

### 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/HMC424](http://www.analog.com/HMC424)

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

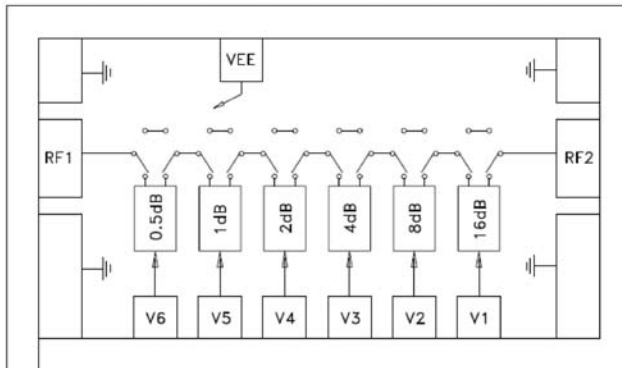
Part Number	Description
HMC8802	MMIC Digital Attenuator, DC-13GHz Die

### 3.0 Die Information

#### 3.1 Die Dimensions

Die Size	Die Thickness	Bond Pad Metalization
33 mil x 57 mil	4 mil $\pm$ 0.5 mil	Au

#### 3.2 Die Picture



1. RF1 (DC coupled, matched to 50 ohms)\*
  2. VEE (Supply Voltage, -5V  $\pm$  10%)
  3. RF2 (DC coupled, matched to 50 ohms)\*
  4. V1
  5. V2
  6. V3
  7. V4
  8. V5
  9. V6
- Die bottom must be connected to RF GND
  - \*Blocking capacitors are required if RF line potential is not equal to 0V

Control Voltage Input						Attenuation State RF1 – RF2
V1 (16 dB)	V2 (8 dB)	V3 (4 dB)	V4 (2 dB)	V5 (1 dB)	V6 (0.5 dB)	
Low	Low	Low	Low	Low	Low	Reference I.L.
Low	Low	Low	Low	Low	High	0.5 dB
Low	Low	Low	Low	High	Low	1 dB
Low	Low	Low	High	Low	Low	2 dB
Low	Low	High	Low	Low	Low	4 dB
Low	High	Low	Low	Low	Low	8 dB
High	Low	Low	Low	Low	Low	16 dB
High	High	High	High	High	High	31.5 dB

Note: Any combination of the above states will provide an attenuation approximately equal to the sum of the bits selected

### 3.3 Absolute Maximum Ratings 1/

Control Voltage Range.....	VEE - 0.5 VDC
Bias Voltage (VEE) .....	-7 VDC
Channel Temperature .....	150°C
RF Input Power (0.5 to 13 GHz) .....	+25 dBm
Thermal Resistance (Junction to Die Bottom) .....	330°C /W
Ambient Operating Temperature Range (T <sub>A</sub> ).....	-40°C to +85°C
Storage Temperature.....	-65°C to +150°C

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/, 4/ 50 Ω System	Limit Min	Limit Max	Units
Insertion Loss	IL	DC – 8.0 GHz 8 – 13.0 GHz		3.8 4.6	dB
Attenuation Range	AR	DC – 13.0 GHz	29.3	33.7	dB
Return Loss (RF1 & RF2 All Attenuation States)	RL	DC – 8.0 GHz 8 – 13.0 GHz	8 9		dB
Attenuation Accuracy: (Referenced to Insertion Loss) 0.5 -7.5 dB States 8 – 31.5 dB States	Acc	DC – 13.0 GHz DC – 13.0 GHz		±0.3 +4% of Atten Setting Max ±0.3 + 6% of Atten Setting Max	dB
IEE	IEE	DC – 13 GHz		4	mA

Table I Notes:

1/ Limits apply at +25°C only.

2/ Tested with VEE = -5V, V1-V6 Low = -3V, High = -4.2V

3/ S-par data to be tabulated at 250 MHz, 1 GHz, 3 GHz, 5 GHz, 9 GHz, 11 GHz, and 13 GHz. Pin = -25 dBm

4/ Measure major attenuation states only

<b>Table II - Electrical Characteristics for Qual Samples</b>						
Parameter	Symbol	Conditions <u>1/</u> <u>2/</u> <u>3/</u> <u>4/</u> <u>5/</u> <u>6/</u> -40°C ≤ T <sub>A</sub> ≤ 85°C unless otherwise specified, 50 Ohm System	Sub- groups	Min Limit	Max Limit	Units
Insertion Loss	IL	DC – 8.0 GHz 8.0 – 13.0 GHz	4,5,6		3.8	dB
			4,5,6		4.6	
Attenuation Range	AR	DC – 13.0 GHz	4,5,6	29.3	33.7	dB
Return Loss (RF1 & RF2 All Attenuation States)	RL	DC – 8.0 GHz 8.0 – 13.0 GHz	4,5,6	8		dB
			4,5,6	10		
Attenuation Accuracy: (Referenced to Insertion Loss)  0.5 - 7.5dB States 8 – 31.5 dB States	Acc	DC – 13 GHz DC – 13 GHz  DC – 13 GHz DC – 13 GHz	4,5,6	±0.3 + 4% of Atten. Setting Max		dB
			4,5,6	±0.3 + 6% of Atten. Setting Max		
Input Power for 0.1dB Compression (REF State)	IP0.1dB	1.0 – 13.0 GHz	4	22		dBm
			5,6	17		
Input Third Order Intercept Point (REF State) Two-Tone Input Power = 0dBm each tone, 1MHz tone separation	IIP3	1.0 – 13.0 GHz	4	38		dBm
			5,6	34		
IEE	IEE	DC – 13 GHz	4,5,6		5	mA

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/ Tested with VEE = -5V, V1-V6 Low = -3V, High = -4.2V
- 4/ Measure major attenuation states only
- 5/ S-par data to be tabulated at 250 MHz, 1 GHz, 3 GHz, 5 GHz, 9 GHz, 11 GHz, and 13 GHz. Pin = -25 dBm
- 6/ P0.1dB and IP3 shall be tabulated at 1 GHz, 3 GHz, 5 GHz, 9 GHz, and 11 GHz

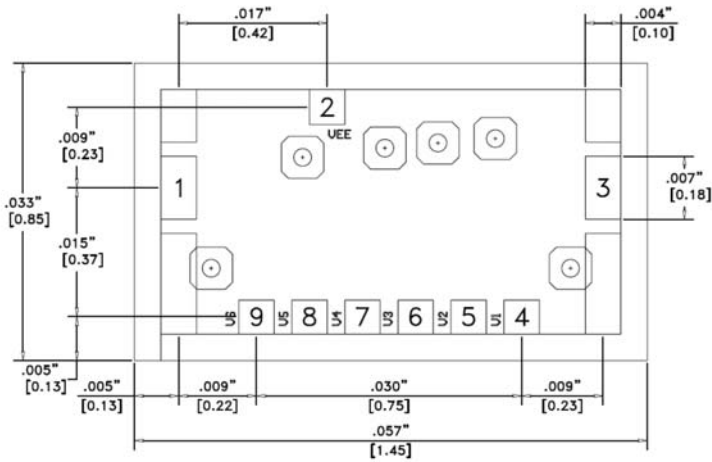
<b>Table III - Endpoint and Delta Limits (+25°C)</b>					
<b>(Product is tested in accordance with Table II with the following exceptions)</b>					
Parameter	Sub- groups	End-point		Delta	Units
		Min	Max		
Insertion Loss	4		4.6	±1.0	dB
IEE (Biased at -5V)	1		5	±10	%

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<sub>A</sub> = 25°C

# ADH424S

## 5.0 Die Outline



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

1. RF1 (DC coupled, matched to 50 ohms)\*
  2. VEE (Supply Voltage, -5V ±10%)
  3. RF2 (DC coupled, matched to 50 ohms)\*
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  7. V4
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  9. V6
- Die bottom must be connected to RF GND
  - \*Blocking capacitors are required if RF line potential is not equal to 0V

Rev	Description of Change	Date
A	Initiate	26-October-2015
B	Added Clarification to sections 3.2, 3.3 and 5.0. Adding IEE parameter to Tables I and II. Remove symbol Column from Tables I, II and III	11-December-2015
C	Add note to clarify exception for temperatures for interim and post burn-in electrical tests. Remove exception notes for maximum die qual temperature and for sample size and qual acceptance criteria.	4-June-2019