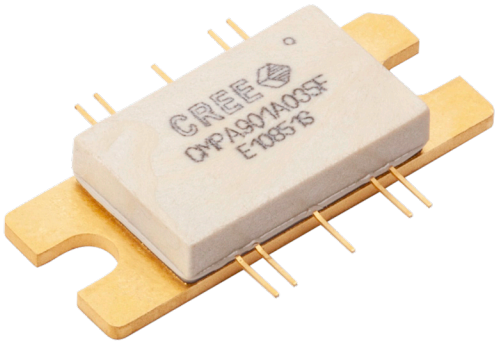
CMPA901A035F

35 W, 9.0 - 11.0 GHz, GaN MMIC, Power Amplifier



PN: CMPA901A035F
Package Type: 440213

Description

The CMPA901A035F is a gallium nitride (GaN) High Electron Mobility Transistor (HEMT) based monolithic microwave integrated circuit (MMIC) on a silicon carbide (SiC) substrate. The semiconductor offers 35 Watts of power from 9 to 11 GHz of instantaneous bandwidth. The GaN HEMT MMIC is housed in a thermally-enhanced, 10-lead 25 mm x 9.9 mm metal/ceramic flanged package. It offers high gain and superior efficiency in a small footprint package at 50 ohms.

Typical Performance Over 9.0 - 11.0 GHz (T_C = 25˚C)

CW Performance	9.0 GHz	9.5 GHz	10.0 GHz	10.5 GHz	11.0 GHz	Units
Output Power	46	45	43	42	37	W
Gain	23.7	23.5	23.3	23.2	22.7	dB
Power Added Efficiency	40	36	34	34	35	%

Note: Measured in the CMPA901A035F-AMP application circuit, under CW signal, P_{IN} = 23 dBm

Pulsed Performance	9.0 GHz	9.5 GHz	10.0 GHz	10.5 GHz	11.0 GHz	Units
Output Power	51	52	50	48	40	W
Gain	24.1	24.2	24.0	23.8	23.0	dB
Power Added Efficiency	41.7	38.0	36.5	36.4	35.3	%

Note: Measured in the CMPA901A035F-AMP application circuit, under 100 µs pulse width, 10% duty cycle, P_{IN} = 23 dBm

Features

- 9.0 - 11.0 GHz Operation
- Typical Output Power 40 W
- Typical Power Gain 23 dB
- Typical PAE 35%
- Operation up to 28 V

Applications

- Military Radar
- Marine Radar
- Weather Radar
- Medical Applications

RoHS COMPLIANT

Absolute Maximum Ratings (not simultaneous) at 25˚C

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	V_{DS}	84	V_{DC}	25˚C
Gate-source Voltage	V_{GS}	-10, +2	V_{DC}	25˚C
Storage Temperature	T_{STG}	-40, +150	˚C	
Operating Junction Temperature	T_J	225	˚C	
Maximum Forward Gate Current	I_{GMAX}	19	mA	25˚C
Soldering Temperature[1]	T_{STG}	245	˚C	
Screw Torque	T	40	in-oz	
Thermal Resistance, Junction to Case, CW	$R_{\theta JC}$	1.3	˚C/W	85˚C @ P_{DISS} = 80 W
Thermal Resistance, Junction to Case, Pulsed	$R_{\theta JC}$	0.93	˚C/W	85˚C @ P_{DISS} = 80 W
Case Operating Temperature	T_C	-40, +150	˚C	

Note:
[1] Refer to the Application Note on soldering at wolfspeed.com/rf/document-library

Electrical Characteristics (Frequency = 9.0 GHz to 11.0 GHz unless otherwise stated; T_C = 25˚C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[1,2]						
Gate Threshold	V_{TH}	-3.8	-2.8	-2.3	V	V_{DS} = 10 V, I_{DS} = 19.8 mA
Saturated Drain Current[3]	I_{DS}	14.3	19.8	–	A	V_{DS} = 6 V, V_{GS} = 2 V
Drain-Source Breakdown Voltage	V_{BD}	84	–	–	V	V_{GS} = -8 V, I_{DS} = 19.8 mA
RF Characteristics						
Small Signal Gain	S21	–	34	–	dB	V_{DD} = 28 V, I_{DQ} = 1.5 A, P_{IN} = -23 dBm
Input Return Loss	S11	–	-6.4	–	dB	V_{DD} = 28 V, I_{DQ} = 1.5 A, P_{IN} = -23 dBm
Output Return Loss	S22	–	-6.8	–	dB	V_{DD} = 28 V, I_{DQ} = 1.5 A, P_{IN} = -23 dBm
Output Power [4,5]	P_{OUT1}	–	45.7	–	W	V_{DD} = 28 V, I_{DQ} = 1.5 A, P_{IN} = 23 dBm, Freq = 9 GHz
Output Power [4,5]	P_{OUT2}	–	44.7	–	W	V_{DD} = 28 V, I_{DQ} = 1.5 A, P_{IN} = 23 dBm, Freq = 10 GHz
Power Added Efficiency [4,5,6]	PAE_1	–	40	–	%	V_{DD} = 28 V, I_{DQ} = 1.5 A, P_{IN} = 23 dBm, Freq = 9 GHz
Power Added Efficiency [4,5,6]	PAE_2	–	37	–	%	V_{DD} = 28 V, I_{DQ} = 1.5 A, P_{IN} = 23 dBm, Freq = 10 GHz
Output Mismatch Stress	VSWR	–	5:1	VSWR	Ψ	No damage at all phase angles, V_{DD} = 28 V, I_{DQ} = 1.5 A, P_{IN} = 23 dBm, CW

Notes:
[1] At 25 ˚C
[2] Measured on-wafer prior to packaging
[3] Scaled from PCM data
[4] Measured in the CMPA901A035F-TB fixture (AD-938547)
[5] Fixture loss de-embedded using the following offsets. The offset is subtracted from the input offset value and added to the output offset value
a) 9.0 GHz - 0.20 dB
b) 10.0 GHz - 0.25 dB
[6] Power added efficiency = (P_{OUT} - P_{IN}) / P_{DC}

CMPA901A035F Typical Performance

Figure 1. Small Signal Gain and Return Loss vs. Frequency of the CMPA901A035F as Measured in Circuit CMPA901A035F-AMP Demonstration Amplifier
V_{DD} = 28 V, I_{DQ} = 1.5 A

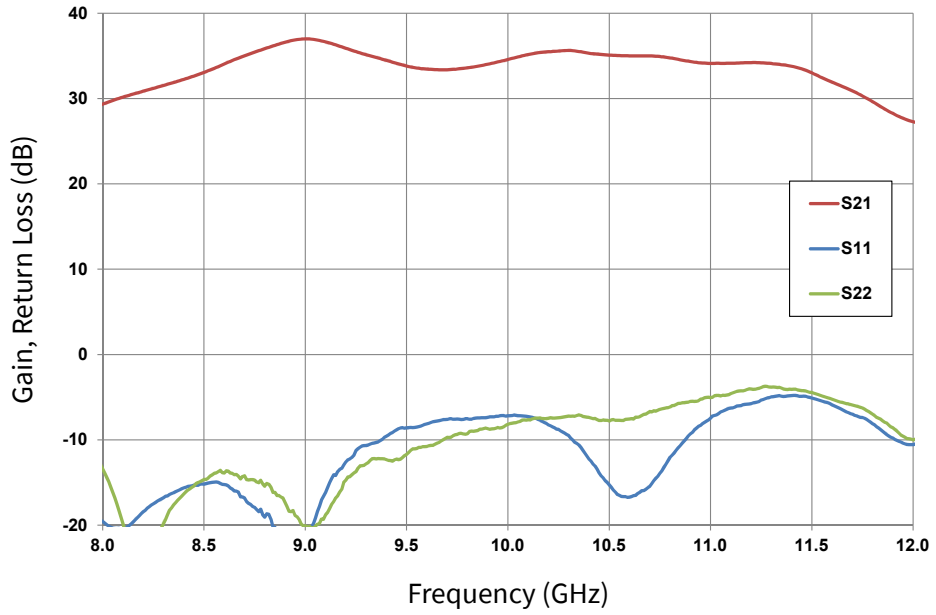
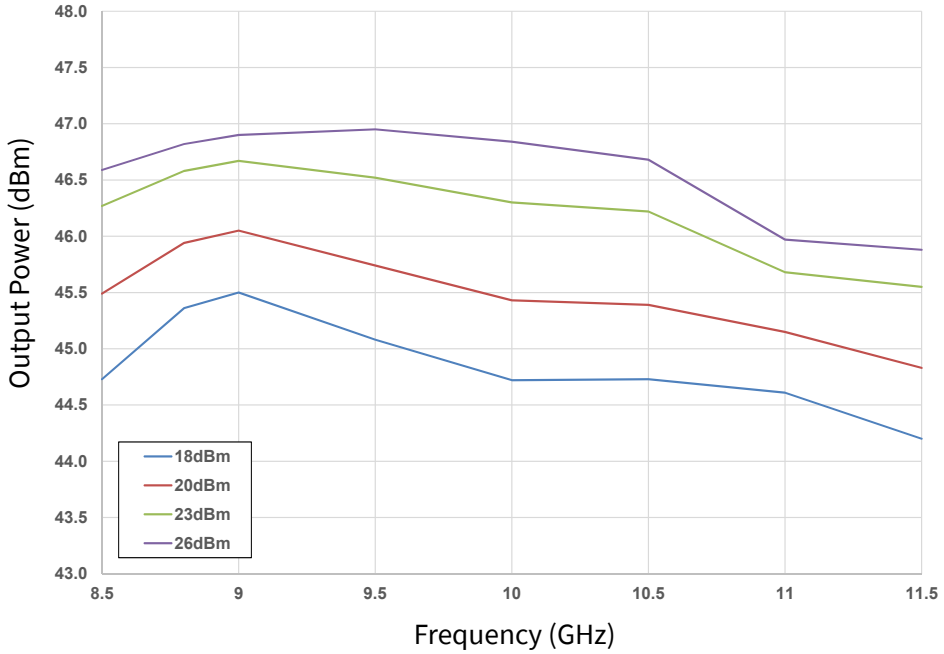


Figure 2. CW Output Power vs. Frequency as a Function of Input Power of the CMPA901A035F as Measured in Demonstration Amplifier Circuit CMPA901A035F-AMP
V_{DD} = 28 V, I_{DQ} = 1.5 A



CMPA901A035F Typical Performance

Figure 3. CW Power Gain vs. Frequency as a Function of Input Power
V_{DD} = 28 V, I_{DQ} = 1.5 A

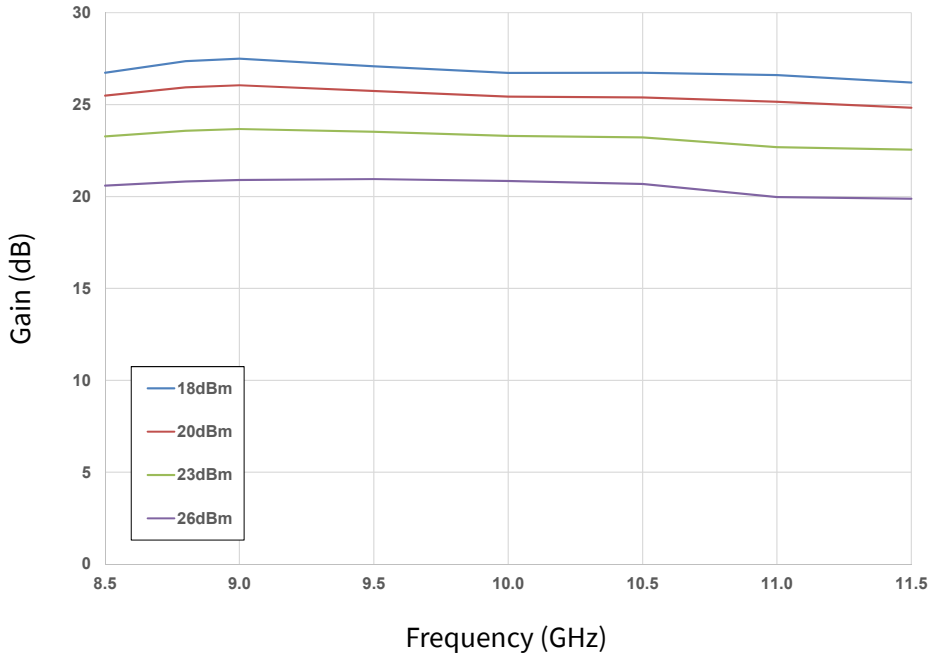
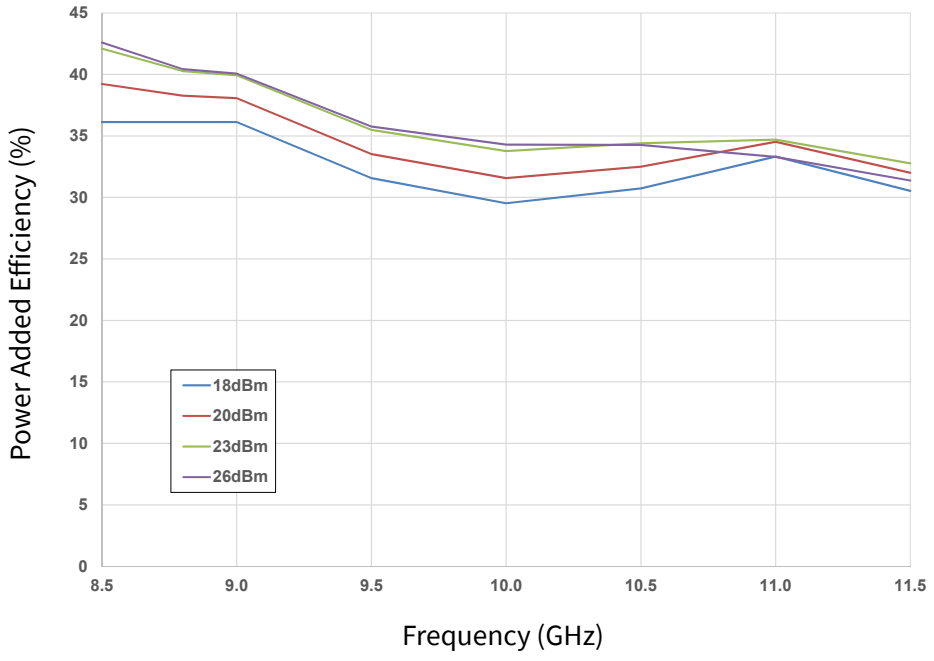


Figure 4. CW Power Added Efficiency vs. Frequnecy as a Function of Input Power
V_{DD} = 28 V, I_{DQ} = 1.5 A



CMPA901A035F Typical Performance

Figure 5. CW Output Power vs. Input Power as a Function of Input Power
V_{DD} = 28 V, I_{DQ} = 1.5 A

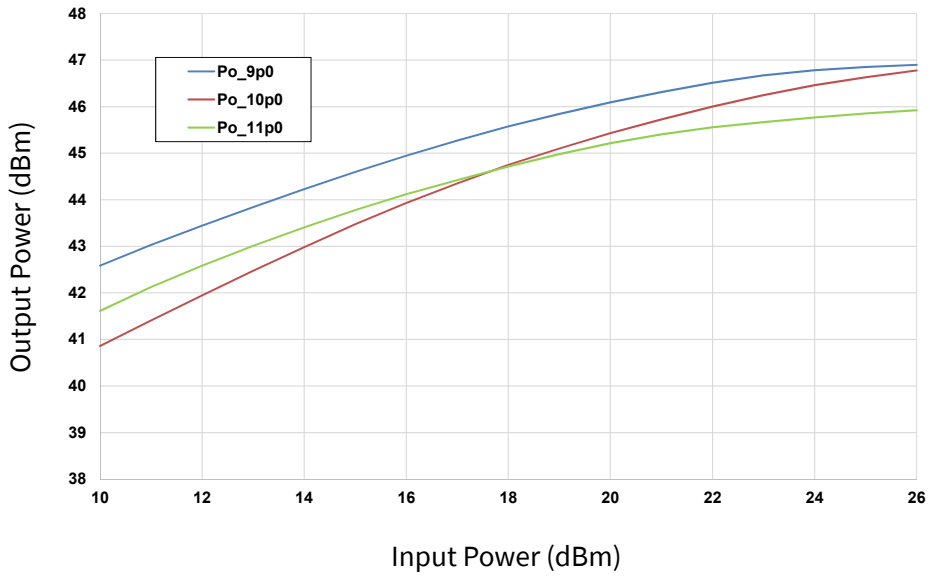
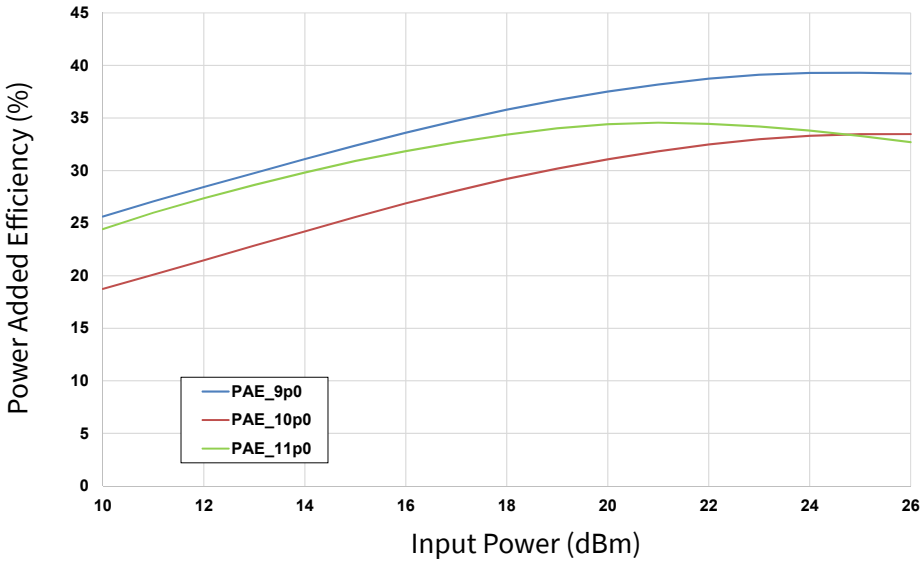


Figure 6. CW Power Added Efficiency vs. Input Power as a Function of Input Power
V_{DD} = 28 V, I_{DQ} = 1.5 A



CMPA901A035F Typical Performance

Figure 7. CW Gain vs. Input Power as a Function of Input Power
V_{DD} = 28 V, I_{DQ} = 1.5 A

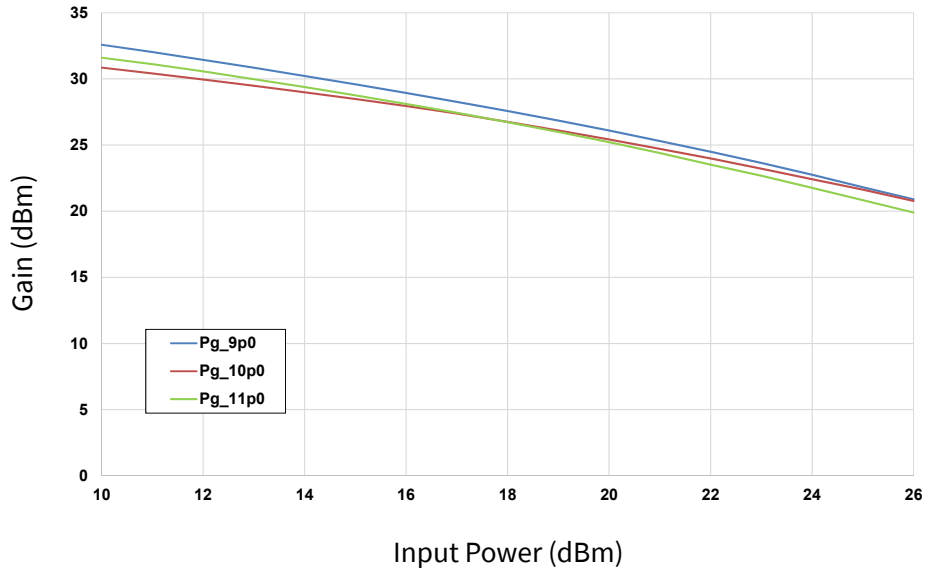
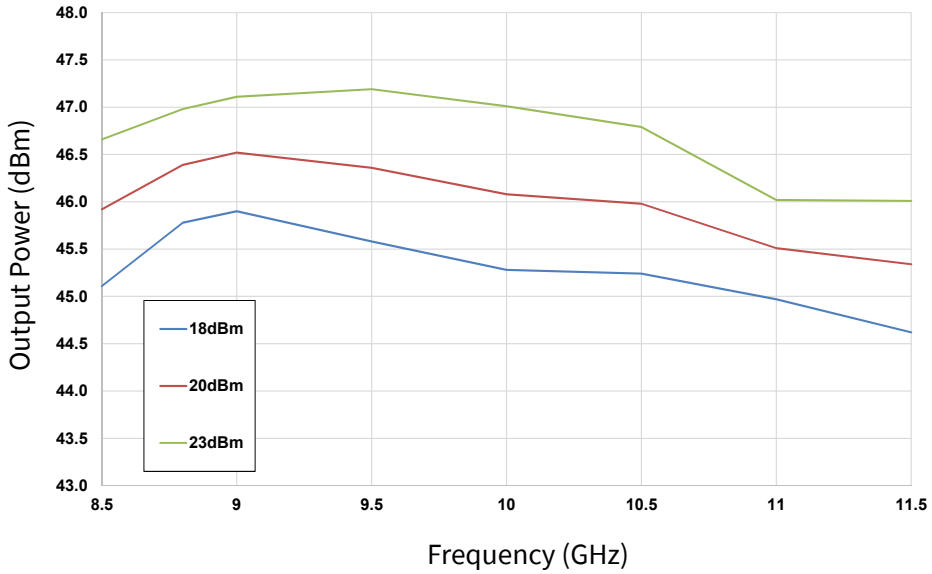


Figure 8. Pulsed Output Power vs. Frequency as a Function of Input Power
V_{DD} = 28 V, I_{DQ} = 1.5 A, Pulse Width = 100 µSec, Duty Cycle = 10%



CMPA901A035F Typical Performance

Figure 9. Pulsed Power Gain vs. Frequency
V_{DD} = 28 V, I_{DQ} = 1.5 A, Pulse Width = 100 µSec, Duty Cycle = 10%

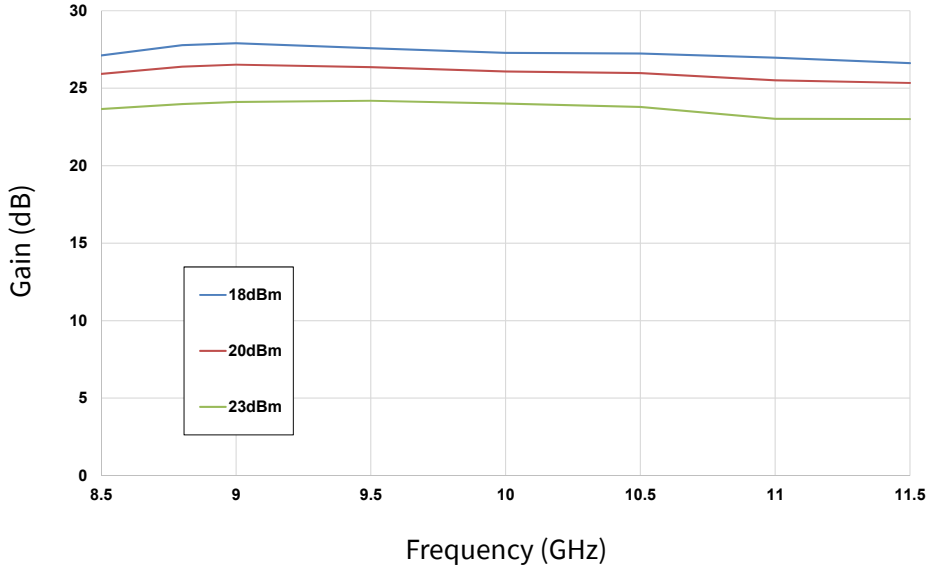
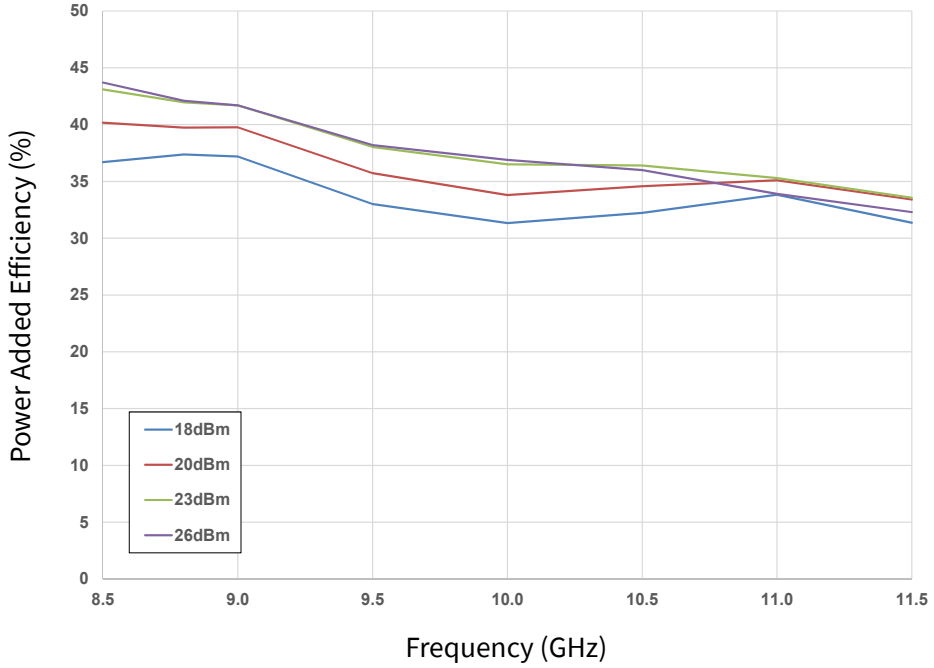


Figure 10. Pulsed Power Added Efficiency vs. Frequency
V_{DD} = 28 V, I_{DQ} = 1.5 A, Pulse Width = 100 µSec, Duty Cycle = 10%



CMPA901A035F Typical Performance

Figure 11. Pulsed Output Power vs. Input Power
V_{DD} = 28 V, I_{DQ} = 1.5 A, Pulse Width = 100 µSec, Duty Cycle = 10%

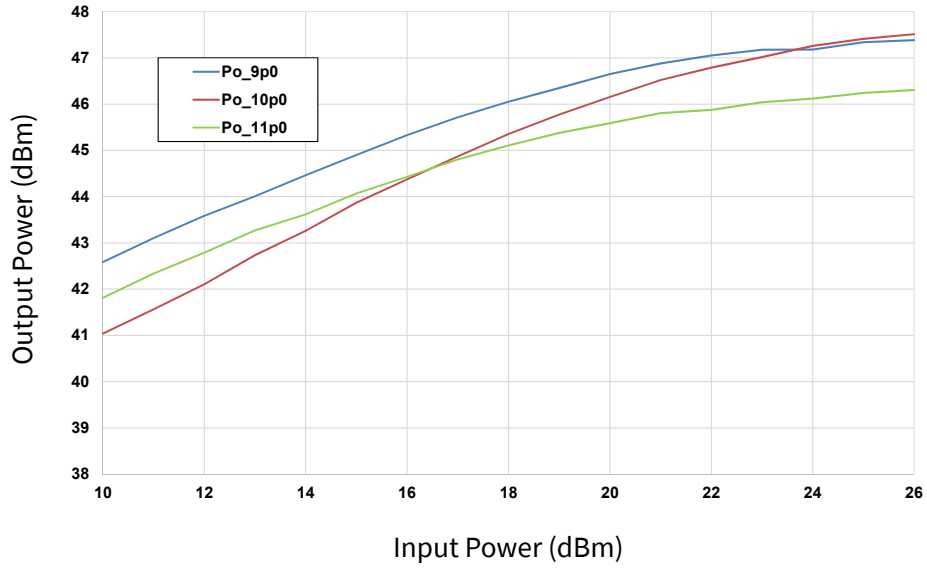
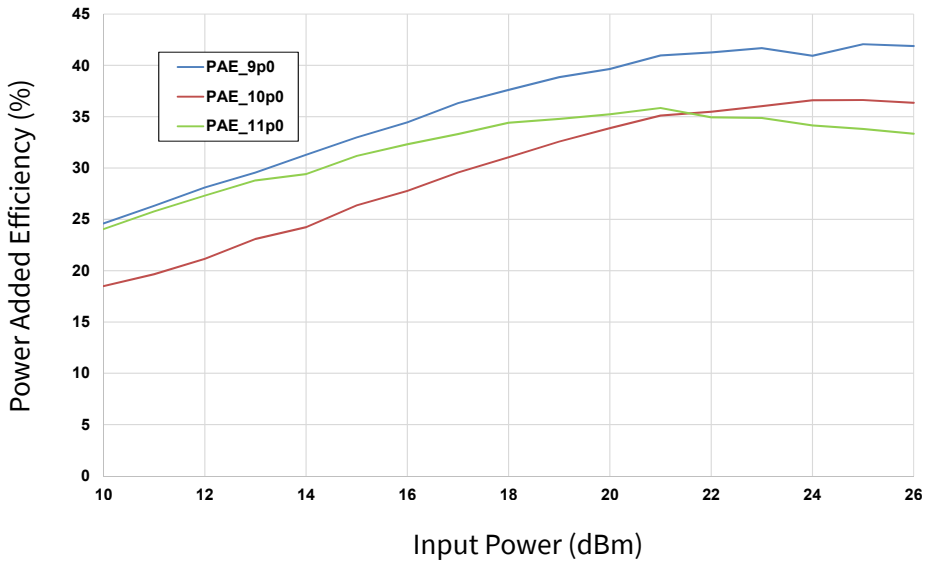


Figure 12. Pulsed Power Added Efficiency vs. Input Power
V_{DD} = 28 V, I_{DQ} = 1.5 A, Pulse Width = 100 µSec, Duty Cycle = 10%



CMPA901A035F Typical Performance

Figure 13. Pulsed Gain vs. Input Power
V_{DD} = 28 V, I_{DQ} = 1.5 A, Pulse Width = 100 µSec, Duty Cycle = 10%

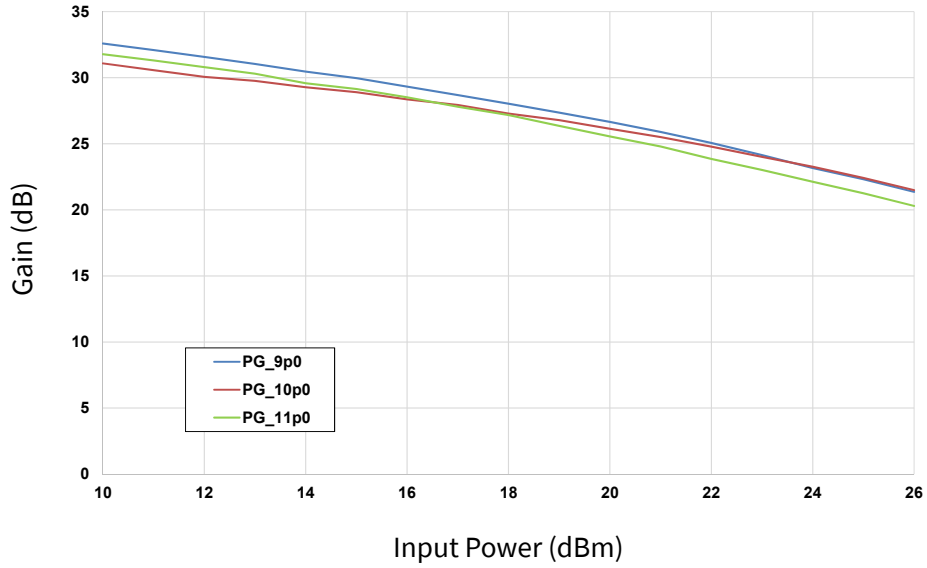
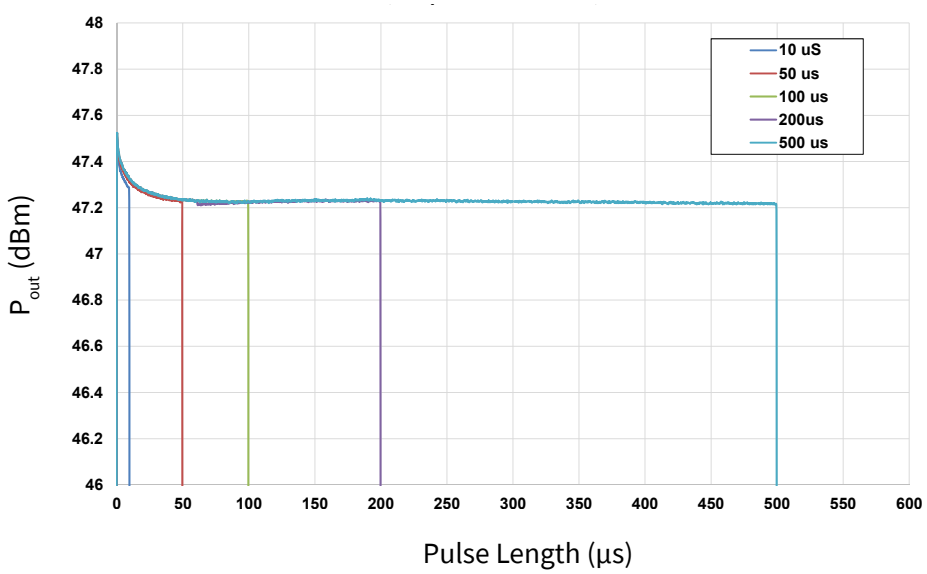


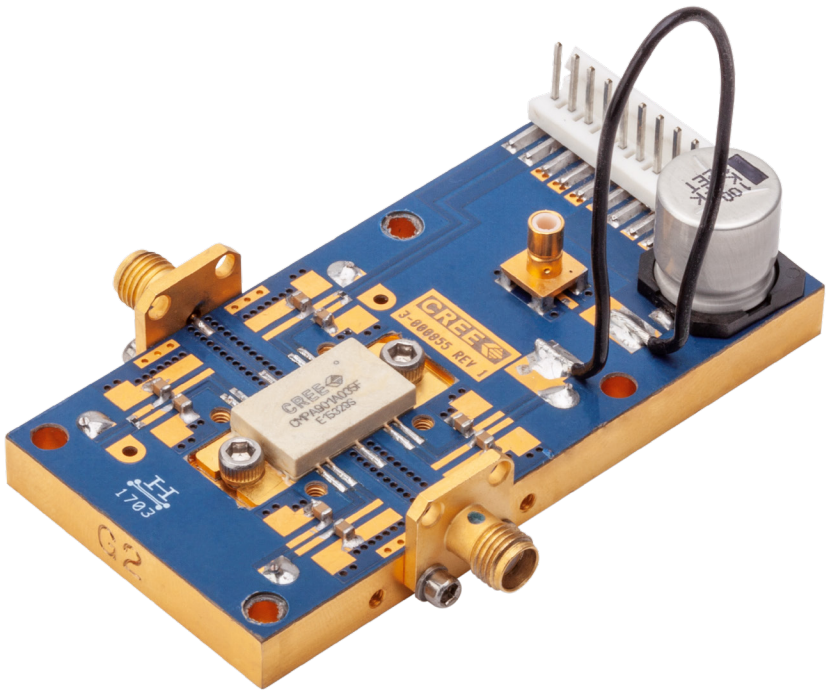
Figure 14. Pulse Droop
V_{DD} = 28 V, I_{DQ} = 1.5 A, Frequency = 9.5 GHz, P_{IN} = 26 dBm



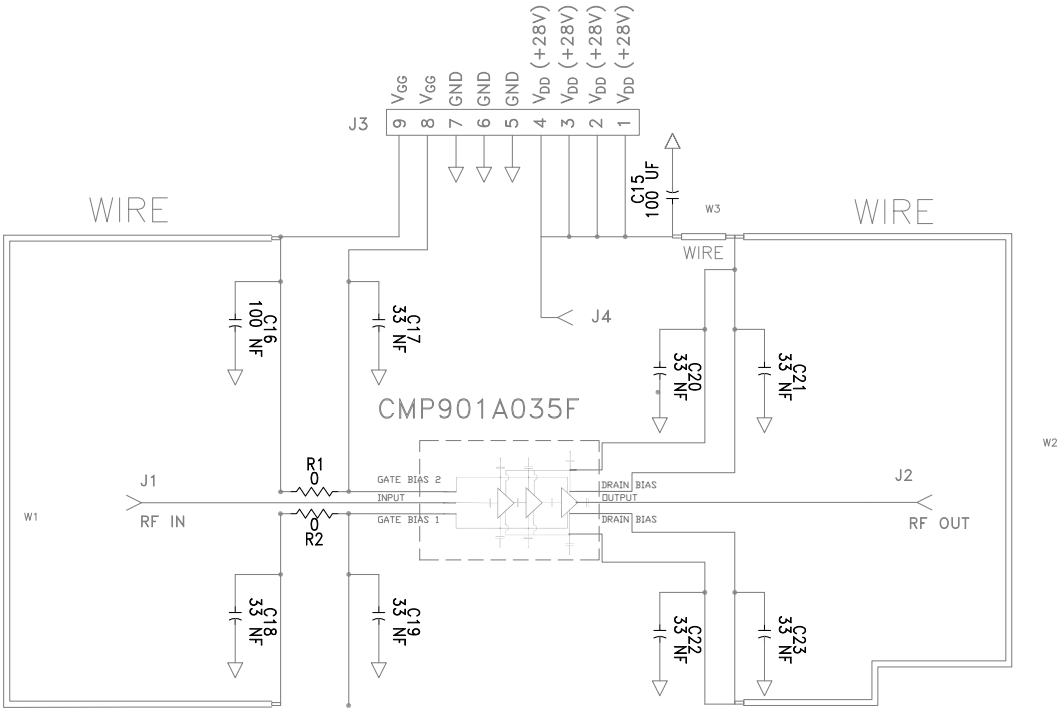
CMPA901A035F-AMP Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
C15	CAP ELECT 100UF 80V AFK SMD	1
C16-C23	CAP,33000PF, 0805,100V, X7R	8
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
J4	CONN, SMB, STRAIGHT JACK RECEPTACLE, SMT, 50 OHM, Au PLATED	1
J3	HEADER RT>PLZ .1CEN LK 9POS	1
W1	WIRE, BLACK, 22 AWG ~ 1.50”	1
W2	WIRE, BLACK, 22 AWG ~ 1.75”	1
W3	WIRE, BLACK, 22 AWG ~ 3.0”	1
Q1	CMPA901A035F	1

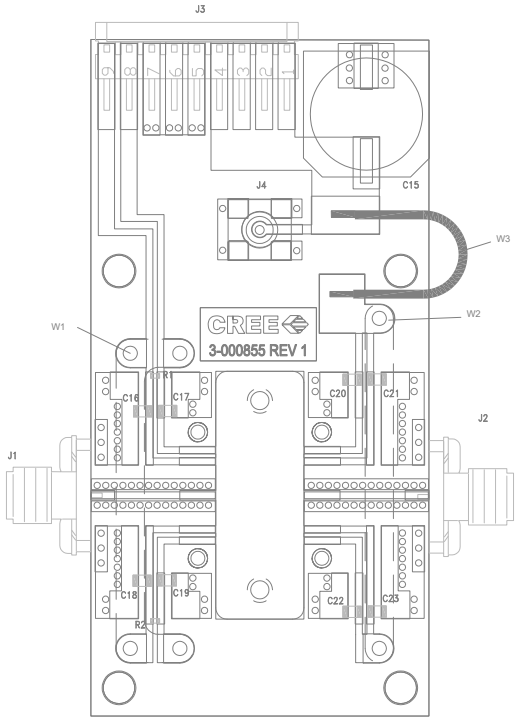
CMPA901A035F-AMP Demonstration Amplifier Circuit



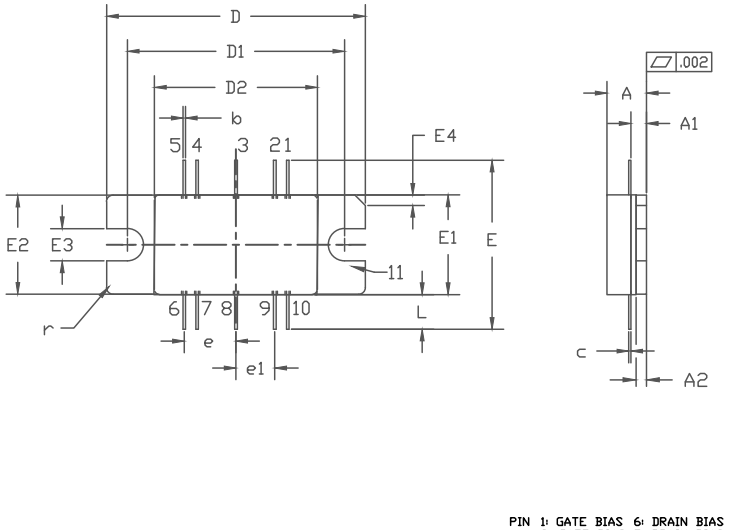
CMPA901A035F-AMP Demonstration Amplifier Circuit Schematic



CMPA901A035F-AMP Demonstration Amplifier Circuit Outline



Product Dimensions CMPA901A035F



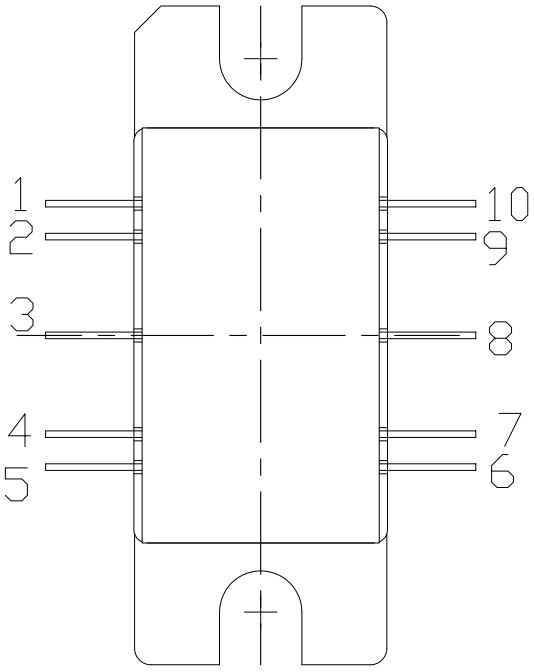
PIN 1: GATE BIAS 6: DRAIN BIAS
2: GATE BIAS 7: DRAIN BIAS
3: RF IN 8: RF OUT
4: GATE BIAS 9: DRAIN BIAS
5: GATE BIAS 10: DRAIN BIAS
11: SOURCE

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	0.148	0.168	3.76	4.27	
A1	0.055	0.065	1.40	1.65	
A2	0.035	0.045	0.89	1.14	
b	0.01 TYP		0.254 TYP		10x
c	0.007	0.009	0.18	0.23	
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	0.653 TYP		16.59 TYP		
E1	0.380	0.390	9.65	9.91	
E2	0.380	0.390	9.65	9.91	
E3	0.120	0.130	3.05	3.30	
E4	0.035	0.045	0.89	1.14	45° CHAMFER
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	0.025 TYP		.635 TYP		3x

Pin Number	Qty
1	Gate Bias for Stage 1, 2 & 3
2	Gate Bias for Stage 1, 2 & 3
3	RF IN
4	Gate Bias for Stage 1, 2 & 3
5	Gate Bias for Stage 1, 2 & 3
6	Drain Bias
7	Drain Bias
8	RF OUT
9	Drain Bias
10	Drain Bias



Part Number System

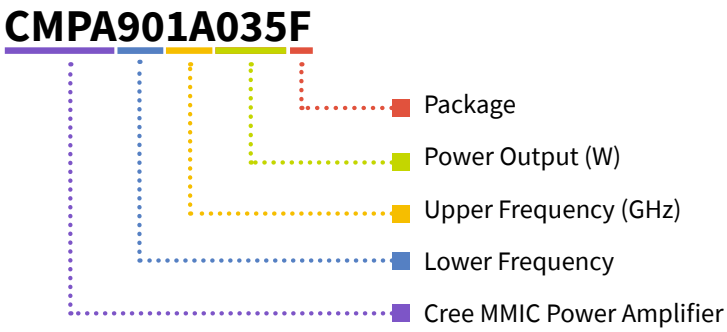


Table 1.

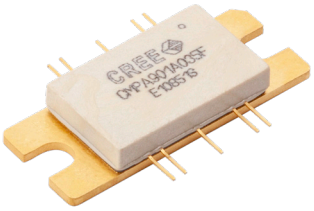
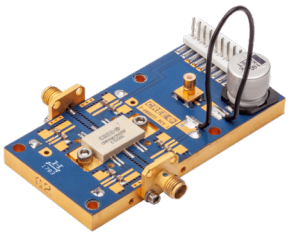
Parameter	Value	Units
Lower Frequency	9.0	GHz
Upper Frequency[1]	10.0	GHz
Power Output	35	W
Package	Flanged	-

Note[1]: Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value.

Table 2.

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

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CMPA901A035F	GaN HEMT	Each	
CMPA901A035F-AMP	Test board with GaN HEMT installed	Each	

For more information, please contact:

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Notes

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