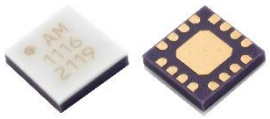
AM1116 – Amplifier

20 MHz to 6 GHz Gain Block

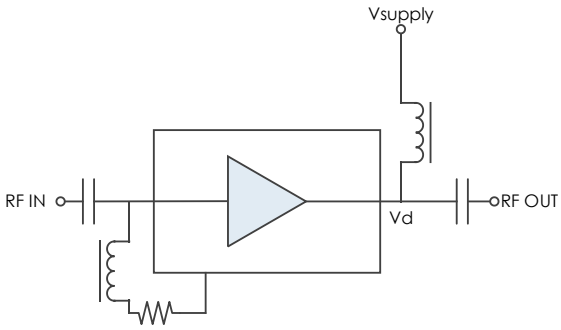


AM1116 is a high dynamic range gain block covering the 20 MHz to 6 GHz frequency range. The device exhibits flat gain, low noise figure and high third order intercept performance while also providing excellent gain stability over the operating temperature range. With internal 50 ohm matching and packaged in a 3mm QFN, the AM1116 represents a compact total PCB footprint.

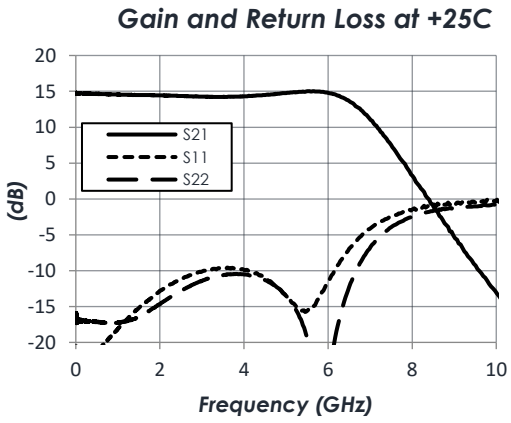
FEATURES

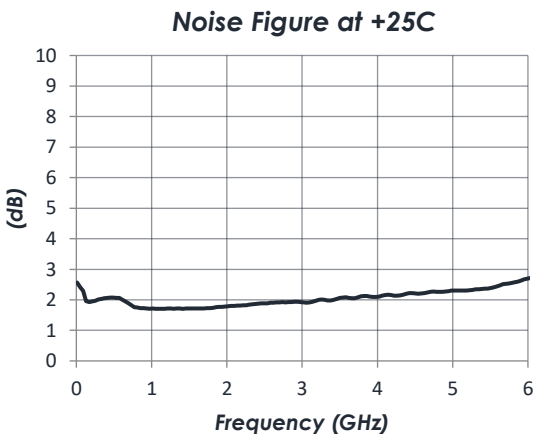
- 13 dB Gain
- 3.0 dB Noise Figure
- +35 dBm OIP3
- +22 dBm P1dB
- +5.0V, 115 mA
- 3mm QFN Package
- -40C to +85C Operation
- Unconditionally Stable

FUNCTIONAL DIAGRAM



CHARACTERISTIC PERFORMANCE





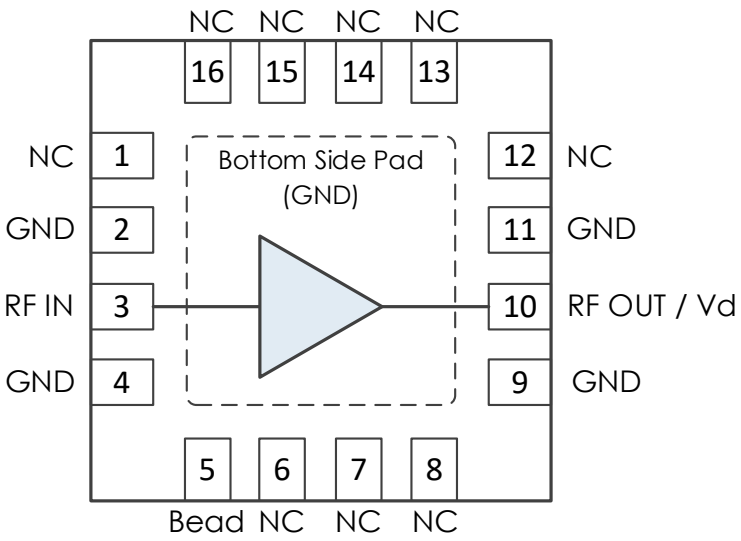
CONTENTS

REVISION HISTORY

Date	Revision	Notes
October 25, 2021	1	Initial Release
December 16, 2021	2	Updated format, added DFN package.
November 18, 2024	3	Changed to Mercury branding. No content changes.

PIN LAYOUT AND DEFINITIONS

AM1116-1: 3mm QFN

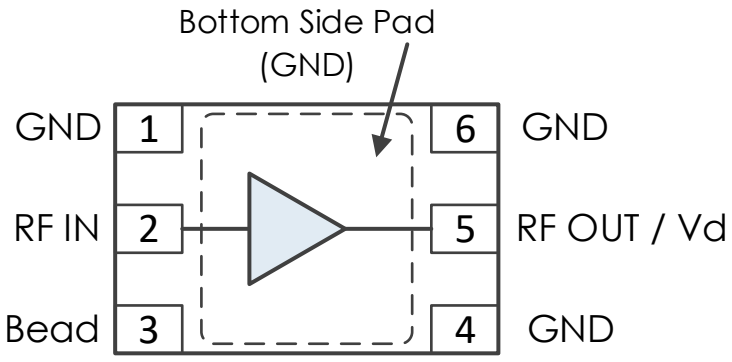


Pin	Name	Function
1	NC	Not Connected *
2	GND	Ground – Common
3	RF IN	RF Input – 50 ohms – DC Coupled, External DC Block Required
4	GND	Ground – Common
5	Bead	Connect to RF IN through external ferrite bead or large inductor in series with a 32.4-ohm resistor.
6-8	NC	Not Connected *
9	GND	Ground – Common
10	RF OUT/Vd	Output and DC Power Input – 50 ohms – DC Coupled, External DC Block Required
11	GND	Ground – Common
12-16	NC	Not Connected *

* NC pins may be grounded or left open.

PIN LAYOUT AND DEFINITIONS (CONTINUED)

AM1116-2: 2mm DFN



Pin	Name	Function
1	GND	Ground – Common
2	RF IN	RF Input – 50 ohms – DC Coupled, External DC Block Required
3	Bead	Connect to RF IN through external ferrite bead or large inductor in series with a 32.4-ohm resistor.
4	GND	Ground – Common
5	RF Out	RF Output – 50 Ohms – DC Coupled. External DC Blocking Capacitor Required
6	GND	Ground – Common

SPECIFICATIONS

Absolute Maximum Ratings

	Minimum	Maximum
Supply Voltage	-0.3 V	+3.5 V
RF Input Power		+20 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
Moisture Sensitivity Level (-1 package)	MSL 1	
(-2 package)	MSL 3	
ESD classification (HBM, survivable)	Class 1A	

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

Recommended Operating Conditions

	Minimum	Typical	Maximum
Supply Voltage	+3.0 V	+3.3 V	+3.5 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})	234 C/W
Nominal junction temperature at +85degC	+125 C
Channel Temperature to maintain 1 million hour MTTF	+175 C

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Param	Testing Conditions	Min	Typical	Max
DC Supply Voltage			+3.3 V	
DC Supply Current	VDD = +3.3 V		51 mA	
Power Dissipated	VDD = +3.3 V		168 W	

RF Performance

(T = 25 °C unless otherwise specified)

Param	Testing Conditions	Min	Typical	Max
Frequency Range		0.02 GHz		6.0 GHz
Gain	f = 3 GHz		13 dB	
Return Loss	f = 3 GHz		-10 dB	
Output IP2	f = 3 GHz, Sum IM2		+37 dBm	
	f = 3 GHz, Difference IM2		+40 dBm	
Output IP3	f = 3 GHz		+30 dBm	
Output P1dB	f = 3 GHz		+17 dBm	
Noise Figure	f = 3 GHz		2.0 dB	

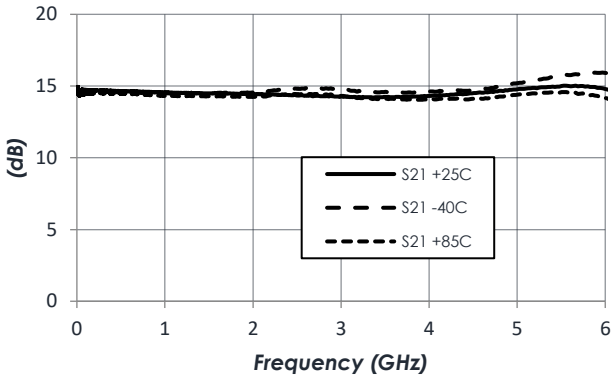
Notes:

1. OIP3 measured with 10MHz tone spacing.
2. OIP2 characterized with sum and difference measurements.
   - OIP2 sum measured with 10MHz tone spacing. IM2 measured at f_1+f_2
   - OIP2 difference measured with tones at $f_1$and f_2= $2f_1$– 10*MHz*. IM2 measured at $f_2 - f_1$

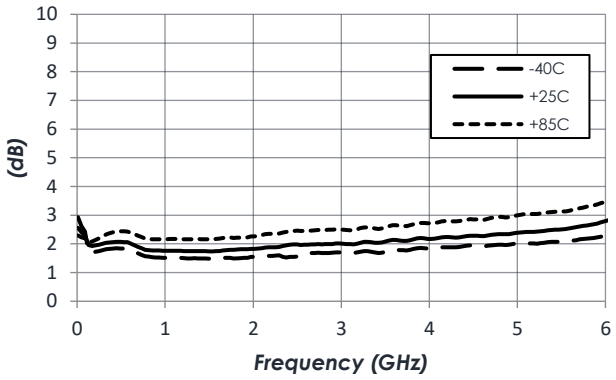
TYPICAL PERFORMANCE

(VDD=3.3V, T = 25 °C unless otherwise specified)

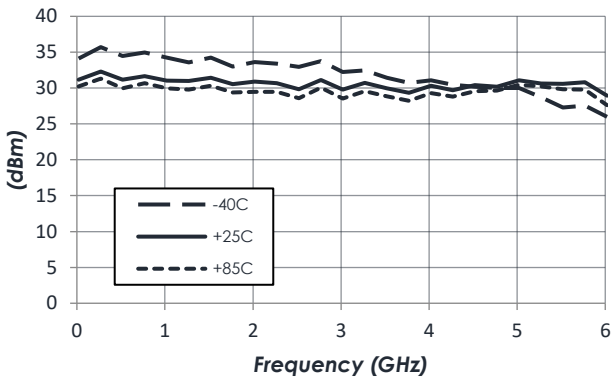
Gain vs Temperature



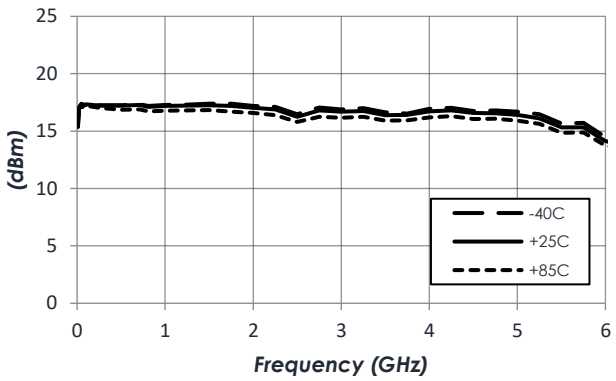
Noise Figure vs Temperature



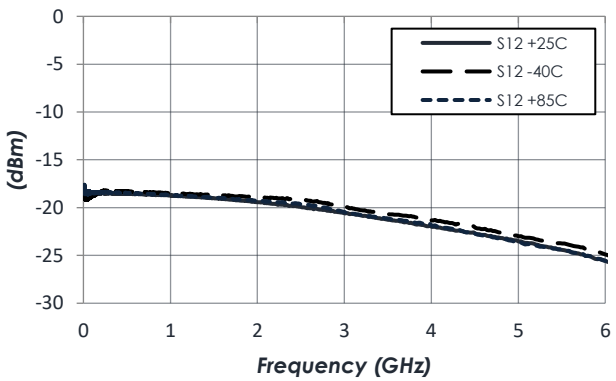
Output IP3 vs Temperature



P1dB vs Temperature

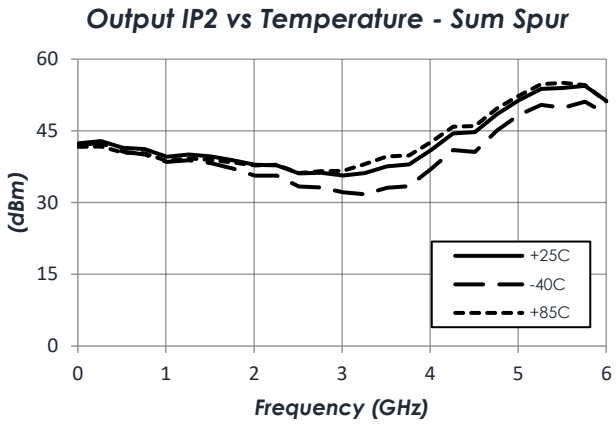


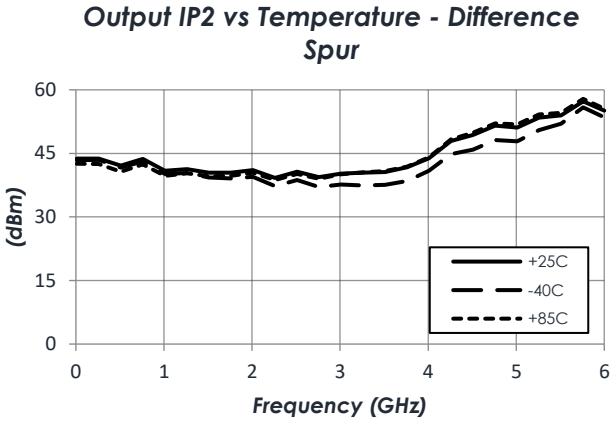
Reverse Isolation vs Temperature

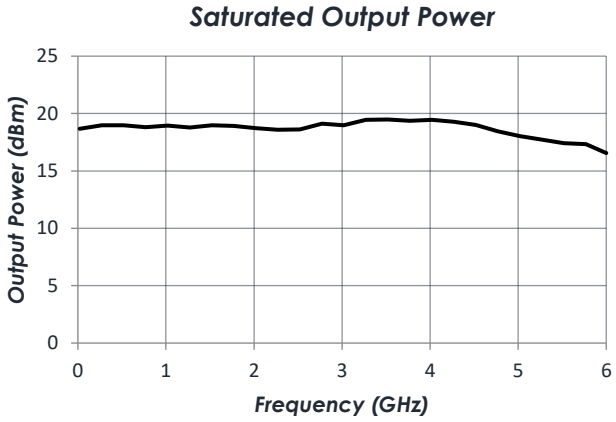


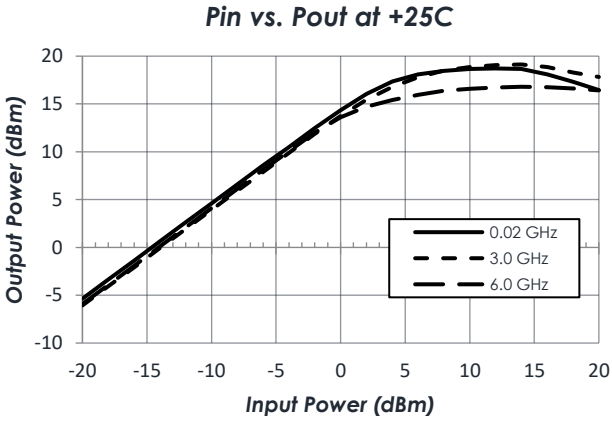
TYPICAL PERFORMANCE (CONTINUED)

(VDD=3.3V, T = 25 °C unless otherwise specified)

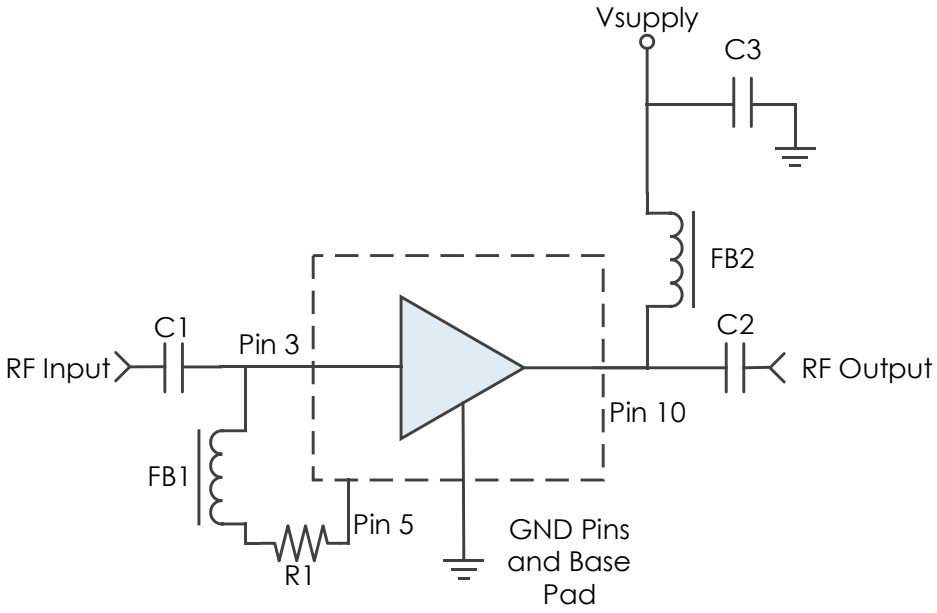








TYPICAL APPLICATION



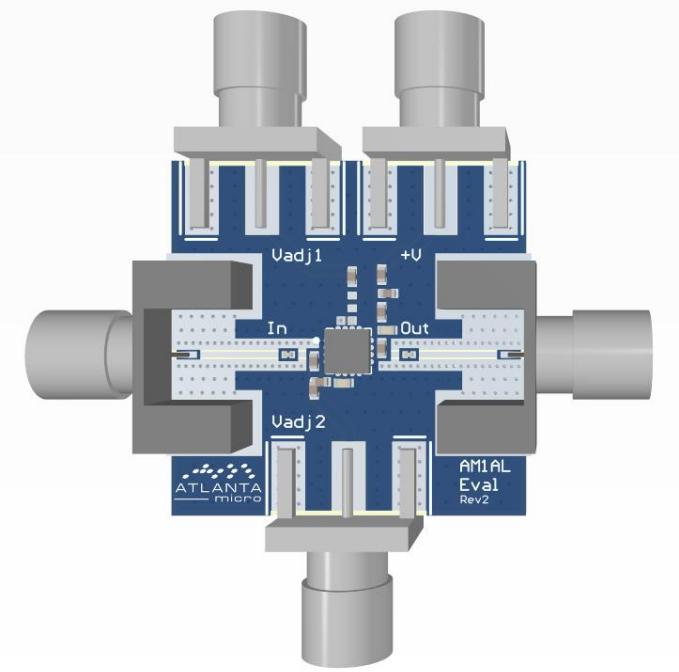
Recommended Component List (or Equivalent)

Part	Value	Part Number	Manufacturer
C1, C2	0.1 µF	0402BB104KW160	Passives Plus
C3	0.1 µF	GRM155R71C104KA88	Murata
FB1	-	MMZ1005A222E	TDK
R1	32.4 Ω	RC0402FR-0732R4L	Yageo

Notes:

1. DC blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance.
2. R1 is required for optimum performance.

EVALUATION PC BOARD



RELATED PARTS

Part Number		Description
AM1016	20 MHz to 6 GHz	Low Noise Gain Block, +3.3 V
AM1018	20 MHz to 6 GHz	Low Noise Gain Block, +3.3 V
AM1127	20 MHz to 6 GHz	Driver Amplifier, +6 V

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 (CrVl)	<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)

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