

# CMPA2735075F

## 75 W, 2.7 - 3.5 GHz, GaN MMIC, Power Amplifier

Cree's CMPA2735075F 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 design approach enabling very wide bandwidths to be achieved. This MMIC enables extremely wide bandwidths to be achieved in a small footprint screw-down package.



PN: CMPA2735075F  
Package Type: 780019

### Typical Performance Over 2.7-3.5 GHz ( $T_c = 25^\circ\text{C}$ )

Parameter	2.7 GHz	2.9 GHz	3.1 GHz	3.3 GHz	3.5 GHz	Units
Small Signal Gain	27	29	29	28	27	dB
Saturated Output Power, $P_{SAT}^1$	59	76	89	90	83	W
Power Gain @ $P_{SAT}^1$	21	23	24	24	23	dB
PAE @ $P_{SAT}^1$	43	54	56	56	56	%

Note<sup>1</sup>:  $P_{SAT}$  is defined as the RF output power where the device starts to draw positive gate current in the range of 2-8 mA.

### Features

- 27 dB Small Signal Gain
- 80 W Typical  $P_{SAT}$
- Operation up to 28 V
- High Breakdown Voltage
- High Temperature Operation
- 0.5" x 0.5" Total Product Size

### Applications

- Civil and Military Pulsed Radar Amplifiers

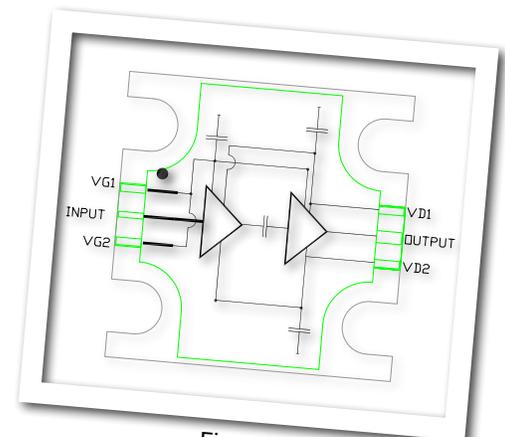


Figure 1.



## Absolute Maximum Ratings (not simultaneous) at 25°C

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	$V_{DSS}$	84	VDC	25°C
Gate-source Voltage	$V_{GS}$	-10, +2	VDC	25°C
Storage Temperature	$T_{STG}$	-65, +150	°C	
Operating Junction Temperature	$T_J$	225	°C	
Maximum Forward Gate Current	$I_G$	28	mA	25°C
Screw Torque	T	40	in-oz	
Thermal Resistance, Junction to Case (packaged) <sup>1</sup>	$R_{\theta JC}$	2.5	°C/W	300 μsec, 20%, 85°C

### Notes:

<sup>1</sup> Measured for the CMPA2735075F at  $P_{DISS} = 64$  W.

## Electrical Characteristics (Frequency = 2.9 GHz to 3.5 GHz unless otherwise stated; $T_c = 25^\circ\text{C}$ )

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
<b>DC Characteristics</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	-3.8	-3.0	-2.3	V	$V_{DS} = 10$ V, $I_D = 28$ mA
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.7	-	V <sub>DC</sub>	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 2.9 GHz
Saturated Drain Current <sup>1</sup>	$I_{DS}$	19.6	27.4	-	A	$V_{DS} = 6.0$ V, $V_{GS} = 2.0$ V
Drain-Source Breakdown Voltage	$V_{BD}$	84	100	-	V	$V_{GS} = -8$ V, $I_D = 28$ mA
<b>RF Characteristics<sup>2,3</sup></b>						
Small Signal Gain <sub>1</sub>	S <sub>21</sub>	-	29	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 2.9 GHz
Small Signal Gain <sub>2</sub>	S <sub>21</sub>	26.5	29	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.1 GHz
Small Signal Gain <sub>3</sub>	S <sub>21</sub>	26	27	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.5 GHz
Power Output <sub>1</sub>	$P_{OUT}$	-	76	-	W	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, $P_{IN} = 28$ dBm, Freq = 2.9 GHz
Power Output <sub>2</sub>	$P_{OUT}$	66	82	-	W	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, $P_{IN} = 28$ dBm, Freq = 3.1 GHz
Power Output <sub>3</sub>	$P_{OUT}$	66	85	-	W	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, $P_{IN} = 28$ dBm, Freq = 3.5 GHz
Power Added Efficiency <sub>1</sub>	PAE	-	54	-	%	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 2.9 GHz
Power Added Efficiency <sub>2</sub>	PAE	45	54	-	%	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.1 GHz
Power Added Efficiency <sub>3</sub>	PAE	45	53	-	%	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.5 GHz
Power Gain <sub>1</sub>	$G_p$	-	23	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 2.9 GHz
Power Gain <sub>2</sub>	$G_p$	20	21	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.1 GHz
Power Gain <sub>3</sub>	$G_p$	20	21	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.5 GHz
Input Return Loss <sub>1</sub>	S <sub>11</sub>	-	-11	-8	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.1 GHz
Input Return Loss <sub>2</sub>	S <sub>11</sub>	-	-16	-10	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.5 GHz
Output Return Loss <sub>1</sub>	S <sub>22</sub>	-	-9	-4	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.1 GHz
Output Return Loss <sub>2</sub>	S <sub>22</sub>	-	-17	-10	dB	$V_{DD} = 28$ V, $I_{DQ} = 700$ mA, Freq = 3.5 GHz
Output Mismatch Stress	VSWR	-	-	5 : 1	Ψ	No damage at all phase angles, $V_{DD} = 28$ V, $I_{DQ} = 700$ mA, $P_{OUT} = 75$ W CW

### Notes:

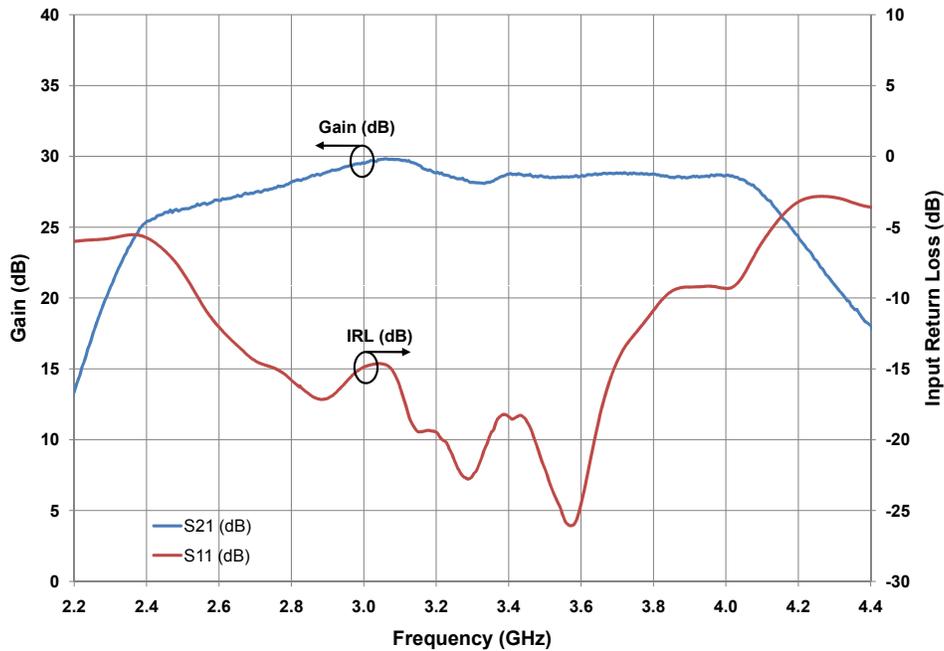
<sup>1</sup> Scaled from PCM data.

<sup>2</sup> All data pulse tested in CMPA2735075F-AMP

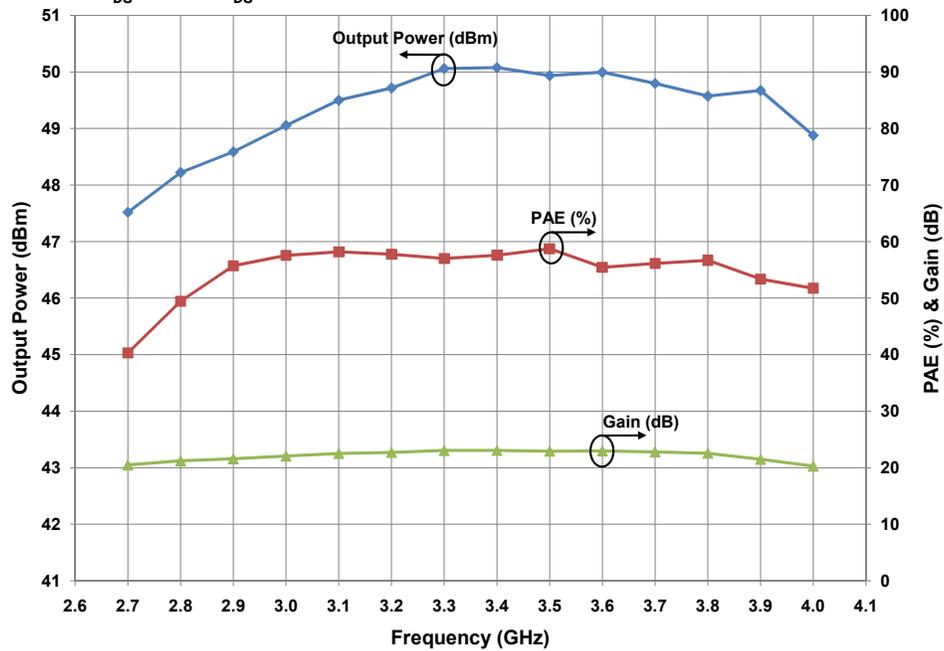
<sup>3</sup> Pulse Width = 300 μS, Duty Cycle = 20%.

## Typical Performance of the CMPA2735075F

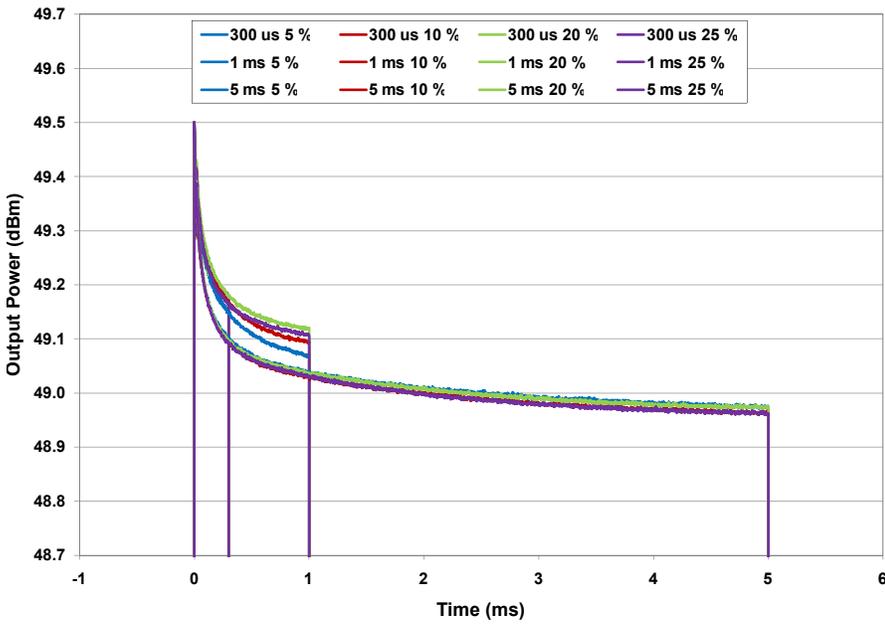
**Gain and Input Return Loss vs Frequency of the CMPA2735075F**  
**Measured in CMPA2735075F-AMP Amplifier Circuit.**  
 $V_{DS} = 28\text{ V}$ ,  $I_{DS} = 700\text{ mA}$



**Output Power, Gain and PAE vs Frequency of the CMPA2735075F**  
**Measured in CMPA2735075F-AMP Amplifier Circuit.**  
 $V_{DS} = 28\text{ V}$ ,  $I_{DS} = 700\text{ mA}$ , Pulse Width =  $300\ \mu\text{s}$ , Duty Cycle = 20%



## Typical Pulse Droop Performance



Pulse Width	Duty Cycle (%)	Droop (dB)
10 us	5-25	0.30
50 us	5-25	0.30
100 us	5-25	0.30
300 us	5-25	0.35
1 ms	5-25	0.40
5 ms	5-25	0.55

## 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

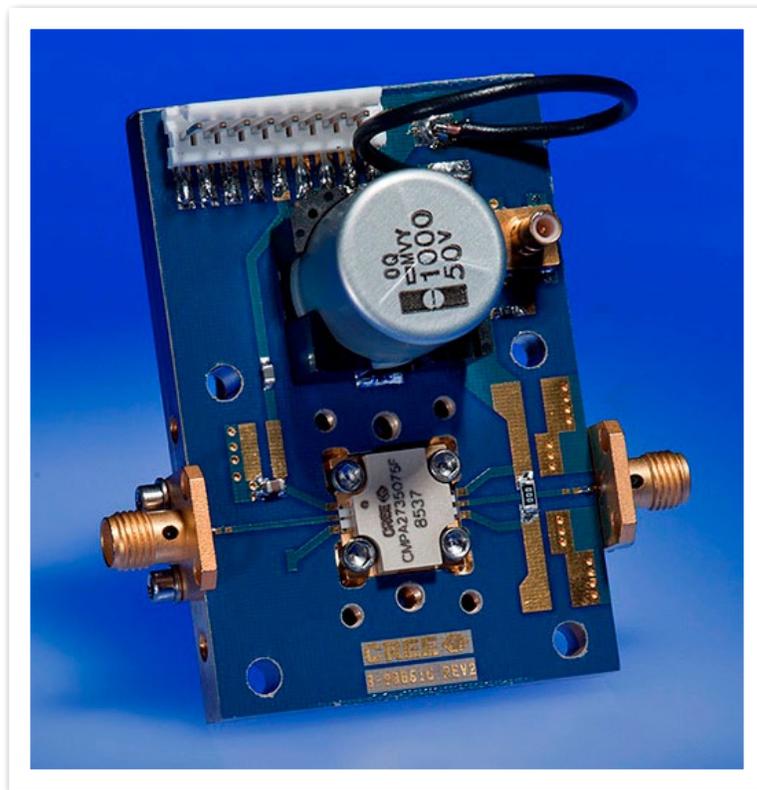
## CMPA2735075F-AMP Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
C1	CAP, 15000pF, 100V, 0805, X7R	1
C2	CAP, 1000uF, 20%, 50V, ELECT, MVY, SMD	1
R1	RES, 1/8W, 1206, +/-5%, 0 OHMS	1
R2	RES, 1/16W, 0603, +/-5%, 10K OHMS	1
L1	FERRITE, 22 OHM, 0805, BLM21PG220SN1	1
J1,J2	CONNECTOR, N-TYPE, FEMALE, W/0.500 SMA FLNG	2
J3	CONNECTOR, HEADER, RT>PLZ .1CEN LK 9POS	1
J4	CONNECTOR, SMB, STRAIGHT JACK, SMD	1
-	PCB, TACONIC, RF-35-0100-CH/CH	1
Q1	CMPA2735075F	1

### Notes

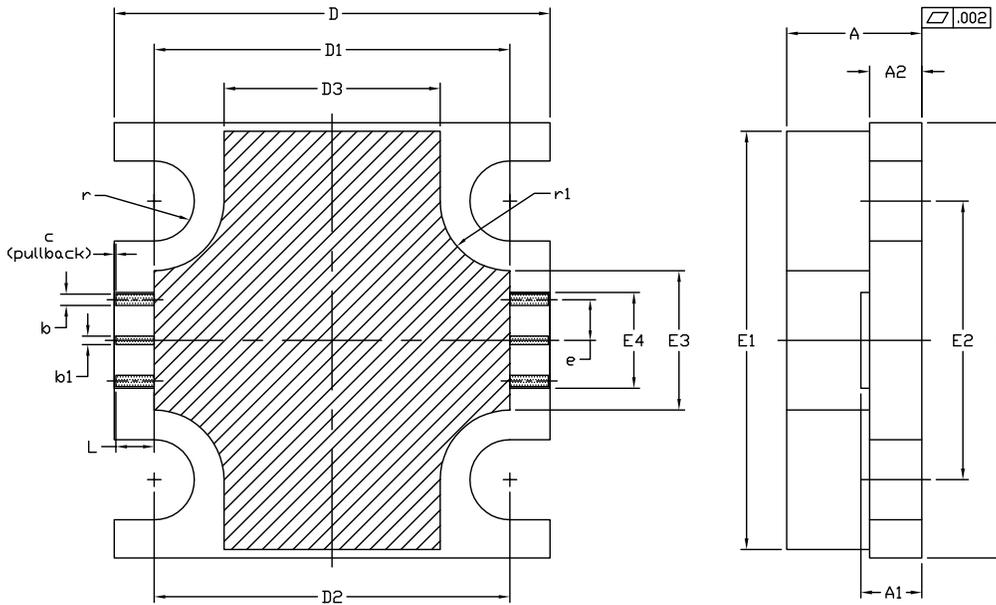
<sup>1</sup>The CMPA2735075F is connected to the PCB with 2.0 mil Au bond wires.

## CMPA2735075F-AMP Demonstration Amplifier Circuit





## Product Dimensions CMPA2735075F (Package Type – 780019)

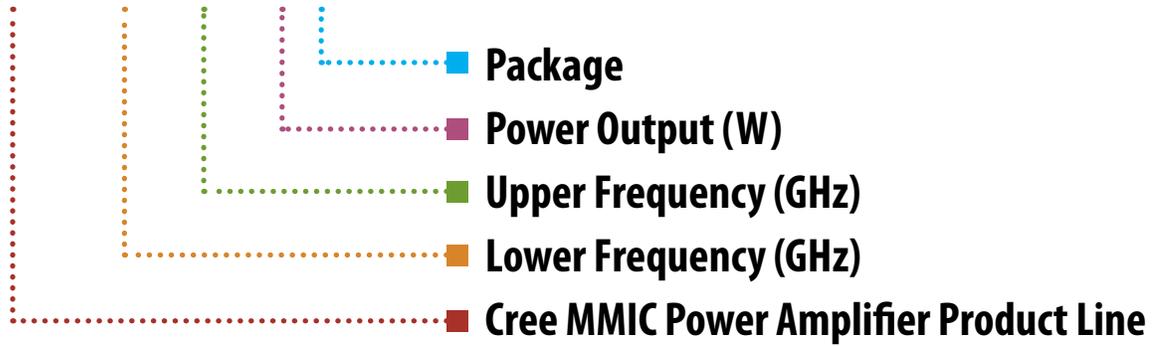


**NOTES:**

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		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	0.013		0.33		x4
b1	0.010		0.25		x2
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
L	0.044		1.12		x6
r	R0.046		R1.17		x4
r1	R0.080		R2.03		x4

# CMPA2735075F



Parameter	Value	Units
Lower Frequency	2.7	GHz
Upper Frequency	3.5	GHz
Power Output	75	W
Package	Flange	-

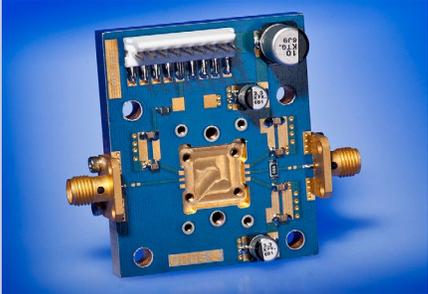
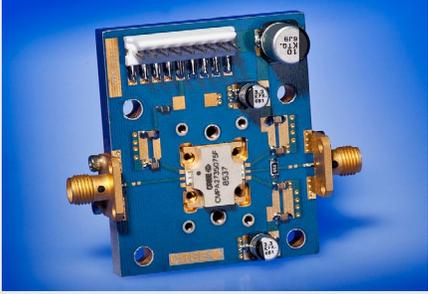
Table 1.

**Note:** Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value.

Character Code	Code Value
A	0
B	1
C	2
D	3
E	4
F	5
G	6
H	7
J	8
K	9
Examples:	1A = 10.0 GHz 2H = 27.0 GHz

Table 2.

## Product Ordering Information

Order Number	Description	Unit of Measure	Image
CMPA2735075F	GaN HEMT	Each	
CMPA2735075F-TB	Test board without GaN MMIC	Each	
CMPA2735075F-AMP	Test board with GaN MMIC installed	Each	



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