AH920

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.

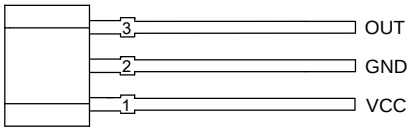
Superior high-temperature performance is made possible through dynamic offset cancellation, which reduces the residual offset voltage normally caused by device over-molding, temperature dependencies, and thermal stress. The device integrates a voltage regulator, Hall-voltage generator, small-signal amplifier,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

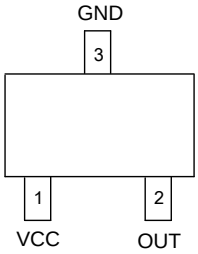
Pin Assignments

(Front View)



TO-92S-3 (Z3 Package)

(Top View)



SOT-23-3 (N Package)

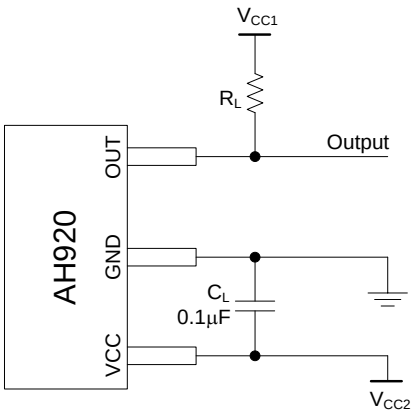
Features

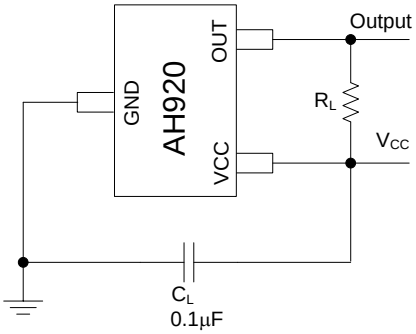
- Wide Operating Voltage Range from 3.5V to 20V
- Symmetrical Switch Points
- Chopper-stabilized Amplifier Stage
- Superior Temperature Stability
- Open-drain Output
- Compact Size
- ESD Rating: 6000V (Human Body Model)

Applications

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

Typical Applications Circuit

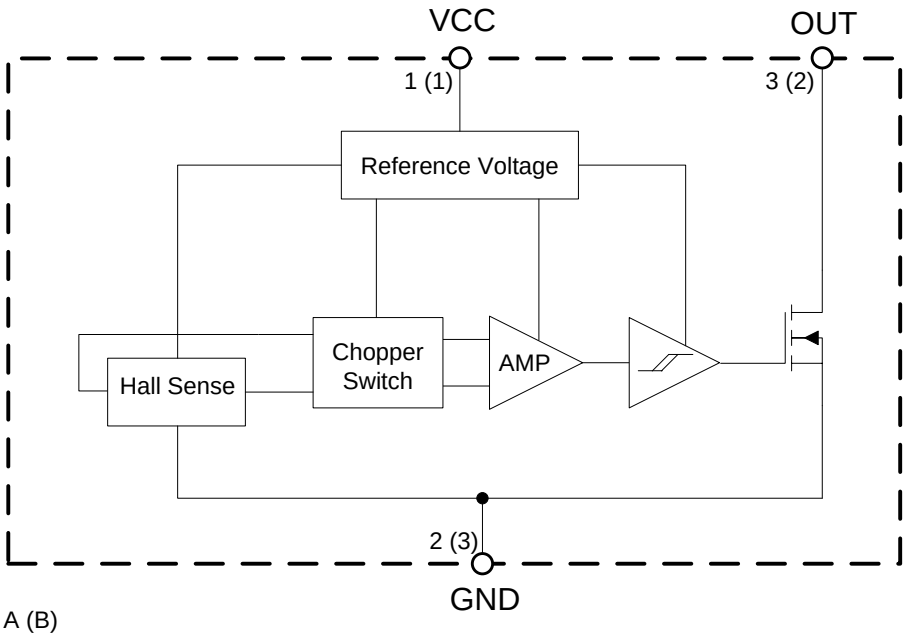




Pin Descriptions

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

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

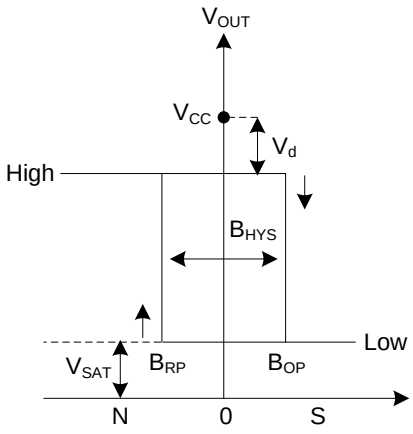
Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	3.5	20	V
T_A	Operating Ambient Temperature	-40	+125	ºC

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

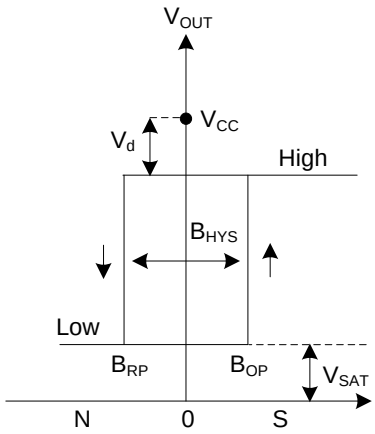
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating	3.5	12	20	V
I_{CC}	Supply Current	V_{CC}=12V, B<B_{RP}		3.0	5.0	mA
		V_{CC}=12V, B>B_{OP}		3.0	5.0	mA
V_{SAT}	Saturation Voltage	I_{OUT}=20mA, B>B_{OP}		185	500	mV
$I_{LEAKAGE}$	Output Leakage Current	V_{OUT}=20V, B<B_{RP}		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

Magnetic Characteristics (Cont.)

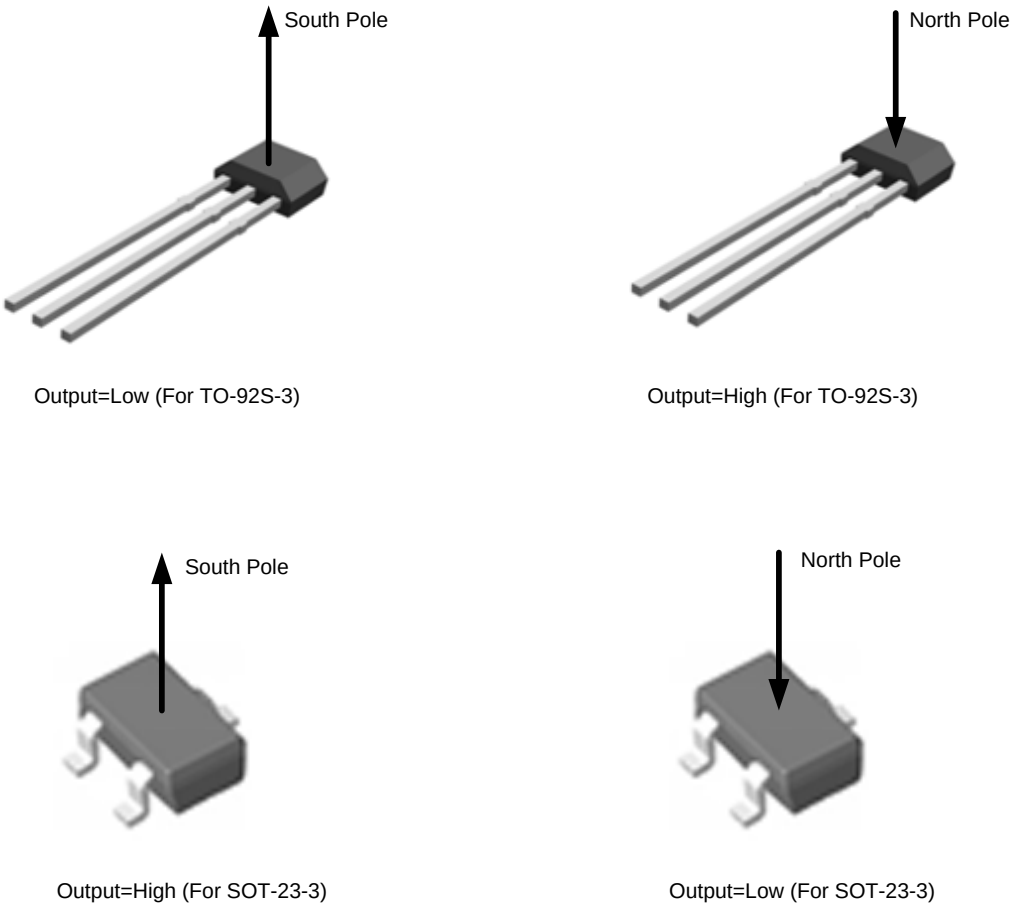


Figure 2. Output Status vs. Magnetic Pole

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

Magnetic Characteristics (Cont.)

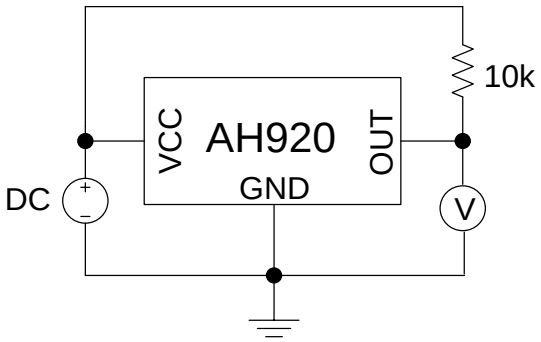


Figure 3. Magnetic Thresholds

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

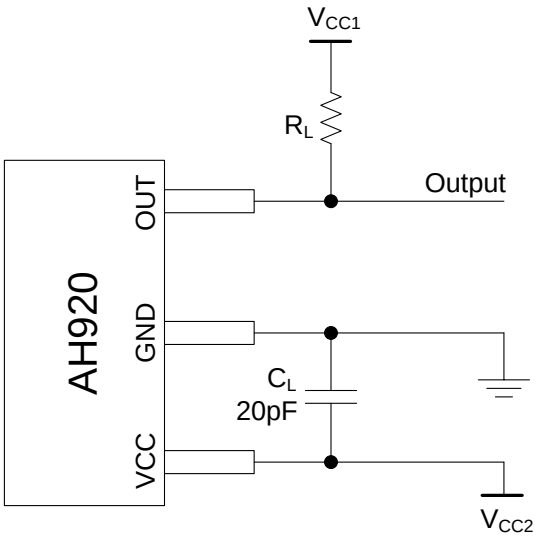


Figure 4. Test Circuit of AH920

Test Circuit and Test Conditions (Cont.)

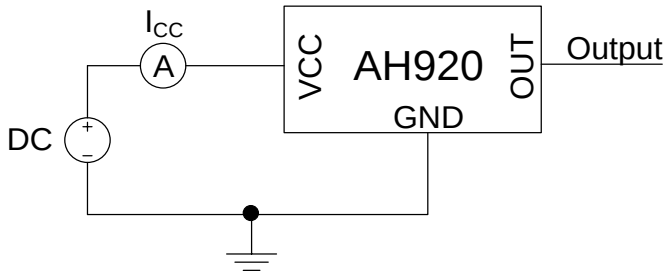


Figure 5. Test Condition of AH920 (Supply Current)

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: $B<B_{RP}$.

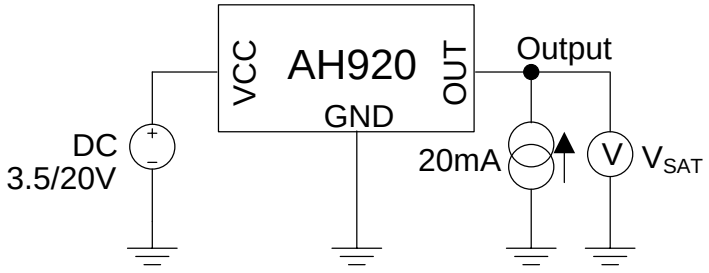


Figure 6. Test Condition of AH920 (Output Saturation Voltage)

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: $B>B_{OP}$.

Test Circuit and Test Conditions (Cont.)

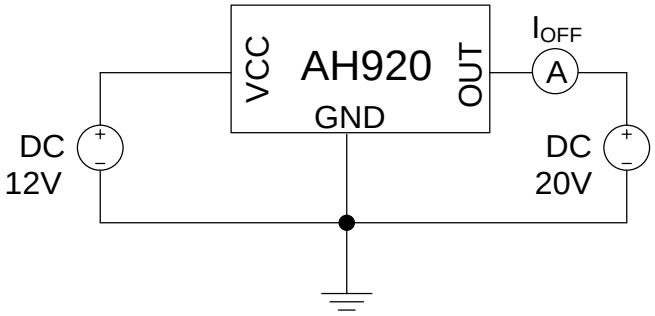
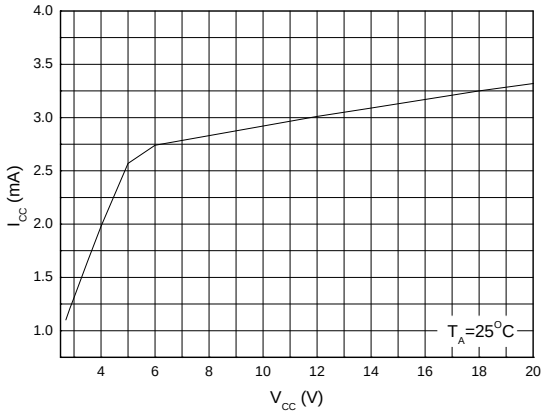


Figure 7. Test Condition of AH920 (Output Leakage Current)

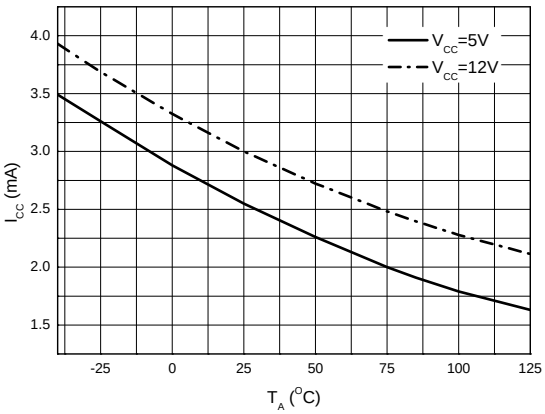
Note 9: The device is put under the magnetic field: $B<B_{RP}$.

Typical Performance Characteristics

I_{CC} vs. V_{CC}

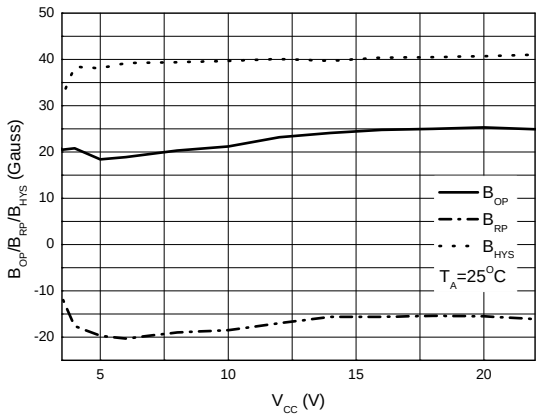


I_{CC} vs. T_A

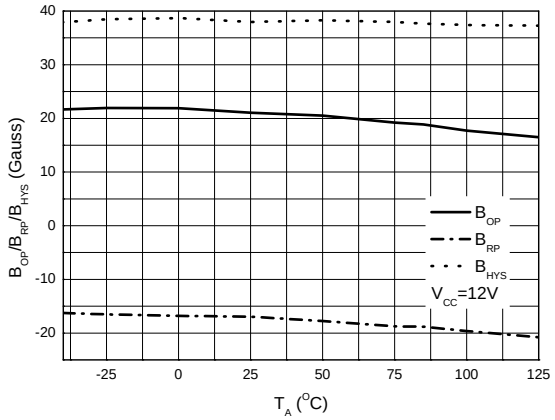


Typical Performance Characteristics (Cont.)

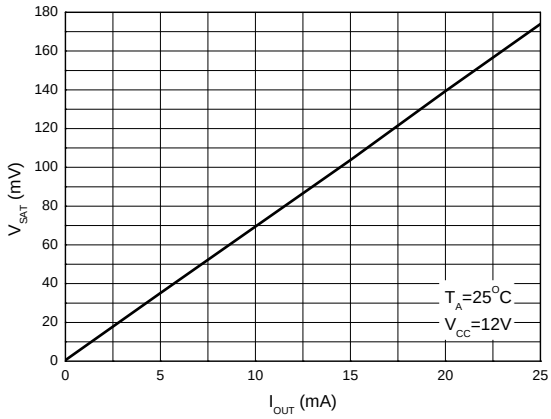
$B_{OP}/B_{RP}/B_{HYS}$ vs. V_{CC}



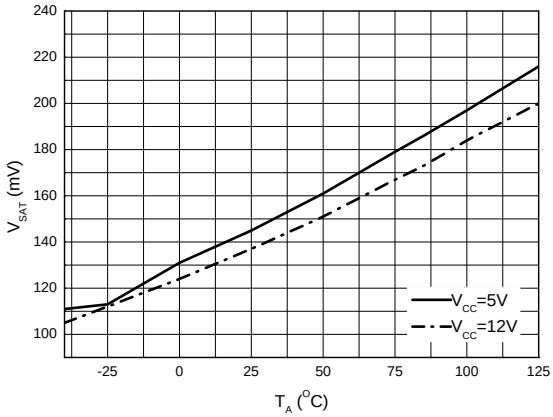
$B_{OP}/B_{RP}/B_{HYS}$ vs. T_A



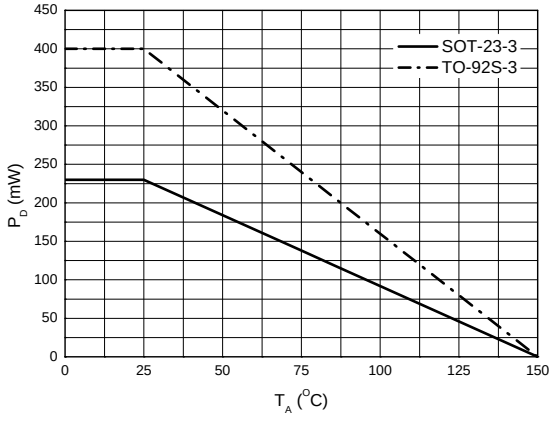
V_{SAT} vs. I_{OUT}



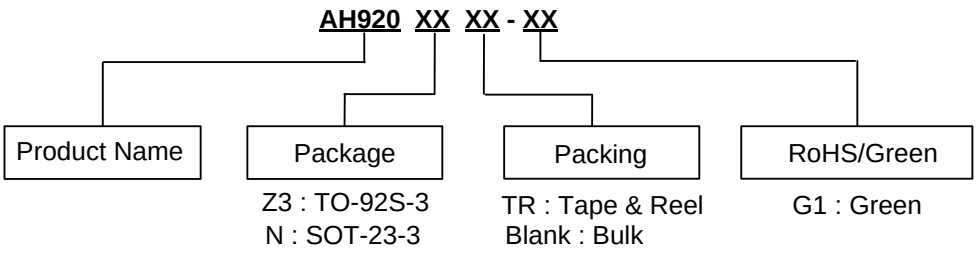
V_{SAT} vs. T_A



P_D vs. T_A



Ordering Information

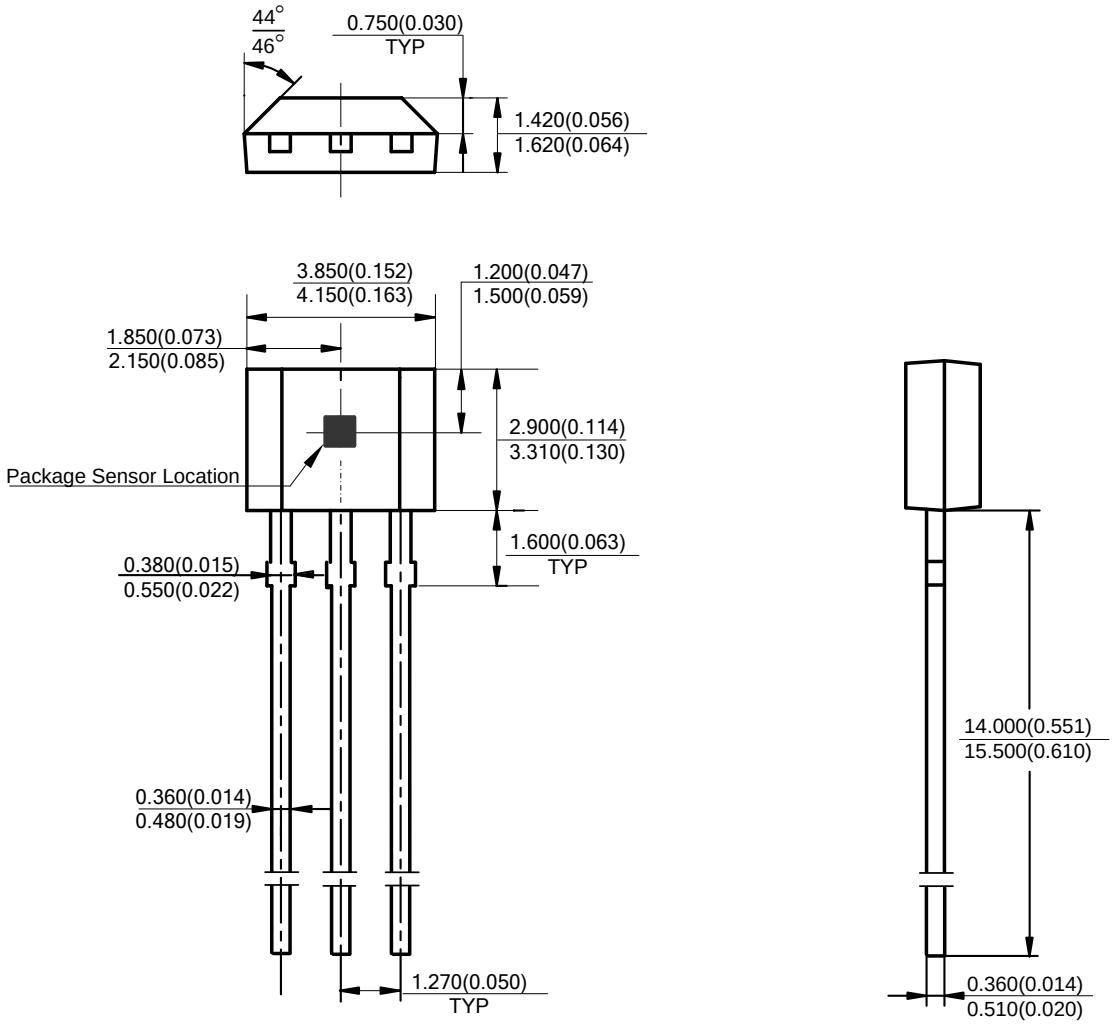


Package	Temperature Range	Part Number	Marking ID	Packing Type
TO-92S-3	-40 to 125°C	AH920Z3-G1	920	Bulk
SOT-23-3	-40 to 125°C	AH920NTR-G1	GS7	Tape & Reel

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

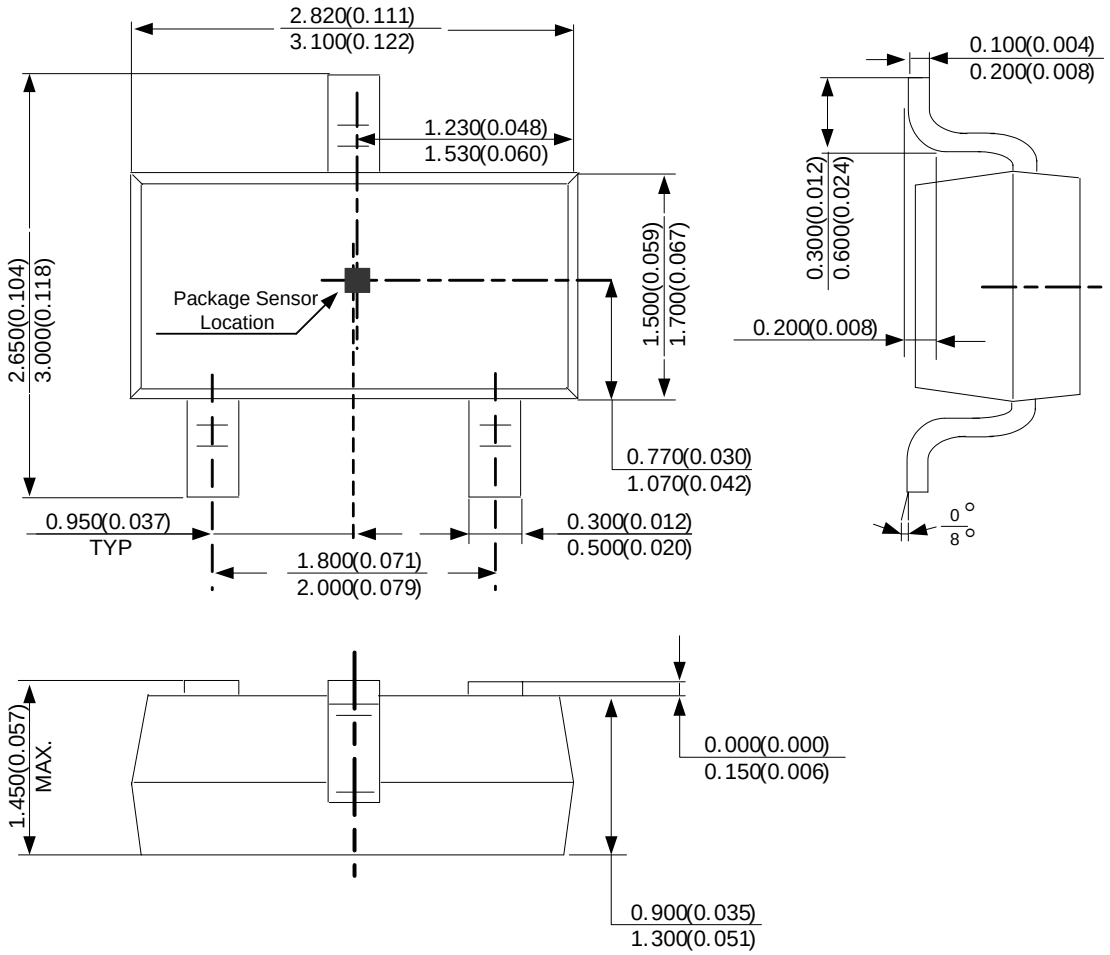
Package Outline Dimensions (All dimensions in mm(inch).)

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



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

(2) Package Type: SOT-23-3



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