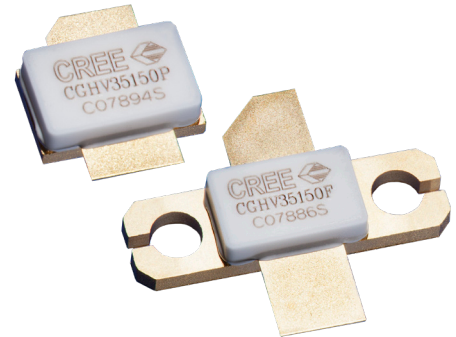


# CGHV35150

150 W, 2900 - 3500 MHz, 50V, GaN HEMT  
for S-Band Radar Systems

## Description

Cree's CGHV35150 is a gallium nitride (GaN) high electron mobility transistor (HEMT) designed specifically with high efficiency, high gain and wide bandwidth capabilities, which makes the CGHV35150 ideal for 2.9 - 3.5 GHz S-Band radar amplifier applications. The transistor is supplied in a ceramic/metal flange and pill package.



Package Types: 440193 / 440206  
PNs: CGHV35150F / CGHV35150P

## Typical Performance 3.1 - 3.5 GHz ( $T_c = 85^\circ\text{C}$ )

Parameter	3.1 GHz	3.2 GHz	3.3 GHz	3.4 GHz	3.5 GHz	Units
Output Power	180	180	180	170	150	W
Gain	13.5	13.5	13.5	13.3	12.7	dB
Drain Efficiency	50	49	50	49	48	%

Note: Measured in the CGHV35150-AMP application circuit, under 300  $\mu\text{s}$  pulse width, 20% duty cycle,  $P_{IN} = 39\text{ dBm}$

## Features

- Rated Power = 150 W @  $T_{CASE} = 85^\circ\text{C}$
- Operating Frequency = 2.9 - 3.5 GHz
- Transient 100  $\mu\text{sec}$  - 300  $\mu\text{sec}$  @ 20% Duty Cycle
- 13 dB Power Gain @  $T_{CASE} = 85^\circ\text{C}$
- 50% Typical Drain Efficiency @  $T_{CASE} = 85^\circ\text{C}$
- Input Matched
- <0.3 dB Pulsed Amplitude Droop

 Large Signal Models Available for ADS and MWO

**RoHS**  
COMPLIANT



## Absolute Maximum Ratings (not simultaneous)

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	$V_{DSS}$	150	Volts	25 °C
Gate-to-Source Voltage	$V_{GS}$	-10, +2	Volts	25 °C
Storage Temperature	$T_{STG}$	-65, +150	°C	
Operating Junction Temperature	$T_J$	225	°C	
Maximum Forward Gate Current	$I_{GMAX}$	30	mA	25 °C
Maximum Drain Current <sup>1</sup>	$I_{DMAX}$	12	A	25 °C
Soldering Temperature <sup>2</sup>	$T_S$	245	°C	
Screw Torque	$\tau$	40	in-oz	
Pulsed Thermal Resistance, Junction to Case <sup>3</sup>	$R_{\theta JC}$	0.81	°C/W	300 $\mu$ sec, 20%, 85 °C
Pulsed Thermal Resistance, Junction to Case <sup>4</sup>	$R_{\theta JC}$	0.86	°C/W	300 $\mu$ sec, 20%, 85 °C
Case Operating Temperature	$T_C$	-40, +150	°C	

### Notes:

<sup>1</sup> Current limit for long term, reliable operation

<sup>2</sup> Refer to the Application Note on soldering at [wolfspeed.com/rf/document-library](http://wolfspeed.com/rf/document-library)

<sup>3</sup> Measured for the CGHV35150P at  $P_{DISS} = 150$  W

<sup>4</sup> Measured for the CGHV35150F at  $P_{DISS} = 150$  W

## Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
<b>DC Characteristics<sup>1</sup> (<math>T_C = 25</math> °C)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.0	-2.3	$V_{DC}$	$V_{DS} = 10$ V, $I_D = 28.8$ mA
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.7	-	$V_{DC}$	$V_{DS} = 50$ V, $I_D = 500$ mA
Saturated Drain Current <sup>2</sup>	$I_{DS}$	18.7	26.8	-	A	$V_{DS} = 6.0$ V, $V_{GS} = 2.0$ V
Drain-Source Breakdown Voltage	$V_{BR}$	125	-	-	$V_{DC}$	$V_{GS} = -8$ V, $I_D = 28.8$ mA
<b>RF Characteristics<sup>3</sup> (<math>T_C = 85</math> °C, <math>F_0 = 3.1 - 3.5</math> GHz unless otherwise noted)</b>						
Output Power at 3.1 GHz	$P_{OUT}$	130	170	-	W	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 39$ dBm
Output Power at 3.5 GHz	$P_{OUT}$	100	135	-	W	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 39$ dBm
Gain at 3.1 GHz	$G_P$	12.0	13.3	-	dB	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 39$ dBm
Gain at 3.5 GHz	$G_P$	11.0	12.3	-	dB	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 39$ dBm
Drain Efficiency at 3.1 GHz	$D_E$	40	47	-	%	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 39$ dBm
Drain Efficiency at 3.5 GHz	$D_E$	40	44	-	%	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 39$ dBm
Amplitude Droop	D	-	-0.3	-	dB	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 39$ dBm
Output Mismatch Stress	VSWR	-	-	5 : 1	$\Psi$	No damage at all phase angles, $V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 39$ dBm Pulsed

### Notes:

<sup>1</sup> Measured on wafer prior to packaging

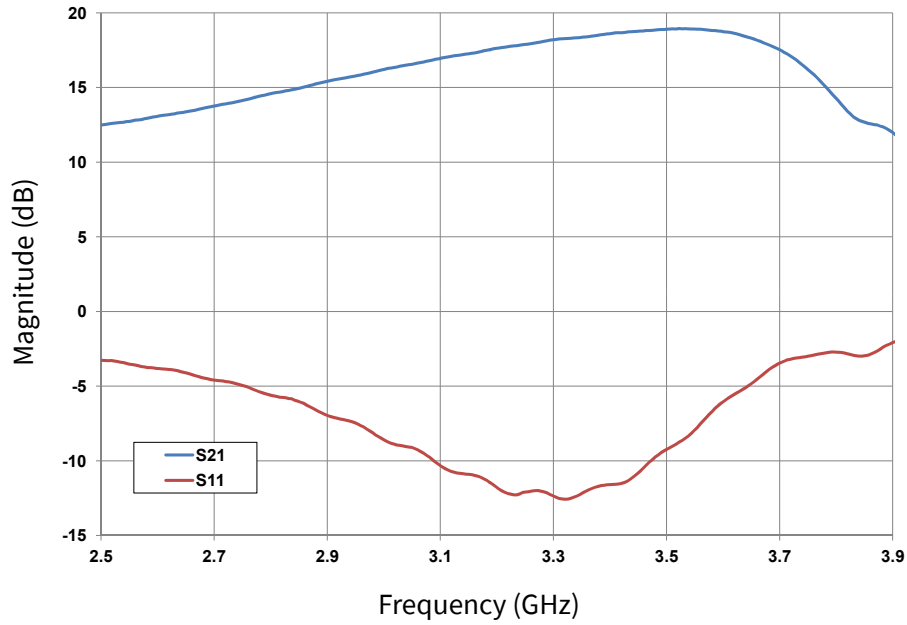
<sup>2</sup> Scaled from PCM data

<sup>3</sup> Measured in CGHV35150-AMP. Pulse Width = 300  $\mu$ s, Duty Cycle = 20%

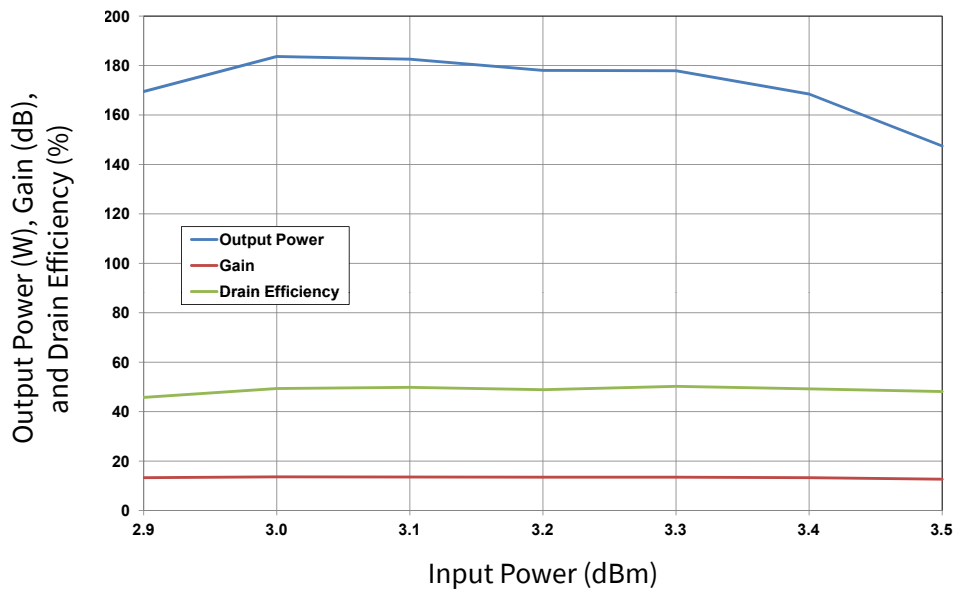


Typical Performance

**Figure 1. CGHV35150 Typical Sparameters**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 500\text{ mA}$ ,  $T_{CASE} = 25^\circ\text{C}$



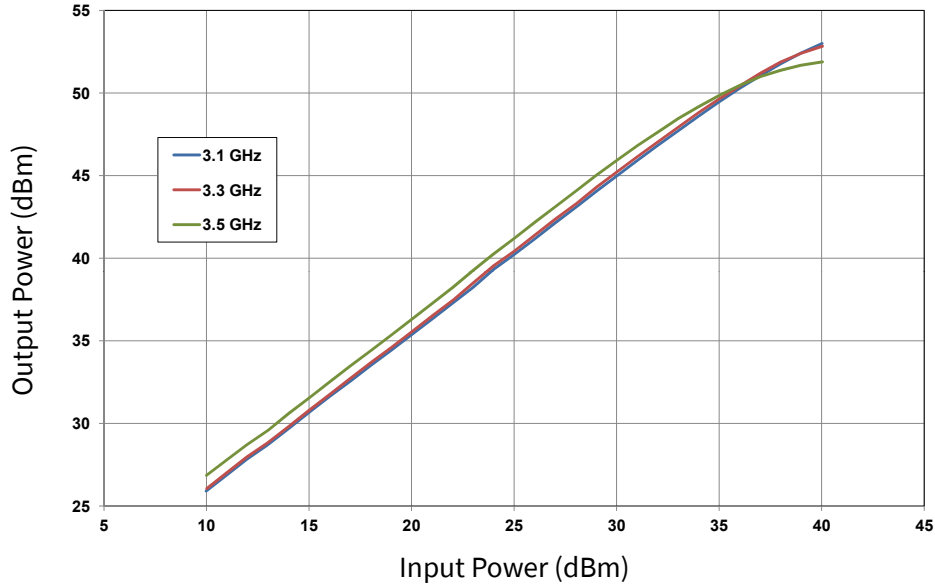
**Figure 2. CGHV35150 Typical RF Results**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 500\text{ mA}$ ,  $P_{IN} = 39\text{ dBm}$   
 $T_{plate} = 85^\circ\text{C}$ , Pulse Width = 300 us, Duty Cycle = 20%



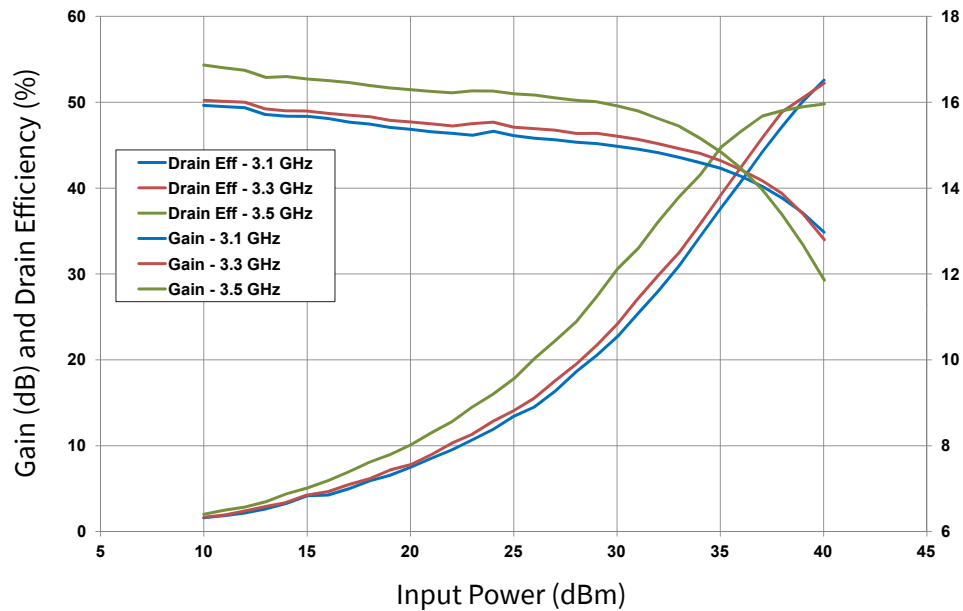


Typical Performance

**Figure 3. CGHV35150 Output Power vs Input Power**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 500\text{ mA}$ ,  $T_{PLATE} = 85^\circ\text{C}$ , Pulse Width =  $300\ \mu\text{s}$ , Duty Cycle = 20%



**Figure 4. CGHV35150 Gain and Drain Efficiency vs Input Power**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 500\text{ mA}$ ,  $T_{plate} = 85^\circ\text{C}$ , Pulse Width =  $300\ \mu\text{s}$ , Duty Cycle = 20%



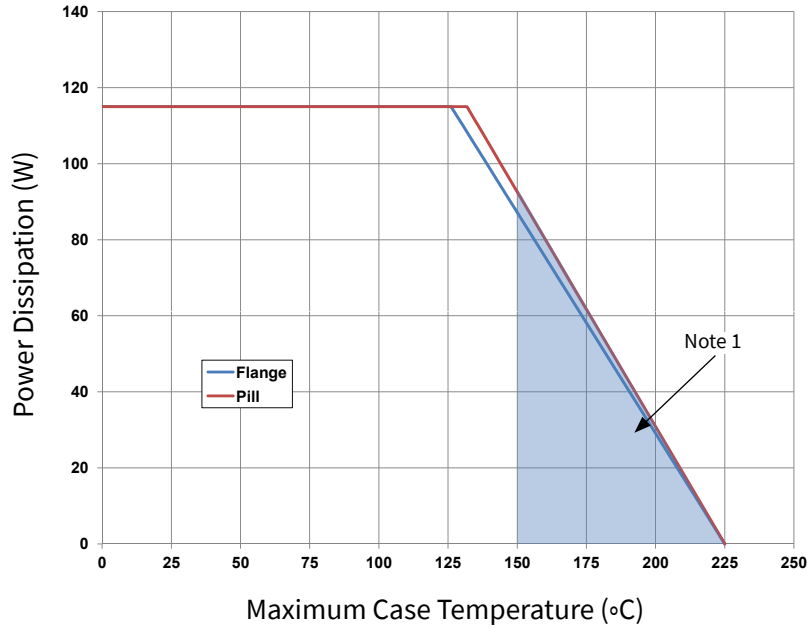
Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Class	Test Methodology
Human Body Model	HBM	1A (> 250 V)	JEDEC JESD22 A114-D
Charge Device Model	CDM	II (200 V to 500 V)	JEDEC JESD22 C101-C



**CGHV35150 Power Dissipation De-rating Curve**

**Figure 5. CGHV35150 Transient Power Dissipation De-Rating Curve**

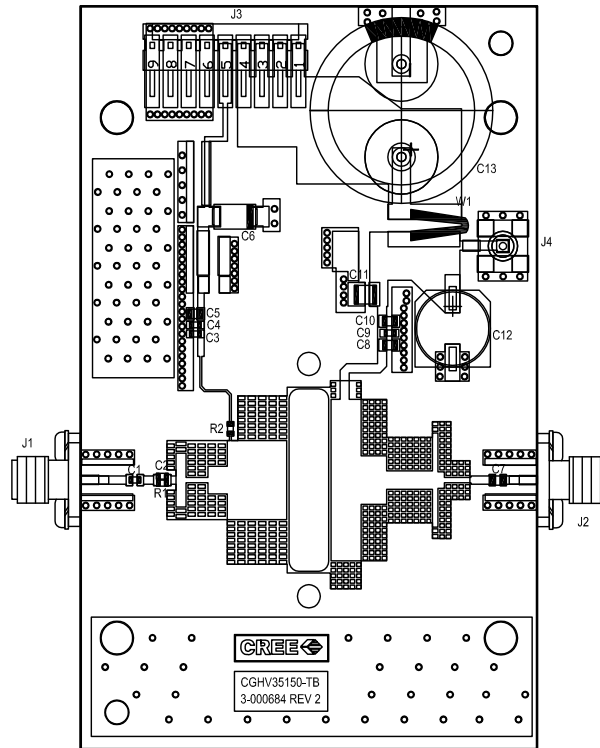


Note 1. Area exceeds Maximum Case Temperature (See Page 2)

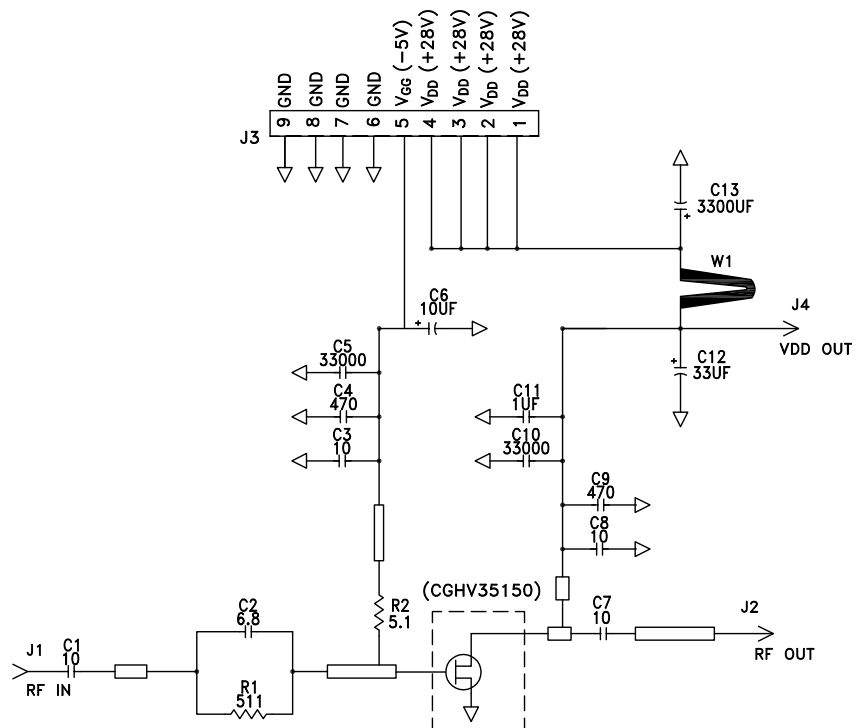
**CGHV35150-AMP Application Circuit Bill of Materials**

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, CGHV35150	1
Q1	CGHV35150	1

**CGHV35150-AMP Application Circuit Outline**

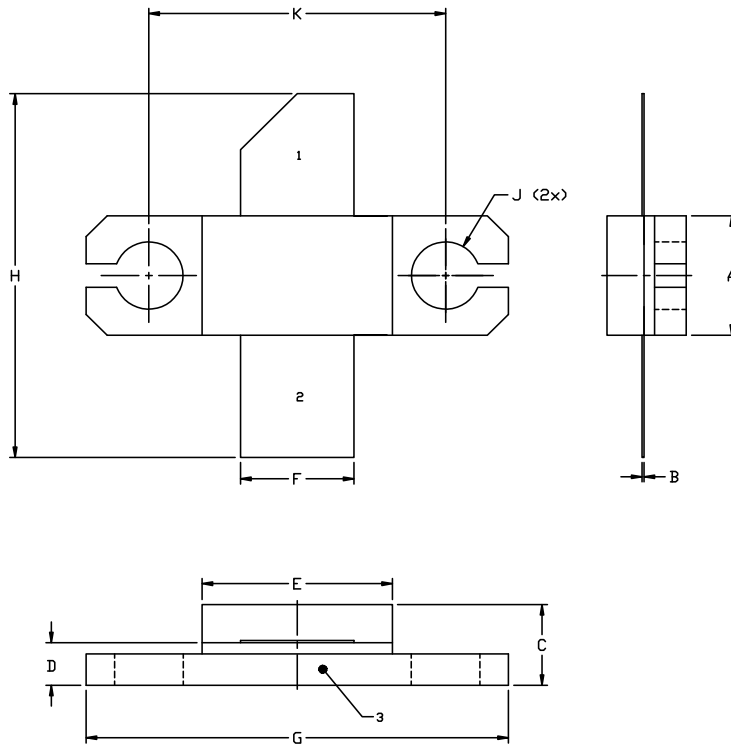


**CGHV35150-AMP Application Circuit Schematic**





**Product Dimensions CGHV35150F (Package Type — 440193)**



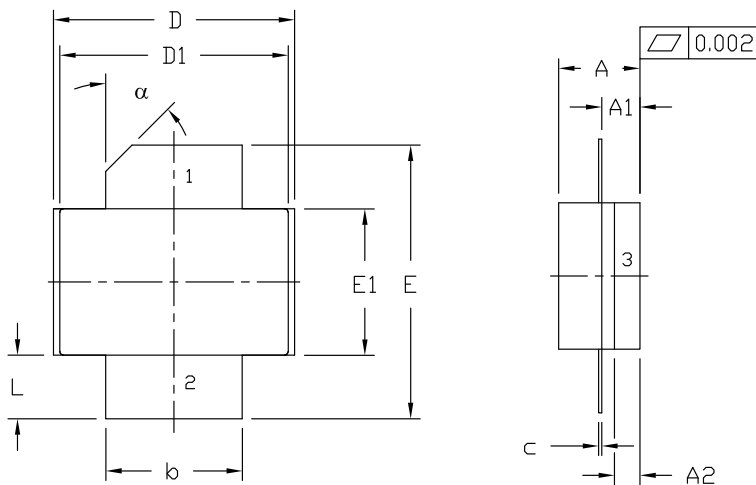
NOTES:

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	∅ .130		3.30	
k	0.562		14.28	

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

**Product Dimensions CGHV35150P (Package Type — 440206)**



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



**Part Number System**

**CGHV35150F**



**Table 1.**

Parameter	Value	Units
Upper Frequency <sup>1</sup>	3.5	GHz
Power Output	150	W
Package	F = Flange, P = Pill	-

**Note<sup>1</sup>:** Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value


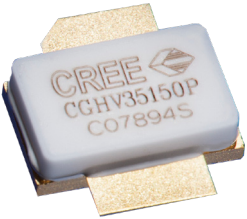
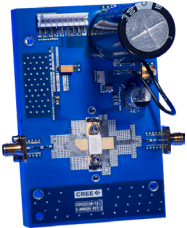
**Table 2.**

Character Code	Code Value
A	0
B	1
C	2
D	3
E	4
F	5
G	6
H	7
J	8
K	9
Examples:	1A = 10.0 GHz 2H = 27.0 GHz





**Product Ordering Information**

Order Number	Description	Unit of Measure	Image
CGHV35150F	GaN HEMT	Each	
CGHV35150P	GaN HEMT	Each	
CGHV35150F-AMP	Test board with GaN HEMT installed	Each	



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## Notes

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