

Analog Devices Welcomes Hittite Microwave Corporation

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SMT GaAs HBT MMIC DIVIDE-BY-2, 0.01 - 13 GHz

Typical Applications

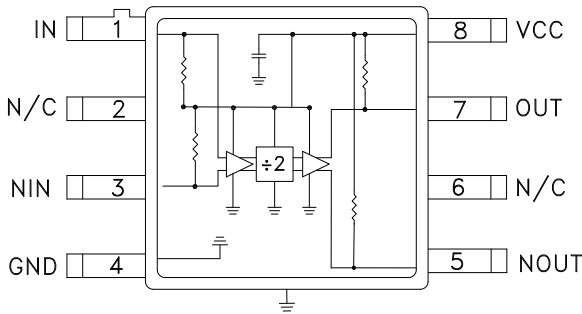
Prescaler for 10 MHz to 13 GHz PLL Applications:

- Point-to-Point / Multi-Point Radios
- VSAT Radios
- Fiber Optic
- Test Equipment
- Space & Military

Features

- Ultra Low SSB Phase Noise: -148 dBc/Hz
- Wide Bandwidth
- Output Power: 3 dBm
- Single DC Supply: +5V
- 8 Lead Hermetic SMT Package

Functional Diagram



General Description

The HMC361G8 is a low noise N=2 static divider in an 8 lead glass/metal surface mount (hermetic) package. This device operates from 10 MHz (with a square wave input) to 13 GHz input frequency with a single +5V DC supply. The low additive SSB phase noise of -148 dBc/Hz at 100 kHz offset helps the user maintain good system noise performance.

Electrical Specifications, $T_A = +25^\circ \text{C}$, 50 Ohm System, $V_{CC} = 5V$

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|--|---|------|------|------|--------|
| Maximum Input Frequency | Sine Wave or Square Wave input | 13 | | | GHz |
| Minimum Input Frequency | Sine Wave or Square Wave Input. {1} | | | 0.20 | GHz |
| Minimum Input Frequency | Square Wave {1} {2} | | | 0.01 | GHz |
| Input Power Range | $F_{in} = 0.01$ to 0.20 GHz (square wave) | -10 | | 10 | dBm |
| | $F_{in} = 0.20$ to 0.5 GHz (sine) | 0 | | 10 | dBm |
| | $F_{in} = 0.5$ to 1 GHz (sine) | -10 | | 10 | dBm |
| | $F_{in} = 1$ to 8 GHz (sine) | -15 | | 10 | dBm |
| | $F_{in} = 8$ to 11 GHz (sine) | -15 | | 2 | dBm |
| Output Power | $F_{in} = 8 - 13$ GHz (sine) | -15 | | 0 | dBm |
| | $F_{in} = 0.20$ GHz | | 4.5 | | dBm |
| | $F_{in} = 6$ GHz | | 3.6 | | dBm |
| | $F_{in} = 9$ GHz | | 1.6 | | dBm |
| Output Power | $F_{in} = 13$ GHz | | -2.5 | | dBm |
| | Both RF Outputs Terminated | | 40 | | dB |
| Reverse Leakage | Both RF Outputs Terminated | | 40 | | dB |
| SSB Phase Noise (100 kHz offset) | $P_{in} = 0$ dBm, $F_{in} = 6$ GHz (sine) | | -148 | | dBc/Hz |
| Output Transition Time | $P_{in} = 0$ dBm, $F_{out} = 882$ MHz | | 100 | | ps |
| Supply Current (I_{CC}) ($V_{CC} = +5V$) | | | 84 | | mA |

1. Divider will operate down to 0.01 GHz with a square-wave input signal.

2. Square wave input waveform is recommended for operation below 200 MHz. Recommended transition times are < 100 ps.

For price, delivery and to place orders: Hittite Microwave Corporation, 2 Elizabeth Drive, Chelmsford, MA 01824

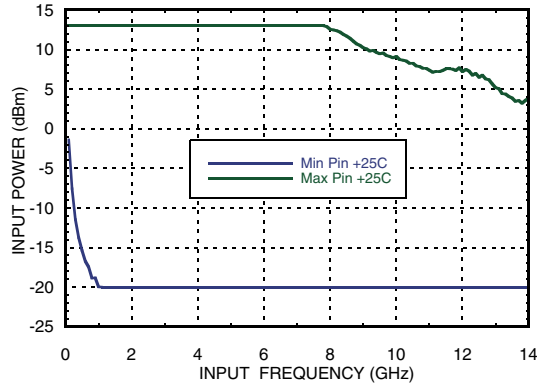
Phone: 978-250-3343 Fax: 978-250-3373 Order On-line at www.hittite.com

Application Support: Phone: 978-250-3343 or apps@hittite.com

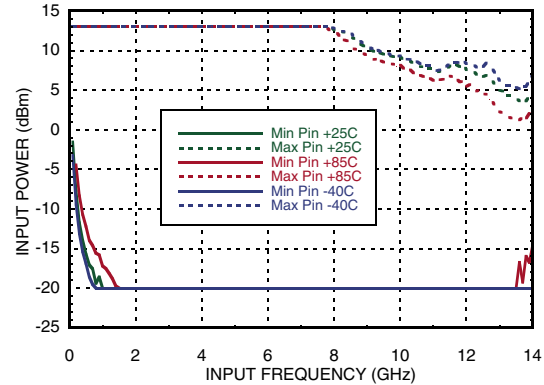


**SMT GaAs HBT MMIC
DIVIDE-BY-2, 0.01 - 13 GHz**

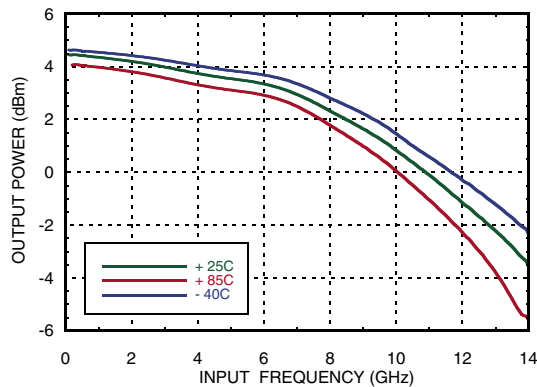
Input Sensitivity Window, $T = 25\text{ }^{\circ}\text{C}$



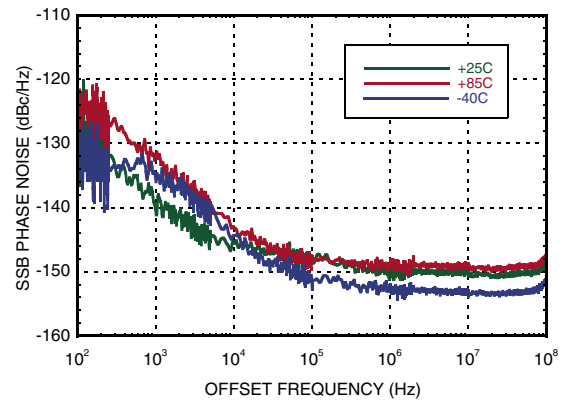
Input Sensitivity Window vs. Temperature



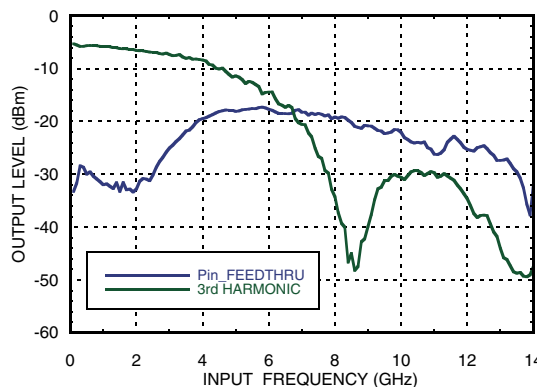
Output Power vs. Temperature



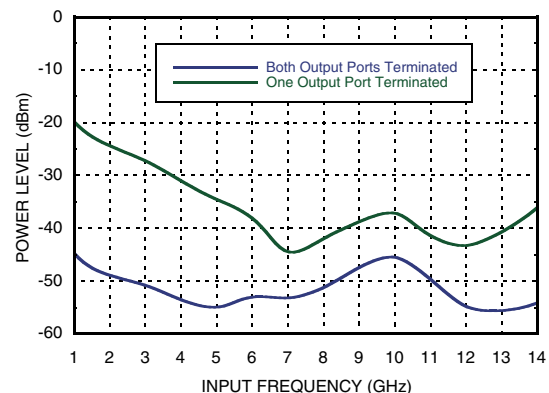
SSB Phase Noise Performance vs. Temperature, $P_{in} = 0\text{ dBm}$, $F_{in} = 6\text{ GHz}$



Output Harmonic Content, $P_{in} = 0\text{ dBm}$, $T = 25\text{ }^{\circ}\text{C}$



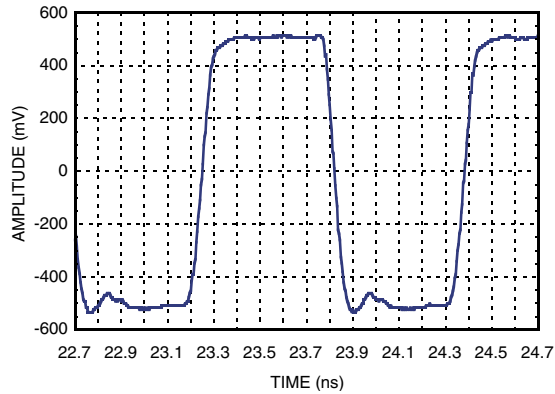
Reverse Leakage, $P_{in} = 0\text{ dBm}$, $T = 25\text{ }^{\circ}\text{C}$





**SMT GaAs HBT MMIC
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**Output Voltage Waveform,
Pin= 0 dBm, Fout= 882 MHz, T= 25 °C**



Absolute Maximum Ratings

| | |
|-----------------------|----------------|
| RF Input (Vcc = +5V) | +13 dBm |
| Vcc | +5.5V |
| Storage Temperature | -65 to +150 °C |
| ESD Sensitivity (HBM) | 100V |

Reliability Information

| | |
|--|---------------|
| Junction Temperature to Maintain 1 Million Hour MTTF | 135 °C |
| Nominal Junction Temperature (T = 85 °C and Pin = + 10 dBm) | 126 °C |
| Thermal Resistance (Rth) (Junction to GND Paddle, 5V Supply) | 96.9 °C/W |
| Operating Temperature | -40 to +85 °C |

Typical Supply Current vs. Vcc, T= 25 °C

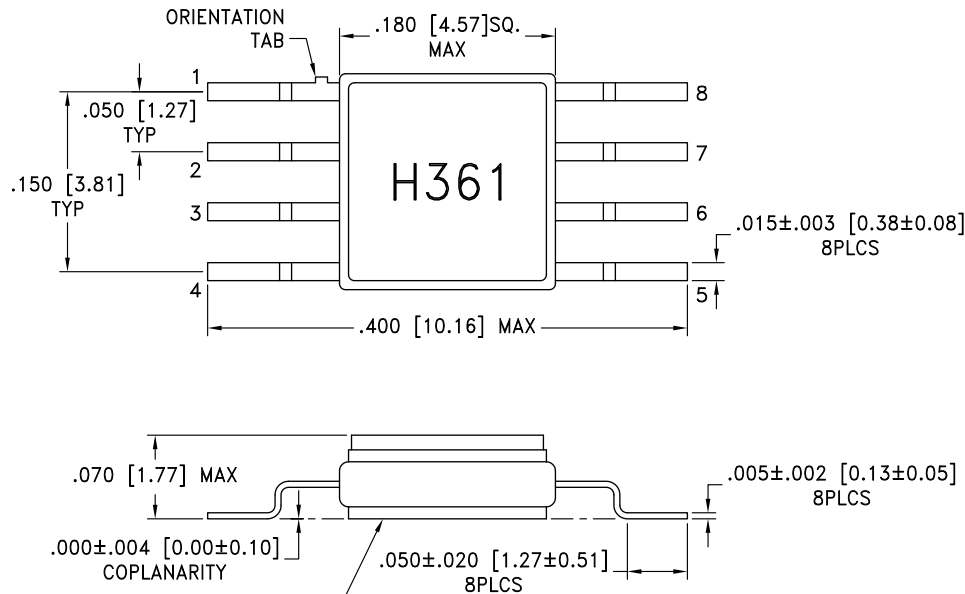
| Vcc (V) | Icc (mA) |
|---------|----------|
| 4.75 | 76 |
| 5.0 | 84 |
| 5.25 | 90 |

Note: Divider will operate over full voltage range shown above



**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

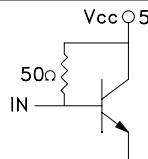
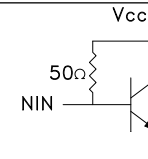

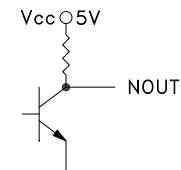
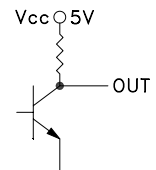
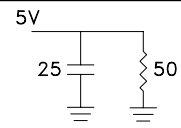
Outline Drawing



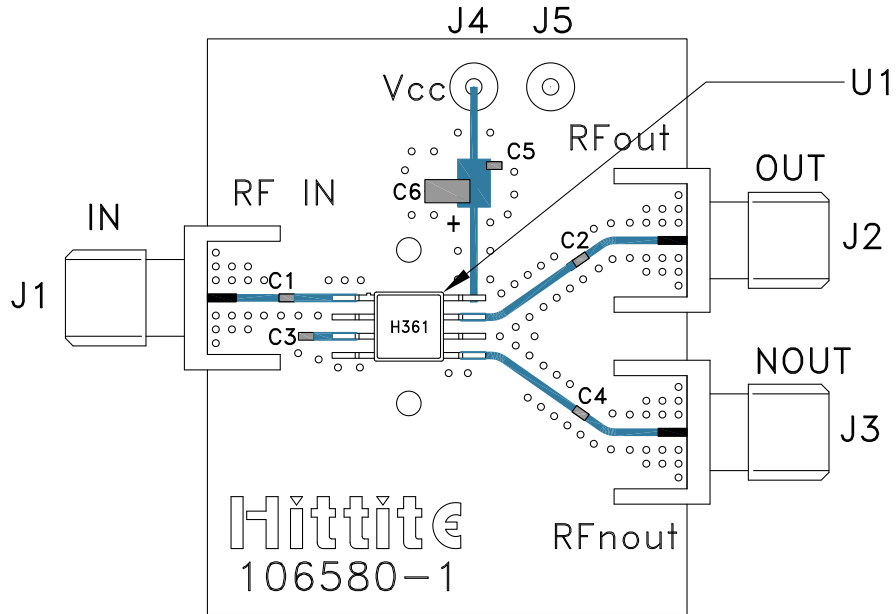
NOTES:

1. PACKAGE MATERIAL: ALUMINA LOADED BOROSILICATE GLASS.
2. LEAD, BASE, COVER MATERIAL: KOVAR™ (#7052 CORNING).
3. PLATING: ELECTROLYTIC GOLD 50 MICROINCHES MIN., OVER ELECTROLYTIC NICKEL 50 MICROINCHES MIN.
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. TOLERANCES: ±.005 [0.13] UNLESS OTHERWISE SPECIFIED.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

Pin Description

| Pin Number | Function | Description | Interface Schematic |
|------------|----------|---|---|
| 1 | IN | RF Input, must be DC blocked. |  |
| 2, 6 | N/C | These pins are not connected internally; however, all data shown herein was measured with the pins connected to RF/DC ground. | |
| 3 | NIN | RF Input 180° out of phase with pin 1 for differential operation. Must be DC blocked. AC ground for single ended operation. |  |
| 4 | GND | Pin and exposed paddle must be connected to RF/DC ground. |  |
| 5 | NOUT | Divided output 180° out of phase with pin 7, must be DC blocked. |  |
| 7 | OUT | Divided Output, must be DC blocked. |  |
| 8 | Vcc | Supply voltage 5V ± 0.25V. |  |

Evaluation PCB



List of Materials for Evaluation PCB EVAL01-HMC361G8 [1]

| Item | Description |
|---------|---|
| J1 - J3 | Connector, SMA, Female |
| J4, J5 | DC Pins |
| C1 - C4 | ATC530L, Broadband Capacitor, 0402 Pkg. |
| C5 | 1000 pF Capacitor, 0603 Pkg. |
| C6 | 10 uF Tantalum Capacitor, 1206 Pkg. |
| U1 | HMC361G8 |
| PCB [2] | 106580 Evaluation PCB |

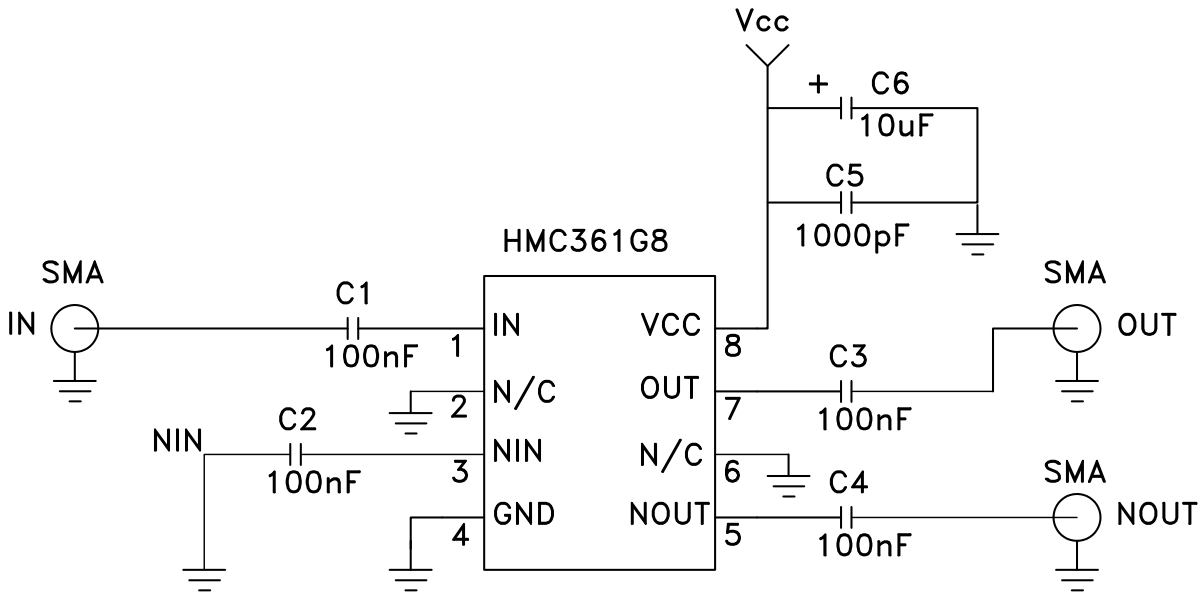
[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and backside ground slug 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 circuit board shown is available from Hittite upon request. This evaluation board is designed for single ended input testing. J2 and J3 provide differential output signals.



Application Circuit



Capacitors C1, C2, C3, and C4 are broadband multilayer capacitors, American Technical Ceramics part number ATC530L. The 100 nF capacitance value is per ATC datasheet.

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А