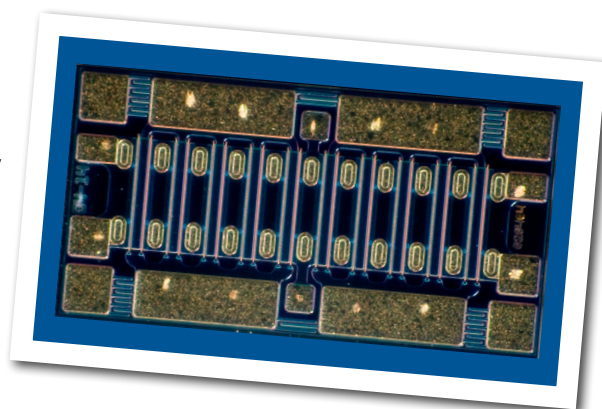


## CGH80030D

30 W, 8.0 GHz, GaN HEMT Die

Cree's CGH80030D is a gallium nitride (GaN) High Electron Mobility Transistor (HEMT), based on Cree's 28V, 0.25um GaN-on-SiC process technology. GaN has superior properties compared to silicon or gallium arsenide, including higher breakdown voltage, higher saturated electron drift velocity, and higher thermal conductivity. GaN HEMTs offer greater power density and wider bandwidths compared to Si and GaAs transistors.



PN: CGH80030D

### FEATURES

- 17 dB Typical Small Signal Gain at 4 GHz
- 12 dB Typical Small Signal Gain at 8 GHz
- 30 W Typical  $P_{SAT}$
- 28 V Operation
- High Breakdown Voltage
- High Temperature Operation
- Up to 8 GHz Operation
- High Efficiency

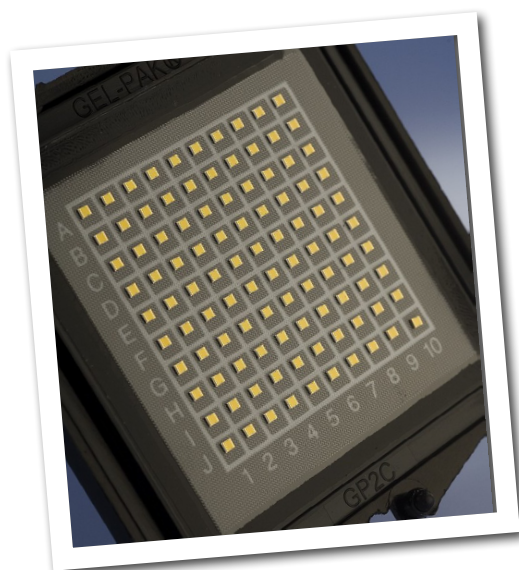
### APPLICATIONS

- 2-Way Private Radio
- Broadband Amplifiers
- Cellular Infrastructure
- Test Instrumentation
- Class A, AB, Linear amplifiers suitable for OFDM, W-CDMA, EDGE, CDMA waveforms

### Packaging Information



- Bare die are shipped in Gel-Pak® containers.
- Non-adhesive tacky membrane immobilizes die during shipment.



Large Signal Models Available for ADS and MWO

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

| Parameter                                                    | Symbol          | Rating    | Units | Conditions              |
|--------------------------------------------------------------|-----------------|-----------|-------|-------------------------|
| Drain-source Voltage                                         | $V_{DS}$        | 84        | VDC   | 25°C                    |
| Gate-source Voltage                                          | $V_{GS}$        | -10, +2   | VDC   | 25°C                    |
| Storage Temperature                                          | $T_{STG}$       | -65, +150 | °C    |                         |
| Operating Junction Temperature                               | $T_J$           | 225       | °C    |                         |
| Maximum Forward Gate Current                                 | $I_{GMAX}$      | 7.0       | mA    | 25°C                    |
| Maximum Drain Current <sup>1</sup>                           | $I_{DMAX}$      | 3.0       | A     | 25°C                    |
| Thermal Resistance, Junction to Case (packaged) <sup>2</sup> | $R_{\theta JC}$ | 4.9       | °C/W  | 85°C, 28.8W Dissipation |
| Thermal Resistance, Junction to Case (die only)              | $R_{\theta JC}$ | 2.74      | °C/W  | 85°C, 28.8W Dissipation |
| Mounting Temperature (30 seconds)                            | $T_S$           | 320       | °C    | 30 seconds              |

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

Note<sup>2</sup> Eutectic die attach using 80/20 AuSn mounted to a 10 mil thick Cu15Mo85 carrier.

## Electrical Characteristics (Frequency = 4 GHz unless otherwise stated; $T_c = 25^\circ\text{C}$ )

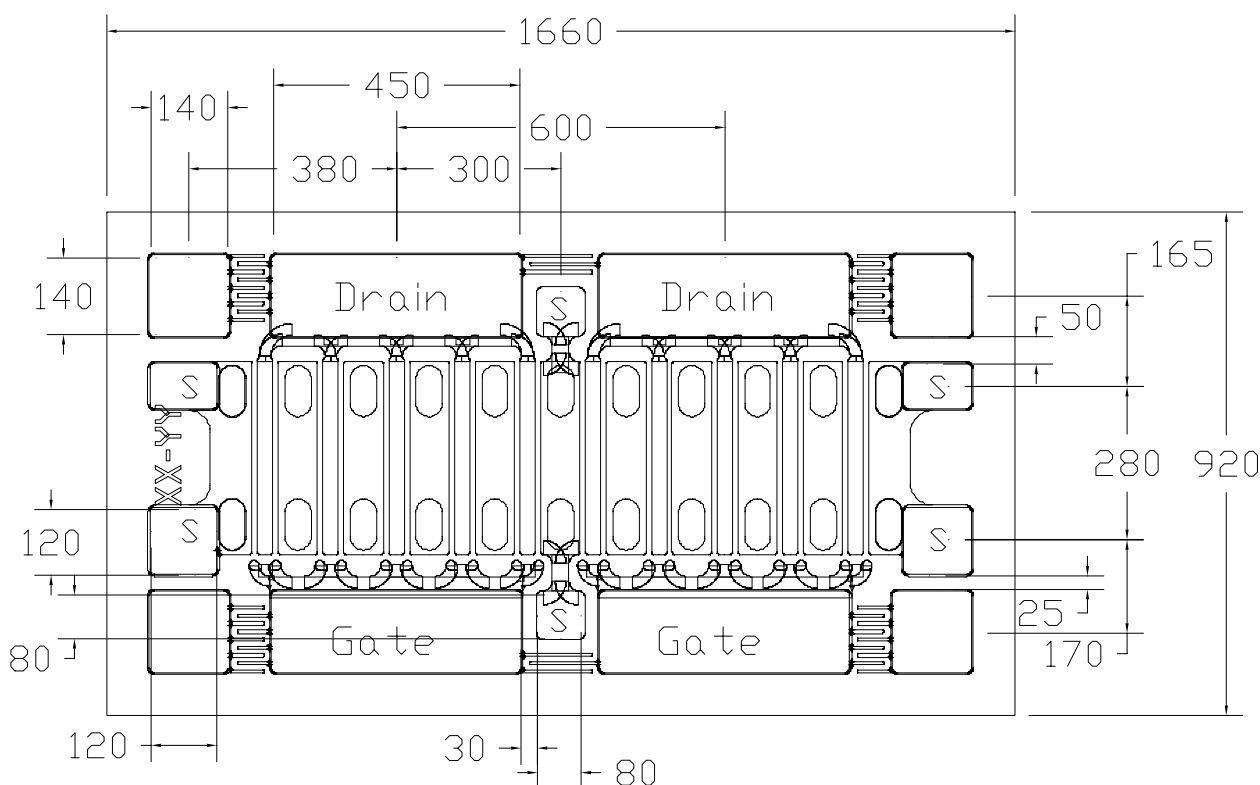
| Characteristics                     | Symbol       | Min. | Typ. | Max.   | Units           | Conditions                                                                                                      |
|-------------------------------------|--------------|------|------|--------|-----------------|-----------------------------------------------------------------------------------------------------------------|
| <b>DC Characteristics</b>           |              |      |      |        |                 |                                                                                                                 |
| Gate Threshold Voltage              | $V_{GS(TH)}$ | -3.6 | -3.0 | -2.4   | V               | $V_{DS} = 10\text{ V}, I_D = 7.2\text{ mA}$                                                                     |
| Gate Quiescent Voltage              | $V_{GS(Q)}$  | –    | -2.7 | –      | V <sub>DC</sub> | $V_{DD} = 28\text{ V}, I_{DQ} = 200\text{ mA}$                                                                  |
| Drain-Source Breakdown Voltage      | $V_{BD}$     | 120  | –    | –      | V               | $V_{GS} = -8\text{ V}, I_D = 7.2\text{ mA}$                                                                     |
| On Resistance                       | $R_{ON}$     | 0.26 | 0.33 | 0.41   | Ω               | $V_{DS} = 0.1\text{ V}$                                                                                         |
| <b>RF Characteristics</b>           |              |      |      |        |                 |                                                                                                                 |
| Small Signal Gain                   | $G_{SS}$     | –    | 16.5 | –      | dB              | $V_{DD} = 28\text{ V}, I_{DQ} = 200\text{ mA}$                                                                  |
| Saturated Power Output <sup>1</sup> | $P_{SAT}$    | –    | 30   | –      | W               | $V_{DD} = 28\text{ V}, I_{DQ} = 200\text{ mA}$                                                                  |
| Drain Efficiency <sup>2</sup>       | $\eta$       | –    | 65   | –      | %               | $V_{DD} = 28\text{ V}, I_{DQ} = 200\text{ mA}, P_{SAT} = 30\text{ W}$                                           |
| Output Mismatch Stress              | VSWR         | –    | –    | 10 : 1 | Y               | No damage at all phase angles,<br>$V_{DD} = 28\text{ V}, I_{DQ} = 200\text{ mA},$<br>$P_{OUT} = 30\text{ W CW}$ |
| <b>Dynamic Characteristics</b>      |              |      |      |        |                 |                                                                                                                 |
| Input Capacitance                   | $C_{GS}$     | –    | 7.3  | –      | pF              | $V_{DS} = 28\text{ V}, V_{gs} = -8\text{ V}, f = 1\text{ MHz}$                                                  |
| Output Capacitance                  | $C_{DS}$     | –    | 2.2  | –      | pF              | $V_{DS} = 28\text{ V}, V_{gs} = -8\text{ V}, f = 1\text{ MHz}$                                                  |
| Feedback Capacitance                | $C_{GD}$     | –    | 0.37 | –      | pF              | $V_{DS} = 28\text{ V}, V_{gs} = -8\text{ V}, f = 1\text{ MHz}$                                                  |

Notes:

<sup>1</sup>  $P_{SAT}$  is defined as  $I_G = 0.7\text{ mA}$ .

<sup>2</sup> Drain Efficiency =  $P_{OUT} / P_{DC}$ .

## DIE Dimensions (units in microns)



Overall die size 1660 x 920 (+0/-50) microns, die thickness 100 (+/- 10) microns.  
All Gate and Drain pads must be wire bonded for electrical connection.

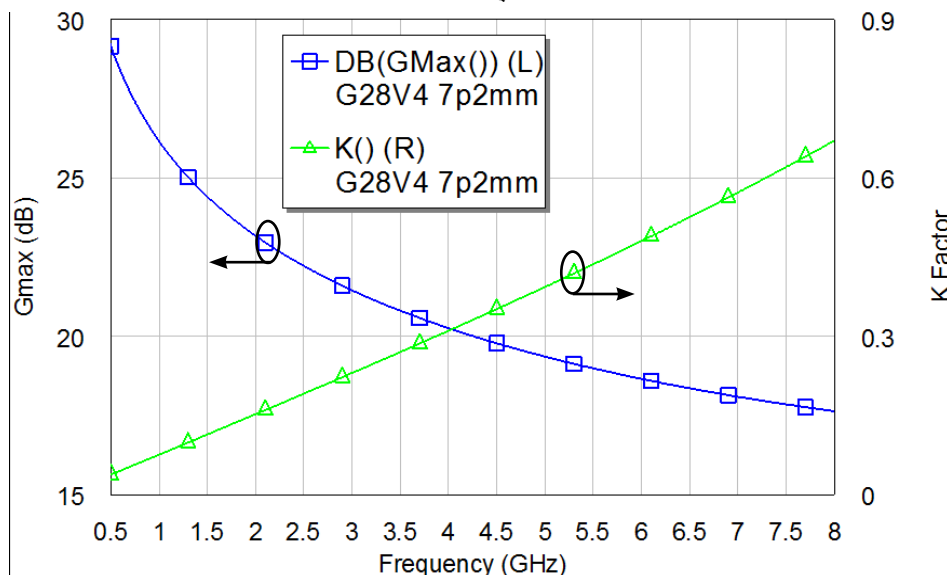
### Assembly Notes:

- Recommended solder is AuSn (80/20) solder. Refer to Cree's website for the Eutectic Die Bond Procedure application note at [www.cree.com/RF/Document-Library](http://www.cree.com/RF/Document-Library)
- Vacuum collet is the preferred method of pick-up.
- The backside of the die is the Source (ground) contact.
- Die back side gold plating is 5 microns thick minimum.
- Thermosonic ball or wedge bonding are the preferred connection methods.
- Gold wire must be used for connections.
- Use the die label (XX-YY) for correct orientation.

## Typical Performance

Simulated Maximum Available Gain and K Factor of the CGH80030D

$V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 200\text{ mA}$

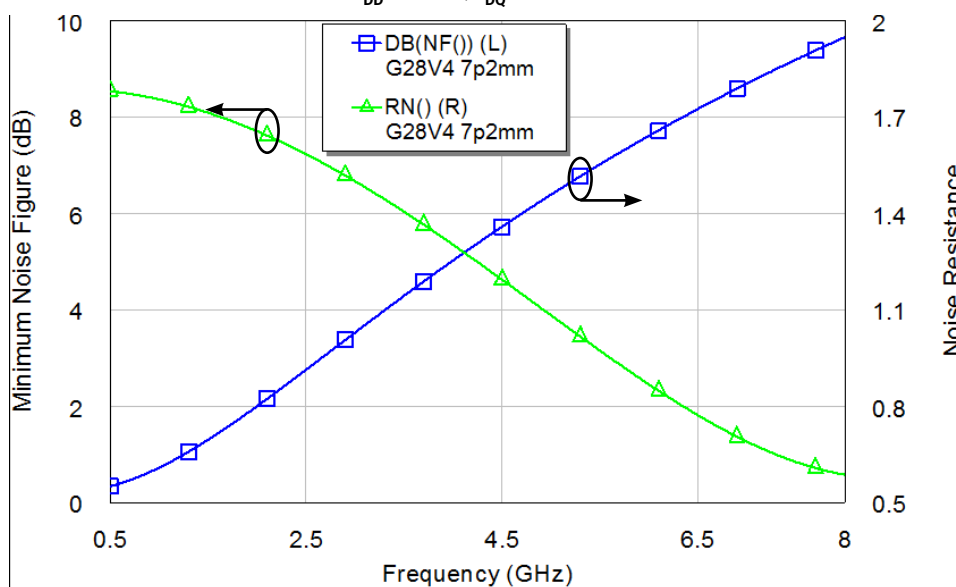


Intrinsic die parameters - reference planes at centers of gate and drain bonding pads. No wire bonds assumed.

## Typical Noise Performance

Simulated Minimum Noise Figure and Noise Resistance vs Frequency of the CGH80030D

$V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 200\text{ mA}$



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