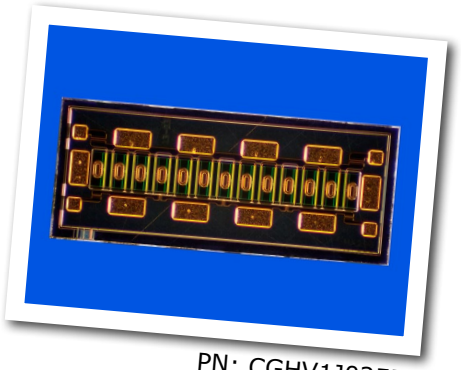
CGHV1J025D

25 W, 18.0 GHz, GaN HEMT Die

Cree's CGHV1J025D is a high voltage gallium nitride (GaN) High Electron Mobility Transistor (HEMT) on a silicon carbide substrate, using a 0.25 µm gate length fabrication process. This GaN-on-SiC product offers superior high frequency, high efficiency features. It is ideal for a variety of applications operating from 10 MHz to 18 GHz at 40 V with a high breakdown voltage.



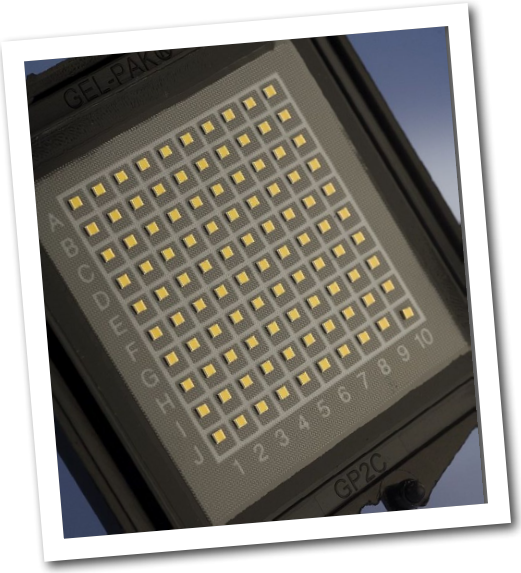
PN: CGHV1J025D

FEATURES

- 17 dB Typ. Small Signal Gain at 10 GHz
- 60% Typ. PAE at 10 GHz
- 25 W Typical Psat
- 40 V Operation
- Up to 18GHz Operation

APPLICATIONS

- Satellite Communications
- PTP Communications Links
- Marine Radar
- Pleasure Craft Radar
- Port Vessel Traffic Services
- Broadband Amplifiers
- High Efficiency Amplifiers



Packaging Information

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

Large Signal Models Available for SiC & GaN

Absolute Maximum Ratings (not simultaneous)

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	V_{DSS}	100	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 Forward Gate Current	I_{GMAX}	4.8	mA	25˚C
Maximum Drain Current[1]	I_{DMAX}	2.0	A	25˚C
Thermal Resistance, Junction to Case (packaged)[2]	$R_{\theta JC}$	5.83	˚C/W	85˚C
Thermal Resistance, Junction to Case (die only)[2]	$R_{\theta JC}$	3.91	˚C/W	85˚C
Mounting Temperature	T_S	320	˚C	30 seconds

Note[1] Current limit for long term reliable operation.
Note[2] Eutectic die attach using 0.5 mil thick 80/20 AuSn mounted to a 40 mil thick CMC carrier. Bottom of the CMC carrier fixed at 85°C and is at 19.2 W dissipated power.

Electrical Characteristics (Frequency = 10 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	V_{DS} = 10 V, I_D = 4.8 mA
Gate Quiescent Voltage	$V_{(GS)Q}$	–	-2.7	–	VDC	V_{DD} = 40 V, I_{DQ} = 240 mA
Saturated Drain Current[1]	I_{SAT}	3.8	4.3	–	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BD}	100	–	–	V	V_{GS} = -8 V, I_D = 4.8 mA
On Resistance	R_{ON}	–	0.6	–	Ω	V_{DS} = 0.1 V, V_{GS} = 0 V
Gate Forward Voltage	V_{G-ON}	–	1.85	–	V	I_{GS} = 4.8 mA
RF Characteristics						
Small Signal Gain	G_{SS}	–	17	–	dB	V_{DD} = 40 V, I_{DQ} = 240 mA
Saturated Power Output[1]	P_{SAT}	–	25	–	W	V_{DD} = 40 V, I_{DQ} = 240 mA
Drain Efficiency[2]	η	–	60	–	%	V_{DD} = 40 V, I_{DQ} = 240 mA
Intermodulation Distortion	IM3	–	-30	–	dBc	V_{DD} = 40 V, I_{DQ} = 240 mA, P_{OUT} = 25 W PEP
Output Mismatch Stress	VSWR	–	–	10 : 1	Ψ	No damage at all phase angles, V_{DD} = 40 V, I_{DQ} = 240 mA, P_{OUT} = 25 W CW
Dynamic Characteristics						
Input Capacitance	C_{GS}	–	5.1	–	pF	V_{DS} = 40 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance	C_{DS}	–	1.2	–	pF	V_{DS} = 40 V, V_{gs} = -8 V, f = 1 MHz
Feedback Capacitance	C_{GD}	–	0.16	–	pF	V_{DS} = 40 V, V_{gs} = -8 V, f = 1 MHz

Notes:
[1] Scaled from PCM unit cell.
[1] P_{SAT} is defined as I_G = 0.48 mA.
[2] Drain Efficiency = P_{OUT} / P_{DC}

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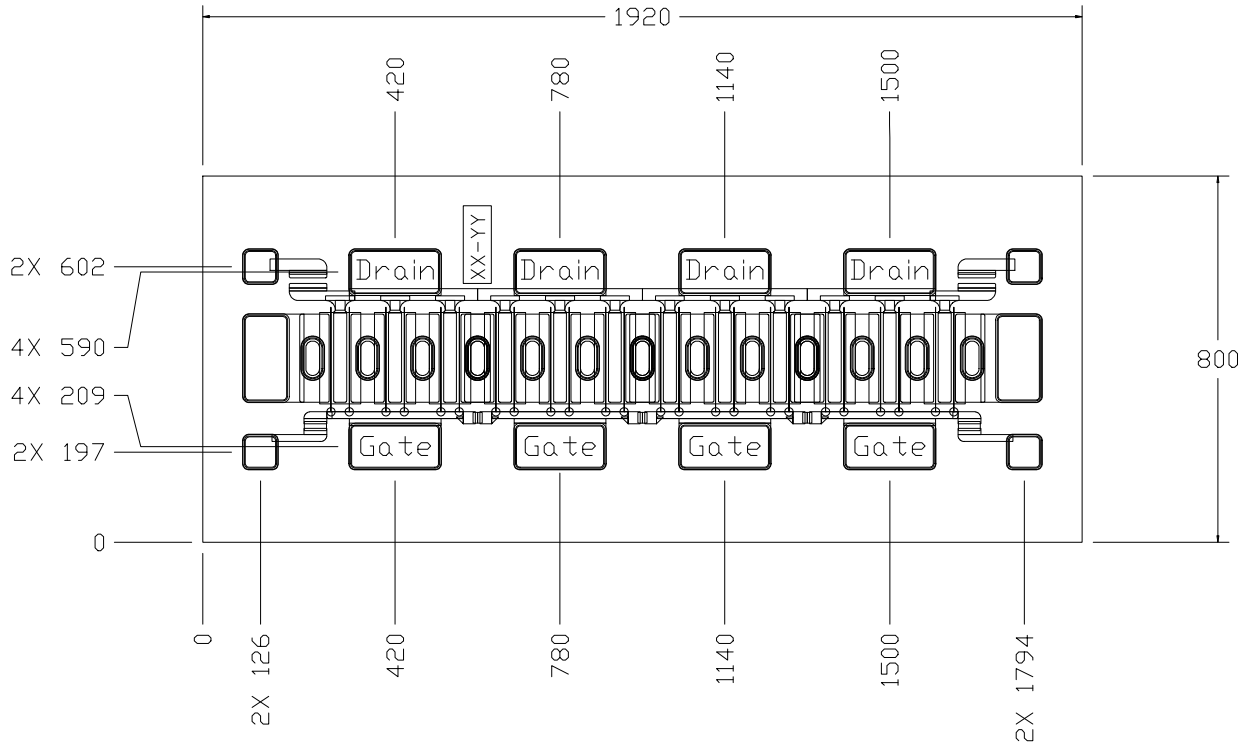
Die Dimensions (units in microns)



Overall die size 800 x 1920 (+0/-50) microns, die thickness 100 (+/-10) microns.
All Gate and Drain pads must be wire bonded for electrical connection.

Pad	Size (microns)
Drain	200 x 100
Gate	200 x 100
Interconnect	80 x 80

Assembly Notes:

- Recommended solder is AuSn (80/20) solder. Refer to Cree's website for the Eutectic Die Bond Procedure application note at http://www.cree.com/products/wireless_documents.asp
- 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.

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Gmax and K Factor

Figure 1. CGHV1J025D - Stability with Gmax and K Factor
V_{DD} = 40 V, I_{DS} = 120 mA

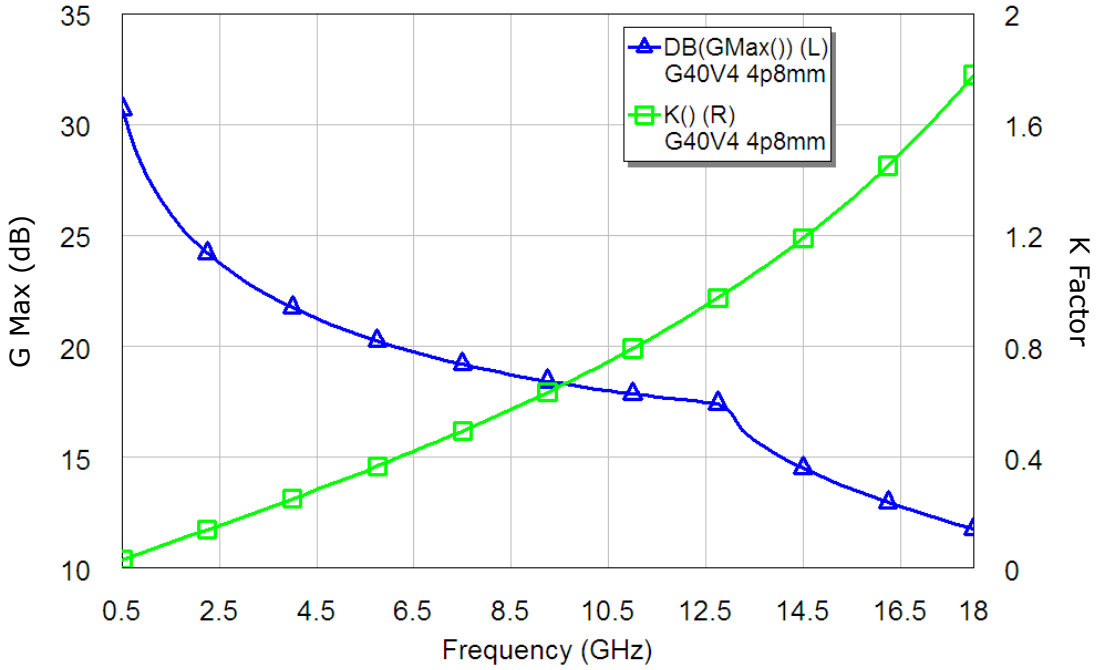
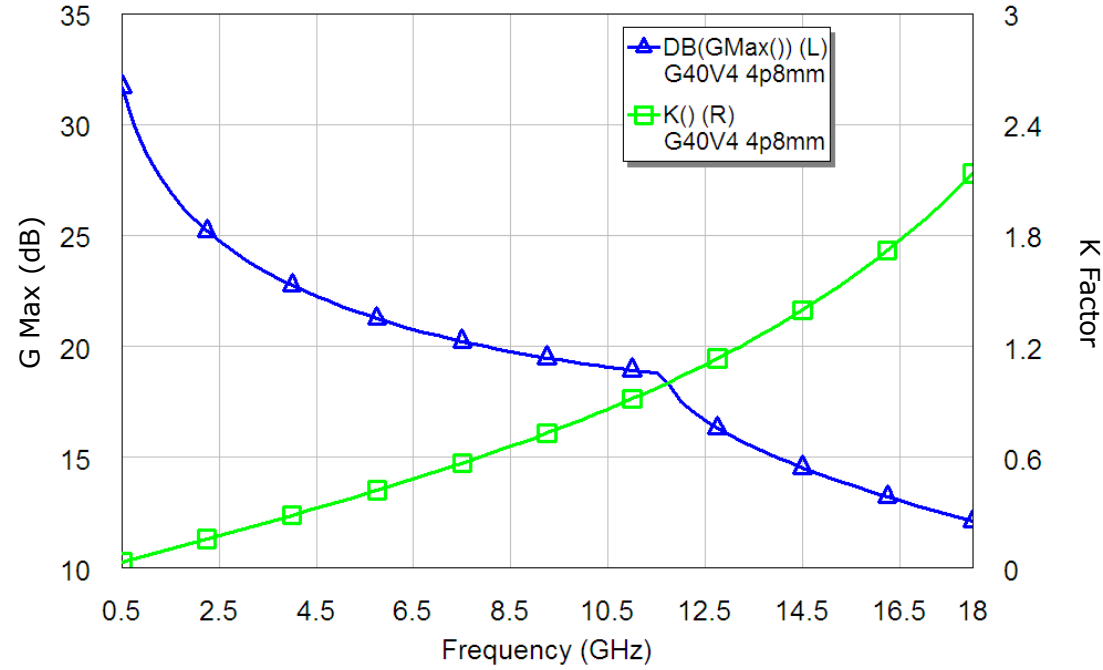


Figure 2. CGHV1J025D - Stability with Gmax and K Factor
V_{DD} = 40 V, I_{DS} = 240 mA



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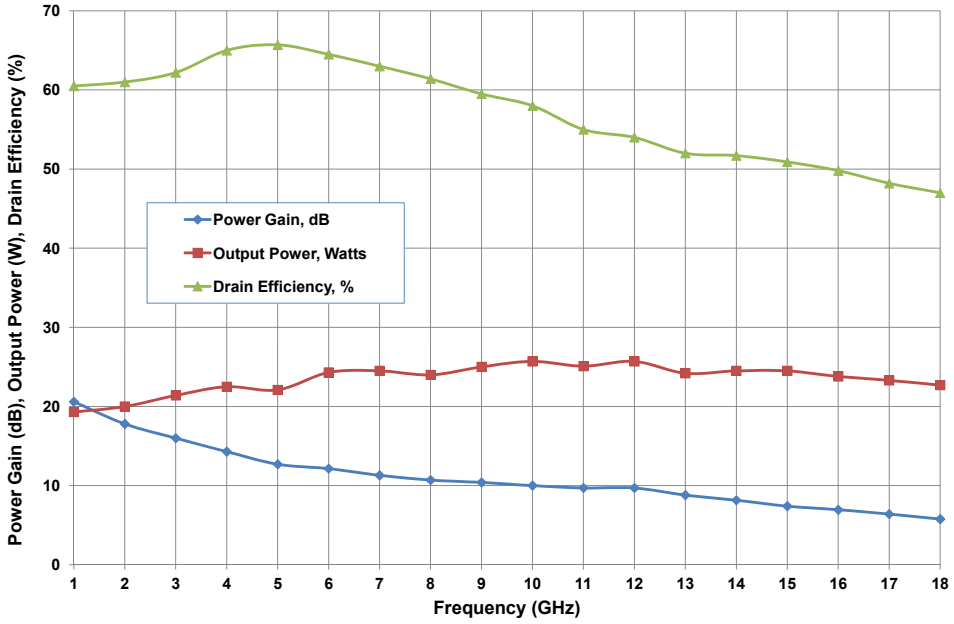
Source and Load Impedances

Frequency (GHz)	Source Impedance (ohms)	Load Impedance (ohms)	Series Gate Stability Resistor (ohms)
1.0	8.1 + j10.8	31.4 + j24.75	7.00
2.0	3.9 + j5.43	17.6 + j23.4	3.30
3.0	2.35 + j3.48	9.57 + j19.67	2.05
4.0	1.81 + j2.49	6.52 + j16.94	1.40
5.0	1.47 + j1.67	4.22 + j14.57	0.95
6.0	1.36 + j1.365	3.73 + j12.4	0.70
7.0	1.377 + j0.97	3.06 + j10.82	0.525
8.0	1.32 + j0.6	2.47 + j9.6	0.425
9.0	1.16 + j0.32	2.22 + j8.53	0.275
10.0	0.957 + j0.07	2.1 + j7.67	0.175
11.0	1 + j0.01	1.94 + j6.96	0.10
12.0	0.548 + j0.01	1.87 + j6.186	0.025
13.0	76 +j0	1.6 + j5.63	0
14.0	0.69 – j0.34	1.4 + j5.1	0
15.0	0.437 – j0.78	1.22 + j4.68	0
16.0	0.44 – j0.99	1.07 + j4.25	0
17.0	0.416 – j1.23	0.97 + j3.81	0
18.0	0.45 – j1.434	0.87 + j3.47	0

Table 1.

Note: V_{DD} = 40 V, I_{DQ} = 178 mA.

Figure 3. CGHV1J025D - Power Gain, Output Power and Drain Efficiency using Source and Load Pull Impedances (Series gate stability resistor values chosen to make K>1)



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Typical S-Parameters for CGHV1J025D
(Small Signal, V_{DS} = 40 V, I_{DQ} = 120 mA, angle in degrees)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
500 MHz	0.928	-124.66	23.24	109.88	0.020	20.43	0.360	-95.71
1.00 GHz	0.918	-150.14	12.40	91.05	0.021	2.17	0.361	-115.87
1.50 GHz	0.919	-159.38	8.19	80.38	0.021	-7.95	0.408	-122.40
2.00 GHz	0.922	-164.05	5.98	72.24	0.020	-15.53	0.466	-126.33
2.50 GHz	0.927	-166.89	4.61	65.39	0.020	-21.82	0.524	-129.70
3.00 GHz	0.932	-168.83	3.68	59.40	0.019	-27.25	0.579	-132.87
3.50 GHz	0.937	-170.28	3.01	54.08	0.018	-32.00	0.628	-135.88
4.00 GHz	0.942	-171.43	2.51	49.32	0.017	-36.21	0.671	-138.72
4.50 GHz	0.946	-172.38	2.12	45.03	0.016	-39.94	0.708	-141.37
5.00 GHz	0.950	-173.20	1.82	41.14	0.015	-43.26	0.741	-143.82
5.50 GHz	0.954	-173.92	1.57	37.61	0.014	-46.22	0.769	-146.08
6.00 GHz	0.957	-174.57	1.37	34.39	0.013	-48.87	0.793	-148.15
6.50 GHz	0.960	-175.16	1.20	31.45	0.013	-51.25	0.814	-150.06
7.00 GHz	0.962	-175.70	1.07	28.73	0.012	-53.39	0.832	-151.80
7.50 GHz	0.965	-176.19	0.95	26.23	0.011	-55.32	0.847	-153.41
8.00 GHz	0.966	-176.66	0.85	23.91	0.011	-57.07	0.861	-154.89
8.50 GHz	0.968	-177.10	0.77	21.74	0.010	-58.65	0.873	-156.25
9.00 GHz	0.970	-177.51	0.70	19.72	0.010	-60.09	0.883	-157.51
9.50 GHz	0.971	-177.90	0.63	17.83	0.009	-61.40	0.892	-158.68
10.00 GHz	0.972	-178.27	0.58	16.04	0.009	-62.59	0.900	-159.77
10.50 GHz	0.973	-178.63	0.53	14.36	0.008	-63.68	0.907	-160.78
11.00 GHz	0.974	-178.97	0.49	12.76	0.008	-64.67	0.914	-161.72
11.50 GHz	0.975	-179.30	0.45	11.25	0.008	-65.58	0.919	-162.61
12.00 GHz	0.976	-179.61	0.42	9.80	0.007	-66.42	0.924	-163.44
12.50 GHz	0.976	-179.92	0.39	8.42	0.007	-67.18	0.929	-164.22
13.00 GHz	0.977	179.78	0.36	7.10	0.007	-67.87	0.933	-164.96
13.50 GHz	0.977	179.49	0.34	5.83	0.006	-68.51	0.937	-165.65
14.00 GHz	0.978	179.21	0.32	4.61	0.006	-69.08	0.940	-166.31
14.50 GHz	0.978	178.93	0.30	3.44	0.006	-69.60	0.943	-166.94
15.00 GHz	0.979	178.66	0.28	2.30	0.006	-70.07	0.946	-167.53
15.25 GHz	0.979	178.53	0.27	1.75	0.005	-70.29	0.947	-167.82
15.50 GHz	0.979	178.40	0.26	1.20	0.005	-70.49	0.948	-168.10
15.75 GHz	0.979	178.26	0.26	0.67	0.005	-70.68	0.949	-168.37
16.00 GHz	0.979	178.13	0.25	0.14	0.005	-70.86	0.951	-168.64
16.25 GHz	0.979	178.00	0.24	-0.38	0.005	-71.03	0.952	-168.90
16.50 GHz	0.980	177.88	0.24	-0.89	0.005	-71.19	0.953	-169.16
16.75 GHz	0.980	177.75	0.23	-1.40	0.005	-71.33	0.954	-169.41
17.00 GHz	0.980	177.62	0.22	-1.89	0.005	-71.46	0.955	-169.65
17.25 GHz	0.980	177.50	0.22	-2.39	0.004	-71.58	0.955	-169.89
17.50 GHz	0.980	177.37	0.21	-2.87	0.004	-71.69	0.956	-170.13
17.75 GHz	0.980	177.25	0.21	-3.35	0.004	-71.78	0.957	-170.36
18.00 GHz	0.980	177.13	0.20	-3.82	0.004	-71.87	0.958	-170.58

To download the s-parameters in s2p format, go to the CGHV1J025D Product Page and click on the documentation tab.

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Typical S-Parameters for CGHV1J025D
(Small Signal, V_{DS} = 40 V, I_{DQ} = 240 mA, angle in degrees)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
500 MHz	0.936	-131.40	24.37	107.30	0.017	17.88	0.330	-112.72
1.00 GHz	0.928	-154.25	12.80	90.22	0.017	1.38	0.350	-128.83
1.50 GHz	0.929	-162.37	8.46	80.49	0.017	-7.76	0.396	-132.36
2.00 GHz	0.932	-166.47	6.19	72.98	0.017	-14.68	0.450	-134.10
2.50 GHz	0.935	-168.95	4.80	66.58	0.016	-20.49	0.504	-135.82
3.00 GHz	0.939	-170.65	3.85	60.92	0.015	-25.56	0.556	-137.73
3.50 GHz	0.943	-171.91	3.17	55.83	0.015	-30.06	0.603	-139.77
4.00 GHz	0.947	-172.91	2.65	51.23	0.014	-34.07	0.646	-141.86
4.50 GHz	0.950	-173.73	2.25	47.04	0.013	-37.67	0.684	-143.92
5.00 GHz	0.954	-174.45	1.93	43.22	0.013	-40.89	0.717	-145.91
5.50 GHz	0.957	-175.07	1.68	39.72	0.012	-43.79	0.746	-147.80
6.00 GHz	0.959	-175.64	1.47	36.51	0.011	-46.40	0.771	-149.58
6.50 GHz	0.962	-176.15	1.30	33.55	0.011	-48.75	0.793	-151.25
7.00 GHz	0.964	-176.63	1.15	30.82	0.010	-50.87	0.812	-152.81
7.50 GHz	0.966	-177.07	1.03	28.29	0.010	-52.79	0.829	-154.26
8.00 GHz	0.968	-177.48	0.92	25.93	0.009	-54.53	0.844	-155.62
8.50 GHz	0.969	-177.87	0.83	23.73	0.009	-56.11	0.857	-156.88
9.00 GHz	0.970	-178.25	0.76	21.67	0.008	-57.54	0.868	-158.05
9.50 GHz	0.972	-178.60	0.69	19.74	0.008	-58.84	0.878	-159.15
10.00 GHz	0.973	-178.94	0.63	17.91	0.008	-60.02	0.887	-160.17
10.50 GHz	0.974	-179.27	0.58	16.19	0.007	-61.10	0.895	-161.13
11.00 GHz	0.975	-179.58	0.54	14.55	0.007	-62.07	0.902	-162.04
11.50 GHz	0.975	-179.88	0.49	13.00	0.007	-62.96	0.909	-162.88
12.00 GHz	0.976	179.82	0.46	11.52	0.006	-63.76	0.914	-163.68
12.50 GHz	0.977	179.54	0.43	10.10	0.006	-64.49	0.919	-164.43
13.00 GHz	0.977	179.26	0.40	8.74	0.006	-65.14	0.924	-165.15
13.50 GHz	0.978	178.99	0.37	7.44	0.005	-65.72	0.928	-165.82
14.00 GHz	0.978	178.72	0.35	6.19	0.005	-66.24	0.932	-166.46
14.50 GHz	0.978	178.46	0.33	4.98	0.005	-66.70	0.936	-167.07
15.00 GHz	0.979	178.20	0.31	3.82	0.005	-67.09	0.939	-167.65
15.25 GHz	0.979	178.08	0.30	3.25	0.005	-67.26	0.940	-167.93
15.50 GHz	0.979	177.95	0.29	2.69	0.004	-67.42	0.942	-168.21
15.75 GHz	0.979	177.82	0.28	2.15	0.004	-67.57	0.943	-168.47
16.00 GHz	0.979	177.70	0.28	1.60	0.004	-67.69	0.944	-168.74
16.25 GHz	0.980	177.58	0.27	1.07	0.004	-67.81	0.945	-168.99
16.50 GHz	0.980	177.45	0.26	0.55	0.004	-67.90	0.947	-169.24
16.75 GHz	0.980	177.33	0.25	0.03	0.004	-67.99	0.948	-169.49
17.00 GHz	0.980	177.21	0.25	-0.48	0.004	-68.05	0.949	-169.73
17.25 GHz	0.980	177.09	0.24	-0.98	0.004	-68.10	0.950	-169.97
17.50 GHz	0.980	176.97	0.23	-1.48	0.004	-68.14	0.951	-170.20
17.75 GHz	0.980	176.85	0.23	-1.97	0.004	-68.15	0.952	-170.43
18.00 GHz	0.980	176.73	0.22	-2.45	0.003	-68.15	0.953	-170.65

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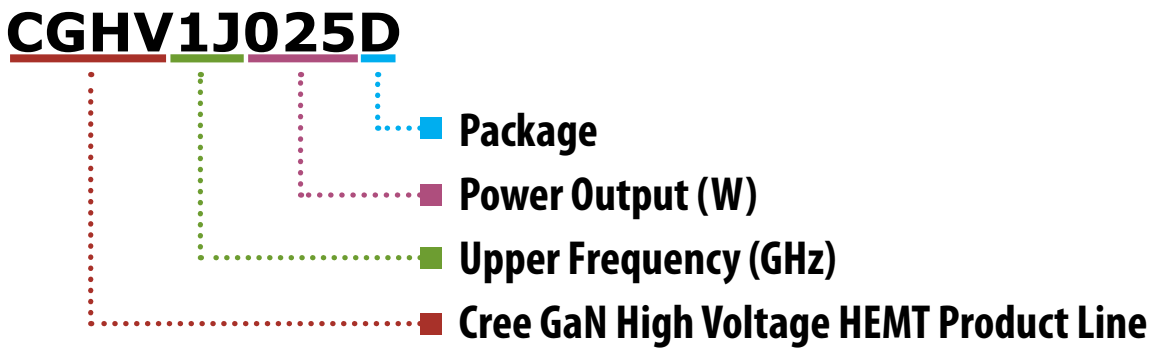
Part Number System



Parameter	Value	Units
Lower Frequency	DC	GHz
Upper Frequency[1]	18.0	GHz
Power Output	25	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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- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

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