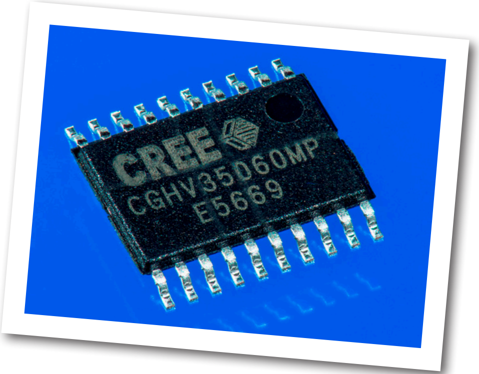
CGHV35060MP

60W, 2700-3800 MHz, 50V, GaN HEMT for S Band Radar and LTE base stations

Cree's CGHV35060MP is a 60W input matched, gallium nitride (GaN) high electron mobility transistor (HEMT) optimized for S Band performance. The CGHV35060MP is suitable for typical bands of 2.7-3.1GHz and 3.1-3.5GHz while the input matched transistor provides optimal gain, power and efficiency in a small 6.5mm x 4.4mm plastic surface mount (SMT) package. The typical performance plots in the datasheet are derived with CGHV35060MP matched into a 3.1-3.5 GHz high power amplifier.



PN: CGHV35060MP

Typical Performance Over 3.1 - 3.5 GHz (T_c = 25˚C) of Demonstration Amplifier

Parameter	3.1 GHz	3.3 GHz	3.5 GHz	Units
Gain	14.5	14.3	13.8	dB
Output Power	88	88	75	W
Drain Efficiency	61	67	64	%

Note:
Measured in the CGHV35060MP-TB1 amplifier circuit, under 100 μs pulse width, 10% duty cycle, P_{IN} = 35 dBm.

Features

- Reference design amplifier 3.1 - 3.5 GHz
- 75W Typical output power
- 14.5 dB power gain
- 67% Drain efficiency
- Internally pre-matched on input, unmatched output

RoHS COMPLIANT

Rev 2.0 – August 2018

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

Parameter	Symbol	Rating	Units	Conditions
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}	10.4	mA	25˚C
Maximum Drain Current[1]	I_{DMAX}	6.3	A	25˚C
Soldering Temperature[2]	T_S	245	˚C	
CW Thermal Resistance, Junction to Case[3]	$R_{\theta JC}$	2.6	˚C/W	85˚C, P_{DISS} = 52 W
Pulsed Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.95	˚C/W	85˚C, P_{DISS} = 62 W, 100 µsec 10%
Case Operating Temperature[4]	T_C	-40, +107	˚C	CW

Note:
[1] Current limit for long term, reliable operation.
[2] Refer to the Application Note on soldering at http://www.cree.com/rf/document-library
[3] Measured for the CGHV35060MP
[4] See also, the Power Dissipation De-rating Curve on Page 4.

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 = 10.4 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.7	–	V_{DC}	V_{DS} = 50 V, I_D = 125 mA
Saturated Drain Current[2]	I_{DS}	8.4	10.4	–	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 = 10.4 mA
RF Characteristics[4] (T_C = 25˚C, F_0 = 3.225 GHz unless otherwise noted)						
Saturated Output Power[3,7]	P_{SAT}	–	75	–	W	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{IN} = 34.5 dBm
Pulsed Drain Efficiency[3,7]	η	–	59.1	–	%	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{IN} = 34.5 dBm
Gain[3,7]	G	–	14.3	–	dB	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{IN} = 34.5 dBm
Gain[5,7]	G	–	16.3	–	dB	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 41.5 dBm
WCDMA Linearity[5]	ACLR	–	-35	–	dBc	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 41.5 dBm
Drain Efficiency[5]	η	–	35	–	%	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 41.5 dBm
Output Mismatch Stress[3]	VSWR	–	–	10:1	Ψ	No damage at all phase angles, V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 60 W Pulsed
Dynamic Characteristics						
Input Capacitance[6]	C_{GS}	–	32.16	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance[6]	C_{DS}	–	4.4	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz
Feedback Capacitance	C_{GD}	–	0.5	–	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] Pulse Width = 100 µs, Duty Cycle = 10%
[4] Measured in CGHV35060MP-TB high volume test fixture.
[5] Single Carrier WCDMA, 3GPP Test Model 1, 64 DPCH, 45% Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF, V_{DD} = 50 V.
[6] Includes package.
[7] Includes offsets correlating data taken in high volume test fixture to data taken in application circuit with device soldered down.

Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
USA Tel: +1.919.313.5300
Fax: +1.919.869.2733
www.cree.com/rf

Typical Performance

Figure 1. - Small Signal Gain and Return Losses of the CGHV35060MP Measured in Demonstration Amplifier Circuit CGHV35060MP-TB1

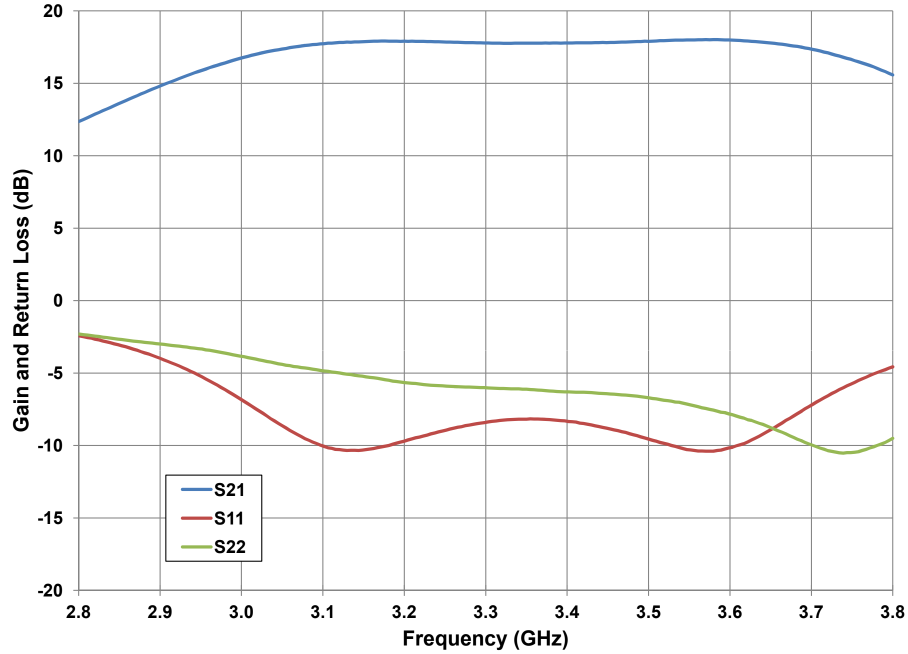
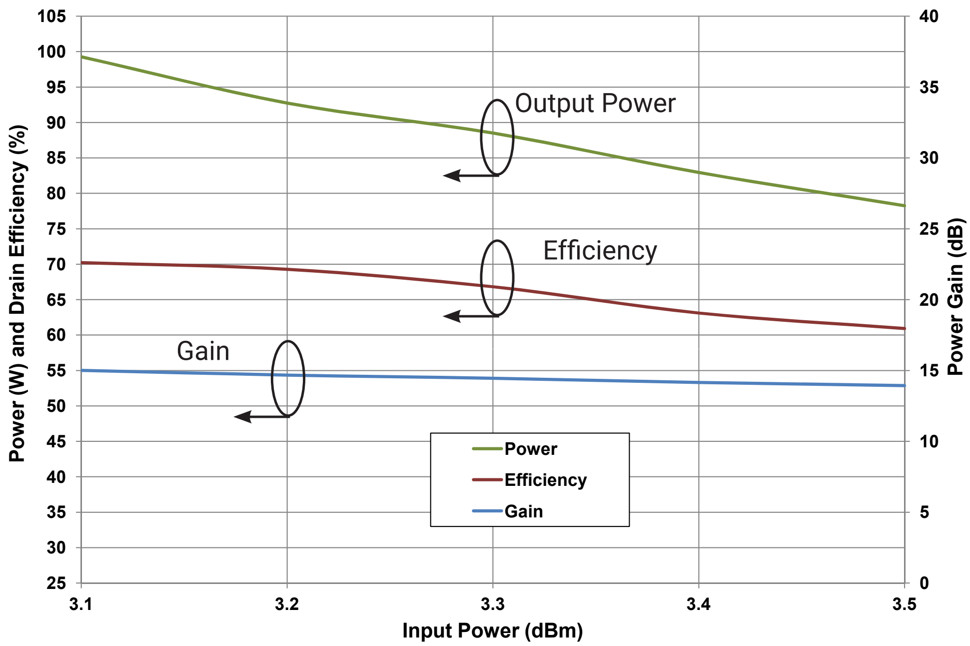


Figure 2. - CGHV35060MP-TB1 Gain, Efficiency & Output Power
V_{DD} = 50 V I_{DQ} = 125 mA, Pulse Width = 100 us, Duty Cycle = 10%, Tcase = 25°C



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Typical Performance

Figure 3. - CGHV35060MP-TB1 Output Power vs. Input Power
V_{DD} = 50 V I_{DQ} = 125 mA, Pulse Width = 100 us, Duty Cycle = 10%, Tcase = 25°C

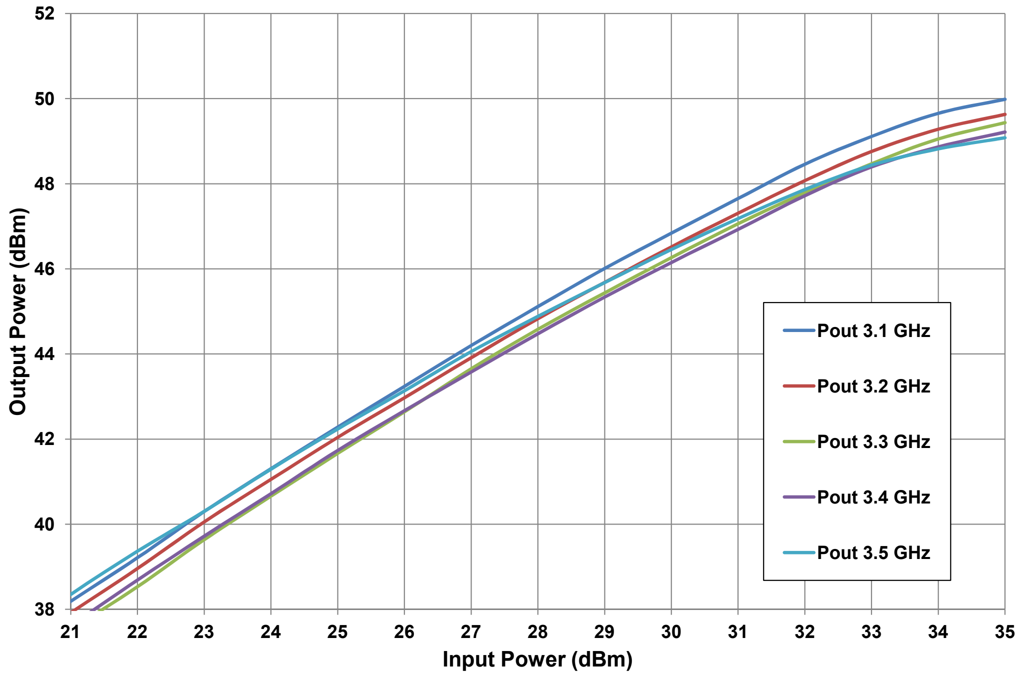
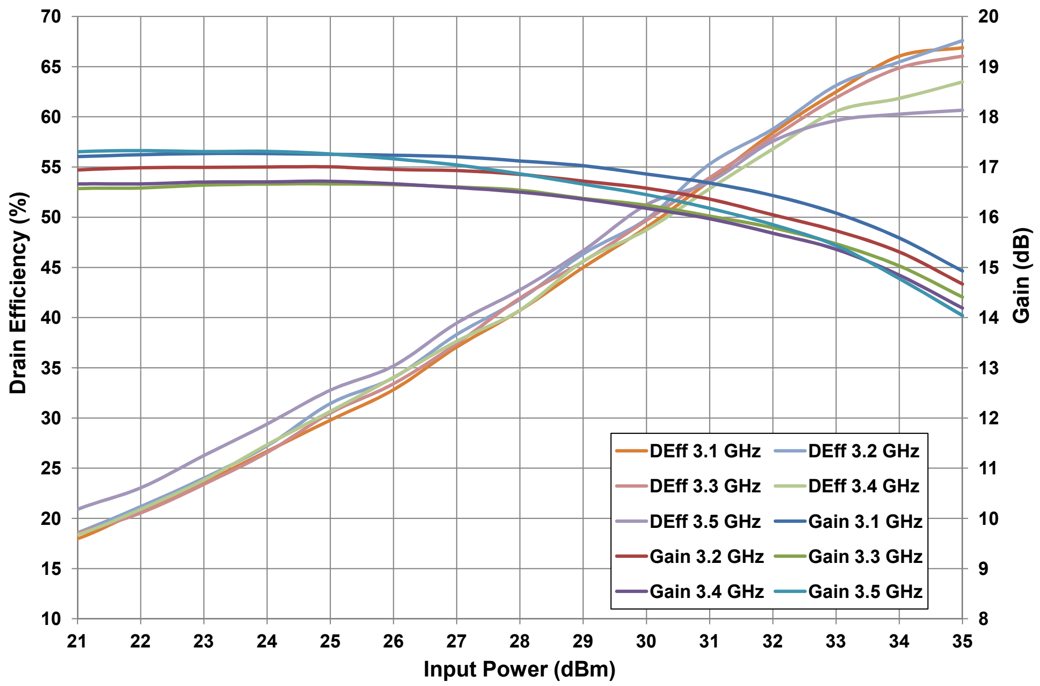


Figure 4. - CGHV35060MP-TB1 Gain & Efficiency vs Input Power
V_{DD} = 50 V I_{DQ} = 125 mA, Pulse Width = 100 us, Duty Cycle = 10%, Tcase = 25°C



Cree, Inc.
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Durham, North Carolina, USA 27703
USA Tel: +1.919.313.5300
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Typical Performance

Figure 5. - CGHV35060MP-TB1 Tj_rise vs. Input Power
V_{DD} = 50 V I_{DQ} = 125 mA, Pulse Width = 100 us, Duty Cycle = 10%, Tcase = 25°C

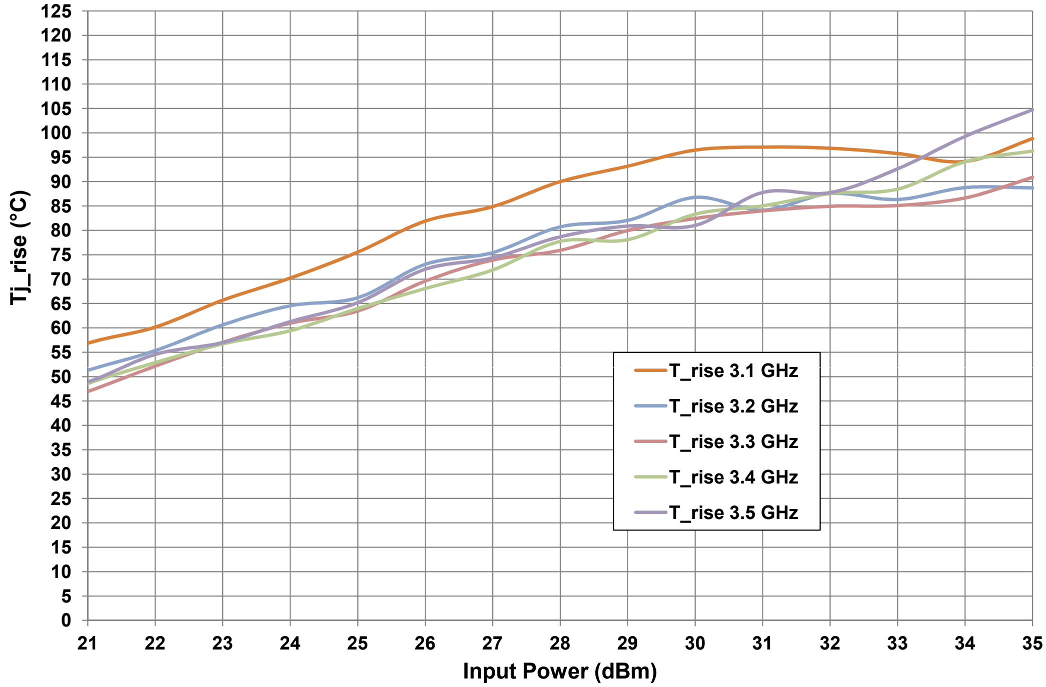
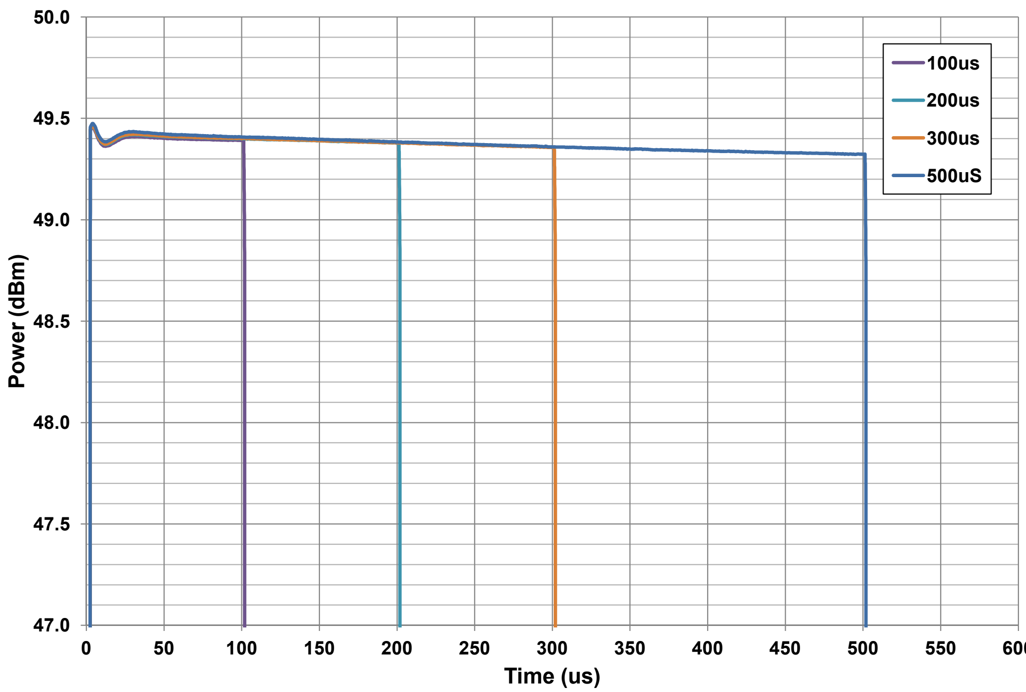


Figure 6. - CGHV35060MP-TB1 Output Power vs. Time, Varying Pulse Lengths
V_{DD} = 50 V P_{IN} = 35 dBm, Duty Cycle = 10%



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Durham, North Carolina, USA 27703
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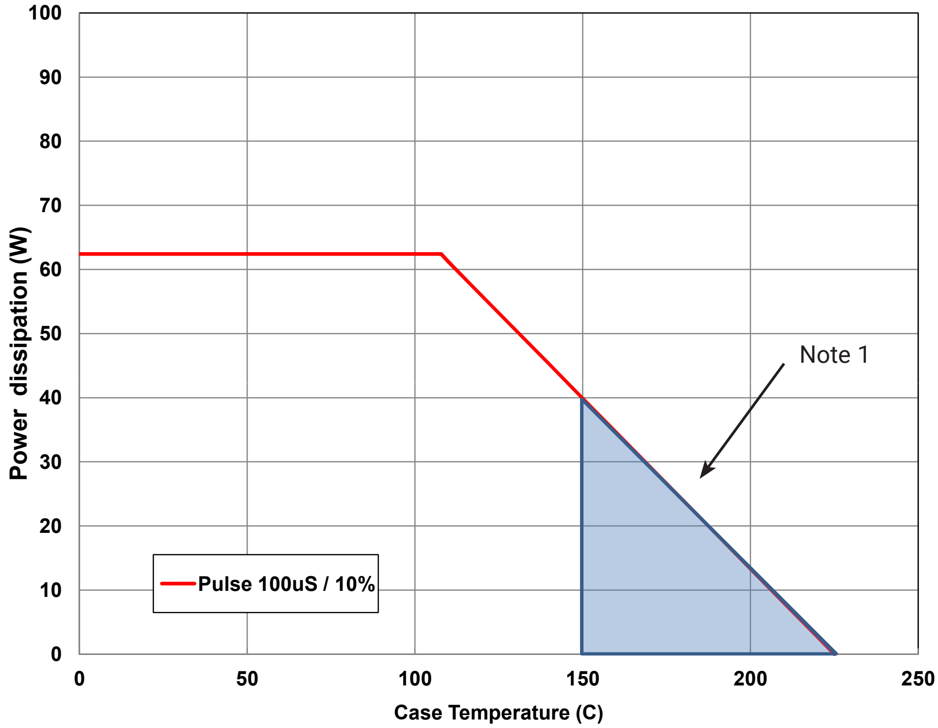
CGHV35060MP Power Dissipation De-rating Curve



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

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USA Tel: +1.919.313.5300
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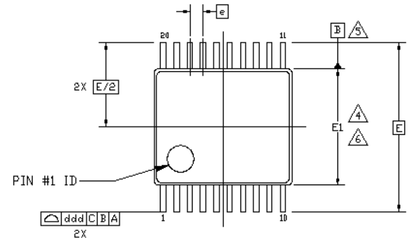
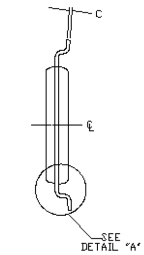
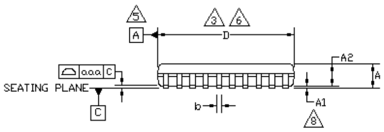
Product Dimensions CGHV35060MP (4.4 mm TSSOP 20-Lead Package)

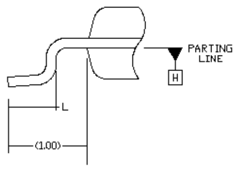




NOTES:

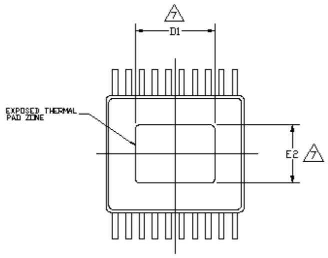
1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING & TOLERANCES PER ASME. Y14.5M-1994.
3. DIMENSION 'D' DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.
4. DIMENSION 'E1' DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 PER SIDE
5. DATUMS A AND B TO BE DETERMINED AT DATUM PLANE H.
6. DIMENSIONS 'D' AND 'E1' TO BE DETERMINED AT DATUM PLANE H.
7. 'D1' AND 'E2' DIMENSIONS DO NOT INCLUDE MOLD FLASH.
8. A1 IS DEFINED AS THE VERTICAL CLEARANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.





DETAIL 'A'

(VIEW ROTATED 90° C.W.)



SYMBOL	COMMON DIMENSIONS MIN.	NOM.	MAX.	NOTE
A	—	—	1.10	
A_1	0.05	—	0.15	8
A_2	0.85	0.90	0.95	
aaa		0.076		
b	0.19	–	0.30	
c	0.09	–	0.20	
D	6.40	6.50	6.60	3,6
E1	4.30	4.40	4.50	4,6
e		0.65 BSC		
E		6.40 BSC		
L	0.50	0.60	0.70	
D1	4.10	4.20	4.30	7
E2	2.90	3.00	3.10	7
ddd		0.20		

PINOUT TABLE

PIN	FUNCTION
1	GND
2	GND
3	RF INPUT
4	RF INPUT
5	RF INPUT
6	RF INPUT
7	RF INPUT
8	RF INPUT
9	GND
10	GND
11	GND
12	GND
13	RF OUTPUT
14	RF OUTPUT
15	RF OUTPUT
16	RF OUTPUT
17	RF OUTPUT
18	RF OUTPUT
19	GND
20	GND

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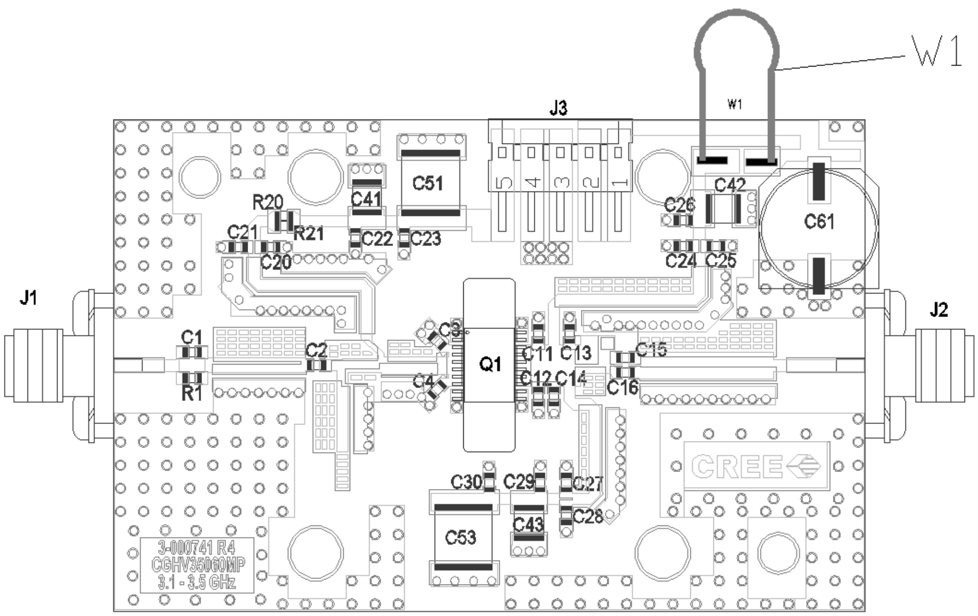
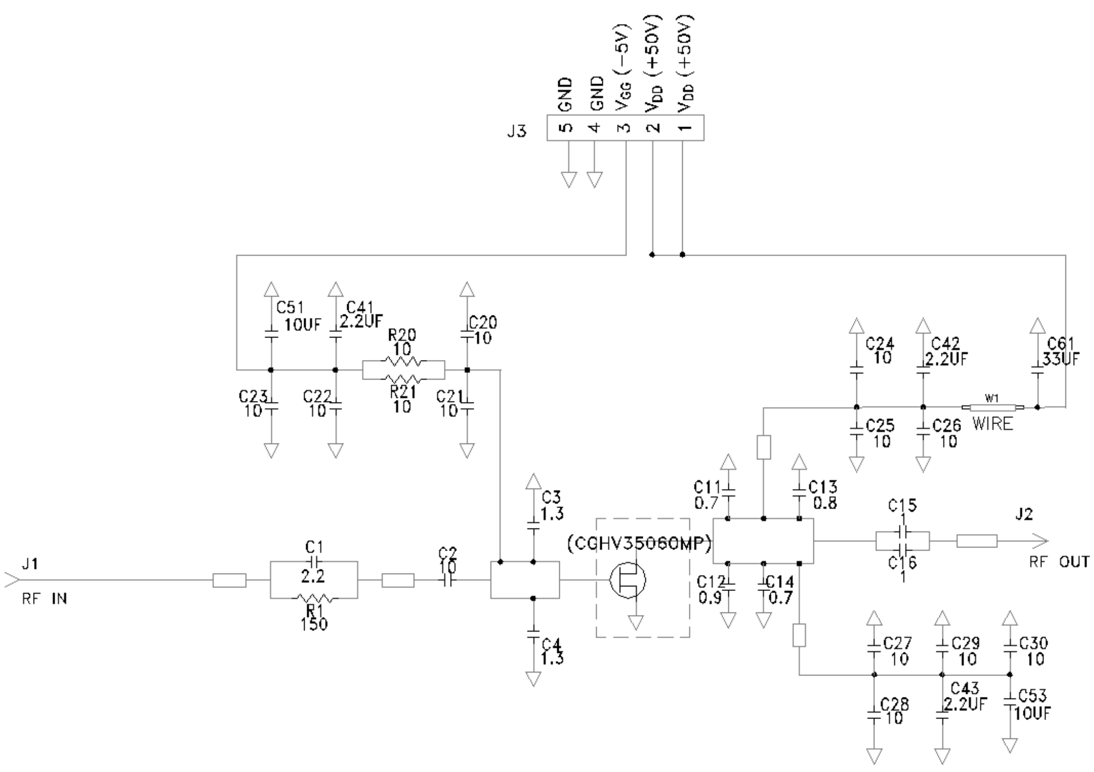
CREE

CGHV35060MP-AMP1 Application Circuit Outline



CGHV35060MP-AMP1 Application Circuit Schematic



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USA Tel: +1.919.313.5300
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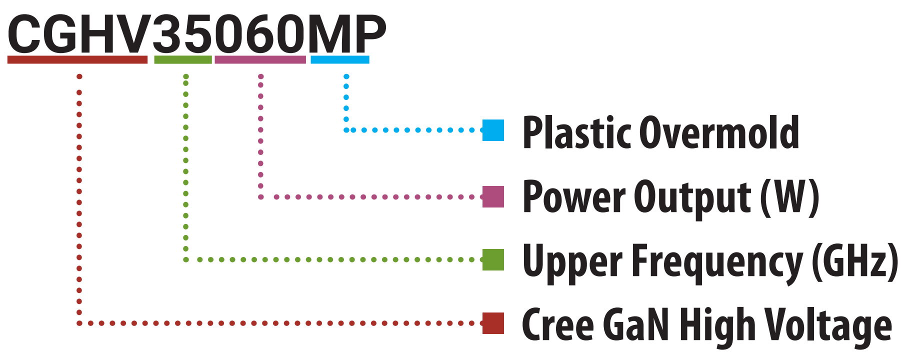
Part Number System



Parameter	Value	Units
Upper Frequency[1]	3.5	GHz
Power Output	60	W
Package	MP	-

Table 1.

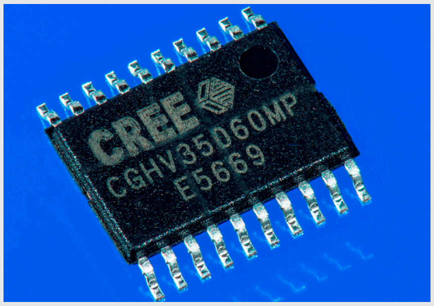
Note[1]: Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value.

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.

Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
USA Tel: +1.919.313.5300
Fax: +1.919.869.2733
www.cree.com/rf

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CGHV35060MP	GaN HEMT	Each	
CGHV35060MP-AMP1	Test board with GaN HEMT installed	Each	
CGHV35060MP	GaN HEMT	Tape and Reel	

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For more information, please contact:

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

Sarah Miller
Marketing
Cree, RF Components
1.919.407.5302

Ryan Baker
Marketing & Sales
Cree, RF Components
1.919.407.7816

Tom Dekker
Sales Director
Cree, RF Components
1.919.407.5639