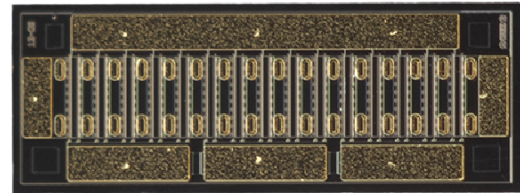# CG2H80045D

45 W, 8.0 GHz, GaN HEMT Die

Description

Wolfspeed's CG2H80045D 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: CG2H80045D

Features

- 15 dB Typical Small Signal Gain at 4 GHz
- 12 dB Typical Small Signal Gain at 8 GHz
- 45 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 25℃ 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}	12	mA	25ºC
Maximum Drain Current[1]	I_{DMAX}	4.5	A	
Thermal Resistance, Junction to Case (packaged)[2]	$R_{\theta JC}$	3.4	ºC/W	
Thermal Resistance, Junction to Case (die only)		2.1		85ºC
Mounting Temperature (30 seconds)	T_s	320	ºC	30 seconds

Notes:
[1] Current limit for long term, reliable operation
[2] Eutectic die attach using 80/20 AuSn mounted to a 60 mil thick CuMoCu carrier

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

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.1	-2.3	V_{DC}	V_{DS} = 10 V, I_D = 10.8 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	—	-2.7	—		V_{DD} = 28 V, I_{DQ} = 500 mA
Drain Current	I_{DSS}	7.8	10.8	—	A	V_{DS} = 6 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BD}	84	—	—	V	V_{GS} = -8 V, I_D = 10.8 mA
On Resistance	R_{ON}	—	0.24	—	Ω	V_{DS} = 0.10 V
Gate Forward Voltage	V_{G-ON}	—	1.0	—	V	I_{GS} = 10.8 mA
RF Characteristics						
Small Signal Gain	G_{SS}	—	15	—	dB	V_{DD} = 28 V, I_{DQ} = 500 mA
Saturated Output Power[1]	P_{SAT}	—	45	—	W	
Drain Efficiency[2]	η	—	65	—	%	V_{DD} = 28 V, I_{DQ} = 500 mA, P_{SAT} = 45 W
Intermodulation Distortion	IM3	—	-30	—	dBC	V_{DD} = 28 V, I_{DQ} = 500 mA, P_{OUT} = 45 W PEP
Output Mismatch Stress[3]	VSWR	—	—	10 : 1	Ψ	V_{DD} = 28 V, I_{DQ} = 500 mA, P_{OUT} = 45 W (CW)
Dynamic Characteristics						
Input Capacitance	C_{GS}	—	11.0	—	pF	V_{DS} = 28 V, V_{GS} = -8 V, f = 1 MHz
Output Capacitance	C_{DS}	—	3.0	—		
Feedback Capacitance	C_{GD}	—	0.7	—		

Notes:
[1] P_{SAT} is defined as I_G = 0.7 mA
[2] Drain Efficiency = P_{OUT} / P_{DC}
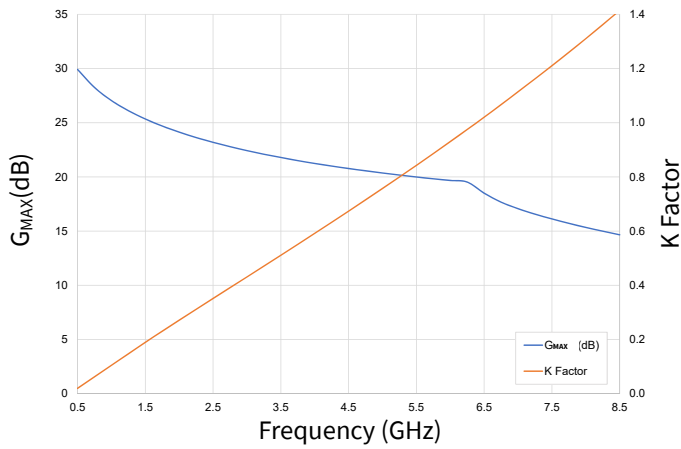[3] No damage at all phase angles

Typical Performance

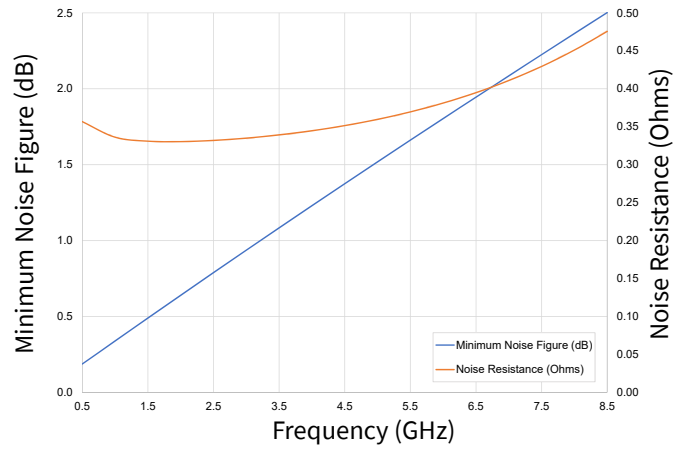**Figure 1.** Simulated Maximum Available Gain and K Factor
V_{DD} = 28 V, I_{DQ} = 500 mA

Figure 2. Simulated Minimum Noise Figure and
Noise Resistance vs. Frequency
V_{DD} = 28 V, I_{DQ} = 500 mA
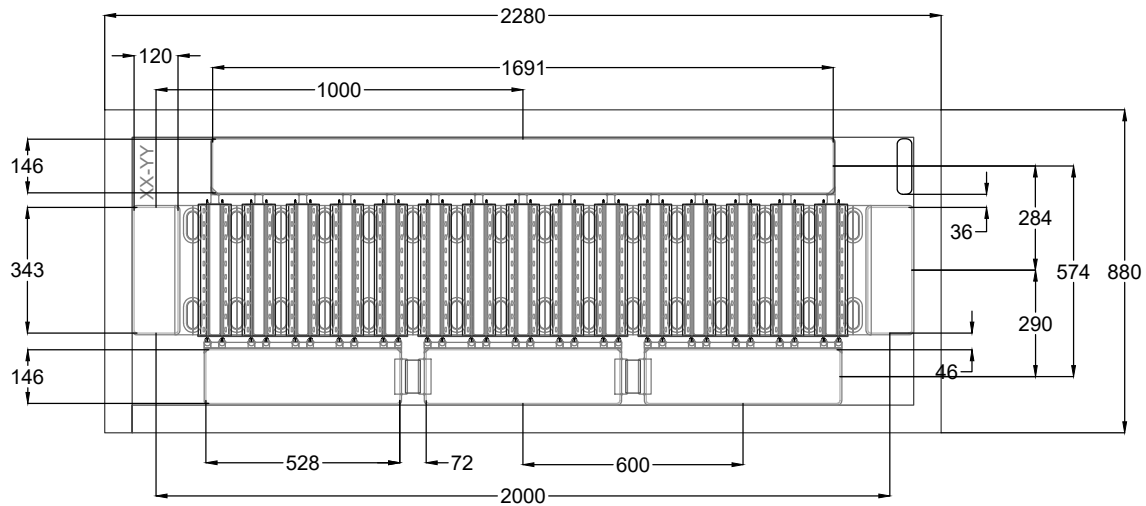
Intrinsic die parameters - reference planes at centers of gate and drain bonding pads. No wire bonds assumed.

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

Die Dimensions (units in microns)

- 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 CG2H80045D
(Small Signal, V_{DS} = 28 V, I_{DQ} = 250 mA, magnitude/angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
0.5	0.942	-164.275	10.729	92.353	0.013	1.630	0.703	-171.310
0.6	0.941	-166.816	8.953	90.072	0.013	-0.450	0.707	-172.076
0.7	0.941	-168.631	7.674	88.148	0.013	-2.145	0.710	-172.549
0.8	0.941	-169.989	6.709	86.448	0.013	-3.603	0.712	-172.837
0.9	0.942	-171.041	5.956	84.900	0.013	-4.907	0.715	-173.003
1.0	0.942	-171.880	5.351	83.460	0.013	-6.105	0.717	-173.083
1.2	0.942	-173.126	4.438	80.804	0.013	-8.293	0.722	-173.079
1.4	0.943	-174.005	3.782	78.348	0.013	-10.303	0.726	-172.944
1.6	0.943	-174.656	3.287	76.027	0.013	-12.197	0.731	-172.741
1.8	0.944	-175.155	2.900	73.808	0.013	-14.007	0.736	-172.506
2.0	0.945	-175.549	2.588	71.669	0.012	-15.749	0.742	-172.260
2.2	0.945	-175.868	2.331	69.599	0.012	-17.433	0.748	-172.017
2.4	0.946	-176.132	2.116	67.590	0.012	-19.064	0.754	-171.787
2.6	0.947	-176.354	1.932	65.636	0.012	-20.646	0.760	-171.576
2.8	0.948	-176.545	1.774	63.735	0.012	-22.181	0.766	-171.387
3.0	0.949	-176.711	1.637	61.884	0.012	-23.670	0.772	-171.222
3.2	0.950	-176.858	1.516	60.081	0.012	-25.116	0.779	-171.082
3.4	0.951	-176.989	1.409	58.324	0.011	-26.518	0.785	-170.966
3.6	0.952	-177.109	1.313	56.613	0.011	-27.877	0.792	-170.875
3.8	0.952	-177.218	1.227	54.946	0.011	-29.194	0.798	-170.808
4.0	0.953	-177.319	1.150	53.322	0.011	-30.470	0.804	-170.763
4.2	0.954	-177.414	1.080	51.740	0.011	-31.705	0.810	-170.739
4.4	0.955	-177.504	1.016	50.200	0.010	-32.900	0.816	-170.734
4.6	0.956	-177.589	0.958	48.699	0.010	-34.056	0.822	-170.748
4.8	0.957	-177.670	0.905	47.239	0.010	-35.174	0.828	-170.777
5.0	0.958	-177.748	0.856	45.816	0.010	-36.254	0.834	-170.822
5.2	0.959	-177.823	0.810	44.431	0.010	-37.298	0.839	-170.880
5.4	0.959	-177.897	0.769	43.081	0.010	-38.306	0.845	-170.951
5.6	0.960	-177.968	0.730	41.767	0.009	-39.280	0.850	-171.032
5.8	0.961	-178.037	0.694	40.487	0.009	-40.220	0.855	-171.123
6.0	0.962	-178.105	0.661	39.240	0.009	-41.127	0.859	-171.223
6.2	0.962	-178.171	0.630	38.025	0.009	-42.003	0.864	-171.330
6.4	0.963	-178.237	0.601	36.841	0.009	-42.848	0.869	-171.443
6.6	0.964	-178.301	0.574	35.687	0.008	-43.663	0.873	-171.563
6.8	0.964	-178.364	0.549	34.562	0.008	-44.449	0.877	-171.687
7.0	0.965	-178.426	0.525	33.465	0.008	-45.208	0.881	-171.816
7.2	0.966	-178.487	0.503	32.394	0.008	-45.940	0.885	-171.948
7.4	0.966	-178.547	0.482	31.350	0.008	-46.645	0.889	-172.083
7.6	0.967	-178.607	0.462	30.331	0.008	-47.326	0.892	-172.220
7.8	0.967	-178.666	0.444	29.336	0.007	-47.982	0.895	-172.360
8.0	0.968	-178.724	0.426	28.364	0.007	-48.614	0.899	-172.501

To download the s-parameters in s2p format, go to the CG2H80045D Product page and click on the documentation tab.
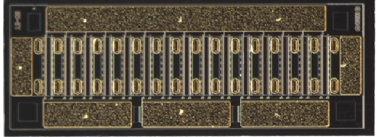
Typical Package S-Parameters for CG2H80045D
(Small Signal, V_{DS} = 28 V, I_{DQ} = 500 mA, magnitude/angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
0.5	0.948	-165.710	10.792	92.215	0.011	0.034	0.738	-172.689
0.6	0.949	-168.027	9.000	90.194	0.011	-1.754	0.742	-173.378
0.7	0.949	-169.687	7.713	88.498	0.011	-3.154	0.745	-173.832
0.8	0.949	-170.933	6.744	87.006	0.011	-4.321	0.747	-174.136
0.9	0.949	-171.903	5.988	85.652	0.011	-5.345	0.750	-174.337
1.0	0.950	-172.677	5.381	84.395	0.011	-6.274	0.751	-174.464
1.2	0.950	-173.835	4.469	82.076	0.011	-7.964	0.755	-174.572
1.4	0.950	-174.657	3.814	79.931	0.010	-9.522	0.758	-174.555
1.6	0.951	-175.269	3.321	77.900	0.010	-11.004	0.762	-174.464
1.8	0.951	-175.742	2.936	75.952	0.010	-12.436	0.765	-174.331
2.0	0.952	-176.118	2.626	74.068	0.010	-13.829	0.769	-174.174
2.2	0.952	-176.423	2.371	72.237	0.010	-15.189	0.773	-174.006
2.4	0.953	-176.677	2.158	70.452	0.010	-16.520	0.777	-173.835
2.6	0.953	-176.890	1.976	68.708	0.010	-17.824	0.781	-173.667
2.8	0.954	-177.074	1.820	67.003	0.010	-19.100	0.785	-173.507
3.0	0.954	-177.233	1.684	65.333	0.010	-20.349	0.790	-173.358
3.2	0.955	-177.373	1.564	63.698	0.010	-21.571	0.794	-173.221
3.4	0.956	-177.498	1.458	62.096	0.009	-22.765	0.799	-173.097
3.6	0.956	-177.611	1.363	60.527	0.009	-23.932	0.803	-172.988
3.8	0.957	-177.713	1.278	58.990	0.009	-25.071	0.808	-172.894
4.0	0.957	-177.807	1.202	57.484	0.009	-26.183	0.812	-172.814
4.2	0.958	-177.895	1.132	56.009	0.009	-27.266	0.817	-172.750
4.4	0.959	-177.976	1.069	54.565	0.009	-28.322	0.822	-172.699
4.6	0.959	-178.053	1.010	53.151	0.009	-29.349	0.826	-172.662
4.8	0.960	-178.126	0.957	51.766	0.009	-30.349	0.831	-172.639
5.0	0.960	-178.195	0.908	50.410	0.008	-31.321	0.835	-172.627
5.2	0.961	-178.262	0.863	49.083	0.008	-32.266	0.840	-172.628
5.4	0.962	-178.326	0.821	47.785	0.008	-33.184	0.844	-172.640
5.6	0.962	-178.388	0.782	46.513	0.008	-34.075	0.848	-172.661
5.8	0.963	-178.448	0.746	45.269	0.008	-34.940	0.852	-172.693
6.0	0.963	-178.507	0.712	44.051	0.008	-35.779	0.856	-172.733
6.2	0.964	-178.564	0.680	42.860	0.008	-36.592	0.860	-172.782
6.4	0.965	-178.621	0.651	41.693	0.007	-37.381	0.864	-172.838
6.6	0.965	-178.676	0.623	40.551	0.007	-38.144	0.868	-172.901
6.8	0.966	-178.730	0.597	39.434	0.007	-38.884	0.871	-172.970
7.0	0.966	-178.783	0.573	38.339	0.007	-39.600	0.875	-173.045
7.2	0.967	-178.836	0.550	37.268	0.007	-40.293	0.878	-173.125
7.4	0.967	-178.887	0.528	36.219	0.007	-40.963	0.882	-173.209
7.6	0.967	-178.939	0.508	35.192	0.007	-41.611	0.885	-173.298
7.8	0.968	-178.989	0.488	34.186	0.007	-42.238	0.888	-173.391
8.0	0.968	-179.039	0.470	33.200	0.006	-42.843	0.891	-173.487

To download the s-parameters in s2p format, go to the CG2H80045D Product page and click on the documentation tab.

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CG2H80045D	GaN HEMT Bare Die	Each	

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