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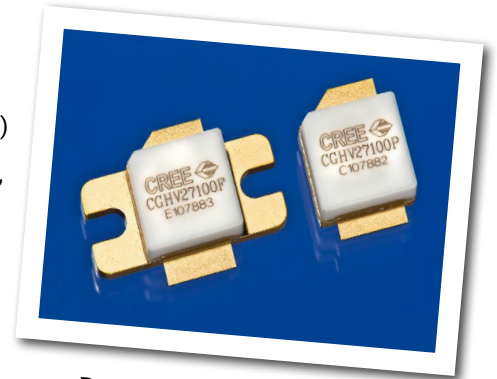
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# CGHV27100

100 W, 2500-2700 MHz, 50 V, GaN HEMT for LTE

Cree's CGHV27100 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 CGHV27100 ideal for 2.5 - 2.7 GHz LTE, 4G Telecom and BWA amplifier applications. The transistor is input matched and supplied in a ceramic/metal pill and flange packages.



Package Type: 440162 and 440161  
PN: CGHV27100F and CGHV27100P

## Typical Performance Over 2.5 - 2.7 GHz ( $T_c = 25^\circ\text{C}$ ) of Demonstration Amplifier

Parameter	2.5 GHz	2.6 GHz	2.7 GHz	Units
Gain @ 44 dBm	18.1	18.0	17.9	dB
ACLR @ 44 dBm	-37.0	-37.0	-37.0	dBc
Drain Efficiency @ 44 dBm	34.0	33.5	32.0	%

**Note:**

Measured in the CGHV27100-AMP amplifier circuit, under WCDMA 3GPP test model 1, 64 DPCH, 45% clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF,  $V_{DD} = 50\text{ V}$ ,  $I_{DS} = 500\text{ mA}$ .

## Features



- 2.5 - 2.7 GHz Operation
- 18.0 dB Gain
- -37 dBc ACLR at 25 W  $P_{AVE}$
- 33 % Efficiency at 25 W  $P_{AVE}$
- High Degree of DPD Correction Can be Applied

Large Signal Models Available for ADS and MWO

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

Parameter	Symbol	Rating	Units	Conditions
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	$I_{GMAX}$	16	mA	25°C
Maximum Drain Current <sup>1</sup>	$I_{DMAX}$	6	A	25°C
Soldering Temperature <sup>2</sup>	$T_S$	245	°C	
Screw Torque	$\tau$	80	in-oz	
Thermal Resistance, Junction to Case <sup>3</sup>	$R_{JJC}$	2.34	°C/W	85°C, $P_{DISS} = 48$ W
Thermal Resistance, Junction to Case <sup>4</sup>	$R_{JJC}$	2.95	°C/W	85°C, $P_{DISS} = 48$ W
Case Operating Temperature <sup>5</sup>	$T_C$	-40, +150	°C	

Note:

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

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

<sup>3</sup> Measured for the CGHV27100P

<sup>4</sup> Measured for the CGHV27100F

<sup>5</sup> See also, the Power Dissipation De-rating Curve on Page 5.

## 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	$V_{DC}$	$V_{DS} = 10$ V, $I_D = 16$ mA
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.7	-	$V_{DC}$	$V_{DS} = 50$ V, $I_D = 500$ mA
Saturated Drain Current <sup>2</sup>	$I_{DS}$	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
<b>RF Characteristics<sup>5</sup> (<math>T_C = 25^\circ\text{C}</math>, <math>F_0 = 2.7</math> GHz unless otherwise noted)</b>						
Saturated Output Power <sup>3,4</sup>	$P_{SAT}$	-	135	-	W	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA
Pulsed Drain Efficiency <sup>3,4</sup>	$\eta$	-	68	-	%	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{OUT} = P_{SAT}$
Gain <sup>6</sup>	G	-	18	-	dB	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{OUT} = 44$ dBm
WCDMA Linearity <sup>6</sup>	ACLR	-	-37	-	dBc	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{OUT} = 44$ dBm
Drain Efficiency <sup>6</sup>	$\eta$	-	33	-	%	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{OUT} = 44$ dBm
Output Mismatch Stress <sup>3</sup>	VSWR	-	-	10 : 1	$\Psi$	No damage at all phase angles, $V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{OUT} = 100$ W Pulsed
<b>Dynamic Characteristics</b>						
Input Capacitance <sup>7</sup>	$C_{GS}$	-	66	-	pF	$V_{DS} = 50$ V, $V_{GS} = -8$ V, $f = 1$ MHz
Output Capacitance <sup>7</sup>	$C_{DS}$	-	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:

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

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

<sup>3</sup> Pulse Width = 100  $\mu$ s, Duty Cycle = 10%

<sup>4</sup>  $P_{SAT}$  is defined as  $I_{GS} = 1.6$  mA peak

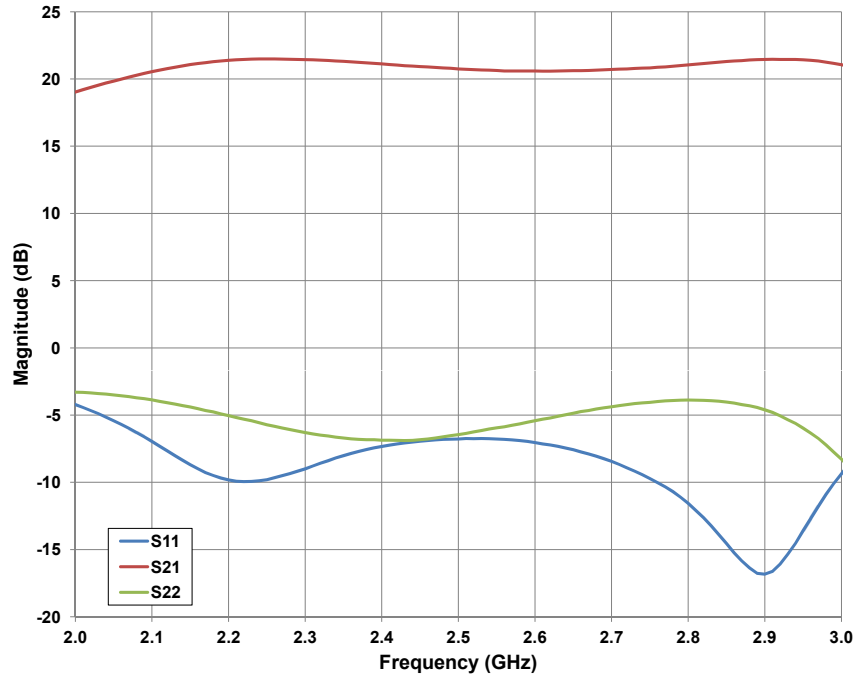
<sup>5</sup> Measured in CGHV27100-AMP

<sup>6</sup> Single Carrier WCDMA, 3GPP Test Model 1, 64 DPCH, 45% Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF,  $V_{DD} = 50$  V.

<sup>7</sup> Includes package and internal matching components.

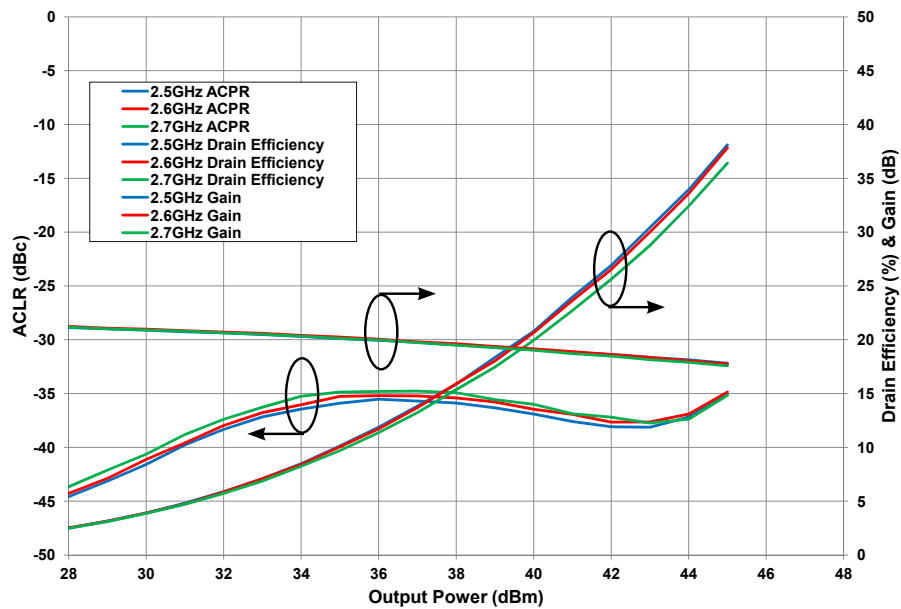
## Typical Performance

**Figure 1. - Small Signal Gain and Return Losses vs Frequency for the CGHV27100 measured in CGHV27100-AMP Amplifier Circuit**  
 $V_{DD} = 50\text{ V}, I_{DQ} = 0.5\text{ A}$



## Typical Linear Performance

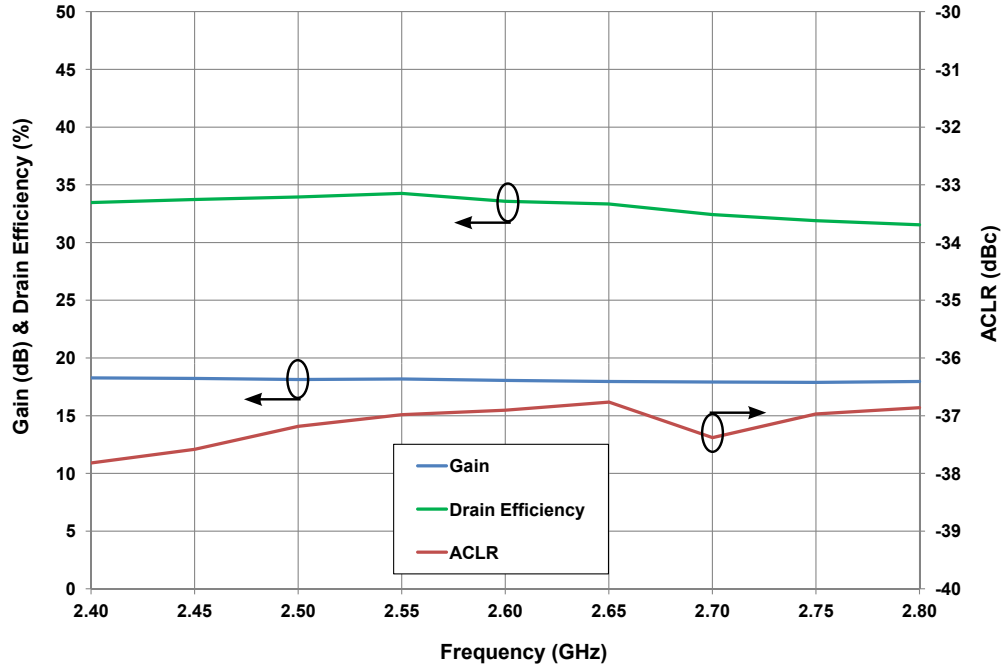
**Figure 2. - Typical Gain, Drain Efficiency and ACLR vs Output Power of the CGHV27100 measured in CGHV27100-AMP Amplifier Circuit**  
 $V_{DS} = 50\text{ V}, I_{DS} = 0.5\text{ A}, 1\text{c WCDMA}, \text{PAR} = 7.5\text{ dB}$



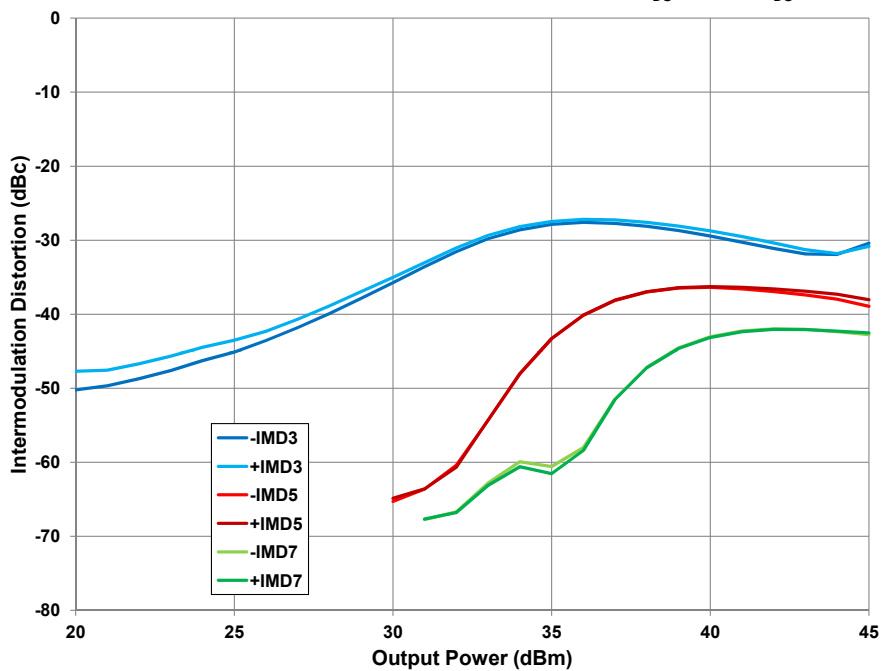
## Typical Performance

**Figure 3. - Typical Gain, Drain Efficiency and ACLR vs Frequency of the CGHV27100 measured in CGHV27100-AMP Amplifier Circuit.**

$V_{DS} = 50\text{ V}$ ,  $I_{DS} = 0.5\text{ A}$ ,  $P_{AVE} = 25\text{ W}$ , 1c WCDMA, PAR = 7.5 dB

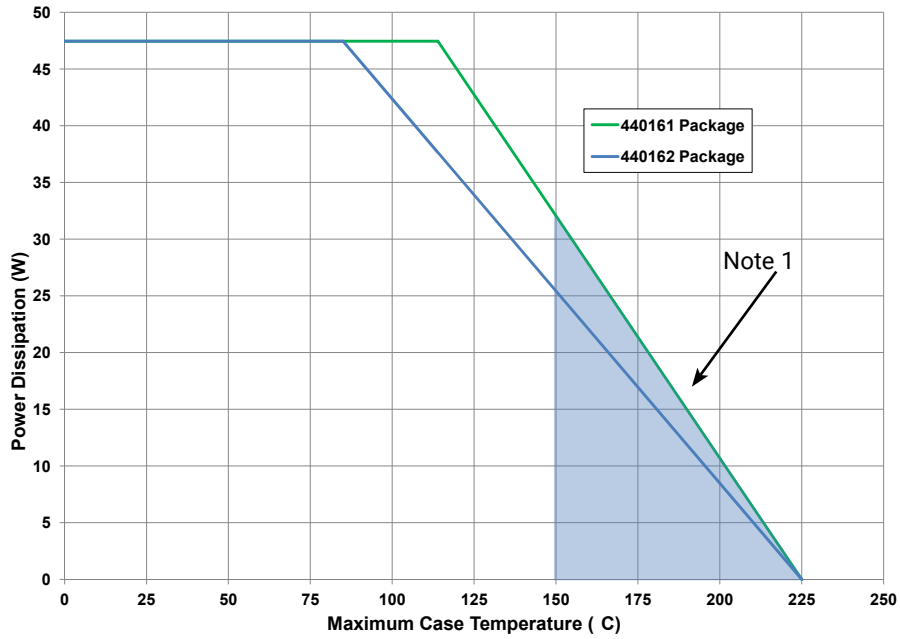


**Figure 4. - Typical Two Tone Linearity vs Output Power of the CGHV27100 measured in CGHV27100-AMP1 Amplifier Circuit.  $V_{DS} = 50\text{ V}$ ,  $I_{DS} = 0.5\text{ A}$**



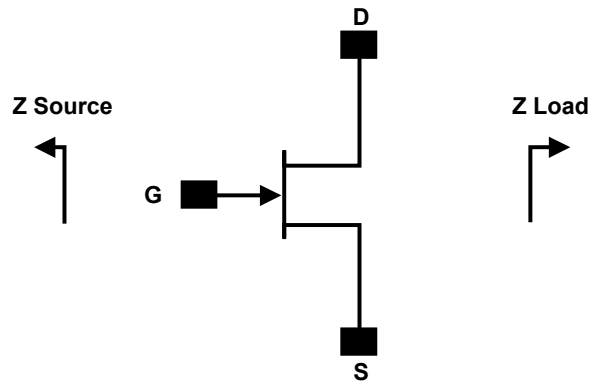
## Typical Performance

Figure 5. - Power Dissipation Derating Curve



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

## Source and Load Impedances



Frequency (MHz)	Z Source	Z Load
2500	4.01 - j3.88	10.69 - j2.86
2600	3.99 - j3.29	11.16 - j3.17
2700	4.01 - j2.72	11.67 - j3.94

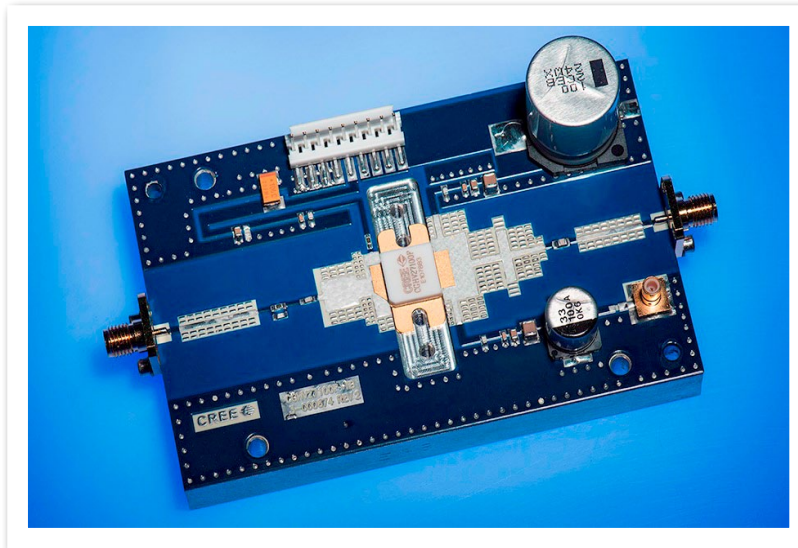
Note<sup>1</sup>:  $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 500\text{ mA}$ . In the 440162 package.

Note<sup>2</sup>: Impedances are extracted from CGHV27100-AMP demonstration circuit and are not source and load pull data derived from transistor.

## CGHV27100-AMP Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
R1, R2	RES, 10 OHM, +/- 1%, 1/16 W, 0603	2
C1	CAP, 5.6 pF, +/- 0.25 pF, 0603, ATC	1
C2	CAP, 27 pF, +/-5%, 0603, ATC	1
C3	CAP, 10.0 pF, +/-5%, 0603, ATC	1
C8, C13	CAP, 8.2 pF, +/-0.25 pF, 0603, ATC	2
C4, C9, C14	CAP, 470 pF, 5%, 100 V, 0603, X	3
C5, C10, C15	CAP, 33000 pF, 0805, 100 V, X7R	3
C6	CAP, 10 UF, 16 V, TANTALUM	1
C7	CAP, 27 pF, +/-5%, 250 V, 0805, ATC 600 F	1
C11, C16	CAP, 1.0 UF, 100 V, 10%, X7R, 1210	2
C12	CAP, 100 UF, +/-20%, 160 V, ELECTROLYTIC	1
C17	CAP, 33 UF, 20%, ELECTROLYTIC	1
J1, J2	CONN, SMA	2
J3	HEADER RT>PLZ.1CEN LK 9POS	1
	PCB, RO4350, 0.020" THK, CGHV27100F	1
	2-56 SOC HD SCREW 1/4 SS	4
	#2 SPLIT LOCKWASHER SS	4
	CGHV27100F	1

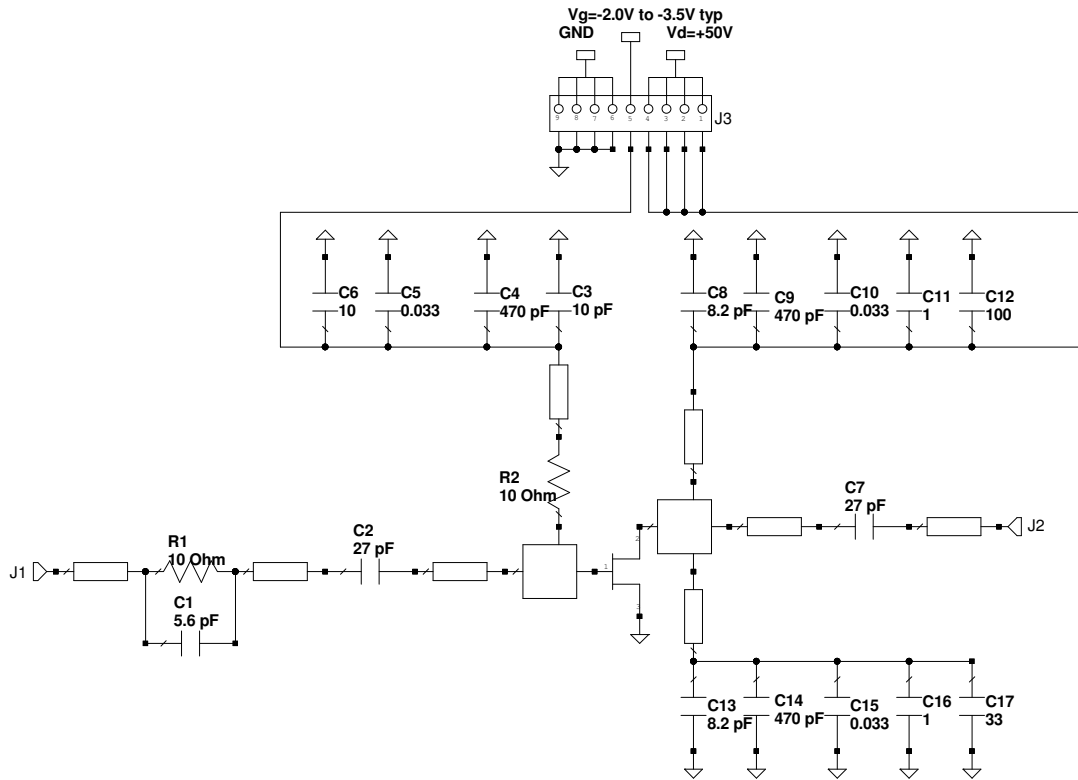
## CGHV27100-AMP Demonstration Amplifier Circuit



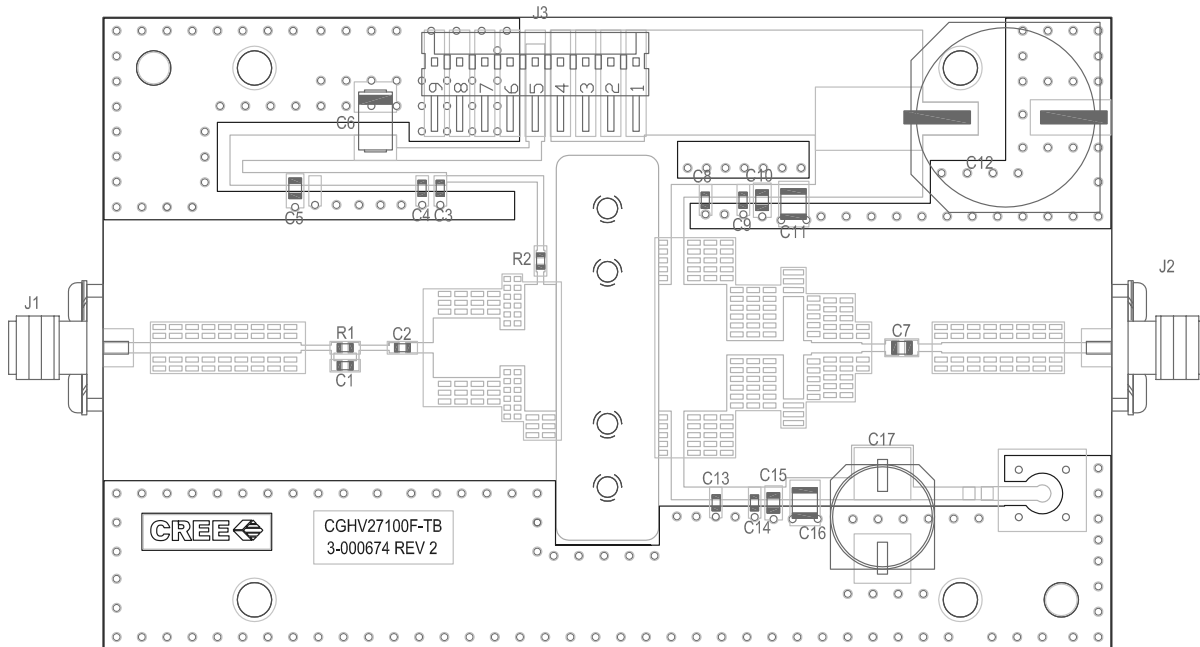
## Electrostatic Discharge (ESD) Classifications

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

## CGHV27100-AMP Demonstration Amplifier Circuit Schematic

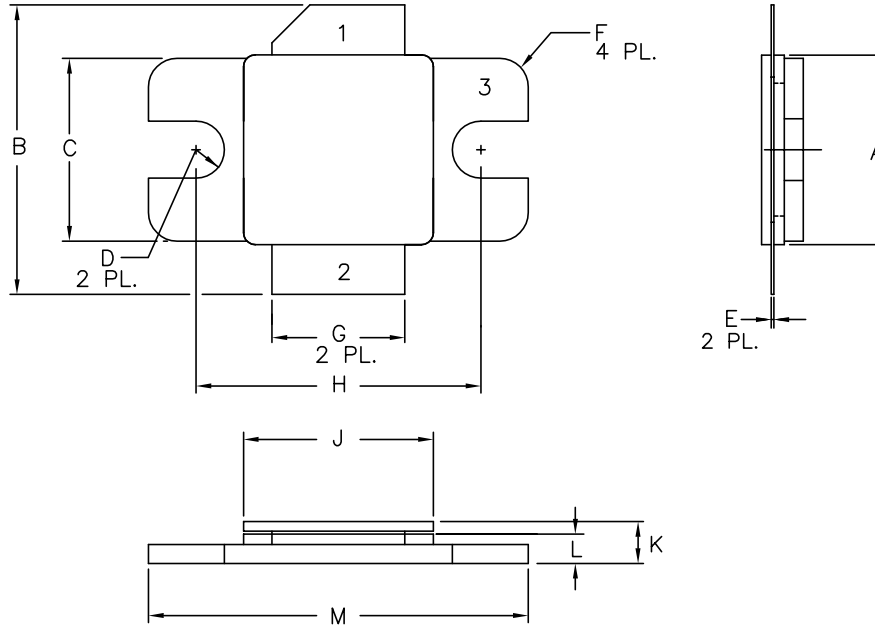


## CGHV27100-AMP Demonstration Amplifier Circuit Outline





## Product Dimensions CGHV27100F (Package Type – 440162)



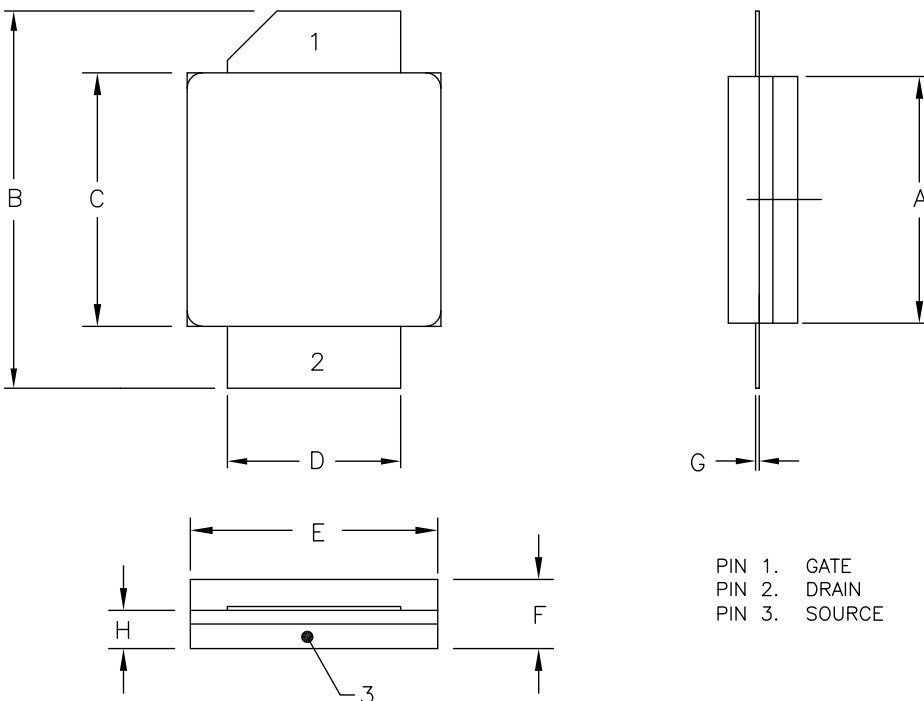
**NOTES:**

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 CGHV27100P (Package Type – 440161)



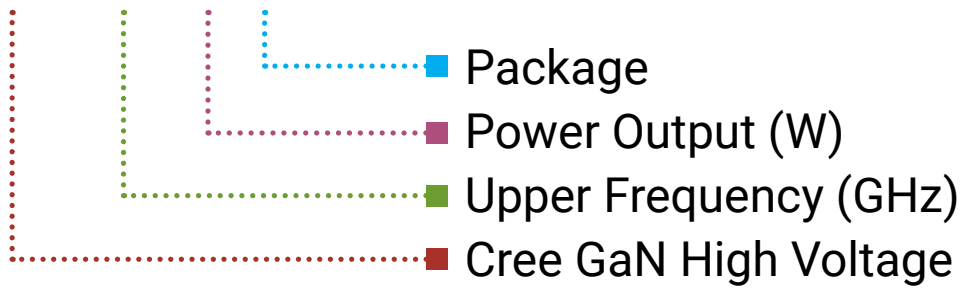
**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
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4. LID MAY BE MISALIGNED TO THE BODY OF PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.

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  
 PIN 2. DRAIN  
 PIN 3. SOURCE

### CGHV27100F



Parameter	Value	Units
Upper Frequency <sup>1</sup>	2.7	GHz
Power Output	100	W
Package	Flange	-



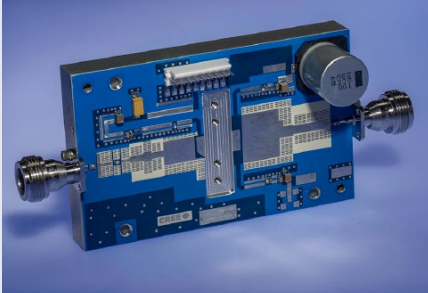
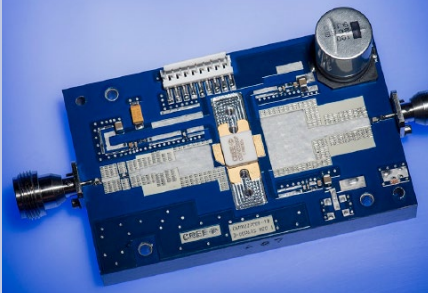
**Table 1.**

**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
CGHV27100F	GaN HEMT	Each	
CGHV27100P	GaN HEMT	Each	
CGHV27100-TB	Test board without GaN HEMT	Each	
CGHV27100F-AMP	Test board with GaN HEMT installed	Each	



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