

# GaN Amplifier Pallet 50 V, 400 W

## 1.30 - 1.85 GHz



**MACOM PURE CARBIDE™**

**MAPC-P1015**

Rev. V1

### Features

- MACOM PURE CARBIDE™ Amplifier Series
- Suitable for Linear & Saturated Applications
- CW & Pulsed Operation: 400 W Output Power
- Input and Output Matched to 50 Ohms
- Integrated Bias Controller/Sequencer
- 50 V Operation
- 100% RF Tested

### Applications

- L-Band RADAR

### Description

The MAPC-P1015 is a 50 Ohm matched high power GaN on Silicon Carbide HEMT D-mode pallet amplifier suitable for 1.30 - 1.85 GHz frequency operation. The device supports pulsed operation with output power levels of 400 W (56 dBm).

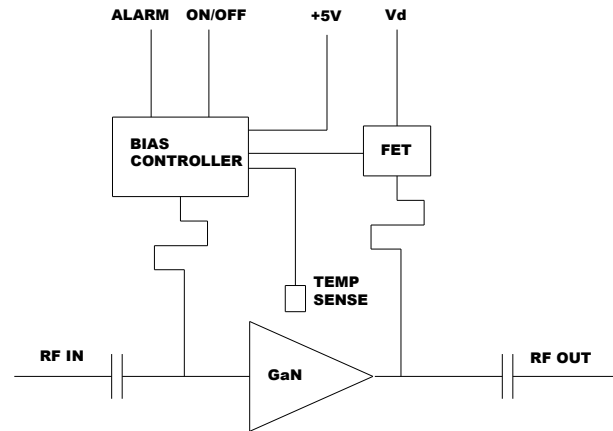
The MAPC-P1015 uses an on board bias controller which greatly simplifies system integration. The bias controller incorporates MACOM's proprietary Power Management IC (PMIC) which features full bias sequencing, temperature compensation, on/off control, and temperature alarm. A TTL High enables the pallet while a TTL Low turns it off.

### Typical Performance:

- Measured at 2.5 dB compression, 100  $\mu$ s pulse width, 10% duty cycle
- $V_{DS} = 50$  V,  $T_C = 25^\circ$ C

Frequency (GHz)	Output Power (dBm)	Gain (dB)	$\eta_D$ (%)
1.30	56.7	14.6	60
1.60	56.2	14.2	56
1.85	56.4	14.4	58

### Functional Schematic



### DC/Controller Pin Configuration

Pin #	Pin Name	Function
1, 2	$V_D$	Drain Voltage
3, 4, 6	GND	Ground
5	+5V	Controller Supply
7	On/Off	Pallet Enable/ Blanking
8	Alarm	Alarm Output

### RF Interface

Pin #	Pin Name	Function
11	RF <sub>IN</sub>	RF Input
12	RF <sub>OUT</sub>	RF Output
13, 14, 15, 16	GND	Ground

### Ordering Information

Part Number	Configuration
MAPC-P1015-AB000	Microstrip RF Launch

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### RF Electrical Characteristics: $T_C = 25^\circ\text{C}$ , $V_{DS} = 50\text{ V}$

Note: Performance in MACOM Evaluation Test Fixture, 50  $\Omega$  system

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Small Signal Gain	Pulsed <sup>1</sup> 1.30 GHz, 1.60 GHz, 1.85 GHz	$G_{SS}$	—	16.5	—	dB
Power Gain	Pulsed <sup>1</sup> , 2.5 dB Gain Compression 1.30 GHz 1.60 GHz 1.85 GHz	$G_{SAT}$	—	14.6 14.2 14.4	—	dB
Saturated Drain Efficiency	Pulsed <sup>1</sup> , 2.5 dB Gain Compression 1.30 GHz 1.60 GHz 1.85 GHz	$\eta_{SAT}$	—	60 56 58	—	%
Saturated Output Power	Pulsed <sup>1</sup> , 2.5 dB Gain Compression 1.30 GHz 1.60 GHz 1.85 GHz	$P_{SAT}$	—	56.7 56.2 56.4	—	dBm
Power Gain	Pulsed <sup>1</sup> , $P_{OUT} = 56\text{ dBm}$ 1.30 GHz 1.60 GHz 1.85 GHz	$G_P$	—	16.0 15.0 16.5	—	dB
Drain Efficiency	Pulsed <sup>1</sup> , $P_{OUT} = 56\text{ dBm}$ 1.30 GHz 1.60 GHz 1.85 GHz	$\eta$	—	58 54 55	—	%
Input Return Loss	Pulsed <sup>1</sup> , $P_{OUT} = 56\text{ dBm}$ 1.30 GHz, 1.60 GHz, 1.85 GHz	IRL	—	-6	—	dB
Gain Flatness	Pulsed <sup>1</sup> , $P_{OUT} = 56\text{ dBm}$ , 1.30 - 1.85 GHz	$\Delta G$	—	+/- 0.75	—	dB
Phase Variation	Pulsed <sup>1</sup> , $P_{OUT} = 56\text{ dBm}$ , 1.30 - 1.85 GHz	$\Delta\phi$	—	+/- 10	—	Deg
Ruggedness: Output Mismatch	All phase angles	$\Psi$	VSWR = 10:1, No Damage			

### RF Electrical Specifications: $T_A = 25^\circ\text{C}$ , $V_{DS} = 50\text{ V}$

Note: Performance in MACOM Production Test Fixture, 50  $\Omega$  system

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	Pulsed <sup>1</sup> , $P_{IN} = 42\text{ dBm}$ 1.30 GHz 1.60 GHz 1.85 GHz	$G_P$	—	15.5 14.5 16.0	—	dB
Gain Flatness	Pulsed <sup>1</sup> , $P_{IN} = 42\text{ dBm}$ , 1.30 - 1.85 GHz	$\Delta G$	—	+/- 0.75	—	dB
Drain Efficiency	Pulsed <sup>1</sup> , $P_{IN} = 42\text{ dBm}$ 1.30 GHz 1.60 GHz 1.85 GHz	$\eta$	—	58 54 55	—	%
Input Return Loss	Pulsed <sup>1</sup> , $P_{IN} = 45\text{ dBm}$ 1.30 GHz, 1.60 GHz, 1.85 GHz	IRL	—	-6	—	dB

1. Pulse details: 100  $\mu\text{s}$  pulse width, 10% duty cycle.

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### Absolute Maximum Ratings<sup>2,3,4,5,6</sup>

Parameter	Absolute Maximum
Output Power, P <sub>OUT</sub>	500 W
Drain Source Voltage, V <sub>DS</sub>	65 V
Storage Temperature Range	-40°C to +150°C
Case Operating Temperature Range	-40°C to +85°C
Channel Operating Temperature Range, T <sub>CH</sub>	-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<sub>DS</sub> ≤ 55 V will ensure MTTF > 2 x 10<sup>6</sup> hours.
5. Operating at nominal conditions with T<sub>CH</sub> ≤ 225°C will ensure MTTF > 2 x 10<sup>6</sup> hours.
6. MTTF may be estimated by the expression MTTF (hours) = A e<sup>[B + C/(T+273)]</sup>, where T is the channel temperature in degrees Celsius, A = 1, B = -38.215, and C = 26,343.

### RF Output Stage Thermal Characteristics<sup>7</sup>

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance using Finite Element Analysis	V <sub>DS</sub> = 50 V, T <sub>C</sub> = 85°C, T <sub>CH</sub> = 225°C	R <sub>θ</sub> (FEA)	0.55	°C/W
Thermal Resistance using Infrared Measurement of Die Surface Temperature	V <sub>DS</sub> = 50 V, T <sub>C</sub> = 85°C, T <sub>CH</sub> = 225°C	R <sub>θ</sub> (IR)	0.44	°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:

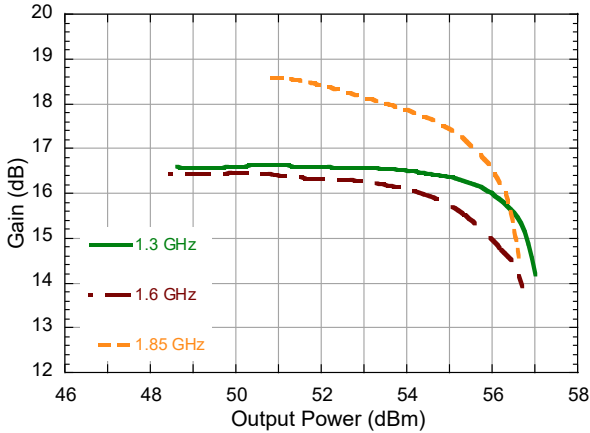
### Static Sensitivity

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.

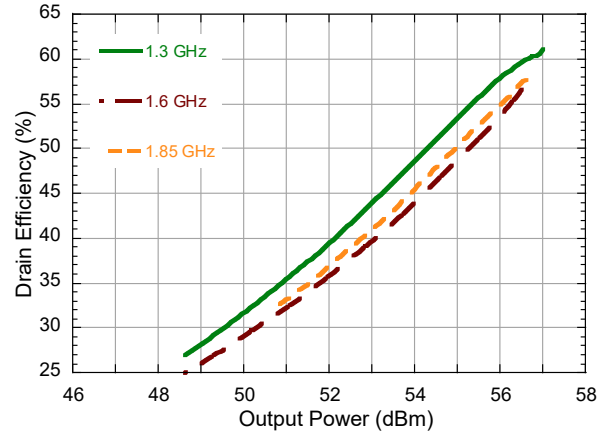
Typical Performance Curves

Pulsed<sup>1</sup>,  $V_{DS} = 50\text{ V}$ ,  $I_{DQ} = 250\text{ mA}$ ,  $T_C = 25^\circ\text{C}$  (Unless Otherwise Noted)

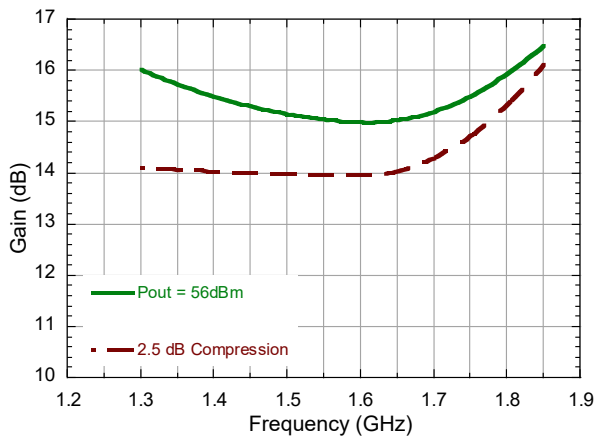
Gain vs. Output Power and Frequency



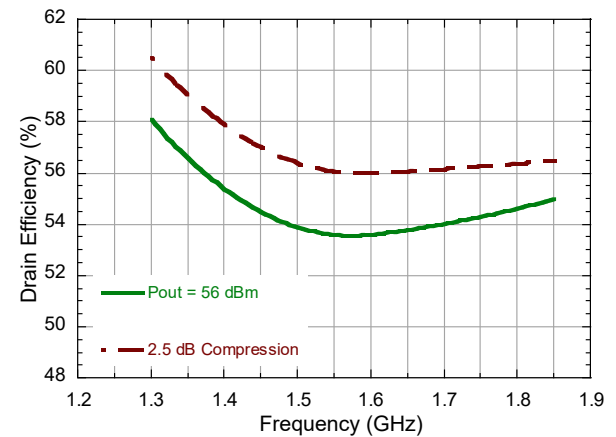
Drain Efficiency vs. Output Power and Frequency



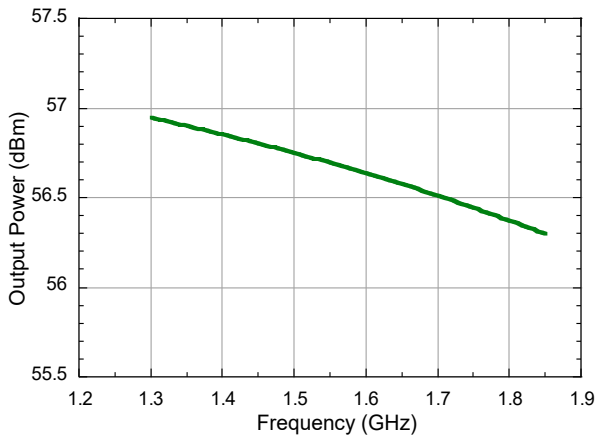
Gain vs. Frequency



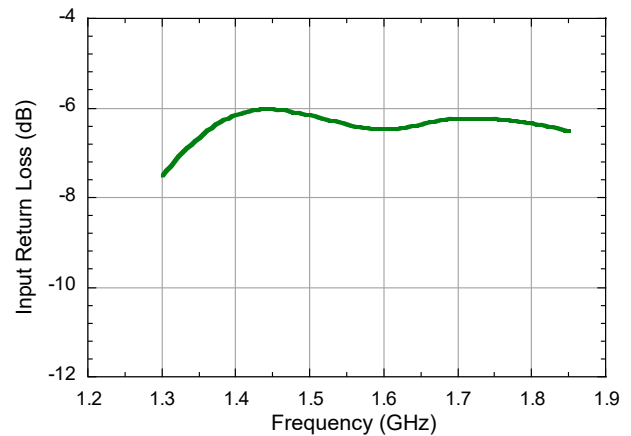
Drain Efficiency vs. Frequency



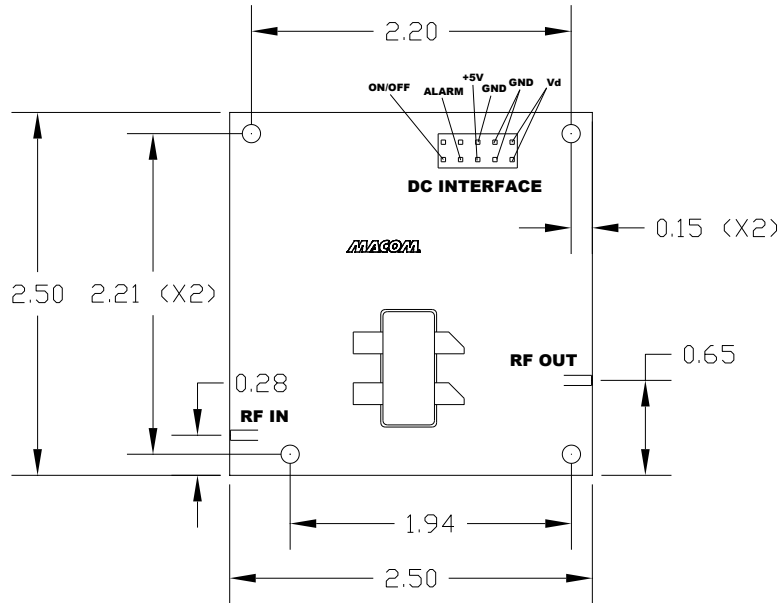
Output Power vs. Frequency, 2.5dB Compression



IRL vs. Frequency, 2.5dB Compression



Outline Drawing



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