Description

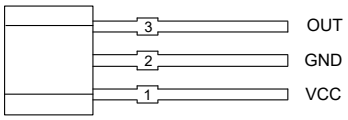
The AH49F is a small, versatile linear Hall effect device that is operated by the magnetic field from a permanent magnet or an electromagnet. The output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field.

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°C to +105°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.

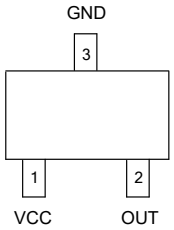
Pin Assignments

(Front View)



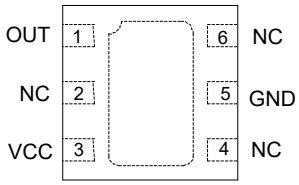
TO92S (TYPE A)
TO92S (TYPE CJ)

(Top View)



SC59

(Top View)



U-DFN2020-6 (Type C)

Features

- Power Consumption of 3.0mA at V_{CC} = 5V 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°C to +105°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)**

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.

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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

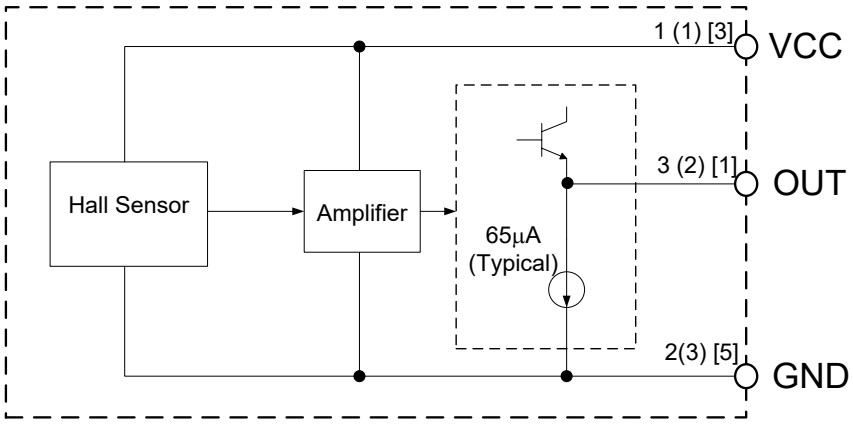
Pin Number	Pin Name	Description
1	VCC	Power supply pin
2	OUT	Output pin
3	GND	Ground pin

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)

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Absolute Maximum Ratings (Note 6)

Symbol	Parameter	Rating		Unit
V_{CC}	Supply Voltage	10		V
V_{CC_INST}	Instantaneous Supply Voltage	50		V
P_D	Power Dissipation	TO92S (TYPE A) TO92S (TYPE CJ)	400	mW
		SC59	230	
		U-DFN2020-6 (Type C)	230	
T_A	Ambient Temperature	-40 to +125		°C
T_{STG}	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_A = +25°C)

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	3	8	V
T_{OP}	Operating Temperature	-40	+105	°C

Electrical Characteristics (@V_{CC} = 5V, T_A = +25°C, unless otherwise specified.)

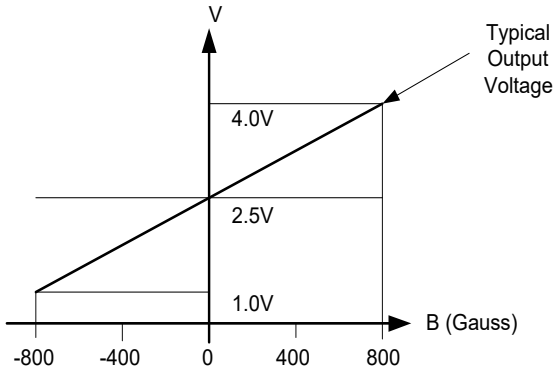
Symbol	Parameters	Conditions	Min	Typ	Max	Unit
I_{CC}	Supply Current	—	2	3	4	mA
V_{NULL}	Quiescent Output Voltage	B = 0 (Gauss)	2.25	2.5	2.75	V
V_{SEN}	Output Voltage Sensitivity	B = 0 to ±600 (Gauss)	1.7	2.1	2.5	mV/Gauss
V_{OUT_S}	Output Voltage Span	—	1.0 to (V_{CC} - 1.0)	0.8 to (V_{CC} -0.8)	—	V
R_{OUT}	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

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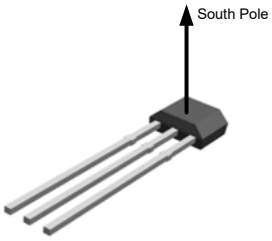
Transferring Characteristics (@V_{CC} = 5V)

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

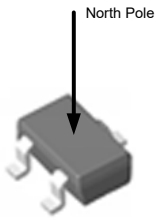
For TO92S (TYPE A), TO92S (TYPE CJ) and U-DFN2020-6 (Type C) packages, if a south magnetic pole approaches the part marking surface (the side with part marking ID) of the Hall effect sensor, the circuit will drive the output voltage higher. In contrary, a north magnetic pole will drive the output voltage 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.



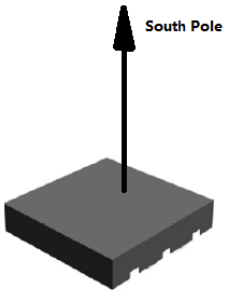
Transfer Characteristic



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



Magnetic Characteristic For SC59

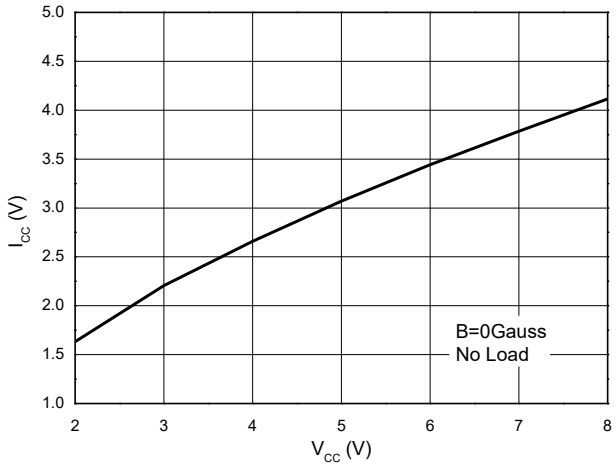


Magnetic Characteristic For U-DFN2020-6 (Type C)

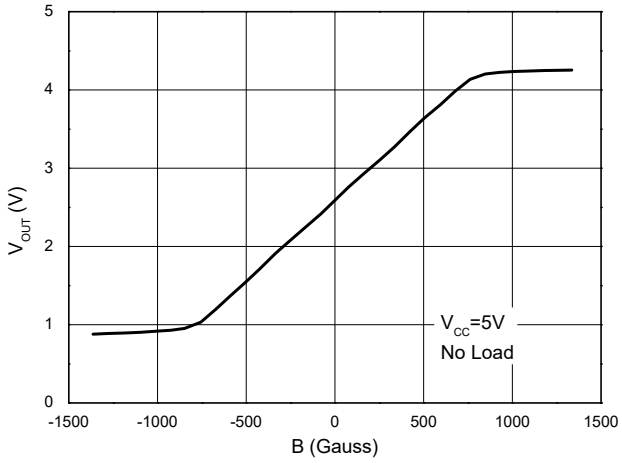
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Performance Characteristics

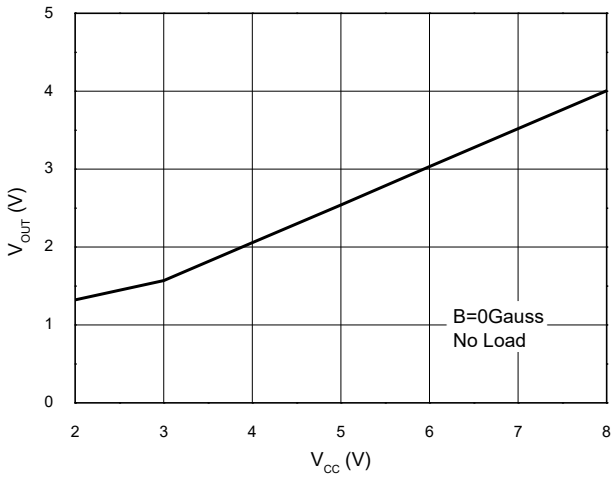
Supply Current vs. Supply Voltage



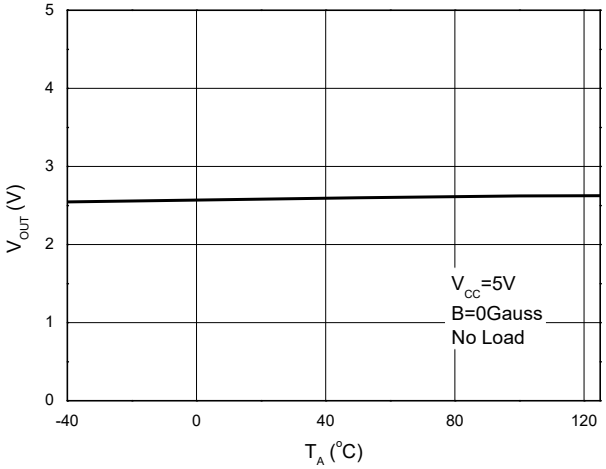
Output Voltage vs. Magnetic Field



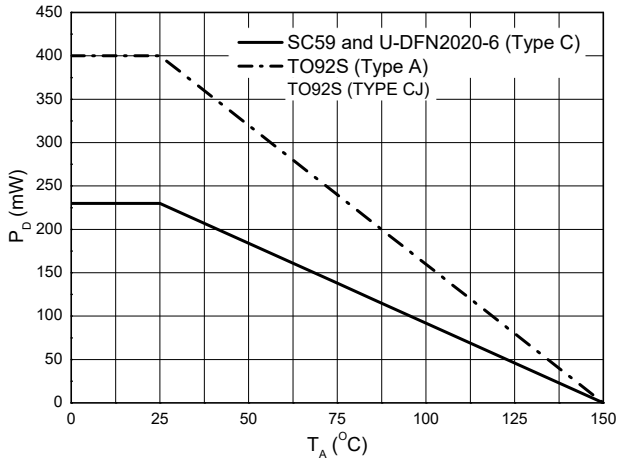
Output Voltage vs. Supply Voltage



Output Voltage vs. Ambient Temperature

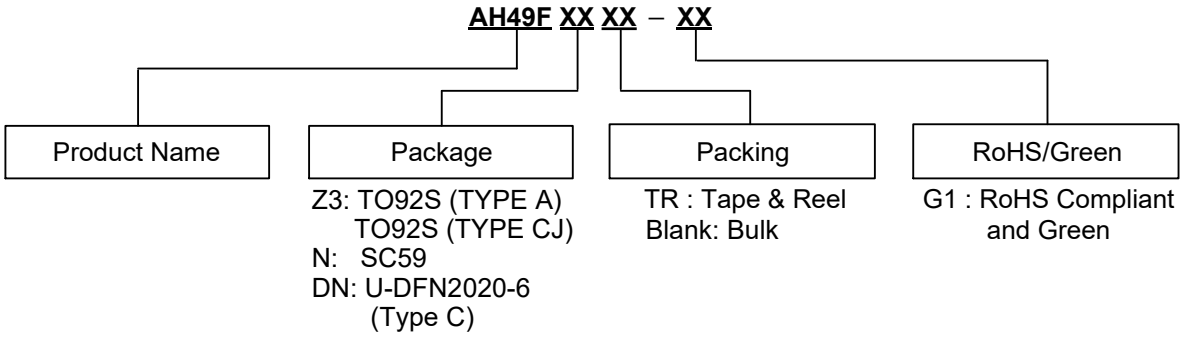


Power Dissipation vs. Ambient Temperature



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Ordering Information (Note 7)



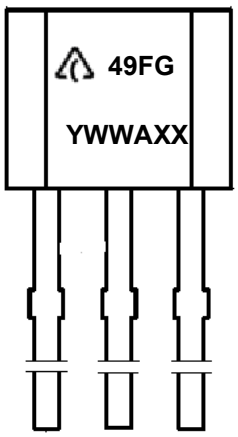
Orderable Part Number	Identification Code	Status (Note 8)	Package	Temperature Range	Packing	
					Qty.	Carrier
AH49FZ3-G1	49FG	NRND (CONTACT US)	TO92S (TYPE A)	-40°C to +105°C	1000	Bulk
		Active	TO92S (TYPE CJ)		1000	Bulk
AH49FNTR-G1	GT6	Active	SC59		3000	Tape & Reel
AH49FDNTR-G1	CN	Active	U-DFN2020-6 (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: 7th and 8th Digits: Batch No.

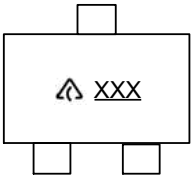
Orderable Part Number	Package	Identification Code
AH49FZ3-G1	TO92S (TYPE A)	49FG
	TO92S (TYPE CJ)	

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Marking Information (continued)

(2) Package Type: SC59

(Top View)

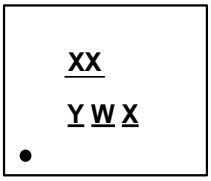


: Logo
XXX : Identification Code

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

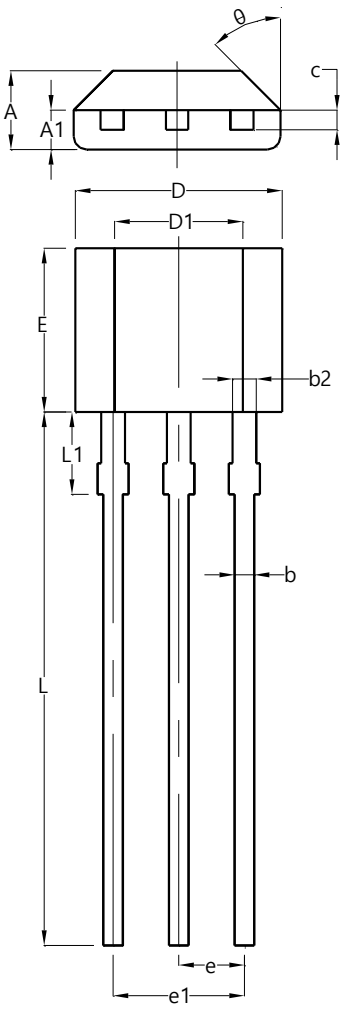
Orderable Part Number	Package	Identification Code
AH49FDNTR-G1	U-DFN2020-6 (Type C)	CN

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Package Outline Dimensions

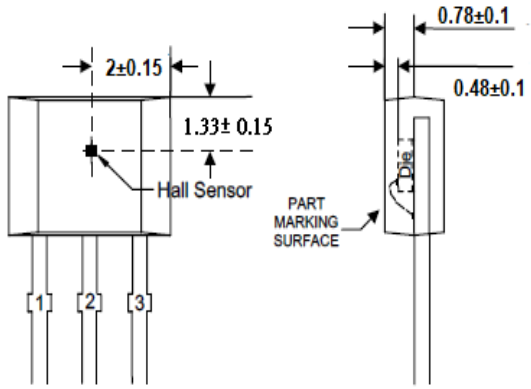
Please see http://www.diodes.com/package-outlines.html for the latest version.

TO92S (TYPE CJ)



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

Min/Max(in mm)



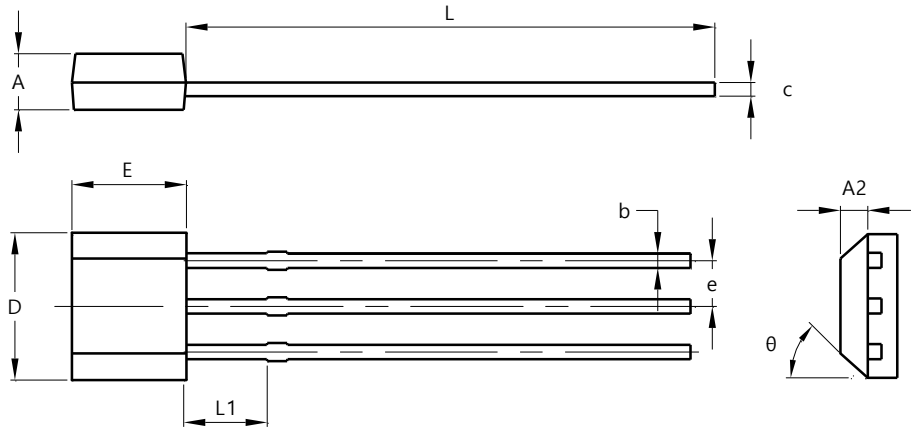
Sensor Location

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Package Outline Dimensions (continued)

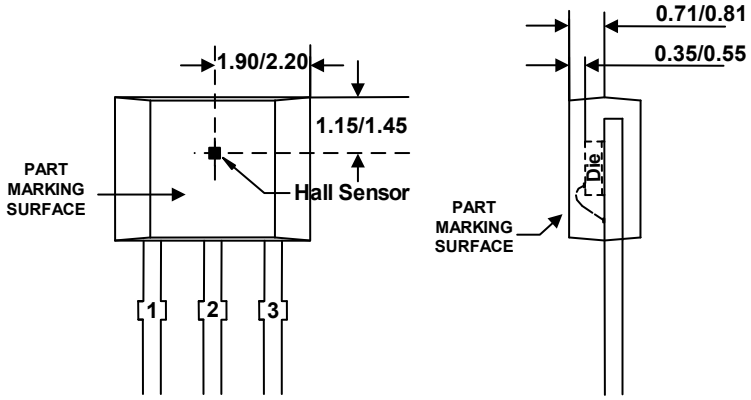
Please see http://www.diodes.com/package-outlines.html for the latest version.

TO92S (TYPE A)



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

Min/Max(in mm)



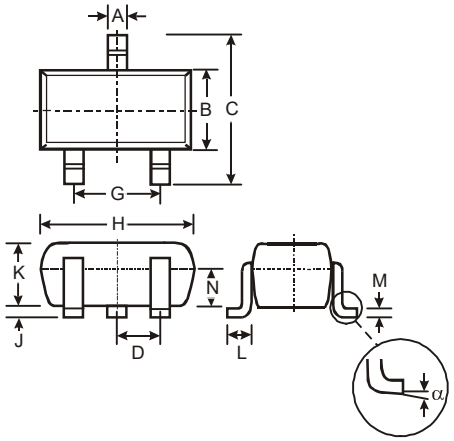
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Package Outline Dimensions (continued)

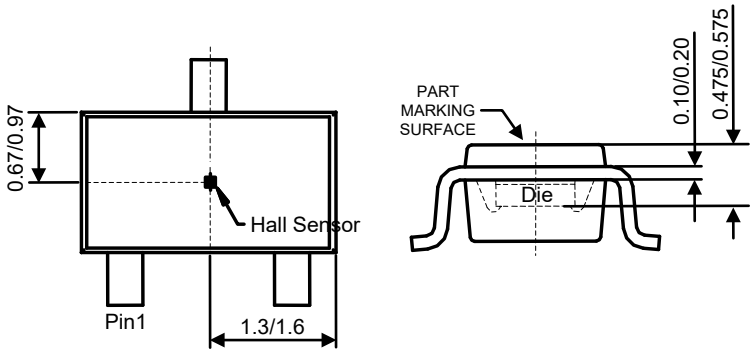
Please see http://www.diodes.com/package-outlines.html for the latest version.

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
α	0°	8°	-
All Dimensions in mm			

Min/Max(in mm)



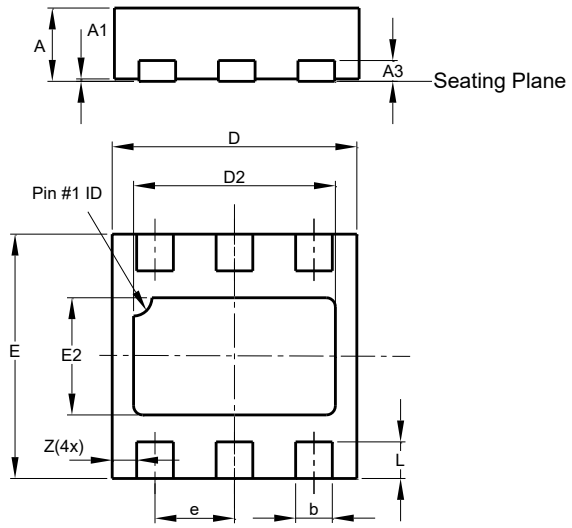
Sensor Location

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Package Outline Dimensions (continued)

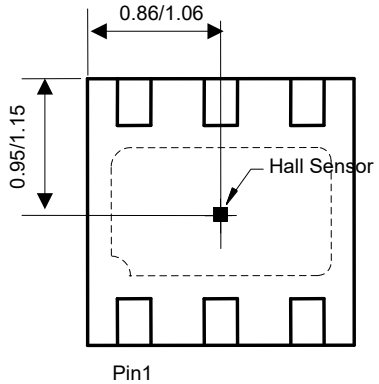
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U-DFN2020-6 (Type C)

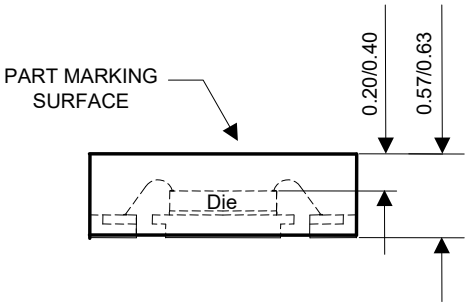


U-DFN2020-6 Type C			
Dim	**Min**	**Max**	**Typ**
A	0.57	0.63	0.60
A1	0.00	0.05	0.02
A3	—	—	0.15
b	0.25	0.35	0.30
D	1.95	2.075	2.00
D2	1.55	1.75	1.65
E	1.95	2.075	2.00
E2	0.86	1.06	0.96
e	—	—	0.65
L	0.25	0.35	0.30
Z	—	—	0.20
All Dimensions in mm			

Min/Max(in mm)



Top View



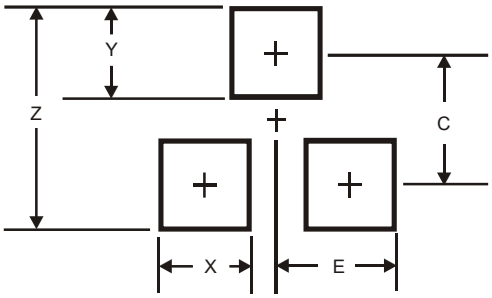
Sensor Location

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Suggested Pad Layout

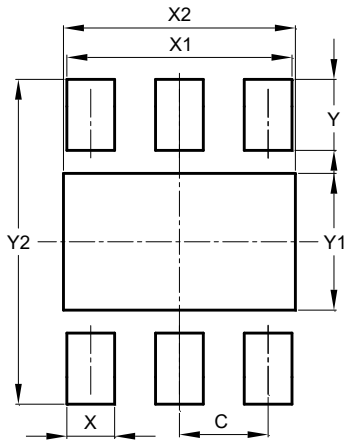
Please see http://www.diodes.com/package-outlines.html for the latest version.

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)

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