

## Excellent Integrated System Limited

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**High Sensitivity Micropower Omnipolar Hall-Effect Switch**

**AH9249**

**General Description**

The AH9249 is an ultra-sensitive Hall-effect switch with digital latched output, mainly designed for battery-operation, hand-held equipments.

Special CMOS process is used for low-voltage and low-power requirement. A chopper stabilized amplifier improves stability of magnetic switch points. A sleep-awake logic controls the IC in sleep time or awake time. This function will reduce the average operating current of the IC. During the awake time, the output is changed with the magnetic flux density. During the sleep time, the output is latched in its previous state and the current consumption will reduce to some  $\mu$ A.

The IC switching behaviour is omnipolar, either north or south pole sufficient strength will turn the output on. If the magnetic flux density is larger than operating point( $B_{OP}$ ), the output will be turned on; if it is less than releasing point( $B_{RP}$ ), the output will be turned off.

The AH9249 is available in TO-92S-3, SOT-23-3 and DFN-2x2-3 packages which are optimized for most applications.

**Features**

- Micropower Operation
- 2.5 to 5.5V Power Supply
- Switching for Both Poles of a Magnet (Omnipolar)
- Stabilized Chopper
- Superior Temperature Stability
- Digital Output Signal
- Built-in Pull-up Resistor
- ESD Rating: 4000V (Human Body Model)  
600V (Machine Model)

**Applications**

- Cover Switch in Notebook PC/PDA
- Handheld Wireless Application Awake Switch
- Magnet Switch in Low Duty Cycle Applications

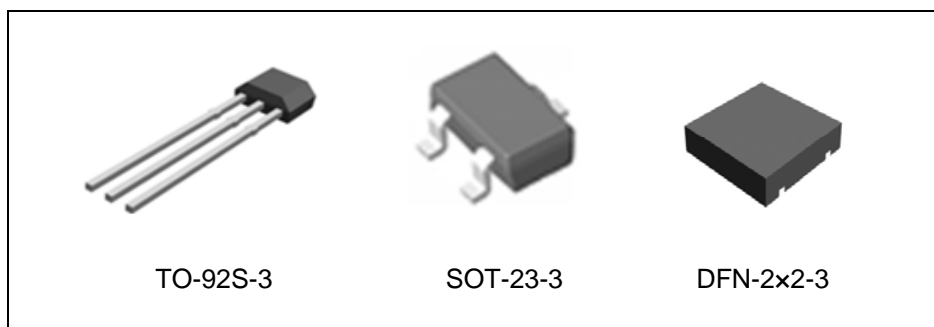


Figure 1. Package Types of AH9249



**High Sensitivity Micropower Omnipolar Hall-Effect Switch**

**AH9249**

**Pin Configuration**

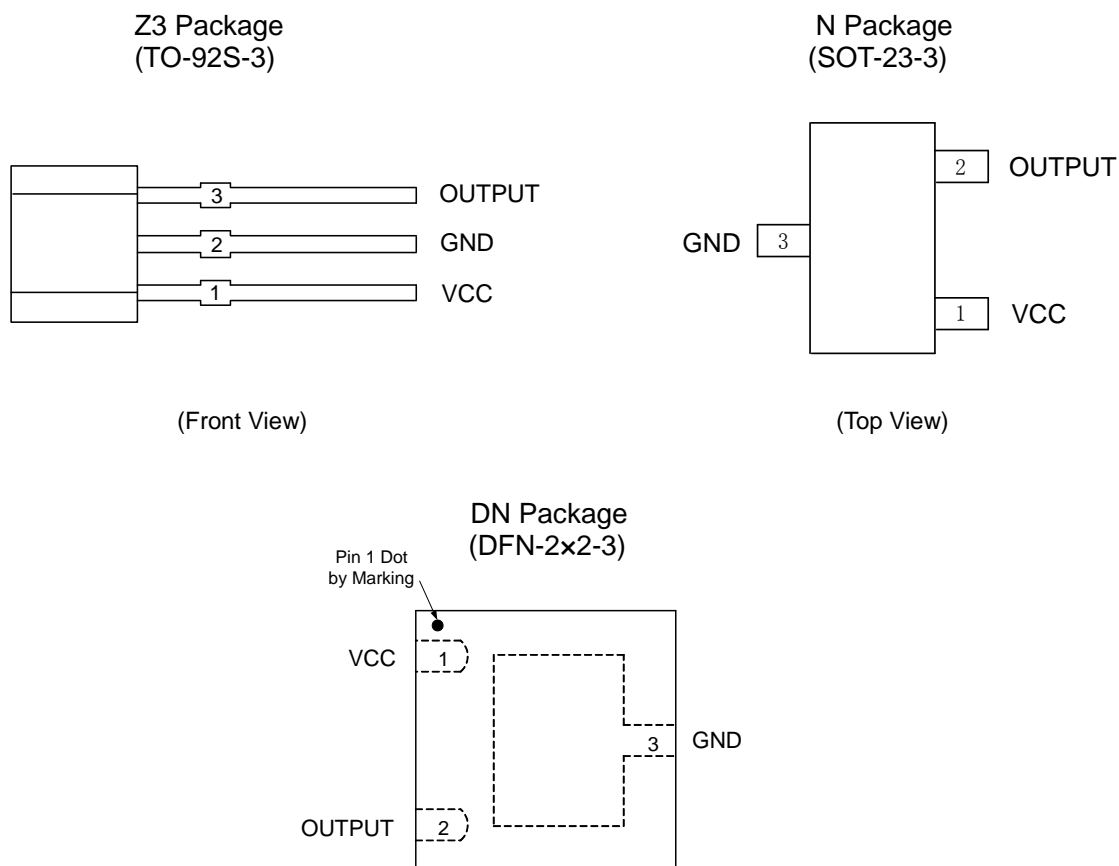


Figure 2. Pin Configuration of AH9249

**Pin Description**

Pin Number			Pin Name	Function
TO-92S-3	SOT-23-3	DFN-2x2-3		
1	1	1	VCC	Power supply pin
2	3	3	GND	Ground pin
3	2	2	OUTPUT	Output pin



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**Functional Block Diagram**

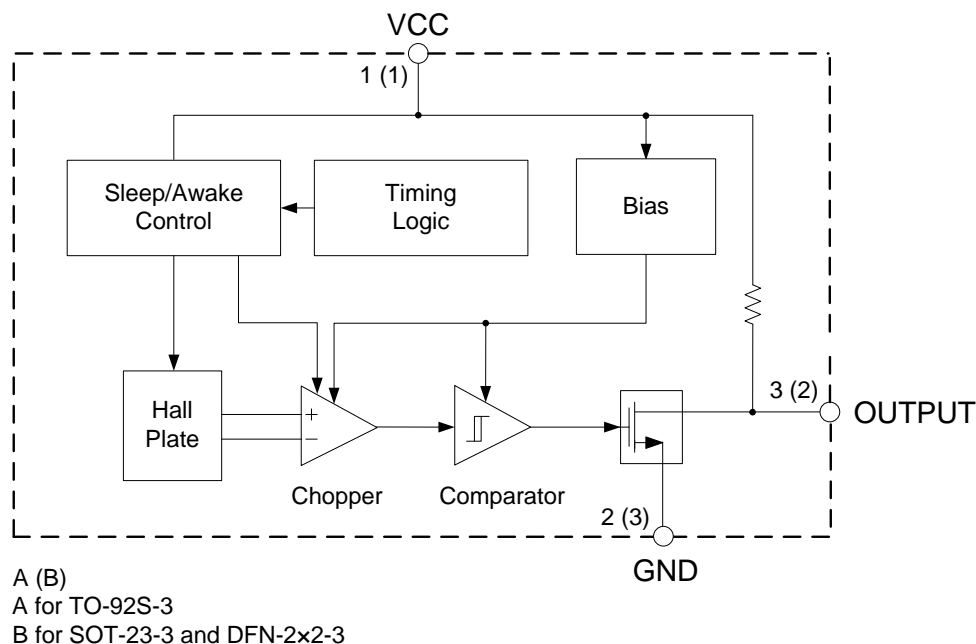
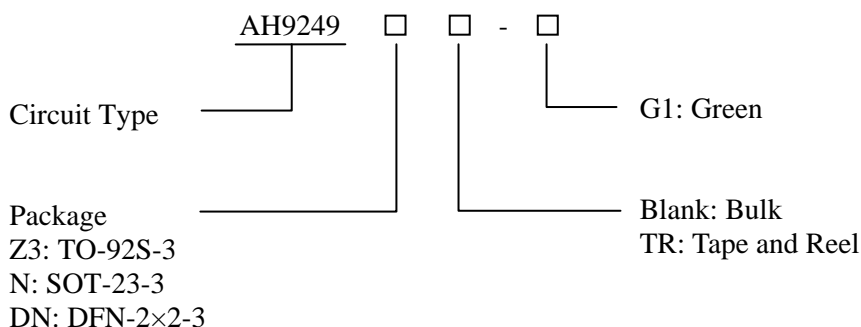


Figure 3. Functional Block Diagram of AH9249

**Ordering Information**



Package	Temperature Range	Part Number	Marking ID	Packing Type
TO-92S-3	-40 to 85°C	AH9249Z3-G1	9249	Bulk
SOT-23-3		AH9249NTR-G1	GJ9	Tape & Reel
DFN-2x2-3		AH9249DNTR-G1	JB	Tape & Reel

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



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**Absolute Maximum Ratings (T<sub>A</sub>=25°C, Note 1)**

Parameter	Symbol	Value	Unit
Supply Voltage	V <sub>CC</sub>	7	V
Supply Current (Fault)	I <sub>CC</sub>	6	mA
Output Voltage	V <sub>OUT</sub>	7	V
Output Current	I <sub>OUT</sub>	2	mA
Magnetic Flux Density	B	Unlimited	Gauss
Power Dissipation	P <sub>D</sub>	TO-92S-3	400
		SOT-23-3	230
		DFN-2×2-3	230
Storage Temperature	T <sub>STG</sub>	-55 to 150	°C
Junction Temperature	T <sub>J</sub>	150	
ESD (Human Body Model) (Note 2)		4000	V
ESD (Machine Model) (Note 2)		600	

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.

Note 2: Electronic semiconductor products are sensitive to Electro Static Discharge (ESD). Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

**Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V <sub>CC</sub>	2.5	5.5	V
Operating Temperature	T <sub>OP</sub>	-40	85	°C



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**Electrical Characteristics**

$V_{CC}=3V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	$V_{CC}$	Operating	2.5	3	5.5	V
Supply Current	$I_{AW}$	Awake		2	4	mA
	$I_{SL}$	Sleep		6	10	$\mu A$
	$I_{AVG}$	Average		10	15	$\mu A$
Output Current	$I_{OUT}$				1.0	mA
Output Leakage Current	$I_{LEAK}$	$B <  B_{RP} $		<0.1	1	$\mu A$
Saturation Voltage	$V_{SAT}$	$I_{OUT}=1.0mA$			0.4	V
Awake Mode Time	$t_{AW}$	Operating		150		$\mu s$
Sleep Mode Time	$t_{SL}$	Operating		90	120	ms
Duty Cycle	D			0.15		%
Chopper Frequency	$f_C$			15		kHz

**Magnetic Characteristics (Note 3)**

$V_{CC}=3V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating Point	$B_{OPS}$	South pole to branded side $B > B_{OPS}, V_{OUT}=low$ (output on)		30	55	Gauss
	$B_{OPN}$	North pole to branded side $B > B_{OPN}, V_{OUT}=low$ (output on)	-55	-30		Gauss
Releasing Point	$B_{RPS}$	South pole to branded side $B < B_{RPS}, V_{OUT}=high$ (output off)	5	20		Gauss
	$B_{RPN}$	North pole to branded side $B < B_{RPN}, V_{OUT}=high$ (output off)		-20	-5	Gauss
Hysteresis	$B_{HYS}$	$ B_{OPX} - B_{RPX} $ (Note 4)		10		Gauss

Note 3: The specifications stated here are guaranteed by design. 1 Gauss=0.1Mt.

Note 4:  $B_{OPX}$ =operating point (output turns on);  $B_{RPX}$ =releasing point (output turned off).



**High Sensitivity Micropower Omnipolar Hall-Effect Switch**

**AH9249**

**Magnetic Characteristics (Continued)**

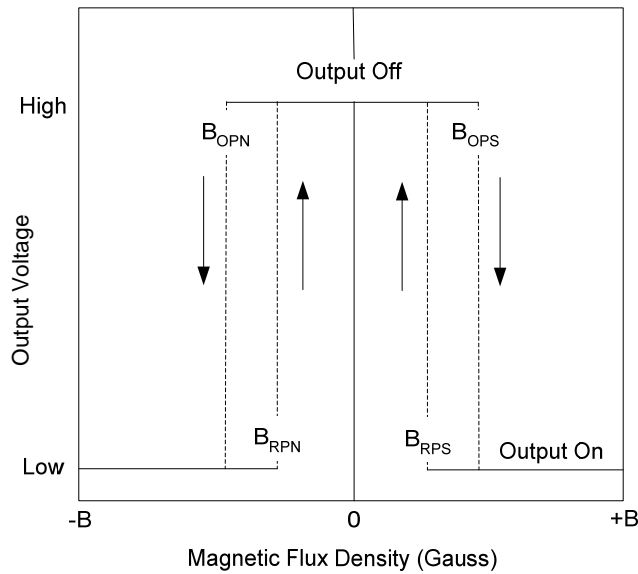


Figure 4. Output Voltage vs. Magnetic Flux Density

**Test Conditions**

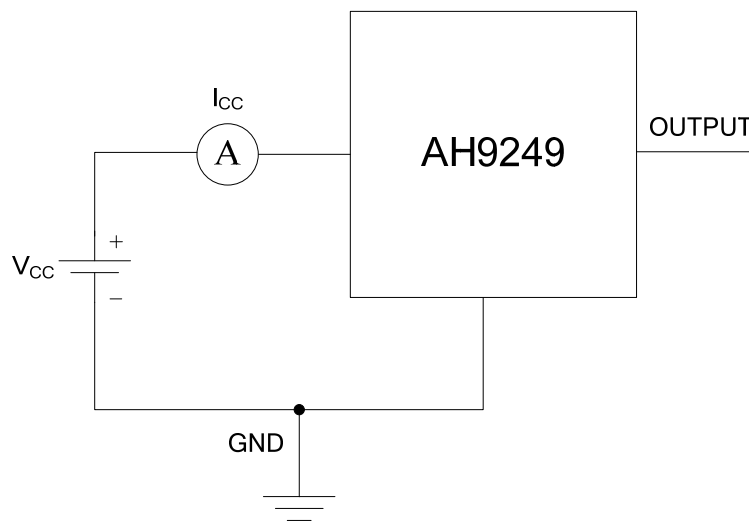


Figure 5. Average Supply Current (Note 5, 6)

Note 5:  $I_{CC}$  represents the average supply current. OUTPUT is open during measurement.  
 Note 6: The device is put under magnetic field with  $B < B_{RP}$ .



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**AH9249**

**Test Conditions (Continued)**

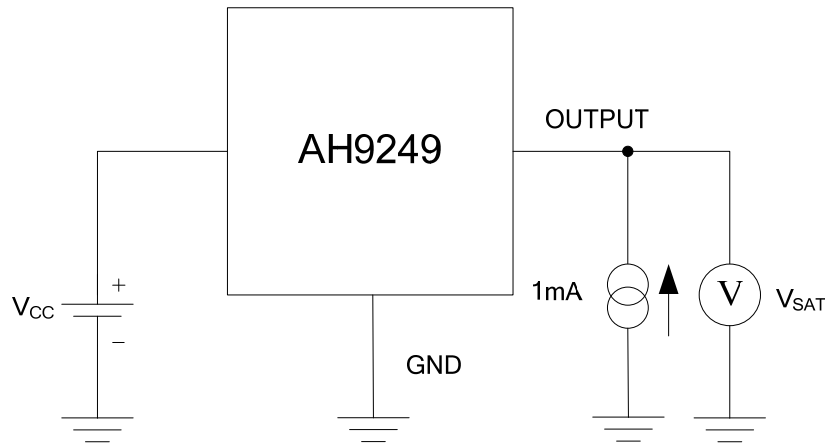


Figure 6. Output Saturation Voltage (Note 7, 8)

Note 7: The output saturation voltage  $V_{SAT}$  is measured at  $V_{CC}=2.5V$  and  $V_{CC}=5.5V$ .

Note 8: The device is put under magnetic field with  $B > B_{OP}$ .

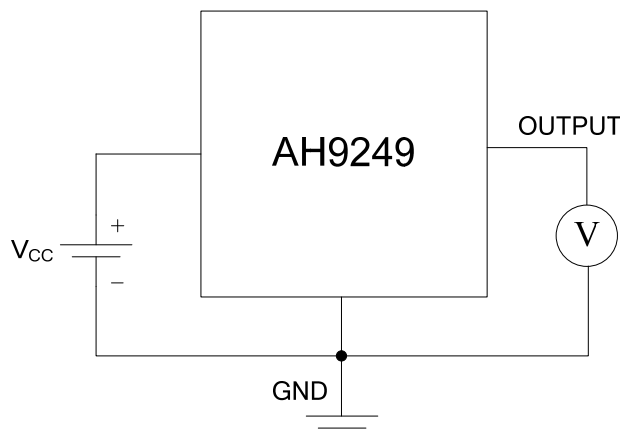


Figure 7. Magnetic Thresholds (Note 9, 10)

Note 9:  $B_{OP}$  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 10:  $B_{RP}$  is determined by putting the device under magnetic field swept from  $B_{OP(max)}$  to  $B_{RP(min)}$  until the output is switched off.





**High Sensitivity Micropower Omnipolar Hall-Effect Switch**

**AH9249**

**Typical Performance Characteristics**

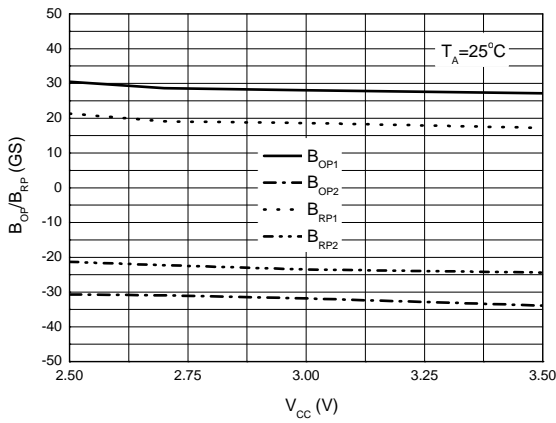


Figure 8. B<sub>OP</sub>/B<sub>RP</sub> vs. Supply Voltage

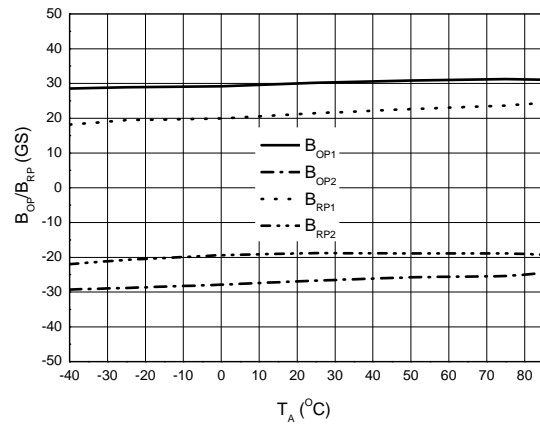


Figure 9. B<sub>OP</sub>/B<sub>RP</sub> vs. Ambient Temperature

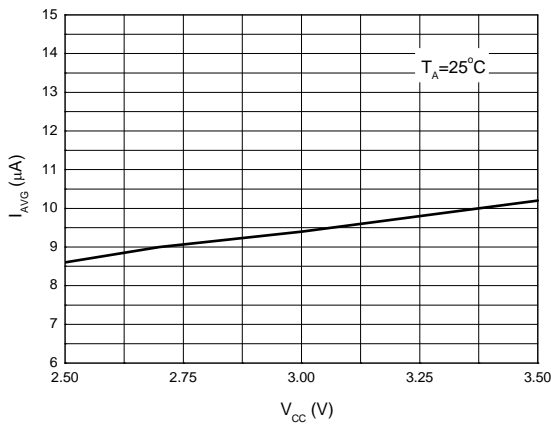


Figure 10. Average Supply Current vs. Supply Voltage

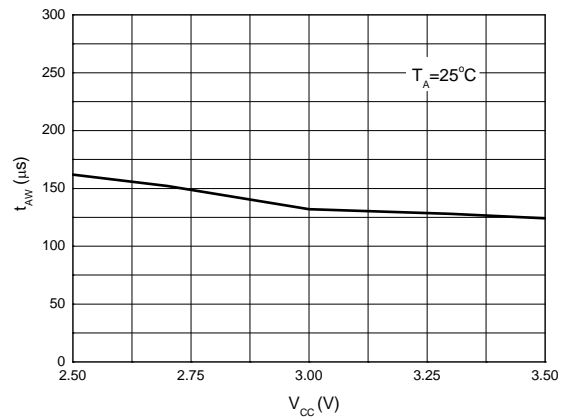


Figure 11. Awake Mode Time vs. Supply Voltage



**High Sensitivity Micropower Omnipolar Hall-Effect Switch**

**AH9249**

**Typical Performance Characteristics (Continued)**

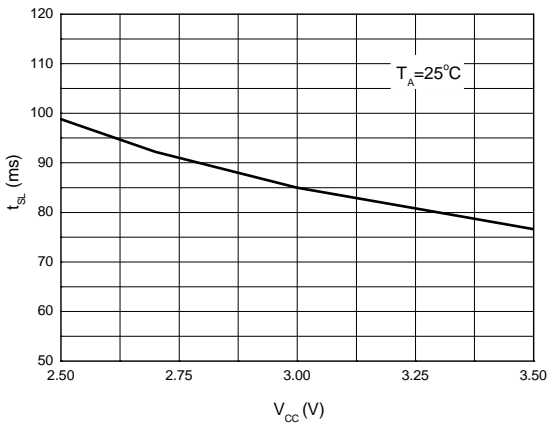


Figure 12. Sleep Mode Time vs. Supply Voltage

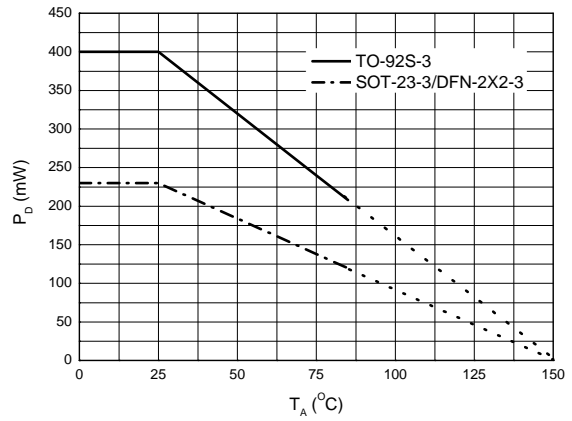


Figure 13. Power Dissipation vs. Ambient Temperature



**High Sensitivity Micropower Omnipolar Hall-Effect Switch**

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**Typical Application**

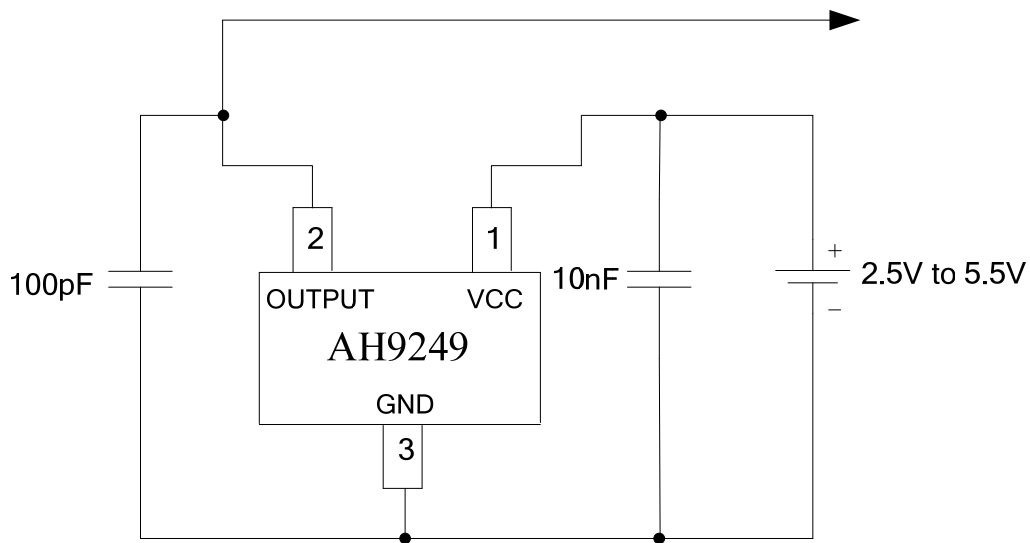


Figure 14. Typical Application Circuit of AH9249



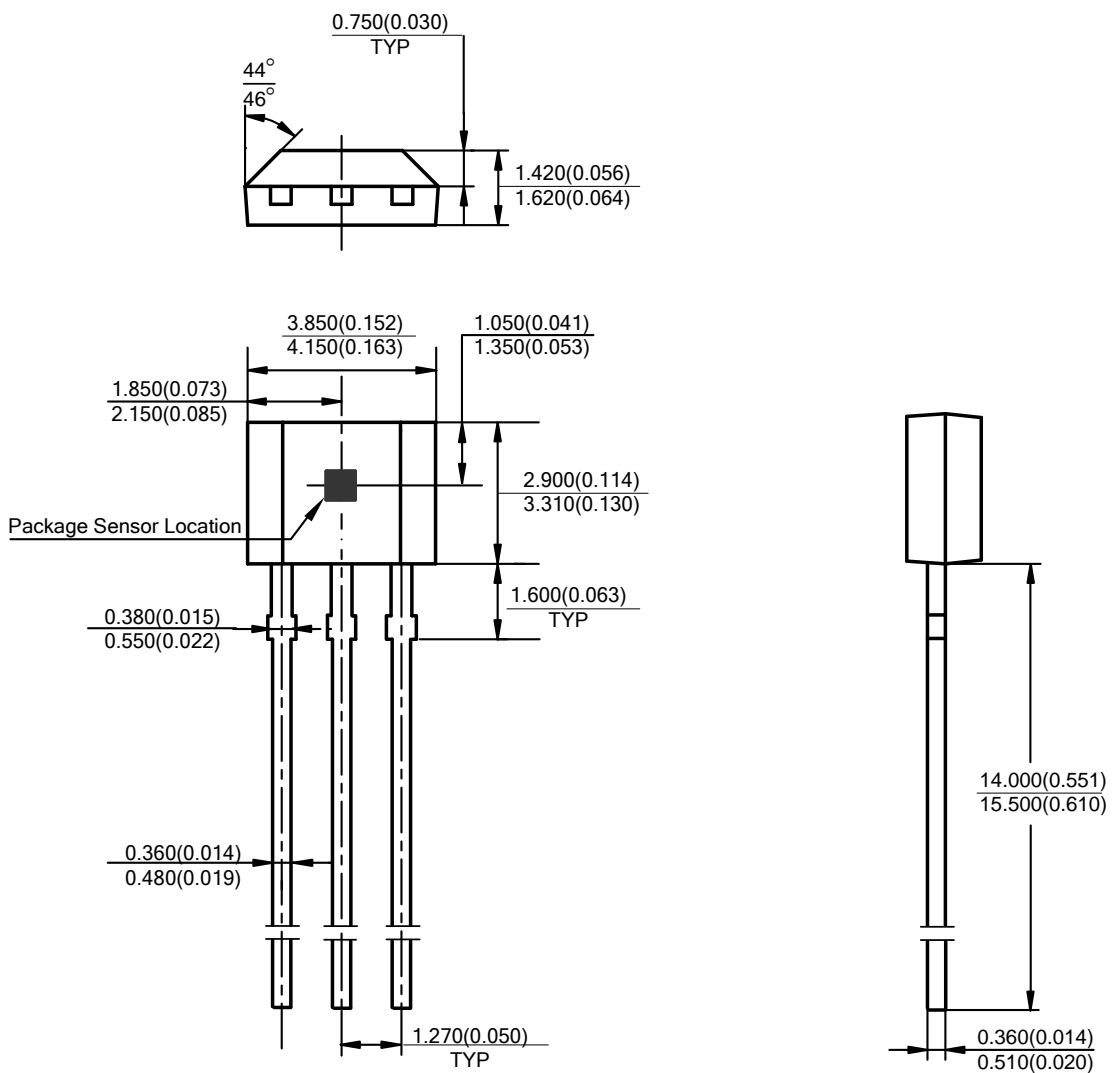
**High Sensitivity Micropower Omnipolar Hall-Effect Switch**

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**Mechanical Dimensions**

**TO-92S-3**

**Unit: mm(inch)**





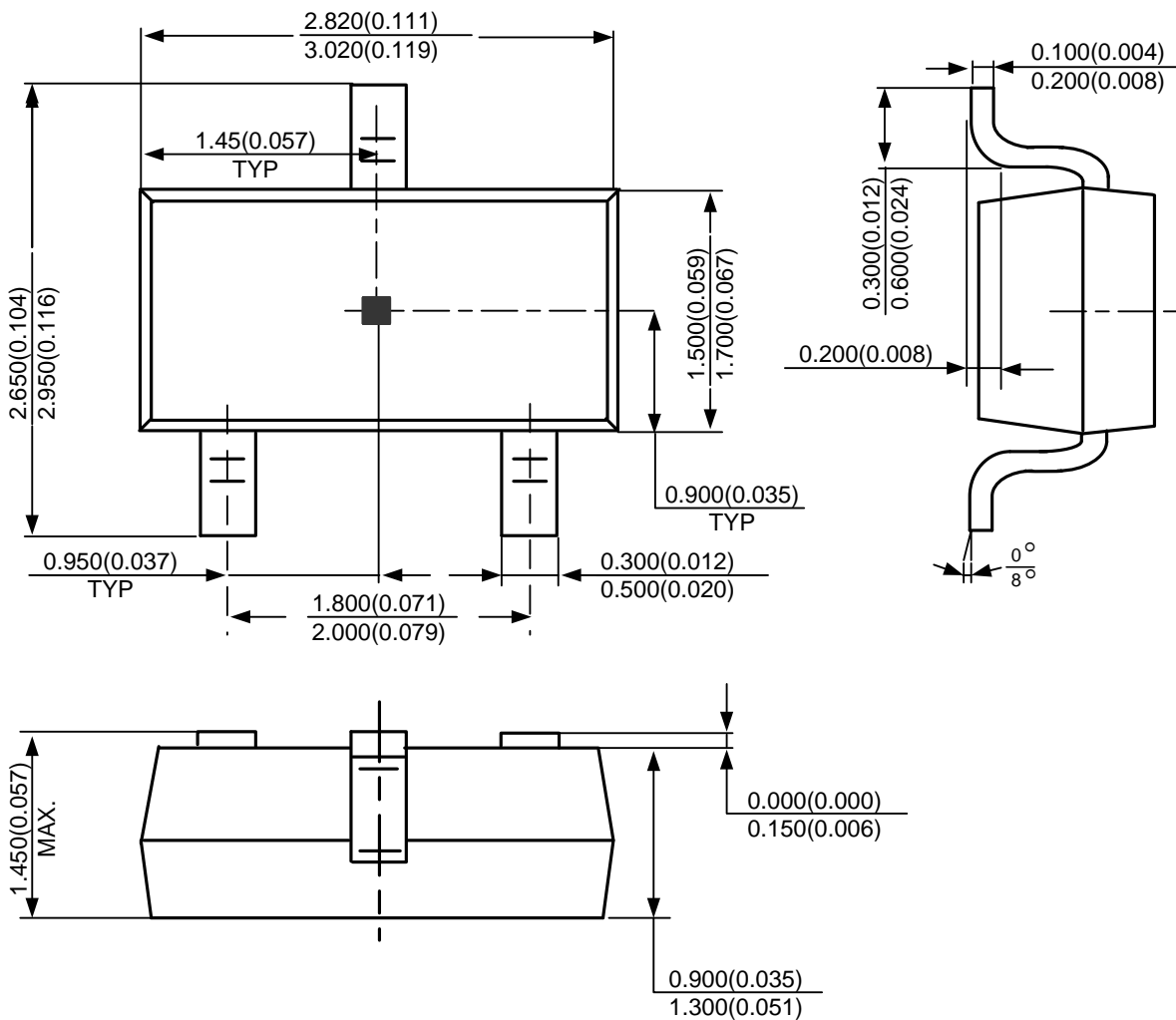
**High Sensitivity Micropower Omnipolar Hall-Effect Switch**

**AH9249**

**Mechanical Dimensions (Continued)**

**SOT-23-3**

**Unit: mm(inch)**





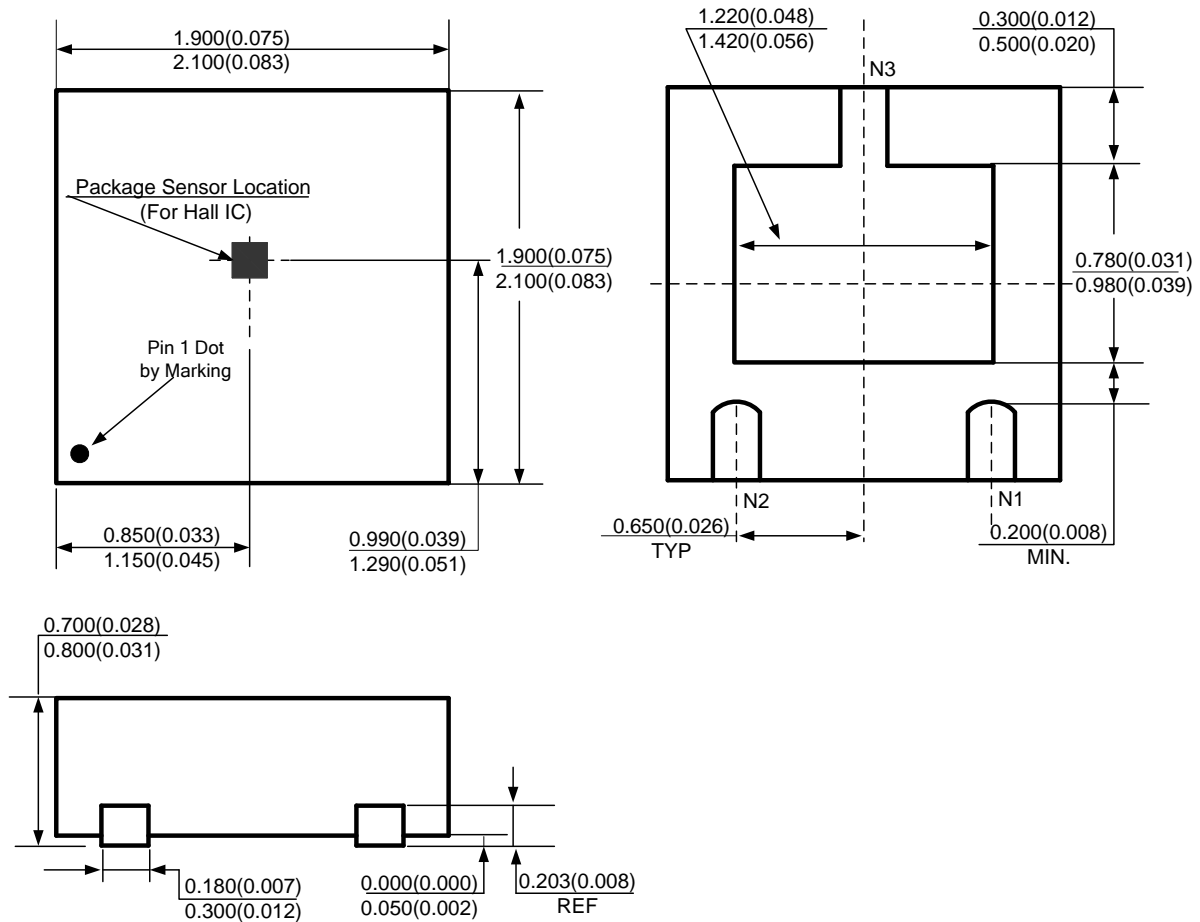
**High Sensitivity Micropower Omnipolar Hall-Effect Switch**

**AH9249**

**Mechanical Dimensions (Continued)**

**DFN-2x2-3**

**Unit: mm(inch)**





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