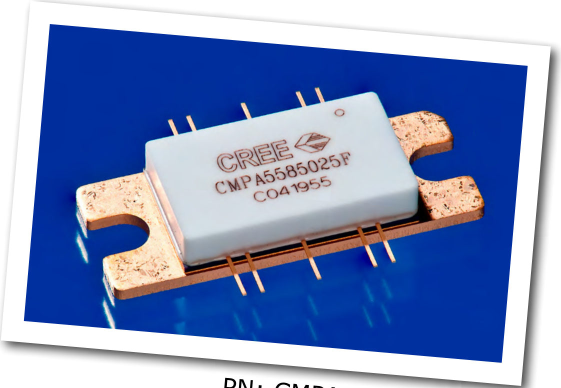
CMPA5585025F

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

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.



PN: CMPA5585025F
Package Type: 440208

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 at -30 dBc, 1.6 MHz from carrier, 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 1.00 x 0.385 inches

Applications

- Point to Point Radio
- Communications
- Satellite Communication Uplink

Rev 1.6 – July 2012

Absolute Maximum Ratings (not simultaneous)

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	V_{DSS}	84	V_{DC}	25˚C
Gate-source Voltage	V_{GS}	-10, +2	V_{DC}	25˚C
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	25˚C
Soldering Temperature[1]	T_S	245	˚C	
Screw Torque	τ	40	in-oz	
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.55	˚C/W	OQPSK, 85˚C, P_{DISS} = 55 W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.80	˚C/W	CW, 85˚C, P_{DISS} = 77 W
Case Operating Temperature	T_C	-40, +140	˚C	P_{DISS} = 55 W
Case Operating Temperature	T_C	-40, +85	˚C	P_{DISS} = 77 W

Note:
[1] Refer to the Application Note on soldering at www.cree.com/products/wireless_appnotes.asp

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 Voltage	$V_{GS(TH)}$	-3.8	-3.0	-2.3	V	V_{DS} = 10 V, I_D = 13.2 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.7	–	V_{DC}	V_{DS} = 28 V, I_D = 285 A
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	18.25	24	–	dB	V_{DD} = 28 V, I_{DQ} = 285 mA, P_{IN} = -20 dBm
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.

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Electrical Characteristics Continued... (T_C = 25˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
RF Characteristics[1,2,3,4]						
Power Added Efficiency	PAE1	20.0	24.5	–	%	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 5.8 GHz
Power Added Efficiency	PAE2	17.0	21.0	–	%	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 7.2 GHz
Power Added Efficiency	PAE3	16.0	19.0	–	%	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 7.9 GHz
Power Added Efficiency	PAE4	17.5	21.5	–	%	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 8.4 GHz
Power Gain	G_{P1}	19.5	23.0	–	dB	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 5.8 GHz
Power Gain	G_{P2}	17.1	19.0	–	dB	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 7.2 GHz
Power Gain	G_{P3}	17.3	19.5	–	dB	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 7.9 GHz
Power Gain	G_{P4}	18.5	21.5	–	dB	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 8.4 GHz
OQPSK Linearity	ACLR1	–	-34.5	−28.5	dB	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 5.8 GHz
OQPSK Linearity	ACLR2	–	-37.5	−30.0	dB	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 7.2 GHz
OQPSK Linearity	ACLR3	–	-31.0	−26.0	dB	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 7.9 GHz
OQPSK Linearity	ACLR4	–	-38.5	−32.5	dB	V_{DD} = 28 V, I_{DQ} = 285 mA, Frequency = 8.4 GHz

Notes:

[1] Measured in the CMPA5585025F-TB.

[2] Under OQPSK modulated signal, 1.6 Msps, PN23, Alpha Filter = 0.2.

[3] Measured at P_{AVE} = 40 dBm.

[4] Fixture loss de-embedded.

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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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

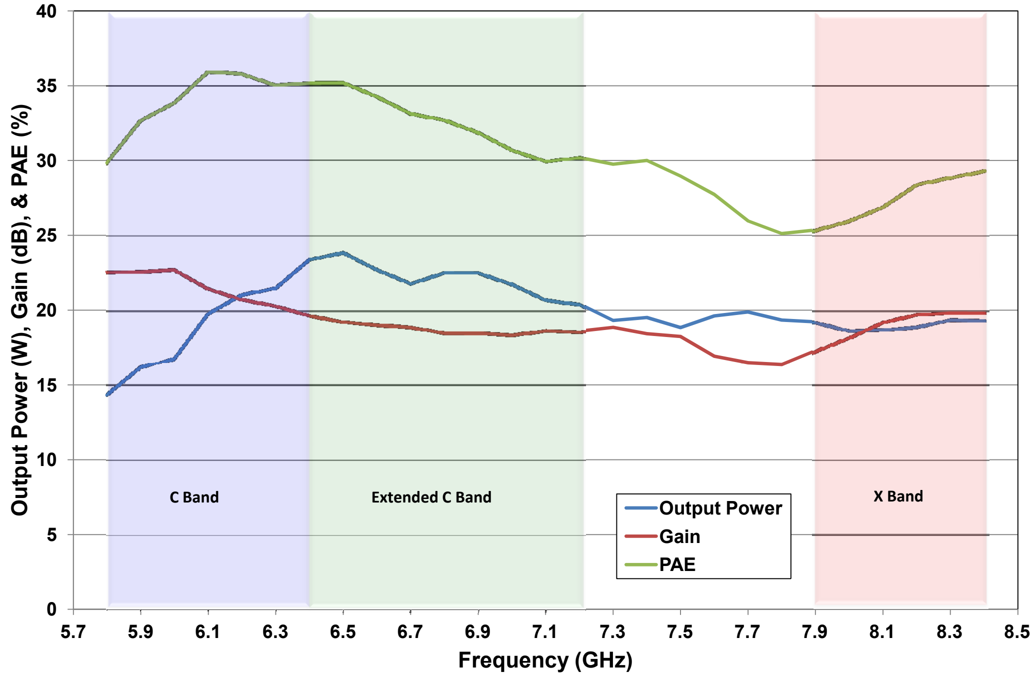

Figure 2. Typical Small Signal Gain and Return Loss vs Frequency of the CMPA5585025F measured in CMPA5585025F-TB Amplifier Circuit. V_{DS} = 28 V, I_{DS} = 285 mA

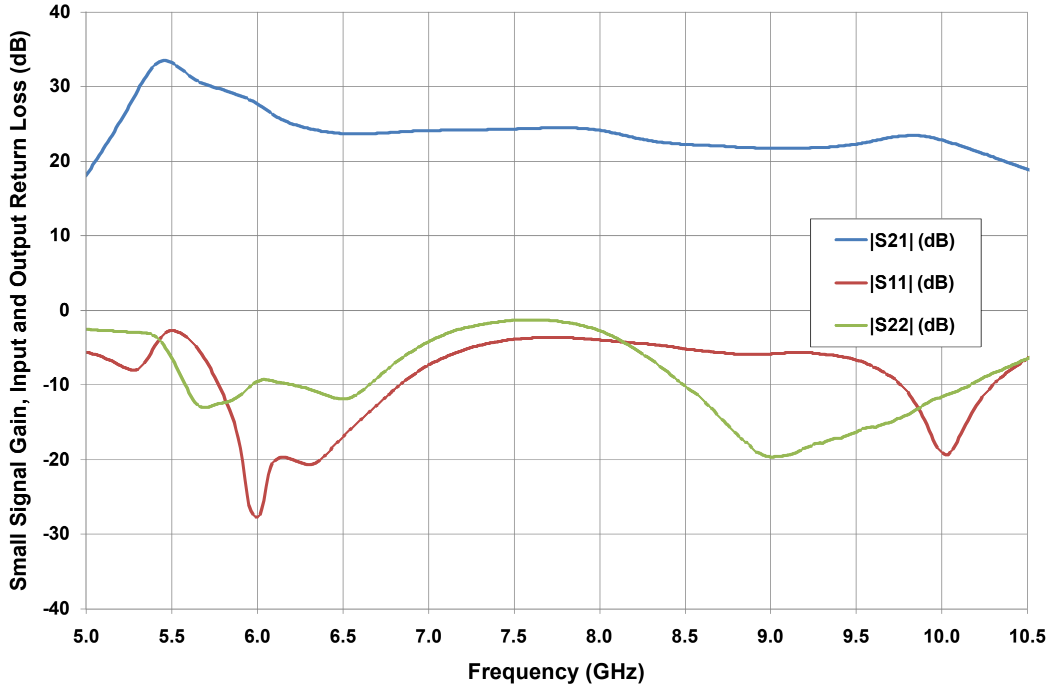

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Figure 3. CMPA5585025F C-band Spectral Mask at 15 W
PAE = 29.1% at 5.8 GHz, 28.5% at 6.4 GHz & 25.6% at 7.2 GHz

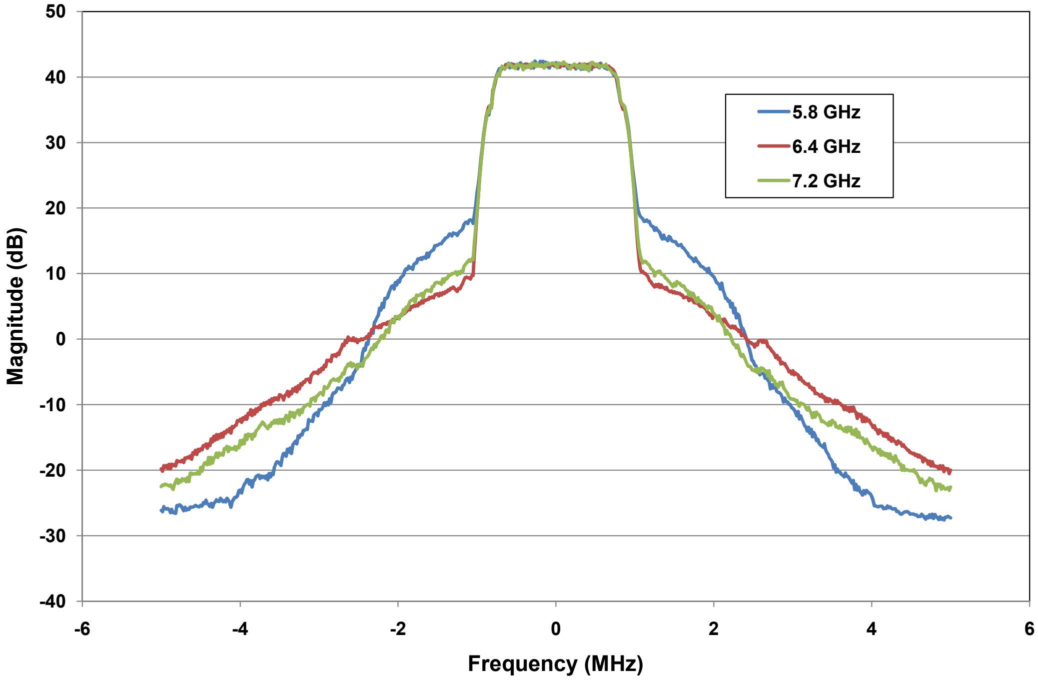

Figure 4. CMPA5585025F X-band Spectral Mask at 15 W
PAE = 25.6% at 7.9 GHz & 25.3% at 8.4 GHz

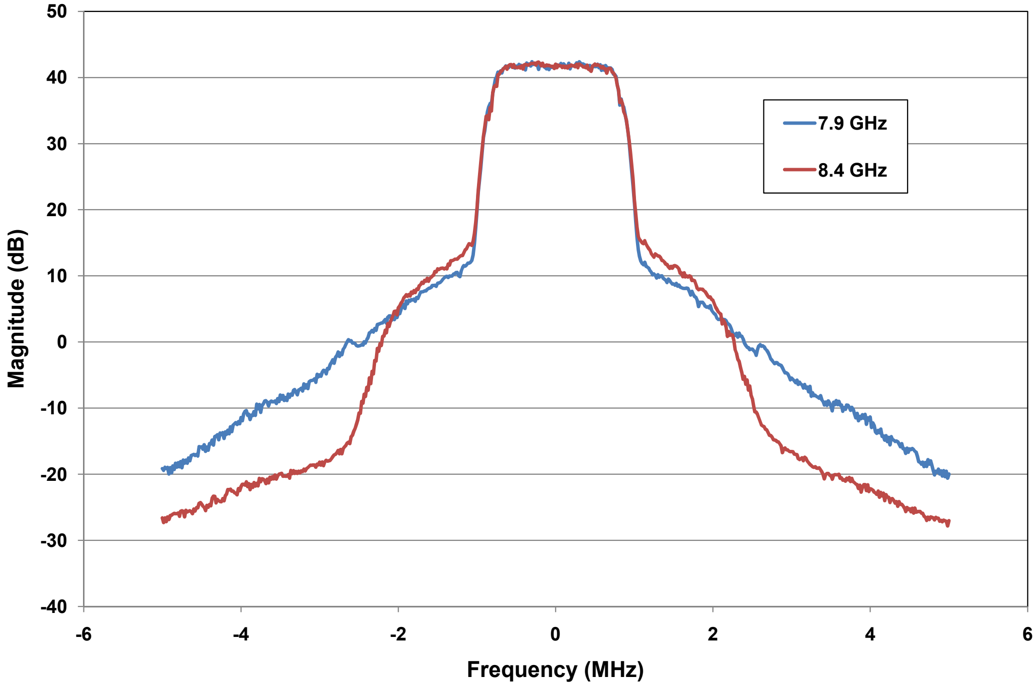

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Figure 5. CMPA5585025F C-band Linearity, Gain, and PAE vs Average Output Power V_{DS} = 28 V, I_{DS} = 285 mA, OQPSK, 1.6 Msps

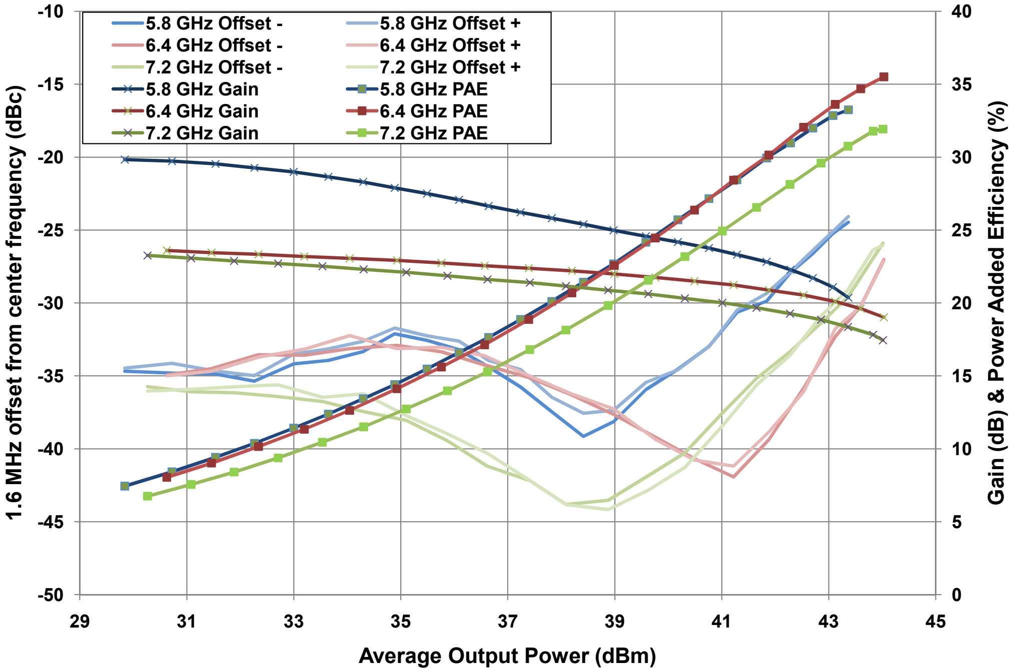

Figure 6. CMPA5585025F X-band Linearity, Gain, and PAE vs Average Output Power V_{DS} = 28 V, I_{DS} = 285 mA, OQPSK, 1.6 Msps

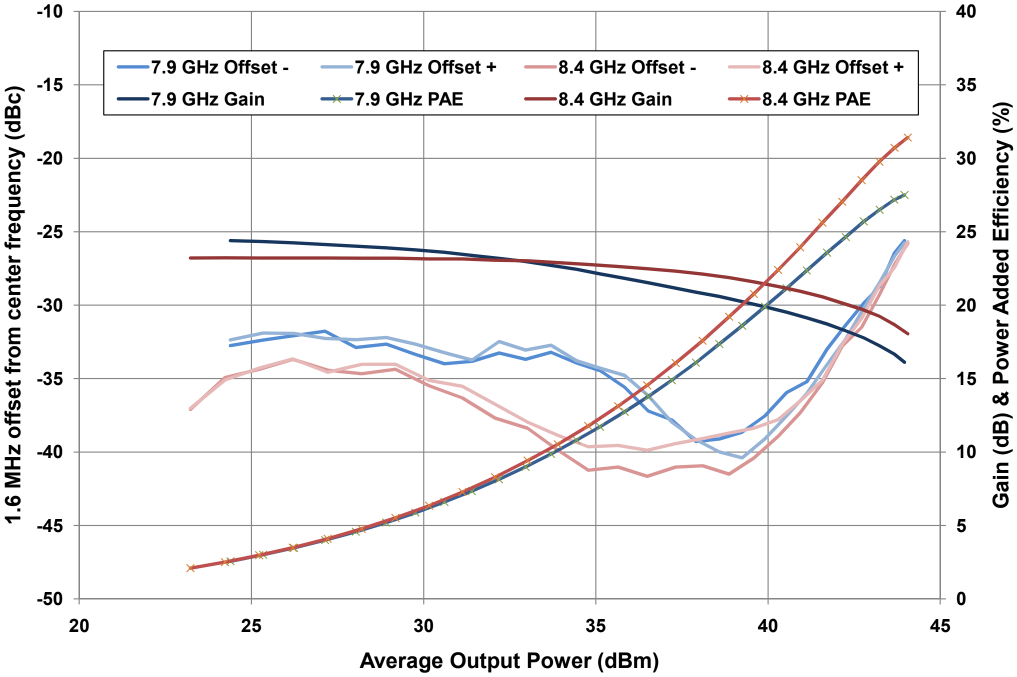

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Figure 7. CMPA5585025F EVM vs Average Output Power
V_{DS} = 28 V, I_{DS} = 285 mA, 1.6 Msps OQPSK Modulation

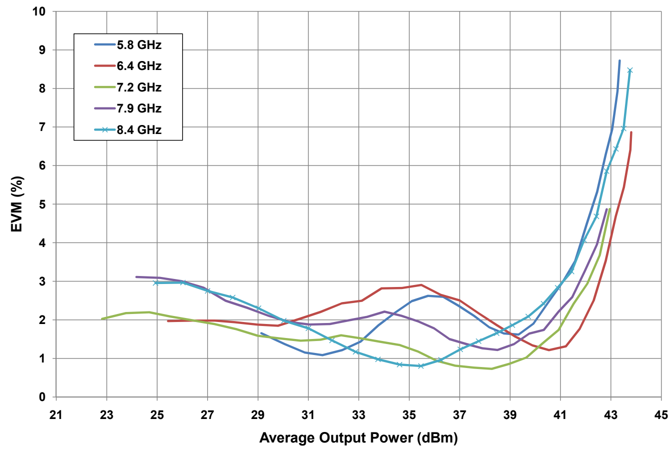


Figure 8. CMPA5585025F - Linearity vs Average Output Power
OQPSK, 1.6 Msps, I_{DS} = 285 mA

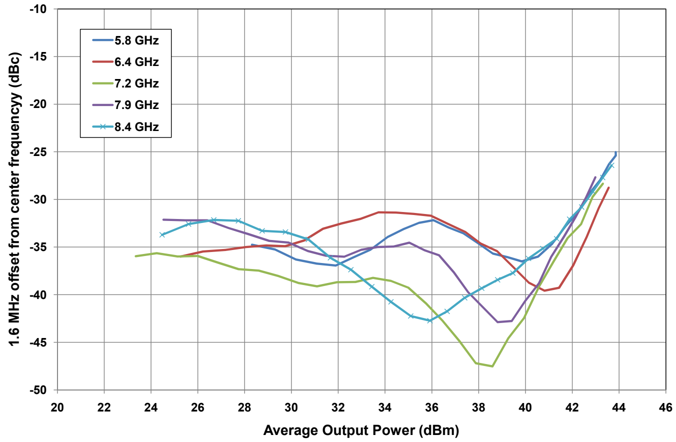
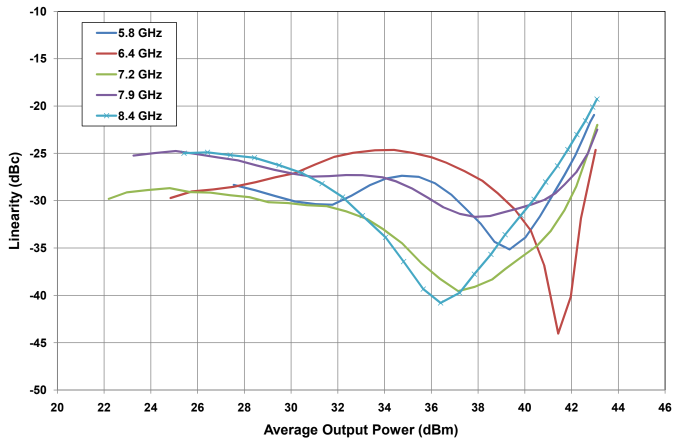


Figure 9. CMPA5585025F Linearity vs Average Output Power
V_{DS} = 28 V, I_{DS} = 285 mA, IM3 5 MHz spacing



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Typical Performance of the CMPA5585025F

Figure 10. CMPA5585025F - C-band Output Power, Gain and PAE vs Input Power
V_{DS} = 28 V, I_{DS} = 1.2 A, CW

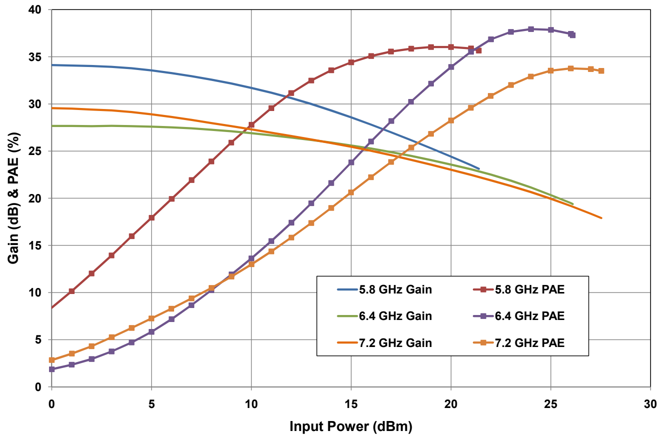


Figure 11. CMPA5585025F - X-band Output Power, Gain and PAE vs Input Power
V_{DS} = 28 V, I_{DS} = 1.2 A, CW

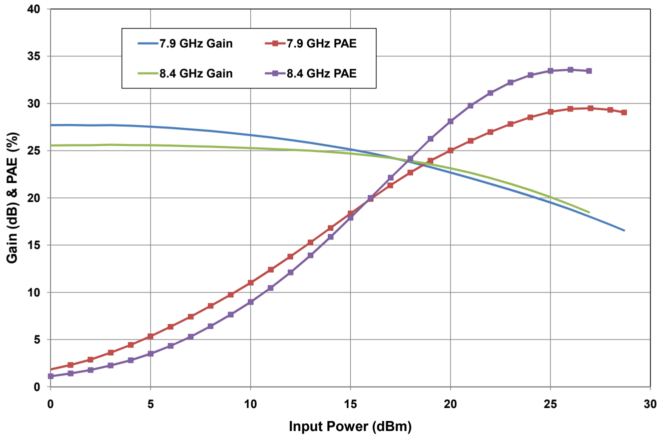
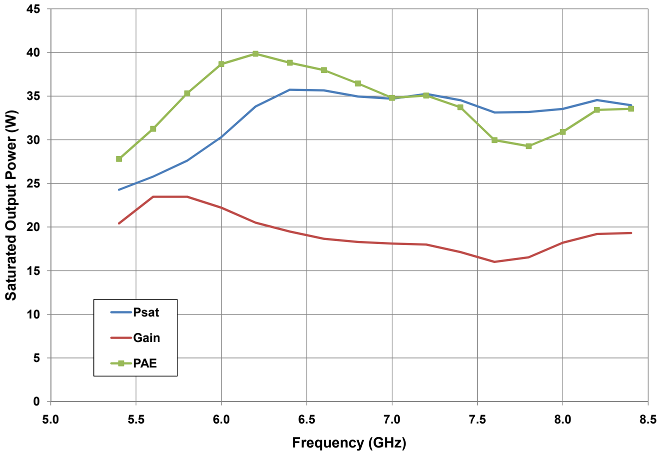


Figure 12. CMPA5585025F - Power, Gain and PAE vs Frequency
V_{DS} = 28 V, I_{DS} = 1.2 A, CW



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Typical Performance of the CMPA5585025F

Figure 13. CMPA5585025F - Typical Drain Current vs Average Output Power
V_{DS} = 28 V, I_{DS} = 285 mA, OQPSK, 1.6 Msps

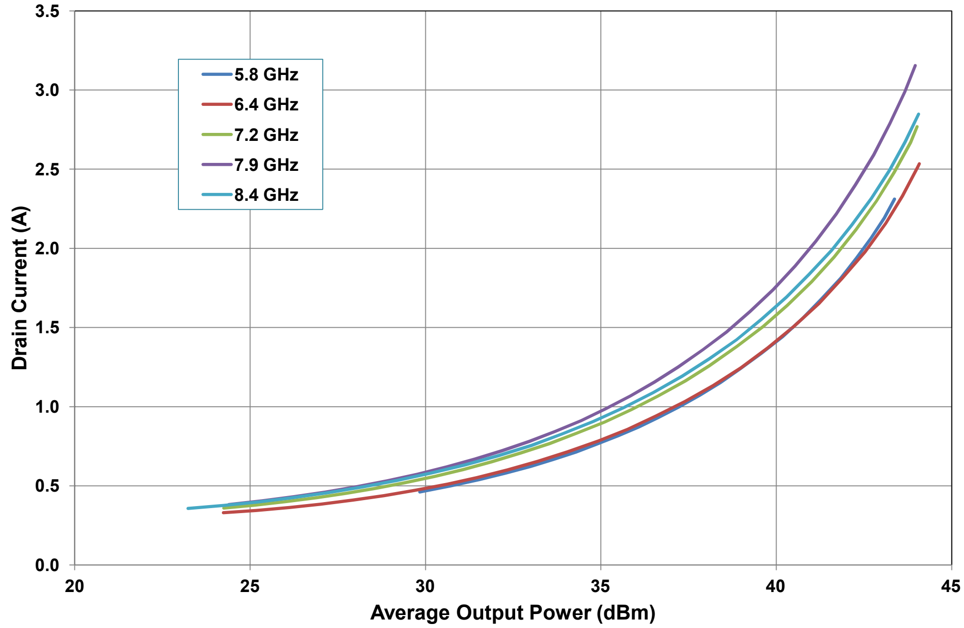
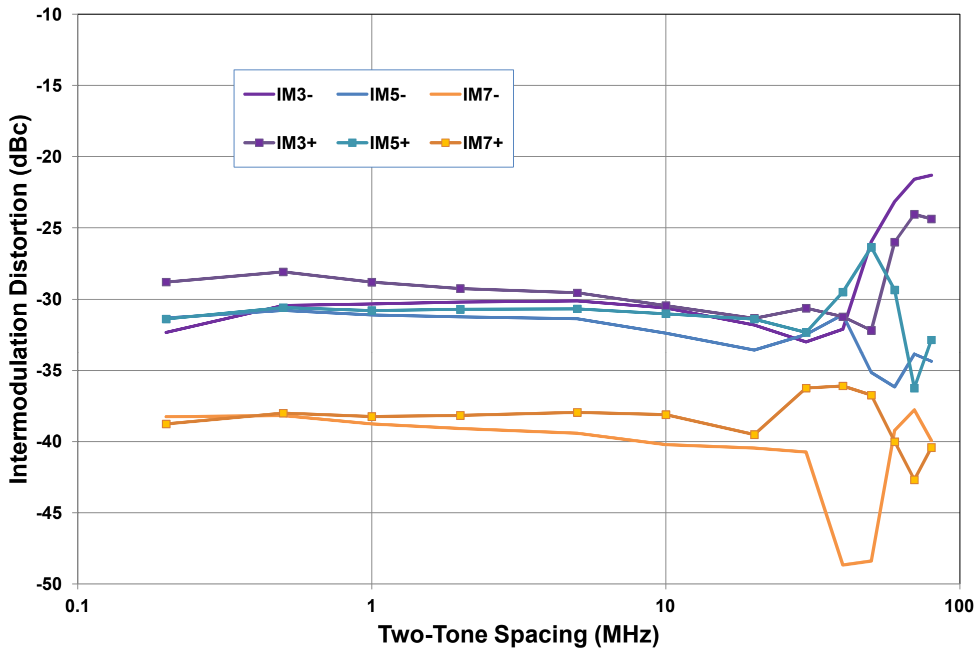


Figure 14. CMPA5585025F - Intermodulation Distortion Products vs Tone Spacing
V_{DS} = 28 V, I_{DS} = 285 mA, Center Freq = 7.9 GHz



Note: Divergence in IM5 and IM7 at tone spacings greater than 20 MHz is due to the bias components on the test fixture.

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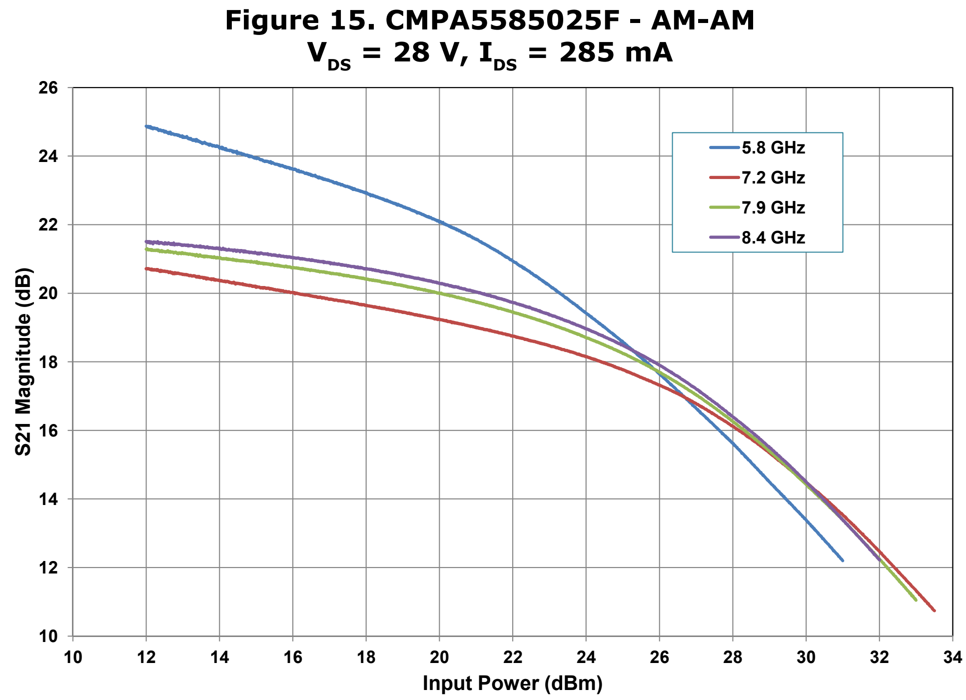
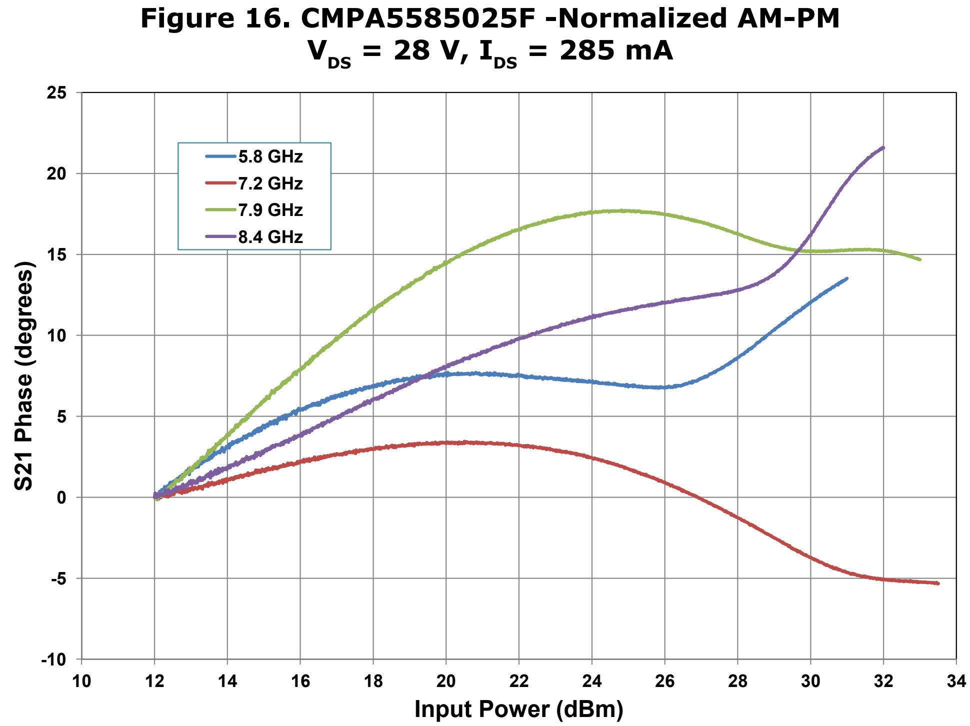
Typical Performance of the CMPA5585025F





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Typical Performance of the CMPA5585025F

Figure 17. CMPA5585025F EVM vs Average Output Power
V_{DS} = 28 V, I_{DS} = 285 mA, 256 QAM

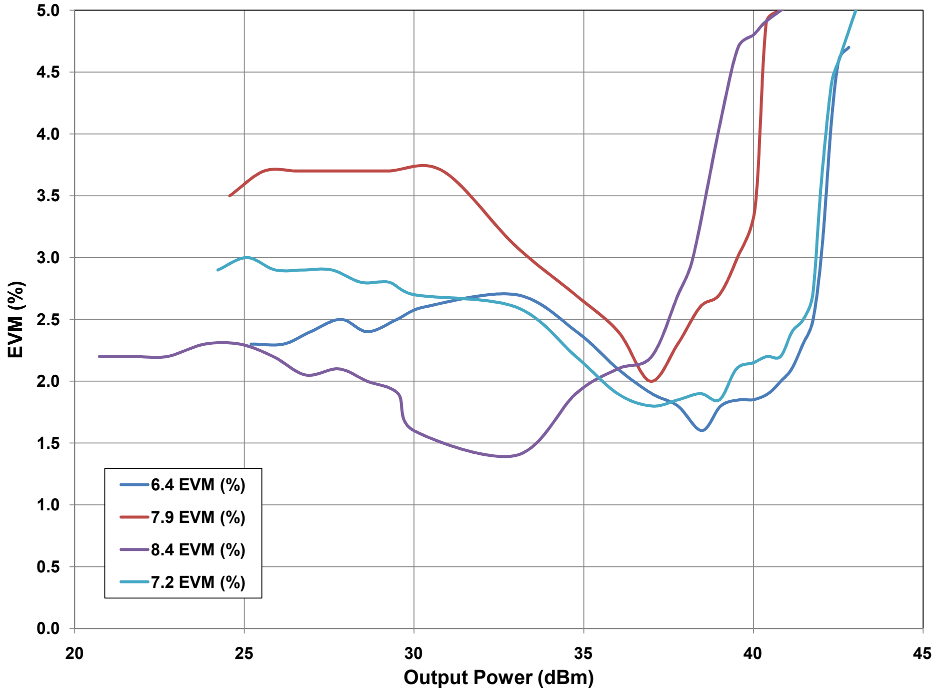
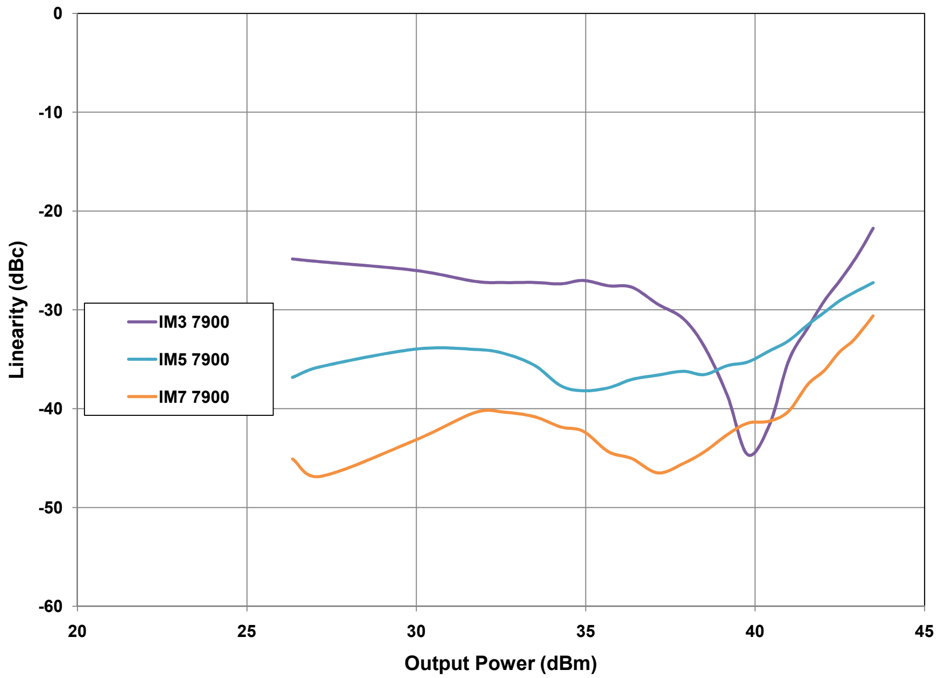


Figure 18. CMPA5585025F Linearity vs Average Output Power
V_{DS} = 28 V, I_{DS} = 285 mA, IM3, IM5, IM7, 5 MHz spacing



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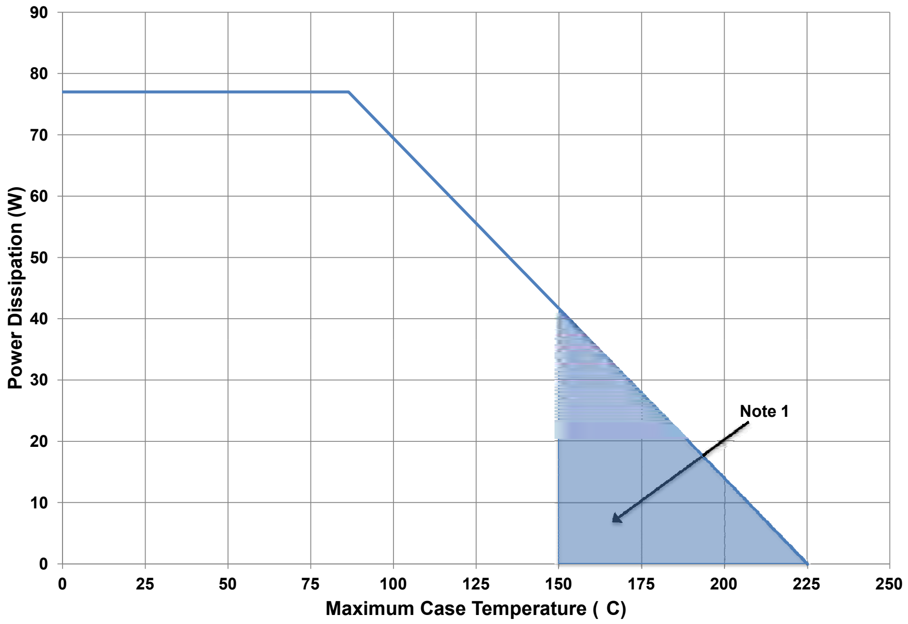
CMPA5585025F Power Dissipation De-rating Curve



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

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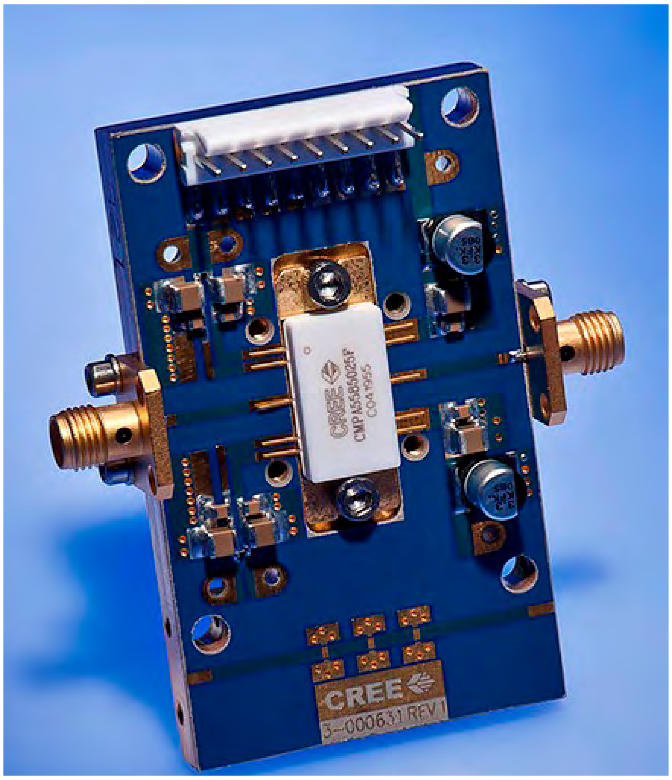
CMPA5585025F-TB Demonstration Amplifier Circuit Bill of Materials

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-35P-0200-CL1/CL1	1
Q1	CMPA5585025F	1

CMPA5585025F-TB Demonstration Amplifier Circuit



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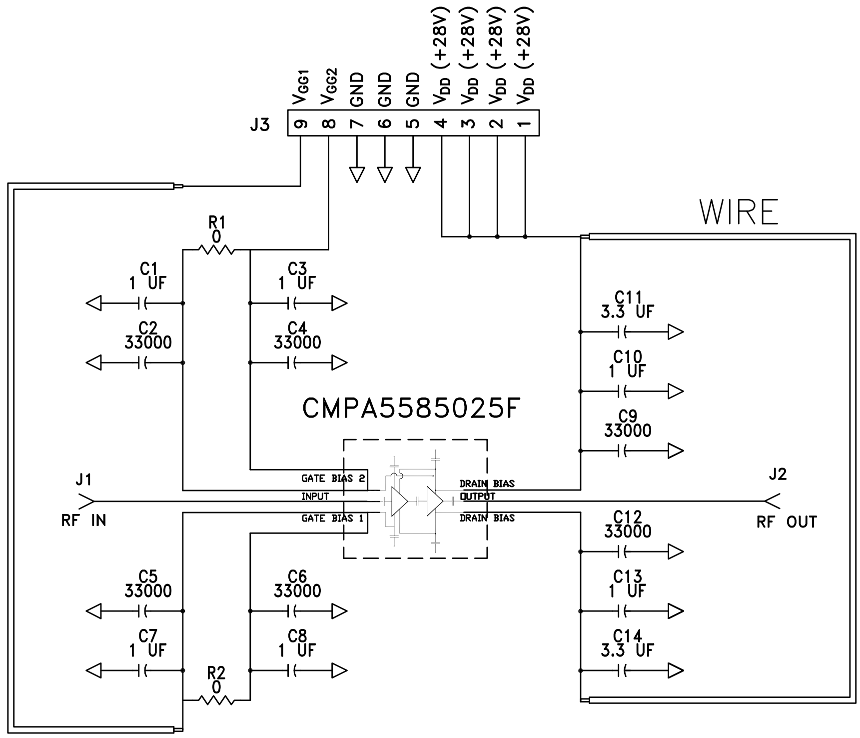
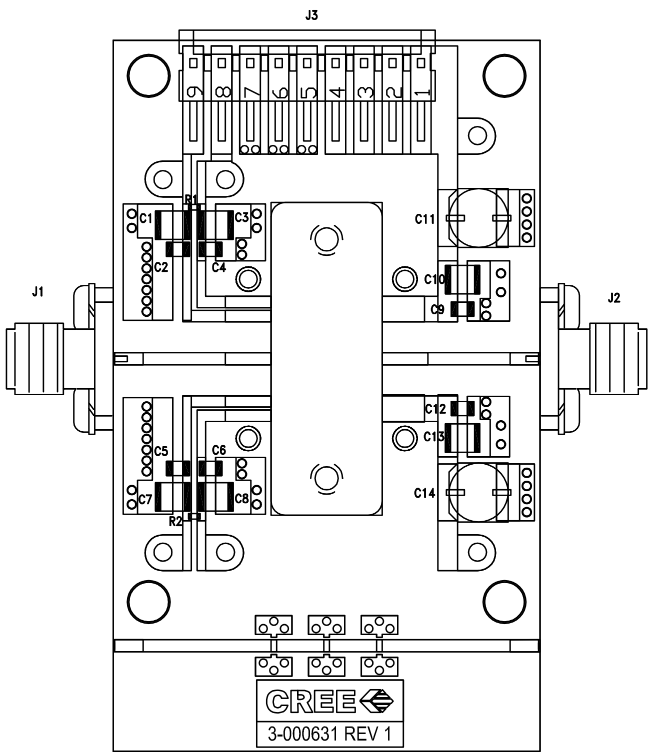
CMPA5585025F-TB Demonstration Amplifier Circuit



CMPA5585025F-TB Demonstration Amplifier Circuit Outline



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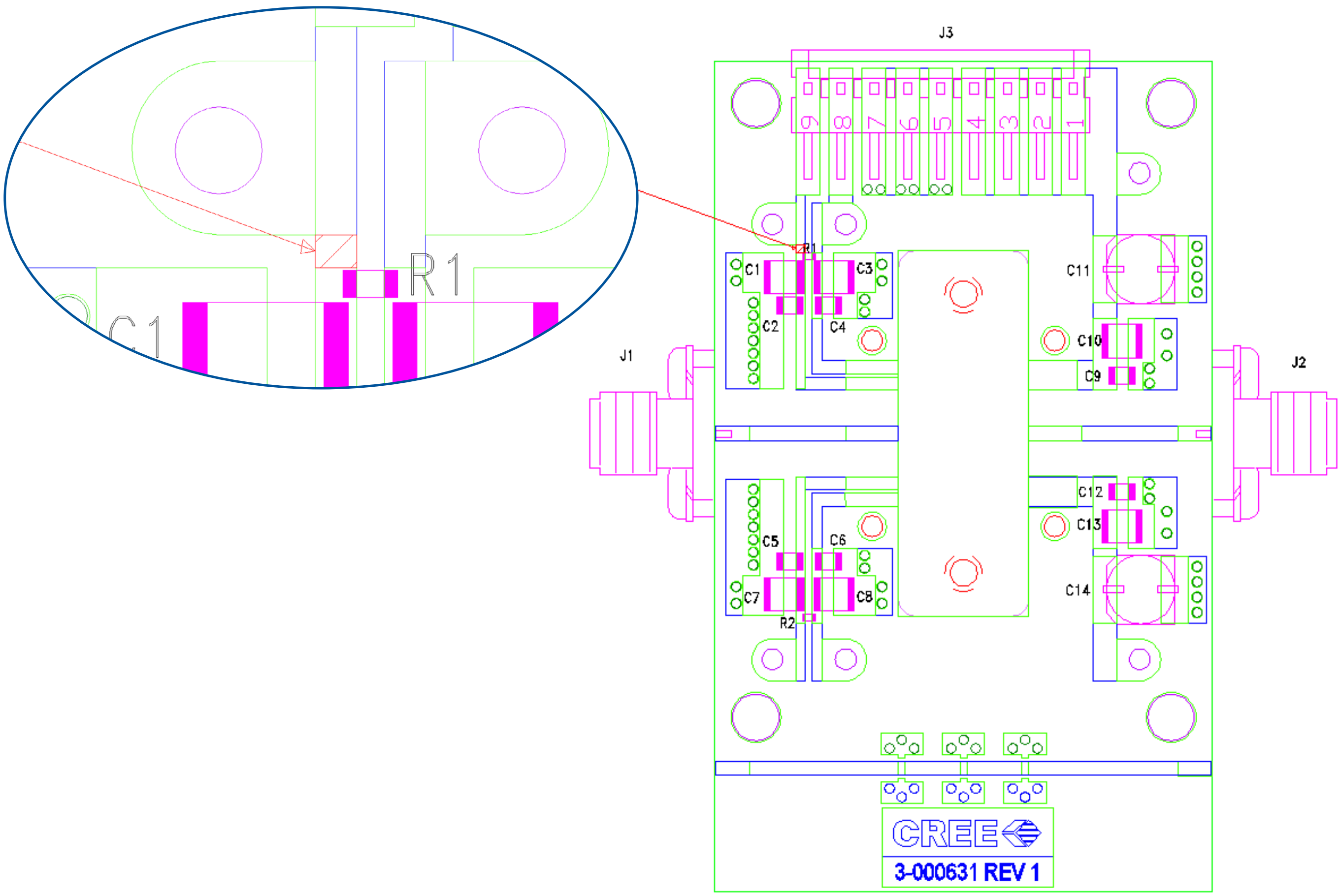
To configure the CMPA5585025F test fixture to enable independent V_{G1} / V_{G2} control of the device, a cut must be made to the microstrip line just above the R1 resistor as shown. Pin 9 will then supply V_{G1} and Pin 8 will supply V_{G2}.



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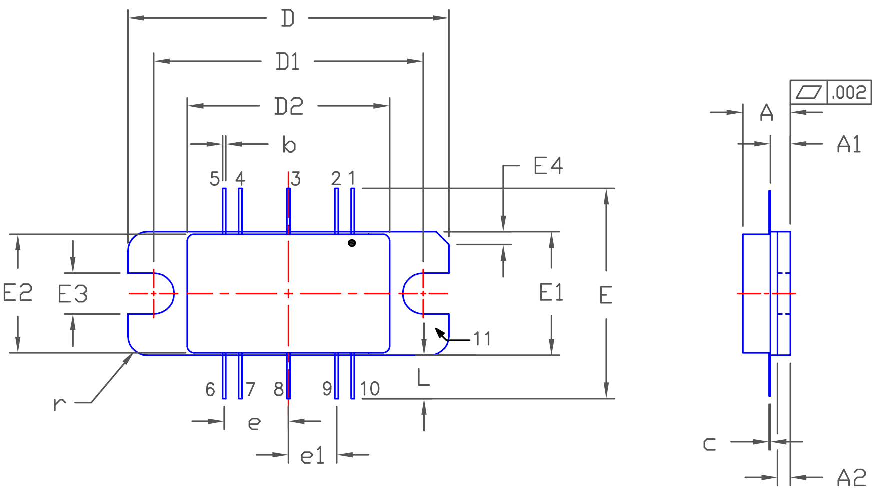
Product Dimensions CMPA5585025F (Package Type — 440208)



NOTES:

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

2. CONTROLLING DIMENSION: INCH.

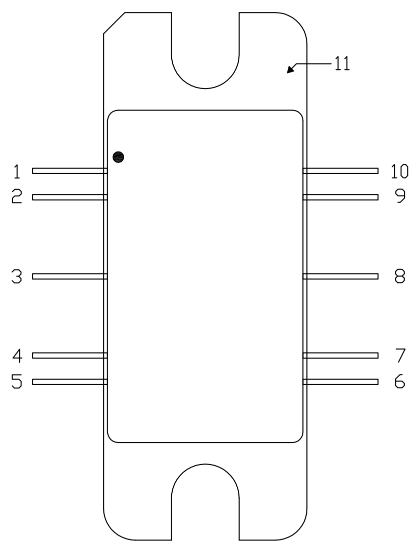
3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.

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

DIM	INCHES		MILLIMETERS		NOTES
	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 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

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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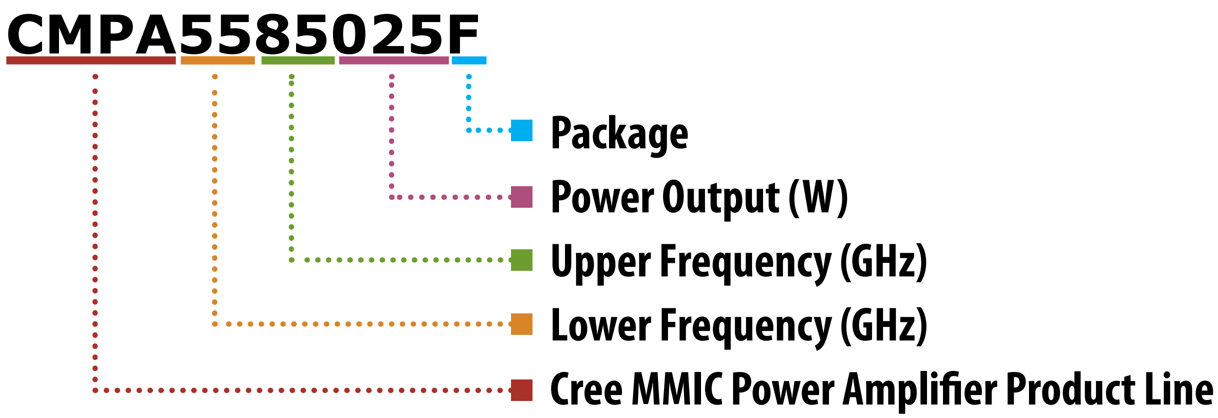
Part Number System



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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LifeElectronics
Живое партнерство

ООО "ЛайфЭлектроникс" "LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

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- *Приемлемые сроки поставки, возможна ускоренная поставка.*
- *Доставку товара в любую точку России и стран СНГ.*
- *Комплексную поставку.*
- *Работу по проектам и поставку образцов.*
- *Формирование склада под заказчика.*

- *Сертификаты соответствия на поставляемую продукцию (по желанию клиента).*
- *Тестирование поставляемой продукции.*
- *Поставку компонентов, требующих военную и космическую приемку.*
- *Входной контроль качества.*
- *Наличие сертификата ISO.*

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

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- *Регистрацию проекта у производителя компонентов.*
- *Техническую поддержку проекта.*
- *Защиту от снятия компонента с производства.*
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- *Изготовление тестовой платы монтаж и пусконаладочные работы.*

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