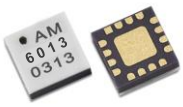
AM6013 – Switch, Reflective

DC to 20 GHz SP4T

Description

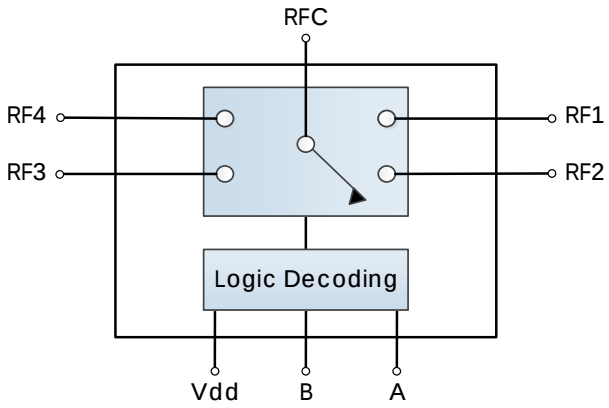
AM6013 is a Single-Pole 4-Throw (SP4T) switch covering the DC to 20 GHz frequency range. The positive control device exhibits low insertion loss, flat frequency response, and high isolation over the operating temperature range of -40C to +85C.



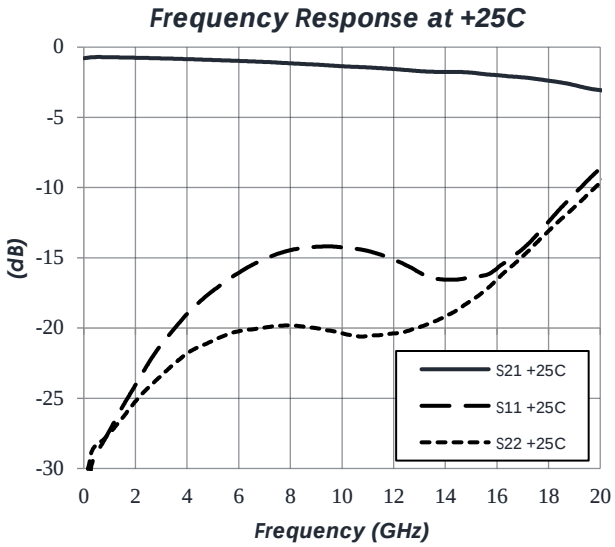
Features

- 1.3 dB Insertion Loss
- +42 dBm Input IP3
- +3.3V to +5V Supply
- +3.3V to +5V Control
- >30 dB Isolation
- 3mm QFN
- -40C to +85C Operation

Functional Diagram



Characteristic Performance



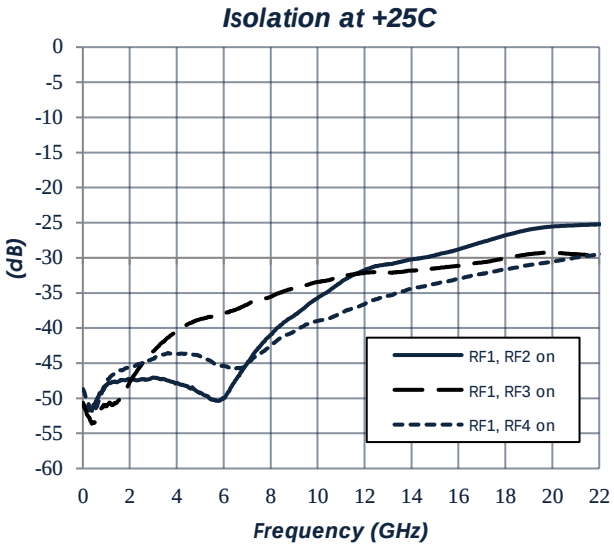
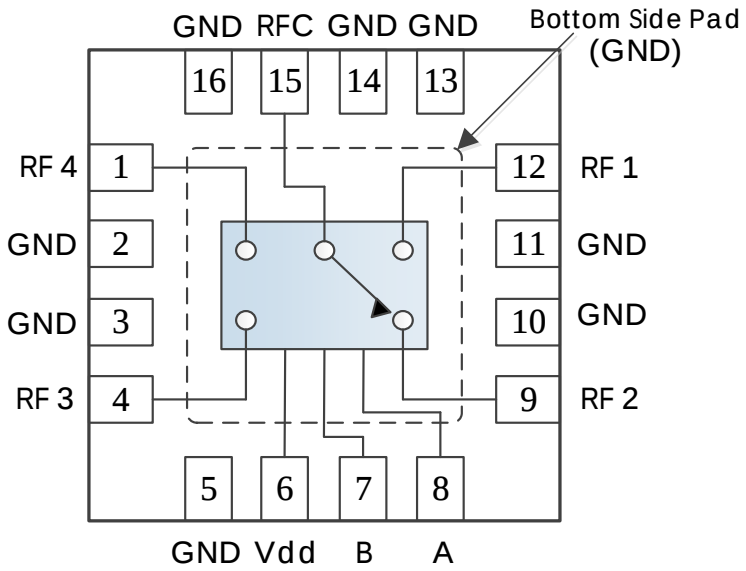


Table of Contents

Revision History

Date	Revision Number	Notes
October 23, 2019	1	Initial Release

Pin Layout and Definitions



Pin Number	Pin Name	Pin Function
1	RF4	RF4 Output – 50 Ohms – DC Coupled. External DC blocking capacitors required*
2-3	GND	Ground – Common
4	RF3	RF3 Output – 50 Ohms – DC Coupled. External DC blocking capacitors required*
5	GND	Ground – Common
6	VDD	DC Power Input
7	B	Switch Control B
8	A	Switch Control A
9	RF2	RF2 Output – 50 Ohms – DC Coupled. External DC blocking capacitors required*
10-11	GND	Ground – Common
12	RF1	RF1 Output – 50 Ohms – DC Coupled. External DC blocking capacitors required*
13-14	GND	Ground – Common
15	RFC	RFC Input – 50 Ohms – DC Coupled. External DC blocking capacitors required*
16	GND	Ground – Common

***Note**: DC blocking caps not required if in series with other Atlanta Micro 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	-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	+2.5 V	+5.0 V	
Operating Case Temperature	-40 C		+85 C
Operating Junction Temperature	-40 C		+125 C

DC Electrical Characteristics

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
DC Supply Voltage		+2.5 V	+5.0 V	
DC Supply Current	VDD = +3.3 V		6 mA	
	VDD = +5.0 V		7 mA	
Power Dissipated	VDD = +3.3 V		20 mW	
	VDD = +5.0 V		35 mW	
Logic Level Low		0.0 V		+0.5 V
Logic Level High		+2.0 V		+VDD

RF Performance

(T = 25 °C unless otherwise specified)

Parameter	Testing Conditions	Minimum	Typical	Maximum
Frequency Range		DC		20 GHz
Insertion Loss	f = 0.01 GHz		0.8 dB	
	f = 10 GHz		1.3 dB	
	f = 20 GHz		3 dB	
Return Loss	f = 0.01 GHz		30 dB	
	f = 10 GHz		14 dB	
	f = 20 GHz		9 dB	
Input IP3	VDD = +5.0 V		+42 dBm	

Timing Characteristics

Parameter	Minimum	Typical	Maximum
Switching Speed (Path Enabled to Disabled)		6 ns	
Switching Speed (Path Disabled to Enabled)		6 ns	

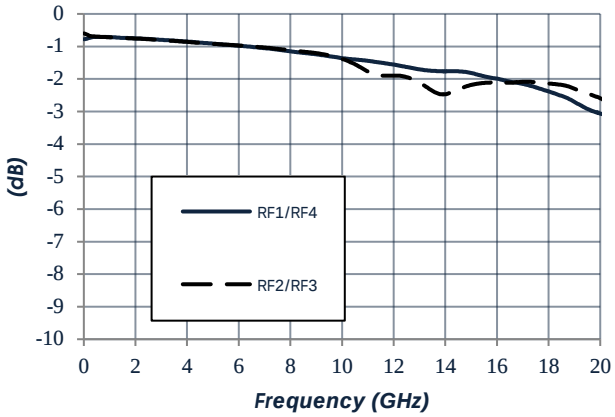
State Table

A	B	State
Low	Low	RFC to RF1
Low	High	RFC to RF3
High	Low	RFC to RF2
High	High	RFC to RF4

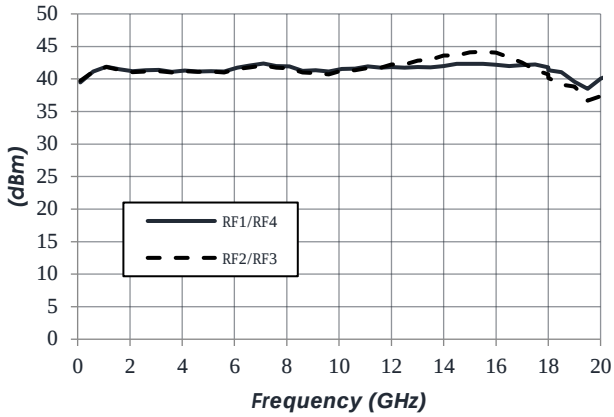
Typical Performance

(VDD = +5.0 V. Data measured via probes outside IC package on 10 mil Rogers RO4350B™)

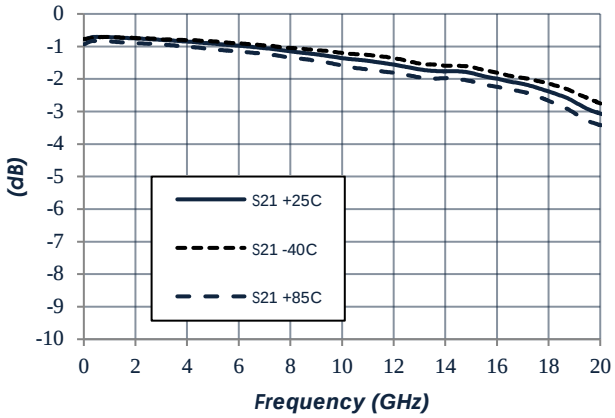
Insertion Loss at +25C



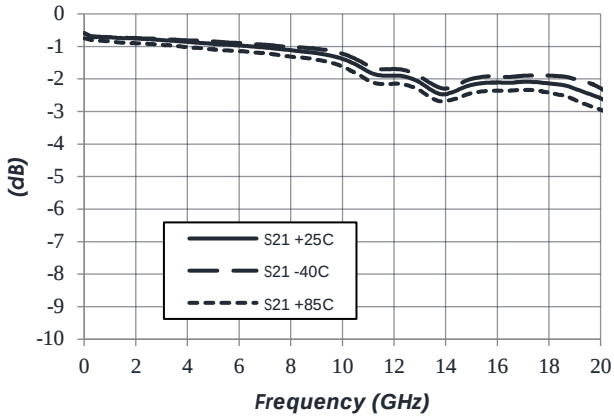
Input IP3 at +25C



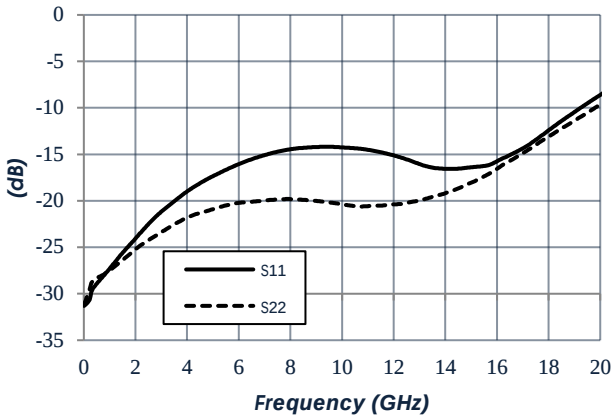
RF1/RF4 Insertion Loss vs Temp.



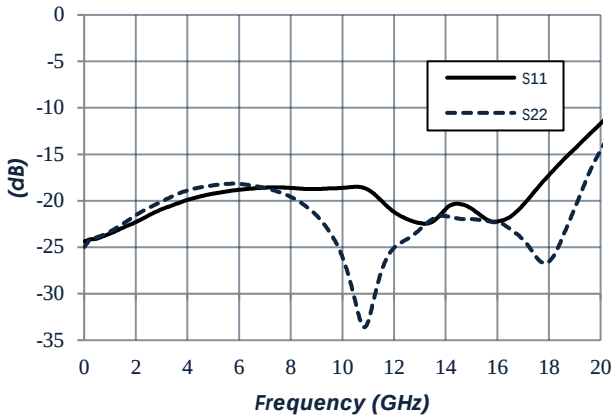
RF2/RF3 Insertion Loss vs Temp.



RF1/RF4 Return Loss at +25C



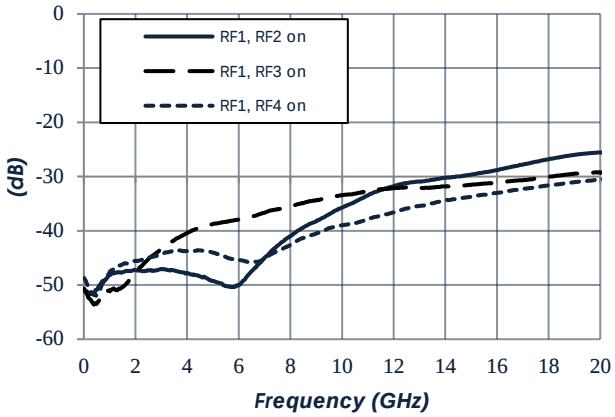
RF2/RF3 Return Loss at +25C



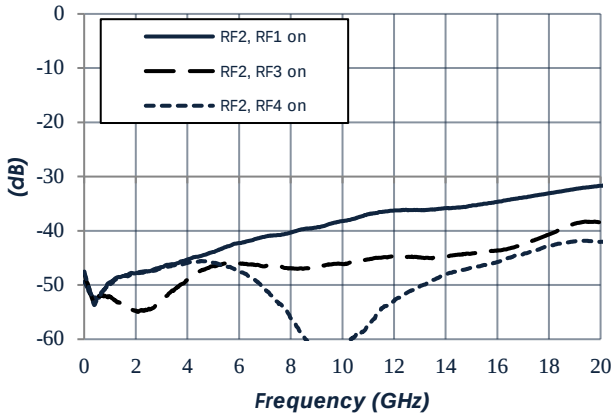
Typical Performance (continued)

(VDD = +5.0 V. Data measured on 10 mil Rogers RO4350B™)

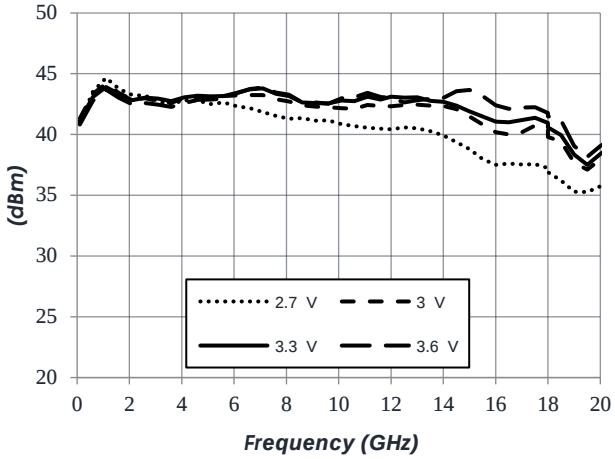
Isolation at +25C



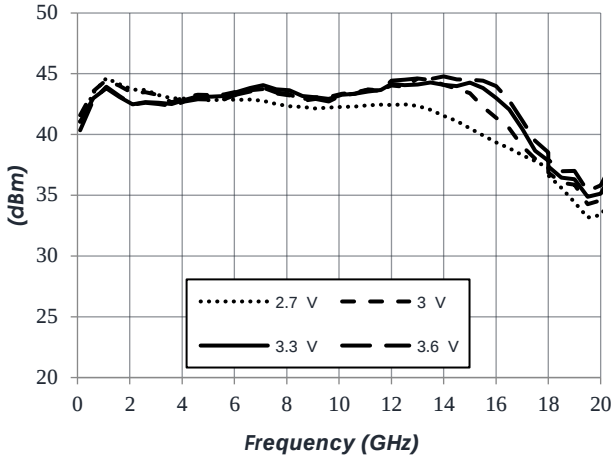
Isolation at +25C



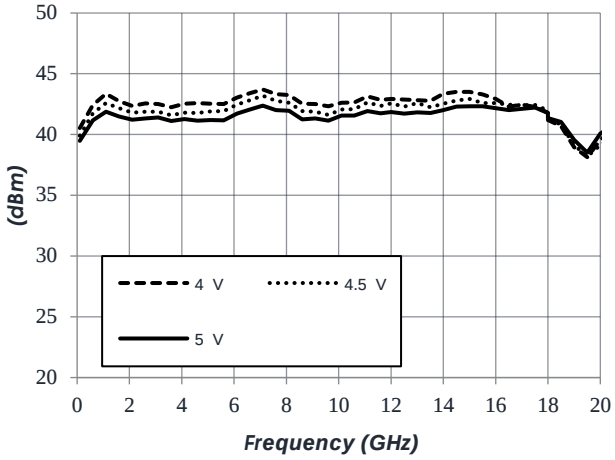
RF1/RF4 Input IP3 at +25 C



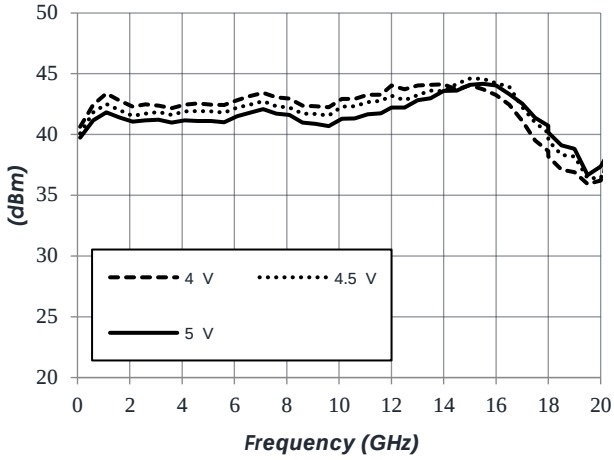
RF2/RF3 Input IP3 at +25 C



RF1/RF4 Input IP3 at +25 C

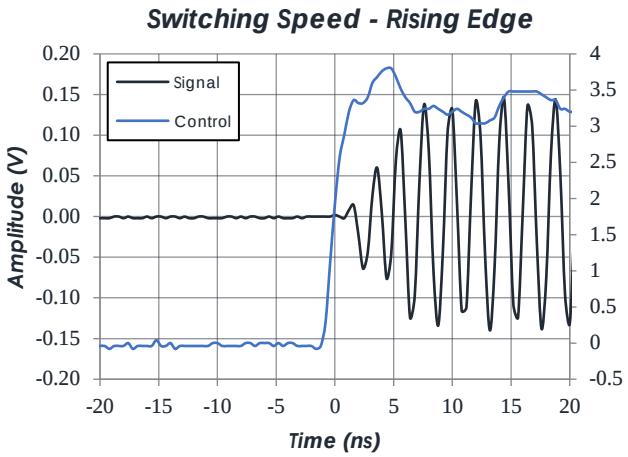


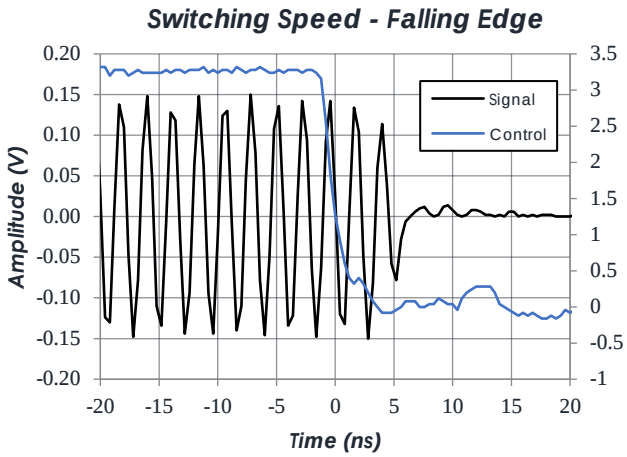
RF2/RF3 Input IP3 at +25 C



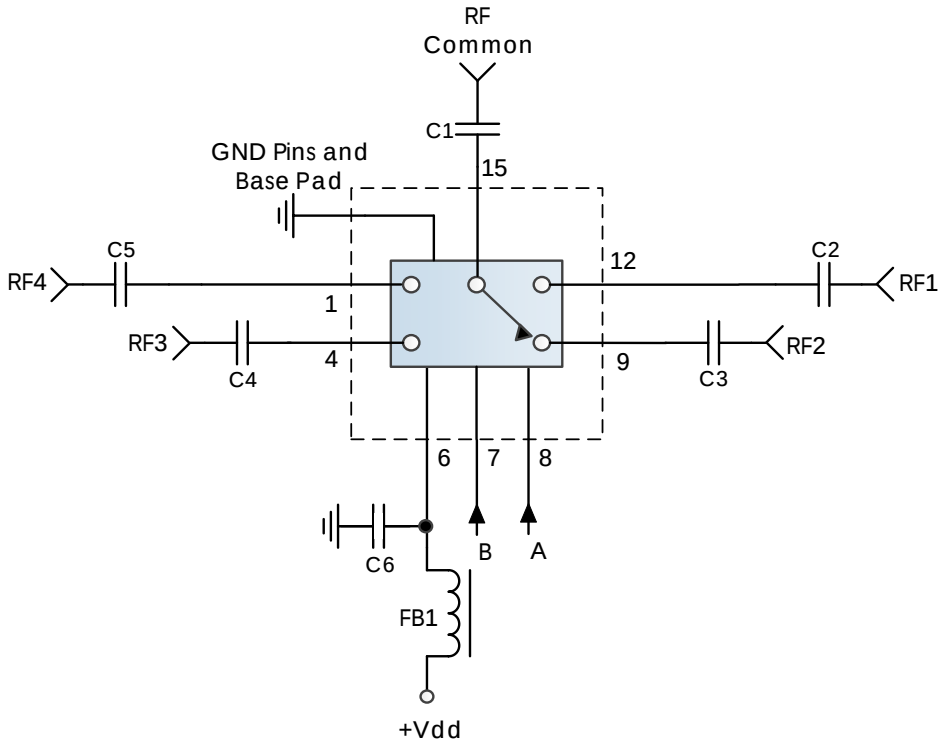
Typical Performance (continued)

(VDD = +5.0 V, T = 25 C. Data measured on 10 mil Rogers RO4350B™)





Typical Application



Recommended Component List (or equivalent):

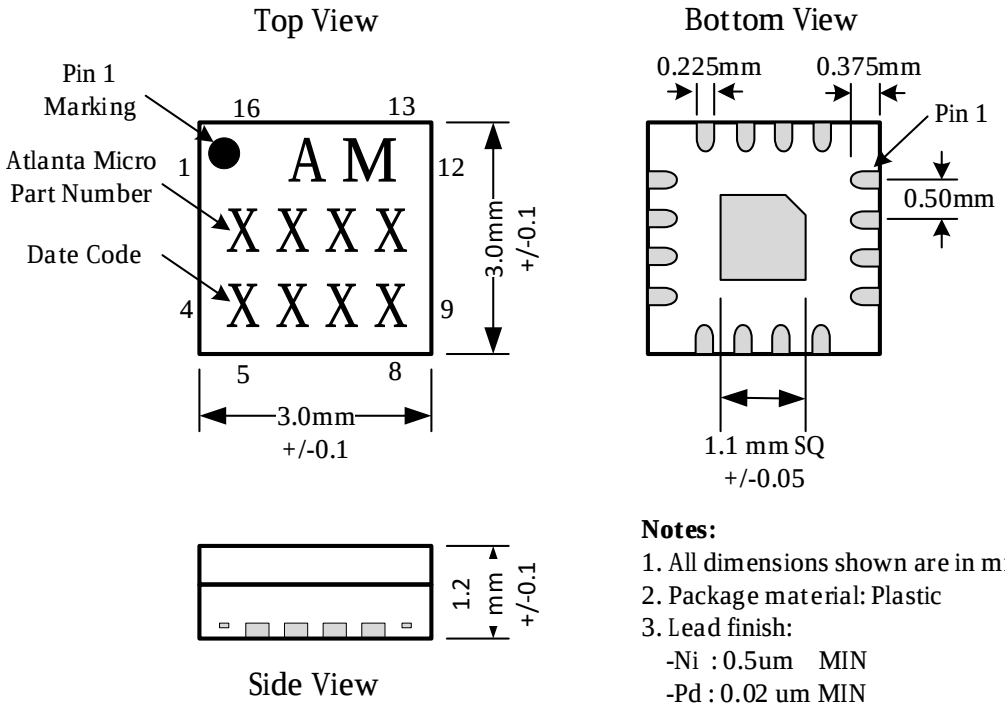
Part	Value	Part Number	Manufacturer
C1-C5	0.1 µF	0201BB104KW160	Passives Plus
C6	0.1 µF	C1005X7R1H104K050BB	TDK
FB1	-	MMZ1005A222E	TDK

Notes:

1. DC blocking capacitors should be high performance, low-loss, broadband capacitors for optimal performance.
2. RC Filtering on the control line 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.

3mm 16 Lead QFN Details

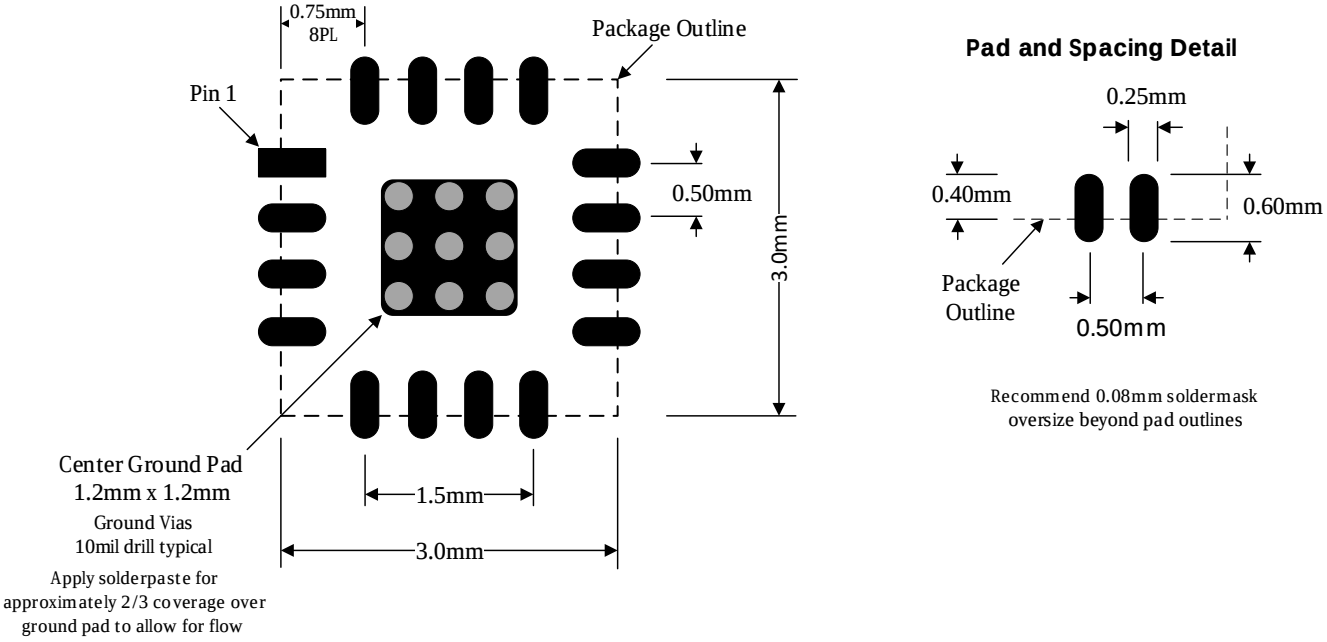
Package Drawing



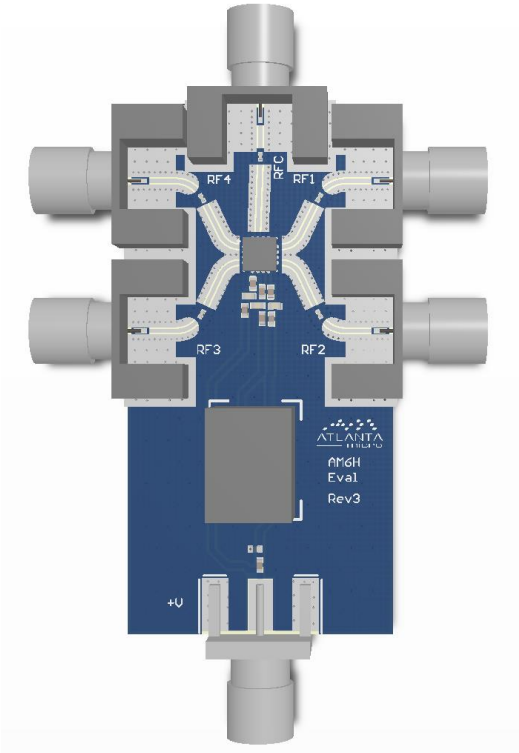
Notes:

1. All dimensions shown are in mm
2. Package material: Plastic
3. Lead finish:
   -Ni : 0.5um MIN
   -Pd : 0.02 um MIN
   -Au : 0.05 um MAX

Recommended Footprint



Evaluation PC Board



Related Parts

Part Number				Description
AM6011	DC	to	10 GHz	SP8T, Reflective
AM6012	DC	to	18 GHz	SPDT, Reflective
AM6015	DC	to	18 GHz	SP6T, Reflective
AM6016	DC	to	26.5 GHz	SPDT, Reflective
AM6029	DC	to	18 GHz	SP4T, Reflective
AM6031	DC	to	20 GHz	SPDT, Absorptive

Component Compliance Information

RoHS: Atlanta Micro, 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 Atlanta Micro 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: Atlanta Micro, 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).

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