Features

- *MACOM PURE CARBIDE*™ Amplifier Series
- Suitable for Linear & Saturated Applications
- Pulsed Operation: 120 W Output Power
- Input and Output Matched to 50 Ohms
- High gain, 2-Stage Amplifier
- 50 V Operation
- 100% RF Tested
- End-Use Statement Required

Applications

- S-Band RADAR

Description

The MAPC-P1017 is a 2-stage, 50 Ohm matched high power GaN on Silicon Carbide HEMT D-mode pallet amplifier suitable for 3.0 - 3.6 GHz frequency operation. This pallet includes isolator and dual directional coupler following 2nd stage amplifier. It supports pulsed operation.

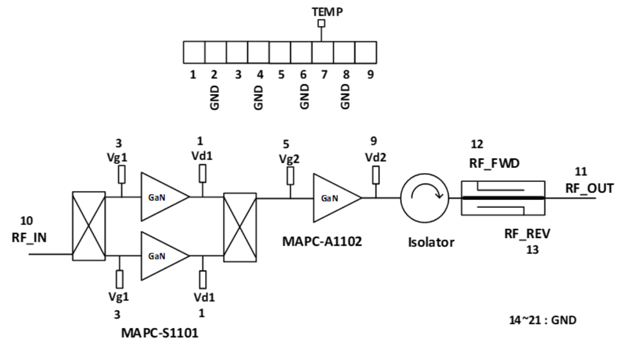
Typical Performance:

- Measured at 2.5 dB compression, 100 μs pulse width, 10% duty cycle
- T_C = 25°C, V_{DS} = 50 V,
  First Stage I_{DQ} = 80 mA (sum of 2 ea.),
  Second Stage I_{DQ} = 250 mA.

Frequency (GHz)	Output Power (dBm)	Gain	η_D
		(dB)	(%)
3.0	51.5	28.4	39.7%
3.1	51.4	29.3	38.7%
3.2	51.3	30.6	39.8%
3.3	51.2	30.1	40.1%
3.4	51.3	30.1	41.1%
3.5	51.0	30.2	44.0%
3.6	49.8	30.3	44.8%

- Forward coupling: 32 +/- 1 dB
- Reverse coupling: 32 +/- 1 dB

Functional Schematic



DC/Controller Pin Configuration

Pin #	Pin Name	Function
1	Vd1	Drain Voltage for 1st stage
2,4,6,8	GND	Ground
3	Vg1	Gate Voltage for 1st stage
5	Vg2	Gate Voltage for 2nd stage
7	Temp	Temperature sensing
9	Vd2	Drain Voltage for 2nd stage

RF Interface

Pin #	Pin Name	Function
10	RF_IN	RF Input
11	RF_OUT	RF Output
12	RF_FWD	RF Forward coupling
13	RF_REV	RF Reverse coupling
14,15,16,17 18,19,20,21	GND	Ground

Ordering Information

Part Number	Configuration
MAPC-P1017-AB000	Microstrip RF Launch

RF Electrical Characteristics: Pulsed[1], T_C = +25°C, V_{DS} = 50 V, First Stage I_{DQ} = 80 mA (sum of 2 ea.), Second Stage I_{DQ} = 250 mA (Performance in MACOM Evaluation Test Fixture, 50 Ω system)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Small Signal Gain	3.0 GHz 3.3 GHz 3.6 GHz	G_{SS}	—	30.0	—	dB
Power Gain	2.5 dB Gain Compression, 3.0 GHz 3.3 GHz 3.6 GHz	G_{SAT}	—	28.4 30.1 30.3	—	dB
Saturated Drain Efficiency	2.5 dB Gain Compression, 3.0 GHz 3.3 GHz 3.6 GHz	η_{SAT}	—	39.7 40.1 44.8	—	%
Saturated Output Power	2.5 dB Gain Compression, 3.0 GHz 3.3 GHz 3.6 GHz	P_{SAT}	—	51.5 51.2 49.8	—	dBm
Power Gain	P_{OUT} = 49 dBm, 3.0 GHz 3.3 GHz 3.6 GHz	G_P	—	30.2 31.8 31.5	—	dB
Drain Efficiency	P_{OUT} = 49 dBm, 3.0 GHz 3.3 GHz 3.6 GHz	η	—	32.0 32.8 42.6	—	%
Input Return Loss	P_{OUT} = 49 dBm, 3.0 GHz 3.3 GHz 3.6 GHz	IRL	—	-16.1 -13.5 -10.1	—	dB
Gain Flatness	P_{OUT} = 49 dBm, 3.0 - 3.6 GHz	ΔG	—	+/-1	—	dB
Forward Coupling	P_{OUT} = 49 dBm, 3.0 - 3.6 GHz	RF_{FWD}	—	32	—	dB
Reverse Coupling	Power Input at RF Output Port = 10 dBm, 3.0 - 3.6 GHz	RF_{REV}	—	32	—	dB
Phase Variation	P_{OUT} = 49 dBm, 3.0 - 3.6 GHz	$\Delta\phi$	—	+/-15	—	Deg.
Ruggedness: Output Mismatch	All phase angles	Ψ	VSWR = 10:1, No Damage			

1. Pulse details: 100 µs pulse width, 10% duty cycle.

RF Electrical Characteristics: Pulsed[1], T_C = +25°C, V_{DS} = 50 V, First Stage I_{DQ} = 80 mA (sum of 2 ea.), Second Stage I_{DQ} = 250 mA (Performance in MACOM Evaluation Test Fixture, 50 Ω system)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Saturated Output Power	P_{IN} = 23.5 dBm, 3.0 GHz P_{IN} = 21.5 dBm, 3.3 GHz P_{IN} = 20.0 dBm, 3.6 GHz	P_{SAT}	—	51.0 50.7 49.3	—	dBm
Power Gain	P_{IN} = 23.5 dBm, 3.0 GHz P_{IN} = 21.5 dBm, 3.3 GHz P_{IN} = 20.0 dBm, 3.6 GHz	G_P	—	27.0 28.7 28.8	—	dB
Gain Flatness	P_{IN} = 10 dBm, 3.0 - 3.6 GHz	ΔG	—	+/-1.5	—	dB
Drain Efficiency	P_{IN} = 23.5 dBm, 3.0 GHz P_{IN} = 21.5 dBm, 3.3 GHz P_{IN} = 20.0 dBm, 3.6 GHz	η	—	37.7 38.1 42.8	—	%
Input Return Loss	P_{IN} = 23.5 dBm, 3.0 GHz P_{IN} = 21.5 dBm, 3.3 GHz P_{IN} = 20.0 dBm, 3.6 GHz	IRL	—	-8 -8 -8	—	dB
Forward Coupling	P_{OUT} = 49 dBm, 3.0 - 3.6 GHz	RF_{FWD}	31	32	33	dB
Reverse Coupling	Power Input at RF Output Port =10 dBm, 3.0 - 3.6 GHz	RF_{REV}	31	32	33	dB

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

Parameter	Absolute Maximum
Output Power, P_{OUT}	53 dBm
Drain Source Voltage, V_{DS}	65 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 $V_{DS} \leq 55$ V will ensure MTTF > 2×10^6 hours.
5. Operating at nominal conditions with $T_{CH} \leq 225$°C will ensure MTTF > 2×10^6 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 = 1.03, B = -33.74, and C = 24.137 for 1st stage, A = 1, B = -38.215, and C = 26,343 for 2nd stage.

RF Output Stage Thermal Characteristics[7]

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance using Finite Element Analysis	V_{DS} = 50 V, T_C = 85°C, T_{CH} = 225°C	R_θ(FEA)	9.0 (1st stage) 1.64 (2nd stage)	°C/W
Thermal Resistance using Infrared Measurement of Die Surface Temperature	V_{DS} = 50 V, T_C = 85°C, T_{CH} = 225°C	R_θ(IR)	7.2 (1st stage) 1.28 (2nd stage)	°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

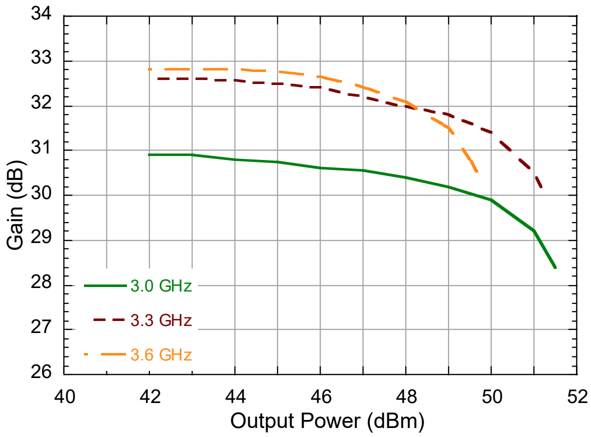
Please observe the following precautions to avoid damage:

Static Sensitivity

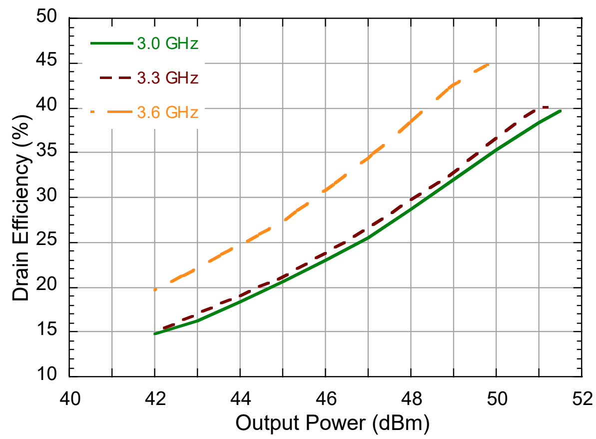
Gallium Nitride Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves: Pulsed[1], T_C = +25°C, V_{DS} = 50 V, First Stage I_{DQ} = 80 mA (sum of 2 ea.), Second Stage I_{DQ} = 250 mA, T_C = 25°C

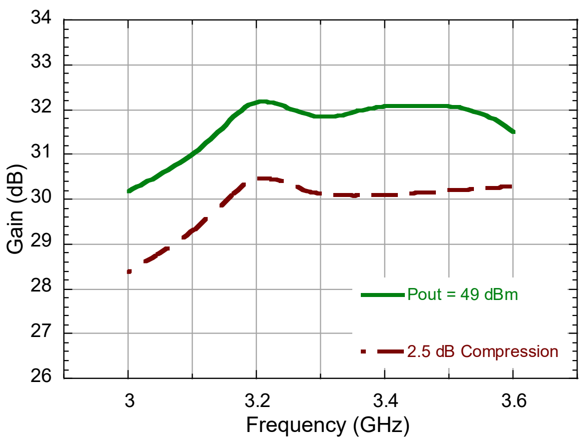
Gain vs. Output Power and Frequency



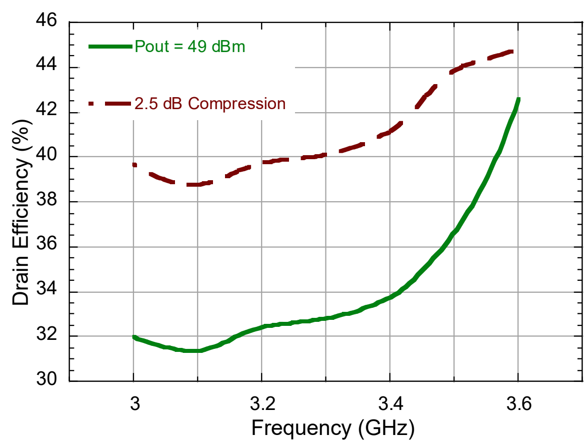
Drain Efficiency vs. Output Power and Frequency



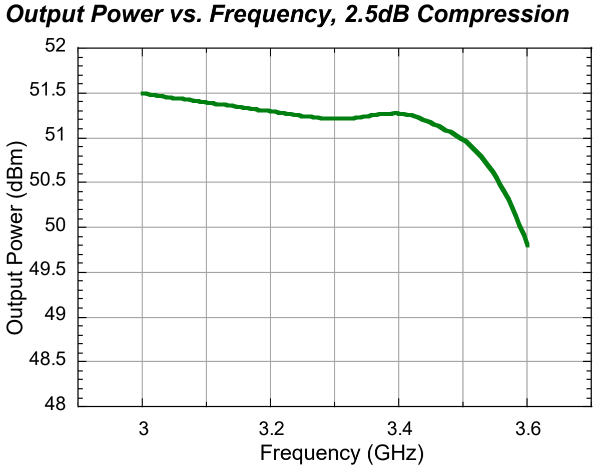
Gain vs. Frequency



Drain Efficiency vs. Frequency



Output Power vs. Frequency, 2.5dB Compression



Outline: (unit: inch [mm])