

MAGX-101214-500L0x



GaN on Si HEMT Power Transistor
500 W, 1200 - 1400 MHz

Advance - Rev. 1

Features

- GaN on Si Transistor Technology
- Internally Input Matched
- Common-Source Configuration
- Broadband Class AB Operation
- Thermally enhanced package
- RoHS Compliant

Applications

- L-Band pulsed radar

Description

The MAGX-101214-500L0x is a gold-metalized matched Gallium Nitride (GaN) on Silicon (Si) RF power transistor optimized for pulsed L-Band radar applications. The MAGX-101214-500L0x is constructed using a thermally enhanced, flanged ceramic package which provides excellent thermal performance. High breakdown voltages allow for reliable and stable operation under compared with older semiconductor technologies.

MAGX-101214-500L00



MAGX-101214-500L0S



RF Performance, $P_{out} = 500\text{ W}$

Freq. = 1200-1400 MHz, $V_{DD} = 50\text{ V}$, $I_{DQ} = 125\text{ mA}$, Pulse = 300 μs , Duty = 10 %, $T_C = 25\text{ }^\circ\text{C}$

Freq. (MHz)	P_{OUT} (W)	Gain (dB)	Eff. (%)	Droop (dB)	P2dB (W)
1200	500	17.3	70	0.1	558
1250	500	16.7	68	0.1	516
1300	500	16.8	71	0.1	525
1350	500	16.75	69	0.1	545
1400	500	16	71	0.1	525

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RF Performance , $P_{out} = 500 \text{ W}$

Freq. = 1200-1400 MHz, $V_{DD} = 50 \text{ V}$, $I_{DQ} = 100 \text{ mA}$, Pulse = 2ms, Duty = 20 %, $T_C = 25 \text{ }^\circ\text{C}$

Freq. (MHz)	P_{OUT} (W)	Gain (dB)	Eff. (%)	Droop (dB)	P2dB (W)
1200	500	17.08	73.7	0.1	560.6
1250	500	16.29	71.7	0.1	509.6
1300	500	16.26	73.7	0.1	509.0
1350	500	16.43	71.3	0.1	530.7
1400	500	15.85	72.3	0.1	519.7

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Electrical Specifications, Standard Operating Conditions:

Freq. = 1200 - 1400 MHz, $V_{DD} = 50$ V, $I_{DQ} = 125$ mA, Pulse = 300 μ s, Duty = 10 %, $T_C = 25$ °

Parameter	Test Conditions	Symbol	Typ.	Units
RF Functional Tests				
Peak Input Power	$V_{DD} = 50$ V, $I_{DQ} = 125$ mA Pulse Width = 300 μ s, Duty Cycle = 10% $P_{OUT} = 500$ W	P_{OUT}	500	W
Power Gain		G_P	16	dB
Drain Efficiency		η_D	65	%
Pulse Droop		Droop	0.1	dB
Load Mismatch Stability		VSWR-S	5:1	-
Load Mismatch Tolerance		VSWR-T	10:1	-

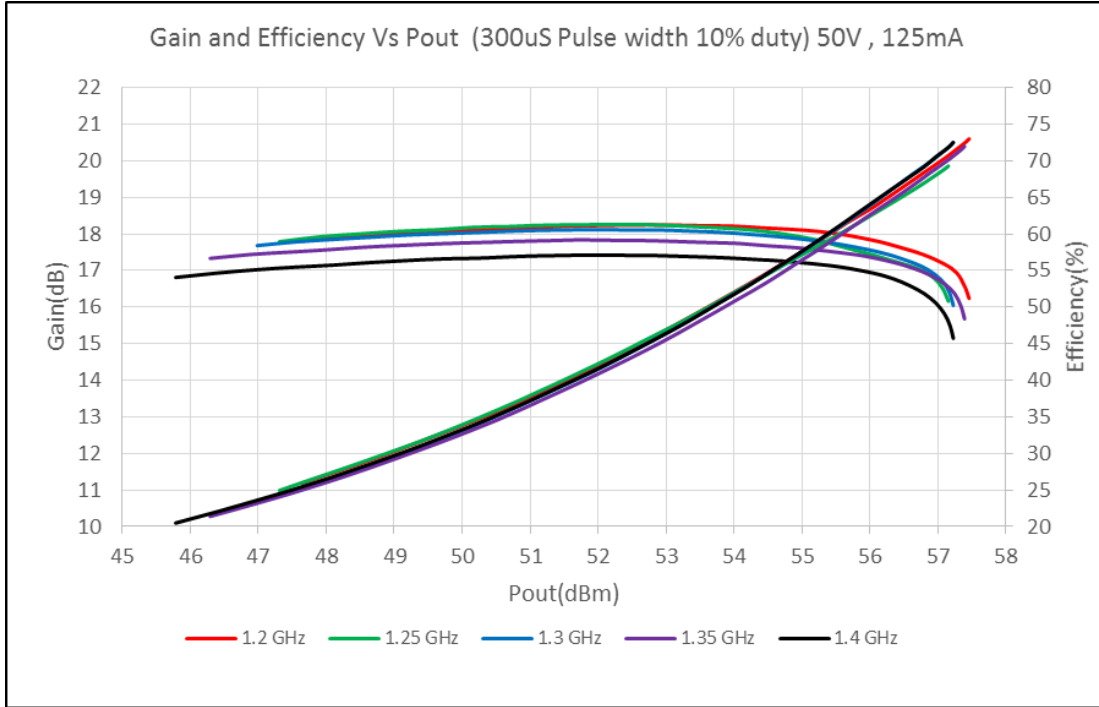
Electrical Characteristics: $T_A = 25^\circ\text{C}$

Parameter	Test Conditions	Symbol	Typ.	Units
DC Characteristics				
Drain-Source Leakage Current	$V_{GS} = -8$ V, $V_{DS} = 175$ V	I_{DS}	40	mA
Gate Threshold Voltage	$V_{DS} = 50$ V, $I_D = 10$ mA	$V_{GS(TH)}$	-1.9	V
Forward Transconductance	$V_{DS} = 5$ V, $I_D = 21$ mA	G_M	TBD	S
Dynamic Characteristics				
Input Capacitance	Not applicable - Input matched	C_{ISS}	N/A	pF
Output Capacitance	$V_{DS} = 50$ V, $V_{GS} = -8$ V, Freq. = 1 MHz	C_{OSS}	TBD	pF
Reverse Transfer Capacitance		C_{RSS}	TBD	pF

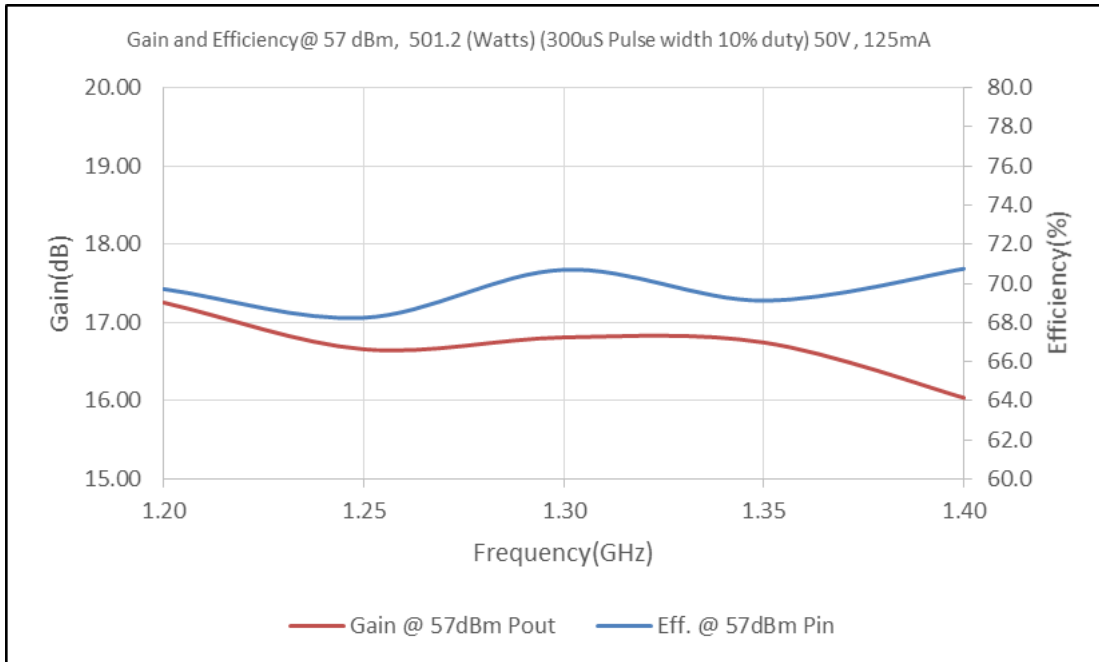
Thermal Characteristics

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance	$T_C = 85$ °C, $V_{DD} = 50$ V, $I_{DQ} = 125$ mA, $P_{OUT} = 500$ W Pulse Width = 2mSec, Duty Cycle = 20%	Θ_{JC}	0.33	°C/W

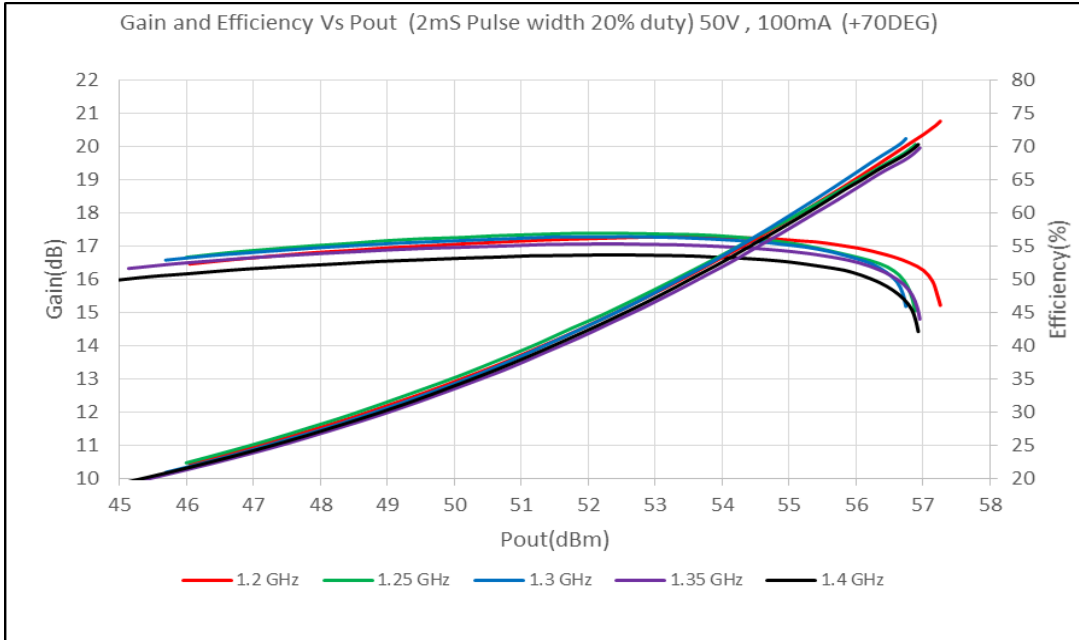
RF Gain & Efficiency Vs Pout



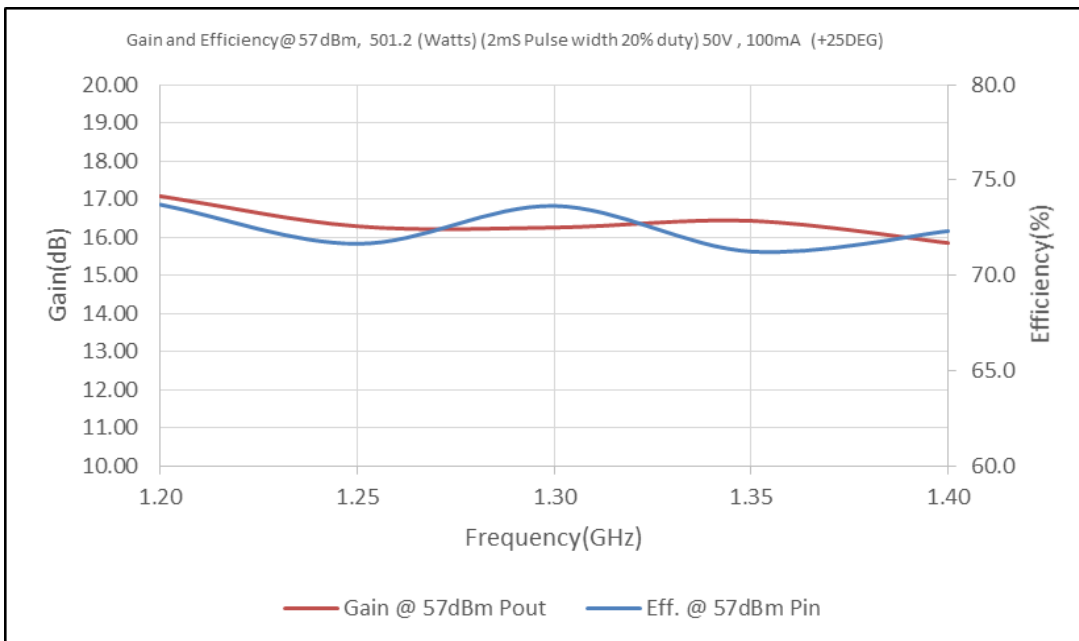
Gain and efficiency at 500W



RF Gain & Efficiency Vs Pout

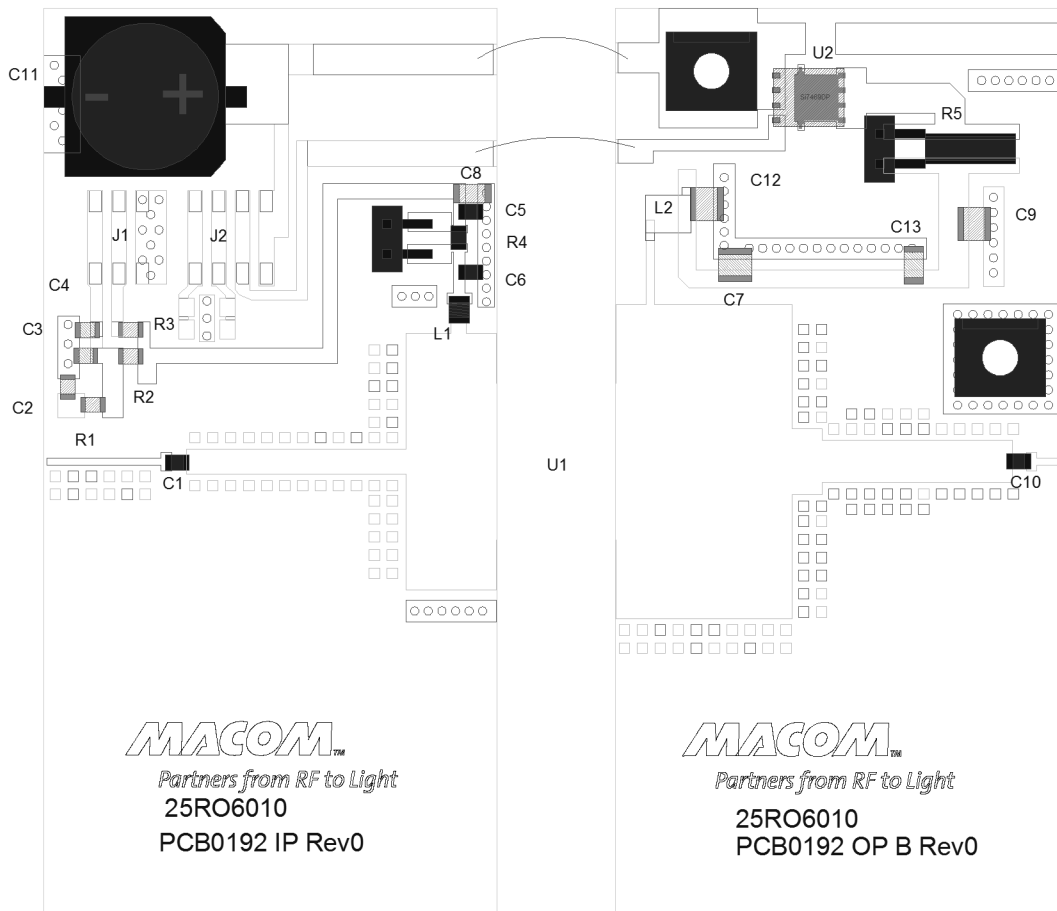


Gain and efficiency at 500W



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Demo circuit Board

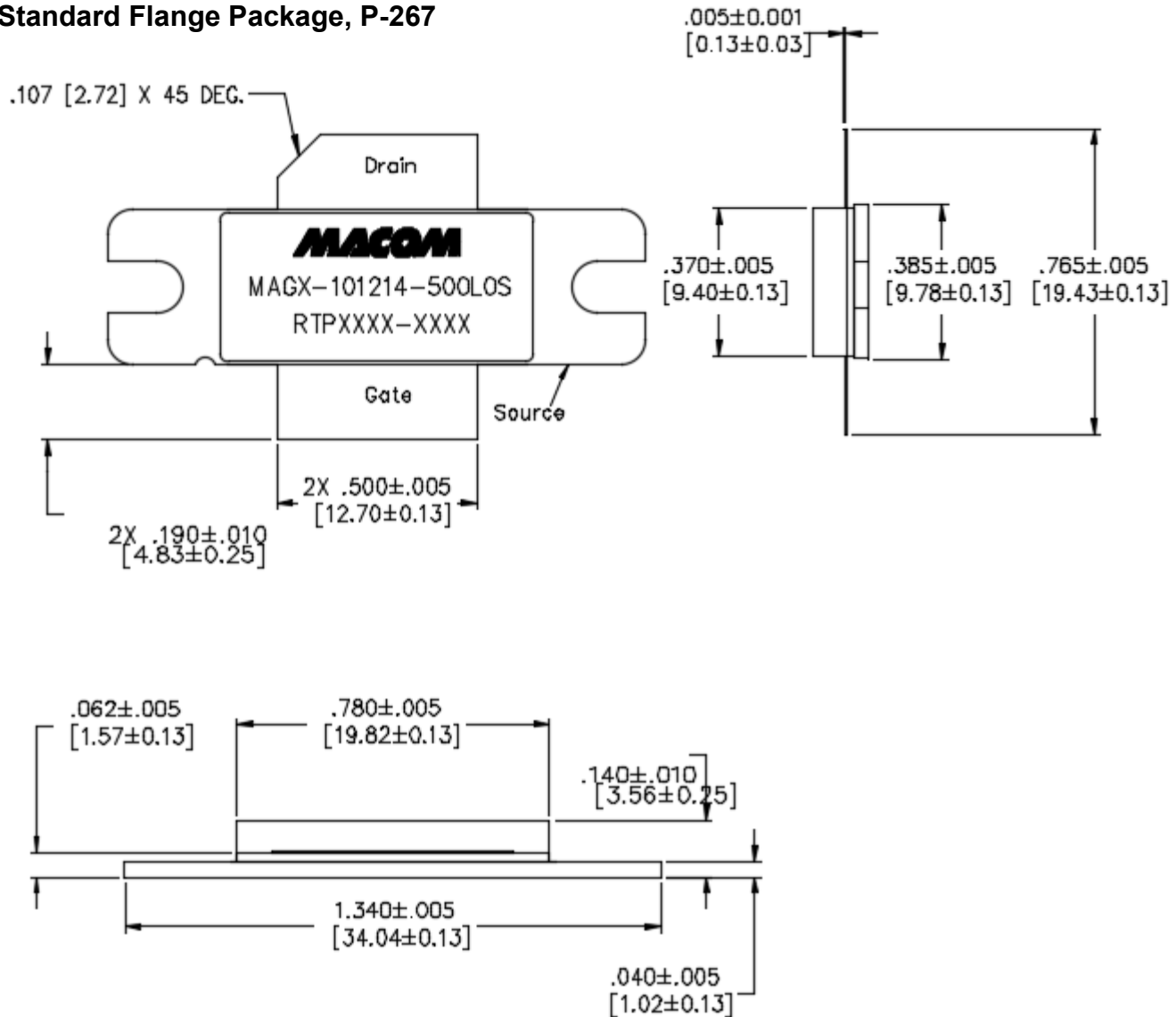


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Bill of materials

Reference	Qty.	Part Type	Value	Manufacturer	Part Number
PCB	1	Rogers 6010LM, 0.025in. Thk.	-	Avanti Circuits	PCB0192 Rev. 00
Base Plate	1	1.5x3"	-	Jones Machine	BP-0003-BIP3015VARIBR20
Base Plate	1	1.5x3"	-	Jones Machine	BP-0004-BIP3015VARIBR20
U1	1	GaN PA, MAGX-100914-500L0S	-	MACOM	MAGX-100914-500L00
U2	1	P-Channel MOSFET, 80-V	-	MACOM	Si7469DP
C1	1	Capacitor, 0805	36 pF	Passive Plus	0805N360GW251X
C2, C4	2	Capacitor, 0805	1000 pF	Murata	GRM219R72A102JA01D
C3	1	Capacitor, 0805	100 pF	Passive Plus	0805N101BW251T
C5, C6	2	Capacitor, 0805	20 pF	Passive Plus	0805N200BW251X
C7	1	Capacitor, 1111, 500V	43pF	Passive Plus	1111N430CW501XT
C8, C13	12	Capacitor, 1206, 100V	1uF	Murata	GRM31CR72A105K
C9	1	Capacitor	10 uF	TDK	
C10	1	Capacitor, 0805	56 pF	Passive Plus	0805N560GW251X
C11	1	Capacitor, Electrolytic, 80V	150uF	Panasonic	EEV-FK1K151Q
C12	1	Capacitor, 1111, 500V	1.2pF	Passive Plus	1111N1R2BW501XT
R1	1	Resistor, 0805	100 Ω	VIKING	CR-05FL7-100R
R2	1	Resistor, 0805	10 Ω	VIKING	CR-05FL7-10R
R3	1	Resistor, 0805	365 Ω	VIKING	CR-05FL7-365R
R4	1	Resistor, 0805	5.1 Ω	VIKING	CR-05FL7-5R1R
R5	1	Resistor, 7520	0.005 Ω	Susumu	RL7520WT-R005-F
L1	1	Inductor, 0805HQ	48 nH	Coilcraft	0805HQ-48NX_L_
L2	1	Inductor	2.5 nH	Coilcraft	A01T
J1	1	Top Mount Card Edge Conn., 3 Slot	-	AVX Interconnect	0091590003551906
J2	1	Top Mount Card Edge Conn., 4 Slot	-	AVX Interconnect	009159004551906

Outline Drawing
Standard Flange Package, P-267



CORRECT DEVICE SEQUENCING

TURNING THE DEVICE ON

1. Set V_{GS} to the pinch-off (V_P), typically -4V
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}

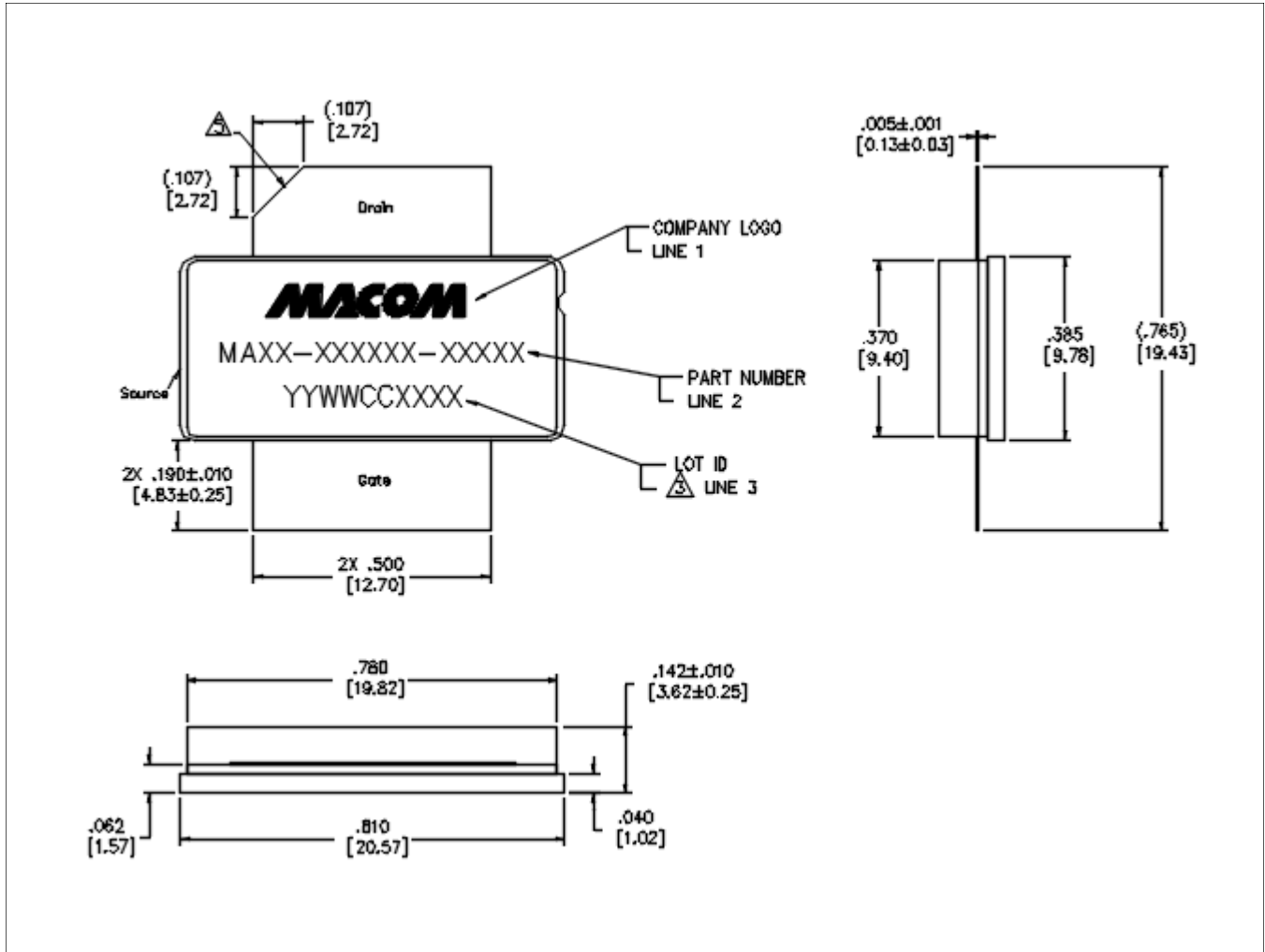
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Outline Drawing Earless Flange Package, P-285



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