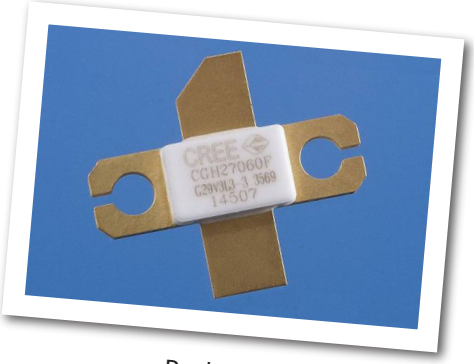
PRELIMINARY

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°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

RoHS COMPLIANT

- 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

Rev 1.0 – May 2007

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˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[4]						
Gate Threshold Voltage	$V_{GS(th)}$	-3.6	-2.5	–	VDC	V_{DS} = 10 V, I_D = 14.4 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.6	–	VDC	V_{DS} = 28 V, I_D = 240 mA
Saturated Drain Current	I_{DS}	9.6	10.4	-	A	V_{DS} = 6.0 V, V_{GS} = 2 V
Drain-Source Breakdown Voltage	V_{BR}	84	100	–	VDC	V_{GS} = -8 V, I_D = 14.4 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˚C, F_0 = 2.5 GHz unless otherwise noted)						
Small Signal Gain	G_{SS}	–	13.0	–	dB	V_{DD} = 28 V, I_{DQ} = 240 mA
Drain Efficiency[1]	η	–	22.5	–	%	V_{DD} = 28 V, I_{DQ} = 240 mA, P_{AVE} = 8 W
Back-Off Error Vector Magnitude	EVM_1	–	2.5	–	%	V_{DD} = 28 V, I_{DQ} = 240 mA, P_{AVE} = 24 dBm
Error Vector Magnitude	EVM_2	–	2.0	–		V_{DD} = 28 V, I_{DQ} = 240 mA, P_{AVE} = 8 W
Output Mismatch Stress	VSWR	–	TBD	–	Ψ	No damage at all phase angles, V_{DD} = 28 V, I_{DQ} = 240 mA
Dynamic Characteristics						
Input Capacitance	C_{GS}	–	19.3	–	pF	V_{DS} = 28 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance	C_{DS}	–	4.6	–	pF	V_{DS} = 28 V, V_{gs} = -8 V, f = 1 MHz
Feedback Capacitance	C_{GD}	–	1.7	–	pF	V_{DS} = 28 V, V_{gs} = -8 V, f = 1 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.

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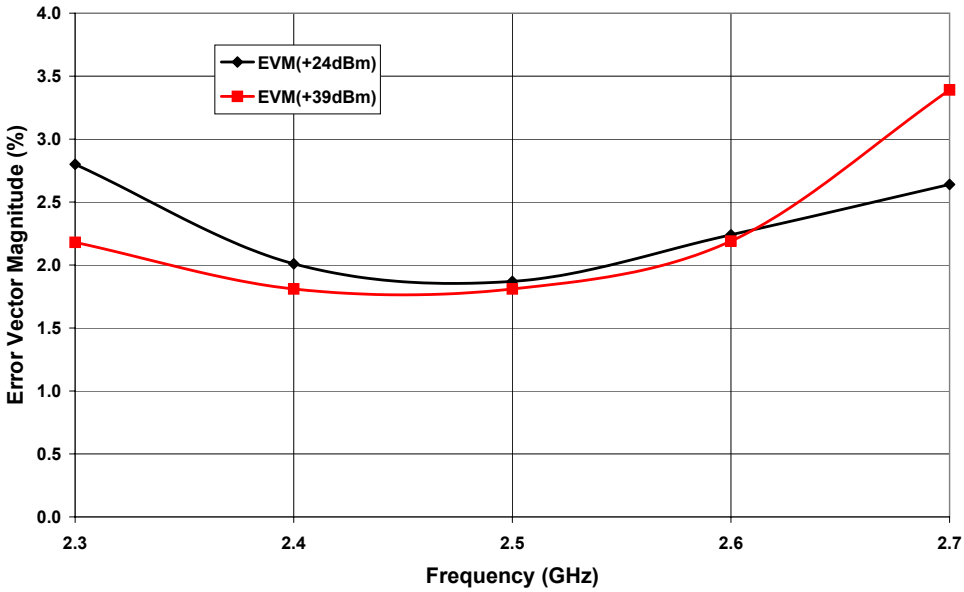
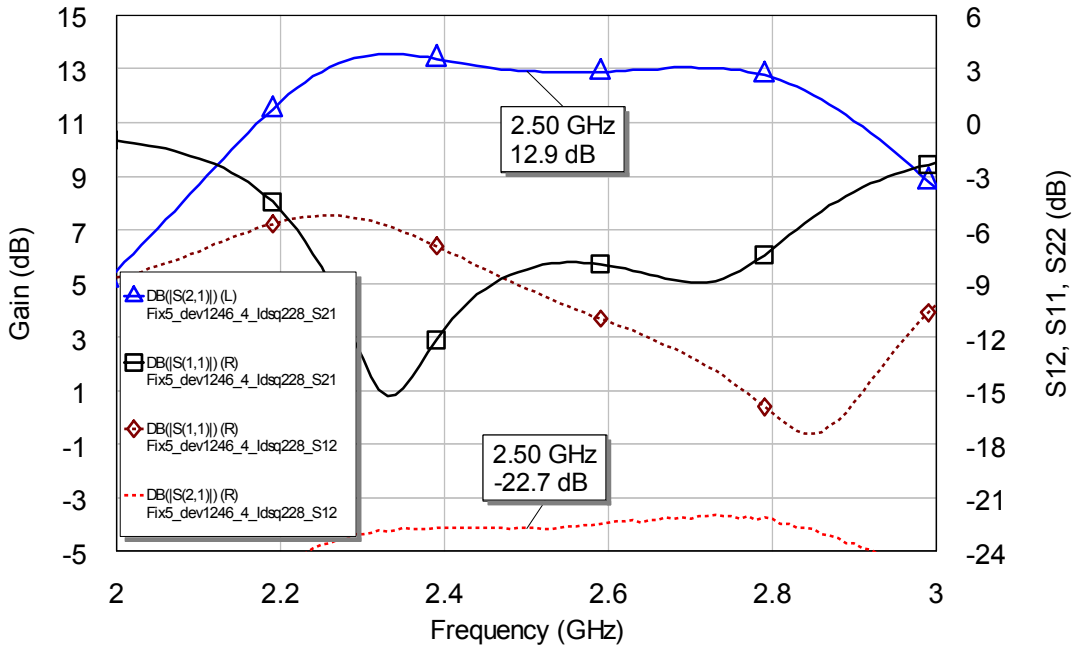
Typical WiMAX Performance

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 V, I_{DQ} = 240 mA



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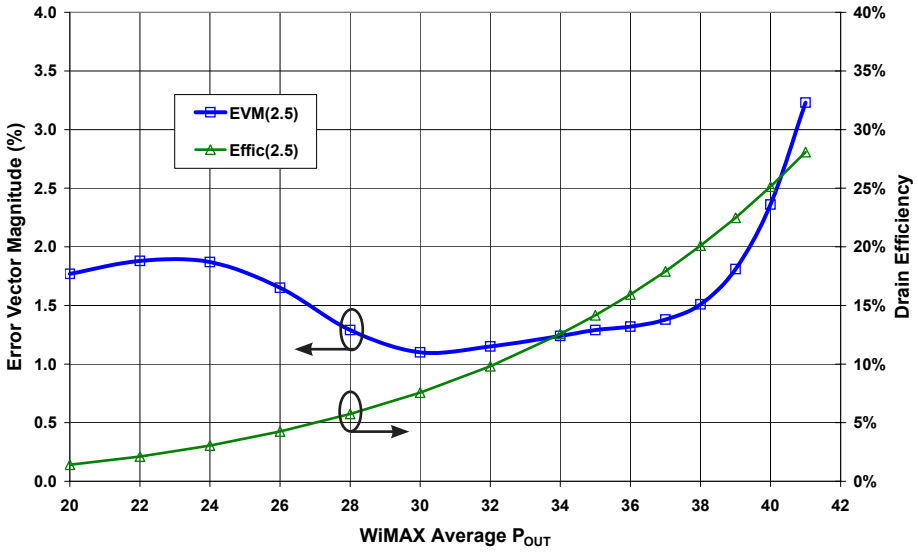
Typical WiMAX Performance

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.

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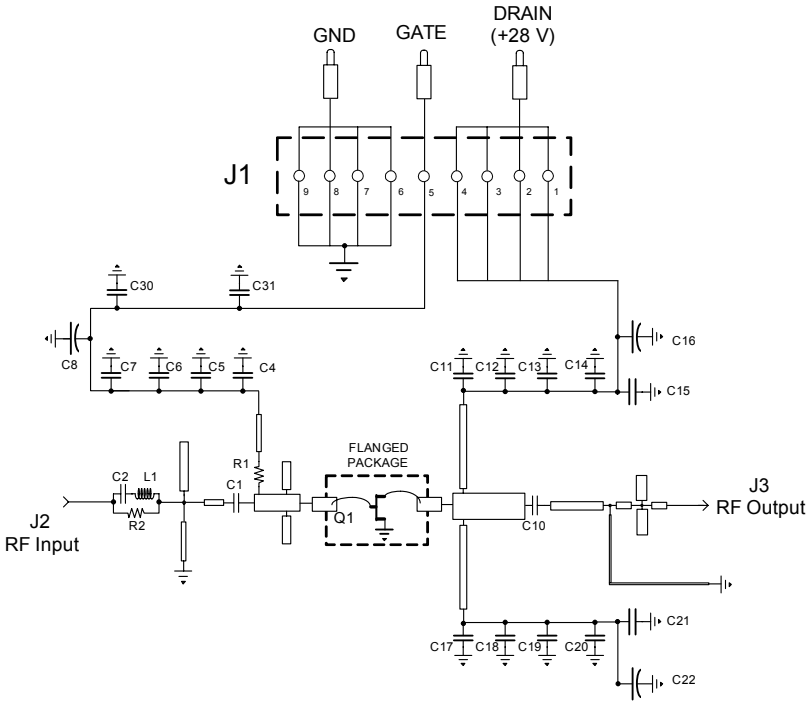
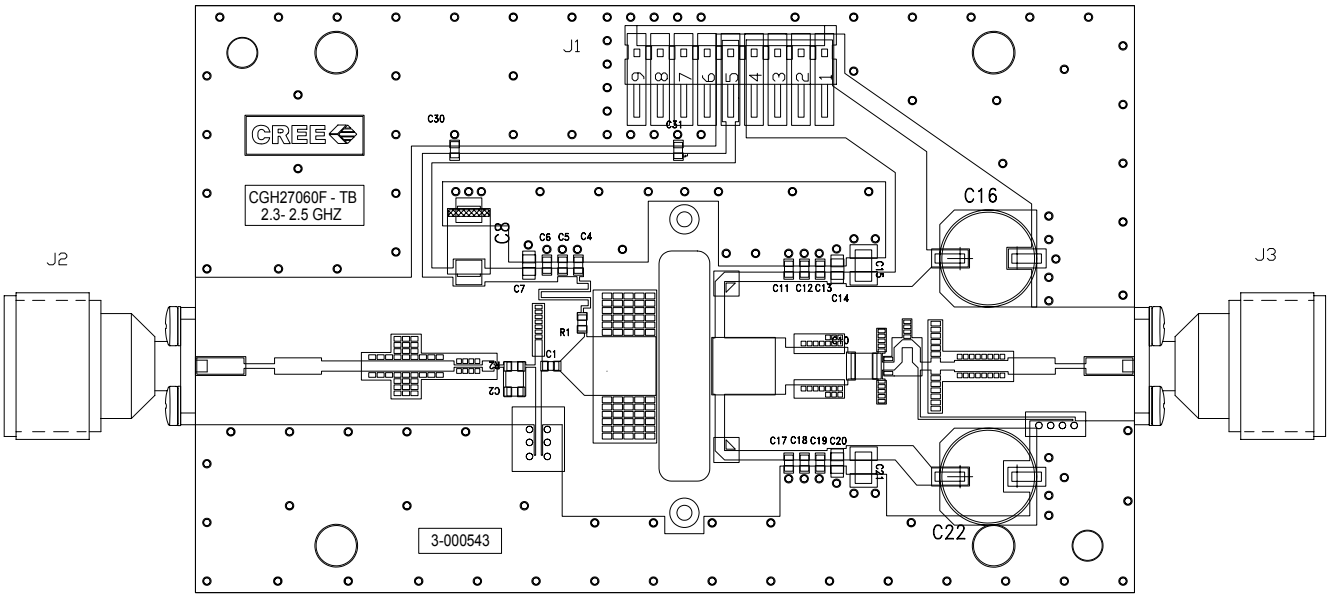
CGH27060F-TB Demonstration Amplifier Circuit Schematic



CGH27060F-TB Demonstration Amplifier Circuit Outline



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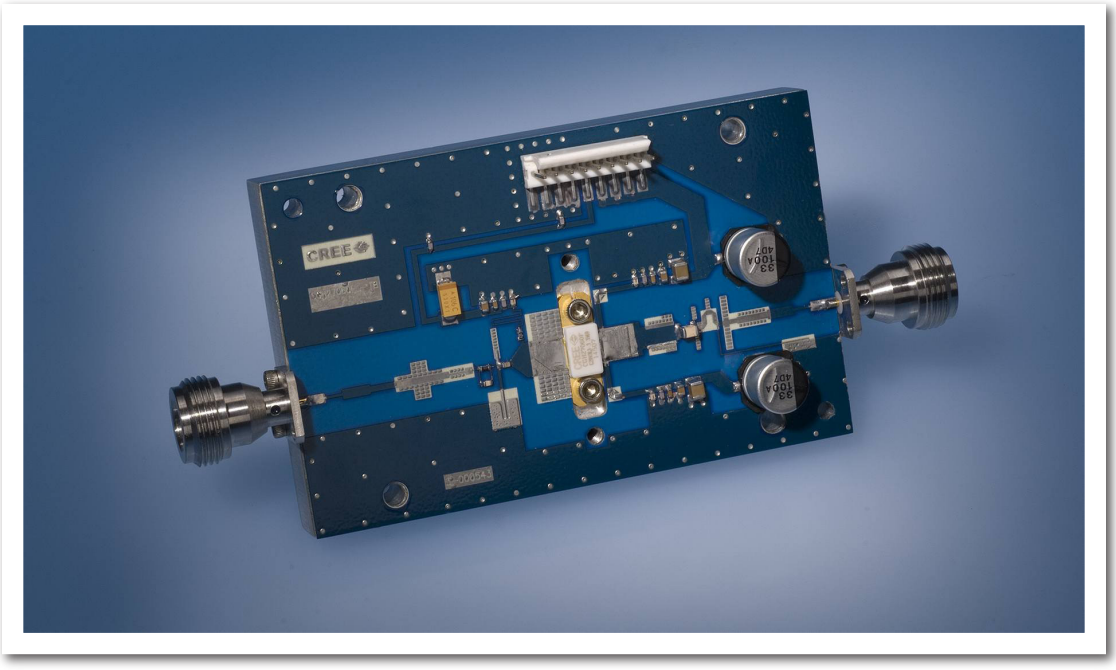
CGH27060F-TB Demonstration Amplifier Circuit Bill of Materials

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



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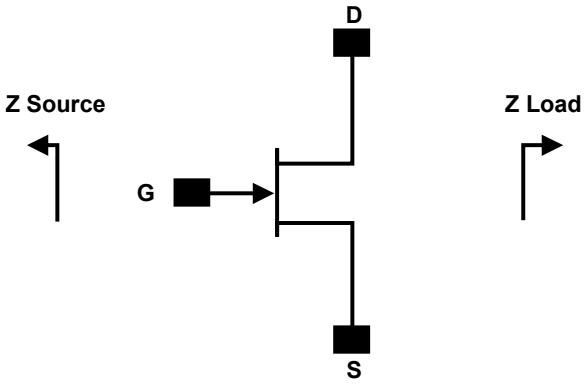
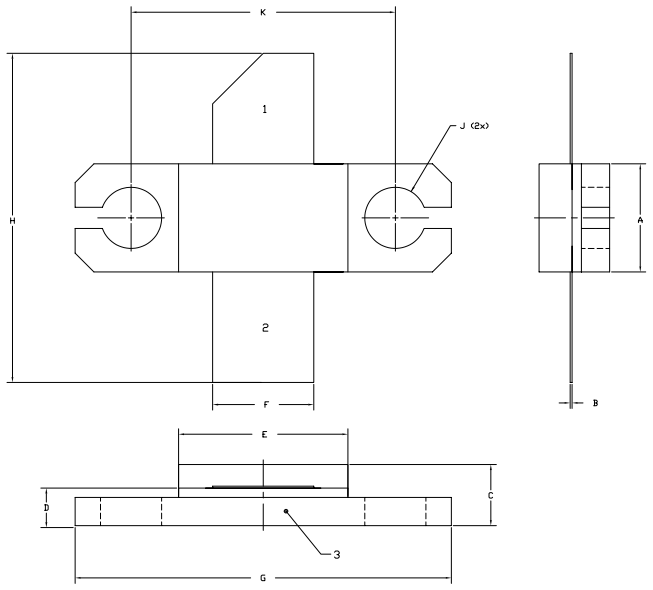
Source and Load Impedances



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

Note[1]: V_{DD} = 28V, I_{DQ} = 240mA. In the 440193 package.
Note[2]: 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 TOLERANICING 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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