MAGX-000245-025000

GaN on SiC HEMT Power Transistor
25 W, DC-2.5 GHz, CW Power

Rev. V1

Features

- GaN on SiC Depletion Mode Transistor
- Common-Source Configuration
- Broadband Class AB Operation
- Thermally Enhanced Cu/Mo/Cu Package
- RoHS* Compliant
- +28V Typical Operation
- MTTF = 600 years (T_J < 200°C)

Primary Applications

- RF Lighting
- RF Plasma Generation
- RF Heating
- RF Drying
- Material Processing
- Power Industrial Equipment
- ISM
- Broadcast
- MILCOM
- Datalinks
- Air Traffic Control Radar - Commercial
- Weather Radar - Commercial
- Military Radar - Military

Description

The MAGX-000245-025000 is a gold metalized unmatched Gallium Nitride (GaN) on Silicon Carbide (SiC) RF power transistor suitable for CW applications centered at 2.45GHz for application in ISM/Broadcast/Plasma applications. This product differentiates itself from other GaN power transistors in that it runs well in CW. The matching network is compact and small. The frequency of operation covers DC - 2.5 GHz which captures commercial as well as military applications. This product is designed as a high power driver amplifier or final stage depending on the application. Using state of the art wafer fabrication processes, these high performance transistors provide high gain, efficiency, bandwidth and ruggedness over a wide bandwidth for today's demanding application needs. The MAGX-000245-025000 is constructed using a thermally enhanced Cu/Mo/Cu flanged ceramic package which provides excellent thermal performance.

MAGX-000245-025000

Ordering Information

Part Number	Description
MAGX-000245-025000	Bulk Packaging
MAGX-S00245-025000	Sample Board (2.45 GHz)

* 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

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Electrical Specifications[1]: Freq. = 2450 MHz, T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
RF Functional Tests: V_{DD} = +28 V, I_{DQ} = 100 mA, CW Operation						
Input Power	P_{out}= 25 W	P_{in}	-	1.6	2.4	W
Power Gain	P_{out}= 25 W	G_P	10.2	12	-	dB
Drain Efficiency	P_{out}= 25 W	η_D	57	62	-	%
Load Mismatch Stability	P_{out}= 25 W	VSWR-S	-	5:1	-	-
Load Mismatch Tolerance	P_{out}= 25 W	VSWR-T	-	10:1	-	-

Electrical Characteristics: T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
DC Characteristics						
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 175 V	I_{DS}	-	-	3.0	mA
Gate Threshold Voltage	V_{DS} = 5 V, I_D = 6 mA	$V_{GS\ (TH)}$	-5	-3	-2	V
Forward Transconductance	V_{DS} = 5 V, I_D = 1500 mA	G_M	1.1	-	-	S
Dynamic Characteristics						
Input Capacitance	V_{DS} = 0 V, V_{GS} = -8 V, F = 1 MHz	C_{ISS}	-	13.2	-	pF
Output Capacitance	V_{DS} = 50 V, V_{GS} = -8 V, F = 1 MHz	C_{OSS}	-	5.6	-	pF
Reverse Transfer Capacitance	V_{DS} = 50 V, V_{GS} = -8 V, F = 1 MHz	C_{RSS}	-	0.5	-	pF

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 (+28V).
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}.

1. Electrical Specifications measured in MACOM RF evaluation board.

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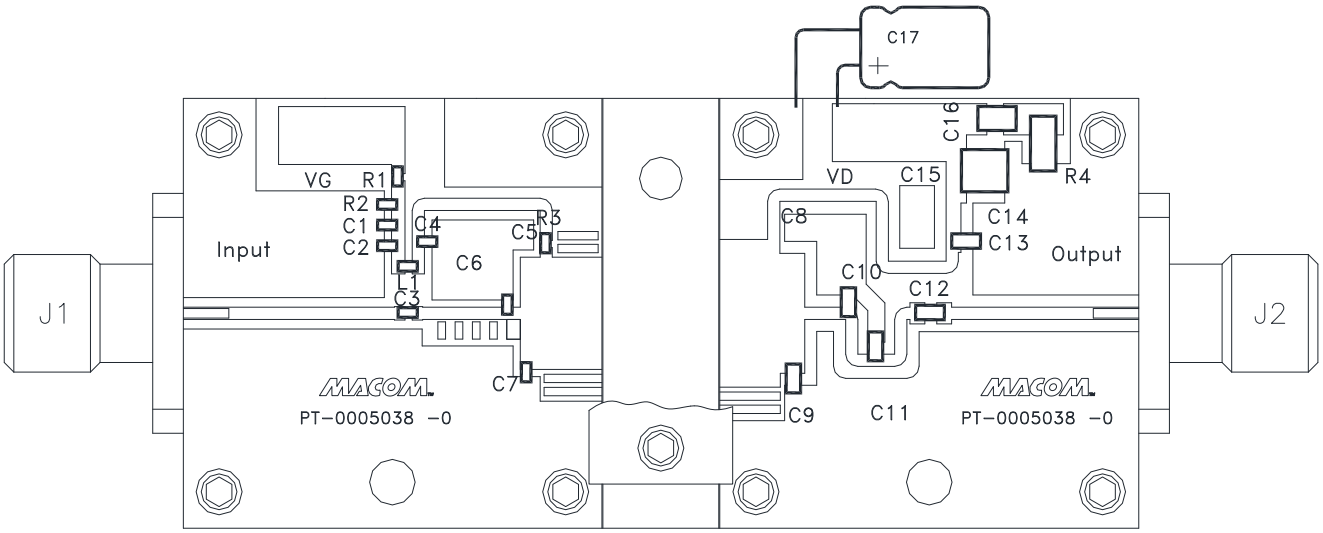
Absolute Maximum Ratings[2,3,4]

Parameter	Limit
Supply Voltage (V_{DD})	+32 V
Supply Voltage (V_{Gg})	-8 to 0 V
Supply Current (I_{DMAX}) for CW Operation at V_{DD} = +32 V	3 A
Input Power (P_{IN}) for CW Operation at V_{DD} = +28 V	P_{IN} (nominal) + 3 dB
Absolute Max. Junction/Channel Temperature	200ºC
Power Dissipation at 85 ºC for CW Operation at V_{DD} = +28 V	13 W
MTTF (T_J<200°C)	600 years
Thermal Resistance, (T_J= 200 ºC) V_{DD} = 28 V, I_{DQ} = 100 mA, CW Operation	9.0 ºC/W
Operating Temperature	-40 to +95ºC
Storage Temperature	-65 to +150ºC
Mounting Temperature	See solder reflow profile
ESD Min. - Charged Device Model (CDM)	200 V
ESD Min. - Human Body Model (HBM)	550 V

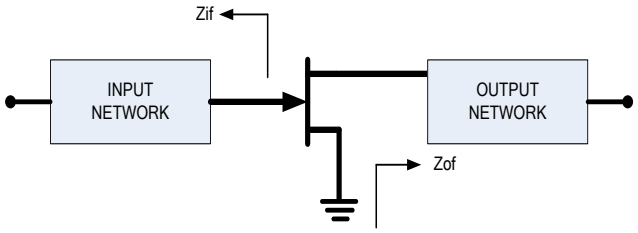
2. Operation of this device above any one of these parameters may cause permanent damage.
3. Channel temperature directly affects a device's MTTF. Channel temperature should be kept as low as possible to maximize lifetime.
4. For saturated performance it is recommended that the sum of (3*V_{DD} + abs(V_{GG})) <175 V.

Test Fixture Assembly (2450 MHz, CW Operation)



Test Fixture Impedances

F (MHz)	Z_{IF} (Ω)	Z_{OF} (Ω)
2450	1.6 - j4.5	5.6 + j3.9



Parts List

Reference Designator	Part Description	Manufacturer Part Number
C1	0.1 µF, 0402, X7R, 10%, 16 V, Murata	GRM155R71C104K
C2	10 nF, 0402, X7R, 10%, 50 V, Murata	GRM155R71H103K
C16	0.1 µF, 0805, X7R, 10%, 100 V, TDK	C2012X7R2A104K125AA
C15	5000 pF, 100B, 5%, 250 V, ATC	-
C3, C4	12 pF, 0402, ± 1%, 200 V, ATC	ATC600L120FT
C12, C13	12 pF, 0603, ± 2%, 250 V, ATC	ATC600S120GT
C10	2.4 pF, 0603, ± 0.05 pF, 250 V, ATC	ATC600S2R4BT
C7	2.4 pF, 0402, ± 1 %, 200 V, ATC	ATC600L2R4FT
C11	1.3 pF, 0603, ± 0.1 pF, 250 V, ATC	ATC600S1R3BT
C9	1.6 pF, 0603, ± 0.1 pF, 250 V, ATC	ATC600S1R6BT
C6	1.5 pF, 0402, ± 0.1 pF, 200 V, ATC	ATC600L1R5FT
C17	100 µF, 160 V, Electrolytic Capacitor	-
C5, C8, C14	Not Populated	-
L1	10 nH, 0402, 2%, Coilcraft	0402HP-10NXGLW
R1	200 Ω, 0402, 5%, Panasonic	ERJ-2GEJ201X
R2	3K Ω, 0402, 5%, Panasonic	ERJ-2GEJY302X
R3	11 Ω, 0402, 1%, Panasonic	ERJ-2RKF11R0X
R4	2.2 Ω, 1206, 1%, Panasonic	CR1206-J/-2R2ELF
J1, J2	SMA Connector	2052-5636-02

4 Contact factory for Gerber file or additional circuit information.

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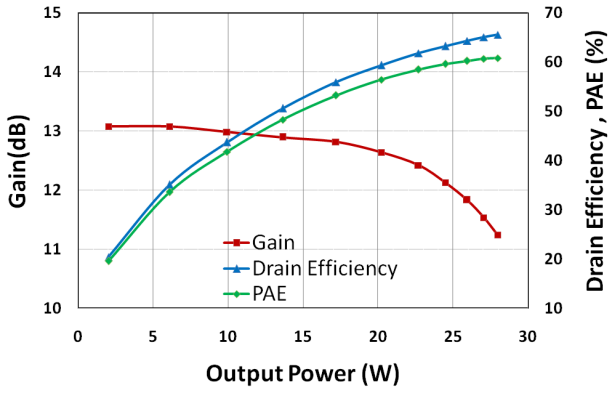
Application Section

Typical Performance Curves

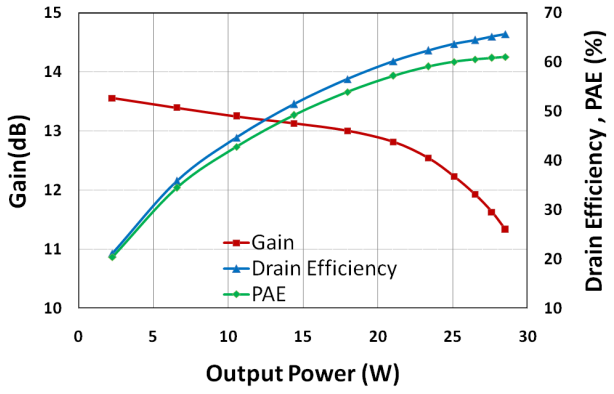
2450 MHz, V_{DD} = 28 V, CW Operation, T_A = 25°C

Gain, Drain Efficiency, and PAE vs. Output Power over I_{DQ}

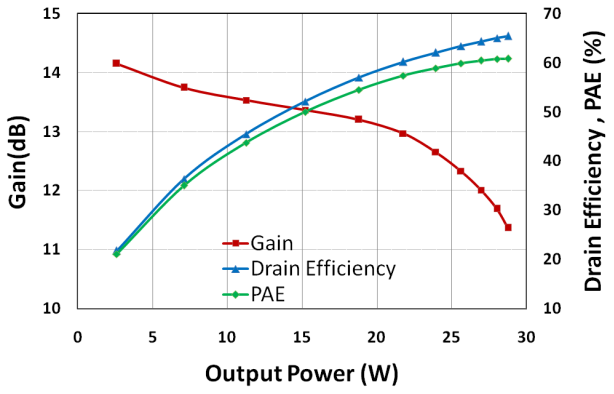
I_{DQ}= 50mA



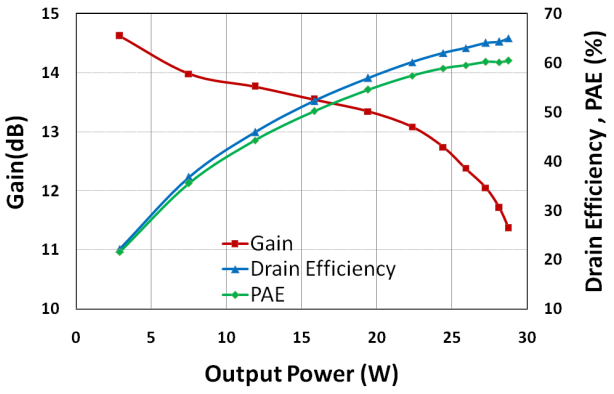
I_{DQ}= 100mA



I_{DQ}= 200mA



I_{DQ}= 300mA



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Outline Drawing MAGX-000245-025000