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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



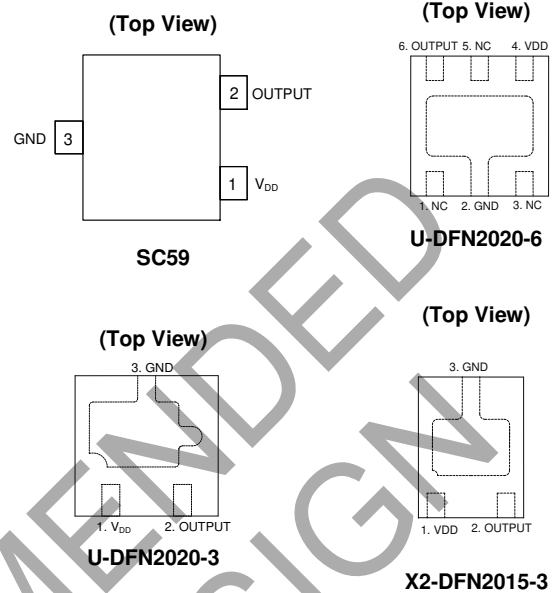
MICROPOWER, ULTRA-SENSITIVE OMNIPOLAR HALL-EFFECT SENSOR SWITCH

Description

The AH1802 is a high-sensitivity, micropower, omnipolar Hall Effect switch integrated circuit (IC) designed for portable and battery-powered equipment, such as cellular phones, PDAs, and portable PCs. Based on two sensitive Hall Effect plates and a chopper-stabilized architecture, the AH1802 provides a reliable solution over the whole operating range. To support portable and battery-powered equipment, the design has been optimized to operate over the supply range of 2.5V to 5.5V and consumes only 24 μ W with a supply of 3V.

The single open-drain output can be switched on with either a north or south pole of sufficient strength. When the magnetic flux density (B) perpendicular to the part marking surface is larger than operate point (Bop), the output is switched on (pulled low). The output is turned off when B becomes lower than the release point (Brp). The output remains off when there is no magnetic field.

Pin Assignments



Features

- Omnipolar (North or South Pole) Operation
- 2.5V to 5.5V Operating Range
- High Sensitivity
- Single Open-Drain Output
- Micropower Operation
- Chopper-Stabilized Design Provides
 - Superior Temperature Stability
 - Minimal Switch Point Drift
 - Enhanced Immunity to Stress
- Good RF Noise Immunity
- -40°C to +85°C Operating Temperature
- ESD > 5kV for U-DFN2020-6, U-DFN2020-3 and X2-DFN2015-3
- ESD > 6kV for SC59
- Low Profile SC59, U-DFN2020-6, U-DFN2020-3 and X2-DFN2015-3 packages
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

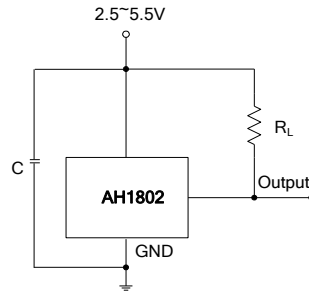
Applications

- Open and Close Detect for Flip/Slide Cellular Phones
- Smart Cover or Dock Detect for Cellular Phones and Tablets
- Cover or Display Switch in Portable PCs (such as Ultrabook™)
- Display Switch for Portable PCs
- On/Off switch for PDAs and Digital Cameras
- Contactless Switch in Consumer Products

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

Package: SC59

| Pin Number | Pin Name | Function |
|------------|-----------------|--------------------|
| 1 | V _{DD} | Power Supply Input |
| 2 | OUTPUT | Output Pin |
| 3 | GND | Ground Pin |

Package: U-DFN2020-3 and X2-DFN2015-3

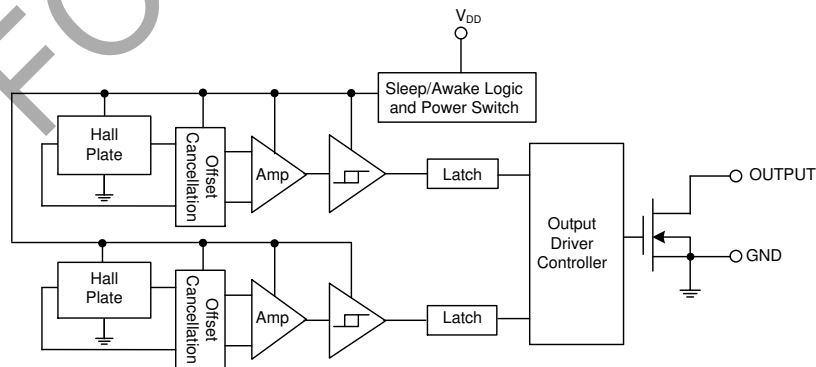
| Pin Number | Pin Name | Function |
|------------|-----------------|--------------------|
| 1 | V _{DD} | Power Supply Input |
| 2 | OUTPUT | Output Pin |
| 3 | GND | Ground Pin |

Package: U-DFN2020-6 and X2-DFN2015-3

| Pin Number | Pin Name | Function |
|------------|-----------------|------------------------|
| 1 | NC | No Connection (Note 4) |
| 2 | GND | Ground Pin |
| 3 | NC | No Connection (Note 4) |
| 4 | V _{DD} | Power Supply Input |
| 5 | NC | No Connection (Note 4) |
| 6 | OUTPUT | Output Pin |

Note: 4. NC is *No Connection*—recommendation is to connect the NC pin to ground externally.

Functional Block Diagram



Absolute Maximum Ratings (Note 6) (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Symbol | Parameter | Values | Unit |
|----------|------------------------------|-------------|------------------|
| V_{DD} | Supply Voltage (Note 7) | 7 | V |
| B | Magnetic Flux Density | Unlimited | |
| T_s | Storage Temperature Range | -65 to +150 | $^\circ\text{C}$ |
| P_D | Package Power Dissipation | 230 | mW |
| T_J | Maximum Junction Temperature | 150 | $^\circ\text{C}$ |

- Notes:
- Stresses greater than the 'Absolute Maximum Ratings' specified above may cause permanent damage to the device. These are stress ratings only; functional operation of the device at these or any other conditions exceeding those indicated in this specification is not implied. Device reliability may be affected by exposure to absolute maximum rating conditions for extended periods of time.
 - The absolute maximum V_{DD} of 7V is a transient stress rating and is not meant as a functional operating condition. It is not recommended to operate the device at the absolute maximum rated conditions for any period of time.

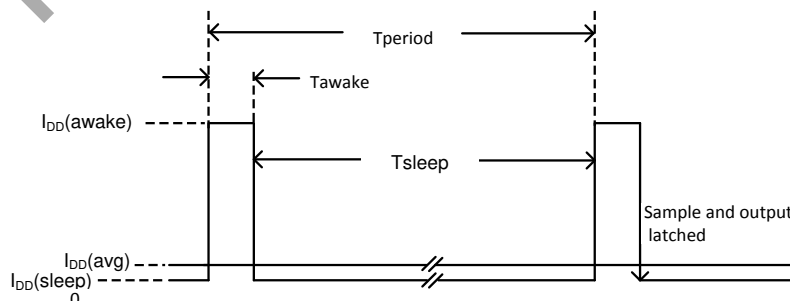
Recommended Operating Conditions (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Symbol | Parameter | Conditions | Rating | Unit |
|----------|-----------------------------|------------|------------|------------------|
| V_{DD} | Supply Voltage | Operating | 2.5 to 5.5 | V |
| T_A | Operating Temperature Range | Operating | -40 to +85 | $^\circ\text{C}$ |

Electrical Characteristics (@ $V_{DD} = 3\text{V}$, $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Symbol | Characteristic | Conditions | Min | Typ | Max | Unit |
|------------------------|--------------------------------|---|-----|------|-----|---------------|
| V_{OUT} | Output On Voltage (V_{OL}) | $I_{OUT} = 1\text{mA}$ | — | 0.1 | 0.3 | V |
| I_{OFF} | Output Leakage Current | $V_{OUT} = 5.5\text{V}$, $B < Brp$ | — | <0.1 | 1 | μA |
| $I_{DD}(\text{awake})$ | Supply Current | During 'Awake' Period, $T_A = +25^\circ\text{C}$, $V_{DD} = 3\text{V}$ | — | 3 | 6 | mA |
| | | During 'Awake' Period, $T_A = -40$ to $+85^\circ\text{C}$, $V_{DD} = 2.5$ to 5.5V | — | 3 | 10 | mA |
| $I_{DD}(\text{sleep})$ | | During 'Sleep' Period, $T_A = +25^\circ\text{C}$, $V_{DD} = 3\text{V}$ | — | 5 | 10 | μA |
| | | During 'Sleep' Period, $T_A = -40$ to $+85^\circ\text{C}$, $V_{DD} = 2.5$ to 5.5V | — | 5 | 18 | μA |
| $I_{DD}(\text{avg})$ | | Average Supply Current, $T_A = +25^\circ\text{C}$, $V_{DD} = 3\text{V}$ | — | 8 | 16 | μA |
| | | Average Supply Current, $T_A = -40$ to $+85^\circ\text{C}$, $V_{DD} = 2.5$ to 5.5V | — | 8 | 23 | μA |
| F_C | Chopping Frequency | For Design Information Only | — | 300 | — | kHz |
| T_{awake} | Awake Time | (Note 8) | — | 75 | 150 | μs |
| T_{period} | Period | (Note 8) | — | 75 | 150 | ms |
| D.C. | Duty Cycle | — | — | 0.1 | — | % |

- Note: 8. When power is initially turned on, V_{DD} must be within its correct operating range (2.5V to 5.5V) to guaranteed the output sampling. The output state is valid after the second operating cycle (typical 150ms).

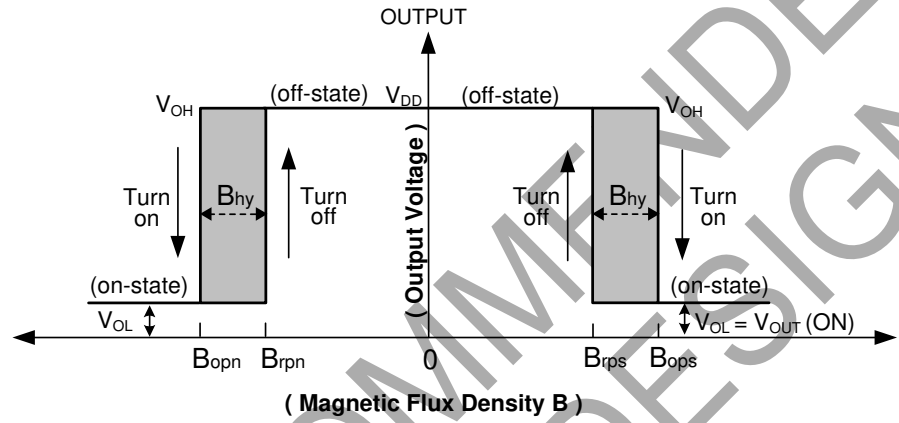


Magnetic Characteristics (Notes 9 & 10) (@ $V_{DD} = 3V$, $T_A = +25^\circ C$, unless otherwise specified.)

(1mT=10 Gauss)

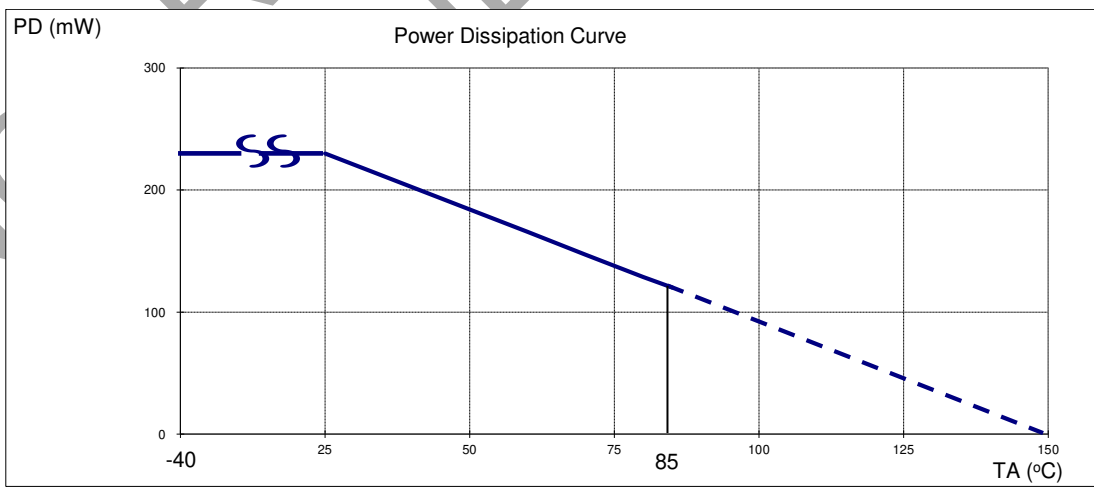
| Symbol | Characteristic | Min | Typ | Max | Unit |
|---------------------------------------|----------------|-----|-----|-----|-------|
| Bops(South Pole to Part Marking Side) | Operate Point | 20 | 28 | 40 | Gauss |
| Bopn(North Pole to Part Marking Side) | | -40 | -28 | -20 | |
| Brps(South Pole to Part Marking Side) | Release Point | 10 | 20 | — | |
| Brpn(North Pole to Part Marking Side) | | — | -20 | -10 | |
| $B_{hy}(B_{opx} - B_{rp})$ | Hysteresis | 5 | 8 | — | |

Notes: 9. Typical data is at $T_A = +25^\circ C$, $V_{DD} = 3V$, and for design information only.
10. The magnetic characteristics may vary with supply voltage, operating temperature, and after soldering.



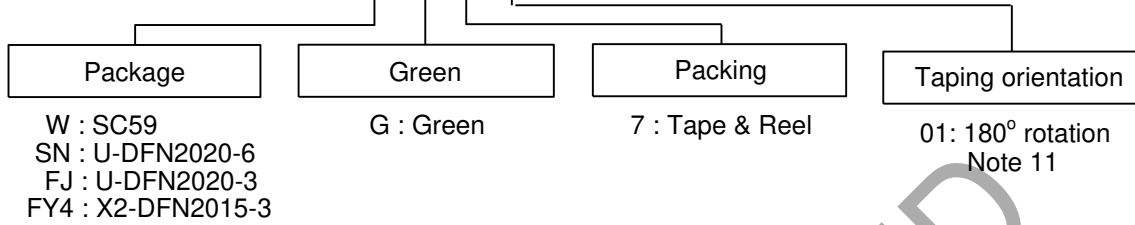
Performance Characteristics

| T_A (°C) | 25 | 50 | 60 | 70 | 80 | 85 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| P_D (mW) | 230 | 184 | 166 | 147 | 129 | 120 | 110 | 92 | 74 | 55 | 37 | 18 | 0 |



Ordering Information

AH 1802 - XXX G - 7 - 01



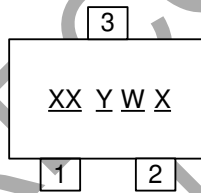
| Part Number | Status (Note 12) | Package Code | Packaging | 7" Tape and Reel | |
|--------------------------|------------------|--------------|--------------|------------------|--------------------|
| | | | | Quantity | Part Number Suffix |
| AH1802-WG-7 | NRND | W | SC59 | 3000/Tape & Reel | -7 |
| AH1802-SNG-7 | NRND | SN | U-DFN2020-6 | 3000/Tape & Reel | -7 |
| AH1802-FJG-7 | NRND | FJ | U-DFN2020-3 | 3000/Tape & Reel | -7 |
| AH1802-FJG-7-01 (Note 8) | NRND | FJ | U-DFN2020-3 | 3000/Tape & Reel | -7 |
| AH1802-FY4G-7 | NRND | FY4 | X2-DFN2015-3 | 3000/Tape & Reel | -7 |

Note: 11. AH1802-FJG-7-01 DFN2020-3 package taping orientation is rotated by 180° compared to standard part AH1802-FJG-7. See package orientation diagrams on pages 9 and 10.
12. NRND = Not Recommended for New Design

Marking Information

(1) Package Type: SC59

(Top View)

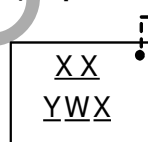


XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : A~Z : Green

| Part Number | Package | Identification Code |
|-------------|---------|---------------------|
| AH1802 | SC59 | KC |

(2) Package Type: U-DFN2020-6

(Top View)



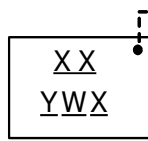
Pin 1 indicator
XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : A~Z : Green

| Part Number | Package | Identification Code |
|-------------|-------------|---------------------|
| AH1802 | U-DFN2020-6 | KC |

Marking Information (continued)

(3) Package Type: U-DFN2020-3

(Top View)

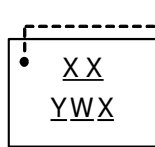


Pin 1 indicator
XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
 a~z : 27~52 week; z represents
 52 and 53 week
X : A~Z : Green

| Part Number | Package | Identification Code |
|-------------|-------------|---------------------|
| AH1802 | U-DFN2020-3 | KE |

(4) Package Type: X2-DFN2015-3

(Top View)



Pin 1 indicator
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 : A~Z : Green

| Part Number | Package | Identification Code |
|-------------|--------------|---------------------|
| AH1802 | X2-DFN2015-3 | KF |

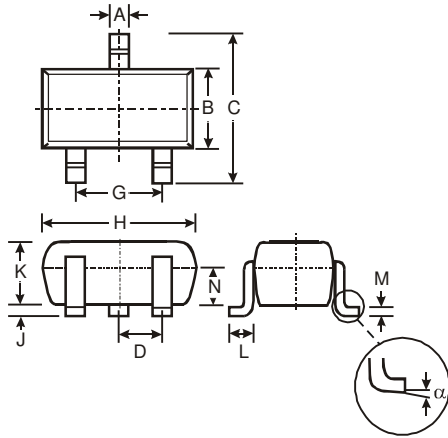
NOT RECOMMENDED FOR NEW DESIGN

Package Outline Dimensions (All dimensions in mm.)

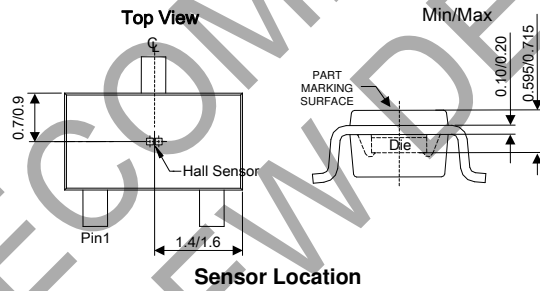
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: SC59

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 |
| | $\square .0^\circ$ | 8° | - |
| All Dimensions in mm | | | |



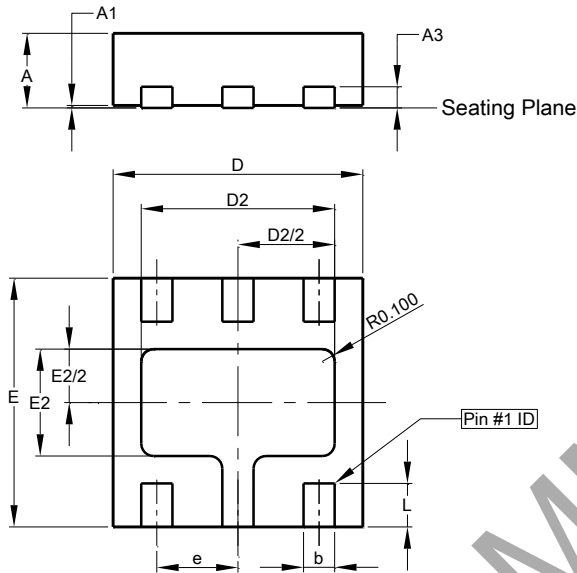
NOT RECOMMENDED FOR NEW DESIGN

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

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

(2) Package Type: U-DFN2020-6

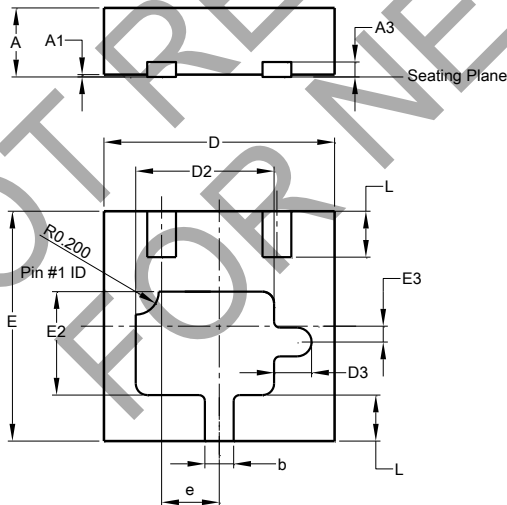
U-DFN2020-6



| U-DFN2020-6 | | | |
|----------------------|------|-------|------|
| Dim | Min | Max | Typ |
| A | 0.57 | 0.63 | 0.60 |
| A1 | 0 | 0.05 | 0.03 |
| A3 | - | - | 0.15 |
| b | 0.20 | 0.30 | 0.25 |
| D | 1.95 | 2.075 | 2.00 |
| D2 | 1.45 | 1.65 | 1.55 |
| e | - | - | 0.65 |
| E | 1.95 | 2.075 | 2.00 |
| E2 | 0.76 | 0.96 | 0.86 |
| L | 0.30 | 0.40 | 0.35 |
| All Dimensions in mm | | | |

(3) Package type: U-DFN2020-3

U-DFN2020-3



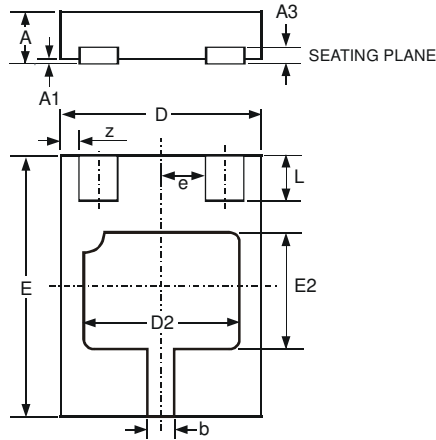
| U-DFN2020-3 | | | |
|----------------------|-----------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.57 | 0.63 | 0.60 |
| A1 | 0 | 0.05 | 0.02 |
| A3 | - | - | 0.152 |
| b | 0.20 | 0.30 | 0.25 |
| D | 1.950 | 2.075 | 2.00 |
| D2 | 1.10 | 1.30 | 1.20 |
| D3 | 0.325 REF | | |
| e | - | - | 0.50 |
| E | 1.950 | 2.075 | 2.00 |
| E2 | 0.80 | 1.00 | 0.90 |
| E3 | 0.138 REF | | |
| L | 0.35 | 0.45 | 0.40 |
| All Dimensions in mm | | | |

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

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

(4) Package type: X2-DFN2015-3

X2-DFN2015-3



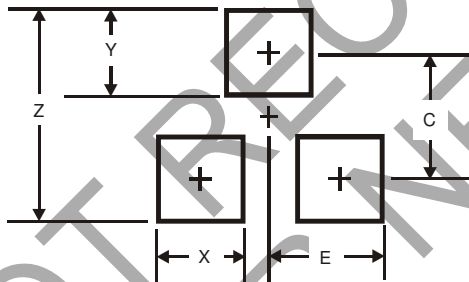
| X2-DFN2015-3 | | | |
|----------------------|------|-------|-------|
| Dim | Min | Max | Typ |
| A | - | 0.40 | - |
| A1 | 0 | 0.05 | 0.02 |
| A3 | - | - | 0.13 |
| b | 0.20 | 0.30 | 0.25 |
| D | 1.45 | 1.575 | 1.5 |
| D2 | 1.00 | 1.20 | 1.10 |
| e | - | - | 0.50 |
| E | 1.95 | 2.075 | 2.00 |
| E2 | 0.70 | 0.90 | 0.80 |
| L | 0.25 | 0.35 | 0.30 |
| z | - | - | 0.125 |
| All Dimensions in mm | | | |

Suggested Pad Layout

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

(1) Package Type: SC59

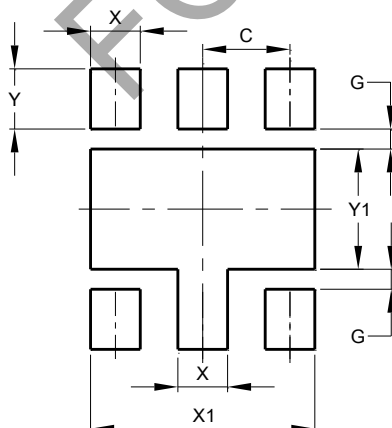
SC59



| Dimensions | SC59 |
|------------|------|
| Z | 3.4 |
| X | 0.8 |
| Y | 1.0 |
| C | 2.4 |
| E | 1.35 |

(2) Package Type: U-DFN2020-6

U-DFN2020-6



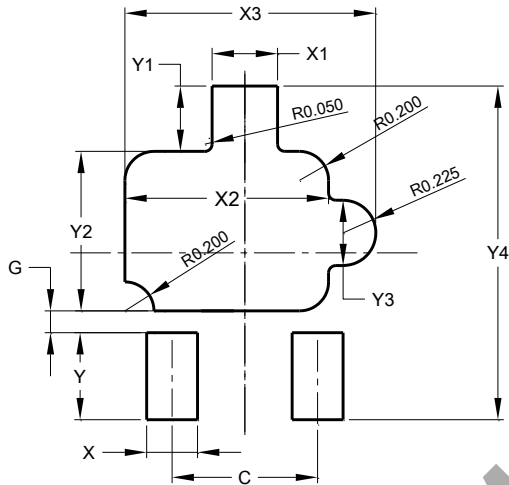
| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.65 |
| G | 0.15 |
| X | 0.37 |
| X1 | 1.67 |
| Y | 0.45 |
| Y1 | 0.90 |

Suggested Pad Layout (continued)

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

(3) Package Type: U-DFN2020-3

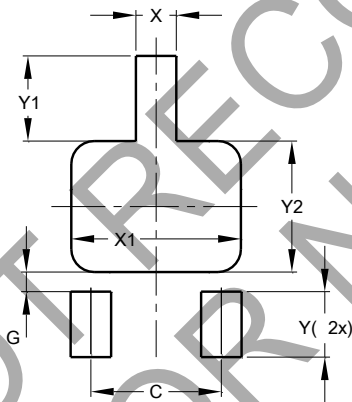
U-DFN2020-3



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 1.000 |
| G | 0.150 |
| X | 0.350 |
| X1 | 0.450 |
| X2 | 1.400 |
| X3 | 1.724 |
| Y | 0.600 |
| Y1 | 0.450 |
| Y2 | 1.100 |
| Y3 | 0.450 |
| Y4 | 2.300 |

(4) Package Type: X2-DFN2015-3

X2-DFN2015-3



| X2-DFN2015-3 | |
|--------------|---------------|
| Dimensions | Value (in mm) |
| C | 1.000 |
| G | 0.150 |
| X | 0.310 |
| X1 | 1.300 |
| Y | 0.500 |
| Y1 | 0.650 |
| Y2 | 1.000 |

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