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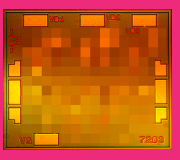
AMM-7203CH

30 GHz – 60 GHz Low Noise Amplifier

DEVICE OVERVIEW

General Description

The AMM-7203 is a broadband MMIC low noise amplifier that efficiently provides low noise figure and return losses in the 30-60 GHz frequency band. It is designed to provide less than 5 dB noise figure with greater than 10 dB gain at <200 mW DC power consumption. It has built-in DC blocking capacitors on the input and output.



[Download s-parameters here]

Features

- 4dB Noise Figure
- Broadband Performance
- 100-200mW DC Power Consumption
- Low Return Losses
- Small Die size

Applications

- Mobile test and measurement equipment
- Radar and satellite communications
- 5G Transceivers

Functional Block Diagram

N/A

Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
AMM-7203CH	30 GHz – 60 GHz Low Noise Amplifier	CH	REACH RoHS	Released	3A001.b.2.d

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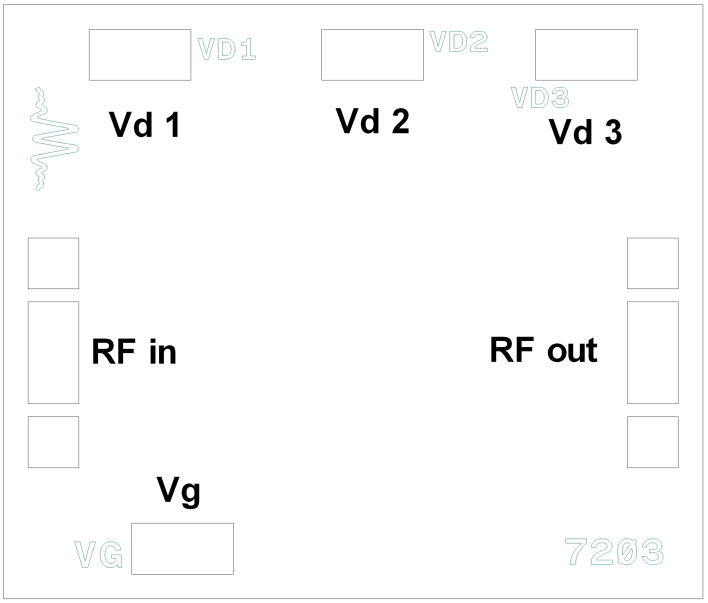
Revision History

Revision Code	Revision Date	Comment
-	2021-05-01	Datasheet Initial Release
A	2026-02-13	MTTF Table Added.

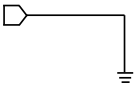
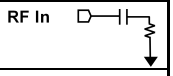
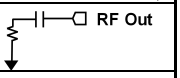
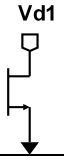
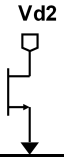
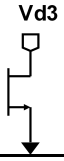
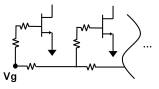
Port Configuration and Functions

Port Diagram

A port diagram of the AMM-7203CH is shown below.



Port Functions

Port	Function	Description	DC Equivalent Circuit
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 175 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 175 µm pitch.	
Vd1	Drain Supply Port 1	Pad Vd 1 supplies drain voltage to the first stage of the 3-stage amplifier IC. Apply gate voltage Vg before applying drain voltage.	
Vd2	Drain Supply Port 2	Pad Vd 2 supplies drain voltage to the second stage of the 3-stage amplifier IC. Apply gate voltage Vg before applying drain voltage.	
Vd3	Drain Supply Port 3	Pad Vd 3 supplies drain voltage to the third stage of the 3-stage amplifier IC. Apply gate voltage Vg before applying drain voltage.	
Vg	Gate Bias Voltage Pad	The Vg pad is connected resistively on chip. The user should apply between 0.4V and -0.6V to Vg pad 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 become inoperable or have a reduced lifetime. This amplifier is designed and characterized in a 50Ω system, and operation in a reflective environment can cause performance degradation.

Parameter	Maximum Rating	Unit
Continuous Power Dissipation (PDISS) (at 85 ˚C case temp.) [1]	760	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 Voltage (Vg)	-2	V
Positive Drain Supply Current (Id) (with RF Input)	200	dBm
Positive Drain Supply Voltage (Vd)	4.5	V
RF Input Power	20	dBm
Thermal Resistance, θJC	117	°C/W

[1] Derates by 8.5 mW/ ˚C above 85 ˚C case temperature.

FIT and MTTF Table

T (°C)	λ (TIF)	MTTF (hr)	MTTF (yr)
105	2,441.45	4.10E+05	47
85	310.48	3.22E+06	368
55	8.79	1.14E+08	12,992
25	0.12	8.24E+09	941,063

Package Information

Parameter	Details	Rating
Dimensions	-	1.38 x 1.17 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 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
Power Supply DC Voltage (Vd)	1.5	2	3	V
Power Supply DC Current (Id) (No RF Input)	45	80	125	mA
Negative Bias Voltage (Vg)	-0.6	-0.5	-0.4	V
Ambient Temperature	-40	25	85	°C

Power Supply DC current should be modified by changing bias voltage Vg to maintain junction temperature within MTTF target for given operating conditions.

Sequencing Requirements

Turn-on Procedure:
1. Apply negative bias to Vg
2. Apply Vd

Turn-off Procedure:
1. Turn off Vd
2. Turn off Vg

Note: RF input power can be injected at any moment in the bias sequencing procedure.

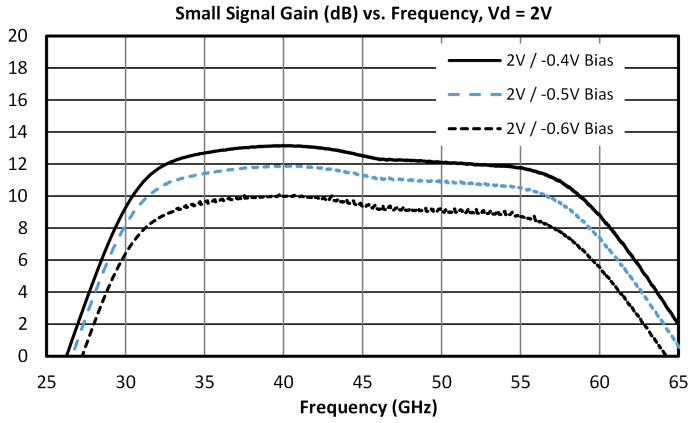
Electrical Specifications

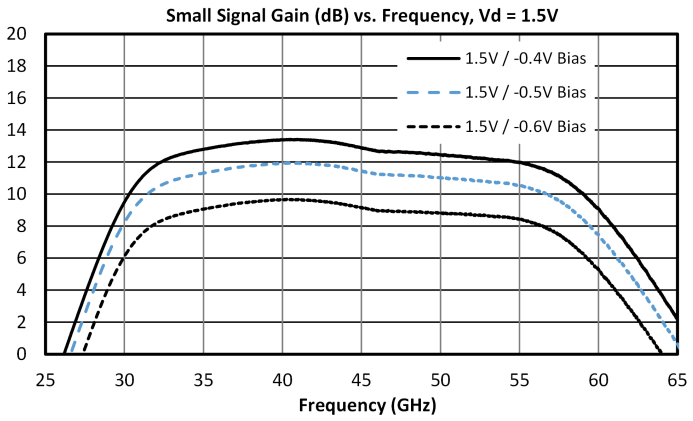
The electrical specifications apply at TA=+25°C in a 50Ω system. Min and Max limits apply only to our connectorized units and are guaranteed at TA=+25°C. Die are 100% DC tested and RF tested on a per lot basis

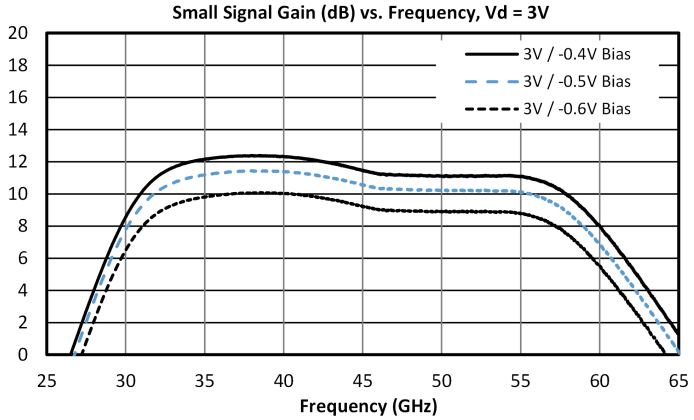
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Current Consumption [1]	1.5V/-0.6V	-	-	-	45	-	mA
Current Consumption [2]	2V/-0.5V	-	-	-	80	-	mA
Current Consumption [3]	3V/-0.5V	-	-	-	100	-	mA
Input IP3	2V/-0.5V, -20 dBm Input Power	30	60	-	10	-	dBm
Input Return Loss	2V/-0.5V Bias	30	60	-	14	-	dB
Noise Figure	1.5V/-0.6V Bias	30	55	-	4.2	-	dB
Noise Figure	2V/-0.5V Bias	30	55	-	4.4	-	dB
Noise Figure	3V/-0.5V Bias	30	55	-	4.8	-	dB
Output IP3	2V/-0.5V, -20 dBm Input Power	30	60	-	21	-	dBm
Output P1dB	2V/-0.5V Bias	30	60	-	11	-	dBm
Output Return Loss	2V/-0.5V Bias	30	60	-	17	-	dB
Reverse Isolation	2V/-0.5V Bias	30	60	-	45	-	dB
Saturated Output Power [4]	2V/-0.5V Bias	30	60	-	13	-	dBm
Saturated Output Power [5]	3V/-0.5V Bias	30	60	-	16	-	dBm
Small Signal Gain	1.5V/-0.6V Bias	30	60	-	9	-	dB
Small Signal Gain	2V/-0.5V Bias	30	35	-	10	-	dB
Small Signal Gain	2V/-0.5V Bias	53	60	-	9	-	dB
Small Signal Gain	2V/-0.5V Bias	35	53	8	11.5	-	dB
Small Signal Gain	3V/-0.5V Bias	30	60	-	10.5	-	dB

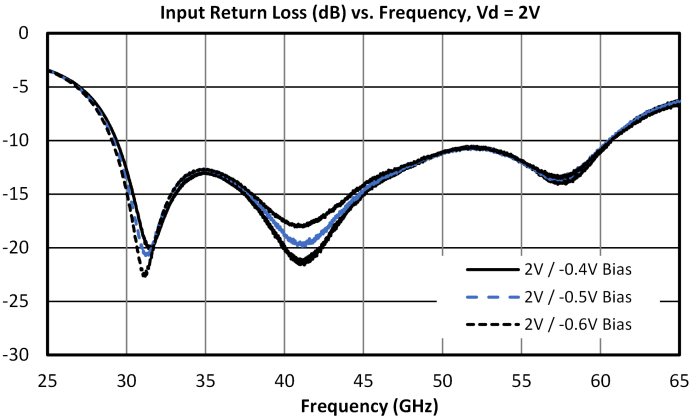
[1][2][3] Bias conditions tested with no RF input power. Bias conditions presented as Vd/Vg.
[4][5] Saturated Output Power specification defined using the AMM-7203UC P5dB compression curve shown in Typical Performance Plot

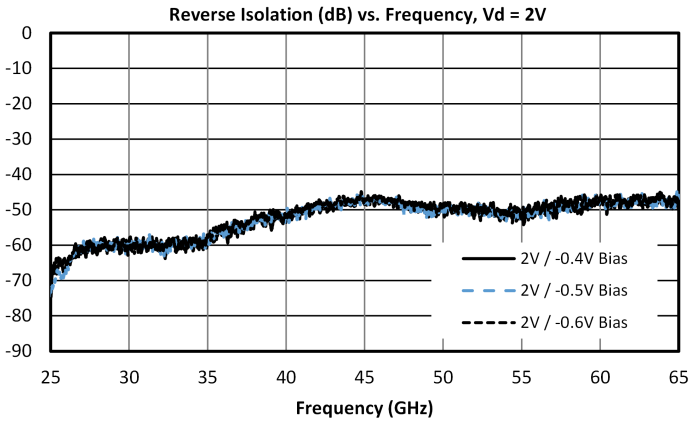
Typical Performance Plots

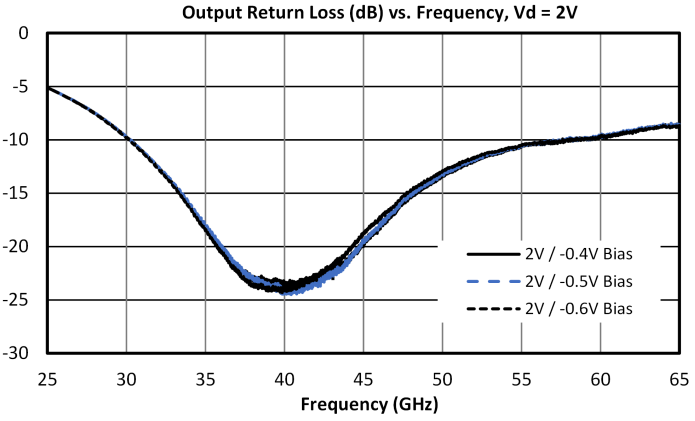






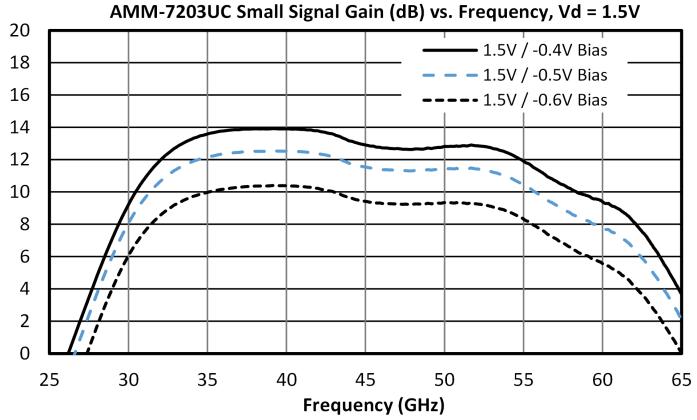




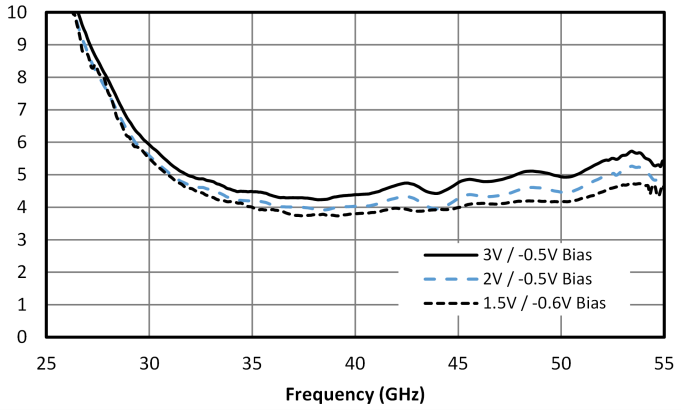


AMM-7203UC - AMM-7203UC Typical Performance Plots

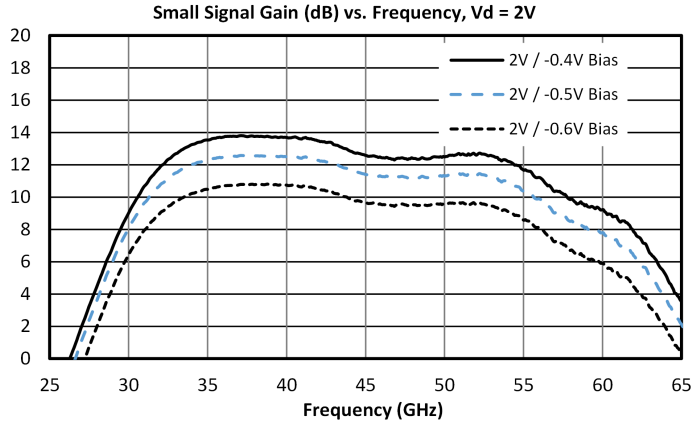
AMM-7203UC Small Signal Gain (dB) vs. Frequency, Vd = 1.5V



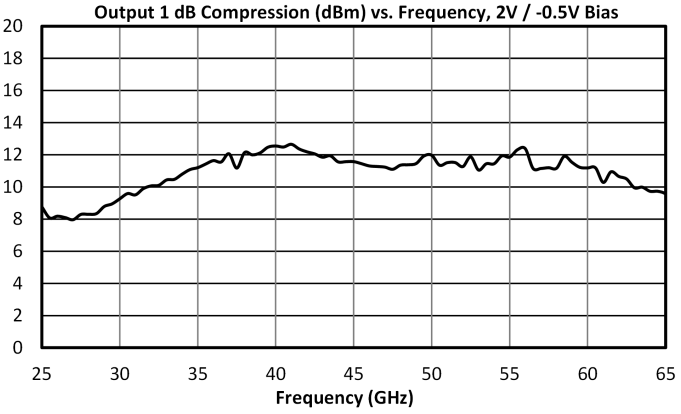
Noise Figure (dB) vs. Frequency



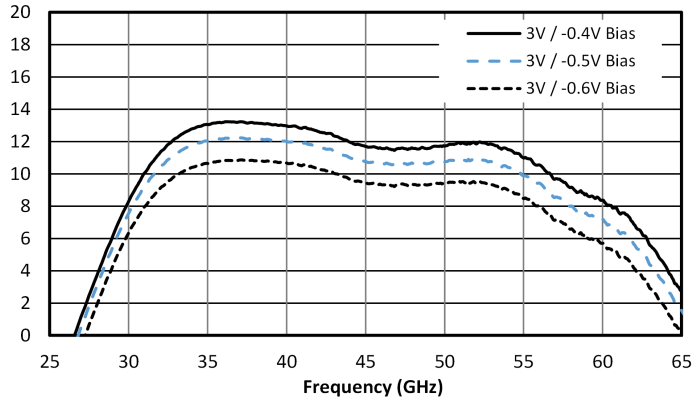
Small Signal Gain (dB) vs. Frequency, Vd = 2V



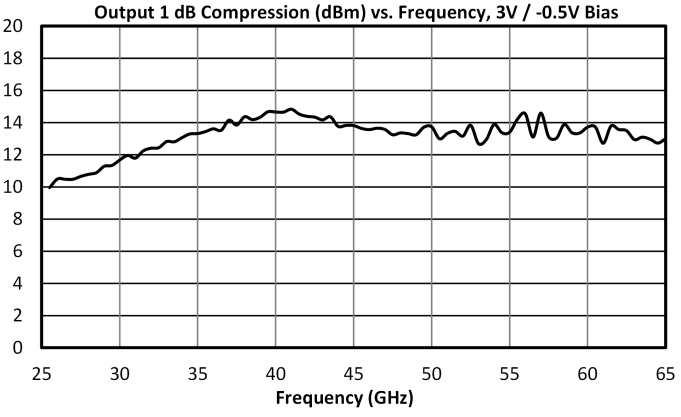
Output 1 dB Compression (dBm) vs. Frequency, 2V / -0.5V Bias



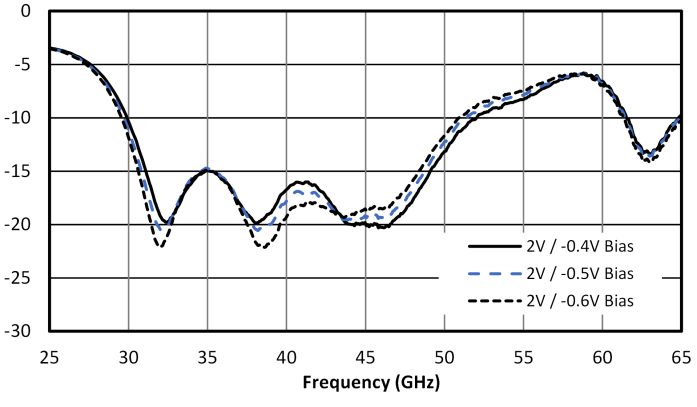
Small Signal Gain (dB) vs. Frequency, Vd = 3V



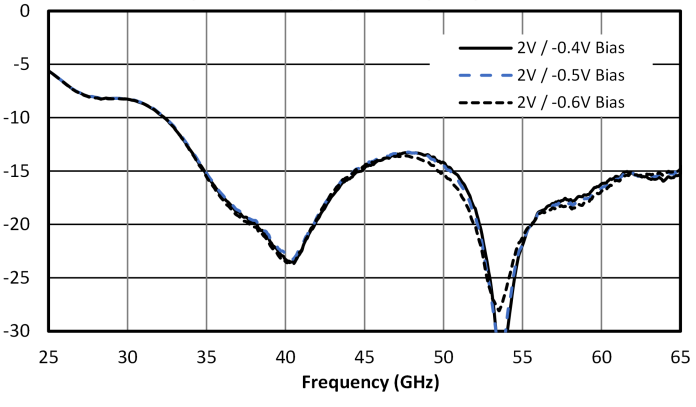
Output 1 dB Compression (dBm) vs. Frequency, 3V / -0.5V Bias



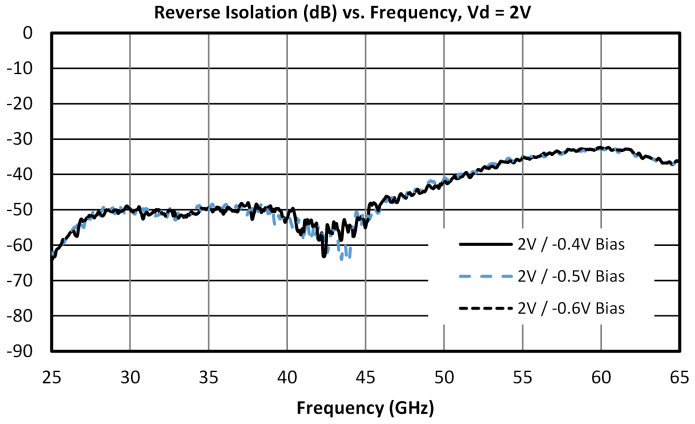
Input Return Loss (dB) vs. Frequency, Vd = 2V



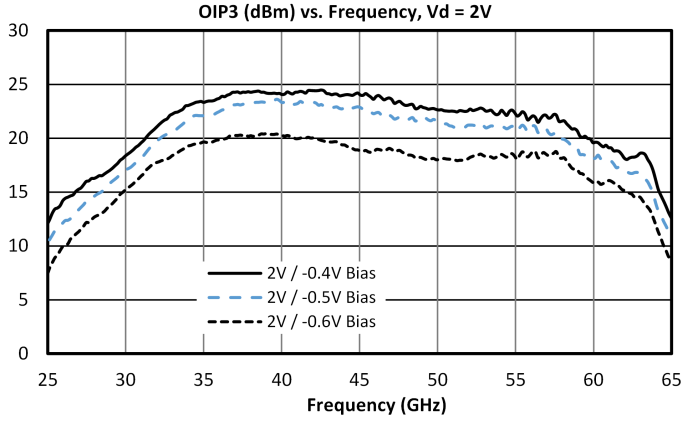
Output Return Loss (dB) vs. Frequency, Vd = 2V



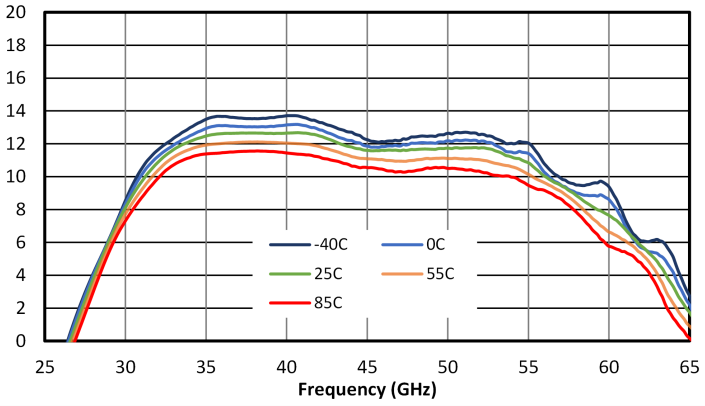
Reverse Isolation (dB) vs. Frequency, Vd = 2V



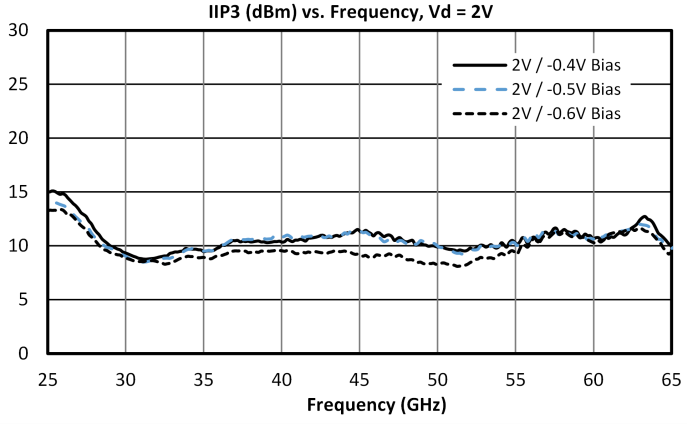
OIP3 (dBm) vs. Frequency, Vd = 2V



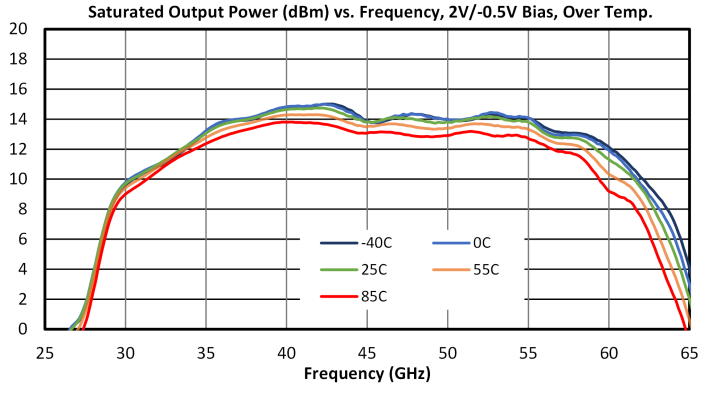
Small Signal Gain (dB) vs. Frequency, 2V/-0.5V Bias, Over Temp.



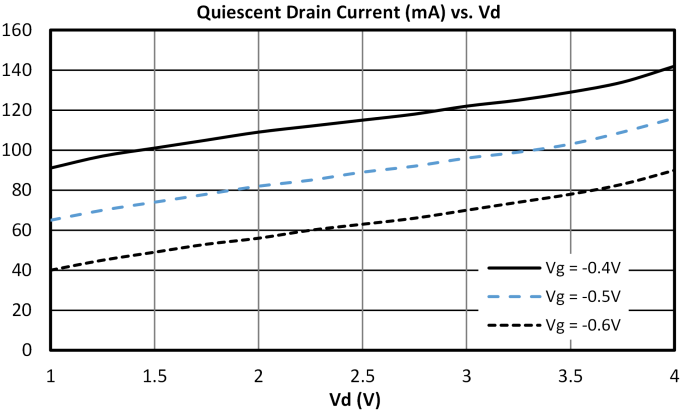
IIP3 (dBm) vs. Frequency, Vd = 2V



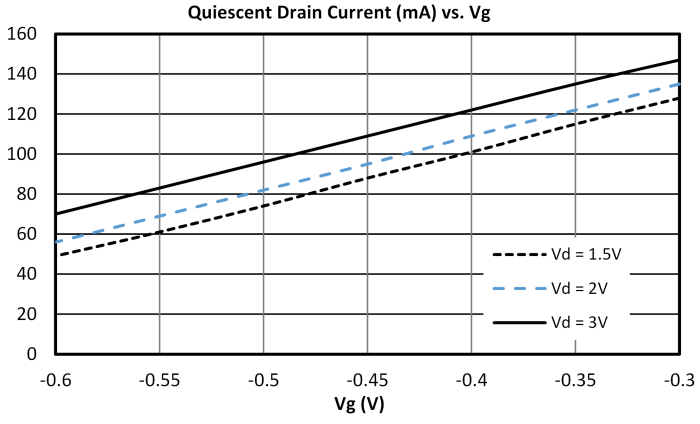
Saturated Output Power (dBm) vs. Frequency, 2V/-0.5V Bias, Over Temp.



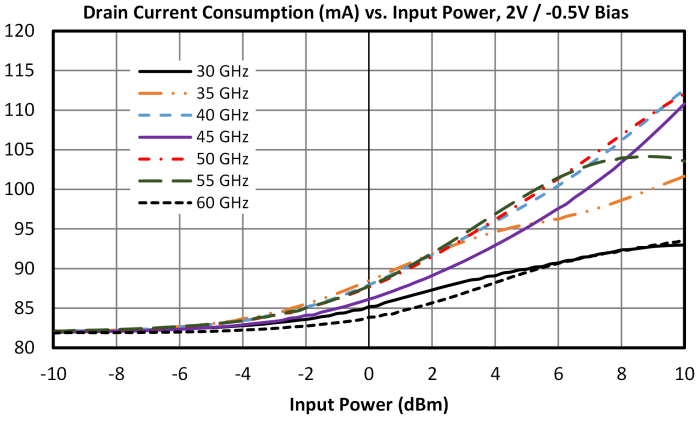
Quiescent Drain Current (mA) vs. Vd



Quiescent Drain Current (mA) vs. Vg



Drain Current Consumption (mA) vs. Input Power, 2V / -0.5V Bias

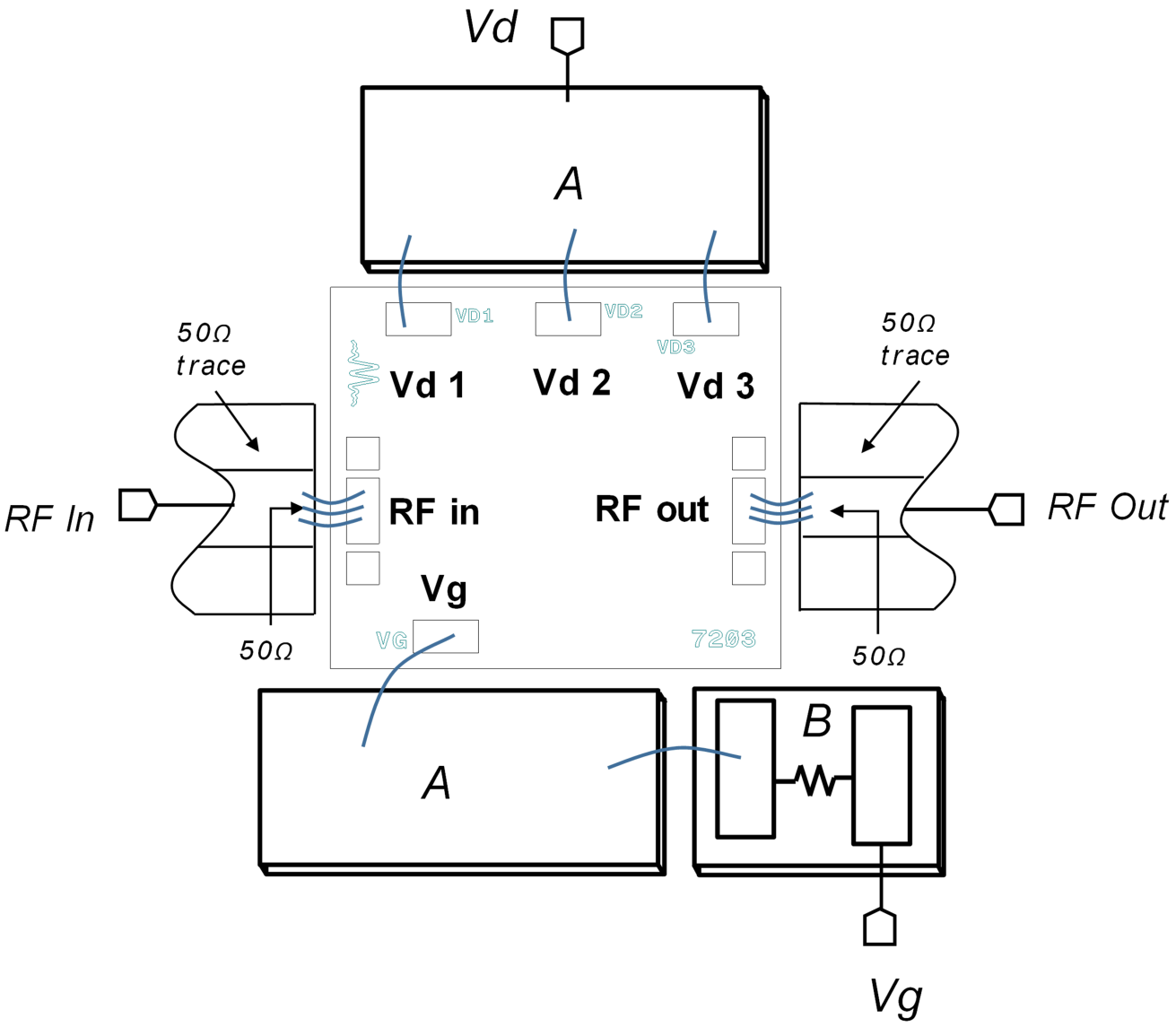


Application Information

AMM-7203CH Application Circuits

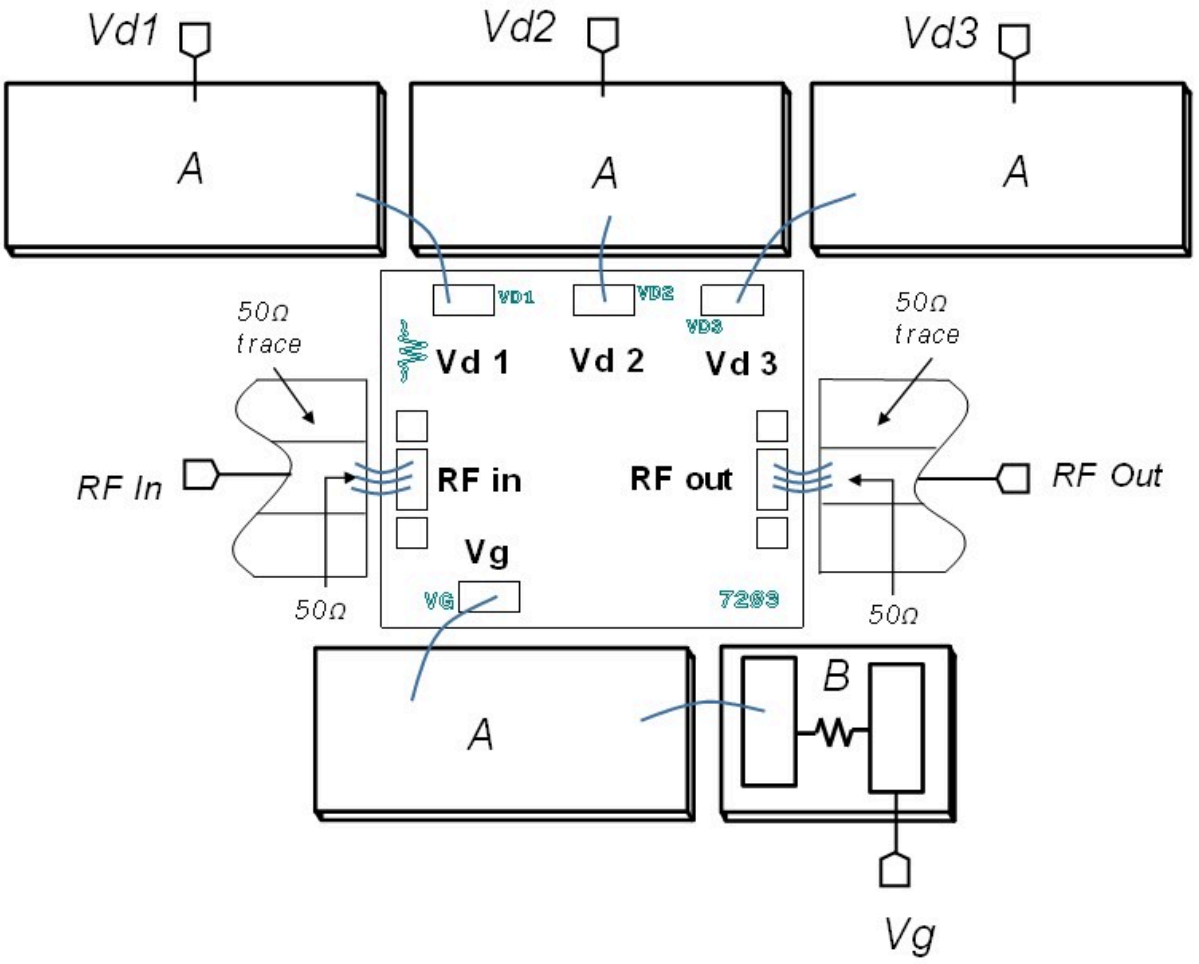
Below are the recommended application circuits for the AMM-7203CH. This application circuit is used for the performance plots shown in this datasheet. However, each PCB layout and environment are different which may require minor modifications of the biasing network. Please contact support@markimicrowave.com for more information.

Application Circuit



Application Circuit Description

One can also choose to break out Vd1, Vd2, and Vd3 to separate power supply lines to increase gain control and further strengthen amplifier stability.

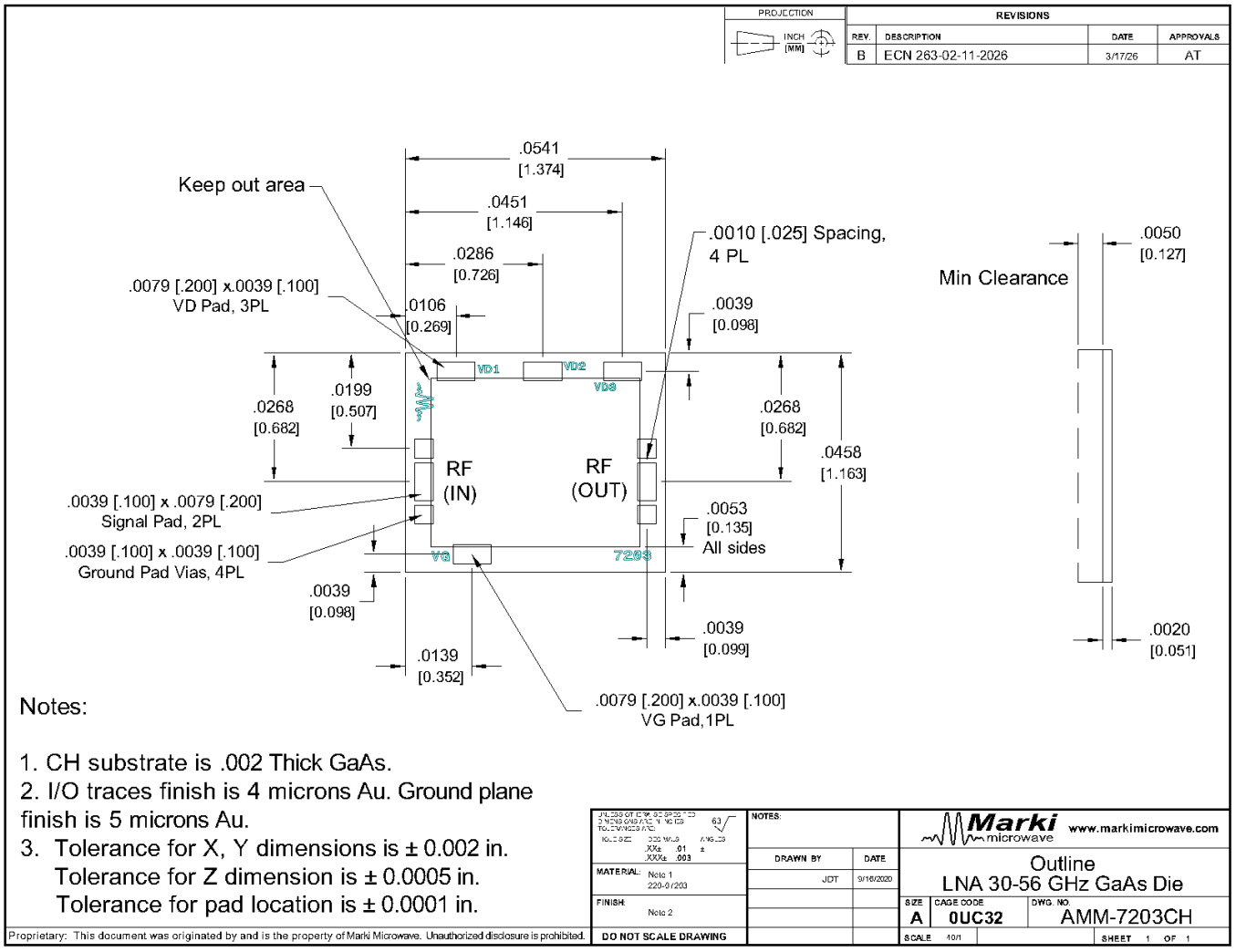


Designator	Description	Sample Part Number
A	Presidio 0.1 µF + 1800 pF Capacitor	MVB4080X104ZGH5R3
B	PPI 10Ω Wire-bondable series resistor	PRT135-14x12x10A10R00FQE

Mechanical Data

Outline Drawing

Download : Outline 2D Drawing



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