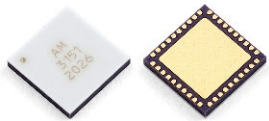


# AM3151 – Filter Bank

## Digitally Tunable 20 to 360 MHz Highpass

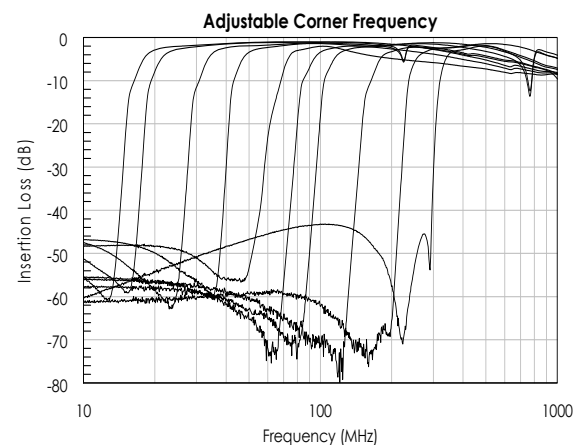


**AM3151 is a digitally tunable highpass filter covering the 20 MHz to 360 MHz frequency range.** The filter provides 32 selectable highpass cutoff states with 5 digital control bits. The tunable highpass filter can be combined with one of Mercury's tunable lowpass filters to provide a flexible bandpass filter solution. AM3151 is packaged in a 6mm QFN package and operates over the -40C to +85C temperature range.

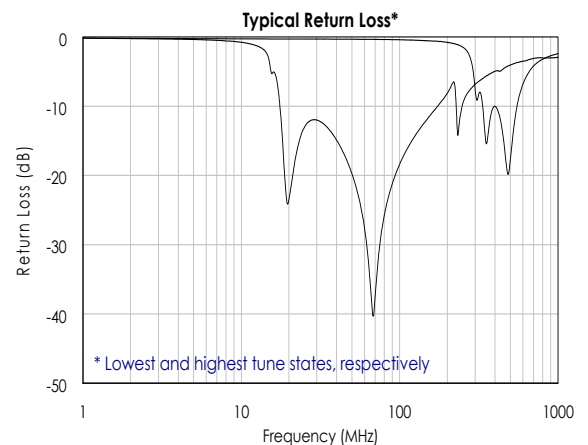
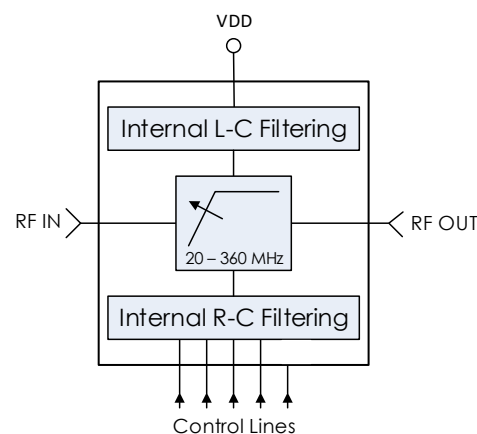
### FEATURES

- Digitally Tunable Highpass Filter
- Integrated Control Line Filtering
- +3.3V to +5.0V Supply
- 1.8 dB Insertion Loss
- +41 dBm Input IP3
- +65 dBm Input IP2
- 6mm QFN Package
- -40C to +85C Operation

### CHARACTERISTIC PERFORMANCE



### FUNCTIONAL DIAGRAM





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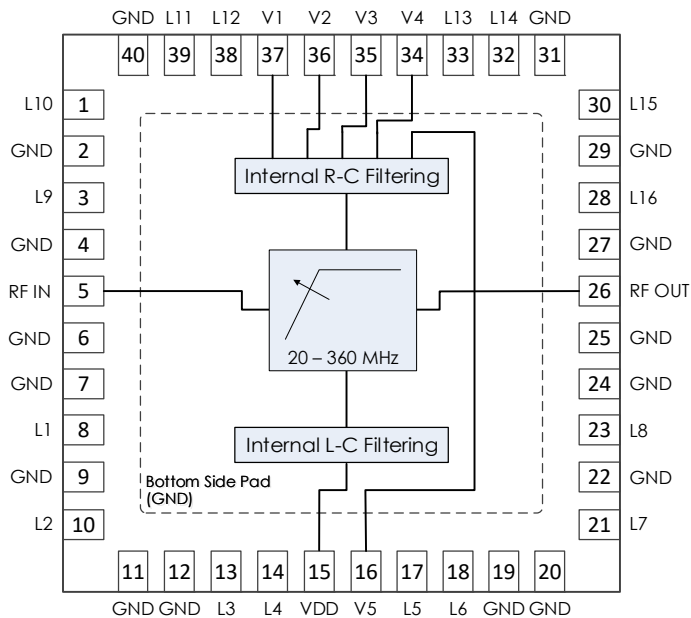
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REVISION HISTORY

Date	Revision	Notes
April 2, 2020	1	Initial Release.
April 17, 2020	2	Recommended Component List corrected.
June 29, 2020	3	Updated RF Performance.
July 8, 2020	4	Added Timing Characteristics.
January 12, 2021	5	Added control bits current drive requirements.
April 20, 2021	6	Added external RC filtering on VE.
July 15, 2024	7	Changed to Mercury branding. No content changes.

## PIN LAYOUT AND DEFINITIONS

Note: All Non-Named Pins are NC or GND



Pin	Name	Function
1	L10	L10 Connection
2	GND	Ground - Common
3	L9	L9 Connection
4	GND	Ground - Common
5	RF IN	RF Input - 50 Ohms - DC Coupled, External DC Block Required
6-7	GND	Ground - Common
8	L1	L1 Connection
9	GND	Ground - Common
10	L2	L2 Connection
11-12	GND	Ground - Common
13	L3	L3 Connection
14	L4	L4 Connection
15	VDD	DC Power Input

Pin	Name	Function
16	V5	Low Pass Filter Control Bit E (MSB)
17	L5	L5 Connection
18	L6	L6 Connection
19-20	GND	Ground - Common
21	L7	L7 Connection
22	GND	Ground - Common
23	L8	L8 Connection
24-25	GND	Ground - Common
26	RF OUT	RF Output - 50 Ohms - DC Coupled, External DC Block Required
27	GND	Ground - Common
28	L16	L16 Connection
29	GND	Ground - Common
30	L15	L15 Connection
31	GND	Ground - Common
32	L14	L14 Connection
33	L13	L13 Connection
34	V4	Low Pass Filter Control Bit D
35	V3	Low Pass Filter Control Bit C
36	V2	Low Pass Filter Control Bit B
37	V1	Low Pass Filter Control Bit A (LSB)
38	L12	L12 Connection
39	L11	L11 Connection
40	GND	Ground - Common
Bottom Pad	GND	Ground - Common

## SPECIFICATIONS

## Absolute Maximum Ratings

	Minimum	Maximum
Supply Voltage	-0.3 V	+6.0 V
RF Input Power		+30 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	



Mercury 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

## DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Param	Testing Conditions	Min	Typical	Max
DC Supply Voltage		+3.0 V	+5.0 V	+5.2 V
DC Supply Current	VDD = +5.0 V		5 mA	
Power Dissipated	VDD = +5.0 V		25 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 $\mu$ A		
	Vx = +5V	200 $\mu$ A		

## RF Performance

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

Param	Testing Conditions	Min	Typical	Max
Frequency Range		20 MHz		360 MHz
Insertion Loss	Lowest Tune State		-1.5 dB	
	Highest Tune State		-2.1 dB	
Return Loss	Lowest Tune State		-15.5 dB	
	Highest Tune State		-10.5 dB	
Input IP3			+41 dBm	
Input IP2			+64 dBm	

**Timing Characteristics**

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

Parameter	Minimum	Typical	Maximum
Tuning Speed, Rise <sup>1</sup> (Out of Band → In Band)		200 ns	
Tuning Speed, Fall <sup>2</sup> (In Band → Out of Band)		250 ns	
Settling Time, Rise <sup>3</sup> (Out of Band → In Band)		1 $\mu$ s	5.7 $\mu$ s <sup>4</sup>
Settling Time, Fall <sup>3</sup> (In Band → Out of Band)			500 ns

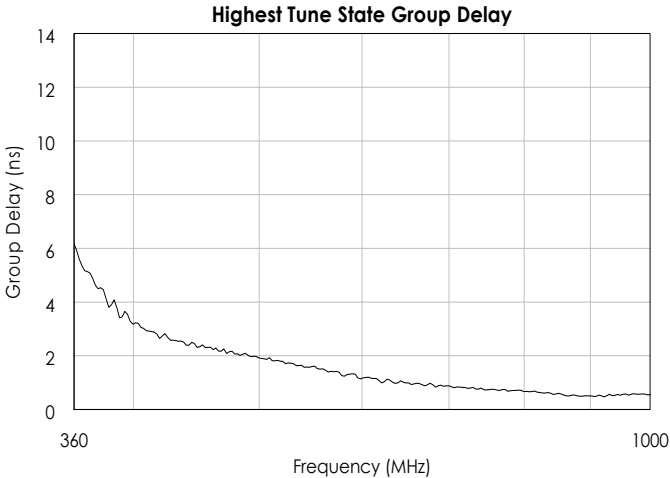
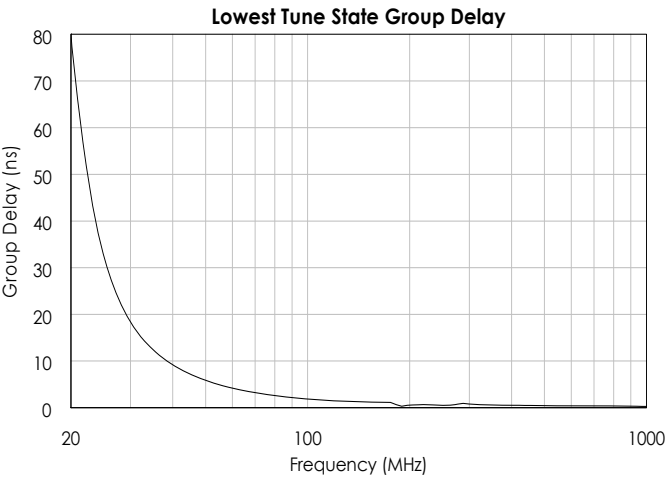
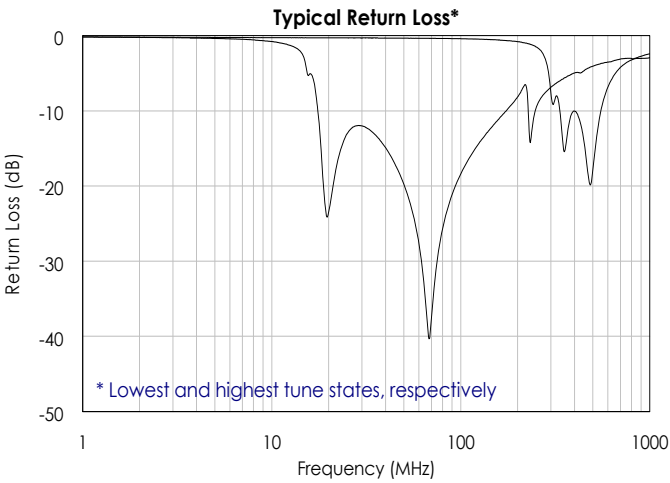
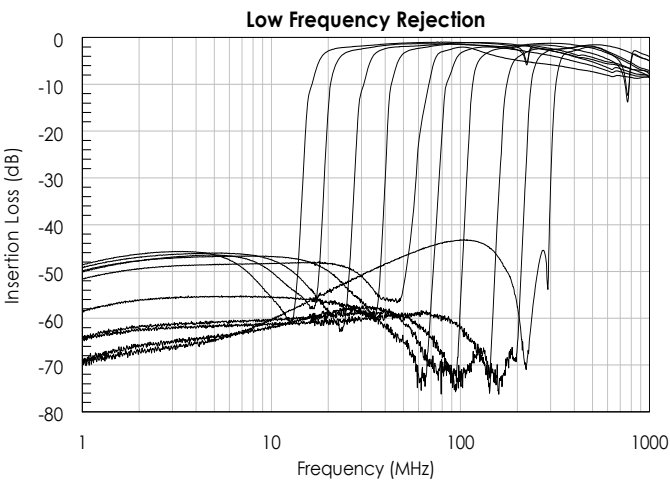
**Notes:**

1. Tuning speed rise defined by 50% CTL to 90% RF.
2. Tuning speed fall defined as 50% CTL to 10% RF.
3. Settling time error band defined to be within 1% of steady state value.
4. 5.7 $\mu$ s settling time only observed in one switching instance, when switching from 0XXXX to 1XXXX where the signal went from out of band to in band. Signal was just outside of 1% error band for a long time before finally settling within the 1% band. All other switching metrics settled within 1 $\mu$ s.

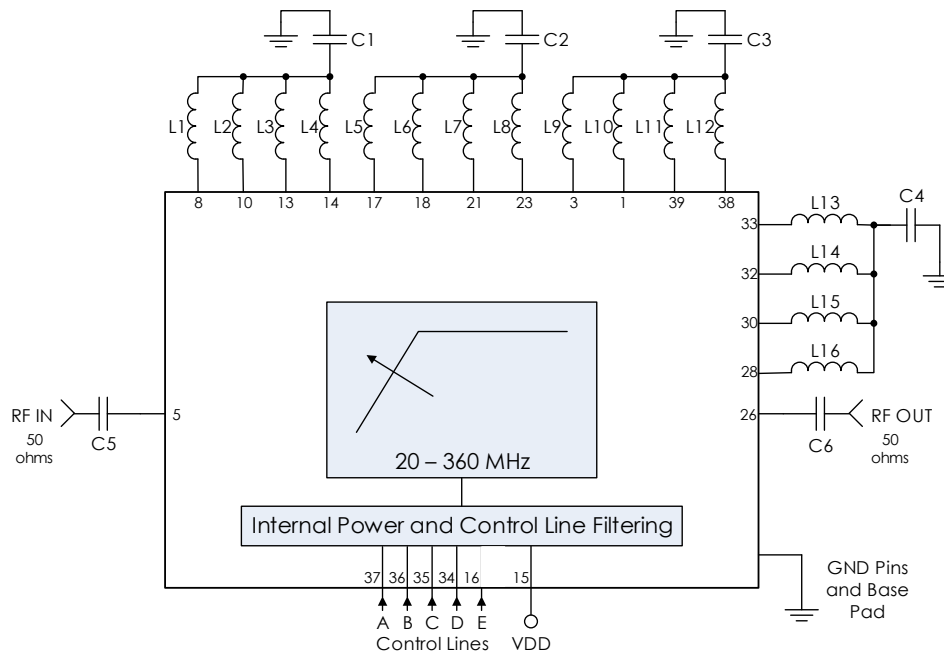
State Table

E	D	C	B	A	Typical Cutoff Freq. (MHz)
H	L	L	L	L	19
H	L	L	L	H	19
H	L	L	H	L	20
H	L	L	H	H	20
H	L	H	L	L	23
H	L	H	L	H	23
H	L	H	H	L	24
H	L	H	H	H	25
H	H	L	L	L	35
H	H	L	L	H	36
H	H	L	H	L	38
H	H	L	H	H	39
H	H	H	L	L	50
H	H	H	L	H	53
H	H	H	H	L	64
H	H	H	H	H	76
L	L	L	L	L	100
L	L	L	L	H	100
L	L	L	H	L	103
L	L	L	H	H	105
L	L	H	L	L	121
L	L	H	L	H	124
L	L	H	H	L	131
L	L	H	H	H	136
L	H	L	L	L	193
L	H	L	L	H	196
L	H	L	H	L	209
L	H	L	H	H	215
L	H	H	L	L	260
L	H	H	L	H	272
L	H	H	H	L	316
L	H	H	H	H	355

TYPICAL PERFORMANCE



## TYPICAL APPLICATION



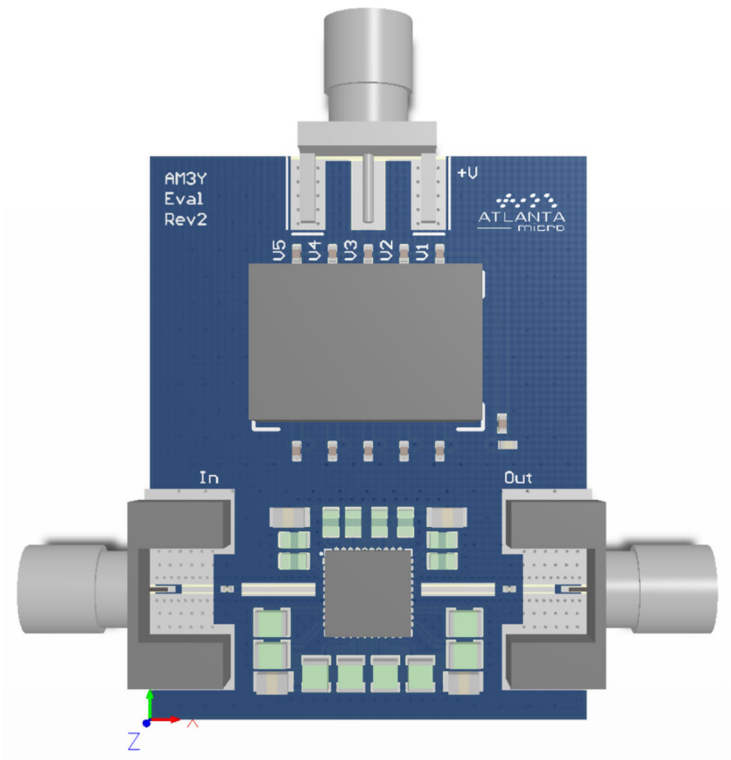
## Recommended Component List (or Equivalent)

Part	Value	Part Number	Manufacturer
C1, C2	47 $\mu$ F	GRM21BR61A476ME15L	Murata
C3, C4	10 $\mu$ F	GCM21BR71A106KE22K	Murata
C5, C6	0.1 $\mu$ F	0201BB104KW160	Passives Plus
L1-L8	390 nH	0805HP-391XGRB	Coilcraft
L9, L11, L14, L16	39 nH	0603HP-39NXGEU	Coilcraft
L10, L12, L13, L15	56 nH	0603HP-56NXGEU	Coilcraft

## Notes:

- DC blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance.
- VDD and control lines filtered internally providing high frequency isolation.
- VE (pin 16) is not internally filtered and RF filtering on the control line is recommended to prevent digital noise from coupling to the RF path
  - Select control line RC filter values based on desired logic source decoupling and switching speed.
- RC time constant is 20ns for control lines.

EVALUTATION PC BOARD



RELATED PARTS

Part Number		Description
AM3031	1.0 GHz to 1.8 GHz	Digitally Tunable Highpass Filter
AM3032	2.5 GHz to 4.5 GHz	Digitally Tunable Highpass Filter
AM3033	100 MHz to 225 MHz	Digitally Tunable Highpass Filter
AM3036	330 MHz to 700 MHz	Digitally Tunable Highpass Filter
AM3041	6.0 GHz to 10.0 GHz	Digitally Tunable Highpass Filter
AM3108	12.0 GHz to 18.0 GHz	Digitally Tunable Highpass Filter
AM3109	18.0 GHz to 26.5 GHz	Digitally Tunable Highpass Filter
AM3150	30 MHz to 550 MHz	Digitally Tunable Lowpass Filter

## 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-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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**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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