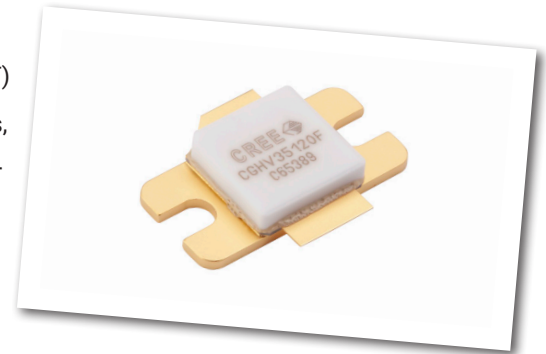


CGHV35120F

120 W, 3100 - 3500 MHz, 50V, GaN HEMT for S-Band Radar Systems

Cree's CGHV35120F is a gallium nitride (GaN) high electron mobility transistor (HEMT) designed specifically with high efficiency, high gain and wide bandwidth capabilities, which makes the CGHV35120F ideal for 3.1 - 3.5 GHz S-Band radar amplifier applications. The transistor is supplied in a ceramic/metal flange package.



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	142	135	132	136	134	W
Gain	13	12.8	12.8	12.9	12.8	dB
Drain Efficiency	68	66	63	62	62	%

Note: Measured in the CGHV35120F-AMP1 application circuit, under 100 μs pulse width, 10% duty cycle, $P_{IN} = 38.5 \text{ dBm}$

Features:



- Rated Power = 120 W @ $T_{CASE} = 85^\circ\text{C}$
- Operating Frequency = 3.1 - 3.5 GHz
- Transient 100 μsec - 300 μsec @ 20% Duty Cycle
- 13 dB Power Gain @ $T_{CASE} = 85^\circ\text{C}$
- 62 % 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

Absolute Maximum Ratings (not simultaneous)

Parameter	Symbol	Rating	Units	Conditions
Pulse Width	PW	300	µs	
Duty Cycle	DC	20	%	
Drain-Source Voltage	V _{DSS}	125	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}	22.5	mA	25°C
Maximum Drain Current ¹	I _{DMAX}	9	A	25°C
Soldering Temperature ²	T _S	245	°C	
Screw Torque	τ	40	in-oz	
Pulsed Thermal Resistance, Junction to Case ³	R _{JJC}	1.2	°C/W	300 µsec, 20%, 85°C
Case Operating Temperature	T _C	-40, +130	°C	30 seconds

Note:

¹ Current limit for long term, reliable operation

² Refer to the Application Note on soldering at <http://www.cree.com/rf/document-library>

³ Measured for the CGHV35120F at P_{DISS} = 80 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 = 21.6 mA
Gate Quiescent Voltage	V _{GS(Q)}	-	-2.7	-	V _{DC}	V _{DS} = 48 V, I _D = 220 mA
Saturated Drain Current ²	I _{DS}	16.2	19.4	-	A	V _{DS} = 6.0 V, V _{GS} = 2.0 V
Drain-Source Breakdown Voltage	V _{BR}	150	-	-	V _{DC}	V _{GS} = -8 V, I _D = 21.6 mA
RF Characteristics³ (T_c = 85°C, F₀ = 3.1 - 3.5 GHz unless otherwise noted)						
Output Power at 3.1 GHz	P _{OUT}	-	142	-	W	V _{DD} = 48 V, I _{DQ} = 220 mA, P _{IN} = 38.5 dBm
Output Power at 3.5 GHz	P _{OUT}	-	134	-	W	V _{DD} = 48 V, I _{DQ} = 220 mA, P _{IN} = 38.5 dBm
Gain at 3.1 GHz	G _p	-	13	-	dB	V _{DD} = 48 V, I _{DQ} = 220 mA, P _{IN} = 38.5 dBm
Gain at 3.5 GHz	G _p	-	12.8	-	dB	V _{DD} = 48 V, I _{DQ} = 220 mA, P _{IN} = 38.5 dBm
Drain Efficiency at 3.1 GHz	η	-	68	-	%	V _{DD} = 48 V, I _{DQ} = 220 mA, P _{IN} = 38.5 dBm
Drain Efficiency at 3.5 GHz	η	-	62	-	%	V _{DD} = 48 V, I _{DQ} = 220 mA, P _{IN} = 38.5 dBm
Amplitude Droop	D	-	-0.3	-	dB	V _{DD} = 48 V, I _{DQ} = 220 mA, P _{IN} = 38.5 dBm
Output Mismatch Stress	VSWR	-	-	5 : 1	Ψ	No damage at all phase angles, V _{DD} = 48 V, I _{DQ} = 220 mA, P _{IN} = 38.5 dBm Pulsed
Dynamic Characteristics						
Input Capacitance	C _{GS}	-	65	-	pF	V _{DS} = 48 V, V _{GS} = -8 V, f = 1 MHz
Output Capacitance	C _{DS}	-	9.5	-	pF	V _{DS} = 48 V, V _{GS} = -8 V, f = 1 MHz
Feedback Capacitance	C _{GD}	-	0.7	-	pF	V _{DS} = 48 V, V _{GS} = -8 V, f = 1 MHz

Notes:

¹ Measured on wafer prior to packaging.

² Scaled from PCM data.

³ Measured in Cree's production test fixture. Pulse Width = 100 µs, Duty Cycle = 10%.

Typical Performance

Figure 1. - CGHV35120F Typical Sparameters Measured in CGHV35120F-AMP1
 $V_{DD} = 48\text{ V}$, $I_{DQ} = 220\text{ mA}$, $T_{CASE} = 25^\circ\text{C}$

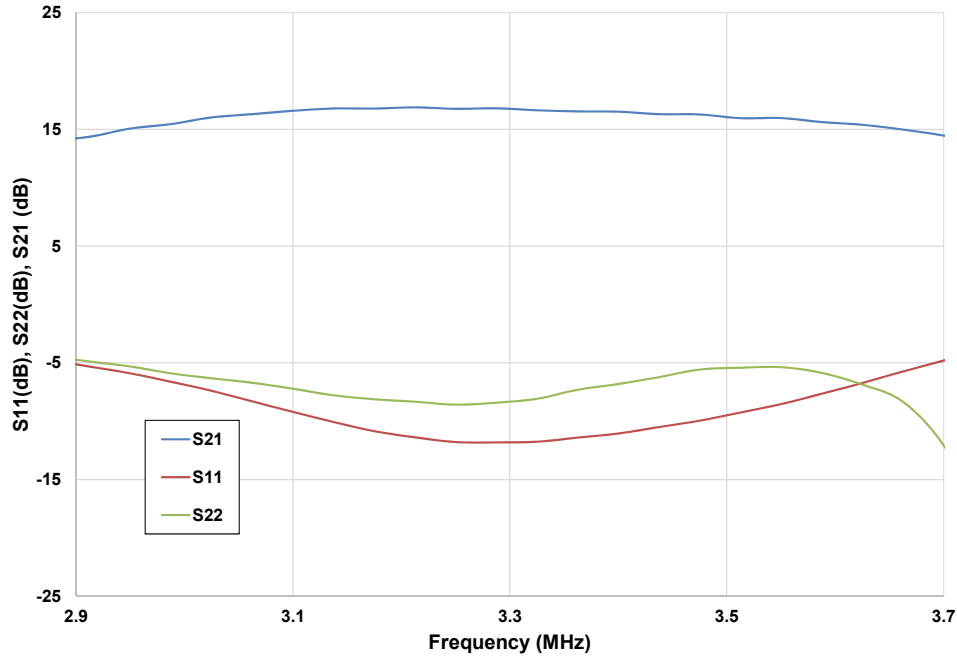
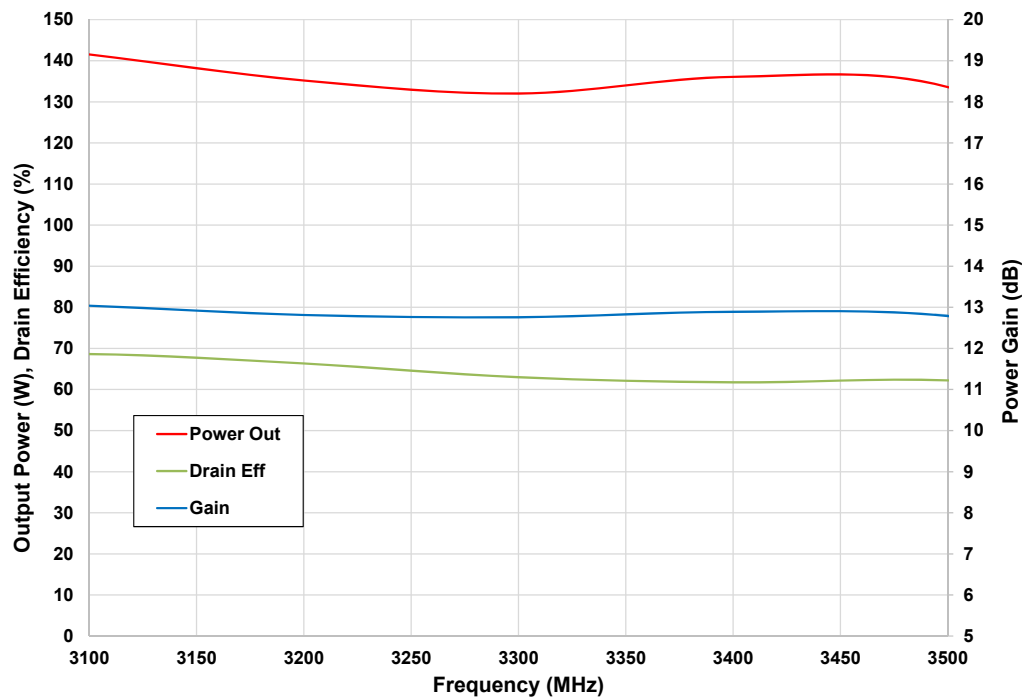


Figure 2. - CGHV35120F Typical RF Results Measured in CGHV35120F-AMP1
 $V_{DD} = 48\text{ V}$, $I_{DQ} = 220\text{ mA}$, $T_{plate} = 85^\circ\text{C}$, Pulse Width = 100 μs , Duty Cycle = 10 %



Typical Performance

Figure 3. - CGHV35120F Output Power vs Input Power Measured in CGHV35120F-AMP1

$V_{DD} = 48\text{ V}$, $I_{DQ} = 220\text{ mA}$, $T_{PLATE} = 85^\circ\text{C}$, Pulse Width = 100 μs , Duty Cycle = 10%

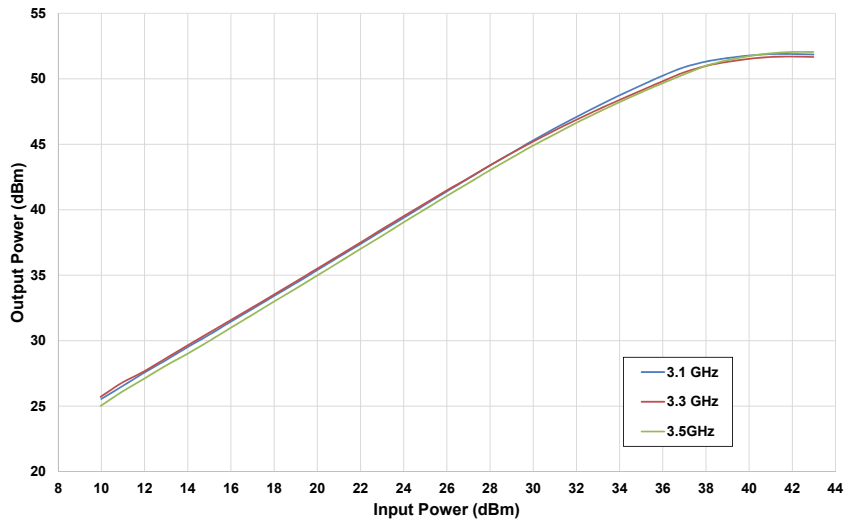
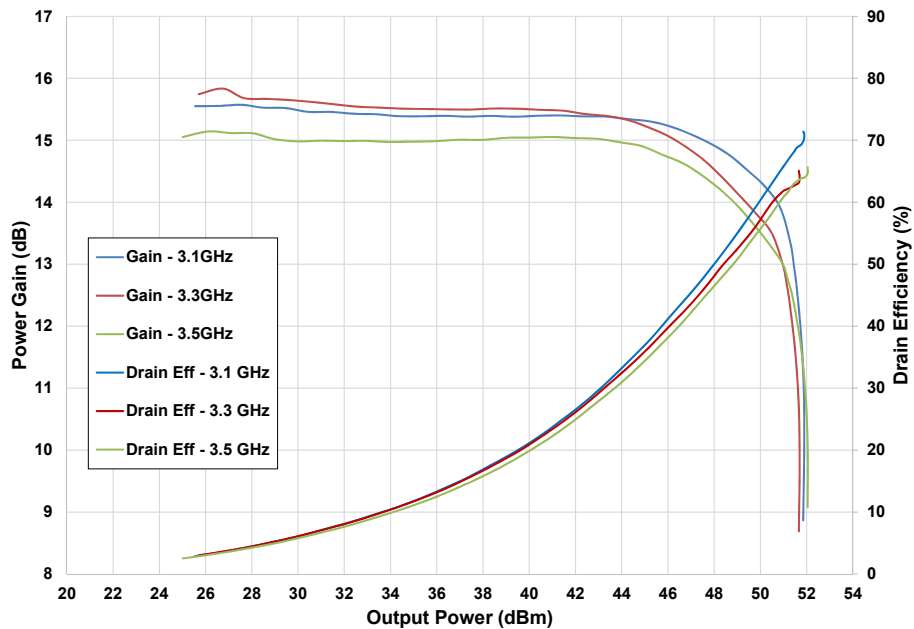


Figure 4. - CGHV35120F Gain and Drain Efficiency vs Output Power Measured in CGHV35120F-AMP1

$V_{DD} = 48\text{ V}$, $I_{DQ} = 220\text{ mA}$, $T_{plate} = 85^\circ\text{C}$, Pulse Width = 100 μs , Duty Cycle = 10%

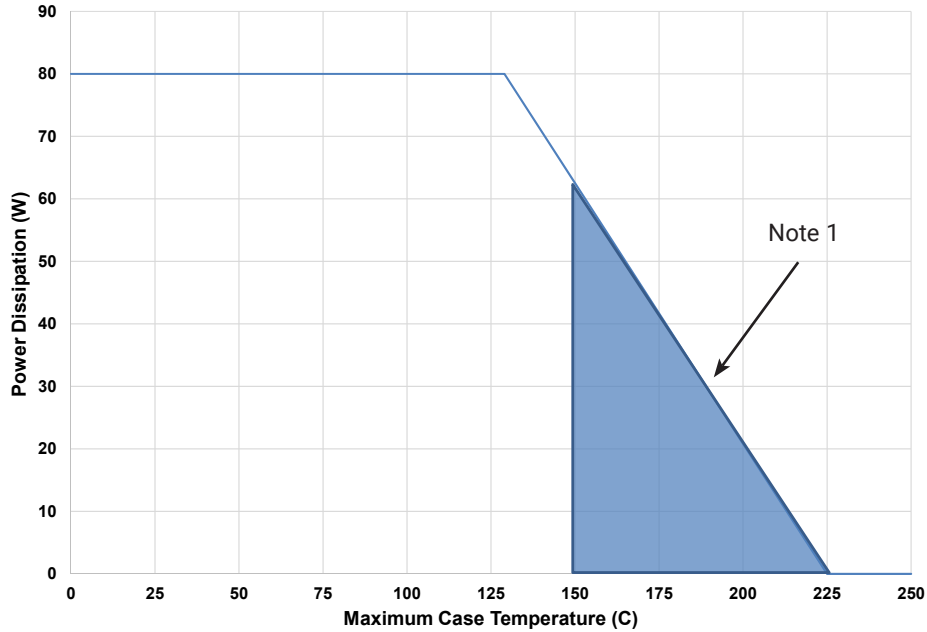


Electrostatic Discharge (ESD) Classifications

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

CGHV35120F Power Dissipation De-rating Curve

Figure 5. - CGHV35120F Transient Power Dissipation De-Rating Curve

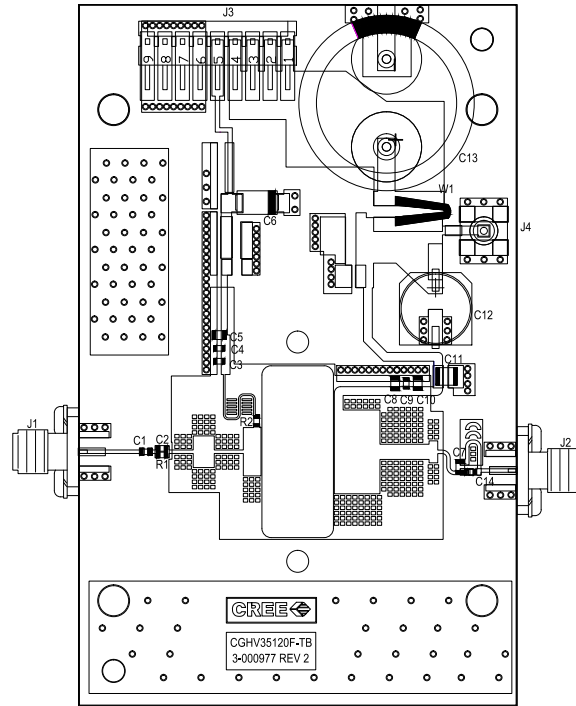


Note 1. Area exceeds Maximum Case Temperature (See Page 2).

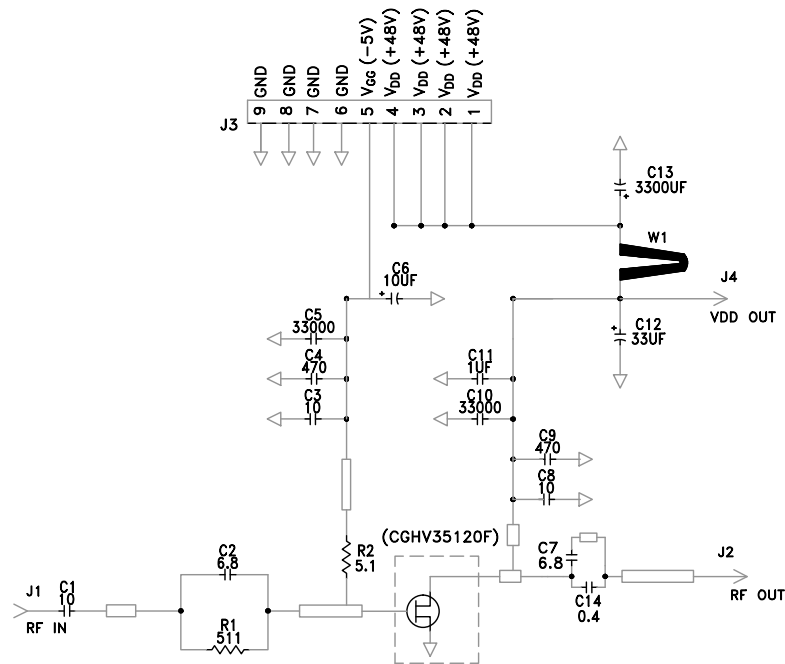
CGHV35120F-AMP1 Application Circuit Bill of Materials

Designator	Description	Qty
R1	RES, 511 OHMS, +/- 1%, 1/16W,0603	1
R2	RES, 5.1, OHM, +/- 1%, 1/16W,0603	1
C8	CAP, 10pF, +/- 1%, 250V, 0805, ATC	2
C2	CAP, 6.8pF, +/- 0.25 pF,250V, 0603, ATC	1
C1, C3	CAP, 10.0pF, +/-5%,250V, 0603, ATC	2
C4, C9	CAP, 470PF, 5%, 100V, 0603, X7R	2
C5, C10	CAP,33000PF, 0805,100V, X7R	2
C6	CAP 10UF 16V TANTALUM	1
C7	CAP, 6.8pF, +/- 1%, 250V, 0805, ATC	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
C14	CAP, 0.4pF, +/-0.1pF, 0603, ATC	1
J1, J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20MIL	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, 10 MIL THK, CGHV35120F	1
Q1	CGHV35120F	1

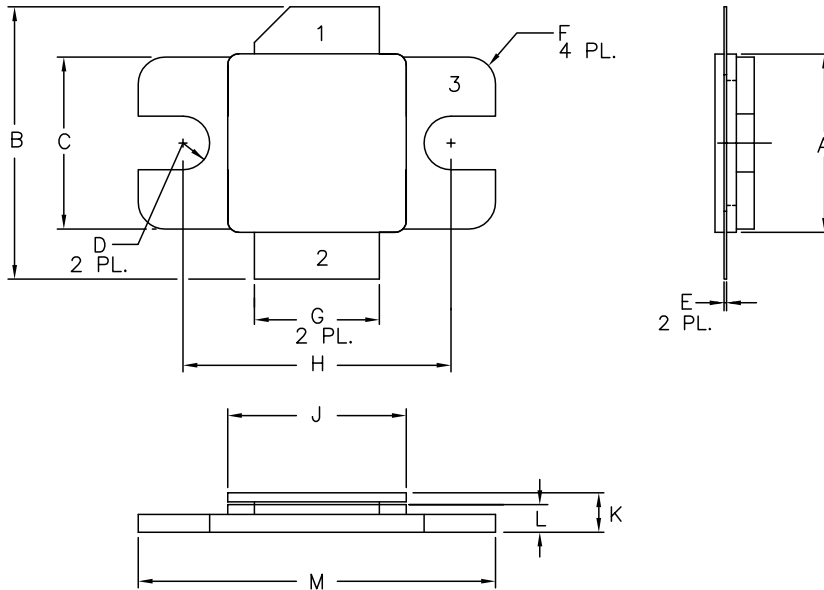
CGHV35120F-AMP1 Application Circuit Outline



CGHV35120F-AMP1 Application Circuit Schematic



Product Dimensions CGHV35120F (Package Type – 440162)



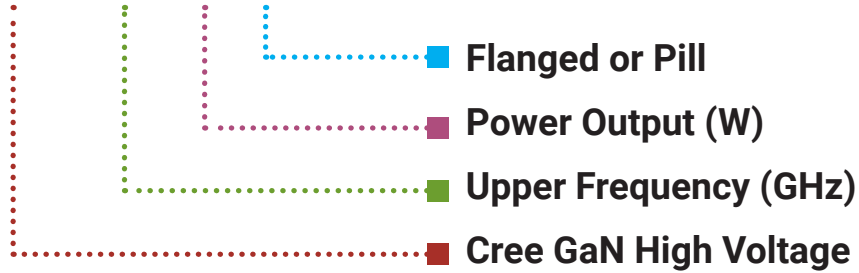
NOTES:

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.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.395	.405	10.03	10.29
B	.580	.620	14.73	15.75
C	.380	.390	9.65	9.91
D	.055	.065	1.40	1.65
E	.004	.006	0.10	0.15
F	.055	.065	1.40	1.65
G	.275	.285	6.99	7.24
H	.595	.605	15.11	15.37
J	.395	.405	10.03	10.29
K	.129	.149	3.28	3.78
L	.053	.067	1.35	1.70
M	.795	.805	20.19	20.45

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

CGHV35120F



Parameter	Value	Units
Upper Frequency ¹	3.5	GHz
Power Output	120	W
Package	Flange	-

Table 1.

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

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

Table 2.

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CGHV35120F	GaN HEMT	Each	
CGHV35120F-AMP1	Test board with GaN HEMT installed	Each	



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For more information, please contact:

Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
www.cree.com/rf