GaN Amplifier Pallet, 80 V, 2 KW
960 - 1215 MHz

MACOM PURE CARBIDE™

MAPC-P1008
Rev. V2

Features

- *MACOM PURE CARBIDE*™ Amplifier Series
- Suitable for Linear & Saturated Applications
- CW & Pulsed Operation: 2 KW Output Power
- Input and Output Matched to 50 Ω
- 80 V Operation
- 100% RF Tested

Applications

- Avionics

Description

The MAPC-P1008 is a 50 Ohm matched high power GaN on Silicon Carbide HEMT D-mode pallet amplifier suitable for 960 - 1215 MHz frequency operation. The device supports pulsed operation with output power levels of 2 KW (63.0 dBm).

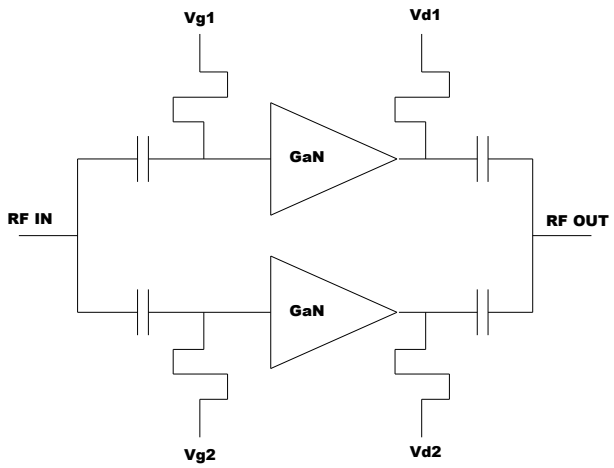
Typical Performance:

- Measured at 2.5 dB compression, 100 µs pulse width, 1% duty cycle

- V_{DS} = 80 V, T_C = 25°C, I_{DQ} = 400 mA

Frequency (MHz)	Output Power (dBm)	Gain (dB)	η_D (%)
960	64.7	16.8	57
1100	63.6	15.9	57
1215	63.7	15.8	64

Functional Schematic



Pin Configuration

Pin Name	Function
V_{D1},V_{D2}	Drain Voltage
V_{G1},V_{G2}	Gate Voltage
RF IN	RF Input
RF OUT	RF Output

Ordering Information

Part Number	Configuration
MAPC-P1008-AB000	Microstrip RF Launch
MAPC-P1008-ABSB1	SMA Connectorized

RF Electrical Characteristics: T_C = 25°C, V_{DS} = 80 V, I_{DQ} = 400 mA, Note: Performance in MACOM Evaluation Test Fixture, 50 Ω system

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Small Signal Gain	Pulsed[1], 960 MHz 1100 MHz 1215 MHz	G_{SS}	—	18.0	—	dB
Power Gain	Pulsed[1], 2.5 dB Gain Compression, 960 MHz 1100 MHz 1215 MHz	G_{SAT}	—	15.5 15.6 15.0	—	dB
Saturated Drain Efficiency	Pulsed[1], 2.5 dB Gain Compression, 960 MHz 1100 MHz 1215 MHz	η_{SAT}	—	58.4 57.0 66.4	—	%
Saturated Output Power	Pulsed[1], 2.5 dB Gain Compression, 960 MHz 1100 MHz 1215 MHz	P_{SAT}	—	65.0 63.9 63.9	—	dBm
Power Gain	Pulsed[1], P_{OUT} = 63 dBm, 960 MHz 1100 MHz 1215 MHz	G_P	—	17.5 16.9 16.6	—	dB
Drain Efficiency	Pulsed[1], P_{OUT} = 63 dBm, 960 MHz 1100 MHz 1215 MHz	η	—	50.0 52.5 61.0	—	%
Input Return Loss	Pulsed[1], P_{OUT} = 63 dBm, 960 MHz 1100 MHz 1215 MHz	IRL	—	- 5.7 - 5.5 - 4.7	—	dB
Gain Flatness	Pulsed[1], P_{OUT} = 63 dBm, 960 - 1215 MHz	ΔG	—	+/- 0.4	—	dB
Phase Variation	Pulsed[1], P_{OUT} = 63 dBm, 960 - 1215 MHz	$\Delta\phi$	—	+/- 15	—	Deg
Ruggedness: Output Mismatch	All phase angles	Ψ	VSWR = 10:1, No Damage			

RF Electrical Specifications: T_A = 25°C, V_{DS} = 80 V, I_{DQ} = 400 mA, Note: Performance in MACOM Production Test Fixture, 50 Ω system

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	Pulsed[1], P_{IN} = 48 dBm, 960 MHz, 1100 MHz, 1215 MHz	G_P	—	15.5 15.6 15.0	—	dB
Gain Flatness	Pulsed[1], P_{IN} = 35 dBm, 960 - 1215 MHz	ΔG	—	+/- 0.6	—	dB
Drain Efficiency	Pulsed[1], P_{IN} = 48 dBm, 960 MHz, 1100 MHz, 1215 MHz	η	—	56.5 56.8 63.9	—	%
Input Return Loss	Pulsed[1], P_{IN} = 46.6 dBm, 960 MHz, 1100 MHz, 1215 MHz	IRL	—	- 4.5 - 4.5 - 4.5	—	dB

1. Pulse details: 100 µs pulse width, 1% duty cycle.

Absolute Maximum Ratings[2,3,4,5,6]

Parameter	Absolute Maximum
Output Power, P_{OUT}	66 dBm
Drain Source Voltage, V_{DS}	120 V
Storage Temperature Range	-40°C to +150°C
Case Operating Temperature Range	-40°C to +85°C
Channel Operating Temperature Range, T_{CH}	-40°C to +225°C
Absolute Maximum Channel Temperature	+250°C

2. Exceeding any one or combination of these limits may cause permanent damage to this device.
3. MACOM does not recommend sustained operation above maximum operating conditions.
4. Operating at drain source voltage $V_{DS} \leq 120V$ will ensure MTTF > 2 x 10^6 hours.
5. Operating at nominal conditions with $T_{CH} \leq 225°C$ will ensure MTTF > 2 x 10^6 hours.
6. 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, B = -38.215, and C = 26,343.

RF Output Stage Thermal Characteristics[7]

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance using Finite Element Analysis	V_{DS} = 120 V, T_C = 85°C, T_{CH} = 225°C	R_{θ}(FEA)	0.057	°C/W
Thermal Resistance using Infrared Measurement of Die Surface Temperature	V_{DS} = 120 V, T_C = 85°C, T_{CH} = 225°C	R_{θ}(IR)	0.057	°C/W

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

Handling Procedures

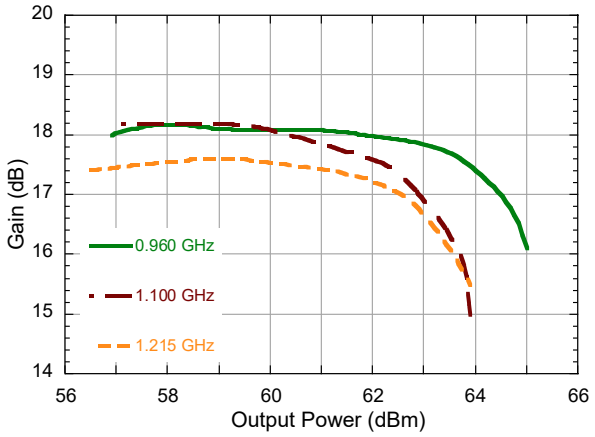
Please observe the following precautions to avoid damage:

Static Sensitivity

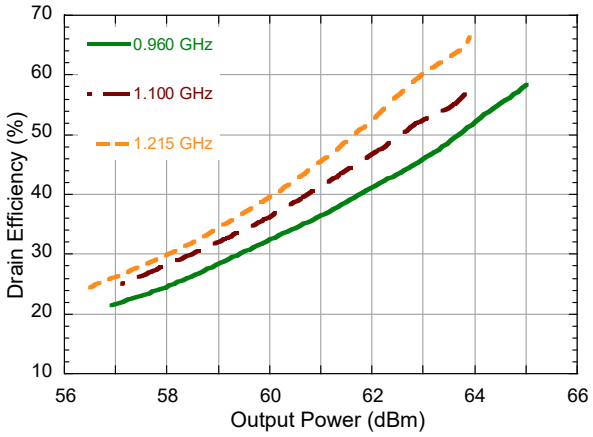
Gallium Nitride Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves:
Pulsed[1], V_{DS} = 80 V, I_{DQ} = 400 mA, T_C = 25°C (Unless Otherwise Noted)

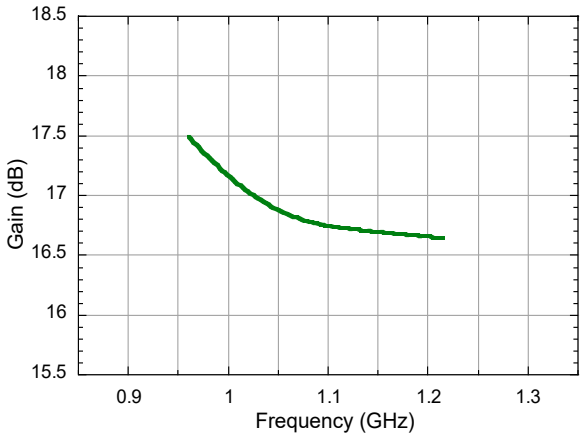
Gain vs. Output Power and Frequency



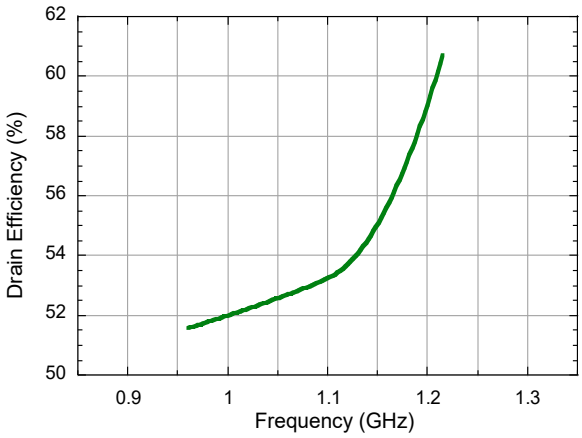
Drain Efficiency vs. Output Power and Frequency



Gain vs. Frequency, Pin = 46.6 dBm



Drain Efficiency vs. Frequency, Pin = 46.6 dBm



Outline Drawing