

## High Power GaAs Amplifier at 6.3 Watt Psat Operating from 5.5 GHz to 9.5 GHz with 47 dBm IP3, SMA

FMAM5009 is a broadband 6 W GaAs PHEMT MMIC-based coaxial power amplifier module designed to be used in a wide range of commercial and defense applications in the 5.5 to 9.0 GHz frequency range. The amplifier offers 23.5 dB small signal gain with the gain flatness of  $\pm 2$  dB. This performance is achieved through the use of advanced GaAs PHEMT MMIC circuitry. The amplifier requires manual voltage sequencing (see pages 4 & 5) and operates over the temperature range of  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ . This Innovative design is characterized by light weight (45 g) and small size (1.5"x1.2"x0.56"). An available finned heatsink (model FMAMC5014) is recommended to maintain an optimum baseplate temperature during operation.

### Electrical Specifications

(TA =  $+25^{\circ}\text{C}$ )

Description	Min	Typ	Max	Unit
Frequency Range	5.5		9.5	GHz
Small Signal Gain		23.5		dB
Gain Flatness		$\pm 2$		dB
Psat		+38		dBm
Efficiency Psat		26		%
P1dB		+37		dBm
Output 3rd Order Intercept Point		+47		dBm
Noise Figure		8.5		dB
Impedance (Input)		50		Ohms
Impedance (Output)		50		Ohms
Input Return Loss		13		dB
Output Return Loss		8		dB
Operating DC Drain Source Voltage		8		Volts
Operating DC Gate Source Voltage		-1		
Operating Temperature Range	-40		+85	$^{\circ}\text{C}$
Thermal Resistance		4.1		$^{\circ}\text{C}/\text{W}$

### Absolute Maximum Rating

Parameter	Rating	Units
Drain Source Voltage, Vds 1,2,3	+9	Volts
Gate Source Voltage Vgs 1,2,3	-3	Volts
Drain Source Current Idsq 1	0.3	A
Drain Source Current Idsq 2	1	A
Drain Source Current Idsq 3	2	A
Continuous Dissipation at $25^{\circ}\text{C}$	30	W
Channel Temperature	175	$^{\circ}\text{C}$
Operating Temperature (base-plate)	-40 to +85	$^{\circ}\text{C}$
Storage Temperature	-55 to +135	$^{\circ}\text{C}$



ESD Sensitive Material, Transport material in Approved ESD bags. Handle only in approved ESD Workstation.



### Features:

- 5.5 GHz to 9.5 GHz Frequency Range
- P1dB Output Power: 37.5 dBm
- Psat: 38 dBm
- Small Signal Gain: 23.5 dB
- Gain Flatness:  $\pm 2$  dB
- Power Added Efficiency @Psat: 26%
- 50 Ohm Input and Output Matched
- $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  Operating Temperature
- Small Size & Light Weight
- EAR99 (No Export License Required)
- Manual Voltage Sequencing
- Optional Heatsink Available: Model FMAMC5014

### Applications:

- Telecom Infrastructure
- Fixed Microwave Backhaul
- Microwave Radio Systems
- Military & Space
- Radar & Sensors
- Satellite Communication
- Driver Amplifier
- High Power Output
- General Purpose Amplification

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**Mechanical Specifications**

**Size**

Length	1.2 in [30.48 mm]
Width	1.5 in [38.1 mm]
Height	0.56 in [14.22 mm]
Weight	0.109 lbs [49.44 g]
Input Connector	SMA Female
Output Connector	SMA Female

**Environmental Specifications**

**Temperature**

Operating Range	-40 to +85 deg C
Storage Range	-55 to +135 deg C

**Compliance Certifications** (see [product page](#) for current document)

**Plotted and Other Data**

Notes:

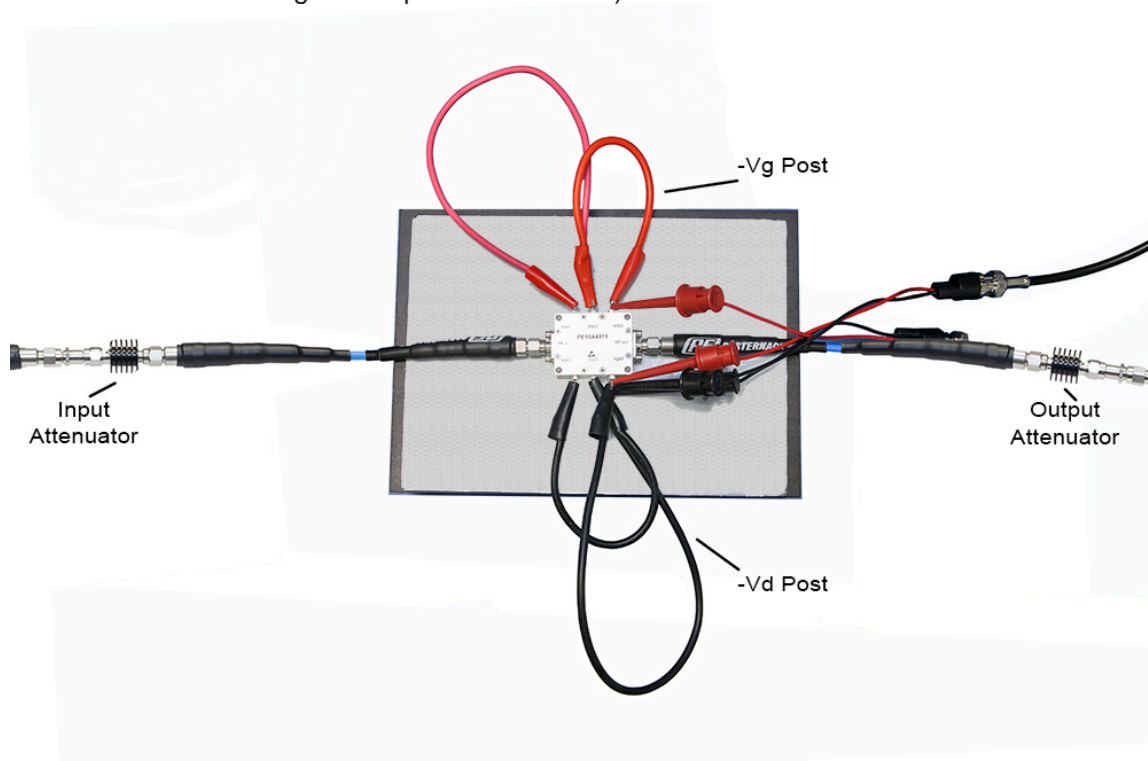
- Values at 25 °C, sea level
- ESD Sensitive Material, Transport material in Approved ESD bags. Handle only in approved ESD Workstation.
- Heat Sink Required for Proper Operation, Unit is cooled by conduction to heat sink. The amplifier module has 4 screw slots for mounting to a heat sink.
- DO NOT apply Vds without proper negative voltage on Vgs pins.

## Amplifier Power-up Precautions

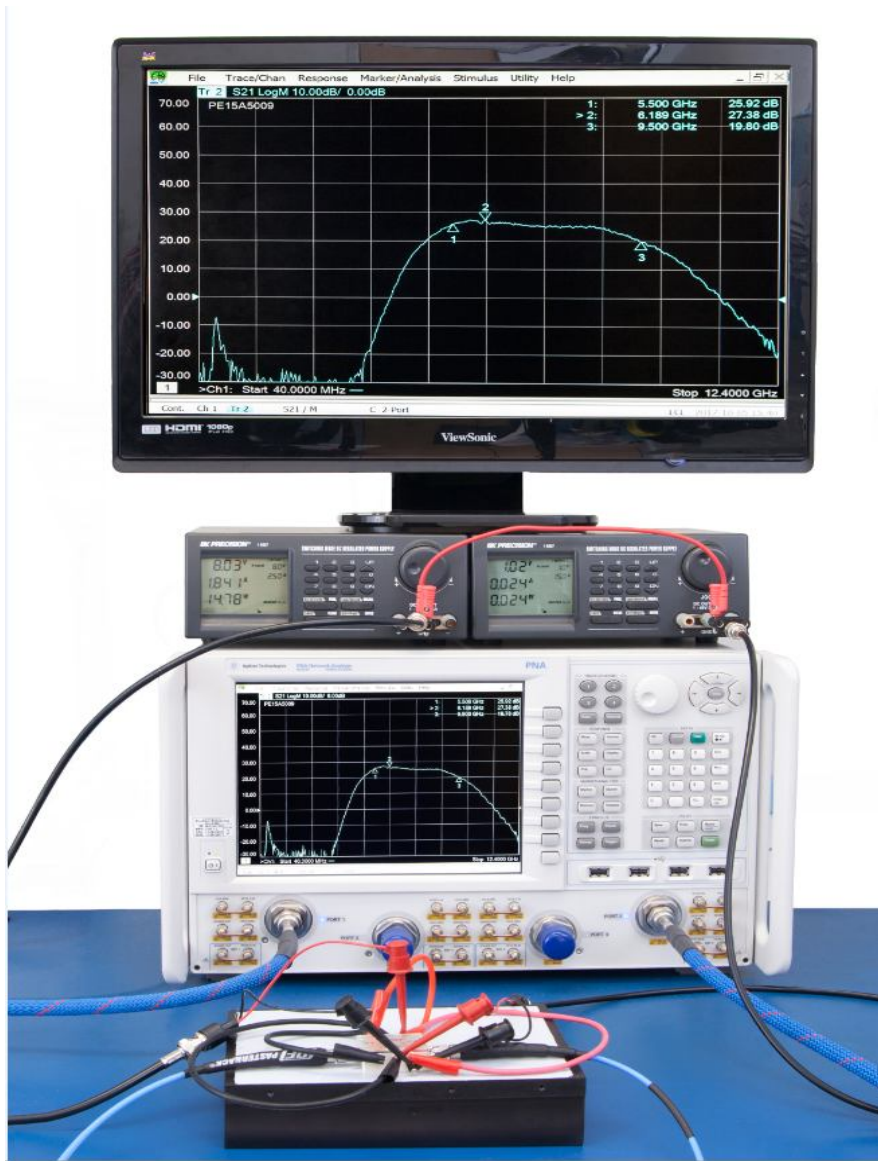
- 1.) Confirm that proper ESD precautions and controls are always in place before handling any Amplifier module.
  - 2.) Confirm adequate thermal management is in place to effectively dissipate heat away from the Amplifier package. The Amplifier operational baseplate temperature must be within the operational temperature range stated in the Amplifier datasheet. Depending on the design and thermal requirements, using a heatsink with cooling fan is always recommended for safe reliable operation. A heat sink without a cooling fan may also be used. Damage caused from overheating will void the warranty.
  - 3.) Confirm adequate system grounding is established. The DC power supply and Amplifier must have a common ground in order to operate properly.
  - 4.) Power Amplifiers may require additional DC Current when initially powered-up. Depending on the design, the input current draw could range from an additional 10% to 100% above the maximum rated DC current of the Amplifier. This varies based on product part number.
  - 5.) Confirm the DC power supply, if limited, is set to allow for additional start-up current that's rated for the Power Amplifier.
  - 6.) Confirm the system is designed and calibrated for 50 ohms. Any impedance mismatch may cause performance issues.
  - 7.) Perform a CALIBRATION (if required) with the loads before connecting the Amplifier to the Network Analyzer to ensure proper performance.
  - 8.) Use a fixed attenuator between the signal source and input port of the Amplifier to optimize the input VSWR match.
  - 9.) Confirm the input power level at the input port of the amplifier does not exceed the maximum rated limit for input power (as stated in the Amplifier datasheet).
    - $P_{in}$  for Small Signal Gain = P1dB-SSG-10 dB
    - $P_{in}$  for P1dB = P1dB-SSG+1 dB
  - 10.) Confirm the Network Analyzer is always connected to the Amplifier first before DC power is applied to the Amplifier.
  - 11.) As long as the input and output ports of the amplifier are connected to a 50ohm load and RF signal power is applied, the Amplifier can be powered up with DC voltage.
  - 12.) Confirm the Amplifier output load is matched for a 50 Ohm impedance and will not exceed the maximum rated VSWR or Return Loss limit for the Amplifier. Exceeding the maximum rated VSWR or Return Loss limit will result in reflected signal power that could damage the Amplifier and void the warranty.
  - 13.) **Power Amplifier connected to an Antenna for signal transmission** - It's strongly recommended to use a high power fixed attenuator pad or an Isolator between the output port of the Amplifier and input port to the antenna. Any reflected signal power due to impedance mismatch will likely damage the Amplifier and void the warranty.
  - 14.) The attenuator or isolator used at the output port of the Amplifier must be rated to handle the output power level and operational frequency band of the amplifier.
- GaAs PHEMT MMIC-Based Power up sequence

GaAs PHEMT MMIC-Based Power up sequence

1. Connect common ports
  - a. Connect single GND lead
  - b. Connect all  $-V_g$  ports together
  - c. Connect all  $+V_d$  ports together
2. Connect the load, attenuator to protect the VNA.
3. Connect the input port, may have an attenuator at the input (perform the CAL with the loads before connecting the amplifier to the VNA).



4. Apply the  $-V_g$  voltage -1.0 Volts (Always apply  $-V_g$  first).
5. Apply the  $+V_d$  voltage +8 Volts (Then apply  $+V_d$  second).



6. Observe the gain and power output

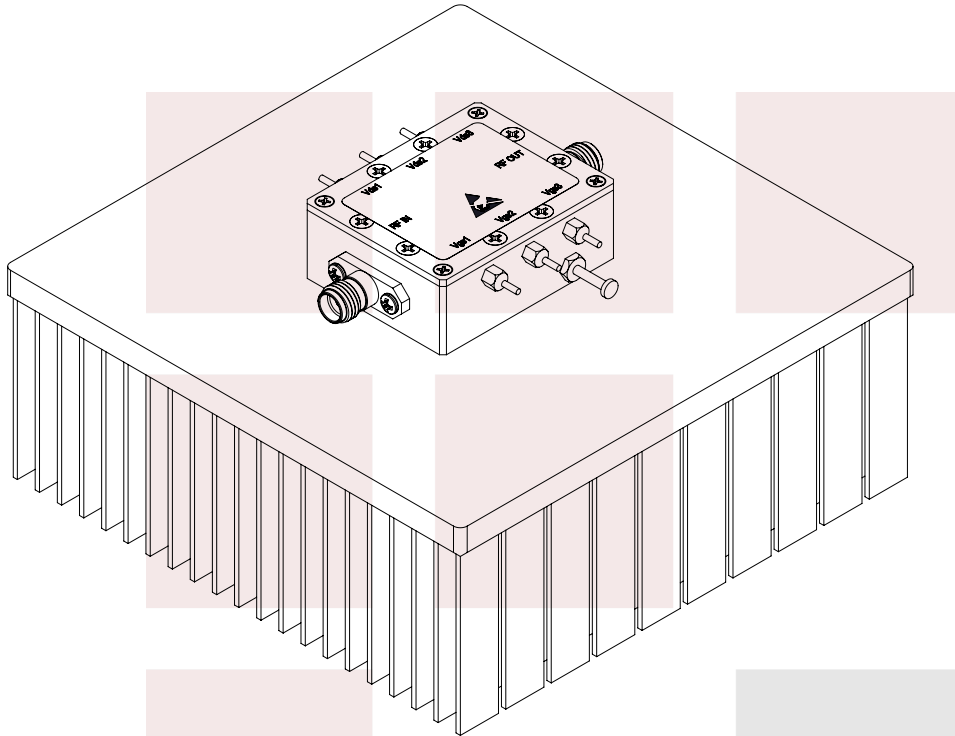
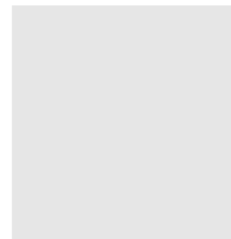
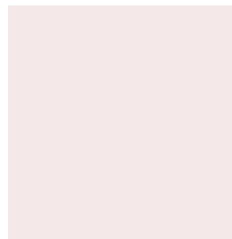
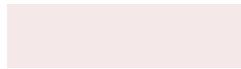
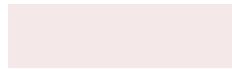
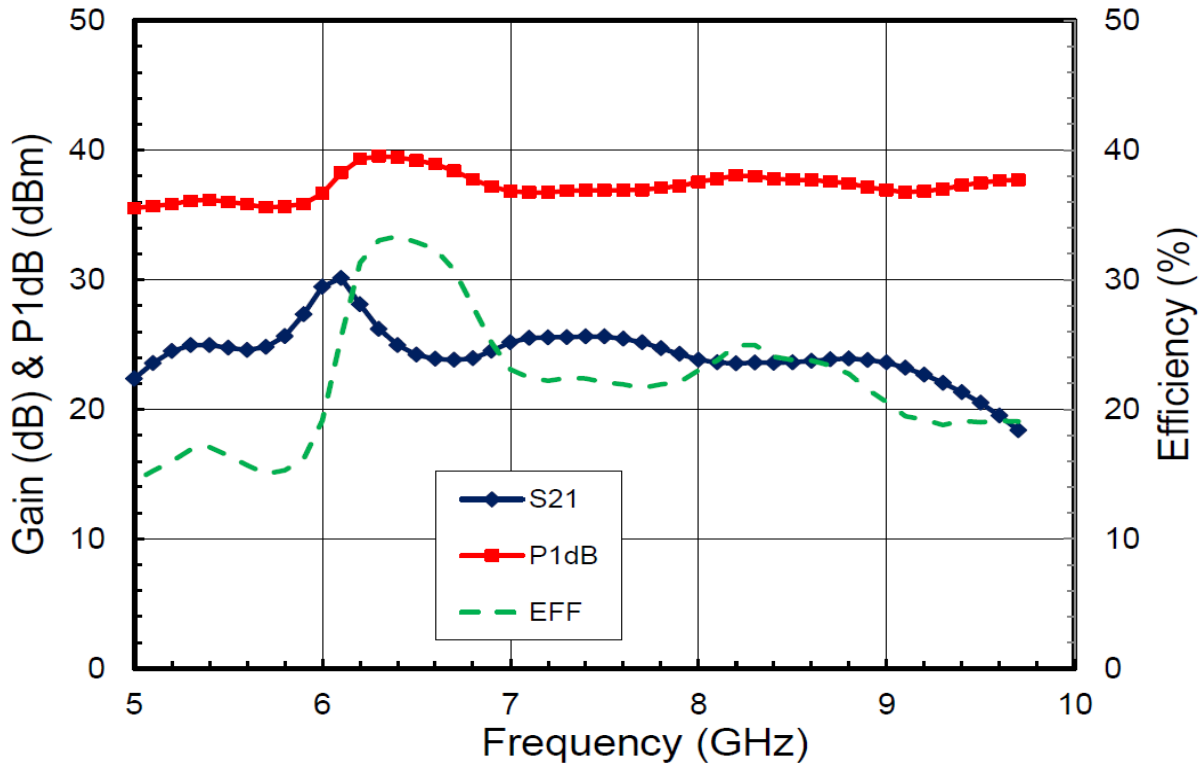
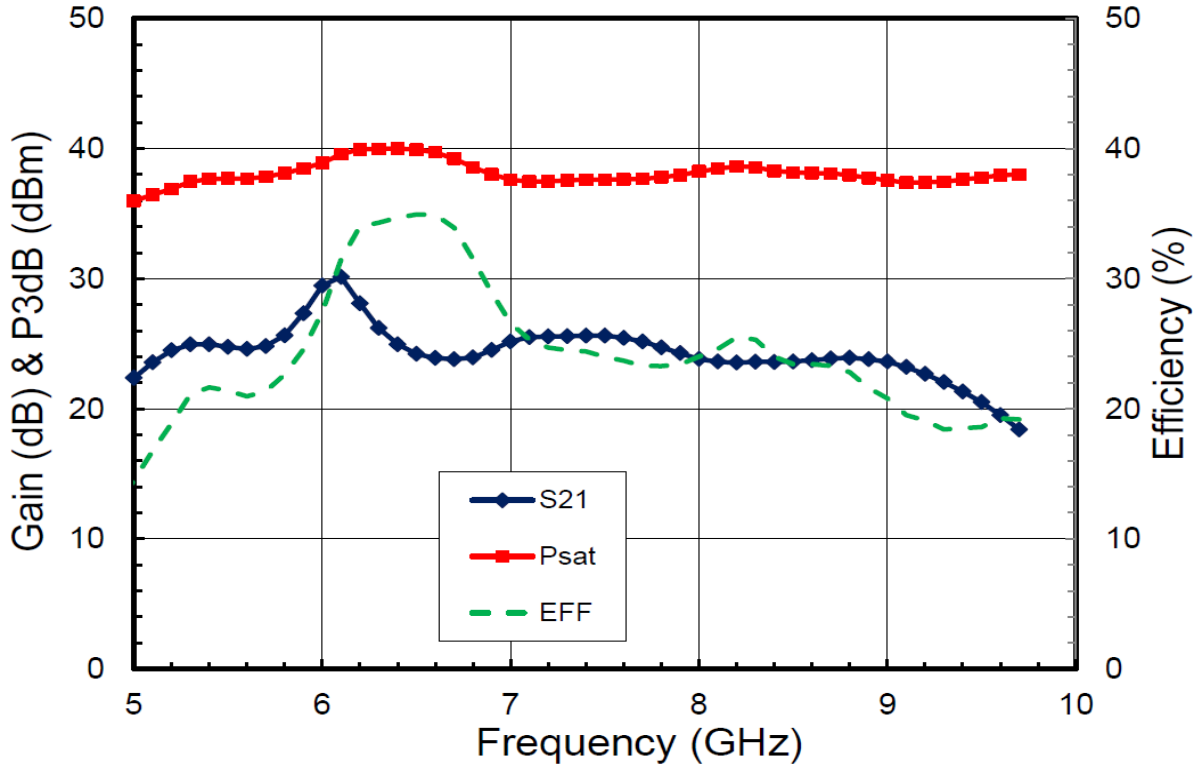


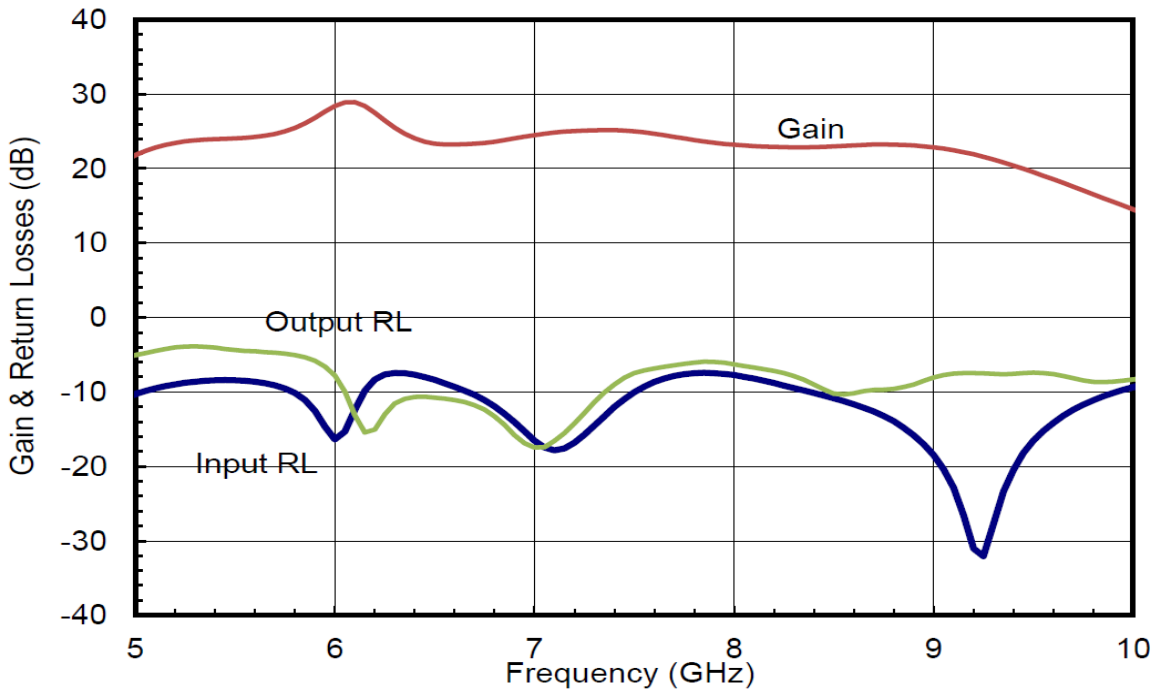
illustration of Amplifier mounted on Heatsink.  
Heatsink model **FMAMC5014** sold separately.  
(Picture shown for Reference Only)

**Typical Performance Data**





\* Biased at  $V_{ds1,2,3}=+8V$ ,  $I_{dsq1}=0.25A$ ,  $I_{dsq2}=0.66A$ ,  $I_{dsq3}=1.6A$ .



\* Biased at  $V_{ds1,2,3}=8V$ ,  $I_{dsq1}=0.25A$ ,  $I_{dsq2}=0.66A$ ,  $I_{dsq3}=1.6A$ ,  $V_{gs1,2,3}=-0.87V$ .

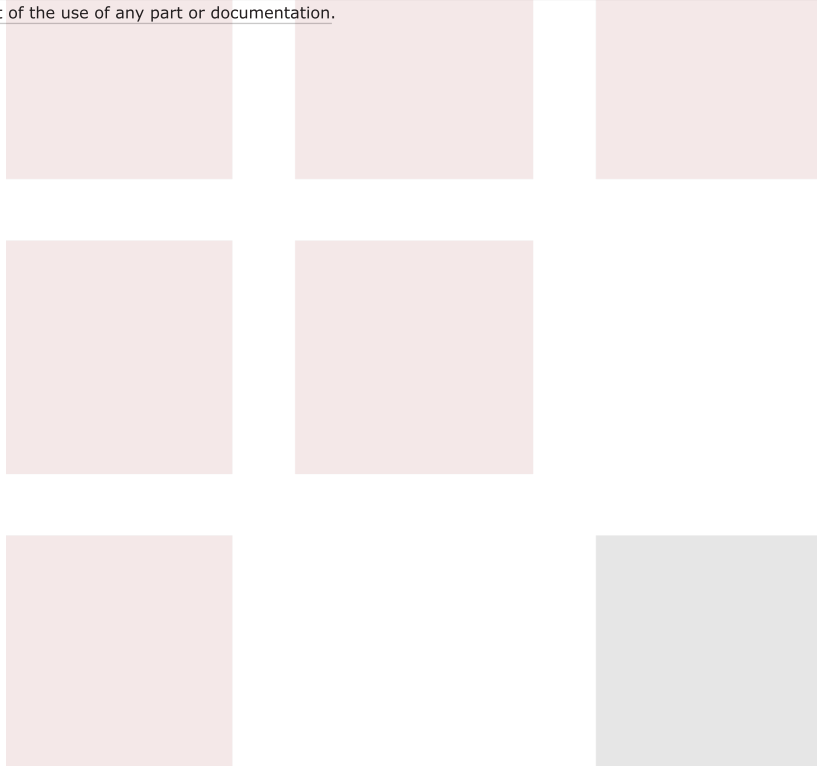


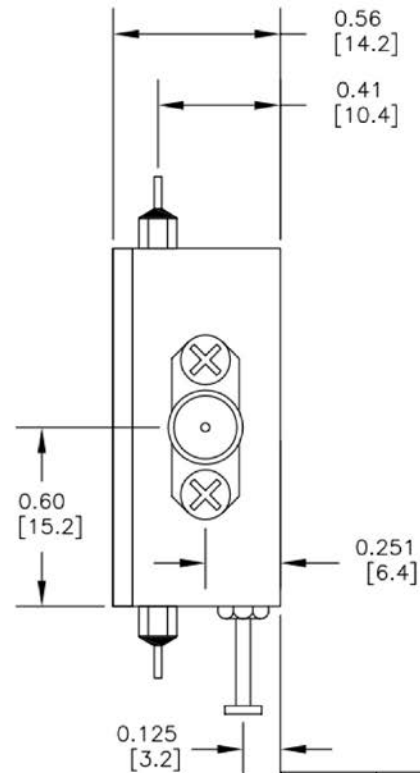
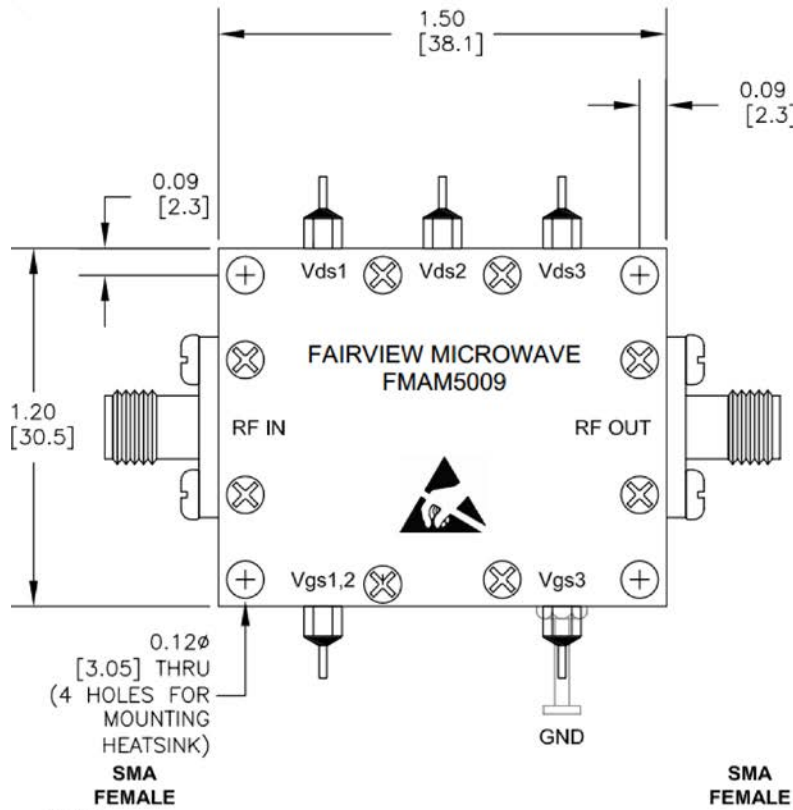
High Power GaAs Amplifier at 6.3 Watt Psat Operating from 5.5 GHz to 9.5 GHz with 47 dBm IP3, SMA from Fairview Microwave is in-stock and available to ship same-day. All of our RF/microwave products are available off-the-shelf from our ISO 9001:2008 certified facilities in Allen, Texas. Fairview Microwave is RF on-demand.

For additional information on this product, please click the following link: [High Power GaAs Amplifier at 6.3 Watt Psat Operating from 5.5 GHz to 9.5 GHz with 47 dBm IP3, SMA FMAM5009](#)

URL: <https://www.fairviewmicrowave.com/high-power-amplifier-6watt-23.5db-fmam5009-p.aspx>

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PIN NO.	FUNCTION	BIAS
1	$V_{gs1}, V_{gs2}$	-0.87V
2	NC	-
3	$V_{gs3}$	-0.87V
4	$V_{ds3}$	+8V
5	$V_{ds2}$	+8V
6	$V_{ds1}$	+8V

**NOTE:**

1. Recommended currents are :  $I_{dsq1}=0.25A$ ,  $I_{dsq2}=1.05A$  &  $I_{dsq3}=1.05A$  for the first, second & third stage respectively.
2. Gate  $V_{gs1,2,3}$  bias of -0.87V are for reference only.  $V_{gs1,2,3}$  could be adjusted to vary currents going thru the module.
3. Do **NOT** apply  $V_{ds1}$  &  $V_{ds2}$  &  $V_{ds3}$  without proper negative voltages.

**STANDARD TOLERANCES**

- .X ±0.2
- .XX ±0.01
- .XXX ±0.005

\*STANDARD TOLERANCES APPLY ONLY TO DIMENSIONS IN INCHES



NOTES:  
1. UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE NOMINAL.  
2. ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE AT ANY TIME.  
3. DIMENSIONS ARE IN INCHES [mm].

TITLE	DWG NO	CAGE CODE	
High Power GaAs Amplifier at 6.3 Watt Psat Operating from 5.5 GHz to 9.5 GHz with 47 dBm IP3, SMA	FMAM5009	3FKR5	
CAD FILE	05/18/18	SHEET	1 OF 1
SCALE	N/A	SIZE	A
			7361