0.1-35 GHz 2-Stage LO Driver Amplifier **ADM2-0035PA**

1. Device Overview

1.1 General Description

The ADM2-0035PA is an LO driver amplifier module with 2 internally connected wideband gain stages and equalization. It is designed to provide sufficient gain and output power for Marki S-diode mixers below 35 GHz with an input power of 0-5 dBm.

ADM2-0035 PA Module

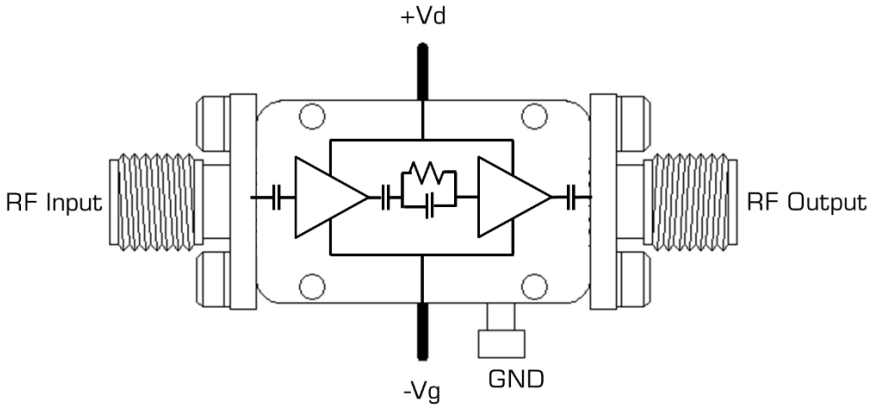
1.2 Features

- 23 dB gain
- Broadband DC-35 GHz performance
- +23 dBm output power
- No sequencing required
- DC blocked

1.3 Applications

- General purpose laboratory amplifier
- Radar and satellite communications
- 5G transceivers
- LO driver amp for Marki H-diode S-diode, and T3 mixers

1.4 Functional Block Diagram



1.5 Part Ordering Options[1]

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
ADM2-0035PA	Connectorized Module	PA	**RoHS**	Active	EAR99

[1] Refer to our website for a list of definitions for terminology presented in this table.

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

Table of Contents

Revision History

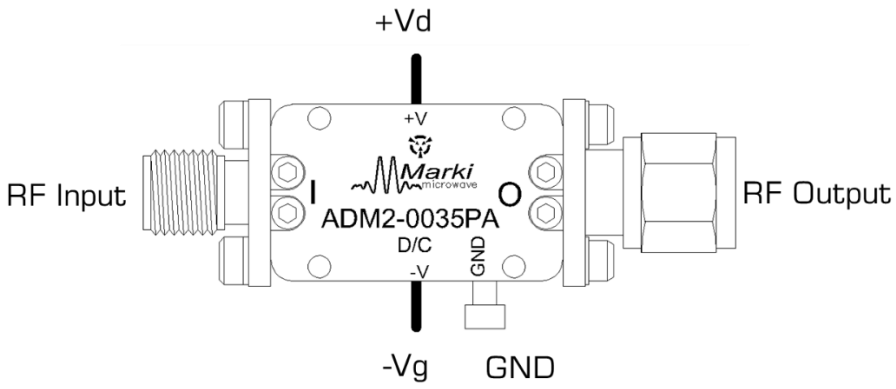
Revision Code	Revision Date	Comment
-	January 2020	Datasheet Initial Release
A	February 2020	Added Heat Sinking Information, Updated Production Specs

ES France - Département RF & Hyperfréquences - 127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 60 - Fax. 01 47 01 16 22 - e-mail: hyper@es-france.com - Site Web: www.es-france.com

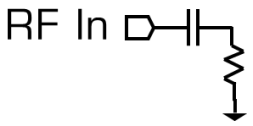
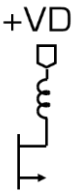
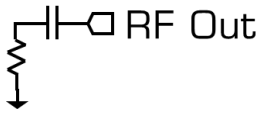
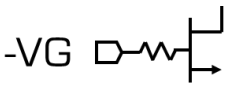
2. Port Configurations and Functions

2.1 Port Diagram

A top-down port diagram of the ADM2-0035PA's connectorized package is shown below



2.2 Port Functions

Port	Function	Description	Equivalent Circuit for Package
RF Input	RF Input	This is the RF input of the amplifier. It is internally DC blocked.	
+Vd	Positive DC Supply Voltage	This supplies positive voltage to both internal amplifier stages. A larger positive supply voltage will increase linearity, power output, and power consumption, with minimal effect on small signal gain. All DC current will flow through this port.	
RF Output	RF Output	This is the RF output of the amplifier. It is internally DC blocked.	
-Vg	Negative DC Supply Voltage	This supplies negative gate voltage to both internal amplifier stages. More negative gate voltage will result in lower DC current draw to the +Vd port. For thermal and performance reasons, we recommend using -0.25 V as the gate bias voltage.	
GND	Ground	Exterior housing must be connected to a DC/RF ground potential with high thermal and electrical conductivity.	

3. Specifications

3.1 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	Units
Positive Bias Voltage (Pin 1)	9	V
Positive Bias Current (Pin 1)	550	mA
Negative Bias Voltage (Pin 4)	-2	V
Negative Bias Current (Pin 4)	400	µA
RF Input Power	+20	dBm
Operating Temperature	-55 to +85	ºC
Storage Temperature	-65 to +150	ºC
θ_{ja}, Junction to Ambient Thermal Resistance	TBD	ºC/W

3.2 Package Information

Parameter	Details	Rating
ESD	Human Body Model (HBM), per MIL-STD-750, Method 1020	0
Weight	ADM2-0035PA	14.1g

3.3 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 (3.1).

	Min	Nominal	Max	Units
T_A, Ambient Temperature	-55	+25	+85	°C
Positive DC Voltage	+3	+7	+7	V
Positive DC Current	200	320	400	mA
Negative DC Voltage[2]	-0.5	-0.25	0	V

3.4 Sequencing Requirements

There is no sequencing required for this part, however, if not using an additional heat sink, we recommend connecting the negative VG voltage either before or simultaneously to connecting the positive VD voltage to avoid excessive self-heating from high current consumption.

3.5 Heat Sinking

We have observed non-catastrophic self-heating in normal 7V/-0.25V operation which results in decreased gain and output power over time. To maintain peak performance, we recommend attaching a heat sink to the ADM2-0035PA module. We will be adding an alternate ADM2-0035PA-H module that comes with an attached heat sink in the near future.

[2] Lower gate voltages (more negative) will limit current consumption. For grounded-gate operation or gate voltages larger than -0.15 V, we recommend using a heat sink to prevent overheating.

3.6 Electrical Specifications

The electrical specifications apply at T_A=+25°C in a 50Ω system.

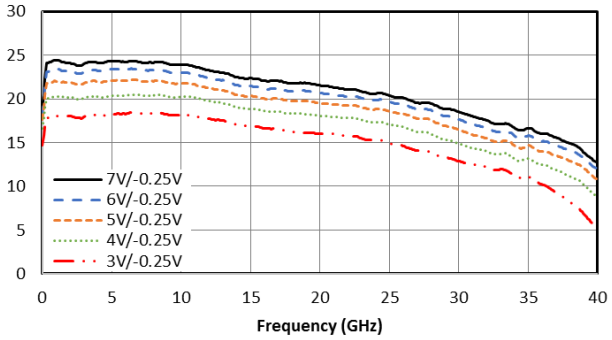
Min and Max limits apply only to our connectorized units and are guaranteed at T_A=+25°C.

Parameter	Test Conditions	Frequency	Min	Typical	Max	Units
Frequency			0.1		35	
P_{sat}	7V/-0.25V bias, +5 dBm Input Power	0.2 – 24 GHz	19	23		dBm
		24 – 35 GHz	15	19		
Small Signal Gain	7V/-0.25V bias, -25 dBm Input Power	0.2 – 29 GHz	20	23		dB
		29 – 34 GHz	19			
Input Return Loss		0.2 – 35 GHz		14		
Output Return Loss				24		
Reverse Isolation				80		
Noise Figure	7V/-0.25V	0.2 – 26.5 GHz		5		
Bias Requirements[3]	7V/-0.25V			320		mA
Input IP3 (IIP3)	7V/-0.25V bias, -25 dBm Input Power	0.2 – 35 GHz		7		dBm
Output IP3 (OIP3)				30		
P_{1dB}	7V/-0.25V bias	0.2-24 GHz		18		
		24-35 GHz		13		

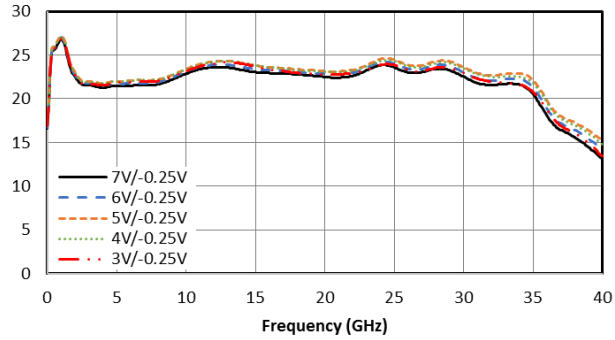
[3] Bias conditions refer to operation with no RF input power. See section 3.6 for relationship between RF input power and DC current draw.

3.7 Typical Performance Plots

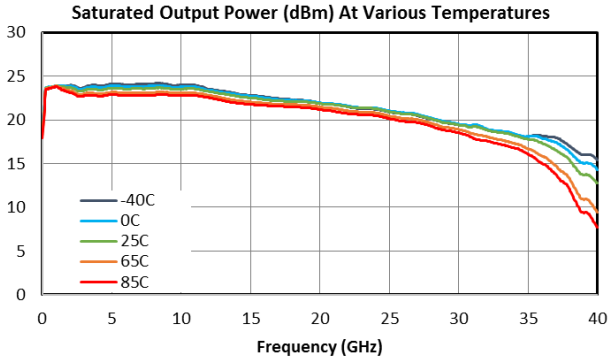
Saturated Output Power (dBm)



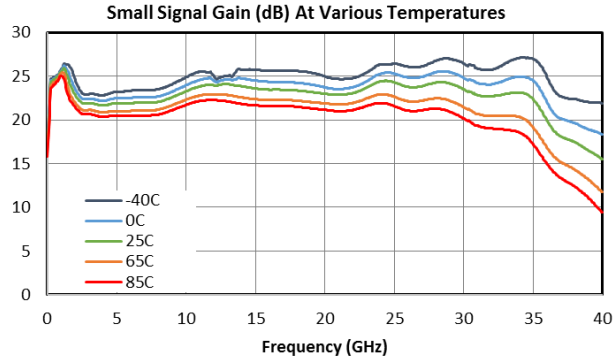
Small Signal Gain (dB)



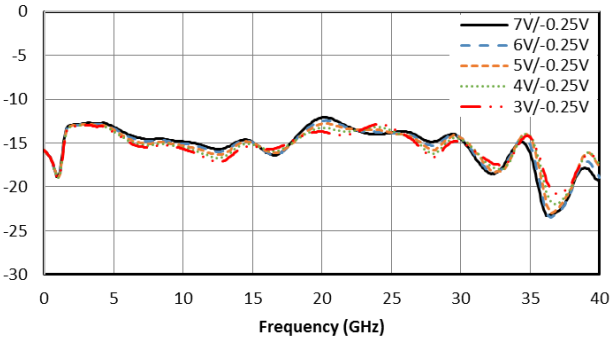
Saturated Output Power (dBm) At Various Temperatures



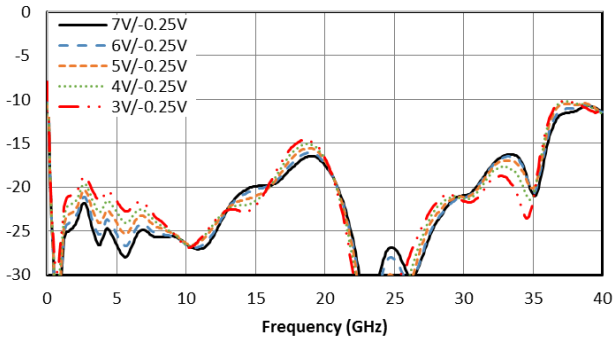
Small Signal Gain (dB) At Various Temperatures



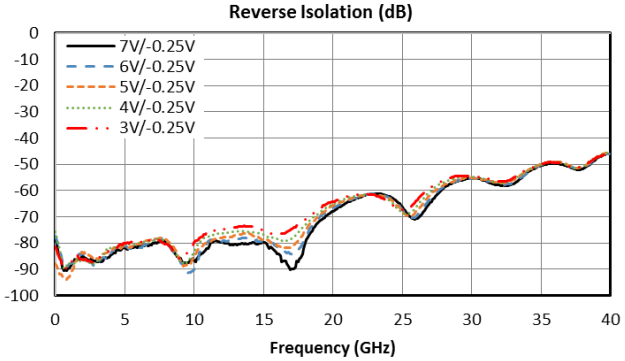
Input Return Loss (dB)



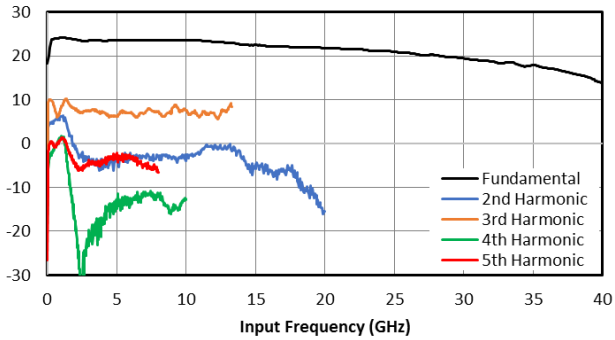
Output Return Loss (dB)

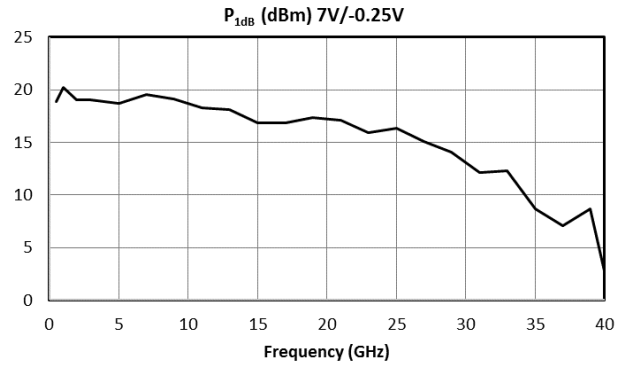


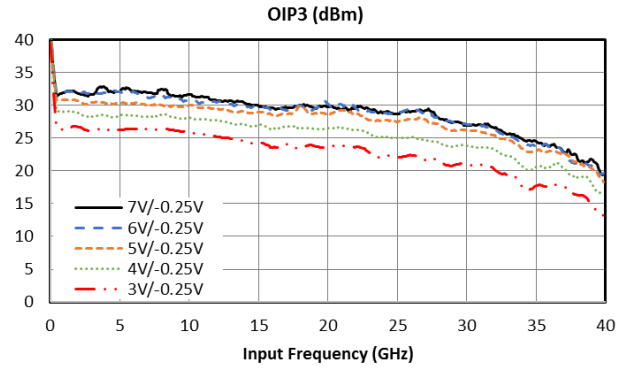
Reverse Isolation (dB)

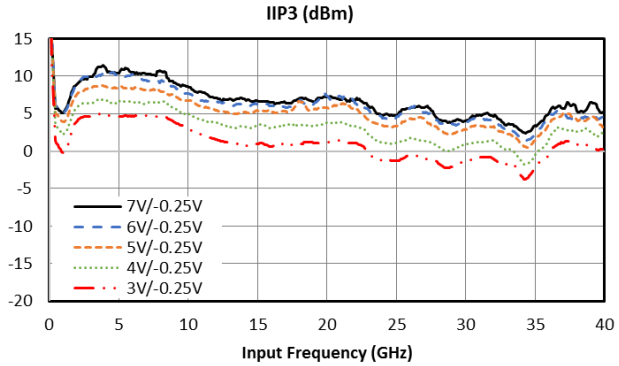


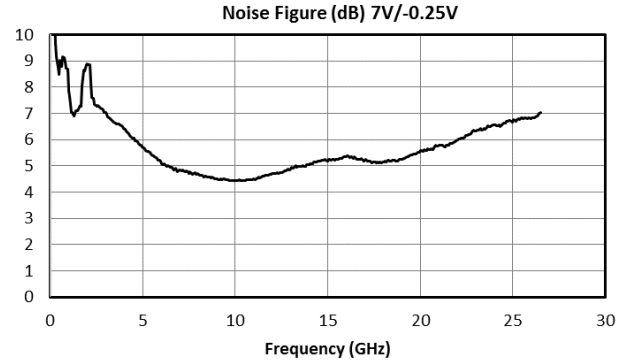
Saturated Harmonic Response (dBm), +5 dBm P_{in}, 7V/-0.25V

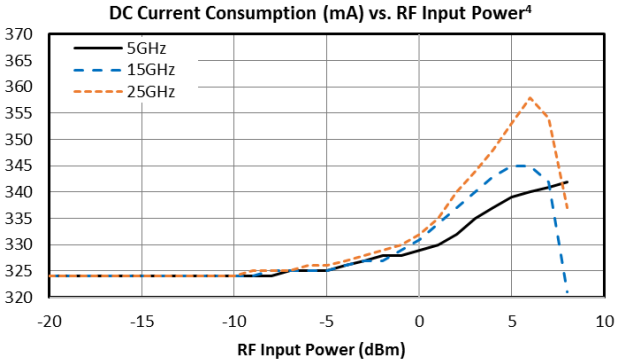


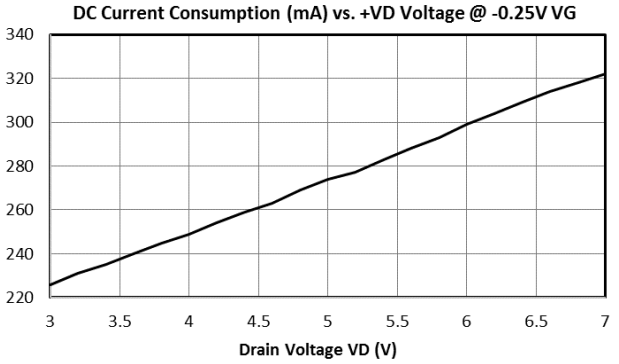






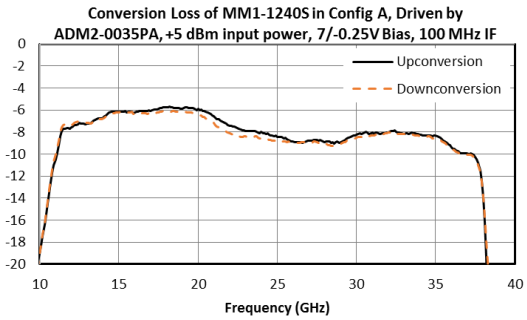


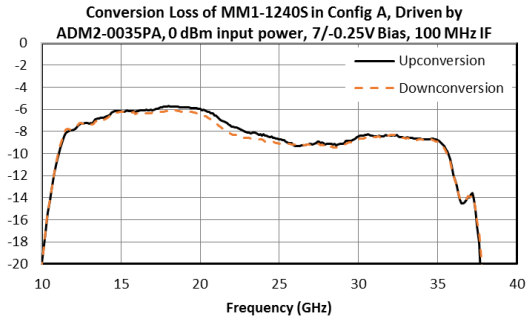


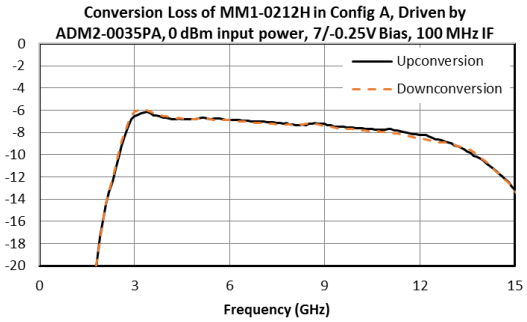


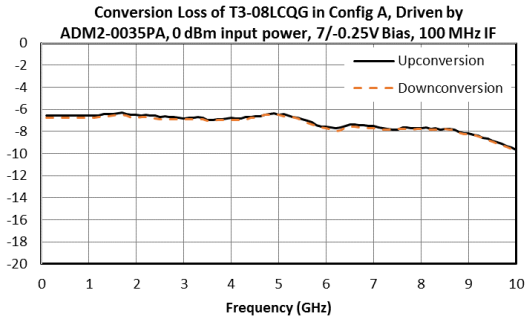
[4] At high RF power, rectified gate current pulls down the gate voltages, resulting in a lower overall DC current draw.

3.8 Typical Mixer Performance Plots with ADM2-0035PA as LO Driver



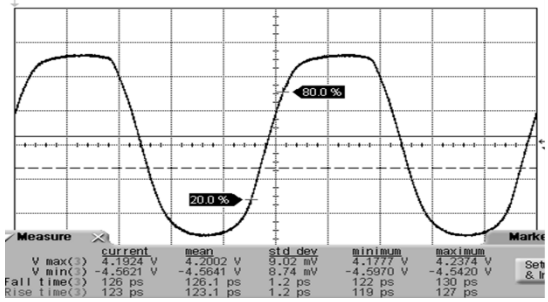




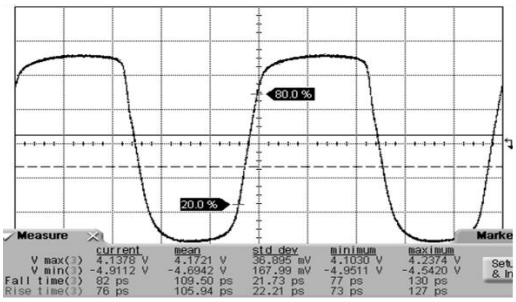


3.9 Time Domain Plots of Output Waveform[5]

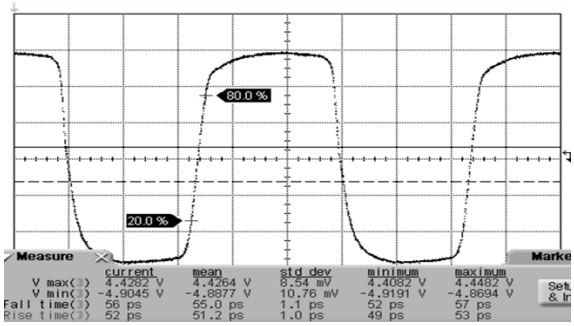
Output Waveform, 1 GHz, 0 dBm Input Power



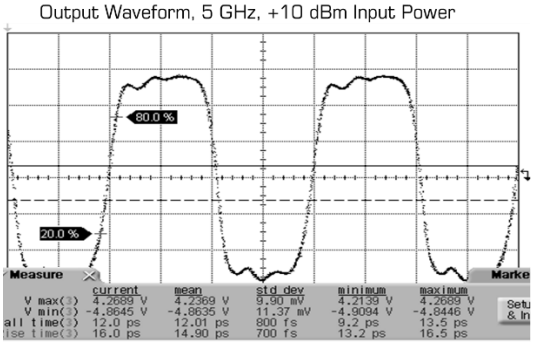
Output Waveform, 1 GHz, +5 dBm Input Power



Output Waveform, 1 GHz, +10 dBm Input Power



Output Waveform, 5 GHz, +10 dBm Input Power



[5] Square wave compression is a desirable LO Driver characteristic for linear operation of Marki T3 mixers

4. Mechanical Data

4.1 PA Package Outline Drawing