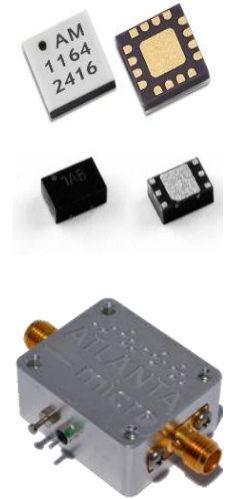


AM1164 – Amplifier

DC to 8 GHz Gain Block

Description

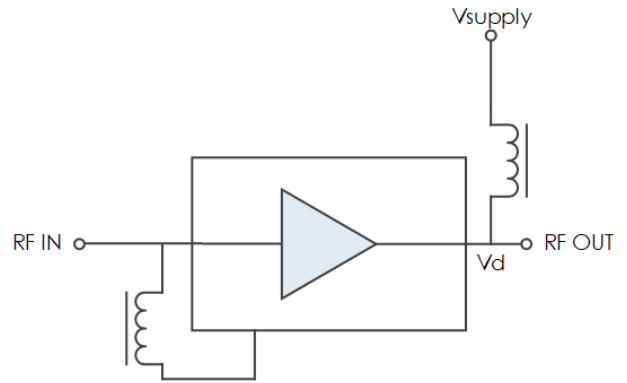
The AM1164 is a high dynamic range DC-coupled amplifier covering up to 8 GHz. The device exhibits a moderate positive gain-slope, providing frequency equalization useful in many broadband applications. AM1164 provides similar performance to Atlanta Micro’s AM1064 with the benefit of improved low frequency NF. With internal 50Ω matching and packaged in a 1.3mm x 2.0mm DFN, a 3mm QFN or a shielded module, the AM1164 represents a compact total PCB footprint.



Features

- 21 dB Gain
- 1.5 dB Noise Figure
- +33 dBm OIP3
- +18 dBm P1dB
- +3.3V or +5.0V Operation
- 3mm QFN or 1.3mm x 2mm DFN
- -55C to +85C Operation

Functional Diagram



Characteristic Performance

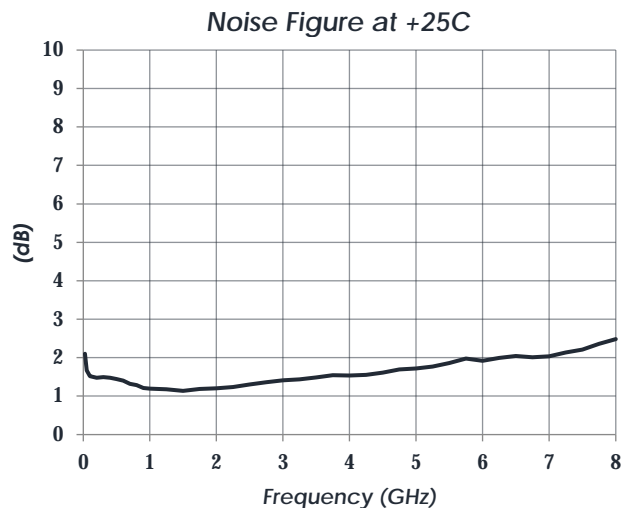
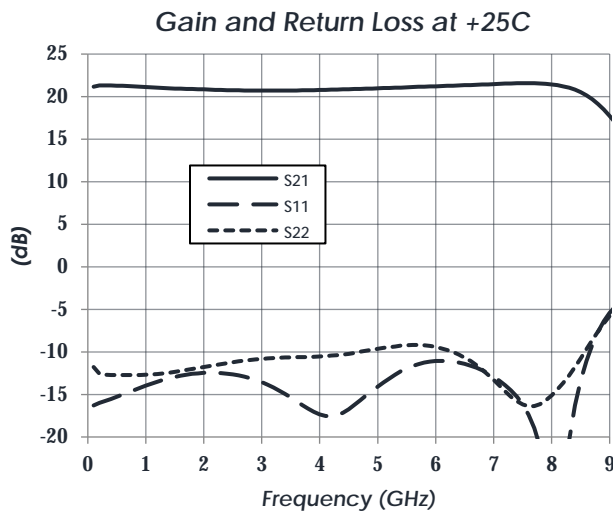


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Revision History

Date	Revision Number	Notes
June 28, 2019	1	Preliminary Release
July 23, 2019	2	Added 1.3mm x 2mm DFN details.
September 6, 2019	2A	Added 1.3mm x 2mm DFN picture.
November 25, 2019	3	RF-Shielded Module Information Added, Updated packaging options in Description, Part Ordering Details Added
November 11, 2020	4	Package and Module information moved to main product page on website.
September 20, 2021	5	Updated s-parameter plots.

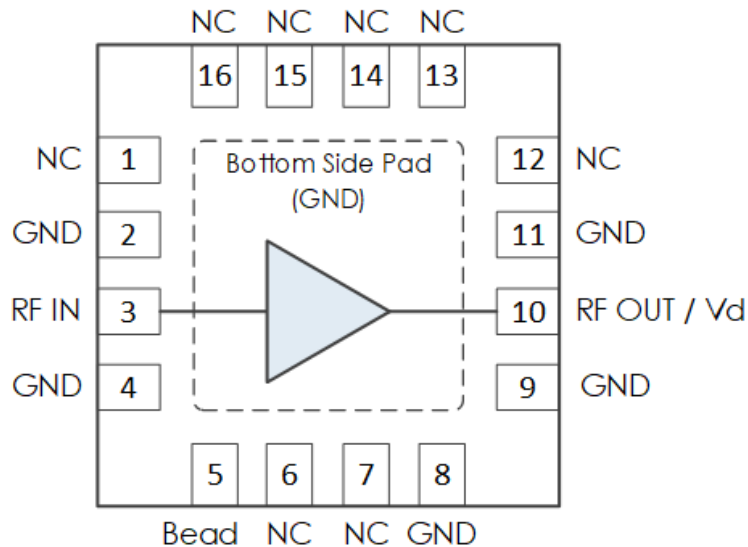
AM1164 – Amplifier



DC to 8 GHz Gain Block

Pin Layout and Definitions

AM1164-1: 3mm QFN



Pin Number	Pin Name	Pin Function
1	NC	Not Connected*
2	GND	Ground - Common
3	RF In	RF Input – 50 Ohms – DC Coupled. External DC Blocking Capacitor Required
4	GND	Ground - Common
5	Bead	Connect to RF In through external ferrite bead or large inductor
6,7	NC	Not Connected*
8,9	GND	Ground - Common
10	RF Out / Vd	RF Output and DC Power Input – 50 Ohms – DC Coupled. External DC Blocking Capacitor Required
11	GND	Ground - Common
12-16	NC	Not Connected*
Case GND	GND	Ground - Common

*NC pins may be grounded or left open

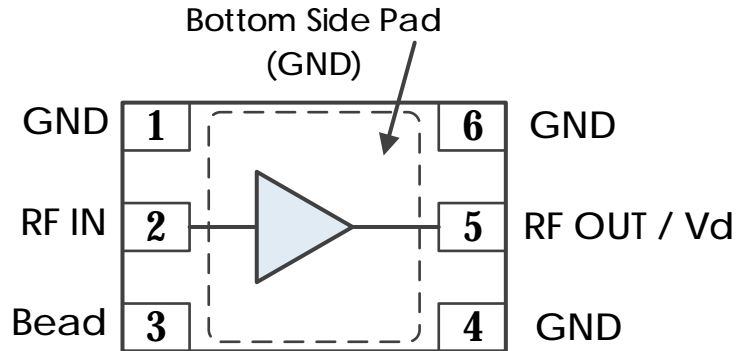
AM1164 – Amplifier



DC to 8 GHz Gain Block

Pin Layout and Definitions (Continued)

AM1164-2: 1.3mm x 2mm DFN



Pin Number	Pin Name	Pin Function
1	GND	Ground - Common
2	RF In	RF Input - 50 Ohms - DC Coupled. External DC Blocking Capacitor Required
3	Bead	Connect to RF In through external ferrite bead or large inductor
4	GND	Ground - Common
5	RF Out	RF Output - 50 Ohms - DC Coupled. External DC Blocking Capacitor Required
6	GND	Ground - Common

AM1164 – Amplifier



DC to 8 GHz Gain Block

Specifications

Absolute Maximum Ratings

	Minimum	Maximum
Supply Voltage	-0.3 V	+8.0 V
RF Input Power		+20 dBm
Operating Junction Temperature	-40 C	+150 C
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
Storage Temperature Range (Recommended)	-50 C	+125 C
Moisture Sensitivity Level	MSL 3	



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

Recommended Operating Conditions

	Minimum	Typical	Maximum
Supply Voltage	+2.7 V		+5.2 V
Operating Case Temperature	-40 C		+85 C
Operating Junction Temperature	-40 C		+125 C

Thermal Information

	Thermal Resistance (°C / W)
Junction to Case Thermal Resistance (θ_{JC})	88

AM1164 – Amplifier

DC to 8 GHz Gain Block

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
Device Voltage (Vd)		+3.0 V	+4.7 V	+5.0 V
DC Supply Current	Vd = 3.1 V		35 mA	
	Vd = 3.3 V		40 mA	
	Vd = 4.7 V		77 mA	
	Vd = 5.0 V		85 mA	
Power Dissipated	Vd = 3.1 V		0.11 W	
	Vd = 3.3 V		0.13 W	
	Vd = 4.7 V		0.36 W	
	Vd = 5.0 V		0.43 W	

RF Performance

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
Frequency Range		DC		8 GHz
Gain	Vd = 5.0 V		21.0 dB	
Return Loss	Vd = 5.0 V		11 dB	
Output IP3			+32 dBm	
Output P1dB			+18 dBm	
Noise Figure			1.5 dB	

Notes:

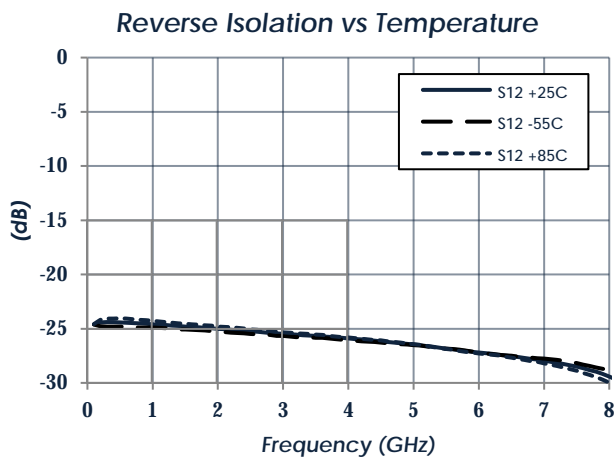
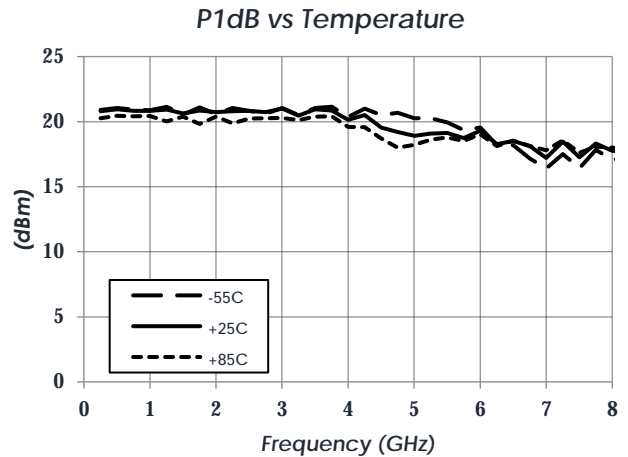
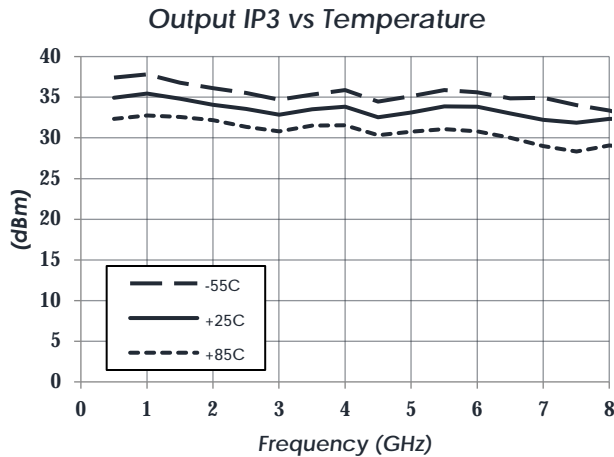
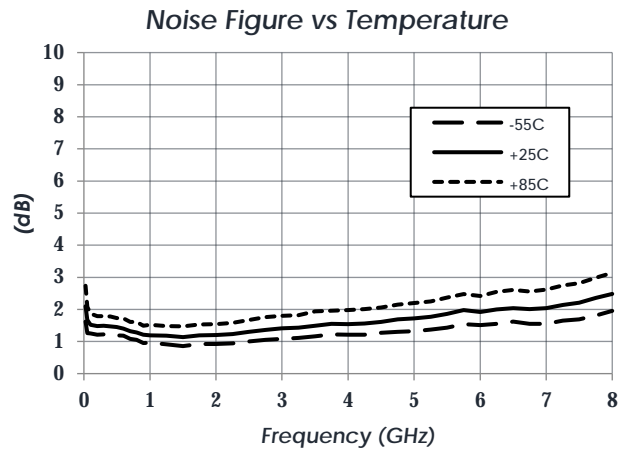
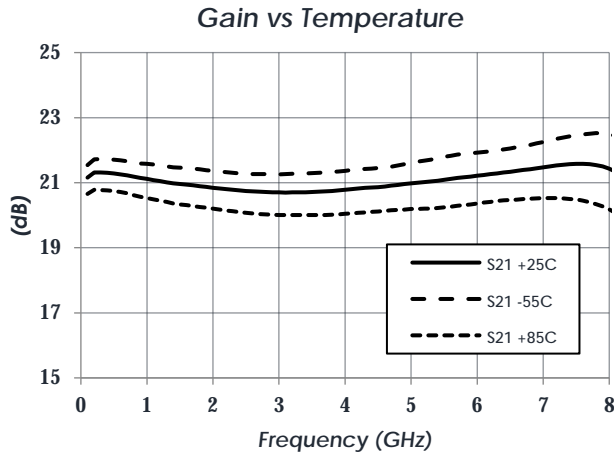
1. OIP3 shown was measured at 10 MHz input tone spacing
2. All performance metrics were measured using the recommended MMZ1005A222E ferrite bead connecting RF In and the Bead pin (see Typical Application section)

AM1164 – Amplifier

DC to 8 GHz Gain Block

Typical Performance

(Vd = +5.0 V, Id = 85 mA)



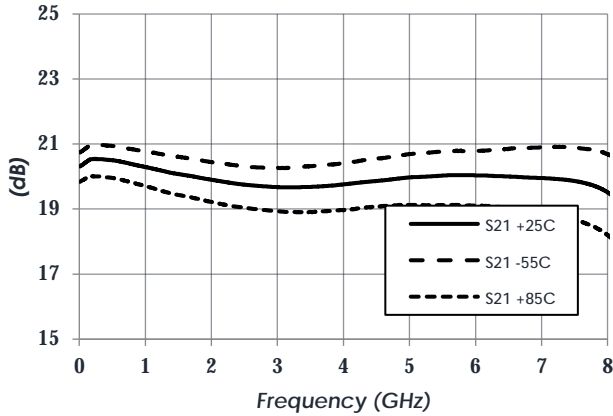
AM1164 – Amplifier

DC to 8 GHz Gain Block

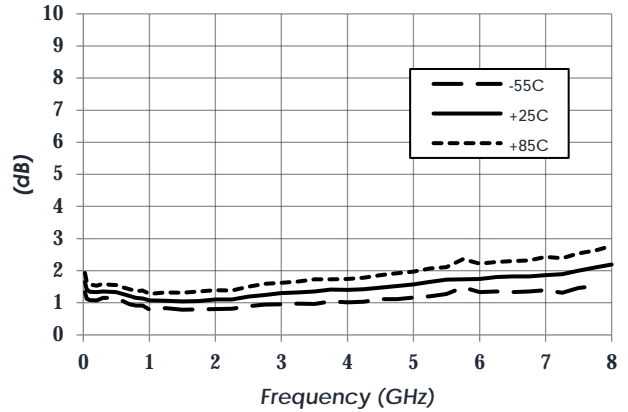
Typical Performance (continued)

(Vd = +3.3 V, Id = 40 mA)

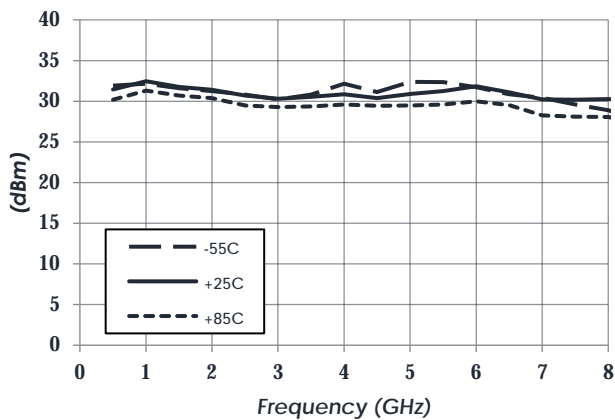
Gain vs Temperature



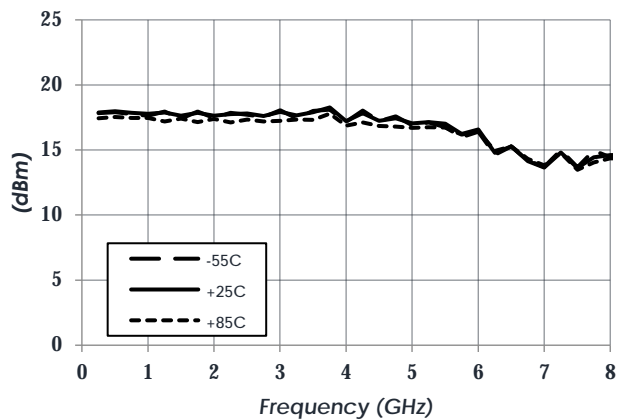
Noise Figure vs Temperature



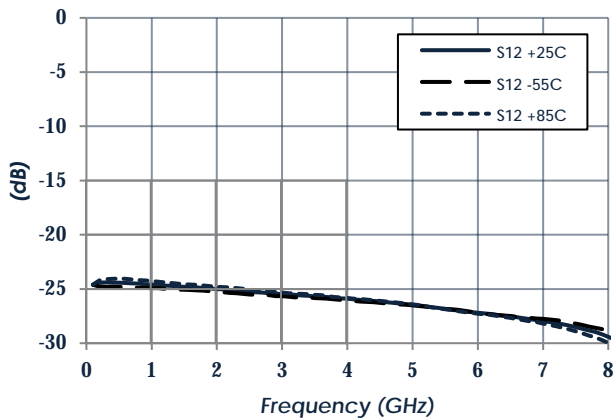
Output IP3 vs Temperature



P1dB vs Temperature



Reverse Isolation vs Temperature

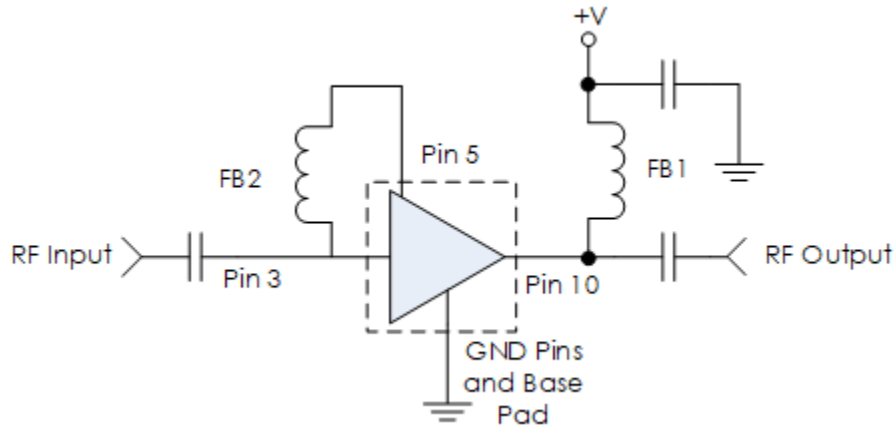


AM1164 – Amplifier



DC to 8 GHz Gain Block

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	GRM155R71C104KA88	Murata
FB1	-	MMZ1005A222E	TDK
FB2	-	MMZ1005A222E	TDK

Notes:

1. NC pins may be grounded or left open.
2. RF blocking capacitors should be high performance, low-loss, broadband capacitors for optimum performance.
3. FB2 can be substituted for a different bead or inductor to extend performance to lower frequencies.

AM1164 – Amplifier

DC to 8 GHz Gain Block

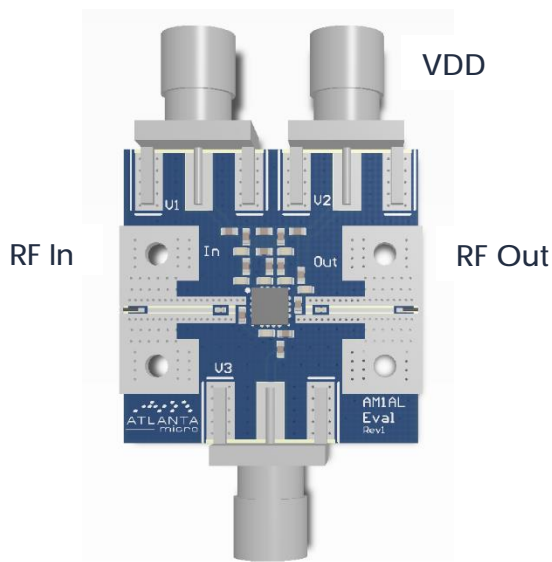
Part Ordering Details

Description	Part Number
3mm 16 Lead QFN	AM1164-1
1.3mm x 2.0mm 6 Lead DFN	AM1164-2
AM1164-1 Evaluation Board	AM1164-1 Eval
AM1164-2 Evaluation Board	AM1164-2 Eval
AM1164-1 in 0.95" x 1.13" x 0.6" RF-Shielded Module with Integrated Bias Tee and Field Replaceable SMA Connectors	AM1164-M

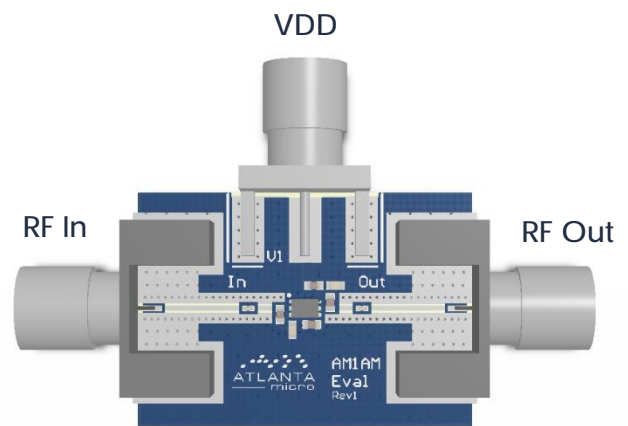
Related Parts

Part Number	Description
AM1163	DC to 10 GHz Gain Block with External Bead
AM1063-1	DC to 10 GHz Gain Block
AM1063-2	DC to 10 GHz Miniature Gain Block
AM1064-1	DC to 8 GHz Gain Block
AM1064-2	DC to 8 GHz Miniature Gain Block
AM1016B	20 MHz to 6 GHz +3.3V Gain Block
AM1018C	20 MHz to 6 GHz +5.0V Gain Block
AM1025B	20 MHz to 3 GHz +8.0V Gain Block (High P1dB)
AM1031C	20 MHz to 8 GHz +3.3V Gain Block
AM1065	DC to 8 GHz Bypassable Gain Block
AM1073	DC to 8 GHz Bidirectional / Bypassable Gain Block

Evaluation PC Board



AM1164-1 Eval



AM1164-2 Eval

To obtain price, delivery, or to place an order contact MMICSales@mrcty.com
 Atlanta Micro Inc., 3720 Davinci Ct, Suite 125, Norcross, GA 30092 • Phone: (470) 253-7640 • www.atlantamicro.com

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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)
Bis (2-ethylhexyl) 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)

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