HIGH SENSITIVITY CMOS HALL-EFFECT LATCH

Description

The AH921 is a Hall-effect latch designed in mixed signal CMOS technology. It is quite suitable for use in automotive, industrial and consumer applications.

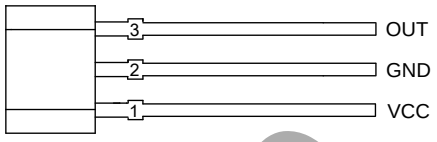
Superior high-temperature performance is made possible through dynamic offset cancellation, which reduces the residual offset voltage normally caused by device over-molding, temperature dependencies, and thermal stress. The device integrates a voltage regulator, Hall-voltage generator, small-signal amplifier,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

An on-board regulator permits operation with supply voltage from 3.5V to 24V.

The AH921 is available in TO-92S-3 and SOT-23-3 packages, which are optimized for most applications.

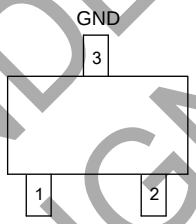
Pin Assignments

(Front View)



TO-92S-3

(Top View)



SOT-23-3

Features

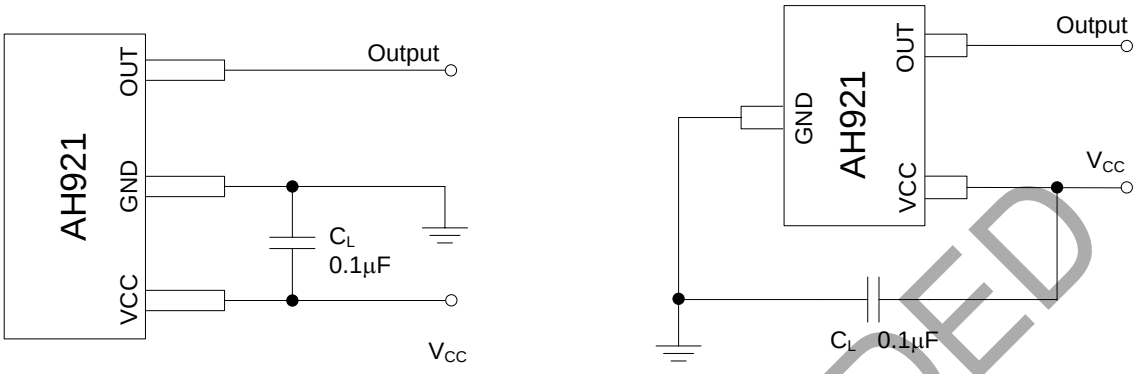
- Wide Operating Voltage Range from 3.5V to 24V
- Symmetrical Switch Points
- Chopper-stabilized Amplifier Stage
- Superior Temperature Stability
- Compact Size
- Built-in Pull-up Resistor
- Wide Operating Temperature Range: -40ºC to +125ºC
- ESD Rating: 3500V (Human Body Model)
- **Totally Lead-free & Fully RoHS Compliant (Note 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Applications

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

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

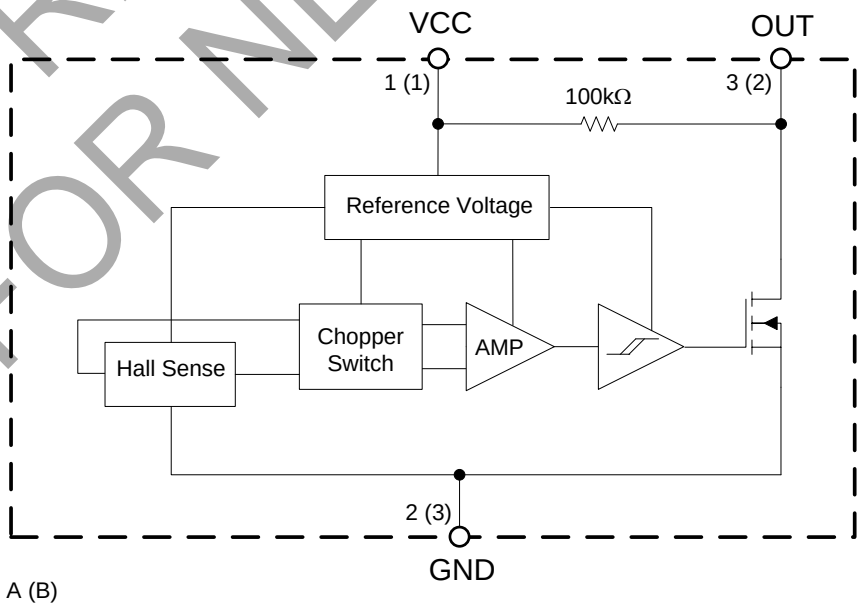
Typical Applications Circuit



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 4)

Symbol	Parameter	Rating		Unit
V_{CC}	Supply Voltage	28		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	Operating 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)	3500		V

Note: 4. Stresses greater than those listed under *Absolute Maximum Ratings* can 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 can affect device reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	3.5	24	V
T_A	Operating Temperature	-40	+125	ºC

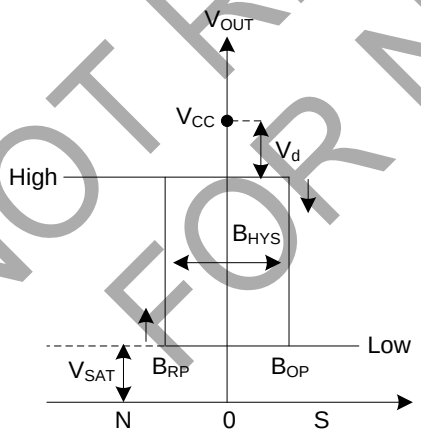
Electrical Characteristics (@V_{CC}=12V, T_A=+25°C, unless otherwise specified. Notes 5 & 6.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating	3.5	12	24	V
I_{CC}	Supply Current	B<B_{RP}	–	3.0	5.0	mA
		B>B_{OP}	–	3.0	5.0	
V_{SAT}	Saturation Voltage	V_{CC}=3.5V, I_{OUT} =5mA, B>B_{OP} (Note 7)	–	50	120	mV
		I_{OUT}=20mA, B>B_{OP} (Note 7)	–	185	500	
		V_{CC}=24V, I_{OUT} =20mA, B>B_{OP} (Note 7)	–	185	500	
$I_{LEAKAGE}$	Output Leakage Current	V_{CC}=V_{OUT}=24V, B<B_{RP} (Note 8)	–	0.1	10	μA
t_{RISING}	Output Rising Time	C_L=20pF	–	0.4	2	μs
$t_{FALLING}$	Output Falling Time	C_L=20pF	–	0.4	2	μs

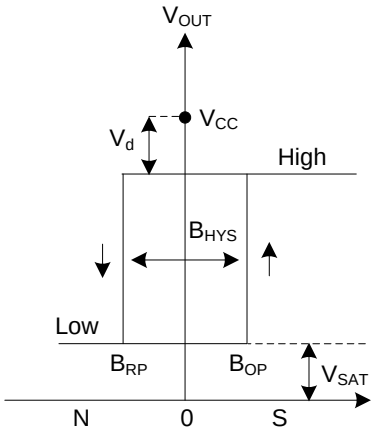
Notes: 5. Output initial status is low when powering on.
6. The supply current I_{CC} represents the average supply current. The output is open during measurement.
7. The device is put under the magnetic field: B>B_{OP}.
8. The device is put under the magnetic field: B<B_{RP}.

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 AH921

Magnetic Characteristics (Continued)

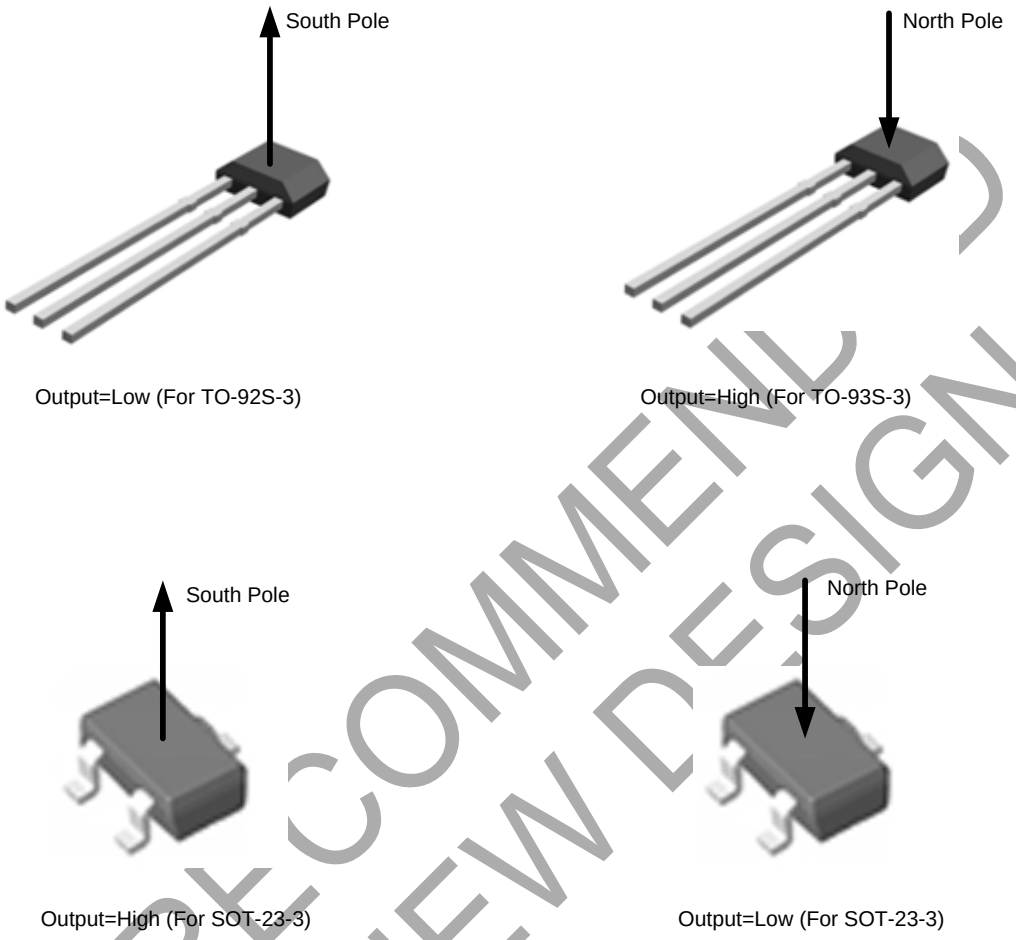


Figure 2. Output Status vs. Magnetic Pole

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 (Continued)

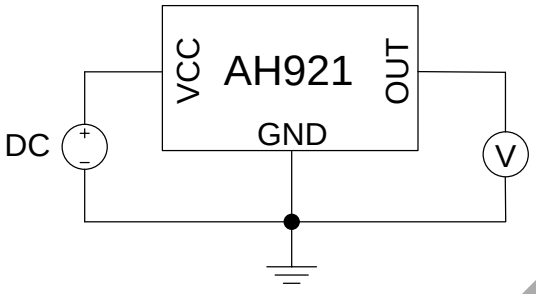


Figure 3. Magnetic Thresholds

Test Circuit and Test Conditions

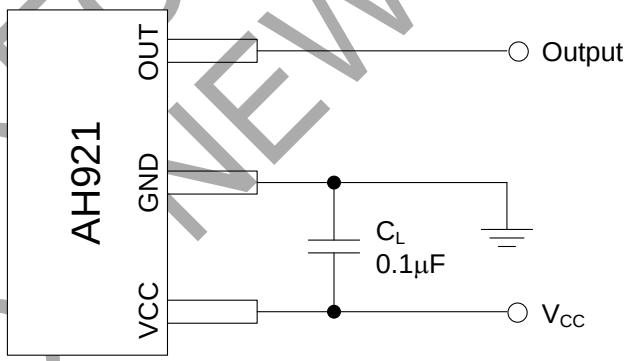


Figure 4. Test Circuit of AH921

Test Circuit and Test Conditions (Continued)

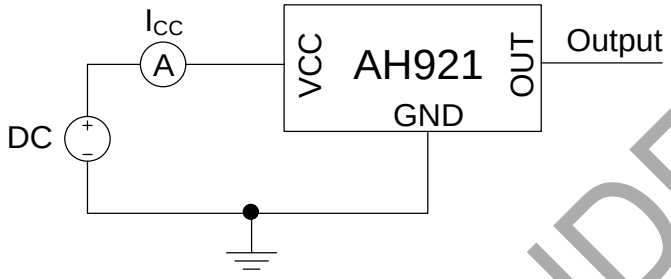


Figure 5. Test Condition of AH921 (Supply Current)

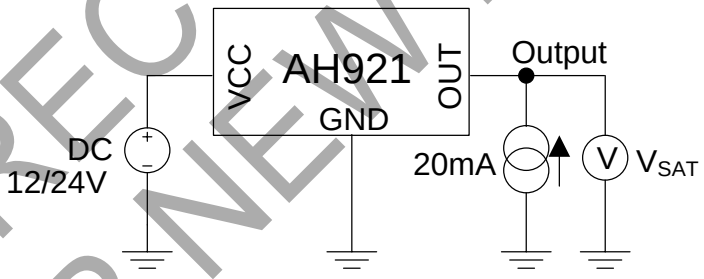


Figure 6. Test Condition of AH921 (Output Saturation Voltage)

Test Circuit and Test Conditions (Continued)

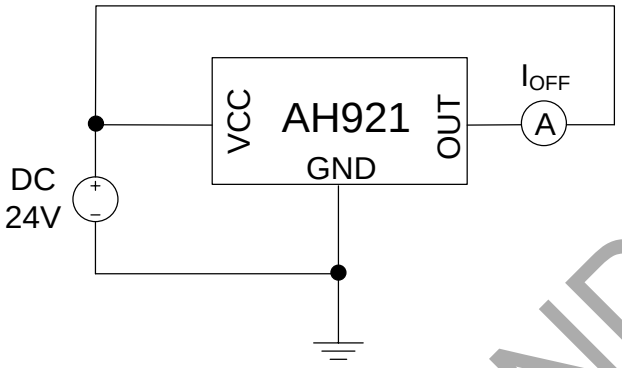
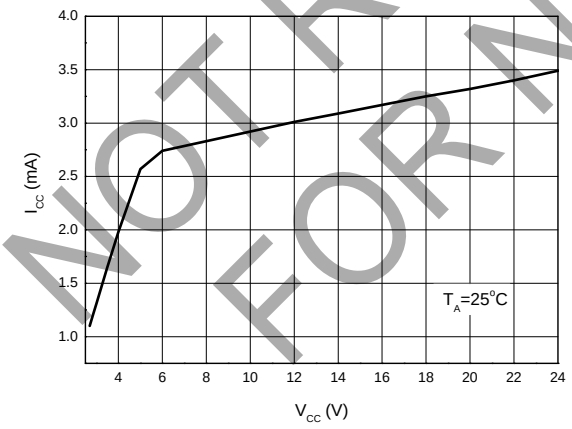


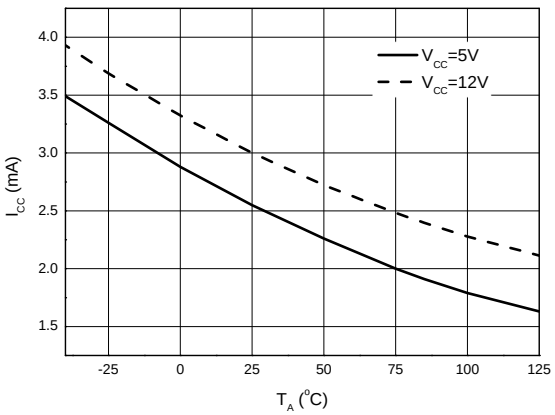
Figure 7. Test Condition of AH921 (Output Leakage Current)

Performance Characteristics

ICC vs. VCC

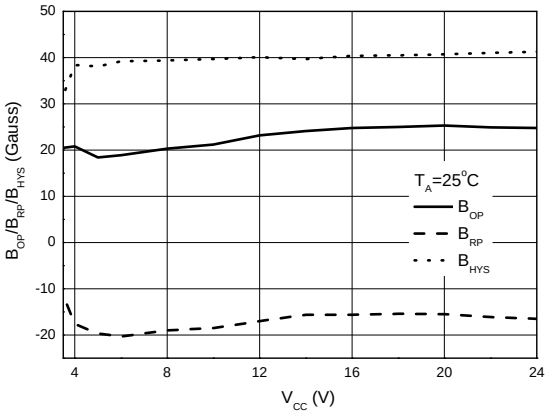


ICC vs. TA

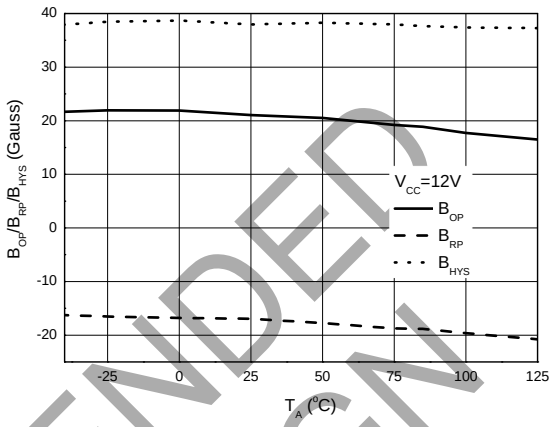


Performance Characteristics (Continued)

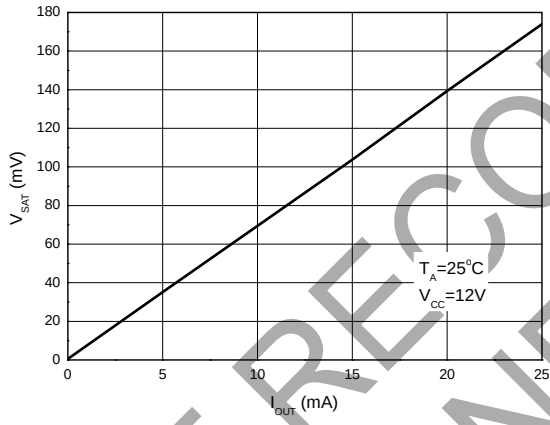
BOP/BRP/BHYS vs. VCC



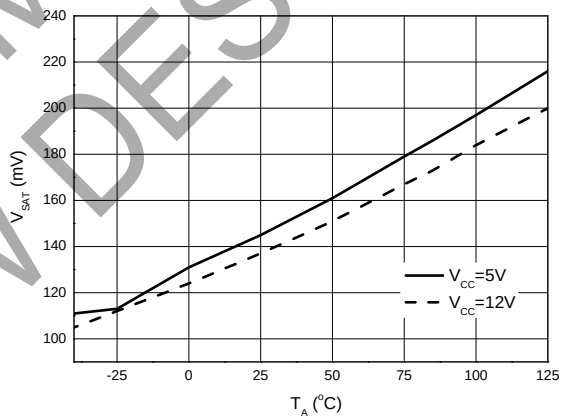
BOP/BRP/BHYS vs. TA



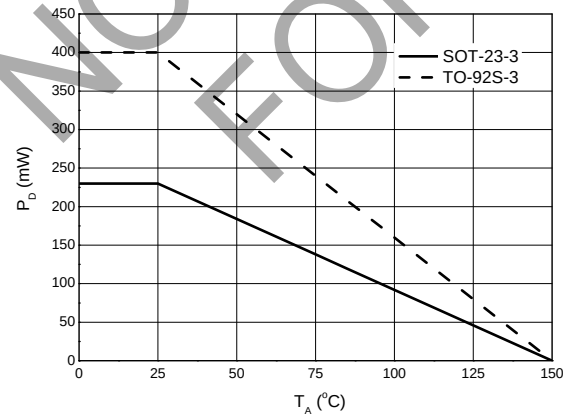
VSAT vs. IOUT



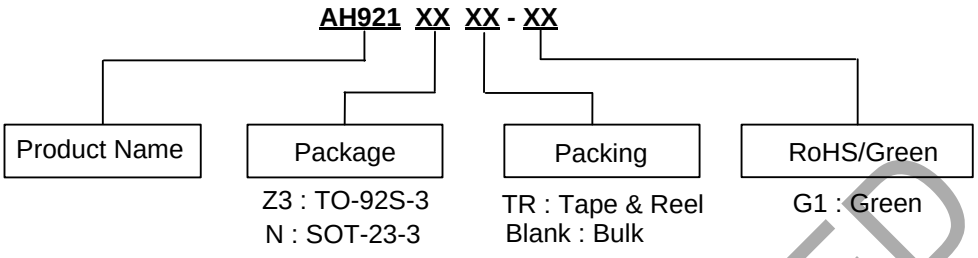
VSAT vs. TA



PD vs. TA



Ordering Information

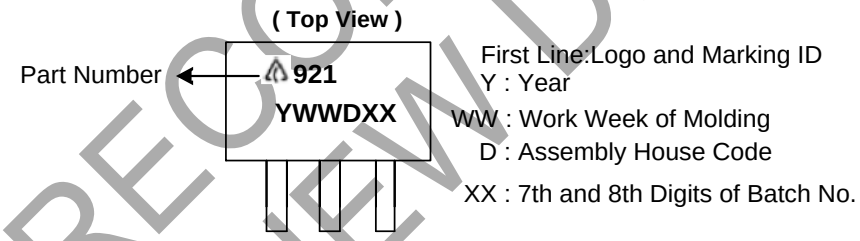


Device	Status(Note 9)	Package Code	Packaging	Bulk	7" Tape and Reel
				Quantity	Quantity
AH921Z3-G1	NRND	Z3	TO-92S-3	1000/Bulk	NA
AH921NTR-G1	NRND	N	SOT-23-3	NA	3000/Tape & Reel

Note 9: NRND = Not Recommended for New Design.

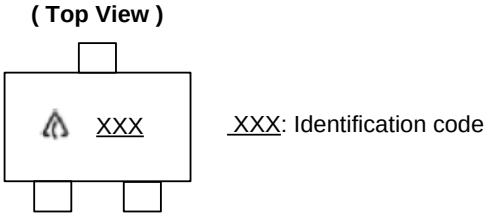
Marking Information

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



Part Number	Package	Identification Code
AH921	TO-92S-3	921

(2) Package Type: SOT-23-3

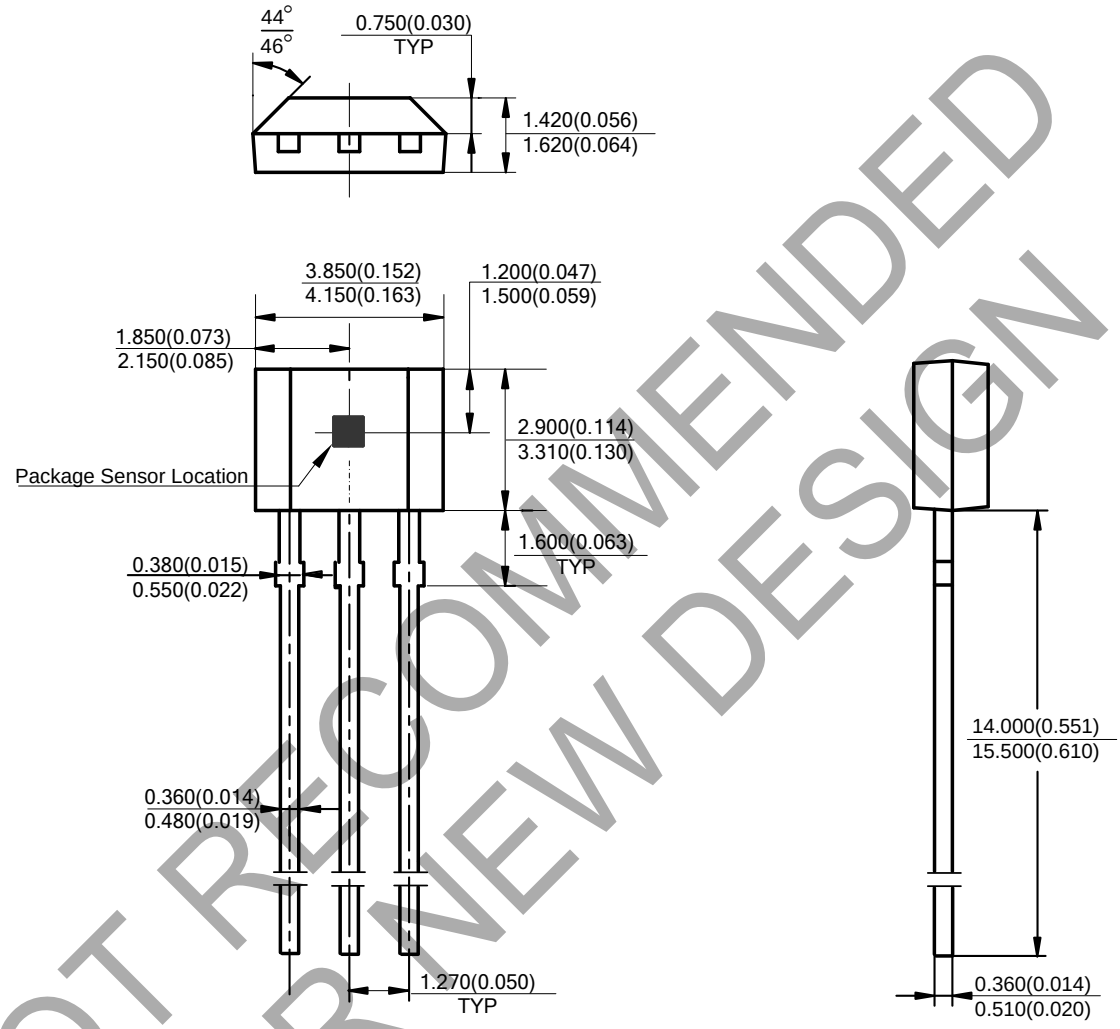


Part Number	Package	Identification Code
AH921	SOT-23-3	GS6

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

Please see http://www.diodes.com/package-outlines.html for the latest version.

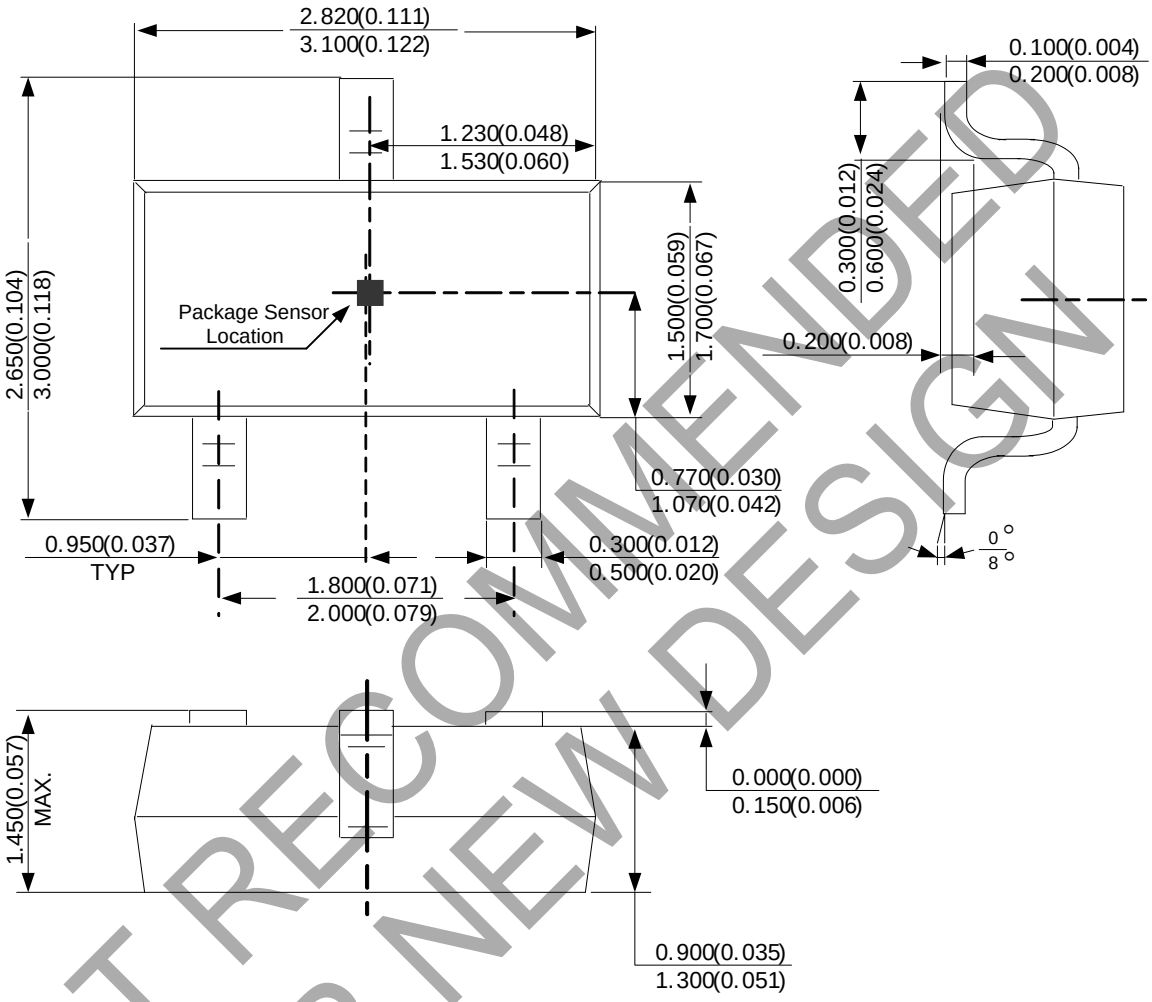
(1) Package Type: TO-92S-3



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

Please see http://www.diodes.com/package-outlines.html for the latest version.

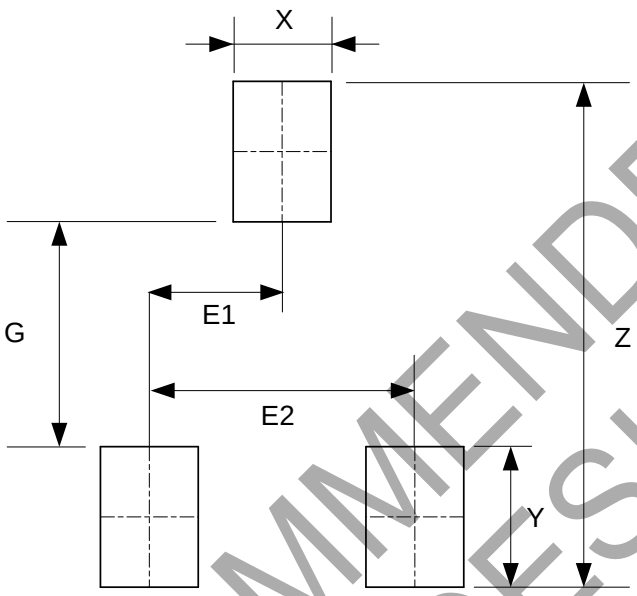
(2) Package Type: SOT-23-3



Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: SOT-23-3



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

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