HIGH SENSITIVITY CMOS HALL-EFFECT LATCH

Description

The AH920 is a Hall-effect latch designed in mixed signal CMOS technology. It is quite suitable for use in automotive, industrial and consumer applications.

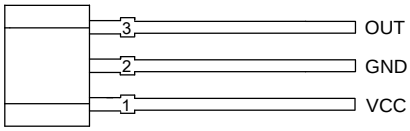
Superior high-temperature performance is made possible through dynamic offset cancellation, which reduces the residual offset voltage normally caused by device over-molding, temperature dependencies, and thermal stress. The device integrates a voltage regulator, Hall-voltage generator, small-signal amplifier, chopper stabilization, schmitt trigger, and open-drain output.

An on-board regulator permits operation with supply voltage from 3.5V to 20V.

The AH920 is available in TO-92S-3 and SOT-23-3 packages, which are optimized for most applications.

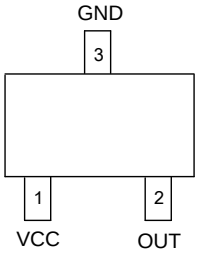
Pin Assignments

(Front View)



TO-92S-3 (Z3 Package)

(Top View)



SOT-23-3 (N Package)

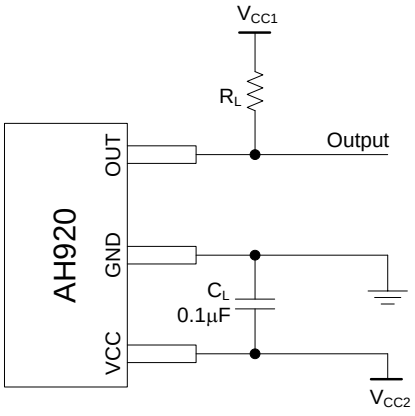
Features

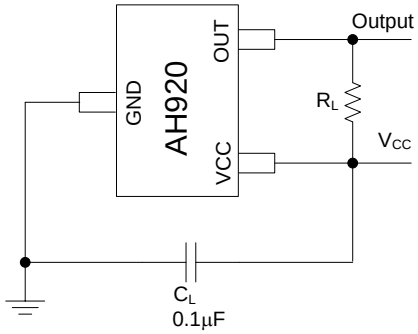
- Wide Operating Voltage Range from 3.5V to 20V
- Symmetrical Switch Points
- Chopper-stabilized Amplifier Stage
- Superior Temperature Stability
- Open-drain Output
- Compact Size
- ESD Rating: 6000V (Human Body Model)

Applications

- Brushless DC Motor Commutation
- Brushless DC Fan
- Solid-state Switch
- Revolution Counting
- Speed Detection
- High Sensitivity and Unconnected Switch

Typical Applications Circuit



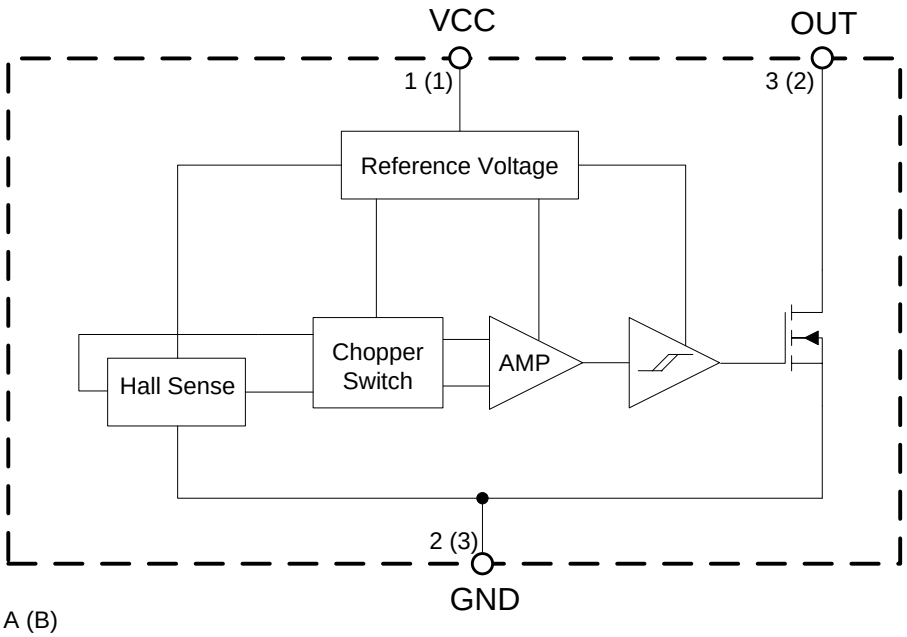


© Diodes Incorporated

Pin Descriptions

Pin Number		Pin Name	Function
TO-92S-3	SOT-23-3		
1	1	VCC	Supply voltage
2	3	GND	Ground pin
3	2	OUT	Output Pin

Functional Block Diagram



A (B)
A for TO-92S-3
B for SOT-23-3

© Diodes Incorporated

Absolute Maximum Ratings (Note 1)

Symbol	Parameter	Value		Unit
V_{CC}	Supply Voltage	20		V
I_{CC}	Supply Current (Fault)	5		mA
I_{OUT}	Output Current (Continuous)	25		mA
P_D	Power Dissipation	TO-92S-3	400	mW
		SOT-23-3	230	
T_A	Operation Temperature	-50 to +150		ºC
T_{STG}	Storage Temperature	-65 to +150		ºC
T_J (Max)	Maximum Junction Temperature	+165		ºC
ESD	ESD (Human Body Model)	6000		V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	3.5	20	V
T_A	Operating Ambient Temperature	-40	+125	ºC

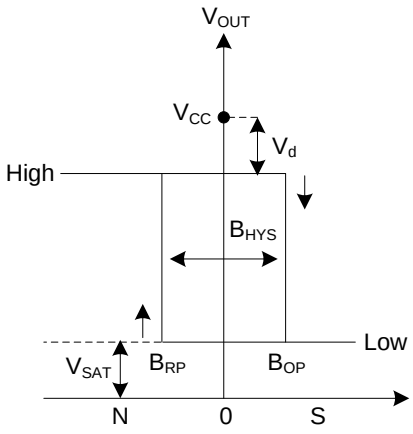
© Diodes Incorporated

Electrical Characteristics (@V_{CC} =12V, T_A =+25°C, unless otherwise specified.)

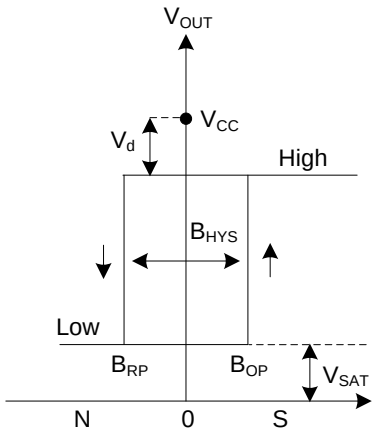
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating	3.5	12	20	V
I_{CC}	Supply Current	V_{CC}=12V, B<B_{RP}		3.0	5.0	mA
		V_{CC}=12V, B>B_{OP}		3.0	5.0	mA
V_{SAT}	Saturation Voltage	I_{OUT}=20mA, B>B_{OP}		185	500	mV
$I_{LEAKAGE}$	Output Leakage Current	V_{OUT}=20V, B<B_{RP}		0.1	10	μA
t_{RISING}	Output Rising Time	R_L=1kΩ,C_L=20pF		0.4	2	μs
$t_{FALLING}$	Output Falling Time	R_L=1kΩ,C_L=20pF		0.4	2	μs

Magnetic Characteristics (@V_{CC}=12V, T_A=+25°C, unless otherwise specified.)

Symbol	Parameter	Min	Typ	Max	Unit
B_{OP}	Operating Point	5	22	40	Gauss
B_{RP}	Releasing Point	-40	-22	-5	Gauss
B_{HYS}	Hysteresis		45		Gauss



For TO-92S-3



For SOT-23-3

Figure 1. Magnetic Flux Density of AH920

© Diodes Incorporated

Magnetic Characteristics (Cont.)

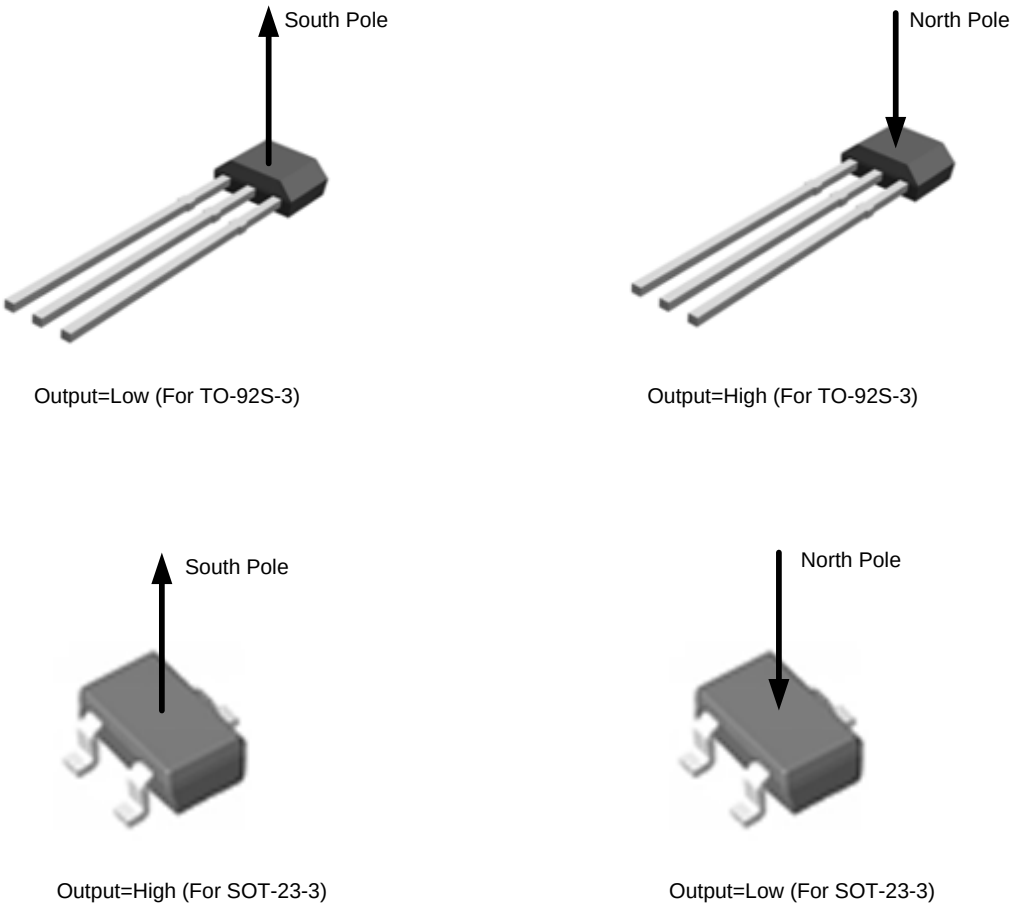


Figure 2. Output Status vs. Magnetic Pole

Package Type	Parameter	Test Condition	Output
TO-92S-3	South Pole	$B > B_{OP}$	Low
	North Pole	$B < B_{RP}$	High
SOT-23-3	South Pole	$B > B_{OP}$	High
	North Pole	$B < B_{RP}$	Low

Table 1. Output Status vs. Magnetic Pole

© Diodes Incorporated

Magnetic Characteristics (Cont.)

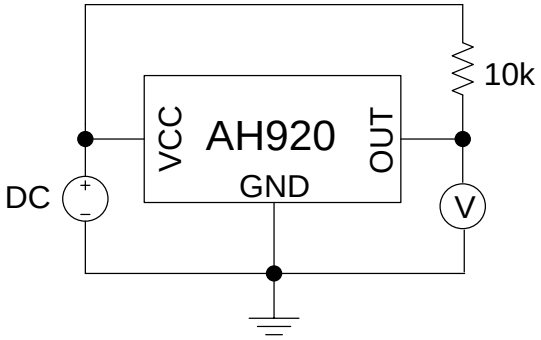


Figure 3. Magnetic Thresholds

Note 2: B_{OP} is determined by putting the device under magnetic field swept from B_{RP} (Min) to B_{OP} (Max) until the output is switched on.
Note 3: B_{RP} is determined by putting the device under magnetic field swept from B_{OP} (Max) to B_{RP} (Min) until the output is switched off.

Test Circuit and Test Conditions

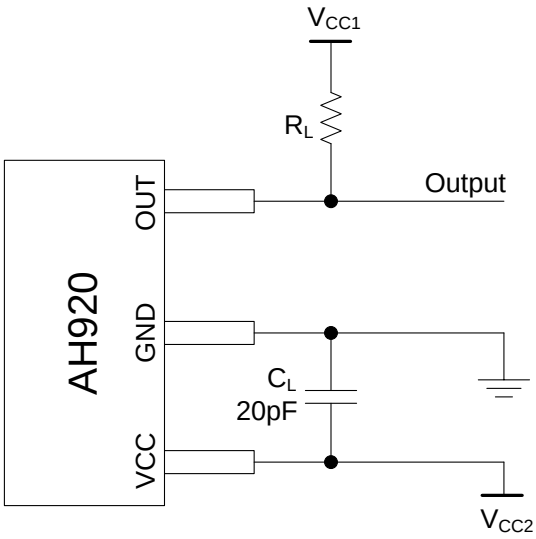


Figure 4. Test Circuit of AH920

© Diodes Incorporated

Test Circuit and Test Conditions (Cont.)

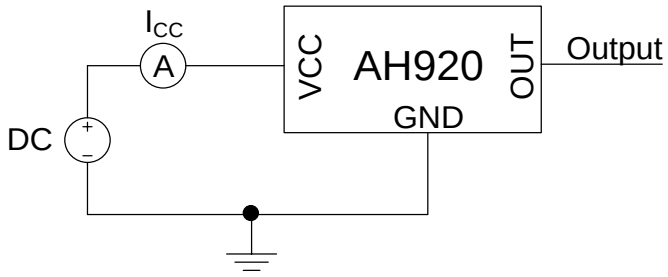


Figure 5. Test Condition of AH920 (Supply Current)

Note 4: Output initial status is low when powering on.
Note 5: The supply current I_{CC} represents the average supply current. The output is open during measurement.
Note 6: The device is put under the magnetic field: $B<B_{RP}$.

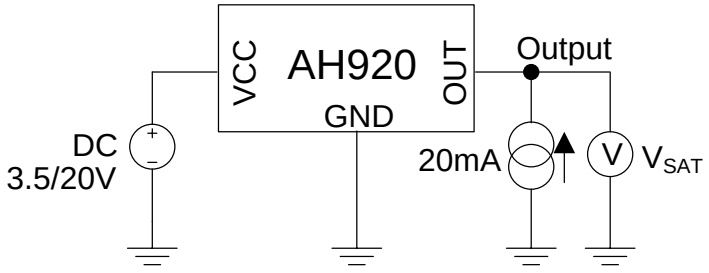


Figure 6. Test Condition of AH920 (Output Saturation Voltage)

Note 7: The output saturation voltage V_{SAT} is measured at V_{CC}=3.5V and V_{CC}=20V.
Note 8: The device is put under the magnetic field: $B>B_{OP}$.

© Diodes Incorporated

Test Circuit and Test Conditions (Cont.)

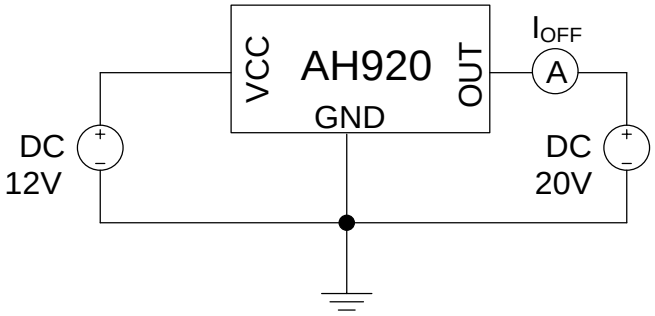
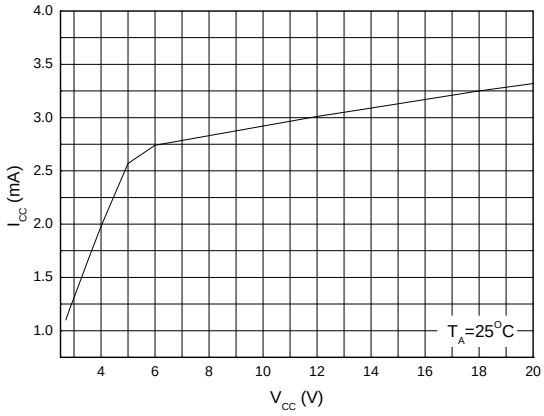


Figure 7. Test Condition of AH920 (Output Leakage Current)

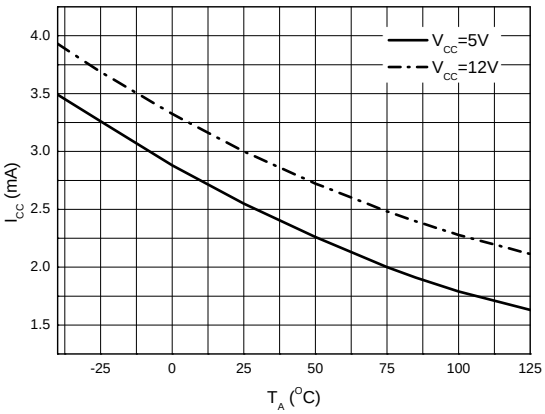
Note 9: The device is put under the magnetic field: $B<B_{RP}$.

Typical Performance Characteristics

I_{CC} vs. V_{CC}



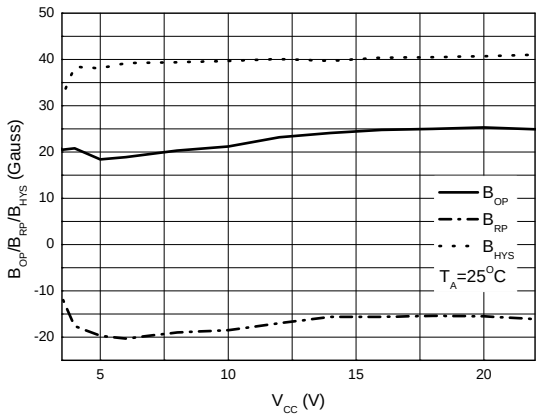
I_{CC} vs. T_A



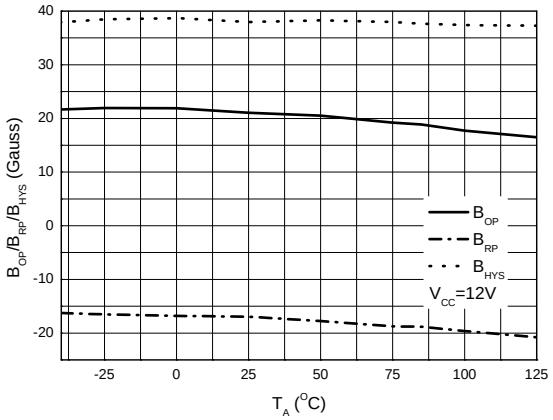
© Diodes Incorporated

Typical Performance Characteristics (Cont.)

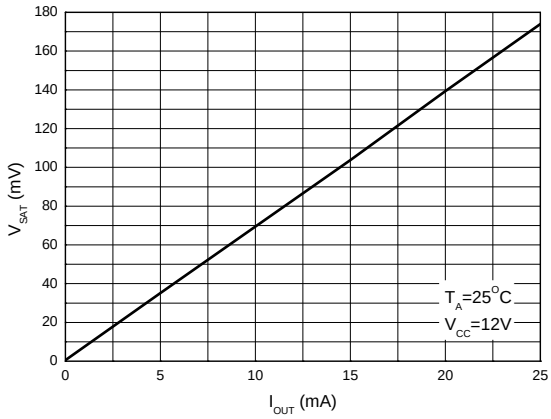
$B_{OP}/B_{RP}/B_{HYS}$ vs. V_{CC}



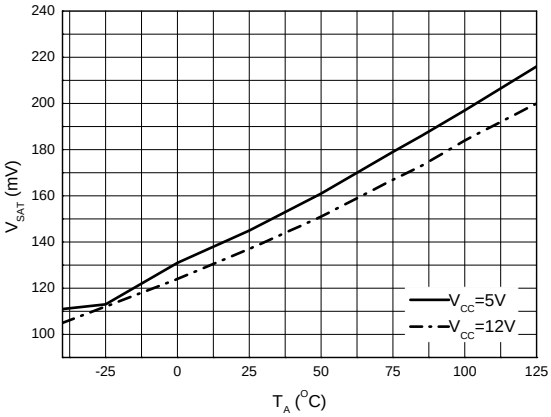
$B_{OP}/B_{RP}/B_{HYS}$ vs. T_A



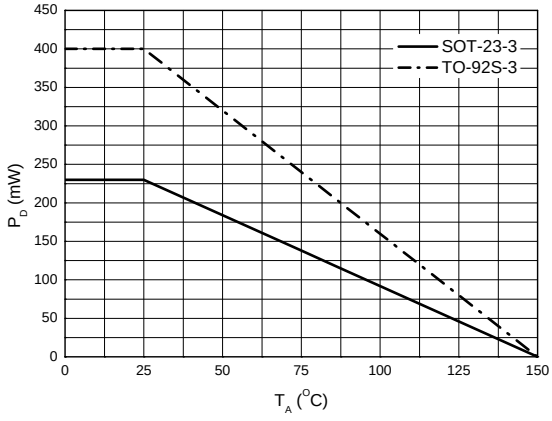
V_{SAT} vs. I_{OUT}



V_{SAT} vs. T_A

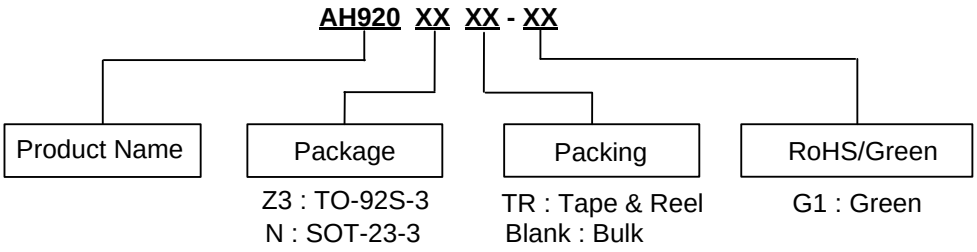


P_D vs. T_A



© Diodes Incorporated

Ordering Information



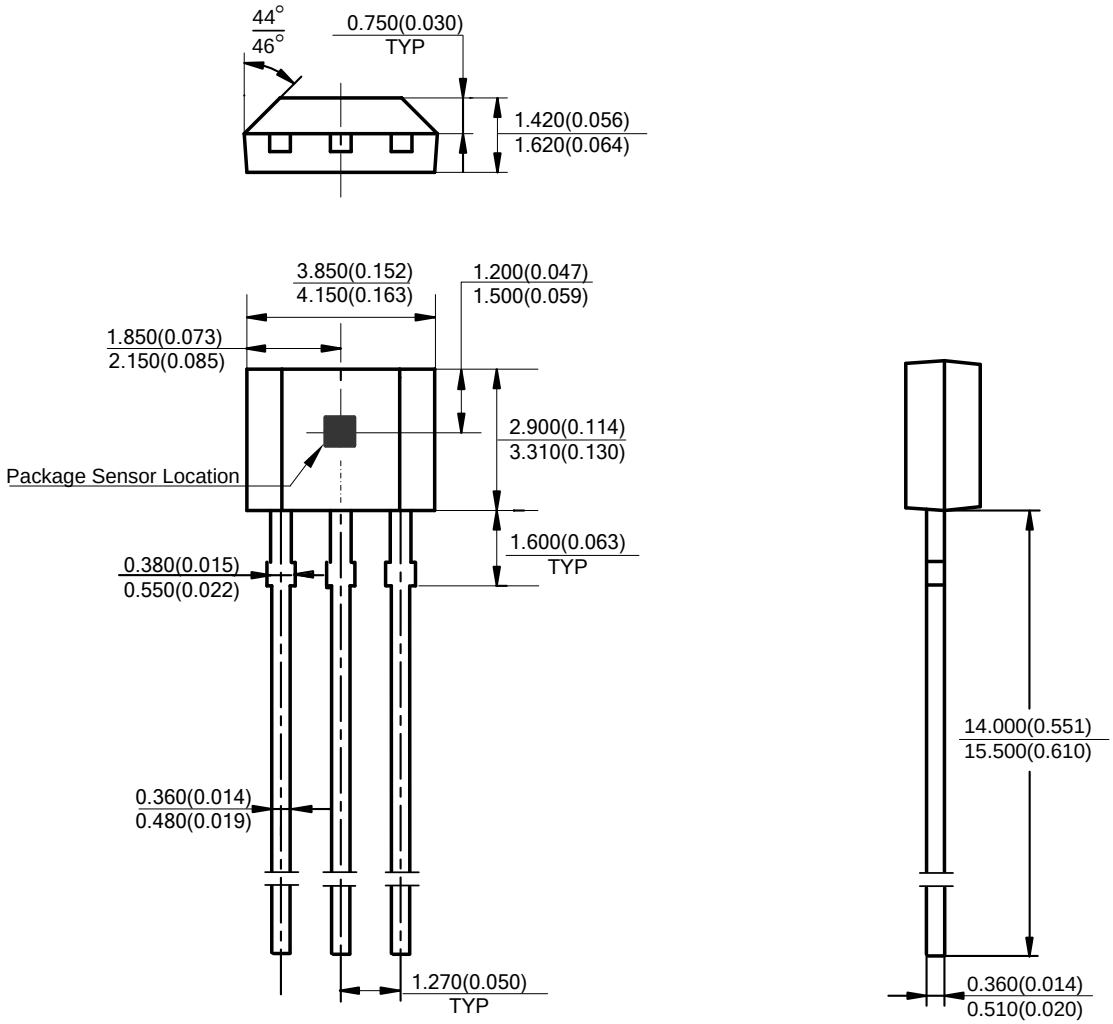
Package	Temperature Range	Part Number	Marking ID	Packing Type
TO-92S-3	-40 to 125°C	AH920Z3-G1	920	Bulk
SOT-23-3	-40 to 125°C	AH920NTR-G1	GS7	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "G1" suffix in the part number, are RoHS compliant and green.

© Diodes Incorporated

Package Outline Dimensions (All dimensions in mm(inch).)

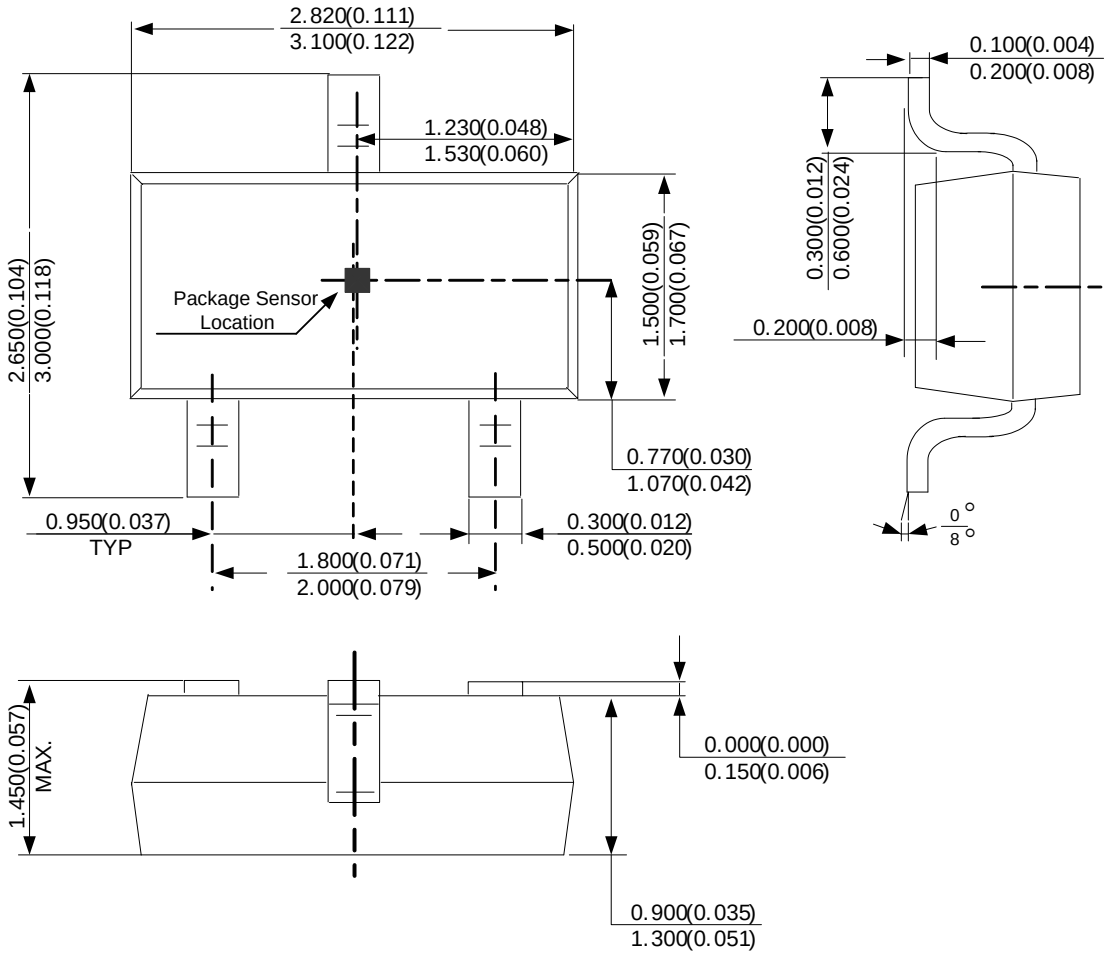
(1) Package Type: TO-92S-3



© Diodes Incorporated

Package Outline Dimensions (All dimensions in mm(inch). Cont.)

(2) Package Type: SOT-23-3



© Diodes Incorporated

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2013, Diodes Incorporated

www.diodes.com