

1.0 SCOPE

This specification documents the detail requirements for an internally defined equivalent flow per MIL-PRF-38535 Level V except as modified herein.

The manufacturing flow described in the RF & MICROWAVE STANDARD SPACE LEVEL PRODUCTS PROGRAM brochure is to be considered a part of this specification.

This data specifically details the space grade version of this product. A more detailed operational description and a complete data sheet for commercial product grades can be found at <https://www.analog.com/hmc347lp3>.

2.0 Part Number

The complete part number(s) of this specification follows:

<u>Specific Part Number</u>	<u>Description</u>
ADH347-701LH5	SPDT Non-Reflective Switch, DC to 14 GHz

3.0 Case Outline

The case outline is as follows:

<u>Outline Letter</u>	<u>Descriptive Designator</u>	<u>Terminals</u>	<u>Lead Finish</u>	<u>Package style</u>
X	E-12-5	12 Lead	Gold	Ceramic Hermetic SMT (LH5)

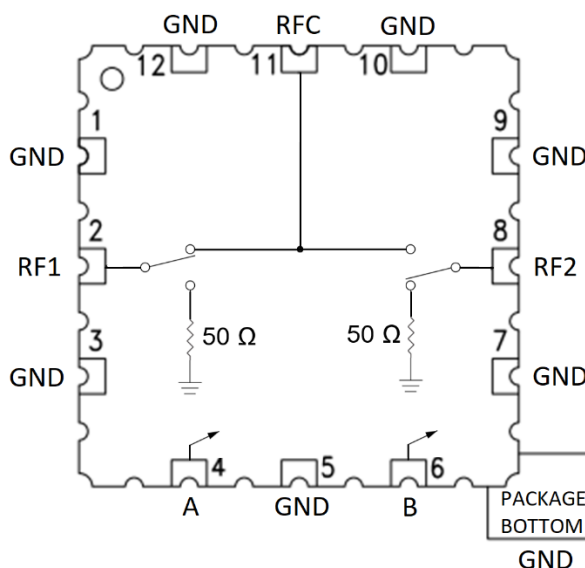


Figure 1 – Functional Block Diagram ^{1/}

^{1/} Package top view

ASD0016617

Rev. A

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective companies.

ADH347S


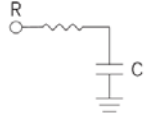


Package: X				
Pin Number	Terminal Symbol	Pin Type	Pin Description	Interface Schematic
1, 3, 5, 7, 9, 10, 12	GND	Power	RF/DC ground	
2	RF1	RF I/O	This pad is DC coupled and matched to 50 Ω. Blocking capacitors are required if RF line potential is not equal to 0 V.	
4	A	Power	See Truth Table (Table III) and Control Voltages Table (Table IV).	
6	B			
8	RF2	RF I/O	This pad is DC coupled and matched to 50 Ω. Blocking capacitors are required if RF line potential is not equal to 0 V.	
11	RFC	RF I/O	This pad is DC coupled and matched to 50 Ω. Blocking capacitors are required if RF line potential is not equal to 0 V.	
Package Bottom	GND	Power	RF/DC ground <u>1/</u>	
Package Lid	GND	Power	RF/DC ground <u>2/</u>	

Figure 2 – Terminal Connections

1/ Package bottom must be connected to RF/DC ground.

2/ Package lid is internally connected to GND.

4.0 Specifications

4.1. Absolute Maximum Ratings ^{1/}

RF Input Power (Apply up to $T_A = +51\text{ }^\circ\text{C}$)	+27 dBm ^{2/}
RF Input Power (Apply between $T_A > +51\text{ }^\circ\text{C}$ to $T_A = +85\text{ }^\circ\text{C}$ only)	+25.1 dBm ^{2/}
Control Input Voltage Range (A & B)	+0.5 V to -7.5 V
Hot Switch Power Level	+23 dBm ^{2/}
Channel Temperature	150 $^\circ\text{C}$
Thermal Resistance (Insertion Loss Path)	358.5 $^\circ\text{C/W}$
Thermal Resistance (Terminated Path)	457.1 $^\circ\text{C/W}$
Storage Temperature Range	-65 $^\circ\text{C}$ to +150 $^\circ\text{C}$
ESD Sensitivity (HBM)	Class 1A, passed 250 V

4.2. Recommended Operating Conditions

Ambient Operating Temperature Range (T_A)	-40 $^\circ\text{C}$ to +85 $^\circ\text{C}$
---	--

4.3. Nominal Operating Performance Characteristics ^{3/}

tRISE, tFALL (10/90% RF) (DC – 14.0 GHz)	3 ns
tON, tOFF (50% A/B to 10/90% RF) (DC – 14.0 GHz)	6 ns
Input Power for 1 dB Compression (0.5 GHz to 14 GHz).....	23 dBm
Input Third Order Intercept Point (0.5 GHz to 14 GHz)	43 dBm ^{4/}

^{1/} Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions outside of those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

^{2/} A & B Control Voltage = 0/-5 V.

^{3/} All specifications apply at $T_A = 25\text{ }^\circ\text{C}$ with A & B Control Input Voltage Low = 0 V, High = -5.0 V unless otherwise noted.

^{4/} Two-Tone Input Power = +7 dBm per tone with 1 MHz spacing.

TABLE I – ELECTRICAL PERFORMANCE CHARACTERISTICS

Parameter See notes at end of table	Symbol	Conditions ^{1/} Unless otherwise specified	Group A Subgroups	Limits		Units	
				Min	Max		
Frequency = 0.1 GHz Continuous Wave (CW) Input							
Insertion Loss	IL	RFC P _{IN} = -25 dBm	4, 6		1.6	dB	
			5		2.2		
Isolation	ISO		4, 5, 6	50		dB	
Return Loss RF1, RF2 & RFC "ON State"	RL _{ON}		4, 5, 6	9		dB	
Return Loss RF1, RF2 "OFF State"	RL _{OFF}		4, 5, 6	8		dB	
Frequency = 6.2 GHz Continuous Wave (CW) Input							
Insertion Loss	IL		RFC P _{IN} = -25 dBm	4, 6		2.7	dB
				5		2.9	
Isolation	ISO	4		45		dB	
		5, 6		38			
Return Loss RF1, RF2 & RFC "ON State"	RL _{ON}	4, 5, 6		9		dB	
Return Loss RF1, RF2 "OFF State"	RL _{OFF}	4, 5, 6		8		dB	
Frequency = 8.4 GHz Continuous Wave (CW) Input							
Insertion Loss	IL	RFC P _{IN} = -25 dBm		4, 6		2.7	dB
			5		2.9		
Isolation	ISO		4	45		dB	
			5, 6	38			
Return Loss RF1, RF2 & RFC "ON State"	RL _{ON}		4, 5, 6	8.5		dB	
Return Loss RF1, RF2 "OFF State"	RL _{OFF}		4, 5, 6	6		dB	
Frequency = 14 GHz Continuous Wave (CW) Input							
Insertion Loss	IL		RFC P _{IN} = -25 dBm	4, 6		3	dB
		5			3.5		
Isolation	ISO	4		45		dB	
		5, 6		38			
Return Loss RF1, RF2 & RFC "ON State"	RL _{ON}	4, 5, 6		9		dB	
Return Loss RF1, RF2 "OFF State"	RL _{OFF}	4, 5, 6		8		dB	

TABLE I Note:

^{1/} T_A Nom = +25 °C, T_A Max = +85 °C, T_A Min = -40 °C, A & B Control Input Voltage Low = 0 V, High = -5.0 V.

TABLE IIA – ELECTRICAL TEST REQUIREMENTS

Test Requirements	Subgroups (in accordance with MIL-PRF-38535, Table III)
Interim Electrical Parameters	1, 4
Final Electrical Parameters	1, 4 <u>1/</u> <u>2/</u>
Group A Test Requirements	1, 2, 3, 4, 5, 6
Group C end-point electrical parameters	1, 4 <u>2/</u>
Group D end-point electrical parameters	1, 4

TABLE IIA Notes:

1/ PDA applies to Table I subgroup 1 and Table IIB delta parameters.

2/ See Table IIB for delta parameters

TABLE IIB – BURN-IN/LIFE TEST DELTA LIMITS 1/2/

Parameter	Test Conditions	Symbol	Delta	Units
Insertion Loss	<u>3/</u>	IL	± 1	dB

TABLE IIB Notes:

1/ 240 hour burn in and 1000 hour life test end point electrical parameters.

2/ Deltas are performed at T_A = +25 °C only

3/ Product is tested in accordance with conditions in Table I.

TABLE III – TRUTH TABLE

Control Input		Signal Path State	
A	B	RFC to RF1	RFC to RF2
High	Low	ON	OFF
Low	High	OFF	ON

TABLE IV – CONTROL VOLTAGES

State	Bias Condition
Low	0 V to -0.2 V @ 10 μA Max.
High	-5 V @ 10 μA Typ. to -7 V @ 40 μA Max.

5.0 **Burn-In Life Test, and Radiation**

5.1. Burn-In Test Circuit, Life Test Circuit

5.1.1. The test conditions and circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 test condition B of MIL-STD-883.

5.1.2. HTRB is not applicable for this drawing.

6.0 **MIL-PRF-38535 QMLV Exceptions**

The manufacturing flow described in the RF & MICROWAVE STANDARD SPACE LEVEL PRODUCTS PROGRAM is to be considered a part of this specification. The brochure describes standard QMLV exceptions for Aerospace products run at the ADI Chelmsford, MA facility.

6.1. Wafer Fabrication

Foundry information is available upon request.

6.2. Group D

Group D-5 Salt Atmosphere testing is not performed.

7.0 **Application Notes**

The circuit board used in the final application should be generated with proper RF circuit design techniques. Signal lines at the RF ports (RFC, RF1 & RF2) should have 50 Ohm impedance. Also, the package ground leads, and package bottom should be connected directly to the ground plane. The recommended circuit board material is Rogers 4350.

8.0 **Package Outline Dimensions**

The LH5 package and outline dimensions can be found at <http://www.analog.com> or upon request.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
ADH347-701LH5	-40 °C to +85 °C	12 Lead Ceramic Leadless SMT	LH5 (E-12-5)

Revision History		
Rev	Description of Change	Date
A	Initial Production Release	6/28/2022