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 μA.

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-2×2-3 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

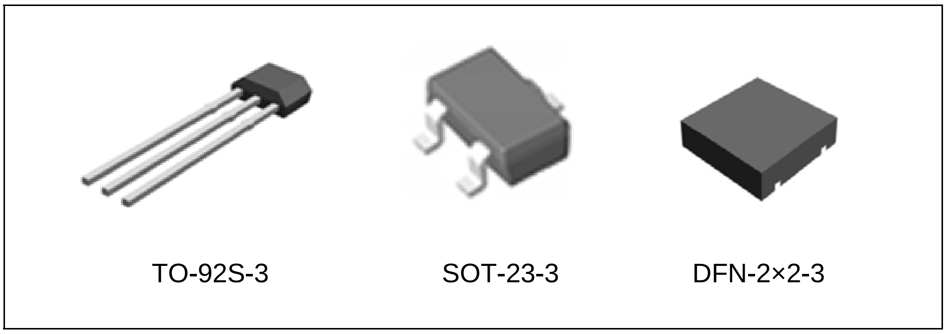


Figure 1. Package Types of AH9249

Pin Configuration

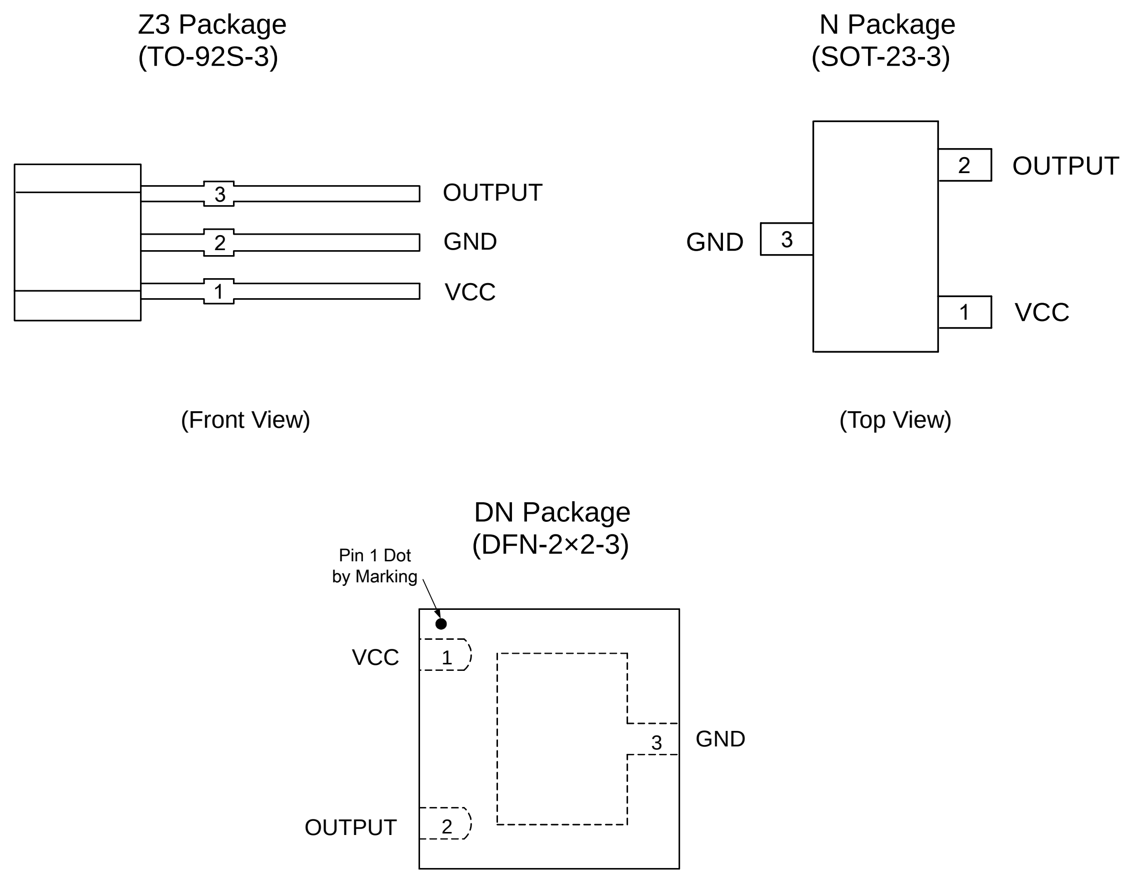


Figure 2. Pin Configuration of AH9249

Pin Description

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

Functional Block Diagram

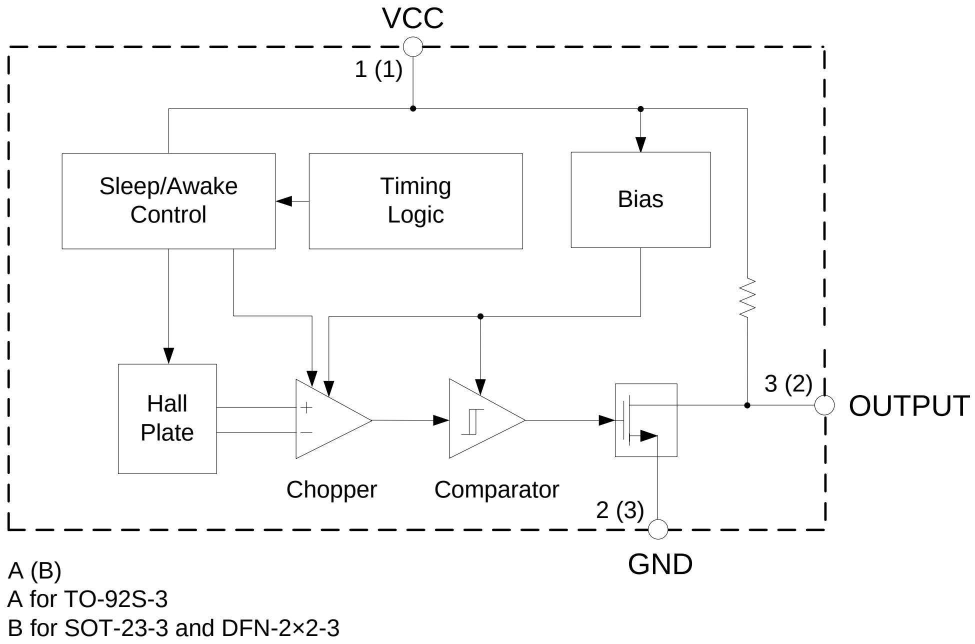
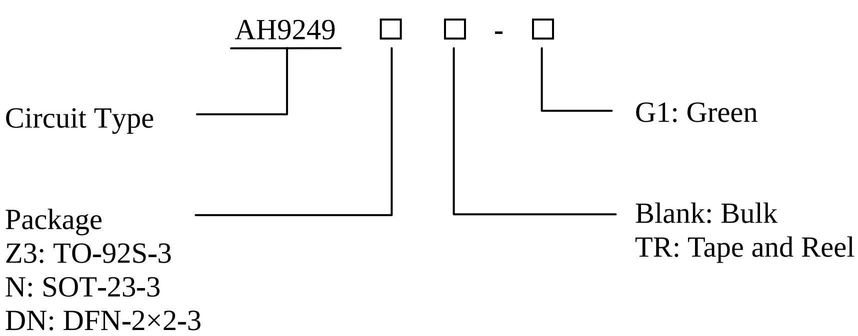


Figure 3. Functional Block Diagram of AH9249

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-2×2-3		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.

Absolute Maximum Ratings (T_A=25°C, Note 1)

Parameter	Symbol	Value		Unit
Supply Voltage	V_{CC}	7		V
Supply Current (Fault)	I_{CC}	6		mA
Output Voltage	V_{OUT}	7		V
Output Current	I_{OUT}	2		mA
Magnetic Flux Density	B	Unlimited		Gauss
Power Dissipation	P_D	TO-92S-3	400	mW
		SOT-23-3	230	
		DFN-2×2-3	230	
Storage Temperature	T_{STG}	-55 to 150		°C
Junction Temperature	T_J	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_{CC}	2.5	5.5	V
Operating Temperature	T_{OP}	-40	85	°C

Electrical Characteristics

V_{CC} =3V, T_A =25°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	µA
	I_{AVG}	Average		10	15	µA
Output Current	I_{OUT}				1.0	mA
Output Leakage Current	I_{LEAK}	B<｜B_{RP}｜		<0.1	1	µA
Saturation Voltage	V_{SAT}	I_{OUT} =1.0mA			0.4	V
Awake Mode Time	t_{AW}	Operating		150		µs
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°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).

Magnetic Characteristics (Continued)

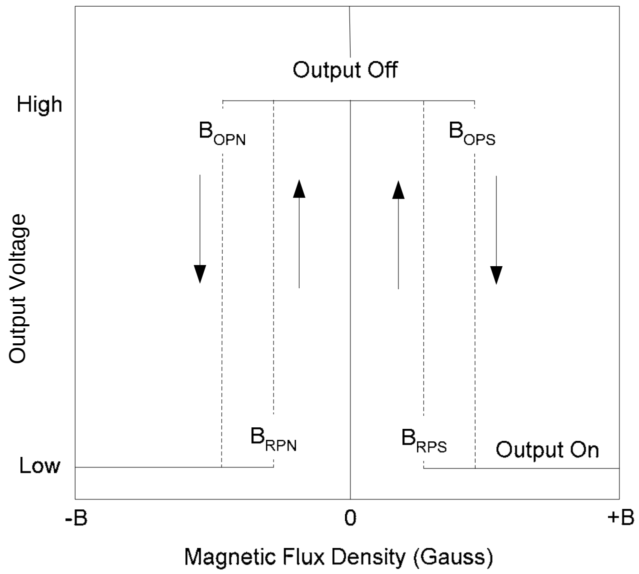


Figure 4. Output Voltage vs. Magnetic Flux Density

Test Conditions

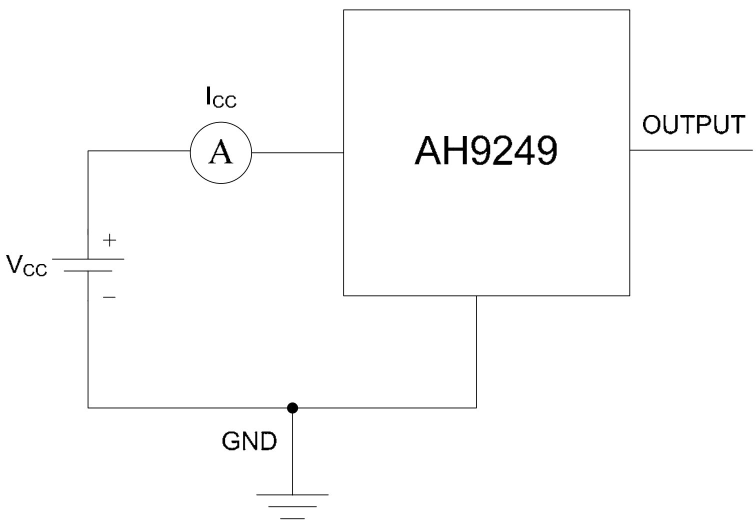


Figure 5. Average Supply Current (Note 5, 6)

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

Test Conditions (Continued)

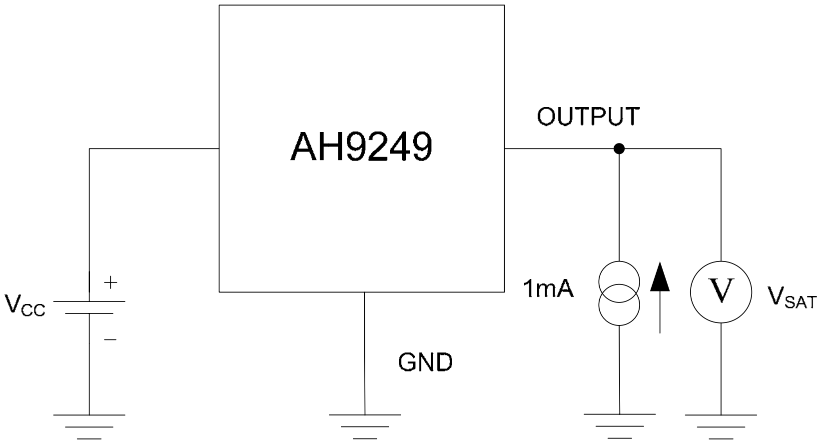


Figure 6. Output Saturation Voltage (Note 7, 8)

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 $B>B_{OP}$.

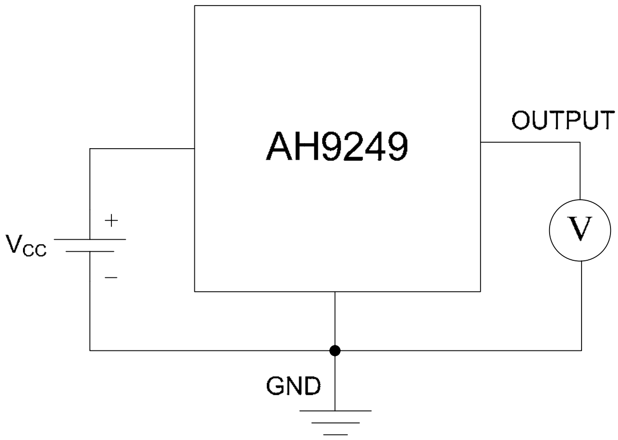


Figure 7. Magnetic Thresholds (Note 9, 10)

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.

Typical Performance Characteristics

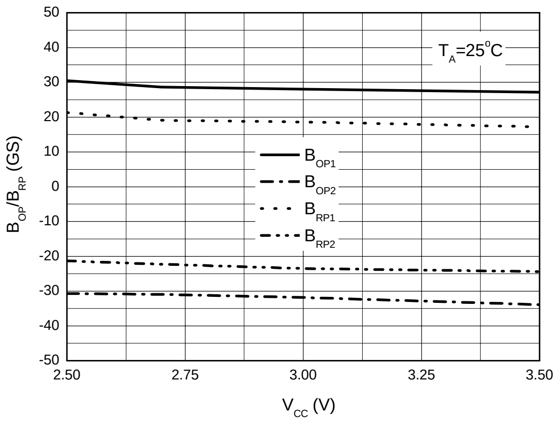


Figure 8. B_{OP}/B_{RP} vs. Supply Voltage

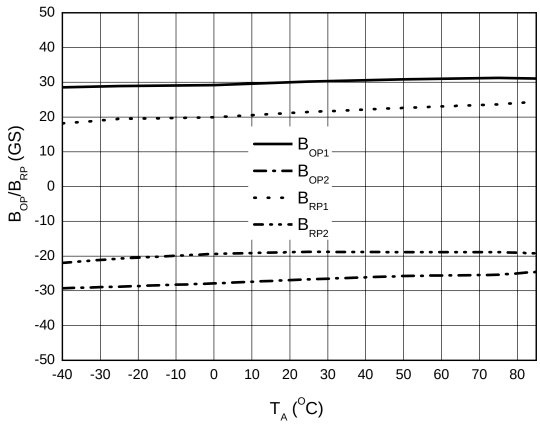


Figure 9. B_{OP}/B_{RP} vs. Ambient Temperature

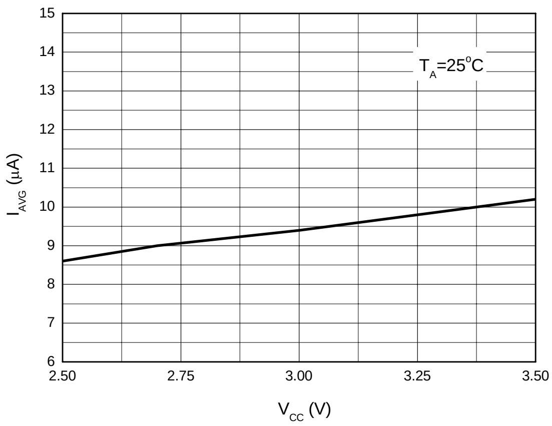


Figure 10. Average Supply Current vs. Supply Voltage

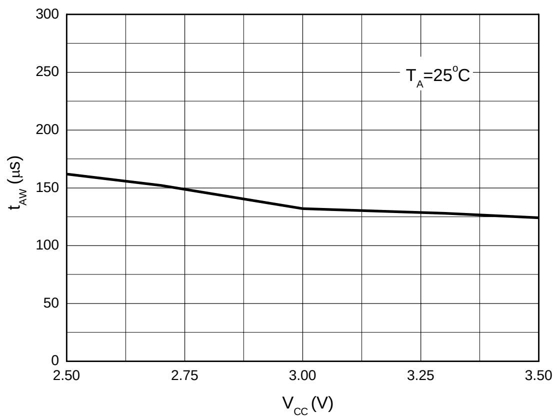


Figure 11. Awake Mode Time vs. Supply Voltage

Typical Performance Characteristics (Continued)

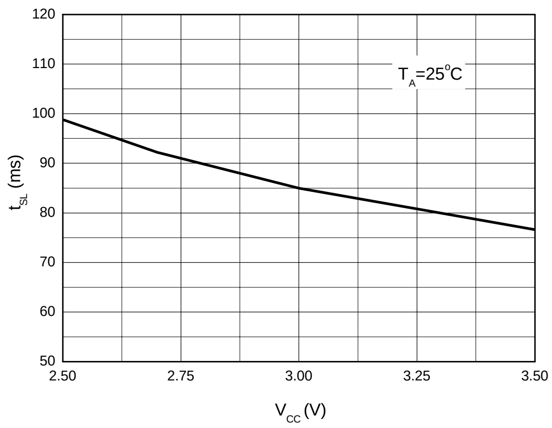


Figure 12. Sleep Mode Time vs. Supply Voltage

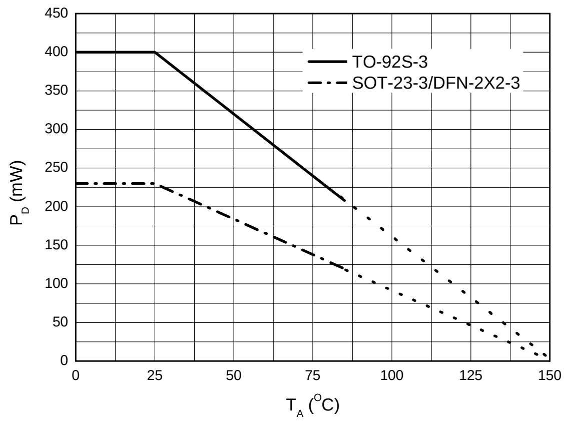


Figure 13. Power Dissipation vs. Ambient Temperature

Typical Application

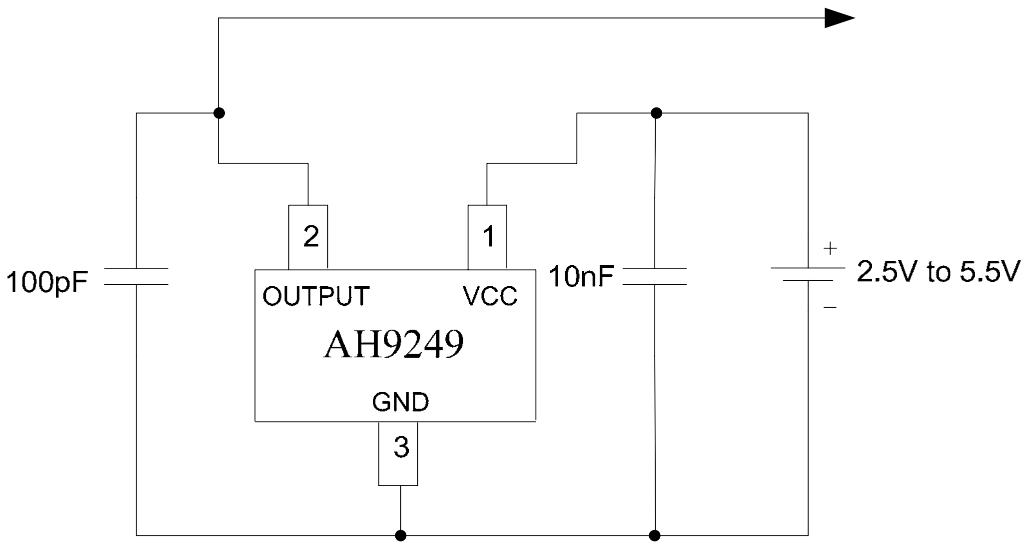
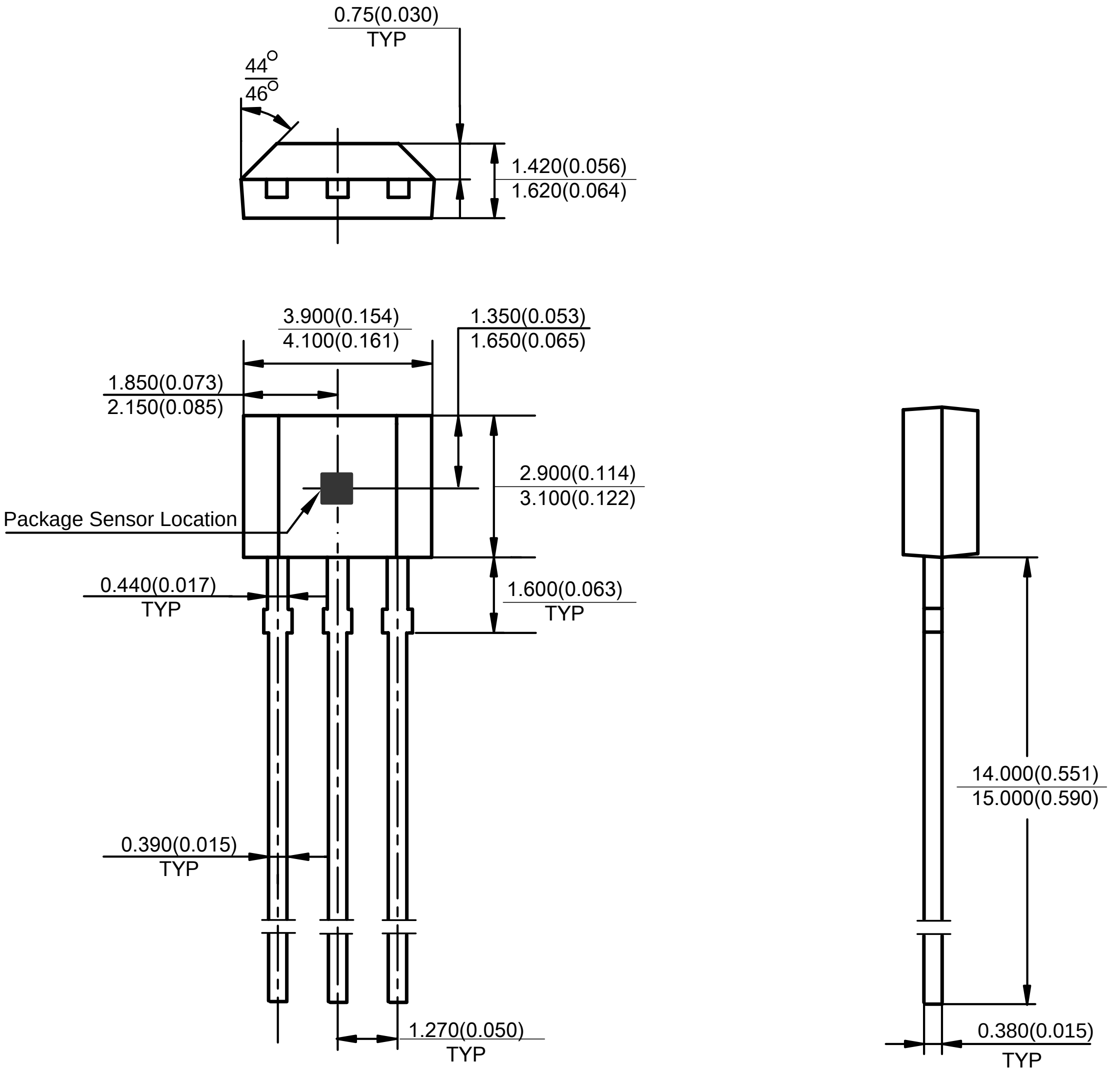


Figure 14. Typical Application Circuit of AH9249

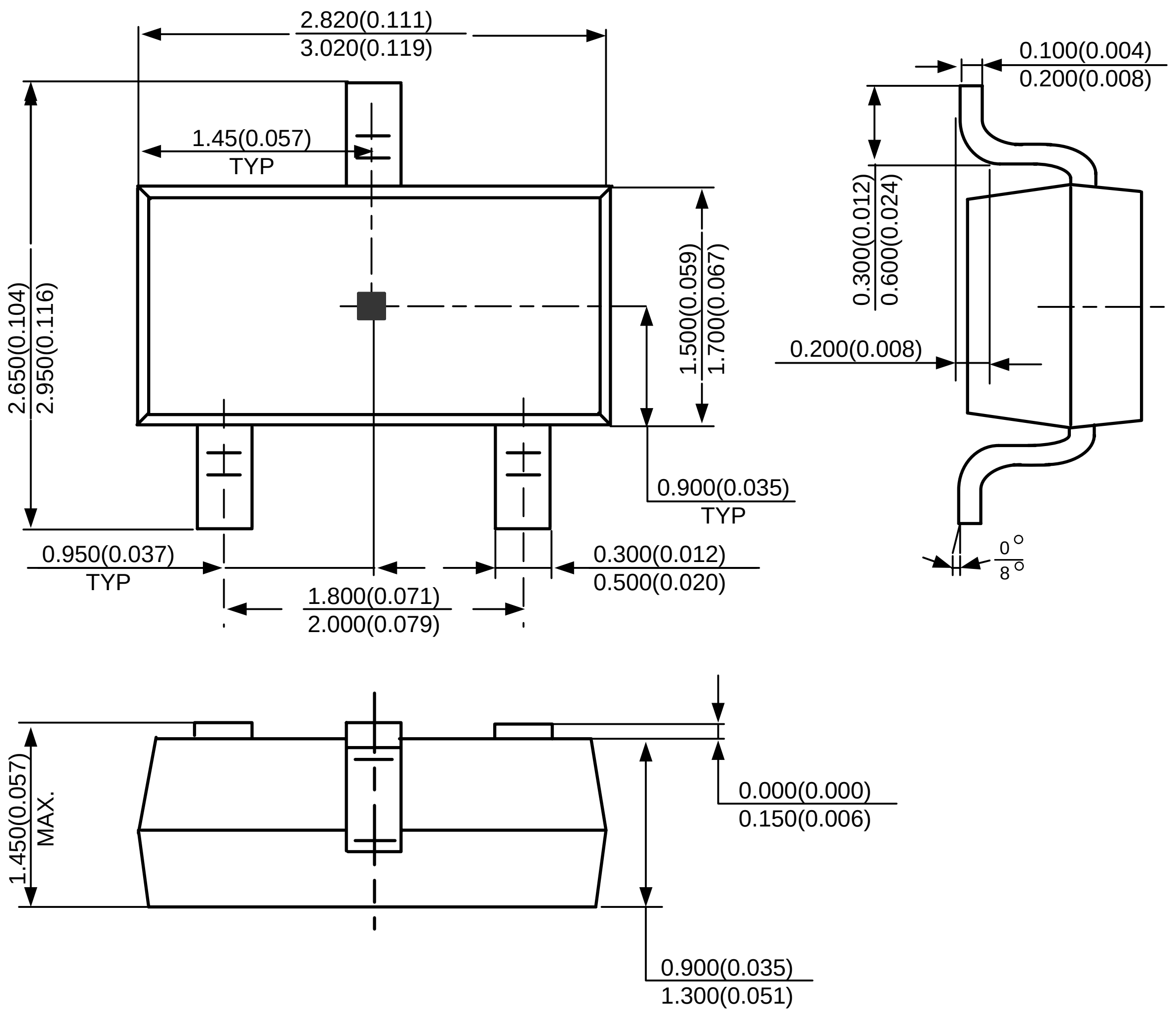
Mechanical Dimensions

TO-92S-3 **Unit: mm(inch)**



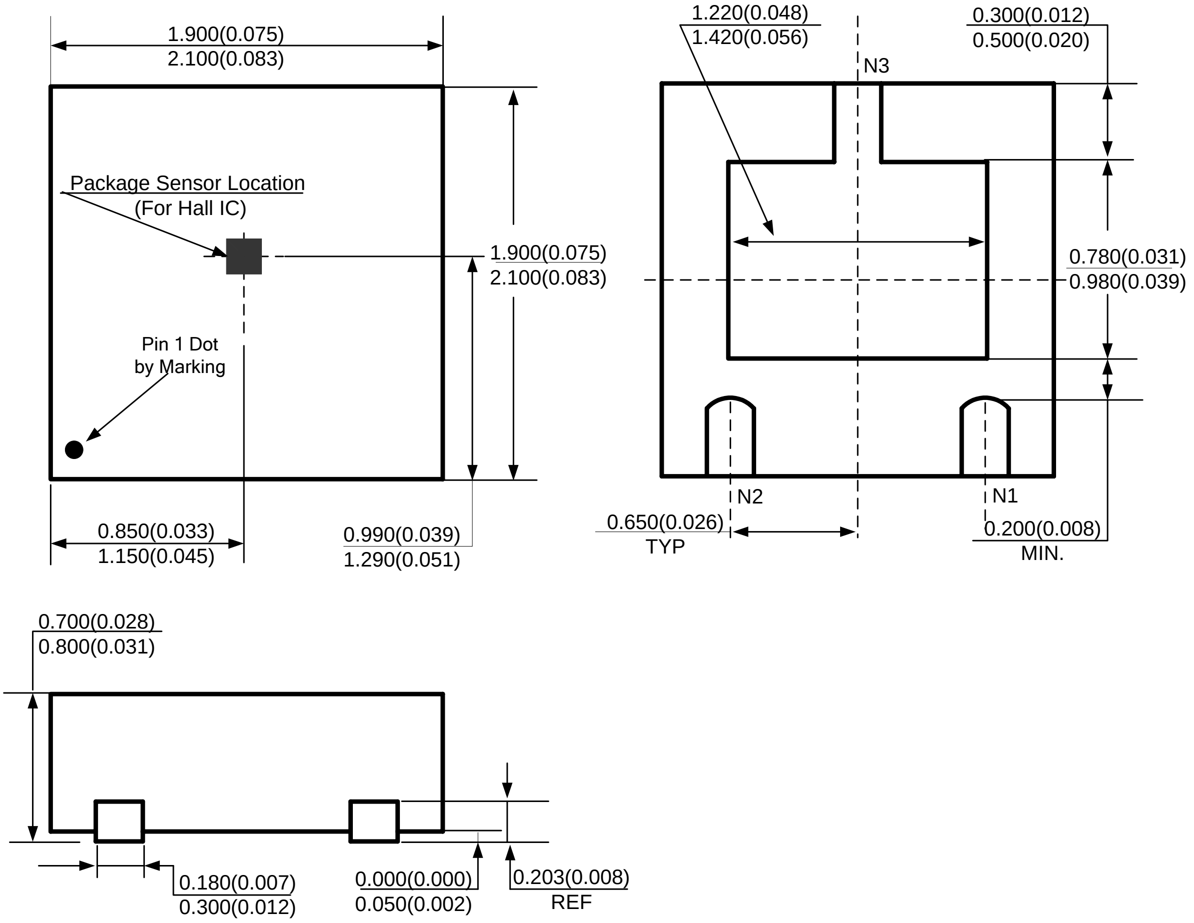
Mechanical Dimensions (Continued)

SOT-23-3 **Unit: mm(inch)**



Mechanical Dimensions (Continued)

DFN-2×2-3 **Unit: mm(inch)**



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