HIGH SENSITIVITY MICROPOWER OMNIPOLAR HALL-EFFECT SWITCH

Description

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

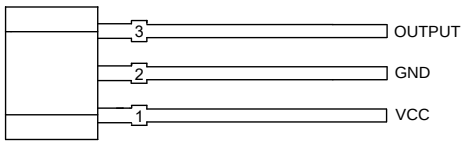
A chopper stabilized amplifier improves stability of magnetic switch points. A sleep-awake logic controls the IC in sleep time or awake time. This function will reduce the average operating current of the IC. During the awake time, the output is changed with the magnetic flux density. During the sleep time, the output is latched in its previous state and the current consumption will reduce to some μA.

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.

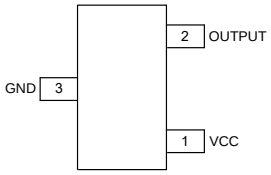
Pin Assignments

(Front View)

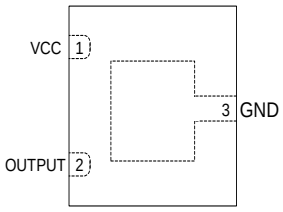


TO92S (TYPE B)

(Top View)



SC59



DFN-2X2-3

Features

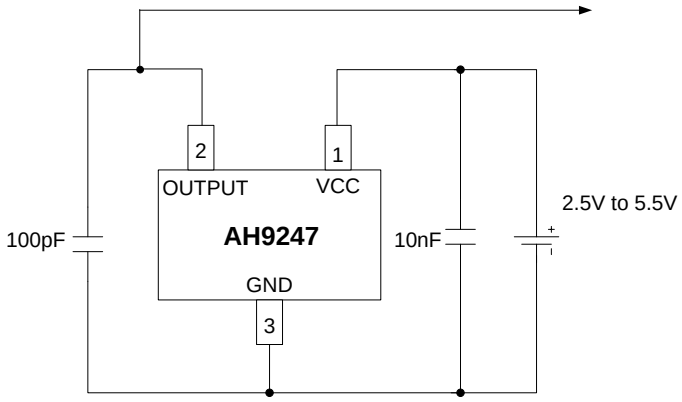
- Micropower Operation
- 2.5V to 5.5V Power Supply
- Switching for Both Poles of a Magnet (Omnipolar)
- Stabilized Chopper
- Superior Temperature Stability
- Digital Output Signal
- Built-in Pullup Resistor
- ESD (HBM): 6000V
- Small Low Profile DFN-2X2-3, Industry-Standard SC59 and TO92S (TYPE B) Packages
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Applications

- Cover switches in notebook PC/PDA
- Handheld wireless application awake switches
- Magnet switches in low duty-cycle applications

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.

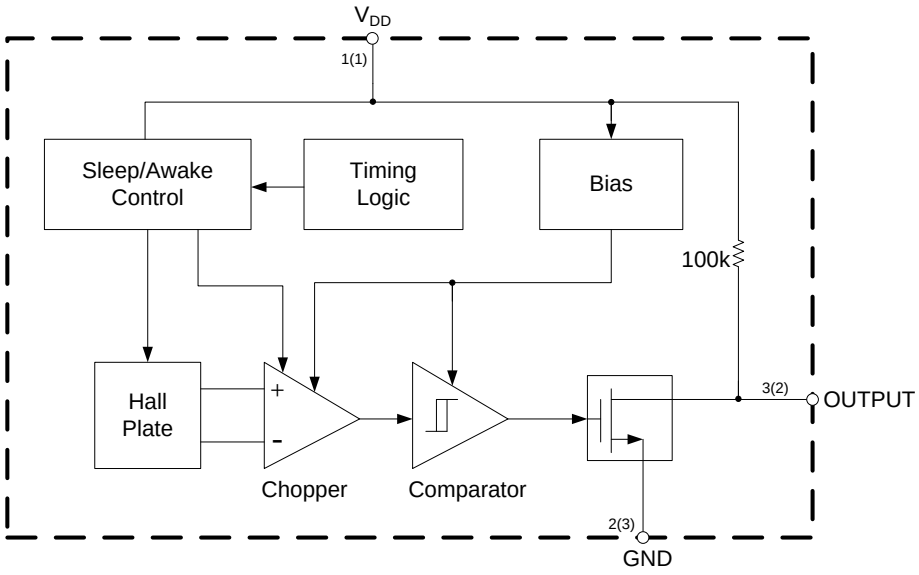
Typical Applications Circuit



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

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	TO92S (TYPE B)	400	mW
		SC59	230	
		DFN-2X2-3	230	
T_{STG}	Storage Temperature	-55 to +150		°C
T_J	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* can 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 can 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	–	1.8	3	mA
I_{SL}		Sleep	–	4	10	µA
I_{AVG}		Average	–	8	15	µA
I_{OUT}	Output Current	–	–	–	1.0	mA
V_{SAT}	Saturation Voltage	I_{OUT}=1.0mA	–	–	0.4	V
t_{AW}	Awake Mode Time	Operating	–	120	–	µs
t_{SL}	Sleep Mode Time	Operating	–	80	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)

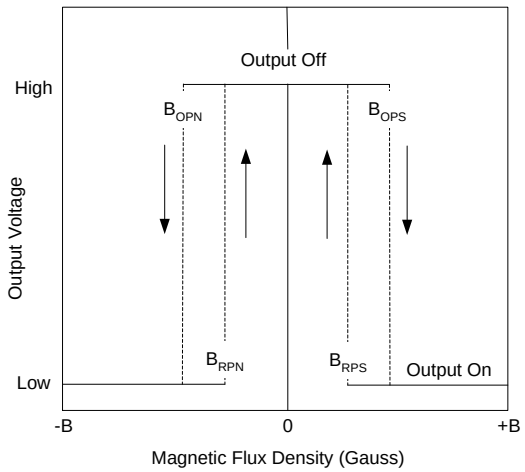
For TO92S (TYPE B) Package

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

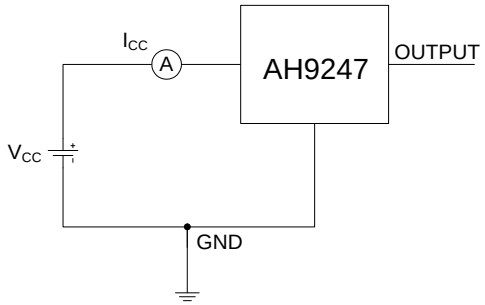
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
B_{OPS} (South Pole to Part Marking Side)	Operating Point	B>B_{OPS},V_{OUT}=low(output on)	20	30	40	Gauss
B_{OPN} (North Pole to Part Marking Side)		B>B_{OPN},V_{OUT}=low(output on)	-40	-30	-20	Gauss
B_{RPS} (South Pole to Part Marking Side)	Releasing Point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



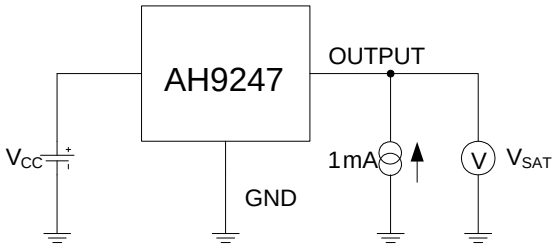
Output Voltage vs. Magnetic Flux Density

Test Conditions



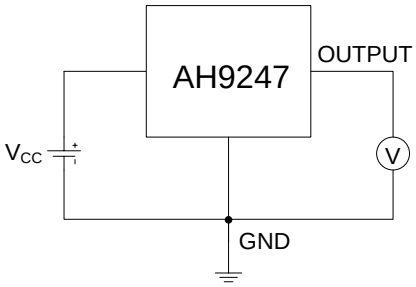
Average Supply Current (Notes 8 and 9)

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 $B>B_{OP}$.

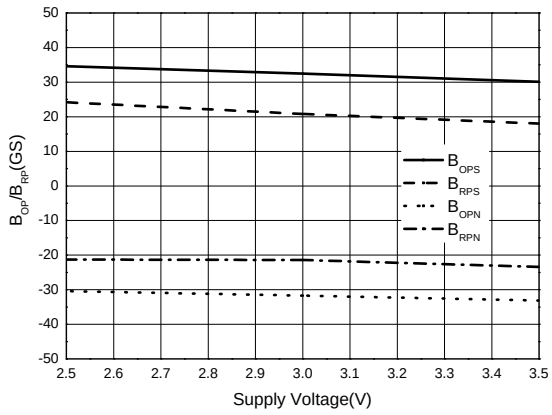


Magnetic Thresholds (Notes 12 and 13)

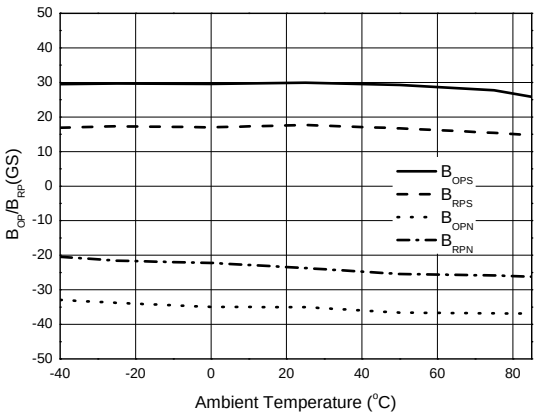
Note 12: B_{OP} is determined by putting the device under magnetic field swept from $B_{RP(min)}$ to $B_{OP(max)}$ until the output is switched on.
Note 13: B_{RP} is determined by putting the device under magnetic field swept from $B_{OP(max)}$ to $B_{RP(min)}$ until the output is switched off.

Performance Characteristics

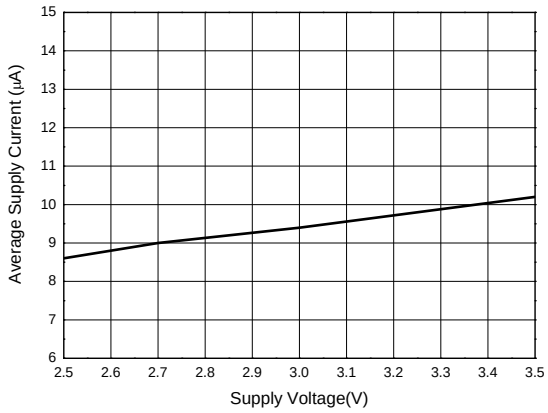
B_{OP}/B_{RP} vs. Supply Voltage



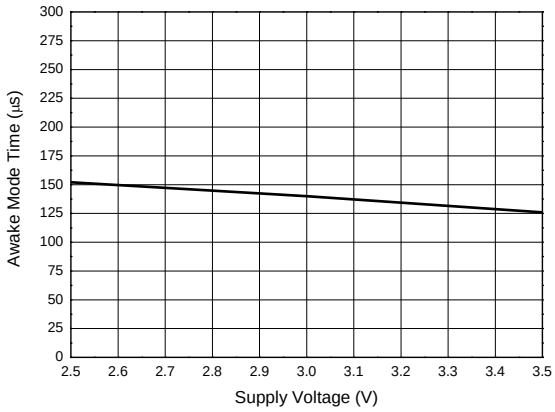
B_{OP}/B_{RP} vs. Ambient Temperature



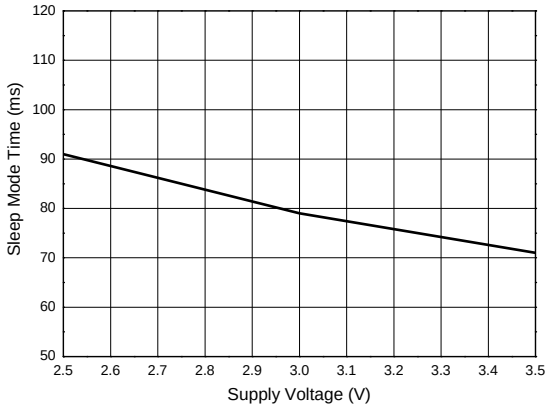
Average Supply Current vs. Supply Voltage



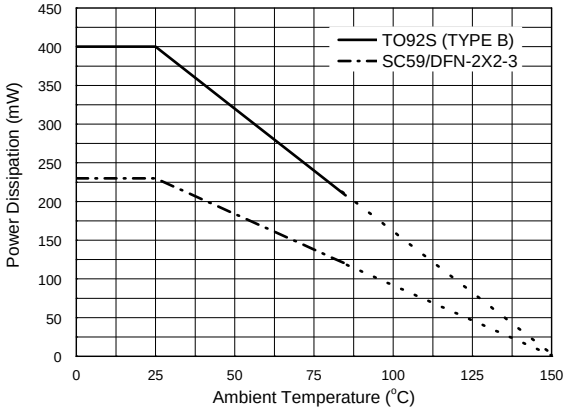
Awake Mode Time vs. Supply Voltage



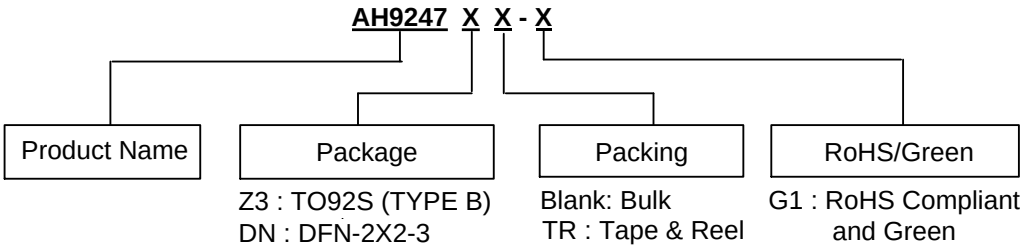
Sleep Mode Time vs. Supply Voltage



Power Dissipation vs. Ambient Temperature

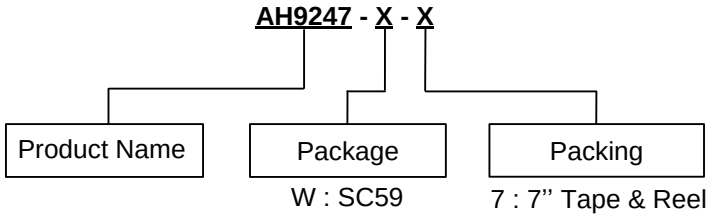


Ordering Information



Part Number	Status	Package	Package Code	Packing	
				Qty.	Carrier
AH9247Z3-G1	Active	TO92S (TYPE B)	Z3	1000	Bulk
AH9247DNTR-G1	EOL (Note 14)	DFN-2X2-3	DN	3000	7” Tape & Reel

Note 14: the AH9247DNTR-G1 is obsolete. please **CONTACT US**.

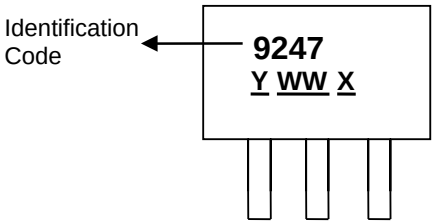


Part Number	Status	Package	Package Code	Packing	
				Qty.	Carrier
AH9247-W-7	Active	SC59	W	3000	7” Tape & Reel

Marking Information

(1) Package Type: TO92S (TYPE B)

(Front View)

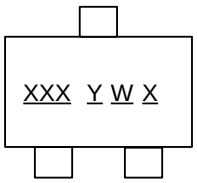


Y: Year : 0~9
WW: Week : 01~52, "52" represents 52 and 53 week
X: Internal Code

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

(2) Package Type: SC59

(Top View)

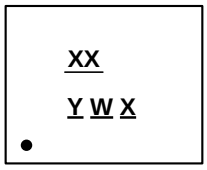


XXX: Identification Code
Y : Year 0 to 9
W : Week : A to Z : 1 to 26 week; a to z : 27 to 52 week; z represents 52 and 53 week
X : Internal Code

Part Number	Package	Identification Code
AH9247	SC59	GX8

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

(Top View)



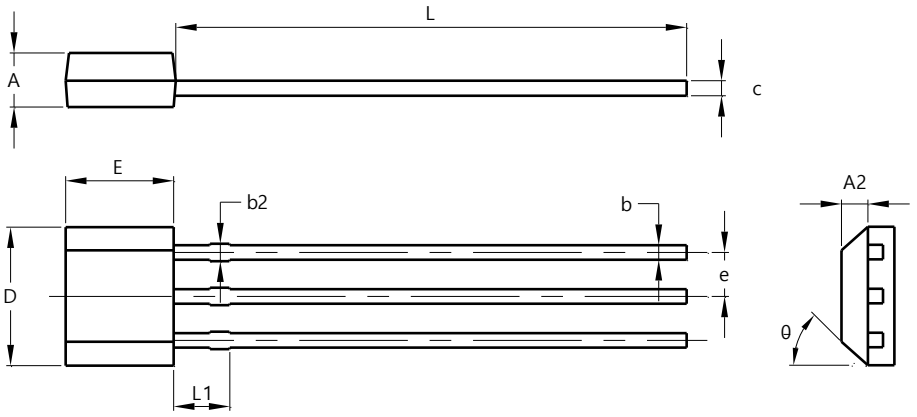
XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week; a~z : 27~52 week; z represents 52 and 53 week
X : Internal Code

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

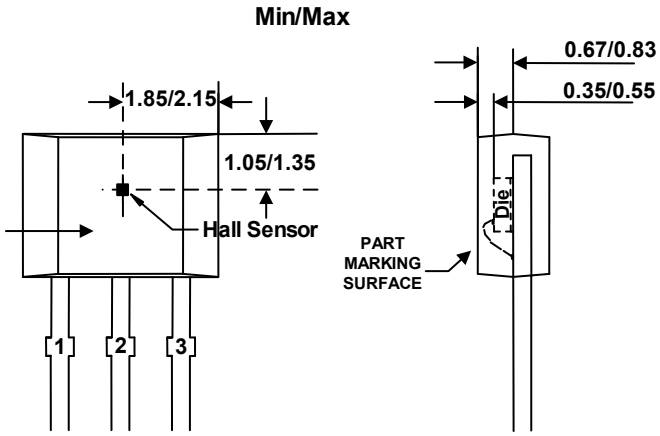
Package Outline Dimensions (All dimensions in mm(inch).)

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			

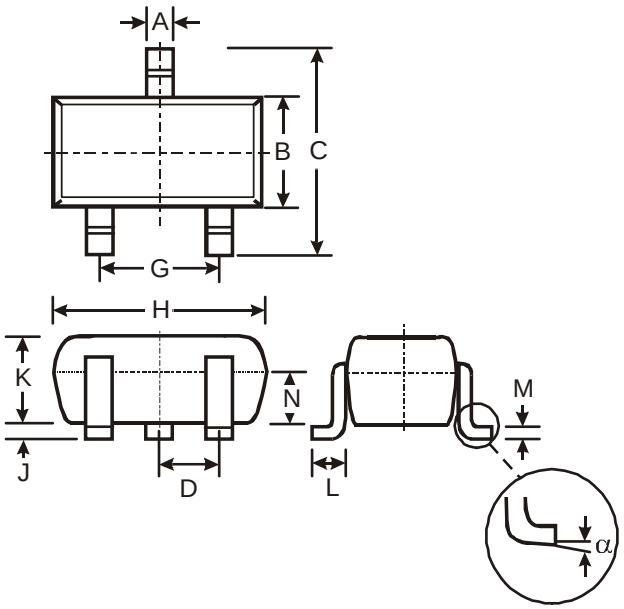


Sensor Location

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

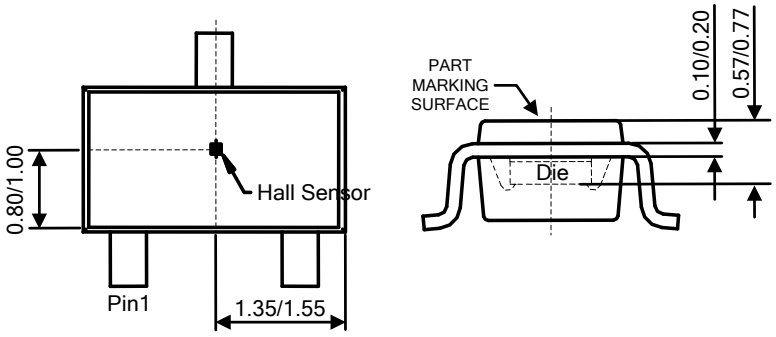
Please see http://www.diodes.com/package-outlines.html for the latest version.

(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
α	0°	8°	-
All Dimensions in mm			

Min/Max

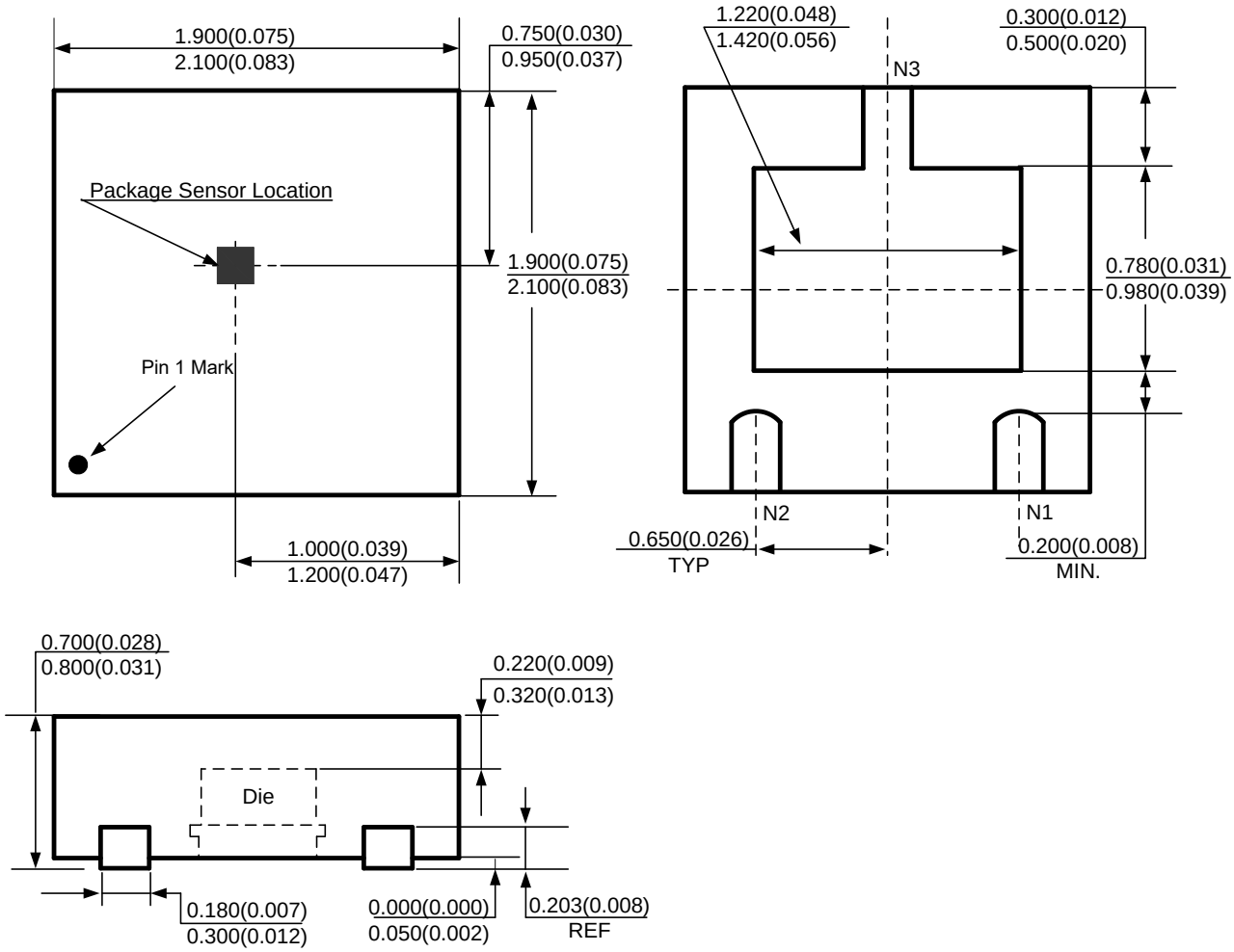


Sensor Location

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

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

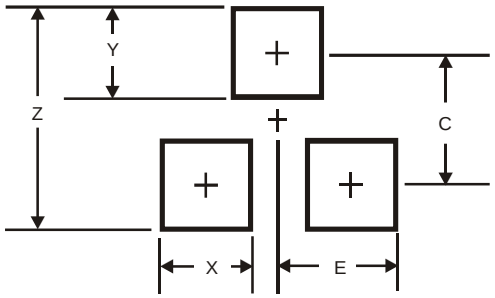
(3) Package Type: DFN-2X2-3



Suggested Pad Layout

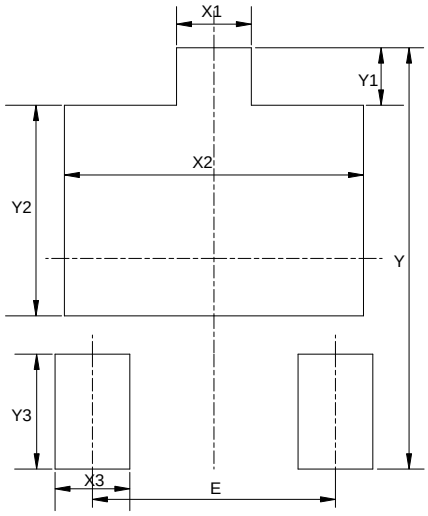
Please see http://www.diodes.com/package-outlines.html for the latest version.

(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

Mechanical Data

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: TO92S (TYPE B) – 0.077 grams (Approximate)
  SC59 – 0.009 grams (Approximate)

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