

Medium Sensitivity Micropower Omnipolar Hall-effect Switch

Features

- Medium sensitivity omnipolar operation
- Micropower operation:
Typ 0.8 μ A (average:VDD=1.8V)
- On board voltage regulator for 1.6V to 5.5V range
- Magnetic threshold options (Sensitivity Bop, Brp) :
 - Bop= $\pm$ 30Gs, Brp= $\pm$ 23Gs
- Industry-leading ultra-low power consumption
- AW86512EBADNR: 20Hz sampling rate options
- Wide operating temperature range: -40°C to 85°C
- WBDNF 1.6mm $\times$ 1.2mm-4L 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 AW86512EBADNR device is an ultra-low-power digital-switch Hall effect sensor, designed for the most compact and battery-sensitive systems. The supply range of AW86512EBADNR is 1.6V to 5.5V to support portable equipment. To minimize PCB space, the AW86512EBADNR have ultra-small packages: WBDNF 1.6mm $\times$ 1.2mm-4L

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 AW86512EBADNR

Pin Configuration And Top Mark

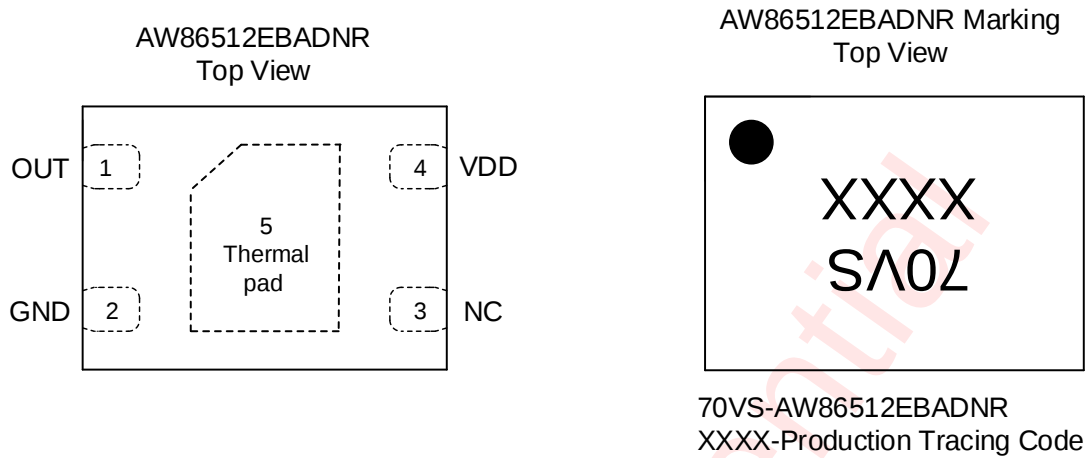


Figure 2 Pin Configuration And Top Mark

Pin Definition

No.	NAME	DESCRIPTION
1	OUT	Omnipolar output that responds to north and south magnetic
2	GND	Ground
3	NC	Not Connected
4	VDD	Power Supply
5	Thermal pad	No Connection

Functional Block Diagram

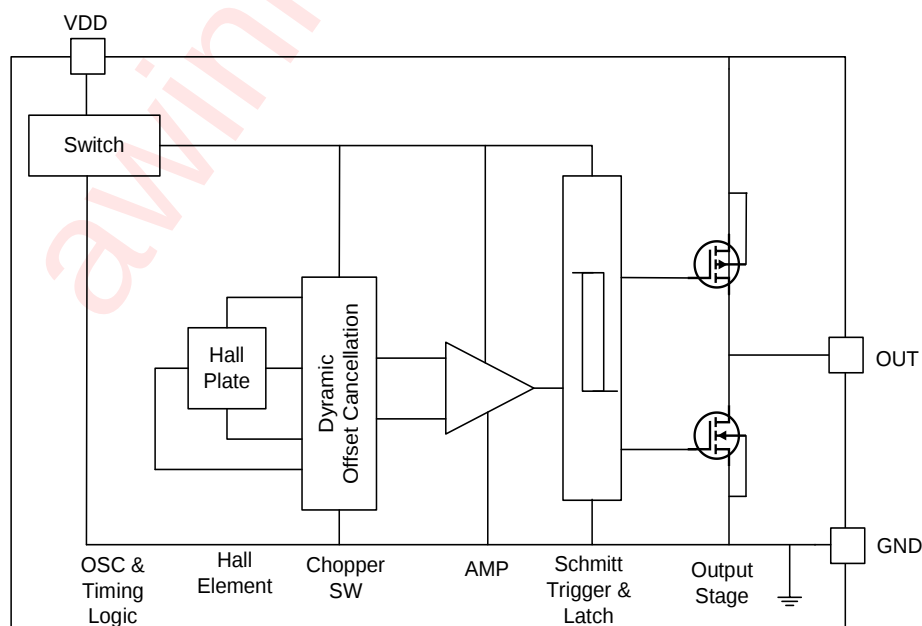


Figure 3 Functional Block Diagram of AW86512EBADNR

Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW86512EBADNR	-40°C~85°C	WBDFN 1.6mm×1.2mm-4L	70VS	MSL1	ROHS+HF	4500 units/ Tape and Reel

Detailed Functional Description

When the magnetic field strength is greater than B_{op} , then the device output is pulled low; When the magnetic field strength is less than B_{rp} , then the device output is pulled high; When the magnetic field strength is between B_{op} and B_{rp} , then the device output remains in the previous state.

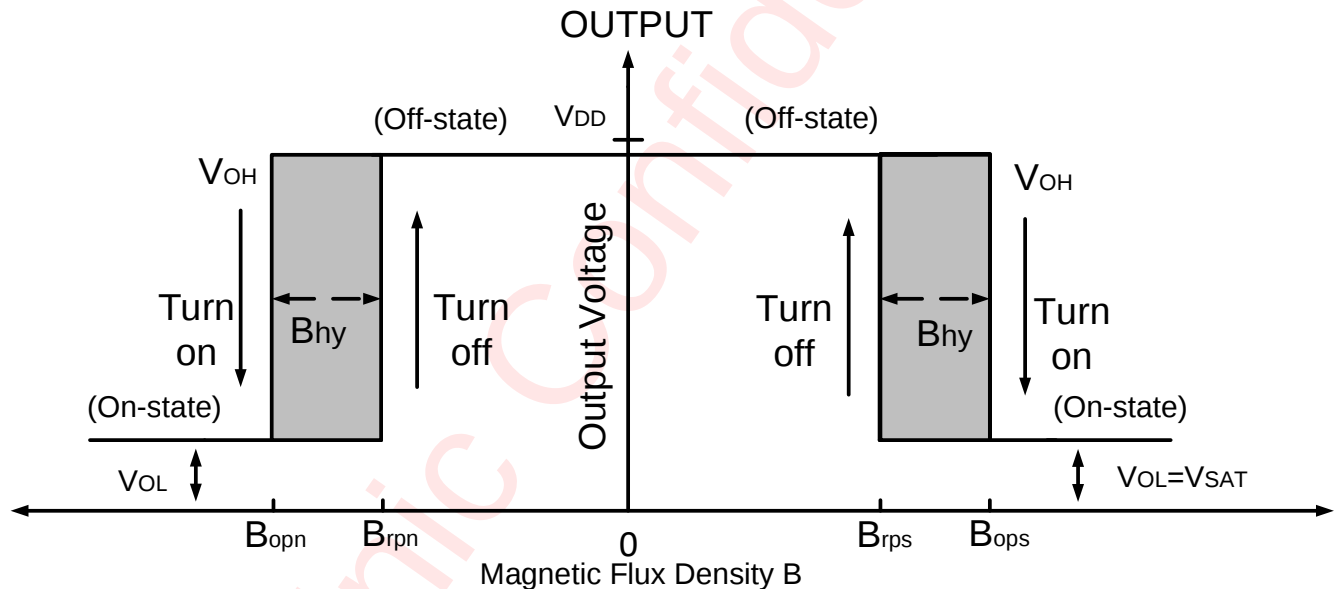


Figure 4 The Working Process of Omnipolar output

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
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

VDD=3.3V supply, T_A= -40 °C to 85°C (unless otherwise noted)

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)	Supply Current	During awake period, T _A =25°C, V _{DD} =3.3V	-	0.95	1.3	mA
I _{DD} (sleep)		During sleep period, T _A =25°C, V _{DD} =3.3V	-	0.43	0.7	μA
I _{DD} (avg)	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}	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}	Output Leakage Current	V _{OUT} =5.5V; 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.

Magnetic Characteristics

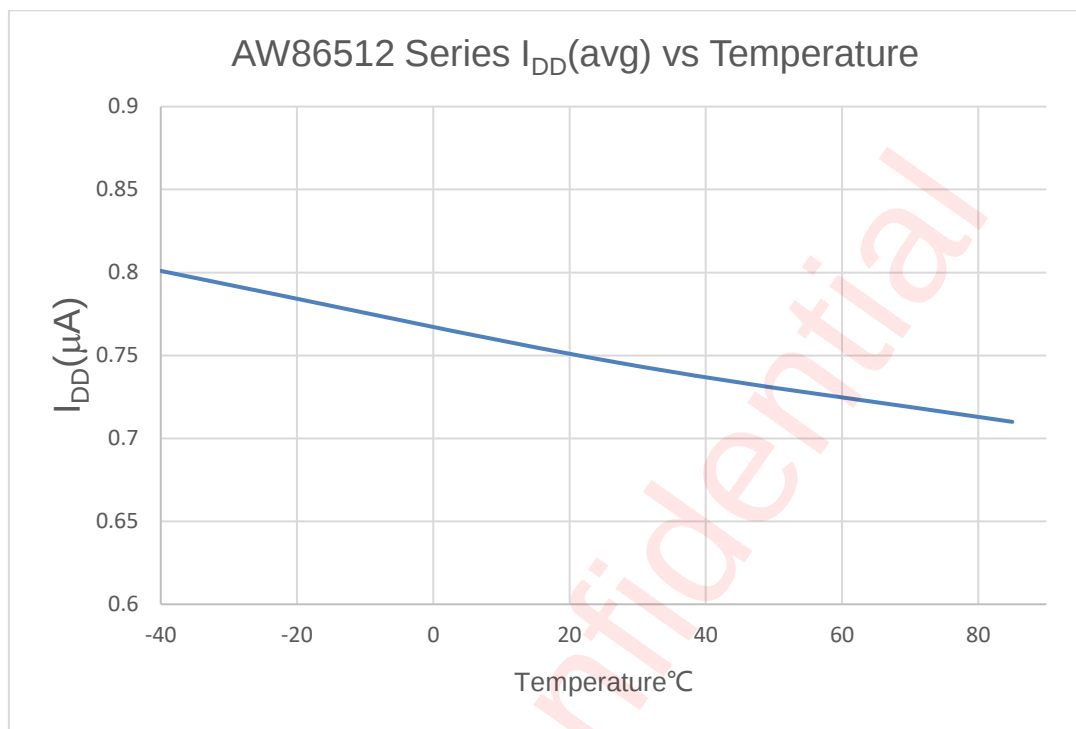
VDD=3.3V supply, T_A=+25°C for typical values (unless otherwise noted)

(1 mT=10 Gauss)

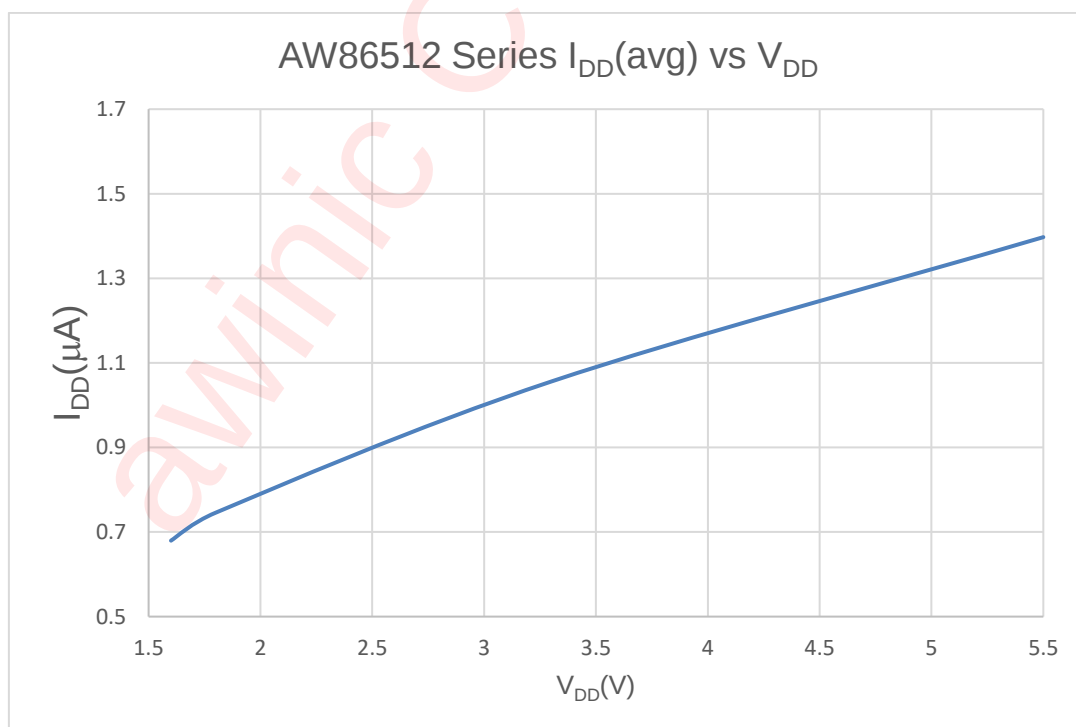
Symbol	Characteristics	Test condition	Min	Typ	Max	Unit
Bops(south polar to part marking side)	Operation Point		21	30	39	Gauss
		V _{DD} =1.6V to 5.5V, T _A =-40°C to +85°C	19	30	42	
Bopn (north pole to part marking side)			-39	-30	-21	
		V _{DD} =1.6V to 5.5V, T _A =-40°C to +85°C	-42	-30	-19	
Brps(sorth pole to part marking side)	Release Point		14	23	30	
		V _{DD} =1.6V to 5.5V, T _A =-40°C to +85°C	12	23	33	
Brpn (north pole to part marking side)			-30	-23	-14	
		V _{DD} =1.6V to 5.5V, T _A =-40°C to +85°C	-33	-23	-12	
Bhy (Bopx - Brpx)	Hysteresis		2	7		

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.

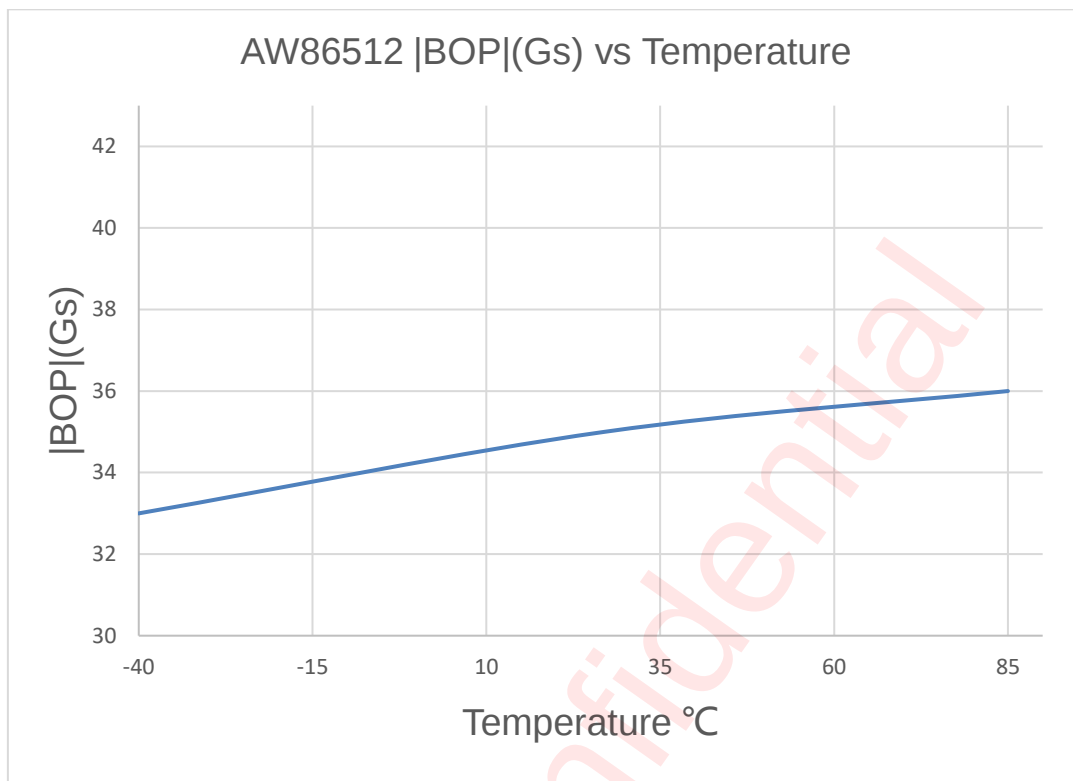
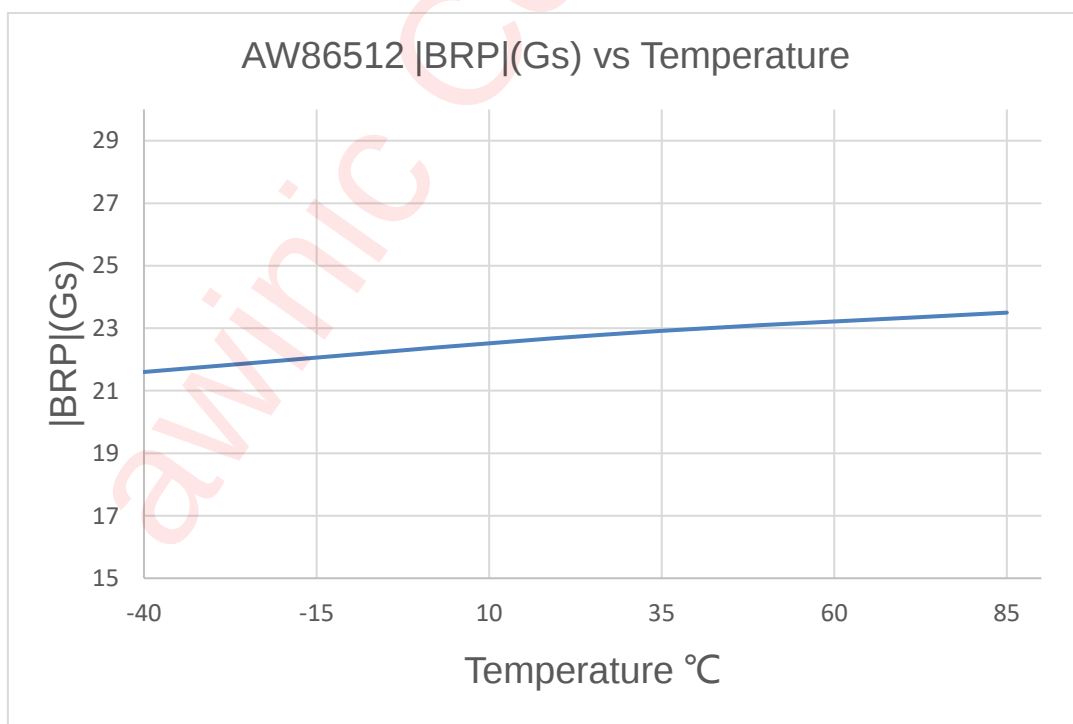
Typical Characteristics



Ambient Temperature $T_a[^{\circ}\text{C}]$ I_{DD} vs. T_a ($V_{DD}=1.8\text{V}$)



Average Supply Current vs. Supply Voltage ($T_a=25^{\circ}\text{C}$)

Ambient Temperature T_a [°C] |Bop| vs. T_a ($V_{DD}=3.3V$)Ambient Temperature T_a [°C] |Brp| vs. T_a ($V_{DD}=3.3V$)

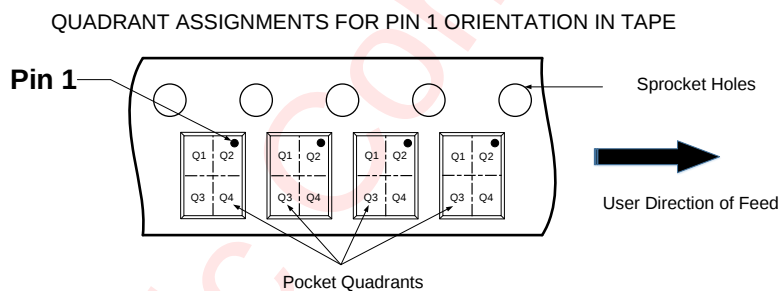
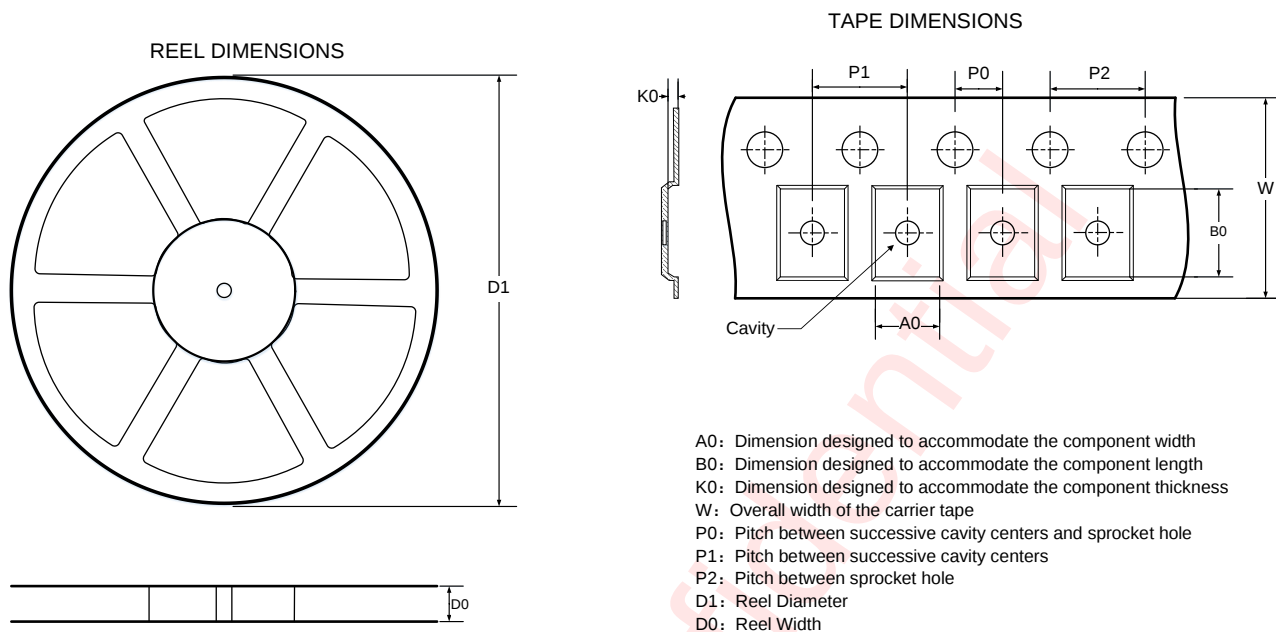
Application Information

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 AW86512EBADNR

Tape And Reel Information



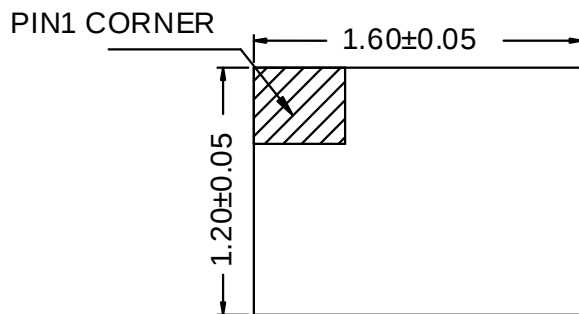
Note: The above picture is for reference only. Please refer to the value in the table below for the actual size

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	1.37	1.77	0.55	2	4	4	8	Q2

All dimensions are nominal

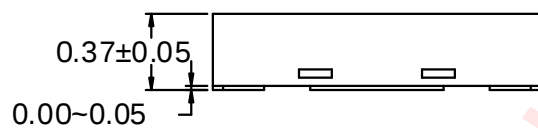
Package Description



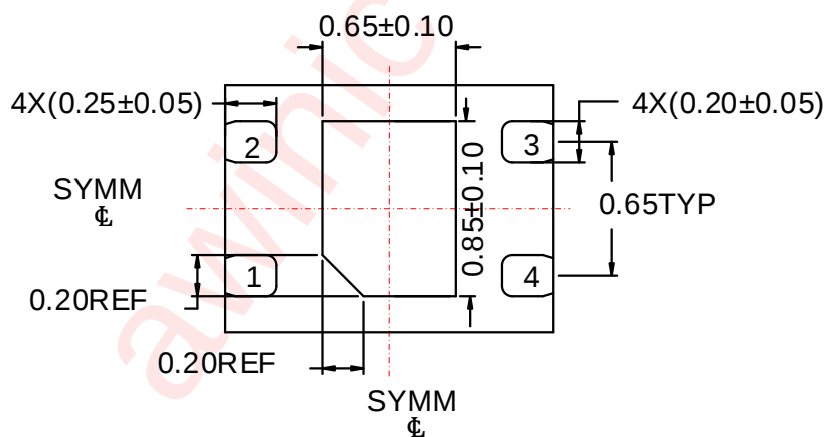
Top View



Side View



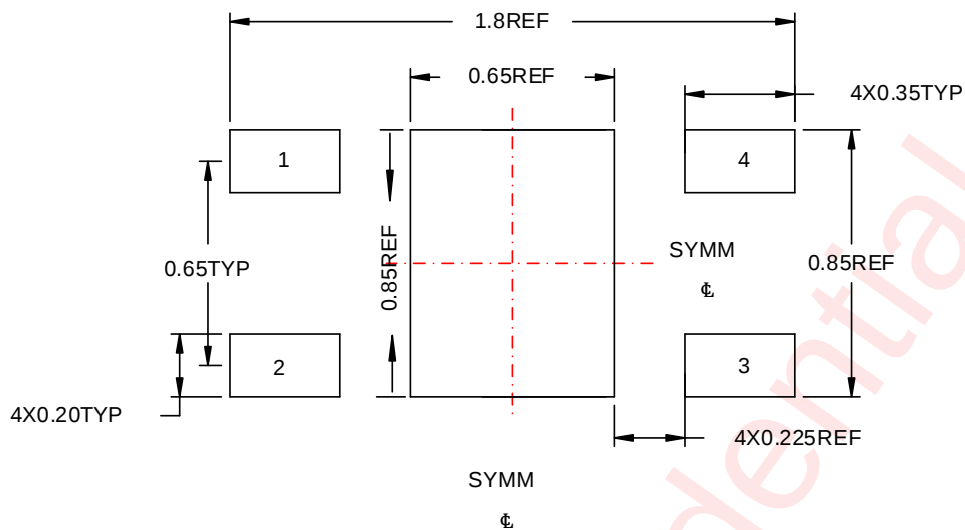
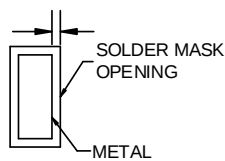
Side View



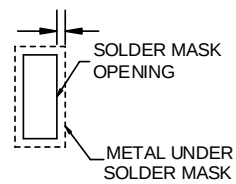
Bottom View

Unit: mm

Land Pattern Data

0.05 MAX
All AROUND

NON SOLDER MASK DEFINED

0.05 MIN
All AROUND

SOLDER MASK DEFINED

Unit: mm

REVISION HISTORY

Version	Date	Change Record
V1.0	Dec. 2023	Officially released

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