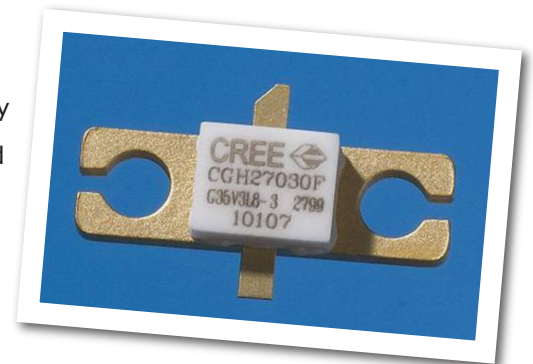


CGH27030F

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

Cree's CGH27030F is a gallium nitride (GaN) high electron mobility transistor (HEMT) designed specifically for high efficiency, high gain and wide bandwidth capabilities, which makes the CGH27030F ideal for 2.3-2.9GHz WiMAX and BWA amplifier applications. The transistor is supplied in a ceramic/metal flange package.



Package Type: 440166
PN: CGH27030F

Typical Performance Over 2.3-2.7GHz ($T_c = 25^\circ\text{C}$) of Demonstration Amplifier

Parameter	2.3 GHz	2.4 GHz	2.5 GHz	2.6 GHz	2.7 GHz	Units
Small Signal Gain	14.1	13.8	13.5	13.2	13.0	dB
EVM @ 21 dBm	2.3	2.1	1.7	1.7	1.9	%
EVM @ 36 dBm	1.7	1.7	1.8	1.8	2.0	%
Drain Efficiency @ 36 dBm	26.0	26.2	26.0	25.8	25.7	%
Input Return Loss	7.9	7.2	6.6	6.4	7.2	dB

Note:

Measured in the CGH27030F-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
- >13.5 dB Small Signal Gain
- 26 % Drain Efficiency at 4 W P_{OUT}
- 3.7°C/W Typical thermal resistance under 4.0 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	$R_{\theta JC}$	3.7	°C/W

Note:

¹ Measured for the CGH27030F at 14 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	$V_{DS} = 10\text{ V}, I_D = 7.2\text{ mA}$
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.6	-	VDC	$V_{DS} = 28\text{ V}, I_D = 120\text{ mA}$
Saturated Drain Current	I_{DS}	4.8	5.4	-	A	$V_{DS} = 6.0\text{ V}, V_{GS} = 2\text{ V}$
Drain-Source Breakdown Voltage	V_{BR}	84	100	-	VDC	$V_{GS} = -8\text{ V}, I_D = 7.2\text{ mA}$
Case Operating Temperature	T_c	-10	-	+105	°C	
Screw Torque	T	-	-	60	in-oz	Reference 440166 Package Revision 3
RF Characteristics^{2,3} ($T_c = 25^\circ\text{C}$, $F_0 = 2.5\text{ GHz}$ unless otherwise noted)						
Small Signal Gain	G_{SS}	-	13.5	-	dB	$V_{DD} = 28\text{ V}, I_{DQ} = 120\text{ mA}$
Drain Efficiency ¹	η	-	26.0	-	%	$V_{DD} = 28\text{ V}, I_{DQ} = 120\text{ mA}, P_{AVE} = 4\text{ W}$
Back-Off Error Vector Magnitude	EVM_1	-	1.9	-	%	$V_{DD} = 28\text{ V}, I_{DQ} = 120\text{ mA}, P_{AVE} = 21\text{ dBm}$
Error Vector Magnitude	EVM_2	-	1.8	-	%	$V_{DD} = 28\text{ V}, I_{DQ} = 120\text{ mA}, P_{AVE} = 4\text{ W}$
Output Mismatch Stress	VSWR	-	TBD	-	Ψ	No damage at all phase angles, $V_{DD} = 28\text{ V}, I_{DQ} = 120\text{ mA}$
Dynamic Characteristics						
Input Capacitance	C_{GS}	-	9.3	-	pF	$V_{DS} = 28\text{ V}, V_{gs} = -8\text{ V}, f = 1\text{ MHz}$
Output Capacitance	C_{DS}	-	2.0	-	pF	$V_{DS} = 28\text{ V}, V_{gs} = -8\text{ V}, f = 1\text{ MHz}$
Feedback Capacitance	C_{GD}	-	0.9	-	pF	$V_{DS} = 28\text{ V}, V_{gs} = -8\text{ V}, f = 1\text{ MHz}$

Notes:

¹ Drain Efficiency = P_{OUT} / P_{DC}

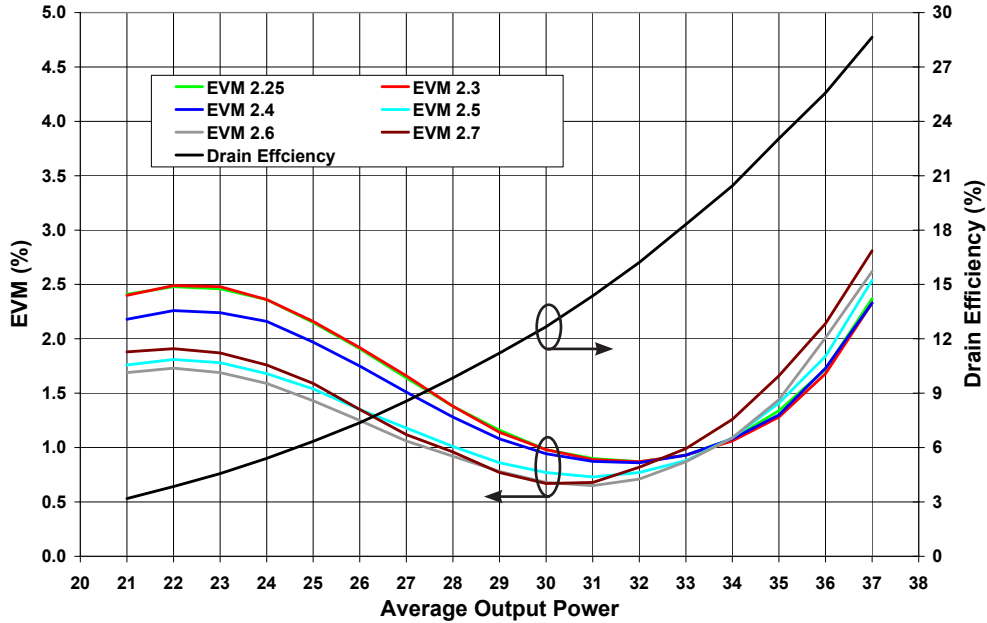
² Under 802.16-2004 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3.

³ Measured in the CGH27030F-TB test fixture.

⁴ Measured on wafer prior to packaging.

Typical WiMAX Performance

Typical EVM and Efficiency vs Frequency of CGH27030F in Broadband Amplifier Circuit CGH27030F-TB

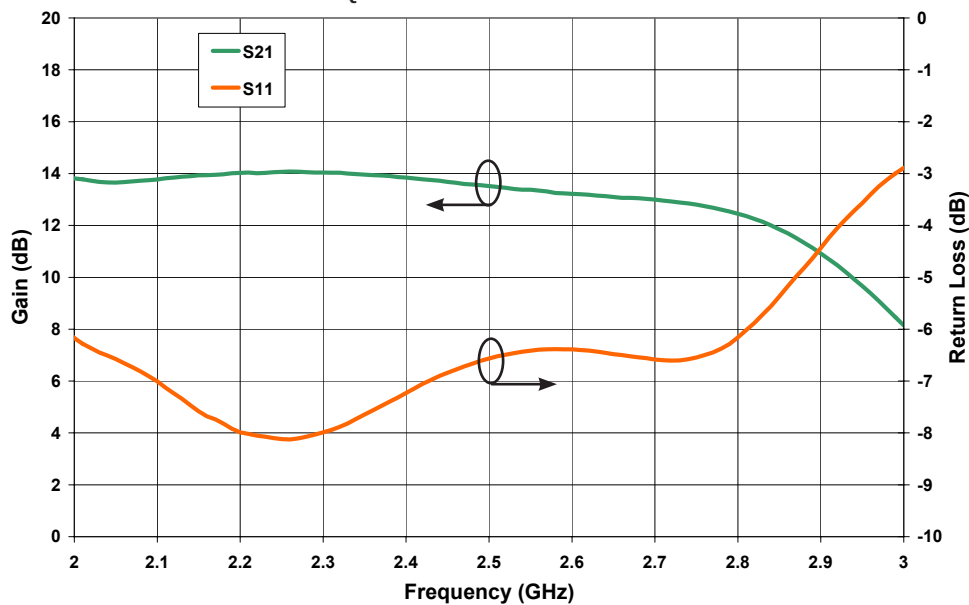


Note:

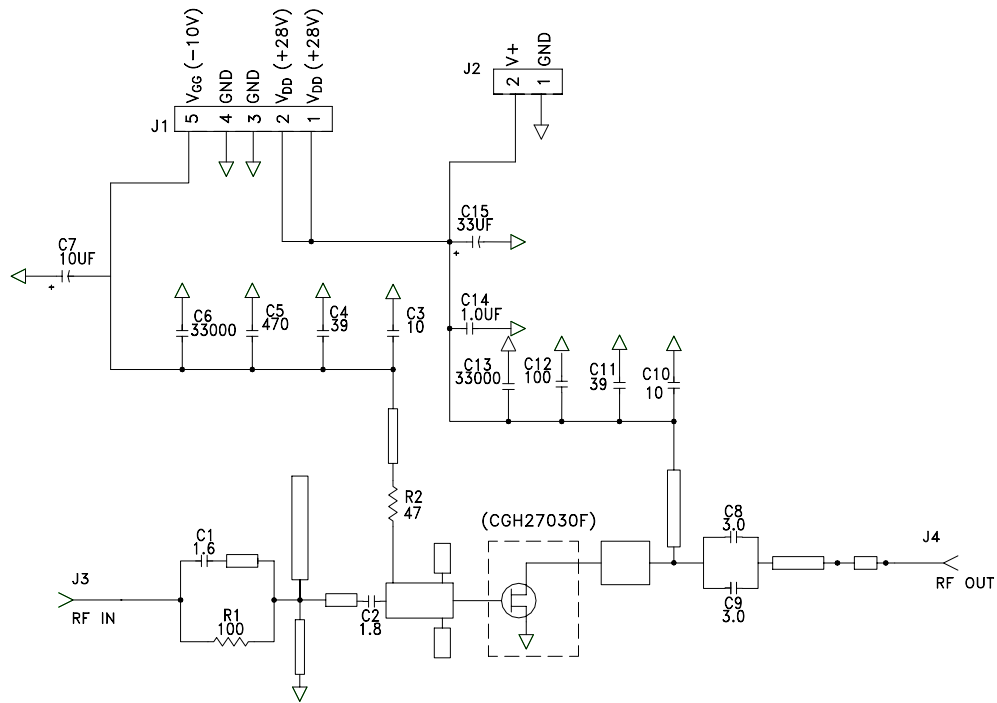
Under 802.16-2004 OFDM, 3.5 MHz Channel BW, 1/4 Cyclic Prefix, 64 QAM Modulated Burst, Symbol Length of 59, Coding Type RS-CC, Coding Rate Type 2/3.

Gain and Return Loss vs Frequency of CGH27030F in Broadband Amplifier Circuit CGH27030F-TB

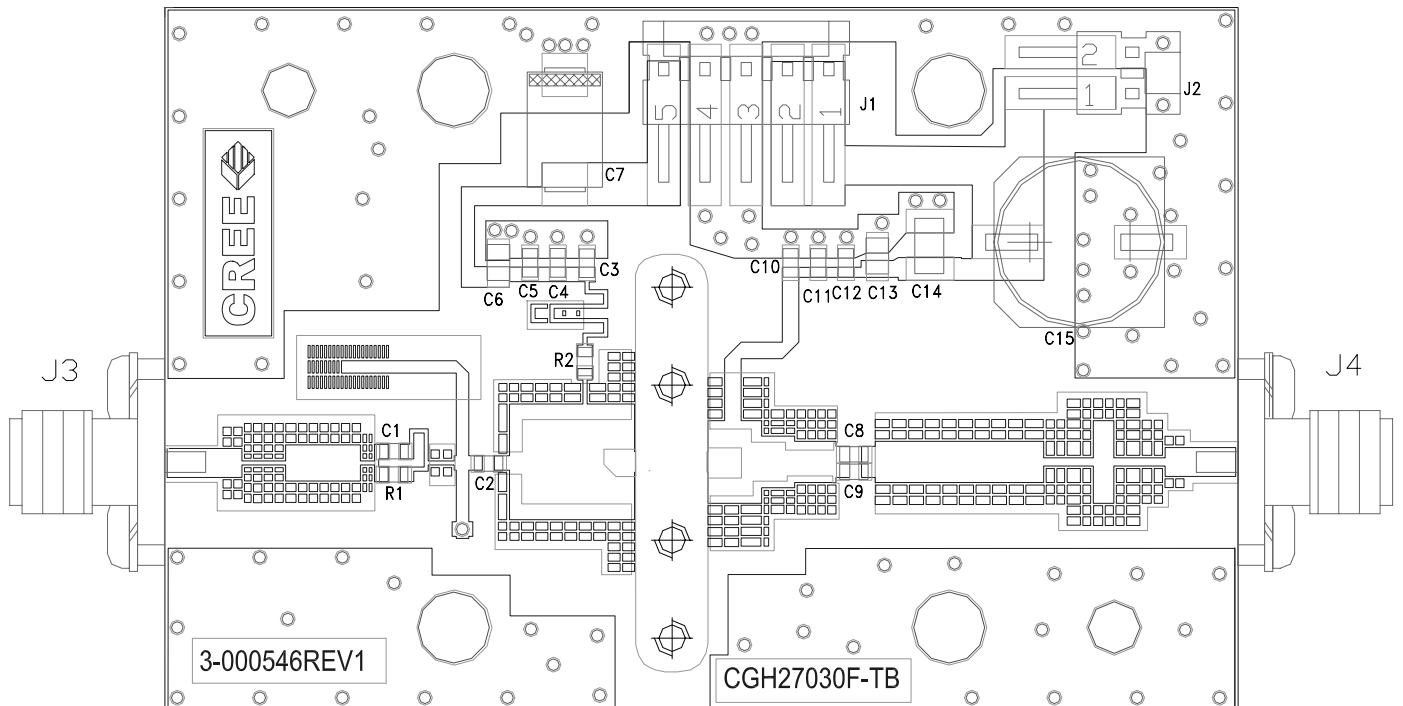
$V_{DD} = 28\text{ V}$, $I_{DQ} = 120\text{ mA}$, OFDM BW = 3.5 MHz



CGH27030F-TB Demonstration Amplifier Circuit Schematic



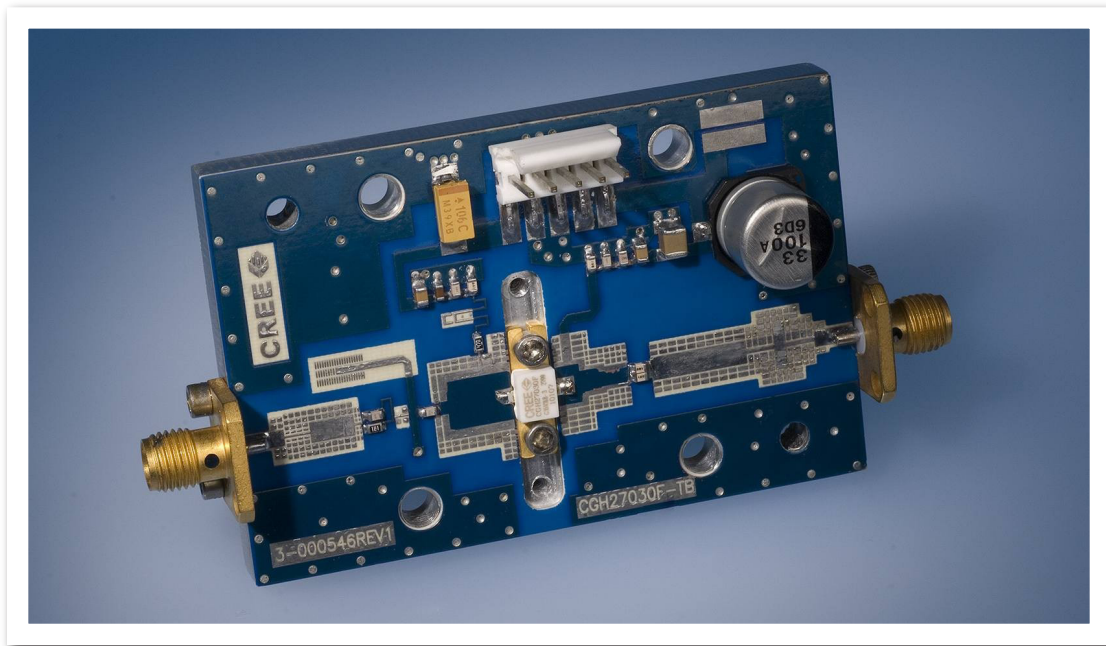
CGH27030F-TB Demonstration Amplifier Circuit Outline



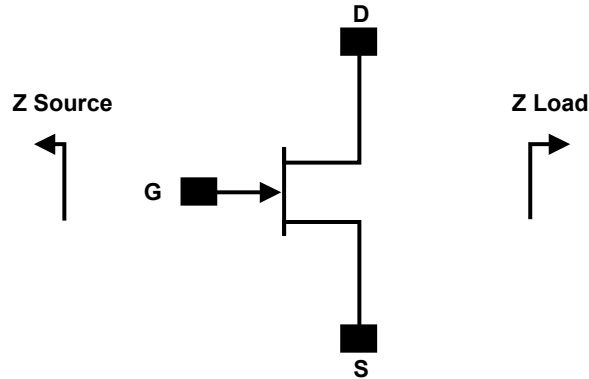
CGH27030F-TB Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
R1	RES,1/16W,0603,1%,100 OHMS	1
R2	RES,1/16W,0603,1%,47 OHMS	1
C5	CAP, 470PF, 10%,100V, 0603	1
C15	CAP, 33 UF, 20%, G CASE	1
C14	CAP, 1.0UF, 100V, 10%, X7R, 1210	1
C7	CAP 10UF 16V TANTALUM	1
C12	CAP, 100.0pF, +/-5%, 0603	1
C1	CAP, 1.6pF, +/-0.1pF, 0603	1
C2	CAP, 1.8pF, +/-0.1pF, 0603	1
C3,C10	CAP, 10.0pF,+/-5%, 0603	2
C4,C11	CAP, 39pF, +/-5%, 0603	2
C8,C9	CAP, 3.0pF, +/-0.1pF, 0603	2
C6,C13	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	CGH27030F	1

CGH27030F-TB Demonstration Amplifier Circuit



Source and Load Impedances

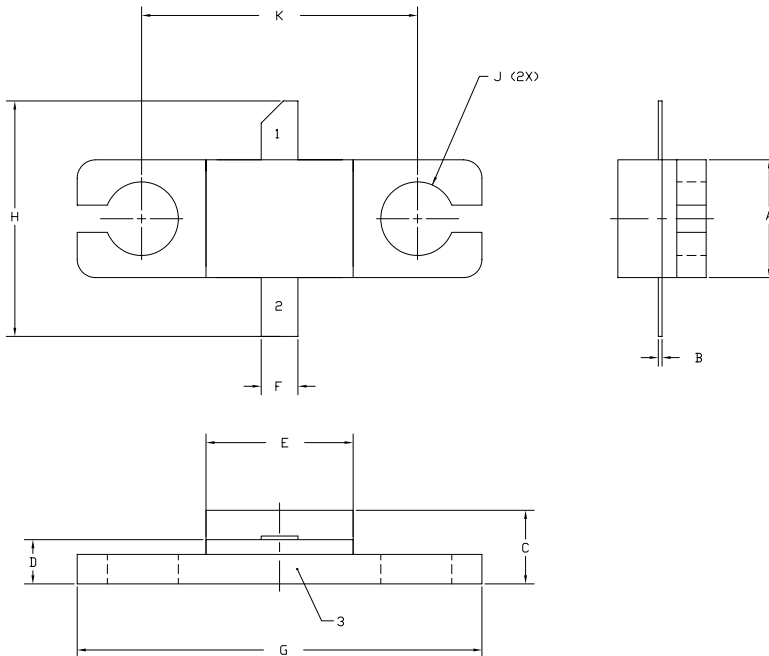


Frequency (MHz)	Z Source	Z Load
2300	5.5 - j4.9	13.6 - j4.8
2400	5.7 - j4.5	13.3 - j4.0
2500	5.85 - j4.4	13.1 - j3.2
2600	5.8 - j4.5	12.9 - j2.5
2700	5.2 - j4.6	12.9 - j1.7

Note¹: $V_{DD} = 28V$, $I_{DQ} = 120mA$. In the 440166 package.

Note²: Impedances are extracted from the CGH27030-TB demonstration circuit and are not source and load pull data derived from the transistor.

Product Dimensions CGH27030F (Package Type – 440166)



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.
- LID MAY BE MISALIGNED TO THE BODY OF THE PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.
- 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	∅ .100		2.54	
K	0.375		9.53	

PIN 1. GATE
PIN 2. DRAIN
PIN 3. SOURCE



Typical Package S-Parameters
(Small Signal, $V_{DS} = 28\text{ V}$, $I_{DQ} = 120\text{ mA}$, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
100 MHz	0.9478	-99.95	27.40	127.30	0.0250	37.44	0.530	-135.93
200 MHz	0.9247	-135.24	16.34	108.58	0.0298	18.89	0.631	-155.85
300 MHz	0.9181	-150.29	11.35	99.88	0.0310	10.36	0.657	-163.99
400 MHz	0.9155	-158.58	8.64	94.47	0.0315	5.11	0.667	-168.40
500 MHz	0.9143	-163.93	6.96	90.47	0.0317	1.28	0.672	-171.22
600 MHz	0.9136	-167.75	5.82	87.21	0.0318	-1.82	0.676	-173.22
700 MHz	0.9133	-170.68	5.00	84.38	0.0319	-4.49	0.678	-174.75
800 MHz	0.9131	-173.05	4.38	81.82	0.0319	-6.89	0.680	-175.99
900 MHz	0.9131	-175.05	3.90	79.44	0.0319	-9.11	0.682	-177.03
1.0 GHz	0.9131	-176.78	3.51	77.19	0.0320	-11.20	0.684	-177.93
1.1 GHz	0.9131	-178.32	3.19	75.04	0.0319	-13.20	0.685	-178.74
1.2 GHz	0.9132	-179.72	2.92	72.96	0.0319	-15.12	0.687	-179.48
1.3 GHz	0.9133	178.99	2.70	70.93	0.0319	-16.98	0.688	179.83
1.4 GHz	0.9135	177.78	2.50	68.95	0.0319	-18.80	0.690	179.18
1.5 GHz	0.9136	176.64	2.34	67.01	0.0319	-20.59	0.692	178.55
1.6 GHz	0.9138	175.56	2.19	65.10	0.0319	-22.34	0.694	177.95
1.7 GHz	0.9140	174.52	2.06	63.22	0.0318	-24.07	0.696	177.36
1.8 GHz	0.9142	173.51	1.95	61.36	0.0318	-25.78	0.698	176.78
1.9 GHz	0.9144	172.53	1.84	59.52	0.0318	-27.46	0.700	176.20
2.0 GHz	0.9147	171.57	1.75	57.69	0.0318	-29.13	0.702	175.63
2.1 GHz	0.9149	170.63	1.67	55.88	0.0317	-30.79	0.704	175.06
2.2 GHz	0.9151	169.71	1.59	54.09	0.0317	-32.43	0.706	174.48
2.3 GHz	0.9154	168.80	1.52	52.31	0.0317	-34.06	0.708	173.91
2.4 GHz	0.9156	167.90	1.46	50.54	0.0317	-35.68	0.710	173.33
2.5 GHz	0.9159	167.00	1.40	48.78	0.0317	-37.29	0.712	172.74
2.6 GHz	0.9161	166.11	1.34	47.03	0.0316	-38.90	0.714	172.15
2.7 GHz	0.9163	165.22	1.29	45.29	0.0316	-40.49	0.716	171.55
2.8 GHz	0.9166	164.34	1.25	43.56	0.0316	-42.08	0.719	170.94
2.9 GHz	0.9168	163.45	1.20	41.84	0.0316	-43.66	0.721	170.32
3.0 GHz	0.9170	162.57	1.16	40.12	0.0316	-45.23	0.723	169.69
3.1 GHz	0.9172	161.68	1.13	38.41	0.0316	-46.80	0.725	169.05
3.2 GHz	0.9174	160.79	1.09	36.71	0.0316	-48.37	0.727	168.40
3.3 GHz	0.9176	159.90	1.06	35.01	0.0316	-49.93	0.730	167.74
3.4 GHz	0.9178	159.00	1.03	33.31	0.0316	-51.48	0.732	167.07
3.5 GHz	0.9180	158.10	1.00	31.62	0.0316	-53.04	0.734	166.38
3.6 GHz	0.9182	157.19	0.97	29.94	0.0316	-54.59	0.736	165.69
3.7 GHz	0.9183	156.28	0.95	28.26	0.0316	-56.14	0.738	164.98
3.8 GHz	0.9185	155.36	0.92	26.58	0.0316	-57.69	0.740	164.26
3.9 GHz	0.9186	154.43	0.90	24.90	0.0316	-59.23	0.742	163.52
4.0 GHz	0.9187	153.49	0.88	23.23	0.0317	-60.78	0.744	162.78



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, 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