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MAGX-000035-010000
MAGX-000035-01000S

GaN on SiC HEMT Power Transistor
10W CW, 30 MHz - 3.5 GHz

Rev. V3

Features

- GaN Depletion-Mode HEMT Microwave Transistor
- Common-Source configuration
- No internal matching
- Broadband Class AB operation
- RoHS* Compliant
- +50 V Typical Operation
- MTTF = 600 years

Description

The MAGX-000035-01000X 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, and ruggedness over multiple octave bandwidths for today's demanding application needs.

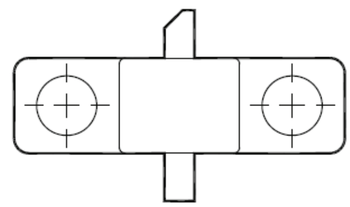
The MAGX-000035-01000X is constructed with either a flanged or flangeless ceramic package which provides excellent thermal performance. High breakdown voltages allow for reliable and stable operation in extreme mismatched load conditions compared with older semiconductor technologies.

Applications

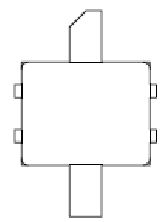
General purpose for pulsed or CW applications:

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

MAGX-000035-010000 (Flanged)



MAGX-000035-01000S (Flangeless)



Ordering Information

Part Number	Package
MAGX-000035-010000	10 W GaN Power Transistor (Flanged)
MAGX-000035-01000S	10 W GaN Power Transistor (Flangeless)
MAGX-000035-SB2PPR	1.2-1.4 GHz Evaluation Board (Flanged)
MAGX-000035-SB3PPR	1.2-1.4 GHz Evaluation Board (Flangeless)

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

- **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

Absolute Maximum Ratings[1, 2, 3]

Parameter	Limit
Supply Voltage (V_{DD})	+65 V
Supply Voltage (V_{GG})	-8 to 0 V
Supply Current (I_{DD})	800 mA
Input Power (P_{IN})	25 dBm
Junction/Channel Temp	200ºC
MTTF (T_J < 200 °C)	600 years
Continuous Power Dissipation (P_{DISS}) at 85 ºC	18 W
Pulsed Power Dissipation (P_{AVG}) at 85 ºC	43 W
Thermal Resistance, (T_J = 200 ºC), CW	9.2 ºC/W
Thermal Resistance, (T_J = 200 ºC), Pulsed 500 µs, 10% Duty cycle	3.4 ºC/W
Operating Temp	-40 to +95ºC
Storage Temp	-65 to +150ºC
ESD Min. - Charged Device Model (CDM)	250 V
ESD Min. - Human Body Model (HBM)	250 V

1. Exceeding any one or combination of these limits may cause permanent damage to this device
2. Junction temperature directly affects device MTTF. Junction temperature should be kept as low as possible to maximize lifetime.
3. For saturated performance it is recommended that the sum of (3*Vdd + abs(Vgg)) <175 V.

DC Characteristics

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 175 V	I_{DS}	-	-	10.8	mA
Gate Threshold Voltage	V_{DS} = 5 V, I_D = 2 mA	$V_{GS\ (TH)}$	-5	-3	-2	V
Forward Transconductance	V_{DS} = 5 V, I_D = 500 mA	G_M	5.5	-	-	S

DC Characteristics

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	V_{DS} = 0 V, V_{GS} = -8 V, F = 1 MHz	C_{ISS}	-	4.4	-	pF
Output Capacitance	V_{DS} = 50 V, V_{GS} = -8 V, F = 1 MHz	C_{OSS}	-	1.9	-	pF
Reverse Transfer Capacitance	V_{DS} = 50 V, V_{GS} = -8 V, F = 1 MHz	C_{RSS}	-	0.2	-	pF

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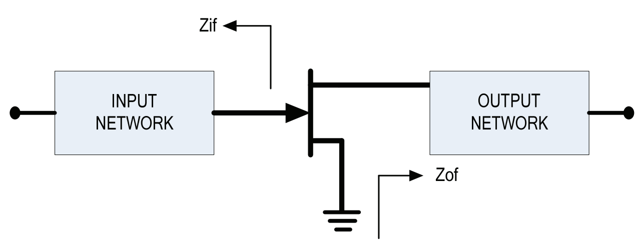
Electrical Specifications: T_A = 25 ºC

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
RF FUNCTIONAL TESTS						
CW Output Power (P2dB) 1.3 GHz	V_{DD} = 50 V, I_{DQ} = 25 mA, P_{IN} = 0.3 W	P_{OUT}	10	11	-	W
Power Gain (P2dB) 1.3 GHz	V_{DD} = 50 V, I_{DQ} = 25 mA	G_P	18	19		dB
Drain Efficiency @ 1.3 GHz	V_{DD} = 50 V, I_{DQ} = 25 mA, P_{OUT} = 10 W	η_D		45		%
Load Mismatch Stability	V_{DD} = 50 V, I_{DQ} = 25 mA, P_{IN} = 0.3 W	VSWR-S	5:1	-	-	-
Load Mismatch Tolerance	V_{DD} = 50 V, I_{DQ} = 25 mA, P_{IN} = 0.3 W	VSWR-T	10:1	-	-	-

Test Fixture Impedance

Freq. (MHz)	Z_{IN-OPT} (Ω)	$Z_{OUT-OPT}$ (Ω)
1300	3.6 + j6.9	38.3 + j20.5



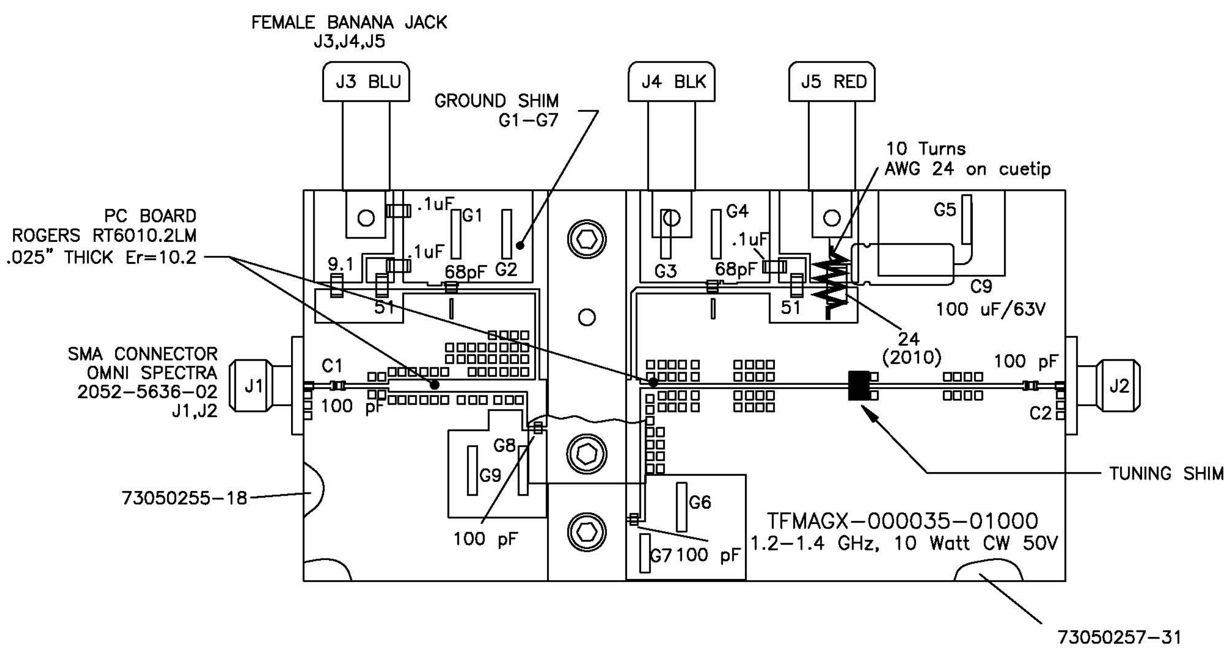
1.2—1.4 GHz Typical CW Performance

Freq. (GHz)	P_{OUT} (dBm)	P_{OUT} (W)	Gain (dB)	I_D (A)	Eff. (%)	V_D (V)	I_{DQ} (mA)
1.20	40.0	10.0	17.5	0.49	41	50	25
1.30	40.0	10.0	18.4	0.40	44	-	-
1.40	40.0	10.0	17.8	0.50	40	-	-

3.3 GHz Typical CW Performance

Freq. (GHz)	P2dB (dBm)	P_{OUT} (W)	Gain (dB)	I_D (A)	Eff. (%)	V_D (V)	I_{DQ} (mA)
3.30	40.3	10.7	16.2	0.38	57	50	25

1.2—1.4 GHz Test Fixture



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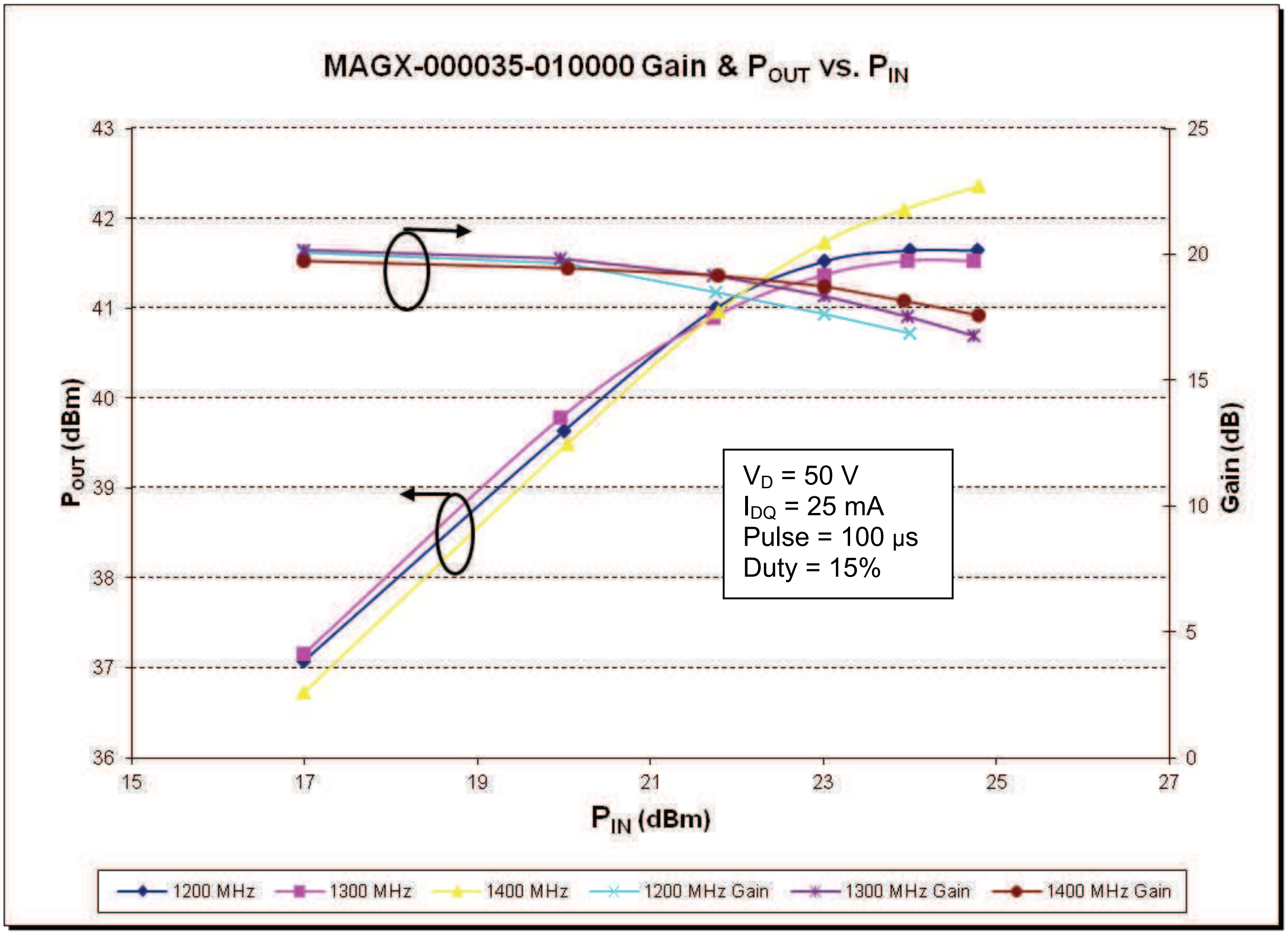
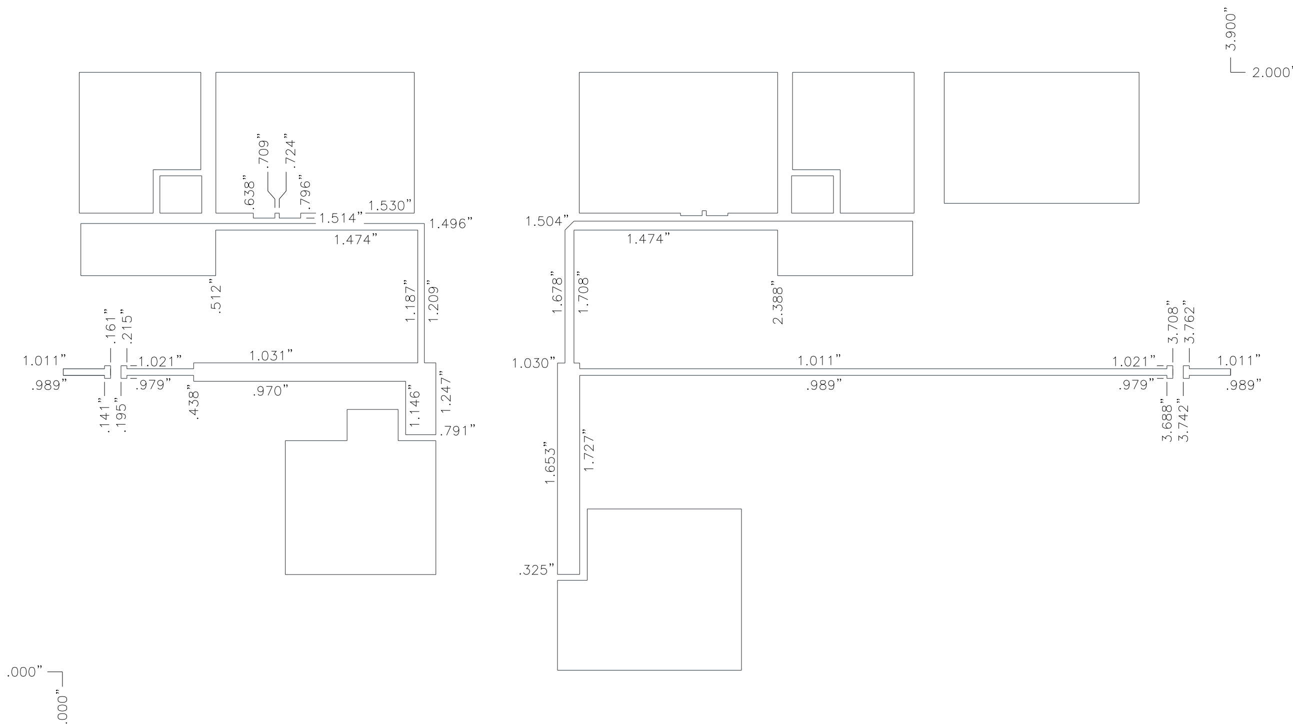
1.2—1.4 GHz Performance With Pulsed Signal

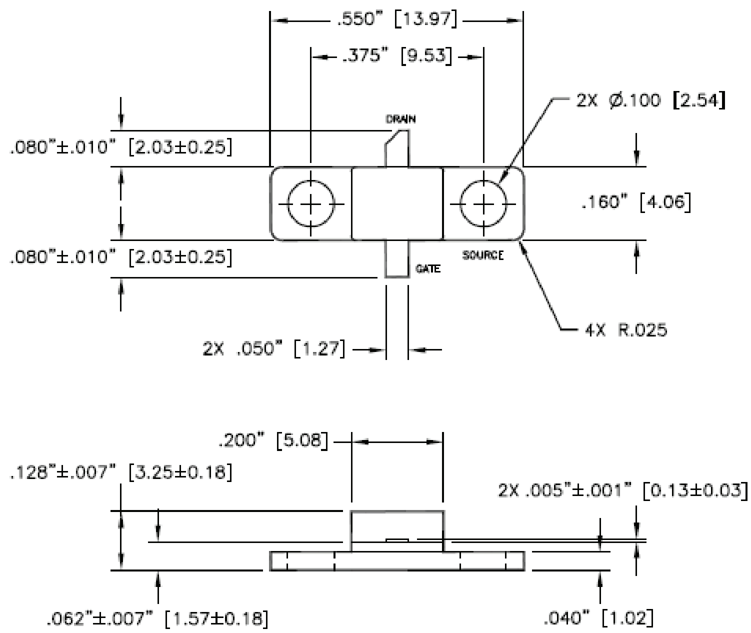


1.2—1.4 GHz Matching Circuit For Rogers RT6010.2LM

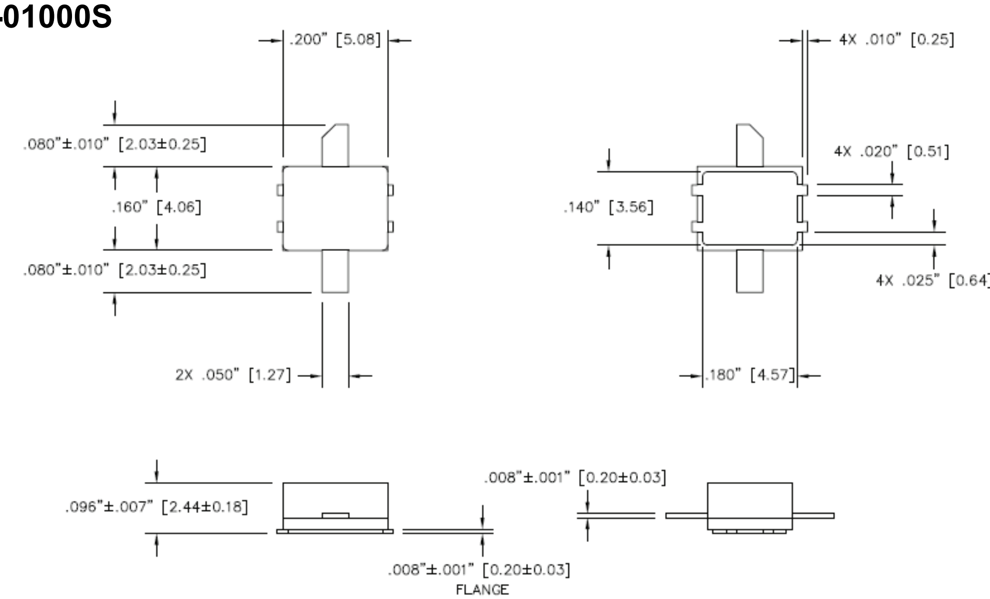


Outline Drawings

MAGX-000035-010000



MAGX-000035-01000S



Unless otherwise noted, tolerances are inches ±.005" [millimeters ±0.13mm]

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CORRECT DEVICE SEQUENCING

TURNING THE DEVICE ON

1. Set V_{GS} to the pinch-off (V_P), typically -5 V.
2. Turn on V_{DS} to nominal voltage (50 V).
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 0 V.
4. Turn off V_{GS}.

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