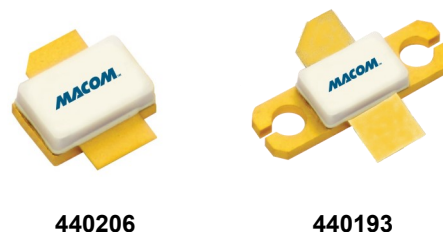


**Features**

- Rated Power: 180 W
- Operating Frequency: 3.1 - 3.5 GHz
- Power Gain: 13.5 dB
- Drain Efficiency: 55%
- Input Matched
- < 0.3 dB Pulsed Amplitude Droop
- Lead-Free Air Cavity Ceramic Package
- RoHS\* Compliant



**Applications**

- S-Band Radar Systems

**Description**

The CGHV35150 is a gallium nitride (GaN) amplifier designed specifically with high efficiency, high gain and wide bandwidth capabilities, which makes the CGHV35150 ideal for 3.1 - 3.5 GHz S-Band radar amplifier applications. The amplifier is supplied in a ceramic/metal flange and pill package.

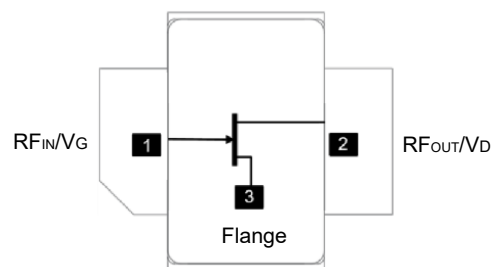
**Typical RF Performance:**

Measured in Evaluation Test Fixture @  $P_{IN} = 39$  dBm, 300  $\mu$ sec pulse width and 20% Duty Cycle.

- $V_{DS} = 50$  V,  $I_{DQ} = 500$  mA,  $T_C = 25^\circ$ C

Frequency (GHz)	Output Power (W)	Gain (dB)	$\eta_D$ (%)
3.1	210	14.0	55
3.2	215	14.2	56
3.3	220	14.3	60
3.4	210	14.5	60
3.5	185	13.6	59

**Functional Schematic**



**Pin Configuration**

Pin #	Pin Name	Function
1	RF <sub>IN</sub> / V <sub>G</sub>	RF Input / Gate
2	RF <sub>OUT</sub> / V <sub>D</sub>	RF Output / Drain
3	Flange <sup>1</sup>	Ground / Source

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

**Ordering Information**

Part Number	MOQ Increment
CGHV35150F	Bulk
CGHV35150P	Bulk
CGHV35150F-AMP	Sample Board

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

# GaN Amplifier, 50 V, 180 W

## 3.1 – 3.5 GHz



**MACOM PURE CARBIDE™**

**CGHV35150F/P**

Rev. V1

**RF Electrical Specifications: Frequency = 3.1 - 3.5 GHz,  $P_{IN}$  = 39 dBm,  $T_A$  = +25°C,  $V_{DS}$  = 50 V,  $I_{DQ}$  = 500 mA, Pulse Width = 300 µsec, Duty Cycle = 20%**

Parameter	Conditions	Symbol	Units	Min.	Typ.	Max.
Output Power	3.1 GHz 3.5 GHz	$P_{OUT}$	W	130 100	170 135	—
Power Gain	3.1 GHz 3.5 GHz	$G_P$	dB	12 11	13.3 12.3	—
Drain Efficiency	3.1 GHz 3.5 GHz	$\eta_{SAT}$	%	40 40	47 44	—
Amplitude Droop	—	D	dB	—	-0.3	—
Output Mismatch Stress <sup>2</sup>	—	VSWR	$\Psi$	—	—	5:1

2. No damage at all phase angles.

Note: Final testing and screening for all amplifier sales is performed using the CGHV35150F/P-AMP.

### DC Electrical Characteristics $T_A = 25^\circ\text{C}$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain-Source Leakage Current ( $I_{DLK}$ )	$V_{GS} = -8\text{ V}$ , $V_{DS} = 150\text{ V}$	mA	—	—	11.5
Gate-Source Leakage Current ( $I_{GLK}$ )	$V_{GS} = -8\text{ V}$ , $V_{DS} = 10\text{ V}$	mA	-4	—	—
Gate Threshold Voltage ( $V_T$ )	$V_{DS} = 10\text{ V}$ , $I_D = 28.8\text{ mA}$	V	-3.8	-3.0	-2.3
Gate Quiescent Voltage ( $V_{GSQ}$ )	$V_{DS} = 50\text{ V}$ , $I_D = 500\text{ mA}$	V	—	-2.7	—

### Absolute Maximum Ratings<sup>3,4</sup>

Parameter	Absolute Maximum
Drain-Source Voltage	150 V
Gate Voltage	-10, +2 V
Drain Current	12 A
Gate Current	30 mA
Screw Torque	40 in-oz
Storage Temperature	-65°C to +150°C
Mounting Temperature	+245°C
Junction Temperature <sup>5,6</sup>	+225°C
Operating Temperature	-40°C to +150°C

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.
- Operating at nominal conditions with  $T_J \leq +225^\circ\text{C}$  will ensure  $\text{MTTF} > 1 \times 10^6$  hours.
- Junction Temperature ( $T_J$ ) =  $T_C + \theta_{jc} * (V * I)$   
Typical thermal resistance ( $\theta_{jc}$ ), CGHV35150P = 0.81 °C/W for 300  $\mu\text{s}$ , 20%.
  - For  $T_C = +85^\circ\text{C}$ ,  
 $T_J = 207^\circ\text{C}$  @  $P_{\text{DISS}} = 150\text{ W}$
- Typical thermal resistance ( $\theta_{jc}$ ), CGHV35150F = 0.86 °C/W for 300  $\mu\text{s}$ , 20%.
  - For  $T_C = +85^\circ\text{C}$ ,  
 $T_J = 214^\circ\text{C}$  @  $P_{\text{DISS}} = 150\text{ W}$

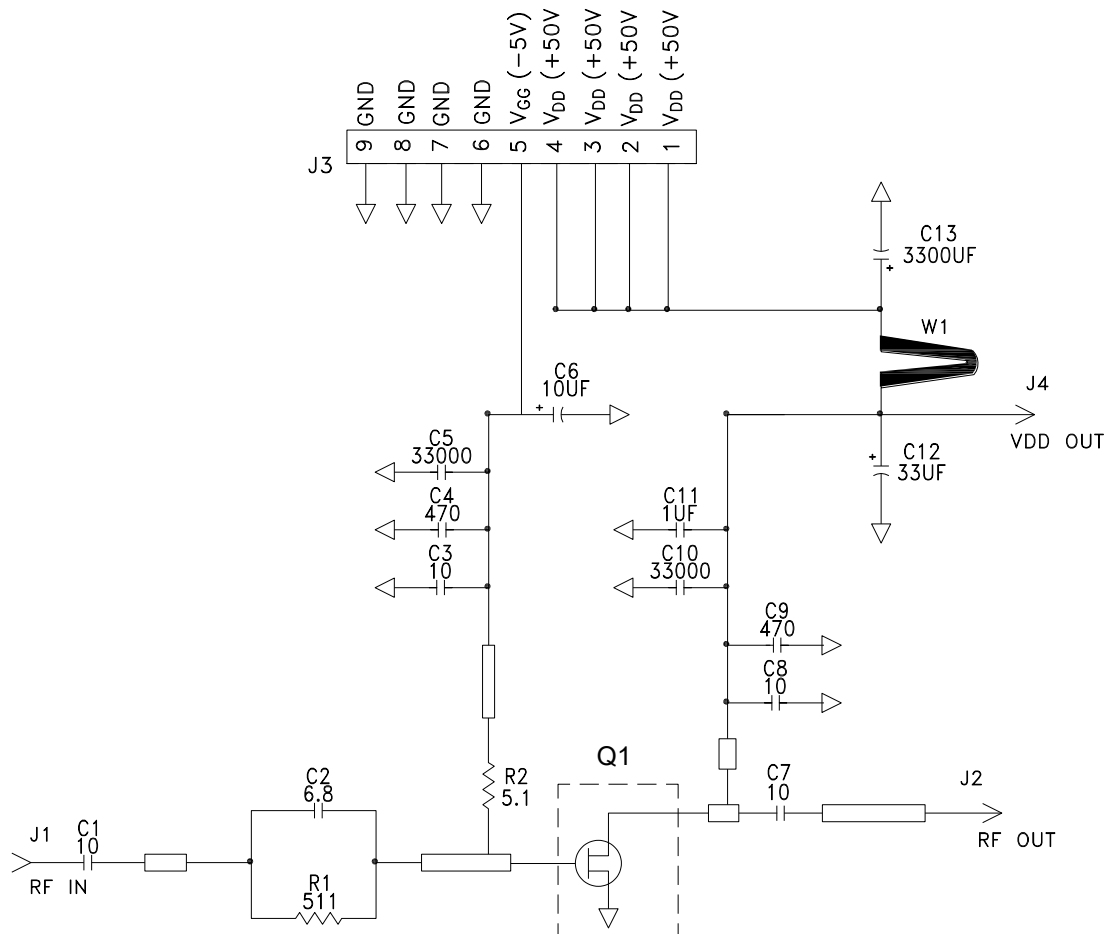
### Handling Procedures

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, 3.1 – 3.5 GHz



**Description**

Parts measured on evaluation board (20-mil thick RO4350). 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**

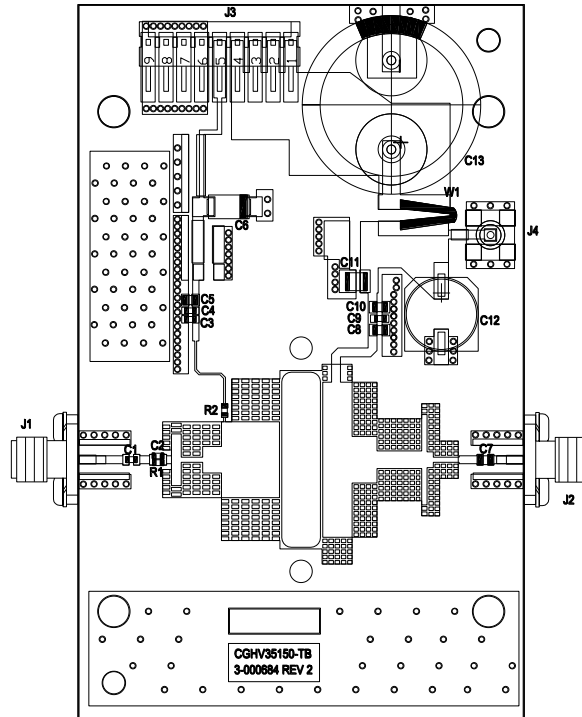
**Bias ON**

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, 3.1 – 3.5 GHz**



**Assembly Parts List**

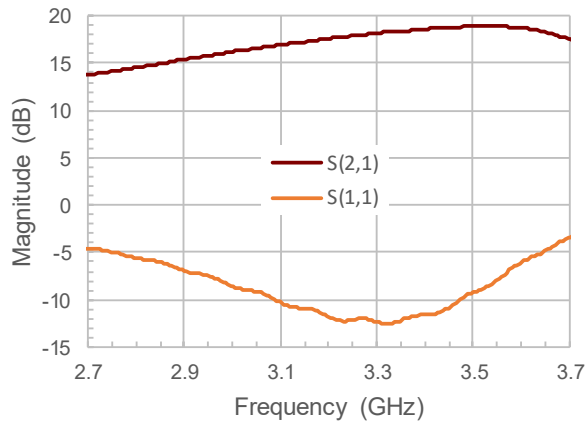
Reference Designator	Description	Qty.
R1	RES, 511 OHM, +/- 1%, 1/16W,0603	1
R2	RES, 5.1,OHM, +/- 1%, 1/16W,0603	1
C1,C7,C8	CAP, 10pF, +/- 1%, 250V, 0805	3
C2	CAP, 6.8pF, +/- 0.25 pF,250V, 0603	1
C3	CAP, 10.0pF, +/-5%,250V, 0603,	1
C4,C9	CAP, 470PF, 5%, 100V, 0603, X	2
C5,C10	CAP,33000PF, 0805,100V, X7R	1
C6	CAP 10UF 16V TANTALUM	1
C11	CAP, 1.0UF, 100V, 10%, X7R, 1210	1
C12	CAP, 33 UF, 20%, G CASE	1
C13	CAP, 3300 UF, +/-20%, 100V, ELECTROLYTIC	1
J1,J2	CONN, SMA, PANEL MOUNT JACK, FL	2
J3	HEADER RT>PLZ .1CEN LK 9POS	1
J4	CONNECTOR ; SMB, Straight, JACK,SMD	1
W1	CABLE ,18 AWG, 4.2	1
—	PCB, RO4350, 20 MIL THK,	1
Q1	CGHV35150F	1

**Typical Performance Curves as Measured in the 3.1– 3.5 GHz Evaluation Test Fixture**

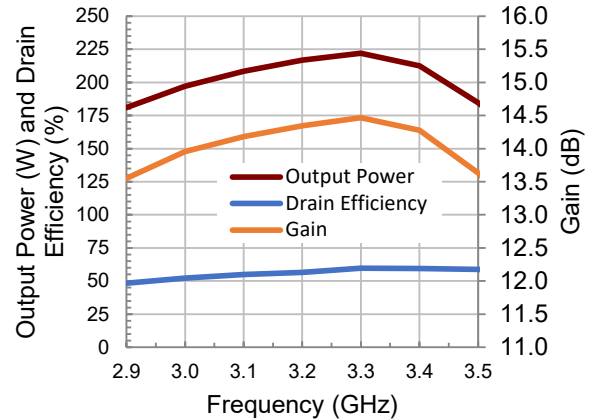
Pulse width = 300  $\mu$ s, Duty Cycle = 20%,  $P_{IN}$  = 39 dBm,  $V_{DS}$  = 50V,  $I_{DQ}$  = 500 mA (Unless otherwise noted)

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

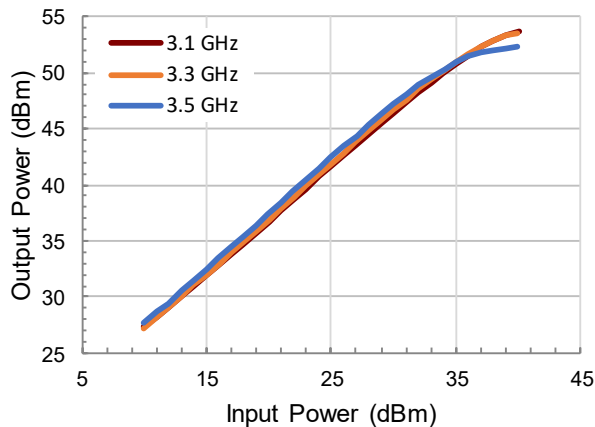
**S11 & S21 vs. Frequency**



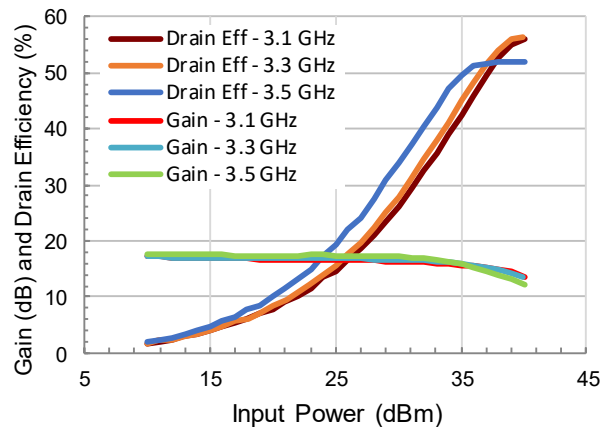
**Output Power, Gain, Drain Efficiency vs. Frequency**



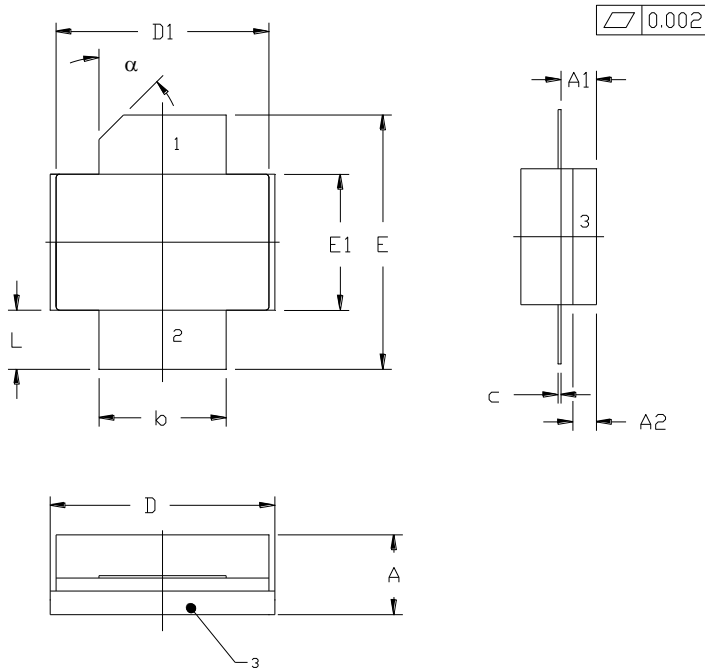
**Output Power vs. Input Power and Frequency**



**Drain Efficiency vs. Input Power and Frequency**



Lead-free 440206 Package Dimensions



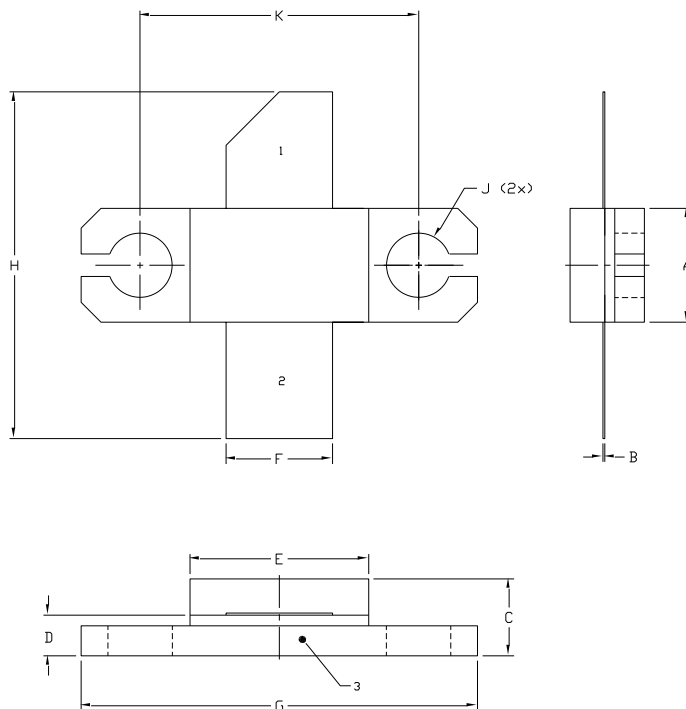
NOTES:

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.

DIM	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.125	0.145	3.18	3.68	
A1	0.057	0.067	1.45	1.70	
A2	0.035	0.045	0.89	1.14	
b	0.210	0.220	5.33	5.59	2x
c	0.004	0.006	0.10	0.15	2x
D	0.375	0.385	9.53	9.78	
D1	0.355	0.365	9.02	9.27	
E	0.400	0.460	10.16	11.68	
E1	0.225	0.235	5.72	5.97	
L	0.085	0.115	2.16	2.92	2x
α	45° REF		45° REF		

- PIN 1. GATE  
PIN 2. DRAIN  
PIN 3. SOURCE

Lead-free 440193 Package Dimensions



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
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 THE PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.
5. ALL PLATED SURFACES ARE Ni/AU

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.225	0.235	5.72	5.97
B	0.004	0.006	0.10	0.15
C	0.145	0.165	3.18	4.19
D	0.077	0.087	1.96	2.21
E	0.355	0.365	9.02	9.27
F	0.210	0.220	5.33	5.59
G	0.795	0.805	20.19	20.45
H	0.670	0.730	17.02	18.54
J	ø .130		3.30	
k	0.562		14.28	

- PIN 1. GATE  
PIN 2. DRAIN  
PIN 3. SOURCE

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