High Sensitivity Micropower Omniploar Hall-effect Switch

Features

- High 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=±18Gs, Brp=±11Gs
- Industry-leading ultra-low power consumption
- Wide operating temperature range: -40℃ to 85℃
- WBSOT23-3L package
- WBTO92S-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 AW86510EB device is an ultra-low-power digital-switch Hall effect sensor, designed for the most compact and battery-sensitive systems. The device is offered in multiple magnetic thresholds, sampling rates, output drivers, and packages to accommodate various applications. The supply range of AW86510EB is 1.6V to 5.5V to support portable equipment. To minimize PCB space, the AW86510EB have packages: WBSOT23-3L, WBTO92S-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

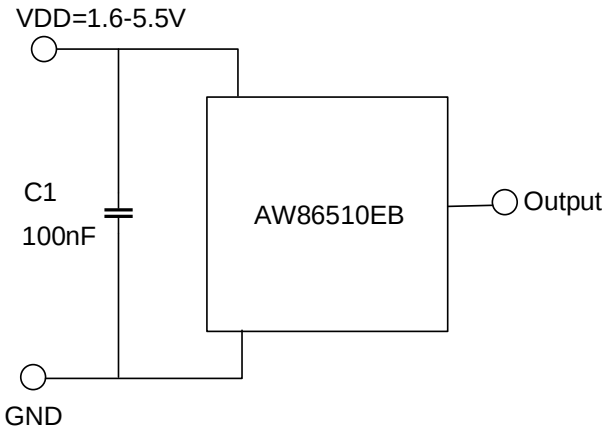


Figure 1 Typical Application Circuit of AW86510EB

Pin Configuration And Top Mark

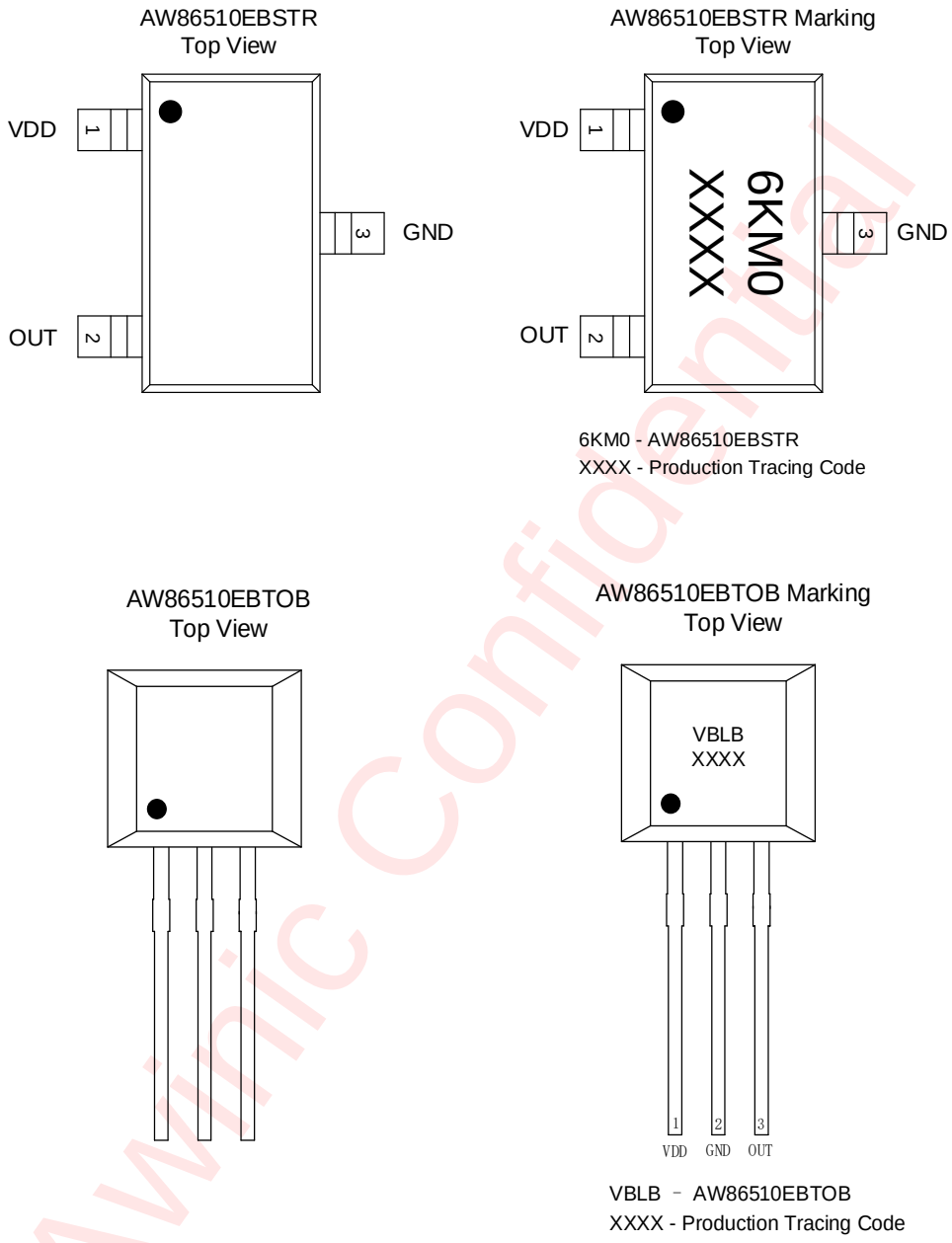


Figure 2 Pin Configuration And Top Mark

Pin Definition

PIN NUMBER		NAME	DESCRIPTION
AW86510EBSTR	AW86510EBTOB		
1	1	VDD	Power Supply
2	3	OUT	Omnipolar output that responds to north and south magnetic
3	2	GND	Ground

Functional Block Diagram

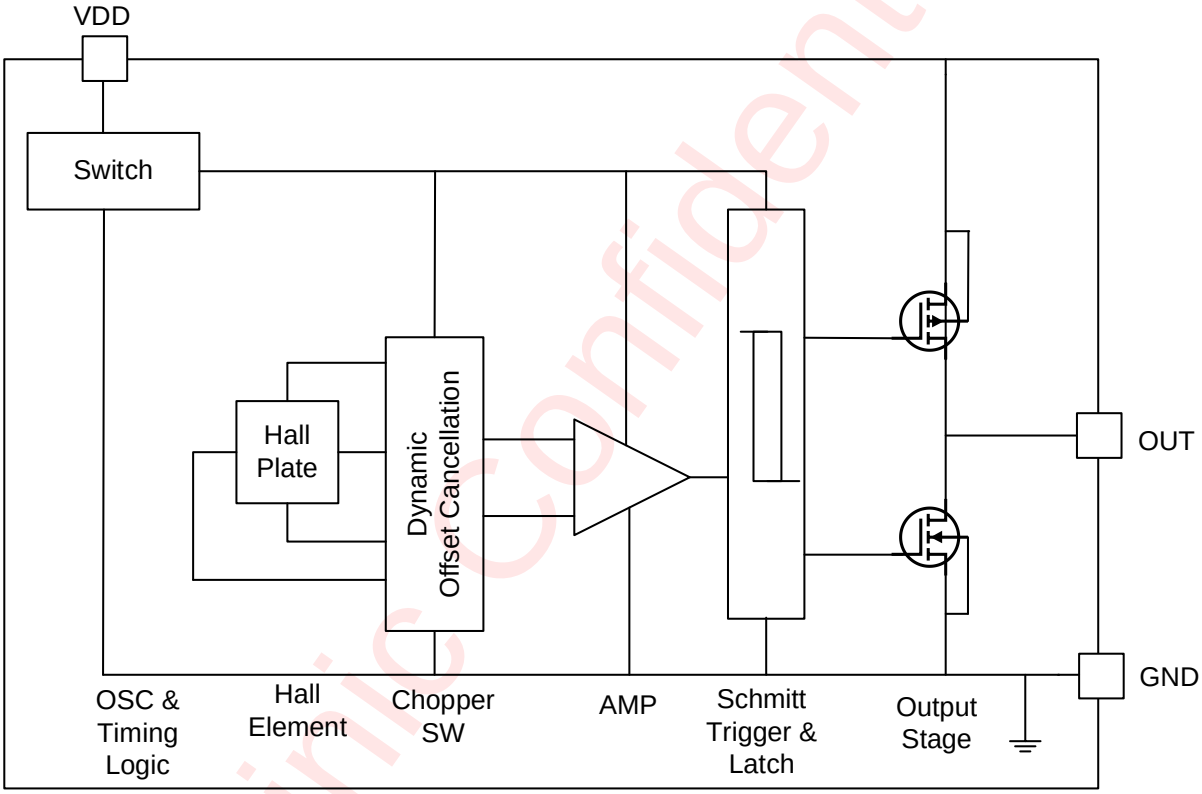


Figure 3 Functional Block Diagram of AW86510EB

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW86510EBSTR	-40℃~85℃	WBSOT23-3L	6KM0	MSL3	ROHS+HF	3000 units/ Tape and Reel
AW86510EBTOB	-40℃~85℃	WBTO92S-3L	VBLB	NA	ROHS+HF	10000 units

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.

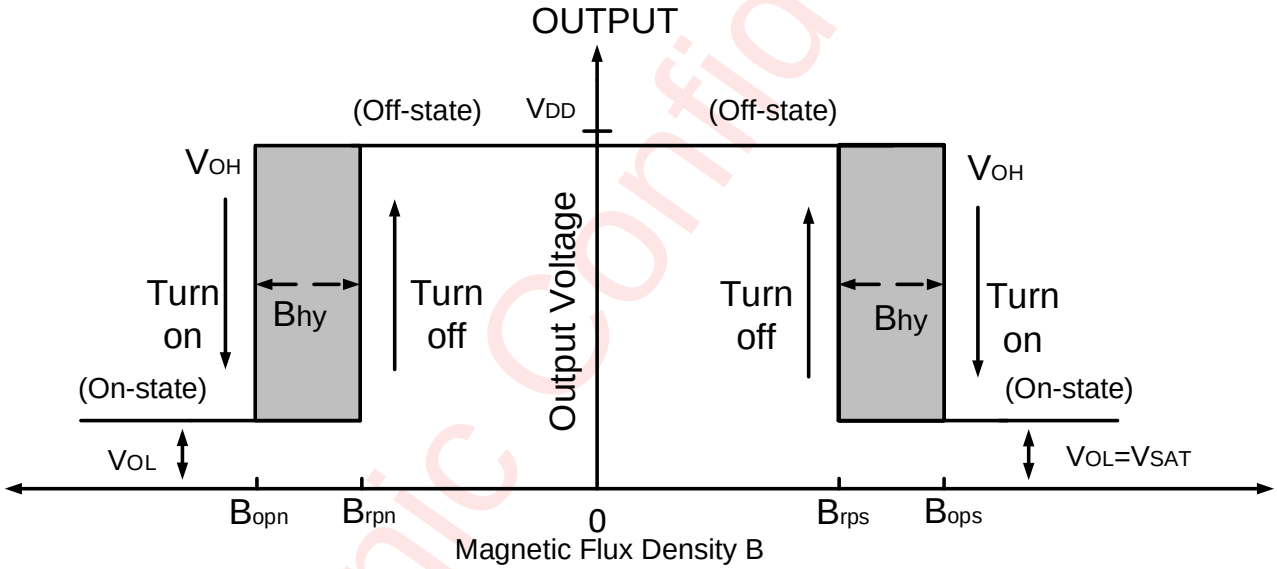


Figure 4 The Working Process of Omnipolar output

Absolute Maximum Ratings

PARAMETERS	RANGE
Supply Voltage	-0.3V to 6V
Supply Current	4mA
Output Voltage	-0.4V to V_{DD}+0.4V
Output Current	4mA
Operating Ambient Temperature T_A	-40℃ to 85℃
Storage Temperature T_{STG}	-65℃ to 150℃
Junction temperature T_J	-50℃ to 165℃
Magnetic Flux	No limit
Package Power Dissipation	230mW
ESD Rating(NOTE2 3)	
Human Body Model (HBM) ESD capability	±6kV
Charged-device model (CDM) ESD capability	±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

Parameters Specification (V_{DD}=3.3V supply, T_A= 25ºC except where otherwise specified)						
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{DD}	Supply Voltage	Operating, T_J < 165°C	1.6		5.5	V
I_{DD}(awake) (Note1)	Supply Current	During awake period, T_A = 25℃, V_{DD}=3.3V	-	0.95	1.3	mA
I_{DD}(sleep)		During sleep period, T_A = 25℃, V_{DD}=3.3V	-	0.43	0.8	μA
I_{DD}(avg) (Note1)	Average supply current	T_A = 25°C,V_{DD} = 1.8V, f_S=20Hz		0.8	-	μA
		T_A = 25°C,V_{DD} = 3.3V, f_S=20Hz		-	1.7	μA
V_{OL}	Output low voltage(on)	I_{OUT} =1 mA	-	0.1	0.2	V
V_{OH}	Output high voltage(off)	I_{OUT} = -1mA	V_{DD}-0.2	V_{DD}-0.1	-	V
T_{awake}(Note1)	Awake time	(note)	-	40	60	μs
T_{period}	Period	f_S=20Hz（sampling rate）		50	75	ms
D.C.	Duty cycle	-	-	0.08	-	%
f_C	Chopping Frequency		-	500	-	kHz
I_{OFF}(Note1)	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.*

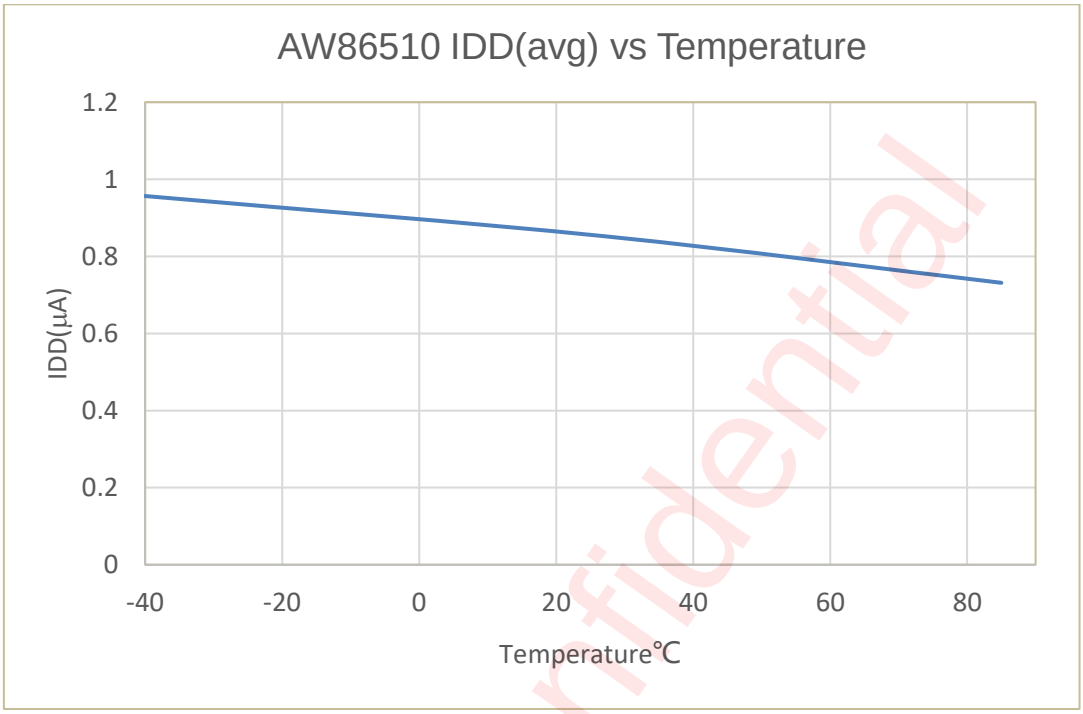
Note1: Minimum and/or maximum limit is guaranteed by design and by statistical analysis of device characterization data. The specification is not guaranteed by production testing.

Magnetic Characteristics

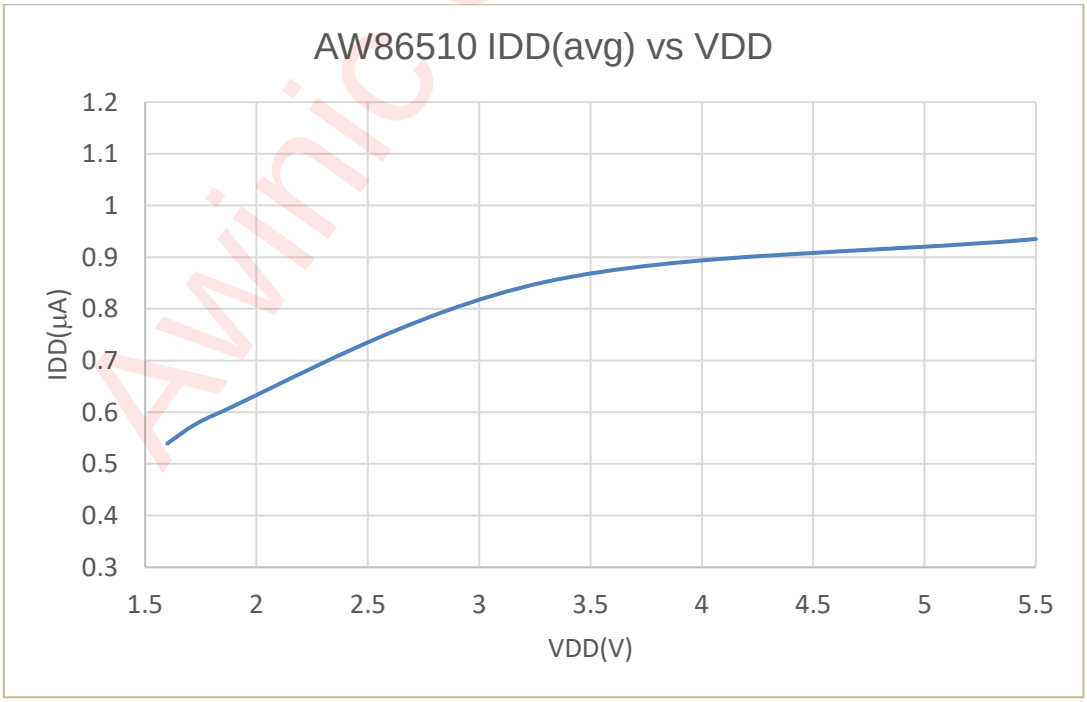
(1 mT=10 Gauss)

Magnetic Characteristics (VDD=3.3V supply, TA= 25ºC except where otherwise specified)						
Symbol	Characteristics	Test condition	Min	Typ	Max	Unit
Bops(south pole to part marking side)	Operation Point	T_A=+25℃,V_{DD}=3.3V	9	18	25	Gauss
Bopn(north pole to part marking side)		T_A=+25℃,V_{DD}=3.3V	-25	-18	-9	
Brps(south pole to part marking side)	Release Point	T_A=+25℃,V_{DD}=3.3V	4	11	19	
Brpn (north pole to part marking side)		T_A=+25℃,V_{DD}=3.3V	-19	-11	-4	
Bhy (|Bopx|-|Brpx|)	Hysteresis		-	7	-	

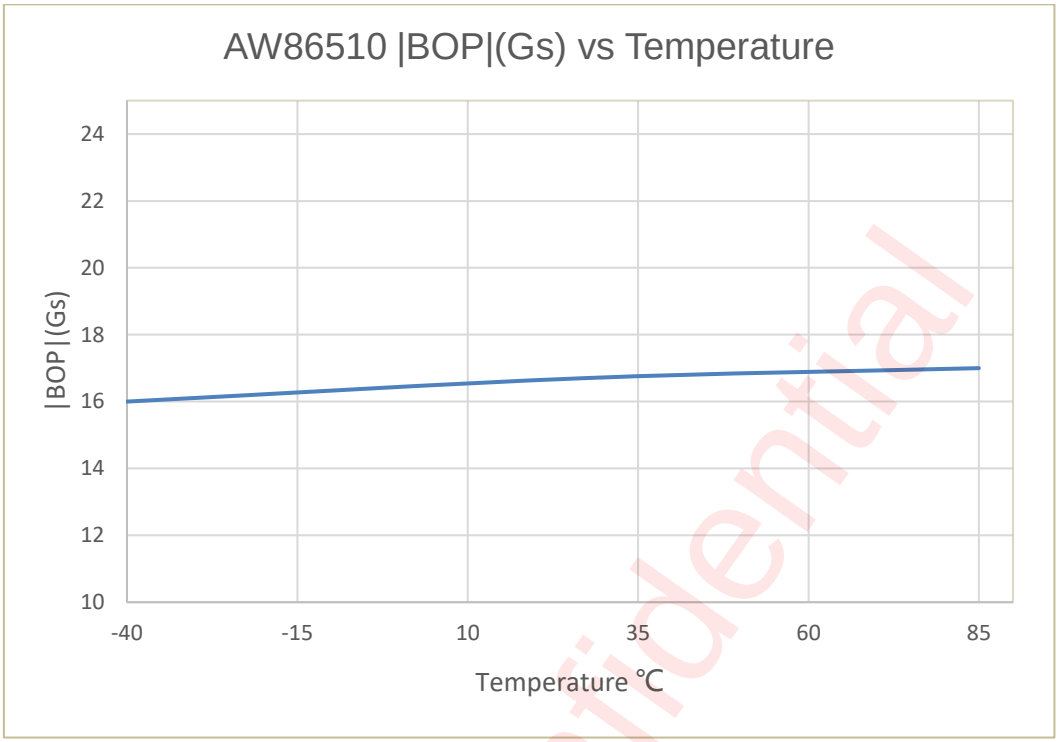
Typical Characteristics



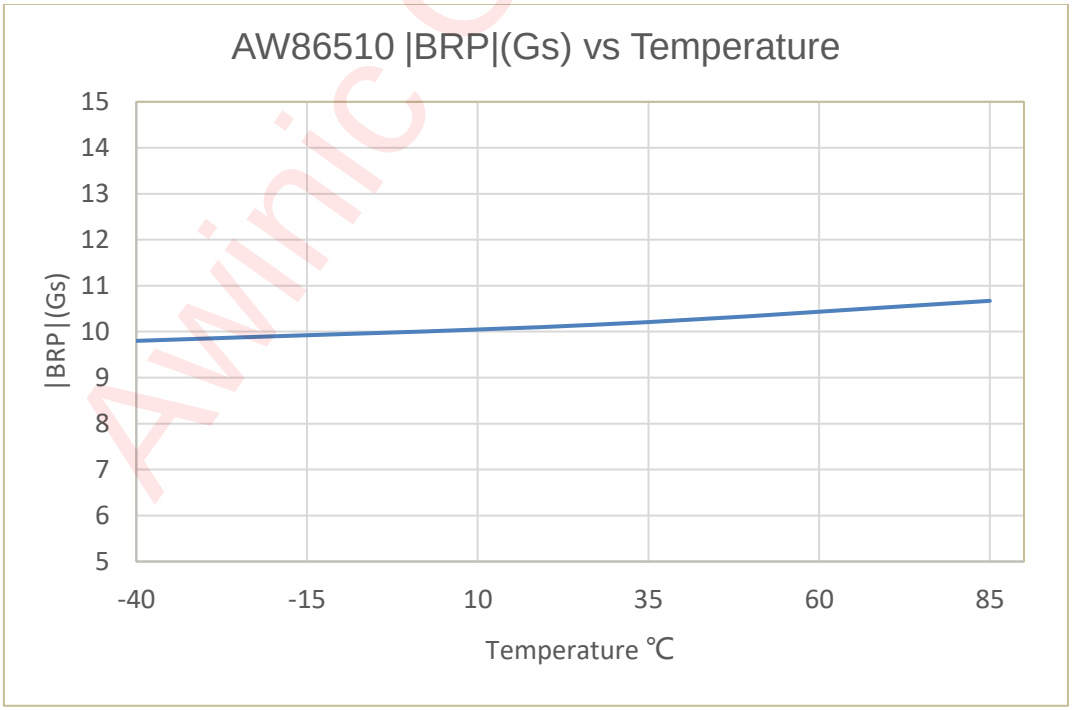
Ambient Temperature Ta[℃] I_{DD} vs. Ta（VDD=1.8V）



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

It is recommended to connect an external capacitor of 100nF to VDD and GND. The noise of the injection device can be reduced.

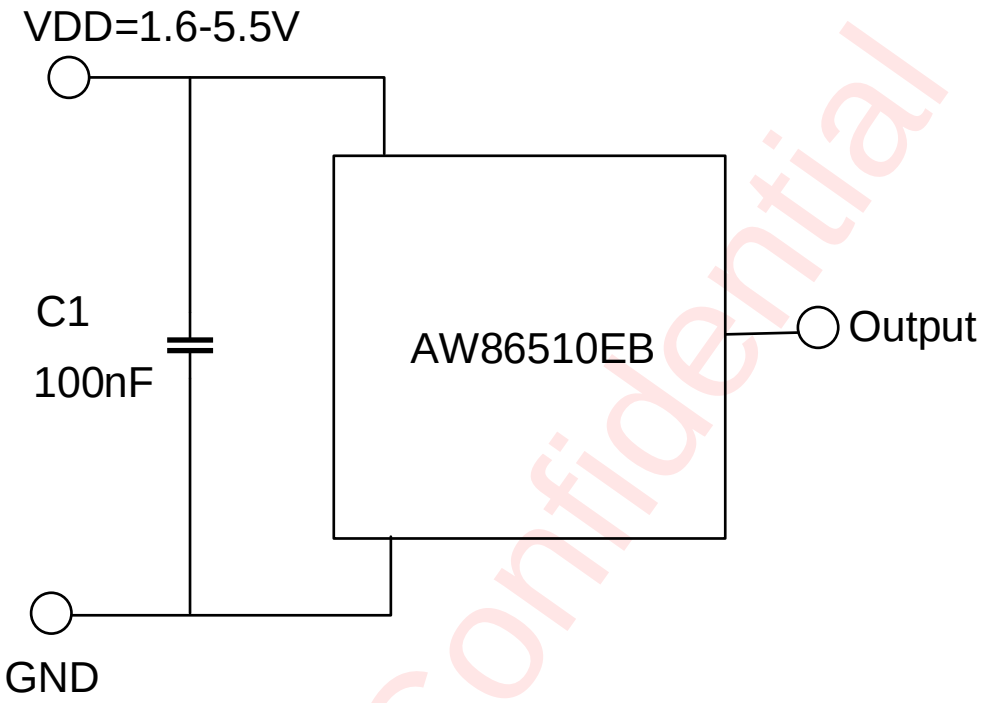
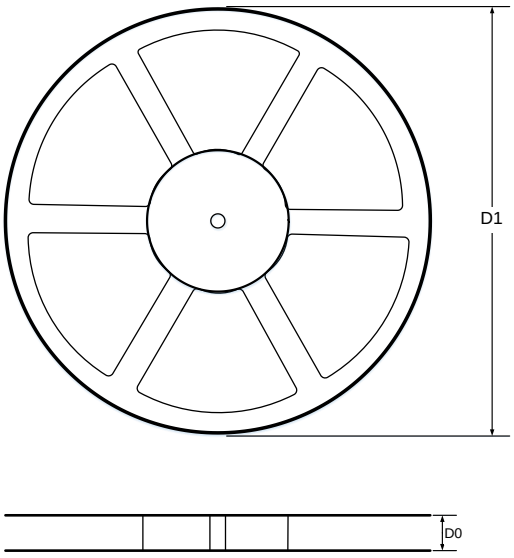


Figure 5 The Application Circuit of AW86510EB

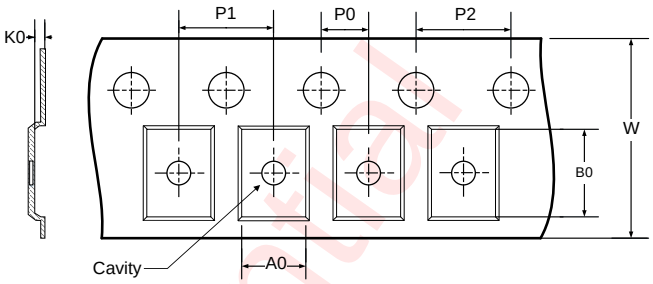
Tape And Reel Information

AW86510EBSTR

REEL DIMENSIONS

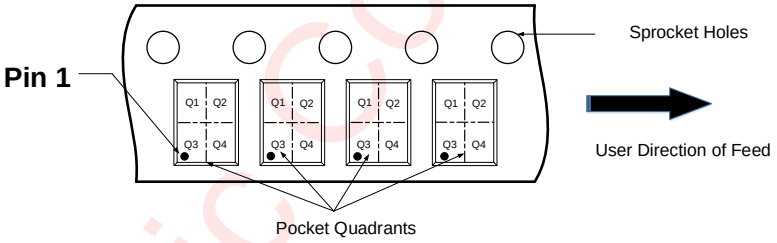


TAPE DIMENSIONS



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

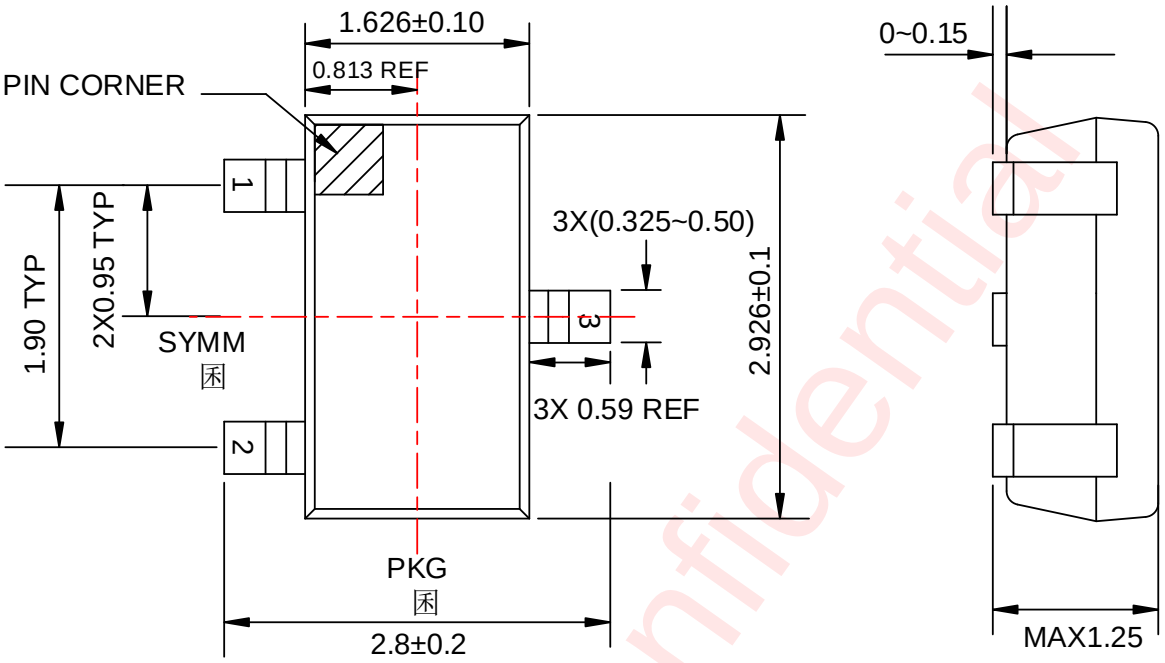
DIMENSIONS AND PIN1 ORIENTATION

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

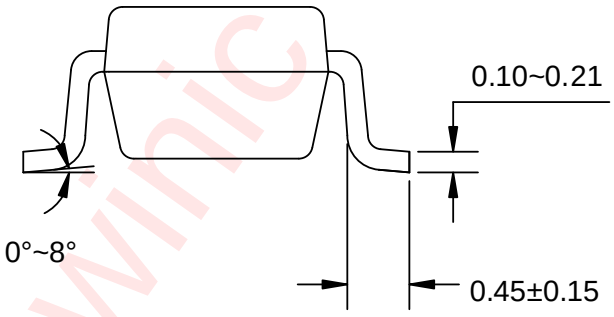
All dimensions are nominal

Package Description

AW86510EBSTR



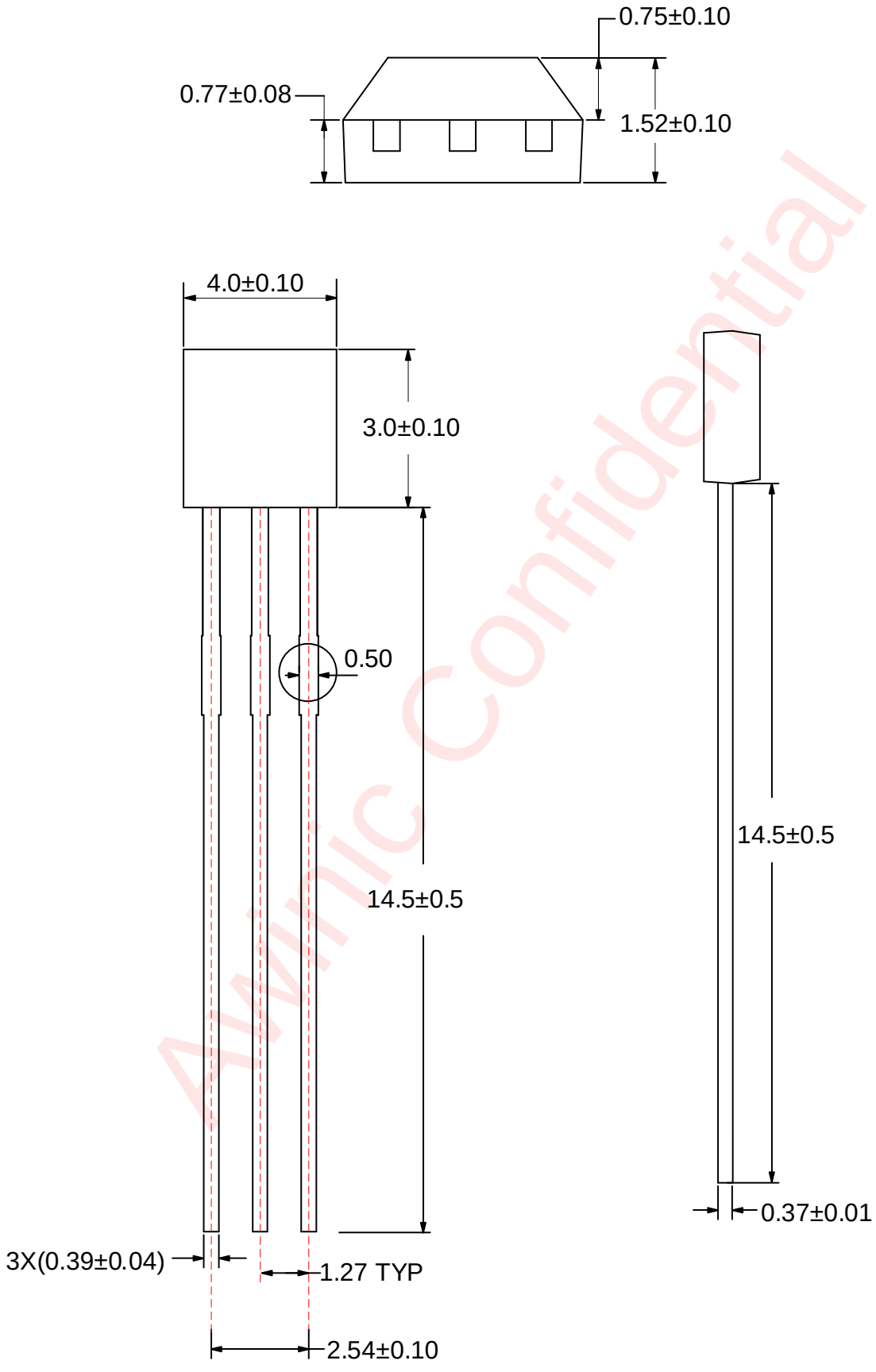
Top View **Side View**



Side View

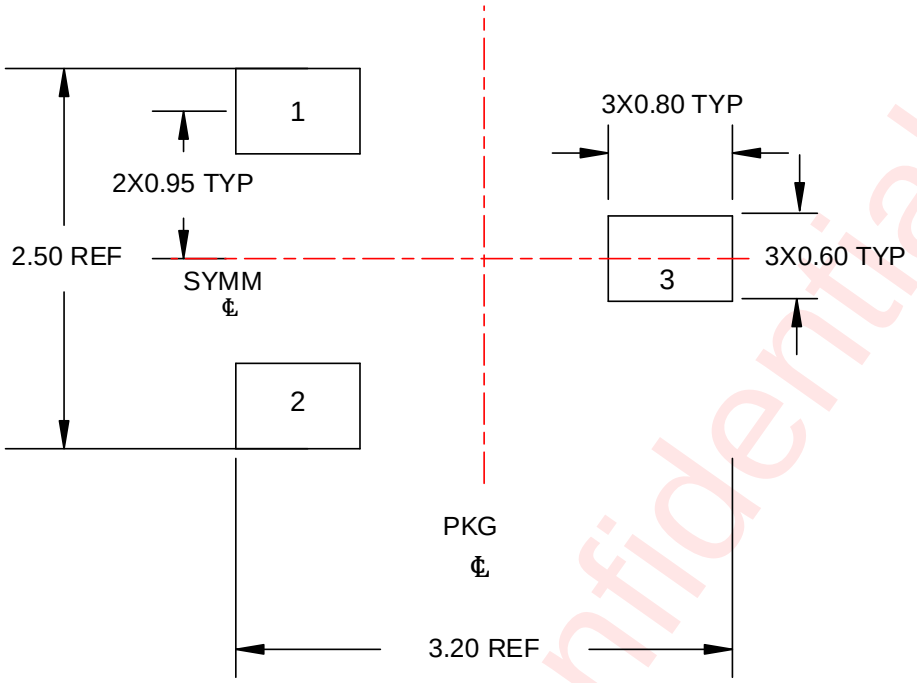
Unit: mm

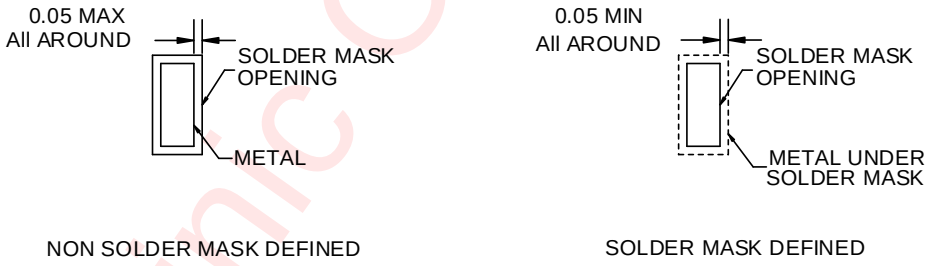
AW86510EBTOB



Land Pattern Data

AW86510EBSTR





Unit: mm

REVISION HISTORY

Version	Date	Change Record
V1.0	Jun. 2023	Officially released
V1.1	Jul. 2023	Arrows have been added to the side view of the POD diagram
V1.2	Nov. 2024	Add WBTO92S-3L package
V1.3	Apr. 2025	Change the Delivery Form of AW86510EBTOB to 10000 Uints

Disclaimer

All trademarks are the property of their respective owners. Information in this document is believed to be accurate and reliable. However, Shanghai AWINIC Technology Co., Ltd (AWINIC Technology) does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

AWINIC Technology reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. Customers shall obtain the latest relevant information before placing orders and shall verify that such information is current and complete. This document supersedes and replaces all information supplied prior to the publication hereof.

AWINIC Technology products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of an AWINIC Technology product can reasonably be expected to result in personal injury, death or severe property or environmental damage. AWINIC Technology accepts no liability for inclusion and/or use of AWINIC Technology products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications that are described herein for any of these products are for illustrative purposes only. AWINIC Technology makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

All products are sold subject to the general terms and conditions of commercial sale supplied at the time of order acknowledgement.

Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Reproduction of AWINIC information in AWINIC data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. AWINIC is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of AWINIC components or services with statements different from or beyond the parameters stated by AWINIC for that component or service voids all express and any implied warranties for the associated AWINIC component or service and is an unfair and deceptive business practice. AWINIC is not responsible or liable for any such statements.

