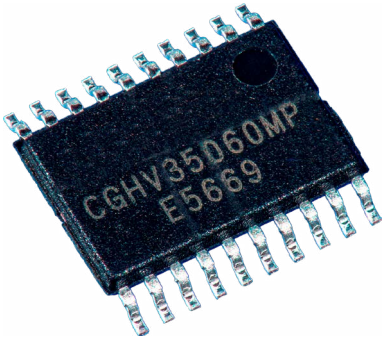
CGHV35060MP

60 W, 2700-3800 MHz, 50 V GaN HEMT for S-Band Radar and LTE Base Stations



PN: CGHV35060MP

Description

CGHV35060MP is a 60 W input matched, gallium nitride (GaN) high electron mobility transistor (HEMT) optimized for S-Band performance. The CGHV35060MP is suitable for typical bands of 2.7-3.1 GHz and 3.1-3.5 GHz while the input matched transistor provides optimal gain, power and efficiency in a small 6.5mm x 4.4mm plastic surface mount (SMT) package. The typical performance plots in the datasheet are derived with CGHV35060MP matched into a 3.1-3.5 GHz high power amplifier.

Typical Performance Over 3.1 - 3.5 GHz (T_C = 25°C) of Demonstration Amplifier

Parameter	3.1 GHz	3.3 GHz	3.5 GHz	Units
Gain	14.5	14.3	13.8	dB
Output Power	88	88	75	W
Drain Efficiency	61	67	64	%

Note: Measured in the CGHV35060MP-AMP1 amplifier circuit, under 100µs pulse width, 10% duty cycle, P_{IN} = 35 dBm

Features

- Reference design amplifier 3.1 - 3.5 GHz
- 75W Typical output power
- 14.5 dB power gain
- 67% Drain efficiency
- Internally pre-matched on input, unmatched output

Large Signal Models Available for ADS and MWO

RoHS compliant

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Rev. 2.4, 2022-12-2

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

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	V_{DSS}	150	V	25°C
Gate-to-Source Voltage	V_{GS}	-10, +2		
Storage Temperature	T_{STG}	-65, +150	°C	
Operating Junction Temperature	T_J	225		
Maximum Forward Gate Current	I_{GMAX}	10.4	mA	25°C
Maximum Drain Current[1]	I_{DMAX}	6.3	A	
Soldering Temperature[2]	T_S	245	°C	
CW Thermal Resistance, Junction to Case[3]	$R_{\theta JC}$	2.6	°C/W	85°C, P_{DISS} = 52 W
Pulsed Thermal Resistance, Junction to Case		1.95		85°C, P_{DISS} = 62 W, 100µsec 10%
Case Operating Temperature[4]	T_C	-40, +107	°C	CW

Notes:
[1] Current limit for long term, reliable operation
[2] Refer to the Application Note on soldering
[3] Measured for the CGHV35060MP
[4] See also, the Power Dissipation De-rating Curve on Page 6

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 = 10.4 mA
Gate Quiescent Voltage	$V_{GS(Q)}$	–	-2.7	–		V_{DS} = 50 V, I_D = 125 mA
Saturated Drain Current[2]	I_{DS}	8.4	10.4	–	A	V_{DS} = 6.0 V, V_{GS} = 2.0 V
Drain-Source Breakdown Voltage	V_{BR}	125	–	–	V_{DC}	V_{GS} = -8 V, I_D = 10.4 mA
RF Characteristics[4] (T_C = 25°C, F_0 = 3.225 GHz unless otherwise noted)						
Saturated Output Power[3,6]	P_{SAT}	55	75	–	W	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{IN} = 34.5 dBm
Pulsed Drain Efficiency[3,6]	η	46	59.1	–	%	
Gain[3,6]	G	14.35	16.3	–	dB	V_{DD} = 50 V, I_{DQ} = 125 mA, P_{IN} = 10 dBm
Output Mismatch Stress[3]	VSWR	–	–	10:1	Ψ	No damage at all phase angles, V_{DD} = 50 V, I_{DQ} = 125 mA, P_{OUT} = 60 W Pulsed
Dynamic Characteristics						
Input Capacitance[5]	C_{GS}	–	32.16	–	pF	V_{DS} = 50 V, V_{GS} = -8 V, ƒ = 1 MHz
Output Capacitance[5]	C_{DS}	–	4.4	–		
Feedback Capacitance	C_{GD}	–	0.5	–		

Notes:
[1] Measured on wafer prior to packaging
[2] Scaled from PCM data
[3] Pulse Width = 100µs, Duty Cycle = 10%
[4] Measured in CGHV35060MP high volume test fixture
[5] Includes package
[6] Includes offsets correlating data taken in high volume test fixture to data taken in application circuit with device soldered down

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Typical Performance

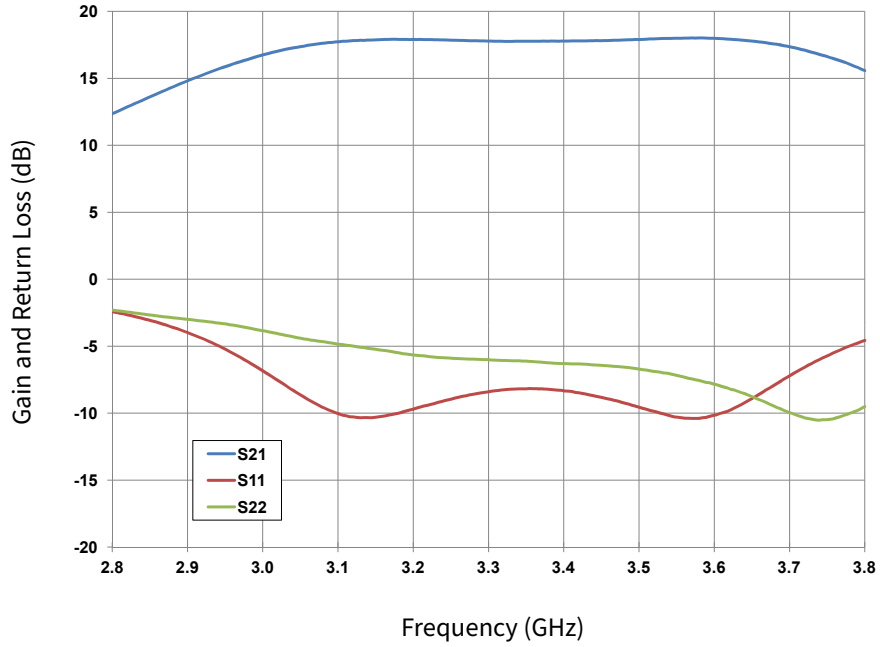

Figure 1. Small Signal Gain and Return Losses vs Frequency
Measured in Demonstration Amplifier Circuit CGHV35060MP-AMP1

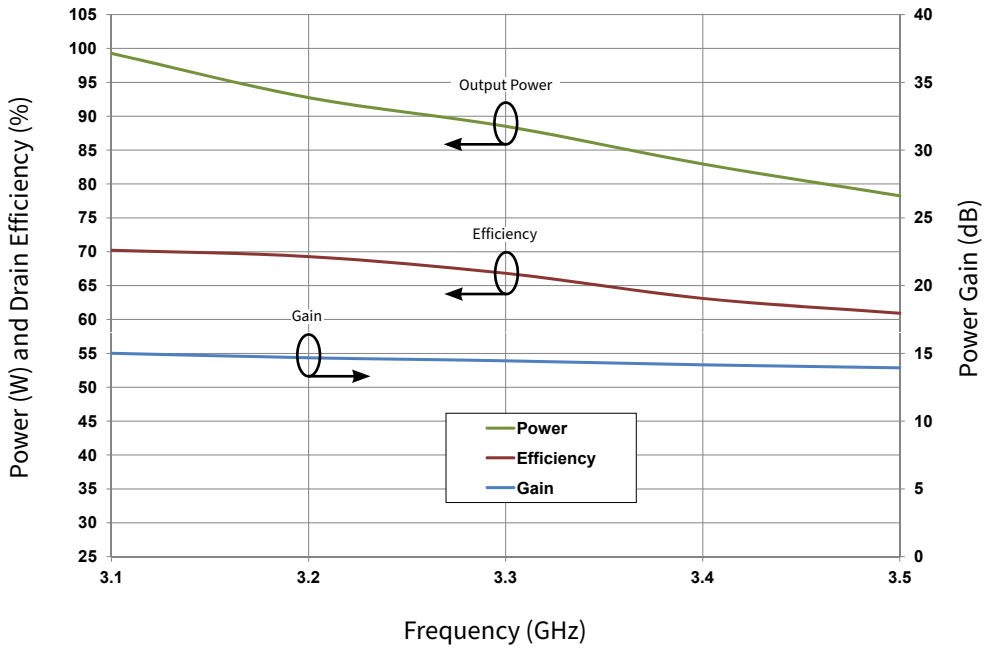

Figure 2. Gain, Efficiency & Output Power vs Frequency
V_{DD} = 50 V I_{DQ} = 125 mA, Pulse Width = 100µs, Duty Cycle = 10%, T_{CASE} = 25°C

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Typical Performance

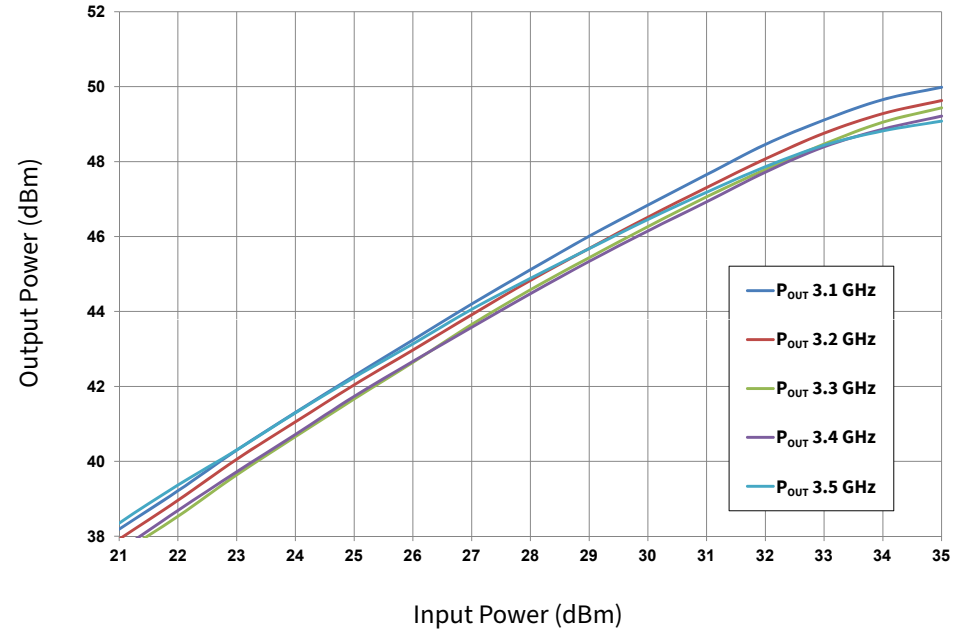

Figure 3. CGHV35060MP-AMP1 Output Power vs. Input Power
V_{DD} = 50 V I_{DQ} = 125 mA, Pulse Width = 100µs, Duty Cycle = 10%, T_{CASE} = 25°C

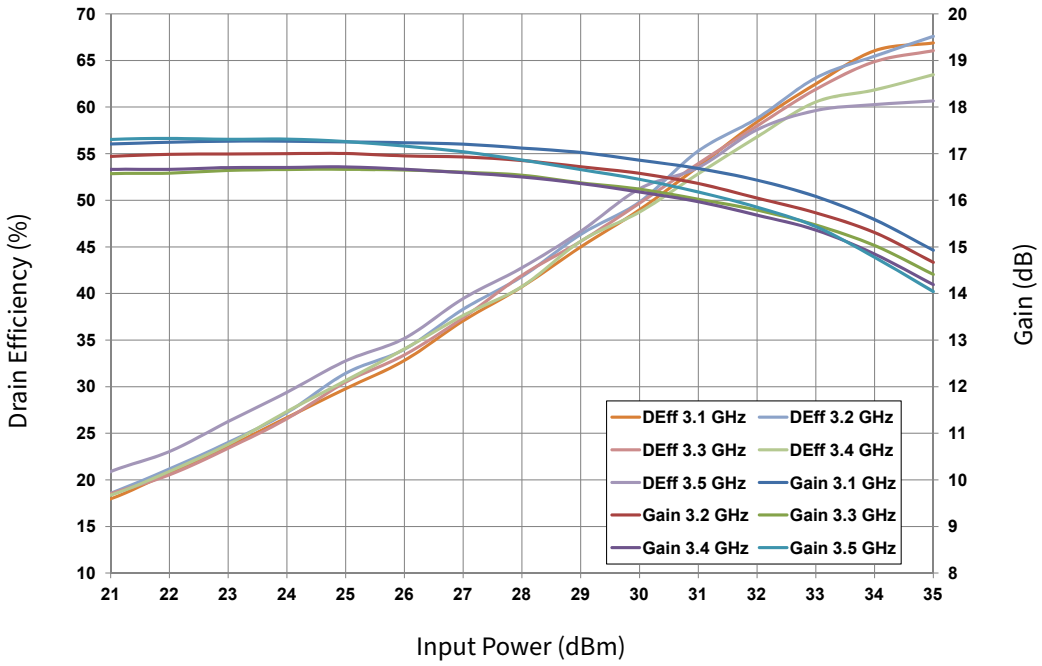

Figure 4. CGHV35060MP-AMP1 Gain & Efficiency vs Input Power
V_{DD} = 50 V I_{DQ} = 125 mA, Pulse Width = 100µs, Duty Cycle = 10%, T_{CASE} = 25°C

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Typical Performance

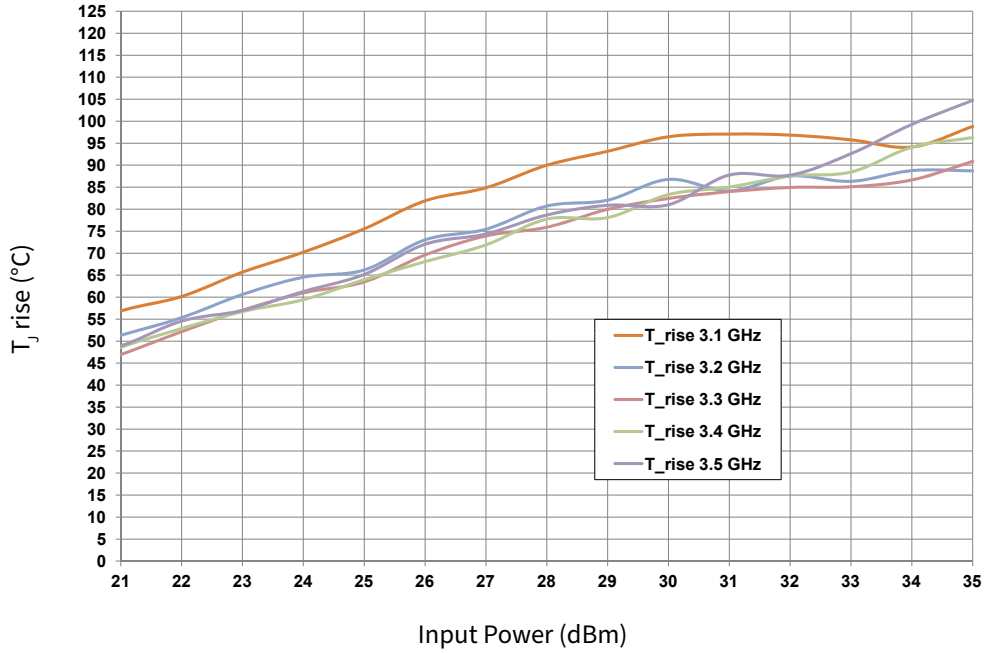

Figure 5. CGHV35060MP-AMP1 T_J rise vs. Input Power
V_{DD} = 50 V I_{DQ} = 125 mA, Pulse Width = 100µs, Duty Cycle = 10%, T_{CASE} = 25°C

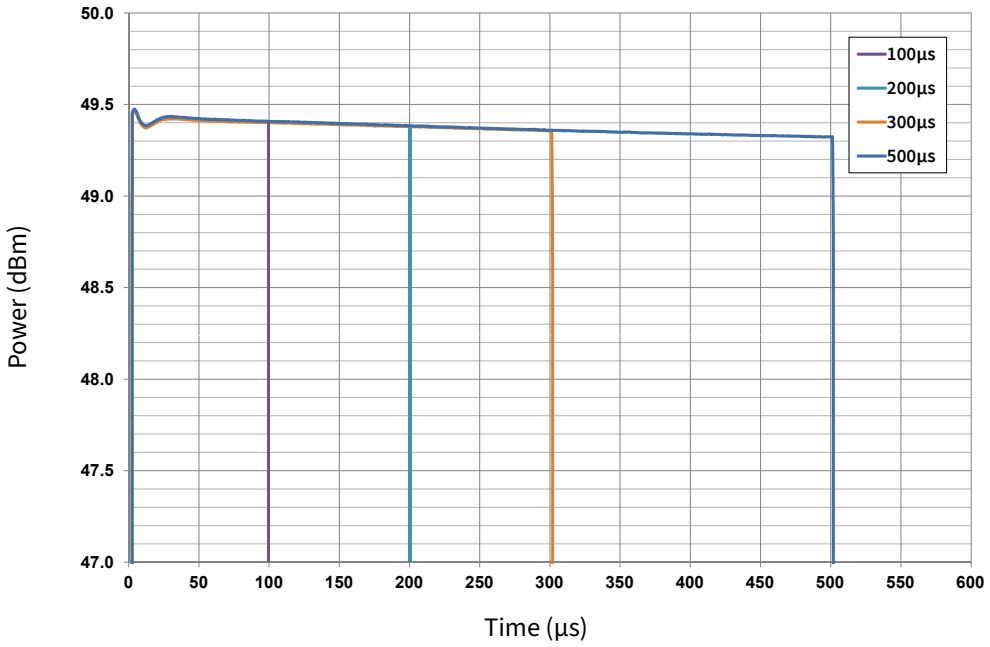

Figure 6. CGHV35060MP-AMP1 Output Power vs. Time, Varying Pulse Lengths
V_{DD} = 50 V P_{IN} = 35 dBm, Duty Cycle = 10%

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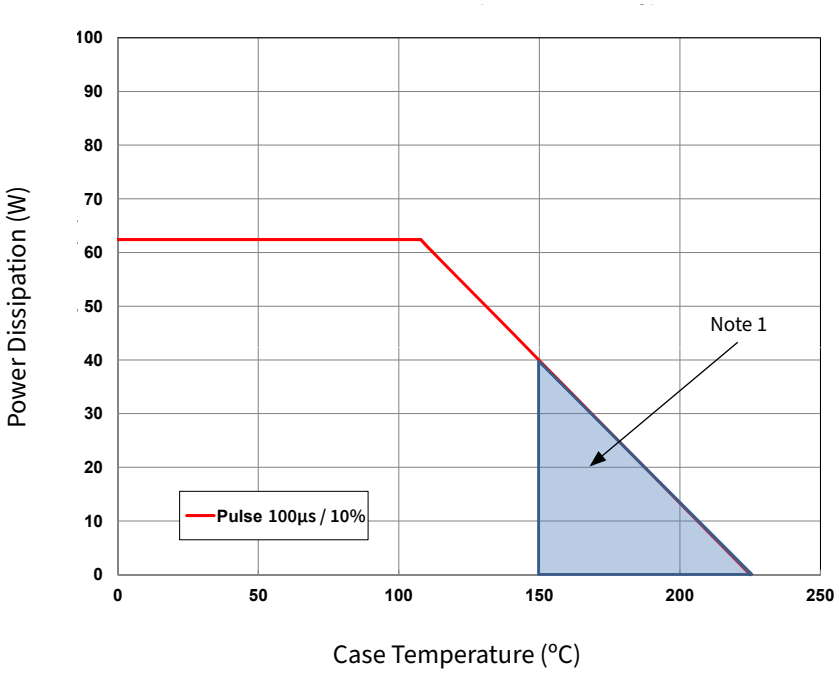
CGHV35060MP Power Dissipation De-rating Curve



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

CGHV35060MP-AMP1 Application Circuit Bill of Materials

Designator	Description	Qty
R1	RES,1/16W,0603,1%,150 OHMS	1
R20,R21	RES,1/16W,0603,1%,10.0 OHMS	2
C1	CAP, 2.2pF, +/-0.1pF, 0603, ATC	1
C2,C20-C30	CAP, 10.0pF, +/-5%, 0603, ATC	12
C3,C4	CAP, 1.3pF, +/-0.1pF, 0603, ATC	2
C11,C14	CAP, 0.7pF, +/-0.05pF, 0603, ATC	2
C13,C12	CAP, 0.9pF, +/-0.05 pF, 0603, ATC	2
C15,C16	CAP, 1.0pF, +/-0.05pF, 0603, ATC	2
C17	CAP, 0.1pF, +/-0.05pF, 0603, ATC	1
C41,C42,C43	CAP CER 2.2µF 100V 10% X7R 1210	3
C51,C53	CAP CER 10µF 100V 20% X7S 2220	2
C61	CAP, 33µF, 20%, G CASE, 100V	1
J1,J2	SMA PANEL RECEPTACLE JACK	2
J3	HEADER RT>PLZ .1CEN LK 5POS	1
	Cu BASEPLATE 2.6 x 1.7 x 0.25” WITH PEDESTAL FOR GULLWING eTSSOP	1
	PCB, TEST FIXTURE, RO4350, .020 THK, CGHV35060MP	1
	2-56 SOC HD SCREW 1/4 SS	4
	#2 SPLIT LOCKWASHER SS	4
	PREFORM, eTSSOP, 0.174 x 0.130 x 0.005	1
Q1	60W, GaN HEMT TSSOP 20L, 2.7 -3.5GHz, 50V PLASTIC, "CGHV35060MP"	1

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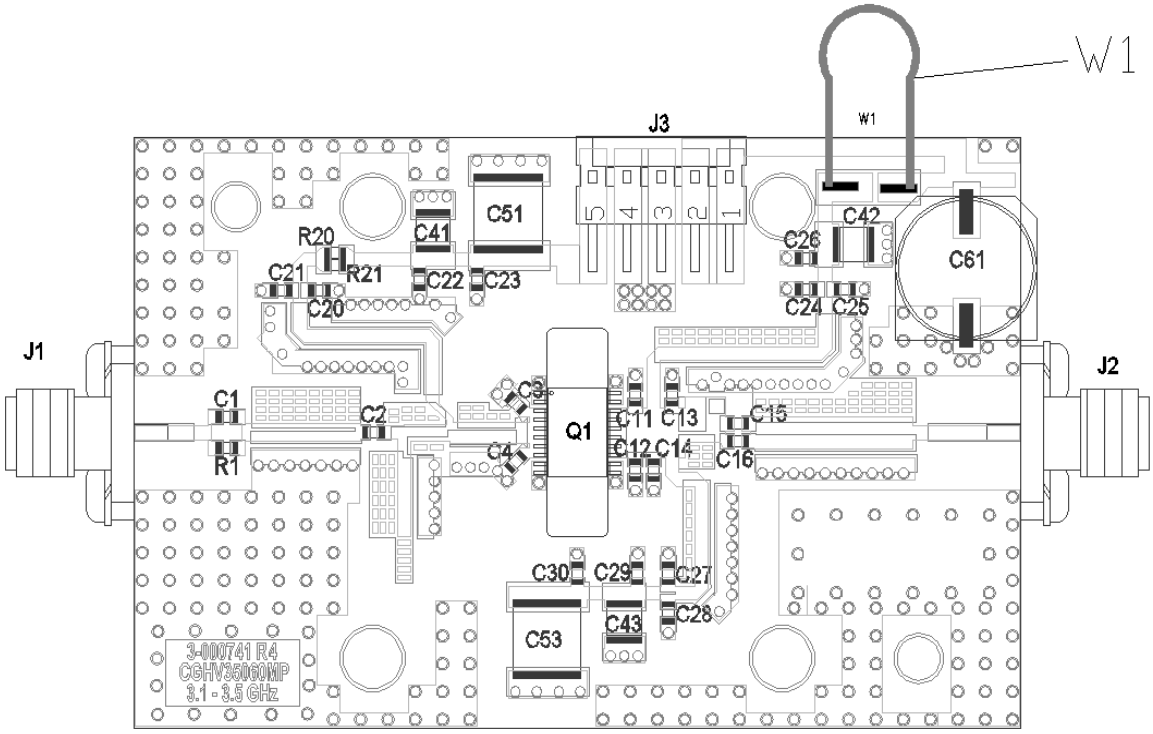
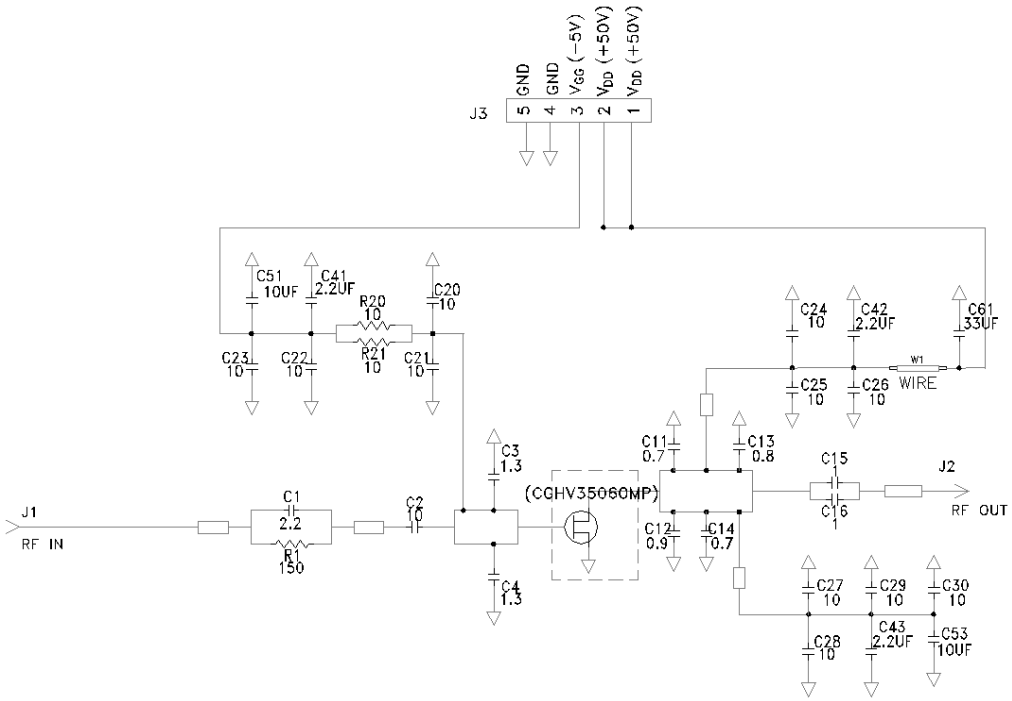
CGHV35060MP-AMP1 Application Circuit Outline



CGHV35060MP-AMP1 Application Circuit Schematic



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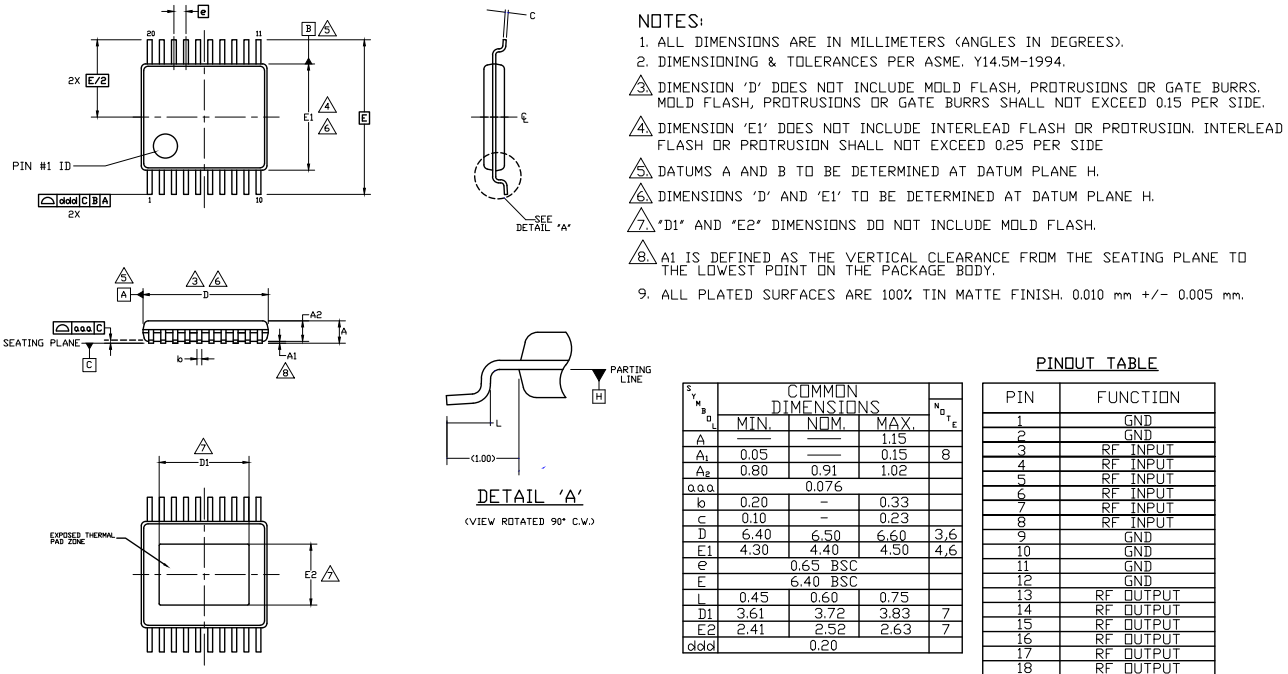
Product Dimensions CGHV35060MP (4.4 mm TSSOP 20-Lead Package)



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING & TOLERANCES PER ASME. Y14.5M-1994.
3. DIMENSION 'D' DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.
4. DIMENSION 'E1' DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 PER SIDE
5. DATUMS A AND B TO BE DETERMINED AT DATUM PLANE H.
6. DIMENSIONS 'D' AND 'E1' TO BE DETERMINED AT DATUM PLANE H.
7. "D1" AND "E2" DIMENSIONS DO NOT INCLUDE MOLD FLASH.
8. A1 IS DEFINED AS THE VERTICAL CLEARANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
9. ALL PLATED SURFACES ARE 100% TIN MATTE FINISH. 0.010 mm +/- 0.005 mm.

SYMBOL	COMMON DIMENSIONS			NOTE
	MIN.	NOM.	MAX.	
A	——	——	1.15	
A_1	0.05	——	0.15	8
A_2	0.80	0.91	1.02	
aaa		0.076		
b	0.20	–	0.33	
c	0.10	–	0.23	
D	6.40	6.50	6.60	3,6
E1	4.30	4.40	4.50	4,6
e		0.65 BSC		
E		6.40 BSC		
L	0.45	0.60	0.75	
D1	3.61	3.72	3.83	7
E2	2.41	2.52	2.63	7
ddd		0.20		

PINOUT TABLE

PIN	FUNCTION
1	GND
2	GND
3	RF INPUT
4	RF INPUT
5	RF INPUT
6	RF INPUT
7	RF INPUT
8	RF INPUT
9	GND
10	GND
11	GND
12	GND
13	RF OUTPUT
14	RF OUTPUT
15	RF OUTPUT
16	RF OUTPUT
17	RF OUTPUT
18	RF OUTPUT
19	GND
20	GND

Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Class	Classification Level	Test Methodology
Human Body Model	HBM	TBD	ANSI/ESDA/JEDEC JS-001 Table 3	JEDEC JESD22 A114-D
Charge Device Model	CDM	TBD	ANSI/ESDA/JEDEC JS-002 Table 3	JEDEC JESD22 C101-C

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Part Number System

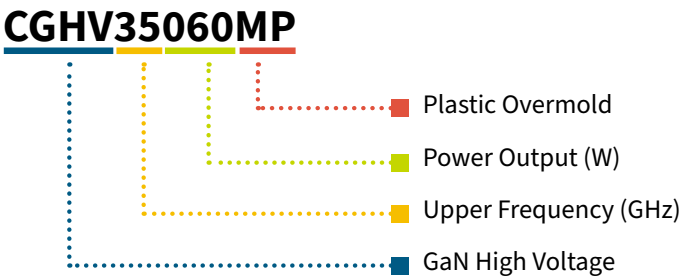

Table 1.

Parameter	Value	Units
Upper Frequency[1]	3.5	GHz
Power Output	60	W
Package	MP	–

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

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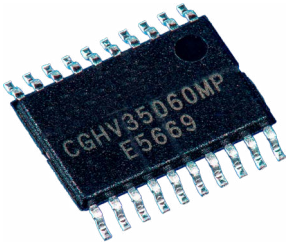
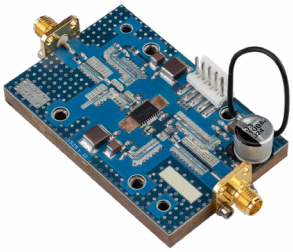
Product Ordering Information

Order Number	Description	Unit of Measure	Image
CGHV35060MP	GaN HEMT	Each	
CGHV35060MP-AMP1	Test board with GaN HEMT installed	Each	

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