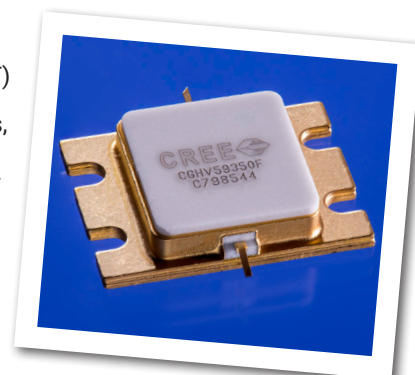


CGHV59350

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.



PN: CGHV59350
Package Type: 440217

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	468	475	468	W
Gain	10.7	10.8	10.7	dB
Drain Efficiency	68	62	59	%

Note:

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

Features

- 5.2 - 5.9 GHz Operation
- 470 W Typical Output Power
- 10.7 dB Power Gain
- 60% 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 _{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}	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 _{θJC}	0.31	°C/W	100 μsec, 10%, 85°C, P _{DISS} = 320 W
Case Operating Temperature ³	T _C	-40, +125	°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>

³ Refer to Figure 5

Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics¹ (T_C = 25°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}	389	466	–	W	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Output Power at 5.4 GHz	P_{OUT2}	335	499	–	W	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Output Power at 5.8 GHz	P_{OUT3}	302	446	–	W	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Output Power at 5.9 GHz	P_{OUT4}	302	468	–	W	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Gain at 5.2 GHz	G_{P1}	–	10.7	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Gain at 5.4 GHz	G_{P2}	–	11	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Gain at 5.8 GHz	G_{P3}	–	10.5	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Gain at 5.9 GHz	G_{P4}	–	10.7	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Drain Efficiency at 5.2 GHz	D_{E1}	53	68	–	%	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Drain Efficiency at 5.4 GHz	D_{E2}	46	67	–	%	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Drain Efficiency at 5.8 GHz	D_{E3}	40	58	–	%	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Drain Efficiency at 5.9 GHz	D_{E4}	40	59	–	%	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = 46\text{ dBm}$
Small Signal Gain	S_{21}	11.50	15	–	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = -10\text{ dBm}$
Input Return Loss	S_{11}	–	-7	-3	dB	$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, $P_{IN} = -10\text{ dBm}$
Output Return Loss	S_{22}	–	-11	-3	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-AMP. Pulse Width = 100 μs , Duty Cycle = 10%.

Typical Performance

Figure 1. - Small Signal S-Parameters for the
CGHV59350F in Test Fixture CGHV59350F-TB

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

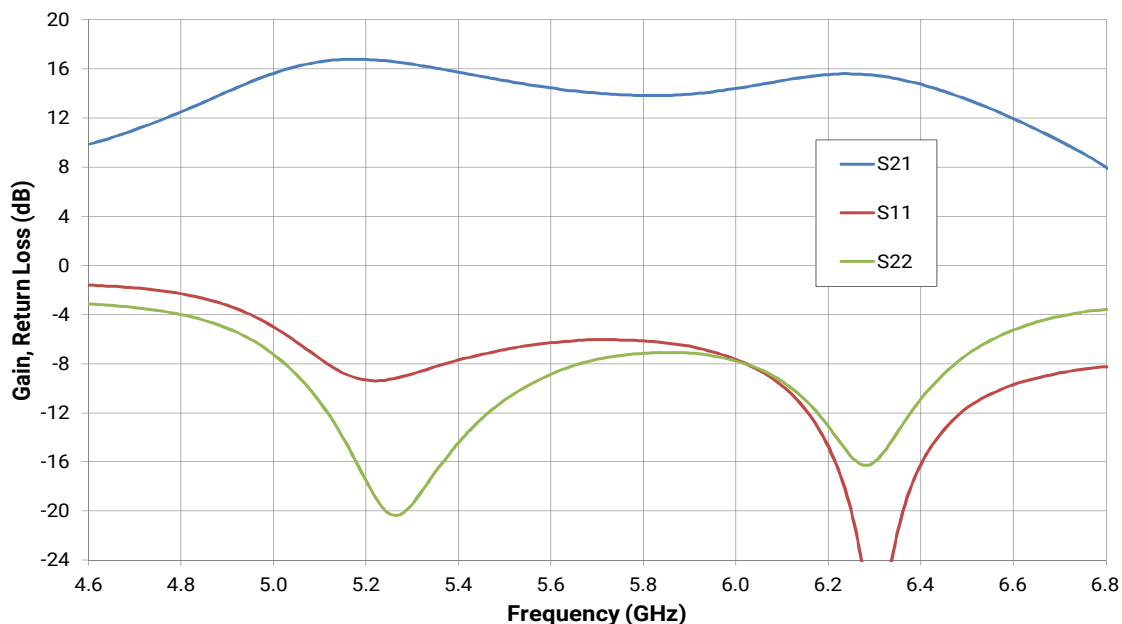
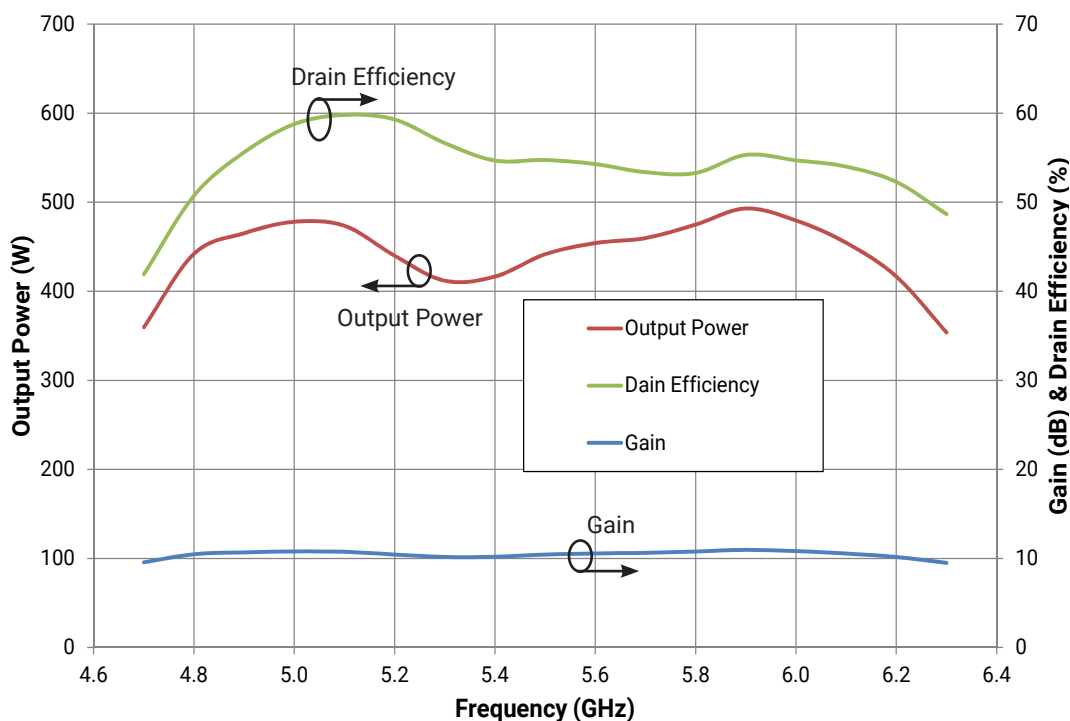


Figure 2. - CGHV59350 Output Power, Drain Efficiency, and Gain vs. Frequency at $T_{case} = 25\text{ }^{\circ}\text{C}$

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



Typical Performance

Figure 3. - CGHV59350 Output Power vs. Input Power

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

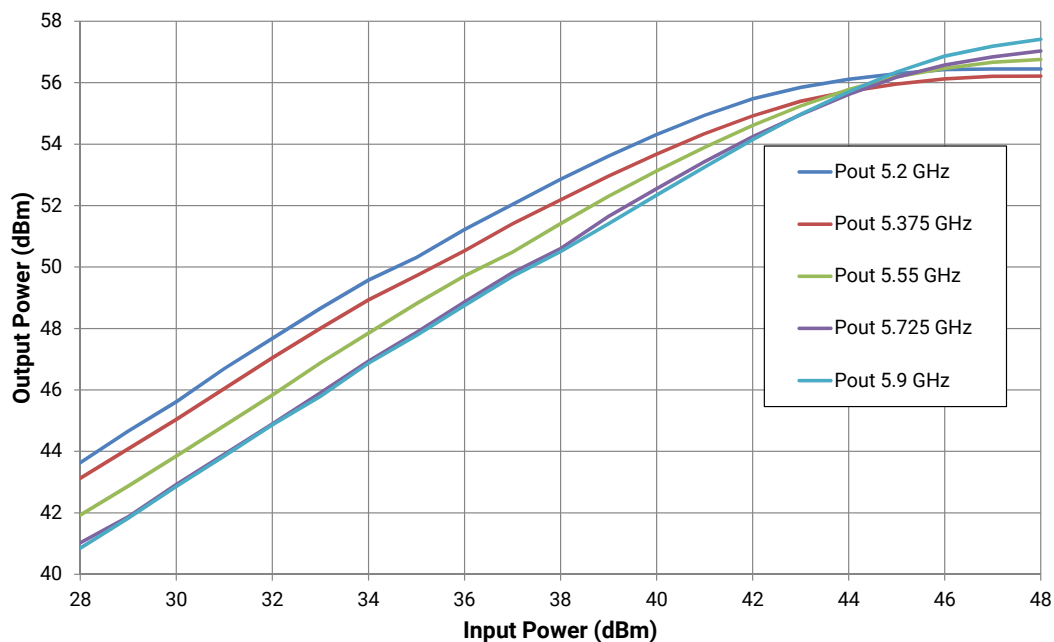
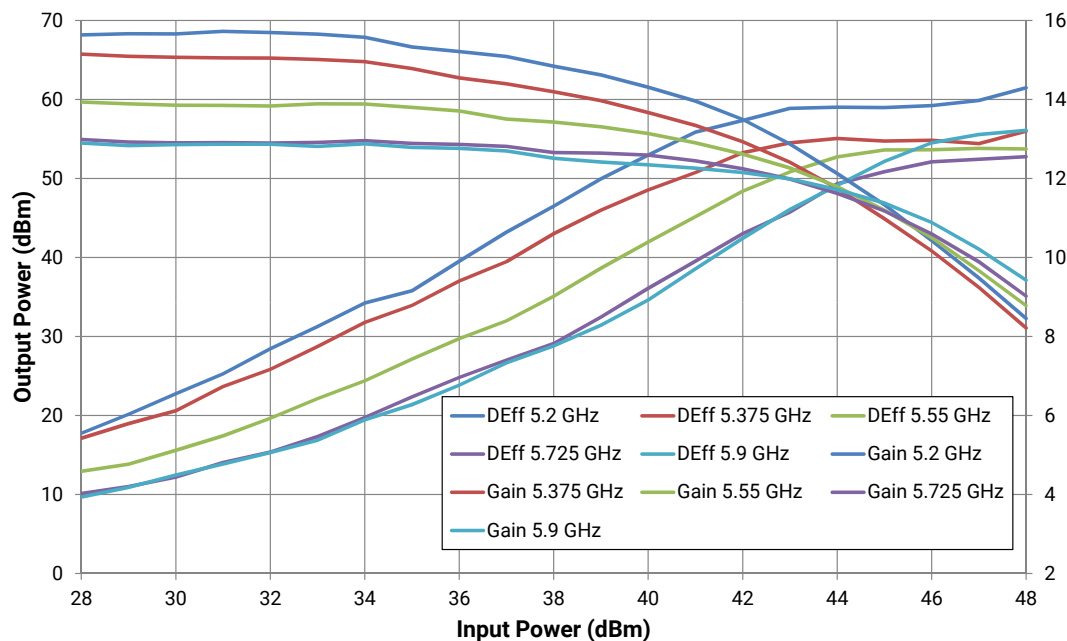


Figure 4. - CGHV59350 Output Power vs. Input Power for Gain and Drain Efficiency

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



Typical Performance

Figure 5. - CGHV59350 Output Power vs. Input Power

$V_{DD} = 50\text{ V}$, $I_{DQ} = 1\text{ A}$, Pulse Width = 100 μS , Duty Cycle = 10 %, $T_{case} = 25\text{ }^{\circ}\text{C}$

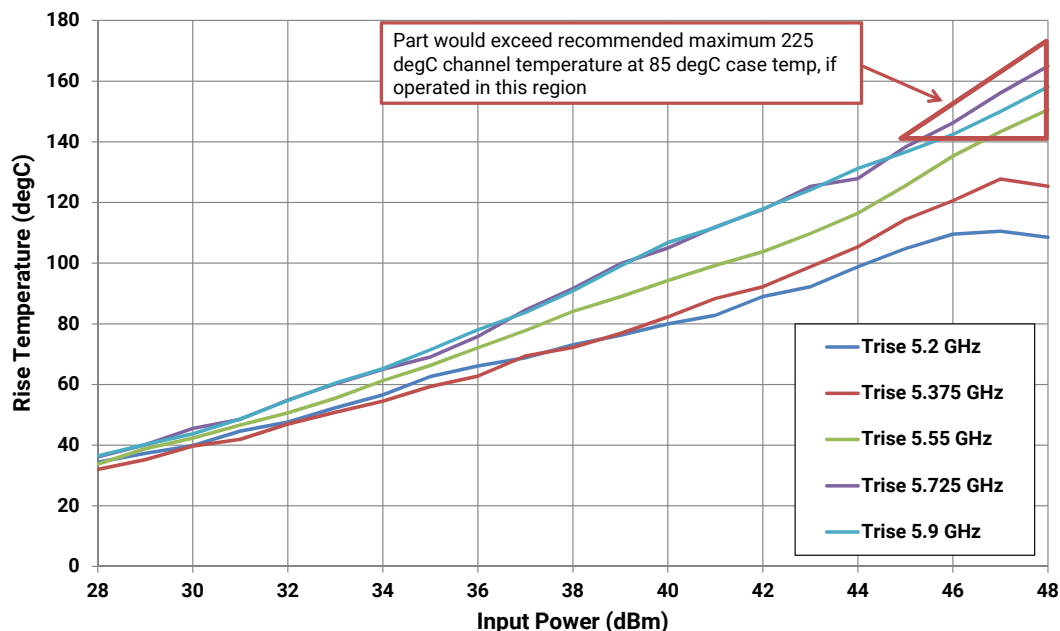
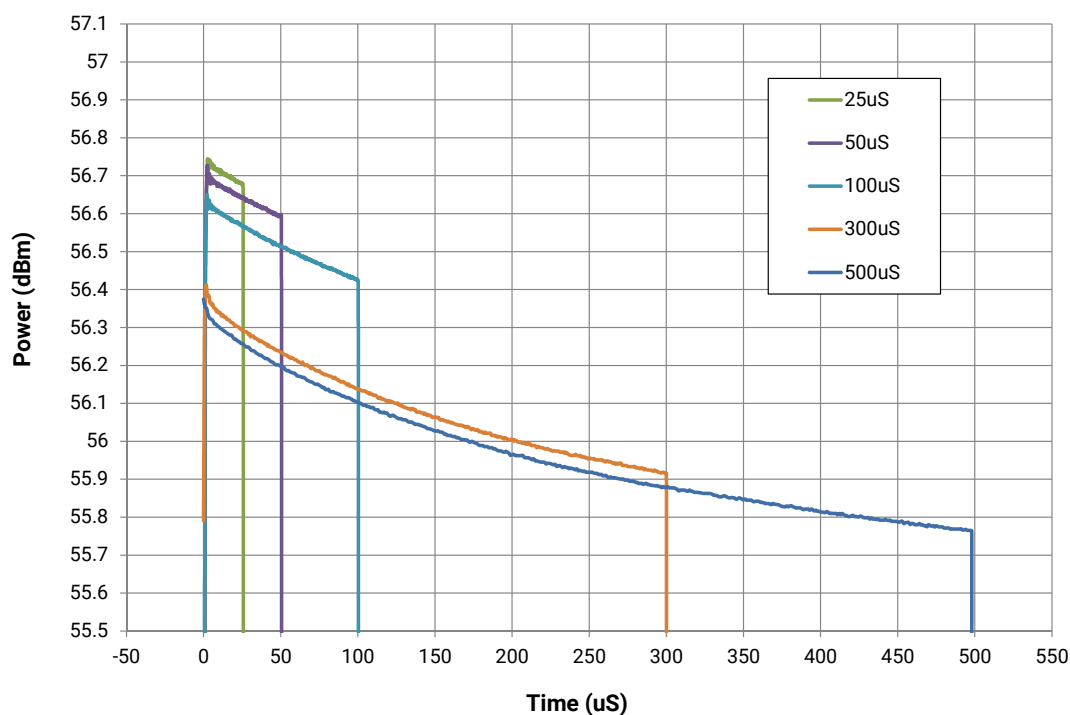


Figure 6. - CGHV59350 Output Power vs. Time

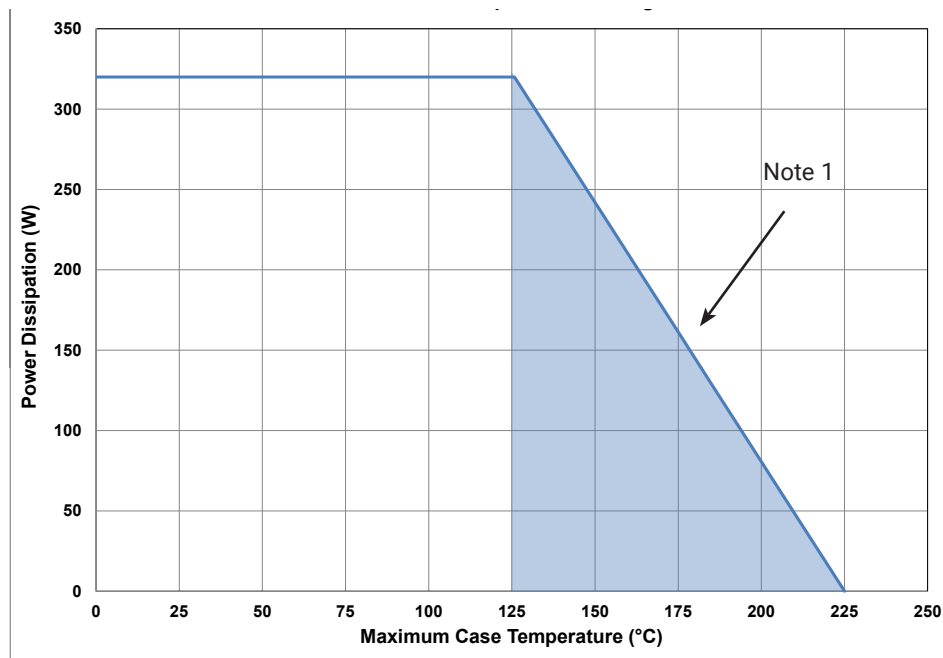
$V_{DD} = 50\text{ V}$, $P_{IN} = 46\text{ dBm}$, Duty Cycle = 10%



CGHV59350-AMP Application Circuit Bill of Materials

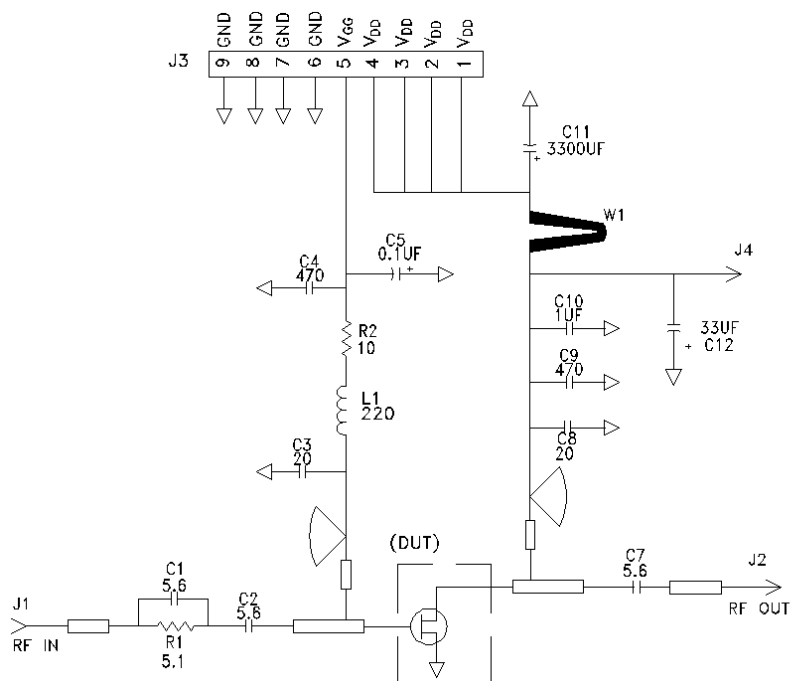
Designator	Description	Qty
R1	RES, 5.1OHM, +/- 1%, 1/16W,0603	1
R2	RES, 100OHM, +/- 1%, 1/16W,0603	1
C1,C2	CAP, 5.6pF, +/- 0.25 pF,250V, 0603	2
C3,C8	CAP, 20pF, +/- 0.25 pF,250V, 0603	2
C4,C9	CAP, 470PF, 5%, 100V, 0603, X	2
C5	CAP, 0.1MF, 1206, 250 V, X7R	1
L1	IND, FERRITE, 220 OHM, 0603	1
C10	CAP, 1.0UF, 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

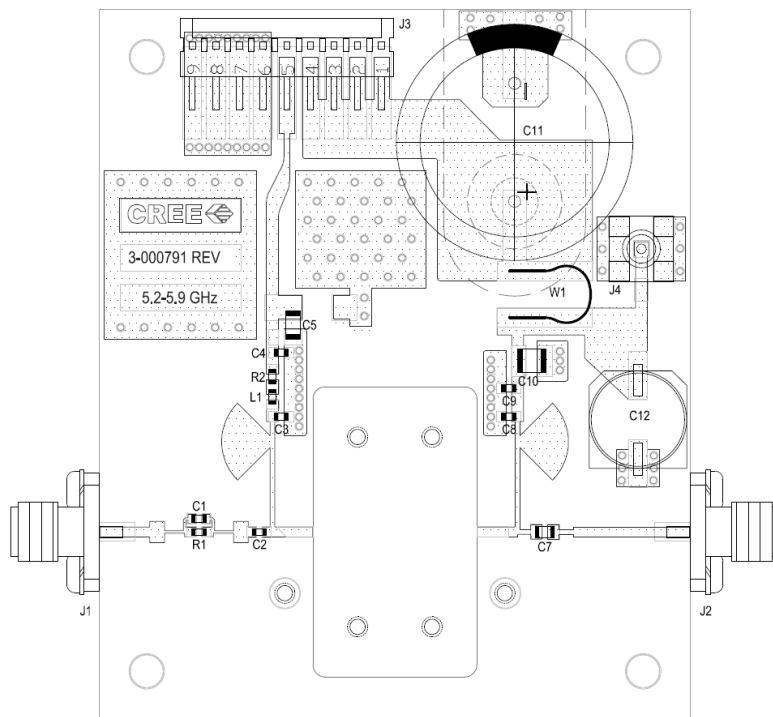


Note 1. Area exceeds Maximum Case Temperature (See Page 2).

CGHV59350-AMP Application Circuit Schematic



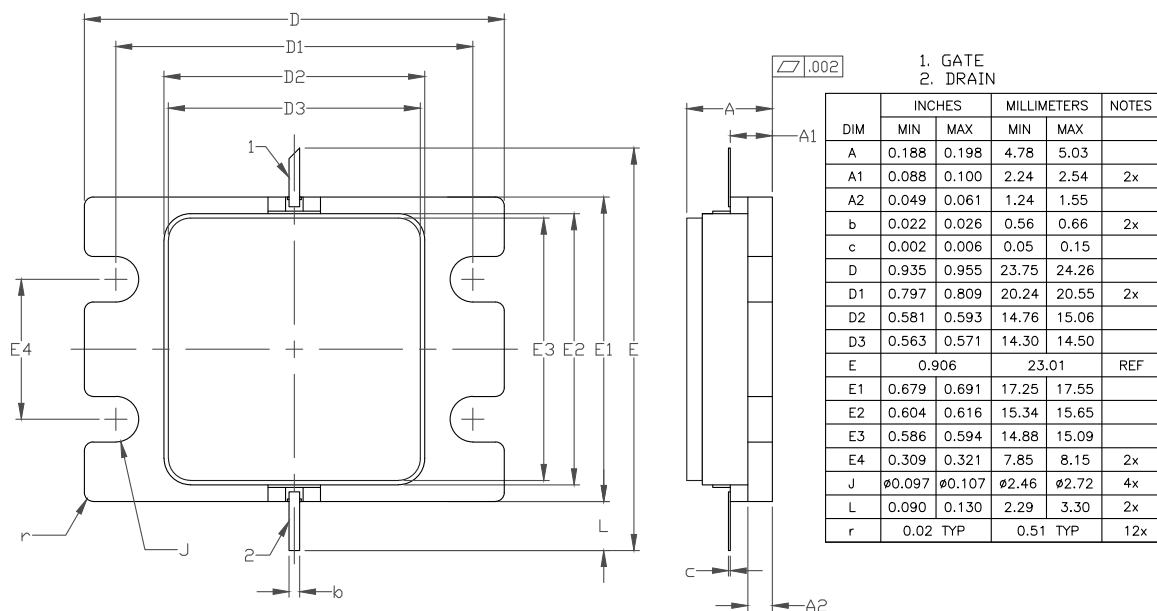
CGHV59350-AMP Application Circuit Outline



Product Dimensions CGHV59350F (Package Type – 440217)

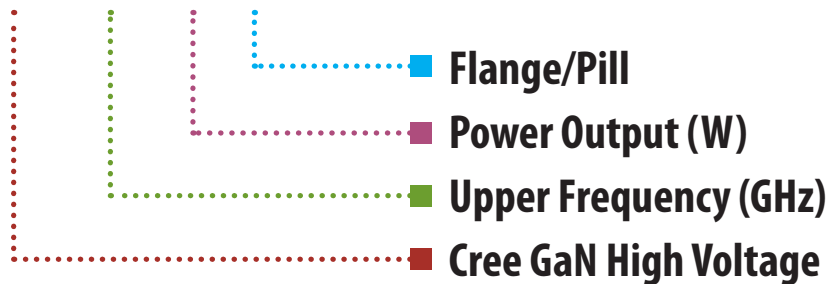
NOTES: (UNLESS OTHERWISE SPECIFIED)

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



Part Number System

CGHV59350F



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

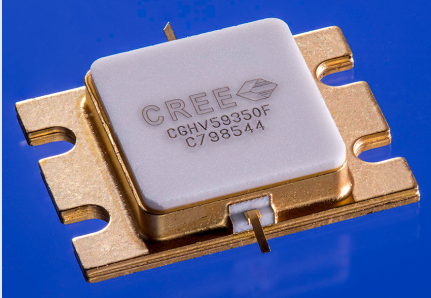
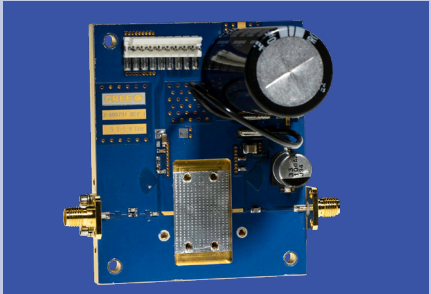
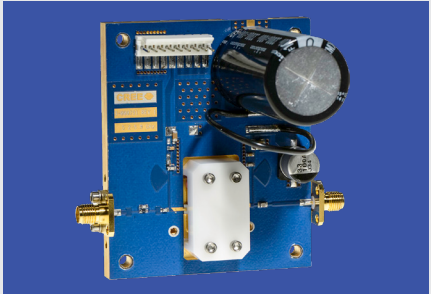
Table 1.

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	
CGHV59350-TB	Test board without GaN HEMT	Each	
CGHV59350-AMP	Test board with GaN HEMT installed	Each	

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