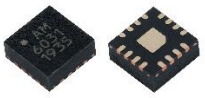
AM6031 – Switch

DC to 20 GHz SPDT, Absorptive

Description

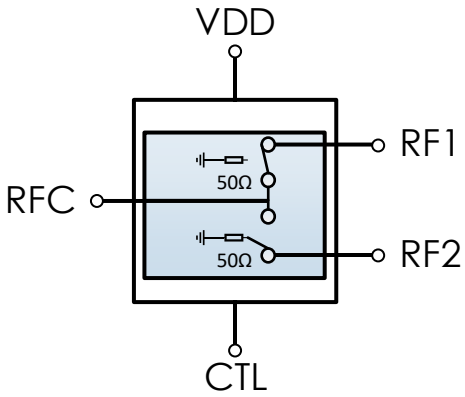
AM6031 is a Single-Pole Double-Throw (SPDT) absorptive switch covering the DC to 20 GHz frequency range. The positive control device exhibits high isolation and low insertion loss over the operating temperature range of -40C to +85C.



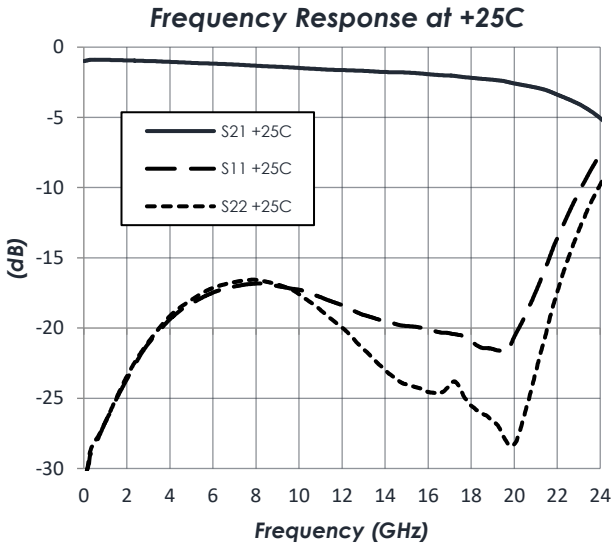
Features

- 1.5 dB Insertion Loss
- +45 dBm Input IP3
- +3.3V to +5.0V Supply
- +3.3V to +5.0V Control
- >43 dB Isolation
- 3mm QFN
- -40C to +85C Operation

Functional Diagram



Characteristic Performance



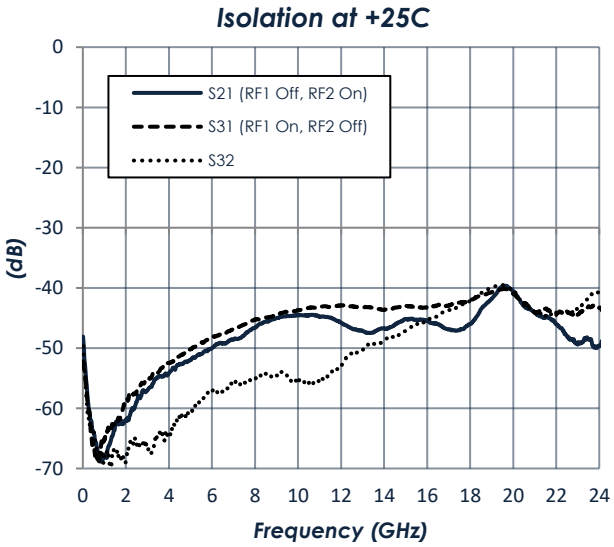
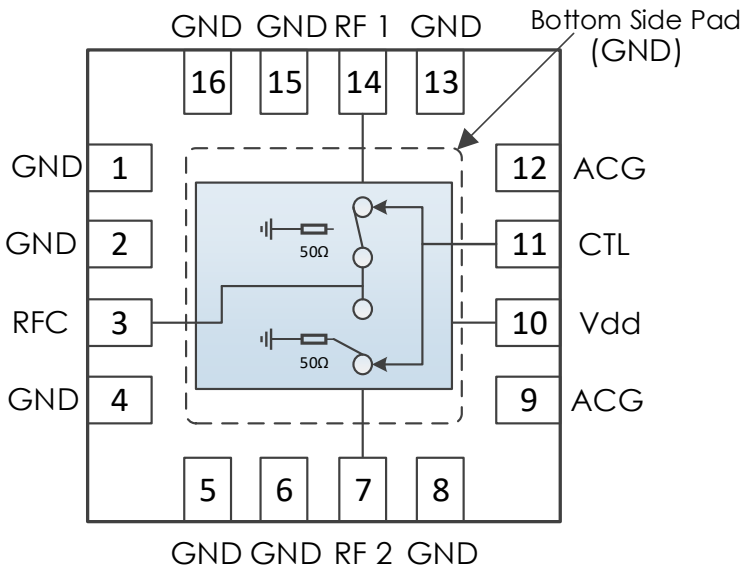


Table of Contents

Revision History

Date	Revision Number	Notes
October 23, 2019	1	Initial Release
November 8, 2019	2	Pinout Corrected
February 12, 2020	3	Pinout Updated. Information about extending bandwidth to below 400 MHz added.

Pin Layout and Definitions



Pin Number	Pin Name	Pin Function
1-2	GND	Ground – Common
3	RFC	RFC Input – 50 Ohms – DC Coupled. External DC blocking capacitor required*
4-6	GND	Ground – Common
7	RF2	RF2 Output – 50 Ohms – DC Coupled. External DC blocking capacitor required*
8	GND	Ground – Common
9	ACG	Optional AC Ground**
10	VDD	DC Power Input
11	CTL	Switch Control
12	ACG	Optional AC Ground**
13	GND	Ground – Common
14	RF1	RF1 Output – 50 Ohms – DC Coupled. External DC blocking capacitor required*
15-16	GND	Ground – Common

Notes:

***** DC Blocking caps not required if in series with other Atlanta Micro parts of the same reference voltage
****** AC Ground caps optional. Installing AC ground capacitors offer optimum absorptive performance below 400 MHz. See *Typical Performance* section for more details.

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		1 mA	
	VDD = +5.0 V		1 mA	
Power Dissipated	VDD = +3.3 V		3.3 mW	
	VDD = +5.0 V		3.3 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		1 dB	
	f = 10 GHz		1.5 dB	
	f = 20 GHz		2.5 dB	
Return Loss	f = 0.01 GHz		30 dB	
	f = 10 GHz		17 dB	
	f = 20 GHz		20 dB	
Input IP3	VDD = +5.0V		+45 dBm	
Isolation	VDD = +5.0V		+43 dBm	

Timing Characteristics

Parameter	Minimum	Typical	Maximum
Switching Speed (Path Enabled to Disabled)		10 ns	
Switching Speed (Path Disabled to Enabled)		30 ns	

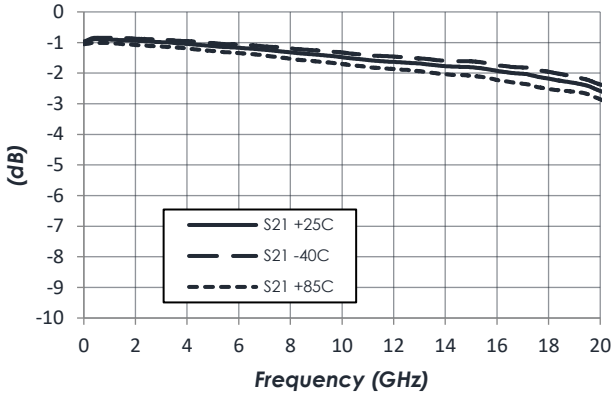
State Table

CTL	State
Low	RFC to RF1
High	RFC to RF2

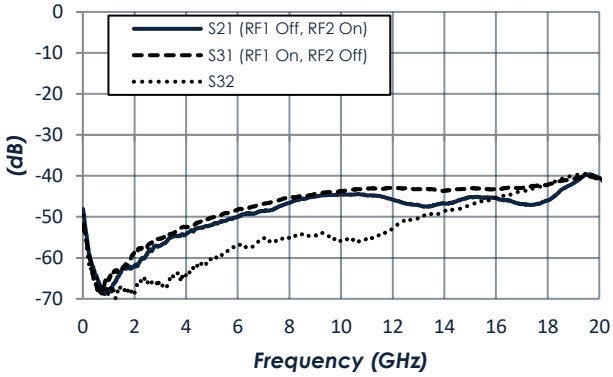
Typical Performance

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

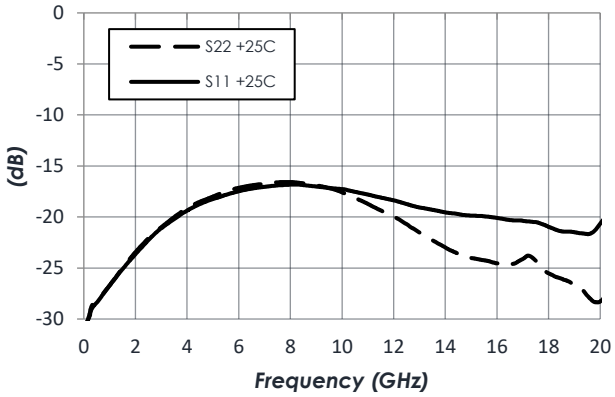
Insertion Loss vs Temperature *



Isolation at +25C *



Return Loss at +25C *

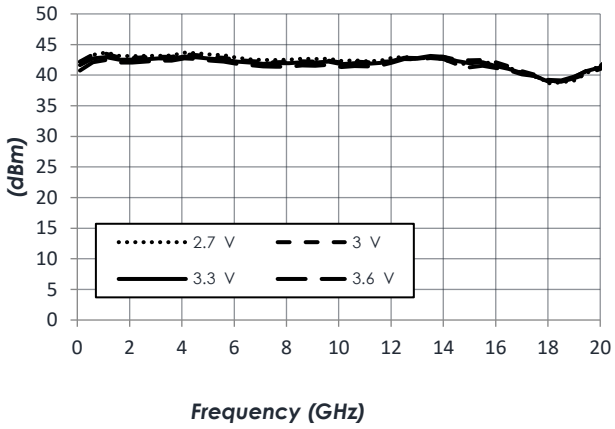


Notes: *measurements made with Configuration A. See *Typical Application* for more information.

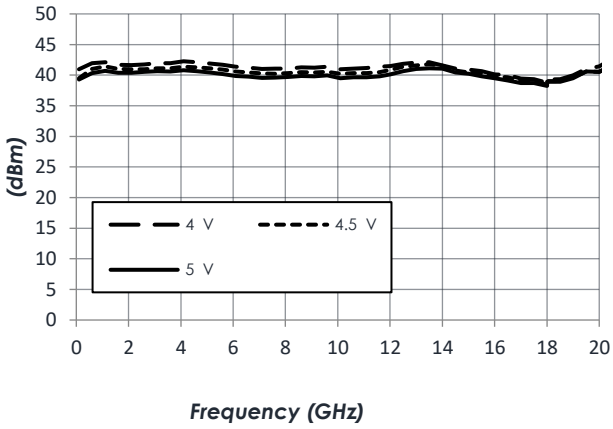
Typical Performance (continued)

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

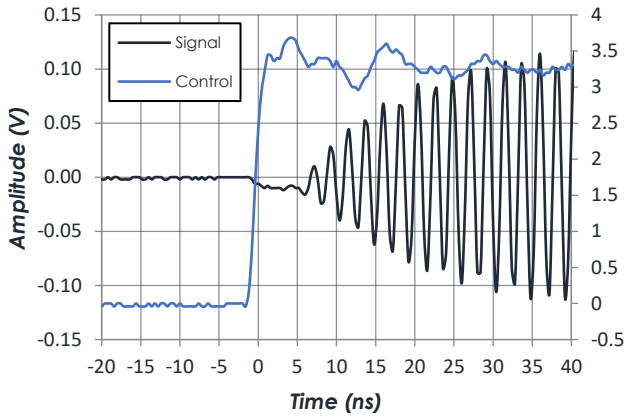
Input IP3 at +25 C



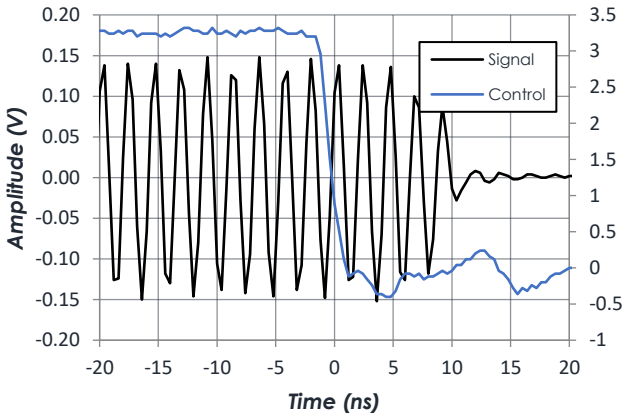
Input IP3 at +25 C



Switching Speed - Rising Edge

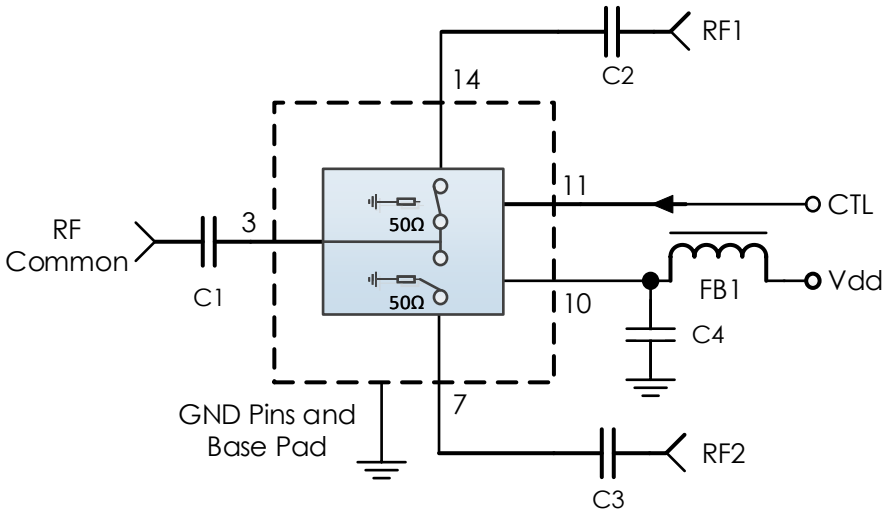


Switching Speed - Falling Edge



Typical Applications

Configuration A: 400 MHz to 20 GHz



Recommended Component List (or equivalent):

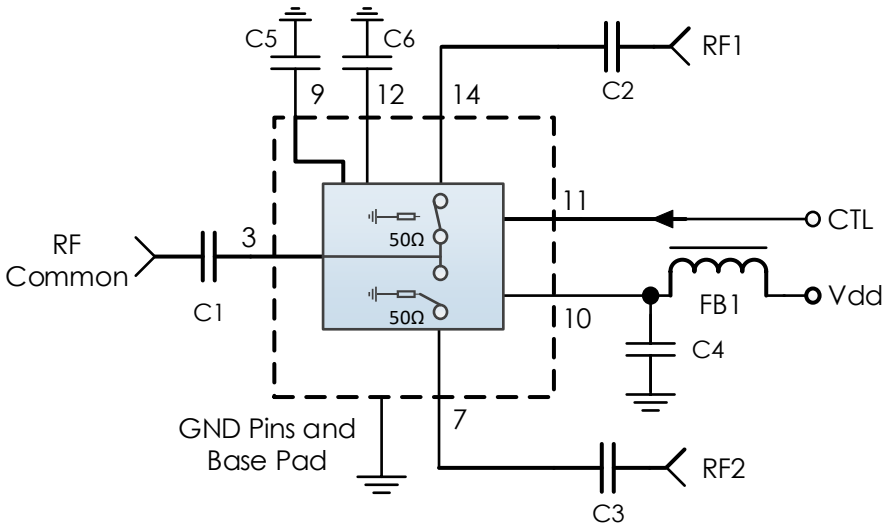
Part	Value	Part Number	Manufacturer
C1-C3	0.1 µF	0201BB104KW160	Passives Plus
C4	0.1 µF	C1005X7R1H104K050BB	TDK
FB1	-	MMZ1005A222E	TDK

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.

Typical Applications (continued)

Configuration B: DC to 20 GHz



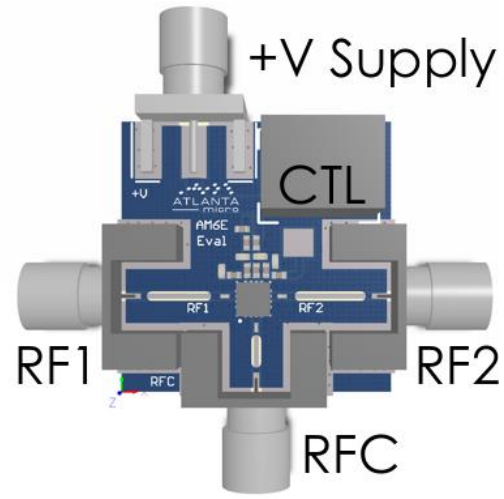
Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1-C3	0.1 µF	0201BB104KW160	Passives Plus
C4-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.

Evaluation PC Board



Related Parts

Part Number				Description
AM6012	DC	to	18 GHz	SPDT, Reflective
AM6013	DC	to	18 GHz	SP4T, Reflective
AM6015	DC	to	18 GHz	SP6T, Reflective
AM6016	DC	to	26.5 GHz	SPDT, Reflective
AM6029	DC	to	18 GHz	SP4T, Reflective

Component Compliance Information

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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-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)

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