# Two-Stage Power Amplifier Module, 10 MHz to 6 GHz

Data Sheet **HMC-C075**

## FEATURES

- High gain: 25 dB
- High 1 dB compression (P1dB) output power: 29 dBm
- High output third-order intercept (IP3): 42 dBm
- Regulated supply and bias sequencing
- SMA connectors
- Operating temperature: −40°C to +70°C

## APPLICATIONS

- Telecommunications infrastructure
- Test instrumentation
- Military and space
- Electronic warfare (EW)
- Electronic countermeasures (ECM)
- Radar
- Test equipment

## FUNCTIONAL BLOCK DIAGRAM

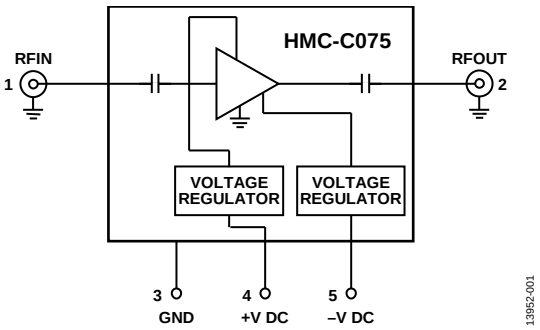


*Figure 1.*

## GENERAL DESCRIPTION

The HMC-C075 is a two-stage power amplifier module that operates between 10 MHz and 6 GHz. The amplifier provides 25 dB of gain, 42 dBm of output IP3, and 29 dBm of output power at 1 dB gain compression, while consuming only 740 mA from a 15 V supply.

The HMC-C075 is ideal for EW, ECM, radar, and test equipment applications

The amplifier inputs/outputs (I/Os) are dc blocked and internally matched to 50 Ω. Integrated voltage regulators allow flexible biasing of both the negative and positive supply pins, while internal bias sequencing and active bias control allows robust operation and stable performance over temperature.

Rev. C


One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700

Technical Support www.analog.com

# TABLE OF CONTENTS



## REVISION HISTORY

**1/16—Revision C: Initial Version**

# SPECIFICATIONS

Bias voltages = +15 V and −5 V; baseplate temperature = 25°C, unless otherwise noted.

**Table 1.**

| Parameter | Min | Typ | Max | Unit | Test Conditions/Comments |
|---|---|---|---|---|---|
| FREQUENCY RANGE | 0.01 | | 6 | GHz | |
| GAIN | | | | | |
| 0.01 GHz to 1 GHz | 21 | 25 | | dB | |
| 1 GHz to 3 GHz | 21 | 25 | | dB | |
| 3 GHz to 6 GHz | 18 | 23 | | dB | |
| GAIN FLATNESS | | ±3 | | dB | |
| GAIN VARIATION OVER TEMPERATURE | | 0.03 | | dB/°C | |
| NOISE FIGURE | | | | | |
| 1 GHz to 3 GHz | | 8 | | dB | |
| 3 GHz to 6 GHz | | 5 | | dB | |
| 1 dB COMPRESSION (P1dB) | | | | | |
| 0.01 GHz to 1 GHz | 24 | 28 | | dBm | |
| 1 GHz to 3 GHz | 27 | 30 | | dBm | |
| 3 GHz to 6 GHz | 26 | 29 | | dBm | |
| OUTPUT THIRD-ORDER INTERCEPT (IP3) | | | | | |
| 0.01 GHz to 1 GHz | | 42 | | dBm | |
| 1 GHz to 3 GHz | | 43 | | dBm | |
| 3 GHz to 6 GHz | | 41 | | dBm | |
| SATURATED OUTPUT POWER ($P_{SAT}$) | | 30 | | dBm | |
| RETURN LOSS | | | | | |
| Input | | −12 | | dB | |
| Output | | −14 | | dB | |
| SUPPLY INPUT | | | | | |
| +V DC | | 15 | | V | |
| −V DC | | −5 | | V | |
| CURRENT | | | | | |
| +V DC | | 740 | 900 | mA | +V DC = +15 V, −V DC = −5 V |
| −V DC | | 5 | 10 | mA | |

# ABSOLUTE MAXIMUM RATINGS

**Table 2.**

| Parameter | Rating |
|---|---|
| 15 V Bias Line | 16 V |
| −5 V Bias Line | −16 V |
| Radio Frequency (RF) Input Level | 10 dBm |
| Operating Temperature Range | −40°C to +70°C |
| Storage Temperature Range | −55°C to +150°C |
| ESD Sensitivity, Human Body Model (HBM) | Class IA |
| Thermal Resistance | 5.9°C/W |

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

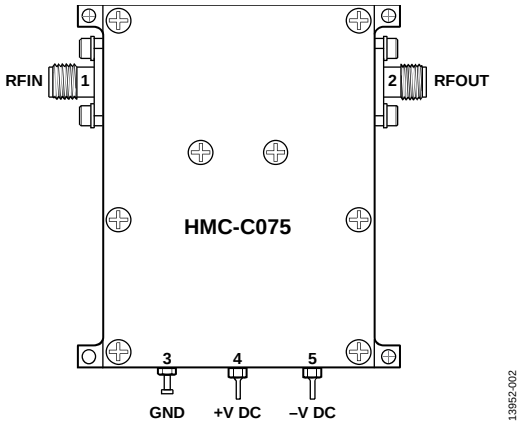


*Figure 2. Pin Configuration*

**Table 3. Pin Function Descriptions**

| Pin No. | Mnemonic | Description |
|---|---|---|
| 1 | RFIN | RF Input Connector, SMA Female, Field Replaceable. This pin is ac-coupled and matched to 50 Ω. |
| 2 | RFOUT | RF Output Connector, SMA Female, Field Replaceable. This pin is ac-coupled and matched to 50 Ω. |
| 3 | GND | Power Supply Ground. |
| 4 | +V DC | Positive Supply Voltage, 14 V to 16 V. |
| 5 | −V DC | Negative Supply Voltage, −5 V to −16 V. |

# TYPICAL PERFORMANCE CHARACTERISTICS

Bias voltages = +15 V and −5 V; baseplate temperature = 25°C, unless otherwise noted.

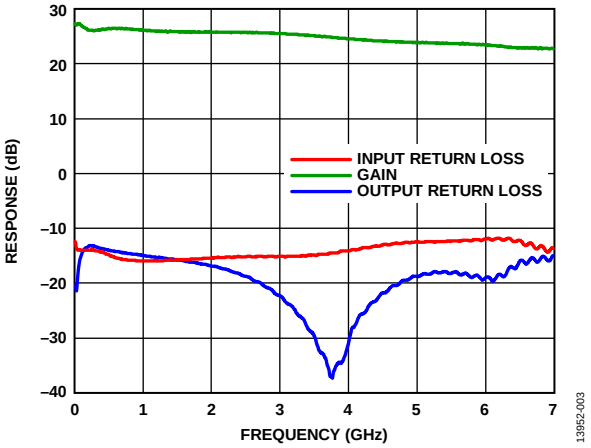


*Figure 3. Gain and Input/Output Return Loss vs. Frequency*

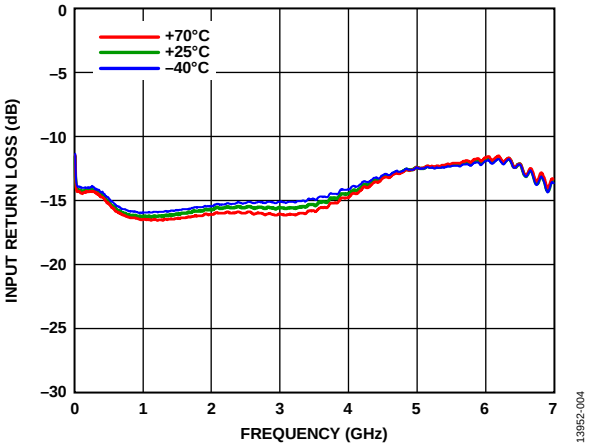


*Figure 4. Input Return Loss vs. Frequency for Various Temperatures*

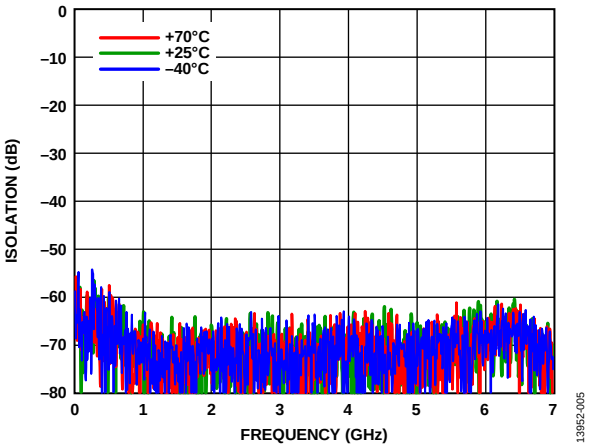


*Figure 5. Isolation vs. Frequency for Various Temperatures*

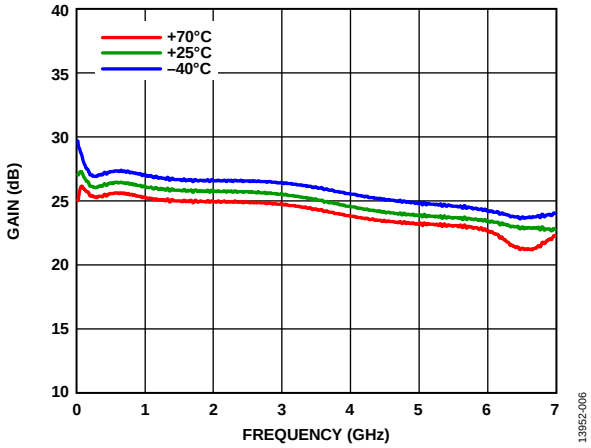


*Figure 6. Gain vs. Frequency for Various Temperatures*

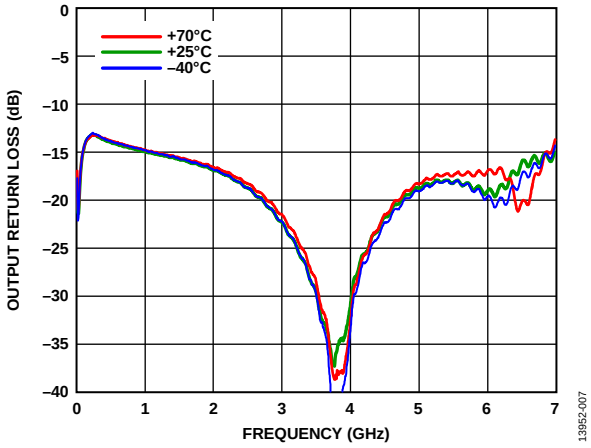


*Figure 7. Output Return Loss vs. Frequency for Various Temperatures*

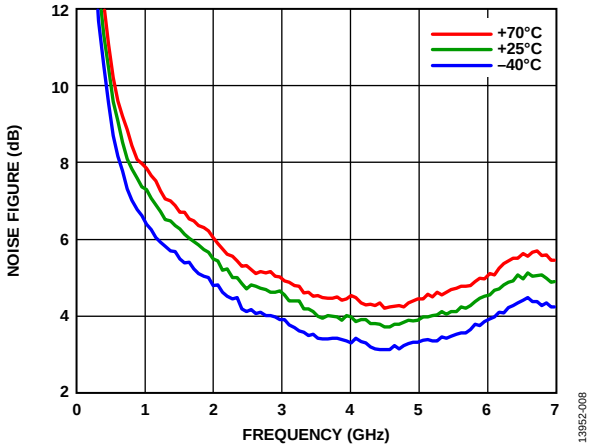


*Figure 8. Noise Figure vs. Frequency for Various Temperatures*

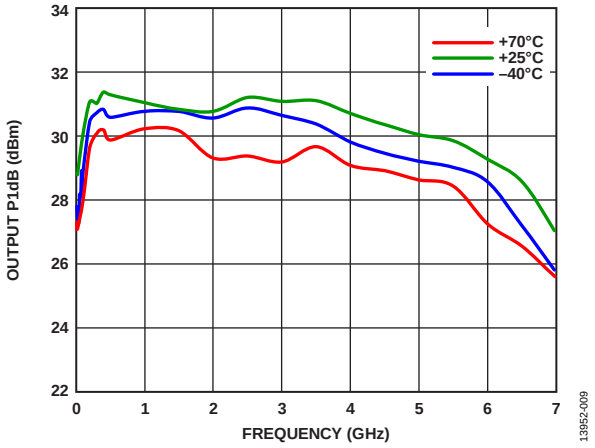


Figure 9. Output P1dB vs. Frequency for Various Temperatures

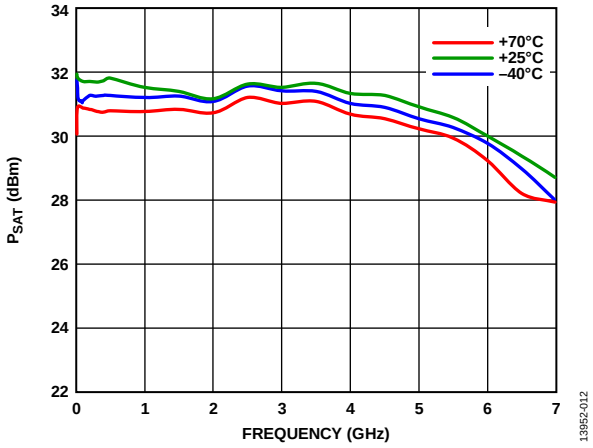


Figure 12. $P_{SAT}$ vs. Frequency for Various Temperatures

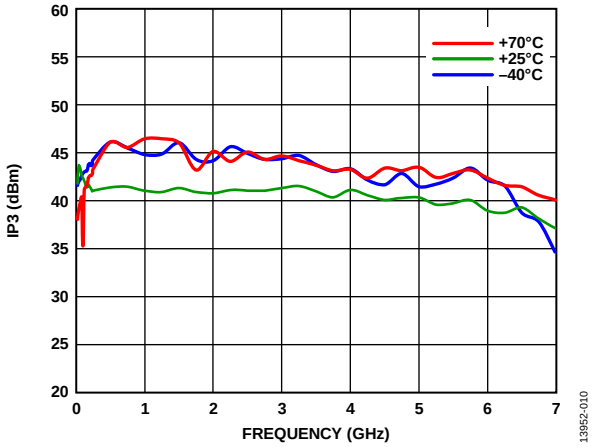


Figure 10. IP3 vs. Frequency for Various Temperatures

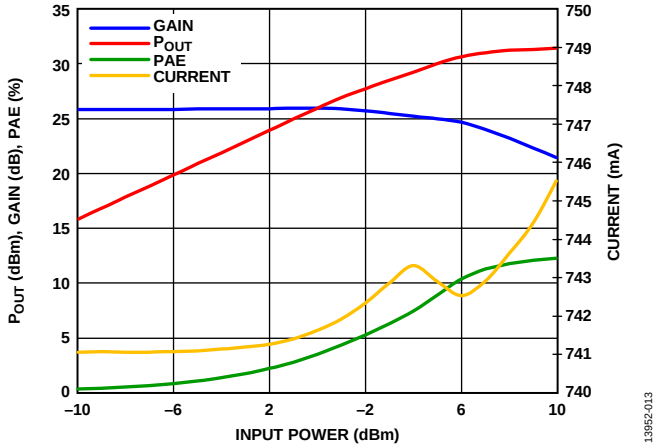


Figure 13. Output Power ($P_{OUT}$), Gain, and Power Added Efficiency (PAE) vs. Input Power

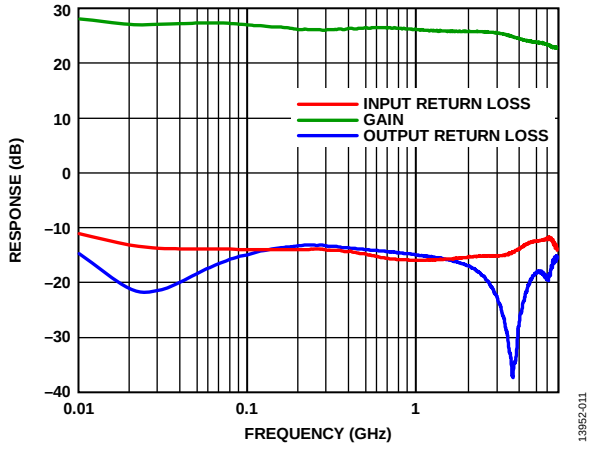


Figure 11. Gain, Input Return Loss, and Output Return Loss vs. Frequency

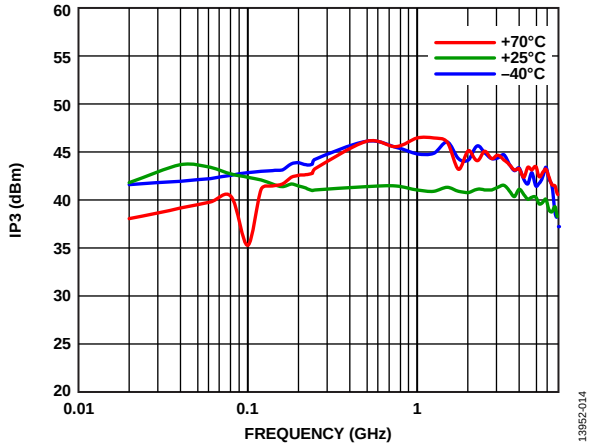


Figure 14. Output IP3 vs. Frequency

# THEORY OF OPERATION

The HMC-C075 package contains four mounting locations for screws to secure the amplifier package in dynamic applications and for thermal contact. Attach the amplifier to a heat sink of a suitable size such that, during operation, the backside case temperature never exceeds 70°C. Operation of the device at backside case temperatures greater than 70°C results in reduced life of the device.

Prior to applying dc voltages, terminate both the RF input and the RF output to 50 Ω. Never disconnect the RF output when dc voltages are applied to the device.

# APPLICATIONS INFORMATION

The HMC-C075 is a connectorized amplifier module designed with two stage amplifiers to deliver 29 dBm of typical power with a 25 dB gain from 0.01 GHz to 6 GHz. The bias of the internal amplifiers is supplied by 15 V and −5 V dc sources that power internal voltage regulators. The HMC-C075 features built-in bias sequencing and active bias control to prevent damage to the amplifiers and to maintain stable gain over temperature.

The HMC-C075 is built in a miniature module with SMA connectors for RF input and output, and robust feedthroughs for bias and ground return.

To turn on the amplifier, complete the following steps:

1. Verify that the dc connections are correct.
2. Verify that the RF input power is off.
3. Apply –V DC to the supply pin.
4. Apply +V DC to the supply pin.
5. Apply the RF input, ensuring that the power level is correct.

To turn off the amplifier, complete the following steps:

1. Turn the RF input off.
2. Turn off the +V DC supply.
3. Turn off the –V DC supply.

# OUTLINE DIMENSIONS

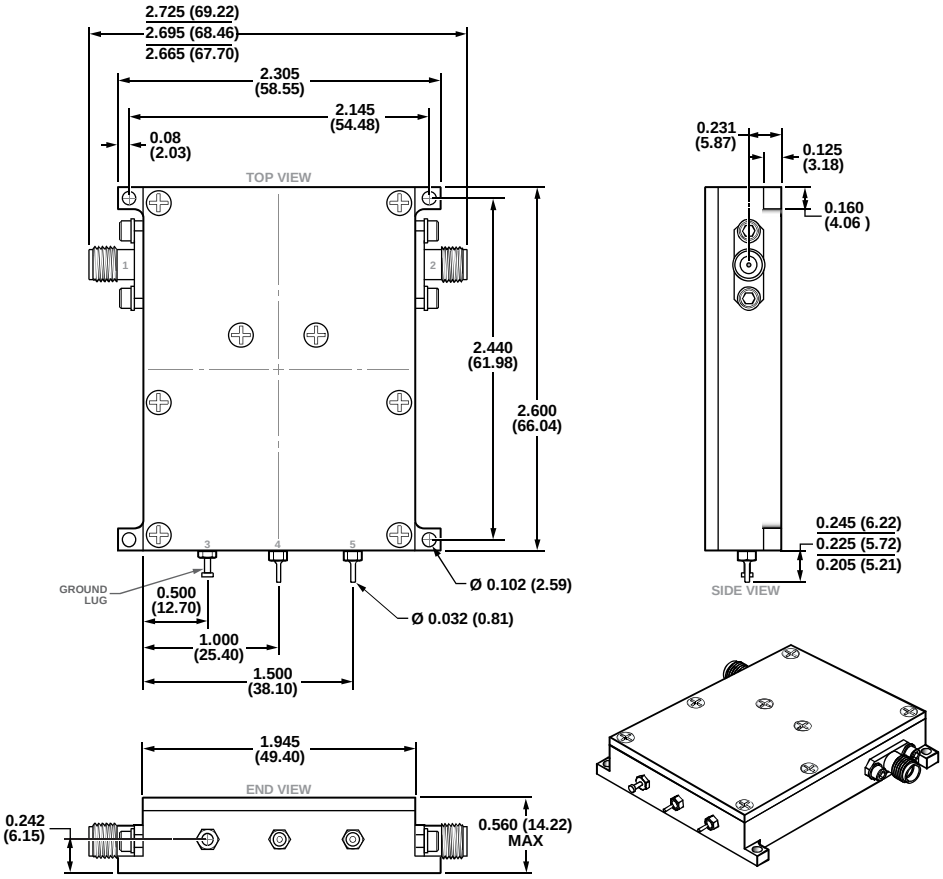


*Figure 15. 5-Lead Module with Connector Interface [MODULE]*
*(ML-5-2)*
*Dimensions shown in inches and (millimeters)*

## ORDERING GUIDE

| Model | Temperature Range | Package Description | Package Option |
|---|---|---|---|
| HMC-C075 | −40°C to +70°C | 5-Lead Module with Connector Interface [MODULE] | ML-5-2 |