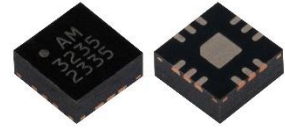


AM1135 – Amplifier

6 to 26.5 GHz Variable Gain Amplifier

Description

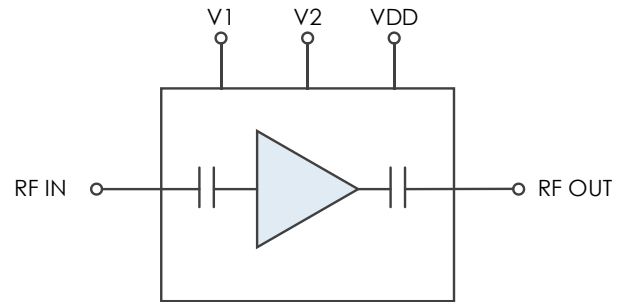
The AM1135 is a wideband digitally controlled variable gain amplifier that covers the 6-26.5 GHz frequency range. It provides 2dB of gain variation with approximately equal steps of 0.6dB. Output IP3, P1dB, and noise figure are decoupled from the gain variation, so the AM1135 provides consistent noise figure and nonlinear performance for any gain state. The device is packaged in a 3mm QFN with internal 50Ω matching and draws 140mW of DC power which makes the AM1135 ideal for demanding, low SWaP applications.



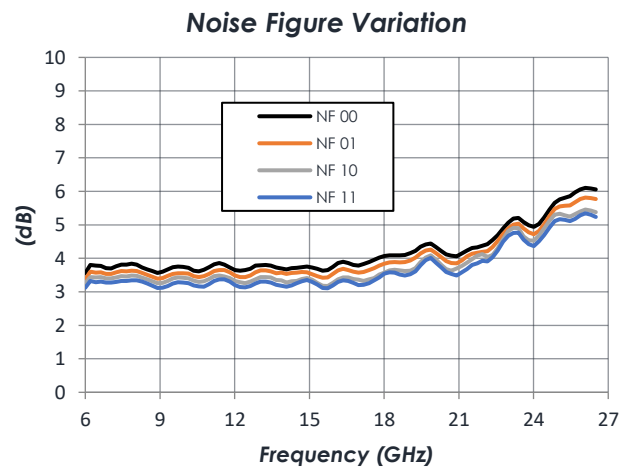
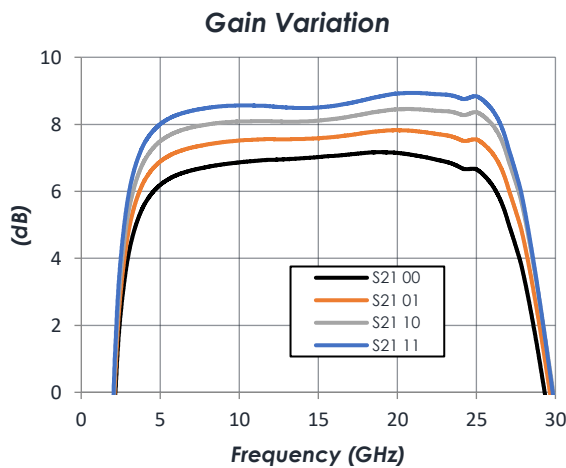
Features

- 2 dB Gain Variation
- 7-9 dB Gain
- 3.5 dB Noise Figure
- +25 dBm OIP3
- +13 dB P1dB
- 140 mW DC Power Consumption
- +3.3V VDD and Control
- 3mm QFN Package
- -40C to +85C Operation
- Unconditionally Stable

Functional Diagram



Characteristic Performance



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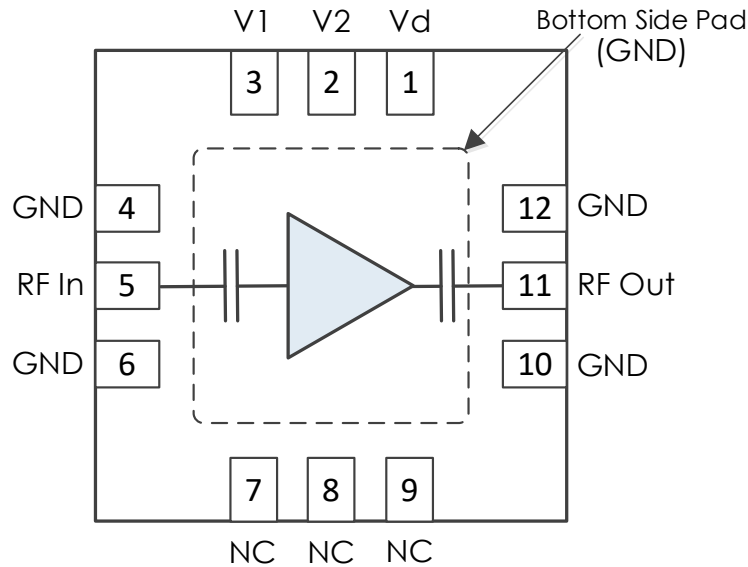
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Revision History

Date	Revision Number	Notes
December 9, 2021	1	Initial Release
April 26, 2024	1.1	Various notes modified.

Pin Layout and Definitions



Pin Number	Pin Name	Pin Function
1	Vd	DC Power Input
2	V2	Control Voltage 2
3	V1	Control Voltage 1
4	GND	Ground - Common
5	RF In	RF Input – 50 Ohms – AC Coupled
6	GND	Ground - Common
7-9	NC	No Connect
10	GND	Ground - Common
11	RF Out	RF Output – 50 Ohms – AC Coupled
12	GND	Ground - Common

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

AM1135 – Amplifier

6 to 26.5 GHz Variable Gain Amplifier

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

Thermal Resistance (channel to center ground paddle)	445 C/W
Nominal Junction Temperature at +85C Ambient	+147 C
Channel Temperature to Maintain 1 Million Hour MTF	+175 C

AM1135 – Amplifier

6 to 26.5 GHz Variable Gain Amplifier

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
DC Supply Voltage			+3.3 V	
DC Supply Current	All States, VDD = +3.3V		42 mA	
Power Dissipated	VDD = +3.3V		140mW	
Logic Level Low		-0.1 V		+0.4 V
Logic Level High		+2.2 V		+VDD
DC Control Current	VDD = +3.3V		<100 μ A	

RF Performance

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
Frequency Range		6 GHz		26.5 GHz
Gain	State 00, f=16 GHz		7.0 dB	
	State 01, f=16 GHz		7.6 dB	
	State 10, f=16 GHz		8.1 dB	
	State 11, f=16 GHz		8.6 dB	
Return Loss	State 00, f=16 GHz		-10.5 dB	
	State 01, f=16 GHz		-9.4 dB	
	State 10, f=16 GHz		-8.8 dB	
	State 11, f=16 GHz		-7.9 dB	
Output IP3	f = 16 GHz		+25 dBm	
Output P1dB	f = 16 GHz		+13 dBm	
Noise Figure	State 00, f=16 GHz		3.8 dB	
	State 01, f=16 GHz		3.7 dB	
	State 10, f=16 GHz		3.4 dB	
	State 11, f=16 GHz		3.3 dB	

*Note: OIP3 measured with 10MHz tone spacing

Timing Characteristics

(T = 25 °C unless otherwise specified)

Parameter	Minimum	Typical	Maximum
Switching Speed		20 ns	

*Note: Timing Characteristics measured from 50% control to 90% RF.

State Table

(T = 25 °C unless otherwise specified)

V1	V2	Gain (20 GHz)
Low	Low	7.1 dB
Low	High	7.8 dB
High	Low	8.5 dB
High	High	8.9 dB

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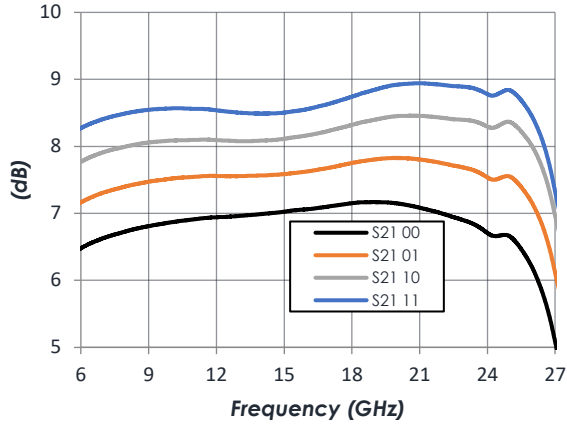
AM1135 – Amplifier

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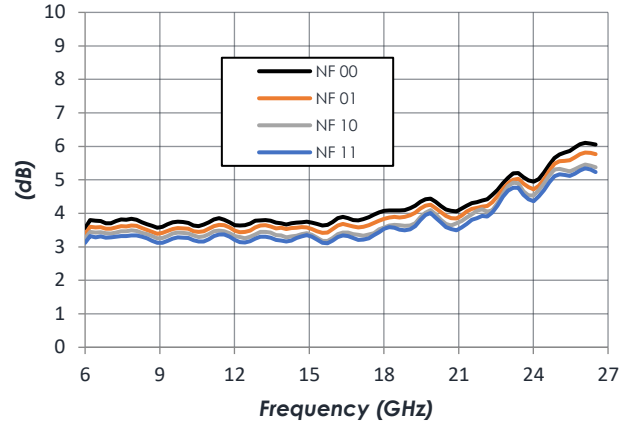
Typical Performance

(T = 25 °C unless otherwise specified)

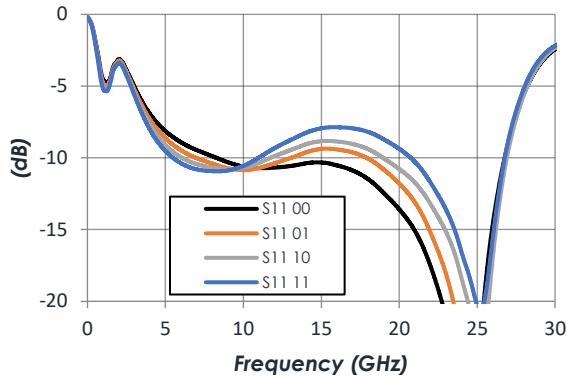
Gain Variation



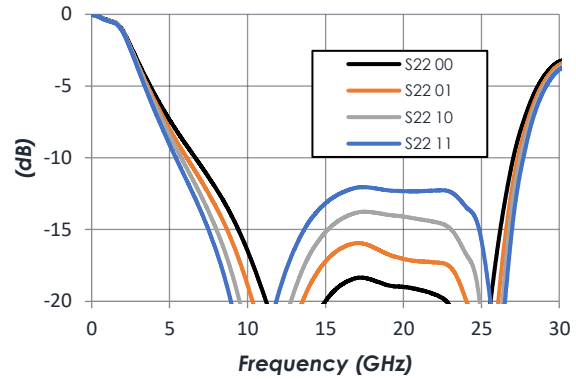
Noise Figure Variation



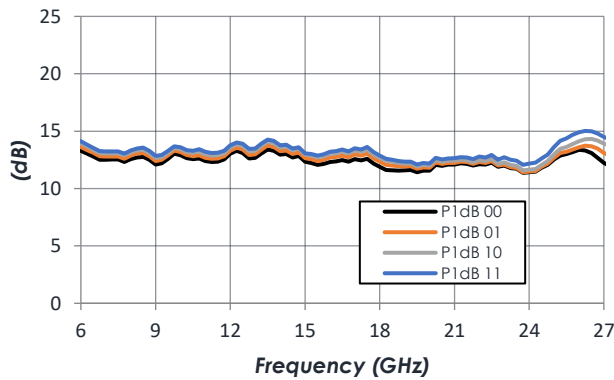
Input Return Loss Variation



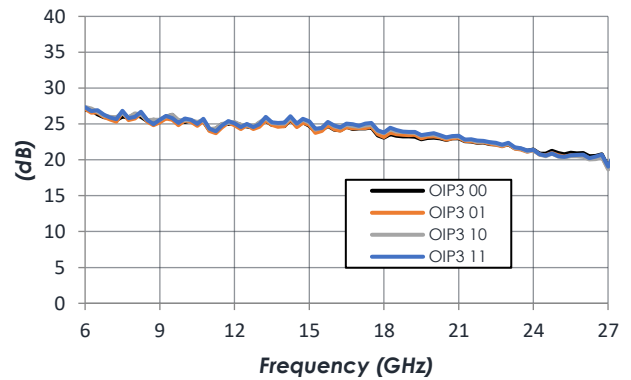
Output Return Loss Variation



P1dB Variation



OIP3 Variation



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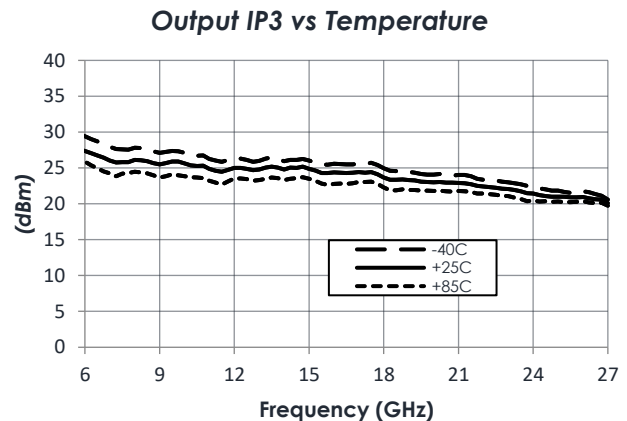
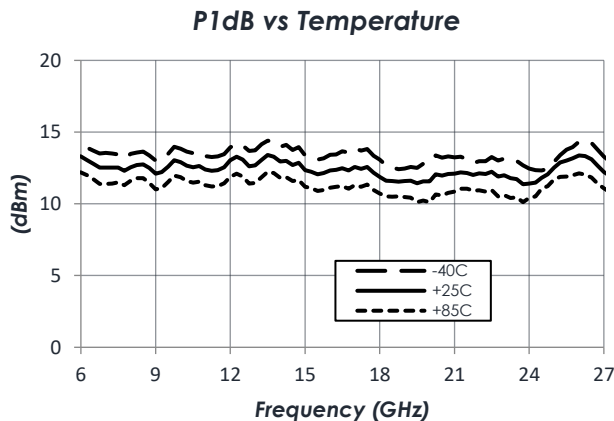
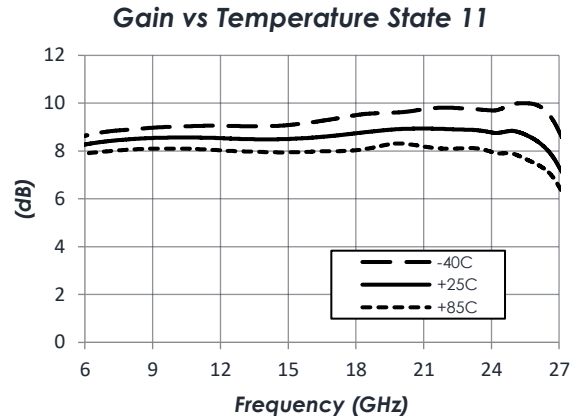
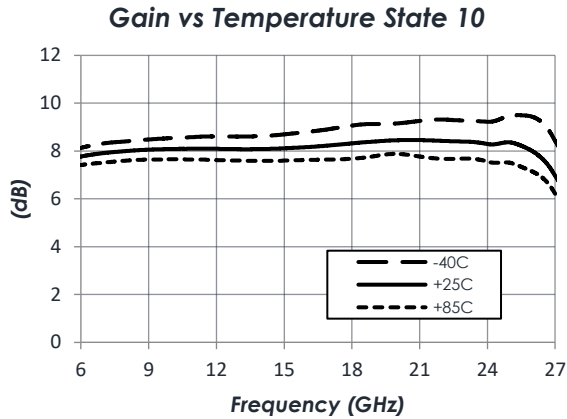
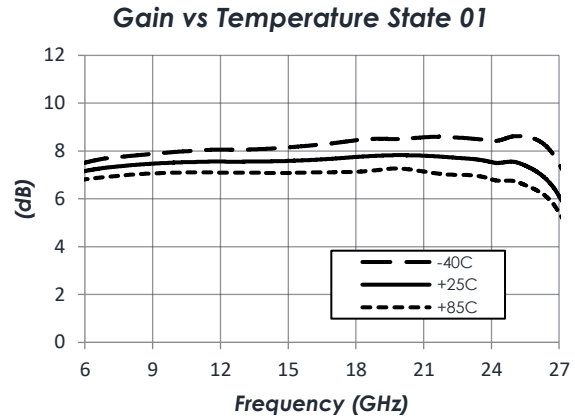
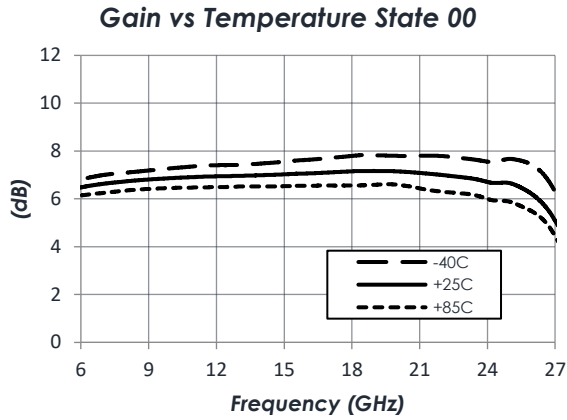
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AM1135 – Amplifier

6 to 26.5 GHz Variable Gain Amplifier

Typical Performance (continued)

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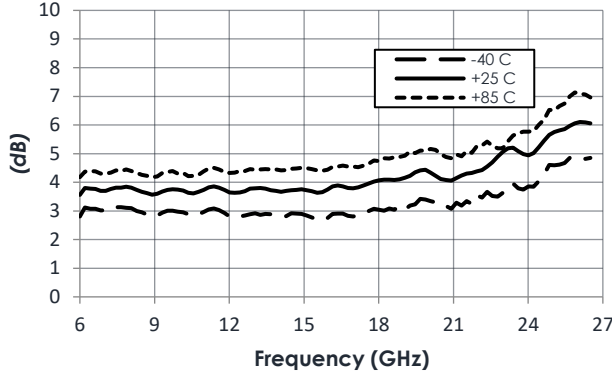
6 to 26.5 GHz Variable Gain Amplifier



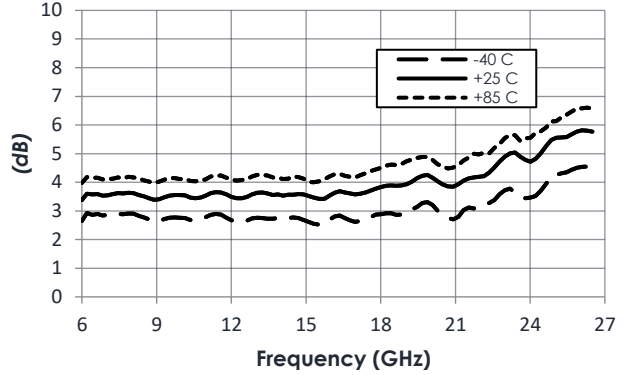
Typical Performance (continued)

(T = 25 °C unless otherwise specified)

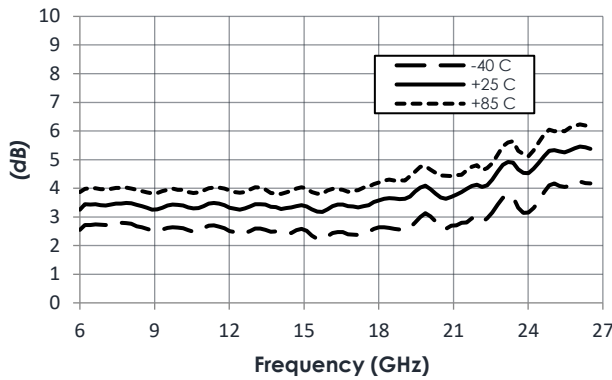
Noise Figure vs Temperature State 00



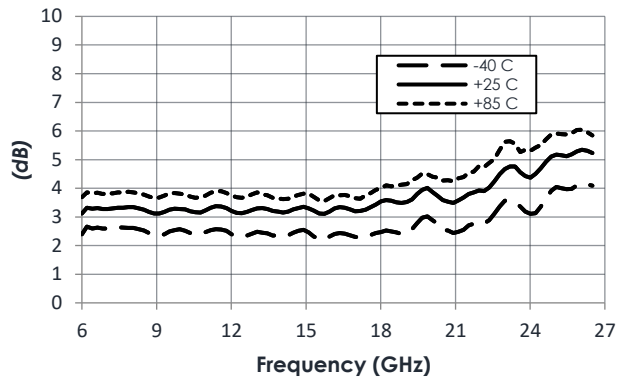
Noise Figure vs Temperature State 01



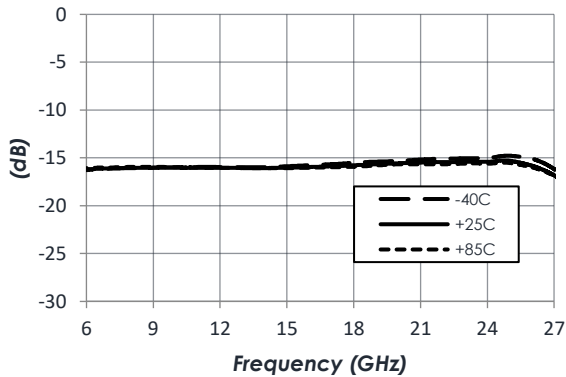
Noise Figure vs Temperature State 10



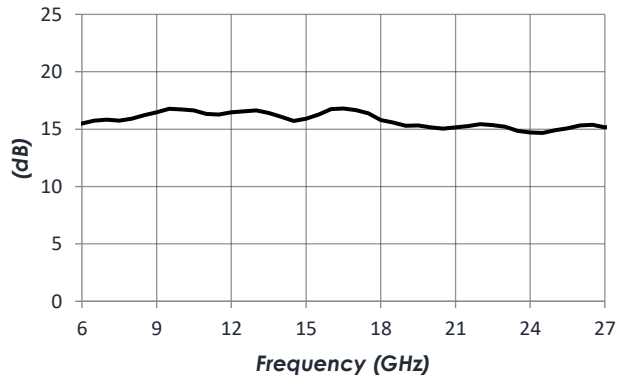
Noise Figure vs Temperature State 11



Typical Reverse Isolation vs Temperature



Power Saturation State 11

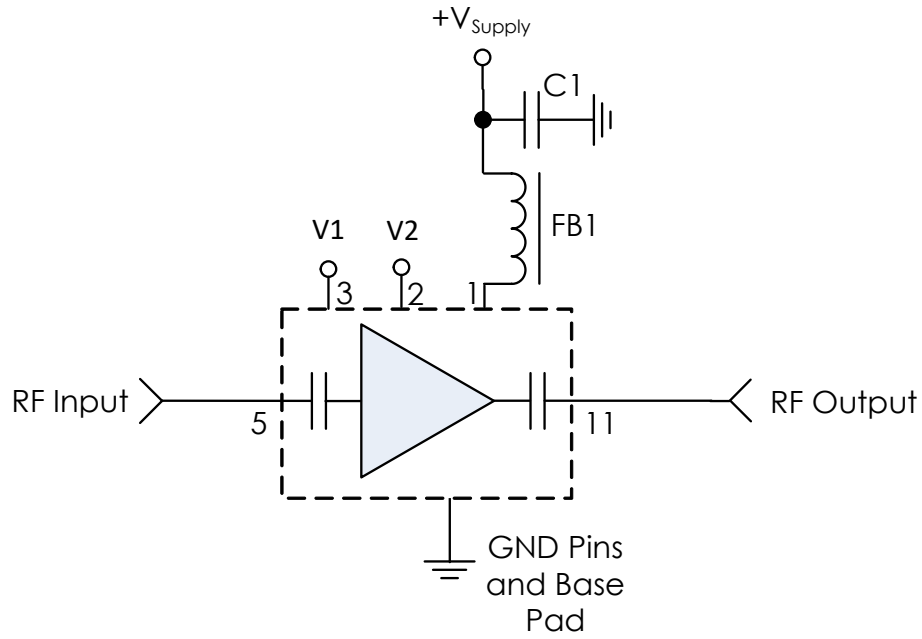


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AM1135 – Amplifier

6 to 26.5 GHz Variable Gain Amplifier

Typical Application



Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1	0.1 μ F	C1005X7R1H104K05BB	TDK
FB1	-	MMZ1005A222E	TDK

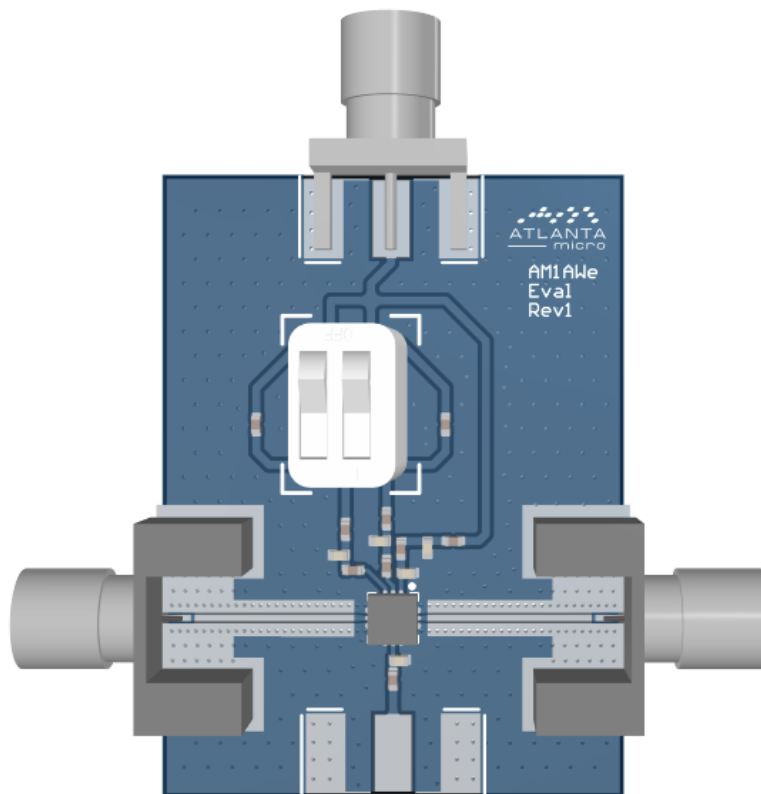
Notes:

1. Control lines are filtered internally providing high frequency isolation.
2. AM1135 is AC coupled. No external DC blocking caps are required.

AM1135 – Amplifier

6 to 26.5 GHz Variable Gain Amplifier

Evaluation PC Board



Related Parts

Part Number	Description
AM1101	2 GHz to 26.5 GHz Bypassable Amplifier
AM1134	6 GHz to 26.5 GHz Low Noise Amplifier
AM1145	2 GHz to 18 GHz Variable Slope Amplifier
AM1146	2 GHz to 18 GHz Variable Gain Amplifier

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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-ethylhexyl) 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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