

CGHV27200

200 W, 2500-2700 MHz, GaN HEMT for LTE

Cree's CGHV27200 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 CGHV27200 ideal for 2.5-2.7 GHz LTE and BWA amplifier applications. The transistor is input matched and supplied in a ceramic/metal flange package.



Package Type: 440162 and 440161
PN: CGHV27200F and CGHV27200P

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 @ 46 dBm	15.0	16.0	16.0	dB
ACLR @ 46 dBm	-36.5	-37.5	-37.0	dBc
Drain Efficiency @ 46 dBm	29.0	28.5	29.0	%

Note:

Measured in the CGHV27200-AMP amplifier circuit, under WCDMA 3GPP test model 1, 64 DPCH, 45% clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF.

Features



- 2.5 - 2.7 GHz Operation
- 16 dB Gain
- -37 dBc ACLR at 40 W P_{AVE}
- 29 % Efficiency at 40 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}	32	mA	25°C
Maximum Drain Current ¹	I_{DMAX}	12	A	25°C
Soldering Temperature ²	T_S	245	°C	
Screw Torque	τ	80	in-oz	
Thermal Resistance, Junction to Case ³	$R_{\theta JC}$	1.22	°C/W	85°C, $P_{DISS} = 96$ W
Thermal Resistance, Junction to Case ⁴	$R_{\theta JC}$	1.54	°C/W	85°C, $P_{DISS} = 96$ 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 CGHV27200P

⁴ Measured for the CGHV27200F

⁵ See also, the Power Dissipation De-rating Curve on Page 6

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

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics¹						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.0	-2.3	V_{DC}	$V_{DS} = 10$ V, $I_D = 32$ mA
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.7	-	V_{DC}	$V_{DS} = 50$ V, $I_D = 1.0$ A
Saturated Drain Current ²	I_{DS}	24	28.8	-	A	$V_{DS} = 6.0$ V, $V_{GS} = 2.0$ V
Drain-Source Breakdown Voltage	V_{BR}	150	-	-	V_{DC}	$V_{GS} = -8$ V, $I_D = 32$ mA
RF Characteristics⁵ ($T_C = 25^\circ\text{C}$, $F_0 = 2.7$ GHz unless otherwise noted)						
Saturated Output Power ^{3,4}	P_{SAT}	-	300	-	W	$V_{DD} = 50$ V, $I_{DQ} = 1.0$ A
Pulsed Drain Efficiency ³	η	-	62	-	%	$V_{DD} = 50$ V, $I_{DQ} = 1.0$ A, $P_{OUT} = P_{SAT}$
Gain ⁶	G	-	15.25	-	dB	$V_{DD} = 50$ V, $I_{DQ} = 1.0$ A, $P_{OUT} = 46$ dBm
WCDMA Linearity ⁶	ACLR	-	-37	-	dBc	$V_{DD} = 50$ V, $I_{DQ} = 1.0$ A, $P_{OUT} = 46$ dBm
Drain Efficiency ⁶	η	-	30.5	-	%	$V_{DD} = 50$ V, $I_{DQ} = 1.0$ A, $P_{OUT} = 46$ dBm
Output Mismatch Stress ³	VSWR	-	-	10 : 1	Ψ	No damage at all phase angles, $V_{DD} = 50$ V, $I_{DQ} = 1.0$ A, $P_{OUT} = 200$ W Pulsed
Dynamic Characteristics						
Input Capacitance ⁷	C_{GS}	-	97	-	pF	$V_{DS} = 50$ V, $V_{GS} = -8$ V, $f = 1$ MHz
Output Capacitance ⁷	C_{DS}	-	13.4	-	pF	$V_{DS} = 50$ V, $V_{GS} = -8$ V, $f = 1$ MHz
Feedback Capacitance	C_{GD}	-	0.94	-	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 Pulse Width = 100 μ s, Duty Cycle = 10%

⁴ P_{SAT} is defined as $I_G = 3$ mA peak.

⁵ Measured in CGHV27200-AMP.

⁶ Single Carrier WCDMA, 3GPP Test Model 1, 64 DPCH, 45% Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF.

⁷ Includes package and internal matching components.

Typical Performance

Figure 1. - Small Signal Gain and Return Losses vs Frequency for the CGHV27200 measured in CGHV27200-AMP Amplifier Circuit
 $V_{DD} = 50 \text{ V}, I_{DQ} = 1.0 \text{ A}$

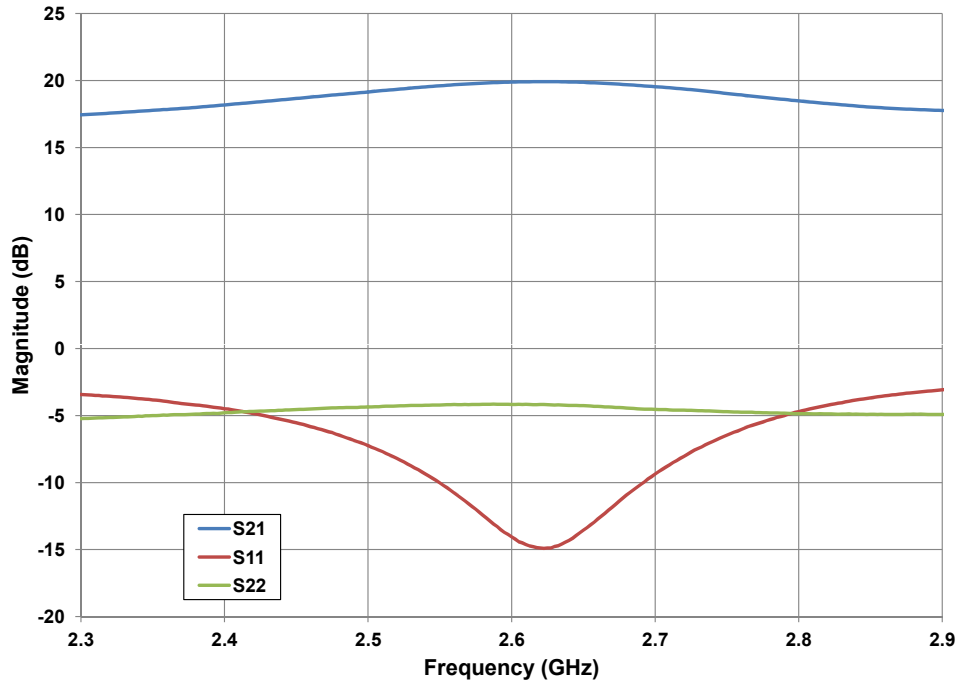
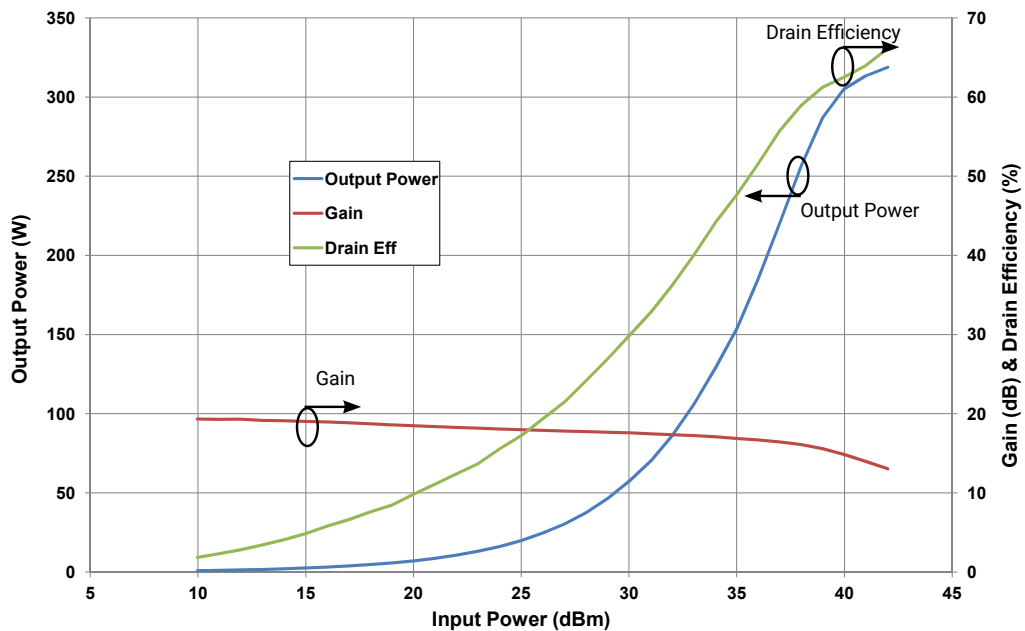


Figure 2. - Typical Pulsed Measurements vs Input Power of the CGHV27200 measured in CGHV27200-AMP Amplifier Circuit.
 $V_{DS} = 50 \text{ V}, I_{DQ} = 1.0 \text{ A}, \text{Freq} = 2.6 \text{ GHz}, \text{Pulse Width} = 100 \mu\text{s}, \text{Duty Cycle} = 10 \%$



Typical Performance

Figure 3. - Typical Linearity vs Output Power for the CGHV27200 measured in CGHV27200-AMP Amplifier Circuit
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 1.0\text{ A}$, Freq = 2.6 GHz, 1c WCDMA 7.5 dB PAR

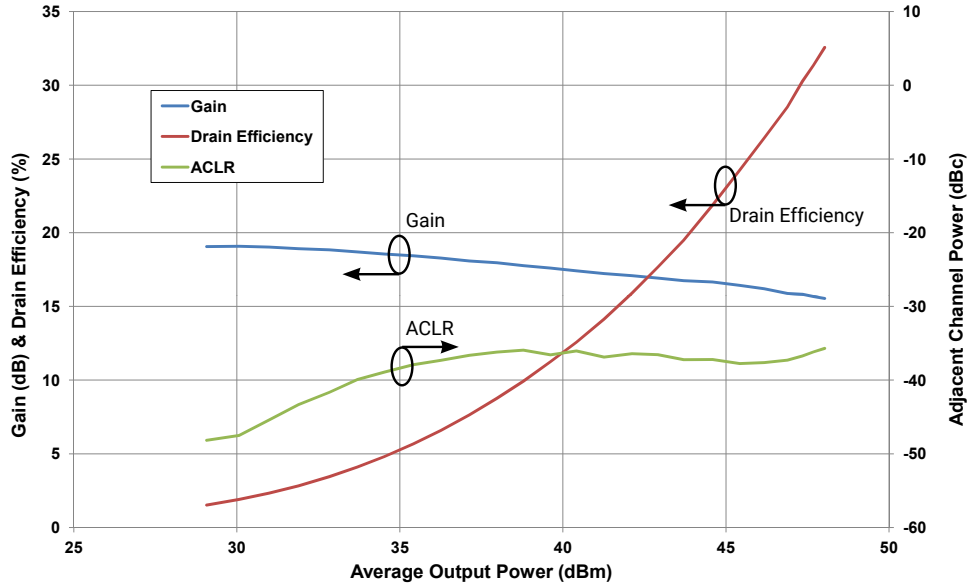
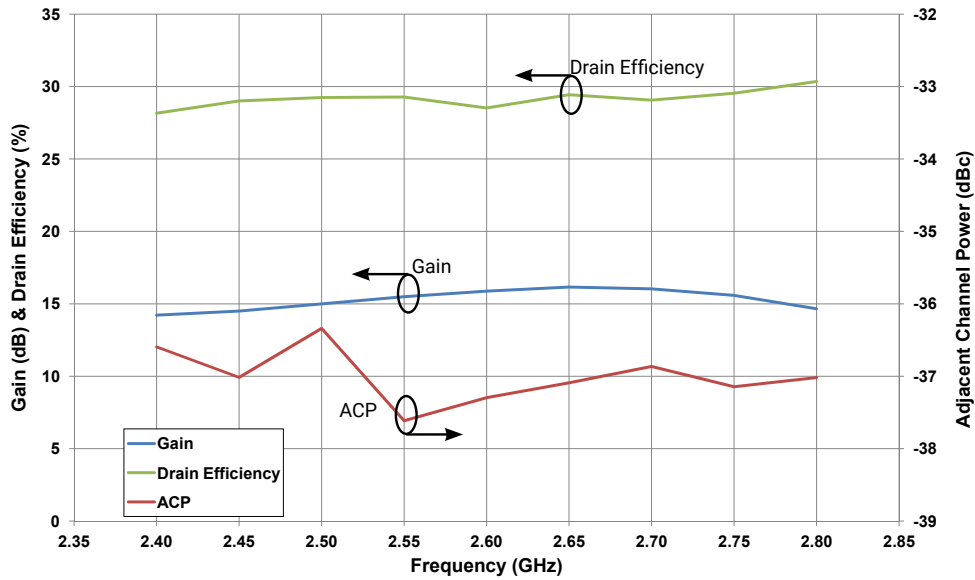


Figure 4. - Typical Linearity at $P_{AVE} = 46\text{ dBm}$ over Frequency of the CGHV27200 measured in CGHV27200-AMP Amplifier Circuit.
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 1.0\text{ A}$, 1c WCDMA 7.5 dB PAR



Typical Performance

Figure 5. - Typical Linearity under DPD vs Output Power
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 1.0\text{ A}$, Freq = 2.6 GHz, 1c WCDMA 7.5 dB PAR

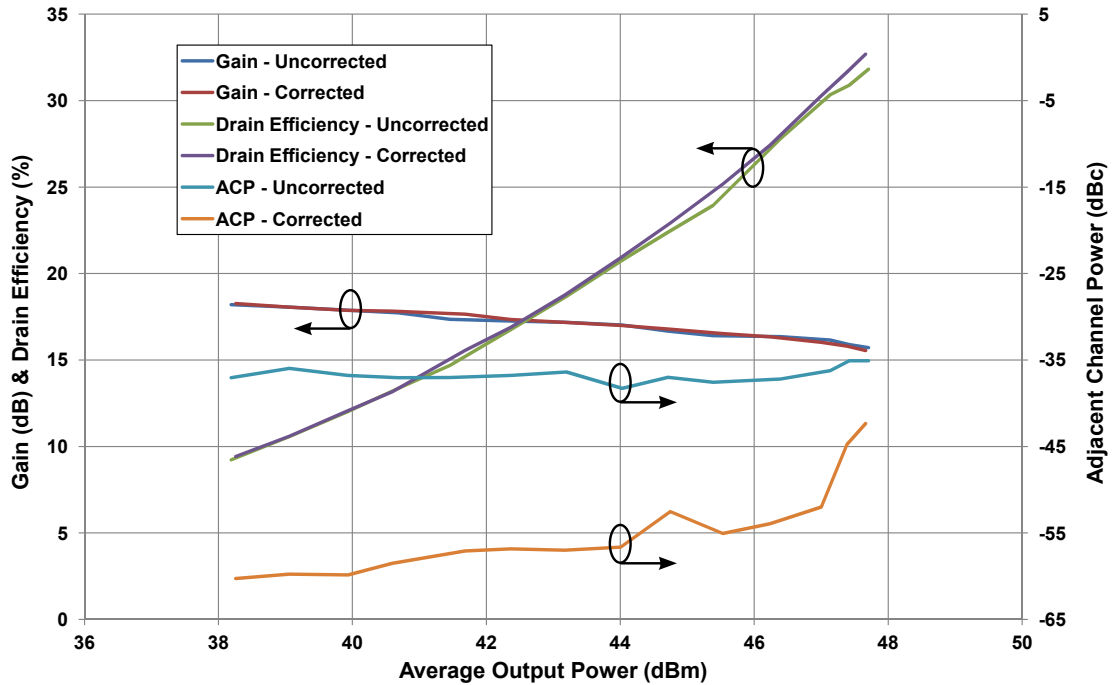
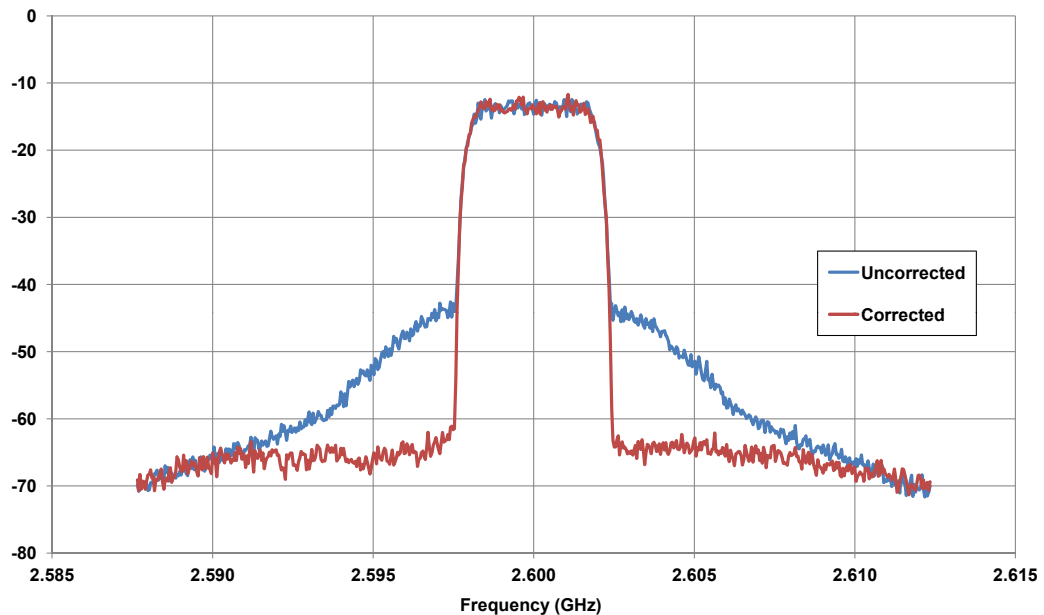


Figure 6. - Spectral Mask at $P_{AVE} = 46\text{ dBm}$ with and without DPD
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 1.0\text{ A}$, 1c WCDMA 7.5 dB PAR



Typical Performance

Figure 7. - Intermodulation Distortion Products vs Output Power
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 1.0\text{ A}$, Tone Spacing = 100 kHz

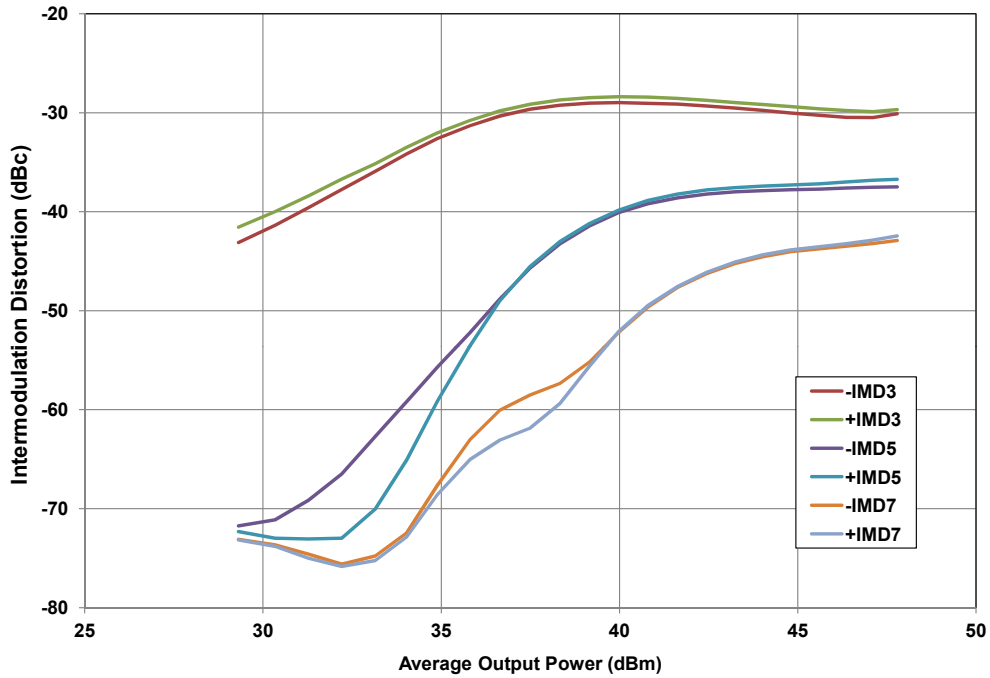
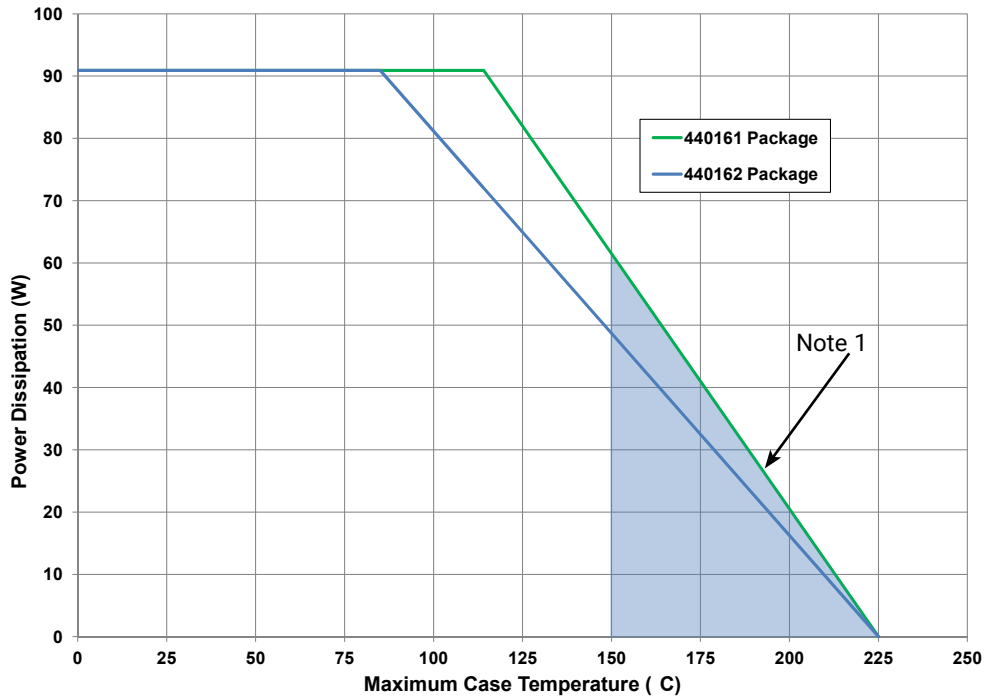
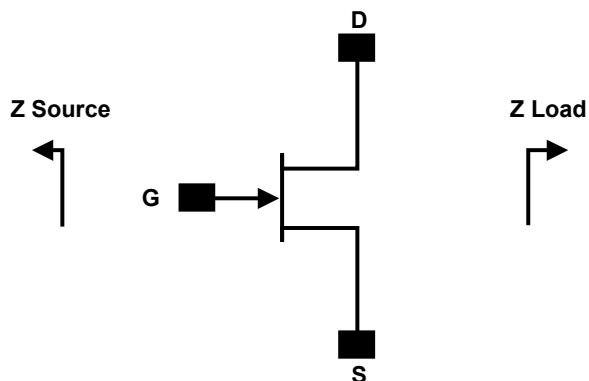


Figure 8. - Power Dissipation Derating Curve



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

Source and Load Impedances

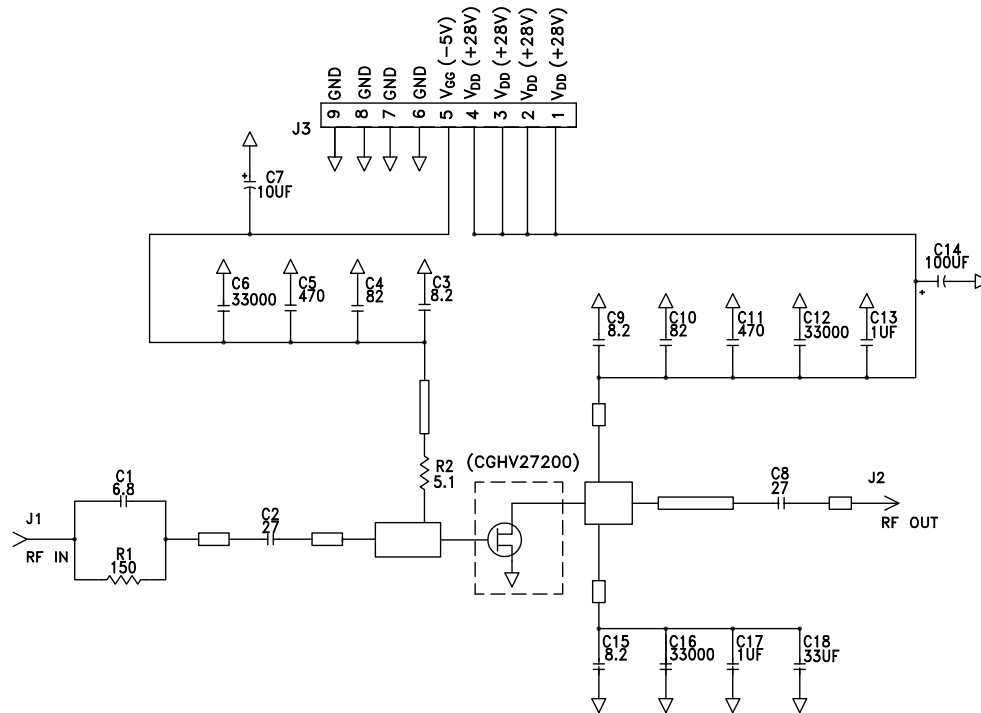


Frequency (MHz)	Z Source	Z Load
2500	11.14 - j14.20	4.66 - j0.69
2550	9.58 - j14.73	4.51 - j0.92
2600	7.99 - j14.81	4.30 - j1.12
2650	6.53 - j14.52	4.02 - j1.27
2700	5.28 - j13.97	3.70 - j1.36

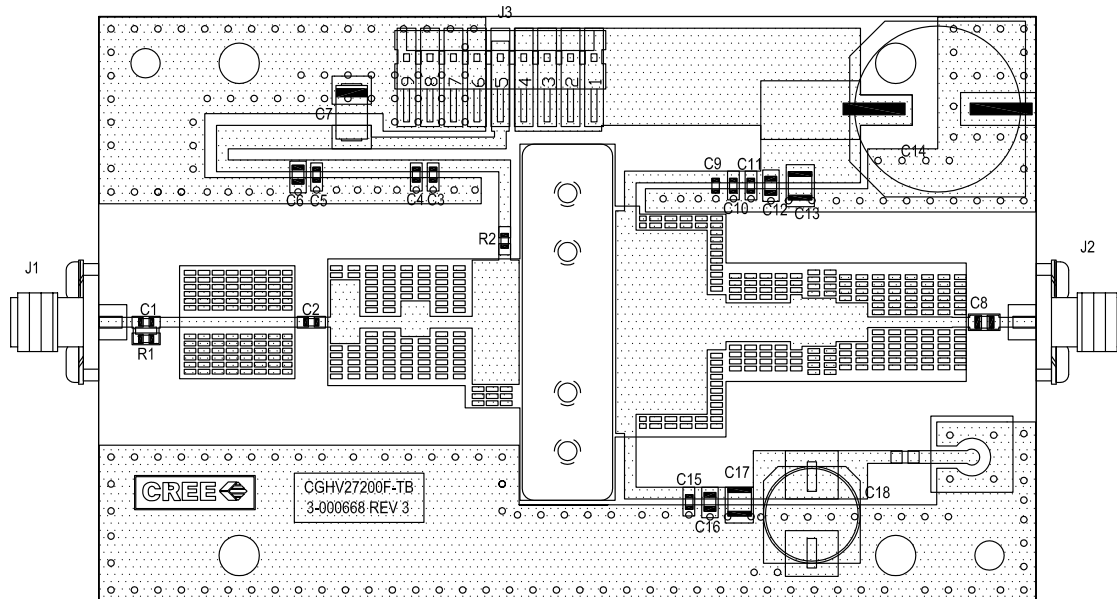
Note¹: $V_{DD} = 50\text{ V}$, $I_{DQ} = 1.0\text{ A}$. In the 440162 package.

Note²: Impedances are extracted from CGHV27200-AMP demonstration circuit and are not source and load pull data derived from transistor.

CGHV27200-AMP Demonstration Amplifier Circuit Schematic



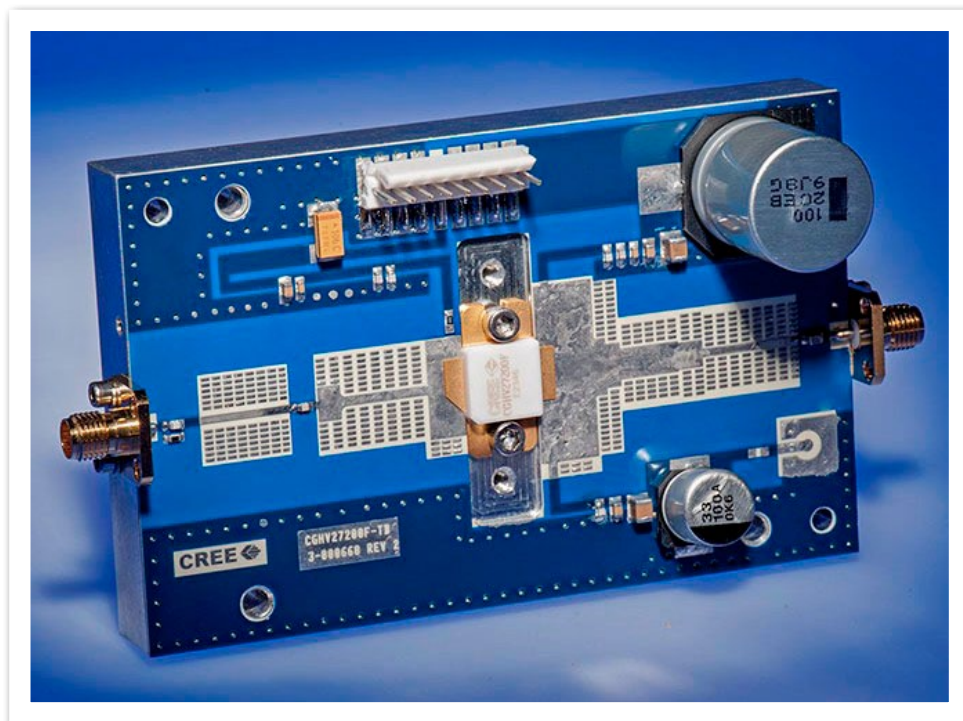
CGHV27200-AMP Demonstration Amplifier Circuit Outline



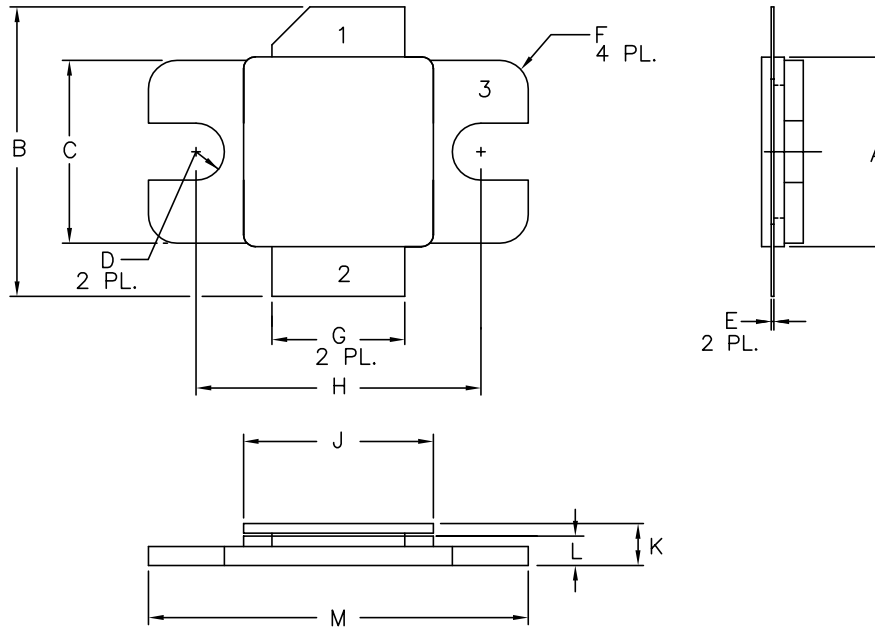
CGHV27200-AMP Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
R1	RES, 1/16 W, 0603, 1%, 150 OHMS	1
R2	RES, 1/16 W, 0603, 1%, 5.1 OHMS	1
C1	CAP, 6.2 pF, +/-0.25 pF, 0603, ATC600S	1
C2	CAP, 27 pF, +/-5%, 0603, ATC600S	1
C3,C9,C15	CAP, 8.2 pF, +/-0.25 pF, 0603, ATC600S	3
C4,C10	CAP, 82.0 pF, +/-5%, 0603, ATC600S	2
C5,C11	CAP, 470 pF, 5%, 100 V, 0603, X7R	2
C6,C12,C16	CAP, 33000 pF, 0805, 100 V, X7R	3
C7	CAP, 10 UF, 16V, TANTALUM	1
C8	CAP, 27 pF, +/-5%, 250 V, 0603, ATC600S	1
C13,C17	CAP, 1.0 UF, 100 V, 10%, X7R, 1210	2
C14	CAP, 100 UF, +/-20%, 160V, ELECTROLYTIC	2
C18	CAP, 33 UF, 20%, G CASE	1
J1,J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST	2
J3	CONN, Header, RT> PLZ, 0.1 CEN, LK, 9 POS	1
	PCB, RO4350, 0.020" THK, CGHV27200	1
	2-56 SOC HD SCREW 1/4 SS	4
	#2 SPLIT LOCKWASHER SS	4
	CGHV27200	1

CGHV27200-AMP Demonstration Amplifier Circuit



Product Dimensions CGHV27200F (Package Type – 440162)



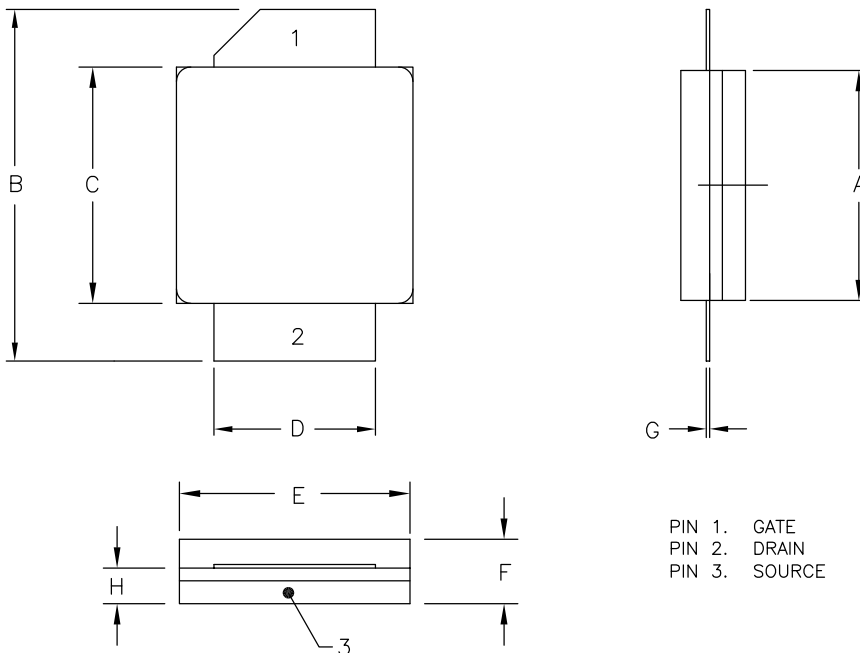
NOTES:

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 CGHV27200P (Package Type – 440161)



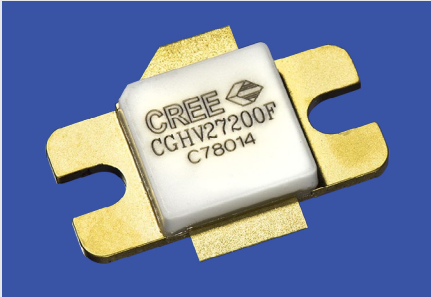

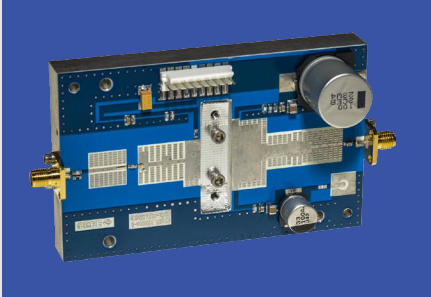
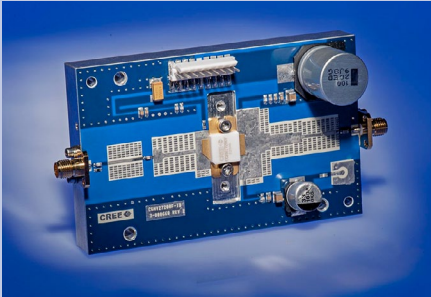
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DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.395	.407	10.03	10.34
B	.594	.634	15.09	16.10
C	.395	.407	10.03	10.34
D	.275	.285	6.99	7.24
E	.395	.407	10.03	10.34
F	.129	.149	3.28	3.78
G	.004	.006	0.10	0.15
H	.057	.067	1.45	1.70

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

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CGHV27200F	GaN HEMT	Each	
CGHV27200P	GaN HEMT	Each	
CGHV27200-TB	Test board without GaN HEMT	Each	
CGHV27200-AMP	Test board with GaN HEMT installed	Each	



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