



MMIC Voltage-Variable Attenuator DC-20GHz Die

ADH346S

1.0 SCOPE

This specification documents the detail requirements for space qualified die per MIL-PRF-38534 class K except as modified herein.

The manufacturing flow described in the SPACE DIE BROCHURE is to be considered a part of this specification.

This datasheet specifically details the space grade version of this product. A more detailed operational description and a complete datasheet for commercial product grades can be found at www.analog.com/HMC346

2.0 Part Number. The complete part number(s) of this specification follow:

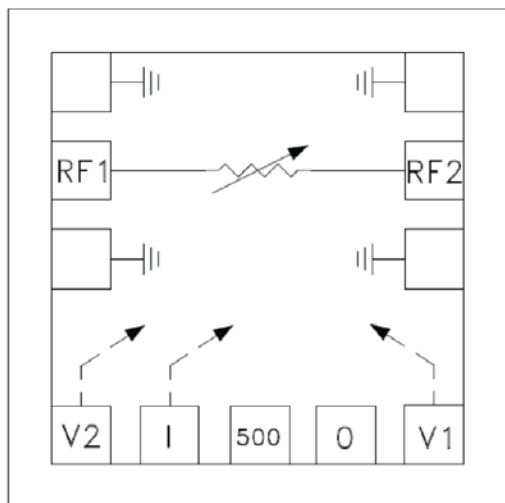
Part Number	Description
HMC8801	MMIC Voltage-Variable Attenuator DC-20GHz Die

3.0 Die Information

3.1 Die Dimensions

Die Size	Die Thickness	Bond Pad and Backside Metalization
33 mil x 33 mil	4 mil $\pm$ 0.5 mil	Au

3.2 Die Picture



1. RF1 Input (DC coupled, matched to 50 ohms) *
 2. RF2 Output (DC coupled, matched to 50 ohms) *
 3. V2 (Control input, master)
 4. I (Control input, slave)
 5. 500 (This pad must be DC grounded)
 6. V1 (Control input, master)
 7. O (DO NOT CONNECT)
- Die bottom must be connected to RF GND
 - No connection required for unlabeled bond pads

* Blocking capacitors required if RF line potential is not equal to 0V

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Rev. C

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One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700
Fax: 781.326.8703
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3.3	<u>Absolute Maximum Ratings</u> ^{1/}
	Control Voltage Range..... +1 to -5 VDC
	RF input power (RFIN).....+18 dBm
	Ambient Operating Temperature Range (T _A).....-40°C to +85°C
	Storage Temperature.....-65°C to +150°C
	ESD Sensitivity (HBM).....Class 1A

Absolute Maximum Ratings Notes:

- ^{1/} Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.

4.0 Die Qualification

In accordance with class-K version of MIL-PRF-38534, Appendix C, Table C-II, except as modified herein.

- (a) Pre-screen test post assembly required prior to die qualification, to remove all assembly related rejects.
- (b) Mechanical Shock or Constant Acceleration not performed; die qualification is performed in an open carrier.
- (c) Interim and post burn-in electrical tests will include static tests screened at +25°C only.

Table I - Dice Electrical Characteristics					
Parameter	Symbol	Conditions ^{1/} , ^{2/} , ^{3/} 50 Ω System	Limit Min	Limit Max	Units
Insertion Loss	IL	DC – 12 GHz 12 GHz – 20 GHz		2.0 2.5	dB
Attenuation Range	AR	DC – 12 GHz 12 GHz – 20 GHz	27 22		dB
Return Loss	RL	DC – 12 GHz 12 GHz – 20 GHz	6 10		dB

Table I Notes:

- ^{1/} Limits apply at +25°C only.
- ^{2/} Min and Max Attenuation tested only with VCTL = 0/-3 V.
- ^{3/} S-par data to be taken at 50 MHz, 1 GHz, 3 GHz, 6 GHz, 12 GHz, 16 GHz, and 20 GHz. Pin = -25 dBm

Table II - Electrical Characteristics for Qual Samples

Parameter	Symbol	Conditions <u>1/</u> , <u>2/</u> , <u>3/</u> , <u>4/</u> , <u>5/</u> -40°C ≤ T _A ≤ 85°C unless otherwise specified, 50 Ohm System	Sub- groups	Min Limit	Max Limit	Units
Insertion Loss	IL	DC – 12.0 GHz 12.0 – 20.0 GHz	4,5,6		2.0	dB
			4,5,6		2.5	
Attenuation Range	AR	DC – 12.0 GHz 12.0 – 20.0 GHz	4,5,6	27		dB
			4,5,6	22		
Return Loss	RL	DC – 12.0 GHz 12.0 – 20.0 GHz	4,5,6	6		dB
			4,5,6	10		
Input Power for 0.25dB Compression (Min Attenuation)	IP0.25dB	0.5 – 20.0 GHz	4,5,6	7		dBm
Input Third Order Intercept Point (Min Attenuation) Two-Tone Input Power -8dBm each tone, 1MHz tone separation	IIP3	DC – 12.0 GHz	4	20		dBm
			5,6	17		
		12.0 – 20.0 GHz	4	16		
			5,6	13		

Table II Notes:

- 1/ Pre burn-in and Post burn-in electrical require S-parameter testing only as defined. Final electrical tests shall incorporate power tests as defined.
- 2/ Temperature testing required for Final Electrical testing only
- 3/ Min and Max Attenuation tested only with VCTL = 0/-3V.
- 4/ S-par data to be tabulated at 50 MHz, 1 GHz, 3 GHz, 6 GHz, 12 GHz, 16 GHz, and 20 GHz. Pin = -25 dBm
- 5/ P0.25dB and IP3 shall be measured at 0.5 GHz, 3 GHz, 6 GHz, 12 GHz, and 20 GHz at Min Attenuation only

Table III - Endpoint and Delta Limits (+25°C)

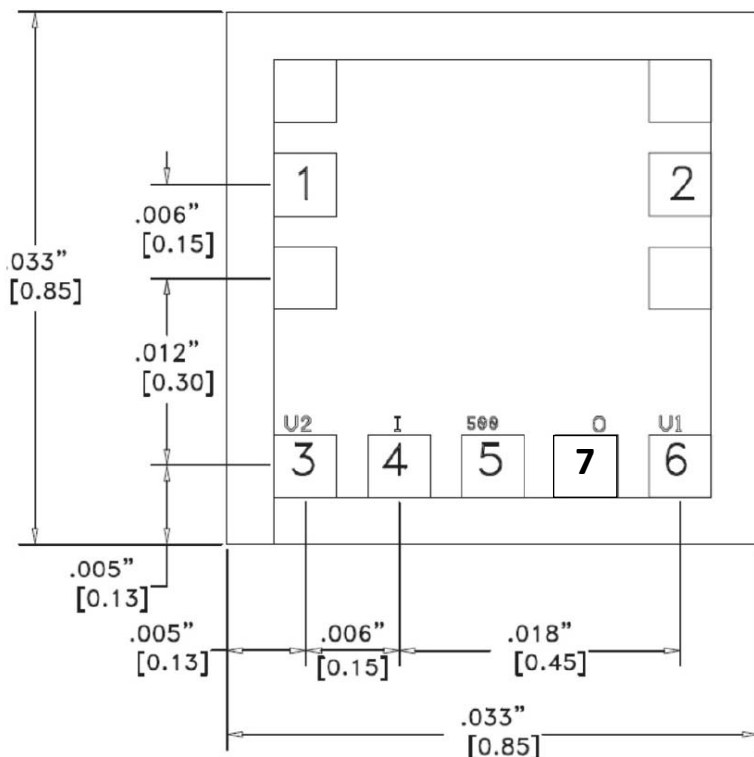
(Product is tested in accordance with Table II with the following exceptions)

Parameter	Symbol	Sub- groups	End-point		Delta	Units
			Min	Max		
Insertion Loss	IL	4		2.5	±1.0	dB

Table III Notes:

- 1/ Table II limits will not be exceeded
- 2/ 240 hour burn in and Group C end point electrical parameters. Deltas are performed at T_A = 25°C

5.0 Die Outline



1. RF1 Input (DC coupled, matched to 50 ohms)*
2. RF2 Output (DC coupled, matched to 50 ohms)*
3. V2 (Control input, master)
4. I (Control input, slave)
5. 500 (This pad must be DC grounded)
6. V1 (Control input, master)
7. O (DO NOT CONNECT)

- Die bottom must be connected to RF GND
- No connection required for unlabeled bond pads

* Blocking capacitors required if RF line potential is not equal to 0V

1. ALL DIMENSIONS ARE IN INCHES (MILLIMETERS).
2. TYPICAL BOND PAD IS .004" SQUARE.
3. TYPICAL BOND PAD SPACING IS .006" CENTER TO CENTER EXCEPT AS NOTED.
4. BACKSIDE METALIZATION: GOLD
5. BACKSIDE METAL IS GROUND
6. BOND PAD METALIZATION: GOLD

Rev	Description of Change	Date
A	Initiate	27-October-2015
B	Added Clarification to sections 3.2, 5.0 and Table II	11-December-2015
C	Added note to clarify test temperatures for interim and post burn-in electrical tests	5-June-2019