High Sensitivity Micropower Unipolar Hall-effect Switch

Features

- High sensitive unipolar operation
- Open-drain output
- Micropower operation Typ 0.8μA
  (average : V_{DD}=1.8V)
- Ultra small package:
  WBDFN 1.0mm×1.0mm-4L
- On board voltage regulator for 1.6V to 5.5V range
- Wide operating temperature range:
  -40°C to 85°C

Applications

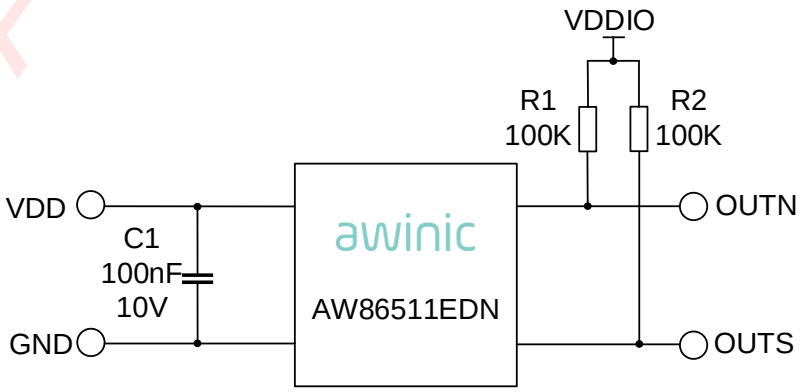
- Smartphone.
- Notebook computer.
- Handheld gaming consoles.
- Bluetooth headset.
- DV.
- Contact-less switch, Level, proximity and position switches in consumer products.

General Description

AW86511EDNCDNR is a high-sensitivity micropower unipolar Hall effect switch IC with Open-drain output. AW86511EDNCDNR uses a hibernating clocking system to reduce power consumption, which the total power consumption in normal operation is typically 0.8μA with a 1.8V power source. Mainly designed for portable devices such as laptop computer, smartphone and bluetooth headset etc. The supply range of AW86511EDNCDNR is 1.6V to 5.5V to support portable equipment.

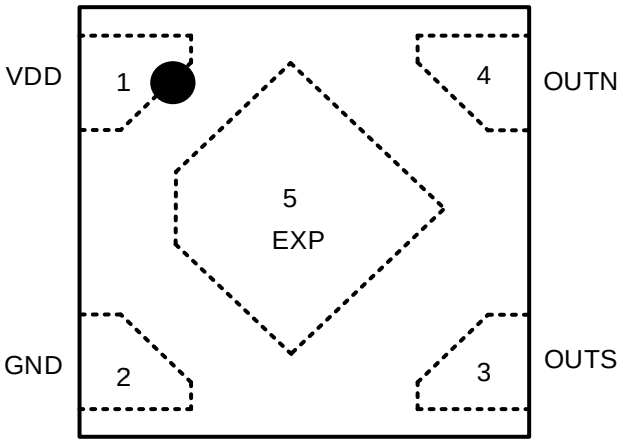
The OUTN is activity with a north pole of sufficient magnetic field strength. When the magnetic flux density perpendicular to the package is large than operate point(BopN) , the output will be turned on (pulled low) and held until B is lower than release point (BrpN). The OUTS is activity with a south pole of sufficient magnetic field strength. When the magnetic flux density perpendicular to the package is large than operate point(BopS) , the output will be turned on (pulled low) and held until B is lower than release point (BrpS).

Typical Application Circuit

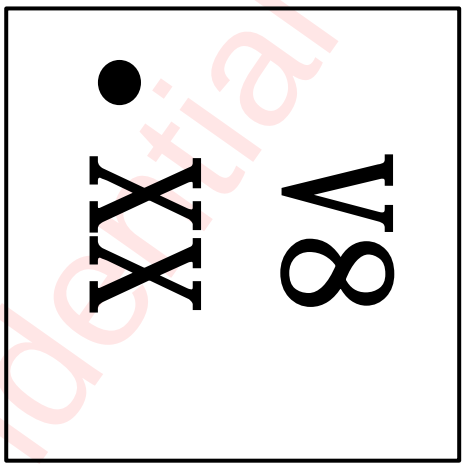


Pin Configuration And Top Mark

AW86511EDNCDNR
(Top View)



AW86511EDNCDNR Marking
(Top View)

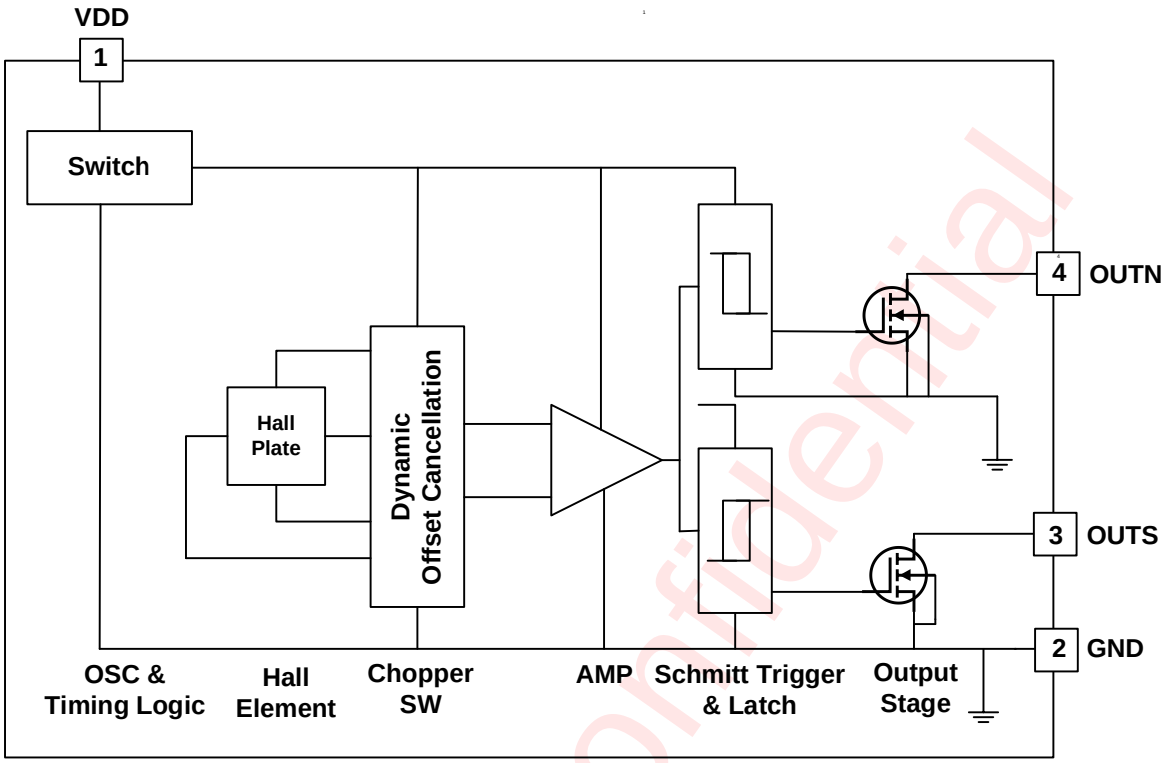


V8 – AW86511EDNCDNR
XX – Production Tracing Code

Pin Definition

NO.	Name	Description
1	VDD	Power Supply
2	GND	Ground
3	OUTS	S pole detection open-drain output. The open drain requires a resistor pullup
4	OUTN	N pole detection open-drain output. The open drain requires a resistor pullup
5	EXP	Not Connect

Functional Block Diagram



Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW86511EDNCDNR	-40°C～85°C	WBDFN 1.0mm×1.0mm-4L	V8	MSL1	RoHS+HF	4500 units/ Tape and Reel

Absolute Maximum Ratings（NOTE1）

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°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
Lead temperature (soldering 10 seconds)	260°C
ESD Rating(NOTE2 3)	
Human Body Model (HMB) 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 test method: ESDA/JEDEC JS -001-2017.

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

Electrical Characteristics

VDD = 3.3V, T_A =25ºC for typical values (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) (Note1)	Supply Current	During awake period, T_A = 25°C,VDD=3.3V	-	0.95	1.3	mA
I_{DD}(sleep)		During sleep period, T_A = 25°C,VDD=3.3V	-	0.43	0.8	μA
I_{DD}(avg) (Note1)	Average supply current	T_A = 25°C,VDD=1.8V, f_S=20Hz	-	0.8	-	μA
		TA = 25°C,VDD=3.3V, f_S=20Hz	-	-	1.7	μA
V_{OL}	Output low voltage(on)	IOUT = 1mA	-	0.1	0.2	V
T_{awake} (Note1)	Awake time		-	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

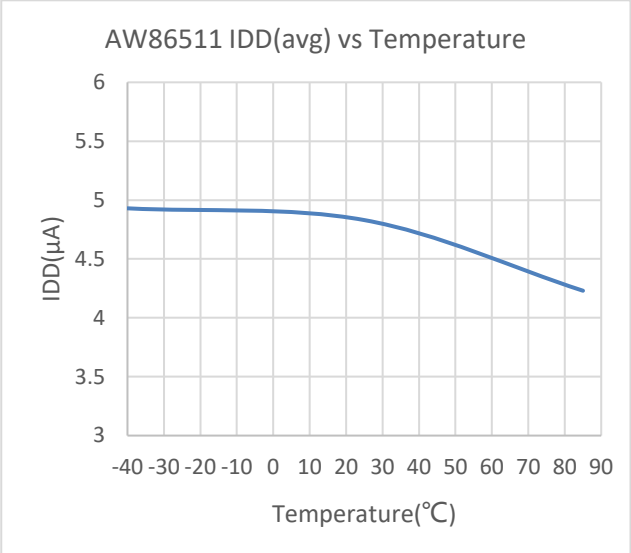
T_A=25ºC, V_{DD}=3.3V for typical values (unless otherwise noted) (1mT = 10Gauss)

Symbol	Characteristics	Test condition	Min	Typ	Max	Unit
Bops (south pole to part marking side)	Operation Point	T_A = 25ºC,V_{DD}=3.3V	14	25	32	Gauss
		T_A = -40ºC to 85ºC V_{DD} =1.6V~5.5V	13	25	39	
Bopn (north pole to part marking side)		T_A = 25ºC,V_{DD}=3.3V	-32	-25	-14	
		T_A = -40ºC to 85ºC V_{DD} =1.6V~5.5V	-39	-25	-13	
Brps (south pole to part marking side)	Release Point	T_A = 25ºC,V_{DD}=3.3V	12	18	30	
		T_A = -40ºC to 85ºC V_{DD} =1.6V~5.5V	9	18	35	
Brpn (north pole to part marking side)		T_A = 25ºC,V_{DD}=3.3V	-30	-18	-12	
		T_A = -40ºC to 85ºC V_{DD} =1.6V~5.5V	-35	-18	-9	
Bhy (|Bopx|-|Brpx|)	Hysteresis	T_A = -40ºC to 85ºC V_{DD} =1.6V~5.5V	-	7	-	

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

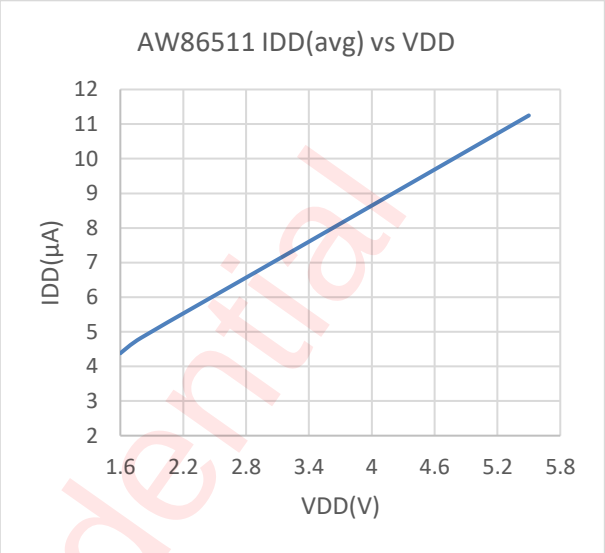
Maximum and minimum parameters values over operating temperature range are not tested in production. They are guaranteed by design, characterization and process control. The magnetic characteristics may vary with supply voltage, operating temperature and after soldering.

Typical Characteristics



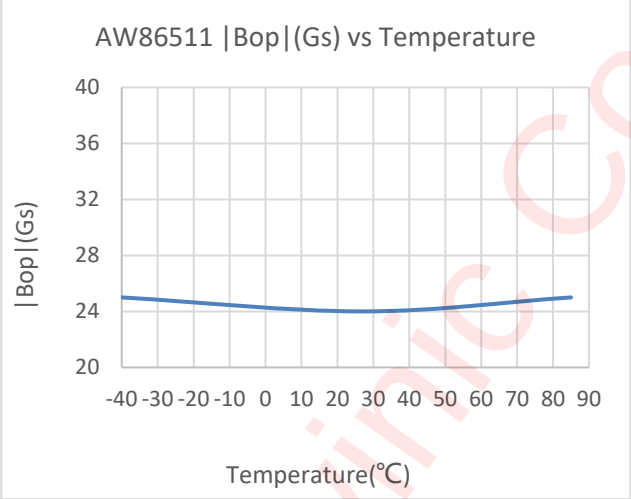
Ambient Temperature Ta[°C] I_{DD} vs. Ta

V_{DD}=1.8V



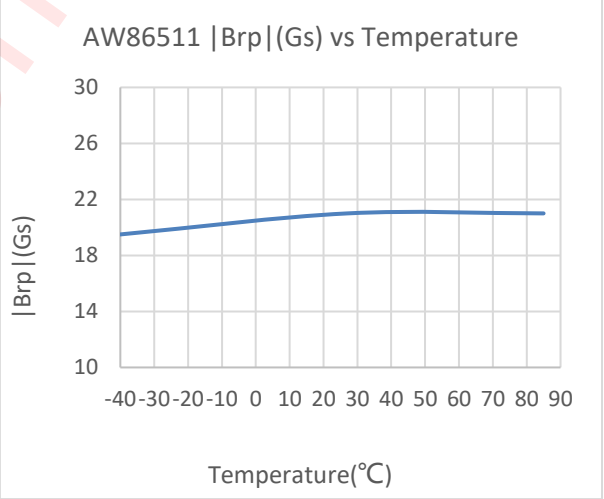
Average Supply Current vs. Supply Voltage

Ta=25°C



Ambient Temperature Ta[°C] |Bop| vs. Ta

VDD=3.3V



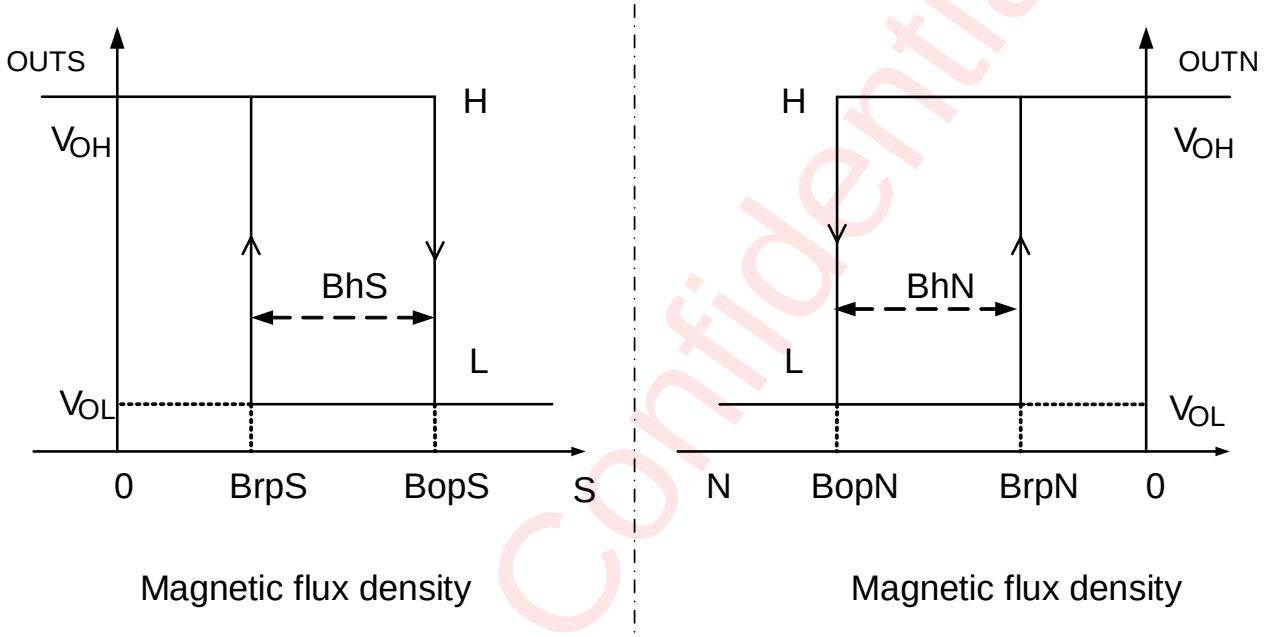
Ambient Temperature Ta[°C] |Brp| vs. Ta

V_{DD}=3.3V

Detailed Functional Description

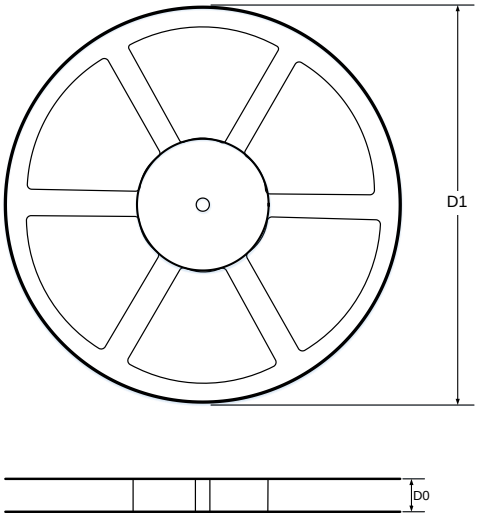
Magnetic Response

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

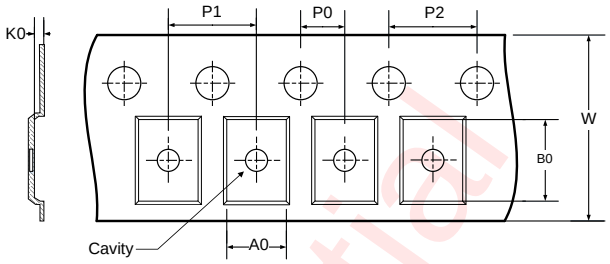


Tape And Reel Information

REEL DIMENSIONS

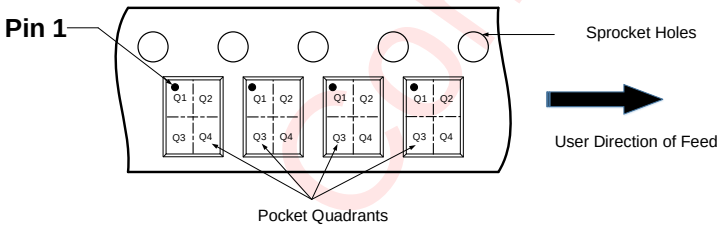


TAPE DIMENSIONS



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



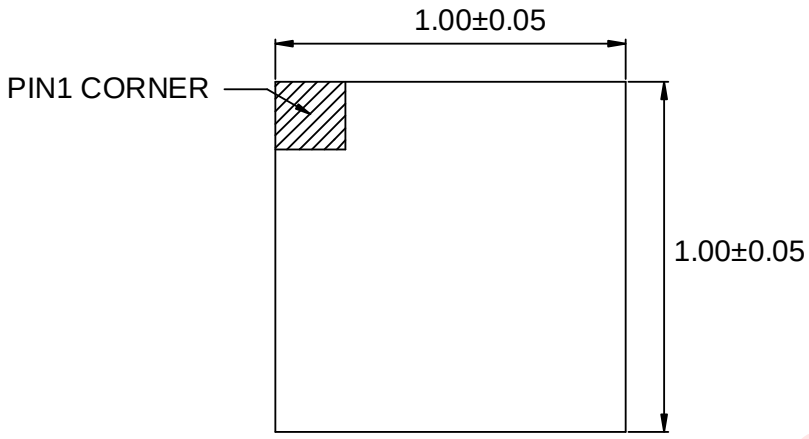
Note：The above picture is for reference only. Please refer to the value in the table below for the actual size

DIMENSIONS AND PIN1 ORIENTATION

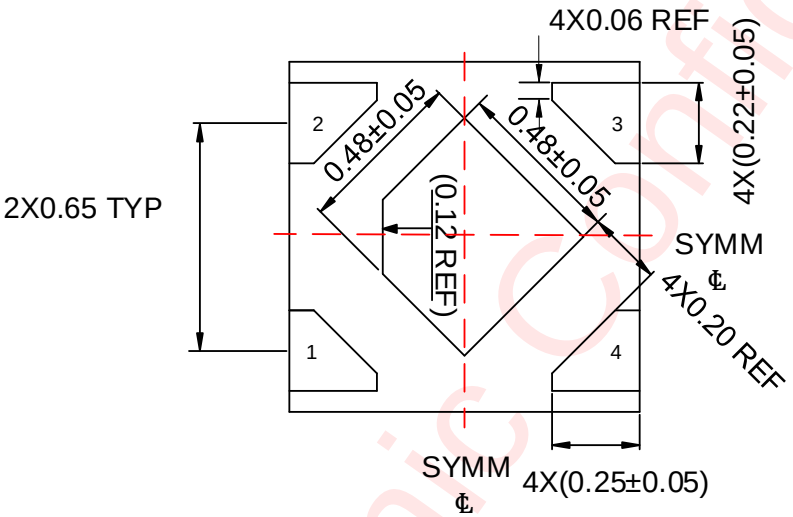
D1 (mm)	D0 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
178	8.4	1.14	1.17	0.56	2	4	4	8	Q1

All dimensions are nominal

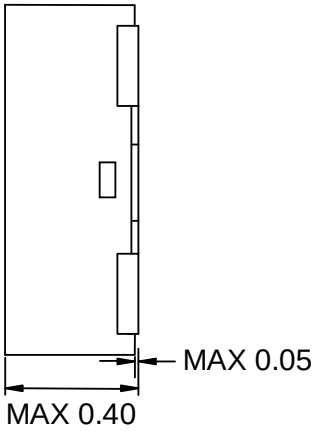
Package Description



Top View



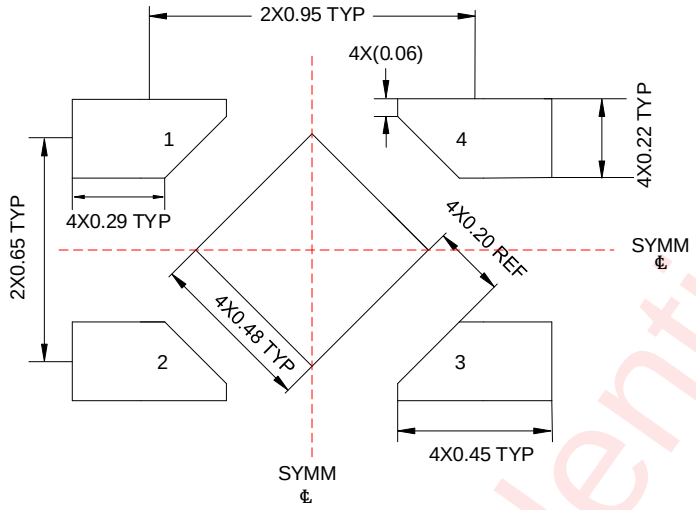
Bottom View

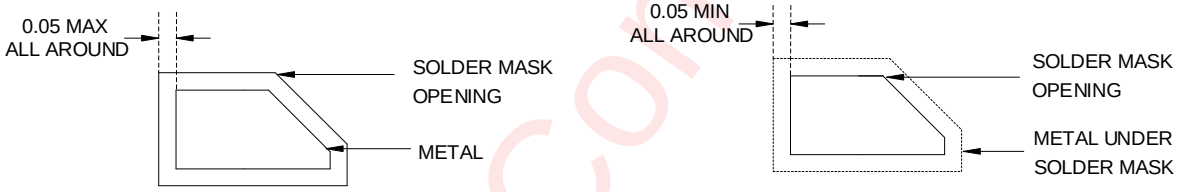


Side View

Unit:mm

Land Pattern Data





NON SOLDER MASK DEFINED

SOLDER MASK DEFINED

UNIT : mm

Revision History

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

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