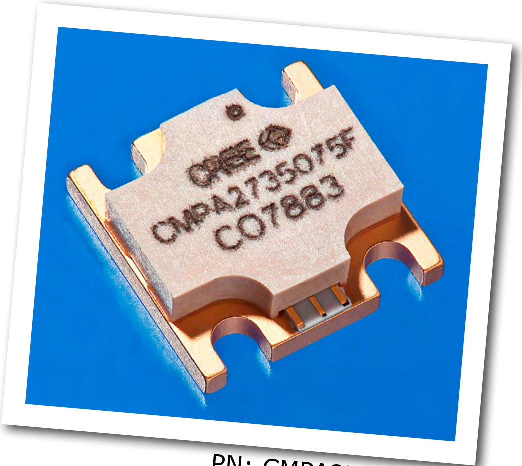
CMPA2735075F

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˚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[1]: 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

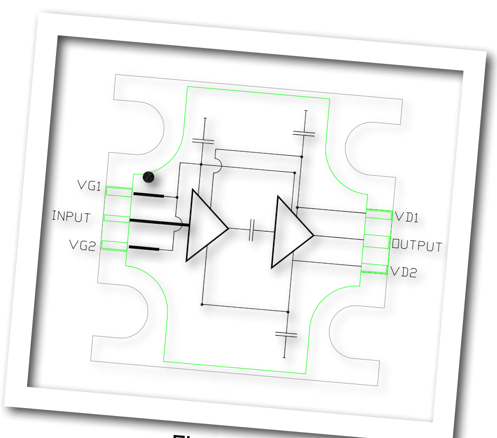


Figure 1.

Rev 1.1 – April 2012

Absolute Maximum Ratings (not simultaneous) at 25˚C

Parameter	Symbol	Rating	Units
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	28	mA
Screw Torque	T	40	in-oz
Thermal Resistance, Junction to Case (packaged)[1]	$R_{\theta JC}$	2.5	˚C/W

Electrical Characteristics (Frequency = 2.9 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 = 28 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.7	–	V_{DC}	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 2.9 GHz
Saturated Drain Current[1]	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
RF Characteristics[2,3]						
Small Signal Gain$_1$	S21	–	29	–	dB	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 2.9 GHz
Small Signal Gain$_2$	S21	26.5	29	–	dB	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 3.1 GHz
Small Signal Gain$_3$	S21	26	27	–	dB	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 3.5 GHz
Power Output$_1$	P_{OUT}	–	76	–	W	V_{DD} = 28 V, I_{DQ} = 700 mA, P_{IN} = 28 dBm, Freq = 2.9 GHz
Power Output$_2$	P_{OUT}	66	82	–	W	V_{DD} = 28 V, I_{DQ} = 700 mA, P_{IN} = 28 dBm, Freq = 3.1 GHz
Power Output$_3$	P_{OUT}	66	85	–	W	V_{DD} = 28 V, I_{DQ} = 700 mA, P_{IN} = 28 dBm, Freq = 3.5 GHz
Power Added Efficiency$_1$	PAE	–	54	–	%	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 2.9 GHz
Power Added Efficiency$_2$	PAE	45	54	–	%	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 3.1 GHz
Power Added Efficiency$_3$	PAE	45	53	–	%	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 3.5 GHz
Power Gain$_1$	G_P	–	23	–	dB	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 2.9 GHz
Power Gain$_2$	G_P	20	21	–	dB	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 3.1 GHz
Power Gain$_3$	G_P	20	21	–	dB	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 3.5 GHz
Input Return Loss$_1$	S11	–	-11	-8	dB	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 3.1 GHz
Input Return Loss$_2$	S11	–	-16	-10	dB	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 3.5 GHz
Output Return Loss$_1$	S22	–	-9	–4	dB	V_{DD} = 28 V, I_{DQ} = 700 mA, Freq = 3.1 GHz
Output Return Loss$_2$	S22	–	-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} = 28V, I_{DQ} = 700mA, P_{OUT} = 75W CW

Notes:
[1] Scaled from PCM data.
[2] All data pulse tested in CMPA2735075F-TB.
[3] Pulse Width = 300 μS, Duty Cycle = 20%.

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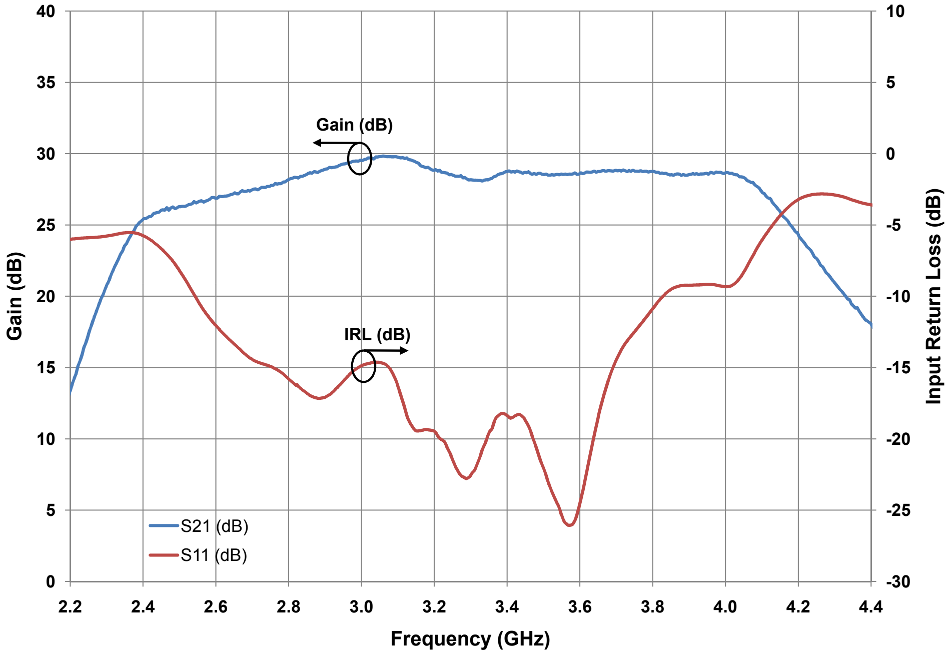
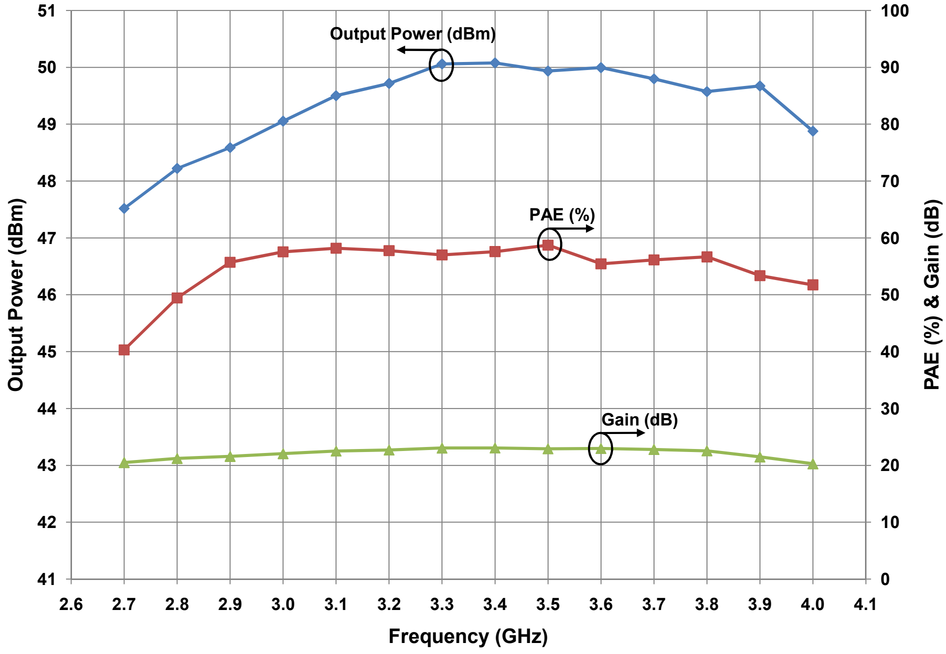
Typical Performance of the CMPA2735075F

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



Output Power, Gain and PAE vs Frequency of the CMPA2735075F Measured in CMPA2735075F-TB Amplifier Circuit. V_{DS} = 28 V, I_{DS} = 700 mA, Pulse Width = 300 μS, Duty Cycle = 20%



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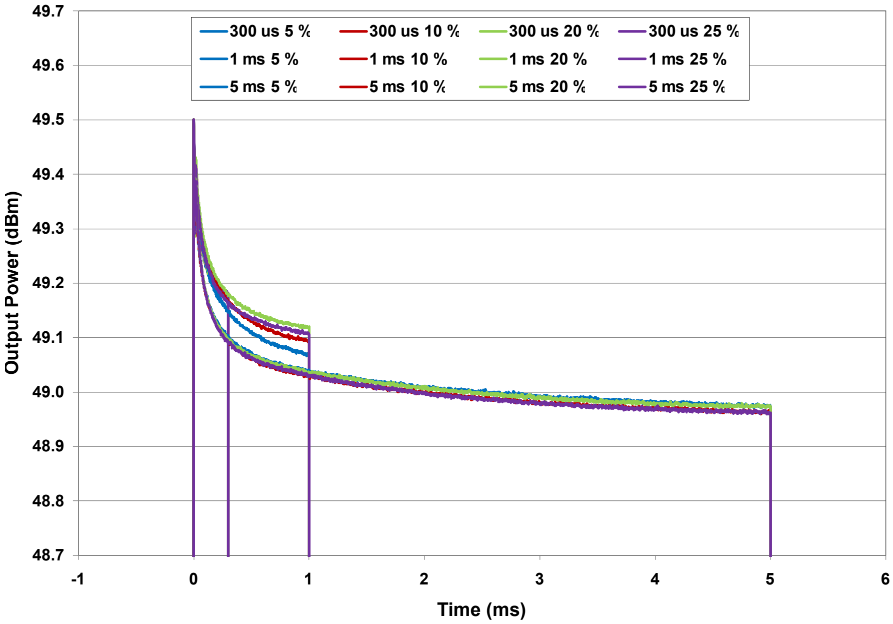
Typical Pulse Droop Performance



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

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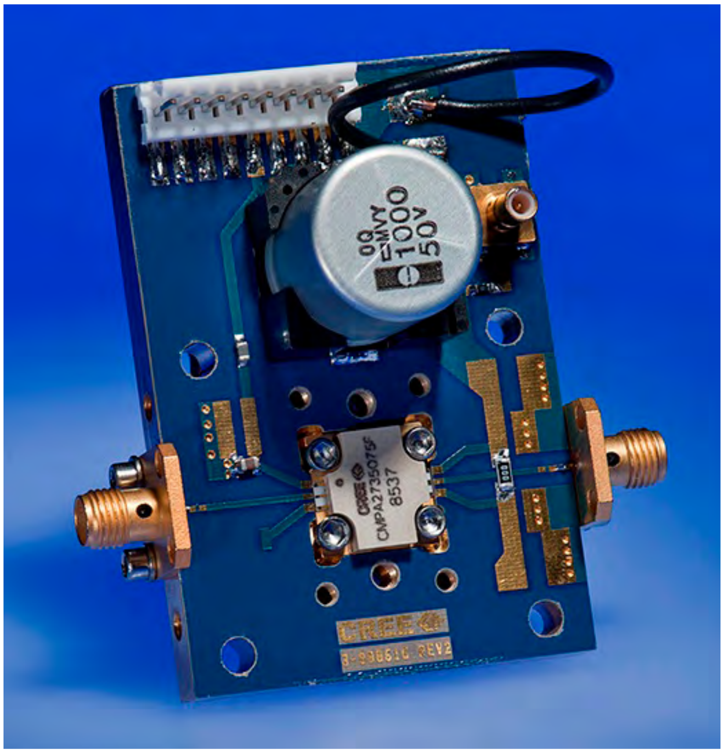
CMPA2735075F-TB Demonstration Amplifier Circuit Bill of Materials

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

[1] The CMPA2735075F is connected to the PCB with 2.0 mil Au bond wires.

CMPA2735075F-TB Demonstration Amplifier Circuit



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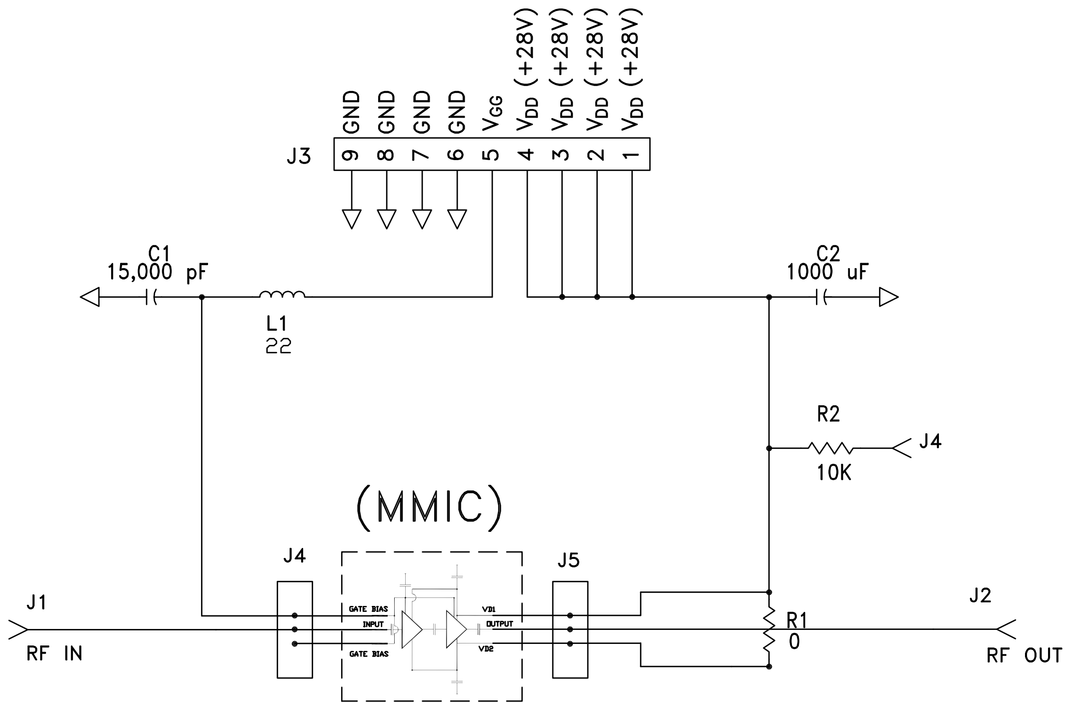
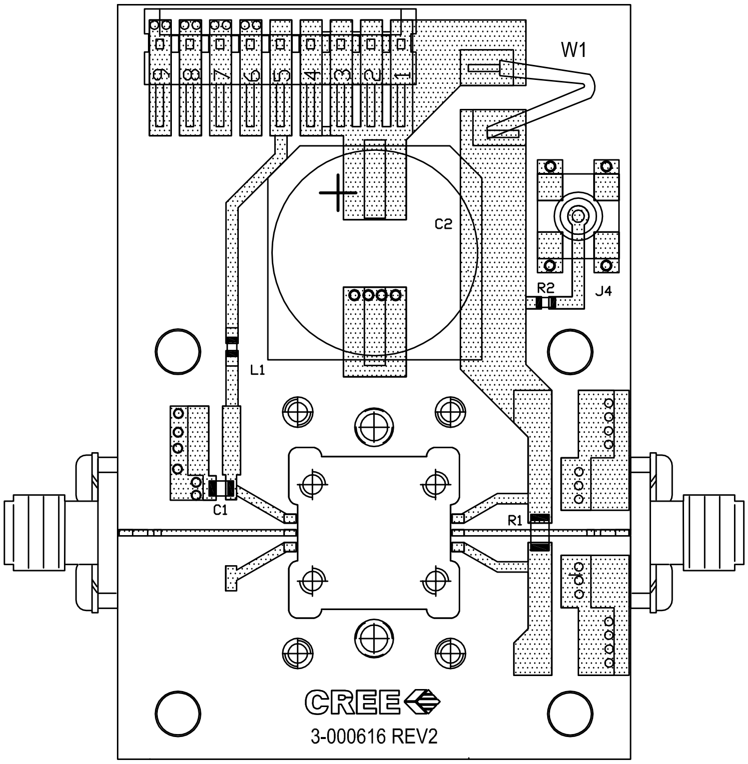
CMPA2735075F-TB Demonstration Amplifier Circuit Schematic



CMPA2735075F-TB Demonstration Amplifier Circuit Outline



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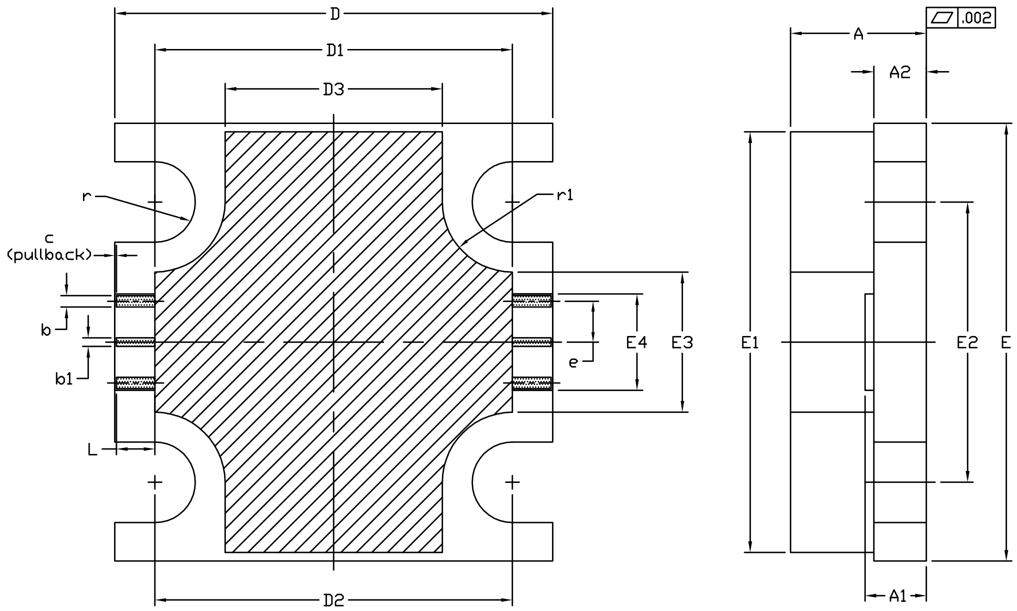
Product Dimensions CMPA2735075F (Package Type — 780019)



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	0.013		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

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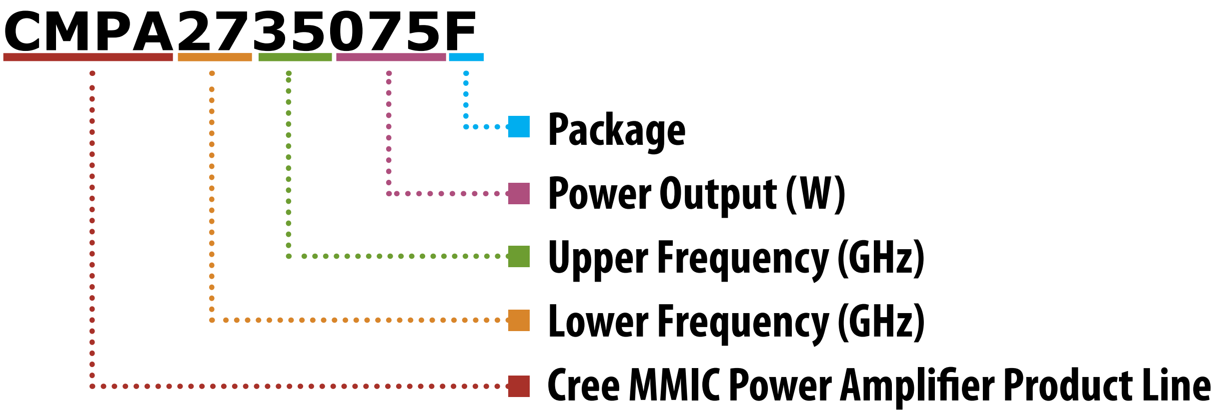
Part Number System



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.

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