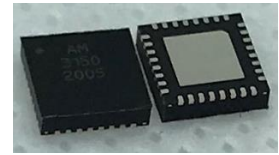


AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass

Description

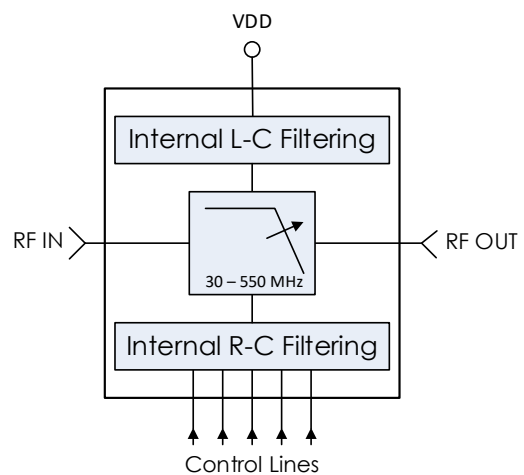
AM3150 is a digitally tunable lowpass filter covering the 30 MHz to 550 MHz frequency range. The filter provides 32 selectable lowpass cutoff states with 5 digital control bits. The tunable lowpass filter can be combined with one of Atlanta Micro's tunable highpass filters to provide a flexible bandpass filter solution. AM3150 is packaged in a 5mm QFN package and operates over the -40C to +85C temperature range.



Features

- Digitally Tunable Lowpass Filter
- Integrated Control Line Filtering
- +3.3V to +5.0V Supply
- 1.5 dB Insertion Loss
- +40 dBm Input IP3
- +24 dBm Input P1dB
- -40C to +85C Operation

Functional Diagram



Characteristic Performance

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

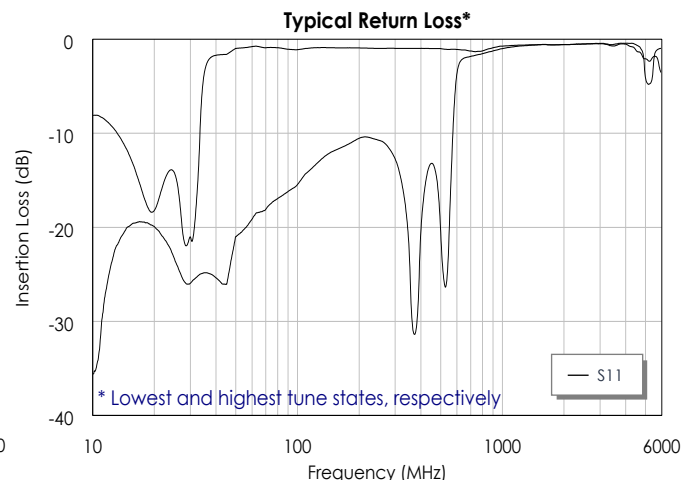
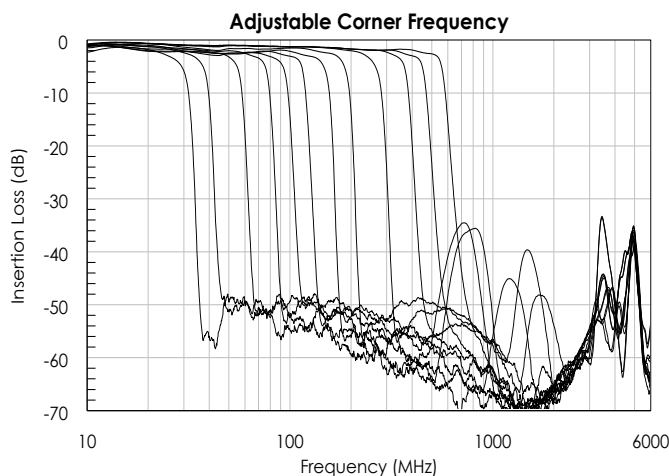


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Revision History

Date	Revision Number	Notes
April 2, 2020	1	Initial Release
May 13, 2020	2	Updated Performance
July 8, 2020	3	Added Timing Characteristics
July 13, 2020	3.1	Pin Layout Image Corrected
October 23, 2020	4	Added information for a smaller form factor configuration.
January 12, 2021	5	Added control bits current drive requirements. Added Input IP2 information.

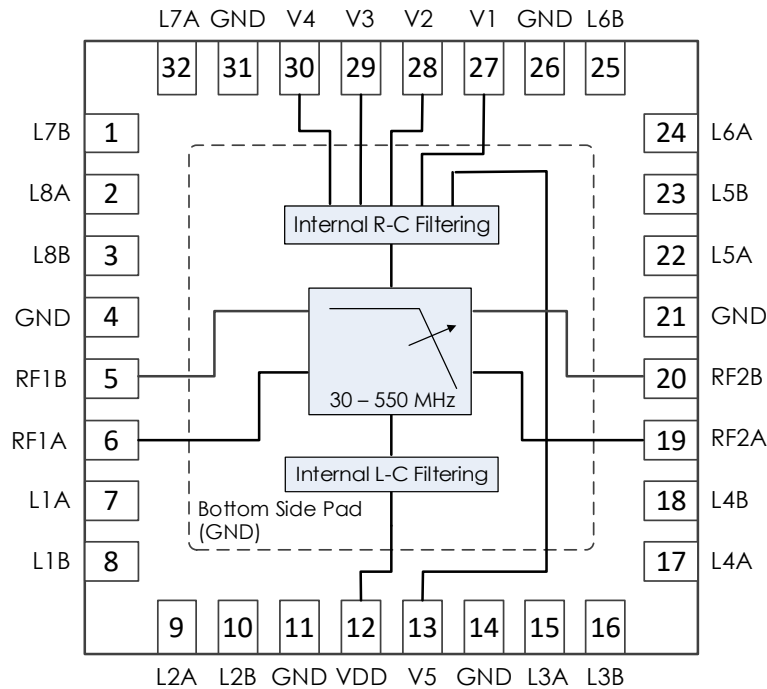
AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass



Pin Layout and Definitions

Note: All Non-Named Pins are NC or GND



Pin Number	Pin Name	Pin Function
1	L7B	L7 Connection B
2	L8A	L8 Connection A
3	L8B	L8 Connection B
4	GND	Ground – Common
5	RF1B	RF Input – 50 Ohms – DC Coupled, External DC Block Required
6	RF1A	RF Input – 50 Ohms – DC Coupled, External DC Block Required
7	L1A	L1 Connection A
8	L1B	L1 Connection B
9	L2A	L2 Connection A
10	L2B	L2 Connection B
11	GND	Ground – Common
12	VDD	DC Power Input
13	V5	Low Pass Filter Control Bit E (MSB)
14	GND	Ground - Common
15	L3A	L3 Connection A
16	L3B	L3 Connection B
17	L4A	L4 Connection A
18	L4B	L4 Connection B
19	RF2A	RF Output – 50 Ohms – DC Coupled, External DC Block Required
20	RF2B	RF Output – 50 Ohms – DC Coupled, External DC Block Required
21	GND	Ground – Common

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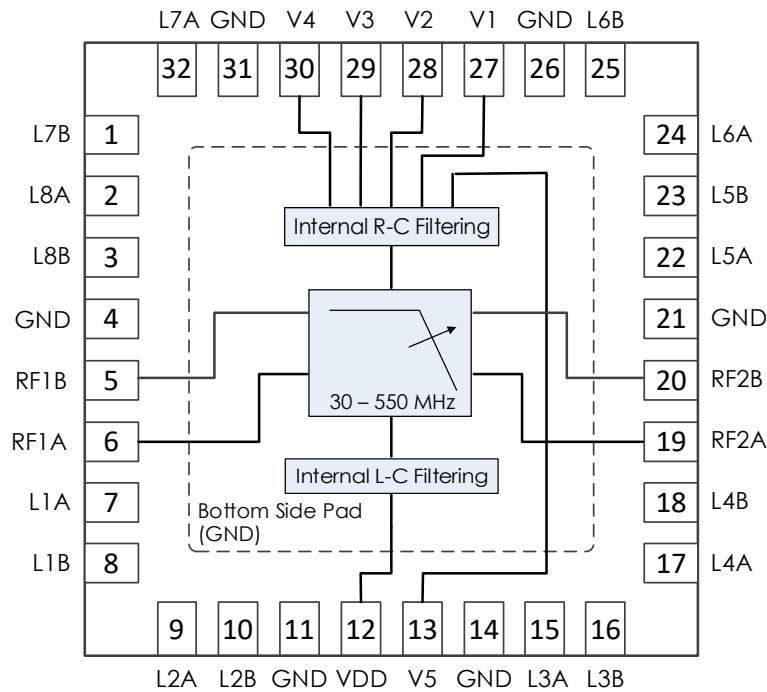
AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass



Pin Layout and Definitions (continued)

Note: All Non-Named Pins are NC or GND



Pin Number	Pin Name	Pin Function
22	L5A	L5 Connection A
23	L5B	L5 Connection B
24	L6A	L6 Connection A
25	L6B	L6 Connection B
26	GND	Ground – Common
27	V1	Low Pass Filter Control Bit A (LSB)
28	V2	Low Pass Filter Control Bit B
29	V3	Low Pass Filter Control Bit C
30	V4	Low Pass Filter Control Bit D
31	GND	Ground – Common
32	L7A	L7 Connection A
Bottom Pad	GND	Ground – Common

AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass



Specifications

Absolute Maximum Ratings

	Minimum	Maximum
Supply Voltage	-0.3 V	+6.0 V
RF Input Power		+27 dBm
Operating Junction Temperature	-40 C	+150 C
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
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	+5.0 V	+5.2 V
Operating Case Temperature	-40 C		+85 C
Operating Junction Temperature	-40 C		+125 C

AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
DC Supply Voltage		+3.0 V	+5.0 V	+5.2 V
DC Supply Current	VDD = +5.0 V		1 mA	
Power Dissipated	VDD = +5.0 V		5 mW	
Logic Level Low		-0.1 V		+0.5 V
Logic Level High		+2.0 V		+VDD V
Logic Current Drive	Vx = +3.3V	100 μ A		
	Vx = +5V	200 μ A		

RF Performance

(VDD = +5.0V, T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
Frequency Range		30 MHz		550 MHz
Insertion Loss	Lowest Tune State, CFG A		-3 dB	
	Highest Tune State, CFG A		-1.5 dB	
Return Loss	Lowest Tune State, CFG A		-14 dB	
	Highest Tune State, CFG A		-18 dB	
Input IP3	VDD = +5.0V		+40 dBm	
Input IP2	VDD = +5.0V		+60 dBm	
Input P1dB	Lowest Tune State		+21 dBm	
	Highest Tune State		+24 dBm	

Timing Characteristics

(VDD = +5.0V, T = 25 °C unless otherwise specified)

Parameter	Minimum	Typical	Maximum
Tuning Speed, Rise (Out of Band → In Band)		100 ns	
Tuning Speed, Fall (In Band → Out of Band)		50 ns	
Settling Time, Rise (Out of Band → In Band)			500 ns
Settling Time, Fall (In Band → Out of Band)			500 ns

NOTES:

- Tuning speed rise defined by 50% CTL to 90% RF.
- Tuning speed fall defined as 50% CTL to 10% RF.
- Settling time error band defined to be within 1% of steady state value.

AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass



State Table

(Typical Cutoff shown is for **Configuration A**, VDD = 5V. Download provided s-parameters for more information.)

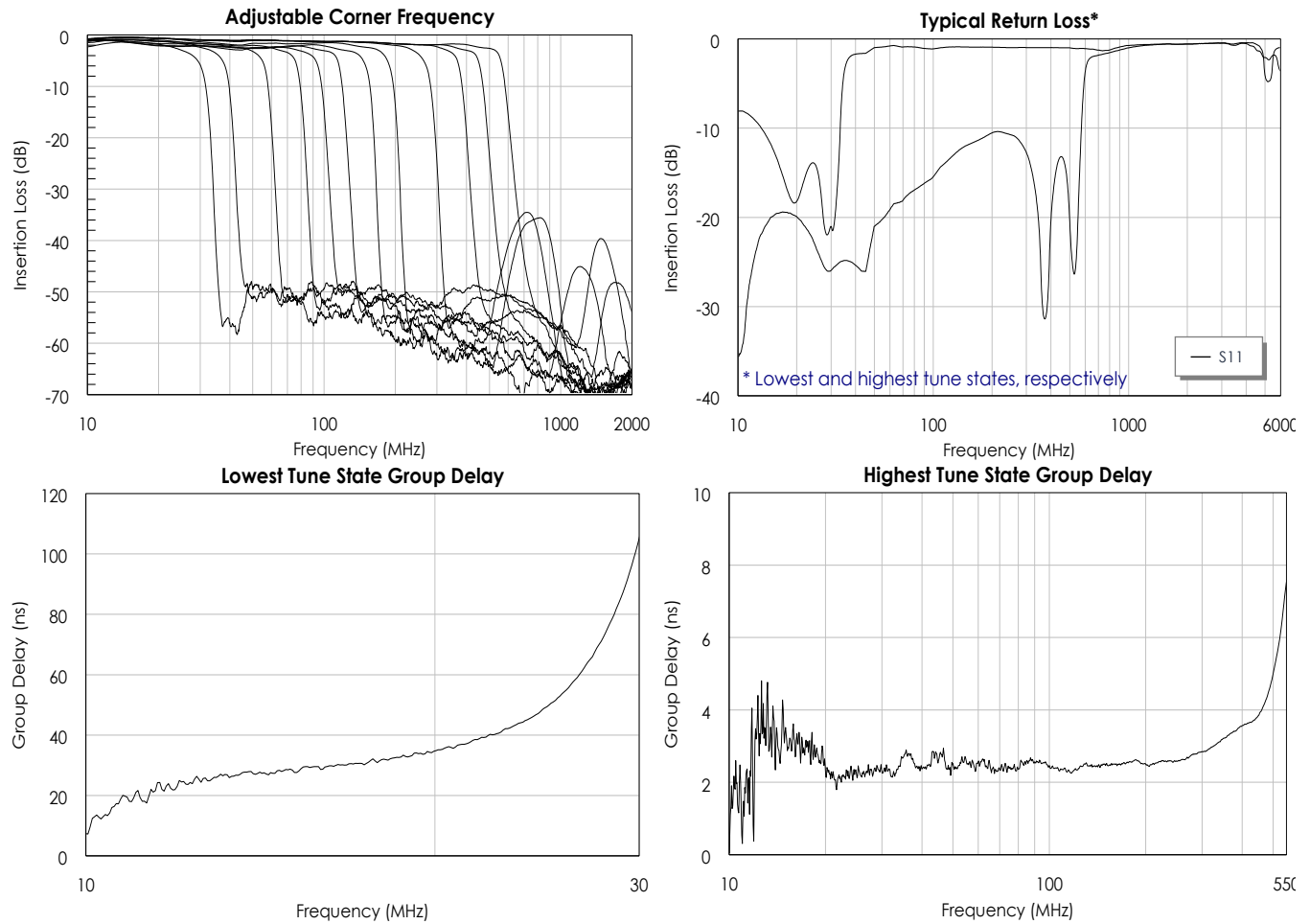
E	D	C	B	A	Typical Cutoff Frequency (MHz)
L	L	L	L	L	28
L	L	L	L	H	29
L	L	L	H	L	30
L	L	L	H	H	31
L	L	H	L	L	32
L	L	H	L	H	33
L	L	H	H	L	35
L	L	H	H	H	36
L	H	L	L	L	43
L	H	L	L	H	46
L	H	L	H	L	49
L	H	L	H	H	53
L	H	H	L	L	65
L	H	H	L	H	73
L	H	H	H	L	89
L	H	H	H	H	112
H	L	L	L	L	141
H	L	L	L	H	145
H	L	L	H	L	149
H	L	L	H	H	153
H	L	H	L	L	163
H	L	H	L	H	168
H	L	H	H	L	174
H	L	H	H	H	180
H	H	L	L	L	213
H	H	L	L	H	224
H	H	L	H	L	239
H	H	L	H	H	254
H	H	H	L	L	318
H	H	H	L	H	357
H	H	H	H	L	439
H	H	H	H	H	550

AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass

Typical Performance

(Only some states shown for simplicity. Download provided s-parameters for more information. Data shown is for **Configuration A**, VDD = 5V)

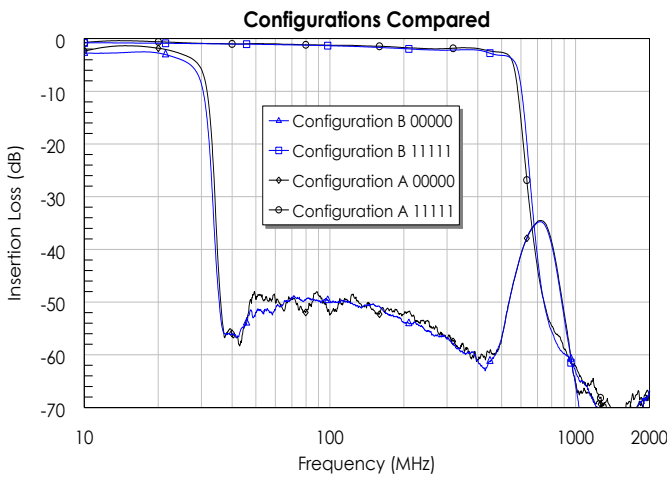
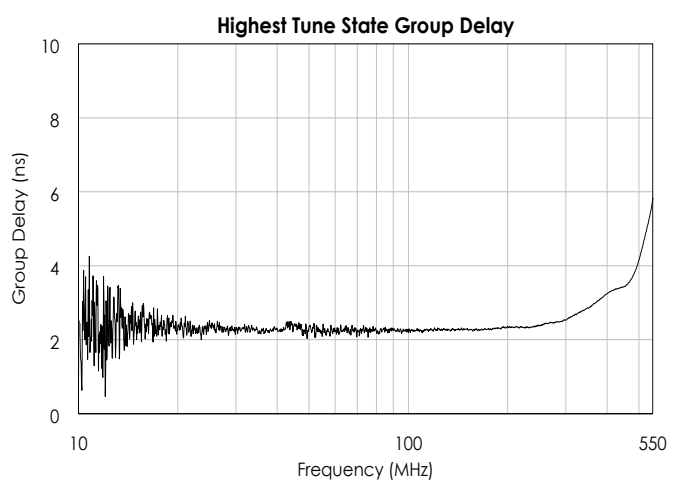
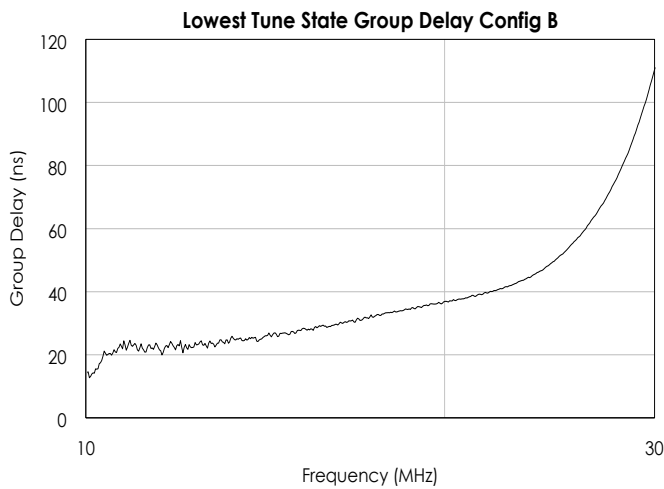
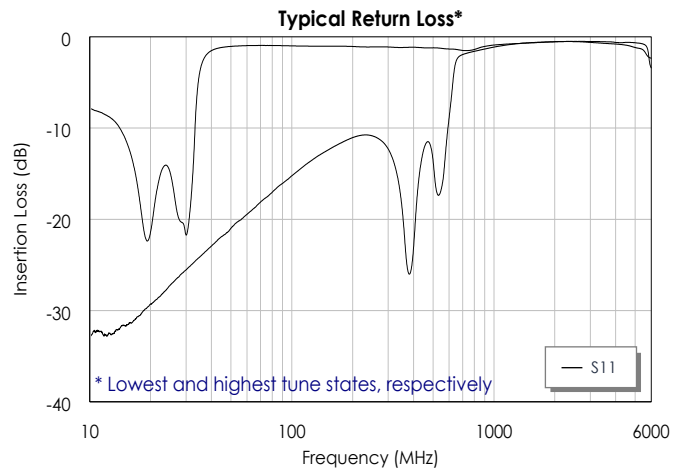
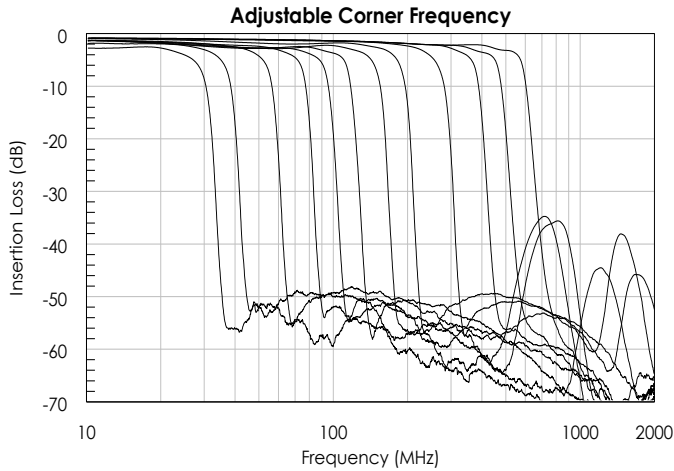


AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass

Typical Performance (Continued)

(Only some states shown for simplicity. Download provided s-parameters for more information. Data shown is for **Configuration B**, VDD = 5V)



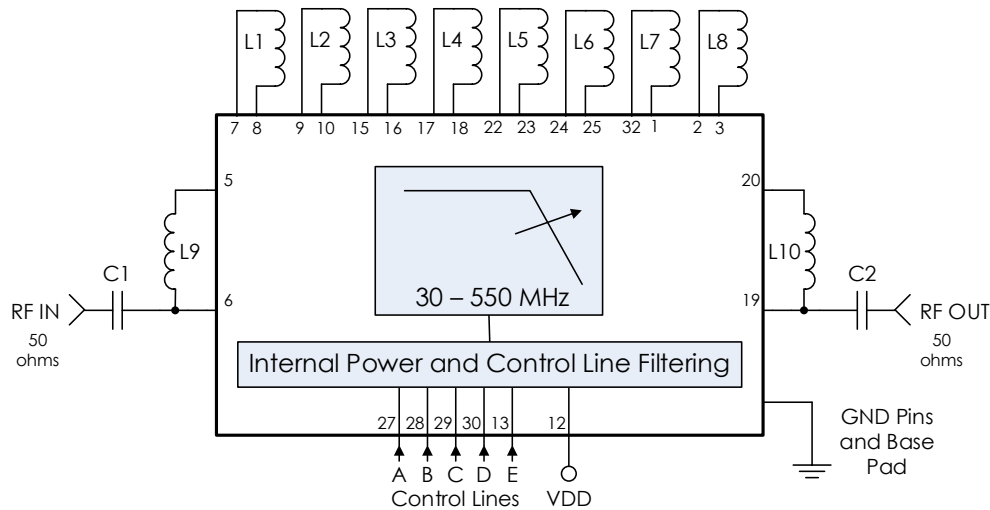
AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass



Typical Application

Configuration A: Best Performance



Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1, C2	0.1 μ F	0201BB104KW160	Passives Plus
L1, L4	18 nH	0805HP-18NXGRB	Coilcraft
L2, L3	27.3 nH	0908SQ-27NGLB	Coilcraft
L5, L8	150 nH	0805HP-151XGRB	Coilcraft
L6, L7	120 nH	0805HP-121XGRB	Coilcraft
L9, L10	11 nH	0302CS-11NXJEU	Coilcraft

Notes:

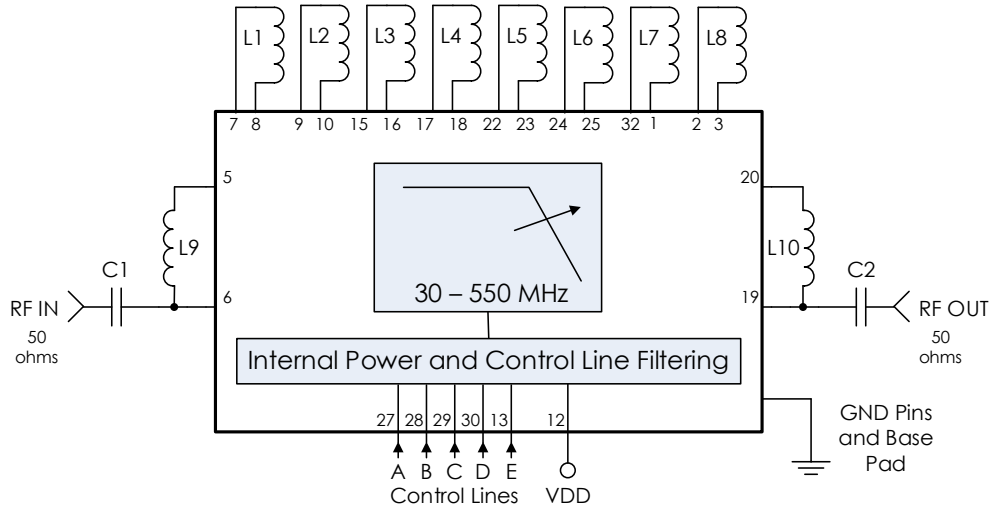
1. DC blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance.
2. VDD and control lines filtered internally providing high frequency isolation.
3. RC time constant is 20ns for control lines.
4. See *Application Notes* on product page for more information about how to layout for best performance.

AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass

Typical Application (Continued)

Configuration B: Smallest Form Factor



Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1, C2	0.1 μ F	0201BB104KW160	Passives Plus
L1, L4	18 nH	0603HP-18NXGEU	Coilcraft
L2, L3	27 nH	0603HP-27NXGEU	Coilcraft
L5, L8	150 nH	0603HP-R15XGEU	Coilcraft
L6, L7	120 nH	0603HP-R12XGEU	Coilcraft
L9, L10	11 nH	0302CS-11NXJEU	Coilcraft

Notes:

1. DC blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance.
2. VDD and control lines filtered internally providing high frequency isolation.
3. RC time constant is 20ns for control lines.
4. See *Application Notes* on product page for more information about how to layout for best performance.

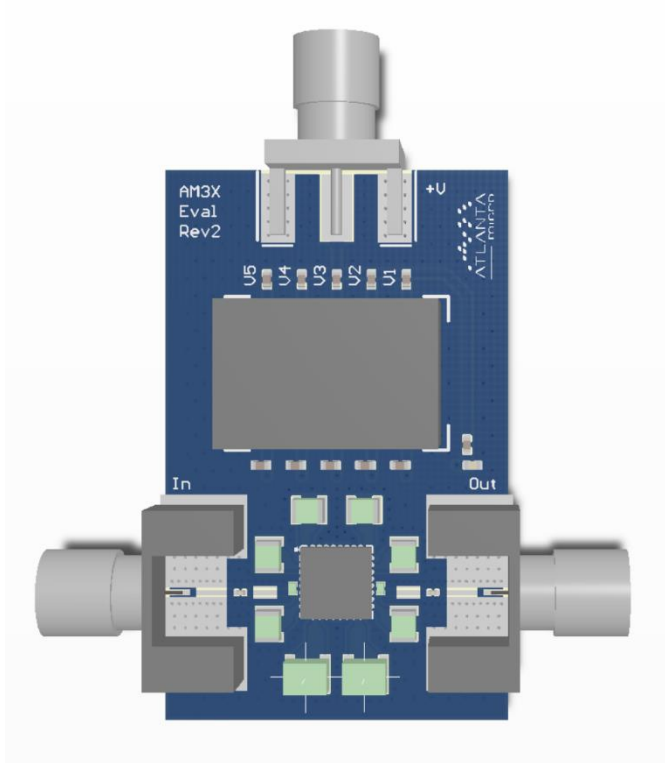
AM3150 – Filter Bank

Digitally Tunable 30 to 550 MHz Lowpass

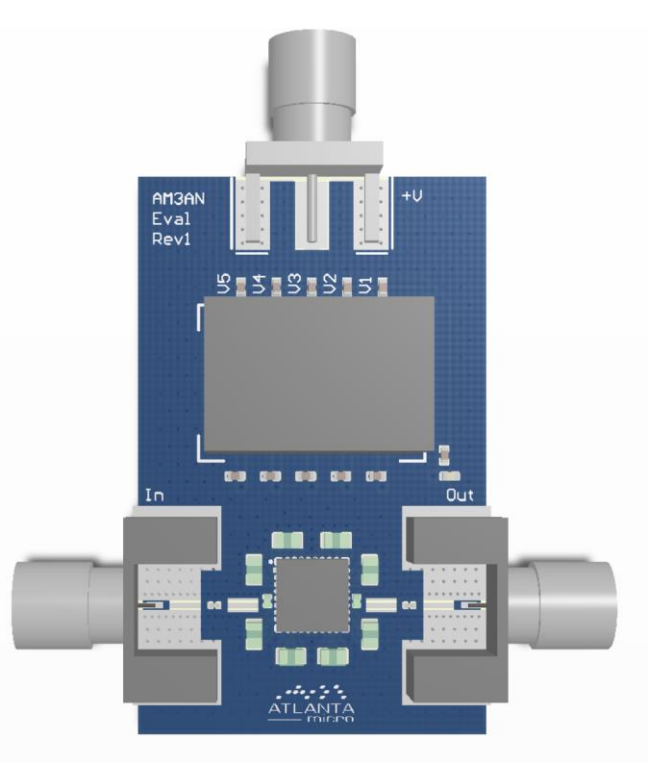


Evaluation PC Board

Configuration A



Configuration B



Related Parts

Part Number	Description
AM3151	20 MHz to 320 MHz Digitally Tunable Highpass Filter
AM3029	1.5 GHz to 3.0 GHz Digitally Tunable Lowpass Filter
AM3030	3.5 GHz to 6.5 GHz Digitally Tunable Lowpass Filter
AM3034	150 MHz to 450 MHz Digitally Tunable Lowpass Filter
AM3035	500 MHz to 1.2 GHz Digitally Tunable Lowpass Filter
AM3039	9.0 GHz to 18.0 GHz Digitally Tunable Lowpass Filter
AM3107	6.0 GHz to 12.0 GHz Digitally Tunable Lowpass Filter
AM3110	18.0 GHz to 26.5 GHz Digitally Tunable Lowpass Filter

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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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