



**THE DATASHEET OF  
AH9247NTR-G1**



## Description

The AH9247 is a high sensitivity Hall-effect switch with internal pull-up resistor on the output, designed for battery-operation, handheld equipments.

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 output can be switched on with either north or south pole of sufficient strength. If the magnetic flux density perpendicular to the part marking surface 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 AH9247 is available in TO92S (TYPE B), SC59 and DFN-2X2-3 packages which are optimized for most applications.

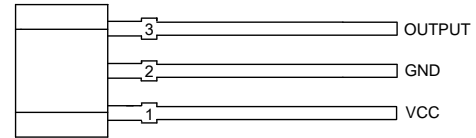
## Features

- 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 (HBM): 6000V
- Small Low Profile DFN-2X2-3 and Industry Standard SC59 and TO92S (TYPE B) Packages
- **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) & 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.

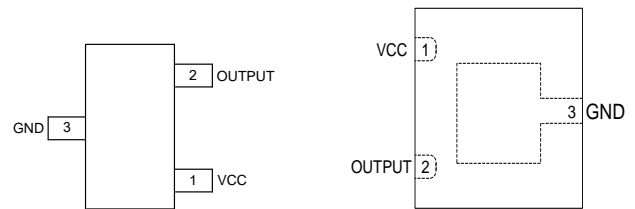
## Pin Assignments

(Front View)



TO92S (TYPE B)

(Top View)



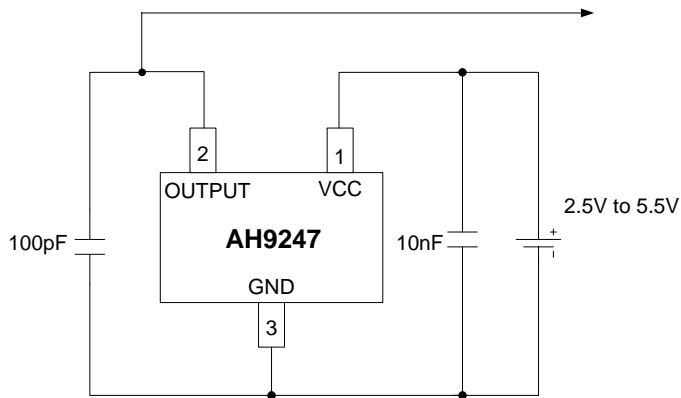
SC59

DFN-2X2-3

## Applications

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

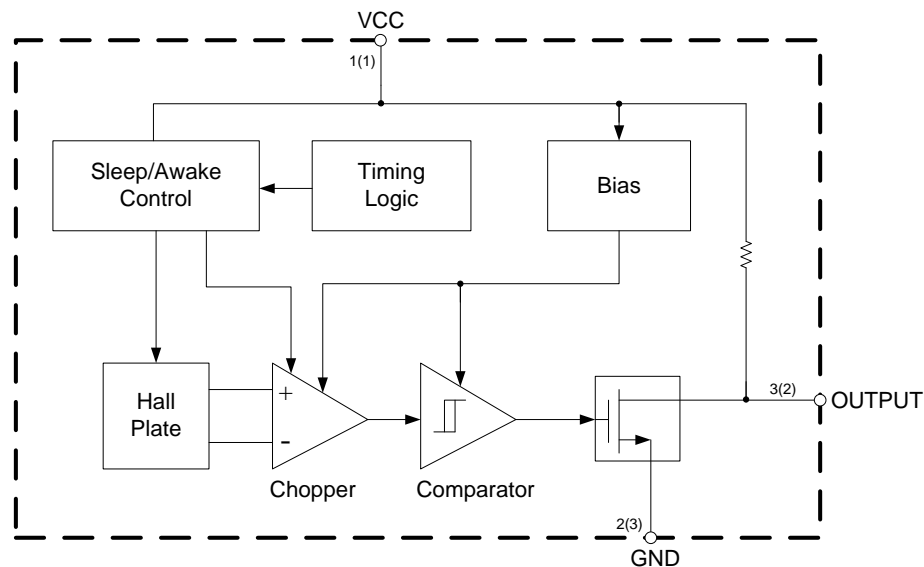
**Typical Applications Circuit**



**Pin Descriptions**

Pin Number			Pin Name	Function
TO92S (TYPE B)	SC59	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 TO92S (TYPE B)  
B for SC59 and DFN-2X2-3

NEW PRODUCT

### Absolute Maximum Ratings (@T<sub>A</sub>=+25°C, Note 4)

Symbol	Parameter	Rating		Unit
V <sub>CC</sub>	Supply Voltage	7		V
I <sub>CC</sub>	Supply Current (Fault)	6		mA
V <sub>OUT</sub>	Output Voltage	7		V
I <sub>OUT</sub>	Output Current	2		mA
B	Magnetic Flux Density	Unlimited		Gauss
P <sub>D</sub>	Power Dissipation	TO92S (TYPE B)	400	mW
		SC59	230	
		DFN-2X2-3	230	
T <sub>STG</sub>	Storage Temperature	-55 to +150		°C
T <sub>J</sub>	Junction Temperature	+150		°C
–	ESD (Human Body Model) (Note 5)	6000		V
–	ESD (Machine Model) (Note 5)	400		V

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 <sub>CC</sub>	Supply Voltage	2.5	5.5	V
T <sub>OP</sub>	Operating Temperature	-40	+85	°C

### Electrical Characteristics (@T<sub>A</sub>=+25°C, V<sub>CC</sub>=3V, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	Supply Voltage	Operating	2.5	3	5.5	V
I <sub>AW</sub>	Supply Current	Awake	–	1.8	3	mA
I <sub>SL</sub>		Sleep	–	4	10	µA
I <sub>AVG</sub>		Average	–	8	15	µA
I <sub>OUT</sub>	Output Current	–	–	–	1.0	mA
V <sub>SAT</sub>	Saturation Voltage	I <sub>OUT</sub> =1.0mA	–	–	0.4	V
t <sub>AW</sub>	Awake Mode Time	Operating	–	120	–	µs
t <sub>SL</sub>	Sleep Mode Time	Operating	–	80	120	ms
D	Duty Cycle	–	–	0.15	–	%
f <sub>C</sub>	Chopper Frequency	–	–	15	–	kHz

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

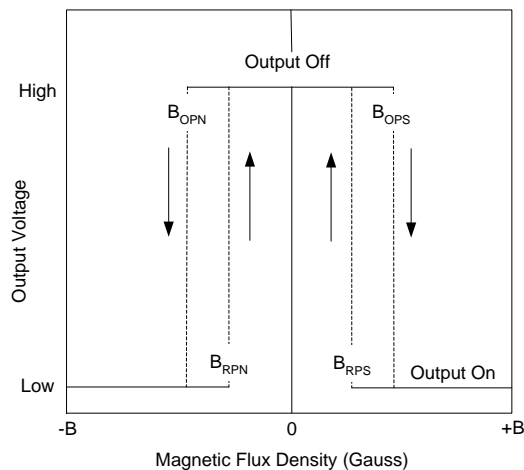
For TO92S (TYPE B) Package

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$B_{OPS}$ (South Pole to Part Marking Side)	Operating Point	$B > B_{OPS}, V_{OUT} = \text{low (output on)}$	15	30	55	Gauss
$B_{OPN}$ (North Pole to Part Marking Side)		$B > B_{OPN}, V_{OUT} = \text{low (output on)}$	-55	-30	-15	Gauss
$B_{RPS}$ (South Pole to Part Marking Side)	Releasing Point	$B < B_{RPS}, V_{OUT} = \text{high (output off)}$	5	20	45	Gauss
$B_{RPN}$ (North Pole to Part Marking Side)		$B < B_{RPN}, V_{OUT} = \text{high (output off)}$	-45	-20	-5	Gauss
$B_{HYS}$	Hysteresis	$ B_{OPX} - B_{RPX} $ (Note 7)	–	10	–	Gauss

For SC59 and DFN-2X2-3 Packages

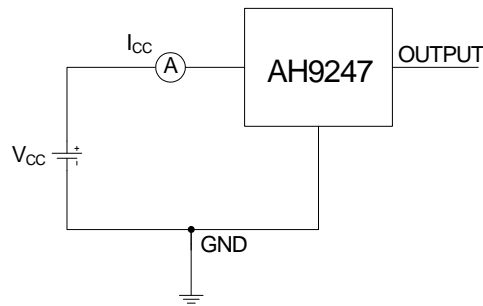
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$B_{OPS}$ (South Pole to Part Marking Side)	Operating Point	$B > B_{OPS}, V_{OUT} = \text{low (output on)}$	20	30	40	Gauss
$B_{OPN}$ (North Pole to Part Marking Side)		$B > B_{OPN}, V_{OUT} = \text{low (output on)}$	-40	-30	-20	Gauss
$B_{RPS}$ (South Pole to Part Marking Side)	Releasing Point	$B < B_{RPS}, V_{OUT} = \text{high (output off)}$	5	20	32	Gauss
$B_{RPN}$ (North Pole to Part Marking Side)		$B < B_{RPN}, V_{OUT} = \text{high (output off)}$	-32	-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)



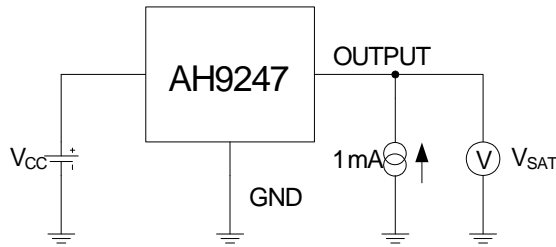
**Output Voltage vs. Magnetic Flux Density**

**Test Conditions**



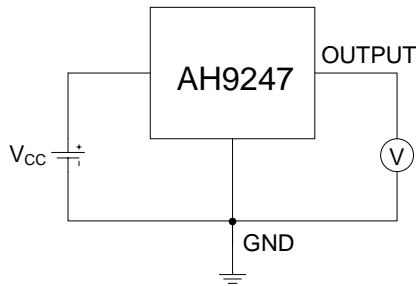
**Average Supply Current (Notes 8 and 9)**

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 (Notes 10 and 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  $B > B_{OP}$ .

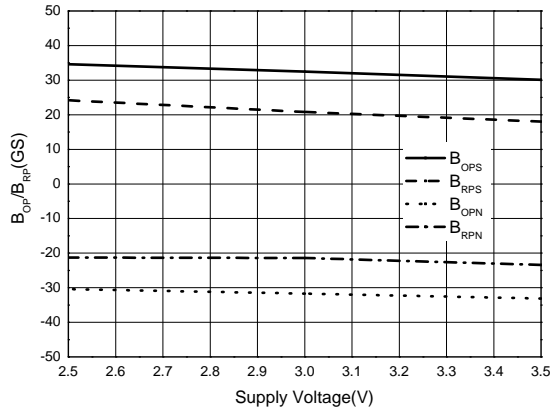


**Magnetic Thresholds (Notes 12 and 13)**

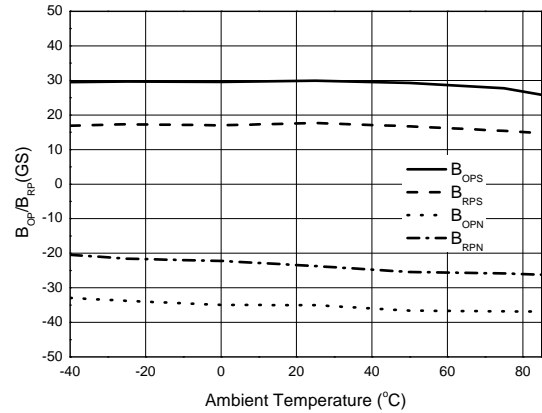
Note 12:  $B_{OP}$  is determined by putting the device under magnetic field swept from  $B_{RP(min)}$  to  $B_{OP(max)}$  until the output is switched on.  
 Note 13:  $B_{RP}$  is determined by putting the device under magnetic field swept from  $B_{OP(max)}$  to  $B_{RP(min)}$  until the output is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

**Performance Characteristics**

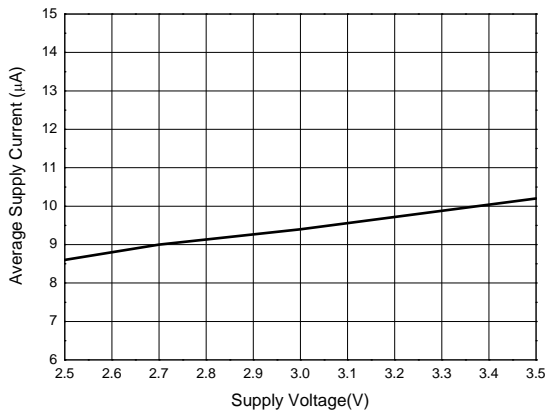
**$B_{OP}/B_{RP}$  vs. Supply Voltage**



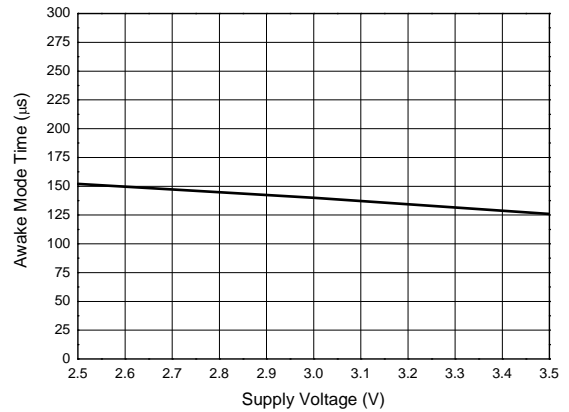
**$B_{OP}/B_{RP}$  vs. Ambient Temperature**



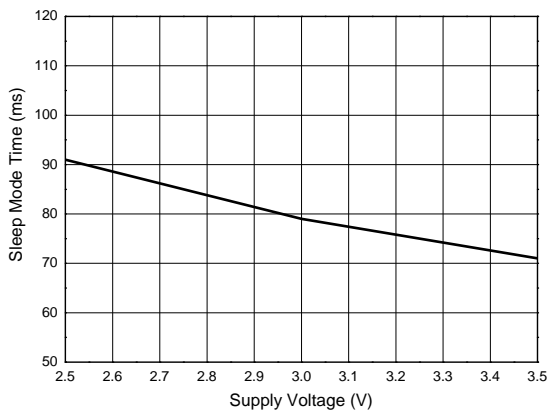
**Average Supply Current vs. Supply Voltage**



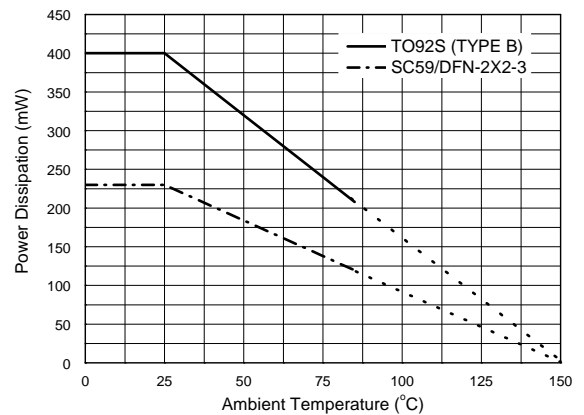
**Awake Mode Time vs. Supply Voltage**



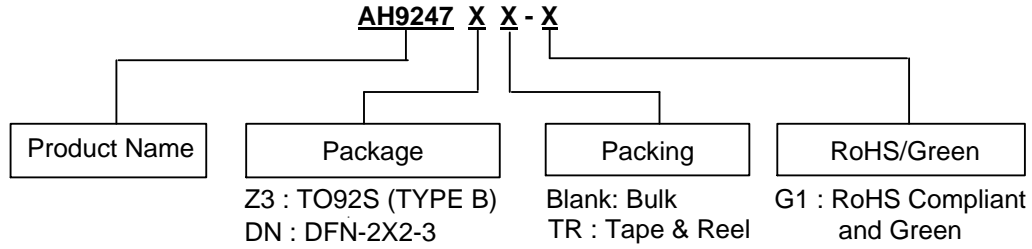
**Sleep Mode Time vs. Supply Voltage**



**Power Dissipation vs. Ambient Temperature**

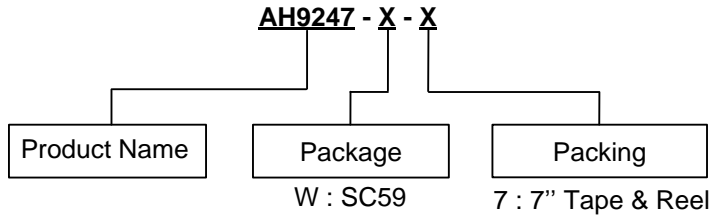


**Ordering Information**



Device	Status	Package Code	Packaging	Bulk	7" Tape and Reel
				Quantity	Quantity
AH9247Z3-G1	Active	Z3	TO92S (TYPE B)	1000/Bulk	NA
AH9247DNTR-G1	NRND	DN	DFN-2X2-3	NA	3000/Tape & Reel

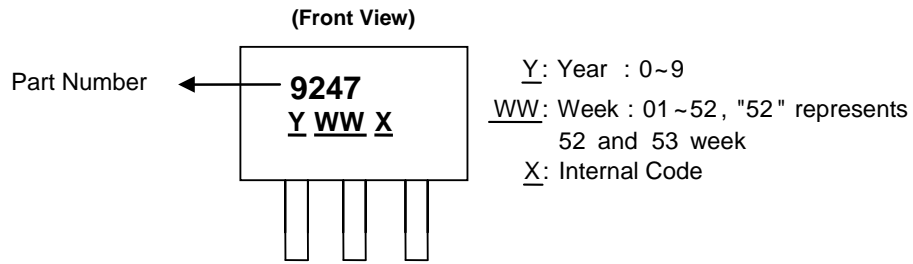
Note 14: NRND = Not Recommended for New Design.



Device	Status	Package Code	Packaging	Bulk	7" Tape and Reel
				Quantity	Quantity
AH9247-W-7	Active	W	SC59	NA	3000/Tape & Reel

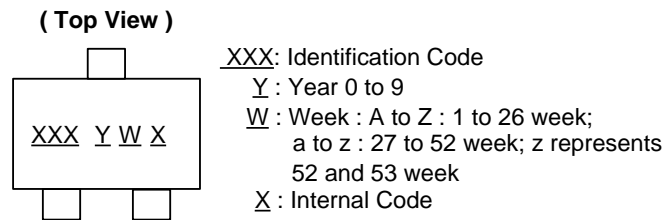
**Marking Information**

(1) Package Type: TO92S (TYPE B)



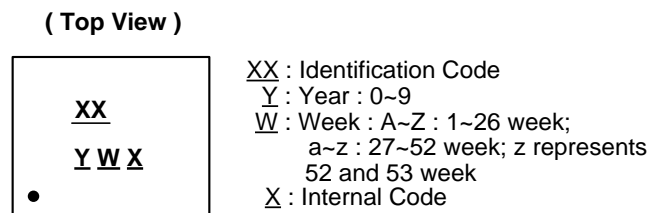
Part Number	Package	Identification Code
AH9247	TO92S (TYPE B)	9247

(2) Package Type: SC59



Part Number	Package	Identification Code
AH9247	SC59	GX8

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

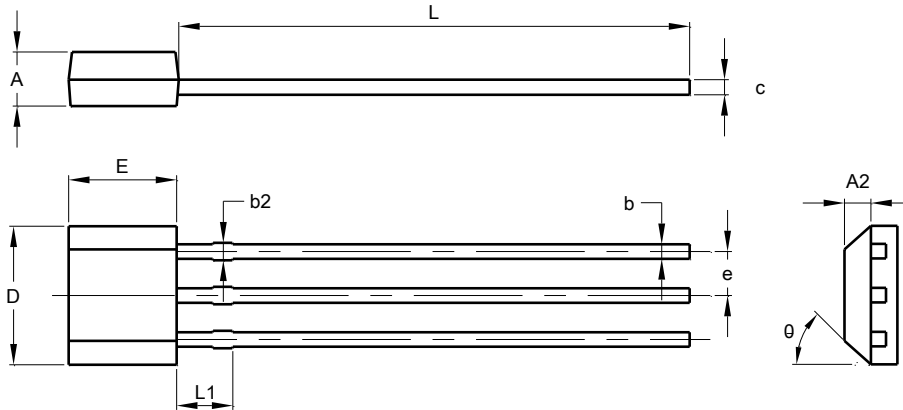


Part Number	Package	Identification Code
AH9247	DFN-2X2-3	JF

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

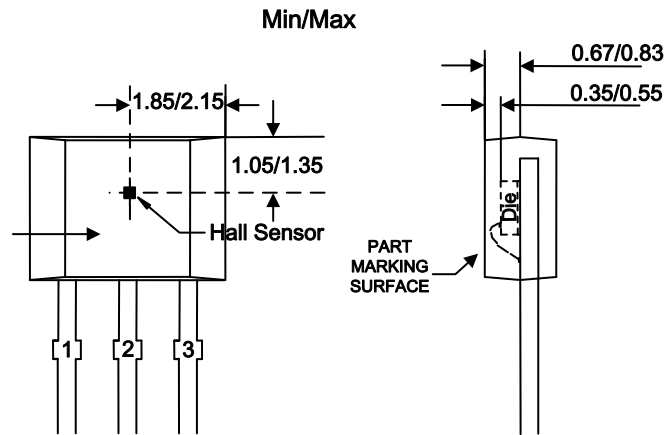
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: TO92S(TYPE B)



TO92S (TYPE B)			
Dim	Min	Max	Typ
A	1.420	1.620	-
A2	-	-	0.750
b	0.360	0.480	-
b2	0.380	0.550	-
c	0.360	0.510	-
D	3.850	4.150	-
E	2.900	3.310	-
e	-	-	1.270
L	14.000	15.500	-
L1	-	-	1.600
θ	44°	46°	-

All Dimensions in mm



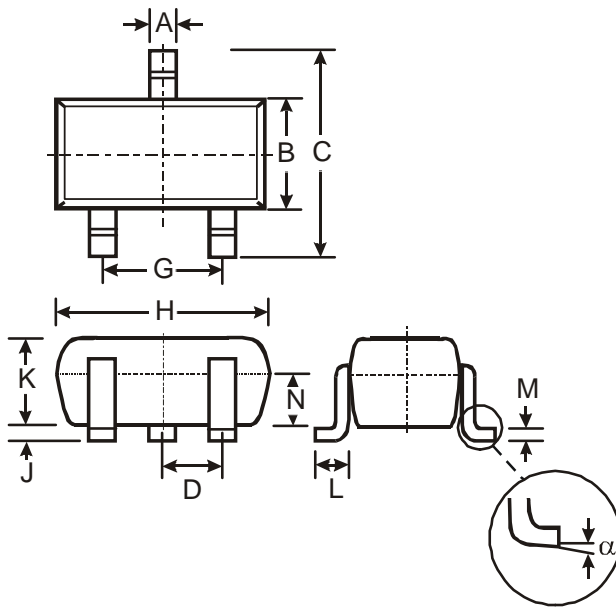
Sensor Location

NEW PRODUCT

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

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

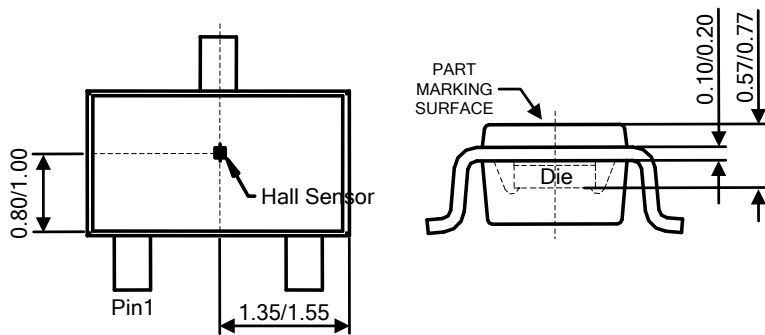
(2) Package Type: SC59



SC59			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
G	-	-	1.90
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
$\alpha$	0°	8°	-
All Dimensions in mm			

NEW PRODUCT

Min/Max

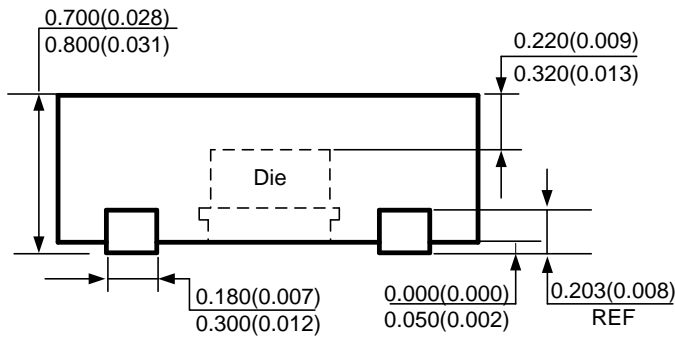
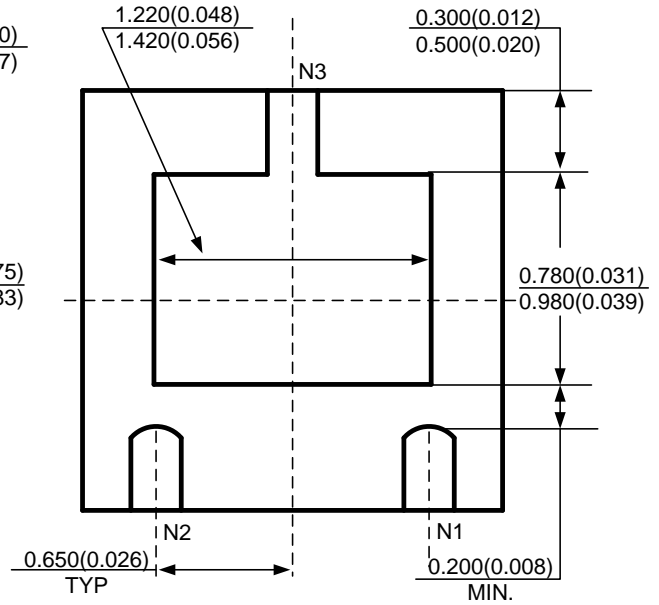
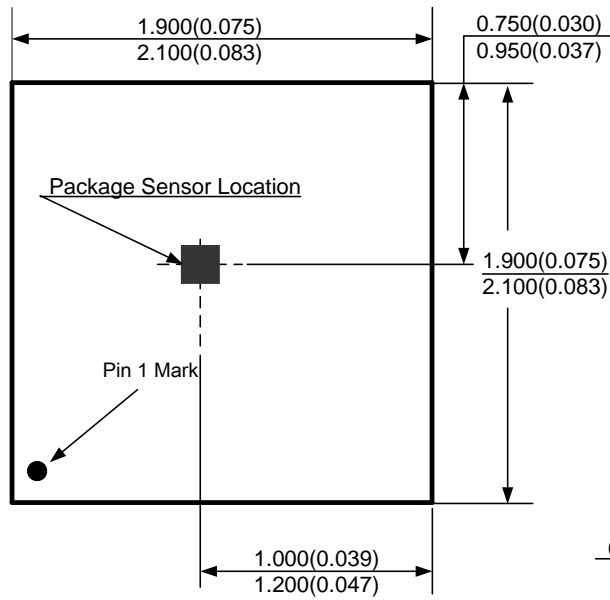


Sensor Location

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

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

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

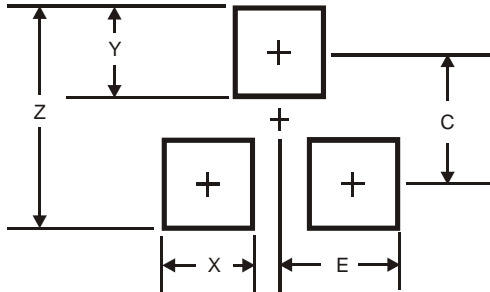


NEW PRODUCT

## Suggested Pad Layout

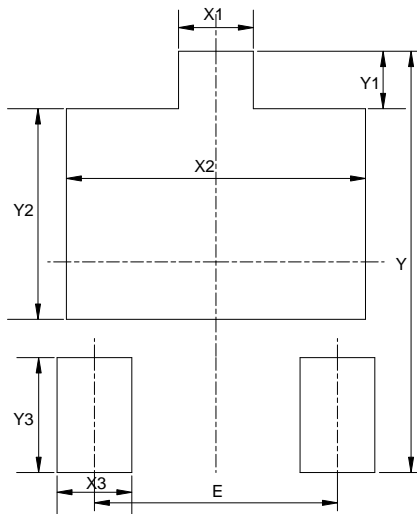
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: SC59



Dimensions	Value (in mm)
Z	3.4
X	0.8
Y	1.0
C	2.4
E	1.35

(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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