

## 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  $\mu\text{A}$ .

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.

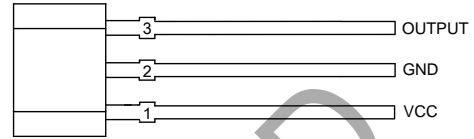
## Features

- Micropower Operation
- 2.5V 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)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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.

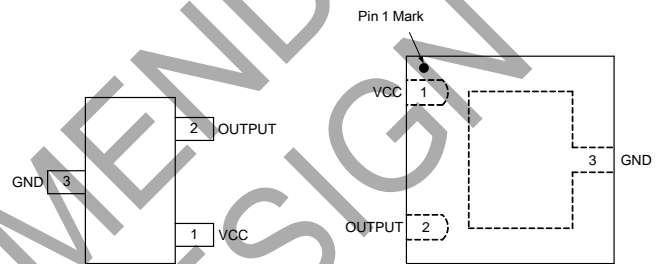
## Pin Assignments

(Front View)



TO-92S-3

(Top View)



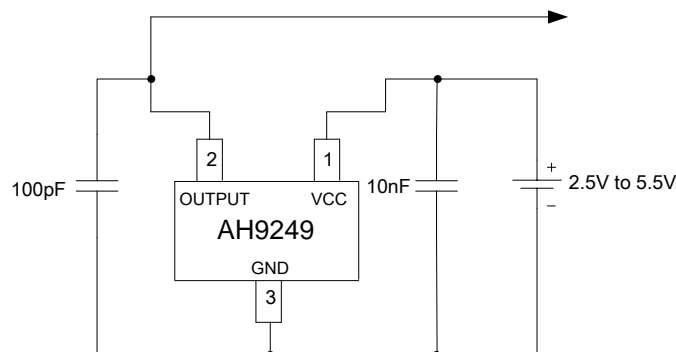
SOT-23-3

DFN-2x2-3

## Applications

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

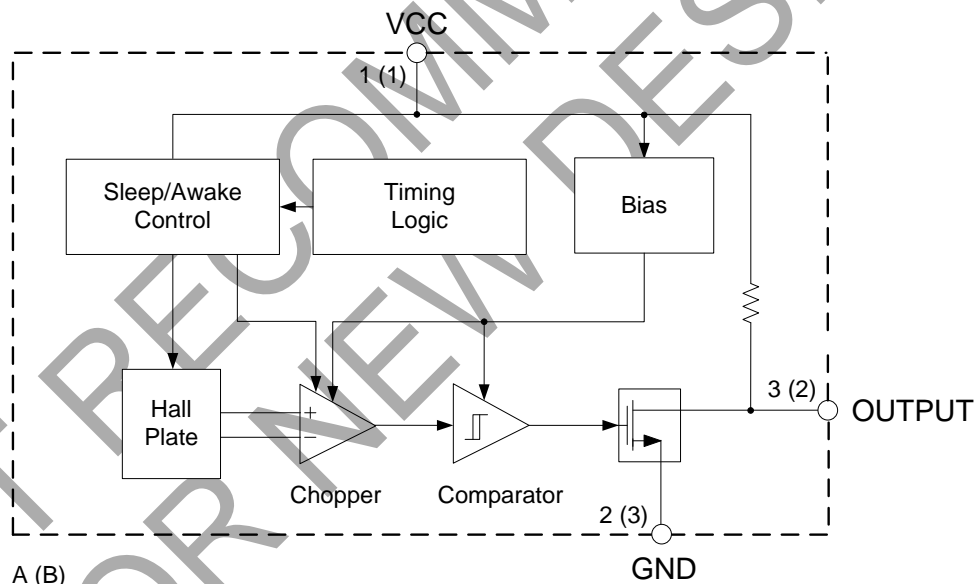
## Typical Applications Circuit



**Pin Descriptions**

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

**Functional Block Diagram**



A (B)  
A for TO-92S-3  
B for SOT-23-3 and DFN-2x2-3

### Absolute Maximum Ratings (@ $T_A=+25^{\circ}\text{C}$ , Note 4)

Symbol	Parameter	Rating	Unit
$V_{CC}$	Supply Voltage	7	V
$I_{CC}$	Supply Current (Fault)	6	mA
$V_{OUT}$	Output Voltage	7	V
$I_{OUT}$	Output Current	2	mA
B	Magnetic Flux Density	Unlimited	Gauss
$P_D$	Power Dissipation	TO-92S-3	400
		SOT-23-3	230
		DFN-2x2-3	230
$T_{STG}$	Storage Temperature	-55 to +150	$^{\circ}\text{C}$
$T_J$	Junction Temperature	+150	$^{\circ}\text{C}$
—	ESD (Human Body Model) (Note 5)	4000	V
—	ESD (Machine Model) (Note 5)	600	

Notes: 4. 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..  
5. Electronic semiconductor products are sensitive to Electro Static Discharge (ESD). Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

### Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
$V_{CC}$	Supply Voltage	2.5	5.5	V
$T_{OP}$	Operating Temperature	-40	+85	$^{\circ}\text{C}$

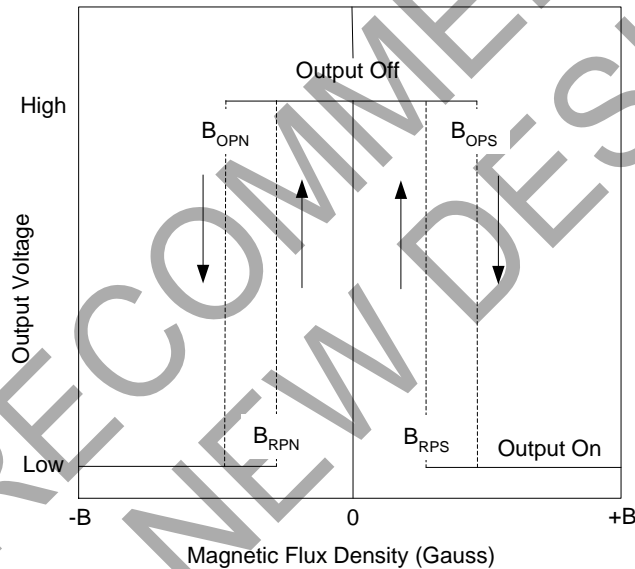
### Electrical Characteristics (@ $T_A=+25^{\circ}\text{C}$ , $V_{CC}=3\text{V}$ , unless otherwise specified.)

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

**Magnetic Characteristics** (@ $T_A=+25^{\circ}\text{C}$ ,  $V_{CC}=3\text{V}$ , unless otherwise specified. Note 6)

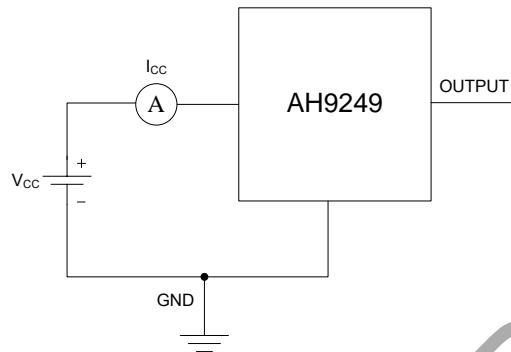
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$B_{OPS}$	Operating Point	South pole to branded side $B > B_{OPS}, V_{OUT} = \text{low}$ (output on)	—	30	55	Gauss
$B_{OPN}$		North pole to branded side $B > B_{OPN}, V_{OUT} = \text{low}$ (output on)	-55	-30	—	Gauss
$B_{RPS}$	Releasing Point	South pole to branded side $B < B_{RPS}, V_{OUT} = \text{high}$ (output off)	5	20	—	Gauss
$B_{RPN}$		North pole to branded side $B < B_{RPN}, V_{OUT} = \text{high}$ (output off)	—	-20	-5	Gauss
$B_{HYS}$	Hysteresis	$ B_{OPX} - B_{RPX} $ (Note 7)	—	10	—	Gauss

- Notes: 6. The specifications stated here are guaranteed by design. 1 Gauss=0.1mT  
7.  $B_{OPX}$ =operating point (output turns on);  $B_{RPX}$ =releasing point (output turns off)



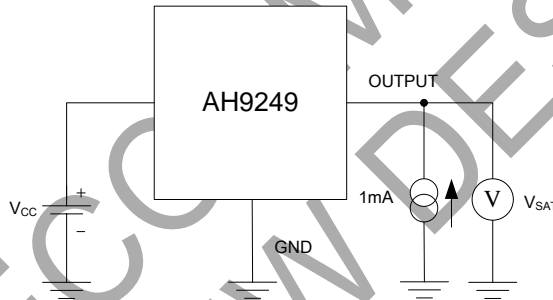
**Output Voltage vs. Magnetic Flux Density**

**Test Conditions**



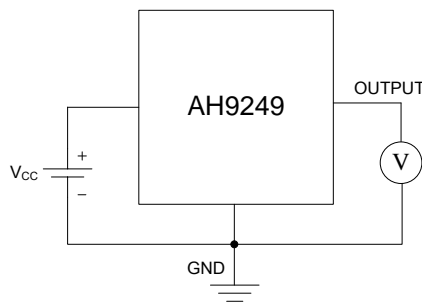
**Average Supply Current (Note 8, Note 9)**

Note 8:  $I_{CC}$  represents the average supply current. OUTPUT is open during measurement.  
Note 9: The device is put under magnetic field with  $B < B_{RP}$ .



**Output Saturation Voltage (Note 10, Note 11)**

Note 10: The output saturation voltage  $V_{SAT}$  is measured at  $V_{CC}=2.5V$  and  $V_{CC}=5.5V$ .  
Note 11: The device is put under magnetic field with  $B > B_{OP}$ .

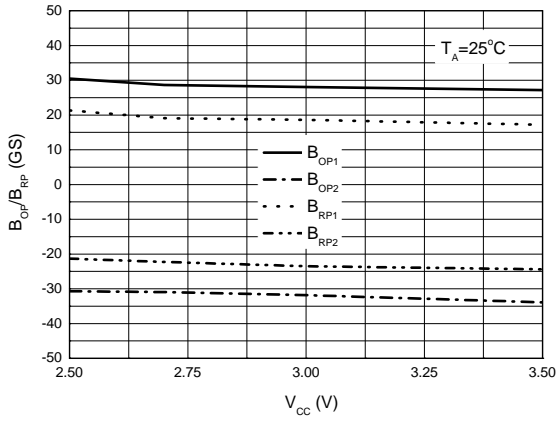


**Magnetic Thresholds (Note 12, Note 13)**

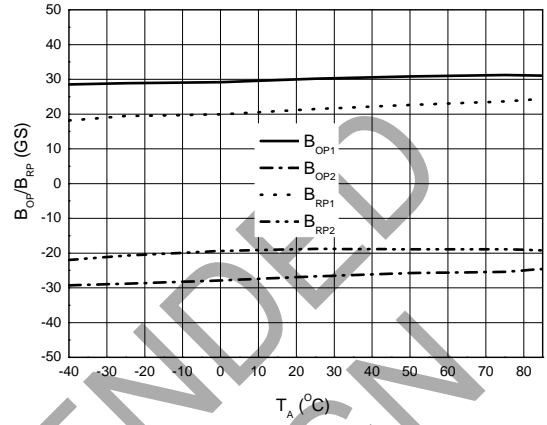
Note 12:  $B_{OP}$  is determined by putting the device under magnetic field swept from  $B_{RP}(min)$  to  $B_{OP}(max)$  until the output is switched on.  
Note 13:  $B_{RP}$  is determined by putting the device under magnetic field swept from  $B_{OP}(max)$  to  $B_{RP}(min)$  until the output is switched off.

**Performance Characteristics**

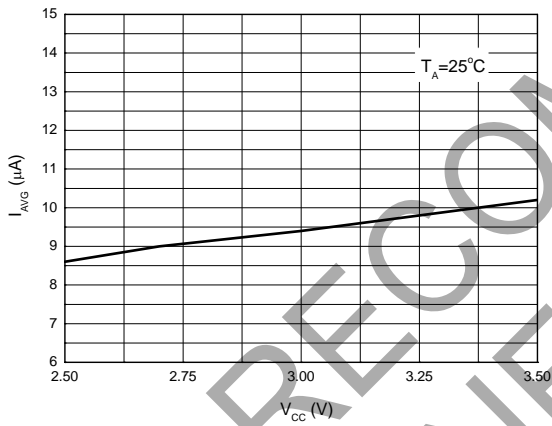
**$B_{OP}/B_{RP}$  vs. Supply Voltage**



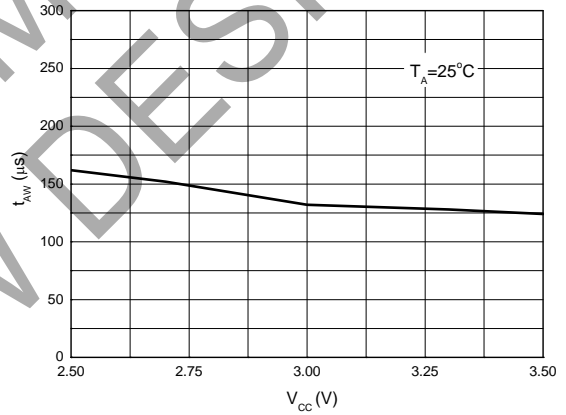
**$B_{OP}/B_{RP}$  vs. Ambient Temperature**



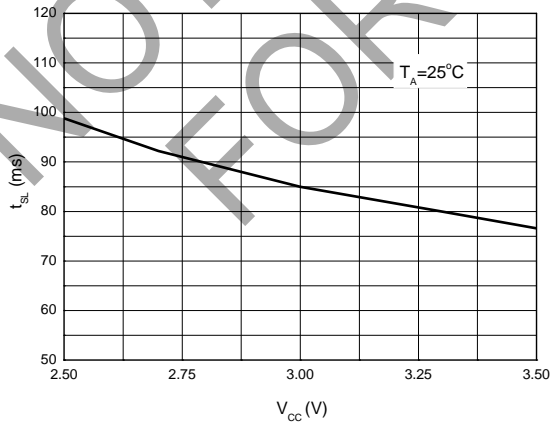
**Average Supply Current vs. Supply Voltage**



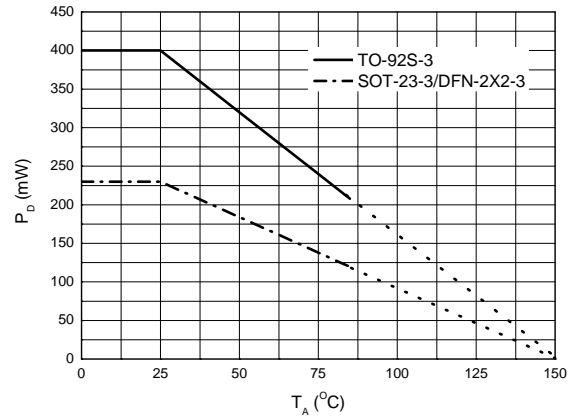
**Awake Mode Time vs. Supply Voltage**



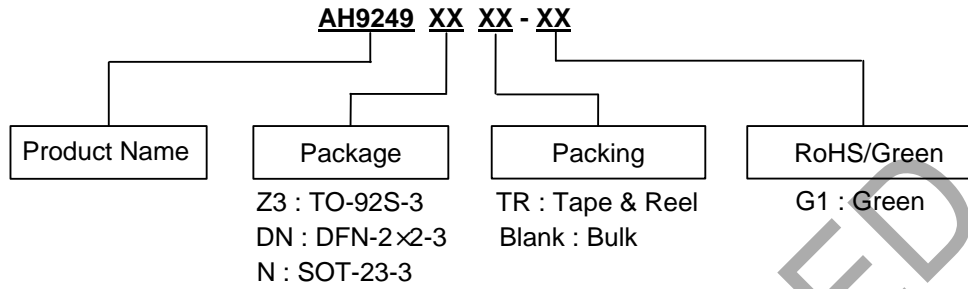
**Sleep Mode Time vs. Supply Voltage**



**Power Dissipation vs. Ambient Temperature**



**Ordering Information**



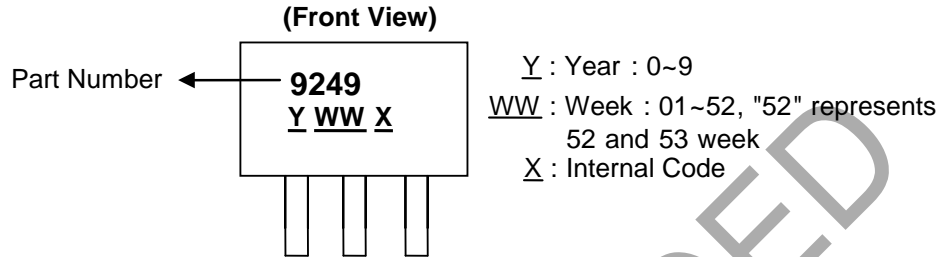
Device	Status(Note 14)	Package Code	Packaging	Bulk	7" Tape and Reel
				Quantity	Quantity
AH9249Z3-G1	NRND	Z3	TO-92S-3	1000/Bulk	NA
AH9249DNTR-G1	NRND	DN	DFN-2X2-3	NA	3000/Tape & Reel
AH9249NTR-G1	NRND	N	SOT-23-3	NA	3000/Tape & Reel

Note 14: NRND = Not Recommended for New Design.

NOT RECOMMENDED FOR NEW DESIGN

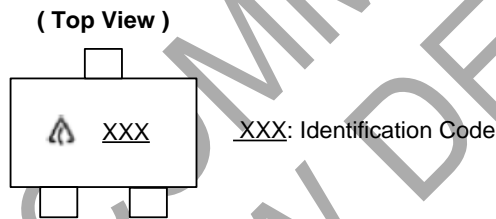
## Marking Information

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



Part Number	Package	Identification Code
AH9249	TO-92S-3	9249

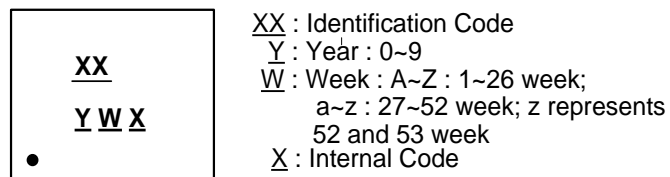
### (2) Package Type: SOT-23-3



Part Number	Package	Identification Code
AH9249	SOT-23-3	GJ9

### (3) Package Type: DFN-2X2-3

**( Top View )**

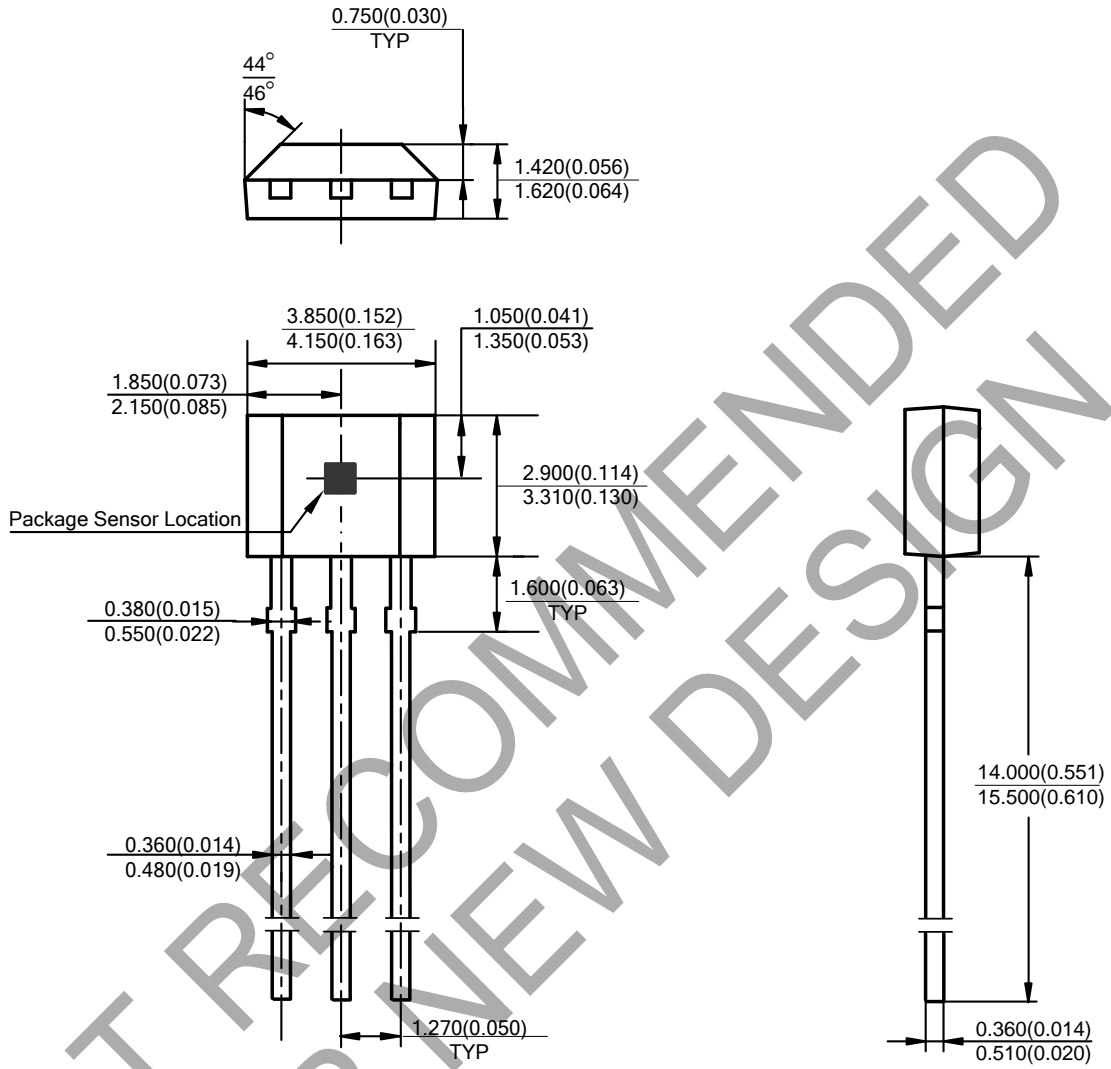


Part Number	Package	Identification Code
AH9249	DFN-2X2-3	JB



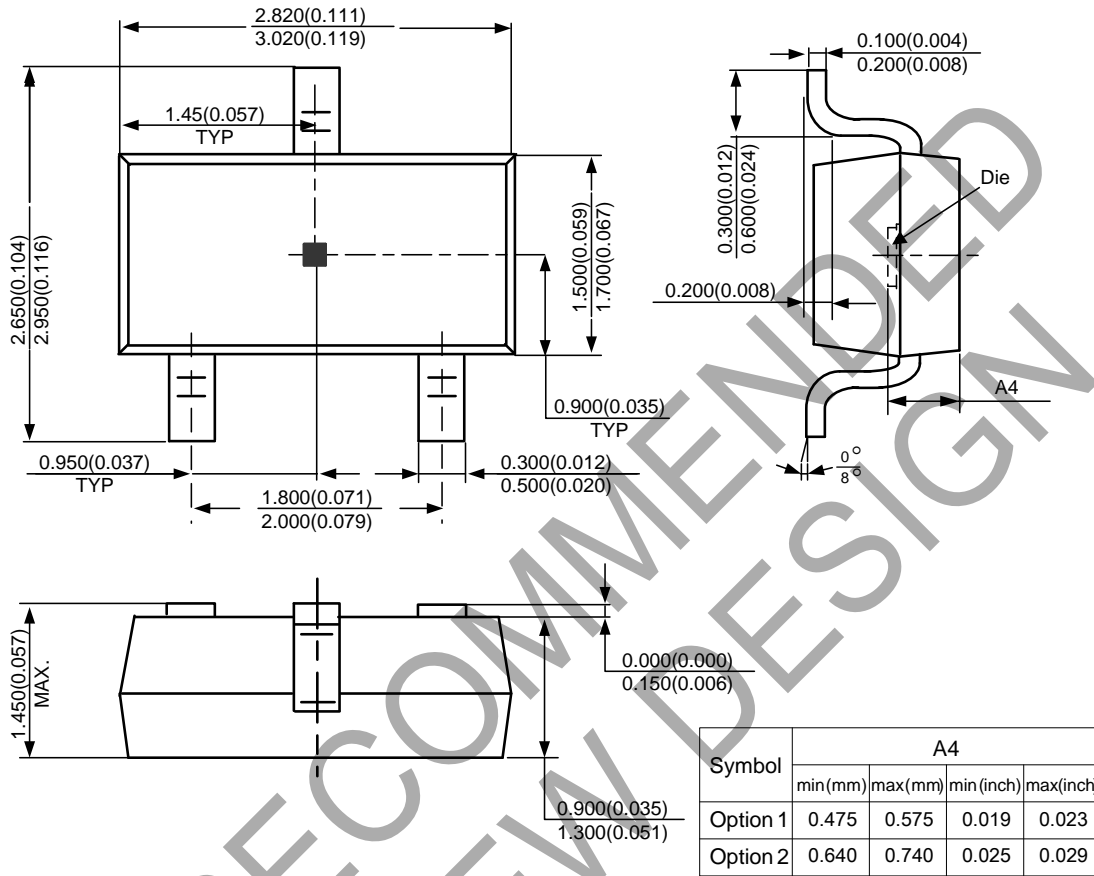
**Package Outline Dimensions** (All dimensions in mm(inch).)

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



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

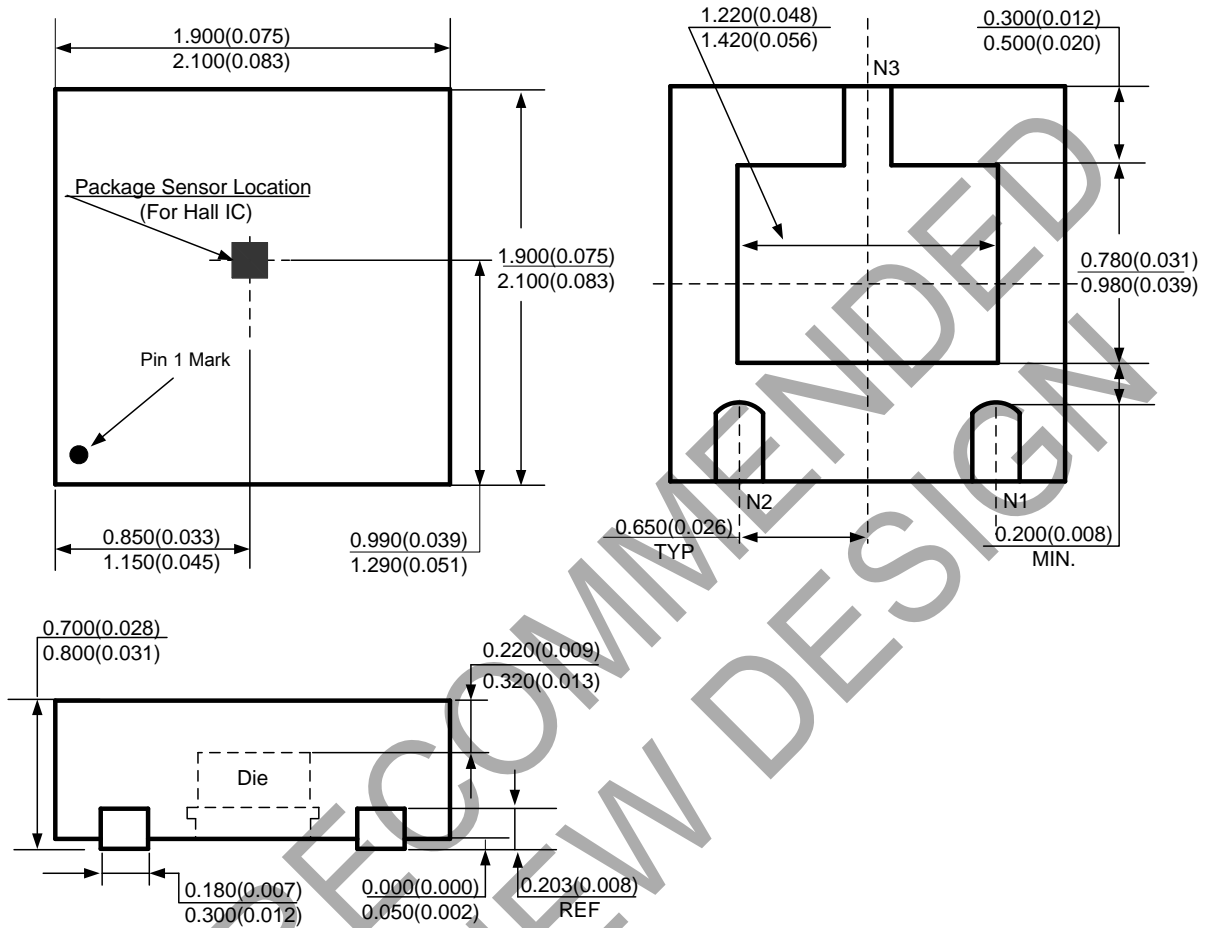
(2) Package Type: SOT-23-3



NOT RECOMMENDED FOR NEW DESIGN

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

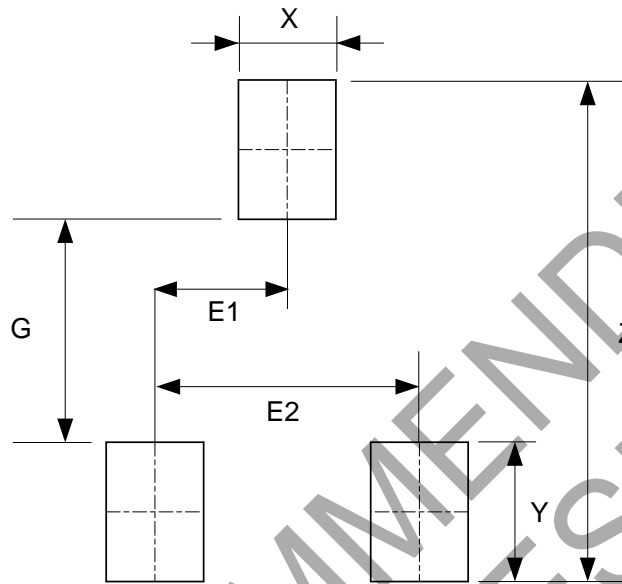
(3) Package Type: DFN-2x2-3



NOT RECOMMENDED FOR NEW DESIGN

## Suggested Pad Layout

(1) Package Type: SOT-23-3

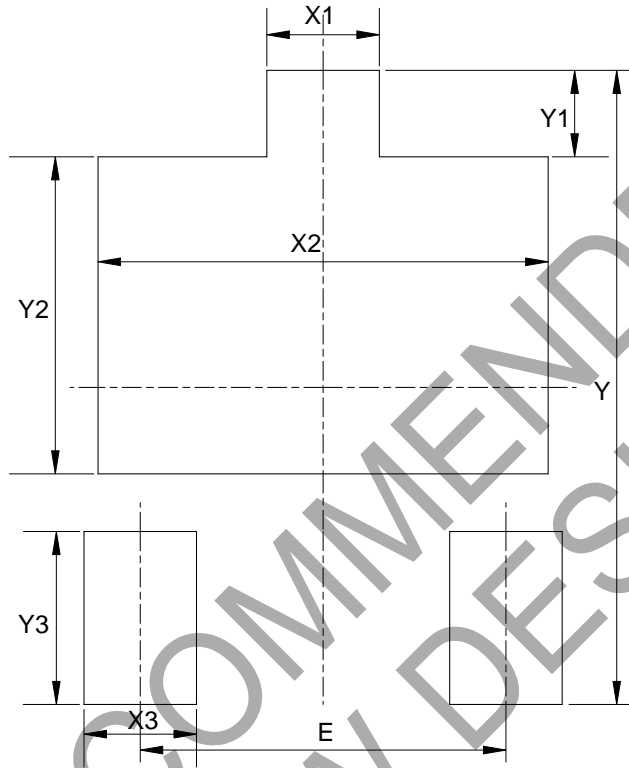


Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

NOT RECOMMENDED FOR NEW DESIGN

**Suggested Pad Layout** (cont.)

(2) Package Type: DFN-2x2-3



Dimensions	Y (mm)/(inch)	X1=X3 (mm)/(inch)	Y1 (mm)/(inch)	X2 (mm)/(inch)	Y2 (mm)/(inch)	Y3 (mm)/(inch)	E (mm)/(inch)
Value	2.200/0.087	0.400/0.016	0.300/0.012	1.600/0.063	1.100/0.043	0.600/0.024	1.300/0.051

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