



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-001214-250L00 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 _{DD}) | +65V | | | |
| Supply Voltage (V _{GS}) | -8 to -2V | | | |
| Supply Current (I _{DMAX}) | 8.8 Apk | | | |
| Input Power (P _{IN}) | +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 _{DD} = 50V, I _{DQ} = 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 _{GS} = -8V, V _{DS} = 175V | I _{DS} | - | 0.4 | 12 | mA |
| Gate Threshold Voltage | $V_{DS} = 5V, I_D = 30mA$ | $V_{GS\ (th)}$ | -5 | -3.1 | -2 | V |
| Forward Transconductance | V _{DS} = 5V, I _D = 7.0mA | G _M | 5.0 | 7.7 | - | 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} | _ | 22 | - | pF |
| Feedback Capacitance | V_{DS} = 50V, V_{GS} = -8V, F = 1MHz | C _{RSS} | - | 2.2 | - | pF |

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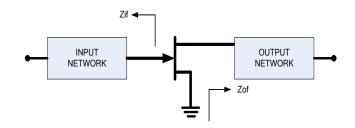
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Electrical Specifications: $T_c = 25 \pm 5^{\circ}C$ (Room Ambient)

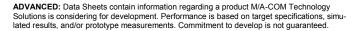
| Parameter | Test Conditions | Symbol | Min | Тур | Max | Units |
|---|----------------------------|-----------------|------|------|-----|-------|
| RF FUNCTIONAL TESTS (V_{DD} = 50V, I_{DQ} = 250mA, 300us / 10% duty, 1200-1400MHz) | | | | | | |
| Input Power | Pout = 250W Peak (25W avg) | P _{IN} | _ | 4.2 | 5.6 | Wpk |
| Power Gain | Pout = 250W Peak (25W avg) | G _P | 16.5 | 17.7 | - | dB |
| Drain Efficiency | Pout = 250W Peak (25W avg) | η _D | 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 _{IF} (Ω) | Z _{OF} (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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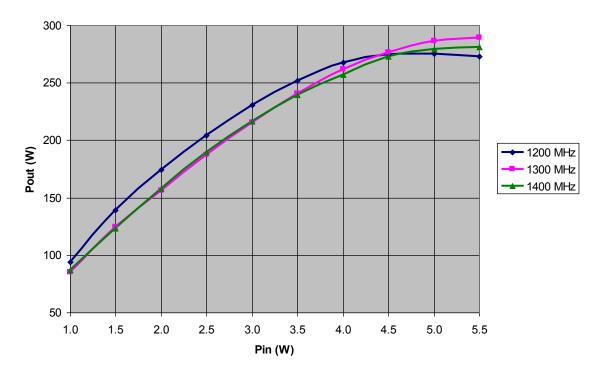


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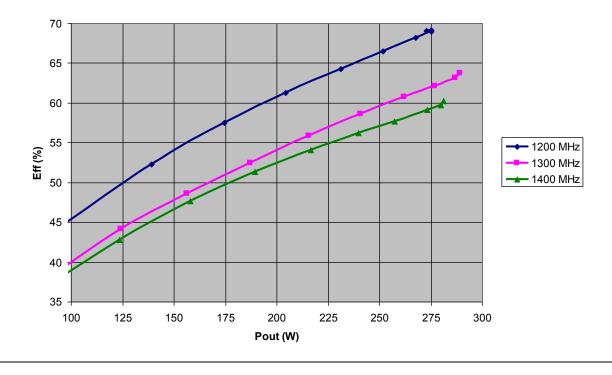


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RF Power Transfer Curve (Output Power Vs. Input Power)

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



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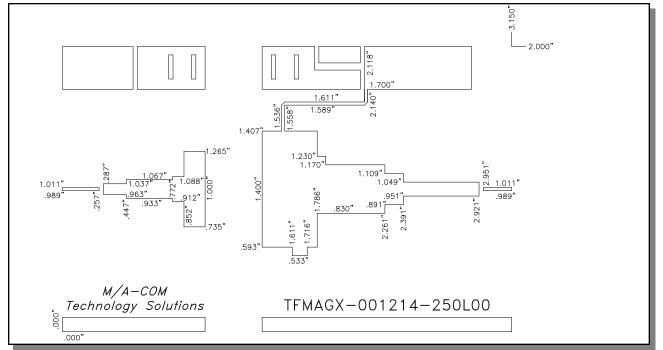
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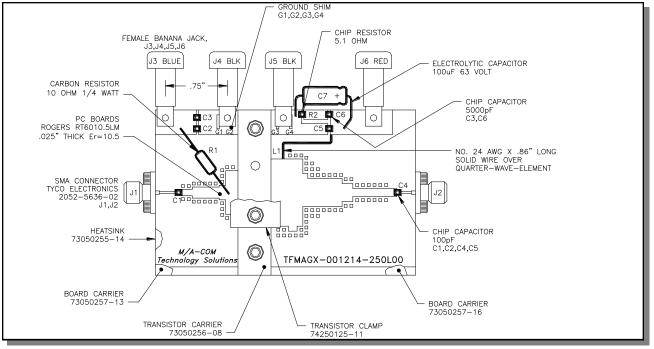


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Test Fixture Circuit Dimensions



Test Fixture Assembly



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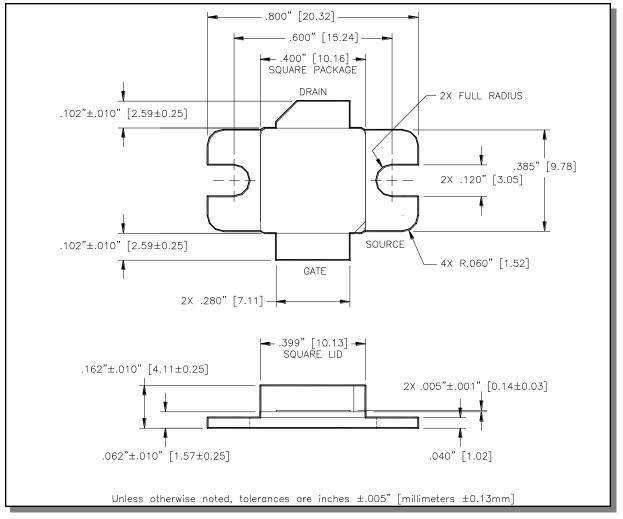
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Outline Drawing



CORRECT DEVICE SEQUENCING

TURNING THE DEVICE ON

- 1. Set V_{GS} to the pinch-off (V_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

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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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