

### 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/HMC554>

### 2.0 Part Number

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

<u>Specific Part Number</u>	<u>Description</u>
ADH554-701LH5	11 GHz to 18 GHz Fundamental Mixer

### 3.0 Case Outline

3.1. 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)

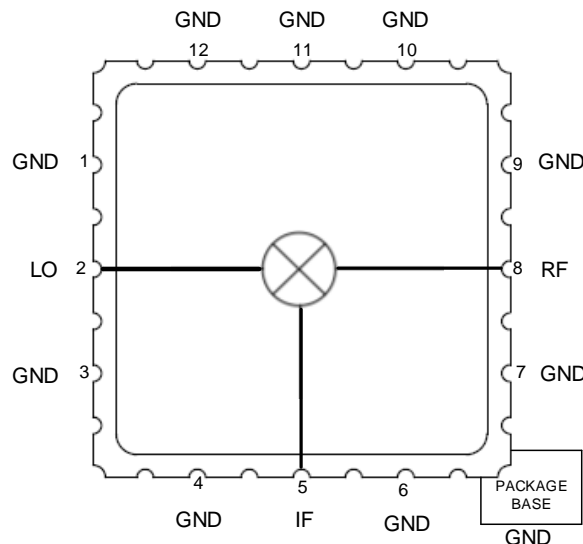


Figure 1 – Functional Block Diagram

ASD0016594

Rev. C

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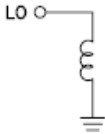

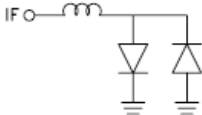

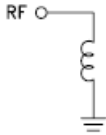

Package: X				
Pin Number	Terminal Symbol	Pin Type	Pin Description	Interface Schematic
1	GND	Power	RF/DC ground	
2	LO	Input	LO Input <u>1/</u>	
3	GND	Power	RF/DC ground	
4	GND	Power	RF/DC ground	
5	IF	I/O	IF up converter Input / down converter Output <u>2/</u>	
6	GND	Power	RF/DC ground	
7	GND	Power	RF/DC ground	
8	RF	I/O	RF down converter Input / up converter Output <u>1/</u>	
9	GND	Power	RF/DC ground	
10	GND	Power	RF/DC ground	
11	GND	Power	RF/DC ground	
12	GND	Power	RF/DC ground	
Package Bottom	GND	Power	RF/DC ground <u>3/</u>	
Package Lid	GND	Power	RF/DC ground <u>4/</u>	

Figure 2 – Terminal Connections

1/ This pin is DC coupled and matched to 50 Ohms.

2/ This pin is DC coupled. For applications not requiring operation to DC, this port should be DC blocked externally using a series capacitor whose value has been chosen to pass the necessary IF frequency range. For operation to DC, this pin must not source or sink more than 2 mA of current or part non-function and possible part failure will result.

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

4/ Package lid is internally connected to RF/DC ground

## 4.0 Specifications

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

RF / IF Input .....	+24 dBm
LO Drive .....	+24 dBm
IF Source and Sink Current .....	± 2 mA
Channel temperature .....	+150 °C
Continuous Pdiss (T <sub>A</sub> = +85 °C) (Derate 3.67 mW/°C above +85 °C) ....	0.238 W
Thermal Resistance (Junction to Package Bottom) .....	272.8 °C/W
Storage temperature range .....	-65 °C to +150 °C
ESD Sensitivity (HBM) .....	Class 1C

### 4.2. Recommended Operating Conditions

Ambient operating temperature range (T <sub>A</sub> ).....	-40 °C to +85 °C
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### 4.3. Nominal Operating Performance Characteristics <sup>2/</sup>

Input Third Order Intercept (IIP3) (11 GHz - 18 GHz) .....	17.5 dBm <sup>3/</sup> <sup>4/</sup>
Input Second Order Intercept (IIP2) (11 GHz - 18 GHz) .....	42 dBm <sup>3/</sup> <sup>4/</sup>
Input Second Order Intercept (IIP2) (12 GHz - 16 GHz) .....	44 dBm <sup>3/</sup> <sup>4/</sup>
1 dB Gain Compression (IP1dB) (11 GHz - 18 GHz) .....	11 dBm <sup>3/</sup>
LO to RF Isolation (16 GHz – 18 GHz) .....	30 dB
LO to IF Isolation (16 GHz – 18 GHz) .....	20 dB
RF to IF Isolation (16 GHz – 18 GHz) .....	16 dB

<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 apply at T<sub>A</sub> = 25 °C only with LO = +13 dBm, RF = -10 dBm, unless otherwise noted.

<sup>3/</sup> Measured as downconverter, IF = 100 MHz.

<sup>4/</sup> Two-tone RF input power = -10 dBm each tone, 1 MHz spacing.

**TABLE I – ELECTRICAL PERFORMANCE CHARACTERISTICS**

Parameter See notes at end of table	Symbol	Conditions <u>1/</u> Unless otherwise specified	Group A Subgroups	Limits		Units	
				Min	Max		
<b>Frequency = 11.0 GHz Continuous Wave (CW) input</b>							
Conversion Loss	S21	RF = 11 GHz, LO = 10.9 GHz	4		11	dB	
			5, 6		12	dB	
Noise Figure (SSB) <u>2/</u>	NF		4		11	dB	
			5, 6		12	dB	
LO to RF Isolation	ISO <sub>LO-RF</sub>		4	40		dB	
			5, 6	35		dB	
LO to IF Isolation	ISO <sub>LO-IF</sub>		4	29		dB	
			5, 6	26		dB	
RF to IF Isolation	ISO <sub>RF-IF</sub>		4	15		dB	
			5, 6	13		dB	
<b>Frequency = 14.5 GHz Continuous Wave (CW) input</b>							
Conversion Loss	S21		RF = 14.5 GHz, LO = 14.4 GHz	4		9	dB
		5, 6			10	dB	
Noise Figure (SSB) <u>2/</u>	NF	4			9	dB	
		5, 6			10	dB	
LO to RF Isolation	ISO <sub>LO-RF</sub>	4		36		dB	
		5, 6		34		dB	
LO to IF Isolation	ISO <sub>LO-IF</sub>	4		34		dB	
		5, 6		31		dB	
RF to IF Isolation	ISO <sub>RF-IF</sub>	4		18		dB	
		5, 6		16		dB	
<b>Frequency = 18.0 GHz Continuous Wave (CW) input</b>							
Conversion Loss	S21	RF = 18 GHz, LO = 17.9 GHz		4		12	dB
			5, 6		13	dB	
Noise Figure (SSB) <u>2/</u>	NF		4		12	dB	
			5, 6		13	dB	
LO to RF Isolation	ISO <sub>LO-RF</sub>		4	40		dB	
			5, 6	35		dB	
LO to IF Isolation	ISO <sub>LO-IF</sub>		4	30		dB	
			5, 6	27		dB	
RF to IF Isolation	ISO <sub>RF-IF</sub>		4	16		dB	
			5, 6	14		dB	

Table I Notes:

1/ Tested as downconverter at T<sub>A</sub> nom = +25 °C, T<sub>A</sub> max = +85 °C, T<sub>A</sub> min = -40 °C, IF = 100 MHz, LO = +13 dBm and RF = -10 dBm, unless otherwise noted.

2/ Noise Figure not tested, guaranteed by Conversion Loss.

**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 – BURN-IN/LIFE TEST DELTA LIMITS 1/ 2/**

Parameter	Test Conditions	Symbol	Delta	Units
Conversion Loss	Per Table I	S21	± 1.0	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 C 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 this application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane. Enough via holes should be used to connect the top and bottom ground planes.

## 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
ADH554-701LH5	-40°C to +85°C	12 Lead Ceramic Hermetic SMT	LH5 (E-12-5)

Revision History		
Rev	Description of Change	Date
A	Initial release.	12/21/18
B	Update Table I, Section 3.0, 4.1, 4.3, 6.0, 7.0 and 8.0	05/06/19
C	Revise Section 5.1.1	10/01/2020