AM3098 – Digitally Tunable Filter

100 to 225 MHz Highpass; 500 to 1200 MHz Lowpass

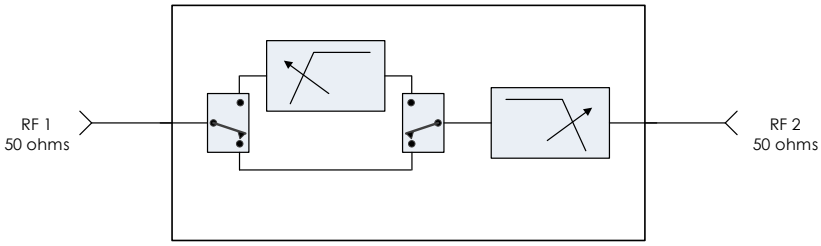
Description

AM3098 is a miniature digitally tunable filter providing selectable highpass filtering over the 100 to 225 MHz and independently selectable lowpass filtering over the 500 to 1200 MHz frequency range. The filter also provides a bypass mode where only the lowpass filter is active. With independent 4 bit digital control for each of the filters a large number of distinct center frequency/bandwidth configurations can easily be achieved. AM3098 has a compact 4mm x 8mm QFN footprint.

Features

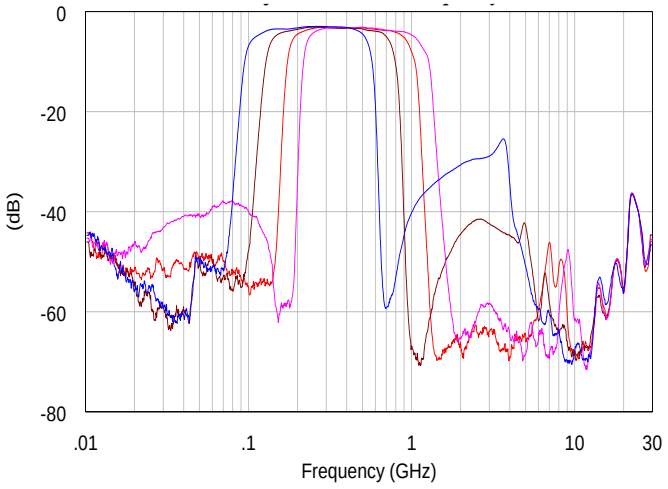
- Independent LP and HP Control
- DC Coupled Lowpass Mode
- +3.3V to +5.0V Supply
- 4-bit Control, +3V to +5V Logic
- 3.0 dB Insertion Loss
- Integrated Control Line Filtering
- 4mm x 8mm x 0.9mm QFN Package
- -40C to +85C Operation
- No Calibration Required

Functional Diagram



Characteristic Performance

Adjustable Center Frequency



DC-Coupled Low Pass Mode

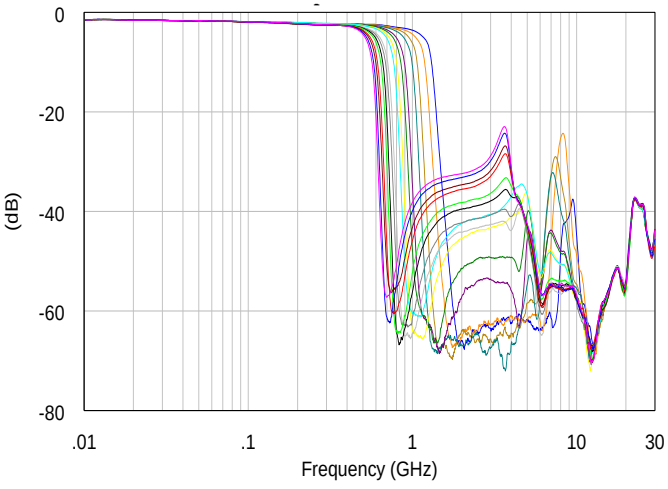
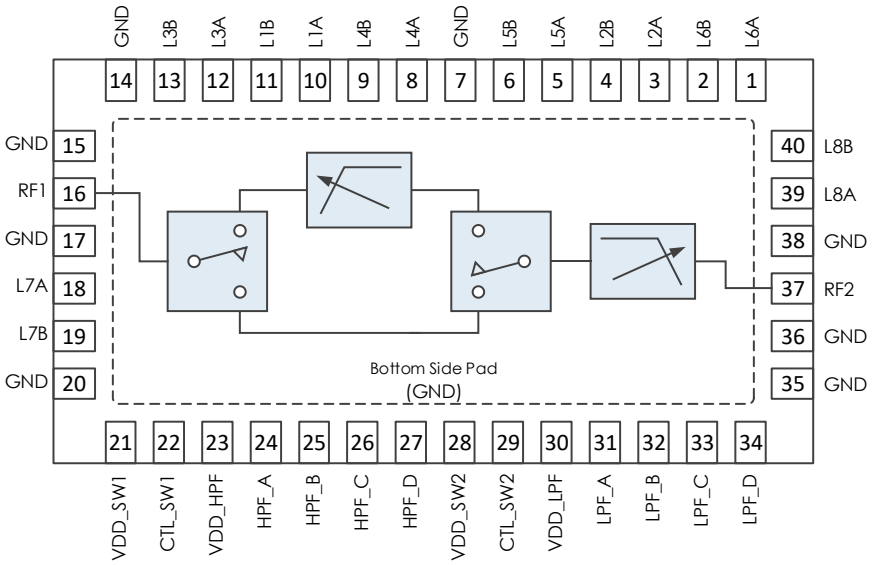


Table of Contents

Revision History

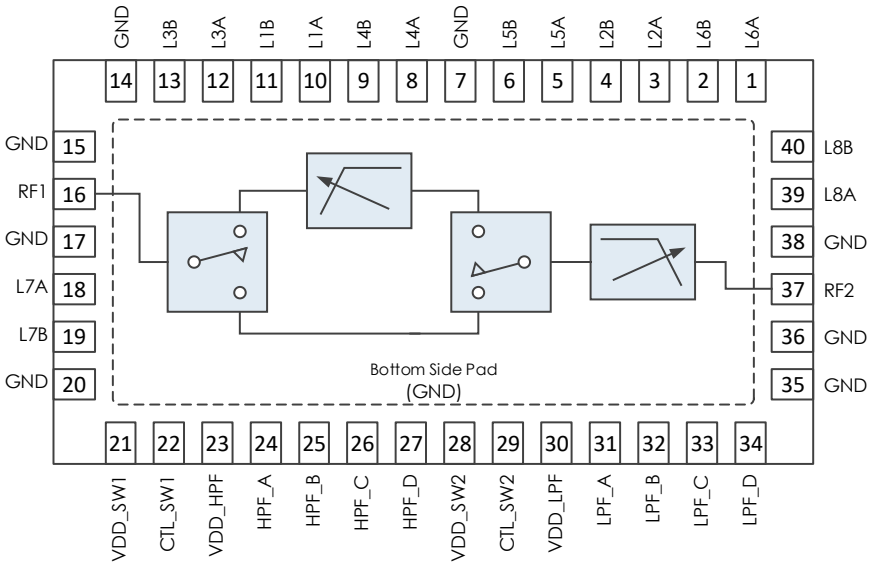
Date	Revision Number	Notes
May 19, 2020	3	Updated to new datasheet format.

Pin Layout and Definitions



Pin Number	Pin Name	Pin Function
1	L6A	External Inductor L6 Connection
2	L6B	External Inductor L6 Connection
3	L2A	External Inductor L2 Connection
4	L2B	External Inductor L2 Connection
5	L5A	External Inductor L5 Connection
6	L5B	External Inductor L5 Connection
7	GND	Ground – Common
8	L4A	External Inductor L4 Connection
9	L4B	External Inductor L4 Connection
10	L1A	External Inductor L1 Connection
11	L1B	External Inductor L1 Connection
12	L3A	External Inductor L3 Connection
13	L3B	External Inductor L3 Connection
14, 15	GND	Ground – Common
16	RF1	RF Port 1 – 50 Ohms – DC Coupled. External DC blocking capacitor required
17	GND	Ground – Common
18	L7A	External Inductor L7 Connection
19	L7B	External Inductor L7 Connection
20	GND	Ground – Common
21	VDD_SW1	DC Power Input
22	CTL_SW1	Control Line for Switch 1

Pin Layout and Definitions



Pin Number	Pin Name	Pin Function
23	VDD_HPF	DC Power Input
24	HPF_A	Highpass Filter Control Bit A
25	HPF_B	Highpass Filter Control Bit B
26	HPF_C	Highpass Filter Control Bit C
27	HPF_D	Highpass Filter Control Bit D
28	VDD_SW2	DC Power Input
29	CTL_SW2	Control Line for Switch 2
30	VDD_LPF	DC Power Input
31	LPF_A	Lowpass Filter Control Bit A
32	LPF_B	Lowpass Filter Control Bit B
33	LPF_C	Lowpass Filter Control Bit C
34	LPF_D	Lowpass Filter Control Bit D
35, 36	GND	Ground – Common
37	RF2	RF Port 2 – 50 Ohms – DC Coupled. External DC blocking capacitor required.
38	GND	Ground – Common
39	L8A	External Inductor L8 Connection
40	L8B	External Inductor L8 Connection
Bottom Pad	GND	Ground – Common

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	+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)

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		3 mA	
Power Dissipated	VDD = +5.0 V		15 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
HPF Frequency Range		100 MHz		225 MHz
LPF Frequency Range		500 MHz		1200 MHz
Insertion Loss			3 dB	
Input IP3	f = 350 MHz		+40 dBm	

Timing Characteristics

Parameter	Minimum	Typical	Maximum
Switching Speed			1µs

State Tables

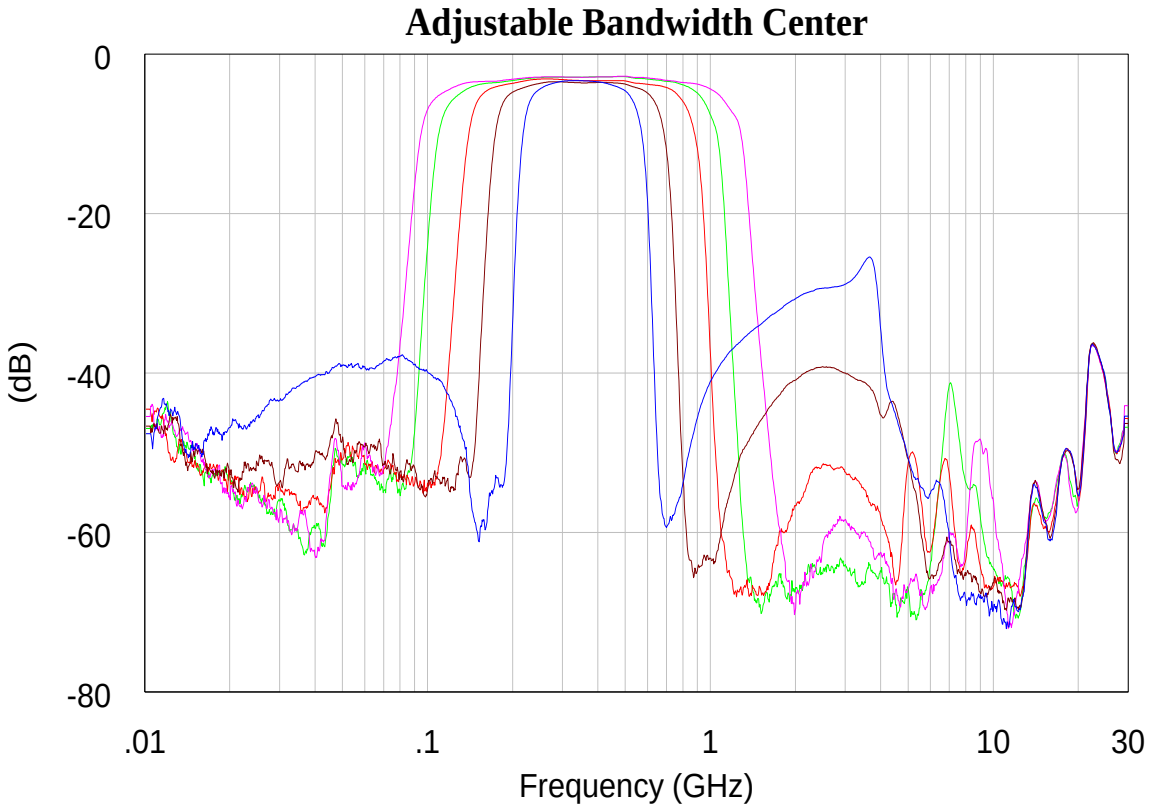
SW1	SW2	State
Low	High	HPF Bypassed
High	Low	HPF Active

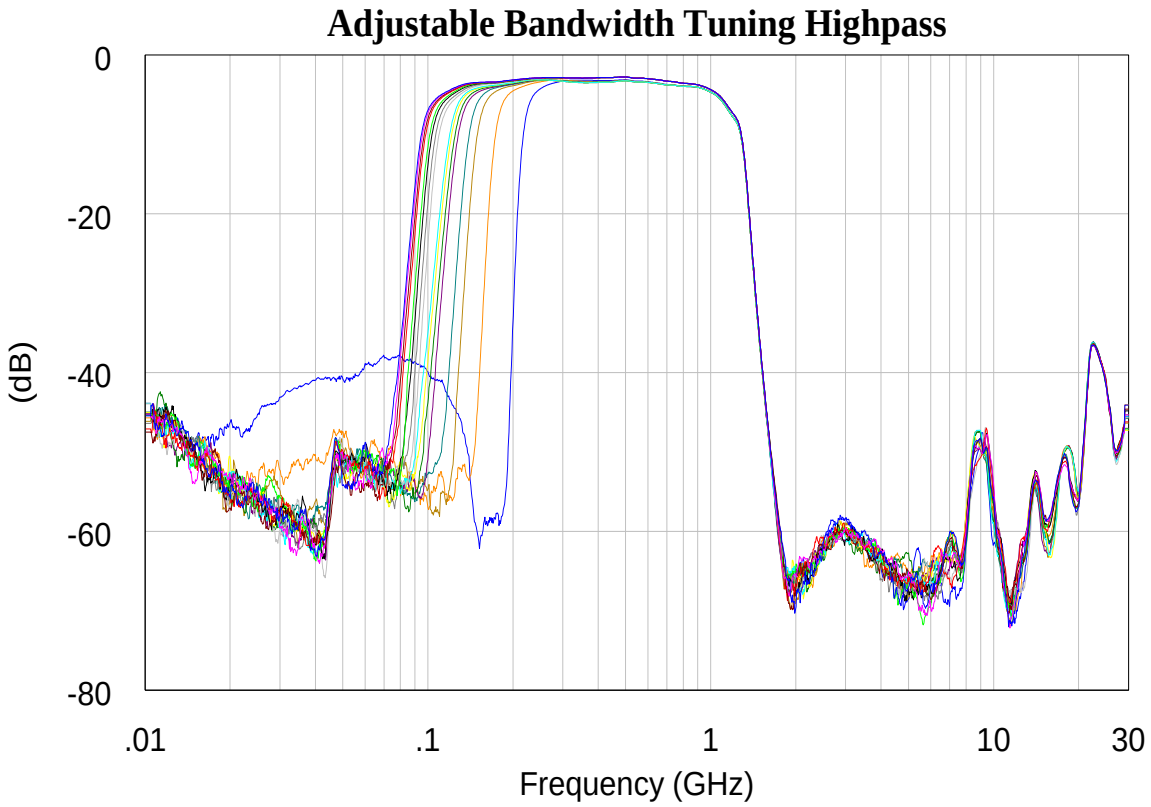
State Tables (continued)

High Pass Control Lines				Typical Cutoff Frequency (MHz)
HPF_D	HPF_C	HPF_B	HPF_A	
L	L	L	L	102
L	L	L	H	103
L	L	H	L	105
L	L	H	H	106
L	H	L	L	110
L	H	L	H	112
L	H	H	L	116
L	H	H	H	120
H	L	L	L	127
H	L	L	H	130
H	L	H	L	134
H	L	H	H	138
H	H	L	L	148
H	H	L	H	159
H	H	H	L	183
H	H	H	H	228

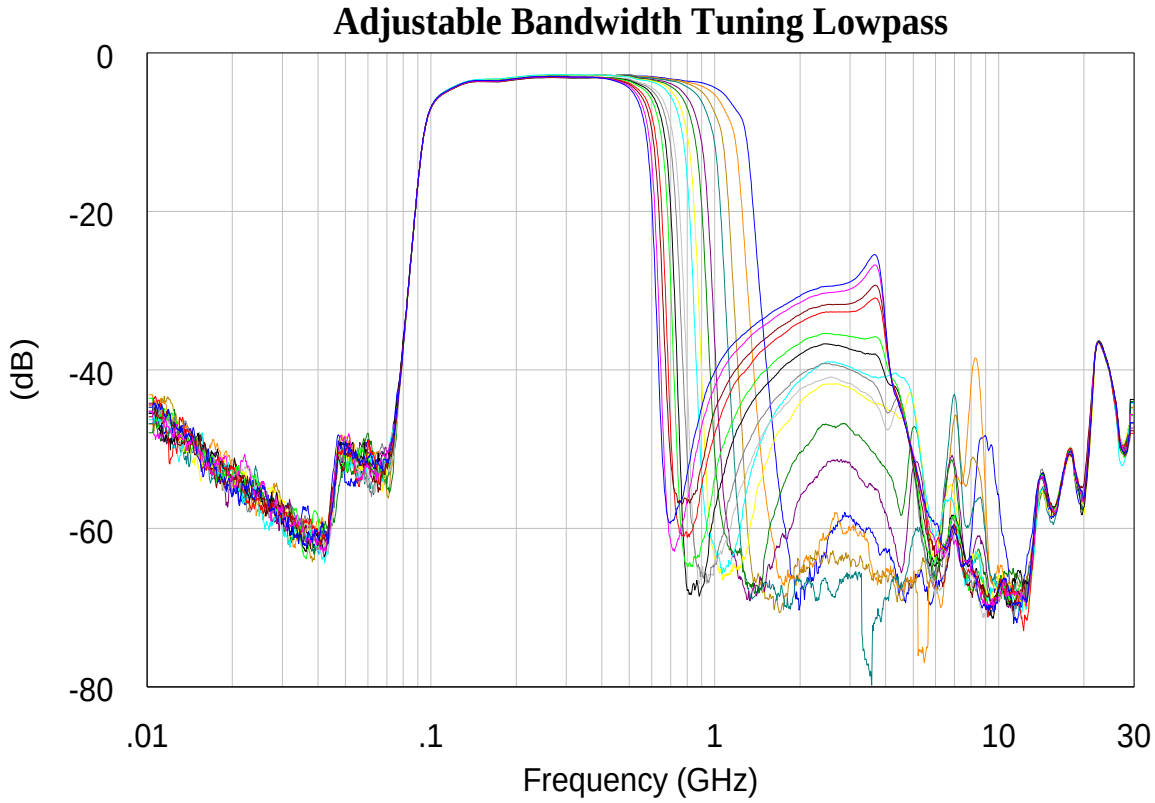
Low Pass Control Lines				Typical Cutoff Frequency (MHz)
LPF_D	LPF_C	LPF_B	LPF_A	
L	L	L	L	508
L	L	L	H	518
L	L	H	L	533
L	L	H	H	545
L	H	L	L	567
L	H	L	H	582
L	H	H	L	603
L	H	H	H	620
H	L	L	L	680
H	L	L	H	710
H	L	H	L	749
H	L	H	H	787
H	H	L	L	876
H	H	L	H	945
H	H	H	L	1040
H	H	H	H	1163

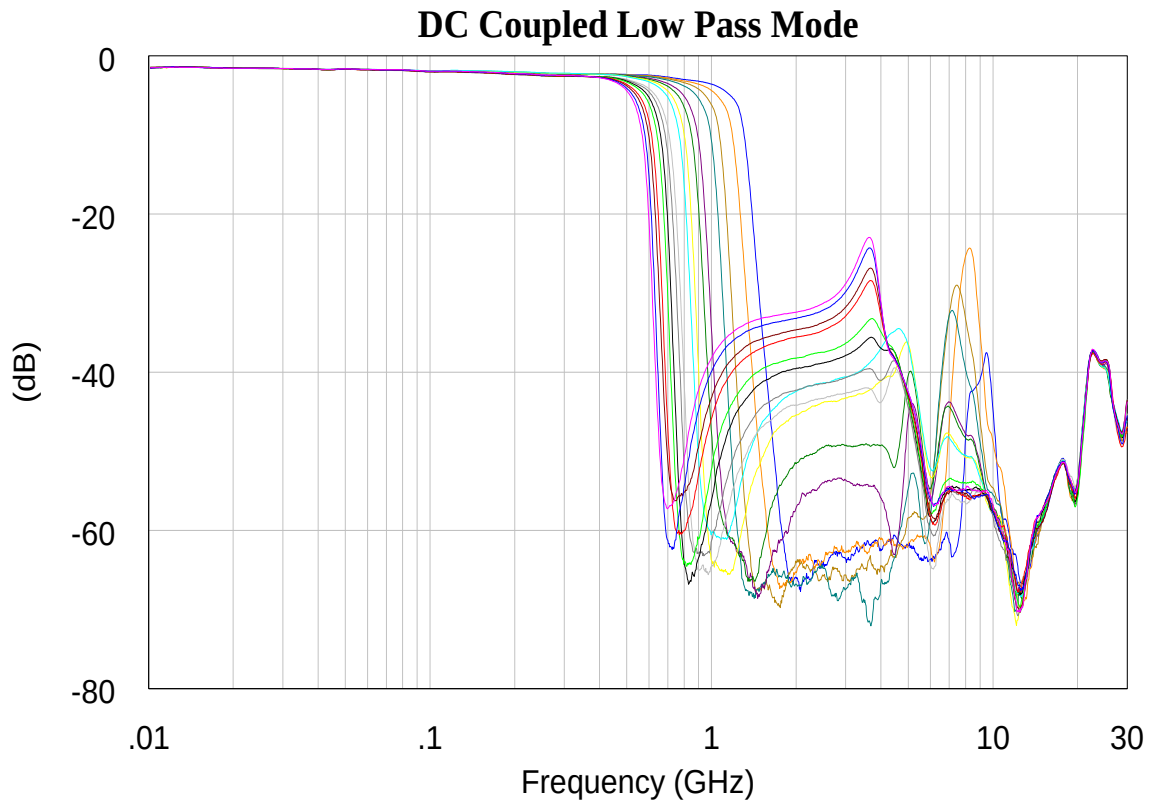
Typical Performance



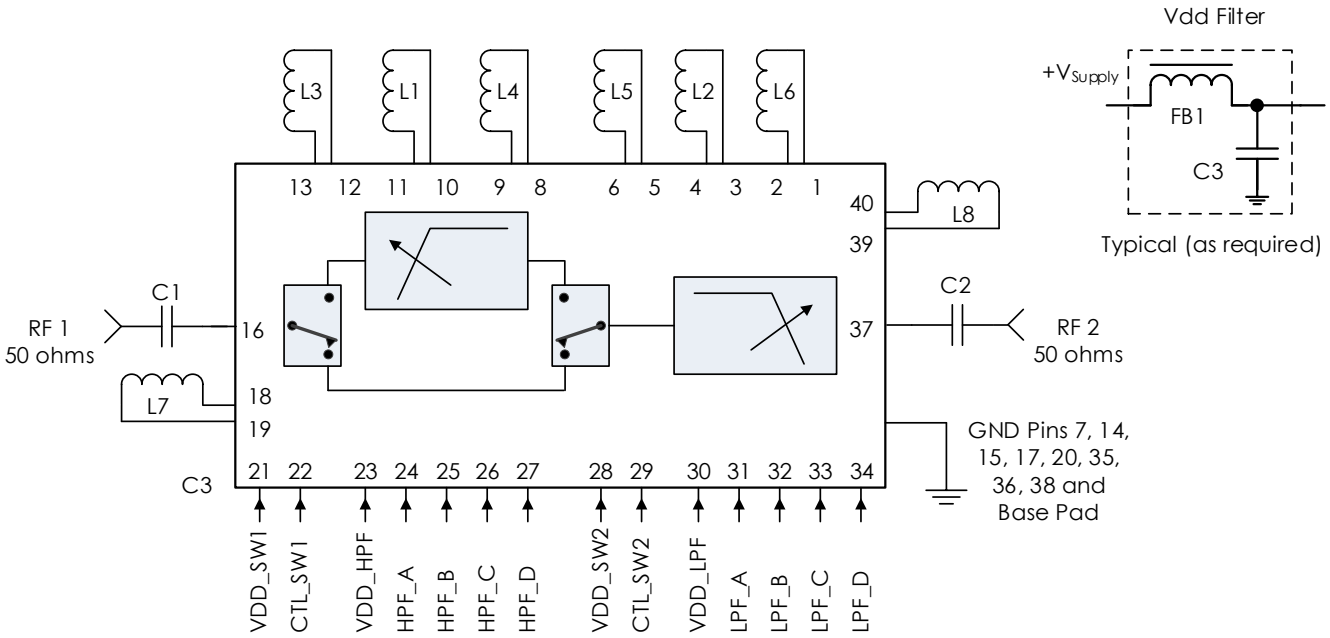


Typical Performance (continued)





Typical Application



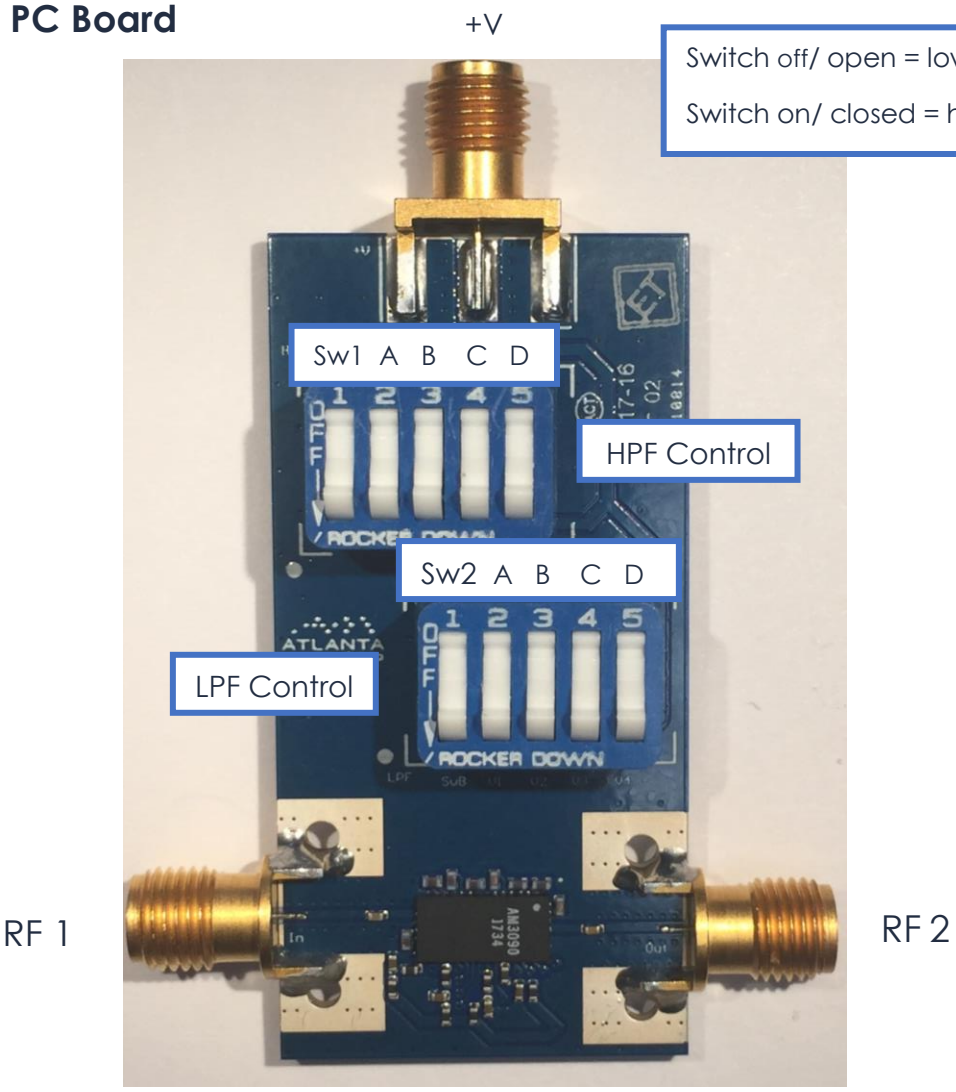
Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1, C2	0.1 µF	0402BB104KW160	Passives Plus
C3	0.1 µF	C1005X7R1H104K050BB	TDK
FB1	-	MMZ1005A222E	TDK
L4, L7	68 nH	0402HP-68NXGLW	Coilcraft
L1, L3	56 nH	0402HP-56NXGLW	Coilcraft
L2, L6	6.8 nH	0402HP-6N8XGLW	Coilcraft
L5, L8	6.2 nH	0402HP-6N2XGLW	Coilcraft

Notes:

1. DC blocking capacitors should be low-loss, broadband capacitors for optimum performance
2. Routes to off-chip inductors, L1 through L8, should be kept as short as possible.
3. VDD and control lines filtered internally providing high frequency isolation to 50 + GHz. See AM35 datasheet.

Evaluation PC Board



Related Parts

Part Number				Description
AM3090	100 MHz	to	450 MHz	Digitally Tunable BPF with HPF Bypass
AM3060	400 MHz	to	6.5 GHz	Switched Digitally Tunable BPF Bank
AM3063	6.0 GHz	to	18.0 GHz	Digitally Tunable Bandpass Filter Bank
AM3064	1.0 GHz	to	6.5 GHz	Digitally Tunable Bandpass Filter Bank
AM3065	6.0 GHz	to	12.0 GHz	Digitally Tunable Bandpass Filter
AM3066	12.0 GHz	to	26.5 GHz	Digitally Tunable Bandpass Filter Bank
AM3102	330 MHz	to	1.2 GHz	Digitally Tunable Bandpass Filter
AM3103	1.0 GHz	to	3.0 GHz	Digitally Tunable Bandpass Filter
AM3104	2.5 GHz	to	6.5 GHz	Digitally Tunable Bandpass Filter

Component Compliance Information

RoHS: Atlanta Micro, Inc. hereby certifies that all products comply with the EC Directive 2011/65/EC on the Restriction of Hazardous Substances, commonly known as RoHS II. All products supplied by Atlanta Micro 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)

REACH: Atlanta Micro, Inc. neither uses nor intentionally adds any of the substances considered to be a Substance of Very High Concern (SVHC) as defined by the EU Regulation (EC) No. 1907-2006 on Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH).

Conflict Materials: Atlanta Micro does not knowingly use materials that are sourced from the Democratic Republic of Congo (DRC) or any other known conflict regions. Atlanta Micro's supply chain is comprised of sources that are both environmentally and socially responsible. We periodically review this requirement with our vendors to ensure continued compliance.

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.