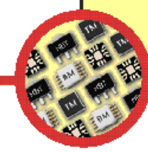
AMCOM COMMUNICATIONS
The RF Power House

GaAs MMIC Power Amplifier

AM142540MM-BM-R
AM142540MM-FM-R
Aug 2010
Rev 8



DESCRIPTION

AMCOM's AM142540MM-BM/FM-R is part of the GaAs HiFET MMIC power amplifier series. It is a 2-stage GaAs MESFET MMIC power amplifier biased at 14V. The input and inter-stage matching networks cover 1.4 to 2.5GHz. The MMIC output requires partial external matching to your band of interest between 1.4GHz to 2.5GHz to provide maximum bandwidth flexibility. The output matching can be designed to cover any 400MHz bandwidth in the 1.4 to 2.5GHz band. As an example, one of the available evaluation boards has over 25dB gain, 10 watts (40dBm) saturated output power over the 1.4 to 1.8GHz band at 14V. The other evaluation board for 2.1 to 2.5GHz achieved 23dB gain and 37dBm output power at 12V.

This MMIC is in a ceramic package with both RF and DC leads at the lower level of the package to facilitate low-cost SMT assembly to the PC board. When mounting directly to PCB, please see application note AN700 for instructions. Because of high DC power dissipation, we strongly recommend to mount these devices directly on a metal heat sink. The AM142540MM-FM-R is the AM142540MM-BM-R mounted on a gold plated copper flange carrier. There are two screw holes on the flange to facilitate screwing on to a metal heat sink. This MMIC is RoHS compliant.

FEATURES

- Frequency applications from 1.4 to 2.6GHz
- High output power, P1dB = 39dBm
- High gain > 20dB
- Input matched from 1.4GHz to 2.5GHz
- Can cover 400MHz bandwidth in the 1.4GHz to 2.5GHz band by adjusting output matching

APPLICATIONS

- PCS Base Station
- GPS Applications
- MMDS
- WLAN Repeaters
- 14V Applications

TYPICAL PERFORMANCE*

a) TEST BOARD FOR 1.4 to 1.8GHz

V_{dd} = +14V, Vgs = -0.86V, I_{dq} = 1500mA, T_a = 25°C**

Parameters	Minimum	Typical	Maximum
Frequency		1.4 – 1.8GHz	
Small Signal Gain	22dB	25dB	
Gain Ripple		± 1.0dB	± 2.0dB
P1dB	37.0dBm	39.0dBm	
Psat	37.5dBm	40.0dBm	
IP3		51dBm	
Efficiency @ P1dB		35%	
Input Return Loss	15dB	20dB	
Output Return Loss		15dB	
		5°C/W	

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Typical Performance at V_{dd} = 8V, 10V & 14V, Vgs = -0.86V, I_{dq} = 1500mA, T_a = 25°C

Parameters	V_{dd} = +8V	V_{dd} = +10V	V_{dd} = +14V
Frequency	1.4 – 1.8GHz	1.4 – 1.8GHz	1.4 – 1.8GHz
Small Signal Gain	27dB	26dB	25dB
Gain Ripple	± 1.0dB	± 1.0dB	± 1.0dB
P1dB	36.0dBm	37.5dBm	39.0dBm
Psat	37.0dBm	38.5dBm	40.0dBm
IP3	49dBm	50dBm	51dBm
Efficiency @ P1dB	40%	40%	35%
Input Return Loss	20dB	20dB	20dB
Output Return Loss	15dB	15dB	15dB
Thermal Resistance	5°C/W	5°C/W	5°C/W

b) TEST BOARD FOR 2.1 to 2.5GHz

Performance at V_{dd} = +12V, Vgs = -0.68V**, I_{dq} = 1700mA, T_a = 25°C

Parameters	Minimum	Typical	Maximum
Frequency		2.1 – 2.5GHz	
Small Signal Gain	20dB	23dB	
Gain Ripple		± 2.0dB	± 3.0dB
P1dB	35dBm	36dBm	
Psat	36.0dBm	37dBm	
IP3		51dBm	
Efficiency @ P1dB		25%	
Input Return Loss	10dB	15dB	
Output Return Loss		10dB	
Thermal Resistance		5°C/W	

Typical Performance at V_{dd} = 8V, 10V & 12V, Vgs = -0.68V I_{dq} = 1700mA, T_a = 25°C

Parameters	V_{dd} = +8V	V_{dd} = +10V	V_{dd} = +12V
Frequency	2.1 – 2.5GHz	2.1 – 2.5GHz	2.1 – 2.5GHz
Small Signal Gain	25dB	24dB	23dB
Gain Ripple	± 2.0dB	± 2.0dB	± 2.0dB
P1dB	35dBm	35.5dBm	36dBm
Psat	36.0dBm	36.5dBm	37dBm
IP3	47dBm	49dBm	51dBm
Efficiency @ P1dB	28%	30%	25%
Input Return Loss	15dB	15dB	15dB
Output Return Loss	10dB	10dB	10dB
Thermal Resistance	5°C/W	5°C/W	5°C/W

*Specifications subject to change without notice.

**V_{gs} value is for reference only and may vary from lot to lot.

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ABSOLUTE MAXIMUM RATING

Parameters	Symbol	Rating
Drain source voltage	V_{dd}	17V
Gate source voltage	V_{gg}	-5V
Drain source current	I_{dd}	2.0A
Continuous dissipation at room temperature	P_t	30W
Channel temperature	T_{ch}	175°C
Storage temperature	T_{sto}	-55°C to +135°C

NEGATIVE CURRENT REQUIREMENT

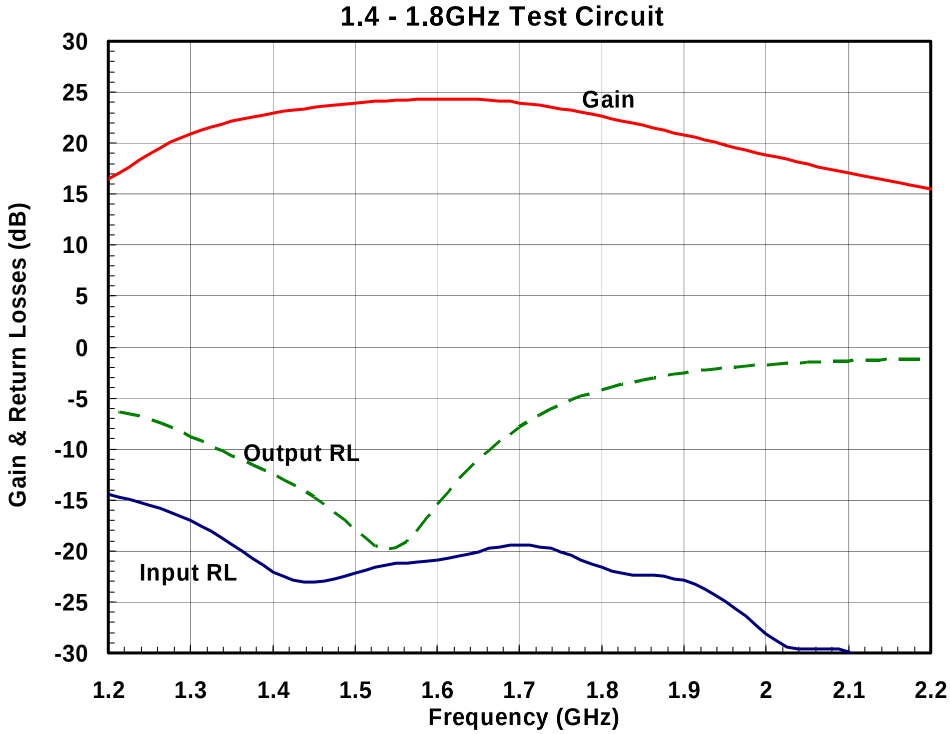
In order to maximize the bandwidth and linearity, this product has built-in feedback resistors on-chip. The product will draw negative current in the V_{gg} circuit through these resistors. The Table below shows the negative current values.

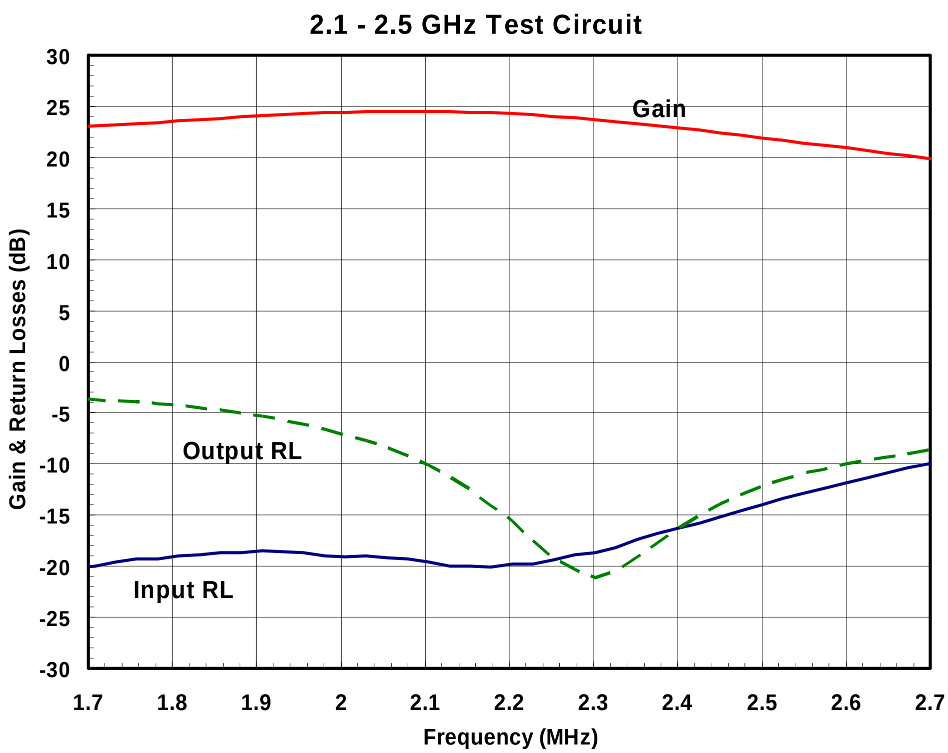
The typical negative currents for different V_{dd} are shown in the table below. The actual V_{gg} should be adjusted to have an I_{dd} of about 1.5A. The actual negative current value varies depending on V_{gg} and may also vary due to MMIC process variation.

Typical Negative Currents Variation vs Positive Bias

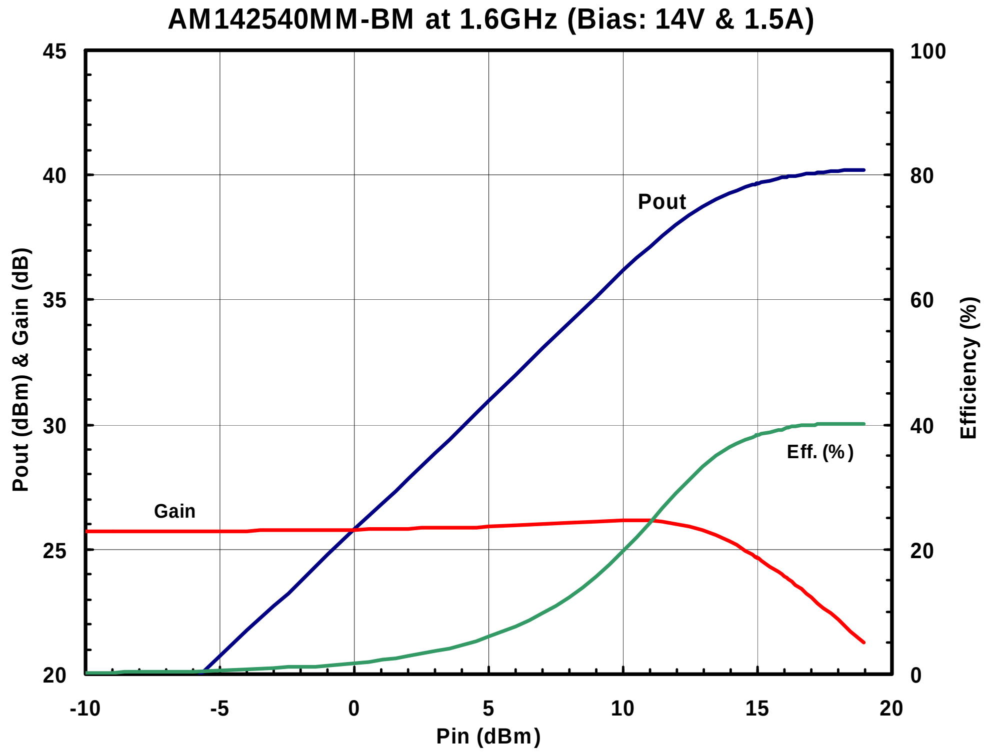
Parameters	V_{dd} = 10V	V_{dd} = 12V	V_{dd} = 14V
V_{gg}	- 1V	- 1V	- 1V
I_{gg1} (mA)	18	22	25
I_{gg2} (mA)	56	66	76
Total I_{gg} (mA)	74mA	88mA	101mA

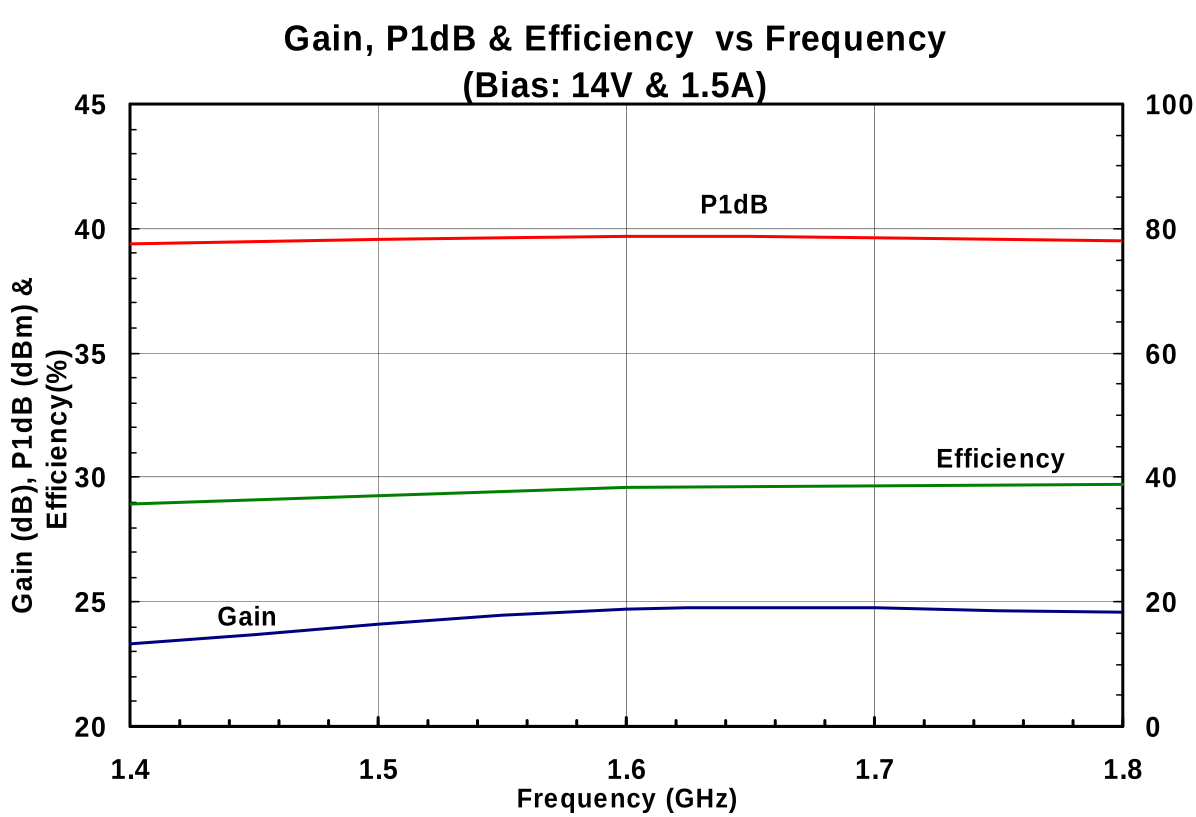
SMALL SIGNAL DATA

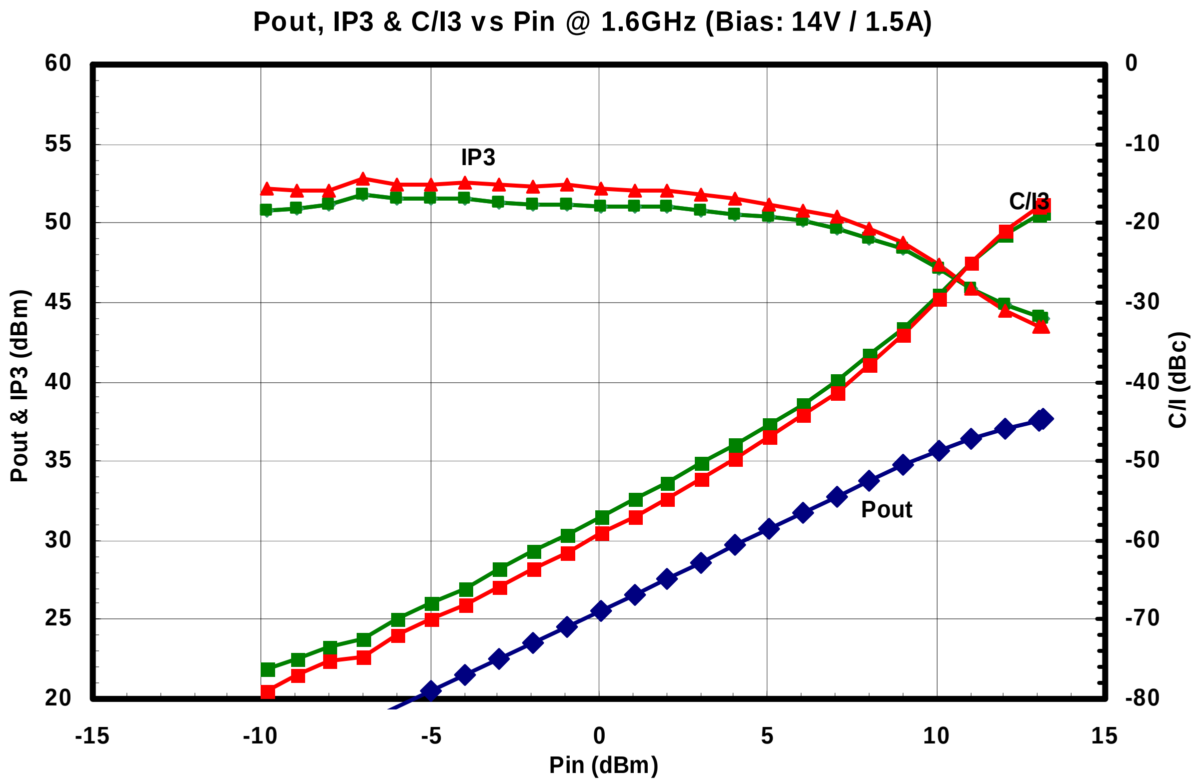




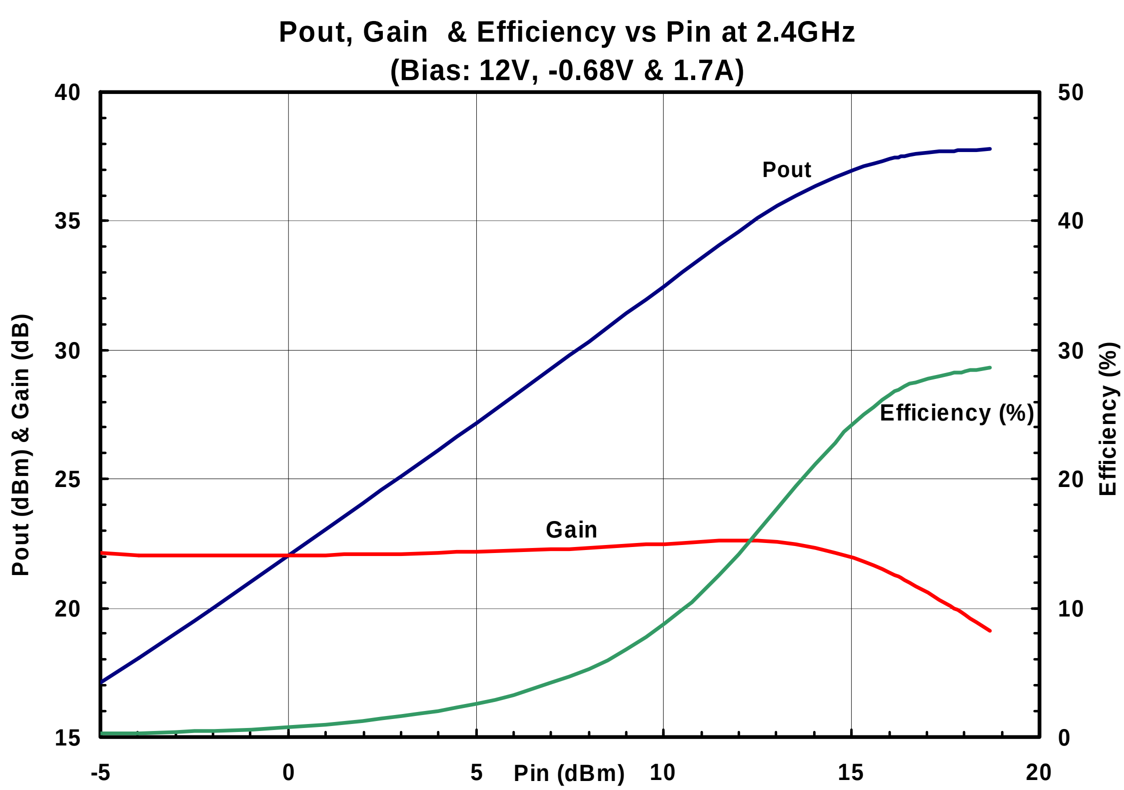
POWER DATA of 1.4 to 1.8GHz TEST BOARD







POWER DATA of 2.1 to 2.5GHz TEST BOARD



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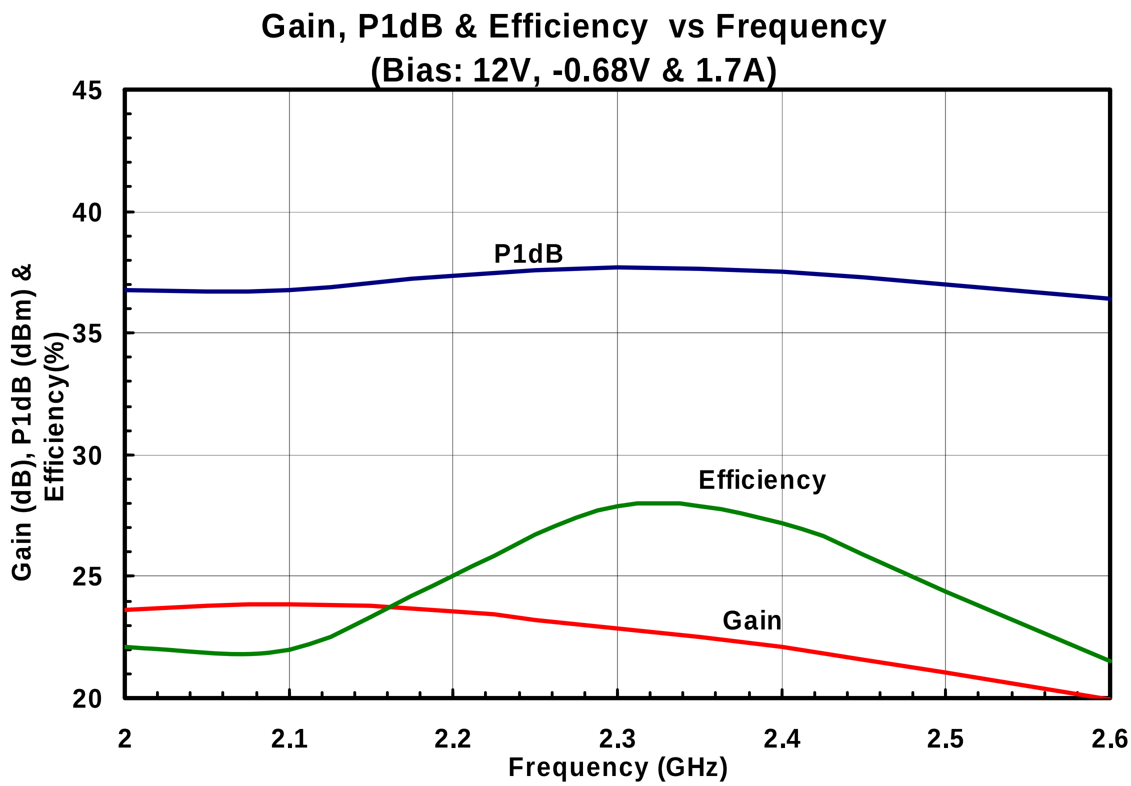
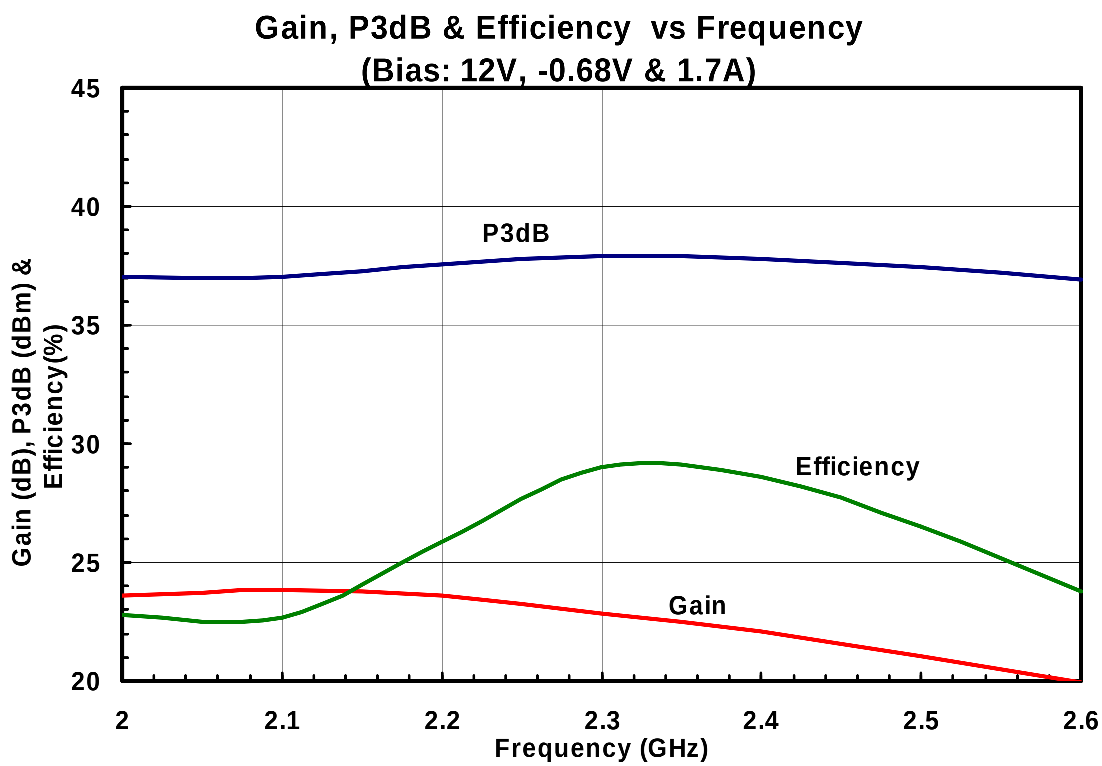
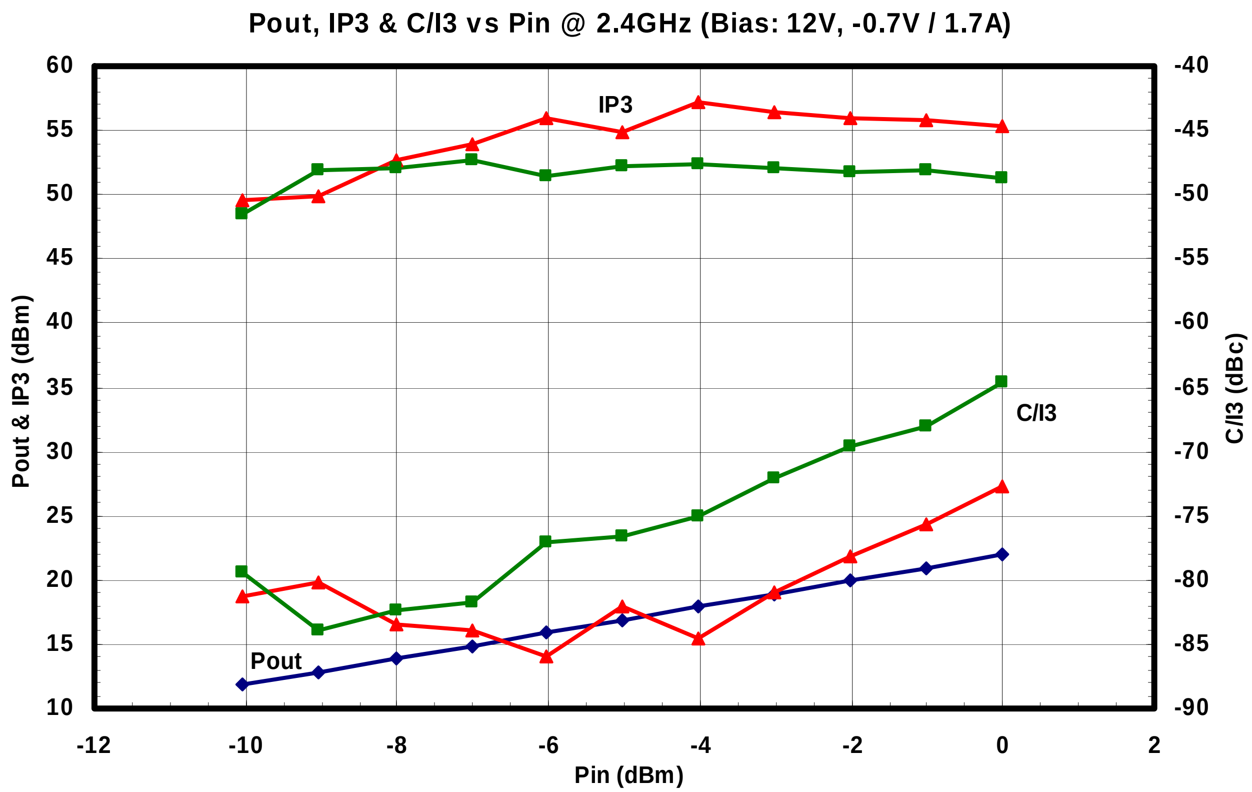
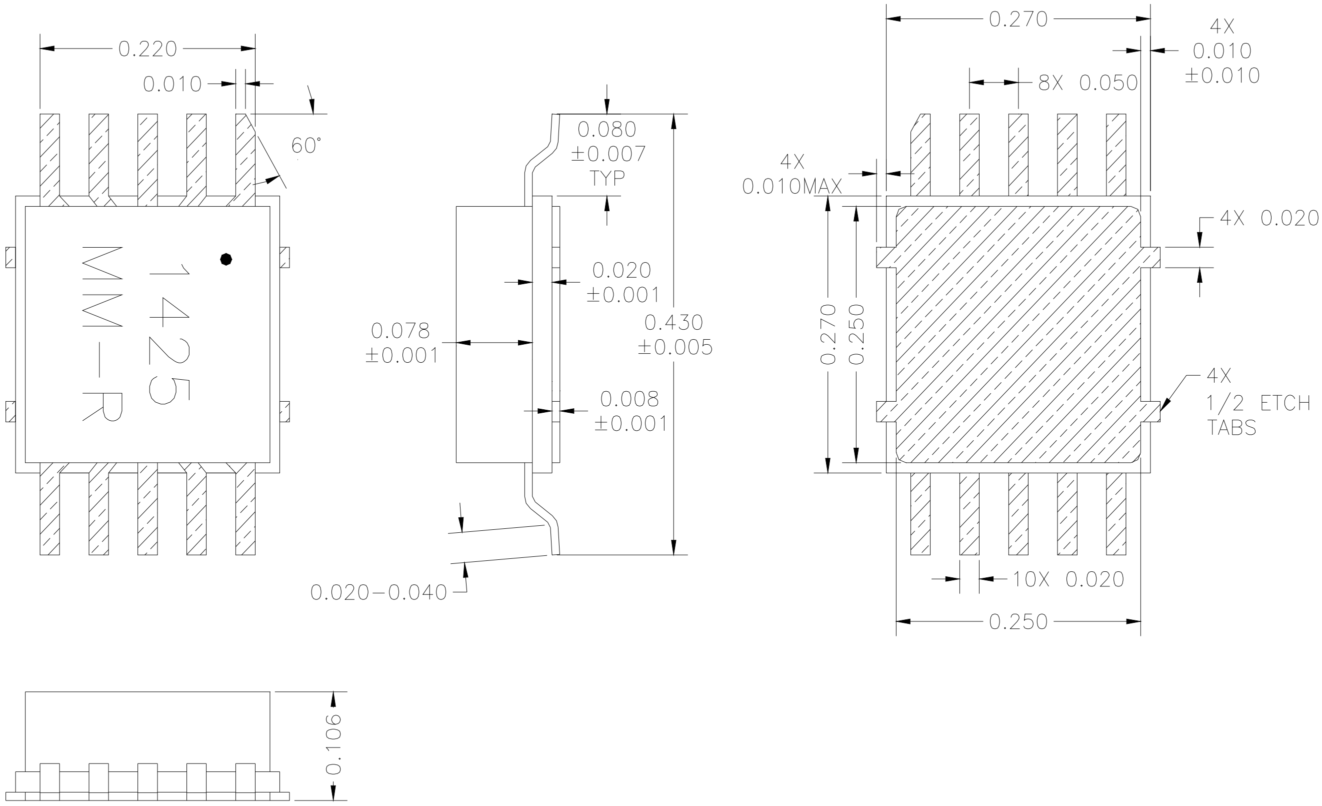

Gain, P1dB & Efficiency vs Frequency
(Bias: 12V, -0.68V & 1.7A)
Gain (dB), P1dB (dBm) &
Efficiency(%)
Frequency (GHz)
P1dB
Efficiency
Gain
45
40
35
30
25
20
2
2.1
2.2
2.3
2.4
2.5
2.6

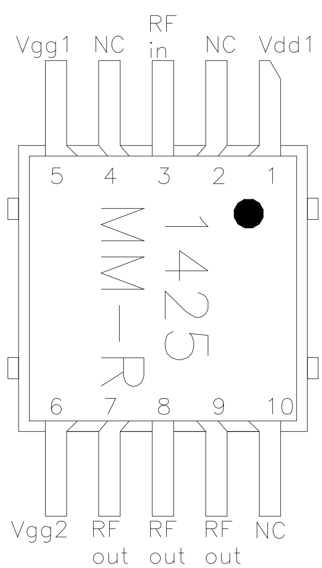

Gain, P3dB & Efficiency vs Frequency
(Bias: 12V, -0.68V & 1.7A)
Gain (dB), P3dB (dBm) &
Efficiency(%)
Frequency (GHz)
P3dB
Efficiency
Gain
45
40
35
30
25
20
2
2.1
2.2
2.3
2.4
2.5
2.6


Pout, IP3 & C/I3 vs Pin @ 2.4GHz (Bias: 12V, -0.7V / 1.7A)
Pout & IP3 (dBm)
60
55
50
45
40
35
30
25
20
15
10
-40
-45
-50
-55
-60
-65
-70
-75
-80
-85
-90
C/I3 (dBc)
IP3
C/I3
Pout
-12
-10
-8
-6
-4
-2
0
2
Pin (dBm)

PACKAGE OUTLINE (BM)



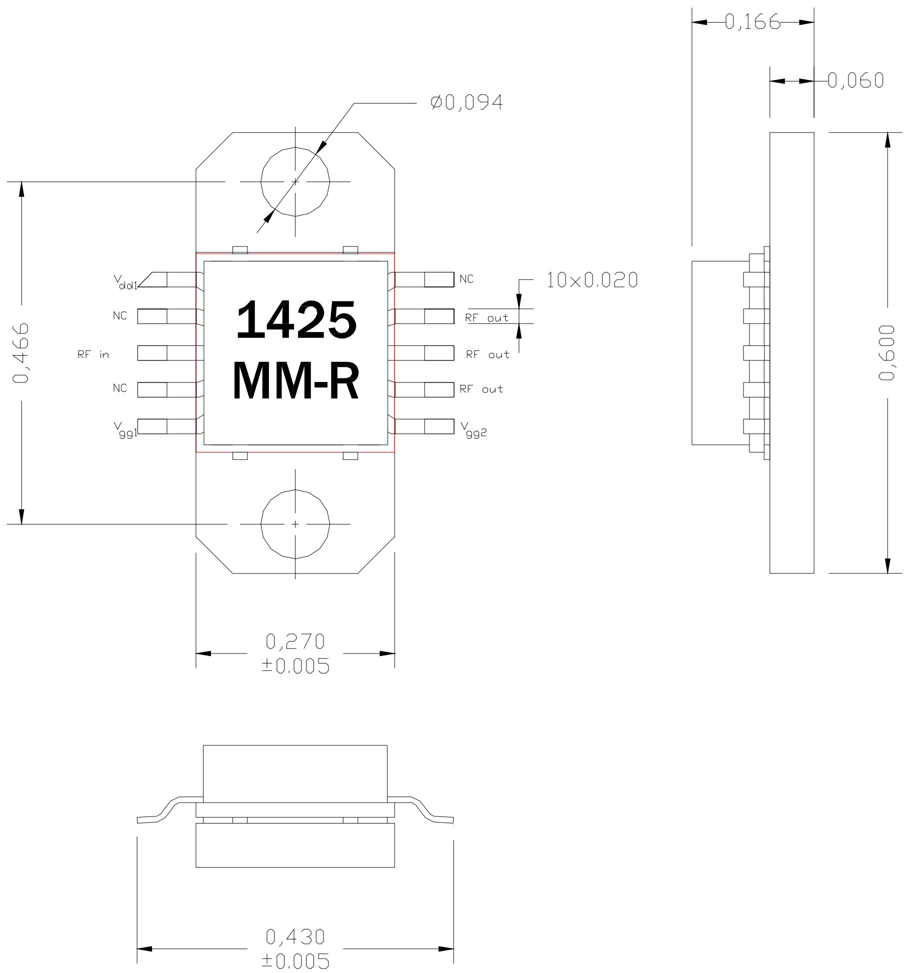
PIN LAYOUT



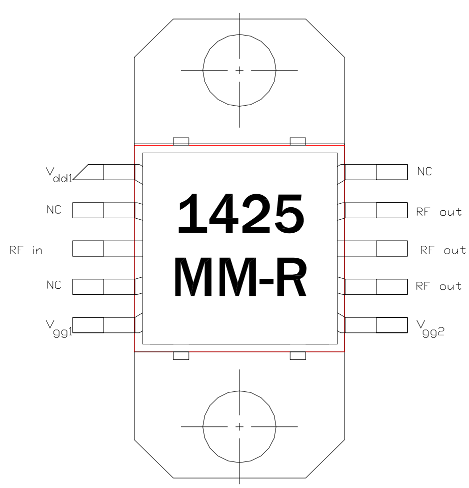
Pin No.	Function	Bias
1	Vdd1	+14V
2	NC	
3	RF in	
4	NC	
5	Vgg1	-2V
6	Vgg2	-2V
7	RF out	+14V
8	RF out	+14V
9	RF out	+14V
10	NC	

* V_{gg1} & V_{gg2} may vary from lot to lot

PACKAGE OUTLINE (FM)



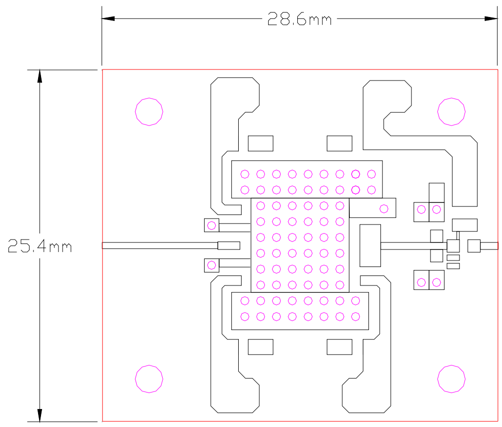
PIN LAYOUT



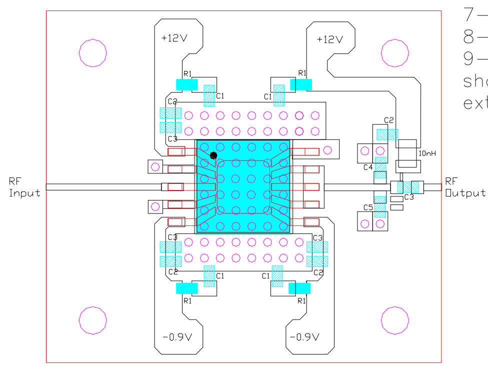
Pin No.	Function	Bias
1	Vdd1	+14V
2	NC	
3	RF in	
4	NC	
5	Vgg1	-2V
6	Vgg2	-2V
7	RF out	+14V
8	RF out	+14V
9	RF out	+14V
10	NC	

* V_{gg1} & V_{gg2} may vary from lot to lot

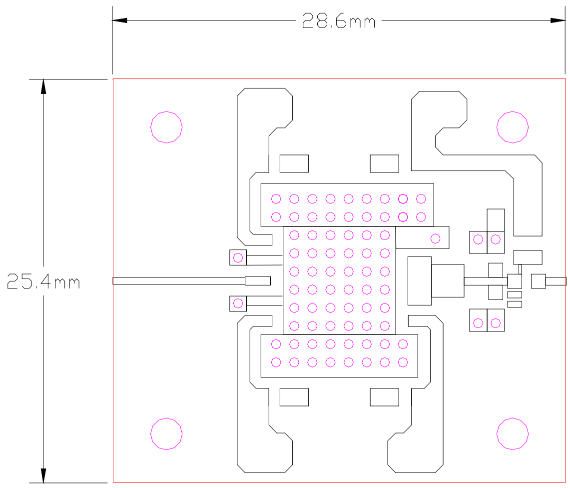
1.4 to 1.8GHz TEST CIRCUIT



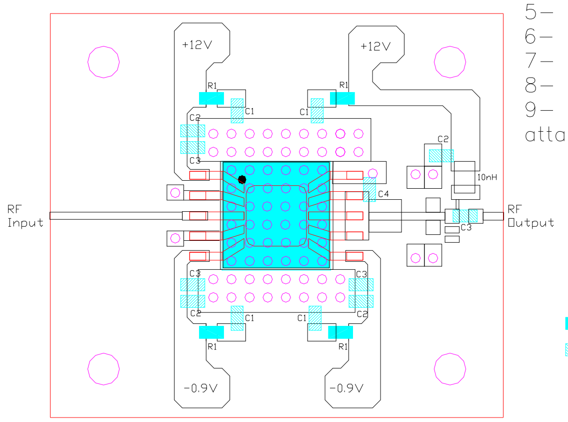
Notes:
1– Material is 10mils FR4 with 1 Oz Copper
2– All vias are plated thru.
3– Min. via thickness = 25um
4– R1=50Ohms, C1=1000pF, C2=100pF, C3=20pF, C4=2pF, C5=1pF
5– All capacitors & resistors are 0603 size
6– Inductors are 1206 size
7– This PCB is for 1.4 to 1.9GHz applications
8– Dimensions are in mm
9– External 1 μF dipped tantalum capacitor should be attached to Vd and Vg to decouple external bias leads.



2.1 to 2.5GHz TEST CIRCUIT



Notes:
1– Material is 10mils FR4 with 1oz Copper
2– All vias are plated thru
3– Min. via thickness = 25um
4– R1=50Ohms, C1=1000pF, C2=100pF, b
C3=20pF, C4=1pF
5– All capacitors & resistors are 0603 size
6– Inductors are 1206 size
7– This PCB is for 2.1 to 2.5GHz applications
8– Dimensions are in mm
9– External 1 μF dipped tantalum capacitor should be attached to Vd and Vg to decouple external bias leads.



Resistor
Capacitor