# HMC361

## GaAs HBT MMIC DIVIDE-BY-2, DC - 11 GHz

### Typical Applications

Prescaler for DC to X Band PLL Applications:

- Satellite Communication Systems
- Fiber Optic
- Point-to-Point and Point-to-Multi-Point Radios
- VSAT

### Features

Ultra Low SSB Phase Noise: -148 dBc/Hz

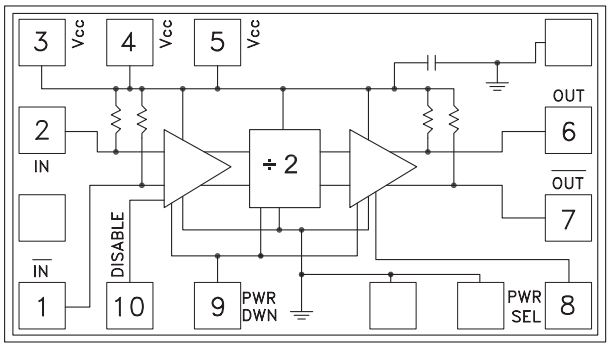
Wide Bandwidth

Output Power: 3 dBm

Single DC Supply: +5V

Small Size: 1.14 x 0.69 x 0.1 mm

### Functional Diagram




### General Description

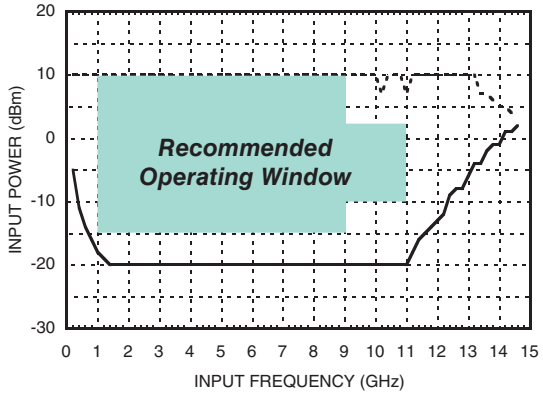
The HMC361 is a low noise Divide-by-2 Static Divider with InGaP GaAs HBT technology that has a small size of 1.14 x 0.69 mm. This device operates from DC (with a square wave input) to 11 GHz input frequency with a single +5V DC supply. The low additive SSB phase noise of -148 dBc/Hz at 100 kHz offset helps the user maintain good system noise performance.

### Electrical Specifications, $T_A$ = +25° C, 50 Ohm System, Vcc = 5V

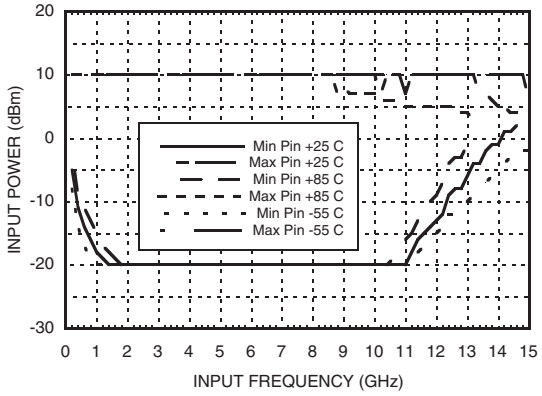
| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Maximum Input Frequency | | 11 | 12 | | GHz |
| Minimum Input Frequency | Sine Wave Input. [1] | | 0.2 | 0.5 | GHz |
| Input Power Range | Fin = 1 to 9 GHz | -15 | >-20 | +10 | dBm |
| | Fin = 9 to 11 GHz | -10 | >-15 | +2 | dBm |
| Output Power [2] | Fin = 6 GHz | 0 | 3 | | dBm |
| | Fin = 9 GHz | -5 | | | dBm |
| | Fin = 11 GHz | -8 | | | dBm |
| Reverse Leakage | Both RF Outputs Terminated | | 45 | | dB |
| SSB Phase Noise (100 kHz offset) | Pin = 0 dBm, Fin = 6 GHz | | -148 | | dBc/Hz |
| Output Transition Time | Pin = 0 dBm, Fout = 882 MHz | | 100 | | ps |
| Supply Current (Icc) [2] | | | 83 | | mA |

[1] Divider will operate down to DC for square-wave input signal.
[2] When operated in high power mode (pin 8 connected to ground).

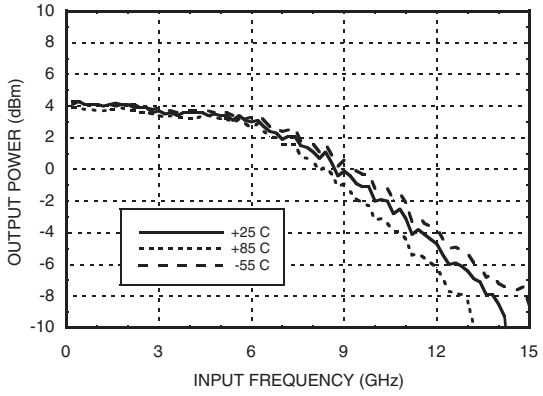
### Input Sensitivity Window, T= 25 °C



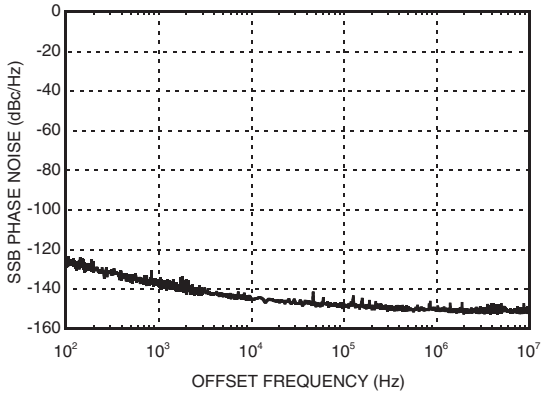

### Input Sensitivity Window vs. Temperature



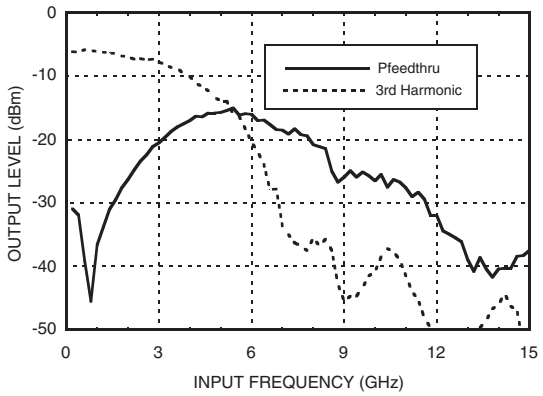

### Output Power vs. Temperature



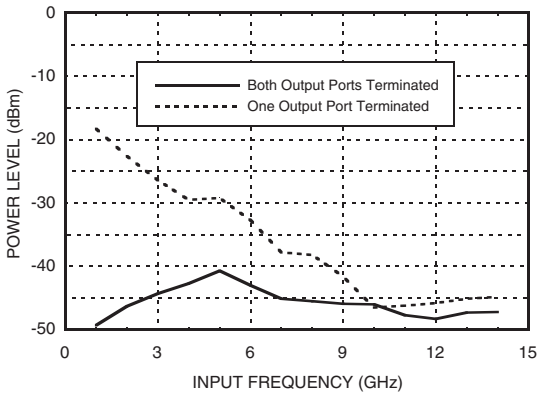

### SSB Phase Noise Performance, Pin= 0 dBm, T= 25 °C




### Output Harmonic Content, Pin= 0 dBm, T= 25 °C

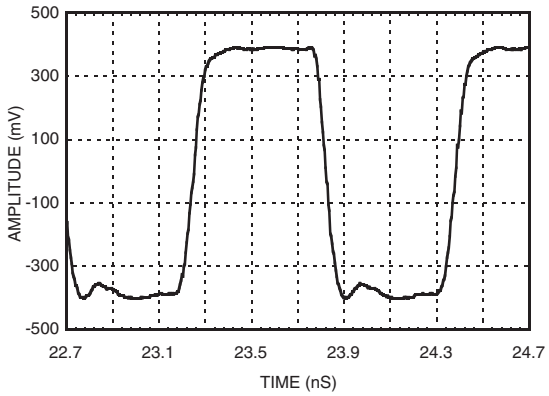



### Reverse Leakage, Pin= 0 dBm, T= 25 °C



## GaAs HBT MMIC DIVIDE-BY-2, DC - 11 GHz

### Output Voltage Waveform, Pin= 0 dBm, Fout= 882 MHz, T= 25 °C




ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

### Absolute Maximum Ratings

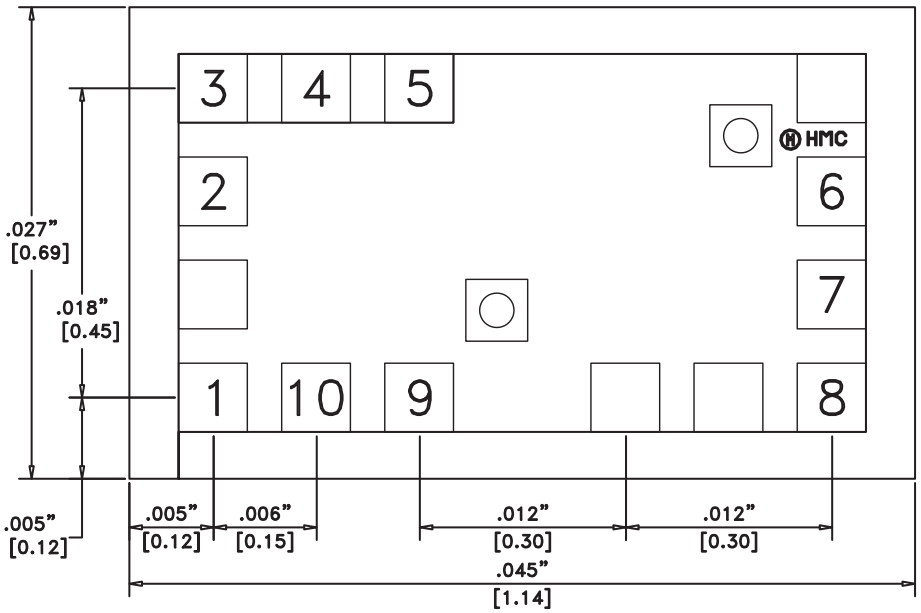
| | |
|---|---|
| RF Input (Vcc = +5V) | +13 dBm |
| Vcc | +5.5V |
| VLogic | Vcc -1.6V to Vcc -1.2V |
| Junction Temperature ($T_j$) | 135 °C |
| Continuous Pdiss (T= 85 °C) (derate 15.9 mW/ °C above 85 °C) | 0.79W |
| Thermal Resistance ($R_{TH}$) (junction to die bottom) | 63 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -55 to +85 °C |

### Typical Supply Current vs Vcc

| Vcc (V) | Icc (mA) |
|---|---|
| 4.75 | 74 |
| 5.0 | 83 |
| 5.25 | 89 |

*Note: Divider will operate over full voltage range shown above*

### Outline Drawing



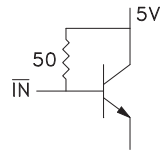
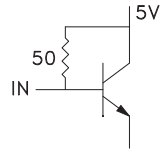
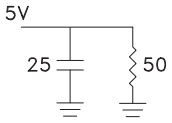
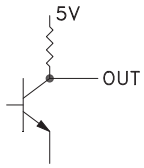
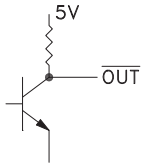
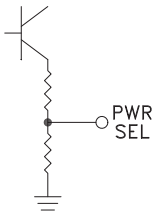
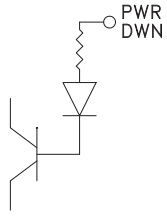
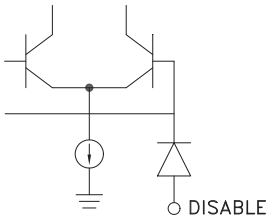

### Die Packaging Information [1]

| Standard | Alternate |
|---|---|
| WP-8 (Waffle Pack) | [2] |

*[1] Refer to the "Packaging Information" section for die packaging dimensions.*
*[2] For alternate packaging information contact Hittite Microwave Corporation.*

NOTES;
1. ALL DIMENSIONS IN INCHES (MILLIMETERS)
2. ALL TOLERANCES ARE ± 0.001 (0.025)
3. DIE THICKNESS IS 0.004 (0.100) BACKSIDE IS GROUND
4. BOND PADS ARE 0.004 (0.100) SQUARE
5. BOND PAD SPACING, CTR-CTR: 0.006 (0.150)
6. BACKSIDE METALLIZATION: GOLD
7. BOND PAD METALLIZATION: GOLD

## Pad Description

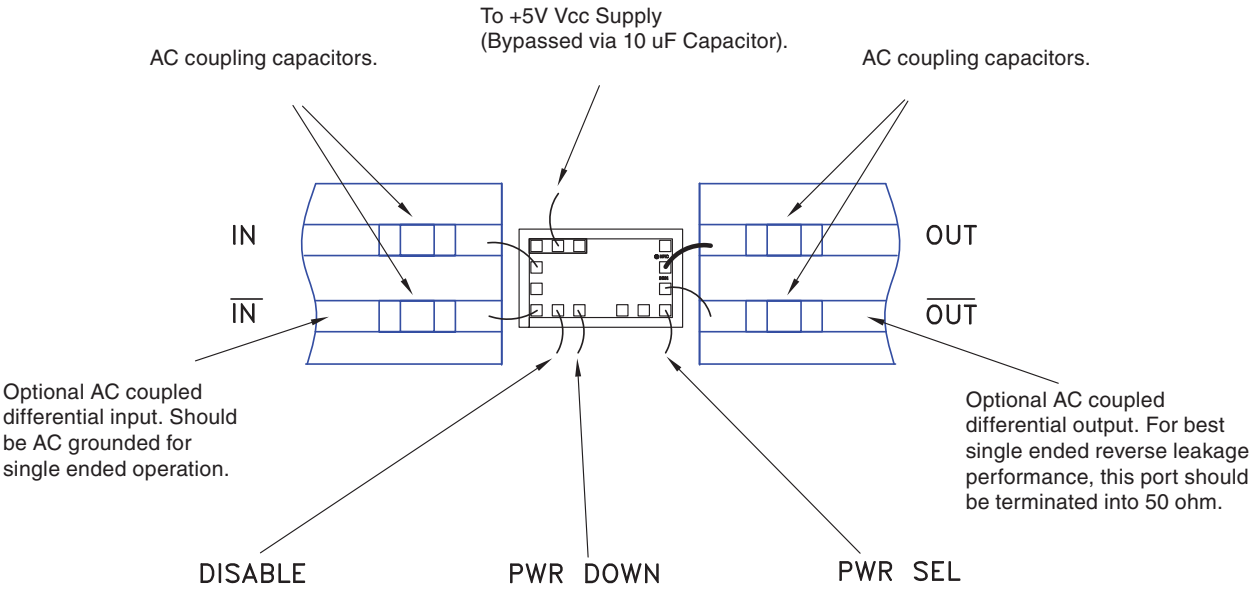
| Pad Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1 | $\overline{IN}$ | RF Input 180° out of phase with pad 3 for differential operation. AC ground for single ended operation. |   |
| 2 | IN | RF Input must be DC blocked. |   |
| 3, 4, 5 | Vcc | Supply Voltage 5V ±0.25V can be applied to pad 3, 4, or 5. |   |
| 6 | OUT | Divided Output |   |
| 7 | $\overline{OUT}$ | Divided output 180° out of phase with OUT. |   |
| 8 | PWR SEL | In the low power mode, the power select pin is left floating. By grounding this pin, the output power is increased by approximately 10 dB. |   |
| 9 | PWR DWN | The power down pin is grounded for normal operation. Applying 5 volts to this pin will power down this device. |   |
| 10 | DISABLE | The disable pin is grounded for normal operation. Applying 5 volts to this pin will disable the input buffer amplifier. |   |

### Truth Table

| Function | Pin | 5V | GND | Float |
|---|---|---|---|---|
| DISABLE | 10 | Output Off | Output On | X |
| PWR DWN | 9 | Power Down | Power Up | X |
| PWR SEL | 8 | x | High Power Output | Low Power Output |

X = State not permitted.

### Assembly Diagram



## Handling Precautions

*Follow these precautions to avoid permanent damage.*

**Cleanliness:** Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.
**Static Sensitivity:** Follow ESD precautions to protect against ESD strikes.
**Transients:** Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.
**General Handling:** Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers. The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

## Mounting

*The chip is back-metallized and can be die mounted with electrically conductive epoxy. The mounting surface should be clean and flat.*

**Epoxy Die Attach:** Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position. Cure epoxy per the manufacturer's schedule.

## Wire Bonding

Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.31 mm (12 mils).