

CGH27015F

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

Cree's CGH27015 is a gallium nitride (GaN) high electron mobility transistor designed specifically for high efficiency, high gain and wide bandwidth capabilities, which makes the CGH27015 ideal for 2.3 to 2.9GHz WiMAX and BWA amplifier applications. The transistor is available in ceramic, metal flange package.



Package Type: 440166
PN: CGH27015F

Typical Performance 2.4-2.7 GHz ($T_c = 25^\circ\text{C}$)

Parameter	2.4 GHz	2.5 GHz	2.6 GHz	2.7 GHz	Units
Small Signal Gain	14.5	14.5	14.5	14.5	dB
P_{OUT} @ 2.0 % EVM	34.0	34.0	34.0	34.0	dBm
Drain Efficiency @ 2.0 % EVM	23.0	24.0	24.0	23.0	%
Input Return Loss	7.0	6.0	5.0	5.0	dB
Output Return Loss	5.0	6.0	7.0	7.0	dB

Note:

Measured in the CGH27015F-TB amplifier circuit, under 802.16-2004 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, 5 ms Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3.

Features

- 2.3 - 2.9 GHz Operation
- >14.5 dB Small Signal Gain
- >2.0 W P_{OUT} at 2.0 % EVM
- 25 % Efficiency at 2.5 % EVM
- 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_{DS}	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_{JC}	5.0	°C/W

Note:

¹ Measured for the CGH27015F at $P_{DISS} = 14W$.

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

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics¹						
Gate Threshold Voltage	$V_{GS(th)}$	-3.0	-2.5	-1.8	VDC	$V_{DS} = 10 V, I_D = 3.6 mA$
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.45	-	VDC	$V_{DS} = 28 V, I_D = 60 mA$
Saturated Drain Current	I_{DS}	2.4	2.7	-	A	$V_{DS} = 6.0 V, V_{GS} = 2.0 V$
Drain-Source Breakdown Voltage	V_{BR}	84	100	-	VDC	$V_{GS} = -8 V, I_D = 3.6 mA$
Case Operating Temperature	T_C	-10	-	+105	°C	
Screw Torque	T	-	-	60	in-oz	Reference 440166 Package Revision 3
RF Characteristics^{2,3} ($T_c = 25^\circ C, F_0 = 2.5 GHz$ unless otherwise noted)						
Small Signal Gain	G_{SS}	13	14.5	-	dB	$V_{DD} = 28 V, I_{DQ} = 60 mA$
Drain Efficiency ¹	η	20	21	-	%	$V_{DD} = 28 V, I_{DQ} = 60 mA, P_{AVE} = 2.0 W$
Back-Off Error Vector Magnitude	EVM_1	-	2.5	-	%	$V_{DD} = 28 V, I_{DQ} = 60 mA, P_{AVE} = 18 dBm$
Error Vector Magnitude	EVM_2	-	2.0	-	%	$V_{DD} = 28 V, I_{DQ} = 60 mA, P_{AVE} = 2.0 W$
Output Mismatch Stress	VSWR	-	10:1	-	Ψ	No damage at all phase angles, $V_{DD} = 28 V, I_{DQ} = 60 mA,$ $P_{AVE} = 2.0 W$ OFDM P_{AVE}
Dynamic Characteristics						
Input Capacitance	C_{GS}	-	5.00	-	pF	$V_{DS} = 28 V, V_{GS} = -8 V, f = 1 MHz$
Output Capacitance	C_{DS}	-	1.32	-	pF	$V_{DS} = 28 V, V_{GS} = -8 V, f = 1 MHz$
Feedback Capacitance	C_{GD}	-	0.43	-	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, 5 ms Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3.

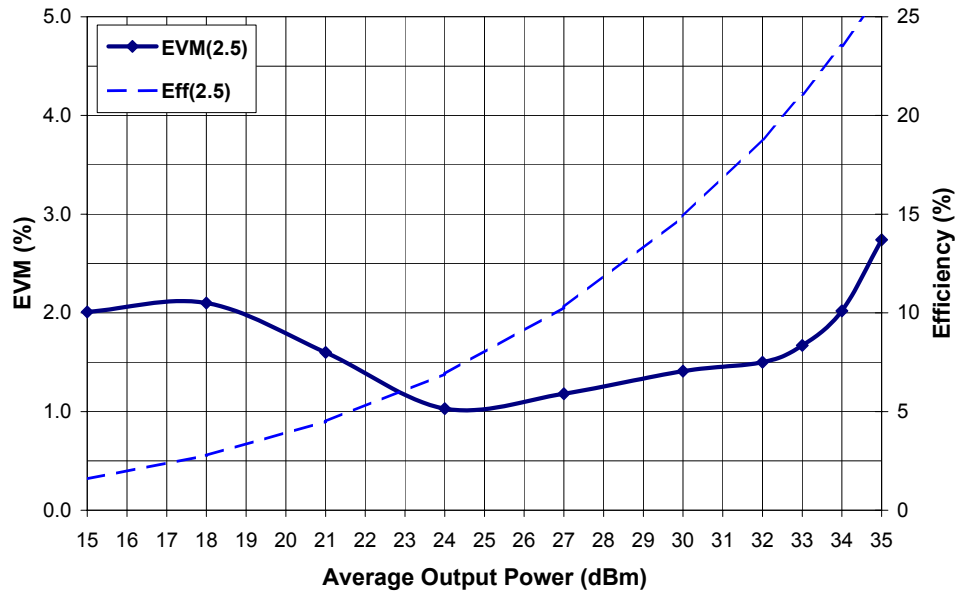
³ Measured in the CGH27015F-TB test fixture.

⁴ Measured on wafer prior to packaging.



Typical Performance Data

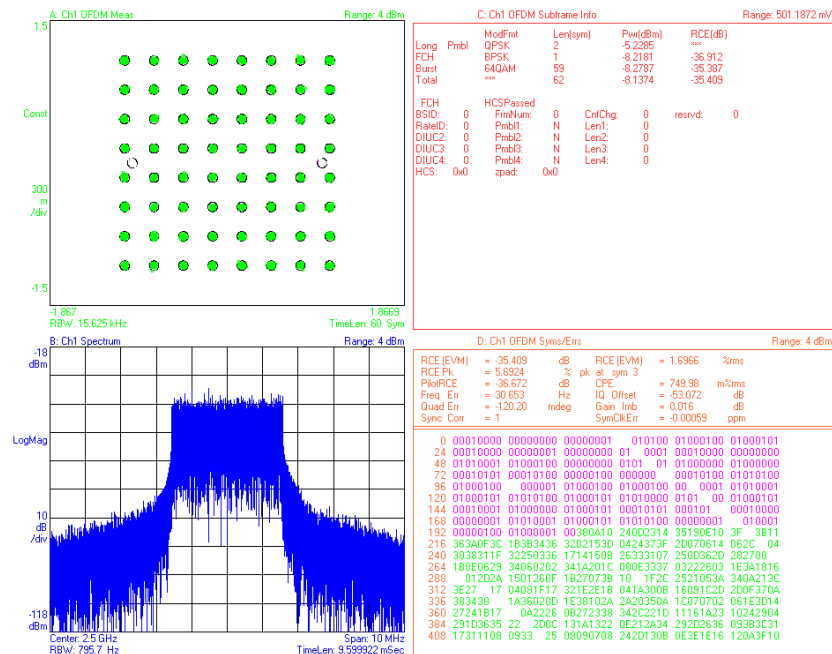
Typical EVM and Efficiency of CGH27015F in Broadband Amplifier Circuit at 2.5 GHz F=2.5 GHz, 802.16-2004 OFDM, P/A=9.8 dB



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.

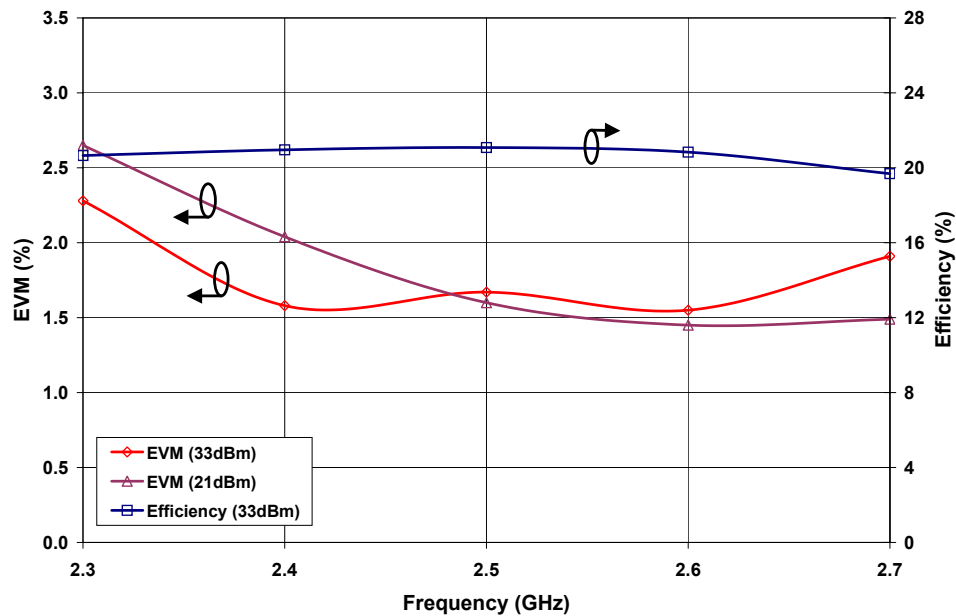
Typical Constellation Chart, Spectral Mask, and EVM of CGH27015F in Broadband Amplifier Circuit at 2.5 GHz $V_{DD} = 28 V$, $I_{DQ} = 60 mA$, $P_{AVE} = 2.0 W$





Typical Performance Data

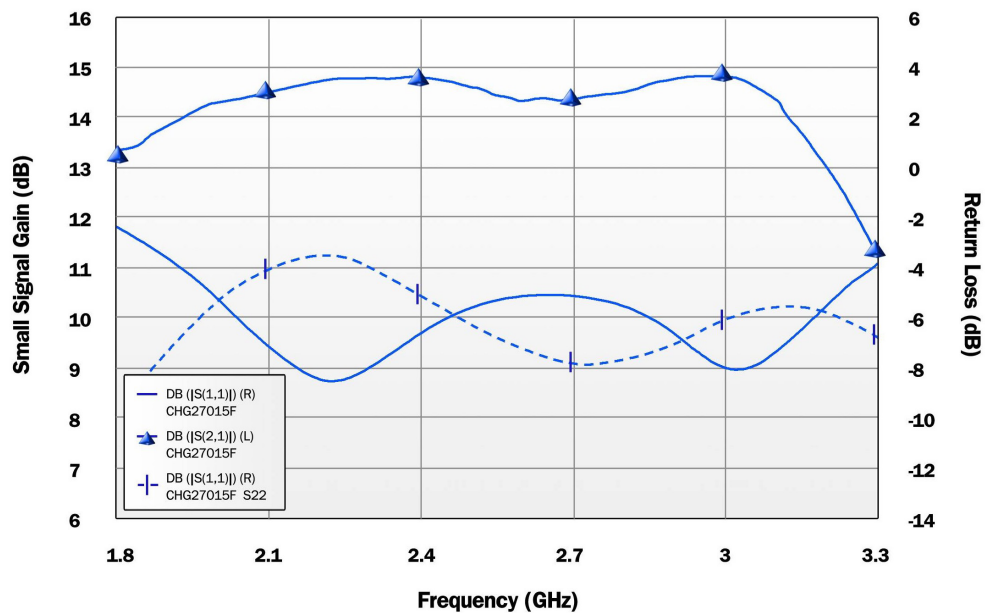
Typical EVM and Efficiency at 22dB and 33 dB vs Frequency of CGH27015F in Broadband Amplifier Circuit



Note:

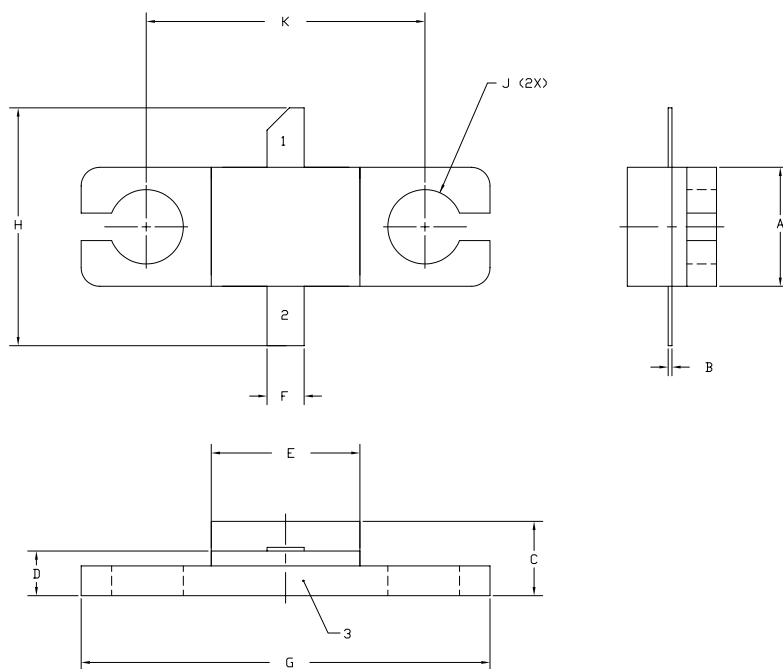
Under 802.16 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3.

Performance of CGH27015F in Broadband Amplifier Circuit
 $V_{DD} = 28 \text{ V}$, $I_{DQ} = 60 \text{ mA}$, OFDM BW = 3.5 MHz





Product Dimensions CGH27015F (Package Type — 440166)

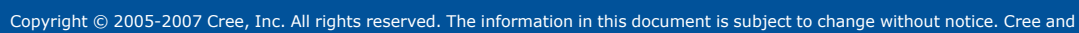


NOTES:

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	0.155	0.165	3.94	4.19
B	0.004	0.006	0.10	0.15
C	0.115	0.135	2.92	3.43
D	0.057	0.067	1.45	1.70
E	0.195	0.205	4.95	5.21
F	0.045	0.055	1.14	1.40
G	0.545	0.555	13.84	14.09
H	0.280	0.360	7.87	8.38
J	Ø .100		2.54	
K	0.375		9.53	

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

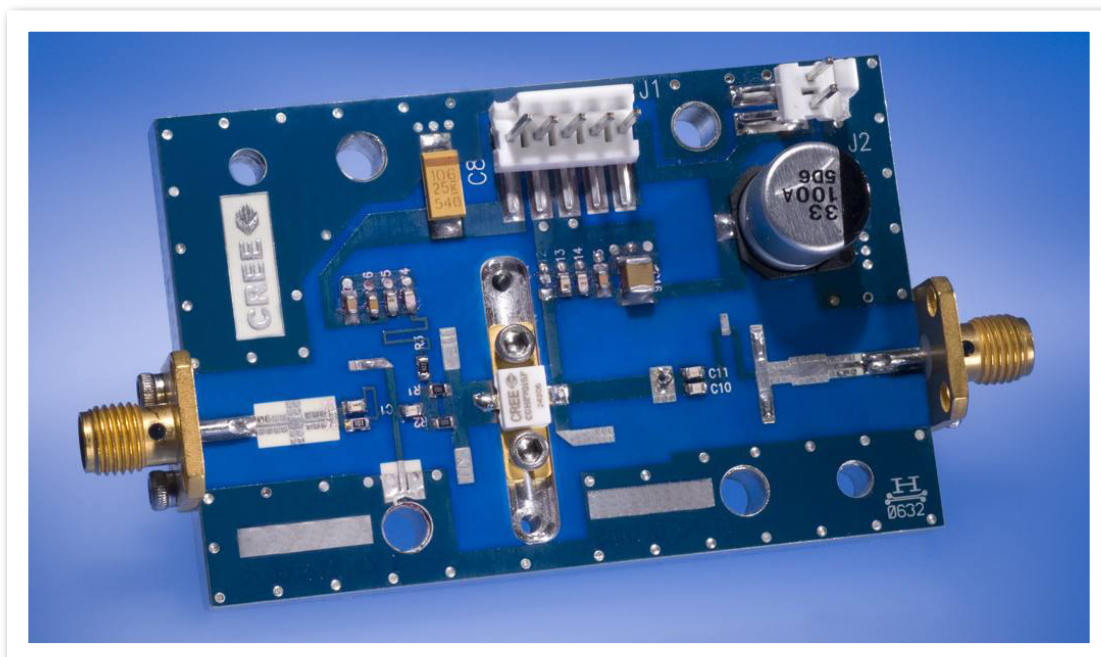




CGH27015F-TB Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
R1,R2	RES,1/16W,0603,1%,0 OHMS	2
R4	RES,1/16W,0603,1%,100 OHMS	1
R3	RES,1/16W,0603,1%,22.6 OHMS	1
C6	CAP, 470PF, 5%,100V, 0603	1
C17	CAP, 33 UF, 20%, G CASE	1
C16	CAP, 1.0UF, 100V, 10%, X7R, 1210	1
C8	CAP 10UF 16V TANTALUM	1
C14	CAP, 100.0pF, +/-5%, 0603	1
C4	CAP, 15pF, +/-5%, 0603	1
C1	CAP, 1.2pF, +/-0.1pF, 0603	1
C2	CAP, 2.0pF, +/-0.1pF, 0603	1
C10,C11	CAP, 2.4pF,+/-0.1pF, 0603	2
C5,C13	CAP, 39pF, +/-5%, 0603	2
C7,C15	CAP,33000PF, 0805,100V, X7R	2
J3,J4	CONN SMA STR PANEL JACK RECP	1
J2	HEADER RT>PLZ.1CEN LK 2 POS	1
J1	HEADER RT>PLZ .1CEN LK 5POS	1
Q1	CGH27015F	1

CGH27015F-TB Demonstration Amplifier Circuit





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For more information, please contact:

Cree, Inc.
4600 Silicon Drive
Durham, NC 27703
www.cree.com/wireless

Ryan Baker
Marketing
Cree, Wireless Devices
919.287.7816

Tom Dekker
Sales Director
Cree, Wireless Devices
919.313.5639