CGHV22100

100 W, 1800-2200 MHz, GaN HEMT for LTE

Cree's CGHV22100 is a gallium nitride (GaN) high electron mobility transistor (HEMT) is designed specifically for high efficiency, high gain and wide bandwidth capabilities, which makes the CGHV22100 ideal for 1.8 - 2.2 GHz LTE, 4G Telecom and BWA amplifier applications. The transistor is input matched and supplied in a ceramic/metal flange package.

Package Type: 440162 and 440161
PN: CGHV22100F and CGHV22100P

Typical Performance Over 1.8 - 2.2 GHz (T_C = 25°C) of Demonstration Amplifier

Parameter	1.8 GHz	2.0 GHz	2.2 GHz	Units
Gain @ 44 dBm	18.7	20.7	22.0	dB
ACLR @ 44 dBm	-37.8	-37.1	-35.1	dBc
Drain Efficiency @ 44 dBm	35.4	31.7	30.6	%

Note:
Measured in the CGHV22100-TB amplifier circuit, under WCDMA 3GPP test model 1, 64 DPCH, 45% clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF.

Features

RoHS COMPLIANT

- 1.8 - 2.2 GHz Operation
- 20 dB Gain
- -35 dBc ACLR at 25 W P_{AVE}
- 31-35 % Efficiency at 25 W P_{AVE}
- High Degree of DPD Correction Can be Applied

Rev 1.1 – January 2014

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

Parameter	Symbol	Rating	Units	Units
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[3]	T_J	225	˚C	
Maximum Forward Gate Current	I_{GMAX}	16	mA	25˚C
Maximum Drain Current[1]	I_{DMAX}	6	A	25˚C
Soldering Temperature[2]	T_S	245	˚C	
Screw Torque	τ	80	in-oz	
Thermal Resistance, Junction to Case[3]	$R_{\theta JC}$	2.34	˚C/W	85˚C, P_{DISS} = 48 W
Thermal Resistance, Junction to Case[4]	$R_{\theta JC}$	2.95	˚C/W	85˚C, P_{DISS} = 48 W
Case Operating Temperature[5]	T_C	-40, +150	˚C	

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 CGHV22100P
[4] Measured for the CGHV22100F
[5] See also, the Power Dissipation De-rating Curve on Page 4.

Electrical Characteristics (T_C = 25˚C)

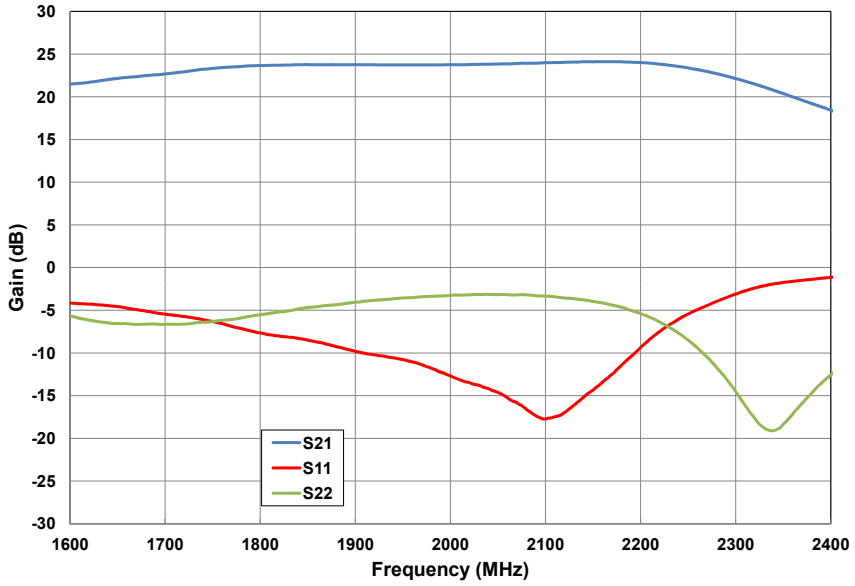
Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[1]						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.0	-2.3	V_{DC}	V_{DS} = 10 V, I_D = 16 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.7	–	V_{DC}	V_{DS} = 50 V, I_D = 0.5 A
Saturated Drain Current[2]	I_{DS}	12	14.4	–	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BR}	150	–	–	V_{DC}	V_{GS} = -8 V, I_D = 16 mA
RF Characteristics[3] (T_C = 25˚C, F_0 = 2.17 GHz unless otherwise noted)						
Gain[4]	G	19.75	22	–	dB	V_{DD} = 50 V, I_{DQ} = 0.5 A, P_{OUT} = 44 dBm
WCDMA Linearity[4]	ACLR	–	-35	-31	dBc	V_{DD} = 50 V, I_{DQ} = 0.5 A, P_{OUT} = 44 dBm
Drain Efficiency[4]	η	26.5	30.5	–	%	V_{DD} = 50 V, I_{DQ} = 0.5 A, P_{OUT} = 44 dBm
Output Mismatch Stress	VSWR	–	–	10 : 1	Ψ	No damage at all phase angles, V_{DD} = 50 V, I_{DQ} = 0.5 A, P_{OUT} = 100 W Pulsed
Dynamic Characteristics						
Input Capacitance[5]	C_{GS}	–	66	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance[5]	C_{DS}	–	8.7	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz
Feedback Capacitance	C_{GD}	–	0.47	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz

Notes:
[1] Measured on wafer prior to packaging.
[2] Scaled from PCM data.
[3] Measured in CGHV22100-TB.
[4] Single Carrier WCDMA, 3GPP Test Model 1, 64 DPCH, 45% Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF.
[5] Includes package and internal matching components.

Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
USA Tel: +1.919.313.5300
Fax: +1.919.869.2733
www.cree.com/rf

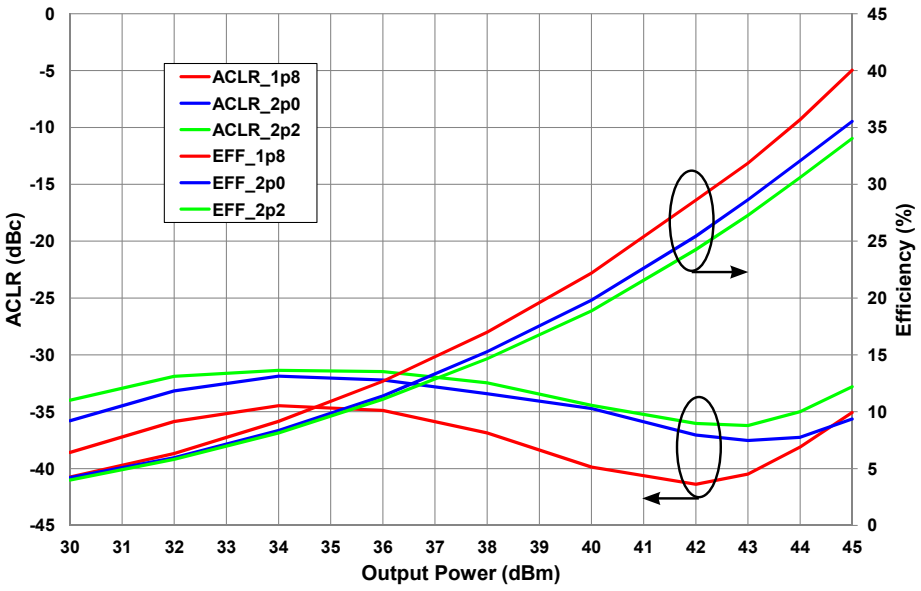
Typical Performance

Figure 1. - Small Signal Gain and Return Losses vs Frequency for the CGHV22100 measured in CGHV22100-TB Amplifier Circuit
V_{DD} = 50 V, I_{DQ} = 0.5 A



Typical Linear Performance

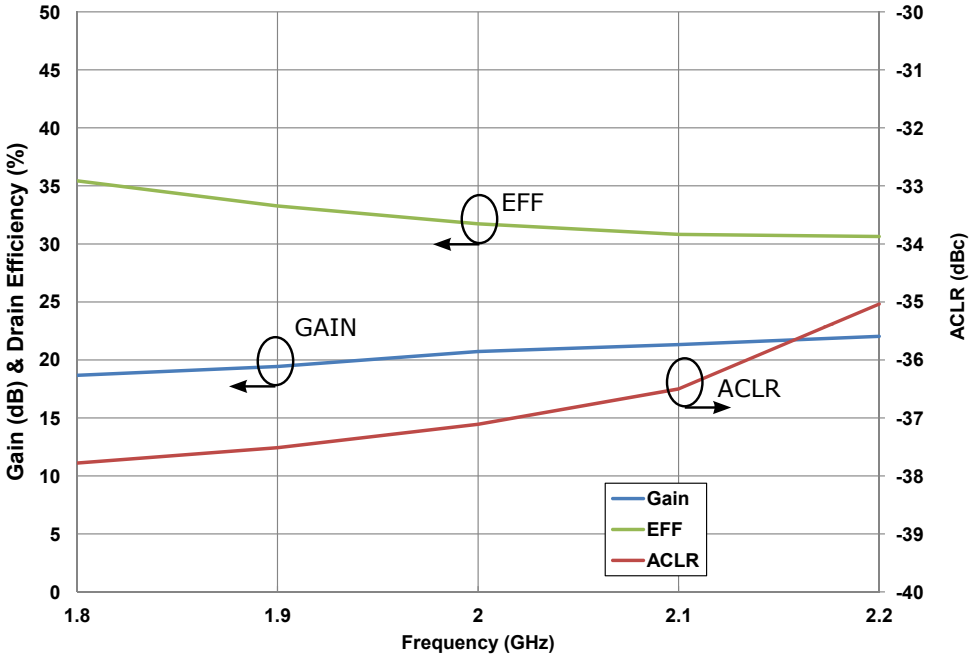
Figure 2. - Typical Drain Efficiency and ACLR vs Output Power of the CGHV22100 measured in CGHV22100-TB Amplifier Circuit.
V_{DS} = 50 V, I_{DS} = 0.5 A, 1c WCDMA, PAR = 7.5 dB



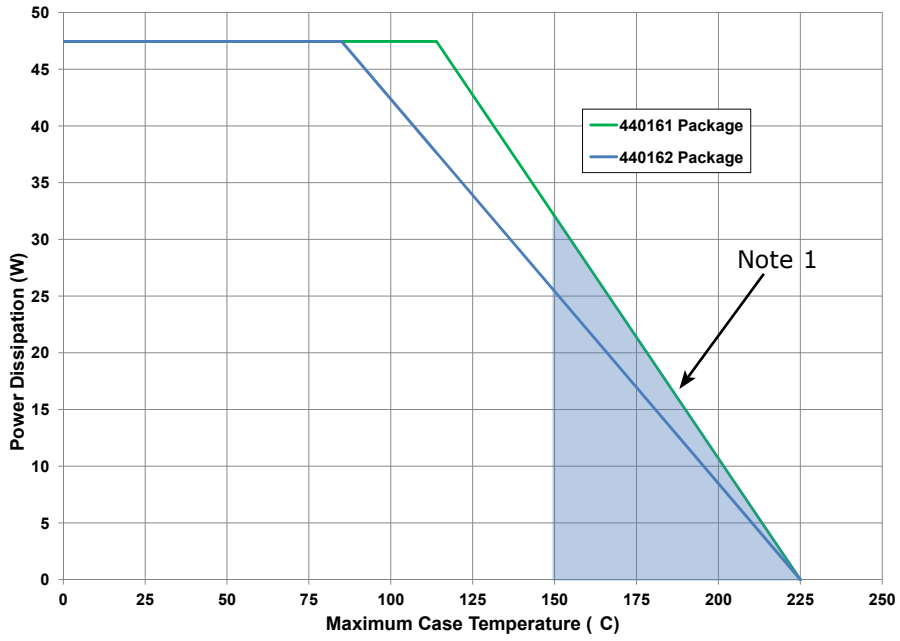
Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
USA Tel: +1.919.313.5300
Fax: +1.919.869.2733
www.cree.com/rf

Typical Performance

Figure 3. - Typical Gain, Drain Efficiency and ACLR vs Frequency of CGHV22100 measured in CGHV22100-TB Amplifier Circuit. V_{DS} = 50 V, I_{DS} = 0.5 A, P_{AVE} = 25 W, 1c WCDMA, PAR = 7.5 dB



CGHV22100 Power Dissipation De-rating Curve



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

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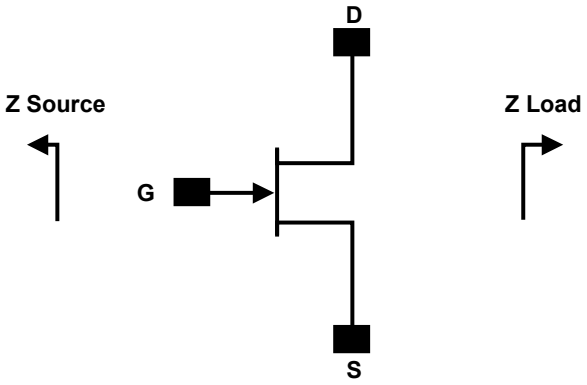
Source and Load Impedances



Frequency (MHz)	Z Source	Z Load
1800	4.50 + j0.91	5.21 - j2.58
1900	5.20 + j1.15	5.01 - j2.09
2000	6.02 + j1.03	4.85 - j1.61
2100	6.75 + j0.42	4.70 - j1.12
2200	7.03 - j0.64	4.58 - j0.62

Note[1]: V_{DD} = 50 V, I_{DQ} = 0.5 A. In the 440162 package.
Note[2]: Impedances are extracted from CGHV22100-TB demonstration circuit and are not source and load pull data derived from transistor.

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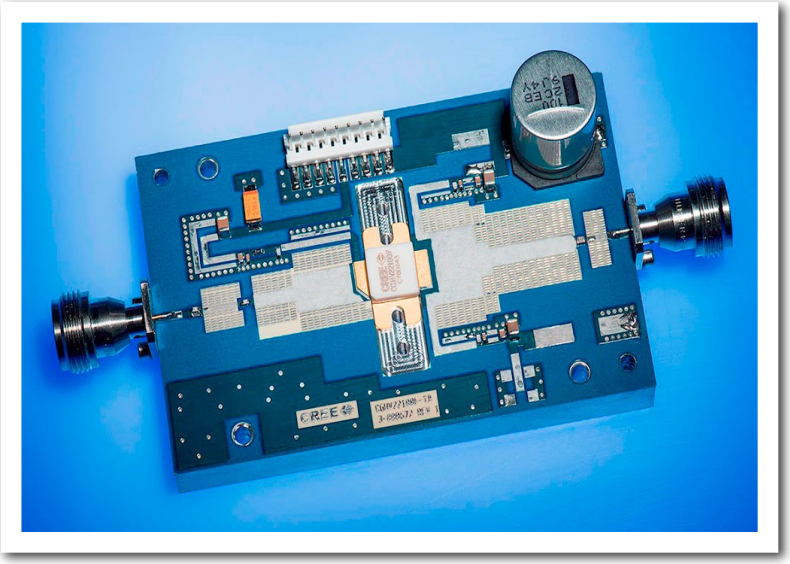
CGHV22100-TB Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
R1	RES, 1/16 W, 0603, 1%, 10.0 OHMS	1
R2	RES, 1/16 W, 0603, 1%, 5.1 OHMS	1
C4, C14, C24	CAP, 470 pF, 5%, 100 V, 0603, X	3
C6,C16, C26	CAP, 1.0 UF, 100 V, 10%, x7R, 121	3
C17, C27	CAP, 100 UF, 20%, 160 V, ELEC	2
C7	CAP, 10 UF, 16 V, TANTALUM, 2312	1
C1, C2, C3, C13, C23	CAP, 10.0 pF, 5%, 0603, ATC	5
C5, C15, C25	CAP, 33000 pF, 0805, 100 V, X7R	3
C11	CAP, 10 pF, 5%, 250 V, 0805, A	1
J1, J2	CONN, N, FEM, W/.500 SMA FLNG	2
J3	HEADER RT>PLZ .1CEN LK 9POS	1
	BASEPLATE, CGH35120	
	PCB, CGHV22100F, RO4350	1
	2-56 SOC HD SCREW 1/4 SS	4
	#2 SPLIT LOCKWASHER SS	4
	CGHV22100F	1

CGHV22100-TB Demonstration Amplifier Circuit



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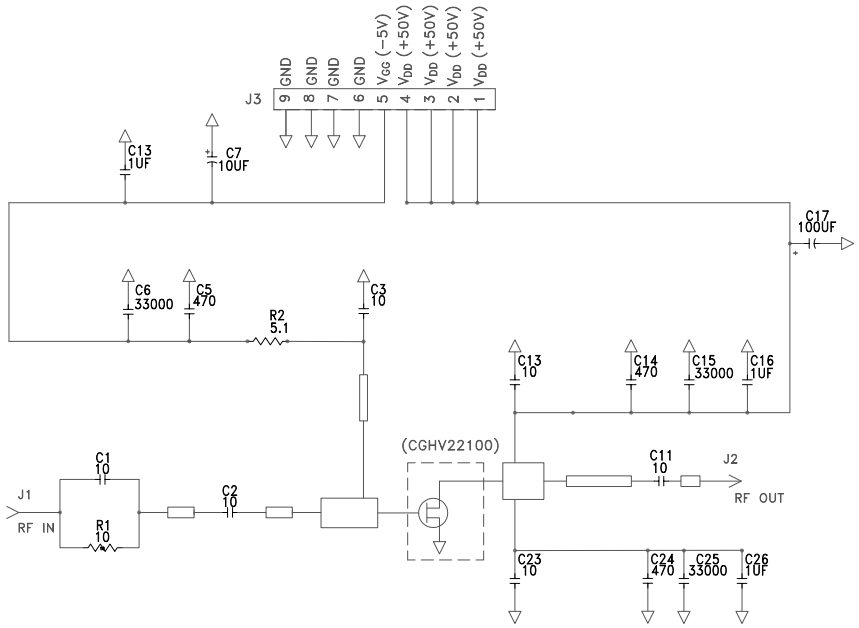
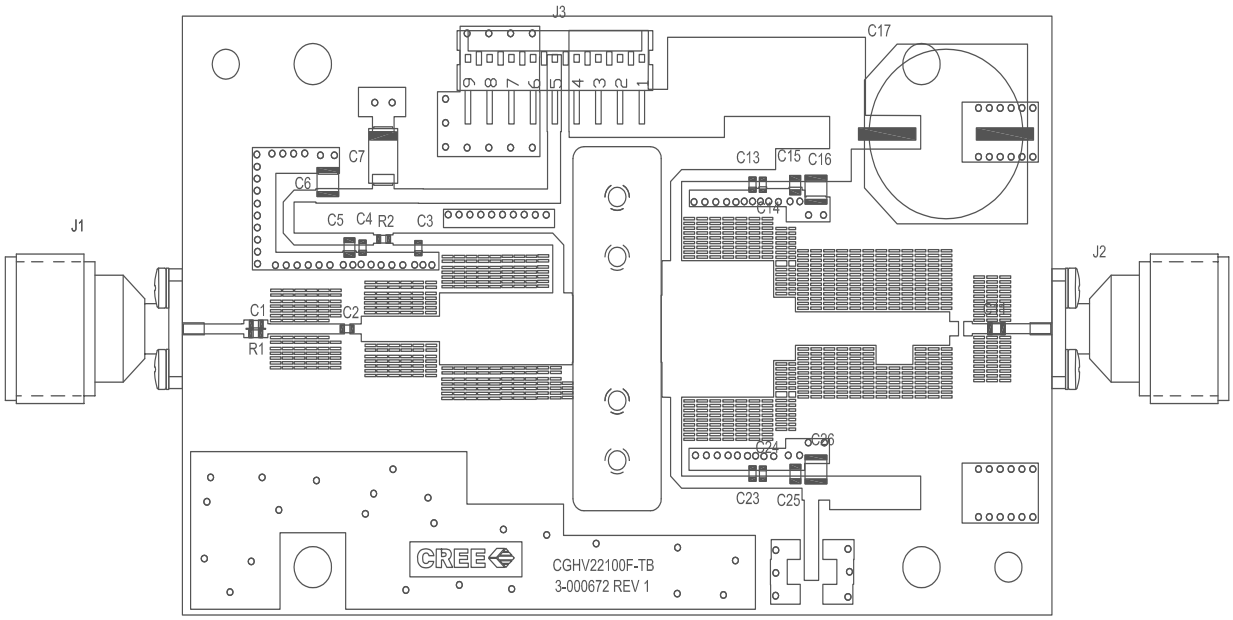
CGHV22100-TB Demonstration Amplifier Circuit Schematic



CGHV22100-TB Demonstration Amplifier Circuit Outline



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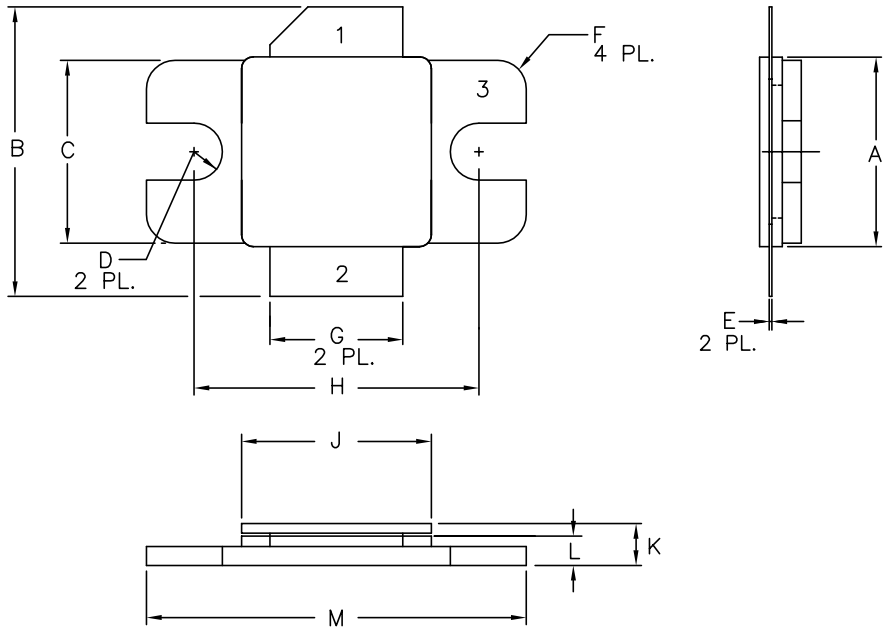
Product Dimensions CGHV22100 (Package Type — 440162)



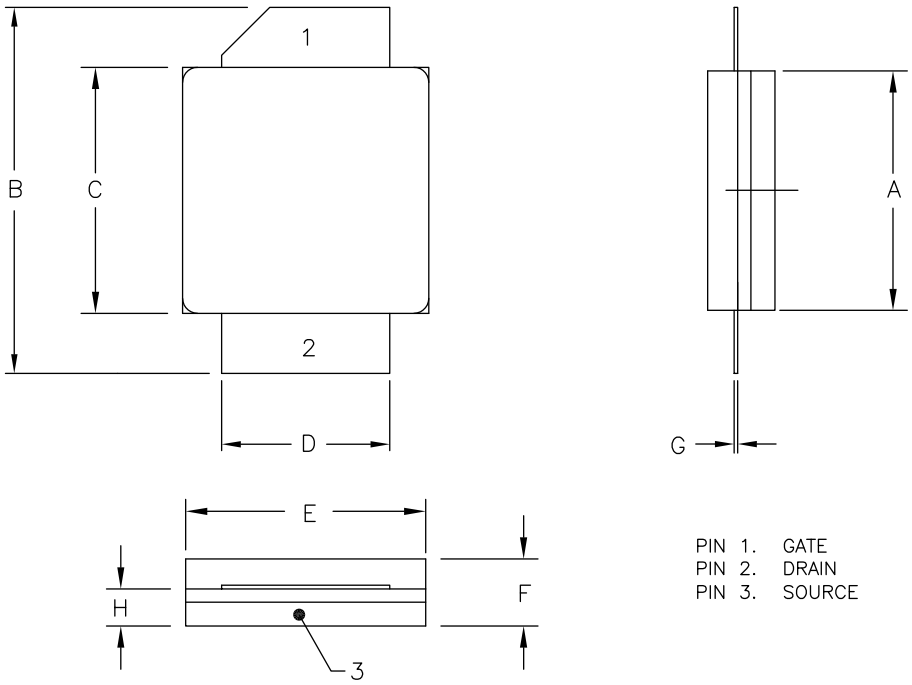
NOTES:

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

Product Dimensions CGHV22100 (Package Type — 440161)



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DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.395	.407	10.03	10.34
B	.594	.634	15.09	16.10
C	.395	.407	10.03	10.34
D	.275	.285	6.99	7.24
E	.395	.407	10.03	10.34
F	.129	.149	3.28	3.78
G	.004	.006	0.10	0.15
H	.057	.067	1.45	1.70

PIN 1. GATE
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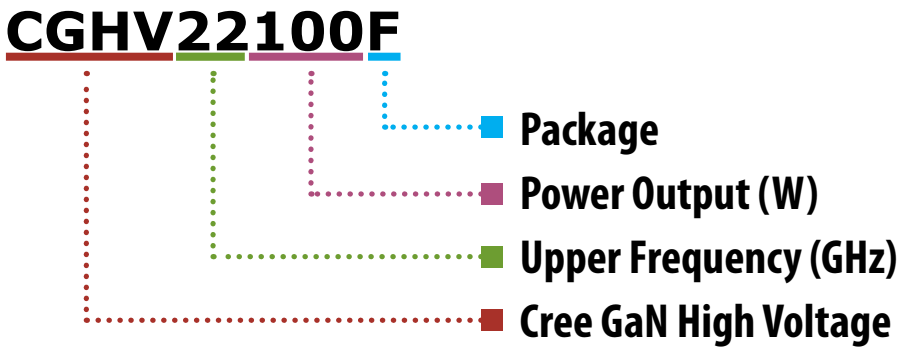
Part Number System



Parameter	Value	Units
Upper Frequency[1]	2.2	GHz
Power Output	100	W
Package	Flange	-

Table 1.

Note[1]: 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.

Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
USA Tel: +1.919.313.5300
Fax: +1.919.869.2733
www.cree.com/rf

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For more information, please contact:

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

Sarah Miller
Marketing & Export
Cree, RF Components
1.919.407.5302

Ryan Baker
Marketing
Cree, RF Components
1.919.407.7816

Tom Dekker
Sales Director
Cree, RF Components
1.919.407.5639

Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
USA Tel: +1.919.313.5300
Fax: +1.919.869.2733
www.cree.com/rf