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AH1802

MICROPOWER, ULTRA-SENSITIVE OMNIPOLAR HALL-EFFECT SENSOR SWITCH

Description

The AH1802 is a high sensitivity, micropower omnipolar Hall Effect switch IC designed for portable and battery powered equipment such as cellular phones, PDA's and portable PC's. 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 24μW with a supply of 3V.

The single open drain output can switched on with either a north or south pole of sufficient strength. When the magnetic flux density (B) perpendicular 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 will remain off when there is no magnetic field.

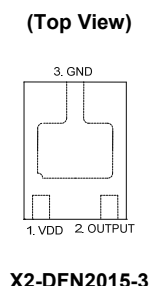
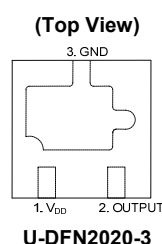
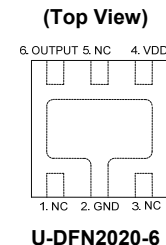
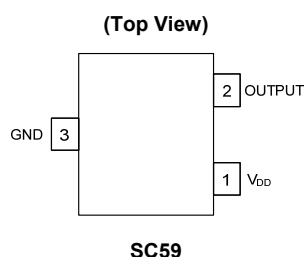
Features

- 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)**

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html 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.

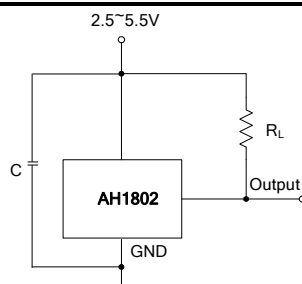
Pin Assignments



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 (eg Ultrabook)
- Display switch for portable PCs
- On/Off switch for PDAs and digital cameras
- Contact-less switch in consumer products

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

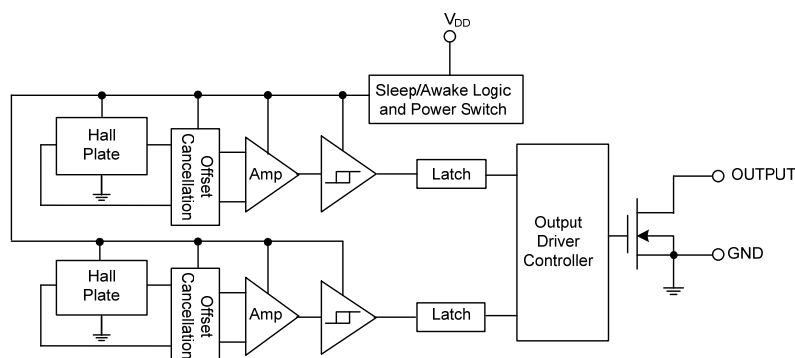
Pin Number	Pin Name	Function
1	V _{DD}	Power Supply Input
2	OUTPUT	Output Pin
3	GND	Ground Pin

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°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	°C
P _D	Package Power Dissipation	230	mW
T _J	Maximum Junction Temperature	150	°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.

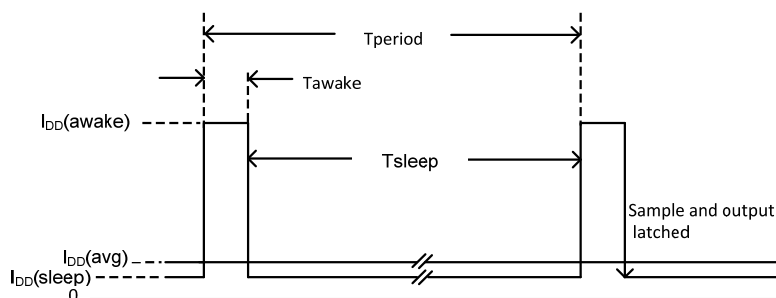
Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

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	°C

Electrical Characteristics (@ V_{DD} = 3V, T_A = +25°C, unless otherwise specified.)

Symbol	Characteristic	Conditions	Min	Typ	Max	Unit
V _{OUT}	Output On Voltage (V _{OL})	I _{OUT} = 1mA	—	0.1	0.3	V
I _{OFF}	Output Leakage Current	V _{OUT} = 5.5V, B < Brp	—	<0.1	1	μA
I _{DD} (awake)	Supply Current	During 'awake' period, T _A = +25°C, V _{DD} = 3V	—	3	6	mA
		During 'awake' period, T _A = -40 to +85°C, V _{DD} = 2.5 to 5.5V	—	3	10	mA
I _{DD} (sleep)		During 'sleep' period, T _A = +25°C, V _{DD} = 3V	—	5	10	μA
		During 'sleep' period, T _A = -40 to +85°C, V _{DD} = 2.5~5.5V	—	5	18	μA
I _{DD} (avg)		Average supply current, T _A = +25°C, V _{DD} = 3V	—	8	16	μA
		Average supply current, T _A = -40 to +85°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:
- 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).

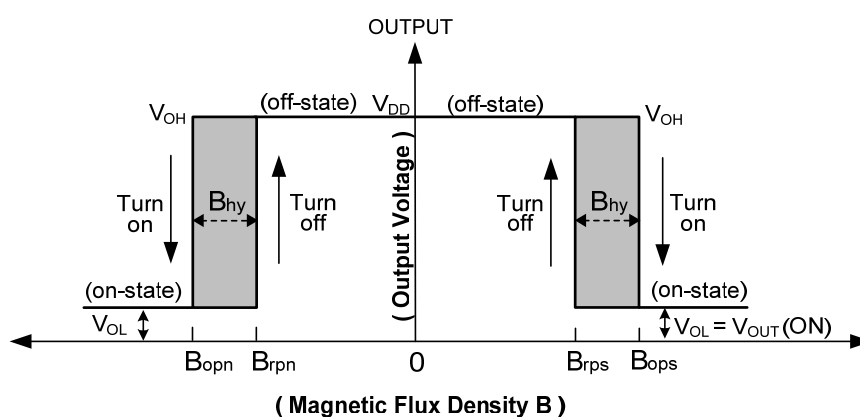


Magnetic Characteristics (Notes 9 & 10) (@ $V_{DD} = 3V$, $T_A = +25^\circ C$, unless otherwise specified.)

(1mT=10 Gauss)

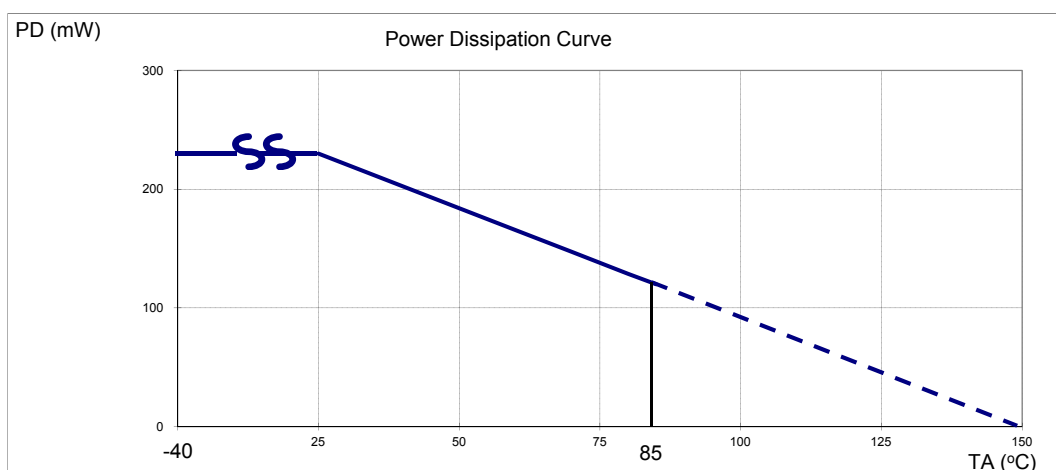
Symbol	Characteristic	Min	Typ	Max	Unit
Bops(south pole to part marking side)	Operate Point	20	28	40	Gauss
Bopn(north pole to part marking side)		-40	-28	-20	
Brps(south pole to part marking side)	Release Point	10	20	—	
Brpn(north pole to part marking side)		—	-20	-10	
$B_{hy}(B_{opx} - B_{rpx})$	Hysteresis	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.



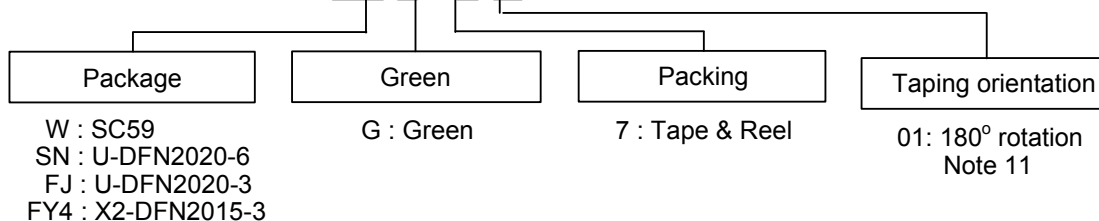
Performance Characteristics

T_A ($^\circ C$)	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



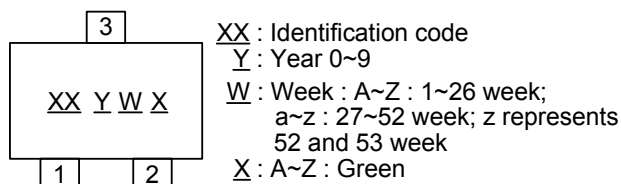
Part Number	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
AH1802-WG-7	W	SC59	3000/Tape & Reel	-7
AH1802-SNG-7	SN	U-DFN2020-6	3000/Tape & Reel	-7
AH1802-FJG-7	FJ	U-DFN2020-3	3000/Tape & Reel	-7
AH1802-FJG-7-01 (Note 8)	FJ	U-DFN2020-3	3000/Tape & Reel	-7
AH1802-FY4G-7	FY4	X2-DFN2015-3	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 page 10.

Marking Information

(1) Package Type: SC59

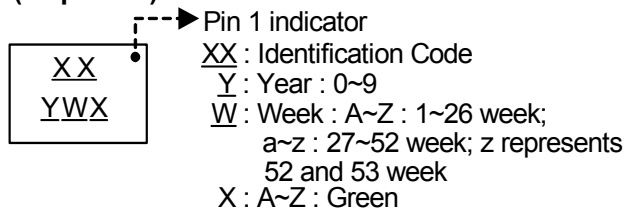
(Top View)



Part Number	Package	Identification Code
AH1802	SC59	KC

(2) Package Type: U-DFN2020-6

(Top View)

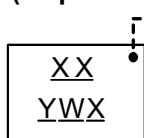


Part Number	Package	Identification Code
AH1802	U-DFN2020-6	KC

Marking Information (cont.)

(3) Package Type: U-DFN2020-3

(Top View)



Pin 1 indicator

XX : Identification Code

Y : Year : 0~9

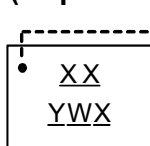
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week

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

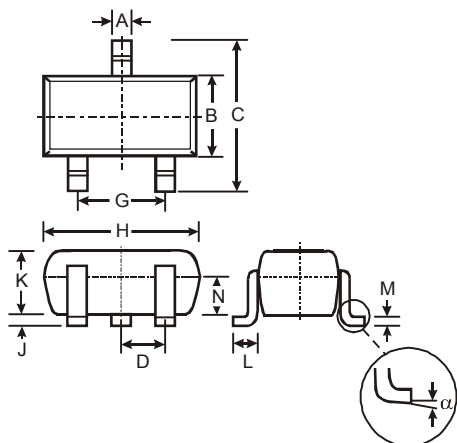
X : A~Z : Green

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

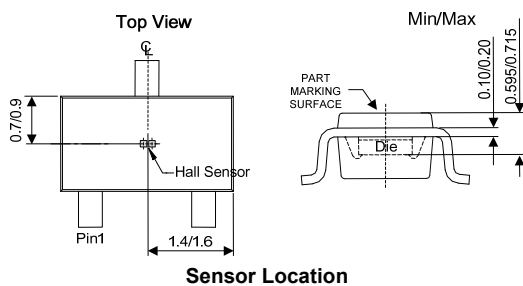
Package Outline Dimensions (cont.) (All dimensions in mm.)

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

(1) Package Type: SC59



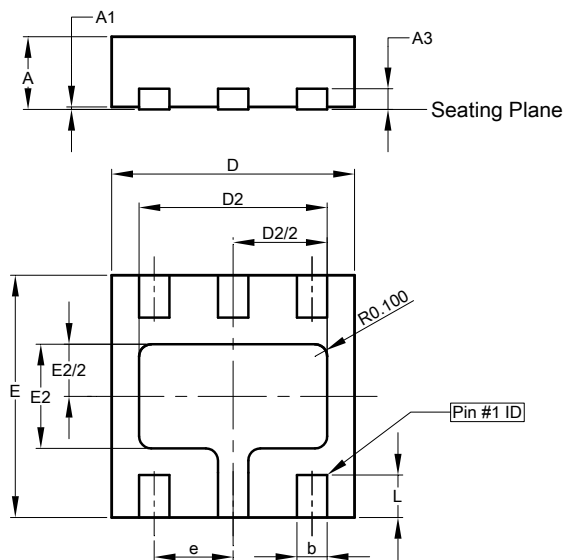
SC59			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
G	-	-	1.90
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			



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

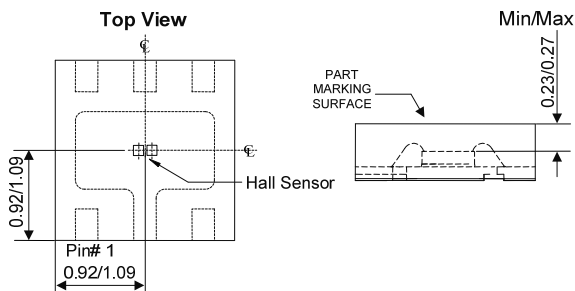
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

(2) Package Type: U-DFN2020-6



Bottom View

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			

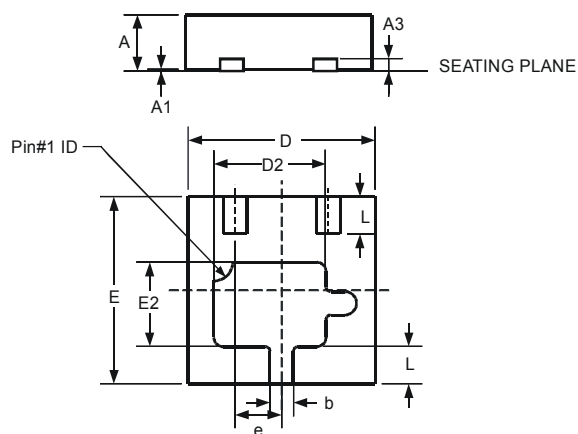


Sensor Location

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

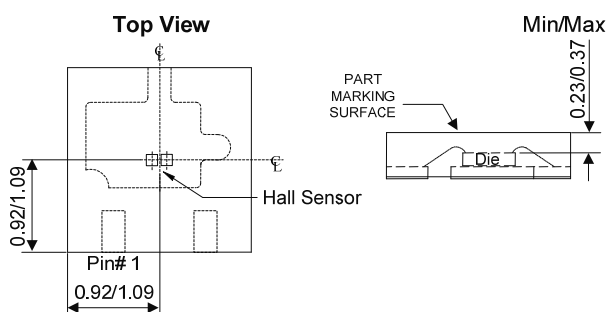
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

(3) Package type: U-DFN2020-3



Bottom View

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	1.95	2.075	2.00
D2	1.10	1.30	1.20
e	—	—	0.50
E	1.95	2.075	2.00
E2	0.80	1.00	0.90
L	0.35	0.45	0.40
All Dimensions in mm			

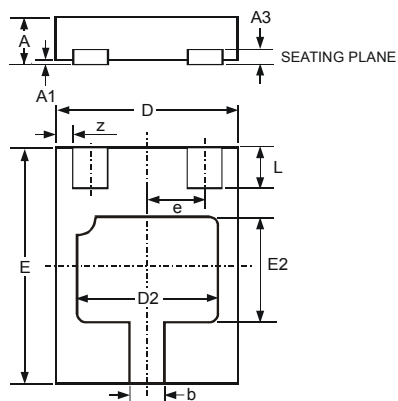


Sensor Location

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

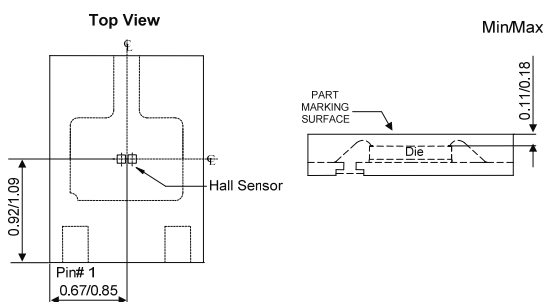
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

(4) Package type: X2-DFN2015-3



Bottom View

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	1.50
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			

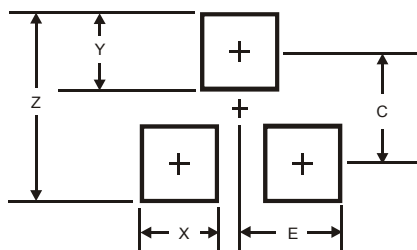


Sensor Location

Suggested Pad Layout

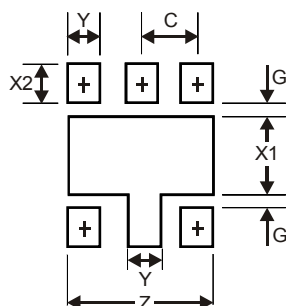
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

(1) Package Type: SC59



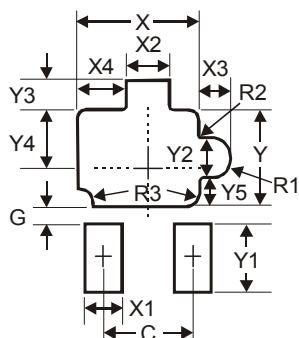
Dimensions	Value (in mm)
Z	3.4
X	0.8
Y	1
C	2.4
E	1.35

(2) Package Type: U-DFN2020-6



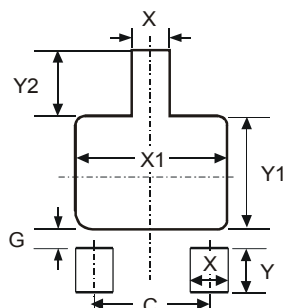
Dimensions	Value (in mm)
Z	1.67
G	0.15
X1	0.90
X2	0.45
Y	0.37
C	0.65

(3) Package Type: U-DFN2020-3



Dimensions	Value (in mm)	Dimensions	Value (in mm)
C	1.00	Y1	0.60
G	0.15	Y2	0.45
X	1.40	Y3	0.45
X1	0.35	Y4	0.698
X2	0.45	Y5	0.313
X3	0.322	R1	0.225
X4	0.60	R2	0.05
Y	1.10	R3	0.20

(4) Package Type: X2-DFN2015-3



Dimensions	Value (in mm)
C	1.00
G	0.15
X	0.31
X1	1.30
Y	0.50
Y1	1.00
Y2	0.65

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