

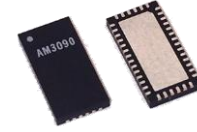
AM3098 – Digitally Tunable Filter



100 to 225 MHz Highpass; 500 to 1200 MHz Lowpass

Description

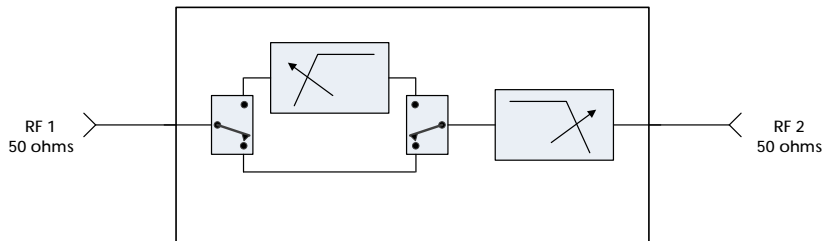
AM3098 is a miniature digitally tunable filter providing selectable highpass filtering over the 100 to 225 MHz and independently selectable lowpass filtering over the 500 to 1200 MHz frequency range. The filter also provides a bypass mode where only the lowpass filter is active. With independent 4 bit 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

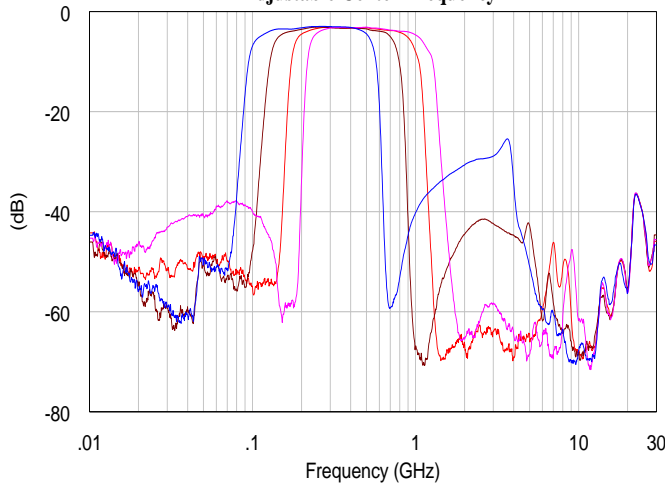
Functional Diagram



Characteristic Performance

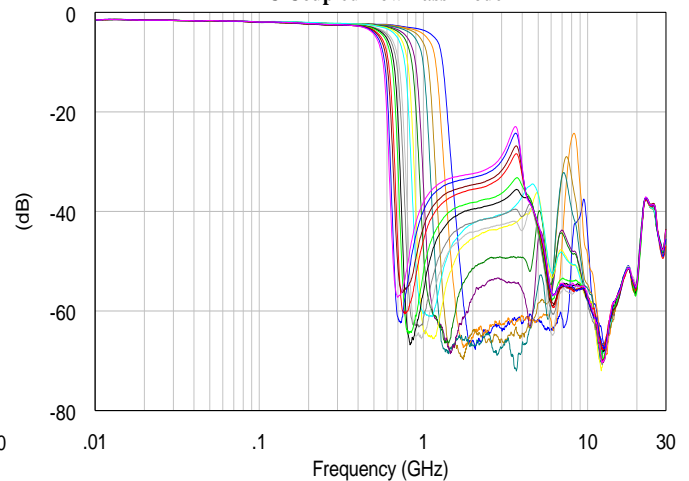
Adjustable Center Frequency

Adjustable Center Frequency



DC-Coupled Low Pass Mode

DC Coupled Low Pass Mode



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Revision History

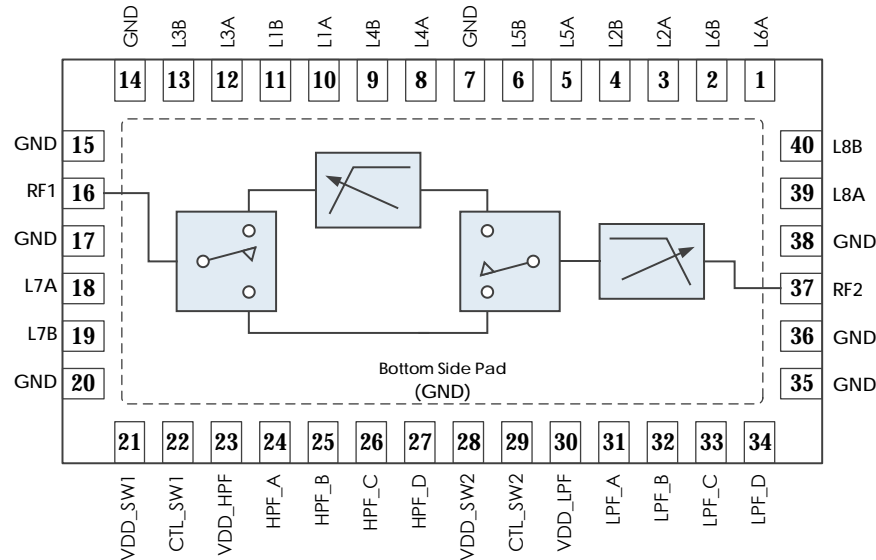
| Date | Revision Number | Notes |
|--------------|-----------------|----------------------------------|
| May 19, 2020 | 3 | Updated to new datasheet format. |

AM3098 – Digitally Tunable Filter



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Pin Layout and Definitions



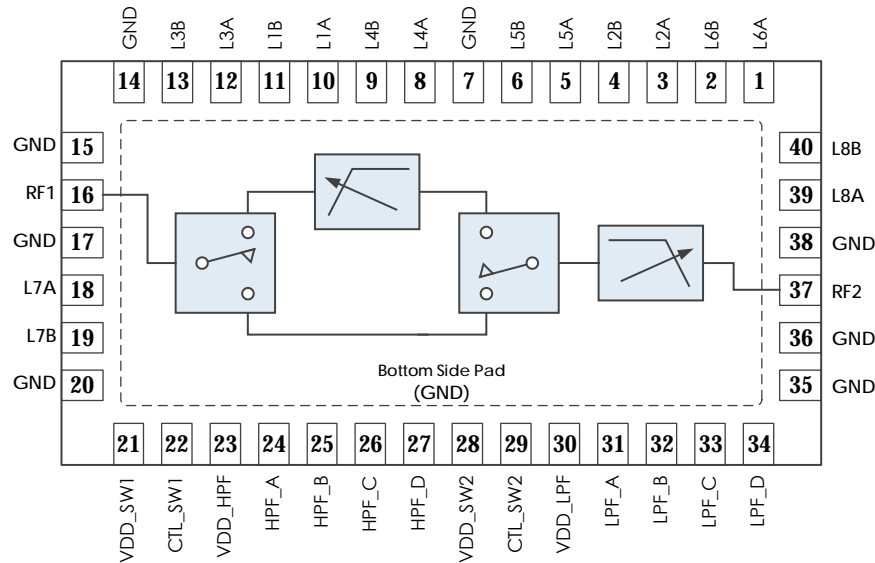
| Pin Number | Pin Name | Pin Function |
|------------|----------|---|
| 1 | L6A | External Inductor L6 Connection |
| 2 | L6B | External Inductor L6 Connection |
| 3 | L2A | External Inductor L2 Connection |
| 4 | L2B | External Inductor L2 Connection |
| 5 | L5A | External Inductor L5 Connection |
| 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 |

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AM3098 – Digitally Tunable Filter

100 to 225 MHz Highpass; 500 to 1200 MHz Lowpass

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 |

AM3098 – Digitally Tunable Filter



100 to 225 MHz Highpass; 500 to 1200 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 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 |

AM3098 – Digitally Tunable Filter

100 to 225 MHz Highpass; 500 to 1200 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 | | 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 |

AM3098 – Digitally Tunable Filter



100 to 225 MHz Highpass; 500 to 1200 MHz Lowpass

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 |

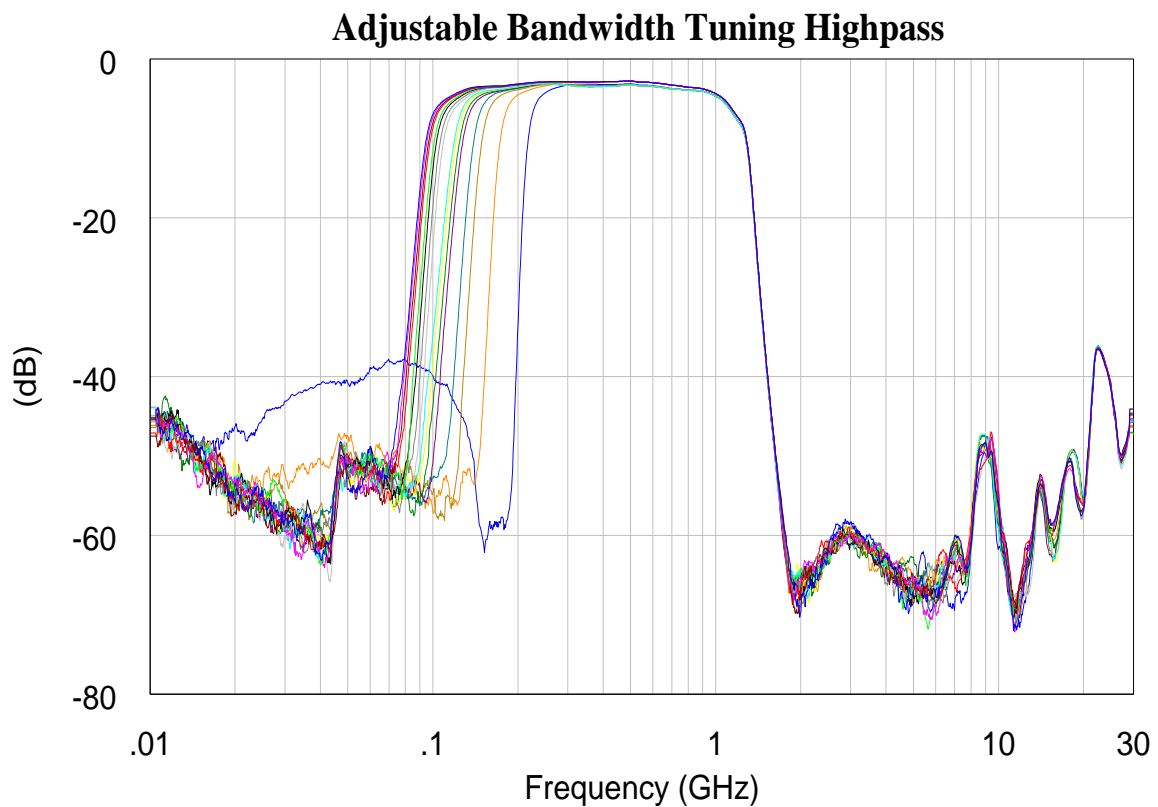
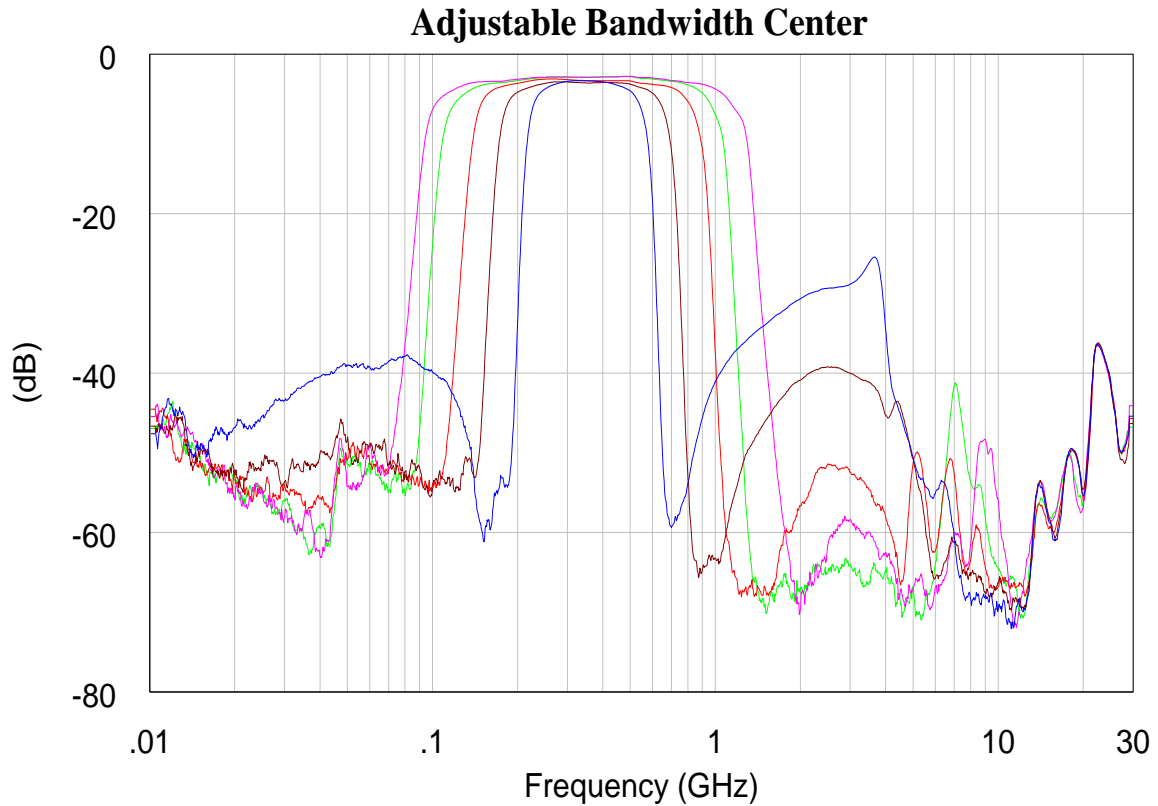
| Low Pass Control Lines | | | | Typical Cutoff Frequency (MHz) |
|------------------------|-------|-------|-------|--------------------------------|
| LPF_D | LPF_C | LPF_B | LPF_A | |
| L | L | L | L | 508 |
| L | L | L | H | 518 |
| L | L | H | L | 533 |
| L | L | H | H | 545 |
| L | H | L | L | 567 |
| 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 |

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Typical Performance



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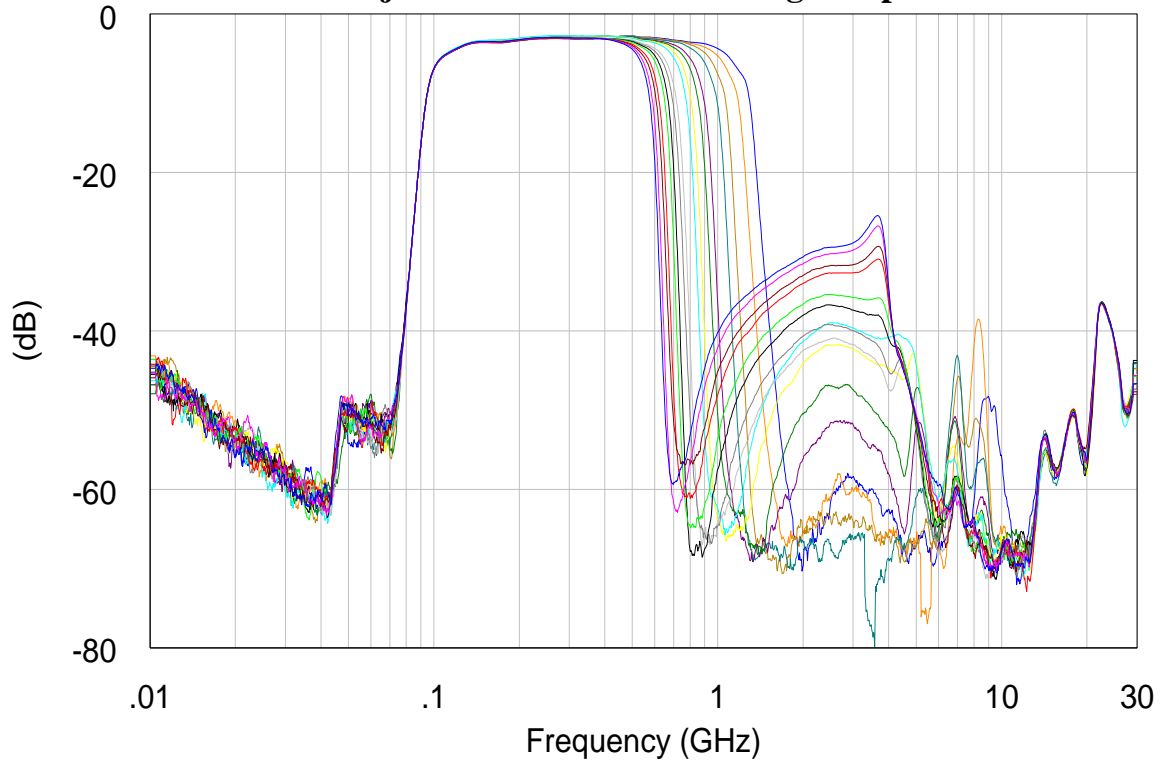
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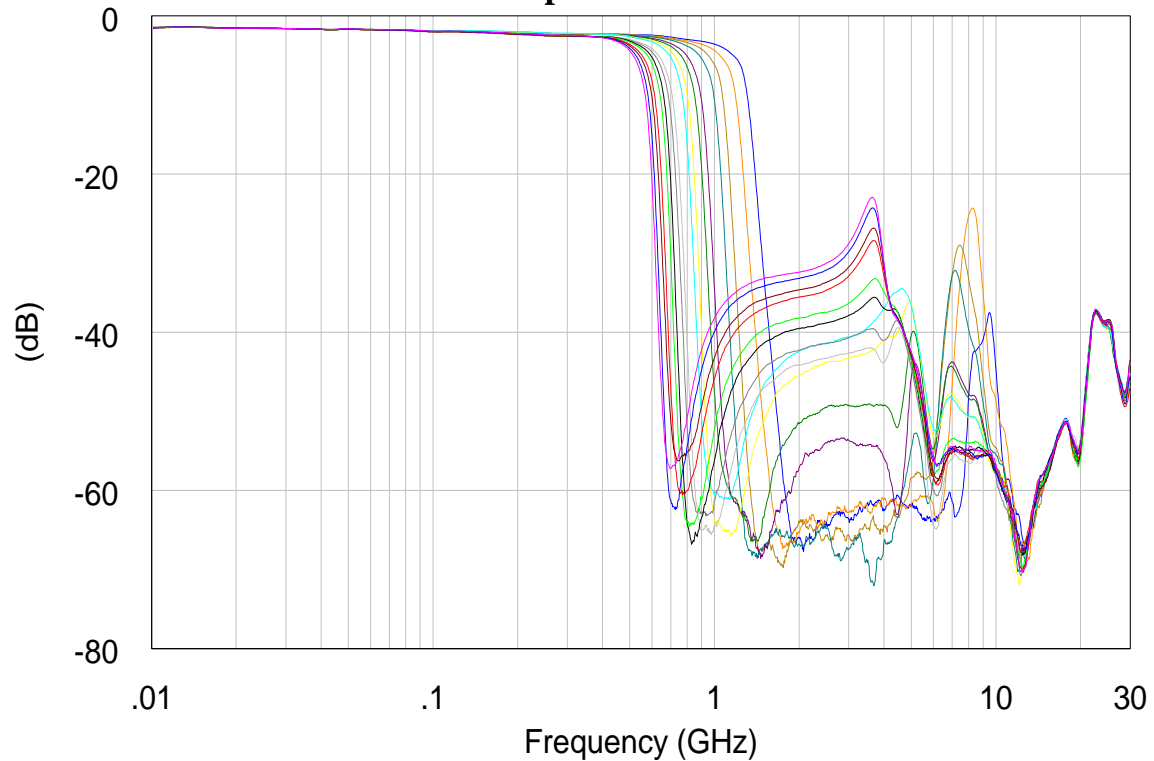
100 to 225 MHz Highpass; 500 to 1200 MHz Lowpass

Typical Performance (continued)

Adjustable Bandwidth Tuning Lowpass



DC Coupled Low Pass Mode

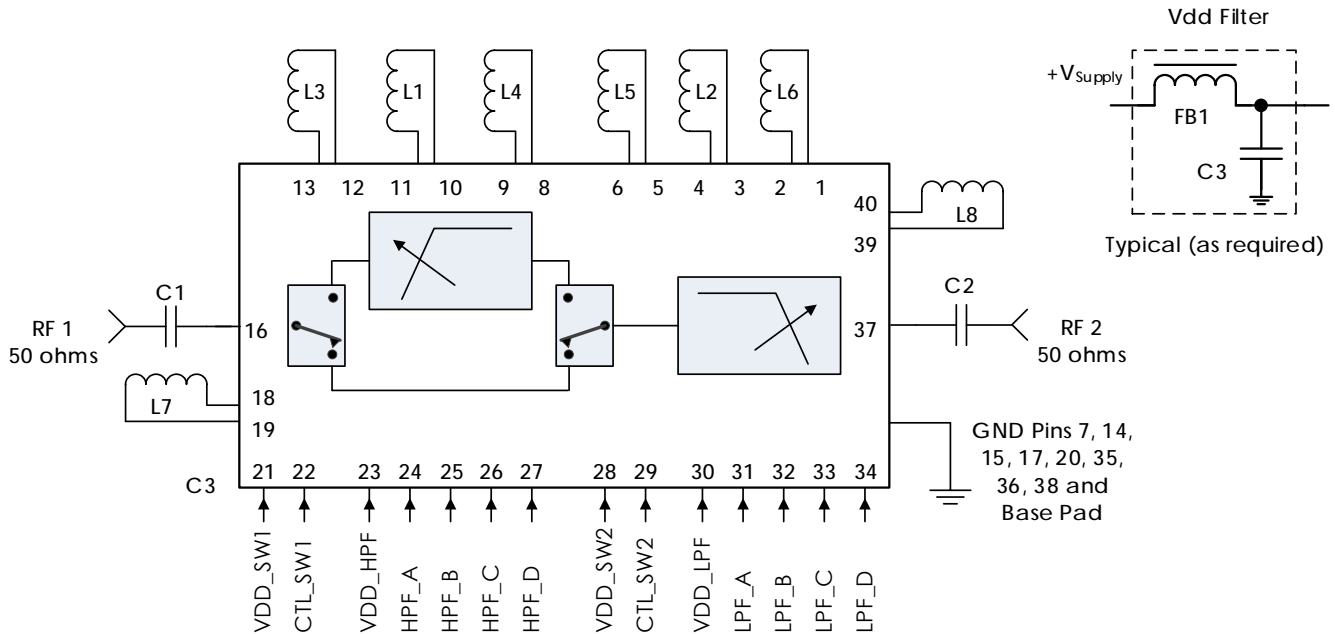


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Typical Application



Recommended Component List (or equivalent):

| Part | Value | Part Number | Manufacturer |
|--------|-------------|---------------------|---------------|
| C1, C2 | 0.1 μ F | 0402BB104KW160 | Passives Plus |
| C3 | 0.1 μ F | 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 |

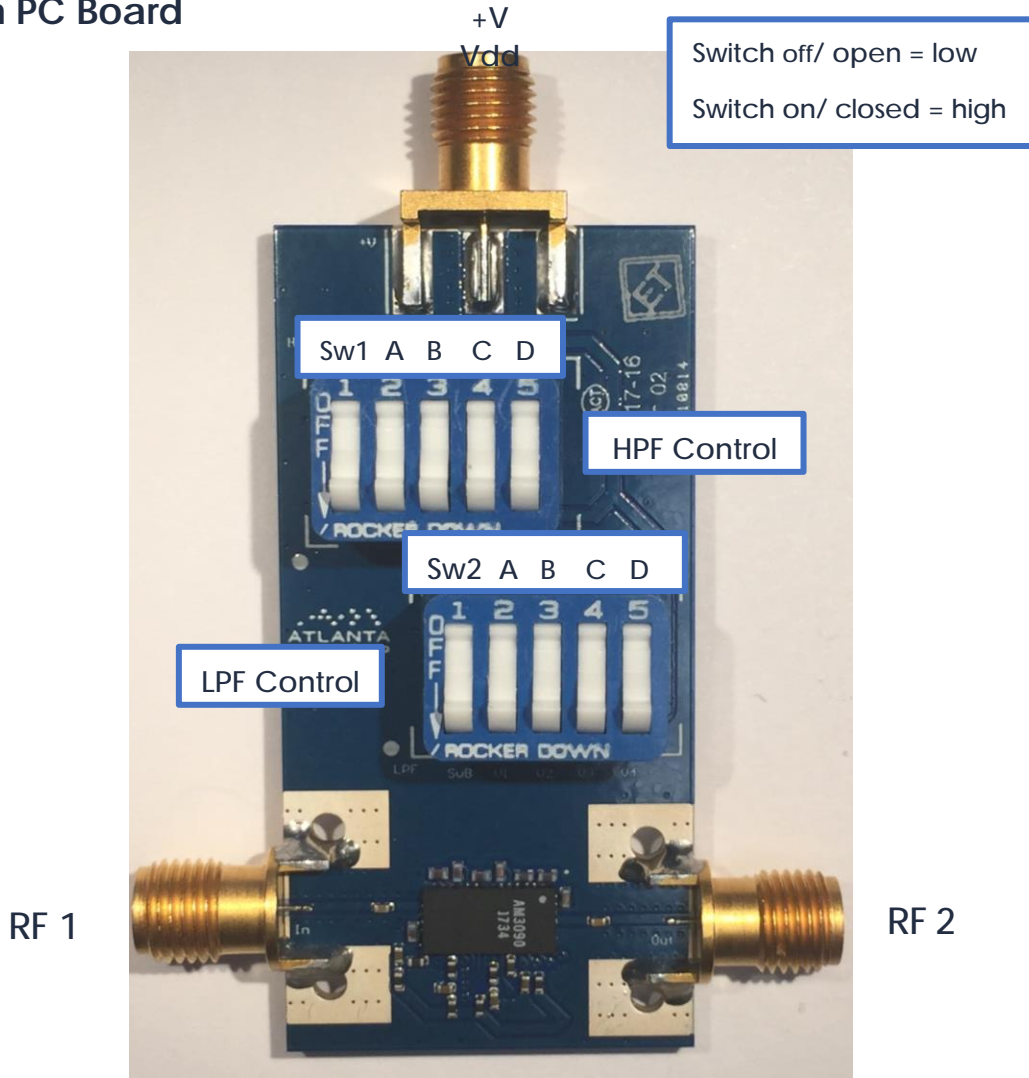
Notes:

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.

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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 |

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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) |

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