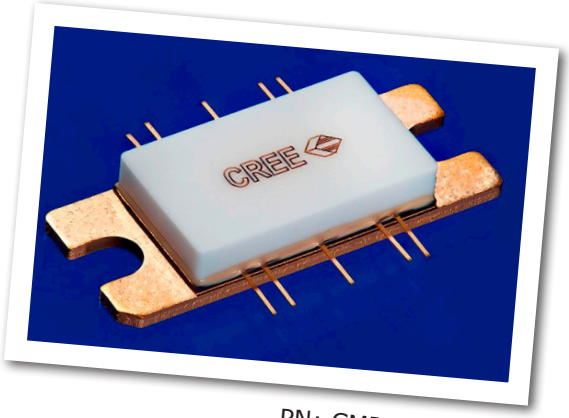
CMPA5585025F

25 W, 5.5 - 8.5 GHz, GaN MMIC, Power Amplifier



PN: CMPA5585025F
Package Type: 440208

Cree's CMPA5585025F 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 is available in a 10 lead metal/ceramic flanged package for optimal electrical and thermal performance.

Typical Performance Over 5.8-8.4 GHz (T_c = 25°C)

Parameter	5.8 GHz	6.4 GHz	7.2 GHz	7.9 GHz	8.4 GHz	Units
Small Signal Gain	29.5	24.0	24.0	24.0	22.0	dB
Output Power[1]	15	23	20	19	19	W
Power Gain[1]	22.5	20.0	18.5	17.5	20.0	dB
Power Added Efficiency[1]	30	35	30	25	30	%

Note[1]: Measured in the CMPA5585025F-TB under OQPSK modulation, 1.6 Msps, PN23, Alpha Filter = 0.2.

Features

- 25 dB Small Signal Gain
- 35 W Typical P_{SAT}
- Operation up to 28 V
- High Breakdown Voltage
- High Temperature Operation
- Size 0.142 x 0.188 x 0.004 inches

Applications

- Point to Point Radio
- Communications
- Satellite Communication Uplink

Rev 0.1 – May 2011

Absolute Maximum Ratings (not simultaneous) at 25˚C

Parameter	Symbol	Rating	Units
Drain-source Voltage	V_{DSS}	84	V_{DC}
Gate-source Voltage	V_{GS}	-10, +2	V_{DC}
Power Dissipation	P_{DISS}	55	W
Storage Temperature	T_{STG}	-65, +150	˚C
Operating Junction Temperature	T_J	225	˚C
Maximum Forward Gate Current	I_{GMAX}	10	mA
Soldering Temperature[1]	T_S	245	˚C
Screw Torque	τ	40	in-oz
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.0	˚C/W
Case Operating Temperature[2]	T_C	-40, +60	˚C

Note:
[1] Refer to the Application Note on soldering at www.cree.com/products/wireless_appnotes.asp
[2] Measured for the CMPA5585025F at P_{DISS} = 55 W

Electrical Characteristics (Frequency = 5.5 GHz to 8.5 GHz unless otherwise stated; T_C = 25˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[1]						
Gate Threshold	V_{TH}	-3.8	-2.8	-2.3	V	V_{DS} = 10 V, I_D = 13.2 mA
Saturated Drain Current[2]	I_{DS}	10.6	12.8	–	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 = 13.2 mA
RF Characteristics[3]						
Small Signal Gain	S21	–	24	–	dB	V_{DD} = 28 V, I_{DQ} = 285 mA
Output Power[4,5,6]	P_{OUT}	–	20	–	W	V_{DD} = 28 V, I_{DQ} = 285 mA,
Power Added Efficiency[4,5,6]	PAE	–	30	–	%	V_{DD} = 28 V, I_{DQ} = 285 mA
Power Gain[4,5,6]	G_P	–	19	–	dB	V_{DD} = 28 V, I_{DQ} = 285 mA
Input Return Loss	S11	–	10	–	dB	V_{DD} = 28 V, I_{DQ} = 285 mA
Output Return Loss	S22	–	6	–	dB	V_{DD} = 28 V, I_{DQ} = 285 mA
Output Mismatch Stress	VSWR	–	5:1	–	Ψ	No damage at all phase angles, V_{DD} = 28 V, I_{DQ} = 285 mA, P_{OUT} = 25W OQPSK

Notes:
[1] Measured on-wafer prior to packaging.
[2] Scaled from PCM data.
[3] Measured in the CMPA5585025F-TB.
[4] Under OQPSK modulated signal, 1.6 Msps, PN23, Alpha Filter = 0.2.
[5] Fixture loss de-embedded.
[6] Measured at -30 dBc, 1.6 MHz from carrier.

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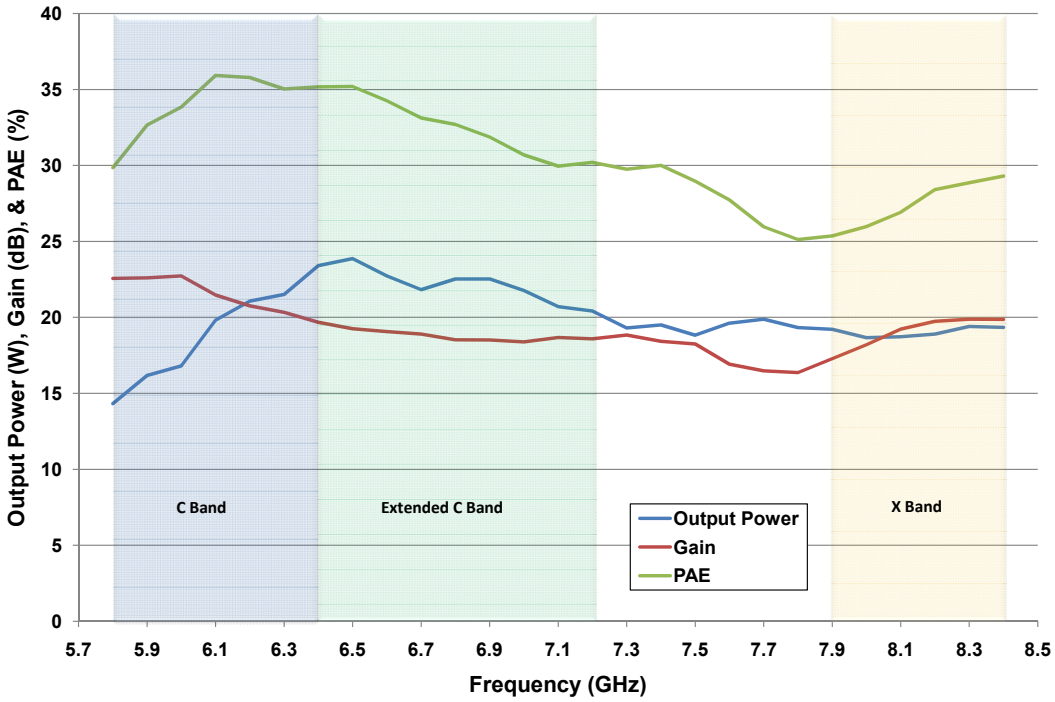
Typical Performance of the CMPA5585025F

Figure 1. CMPA5585025F Linear Output Power, Gain and PAE at -30 dBc, 1.6 MHz from carrier
V_{DD} = 28 V, I_{DQ} = 285 mA, 1.6 Msps OQPSK Modulation



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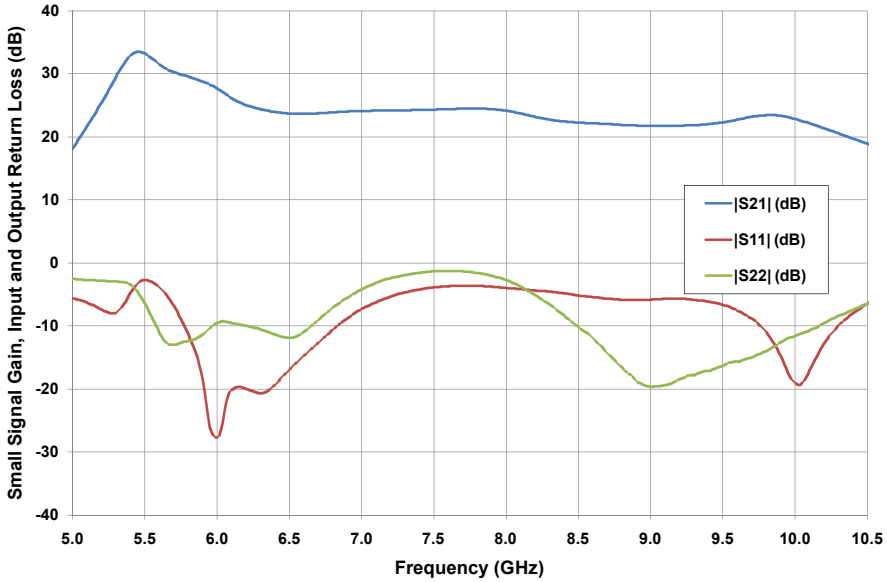
Typical Performance

Figure 2. Typical Small Signal Gain and Return Loss vs Frequency of the CMPA5585025F measured in CMPA5585025F-TB Amplifier Circuit. V_{DS} = 28 V, I_{DS} = 285 mA



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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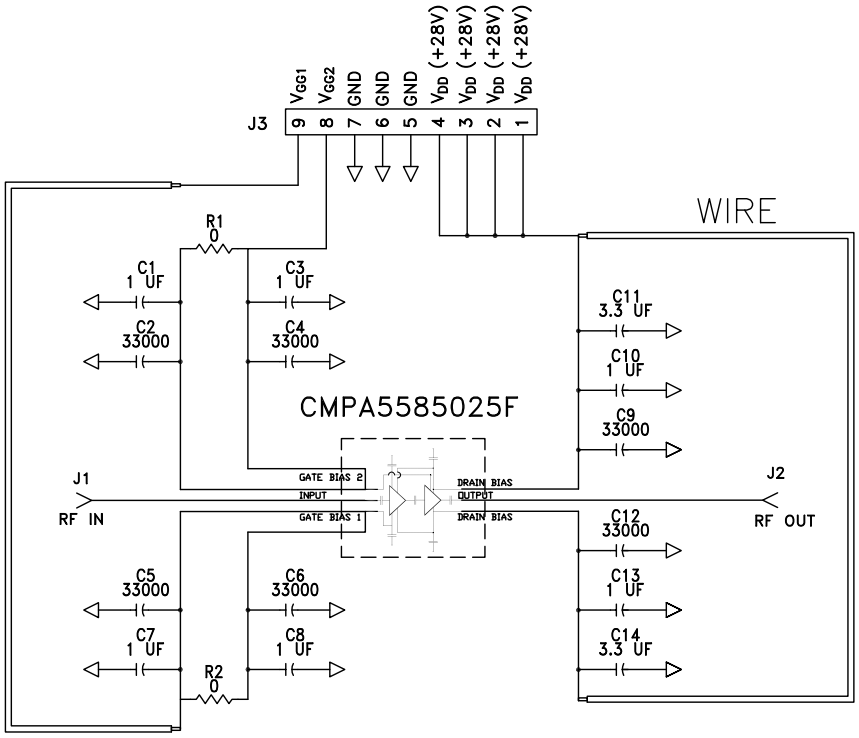
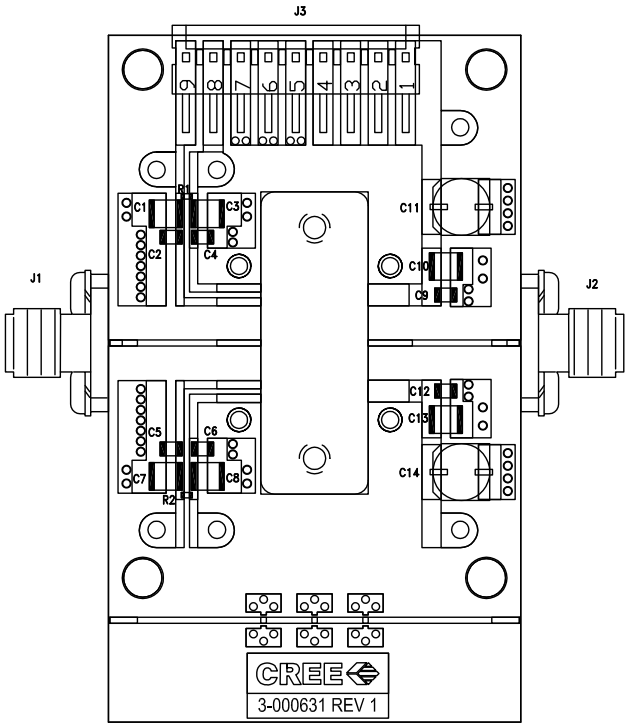
CMPA5585025F-TB Demonstration Amplifier Circuit



CMPA5585025F-TB Demonstration Amplifier Circuit Outline



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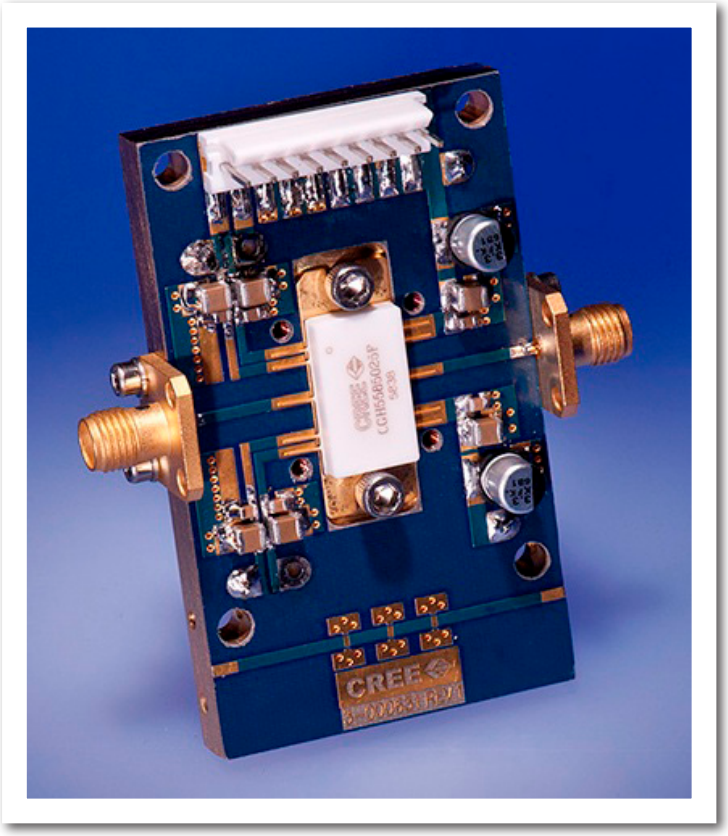
CMPA5585025F-TB Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
C1, C3, C7, C8, C10, C13	CAP, 1.0 uF, +/-10%, 1210, 100V, X7R	6
C2, C4, C5, C6, C9, C12	CAP, 33000 pF, 0805, 100V, X7R	6
C11, C14	CAP ELECT 3.3UF 80V FK SMD	2
R1, R2	RES 0.0 OHM 1/16W 0402 SMD	2
J1,J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20MIL	2
J3	CONNECTOR, HEADER, RT>PLZ .1CEN LK 9POS	1
-	PCB, TACONIC, RF-35-0200-CH/CH	1
Q1	CMPA5585025F	1

CMPA5585025F-TB Demonstration Amplifier Circuit



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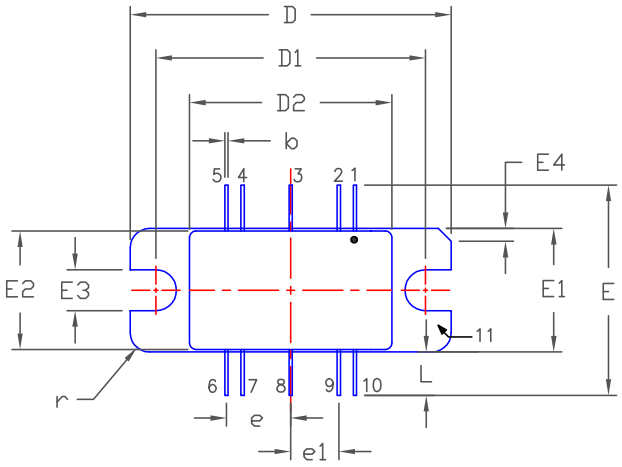
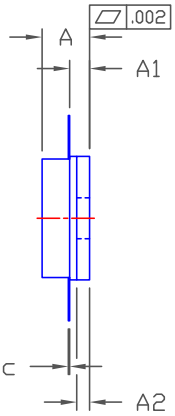
Product Dimensions CMPA5585025F (Package Type — 440208)





PIN 1. GATE BIAS
2. GATE BIAS
3. RF INPUT
4. GATE BIAS
5. GATE BIAS
6. DRAIN BIAS
7. DRAIN BIAS
8. RF OUTPUT
9. DRAIN BIAS
10. DRAIN BIAS
11. SOURCE

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M – 1994.

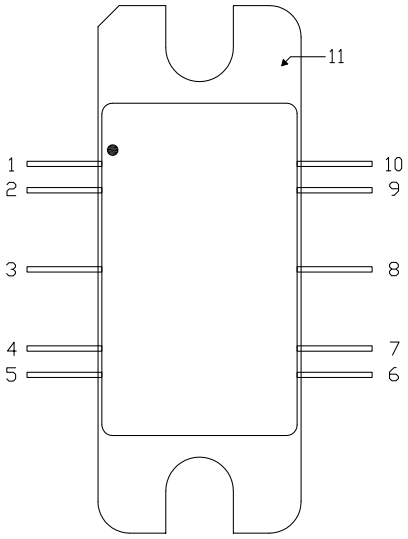
2. CONTROLLING DIMENSION: INCH.

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

4. LID MAY BE MISALIGNED TO THE BODY OF PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.

	INCHES		MILLIMETERS		NOTES
DIM	MIN	MAX	MIN	MAX	
A	0.138	0.158	3.51	4.01	
A1	0.057	0.067	1.45	1.70	
A2	0.035	0.045	0.89	1.14	
b	0.01 TYP		0.254 TYP		10x
c	0.003	0.006	0.08	0.15	
D	0.995	1.005	25.27	25.53	
D1	0.835	0.845	21.21	21.46	
D2	0.623	0.637	15.82	16.18	
E	0.654 TYP		16.61 TYP		
E1	0.380	0.390	9.65	9.91	
E2	0.365	0.375	9.72	9.53	
E3	0.123	0.133	3.12	3.38	
E4	0.035	0.045	0.89	1.14	
e	0.200 TYP		5.08 TYP		4x
e1	0.150 TYP		3.81 TYP		4x
L	0.115	0.155	2.92	3.94	10x
r	0.06 TYP		1.52 TYP		4x

Pin Number	Qty
1	Gate Bias for Stage 2
2	Gate Bias for Stage 2
3	RF In
4	Gate Bias for Stage 1
5	Gate Bias for Stage 1
6	Drain Bias
7	Drain Bias
8	RF Out
9	Drain Bias
10	Drain Bias
11	Source



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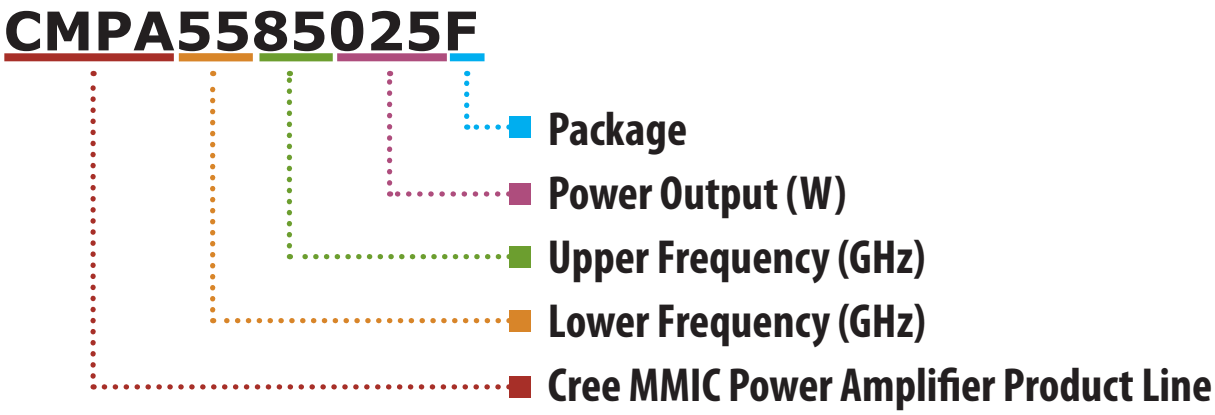
Part Number System



Parameter	Value	Units
Lower Frequency	5.5	GHz
Upper Frequency[1]	8.5	GHz
Power Output	25	W
Package	Flange	-

Table 1.

Note[1]: 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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