MAGX-001220-100L00

M/ACOM Technology Solutions

GaN HEMT Power Transistor
100W Peak, 1.2 - 2.0 GHz

Production V1
19 Sept 11

Features

- GaN depletion mode HEMT microwave transistor
- Common source configuration
- 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
- DTV

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Product Description

The MAGX-001220-100L00 is a gold metalized 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-001220-100L00 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)	Pin (W Peak)	Pout (W Peak)	Gain (dB)	Id-Pk (A)	Eff (%)
1200	4	120	14.8	4.0	60
1400	4	120	14.8	4.6	52
1600	4	130	15.1	4.9	53
1800	4	120	14.8	4.4	54
2000	4	120	14.8	4.5	53

Ordering Information

MAGX-001220-100L00	100W GaN Power Transistor
MAGX-001220-1SB1PPR	Evaluation Board

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Absolute Maximum Ratings Table (1, 2, 3)

Supply Voltage (Vdd)	+65V
Supply Voltage (Vgg)	-8 to 0V
Supply Current (Id1)	9A Pk
Input Power (Pin)	+38 dBm
Absolute Max. Junction/Channel Temp	200 ºC
Pulsed Power Dissipation (Pavg) at 85 ºC	105W
MTTF (T_J<200°C)	114 years
Thermal Resistance, (Tchannel = 200 ºC) V_{DD} = 50V, I_{DQ} = 100mA, Pout = 100W 300us Pulse / 10% Duty	0.84 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
MSL Level	MSL1

(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

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Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
DC CHARACTERISTICS						
Drain-Source Leakage Current	V_{GS} = -8V, V_{DS} = 175V	I_{DS}	-	-	6	mA
Gate Threshold Voltage	V_{DS} = 5V, I_D = 15.0mA	$V_{GS\ (th)}$	-5	-3	-2	V
Forward Transconductance	V_{DS} = 5V, I_D = 3.5A	G_M	2.5	-	-	S
DYNAMIC CHARACTERISTICS						
Input Capacitance	Not applicable—Input internally matched	N/A	N/A	N/A	N/A	pF
Output Capacitance	V_{DS} = 50V, V_{GS} = -8V, F = 1MHz	C_{OSS}	-	30.3	35	pF
Feedback Capacitance	V_{DS} = 50V, V_{GS} = -8V, F = 1MHz	C_{RSS}	-	2.8	5.4	pF

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

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
RF FUNCTIONAL TESTS *Vdd=50V, Idq=500mA (pulsed), F=1.2—2.0 GHz, Pulse=300us, Duty=10%*						
Output Power	Pin = 4W Peak, 0.4W Ave	P_{OUT}	100	110	-	W Peak
Power Gain	Pout = 100W Peak, 10W Ave	G_P	14.0	14.8	-	dB
Drain Efficiency	Pin = 4W Peak, 0.4W Ave	η_D	50	55	-	%
Load Mismatch Stability	Pin = 4W Peak, 0.4W Ave	VSWR-S	5:1	-	-	-
Load Mismatch Tolerance	Pin = 4W Peak, 0.4W Ave	VSWR-T	10:1	-	-	-

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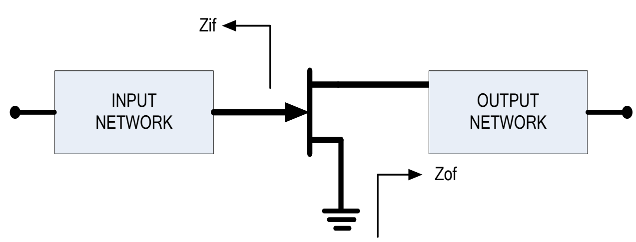
Test Fixture Impedance

F (MHz)	Z_{IF} (Ω)	Z_{OF} (Ω)
1200	3.82 - j2.85	8.6 + j1.1
1400	4.17 - j1.79	6.9 + j0.16
1600	4.69 - j2.15	6.8 + j0.7
1800	3.53 - j2.79	6.1 - j0.6
2000	2.19 - j1.90	3.2 + j0.39



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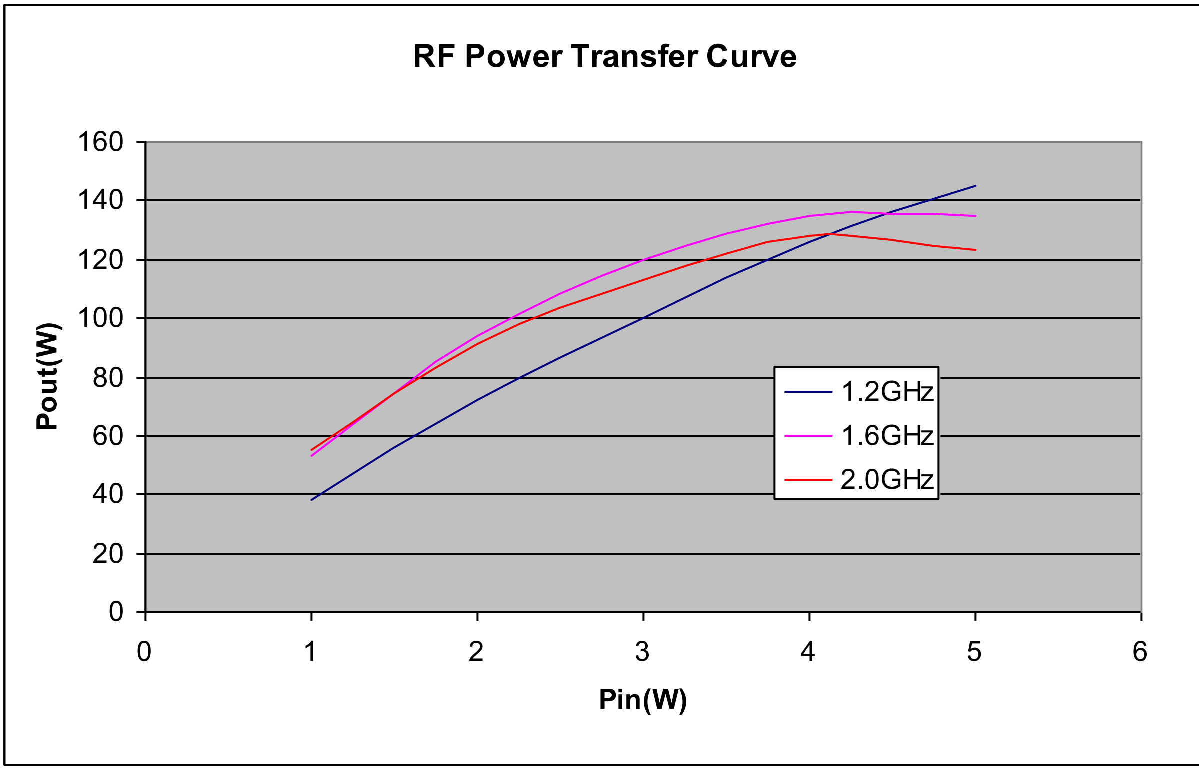

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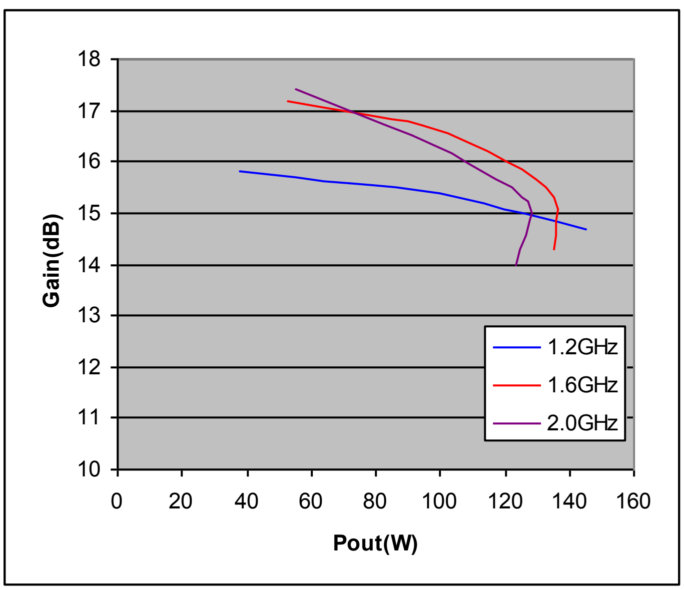
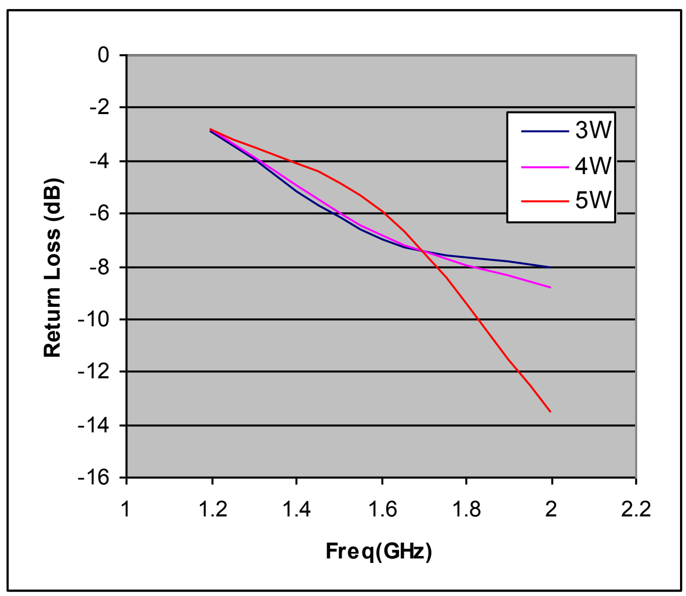
RF Power Transfer Curve
Power Gain vs. Output Power



Return Loss vs. Frequency



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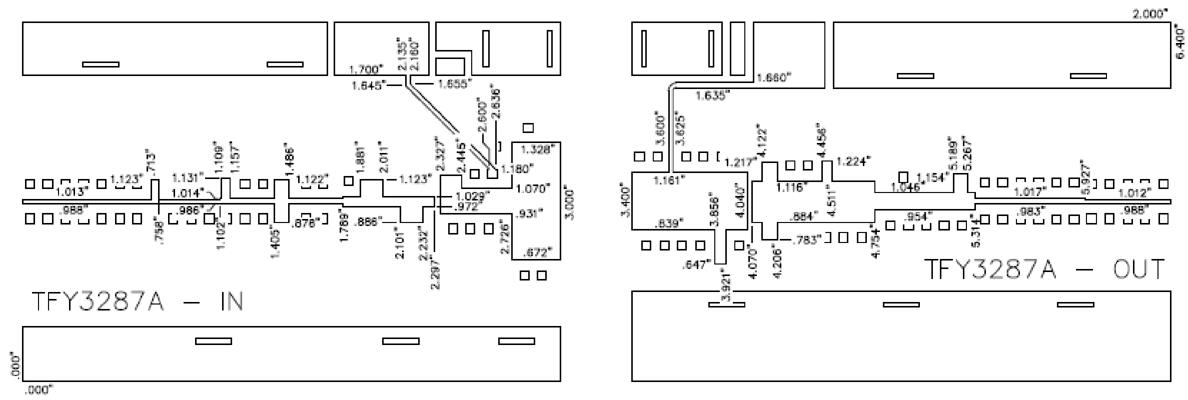
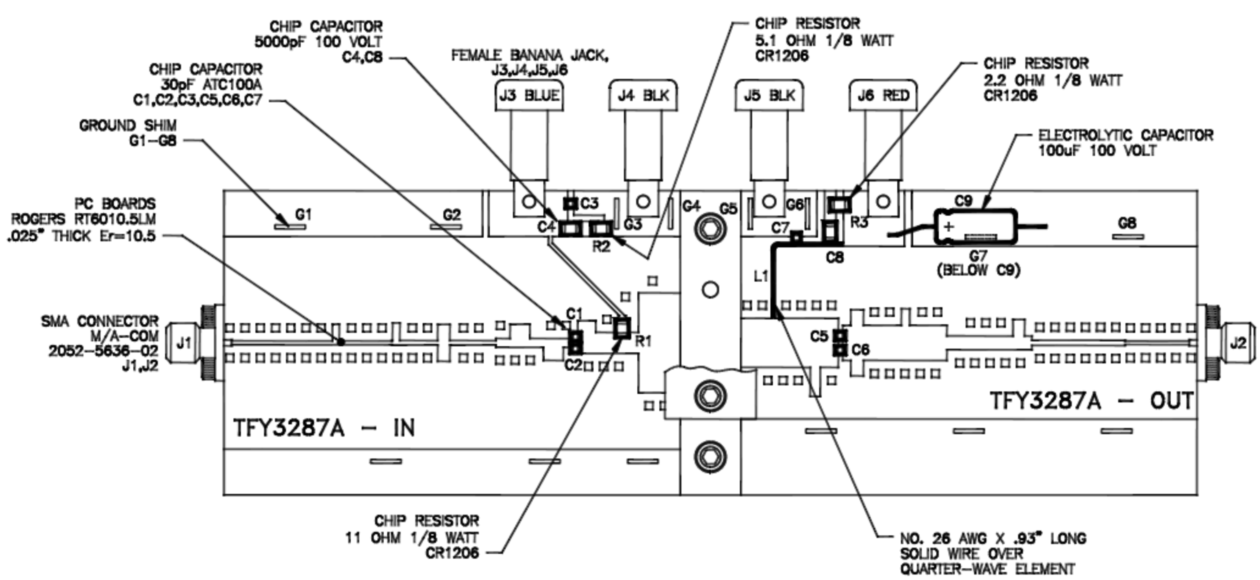
Test Fixture Circuit Dimensions



Note: A .dwg circuit drawing is available upon request

Test Fixture Assembly



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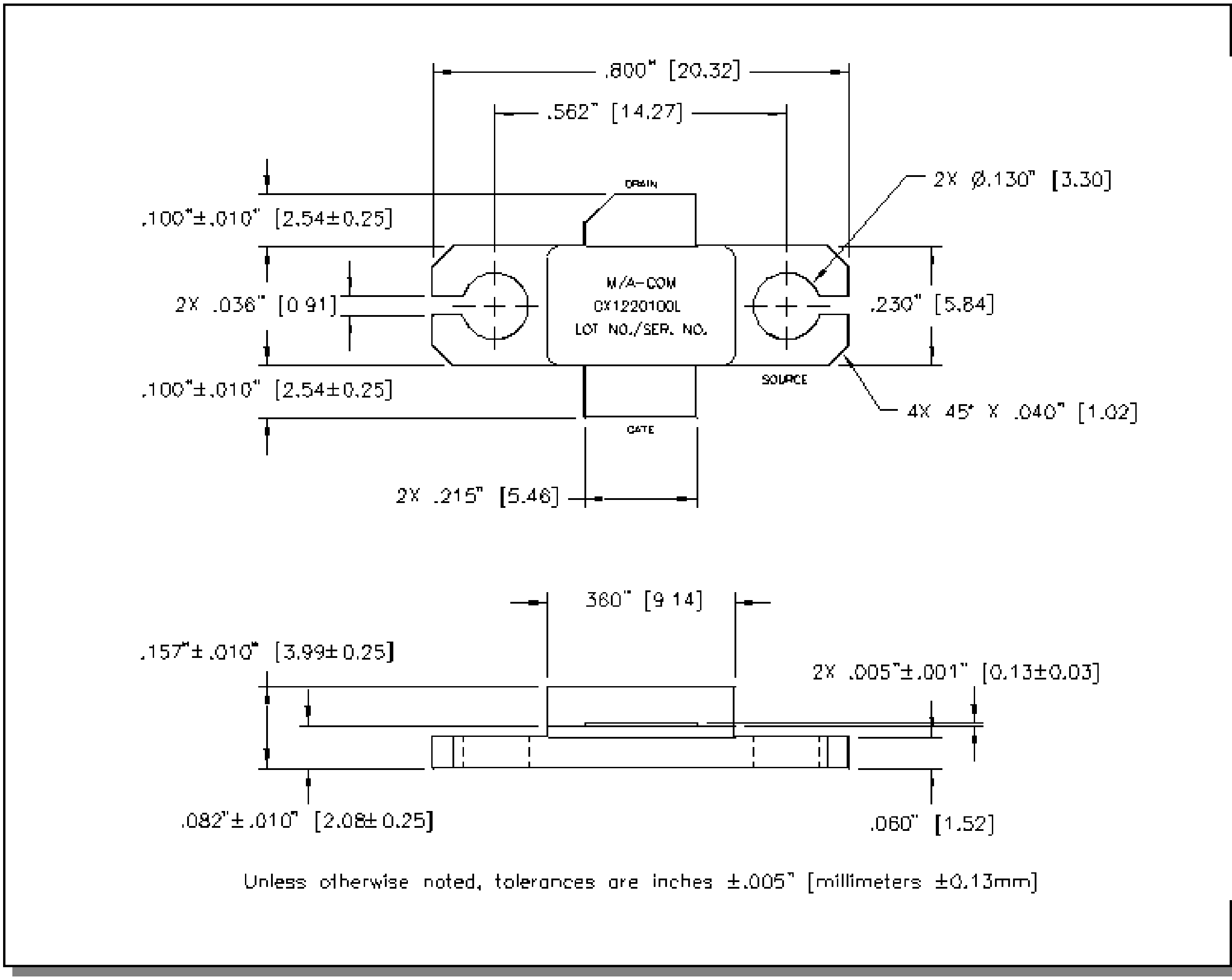
Outline Drawings



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CORRECT DEVICE BIAS 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}

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