MAPG-002729-350L00

S-Band 350 W Radar Pulsed Power GaN Pallet
2700 - 2900 MHz

Rev. V4

Features

- Output Power > 350 W, with 11.5 dB Gain and 50% Drain Efficiency
- 2.0 x 0.9 Inches (50.8 x 23 mm^2) Size
- Weight: 19 Grams
- Nickel Plated Aluminum Carrier
- +50 V Operation
- Input and Output Matched to 50 Ω
- RO4003C Substrate ε_R = 3.38 Circuit Board
- True Standard SMT Assembly
- Single Gate and Drain Bias
- Dual GaN on SiC High Power Transistors
- Enhanced Harmonic Rejection
- MTTF = 600 years (T_J < 200ºC)
- RoHS* Compliant. Lead Free Reflow Compatible

Description

The MAPG-002729-350L00 is a common-source, Class AB, S-band GaN pallet power amplifier. The pallet is comprised of a matched pair of discrete GaN on SiC high power transistors which are combined to produce a guaranteed 350 W peak pulsed power and 35 W average power.

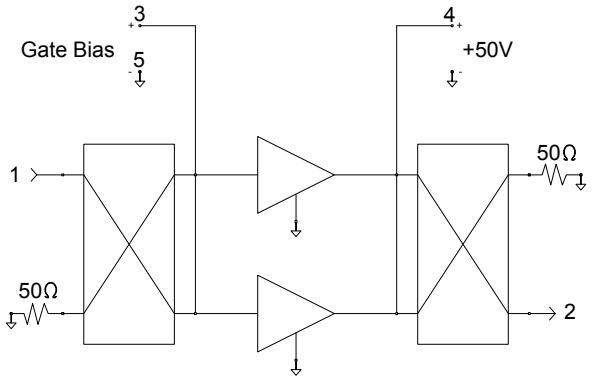
The GaN pallet has excellent harmonic rejection and robust operation under a wide range of environmental conditions. The pallet is constructed by combining a laminate board (RO4003C) with an aluminum carrier to allow for true standard SMT assembly.

The compact size of the integrated pallet, combined with excellent RF performance makes this product an ideal solution for pulsed radar and medical applications where small size, light weight and high power performance (SWaP) are required.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

MAPG-002729-350L00

Functional Schematic[1, 2]



Pin Configuration[3]

Pin No.	Function
1	RF Input
2	RF Output
3	Gate Bias Voltage[1] (V_{GG})
4	Drain Bias Voltage[2] (V_{DD})
5	GND

Ordering Information

Part Number	Package
MAPG-002729-350L00	Bulk Packaging
MAPG-S22729-350L00	Sample Board

1. One common gate voltage for both transistors.
2. One common drain voltage for both transistors.
3. The exposed pad centered on the package bottom must be connected to RF and DC ground.

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Electrical Specifications[4]: 2700 - 2900 MHz, T_A = 25°C, Z_L = 50 Ω

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
RF Functional Tests: V_{DD} = 50 V, I_{DQ} = 500 mA, 300 µs Pulse, 10% Duty Cycle						
Output Power	P_{IN} = 32 Wpk	P_{OUT}	350	400	-	Wpk
Gain	P_{IN} = 32 Wpk	G_P	10.4	11.5	-	dB
Drain Efficiency	P_{IN} = 32 Wpk	η_D	45	50	-	%
Droop	P_{IN} = 32 Wpk	Droop	-	0.2	0.5	dB
Input Return Loss	P_{IN} = 32 Wpk	IRL	-	-20	-10	dB
2ND Harmonic	P_{IN} = 32 Wpk	$2F_O$	-	- 50	-	dBc
3RD Harmonic	P_{IN} = 32 Wpk	$3F_O$	-	- 30	-	dBc
Load Mismatch Stability	P_{IN} = 32 Wpk	VSWR-S	-	5:1	-	-
Load Mismatch Tolerance	P_{IN} = 32 Wpk	VSWR-T	-	10:1	-	-

4. Typical RF performance measured in RF evaluation board (see test fixture assembly on page 3).

Absolute Maximum Ratings [5,6,7,8]

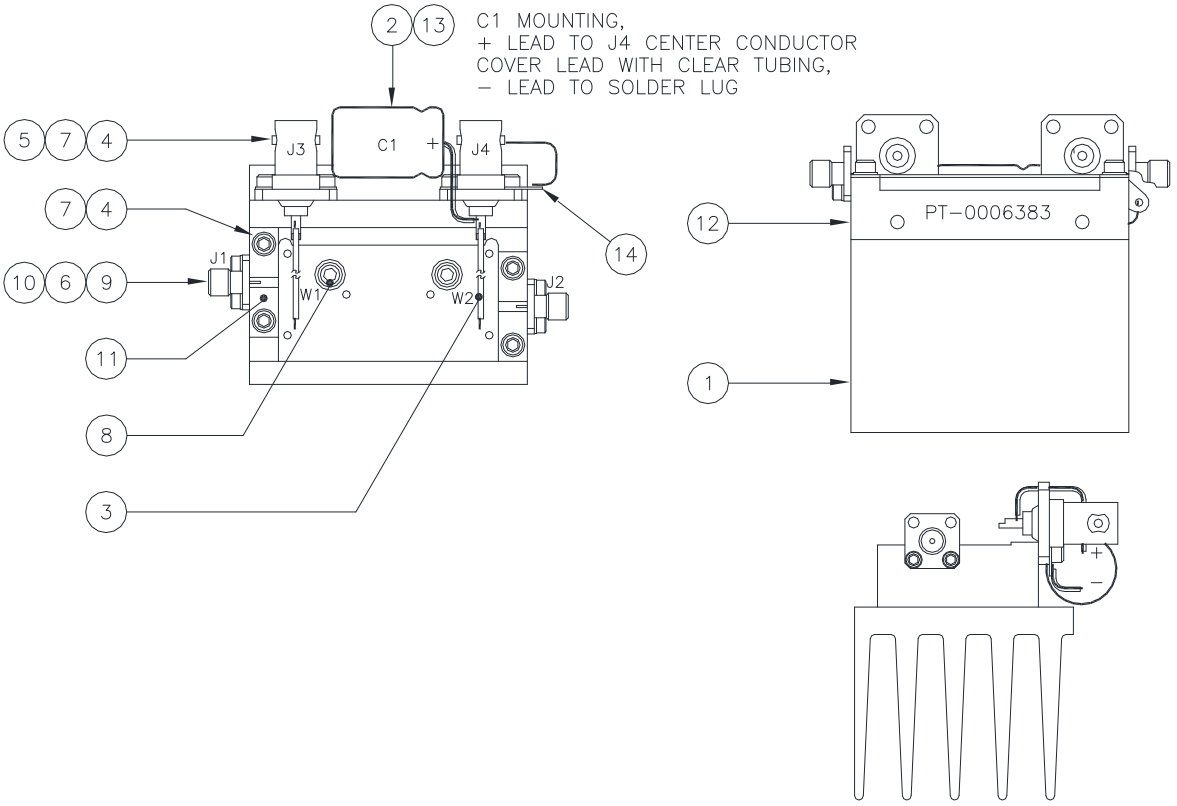
Parameter	Absolute Maximum
Peak Input Power (P_{IN})	+36 W
Drain Supply Voltage (V_{DD})	+55 V
Gate Supply Voltage (V_{GG})	-9 V to -2.0 V
Supply Current (I_{DD})	10 A
Peak Power Dissipation (300 µs Pulse, 10% duty cycle)	460 W
Peak Power Dissipation (150 µs Pulse, 15% duty cycle)	550 W
Operating Junction Temperature[9]	250 ºC
Operating Temperature Range	-40 °C to +85 °C
Storage Temperature Range	-65 °C to +150 °C
ESD Min. - Human Body Model (HBM)	550 V

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.
7. For saturated performance it is recommended that the sum of $(3 * V_{DD} + \text{abs}(V_{GG})) \leq 175$ V.
8. CW operation is not recommended.
9. Operating junction temperature is measured with infrared (IR) microscope. Junction temperature directly affects a device's MTTF and should be kept as low as possible to maximize lifetime.
   - MTTF = 5.3×10^6 hours (T_J < 200 °C)
   - MTTF = 6.8×10^4 hours (T_J < 250 °C)

Thermal Characteristics

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance	T_C = 85 ºC, V_{DD} = 50 V, I_{DQ} = 500 mA Pulse Width = 300 µs, Duty Cycle = 10%	Θ_{JC}	0.2	°C/W

Test Fixture Assembly



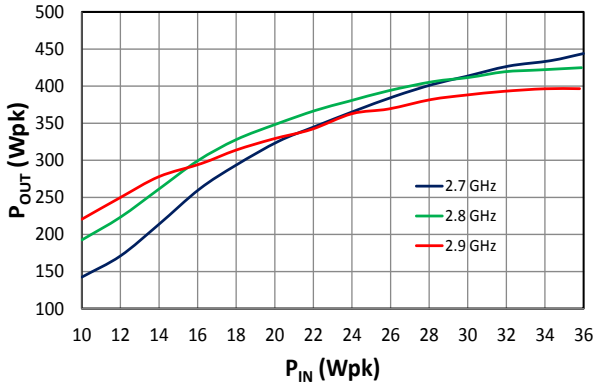
Parts List

Item	Part	Description
1	-	Aluminum Heatsink
2	C1	100 µF, 160 V, Electrolytic Capacitor, Panasonic
3	W1, W2	NO. 24 AWG X 3" Insulated Red Jumper Wire
4	-	NO. 4 Lock Washer
5	J3, J4	BNC Connector, Pomona Electronics
6	-	NO. 2-56 X 1/4" LG SOC HD SCR
7	-	NO. 4-40 X 1/4" LG SOC HD SCR
8	-	NO. 6-32 X 1/2" LG SOC HD SCR
9	-	NO. 2 Lock Washer
10	J1, J2	SMA Connector, Tyco Electronics
11	-	PCB
12	-	Aluminum Carrier
13	-	Clear Tubing
14	-	Solder Lug

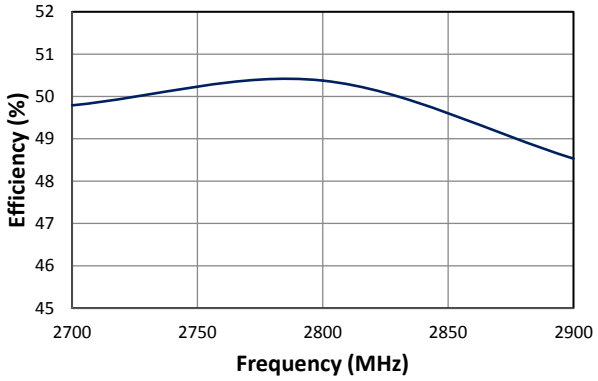
Typical Large-Signal Performance Curves

2700 - 2900 MHz, 300 µs Pulse, 10% Duty Cycle, V_{DD} = 50 V, I_{DQ} = 500 mA, P_{IN} = 32 Wpk, T_A = 25°C

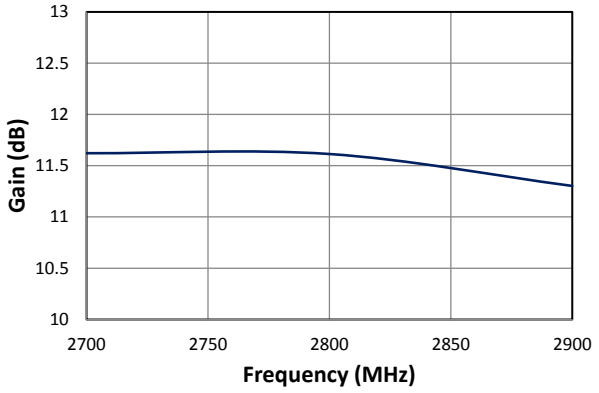
Output Power vs. Input Power



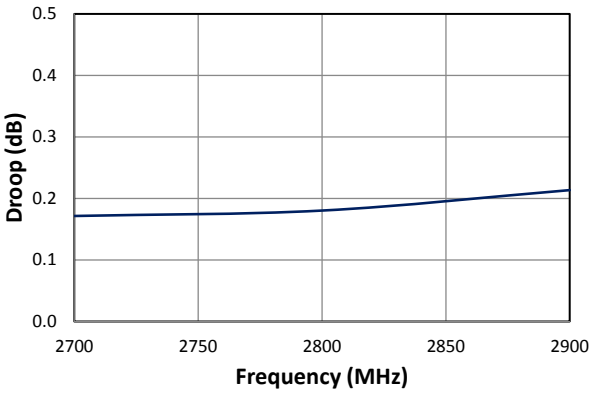
Drain Efficiency vs. Frequency



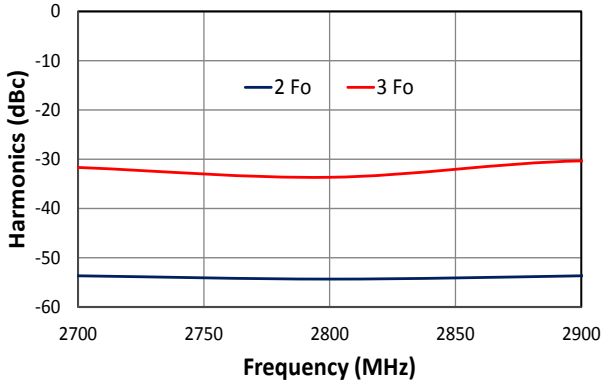
Gain vs. Frequency



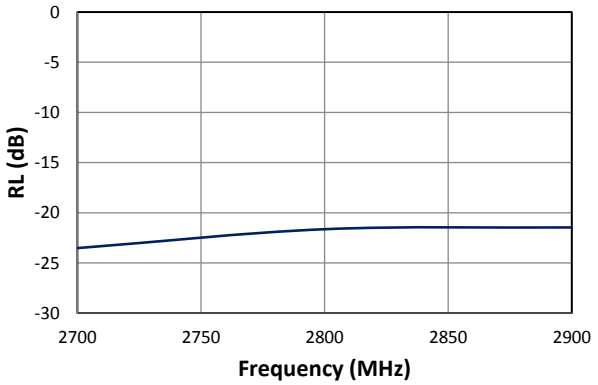
Droop vs. Frequency



$2F_O$ and $3F_O$ Harmonics vs. Frequency



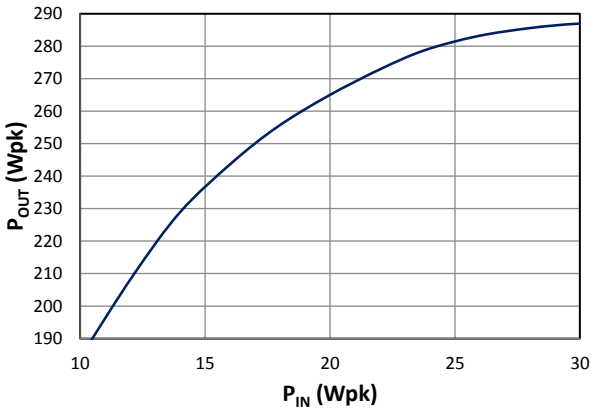
Return Loss vs. Frequency



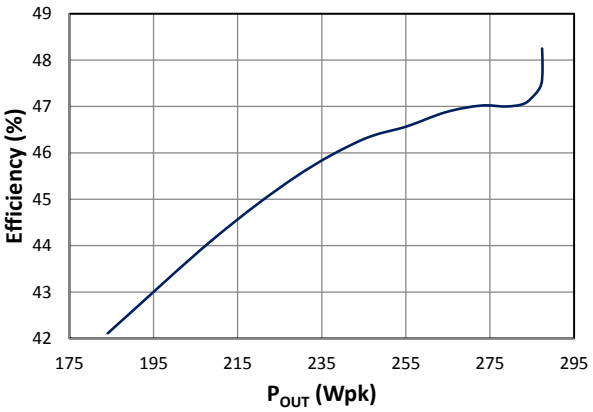
Typical Large-Signal Performance Curves

2856 MHz, 1 ms Pulse, 3.3% Duty Cycle, V_{DD} = 40 V, I_{DQ} = 500 mA, T_A = 25°C

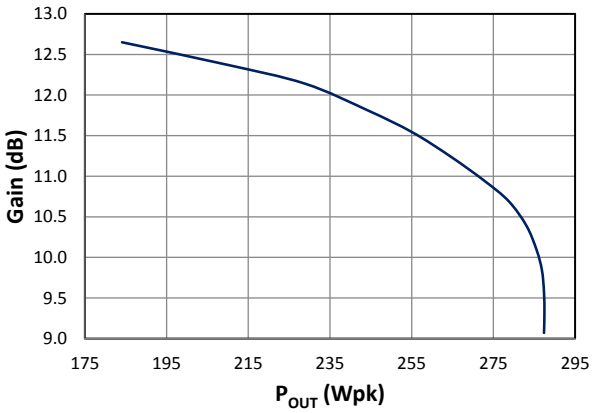
Output Power vs. Input Power



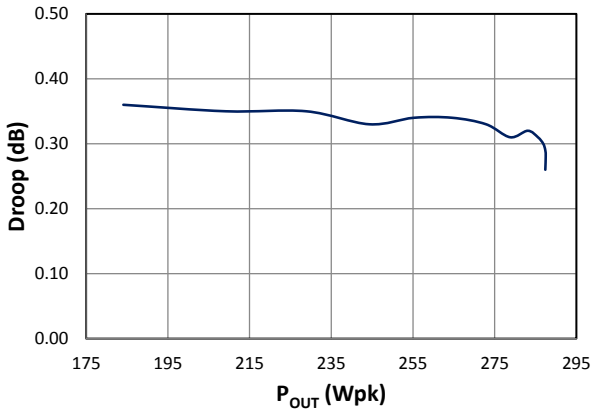
Drain Efficiency vs. Output Power



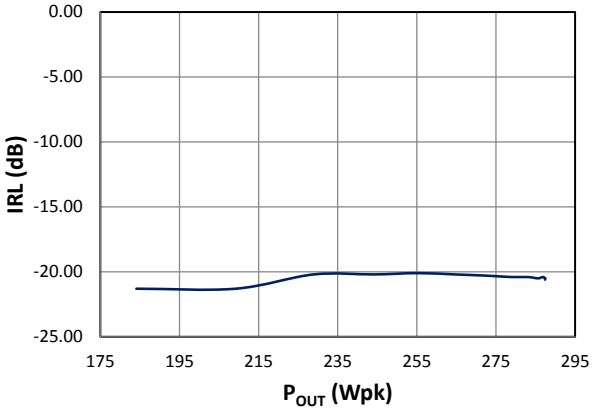
Gain vs. Output Power



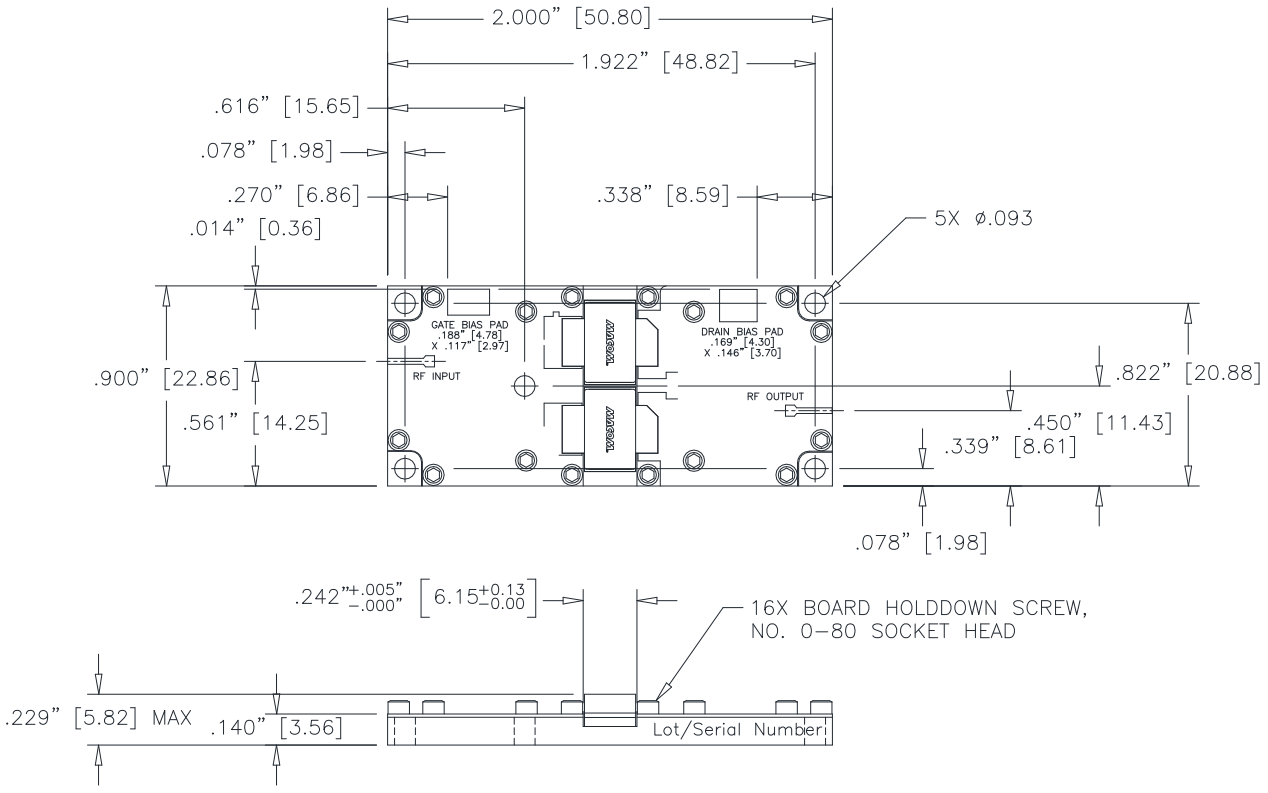
Droop vs. Output Power



Return Loss vs. Output Power



Pallet Outline: 2.0 x 0.9 Inches (50.8 x 23 mm^2). Lead Free.



UNLESS OTHERWISE NOTED, TOLERANCES ARE INCHES ±.005" [millimeters ±0.13mm]

Bias Sequencing

Turning the device ON

1. Set V_G to the pinch-off value (V_P), typically -6 V.
2. Turn on V_D to nominal voltage (50 V).
3. Increase V_G to desired quiescent current.
4. Apply RF power to desired level.

Turning the device OFF

1. Turn the RF power off.
2. Decrease V_G down to V_P.
3. Turn off V_D.
4. Turn off V_G.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Nitride Devices and 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.