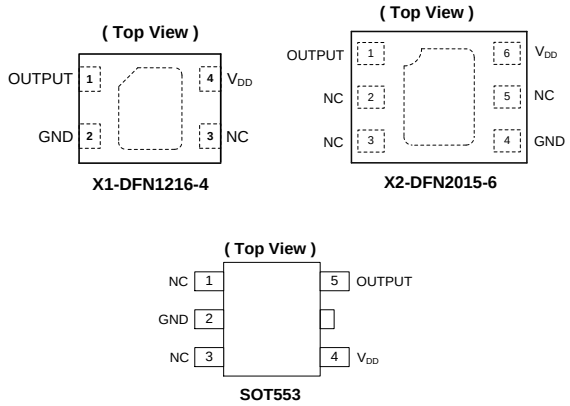
HIGH SENSITIVITY MICROPOWER OMNIPLOAR HALL-EFFECT SWITCH

Description

The AH1902 is a high-sensitivity micropower Omnipolar Hall effect switch IC with internal pull up and pull down capability. Designed for portable and battery powered consumer equipment such as cellular phones and portable PCs to office equipment, home appliances and industrial applications, the average supply current is only 4.3μA at 1.8V. To support potable equipment the AH1902 can operate over the supply range of 1.6V to 3.6V and uses a hibernating clocking system to minimize the power consumption. To minimize PCB space, the AH1902 is available in small low profile X1-DFN1216-4, X2-DFN2015-6 and SOT553 packages.

The output is activated with either a north or south pole of sufficient magnetic field strength. When the magnetic flux density (B) perpendicular to the package is larger than operate point (Bop), the output will be turned on (pulled low) and held until B is lower than release point (Brp).

Pin Assignments



Features

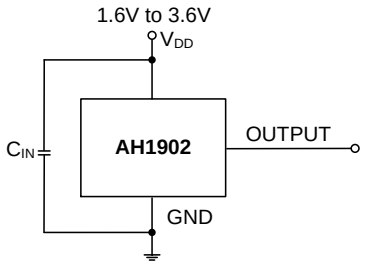
- Omnipolar Operation (North or South Pole)
- Supply Voltage of 1.6V to 3.6V
- High Sensitivity
- Micropower Operation
- Chopper Stabilized Design Provides:
  - Superior Temperature Stability
  - Minimal Switch Point Drift
  - Enhanced Immunity to Physical Stress
- No External Pull-up Resistors Required
- Good RF Noise Immunity
- -40°C to +85°C Operating Temperature
- High ESD capability of 8kV (Human Body Model)
- Small Low Profile X1-DFN1216-4, X2-DFN2015-6 and SOT553 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 Tablet PCs
- Cover or Display Switch in Portable PCs (eg: Ultrabook)
- Digital Still, Video Cameras and Handheld Gaming Consoles
- Door, Lids and Tray Position Switches
- Level, Proximity and Position Switches
- Contact-Less Switches in Home Appliances and Industrial Applications

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
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.

Typical Applications Circuit



Note: 4. C_{IN} is for power stabilization and to strengthen the noise immunity, the recommended capacitance is 100nF typical and should be placed as close to the supply pin as possible.

Pin Descriptions

Package: X1-DFN1216-4

Pin Number	Pin Name	Function
1	OUTPUT	Output Pin
2	GND	Ground Pin
3	NC	No Connection (Note 5)
4	V_{DD}	Power Supply Input
Pad	Pad	The center exposed pad – No connection internally. The exposed pad can be left open (unconnected to) on the PCB layout.

Package: X2-DFN2015-6

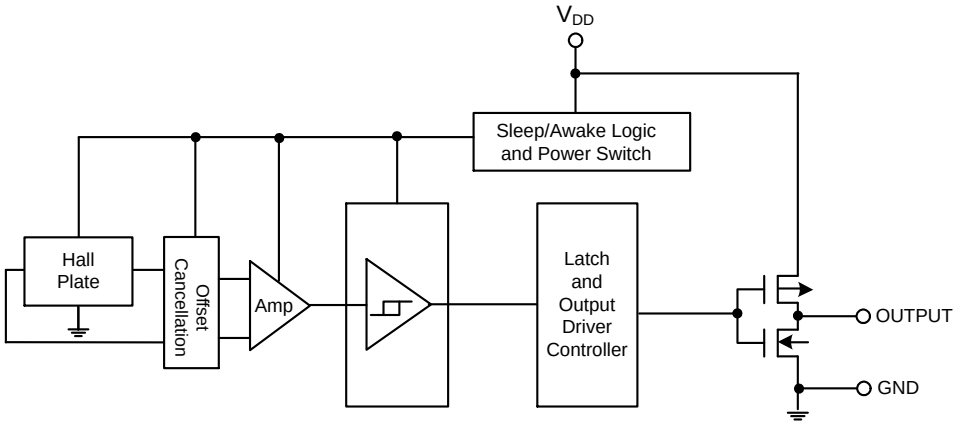
Pin Number	Pin Name	Function
1	OUTPUT	Output Pin
2	NC	No Connection (Note 5)
3	NC	No Connection (Note 5)
4	GND	Ground Pin
5	NC	No Connection (Note 5)
6	V_{DD}	Power Supply Input
Pad	Pad	The center exposed pad – No connection internally. The exposed pad can be left open (unconnected to) on the PCB layout.

Package: SOT553

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

Note: 5. NC is “No Connection” pin and is not connected internally. This pin can be left open or tied to ground.

Functional Block Diagram



Absolute Maximum Ratings (Note 6) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter		Rating	Unit
V_{DD}	Supply Voltage (Note 7)		6	V
V_{DD_REV}	Reverse Supply Voltage		-0.3	V
I_{OUTPUT}	Output Current (source and sink)		3	mA
B	Magnetic Flux Density		Unlimited	
P_D	Package Power Dissipation	X1-DFN1216-4 and X2-DFN2015-6	230	mW
		SOT553	230	mW
Ts	Storage Temperature Range		-65 to +150	°C
T_J	Maximum Junction Temperature		+150	°C
ESD HBM	Human Body Model (HMB) ESD capability		8	kV

Notes: 6. 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.

7. The absolute maximum V_{DD} of 6V 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.

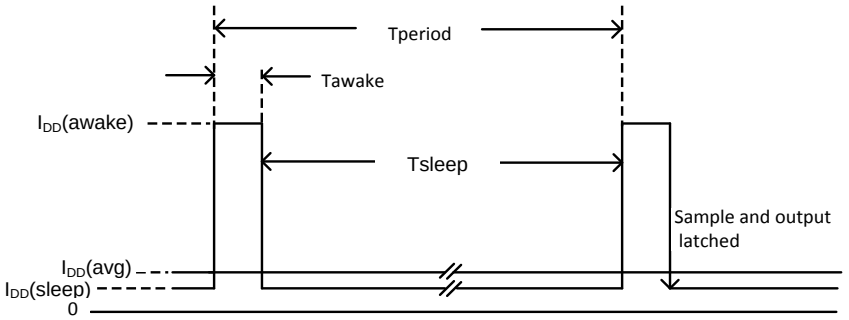
Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Rating	Unit
V_{DD}	Supply Voltage	Operating	1.6V to 3.6V	V
T_A	Operating Temperature Range	Operating	-40 to +85	°C

Electrical Characteristics (@T_A = +25°C, V_{DD} = 1.8V, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OL}	Output Low Voltage (on)	I_{OUT} = 1mA	—	0.1	0.2	V
V_{OH}	Output High Voltage (off)	I_{OUT} = -1mA	V_{DD}-0.2	V_{DD}-0.1	—	V
Ioff	Output Leakage Current	V_{OUT} = 3.6V, Output off	—	< 0.1	1	µA
I_{DD}(awake)	Supply Current	During ‘awake’ period, T_A = +25°C, V_{DD} = 3V	—	2.1	—	mA
I_{DD}(sleep)		During ‘sleep’ period, T_A = +25°C, V_{DD} = 3V	—	2.5	—	µA
I_{DD}(avg)	Average Supply Current	T_A = +25°C, V_{DD} = 1.8V	—	4.3	8	µA
		T_A = +25°C, V_{DD} = 3.6V	—	7.2	13	µA
Tawake	Awake Time	(Note 8)	—	50	100	µs
Tperiod	Period	(Note 8)	—	50	100	ms
D.C.	Duty Cycle	—	—	0.1	—	%

Note: 8. When power is initially turned on, the operating V_{DD} (1.6V to 3.6V) must be applied to guaranteed the output sampling. The output state is valid after the second operating cycle (typical 100ms).



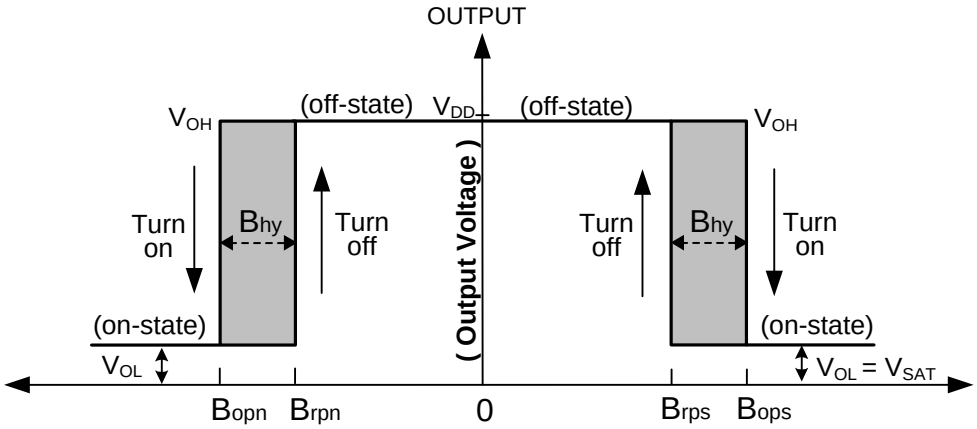
Magnetic Characteristics (Note 9 &10) (T_A = +25°C, V_{DD} = 1.8V, unless otherwise specified)

(1mT=10 Gauss)

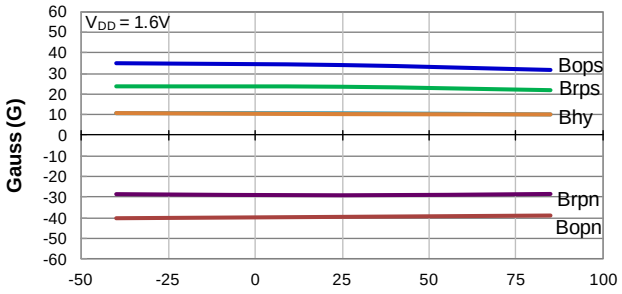
Symbol	Characteristics	Test Condition	Min	Typ	Max	Unit
Bops (south pole to part marking side)	Operation Point	—	23	33	47	Gauss
		V_{DD} = 1.6V to 3.6V T_A = -40°C to +85°C	21	33	48	
Bopn (north pole to part marking side)		—	-47	-33	-24	
		V_{DD} = 1.6V to 3.6V T_A = -40°C to +85°C	-48	-33	-21	
Brps (south pole to part marking side)	Release Point	—	12	23	35	
		V_{DD} = 1.6V to 3.6V T_A = -40°C to +85°C	9	23	38	
Brpn (north pole to part marking side)		—	-35	-23	-12	
		V_{DD} = 1.6V to 3.6V T_A = -40°C to +85°C	-38	-23	-9	
Bhy (|Bopx|-|Brpx|)	Hysteresis	—	—	10	—	

Notes: 9. Typical data is at T_A = +25°C, V_{DD} = 1.8V.

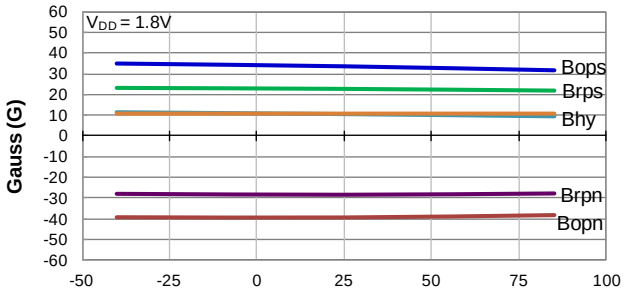
10. Maximum and minimum parameters values over operating temperature range are not tested in production, they are guaranteed by design, characterization and process control. The magnetic characteristics may vary with supply voltage, operating temperature and after soldering.



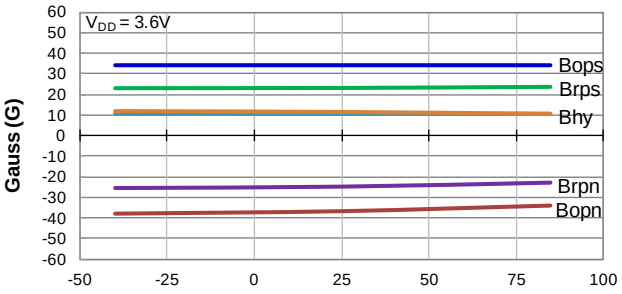
Typical Operating Characteristics



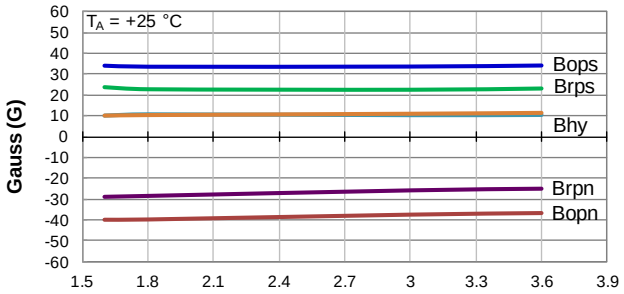
Switch Points vs Temperature



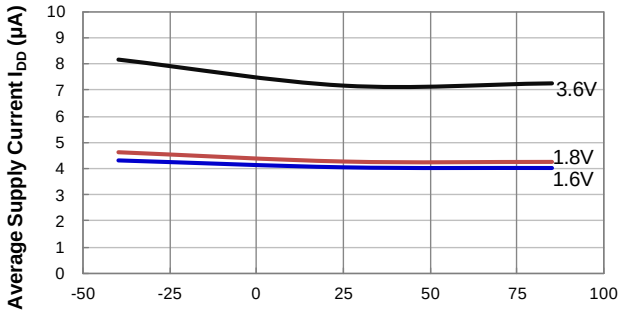
Switch Points vs Temperature



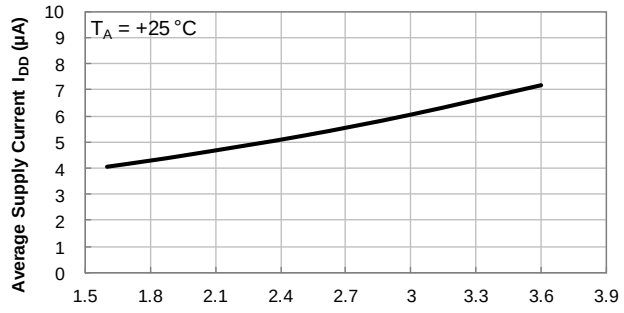
Switch Points vs Temperature



Switch Points vs Temperature

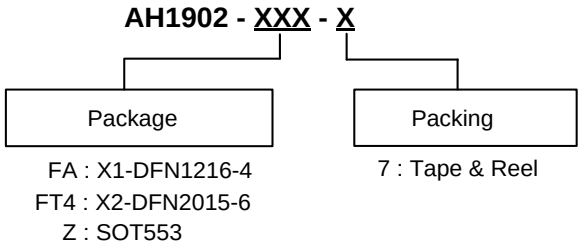


Average Supply Current vs. Temperature



Average Supply Current vs. Supply Voltage

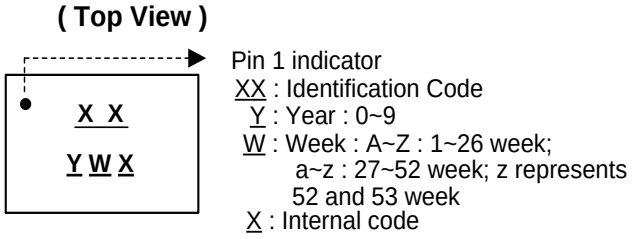
Ordering Information



Part Number	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
AH1902-FA-7	FA	X1-DFN1216-4	3,000/Tape & Reel	-7
AH1902-FT4-7	FT4	X2-DFN2015-6	3,000/Tape & Reel	-7
AH1902-Z-7	Z	SOT553	3,000/Tape & Reel	-7

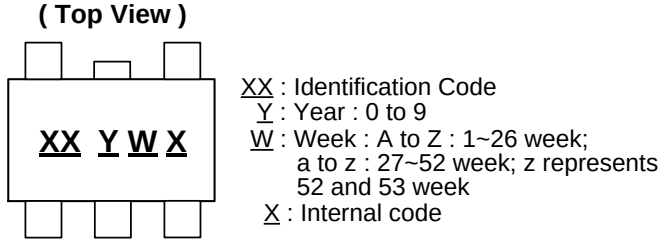
Marking Information

(1) Package Type: X1-DFN1216-4 and X2-DFN2015-6



Part Number	Package	Identification Code
AH1902-FA-7	X1-DFN1216-4	F2
AH1902-FT4-7	X2-DFN2015-6	D2

(2) Package Type: SOT553

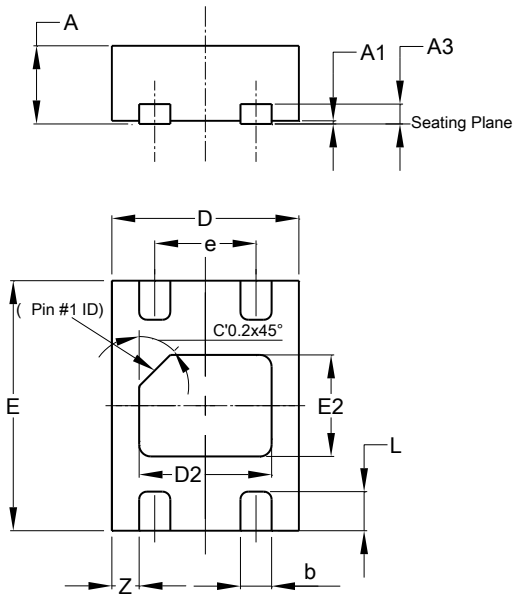


Part Number	Package	Identification Code
AH1902-Z-7	SOT553	D2

Package Outline Dimensions (All dimensions in mm.)

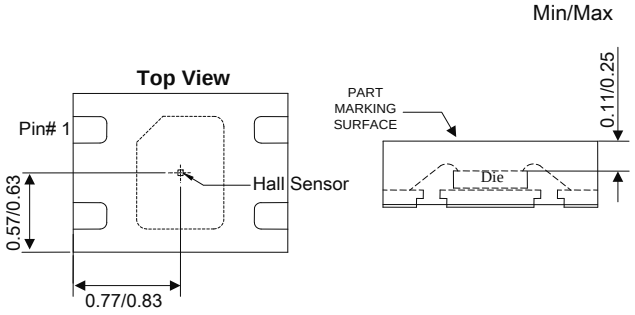
Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: X1-DFN1216-4



Bottom View

X1-DFN1216-4			
Dim	**Min**	**Max**	**Typ**
A	0.47	0.53	0.50
A1	0.00	0.05	0.02
A3	--	--	0.13
b	0.15	0.25	0.20
D	1.15	1.25	1.20
D2	0.75	0.95	0.85
E	1.55	1.65	1.60
E2	0.55	0.75	0.65
e	-	-	0.65
L	0.20	0.30	0.25
Z	-	-	0.175
All Dimensions in mm			

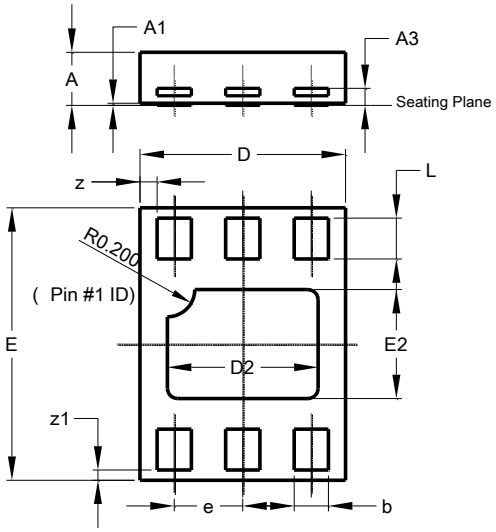


Sensor Location

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

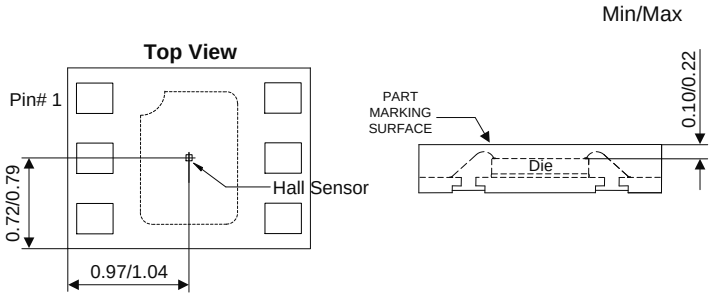
Please see http://www.diodes.com/package-outlines.html for the latest version.

(2) Package Type: X2-DFN2015-6



Bottom View

X2-DFN2015-6			
Dim	**Min**	**Max**	**Typ**
A	0.375	0.40	0.390
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
Z1	-	-	0.075
All Dimensions in mm			

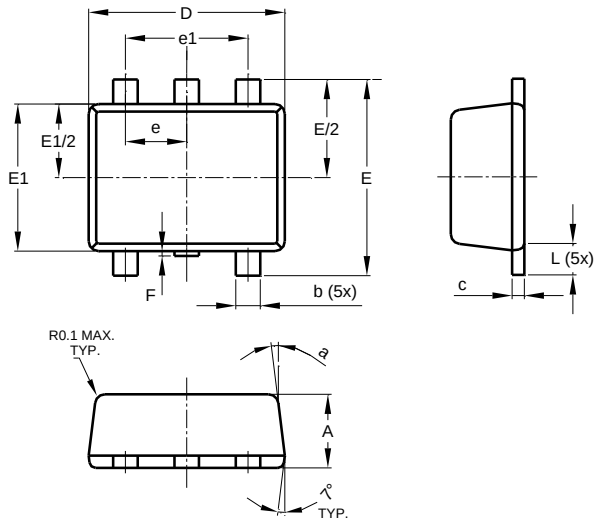


Sensor Location

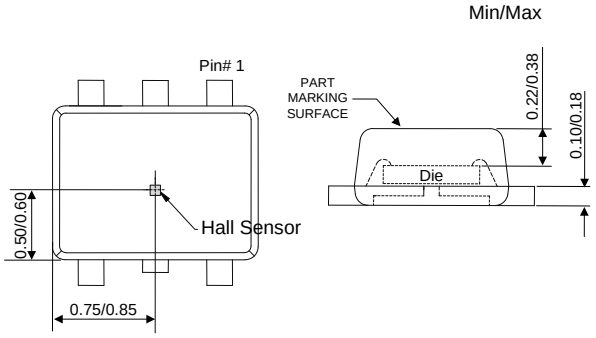
Package Outline Dimensions (cont.) (All dimensions in mm.)

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

(3) Package Type: SOT553



SOT553			
Dim	**Min**	**Max**	**Typ**
A	0.55	0.62	0.60
b	0.15	0.30	0.20
c	0.10	0.18	0.15
D	1.50	1.70	1.60
E	1.55	1.70	1.60
E1	1.10	1.25	1.20
e	0.50 BSC		
e1	1.00 BSC		
F	0.00	0.10	—
L	0.10	0.30	0.20
a	6°	8°	7°
All Dimensions in mm			

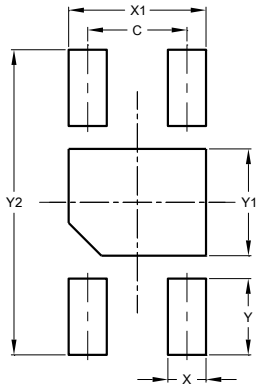


Sensor Location

Suggested Pad Layout

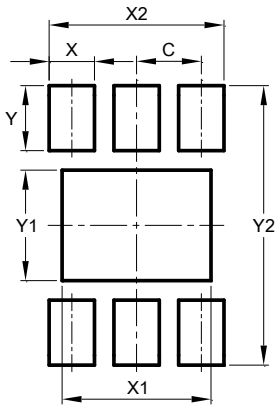
Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: X1-DFN1216-4



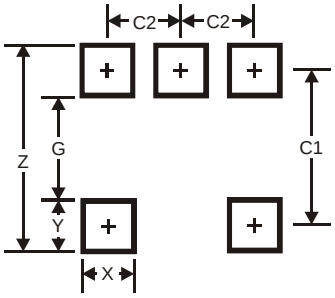
X1-DFN1216-4	
Dimensions	**Value**
C	0.65
X	0.25
X1	0.90
Y	0.50
Y1	0.70
Y2	2.00
All Dimensions in mm	

(2) Package Type: X2-DFN2015-6



X2-DFN2015-6	
Dimensions	**Value**
C	0.500
X	0.350
X1	1.150
X2	1.350
Y	0.500
Y1	0.850
Y2	2.150
All Dimensions in mm	

(3) Package Type: SOT553



SOT553	
Dimensions	**Value**
Z	2.2
G	1.2
X	0.375
Y	0.5
C1	1.7
C2	0.5
All Dimensions in mm	

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- *Защиту от снятия компонента с производства.*
- *Оценку стоимости проекта по компонентам.*
- *Изготовление тестовой платы монтаж и пусконаладочные работы.*

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