

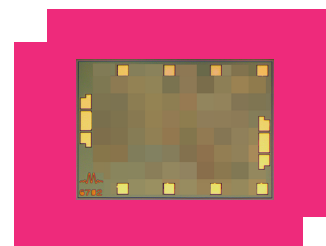
AMM-6702CH

20-55 GHz GaAs LO Driver Amplifier

DEVICE OVERVIEW

General Description

The AMM-6702 is a broadband MMIC LO buffer amplifier that efficiently provides high gain and output power over a 20-55 GHz frequency band. It is designed to provide a strong, flat output power response when driven with an input power at 0 dBm. It has built-in DC blocking capacitors on the input and output.



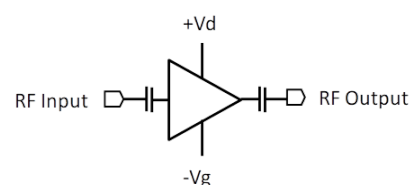
Features

- High 25+ dB gain
- Broadband performance
- +20 dBm output power
- 20%+ PAE
- 5V Single Supply Voltage Module

Applications

- Radar
- 5G transceivers
- Test and Measurement Equipment
- Optimal LO driver amp for Marki S-diode and H-diode mixers and millimeter-wave multipliers

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Packing Size	Green Status	Product Lifecycle	Export Classification
AMM-6702UC	20-55 GHz GaAs LO Driver Amplifier	UC	-	RoHS	Released	EAR99
AMM-6702UC5	20-55 GHz GaAs LO Driver Amplifier	UC5	-	RoHS	Released	EAR99
AMM-6702CH	20-55 GHz GaAs LO Driver Amplifier	CH	-	RoHS RoHS	Released	3A001.b.2.d

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Revision History

Revision Code	Revision Date	Comment
-	2018-10-01	Datasheet Initial Release
A	2019-01-01	AMM-6702UC Release, additional data
B	2019-02-01	Updated Export Classification
C	2019-03-01	Updated Module Production Specs
D	2019-08-01	Updated Module Production Specs
E	2019-09-01	Updated Absolute Maximum Ratings
F	2020-01-01	Added .s2p Files Link
G	2020-02-01	Updated Datasheet Format, Expanded Performance Plots, Expanded Electrical Specs, Added Sequencing Procedure, Added AMM-6702UC5 Package
H	2020-04-01	Updated AMM-6702UC5 Specs and Performance Plots
I	2020-06-01	Corrected AMM-6702UC Outline Drawing to include Ground Screw
J	2020-06-01	Updated Absolute Maximum Ratings
K	2020-07-01	Update AMM-6702UC5 Saturated Output Power Min Spec
L	2020-07-01	Revised Max Operating Temperature
M	2020-09-01	Updated Ground Pin Location on AMM 6702UC5 Module
N	2020-10-01	Updated Thermal Specs, Updated OIP3 Spec
O	2020-11-01	Updated Min Frequency Spec
P	2020-12-01	Updated Electrical Specifications Table

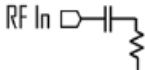
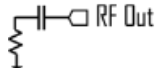
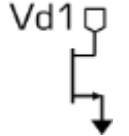
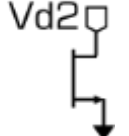
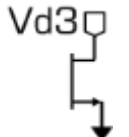
Port Configuration and Functions

Port Diagram

A top-down view of the AMM-6702CH's outline drawing is shown below. The port functions are detailed in section 2.2 of this datasheet.



Port Functions

Port	Function	Description	Equivalent Circuit for Package
GND	Ground	Bottom side must be connected to a DC/RF ground potential with high thermal and electrical conductivity.	
RF In	RF Input	This is the RF Input port of the amplifier die. It is internally DC blocked and RF matched to 50 Ω . RF input pad is GSG with 150 μm pitch.	
RF Out	RF Output	This is the RF Output port of the amplifier die. It is internally DC blocked and RF matched to 50 Ω . RF output pad is GSG with 150 μm pitch.	
Vd1	Drain Supply Port 1	Pad Vd1 supplies drain voltage to the first stage of the 4-stage amplifier IC. Apply gate voltage Vg before applying drain voltage.	
Vd2	Drain Supply Port 2	Pad Vd2 supplies drain voltage to the second stage of the 4-stage amplifier IC. Apply gate voltage Vg before applying drain voltage.	
Vd3	Drain Supply Port 3	Pad Vd3 supplies drain voltage to the third stage of the 4-stage amplifier IC. Apply gate voltage Vg before applying drain voltage.	
Vd4	Drain Supply Port 4	Pad Vd3 supplies drain voltage to the fourth stage of the 4-stage amplifier IC. Apply gate voltage Vg before applying drain voltage.	
Vg1-4	Gate Supply Voltage Pads	The Vg pads are connected resistively on chip. The user should apply between -0.4V and -0.6V to any one of the 4 Vg pads before applying positive DC voltage to any Vd port. Lower (more negative) voltages on a Vg pad will result in lower drain current and lower small signal gain.	

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Unit
Continuous Power Dissipation (PDISS)	824	mW
Maximum Operating Temperature	85	°C
Maximum Storage Temperature	150	°C
Max Junction Temperature for MTTF > 1E6 Hours	175	°C
Minimum Operating Temperature	-40	°C
Minimum Storage Temperature	-65	°C
Negative Bias Current (Pin 4)	10	μA
Positive Bias Current (Pin1)	400	mA
Positive Bias Current (Pin1)	400	mA
Positive Bias Voltage (Pin1)	4.5	V
RF Input Power	22	dBm
Thermal Resistance, θJC	90	°C/W

Package Information

Parameter	Details	Rating
ESD	< 250 Volts	HBM Class 0
Dimensions	-	1.72x1.23 mm

Recommended Operating Conditions

The Recommended Operating Conditions indicate the limits, inside which the device should be operated, to guarantee the performance given in Electrical Specifications (3.5). Operating outside these limits may not necessarily cause damage to the device, but the performance may degrade outside the limits of the Electrical Specifications. For limits, above which damage may occur, see Absolute Maximum Ratings.

Parameter	Min	Nominal	Max	Unit
Negative DC Voltage	-0.4	-0.5	-0.6	V
Positive DC Current	100	180	350	mA
Ambient Temperature	-55	25	85	°C
Positive DC Voltage	2	3.5	4	V

Sequencing Requirements

Turn-on Procedure:

1. Apply <-0.4V to Vg (Pin 4)
2. Apply Vd (Pin 1)

Turn-off Procedure:

1. Turn off Vd (Pin 1)
2. Turn off Vg (Pin 4)

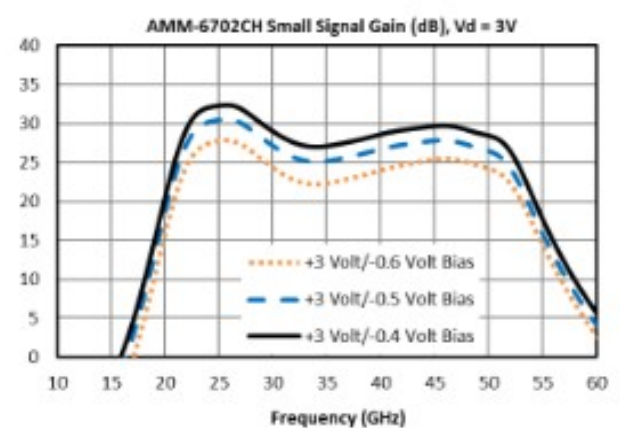
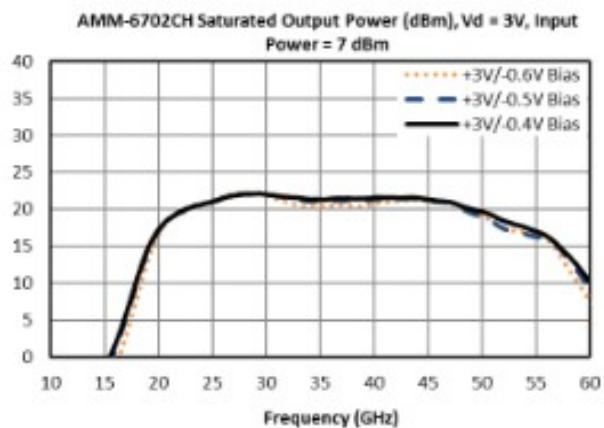
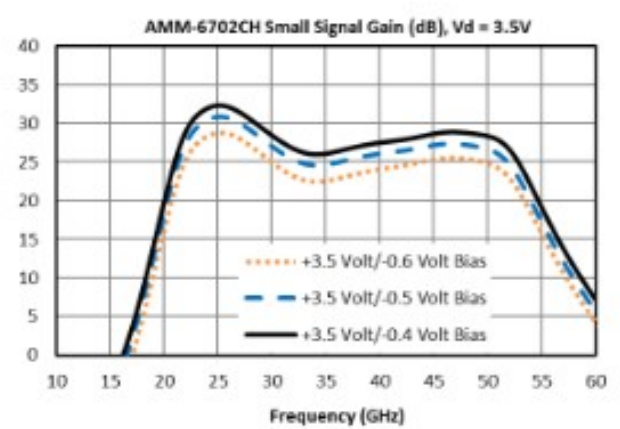
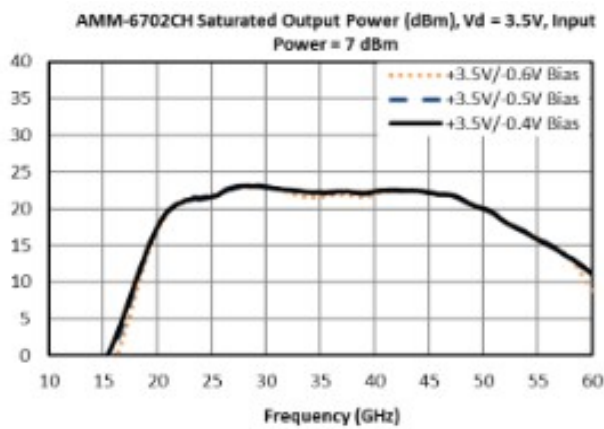
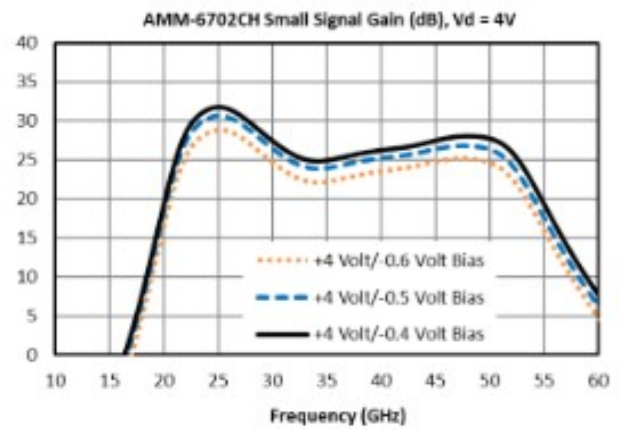
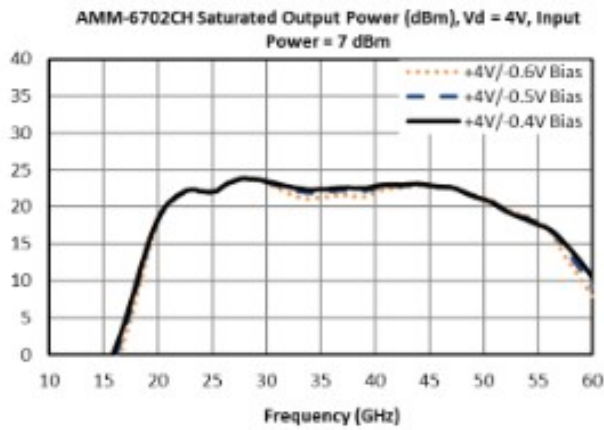
Electrical Specifications

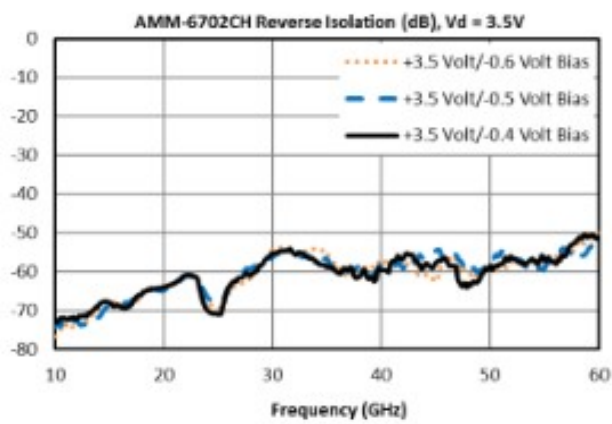
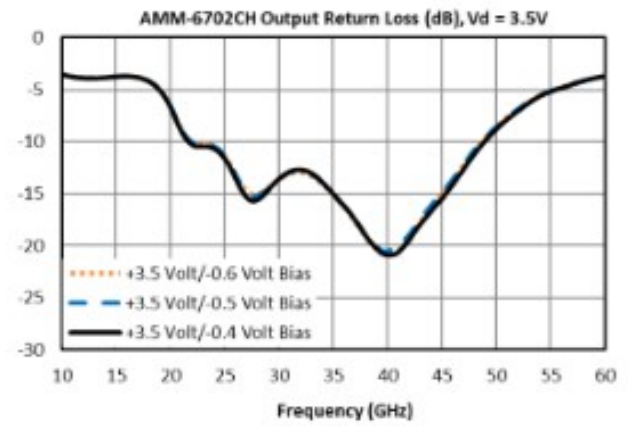
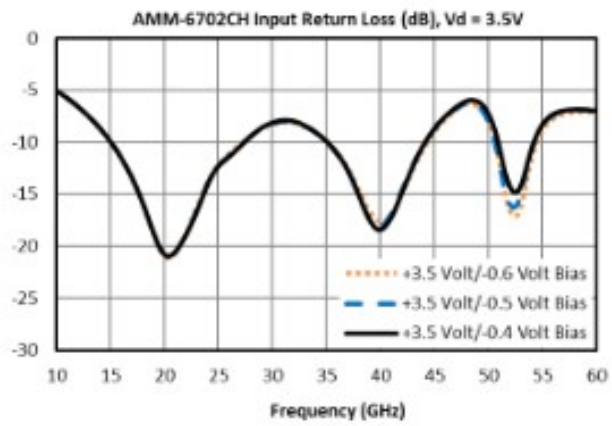
The electrical specifications apply at TA=+25°C in a 50Ω system. Min and Max limits apply only to our connectorized units and are guaranteed at TA=+25°C.

Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Small Signal Gain	3.0V/-0.5V Bias	21	55	-	24	-	dB
Small Signal Gain	3.0V/-0.5V Bias	21	25	-	25	-	dB
Small Signal Gain	4.0V/-0.5V Bias	21	55	-	23	-	dB
Small Signal Gain	3.0V/-0.5V Bias	25	48	20	24	-	dB
Small Signal Gain	3.0V/-0.5V Bias	48	55	-	22	-	dB
Noise Figure	3.5V/-0.5V bias, 25 dBm Input Power	21	55	-	6.5	-	dB
Saturated Output Power	3.0V/-0.5V Bias	21	55	-	19	-	dBm
Saturated Output Power	3.5V/-0.5V Bias	21	25	-	20	-	dBm
Saturated Output Power	4.0V/-0.5V Bias	21	55	-	20	-	dBm
Saturated Output Power	3.5V/-0.5V Bias	25	48	17	21	-	dBm
Saturated Output Power	3.5V/-0.5V Bias	48	55	-	17	-	dBm
Output IP3	3.5V/-0.5V bias, -25 dBm Input Power	21	55	-	27	-	dBm
Input IP3	3.5V/-0.5V bias, -25 dBm Input Power	21	55	-	3	-	dBm
P1dB	3.5V/-0.5V bias	21	55	-	14.8	-	dBm
Input Return Loss	3.5V/-0.5V bias, 25 dBm Input Power	21	55	-	8	-	dB
Output Return Loss	3.5V/-0.5V bias, 25 dBm Input Power	21	55	-	9	-	dB
Reverse Isolation	3.5V/-0.5V bias, 25 dBm Input Power	21	55	-	45	-	dB
Input Power for Saturation	3.5V/-0.5V bias	21	55	-	3	-	dBm
Bias Requirements ¹	3.5V/-0.4V	-	-	-	228	-	mA
Bias Requirements ²	3.5V/-0.5V	-	-	-	180	-	mA
Bias Requirements ³	3.5V/-0.6V	-	-	-	130	-	mA

[1][2][3] Bias conditions tested with no RF input power. See section 3.6 for DC current vs. RF power

Typical Performance Plots





Application Information

Example AMM-6702CH Application Circuit

Below is an example application circuit for the AMM-6702CH. It is particularly important to use sufficient external capacitance on the Vd pads to prevent potential feedback oscillations from occurring. We have found that adding some small (10 Ω) shunt resistance as shown in the application circuit diagram creates very reliable operation.

Since the amplifier IC has very high gain, it is possible for positive radiative feedback to occur between the wire bonds on the RF traces and the power supply network. We have observed that the most effective ways to protect against radiative feedback oscillations is to epoxy ferritic absorber material near the input and output traces and to avoid mounting the chip inside of an extremely small cavity. Email support@markimicrowave.com for any additional questions and assistance in avoiding oscillations in the AMM-6702CH in your specific application.

Parts List:

- A: Tecdia 0.030"x0.030" 150 pF capacitor
- B: CMS151Z2NC-CK
- C: Presidio 0.1 μ F + 1800 pF capacitor
- D: MVB4080X104ZGK5R3

Application Circuit Description

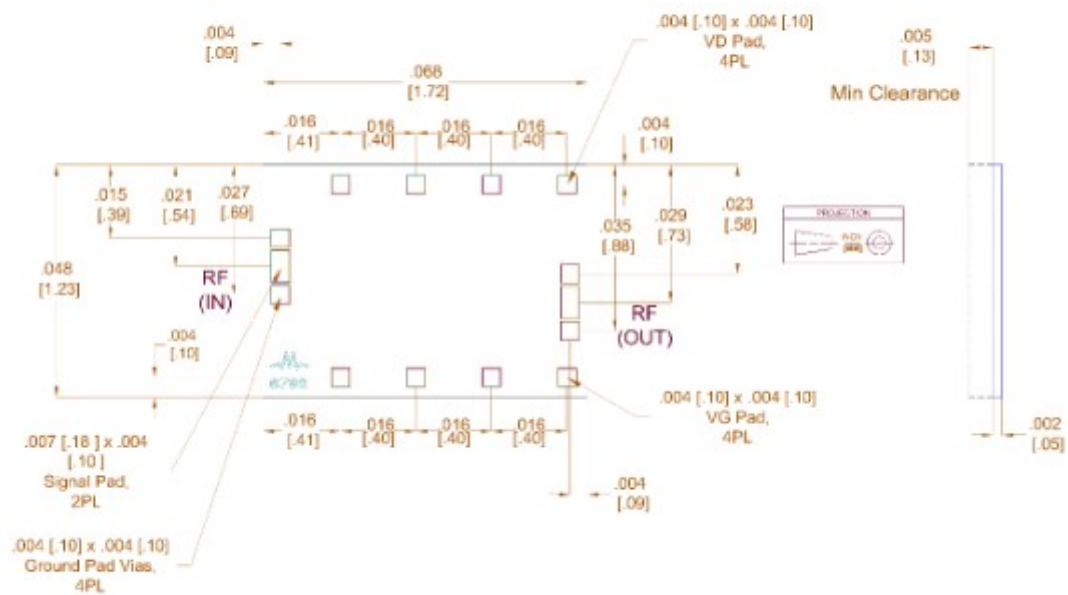
The AMM-6702 has a potential oscillation if driven between -10 dBm and -8 dBm with a frequency between 22 GHz and 27 GHz with a V_d higher than 3.3V. If your application or frequency plan requires this specific condition, we advise that the user either reduce V_d or add an attenuator or pre-driver to the input to change the input power presented to the amplifier. The most stable condition to run this amplifier is in compression with at least 0 dBm to 5 dBm of input power.

AMM-6702CH

20-55 GHz GaAs LO Driver Amplifier

Mechanical Data

Outline Drawing



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