

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 ($T_c = 25^{\circ}C$) 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	А	25°C
Soldering Temperature ²	T _s	245	°C	
Screw Torque	τ	80	in-oz	
Thermal Resistance, Junction to Case ³	$R_{_{ heta JC}}$	1.22	°C/W	85°C, P _{DISS} = 96 W
Thermal Resistance, Junction to Case ⁴	$R_{_{ heta JC}}$	1.54	°C/W	85°C, P _{DISS} = 96 W
Case Operating Temperature ⁵	T _c	-40, +150	°C	

Note:

Electrical Characteristics (T_c = 25°C)

Characteristics	Symbol	Min.	Тур.	Max.	Units	Conditions
DC Characteristics ¹						
Gate Threshold Voltage	$V_{\rm GS(th)}$	-3.8	-3.0	-2.3	V _{DC}	$V_{DS} = 10 \text{ V, I}_{D} = 32 \text{ mA}$
Gate Quiescent Voltage	$V_{\rm GS(Q)}$	-	-2.7	-	V _{DC}	$V_{DS} = 50 \text{ V, I}_{D} = 1.0 \text{ A}$
Saturated Drain Current ²	I _{DS}	24	28.8	-	А	$V_{DS} = 6.0 \text{ V}, V_{GS} = 2.0 \text{ V}$
Drain-Source Breakdown Voltage	$V_{_{\mathrm{BR}}}$	150	-	-	V _{DC}	$V_{GS} = -8 \text{ V, I}_{D} = 32 \text{ mA}$
RF Characteristics ⁵ (T _c = 25°C, F ₀ = 2.7 GHz	z unless otherwi	se noted)				
Saturated Output Power ^{3,4}	P_{SAT}	-	300	-	W	$V_{DD} = 50 \text{ V, } I_{DQ} = 1.0 \text{ A}$
Pulsed Drain Efficiency ³	η	-	62	-	%	$V_{DD} = 50 \text{ V, } I_{DQ} = 1.0 \text{ A, } P_{OUT} = P_{SAT}$
Gain ⁶	G	-	15.25	-	dB	$V_{DD} = 50 \text{ V, } I_{DQ} = 1.0 \text{ A, } P_{OUT} = 46 \text{ dBm}$
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, $V_{\rm DD}$ = 50 V, $I_{\rm DQ}$ = 1.0 A, $P_{\rm OUT}$ = 200 W Pulsed
Dynamic Characteristics						
Input Capacitance ⁷	C _{GS}	-	97	-	pF	$V_{DS} = 50 \text{ V, } V_{gs} = -8 \text{ V, } f = 1 \text{ MHz}$
Output Capacitance ⁷	C _{DS}	-	13.4	-	pF	$V_{DS} = 50 \text{ V, } V_{gs} = -8 \text{ V, f} = 1 \text{ MHz}$
Feedback Capacitance	C_{GD}	-	0.94	-	pF	$V_{DS} = 50 \text{ V, } V_{gs} = -8 \text{ V, } f = 1 \text{ MHz}$

Notes:

¹ Current limit for long term, reliable operation.

 $^{^2\,}Refer to the \,Application \,\, Note \,\, on \,\, soldering \,\, at \,\, \underline{http://www.cree.com/rf/document-library}$

³ Measured for the CGHV27200P

⁴ Measured for the CGHV27200F

 $^{^{\}rm 5}$ See also, the Power Dissipation De-rating Curve on Page 6

¹ Measured on wafer prior to packaging.

² Scaled from PCM data.

 $^{^3}$ Pulse Width = 100 μ S, Duty Cycle = 10%

 $^{^4\,\}mathrm{P}_{\mathrm{SAT}}$ 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.

 $^{^{\}rm 7}$ Includes package and internal matching components.



Figure 1. - Small Signal Gain and Return Losses vs Frequency for the CGHV27200 measured in CGHV27200-AMP Amplifier Circuit

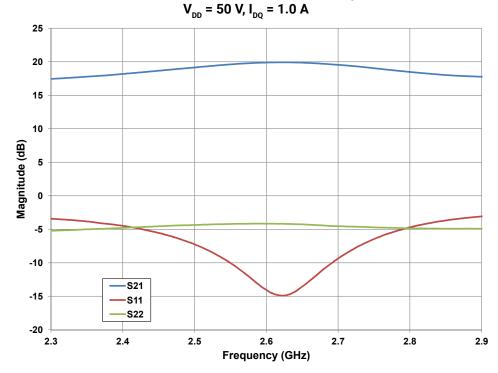


Figure 2. - Typical Pulsed Measurements vs Input Power of the CGHV27200 measured in CGHV27200-AMP Amplifier Circuit. V_{DS} = 50 V, I_{DO} = 1.0 A, Freq = 2.6 GHz, Pulse Width = 100 μ s, Duty Cycle = 10 %

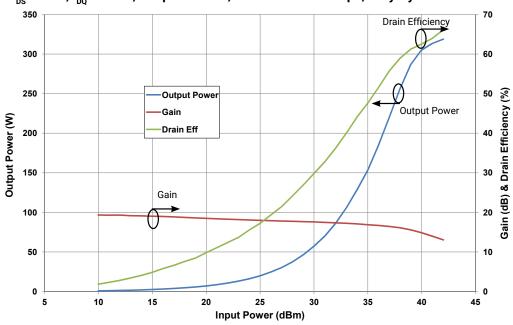




Figure 3. - Typical Linearity vs Output Power for the CGHV27200 measured in CGHV27200-AMP Amplifier Circuit $V_{\rm DD}$ = 50 V, $I_{\rm DO}$ = 1.0 A, Freq = 2.6 GHz, 1c WCDMA 7.5 dB PAR

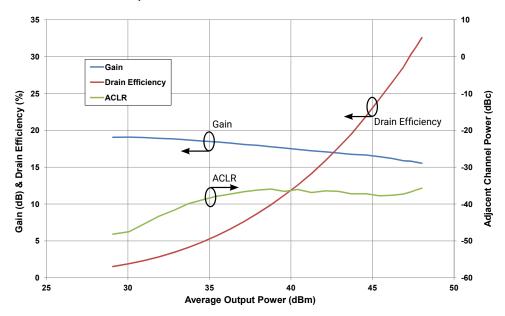
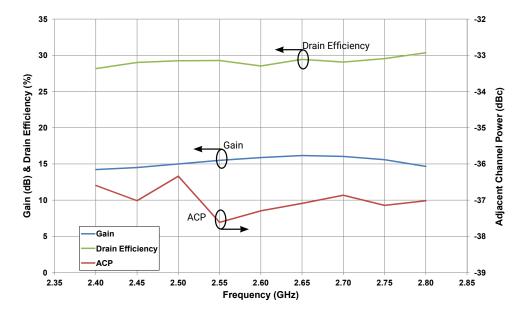


Figure 4. - Typical Linearity at P $_{AVE}$ = 46 dBm over Frequency of the CGHV27200 measured in CGHV27200-AMP Amplifier Circuit. V_{DD} = 50 V, I_{DO} = 1.0 A, 1c WCDMA 7.5 dB PAR





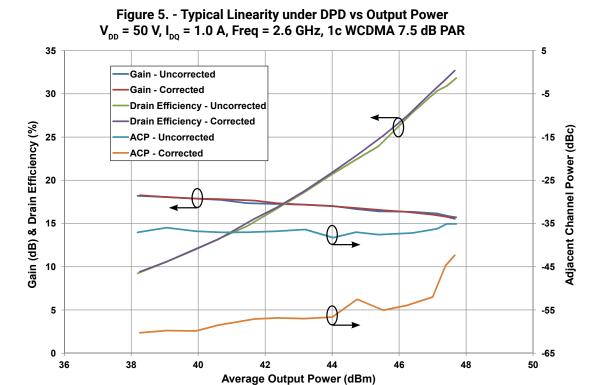
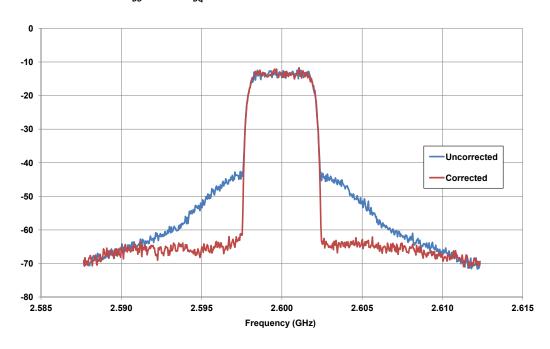


Figure 6. - Spectral Mask at P $_{\rm AVE}$ = 46 dBm with and without DPD V $_{\rm DD}$ = 50 V, I $_{\rm DQ}$ = 1.0 A, 1c WCDMA 7.5 dB PAR

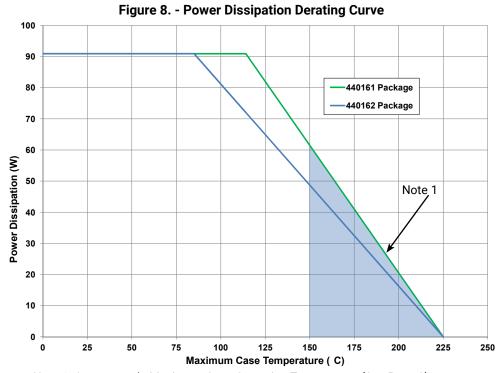




 $V_{\rm DD}$ = 50 V, $I_{\rm DQ}$ = 1.0 A, Tone Spacing = 100 kHz -20 -30 Intermodulation Distortion (dBc) -50 -IMD3 -60 +IMD3 -IMD5 +IMD5 -IMD7 -70

Figure 7. - Intermodulation Distortion Products vs Output Power

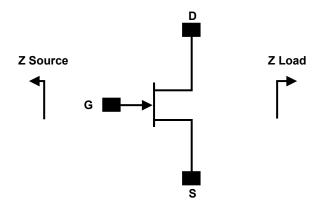
+IMD7 -80 25 30 45 50 Average Output Power (dBm)



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



Source and Load Impedances

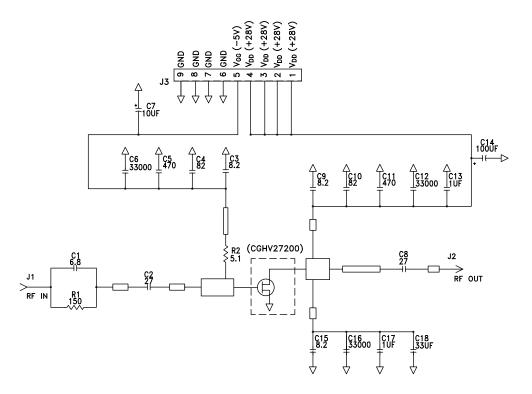


Frequency (MHz)	Z Source	Z Load
2500	11.14 - j14.20	4.66 - j0.69
2550	9.58 - j14.73	4.51 - j0.92
2600	7.99 - j14.81	4.30 - j1.12
2650	6.53 - j14.52	4.02 - j1.27
2700	5.28 - j13.97	3.70 - j1.36

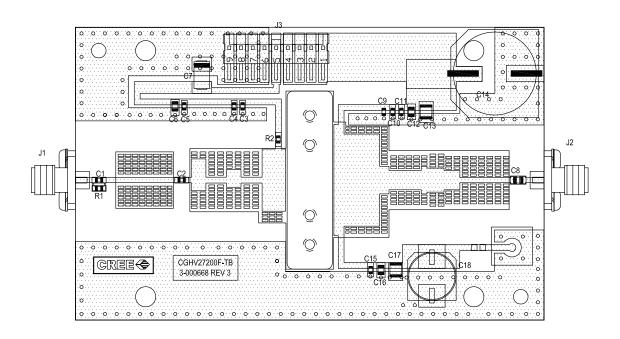
Note¹: V_{DD} = 50 V, I_{DQ} = 1.0 A. In the 440162 package. Note²: Impedances are extracted from CGHV27200-AMP demonstration circuit and are not source and load pull data derived from transistor.



CGHV27200-AMP Demonstration Amplifier Circuit Schematic



CGHV27200-AMP Demonstration Amplifier Circuit Outline





CGHV27200-AMP Demonstration Amplifier Circuit Bill of Materials

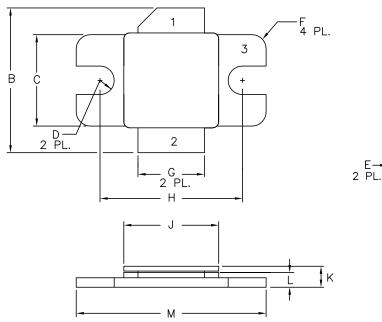
Designator	Description	Qty
R1	RES, 1/16 W, 0603, 1%, 150 OHMS	1
R2	RES, 1/16 W, 0603, 1%, 5.1 OHMS	1
C1	CAP, 6.2 pF, +/-0.25 pF, 0603, ATC600S	1
C2	CAP, 27 pF, +/-5%, 0603, ATC600S	1
C3,C9,C15	CAP, 8.2 pF, +/-0.25 pF, 0603, ATC600S	3
C4,C10	CAP, 82.0 pF, +/-5%, 0603, ATC600S	2
C5,C11	CAP, 470 pF, 5%, 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

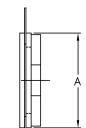
CGHV27200-AMP Demonstration Amplifier Circuit





Product Dimensions CGHV27200F (Package Type — 440162)





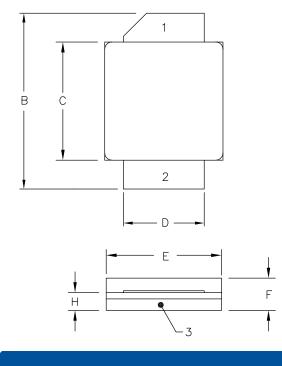
NOTES:

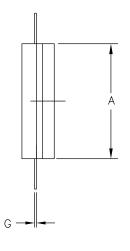
- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- 2. CONTROLLING DIMENSION: INCH.
- 3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.
- LID MAY BE MISALIGNED TO THE BODY
 OF THE PACKAGE BY A MAXIMUM OF 0.008" IN
 ANY DIRECTION.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
Α	.395	.405	10.03	10.29
В	.580	.620	14.73	15.75
С	.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
Н	.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
М	.795	.805	20.19	20.45

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

Product Dimensions CGHV27200P (Package Type - 440161)





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

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 PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
Α	.395	.407	10.03	10.34
В	.594	.634	15.09	16.10
С	.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
Н	.057	.067	1.45	1.70



Product Ordering Information

Order Number	Description	Unit of Measure	Image
CGHV27200F	GaN HEMT	Each	CGHV27200 CGHV272004
CGHV27200P	GaN HEMT	Each	CREE 300P CCH127200P CCH2727200P
CGHV27200-TB	Test board without GaN HEMT	Each	
CGHV27200-AMP	Test board with GaN HEMT installed	Each	



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