

# CGHV27030S

**30 W, DC - 6.0 GHz, GaN HEMT**

The CGHV27030S is an unmatched, gallium nitride (GaN) high electron mobility transistor (HEMT) which offers high efficiency, high gain and wide bandwidth capabilities. The CGHV27030S GaN HEMT devices are ideal for telecommunications applications with frequencies of 700-960 MHz, 1200-1400 MHz, 1800-2200 MHz, 2500-2700 MHz, and 3300-3700 MHz at both 50 V and 28 V operations. The CGHV27030S is also ideal for tactical communications applications operating from 20-2500 MHz, including land mobile radios. Additional applications include L-Band RADAR and S-Band RADAR. The CGHV27030S can operate with either a 50 V or 28 V rail. The transistor is available in a 3mm x 4mm, surface mount, dual-flat-no-lead (DFN) package.



Package Type: 3x4 DFN  
PN: CGHV27030S

## Typical Performance 2.5-2.7 GHz ( $T_c = 25^\circ\text{C}$ ), 50 V

| Parameter                                       | 2.5 GHz | 2.6 GHz | 2.7 GHz | Units |
|-------------------------------------------------|---------|---------|---------|-------|
| Small Signal Gain                               | 23.0    | 22.0    | 21.4    | dB    |
| Adjacent Channel Power @ $P_{OUT} = 5\text{ W}$ | -34.5   | -36.5   | -37.0   | dBc   |
| Drain Efficiency @ $P_{OUT} = 5\text{ W}$       | 29.5    | 31.5    | 32.9    | %     |
| Input Return Loss                               | 13.4    | 9.5     | 10.4    | dB    |

Note:

Measured in the CGHV27030S-AMP1 application circuit, under 7.5 dB PAR single carrier WCDMA signal test model 1 with 64 DPCH.

## Features for 50 V in CGHV27030S-AMP1

- 2.5 - 2.7 GHz Operation
- 30 W Typical Output Power
- 21 dB Gain at 5 W  $P_{AVE}$
- -36 dBc ACLR at 5 W  $P_{AVE}$
- 32% efficiency at 5 W  $P_{AVE}$
- High degree of APD and DPD correction can be applied

Large Signal Models Available for ADS and MWO

## Listing of Available Hardware Application Circuits / Demonstration Circuits

| Application Circuit | Operating Frequency | Amplifier Class | Operating Voltage |
|---------------------|---------------------|-----------------|-------------------|
| CGHV27030S-AMP1     | 2.5 - 2.7 GHz       | Class A/B       | 50 V              |
| CGHV27030S-AMP2     | 2.5 - 2.7 GHz       | Class A/B       | 28 V              |
| CGHV27030S-AMP3     | 1.8 - 2.2 GHz       | Class A/B       | 28 V              |
| CGHV27030S-AMP4     | 1.8 - 2.2 GHz       | Class A/B       | 50 V              |
| CGHV27030S-AMP5     | 1.2 - 1.4 GHz       | Class A/B       | 50 V              |

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

| Parameter                                         | Symbol          | Rating    | Units | Notes |
|---------------------------------------------------|-----------------|-----------|-------|-------|
| Drain-Source Voltage                              | $V_{DS}$        | 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                      | $I_{GMAX}$      | 4         | mA    | 25°C  |
| Maximum Drain Current <sup>1</sup>                | $I_{DMAX}$      | 1.5       | A     | 25°C  |
| Soldering Temperature <sup>2</sup>                | $T_S$           | 245       | °C    |       |
| Case Operating Temperature <sup>3</sup>           | $T_C$           | -40, +150 | °C    |       |
| Thermal Resistance, Junction to Case <sup>4</sup> | $R_{\theta JC}$ | 6.18      | °C/W  | 85°C  |

Note:

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

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

<sup>3</sup>  $T_C$  = Case temperature for the device. It refers to the temperature at the ground tab underneath the package. The PCB will add additional thermal resistance. See also, the Power Dissipation De-rating Curve on page 12.

<sup>4</sup> Measured for the CGHV27030S at  $P_{DISS} = 12$  W

<sup>5</sup> The  $R_{\theta TH}$  for Cree's demonstration amplifier, CGHV27030S-AMP1, with 33 x 0.011 via holes designed on a 20 mil thick Rogers 4350 PCB, is 3.9°C. The total  $R_{\theta TH}$  from the heat sink to the junction is 6.18°C + 3.9°C = 10.08°C/W.

## 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, $I_D = 4$ mA                                                            |
| Gate Quiescent Voltage                                                                                                           | $V_{GS(Q)}$   | –    | -2.7   | –    | $V_{DC}$ | $V_{DS} = 50$ V, $I_D = 0.13$ mA                                                         |
| Saturated Drain Current                                                                                                          | $I_{DS}$      | 3.0  | 3.6    | –    | A        | $V_{DS} = 6.0$ V, $V_{GS} = 2.0$ V                                                       |
| Drain-Source Breakdown Voltage                                                                                                   | $V_{(BR)DSS}$ | 150  | –      | –    | $V_{DC}$ | $V_{GS} = -8$ V, $I_D = 4$ mA                                                            |
| <b>RF Characteristics<sup>2,3</sup> (<math>T_C = 25^\circ\text{C}</math>, <math>F_0 = 2.7</math> GHz unless otherwise noted)</b> |               |      |        |      |          |                                                                                          |
| Gain                                                                                                                             | G             | –    | 20.7   | –    | dB       | $V_{DD} = 50$ V, $I_{DQ} = 0.13$ A, $P_{OUT} = 37$ dBm                                   |
| WCDMA Linearity <sup>4</sup>                                                                                                     | ACLR          | –    | -37    | –    | dBc      | $V_{DD} = 50$ V, $I_{DQ} = 0.13$ A, $P_{OUT} = 37$ dBm                                   |
| Drain Efficiency <sup>4</sup>                                                                                                    | $\eta$        | –    | 32.9   | –    | %        | $V_{DD} = 50$ V, $I_{DQ} = 0.13$ A, $P_{OUT} = 37$ dBm                                   |
| Output Mismatch Stress                                                                                                           | VSWR          | –    | 10 : 1 | –    | Y        | No damage at all phase angles,<br>$V_{DD} = 50$ V, $I_{DQ} = 0.13$ A, $P_{OUT} = 37$ dBm |
| <b>Dynamic Characteristics</b>                                                                                                   |               |      |        |      |          |                                                                                          |
| Input Capacitance <sup>5</sup>                                                                                                   | $C_{GS}$      | –    | 5.38   | –    | pF       | $V_{DS} = 50$ V, $V_{gs} = -8$ V, $f = 1$ MHz                                            |
| Output Capacitance <sup>5</sup>                                                                                                  | $C_{DS}$      | –    | 1.18   | –    | pF       | $V_{DS} = 50$ V, $V_{gs} = -8$ V, $f = 1$ MHz                                            |
| Feedback Capacitance                                                                                                             | $C_{GD}$      | –    | 0.12   | –    | 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> Measured in Cree's production test fixture. This fixture is designed for high volume test at 2.7 GHz

<sup>4</sup> Single Carrier WCDMA, 3GPP Test Model 1, 64 DPCH, 45% Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF

<sup>5</sup> Includes package parasitics.

## Typical Performance in Application Circuit CGHV27030S-AMP1

Figure 1. - Small Signal Gain and Return Losses vs Frequency  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$

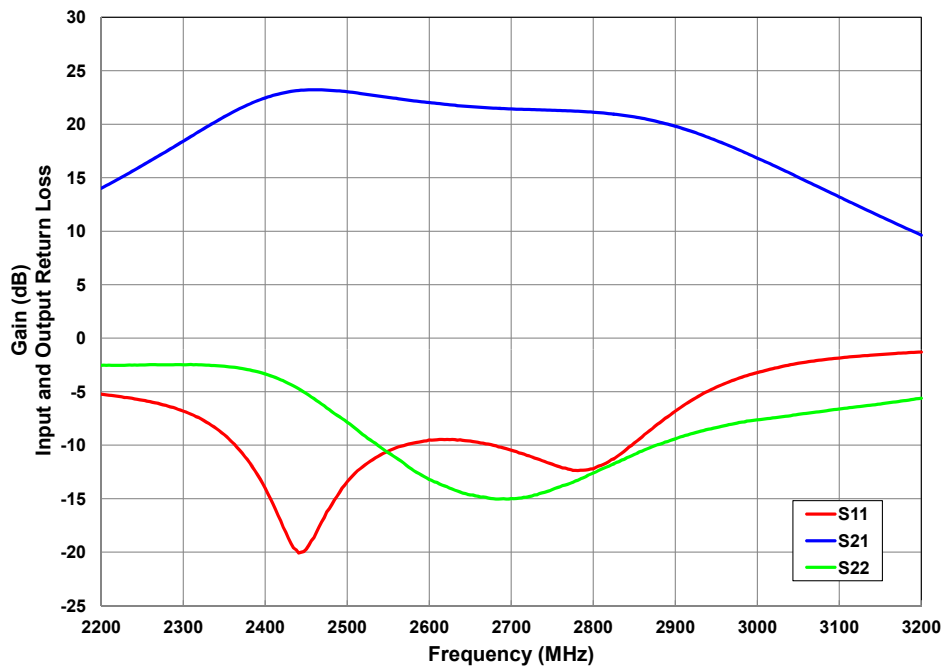
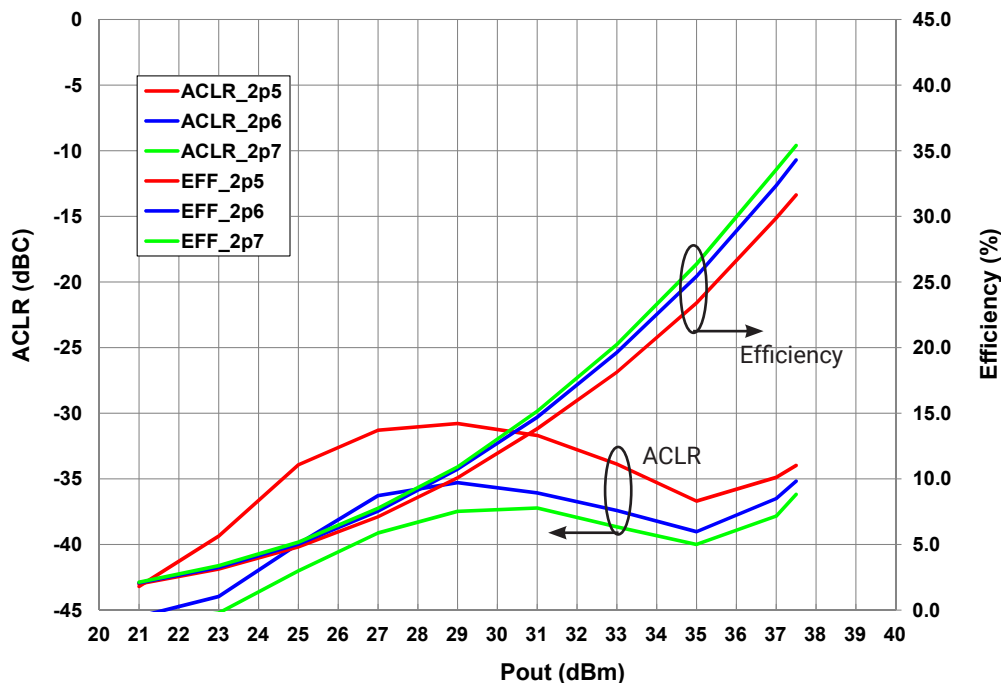
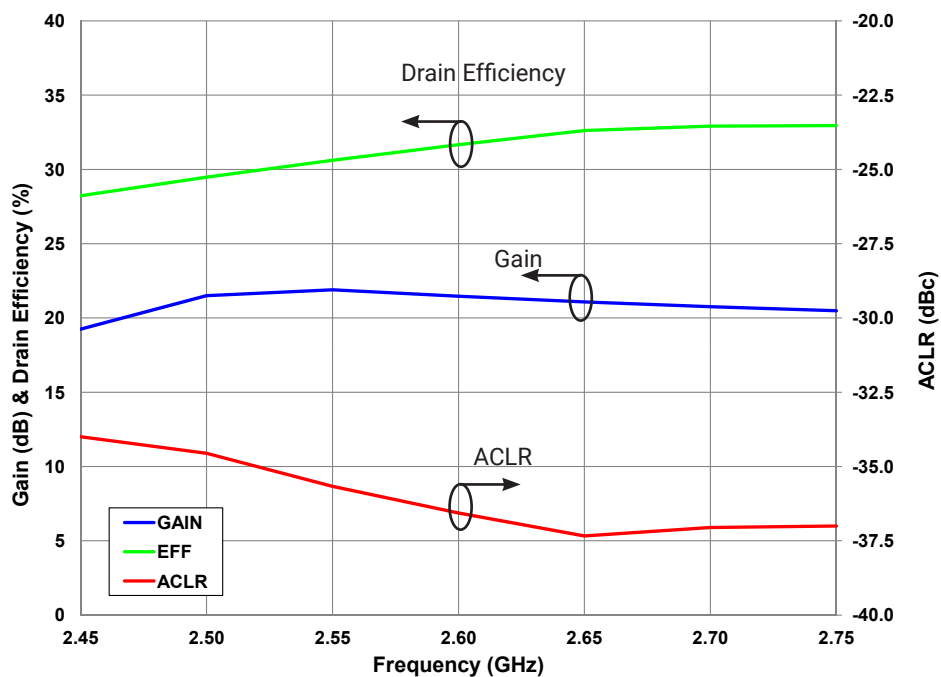


Figure 2. - Typical Drain Efficiency and ACLR vs. Output Power  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$ , 1c WCDMA, PAR = 7.5 dB

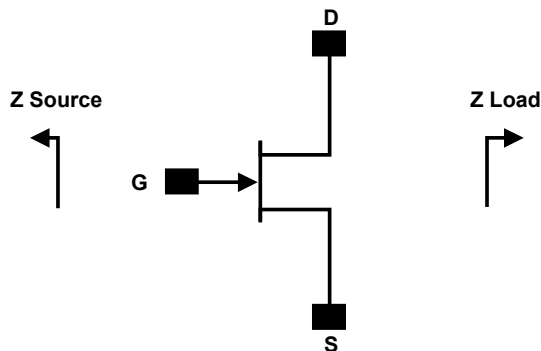


## Typical Performance in Application Circuit CGHV27030S-AMP1

**Figure 3. - Typical Gain, Drain Efficiency and ACLR vs Frequency**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$ ,  $P_{AVE} = 5\text{ W}$ , 1c WCDMA, PAR = 7.5 dB



## Source and Load Impedances for Application Circuit CGHV27030S-AMP1



| Frequency (MHz) | Z Source   | Z Load       |
|-----------------|------------|--------------|
| 2500            | 2.2 - j0.7 | 10.9 + j15.7 |
| 2600            | 2.8 - j1.1 | 11.5 + j16.7 |
| 2700            | 2.5 - j1.7 | 12.1 + j17.7 |

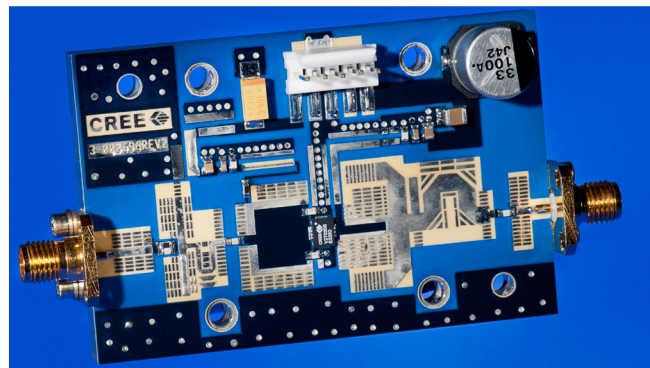
Note<sup>1</sup>:  $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$  in the DFN package.

Note<sup>2</sup>: Impedances are extracted from the CGHV27030S-AMP1 application circuit and are not source and load pull data derived from the transistor.

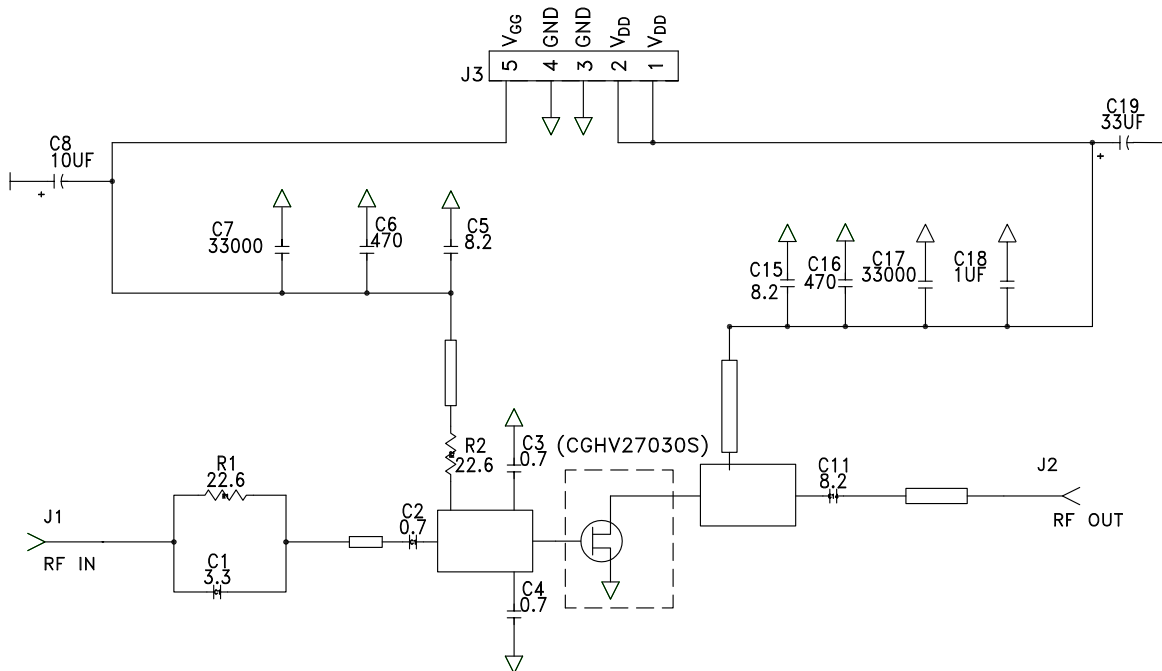
## CGHV27030S-AMP1 Bill of Materials

| Designator   | Description                                             | Qty |
|--------------|---------------------------------------------------------|-----|
| R1, R2       | RES, 22.6, OHM, +/-1%, 1/16W, 0603                      | 2   |
| C1           | CAP, 3.3 pF, ±0.1 pF, 0603, ATC                         | 1   |
| C2, C3, C4   | CAP, 0.7 pF, ±0.05 pF, 0603, ATC                        | 3   |
| C5, C11, C15 | CAP, 8.2 pF, ±0.25 pF, 0603, ATC                        | 3   |
| C6, C16      | CAP, 470 pF, 5%, 100 V, 0603                            | 2   |
| C7, C17      | CAP, 33000 pF, 0805, 100 V, 0603, X7R                   | 2   |
| C18          | CAP, 1.0 uF, 100 V, 10%, X7R, 1210                      | 1   |
| C8           | CAP, 10 uF 16 V TANTALUM                                | 1   |
| C19          | CAP, 33 uF, 20%, G CASE                                 | 1   |
| J1, J2       | CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST | 2   |
| J3           | HEADER RT>PLZ .1CEN LK 5 POS                            | 1   |
| PCB          | PCB, ROGERS 4350, ER 3.66                               | 1   |
| Q1           | CGHV27030S, QFN                                         | 1   |

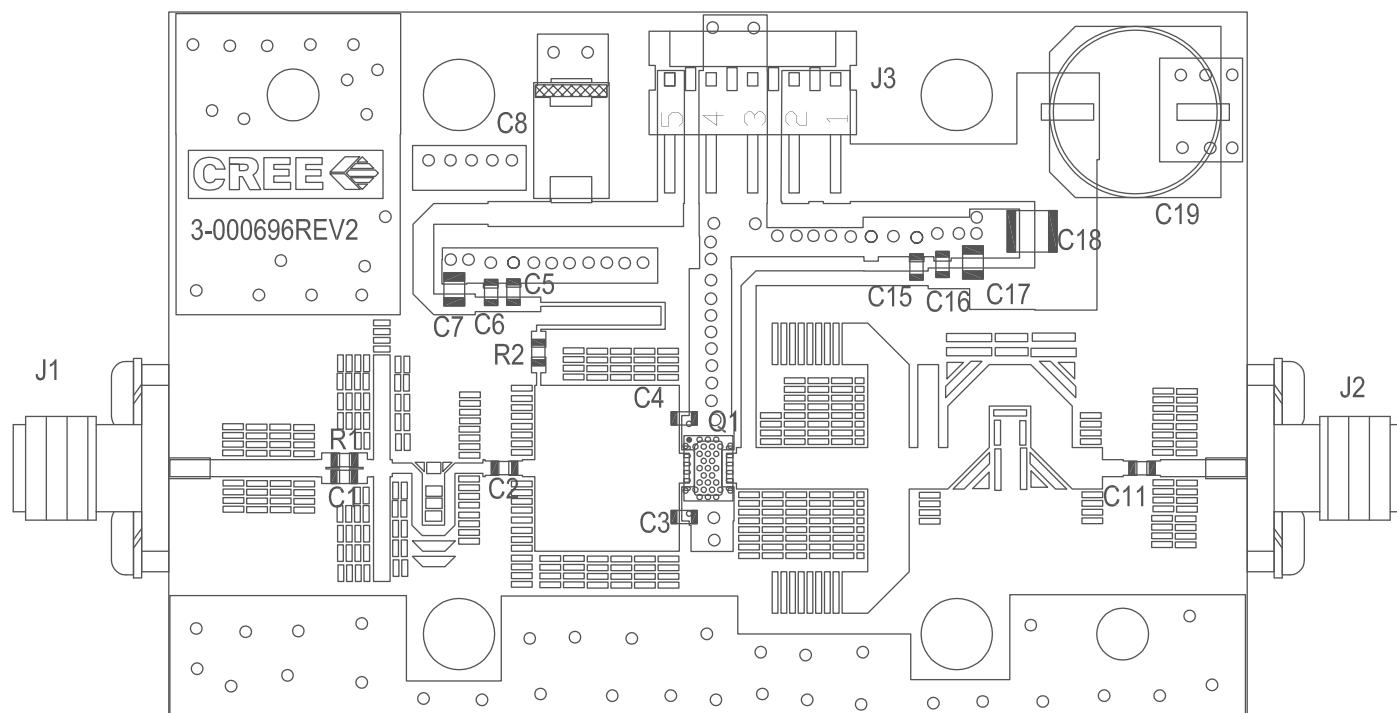
## CGHV27030S -AMP1 Application Circuit



## CGHV27030S-AMP1 Application Circuit Schematic, 50 V



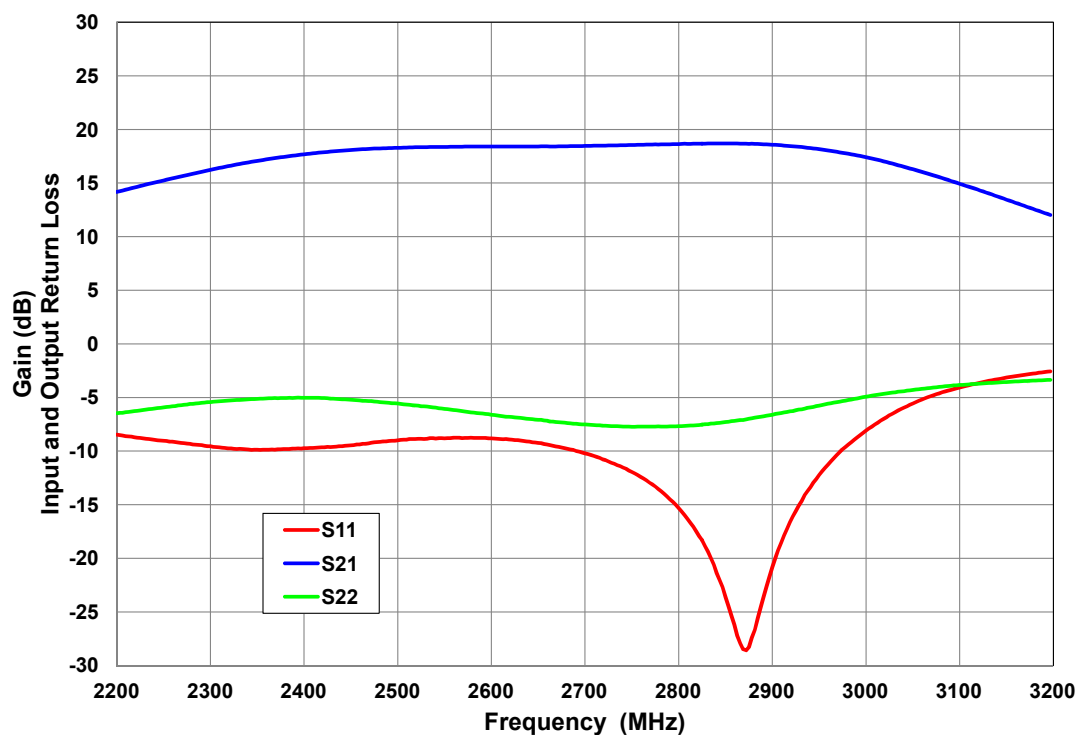
## CGHV27030S-AMP1 Application Circuit Outline, 50 V



## Electrical Characteristics When Tested in CGHV27030S-AMP2, 28 V, 2.5 - 2.7 GHz

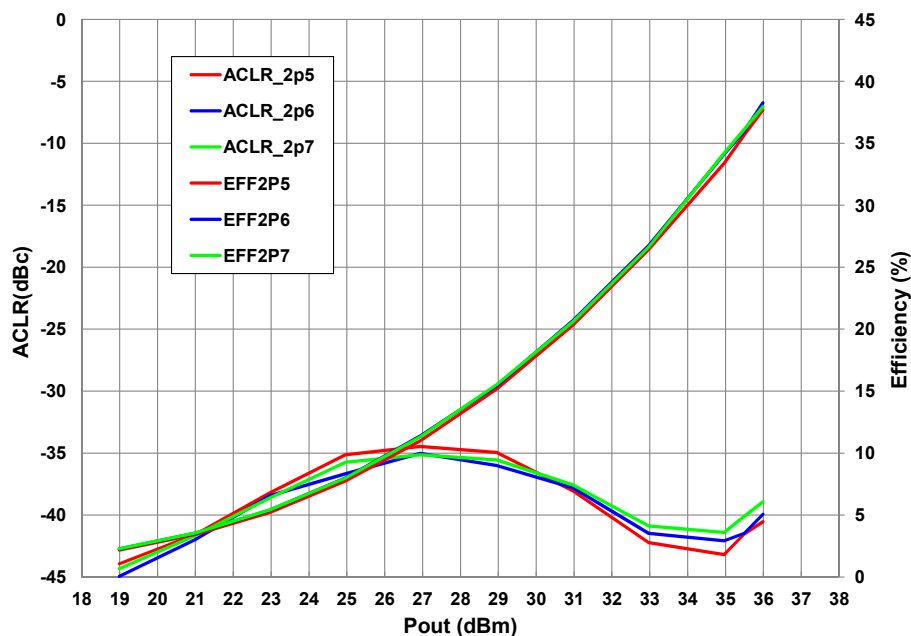
| Parameter                                  | 2.5 GHz | 2.6 GHz | 2.7 GHz | Units |
|--------------------------------------------|---------|---------|---------|-------|
| Small Signal Gain                          | 15.5    | 15.7    | 16.0    | dB    |
| Adjacent Channel Power @ $P_{OUT} = 3.2$ W | -42.0   | -41.7   | -41.2   | dBc   |
| Drain Efficiency @ $P_{OUT} = 3.2$ W       | 33.5    | 34.2    | 34.1    | %     |
| Input Return Loss                          | -9.0    | -8.8    | -10.2   | dB    |

Figure 4. - Small Signal Gain and Return Losses vs Frequency  
 $V_{DD} = 28$  V,  $I_{DQ} = 0.13$  A

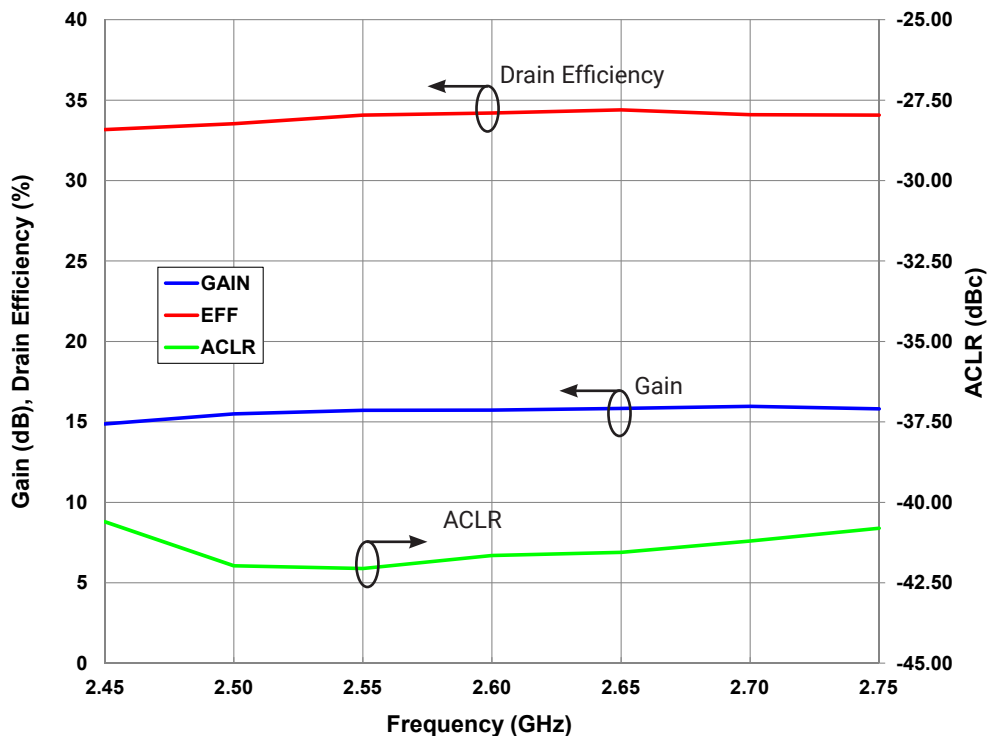


## Typical Performance in Application Circuit CGHV27030S-AMP2

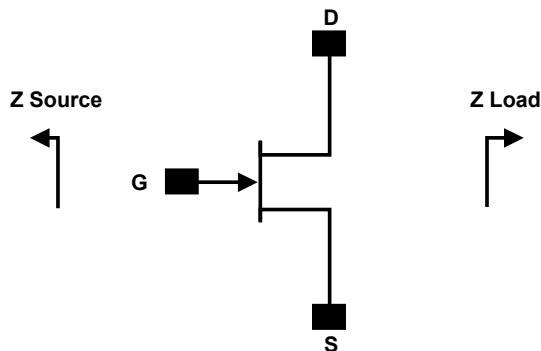
**Figure 5. - Typical Drain Efficiency and ACLR vs. Output Power**  
 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$ , 1c WCDMA, PAR = 7.5 dB



**Figure 6. - Typical Gain, Drain Efficiency and ACLR vs Frequency**  
 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$ ,  $P_{AVE} = 3.2\text{ W}$ , 1c WCDMA, PAR = 7.5 dB



## Source and Load Impedances for Application Circuit CGHV27030S-AMP2



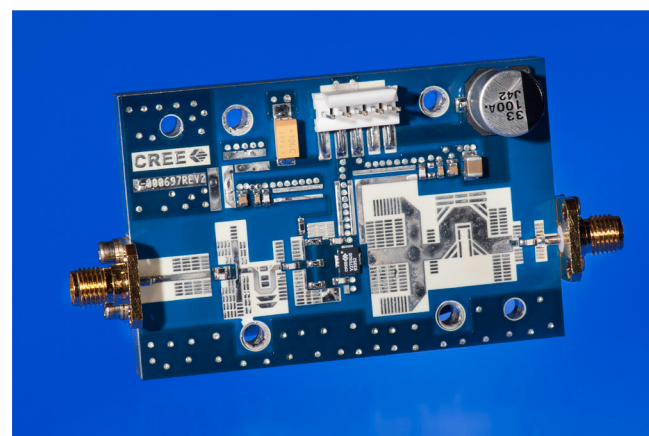
| Frequency (MHz) | Z Source   | Z Load      |
|-----------------|------------|-------------|
| 2500            | 2.9 - j2.7 | 14.5 + j7.4 |
| 2600            | 3.1 - j2.9 | 13.8 + j7.3 |
| 2700            | 2.7 - j3.1 | 12.9+j7.6   |

Note<sup>1</sup>:  $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$  in the DFN package.  
Note<sup>2</sup>: Impedances are extracted from the CGHV27030S-AMP2 application circuit and are not source and load pull data derived from the transistor

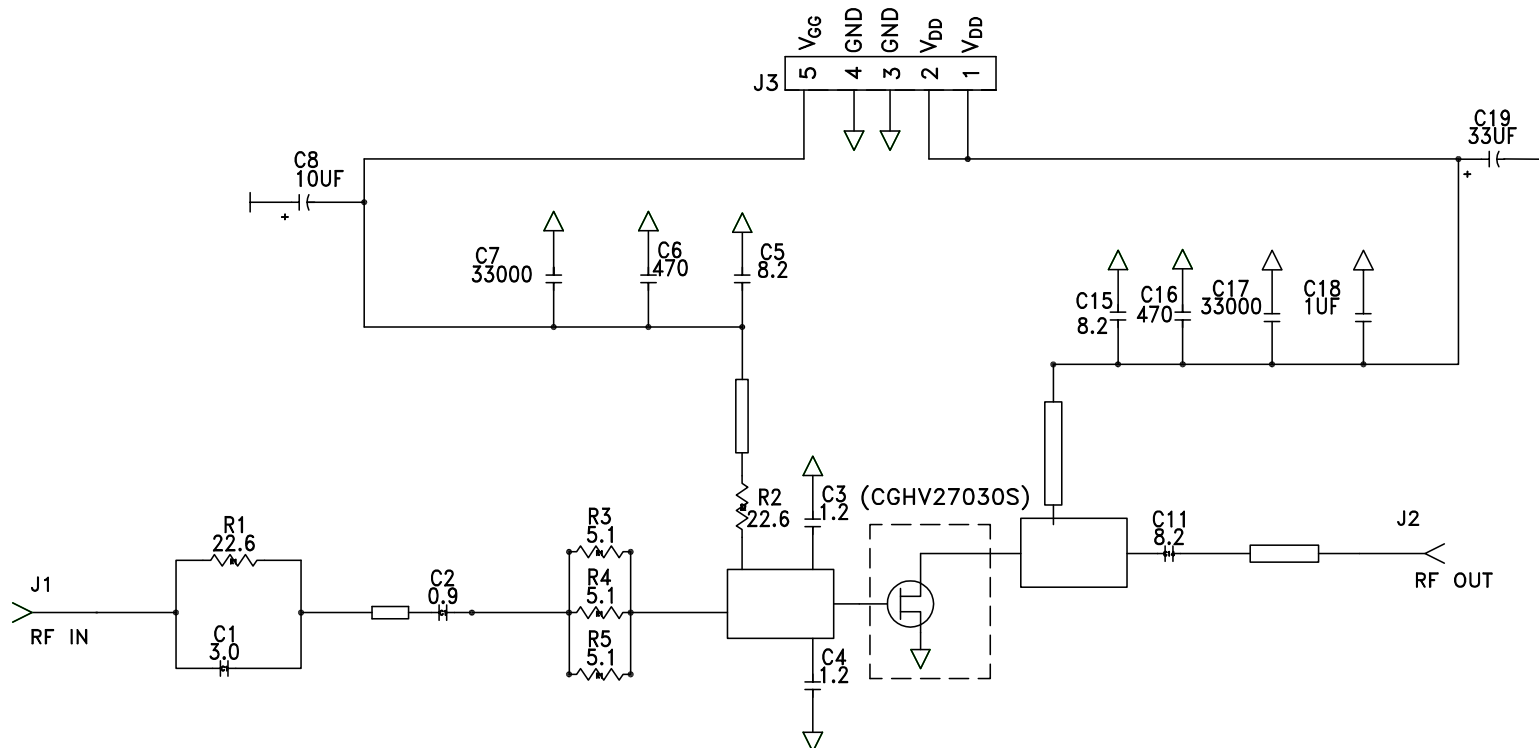
## CGHV27030S-AMP2 Bill of Materials

| Designator   | Description                           | Qty |
|--------------|---------------------------------------|-----|
| R1, R2       | RES, 22.6, OHM, +/-1%, 1/16W, 0603    | 2   |
| C1           | CAP, 3.0 pF, ±0.1 pF, 0603, ATC       | 1   |
| C2           | CAP, 0.9 pF, ±0.05 pF, 0603, ATC      | 3   |
| R3,R4,R5     | RES, 1/16W, 0603, 1%, 5.1% OHMS       | 3   |
| C3,C4        | CAP, 1.2 pF, +/-0.1 pF, 0603, ATC     | 2   |
| C5, C11, C15 | CAP, 8.2 pF, ±0.25 pF, 0603, ATC      | 3   |
| C6, C16      | CAP, 470 pF, 5%, 100 V, 0603          | 2   |
| C7, C17      | CAP, 33000 pF, 0805, 100 V, 0603, X7R | 2   |
| C18          | CAP, 1.0 UF, 100 V, 10%, X7R, 1210    | 1   |
| C8           | CAP, 10 UF 16 V TANTALUM              | 1   |
| C19          | CAP, 33 UF, 20%, G CASE               | 1   |
| J1, J2       | CONN, SMA, PANEL MOUNT JACK           | 2   |
| J3           | HEADER RT>PLZ .1CEN LK 5 POS          | 1   |
| PCB          | PCB, ROGERS 4350, ER 3.66             | 1   |
| Q1           | CGHV27030S, QFN                       | 1   |

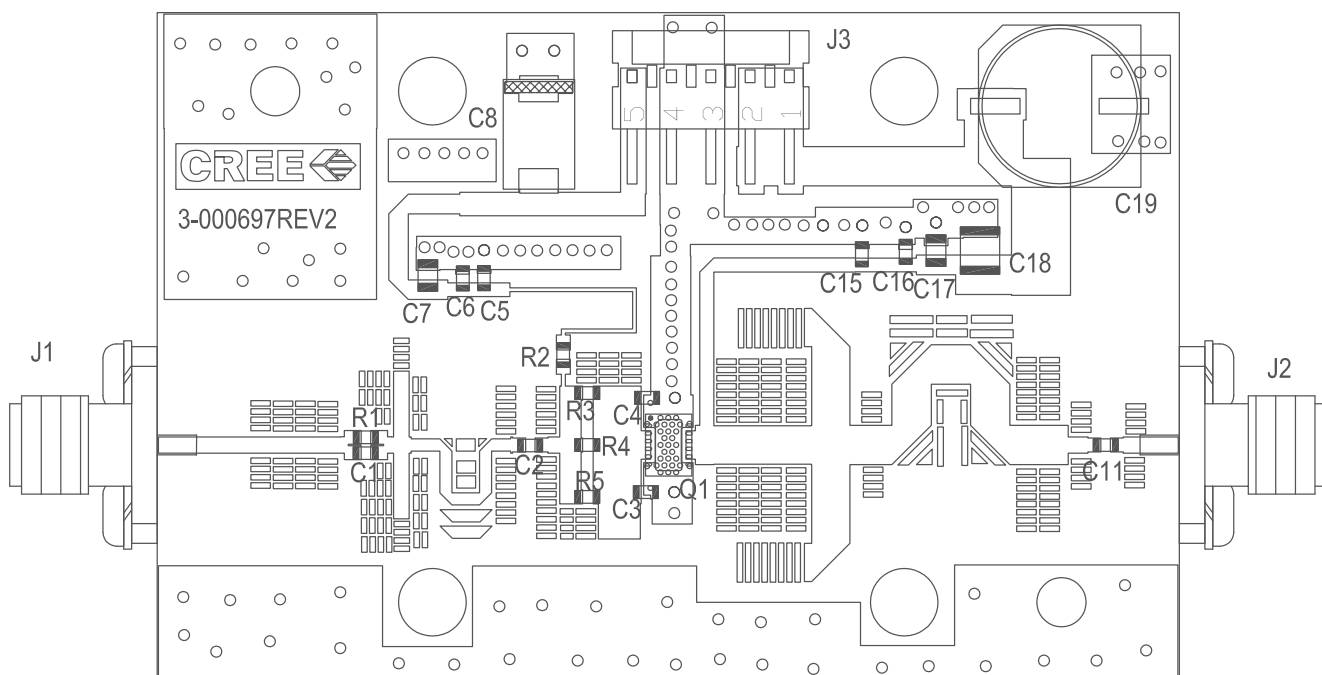
## CGHV27030S-AMP2 Application Circuit



## CGHV27030S-AMP2 Application Circuit Schematic, 28 V



## CGHV27030S-AMP2 Application Circuit Outline, 28 V

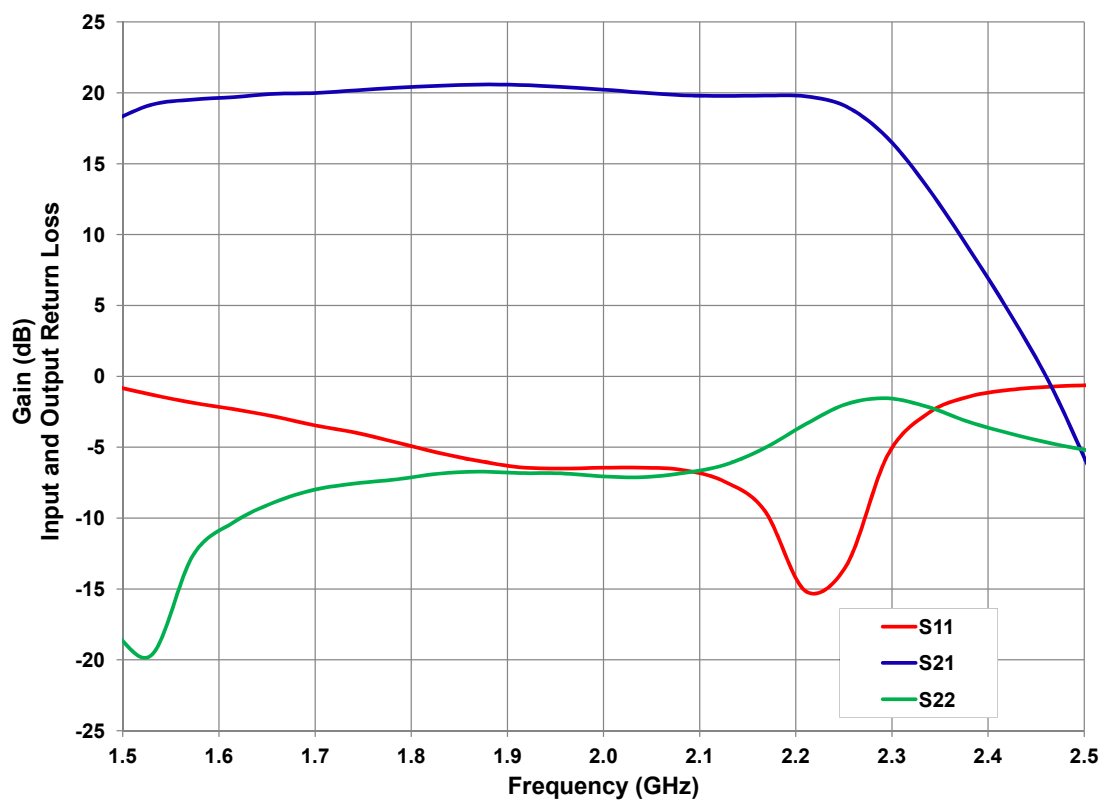


## Electrical Characteristics When Tested in CGHV27030S-AMP3, 28 V, 1.8 - 2.2 GHz

| Parameter                                  | 1.8 GHz | 2.0 GHz | 2.2 GHz | Units |
|--------------------------------------------|---------|---------|---------|-------|
| Small Signal Gain                          | 19      | 19      | 18      | dB    |
| Adjacent Channel Power @ $P_{OUT} = 3.2$ W | -37     | -38     | -39     | dBc   |
| Drain Efficiency @ $P_{OUT} = 3.2$ W       | 35      | 35      | 33      | %     |
| Input Return Loss                          | 5       | 6       | 7       | dB    |

Figure 7. - Small Signal Gain and Return Losses vs Frequency

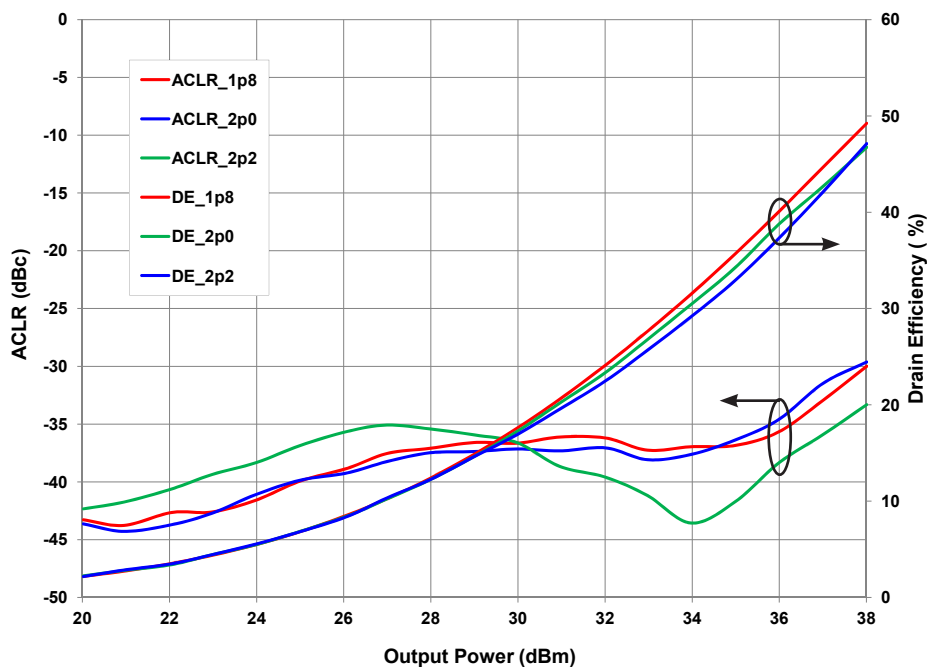
$V_{DD} = 28$  V,  $I_{DQ} = 0.13$  A



## Typical Performance in Application Circuit CGHV27030S-AMP3

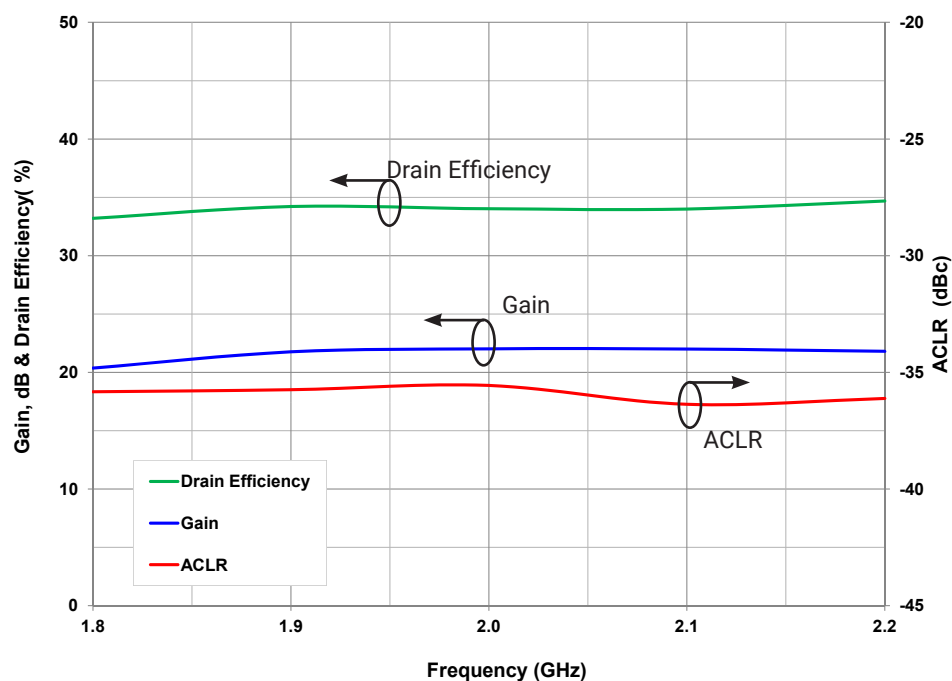
**Figure 8. - Typical Drain Efficiency and ACLR vs. Output Power**

$V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$ , 1c WCDMA, PAR = 7.5 dB

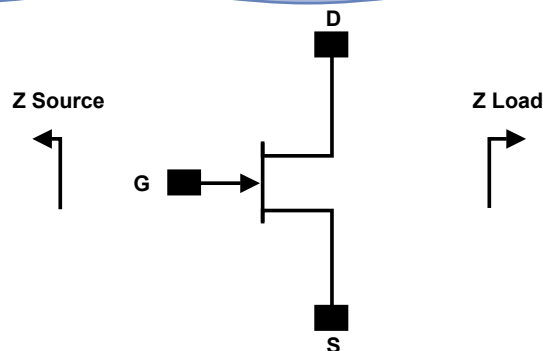


**Figure 9. - Typical Gain, Drain Efficiency and ACLR vs Frequency**

$V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$ ,  $P_{AVE} = 3.2\text{ W}$ , 1c WCDMA, PAR = 7.5 dB



## Source and Load Impedances for Application Circuit CGHV27030S-AMP3



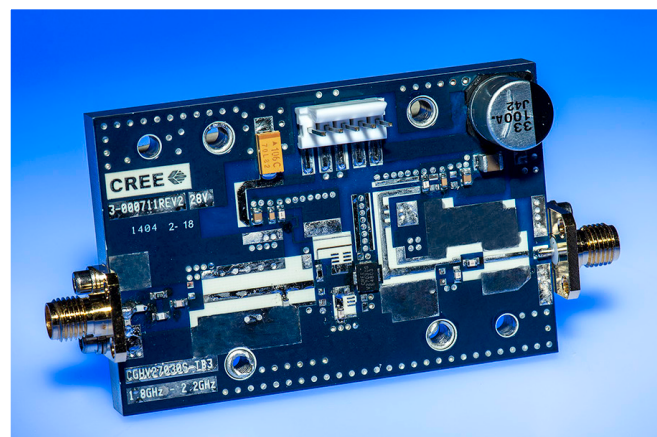
| Frequency (MHz) | Z Source    | Z Load      |
|-----------------|-------------|-------------|
| 1800            | 6.16 - j3.5 | 21.9 + j6.5 |
| 2000            | 6.8 - j1.7  | 21 + j8.4   |
| 2200            | 5.5 - j2.0  | 20.8 + j11  |

Note<sup>1</sup>:  $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$  in the DFN package.  
 Note<sup>2</sup>: Impedances are extracted from the CGHV27030S-AMP3 application circuit and are not source and load pull data derived from the transistor

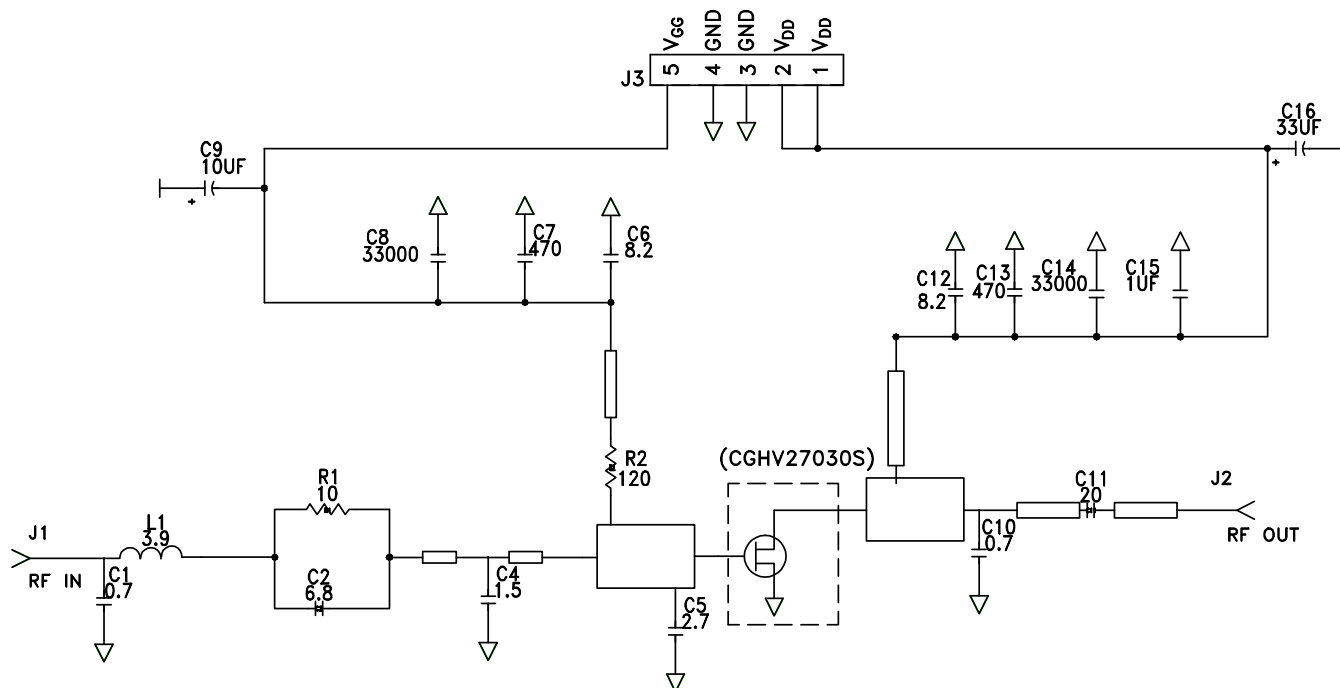
## CGHV27030S-AMP3 Bill of Materials

| Designator | Description                                             | Qty |
|------------|---------------------------------------------------------|-----|
| R1         | RES, 10, OHM, +/-1%, 1/16W, 0603                        | 1   |
| R2         | RES, 120, OHM, +/-1%, 1/16W, 0603                       | 1   |
| L1         | IND, 3.9 nH, +/-5%, 0603, JOHANSON                      | 1   |
| C1         | CAP, 0.7 pF, +/-0.1 pF, 0603, ATC                       | 1   |
| C2         | CAP, 6.8 pF, +/-5%, 0603, ATC                           | 1   |
| C3         | CAP, 47pF, +/-0.1 pF, 0603, ATC                         | 1   |
| C4         | CAP, 1.5 pF, +/-0.1 pF, 0603, ATC                       | 1   |
| C5         | CAP, 2.7 pF, +/-0.1 pF, 0603, ATC                       | 1   |
| C6, C12    | CAP, 8.2 pF, +/-0.25 pF, 0603, ATC                      | 2   |
| C7, C13    | CAP, 470 pF, 5%, 100 V, 0603                            | 2   |
| C8, C14    | CAP, 33000 pF, 0805, X7R                                | 2   |
| C9         | CAP 10 UF 16 V TANTALUM                                 | 1   |
| C10        | CAP, 0.7 pF, +/-0.05 pF, 0603, ATC                      | 1   |
| C11        | CAP, 20 pF, +/-5%, 0603, ATC                            | 1   |
| C15        | CAP, 1.0 UF, 100V, 10%, X7R, 1210                       | 1   |
| C16        | CAP, 33 UF, 20%, G CASE                                 | 1   |
| J1, J2     | CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST | 2   |
|            | PCB, RO4350, 0.020" THK                                 | 1   |
|            | BASEPLATE, CGH35015, 2.60 X 1.7                         | 1   |
| J3         | HEADER RT>PLZ .1CEN LK 5POS                             | 1   |
|            | 2-56 SOC HD SCREW 1/4 SS                                | 4   |
|            | #2 SPLIT LOCKWASHER SS                                  | 4   |
| Q1         | CGHV27030S, QFN                                         | 1   |

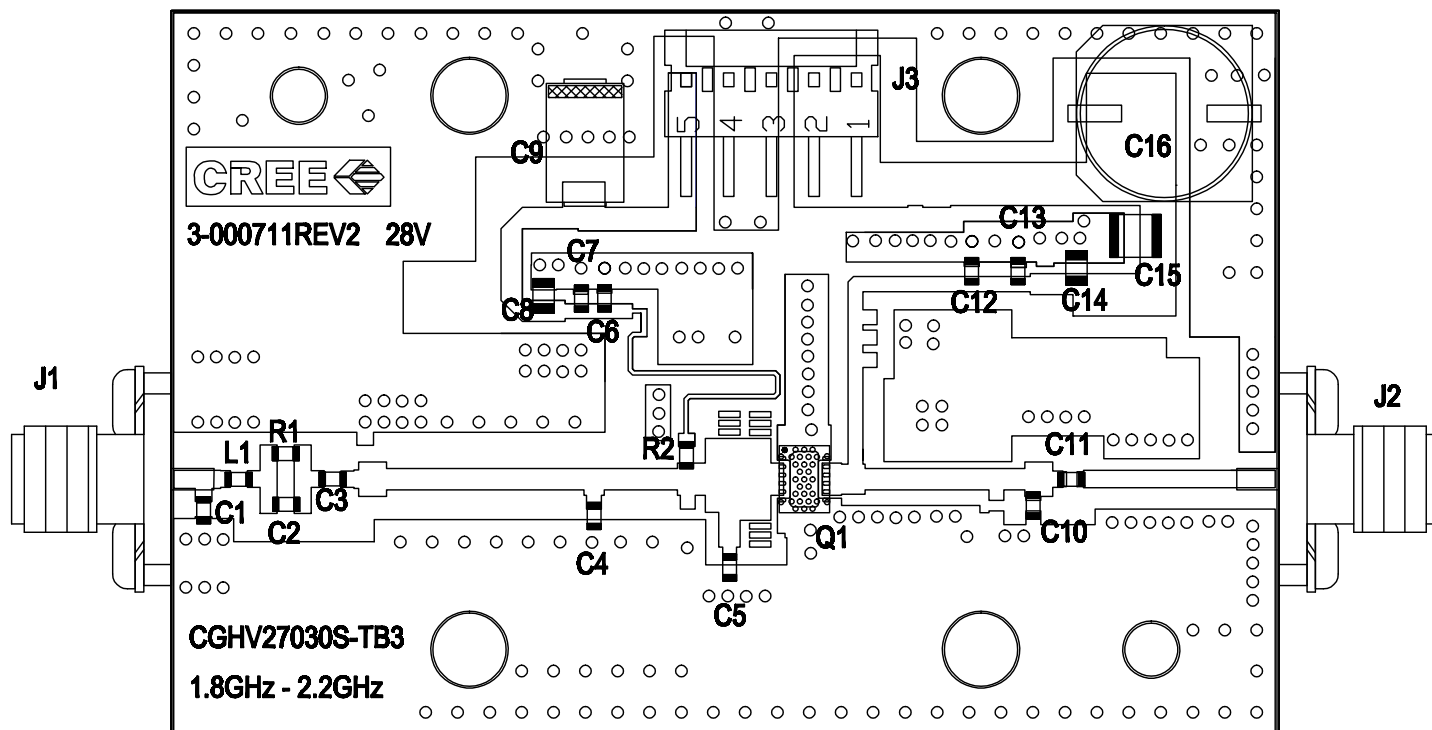
## CGHV27030S-AMP3 Application Circuit



## CGHV27030S-AMP3 Application Circuit Schematic, 28 V



## CGHV27030S-AMP3 Application Circuit Outline, 28 V

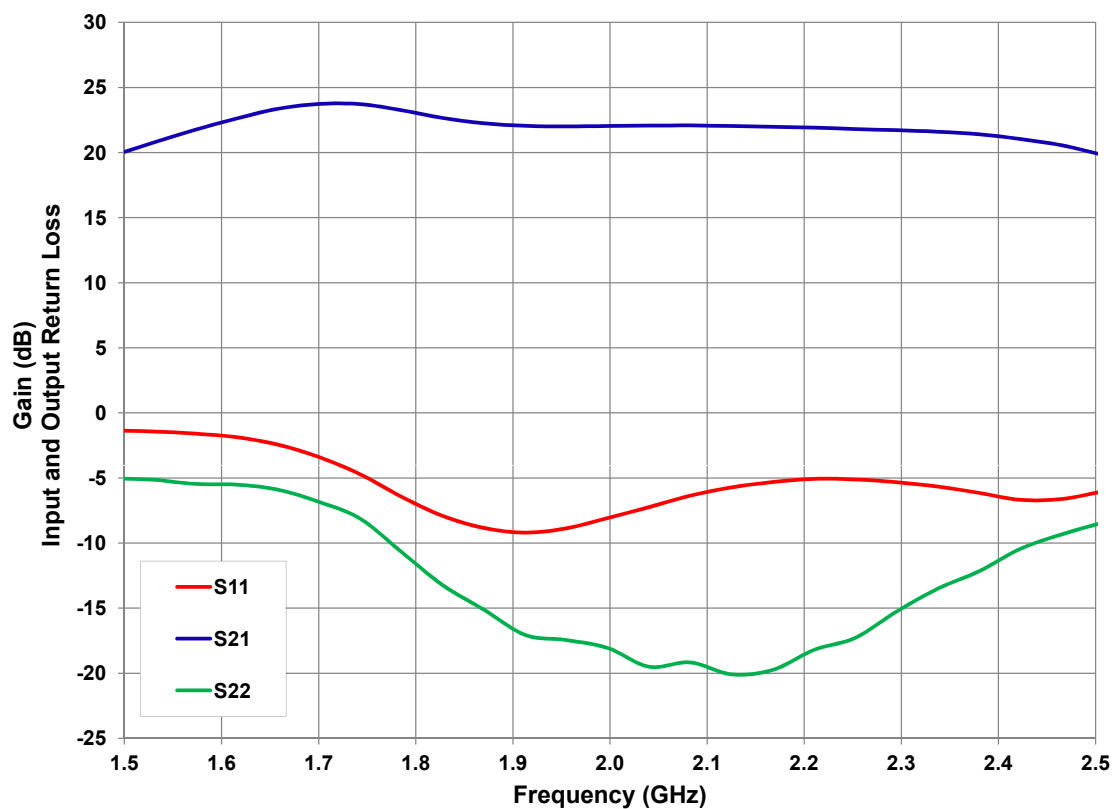


## Electrical Characteristics When Tested in CGHV27030S-AMP4, 50 V, 1.8 - 2.2 GHz

| Parameter                                       | 1.8 GHz | 2.0 GHz | 2.2 GHz | Units |
|-------------------------------------------------|---------|---------|---------|-------|
| Small Signal Gain                               | 22      | 22      | 21      | dB    |
| Adjacent Channel Power @ $P_{OUT} = 5\text{ W}$ | -39     | -38     | -37     | dBc   |
| Drain Efficiency @ $P_{OUT} = 5\text{ W}$       | 31      | 32      | 33      | %     |
| Input Return Loss                               | 5       | 7       | 6       | dB    |

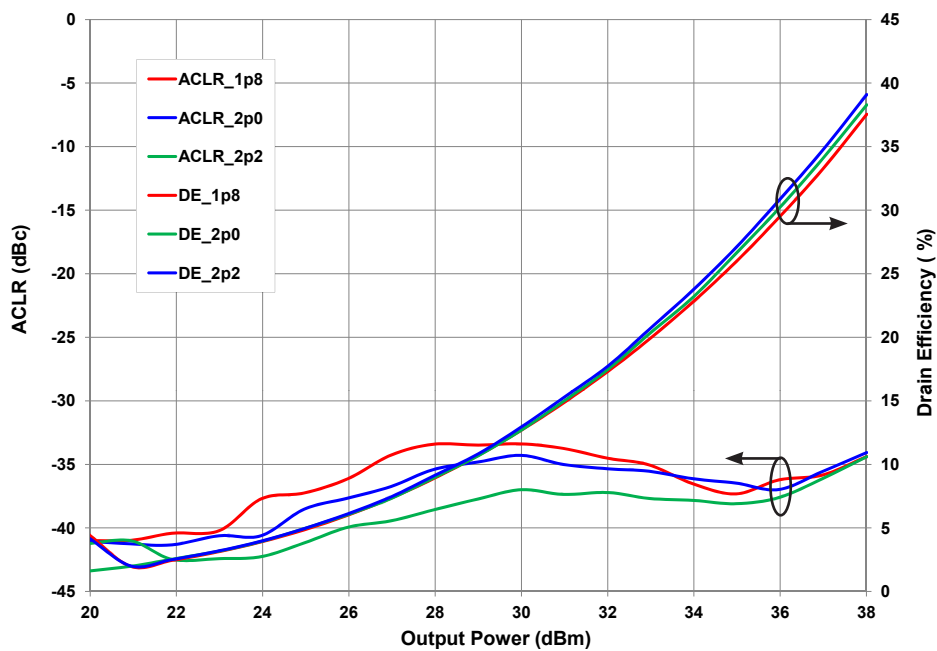
**Figure 10. - Small Signal Gain and Return Losses vs Frequency**

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$

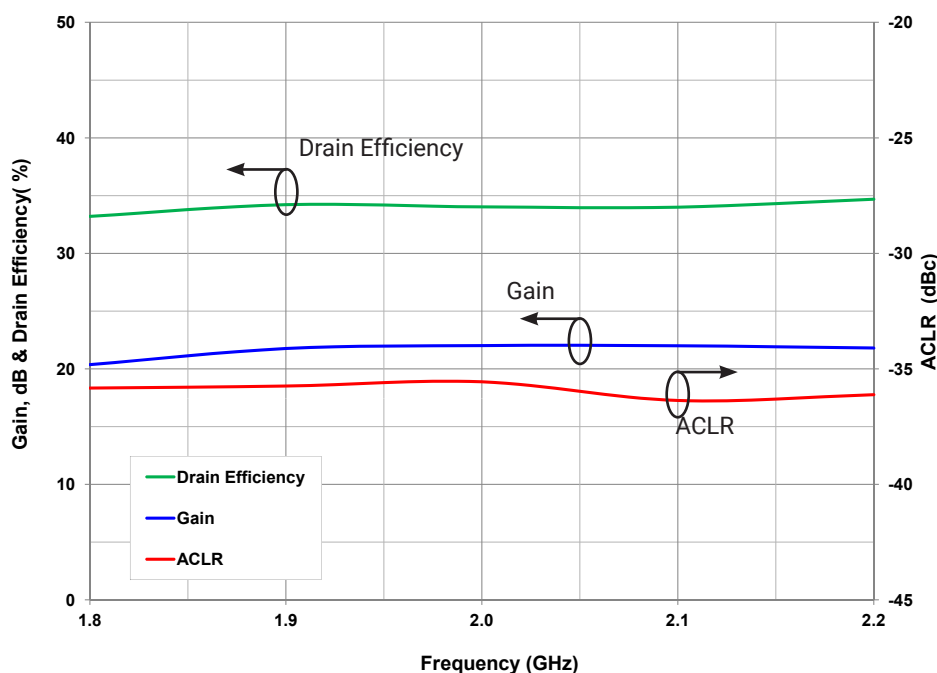


## Typical Performance in Application Circuit CGHV27030S-AMP4

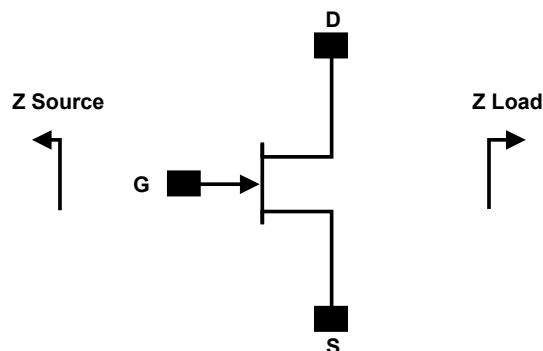
**Figure 11. - Typical Drain Efficiency and ACLR vs. Output Power**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$ , 1c WCDMA, PAR = 7.5 dB



**Figure 12. - Typical Gain, Drain Efficiency and ACLR vs Frequency**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$ ,  $P_{AVE} = 5\text{ W}$ , 1c WCDMA, PAR = 7.5 dB



## Source and Load Impedances for Application Circuit CGHV27030S-AMP4



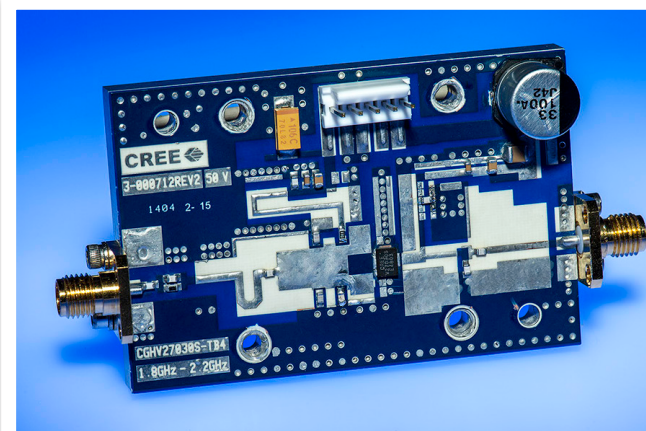
| Frequency (MHz) | Z Source   | Z Load       |
|-----------------|------------|--------------|
| 1800            | 5.0 - j3.3 | 20.0 + j18.6 |
| 2000            | 6.4 - j3.3 | 17.8 + j19.1 |
| 2200            | 4.0 - j2.7 | 16.2 + j20.8 |

Note<sup>1</sup>:  $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.13\text{ A}$  in the DFN package.  
 Note<sup>2</sup>: Impedances are extracted from the CGHV27030S-AMP4 application circuit and are not source and load pull data derived from the transistor

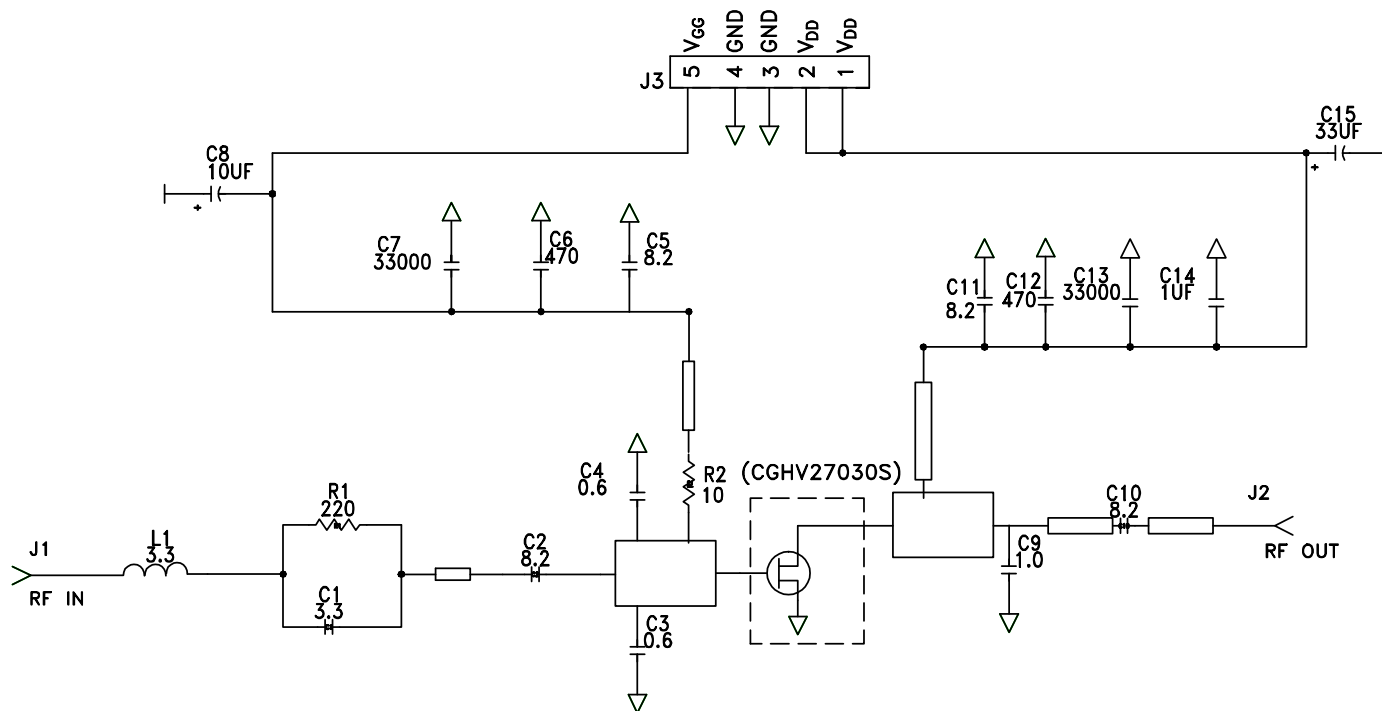
## CGHV27030S-AMP4 Bill of Materials

| Designator       | Description                                             | Qty |
|------------------|---------------------------------------------------------|-----|
| R1               | RES, 220, OHM, +/-1%, 1/16W, 0603                       | 1   |
| R2               | RES, 10, OHM, +/-1%, 1/16W, 0603                        | 1   |
| L1               | IND, 3.3 nH, +/-5%, 0603, JOHANSON                      | 1   |
| C1               | CAP, 3.3 pF, +/-0.1 pF, 0603, ATC                       | 1   |
| C2, C5, C10, C11 | CAP, 8.2 pF, +/-5%, 0603, ATC                           | 1   |
| C3, C4           | CAP, 0.6 pF, +/-0.1 pF, 0603, ATC                       | 2   |
| C6, C12          | CAP, 470 pF, 5%, 100V, 0603, X                          | 2   |
| C7, C13          | CAP, 33000 pF, 0805, 100V, X7R                          | 2   |
| C8               | CAP 10 UF 16 V TANTALUM                                 | 1   |
| C9               | CAP, 1.0 pF, +/-0.1 pF, 0603, ATC                       | 1   |
| C14              | CAP, 1.0 UF, 100V, 10%, X7R, 1210                       | 1   |
| C15              | CAP, 33 UF, 20%, G CASE                                 | 1   |
| J1, J2           | CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST | 2   |
| PCB              | PCB, RO4350, 0.020" THK                                 | 1   |
| J3               | HEADER RT>PLZ .1CEN LK 5POS                             | 1   |
| Q1               | CGHV27030S, QFN                                         | 1   |

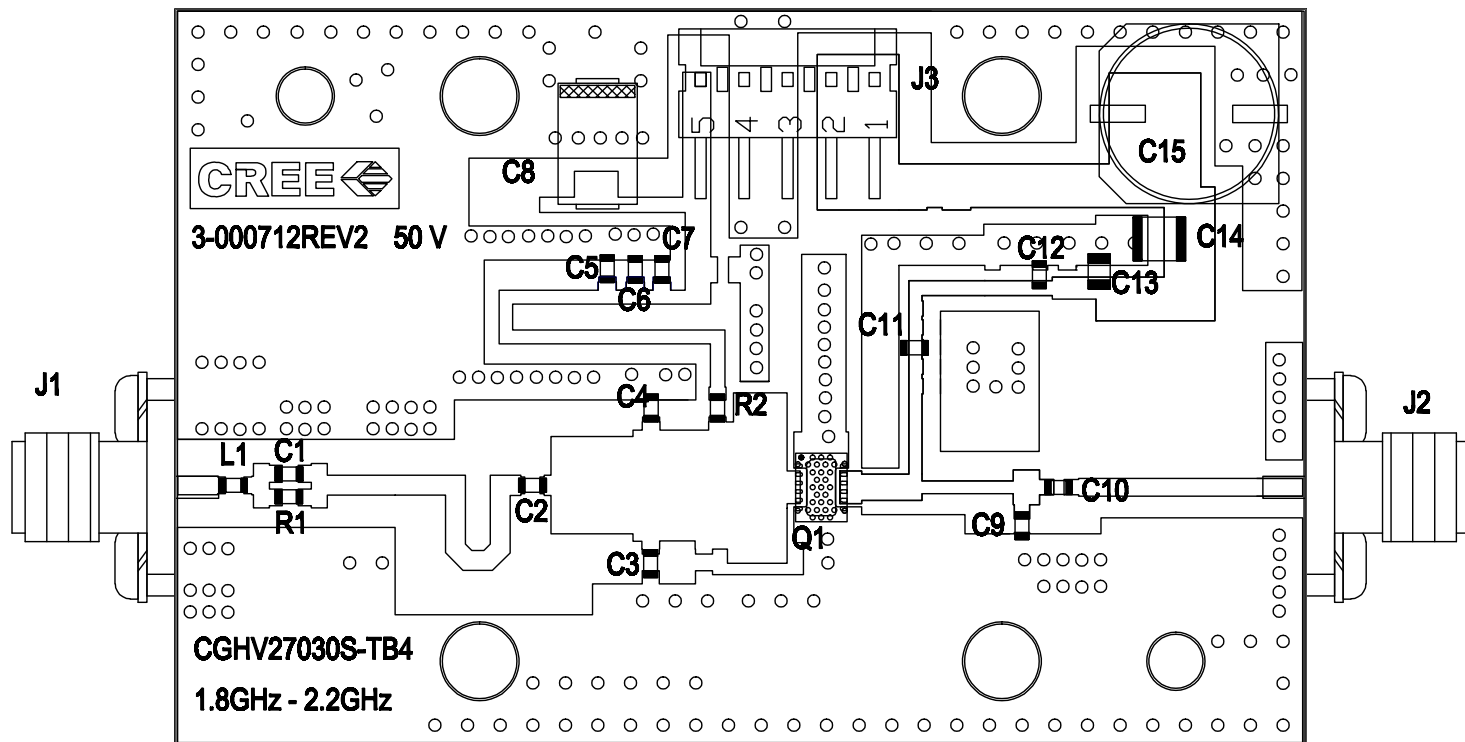
## CGHV27030S-AMP4 Application Circuit



## CGHV27030S-AMP4 Application Circuit Schematic, 50 V



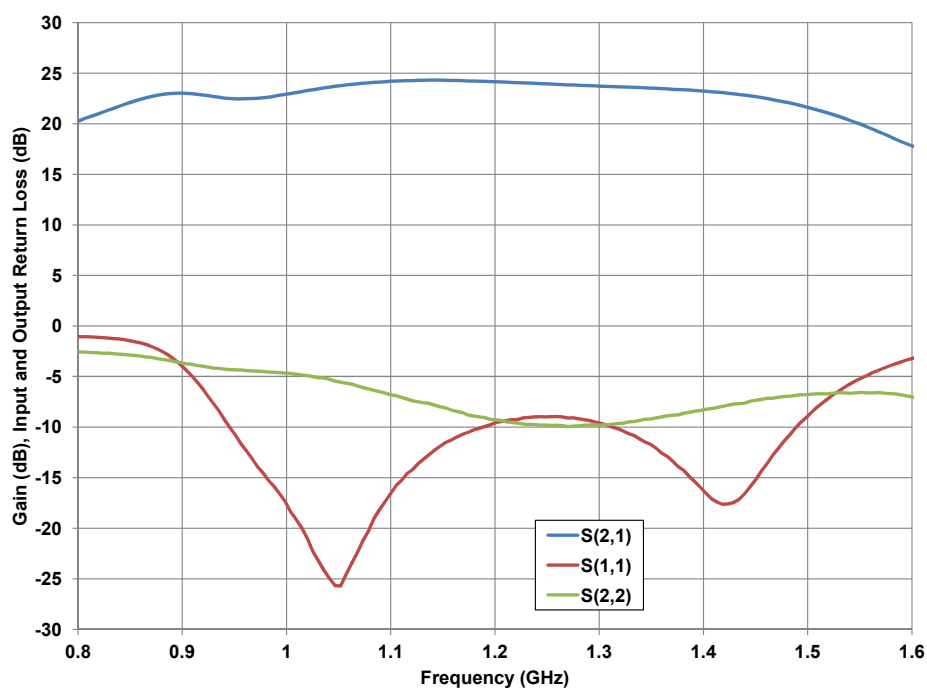
## CGHV27030S-AMP4 Application Circuit Outline, 50 V



## Electrical Characteristics When Tested in CGHV27030S-AMP5, 50 V, 1.2 - 1.4 GHz

| Parameter                            | 1.2 GHz | 1.3 GHz | 1.4 GHz | Units |
|--------------------------------------|---------|---------|---------|-------|
| Output Power @ $P_{IN} = 27$ dBm     | 35.5    | 33.5    | 32.5    | W     |
| Gain @ $P_{IN} = 27$ dBm             | 18.5    | 18.25   | 18.1    | dB    |
| Drain Efficiency @ $P_{IN} = 27$ dBm | 71      | 67      | 65      | %     |

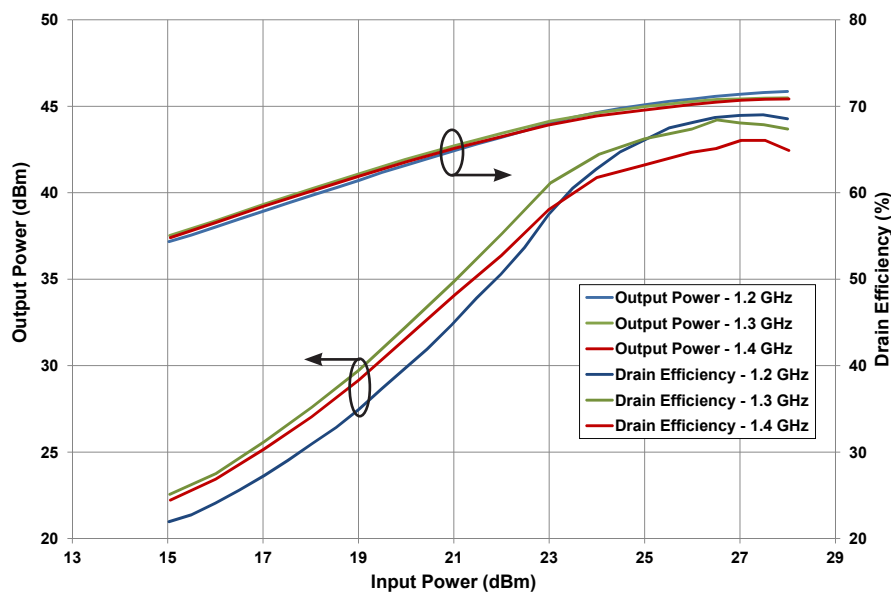
**Figure 13. - Small Signal Gain and Return Losses vs Frequency**  
 $V_{DD} = 50$  V,  $I_{DQ} = 0.125$  A



## Typical Performance in Application Circuit CGHV27030S-AMP5

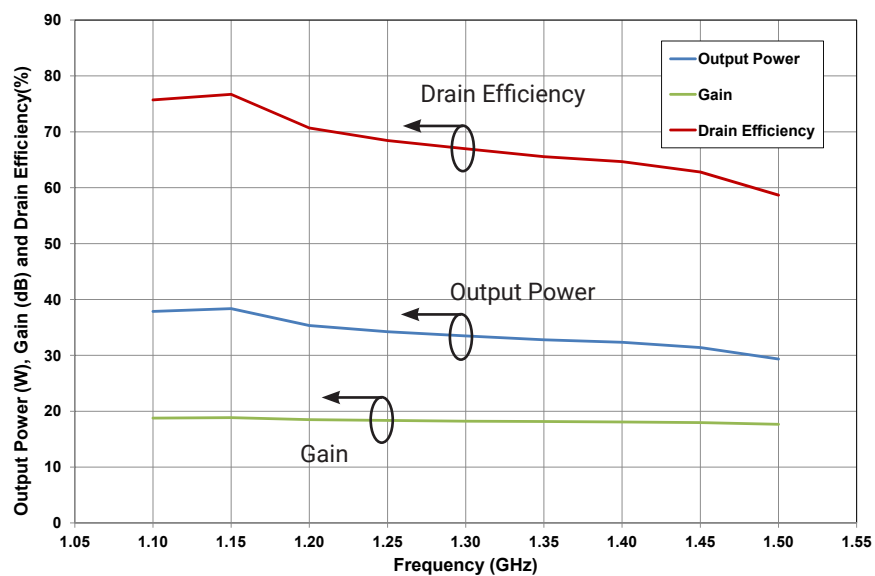
**Figure 14. - Typical Output Power and Drain Efficiency Input Power**

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.125\text{ A}$ , Pulse Width = 100 us, Duty Cycle = 10 %

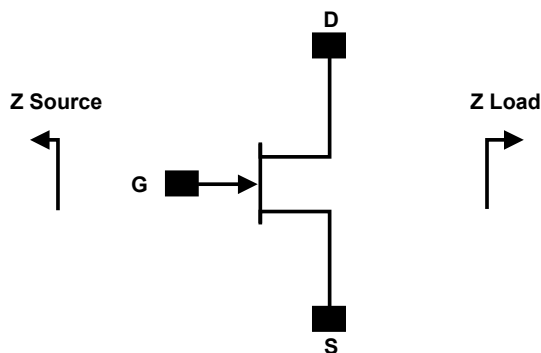


**Figure 15. - Typical Output Power, Gain, and Drain Efficiency vs Frequency**

$V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.125\text{ A}$ ,  $P_{IN} = 27\text{ dBm}$ , Pulse Width = 100 us, Duty Cycle = 10 %



## Source and Load Impedances for Application Circuit CGHV27030S-AMP5



| Frequency (MHz) | Z Source   | Z Load       |
|-----------------|------------|--------------|
| 1200            | 8.6 - j5.4 | 25.4 - j29.2 |
| 1300            | 8.7 - j5.1 | 27.6 - j30.5 |
| 1400            | 7.4 - j5.2 | 30.1 - j31.8 |

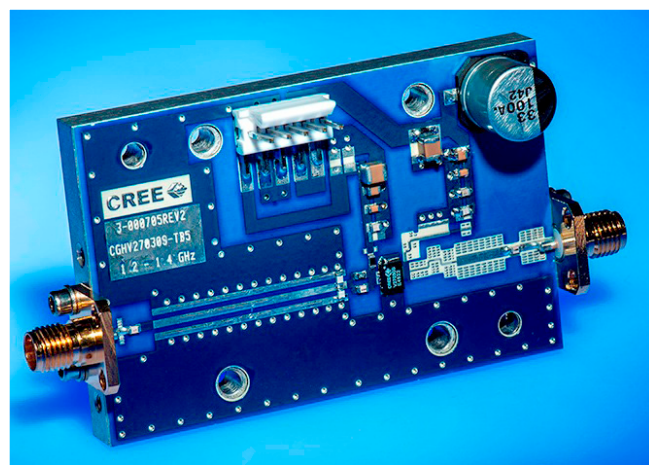
Note<sup>1</sup>:  $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 0.125\text{ A}$  in the DFN package.

Note<sup>2</sup>: Impedances are extracted from the CGHV27030S-AMP5 application circuit and are not source and load pull data derived from the transistor

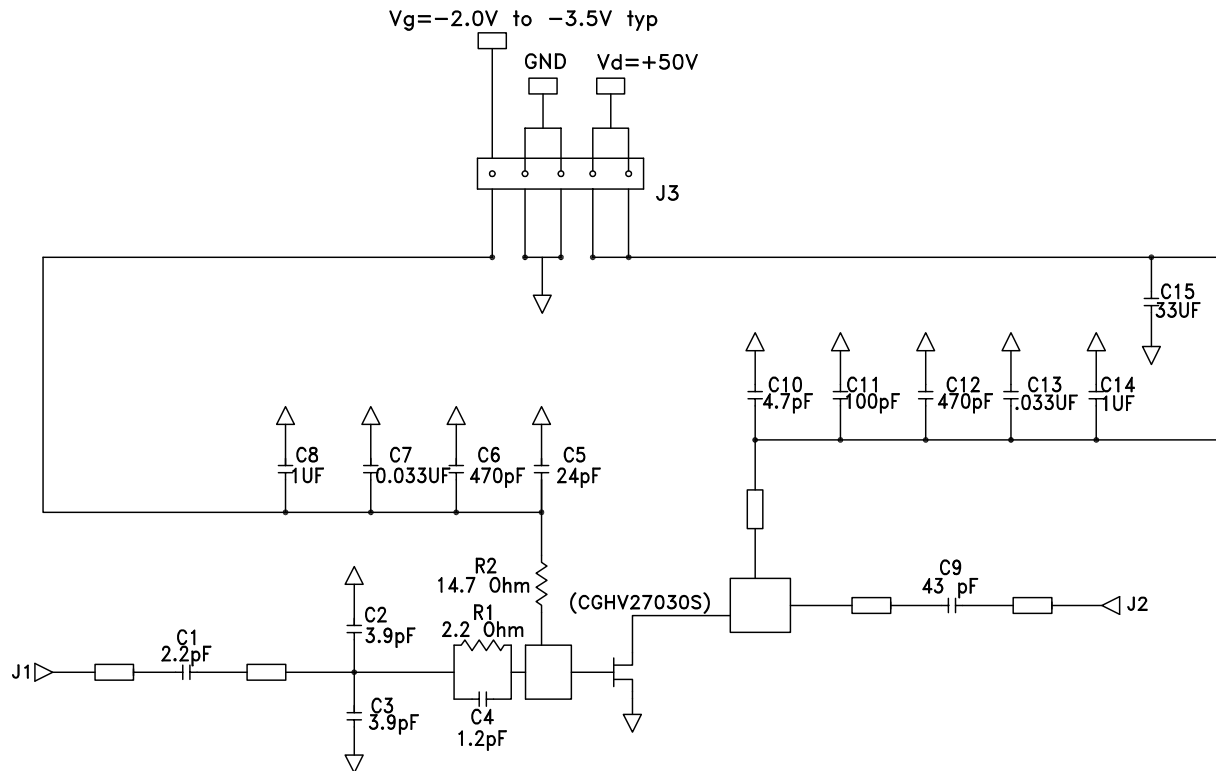
## CGHV27030S-AMP5 Bill of Materials

| Designator | Description                                             | Qty |
|------------|---------------------------------------------------------|-----|
| R1         | RES, 2.2, OHM, 1/10W 5% 0603 SMD                        | 1   |
| R2         | RES, 1/16W, 0603, 1%, 14.7 OHMS                         | 1   |
| C1         | CAP, 2.2 pF, +/-0.1 pF, 0603, ATC                       | 1   |
| C2, C3     | CAP, 3.9 pF, +/-0.1 pF, 0603, ATC                       | 2   |
| C4         | CAP, 1.2 pF, +/-0.1 pF, 0603, ATC                       | 1   |
| C5         | CAP, 24 pF, +/-5%, 0603, ATC                            | 1   |
| C6, C12    | CAP, 470 pF, 5%, 100V, 0603, X                          | 2   |
| C7, C13    | CAP, 33000 pF, 0805, 100V, Z7R                          | 2   |
| C8, C14    | CAP, 1.0 uF, 100V, 10%, X7R, 1210                       | 2   |
| C9         | CAP, 43 pF, +/-5%, 0603, ATC                            | 1   |
| C10        | CAP, 4.7 pF, +/-0.1 pF, 0603, ATC600S                   | 1   |
| C11        | CAP, 100.0 pF, +/-5%, 0603, ATC                         | 1   |
| C15        | CAP, 33 uF, 20%, G CASE                                 |     |
| J1, J2     | CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST | 2   |
| PCB        | PCB, RO4350, L-BAND, 1.7" X 2.6"                        | 1   |
| J3         | HEADER RT>PLZ .1CEN LK 5POS                             | 1   |
| Q1         | CGHV27030S, QFN                                         | 1   |

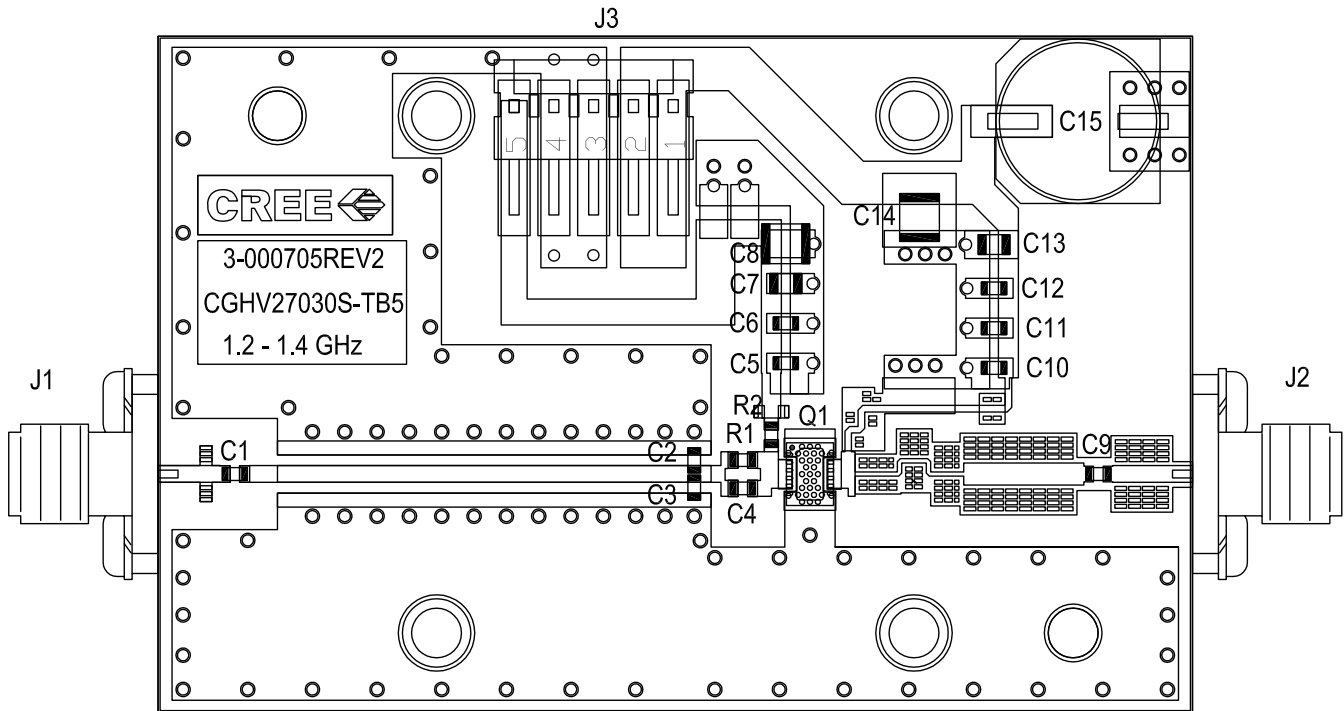
## CGHV27030S-AMP5 Application Circuit



## CGHV27030S-AMP5 Application Circuit Schematic, 50 V

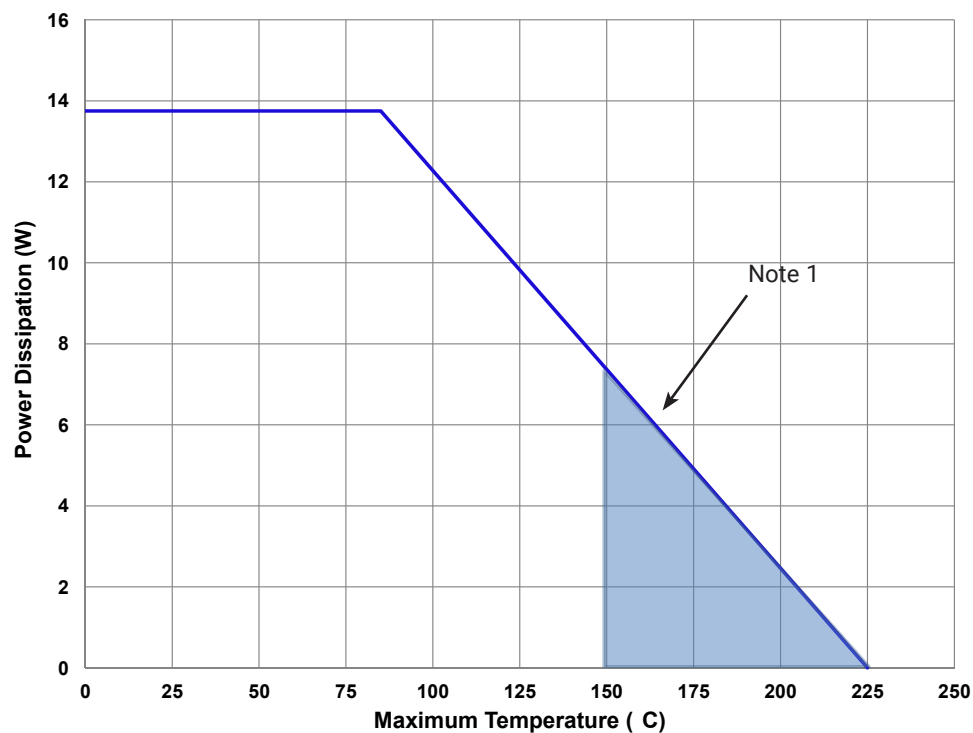


## CGHV27030S-AMP5 Application Circuit Outline, 50 V



## CGHV27030S Power Dissipation De-rating Curve

Figure 16. - CGHV27030S Power Dissipation De-Rating Curve



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

## Electrostatic Discharge (ESD) Classifications

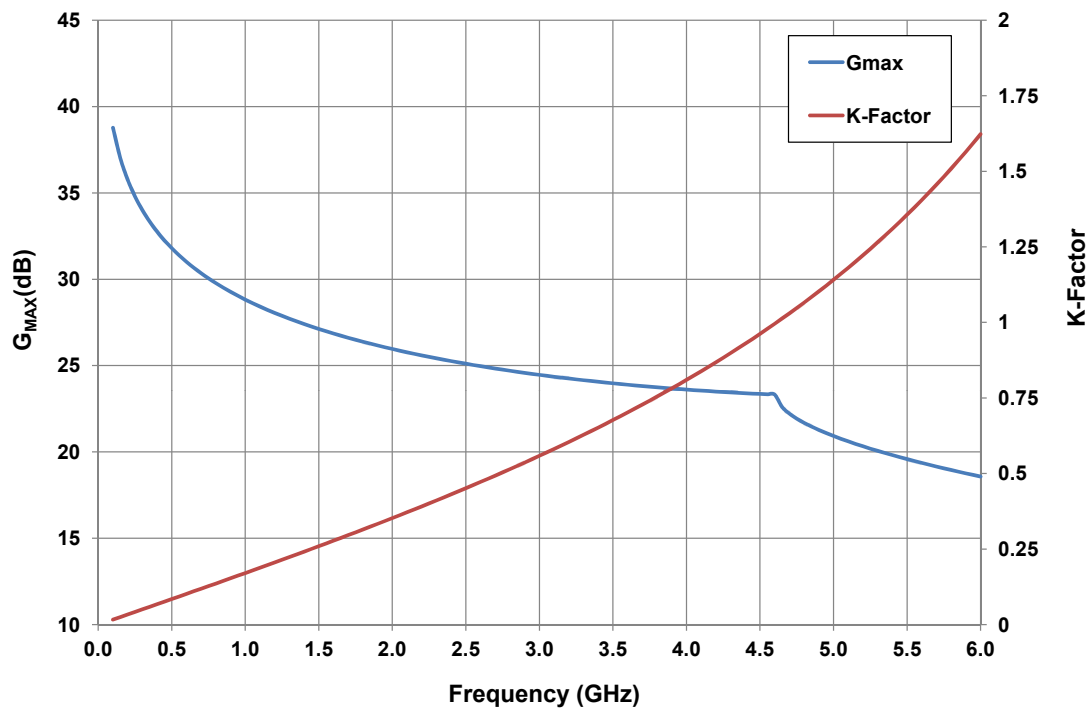
| Parameter           | Symbol | Class              | Test Methodology    |
|---------------------|--------|--------------------|---------------------|
| Human Body Model    | HBM    | 1A (> 250 V)       | JEDEC JESD22 A114-D |
| Charge Device Model | CDM    | 2 (125 V to 250 V) | JEDEC JESD22 C101-C |

## Moisture Sensitivity Level (MSL) Classification

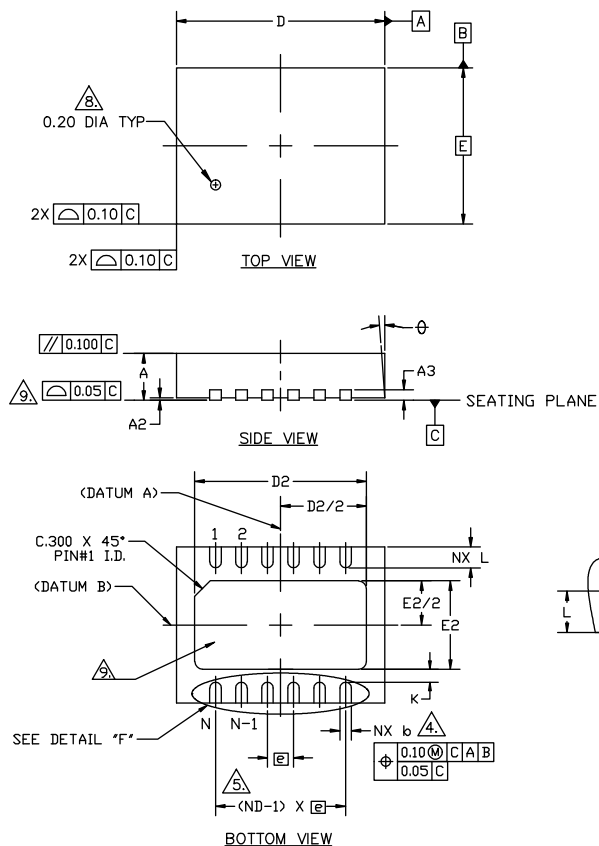
| Parameter                  | Symbol | Level         | Test Methodology   |
|----------------------------|--------|---------------|--------------------|
| Moisture Sensitivity Level | MSL    | 3 (168 hours) | IPC/JEDEC J-STD-20 |

## Typical Performance

**$G_{MAX}$  and K-Factor vs Frequency**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 130\text{ mA}$ ,  $T_{case} = 25^{\circ}\text{C}$

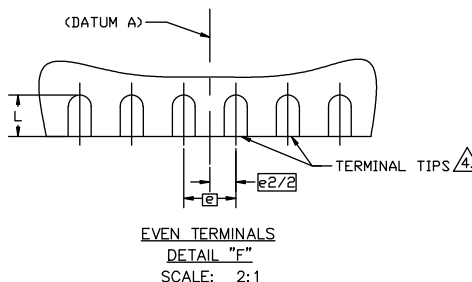


## Product Dimensions CGHV27030S (Package 3 x 4 DFN)



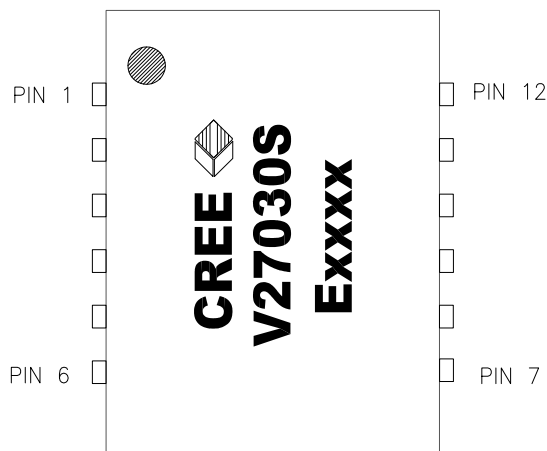
### NOTES :

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M – 1994.
2. ALL DIMENSIONS ARE IN MILLIMETERS,  $\theta$  IS IN DEGREES.
3. N IS THE TOTAL NUMBER OF TERMINALS.
4. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN .15 AND .30mm FROM TERMINAL TIP. IF THE TERMINAL HAS THE OPTIONAL RADIUS ON THE OTHER END OF THE TERMINAL, THE DIMENSION b SHOULD NOT BE MEASURED IN THAT RADIUS AREA.
5. ND REFERS TO THE NUMBER OF TERMINALS ON D SIDE
6. MAXIMUM PACKAGE WARPAGE IS .05 mm.
7. MAXIMUM ALLOWABLE BURRS IS .076 mm IN ALL DIRECTIONS.
8. PIN #1 ID ON TOP WILL BE LASER MARKED.
9. UNILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.



| COMMON DIMENSIONS |            |      |      | N <sub>TER</sub> |
|-------------------|------------|------|------|------------------|
|                   | MIN.       | NOM. | MAX. |                  |
| A                 | 0.80       | 0.85 | 0.90 |                  |
| A1                | 0.00       | 0.02 | 0.05 |                  |
| A3                | 0.203 REF. |      |      |                  |
| $\theta$          | 0          | —    | 12   | 2                |
| D                 | 4.00 BSC   |      |      |                  |
| E                 | 3.00 BSC   |      |      |                  |
| $\square$         | 0.50 BSC   |      |      |                  |
| N                 | 6          |      |      | 3                |
| ND                | 12         |      |      | 3                |
| L                 | 0.35       | 0.40 | 0.45 |                  |
| b                 | 0.17       | 0.22 | 0.27 | 3                |
| D2                | 3.20       | 3.30 | 3.40 |                  |
| E2                | 1.60       | 1.7  | 1.80 |                  |
| K                 | 0.20       | —    | —    |                  |

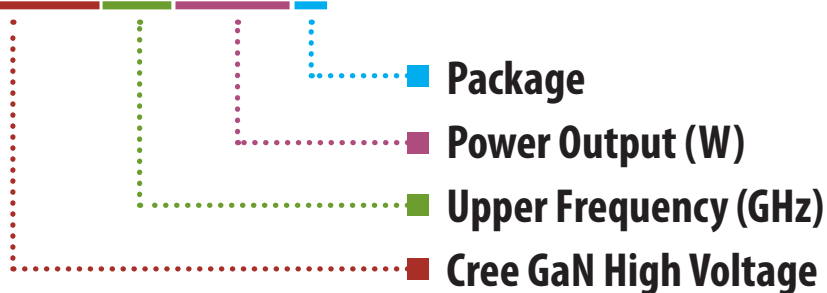
| Pin | Input/Output |
|-----|--------------|
| 1   | GND          |
| 2   | NC           |
| 3   | RF IN        |
| 4   | RF IN        |
| 5   | NC           |
| 6   | GND          |
| 7   | GND          |
| 8   | NC           |
| 9   | RF OUT       |
| 10  | RF OUT       |
| 11  | NC           |
| 12  | GND          |



Note: Leadframe finish for 3x4 DFN package is Nickel/Palladium/Gold. Gold is the outer layer.

## Part Number System

### CGHV27030S



| Parameter                    | Value         | Units |
|------------------------------|---------------|-------|
| Upper Frequency <sup>1</sup> | 2.7           | GHz   |
| Power Output                 | 30            | W     |
| Package                      | Surface Mount | -     |

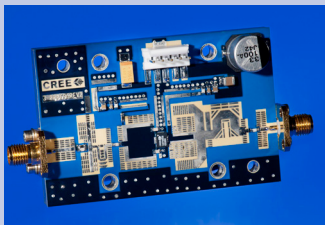
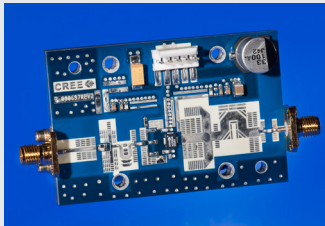
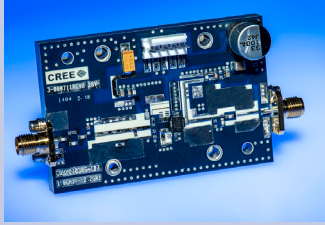
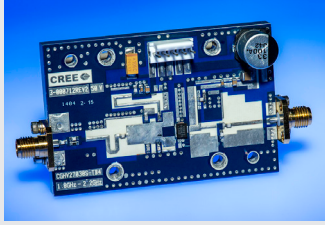
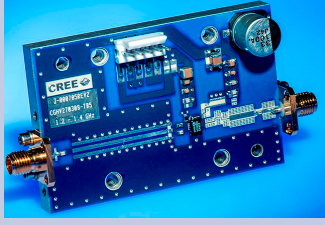
**Table 1.**

**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<br>2H = 27.0 GHz |

**Table 2.**

## Product Ordering Information

| Order Number    | Description                                            | Unit of Measure  | Image                                                                                 |
|-----------------|--------------------------------------------------------|------------------|---------------------------------------------------------------------------------------|
| CGHV27030S      | GaN HEMT                                               | Each             |    |
| CGHV27030S-AMP1 | Test board without GaN HEMT,<br>50 V 2.5-2.7 GHz       | Each             |    |
| CGHV27030S-AMP2 | Test board with GaN HEMT installed<br>28 V 2.5-2.7 GHz | Each             |   |
| CGHV27030S-AMP3 | Test board with GaN HEMT installed<br>28 V 1.8-2.2 GHz | Each             |  |
| CGHV27030S-AMP4 | Test board with GaN HEMT installed<br>50 V 1.8-2.2 GHz | Each             |  |
| CGHV27030S-AMP5 | Test board with GaN HEMT installed<br>50 V 1.2-1.4 GHz | Each             |  |
| CGHV27030S-TR   | Delivered in Tape and Reel                             | 250 parts / reel |                                                                                       |

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