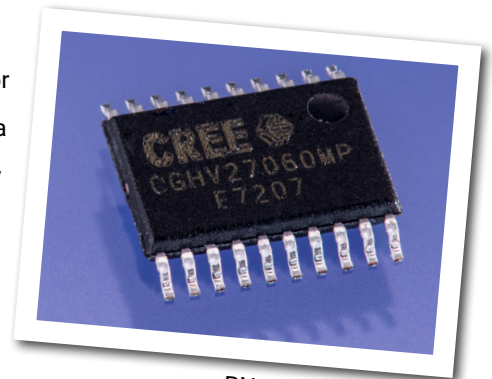


# CGHV27060MP

## 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 ( $T_c = 25^\circ\text{C}$ ) 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,  $V_{DD} = 50\text{ V}$ ,  $I_{DS} = 125\text{ mA}$ .

### Typical Performance Over 2.5 - 2.7 GHz ( $T_c = 25^\circ\text{C}$ ) 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  $\mu\text{s}$ , 10% duty cycle,  $P_{IN} = 33\text{ dBm}$ .

### 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	$V_{DS}$	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 <sup>1</sup>	$I_{DMAX}$	6.3	A	25°C
Soldering Temperature <sup>2</sup>	$T_S$	245	°C	
Thermal Resistance, Junction to Case <sup>3</sup>	$R_{\theta JC}$	2.6	°C/W	85°C, $P_{DISS} = 52$ W
Thermal Resistance Pulsed 10%, 100 $\mu$ s, Junction to Case	$R_{\theta JC}$	1.95	°C/W	85°C, $P_{DISS} = 62$ W, 100 $\mu$ s/10%
Case Operating Temperature <sup>4</sup>	$T_C$	-40, +90	°C	CW

Note:

<sup>1</sup> Current limit for long term, reliable operation.

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

<sup>3</sup> Measured for the CGHV27060MP

<sup>4</sup> See also, the Power Dissipation De-rating Curve on Page 4.

## Electrical Characteristics ( $T_C = 25^\circ\text{C}$ )

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
<b>DC Characteristics<sup>1</sup></b>						
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 <sup>2</sup>	$I_{DS}$	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
<b>RF Characteristics<sup>5</sup> (<math>T_C = 25^\circ\text{C}</math>, <math>F_0 = 2.7</math> GHz unless otherwise noted)</b>						
Saturated Output Power <sup>3,4</sup>	$P_{SAT}$	-	80	-	W	$V_{DD} = 50$ V, $I_{DQ} = 125$ mA
Pulsed Drain Efficiency <sup>3,4</sup>	$\eta$	-	70	-	%	$V_{DD} = 50$ V, $I_{DQ} = 125$ mA, $P_{OUT} = P_{SAT}$
Gain <sup>3,4</sup>	G	-	16.5	-	dB	$V_{DD} = 50$ V, $I_{DQ} = 125$ mA, $P_{OUT} = P_{SAT}$
Gain <sup>6</sup>	G	-	18.5	-	dB	$V_{DD} = 50$ V, $I_{DQ} = 125$ mA, $P_{OUT} = 41.5$ dBm
WCDMA Linearity <sup>6</sup>	ACLR	-	-35	-	dBc	$V_{DD} = 50$ V, $I_{DQ} = 125$ mA, $P_{OUT} = 41.5$ dBm
Drain Efficiency <sup>6</sup>	$\eta$	-	34	-	%	$V_{DD} = 50$ V, $I_{DQ} = 125$ mA, $P_{OUT} = 41.5$ dBm
Output Mismatch Stress <sup>3</sup>	VSWR	-	-	TBD	$\Psi$	No damage at all phase angles, $V_{DD} = 50$ V, $I_{DQ} = 125$ mA, $P_{OUT} = 60$ W Pulsed
<b>Dynamic Characteristics</b>						
Input Capacitance <sup>7</sup>	$C_{GS}$	-	15.3	-	pF	$V_{DS} = 50$ V, $V_{GS} = -8$ V, $f = 1$ MHz
Output Capacitance <sup>7</sup>	$C_{DS}$	-	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:

<sup>1</sup> Measured on wafer prior to packaging.

<sup>2</sup> Scaled from PCM data.

<sup>3</sup> Pulse Width = 100  $\mu$ s, Duty Cycle = 10%

<sup>4</sup>  $P_{SAT}$  is defined as  $I_{GS} = 1.0$  mA peak

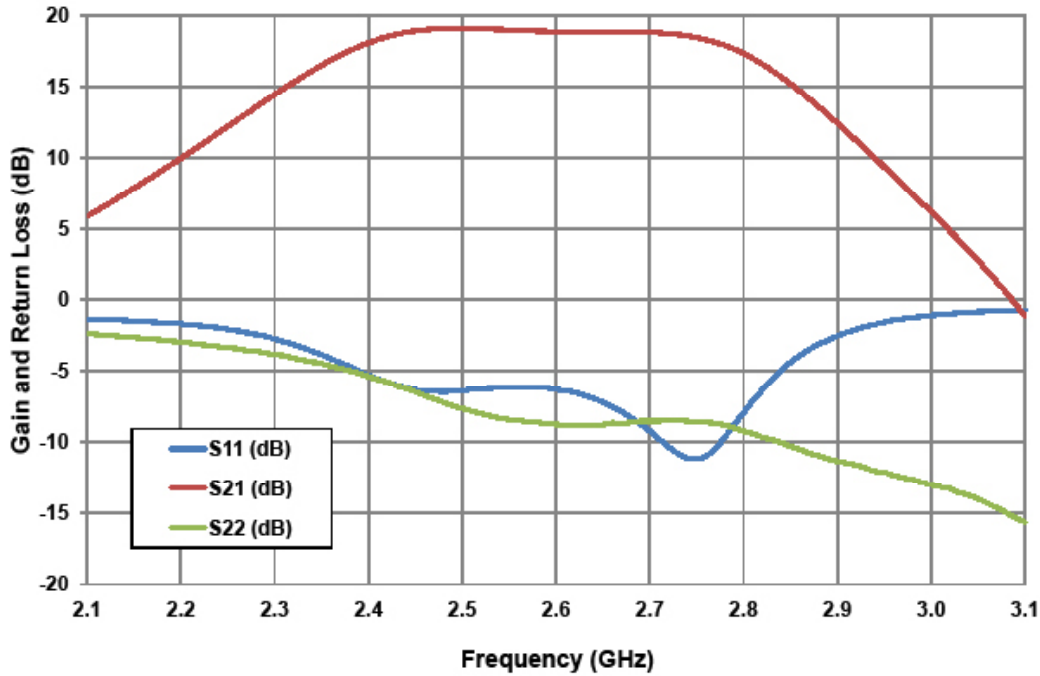
<sup>5</sup> Measured in CGHV27060MP-TB.

<sup>6</sup> Single Carrier WCDMA, 3GPP Test Model 1, 64 DPCH, 45% Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF,  $V_{DD} = 50$  V.

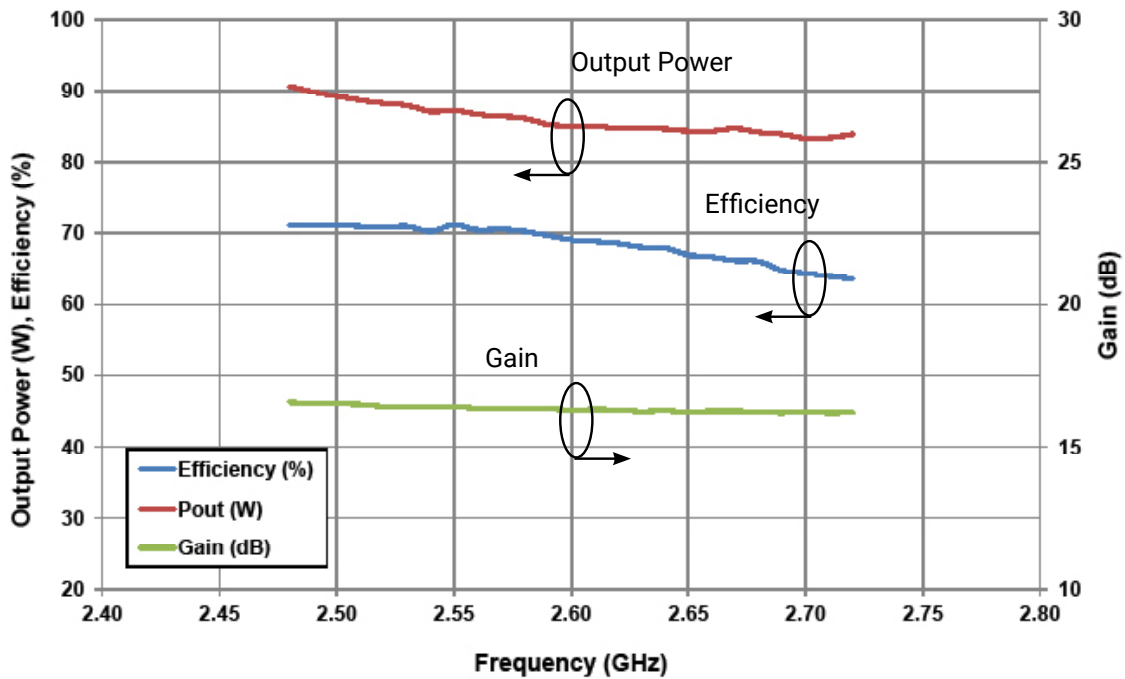
<sup>7</sup> Includes package.

## Typical Performance

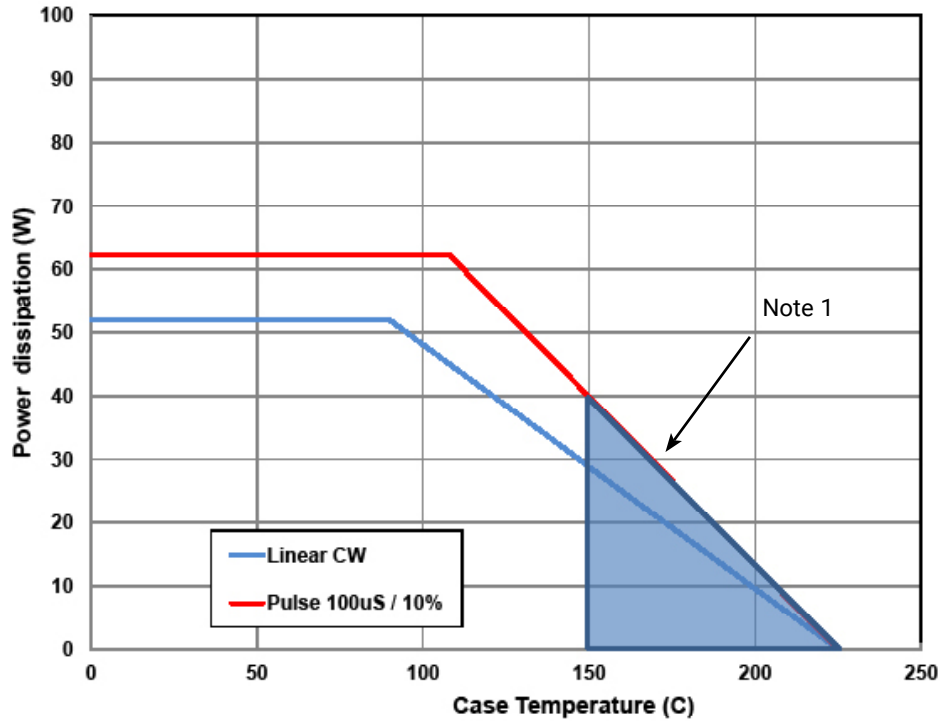
**Figure 1. - Small Signal Gain and Return Losses of the CGHV27060MP Measured in Demonstration Amplifier Circuit CGHV27060MP-TB**



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



## CGHV27060MP Power Dissipation De-rating Curve



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

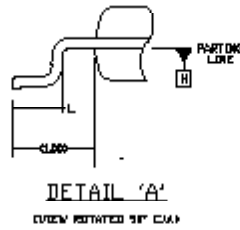
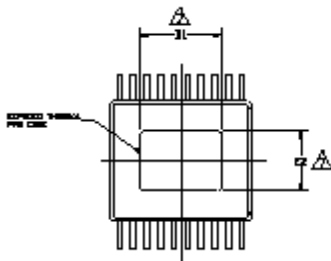
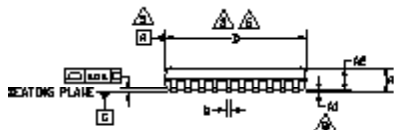
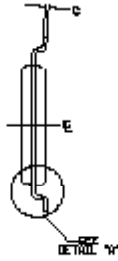
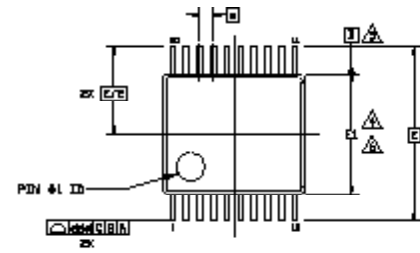
## Electrostatic Discharge (ESD) Classifications

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

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



### NOTES:

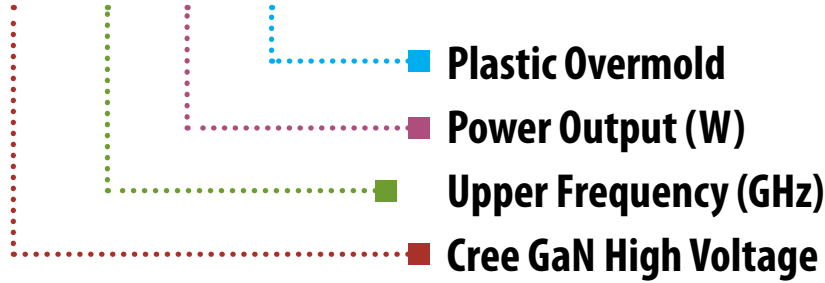
1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
  2. DIMENSIONING & TOLERANCES PER ASME Y14.5M-1994.
-  DIMENSION 'A' DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.
  -  DIMENSION 'A1' DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 PER SIDE.
  -  DATUMS A AND B TO BE DETERMINED AT DATUM PLANE H.
  -  DIMENSIONS 'D' AND 'E' TO BE DETERMINED AT DATUM PLANE H.
  -  'D1' AND 'E2' DIMENSIONS DO NOT INCLUDE MOLD FLASH.
  -  L1 IS DEFINED AS THE VERTICAL CLEARANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

	COMMON DIMENSIONS			B
	MIN.	NOM.	MAX.	
A	—	—	1.10	
A1	0.05	—	0.15	
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	0.63 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

### CGHV27060MP



Parameter	Value	Units
Upper Frequency <sup>1</sup>	2.7	GHz
Power Output	60	W
Package	MP	-

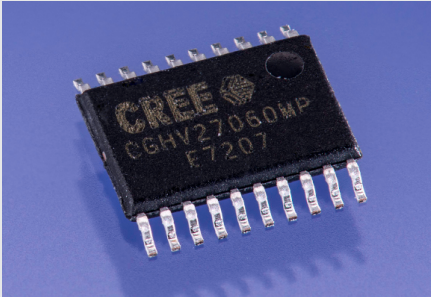
**Table 1.**

**Note<sup>1</sup>:** 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
CGHV27060MP	GaN HEMT	Each	
CGHV27060MP-AMP1	Test board with GaN HEMT installed	Each	



## Disclaimer

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