

Product Features

- 50 – 1500 MHz
- +47 dBm Output IP3
- 13.5 dB Gain
- +26.5 dBm P1dB
- MTTF > 1000 Years
- Internally Matched
- Single +9 V Supply
- Lead-free/Green/RoHS-compliant SOT-89 Package

Applications

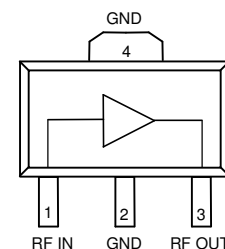
- Mobile Infrastructure
- CATV / DBS
- Defense / Homeland Security

Product Description

The AH101 is a medium power gain block that offers excellent dynamic range in a low-cost surface mount package. The combination of a single supply voltage and an internally matched device makes it ideal for both narrow and broadband applications. Only dc blocking and bypass capacitors as well as an RF choke are required for operation.

Superior thermal design allows the product to achieve +46 dBm IP3 performance at a mounting temperature of +85 °C with an associated MTTF of greater than 1000 years. The AH101 is available in the environmentally-friendly lead-free/green/RoHS-compliant SOT-89 package. The broadband amplifier uses a high reliability GaAs MESFET technology and is targeted for applications where high linearity is required.

Functional Diagram



| Function | Pin No. |
|---------------|---------|
| Input | 1 |
| Ground | 2 |
| Output / Bias | 3 |
| Ground | 4 |

Specifications ⁽¹⁾

| Parameter | Units | Min | Typ | Max |
|---------------------------|-------|-----|-------|------|
| Operational Bandwidth | MHz | 50 | | 1500 |
| Test Frequency | MHz | | 800 | |
| Gain | dB | 12 | 13.5 | |
| Input Return Loss | dB | | 20 | |
| Output Return Loss | dB | | 15 | |
| Output IP3 ⁽²⁾ | dBm | +43 | +47 | |
| Output P1dB | dBm | | +26.5 | |
| Noise Figure | dB | | 3.5 | |
| Operating Current Range | mA | 170 | 200 | 230 |
| Supply Voltage | V | | +9 | |

1. Test conditions unless otherwise noted: T = 25 °C, Vdd = +9 V in a 50 ohm test fixture.
 2. OIP3 is measured with two tones at an output power of +8 dBm/tone separated by 10 MHz. The suppression on the largest IM3 product is used to calculate the OIP3 using a 2:1 rule.

Typical Performance

| Parameter | Units | Typical | | | |
|---------------------------|-------|---------|-------|-------|------|
| Frequency | MHz | 50 | 450 | 900 | 1500 |
| Gain | dB | 13.6 | 13.8 | 13.5 | 12.7 |
| S11 | dB | -23 | -27 | -21 | -14 |
| S22 | dB | -8 | -14 | -18 | -16 |
| Output P1dB | dBm | +26.1 | +26.5 | +26.5 | +25 |
| Output IP3 ⁽²⁾ | dBm | +45 | +47 | +47 | +47 |
| Output IP2 | dBm | +63 | +63 | +60 | +59 |
| Noise Figure | dB | 4.4 | 3.4 | 3.6 | 4.2 |
| Supply Current | mA | | 200 | | |
| Supply Voltage | V | | +9 | | |

Absolute Maximum Rating

| Parameter | Rating |
|-----------------------------|----------------|
| Operating Case Temperature | -40 to +85 °C |
| Storage Temperature | -55 to +150 °C |
| DC Voltage | +11 V |
| RF Input Power (continuous) | +18 dBm |
| Junction Temperature | 220 °C |

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

Ordering Information

| Part No. | Description |
|-----------|--|
| AH101-G | Med. Power High Linearity Amplifier (lead-free/green/RoHS-compliant SOT-89 Pkg) |
| AH101-PCB | 50-1500 MHz Fully Assembled Evaluation Board |

Specifications and information are subject to change without notice



AH101

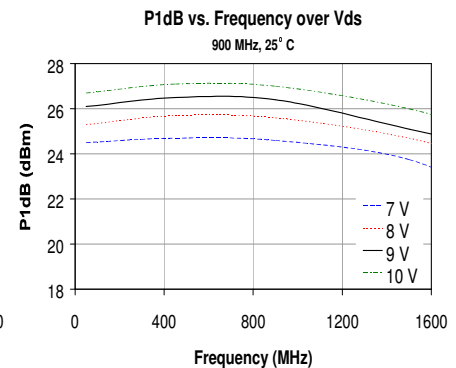
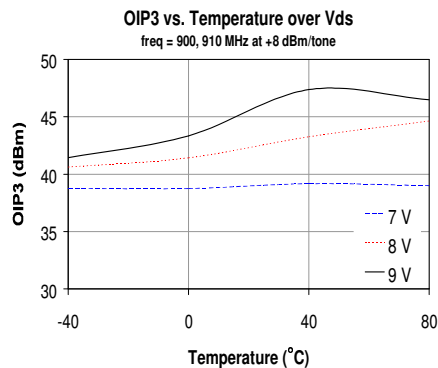
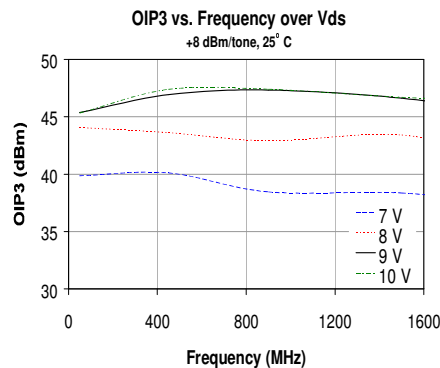
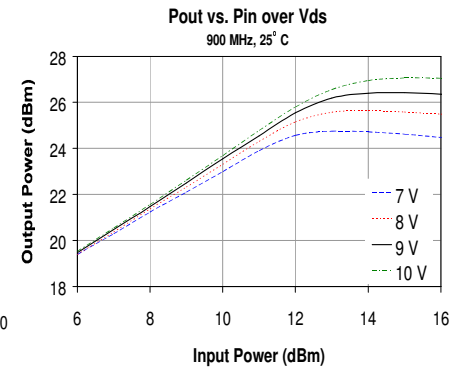
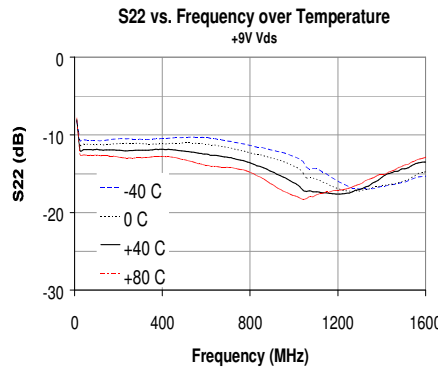
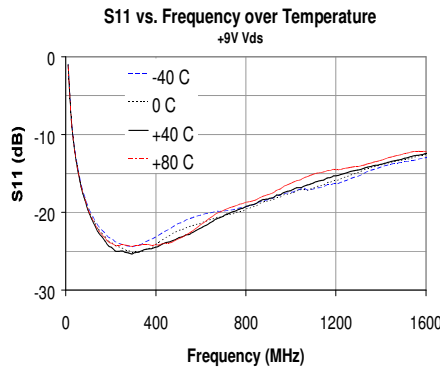
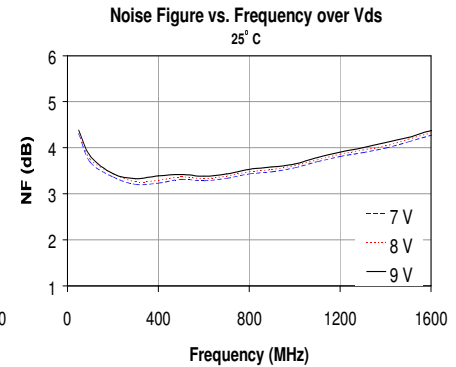
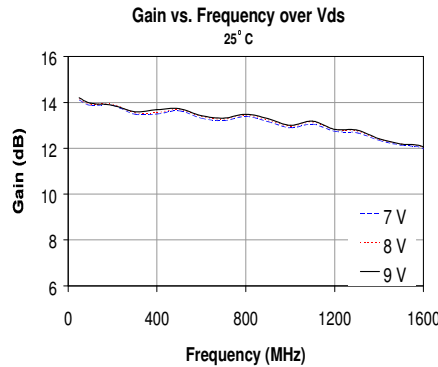
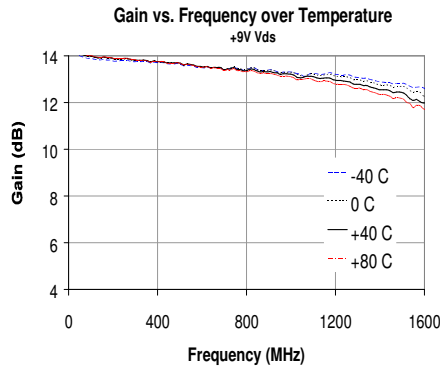
Medium Power, High Linearity Amplifier

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Product Information

Typical Device Data

$V_{DS} = +9\text{ V}$, $I_{DS} = 200\text{ mA}$, $T = 25^\circ\text{C}$, unmatched 50 ohm system



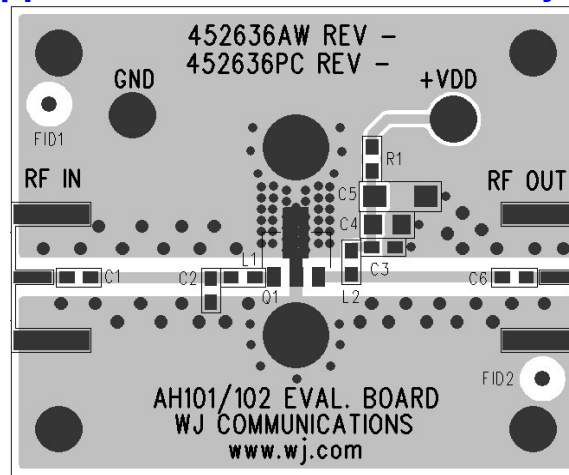
S-Parameters ($V_{DS} = +9\text{ V}$, $I_{DS} = 200\text{ mA}$, $T = 25^\circ\text{C}$, unmatched 50 ohm system, calibrated to device leads)

| Freq (MHz) | S11 (dB) | S11 (ang) | S21 (dB) | S21 (ang) | S12 (dB) | S12 (ang) | S22 (dB) | S22 (ang) |
|------------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 50 | -18.92 | -60.71 | 13.78 | 168.24 | -19.25 | 4.11 | -14.51 | -160.07 |
| 100 | -22.31 | -52.06 | 13.63 | 169.87 | -19.13 | 0.17 | -14.86 | -177.29 |
| 200 | -23.85 | -47.09 | 13.50 | 166.42 | -19.17 | -5.09 | -15.22 | 164.61 |
| 400 | -23.32 | -62.31 | 13.48 | 157.06 | -19.28 | -12.63 | -14.83 | 140.14 |
| 600 | -21.73 | -77.34 | 13.32 | 146.40 | -19.36 | -19.07 | -14.55 | 118.64 |
| 800 | -20.76 | -90.04 | 13.19 | 135.74 | -19.47 | -25.94 | -14.02 | 97.71 |
| 1000 | -19.65 | -105.39 | 13.05 | 124.67 | -19.74 | -33.10 | -13.40 | 80.17 |
| 1200 | -18.62 | -121.62 | 12.94 | 114.96 | -20.07 | -39.77 | -12.95 | 63.09 |
| 1400 | -17.32 | -131.81 | 12.76 | 104.01 | -20.36 | -45.37 | -12.44 | 47.65 |
| 1600 | -16.53 | -141.33 | 12.55 | 93.98 | -20.44 | -53.24 | -12.02 | 31.14 |

Specifications and information are subject to change without notice



Application Circuit PC Board Layout

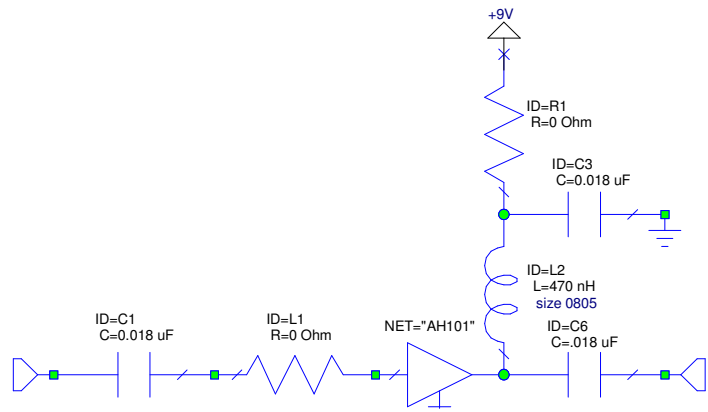


Circuit Board Material: .014" Getek ($\epsilon_r=4.2$), four layer, 1 oz copper
Microstrip line details: width = .026", spacing = .026"

Application Circuit: 900 MHz (AH101-PCB)

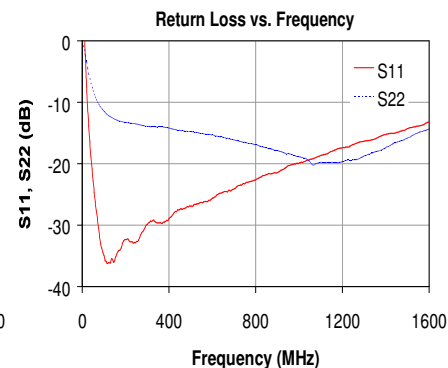
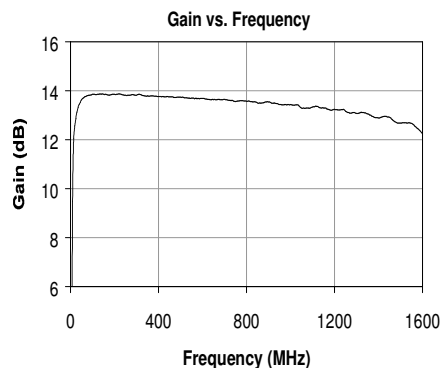
Typical RF Performance at 25°C

| Frequency | Units | 50 | 450 | 900 | 1500 |
|---------------------------|-------|-------|-------|-------|------|
| Gain | dB | 13.6 | 13.8 | 13.5 | 12.7 |
| S11 | dB | -23 | -27 | -21 | -14 |
| S22 | dB | -8 | -14 | -18 | -16 |
| Output P1dB | dBm | +26.1 | +26.5 | +26.5 | +25 |
| Output IP3 ⁽²⁾ | dBm | +45 | +47 | +47 | +47 |
| Output IP2 | dBm | +63 | +63 | +60 | +59 |
| Noise Figure | dB | 4.4 | 3.4 | 3.6 | 4.2 |
| Supply Voltage | V | 9 | | | |
| Supply Current | mA | 200 | | | |



Notes:

1. The amplifier should be connected directly to a +9 V regulator; no dropping resistor is required.
2. If no DC signal is present at the input (pin 1), C1 can be removed. The gate (input pin) is internally grounded in the amplifier.
3. R1, C2, and L1 are used as placeholders for a different device on the same PCB layout. They are not needed for the AH101.
3. Component sizes are 0603 unless otherwise noted.



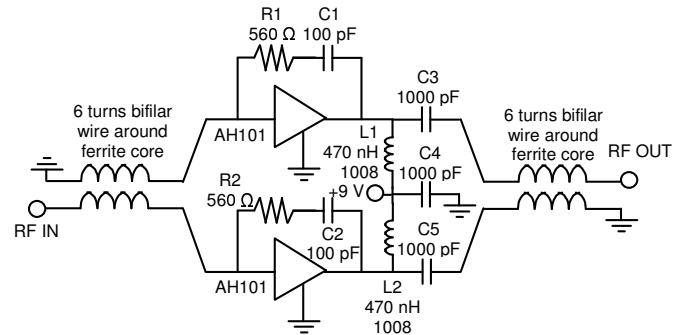


AH101 CATV Push-Pull Reference Design

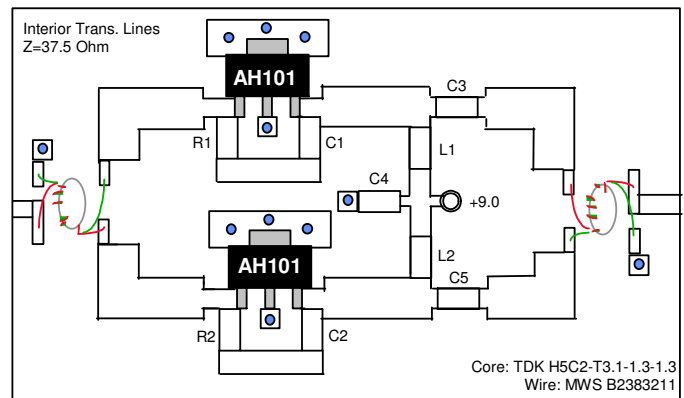
| Frequency | MHz | 50 | 450 | 750 | 860 |
|---------------------|-----|--------------|------|------|------|
| S21 | dB | 11.4 | 10.8 | 10.4 | 10.2 |
| S11 | dB | -17 | -19 | -19 | -25 |
| S22 | dB | -17 | -20 | -16 | -14 |
| OIP2 ⁽²⁾ | dBm | 84 | | | |
| OIP3 ⁽³⁾ | dBm | | | | 50 |
| Noise Figure | dB | 6 | 5.1 | 5.3 | 5.4 |
| CSO ⁽⁴⁾ | dBc | -83.3 | | | |
| CTB ⁽⁴⁾ | dBc | -68.6 | | | |
| Supply Bias | | 9 V @ 200 mA | | | |

Notes:

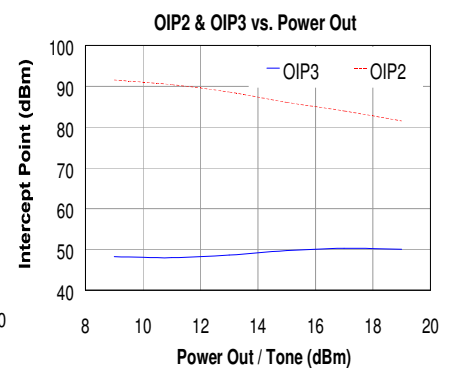
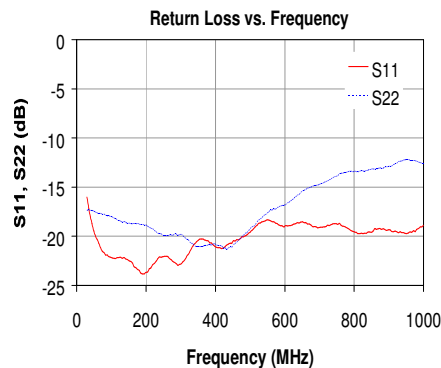
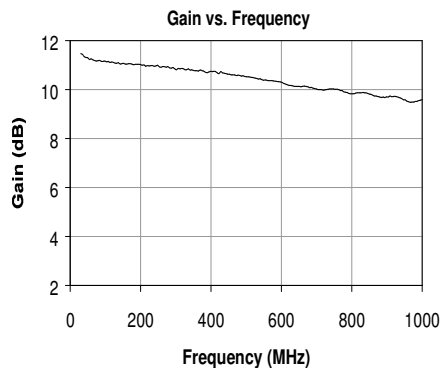
- Parameters reflect performance in the 75Ω push-pull application circuit.
- OIP2 is measured with +17 dBm at the fundamental.
- OIP3 is measured with 2 tones at +17 dBm/tone with 10 MHz spacing.
- 77 Channels Flat Loading, Pin = 34 dBmV / channel.



FR4 Board Layout (T=28 mils to ground plane)



The AH101 should be thermally mounted according to what is shown in the datasheet.





AH101

Medium Power, High Linearity Amplifier

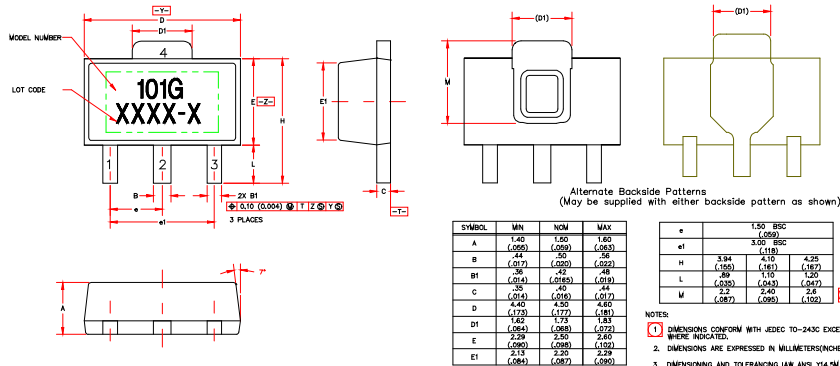
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Product Information

AH101-G (Green / Lead-free SOT-89 Package) Mechanical Information

This package is lead-free/Green/RoHS-compliant. It is compatible with both lead-free (maximum 260 °C reflow temperature) and leaded (maximum 245 °C reflow temperature) soldering processes. The plating material on the leads is NiPdAu.

Outline Drawing

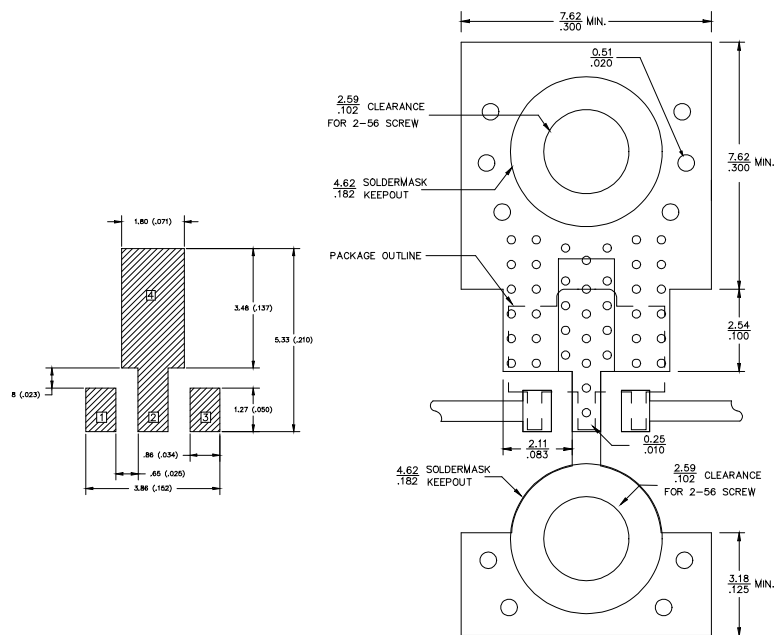


Product Marking

The AH101-G will be marked with an "101G" designator. An alphanumeric lot code ("XXXX-X") is also marked below the part designator on the top surface of the package. The obsolete tin-lead package is marked with an "AH101" designator followed by an alphanumeric lot code.

Tape and reel specifications for this part are located on the website in the "Application Notes" section.

Land Pattern



MSL / ESD Rating



Caution! ESD sensitive device.

ESD Rating: Class 1C

Value: Passes ≥ 1000V min.

Test: Human Body Model (HBM)

Standard: JEDEC Standard JESD22-A114

ESD Rating: Class IV

Value: Passes ≥ 1000V min.

Test: Charged Device Model (CDM)

Standard: JEDEC Standard JESD22-C101

MSL Rating: Level 3 at +260 °C convection reflow

Standard: JEDEC Standard J-STD-020

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.

Thermal Specifications

| Parameter | Rating |
|---|---------------|
| Operating Case Temperature | -40 to +85 °C |
| Thermal Resistance, Rth ⁽¹⁾ | 25 °C / W |
| Junction Temperature, Tj ⁽²⁾ | 130 °C |

1. The thermal resistance is referenced from the hottest part of the junction to the ground tab (pin 4).
2. This corresponds to the typical biasing condition of +9V, 200 mA at an 85 °C case temperature. A minimum MTTF of 1 million hours is achieved for junction temperatures below 160 °C.

