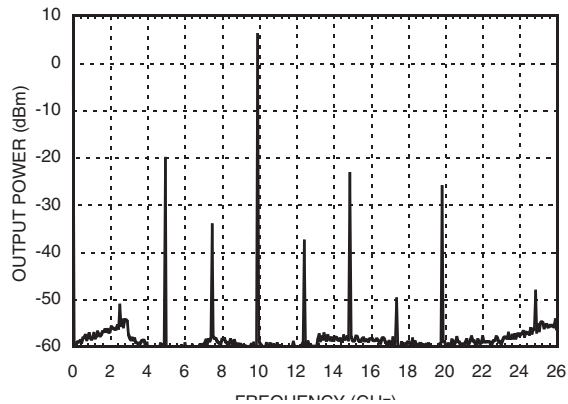


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v04.0210

**SSB Phase Noise  
Performance,  $F_{out} = 10.5$  GHz**

**Output Spectrum**



### SMT GaAs HBT MMIC x4 ACTIVE FREQUENCY MULTIPLIER, 9.8 - 11.2 GHz OUTPUT

#### Absolute Maximum Ratings

RF Input (Vcc = +5V)	+20 dBm
Vcc	+5.5V
Channel Temperature	135 °C
Continuous Pdiss (T=85 °C) (derate 7.6 mW/°C above 85 °C)	500 mW
Thermal Resistance (R <sub>th</sub> ) (junction to ground paddle)	130.8 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

#### Typical Supply Current vs. Vcc

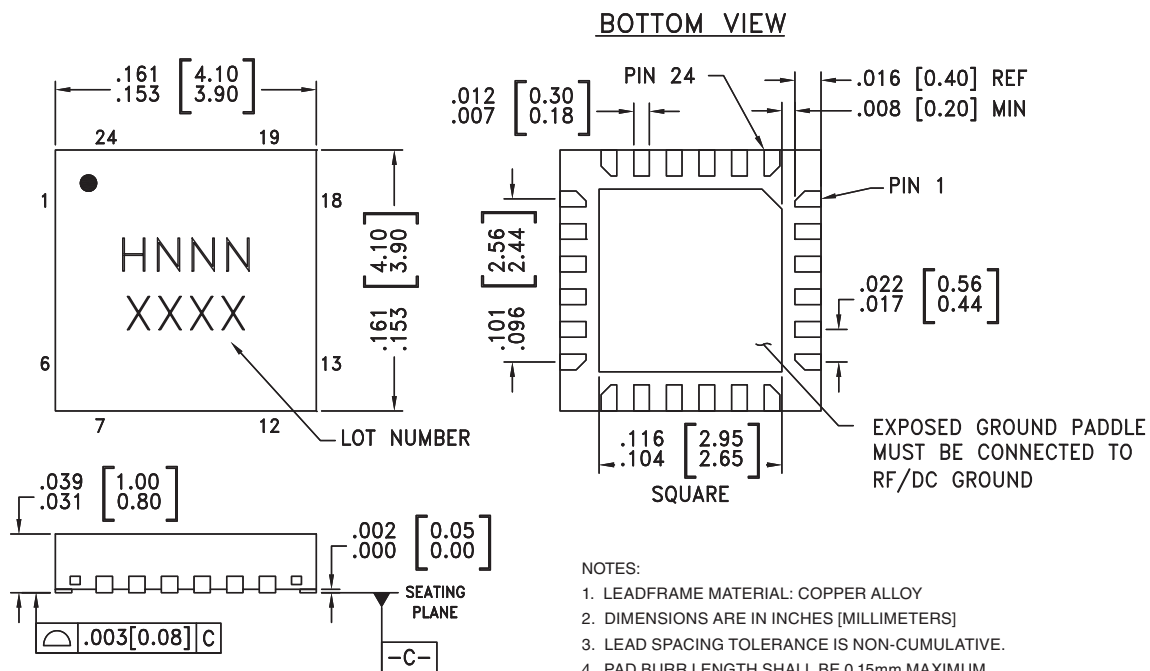
Vcc (V)	Icc (mA)
4.5	51
5.0	52
5.5	54

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



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

#### Outline Drawing



#### NOTES:

- LEADFRAME MATERIAL: COPPER ALLOY
- DIMENSIONS ARE IN INCHES [MILLIMETERS]
- LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
- PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM.  
PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
- PACKAGE WARP SHALL NOT EXCEED 0.05mm.
- ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
- REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED LAND PATTERN.

#### Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking <sup>[3]</sup>
HMC443LP4	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 <sup>[1]</sup>	H443 XXXX
HMC443LP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 <sup>[2]</sup>	H443 XXXX

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX