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# HMC438MS8G / 438MS8GE

v04.0507

## SMT GaAs HBT MMIC DIVIDE-BY-5, DC - 7 GHz

### Typical Applications

Prescaler for DC to C Band PLL Applications:

- UNII, Point-to-Point & VSAT Radios
- 802.11a & HiperLAN WLAN
- Fiber Optic
- Cellular / 3G Infrastructure

### Features

SSB Phase Noise: -153 dBc/Hz @100KHz

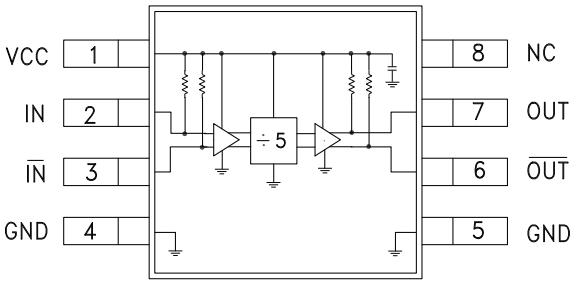
Wide Bandwidth

Output Power: -1 dBm

Single DC Supply: +5V @ 80 mA

MS8G SMT Package

### Functional Diagram




### General Description

The HMC438MS8G & HMC438MS8GE are low noise Divide-by-5 Static Dividers utilizing InGaP GaAs HBT technology in low cost 8 lead surface mount plastic packages. This device operates from DC (with a square wave input) to 7 GHz input frequency from a single +5V DC supply. The low additive SSB phase noise of -153 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 | | 7.0 | 7.5 | | GHz |
| Minimum Input Frequency | Sine Wave Input [1] | | 0.1 | | GHz |
| Input Power Range | Fin= 1 to 5 GHz | -15 | -12 | +12 | dBm |
| | Fin= 5 to 6 GHz | -15 | -12 | +10 | dBm |
| | Fin= 6 to 7 GHz | -15 | -10 | +5 | dBm |
| Output Power | | -4 | -1 | | dBm |
| Reverse Leakage | Both RF Outputs Terminated | | -50 | | dBm |
| SSB Phase Noise (100 kHz offset) | Pin= 0 dBm, Fin= 6 GHz | | -153 | | dBc/Hz |
| Output Transition Time | Pin= 0 dBm, Fout= 882 MHz | | 100 | | ps |
| Supply Current (Icc) | | | 80 | | mA |

*1. Divider will operate down to DC for square-wave input signal.*



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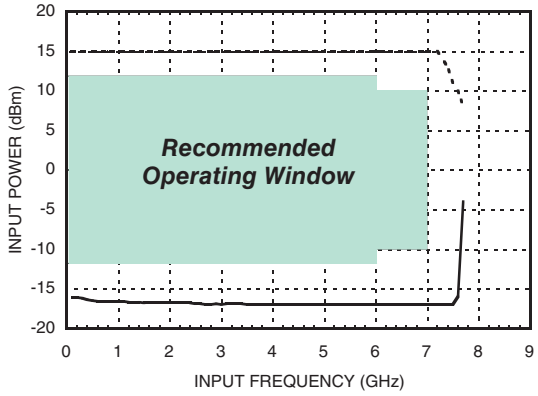
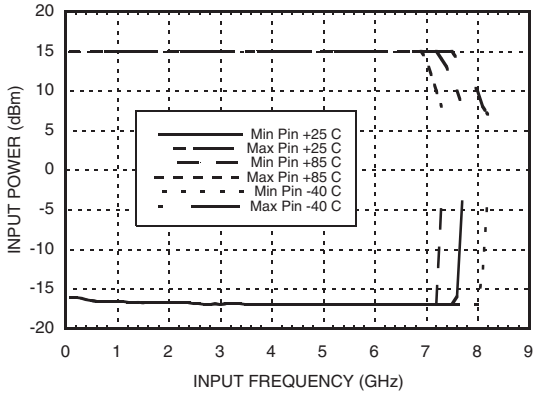
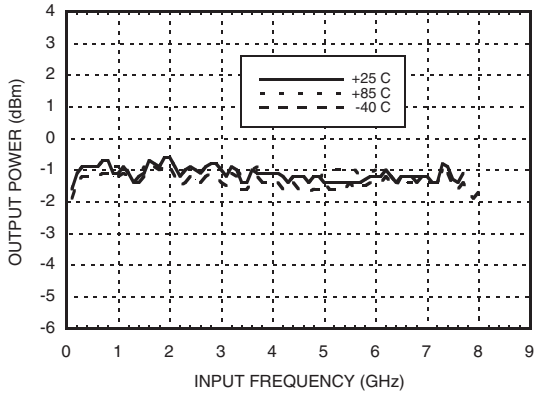
### Input Sensitivity Window, T= 25 °C



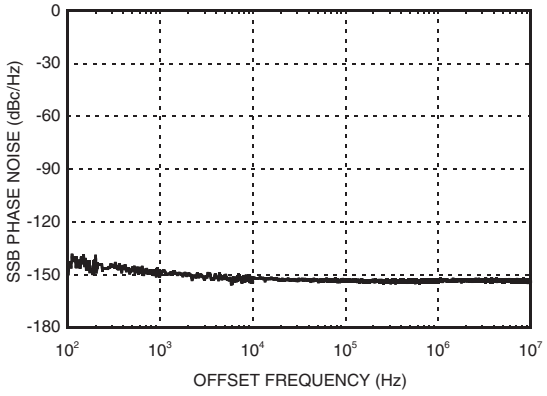

### Input Sensitivity Window vs. Temperature



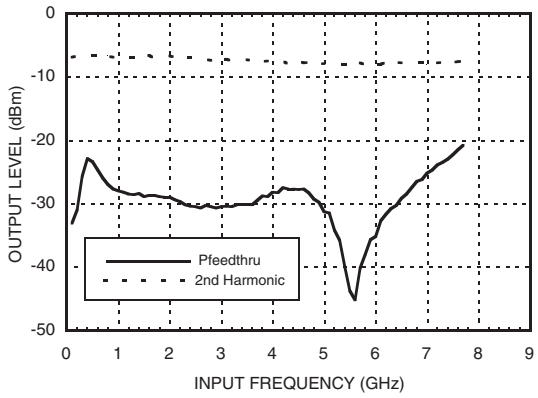

### Output Power vs. Temperature



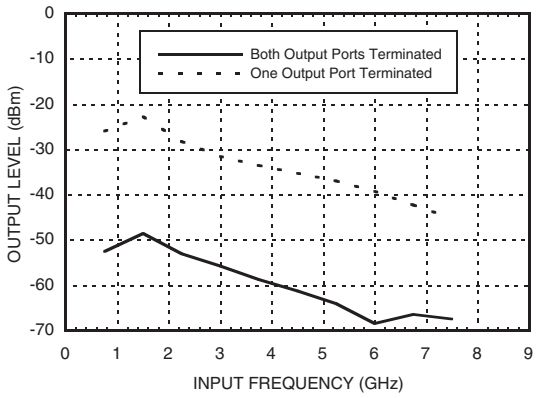

### SSB Phase Noise Performance, Pin= 0 dBm, Fin= 6GHz, T= 25 °C




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




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



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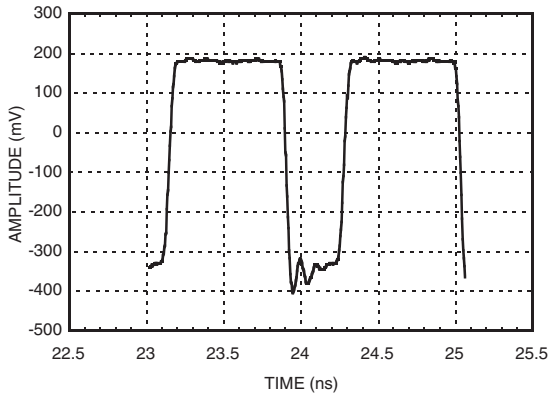
# HMC438MS8G / 438MS8GE

v04.0507

## SMT GaAs HBT MMIC DIVIDE-BY-5, DC - 7 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 |
| Maximum Channel Temperature | 135 °C |
| Continuous Pdiss (T=85 °C) (derate 11.3mW/°C above 92 °C) | 485mW |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

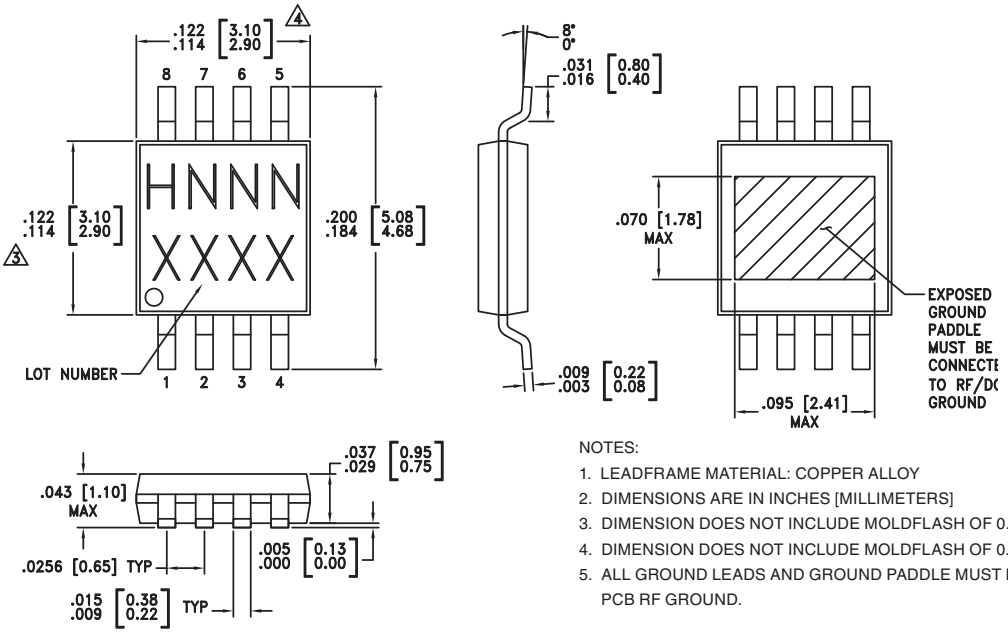
DC blocking capacitors are required at RF input and RF output ports. Choose value for lowest frequency of operation.

### Typical Supply Current vs. Vcc

| Vcc (V) | Icc (mA) |
|---|---|
| 4.75 | 75 |
| 5.0 | 80 |
| 5.25 | 87 |

Note: Divider will operate over full voltage range shown above

### Outline Drawing




NOTES:

1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
4. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
5. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

### Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [3] |
|---|---|---|---|---|
| HMC438MS8G | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 [1] | H438<br>XXXX |
| HMC438MS8GE | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [2] | H438<br>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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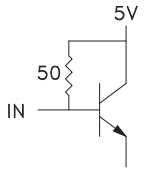
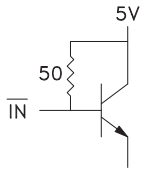
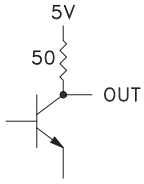
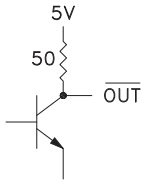
## Pin Description

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1 | Vcc | Supply voltage 5V ± 0.25V. | |
| 2 | IN | RF input must be DC blocked. |   |
| 3 | $\overline{IN}$ | RF input 180° out of phase with pin 2 for differential operation. AC ground for single ended operation. |   |
| 4, 5 | GND | All ground leads and ground paddle must be soldered to PCB RF/DC ground. |   |
| 6 | OUT | Divided output 180° out of phase with pin 7. |   |
| 7 | $\overline{OUT}$ | Divided Output. |   |
| 8 | N/C | No Connection | |

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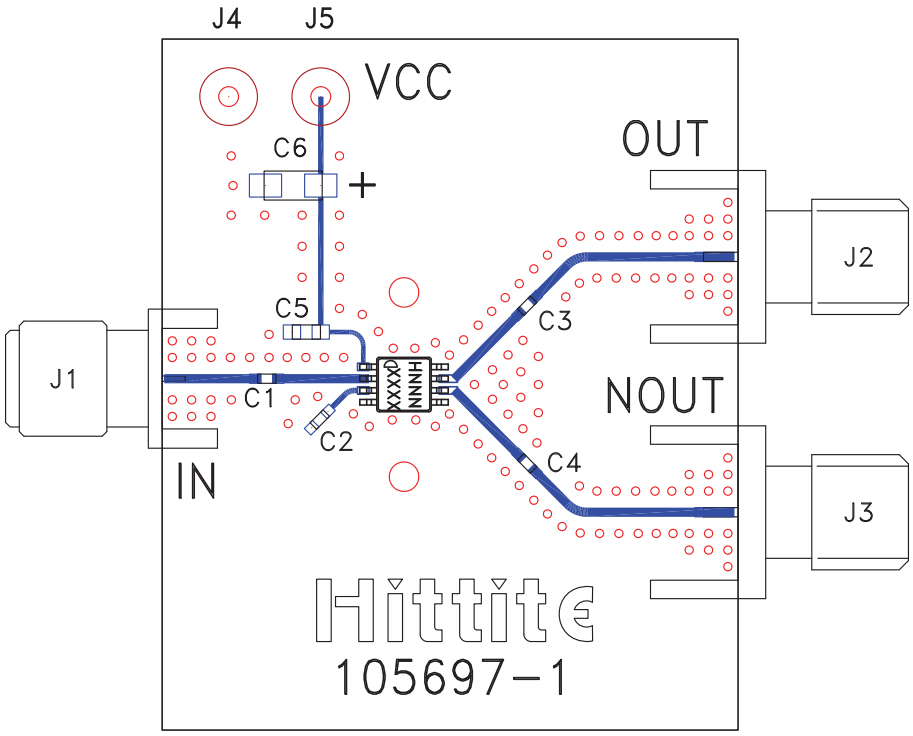
## Evaluation PCB




## List of Materials for Evaluation PCB 105786 [1]

| Item | Description |
|---|---|
| J1 - J3 | PCB Mount SMA RF Connector |
| J4, J5 | DC Pin |
| C1 - C4 | 100 pF Capacitor, 0402 Pkg. |
| C5 | 10,000 pF Capacitor, 0603 Pkg. |
| C6 | 4.7 µF Tantalum Capacitor |
| U1 | HMC438MS8G / HMC438MS8GE Divide-by-5 |
| PCB [2] | 105697 Eval Board |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the final 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.



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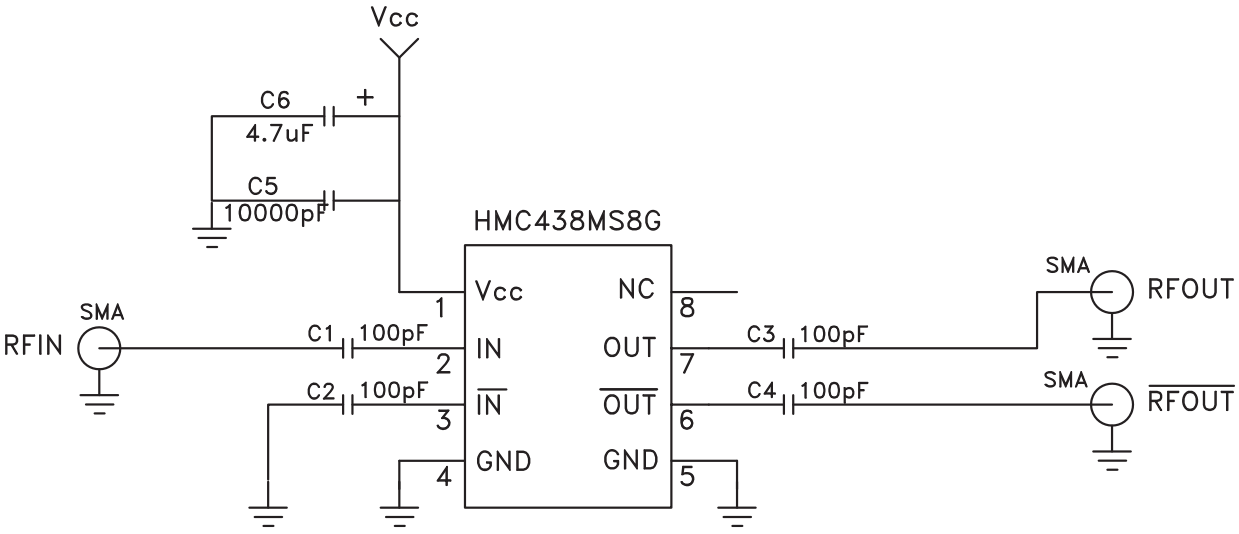
### Application Circuit



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