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HIGH SENSITIVITY MICROPOWER OMNIPOLAR HALL-EFFECT SWITCH

Description

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

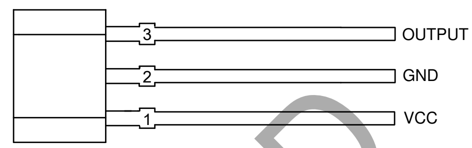
Special CMOS process is used for low-voltage and low-power requirement. A chopper stabilized amplifier improves stability of magnetic switch points. A sleep-awake logic controls the IC in sleep time or awake time. This function will reduce the average operating current of the IC. During the awake time, 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.

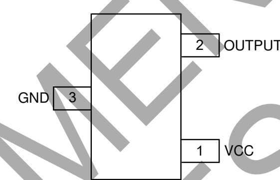
Pin Assignments

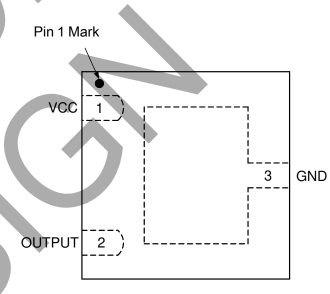
(Front View)



TO-92S-3

(Top View)





SOT-23-3 **DFN-2×2-3**

Features

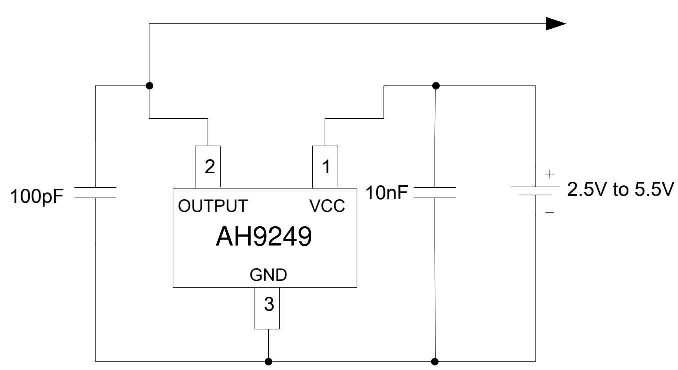
- Micropower Operation
- 2.5V to 5.5V Power Supply
- Switching for Both Poles of a Magnet (Omnipolar)
- Stabilized Chopper
- Superior Temperature Stability
- Digital Output Signal
- Built-in Pull-up Resistor
- ESD Rating: 4000V (Human Body Model)
  600V (Machine Model)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Applications

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

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 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.

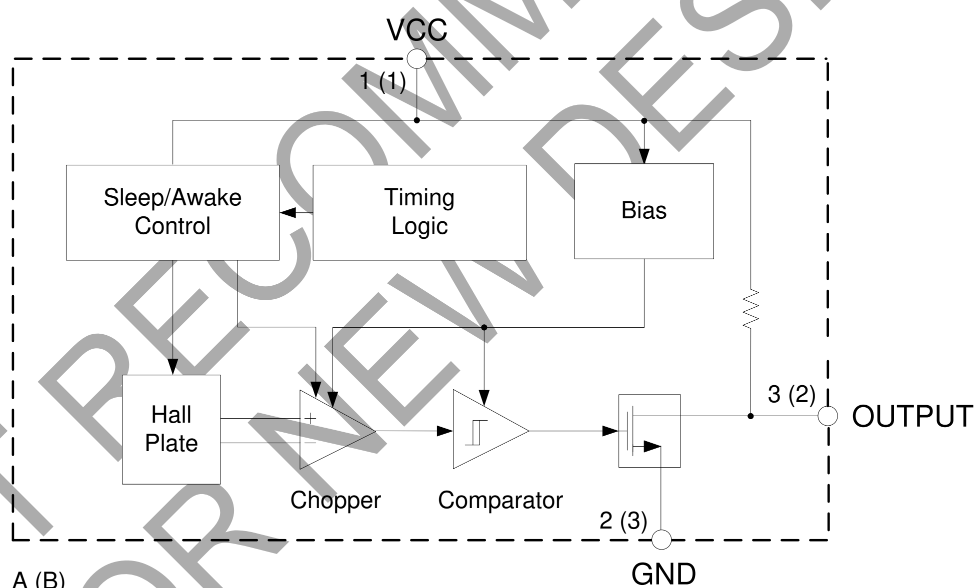
Typical Applications Circuit



Pin Descriptions

Pin Number			Pin Name	Function
TO-92S-3	SOT-23-3	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



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

Absolute Maximum Ratings (@T_A=+25°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	mW
		SOT-23-3	230	
		DFN-2×2-3	230	
T_{STG}	Storage Temperature	-55 to +150		°C
T_J	Junction Temperature	+150		
—	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	°C

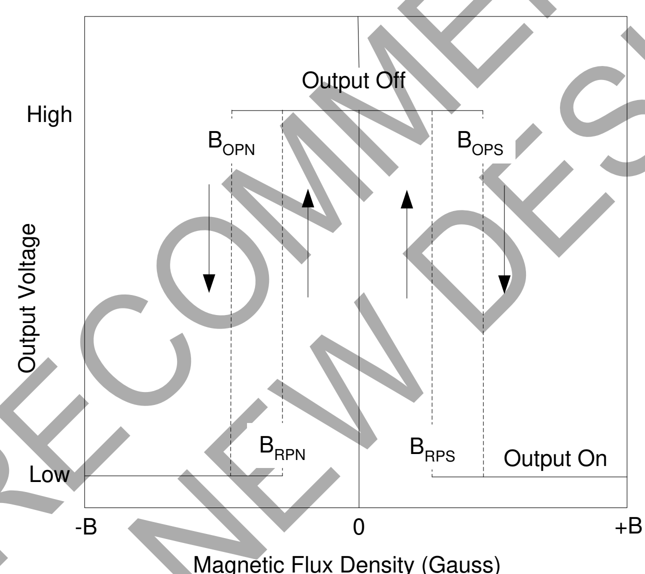
Electrical Characteristics (@T_A=+25°C, V_{CC}=3V, unless otherwise specified.)

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	μA
I_{AVG}		Average	—	10	15	μA
I_{OUT}	Output Current	—	—	—	1.0	mA
I_{LEAK}	Output Leakage Current	$B < \vert B_{RP} \vert$	—	<0.1	1	μA
V_{SAT}	Saturation Voltage	I_{OUT} =1.0mA	—	—	0.4	V
t_{AW}	Awake Mode Time	Operating	—	150	—	μs
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°C, V_{CC}=3V, unless otherwise specified. Note 6)

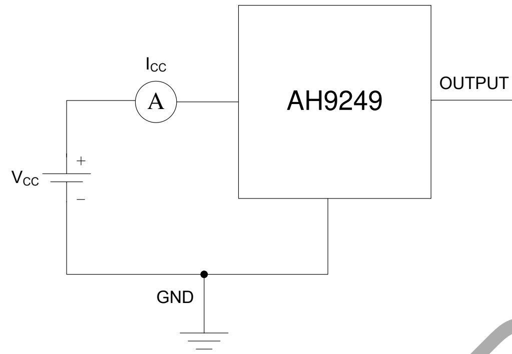
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
B_{OPS}	Operating Point	South pole to branded side $B>B_{OPS}$, V_{OUT}=low (output on)	—	30	55	Gauss
B_{OPN}		North pole to branded side $B>B_{OPN}$, V_{OUT}=low (output on)	-55	-30	—	Gauss
B_{RPS}	Releasing Point	South pole to branded side $B<B_{RPS}$, V_{OUT}=high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



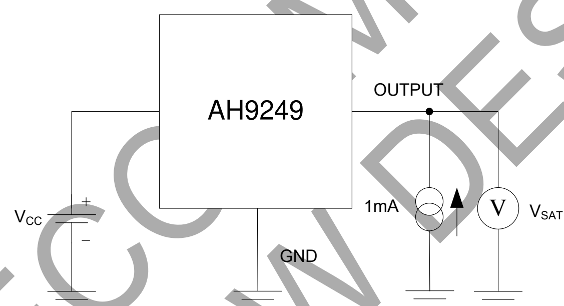
Output Voltage vs. Magnetic Flux Density

Test Conditions



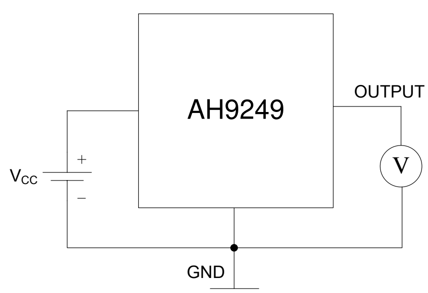
Average Supply Current (Note 8, Note 9)

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 $B>B_{OP}$.

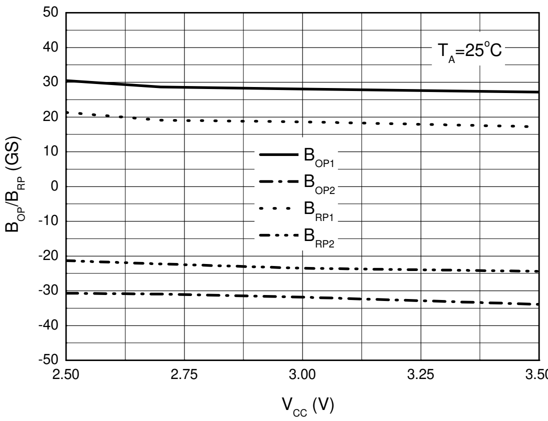


Magnetic Thresholds (Note 12, Note 13)

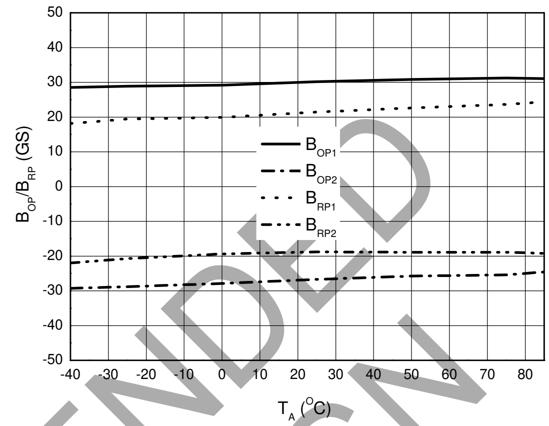
Note 12: B_{OP} is determined by putting the device under magnetic field swept from B_{RP}(min) to B_{OP}(max) until the output is switched on.
Note 13: B_{RP} is determined by putting the device under magnetic field swept from B_{OP}(max) to B_{RP}(min) until the output is switched off.

Performance Characteristics

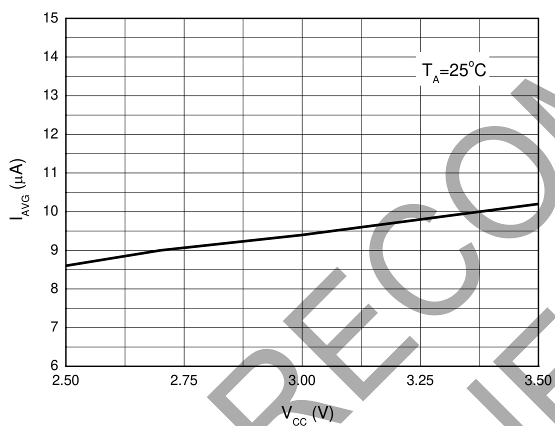
B_{OP}/B_{RP} vs. Supply Voltage



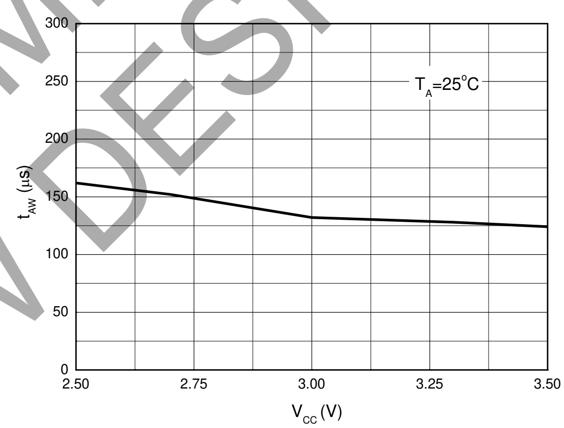
B_{OP}/B_{RP} vs. Ambient Temperature



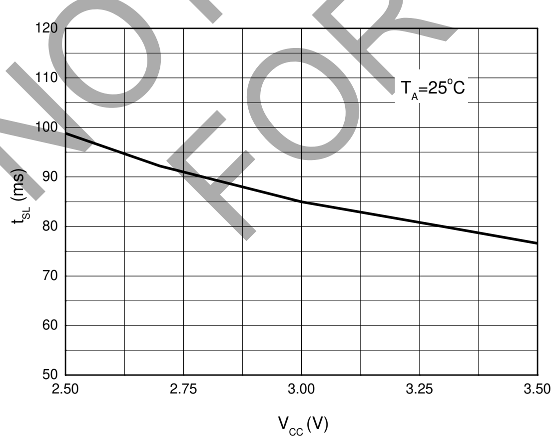
Average Supply Current vs. Supply Voltage



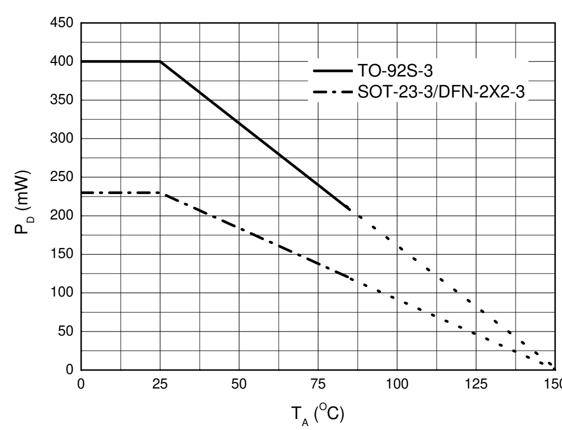
Awake Mode Time vs. Supply Voltage



Sleep Mode Time vs. Supply Voltage



Power Dissipation vs. Ambient Temperature



Ordering Information

AH9249 XX XX - XX

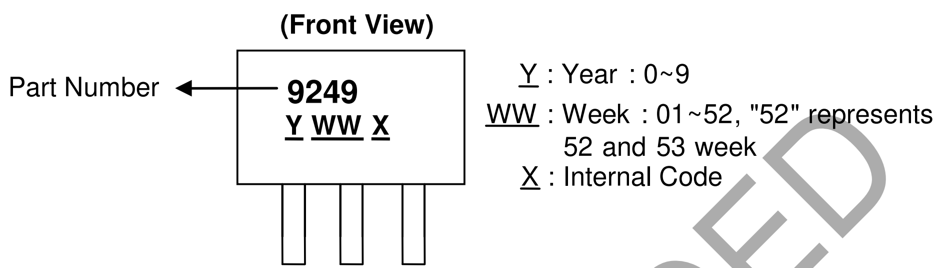
Product Name	Package	Packing	RoHS/Green
	Z3 : TO-92S-3 DN : DFN-2×2-3 N : SOT-23-3	TR : Tape & Reel Blank : Bulk	G1 : Green

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.

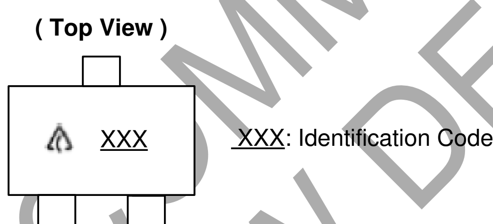
Marking Information

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



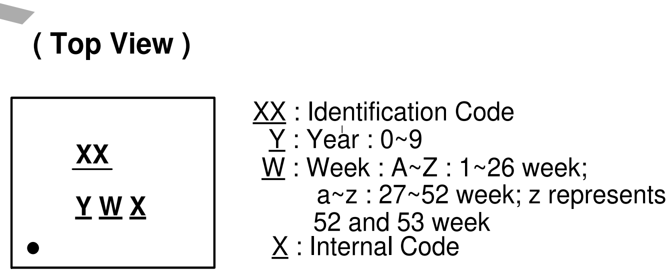
Part Number	Package	Identification Code
AH9249	TO-92S-3	9249

(2) Package Type: SOT-23-3



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

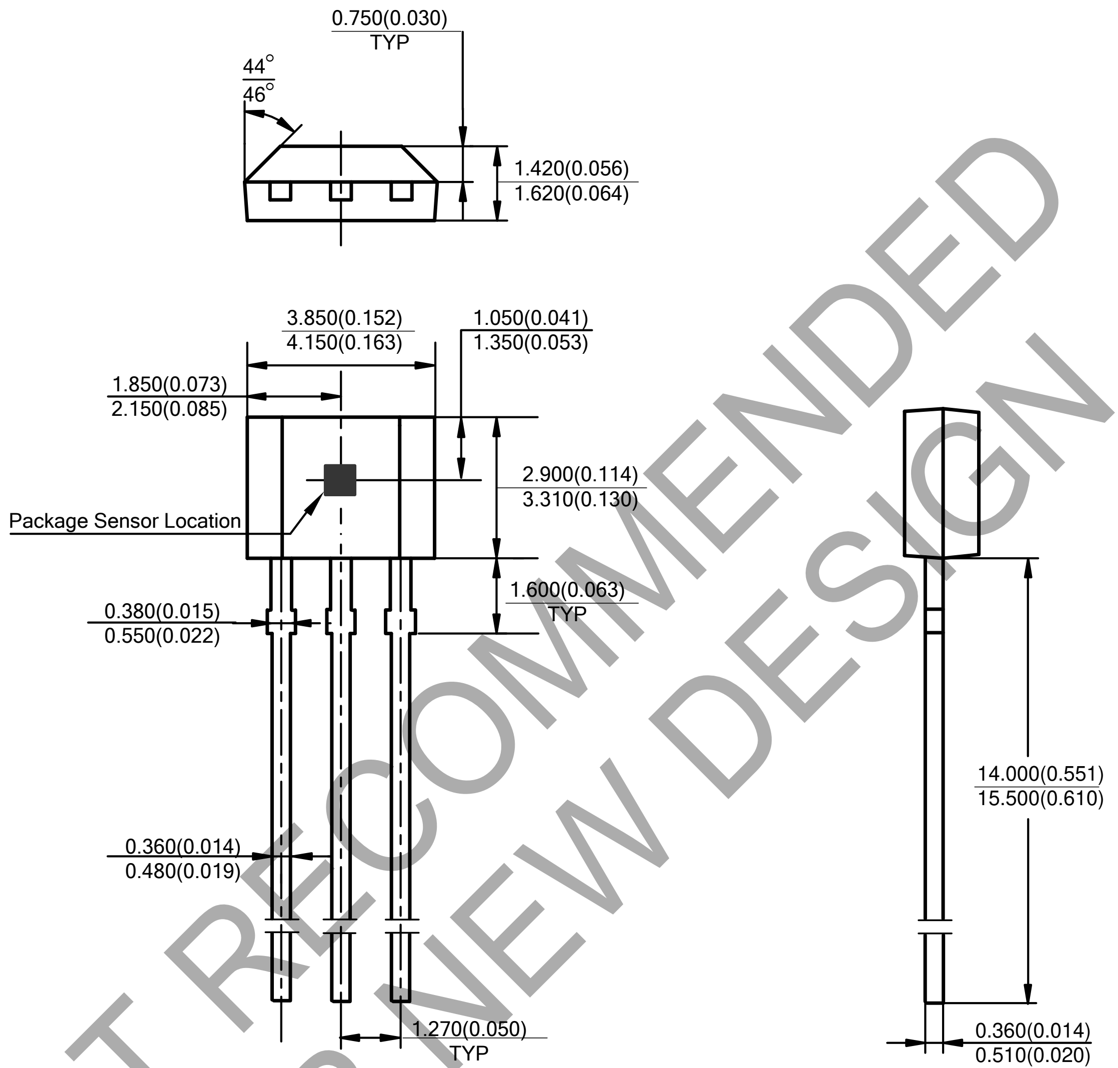
(3) Package Type: DFN-2X2-3



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

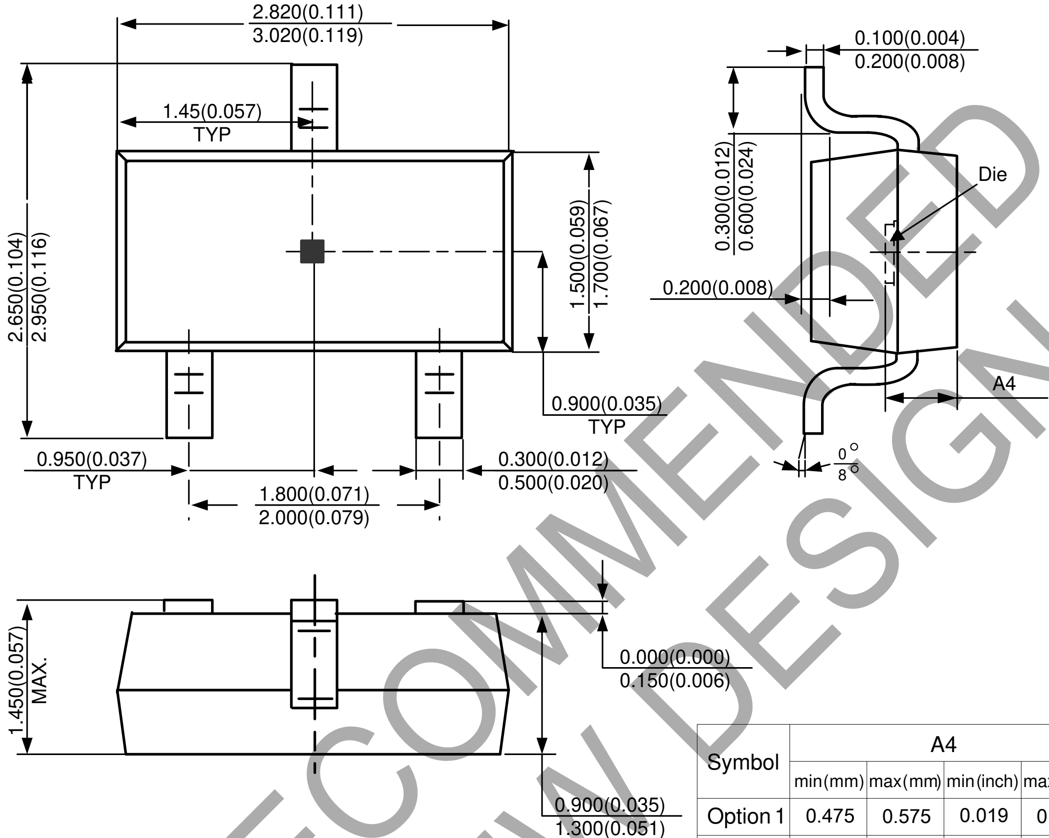
Package Outline Dimensions (All dimensions in mm(inch).)

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



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

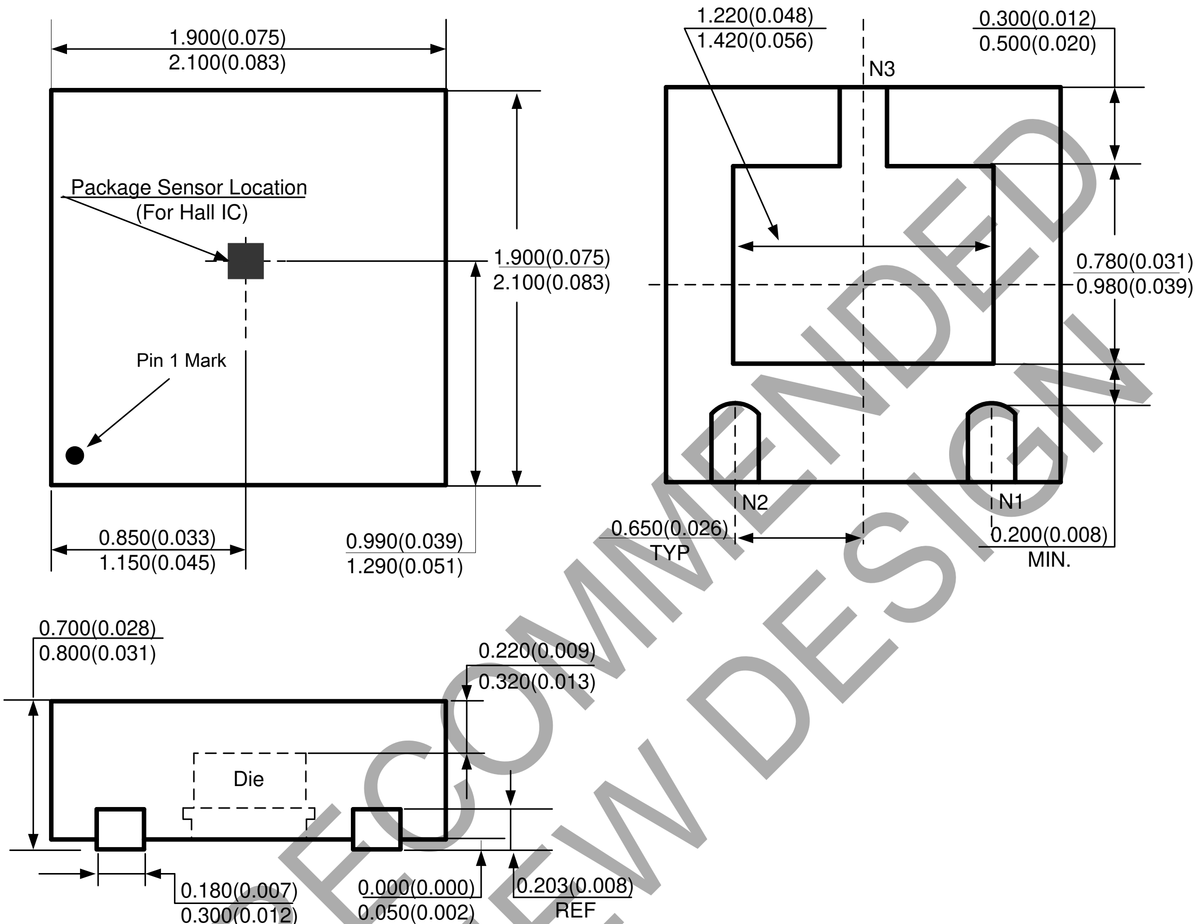
(2) Package Type: SOT-23-3



Symbol	A4			
	min(mm)	max(mm)	min(inch)	max(inch)
Option 1	0.475	0.575	0.019	0.023
Option 2	0.640	0.740	0.025	0.029

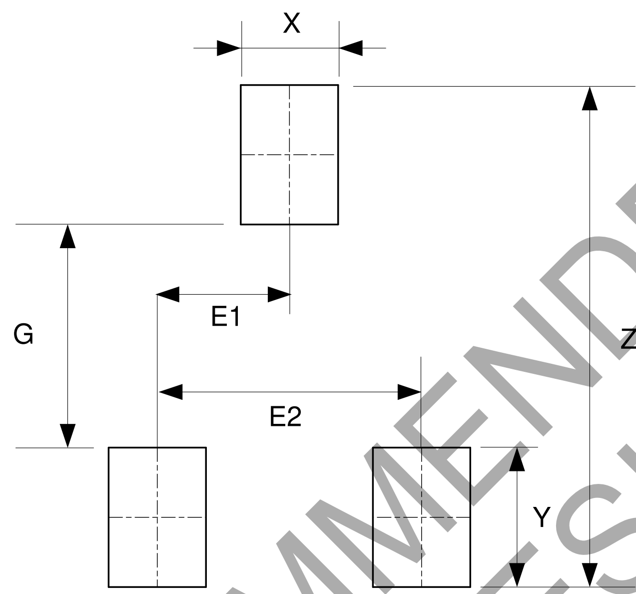
Package Outline Dimensions (cont.) (All dimensions in mm(inch).)

(3) Package Type: DFN-2×2-3



Suggested Pad Layout

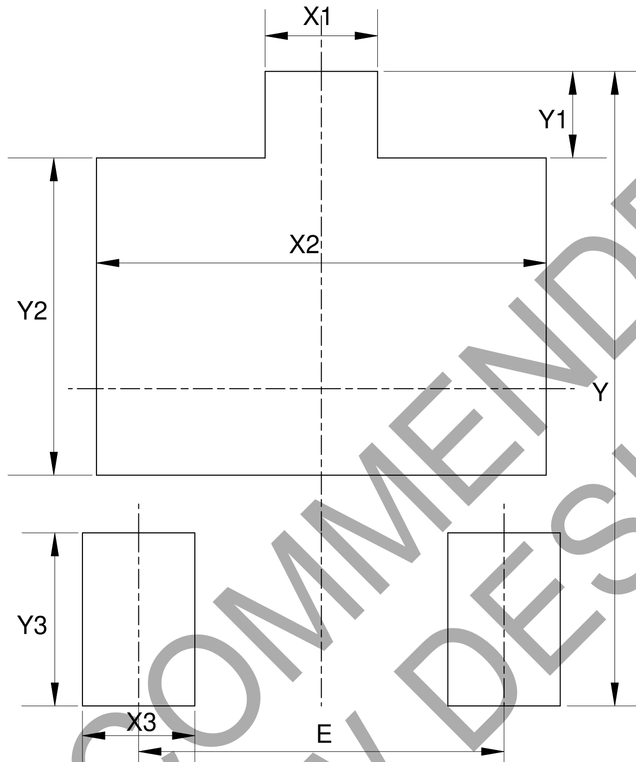
(1) Package Type: SOT-23-3



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

Suggested Pad Layout (cont.)

(2) Package Type: DFN-2×2-3



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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