



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)</li>

#### Applications

L-Band pulsed radar

# **Product Description**

The MAGX-001214-250L00 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 = 250W Peak

Freq	Pin	Gain	Slope	ld	Eff	Avg-Eff	RL	Droop
(MHz)	(W)	(dB)	(dB)	(A)	(%)	(%)	(dB)	(dB)
1200	4.4	17.6	-	8.0	62.2	-	-13.3	0.4
1250	4.0	18.0	-	8.2	60.4	-	-19.2	0.5
1300	4.1	17.8	-	8.7	57.1	-	-22.6	0.6
1350	4.4	17.5	-	9.1	54.6	-	-19.2	0.7
1400	4.4	17.6	0.5	9.0	55.0	57.9	-19.8	0.6

#### **Ordering Information**

MAGX-001214-250L00 250W GaN Power Transistor MAGX-001214-SB1PPR Evaluation Fixture

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GaN on SiC HEMT Pulsed Power Transistor
250W Peak, 1200-1400 MHz, 300µs Pulse, 10% Duty

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Absolute Maximum Ratings Table (1, 2, 3)				
Supply Voltage (V <sub>DD</sub> )	+65V			
Supply Voltage (V <sub>GS</sub> )	-8 to -2V			
Supply Current (I <sub>DMAX</sub> )	8.8 Apk			
Input Power (P <sub>IN</sub> )	+40 dBm			
Absolute Max. Junction/Channel Temp	200 °C			
MTTF (TJ<200°C)	114 years			
Pulsed Power Dissipation at 85°C	192 Wpk			
Thermal Resistance, (Tj = 70 °C) V <sub>DD</sub> = 50V,  I <sub>DQ</sub> = 250mA, Pout = 250W 300us Pulse / 10% Duty	0.60°C/W			
Operating Temp	-40 to +95°C			
Storage Temp	-65 to +150°C			
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	Тур	Мах	Units
DC CHARACTERISTICS						
Drain-Source Leakage Current	V <sub>GS</sub> = -8V, V <sub>DS</sub> = 175V	I <sub>DS</sub>	-	0.4	12	mA
Gate Threshold Voltage	$V_{DS} = 5V, I_D = 30mA$	$V_{GS\ (th)}$	-5	-3.1	-2	V
Forward Transconductance	V <sub>DS</sub> = 5V, I <sub>D</sub> = 7.0mA	G <sub>M</sub>	5.0	7.7	-	S
DYNAMIC CHARACTERISTICS						
Input Capacitance	Not applicable—Input internally matched	C <sub>ISS</sub>	N/A	N/A	N/A	pF
Output Capacitance	$V_{DS}$ = 50V, $V_{GS}$ = -8V, F = 1MHz	C <sub>OSS</sub>	_	22	-	pF
Feedback Capacitance	$V_{DS}$ = 50V, $V_{GS}$ = -8V, F = 1MHz	C <sub>RSS</sub>	-	2.2	-	pF

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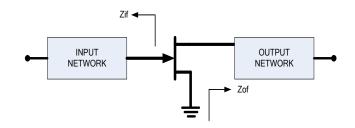
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Electrical Specifications:  $T_c = 25 \pm 5^{\circ}C$  (Room Ambient )

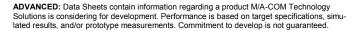
Parameter	Test Conditions	Symbol	Min	Тур	Max	Units
RF FUNCTIONAL TESTS ( $V_{DD}$ = 50V, $I_{DQ}$ = 250mA, 300us / 10% duty, 1200-1400MHz)						
Input Power	Pout = 250W Peak (25W avg)	P <sub>IN</sub>	_	4.2	5.6	Wpk
Power Gain	Pout = 250W Peak (25W avg)	G <sub>P</sub>	16.5	17.7	-	dB
Drain Efficiency	Pout = 250W Peak (25W avg)	η <sub>D</sub>	50	57.9	-	%
Load Mismatch Stability	Pout = 250W Peak (25W avg)	VSWR-S	5:1	-	-	-
Load Mismatch Tolerance	Pout = 250W Peak (25W avg)	VSWR-T	10:1	-	-	-

#### **Test Fixture Impedance**

F (MHz)	Z <sub>IF</sub> (Ω)	Z <sub>OF</sub> (Ω)
1200	3.6 - j5.3	3.5 + j0.7
1250	3.3 - j4.9	3.7 + j0.2
1300	3.2 - j4.4	3.5 - j0.3
1350	3.2 - j4.0	3.2 - j0.6
1400	3.2 - j3.6	2.7 - j0.7



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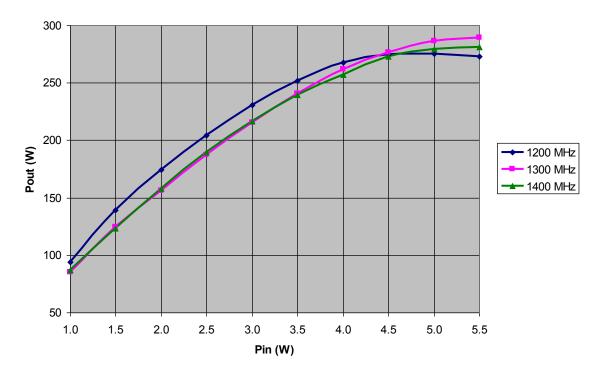


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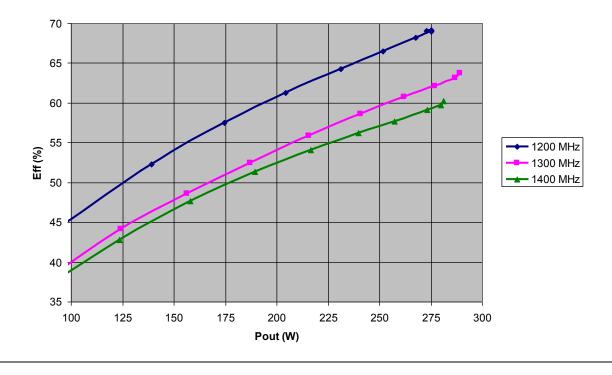


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**RF Power Transfer Curve (Output Power Vs. Input Power)** 

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



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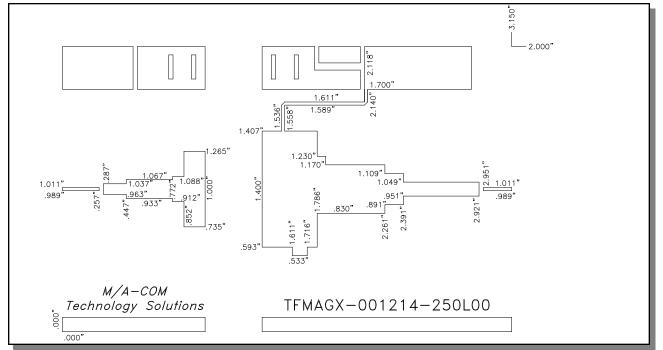
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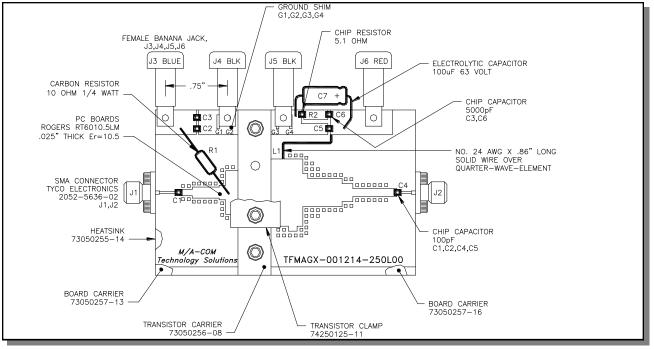


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#### **Test Fixture Circuit Dimensions**



#### **Test Fixture Assembly**



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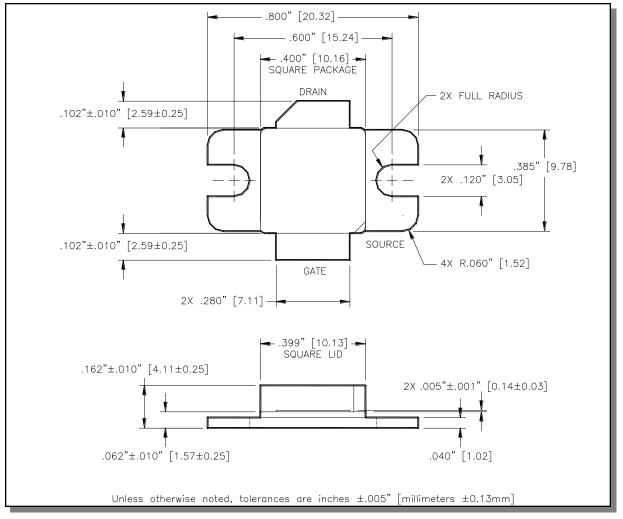
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# **Outline Drawing**



#### CORRECT DEVICE SEQUENCING

#### TURNING THE DEVICE ON

- 1. Set  $V_{GS}$  to the pinch-off (V<sub>P</sub>), 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

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#### TURNING THE DEVICE OFF

- 1. Turn the RF power off
- 2. Decrease  $V_{\text{GS}}$  down to  $V_{\text{P}}$
- 3. Decrease  $V_{DS}$  down to 0V
- 4. Turn off  $V_{GS}$

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