



MICROWAVE CORPORATION v02.0505



# HMC432 / 432E

**SMT GaAs HBT MMIC**  
**DIVIDE-BY-2, DC - 8.0 GHz**

## Typical Applications

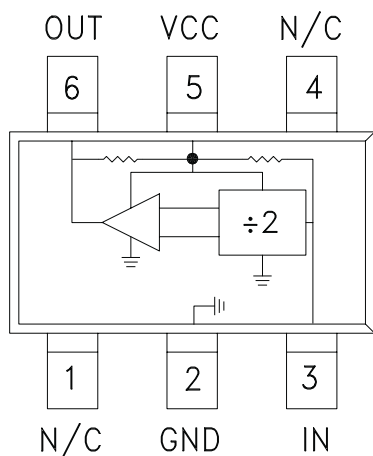
Prescaler for DC to C Band PLL Applications:

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

## Features

Ultra Low SSB Phase Noise: -148 dBc/Hz  
Single-Ended I/O's  
Output Power: -3 to -9 dBm  
Single DC Supply: +3V @ 42 mA  
9 mm<sup>2</sup> Ultra Small Package: SOT26

## Functional Diagram



## General Description

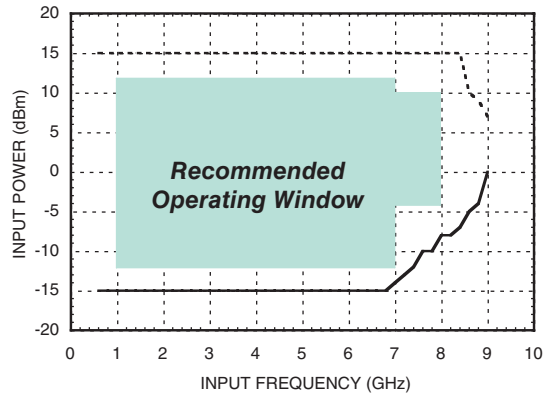
The HMC432 & HMC432E are low noise Divide-by-2 Static Dividers utilizing InGaP GaAs HBT technology in ultra small surface mount SOT26 plastic packages. This device operates from DC (with a square wave input) to 8.0 GHz input frequency with a single +3.0V DC supply. Single-ended inputs and outputs reduce component count and cost. 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, $V_{CC} = +3V$

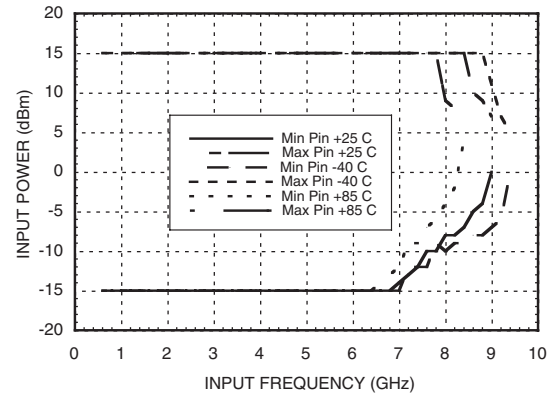
| Parameter                        | Conditions                                                                       | Min.      | Typ.      | Max.       | Units      |
|----------------------------------|----------------------------------------------------------------------------------|-----------|-----------|------------|------------|
| Maximum Input Frequency          |                                                                                  | 8         | 8.5       |            | GHz        |
| Minimum Input Frequency          | Sine Wave Input. [1]                                                             |           | 0.2       |            | GHz        |
| Input Power Range                | $F_{in} = 1 \text{ to } 7 \text{ GHz}$<br>$F_{in} = 7 \text{ to } 8 \text{ GHz}$ | -12<br>-4 | -15<br>-8 | +12<br>+10 | dBm        |
| Output Power                     | $F_{in} = 4 \text{ GHz}$<br>$F_{in} = 8 \text{ GHz}$                             | -6<br>-12 | -3<br>-9  |            | dBm<br>dBm |
| Reverse Leakage                  | RF Output Terminated, $F_{in} = 4 \text{ GHz}$ , $P_{in} = 0 \text{ dBm}$        |           | -30       |            | dBm        |
| SSB Phase Noise (100 kHz offset) | $P_{in} = 0 \text{ dBm}$ , $F_{in} = 4 \text{ GHz}$                              |           | -148      |            | dBc/Hz     |
| Output Transition Time           | $P_{in} = 0 \text{ dBm}$ , $F_{out} = 882 \text{ MHz}$                           |           | 145       |            | ps         |
| Supply Current ( $I_{CC}$ )      | $V_{CC} = 3.0 \text{ V}$                                                         |           | 42        |            | mA         |

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

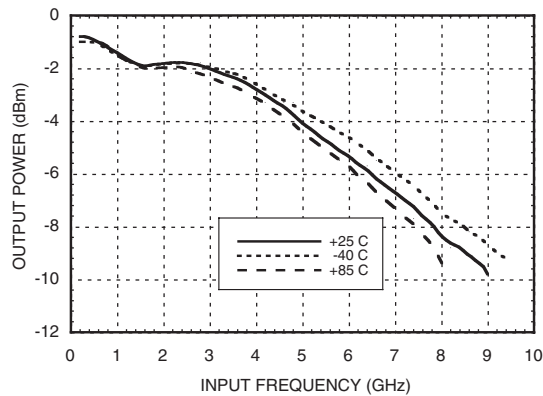
**Input Sensitivity Window,  $T = 25\text{ }^{\circ}\text{C}$**



**Input Sensitivity Window vs. Temperature**

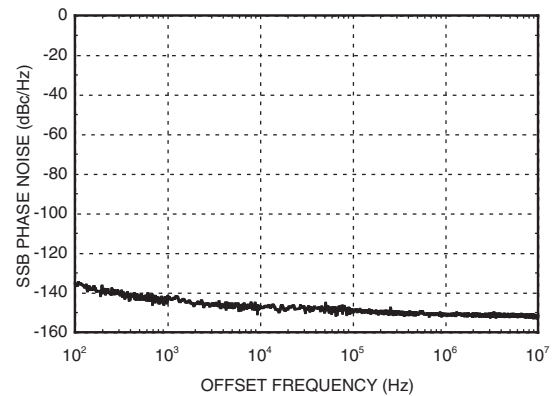


**Output Power vs. Temperature**



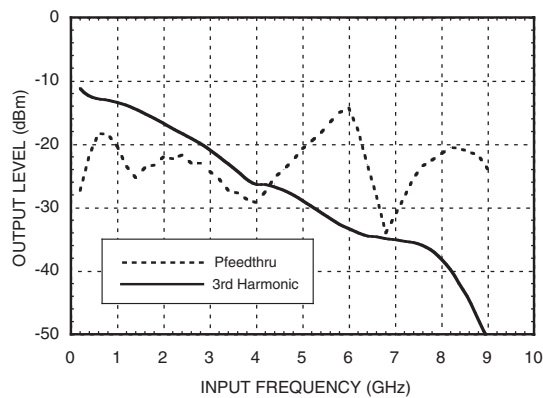
**SSB Phase Noise**

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

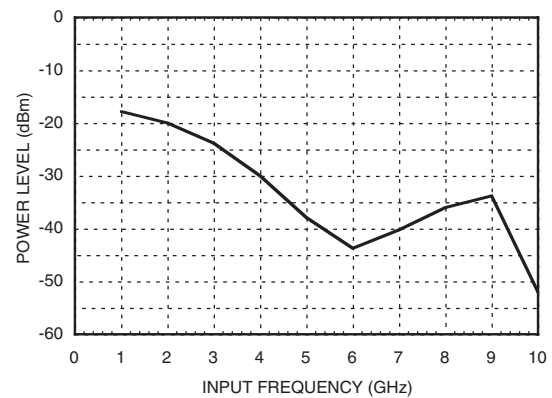


**Output Harmonic**

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



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





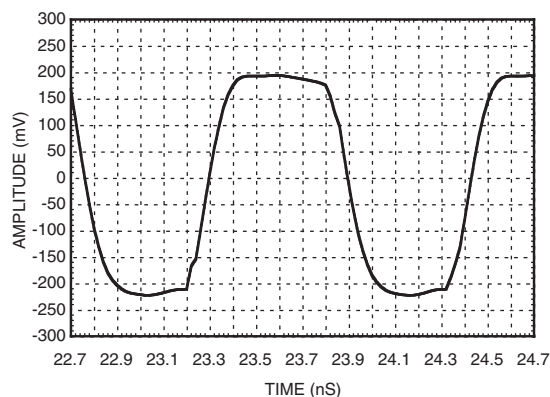
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## HMC432 / 432E

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DIVIDE-BY-2, DC - 8.0 GHz

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



## Absolute Maximum Ratings

|                                                              |                |
|--------------------------------------------------------------|----------------|
| RF Input (Vcc= +3.0V)                                        | +15 dBm        |
| Vcc                                                          | +3.5V          |
| Maximum Channel Temperature                                  | 135 °C         |
| Continuous Pdiss (T=85 °C)<br>(derate 4.44mW/°C above 85 °C) | 222 mW         |
| Storage Temperature                                          | -65 to +150 °C |
| Operating Temperature                                        | -40 to +85 °C  |
| ESD Sensitivity (HBM)                                        | Class 1A       |

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



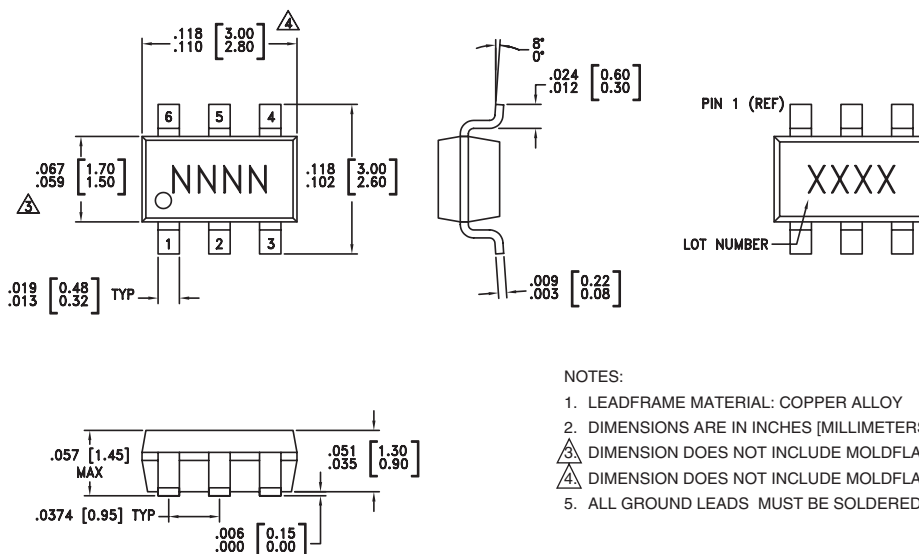
ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

## Typical Supply Current vs. Vcc

| Vcc (V) | Icc (mA) |
|---------|----------|
| 2.70    | 34       |
| 3.0     | 42       |
| 3.30    | 50       |

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 MUST BE SOLDERED TO PCB RF GROUND.

## Package Information

| Part Number | Package Body Material                              | Lead Finish   | MSL Rating          | Package Marking <sup>[3]</sup> |
|-------------|----------------------------------------------------|---------------|---------------------|--------------------------------|
| HMC432      | Low Stress Injection Molded Plastic                | Sn/Pb Solder  | MSL1 <sup>[1]</sup> | H432<br>XXXX                   |
| HMC432E     | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 <sup>[2]</sup> | 432E<br>XXXX                   |

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

For price, delivery, and to place orders, please contact Hittite Microwave Corporation:  
20 Alpha Road, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373  
Order On-line at [www.hittite.com](http://www.hittite.com)



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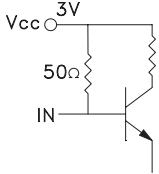
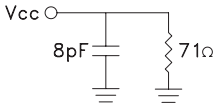
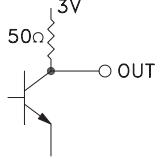
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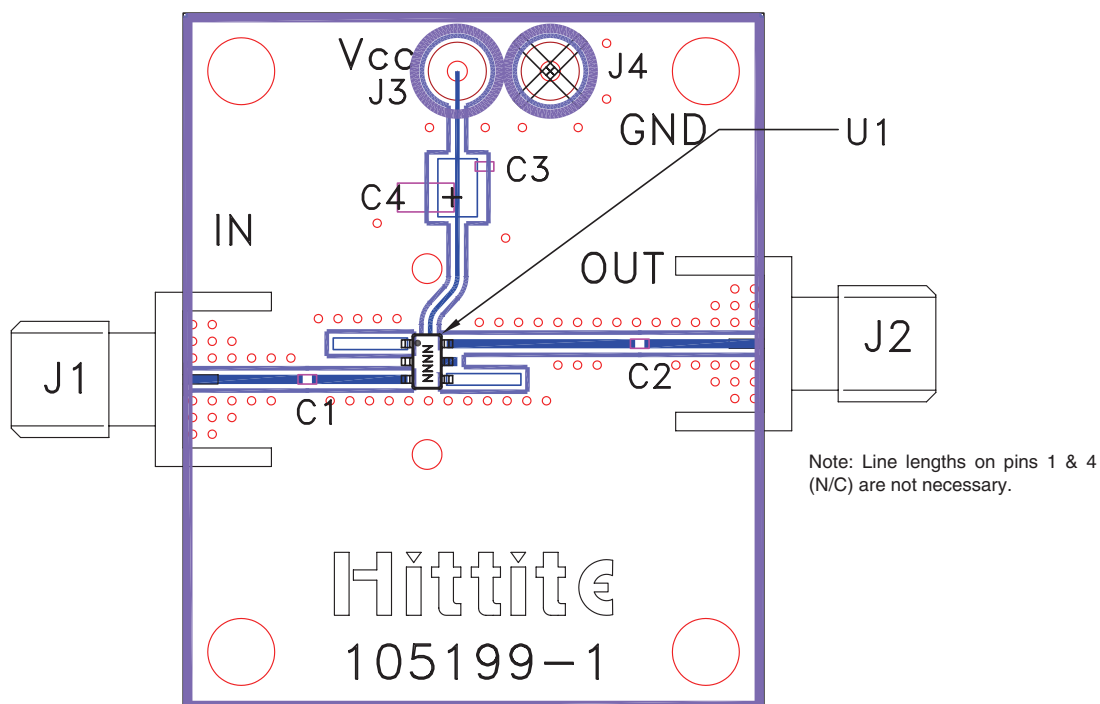
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### Pin Description

| Pin Number | Function | Description                        | Interface Schematic                                                                  |
|------------|----------|------------------------------------|--------------------------------------------------------------------------------------|
| 1, 4       | N/C      | No Connection                      |                                                                                      |
| 2          | GND      | Pin must connect to RF/DC ground.  |   |
| 3          | IN       | RF input must be DC blocked.       |   |
| 5          | Vcc      | Supply voltage 3V ± 0.3V.          |   |
| 6          | OUT      | Divided output must be DC blocked. |  |

**Evaluation PCB**



**List of Materials for Evaluation PCB 105675 <sup>[1]</sup>**

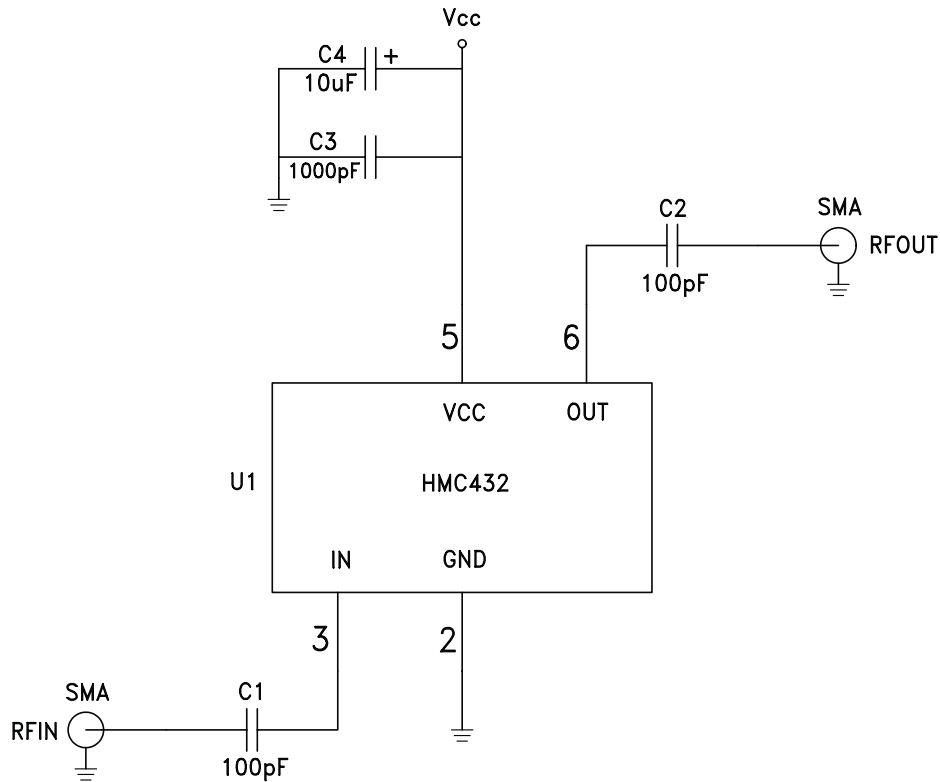
| Item               | Description                              |
|--------------------|------------------------------------------|
| J1 - J2            | PCB Mount SMA RF Connector               |
| J3 - J4            | DC Pin                                   |
| C1 - C2            | 100 pF Capacitor, 0402 Pkg.              |
| C3                 | 1000 pF Capacitor, 0402 Pkg.             |
| C4                 | 10 $\mu$ F Tantalum Capacitor, 1206 Pkg. |
| U1                 | HMC432 / HMC432E Divide-by-2             |
| PCB <sup>[2]</sup> | 105199 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 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.

## Application Circuit



Note:

DC blocking capacitor values (C1, C2) and DC decoupling capacitor values (C3, C4) are chosen for lowest frequency of operation.