Low Sensitivity Micropower Omniploar Hall-effect Switch

Features

- Low sensitivity omnipolar operation.
- Micropower operation:
  Type 0.8μA(average :VDD=1.8V)
- Onboard voltage regulator for 1.6V to 5.5V range.
- Magnetic threshold:Bop=±60Gs, Brp=±50Gs
- Industry-leading ultra-low power consumption.
- Wide operating temperature range:
  -40°C to 85°C.
- WBDFN 1.6mm×1.2mm×0.37mm-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

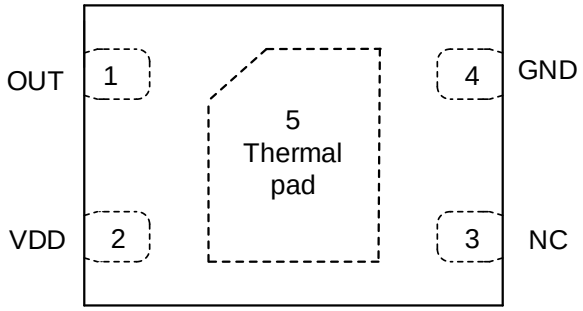
The AW86515 Series device is an ultra-low-power digital-switch Hall effect sensor, designed for the most compact and battery-sensitive systems. The device is offered in multiple sampling rates, output drivers, and packages to accommodate various applications. The supply range of AW86515 series is 1.6V to 5.5V to support portable equipment. To minimize PCB space, the AW86515 series have the ultra-small package: WBDFN 1.6mm×1.2mm×0.37mm -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

Pin Configuration And Top Mark

AW86515EBADNR
Top View



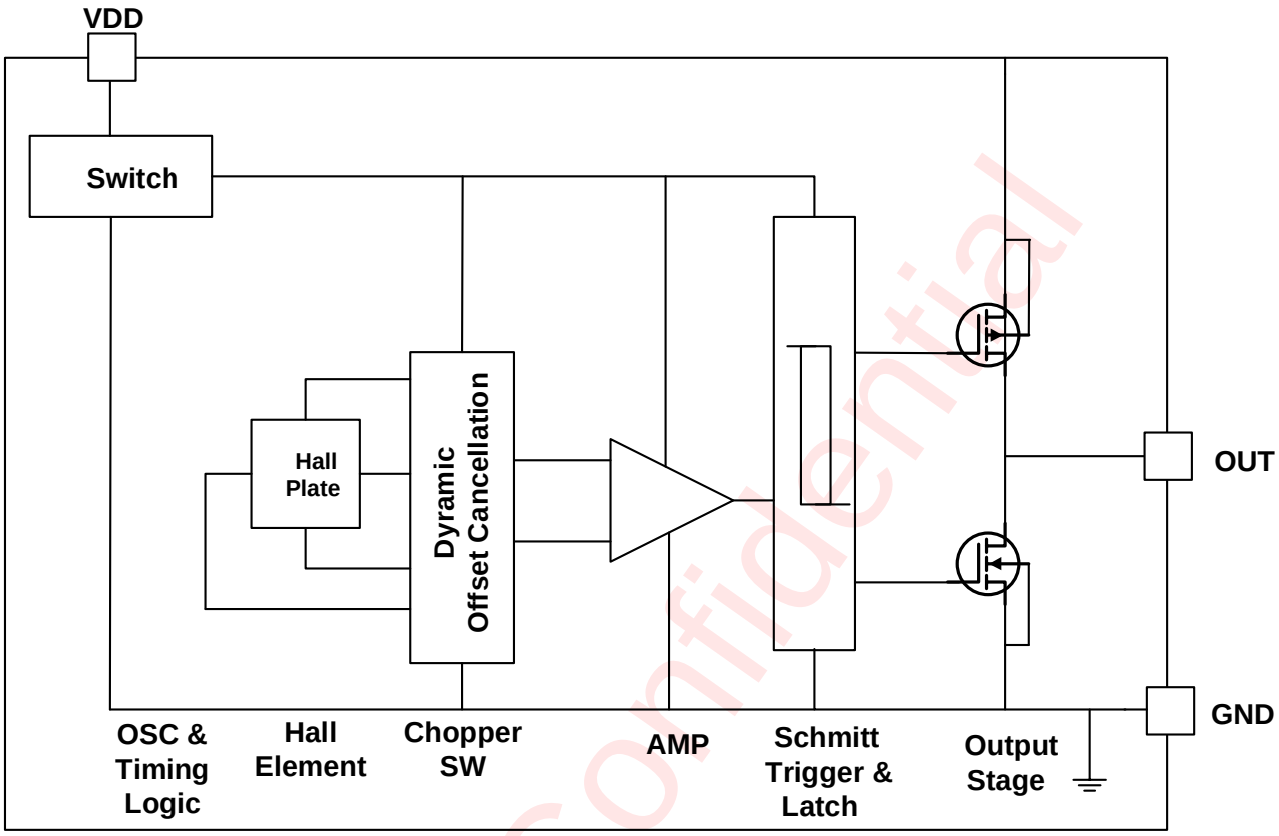
AW86515EBADNR Marking
Top View

VNXD - AW86515EBADNR
XXXX - Production Tracing Code

Pin Definition

No.	NAME	DESCRIPTION
1	OUT	Omnipolar output that responds to north and south magnetic
2	VDD	Power Supply
3	NC	No Connection
4	GND	Ground
5	Thermal pad	No Connection

Functional Block Diagram

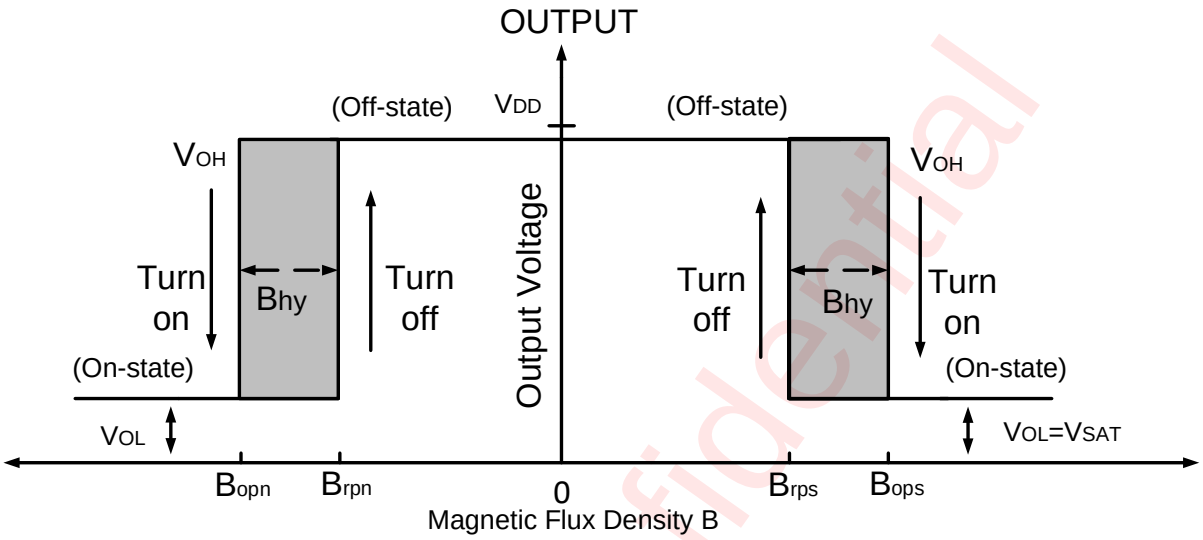


Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW86515EBADNR	-40°C~85°C	WBDFN 1.6mm×1.2mm -4L	VNXD	MSL1	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.



Absolute Maximum Ratings

PARAMETERS	RANGE
Supply Voltage	6V
V_{DD} Reverse Voltage V_{DD}	-0.3V
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

V_{DD}=3.3V supply, T_A= -40 ºC to 85ºC (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	-	μA
I_{DD}(avg)	Average supply current	T_A = 25°C,V_{DD} = 1.8V, f_S=20Hz		0.8		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} = 5.5 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.*

Magnetic Characteristics

T_A=+25°C,V_{DD}=3.3V (unless otherwise noted) (1 mT=10 Gauss)

Symbol	Characteristics	Test condition	Min	Typ	Max	Unit
Bops(south polar to part marking side)	Operation Point	T_A=+25° C,V_{DD}=3.3V	40	60	70	Gauss
Bopn(north pole to part marking side)		T_A=+25° C,V_{DD}=3.3V	-70	-60	-40	
Brps(sorth pole to part marking side)	Release Point	T_A=+25° C,V_{DD}=3.3V	38	50	65	
Brpn (north pole to part marking side)		T_A=+25° C,V_{DD}=3.3V	-65	-50	-38	
Bhy (|Bopx|-|Brpx|)	Hysteresis		-	10	-	

Typical Characteristics

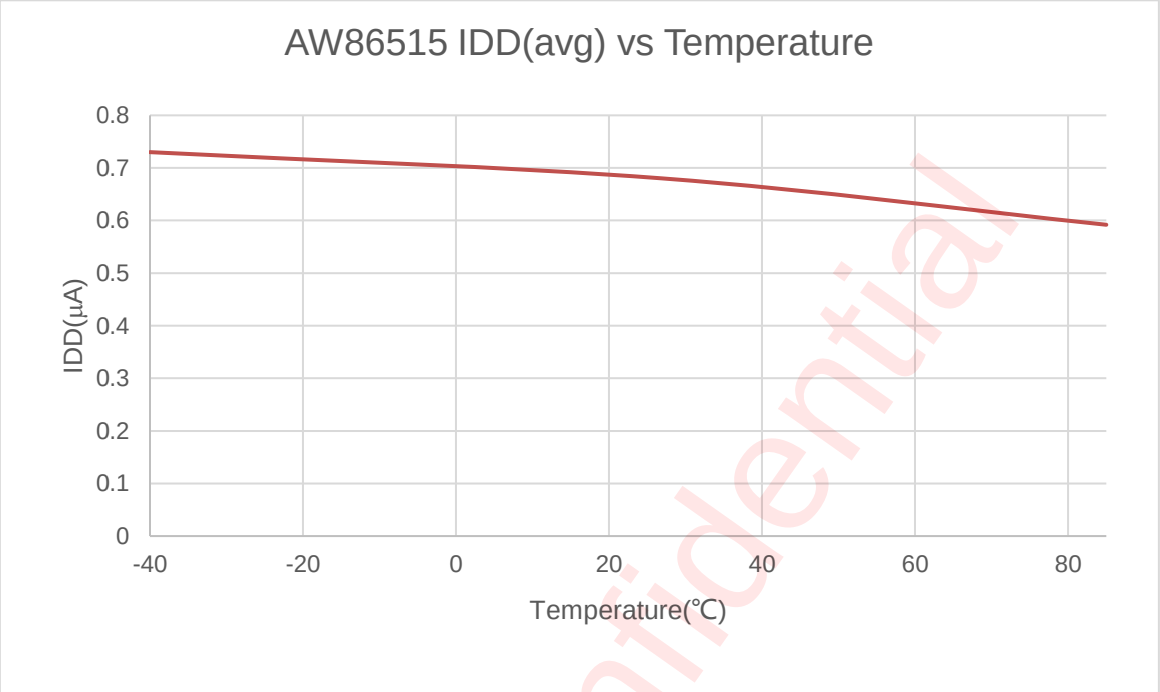


Figure 1 Ambient Temperature Ta[°C] I_{DD} vs. Ta（VDD=1.8V）

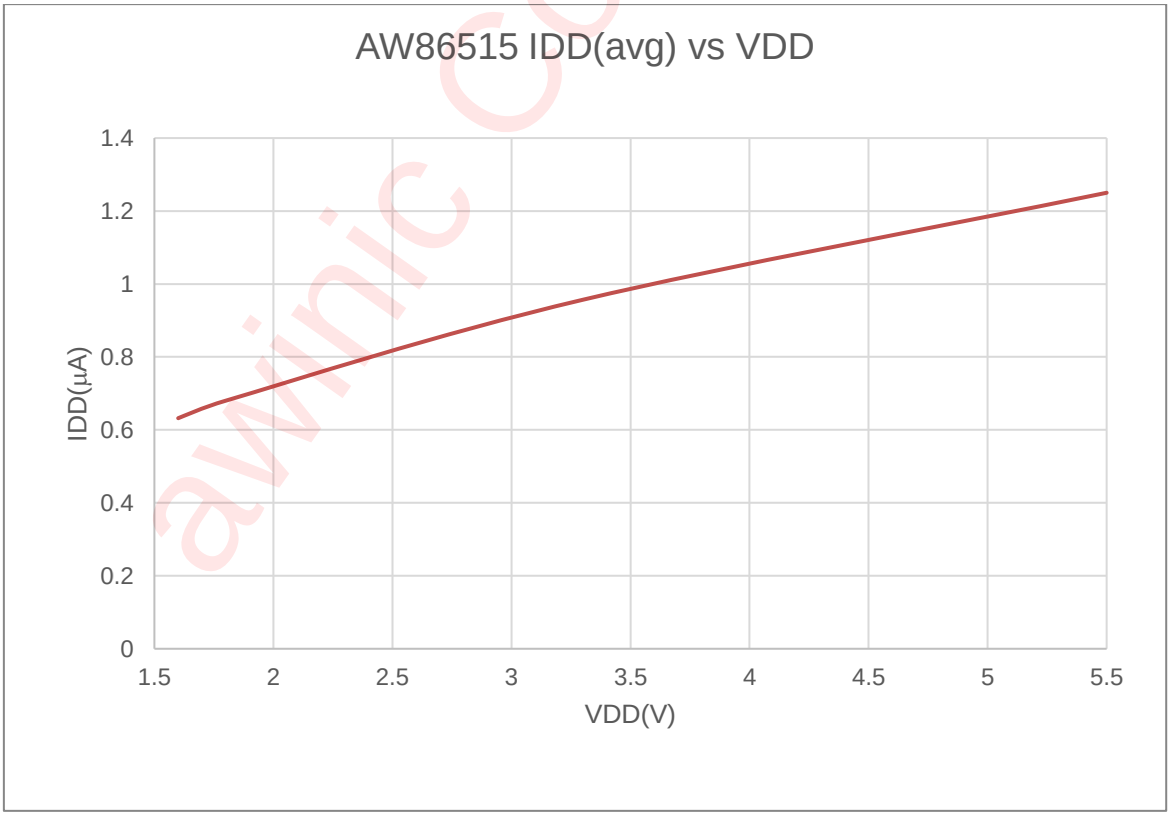


Figure 2 Average Supply Current vs. Supply Voltage(Ta=25°C)

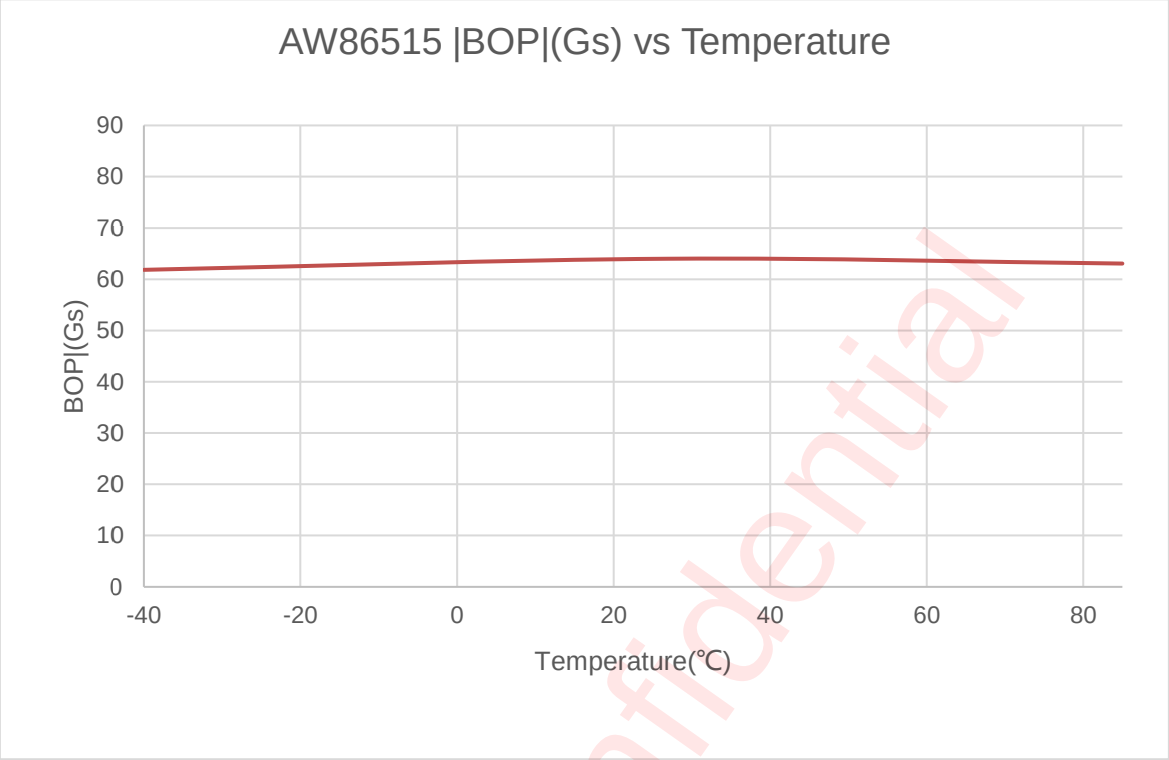


Figure 3 Ambient Temperature Ta[°C] |Bop| vs. Ta(V_{DD}=3.3V)

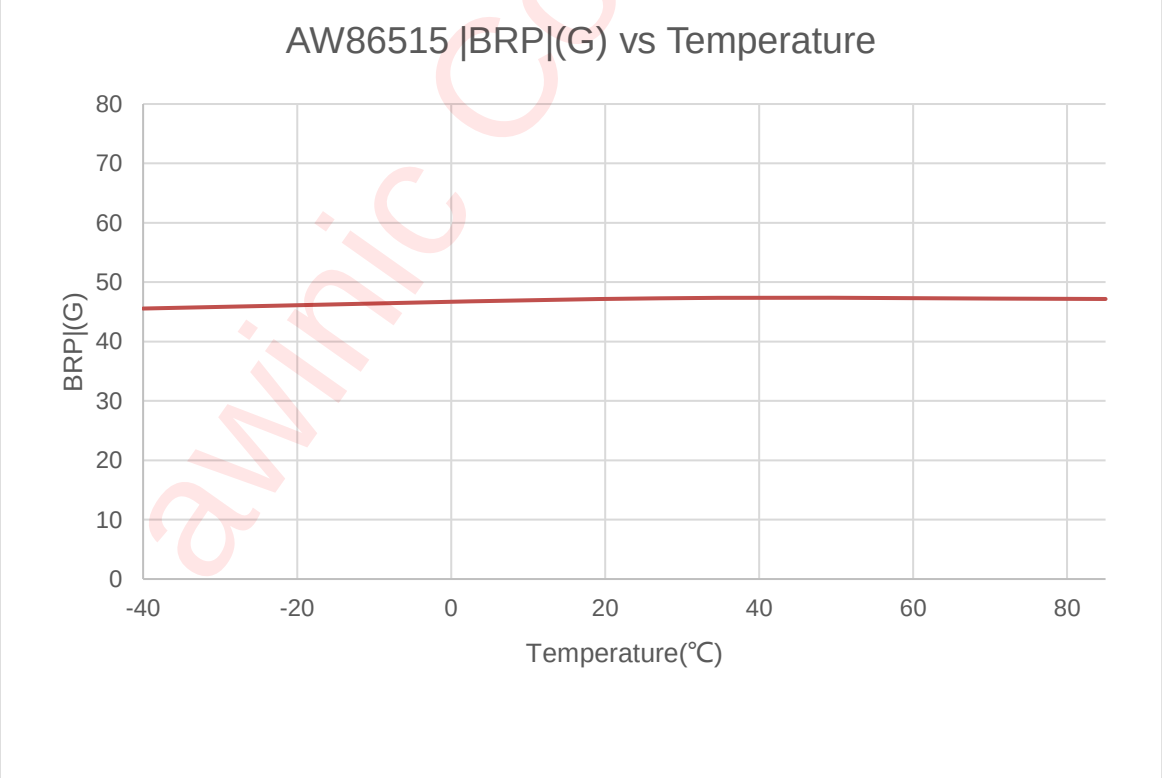


Figure 4 Ambient Temperature Ta[°C] |Brp| vs. Ta(V_{DD}=3.3V)

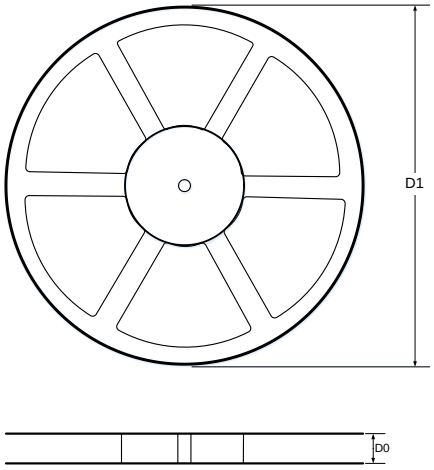
Application Information

It is recommended to connect an external capacitor of 0.1μF to VDD and GND. The noise of the injection device can be reduced.

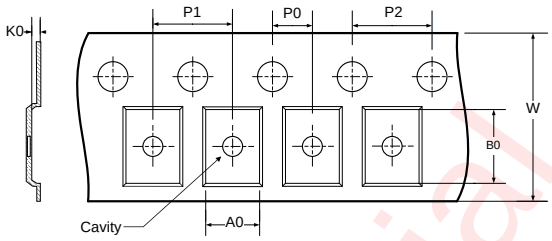
Figure 5 The Application Circuit of AW86515EBADNR

Tape And Reel Information

REEL DIMENSIONS

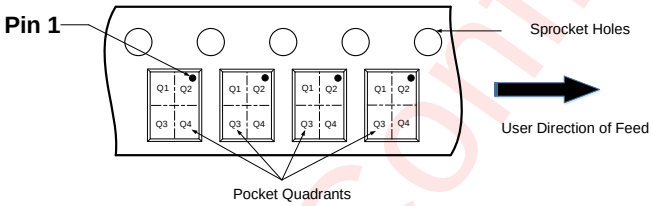


TAPE DIMENSIONS



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



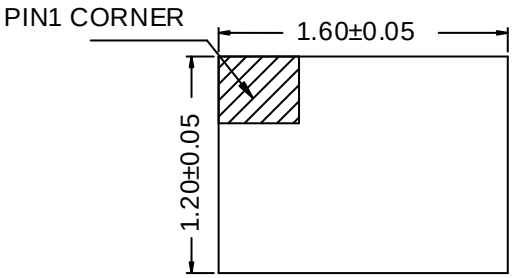
Note：The above picture is for reference only. Please refer to the value in the table below for the actual size

DIMENSIONS AND PIN1 ORIENTATION

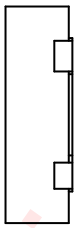
D1 (mm)	D0 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
178	8.4	1.37	1.77	0.55	2	4	4	8	Q2

All dimensions are nominal

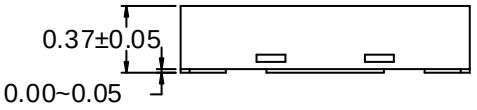
Package Description



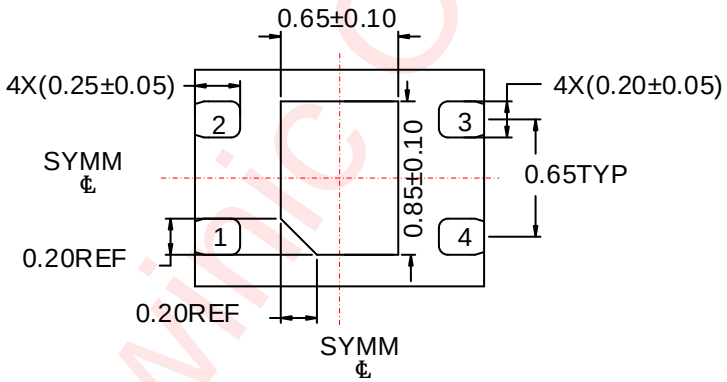
Top View



Side View



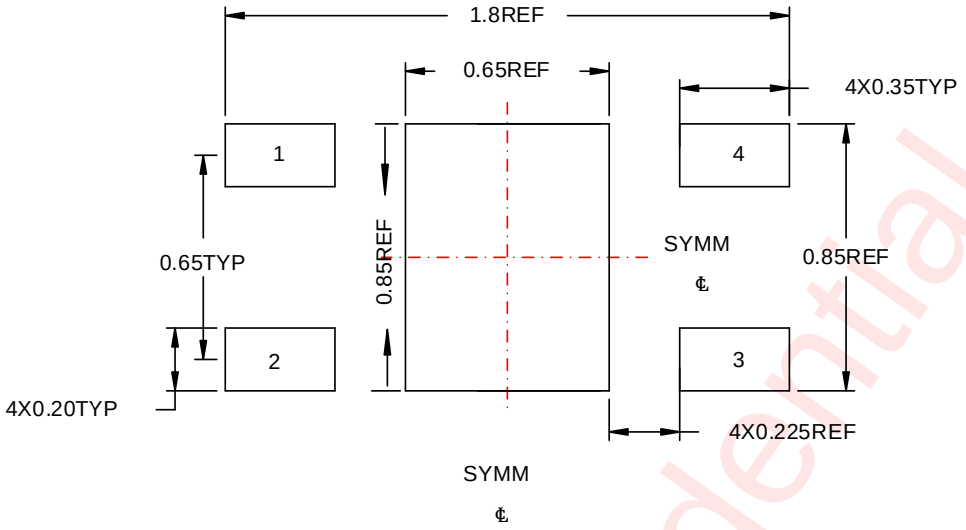
Side View



Unit: mm

Bottom View

Land Pattern Data



NON SOLDER MASK DEFINED

SOLDER MASK DEFINED

Unit：mm

REVISION HISTORY

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

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