High Power RF LDMOS Amplifier
375 W, 50 V, 925 - 960 MHz

MACOM PURE CARBIDE™

PTRA093608PV-V1
Rev. V1

Features

- Designed for Asymmetrical Doherty Application
- 48.8 dBm Average Output Power
- 375 W Peak Output Power
- Broadband internal input and output matching
- Low Thermal Resistance
- RoHS* Compliant

Applications

- Point-to-Point
- Infrastructure

Description

The PTRA093608PV1 is a LDMOS Amplifier designed for asymmetrical Doherty applications. The device is optimized for the frequency band of 925 to 960 MHz. Product is housed in a thermally-enhanced ceramic package.

Typical Doherty Performance:

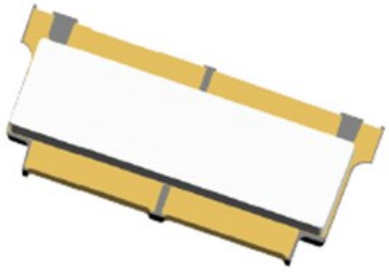
V_{DS} = 48 V, I_{DQm} = 300 mA, V_{GSpk}= 1.2 V
P_{OUT} = 48.8 dBm, T_A = 25°C
Performance in MACOM Doherty Application Fixture.
Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz, PAR 10 dB @ 0.01% CCDF.

Frequency (MHz)	Gain (dB)	Efficiency (%)	Output PAR (dB)	ACPR (dBc)
925	17.0	54.4	7.6	-28.7
942	17.1	54.0	7.6	-29.7
960	17.1	53.7	7.6	-30.5

Ordering Information

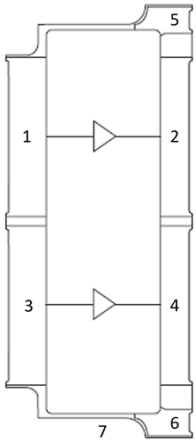
Part Number	Package
PTRA093608PV V1 R2	250 pc Tape and Reel[1]

1. See application note AN-0004525 for tape and reel information.



LG-31275PS-6

Functional Schematic



Pin Configuration

Pin #	Pin Name	Function
1	RF_{IN} / V_{G1}	RF Input / Gate (Main)
2	RF_{OUT} / V_{D1}	RF Output / Drain (Main)
3	RF_{IN} / V_{G2}	RF Input / Gate (Peak)
4	RF_{OUT} / V_{D2}	RF Output / Drain (Peak)
5, 6	VBW Lead	Drain Video Decoupling. No DC Bias
7	Flange[2]	Ground / Source

2. The flange on the package bottom must be connected to RF, DC and thermal ground.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

RF Electrical Characterization:

Freq. = 960 MHz, P_{OUT} = 48.8 dBm, T_A = 25°C, V_{DS} = 48 V, I_{DQm} = 300 mA, V_{GSpk} = 1.2 V
Note: Performance in MACOM Doherty Application Fixture. Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz, PAR 10 dB @ 0.01% CCDF.

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	—	Gp	—	16.3	—	dB
Drain Efficiency	—	η	—	53.1	—	%
Output CCDF @ 0.01%	—	PAR	—	7.6	—	dB
Adjacent Channel Power	—	ACP	—	-30	—	dBc
Input Return Loss	—	IRL	—	-14	—	dB
Gain Flatness	—	G_F	—	0.2	—	dB

RF Electrical Test Specifications:

Freq. = 960 MHz, P_{OUT} = 48.8 dBm, T_A = 25°C, V_{DS} = 48 V, I_{DQm} = 300 mA, V_{GSpk} = 1.2 V
Note: Performance in MACOM Doherty Production Test Fixture. Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz, PAR 10 dB @ 0.01% CCDF.

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	—	Gp	15	16	—	dB
Drain Efficiency	—	η	50	53.5	—	%
Output CCDF @ 0.01%	—	PAR	7.2	7.6	—	dB
Adjacent Channel Power	—	ACP	—	-29.7	-25	dBc

DC Electrical Characteristics T_A = +25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Main Amplifier						
Gate-Source Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GLK}	—	—	1	µA
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 360 mA	V_{GSQ}	—	3.7	—	V
On Resistance	V_{GS} = 0 V, V_{DS} = 0.1 V, I_D = 100 mA	R_{ON}	—	0.13	—	Ω
Peak Amplifier						
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	—	—	1	µA
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 720 mA	V_{GSQ}	—	1.2	—	V
On Resistance	V_{GS} = 0 V, V_{DS} = 0.1 V, I_D = 100 mA	R_{ON}	—	0.09	—	Ω

Recommended Operating Voltages

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain Operating Voltage	—	V	—	—	50
Gate Quiescent Voltage Main Peak	 V_{DS} = 50 V, I_D = 300 mA V_{DS} = 50 V, I_D = 0 mA	V	 3.6 0.8	 3.7 1.2	 3.8 1.6

Absolute Maximum Ratings[5,6,7,8.9]

Parameter	Absolute Maximum
Drain Source Voltage, V_{DS}	105 V
Gate Source Voltage, V_{GS}	-6 to 12 V
Storage Temperature Range	-65°C to +150°C
Absolute Maximum Channel Temperature	+225°C

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation above maximum operating conditions.
7. Operating at drain source voltage V_{DS} < 55V will ensure MTTF > 2.51 x 10^6 hours.
8. Operating at nominal conditions with T_{CH} ≤ 225°C will ensure MTTF > 2.51 x 10^6 hours.
9. MTTF may be estimated by the expression MTTF (hours) = A $e^{[B + C/(T+273)]}$ where *T* is the channel temperature in degrees Celsius., *A* = 1.93, *B* = -45.31, and *C* = 29,585.

Thermal Characteristics[10]

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance (main, T_{CASE} = 70°C, 76 W CW) Thermal Resistance (main, T_{CASE} = 70°C)	P_{DISS} = 76 W T_C = +70°C	R_{θ}(JC)	0.53 0.64	°C/W

10. Case temperature measured using thermocouple embedded in heat-sink. Contact local applications support team for more details on this measurement.

Bias Sequencing

Bias ON

1. Ensure RF is turned off
2. Apply pinch-off voltage of -5 V to the gate
3. Apply nominal drain voltage
4. Bias gate to desired quiescent drain current
5. Apply RF

Bias OFF

1. Turn RF off
2. Apply pinch-off voltage to the gate
3. Turn-off drain voltage
4. Turn-off gate voltage

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Nitride Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

TO-288-8L Package Dimensions

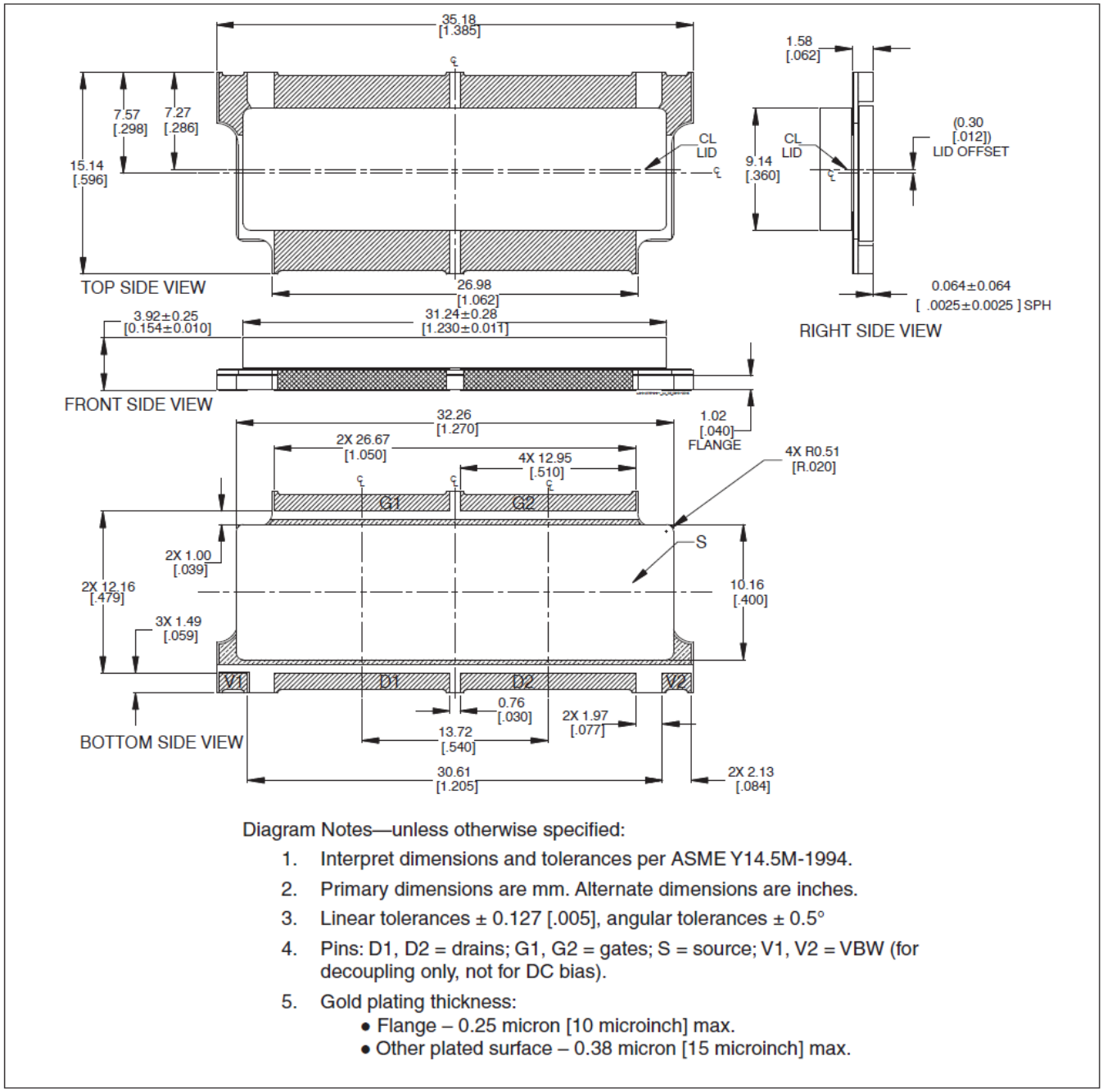


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. Linear tolerances ± 0.127 [.005], angular tolerances ± 0.5°
4. Pins: D1, D2 = drains; G1, G2 = gates; S = source; V1, V2 = VBW (for decoupling only, not for DC bias).
5. Gold plating thickness:
   - Flange – 0.25 micron [10 microinch] max.
   - Other plated surface – 0.38 micron [15 microinch] max.