



Eff (%) 52.0 51.6 50.2

GaN HEMT Pulsed Power Transistor 3.1 - 3.5 GHz, 120W Peak, 300us Pulse, 10% Duty

Production V1 02 Dec 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

Product Description

The MAGX-003135-120L00 is a gold metalized matched Gallium Nitride (GaN) on Silicon Carbide RF power transistor optimized for civilian and military radar pulsed applications between 3100 - 3500 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-003135-120L00 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)	Pout (W Peak)	Pout (W Peak)	Pout (W Ave)	Gain (dB)	RL (dB)	Eff (%)	Freq. (MHz)	Pout (W Peak)	Pout (W Peak)	Pout (W Ave)	Gain (dB)	RL (dB)	
3100	10	134.3	13.4	11.3	-7	50.3	3100	10	142	14.2	11.5	-7	
3300	10	138.6	13.8	11.4	-9	50.3	3300	10	145	14.5	11.6	-9	
3500	10	134.1	13.4	11.2	-12	49.5	3500	10	140	14.0	11.5	-12	

50V, 100us, 10%

M/A-COM Technology Solution

Typical RF performance measured in M/A-COM RF test fixture. Devices tested in common source Class-AB configuration as follows: Vdd=50V, Idg=300mA (pulsed gate bias), F=3.1 - 3.5 GHz, Pulse Width=300us, Duty=10%.

Ordering Information

MAGX-003135-120L00 MAGX-003135-SB5PPR

120W GaN Power Transistor **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)	6700 mA				
Input Power (Pin)	+36 dBm				
Absolute Max. Junction/Channel Temp	200 °C				
MTTF (TJ<200°C)	114 years				
	170 W (100us)				
Pulsed Power Dissipation (Pavg) at 85 °C	144 W (300us)				
Thermal Resistance, (Tchannel = 200 °C) V_{DD} = 50V, I_{DQ} = 300mA, Pin = 10Wpk,Pulse Width 100uS, Duty 10%	0.5 °C/W				
Thermal Resistance, (Tchannel = 200 °C) V_{DD} = 50V, I_{DQ} = 300mA, Pin = 10Wpk, Pulse width 300uS, Duty 10%	0.8 °C/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	Тур	Мах	Units	
DC CHARACTERISTICS							
Drain-Source Leakage Current	V _{GS} = -8V, V _{DS} = 175V	I _{DS}	-	0.5	9	mA	
Gate Threshold Voltage	$V_{DS} = 5V, I_D = 23mA$	V _{GS (th)}	-5	-3	-2	V	
Forward Transconductance	$V_{DS} = 5V, I_D = 9A$	G _M	3.3	-	-	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}	-	13.4	16	pF	
Reverse Transfer Capacitance	V_{DS} = 50V, V_{GS} = -8V, F = 1MHz	C _{RSS}	-	1.4	2.2	pF	

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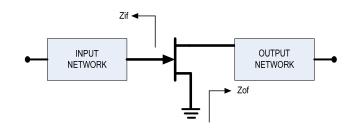
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Electrical Specifications: $T_c = 25 \pm 5^{\circ}C$ (Room Ambient)

Parameter	Test Conditions	Symbol	Min	Тур	Max	Units		
RF FUNCTIONAL TESTS (V_{DD} = 50V, I_{DQ} = 300mA, 300us pulse / 10% duty, 3.1 - 3.5 GHz)								
Output Power	Pin = 10W Peak, 1W Ave	P _{OUT}	120 12	135 13.5	-	W Peak W Ave		
Power Gain	Pin = 10W Peak, 1W Ave	G _P	10.8	11.8	-	dB		
Drain Efficiency	Pin = 10W Peak, 1W Ave	η _D	45	52	-	%		
Load Mismatch Stability	Pin = 10W Peak, 1W Ave	VSWR-S	5:1	-		-		
Load Mismatch Tolerance	Pin = 10W Peak, 1W Ave	VSWR-T	10:1	-		-		

Test Fixture Impedance

F (MHz)	Z _{IF} (Ω)	Z _{OF} (Ω)
3100	5.9 - j4.2	4.1 - j2.4
3300	5.2 - j4.8	4.0 - j2.8
3500	3.9 - j5.0	2.6 - j2.6



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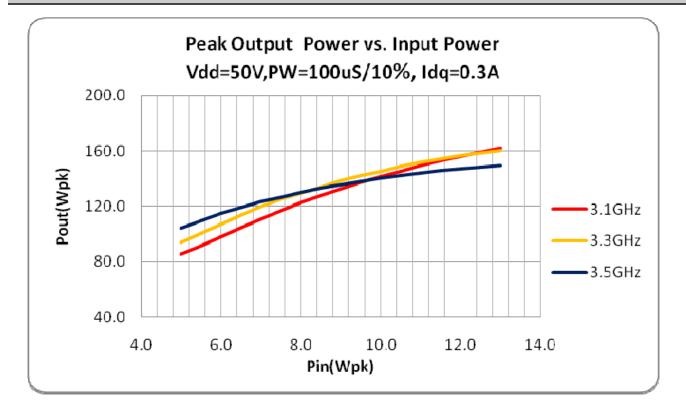
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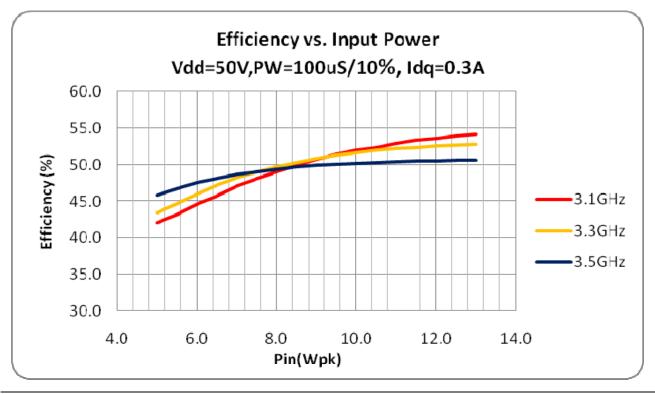
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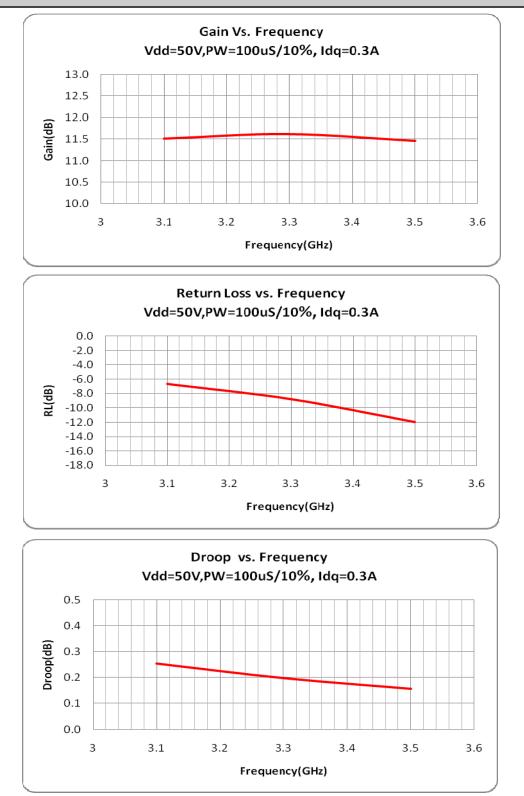
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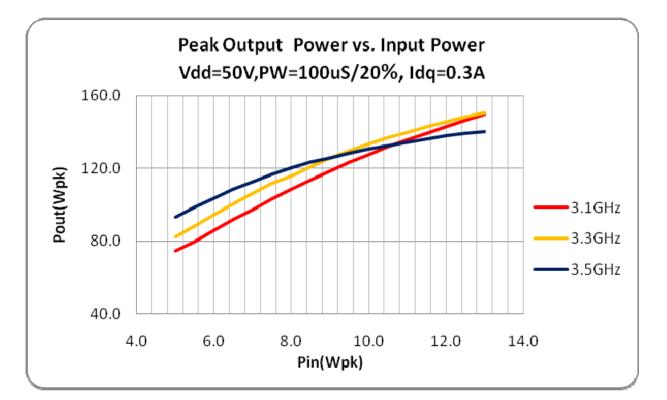
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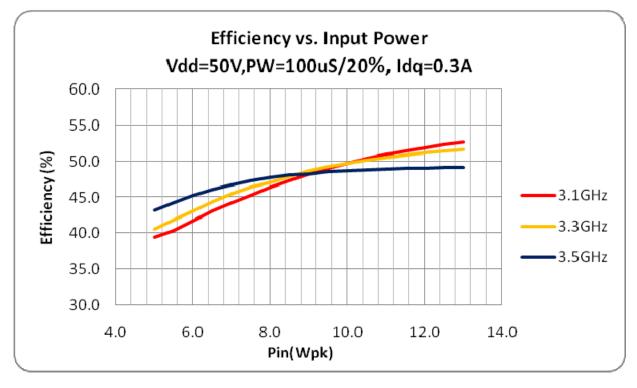
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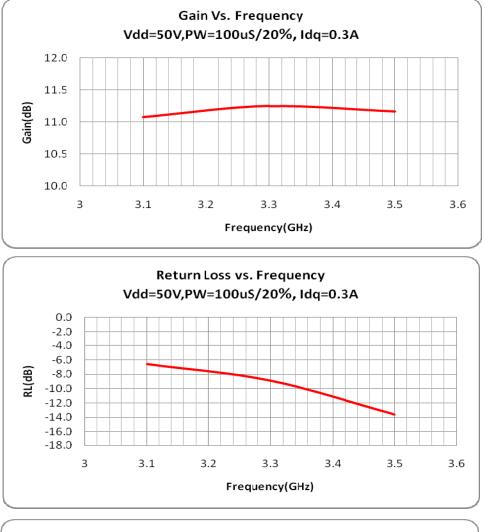
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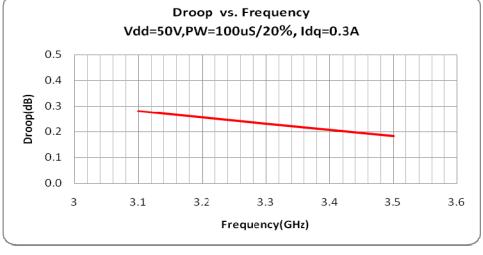
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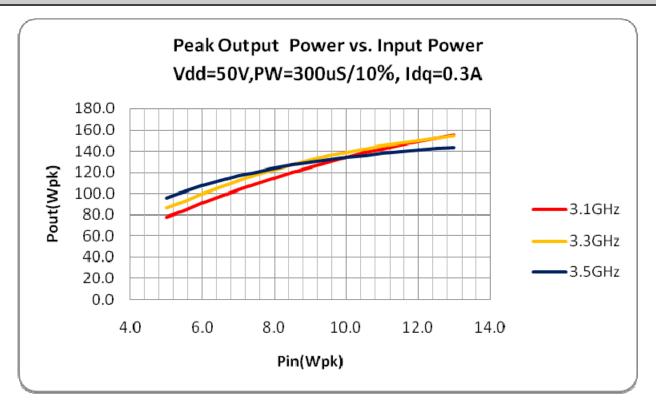
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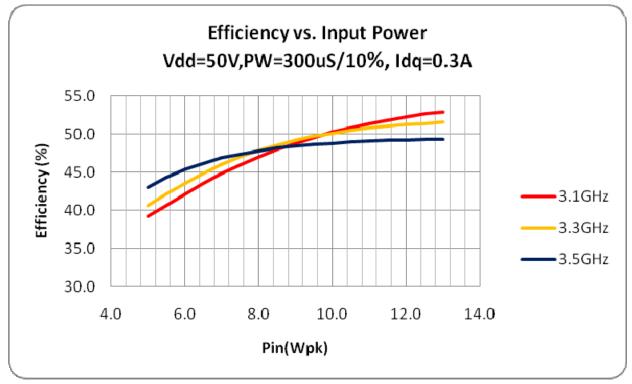
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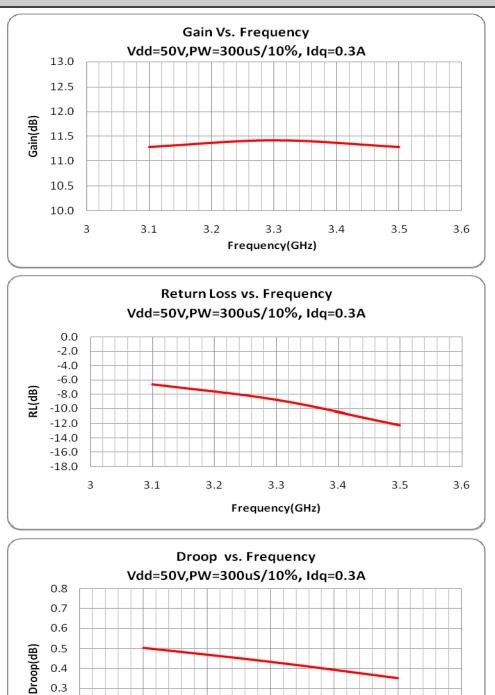
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3.1

3.2

3.3

Frequency(GHz)

3

0.4 0.3 0.2 0.1 0.0

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3.5

3.4

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Test Fixture Assembly FEMALE BANANA JACK, J3,J4,J5,J6 CHIP CAPACITOR J3 BLUE J4 BLK J5 BLK J6 RED .1uF 100 VOLT 1206 C4,C9 CHIP CAPACITOR 39pF ATC CASE B .75 ELECTROLYTIC CAPAITOR CHIP CAPACITOR 100uF 160 VOLT C4 12pF ATC100A C10 | **/** C9 C2.C6 0 G GROUND SHIM G 4 G1,G2,G3,G4,G5 G5 d. IC.7 CHIP RESISTOR 11 OHMS 1/4 WATT 1210. G1 C6 CHIP CAPACITOR 5000pF 100 VOLT 1206 \bigcirc CHIP CAPACITOR SMA CONNECTOR TYCO ELECTRONICS 2052-5636-02 30pF ATC CASE B C1 CF J2 J1 J1,J2 \bigcirc CHIP CAPACITOR PC BOARDS 15pF ATC100A ROGERS RT6010.5LM C1.C5 .025" THICK Er=10.5 TFMAGX-M/A-COM 1 OZ COPPER BOTH SIDES NO. 22 AWG X .47" LONG SOLID COPPER WIRE OVER Technology Solutions 003135-120L00 HEATSINK QUARTER-WAVE ELEMENT 73050255-03 BOARD CARRIER 73050257-13 BOARD CARRIER 73050257-13 TRANSISTOR CARRIER 73050256-23 TRANSISTOR CLAMP 74250125-55 ASSEMBLY VIEW

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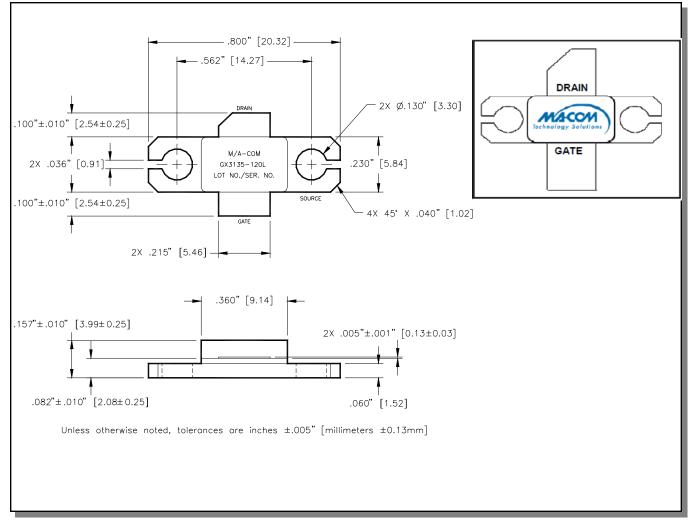
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Outline Drawing



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 (60V)
- 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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