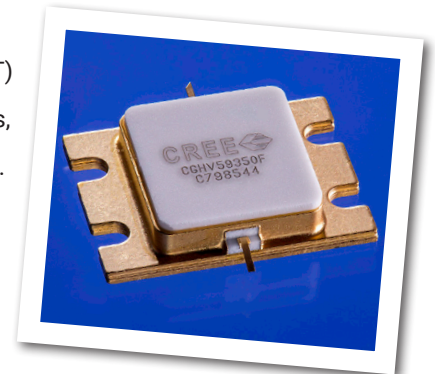


CGHV59350

350 W, 5200 - 5900 MHz, 50-Ohm Input/Output Matched, GaN HEMT for C-Band Radar Systems

Cree's CGHV59350 is a gallium nitride (GaN) high electron mobility transistor (HEMT) designed specifically with high efficiency, high gain and wide bandwidth capabilities, which makes the CGHV59350 ideal for 5.2 - 5.9 GHz C-Band radar amplifier applications. The transistor is supplied in a ceramic/metal flange package, type 440217 and 440218.



PN: CGHV59350
Package Type: 440217 and 440218

Typical Performance Over 5.2 - 5.9 GHz ($T_c = 25^\circ\text{C}$) of Demonstration Amplifier

Parameter	5.2 GHz	5.55 GHz	5.9 GHz	Units
Output Power	440	445	490	W
Gain	10.5	10.5	11	dB
Drain Efficiency	59	54	55	%

Note:

Measured in the CGHV59350-TB under 100 μs pulse width, 10% duty cycle, $P_{IN} = 46 \text{ dBm}$

Features

- 5.2 - 5.9 GHz Operation
- 450 W Typical Output Power
- 10.5 dB Power Gain
- 55% Typical Drain Efficiency
- 50 Ohm Internally Matched
- <0.3 dB Pulsed Amplitude Droop

Absolute Maximum Ratings (not simultaneous)

Parameter	Symbol	Rating	Units	Conditions
Pulse Width	PW	100	μs	
Duty Cycle	DC	10	%	
Drain-Source Voltage	V_{DS}	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}	64	mA	25°C
Maximum Drain Current ¹	I_{DMAX}	24	A	25°C
Soldering Temperature ²	T_S	245	°C	
Screw Torque	τ	40	in-oz	
Pulsed Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.31	°C/W	100 μsec, 10%, 85°C, $P_{DISS} = 320$ W
Case Operating Temperature	T_C	-40, +85	°C	

Notes:

¹ Current limit for long term, reliable operation

² Refer to the Application Note on soldering at <http://www.cree.com/rf/tools-and-support/document-library>

Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics¹ ($T_C = 25^\circ\text{C}$)						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.0	-2.3	V_{DC}	$V_{DS} = 10$ V, $I_D = 64$ mA
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.7	-	V_{DC}	$V_{DS} = 50$ V, $I_D = 1.0$ A
Saturated Drain Current ²	I_{DS}	48	57.8	-	A	$V_{DS} = 6.0$ V, $V_{GS} = 2.0$ V
Drain-Source Breakdown Voltage	V_{BR}	150	-	-	V_{DC}	$V_{GS} = -8$ V, $I_D = 64$ mA

Notes:

¹ Measured on wafer prior to packaging.

² Scaled from PCM data.

Electrical Characteristics Continued...

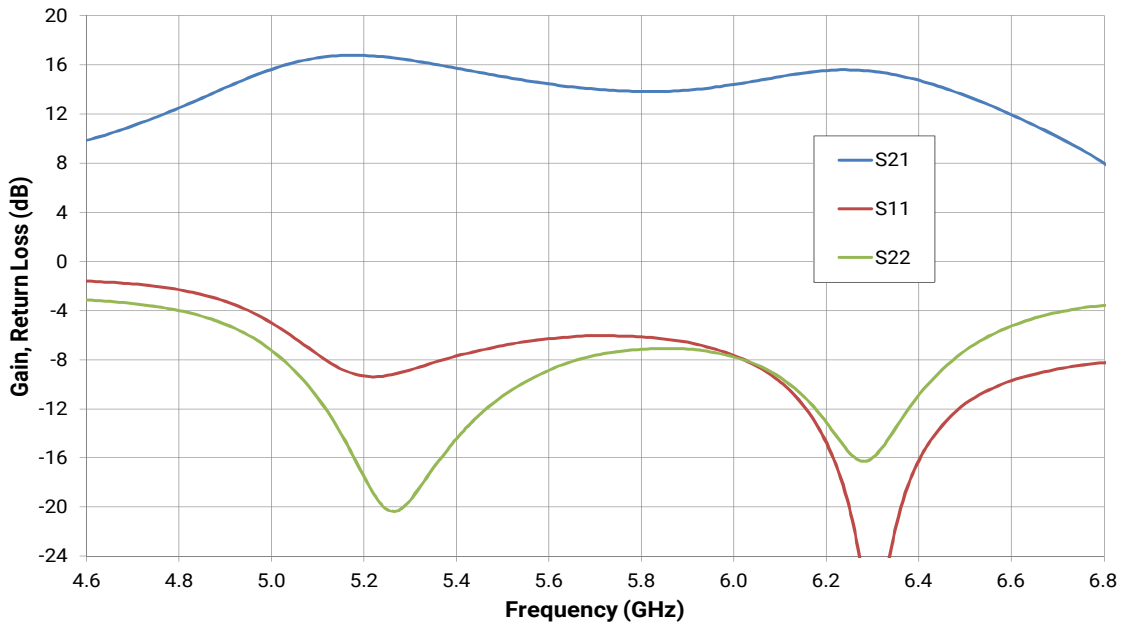
Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
RF Characteristics³ ($T_c = 25^\circ\text{C}$, $F_0 = 5.2 - 5.9\text{ GHz}$ unless otherwise noted)						
Output Power at 5.2 GHz	P_{OUT1}	–	440	–	W	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Output Power at 5.55 GHz	P_{OUT2}	–	445	–	W	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Output Power at 5.9 GHz	P_{OUT3}	–	490	–	W	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Gain at 5.2 GHz	G_{P1}	–	10.5	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Gain at 5.55 GHz	G_{P2}	–	10.5	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Gain at 5.9 GHz	G_{P3}	–	11	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Drain Efficiency at 5.2 GHz	D_{E1}	–	59	–	%	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Drain Efficiency at 5.55 GHz	D_{E2}	–	54	–	%	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Drain Efficiency at 5.9 GHz	D_{E3}	–	55	–	%	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Small Signal Gain	S_{21}	–	15	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = -10\text{ dBm}$
Input Return Loss	S_{11}	–	-7	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = -10\text{ dBm}$
Output Return Loss	S_{22}	–	-11	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = -10\text{ dBm}$
Amplitude Droop	D	–	-0.3	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Output Stress Match	VSWR	–	5:1	–	Ψ	No damage at all phase angles, $V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm Pulsed}$

Notes:

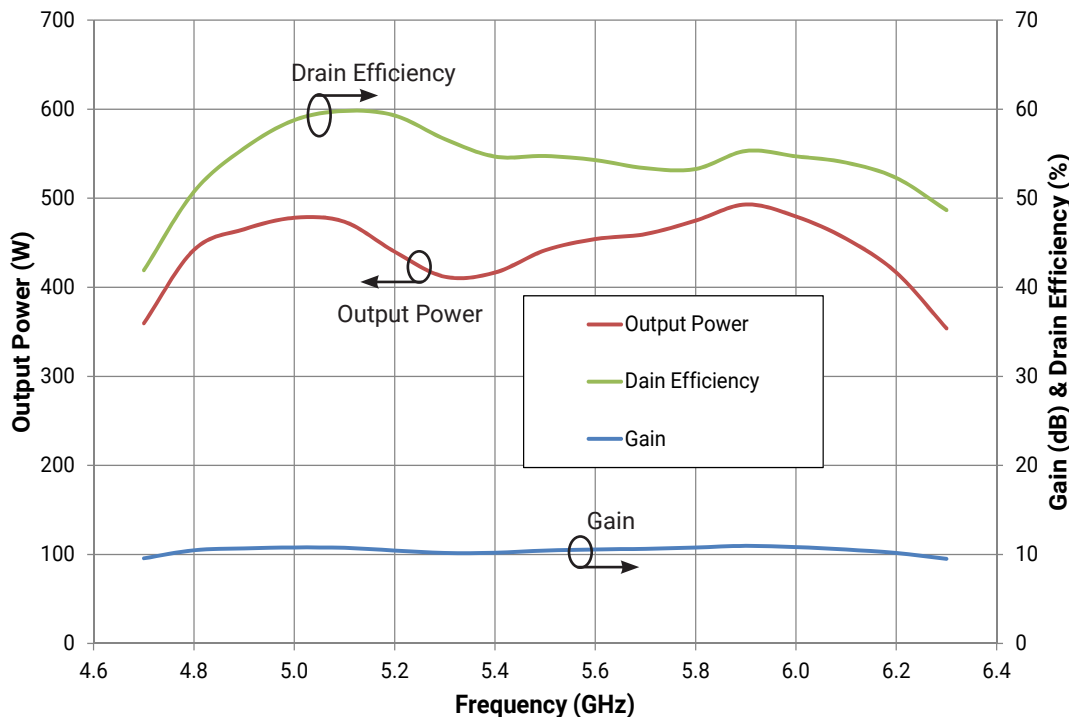
³ Measured in CGHV59350-TB. Pulse Width = 100 μs , Duty Cycle = 10%.

Typical Performance

**Figure 1. - Small Signal S-Parameters
CGHV59350 in Test Fixture
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $T_{case} = 25\text{ }^{\circ}\text{C}$**



**Figure 2. - CGHV59350 Pout, D_{Eff} and Gain vs. Frequency at $T_{case} = 25\text{ }^{\circ}\text{C}$
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 1.0\text{ A}$, $P_{IN} = 46\text{ dBm}$, Pulse Width = $100\mu\text{S}$, Duty Cycle = 10%**



Typical Performance

Figure 3. - CGHV59350 Output Power vs. Input Power

$V_{DD} = 50V, I_{DQ} = 1.0 A, \text{Pulse Width} = 100\mu S, \text{Duty Cycle} = 10\%, T_{case} = 25^\circ C$

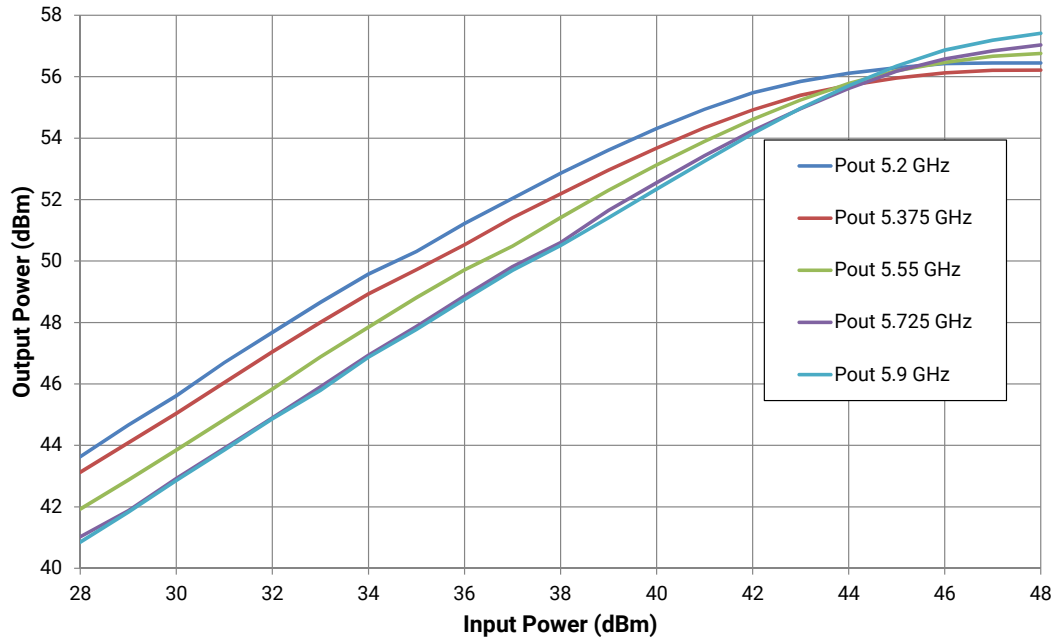
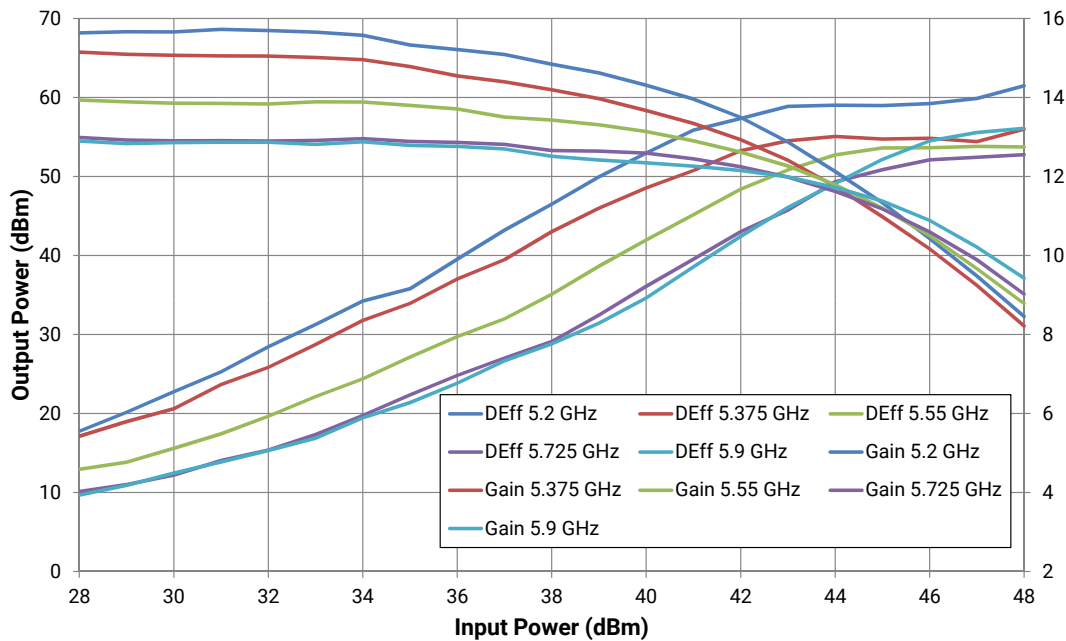


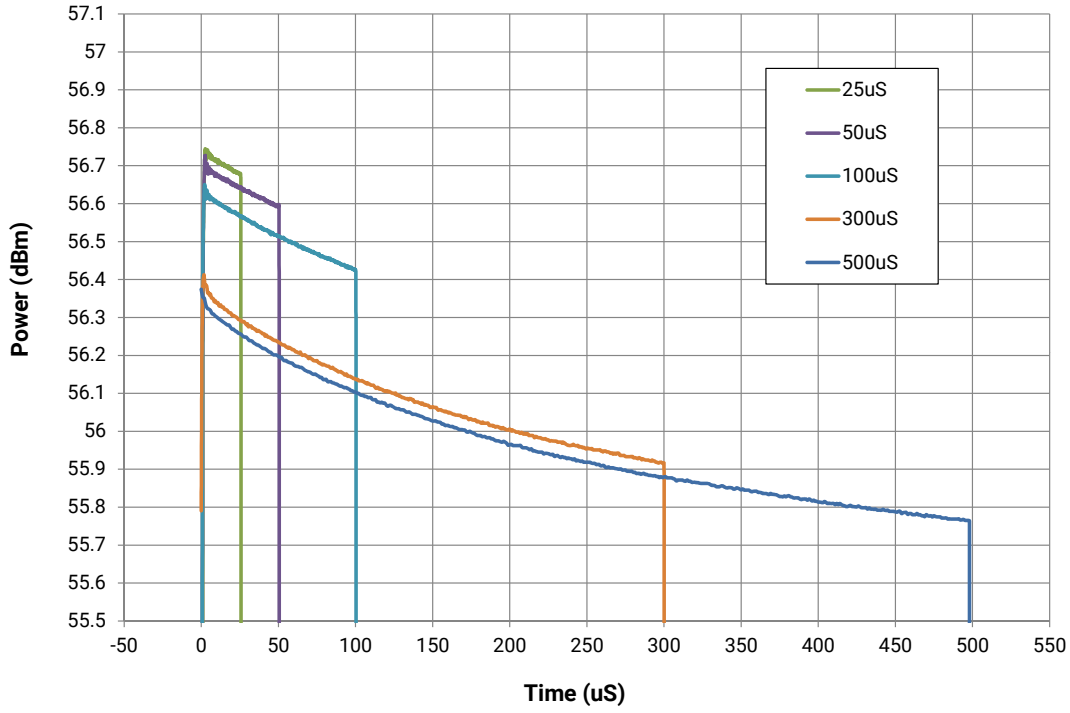
Figure 4. - CGHV59350 Output Power vs. Input Power

$V_{DD} = 50V, I_{DQ} = 1.0 A, \text{Pulse Width} = 100\mu S, \text{Duty Cycle} = 10\%, T_{case} = 25^\circ C$



Typical Performance

Figure 5. - Output Power vs. Time
 $V_{DD} = 50V, P_{IN} = 46 \text{ dBm}, \text{Duty Cycle} = 10\%$

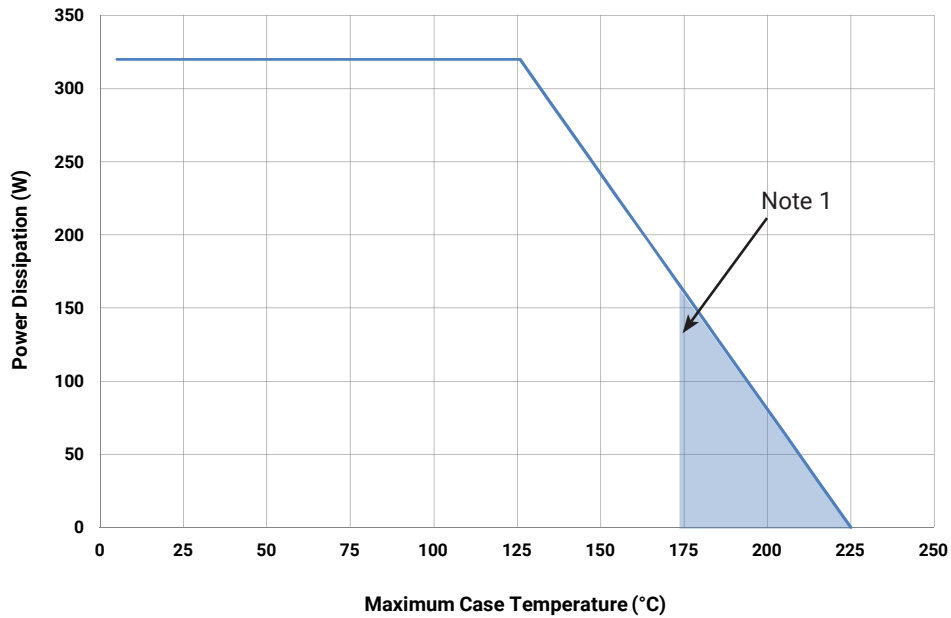


CGHV59350-TB Application Circuit Bill of Materials

Designator	Description	Qty
R1	RES, 5.10HM, +/- 1%, 1/16W,0603	1
R2	RES, 100HM, +/- 1%, 1/16W,0603	1
C1,C2	CAP, 5.6pF, +/- 0.25 pF,250V, 0603	2
C3,C8	CAP, 20pF, +/- 0.25 pF,250V, 0603	2
C4,C9	CAP, 470PF, 5%, 100V, 0603, X	2
C5	CAP, 0.1MF, 1206, 250 V, X7R	1
L1	IND, FERRITE, 220 OHM, 0603	1
C10	CAP, 1.0UF, 100V, 10%, X7R, 1210	1
C7	CAP, 5.6pF, +/- 0.25 pF,250V, 0603	1
C11	CAP, 3300 UF, +/-20%, 100V, ELECTROLYTIC	1
C12	CAP, 33 UF, 20%, G CASE	1
J1,J2	CONN, SMA, PANEL MOUNT JACK, FL	2
J3	HEADER RT>PLZ .1CEN LK 9POS	1
J4	CONNECTOR ; SMB, Straight, JACK,SMD	1
W1	CABLE ,18 AWG, 4.2	1
-	PCB, TEST FIXTURE, TACONIC RF35P 20MIL OVER 0.250 COPPER BACK, 2.5 X 3 X 0.26", CGHV59350-TB	1
-	2-56 SOC HD SCREW 1/4 SS	4
-	#2 SPLIT LOCKWASHER SS	4
Q1	CGHV59350	1

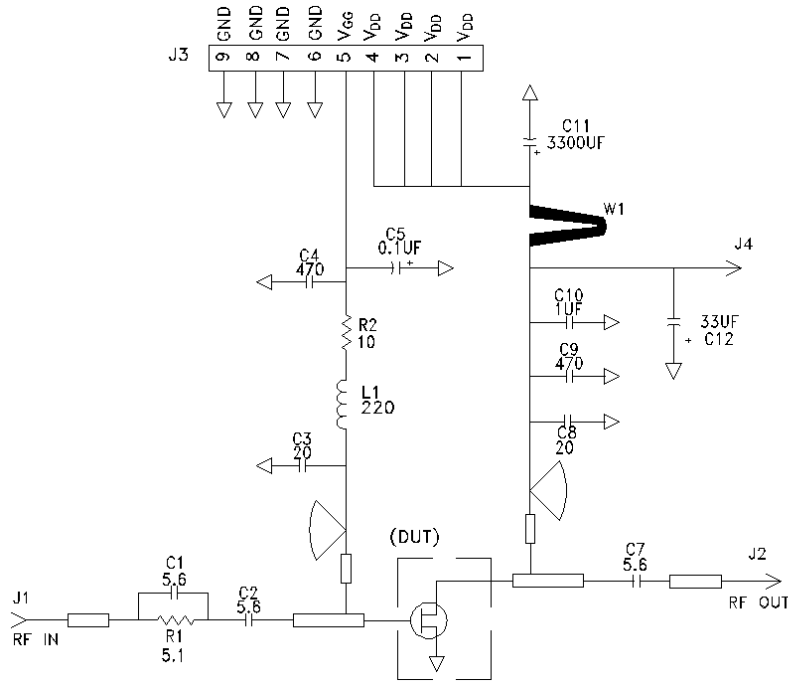
CGHV59350 Power Dissipation De-rating Curve

Figure 4. - Transient Power Dissipation De-Rating Curve

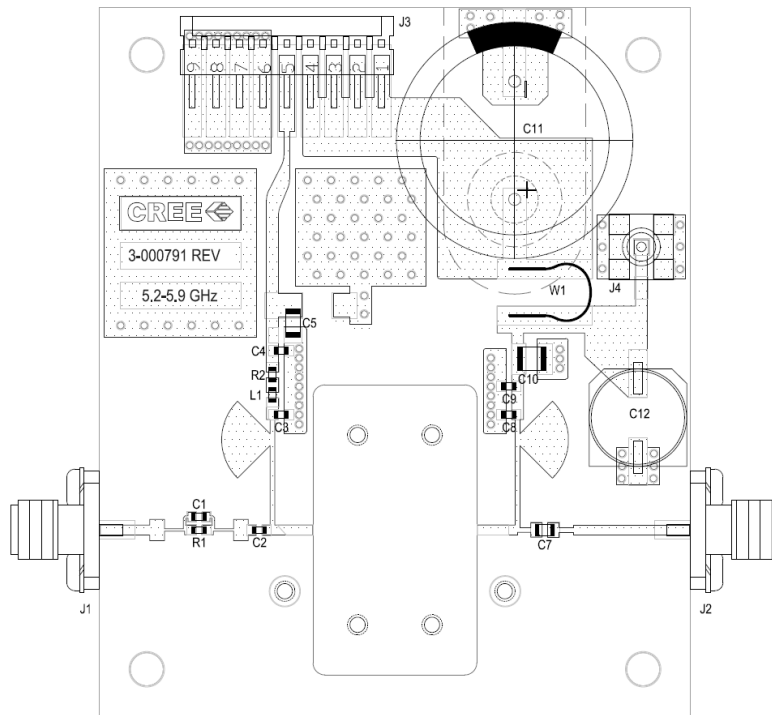


Note 1. Area exceeds Maximum Case Temperature (See Page 2).

CGHV59350-AMP1 Application Circuit Schematic



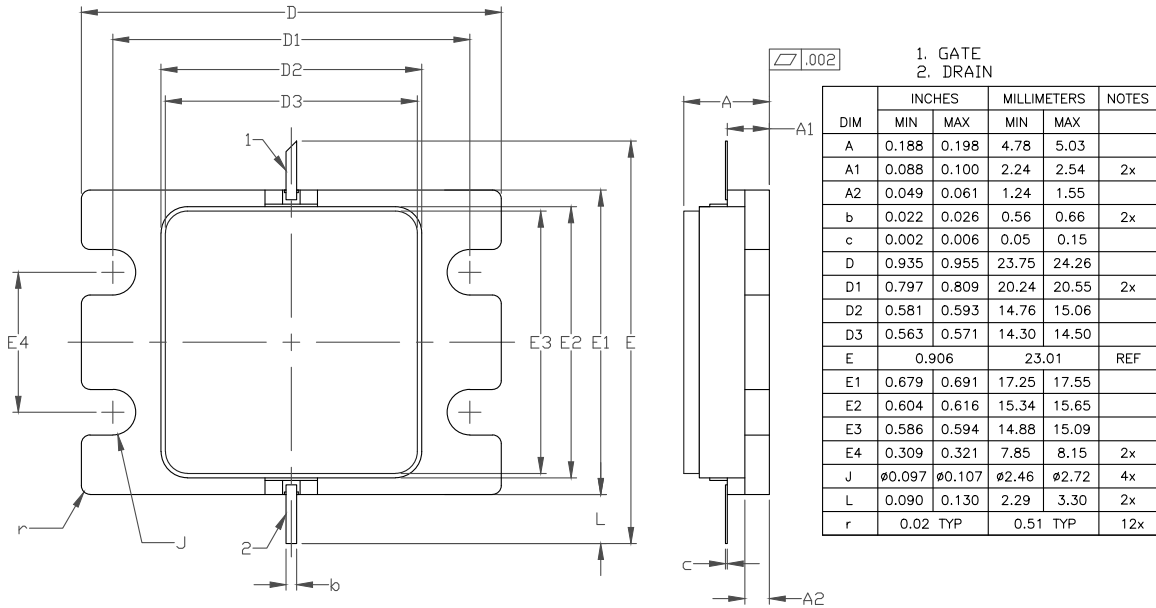
CGHV59350-AMP1 Application Circuit Outline



Product Dimensions CGHV59350F (Package Type – 440217)

NOTES: (UNLESS OTHERWISE SPECIFIED)

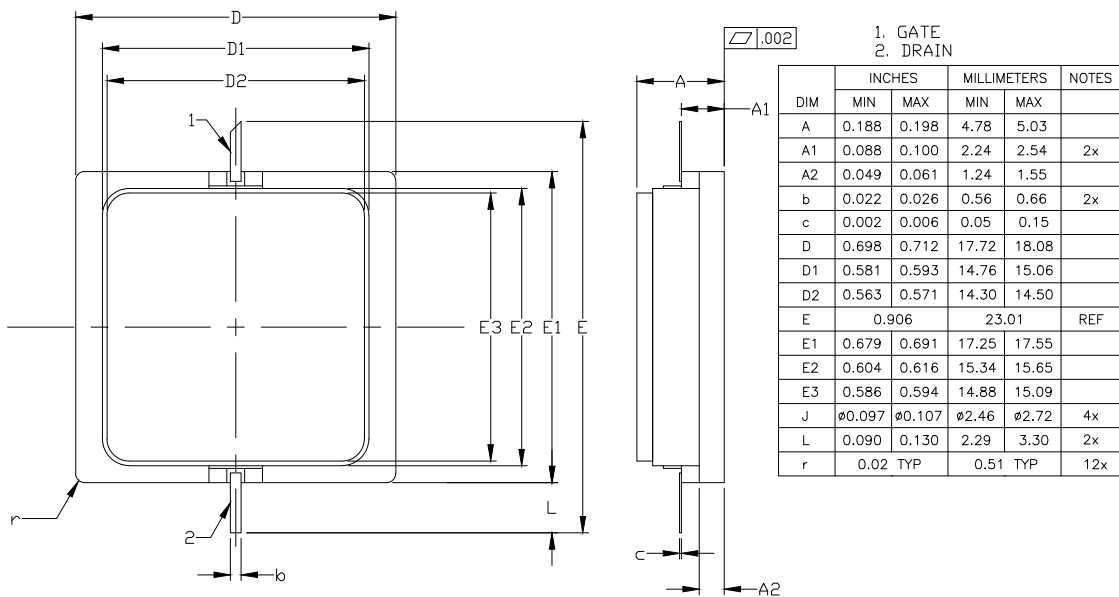
1. INTERPRET DRAWING IN ACCORDANCE WITH ANSI Y14.5M-2009
2. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF .020 BEYOND EDGE OF LID
3. LID MAY BE MISALIGNED TO THE BODY OF PACKAGE BY A MAXIMUM OF .008 IN ANY DIRECTION
4. ALL PLATED SURFACES ARE GOLD OVER NICKEL



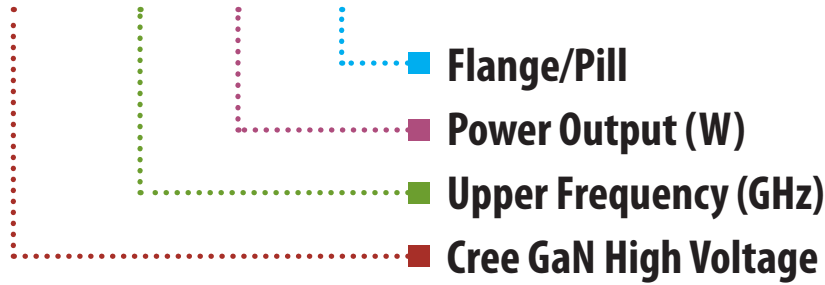
Product Dimensions CGHV59350P (Package Type – 440218)

NOTES: (UNLESS OTHERWISE SPECIFIED)

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2. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF .020 BEYOND EDGE OF LID
3. LID MAY BE MISALIGNED TO THE BODY OF PACKAGE BY A MAXIMUM OF .008 IN ANY DIRECTION
4. ALL PLATED SURFACES ARE GOLD OVER NICKEL



CGHV59350F/P



Parameter	Value	Units
Upper Frequency ¹	5.9	GHz
Power Output	350	W
Package	Flange/Pill	-

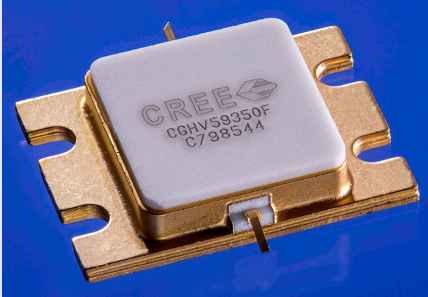

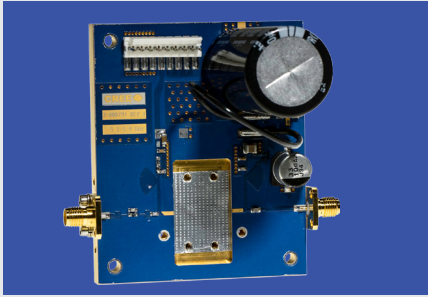
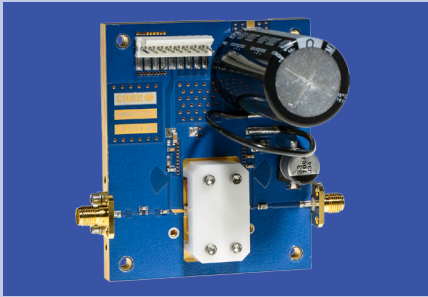
Table 1.

Note¹: 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.

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CGHV59350F	GaN HEMT	Each	
CGHV59350P	GaN HEMT	Each	
CGHV59350-TB	Test board without GaN HEMT	Each	
CGHV59350-AMP1	Test board with GaN HEMT installed	Each	



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