

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:

$V_{DS} = 48 \text{ V}$, $I_{DQm} = 300 \text{ mA}$, $V_{GSpk} = 1.2 \text{ V}$

$P_{OUT} = 48.8 \text{ dBm}$, $T_A = 25^\circ\text{C}$

Performance in MACOM Doherty Application Fixture.

Single Carrier- W-CDMA Channel Bandwidth 3.84 MHz,

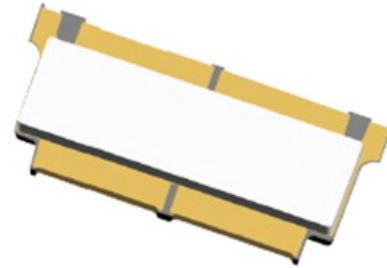
PAR 10 dB @ 0.01% CCDF.

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

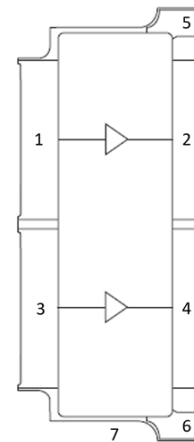
Part Number	Package
PTRA093608PV V1 R2	250 pc Tape and Reel ¹

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.

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

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RF Electrical Characterization:

Freq. = 960 MHz, $P_{OUT} = 48.8$ dBm, $T_A = 25^\circ\text{C}$, $V_{DS} = 48$ 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, $T_A = 25^\circ\text{C}$, $V_{DS} = 48$ 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 $T_A = +25^\circ\text{C}$

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

Recommended Operating Voltages

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

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 $MTTF > 2.51 \times 10^6$ hours.
8. Operating at nominal conditions with $T_{CH} \leq 225^\circ C$ will ensure $MTTF > 2.51 \times 10^6$ hours.
9. MTTF may be estimated by the expression $MTTF \text{ (hours)} = A e^{\frac{B+C}{T+273}}$ where T is the channel temperature in degrees Celsius.,
 $A = 1.93$, $B = -45.31$, and $C = 29,585$.

Thermal Characteristics¹⁰

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

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.

Technical drawing of a cylindrical component, showing four views: TOP SIDE VIEW, FRONT SIDE VIEW, RIGHT SIDE VIEW, and BOTTOM SIDE VIEW. The drawing includes dimensions in inches and millimeters, and labels for various features.

TOP SIDE VIEW: Shows the top of the component. Dimensions include a total width of 35.18 [1.385], a central width of 26.98 [1.062], and a total height of 15.14 [.596]. The central feature is labeled CL LID.

FRONT SIDE VIEW: Shows the front of the component. Dimensions include a total length of 31.24 ± 0.28 [1.230 ± 0.011], a central length of 32.26 [1.270], and a total height of 10.16 [.400]. The central feature is labeled CL LID. The bottom flange is labeled 4X R0.51 [R.020].

RIGHT SIDE VIEW: Shows the right side of the component. Dimensions include a total width of 1.58 [.062], a central width of 9.14 [.360], and a total height of 10.16 [1.062]. The central feature is labeled CL LID. The bottom flange is labeled 4X R0.51 [R.020].

BOTTOM SIDE VIEW: Shows the bottom of the component. Dimensions include a total width of 30.61 [1.205], a central width of 13.72 [.540], and a total height of 10.16 [1.062]. The central feature is labeled CL LID. The bottom flange is labeled 4X R0.51 [R.020].

Labels and Features:

- CL LID: Central Lid
- G1, G2: Grooves
- S: Slot
- B1, B2: Bore
- V1, V2: Vents
- FLANGE: Bottom flange
- 4X R0.51 [R.020]: Four radii of 0.51 inches
- 0.064 ± 0.064 [.0025 ± 0.0025] SPH: Spherical feature
- (0.30 [.012]) LID OFFSET: Lid offset

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 $\pm 0.5^\circ$
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.

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