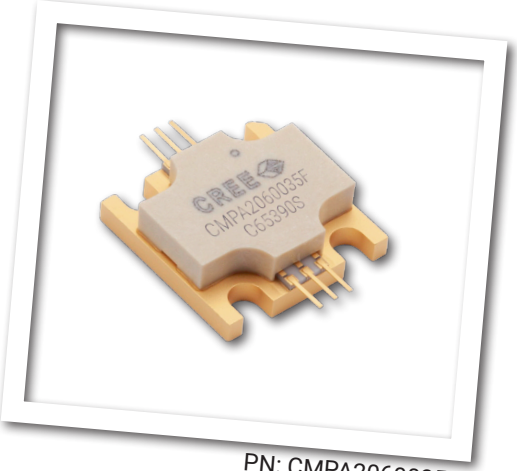
CMPA2060035F

35 W, 2000 - 6000 MHz, GaN MMIC Power Amplifier

Cree's CMPA2060035F is a gallium nitride (GaN) High Electron Mobility Transistor (HEMT) based monolithic microwave integrated circuit (MMIC). GaN has superior properties compared to silicon or gallium arsenide, including higher breakdown voltage, higher saturated electron drift velocity and higher thermal conductivity. GaN HEMTs also offer greater power density and wider bandwidths compared to Si and GaAs transistors. This MMIC contains a two-stage reactively matched amplifier enabling very wide bandwidths to be achieved in a small footprint screw-down package featuring a Copper-Tungsten heat-sink.



PN: CMPA2060035F
Package Type: 440219

Typical Performance Over 2.0-6.0 GHz (T_C = 25°C)

Parameter	2.0 GHz	4.0 GHz	6.0 GHz	Units
Small Signal Gain	25.6	28.5	26.8	dB
Output Power[1]	27.4	54	37	W
Power Gain[1]	17.4	20.3	18.7	dB
Power Added Efficiency[1]	33	47.2	34.2	%

Note[1]: V_{DD} = 32 V, I_{DQ} = 1.2 A, P_{IN} = 27 dBm. All data tested CW

Features

- 28 dB Small Signal Gain
- 35 W Typical P_{SAT}
- Operation up to 32 V
- High Breakdown Voltage
- High Temperature Operation

Applications

- Ultra Broadband Amplifiers
- Fiber Drivers
- Test Instrumentation
- EMC Amplifier Drivers

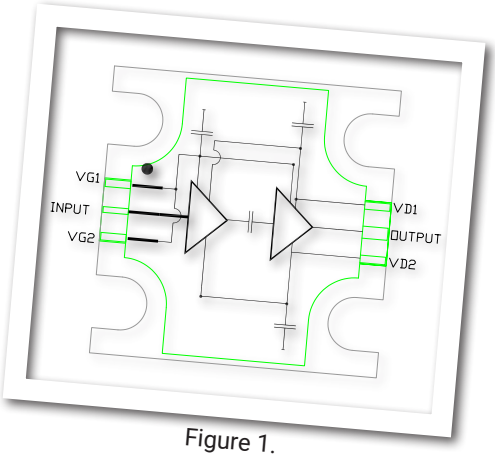


Figure 1.

Absolute Maximum Ratings (not simultaneous) at 25˚C

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	V_{DSS}	84	VDC	
Gate-source Voltage	V_{GS}	-10, +2	VDC	
Storage Temperature	T_{STG}	-65, +150	˚C	
Operating Junction Temperature	T_J	225	˚C	
Forward Gate Current	I_G	16	mA	
Screw Torque	T	40	in-oz	
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.67	˚C/W	85 ˚C, P_{DISS} = 65 W, CW
Case Operating Temperature	T_C	-40, +115	˚C	

Electrical Characteristics (Frequency = 2.0 GHz to 6.0 GHz unless otherwise stated; T_C = 25˚C)

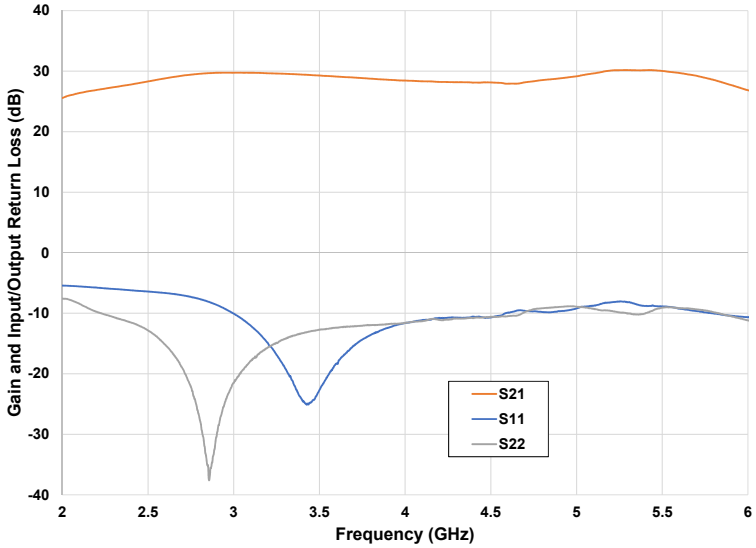
Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[1,2]						
Gate Threshold Voltage	$V_{(GS)TH}$	-3.6	-3.1	-2.4	V	V_{DS} = 10 V, I_D = 16.8 mA
Gate Quiescent Voltage	$V_{(GS)Q}$	–	-2.7	–	VDC	V_{DD} = 28 V, I_D = 1.2 A
Drain-Source Breakdown Voltage	V_{BD}	84	–	–	V	V_{GS} = -8 V, I_D = 16.8 mA
Saturated Drain Current[1]	I_{DC}	12.6	15.1	–	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
RF Characteristics[3,4,5]						
Small Signal Gain	S21	--	28.8	–	dB	V_{DD} = 32 V, I_{DQ} = 1.2 A, P_{IN} = -30 dBm
Input Return Loss	S11	–	-10.7	--	dB	V_{DD} = 32 V, I_{DQ} = 1.2 A, P_{IN} = -30 dBm
Output Return Loss	S22	–	-12.5	--	dB	V_{DD} = 32 V, I_{DQ} = 1.2 A, P_{IN} = -30 dBm
Output $Power_1$	P_{OUT}	–	27.4	–	W	V_{DD} = 32 V, I_{DQ} = 1.2 A, Freq = 2.0 GHz
Output $Power_2$	P_{OUT}	–	54	–	W	V_{DD} = 32 V, I_{DQ} = 1.2 A, Freq = 4.0 GHz
Output $Power_3$	P_{OUT}	–	37	–	W	V_{DD} = 32 V, I_{DQ} = 1.2 A, Freq = 6.0 GHz
Power Added $Efficiency_1$	PAE	–	33.0	–	%	V_{DD} = 32 V, I_{DQ} = 1.2 A, Freq = 2.0 GHz
Power Added $Efficiency_2$	PAE	–	47.2	–	%	V_{DD} = 32 V, I_{DQ} = 1.2 A, Freq = 4.0 GHz
Power Added $Efficiency_3$	PAE	–	34.2	–	%	V_{DD} = 32 V, I_{DQ} = 1.2 A, Freq = 6.0 GHz
Power $Gain_1$	G_P	–	17.4	–	dB	V_{DD} = 32 V, I_{DQ} = 1.2 A, Freq = 2.0 GHz
Power $Gain_2$	G_P	–	20.3	–	dB	V_{DD} = 32 V, I_{DQ} = 1.2 A, Freq = 4.0 GHz
Power $Gain_3$	G_P	–	18.7	–	dB	V_{DD} = 32 V, I_{DQ} = 1.2 A, Freq = 6.0 GHz
Output Mismatch Stress	VSWR	–	–	5 : 1	Ψ	No damage at all phase angles, V_{DD} = 32 V, I_{DQ} = 1.2 A, P_{IN} = 27 dBm

Notes:
[1] Measured on-wafer prior to packaging
[2] Scaled from PCM data
[3] Measured in CMPA2060035F-AMP
[4] Measured at P_{IN} = 27 dBm

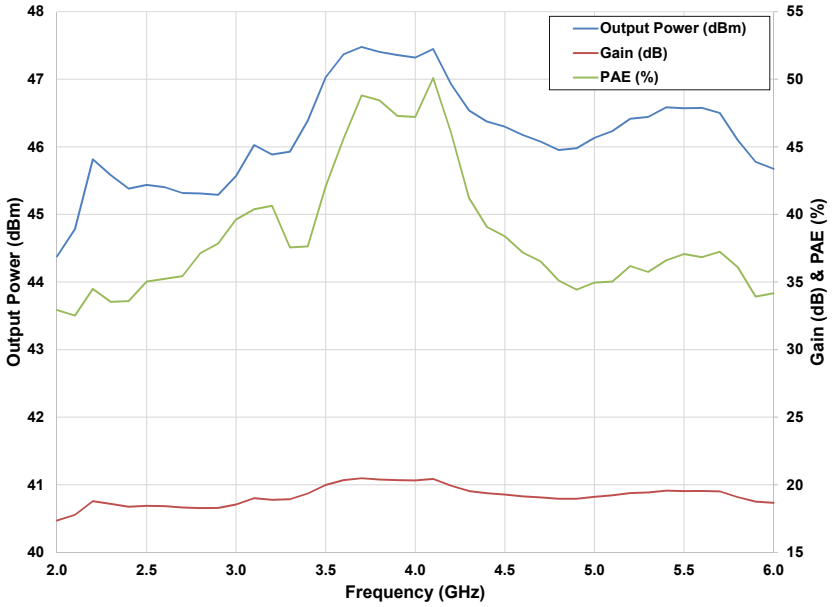
Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
USA Tel: +1.919.313.5300
Fax: +1.919.869.2733
www.cree.com/rf

Typical Performance

CMPA2060035F S-Parameters
V_{DD} = 32 V, I_{DQ} = 1.2 A



CMPA2060035F Output Power, Gain and PAE vs. Frequency
V_{DD} = 32 V, I_{DQ} = 1.2 A, P_{IN} = 27 dBm, CW



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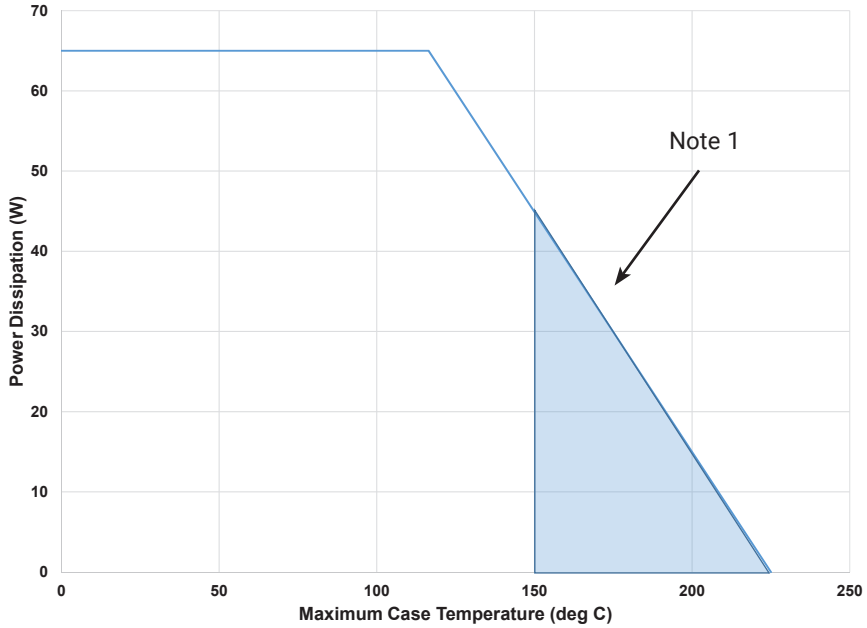
CMPA2060035F CW Power Dissipation De-rating Curve



Note 1. Area exceeds Maximum Case Operating Temperature (See Page 2).

Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Class	Test Methodology
Human Body Model	HBM	1A (> 250 V)	JEDEC JESD22 A114-D
Charge Device Model	CDM	II (200 < 500 V)	JEDEC JESD22 C101-C

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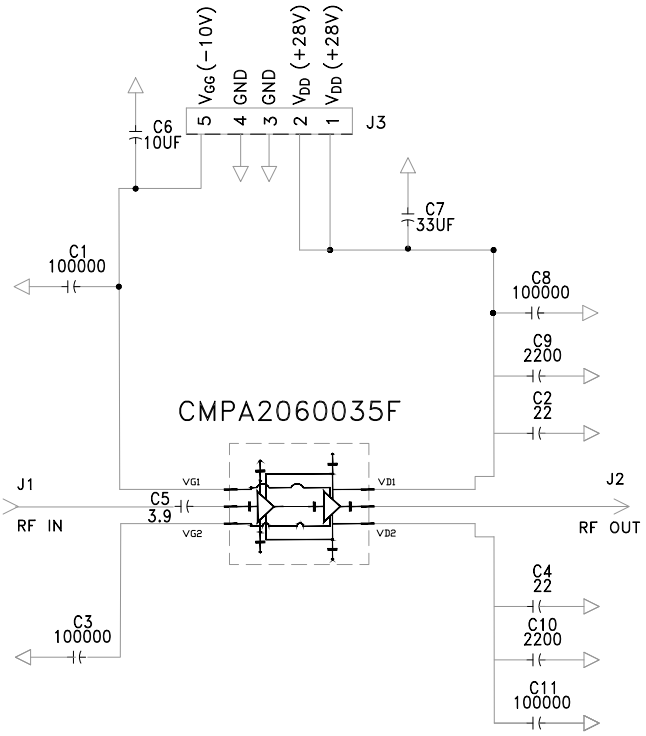
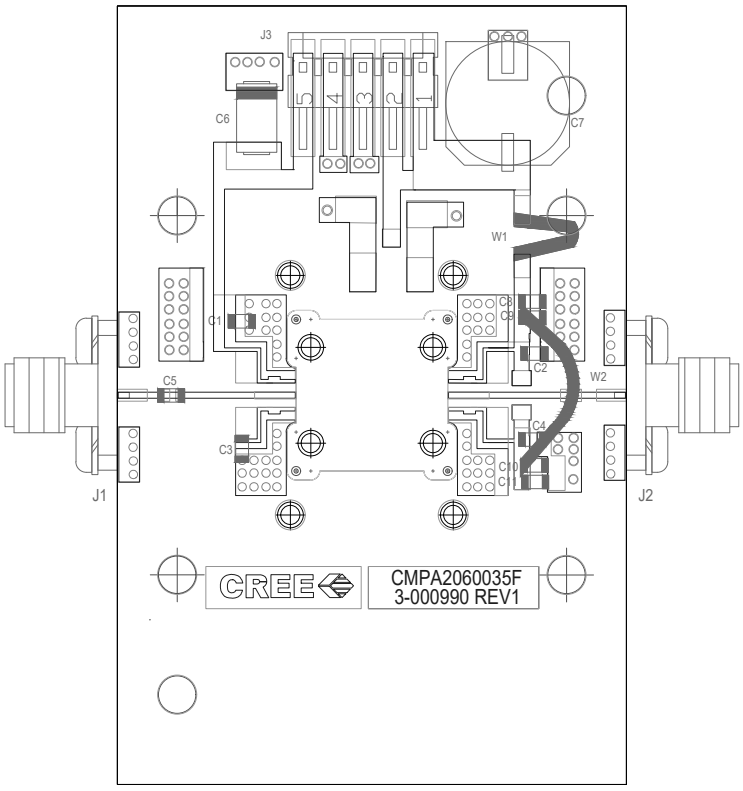
CMPA2060035F-AMP Demonstration Amplifier Circuit Schematic



CMPA2060035F-AMP Demonstration Amplifier Circuit Outline



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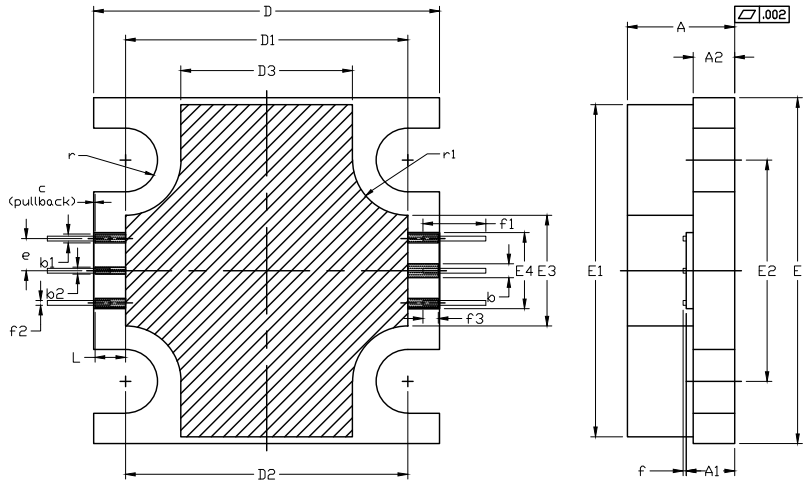
CMPA2060035F-AMP Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
	PCB	1
	CAP, 3.9 PF, 250V, 0805, ATC600F	1
C1, C3, C8, C11	CAP, 100,000 PF, 50V, 0805, 10%	3
C6	CAP, 10 UF, 20%, G CASE	1
C7	CAP, 3.3 UF, 20%, G CASE	2
C5	CAP, 2200 PF, 100V, 0805, 10%	2
C2, C4	CAP, 22 PF, 50V, 10%	2
J1,J2	CONN, SMA, FLANGE, 4-HOLE	2
J3	DC CONN, HEADER RT>PLZ .1CEN LK 5POS	1
	2-56 SOC HD SCREW 1/4 SS	4
	#2 FLATWASHER	2
Q1	CMPA2060035F	1

Product Dimensions CMPA2060035F (Package Type — 440219)



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		NOTE
	MIN	MAX	MIN	MAX	
A	0.148	0.162	3.76	4.12	–
A1	0.066	0.076	1.67	1.93	–
A2	0.056	0.064	1.42	1.63	–
b	0.022		0.56		–
b1	0.013		0.33		x4
b2	0.010		0.25		–
c	0.002		0.05		x2
D	0.495	0.505	12.57	12.83	–
D1	0.403	0.413	10.23	10.49	–
D2	0.408		10.36		–
D3	0.243	0.253	6.17	6.43	–
E	0.495	0.505	12.57	12.83	–
E1	0.475	0.485	12.06	12.32	–
E2	0.320		8.13		–
E3	0.155	0.165	3.93	4.19	–
E4	0.105	0.115	2.66	2.92	–
e	0.046		1.17		x4
f	0.005		0.127		x6
f1	0.100	–	2.54	–	x6
f2	0.010		.254		x6
f3	0.022		.559		x6
L	0.044		1.12		x6
r	R0.046		R1.17		x4
r1	R0.080		R2.03		x4

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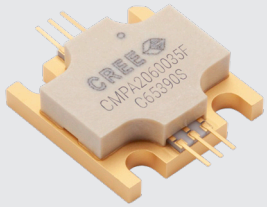
Product Ordering Information

Order Number	Description	Unit of Measure	Image
CMPA2060035F	GaN MMIC	Each	
CMPA2060035F-AMP	Test board with GaN MMIC installed	Each	

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For more information, please contact:

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www.cree.com/RF

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