

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/HMC244>

2.0 Part Number

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

<u>Specific Part Number</u>	<u>Description</u>
ADH244-701G16	GaAs MMIC SP4T Non-Reflective Switch, DC – 4 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	FR-16-2	16 Lead	Gold	Glass/Metal Hermetic Leaded SMT (G16)

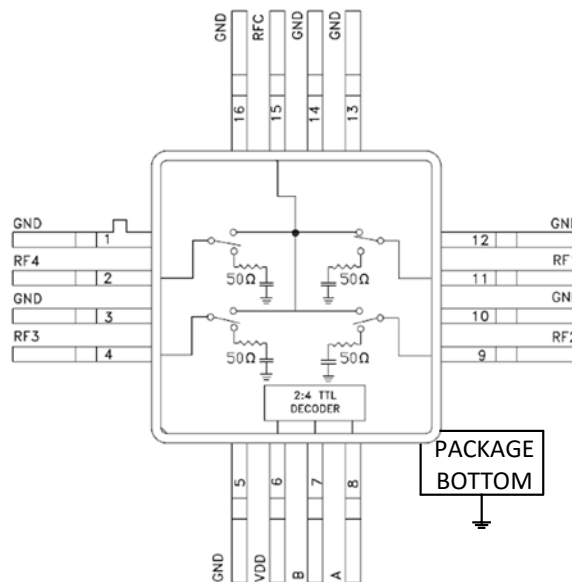


Figure 1 – Functional Block Diagram

ASD0016609

Rev. A

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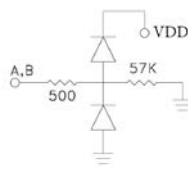



Package: X				
Pin Number	Terminal Symbol	Pin Type	Pin Description	Interface Schematic
1	GND	Power	RF/DC Ground ^{1/}	
2	RF4	RF Output	This pin is DC coupled and matched to 50 Ohms. Blocking capacitor is required	
3	GND	Power	RF/DC Ground ^{1/}	
4	RF3	RF Output	This pin is DC coupled and matched to 50 Ohms. Blocking capacitor is required	
5	GND	Power	RF/DC Ground ^{1/}	
6	VDD	Power	Supply Voltage. Typical: +5.0 Vdc ± 10%	
7	B	Power	Control Inputs See Truth Table (Table III) and TTL/CMOS Control Voltages Table (Table IV)	
8	A	Power		
9	RF2	RF Output	This pin is DC coupled and matched to 50 Ohms. Blocking capacitor is required	
10	GND	Power	RF/DC Ground ^{1/}	
11	RF1	RF Output	This pin is DC coupled and matched to 50 Ohms. Blocking capacitor is required	
12	GND	Power	RF/DC Ground ^{1/}	
13	GND	Power		
14	GND	Power		
15	RFC	RF Input	This pin is DC coupled and matched to 50 Ohms. Blocking capacitor is required	
16	GND	Power	RF/DC Ground ^{1/}	
Package Bottom	GND	Power		
Package Lid		NIC	No Internal Connection. Package Lid is not connected to RF/DC Ground	

Figure 2 – Terminal Connections

^{1/} The package bottom has an exposed metal paddle that must also be connected to RF/DC ground.

4.0 Specifications

4.1. Absolute Maximum Ratings ^{1/}

Bias Voltage Range (VDD)	+7.0 Vdc
Control Input Voltage Range (A & B)	-0.5 Vdc to (VDD + 1 Vdc)
Channel Temperature	150 °C
Thermal Resistance (Insertion Loss Path)	137.8 °C/W
Thermal Resistance (Terminated Path)	295.7 °C/W
Storage Temperature	-65 °C to +150 °C
Maximum Input Power (VDD = +5 Vdc & 0.05 GHz – 0.5 GHz)	+20 dBm
Maximum Input Power (VDD = +5 Vdc & 0.5 GHz – 4 GHz)	+27 dBm
ESD Sensitivity (HBM)	Class 0 (< 250 V)

4.2. Recommended Operating Conditions

Positive Supply Voltage (VDD)	+5.0 Vdc
Ambient Operating Temperature Range (T _A)	-40 °C to +85 °C

4.3. Nominal Operating Performance Characteristics ^{2/}

Positive Supply Current (IDD)	+3.0 mA
Return Loss “On-State” (RL _{ON}) (DC – 3.5 GHz)	18 dB
Return Loss “On-State” (RL _{ON}) (DC – 4.0 GHz)	13 dB
Return Loss RF1-RF4 “Off-State” (RL _{OFF}) (0.2 GHz – 4.0 GHz)	10 dB
Return Loss RF1-RF4 “Off-State” (RL _{OFF}) (0.5 GHz – 4.0 GHz)	15 dB
t _{RISE} , t _{FALL} (10/90% RF) (DC – 4.0 GHz)	40 ns
t _{ON} , t _{OFF} (50% A/B to 10/90% RF) (DC – 4.0 GHz)	150 ns

^{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/} All typical specifications apply at T_A = 25 °C with VDD = +5.0 V and A & B Control Input Voltage Low = 0 V, High = +5.0 V unless otherwise noted.

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, 5, 6		1.1	dB
Isolation	ISO		4, 5, 6	40		dB
Input Power for 1dB Compression 2/	IP1dB		7, 8A, 8B	21		dBm
Frequency = 0.5 GHz Continuous Wave (CW) Input						
Input Third Order Intercept 3/4/	IIP3		4	43		dBm
Frequency = 2.0 GHz Continuous Wave (CW) Input						
Insertion Loss	IL	RFC P _{IN} = -25 dBm	4, 5, 6		1.2	dB
Isolation	ISO		4, 5, 6	35		dB
Input Power for 1dB Compression 2/	IP1dB		7, 8A, 8B	21		dBm
Input Third Order Intercept 3/4/	IIP3		4	43		dBm
Frequency = 4.0 GHz Continuous Wave (CW) Input						
Insertion Loss	IL	RFC P _{IN} = -25 dBm	4, 5, 6		2	dB
Isolation	ISO		4, 5, 6	22		dB
Input Power for 1dB Compression 2/	IP1dB		7, 8A, 8B	21		dBm
Input Third Order Intercept 3/4/	IIP3		4	40		dBm
Power Supplies						
VDD Supply Current	IDD	No Signal at RFC, RF1 – RF4	1, 2, 3		7	mA

TABLE I Notes:

- 1/ T_A Nom = +25 °C, T_A Max = +85 °C, T_A Min = -40 °C, VDD = +5.0 V, A & B Control Input Voltage Low = 0 V, High = +5.0 V.
- 2/ Parameter is part of device initial characterization which is only repeated after design and process changes or with subsequent wafer lots.
- 3/ Guaranteed by design and shall not be tested. It shall be repeated after major design or process changes.
- 4/ Two-Tone Input Power = +7 dBm per Tone with 1 MHz spacing.

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 1/ 2/
Group A Test Requirements	1, 2, 3, 4, 5, 6
Group C end-point electrical parameters	1, 4 2/
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
VDD Supply Current	<u>4/</u>	IDD	± 10	%

TABLE IIB Notes:

1/ 240 hour burn in and 1000 hour life test (Group C) end point electrical parameters.

2/ Deltas are performed at $T_A = +25\text{ }^\circ\text{C}$ only with $V_{DD} = +5.0\text{ V}$

3/ A & B Control Input Voltage Low = 0 V, High = +5.0 V.

4/ No Signal at RFC, RF1 – RF4.

TABLE III – TRUTH TABLE

Control Input		Signal Path State
A	B	RFC to:
Low	Low	RF1
High	Low	RF2
Low	High	RF3
High	High	RF4

TABLE IV – TTL/CMOS CONTROL VOLTAGES

State	Bias Condition
Low	0 Vdc to +0.8 Vdc @ 5 μA Typ.
High	+2.0 Vdc to +5.0 Vdc @ 70 μA Typ.

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 D 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 being 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 – RF4) 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 G16 package and outline dimensions can be found at <http://www.analog.com> or upon request.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
ADH244-701G16	-40 °C to +85 °C	16 Lead Glass/Metal Hermetic SMT	G16 (FR-16-2)

Revision History		
Rev	Description of Change	Date
A	Initial Release	03/24/2021