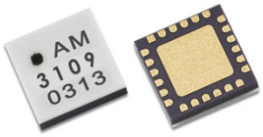
AM3109 – Filter Bank

Digitally Tunable 18.0 to 26.5 GHz Highpass

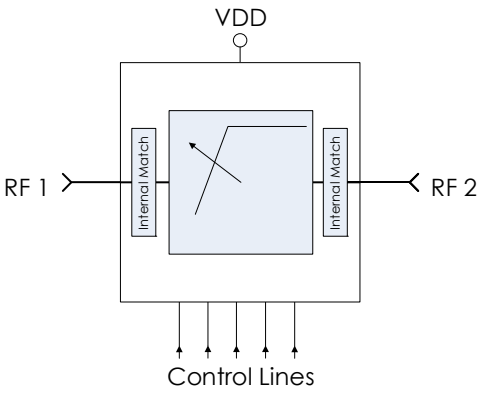


The AM3109 is a miniature digitally tunable highpass filter covering the 18.0 to 26.5 GHz frequency range. The filter provides 32 selectable highpass cutoff states with 5 digital control bits. The tunable lowpass filter can be combined with one of Mercury's tunable lowpass filters to provide a flexible tunable bandpass filter solution. AM3109 has internal 50Ω matching, is packaged in a 4mm QFN package, and operates over the -40C to +85C temperature range.

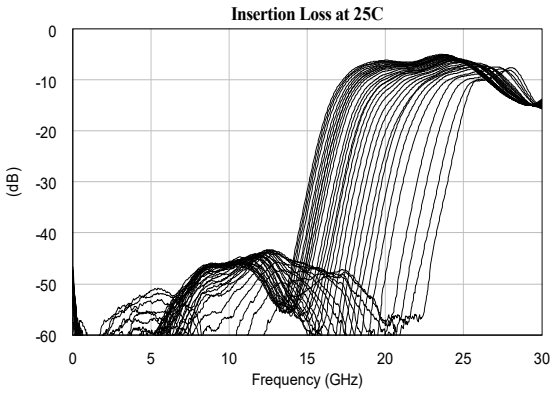
FEATURES

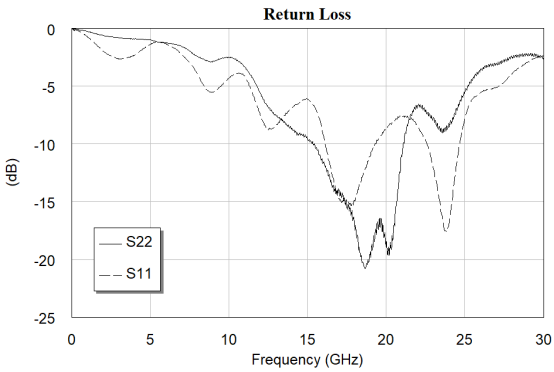
- Discrete Low Pass Cutoff Steps
- 5-bit Control, 3V or 5V Logic
- +3.3V to +5V DC Supply
- 7.0 dB AVG Insertion Loss
- +36 dBm Input IP3
- 4mm QFN Package
- -40C to +85C Operation
- No Calibration Required

FUNCTIONAL DIAGRAM



CHARACTERISTIC PERFORMANCE



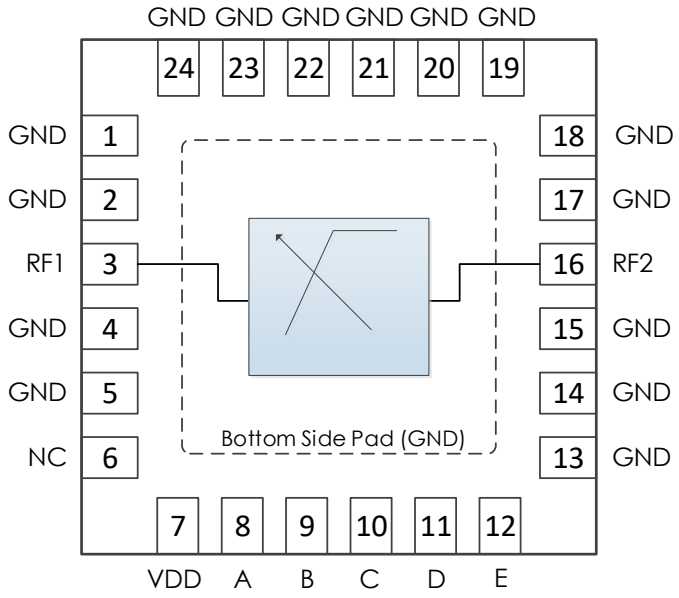


CONTENTS

REVISION HISTORY

Date	Revision	Notes
August 24, 2018	1	Initial Release.
July 25, 2024	2	Changed to Mercury branding. No content changes.

PIN LAYOUT AND DEFINITIONS



Pin	Name	Function
1, 2	GND	Ground – Common
3	RF1	RF Port 1 – 50 ohms – DC coupled. External DC blocking capacitor required*
4, 5	GND	Ground – Common
6	NC	Do Not Connect
7	VDD	DC Power Input
8	A	Control Bit A
9	B	Control Bit B
10	C	Control Bit C
11	D	Control Bit D
12	E	Control Bit E
13-15	GND	Ground – Common
16	RF2	RF Port 2 – 50 ohms – DC coupled. External DC blocking capacitor required*
17-24	GND	Ground – Common
Case GND	GND	Ground – Common

***NOTE:** DC blocking caps not required if in series with other Mercury parts of the same reference voltage.

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	-50C	+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. Devices subjected to conditions outside of what is recommended for extended periods may affect device reliability.

Recommended Operating Conditions

	Minimum	Typical	Maximum
Supply Voltage	+2.7 V	+5.0 V	
Operating Case Temperature	-40 C		+85 C
Operating Junction Temperature	-40 C		+125 C

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.

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Param	Testing Conditions	Min	Typical	Max
DC Supply Voltage		+2.7 V	+5.0 V	
DC Supply Current	V Supply = +3.3 V	1 mA		2 mA
	V Supply = +5.0 V	1 mA		3 mA
Power Dissipated	V Supply = +3.3 V	3.3mW		6.6 mW
	V Supply = +5.0 V	5 mW		15 mW
Logic Level Low		-0.1 V		+0.5 V
Logic Level High		+2.0 V		Vdd

Timing Characteristics

Parameter	Minimum	Typical	Maximum
Switching Speed		1 µs	

RF Performance

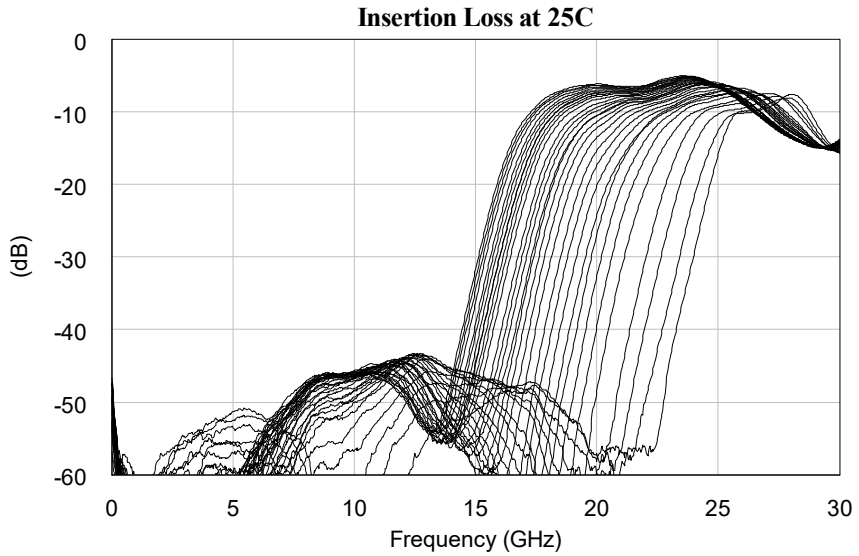
(T = 25 °C, VDD = +5.0 V unless otherwise specified)

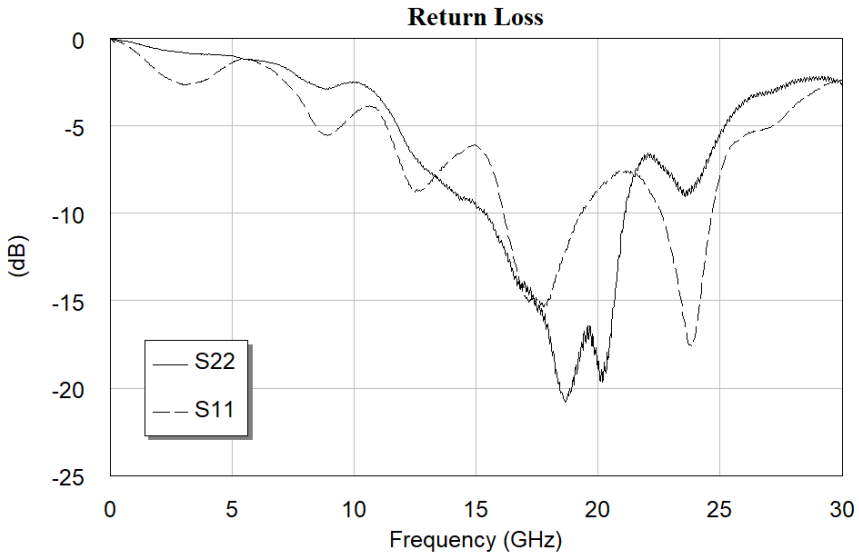
Param	Testing Conditions	Min	Typical	Max
Frequency Range		18.0 GHz		26.5 GHz
Insertion Loss	f=18 GHz, ABCDE=00000		7.8 dB	
	f=25 GHz, ABCDE=00000		6.5 dB	
	f=32 GHz, ABCDE=00000		7.5 dB	
Return Loss	f=18 GHz, ABCDE=00000		15.0 dB	
	f=25 GHz, ABCDE=00000		7.8 dB	
	f=32 GHz, ABCDE=00000		7.8 dB	
Input IP3	ABCDE=00000		+36 dBm	

State Table

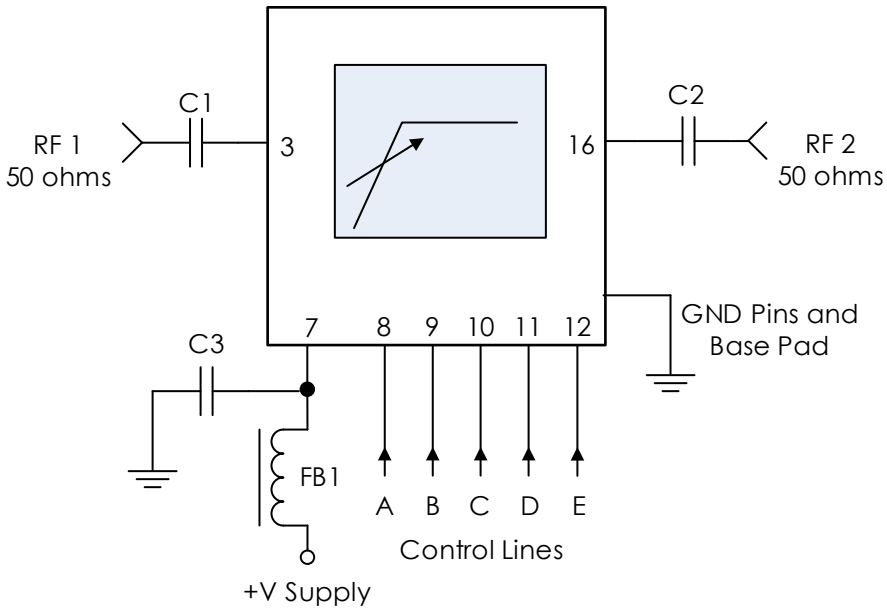
Control Lines					State
E	D	C	B	A	
L	L	L	L	L	17.91
L	L	L	L	H	18.02
L	L	L	H	L	18.16
L	L	L	H	H	18.36
L	L	H	L	L	18.50
L	L	H	L	H	18.79
L	L	H	H	L	18.99
L	L	H	H	H	19.25
L	H	L	L	L	19.42
L	H	L	L	H	19.60
L	H	L	H	L	19.74
L	H	L	H	H	20.01
L	H	H	L	L	20.45
L	H	H	L	H	20.68
L	H	H	H	L	20.93
L	H	H	H	H	21.22
H	L	L	L	L	21.38
H	L	L	L	H	21.67
H	L	L	H	L	21.77
H	L	L	H	H	22.05
H	L	H	L	L	22.57
H	L	H	L	H	22.84
H	L	H	H	L	22.95
H	L	H	H	H	23.40
H	H	L	L	L	23.59
H	H	L	L	H	24.02
H	H	L	H	L	24.25
H	H	L	H	H	24.43
H	H	H	L	L	25.29
H	H	H	L	H	25.43
H	H	H	H	L	25.90
H	H	H	H	H	26.02

TYPICAL PERFORMANCE





TYPICAL APPLICATION



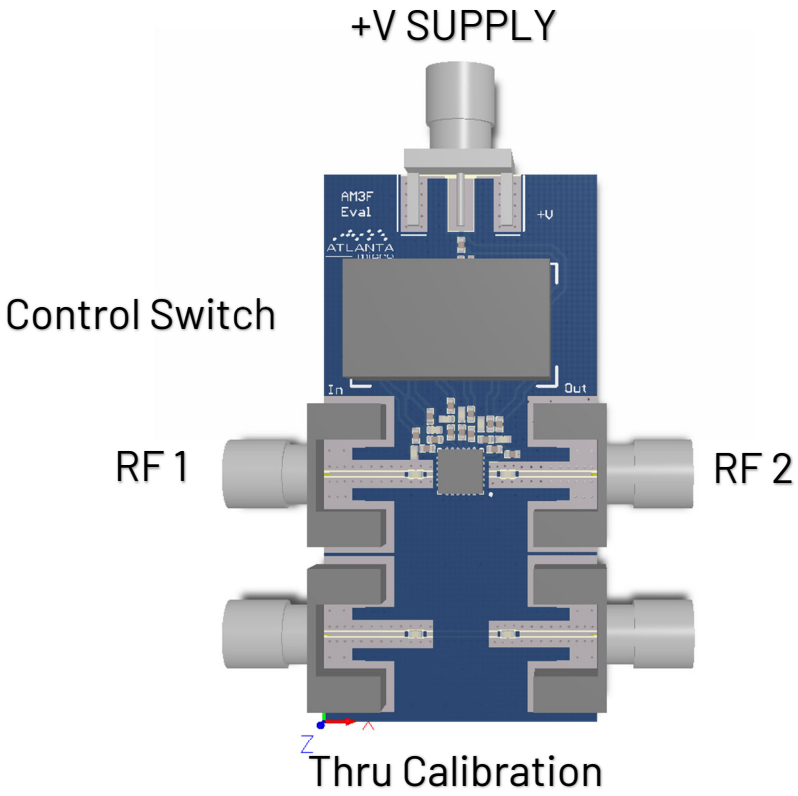
Recommended Component List (or Equivalent)

Part	Value	Part Number	Manufacturer
C1, C2	0.1 µF	0402BB104KW160	Passives Plus
C3-C8	0.1 µF	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.

EVALUATION PC BOARD

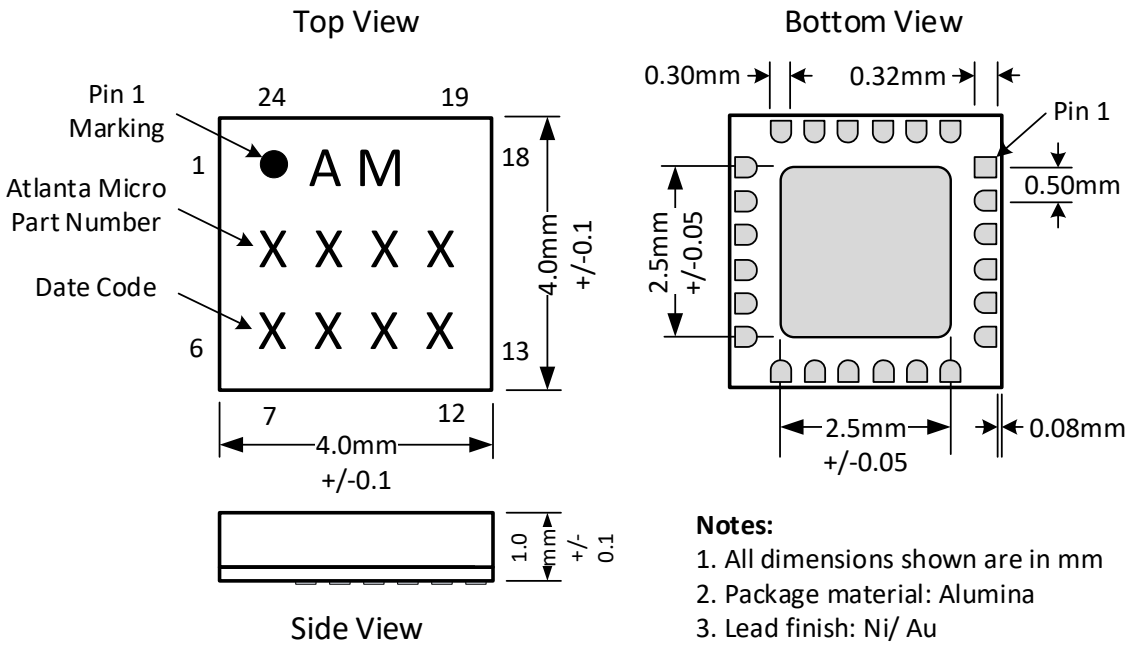


RELATED PARTS

Part Number	Description
AM3030	3.5 GHz to 6.5 GHz Digitally Tunable Lowpass
AM3039	9 GHz to 18 GHz Digitally Tunable Lowpass
AM3107	6 GHz to 12 GHz Digitally Tunable Lowpass
AM3110	18 GHz to 26.5 GHz Digitally Tunable Lowpass
AM3032	2.5 GHz to 4.5 GHz Digitally Tunable Highpass
AM3041	6 GHz to 10 GHz Digitally Tunable Highpass
AM3108	12 GHz to 18.0 GHz Digitally Tunable Highpass

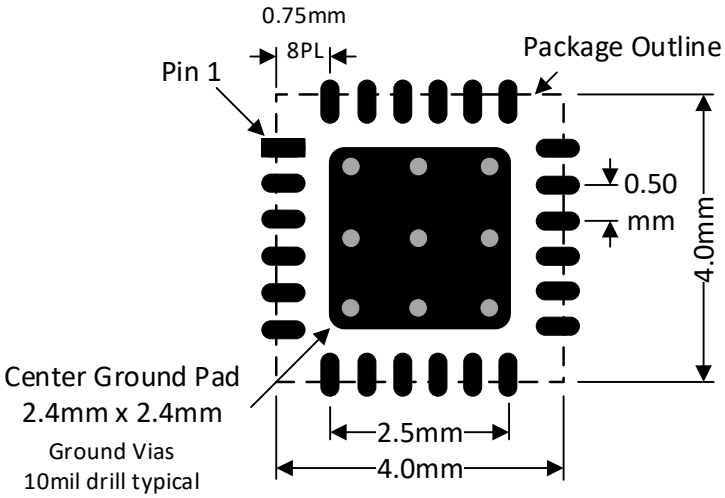
PACKAGE DETAILS

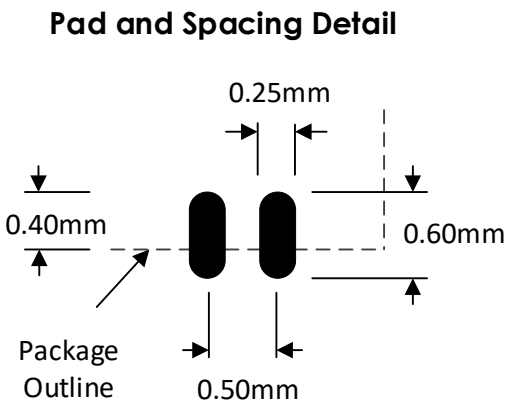
Package Drawing



Notes:
1. All dimensions shown are in mm
2. Package material: Alumina
3. Lead finish: Ni/ Au

Recommended Footprint





Recommend 0.08mm soldermask
oversize beyond pad outlines

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)

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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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