AM3023B – Filter Bank

Miniature Transmit / Receive with Sub-Octave Filtering

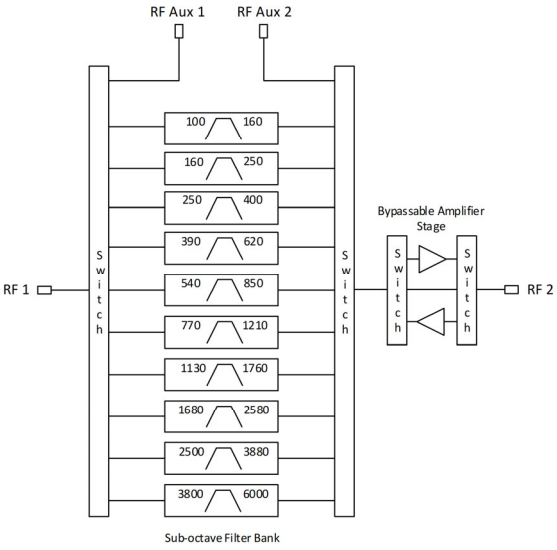
AM3023B is a miniature filter bank with 10 sub-octave filters covering the 100 MHz to 6000 MHz frequency range with full 80-MHz overlap from 400 to 6000 MHz available in a 20.5mm surface mount device or a USB controlled RF-shielded module.

The device contains a bypassable amplifier section and supports both transmit and receive applications. AM3023B is an excellent front-end / back-end for a broadband receiver, transmitter, or transceiver requiring high dynamic range and small size, weight, and power consumption (low SWaP).

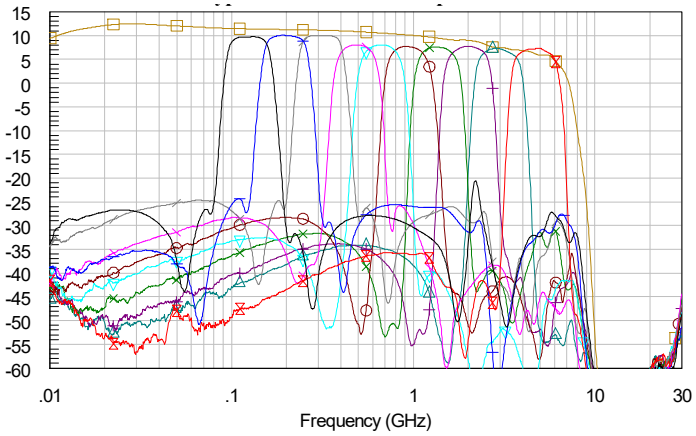
FEATURES

- Sub-Octave Filter Bank
- 5 dB Gain
- +3.3V Supply
- +3V Control
- 0.20 Watts Power Consumption
- 20.5mm L x 20.5mm W x 3.3mm H (0.807" L x 0.807" W x 0.13" H)
- 0.2 oz Weight
- -40C to +85C Operation
- Available in RF Shielded Module

FUNCTIONAL DIAGRAM



CHARACTERISTIC PERFORMANCE

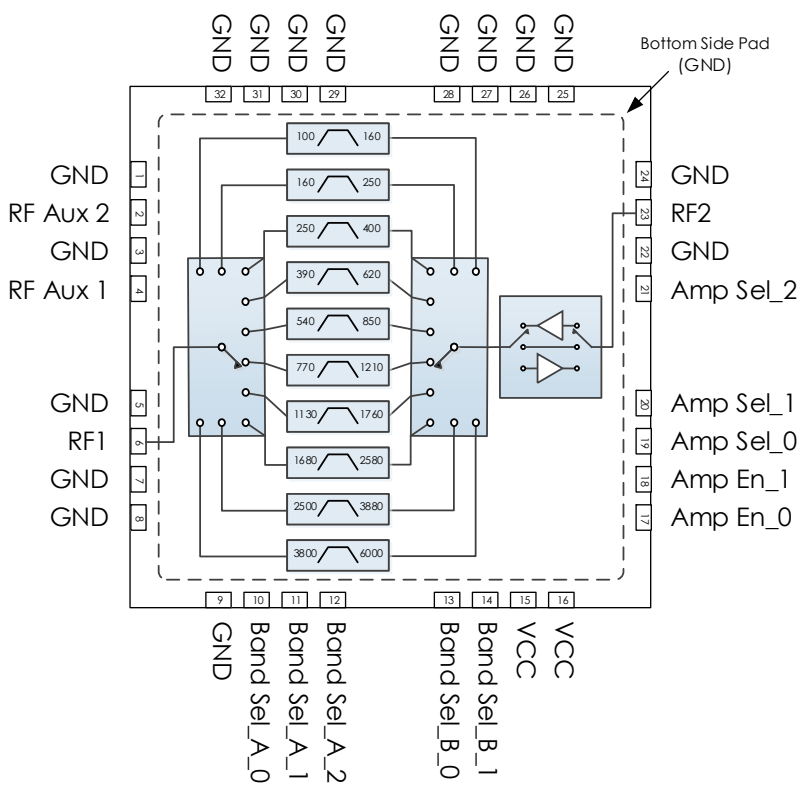


CONTENTS

REVISION HISTORY

Date	Revision	Notes
February 2, 2017	A4	Part picture updated. Added performance plot to first page.
September 12, 2019	5	Updated to new datasheet format. More comprehensive part data included.
August 2, 2024	6	Changed to Mercury branding. No content changes.

PIN LAYOUT AND DEFINITIONS



Pin	Name	Function
1	GND	Ground – Common
2	RF Aux 2	Optional 2 MHz to 6 GHz RF port – Pin 4 Return * - 50 Ohms – AC Coupled
3	GND	Ground – Common
4	RF Aux 1	Optional 2 MHz to 6 GHz RF port – Pin 2 Return * - 50 Ohms – AC Coupled
5	GND	Ground – Common
6	RF 1	RF Port 1 – 50 Ohms – AC Coupled
7-9	GND	Ground – Common
10	Band Sel_A_0	Filter Band Select A_0
11	Band Sel_A_1	Filter Band Select A_1
12	Band Sel_A_2	Filter Band Select A_2
13	Band Sel_B_0	Filter Band Select B_0
14	Band Sel_B_1	Filter Band Select B_1
15	VCC	DC Power Input

*Note: Can be used for external filtering or connected to return pin for a filter bypass path.

SPECIFICATIONS

Absolute Maximum Ratings

	Minimum	Maximum
Supply Voltage	-0.3 V	+3.7 V
RF Input Power		+17 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.

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.

Recommended Operating Conditions

	Minimum	Typical	Maximum
Supply Voltage	+3.1 V	+3.3 V	+3.5 V
Operating Case Temperature	-40 C		+85 C
Operating Junction Temperature	-40 C		+125 C

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Param	Testing Conditions	Min	Typical	Max
DC Supply Voltage		+3.1 V	+3.3 V	+3.5 V
DC Supply Current	Vcc = +3.3 V		60 mA	
Control Line Current			<1 mA	
Power Dissipated	Vcc = +3.3 V		0.20 W	
Logic Level Low		-0.1 V		+0.4 V
Logic Level High		+2.7 V		+3.3 V

RF Performance

(T = 25 °C unless otherwise specified)

Param	Testing Conditions	Min	Typical	Max
Frequency Range	Auxiliary Port	2 MHz		6 GHz
	Sub-octave Filtering	100 MHz		6 GHz
Gain	RF1 to RF2, Amplifier En		7 dB	
	RF1 to RF2, Amplifier Byp		-6 dB	
	RF2 to RF1, Amplifier En		7 dB	
	RF2 to RF1, Amplifier Byp		-10 dB	
Input IP3	RF1 to RF2, Amplifier En		+22 dBm	
	RF1 to RF2, Amplifier Byp		+40 dBm	
Input IP2	RF1 to RF2, Amplifier En		+60 dBm	
	RF1 to RF2, Amplifier Byp		+70 dBm	
Noise Figure	RF1 to RF2, Amplifier En		9 dB	
	RF1 to RF2, Amplifier Byp		6 dB	
	RF2 to RF1, Amplifier En		4 dB	
	RF2 to RF1, Amplifier Byp		6 dB	
Output IP3	RF2 to RF1, Amplifier En		+23 dBm	
	RF2 to RF1, Amplifier Byp		+32 dBm	
Output P1dB	RF2 to RF1, Amplifier En		+10 dBm	
	RF2 to RF1, Amplifier Byp		+16 dBm	
Input Return Loss			10 dB	
Output Return Loss			10 dB	

Timing Characteristics

Param	Min	Typical	Max
Filter / Amplifier Switching Speed			1 µs
Amplifier Enabled Speed			2.5 ms
Note: Switching speed measured without any control line filters. Switching speed measured as time from 50% control to 50% RF.			

State Tables

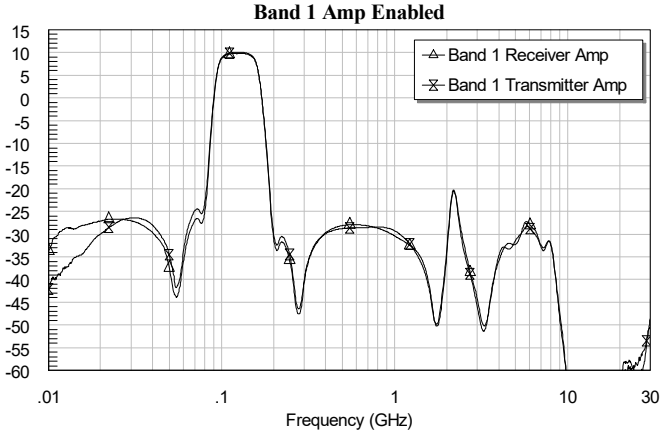
A_0	A_1	A_2	B_0	B_1	Filter Band
Low	Low	Low	Low		RF Aux 1 / RF Aux 2
Low	Low	Low	High		100 – 160 MHz
Low	Low	High	Low		160 – 250 MHz
Low	Low	High	High		250 – 400 MHz
Low	High	Low	Low		390 – 620 MHz
Low	High	Low	High		540 – 850 MHz
Low	High	High	Low		770 – 1210 MHz
Low	High	High	High		1130 – 1760 MHz
High	Low	Low	Low		1680 – 2580 MHz
High	Low	Low	High		2500 – 3880 MHz
High	Low	High	Low		3800 – 6000 MHz
*Note: Filter band control table is not the same as AM3023 / AM3023A					

Amp Sel_0	Amp Sel_1	Amp Sel_2	Amplifier Path
Low	Low	High	RF1 to RF2
Low	High	Low	Amplifier Bypass
High	Low	Low	RF2 to RF1

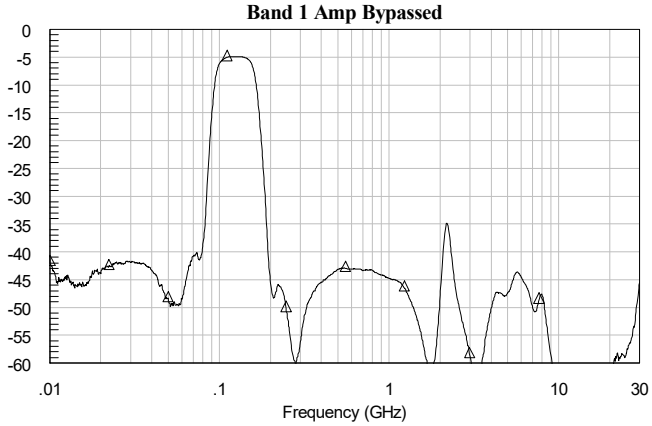
Amp En_0	Amp En_1	Amplifier Enable Status
Low	Low	Both Amps Off
Low	High	RF2 to RF1 Amp Enabled
High	Low	RF1 to RF2 Amp Enabled
High	High	Both Amps Enabled
*Note: Amplifier enable switching speed is 2.5ms max. If a 2.5ms overall switching speed is acceptable, the number of control lines can be reduced and Amp Sel_0 can be connected to Amp En_1 and Amp Sel_2 can be connected to Amp En_0.		

TYPICAL PERFORMANCE

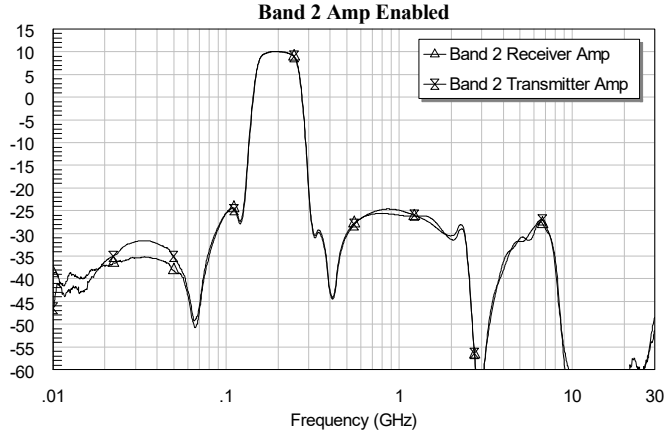
Band 1 Amp Enabled



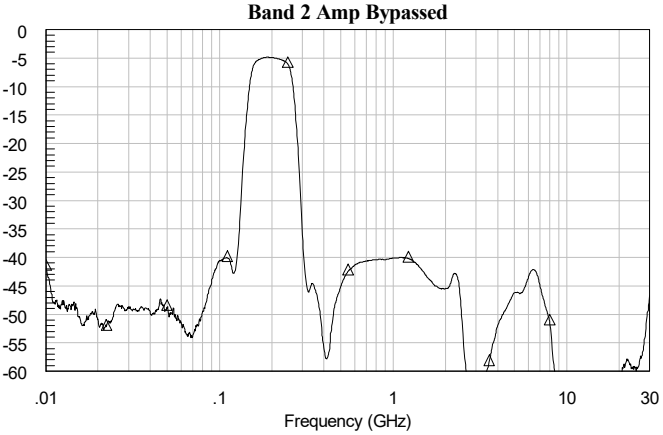
Band 1 Amp Bypassed



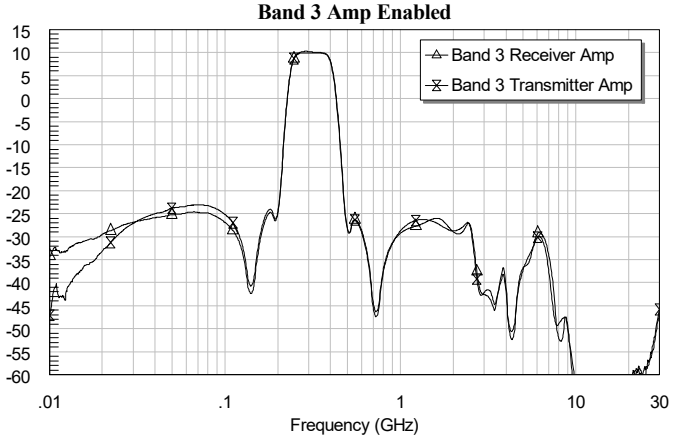
Band 2 Amp Enabled



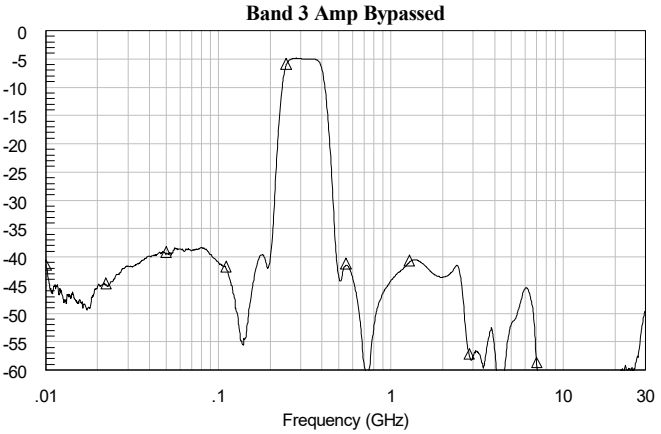
Band 2 Amp Bypassed



Band 3 Amp Enabled

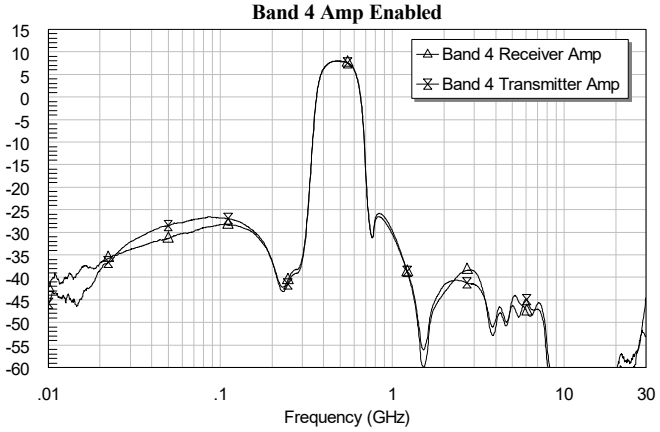


Band 3 Amp Bypassed

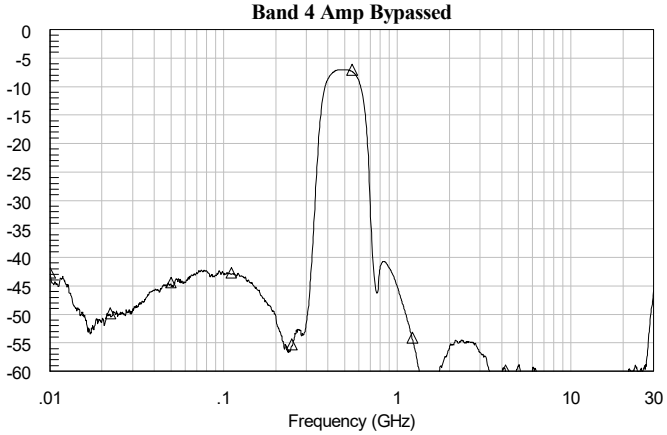


TYPICAL PERFORMANCE (CONTINUED)

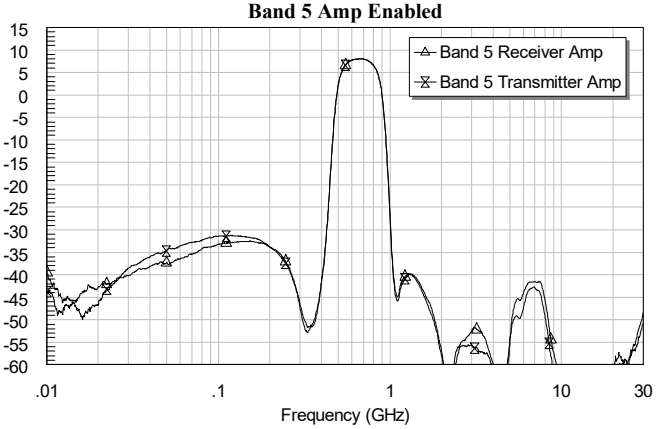
Band 4 Amp Enabled



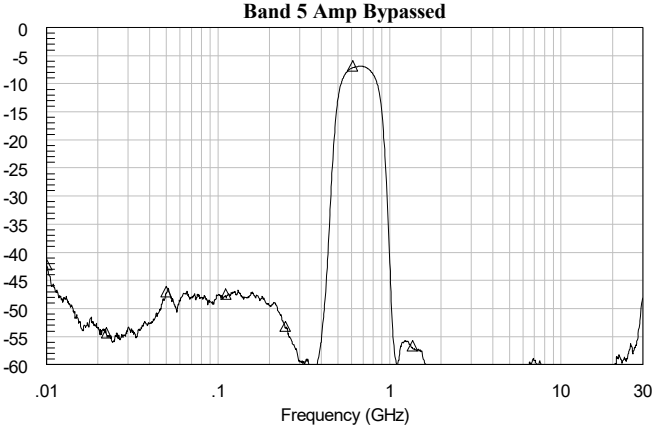
Band 4 Amp Bypassed



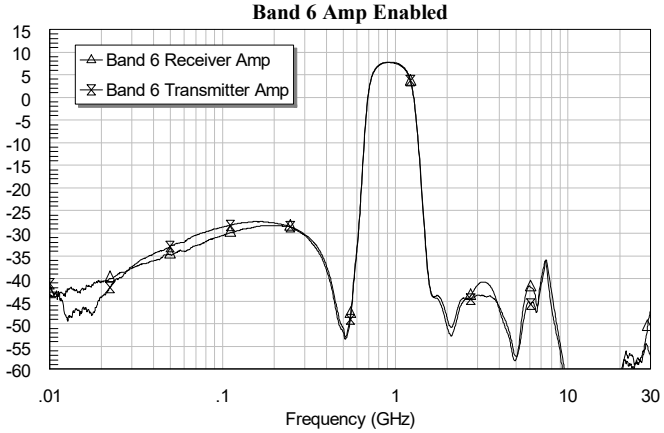
Band 5 Amp Enabled



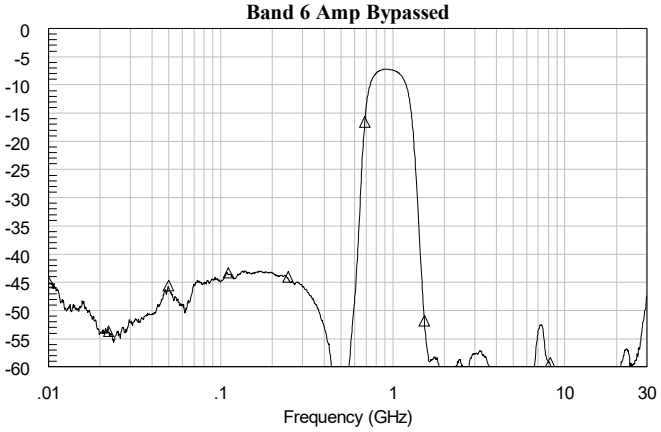
Band 5 Amp Bypassed



Band 6 Amp Enabled

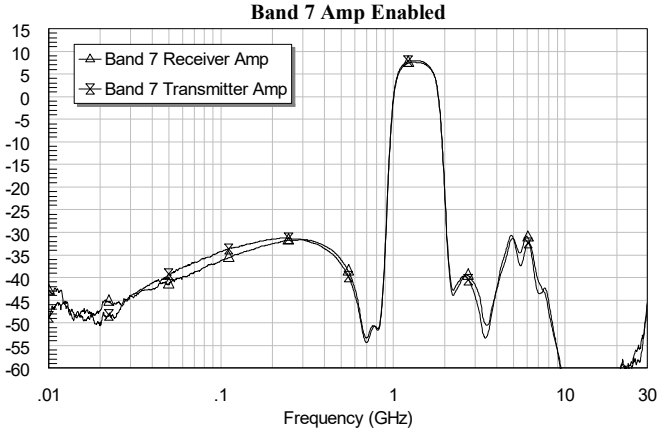


Band 6 Amp Bypassed

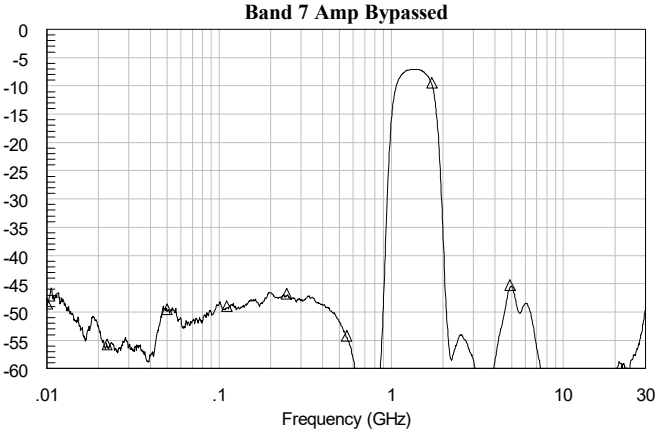


TYPICAL PERFORMANCE (CONTINUED)

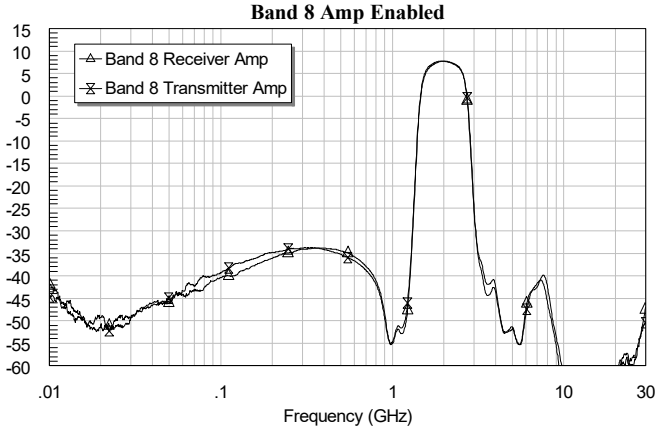
Band 7 Amp Enabled



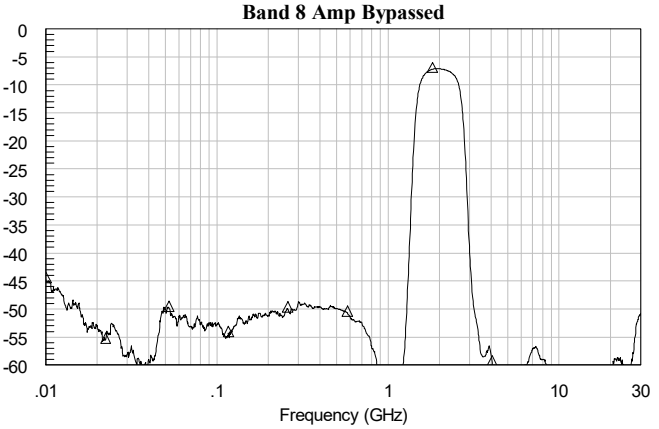
Band 7 Amp Bypassed



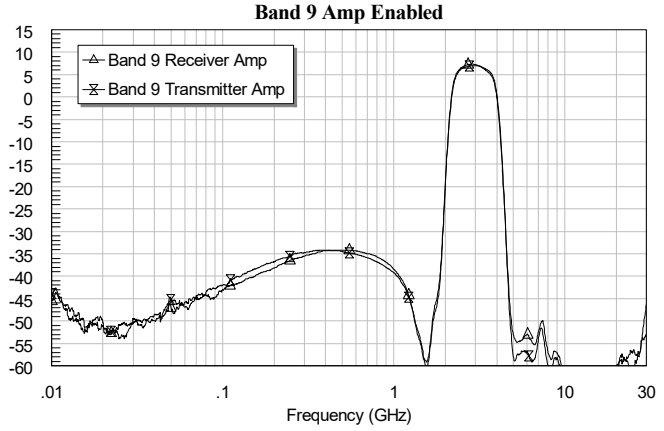
Band 8 Amp Enabled



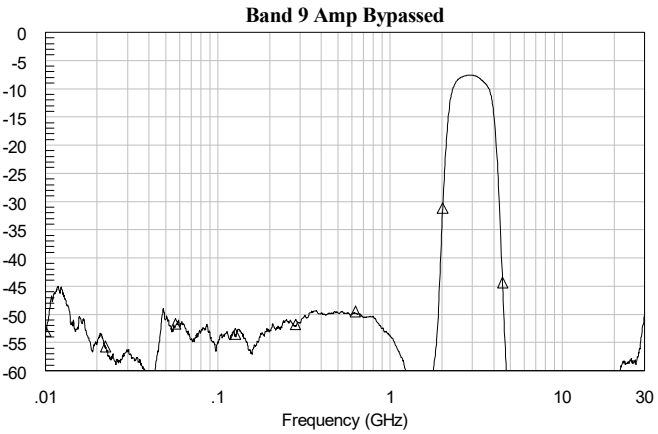
Band 8 Amp Bypassed



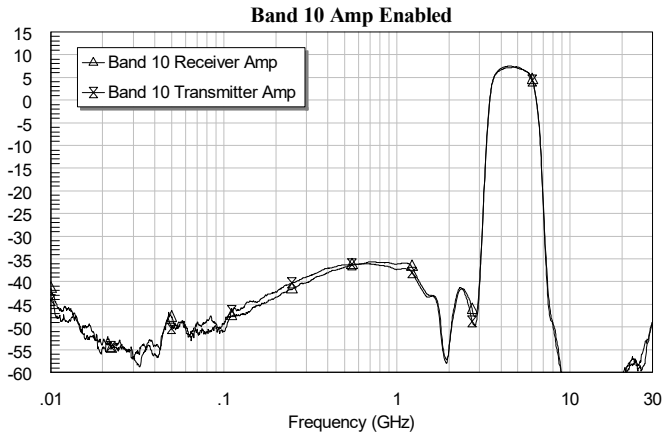
Band 9 Amp Enabled

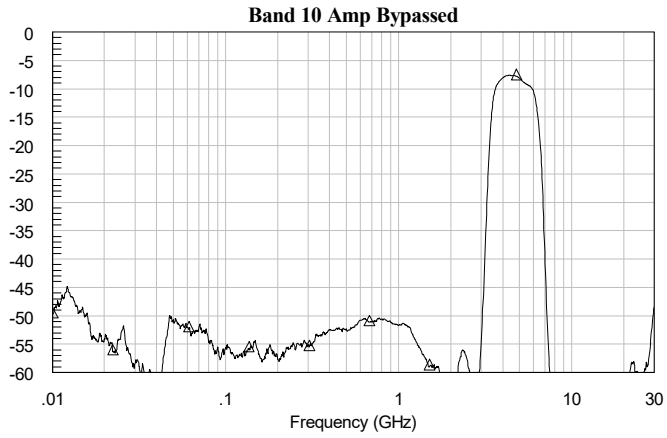


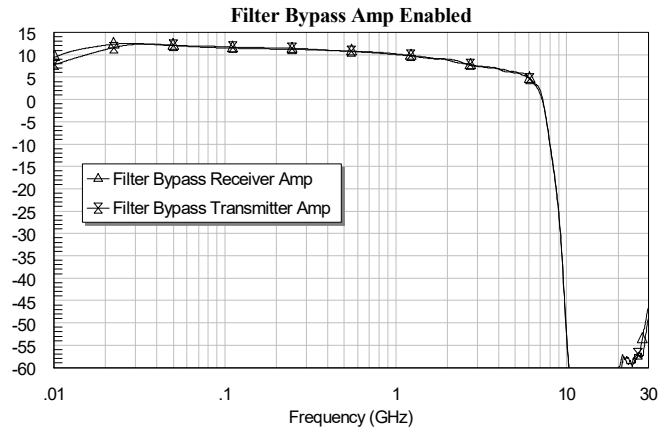
Band 9 Amp Bypassed

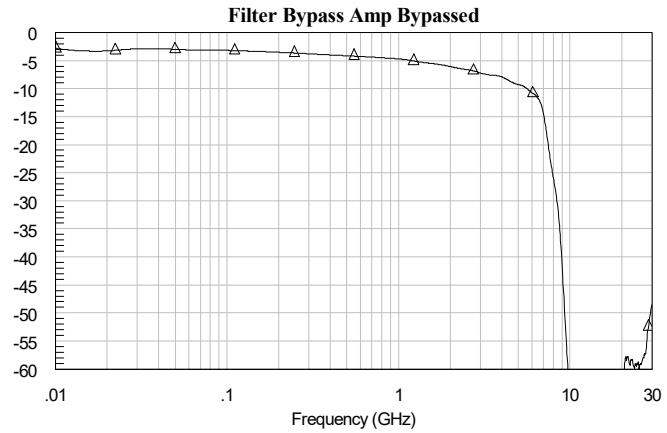


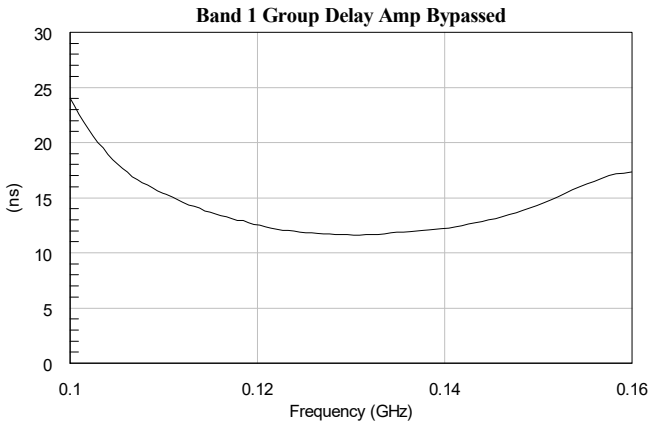
TYPICAL PERFORMANCE (CONTINUED)

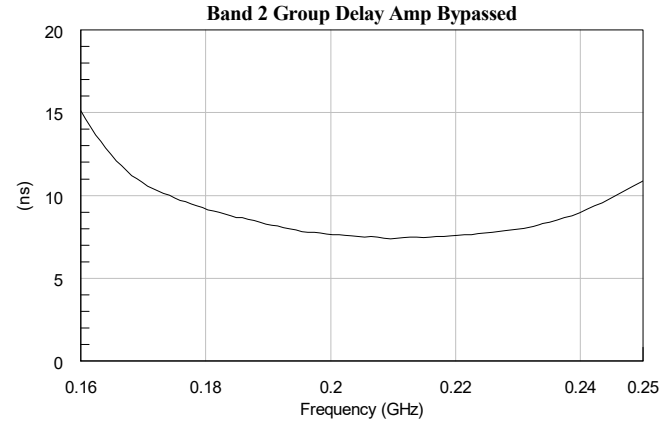






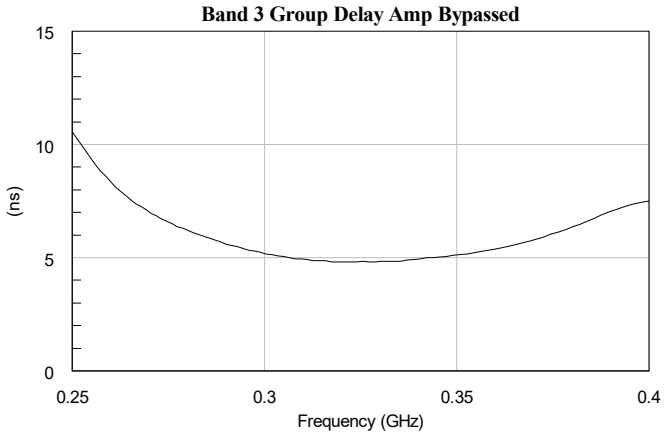


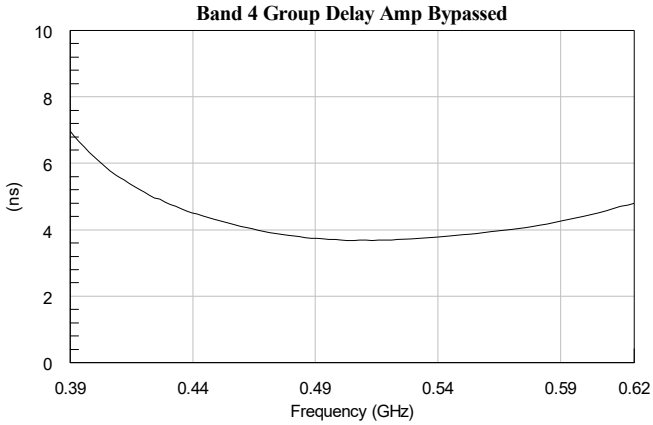


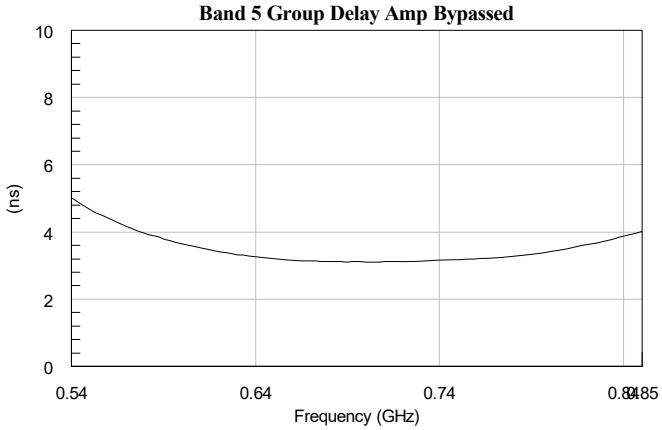


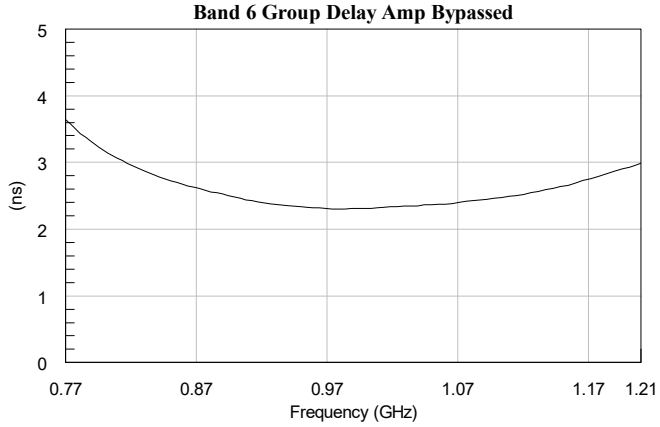
***Note**: Filter Bypass data shows auxiliary path with 50 ohm trace connecting the two ports.

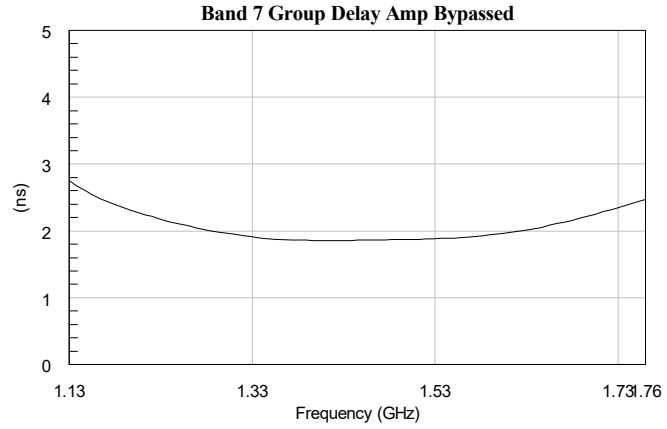
TYPICAL PERFORMANCE (CONTINUED)

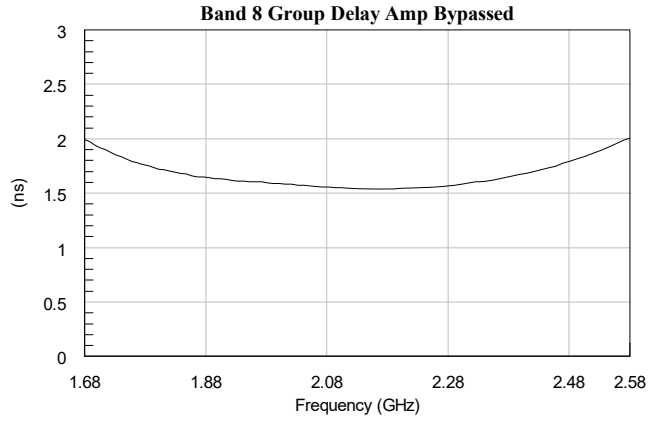




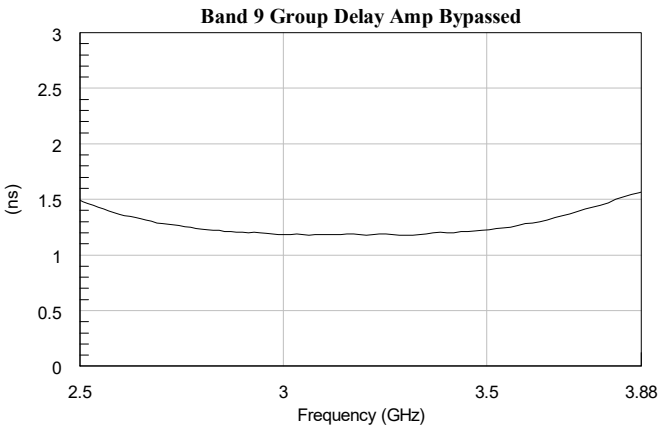


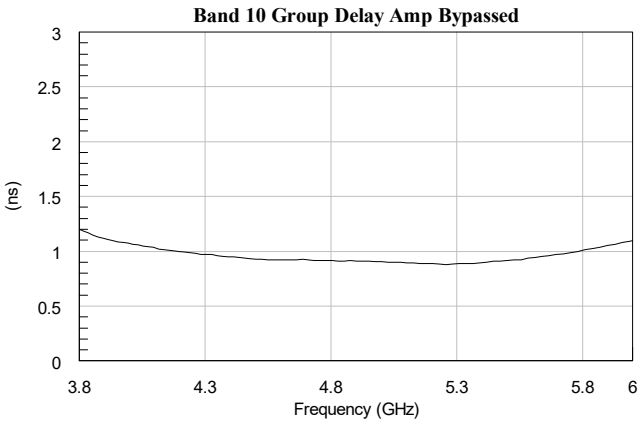


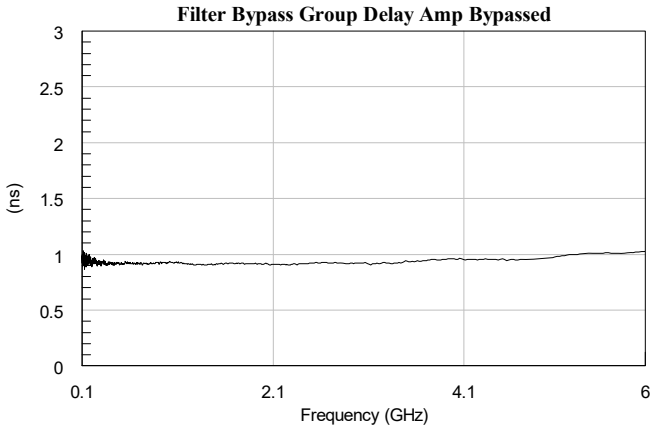




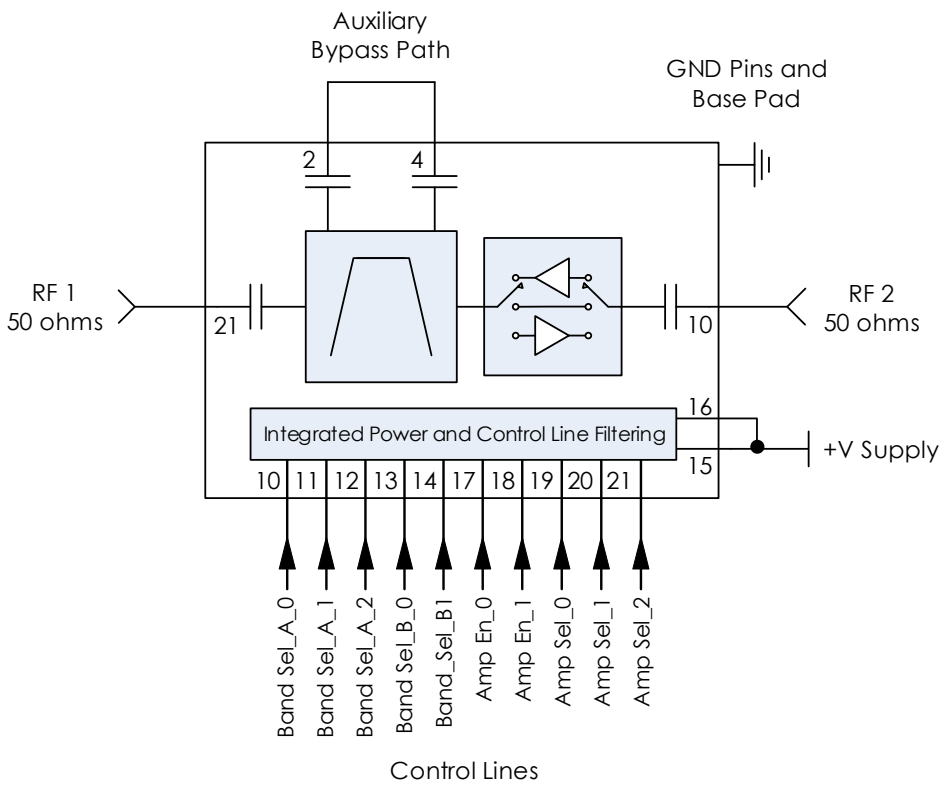
TYPICAL PERFORMANCE (CONTINUED)







TYPICAL APPLICATION

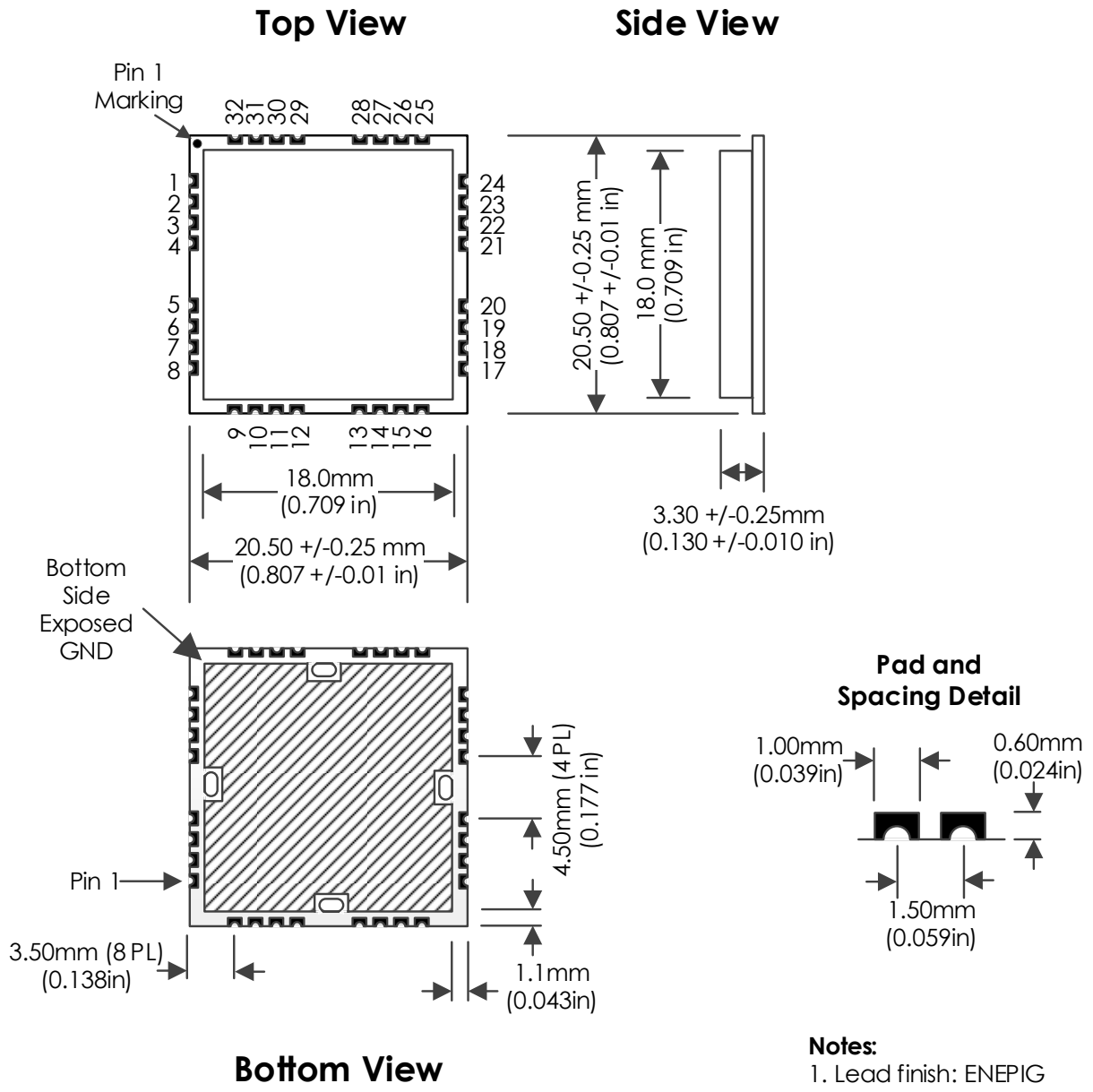


Notes:

1. RF blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance RF Aux 1 and RF Aux 2 are optional ports that can be used for external filtering or can be connected together to provide a filter bypass path.
2. Internal RC filtering time constant is 220 ns.

20.5MM 32 LEAD PACKAGE DETAILS

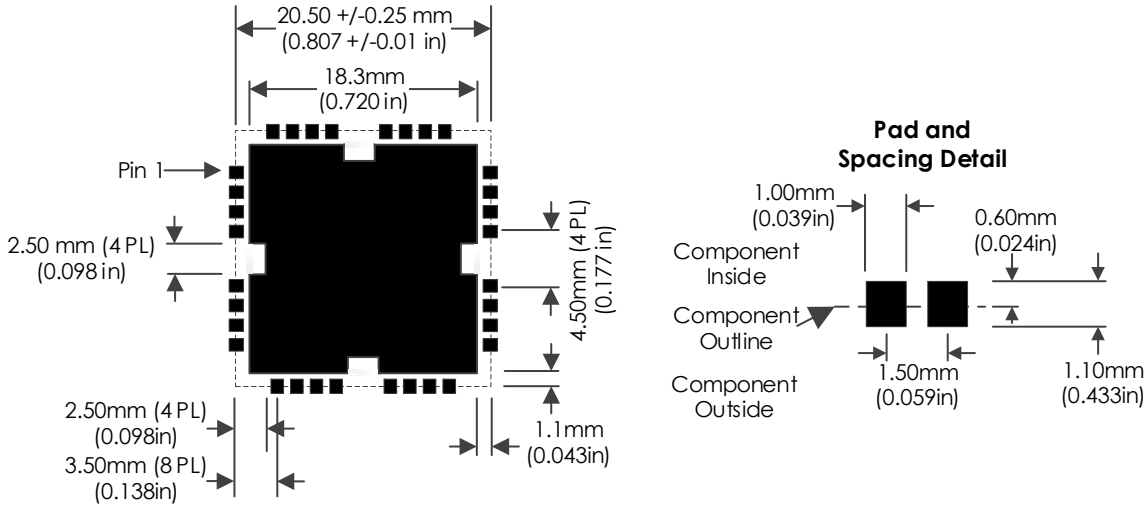
Package Drawing



***Notes:** Height change from AM3023A from 0.12" nominal to 0.13" nominal

20.5MM 32 LEAD PACKAGE DETAILS (CONTINUED)

Recommended Footprint



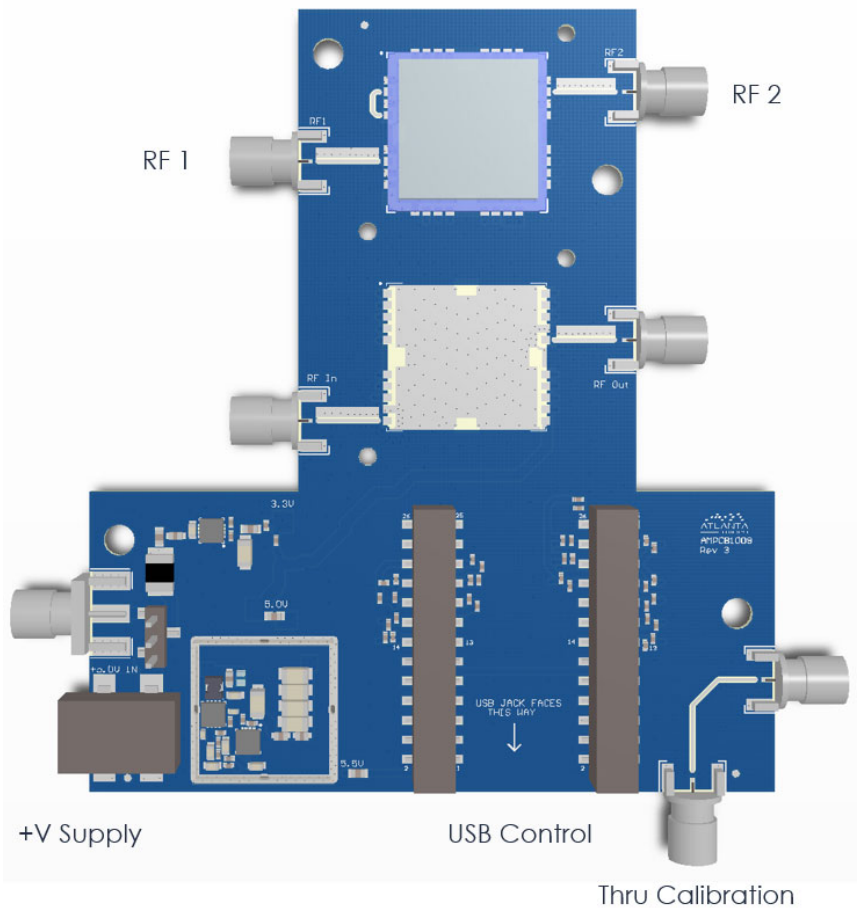
Recommended Footprint

It is recommended to attach the bottom side ground pad to the printed circuit board using a highly conductive silver epoxy and then hand solder the 32 pins along the part's perimeter to their intended printed circuit board pads using lead-free solder.

The recommended silver epoxy is MG Chemicals part 8331S and the recommended assembly thickness is 3 to 5 mils.

If the device is to be attached (both the ground pad and perimeter pins) to the circuit board using a typical lead-free solder reflow process reaching temperatures of 260C, the excessive temperature can cause internal parts to the filter bank to reflow and result in damage to the device. If a solder reflow process must be used, it is recommended to use a lower temperature leaded solder profile, typically 225C maximum.

EVALUATION PC BOARD DETAILS



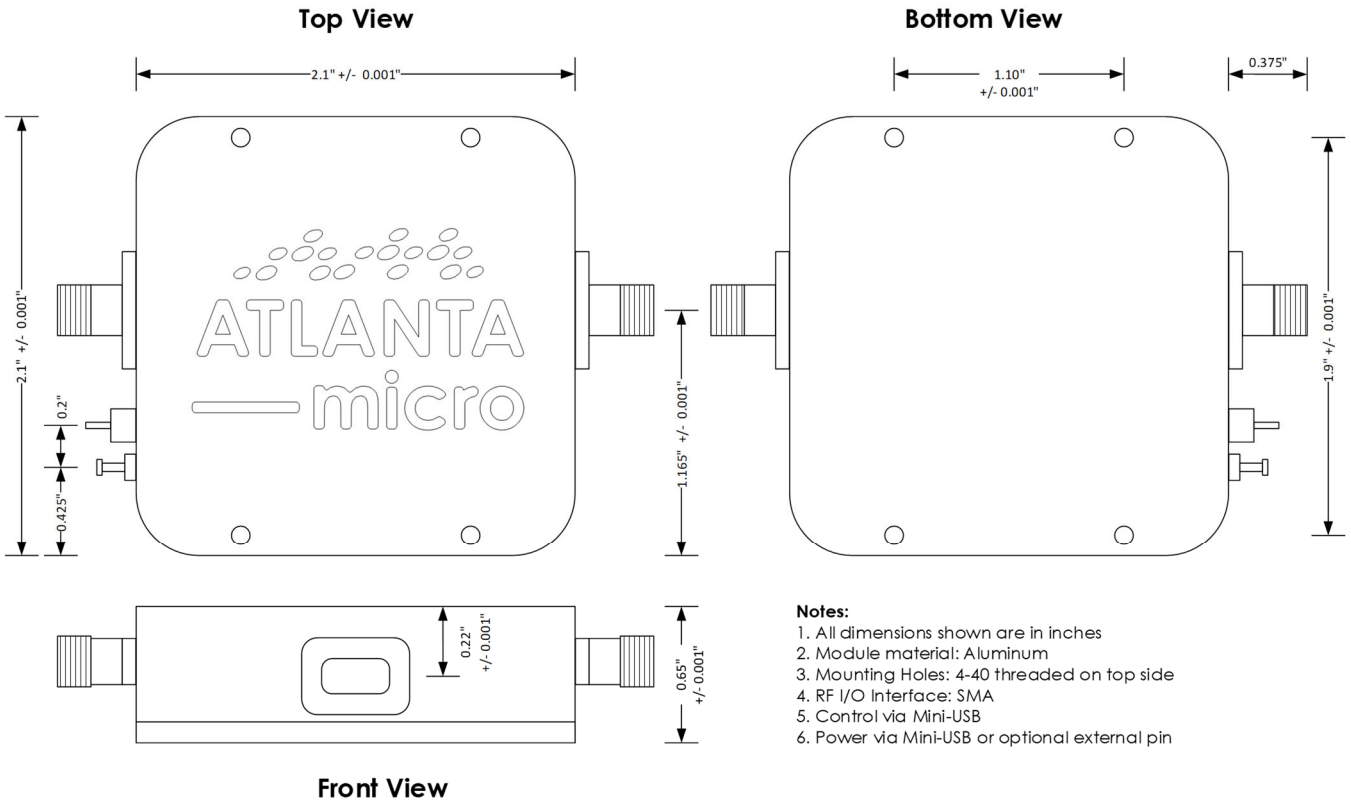
PART ORDERING DETAILS

Part Number	Description
AM3023B	20.5mm 32 Lead PCB as Surface Mount Package
AM3023B Eval	AM3023B IC on PCB with Thru Cal and USB Control with SMA or Header Pin Voltage Input
AM3023B-M	AM3023B in 2.10"x2.10"x0.65" RF-Shielded Module with USB Control, Power via USB or External Pin with Integrated Linear Regulator, and Field Replaceable SMA Connectors. **NOTE:** AM3023B-M is NOT bi-directional. Device currently only supports uni-directional bypassable amplifier.

RELATED PARTS

Part Number		Description
AM3024B	100 MHz to 6 GHz	Switched Sub-Octave Filter Bank w/ Bypassable Amplifier
AM3025A	400 MHz to 6 GHz	Switched Sub-Octave Filter Bank
AM3060	320 MHz to 6 GHz	Switched Digitally Tunable Preselector Filter Bank
AM3089	2 GHz to 3 GHz	Switched Analog Tunable Bandpass Filter Bank
AM3063	6 GHz to 18 GHz	Digitally Tunable Bandpass Filter Bank
AM3064	1 GHz to 6.5 GHz	Digitally Tunable Bandpass Filter Bank
AM3066	12 GHz to 26.5 GHz	Digitally Tunable Bandpass Filter Bank

RF SHIELDED MODULE DETAILS



Notes:
1. All dimensions shown are in inches
2. Module material: Aluminum
3. Mounting Holes: 4-40 threaded on top side
4. RF I/O Interface: SMA
5. Control via Mini-USB
6. Power via Mini-USB or optional external pin

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 (CrVl)	<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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