

High Power GaAs Amplifier at 5 Watt Psat Operating from 2 GHz to 4.4 GHz with 37 dBm IP3, SMA

FMAM4011 is a broadband 5 W GaAs PHEMT MMIC-based coaxial power amplifier module designed to be used in a wide range of commercial and defense applications in the 2.0 to 4.4 GHz frequency range. The amplifier offers 32 dB small signal gain with the excellent gain flatness of ± 0.5 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°C to 85°C . The 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 = $+25^{\circ}\text{C}$, Vds1,2,3 = +8V, Idsq1 = 0.1A, Idsq2 = 0.3A, Idsq3 = 1.4A, Vgs1,2 = -0.80V)

Description	Min	Typ	Max	Unit
Frequency Range	2		4.4	GHz
Small Signal Gain	26	32		dB
Gain Flatness		± 0.5		dB
Output IP3		+45		dBm
Efficiency Psat		25		%
Output Power (1 dB Compress. Point)		+36		dBm
Output 3rd Intercept Point	+35	+37		dBm
Noise Figure			10	
Impedance (Input)		50		Ohms
Impedance (Output)		50		Ohms
Input Return Loss	9	15		dB
Output Return Loss	10	12		dB
Operating DC Drain Source Voltage		8		Volts
Operating DC Gate Source Voltage		-1		Volts
Operating Temperature Range	-40		+85	$^{\circ}\text{C}$
Thermal Resistance		4		$^{\circ}\text{C}/\text{W}$

Absolute Maximum Rating

Parameter	Rating	Units
Drain Source Voltage, Vds 1,2,3	+10	Volts
Gate Source Voltage Vgs 1,2,3	-5	Volts
Drain Source Current Idsq 1	0.15	A
Drain Source Current Idsq 2	0.45	A
Drain Source Current Idsq 3	2.1	A
Continuous Dissipation at 25°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:

- 2.0 GHz to 4.4 GHz Frequency Range
- P1dB Output Power: 36 dBm
- Output IP3: 45 dBm
- Small Signal Gain: 32 dB
- Gain Flatness: ± 0.5 dB
- Power Added Efficiency @Psat: 30%
- 50 Ohm Input and Output Matched
- -40 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
- Wireless Internet Access
- Wireless Local Loop
- Microwave Radio Systems
- Military & Space
- Radar & Sensors
- Commercial 2-Way Radio
- 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	0.1035 lbs [46.95 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

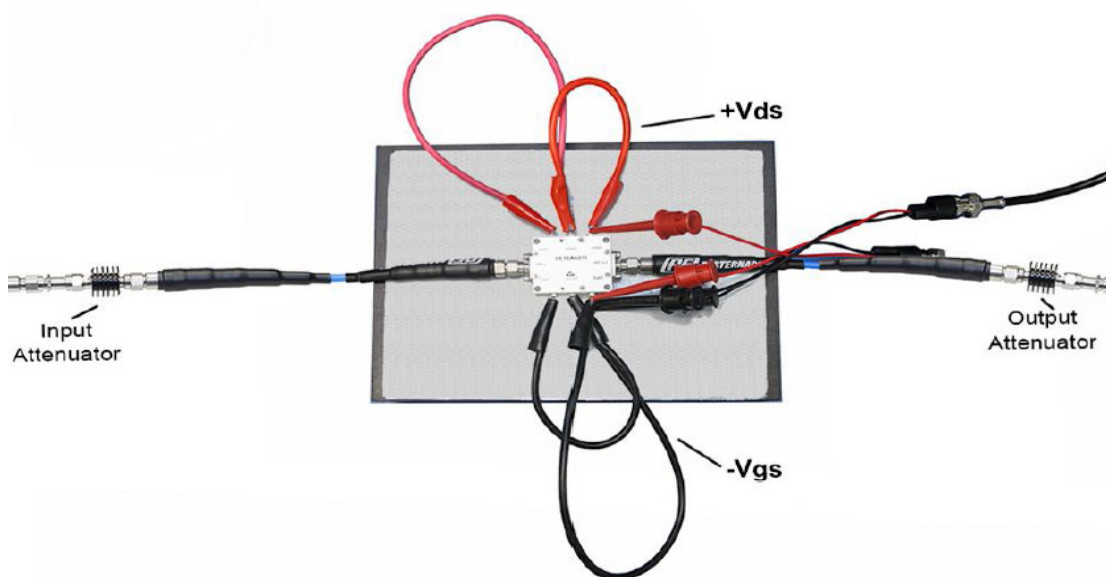
- Notes:
- Values at 25 °C, sea level
 - ESD Sensitive Material, Transport material in Approved ESD bags. Handle only in approved ESD Workstation.
 - Heat Sink Required for Proper Operation, Unit is cooled by conduction to heat sink. The amplifier module has 4 screw slots for mounting to a heat sink.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

Amplifier Power-up Precautions

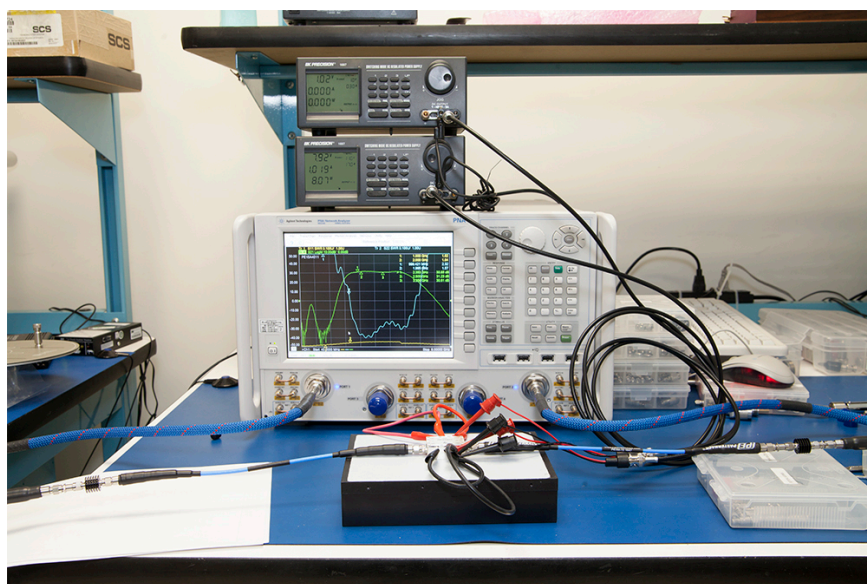
- 1.) Confirm that proper ESD precautions and controls are always in place before handling any Amplifier module.
- 2.) Confirm adequate thermal management is in place to effectively dissipate heat away from the Amplifier package. The Amplifier operational baseplate temperature must be within the operational 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

1. Connect common ports
 - a. Connect single GND lead
 - b. Connect all -Vgs ports together
 - c. Connect all +Vds 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 -Vgs voltage -1.0 Volts (Always apply -Vgs first).
5. Apply the +Vds +8 Volts (Then apply +Vds second).
6. Suggested to add an Isolator on Output to prevent damage to Amplifier. Refer to SFI0206S as a possible Isolator for FMAM4011.



6. Observe the gain and power output

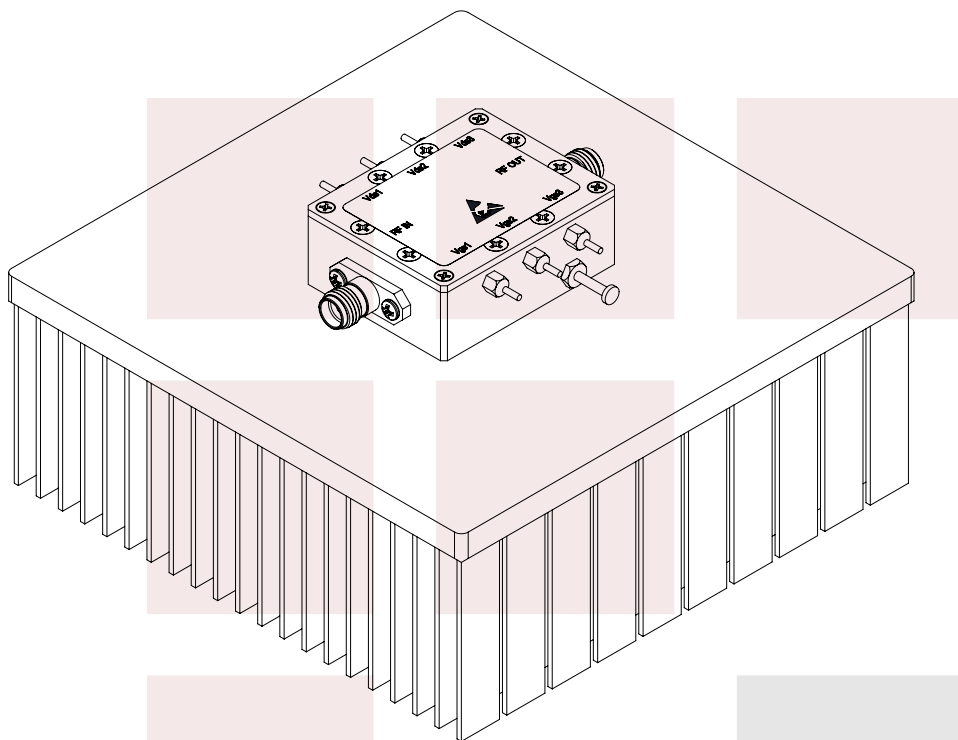
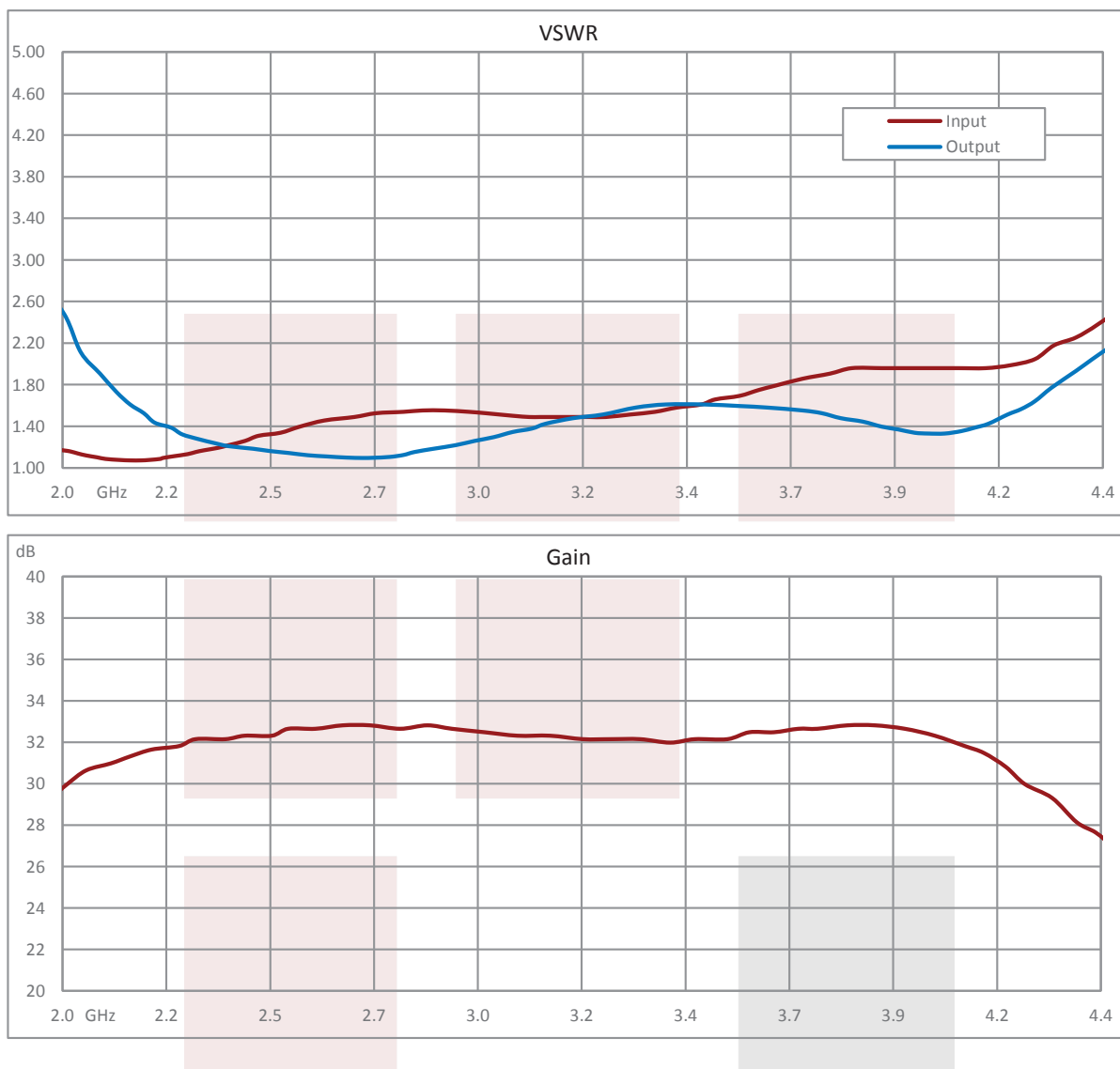
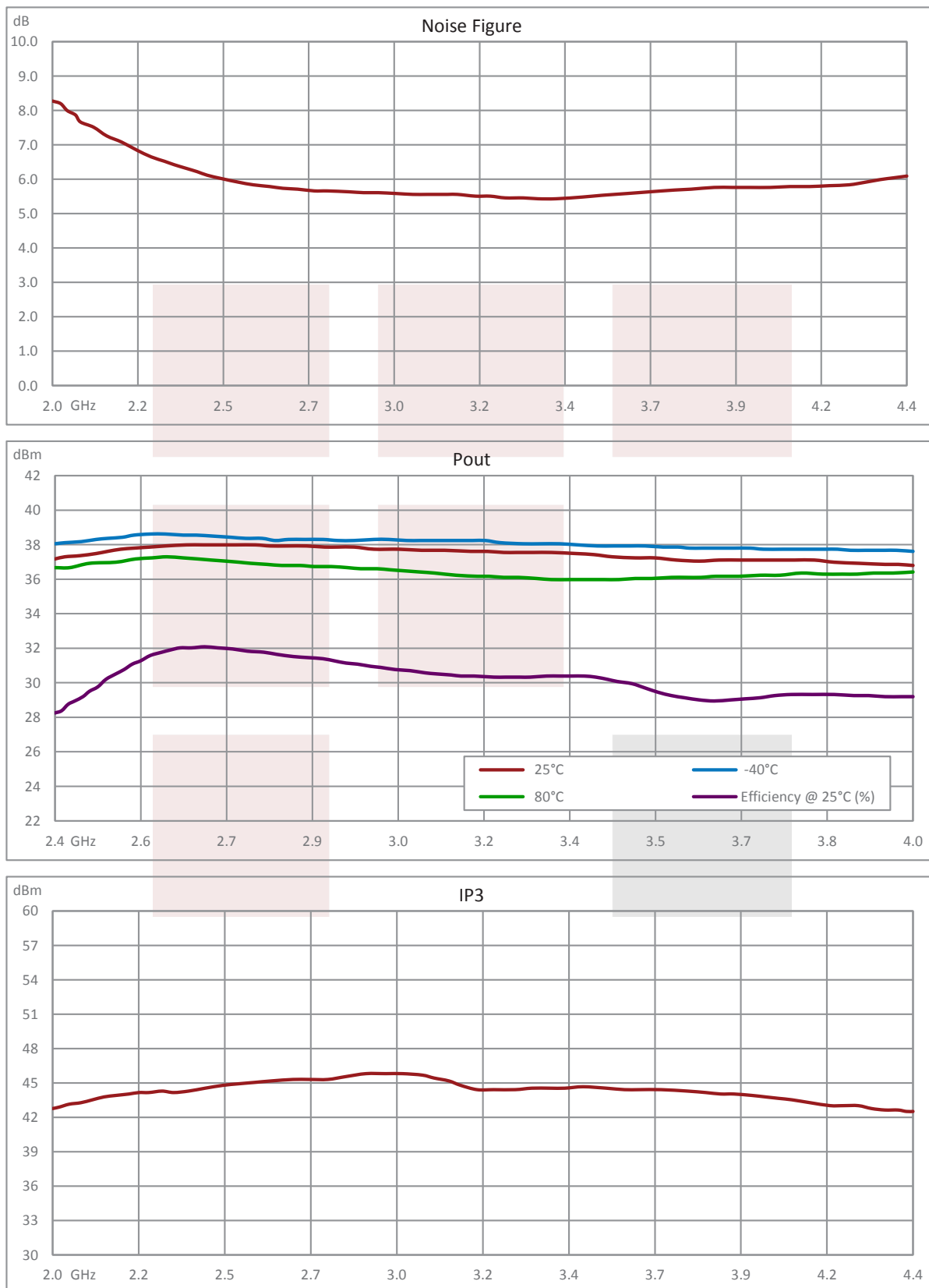


illustration of Amplifier mounted on Heatsink.
Heatsink model **FMAMC5014** sold separately.
(Picture shown for Reference Only)

Typical Performance Data





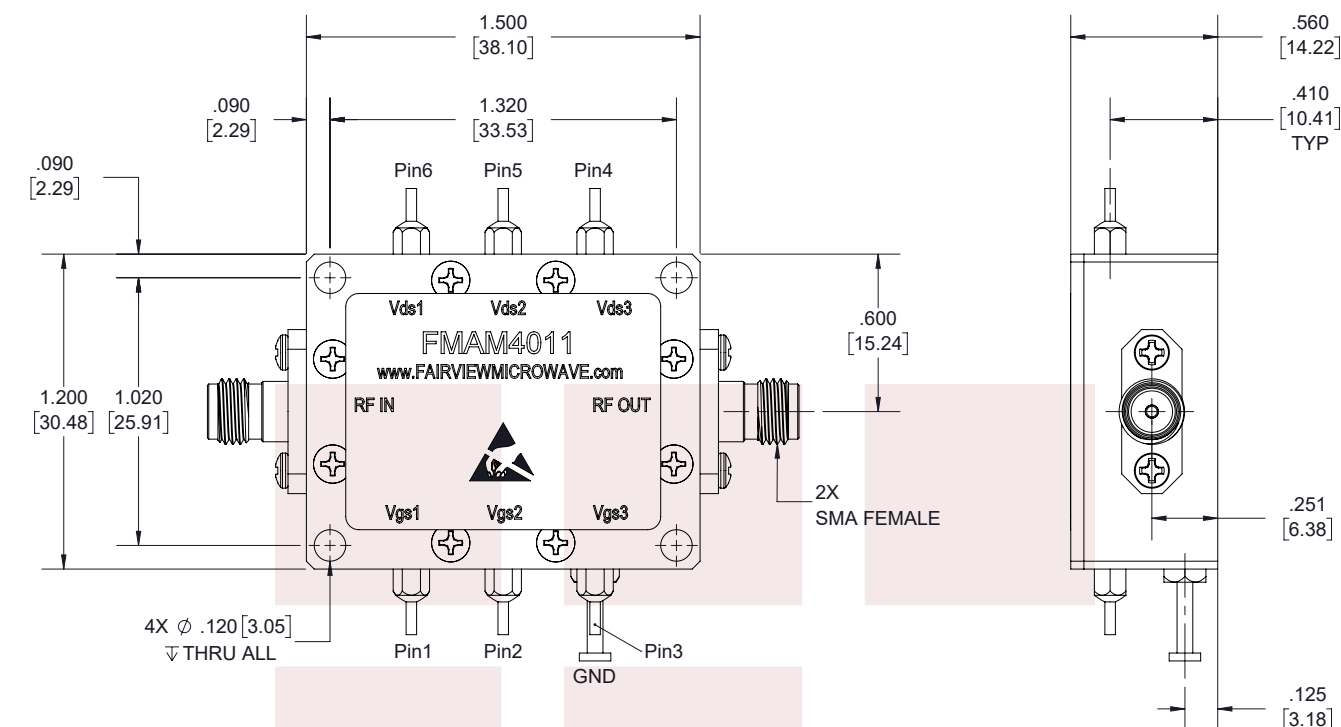
High Power GaAs Amplifier at 5 Watt Psat Operating from 2 GHz to 4.4 GHz with 37 dBm IP3, SMA from Fairview Microwave is in-stock and available to ship same-day. All of our RF/microwave products are available off-the-shelf from our ISO 9001:2008 certified facilities in Lewisville, Texas. Fairview Microwave is RF on-demand.

For additional information on this product, please click the following link: [High Power GaAs Amplifier at 5 Watt Psat Operating from 2 GHz to 4.4 GHz with 37 dBm IP3, SMA FMAM4011](#)

URL: <https://www.fairviewmicrowave.com/high-power-amplifier-6watt-32.5db-fmam4011-p.aspx>

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Pin Layout		
Pin No.	Functions	Bias
1	Vgs1	-0.80V
2	Vgs2	-0.80V
3	Vgs3	-0.80V
4	Vds3	+8V
5	Vds2	+8V
6	Vds1	+8V

STANDARD TOLERANCES

.X ±0.2
.XX ±0.01
.XXX ±0.005

*STANDARD TOLERANCES APPLY ONLY TO DIMENSIONS IN INCHES

NOTES:

1. RECOMMENDED CURRENT BIASES ARE 100mA, 300mA & 1400mA FOR THE FIRST, SECOND AND THIRD STAGES RESPECTIVELY.
2. DO NOT APPLY Vds1, Vds2 & Vds3 WITHOUT PROPER NEGATIVE VOLTAGES ON Vgs1, Vgs2 & Vgs3.
3. THE CURRENTS FLOWING OUT OF THE Vgs1, Vgs2 & Vgs3 PINS ARE LESS THAN 100µA, 600µA & 12mA AT P1dB.

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].

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DWG NO

FMAM4011

CAGE CODE

3FKR5

CAD FILE

05/21/18

SHEET

1 OF 1

SCALE

N/A

SIZE

A 7316