AM1141 – Amplifier

1.7 GHz to 18 GHz Bypassable Gain Block

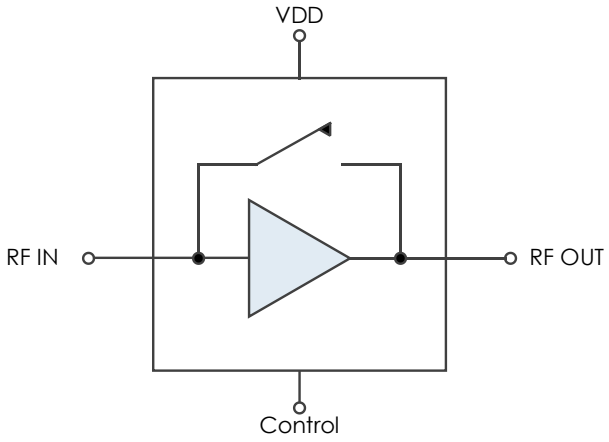
Description

AM1141 is a wideband device consisting of a low noise amplifier integrated with a low-loss, low-power amplifier bypass path. The amplifier covers the 1.7 GHz to 18 GHz frequency band with moderate gain, low noise figure, and good intermodulation performance. The integrated bypass path ranges from DC to 20 GHz with low insertion loss and high linearity. Packaged in a 3mm QFN with internal 50Ω matching, the AM1141 is a dramatic size reduction over a discrete implementation of a bypassable amplifier and provides a compact solution for demanding low-SWaP applications.

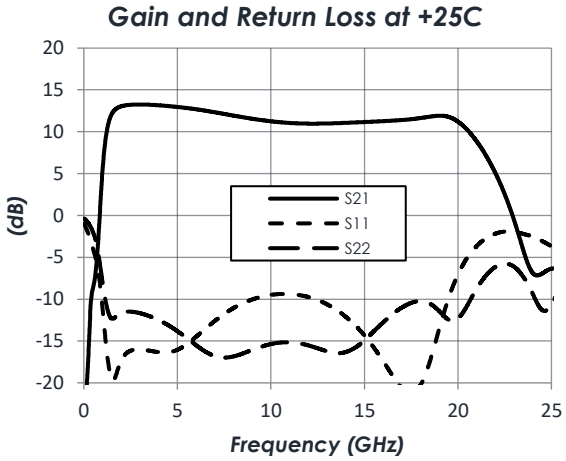
Features

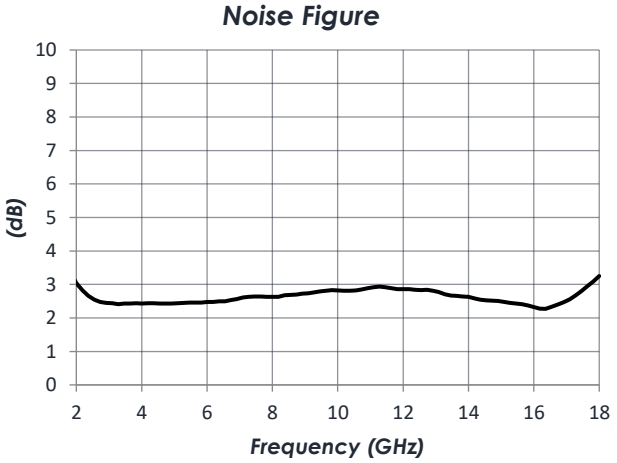
- 12 dB Gain
- 2.5 dB Noise Figure
- +26 dBm OIP3
- +14 dBm P1dB
- 1.75 dB Insertion Loss Bypass Path
- +3.3V, 48/2 mA (Gain/Bypass)
- +3.3V Control
- 3mm QFN Package
- -40C to +85C Operation

Functional Diagram



Characteristic Performance





To obtain price, delivery, or to place an order contact sales@atlantamicro.com
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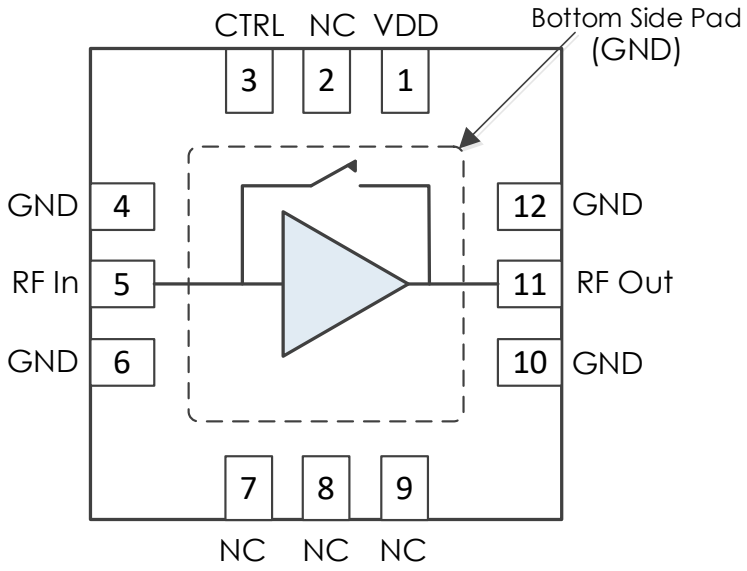
Table of Contents

Revision History

Date	Revision Number	Notes
January 13, 2023	1	Initial Release

Pin Layout and Definitions

Note: All Un-Labeled Pins are NC or Ground



Pin Number	Pin Name	Pin Function
1	VDD	DC Power Input
2	NC	No Connect
3	CTRL	Bypass/Amplifier Mode Control
4	GND	Ground – Common
5	RF In	RF Input – 50 Ohms – DC Coupled. External DC blocking capacitor required
6	GND	Ground – Common
7-9	NC	No Connect
10	GND	Ground – Common
11	RF Out	RF Output – 50 Ohms – DC Coupled. External DC blocking capacitor required
12	GND	Ground – Common

***Note:** NC pins may be grounded or left floating

Specifications

Absolute Maximum Ratings

	Minimum	Maximum
Supply Voltage	-0.3 V	+3.6 V
RF Input Power		+20 dBm
Storage Temperature Range	-55 C	+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	MSL 3	

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

Recommended Operating Conditions

	Minimum	Typical	Maximum
Supply Voltage		+3.3 V	
Operating Case Temperature	-40 C		+85 C

Thermal Information

Junction to Case Thermal Resistance (θ_{JC})	135 C/W
Nominal Junction Temperature at +85C Ambient	107 C
Channel Temperature to Maintain 1 Million Hour MTTF	175 C

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
DC Supply Voltage			+3.3 V	
DC Supply Current	Amplifier Enabled		48 mA	
	Amplifier Bypassed		2 mA	
Power Dissipated	Amplifier Enabled		158 mW	
	Amplifier Bypassed		7 mW	
Logic Level Low		-0.1 V		+0.4 V
Logic Level High		+2.2 V		+ VDD

RF Performance

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
Frequency Range		1.7 GHz		18 GHz
Gain	f = 10 GHz, Amp Enabled		11 dB	
Return Loss	f = 10 GHz, Amp Enabled		-10 dB	
	f = 10 GHz, Amp Bypassed		-17 dB	
Output IP3	f = 10 GHz, Amp Enabled		+26 dBm	
Output P1dB	f = 10 GHz, Amp Enabled		+14 dBm	
Noise Figure	f = 10 GHz, Amp Enabled		2.8 dB	
Insertion Loss	f = 10 GHz, Amp Bypassed		1.75 dB	
Input IP3	f = 10 GHz, Amp Bypassed		+38 dBm	

Timing Characteristics

(T = 25 °C unless otherwise specified)

Parameter	Minimum	Typical	Maximum
Switching Speed (Amp Bypassed -> Amp Enabled)		50 ns	
Switching Speed (Amp Enabled -> Amp Bypassed)		20 ns	

***Note:** Switching speed measured as 50% control to 10%/90% RF

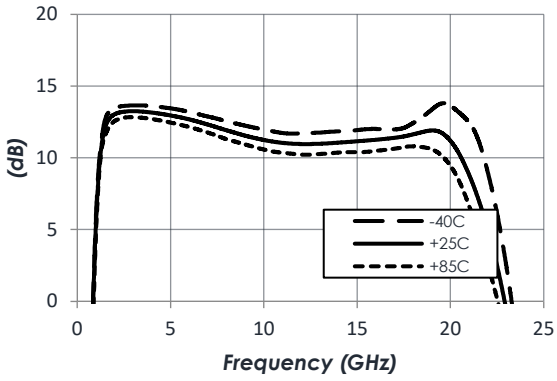
State Table

CTRL	State
Low	Amplifier Bypassed
High	Amplifier Enabled

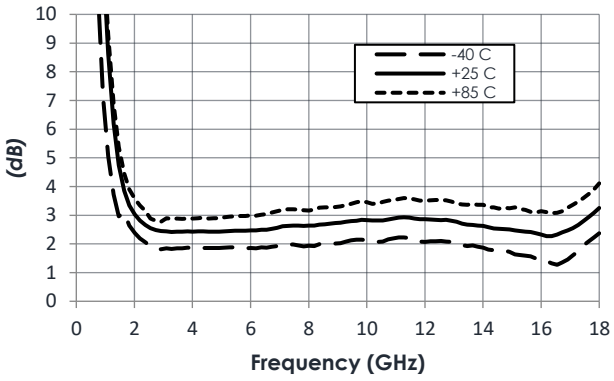
Typical Performance

(T = 25 °C, VDD = +3.3V unless otherwise specified; Amplifier Enabled)

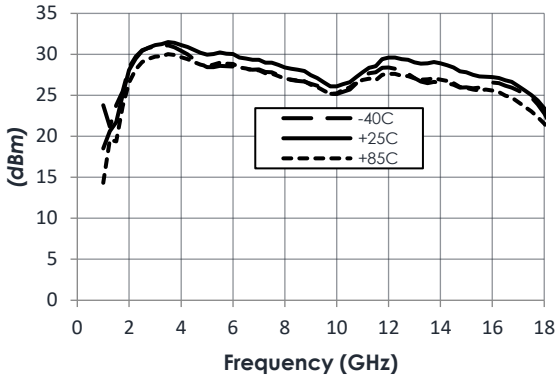
Gain vs Temperature



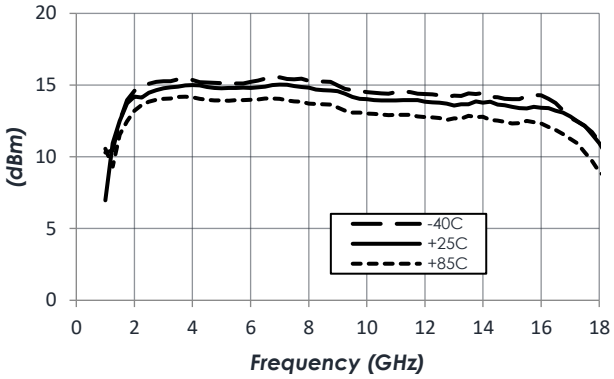
Noise Figure vs Temperature



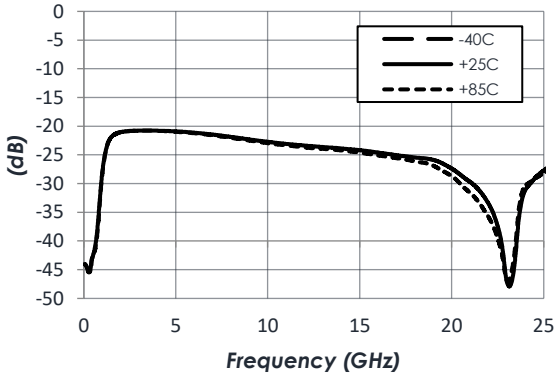
Output IP3 vs Temperature - Amp



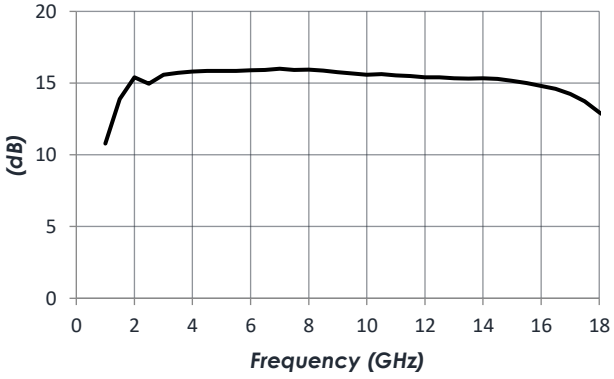
P1dB vs Temperature



Reverse Isolation vs Temperature



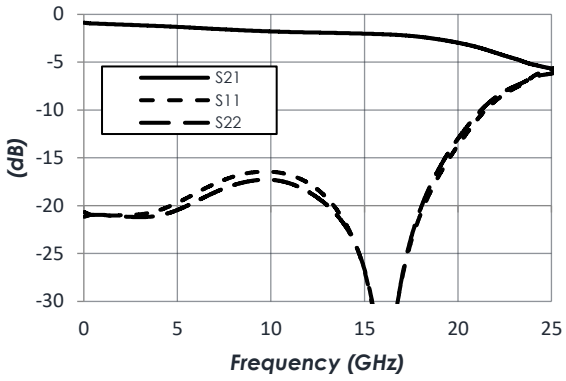
Power Saturation



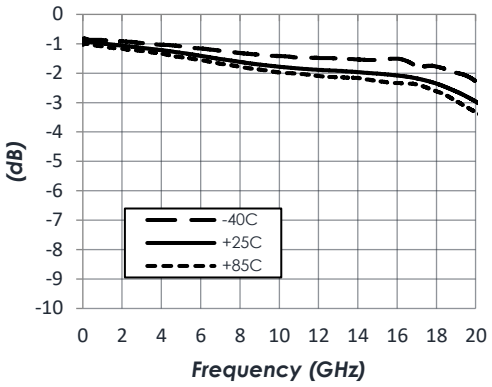
Typical Performance (continued)

(T = 25 °C, VDD = +3.3V unless otherwise specified; Amplifier Bypassed)

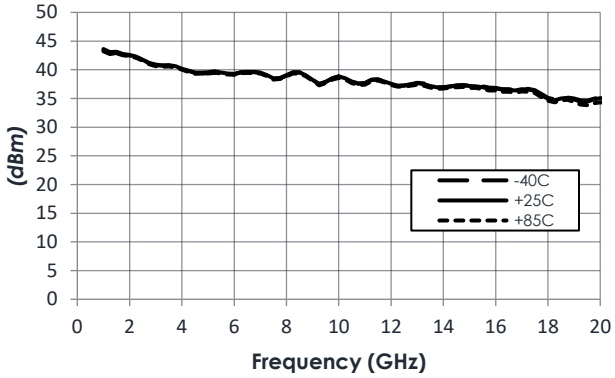
Insertion and Return Loss at +25C



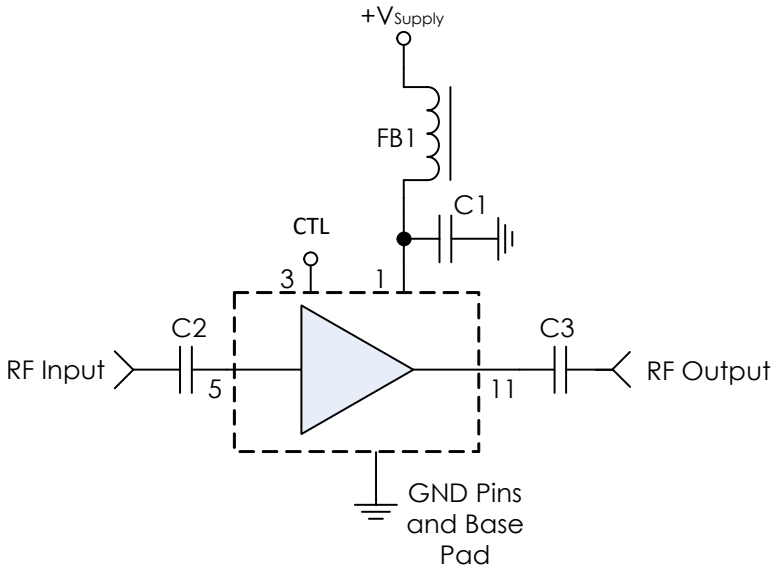
Insertion Loss vs Temperature



Input IP3 vs Temperature - Bypass



Typical Application



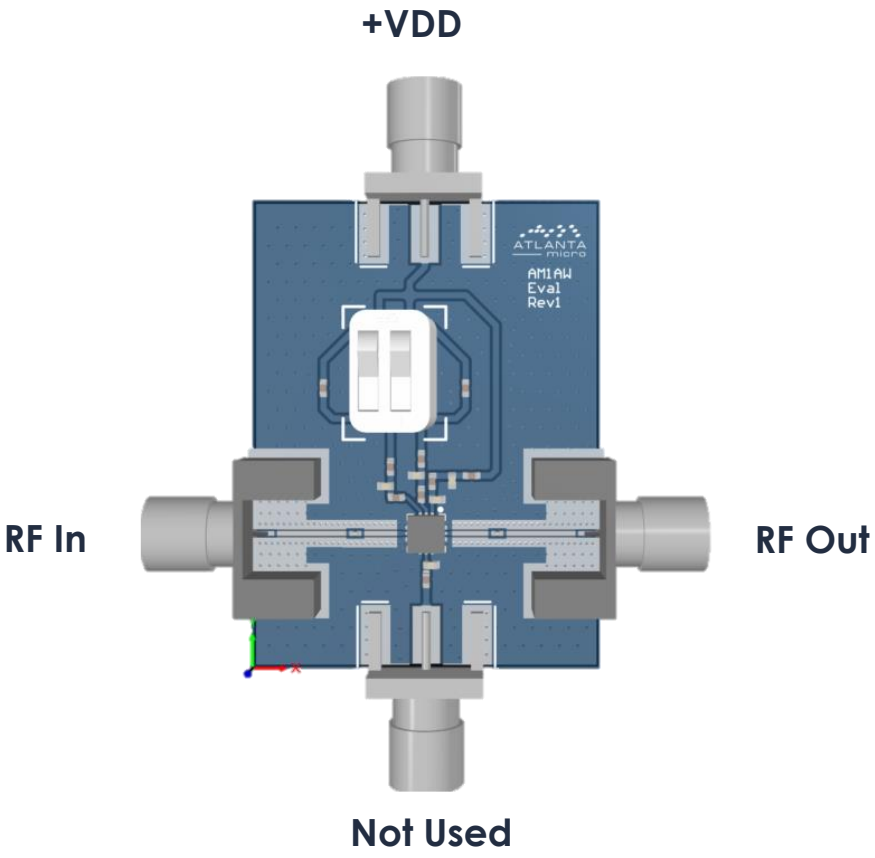
Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1	0.1uF	C1005X7R1H104K05BB	TDK
C2, C3	0.1uF	0201BB104KW160	Passive Plus
FB1	-	MMZ1005A222E	TDK

Notes:

1. DC blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance.
2. Control line filtered internally providing high frequency isolation.
    a. Switching speed measurement inclusive of internal control line filter

Evaluation PC Board



Note: Not all components shown will be installed.

Related Parts

Part Number				Description
AM1067	5 GHz	to	20 GHz	Bypassable Amplifier
AM1101	2 GHz	to	26.5 GHz	Bypassable Amplifier
AM1102	DC	to	22 GHz	Low Noise Amplifier
AM1109	2 GHz	to	18 GHz	Low Noise Amplifier
AM1111	2 GHz	to	18 GHz	Driver Amplifier

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)

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