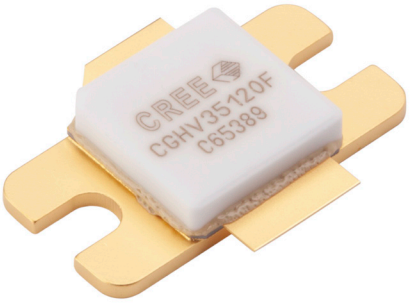
CGHV35120F

120 W, 2.9 - 3.8 GHz, 50 V, GaN HEMT for S-Band Radar Systems



PN: CGHV35120F
Package Type: 440162

Description

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 2.9 - 3.8 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˚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	dBc
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 dBm

Features

- Rated Power = 120 W @ T_{CASE} = 85°C
- Operating Frequency = 2.9 - 3.8 GHz
- Transient 100 µsec - 300 µsec @ 20% Duty Cycle
- 13 dB Power Gain @ T_{CASE} = 85°C
- 62% Typical Drain Efficiency @ T_{CASE} = 85°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}	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]	$R_{\theta JC}$	1.2	˚C/W	300 µsec, 20%, 85˚C
Case Operating Temperature	T_C	-40, +130	˚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 CGHV35120F at $_{PDISS}$ = 80 W

Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[1] (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	20.1	–	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 = 21.6 mA
RF Characteristics[3] (T_C = 25˚C, F_0 = 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	D_E	–	68	–	%	V_{DD} = 48 V, I_{DQ} = 220 mA, P_{IN} = 38.5 dBm
Drain Efficiency at 3.5 GHz	D_E	–	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
Input Capacitance	C_{DS}	–	9.5	–	pF	V_{DS} = 48 V, V_{gs} = -8 V, f = 1 MHz
Input 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 CGHV35120-AMP. Pulse Width = 100 µs, Duty Cycle = 10%

Typical Performance

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

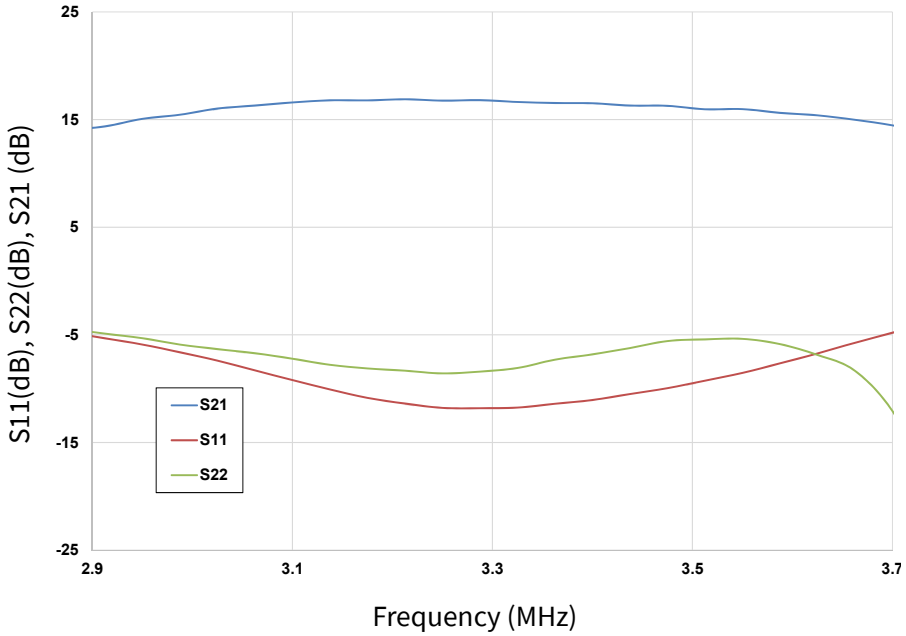
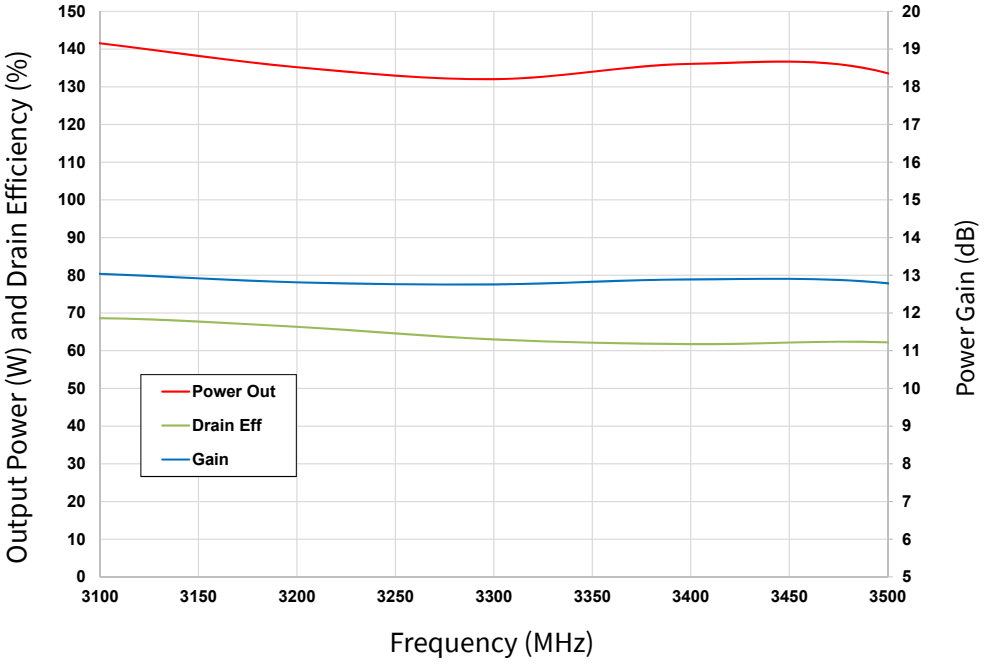


Figure 2. CGHV35120F Typical RF Results Measured in CGHV35120F-AMP1
V_{DD} = 48 V, I_{DQ} = 220 mA, Tplate = 85°C, Pulse Width = 100 µs, Duty Cycle = 10%



Typical Performance

Figure 3. CGHV35120F Output Power vs Input Power Measured in CGHV35120F-AMP1
V_{DD} = 48 V, I_{DQ} = 220 mA, T_{PLATE} = 85°C, Pulse Width = 100 µs, Duty Cycle = 10%

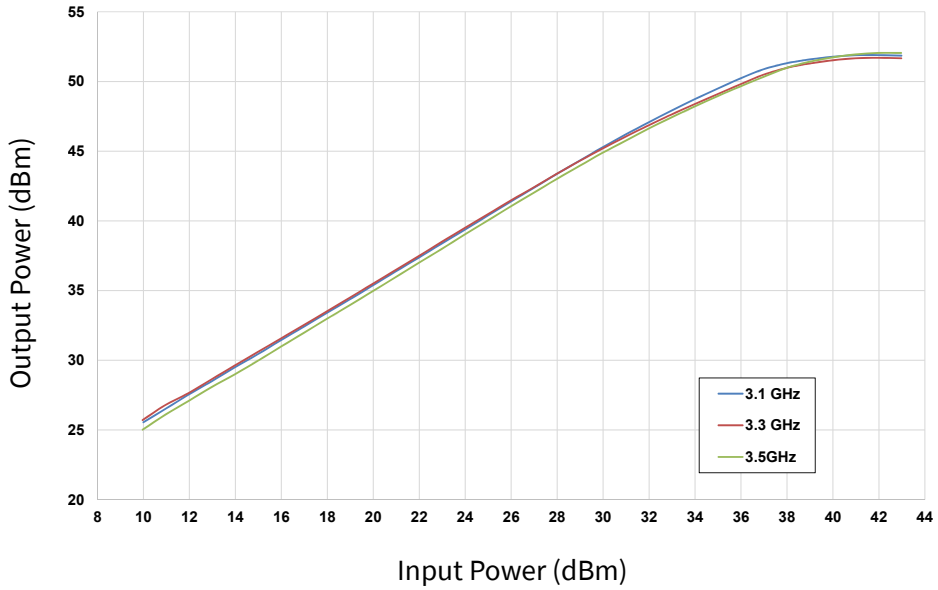
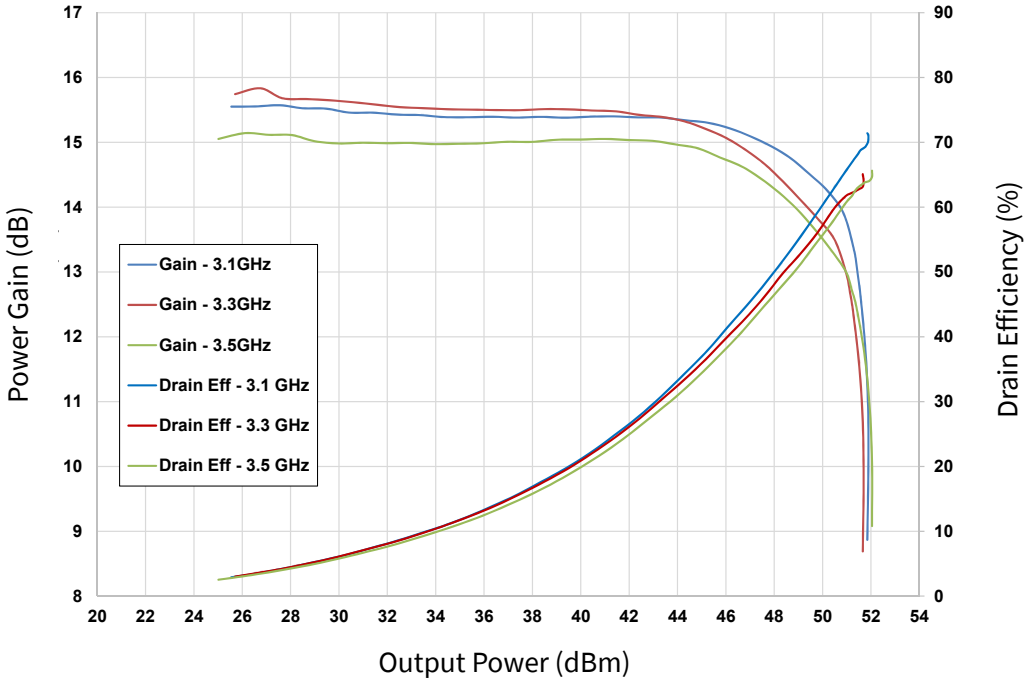


Figure 4. CGHV35120F Gain and Drain Efficiency vs Output Power Measured in CGHV35120F-AMP1
V_{DD} = 48 V, I_{DQ} = 220 mA, Tplate = 85°C, Pulse Width = 100 µs, Duty Cycle = 10%



Typical Performance

Figure 5. CGHV35120F Power Out/Drain Efficiency vs Frequency Measured in CGHV35120F-AMP1
V_{DD} = 48 V, P_{SAT} where IG > 0, Pulse Width = 1msec, Duty Cycle = 20%

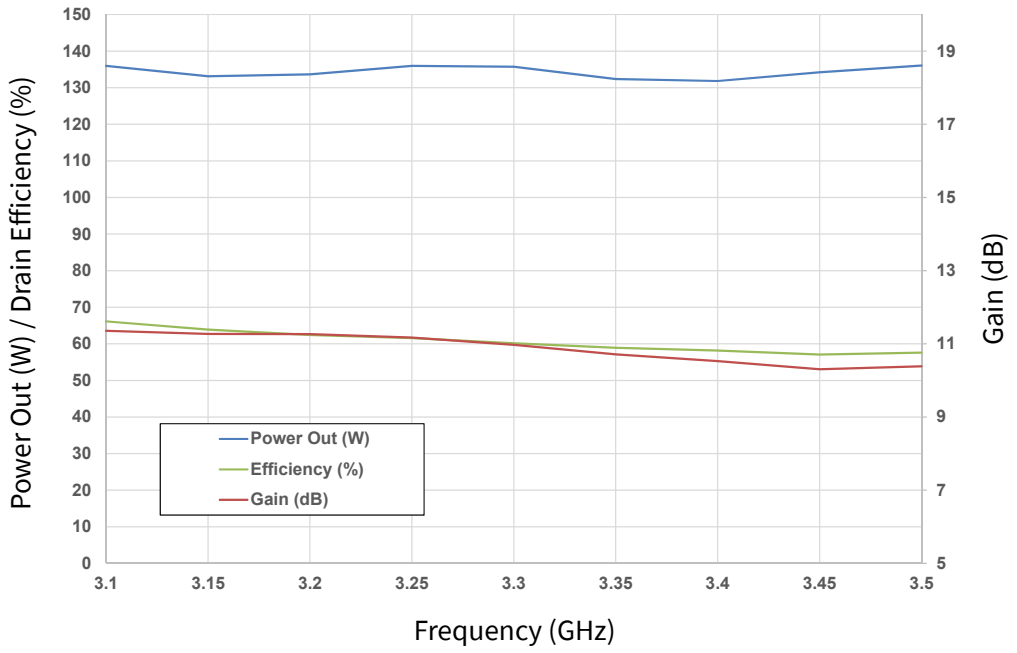
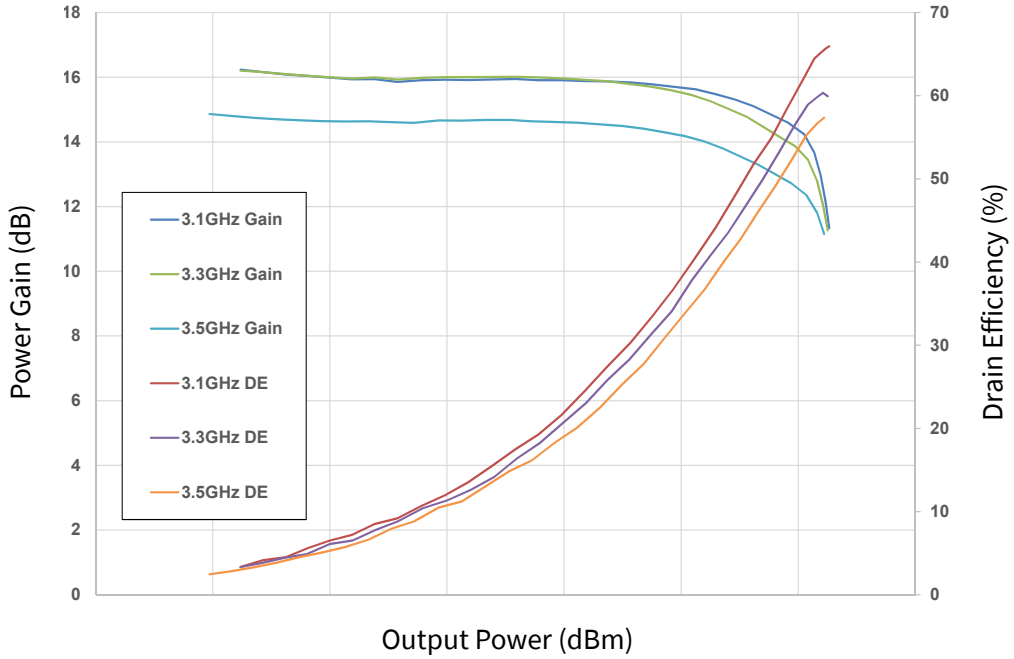
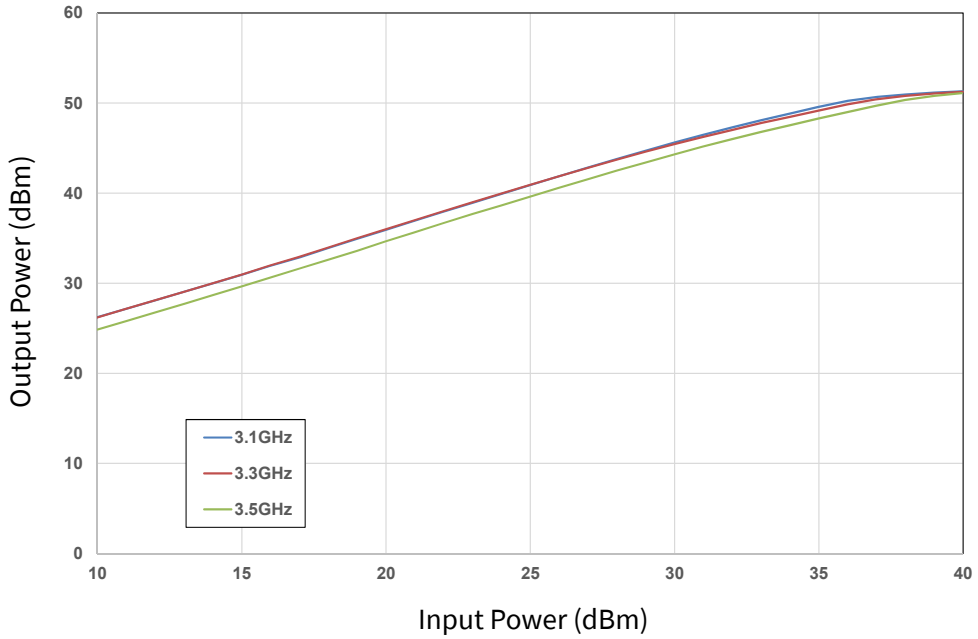


Figure 6. CGHV35120F Gain and Drain Efficiency vs Output Power Measured in CGHV35120F-AMP1
V_{DD} = 48 V, I_{DQ} = 220 mA, Tplate = 25°C, Pulse Width = 1msec, Duty Cycle = 20%



Typical Performance

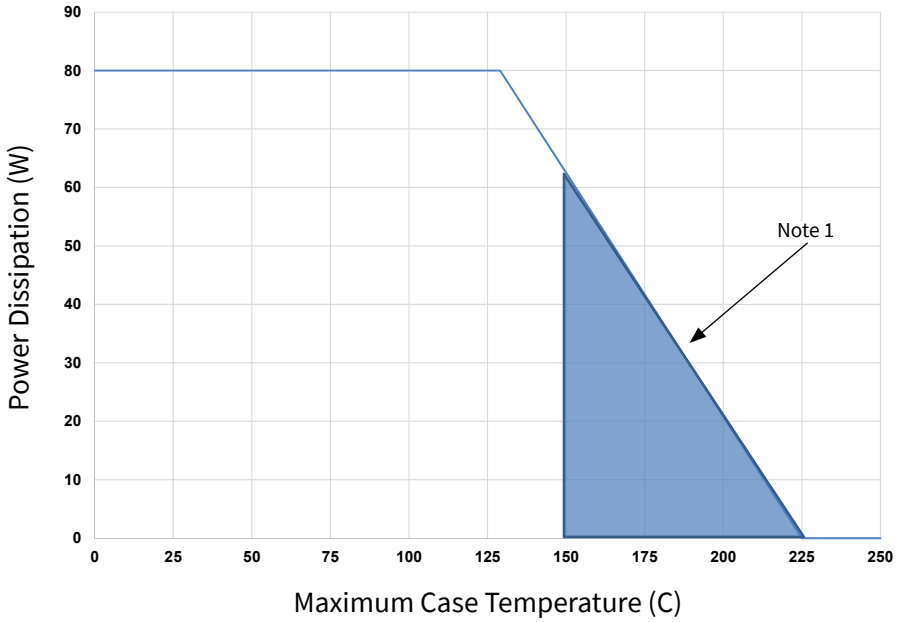
Figure 7. CGHV35120F Output Power vs Input Power Measured in CGHV35120F-AMP1
V_{DD} = 48 V, I_{DQ} = 220 mA, T_{PLATE} = 25°C, Pulse Width = 1msec, Duty Cycle = 20%



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

CGHV35120F Power Dissipation De-rating Curve

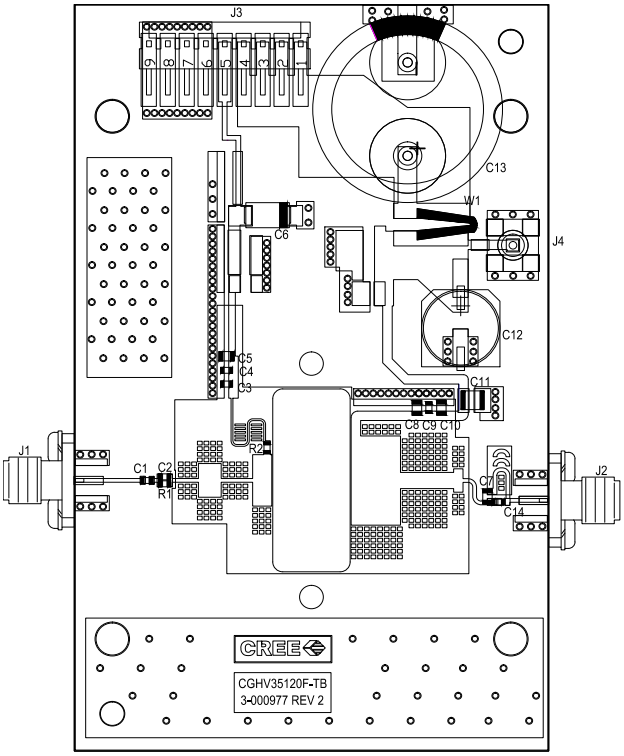


Note 1. Area exceeds Maximum Case Temperature (See Page 2)

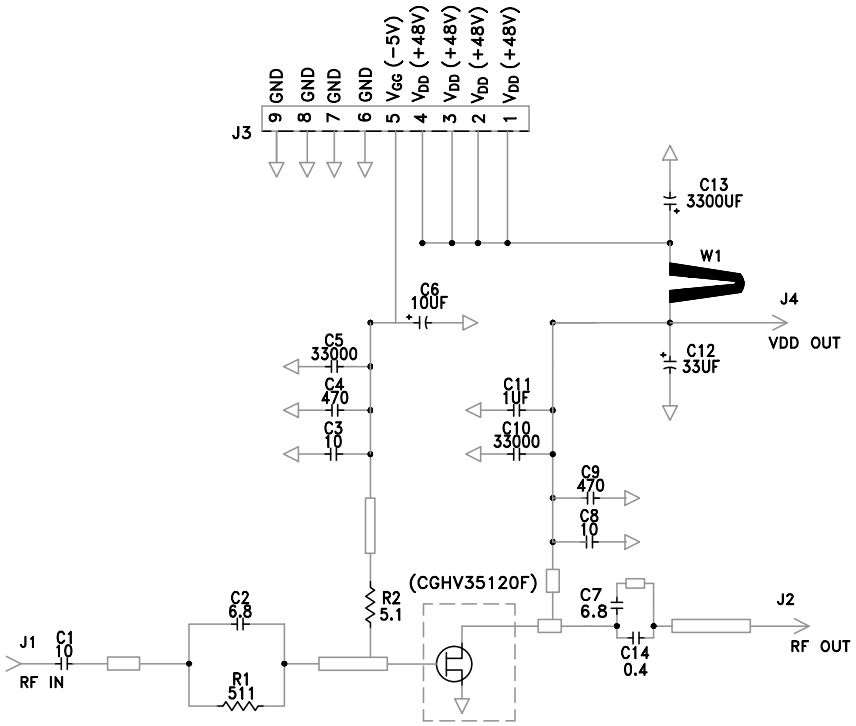
CGHV35120F-AMP1 Application Circuit Bill of Materials

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

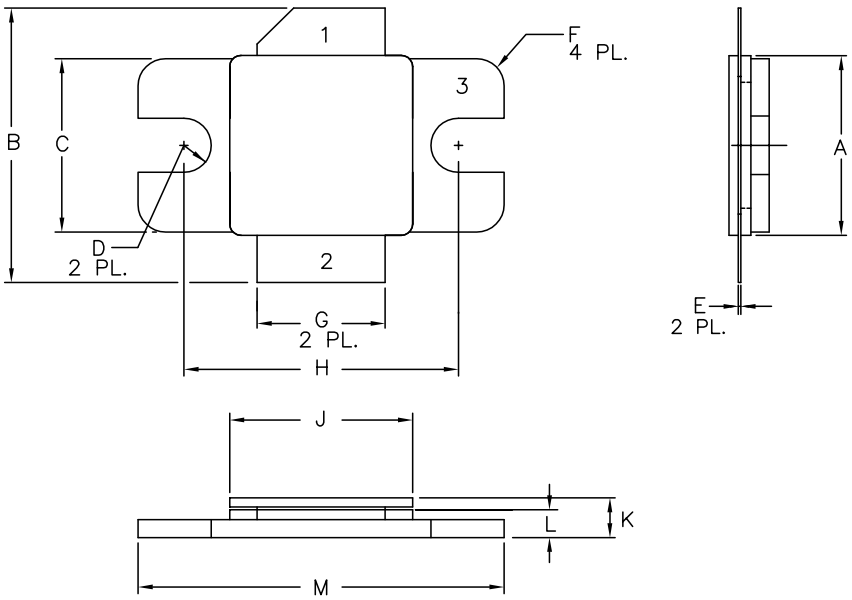
CGHV35120F-AMP1 Application Circuit Outline



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.

	INCHES		MILLIMETERS	
DIM	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

Part Number System

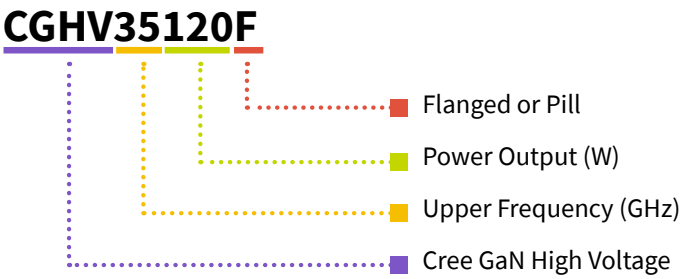


Table 1.

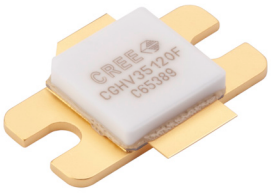
Parameter	Value	Units
Upper Frequency[1]	3.8	GHz
Power Output	120	W
Package	Flange	-

Note[1]: 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
CGHV35120F	GaN HEMT	Each	
CGHV35120F-AMP1	3.1 - 3.5 GHz test board with GaN HEMT installed	Each	

For more information, please contact:

4600 Silicon Drive
Durham, North Carolina, USA 27703
www.wolfspeed.com/RF

Sales Contact
RFSales@wolfspeed.com

RF Product Marketing Contact
RFMarketing@wolfspeed.com

Notes

Disclaimer

Specifications are subject to change without notice. Cree, Inc. believes the information contained within this data sheet to be accurate and reliable. However, no responsibility is assumed by Cree for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Cree. Cree makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose. “Typical” parameters are the average values expected by Cree in large quantities and are provided for information purposes only. These values can and do vary in different applications and actual performance can vary over time. All operating parameters should be validated by customer’s technical experts for each application. Cree products are not designed, intended or authorized for use as components in applications intended for surgical implant into the body or to support or sustain life, in applications in which the failure of the Cree product could result in personal injury or death or in applications for planning, construction, maintenance or direct operation of a nuclear facility.