GaN on SiC HEMT Pulsed Power Transistor
125W Peak, 1200-1400 MHz, 300µs Pulse, 10% Duty

Production V1
18 Aug 11

Features

- GaN depletion mode HEMT microwave transistor
- Internally matched
- Common source configuration
- Broadband Class AB operation
- RoHS Compliant
- +50V Typical Operation
- MTTF of 114 years (Channel Temperature < 200°C)

Applications

- L-Band Pulsed Radar

Product Description

The MAGX-001214-125L00 is a gold metalized matched Gallium Nitride (GaN) on Silicon Carbide RF power transistor optimized for pulsed L-Band radar applications. Using state of the art wafer fabrication processes, these high performance transistors provide high gain, efficiency, bandwidth, ruggedness over a wide bandwidth for today's demanding application needs. High breakdown voltages allow for reliable and stable operation in extreme mismatched load conditions unparalleled with older semiconductor technologies.

Typical RF Performance at Pout = 125W Peak

Freq (MHz)	Pin (W)	Gain (dB)	Slope (dB)	Id (A)	Eff (%)	Avg-Eff (%)	RL (dB)	Droop (dB)
1200	1.8	18.3	-	4.0	43.0	-	-9.0	0.4
1250	1.9	18.1	-	4.2	59.0	-	-11.6	0.6
1300	2.0	18.0	-	4.4	56.5	-	-16.0	0.6
1350	1.9	18.1	-	4.3	57.7	-	-19.0	0.5
1400	1.8	18.4	0.4	3.9	62.9	59.8	-14.5	0.3

Typical RF performance measured in M/A-COM RF test fixture. Devices tested in common source Class-AB configuration as follows: Vdd=50V, Idq=100mA (pulsed), F=1200-1400 MHz, Pulse=300us, Duty=10%.

Ordering Information

MAGX-001214-125L00 125W GaN Power Transistor
MAGX-001214-SB0PPR Evaluation Fixture

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Absolute Maximum Ratings Table (1, 2, 3)

Supply Voltage (V_{DD})	+65V
Supply Voltage (V_{GS})	-8 to -2V
Supply Current (I_{DMAX})	4.8 Apk
Input Power (P_{IN})	+37 dBm
Absolute Max. Junction/Channel Temp	200ºC
MTTF (T_J<200°C)	114 years
Pulsed Power Dissipation at 85ºC	115 Wpk
Thermal Resistance, (Tj = 70ºC) V_{DD} = 50V, I_{DQ} = 100mA, Pout = 125W 300us Pulse / 10% Duty	1.0ºC/W
Operating Temp	-40 to +95ºC
Storage Temp	-65 to +150ºC
Mounting Temperature	See solder reflow profile
ESD Min. - Machine Model (MM)	50V
ESD Min. - Human Body Model (HBM)	>250V
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

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
DC CHARACTERISTICS						
Drain-Source Leakage Current	V_{GS} = -8V, V_{DS} = 175V	I_{DS}	-	0.2	6	mA
Gate Threshold Voltage	V_{DS} = 5V, I_D = 15.0mA	$V_{GS\ (th)}$	-5	-3.8	-2	V
Forward Transconductance	V_{DS} = 5V, I_D = 3.5mA	G_M	2.5	3.6	-	S
DYNAMIC CHARACTERISTICS						
Input Capacitance	Not applicable—Input internally matched	C_{iSS}	N/A	N/A	N/A	pF
Output Capacitance	V_{DS} = 50V, V_{GS} = -8V, F = 1MHz	C_{OSS}	-	11	-	pF
Feedback Capacitance	V_{DS} = 50V, V_{GS} = -8V, F = 1MHz	C_{RSS}	-	1.1	-	pF

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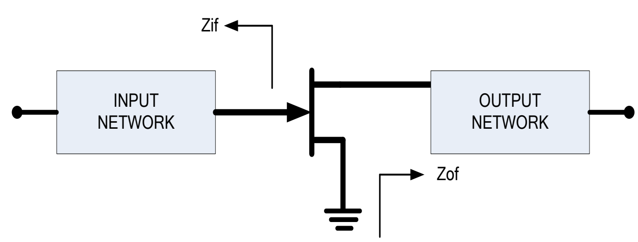
Electrical Specifications: T_C = 25 ± 5°C (Room Ambient)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
RF FUNCTIONAL TESTS (V_{DD} = 50V, I_{DQ} = 100mA, 300us / 10% duty, 1200-1400MHz)						
Input Power	Pout = 125Wpk (12.5W avg)	P_{IN}	-	1.9	2.4	Wpk
Power Gain	Pout = 125Wpk (12.5W avg)	G_P	17.2	18.1	-	dB
Drain Efficiency	Pout = 125Wpk (12.5W avg)	η_D	54	59.8	-	%
Load Mismatch Stability	Pout = 125Wpk (12.5W avg)	VSWR-S	5:1	-	-	-
Load Mismatch Tolerance	Pout = 125Wpk (12.5W avg)	VSWR-T	10:1	-	-	-

Test Fixture Impedance

F (MHz)	Z_{IF} (Ω)	Z_{OF} (Ω)
1200	6.6 - j7.1	8.0 + j1.9
1250	6.6 - j6.9	7.4 + j1.3
1300	6.6 - j6.7	6.6 + j1.3
1350	6.7 - j6.7	6.1 + j1.6
1400	6.7 - j6.7	5.7 + j2.2



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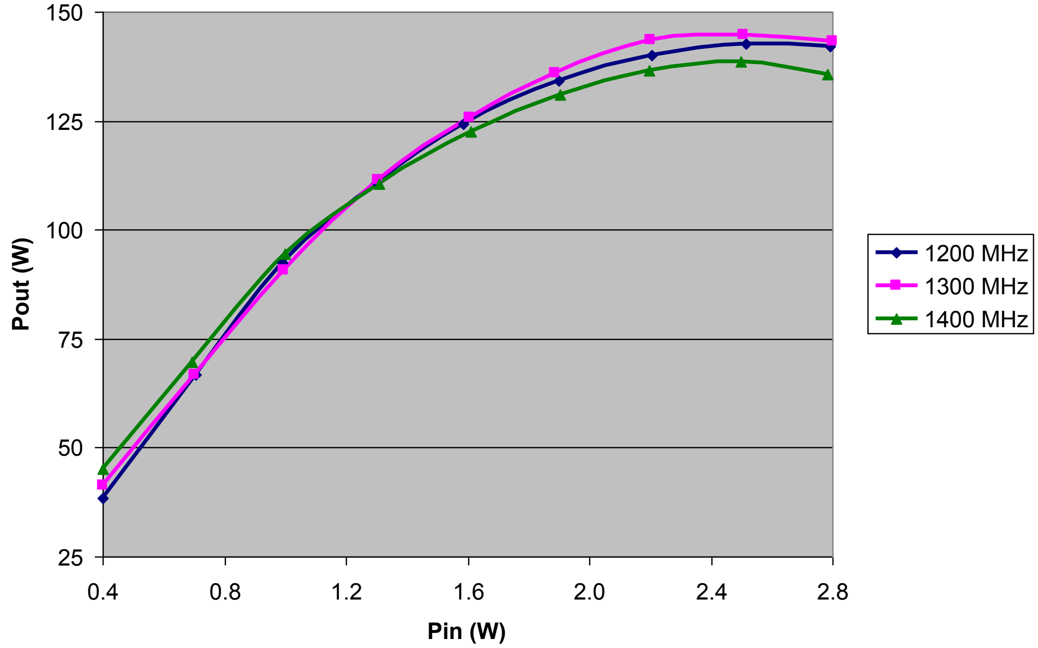
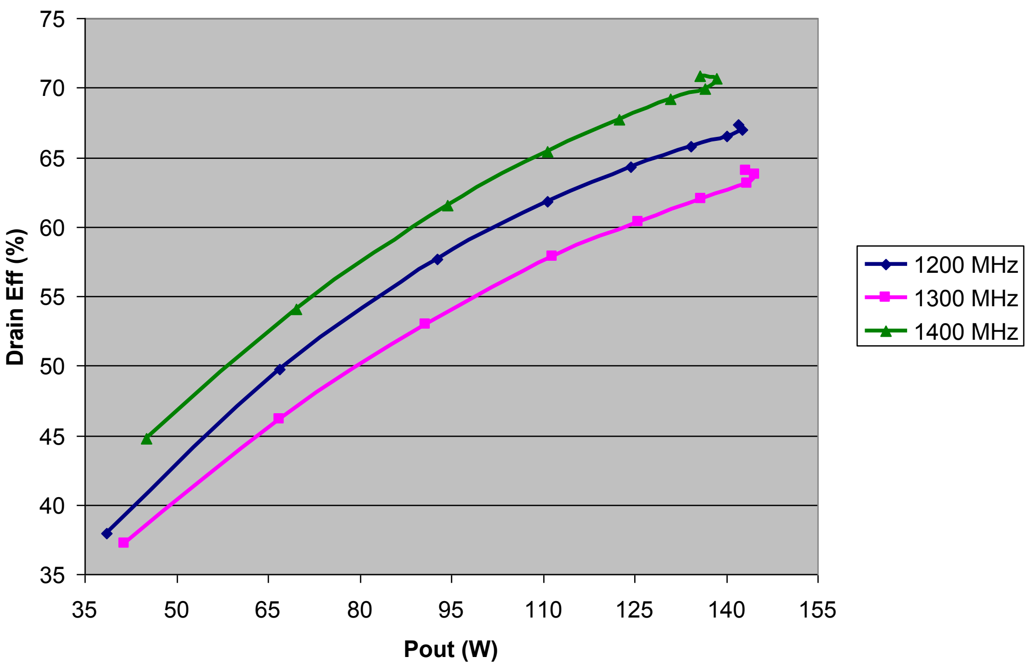
RF Power Transfer Curve (Output Power Vs. Input Power)



RF Power Transfer Curve (Drain Efficiency Vs. Output Power)



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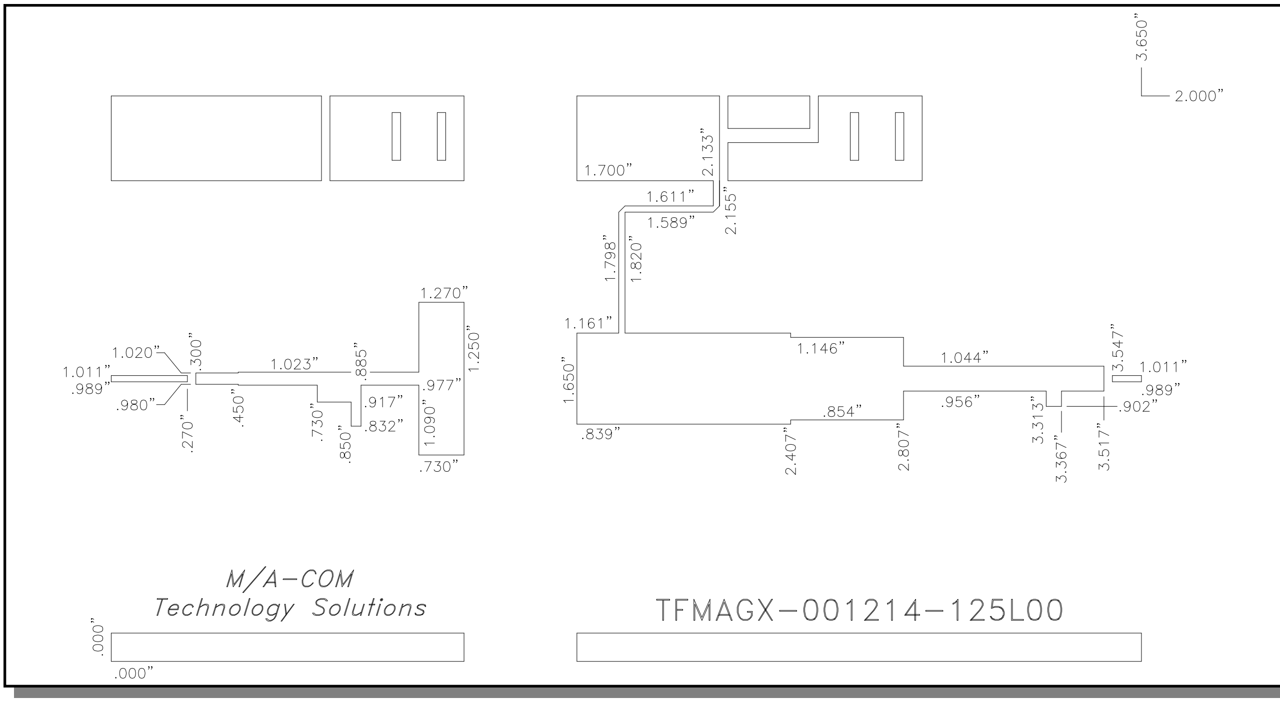
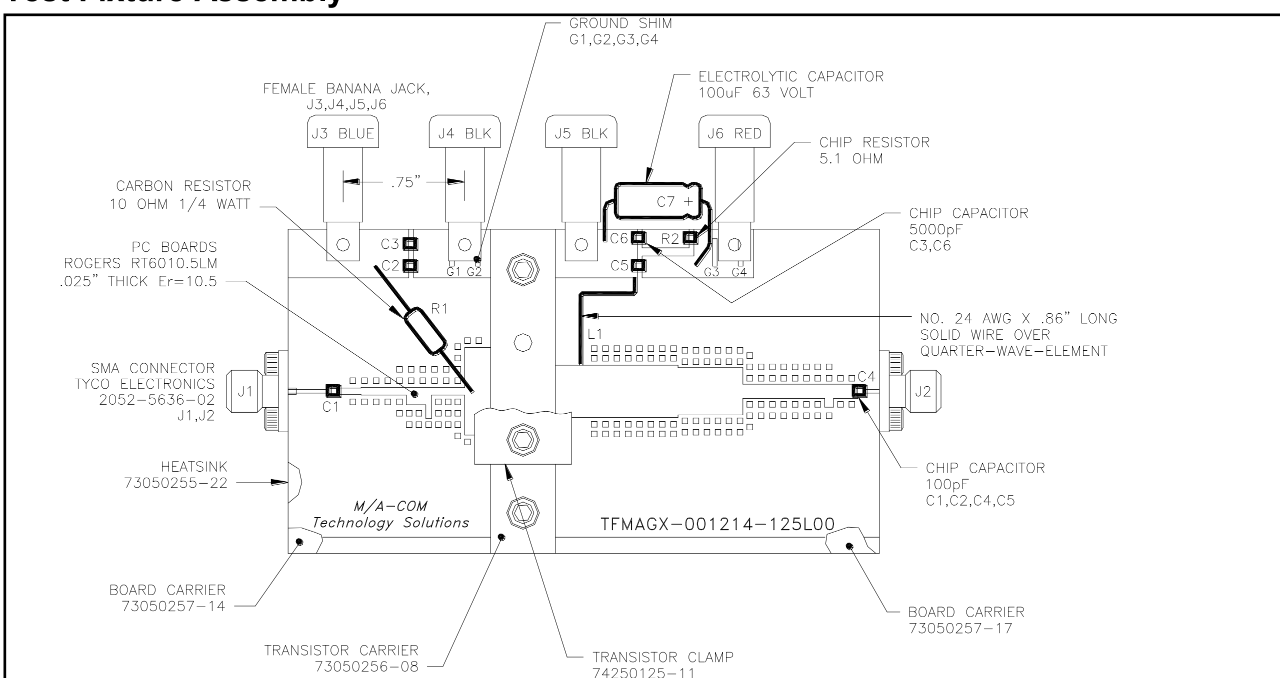
Test Fixture Circuit Dimensions



Test Fixture Assembly



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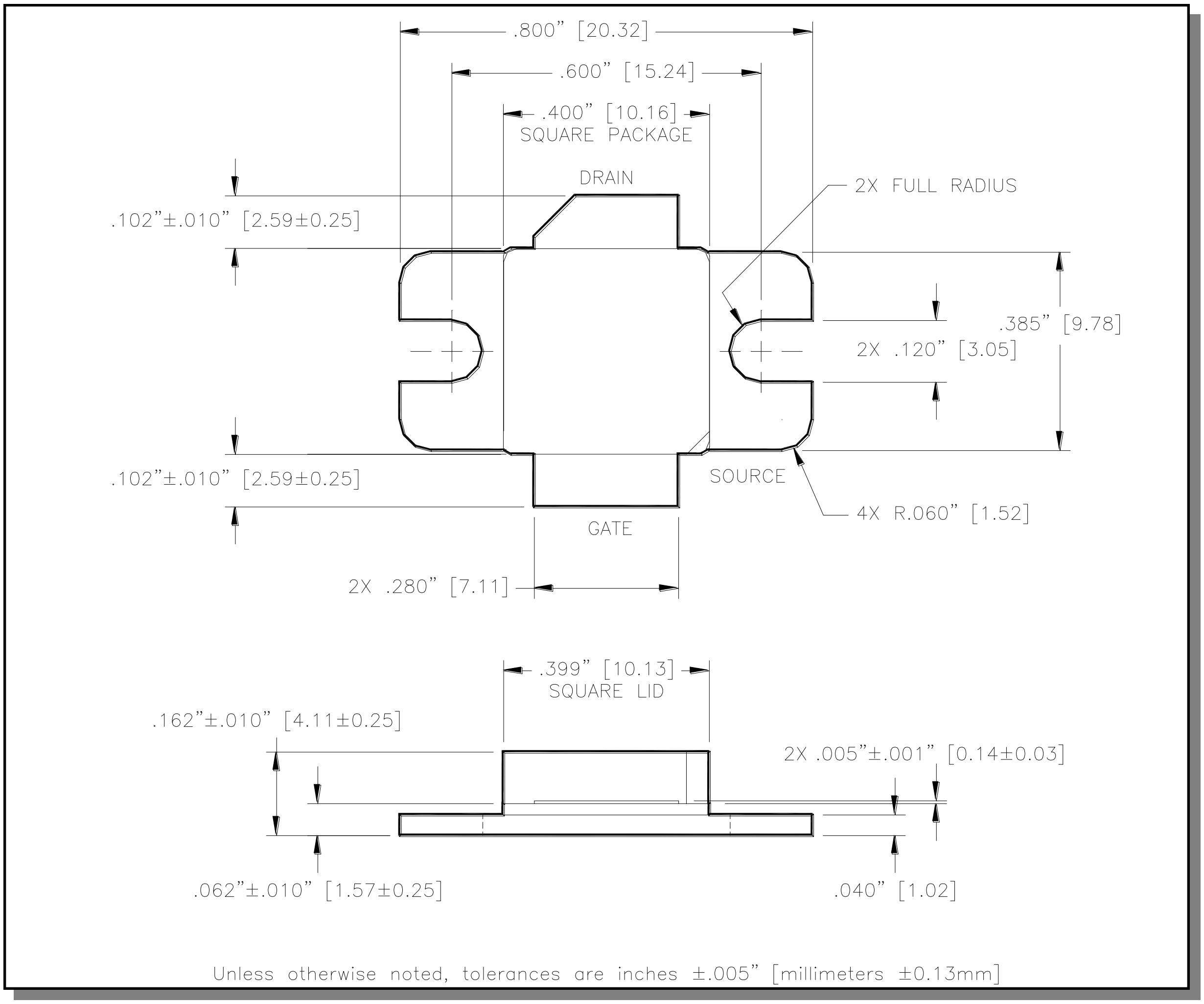
Outline Drawing



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}

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