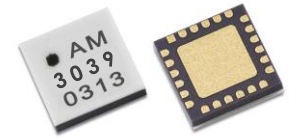


# AM3039 – Tunable Filter

## Digitally Tunable 9 GHz to 18 GHz Lowpass

### Description

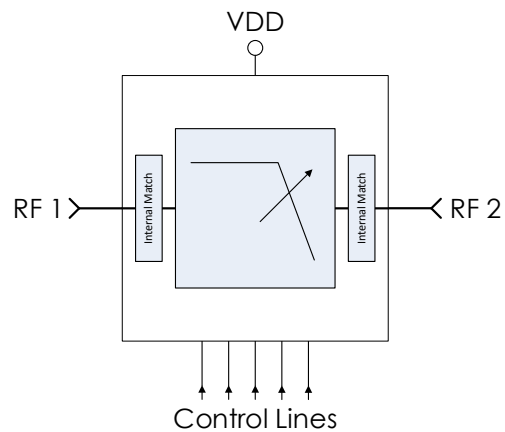
AM3039 is a miniature digitally tunable lowpass filter covering the 9 GHz to 18 GHz frequency range. The filter provides 32 selectable lowpass cutoff states with 5 digital control bits. The tunable lowpass filter can be combined with one of Atlanta Micro's tunable highpass filters to provide a flexible tunable bandpass filter solution. AM3039 is packaged in a 4mm QFN package and operates over the -40C to +100C temperature range.



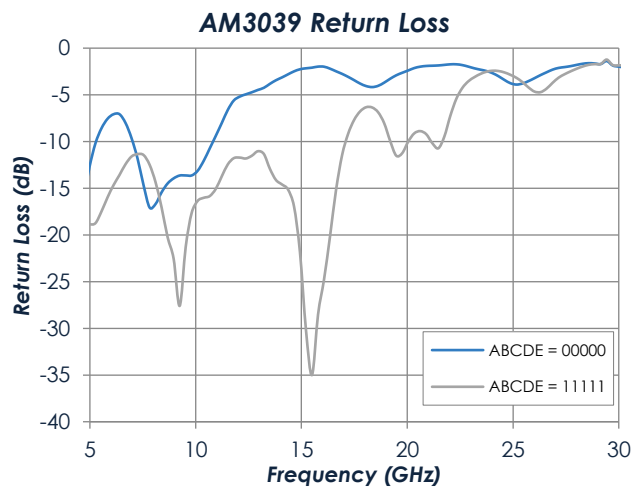
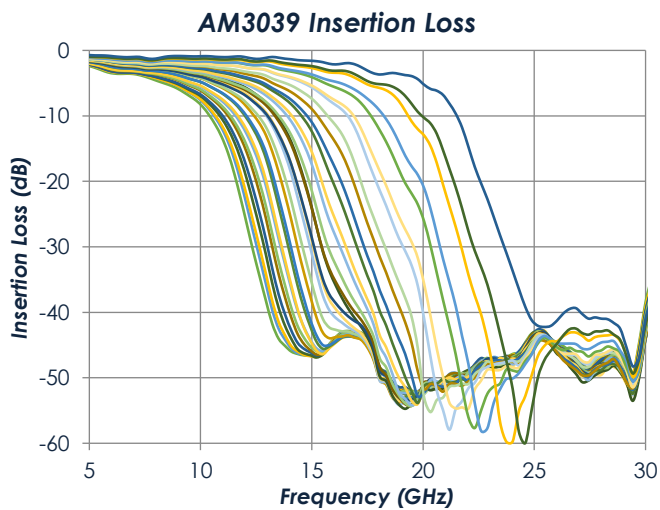
### Features

- Discrete low pass cutoff steps
- 5-bit control, 3V or 5V logic
- No calibration required
- 5V DC supply
- 4mm QFN package
- -40C to +100C operation

### Functional Diagram



### Characteristic Performance



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### Revision History

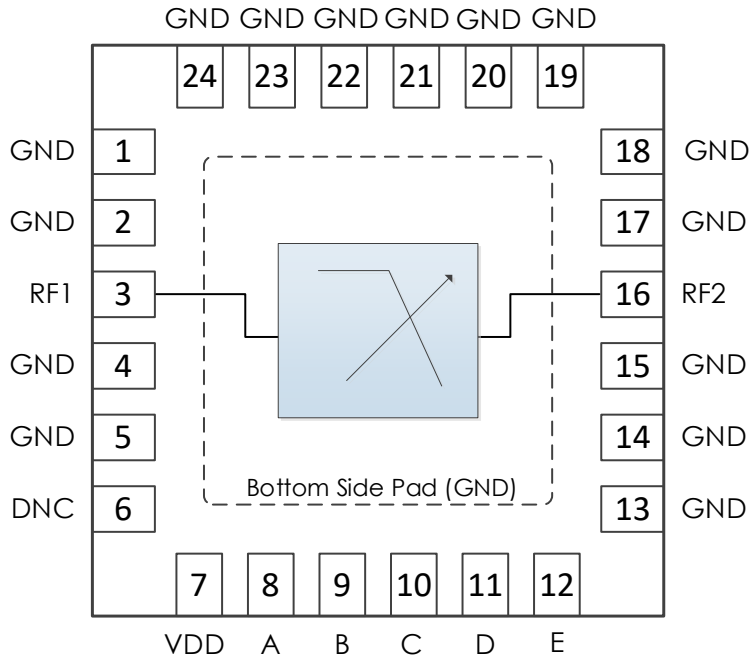
Date	Revision Number	Notes
May 4, 2016	1	Initial Release
May 16, 2016	2	Updated NC pin recommendation, updated VDD supply range
May 19, 2016	3	Updated recommended components, added wideband plot, increased max RF input level
August 29, 2016	4	Corrected state table
September 15, 2016	5	Updated performance plots
January 20, 2017	6	Updated business address
January 26, 2017	7	Updated document format
February 16, 2017	8	Added recommended footprint
June 23, 2021	9	Extended operating temperature to +100C, added group delay plots, moved package information to separate document, updated datasheet format

# AM3039 – Tunable Filter

Digitally Tunable 9 GHz to 18 GHz Lowpass



## Pin Layout and Definitions



Pin Number	Pin Name	Pin Function
1 – 2	GND	Ground – Common
3	RF 1	RF Port 1 – 50 ohms, DC coupled. External AC coupling capacitor required.
4 – 5	GND	Ground – Common
6	DNC	Do Not Connect
7	VDD	+5.0V DC Power Input
8	A	Filter Control Bit A
9	B	Filter Control Bit B
10	C	Filter Control Bit C
11	D	Filter Control Bit D
12	E	Filter Control Bit E
13 – 15	GND	Ground – Common
16	RF 2	RF Port 2 – 50 ohms, DC coupled. External AC coupling capacitor required.
17 – 24	GND	Ground – Common
Base Pad	GND	Ground – Common

# AM3039 – Tunable Filter

Digitally Tunable 9 GHz to 18 GHz 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 1	



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

### Recommended Operating Conditions

	Minimum	Typical	Maximum
Supply Voltage		+5.0 V	
Operating Case Temperature	-40 C		+100 C
Operating Junction Temperature	-40 C		+125 C

# AM3039 – Tunable Filter

## Digitally Tunable 9 GHz to 18 GHz Lowpass

### DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
DC Supply Voltage		+4.7 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		+5.0 V

### RF Performance

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
Cutoff Frequency Range		9 GHz		18 GHz
Insertion Loss	f = 4 GHz, ABCDE = 00000		1.8 dB	
	f = 5 GHz, ABCDE = 00000		2.4 dB	
	f = 9 GHz, ABCDE = 00000		5.9 dB	
Return Loss	f = 4 GHz, ABCDE = 00000		20 dB	
	f = 5 GHz, ABCDE = 00000		13 dB	
	f = 9 GHz, ABCDE = 00000		14 dB	
Input IP3	ABCDE = 11111		+40 dBm	

### Timing Characteristics

Parameter	Minimum	Typical	Maximum
Switching Speed			1 $\mu$ s

# AM3039 – Tunable Filter

Digitally Tunable 9 GHz to 18 GHz Lowpass



## State Table

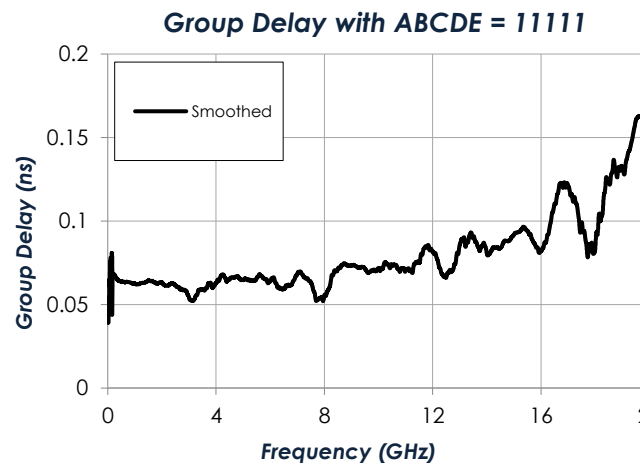
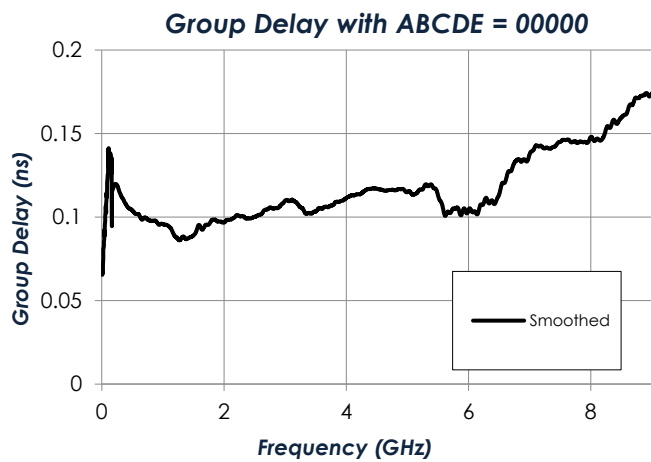
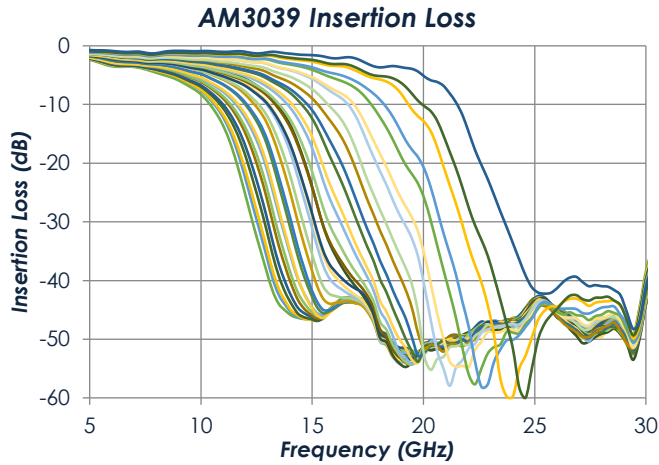
E	D	C	B	A	Typical Cutoff Frequency (GHz)
L	L	L	L	L	9.00
L	L	L	L	H	9.20
L	L	L	H	L	9.28
L	L	L	H	H	9.29
L	L	H	L	L	9.49
L	L	H	L	H	9.62
L	L	H	H	L	9.73
L	L	H	H	H	9.83
L	H	L	L	L	10.05
L	H	L	L	H	10.23
L	H	L	H	L	10.31
L	H	L	H	H	10.47
L	H	H	L	L	10.61
L	H	H	L	H	10.87
L	H	H	H	L	11.00
L	H	H	H	H	11.19
H	L	L	L	L	11.25
H	L	L	L	H	11.49
H	L	L	H	L	11.69
H	L	L	H	H	11.94
H	L	H	L	L	12.18
H	L	H	L	H	12.40
H	L	H	H	L	12.68
H	L	H	H	H	12.84
H	H	L	L	L	13.35
H	H	L	L	H	14.08
H	H	L	H	L	14.86
H	H	L	H	H	15.73
H	H	H	L	L	16.50
H	H	H	L	H	17.85
H	H	H	H	L	18.54
H	H	H	H	H	19.80

# AM3039 – Tunable Filter

## Digitally Tunable 9 GHz to 18 GHz Lowpass

### Typical Performance

(T = 25 °C unless otherwise specified. Only some states shown for simplicity. Refer to s-parameters available for download on Atlanta Micro website for more information)

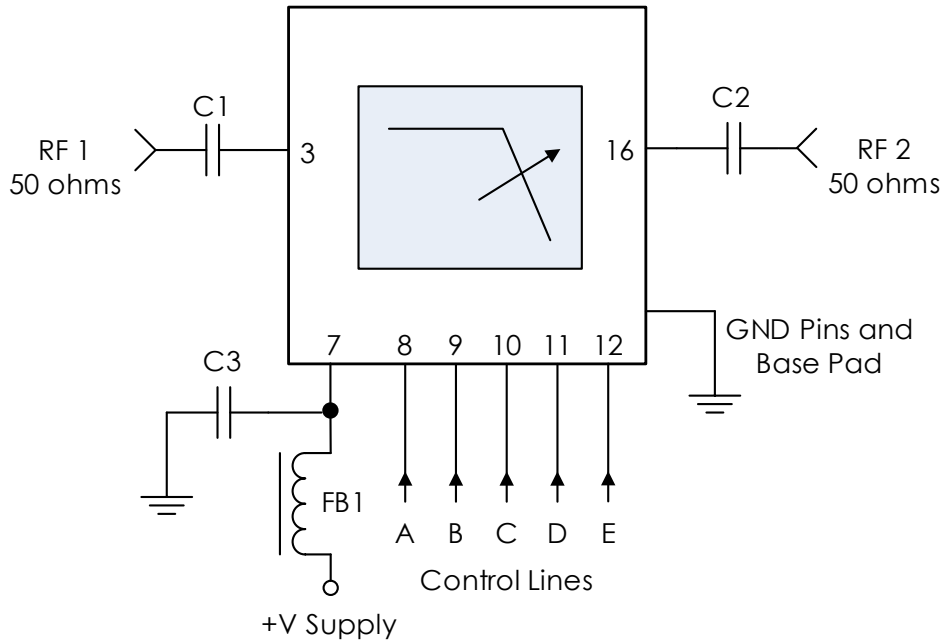


# AM3039 – Tunable Filter

## Digitally Tunable 9 GHz to 18 GHz Lowpass

### Typical Application

#### Multiple Passives



### Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1, C2	0.1 $\mu$ F	0402BB104KW160	Passives Plus
C3	0.1 $\mu$ F	C1005X7R1H104K050BB	TDK
FB1	-	MMZ1005A222E	TDK

### Notes:

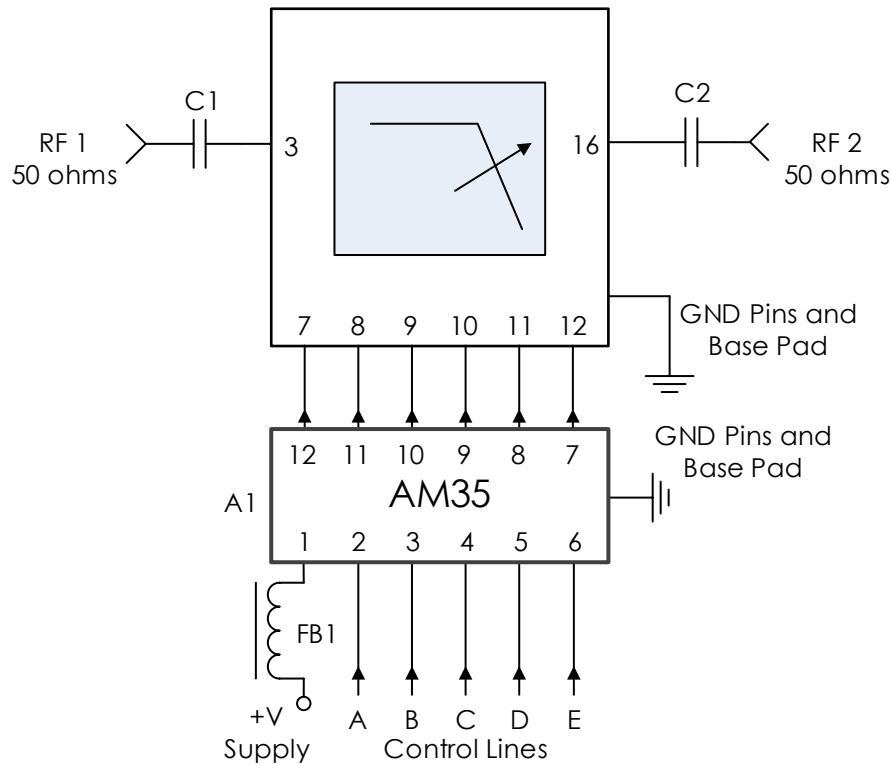
1. RF blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance.
2. RC filtering on the control lines is recommended to prevent digital noise from coupling to the RF path.
  - a. Select control line RC filter values based on desired logic source decoupling and switching speed.



# AM3039 – Tunable Filter

## Digitally Tunable 9 GHz to 18 GHz Lowpass

### Smallest Footprint



### Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1, C2	0.1 uF	0402BB104KW160	Passives Plus
FB1	-	MMZ1005A222E	TDK
A1	-	AM35	Atlanta Micro

### Notes:

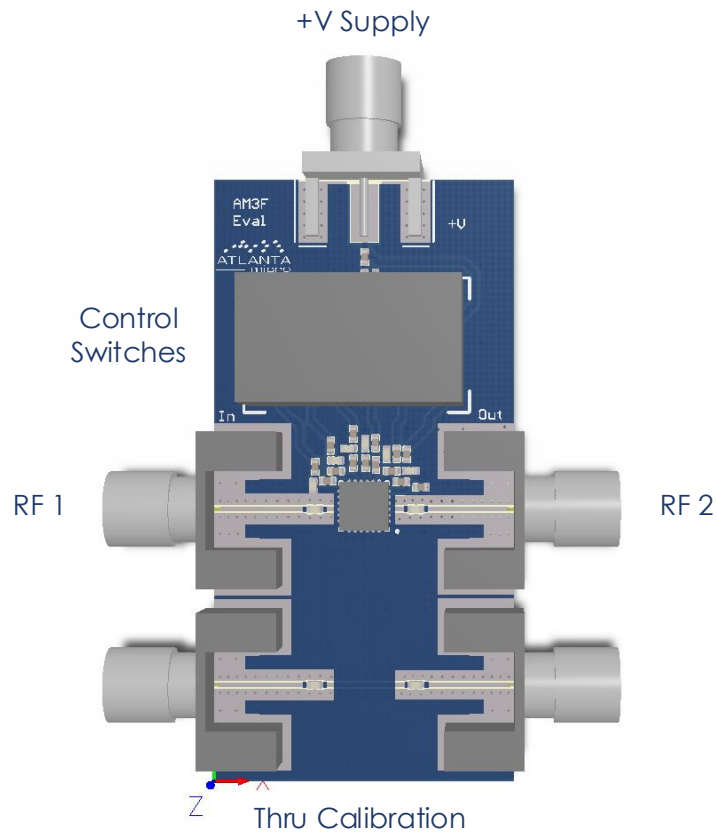
1. RF blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance
2. AM35 provides power and control line filtering with high frequency isolation to 40+ GHz.
  - a. AM35 is a 1.5mm x 3mm (0.5mm pitch) EMI filter bank providing a small total footprint for applications with tight space requirements.
  - b. Ferrite bead in series with power line provides better low frequency isolation.
  - c. See AM35 datasheet for performance details.

# AM3039 – Tunable Filter

Digitally Tunable 9 GHz to 18 GHz Lowpass



## Evaluation PC Board



## Related Parts

Part Number	Description		
AM35	100 MHz	to 40 GHz	Stopband, EMI filter bank
AM3150	30 MHz	to 550 MHz	Digitally Tunable Lowpass
AM3034	150 MHz	to 450 MHz	Digitally Tunable Lowpass
AM3035	500 MHz	to 1200 MHz	Digitally Tunable Lowpass
AM3029	1.5 GHz	to 3.0 GHz	Digitally Tunable Lowpass
AM3107	6 GHz	to 12 GHz	Digitally Tunable Lowpass
AM3151	20 MHz	to 320 MHz	Digitally Tunable Highpass
AM3033	100 MHz	to 225 MHz	Digitally Tunable Highpass
AM3031	1.0 GHz	to 1.8 GHz	Digitally Tunable Highpass
AM3032	2.5 GHz	to 4.5 GHz	Digitally Tunable Highpass
AM3041	6 GHz	to 10 GHz	Digitally Tunable Highpass

To obtain price, delivery, or to place an order contact [sales@atlantamicro.com](mailto:sales@atlantamicro.com)  
Atlanta Micro Inc., 3720 Davinci Ct, Suite 400, Peachtree Corners, GA 30092 • Phone: (470) 253-7640 • [www.atlantamicro.com](http://www.atlantamicro.com)

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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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