



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



# CGHV40030

**30 W, DC - 6 GHz, 50V, GaN HEMT**

Cree's CGHV40030 is an unmatched, gallium nitride (GaN) high electron mobility transistor (HEMT) designed specifically for high efficiency, high gain and wide bandwidth capabilities. The device can be deployed for L, S and C-Band amplifier applications. The datasheet specifications are based on a 0.96 - 1.4 GHz amplifier. The CGHV40030 operates on a 50 volt rail circuit while housed in a 2-lead flange or pill package.



Package Type: 440166 and 440196  
PN: CGHV40030

## Typical Performance 0.96 - 1.4 GHz ( $T_c = 25^\circ\text{C}$ ), 50 V

Parameter	0.96 GHz	1.1 GHz	1.25 GHz	1.4 GHz	Units
Gain @ $P_{SAT}$	15.6	15.8	16.6	15.8	dB
Saturated Output Power	29	30	36	31	W
Drain Efficiency @ $P_{SAT}$	62	74	64	67	%

Note:  
Measured CW in the CGHV40030-AMP application circuit.

## Features

- Up to 6 GHz Operation
- 30 W Typical Output Power
- 16 dB Gain
- Application circuit for 0.96 - 1.4 GHz
- 70% Efficiency at  $P_{SAT}$
- 50 V Operation

Large Signal Models Available for ADS and MWO

## Absolute Maximum Ratings (not simultaneous) at 25°C Case Temperature

Parameter	Symbol	Rating	Units	Notes
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	$I_{GMAX}$	5.2	mA	25°C
Maximum Drain Current <sup>1</sup>	$I_{DMAX}$	4.2	A	25°C
Soldering Temperature <sup>2</sup>	$T_S$	245	°C	
Case Operating Temperature <sup>3</sup>	$T_C$	-40, +85	°C	
Thermal Resistance, Junction to Case <sup>4</sup>	$R_{\theta JC}$	5.9	°C/W	85°C

Note:

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

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

<sup>3</sup>  $P_{DISS} = 23.4 \text{ W}$

<sup>4</sup> CW

## Electrical Characteristics ( $T_C = 25^\circ\text{C}$ )

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
<b>DC Characteristics<sup>1</sup></b>						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.0	-2.3	$V_{DC}$	$V_{DS} = 10 \text{ V}, I_D = 5.2 \text{ mA}$
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.6	-	$V_{DC}$	$V_{DS} = 50 \text{ V}, I_D = 150 \text{ mA}$
Saturated Drain Current <sup>2</sup>	$I_{DS}$	3.9	5.2	-	A	$V_{DS} = 6.0 \text{ V}, V_{GS} = 2.0 \text{ V}$
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	125	-	-	$V_{DC}$	$V_{GS} = -8 \text{ V}, I_D = 5.2 \text{ mA}$
<b>RF Characteristics<sup>3</sup> (<math>T_C = 25^\circ\text{C}, F_0 = 1.2 \text{ GHz}</math> unless otherwise noted)</b>						
Power Gain <sup>4</sup>	$G_p$	15	16	-	dB	$V_{DD} = 50 \text{ V}, I_{DQ} = 150 \text{ mA}, P_{OUT} = P_{SAT}$
Output Power <sup>4</sup>	$P_{OUT}$	30	35	-	W	$V_{DD} = 50 \text{ V}, I_{DQ} = 150 \text{ mA}, P_{OUT} = P_{SAT}$
Drain Efficiency <sup>4</sup>	$\eta$	62	65	-	%	$V_{DD} = 50 \text{ V}, I_{DQ} = 150 \text{ mA}, P_{OUT} = P_{SAT}$
Output Mismatch Stress <sup>4</sup>	VSWR	-	-	10 : 1	$\Psi$	No damage at all phase angles, $V_{DD} = 50 \text{ V}, I_{DQ} = 150 \text{ mA}, P_{OUT} = 30 \text{ W CW}$
<b>Dynamic Characteristics</b>						
Input Capacitance <sup>5</sup>	$C_{GS}$	-	7.4	-	pF	$V_{DS} = 50 \text{ V}, V_{GS} = -8 \text{ V}, f = 1 \text{ MHz}$
Output Capacitance <sup>5</sup>	$C_{DS}$	-	2	-	pF	$V_{DS} = 50 \text{ V}, V_{GS} = -8 \text{ V}, f = 1 \text{ MHz}$
Feedback Capacitance	$C_{GD}$	-	0.15	-	pF	$V_{DS} = 50 \text{ V}, V_{GS} = -8 \text{ V}, f = 1 \text{ MHz}$

Notes:

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

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

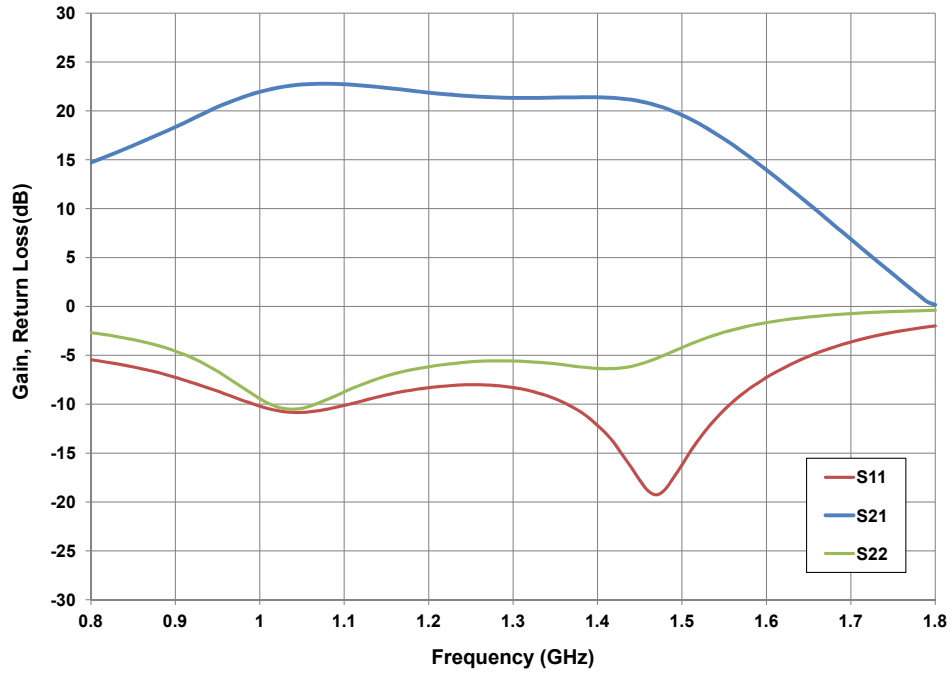
<sup>3</sup> Measured in CGHV40030-AMP

<sup>4</sup>  $P_{SAT}$  is defined as  $I_G = 0.52 \text{ mA}$

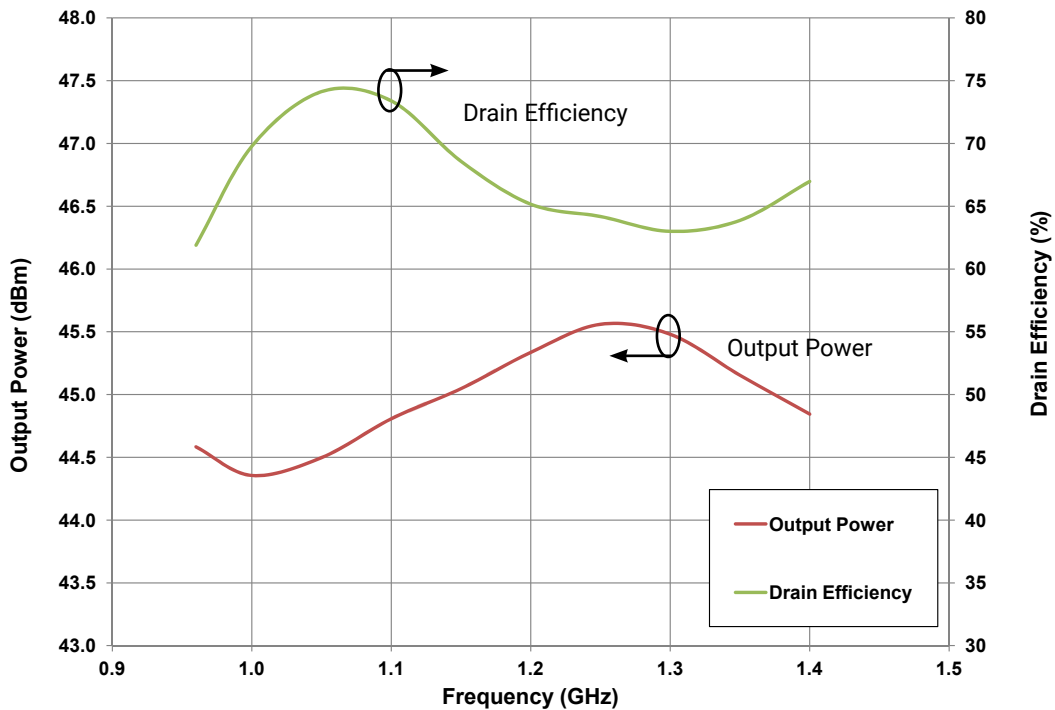
<sup>5</sup> Includes package

## Typical Performance

**Figure 1. - Typical Small Signal Response of CGHV40030-AMP Application Circuit**  
 $V_{DD} = 50\text{ V}, I_{DQ} = 150\text{ mA}$



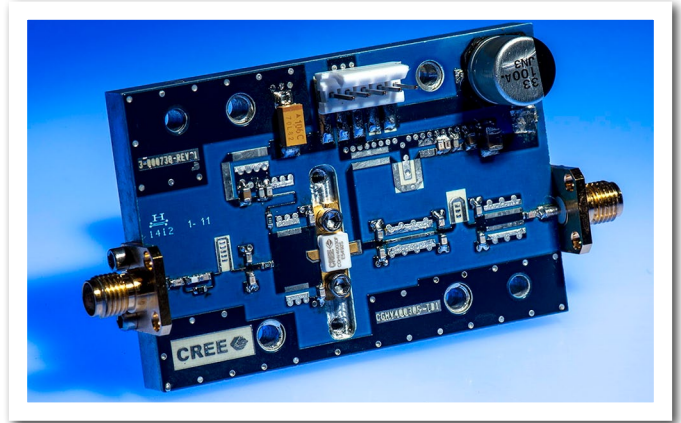
**Figure 2. - Typical Large Signal Response of CGHV40030-AMP Application Circuit**  
 $V_{DD} = 50\text{ V}, I_{DQ} = 150\text{ mA}, P_{IN} = 29\text{ dBm}, T_{CASE} = 25^\circ\text{C}, \text{CW}$



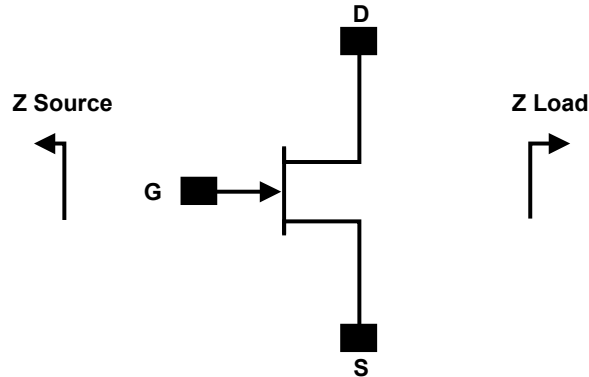
## CGHV40030-AMP Application Circuit Bill of Materials

Designator	Description	Qty
R1	RES,1/16W,0603,1%,187 OHMS	1
R2	RES, 2.2 OHMS, +/- 1%, 1/16W,0603	1
R3	RES,1/16W,0603,1%,15.4 OHMS	1
L1	IND, 5.6nH, 0603	1
C3, C4	CAP, 2.7,+/-0.1pF, 0603, ATC	2
C11, C12	CAP, 1.2pF,+/-0.1pF, 0603, ATC	2
C5, C6	CAP, 0.8pF,+/-0.1pF, 0603, ATC	2
C2, C7, C8	CAP 1.8pF,+/-0.05pF 0603, ATC	3
C9, C10	CAP, 3.9pF,+/-0.1pF 0603, ATC	2
C1, C13	CAP, 24pF,+/-5% 0603, ATC	2
C14	CAP 10UF 16V TANTALUM	1
C15, C20	CAP, 33000pF, 0805, ATC	2
C16,C21	CAP, 470PF, 5%, 100V, 0603,	2
C17	CAP, 68pF,+/-0.1pF 0603, ATC	1
C22	CAP, 56PF +/- 5%, 0603 , ATC600S	1
C18	CAP, 33UF, 20%, G CASE	1
C19	CAP, 1.0UF, 100V, 10%, X7R, 1210	1
J1,J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST	2
J3	HEADER RT>PLZ .1CEN LK 5POS	1
	BASEPLATE, CGH35015, 2.60 X 1.7	1
	CGHV40030F/P PCB, RO4350, 0.020" THK	1
	2-56 SOC HD SCREW 1/4 SS	4
	#2 SPLIT LOCKWASHER SS	4

## CGHV40030-AMP Application Circuit



## Source and Load Impedances



Frequency (MHz)	Z Source	Z Load
500	5.5 + j0.9	43 + j20.8
1000	2.6 - j1.3	25.5 + j29.1
2000	3.8 - j0.9	11.5 + j17.3
3000	2.7 - j7.0	6.7 + j7.8
4000	2.8 - j13.4	6.5 + j1.7

Note<sup>1</sup>:  $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 150\text{ mA}$

Note<sup>2</sup>: Impedances are extracted from source and load pull data derived from the transistor.

## Electrostatic Discharge (ESD) Classifications

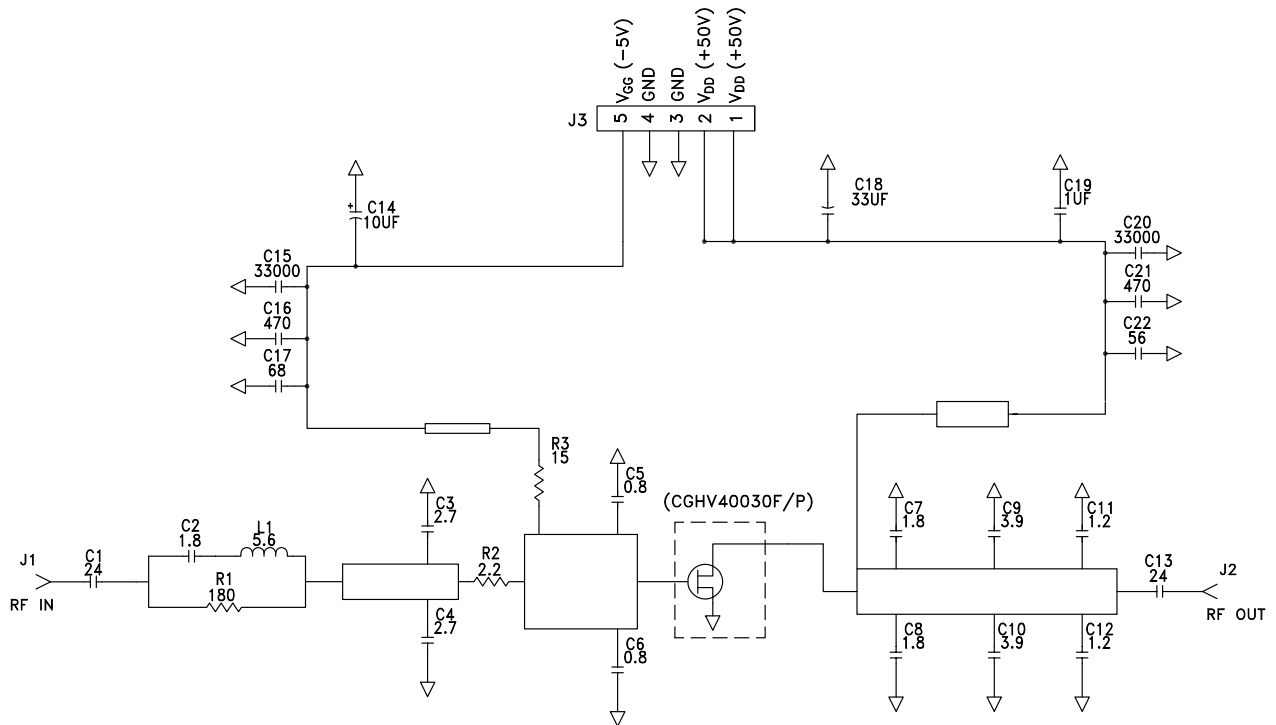
Parameter	Symbol	Class	Test Methodology
Human Body Model	HBM	1A (> 250 V)	JEDEC JESD22 A114-D
Charge Device Model	CDM	II (200 < 500 V)	JEDEC JESD22 C101-C

**Typical Package S-Parameters for CGHV40030**  
 (Small Signal,  $V_{DS} = 50\text{ V}$ ,  $I_{DQ} = 150\text{ mA}$ , angle in degrees)

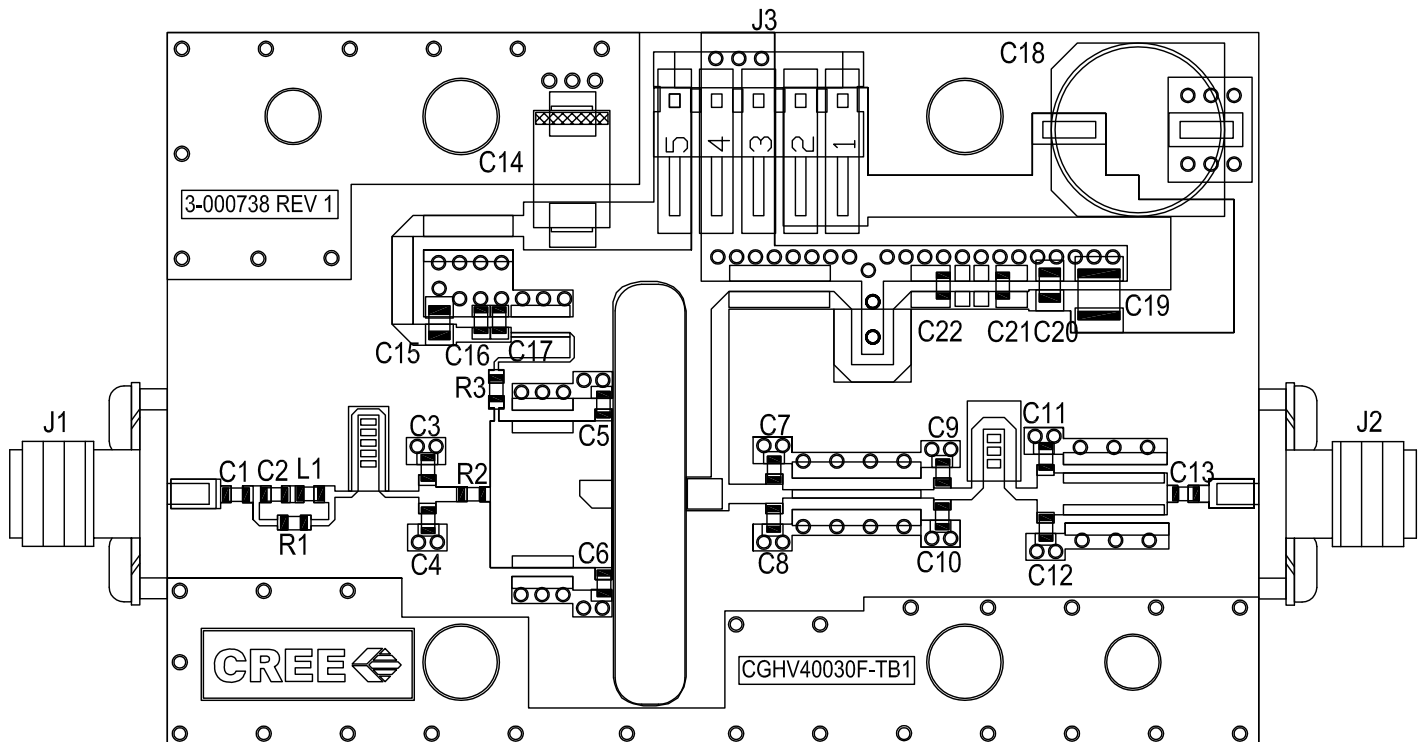
Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
500 MHz	0.92	-135.45	21.23	101.31	0.01	16.50	0.32	-74.10
600 MHz	0.92	-143.51	18.06	95.44	0.01	11.72	0.32	-79.66
700 MHz	0.91	-149.71	15.66	90.50	0.01	7.89	0.31	-84.44
800 MHz	0.91	-154.67	13.78	86.16	0.01	4.69	0.32	-88.69
900 MHz	0.91	-158.75	12.27	82.26	0.01	1.97	0.33	-92.58
1.0 GHz	0.91	-162.21	11.04	78.67	0.01	-0.41	0.34	-96.19
1.1 GHz	0.91	-165.20	10.02	75.32	0.01	-2.50	0.35	-99.57
1.2 GHz	0.91	-167.83	9.15	72.16	0.01	-4.34	0.36	-102.79
1.3 GHz	0.91	-170.19	8.41	69.14	0.01	-5.98	0.37	-105.86
1.4 GHz	0.92	-172.34	7.76	66.24	0.01	-7.43	0.39	-108.80
1.5 GHz	0.92	-174.30	7.20	63.45	0.01	-8.69	0.40	-111.64
1.6 GHz	0.92	-176.13	6.70	60.74	0.01	-9.77	0.42	-114.39
1.7 GHz	0.92	-177.83	6.26	58.11	0.01	-10.67	0.43	-117.06
1.8 GHz	0.92	-179.44	5.86	55.54	0.01	-11.39	0.45	-119.65
1.9 GHz	0.92	179.04	5.50	53.03	0.01	-11.90	0.46	-122.18
2.0 GHz	0.92	177.58	5.18	50.58	0.01	-12.20	0.48	-124.64
2.1 GHz	0.92	176.19	4.89	48.17	0.01	-12.26	0.49	-127.05
2.2 GHz	0.92	174.84	4.62	45.81	0.01	-12.07	0.51	-129.41
2.3 GHz	0.93	173.54	4.37	43.50	0.01	-11.60	0.52	-131.72
2.4 GHz	0.93	172.28	4.14	41.22	0.01	-10.82	0.53	-133.98
2.5 GHz	0.93	171.06	3.93	38.98	0.01	-9.70	0.55	-136.21
2.6 GHz	0.93	169.86	3.73	36.78	0.01	-8.20	0.56	-138.39
2.7 GHz	0.93	168.70	3.55	34.62	0.01	-6.30	0.57	-140.53
2.8 GHz	0.93	167.55	3.38	32.49	0.01	-3.97	0.59	-142.63
2.9 GHz	0.93	166.43	3.23	30.39	0.01	-1.18	0.60	-144.70
3.0 GHz	0.94	165.33	3.08	28.33	0.01	2.04	0.61	-146.73
3.2 GHz	0.94	163.18	2.81	24.29	0.01	9.69	0.64	-150.70
3.4 GHz	0.94	161.08	2.57	20.36	0.01	18.36	0.66	-154.54
3.6 GHz	0.94	159.05	2.36	16.55	0.01	27.05	0.68	-158.26
3.8 GHz	0.95	157.05	2.17	12.85	0.01	34.79	0.70	-161.87
4.0 GHz	0.95	155.10	2.00	9.25	0.01	41.04	0.72	-165.37
4.2 GHz	0.95	153.19	1.85	5.75	0.01	45.73	0.73	-168.77
4.4 GHz	0.95	151.31	1.72	2.35	0.01	49.02	0.75	-172.07
4.6 GHz	0.96	149.46	1.59	-0.96	0.01	51.19	0.76	-175.28
4.8 GHz	0.96	147.65	1.48	-4.18	0.01	52.48	0.78	-178.39
5.0 GHz	0.96	145.86	1.37	-7.31	0.01	53.11	0.79	178.58
5.2 GHz	0.96	144.11	1.28	-10.36	0.01	53.24	0.80	175.63
5.4 GHz	0.96	142.38	1.19	-13.33	0.01	52.98	0.82	172.76
5.6 GHz	0.96	140.68	1.11	-16.22	0.02	52.43	0.83	169.97
5.8 GHz	0.97	139.00	1.04	-19.03	0.02	51.65	0.84	167.25
6.0 GHz	0.97	137.35	0.98	-21.76	0.02	50.70	0.85	164.60

To download the s-parameters in s2p format, go to the CGHV40030 Product Page and click on the documentation tab.

## CGHV40030-AMP Application Circuit Schematic

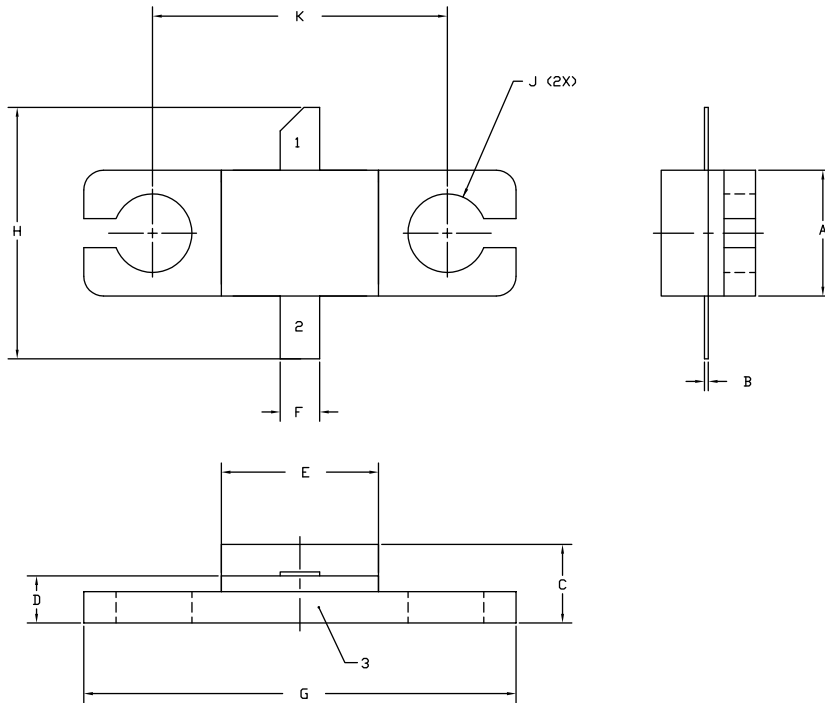


## CGHV40030-AMP Application Circuit Outline





## Product Dimensions CGHV40030F (Package Type - 440166)



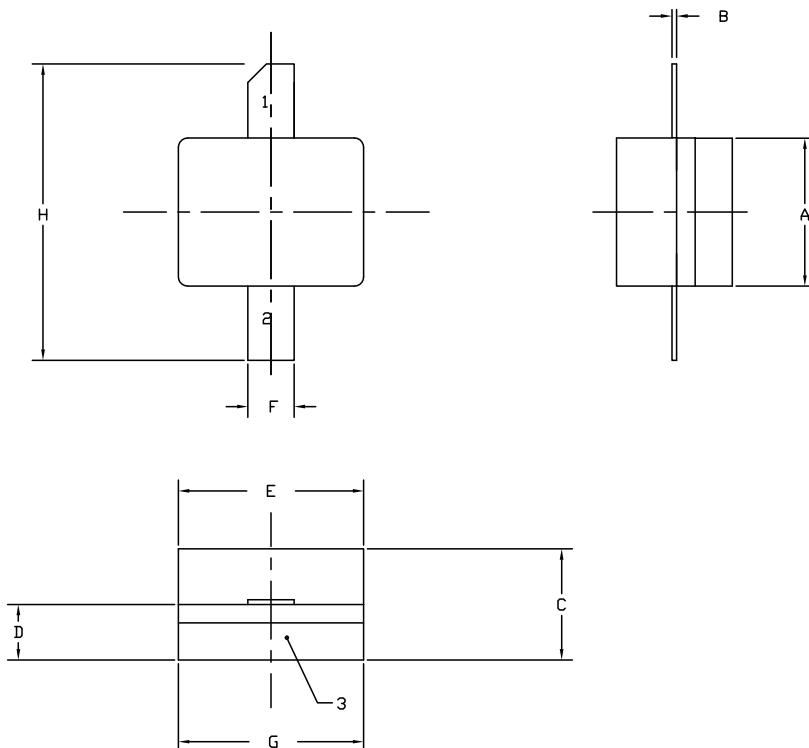
**NOTES:**

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	0.155	0.165	3.94	4.19
B	0.004	0.006	0.10	0.15
C	0.115	0.135	2.92	3.43
D	0.057	0.067	1.45	1.70
E	0.195	0.205	4.95	5.21
F	0.045	0.055	1.14	1.40
G	0.545	0.555	13.84	14.09
H	0.280	0.360	7.11	9.14
J	∅ .100		2.54	
K	0.375		9.53	

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

## Product Dimensions CGHV40030P (Package Type - 440196)



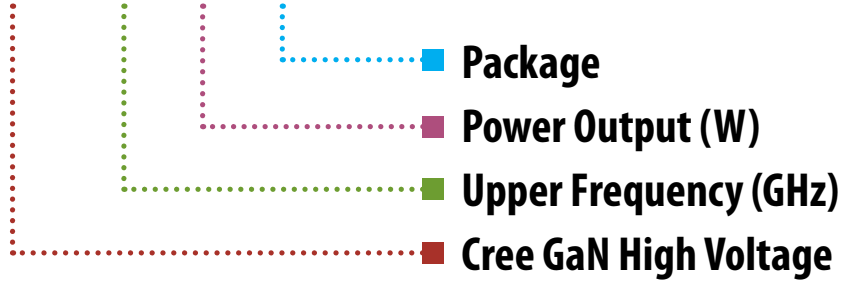
**NOTES:**

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	0.155	0.165	3.94	4.19
B	0.003	0.006	0.10	0.15
C	0.115	0.135	2.92	3.17
D	0.057	0.067	1.45	1.70
E	0.195	0.205	4.95	5.21
F	0.045	0.055	1.14	1.40
G	0.195	0.205	4.95	5.21
H	0.280	0.360	7.11	9.14

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

### CGHV40030F/P



Parameter	Value	Units
Upper Frequency <sup>1</sup>	6	GHz
Power Output	30	W
Package	Flanged/Pill	-

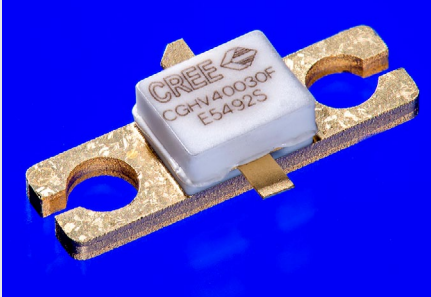

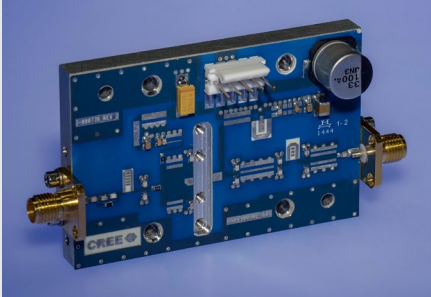
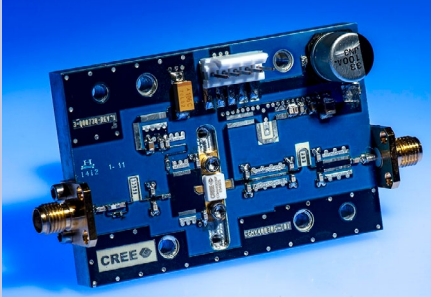
**Table 1.**

**Note<sup>1</sup>:** 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
CGHV40030F	GaN HEMT	Each	
CGHV40030P	GaN HEMT	Each	
CGHV40030-TB	Test board without GaN HEMT	Each	
CGHV40030F-AMP	Test board with GaN HEMT installed	Each	



## 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.

For more information, please contact:

Cree, Inc.  
4600 Silicon Drive  
Durham, North Carolina, USA 27703  
[www.cree.com/rf](http://www.cree.com/rf)

Sarah Miller  
Marketing  
Cree, RF Components  
1.919.407.5302

Ryan Baker  
Marketing & Sales  
Cree, RF Components  
1.919.407.7816

Tom Dekker  
Sales Director  
Cree, RF Components  
1.919.313.5639