

### 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 <http://www.analog.com/HMC346>.

### 2.0 Part Number

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

<u>Specific Part Number</u>	<u>Description</u>
ADH346-701G8	Voltage-Variable Attenuator, DC to 8 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-8-2	8 Lead	Gold	Glass/Metal Hermetic Leaded SMT (G8)

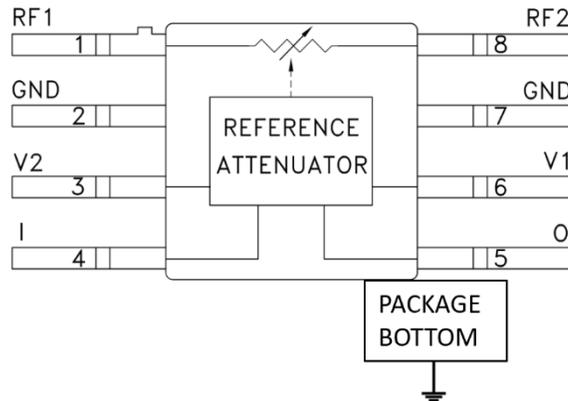


Figure 1 – Functional Block Diagram

ASD0016598

Rev B

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# ADH346S

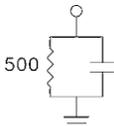
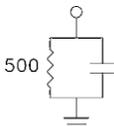
Package: X				
Pin Number	Terminal Symbol	Pin Type	Pin Description	Interface Schematic
1	RF1	RF Input	RF Input <u>2/</u>	
2	GND	Power	Ground	
3	V2	Analog Input	Control Input (Master)	
4	I	Analog Input	Control Input (Slave)	
5	O	None	This pin must have an external 500 Ohm resistor to ground	
6	V1	Analog Input	Control Input (Master)	
7	GND	Power	Ground	
8	RF2	RF Output	RF Output <u>2/</u>	
Package Bottom	GND	Power	Ground <u>1/</u>	
Package Lid	None	None	No Internal Connection	

Figure 2 – Terminal Connections

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

2/ This pin is DC-coupled and matched to 50 Ohm. A DC blocking capacitor is required if the RF line potential does not equal 0 V DC.

**4.0 Specifications**

4.1. Absolute Maximum Ratings <sup>1/</sup>

Control Voltage (V <sub>1</sub> , V <sub>2</sub> ).....	+1 V to -5 V
RF Input Power .....	+18 dBm
Storage Temperature Range .....	-65 °C to +150 °C
Junction Temperature Maximum (T <sub>J</sub> ) .....	150 °C
Thermal Resistance, Junction-to-Case (θ <sub>JC</sub> ) (Insertion Loss) .....	181.5 °C/W
Thermal Resistance, Junction-to-Case (θ <sub>JC</sub> ) (Full Attenuation) .....	304.8 °C/W
ESD Sensitivity (HBM) .....	Class 1A

4.2. Recommended Operating Conditions

Control Voltage Range (V <sub>1</sub> , V <sub>2</sub> ) .....	0 V to -3 V
Ambient Operating Temperature Range (T <sub>A</sub> ).....	-40 °C to +85 °C

4.3. Nominal Operating Performance Characteristics <sup>2/</sup>

Switching Speed	
Rise/Fall (10% / 90% RF).....	2 ns
On/Off (50% CTL to 10% / 90% RF) .....	8 ns
Input Power 0.25 dB Compression (0.5 – 8 GHz)	
Minimum Attenuation .....	+8 dBm
Attenuation > 2 dB.....	-2 dBm
Input Power Third Order Intercept (0.5 – 8 GHz)	
(Two-tone Input Power = -8 dBm Each Tone)	
Minimum Attenuation .....	25 dBm
Attenuation > 2 dB.....	10 dBm

<sup>1/</sup> 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.

<sup>2/</sup> All typical specifications are at T<sub>A</sub> = 25 °C, unless otherwise noted.

**TABLE I – ELECTRICAL PERFORMANCE CHARACTERISTICS**

Parameter See notes at end of table	Symbol	Conditions 1/ Unless otherwise specified	Sub-Group	Limits		Units
				Min	Max	
<b>RF CHARACTERISTICS</b>						
Insertion Loss 2/	IL	2.0 GHz	4,5,6		3.0	dB
		4.0 GHz	4,5,6		3.0	dB
		6.0 GHz	4,5,6		3.0	dB
		8.0 GHz	4,5,6		3.5	dB
Attenuation Range 3/	AR	2.0 GHz	4,5,6	23		dB
		4.0 GHz	4,5,6	23		dB
		6.0 GHz	4,5,6	23		dB
		8.0 GHz	4,5,6	23		dB
Return Loss 4/	S11, S22	2.0 GHz	4,5,6	8		dB
	S11, S22	4.0 GHz	4,5,6	8		dB
	S11, S22	6.0 GHz	4,5,6	8		dB
	S11, S22	8.0 GHz	4,5,6	8		dB

**TABLE I NOTES:**

1/ T<sub>A</sub> Nom = 25 °C, T<sub>A</sub> Max = 85 °C and T<sub>A</sub> Min = -40 °C, 50 Ohm system.

2/ Insertion Loss tested with V1 = 0 V , V2 = -3 V

3/ Maximum Attenuation tested with V1 = -3 V , V2 = 0 V

4/ Parameter is part of initial device characterization which is only repeated after design and process changes or with subsequent wafer lots.

**TABLE IIA – ELECTRICAL TEST REQUIREMENTS:**

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

Parameter	Test Conditions	Symbol	Delta	Units
Insertion Loss 2 GHz	Per Table I	IL	±1	dB
Insertion Loss 4 GHz		IL	±1	dB
Insertion Loss 6 GHz		IL	±1	dB
Insertion Loss 8 GHz		IL	±1.5	dB

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<sub>A</sub> = +25 °C only.

## 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 ADH346S is an absorptive Voltage Variable Attenuator (VVA) operating from DC - 8 GHz. It features an on-chip reference attenuator for use with an external op-amp to provide simple single voltage attenuation control, 0 to -3 V. The device is ideal in designs where an analog DC control signal must control RF signal levels over a 30 dB amplitude range.

**8.0 Package Outline Dimensions**

The G8 package and outline dimensions can be found at <http://www.analog.com> or upon request.

**ORDERING GUIDE**

Model	Temperature Range	Package Description	Package Option
ADH346-701G8	-40 °C to +85 °C	8 Lead Glass/Metal Hermetic SMT	G8 (FR-8-2)

Revision History		
Rev	Description of Change	Date
A	Initial Release	11/30/2020
B	Updating Thermal Resistance with operating condition added	02/14/2022