



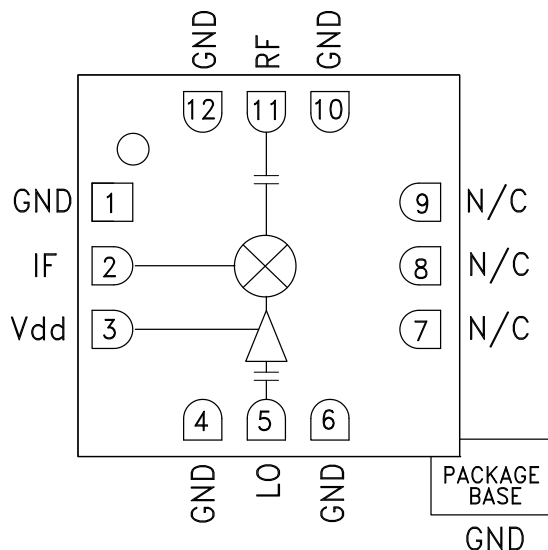
## GaAs MMIC SUB-HARMONIC SMT MIXER, 14.5 - 19.5 GHz

### Typical Applications

The HMC258LC3B is ideal for:

- Point to Point Radios
- VSAT and SATCOM
- Test & Measurement Equipment
- Military & Space

### Functional Diagram



### Features

- Integrated LO Amplifier: 0 dBm Input
- Sub-Harmonically Pumped (x2) LO
- High 2LO/RF Isolation: >45 dB
- Wide IF Bandwidth: DC - 3.5 GHz
- No External Matching Required
- RoHS Compliant 3x3mm Ceramic SMT Package

### General Description

The HMC258LC3B is a 14.5 - 19.5 GHz surface mount sub-harmonically pumped (x2) MMIC mixer with an integrated LO amplifier in a SMT leadless ceramic package. At 45 dB the 2LO to RF isolation eliminates the need for additional filtering. The LO amplifier is a single bias (+5V) two stage design with only 0 dBm drive requirement. The HMC258LC3B requires no external matching components, making it ideal for integrated subsystem applications. Utilizing the HMC258LC3B eliminates the need for wire-bonding, thereby providing a consistent connection interface for the customer.

### Electrical Specifications, $T_A = +25^\circ\text{C}$ , LO Drive = 0 dBm

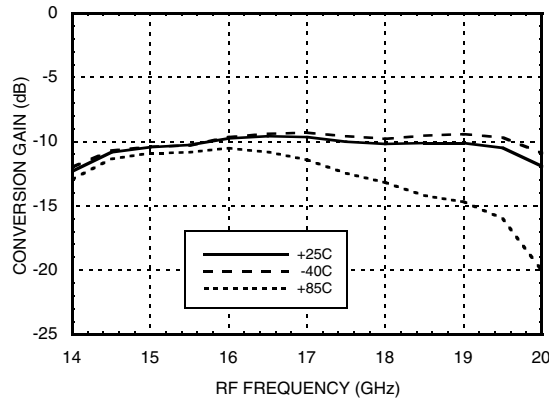
| Parameter                | IF = 1 GHz<br>Vdd = +5.0V |      |      | Units |
|--------------------------|---------------------------|------|------|-------|
|                          | Min.                      | Typ. | Max. |       |
| Frequency Range, RF      | 14.5 - 19.5               |      |      | GHz   |
| Frequency Range, LO      | 7.25 - 10                 |      |      | GHz   |
| Frequency Range, IF      | DC - 3.5                  |      |      | GHz   |
| Conversion Loss          |                           | 10   | 14   | dB    |
| Noise Figure (SSB)       |                           | 10   | 14   | dB    |
| 2LO to RF Isolation      | 35                        | 45   |      | dB    |
| 2LO to IF Isolation      | 30                        | 40   |      | dB    |
| IP3 (Input)              |                           | 5    |      | dBm   |
| 1 dB Compression (Input) |                           | -3   |      | dBm   |
| Supply Current (Idd)     |                           | 42   | 57   | mA    |

\*Unless otherwise noted, all measurements performed as downconverter, IF = 1 GHz.

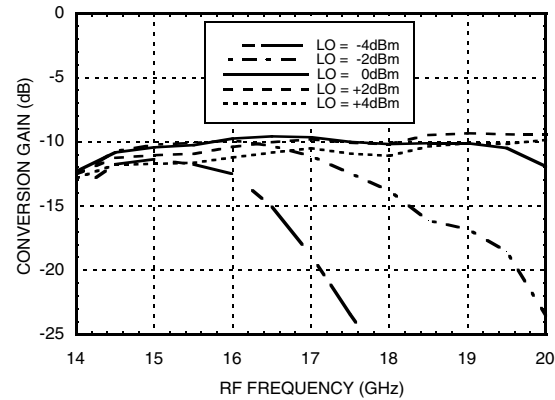


**GaAs MMIC SUB-HARMONIC  
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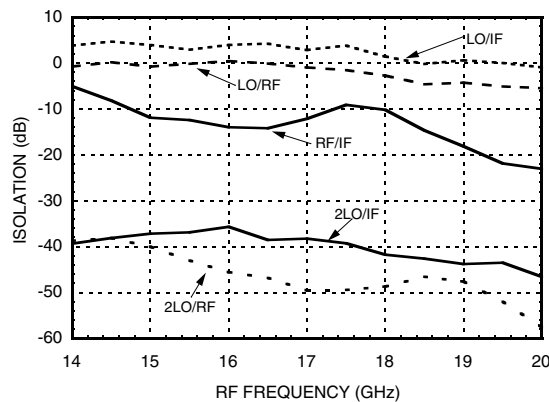
**Conversion Gain vs.  
Temperature @ LO = 0 dBm**



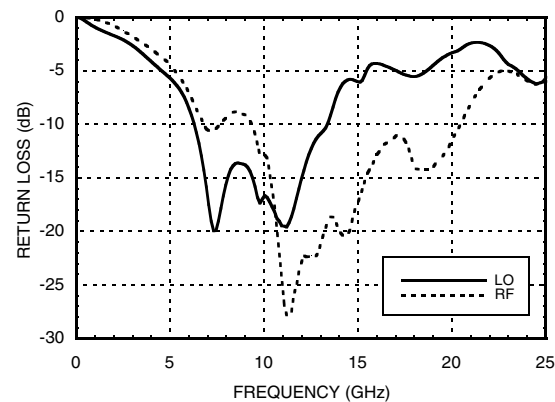
**Conversion Gain vs. LO Drive**



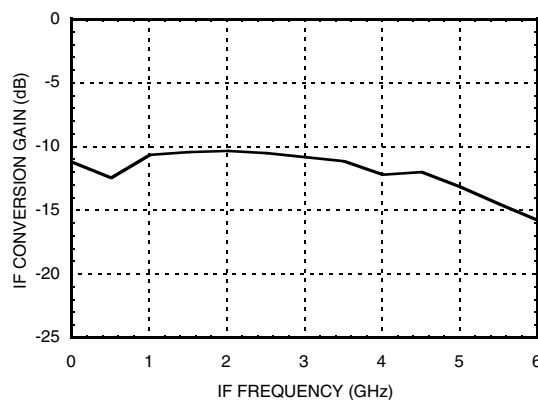
**Isolation @ LO = 0 dBm**



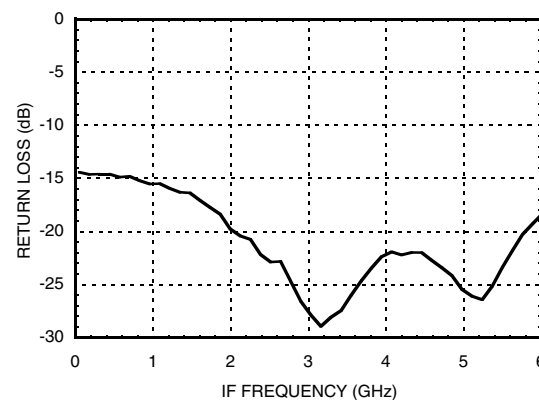
**RF & LO Return Loss @ LO = 0 dBm**

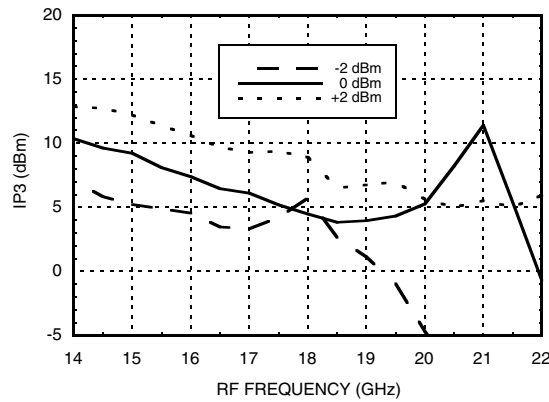
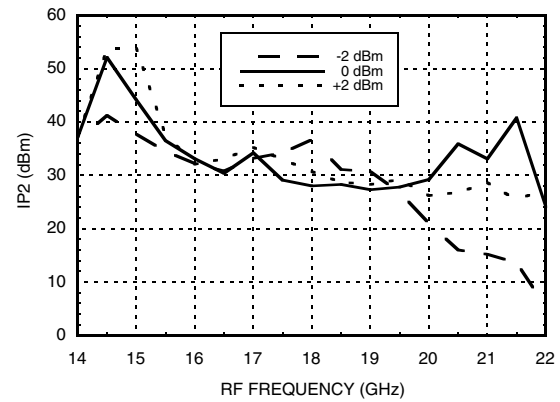
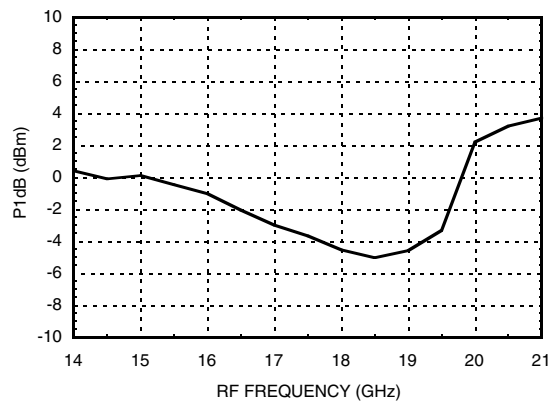
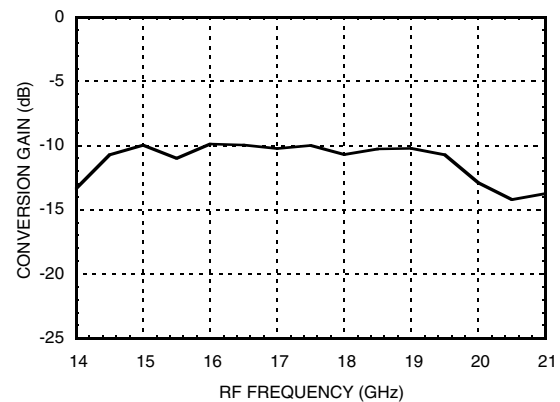


**IF Bandwidth @ LO = 0 dBm**



**IF Return Loss @ LO = 0 dBm**




**GaAs MMIC SUB-HARMONIC  
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**Input IP3 vs. LO Drive \***

**Input IP2 vs. LO Drive \***

**Input P1dB**

**Upconverter Performance  
Conversion Gain @ LO = 0 dBm**

**MxN Spurious Outputs@ LO = 0 dBm**

|     | nLO |      |      |      |      |      |      |      |
|-----|-----|------|------|------|------|------|------|------|
| mRF | -2  | -4   | -6   | -8   | 9    | 7    | 5    | 3    |
| 1   | X   |      |      |      |      |      |      |      |
| 2   |     | 47.1 |      |      |      |      |      |      |
| 3   |     |      | 34.5 |      |      |      |      |      |
| 4   |     |      |      | 66.7 |      |      |      |      |
| -4  |     |      |      |      | 50.1 |      |      |      |
| -3  |     |      |      |      |      | 59.5 |      |      |
| -2  |     |      |      |      |      |      | 32.8 |      |
| -1  |     |      |      |      |      |      |      | 45.4 |

RF = 18 GHz @ -10 dBm  
LO = 8.5 GHz @ 0 dBm  
All values in dBc below IF power level.

\* Two-tone input power = -10 dBm each tone, 1 MHz spacing.

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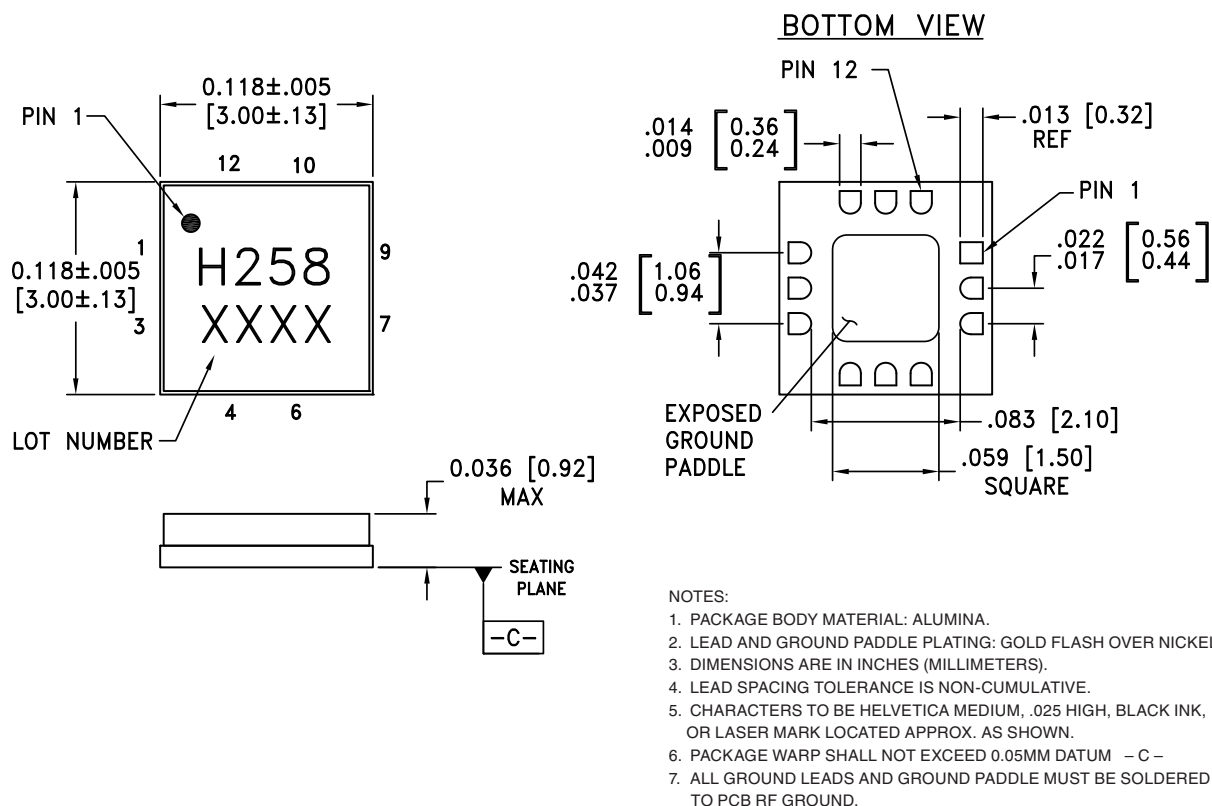
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**GaAs MMIC SUB-HARMONIC  
SMT MIXER, 14.5 - 19.5 GHz**
**Absolute Maximum Ratings**

|   |                |
|---|----------------|
| RF / IF Input (Vdd = +5V)   | +13 dBm        |
| LO Drive (Vdd = +5V)  | +13 dBm        |
| Vdd   | +5.5V          |
| Continuous P <sub>diss</sub> (Ta = 85 °C)<br>(derate 2.1 mW/°C above 85 °C) | 486 mW         |
| Channel Temperature   | 150 °C         |
| Thermal Resistance<br>(channel to ground paddle)                            | 133.6 °C/W     |
| Storage Temperature   | -65 to +150 °C |
| Operating Temperature   | -40 to +85 °C  |



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

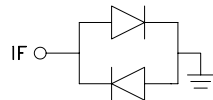
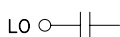
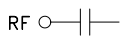
**Outline Drawing**

**Package Information**

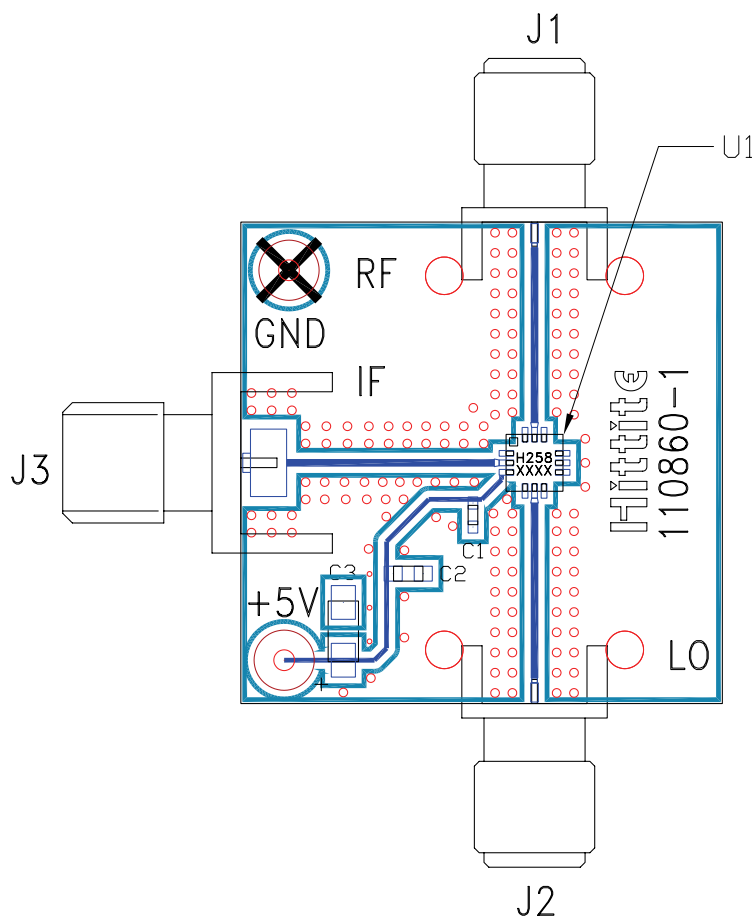
| Part Number | Package Body Material | Lead Finish      | MSL Rating          | Package Marking <sup>[2]</sup> |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC258LC3B  | Alumina, White        | Gold over Nickel | MSL3 <sup>[1]</sup> | H258<br>XXXX                   |

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX


**GaAs MMIC SUB-HARMONIC  
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**Pin Description**

| Pin Number         | Function | Description   | Interface Schematic   |
|--------------------|----------|---|---|
| 1, 4, 6,<br>10, 12 | GND      | Must be soldered to PCB RF ground.  |   |
| 2                  | IF       | IF Port. This pin is DC coupled and should be DC blocked externally using a series capacitor whose value has been chosen to pass the necessary IF frequency range. Any applied DC voltage to this pin will result in die non-function and possible die failure. |  |
| 3                  | Vdd      | Power Supply for the LO Amplifier. An external RF bypass capacitor of 100 - 330 pF is required as close to the package as possible.   |   |
| 5                  | LO       | LO Port. This pin is AC coupled and matched to 50 Ohms.   |  |
| 7 - 9              | N/C      | This pin may be connected to the housing ground or left unconnected.  |   |
| 11                 | RF       | RF Port. This pin is AC coupled and matched to 50 Ohms.   |  |

**Evaluation PCB**

**List of Materials for Evaluation PCB 110862 <sup>[1]</sup>**

| Item               | Description                 |
|--------------------|-----------------------------|
| J1, J2             | SRI SMA Connector           |
| J3                 | Johnson SMA Connector       |
| C1                 | 100pF Capacitor, 0402 Pkg.  |
| C2                 | 1000pF Capacitor, 0603 Pkg. |
| C3                 | 2.2 $\mu$ F                 |
| U1                 | HMC258LC3B Mixer            |
| PCB <sup>[2]</sup> | 110860 Evaluation PCB       |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in this application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Hittite upon request.