

FEATURES

High output power: 14 dBm typical
Input power drive: 0 dBm to 10 dBm
Single sideband (SSB) phase noise at 100 kHz offset:
 –142 dBc/Hz
Output frequency (f_{out}) isolation
 16 dBc at $f_{\text{out}} = 15$ GHz
Hermetically sealed module (HSM)
SMA field replaceable connectors
 –55°C to +85°C operating temperature

APPLICATIONS

Clock generation applications
Synchronous optical networking (SONET) optical carrier (OC)-192 and synchronous digital hierarchy (SDH) synchronous transport module (STM)-64
Point to point and very small aperture terminal (VSAT) radios
Test instrumentation
Military electronic warfare and radar
Space

GENERAL DESCRIPTION

The **HMC-C056** is a $\times 2$ active broadband frequency multiplier module, using gallium arsenide (GaAs), pseudomorphic high electron mobility transistor (pHEMT) technology in a miniature HSM. When driven by a 6 dBm signal, the multiplier provides 14 dBm typical output power from 8 GHz to 21 GHz. The f_{out} isolation is 16 dBc at 15 GHz with respect to the output signal level.

FUNCTIONAL BLOCK DIAGRAM

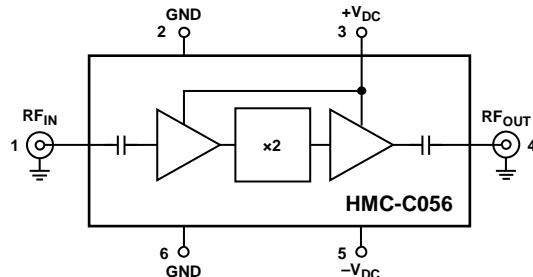


Figure 1.

15002-001

The **HMC-C056** is a frequency multiplier, featuring dc blocked inputs/outputs. The **HMC-C056** is ideal for use in local oscillator (LO) multiplier chains for point to point and VSAT radios yielding reduced devices count vs. traditional approaches. The low additive SSB phase noise of –142 dBc/Hz at 100 kHz offset has minimal impact on system level noise performance.

TABLE OF CONTENTS

| | | | |
|--------------------------------|---|--|---|
| Features | 1 | ESD Caution..... | 4 |
| Applications..... | 1 | Pin Configuration and Function Descriptions..... | 5 |
| Functional Block Diagram | 1 | Interface Schematics | 5 |
| General Description | 1 | Typical Performance Characteristics | 6 |
| Revision History | 2 | Outline Dimensions..... | 8 |
| Specifications..... | 3 | Ordering Guide | 8 |
| Electrical Specifications..... | 3 | | |
| Absolute Maximum Ratings..... | 4 | | |

REVISION HISTORY

This Hittite Microwave Products data sheet has been reformatted to meet the styles and standards of Analog Devices, Inc.

3/2017—Rev. 04.1110 to Rev. D

| | |
|----------------------------------|-----------|
| Updated Format..... | Universal |
| Changes to Features Section..... | 1 |
| Changes to Table 1..... | 3 |
| Changes to Table 3..... | 5 |
| Updated Outline Dimensions | 7 |
| Changes to Ordering Guide | 7 |

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

$T_A = 25^\circ\text{C}$, $+V_{\text{DC}} = 12 \text{ V}$, $-V_{\text{DC}} = -5 \text{ V}$, radio frequency (RF) input power = 6 dBm, unless otherwise noted.

Table 1.

| Parameter | Min | Typ | Max | Unit |
|---|-----|------|------|--------|
| FREQUENCY RANGE | | | | |
| Input | 4 | | 10.5 | GHz |
| Output | 8 | | 21 | GHz |
| OUTPUT POWER, $f_{\text{OUT}} = 10 \text{ GHz}$ to 20 GHz | 10 | 14 | | dBm |
| f_{OUT} ISOLATION (WITH RESPECT TO OUTPUT LEVEL) | | 16 | | dBc |
| INPUT POWER DRIVE | 0 | | 10 | dBm |
| RETURN LOSS | | | | |
| Input | | 14 | | dB |
| Output | | 10 | | dB |
| SSB PHASE NOISE (100 kHz OFFSET), $f_{\text{OUT}} = 15 \text{ GHz}$ | | -142 | | dBc/Hz |
| SUPPLY CURRENT | | | | |
| $+V_{\text{DC}}$ | | 102 | | mA |
| $-V_{\text{DC}}$ | | 5 | | mA |

ABSOLUTE MAXIMUM RATINGS

Table 2.

| Parameter | Rating |
|----------------------------------|-----------------|
| RF Input, $+V_{DC} = 5\text{ V}$ | 13 dBm |
| Bias Supply Voltage $+V_{DC}$ | 15 V |
| $-V_{DC}$ | -15 V |
| Temperature | |
| Storage | -65°C to +150°C |
| Operating | -55°C to +85°C |

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

ESD CAUTION



ESD (electrostatic discharge) sensitive device.

Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

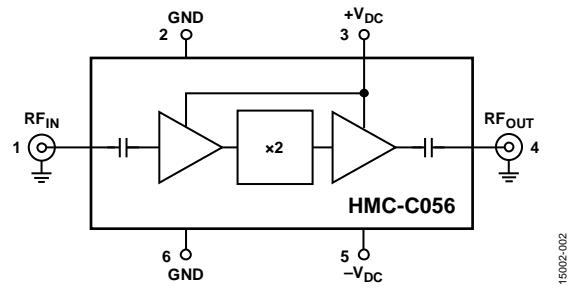


Figure 2. Pin Configuration

Table 3. Pin Function Descriptions

| Pin No. | Mnemonic | Description |
|---------|-------------------|---|
| 1 | RF _{IN} | Radio Frequency Input. This pin is ac-coupled and matched to 50 Ω. RF _{IN} uses a female SMA field replaceable connector. RF ground is supplied by the outer conductor of the SMA connector. See Figure 3 for the interface schematic. |
| 2, 6 | GND | Ground. One of these pins must be connected to power supply ground. See Figure 4 for the interface schematic. |
| 3 | +V _{DC} | Positive Power Supply Voltage. Positive power supply voltage for the multiplier includes a linear regulator. See Figure 5 for the interface schematic. |
| 4 | RF _{OUT} | Radio Frequency Output. This pin is ac-coupled and matched to 50 Ω. RF _{OUT} uses a female SMA field replaceable connector. RF ground is supplied by the outer conductor of the SMA connector. See Figure 6 for the interface schematic. |
| 5 | -V _{DC} | Negative Power Supply Voltage. Negative power supply voltage for the multiplier includes a linear regulator. See Figure 7 for the interface schematic. |

INTERFACE SCHEMATICS

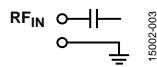
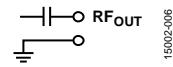
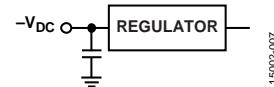
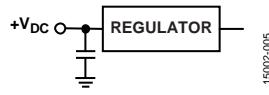
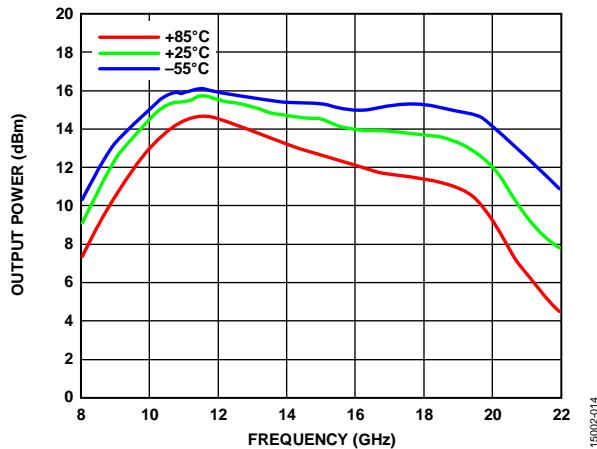
Figure 3. RF_{IN} and RF Ground Interface SchematicFigure 6. RF_{OUT} and RF Ground Interface Schematic

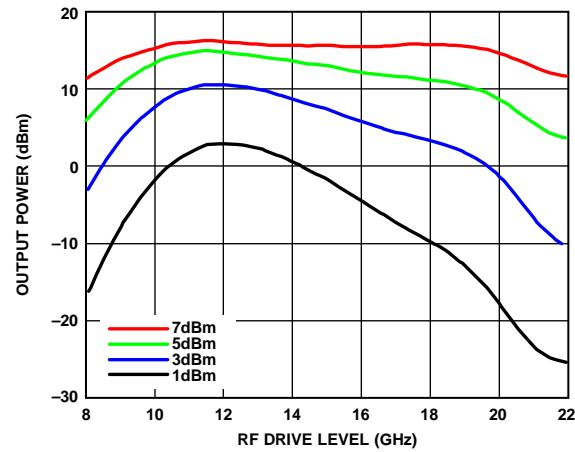
Figure 4. GND Interface Schematic

Figure 7. -V_{DC} Interface SchematicFigure 5. +V_{DC} Interface Schematic

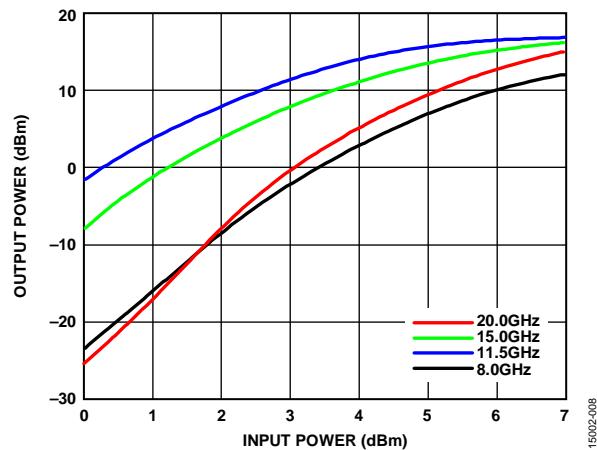
TYPICAL PERFORMANCE CHARACTERISTICS



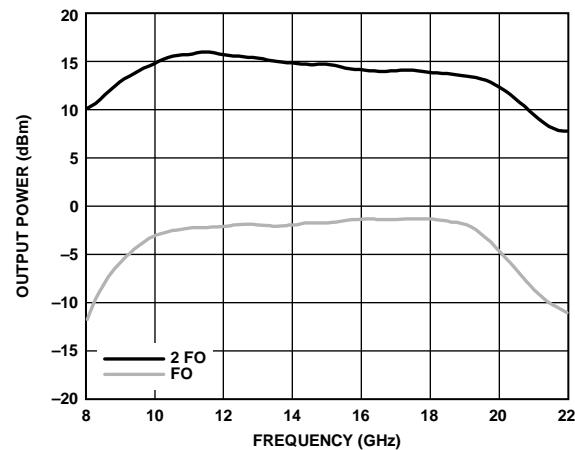
15002-014



15002-009



15002-008



15002-010

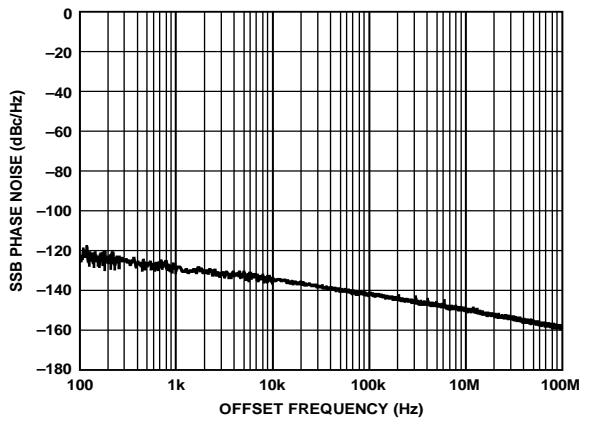


Figure 12. SSB Phase Noise vs. Offset Frequency,
 $f_{\text{OUT}} = 15 \text{ GHz}$, Input Power = 6 dBm

15002-011

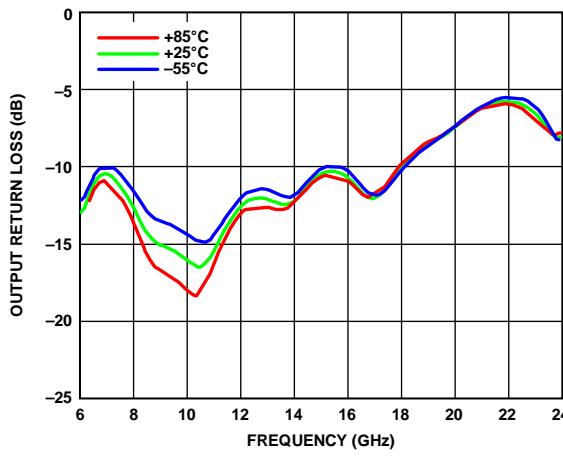


Figure 14. Output Return Loss vs. Frequency at 0 dBm Drive Level

15002-013

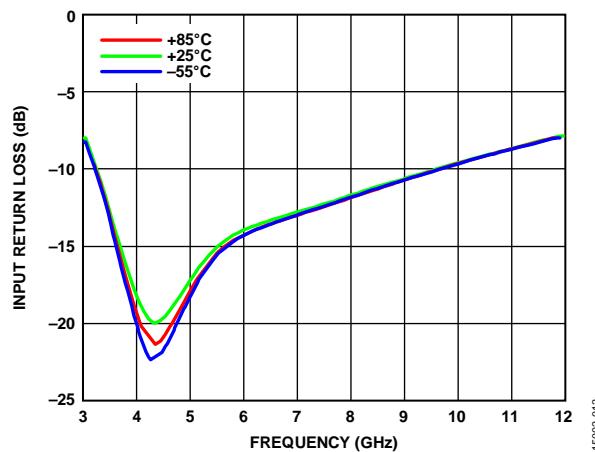
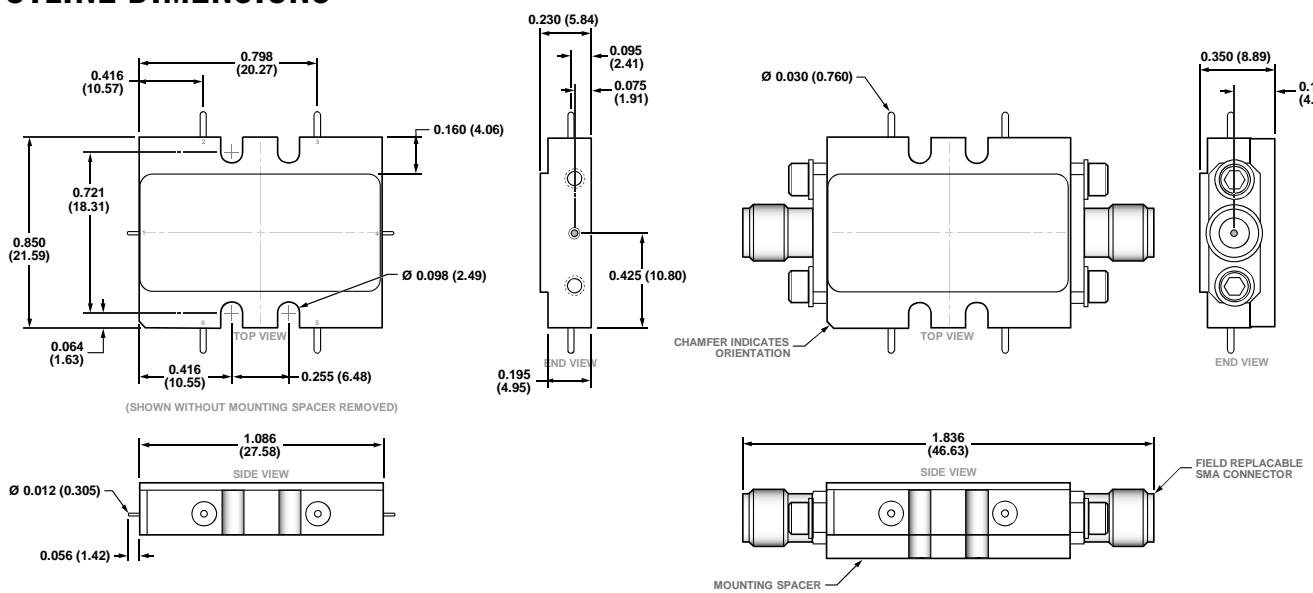


Figure 13. Input Return Loss vs. Frequency at 0 dBm Drive Level

15002-012

OUTLINE DIMENSIONS



CONTROLLING DIMENSIONS ARE IN INCHES; MILLIMETER DIMENSIONS
(IN PARENTHESES) ARE ROUNDED-OFF INCH EQUIVALENTS FOR
REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 15. 6-Lead Multichip Module Laminate, with Input/Output Connector [MODULE]
(HML-6-2)
Dimensions shown in inches and (millimeters)

ORDERING GUIDE

| Model ¹ | Temperature Range | Package Description | Package Option |
|--------------------|-------------------|--|----------------|
| HMC-C056 | -55°C to +85°C | 6-Lead Multichip Module Laminate, with Input/Output Connector [MODULE] | HML-6-2 |

¹ The HMC-C056 is a RoHS Compliant Part.