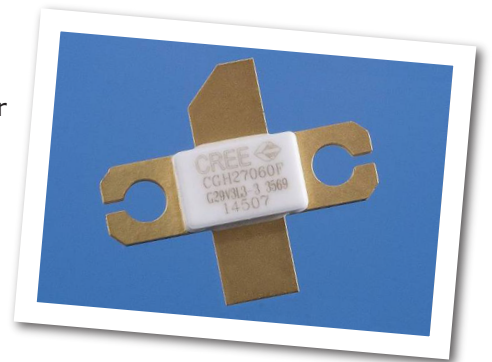


CGH27060F

60 W, 2300-2900 MHz, 28V, GaN HEMT for WiMAX

Cree's CGH27060F is a gallium nitride (GaN) high electron mobility transistor (HEMT) designed specifically for high efficiency, high gain and wide bandwidth capabilities, which makes the CGH27060F ideal for 2.3-2.9GHz WiMAX and BWA amplifier applications. The transistor is supplied in a ceramic/metal flange package.



Package Type: 440193
PN: CGH27060F

Typical Performance Over 2.3-2.6GHz ($T_c = 25^\circ\text{C}$) of Demonstration Amplifier

Parameter	2.3 GHz	2.4 GHz	2.5 GHz	2.6 GHz	Units
Small Signal Gain	13.5	13.3	13.0	12.9	dB
EVM @ 39 dBm	2.1	1.9	1.9	2.2	%
Drain Efficiency @ 39 dBm	24.2	23.8	22.5	22.3	%
Input Return Loss	9.8	16.0	7.7	5.9	dB

Note:

Measured in the CGH27060F-TB amplifier circuit, under 802.16-2004 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3.

Features



- 2.3 - 2.9 GHz Operation
- >13 dB Small Signal Gain
- 2.0 % EVM at 8 W P_{OUT}
- 23 % Efficiency at 8 W P_{OUT}
- 2.7°C/W Typical thermal resistance under 8.0 W P_{AVE} OFDM
- WiMAX Fixed Access 802.16-2004 OFDM
- WiMAX Mobile Access 802.16e OFDMA



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

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DSS}	84	Volts
Gate-to-Source Voltage	V_{GS}	-10, +2	Volts
Storage Temperature	T_{STG}	-55, +150	°C
Operating Junction Temperature	T_J	175	°C
Soldering Temperature	T_S	245	°C
Thermal Resistance, Junction to Case ¹	$R_{\theta JC}$	2.7	°C/W

Note:

¹ Measured for the CGH27060F at 8 W P_{DISS}

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

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics⁴						
Gate Threshold Voltage	$V_{GS(th)}$	-3.6	-2.5	-	VDC	$V_{DS} = 10\text{ V}, I_D = 14.4\text{ mA}$
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.6	-	VDC	$V_{DS} = 28\text{ V}, I_D = 240\text{ mA}$
Saturated Drain Current	I_{DS}	9.6	10.4	-	A	$V_{DS} = 6.0\text{ V}, V_{GS} = 2\text{ V}$
Drain-Source Breakdown Voltage	V_{BR}	84	100	-	VDC	$V_{GS} = -8\text{ V}, I_D = 14.4\text{ mA}$
Case Operating Temperature	T_c	-10	-	+105	°C	Under 8 W P_{AVE}
Screw Torque	T	-	-	80	in-oz	Reference 440193 Package Revision 1
RF Characteristics^{2,3} ($T_c = 25^\circ\text{C}$, $F_0 = 2.5\text{ GHz}$ unless otherwise noted)						
Small Signal Gain	G_{SS}	-	13.0	-	dB	$V_{DD} = 28\text{ V}, I_{DQ} = 240\text{ mA}$
Drain Efficiency ¹	η	-	22.5	-	%	$V_{DD} = 28\text{ V}, I_{DQ} = 240\text{ mA}, P_{AVE} = 8\text{ W}$
Back-Off Error Vector Magnitude	EVM_1	-	2.5	-	%	$V_{DD} = 28\text{ V}, I_{DQ} = 240\text{ mA}, P_{AVE} = 24\text{ dBm}$
Error Vector Magnitude	EVM_2	-	2.0	-	%	$V_{DD} = 28\text{ V}, I_{DQ} = 240\text{ mA}, P_{AVE} = 8\text{ W}$
Output Mismatch Stress	VSWR	-	TBD	-	Ψ	No damage at all phase angles, $V_{DD} = 28\text{ V}, I_{DQ} = 240\text{ mA}$
Dynamic Characteristics						
Input Capacitance	C_{GS}	-	19.3	-	pF	$V_{DS} = 28\text{ V}, V_{GS} = -8\text{ V}, f = 1\text{ MHz}$
Output Capacitance	C_{DS}	-	4.6	-	pF	$V_{DS} = 28\text{ V}, V_{GS} = -8\text{ V}, f = 1\text{ MHz}$
Feedback Capacitance	C_{GD}	-	1.7	-	pF	$V_{DS} = 28\text{ V}, V_{GS} = -8\text{ V}, f = 1\text{ MHz}$

Notes:

¹ Drain Efficiency = P_{OUT} / P_{DC}

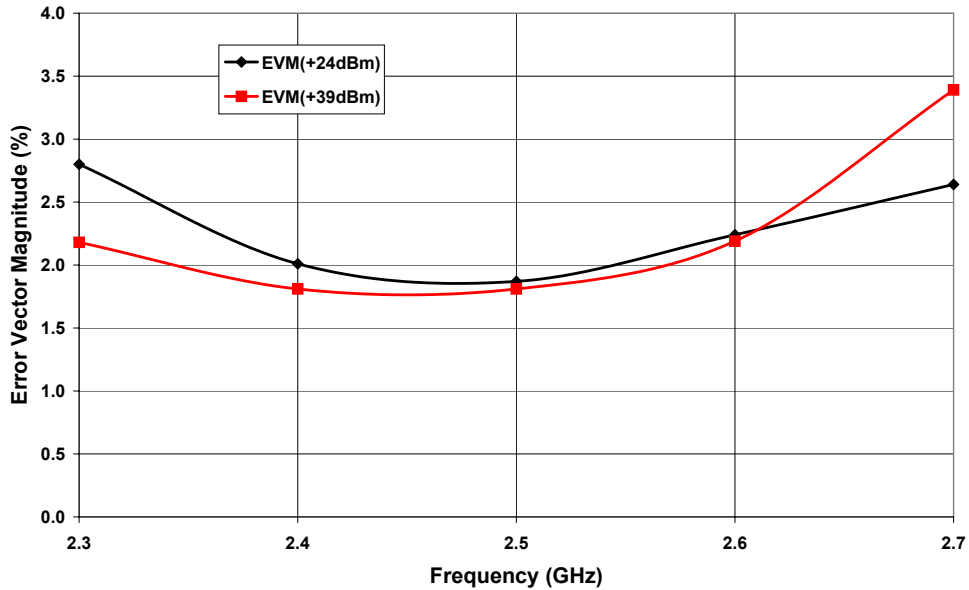
² Under 802.16-2004 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3.

³ Measured in the CGH27060F-TB test fixture.

⁴ Measured on wafer prior to packaging.

Typical WiMAX Performance

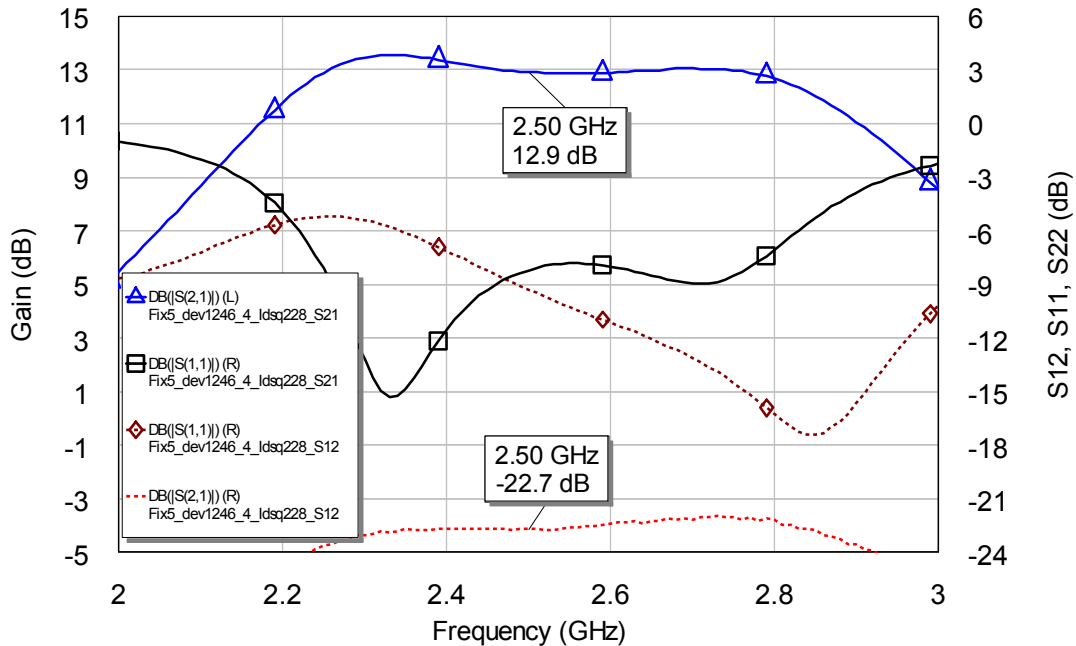
Typical EVM at 24 dBm and 39 dBm vs Frequency of CGH27060F in Broadband Amplifier Circuit CGH27060F-TB



Note:

Under 802.16-2004 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3.

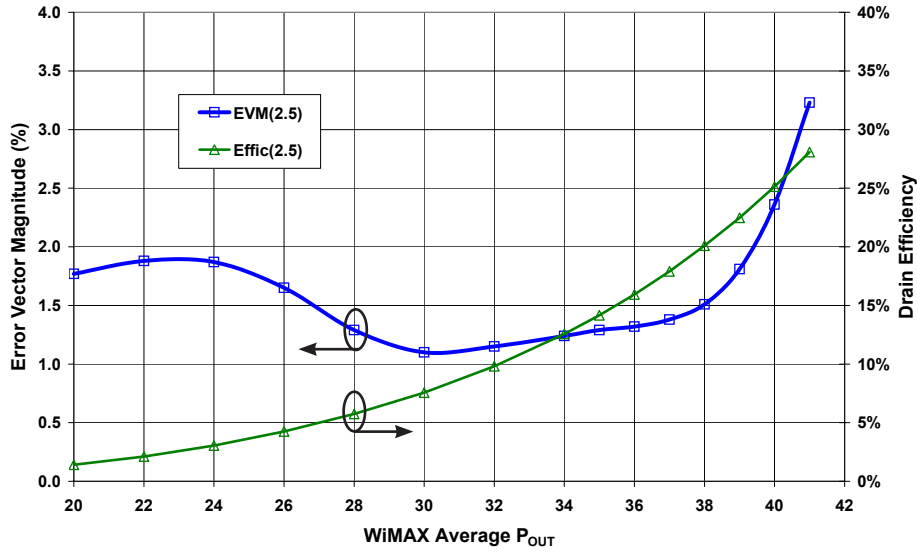
Gain and Return Loss vs Frequency of CGH27060F in Broadband Amplifier Circuit CGH27060F-TB, $V_{DD} = 28\text{ V}$, $I_{DQ} = 240\text{ mA}$





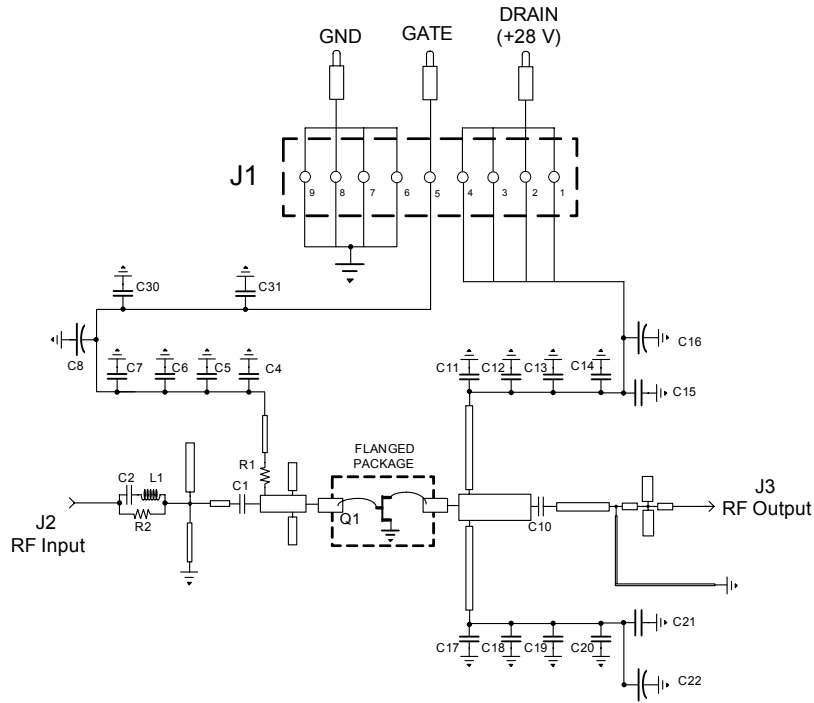
Typical WiMAX Performance

**EVM vs P_{OUT} at 2.5 GHz of CGH27060F in
Broadband Amplifier Circuit CGH27060F-TB**

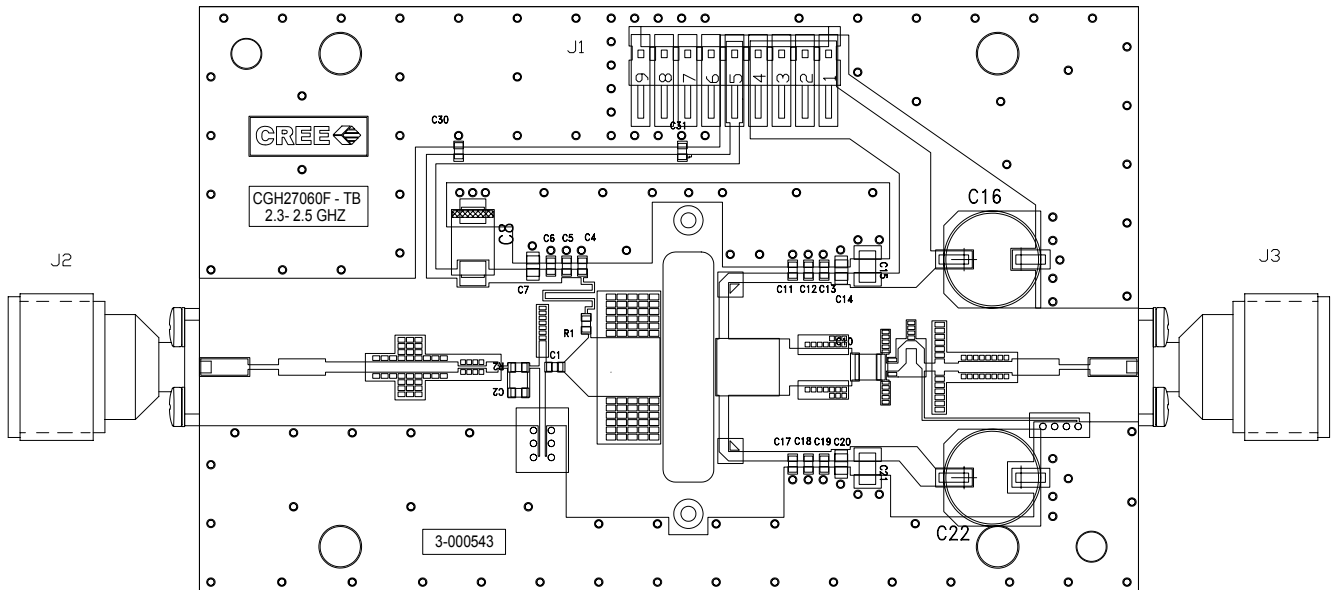


Note:
Under 802.16-2004 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3.

CGH27060F-TB Demonstration Amplifier Circuit Schematic



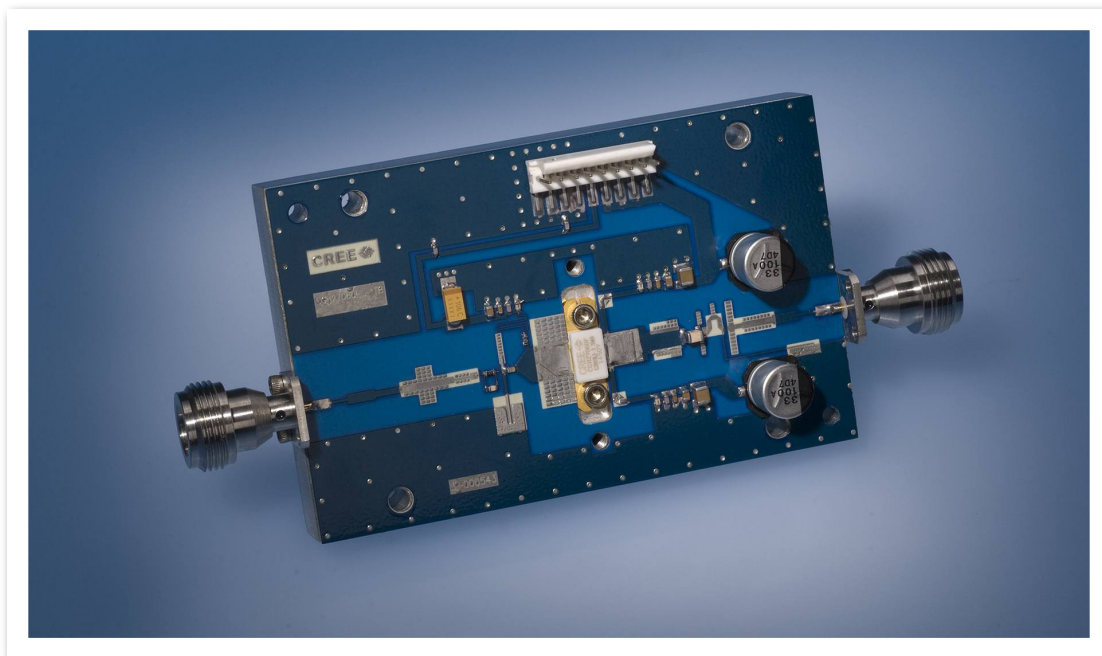
CGH27060F-TB Demonstration Amplifier Circuit Outline



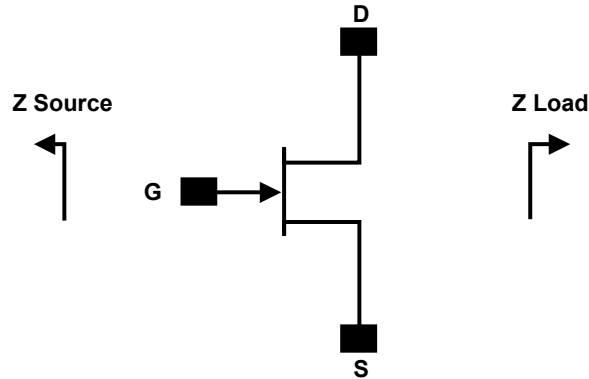
CGH27060F-TB Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
R1	RES, 1/16W, 0603, 1%, 22 OHMS	1
R2	RES, 1/16W, 0603, 1%, 100 OHMS	1
C6,C13,C19	CAP, 470PF, 10%,100V, 0603	3
C16,C22	CAP, 33 UF, 20%, G CASE	1
C15,C21	CAP, 1.0UF, 100V, 10%, X7R, 1210	1
C8	CAP 10UF 16V TANTALUM	1
C10	CAP, 8.2pF, +/-5%, 100B	1
C1	CAP, 0.9pF, +/-0.05pF, 0603	1
C2	CAP, 2.2pF, +/-0.1pF, 0603	1
C4,C11,C17	CAP, 10.0pF,+/-5%, 0603	3
C5,C12,C18,C30,C31	CAP, 82pF, +/-5%, 0603	5
C7,C14,C20	CAP,33000PF, 0805,100V, X7R	3
L1	It is a trace on the PCB and does not require a component.	1
J2,J3	CONN SMA STR PANEL JACK RECP	1
J1	HEADER RT>PLZ .1CEN LK 9POS	1
Q1	CGH27060F	1

CGH27060F-TB Demonstration Amplifier Circuit



Source and Load Impedances

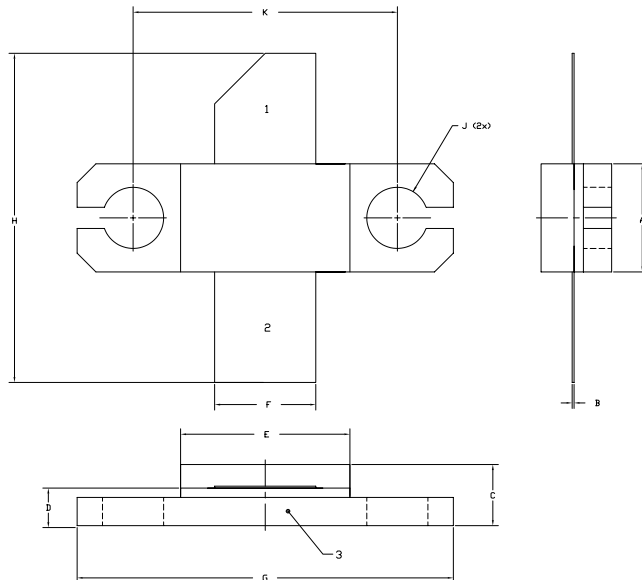


Frequency (MHz)	Z Source	Z Load
2300	3.3 - j7.0	11.2 - j7.8
2400	4.0 - j7.0	9.9 - j8.0
2500	4.1 - j7.5	8.4 - j8.1
2600	3.6 - j7.7	7.3 - j7.8
2700	2.9 - j7.3	6.1 - j7.3

Note¹: $V_{DD} = 28V$, $I_{DQ} = 240mA$. In the 440193 package.

Note²: Impedances are extracted from the CGH27060F-TB demonstration circuit and are not source and load pull data derived from the transistor.

Product Dimensions CGH27060F (Package Type – 440193)



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.
4. LID MAY BE MISALIGNED TO THE BODY OF THE PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.
5. ALL PLATED SURFACES ARE Ni/AU.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.225	0.235	5.72	5.97
B	0.004	0.006	0.10	0.15
C	0.125	0.135	3.18	3.43
D	0.077	0.087	1.96	2.21
E	0.355	0.365	9.02	9.27
F	0.210	0.220	5.33	5.59
G	0.795	0.805	20.19	20.45
H	0.670	0.730	17.02	18.54
J	ø .130		3.30	
k		0.562		14.28

PIN 1: GATE
 PIN 2: DRAIN
 PIN 3: SOURCE



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