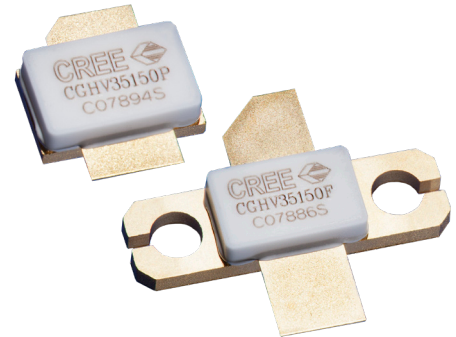


CGHV35150

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 μs 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 μsec - 300 μsec @ 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 ¹	I_{DMAX}	12	A	25 °C
Soldering Temperature ²	T_S	245	°C	
Screw Torque	τ	40	in-oz	
Pulsed Thermal Resistance, Junction to Case ³	$R_{\theta JC}$	0.81	°C/W	300 μ sec, 20%, 85 °C
Pulsed Thermal Resistance, Junction to Case ⁴	$R_{\theta JC}$	0.86	°C/W	300 μ sec, 20%, 85 °C
Case Operating Temperature	T_C	-40, +150	°C	

Notes:

¹ Current limit for long term, reliable operation

² Refer to the Application Note on soldering at wolfspeed.com/rf/document-library

³ Measured for the CGHV35150P at $P_{DISS} = 150$ W

⁴ Measured for the CGHV35150F at $P_{DISS} = 150$ W

Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics¹ ($T_C = 25$ °C)						
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 ²	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
RF Characteristics³ ($T_C = 85$ °C, $F_0 = 3.1 - 3.5$ GHz unless otherwise noted)						
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	Ψ	No damage at all phase angles, $V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 39$ dBm Pulsed

Notes:

¹ Measured on wafer prior to packaging

² Scaled from PCM data

³ Measured in CGHV35150-AMP. Pulse Width = 300 μ s, Duty Cycle = 20%



Typical Performance

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

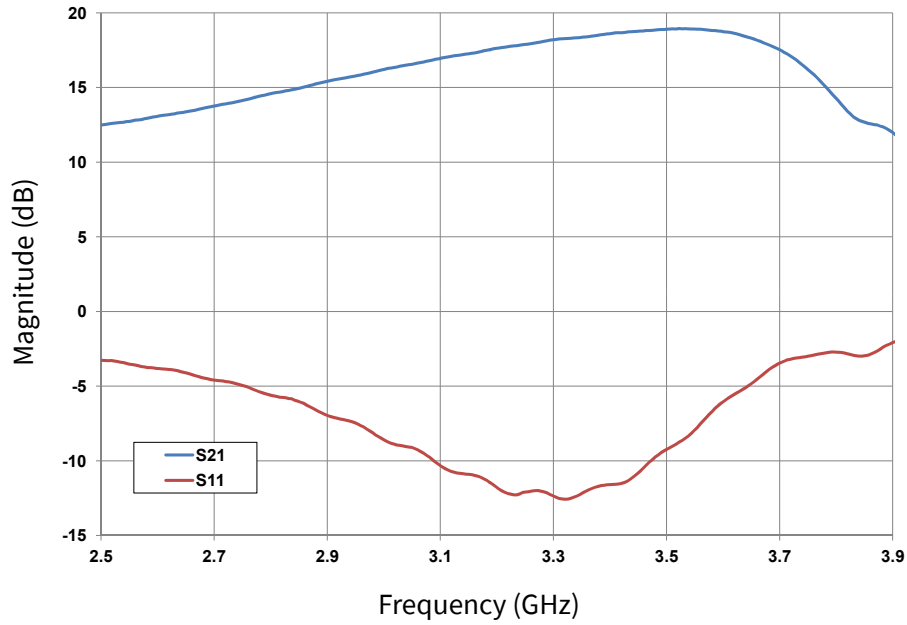
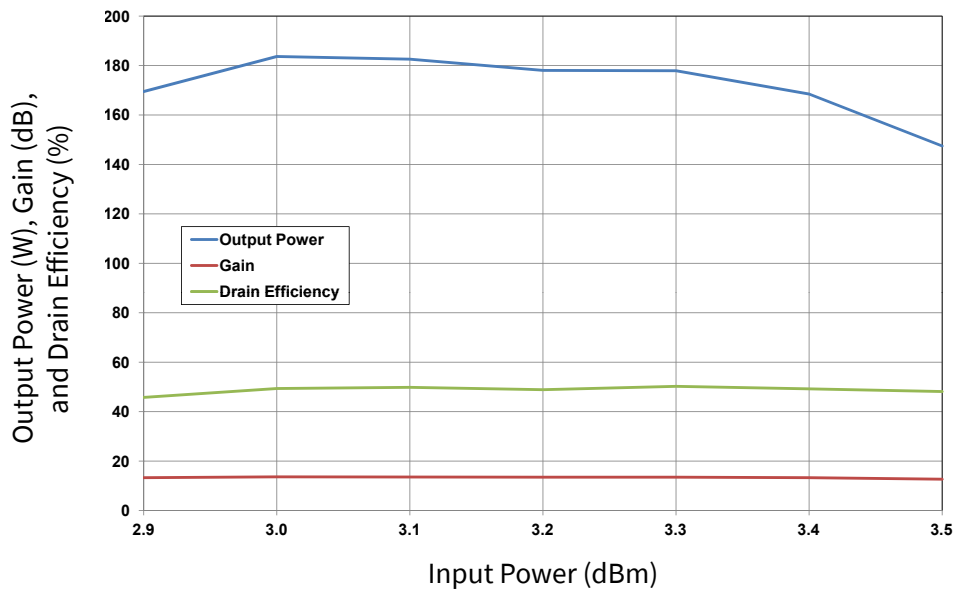


Figure 2. CGHV35150 Typical RF Results
 $V_{DD} = 50\text{ V}, I_{DQ} = 500\text{ mA}, P_{IN} = 39\text{ dBm}$
 $T_{plate} = 85^\circ\text{C}, \text{Pulse Width} = 300\text{ us}, \text{Duty Cycle} = 20\%$





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%

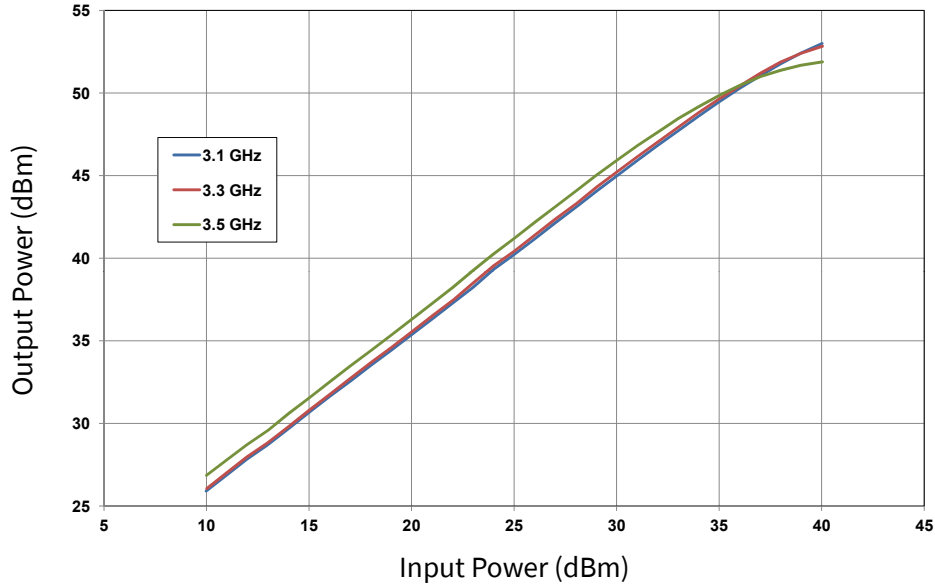
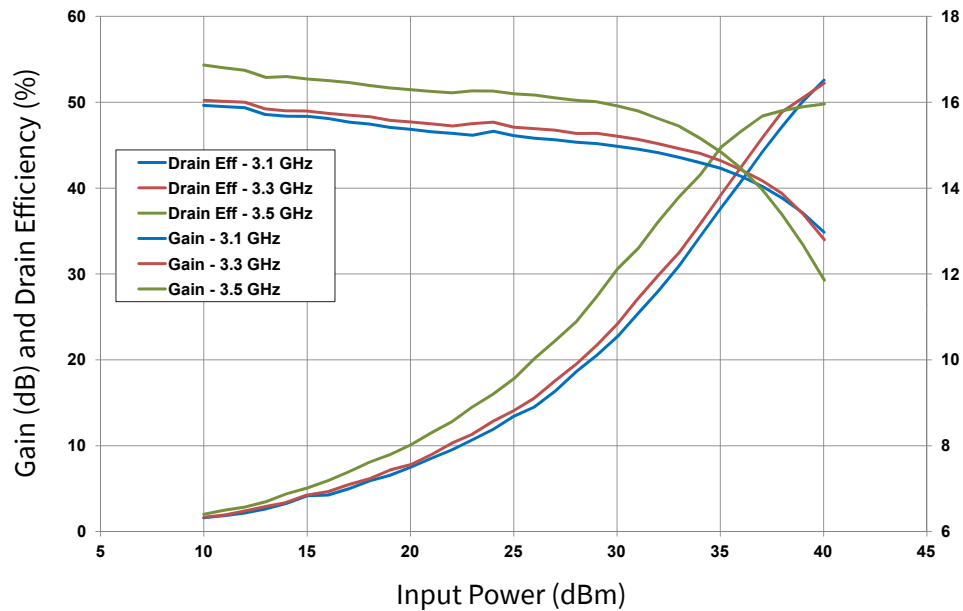


Figure 4. CGHV35150 Gain and Drain Efficiency vs Input Power
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 500\text{ mA}$, $T_{plate} = 85^\circ\text{C}$, Pulse Width = $300\ \mu\text{s}$, Duty Cycle = 20%



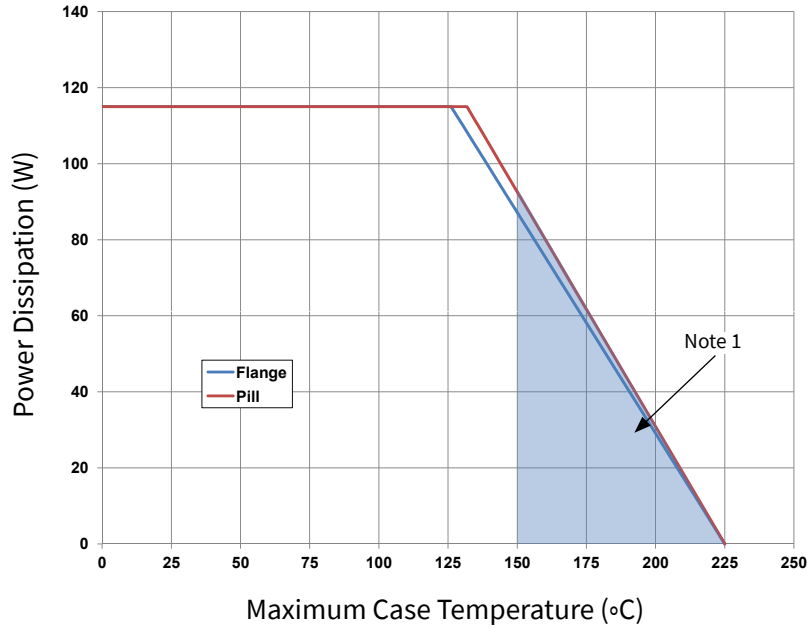
Electrostatic Discharge (ESD) Classifications

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

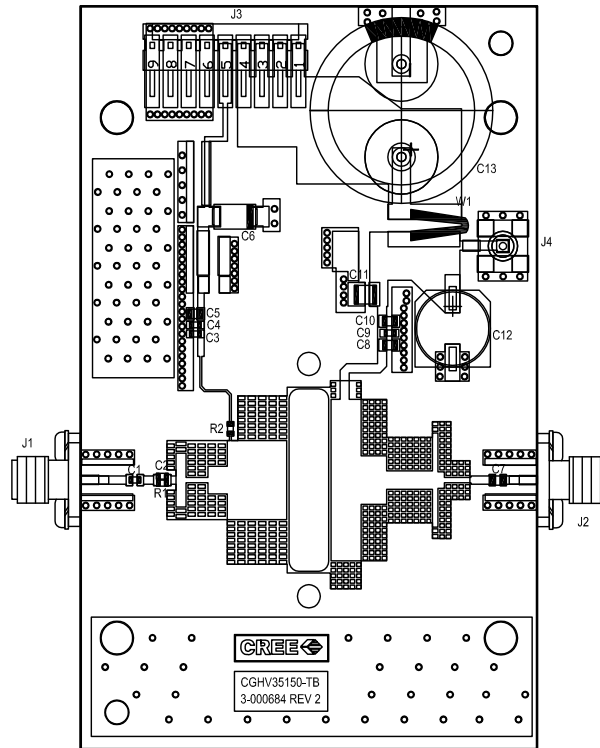


Note 1. Area exceeds Maximum Case Temperature (See Page 2)

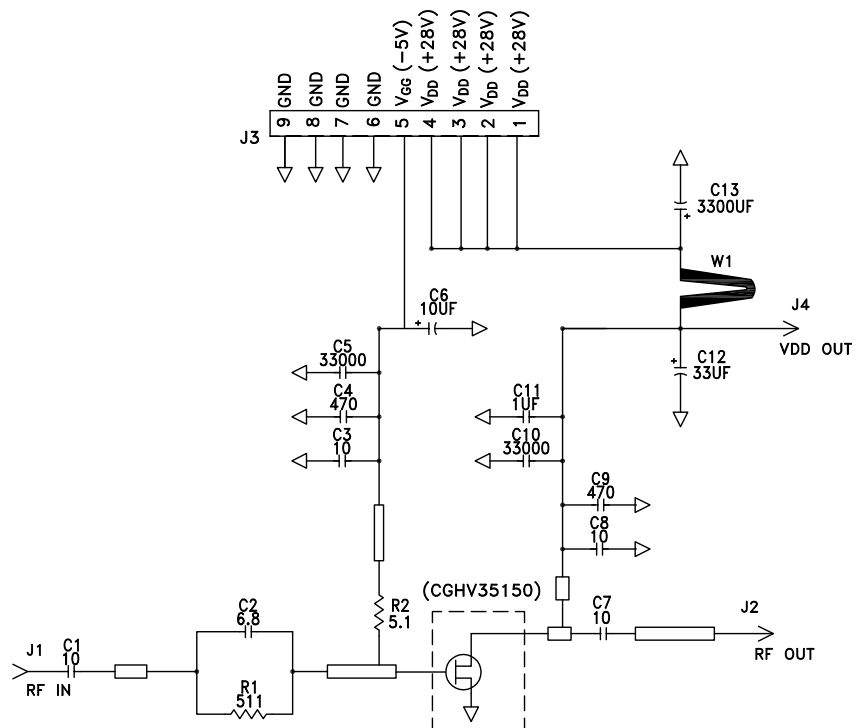
CGHV35150-AMP Application Circuit Bill of Materials

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

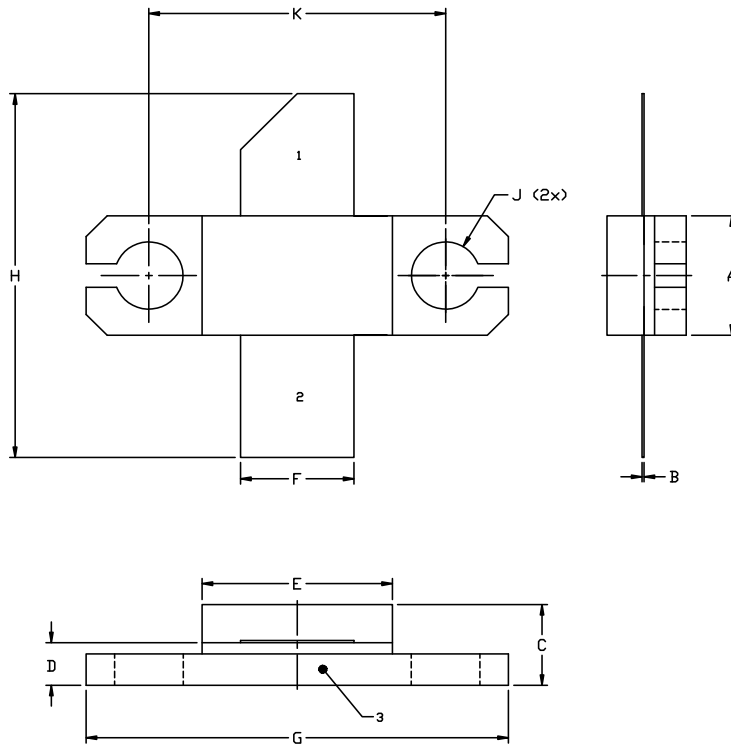


CGHV35150-AMP Application Circuit Schematic





Product Dimensions CGHV35150F (Package Type — 440193)



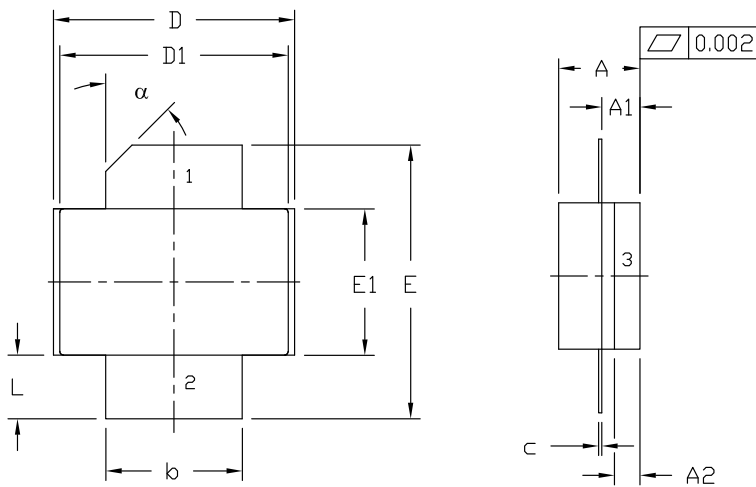
NOTES:

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 ¹	3.5	GHz
Power Output	150	W
Package	F = Flange, P = Pill	-


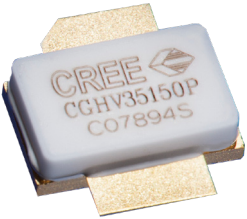
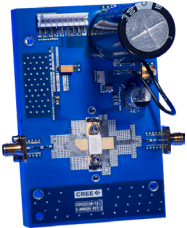
Note¹: Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value

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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