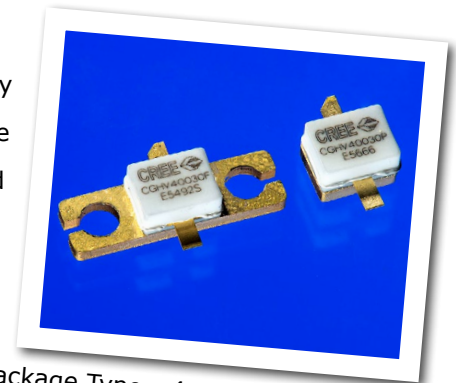


# CGHV40030

**30 W, DC - 6 GHz, 50V, GaN HEMT**

Cree's CGHV40030 is an unmatched, gallium nitride (GaN) high electron mobility transistor (HEMT) designed specifically for high efficiency, high gain and wide bandwidth capabilities. The device can be deployed for L, S and C-Band amplifier applications. The datasheet specifications are based on a 0.96 - 1.4 GHz amplifier. The CGHV40030 operates on a 50 volt rail circuit while housed in a 2-lead flange or pill package.



Package Type: 440166 and 440196  
PN: CGHV40030

## Typical Performance 0.96 - 1.4 GHz ( $T_c = 25^\circ\text{C}$ ), 50 V

| Parameter                    | 0.96 GHz | 1.1 GHz | 1.25 GHz | 1.4 GHz | Units |
|------------------------------|----------|---------|----------|---------|-------|
| Gain @ $P_{SAT}$             | 15.6     | 15.8    | 16.6     | 15.8    | dB    |
| Saturated Output Power       | 29       | 30      | 36       | 31      | W     |
| Drain Efficiency @ $P_{SAT}$ | 62       | 74      | 64       | 67      | %     |

Note:  
Measured CW in the CGHV40030-TB1 application circuit.

## Features

- Up to 6 GHz Operation
- 30 W Typical Output Power
- 16 dB Gain at 1.2 GHz
- Application circuit for 0.96 - 1.4 GHz
- 70% Efficiency at  $P_{SAT}$
- 50 V Operation

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

| Parameter   | Symbol     | Rating    | Units | Notes |
|---|------------|-----------|-------|-------|
| 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                      | $I_{GMAX}$ | 5.2       | mA    | 25 °C |
| Maximum Drain Current <sup>1</sup>                | $I_{DMAX}$ | 4.2       | A     | 25 °C |
| Soldering Temperature <sup>2</sup>                | $T_S$      | 245       | °C    |       |
| Case Operating Temperature <sup>3,4</sup>         | $T_C$      | -40, +150 | °C    |       |
| Thermal Resistance, Junction to Case <sup>5</sup> | $R_{JJC}$  | 5.9       | °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> Simulated at  $P_{DISS} = 23.4$  W
  - <sup>4</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.
  - <sup>5</sup> CW

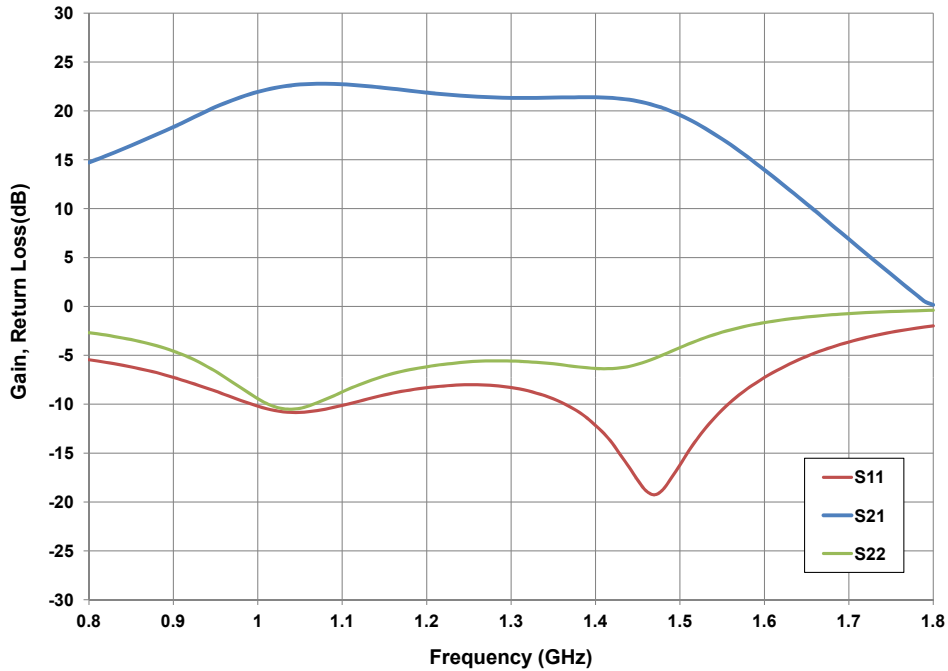
## Electrical Characteristics ( $T_C = 25$ °C) - 50 V Typical

| 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, $I_D = 5.2$ mA  |
| Gate Quiescent Voltage  | $V_{GS(Q)}$   | -    | -2.6 | -      | $V_{DC}$ | $V_{DS} = 50$ V, $I_D = 150$ mA  |
| Saturated Drain Current <sup>2</sup>  | $I_{DS}$      | 4.2  | 5.2  | -      | A        | $V_{DS} = 6.0$ V, $V_{GS} = 2.0$ V   |
| Drain-Source Breakdown Voltage  | $V_{(BR)DSS}$ | 100  | -    | -      | $V_{DC}$ | $V_{GS} = -8$ V, $I_D = 5.2$ mA  |
| <b>RF Characteristics<sup>3</sup> (<math>T_C = 25</math> °C, <math>F_0 = 1.2</math> GHz unless otherwise noted)</b> |               |      |      |        |          |  |
| Power Gain  | $G_p$         | -    | 16   | -      | dB       | $V_{DD} = 50$ V, $I_{DQ} = 150$ mA, $P_{OUT} = P_{SAT}$                                |
| Output Power <sup>4</sup>   | $P_{OUT}$     | -    | 30   | -      | W        | $V_{DD} = 50$ V, $I_{DQ} = 150$ mA, $P_{OUT} = P_{SAT}$                                |
| Drain Efficiency <sup>4</sup>   | $\eta$        | -    | 65   | -      | %        | $V_{DD} = 50$ V, $I_{DQ} = 150$ mA, $P_{OUT} = P_{SAT}$                                |
| Output Mismatch Stress <sup>4</sup>   | VSWR          | -    | -    | 10 : 1 | $\Psi$   | No damage at all phase angles, $V_{DD} = 50$ V, $I_{DQ} = 150$ mA, $P_{OUT} = 30$ W CW |
| <b>Dynamic Characteristics</b>  |               |      |      |        |          |  |
| Input Capacitance <sup>5</sup>  | $C_{GS}$      | -    | 7.4  | -      | pF       | $V_{DS} = 50$ V, $V_{gs} = -8$ V, $f = 1$ MHz  |
| Output Capacitance <sup>5</sup>   | $C_{DS}$      | -    | 2    | -      | pF       | $V_{DS} = 50$ V, $V_{gs} = -8$ V, $f = 1$ MHz  |
| Feedback Capacitance  | $C_{GD}$      | -    | 0.15 | -      | pF       | $V_{DS} = 50$ V, $V_{gs} = -8$ V, $f = 1$ MHz  |

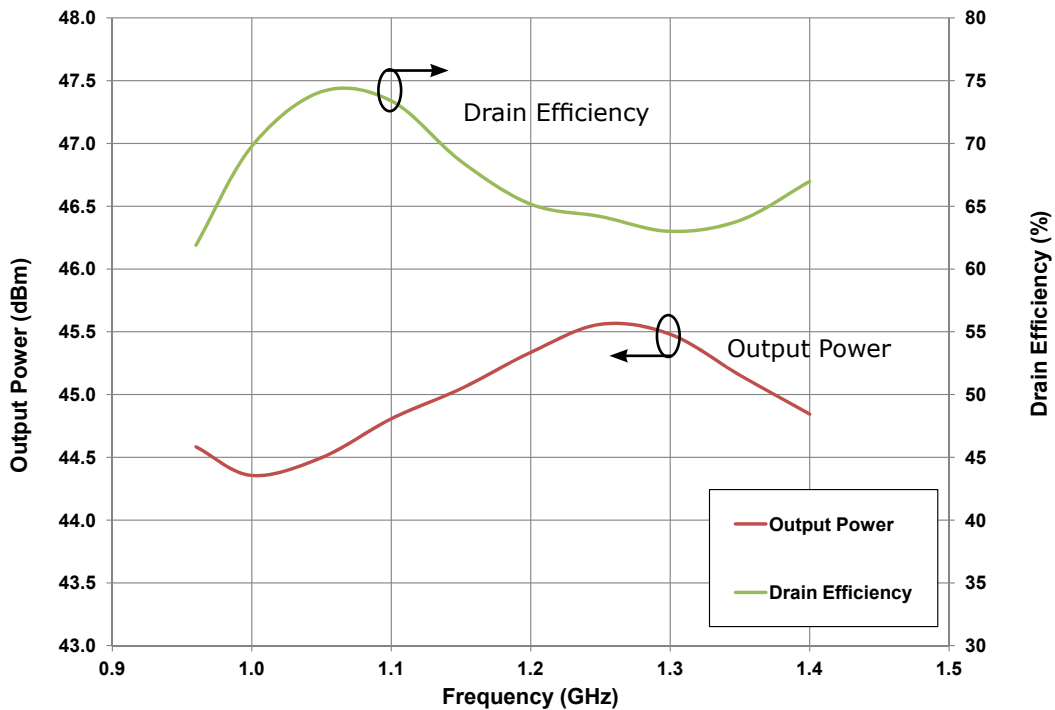
- Notes:
- <sup>1</sup> Measured on wafer prior to packaging
  - <sup>2</sup> Scaled from PCM data
  - <sup>3</sup> Measured in CGHV40030-TB
  - <sup>4</sup>  $P_{SAT}$  is defined as  $I_G = 0.52$  mA
  - <sup>5</sup> Includes package

## Typical Performance

**Figure 1. - Typical Small Signal Response of CGHV40030-TB1 Application Circuit**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 150\text{ mA}$



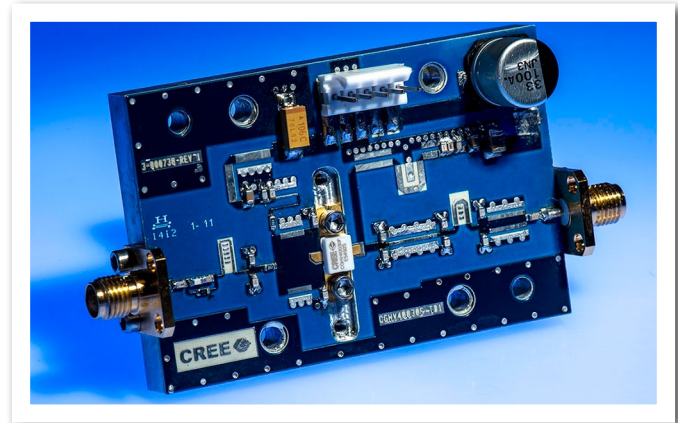
**Figure 2. - Typical Large Signal Response of CGHV40030-TB1 Application Circuit**  
 $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 150\text{ mA}$ ,  $P_{IN} = 29\text{ dBm}$ ,  $T_{CASE} = 25^\circ\text{C}$ , CW



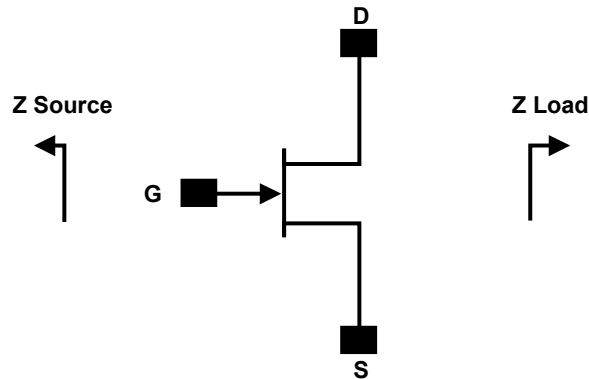
## CGHV40030-TB1 Application Circuit Bill of Materials

| Designator       | Description  | Qty |
|------------------|--|-----|
| R1               | RES,1/16W,0603,1%,187 OHMS                                 | 1   |
| R2               | RES, 2.2 OHMS, +/- 1%, 1/16W,0603                          | 1   |
| R3               | RES,1/16W,0603,1%,15.4 OHMS                                | 1   |
| L1               | IND, 5.6nH, 0603   | 1   |
| C3, C4           | CAP, 2.7,+/-0.1pF, 0603, ATC                               | 2   |
| C5, C6, C11, C12 | CAP, 1.2pF,+/-0.1pF, 0603, ATC                             | 4   |
| C2, C7, C8       | CAP 1.8pF,+/-0.1pF 0603, ATC                               | 2   |
| C9, C10          | CAP, 3.9pF,+/-0.1pF 0603, ATC                              | 2   |
| C1, C13          | CAP, 24pF,+/-5% 0603, ATC                                  | 2   |
| C14              | CAP 10UF 16V TANTALUM                                      | 1   |
| C15, C20         | CAP, 33000pF, 0805, ATC                                    | 2   |
| C16,C21          | CAP, 470PF, 5%, 100V, 0603,                                | 2   |
| C17              | CAP, 68pF,+/-0.1pF 0603, ATC                               | 1   |
| C22              | CAP, 56PF +/- 5%, 0603 , ATC600S                           | 1   |
| C18              | CAP, 33UF, 20%, G CASE                                     | 1   |
| C19              | CAP, 1.0UF, 100V, 10%, X7R, 1210                           | 1   |
| J1,J2            | CONN, SMA, PANEL MOUNT JACK,<br>FLANGE, 4-HOLE, BLUNT POST | 2   |
| J3               | HEADER RT>PLZ .1CEN LK 5POS                                | 1   |
|                  | BASEPLATE, CGH35015, 2.60 X 1.7                            | 1   |
|                  | CGHV40030F/P PCB, RO4350, 0.020" THK                       | 1   |

## CGHV40030-TB1 Application Circuit



## Source and Load Impedances



| Frequency (MHz) | Z Source    | Z Load       |
|-----------------|-------------|--------------|
| 500             | 5.5 + j0.9  | 43 + j20.8   |
| 1000            | 2.6 - j1.3  | 25.5 + j29.1 |
| 2000            | 3.8 - j0.9  | 11.5 + j17.3 |
| 3000            | 2.7 - j7.0  | 6.7 + j7.8   |
| 4000            | 2.8 - j13.4 | 6.5 + j1.7   |

Note<sup>1</sup>:  $V_{DD} = 50\text{ V}$ ,  $I_{DQ} = 150\text{ mA}$

Note<sup>2</sup>: Impedances are extracted from source and load pull data derived from the transistor.

## Electrostatic Discharge (ESD) Classifications

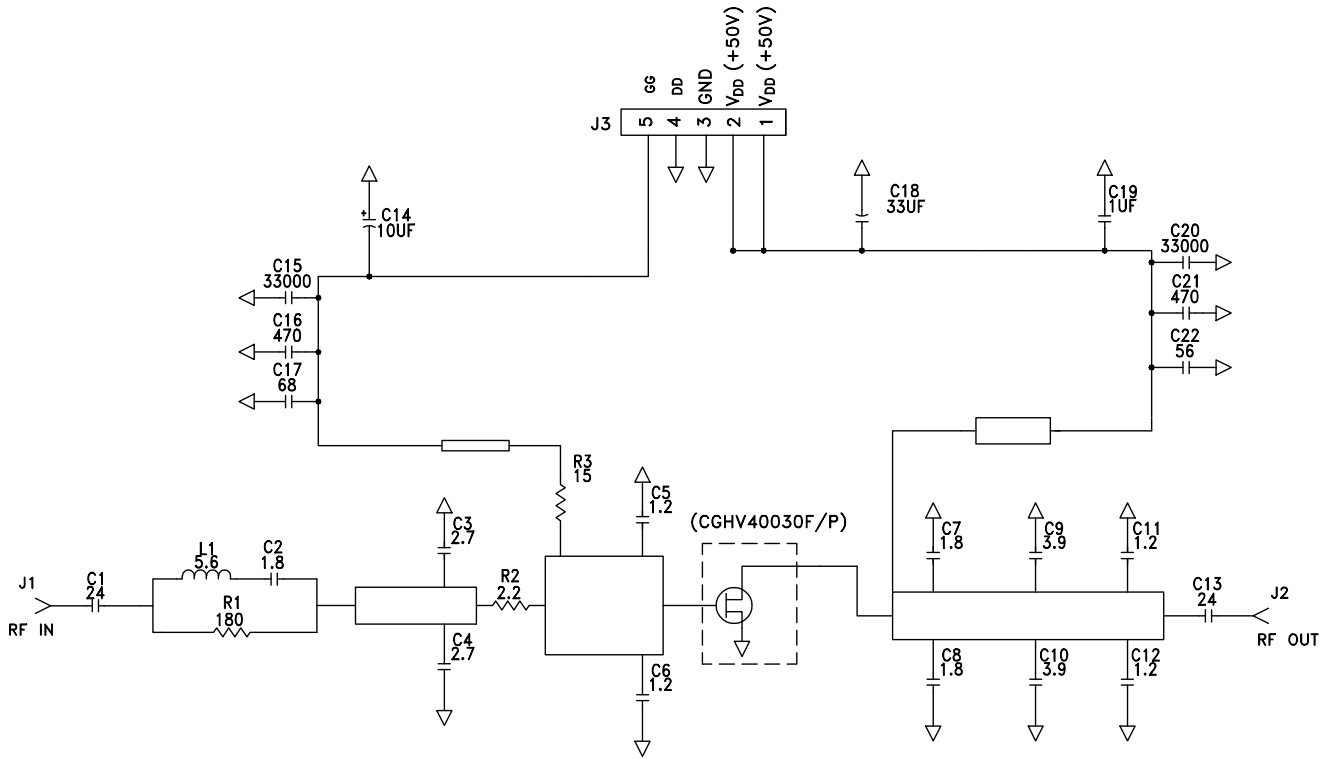
| Parameter           | Symbol | Class            | Test Methodology    |
|---------------------|--------|------------------|---------------------|
| Human Body Model    | HBM    | 1A (> 250 V)     | JEDEC JESD22 A114-D |
| Charge Device Model | CDM    | II (200 < 500 V) | JEDEC JESD22 C101-C |

## Typical Package S-Parameters for CGHV40030 (Small Signal, $V_{DS} = 50\text{ V}$ , $I_{DQ} = 0.52\text{ mA}$ , angle in degrees)

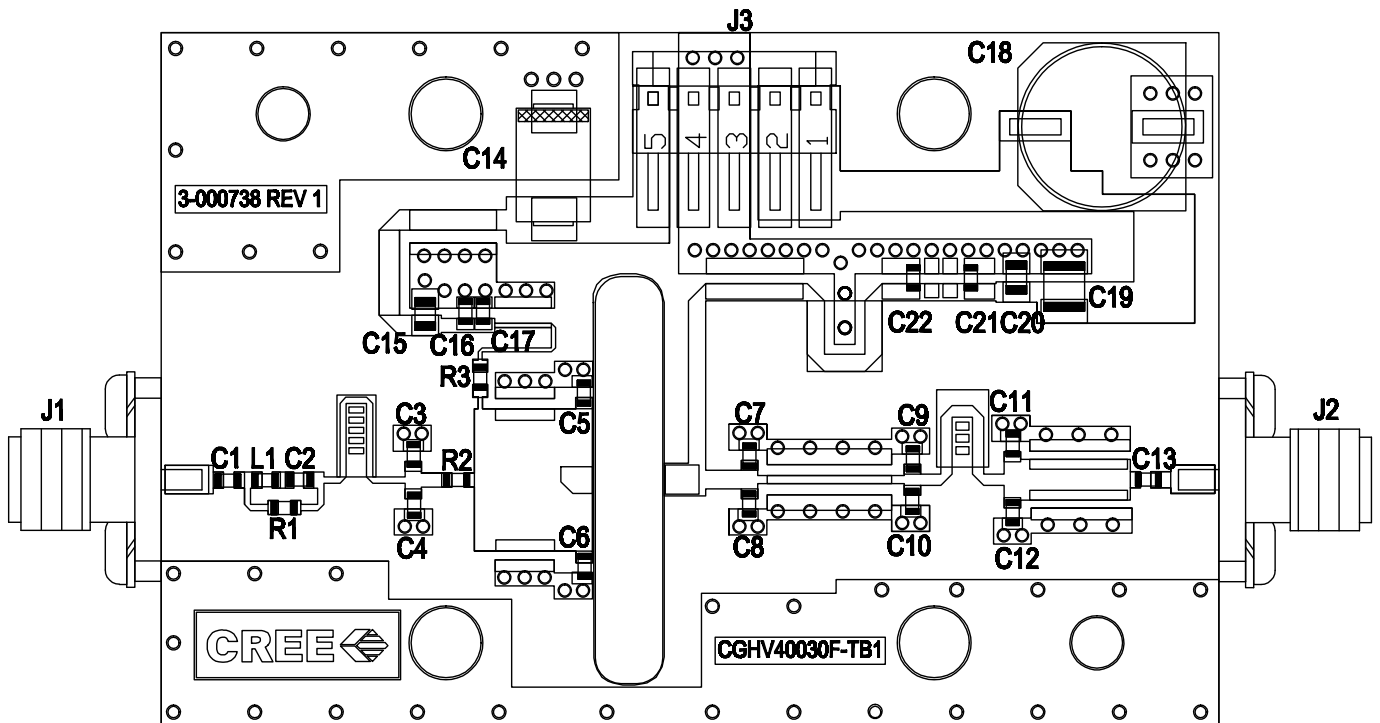
| Frequency | Mag S11 | Ang S11 | Mag S21 | Ang S21 | Mag S12 | Ang S12 | Mag S22 | Ang S22 |
|-----------|---------|---------|---------|---------|---------|---------|---------|---------|
| 500 MHz   | 0.92    | -135.45 | 21.23   | 101.31  | 0.01    | 16.50   | 0.32    | -74.10  |
| 600 MHz   | 0.92    | -143.51 | 18.06   | 95.44   | 0.01    | 11.72   | 0.32    | -79.66  |
| 700 MHz   | 0.91    | -149.71 | 15.66   | 90.50   | 0.01    | 7.89    | 0.31    | -84.44  |
| 800 MHz   | 0.91    | -154.67 | 13.78   | 86.16   | 0.01    | 4.69    | 0.32    | -88.69  |
| 900 MHz   | 0.91    | -158.75 | 12.27   | 82.26   | 0.01    | 1.97    | 0.33    | -92.58  |
| 1.0 GHz   | 0.91    | -162.21 | 11.04   | 78.67   | 0.01    | -0.41   | 0.34    | -96.19  |
| 1.1 GHz   | 0.91    | -165.20 | 10.02   | 75.32   | 0.01    | -2.50   | 0.35    | -99.57  |
| 1.2 GHz   | 0.91    | -167.83 | 9.15    | 72.16   | 0.01    | -4.34   | 0.36    | -102.79 |
| 1.3 GHz   | 0.91    | -170.19 | 8.41    | 69.14   | 0.01    | -5.98   | 0.37    | -105.86 |
| 1.4 GHz   | 0.92    | -172.34 | 7.76    | 66.24   | 0.01    | -7.43   | 0.39    | -108.80 |
| 1.5 GHz   | 0.92    | -174.30 | 7.20    | 63.45   | 0.01    | -8.69   | 0.40    | -111.64 |
| 1.6 GHz   | 0.92    | -176.13 | 6.70    | 60.74   | 0.01    | -9.77   | 0.42    | -114.39 |
| 1.7 GHz   | 0.92    | -177.83 | 6.26    | 58.11   | 0.01    | -10.67  | 0.43    | -117.06 |
| 1.8 GHz   | 0.92    | -179.44 | 5.86    | 55.54   | 0.01    | -11.39  | 0.45    | -119.65 |
| 1.9 GHz   | 0.92    | 179.04  | 5.50    | 53.03   | 0.01    | -11.90  | 0.46    | -122.18 |
| 2.0 GHz   | 0.92    | 177.58  | 5.18    | 50.58   | 0.01    | -12.20  | 0.48    | -124.64 |
| 2.1 GHz   | 0.92    | 176.19  | 4.89    | 48.17   | 0.01    | -12.26  | 0.49    | -127.05 |
| 2.2 GHz   | 0.92    | 174.84  | 4.62    | 45.81   | 0.01    | -12.07  | 0.51    | -129.41 |
| 2.3 GHz   | 0.93    | 173.54  | 4.37    | 43.50   | 0.01    | -11.60  | 0.52    | -131.72 |
| 2.4 GHz   | 0.93    | 172.28  | 4.14    | 41.22   | 0.01    | -10.82  | 0.53    | -133.98 |
| 2.5 GHz   | 0.93    | 171.06  | 3.93    | 38.98   | 0.01    | -9.70   | 0.55    | -136.21 |
| 2.6 GHz   | 0.93    | 169.86  | 3.73    | 36.78   | 0.01    | -8.20   | 0.56    | -138.39 |
| 2.7 GHz   | 0.93    | 168.70  | 3.55    | 34.62   | 0.01    | -6.30   | 0.57    | -140.53 |
| 2.8 GHz   | 0.93    | 167.55  | 3.38    | 32.49   | 0.01    | -3.97   | 0.59    | -142.63 |
| 2.9 GHz   | 0.93    | 166.43  | 3.23    | 30.39   | 0.01    | -1.18   | 0.60    | -144.70 |
| 3.0 GHz   | 0.94    | 165.33  | 3.08    | 28.33   | 0.01    | 2.04    | 0.61    | -146.73 |
| 3.2 GHz   | 0.94    | 163.18  | 2.81    | 24.29   | 0.01    | 9.69    | 0.64    | -150.70 |
| 3.4 GHz   | 0.94    | 161.08  | 2.57    | 20.36   | 0.01    | 18.36   | 0.66    | -154.54 |
| 3.6 GHz   | 0.94    | 159.05  | 2.36    | 16.55   | 0.01    | 27.05   | 0.68    | -158.26 |
| 3.8 GHz   | 0.95    | 157.05  | 2.17    | 12.85   | 0.01    | 34.79   | 0.70    | -161.87 |
| 4.0 GHz   | 0.95    | 155.10  | 2.00    | 9.25    | 0.01    | 41.04   | 0.72    | -165.37 |
| 4.2 GHz   | 0.95    | 153.19  | 1.85    | 5.75    | 0.01    | 45.73   | 0.73    | -168.77 |
| 4.4 GHz   | 0.95    | 151.31  | 1.72    | 2.35    | 0.01    | 49.02   | 0.75    | -172.07 |
| 4.6 GHz   | 0.96    | 149.46  | 1.59    | -0.96   | 0.01    | 51.19   | 0.76    | -175.28 |
| 4.8 GHz   | 0.96    | 147.65  | 1.48    | -4.18   | 0.01    | 52.48   | 0.78    | -178.39 |
| 5.0 GHz   | 0.96    | 145.86  | 1.37    | -7.31   | 0.01    | 53.11   | 0.79    | 178.58  |
| 5.2 GHz   | 0.96    | 144.11  | 1.28    | -10.36  | 0.01    | 53.24   | 0.80    | 175.63  |
| 5.4 GHz   | 0.96    | 142.38  | 1.19    | -13.33  | 0.01    | 52.98   | 0.82    | 172.76  |
| 5.6 GHz   | 0.96    | 140.68  | 1.11    | -16.22  | 0.02    | 52.43   | 0.83    | 169.97  |
| 5.8 GHz   | 0.97    | 139.00  | 1.04    | -19.03  | 0.02    | 51.65   | 0.84    | 167.25  |
| 6.0 GHz   | 0.97    | 137.35  | 0.98    | -21.76  | 0.02    | 50.70   | 0.85    | 164.60  |

To download the s-parameters in s2p format, go to the CGHV40030 Product Page and click on the documentation tab.

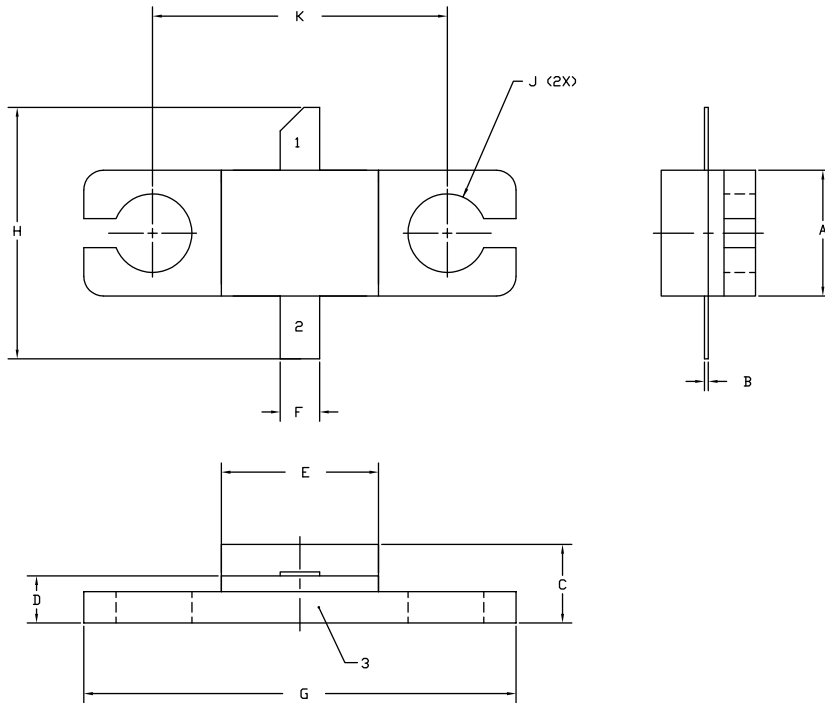
## CGHV40030-TB1 Application Circuit Schematic



## CGHV40030-TB1 Application Circuit Outline



## Product Dimensions CGHV40030F (Package Type - 440166 )



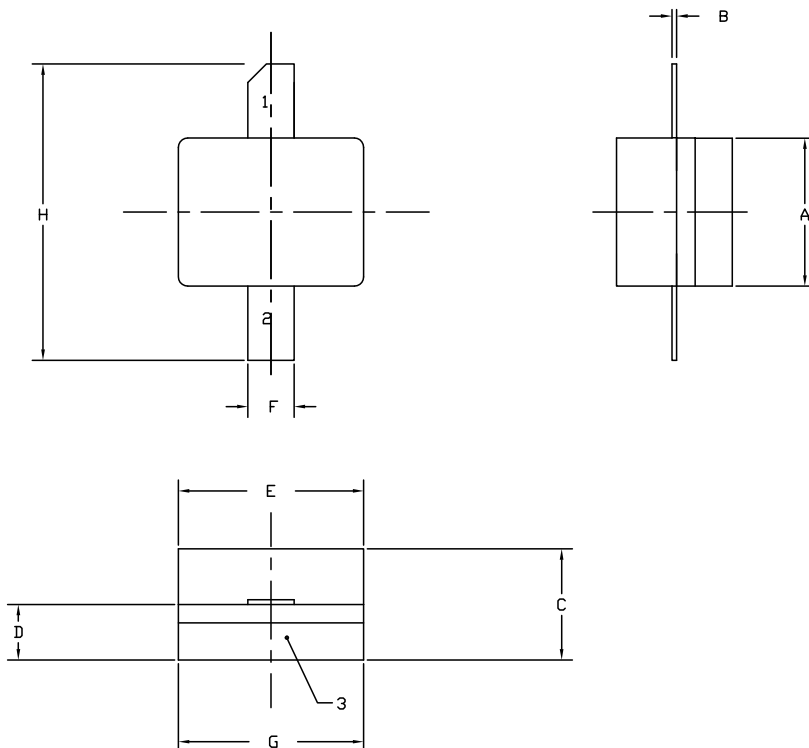
**NOTES:**

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.
5. ALL PLATED SURFACES ARE NI/AU

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.155  | 0.165 | 3.94        | 4.19  |
| B   | 0.004  | 0.006 | 0.10        | 0.15  |
| C   | 0.115  | 0.135 | 2.92        | 3.43  |
| D   | 0.057  | 0.067 | 1.45        | 1.70  |
| E   | 0.195  | 0.205 | 4.95        | 5.21  |
| F   | 0.045  | 0.055 | 1.14        | 1.40  |
| G   | 0.545  | 0.555 | 13.84       | 14.09 |
| H   | 0.280  | 0.360 | 7.11        | 9.14  |
| J   | Ø .100 |       | 2.54        |       |
| K   | 0.375  |       | 9.53        |       |

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

## Product Dimensions CGHV40030P (Package Type - 440196)



**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.
5. ALL PLATED SURFACES ARE NI/AU

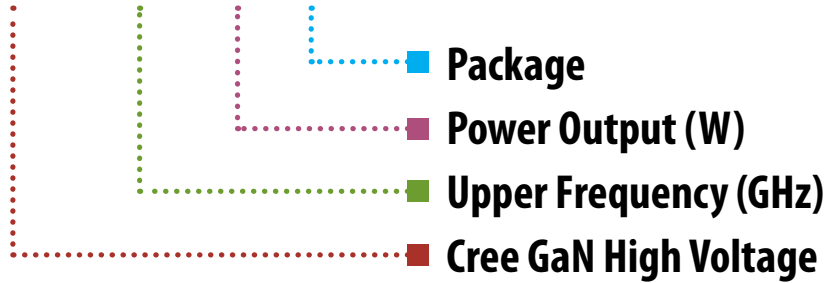
| DIM | INCHES |       | MILLIMETERS |      |
|-----|--------|-------|-------------|------|
|     | MIN    | MAX   | MIN         | MAX  |
| A   | 0.155  | 0.165 | 3.94        | 4.19 |
| B   | 0.003  | 0.006 | 0.10        | 0.15 |
| C   | 0.115  | 0.135 | 2.92        | 3.17 |
| D   | 0.057  | 0.067 | 1.45        | 1.70 |
| E   | 0.195  | 0.205 | 4.95        | 5.21 |
| F   | 0.045  | 0.055 | 1.14        | 1.40 |
| G   | 0.195  | 0.205 | 4.95        | 5.21 |
| H   | 0.280  | 0.360 | 7.11        | 9.14 |

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



## Part Number System

### CGHV40030F/P



| Parameter                    | Value        | Units |
|------------------------------|--------------|-------|
| Upper Frequency <sup>1</sup> | 6            | GHz   |
| Power Output                 | 30           | W     |
| Package                      | Flanged/Pill | -     |

**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.**

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For more information, please contact:

Cree, Inc.  
4600 Silicon Drive  
Durham, North Carolina, USA 27703  
[www.cree.com/rf](http://www.cree.com/rf)

Sarah Miller  
Marketing  
Cree, RF Components  
1.919.407.5302

Ryan Baker  
Marketing  
Cree, RF Components  
1.919.407.7816

Tom Dekker  
Sales Director  
Cree, RF Components  
1.919.313.5639

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Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9