CG2H30070

70 W, 0.5—3.0 GHz, 28 V, RF Power GaN HEMT

Cree's CG2H30070 is an internally matched gallium nitride (GaN) high electron mobility transistor (HEMT). The CG2H30070, operating from a 28 volt rail, offers a general purpose, broadband solution to a variety of RF and microwave applications. GaN HEMTs offer high efficiency, high gain and wide bandwidth capabilities making the CG2H30070 ideal for linear and compressed amplifier circuits. The transistor is available in a flange package.

Package Type: 440224
PN: CG2H30070F

Typical Performance Over 0.5 - 3.0 GHz (T_c = 25°C)

Parameter	500 MHz	1000 MHz	1500 MHz	2000 MHz	2500 MHz	3000 MHz	Units
Small Signal Gain (S21)	16.7	15.3	17.3	15	16.3	14.8	dB
Gain @ P_{in} 39 dBm	10.3	10.4	10.6	9.8	11.4	10.5	dB
Output Power @ P_{in} 39 dBm	85	88	90	76	109	89	W
EFF @ P_{in} 39 dBm	63	57.5	55.6	63.4	62.1	59.8	%

Note: Conditions CW

Features

- 0.5 - 3.0 GHz Operation
- 70 W P_{OUT} typical at 28 V
- 10 dB Power Gain
- 58 % Drain Efficiency
- Internally Matched

Applications

- Broadband Amplifiers
- Milcom
- Radar
- Data Link

Large Signal Models Available for ADS and MWO

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

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	V_{DSS}	120	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}	28.8	mA	25˚C
Maximum Drain Current[1]	I_{DMAX}	12	A	25˚C
Soldering Temperature[2]	T_S	245	˚C	
Screw Torque	τ	40	in-oz	
Thermal Resistance, Junction to Case[3]	$R_{\theta JC}$	1.5	˚C/W	85˚C, CW
Case Operating Temperature[2]	T_C	-40, +150	˚C	

Note:
[1] Current limit for long term, reliable operation
[2] Refer to the Application Note on soldering at www.cree.com/RF/Document-Library
[3] See also, the Power Dissipation De-rating Curve on Page 8.

Electrical Characteristics (T_C = 25˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[1]						
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-2.8	-2.3	V_{DC}	V_{DS} = 10 V, I_D = 28.8 mA
Saturated Drain Current[2]	I_{DS}	23	28.8	–	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BR}	120	–	–	V_{DC}	V_{GS} = -8 V, I_D = 28.8 mA
RF Characteristics[2,3] (T_C = 25˚C, F_0 = 3000 MHz unless otherwise noted)						
Small Signal Gain	G_{SS}	–	17.8	–	dB	V_{DD} = 28 V, I_{DQ} = 1.0 A, P_{IN} = 0 dBm, CW
Power Gain	G_P	–	12.4	–	dB	V_{DD} = 28 V, I_{DQ} = 1.0 A, P_{IN} = 39 dBm, CW
Output Power	P_{OUT}	–	50.4	–	dBm	V_{DD} = 28 V, I_{DQ} = 1.0 A, P_{IN} = 39 dBm, CW
Drain Efficiency[4]	η	–	70	–		V_{DD} = 28 V, I_{DQ} = 1.0 A, P_{IN} = 39 dBm, CW
Output Mismatch Stress	VSWR	–	–	5 : 1	Ψ	No damage at all phase angles, V_{DD} = 28 V, I_{DQ} = 1.0 A, P_{OUT} = 100 W CW
Dynamic Characteristics						
Input Capacitance	C_{GS}	–	68.1	–	pF	V_{DS} = 28 V, V_{gs} = -8 V, f = 1 MHz
Output Capacitance	C_{DS}	–	11.3	–	pF	V_{DS} = 28 V, V_{gs} = -8 V, f = 1 MHz
Feedback Capacitance	C_{GD}	–	1.49	–	pF	V_{DS} = 28 V, V_{gs} = -8 V, f = 1 MHz

Notes:
[1] Measured on wafer prior to packaging per side of device.
[2] Scaled from PCM data.
[3] Measurements are to be performed using Cree test fixture AD-838279F-TB2 (Flange)
[4] Drain Efficiency = P_{OUT} / P_{AC}
[5] Capacitence values are for each side of the device.

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Figure 1 - Small Signal Gain and Return Losses of the CG2H30070-AMP vs Frequency
V_{DD} = 28 V, I_{DQ} = 1.0 A

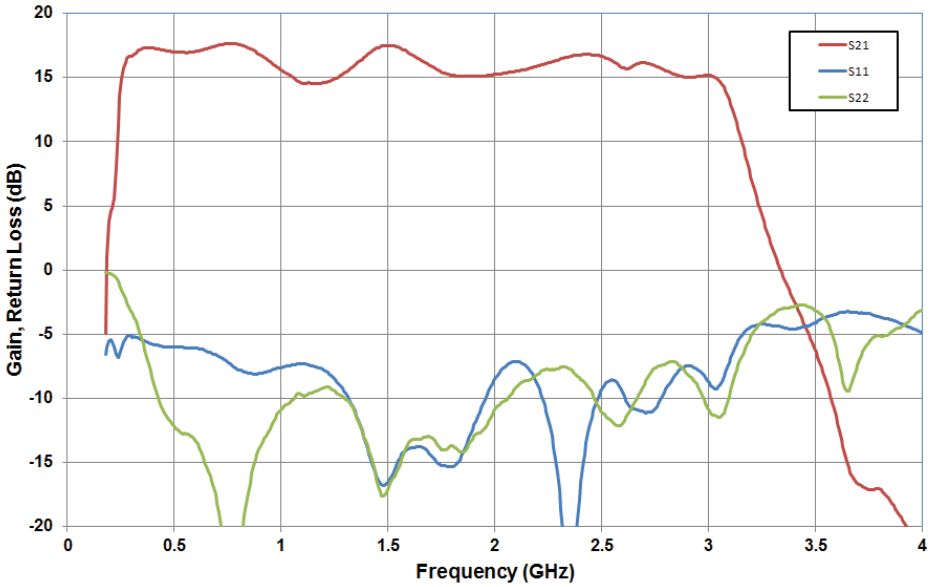

Figure 2 - Output Power and Efficiency vs. Frequency
CG2H30070-TB2
CW Operation, V_{DD}=28 V, I_{DQ}=1.0 A, @ P_{IN} 39 dBm

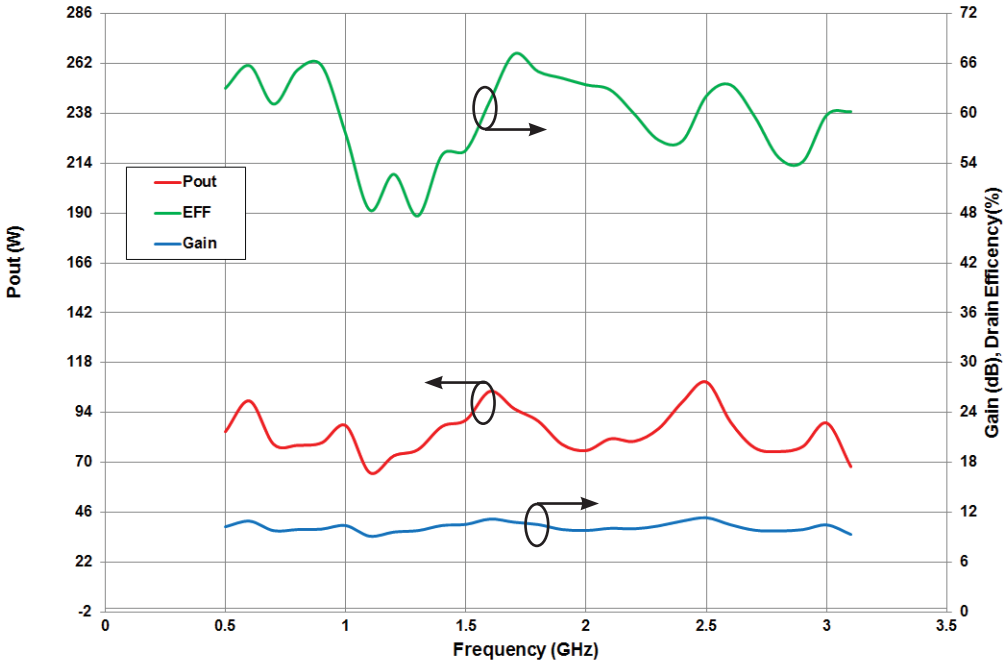

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Figure 3 - Gain and Drain EFF vs. Output Power at Various Frequencies
CG2H30070-TB2
CW-Operation, V_{DD}=28 V, I_{DQ}=1.0 A

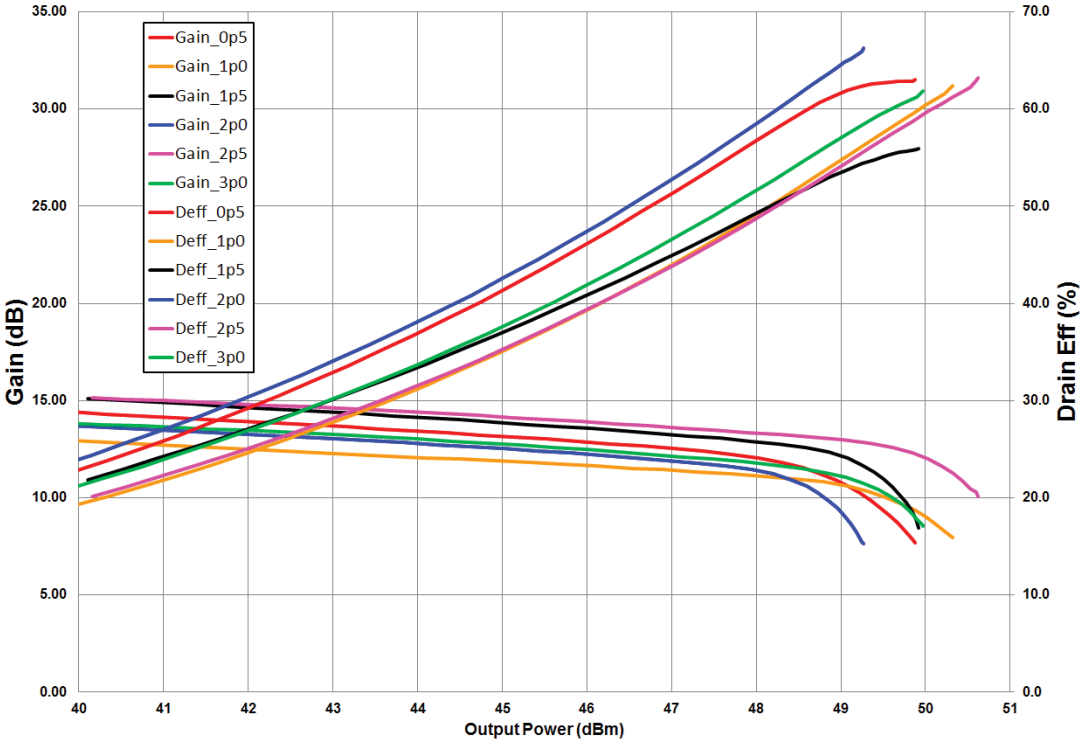

Figure 4 - Simulated Maximum Available Gain and K-factor of the CG2H30070
V_{DD}=28 V, I_{DQ}=1.0 A

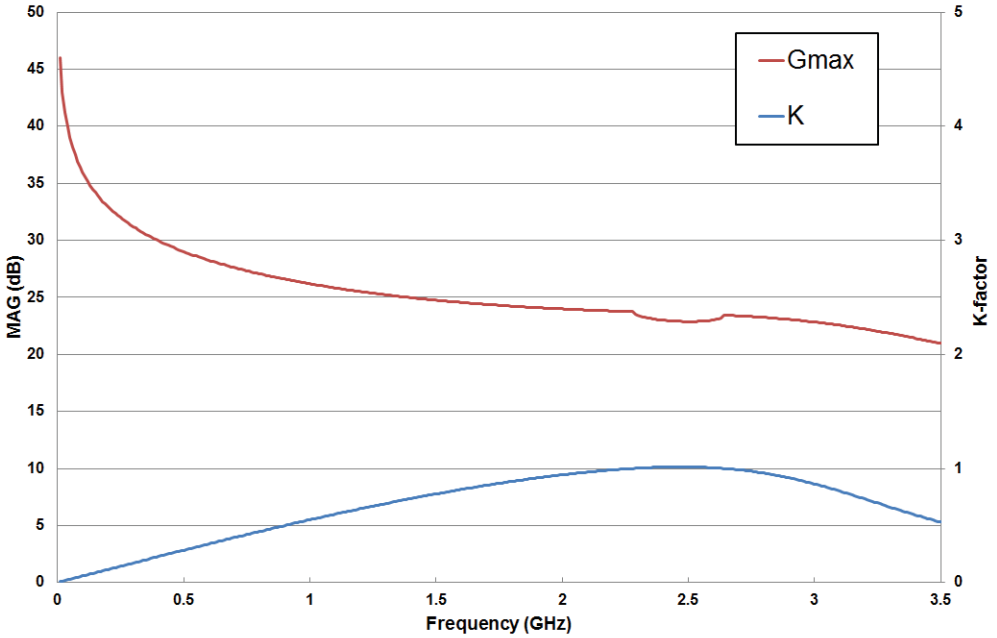

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Figure 5 - IM3 vs. Output Power, I_{DQ}=300 mA, Temp 25°C

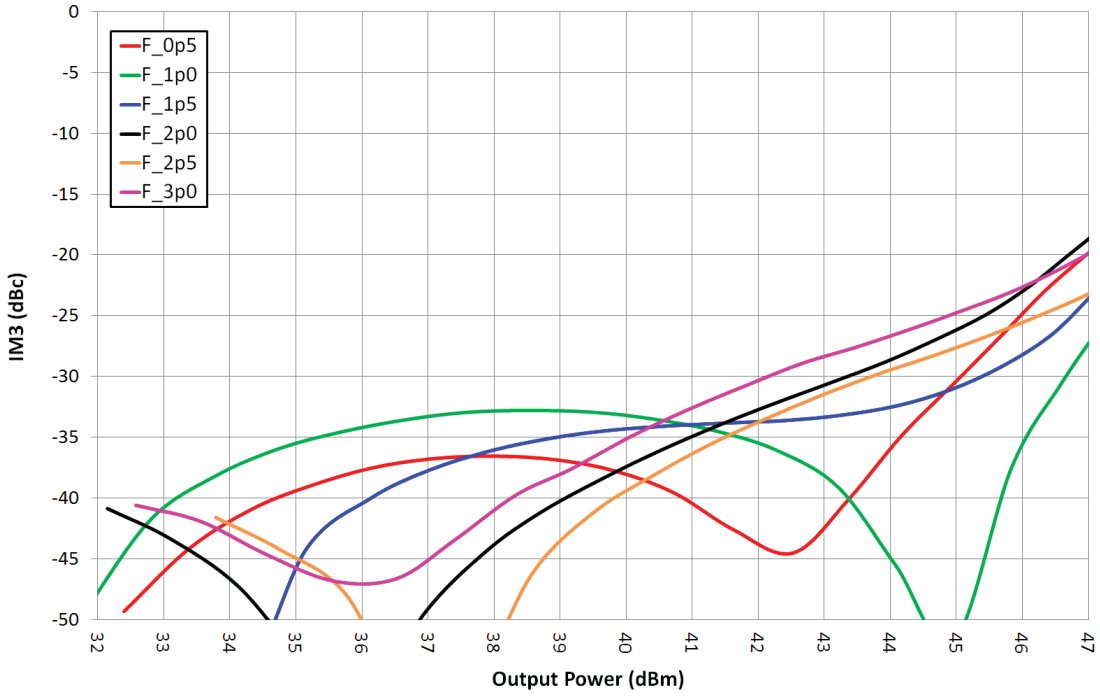
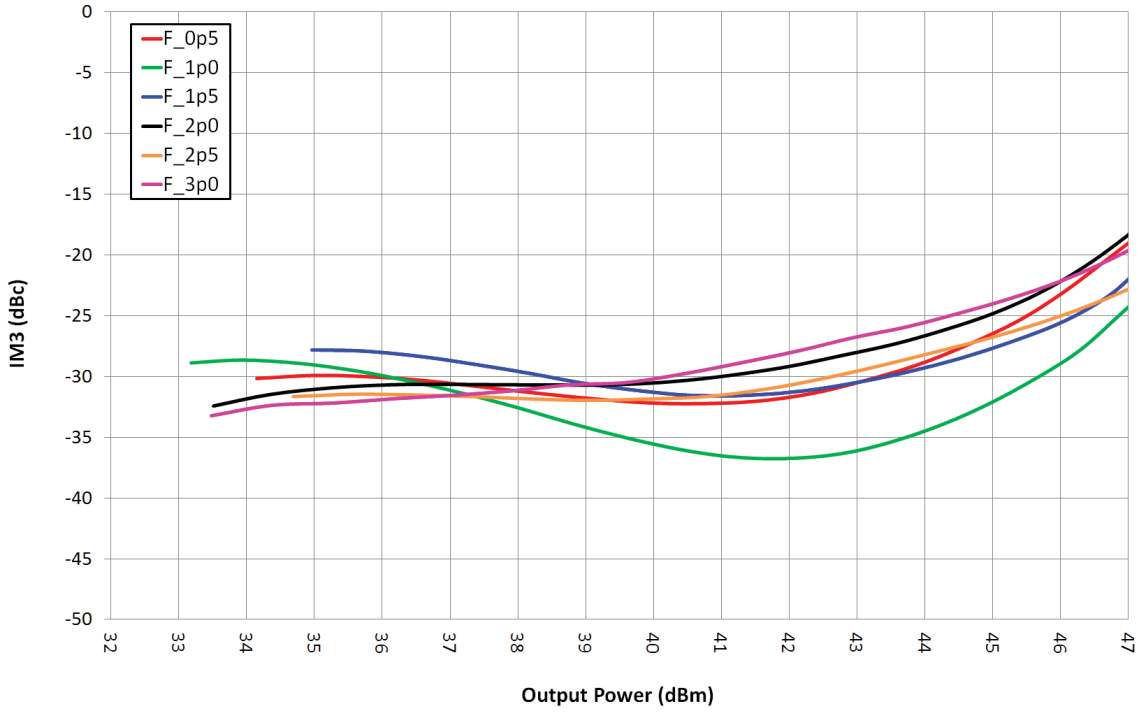


Figure 6 - IM3 vs. Output Power, I_{DQ}= 1000 mA, Temp 25°C



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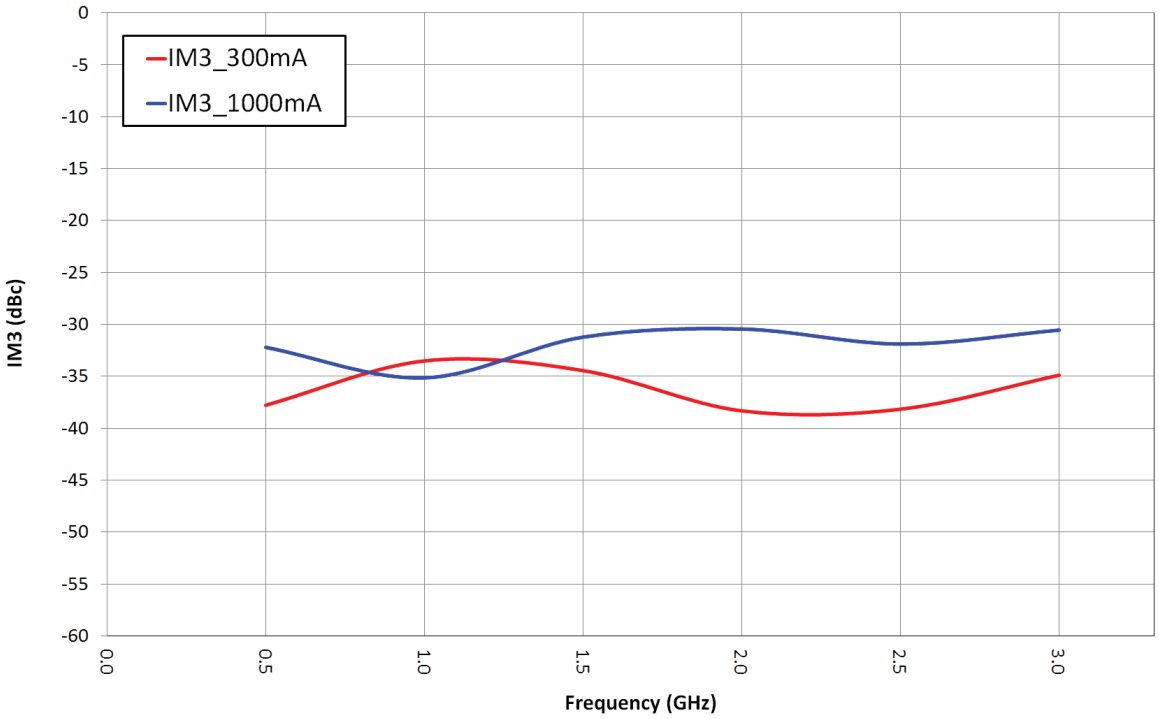
CG2H30070F Typical Performance

Figure 7 - IM3 vs. Frequency, P_{OUT}=40 dBm, Temp 25°C



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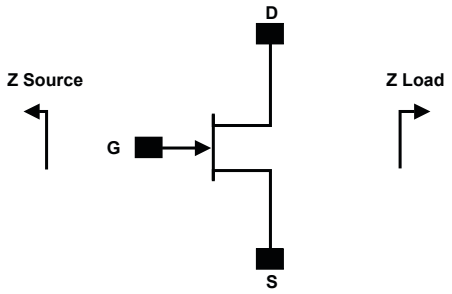
Simulated Source and Load Impedances



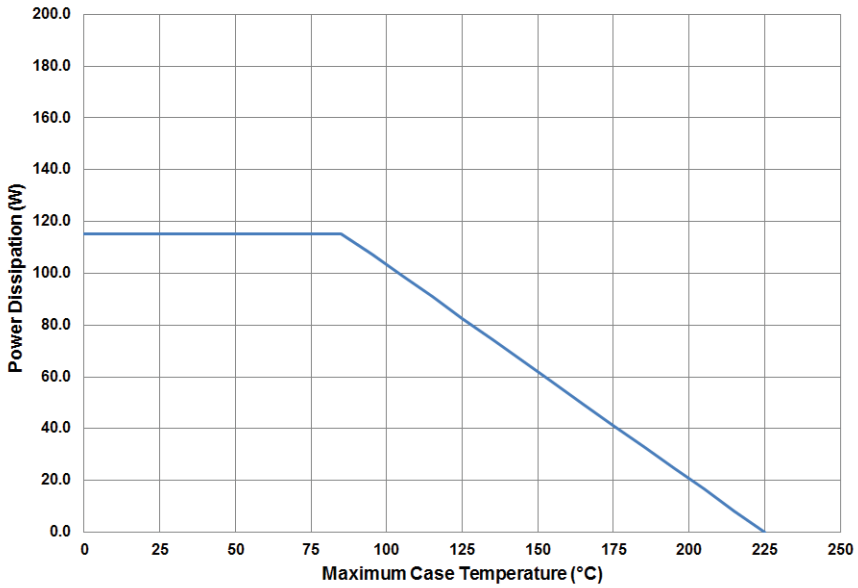
Frequency (MHz)	Z Source	Z Load
500	9 - j5.15	5.79 - j2.56
1000	7.45 - j3.82	4.76 - j1.35
1500	1.7 - j3.24	3.55 + j0.8
2000	2.33 - j0.06	4.19 + j0.19
2500	4.57 - j2.15	4.34 - j1.73
3000	1.07 - j1.04	2.65 - j1.57

Note 1. V_{DD} = 28 V, I_{DQ} = 1.0 A in the 440224 package.

Note 2. Optimized for power gain, P_{SAT} and Drain Efficiency.

Note 3. When using this device at low frequency, series resistors should be used to maintain amplifier stability.

CG2H30070 Power Dissipation De-rating Curve, CW and Pulse (100 µsec, 10%)



Note 1. Area exceeds Maximu

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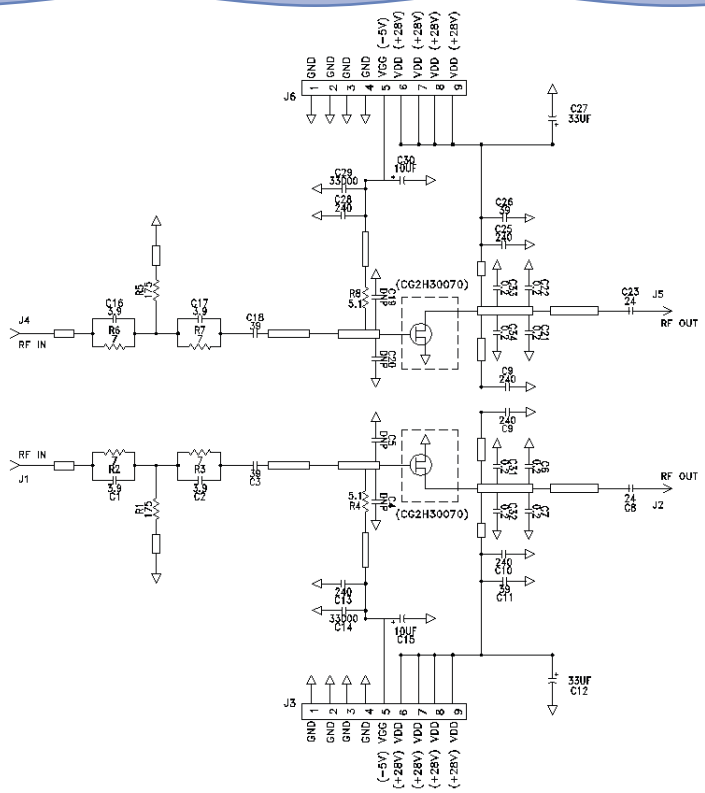
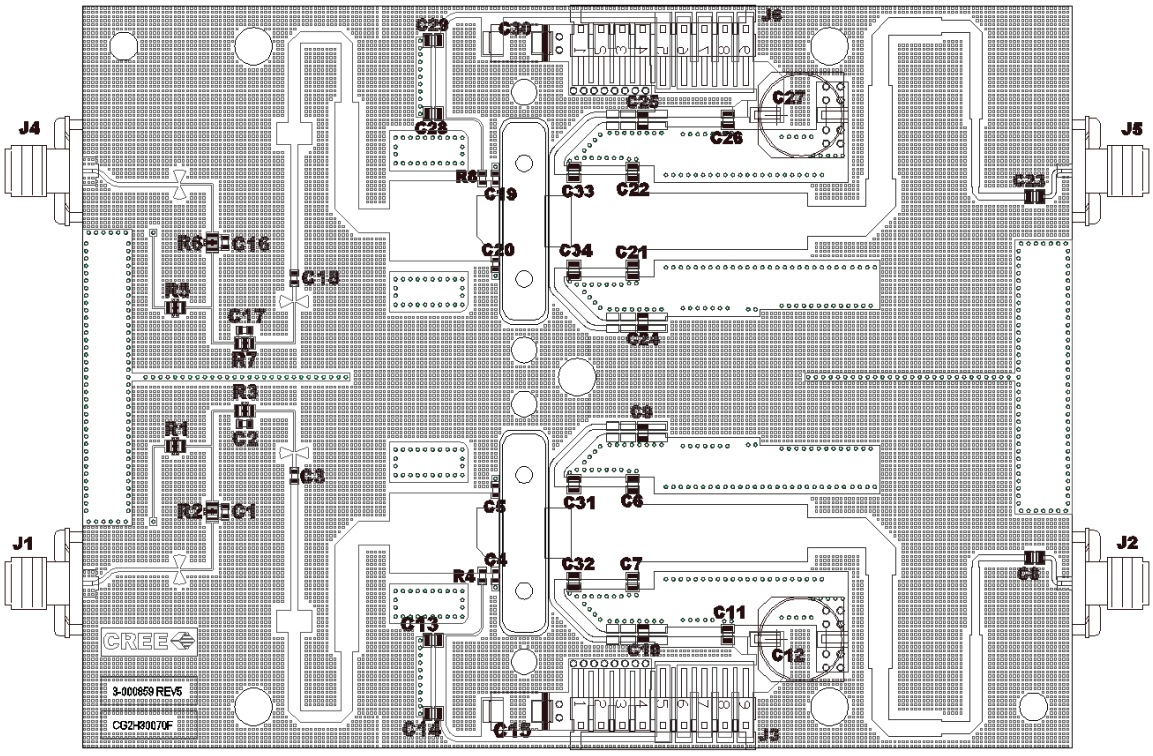
CG2H30070-AMP Demonstration Amplifier Circuit Schematic



CG2H30070-AMP Demonstration Amplifier Circuit Outline



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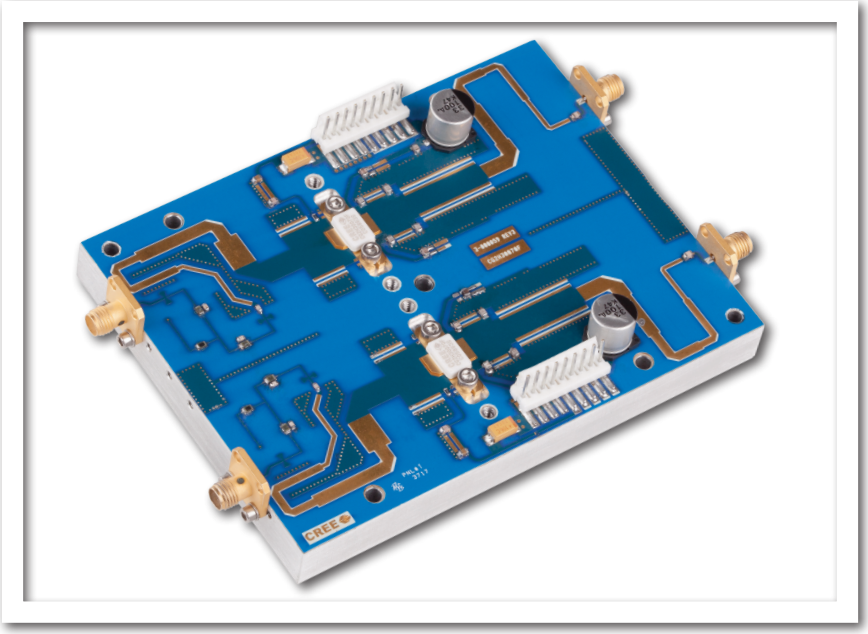
CG2H30070-AMP Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
C11, C26	CAP, 39 pF, ±5%, 250V, 0805, ATC600F	2
C8, C23	CAP, 24 pF, ±5%, 250V, 0805, ATC600F	2
C3, C18	CAP, 39 pF, ±5%, 0603, ATC	2
C14, C29	CAP, 33000PF, 0805, 100V, X7R	2
C15, C30	CAP, 10UF, 16V TANTALUM	2
C13, C9, C10, C28, C24, C25	CAP, 240pF, ±5%, 250V, 0805, ATC600F	6
C6, C7, C31, C32, C21, C22, C33, C34	CAP, 0.2pF, ±0.05%pF, 250V, 0805, ATC600F	8
C4, C5, C19, C20	DO NOT PLACE	0
C1, C2, C16, C17	CAP, 3.9pF, ±0.1pF, 0603, ATC	4
R2, R3, R6, R7	RES, 7 OHM, 0805, HIGH POWER SMT, IMS	4
R1, R5	RES, 175 OHM, 0805, HIGH POWER SMT, IMS	2
R4, R8	RES, 5 OHM, 0603, SMT	2
C12, C27	CAP, 33 UF, 20%, 100V, ELEC	2
J1, J2, J4, J5	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20 MIL	4
J3, J6	HEADER RT>PLZ .1CEN LK 9POS	2
	PCB, RO6035HTC, 3.6"x4.8"x0.10", CG2H30070F	1
	BASEPLATE, AI, 4.8x3.6x0.5	

CG2H30070-AMP Demonstration Amplifier Circuit



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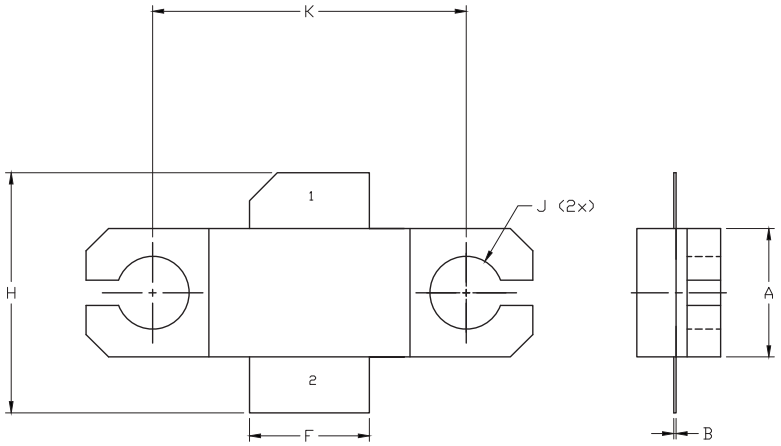
Product Dimensions CG2H30070F (Package Type — 440224)



NOTES:

1. DIMENSIONING AND TOLERANICING PER ANSI Y14.5M, 1982.

2. CONTROLLING DIMENSION: INCH.

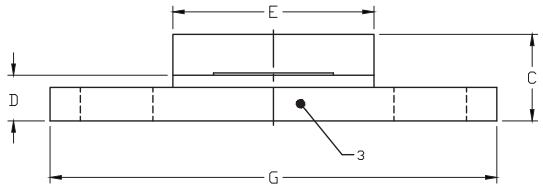
3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.

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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.225	0.235	5.72	5.97
B	0.004	0.006	0.10	0.15
C	0.145	0.165	3.68	4.19
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	0.400	0.460	10.16	11.68
J	ø .130		3.30	
k	0.562		14.27	

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



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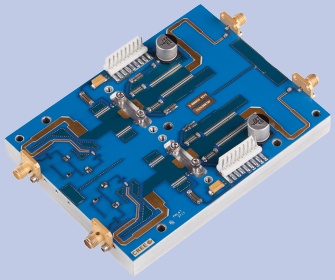
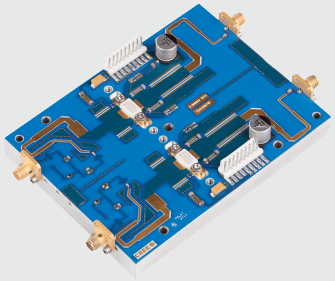
Product Ordering Information

Order Number	Description	Unit of Measure	Image
CG2H30070F	GaN HEMT	Each	
CG2H30070F-TB	Test board without GaN HEMT	Each	
CG2H30070F-AMP	Test board with GaN HEMT installed	Each	

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