

High Sensitivity Micropower Unipolar Hall-effect Switch

Features

- High sensitive unipolar operation
- Micropower operation Typ 4.8 μ A
(average : $V_{DD}=1.8V$)
- Ultra small package:
WBDFN 1.4mm \times 1.1mm-4L
- On board voltage regulator for 1.6V to 5.5V range
- Wide operating temperature range:
-40 $^{\circ}$ C to 85 $^{\circ}$ C

Applications

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

General Description

AW86511FDCBDNR is a high-sensitivity micropower unipolar Hall effect switch IC with internal pull up and pull down capability. AW86511FDCBDNR uses a hibernating clocking system to reduce power consumption, which the total power consumption in normal operation is typically 4.8 μ A with a 1.8V power source. Mainly designed for portable devices such as laptop computer, smartphone and bluetooth headset etc. The supply range of AW86511FDCBDNR is 1.6V to 5.5V to support portable equipment.

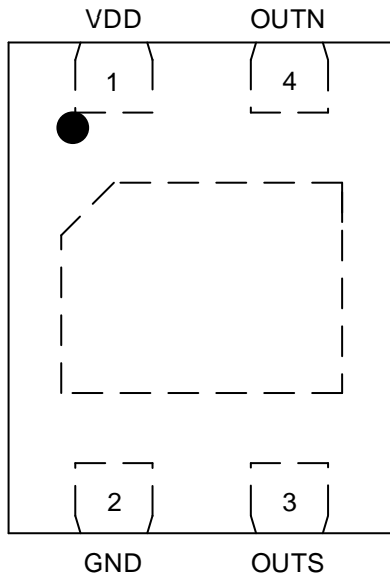
The OUTN is activity with a north pole of sufficient magnetic field strength. When the magnetic flux density perpendicular to the package is large than operate point(BopN) , the output will be turned on (pulled down) and hold until B is lower than release point (BrpN). The OUTS is activity with a south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

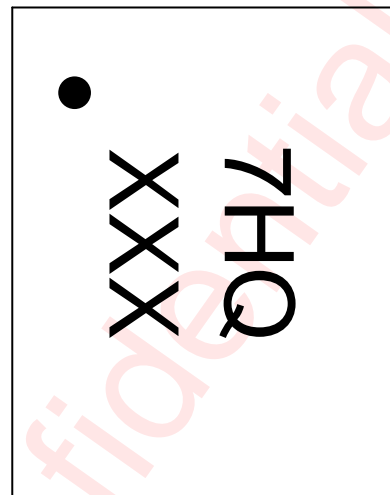


Pin Configuration And Top Mark

AW86511FDCBDNR
(Top View)



AW86511FDCBDNR Marking
(Top View)

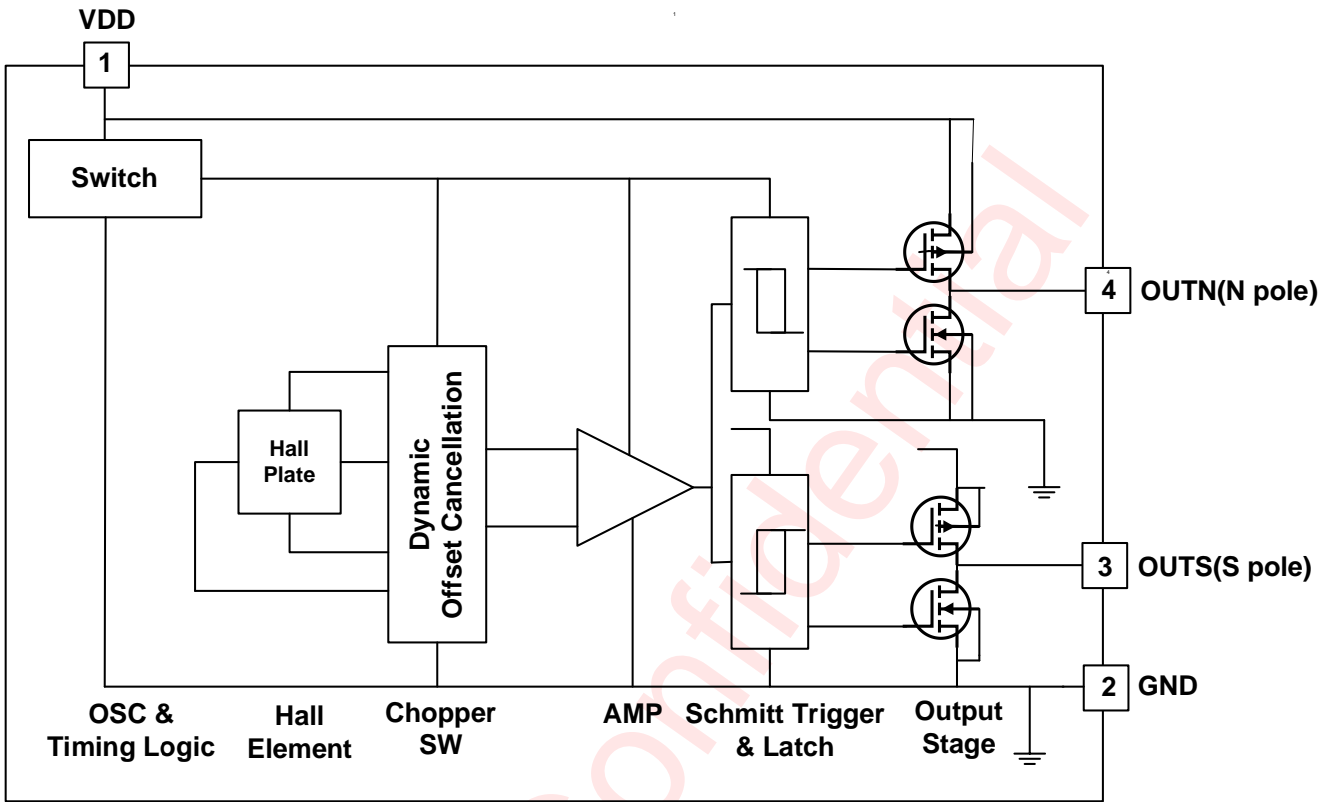


7HQ - AW86511FDCBDNR
XXX - Production Tracing Code

Pin Definition

NO.	Name	Description
1	VDD	Power Supply
2	GND	Ground
3	OUTS	S pole detection output
4	OUTN	N pole detection output
5	Thermal pad	Not Connect

Functional Block Diagram



Ordering Information

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW86511FDCBDNR	-40°C~85°C	WBDFN 1.4mm×1.1mm -4L	7HQ	MSL1	ROHS+HF	4500 units/ Tape and Reel

Absolute Maximum Ratings (NOTE1)

PARAMETERS	RANGE
Supply Voltage	-0.3V to 6V
Supply Current	3mA
Output Voltage	-0.4V to $V_{DD}+0.4V$
Output Current	3mA
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

$V_{DD} = 3.3V$, $T_A = 25^\circ C$ for typical values (unless otherwise noted)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{DD}	Supply Voltage	Operating, $T_J < 165^\circ C$	1.6	-	5.5	V
$I_{DD}(\text{awake})$ (Note1)	Supply Current	During awake period, $T_A = 25^\circ C$, $V_{DD} = 3.3V$	-	0.95	1.3	mA
$I_{DD}(\text{sleep})$		During sleep period, $T_A = 25^\circ C$, $V_{DD} = 3.3V$	-	0.43	0.8	μA
$I_{DD}(\text{avg})$ (Note1)	Average supply current	$T_A = 25^\circ C$, $V_{DD} = 1.8V$, $f_S = 200Hz$	-	4.8	-	μA
		$T_A = 25^\circ C$, $V_{DD} = 3.3V$, $f_S = 200Hz$	-	-	10	μA
V_{OL}	Output low voltage(on)	$I_{OUT} = 1\text{ mA}$	-	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	$f_S = 200Hz$ (sampling rate)	-	5	11	ms
D.C.	Duty cycle	-	-	0.08	-	%
f_C	Chopping Frequency	-	-	500	-	kHz
I_{OFF} (Note1)	Output Leakage Current	$V_{OUT} = 5.5\text{ V}$; 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

$T_A=25^{\circ}\text{C}$, $V_{DD}=3.3\text{V}$ for typical values (unless otherwise noted)

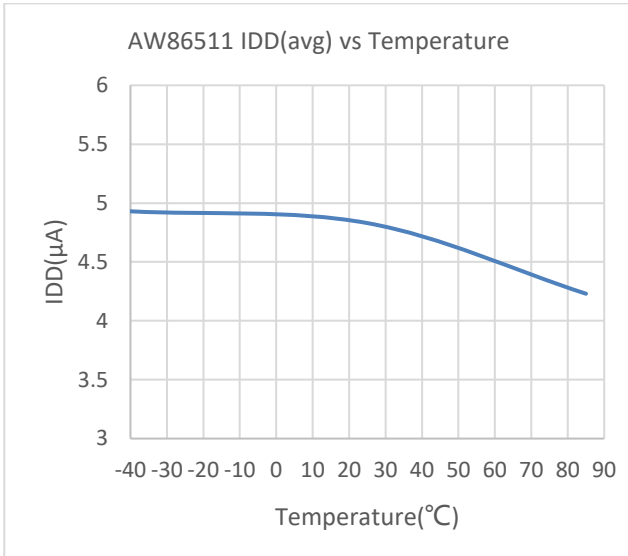
(1mT = 10Gauss)

Symbol	Characteristics	Test condition	Min	Typ	Max	Unit
Bops (south pole to part marking side)	Operation Point	$T_A = 25^{\circ}\text{C}, V_{DD}=3.3\text{V}$	14	25	32	Gauss
		$T_A = -40^{\circ}\text{C to } 85^{\circ}\text{C}$ $V_{DD} = 1.6\text{V}\sim 5.5\text{V}$	13	25	39	
Bopn (north pole to part marking side)		$T_A = 25^{\circ}\text{C}, V_{DD}=3.3\text{V}$	-32	-25	-14	
		$T_A = -40^{\circ}\text{C to } 85^{\circ}\text{C}$ $V_{DD} = 1.6\text{V}\sim 5.5\text{V}$	-39	-25	-13	
Brps (south pole to part marking side)	Release Point	$T_A = 25^{\circ}\text{C}, V_{DD}=3.3\text{V}$	12	18	30	
		$T_A = -40^{\circ}\text{C to } 85^{\circ}\text{C}$ $V_{DD} = 1.6\text{V}\sim 5.5\text{V}$	9	18	35	
Brpn (north pole to part marking side)		$T_A = 25^{\circ}\text{C}, V_{DD}=3.3\text{V}$	-30	-18	-12	
		$T_A = -40^{\circ}\text{C to } 85^{\circ}\text{C}$ $V_{DD} = 1.6\text{V}\sim 5.5\text{V}$	-35	-18	-9	
Bhy ($ B_{opx} - B_{rpx} $)	Hysteresis	$T_A = -40^{\circ}\text{C to } 85^{\circ}\text{C}$ $V_{DD} = 1.6\text{V}\sim 5.5\text{V}$	-	7	-	

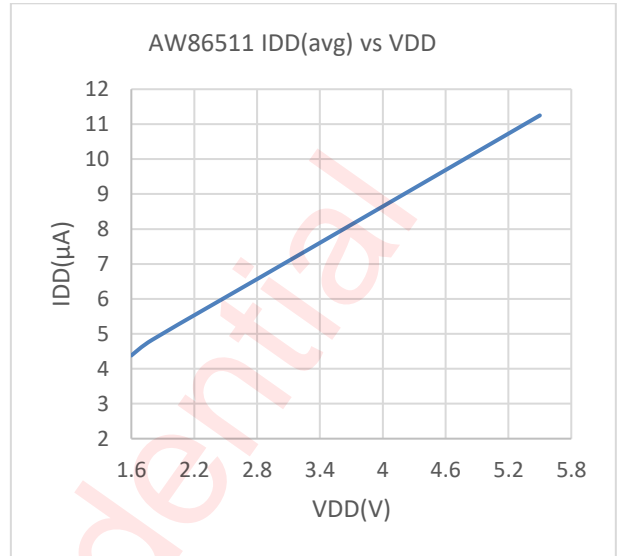
Notes: Typical data is at $T_A=25^{\circ}\text{C}$, $V_{DD}=3.3\text{V}$.

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.

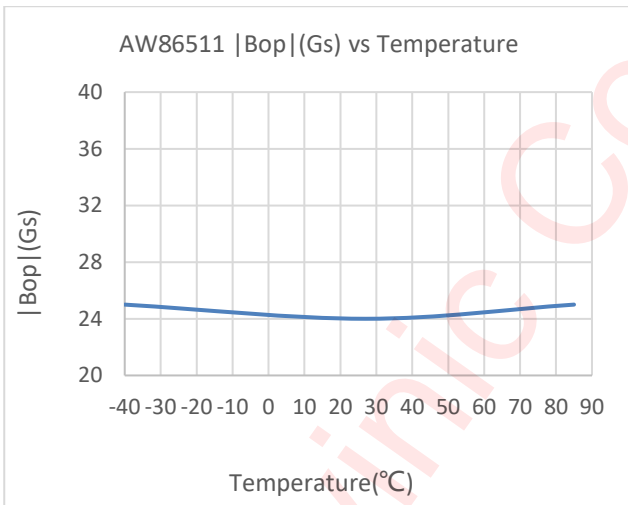
Typical Characteristics



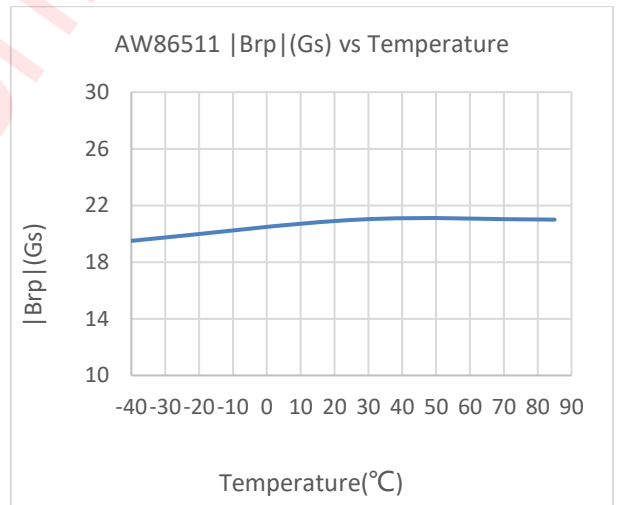
Ambient Temperature T_a [°C] I_{DD} vs. T_a
VDD=1.8V



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



Ambient Temperature T_a [°C] $|B_{op}|$ vs. T_a
VDD=3.3V

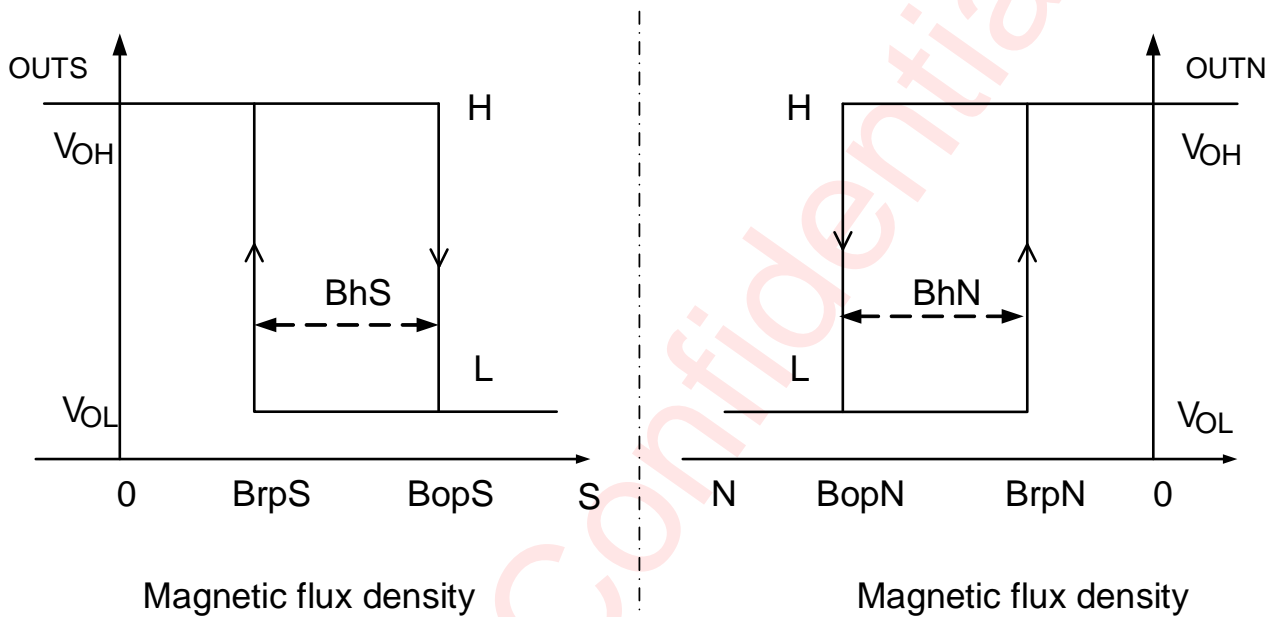


Ambient Temperature T_a [°C] $|B_{rp}|$ vs. T_a
VDD=3.3V

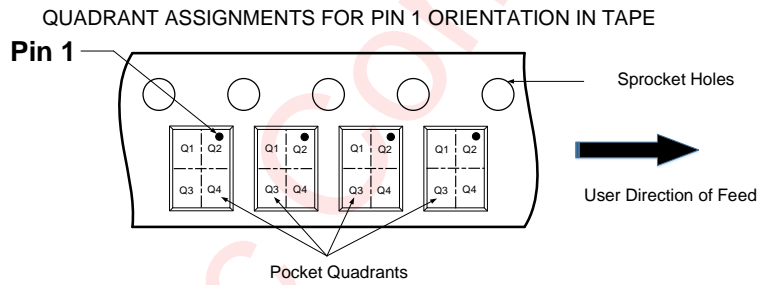
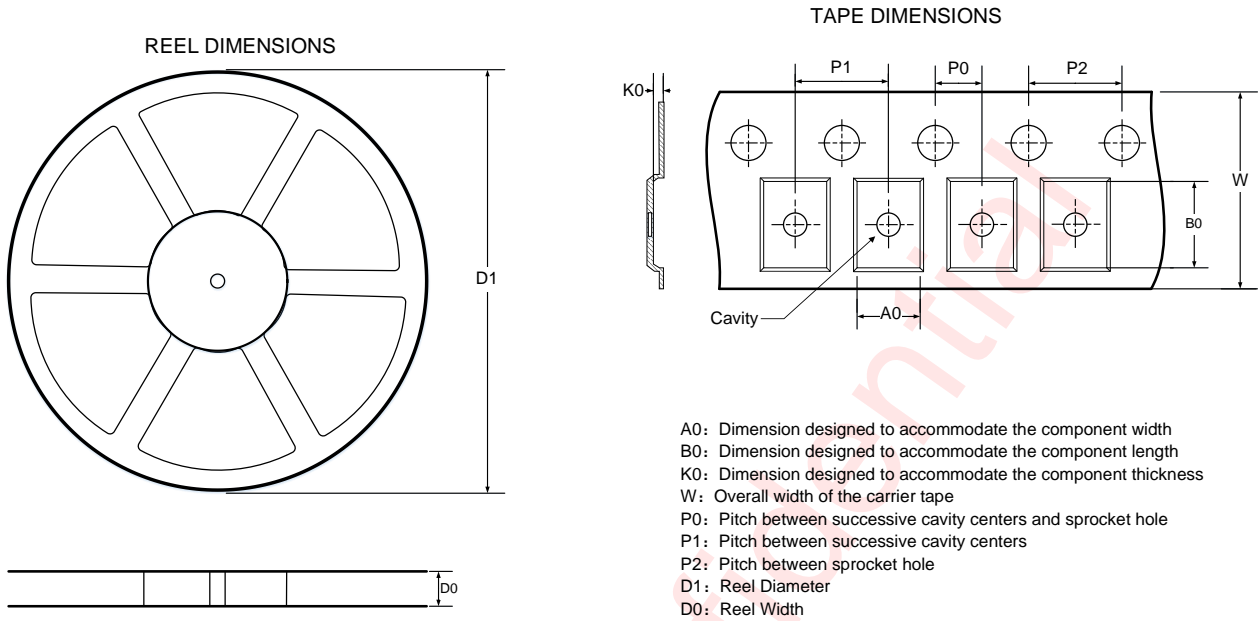
Detailed Functional Description

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 (B_{opN}), the OUTN will be turned on (pulled low) and held until B is lower than release point (B_{rpN}). 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 (B_{opS}), the OUTS will be turned on (pulled low) and held until B is lower than release point (B_{rpS}).



Tape And Reel Information



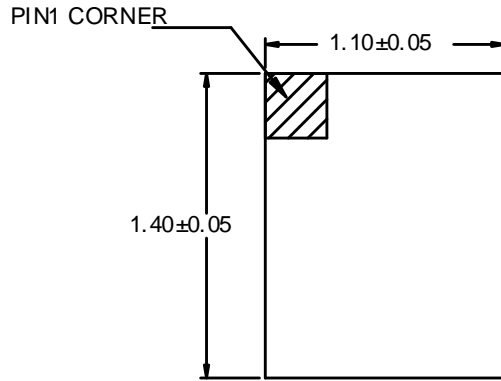
Note: The above picture is for reference only. Please refer to the value in the table below for the actual size

DIMENSIONS AND PIN1 ORIENTATION

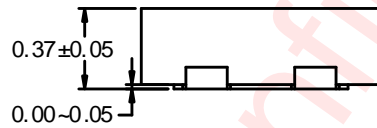
D1 (mm)	D0 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
178	8.4	1.6	1.3	0.5	2	4	4	8	Q2

All dimensions are nominal

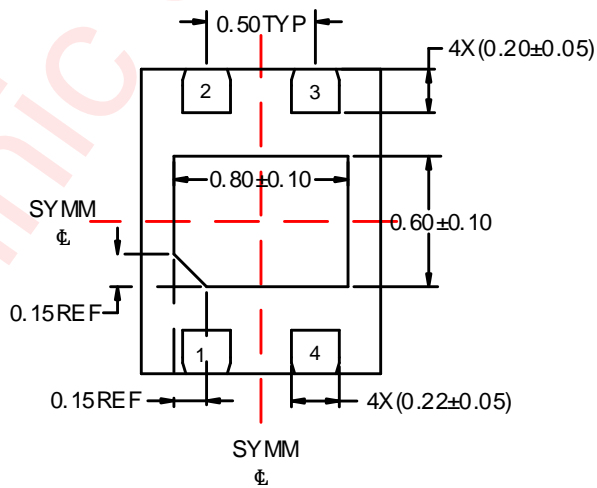
Package Description



Top View



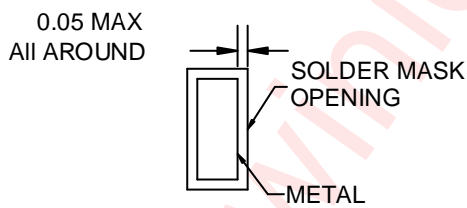
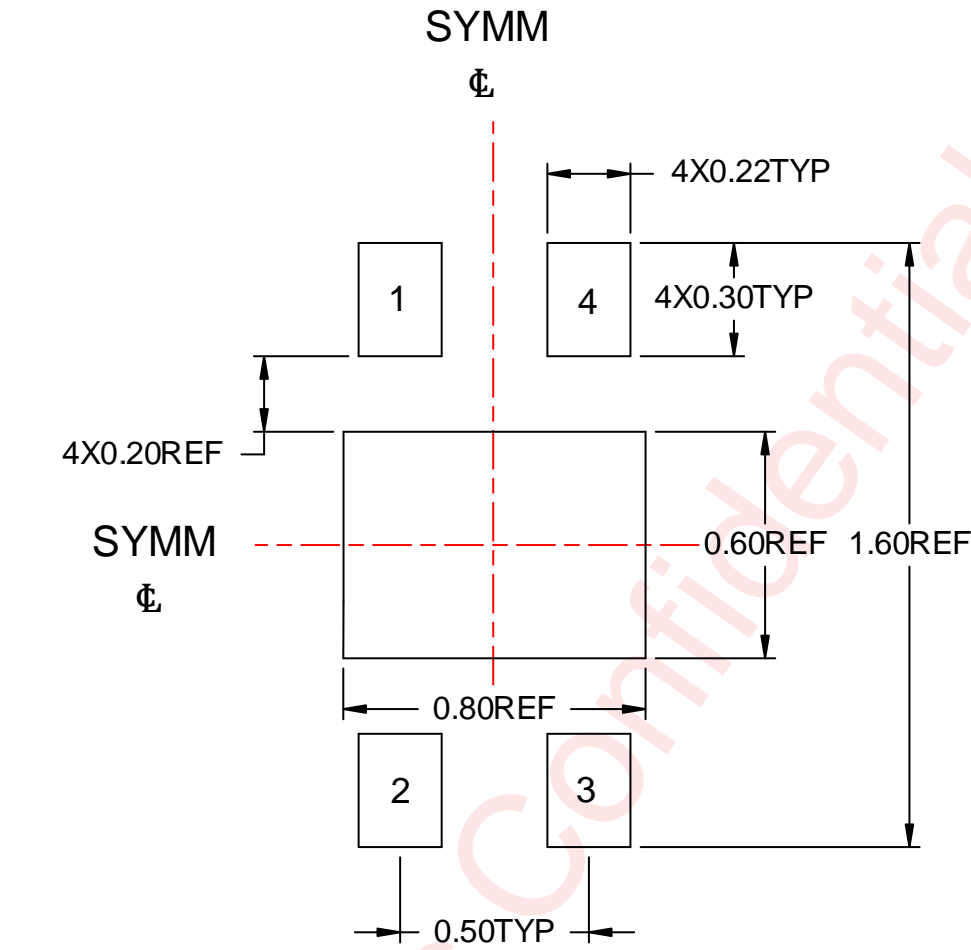
Side View



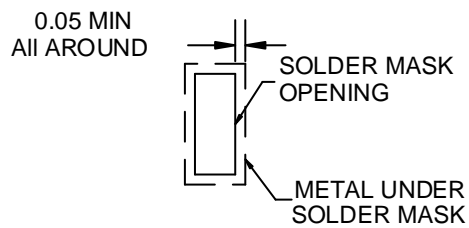
Bottom View

Unit: mm

Land Pattern Data



NON SOLDER MASK DEFINED



SOLDER MASK DEFINED

Unit: mm

Revision History

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

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