Medium Sensitivity Micropower Omnipolar Hall-effect Switch

Features

- Medium sensitivity omnipolar operation
- Micropower operation:

  Typ 0.8μA (average:VDD=1.8V)
- On board voltage regulator for 1.6V to 5.5V range

  Magnetic threshold options (Sensitivity Bop, Brp) :
  - Bop=±32Gs, Brp=±27Gs
- Industry-leading ultra-low power consumption
- AW86512EDNSTR: 20Hz sampling rate options
- Wide operating temperature range: -40℃ to 85℃
- Open-drain output
- WBSOT23-3L package

Applications

- Smartphone.
- Notebook computer.
- Handheld gaming consoles.
- Bluetooth headset.
- DV.
- Contact-less switch, Level, proximity and position switches in consumer products.

General Description

The AW86512EDNSTR device is an ultra-low-power switch Hall effect sensor with Open-drain output, designed for the most compact and battery-sensitive systems. The supply range of AW86512EDNSTR is 1.6V to 5.5V to support portable equipment. To minimize PCB space, the AW86512EDNSTR have ultra small packages: WBSOT23-3L.

When the magnetic field strength is greater than Bop, then the device output is pulled low; When the magnetic field strength is less than Brp, then the device output is pulled high; When the magnetic field strength is between Bop and Brp, then the device output remains in the previous state.

Typical Application Circuit

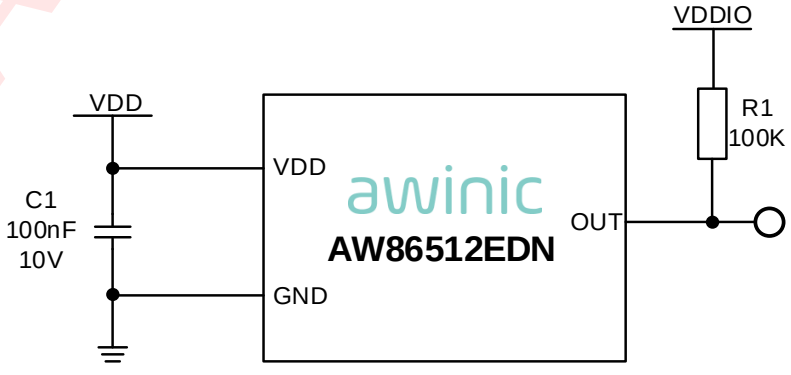


Figure 1 Typical Application Circuit of AW86512EDNSTR

Pin Configuration And Top Mark

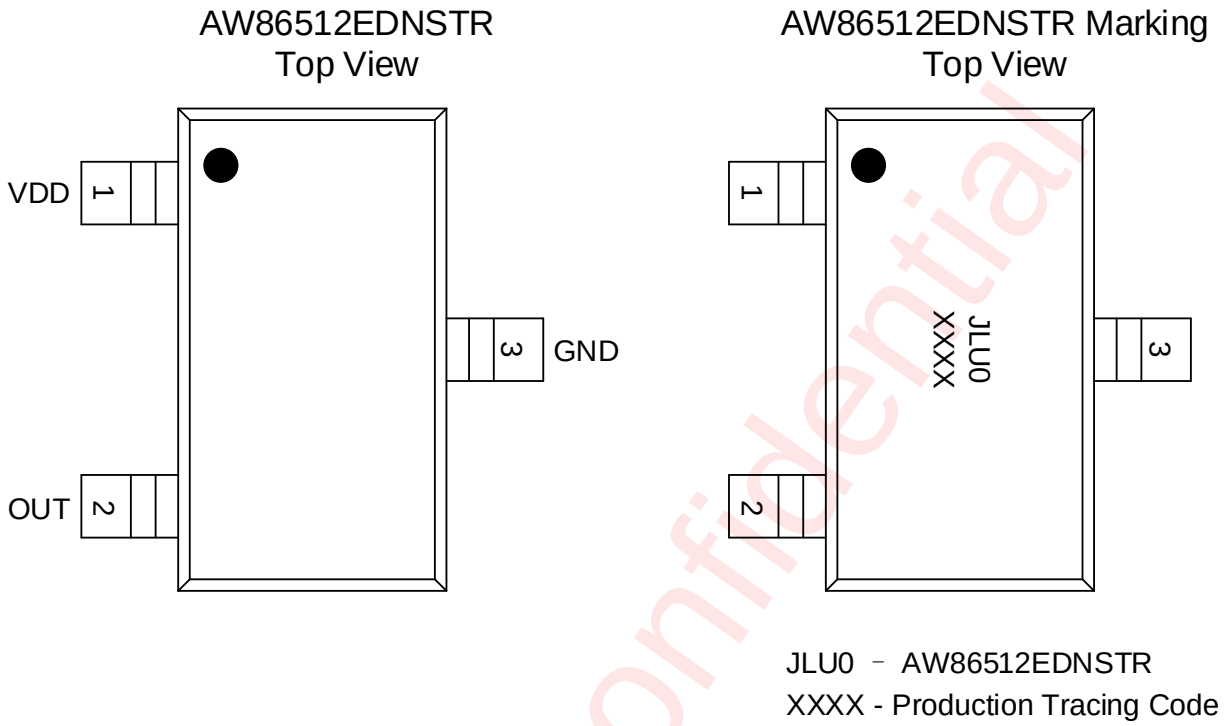


Figure 2 Pin Configuration And Top Mark

Pin Definition

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

Functional Block Diagram

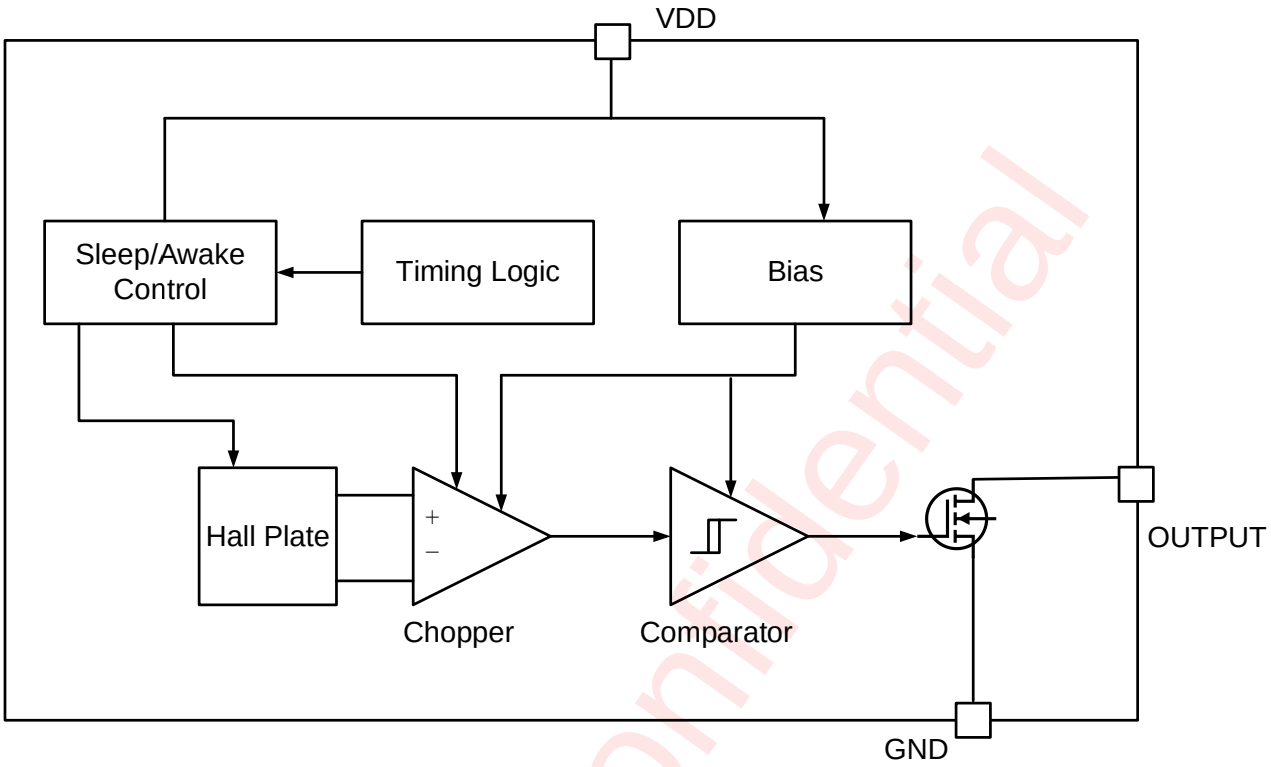


Figure 3 Functional Block Diagram of AW86512EDNSTR

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW86512EDNSTR	-40℃~85℃	WBSOT23-3L	JLU0	MSL3	ROHS+HF	3000 units/ Tape and Reel

Detailed Functional Description

When the magnetic field strength is greater than Bop, then the device output is pulled low; When the magnetic field strength is less than Brp, then the device output is pulled high; When the magnetic field strength is between Bop and Brp, then the device output remains in the previous state.

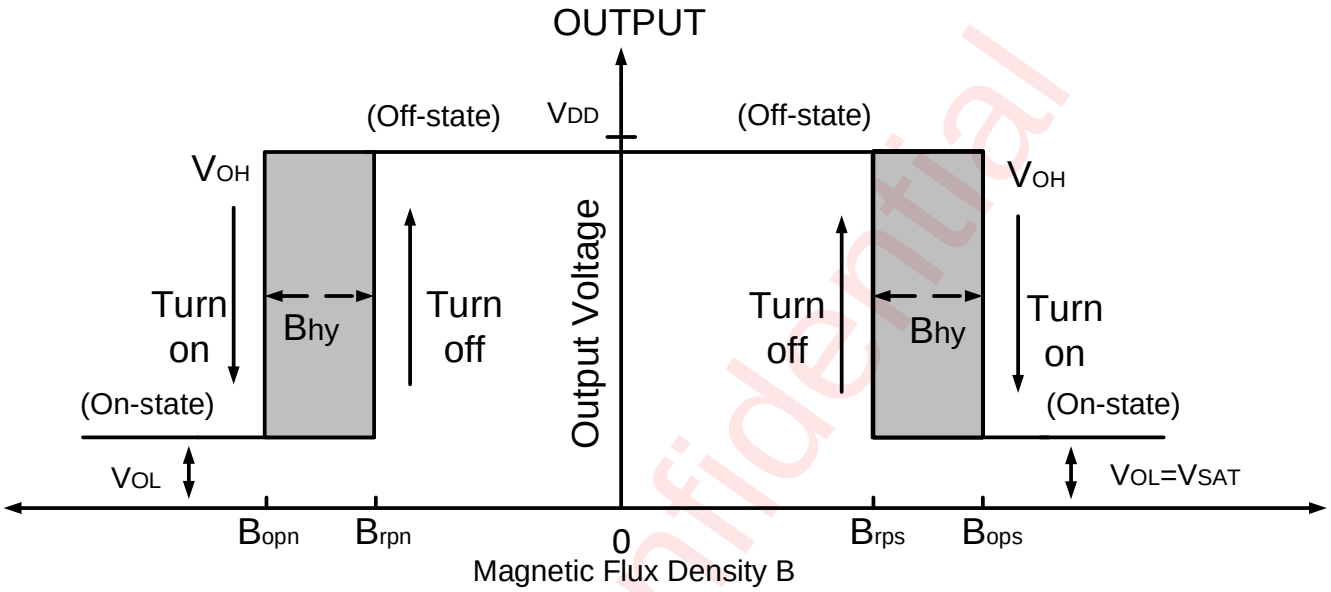


Figure 4 The Working Process of Omnipolar output

Absolute Maximum Ratings

PARAMETERS	RANGE
Supply Voltage	-0.3V to 6V
Supply Current	3mA
Output Voltage	-0.4V to V_{DD}+0.4V
Output Current	4mA
Operating Ambient Temperature T_A	-40°C to 85°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)	±6kV
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

VDD=3.3V supply, T_A= 25ºC (unless otherwise noted)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{DD}	Supply Voltage	Operating, TJ < 165°C	1.6		5.5	V
I_{DD}(awake)	Supply Current	During awake period, TA = 25°C,VDD=3.3V	-	0.95	1.3(Note1)	mA
I_{DD}(sleep)		During sleep period, TA = 25°C,VDD = 3.3V	-	0.43	0.8	μA
I_{DD}(avg)	Average supply current	TA = 25°C,VDD = 1.8V, fs=20Hz	-	0.8	-	μA
		TA = 25°C,VDD = 3.3V, fs=20Hz	-		1.7(Note1)	μA
V_{OL}	Output low voltage(on)	I_{OUT} = 1 mA	-	0.1	0.2	V
T_{awake}	Awake time	(note)	-	40	60(Note1)	μs
T_{period}	Period	fs=20Hz(sampling rate)		50	75	ms
D.C.	Duty cycle	-	-	0.08	-	%
f_C	Chopping Frequency		-	500	-	kHz
I_{OFF}	Output Leakage Current	V_{OUT} = 5.5 V; Switch state=off	-	-	0.1	μA

Note: *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 field strength (Gauss) required to cause the switch to change state (operate and release) will be as specified in the magnetic characteristics. To test the switch against the specified magnetic characteristics, the switch must be placed in a uniform magnetic field.*

Note1: *The relevant data are product design simulation guarantee data, not FT data.*

Magnetic Characteristics

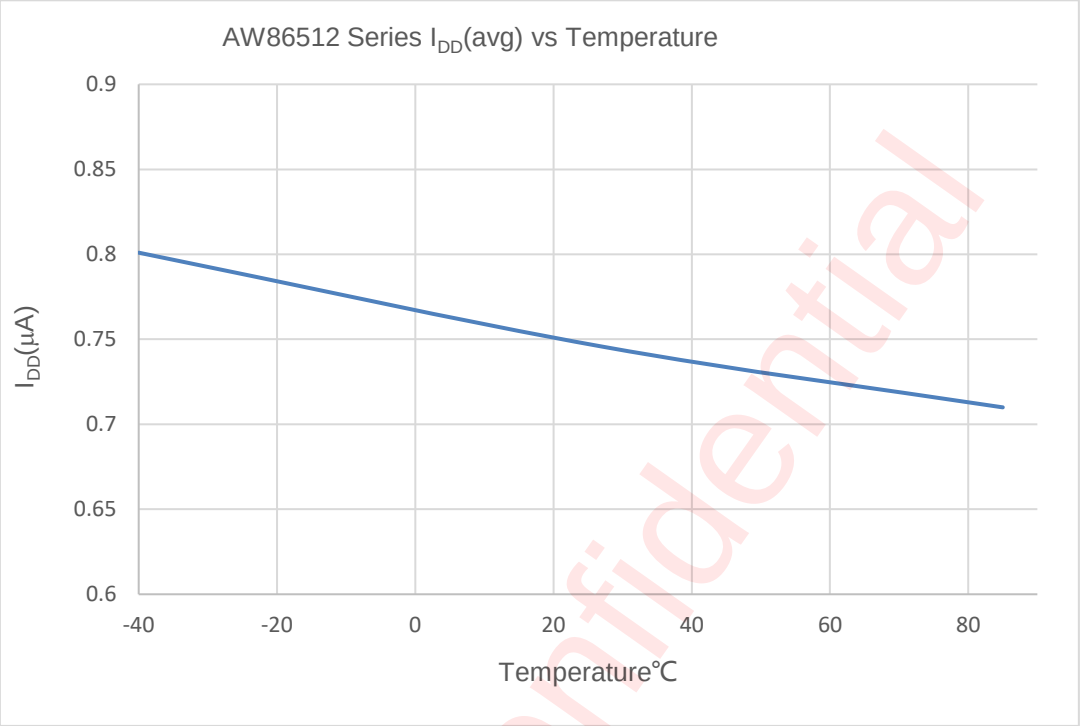
VDD=3.3V supply, T_A=+25°C for typical values (unless otherwise noted) (1 mT=10 Gauss)

Symbol	Characteristics	Test condition	Min	Typ	Max	Unit
Bops(south pole to part marking side)	Operation Point		23	32	41	Gauss
		V_{DD}=1.6V to 5.5V, T_A=-40°C to +85°C	20	32	44	
Bopn (north pole to part marking side)			-41	-32	-23	
		V_{DD}=1.6V to 5.5V, T_A=-40°C to +85°C	-44	-32	-20	
Brps(south pole to part marking side)	Release Point		18	27	36	
		V_{DD}=1.6V to 5.5V, T_A=-40°C to +85°C	15	27	39	
Brpn (north pole to part marking side)			-36	-27	-18	
		V_{DD}=1.6V to 5.5V, T_A=-40°C to +85°C	-39	-27	-15	
Bhy (|Bopx|-|Brpx|)	Hysteresis		-	5	-	

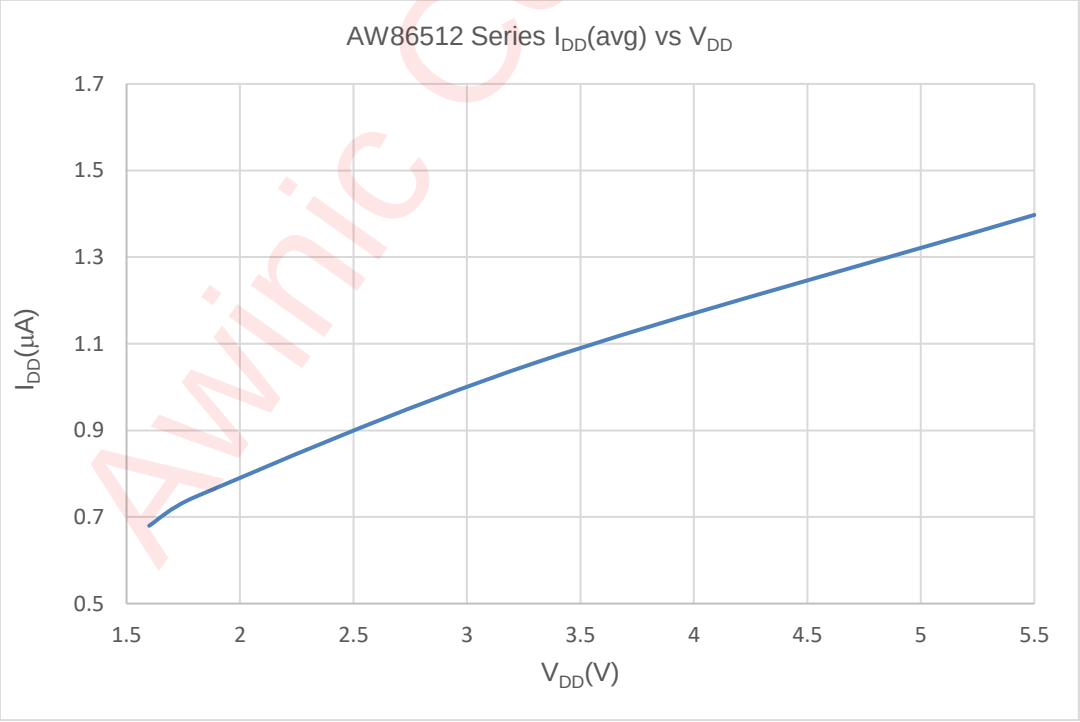
Notes: Typical data is at T_A=+25°C, V_{DD}=3.3V.

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.

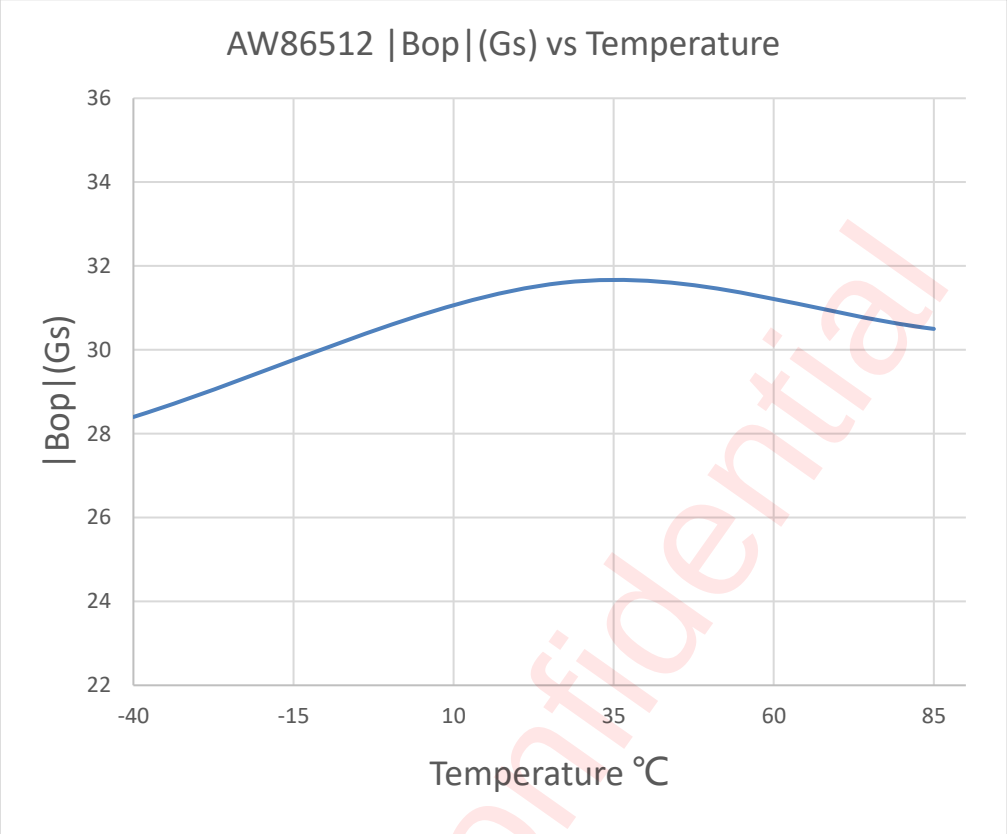
Typical Characteristics



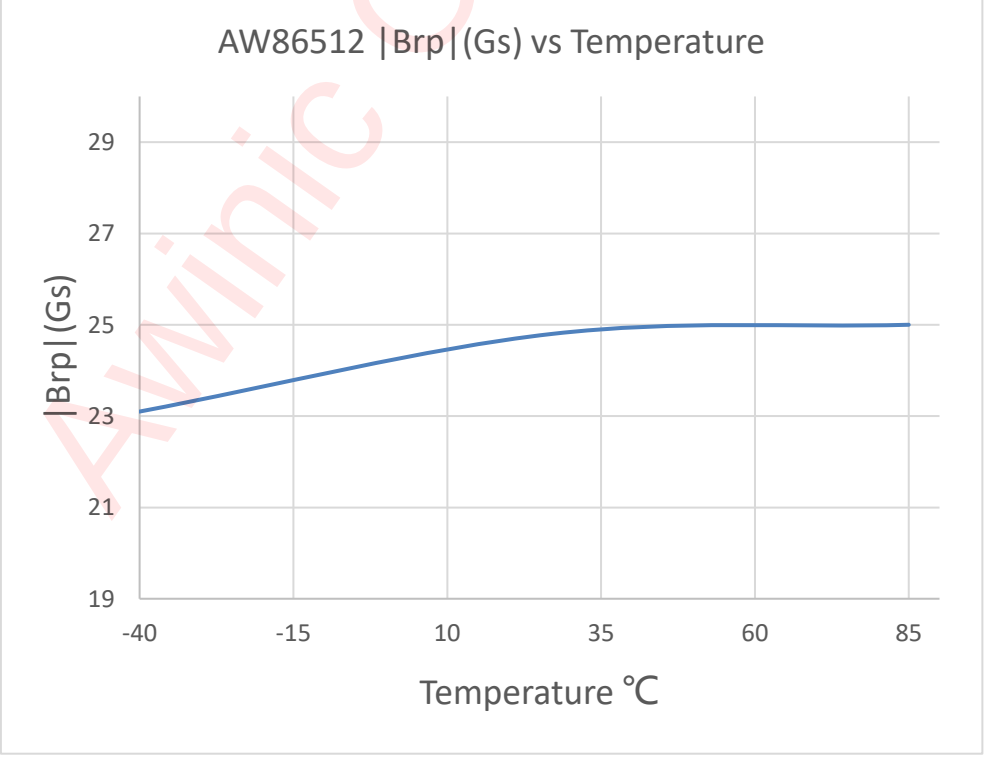
Ambient Temperature Ta[℃] I_{DD} vs. Ta（VDD=1.8V）



Average Supply Current vs. Supply Voltage(Ta=25℃)



Ambient Temperature Ta[℃] |Bop| vs. Ta(V_{DD}=3.3V)



Ambient Temperature Ta[℃] |Brp| vs. Ta(V_{DD}=3.3V)

Application Information

1. It is recommended to connect an external capacitor of 100nF to VDD and GND. The noise of the injection device can be reduced.
2. The out pin of the chip is an open-drain output, and a pull-up resistor is required. A 10K resistor is recommended. The pull-up power supply depends on the IO power supply of the master controller. It can be powered separately. If the voltage of the master control power supply is the same as that of the chip power supply, the OUT can also be pulled up to the VDD power supply of the Hall chip.

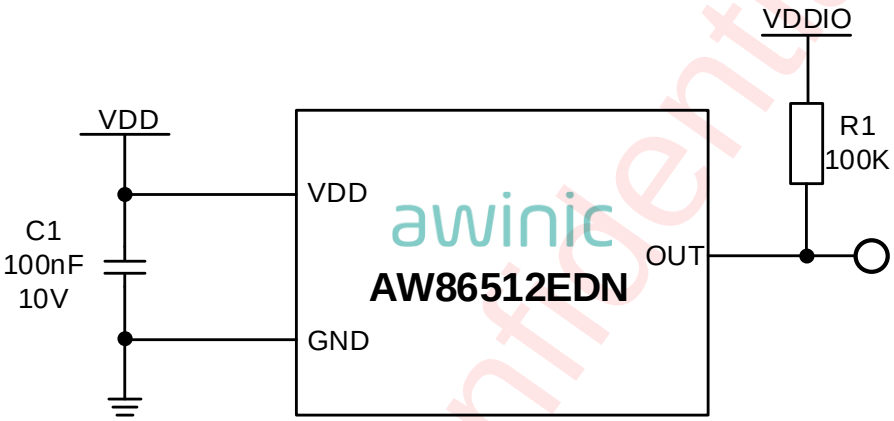
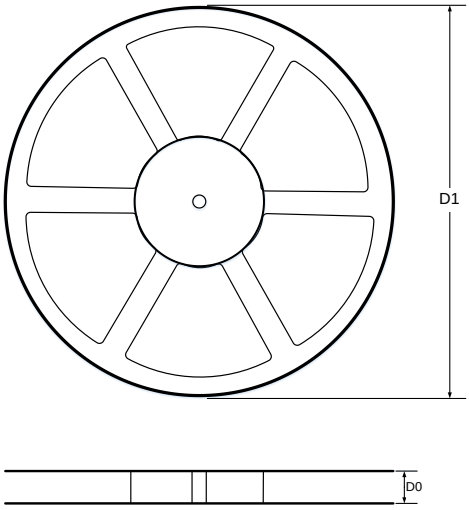


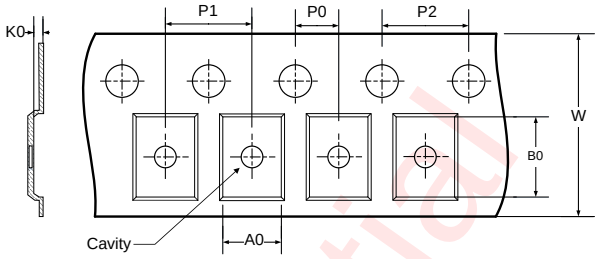
Figure 5 The Application Circuit of AW86512EDNSTR

Tape And Reel Information

REEL DIMENSIONS

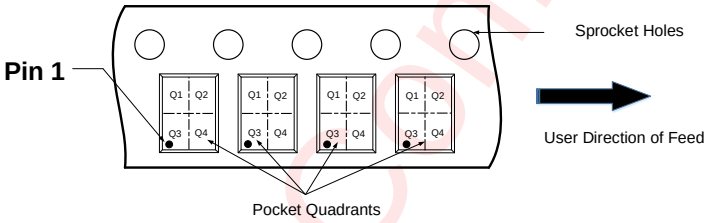


TAPE DIMENSIONS



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



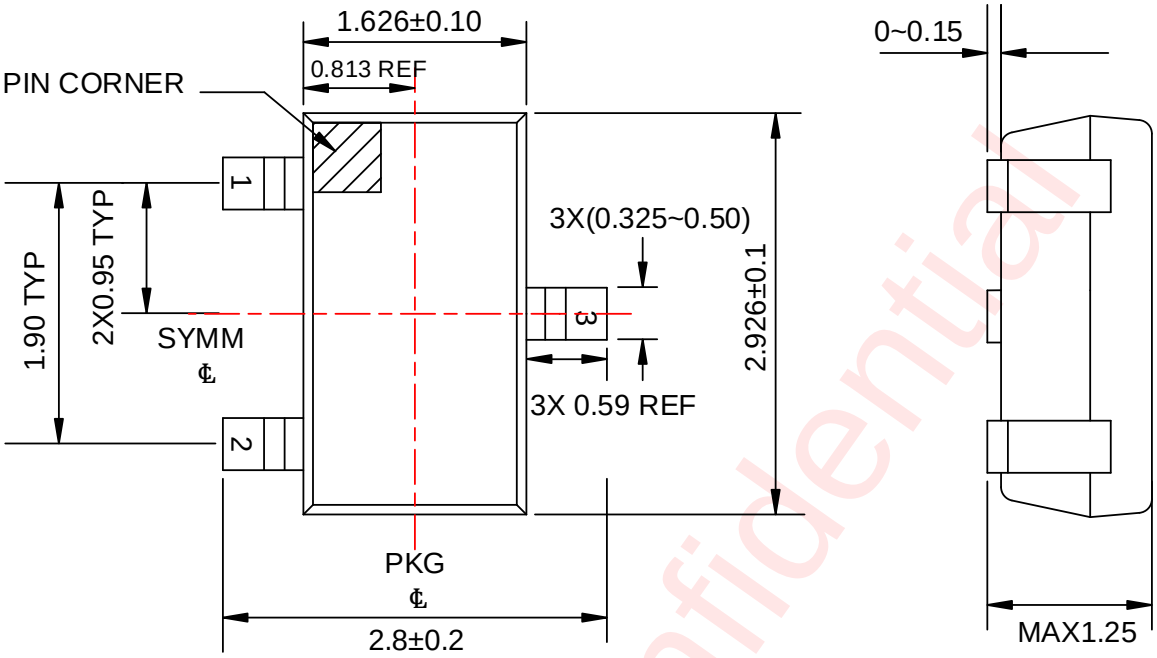
Note：The above picture is for reference only. Please refer to the value in the table below for the actual size

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	1.47	2	4	4	8	Q3

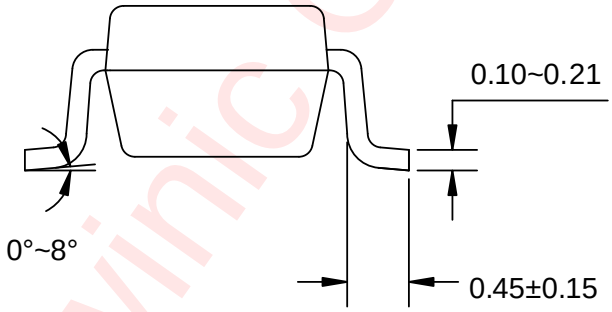
All dimensions are nominal

Package Description



Top View

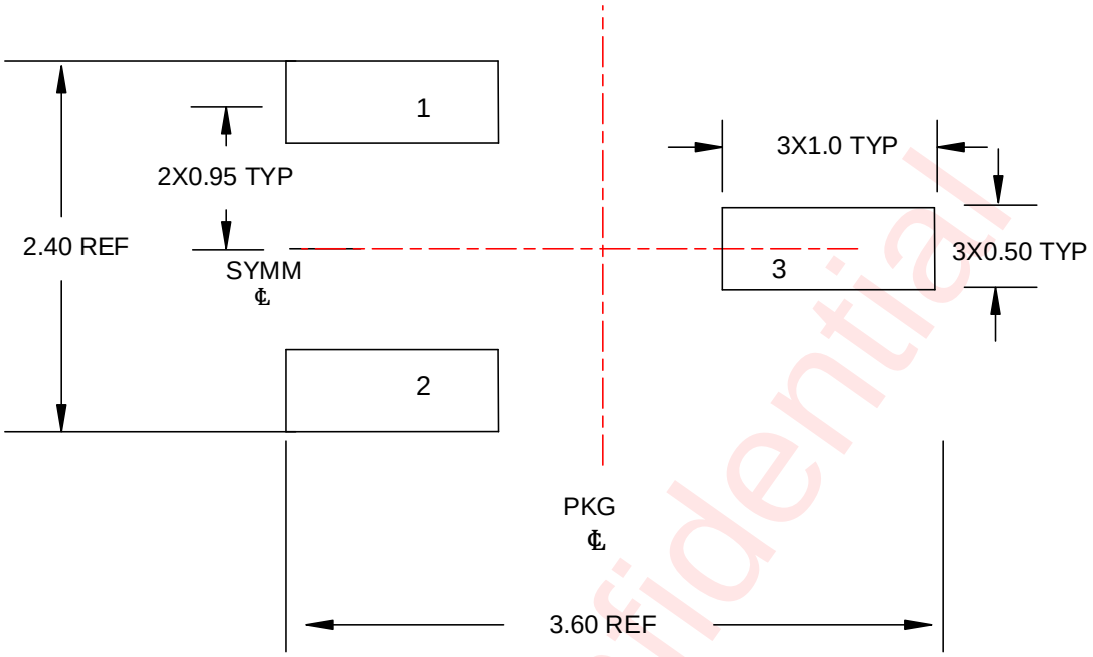
Side View

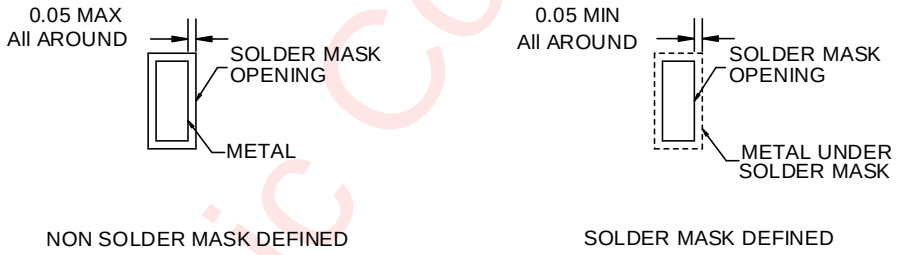


Side View

Unit: mm

Land Pattern Data





NON SOLDER MASK DEFINED

SOLDER MASK DEFINED

Unit: mm

Revision History

Version	Date	Change Record
V1.0	Nov. 2024	Officially released

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