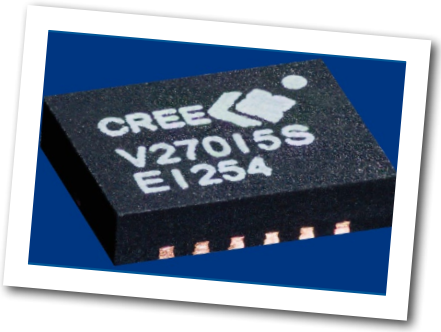
CGHV27015S

15 W, DC - 6.0 GHz, 50 V, GaN HEMT

Cree's CGHV27015S is an unmatched, gallium nitride (GaN) high electron mobility transistor (HEMT) designed specifically for high efficiency, high gain and wide bandwidth capabilities, which makes the CGHV27015S ideal for LTE, 4G Telecom and BWA amplifier applications. The CGHV27015S GaN HEMT devices are suitable for 3300-3500MHz, 4900-5900MHz, 700-960MHz, 1800-2200MHz, 2500-2700MHz and extended S and C Band applications. The CGHV27015S operates from a 50 volt rail. The transistor is available in a 3mm x 4mm, surface mount, dual-flat-no-lead (DFN) package.



Package Type: 3x4 DFN
PN: CGHV27015S

Typical Performance 2.4-2.7 GHz (T_C = 25°C), 50 V

Parameter	2.4 GHz	2.5 GHz	2.6 GHz	2.7 GHz	Units
Small Signal Gain	23	22	21.7	21.2	dB
Adjacent Channel Power @ P_{OUT} = 2.5 W	-36.7	-40.7	-42.4	-42.5	dBc
Drain Efficiency @ P_{OUT} = 2.5 W	35.9	33.5	30.4	30.2	%
Input Return Loss	-9.312	-9.6	-8.6	-7.8	dB

Note:
Measured in the CGHV27015S-TB1 application circuit.
Under 7.5 dB PAR single carrier WCDMA signal test model 1 with 64 DPCH.

Features for 50 V in CGHV27015S-TB1

- 2.4 - 2.7 GHz Operation
- 15 W Typical Output Power
- 21 dB Gain at 2.5 W P_{AVE}
- -38 dBc ACLR at 2.5 W P_{AVE}
- 32% efficiency at 2.5 W P_{AVE}
- High degree of APD and DPD correction can be applied

Rev 0 – March 2014

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

Parameter	Symbol	Rating	Units	Notes
Drain-Source Voltage	V_{DSS}	125	Volts	25˚C
Gate-to-Source Voltage	V_{GS}	-10, +2	Volts	25˚C
Storage Temperature	T_{STG}	-65, +150	˚C	
Operating Junction Temperature	T_J	225	˚C	
Maximum Forward Gate Current	I_{GMAX}	2	mA	25˚C
Maximum Drain Current[1]	I_{DMAX}	0.9	A	25˚C
Soldering Temperature[2]	T_S	245	˚C	
Case Operating Temperature[3]	T_C	-40, +150	˚C	
Thermal Resistance, Junction to Case[4]	$R_{\theta JC}$	11.1	˚C/W	85˚C

Note:

[1] Current limit for long term, reliable operation

[2] Refer to the Application Note on soldering at www.cree.com/rf/document-library

[3] T_C = Case temperature for the device. It refers to the temperature at the ground tab underneath the package. The PCB will add additional thermal resistance. See also, the Power Dissipation De-rating Curve on page 7.

[4] Measured for the CGHV27015S at P_{DISS} = 5 W

[5] The R_{TH} for Cree's demonstration amplifier, CGHV27015S-TB1, with 31 x 0.011 via holes designed on a 20 mil thick Rogers 4350 PCB, is 3.9°C. The total R_{TH} from the heat sink to the junction is 11.1°C + 3.9°C = 15°C/W.

Electrical Characteristics (T_C = 25˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[1]						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.0	-2.3	V_{DC}	V_{DS} = 10 V, I_D = 2 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.6	–	V_{DC}	V_{DS} = 50 V, I_D = 60 mA
Saturated Drain Current	I_{DS}	1.48	1.78	–	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	150	–	–	V_{DC}	V_{GS} = -8 V, I_D = 2 mA
RF Characteristics[2,3] (T_C = 25˚C, F_0 = 2.7 GHz unless otherwise noted)						
Gain	G	–	21.2	-	dB	V_{DD} = 50 V, I_{DQ} = 60 mA, P_{OUT} = 34 dBm
WCDMA Linearity[4]	ACLR	–	-42.5	–	dBc	V_{DD} = 50 V, I_{DQ} = 60 mA, P_{OUT} = 34 dBm
Drain Efficiency[4]	η	–	30.2	-	%	V_{DD} = 50 V, I_{DQ} = 60 mA, P_{OUT} = 34 dBm
Output Mismatch Stress	VSWR	-	10 : 1	-	Ψ	No damage at all phase angles, V_{DD} = 50 V, I_{DQ} = 60 mA, P_{OUT} = 34 dBm
Dynamic Characteristics						
Input Capacitance[5]	C_{GS}	–	3.15	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance[5]	C_{DS}	–	1.06	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz
Feedback Capacitance	C_{GD}	–	0.058	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz

Notes:

[1] Measured on wafer prior to packaging

[2] Scaled from PCM data

[3] Measured in Cree's production test fixture. This fixture is designed for high volume test at 2.7 GHz

[4] Single Carrier WCDMA, 3GPP Test Model 1, 64 DPCH, 45% Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF

[5] Includes package and internal matching components

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Typical Performance in Application Circuit CGHV27015S-TB1

Figure 1. - Small Signal Gain and Return Losses vs Frequency
V_{DD} = 50 V, I_{DQ} = 60 mA

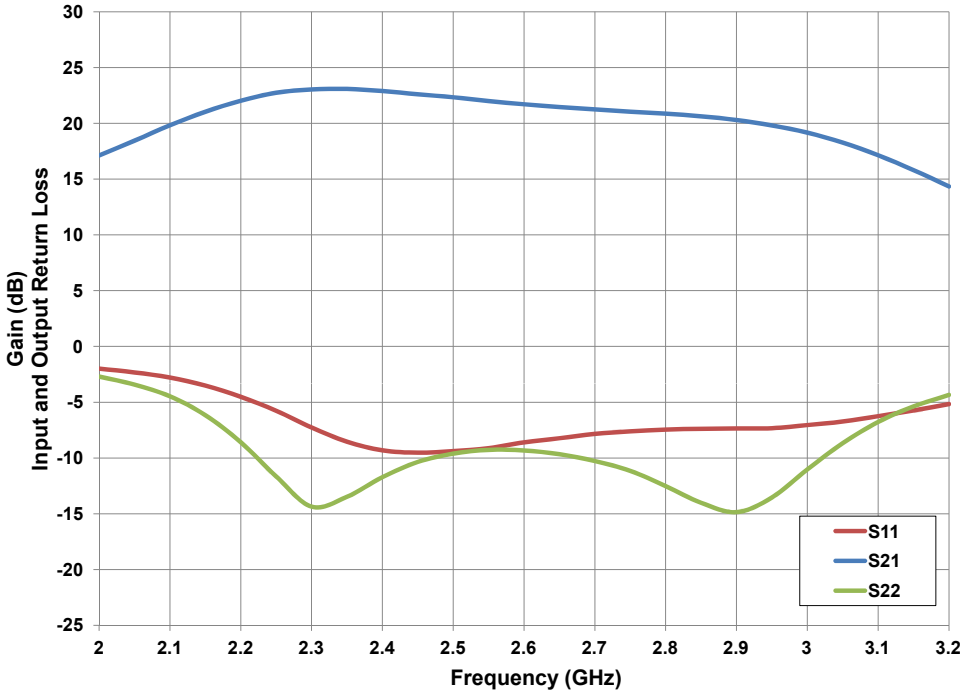
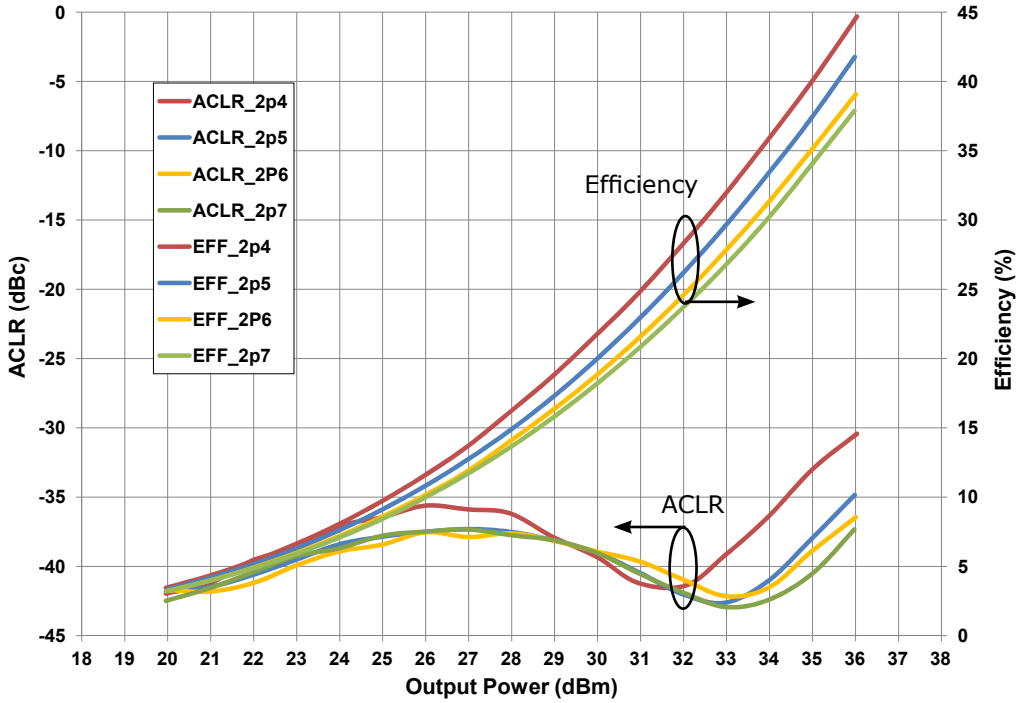


Figure 2. - Typical Drain Efficiency and ACLR vs. Output Power
V_{DD} = 50 V, I_{DQ} = 60 mA, 1 Carrier WCDMA, PAR = 7.5 dB



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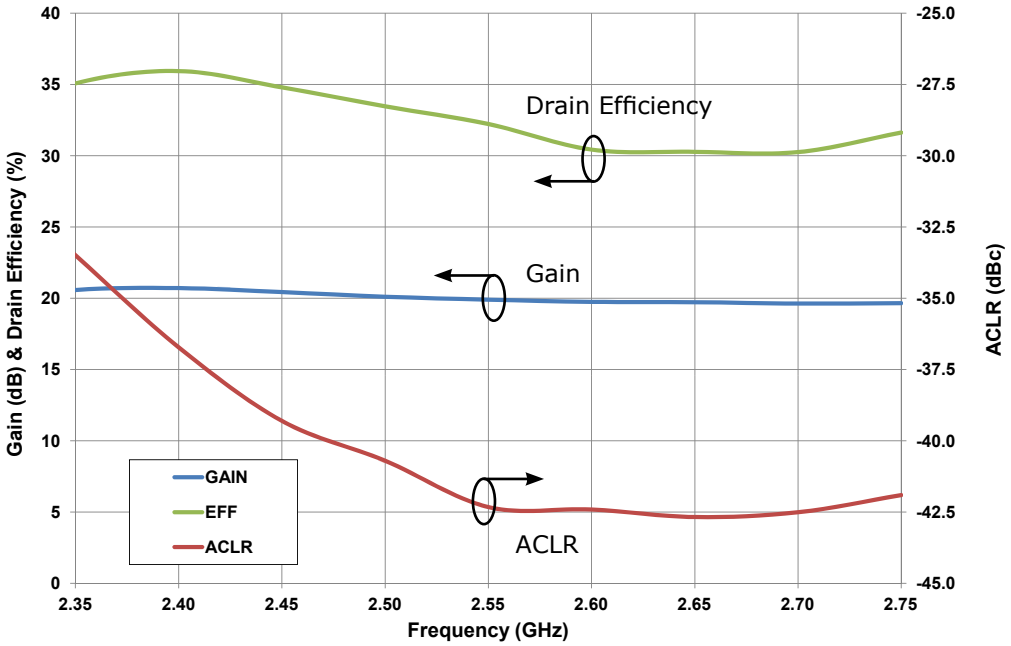
Typical Performance in Application Circuit CGHV27015S-TB1

Figure 3. - Typical Gain, Drain Efficiency and ACLR vs Frequency
V_{DD} = 50 V , I_{DQ} = 60 mA, P_{AVE} = 2.5 W, 1 Carrier WCDMA, PAR = 7.5 dB



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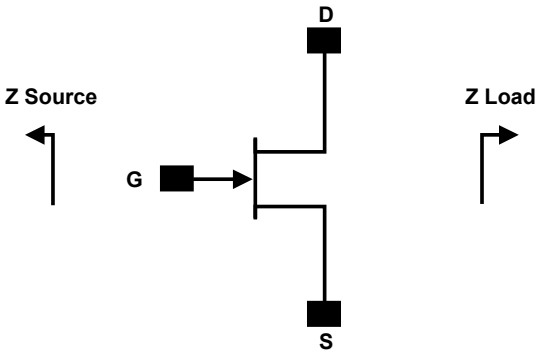
Source and Load Impedances for Application Circuit CGHV27015S-TB1



Frequency (MHz)	Z Source	Z Load
2400	7.9 + j2.14	15.8 + j43.1
2500	8 + j2.9	18.3 + j43.7
2600	7.9 + j3.6	19.7 + j43.4
2700	7.7 - j4.4	19.7 + j43.4

Note[1]: V_{DD} = 50 V, I_{DQ} = 60 mA in the DFN package.
Note[2]: Impedances are extracted from the CGHV27015S-TB1 application circuit and are not source and load pull data derived from the transistor.

CGHV27015S-TB1 Application Circuit Bill of Materials

Designator	Description	Qty
R1	RES, 332,OHM, +/- 1%, Vishay	1
R2	RES, 22.6,OHM, +/- 1%, 1/16W, 0603	1
R3, R4	RES, 2.2,OHM, +/- 1%, 1/16W, 0603	1
C1, C4	CAP, 27pF, +/- 5%, 0603, ATC	2
C2	CAP, 2.0pF,+/-0.1pF, 0603 ATC	1
C3	CAP, 0.1pF,+/-0.05 pF, 0603, ATC	2
C8	CAP, 6.2pF, +/-0.1pF, 0603, ATC	1
C13	CAP, 10pF +/-5%, 0603, ATC	1
C6, C11	CAP, 33000pF, 0805, ATC	2
C7, C12	CAP, 470PF, 5%, 100V, 0603,	2
C10	CAP, 1.0UF, 100V, 10%, X7R, 1210	1
C5	CAP 10UF 16V TANTALUM	1
C9	CAP, 33UF, 20%, G CASE	1
J1, J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST	2
J3	HEADER RT>PLZ .1CEN LK 5POS	1
Q1	CGHV27015S, DFN	1

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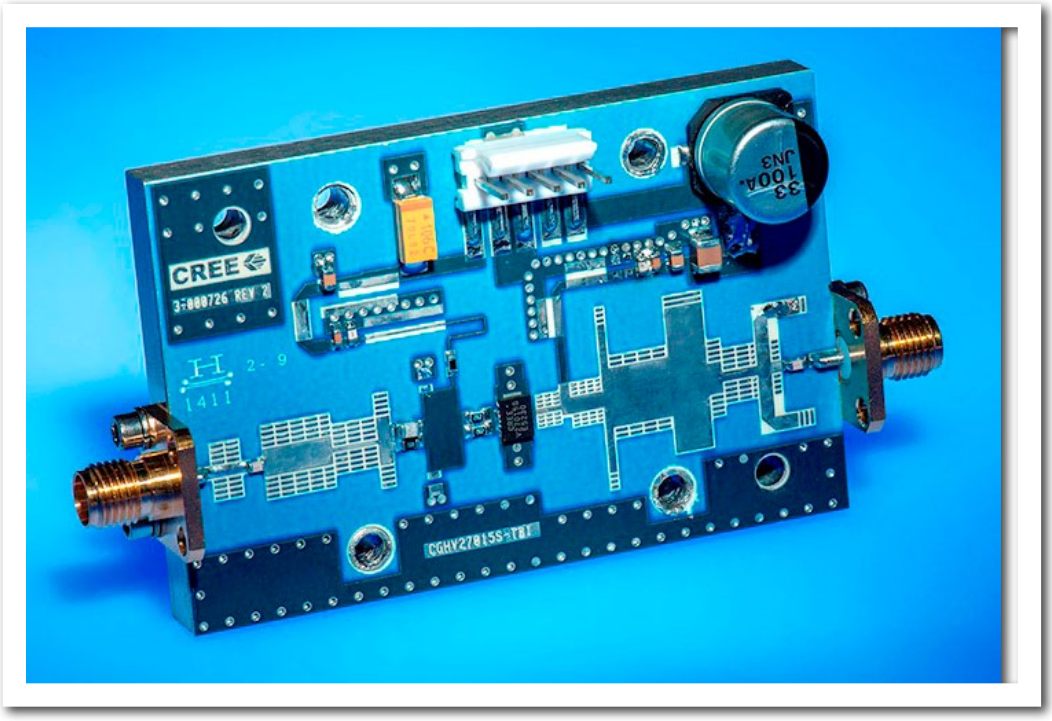
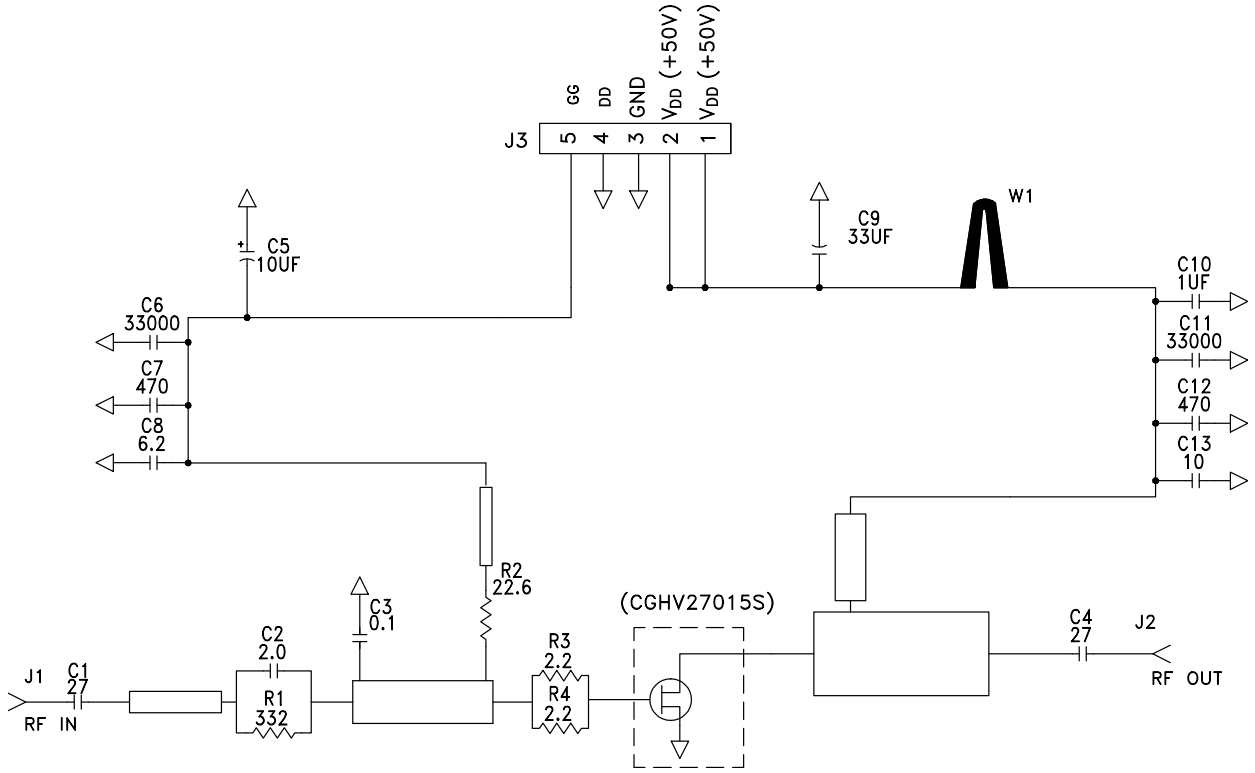
CGHV27015S-TB1 Application Circuit, 50 V



CGHV27015S-TB1 Application Circuit Schematic, 50 V



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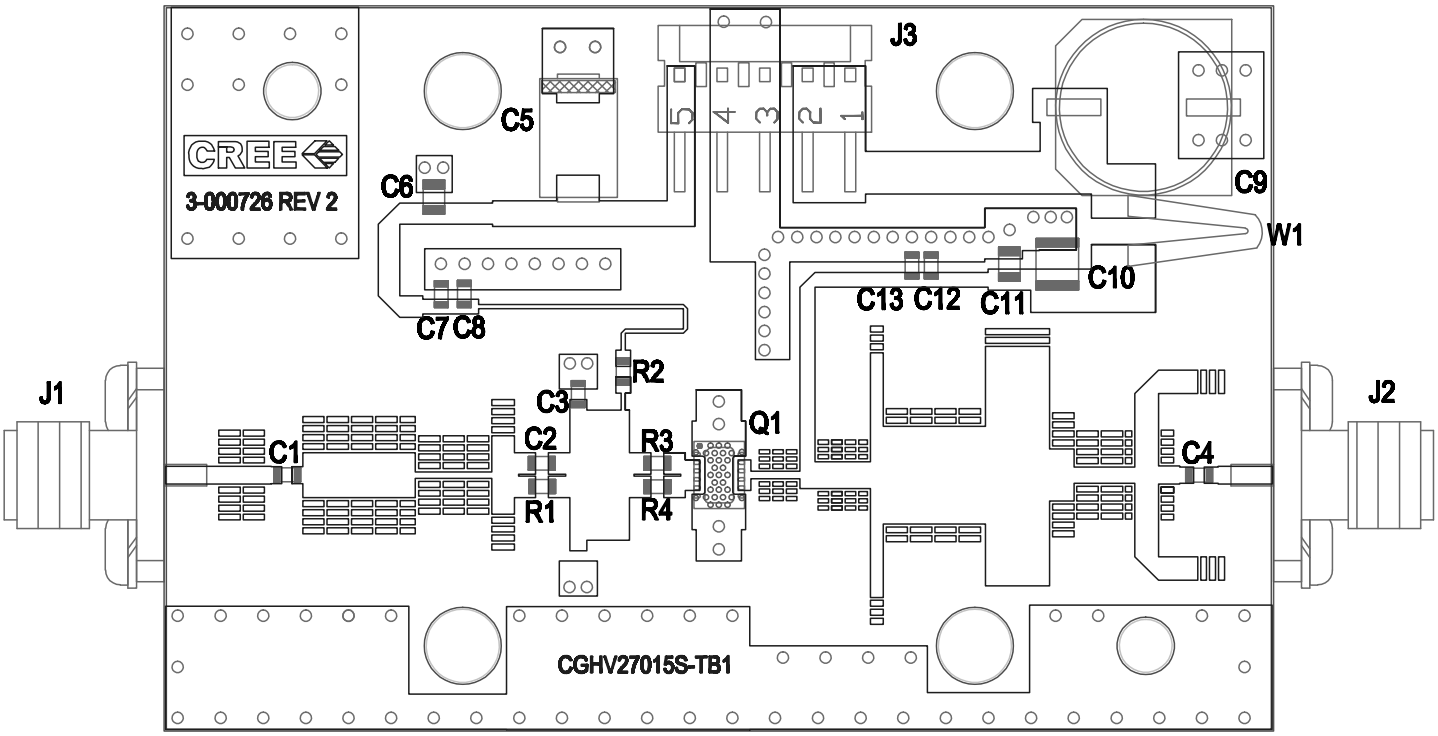
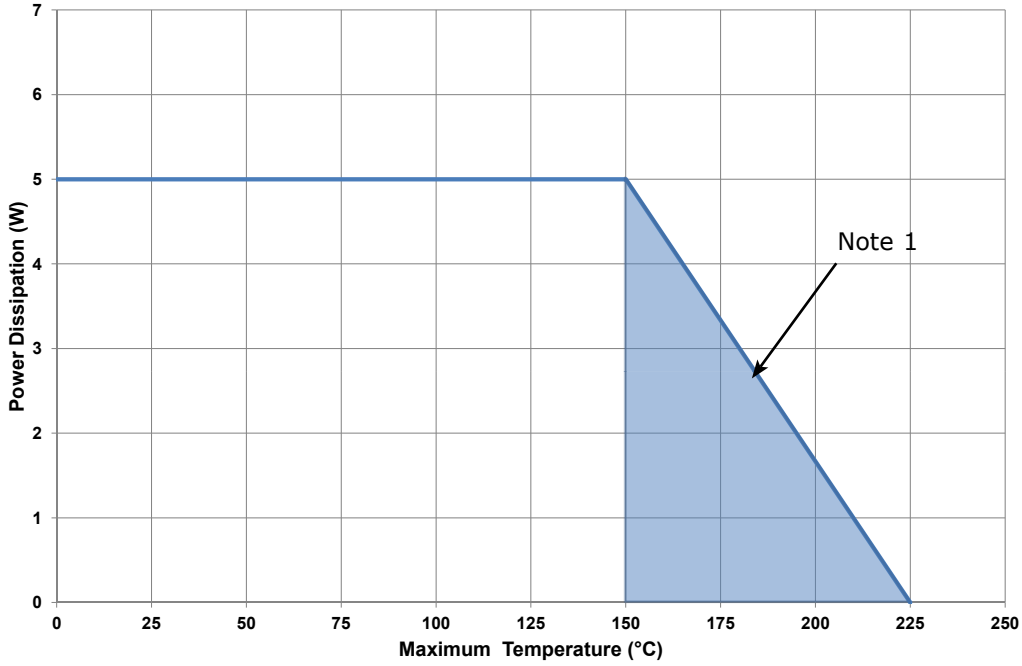
CGHV27015S-TB1 Application Circuit, 50 V



CGHV27015S-TB1 Power Dissipation De-rating Curve



Note 1. Area exceeds Maximum Case Temperature (See Page 2)

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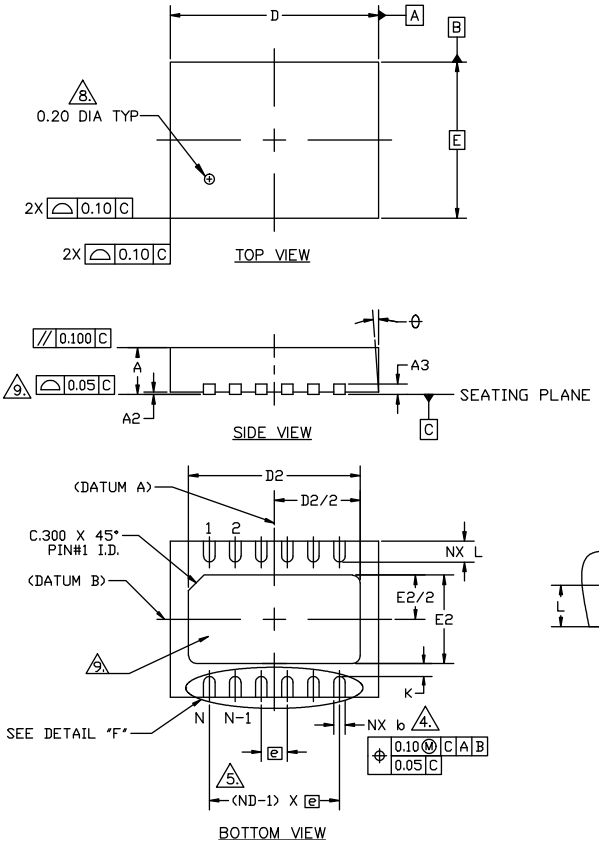
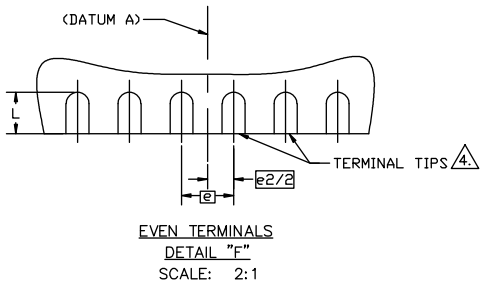
Product Dimensions CGHV27015S (Package 3 x 4 DFN)



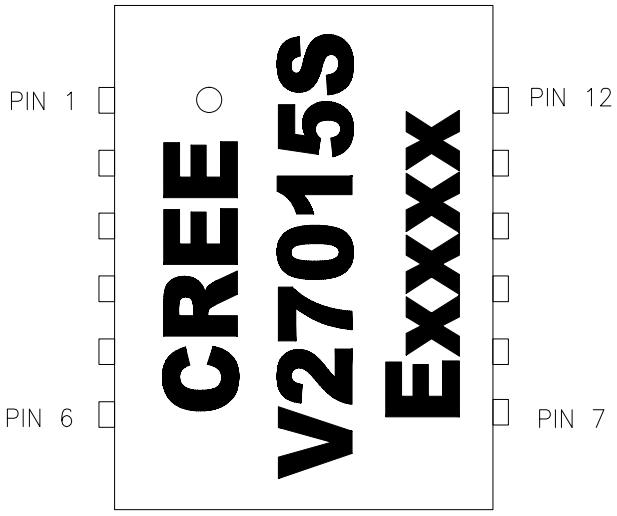


NOTES :

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M – 1994.
2. ALL DIMENSIONS ARE IN MILLIMETERS, θ IS IN DEGREES.
3. N IS THE TOTAL NUMBER OF TERMINALS.
4. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN .15 AND .30mm FROM TERMINAL TIP. IF THE TERMINAL HAS THE OPTIONAL RADIUS ON THE OTHER END OF THE TERMINAL, THE DIMENSION b SHOULD NOT BE MEASURED IN THAT RADIUS AREA.
5. ND REFERS TO THE NUMBER OF TERMINALS ON D SIDE
6. MAXIMUM PACKAGE WARPAGE IS .05 mm.
7. MAXIMUM ALLOWABLE BURRS IS .076 mm IN ALL DIRECTIONS.
8. PIN #1 ID ON TOP WILL BE LASER MARKED.
9. UNILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.

SYMBOL	COMMON DIMENSIONS			NOTE
	MIN.	NOM.	MAX.	
A	0.80	0.85	0.90	
A1	0.00	0.02	0.05	
A3		0.203 REF.		
θ	0	—	12	2
D		4.00 BSC		
E		3.00 BSC		
e		0.50 BSC		
N		6		3
ND		12		5
L	0.35	0.40	0.45	
b	0.17	0.22	0.27	4
D2	3.20	3.30	3.40	
E2	1.60	1.7	1.80	
K	0.20	—	—	

Pin	Input/Output
1	GND
2	NC
3	RF IN
4	RF IN
5	NC
6	GND
7	GND
8	NC
9	RF OUT
10	RF OUT
11	NC
12	GND



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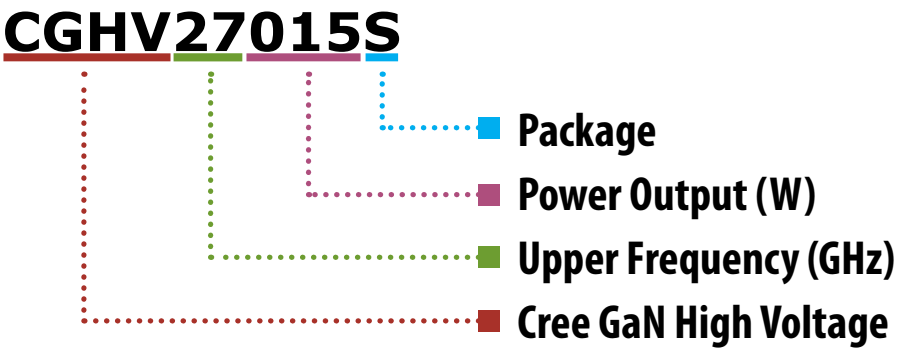
Part Number System



Parameter	Value	Units
Upper Frequency[1]	2.7	GHz
Power Output	15	W
Package	Surface Mount	-

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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