MAGX-002731-180L00

GaN HEMT Pulsed Power Transistor
2.7 - 3.1 GHz, 180W Peak, 300us Pulse, 10% Duty

Production V1
27 Sept 11

Features

- GaN depletion mode HEMT microwave transistor
- Common source configuration
- Broadband Class AB operation
- Thermally enhanced Cu/Mo/Cu package
- RoHS Compliant
- +50V Typical Operation
- MTTF of 114 years (Channel Temperature < 200°C)
- **EAR99 Export Classification**

Application

- Civilian and Military Pulsed Radar

Product Description

The MAGX-002731-180L00 is a gold metalized matched Gallium Nitride (GaN) on Silicon Carbide RF power transistor optimized for civilian and military radar pulsed applications between 2700 - 3100 MHz. 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. The MAGX-002731-180L00 is constructed using a thermally enhanced Cu/Mo/Cu flanged ceramic package which provides excellent thermal performance. High breakdown voltages allow for reliable and stable operation in extreme mismatched load conditions unparalleled with older semiconductor technologies.

Typical Peak RF Performance

50V, 300us, 10%

Freq (MHz)	Pin (Wpk)	Pout (Wpk)	Gain (dB)	Flat (dB)	Eff (%)	Droop (dB)
2700	14	193.6	11.4	- -	48.9	0.45
2800	14	208.0	11.7	- -	48.6	0.43
2900	14	199.3	11.5	- -	45.8	0.44
3000	14	199.3	11.5	- -	47.7	0.45
3100	14	185.8	11.2	0.52	47.5	0.41

50V, 500us, 10%

Freq (MHz)	Pin (Wpk)	Pout (Wpk)	Gain (dB)	Flat (dB)	Eff (%)	Droop (dB)
2700	14	198.2	11.5	- -	50.4	0.58
2800	14	213.1	11.8	- -	49.9	0.55
2900	14	203.2	11.6	- -	46.8	0.58
3000	14	201.2	11.6	- -	48.8	0.53
3100	14	183.2	11.2	0.65	48.3	0.53

Typical RF performance measured in M/A-COM RF test fixture. Devices tested in common source Class-AB configuration as follows: Vdd=50V, Idq=500mA (pulsed gate bias), F=2.7- 3.1 GHz, Pulse Width=300ms, Duty=10%.

Ordering Information

MAGX-002731-180L00	180W GaN Power Transistor
MAGX-002731-SB3PPR	Evaluation Fixture

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Absolute Maximum Ratings Table (1, 2, 3)

Supply Voltage (Vdd)	+65V
Supply Voltage (Vgg)	-8 to 0V
Supply Current (Id1)	10A
Input Power (Pin)	+36 dBm
Absolute Max. Junction/Channel Temp	200 ºC
Pulsed Power Dissipation (Pavg) at 85 ºC	192 W
Thermal Resistance, (Tchannel = 200 ºC) Pulsed 500uS, 10% Duty cycle	0.6 ºC/W
Operating Temp	-40 to +95C
Storage Temp	-65 to +150C
Mounting Temperature	See solder reflow profile
ESD Min. - Machine Model (MM)	50 V
ESD Min. - Human Body Model (HBM)	>250 V
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}	-	-	12	mA
Gate Threshold Voltage	V_{DS} = 5V, I_D = 30mA	$V_{GS\ (th)}$	-5	-3	-2	V
Forward Transconductance	V_{DS} = 5V, I_D = 3.5mA	G_M	5.0	-	-	S
DYNAMIC CHARACTERISTICS						
Input Capacitance	Not applicable - Input internally matched	C_{GS}	N/A	N/A	N/A	pF
Output Capacitance	V_{DS} = 50V, V_{GS} = -8V, F = 1MHz	C_{OSS}	-	26.1	30.3	pF
Reverse Transfer Capacitance	V_{DS} = 50V, V_{GS} = -8V, F = 1MHz	C_{RSS}	-	2.3	4.7	pF

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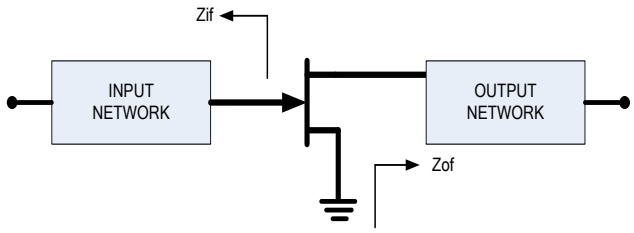
Electrical Specifications: T_C = 25 ± 5°C (Room Ambient)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
RF FUNCTIONAL TESTS *Vdd=50V, Idq=500mA (pulsed gate bias), F=2.7- 3.1 GHz, Pulse Width=300ms, Duty=10%.*						
Output Power	Pin = 14W Peak, 1.4W Ave	P_{OUT}	180 18	190 19	-	W Peak W Ave
Power Gain	Pout = 180W Peak, 18W Ave	G_P	10.5	11.5	-	dB
Drain Efficiency	Pin = 14W Peak, 1.4W Ave	η_D	43	50	-	%
Load Mismatch Stability	Pin = 14W Peak, 1.4W Ave	VSWR-S	5:1	-		-
Load Mismatch Tolerance	Pin = 14W Peak, 1.4W Ave	VSWR-T	10:1	-		-

Test Fixture Impedance

Freq	Zif	Zof
2.7	2.04 - j 5.75	2.82 - j 2.00
2.8	1.61 - j 5.40	3.08 - j 2.73
2.9	1.28 - j 4.98	2.88 - j 3.30
3.0	1.13 - j 4.51	2.49 - j 3.49
3.1	1.19 - j 4.18	2.21 - j 3.64



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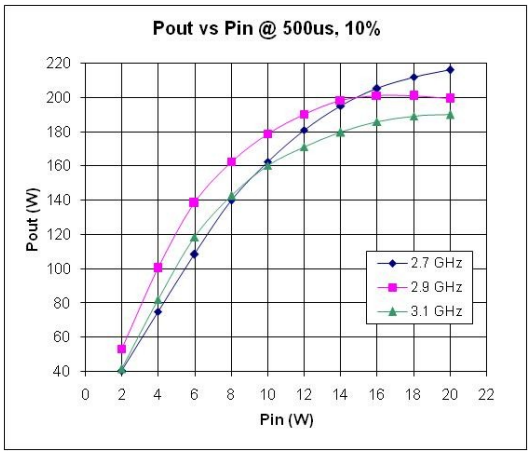
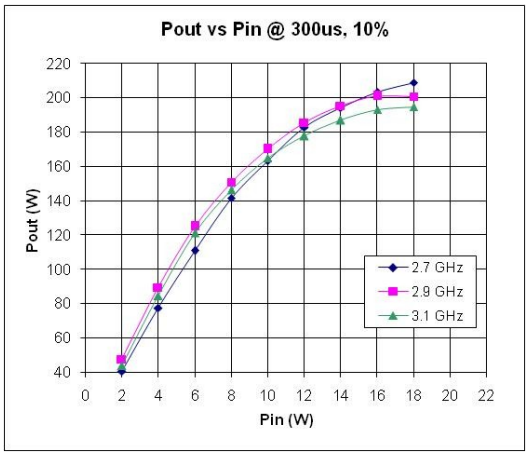
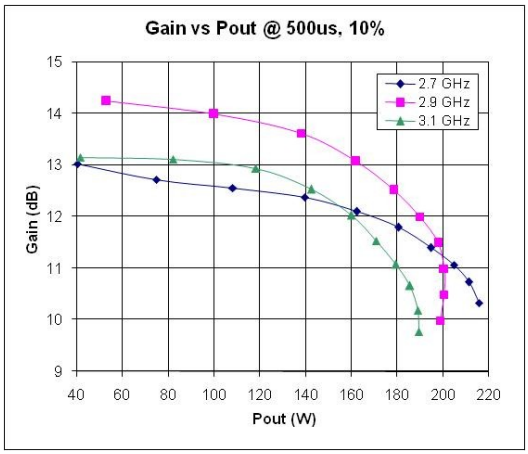
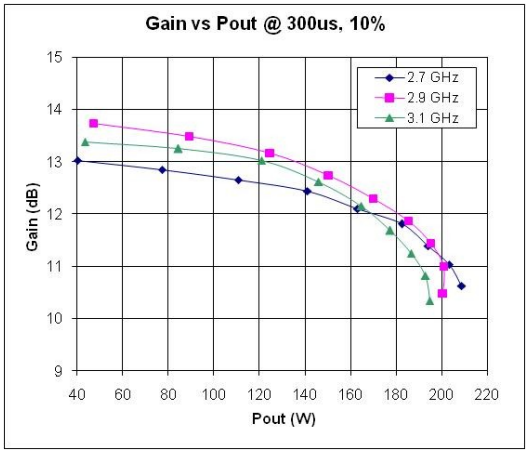
RF Power Transfer Curve
Peak Output Power vs. Input Power



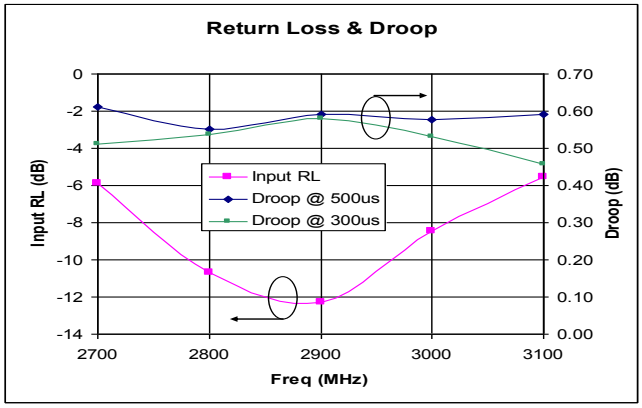


RF Power Transfer Curve
Power Gain vs. Peak Output Power





Input VSWR & Droop (Typ)



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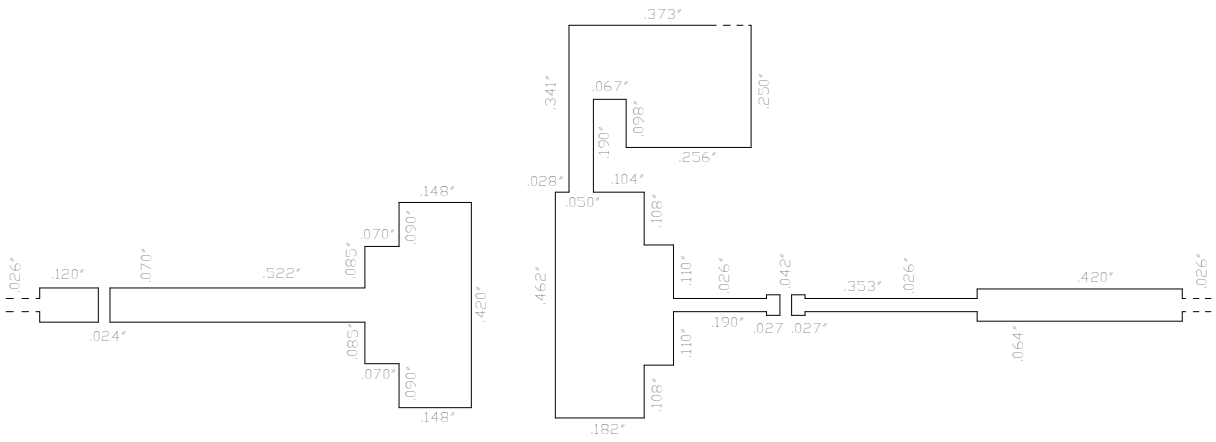
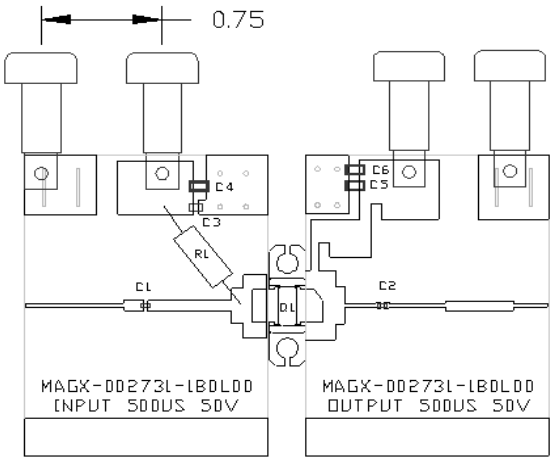
Test Fixture Circuit Dimensions (inches)



Test Fixture Assembly



FIXTURE MAGX-002731-180L00

D1	Y32BB
C1,C2,C3	12pF, ATC100A..
C4,C5	0.01uF, 100V
C6	1.0uF, 100V
R1	10-12ohm, 1/4W

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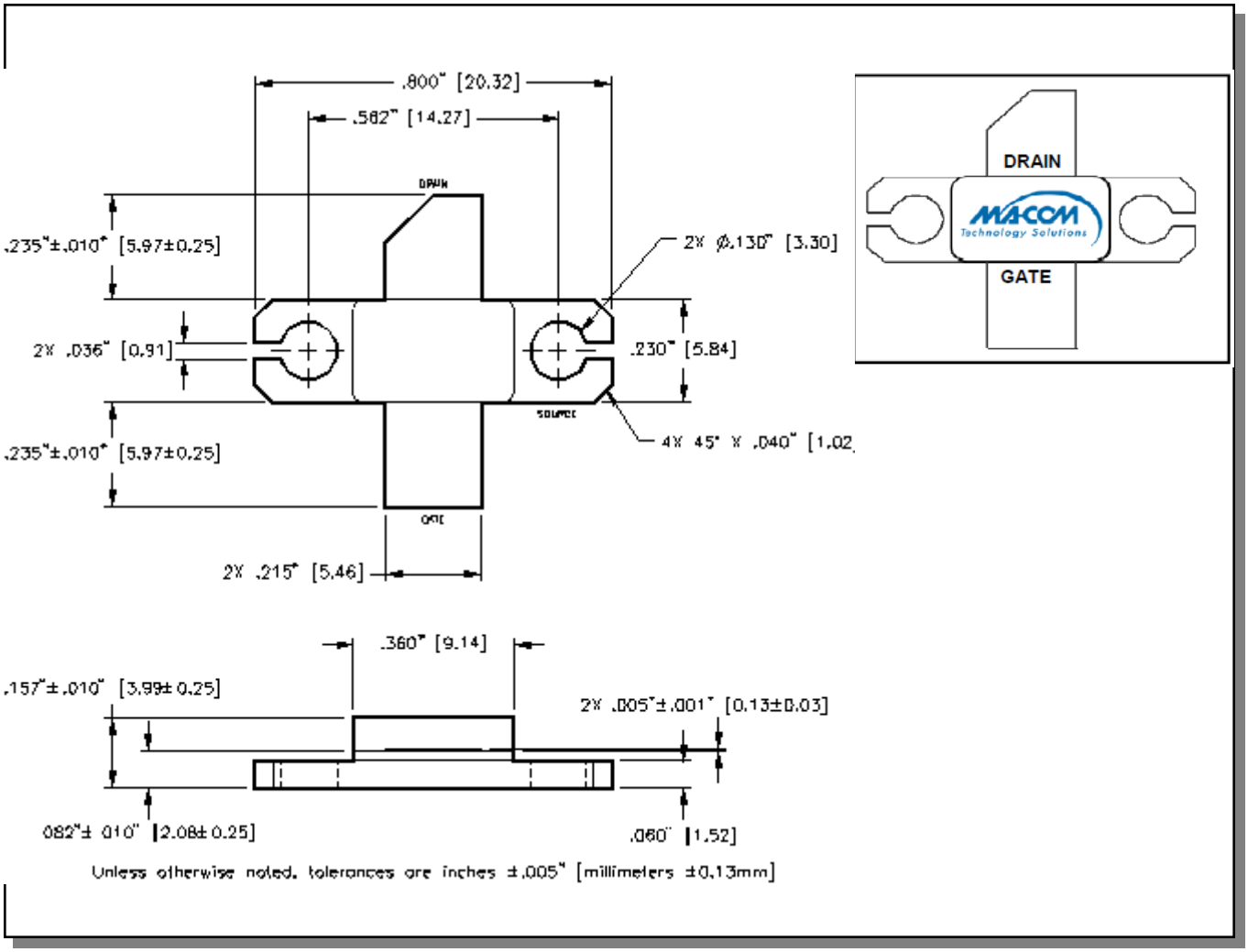
Outline Drawing



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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- ### Sales :

  Direct +86 (21) 6401-6692

  Email amall@ameya360.com

  QQ 800077892

  Skype ameyasales1 ameyasales2

- ### Customer Service :

  Email service@ameya360.com

- ### Partnership :

  Tel +86 (21) 64016692-8333

  Email mkt@ameya360.com