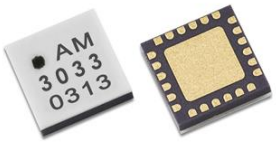
AM3033 – Tunable Filter

Digitally Tunable 100 to 225 MHz Highpass

Description

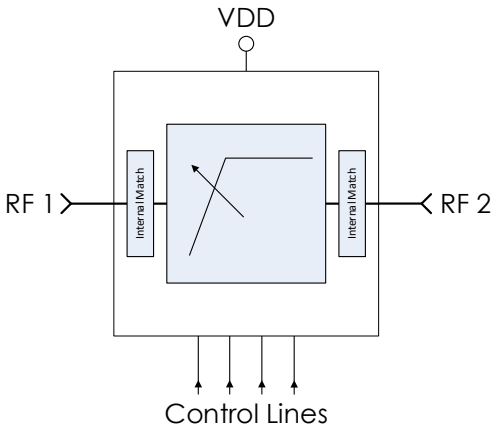
AM3033 is a miniature digitally tunable highpass filter covering the 100 to 225 MHz frequency range. The filter provides 16 selectable highpass cutoff states with 4 digital control bits. The tunable highpass filter can be combined with one of Atlanta Micro's tunable lowpass filters to provide a flexible tunable bandpass filter solution. AM3033 is packaged in a 4mm QFN package and operates over the -40C to +100C temperature range.



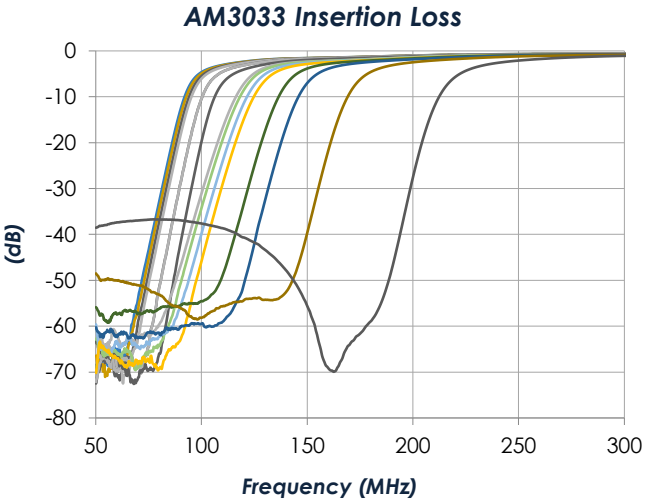
Features

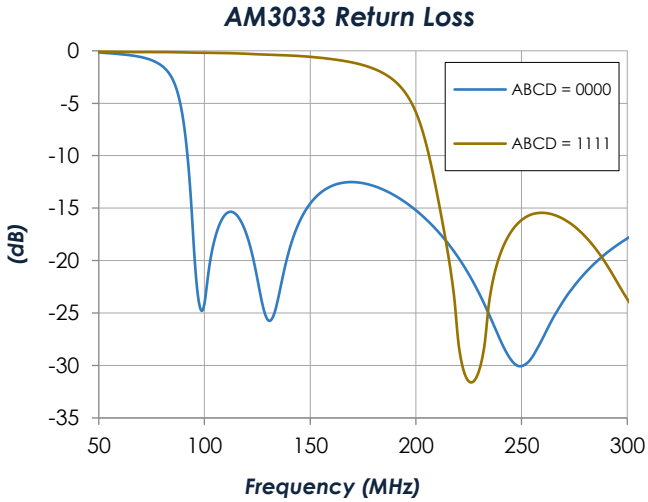
- Discrete high pass cutoff steps
- 4-bit control, 3V or 5V logic
- No calibration required
- 5V DC supply
- 4mm QFN package
- -40C to +100C operation

Functional Diagram



Characteristic Performance





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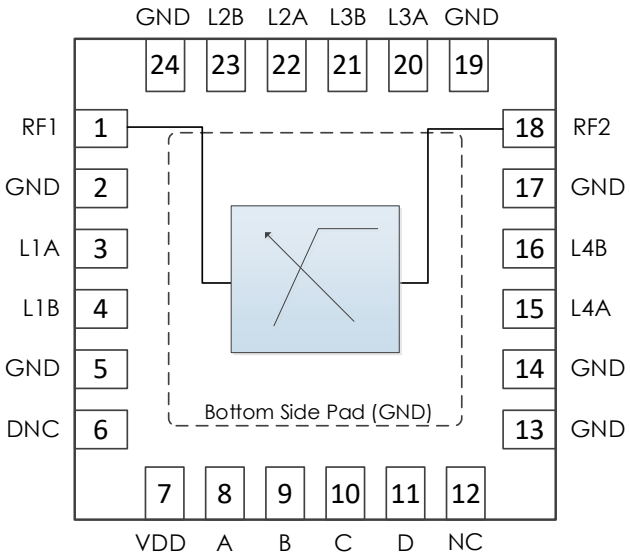
Revision History

Date	Revision Number	Notes
May 16, 2016	1	Initial Release
May 16, 2016	2	Updated NC pin recommendation
May 19, 2016	3	Updated recommended components
January 20, 2017	4	Updated business address
February 16, 2017	5	Added recommended footprint
June 7, 2021	6	Extended operating temperature to +100C, added group delay plots, moved package information to separate document, updated datasheet format
August 13, 2021	7	Updated Max Rated Power to +33dBm

Pin Layout and Definitions



Pin Number	Pin Name	Pin Function
1	RF 1	RF Port 1 – 50 ohms, DC coupled. External AC coupling capacitor required.
2	GND	Ground – Common
3	L1A	External inductor L1 connection
4	L2A	External inductor L1 connection
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	NC	Not Connected. Pin may be grounded or left floating.
13 – 14	GND	Ground – Common
15	L4A	External inductor L4 connection
16	L4B	External inductor L4 connection
17	GND	Ground - Common
18	RF 2	RF Port 2 – 50 ohms, DC coupled. External AC coupling capacitor required.
19	GND	Ground – Common
20	L3A	External inductor L3 connection
21	L3B	External inductor L3 connection
22	L2A	External inductor L2 connection
23	L2B	External inductor L2 connection
24	GND	Ground – Common
Base Pad	GND	Ground – Common

Specifications

Absolute Maximum Ratings

	Minimum	Maximum
Supply Voltage	-0.3 V	+6.0 V
RF Input Power		+33 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

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		100 MHz		225 MHz
Insertion Loss	f = 225 MHz. ABCD = 1111		4.4 dB	
	f = 500 MHz, ABCD = 1111		1.3 dB	
	f = 2.0 GHz, ABCD = 1111		2.0 dB	
Return Loss	f = 225 MHz, ABCD = 1111		32 dB	
Parameter	f = 500 MHz, ABCD = 1111		7.9 dB	
Parameter	f = 2.0 GHz, ABCD = 1111		5.3 dB	
Input IP3	ABCD = 1111		+40 dBm	

Timing Characteristics

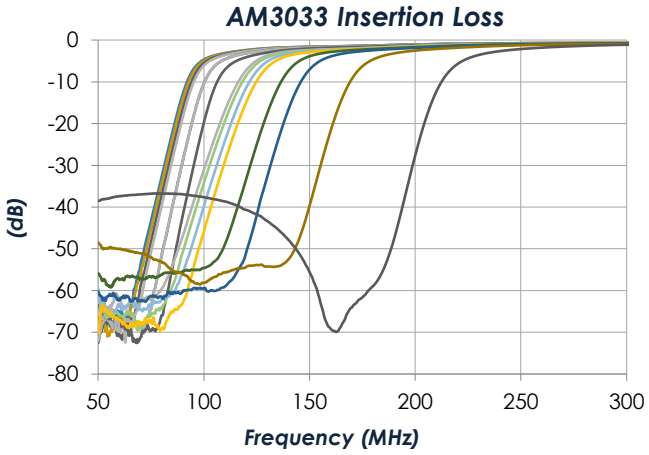
Parameter	Minimum	Typical	Maximum
Switching Speed			1 us

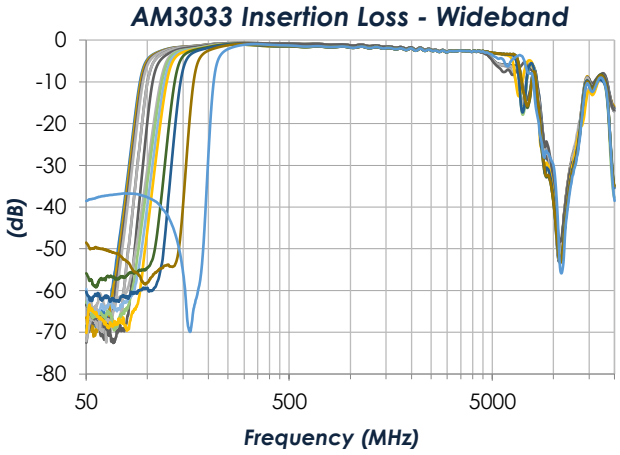
State Table

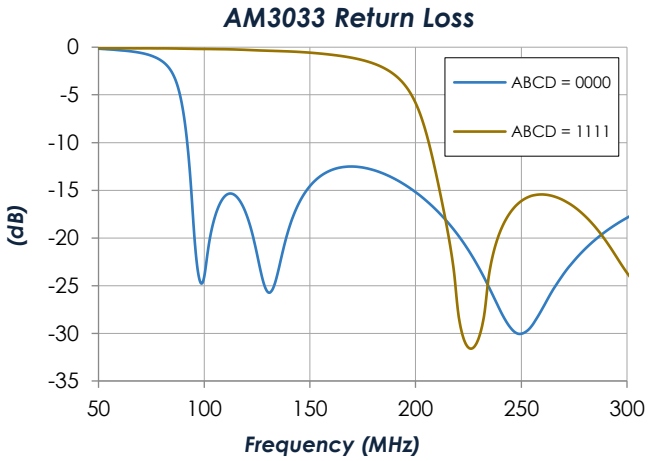
D	C	B	A	Typical Cutoff Frequency (MHz)
L	L	L	L	97
L	L	L	H	98
L	L	H	L	99
L	L	H	H	101
L	H	L	L	104
L	H	L	H	106
L	H	H	L	109
L	H	H	H	113
H	L	L	L	123
H	L	L	H	125
H	L	H	L	128
H	L	H	H	131
H	H	L	L	143
H	H	L	H	152
H	H	H	L	176
H	H	H	H	219

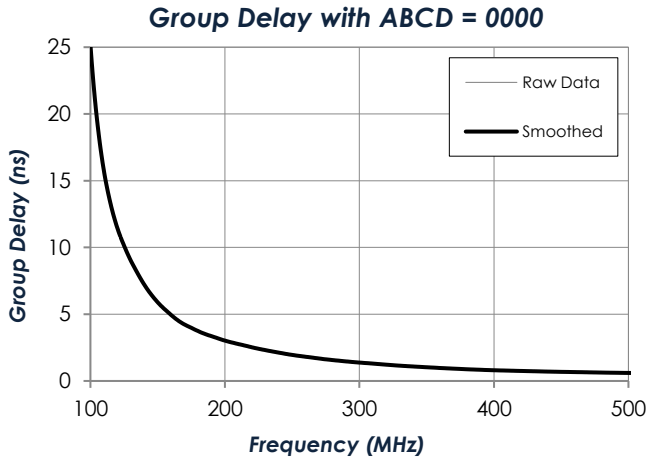
Typical Performance

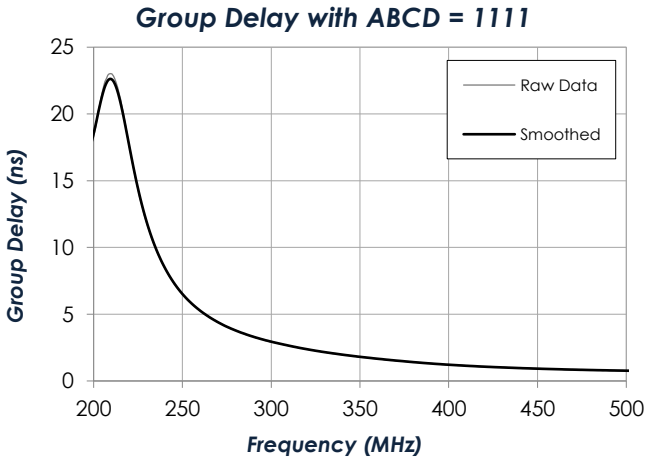
(T = 25 °C unless otherwise specified. Only some states shown for simplicity. Refer to s-parameters available for download on Atlanta Micro website for more information)





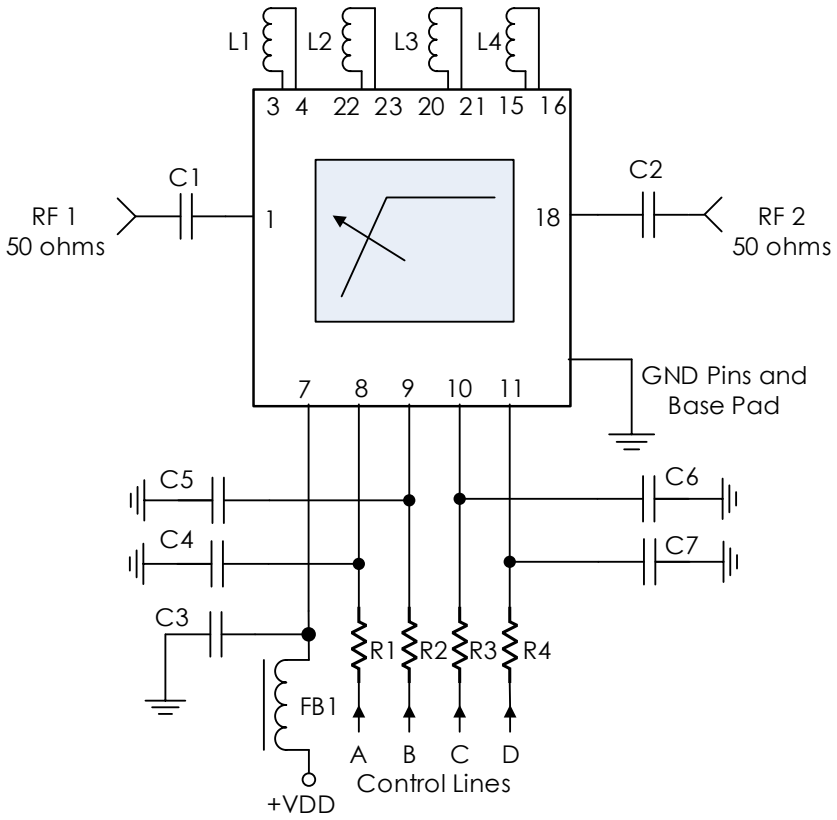






Typical Application

Multiple Passives



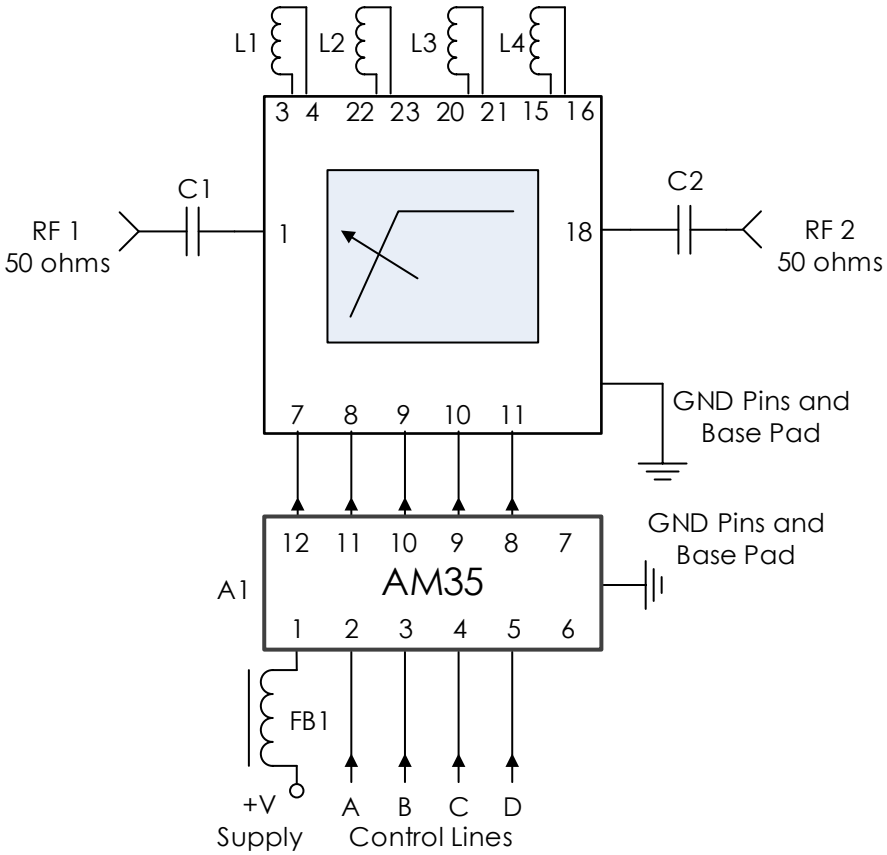
Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1, C2	0.1 uF	0402BB104KW160	Passives Plus
FB1	-	MMZ1005A222E	TDK
R1,R2,R3,R4	100 Ohms	CRCW0402100RJN	Vishay
C3,C4,C5,C6,C7	0.1 uF	C1005X7R1H104K050BB	TDK
L1, L4	68 nH	0402HP-68NXGLW	Coilcraft
L2, L3	56 nH	0402HP-56NXGLW	Coilcraft

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. Select control line RC filter values based on desired logic source decoupling and switching speed.

Smaller Footprint



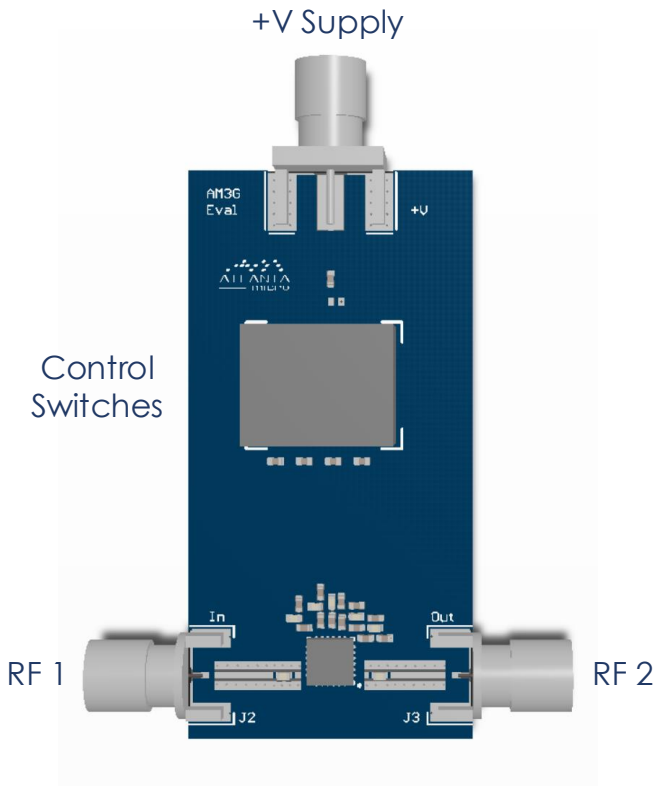
Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
A1	-	AM35	Atlanta Micro
C1, C2	0.1 uF	0402BB104KW160	Passives Plus
FB1	-	MMZ1005A222E	TDK
L1, L4	68 nH	0402HP-68NXGLW	Coilcraft
L2, L3	56 nH	0402HP-56NXGLW	Coilcraft

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 50+ 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.

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	6.0 GHz	to	12.0 GHz	Digitally Tunable Lowpass
AM3151	20 MHz	to	320 MHz	Digitally Tunable Highpass
AM3036	330 MHz	to	700 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

Component Compliance Information

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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-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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Atlanta Micro 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.