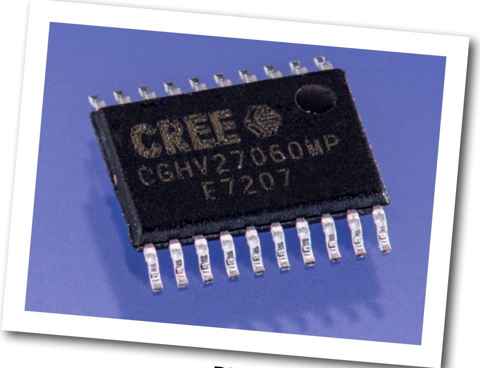
CGHV27060MP

60 W, DC - 2700 MHz, 50 V, GaN HEMT for LTE and Pulse Radar Applications

Cree's CGHV27060MP is a 60W gallium nitride (GaN) high electron mobility transistor (HEMT) housed in a small plastic SMT package 4.4mm x 6.5mm. The transistor is a broadband device with no internal input or output match which allows for the agility to apply to a wide range of frequencies from UHF thru 2.7GHz. The CGHV27060MP makes for an excellent transistor for pulsed applications at UHF, L Band or low S Band (<2.7GHz). Additionally, the transistor is well suited for LTE micro basestation amplifiers in the power class of 10 to 15W average power in high efficiency topologies such as Class A/B, F or Doherty amplifiers.



PN: CGHV27060MP

Typical Performance Over 2.5 - 2.7 GHz (T_c = 25°C) of Demonstration Amplifier

Parameter	2.5 GHz	2.6 GHz	2.7 GHz	Units
Gain @ 41.5 dBm Avg P_{OUT}	18.25	18.5	18.25	dB
ACLR @ 41.5 dBm Avg P_{OUT}	-34	-37	-38	dBc
Drain Efficiency @ 41.5 dBm Avg P_{OUT}	33	35	33	%

Note:
Measured in the CGHV27060MP-TB amplifier circuit, under WCDMA 3GPP test model 1, 64 DPCH, 45% clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF, V_{DD} = 50 V, I_{DS} = 125 mA.

Typical Performance Over 2.5 - 2.7 GHz (T_c = 25°C) of Demonstration Amplifier

Parameter	2.5 GHz	2.6 GHz	2.7 GHz	Units
Gain	16.5	16.3	16.2	dB
Output Power	84	82	79	W
Drain Efficiency	71	69	65	%

Note:
Measured in the CGHV27060MP-TB amplifier circuit, under pulse width 100 μs, 10% duty cycle, P_{IN} = 33 dBm.

Features - WCDMA

- 2.5 - 2.7 GHz Reference Design Amplifier
- 18.5 dB Gain at 14 W P_{AVE}
- -35 dBc ACLR at 14 W P_{AVE}
- 35% Efficiency at 14 W P_{AVE}
- High Degree of DPD Correction Can be Applied

Features - Pulsed

- 16.5 dB Gain at Pulsed P_{SAT}
- 70% Efficiency at Pulsed P_{SAT}
- 80W at Pulsed P_{SAT}

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

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	V_{DSS}	150	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	
Thermal Resistance, Junction to Case[3]	$R_{θJC}$	2.6	˚C/W	85˚C, P_{DISS} = 52 W
Thermal Resistance Pulsed 10%, 100 µs, Junction to Case	$R_{θJC}$	1.95	˚C/W	85˚C, P_{DISS} = 62W, 100 µs/10%
Case Operating Temperature[4]	T_C	-40, +90	˚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 CGHV27060MP
[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[5] (T_C = 25˚C, F_0 = 2.7 GHz unless otherwise noted)						
Saturated Output Power[3,4]	P_{SAT}	–	80	–	W	V_{DD} = 50 V, I_{DQ} = 125 mA
Pulsed Drain Efficiency[3,4]	η	–	70	–	%	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = P_{SAT}
Gain[3,4]	G	–	16.5	–	dB	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = P_{SAT}
Gain[6]	G	–	18.5	–	dB	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 41.5 dBm
WCDMA Linearity[6]	ACLR	–	-35	–	dBc	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 41.5 dBm
Drain Efficiency[6]	η	–	34	–	%	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 41.5 dBm
Output Mismatch Stress[3]	VSWR	–	–	TBD	Ψ	No damage at all phase angles, V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 60 W Pulsed
Dynamic Characteristics						
Input Capacitance[7]	C_{GS}	–	15.3	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance[7]	C_{DS}	–	4.7	–	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] P_{SAT} is defined as I_{GS} = 1.0 mA peak
[5] Measured in CGHV27060MP-TB.
[6] Single Carrier WCDMA, 3GPP Test Model 1, 64 DPCH, 45% Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF, V_{DD} = 50 V.
[7] Includes package.

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 CGHV27060MP Measured in Demonstration Amplifier Circuit CGHV27060MP-TB

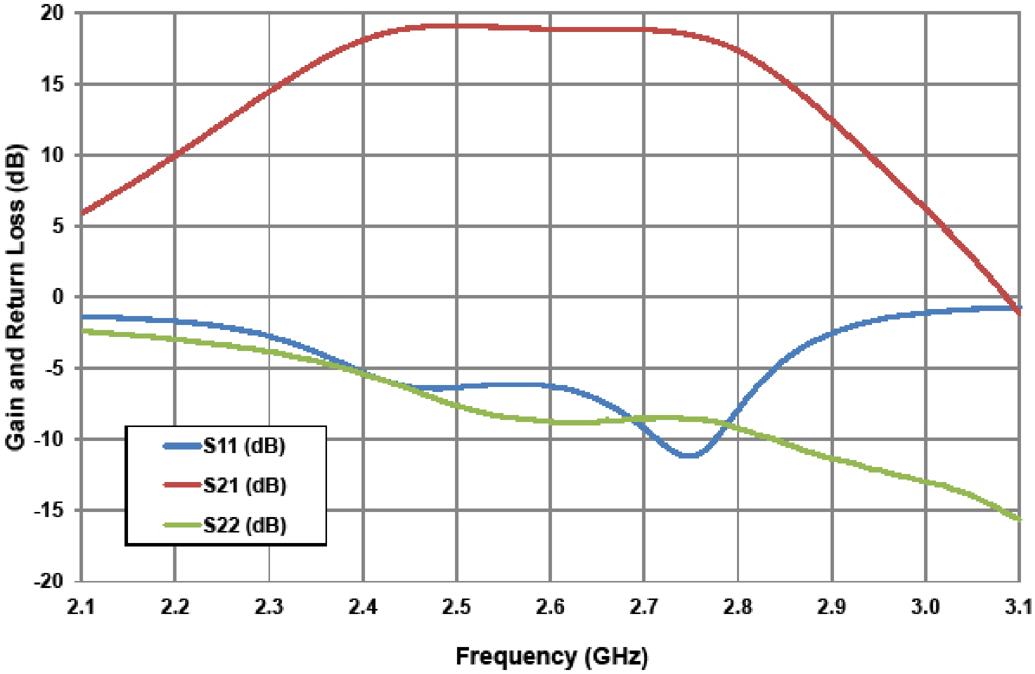
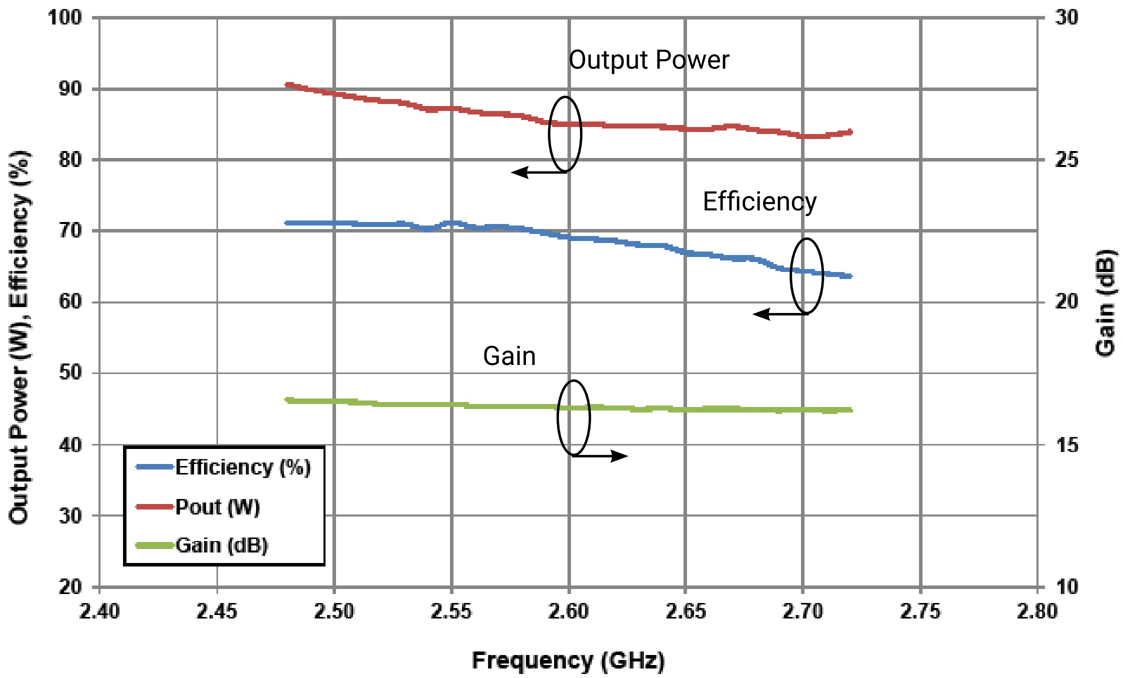
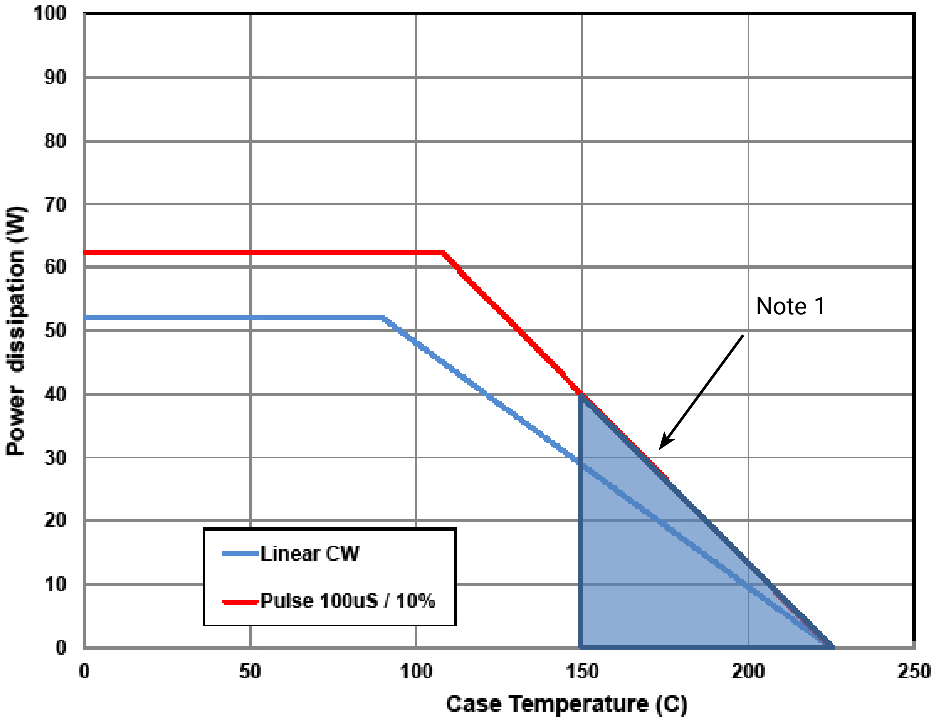


Figure 2. - Gain, Power Added Efficiency & Average Power Output at 10% Duty Cycle for the CGHV27060MP Measured in Demonstration Amplifier Circuit CGHV27060MP-TB



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

CGHV27060MP Power Dissipation De-rating Curve



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

Electrostatic Discharge (ESD) Classifications

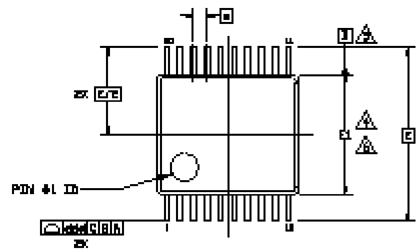
Parameter	Symbol	Class	Test Methodology
Human Body Model	HBM	1A (> 250 V)	JEDEC JESD22 A114-D
Charge Device Model	CDM	2 (125 V to 250 V)	JEDEC JESD22 C101-C

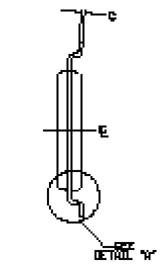
Moisture Sensitivity Level (MSL) Classification

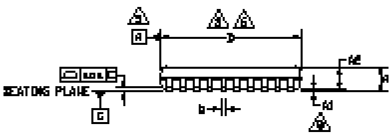
Parameter	Symbol	Level	Test Methodology
Moisture Sensitivity Level	MSL	3 (168 hours)	IPC/JEDEC J-STD-20

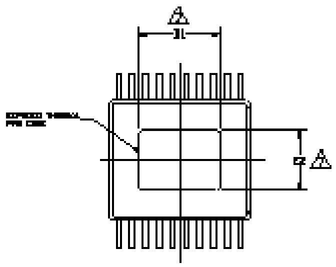
Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
USA Tel: +1.919.313.5300
Fax: +1.919.869.2733
www.cree.com/rf

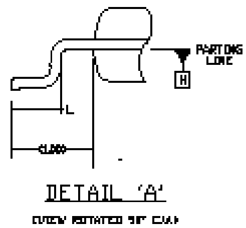
Product Dimensions CGHV27060MP (4.4 mm TSSOP 20-Lead Package)











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.

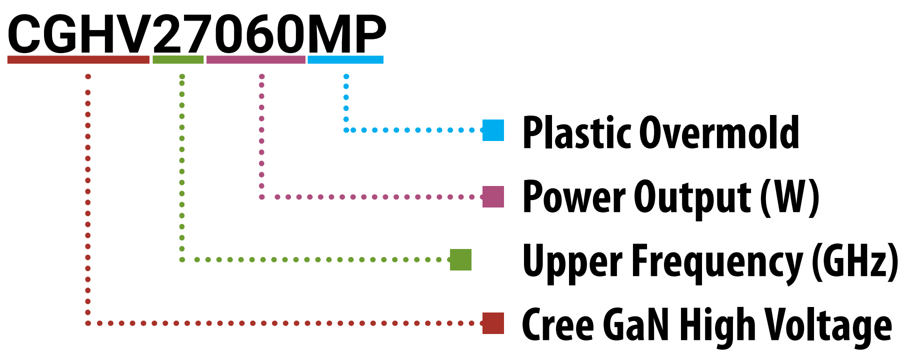
SYMBOL	COMMON DIMENSIONS			NOTE
	MIN.	NOM.	MAX.	
A	—	—	1.10	
A1	0.05	—	0.15	8
A2	0.85	0.90	0.95	
aaa	0.076			
b	0.19	-	0.30	
c	0.09	-	0.20	
D	6.40	6.50	6.60	3,6
E1	4.30	4.40	4.50	4,6
e	0.65 BSC			
E	6.40 BSC			
L	0.50	0.60	0.70	
D1	4.10	4.20	4.30	7
E2	2.90	3.00	3.10	7
ddd	0.20			

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

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

Part Number System



Parameter	Value	Units
Upper Frequency[1]	2.7	GHz
Power Output	60	W
Package	MP	-

Table 1.

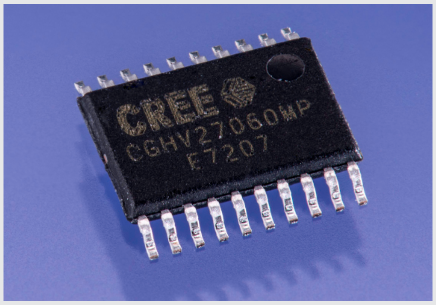
Note[1]: Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value.

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
CGHV27060MP	GaN HEMT	Each	
CGHV27060MP-AMP1	Test board with GaN HEMT installed	Each	

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

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
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

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