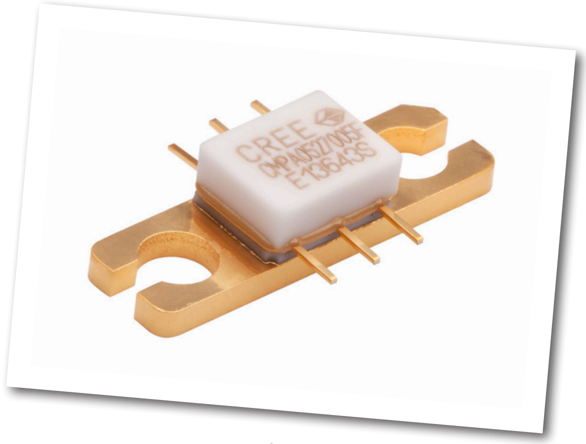
CMPA0527005F

5 W, 0.5 - 2.7 GHz, 50 V, GaN HEMT

CMPA0527005F is packaged gallium nitride (GaN) High Electron Mobility Transistor (HEMT) based monolithic microwave integrated circuit (MMIC). This device is matched to 50 ohms at the input and unmatched at the output. This device operates from a 50 V rail and is intended to be used as a predriver from 500 MHz to 2700 MHz. The transistor is available in a 6 leaded flange package.



Package Types: 440221
PN: CMPA0527005F

Typical Performance Over 500 MHz - 2.7 GHz (T_C = 25˚C), 50 V, P_{IN} = 24dBm, CW

Parameter	500 MHz	1.0 GHz	1.5 GHz	2.0 GHz	2.7 GHz	Units
Small Signal Gain	20.4	20.8	21	20.5	19.5	dB
Output Power	7.8	9.3	9.1	8.7	6.6	W
Drain Efficiency	58.5	53.8	49.2	47.1	41.5	%

Note:
Measured in the CMPA0527005F-AMP1 application circuit.

Features

RoHS

- Up to 2.7 GHz Operation
- 39 dBm Typical Output Power
- 20 dB Small Signal Gain
- Application Circuit for 0.5 - 2.7 GHz
- 50 % Efficiency
- 50 V Operation

Large Signal Models Available for ADS and MWO

Absolute Maximum Ratings (not simultaneous) at 25˚C Case Temperature

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	V_{DSS}	125	Volts	25˚C
Gate-to-Source Voltage	V_{GS}	-10, +2	Volts	25˚C
Storage Temperature	T_{STG}	-65, +150	˚C	
Operating Junction Temperature	T_J	225	˚C	
Maximum Forward Gate Current	I_{GMAX}	1.2	mA	25˚C
Maximum Drain Current[1]	I_{DMAX}	0.5	A	25˚C
Soldering Temperature[2]	T_S	245	˚C	
Screw Torque	τ	40	in-oz	
Thermal Resistance, Junction to Case[3]	$R_{\theta JC}$	18	˚C/W	85˚C
Case Operating Temperature[4]	T_C	-40, +73.8	˚C	

Note:
[1] Current limit for long term, reliable operation
[2] Refer to the Application Note on soldering at www.cree.com/RF/Document-Library
[3] Measured for the CMPA0527005F at P_{DISS} = 8.4 W.
[4] See also, Power Derating Curve on Page 5.

Electrical Characteristics (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_{DC}	V_{DS} = 10 V, I_D = 1.2 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.7	–	V_{DC}	V_{DS} = 50 V, I_D = 0.11 A
Saturated Drain Current[2]	I_{DS}	0.9	1.07	–	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BR}	150	–	–	V_{DC}	V_{GS} = -8 V, I_D = 1.2 mA
RF Characteristics[3,4,5] (T_C = 25˚C, F_0 = 2.7 GHz unless otherwise noted)						
Small Signal Gain	G_{SS}	–	18.5	–	dB	V_{DD} = 50 V, I_{DQ} = 0.11 A P_{IN} = 10 dBm
Power Gain	G_P	–	13.5	–	dB	V_{DD} = 50 V, I_{DQ} = 0.11 A
Output Power	P_{OUT}	–	39.5	–	dBm	V_{DD} = 50 V, I_{DQ} = 0.11 A
Drain Efficiency	η	–	58.0	–	%	V_{DD} = 50 V, I_{DQ} = 0.11 A
Output Mismatch Stress	VSWR	–	–	10 : 1	Ψ	No damage at all phase angles, V_{DD} = 50 V, I_{DQ} = 0.11 A, P_{OUT} = 5 W CW
Dynamic Characteristics[6]						
Output Capacitance	C_{DS}	–	0.8	–	pF	V_{DS} = 50 V, V_{gs} = -8 V, f = 1 MHz

Notes:
[1] Measured on wafer prior to packaging.
[2] Scaled from PCM data.
[3] Measured in Cree's production test fixture.
[4] P_{IN} = 26 dBm
[5] CW
[6] Includes package

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CMPA0527005F Typical Performance in CMPA0527005F-AMP1 Application Circuit

Figure 1. - Small Signal Gain, Return Losses versus Frequency of the CMPA0527005F
V_{DD} = 50 V, I_{DQ} = 0.110 A

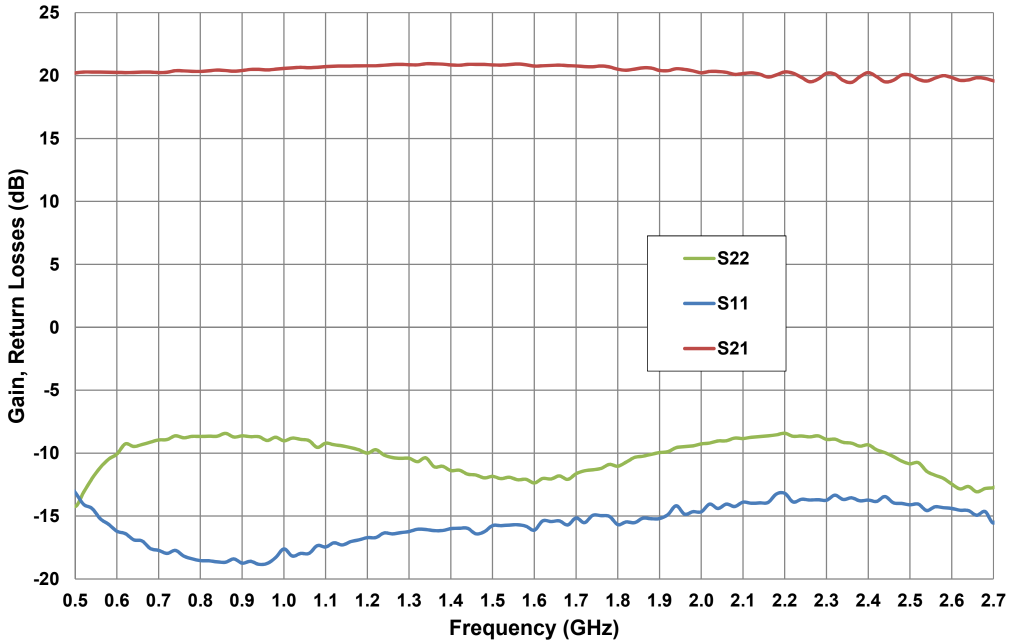
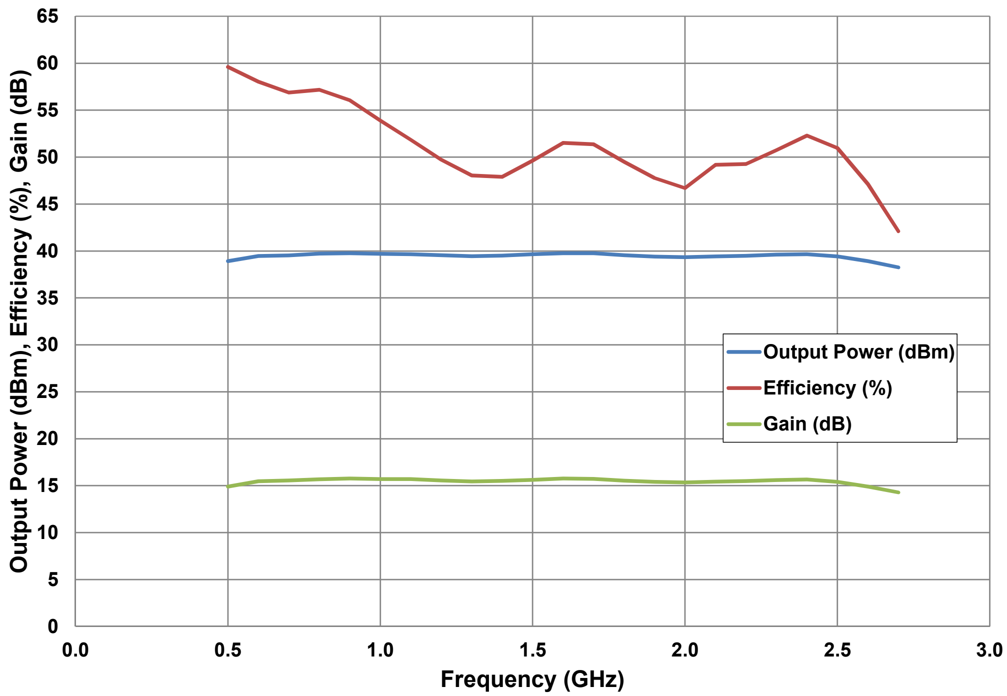


Figure 2. - Output Power, Power Added Efficiency and Gain vs Frequency of the CMPA0527005F as measured in demonstration amplifier circuit CMPA0527005F-AMP1
V_{DD} = 50 V, I_{DQ} =0.110 A, P_{IN}= 24 dBm CW, Tcase = 25°C



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CMPA0527005F Typical Performance in CMPA0527005F-AMP1 Application Circuit

Figure 3. - Gain (dB) and Efficiency (%) vs Output Power (dBm) of the CMPA0527005F as measured in demonstration amplifier circuit CMPA0527005F-AMP1
V_{DD} = 50 V, I_{DQ} = 0.110 A, Tcase = 25°C

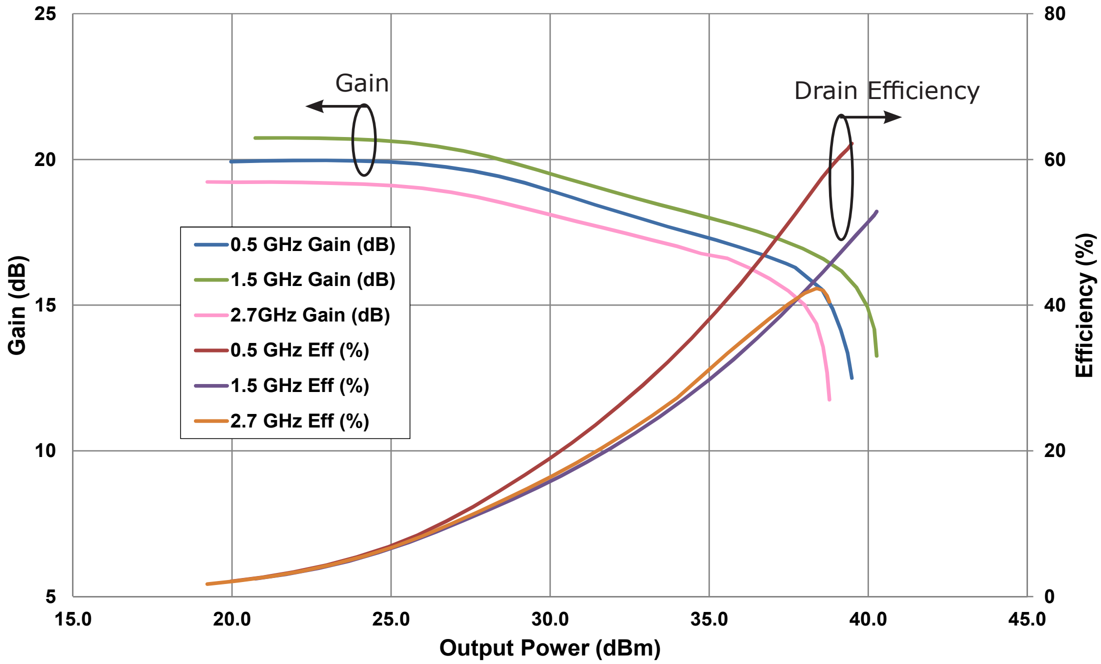
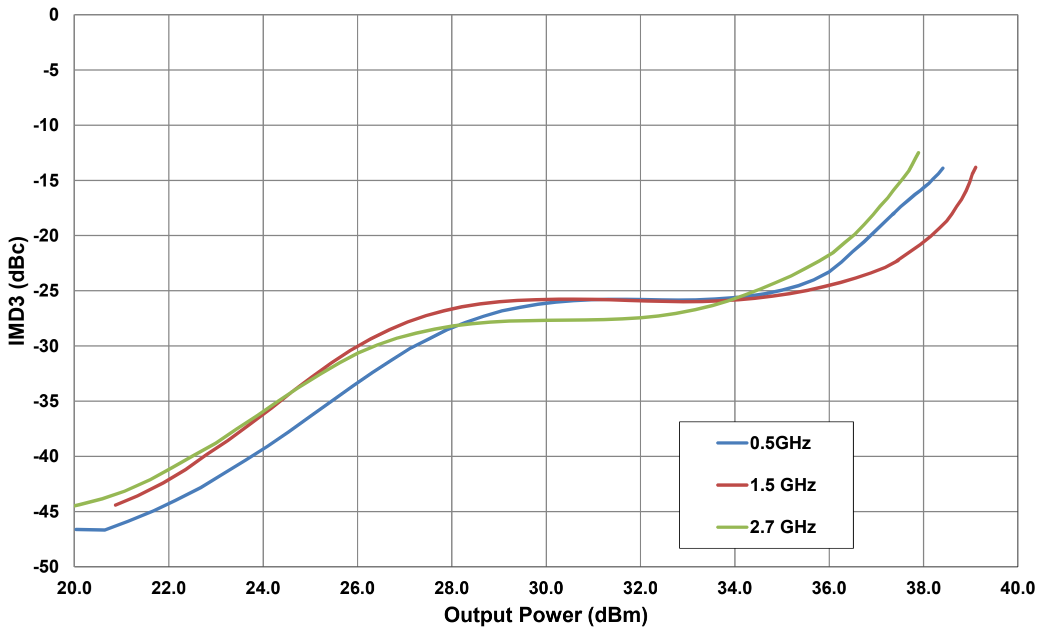


Figure 4. - Third Order Intermodulation Distortion vs Output Power measured in demonstration amplifier circuit CMPA0527005F-AMP1
V_{DD} = 50 V, I_{DQ} = 0.110 A, Tcase = 25°C, Δf= 1 MHz



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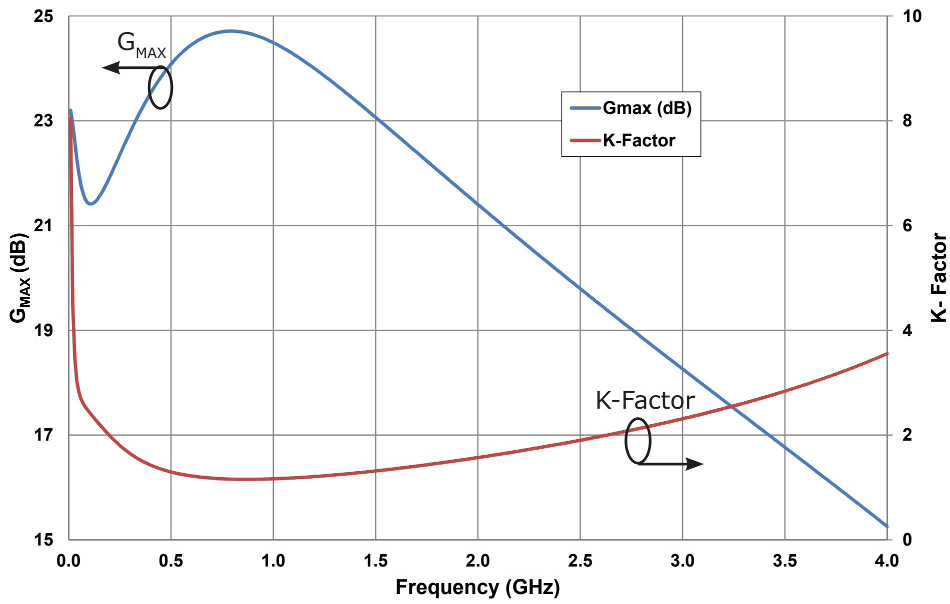
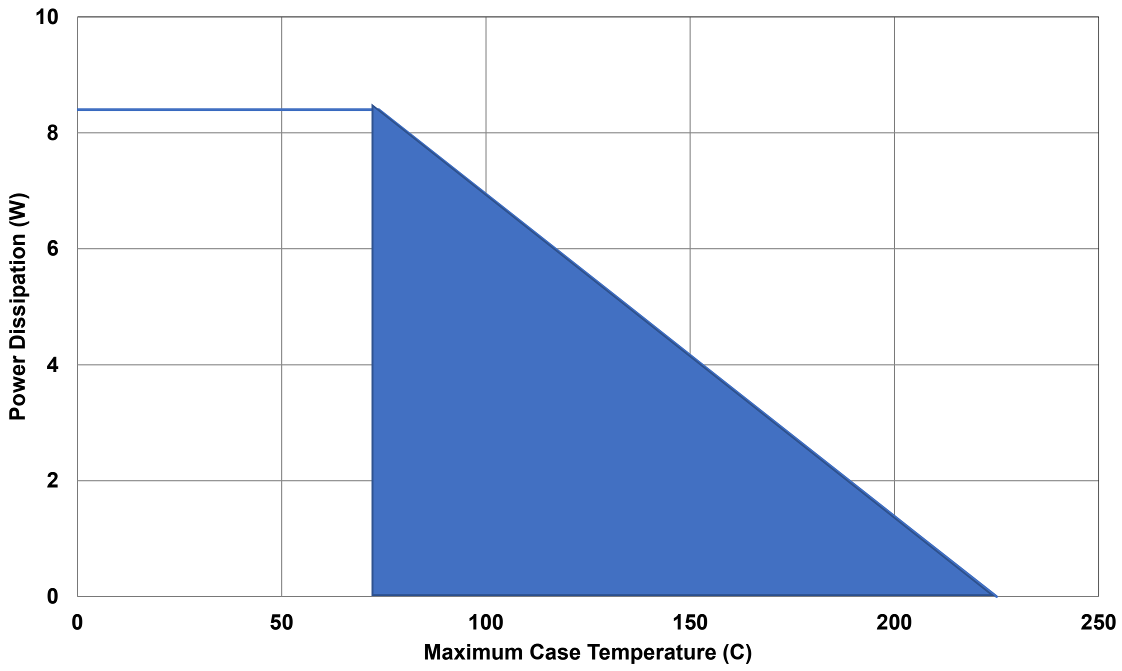
CMPA0527005F Typical Performance

Figure 5. - Simulated G_{MAX} and K-Factor vs Frequency
V_{DD} = 50 V, I_{DQ} = 0.110 A, Tcase = 25°C



CMPA0527005F Power Dissipation De-rating Curve

Figure 6. - Transient Power Dissipation De-Rating Curve



Note 1. Shaded area exceeds Maximum Case Temperature (See Page 2).

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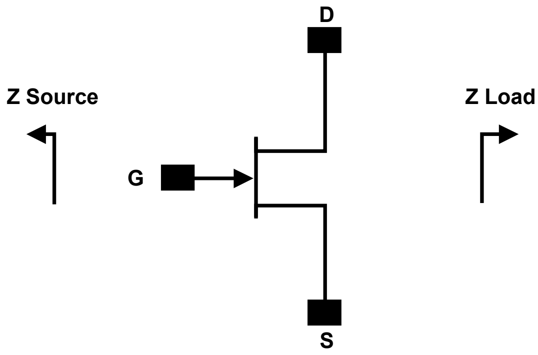
Source and Load Impedances



Frequency (GHz)	Z Load
0.5	143+j115
1	63.18+j93.20
1.5	39.49+j67.24
2	40.13+j42.78
2.3	40.19+j42.82
2.7	30.48+j29.17

Note 1. V_{DD} = 50 V, I_{DQ} = 0.110 A in the 440221 package.

Note 2. Optimized for power gain, P_{SAT} and PAE.

Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Class	Test Methodology
Human Body Model	HBM	1A (> 250 V)	JEDEC JESD22 A114-D
Charge Device Model	CDM	2 (125 V to 250 V)	JEDEC JESD22 C101-C

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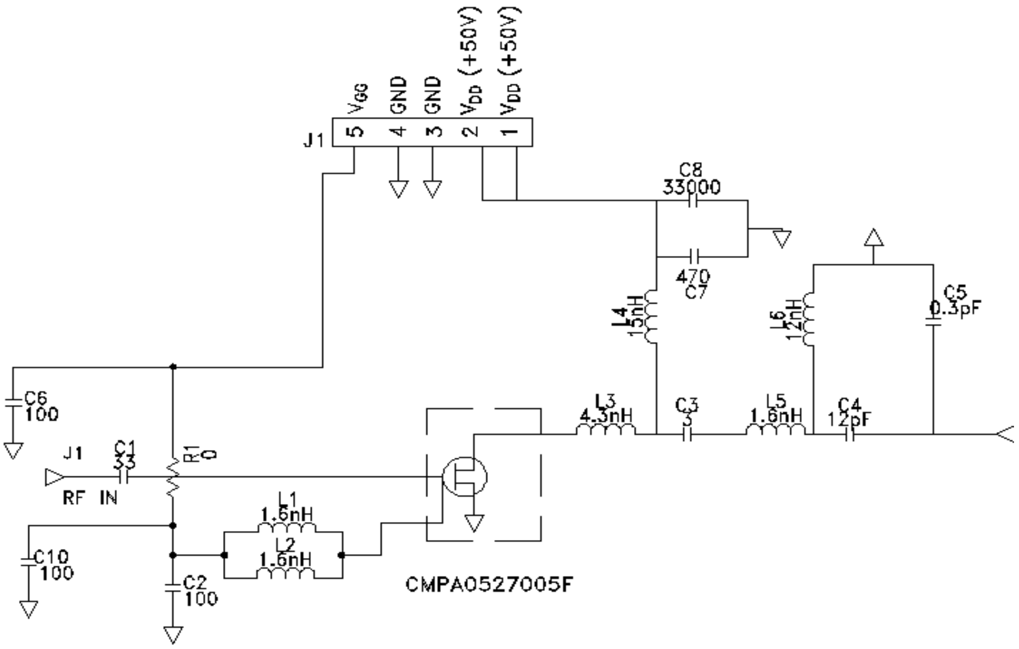
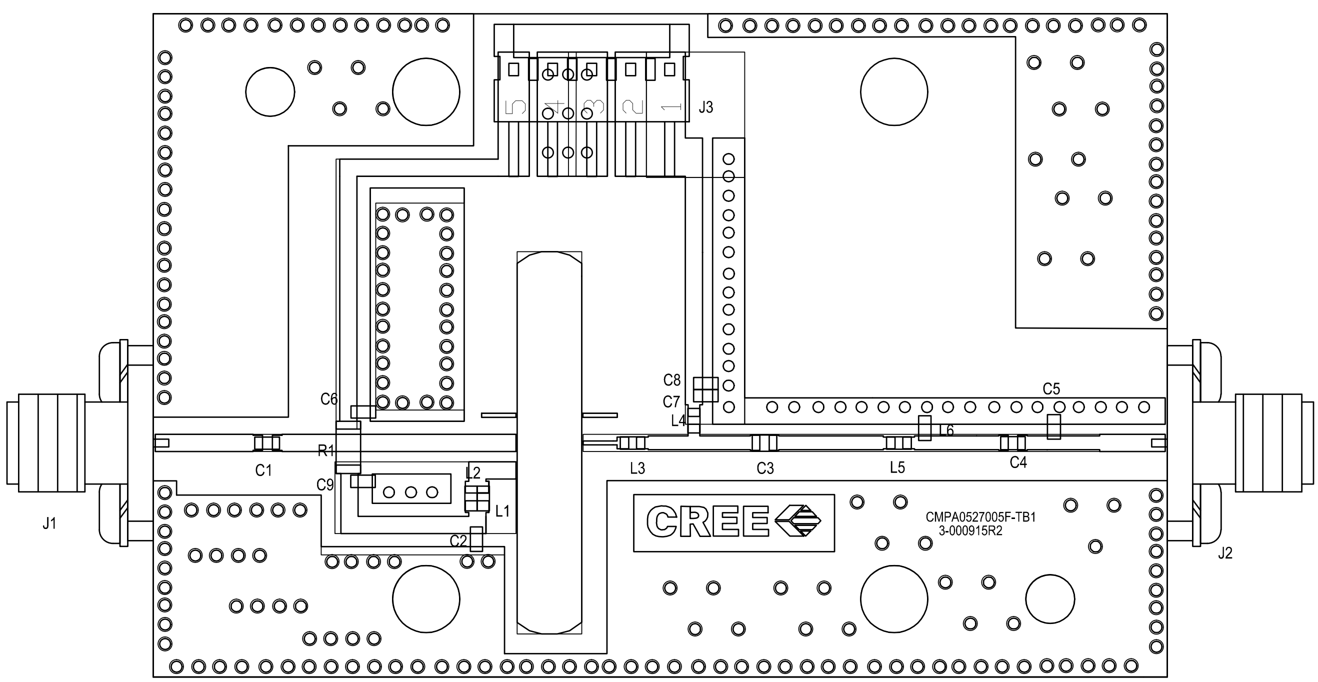
CMPA0527005F-AMP1 Application Circuit Schematic



CMPA0527005F-AMP1 Application Circuit



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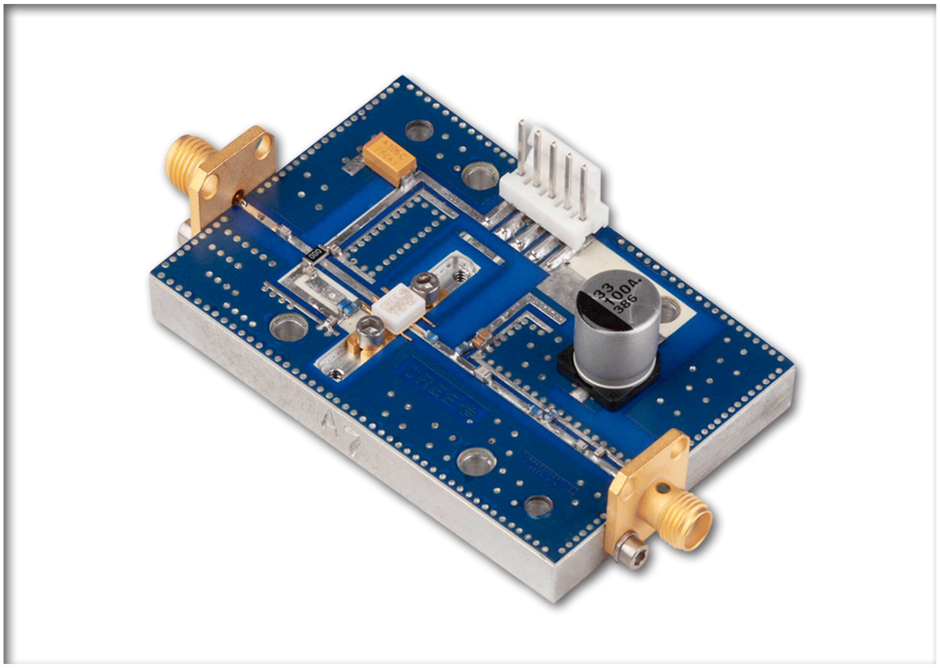
CMPA0527005F-AMP1 Application Circuit Bill of Materials

Designator	Description	Qty
C1	CAP, 33PF, 5%, 0603, ATC	1
C2, C6, C9	CAP, 100PF, 5%, 0603, ATC	3
C3	CAP, 3PF, 5%, 0805, ATC	1
C4	CAP, 12PF, 5%, 0603, ATC	1
C5	CAP, 0.3pF, 5%, 0603, ATC	1
C7	CAP, 470pF, 5%, 0603,100V. X7R	1
C8	CAP, 33000pF, 0805,100V,X7R	1
R1	RES, 1/16W, 1206, 1%, 0 Ohms	1
L1,L2,L5	INDUCTOR,CHIP,1.6nH,0603CS SMT	3
L3	INDUCTOR,CHIP,4.3nH,0603CS SMT	1
L4	INDUCTOR,CHIP,15nH,0603HP SMT	1
L6	INDUCTOR,CHIP,12nH,0603CS SMT	1
Q1	CMPA0527005F	1
	PCB, RO4350, CMPA0527005F Applications Boad, 1.7" X 2.6"X0.02”	1
	BASEPLATE, AL, 2.60 X 1.7 X 0.25	1
	2-56 SOC HD SCREW 1/4 SS	4
	#2 SPLIT LOCKWASHER SS	4
J1,J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20MIL	2
J3	HEADER RT>PLZ .1CEN LK 5POS	1

CMPA0527005F-AMP1 Demonstration Amplifier Circuit



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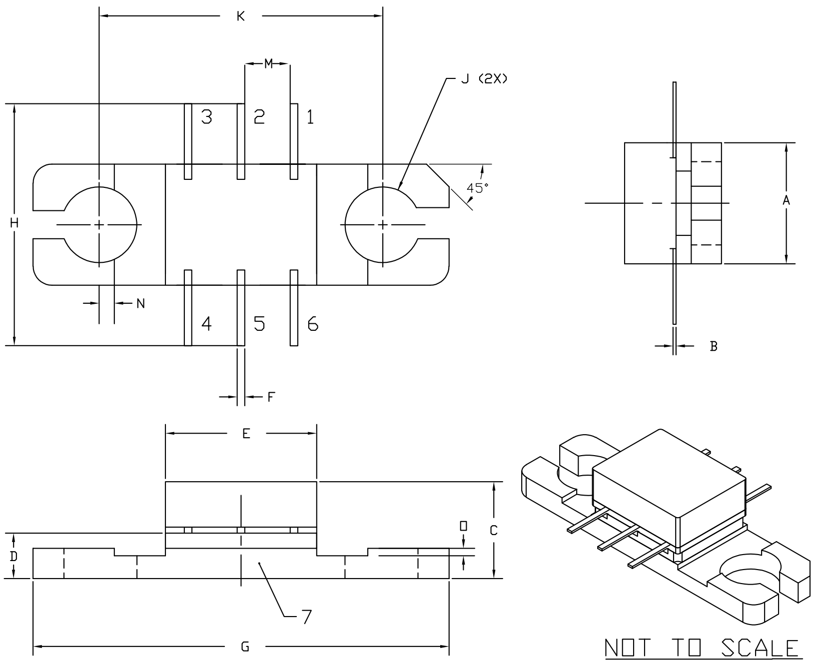
Product Dimensions CMPA0527005F (Package Type — 440221)



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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.155	0.165	3.94	4.19
B	0.003	0.005	0.076	0.127
C	0.118	0.138	3.00	3.50
D	0.055	0.065	1.40	1.65
E	0.195	0.205	4.95	5.21
F	0.009	0.011	0.23	0.28
G	0.545	0.555	13.84	14.09
H	0.280	0.360	7.11	9.14
J	ø .100		2.54	
K	0.375		9.53	
M	0.061		1.54	
N	0.46	0.56	11.684	14.224
O	0.20	0.30	5.08	7.62

7

PIN	
1	Gate Bias
2	RF_{IN}
3	NC
4	NC
5	RF_{OUT} + Drain Bias
6	NC
7	Source

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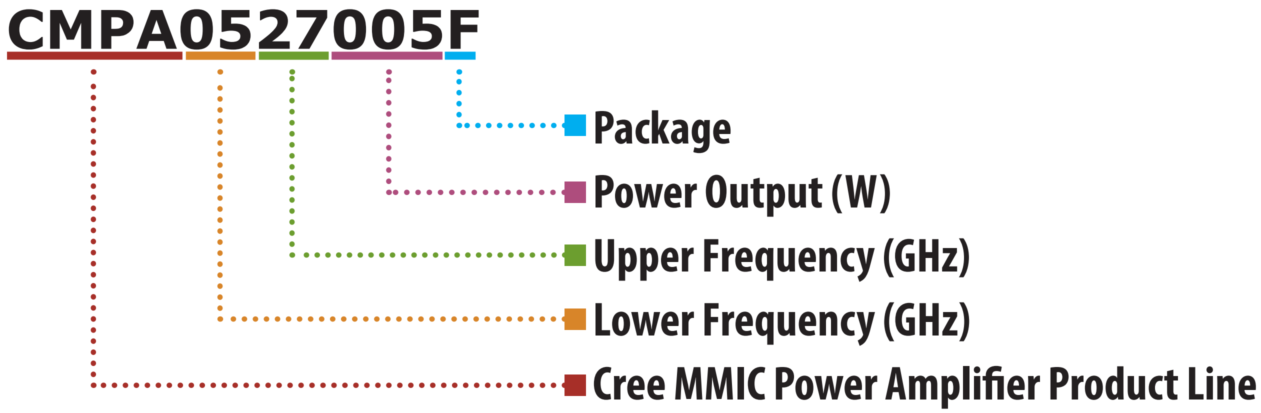
Part Number System



Parameter	Value	Units
Upper Frequency[1]	2.7	GHz
Power Output	5	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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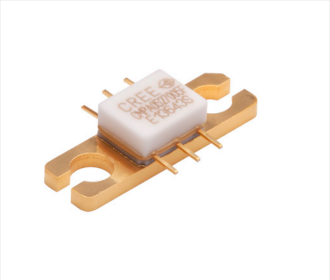
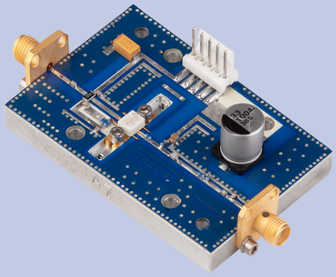
Product Ordering Information

Order Number	Description	Unit of Measure	Image
CMPA0527005F	GaN HEMT	Each	
CMPA0527005F-AMP1	Test board with GaN HEMT (flanged) installed	Each	

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