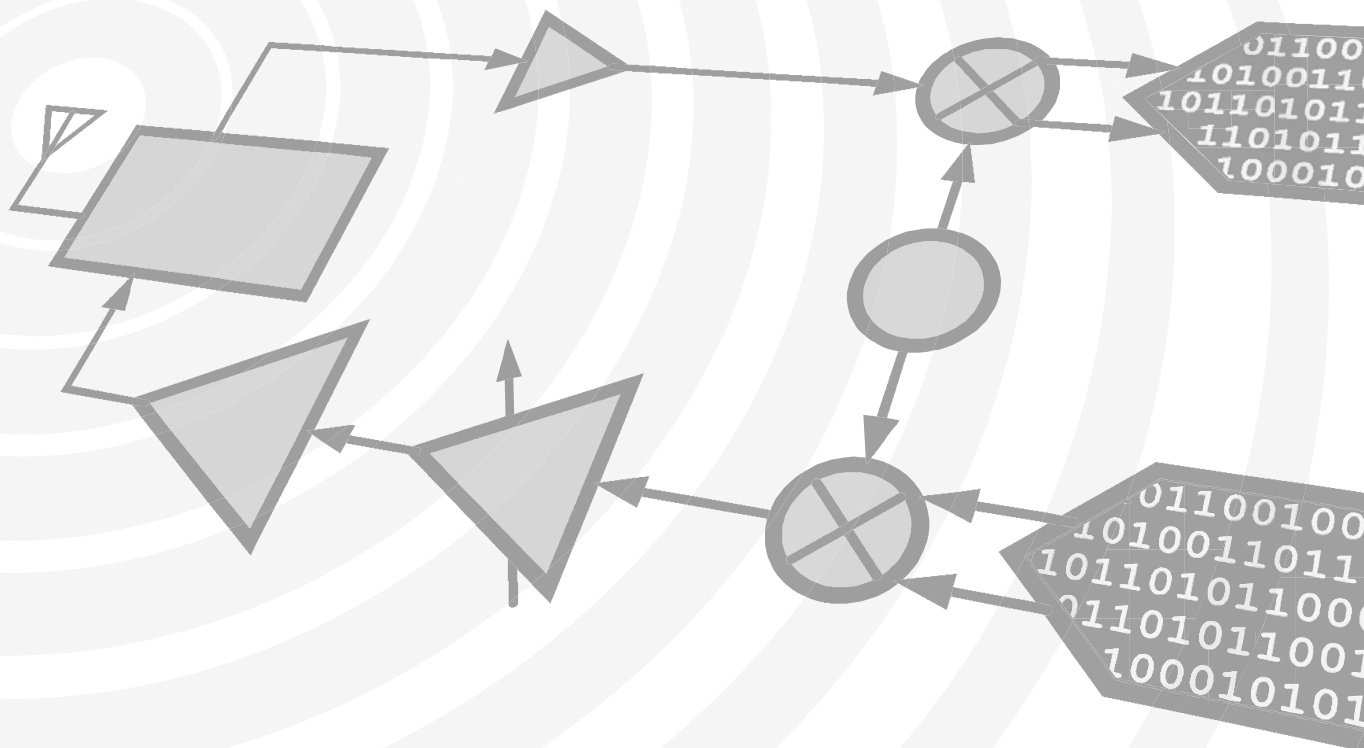




Hittite
MICROWAVE PRODUCTS
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MICROWAVE CORPORATION v05.1214



HMC432 / 432E

SMT GaAs HBT MMIC
DIVIDE-BY-2, DC - 8 GHz

Typical Applications

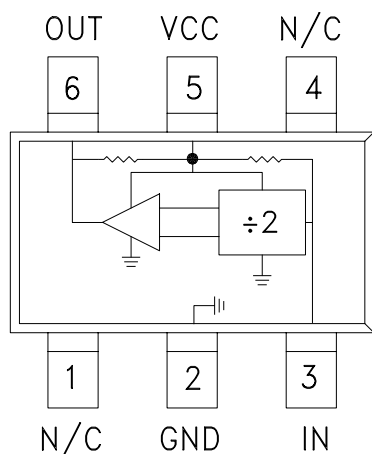
Prescaler for DC to C band PLL applications:

- UNII, point-to-point, and VSAT radios
- 802.11a and HiperLAN WLAN
- Fiber optic
- Cellular / 3G infrastructure

Features

- Ultra low SSB phase noise: -148 dBc/Hz
- Single-ended I/O's
- Output power: -3 dBm to -9 dBm
- Single DC supply: +3V @ 42 mA
- 9 mm² ultra small package: SOT26

Functional Diagram



General Description

The HMC432(E) is a low noise divide-by-2 static divider 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 GHz input frequency with a single +3V 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.

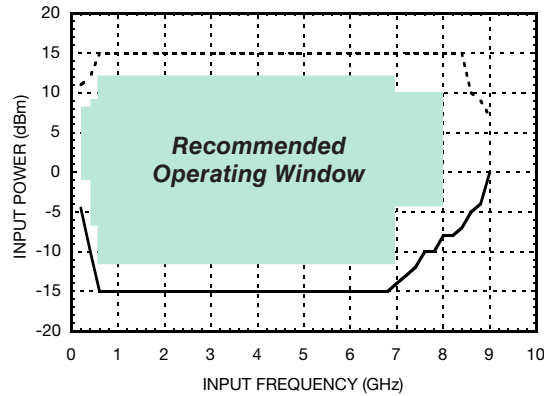
Electrical Specifications, $T_A = +25^\circ\text{C}$, 50 Ω System, $V_{CC} = +3\text{V}$

Parameter	Conditions	Min.	Typ.	Max.	Units
Input frequency	Sine wave input [1] [2]			8	GHz
Input power range	$F_{in} = 0.2 \text{ GHz to } 0.4 \text{ GHz}$	-4		+11	dBm
	$F_{in} = 0.4 \text{ GHz to } 0.6 \text{ GHz}$	-10		+12	
	$F_{in} = 0.6 \text{ GHz to } 1.0 \text{ GHz}$	-15		+15	
	$F_{in} = 1 \text{ GHz to } 7 \text{ GHz}$	-12		+12	
	$F_{in} = 7 \text{ GHz to } 8 \text{ GHz}$	-4		+10	
Output power	$F_{in} = 4 \text{ GHz}$	-6	-3		dBm
	$F_{in} = 8 \text{ GHz}$	-12	-9		
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	56	mA

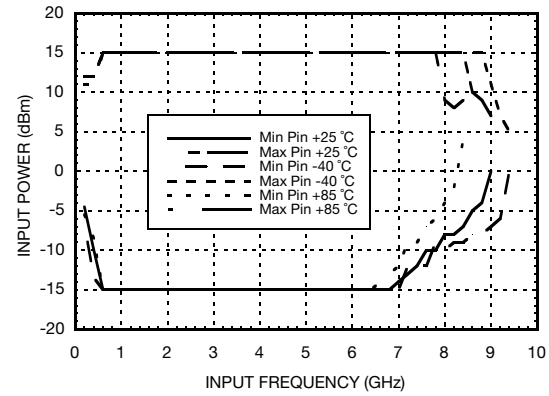
1. Divider will operate down to near DC.

2. For stable operation without an input signal, refer to Analog Devices Application Note, "Frequency Divider Operation & Compensation with No Input Signal."

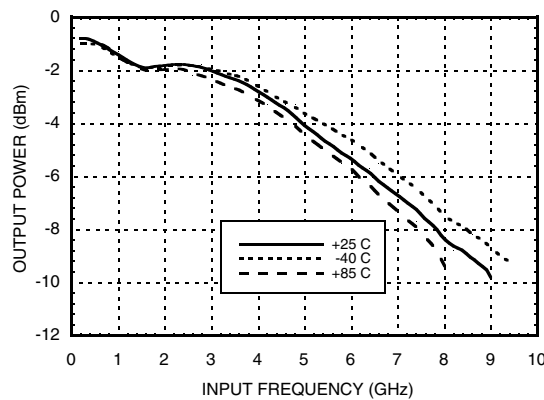
Input Sensitivity Window, $T = 25^\circ\text{C}$



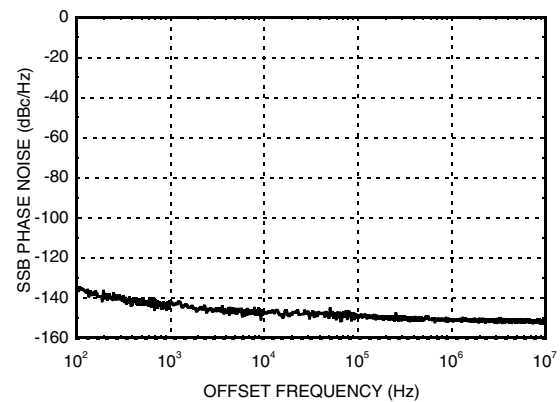
Input Sensitivity Window vs. Temperature



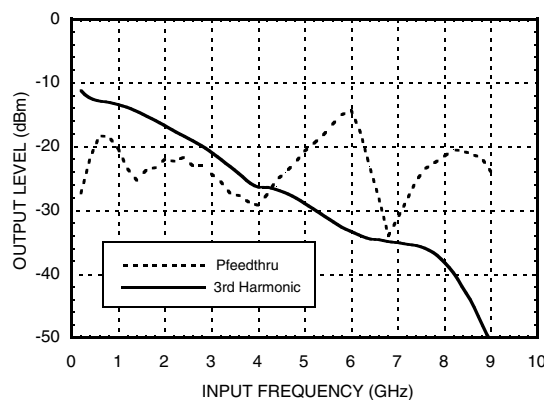
Output Power vs. Temperature



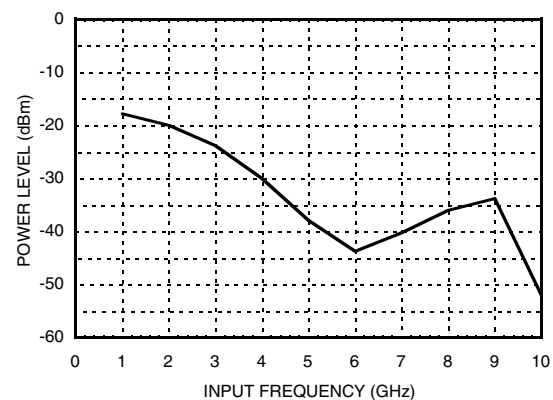
**SSB Phase Noise Performance,
 $P_{in} = 0\text{ dBm}$, $T = 25^\circ\text{C}$**



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



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



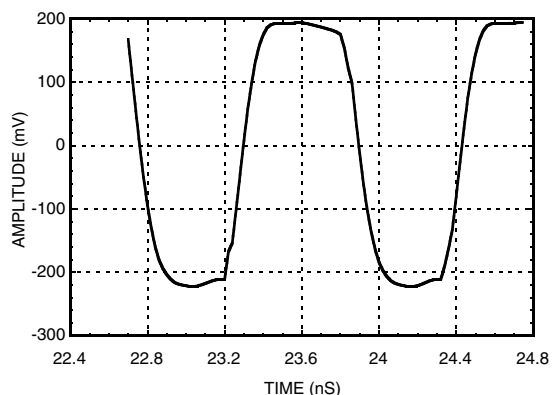


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**HMC432 / 432E**

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Output Voltage Waveform,
 $P_{in} = 0 \text{ dBm}$, $F_{out} = 882 \text{ MHz}$, $T = 25^\circ\text{C}$

**Absolute Maximum Ratings**

RF input power ($V_{cc} = +3V$)	15 dBm
Nominal +3V supply to GND	-0.3V to 3.5V
Max peak flow temperature	260 °C
Storage temperature	-65 °C to +125 °C
ESD sensitivity (HBM)	150 V

Reliability Information

Junction temperature to maintain 1 million hour MTTF	135 °C
Nominal junction temperature ($T = 85^\circ\text{C}$)	99 °C
Thermal resistance (Junction to GND paddle, 3V supply)	108 °C/W
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.



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

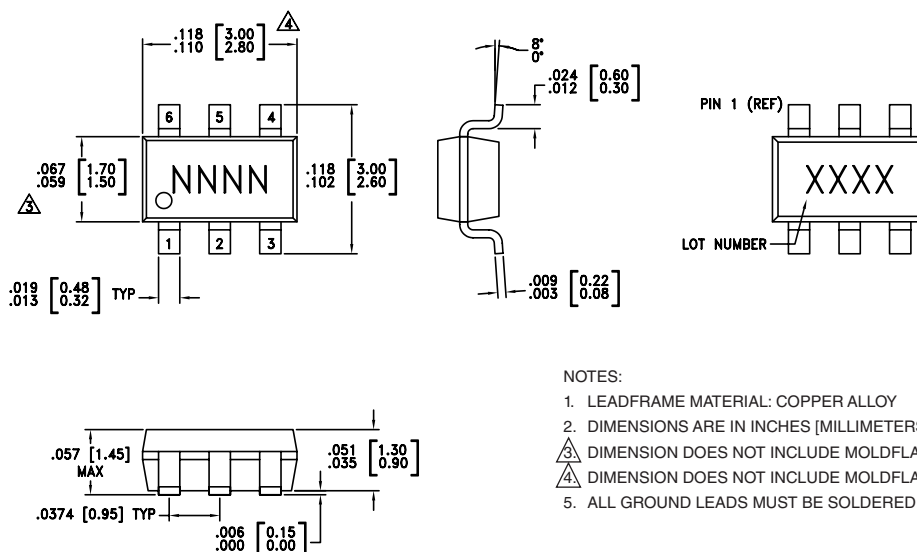
Typical Supply Current vs. V_{cc}

V_{cc} (V)	I_{cc} (mA)
2.70	34
3.00	42
3.30	50

Note: Divider will operate over full voltage range shown above

SMT GaAs HBT MMIC
DIVIDE-BY-2, DC - 8 GHz

Outline Drawing



Package Information

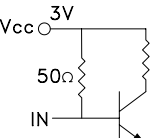
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking ^[3]
HMC432	Low stress injection molded plastic	Sn/Pb solder	MSL1 ^[1]	H432 XXXX
HMC432E	RoHS-compliant low stress injection molded plastic	100% matte Sn	MSL1 ^[2]	432E XXXX

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-digit lot number XXXX

Pin Description

Pin Number	Function	Description	Interface Schematic
1, 4	N/C	The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally.	
2	GND	Pin must connect to RF/DC ground.	
3	IN	RF input must be DC blocked.	



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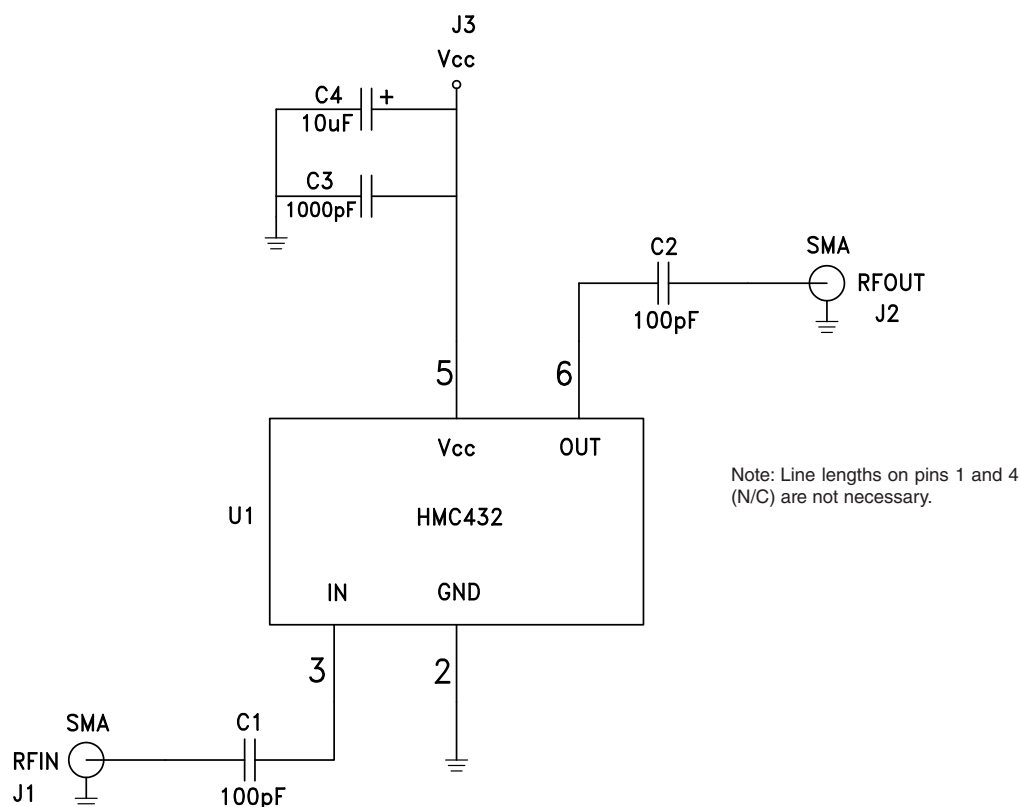
HMC432 / 432E

SMT GaAs HBT MMIC
DIVIDE-BY-2, DC - 8 GHz

Pin Description (Continued)

Pin Number	Function	Description	Interface Schematic
5	Vcc	Supply voltage 3V $\pm$ 0.3V.	
6	OUT	Divided output must be DC blocked.	

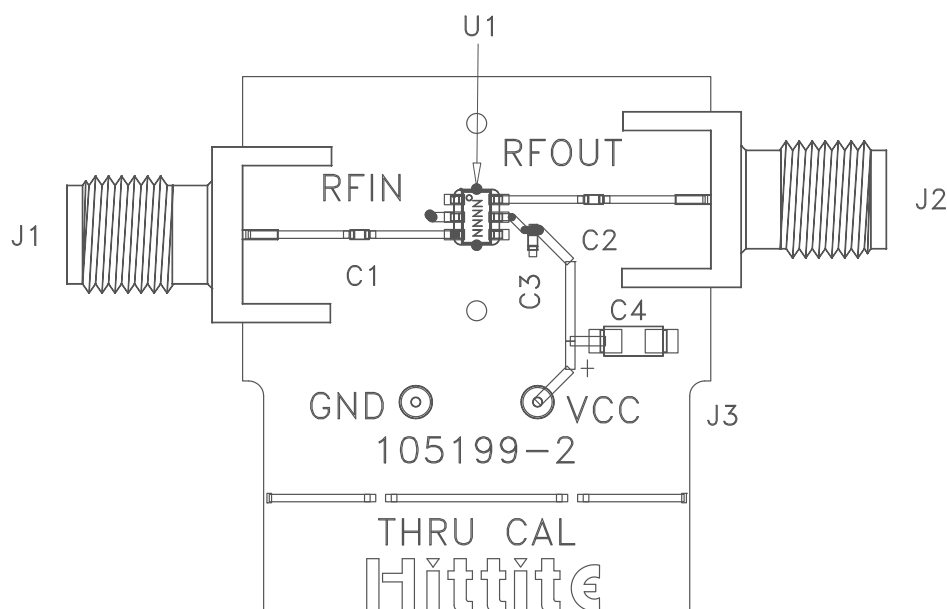
Application Circuit



Note:

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

Evaluation PCB



List of Materials for Evaluation PCB 105675 [1]

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 µF tantalum capacitor, 1206 pkg.
U1	HMC432/HMC432E divide-by-2
PCB [2]	105199 eval board

[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 Ω 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.

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