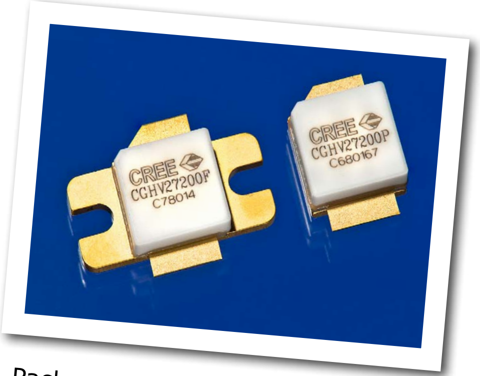
# CGHV27200

## 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°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-TB 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

Rev 0.3 – November 2013

## 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 | $T_J$ | 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 | $\tau$ | 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 | 30 seconds |

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˚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, $I_D$ = 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 | $V_{BR}$ | 125 | – | – | $V_{DC}$ | $V_{GS}$ = -8 V, $I_D$ = 32 mA |
| **RF Characteristics[5] ($T_C$ = 25˚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 μS, Duty Cycle = 10%
[4] $P_{SAT}$ is defined as $I_G$ = 3 mA peak.
[5] Measured in CGHV27200-TB.
[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.



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## Typical Performance

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

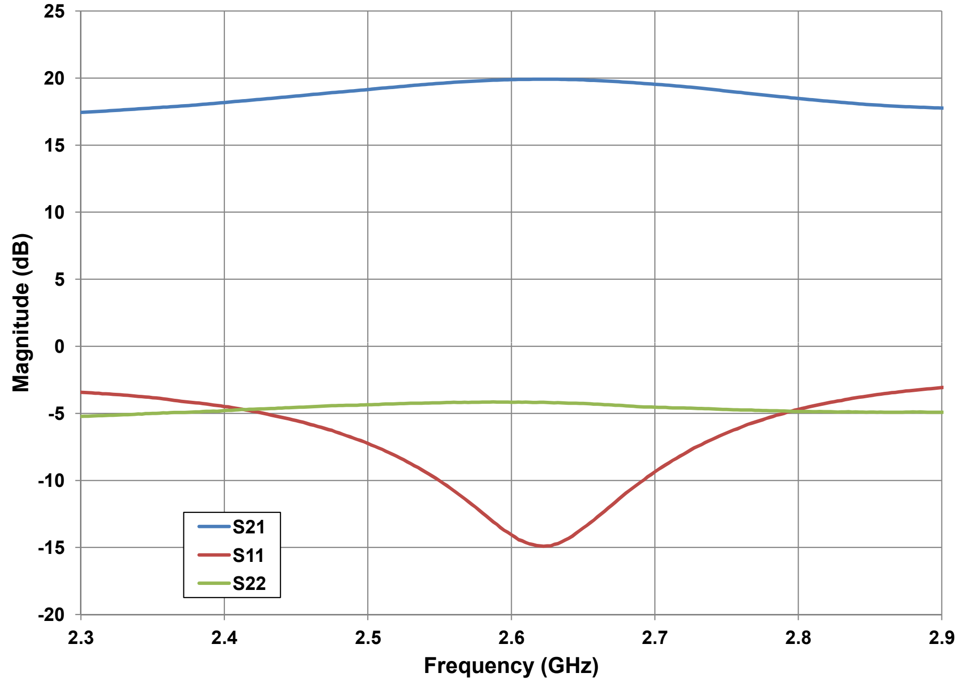
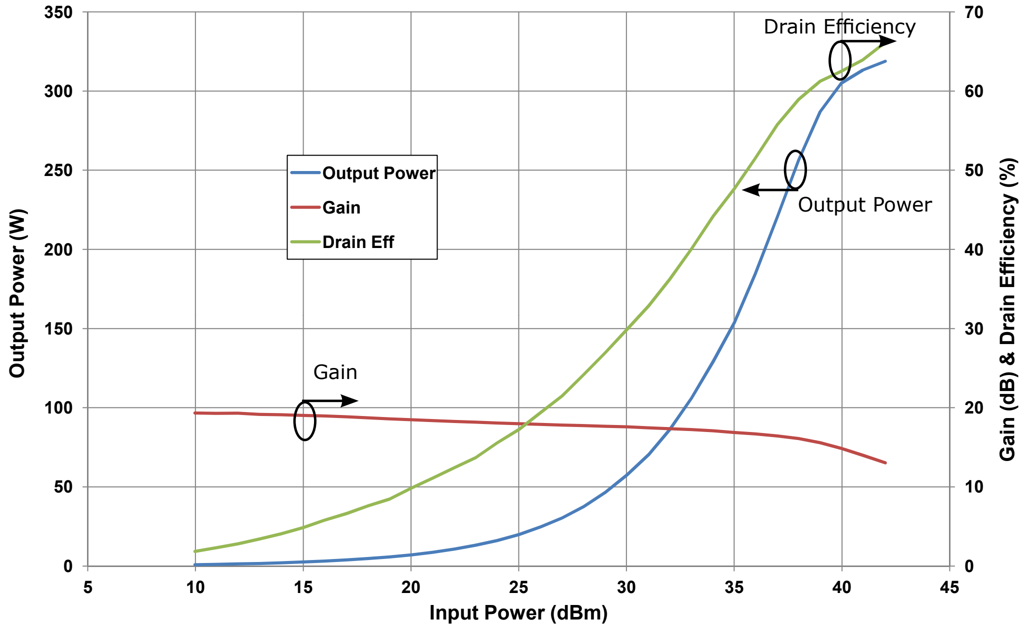



**Figure 2. - Typical Pulsed Measurements vs Input Power of the CGHV27200 measured in CGHV27200-TB Amplifier Circuit.**
**$V_{DS}$ = 50 V, $I_{DQ}$ = 1.0 A, Freq = 2.6 GHz, Pulse Width = 100 μs, Duty Cycle = 10 %**



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## Typical Performance

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

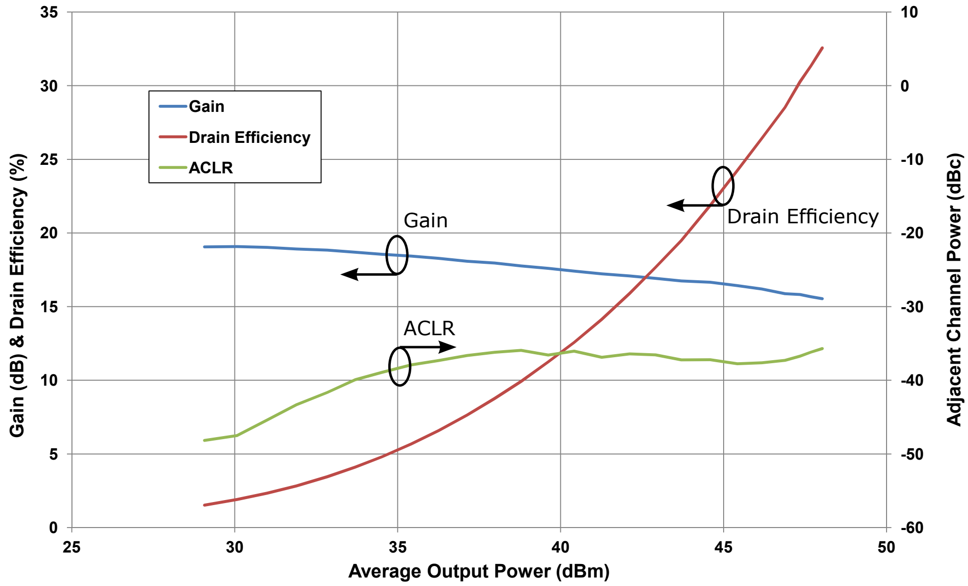
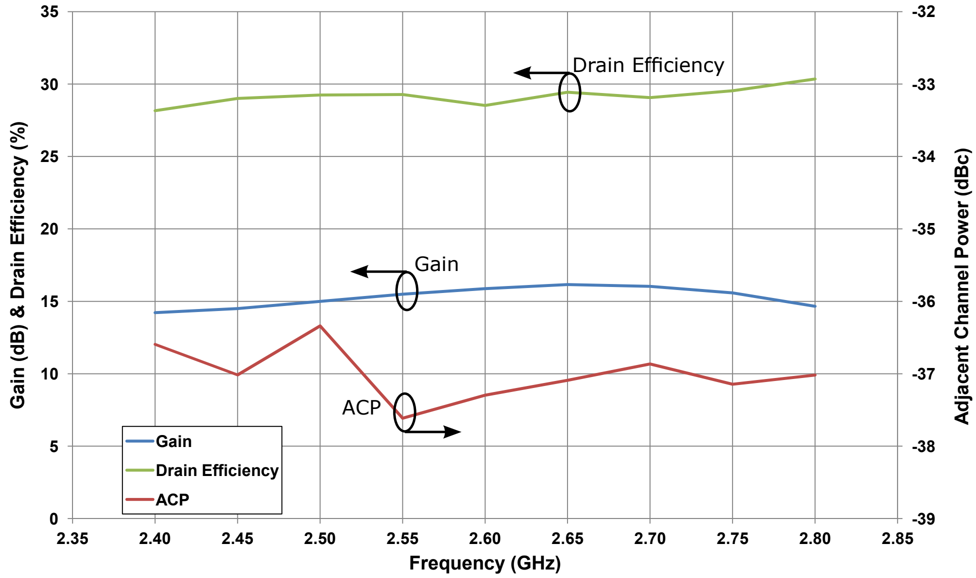



**Figure 4. - Typical Linearity at $P_{AVE}$ = 46 dBm over Frequency of the CGHV27200 measured in CGHV27200-TB Amplifier Circuit.**
**$V_{DD}$ = 50 V, $I_{DQ}$ = 1.0 A, 1c WCDMA 7.5 dB PAR**



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## Typical Performance

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

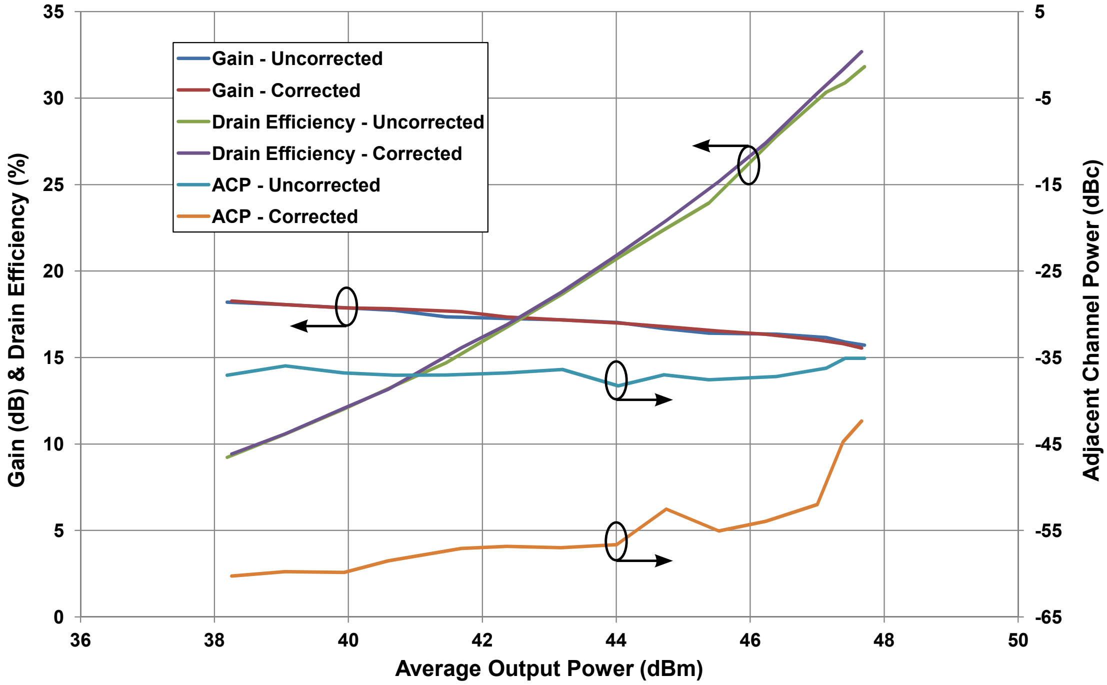
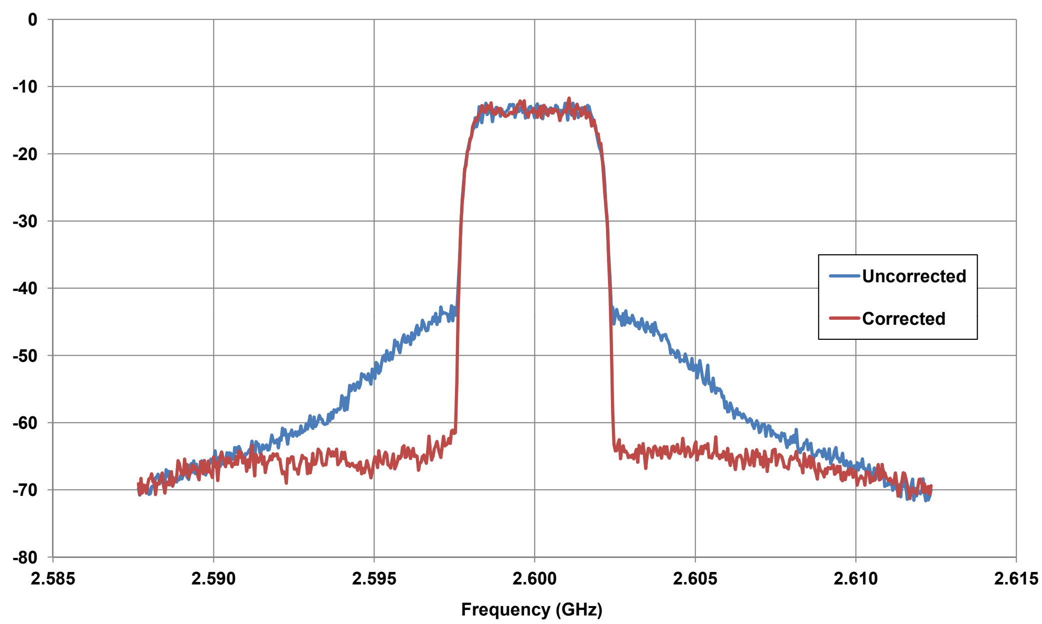



**Figure 6. - Spectral Mask at $P_{AVE}$ = 46 dBm with and without DPD**
**$V_{DD}$ = 50 V, $I_{DQ}$ = 1.0 A, 1c WCDMA 7.5 dB PAR**



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## Typical Performance

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

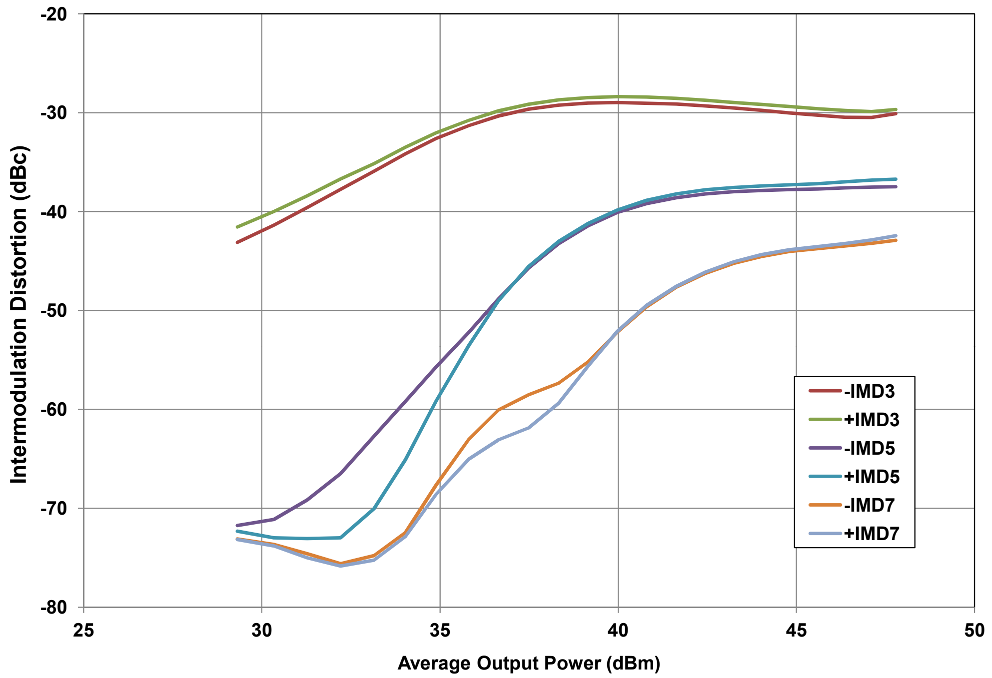
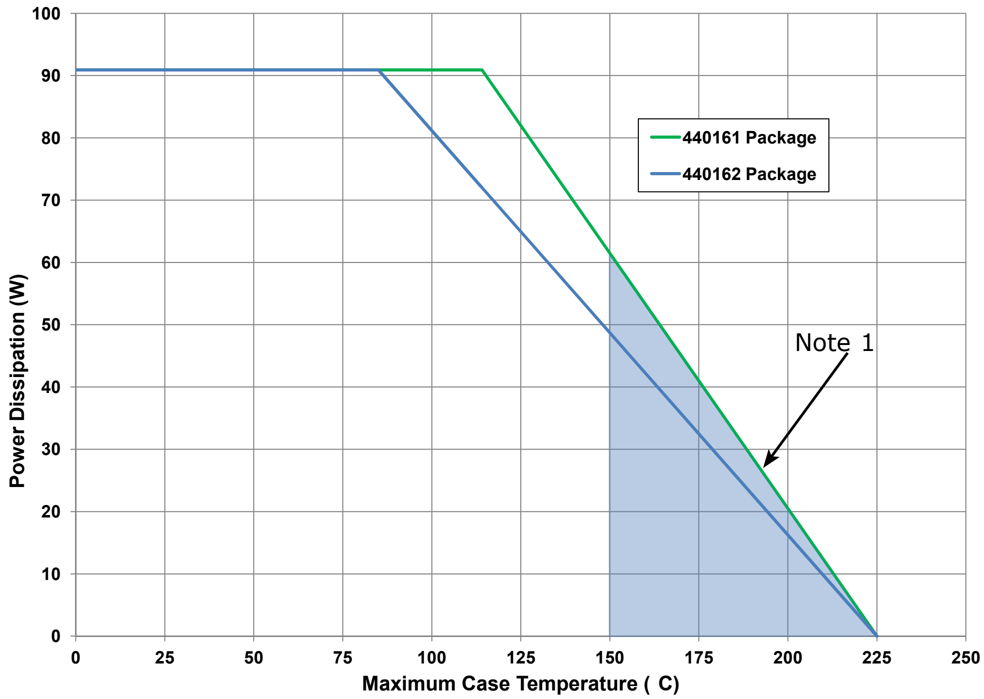



**Figure 8. - Power Dissipation Derating Curve**




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



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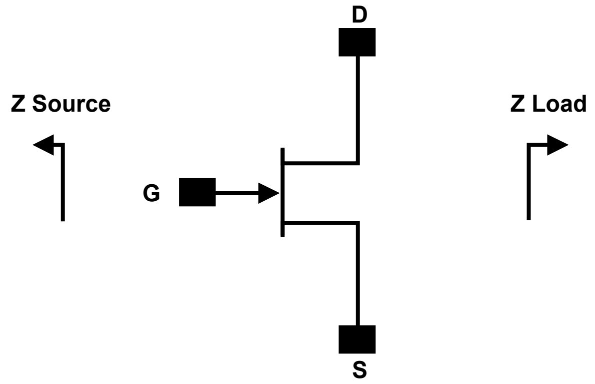
## Source and Load Impedances




| Frequency (MHz) | Z Source | Z Load |
|---|---|---|
| 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 |

Note[1]: $V_{DD}$ = 50 V, $I_{DQ}$ = 1.0 A. In the 440162 package.
Note[2]: Impedances are extracted from CGHV27200-TB demonstration circuit and are not source and load pull data derived from transistor.



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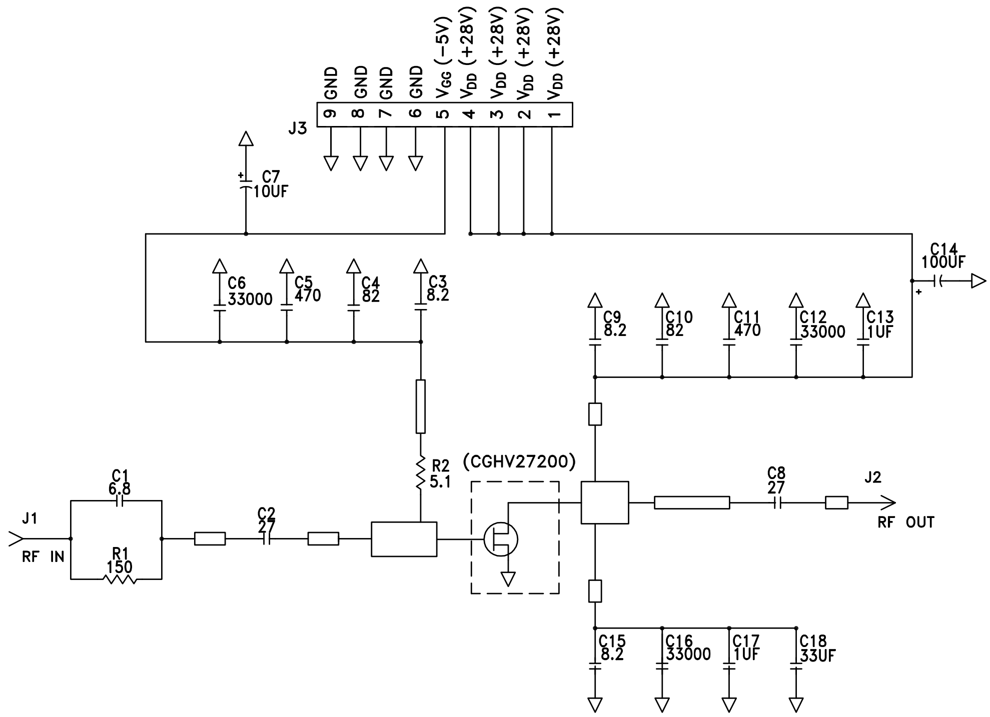
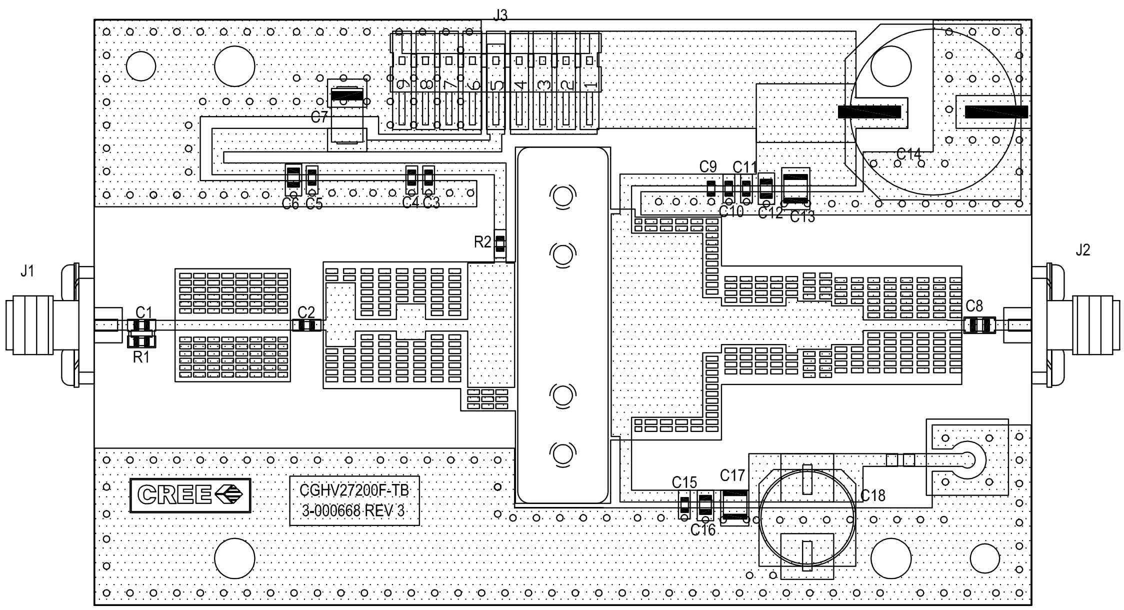
## CGHV27200-TB Demonstration Amplifier Circuit Schematic




## CGHV27200-TB Demonstration Amplifier Circuit Outline



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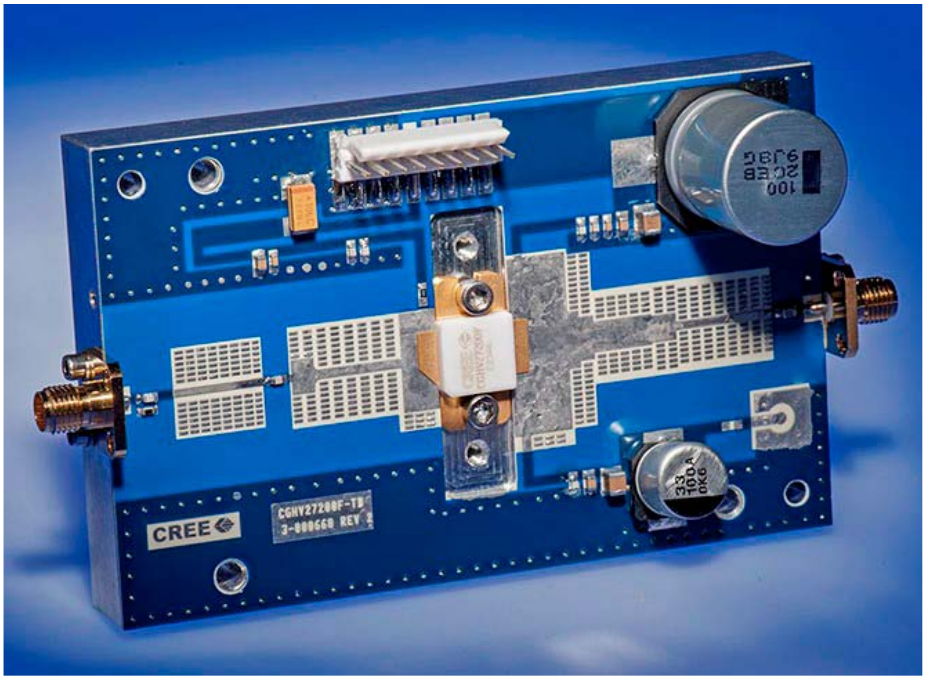
## CGHV27200-TB Demonstration Amplifier Circuit Bill of Materials

| 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-TB Demonstration Amplifier Circuit



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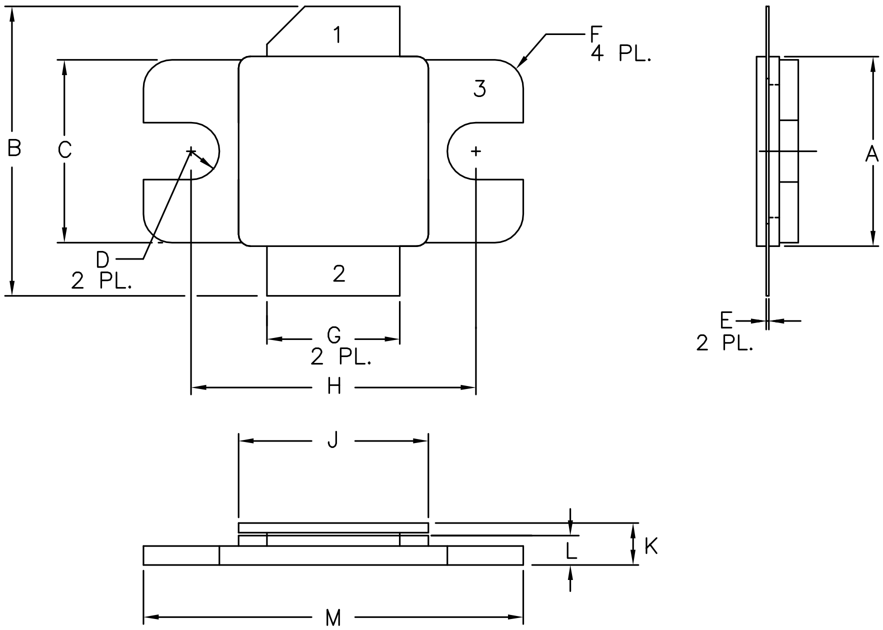
## Product Dimensions CGHV27200F (Package Type — 440162)



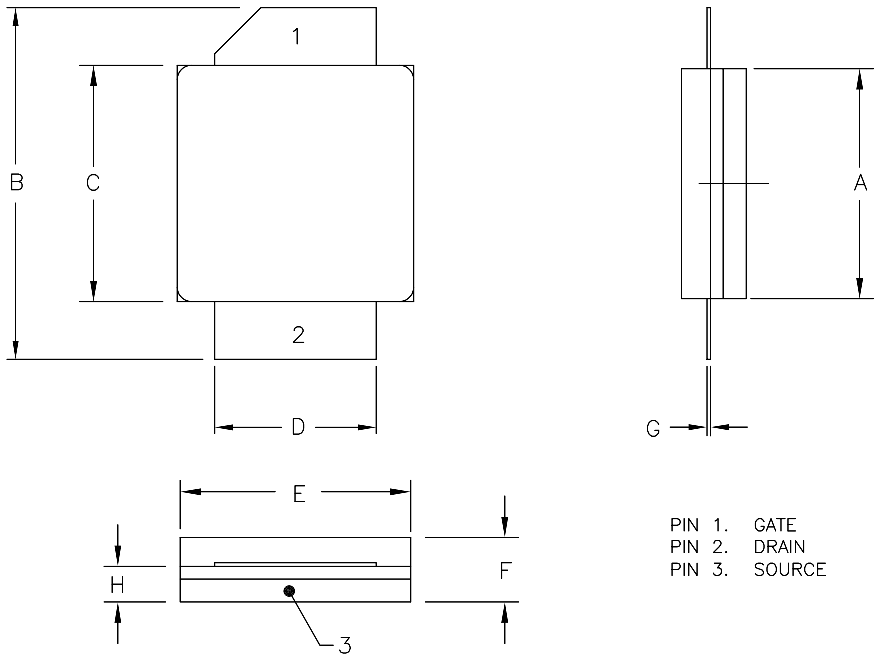

NOTES:

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.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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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| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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



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