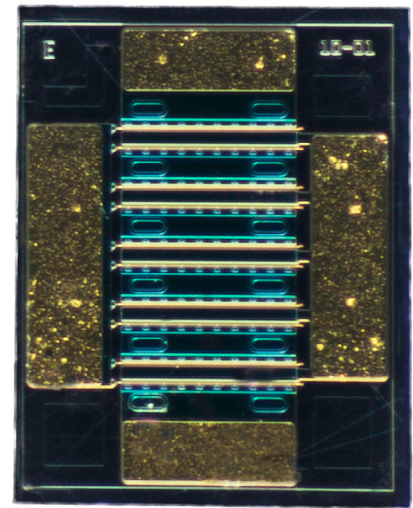# CG2H80015D

15 W, 8.0 GHz, GaN HEMT Die

Description

Wolfspeed's CG2H80015D 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.

PNs: CG2H80015D

Features

- 17 dB Typical Small Signal Gain at 4 GHz
- 12 dB Typical Small Signal Gain at 8 GHz
- 15 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
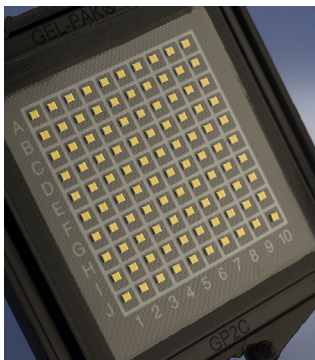
- Bare die are shipped in Gel-Pak® containers
- Non-adhesive tacky membrane immobilizes die during shipment

Large Signal Models Available for ADS and MWO

RoHS compliant

Absolute Maximum Ratings (not simultaneous) at 25ºC Case Temperature

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	V_{DSS}	120	V	25ºC
Gate-to-Source Voltage	V_{GS}	-10, +2		
Storage Temperature	T_{STG}	-65, +150	ºC	
Operating Junction Temperature	T_J	225		
Maximum Forward Gate Current	I_{GMAX}	4.0	mA	25ºC
Maximum Drain Current[1]	I_{DMAX}	1.5	A	
Thermal Resistance, Junction to Case (packaged)[2]	$R_{\theta JC}$	8.0	ºC/W	
Thermal Resistance, Junction to Case (die only)		5.1		
Mounting Temperature (30 seconds)	T_S	300	ºC	30 seconds

Notes:
[1] Current limit for long term, reliable operation
[2] Eutectic die attach using 80/20 AuSn mounted to a 40 mil thick CuMoCu carrier

Electrical Characteristics (Frequency = 4 GHz unless otherwise stated; T_C = 25ºC)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.0	-2.3	V_{DC}	V_{DS} = 10 V, I_D = 3.6 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	—	-2.7	—		V_{DD} = 28, I_{DQ} = 100 mA
Saturated Drain Current	I_{DS}	2.9	3.5	—	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BD}	84	—	—	V_{DC}	V_{GS} = -8 V, I_D = 3.6 mA
On Resistance	R_{ON}	—	0.67	—	Ω	V_{DS} = 0.1 V
Gate Forward Voltage	V_{G-ON}	—	1.9	—	V	I_{GS} = 3.6 mA
RF Characteristics						
Small Signal Gain	G_{SS}	—	17	—	dB	V_{DD} = 28 V, I_{DQ} = 100 mA
Output Power[1]	P_{SAT}	—	15	—	W	
Drain Efficiency[2]	η	—	65	—	%	V_{DD} = 28 V, I_{DQ} = 100 mA, P_{SAT} = 15 W
Intermodulation Distortion	IM3	—	-30	—	dBc	V_{DD} = 28 V, I_{DQ} = 100 mA, P_{OUT} = 15 W PEP
Output Mismatch Stress[3]	VSWR	—	—	10 : 1	Y	V_{DD} = 28 V, I_{DQ} = 100 mA, P_{OUT} = 15 W CW
Dynamic Characteristics						
Input Capacitance	C_{GS}	—	3.7	—	pF	V_{DS} = 28 V, V_{GS} = -8 V, f = 1 MHz
Output Capacitance	C_{DS}	—	1.1	—		
Feedback Capacitance	C_{GD}	—	0.2	—		

Notes:
[1] P_{SAT} is defined as I_G = 0.4 mA
[2] Drain Efficiency = P_{OUT} / P_{DC}
[3] No damage at all phase angles
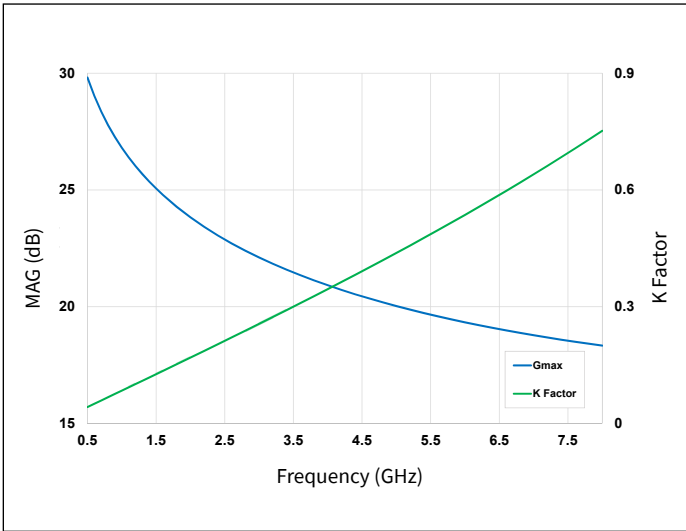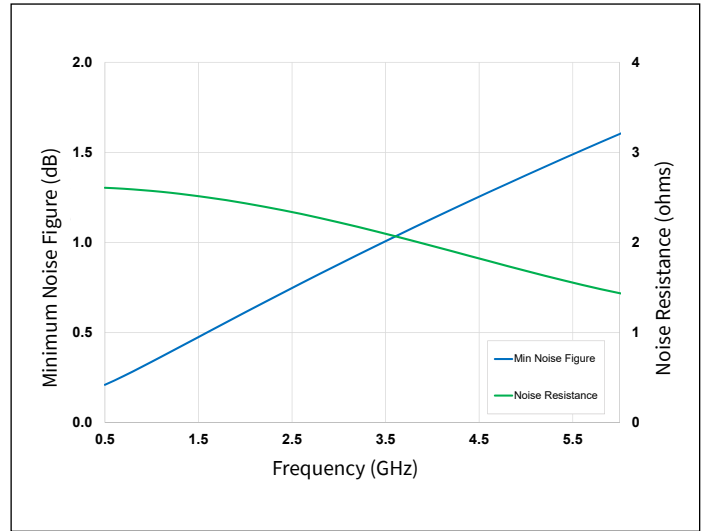
Electrostatic Discharge (ESD) Classifications

| Parameter	Symbol	Class	Classification Level	Test Methodology
Human Body Model	HBM	TBD	ANSI/ESDA/JEDEC JS-001 Table 3	JEDEC JESD22 A114-D

Typical Performance

Figure 1. Simulated Maximum Available Gain and K-Factor
V_{DD} = 28 V, I_{DQ} = 200 mA

Figure 2. Simulated Minimum Noise Figure and Noise Resistance vs. Frequency
V_{DD} = 28 V, I_{DQ} = 200 mA

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

Die Dimensions (units in microns)
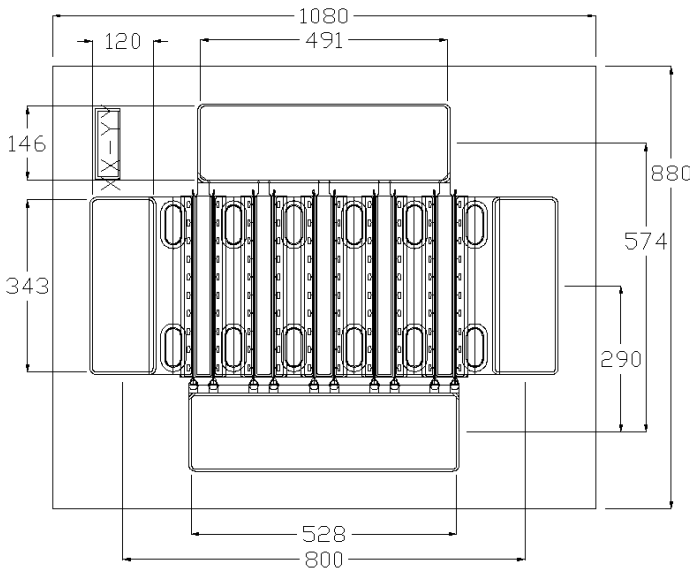
Assembly Notes:

- Recommended solder is AuSn (80/20) solder. Refer to Wolfspeed's website for the Eutectic Die Bond Procedure application note at https://www.wolfspeed.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 Package S-Parameters for CG2H80015D
(Small Signal, V_{DS} = 28 V, I_{DQ} = 100 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
0.5	0.909	-110.59	21.66	117.76	0.030	28.48	0.437	-96.69
0.6	0.900	-120.05	18.90	112.17	0.031	23.04	0.426	-105.26
0.7	0.893	-127.43	16.69	107.63	0.032	18.63	0.419	-111.87
0.8	0.889	-133.31	14.89	103.82	0.033	14.98	0.414	-117.03
0.9	0.885	-138.08	13.41	100.56	0.033	11.86	0.412	-121.10
1.0	0.883	-142.02	12.18	97.71	0.034	9.15	0.412	-124.36
1.1	0.881	-145.32	11.15	95.16	0.034	6.75	0.413	-126.99
1.2	0.880	-148.13	10.26	92.86	0.034	4.59	0.415	-129.14
1.3	0.879	-150.55	9.50	90.74	0.034	2.62	0.418	-130.90
1.4	0.879	-152.65	8.83	88.79	0.034	0.80	0.421	-132.37
1.5	0.879	-154.49	8.25	86.95	0.034	-0.89	0.425	-133.61
1.6	0.878	-156.12	7.73	85.23	0.034	-2.47	0.430	-134.65
1.8	0.879	-158.88	6.86	82.02	0.034	-5.38	0.440	-136.33
2.0	0.879	-161.14	6.15	79.08	0.034	-8.03	0.451	-137.62
2.2	0.880	-163.03	5.57	76.35	0.034	-10.48	0.463	-138.66
2.4	0.881	-164.63	5.07	73.77	0.033	-12.77	0.476	-139.54
2.6	0.883	-166.03	4.65	71.32	0.033	-14.93	0.489	-140.32
2.8	0.884	-167.26	4.28	68.98	0.033	-16.98	0.502	-141.04
3.0	0.886	-168.35	3.97	66.73	0.032	-18.94	0.516	-141.72
3.2	0.887	-169.34	3.69	64.57	0.032	-20.81	0.530	-142.39
3.4	0.889	-170.24	3.44	62.48	0.032	-22.61	0.543	-143.05
3.6	0.891	-171.07	3.21	60.45	0.031	-24.34	0.556	-143.71
3.8	0.893	-171.84	3.01	58.49	0.031	-26.01	0.570	-144.37
4.0	0.895	-172.57	2.83	56.59	0.030	-27.62	0.583	-145.03
4.2	0.896	-173.25	2.67	54.74	0.030	-29.17	0.595	-145.70
4.4	0.898	-173.90	2.52	52.94	0.030	-30.68	0.608	-146.37
4.6	0.900	-174.51	2.38	51.18	0.029	-32.14	0.620	-147.05
4.8	0.902	-175.11	2.26	49.48	0.029	-33.55	0.632	-147.73
5.0	0.904	-175.68	2.14	47.81	0.028	-34.91	0.643	-148.41
5.2	0.905	-176.23	2.04	46.19	0.028	-36.24	0.654	-149.09
5.4	0.907	-176.76	1.94	44.60	0.027	-37.52	0.665	-149.77
5.6	0.909	-177.28	1.85	43.06	0.027	-38.77	0.675	-150.45
5.8	0.910	-177.79	1.76	41.54	0.027	-39.98	0.685	-151.13
6.0	0.912	-178.29	1.68	40.07	0.026	-41.15	0.695	-151.81
6.2	0.914	-178.77	1.61	38.63	0.026	-42.29	0.704	-152.48
6.4	0.915	-179.25	1.54	37.21	0.025	-43.40	0.713	-153.14
6.6	0.917	-179.72	1.48	35.83	0.025	-44.47	0.722	-153.80
6.8	0.918	179.82	1.42	34.48	0.024	-45.52	0.730	-154.46
7.0	0.919	179.36	1.36	33.16	0.024	-46.53	0.738	-155.11
7.2	0.921	178.91	1.31	31.87	0.024	-47.51	0.745	-155.75
7.4	0.922	178.46	1.26	30.60	0.023	-48.47	0.753	-156.38
7.6	0.923	178.02	1.21	29.36	0.023	-49.40	0.760	-157.01
7.8	0.925	177.58	1.17	28.14	0.022	-50.30	0.767	-157.63
8.0	0.926	177.15	1.12	26.94	0.022	-51.18	0.773	-158.24

To download the s-parameters in s2p format, go to the CG2H80015D product page and click on the documentation tab.

Typical Package S-Parameters for CG2H80015D
(Small Signal, V_{DS} = 28 V, I_{DQ} = 200 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
0.5	0.914	-119.76	23.66	114.12	0.025	24.92	0.414	-115.65
0.6	0.908	-128.48	20.44	109.01	0.026	19.96	0.414	-123.32
0.7	0.903	-135.16	17.92	104.91	0.026	16.02	0.414	-128.96
0.8	0.900	-140.41	15.92	101.51	0.027	12.78	0.415	-133.20
0.9	0.898	-144.63	14.29	98.61	0.027	10.04	0.417	-136.45
1.0	0.896	-148.09	12.95	96.08	0.027	7.66	0.419	-138.97
1.1	0.895	-150.98	11.83	93.82	0.027	5.56	0.422	-140.95
1.2	0.894	-153.43	10.87	91.77	0.027	3.68	0.425	-142.52
1.3	0.894	-155.54	10.06	89.90	0.027	1.96	0.428	-143.78
1.4	0.893	-157.37	9.35	88.16	0.027	0.38	0.432	-144.79
1.5	0.893	-158.97	8.73	86.52	0.027	-1.09	0.436	-145.61
1.6	0.893	-160.39	8.18	84.98	0.027	-2.47	0.440	-146.29
1.8	0.893	-162.80	7.26	82.12	0.027	-5.02	0.448	-147.30
2.0	0.894	-164.77	6.51	79.48	0.027	-7.34	0.458	-148.00
2.2	0.894	-166.42	5.90	77.01	0.027	-9.49	0.468	-148.51
2.4	0.895	-167.84	5.38	74.67	0.027	-11.51	0.478	-148.89
2.6	0.896	-169.07	4.94	72.45	0.026	-13.41	0.489	-149.21
2.8	0.897	-170.15	4.56	70.31	0.026	-15.23	0.500	-149.49
3.0	0.898	-171.13	4.23	68.25	0.026	-16.97	0.511	-149.76
3.2	0.899	-172.01	3.93	66.25	0.026	-18.64	0.523	-150.03
3.4	0.900	-172.81	3.68	64.32	0.026	-20.24	0.534	-150.30
3.6	0.902	-173.55	3.44	62.44	0.025	-21.80	0.545	-150.59
3.8	0.903	-174.25	3.24	60.62	0.025	-23.30	0.557	-150.90
4.0	0.904	-174.90	3.05	58.83	0.025	-24.75	0.568	-151.23
4.2	0.906	-175.51	2.88	57.09	0.024	-26.16	0.579	-151.57
4.4	0.907	-176.09	2.72	55.40	0.024	-27.53	0.590	-151.94
4.6	0.908	-176.65	2.58	53.74	0.024	-28.86	0.601	-152.33
4.8	0.910	-177.19	2.45	52.11	0.023	-30.15	0.612	-152.73
5.0	0.911	-177.71	2.33	50.53	0.023	-31.40	0.622	-153.15
5.2	0.912	-178.21	2.22	48.97	0.023	-32.62	0.632	-153.59
5.4	0.913	-178.69	2.11	47.45	0.023	-33.81	0.642	-154.03
5.6	0.915	-179.17	2.02	45.96	0.022	-34.96	0.652	-154.49
5.8	0.916	-179.63	1.93	44.50	0.022	-36.08	0.661	-154.96
6.0	0.917	179.92	1.85	43.07	0.022	-37.17	0.670	-155.43
6.2	0.918	179.47	1.77	41.67	0.021	-38.22	0.679	-155.92
6.4	0.920	179.03	1.70	40.29	0.021	-39.25	0.688	-156.41
6.6	0.921	178.60	1.63	38.94	0.021	-40.25	0.696	-156.90
6.8	0.922	178.17	1.56	37.62	0.020	-41.22	0.704	-157.39
7.0	0.923	177.75	1.50	36.32	0.020	-42.17	0.712	-157.89
7.2	0.924	177.33	1.45	35.04	0.020	-43.09	0.720	-158.39
7.4	0.925	176.92	1.39	33.79	0.019	-43.98	0.727	-158.90
7.6	0.926	176.51	1.34	32.56	0.019	-44.85	0.734	-159.40
7.8	0.927	176.10	1.30	31.35	0.019	-45.69	0.741	-159.90
8.0	0.928	175.69	1.25	30.16	0.018	-46.51	0.747	-160.40

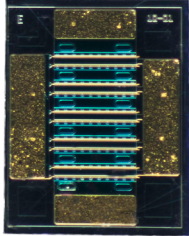To download the s-parameters in s2p format, go to the CG2H80015D product page and click on the documentation tab.

Typical Package S-Parameters for CG2H80015D
(Small Signal, V_{DS} = 28 V, I_{DQ} = 500 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
0.5	0.925	-129.48	24.00	109.96	0.020	20.87	0.401	-131.97
0.6	0.920	-137.20	20.52	105.38	0.020	16.47	0.406	-137.90
0.7	0.918	-143.01	17.88	101.74	0.021	13.01	0.411	-142.09
0.8	0.916	-147.53	15.81	98.73	0.021	10.18	0.414	-145.14
0.9	0.914	-151.13	14.15	96.16	0.021	7.79	0.418	-147.40
1.0	0.914	-154.07	12.79	93.91	0.021	5.73	0.421	-149.10
1.1	0.913	-156.52	11.66	91.90	0.021	3.90	0.424	-150.39
1.2	0.913	-158.60	10.71	90.08	0.021	2.26	0.428	-151.38
1.3	0.912	-160.38	9.89	88.39	0.021	0.76	0.431	-152.14
1.4	0.912	-161.93	9.19	86.83	0.021	-0.63	0.435	-152.72
1.5	0.912	-163.29	8.58	85.35	0.021	-1.92	0.439	-153.16
1.6	0.912	-164.49	8.04	83.95	0.021	-3.14	0.443	-153.50
1.8	0.912	-166.54	7.13	81.34	0.021	-5.38	0.451	-153.93
2.0	0.913	-168.23	6.40	78.92	0.021	-7.44	0.459	-154.16
2.2	0.913	-169.65	5.79	76.63	0.021	-9.36	0.468	-154.27
2.4	0.914	-170.87	5.29	74.46	0.021	-11.16	0.478	-154.31
2.6	0.914	-171.94	4.85	72.38	0.021	-12.87	0.488	-154.32
2.8	0.915	-172.89	4.48	70.38	0.020	-14.50	0.498	-154.32
3.0	0.916	-173.74	4.16	68.44	0.020	-16.07	0.508	-154.33
3.2	0.916	-174.52	3.87	66.56	0.020	-17.58	0.519	-154.36
3.4	0.917	-175.24	3.62	64.72	0.020	-19.03	0.529	-154.41
3.6	0.918	-175.91	3.39	62.94	0.020	-20.44	0.540	-154.49
3.8	0.919	-176.53	3.19	61.19	0.019	-21.80	0.550	-154.60
4.0	0.920	-177.12	3.01	59.49	0.019	-23.12	0.561	-154.75
4.2	0.921	-177.68	2.84	57.82	0.019	-24.41	0.571	-154.92
4.4	0.922	-178.21	2.69	56.19	0.019	-25.65	0.582	-155.12
4.6	0.923	-178.72	2.55	54.59	0.018	-26.86	0.592	-155.35
4.8	0.923	-179.21	2.43	53.03	0.018	-28.04	0.602	-155.61
5.0	0.924	-179.69	2.31	51.49	0.018	-29.18	0.612	-155.89
5.2	0.925	179.85	2.20	49.99	0.018	-30.29	0.622	-156.19
5.4	0.926	179.40	2.10	48.51	0.018	-31.37	0.631	-156.51
5.6	0.927	178.96	2.01	47.06	0.017	-32.41	0.640	-156.85
5.8	0.928	178.53	1.92	45.64	0.017	-33.43	0.649	-157.21
6.0	0.929	178.10	1.84	44.24	0.017	-34.42	0.658	-157.57
6.2	0.930	177.69	1.76	42.87	0.017	-35.37	0.667	-157.96
6.4	0.931	177.28	1.69	41.52	0.016	-36.30	0.675	-158.35
6.6	0.931	176.87	1.63	40.20	0.016	-37.21	0.683	-158.75
6.8	0.932	176.47	1.56	38.90	0.016	-38.08	0.691	-159.16
7.0	0.933	176.07	1.50	37.62	0.015	-38.93	0.699	-159.58
7.2	0.934	175.68	1.45	36.36	0.015	-39.75	0.707	-160.00
7.4	0.934	175.29	1.40	35.13	0.015	-40.54	0.714	-160.43
7.6	0.935	174.90	1.35	33.91	0.015	-41.31	0.721	-160.86
7.8	0.936	174.51	1.30	32.72	0.014	-42.05	0.728	-161.30
8.0	0.937	174.13	1.26	31.54	0.014	-42.77	0.734	-161.73

To download the s-parameters in s2p format, go to the CG2H80015D product page and click on the documentation tab.

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CG2H80015D	GaN HEMT Bare Die	Each	

For more information, please contact:

4600 Silicon Drive
Durham, NC 27703 USA
Tel: +1.919.313.5300
www.wolfspeed.com/RF

Sales Contact
RFSales@wolfspeed.com

RF Product Marketing Contact
RFMarketing@wolfspeed.com

Notes & Disclaimer

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