



AH114

¼ Watt, High Linearity InGaP HBT Amplifier

The Communications Edge™

Product Information

Product Features

- 60 – 2500 MHz
- +24 dBm P1dB
- +41 dBm Output IP3
- 19 dB Gain @ 900 MHz
- 14.5 dB Gain @ 1900 MHz
- Single Positive Supply (+5V)
- SOT-89 SMT Package

Applications

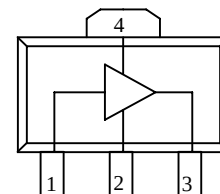
- Final stage amplifiers for Repeaters
- Mobile Infrastructure
- CATV / DBS
- Defense / Homeland Security

Product Description

The AH114 is a high dynamic range driver amplifier in a low-cost surface mount package. The InGaP/GaAs HBT is able to achieve high performance across a broad range with +41 dBm OIP3 and +24 dBm of compressed 1dB power. It is housed in an industry standard SOT-89 SMT package. All devices are 100% RF and DC tested.

The AH114 is targeted for use as a driver amplifier in wireless infrastructure where high linearity and medium power is required. An internal active bias allows the AH114 to maintain high linearity over temperature and operate directly off a single +5 V supply. This combination makes the device an excellent candidate for transceiver line cards in current and next generation multi-carrier 3G base stations.

Functional Diagram



Function	Pin No.
Input / Base	1
Output / Collector	3
Ground	2, 4

Specifications

Parameters	Units	Min	Typ	Max
Frequency Range	MHz	60	1900	2500
S21 - Gain	dB	13.5	14.5	
S11 - Input R.L.	dB		-10	
S22 - Output R.L.	dB		-14	
Output P1dB	dBm		+23	
Output IP3	dBm		+41	
IS-95A Channel Power @ -45 dBc ACPR	dBm		+17	
Noise Figure	dB		5.0	
Operating Current Range	mA	135	150	165
Device Voltage	V		+5	

Test conditions unless otherwise noted.

1. T = 25°C, V_{supply} = +5 V, Frequency = 1900 MHz, in tuned application circuit.
2. 3OIP measured with two tones at an output power of +11 dBm/tone separated by 1 MHz. The suppression on the largest IM3 product is used to calculate the 3OIP using a 2:1 rule.

Typical Performance

Parameters	Units	Typical		
Frequency	MHz	900	1900	2140
S21 - Gain	dB	19	14.5	14
S11 - Input R.L.	dB	-14	-10	-25
S22 - Output R.L.	dB	-10	-14	-20
Output P1dB	dBm	+24	+23	+23
Output IP3	dBm	+40	+41	+40
Noise Figure	dB	5.0	5.0	6.0
Supply Bias		+5 V @ 150 mA		

Typical parameters reflect performance in a tuned application circuit:
Supply Voltage = +5 V, I = 150 mA, +25° C

Absolute Maximum Rating

Parameters	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-65 to +150 °C
RF Input Power (continuous)	+12 dBm
Device Voltage	+6 V
Device Current	220 mA

Operation of this device above any of these parameters may cause permanent damage.

Ordering Information

Part No.	Description
AH114-89	¼ Watt, High Linearity InGaP HBT Amplifier
AH114-89PCB900	900 MHz Evaluation Board
AH114-89PCB1900	1900 MHz Evaluation Board
AH114-89PCB2140	2140 MHz Evaluation Board

Specifications and information are subject to change without notice



AH114

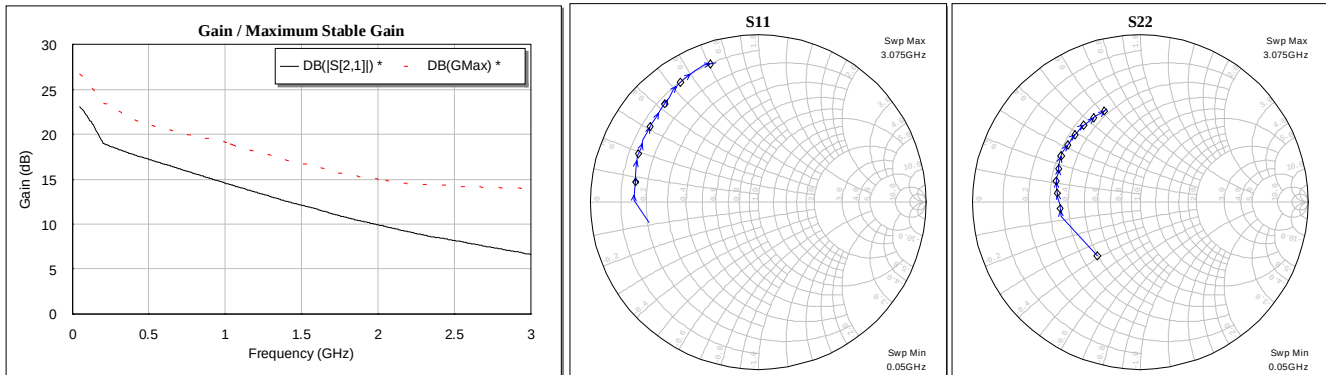
1/4 Watt, High Linearity InGaP HBT Amplifier

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Product Information

Typical Device Data

S-Parameters ($V_{DS} = +5\text{ V}$, $I_{DS} = 150\text{ mA}$, $T = 25^\circ\text{C}$, unmatched 50 ohm system)



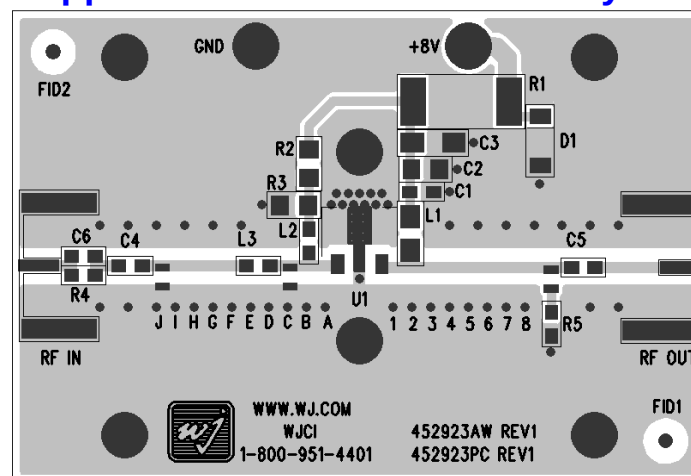
Notes:

The gain for the unmatched device in 50 ohm system is shown as the trace in black color. For a tuned circuit for a particular frequency, it is expected that actual gain will be higher, up to the maximum stable gain. The maximum stable gain is shown in the dashed red line. The return loss plots are shown from 50 – 3000 MHz, with markers placed at 0.5 – 3.0 GHz in 0.5 GHz increments.

S-Parameters ($V_{DS} = +5\text{ V}$, $I_{DS} = 150\text{ mA}$, $T = 25^\circ\text{C}$, unmatched 50 ohm system, calibrated to device leads)

Freq (MHz)	S11 (dB)	S11 (ang)	S21 (dB)	S21 (ang)	S12 (dB)	S12 (ang)	S22 (dB)	S22 (ang)
50	-3.61	-169.14	23.08	149.67	-30.46	17.14	-7.74	-128.38
100	-3.31	-173.35	21.93	148.90	-29.57	14.05	-7.80	-143.29
200	-2.62	179.12	19.02	146.43	-27.97	9.40	-6.40	-169.43
400	-2.62	173.23	17.74	136.11	-27.96	10.86	-6.33	-179.95
600	-2.54	168.30	16.69	123.77	-27.96	10.86	-6.09	173.78
800	-2.39	163.31	15.62	111.53	-27.96	10.62	-5.86	168.37
1000	-2.27	158.06	14.57	101.13	-26.02	9.88	-5.68	163.12
1200	-2.21	152.89	13.55	91.40	-26.02	8.87	-5.58	157.73
1400	-2.16	147.55	12.54	82.69	-26.02	7.57	-5.37	152.46
1600	-2.05	142.54	11.65	74.35	-26.02	5.95	-5.20	147.09
1800	-1.99	137.85	10.70	66.99	-25.08	4.22	-5.20	141.71
2000	-1.84	133.47	9.91	59.96	-24.44	2.37	-5.05	136.43
2200	-1.68	129.41	9.13	53.84	-24.44	0.24	-5.01	131.29
2400	-1.46	125.20	8.46	47.68	-24.44	-2.39	-4.89	126.16
2600	-1.33	120.48	7.85	41.30	-23.27	-5.53	-4.88	121.19
2800	-1.20	115.03	7.22	34.74	-23.10	-9.13	-4.73	116.28
3000	-1.17	109.05	6.62	27.78	-23.10	-12.86	-4.66	111.40

Application Circuit PC Board Layout



Circuit Board Material: .014" Getek, 4 layers (other layers added for rigidity), .062" total thickness, 1 oz copper
Microstrip line details: width = .026", spacing = .026"

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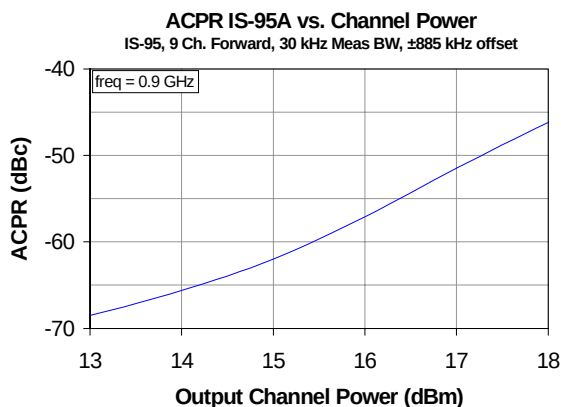
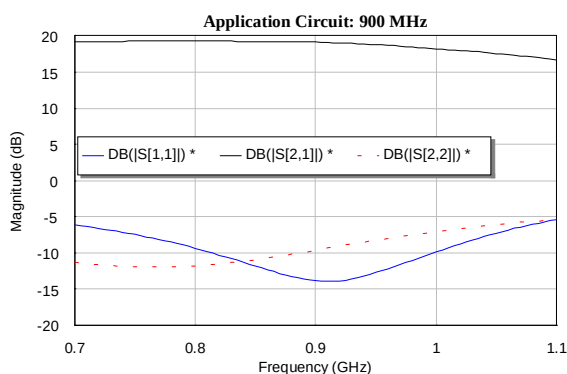
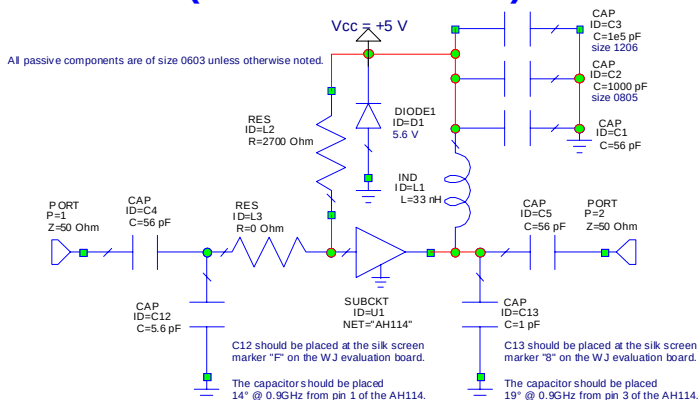
Product Information

900 MHz Application Circuit (AH114-89PCB900)

Typical RF Performance

Frequency	900 MHz
S21 – Gain	19 dB
S11 – Input Return Loss	-14 dB
S22 – Output Return Loss	-10 dB
Output IP3 (+11 dBm / tone, 1 MHz spacing)	+40 dBm
Output P1dB	+24 dBm
Noise Figure	5.0 dB
Supply Voltage	+5 V
Supply Current	150 mA

Measured parameters were taken at 25 °C.

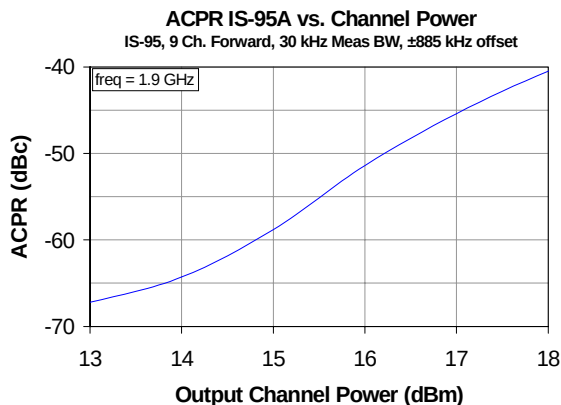
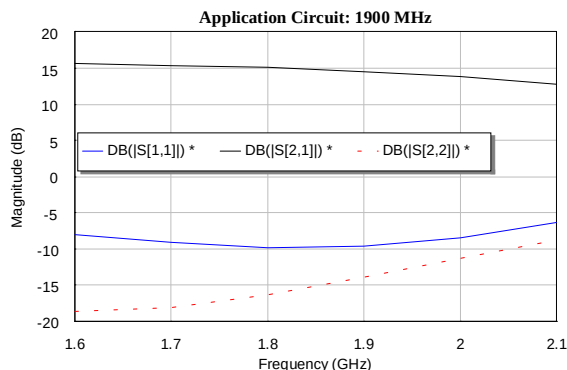
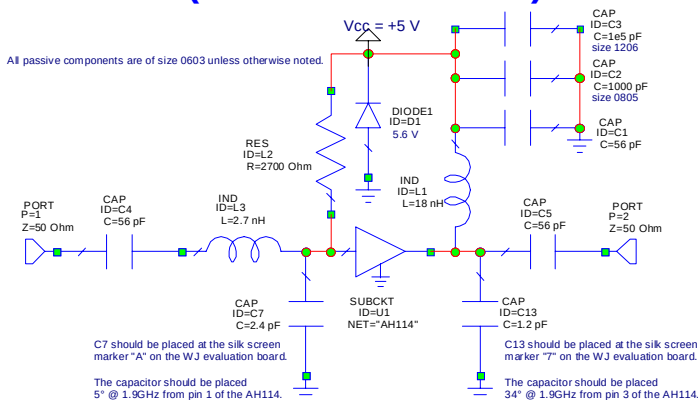


1900 MHz Application Circuit (AH114-89PCB1900)

Typical RF Performance

Frequency	1900 MHz
S21 – Gain	14.5 dB
S11 – Input Return Loss	-10 dB
S22 – Output Return Loss	-14 dB
Output IP3 (+11 dBm / tone, 1 MHz spacing)	+41 dBm
Output P1dB	+23 dBm
Noise Figure	5.0 dB
Supply Voltage	+5 V
Supply Current	150 mA

Measured parameters were taken at 25 °C.



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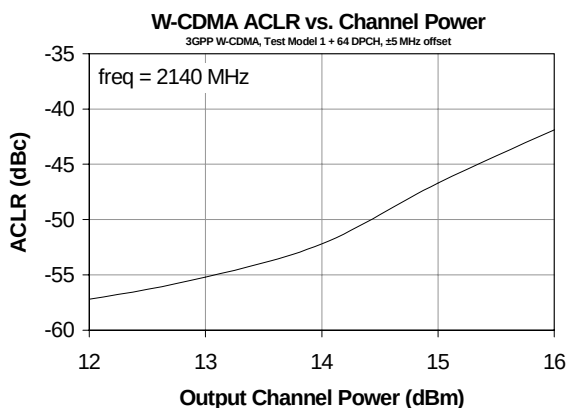
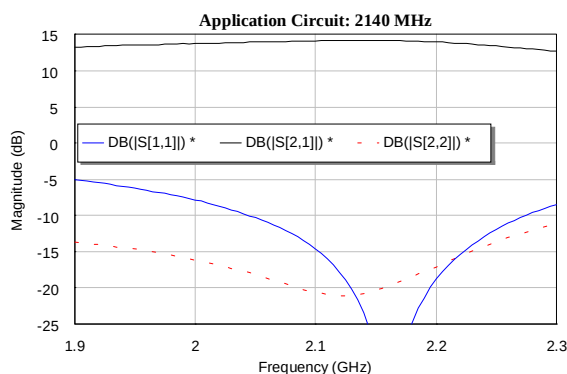
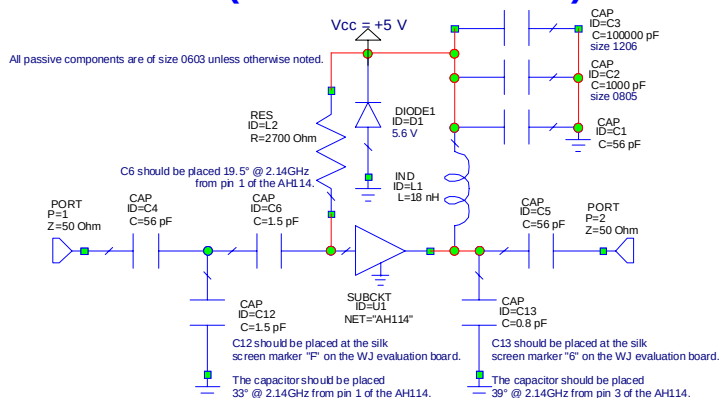
Product Information

2140 MHz Application Circuit (AH114-89PCB2140)

Typical RF Performance

Frequency	2140 MHz
S21 – Gain	14 dB
S11 – Input Return Loss	-25 dB
S22 – Output Return Loss	-20 dB
Output IP3 (+11 dBm / tone, 1 MHz spacing)	+23 dBm
Output P1dB	+40 dBm
Noise Figure	6.0 dB
Supply Voltage	+5 V
Supply Current	150 mA

Measured parameters were taken at 25 °C.

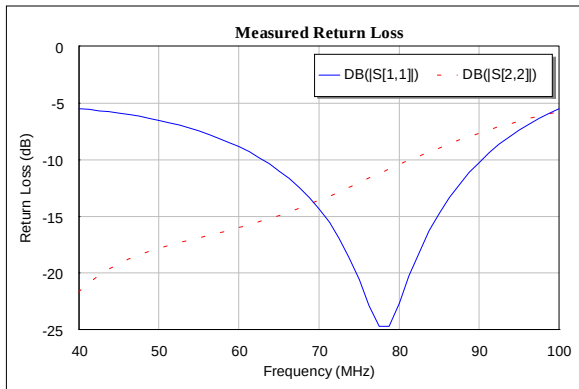
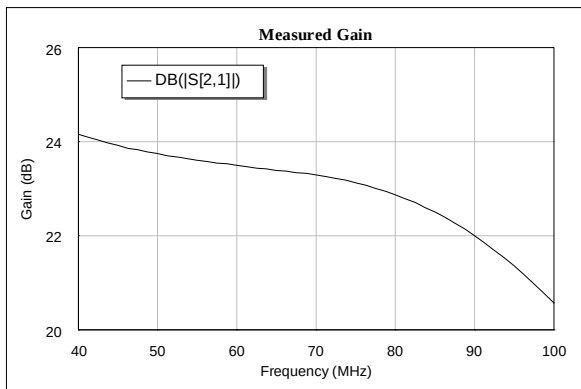
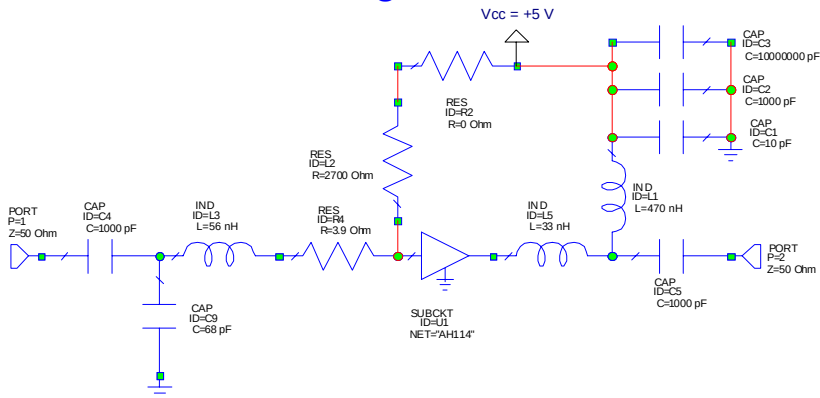


70 MHz Reference Design

Typical RF Performance

Frequency	70 MHz
S21 – Gain	23.4 dB
S11 – Input Return Loss	-15 dB
S22 – Output Return Loss	-14 dB
Output IP3 (+11 dBm / tone, 1 MHz spacing)	+44.5 dBm
Output P1dB	+23.8 dBm
Noise Figure	6.5 dB
Supply Voltage	+5 V
Supply Current	150 mA

Measured parameters were taken at 25 °C.



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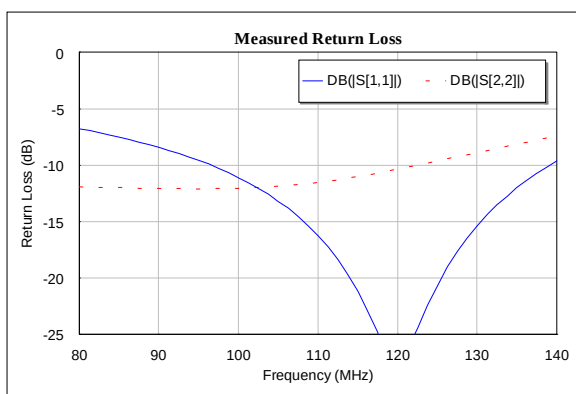
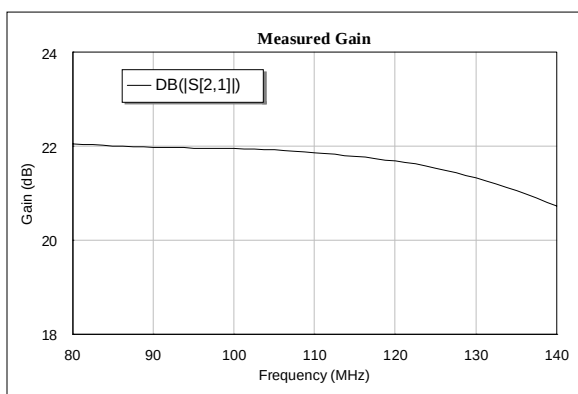
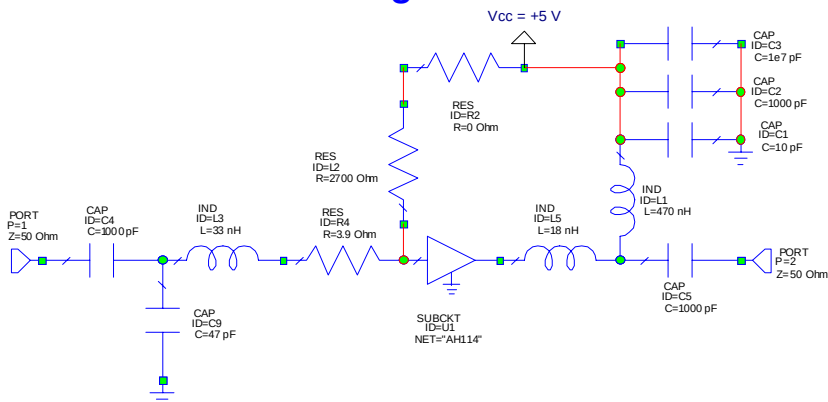
Product Information

110 MHz Reference Design

Typical RF Performance

Frequency	110 MHz
S21 – Gain	21.9 dB
S11 – Input Return Loss	-16 dB
S22 – Output Return Loss	-12 dB
Output IP3 (+11 dBm / tone, 1 MHz spacing)	+44 dBm
Output P1dB	+23.8 dBm
Noise Figure	6.6 dB
Supply Voltage	+5 V
Supply Current	150 mA

Measured parameters were taken at 25 °C.



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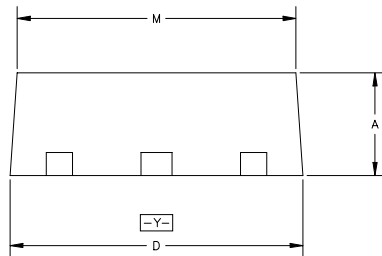
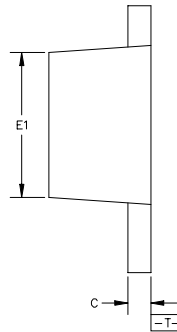
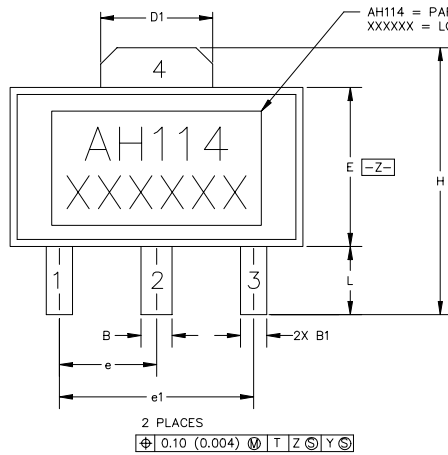
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Product Information

Outline Drawing



NOTES:

1. DIMENSIONS CONFORM WITH JEDEC TO-243C EXCEPT WHERE INDICATED.
2. DIMENSIONS ARE EXPRESSED IN MILLIMETERS (INCHES).
3. DIMENSIONING AND TOLERANCING IAW ANSI Y14.5M

SYMBOL	MIN	MAX
A	1.40 (.055)	1.60 (.063)
B	.44 (.017)	.56 (.022)
B1	.36 (.014)	.48 (.019)
C	.35 (.014)	.44 (.017)
D	4.40 (.173)	4.60 (.181)
D1	1.62 (.064)	1.83 (.072)
E	2.29 (.090)	2.60 (.102)
E1	2.01 (.079)	2.29 (.090)
e	1.50 BSC (.059)	
e1	3.00 BSC (.118)	
H	3.94 (.155)	4.25 (.167)
L	.89 (.035)	1.20 (.047)
M	4.04 (.159)	4.19 (.165)

Product Marking

The component will be marked with an "AH114" designator with an alphanumeric lot code on the top surface of the package. Tape and reel specification for this part is located on the website in the "Application Notes" section.

ESD / MSL Information

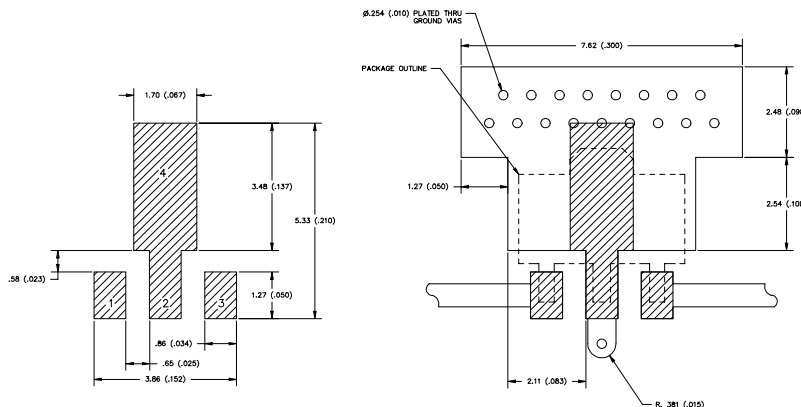
ESD Rating: Class 1A
 Test: Human Body Model (HBM)
 Standard: JEDEC Standard JESD22-A114

MSL Rating: Level 3 at +235° C convection reflow
 Standard: JEDEC Standard J-STD-020A

Mounting Config. Notes

1. Ground / thermal vias are critical for the proper performance of this device. Vias should use a .35mm (#80 / .0135") diameter drill and have a final plated thru diameter of .25 mm (.010").
2. Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.
3. Mounting screws can be added near the part to fasten the board to a heatsink. Ensure that the ground / thermal via region contacts the heatsink.
4. Do not put solder mask on the backside of the PC board in the region where the board contacts the heatsink.
5. RF trace width depends upon the PC board material and construction.
6. Use 1 oz. Copper minimum.
7. All dimensions are in millimeters (inches). Angles are in degrees.

Land Pattern

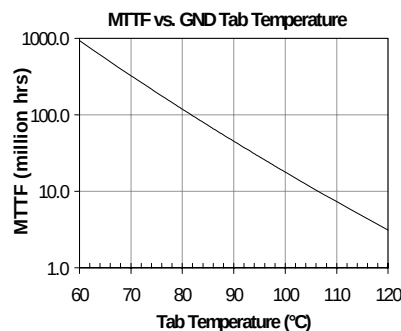


Thermal Specifications

Parameter	Rating
Operating Case Temperature	-40 to +85° C
Thermal Resistance ¹	149° C / W
Junction Temperature ²	197° C

Notes:

1. The thermal resistance is referenced from the junction-to-case at a case temperature of 85° C.
2. This corresponds to the typical biasing condition of +5V, 150 mA at an 85° C case temperature. A minimum MTTF of 1 million hours is achieved for junction temperatures below 247° C.



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