AM1081-2 – Amplifier

DC to 8 GHz Bypassable

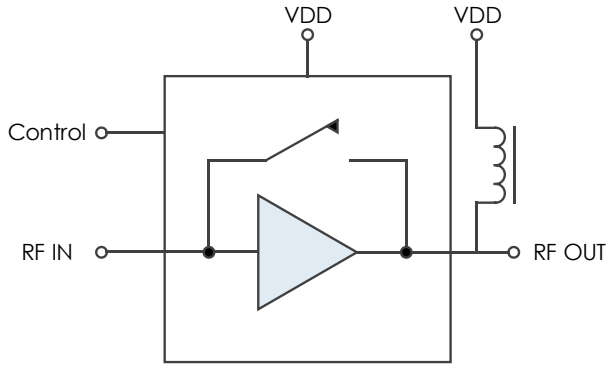
Description

The AM1081-2 is a high dynamic range bypassable DC-coupled amplifier covering up to 8 GHz. The device exhibits low bypass insertion loss and a moderate positive gain-slope, providing frequency equalization useful in many broadband applications. Packaged in a 3mm QFN or a shielded module with internal 50Ω matching and requiring a single positive control voltage, the AM1081-2 represents a dramatic size reduction over a discrete implementation of a bypassable amplifier.

Features

- 17 dB Gain
- 2.5 dB Noise Figure
- +35 dBm OIP3
- +20 dBm P1dB
- +20 dBm PSat
- 1.25 dB Bypass Insertion Loss
- +5.0V, 83/1 mA (Gain/Bypass)
- +3.0V to +5.0V Supply Range
- +3.3V or +5V Logic Compatible
- 3mm QFN Package

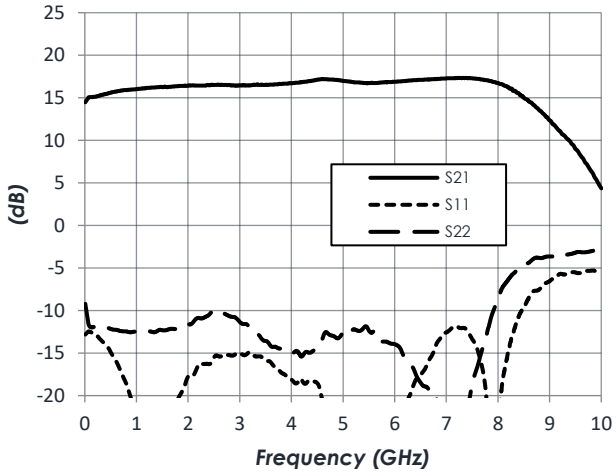
Functional Diagram



Characteristic Performance

(Data shown for Configuration A. See *Typical Application* section for more information.)

Gain and Return Loss at +25C



Noise Figure at +25C

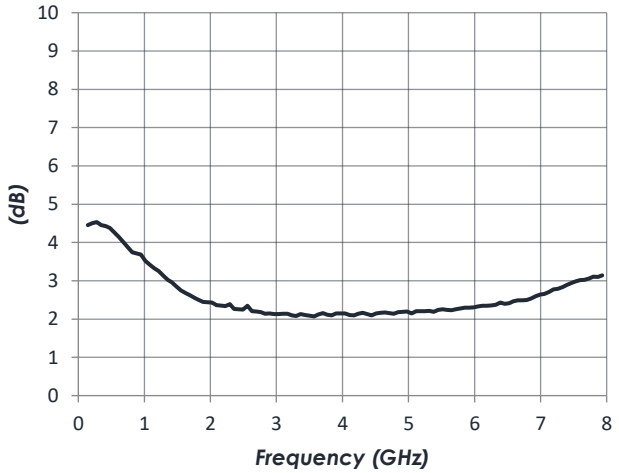
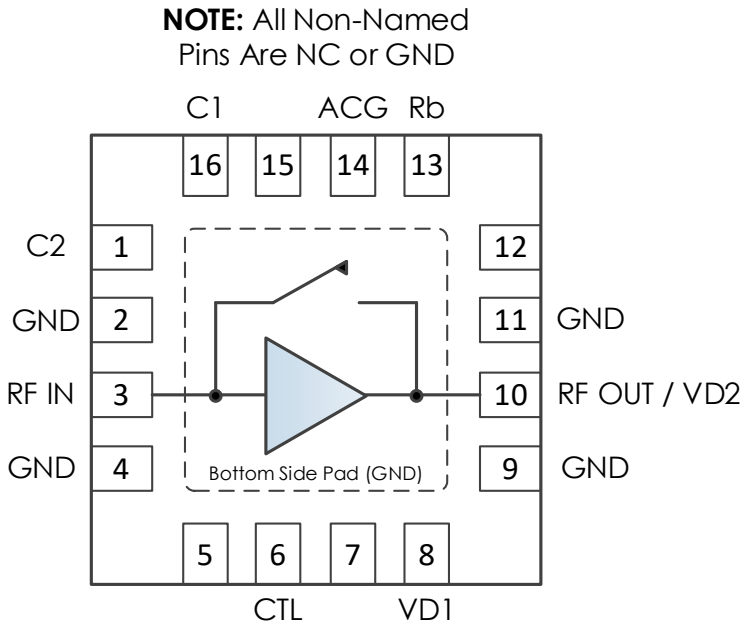


Table of Contents

Revision History

Date	Revision Number	Notes
June 28, 2021	1	Initial Release
July 15, 2022	2	Typical Application Drawing Corrected

Pin Layout and Definitions



Pin Number	Pin Name	Pin Function
1	C2	External Capacitor Connection 2
2	GND	Ground – Common
3	RF IN	RF Input – 50 ohms – DC Coupled, External DC Block Required
4	GND	Ground – Common
5	NC	Not Connected *
6	CTL	Bypass/Amplifier Mode Control
7	NC	Not Connected *
8	VD1	DC Power Input
9	GND	Ground – Common
10	RF OUT/VD2	RF Output and DC Power Input – 50 Ohms – DC Coupled, External DC Block Required.
11	GND	Ground – Common
12	NC	Not Connected *
13	Rb	**Config A:** Do Not Connect (Floating) **Config B:** Ground
14	ACG	AC Ground
15	NC	Not Connected *
16	C1	External Capacitor Connection 1
Bottom Pad	GND	Ground – Common

*NC pins may be grounded or left open

Specifications

Absolute Maximum Ratings

	Minimum	Maximum
Supply Voltage	0.0 V	+6.0 V
RF Input Power		+20 dBm
Operating Junction Temperature	-40 C	+150 C
Storage Temperature Range	-50C	+150 C

Note: *Any device operation beyond the* Absolute Maximum Ratings *may result in permanent damage to the device. The values listed in this table are extremes and do not imply functional operation of the device at these or any other conditions beyond what is listed under* Recommended Operating Conditions. *Any part subjected to conditions outside of what is recommended for an extended amount of time may suffer from reliability concerns.*

Handling Information

	Minimum	Maximum
Storage Temperature Range (Recommended)	-50 C	+125 C
Moisture Sensitivity Level	MSL 3	

Atlanta Micro products are electrostatic sensitive.
Follow safe handling practices to avoid damage

Recommended Operating Conditions

	Minimum	Typical	Maximum
Supply Voltage	+3.0 V	+4.7 V	+5.2 V
Operating Case Temperature	-40 C		+85 C
Operating Junction Temperature	-40 C		+125 C

Thermal Information

	Thermal Resistance (°C / W)
Junction to Case Thermal Resistance (Θ_{JC})	49.5

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Parameter	Configuration	Testing Conditions	Minimum	Typical	Maximum
DC Supply Voltage	A		+3.0 V	+5.0 V	+5.2 V
	B		+4.7 V	+5.0 V	+5.2 V
DC Supply Current	A	VDD = +5.0 V		81 mA	
	B	VDD = +5.0 V		53 mA	
	A	VDD = +3.3 V		43 mA	
Power Dissipated	A	VDD = +5.0 V		0.41 W	
	B	VDD = +5.0 V		0.27 W	
	A	VDD = +3.3 V		0.14 W	
Logic Level Low	A, B		-0.1 V		+0.4 V
Logic Level High	A, B		+2.2 V		+VDD
Control Current	A, B	CTL = +3.3V		115 µA	
	A, B	CTL = +5.0V		200 µA	

RF Performance

(T = 25 °C unless otherwise specified)

Parameter	Configuration	Testing Conditions	Minimum	Typical	Maximum
Frequency Range			DC		8 GHz
Gain	A	VDD = +5.0 V		17 dB	
	B	VDD = +5.0 V		17 dB	
	A	VDD = +3.3 V		16.5 dB	
Return Loss	A	VDD = +5.0 V		17 dB	
	B	VDD = +5.0 V		16.5 dB	
Bypass Insertion Loss	A, B	VDD = +5.0 V		2 dB	
Output IP3	A	VDD = +5.0 V		+35 dBm	
	B	VDD = +5.0 V		+32 dBm	
Output P1dB	A	VDD = +5.0 V		+19 dBm	
	B	VDD = +5.0 V		+17 dBm	
Noise Figure	A	VDD = +5.0 V		2.6 dB	
	B	VDD = +5.0 V		2.6 dB	

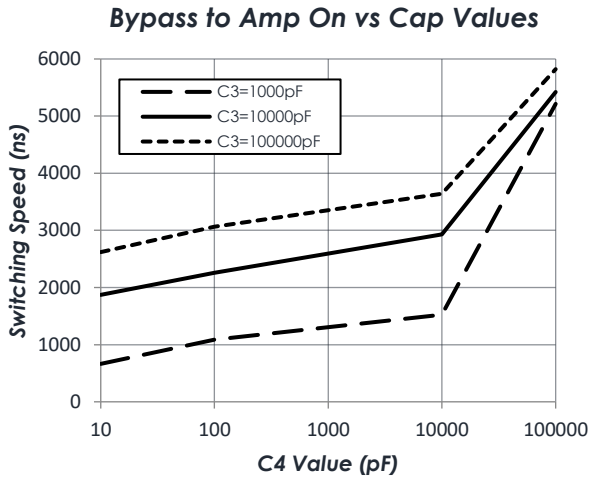
State Table

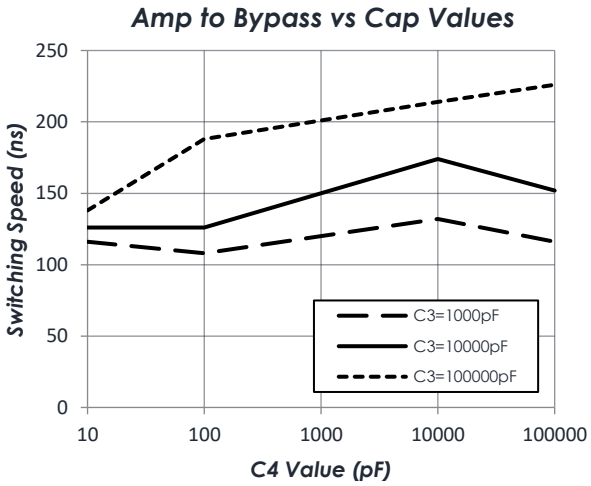
CTL	Amplifier
High	Enabled
Low	Bypassed

Timing Characteristics

(T = 25 °C, VDD = +3.3V, CTL = 0.0V / +3.3V)

Switching Time	Minimum	Typical[2]	Maximum
Amp On → Amp Bypass	125 ns	175 ns	300 ns
Amp Bypass → Amp On	700 ns	3.8 µs	7.0 µs





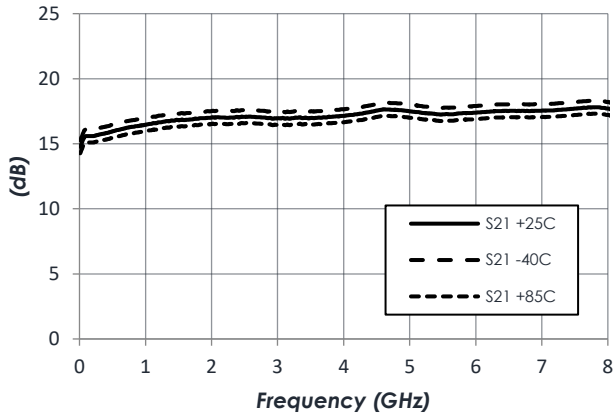
*__Notes__:

1. Switching speeds measured as 50% trigger to 10%/90% RF respectively.
2. Typical measurements reflect switching speeds of amp as configured in Typical Application section.
3. To change times, alter value of C3 and C4 (see Typical Application section).

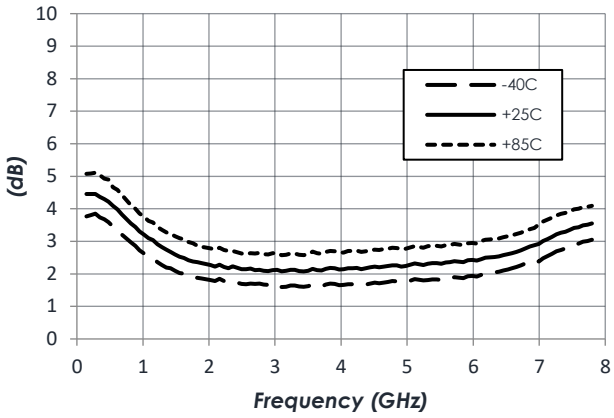
Typical Performance – Configuration A

(Amplifier Enabled, VDD = +5.0 V, ID = 81mA)

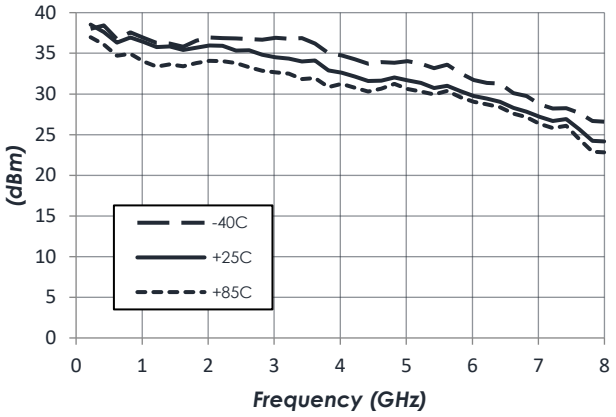
Gain vs Temperature



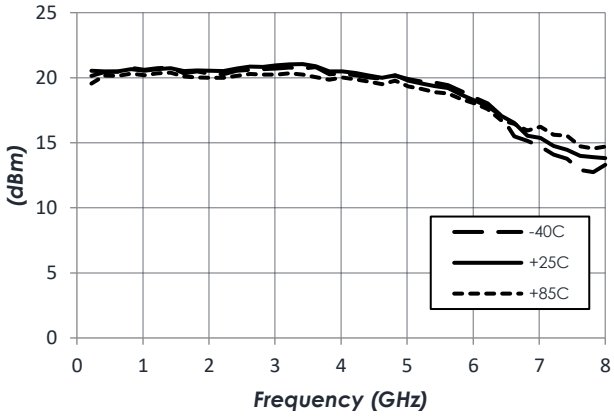
Noise Figure vs Temperature



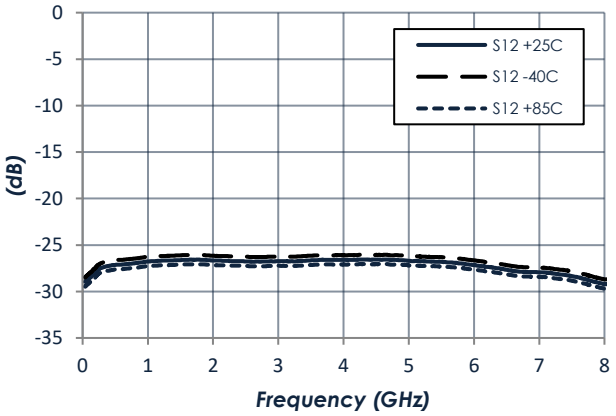
Output IP3 vs Temperature



P1dB vs Temperature



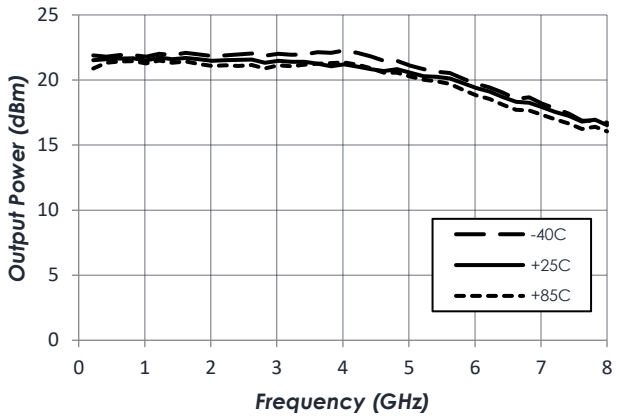
Reverse Isolation vs Temperature



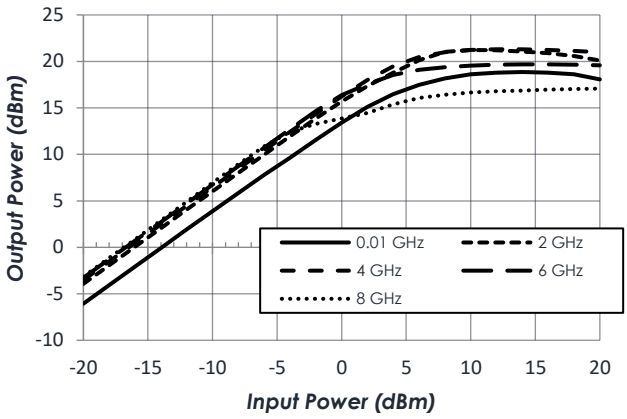
Typical Performance – Configuration A (continued)

(Amplifier Enabled, VDD = +5.0 V, ID = 81mA)

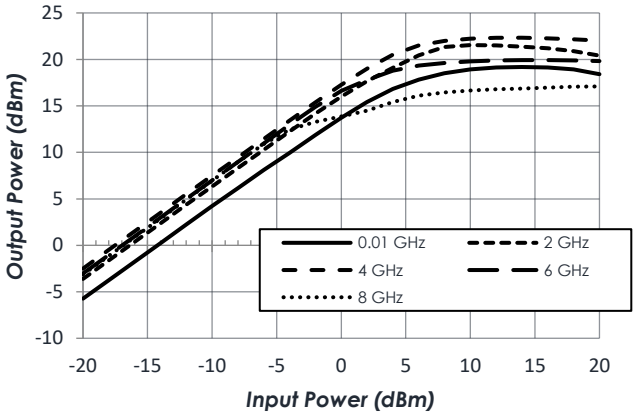
P_Sat vs Temperature



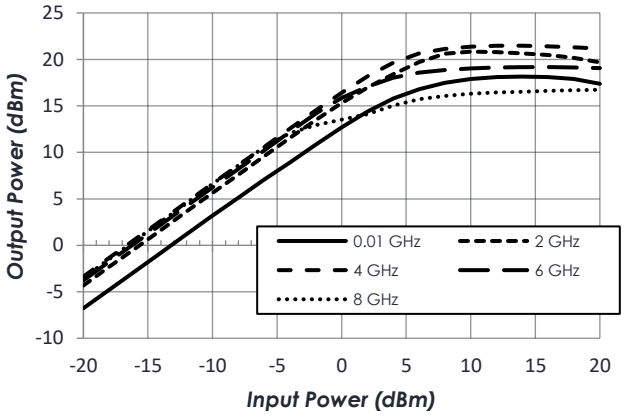
Pin vs. Pout at +25C



Pin vs. Pout at -40C

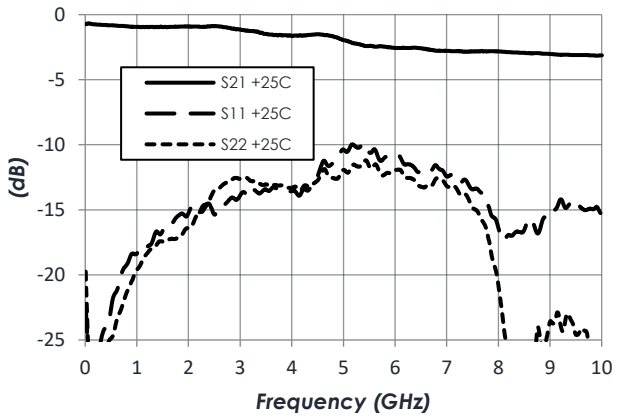


Pin vs. Pout at +85C

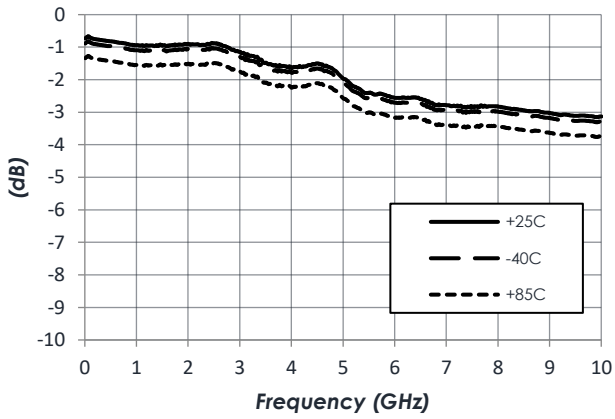


(Amplifier Bypass, VDD = +5.0 V, ID = 1mA, Performance same as Configuration B)

Insertion and Return Loss at +25C



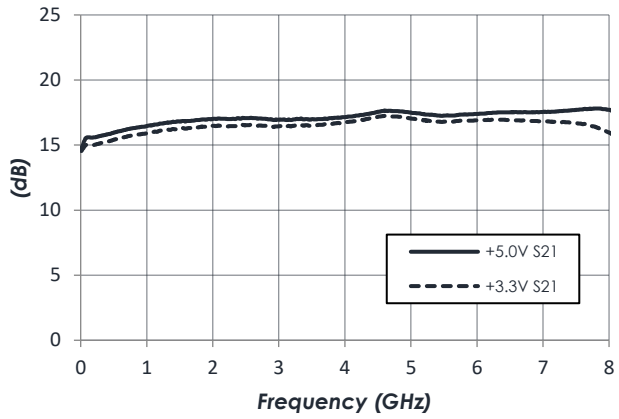
Insertion Loss vs Temperature



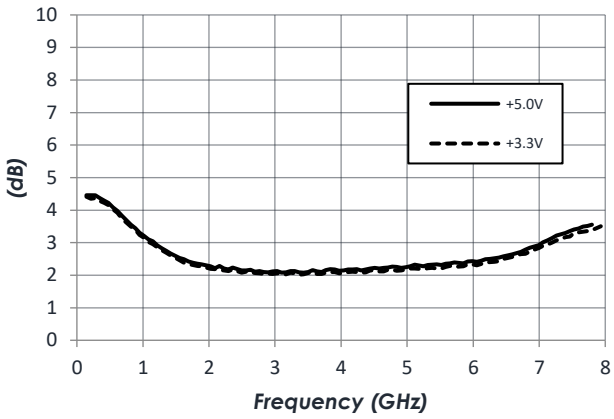
Typical Performance – Configuration A (continued)

(T = 25 °C, Amplifier Enabled unless otherwise specified)

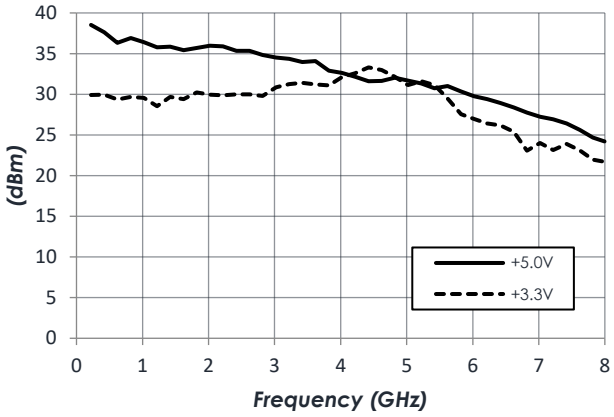
Gain vs VDD



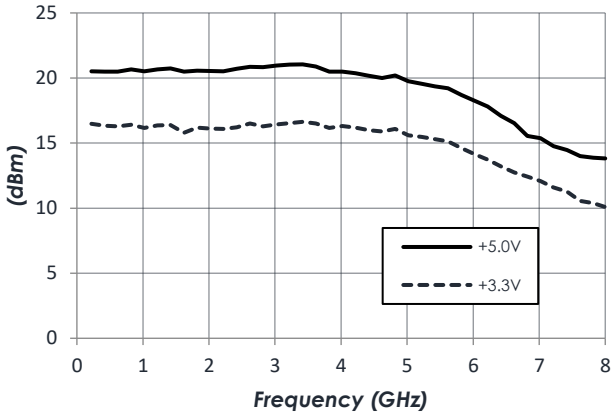
Noise Figure vs VDD



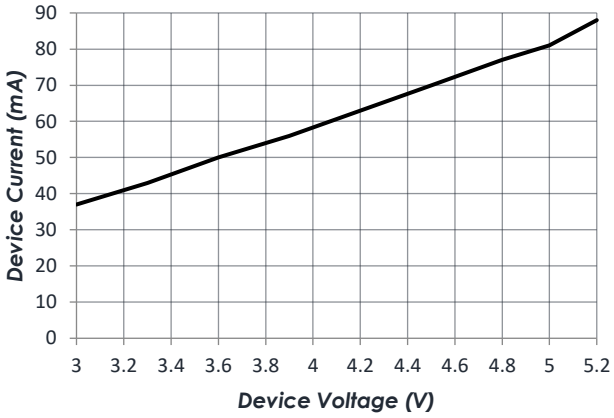
Output IP3 vs VDD



P1dB vs VDD



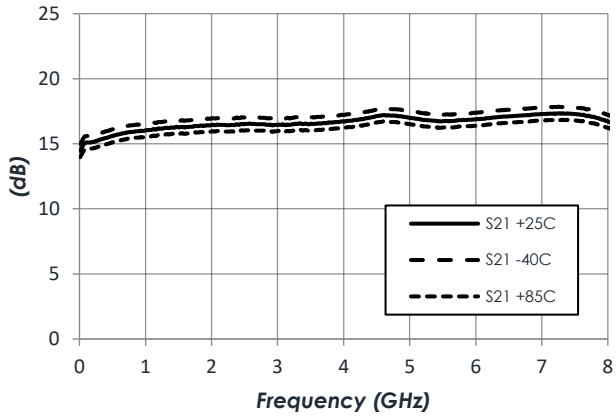
ID vs. VD2



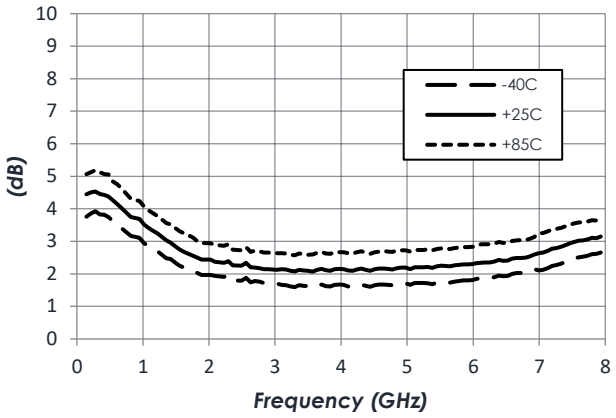
Typical Performance – Configuration B

(Amplifier Enabled, VDD = +5.0 V, ID = 53mA)

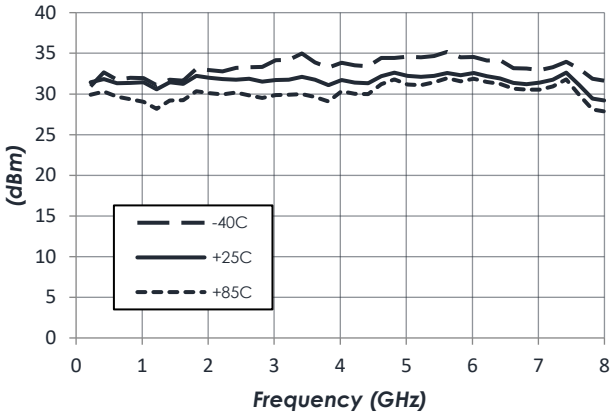
Gain vs Temperature



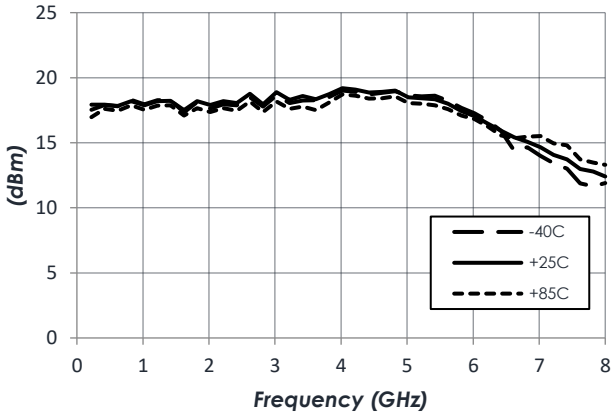
Noise Figure vs Temperature



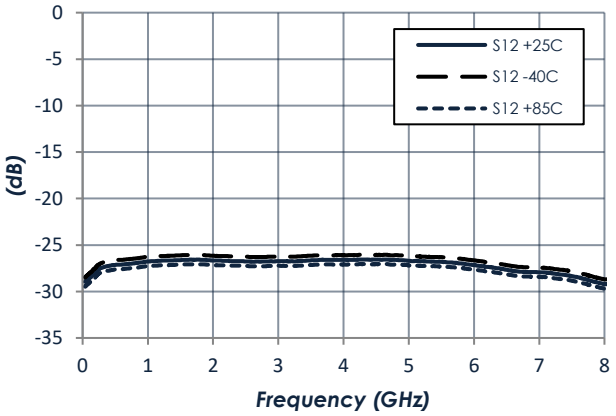
Output IP3 vs Temperature



P1dB vs Temperature



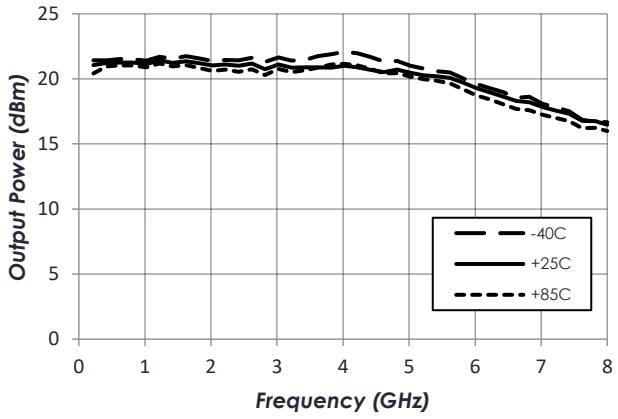
Reverse Isolation vs Temperature



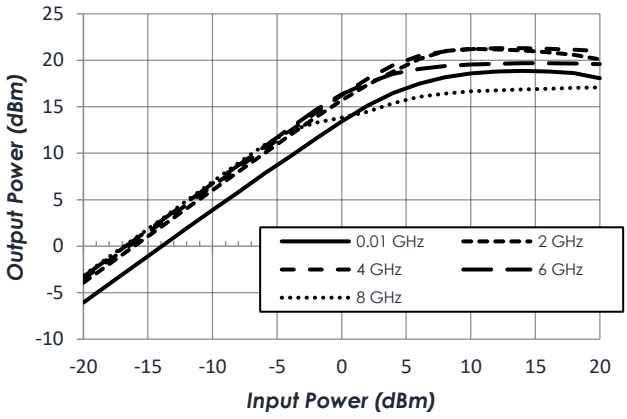
Typical Performance – Configuration B (continued)

(Amplifier Enabled, VDD = +5.0 V, ID = 53mA)

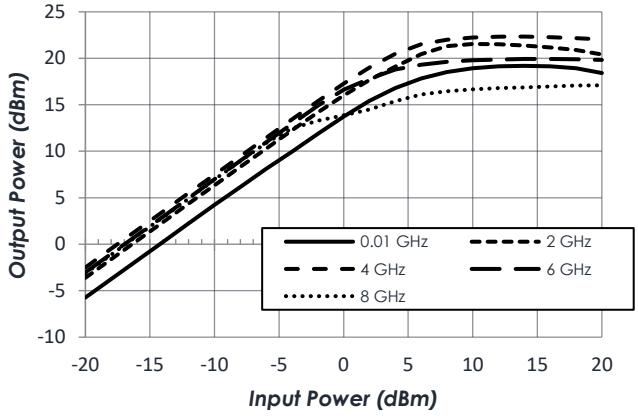
P_Sat vs Temperature



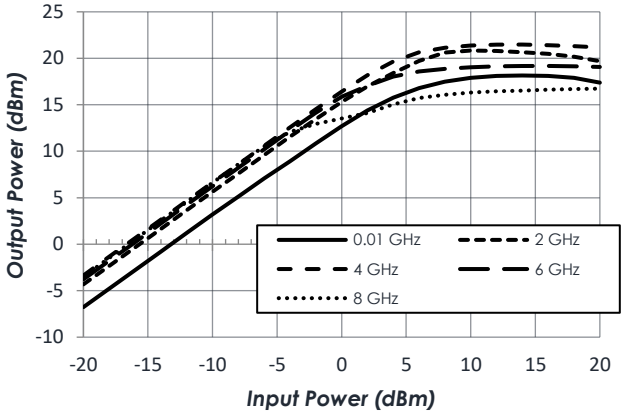
Pin vs. Pout at +25C



Pin vs. Pout at -40C

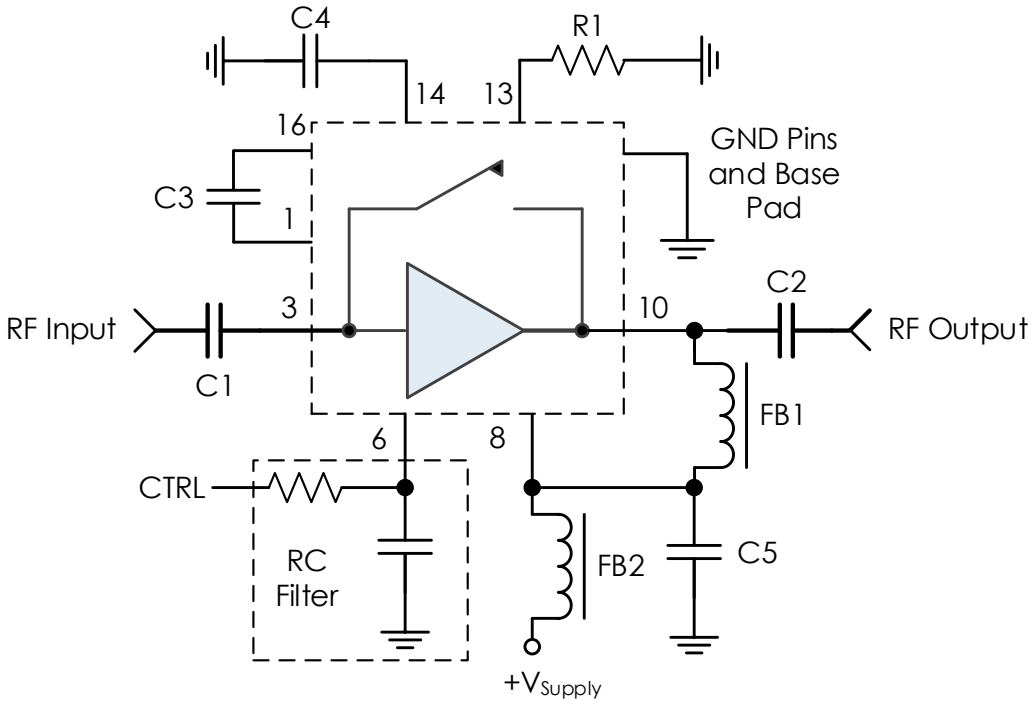


Pin vs. Pout at +85C



Typical Application

Configuration A



Recommended Component List (or equivalent):

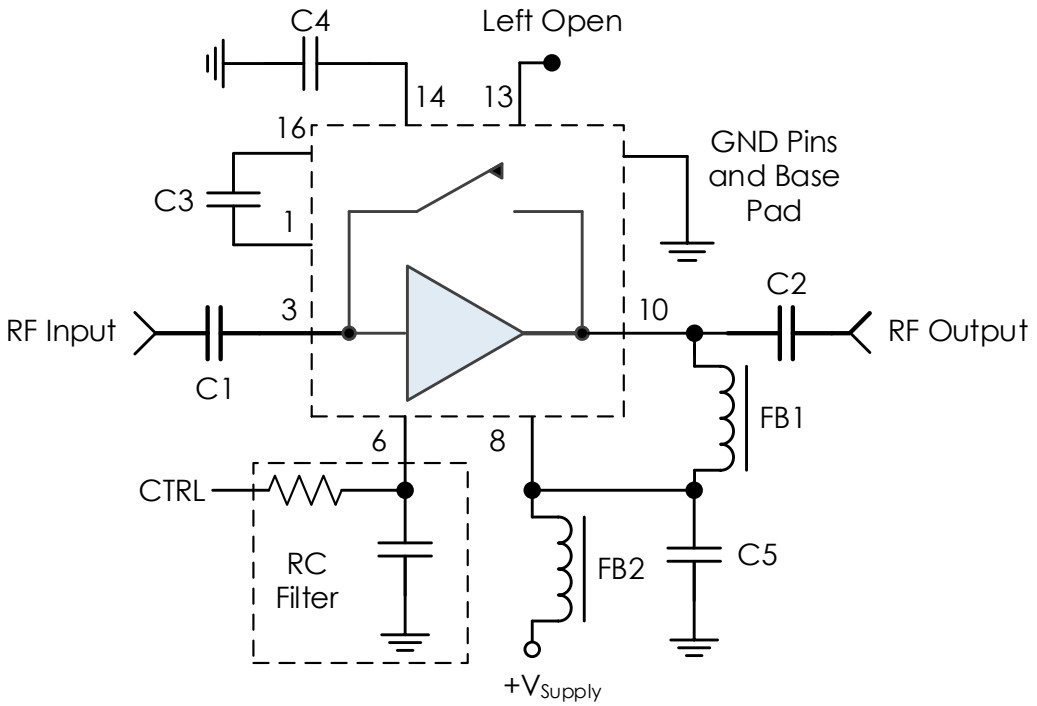
Part	Value	Part Number	Manufacturer
C1, C2, C3	0.1 µF	0201BB104KW250	Passives Plus
C4	10,000 pF	GRM033R61E103KA12D	Murata
C5	0.1 µF	GCM155R71H104KE02J	Murata
FB1, FB2	-	MMZ1005A222E	TDK
R1	DNI	Do Not Install	-

Notes:

1. DC blocking capacitors C1 – C3 should be high performance, low-loss, broadband capacitors for optimum performance.
2. Select control line RC filter values based on desired logic source decoupling and switching speed
3. C3 and C4 should be placed as close to the AM1065 as possible to minimize PCB trace lengths. A 0201 package size is recommended to minimize stray PCB pad capacitance to ground.

Typical Application

Configuration B



Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1, C2, C3	0.1 µF	0201BB104KW250	Passives Plus
C4	10,000 pF	GRM033R61E103KA12D	Murata
C5	0.1 µF	GCM155R71H104KE02J	Murata
FB1, FB2	-	MMZ1005A222E	TDK
R1	0 Ω	CRCW04020000Z0ED	Vishay

Notes:

1. DC blocking capacitors C1 – C3 should be high performance, low-loss, broadband capacitors for optimum performance.
2. Select control line RC filter values based on desired logic source decoupling and switching speed
3. C3 and C4 should be placed as close to the AM1065 as possible to minimize PCB trace lengths. A 0201 package size is recommended to minimize stray PCB pad capacitance to ground.

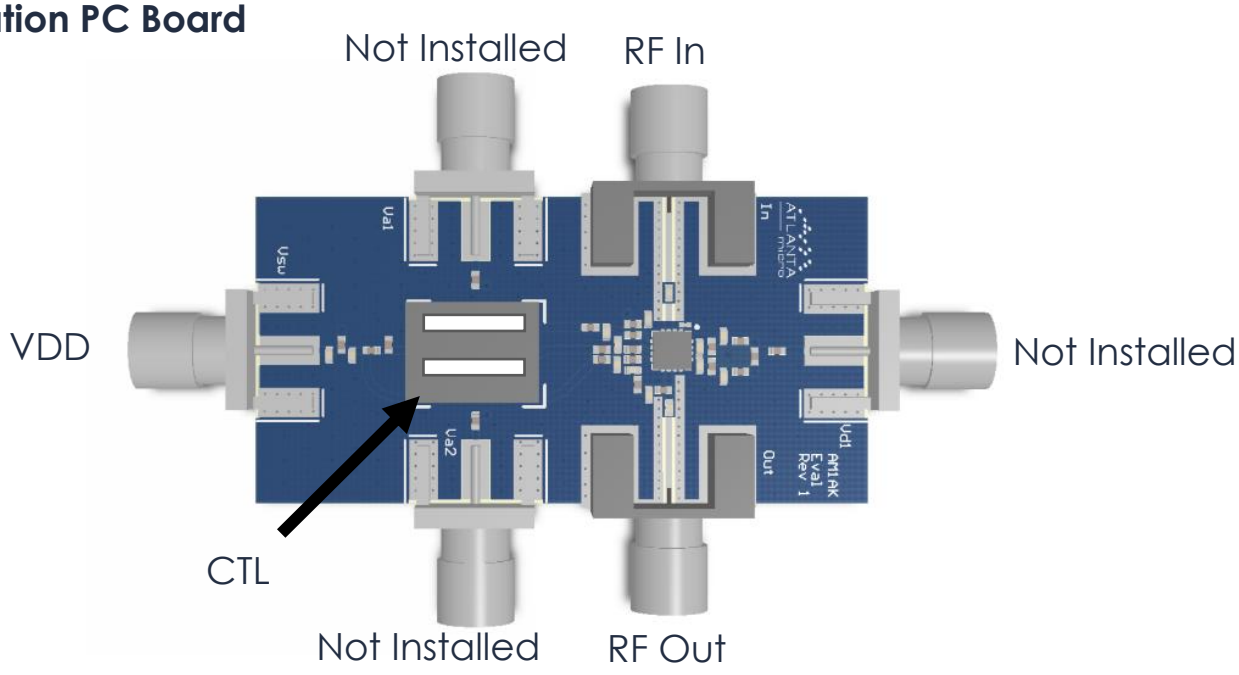
Part Ordering Details

Description	Part Number
4mm 24 Lead QFN	AM1081
3mm 16 Lead QFN	AM1081-2
AM1081 Evaluation Board	AM1081 Eval
AM1081-2 Evaluation Board	AM1081-2 Eval
AM1081 in 0.95" x 1.13" x 0.6" RF-Shielded Module with Integrated Bias Tee and Field Replaceable SMA Connectors	AM1081-M

Related Parts

Part Number				Description
AM1065	DC	to	8 GHz	Bypassable Gain Block
AM1065-2	DC	to	8 GHz	Miniature Bypassable Gain Block
AM1081	DC	to	8 GHz	Bypassable Gain Block (Higher IP3)
AM1063-1	DC	to	10 GHz	Gain Block
AM1063-2	DC	to	10 GHz	Miniature Gain Block
AM1064-1	DC	to	8 GHz	Gain Block
AM1064-2	DC	to	8 GHz	Miniature Gain Block
AM1067	5 GHz	to	20 GHz	Bypassable Gain Block
AM1073	DC	to	8 GHz	Bidirectional / Bypassable Gain Block
AM1075	5 GHz	to	26.5 GHz	Bypassable Gain Block

Evaluation PC Board



Component Compliance Information

RoHS: Atlanta Micro, Inc. hereby certifies that all products comply with the EC Directive 2011/65/EC on the Restriction of Hazardous Substances, commonly known as EU-RoHS 6 and 10. All products supplied by Atlanta Micro shall be compliant with the European Directive 2011/65/EC based on the following substance list.

Substance List	Allowable Maximum Concentration
Lead (Pb)	<1000 PPM (0.1% by weight)
Mercury (Hg)	<1000 PPM (0.1% by weight)
Cadmium (Cd)	<75 PPM (0.0075% by weight)
Hexavalent Chromium (CrVI)	<1000 PPM (0.1% by weight)
Polybrominated Biphenyls (PBB)	<1000 PPM (0.1% by weight)
Polybrominated Diphenyl ethers (PBDE)	<1000 PPM (0.1% by weight)
Decabromodiphenyl Deca BDE	<1000 PPM (0.1% by weight)
Bis (2-ethylheyl) Phthalate (DEHP)	<1000 PPM (0.1% by weight)
Butyl Benzyl Phthalate (BBP)	<1000 PPM (0.1% by weight)
Dibutyl Phthalate (DBP)	<1000 PPM (0.1% by weight)
Diisobutyl Phthalate (DIBP)	<1000 PPM (0.1% by weight)

REACH: Atlanta Micro, Inc. neither uses nor intentionally adds any of the substances considered to be a Substance of Very High Concern (SVHC) as defined by the EU Regulation (EC) No. 1907-2006 on Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH).

Conflict Materials: Atlanta Micro does not knowingly use materials that are sourced from the Democratic Republic of Congo (DRC) or any other known conflict regions. Atlanta Micro's supply chain is comprised of sources that are both environmentally and socially responsible. We periodically review this requirement with our vendors to ensure continued compliance.

Atlanta Micro takes its responsibility as a global partner seriously and will use due diligence within our supply chain to ensure all standards are met to the best of our knowledge.