High Voltage Unipolar Hall-effect Switch

Features

- Digital Unipolar-latch Hall sensor
- 2.7V to 30V Operating Voltage Range
- -32V Reverse Supply Voltage
- 10μs Ultra-fast Response Time
- 50mA Maximum Continuous Output Current
- -40°C to +150°C Operating Temperature
- Open-drain output
- Support S - pole magnetic field detection
- ESD >10kV（HBM）
- Output Limiting Current Protection
- Good RF Nosie Immunity
- WBSOT23-3L(1.25) package

Applications

- Power Tools
- Flow Meters
- Valve and Solenoid Status
- Brushless Dc Motors
- Proximity Sensing
- Tachometers

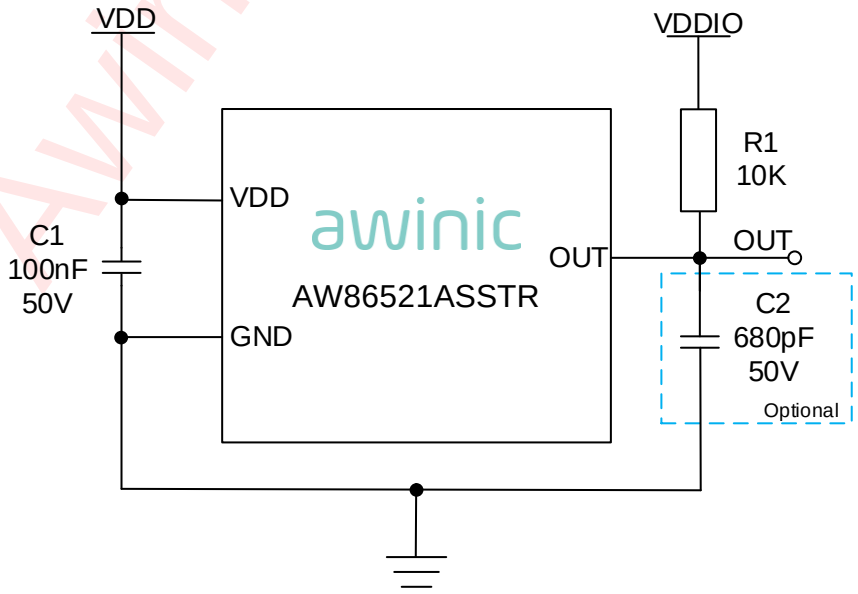
General Description

The AW86521ASSTR is a high - sensitivity and high - voltage unipolar Hall - effect switch integrated IC that responds to a single south pole. It features an open - drain output and can operate with a power supply voltage ranging from 2.7V to 30V. Internally, it incorporates a voltage regulator, temperature compensation circuitry, and a small - signal amplifier.

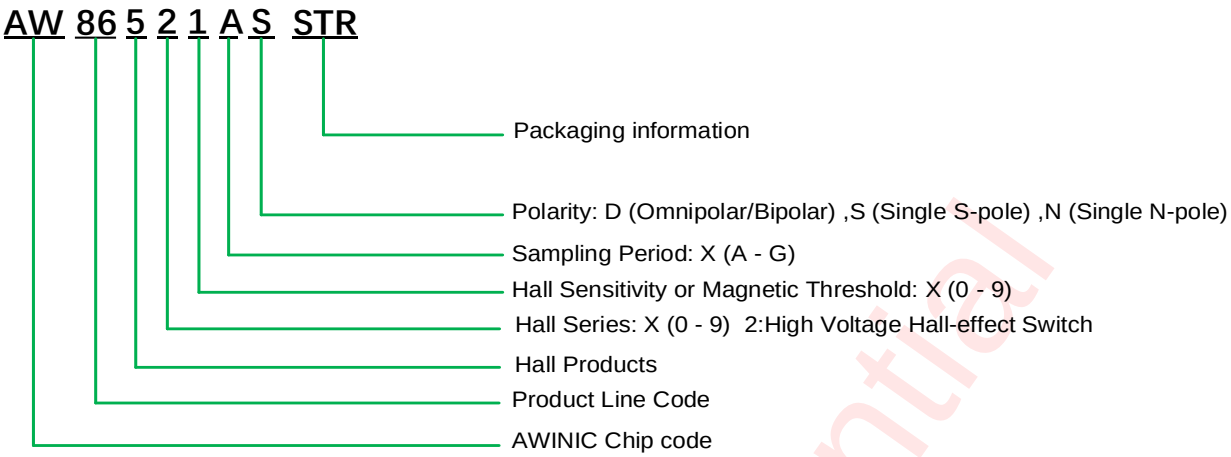
The AW86521ASSTR is designed to react to a single south pole magnetic field. When the magnetic flux density (B) is greater than the operating point (Bops), the output will turn on (low - level). This output state will be maintained until the magnetic flux density (B) is lower than the release point (Brps), at which time the output will turn off (high impedance state) to output a high level through an external pull-up resistor.

The AW86521ASSTR is packaged in a surface-mount WBSOT23-3L (Thin Outline Small Outline Transistor) package and is compliant with RoHS (Restriction of Hazardous Substances) standards.

Typical Application Circuit

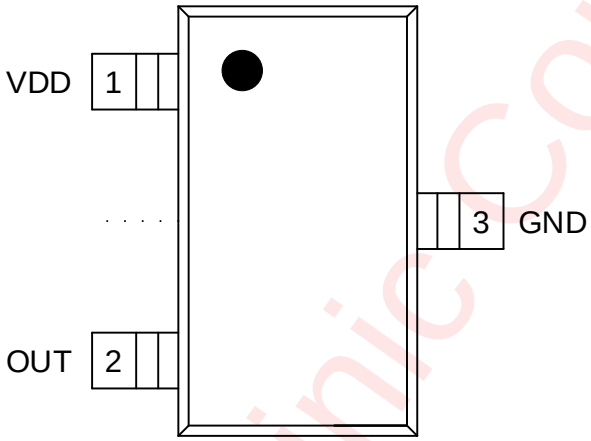


Naming Rule

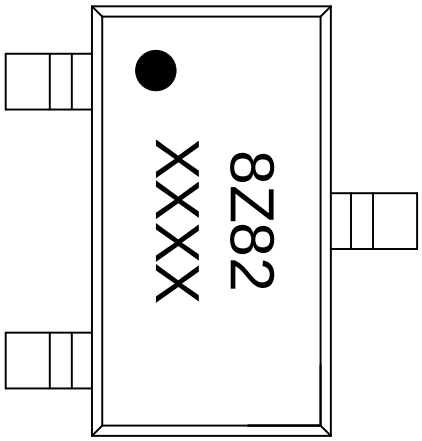


Pin Configuration And Top Mark

AW86521ASSTR
(Top view)



AW86521ASSTR Marking
(Top view)



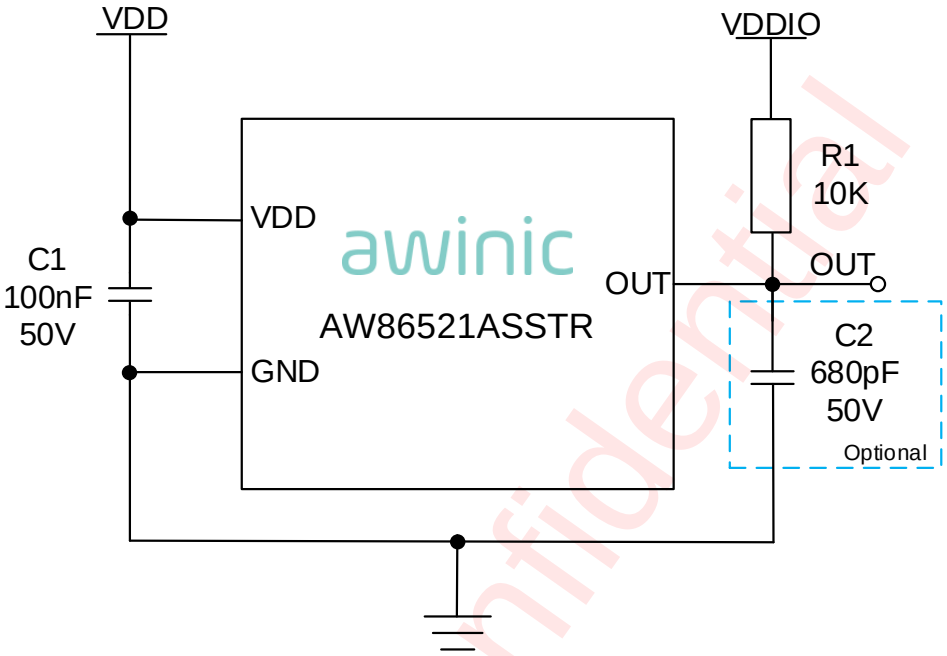
8Z82 - AW86521ASSTR
XXXX - Production Tracing Code

Pin Definition

No.	NAME	DESCRIPTION
1	VDD	Power Supply
2	OUT	Unipolar open-drain output that responds to the south magnetic The open drain output requires a resistor pullup
3	GND	Ground

Functional Block Diagram

Typical Application Circuits



1：Please place C1 as close to the chip as possible.

2：C2 serves as a reserved EMI filter capacitor and can be added as needed. During the design phase, appropriate values for R1 and C2 should be selected according to the signal frequency characteristics to ensure effective filtering of EMI interference while avoiding excessive attenuation of the useful signal.

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW86521ASSTR	-40℃～150℃	WBSOT23-3L	8Z82	MSL3	ROHS+HF	3000 units/ Tape and Reel

Absolute Maximum Ratings(NOTE1)

PARAMETERS	RANGE
Supply Voltage	-32V to 33V
Output Voltage	-0.4V to V_{DD}+0.4V
Output Current	80mA
Operating Ambient Temperature T_A	-40°C to 150°C
Storage Temperature T_{STG}	-65°C to 150°C
Junction temperature T_J	-50°C to 165°C
Magnetic Flux	No limit
Package Power Dissipation	230mW
Lead temperature (soldering 10 seconds)	260°C
ESD Rating(NOTE2 3)	
HBM(Human Body Model)	±10kV
CDM(Charge Device Model)	±1.5kV
Latch-up	
Test Condition: JESD78E	+IT: 200mA -IT: 200mA

NOTE1: Conditions out of those ranges listed in "absolute maximum ratings" may cause permanent damages to the device. In spite of the limits above, functional operation conditions of the device should within the ranges listed in "recommended operating conditions". Exposure to absolute-maximum-rated conditions for prolonged periods may affect device reliability.

NOTE2:The human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin. Test method: ESDA/JEDEC JS -001-2017.

NOTE3:Charge Device Model test method: ESDA/JEDEC JS-002-2018.

Electrical Characteristics

V_{DD}=12V, T_A=25°C for typical values (unless otherwise noted)

Parameter		Test Condition	Min	Typ	Max	Unit
INPUT VOLTAGES and CURRENTS						
V_{DD}	Supply Voltage Range		2.7		30	V
V_{CCR}	Reverse Supply Voltage			-32		V
V_{OUT_ON}	Output On Voltage	I_{OUT}=20mA,B > Bops		0.2	0.4	V
I_Q	Quiescent Current	I_{OUT}=0mA	2	2.52	5	mA
$I_{leakage}$	Output Leakage Current	V_{OUT} = 12V, B < Brps, Output off			1	μA
I_{CCR}	Reverse Supply Current	V_{DD} = -32V			6	μA
t_{ON}	Device Power-On Time	V_{DD} =12V	8	10	13	μs
Fc	Chopping Frequency			800		kHz
Fs	Sampling Frequency			200		kHz
t_D	Response Time Delay			3.75		μs
t_R	Output Rising Time	RL = 1kΩ, CL = 20pF		300	1000	ns
t_F	Output Falling Time	RL = 1kΩ, CL = 20pF		30		ns
I_{OUT}	Output Current Limit	V_{DD} =12V, B>Bops, Out pin short V_{DD}	30	50	80	mA

MAGNETIC CHARACTERISTICS(Note)

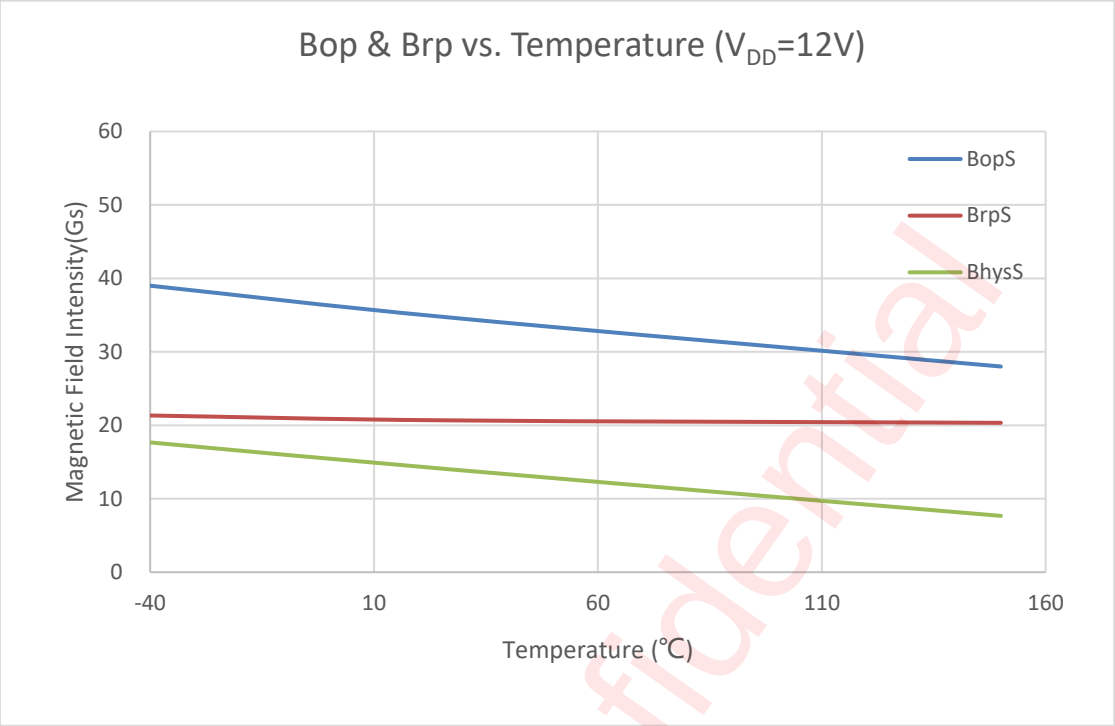
T_A=25ºC, V_{DD}=12V for typical values (unless otherwise noted) (1mT = 10Gauss)

Symbol	Characteristics	Test Condition	Min	Typ	Max	Unit
Bops (south pole to part marking side)	Operation Point	V_{DD} = 12V, TA = 25 ºC	22	35	48	Gauss
Brps (south pole to part marking side)	Release Point	V_{DD} = 12V, TA = 25 ºC	13	20	28	
Bhy (|Bopx|-|Brpx|)	Hysteresis	V_{DD} = 12V, TA = 25 ºC	-	15	-	

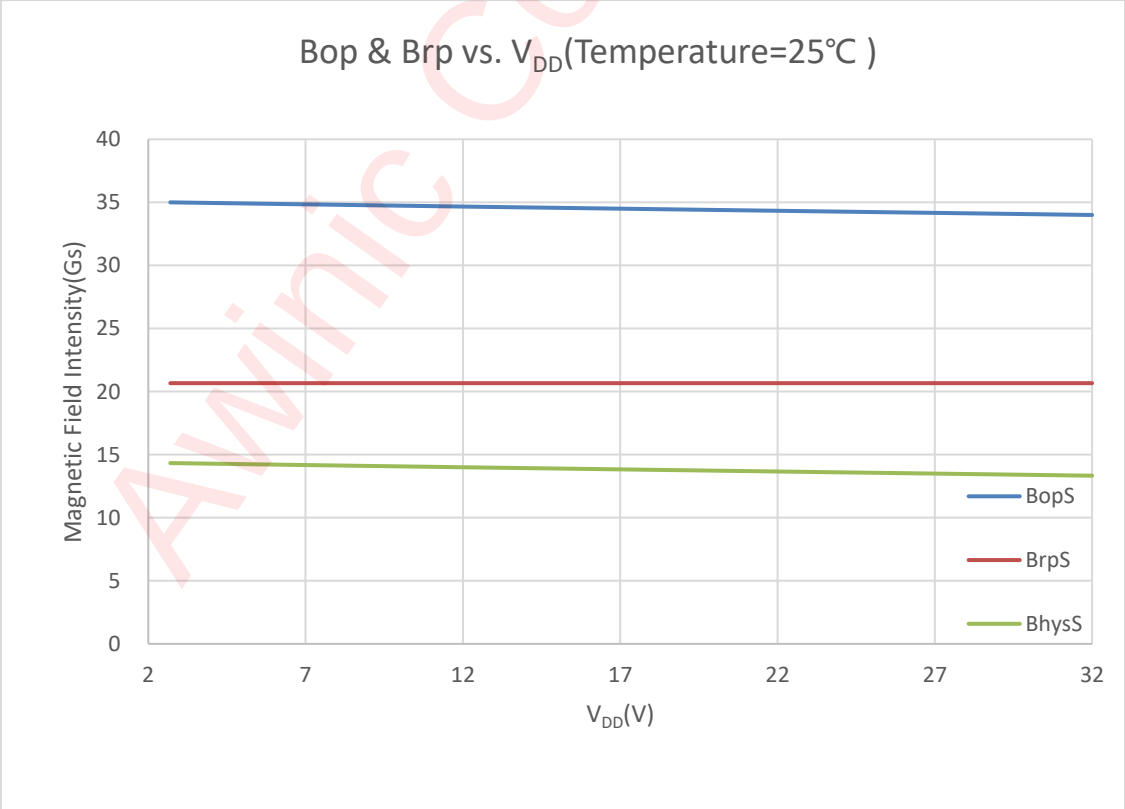
Notes: Typical data is at T_A=25°C, V_{DD}=12V.

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.

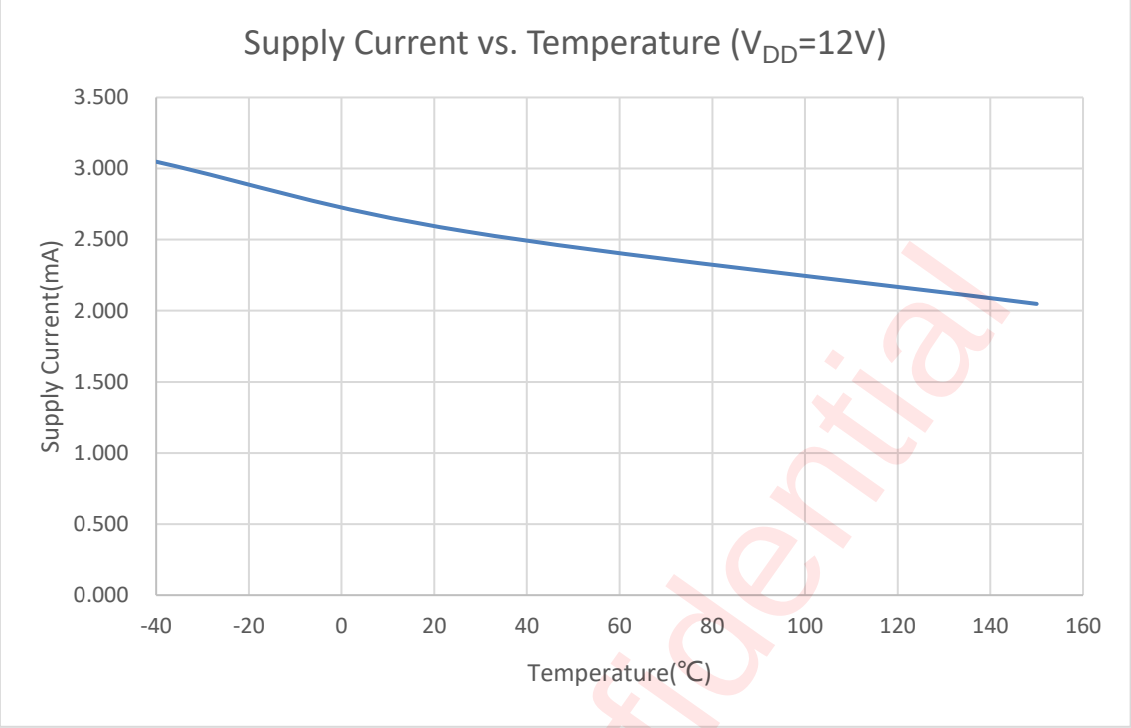
Typical Characteristics



Bop&Brp vs. Ta(V_{DD} =12V)



Bop&Brp vs. V_{DD}(Ta=25℃)

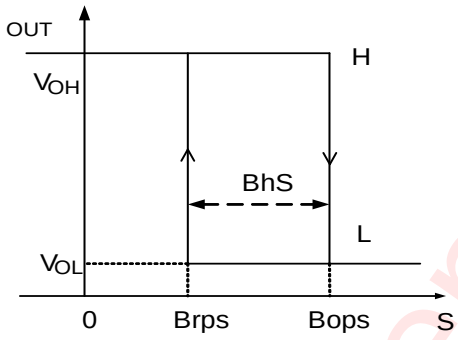


Supply Current vs. Ta(V_{DD}=12V)

Detailed Functional Description

Magnetic Response

The OUT is activity with a south pole of sufficient magnetic field strength. When the magnetic flux density perpendicular to the package is larger than operate point(Bops) , the output will be turned on (pulled low) and held until B is lower than release point (Brps).



Magnetic flux density

Magnetic Flux Direction

As depicted in Figure 1, the AW86521ASSTR is responsive to the magnetic field component which is perpendicular to the top surface of the package.

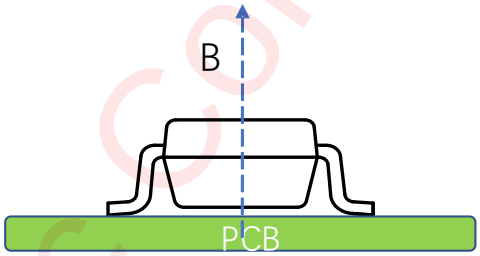
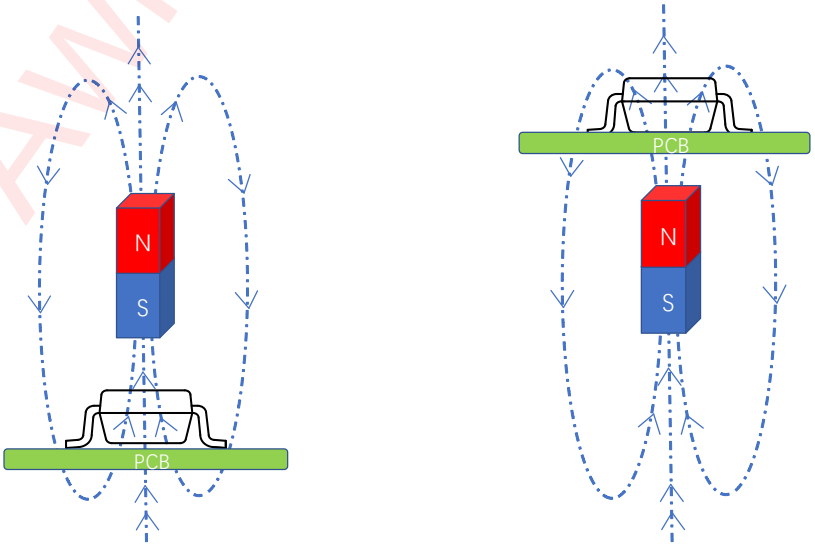


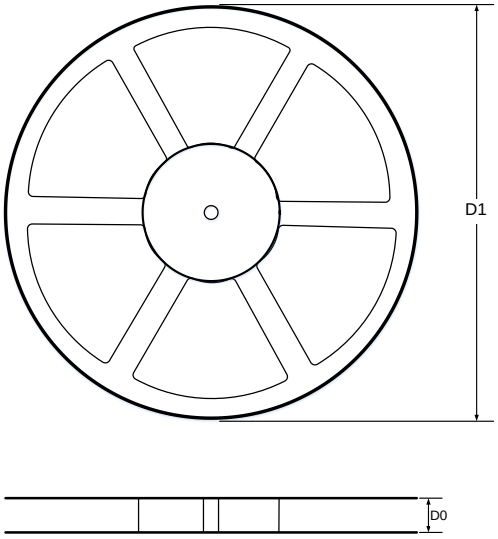
Figure 1 Direction of Sensitivity

In this document, magnetic flux moving from the bottom to the top of the package is defined as positive. This scenario occurs when a south magnetic pole is positioned near the top (marked-side) of the package or when a north magnetic pole is close to the backside of the PCB

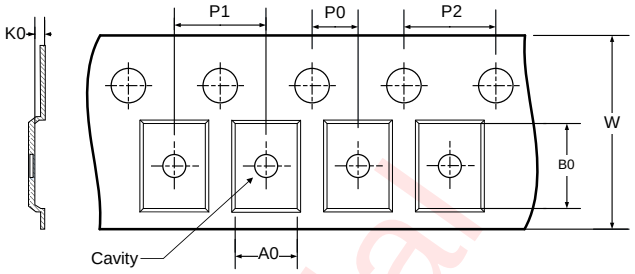


Tape And Reel Information

REEL DIMENSIONS

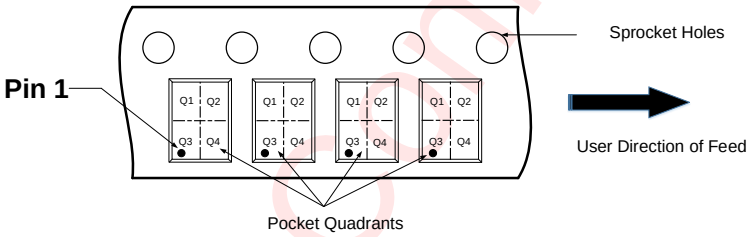


TAPE DIMENSIONS



A0：Dimension designed to accommodate the component width
B0：Dimension designed to accommodate the component length
K0：Dimension designed to accommodate the component thickness
W：Overall width of the carrier tape
P0：Pitch between successive cavity centers and sprocket hole
P1：Pitch between successive cavity centers
P2：Pitch between sprocket hole
D1：Reel Diameter
D0：Reel Width

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



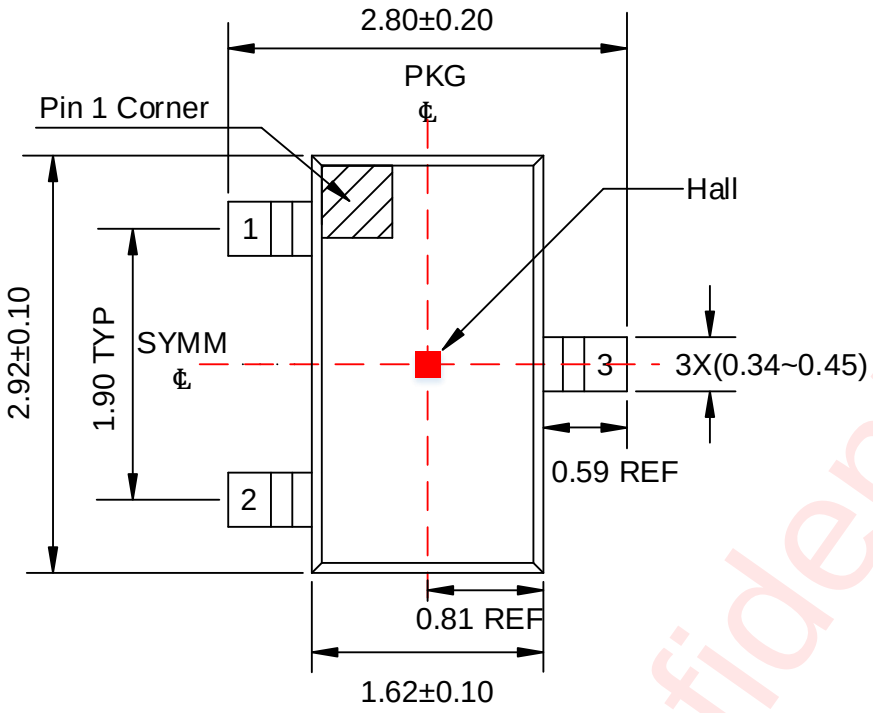
Note：The above picture is for reference only. Please refer to the value in the table below for the actual size

DIMENSIONS AND PIN1 ORIENTATION

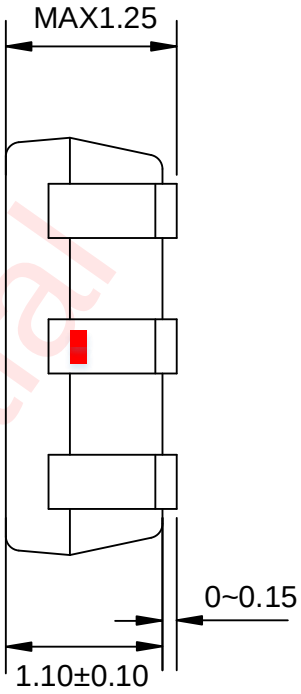
D1 (mm)	D0 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
178	8.4	3.3	3.2	1.4	2	4	4	8	Q3

All dimensions are nominal

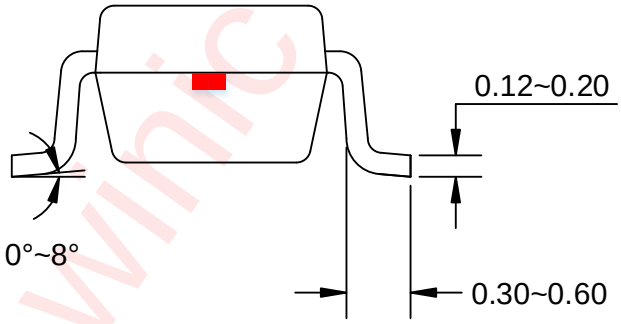
Package Description



Top View



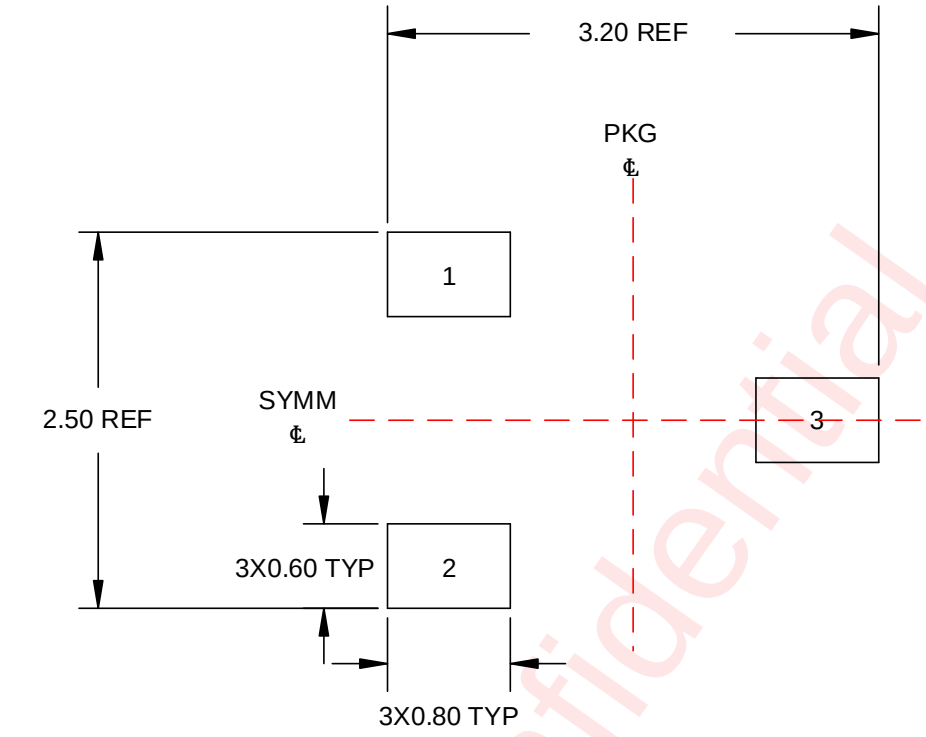
Side View

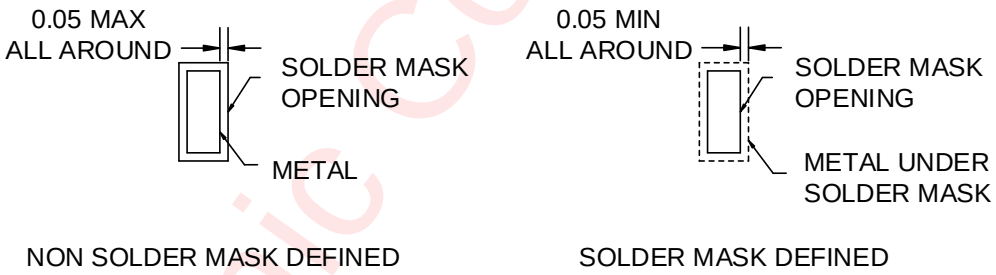


Side View

Unit: mm

Land Pattern Data





NON SOLDER MASK DEFINED

SOLDER MASK DEFINED

Unit: mm

Revision History

Version	Date	Change Record
V1.0	Apr. 2025	Officially released

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