DC – 12 GHz Divide-by-8

ADH363S

1.0 SCOPE

This specification documents the detail requirements for space qualified product manufacturing on Analog Devices, Inc.'s QML certified line per MIL-PRF-38535 Level V except as modified herein.

The manufacturing flow described in the 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/HMC363G8

2.0 Part Number

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

Specific Part Number	Description
ADH363R701G8	DC to 12 GHz Divide-by-8

3.0 Case Outline

The case outline is as follows:

Outline Letter	Descriptive Designator	Terminals	Lead Finish	Package style
X	FR-8-2	8 Lead	Gold	Glass/Metal Hermetic SMT (G8)

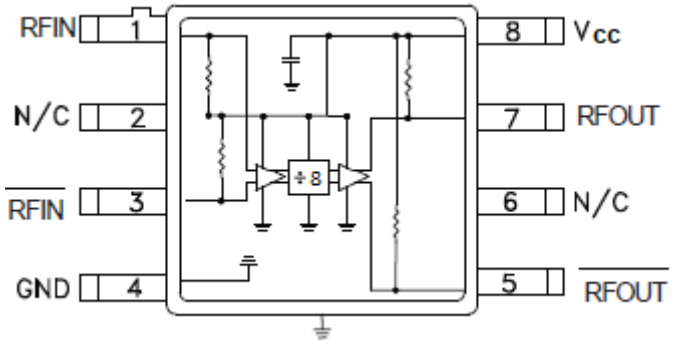


Figure 1 – Functional Block Diagram

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 www.analog.com
Fax: 781.326.8703

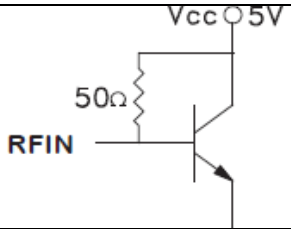
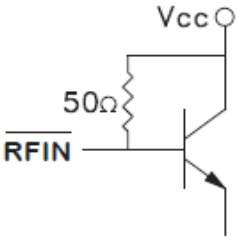
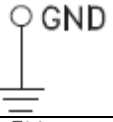
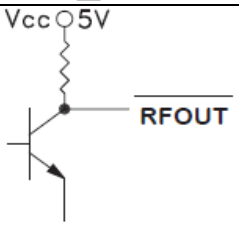
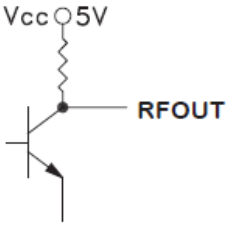
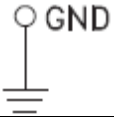
Package: X				
Pin Number	**Terminal Symbol**	**Pin Type**	**Pin Description**	**Interface Schematic**
1	RFIN	RF Input	Positive RF differential Input 1/	
2	N/C		No Connection	
3	$\overline{\text{RFIN}}$	RF Input	Negative RF differential Input 2/	
4	GND	Power	RF/DC ground	
5	$\overline{\text{RFOUT}}$	RF Output	Negative RF differential Output 3/	
6	N/C	N/C	No Connection	
7	RFOUT	RF Output	Positive RF differential Output 4/	
8	Vcc	Power	Supply Voltage 5/	
Package Bottom	GND	Power	RF/DC ground 6/	
Package Lid		NIC	7/	

Figure 2 – Terminal Connections

1/ RF Input must be DC blocked.
2/ RF Input 180° out of phase with pin 1 for differential operation. Must be DC blocked. AC ground for single ended operation.
3/ Divided output 180° out of phase with pin 7. Must be DC blocked.
4/ RF Input must be DC blocked. Divided output.
5/ Supply voltage 4.75 V to 5.25 V
6/ Package bottom must be connected to RF/DC ground.
7/ No internal connection on lid. Lid may be connected to RF/DC ground.

4.0 Specifications

4.1. Absolute Maximum Ratings 1/

Supply voltage (Vcc)	5.5 Vdc
RF Input (Vcc = +5 V)	+13 dBm
Junction temperature maximum (T_J)	+135 °C
Continuous PDiss (T= 85 °C)	676 mW
(derate 13.5 mW/°C above 85 °C)	
Thermal resistance, junction-to-case (θ_{JC})	74 °C/W
Thermal resistance, junction-to-ambient (θ_{JA})	107.56 °C/W
Storage temperature range	-65 °C to +150 °C
ESD Sensitivity (HBM)	Class 1A, Passed 250 V

4.2. Recommended Operating Conditions

Supply voltage (Vcc)	+4.75 V to +5.25 V
Ambient operating temperature range (T_A)	-40 °C to +85 °C

4.3. Nominal Operating Performance Characteristics 2/

Input Sensitivity near DC Operation (Square Wave input)	
0.01 to 0.2 GHz	-10 dBm to +10 dBm
0.2 to 0.5 GHz	-15 dBm to +10 dBm
Input Sensitivity near DC Operation (Sine Wave input)	
0.5 to 1 GHz	-15 dBm to +10 dBm
Output Transition Time (F_{OUT} = 882 MHz, P_{IN}= 0 dBm)	100 ps
Reverse Leakage (both outputs terminated)	-55 dB
SSB Phase Noise (100 kHz offset)	-153 dBc/Hz 3/

Radiation Features

Maximum total dose available (dose rate = 50 – 300 rads (Si)/s) …. 100k rads (Si)

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 are at T_A = 25 °C, Vcc = 5 V, unless otherwise noted.
3/ P_{IN} = 0 dBm, F_{IN} = 6 GHz

TABLE I – ELECTRICAL PERFORMANCE CHARACTERISTICS

Parameter See notes at end of table	Symbol	Conditions 1/ Unless otherwise specified	Sub-Group	Limits		Units
				Min	Max	
RF CHARACTERISTICS						
Input Frequency	F_{IN}		4,5,6	1	12	GHz
		M,D,P,L,R	4	1	12	
Output Power 4/	Pout	F_{IN} = 1 GHz P_{IN} = -15 dBm, +10 dBm	4,6	1		dBm
		M,D,P,L,R	4	1		
		F_{IN} = 1 GHz P_{IN} = -10 dBm, +10 dBm	5	1		
		F_{IN} = 3 GHz, 6 GHz P_{IN} = -15 dBm, +10 dBm	4,5,6	1		
		M,D,P,L,R	4	1		
		F_{IN} = 8 GHz P_{IN} = -15 dBm, +5 dBm	4,5,6	1		
		M,D,P,L,R	4	1		
		F_{IN} = 12 GHz P_{IN} = -15 dBm, 0 dBm	4,6	1		
		M,D,P,L,R	4	1		
		F_{IN} = 12 GHz P_{IN} = -15 dBm, -5 dBm	5	1		
SUPPLY CURRENT						
Supply Current	Icc	Vcc = 5.0 V	1,2,3		105	mA
		No RF M,D,P,L,R	1		105	
		Vcc = 4.75 V, 5.25 V 3/ No RF	1,2,3		105	mA
		Vcc = 5.0 V	1,2,3		105	mA
		P_{IN} = 0 dBm, F_{IN} = 1 GHz M,D,P,L,R	1		105	
		Vcc = 4.75 V, 5.25 V 3/ P_{IN} = 0 dBm, F_{IN} = 1 GHz	1,2,3		105	mA
Harmonic Content						
Feedthrough	FTHRU	P_{IN} = 0 dBm, F_{IN}= 6 GHz 2/ 3/	4,5,6		-24	dBm
2nd harmonic	2nd	P_{IN} = 0 dBm, F_{IN}= 6 GHz 2/ 3/	4,5,6		-31	dBm
3rd harmonic	3rd	P_{IN} = 0 dBm, F_{IN}= 6 GHz 2/ 3/	4,5,6		-4	dBm

TABLE I NOTES:

1/ Vcc = 5 V, T_A nom = 25 ºC, T_A max = 85 ºC, and T_A min = -40 ºC unless otherwise noted.

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

3/ Parameter is not tested post irradiation.

4/ Apply for both pin 5 and pin 7. Output power is single-ended.

TABLE IIA – ELECTRICAL TEST REQUIREMENTS

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

Table IIA Notes:
1/ PDA applies to Table I sub-group 1 and Table IIB delta parameters.
2/ See Table IIB for delta parameters
3/ Parameters noted in Table I are not tested post irradiation.

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

Parameter	Test Conditions	Symbol	Delta	Units
Supply Current	Vcc = 5.0 V No RF	Icc	±10.5	mA
Output Power 3/	Vcc = 5.0 V F_{IN} = 1 GHz, P_{IN} = -15 dBm F_{IN} = 1 GHz, P_{IN} = +10 dBm F_{IN} = 3 GHz, P_{IN} = -15 dBm F_{IN} = 3 GHz, P_{IN} = +10 dBm F_{IN} = 6 GHz, P_{IN} = -15 dBm F_{IN} = 6 GHz, P_{IN} = +10 dBm F_{IN} = 8 GHz, P_{IN} = -15 dBm F_{IN} = 8 GHz, P_{IN} = +5 dBm F_{IN} = 12 GHz, P_{IN} = -15 dBm F_{IN} = 12 GHz, P_{IN} = 0 dBm	Pout	±1	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_A = +25 °C only.

3/ Apply for both pin 5 and pin 7.

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.

5.2. Radiation Exposure Circuit

5.2.1. The radiation exposure circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing and acquiring activity upon request. Total dose irradiation testing shall be performed in accordance with MIL-STD-883 method 1019, condition A.

6.0 MIL-PRF-38535 QMLV Exceptions

6.1. Wafer Fabrication

Foundry information is available upon request.

6.2. Device Assembly

Device assembly occurs at ADI's Chelmsford, MA site.

7.0 Application Notes

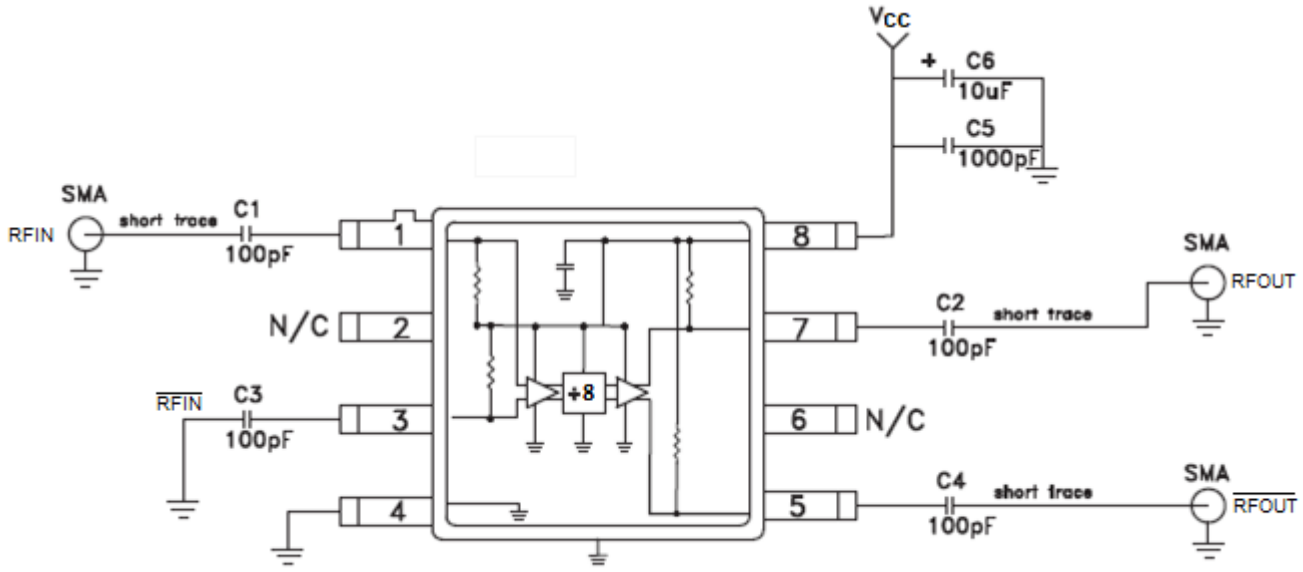


Figure 3 – Application Circuit

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
ADH363R701G8	–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	7/8/2020
B	Corrected Typo In Table IIB	8/4/2020
C	Corrected Typo In Table IIB, Added HBM ESD Level	12/9/2020

12/20