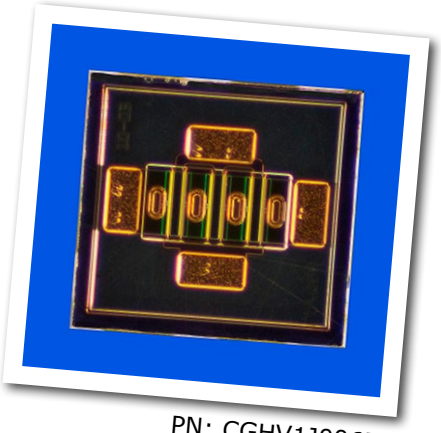
CGHV1J006D

6 W, 18.0 GHz, GaN HEMT Die

Cree's CGHV1J006D 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.



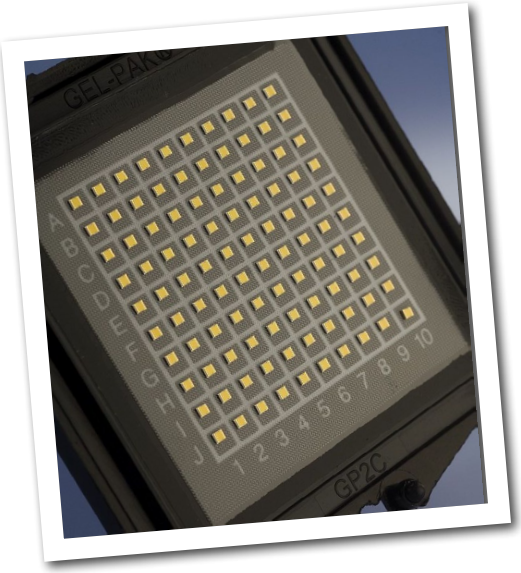
PN: CGHV1J006D

FEATURES

- 17 dB Typ. Small Signal Gain at 10 GHz
- 60% Typ. PAE at 10 GHz
- 6 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}	1.2	mA	25˚C
Maximum Drain Current[1]	I_{DMAX}	0.8	A	25˚C
Thermal Resistance, Junction to Case (packaged)[2]	$R_{\theta JC}$	17.5	˚C/W	85˚C
Thermal Resistance, Junction to Case (die only)[2]	$R_{\theta JC}$	13.2	˚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 80/20 AuSn mounted to a 40 mil thick CMC carrier.

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 = 1.2 mA
Gate Quiescent Voltage	$V_{(GS)Q}$	–	-2.7	–	VDC	V_{DD} = 40 V, I_{DQ} = 70 mA
Saturated Drain Current[1]	I_{SAT}	1.0	1.1	–	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 =1.2 mA
On Resistance	R_{ON}	–	2.3	–	Ω	V_{DS} = 0.1 V, V_{GS} = 0 V
Gate Forward Voltage	V_{G-ON}	–	1.85	–	V	I_{GS} = 1.2 mA
RF Characteristics						
Small Signal Gain	G_{SS}	–	17	–	dB	V_{DD} = 40 V, I_{DQ} = 70 mA
Saturated Power Output[1]	P_{SAT}	–	6	–	W	V_{DD} = 40 V, I_{DQ} = 70 mA
Drain Efficiency[2]	η	–	60	–	%	V_{DD} = 40 V, I_{DQ} = 70 mA
Intermodulation Distortion	IM3	–	-30	–	dBc	V_{DD} = 40 V, I_{DQ} = 70 mA, P_{OUT} = 6 W PEP
Output Mismatch Stress	VSWR	–	–	10 : 1	Ψ	No damage at all phase angles, V_{DD} = 40 V, I_{DQ} = 70 mA, P_{OUT} = 6 W CW
Dynamic Characteristics						
Input Capacitance	C_{GS}	–	2.0	–	pF	V_{DS} = 40 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance	C_{DS}	–	0.35	–	pF	V_{DS} = 40 V, V_{gs} = -8 V, f = 1 MHz
Feedback Capacitance	C_{GD}	–	0.5	–	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 = 0.12 mA.
[2] Drain Efficiency = P_{OUT} / P_{DC}

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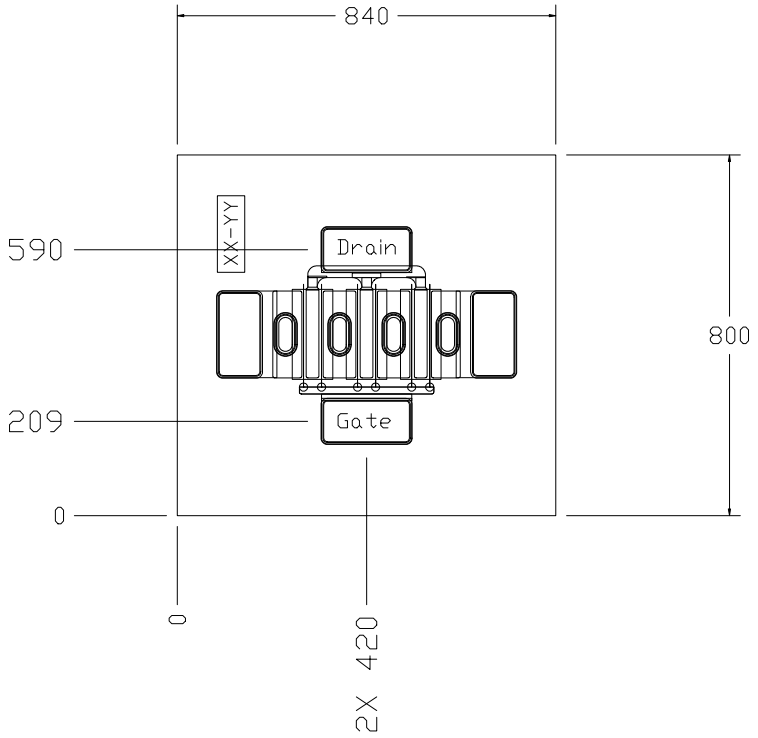
Die Dimensions (units in microns)



Overall die size 800 x 840 (+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

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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Figure 1. CGHV1J006D - Stability with Gmax and K Factor
V_{DD} = 40 V, I_{DS} = 30 mA

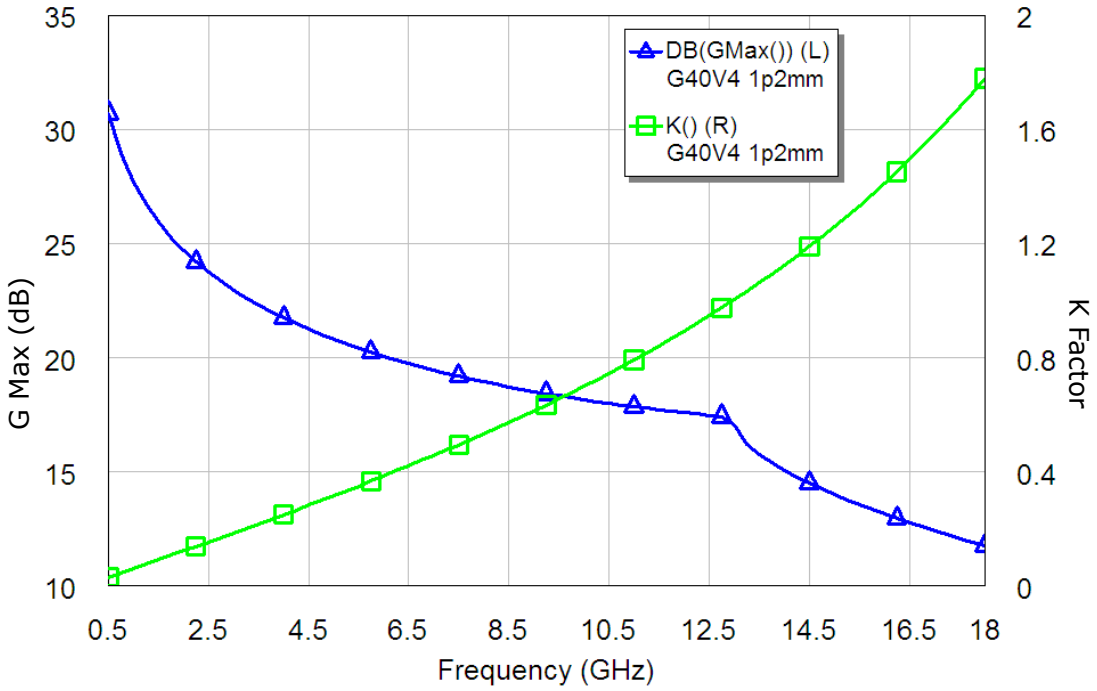
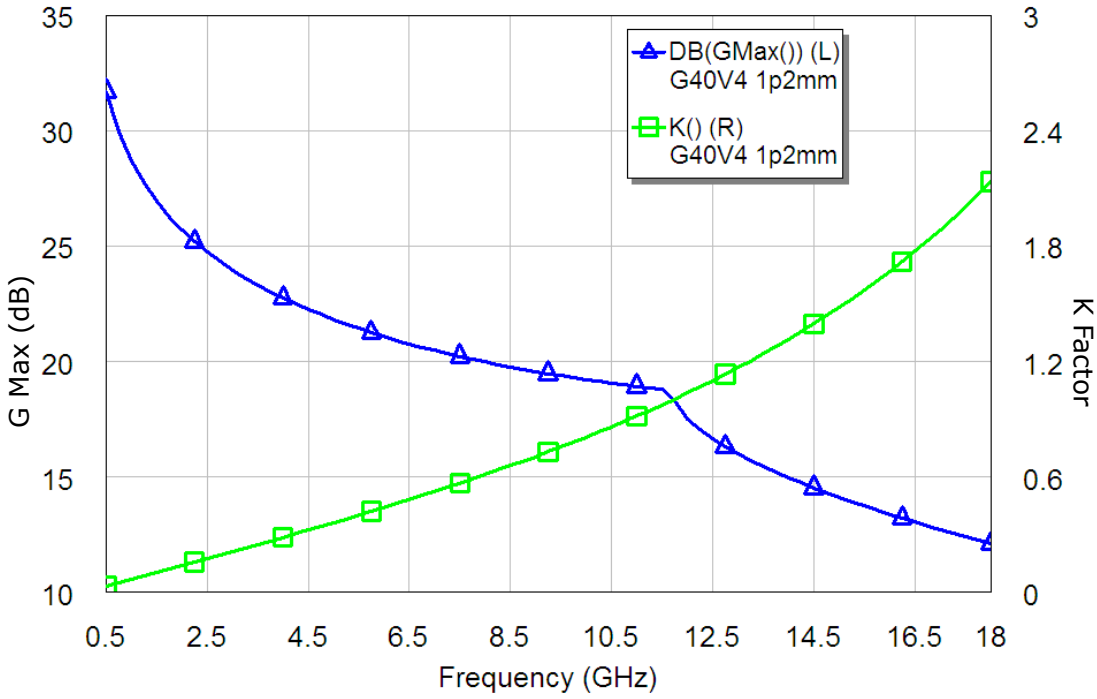


Figure 2. CGHV1J006D - Stability with Gmax and K Factor
V_{DD} = 40 V, I_{DS} = 60 mA



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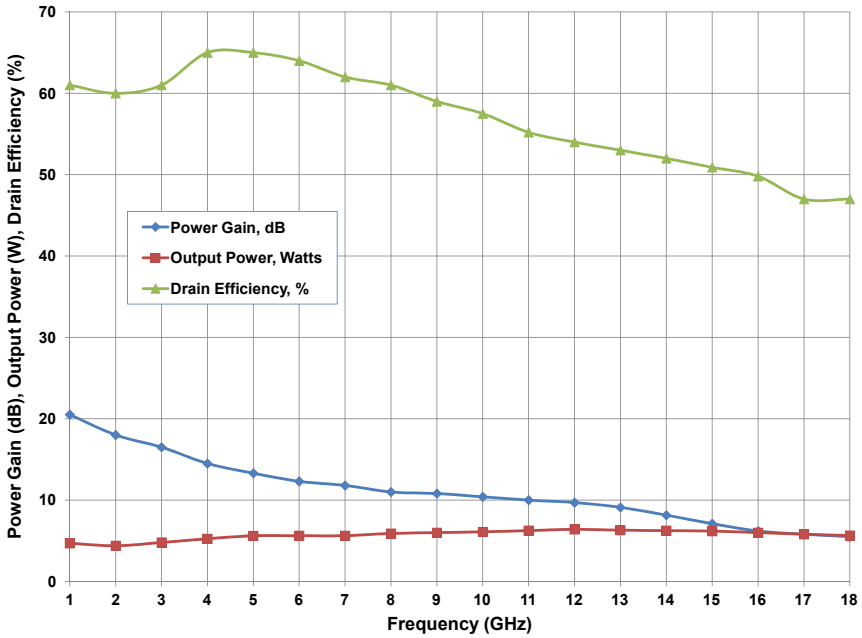
Source and Load Impedances

Frequency (GHz)	Source Impedance (ohms)	Load Impedance (ohms)	Series Gate Stability Resistor (ohms)
1.0	33.5 + j43.4	136.8 + j99	28.0
2.0	14.8 + j19.9	66.1 + j103.5	13.0
3.0	8.92 + j13.2	36.3 + j81.3	7.80
4.0	7.28 + j9.64	25 + j69.1	5.40
5.0	6.25 + j7.2	19.1 + j58	3.90
6.0	5.4 + j5.2	13.47 + j49.5	2.80
7.0	4.9 + j3.54	11 + j43.4	2.05
8.0	4.67 + j2.39	9.84 + j38.5	1.60
9.0	4 + j1.21	8.76 + j34.2	1.10
10.0	3.56 + j0.155	7.93 + j30.75	0.73
11.0	3.2 – j0.226	7.68 + j27.87	0.40
12.0	1.7 – j0.35	7.36 + j24.8	0.15
13.0	1.68 – j1.27	6.76 + j23	0
14.0	1.73 – j2.18	5.59 +j20.5	0
15.0	1.99 – j3.04	4.88 + j18.76	0
16.0	2.41 – j3.89	4.27 + j17.11	0
17.0	1.72 – j4.84	3.9 + j15.26	0
18.0	2.1 – j5.71	3.4 + j14	0

Table 1.

Note: V_{DD} = 40 V, I_{DQ} = 45 mA.

Figure 3. CGHV1J006D - 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 CGHV1J006D
(Small Signal, V_{DS} = 40 V, I_{DQ} = 30 mA, angle in degrees)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
500 MHz	0.987	-38.19	15.03	156.70	0.013	67.25	0.827	-13.92
1.00 GHz	0.962	-69.56	12.91	137.32	0.022	48.44	0.769	-25.11
1.50 GHz	0.940	-92.69	10.74	122.53	0.027	34.21	0.717	-33.51
2.00 GHz	0.925	-109.31	8.96	111.22	0.030	23.46	0.681	-40.24
2.50 GHz	0.915	-121.46	7.56	102.25	0.032	15.04	0.660	-46.13
3.00 GHz	0.910	-130.61	6.48	94.83	0.033	8.18	0.649	-51.59
3.50 GHz	0.906	-137.71	5.63	88.46	0.033	2.38	0.646	-56.81
4.00 GHz	0.904	-143.40	4.95	82.85	0.033	-2.67	0.647	-61.83
4.50 GHz	0.903	-148.06	4.39	77.79	0.033	-7.17	0.651	-66.69
5.00 GHz	0.903	-151.98	3.93	73.16	0.033	-11.24	0.658	-71.37
5.50 GHz	0.903	-155.34	3.54	68.86	0.032	-14.97	0.666	-75.87
6.00 GHz	0.904	-158.26	3.21	64.84	0.032	-18.42	0.675	-80.19
6.50 GHz	0.904	-160.85	2.93	61.05	0.031	-21.64	0.685	-84.33
7.00 GHz	0.905	-163.18	2.68	57.46	0.030	-24.66	0.695	-88.30
7.50 GHz	0.906	-165.28	2.47	54.05	0.030	-27.50	0.706	-92.09
8.00 GHz	0.908	-167.22	2.27	50.79	0.029	-30.19	0.716	-95.71
8.50 GHz	0.909	-169.00	2.11	47.66	0.028	-32.73	0.726	-99.18
9.00 GHz	0.910	-170.67	1.95	44.67	0.027	-35.14	0.736	-102.49
9.50 GHz	0.911	-172.24	1.82	41.78	0.027	-37.44	0.746	-105.65
10.00 GHz	0.912	-173.72	1.70	39.01	0.026	-39.63	0.755	-108.67
10.50 GHz	0.914	-175.12	1.59	36.33	0.025	-41.71	0.764	-111.56
11.00 GHz	0.915	-176.47	1.49	33.74	0.024	-43.70	0.773	-114.33
11.50 GHz	0.916	-177.75	1.40	31.23	0.024	-45.60	0.781	-116.99
12.00 GHz	0.917	-179.00	1.31	28.80	0.023	-47.41	0.788	-119.53
12.50 GHz	0.918	179.80	1.24	26.45	0.022	-49.15	0.796	-121.97
13.00 GHz	0.919	178.64	1.17	24.16	0.021	-50.81	0.803	-124.31
13.50 GHz	0.920	177.51	1.10	21.94	0.021	-52.40	0.809	-126.57
14.00 GHz	0.921	176.41	1.05	19.78	0.020	-53.91	0.816	-128.74
14.50 GHz	0.922	175.33	0.99	17.67	0.019	-55.37	0.822	-130.82
15.00 GHz	0.922	174.27	0.94	15.62	0.019	-56.75	0.827	-132.84
15.25 GHz	0.923	173.75	0.92	14.61	0.018	-57.42	0.830	-133.82
15.50 GHz	0.923	173.24	0.90	13.62	0.018	-58.08	0.833	-134.78
15.75 GHz	0.923	172.73	0.87	12.64	0.017	-58.71	0.835	-135.73
16.00 GHz	0.924	172.22	0.85	11.66	0.017	-59.34	0.838	-136.66
16.25 GHz	0.924	171.72	0.83	10.70	0.017	-59.95	0.840	-137.57
16.50 GHz	0.924	171.22	0.81	9.75	0.016	-60.54	0.843	-138.47
16.75 GHz	0.925	170.72	0.79	8.81	0.016	-61.12	0.845	-139.36
17.00 GHz	0.925	170.23	0.78	7.88	0.016	-61.68	0.847	-140.23
17.25 GHz	0.925	169.74	0.76	6.96	0.015	-62.23	0.849	-141.09
17.50 GHz	0.926	169.26	0.74	6.05	0.015	-62.77	0.851	-141.93
17.75 GHz	0.926	168.77	0.72	5.15	0.015	-63.29	0.853	-142.76
18.00 GHz	0.926	168.29	0.71	4.26	0.015	-63.79	0.855	-143.58

To download the s-parameters in s2p format, go to the CGHV1J006D Product Page and click on the documentation tab.

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Typical S-Parameters for CGHV1J006D
(Small Signal, V_{DS} = 40 V, I_{DQ} = 60 mA, angle in degrees)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
500 MHz	0.984	-43.78	18.23	153.94	0.012	64.52	0.776	-15.67
1.00 GHz	0.956	-77.79	15.10	133.43	0.020	44.60	0.706	-27.34
1.50 GHz	0.935	-101.29	12.21	118.66	0.025	30.42	0.650	-35.52
2.00 GHz	0.922	-117.38	9.99	107.78	0.027	20.12	0.616	-41.92
2.50 GHz	0.914	-128.78	8.34	99.30	0.028	12.23	0.598	-47.57
3.00 GHz	0.909	-137.20	7.10	92.33	0.029	5.85	0.590	-52.89
3.50 GHz	0.906	-143.67	6.14	86.37	0.029	0.48	0.590	-58.01
4.00 GHz	0.905	-148.80	5.38	81.10	0.029	-4.20	0.594	-62.98
4.50 GHz	0.904	-153.01	4.76	76.33	0.028	-8.37	0.601	-67.78
5.00 GHz	0.904	-156.53	4.26	71.95	0.028	-12.16	0.610	-72.42
5.50 GHz	0.905	-159.55	3.84	67.88	0.028	-15.63	0.620	-76.88
6.00 GHz	0.905	-162.19	3.48	64.05	0.027	-18.86	0.631	-81.15
6.50 GHz	0.906	-164.52	3.17	60.43	0.027	-21.87	0.643	-85.25
7.00 GHz	0.907	-166.62	2.90	56.99	0.026	-24.70	0.655	-89.17
7.50 GHz	0.908	-168.54	2.67	53.70	0.025	-27.38	0.667	-92.91
8.00 GHz	0.909	-170.29	2.46	50.56	0.025	-29.90	0.679	-96.48
8.50 GHz	0.910	-171.92	2.28	47.54	0.024	-32.30	0.691	-99.90
9.00 GHz	0.912	-173.45	2.12	44.63	0.023	-34.58	0.702	-103.16
9.50 GHz	0.913	-174.89	1.97	41.83	0.023	-36.75	0.713	-106.27
10.00 GHz	0.914	-176.25	1.84	39.12	0.022	-38.81	0.724	-109.25
10.50 GHz	0.915	-177.55	1.72	36.51	0.021	-40.78	0.734	-112.10
11.00 GHz	0.916	-178.80	1.62	33.97	0.021	-42.65	0.744	-114.83
11.50 GHz	0.917	180.00	1.52	31.52	0.020	-44.44	0.753	-117.45
12.00 GHz	0.918	178.84	1.43	29.14	0.019	-46.14	0.762	-119.96
12.50 GHz	0.919	177.72	1.35	26.82	0.019	-47.77	0.770	-122.37
13.00 GHz	0.920	176.62	1.27	24.57	0.018	-49.31	0.778	-124.68
13.50 GHz	0.921	175.56	1.20	22.38	0.017	-50.79	0.786	-126.90
14.00 GHz	0.922	174.52	1.14	20.25	0.017	-52.19	0.793	-129.05
14.50 GHz	0.922	173.49	1.08	18.16	0.016	-53.52	0.800	-131.11
15.00 GHz	0.923	172.49	1.03	16.13	0.015	-54.78	0.806	-133.10
15.25 GHz	0.923	172.00	1.00	15.14	0.015	-55.38	0.810	-134.07
15.50 GHz	0.924	171.51	0.98	14.15	0.015	-55.97	0.813	-135.02
15.75 GHz	0.924	171.02	0.95	13.18	0.015	-56.53	0.816	-135.96
16.00 GHz	0.924	170.54	0.93	12.21	0.014	-57.09	0.818	-136.88
16.25 GHz	0.925	170.06	0.91	11.26	0.014	-57.62	0.821	-137.79
16.50 GHz	0.925	169.58	0.89	10.32	0.014	-58.13	0.824	-138.68
16.75 GHz	0.925	169.11	0.87	9.38	0.013	-58.63	0.827	-139.55
17.00 GHz	0.926	168.63	0.85	8.46	0.013	-59.11	0.829	-140.42
17.25 GHz	0.926	168.16	0.83	7.54	0.013	-59.57	0.832	-141.27
17.50 GHz	0.926	167.70	0.81	6.64	0.012	-60.02	0.834	-142.10
17.75 GHz	0.926	167.23	0.79	5.74	0.012	-60.44	0.836	-142.93
18.00 GHz	0.927	166.77	0.78	4.86	0.012	-60.84	0.839	-143.74

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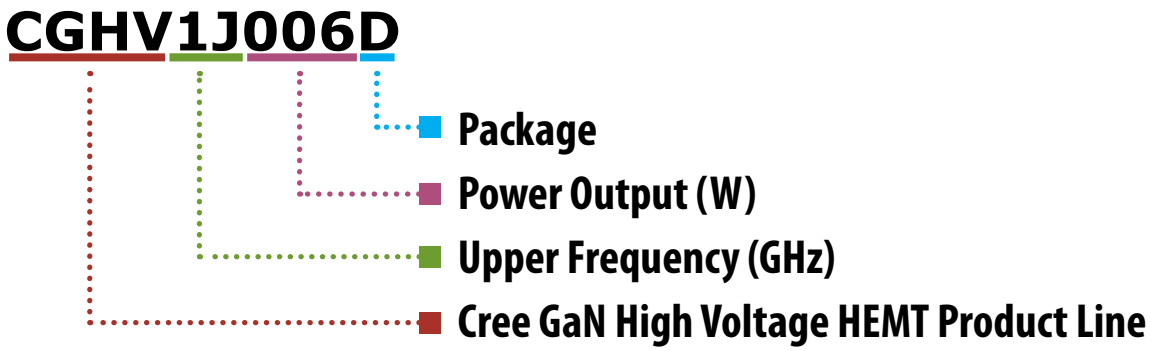
Part Number System



Parameter	Value	Units
Lower Frequency	DC	GHz
Upper Frequency[1]	18.0	GHz
Power Output	6	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 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**».

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«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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