

GaAs MMIC VSAT Power Amplifier, 2.0 W 14.0 - 14.5 GHz

Rev. V8

Features

- High Linear Gain: 22 dB Typical
- High Saturated Output Power: +33 dBm Typical
- High Power Added Efficiency: 22% Typical
- High P1dB: 32 dBm Typ.
- 50 Ω Input/Output Broadband Matched
- Integrated Output Power Detector
- Lead-Free Ceramic Bolt Down Package
- RoHS* Compliant and 260°C Reflow Compatible

Description

The AM42-0007 is a three-stage MMIC linear power amplifier in a lead-free, ceramic bolt down style hermetic package. The AM42-0007 employs a fully matched chip with internally decoupled gate and drain bias networks and an output power detector. The AM42-0007 is designed to be operated from a constant voltage drain supply.

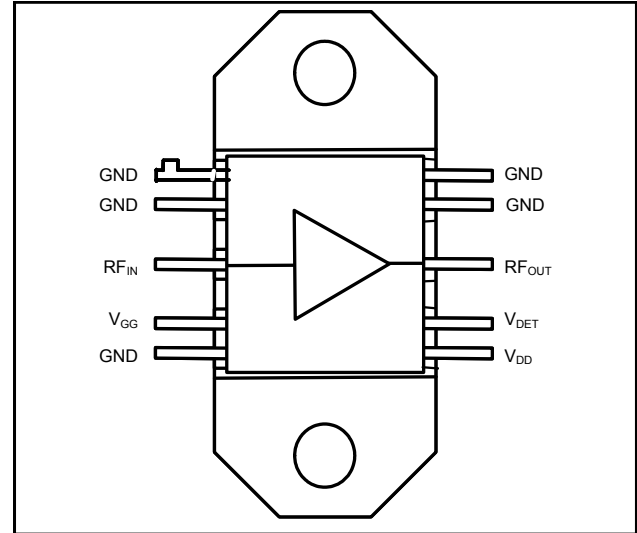
The AM42-0007 is designed for use as an output stage or a driver, in applications for VSAT systems. This design is fully monolithic and requires a minimum of external components.

The AM42-0007 is fabricated using a mature 0.5 micron GaAs MESFET process. The process features full passivation for increased performance and reliability. This product is 100% RF tested to ensure compliance to performance specifications.

Ordering Information

Part Number	Package
AM42-0007	Ceramic Bolt Down

Functional Schematic



Pin Configuration

Pin No.	Pin Name	Description
1	GND	DC and RF Ground
2	GND	DC and RF Ground
3	RF _{IN}	RF Input
4	V _{GG}	Gate Supply
5	GND	DC and RF Ground
6	V _{DD}	Voltage Drain Supply
7	V _{DET}	Output Power Detector
8	RF _{OUT}	RF Output
9	GND	DC and RF Ground
10	GND	DC and RF Ground

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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Electrical Specifications: $T_A = +25^\circ\text{C}$, $V_{DD} = +9\text{ V}$, $V_{GG} = -5.0\text{ V}$, $Z_0 = 50\ \Omega$

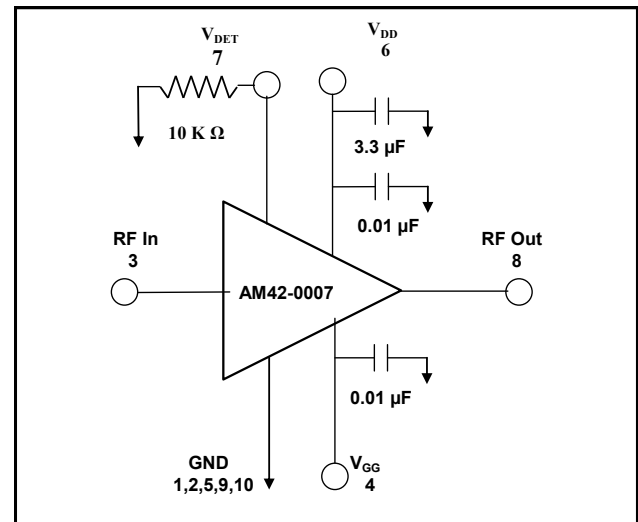
Parameter	Test Conditions	Units	Min.	Typ.	Max.
Linear Gain	$P_{IN} \leq 0\text{ dBm}$	dB	19	22	—
Input VSWR	$P_{IN} \leq 0\text{ dBm}$	Ratio	—	2.5:1	2.7:1
Output VSWR	$P_{IN} \leq 0\text{ dBm}$	Ratio	—	2.7:1	—
Saturated Output Power	$P_{IN} = +14\text{ dBm}$	dBm	—	33	—
Output Power at P1dB	—	dBm	31	32	—
Output IP3	Two +24 dB, output tones @ 1 MHz spacing	dBm	—	41	—
Power Added Efficiency	$P_{IN} = +14\text{ dBm}$	%	—	22	—
Bias Current	I_{DD} (No RF)	mA	—	850	—
	I_{GG} (No RF)	mA	—	18	25
Thermal Resistance	25°C Heat Sink	$^\circ\text{C/W}$	—	9.5	—
Detector Output Voltage	$R_L = 10\text{ K}\ \Omega$, $P_{OUT} = +31\text{dBm}$	V	—	+3.5	—

Absolute Maximum Ratings ^{1,2,3}

Parameter	Absolute Maximum
V_{DD}	12 Volts
V_{GG}	-10 Volts
Power Dissipation	13.2 W
RF Input Power	+23 dBm
Channel Temperature	150°C
Storage Temperature	-65°C to $+150^\circ\text{C}$
I_{DS}	2100 mA

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM Technology does not recommend sustained operation near these survivability limits.
- Case Temperature (T_C) = $+25^\circ\text{C}$.

Typical Bias Configuration ^{4,5,6,7,8}



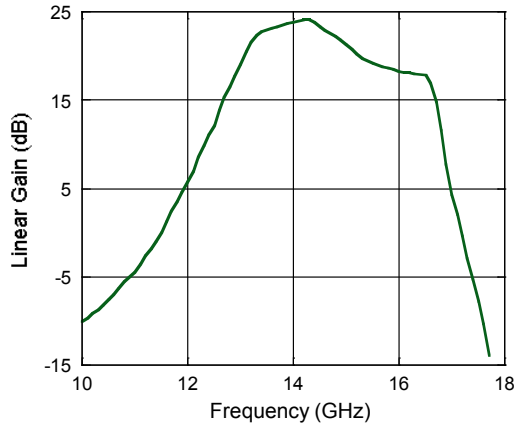
- Nominal bias is obtained by first connecting -5 volts to pin 4 (V_{GG}), followed by connection $+9$ volts to pin 6 (V_{DD}). Note sequence.
- RF ground and thermal interface is the flange (case bottom). Adequate heat sinking is required.
- No DC bias voltage appears at the RF ports.
- For optimum IP3 performance, the V_{DD} bypass capacitors should be placed within 0.5 inches of pin 6.
- Resistor and capacitors surrounding the amplifier are suggestions and not included as part of the AM42-0007.

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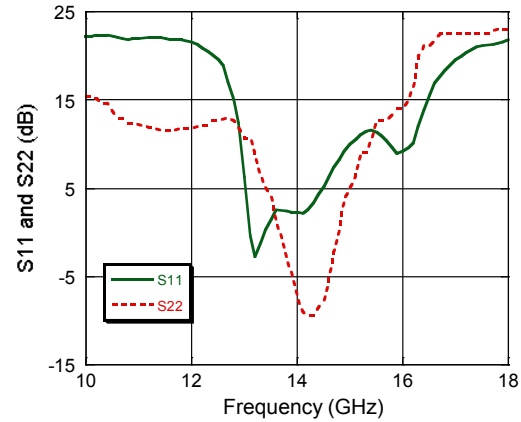
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Typical Performance Curves @ +25°C

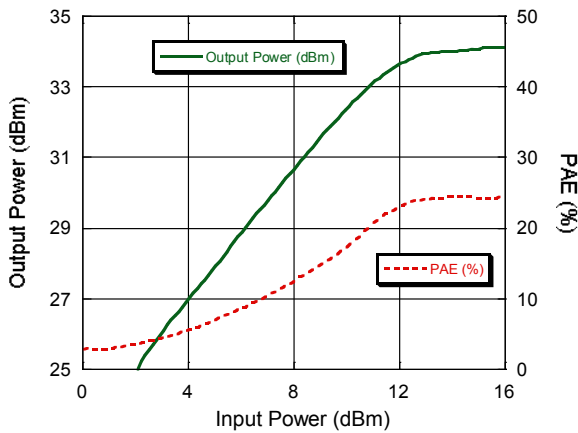
Linear Gain vs. Frequency



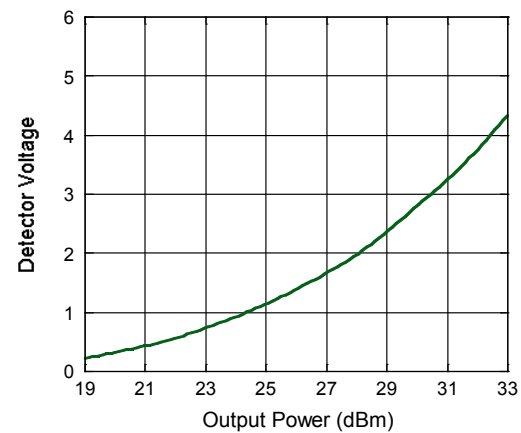
Input and Output Return Loss vs. Frequency



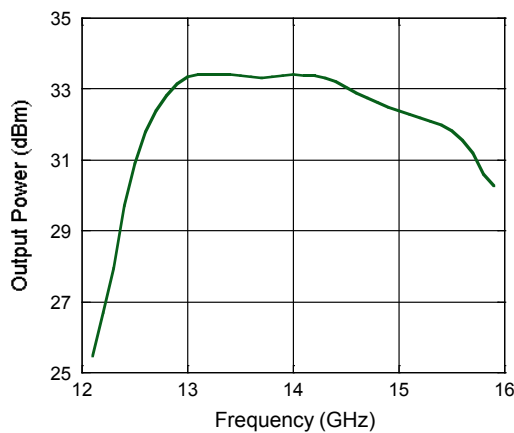
Output Power vs. Input Power @ 14.25 GHz



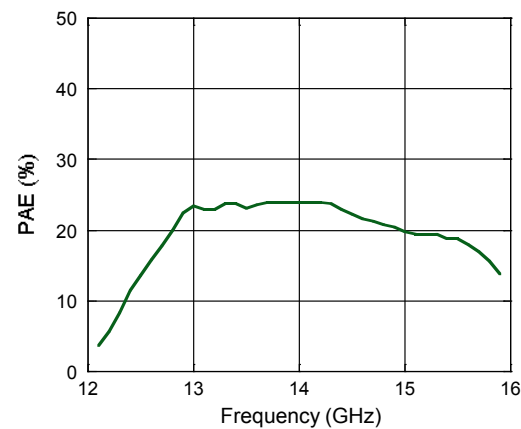
Detector Voltage vs. Output Power @ 14.25 GHz



Output Power vs. Frequency @ $P_{IN} = +14$ dBm



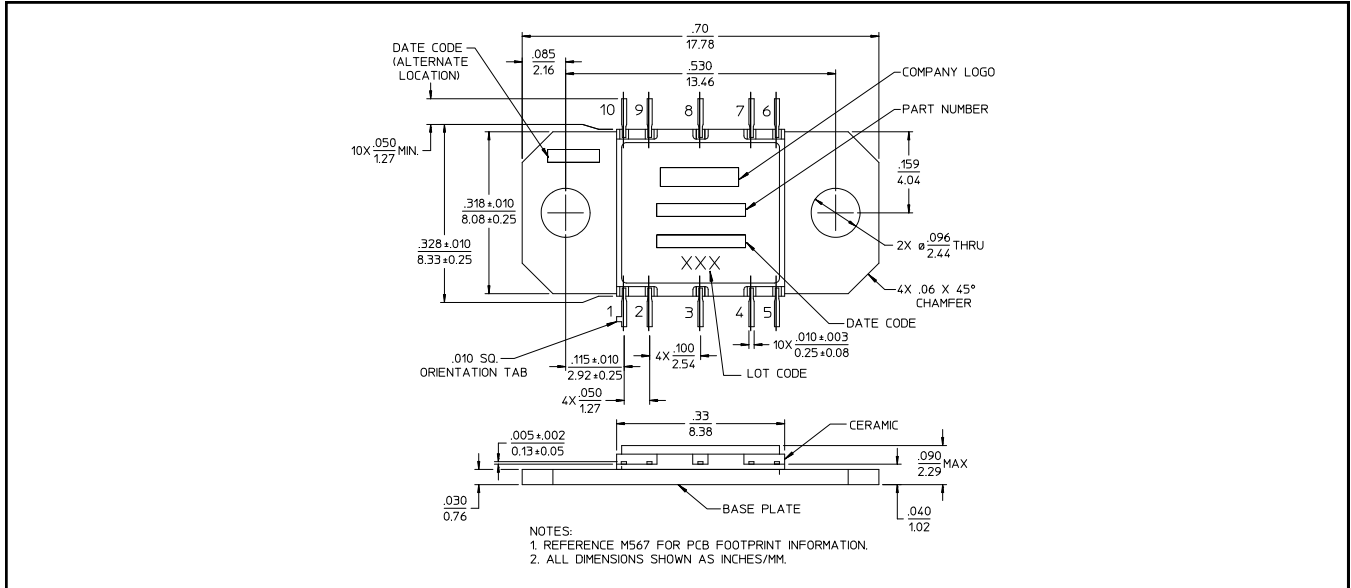
PAE vs. Frequency @ $P_{IN} = +14$ dBm



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Lead-Free CR-15[†]



[†] Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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