AM1031C – Amplifier

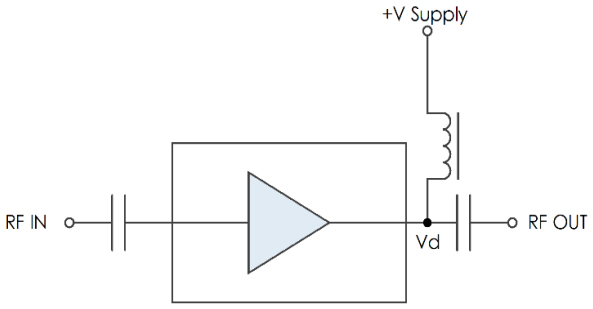
20 MHz to 8 GHz Gain Block

AM1031C is a high dynamic range cascadable gain block covering the 20 MHz to 8 GHz frequency range. The device exhibits low noise figure and high third order intercept performance while also providing excellent gain stability over the operating temperature range. With internal 50Ω matching and packaged in a 3mm QFN or a shielded module, the AM1031C represents a compact total PCB footprint.

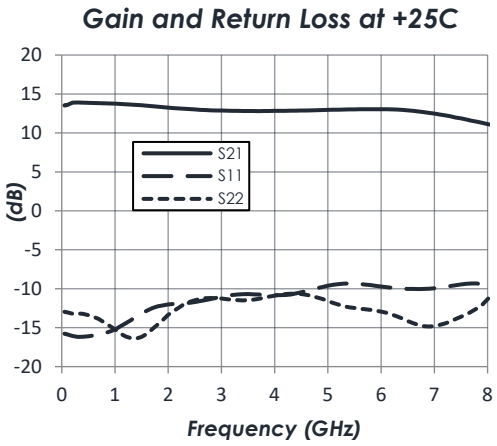
FEATURES

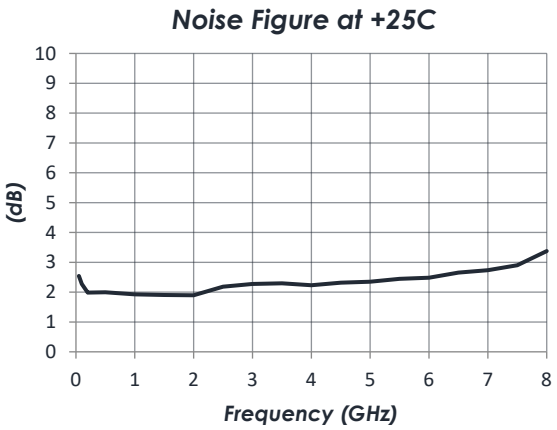
- 13 dB Gain
- 2.2 dB Noise Figure
- +32 dBm OIP3
- +17 dBm P1dB
- +3.3V, 56 mA
- 3mm QFN Package
- -40C to +85C Operation
- Unconditionally Stable

FUNCTIONAL DIAGRAM



CHARACTERISTIC PERFORMANCE





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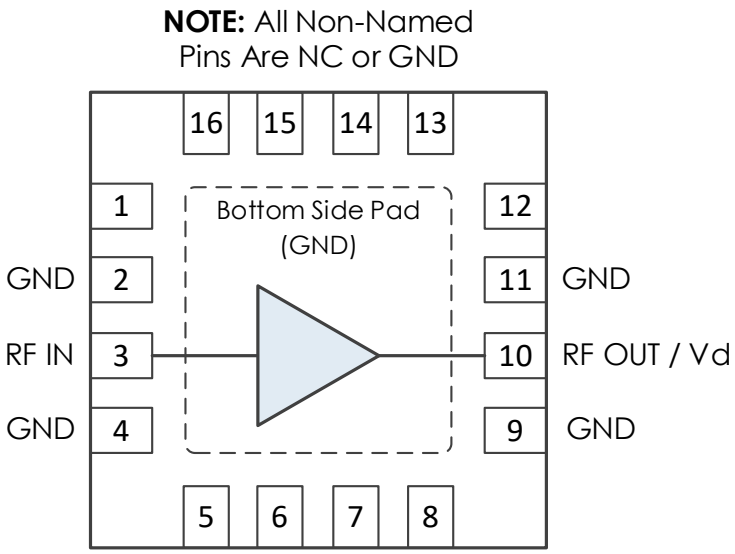
REVISION HISTORY

Date	Revision	Notes
May 14, 2018	0	Preliminary Release
May 24, 2018	1	Initial Release
April 9, 2019	2	Pinout Corrected, Functional Diagram Added, Plots Resized, Part Picture Added.
November 26, 2019	3	RF-Shielded Module Information Added, Part Ordering Details Added.
August 25, 2020	4	Thermal Resistance Information Corrected. Package and Module Information Moved to Main Product Page on Website.
September 16, 2020	4.1	Minor Formatting Issues Fixed. Storage Temperature Updated.
November 7, 2024	5	Changed to Mercury branding. No content changes.

PIN LAYOUT AND DEFINITIONS



Pin	Name	Function
1	NC	Not Connected *
2	GND	Ground – Common
3	RF IN	RF Input – 50 ohms – DC Coupled, External DC Block Required
4	GND	Ground – Common
5-8	NC	Not Connected *
9	GND	Ground – Common
10	RF OUT/Vd	RF Output and DC Power Input – 50 ohms – DC Coupled, External DC Block Required
11	GND	Ground – Common
12-16	NC	Not Connected *
Bottom Pad	GND	Ground – Common

* NC pins may be grounded or left open.

SPECIFICATIONS

Absolute Maximum Ratings

	Minimum	Maximum
Device Voltage, Vd	-0.3 V	+3.4 V
RF Input Power		+16 dBm
Operating Junction Temperature	-40 C	+150 C
Storage Temperature Range	-55C	+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	

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

Recommended Operating Conditions

	Minimum	Typical	Maximum
Supply Voltage	+2.8 V	+3.3 V	+3.7 V
Device Voltage, Vd	+2.5 V	+3.0 V	+3.4 V
Operating Case Temperature	-40 C	+25 C	+85 C
Operating Junction Temperature	-40 C		+125 C

Thermal Information

	Thermal Resistance (°C / W)
Junction to Case Thermal Resistance (θ_{JC})	137

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Param	Testing Conditions	Min	Typical	Max
Device Voltage, Vd	Vsupply = +3.3 V	+2.5 V	+3.0 V	+3.4 V
DC Supply Current	Vsupply = +3.3 V	50 mA	56 mA	62 mA
Power Dissipated	Vsupply = +3.3 V		0.17 W	

RF Performance

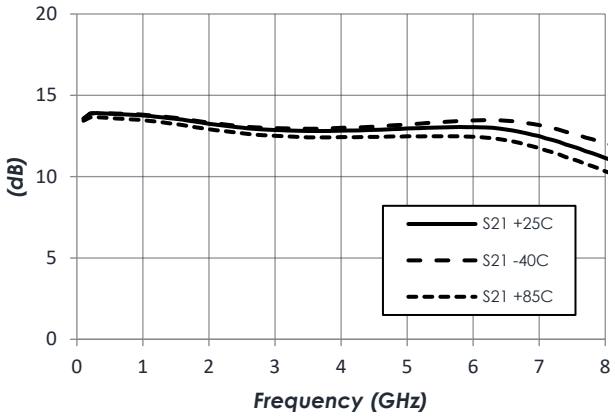
(T = 25 °C unless otherwise specified)

Param	Testing Conditions	Min	Typical	Max
Frequency Range		20 MHz		8 GHz
Gain	f = 4 GHz		13 dB	
Output IP3	f = 4 GHz		+32 dBm	
Output P1dB	f = 4 GHz		+17 dBm	
Noise Figure	f = 4 GHz		2.2 dB	

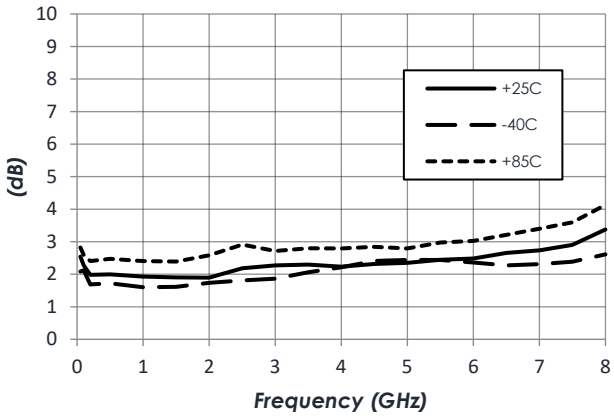
TYPICAL PERFORMANCE

(V Supply = +3.3V, Device Voltage [Vd] = +3.0V, Id = 56 mA)

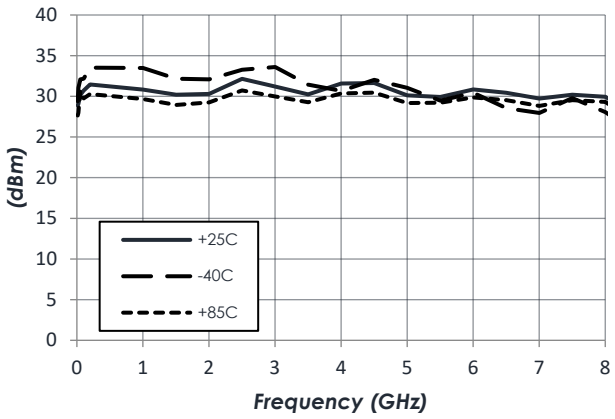
Gain vs Temperature



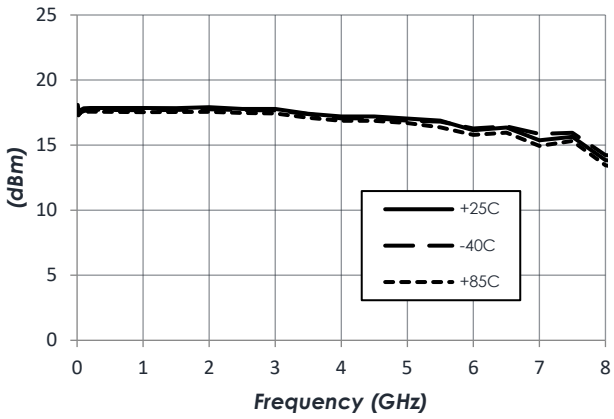
Noise Figure vs Temperature



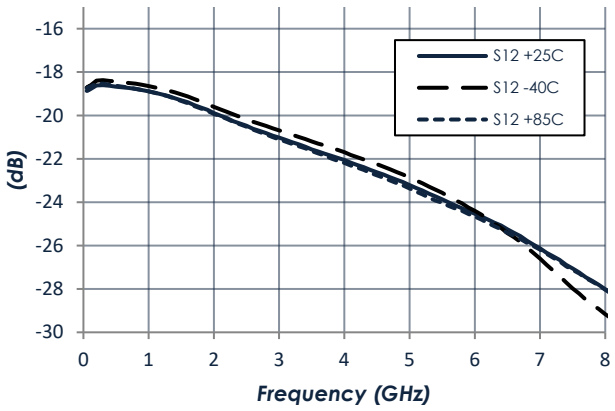
Output IP3 vs Temperature



P1dB vs Temperature

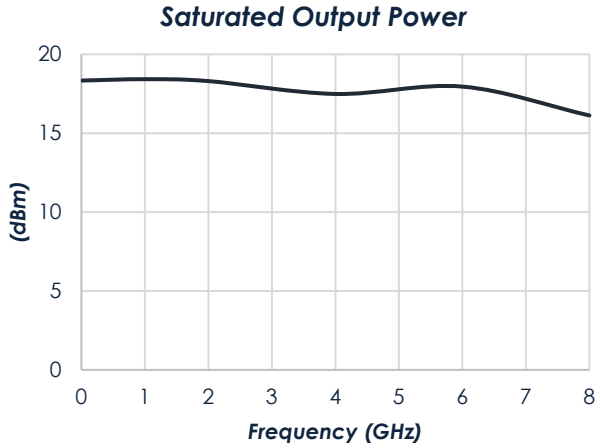


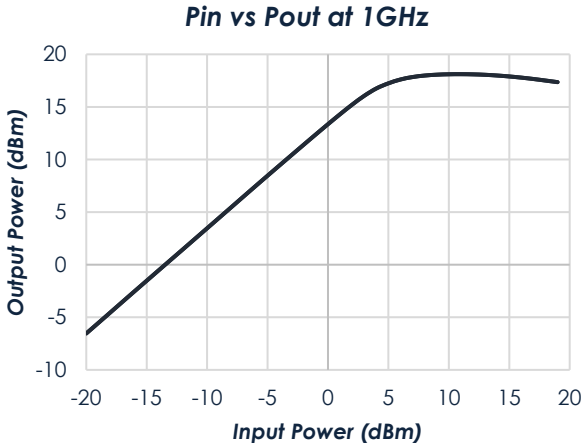
Reverse Isolation vs Temperature

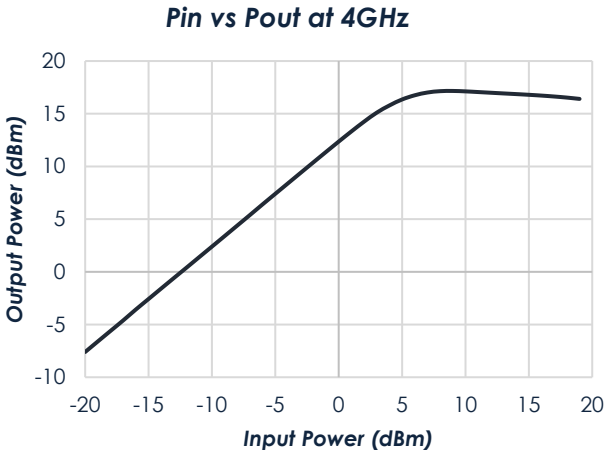


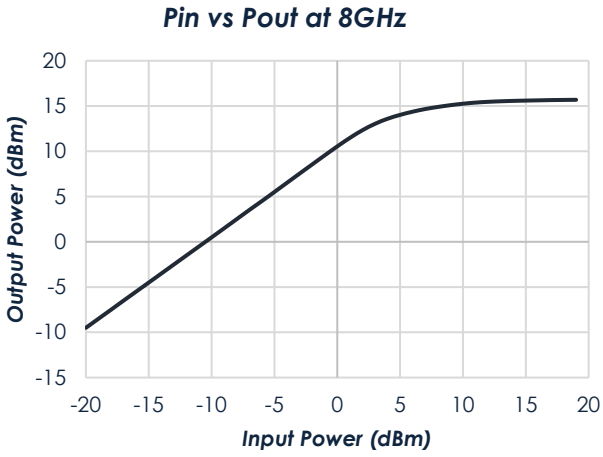
TYPICAL PERFORMANCE (CONTINUED)

(V Supply = +3.3V, Device Voltage [Vd] = +3.0V, Id = 56 mA)

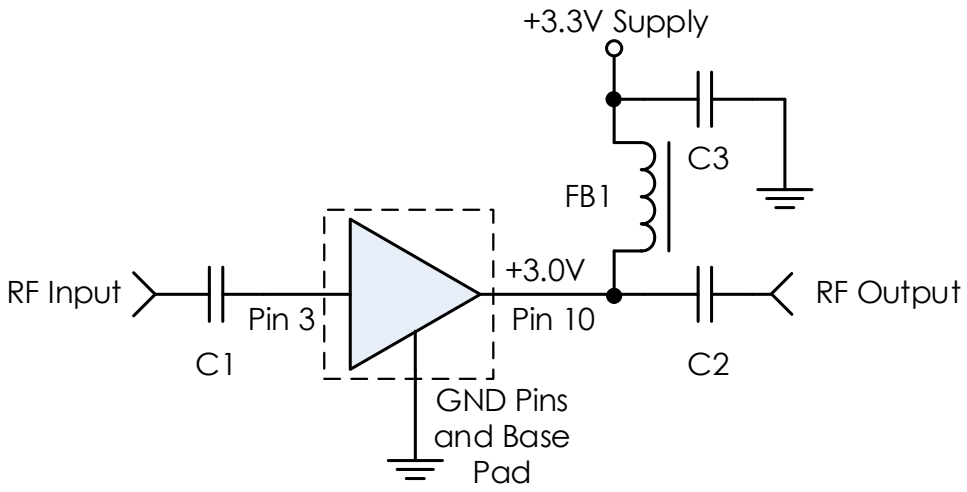








TYPICAL APPLICATION



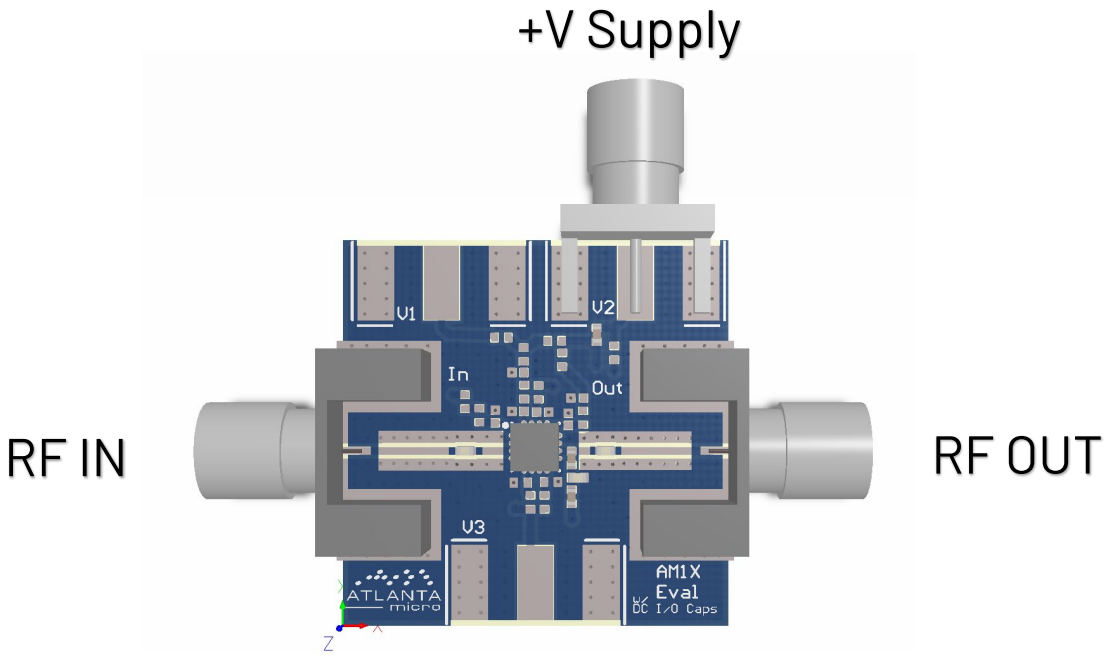
Recommended Component List (or Equivalent)

Part	Value	Part Number	Manufacturer
C1, C2	0.1 µF	0402BB104KW160	Passives Plus
C3	0.1 µF	GRM155R71C104KA88	Murata
FB1	-	BLM15HG102SN1D	Murata

Notes:

1. NC pins may be grounded or left open.
2. External DC blocking capacitors and RF choke are required.
    a. DC blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance.
    b. Select values for the frequency range of interest.
3. No input or output matching is required.

EVALUATION PC BOARD



PART ORDERING DETAILS

Part Number	Description
AM1031C	3mm 16 Lead QFN
AM1031C Eval	AM1031C Evaluation Board
AM1031C -M	AM1031C in 0.95" x 1.13" x 0.6" RF-Shielded Module with Integrated Bias Tee and Field Replaceable SMA Connectors

RELATED PARTS

Part Number		Description
AM1016B	20 MHz to 6 GHz	+3.3V Gain Block
AM1018B	20 MHz to 6 GHz	+5.0V Gain Block
AM1018C	20 MHz to 6 GHz	+5.0V Gain Block
AM1025B	20 MHz to 3 GHz	High P1dB Gain Block
AM1090	DC to 6 GHz	High P1dB Gain Block
AM1063-1	DC to 10 GHz	Low Noise Amplifier
AM1063-2	DC to 10 GHz	Miniature Low Noise Amplifier
AM1064-1	DC to 8 GHz	Low Noise Amplifier
AM1064-2	DC to 8 GHz	Miniature Low Noise Amplifier

COMPONENT COMPLIANCE INFORMATION

RoHS: Mercury Systems, 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 Mercury 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: Mercury Systems, 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: Mercury does not knowingly use materials that are sourced from the Democratic Republic of Congo (DRC) or any other known conflict regions. Mercury'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.

Mercury 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.

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