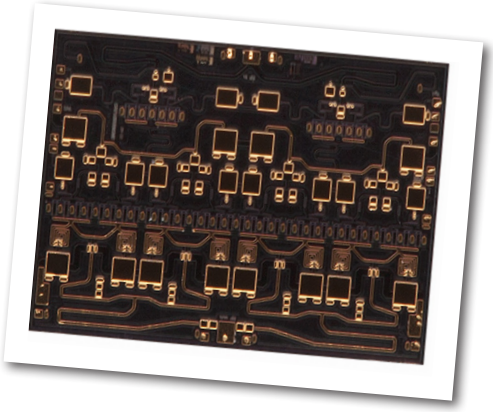
CMPA2735030D

30 W, 2.7 - 3.5 GHz, GaN MMIC, Power Amplifier



Cree's CMPA2735030D 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.

Typical Performance Over 2.7-3.5 GHz (T_c = 25°C)

Parameter	2.7 GHz	2.9 GHz	3.1 GHz	3.3 GHz	3.5 GHz	Units
Small Signal Gain	32	34	35	35	36	dB
Output Power[1]	40	43	48	45	41	W
Power Gain[1]	28	28	29	29	28	dB
PAE[1]	63	62	61	58	55	%

Note[1]: P_{IN} = 18 dBm, Pulse Width = 500 µs; Duty Cycle = 10%

Features

- 35 dB Small Signal Gain
- 40 W Typical P_{SAT}
- Operation up to 50 V
- High Breakdown Voltage
- High Temperature Operation
- Size 0.130 x 0.08 x 0.004 inches

Applications

- Civil and Military Pulsed Radar Amplifiers

Rev 0.0 – June 2019

Absolute Maximum Ratings (not simultaneous) at 25˚C

Parameter	Symbol	Rating	Units
Drain-source Voltage	V_{DSS}	150	VDC
Gate-source Voltage	V_{GS}	-10, +2	VDC
Storage Temperature	T_{STG}	-65, +150	˚C
Operating Junction Temperature	T_J	225	˚C
Thermal Resistance, Junction to Case (packaged)	$R_{\theta JC}$	-	˚C/W
Mounting Temperature (30 seconds)	T_S	260	˚C

Electrical Characteristics (Frequency = 2.7 GHz to 3.5 GHz unless otherwise stated; T_C = 25˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics						
Gate Threshold Voltage	$V_{GS(TH)}$	-3.8	-3.0	-2.3	V	V_{DS} = 10 V, I_D = 6 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.7	–	V_{DC}	V_{DD} = 50 V, I_{DQ} = 135 mA, Frequency = 2.9 GHz
Saturated Drain Current[1]	I_{DS}	–	6	–	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BD}	–	150	–	V	V_{GS} = -8 V, I_D = 6 mA
RF Characteristics[2]						
Small Signal Gain$_1$	S21	–	32	–	dB	V_{DD} = 50 V, I_{DQ} = 135 mA, Frequency = 2.7 GHz
Small Signal Gain$_2$	S21	–	35	–	dB	V_{DD} = 50 V, I_{DQ} = 135 mA, Frequency = 3.1 GHz
Small Signal Gain$_3$	S21	–	36	–	dB	V_{DD} = 50 V, I_{DQ} = 135 mA, Frequency = 3.5 GHz
Power Output$_1$	P_{OUT}	–	40	–	W	V_{DD} = 50 V, I_{DQ} = 135 mA, P_{IN} = 18 dBm, Frequency = 2.7 GHz
Power Output$_2$	P_{OUT}	–	48	–	W	V_{DD} = 50 V, I_{DQ} = 135 mA, P_{IN} = 18 dBm, Frequency = 3.1 GHz
Power Output$_3$	P_{OUT}	–	41	–	W	V_{DD} = 50 V, I_{DQ} = 135 mA, P_{IN} = 18 dBm, Frequency = 3.5 GHz
Power Added Efficiency$_1$	PAE	–	63	–	%	V_{DD} = 50 V, I_{DQ} = 135 mA, Frequency = 2.7 GHz
Power Added Efficiency$_2$	PAE	–	61	–	%	V_{DD} = 50 V, I_{DQ} = 135 mA, Frequency = 3.1 GHz
Power Added Efficiency$_3$	PAE	–	55	–	%	V_{DD} = 50 V, I_{DQ} = 135 mA, Frequency = 3.5 GHz
Power Gain	G_P	–	28	–	dB	V_{DD} = 50 V, I_{DQ} = 135 mA
Input Return Loss	S11	–	-11	–	dB	V_{DD} = 50 V, I_{DQ} = 135 mA
Output Return Loss	S22	–	-8	–	dB	V_{DD} = 50 V, I_{DQ} = 135 mA
Output Mismatch Stress	VSWR	–	–	10 : 1	Ψ	TBD

Notes:

[1] Scaled from PCM data.

[2] All data pulse tested on-wafer with Pulse Width = 10 µs, Duty Cycle = 1%.

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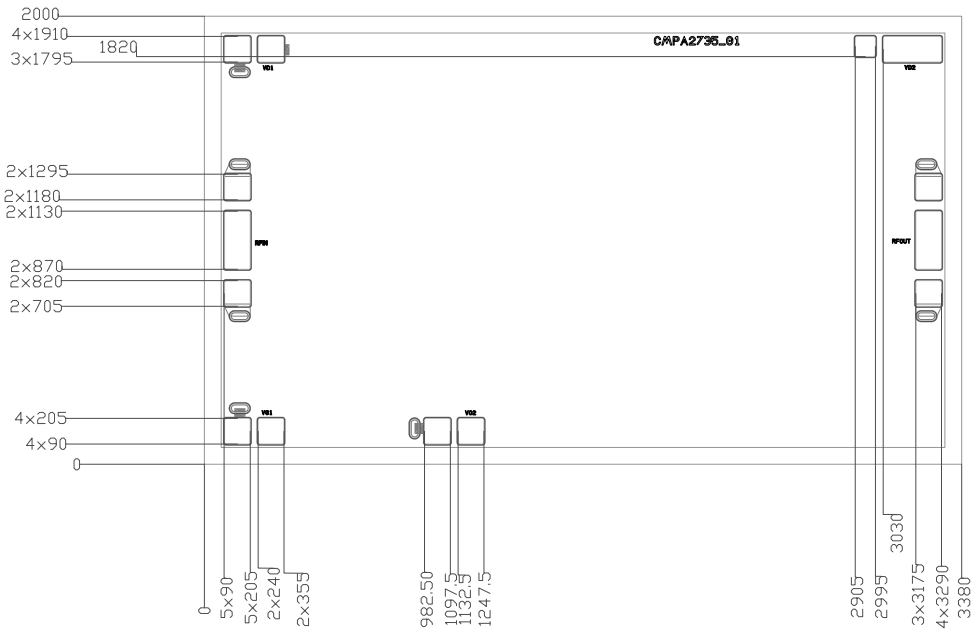
Die Dimensions (units in microns)



Die Assembly Notes:

- Recommended solder is AuSn (80/20) solder. Refer to Cree's website for the Eutectic Die Bond Procedure application note at http://www.cree.com/RF/Document-Library
- Vacuum collet is the preferred method of pick-up.
- The backside of the die is the Source (ground) contact.
- Die back side gold plating is 5 microns thick minimum.
- Thermosonic ball or wedge bonding are the preferred connection methods.
- Gold wire must be used for connections.
- Use the die label (XX-YY) for correct orientation.

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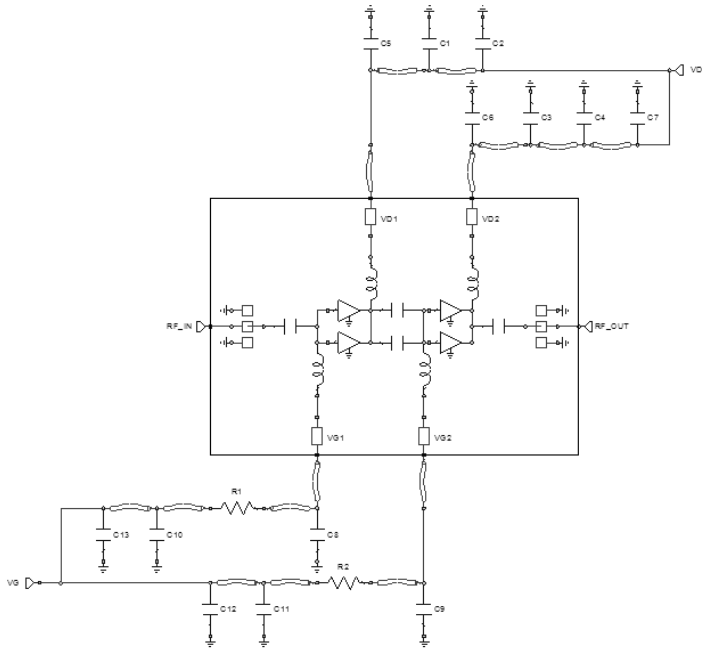
Block Diagram Showing Additional Capacitors & Output Matching Section for Operation Over 2.7 to 3.5 GHz



Designator	Description	Quantity
C1, C4, C10, C11	CAP, 470pF, 100V, 0603	4
C2, C3	CAP, 100pF, 100V, 0603	2
C5, C6, C8, C9	CAP, 10pF, 100V, 0402	4
C7	CAP, 33uF, 50V, ELECT, MVY, SMD	1
C12, C13	CAP, 10uF, 16V, TANTALUM, SMD	1
R1,R2	RES, 100Ohm, 1/16W, 0603	2
Q1	CMPA2735030D	1

Notes:

[1] The input, output and decoupling capacitors should be attached as close as possible to the die- typical distance is 40 to 50 mils.

[2] The MMIC die and capacitors should be connected with 1 mil gold bond wires.

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Typical Performance

Figure 1. - Gain and Input Return Loss vs Frequency of CMPA2735030D
V_{DD} = 50 V, I_{DQ} = 0.135 A

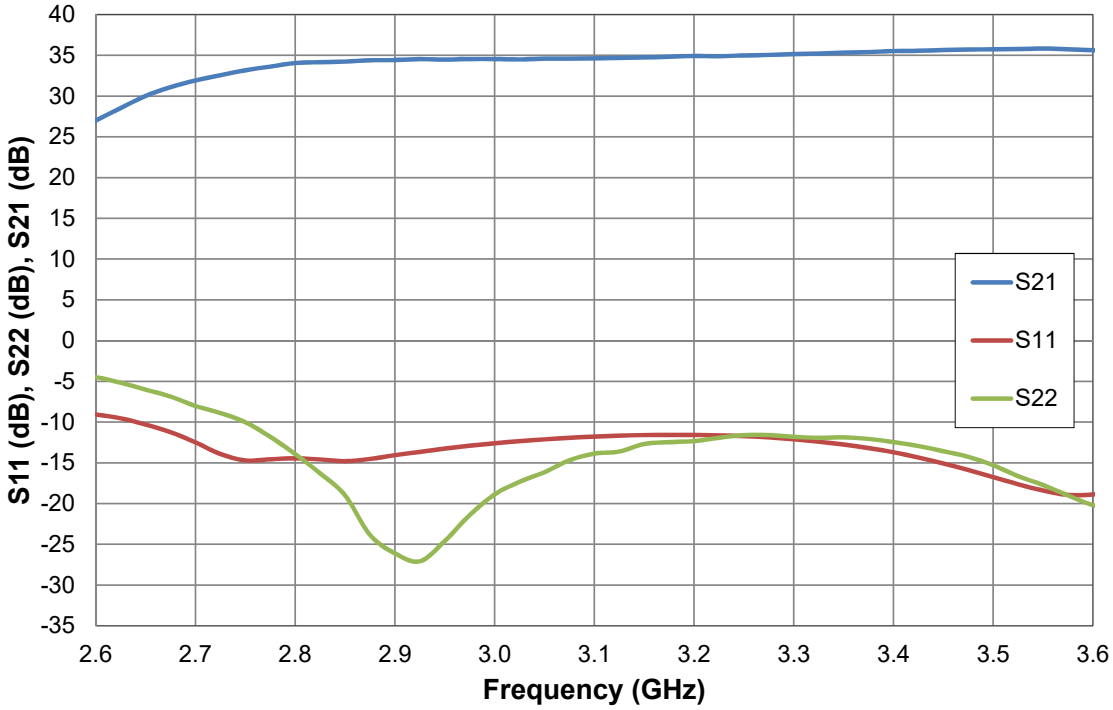
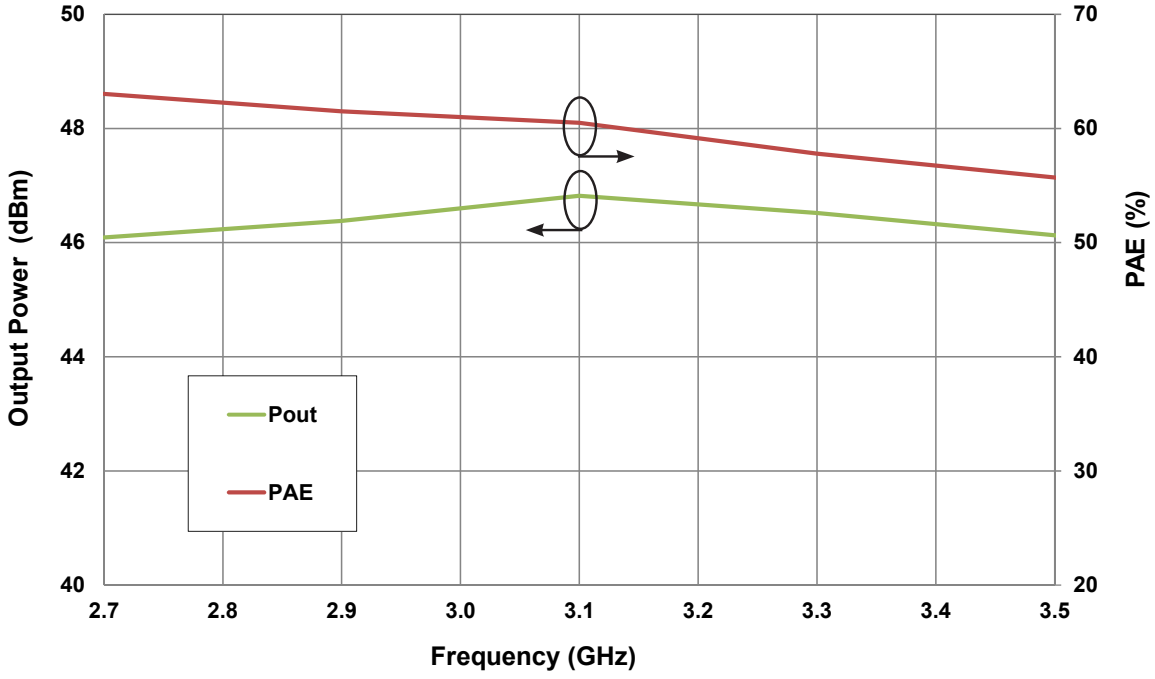


Figure 2. - Output Power and PAE vs Frequency of CMPA2735030D
V_{DD} = 50 V, I_{DQ} = 0.135 A, Pulse Width 500 us, Duty Cycle = 10%, P_{IN} =18 dBm



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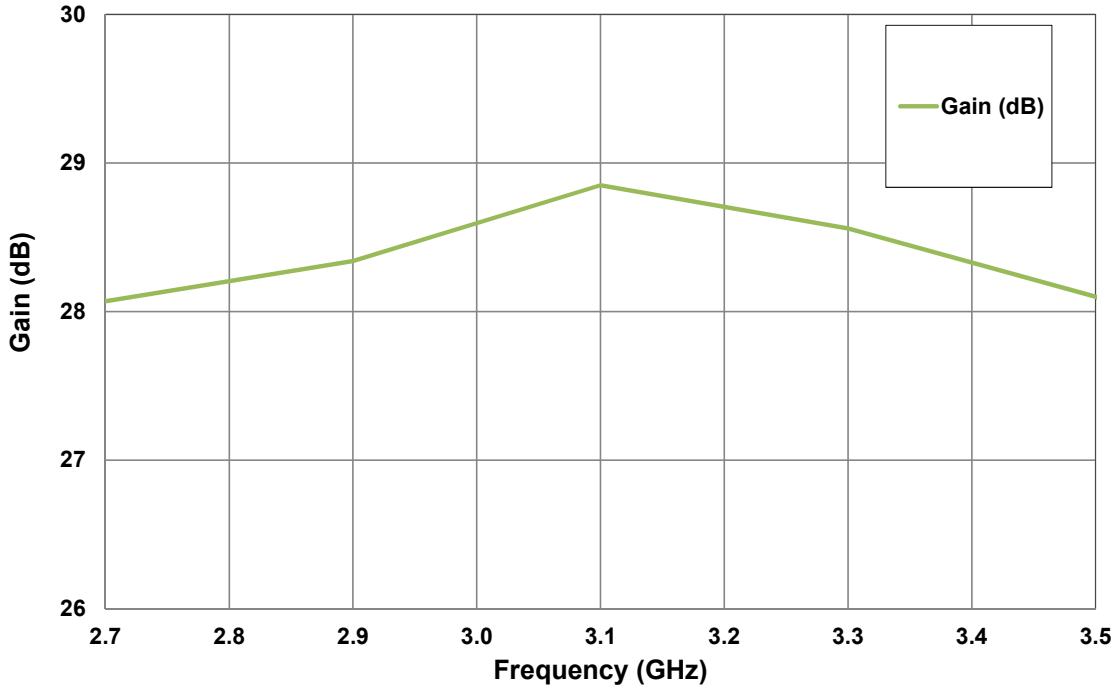
Typical Performance

Figure 3. - Associated Gain vs Frequency of CMPA2735030D
V_{DD} = 50 V, I_{DQ} = 0.135 A, Pulse Width 500 us, Duty Cycle = 10%, P_{IN} =18 dBm



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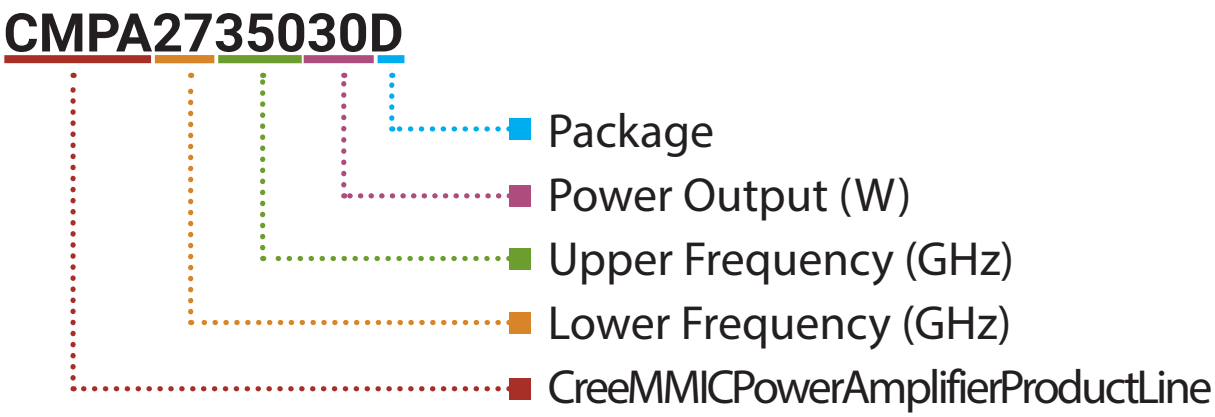
Part Number System



Parameter	Value	Units
Lower Frequency	2.7	GHz
Upper Frequency	3.5	GHz
Power Output	30	W
Package	Bare Die	-

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.

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Product Ordering Information

Order Number	Description	Unit of Measure
CMPA2735030D	GaN MMIC	Each

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