

## Description

The AH49F is a small, versatile linear Hall effect device that is operated by the magnetic field from a permanent magnet or an electromagnet. The output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field.

The integrated circuitry features low noise output, which makes it unnecessary to use external filtering components. It also includes precision resistors to provide increased temperature stability and accuracy. The operating temperature range of these linear Hall sensors is  $-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$ , appropriate for commercial, consumer, and industrial environments.

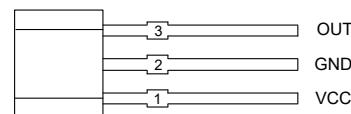
The AH49F is available in standard TO92S (TYPE A), TO92S (TYPE CJ), SC59 and U-DFN2020-6 (Type C) packages.

## Features

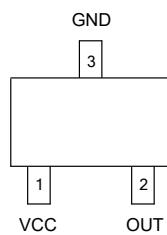
- Power Consumption of 3.0mA at  $\text{Vcc} = 5\text{V}$  for Energy Efficiency
- Single Current Sourcing Output
- Linear Voltage Output for Circuit Design Flexibility
- Low Noise Output Virtually Eliminates the Need for Filtering
- A Stable and Accurate Output
- Temperature Range:  $-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$
- Responds to Either Positive or Negative Gauss
- The Maximum Instantaneous Supply Voltage Up to 50V
- High ESD Rating: 6000V (Human Body Model)  
600V (Machine Model)
- Small Low-Profile U-DFN2020-6 (Type C) and Industry Standard SC59, TO92S (TYPE A), TO92S (TYPE CJ) Packages
- **Totally Lead-free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **An automotive-compliant part is available under a separate datasheet ([AH49FQ](#))**

## Pin Assignments

(Front View)



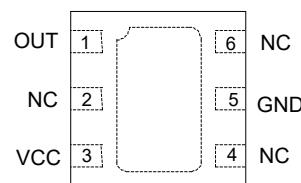
(Top View)



TO92S (TYPE A)  
TO92S (TYPE CJ)

SC59

(Top View)



U-DFN2020-6 (Type C)

## Applications

- Position sensing
- Liquid level sensing
- Weight sensing
- Ferrous metal detectors
- Vibration sensing
- Rotary encoders
- Magnetic code reading
- Motor control
- Current sensing

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 Descriptions

---

Package Types: TO92S (TYPE CJ), TO92S (TYPE A)

Pin Number	Pin Name	Description
1	VCC	Power supply pin
2	GND	Ground pin
3	OUT	Output pin

Package Type: SC59

Pin Number	Pin Name	Description
1	VCC	Power supply pin
2	OUT	Output pin
3	GND	Ground pin

Package Type: U-DFN2020-6 (Type C)

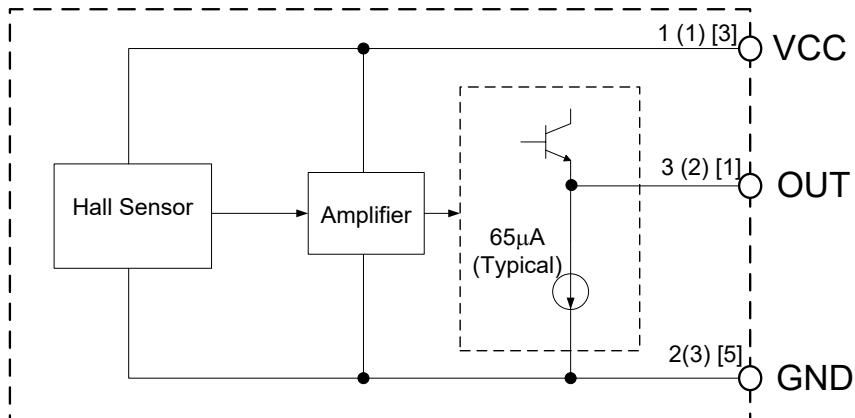
Pin Number	Pin Name	Description
1	OUT	Output pin
2	NC	No connection (Note 4)
3	VCC	Power supply pin
4	NC	No connection (Note 4)
5	GND	Ground pin
6	NC	No connection (Note 4)
Pad	Pad	Center exposed pad is internally connected to GND. It can be connected to GND or left open circuit on the PCB. (Note 5)

Notes:  
 4. NC is "No Connection" pin and is not connected internally. This pin can be left open or tied to ground.  
 5. PAD is the bottom side exposed pad.

---

## Functional Block Diagram

---



A(B)[C]  
 A for TO92S (TYPE A), TO92S (TYPE CJ)  
 B for SC59  
 C for U-DFN2020-6 (Type C)

## Absolute Maximum Ratings (Note 6)

Symbol	Parameter	Rating		Unit
V <sub>CC</sub>	Supply Voltage	10		V
V <sub>CC_INST</sub>	Instantaneous Supply Voltage	50		V
P <sub>D</sub>	Power Dissipation	TO92S (TYPE A) TO92S (TYPE CJ)	400	mW
		SC59	230	
		U-DFN2020-6 (Type C)	230	
T <sub>A</sub>	Ambient Temperature	-40 to +125		°C
T <sub>STG</sub>	Storage Temperature	-50 to +150		°C
—	ESD (Human Body Model)	6000		V
—	ESD (Machine Model)	600		V

Note: 6. 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.

## Recommended Operating Conditions (@T<sub>A</sub> = +25°C)

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage	3	8	V
T <sub>OP</sub>	Operating Temperature	-40	+105	°C

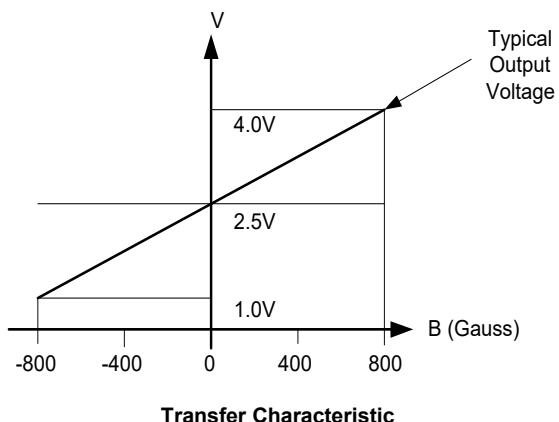
## Electrical Characteristics (@V<sub>CC</sub> = 5V, T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
I <sub>CC</sub>	Supply Current	—	2	3	4	mA
V <sub>NULL</sub>	Quiescent Output Voltage	B = 0 (Gauss)	2.25	2.5	2.75	V
V <sub>SEN</sub>	Output Voltage Sensitivity	B = 0 to ±600 (Gauss)	1.7	2.1	2.5	mV/Gauss
V <sub>OUT_S</sub>	Output Voltage Span	—	1.0 to (V <sub>CC</sub> - 1.0)	0.8 to (V <sub>CC</sub> - 0.8)	—	V
R <sub>OUT</sub>	Output Resistor	—	—	60	120	Ω
B	Linear Magnetic Range	—	±500	±800	—	Gauss
—	Linearity of Span	—	—	0.7	—	%
—	Output Noise	Bandwidth = 10Hz to 10kHz	—	90	—	µV

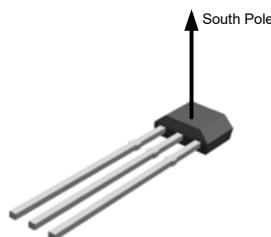
## Transferring Characteristics (@V<sub>CC</sub> = 5V)

When there is no external magnetic field (B = 0Gauss), the quiescent output voltage is one-half the supply voltage in general.

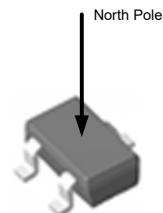
For TO92S (TYPE A), TO92S (TYPE CJ) and U-DFN2020-6 (Type C) packages, if a south magnetic pole approaches the part marking surface (the side with part marking ID) of the Hall effect sensor, the circuit will drive the output voltage higher. In contrary, a north magnetic pole will drive the output voltage lower. The variations of voltage level up or down from the quiescent output voltage (the null voltage) are symmetrical and proportional to the magnetic flux density. In the SC59, the die is placed underneath the lead frame and therefore when a magnet pole approaches the SC59 part marking surface, the direction of the magnetic field into the die is reversed compared to TO92S (TYPE A) and TO92S (TYPE CJ). This results in a reverse response to the magnetic flux density in SC59 package compared with TO92S (TYPE A), TO92S (TYPE CJ), and U-DFN2020-6 (Type C) packages (i.e. if the reverse magnetic pole approaches the part marking surface of SC59, the output is the same as TO92S (TYPE A) package.). The largest magnetic sensitivity is obtained with a supply voltage of 8V, but at the cost of increased supply current and a slight loss of output symmetry. So, it is not recommended to work in such condition unless the output voltage magnitude is a main issue. The output signal can be capacitively coupled to a next-level amplifier for further amplifying if the changing frequency of the magnetic field is high.



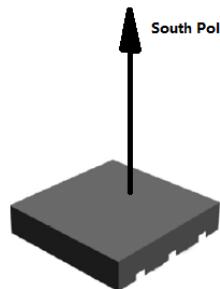
Transfer Characteristic



Magnetic Characteristic For TO92S (TYPE A), TO92S (TYPE CJ)

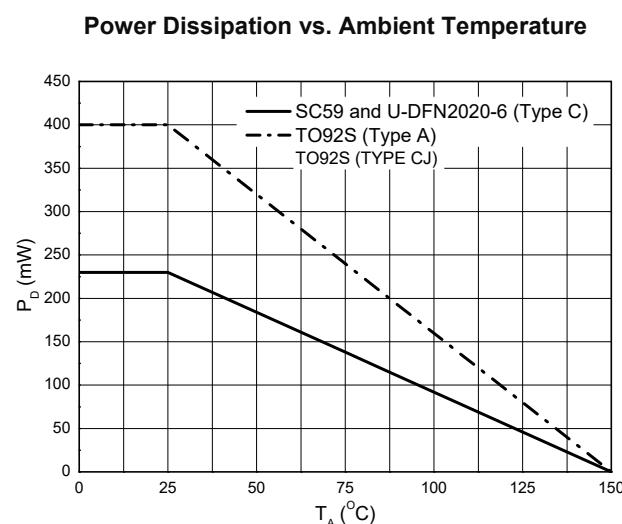
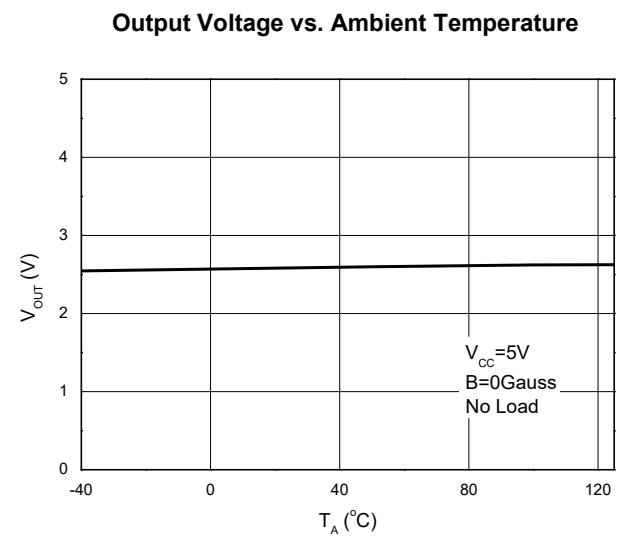
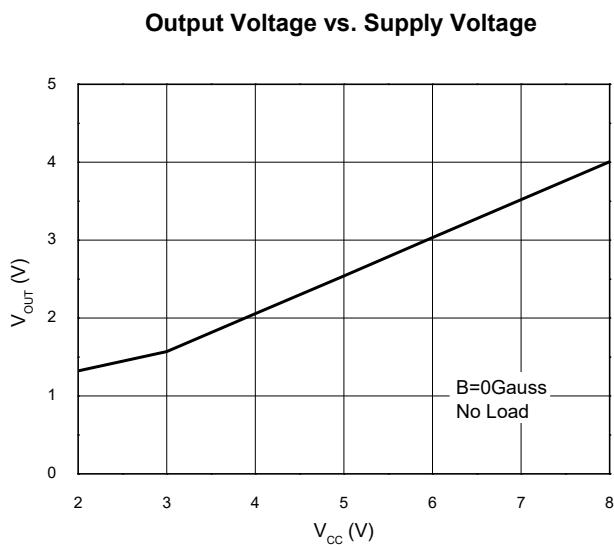
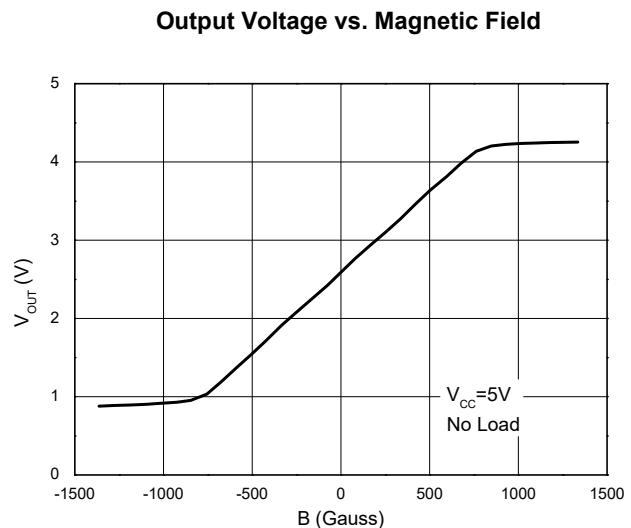
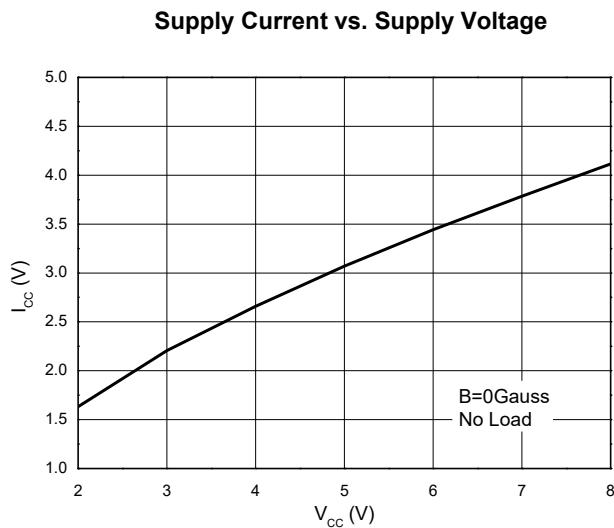


Magnetic Characteristic For SC59



Magnetic Characteristic For U-DFN2020-6 (Type C)

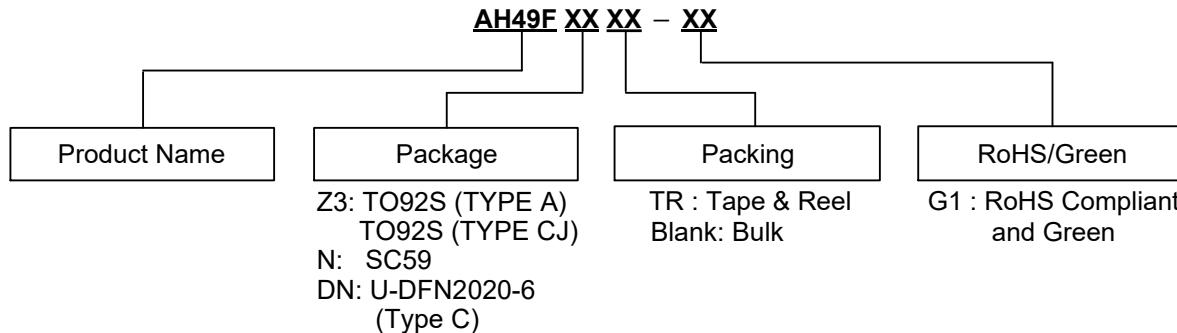
## Performance Characteristics



---

**Ordering Information** (Note 7)
 

---



Orderable Part Number	Identification Code	Status (Note 8)	Package	Temperature Range	Packing	
					Qty.	Carrier
AH49FZ3-G1	49FG	NRND <a href="#">(CONTACT US)</a>	TO92S (TYPE A)	-40°C to +105°C	1000	Bulk
		Active	TO92S (TYPE CJ)		1000	Bulk
AH49FNTR-G1	GT6	Active	SC59		3000	Tape & Reel
AH49FDNTR-G1	CN	Active	U-DFN2020-6 (Type C)		3000	Tape & Reel

Notes: 7. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.  
 8. NRND = Not recommended for new design

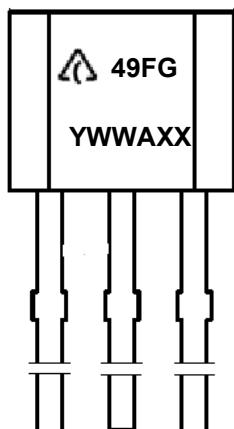
---

**Marking Information**


---

**(1) Package Types: TO92S (TYPE A), TO92S (TYPE CJ)**

(Front View)



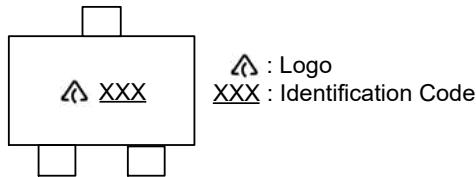
First Line: Logo and Identification Code  
 Second Line: Date Code  
 Y: Year 0 to 9  
 WW: Week 00 to 52 (Work Week of Molding)  
 A: Assembly House Code  
 XX: 7<sup>th</sup> and 8<sup>th</sup> Digits: Batch No.

Orderable Part Number	Package	Identification Code
AH49FZ3-G1	TO92S (TYPE A)	49FG
	TO92S (TYPE CJ)	

## Marking Information (continued)

### (2) Package Type: SC59

( Top View )

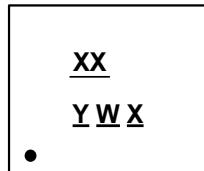


▲ : Logo  
XXX : Identification Code

Orderable Part Number	Package	Identification Code
AH49FNTR-G1	SC59	GT6

### (3) Package Type: U-DFN2020-6 (Type C)

( Top View )



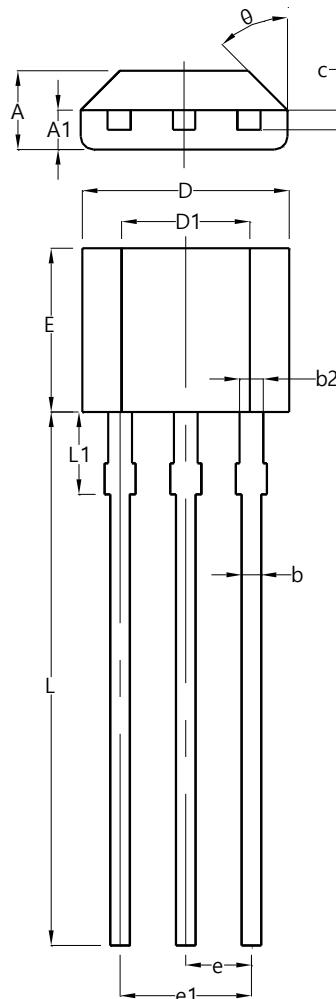
XX : Identification Code  
Y : Year : 0~9  
W : Week : A~Z : 1~26 Week;  
a~z : 27~52 Week; z Represents  
52 and 53 Week  
X : Internal Code

Orderable Part Number	Package	Identification Code
AH49FDNTR-G1	U-DFN2020-6 (Type C)	CN

## Package Outline Dimensions

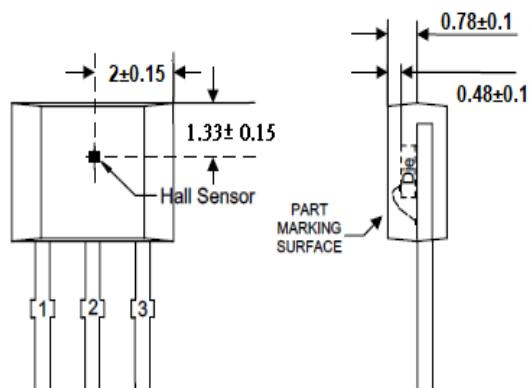
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

TO92S (TYPE CJ)



TO92S (TYPE CJ)			
Dim	Min	Max	Typ
<b>A</b>	1.420	1.620	--
<b>A1</b>	0.660	0.860	--
<b>b</b>	0.330	0.480	--
<b>b2</b>	0.400	0.510	--
<b>c</b>	0.330	0.510	--
<b>D</b>	3.900	4.100	--
<b>D1</b>	2.280	2.680	--
<b>E</b>	3.050	3.250	--
<b>e</b>	--	--	1.270
<b>e1</b>	2.440	2.640	--
<b>L</b>	15.100	15.500	--
<b>L1</b>	1.6 REF		
<b>θ</b>	--	--	45°
All Dimensions in mm			

Min/Max(in mm)

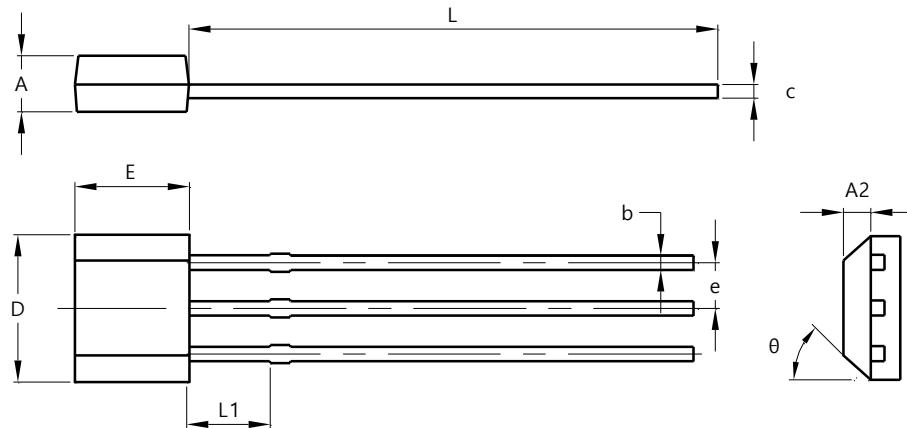


Sensor Location

## Package Outline Dimensions (continued)

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

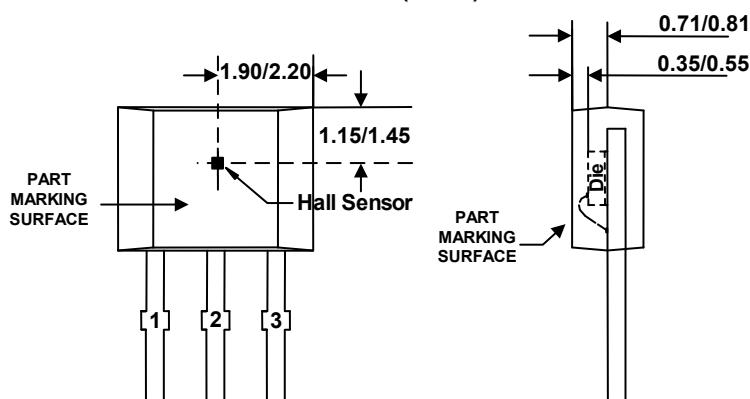
TO92S (TYPE A)



TO92S (TYPE A)			
Dim	Min	Max	Typ
<b>A</b>	1.480	1.680	-
<b>A2</b>	0.710	0.810	-
<b>b</b>	-	-	0.440
<b>c</b>	-	-	0.380
<b>D</b>	4.000	4.200	-
<b>E</b>	3.080	3.280	-
<b>e</b>	-	-	1.270
<b>L</b>	13.500	14.500	-
<b>L1</b>	2.200	2.400	-
<b>θ</b>	44°	46°	-

All Dimensions in mm

Min/Max(in mm)

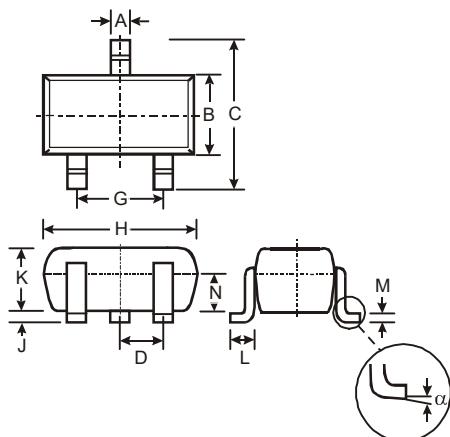


Sensor Location

## Package Outline Dimensions (continued)

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

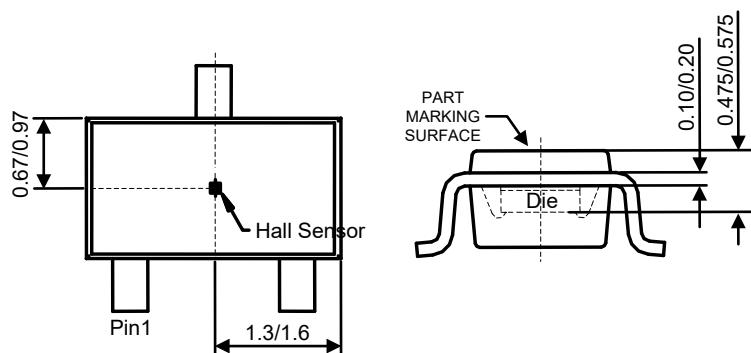
SC59



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

Min/Max(in mm)

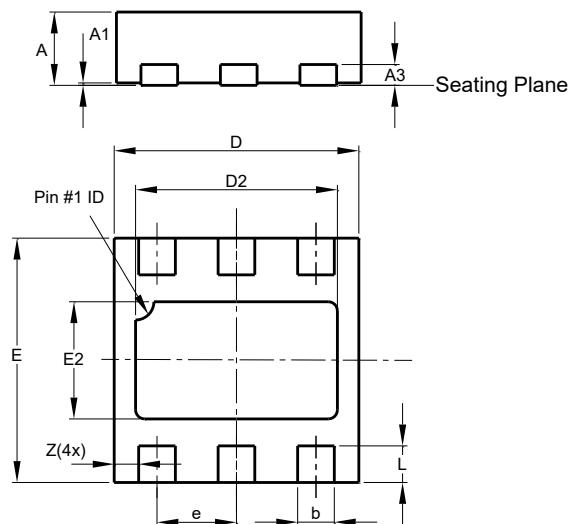


Sensor Location

## Package Outline Dimensions (continued)

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

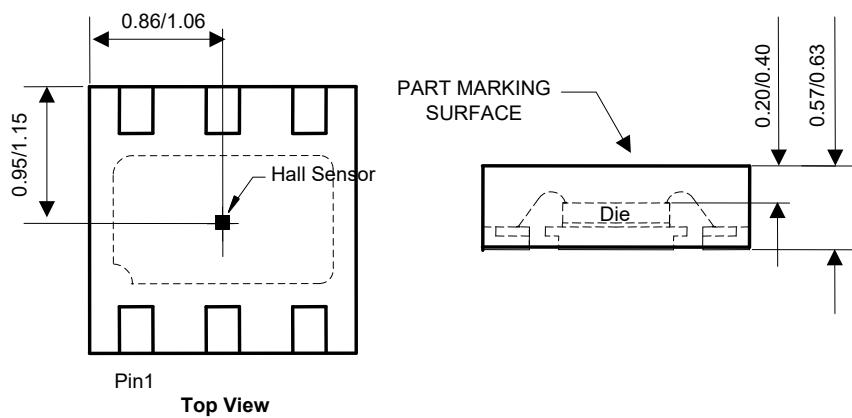
U-DFN2020-6 (Type C)



U-DFN2020-6 Type C			
Dim	Min	Max	Typ
<b>A</b>	0.57	0.63	0.60
<b>A1</b>	0.00	0.05	0.02
<b>A3</b>	—	—	0.15
<b>b</b>	0.25	0.35	0.30
<b>D</b>	1.95	2.075	2.00
<b>D2</b>	1.55	1.75	1.65
<b>E</b>	1.95	2.075	2.00
<b>E2</b>	0.86	1.06	0.96
<b>e</b>	—	—	0.65
<b>L</b>	0.25	0.35	0.30
<b>Z</b>	—	—	0.20

All Dimensions in mm

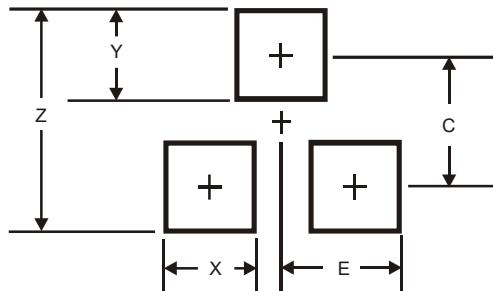
Min/Max(in mm)



## Suggested Pad Layout

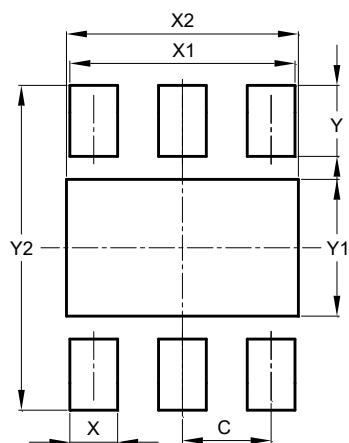
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SC59



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

U-DFN2020-6 (Type C)



Dimensions	Value (in mm)
C	0.650
X	0.350
X1	1.650
X2	1.700
Y	0.525
Y1	1.010
Y2	2.400

## Mechanical Data

- Moisture Sensitivity: Level 1 per J-STD-020 (SC59 and U-DFN2020-6 (Type C))
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (e3)
- Weight: TO92S (TYPE A) – 0.077 grams (Approximate)  
TO92S (TYPE CJ) – 0.077 grams (Approximate)  
U-DFN2020-6 (Type C) – 0.0063 grams (Approximate)  
SC59 – 0.009 grams (Approximate)

**IMPORTANT NOTICE**

1. DIODES INCORPORATED (Diodes) AND ITS SUBSIDIARIES MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO ANY INFORMATION CONTAINED IN THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).
2. The Information contained herein is for informational purpose only and is provided only to illustrate the operation of Diodes' products described herein and application examples. Diodes does not assume any liability arising out of the application or use of this document or any product described herein. This document is intended for skilled and technically trained engineering customers and users who design with Diodes' products. Diodes' products may be used to facilitate safety-related applications; however, in all instances customers and users are responsible for (a) selecting the appropriate Diodes products for their applications, (b) evaluating the suitability of Diodes' products for their intended applications, (c) ensuring their applications, which incorporate Diodes' products, comply the applicable legal and regulatory requirements as well as safety and functional-safety related standards, and (d) ensuring they design with appropriate safeguards (including testing, validation, quality control techniques, redundancy, malfunction prevention, and appropriate treatment for aging degradation) to minimize the risks associated with their applications.
3. Diodes assumes no liability for any application-related information, support, assistance or feedback that may be provided by Diodes from time to time. Any customer or user of this document or products described herein will assume all risks and liabilities associated with such use, and will hold Diodes and all companies whose products are represented herein or on Diodes' websites, harmless against all damages and liabilities.
4. Products described herein may be covered by one or more United States, international or foreign patents and pending patent applications. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks and trademark applications. Diodes does not convey any license under any of its intellectual property rights or the rights of any third parties (including third parties whose products and services may be described in this document or on Diodes' website) under this document.
5. Diodes' products are provided subject to Diodes' Standard Terms and Conditions of Sale (<https://www.diodes.com/about/company/terms-and-conditions/terms-and-conditions-of-sales/>) or other applicable terms. This document does not alter or expand the applicable warranties provided by Diodes. Diodes does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.
6. Diodes' products and technology may not be used for or incorporated into any products or systems whose manufacture, use or sale is prohibited under any applicable laws and regulations. Should customers or users use Diodes' products in contravention of any applicable laws or regulations, or for any unintended or unauthorized application, customers and users will (a) be solely responsible for any damages, losses or penalties arising in connection therewith or as a result thereof, and (b) indemnify and hold Diodes and its representatives and agents harmless against any and all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim relating to any noncompliance with the applicable laws and regulations, as well as any unintended or unauthorized application.
7. While efforts have been made to ensure the information contained in this document is accurate, complete and current, it may contain technical inaccuracies, omissions and typographical errors. Diodes does not warrant that information contained in this document is error-free and Diodes is under no obligation to update or otherwise correct this information. Notwithstanding the foregoing, Diodes reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes.
8. Any unauthorized copying, modification, distribution, transmission, display or other use of this document (or any portion hereof) is prohibited. Diodes assumes no responsibility for any losses incurred by the customers or users or any third parties arising from any such unauthorized use.
9. This Notice may be periodically updated with the most recent version available at <https://www.diodes.com/about/company/terms-and-conditions/important-notice>

The Diodes logo is a registered trademark of Diodes Incorporated in the United States and other countries.  
All other trademarks are the property of their respective owners.  
© 2026 Diodes Incorporated. All Rights Reserved.

[www.diodes.com](http://www.diodes.com)