GaN Amplifier 28 V, 240 W
2.7 - 3.1 GHz

MACOM PURE CARBIDE™

CGH31240F
Rev. V1

Features

- Saturated Power: 240 W
- Large Signal Gain: 12 dB
- Drain Efficiency: 60%
- Internally Matched: 50 Ω
- High Temperature Operation
- RoHS* Compliant

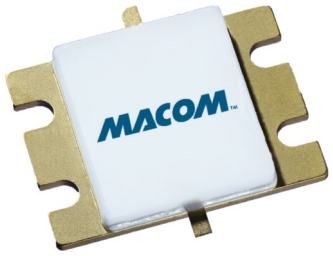
Applications

- General Amplification
- S-Band RADAR

Description

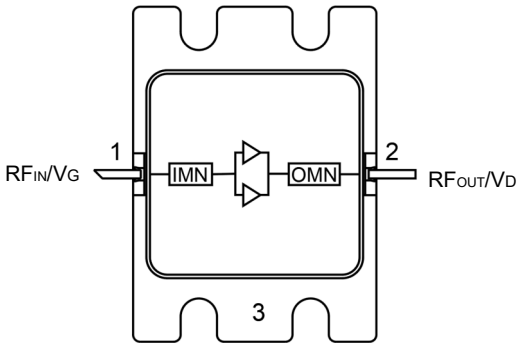
The CGH31240F is a gallium nitride (GaN) amplifier designed specifically with high efficiency, high gain and wide bandwidth capabilities, which makes the CGH31240F ideal for 2.7-3.1 GHz S-Band radar amplifier applications.

The amplifier is supplied in a ceramic/metal flange package.



440201

Functional Schematic



Pin Configuration

Pin #	Pin Name	Function
1	RF_{IN} / V_G	RF Input / Gate
2	RF_{OUT} / V_D	RF Output / Drain
3	Flange[2]	Ground / Source

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

Typical RF Performance:

Measured in Evaluation Test Fixture[1] at P_{IN} = 42 dBm, 300 µsec pulse width and 20% Duty Cycle.

- V_{DS} = 28 V, I_{DQ} = 1 A, T_C = 25°C

Frequency (GHz)	Output[1] Power (W)	Power[1] Gain (dB)	PAE[1] (%)
2.7	243	11.9	60
2.9	249	11.9	60
3.1	243	11.9	52

1. Performance values and curves in this data sheet were measured in this fixture.

Ordering Information

Part Number	MOQ Increment
CGH31240F	Bulk
CGH31240F-AMP	Sample Board

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

RF Electrical Specifications: T_A = +25°C, V_{DS} = 28 V, I_{DQ} = 1 A

Parameter	Units	Min.	Typ.	Max.	Conditions
Output Power at f = 2.7 GHz	W	200	250	—	V_{dd} = 28V, I_{dq} = 1 A, P_{in} = 42 dBm Pulse Width = 300 µs, Duty Cycle = 20%
Output Power at f = 2.9 GHz	W	200	250	—	
Output Power at f = 3.1 GHz	W	200	250	—	
Power Gain at f = 2.7 GHz	dB	11	12	—	
Power Gain at f = 2.9 GHz	dB	11	12	—	
Power Gain at f = 3.1 GHz	dB	11	12	—	
Power Added Efficiency at f = 2.7 GHz	%	49	54	—	
Power Added Efficiency at f = 2.9 GHz	%	52	58	—	
Power Added Efficiency at f = 3.1 GHz	%	42	49	—	
Small-Signal Gain (S21)	dB	14	16	—	V_{dd} = 28V, I_{dq} = 1 A
Input Return Loss (S11)	dB	—	-12	-8	
Output Return Loss (S22)	dB	—	-6	-4.5	

Note: Final testing and screening for all amplifier sales is performed using the CGH31240F-AMP

DC Electrical Characteristics T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 120 V	I_{DLK}	-	-	23.0	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{GLK}	-8.0	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 57.6 mA	V_T	-3.8	-3.0	-2.3	V
Gate Quiescent Voltage	V_{DS} = 28 V, I_D = 1 A	V_{GSQ}	-	-2.7	-	V

Absolute Maximum Ratings[1,2]

Parameter	Absolute Maximum
Pulse Width	1000 µsec
Duty Cycle	50 %
Drain-Source Voltage	120 V
Gate Voltage	-10, +2 V
DC Drain Current	8 A
Gate Current	60 mA
Input Power	43 dBm
Storage Temperature	-65°C to +150°C
Mounting Temperature[3]	+245°C
Junction Temperature[4,5]	+225°C
Operating Temperature	-40°C to +150°C

1. Exceeding any one or combination of these limits may cause permanent damage to this device.
2. MACOM does not recommend sustained operation near these survivability limits.
3. Mounting temperature for 30 seconds.
4. Operating at nominal conditions with $T_J \leq +225$ C will ensure MTTF > 1 x 10^6 hours.
5. Junction Temperature (T_J) = T_C + Θjc * (V * I)
   Typical thermal resistance (Θjc) = 0.5 °C/W for Pulse Width = 300 µs and Duty Cycle = 20 %.
   a) For T_C = +85°C,
   T_J = 225 °C @ P_{diss}= 280 W

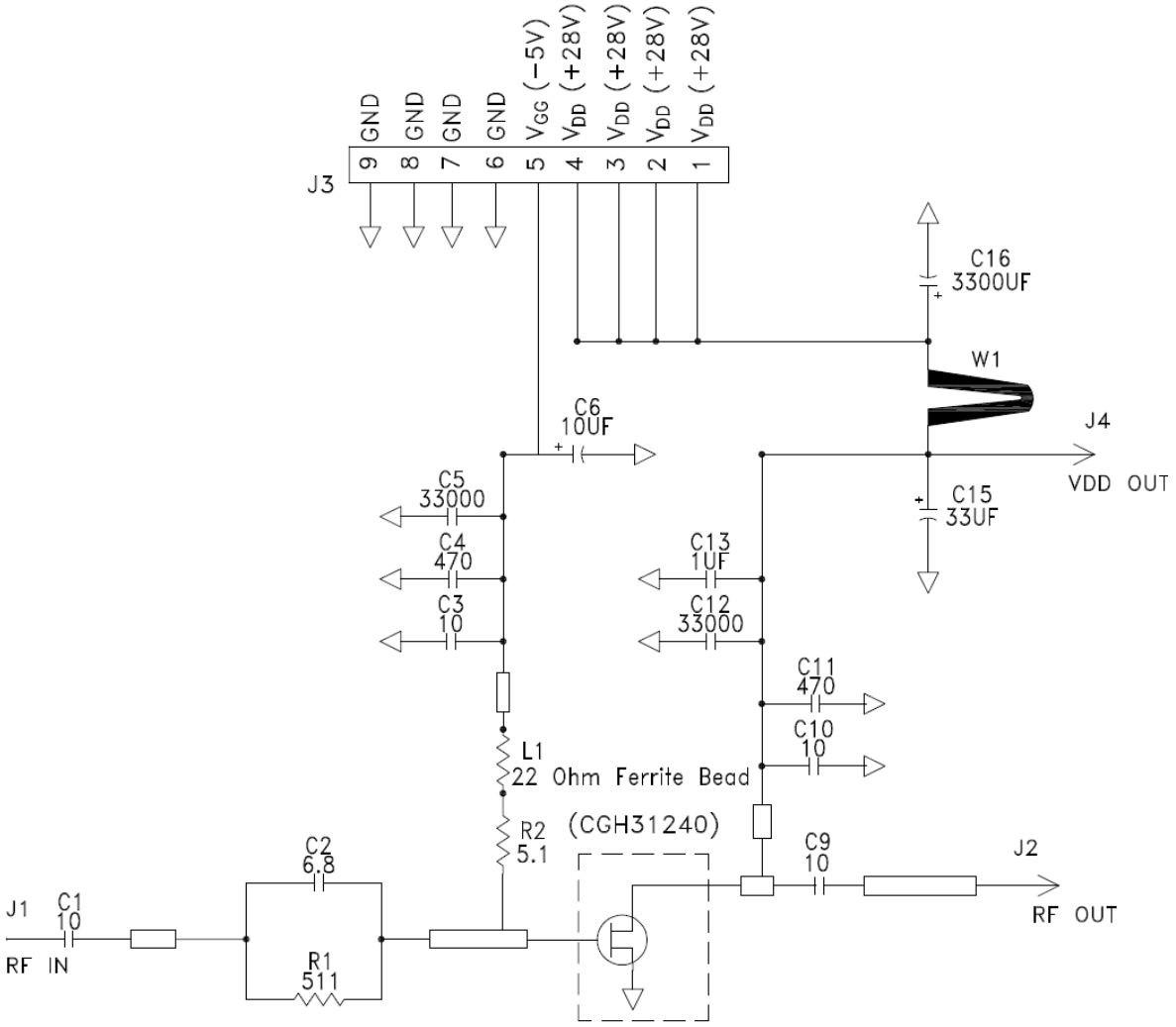
Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

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

Evaluation Test Fixture and Recommended Tuning Solution, 2.7 - 3.1 GHz



Description

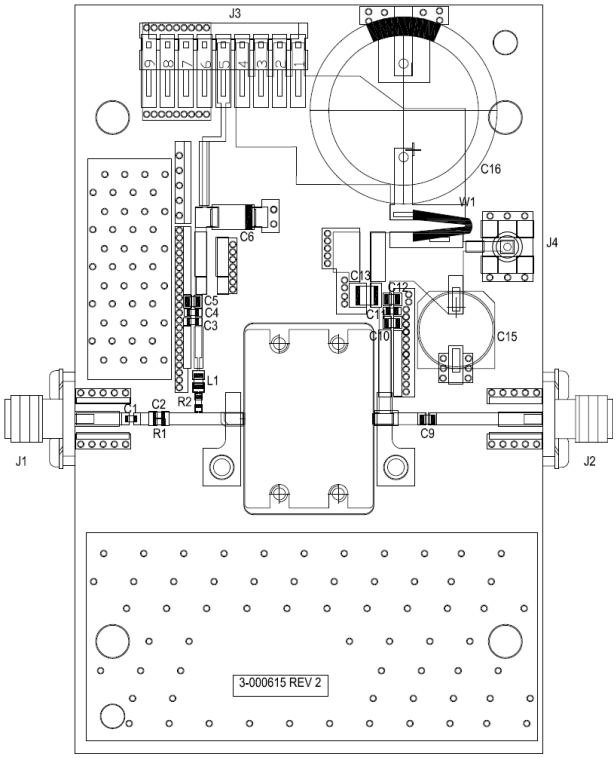
Parts measured on evaluation board (30-mil thick RO4350B). Matching is provided using a combination of lumped elements and transmission lines as shown in the simplified schematic above. Recommended tuning solution component placement, transmission lines, and details are shown on the next page.

Biasing Sequence

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 of -5 V to the gate
3. Turn-off drain voltage
4. Turn-off gate voltage

Evaluation Test Fixture and Recommended Tuning Solution, 2.7—3.1 GHz



Assembly Parts List

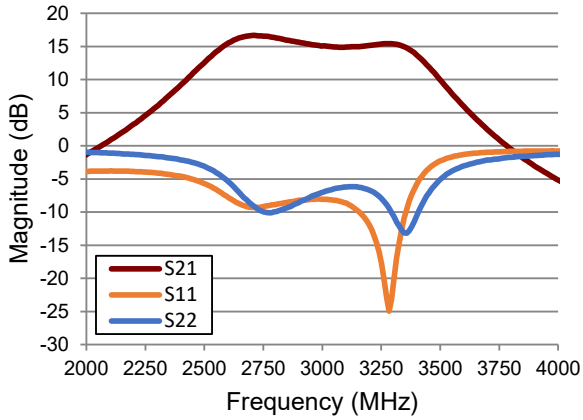
Reference Designator	Description	Qty
R1	RES, 511 OHM, +/- 1%, 1/16W, 0603	1
R2	RES, 5.1, OHM, +/- 1%, 1/16W, 0603	1
C1, C3	CAP, 10.0pF, +/-5%, 250V, 0603, ATC600S	2
C2	CAP, 6.8pF, +/- 0.25pF, 250V, 0603, ATC600S	1
C4, C11	CAP, 470pF, +/-5%, 100V, 0603, X7R	2
C15	CAP, 33µF, 20%, G CASE	1
C5, C12	CAP, 33000pF, 0805, 100V, X7R	2
C13	CAP, 1.0µF, 100V, 10%, X7R, 1210	1
C6	CAP, 10µF, 16V, TANTALUM	1
C9, C10	CAP, 10pF, +/- 1%, 250V, 0805	2
C16	CAP, 3300µF, +/-20%, 100V, ELECTROLYTIC	1
J1, J2	CONN, SMA, PANEL MOUNT JACK, FL	2
J3	HEADER, RT>PLZ, 0.1CEN LK 9POS	1
J4	CONNECTOR, SMB, STRAIGHT, JACK, SMD	1
W1	CABLE, 18 AWG, 4.2	1
L1	FERRITE, 22 OHM, 0805, BLM21PG220SN1	1
-	PCB, RO4350, 2.5 X 4.0 X 0.030	1
Q1	CGH31240F	1

Typical Performance Curves as Measured in the 2.7– 3.1 GHz Evaluation Test Fixture

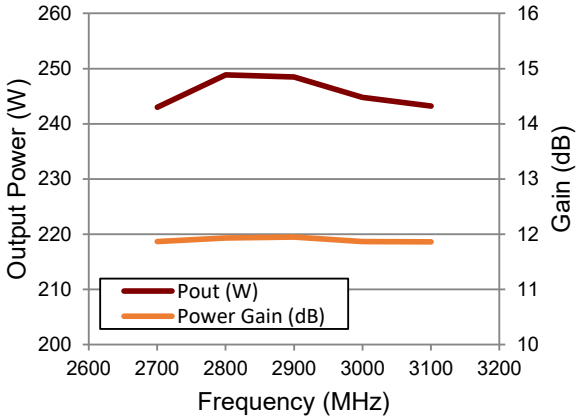
Pulse width = 300 µs, Duty Cycle = 20%, P_{IN} = 42 dBm, V_{DS} = 28V, I_{DQ} = 1 A **(Unless otherwise noted)**

For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

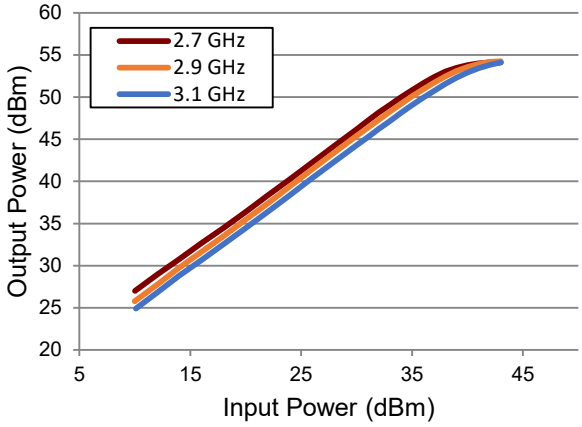
S11, S21, & S22 vs. Frequency



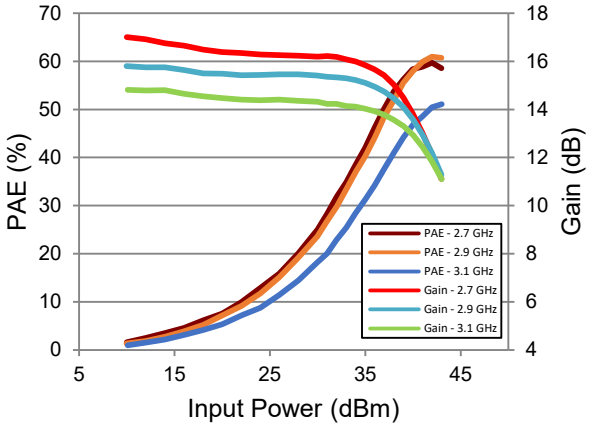
Output Power and Gain vs. Frequency



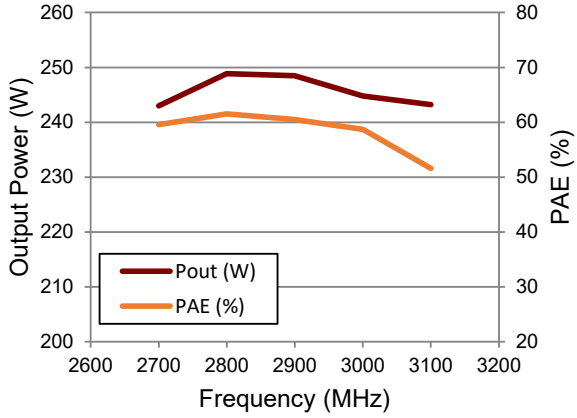
Output Power vs. Input Power and Frequency



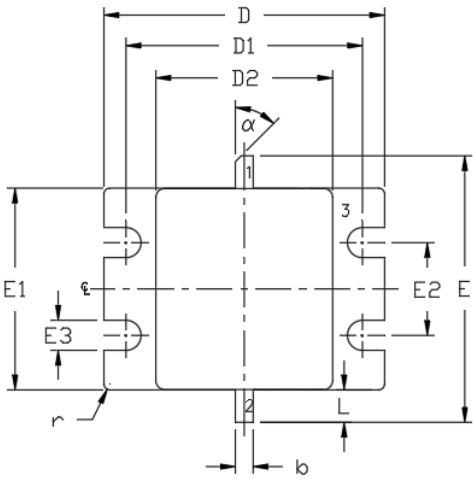
PAE & Gain vs. Input Power and Frequency

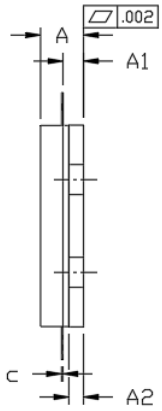


Output Power & PAE vs. Input Power and Frequency



Lead-free 440201 Package Dimensions





NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M – 1994.

2. CONTROLLING DIMENSION: INCH.

3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.

4. LID MAY BE MISALIGNED TO THE BODY OF PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.

	INCHES		MILLIMETERS		NOTES
DIM	MIN	MAX	MIN	MAX	
A	0.128	0.148	3.25	3.76	
A1	0.057	0.067	1.45	1.70	
A2	0.035	0.045	0.89	1.14	
b	0.055	0.065	1.40	1.65	2x
c	0.004	0.007	0.08	0.15	
D	0.948	0.958	24.08	24.33	
D1	0.798	0.808	20.27	20.52	
D2	0.595	0.605	15.11	15.37	
E	0.880	0.930	22.35	23.62	
E1	0.680	0.694	17.27	17.63	
E2	0.310	0.320	7.87	8.13	
E3	0.097	0.107	2.46	2.72	4x
L	0.095	0.125	2.41	3.18	2x
r	0.02 TYP		0.51 TYP		4x
α	45° REF		45° REF		

PIN 1. GATE
2. DRAIN
3. SOURCE

Mouser Electronics

Authorized Distributor

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