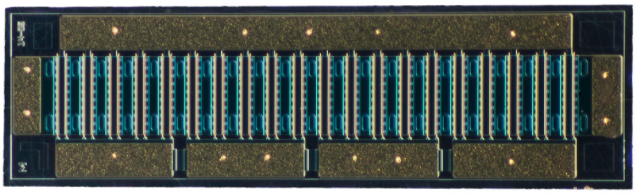
CG2H80060D

60 W, 8.0 GHz, GaN HEMT Die



PNs: CG2H80060D

Description

Wolfspeed's CG2H80060D 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

- 15 dB Typical Small Signal Gain at 4 GHz
- 12 dB Typical Small Signal Gain at 8 GHz
- 60 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

4600 Silicon Drive | Durham, NC 27703 | Tel: +1.919.313.5300

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

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	V_{DSS}	120	V	25°C
Gate-to-Source Voltage	V_{GS}	-10, +2		
Storage Temperature	T_{STG}	-65, +150	°C	
Operating Junction Temperature	T_J	225		
Maximum Forward Gate Current	I_{GMAX}	15	mA	25°C
Maximum Drain Current[1]	I_{DMAX}	6	A	
Thermal Resistance, Junction to Case (packaged)[2]	$R_{\theta JC}$	2.8	°C/W	
Thermal Resistance, Junction to Case (die only)		1.5		85°C
Mounting Temperature (30 seconds)	T_s	320	°C	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°C)

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 = 14.4 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	—	-2.7	—		V_{DD} = 28 V, I_{DQ} = 400 mA
Drain Current	I_{DSS}	11.6	14.0	—	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BD}	120	—	—	V	V_{GS} = -8 V, I_D = 14.4 mA
On Resistance	R_{ON}	—	0.17	—	Ω	V_{DS} = 0.10 V
Gate Forward Voltage	V_{G-ON}	—	1.9	—	V	I_{GS} = 14.4 mA
RF Characteristics						
Small Signal Gain	G_{SS}	—	15	—	dB	V_{DD} = 28 V, I_{DQ} = 400 mA
Saturated Output Power[1]	P_{SAT}	—	60	—	W	
Drain Efficiency[2]	η	—	65	—	%	V_{DD} = 28 V, I_{DQ} = 400 mA, P_{SAT} = 60 W
Intermodulation Distortion	IM3	—	-30	—	dBC	V_{DD} = 28 V, I_{DQ} = 400 mA, P_{OUT} = 60 W PEP
Output Mismatch Stress[3]	VSWR	—	—	10 : 1	Y	V_{DD} = 28 V, I_{DQ} = 400 mA, P_{OUT} = 60 W (CW)
Dynamic Characteristics						
Input Capacitance	C_{GS}	—	14.7	—	pF	V_{DS} = 28 V, V_{GS} = -8 V, f = 1 MHz
Output Capacitance	C_{DS}	—	4.4	—		
Feedback Capacitance	C_{GD}	—	0.8	—		

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

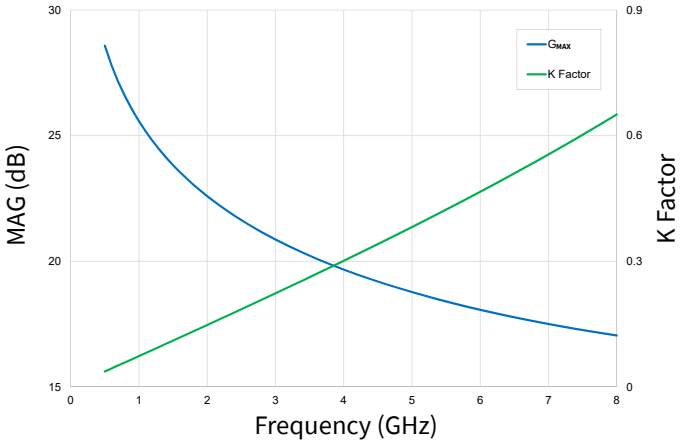


Figure 1. Simulated Maximum Available Gain and K Factor
V_{DD} = 28 V, I_{DQ} = 400 mA

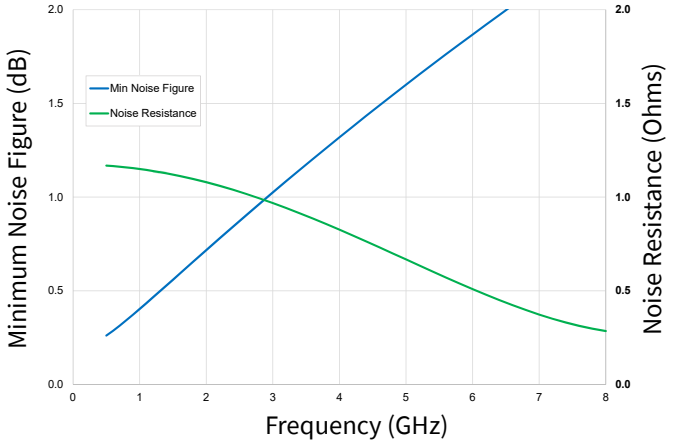


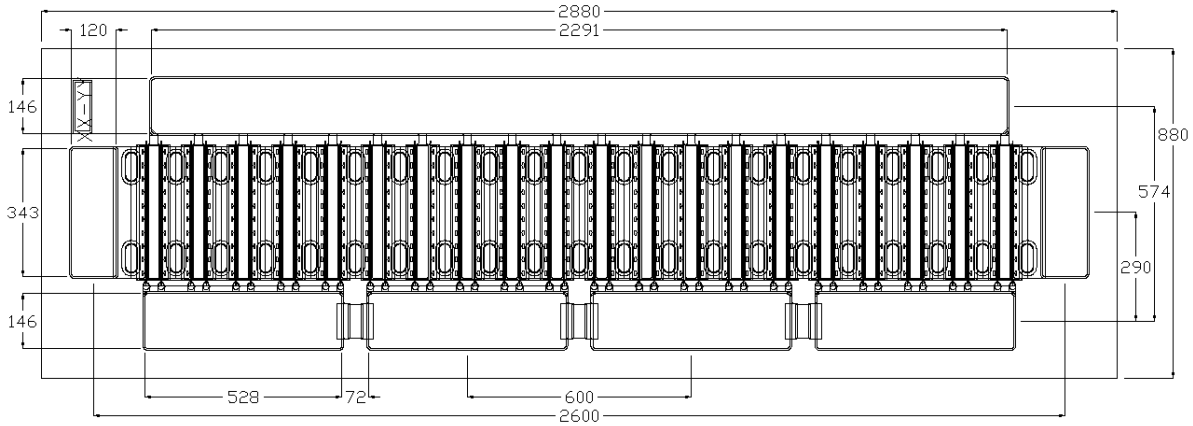
Figure2. Simulated Minimum Noise Figure and Noise Resistance vs. Frequency
V_{DD} = 28 V, I_{DQ} = 400 mA

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)



Overall die size 2880 x 880 (+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 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 CG2H80060D (Small Signal, V_{DS} = 28 V, I_{DQ} = 400 mA, magnitude/angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
0.5	0.940	-168.07	9.42	88.99	0.013	-0.29	0.735	-172.83
0.6	0.940	-169.98	7.85	86.72	0.013	-2.42	0.738	-173.30
0.7	0.941	-171.35	6.71	84.72	0.013	-4.27	0.740	-173.54
0.8	0.941	-172.36	5.86	82.90	0.013	-5.95	0.743	-173.64
0.9	0.941	-173.15	5.19	81.20	0.013	-7.51	0.745	-173.64
1.0	0.942	-173.77	4.66	79.58	0.013	-8.98	0.748	-173.59
1.1	0.942	-174.28	4.21	78.04	0.013	-10.38	0.750	-173.50
1.2	0.942	-174.70	3.85	76.54	0.013	-11.73	0.753	-173.38
1.3	0.943	-175.06	3.53	75.10	0.013	-13.03	0.756	-173.25
1.4	0.944	-175.36	3.26	73.69	0.013	-14.30	0.759	-173.10
1.5	0.944	-175.62	3.03	72.31	0.013	-15.53	0.763	-172.96
1.6	0.945	-175.85	2.82	70.97	0.012	-16.73	0.766	-172.81
1.8	0.946	-176.24	2.48	68.37	0.012	-19.04	0.773	-172.53
2.0	0.947	-176.55	2.20	65.86	0.012	-21.26	0.781	-172.28
2.2	0.949	-176.81	1.97	63.45	0.012	-23.38	0.788	-172.05
2.4	0.950	-177.03	1.78	61.12	0.012	-25.42	0.796	-171.87
2.6	0.952	-177.23	1.61	58.88	0.011	-27.37	0.803	-171.72
2.8	0.953	-177.41	1.47	56.72	0.011	-29.24	0.811	-171.61
3.0	0.955	-177.57	1.35	54.64	0.011	-31.03	0.819	-171.54
3.2	0.956	-177.73	1.24	52.63	0.011	-32.75	0.826	-171.50
3.4	0.958	-177.87	1.15	50.70	0.011	-34.39	0.833	-171.49
3.6	0.959	-178.02	1.06	48.84	0.010	-35.96	0.840	-171.51
3.8	0.960	-178.15	0.99	47.04	0.010	-37.46	0.847	-171.55
4.0	0.962	-178.28	0.92	45.32	0.010	-38.90	0.854	-171.61
4.2	0.963	-178.41	0.86	43.65	0.010	-40.27	0.860	-171.69
4.4	0.964	-178.54	0.80	42.05	0.009	-41.58	0.866	-171.78
4.6	0.965	-178.67	0.75	40.50	0.009	-42.83	0.871	-171.89
4.8	0.967	-178.79	0.71	39.01	0.009	-44.02	0.877	-172.01
5.0	0.968	-178.91	0.67	37.57	0.009	-45.16	0.882	-172.14
5.2	0.969	-179.03	0.63	36.18	0.009	-46.25	0.887	-172.27
5.4	0.970	-179.15	0.60	34.85	0.008	-47.29	0.892	-172.42
5.6	0.970	-179.27	0.56	33.55	0.008	-48.29	0.896	-172.57
5.8	0.971	-179.39	0.53	32.30	0.008	-49.23	0.900	-172.72
6.0	0.972	-179.51	0.51	31.10	0.008	-50.14	0.904	-172.87
6.2	0.973	-179.62	0.48	29.93	0.008	-51.00	0.908	-173.03
6.4	0.974	-179.74	0.46	28.80	0.008	-51.83	0.911	-173.19
6.6	0.974	-179.85	0.44	27.70	0.007	-52.62	0.915	-173.35
6.8	0.975	-179.96	0.42	26.64	0.007	-53.37	0.918	-173.51
7.0	0.976	179.92	0.40	25.62	0.007	-54.09	0.921	-173.67
7.2	0.976	179.81	0.38	24.62	0.007	-54.78	0.924	-173.83
7.4	0.977	179.70	0.36	23.65	0.007	-55.44	0.927	-173.98
7.6	0.977	179.59	0.35	22.71	0.007	-56.06	0.929	-174.14
7.8	0.978	179.48	0.33	21.80	0.006	-56.66	0.932	-174.30
8.0	0.978	179.37	0.32	20.91	0.006	-57.23	0.934	-174.45

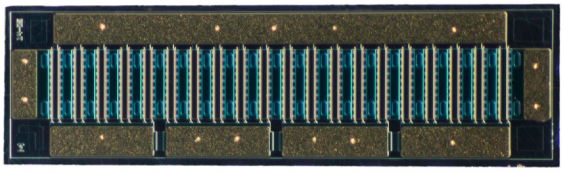
To download the s-parameters in s2p format, go to the CG2H80060D Product page and click on the documentation tab.

Typical Package S-Parameters for CG2H80060D (Small Signal, V_{DS} = 28 V, I_{DQ} = 800 mA, magnitude/angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
0.5	0.954	-169.58	9.41	89.35	0.010	0.14	0.772	-175.06
0.6	0.954	-171.29	7.84	87.37	0.010	-1.67	0.774	-175.40
0.7	0.954	-172.52	6.71	85.64	0.010	-3.25	0.775	-175.57
0.8	0.954	-173.44	5.86	84.06	0.010	-4.67	0.777	-175.64
0.9	0.954	-174.15	5.20	82.58	0.010	-5.99	0.778	-175.64
1.0	0.955	-174.73	4.67	81.19	0.010	-7.23	0.780	-175.60
1.1	0.955	-175.19	4.23	79.84	0.010	-8.41	0.782	-175.53
1.2	0.955	-175.58	3.86	78.55	0.010	-9.55	0.783	-175.44
1.3	0.955	-175.92	3.55	77.29	0.010	-10.65	0.785	-175.34
1.4	0.956	-176.20	3.29	76.06	0.010	-11.72	0.787	-175.23
1.5	0.956	-176.45	3.06	74.86	0.009	-12.76	0.789	-175.11
1.6	0.956	-176.66	2.85	73.68	0.009	-13.78	0.791	-174.99
1.8	0.957	-177.03	2.51	71.38	0.009	-15.75	0.796	-174.75
2.0	0.958	-177.32	2.24	69.16	0.009	-17.65	0.801	-174.51
2.2	0.959	-177.57	2.01	67.01	0.009	-19.49	0.806	-174.30
2.4	0.959	-177.79	1.82	64.92	0.009	-21.25	0.811	-174.10
2.6	0.960	-177.98	1.66	62.89	0.009	-22.96	0.816	-173.93
2.8	0.961	-178.15	1.53	60.91	0.009	-24.61	0.822	-173.78
3.0	0.962	-178.30	1.40	59.00	0.009	-26.21	0.827	-173.66
3.2	0.963	-178.44	1.30	57.14	0.008	-27.75	0.832	-173.56
3.4	0.964	-178.58	1.20	55.33	0.008	-29.23	0.838	-173.48
3.6	0.965	-178.71	1.12	53.57	0.008	-30.66	0.843	-173.43
3.8	0.966	-178.83	1.05	51.87	0.008	-32.03	0.848	-173.40
4.0	0.967	-178.95	0.98	50.22	0.008	-33.36	0.854	-173.38
4.2	0.967	-179.06	0.92	48.61	0.008	-34.63	0.859	-173.38
4.4	0.968	-179.17	0.86	47.06	0.008	-35.86	0.863	-173.40
4.6	0.969	-179.28	0.81	45.55	0.007	-37.04	0.868	-173.43
4.8	0.970	-179.39	0.77	44.08	0.007	-38.17	0.873	-173.47
5.0	0.971	-179.50	0.72	42.66	0.007	-39.25	0.877	-173.53
5.2	0.971	-179.61	0.69	41.28	0.007	-40.30	0.881	-173.60
5.4	0.972	-179.71	0.65	39.95	0.007	-41.30	0.886	-173.67
5.6	0.973	-179.82	0.62	38.65	0.007	-42.25	0.890	-173.75
5.8	0.973	-179.92	0.59	37.39	0.007	-43.17	0.893	-173.84
6.0	0.974	179.98	0.56	36.16	0.006	-44.05	0.897	-173.94
6.2	0.975	179.87	0.53	34.97	0.006	-44.90	0.901	-174.04
6.4	0.975	179.77	0.51	33.82	0.006	-45.70	0.904	-174.14
6.6	0.976	179.67	0.48	32.70	0.006	-46.48	0.907	-174.25
6.8	0.976	179.57	0.46	31.60	0.006	-47.21	0.910	-174.36
7.0	0.977	179.47	0.44	30.54	0.006	-47.92	0.913	-174.48
7.2	0.977	179.37	0.43	29.51	0.006	-48.60	0.916	-174.59
7.4	0.978	179.27	0.41	28.50	0.006	-49.24	0.919	-174.71
7.6	0.978	179.17	0.39	27.52	0.006	-49.86	0.921	-174.83
7.8	0.979	179.07	0.38	26.57	0.005	-50.45	0.924	-174.95
8.0	0.979	178.97	0.36	25.64	0.005	-51.01	0.926	-175.07

To download the s-parameters in s2p format, go to the CG2H80060D Product page and click on the documentation tab.

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CG2H80060D	GaN HEMT Bare Die	Each	

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