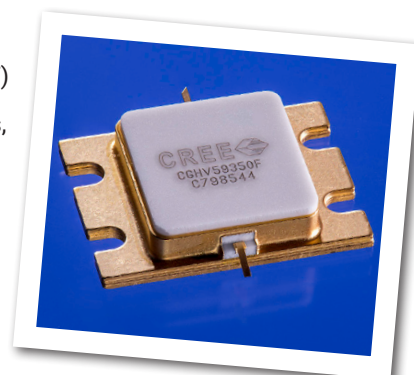


CGHV59350

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, $P_{\text{IN}} = 46 \text{ dBm}$

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

$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $T_{case} = 25\text{ }^{\circ}\text{C}$

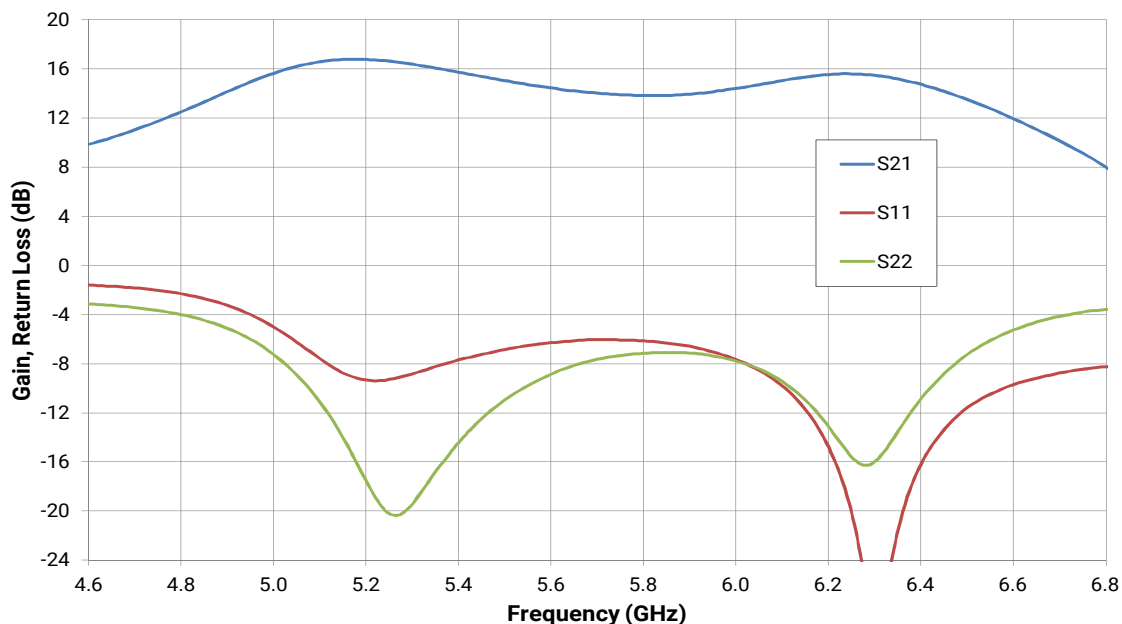
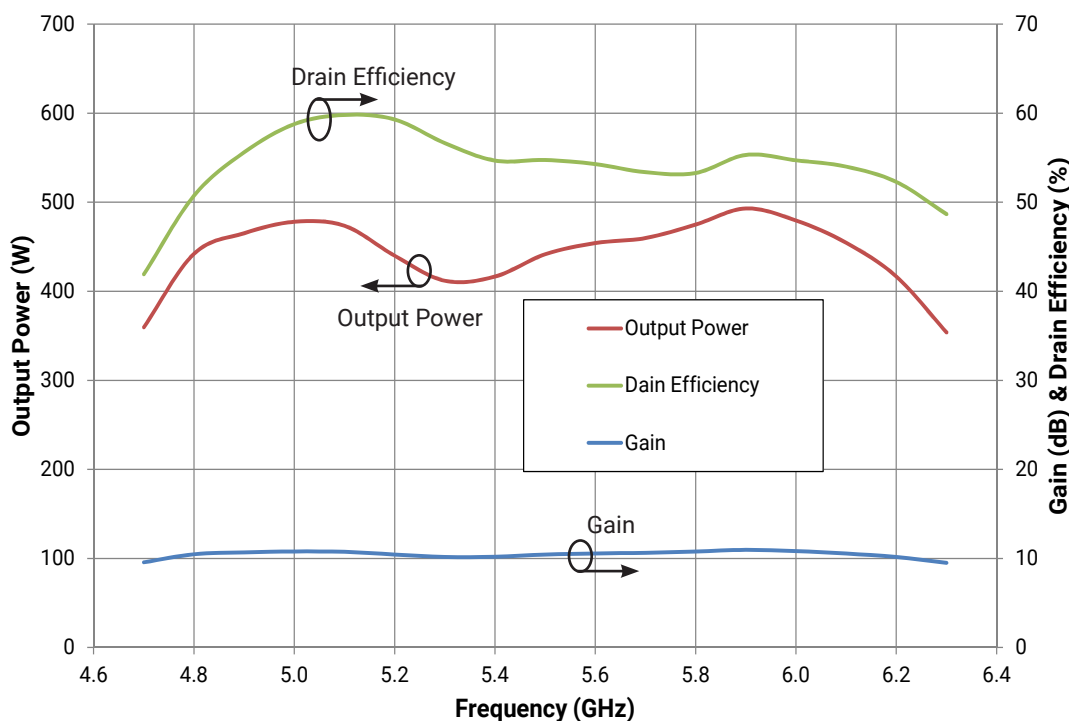


Figure 2. - CGHV59350 P_{out} , D_{Eff} and Gain vs. Frequency at $T_{case} = 25\text{ }^{\circ}\text{C}$

$V_{DD} = 50\text{ V}$, $I_{DQ} = 1.0\text{ A}$, $P_{IN} = 46\text{ dBm}$, Pulse Width = $100\text{ }\mu\text{s}$, Duty Cycle = 10%



Typical Performance

Figure 3. - CGHV59350 Output Power vs. Input Power

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

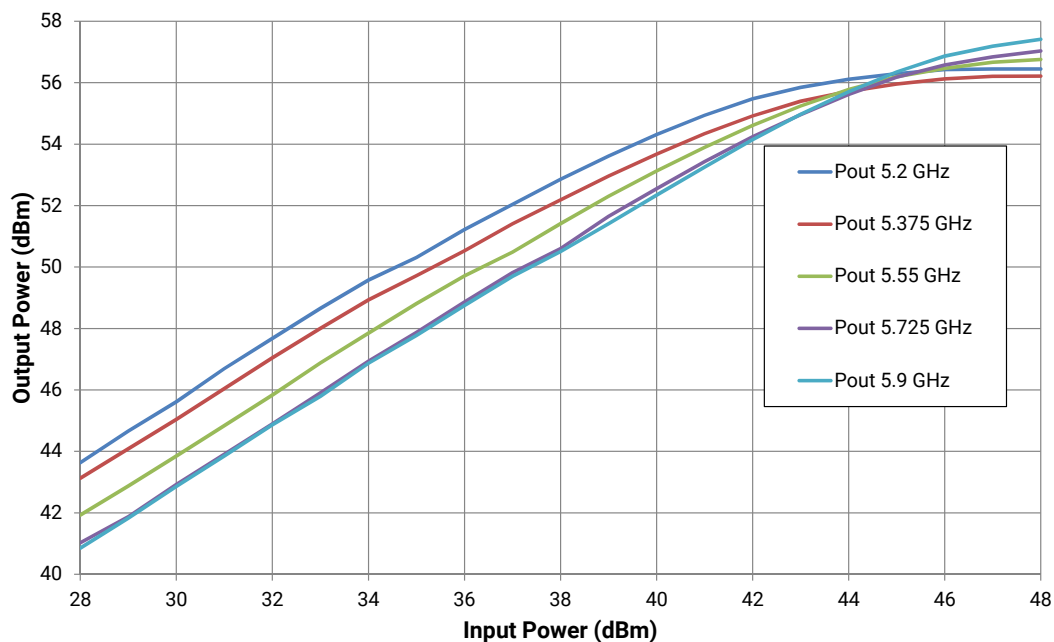
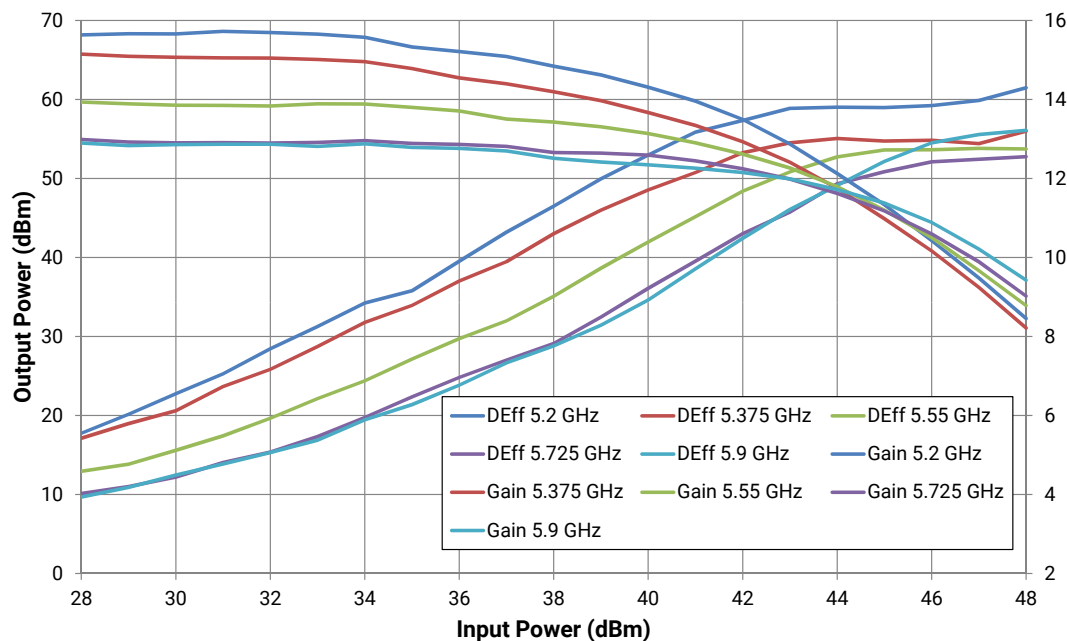


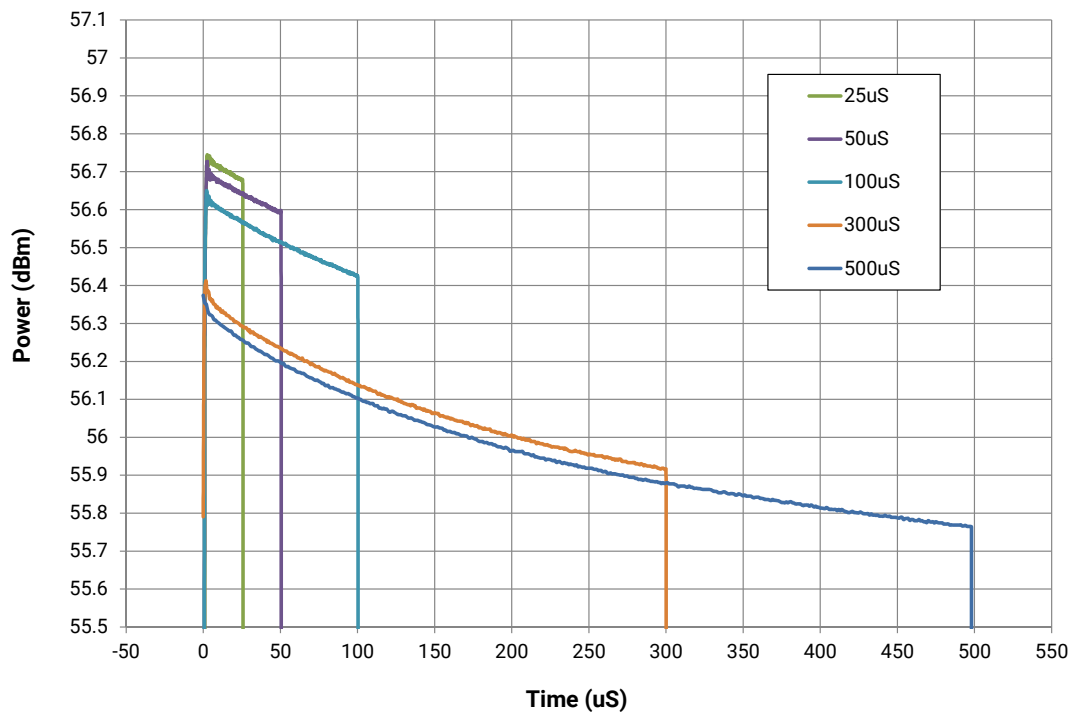
Figure 4. - CGHV59350 Output Power vs. Input Power

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



Typical Performance

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

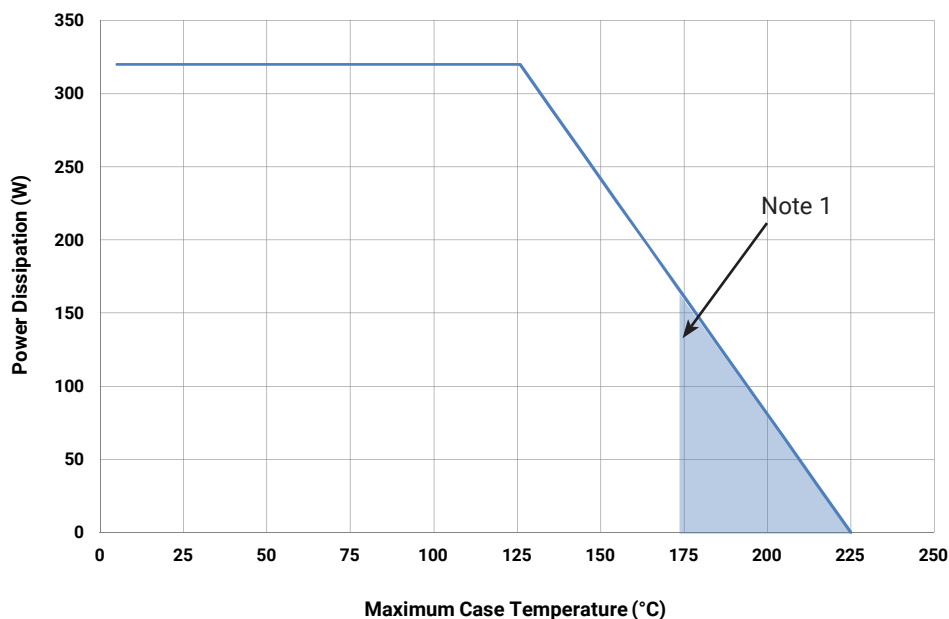


CGHV59350-TB Application Circuit Bill of Materials

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

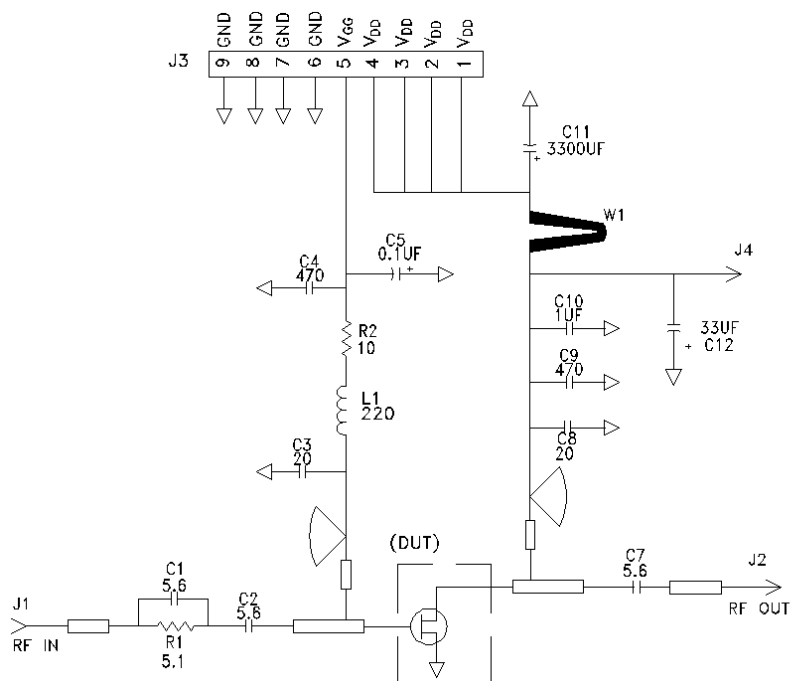
CGHV59350 Power Dissipation De-rating Curve

Figure 4. - Transient Power Dissipation De-Rating Curve

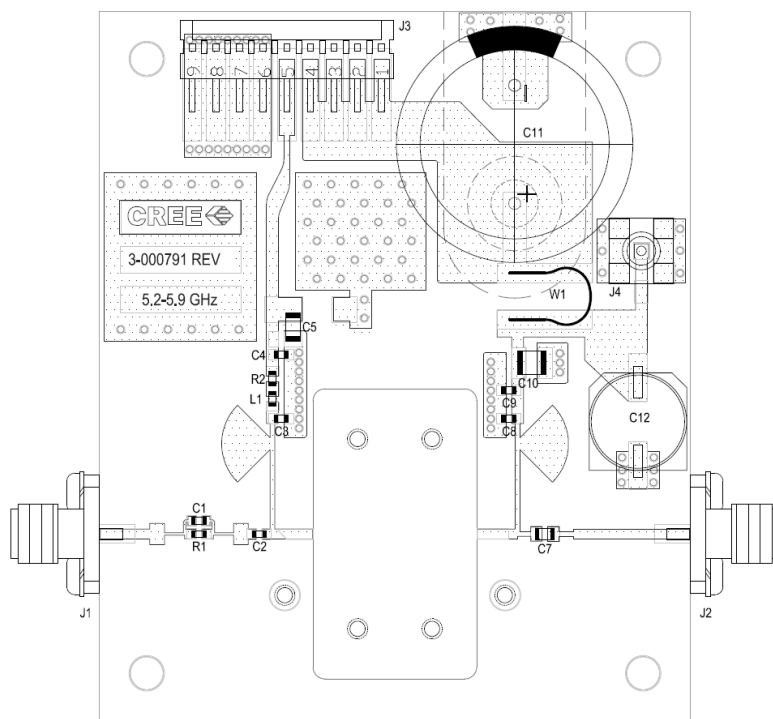


Note 1. Area exceeds Maximum Case Temperature (See Page 2).

CGHV59350-AMP1 Application Circuit Schematic



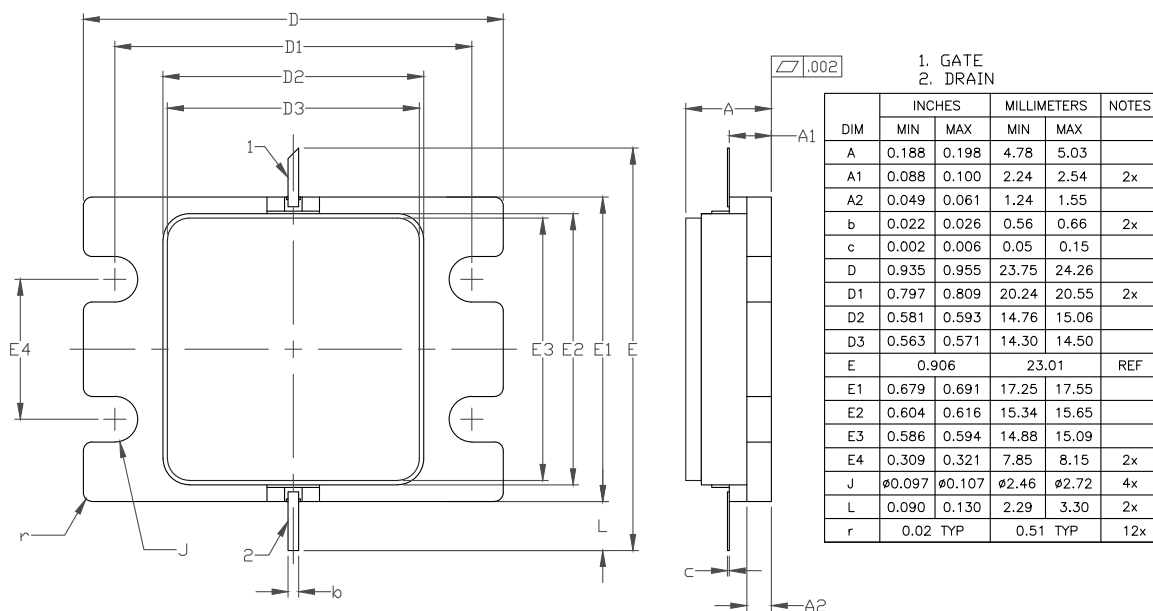
CGHV59350-AMP1 Application Circuit Outline



Product Dimensions CGHV59350F (Package Type – 440217)

NOTES: (UNLESS OTHERWISE SPECIFIED)

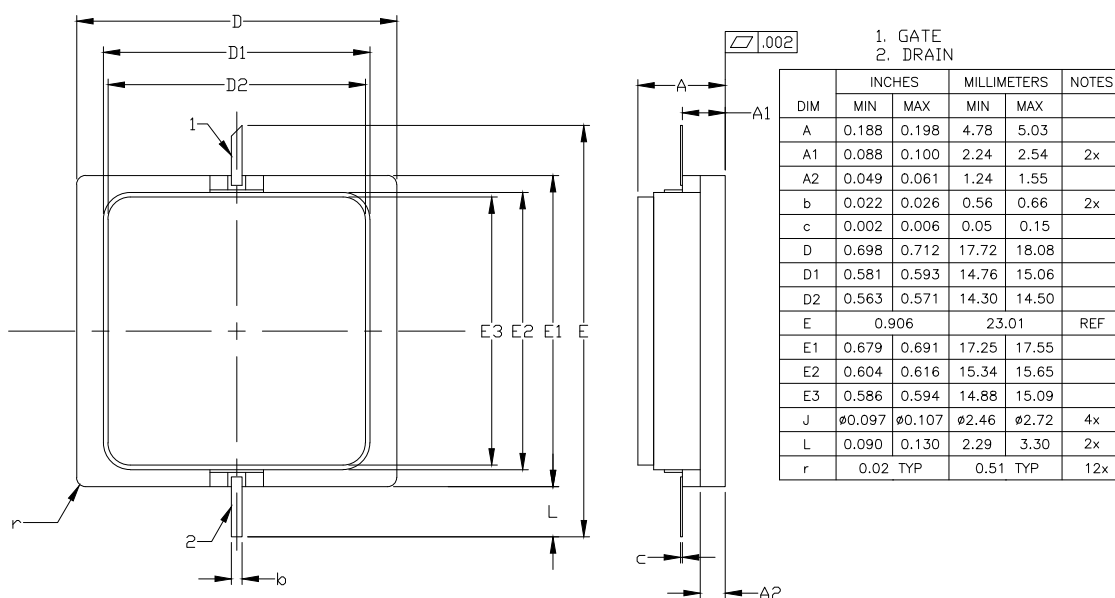
1. INTERPRET DRAWING IN ACCORDANCE WITH ANSI Y14.5M-2009
2. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF .020 BEYOND EDGE OF LID
3. LID MAY BE MISALIGNED TO THE BODY OF PACKAGE BY A MAXIMUM OF .008 IN ANY DIRECTION
4. ALL PLATED SURFACES ARE GOLD OVER NICKEL



Product Dimensions CGHV59350P (Package Type – 440218)

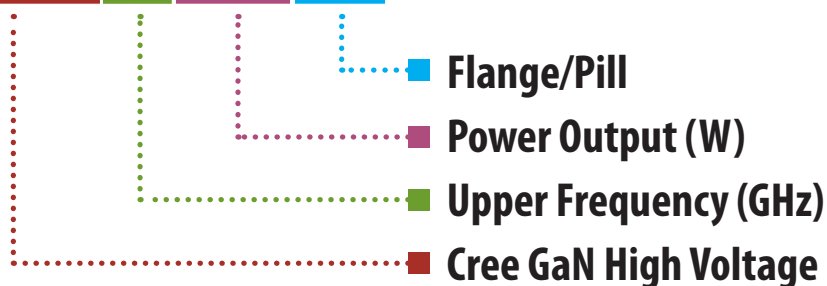
NOTES: (UNLESS OTHERWISE SPECIFIED)

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



Part Number System

CGHV59350F/P



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

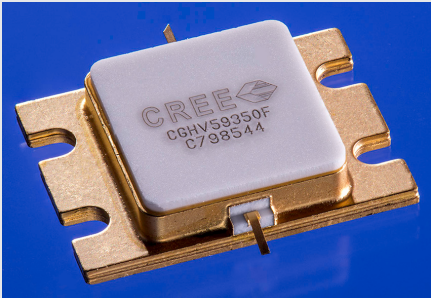
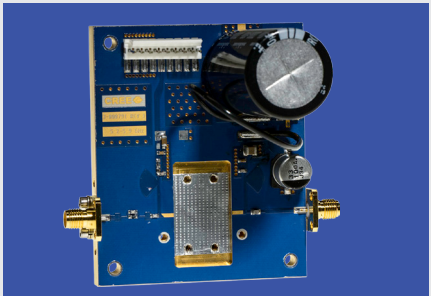
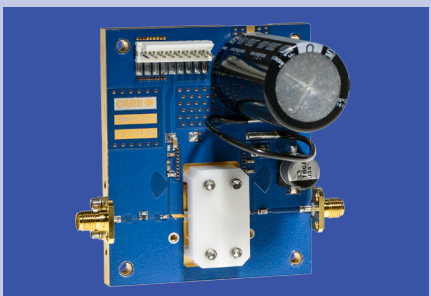
Table 1.

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	

Disclaimer

Specifications are subject to change without notice. Cree, Inc. believes the information contained within this data sheet to be accurate and reliable. However, no responsibility is assumed by Cree for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Cree. Cree makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose. "Typical" parameters are the average values expected by Cree in large quantities and are provided for information purposes only. These values can and do vary in different applications and actual performance can vary over time. All operating parameters should be validated by customer's technical experts for each application. Cree products are not designed, intended or authorized for use as components in applications intended for surgical implant into the body or to support or sustain life, in applications in which the failure of the Cree product could result in personal injury or death or in applications for planning, construction, maintenance or direct operation of a nuclear facility.

For more information, please contact:

Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
www.cree.com/rf

Sarah Miller
Marketing & Export
Cree, RF Components
1.919.407.5302

Ryan Baker
Marketing
Cree, RF Components
1.919.407.7816

Tom Dekker
Sales Director
Cree, RF Components
1.919.407.5639