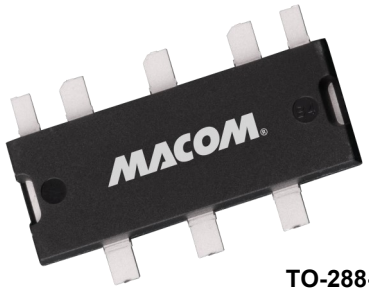
High Power RF GaN Amplifier
600 W, 48 V, 2500 - 2700 MHz

MACOM PURE CARBIDE™

MAPC-C27600-CP
Rev. V1

Features

- GaN on SiC HEMT Technology
- Designed for Asymmetrical Doherty Application
- 49.3 dBm Average Output Power
- 600 W Peak Output Power
- Input & Output Pre-matched Device
- Low Thermal Resistance
- 100% DC & RF Tested
- RoHS* Compliant



TO-288-8L

Applications

- Point-to-Point
- Infrastructure

Description

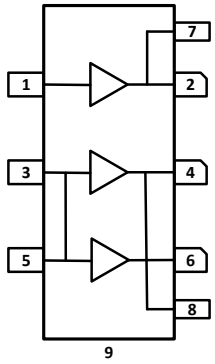
The MAPC-C27600-CP is a GaN on Silicon Carbide HEMT Amplifier designed for asymmetrical Doherty applications. The device is optimized for the frequency band of 2500 to 2700 MHz. Product is housed in an over-molded TO-package.

Typical Doherty Performance:

V_{DS} = 48 V, I_{DQm} = 360 mA, V_{GSpk}= 720 mA -1.5 V
P_{OUT} = 49.3 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)
2496	14.7	54	8.7	-29
2593	15	54	9.0	-31
2690	15	54	8.5	-32

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, 5	RF_{IN} / V_{G2}	RF Input / Gate (Peak)
4, 6	RF_{OUT} / V_{D2}	RF Output / Drain (Peak)
7, 8	VBW Lead	Drain Video Decoupling. No DC Bias
9	Flange[2]	Ground / Source

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

Ordering Information

Part Number	Package
MAPC-C27600-CPTR1	50 pc Tape and Reel[1]
MAPC-C27600-CPTR2	250 pc Tape and Reel[1]
MAPC-C27600-CPSB1	Sample Board

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

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

RF Electrical Characterization:

Freq. = 2690 MHz, P_{OUT} = 49.3 dBm, T_A = 25°C, V_{DS} = 48 V, I_{DQm} = 360 mA, V_{GSpk} = 720 mA –1.5 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	—	15	—	dB
Drain Efficiency	—	η	—	54	—	%
Output CCDF @ 0.01%	—	PAR	—	8.5	—	dB
Adjacent Channel Power	—	ACP	—	-32	—	dBc
Input Return Loss	—	IRL	—	-18	—	dB
Gain Flatness	—	G_F	—	0.5	—	dB
Gain Variation (-40°C to +105°C)	—	ΔG	—	0.02	—	dB/°C
Power Variation (-40°C to +105°C)	Pulsed 10% DC	ΔP_{3dB}	—	0.006	—	dB/°C
Ruggedness: Output Mismatch	All phase angles	Ψ	VSWR =10:1,No Device Damage			

RF Electrical Test Specifications:

Freq. = 2690 MHz, P_{OUT} = 49.3 dBm, T_A = 25°C, V_{DS} = 48 V, I_{DQm} = 360 mA, V_{GSPK} = 720 mA –1.5 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	12	14	—	dB
Drain Efficiency	—	η	41	52	—	%
Output CCDF @ 0.01%	—	PAR	6.9	8.4	—	dB
Adjacent Channel Power	—	ACP	—	-31	-22	dBc

DC Electrical Characteristics T_A = +25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Main Amplifier						
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	—	-0.054	—	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 100 V	I_{GLK}	-2.5	—	—	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 36 mA	V_T	-3.8	-2.8	—	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 360 mA	V_{GSQ}	—	-3.2	—	V
On Resistance	V_{GS} = 0 V, V_{DS} = 0.1 V, I_D = 100 mA	R_{ON}	—	0.093	—	Ω
Peak Amplifier						
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLK}	—	-0.18	—	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 100 V	I_{GLK}	-5	—	—	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 72 mA	V_T	-3.8	-2.8	—	V
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 720 mA	V_{GSQ}	—	-3.2	—	V
On Resistance	V_{GS} = 0 V, V_{DS} = 0.1 V, I_D = 100 mA	R_{ON}	—	0.044	—	Ω

Recommended Operating Voltages

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain Operating Voltage	—	V	—	—	50
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 360 mA	V	-3.6	-2.9	-2.1

Moisture Sensitivity Level

Level	Test Standard	Package Temperature	Unit
3	IPC/JEDEC J-STD-020	260	°C

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

Parameter	Absolute Maximum
Drain Source Voltage, V_{DS}	100 V
Gate Source Voltage, V_{GS}	-10 to 2 V
Gate Current (Main), I_G	36 mA
Gate Current (Peak), I_G	72 mA
Storage Temperature Range	-65°C to +150°C
Case Operating Temperature Range	-40°C to +125°C
Channel Operating Temperature Range, T_{CH}	-40°C to +225°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 $T_{CH} \leq 225°C$ 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 using Infrared Measurement of Die Surface Temperature	P_{DISS} = 131 W T_C = +85°C, T_{CH} = +225°C	R_{θ}(IR)	1.07	°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

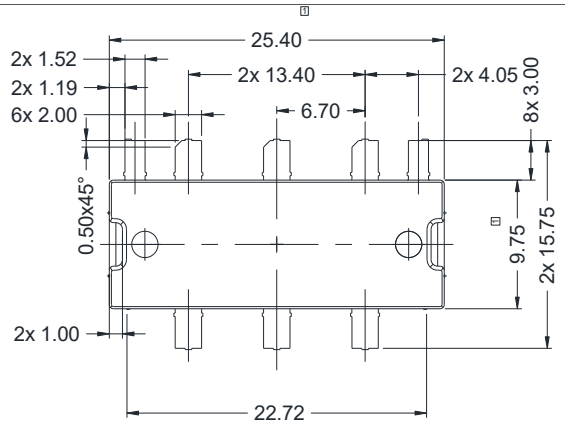
Handling Procedures

Please observe the following precautions to avoid damage:

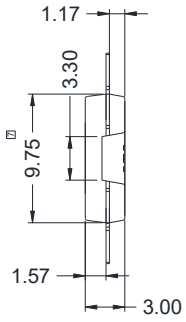
Static Sensitivity

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.

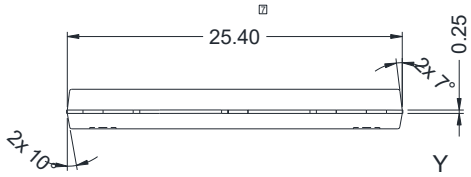
TO-288-8L Package Dimensions



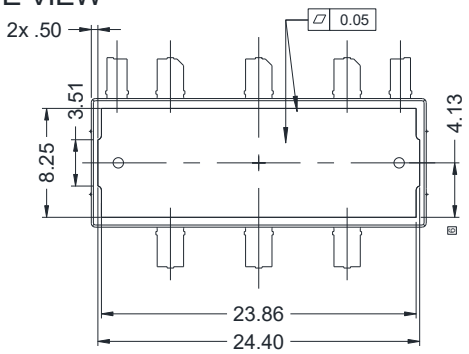
TOP VIEW



END VIEW



SIDE VIEW



BOTTOM VIEW

1. Mold/dam bar/metal protrusion of 0.30 mm max per side not included.
2. Metal protrusions connected to source and shall not exceed 0.10 mm max.
3. Fillets and radii: Unless otherwise noted all radii are 0.3 mm max.
4. Molded package Ra 1.2-1.6 µm.
5. All metal surfaces tin pre-plated, except area of cut.
6. Exposed metal surface tin plated, may not be covered by mold compound.
7. Does not include mold/dam bar/metal protrusion.
8. Interpret dimensions and tolerances per ISO 8015.
9. Dimensions are in mm.
10. All tolerances are ± 0.1 mm unless specified otherwise.