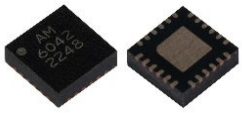
AM6042 – Switch

DC to 20 GHz, SP4T, Absorptive

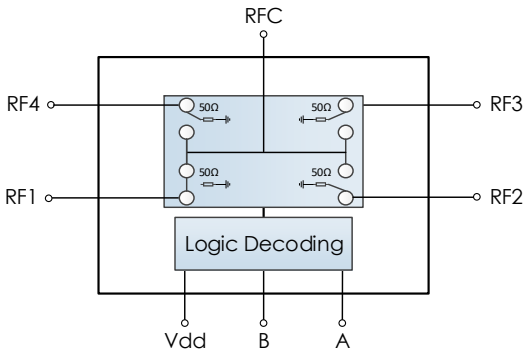


AM6042 is an absorptive Single-Pole Four-Throw (SP4T) switch covering the DC to 20 GHz frequency range suited for a wide range of wireless applications. The AM6042 provides low insertion loss, flat frequency response, high isolation and linearity, and fast switching speed making this switch ideal for high frequency, low power transmit/receive applications. The AM6042 requires only a single positive supply and two positive control voltages. With internal 50Ω matching, internal decoder circuitry, and low current draw all packaged in a 4mm QFN, the AM6042 represents a compact total PCB footprint with minimal size, weight, and power (low SWaP).

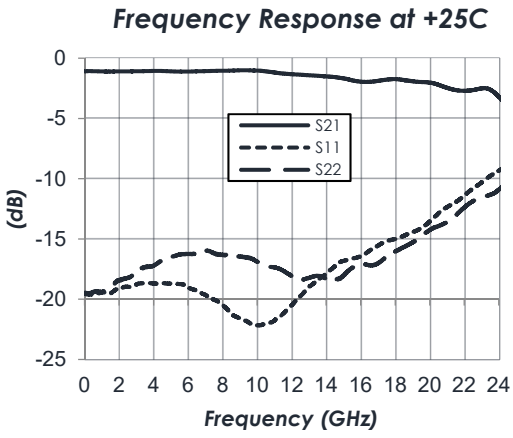
FEATURES

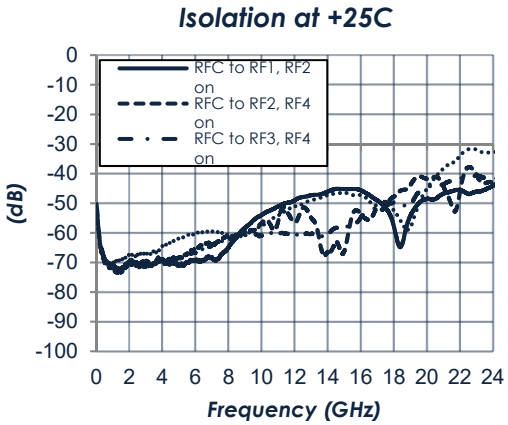
- 1.8 dB Insertion Loss
- +38 dBm Input IP3
- +3.3V to +5.0V Supply
- +3.3V to +5.0V Control
- >40 dB Isolation
- 3mm QFN
- -40C to +85C Operation

FUNCTIONAL DIAGRAM



CHARACTERISTIC PERFORMANCE



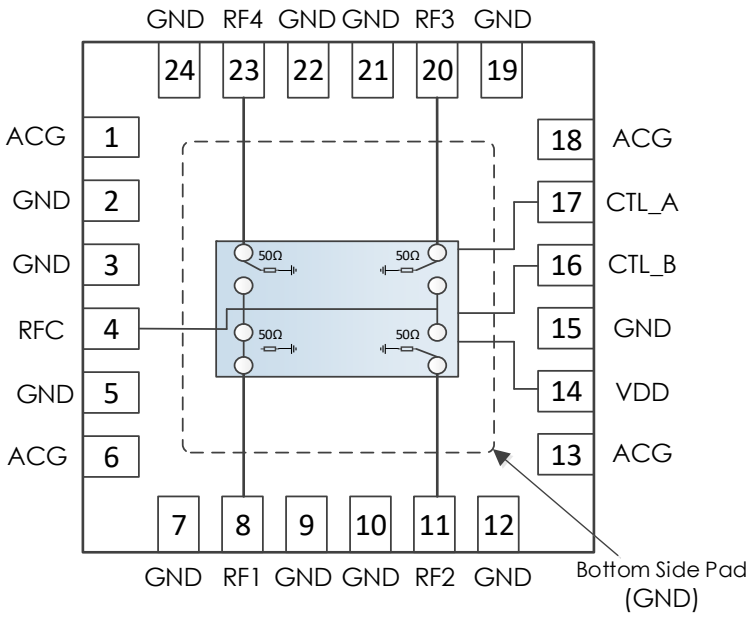


CONTENTS

REVISION HISTORY

Date	Revision	Notes
January 26, 2022	1	Initial Release.
May 18, 2022	2	Added Switching Speed and Corrected Initial Release Date.
August 16, 2022	3	Fixed Logic Table.
July 19, 2024	4	Changed to Mercury branding. No content changes.

PIN LAYOUT AND DEFINITIONS



Pin	Name	Function
1	ACG	Optional AC Ground **
2,3	GND	Ground – Common
4	RFC	RF Input – 50 Ohms – DC Coupled. External DC blocking capacitor required*
5	GND	Ground - Common
6	ACG	Optional AC Ground **
7	GND	Ground – Common
8	RF1	RF Output – 50 Ohms – DC Coupled. External DC blocking capacitor required*
9, 10	GND	Ground - Common
11	RF2	RF Output – 50 Ohms – DC Coupled. External DC blocking capacitor required*
12	GND	Ground - Common
13	ACG	Optional AC Ground **
14	VDD	DC Power Input
15	GND	Ground - Common
16	CTL_B	Switch Control B
17	CTL_A	Switch Control A
18	ACG	Optional AC Ground **
19	GND	Ground - Common
20	RF3	RF Output – 50 Ohms – DC Coupled. External DC blocking capacitor required*
21, 22	GND	Ground - Common
23	RF4	RF Output – 50 Ohms – DC Coupled. External DC blocking capacitor required*
24	GND	Ground - Common

Notes:

* DC Blocking caps not required if in series with other Mercury 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
Storage Temperature Range	-55 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	+2.5 V	+5.0 V	
Operating Case Temperature	-40 C		+85 C

Timing Characteristics

Parameter	Minimum	Typical	Maximum
Switching Speed (Path Enabled to Disabled)		15 ns	
Switching Speed (Path Disabled to Enabled)		15 ns	

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	VDD = +3.3 V		5 mA	
	VDD = +5.0 V		5 mA	
Power Dissipated	VDD = +3.3 V		16.5 mW	
	VDD = +5.0 V		25 mW	
Logic Level Low		0.0 V		+0.5 V
Logic Level High		+2.0 V		+VDD

State Table

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

RF Performance

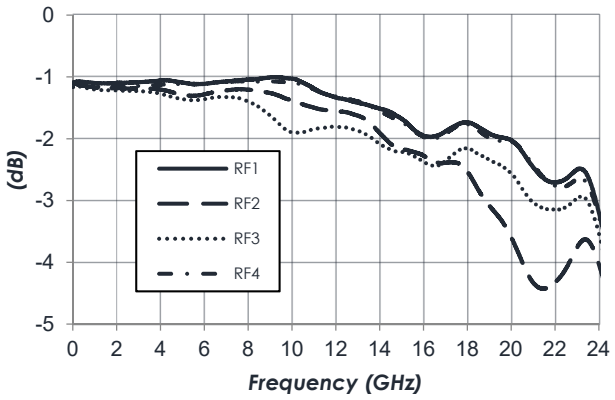
(T = 25 °C unless otherwise specified)

Param	Testing Conditions	Min	Typical	Max.
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		20 dB	
	f = 10 GHz		20 dB	
	f = 20 GHz		17 dB	
Input IP3	VDD = +5.0V		+38 dBm	
Isolation	VDD = +5.0V		+45 dBm	

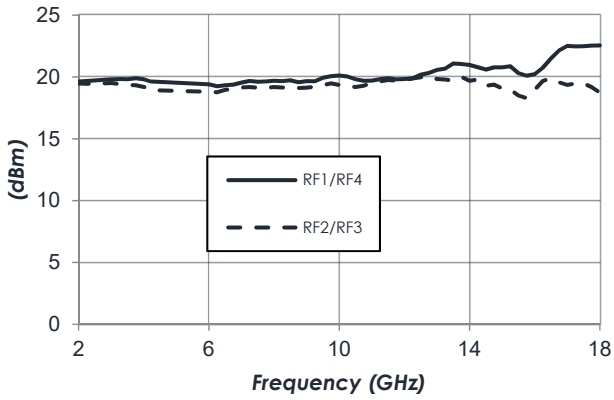
TYPICAL PERFORMANCE

(VDD = +5.0 V, T = 25 °C. Data measured via probes outside IC package on 10 mil Rogers RO4350B™)

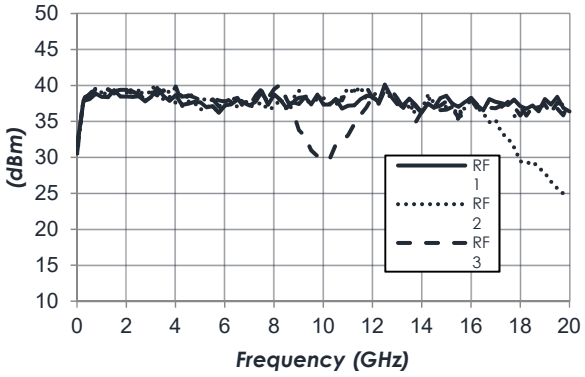
Insertion Loss at +25C



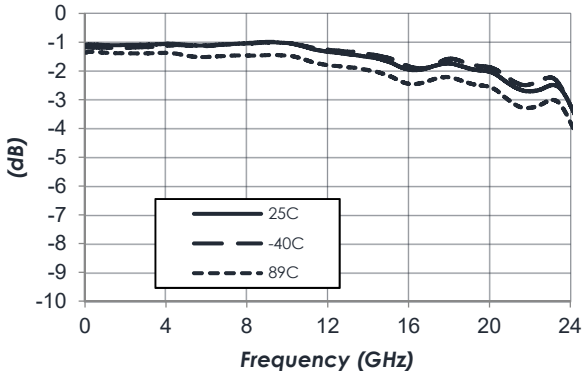
P1dB at +25C



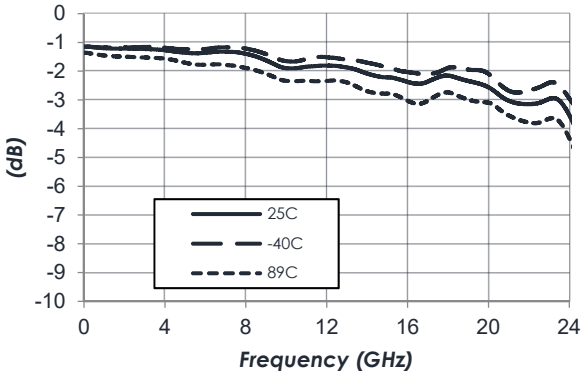
IIP3 at +25C



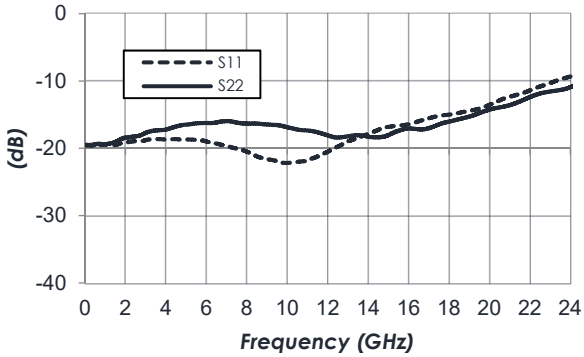
RF1 Insertion Loss vs Temperature



RF3 Insertion Loss vs Temperature

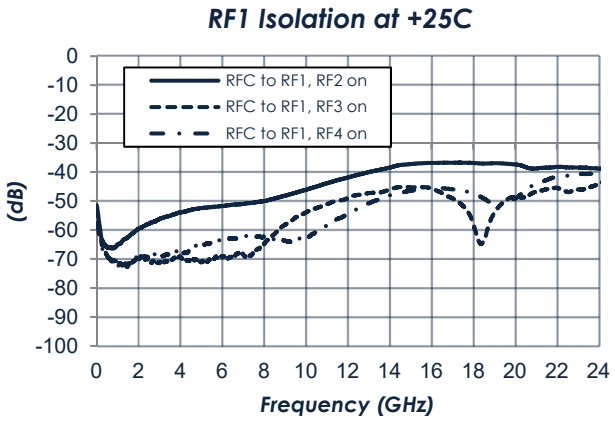


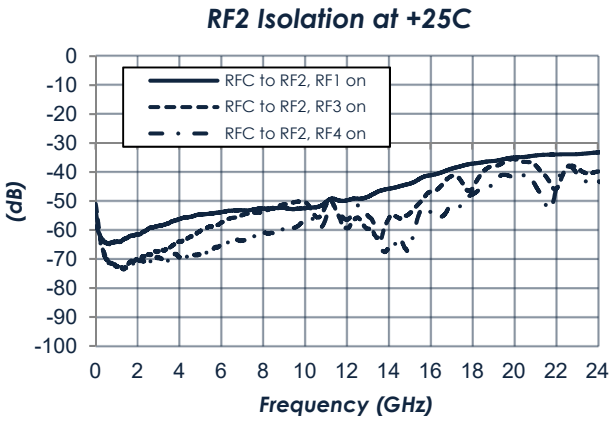
RF1 Return Loss

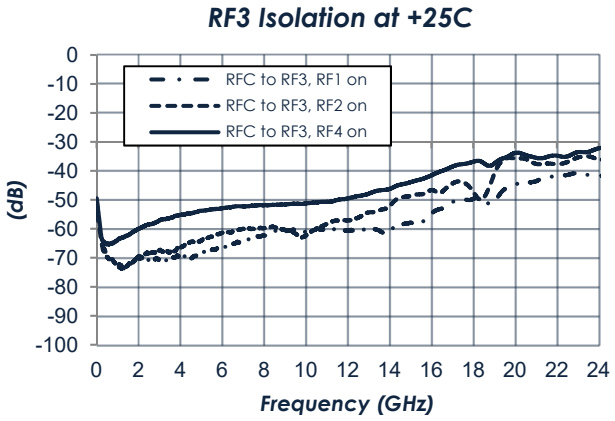


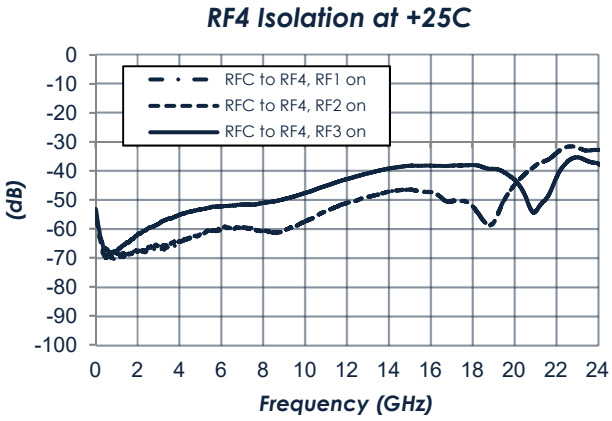
TYPICAL PERFORMANCE (continued)

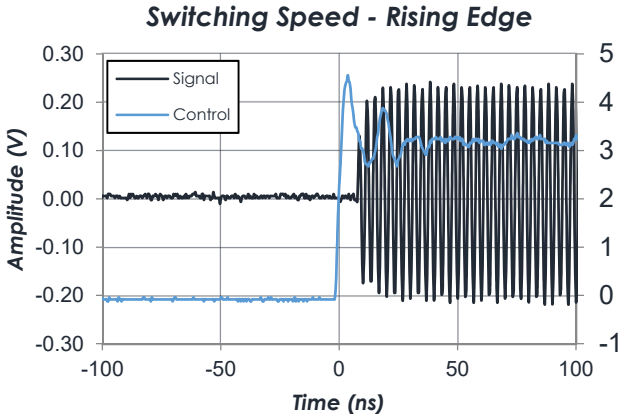
(VDD = +5.0 V, T = 25 °C. Data measured via probes outside IC package on 10 mil Rogers RO4350B™)

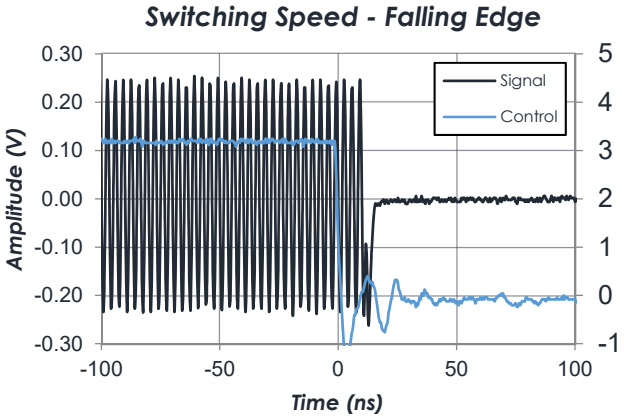






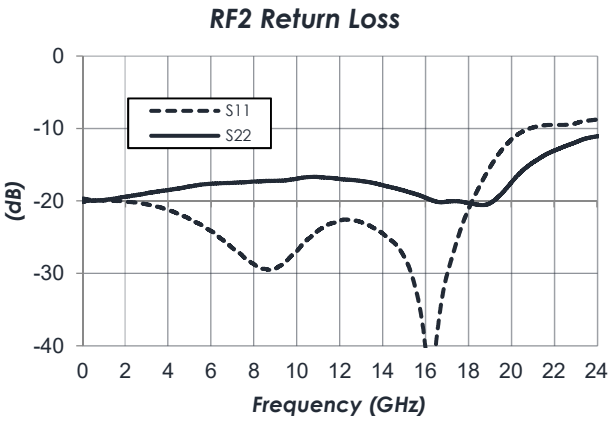


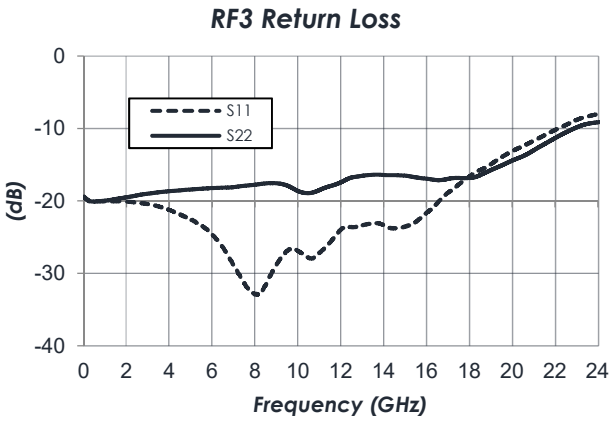


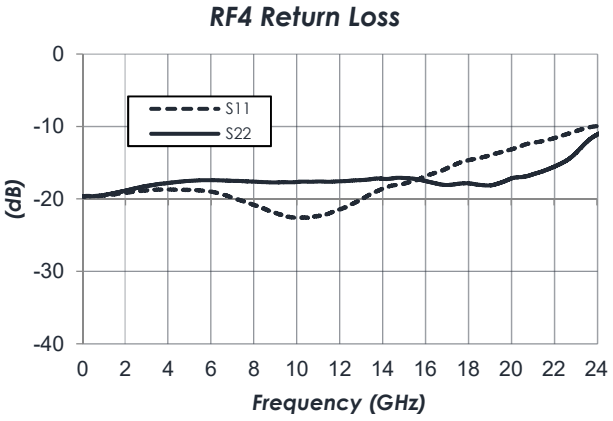


TYPICAL PERFORMANCE (CONTINUED)

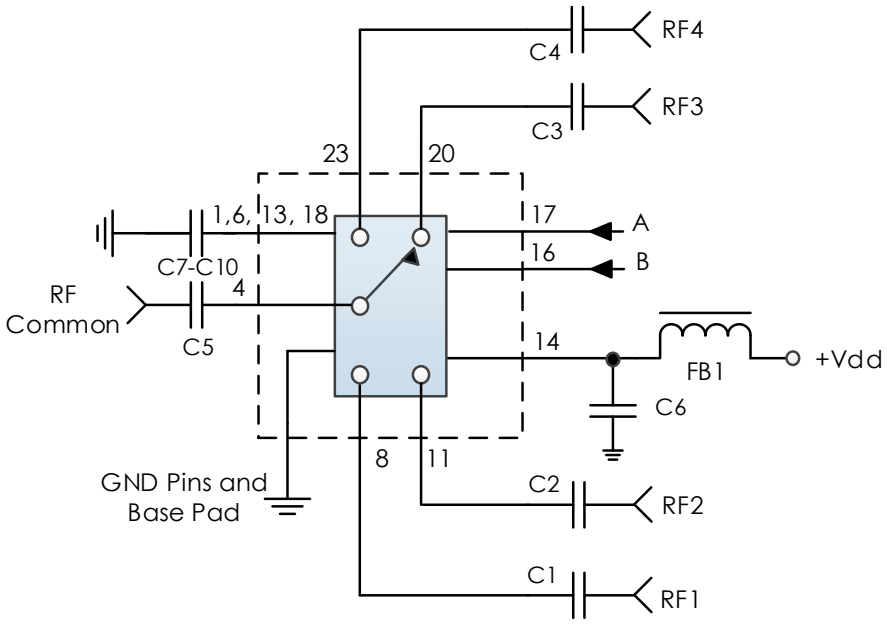
(VDD = +5.0 V, T = 25 °C. Data measured via probes outside IC package on 10 mil Rogers RO4350B™)







TYPICAL APPLICATION



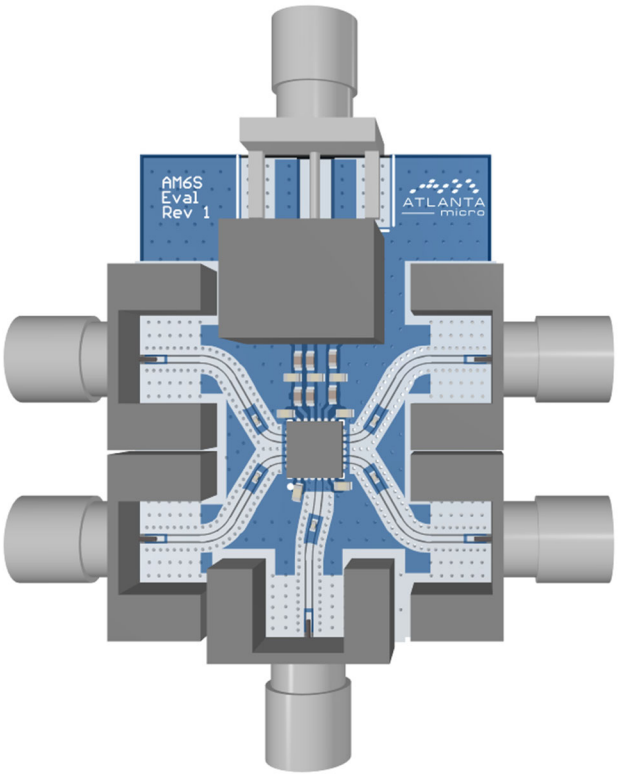
RECOMMENDED COMPONENT LIST (OR EQUIVALENT)

Part	Value	Part Number	Manufacturer [1]
C1-C5	0.1 µF	0201BB104KW160	Passives Plus
C6-C10	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.
3. Installing capacitors C7-C10 is recommended for absorptive performance below 400 MHz.

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
AM6017	DC to 26.5 GHz	SP4T, Reflective
AM6029	DC to 18 GHz	SP4T, Reflective
AM6031	DC to 20 GHz	SPDT, Absorptive

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)

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