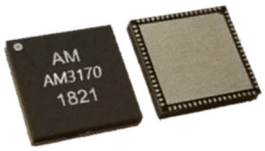
AM3170 – Filter Bank

Analog Tunable 6.0 to 18.0 GHz Notch

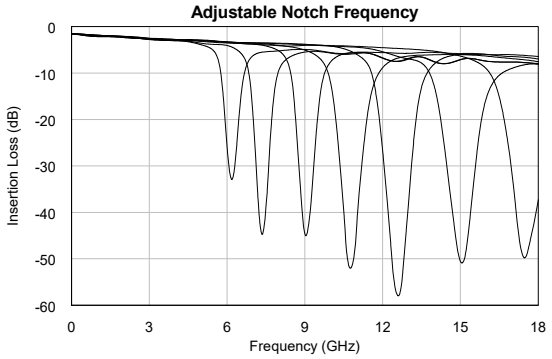


AM3170 is an analog-tunable notch filter bank with notches from 6.0 to 18.0 GHz. Six notch filters with SP6T switches on the input and output are contained in the multi-chip module (MCM). The tune voltage provides control of notch frequency, and a bypass path is provided by applying a 0.0V control voltage while switched to band 1. AM3170 provides an excellent filtering solution for receivers or transceivers requiring flexible center frequency removal, high dynamic range, low insertion loss, and small size, weight, and power consumption (low SWAP).

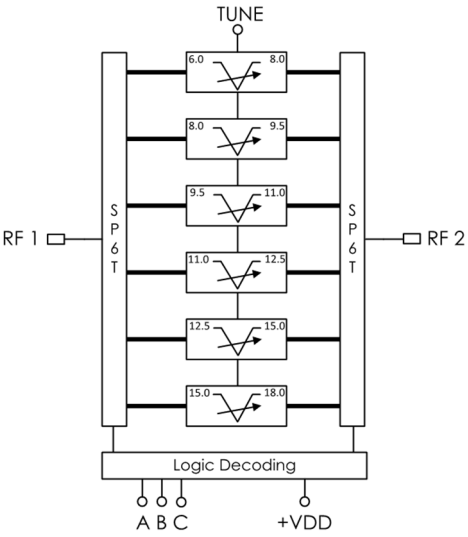
FEATURES

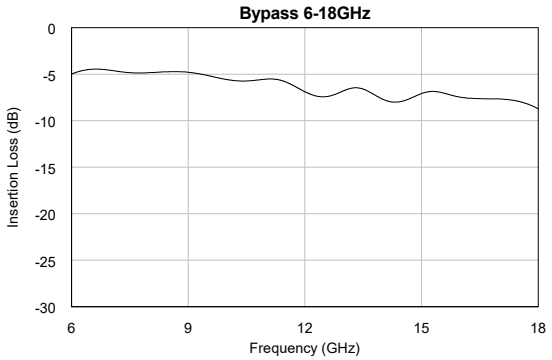
- Analog Tuning
- 40dB Typical Notch Depth
- 5 dB Typical Insertion Loss
- +27 dBm Typical P1dB
- +38 dBm Typical IIP3
- +3.3V to +5.0V Supply
- 0.0V to +8.0V Tuning Voltage Range
- 10mm QFN package
- -40C to +85C Operation

CHARACTERISTIC PERFORMANCE



FUNCTIONAL DIAGRAM



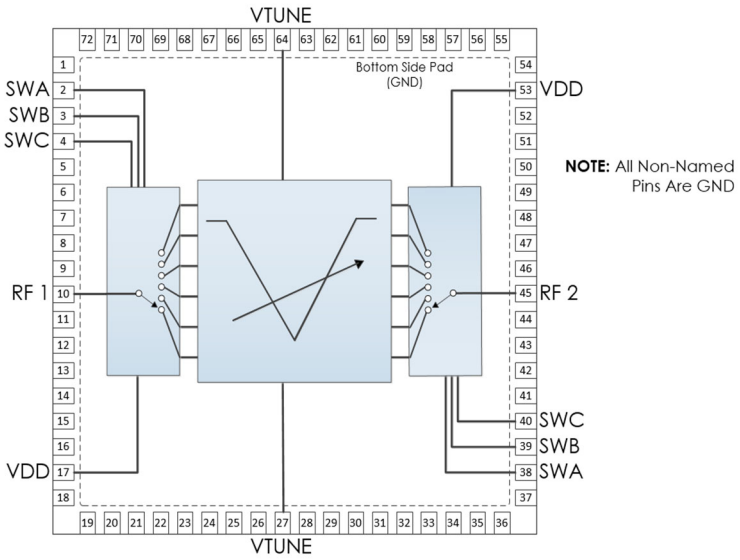


CONTENTS

REVISION HISTORY

Date	Revision	Notes
June 15, 2022	1	Initial Release
September 8, 2022	2	Fixed Table.
July 22, 2024	3	Changed to Mercury branding. No content changes.

PIN LAYOUT AND DEFINITIONS



Pin	Name	Function
1	GND	Ground
2	SWA	Switch Control A
3	SWB	Switch Control B
4	SWC	Switch Control C
5-9	GND	Ground
10	RF1	RF1 – 50 Ohms – DC Coupled, External Blocking Cap Needed*
11-16	GND	Ground
17	VDD	DC Power Input
18-26	GND	Ground
27	VTUNE	DC Control Voltage**
28-37	GND	Ground
38	SWA	Switch Control A
39	SWB	Switch Control B
40	SWC	Switch Control C
41-44	GND	Ground
45	RF2	RF2 – 50 Ohms – DC Coupled, External Blocking Cap Needed*
46-52	GND	Ground
53	VDD	DC Power Input
54-63	GND	Ground
64	VTUNE	DC Control Voltage**
65-72	GND	Ground
Case GND	GND	Ground

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

****Note:** Only one VTUNE input connection is required; the other should be left open.

SPECIFICATIONS

Absolute Maximum Ratings

	Minimum	Maximum
Supply Voltage	-0.3 V	+6.0 V
DC Control Voltage	0.0 V	+12.0 V
RF Input Power		+30 dBm
Storage Temperature Range	-50 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
Moisture Sensitivity Level	MSL 3	

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

Recommended Operating Conditions

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

Thermal Information

	Thermal Resistance (°C / W)
Junction to Case Thermal Resistance (θ_{JC})	144 C/W

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		16 mA	
	V Supply = +5.0 V		20 mA	
Power Dissipated	V Supply = +3.3 V		53 mW	
	V Supply = +5.0 V		100 mW	
Logic Level Low		0.0 V		+0.5 V
Logic Level High		Vdd - 0.5 V		Vdd
DC Control Voltage		+0.5 V		+10.0 V
DC Control Current			< 1 mA	

Timing Characteristics

Parameter	Minimum	Typical	Maximum
Band Switching Speed		1 µs	
Tune Voltage Settling Time		100 ns/V	1 µs/V

Note: Switching speed measured without any tune line capacitors. Switching speed measured as time from 50% control to 90% RF.

RF Performance

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

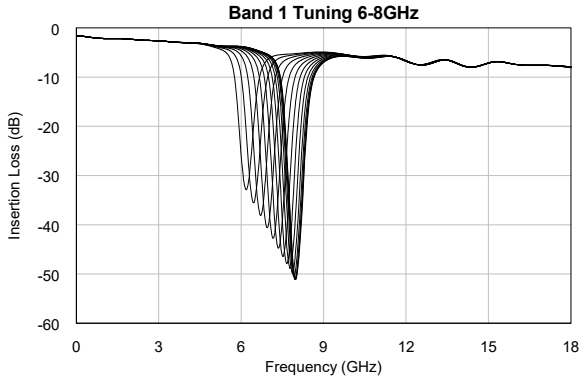
Param	Testing Conditions	Min	Typical	Max
Frequency Range		6.0 GHz		18.0 GHz
Insertion Loss	f = 6.0 GHz		3.0 dB	
	f = 12.0 GHz		5.0 dB	
	f = 18.0 GHz		7.0 dB	
Return Loss	f = 6.0 GHz		15.0 dB	
	f = 12.0 GHz		16.0 dB	
	f = 18.0 GHz		14.0 dB	
Input IP3			+38 dBm	
Input P1dB			+27 dBm	

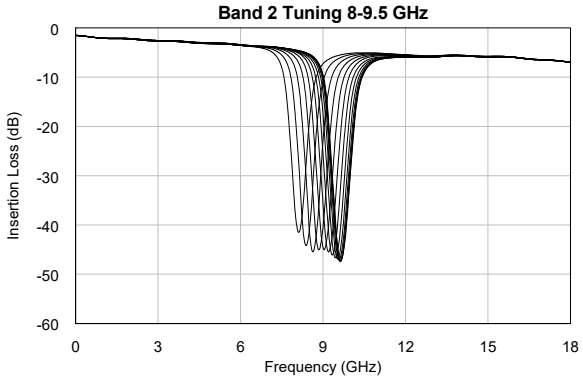
State Table

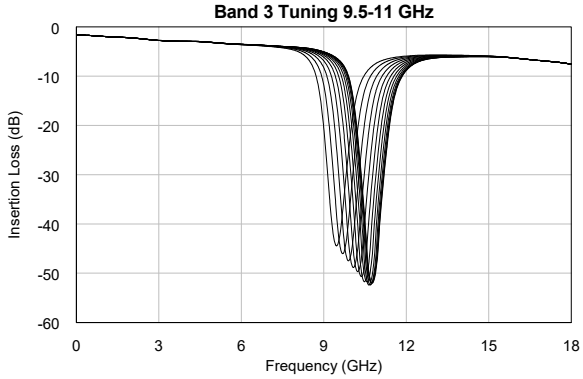
A	B	C	State
Low	Low	High	Band 5 - 12.5 - 15.0 GHz
Low	High	Low	Band 4 - 11.0 - 12.5 GHz
Low	High	High	Band 6 - 15.0 - 18.0 GHz
High	Low	Low	Band 3 - 9.5 - 11.0 GHz
High	Low	High	Band 2 - 8.0 - 9.5 GHz
High	High	Low	Band 1 - 6.0 - 8.0 GHz
All Other States			Do Not Use

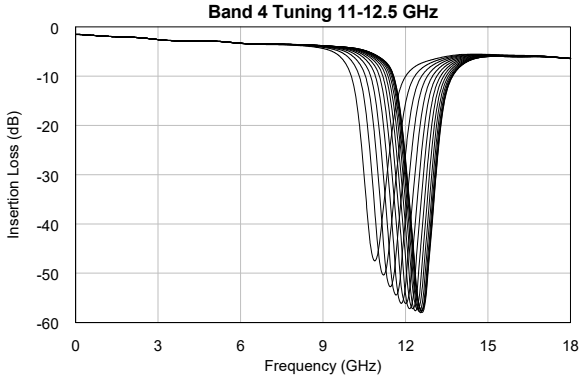
TYPICAL PERFORMANCE

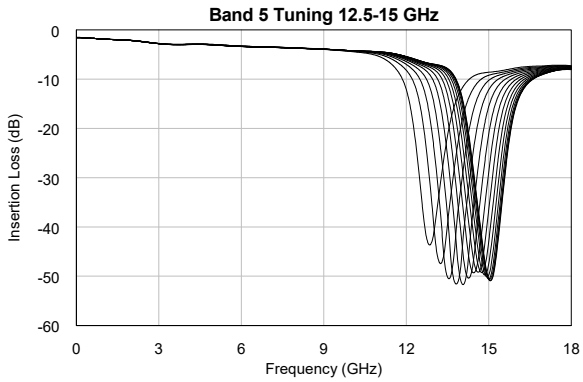
(T = 25 C, VDD = +5.0 V)

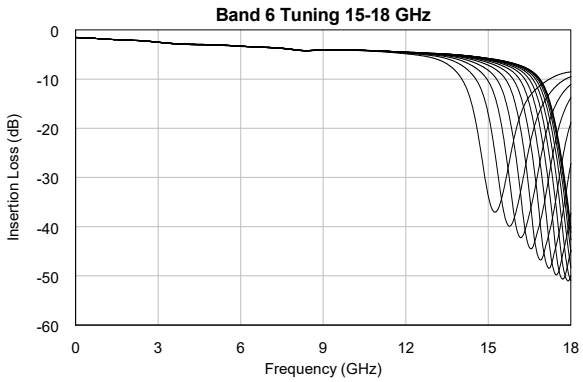






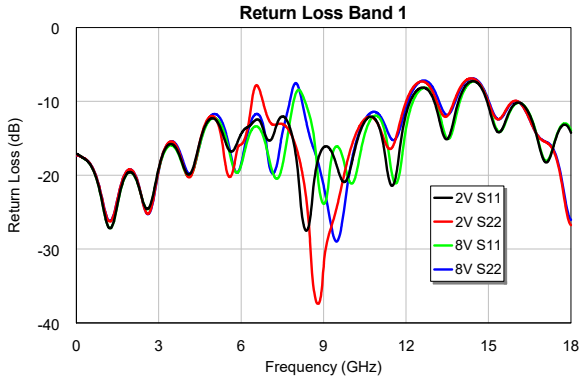


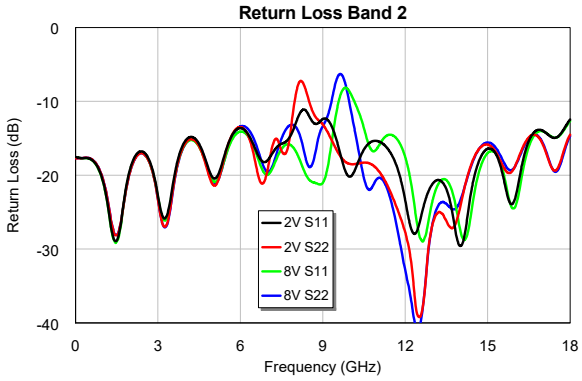


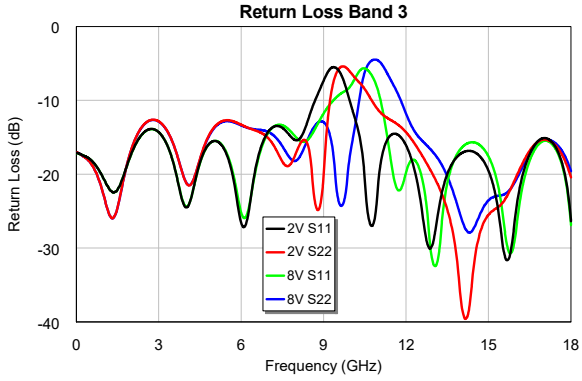


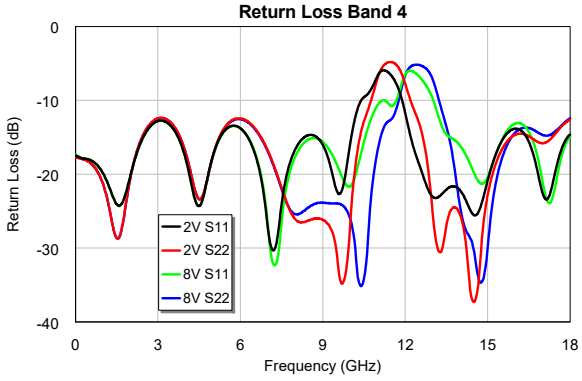
TYPICAL PERFORMANCE (CONTINUED)

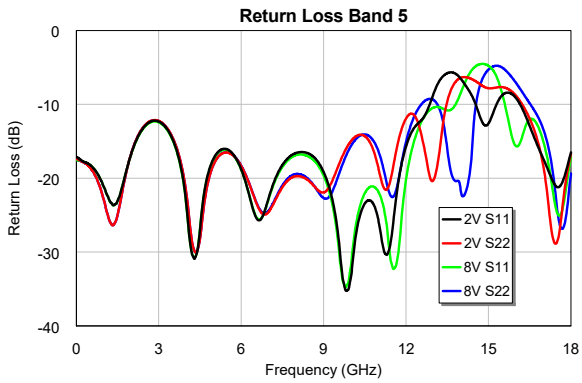
(T = 25 C, VDD = +5.0 V)

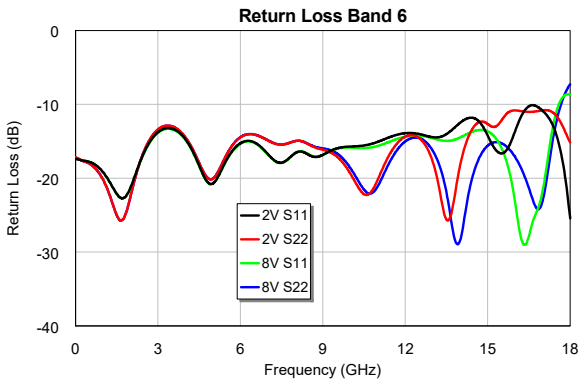






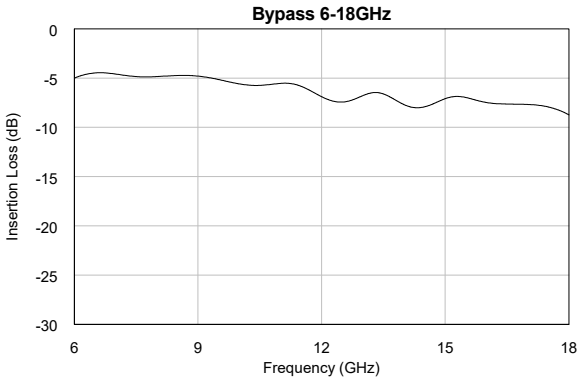


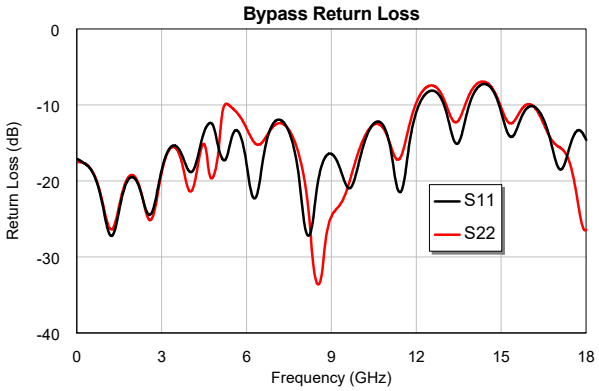


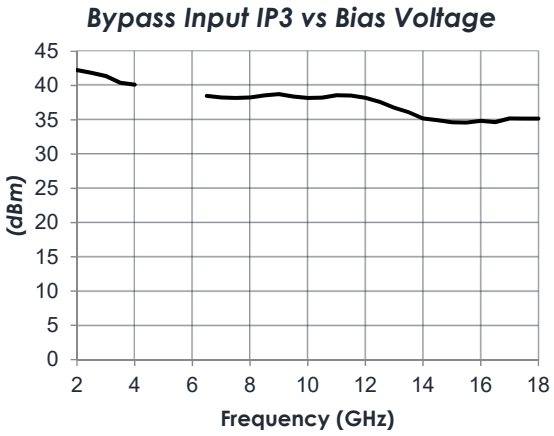


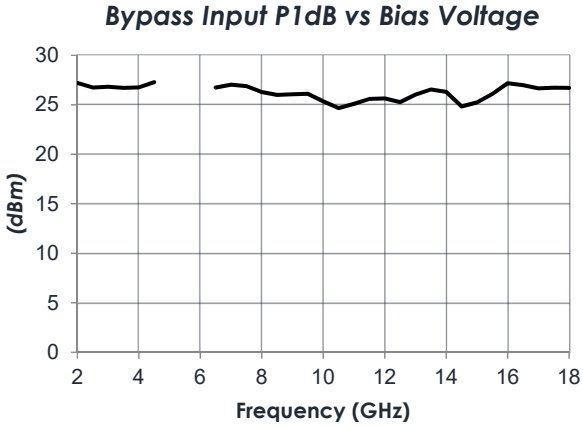
TYPICAL PERFORMANCE (CONTINUED)

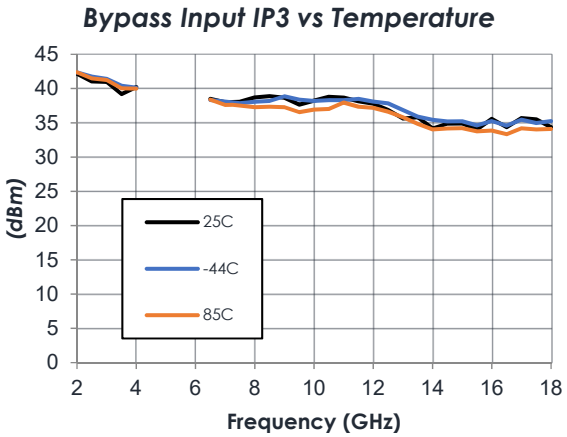
(T = 25 C, VDD = +5.0 V)

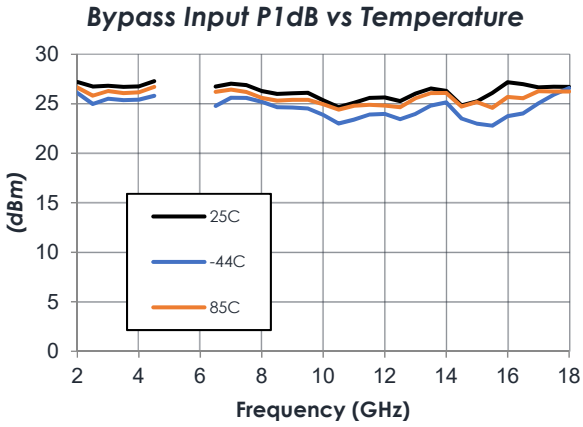








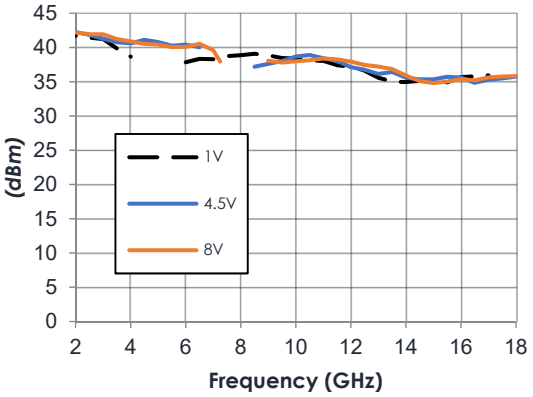




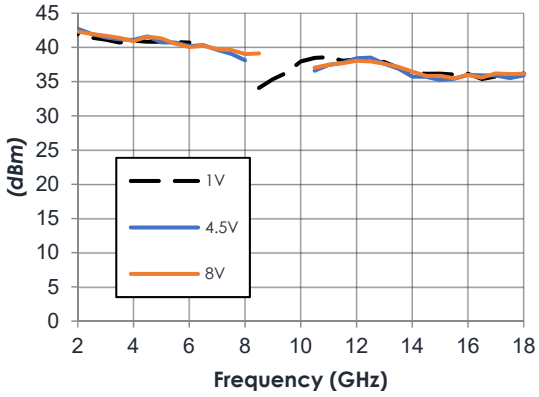
TYPICAL PERFORMANCE (CONTINUED)

(T = 25 C, VDD = +5.0 V)

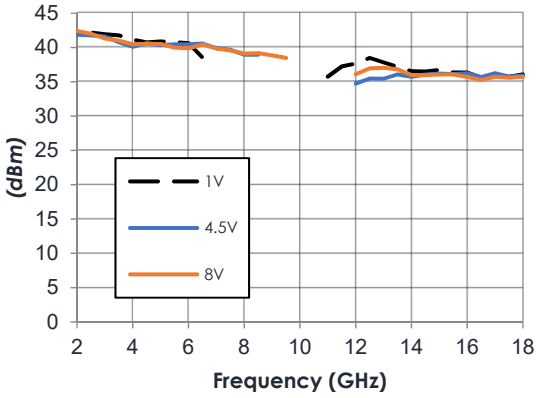
Band 1 Input IP3 vs Bias Voltage



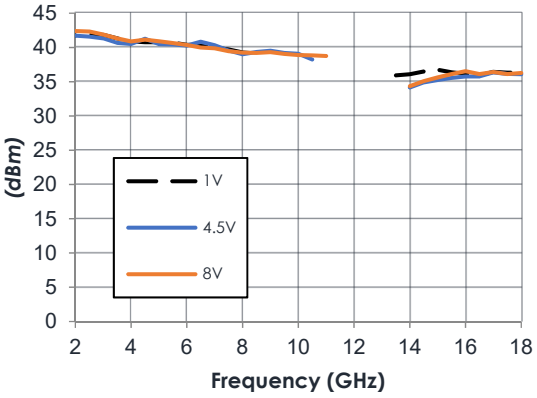
Band 2 Input IP3 vs Bias Voltage



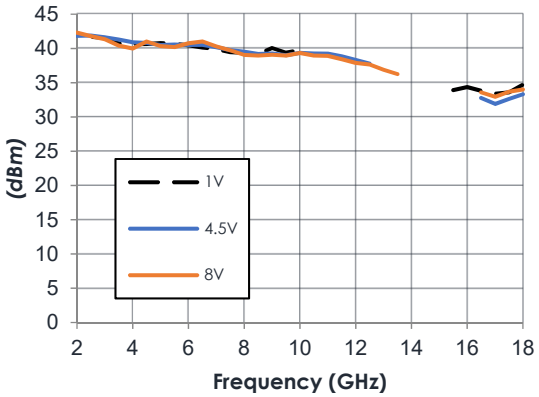
Band 3 Input IP3 vs Bias Voltage



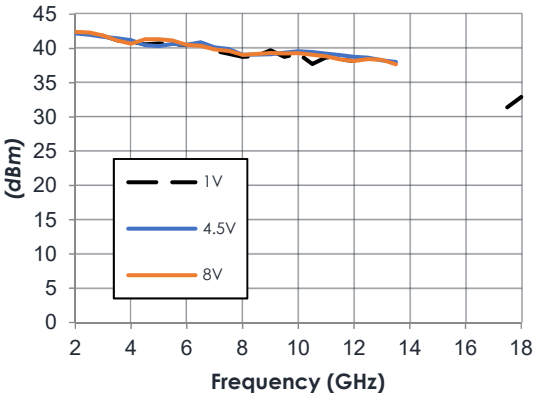
Band 4 Input IP3 vs Bias Voltage



Band 5 Input IP3 vs Bias Voltage



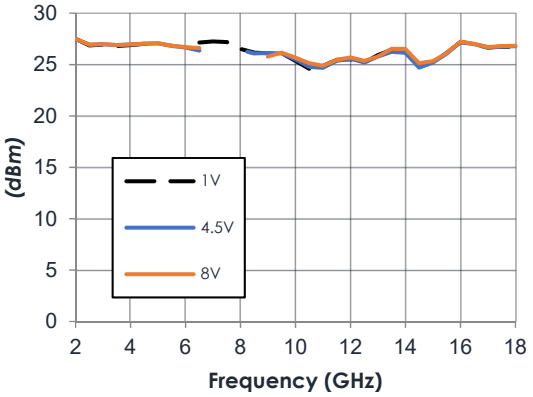
Band 6 Input IP3 vs Bias Voltage



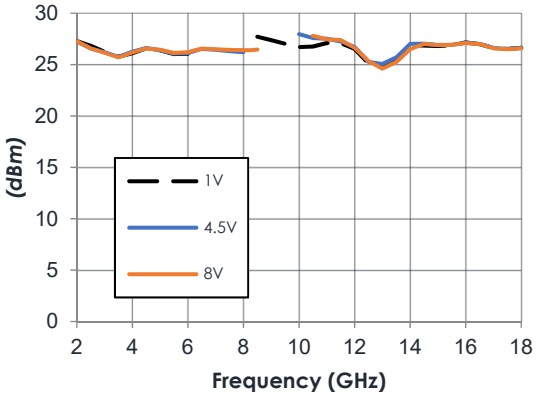
TYPICAL PERFORMANCE (CONTINUED)

(T = 25 C, VDD = +5.0 V)

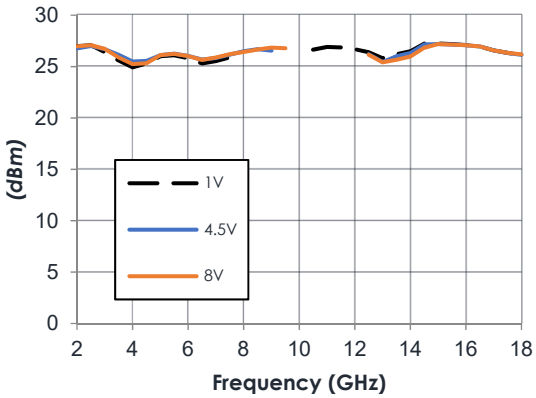
Band 1 Input P1dB vs Bias Voltage



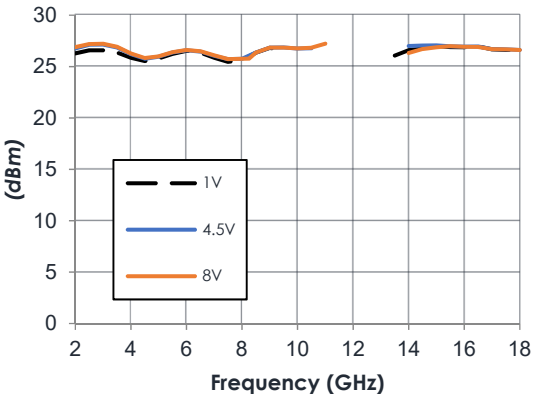
Band 2 Input P1dB vs Bias Voltage



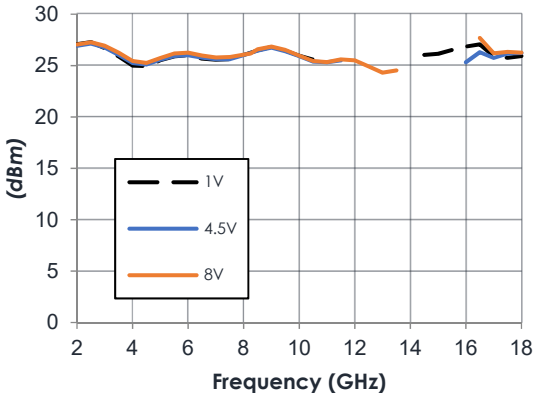
Band 3 Input P1dB vs Bias Voltage



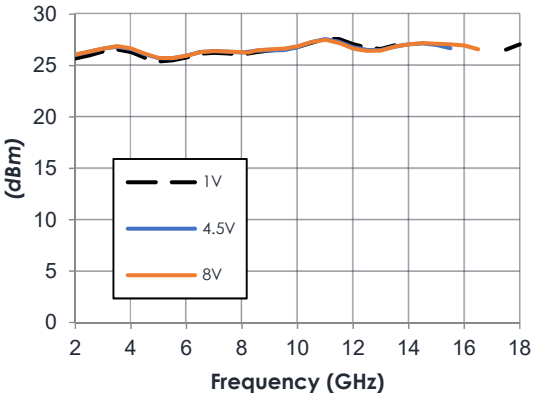
Band 4 Input P1dB vs Bias Voltage



Band 5 Input P1dB vs Bias Voltage

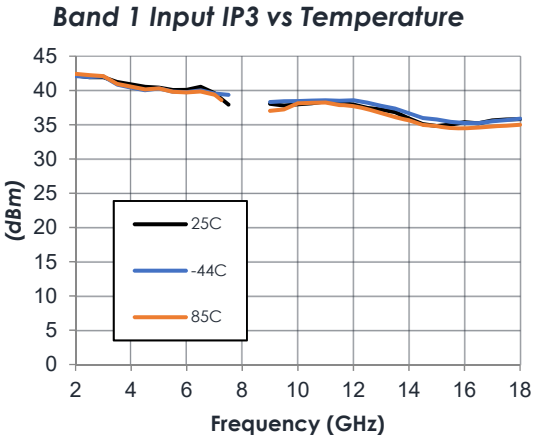


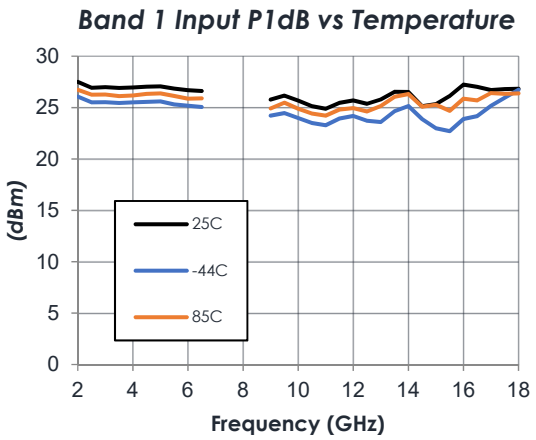
Band 6 Input P1dB vs Bias Voltage



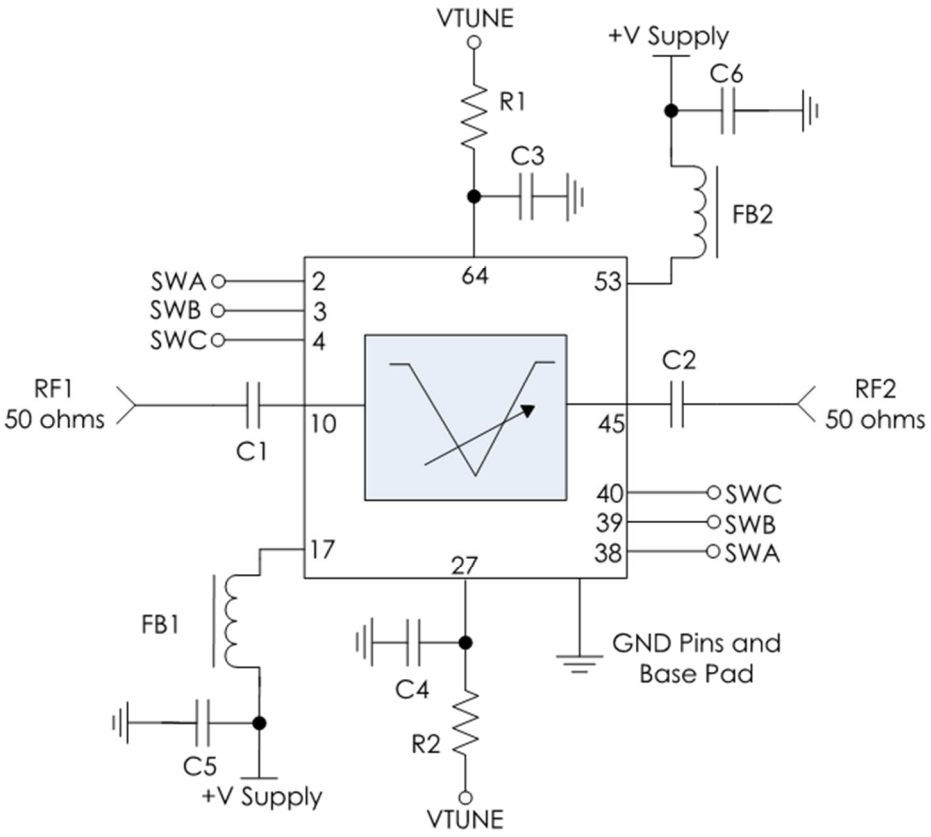
TYPICAL PERFORMANCE (CONTINUED)

(VTUNE = +8.0 V, VDD = +5.0 V)





TYPICAL APPLICATION



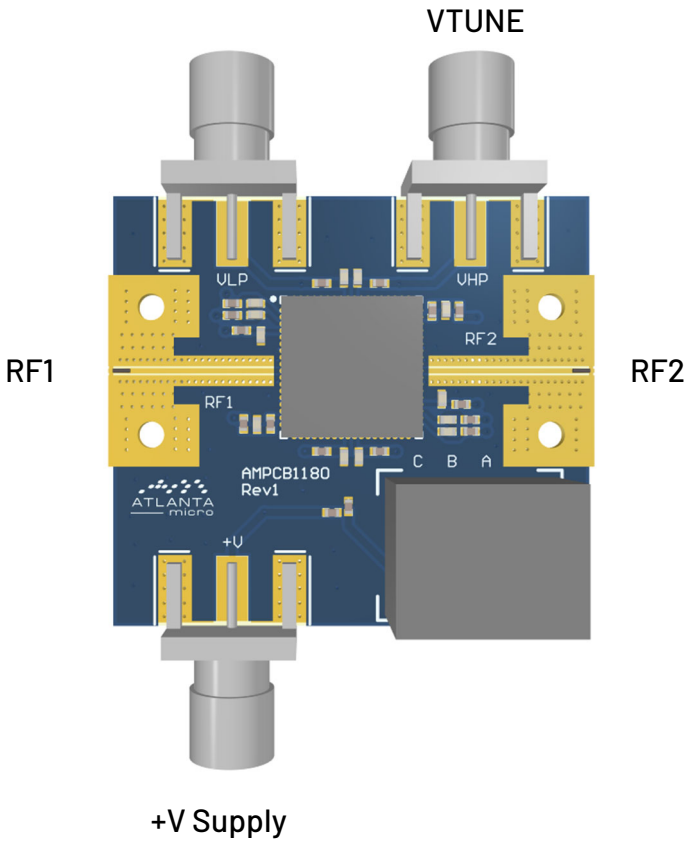
Recommended Component List (or Equivalent)

Part	Value	Part Number	Manufacturer
C1, C2	0.1µF	0201BB104KW160	Passives Plus
C3-C6	0.1µF	C1005X7R1H104K050BB	TDK
FB1, FB2		MMZ1005A222E	TDK
R1, R2	100 Ω	CRCW0402100RFKED	Vishay

Notes:

1. RF 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.

EVALUATION PC BOARD



RELATED PARTS

Part Number		Description
AM3063	6 GHz to 18.0 GHz	Digitally Tunable Bandpass Filter Bank
AM3152	400 MHz to 8.0 GHz	Digitally Tunable Bandpass Filter Bank
AM3153	6.0 GHz to 26.5 GHz	Digitally Tunable Bandpass Filter Bank
AM3089	2.0 GHz to 18.0 GHz	Analog Tunable Bandpass Filter Bank
AM3135	3. 5 GHz to 9.0 GHz	Analog Tunable Bandpass Filter Bank
AM3136	8.0 GHz to 19.0 GHz	Analog Tunable Bandpass Filter Bank
AM3129	700 MHz to 6.0 GHz	Analog Tunable Notch Filter Bank
AM3137	700 MHz to 2.0 GHz	Analog Tunable Notch Filter Bank
AM3138	1.3 GHz to 3.25 GHz	Analog Tunable Notch Filter Bank
AM3139	2.5 GHz to 6.0 GHz	Analog Tunable Notch Filter Bank

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)
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)

REACH: Mercury Systems, 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: Mercury does not knowingly use materials that are sourced from the Democratic Republic of Congo (DRC) or any other known conflict regions. Mercury'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.

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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