MAGX-000035-030000

GaN HEMT Power Transistor
30W CW, 30 MHz - 3.5 GHz

Preliminary, 23 Aug 11

Features

- GaN depletion mode HEMT microwave transistor
- Common source configuration
- No internal matching
- Broadband Class AB operation
- Thermally enhanced Cu/Mo/Cu package
- RoHS Compliant
- +50V Typical Operation
- MTTF of 114 years (Channel Temperature < 200°C)

Applications

General purpose for pulsed or CW applications

- Commercial Wireless Infrastructure
  - WCDMA, LTE, WIMAX
- Civilian and Military Radar
- Military and Commercial Communications
- Public Radio
- Industrial, Scientific and Medical
- SATCOM
- Instrumentation
- Avionics

Product Description

The MAGX-000035-030000 is a gold metalized unmatched Gallium Nitride (GaN) on Silicon Carbide RF power transistor suitable for a variety of RF power amplifier applications. Using state of the art wafer fabrication processes, these high performance transistors provide high gain, efficiency, bandwidth, ruggedness over multiple octave bandwidths for today's demanding application needs. The MAGX-000035-030000 is constructed using a thermally enhanced Cu/Mo/Cu flanged ceramic package which provides excellent thermal performance. High breakdown voltages allow for reliable and stable operation in extreme mismatched load conditions unparalleled with older semiconductor technologies.

Typical CW RF Performance

Freq. (MHz)	Pout (W Ave)	Gain (dB)	Eff (%)
30	58	40	80
100	44	32	65
500	43	27	66
1500	42	20	59
3000	35	13	55
3500	30	12	53

Ordering Information

MAGX-000035-030000	30W GaN Power Transistor
MAGX-000035-SB1PPR	1.5 GHz Evaluation Board

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macomtech.com for additional data sheets and product information.

Absolute Maximum Ratings (1, 2, 3)	Limit
Supply Voltage (Vdd)	+65V
Supply Voltage (Vgg)	-8 to 0V
Supply Current (Id1)	1200 mA
Input Power (Pin)	+30 dBm
Junction/Channel Temp	200 ºC
MTTF (T_J<200°C)	114 years
Continuous Power Dissipation (Pdiss) at 85 ºC	27 W
Pulsed Power Dissipation (Pavg) at 85 ºC	65 W
Thermal Resistance, (Tchannel = 200 ºC), CW	4.2 ºC/W
Thermal Resistance, (Tchannel = 200 ºC), Pulsed 500uS, 10% Duty cycle	1.8 ºC/W
Operating Temp	-40 to +95C
Storage Temp	-65 to +150C
ESD Min. - Machine Model (MM)	50 V
ESD Min. - Human Body Model (HBM)	>250 V

(1) Operation of this device above any one of these parameters may cause permanent damage.

(2) Channel temperature directly affects a device's MTTF. Channel temperature should be kept as low as possible to maximize lifetime.

(3) For saturated performance it recommended that the sum of (3*Vdd + abs(Vgg)) <175

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
DC CHARACTERISTICS						
Drain-Source Leakage Current	V_{GS} = -8V, V_{DS} = 175V	I_{DS}	-	-	2.5	mA
Gate Threshold Voltage	V_{DS} = 5V, I_D = 6mA	$V_{GS\ (th)}$	-5	-3	-2	V
Forward Transconductance	V_{DS} = 5V, I_D = 1.5mA	G_M	1.0	-	-	S
DYNAMIC CHARACTERISTICS						
Input Capacitance	V_{DS} = 0v, V_{GS} = -8V, F = 1MHz	C_{ISS}	-	13.2	-	pF
Output Capacitance	V_{DS} = 50V, V_{GS} = -8V, F = 1MHz	C_{OSS}	-	5.6	-	pF
Reverse Transfer Capacitance	V_{DS} = 50V, V_{GS} = -8V, F = 1MHz	C_{RSS}	-	0.5	-	pF

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

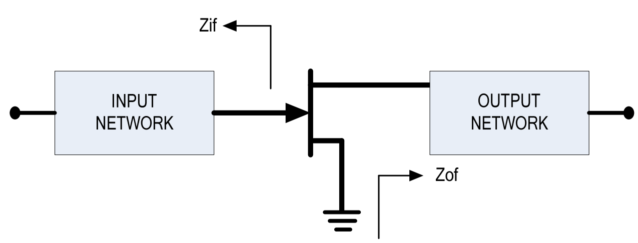
Visit www.macomtech.com for additional data sheets and product information.

Electrical Specifications: T_C = 25 ± 5°C (Room Ambient)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
RF FUNCTIONAL TESTS *Vdd=50V, Idq= 100 mA, single frequency optimized data*						
CW Output Power (P2dB) 1 .5GHz	Pin = 1W Ave	P_{OUT}	30	42	-	W Ave
CW Output Power (P2dB) 3 GHz	Pin = 1W Ave	P_{OUT}	30	31	-	W Ave
Small Signal Gain @ 1.5 GHz	Pout = 5W Ave	G_P	18	20		dB
Small Signal Gain @ 3 GHz	Pout = 5W Ave	G_P	13	13.6		dB
Drain Efficiency @ 3 GHz	Pin = 1W Ave	η_D	50	60		%
Load Mismatch Stability	Pin = 1W Ave	VSWR-S	5:1	-	-	-
Load Mismatch Tolerance	Pin = 1W Ave	VSWR-T	10:1	-	-	-

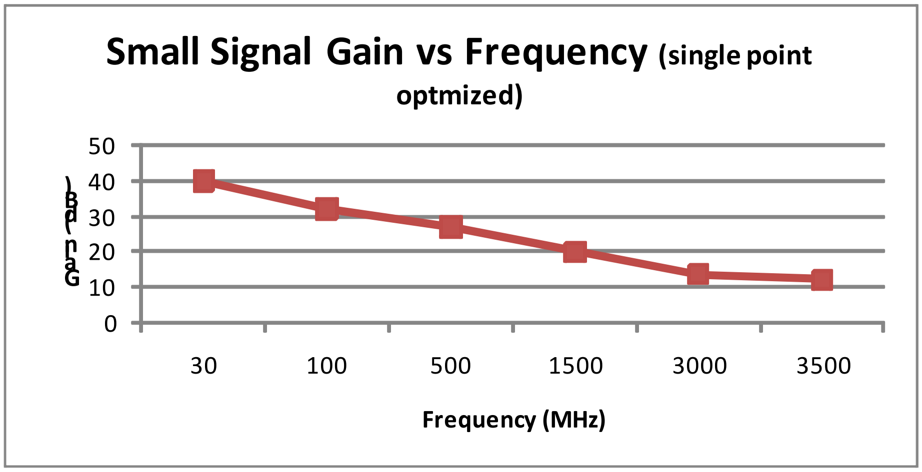
Test Fixture Impedance

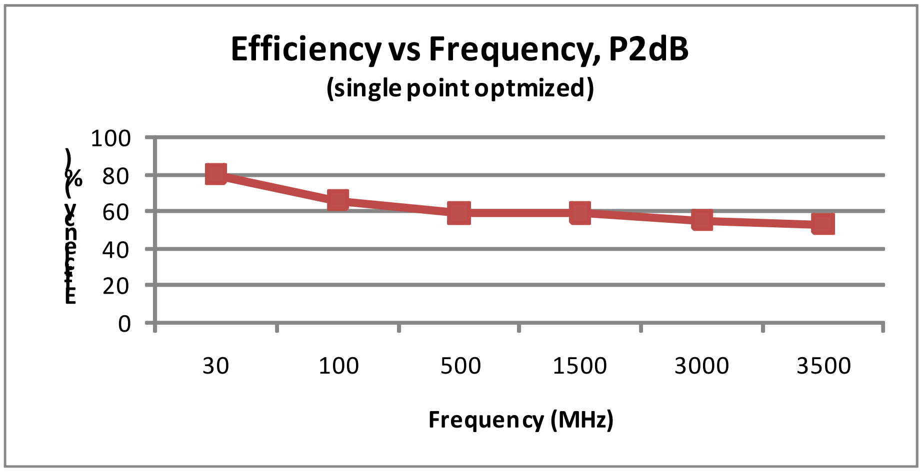
F (MHz)	Zif-opt (Ω)	Zof-opt (Ω)
30	71 + j 255	24.9 - j 6.8
100	7.7 + j 66.6	22.14 - j 4.33
500	3.19 + j 13.8	21.8 + j 9.94
1500	1.4 + j 0.16	9.31 + j 9.34
3000	3.1 - j 9.96	3.32 + j 1.2
3500	TBD	TBD

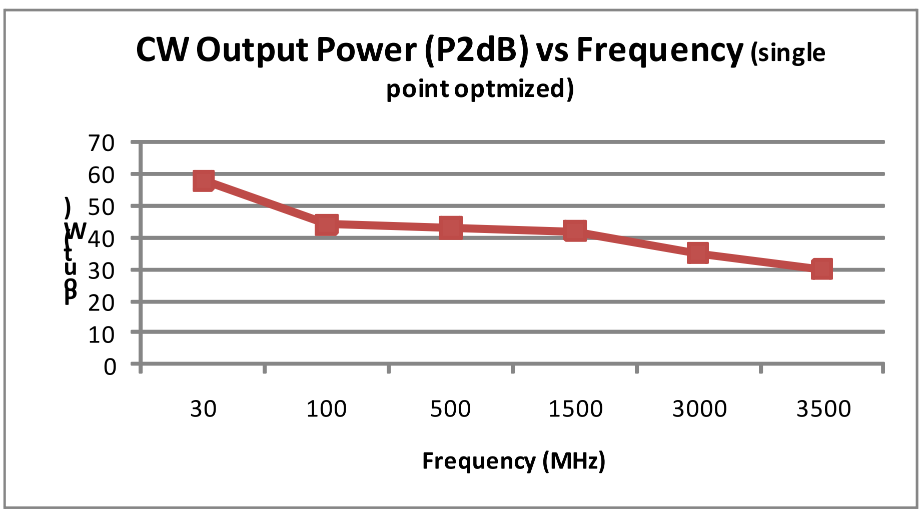


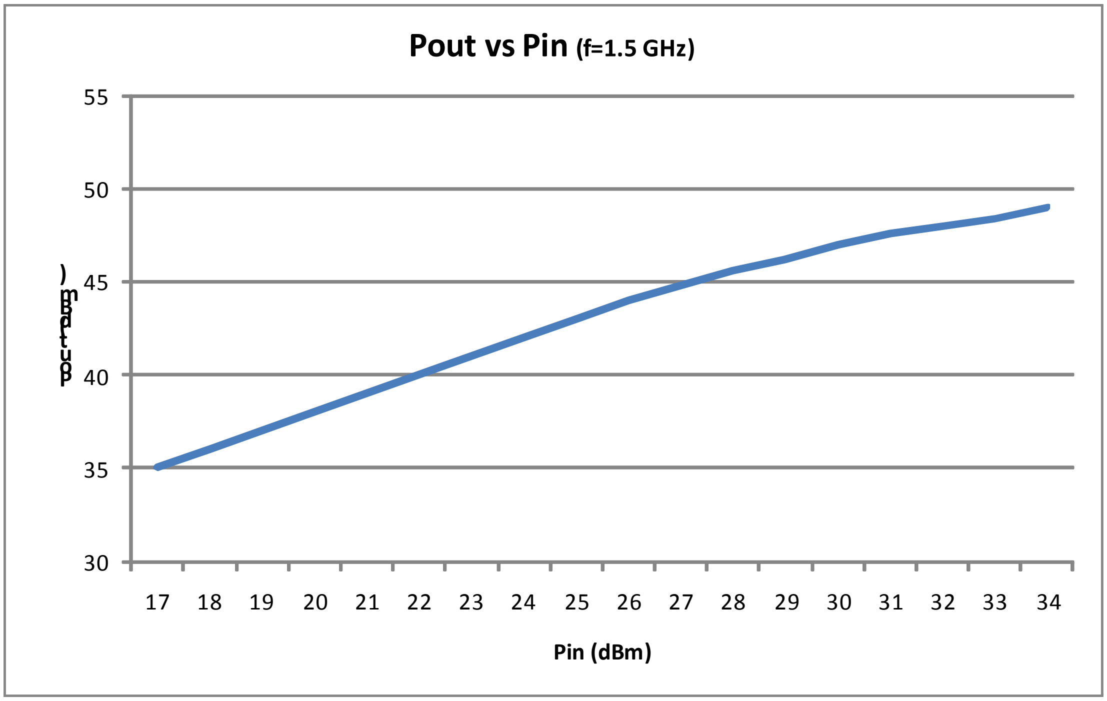
- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

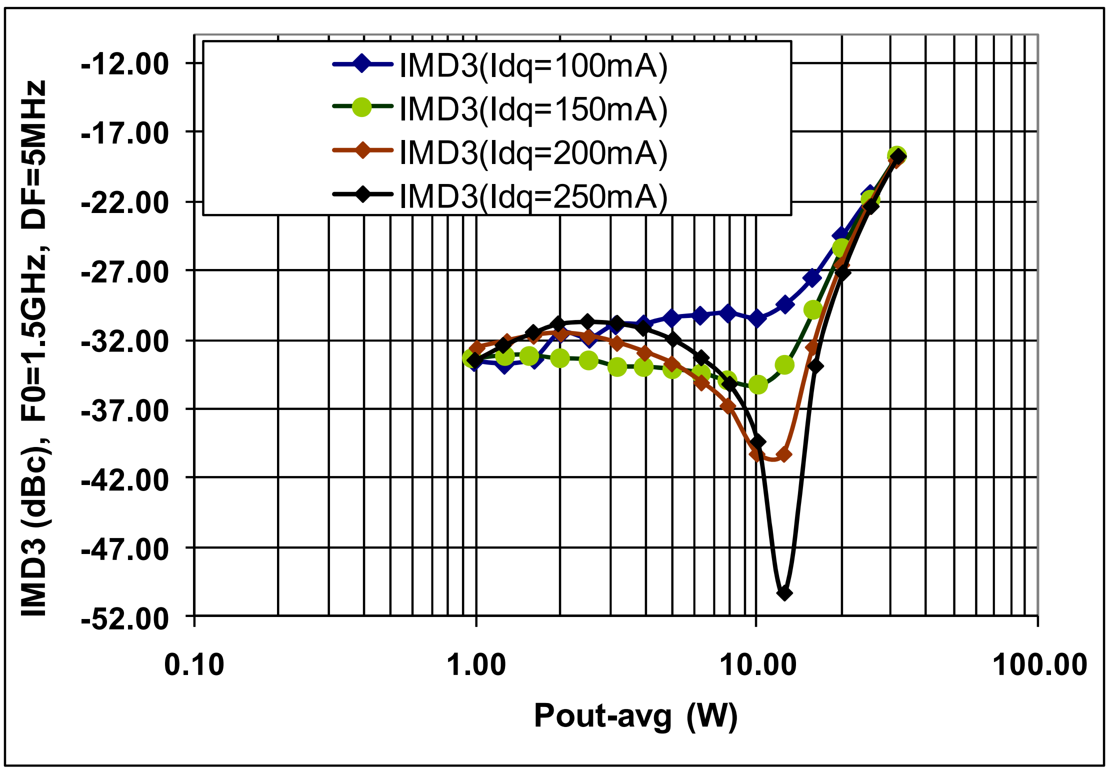
Visit www.macomtech.com for additional data sheets and product information.


Small Signal Gain vs Frequency (single point optmized)
50
40
30
20
10
0
Gain (dB)
30
100
500
1500
3000
3500
Frequency (MHz)


Efficiency vs Frequency, P2dB (single point optmized)
100
80
60
40
20
0
Efficiency (%)
30
100
500
1500
3000
3500
Frequency (MHz)


CW Output Power (P2dB) vs Frequency (single point optmized)
70
60
50
40
30
20
10
0
Pout (W)
30
100
500
1500
3000
3500
Frequency (MHz)

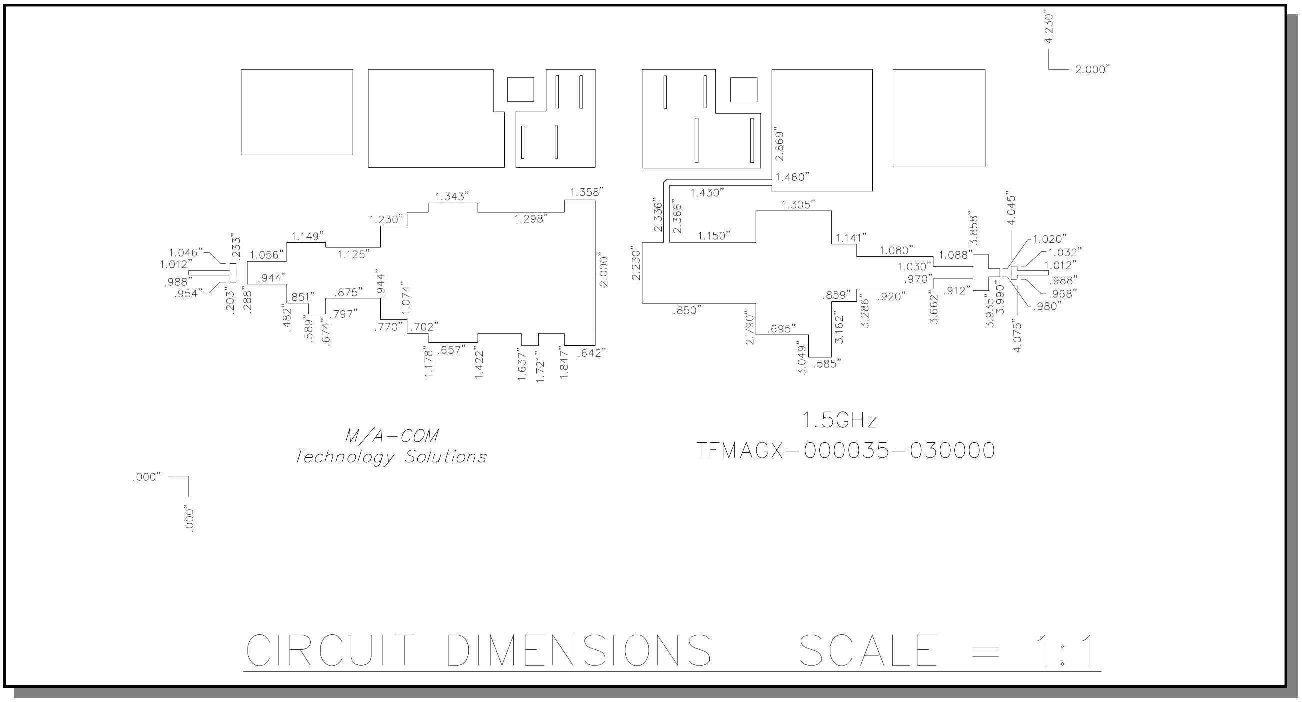

Pout vs Pin (f=1.5 GHz)
55
50
45
40
35
30
Pout (dBm)
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
Pin (dBm)


IMD3(Idq=100mA)
IMD3(Idq=150mA)
IMD3(Idq=200mA)
IMD3(Idq=250mA)
-12.00
-17.00
-22.00
-27.00
-32.00
-37.00
-42.00
-47.00
-52.00
IMD3 (dBc), F0=1.5GHz, DF=5MHz
0.10
1.00
10.00
100.00
Pout-avg (W)

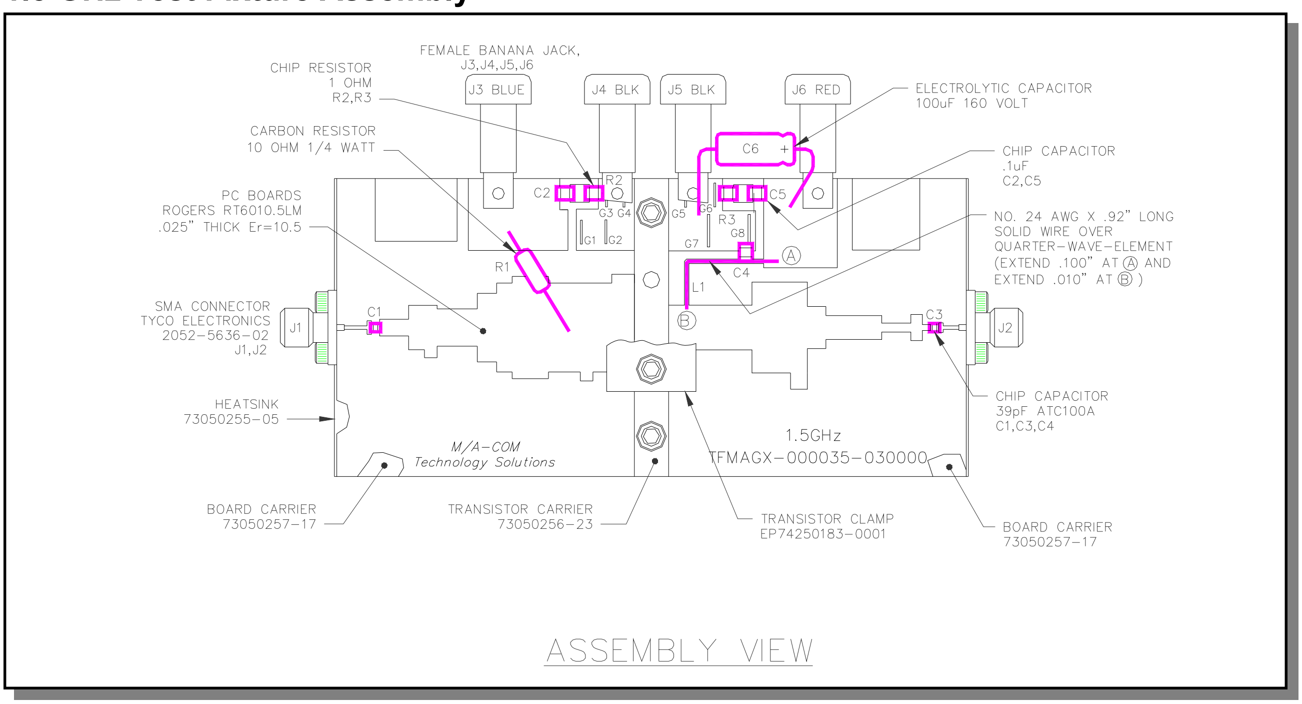
GaN HEMT Power Transistor
30W CW, 30 MHz - 3.5 GHz

Preliminary, 23 Aug 11

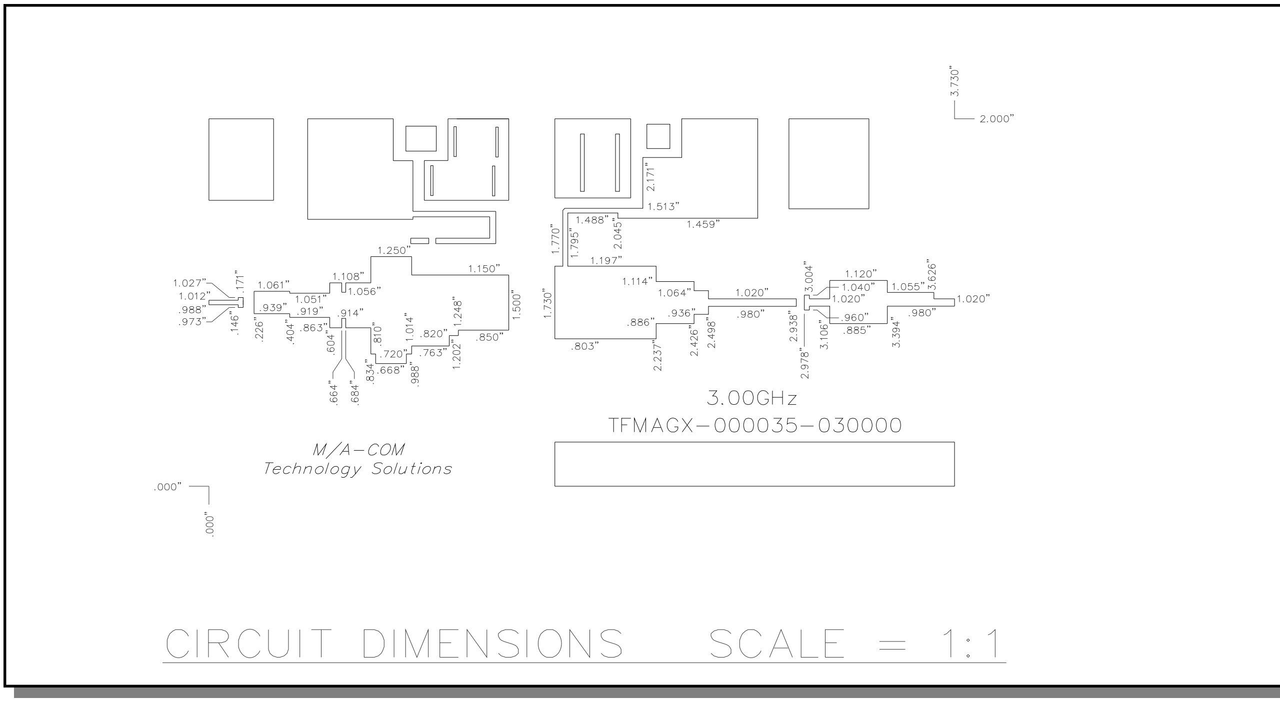
1.5 GHz Test Fixture Circuit Dimensions



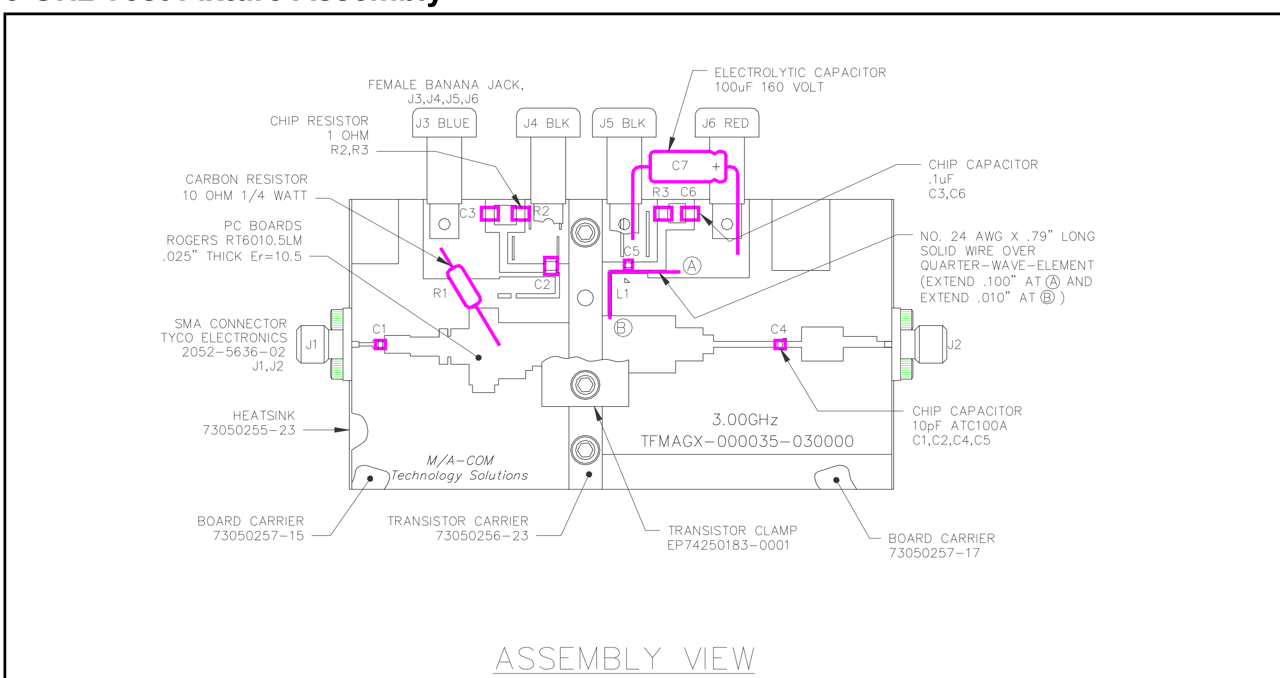
1.5 GHz Test Fixture Assembly



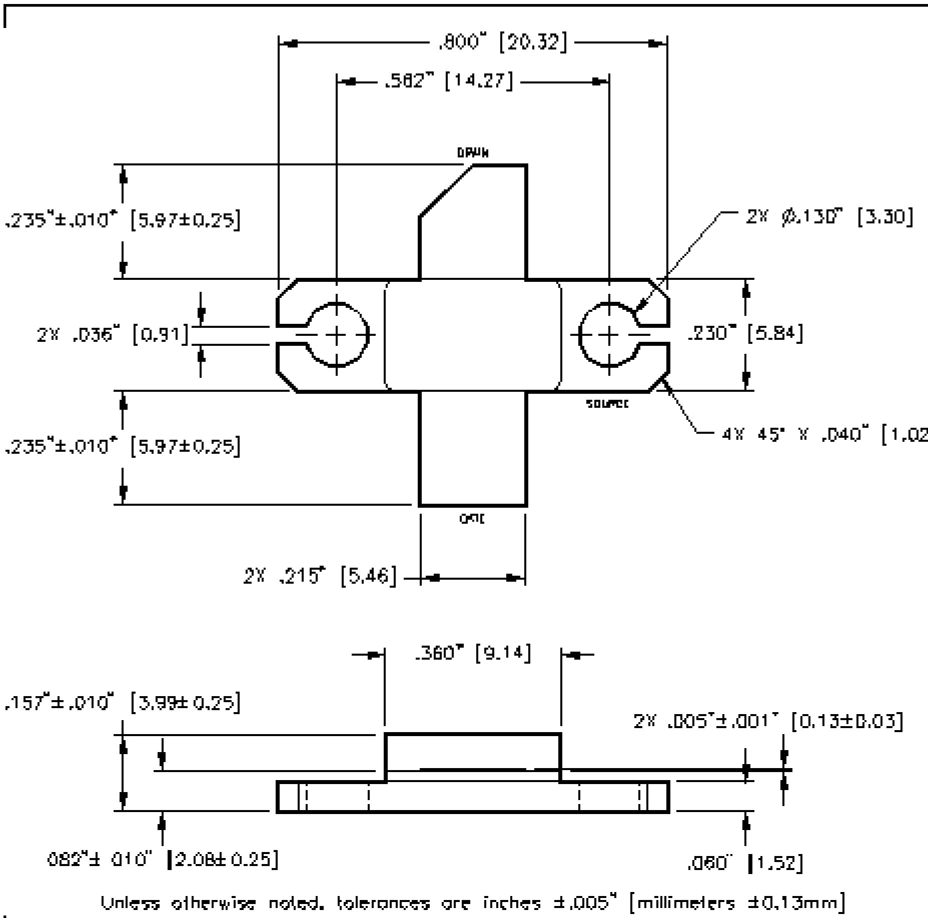
3 GHz Test Fixture Circuit Dimensions

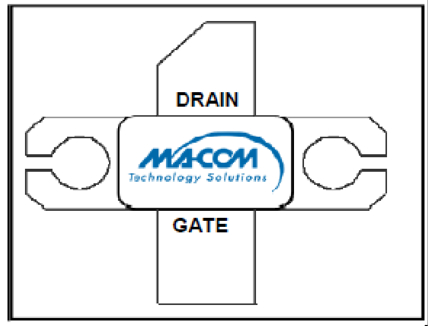


3 GHz Test Fixture Assembly



Outline Drawings





CORRECT DEVICE SEQUENCING

TURNING THE DEVICE ON

1. Set V_{GS} to the pinch-off (V_P), typically -5V
2. Turn on V_{DS} to nominal voltage (50V)
3. Increase V_{GS} until the I_{DS} current is reached
4. Apply RF power to desired level

TURNING THE DEVICE OFF

1. Turn the RF power off
2. Decrease V_{GS} down to V_P
3. Decrease V_{DS} down to 0V
4. Turn off V_{GS}

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macomtech.com for additional data sheets and product information.