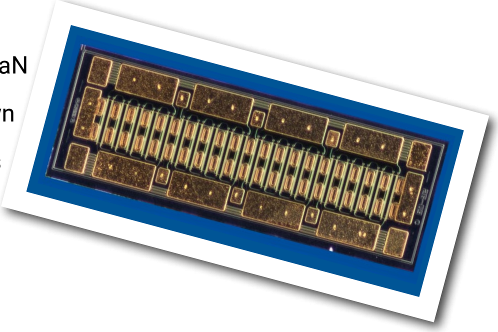
CGHV60075D5

75 W, 6.0 GHz, GaN HEMT Die

Cree's CGHV60075D5 is a gallium nitride (GaN) High Electron Mobility Transistor (HEMT). 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.

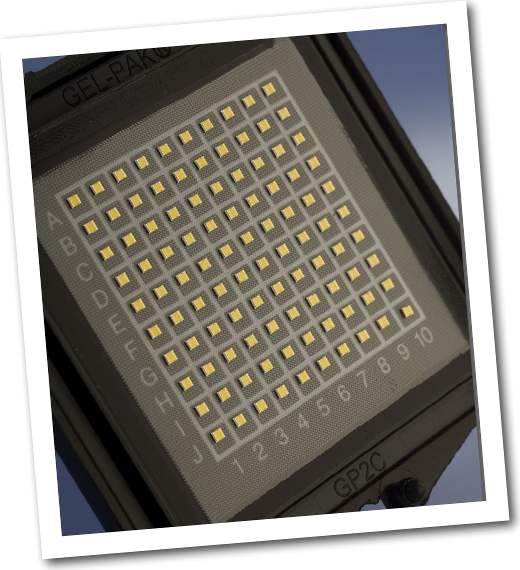


FEATURES

- 19 dB Typical Small Signal Gain at 4 GHz
- 17 dB Typical Small Signal Gain at 6 GHz
- 65% Typical Power Added Efficiency at 4 GHz
- 60% Typical Power Added Efficiency at 6 GHz
- 75 W Typical P_{SAT}
- 50 V Operation
- High Breakdown Voltage
- Up to 6 GHz Operation

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 on tape or in Gel-Pak® containers.
- Non-adhesive tacky membrane immobilizes die during shipment.

Rev 1.1 – September 2016

Absolute Maximum Ratings (not simultaneous)

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	V_{DSS}	150	V_{DC}	25˚C
Gate-source Voltage	V_{GS}	-10, +2	V_{DC}	25˚C
Storage Temperature	T_{STG}	-65, +150	˚C	
Operating Junction Temperature	T_J	225	˚C	
Maximum Drain Current[1]	I_{MAX}	6.3	A	25˚C
Maximum Forward Gate Current	I_{GMAX}	10	mA	25˚C
Thermal Resistance, Junction to Case (packaged)[2]	$R_{\theta JC}$	2.67	˚C/W	85˚C, 41.6W Dissipation
Thermal Resistance, Junction to Case (die only)	$R_{\theta JC}$	1.66	˚C/W	85˚C, 41.6W Dissipation
Mounting Temperature	T_S	320	˚C	30 seconds

Note[1] Current limit for long term reliable operation.

Note[2] Eutectic die attach using 80/20 AuSn mounted to a 10 mil thick Cu15Mo85 carrier.

Electrical Characteristics (Frequency = 6 GHz unless otherwise stated; T_C = 25˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics						
Gate Pinch-Off Voltage	V_P	-3.8	-3.0	−2.3	V	V_{DS} = 10 V, I_D = 10 mA
Drain Current[1]	I_{DSS}	8	10	–	A	V_{DS} = 6 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BD}	150	–	–	V	V_{GS} = -8 V, I_D = 10 mA
On Resistance	R_{ON}	–	0.28	–	Ω	V_{DS} = 0.1 V
Gate Forward Voltage	$V_{G\text{-}ON}$	–	1.9	–	V	I_{GS} = 10 mA
RF Characteristics						
Small Signal Gain	G_{SS}	–	17	–	dB	V_{DD} = 50 V, I_{DQ} = 125 mA
Saturated Power Output[2,3]	P_{SAT}	–	75	–	W	V_{DD} = 50 V, I_{DQ} = 125 mA
Drain Efficiency[3]	η	–	60	–	%	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{SAT} = 75 W
Intermodulation Distortion	IM3	–	-30	–	dBc	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 75 W PEP
Output Mismatch Stress	VSWR	–	–	10 : 1	Ψ	No damage at all phase angles, V_{DD} = 50 V, I_{DQ} = 125 mA P_{OUT} = 75 W CW
Dynamic Characteristics						
Input Capacitance	C_{GS}	–	9.51	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance	C_{DS}	–	3.6	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz
Feedback Capacitance	C_{GD}	–	0.26	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz

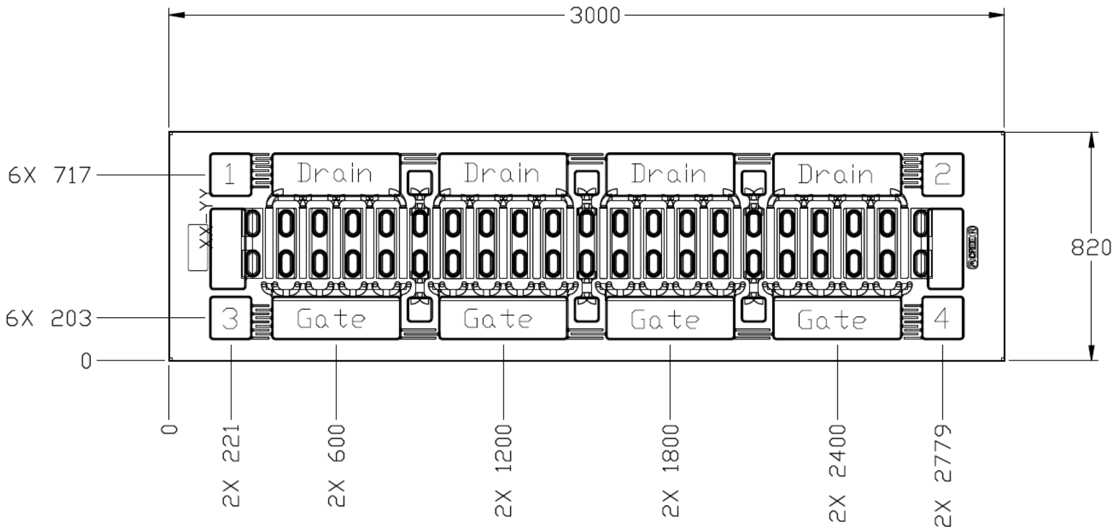
Notes:

[1] Scaled from PCM data

[2] P_{SAT} is defined as I_G = 1.0 mA.

[3] Drain Efficiency = P_{OUT} / P_{DC}

DIE Dimensions (units in microns)



Overall die size 3000 x 820 (+0/-50) microns, die thickness 100 microns.
All Gate and Drain pads must be wire bonded for electrical connection.

Assembly Notes:

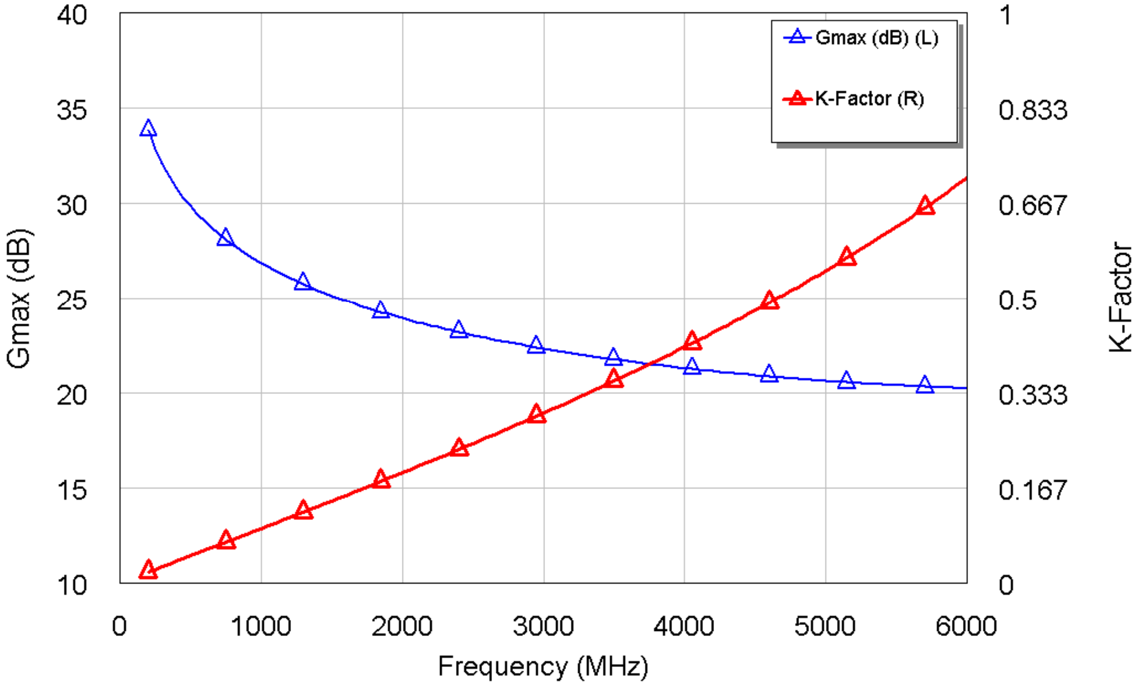
- Recommended solder is AuSn (80/20) solder. Refer to Cree's website for the Eutectic Die Bond Procedure application note at www.cree.com/rf/document-library
- Vacuum collet is the preferred method of pick-up.
- The backside of the die is the Source (ground) contact.
- Die back side gold plating is 5 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.

Electrostatic Discharge (ESD) Classifications

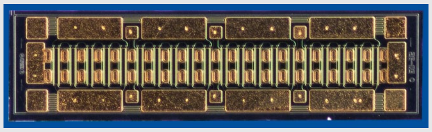
Parameter	Symbol	Class	Test Methodology
Human Body Model	HBM	1A (> 250 V)	JEDEC JESD22 A114-D
Charge Device Model	CDM	II (200 < 500 V)	JEDEC JESD22 C101-C

Typical Performance

Figure 1. - CGHV60075D5 G_{MAX} and K Factor vs. Frequency at Tcase = 25°C
V_{DD} = 50V, I_{DQ} = 125 mA



Product Ordering Information

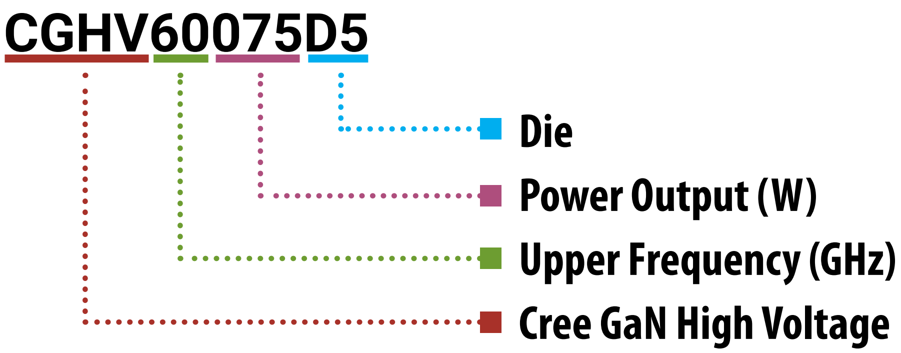
Order Number	Description	Unit of Measure	
CGHV60075D5	Bare Die	Each	

Typical Die S-Parameters (Small Signal, V_{DS} = 50 V, I_{DQ} = 125 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
0.5	0.93309	-154.44	14.266	88.053	0.014402	-0.85181	0.35448	-119.95
0.6	0.93352	-158.34	11.838	83.444	0.01433	-5.2391	0.3779	-122.32
0.7	0.93452	-161.14	10.06	79.434	0.014195	-9.0268	0.40373	-124.1
0.8	0.93586	-163.24	8.7019	75.832	0.014019	-12.407	0.43075	-125.62
0.9	0.93743	-164.87	7.6297	72.531	0.013813	-15.485	0.45814	-127.01
1	0.93917	-166.17	6.761	69.468	0.013583	-18.326	0.48532	-128.36
1.1	0.94101	-167.24	6.0431	66.6	0.013336	-20.972	0.51193	-129.69
1.2	0.94292	-168.13	5.4398	63.9	0.013076	-23.449	0.5377	-131
1.3	0.94485	-168.89	4.926	61.348	0.012806	-25.779	0.56247	-132.31
1.4	0.9468	-169.55	4.4834	58.931	0.01253	-27.974	0.58611	-133.6
1.5	0.94872	-170.12	4.0987	56.635	0.012249	-30.047	0.60859	-134.86
1.6	0.95062	-170.64	3.7616	54.451	0.011966	-32.007	0.62986	-136.11
1.7	0.95247	-171.1	3.4641	52.373	0.011683	-33.861	0.64994	-137.32
1.8	0.95426	-171.51	3.2003	50.392	0.011401	-35.619	0.66885	-138.51
1.9	0.956	-171.89	2.9648	48.503	0.011122	-37.283	0.68662	-139.66
2	0.95767	-172.24	2.7539	46.699	0.010846	-38.863	0.70331	-140.77
2.1	0.95926	-172.56	2.5641	44.976	0.010574	-40.36	0.71895	-141.85
2.2	0.96079	-172.86	2.3927	43.33	0.010307	-41.781	0.73359	-142.89
2.3	0.96225	-173.14	2.2375	41.754	0.010045	-43.13	0.74731	-143.9
2.4	0.96364	-173.41	2.0963	40.247	0.0097893	-44.411	0.76014	-144.87
2.5	0.96496	-173.65	1.9677	38.802	0.0095396	-45.629	0.77216	-145.8
2.6	0.96621	-173.89	1.8502	37.416	0.0092961	-46.787	0.78341	-146.7
2.7	0.9674	-174.11	1.7425	36.087	0.0090588	-47.888	0.79393	-147.57
2.8	0.96853	-174.32	1.6437	34.811	0.0088279	-48.935	0.80379	-148.4
2.9	0.96959	-174.52	1.5528	33.584	0.0086033	-49.933	0.81303	-149.2
3	0.9706	-174.71	1.4689	32.404	0.0083851	-50.882	0.82169	-149.97
3.2	0.97246	-175.07	1.3198	30.177	0.0079668	-52.647	0.83741	-151.43
3.4	0.97412	-175.4	1.1918	28.105	0.0075724	-54.252	0.85128	-152.78
3.6	0.97561	-175.71	1.081	26.175	0.0072005	-55.712	0.86354	-154.03
3.8	0.97695	-175.99	0.98461	24.373	0.0068495	-57.041	0.87439	-155.19
4	0.97815	-176.26	0.90032	22.681	0.0065185	-58.254	0.88404	-156.27
4.2	0.97923	-176.5	0.82619	21.091	0.0062057	-59.361	0.89265	-157.28
4.4	0.9802	-176.74	0.76072	19.592	0.0059099	-60.372	0.90034	-158.21
4.6	0.98108	-176.96	0.70262	18.175	0.0056299	-61.295	0.90725	-159.09
4.8	0.98187	-177.17	0.65085	16.832	0.0053644	-62.137	0.91345	-159.91
5	0.98259	-177.36	0.60454	15.558	0.0051122	-62.903	0.91905	-160.68
5.2	0.98324	-177.55	0.56297	14.343	0.0048724	-63.603	0.92411	-161.41
5.4	0.98383	-177.73	0.52552	13.185	0.0046441	-64.237	0.9287	-162.09
5.6	0.98437	-177.91	0.49168	12.078	0.0044262	-64.81	0.93287	-162.73
5.8	0.98487	-178.07	0.46099	11.017	0.0042182	-65.327	0.93667	-163.34
6	0.98532	-178.23	0.4331	9.9987	0.0040191	-65.79	0.94015	-163.92

To download the s-parameters in s2p format, go to the CGHV60075D5 Product Page and click the documentation tab.

Part Number System



Parameter	Value	Units
Upper Frequency[1]	6.0	GHz
Power Output	75	W
Package	Bare Die	-

Table 1.

Note[1]: 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 2H = 27.0 GHz

Table 2.

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