

This IC, developed by CMOS technology, is a high-accuracy Hall effect switch IC that operates with high temperature and high-withstand voltage.

The output voltage level changes when this IC detects the intensity level of magnetic flux density. Using this IC with a magnet makes it possible to detect the open / close in various devices.

ABLIC Inc. offers a "magnetic simulation service" that provides the ideal combination of magnets and our Hall effect ICs for customer systems. Our magnetic simulation service will reduce prototype production, development period and development costs. In addition, it will contribute to optimization of parts to realize high cost performance.

For more information regarding our magnetic simulation service, contact our sales representatives.

ABLIC Inc. offers FIT rate calculated based on actual customer usage conditions in order to support customer functional safety design.

For more information regarding our FIT rate calculation, contact our sales representatives.

**Caution** This product can be used in vehicle equipment and in-vehicle equipment. Before using the product for these purposes, it is imperative to contact our sales representatives.

## ■ Features

- Uses a thin (t0.80 mm max.) TSOT-23-3S or ultra-thin (t0.50 mm max.) HSNT-6(2025) package, contributing to the enhancement of the designs of devices
- Contributes to accurate mechanism operation with high-accuracy magnetic characteristics (Refer to "■ Magnetic Characteristics" for details.)
- Suitable for devices which require high quality due to the production system of this IC which certifies automotive application quality
- Contributes to device safe design with a built-in reverse voltage protection circuit and output current limit circuit

## ■ Specifications

- Pole detection: Omnipolar detection
- Output logic\*1: Active "L"  
Active "H"
- Output form\*1: Nch open-drain output  
Nch driver + built-in pull-up resistor (1.2 kΩ typ.)
- Magnetic sensitivity\*1:  $B_{OP} = 3.0$  mT typ.  
 $B_{OP} = 6.0$  mT typ.  
 $B_{OP} = 10.0$  mT typ.  
 $B_{OP} = 15.0$  mT typ.
- Chopping frequency:  $f_C = 500$  kHz typ.
- Output delay time:  $t_D = 16.0$  μs typ.
- Power supply voltage range\*2:  $V_{DD} = 2.7$  V to 26.0 V
- Built-in regulator
- Built-in reverse voltage protection circuit
- Built-in output current limit circuit
- Operation temperature range:  $T_a = -40^\circ\text{C}$  to  $+150^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified\*3

## ■ Applications

- Automobile equipment
- Housing equipment
- Industrial equipment

## ■ Packages

- TSOT-23-3S
- HSNT-6(2025)

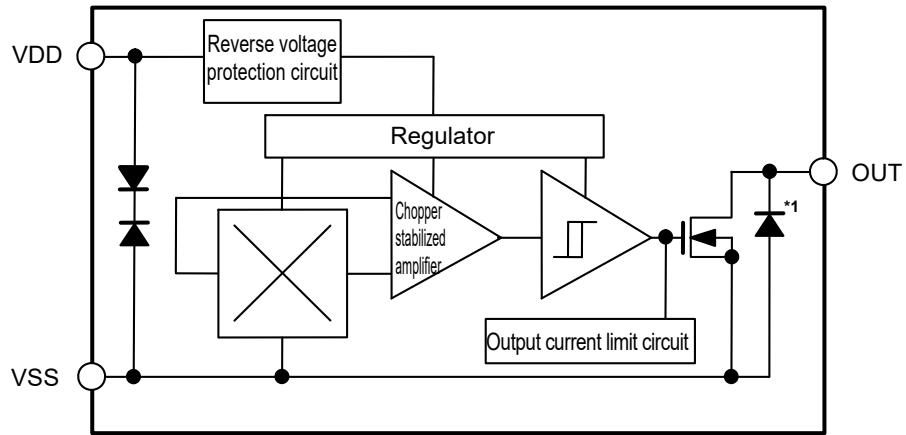
\*1. The option can be selected.

\*2.  $V_{DD} = 2.7$  V to 5.5 V when output form is Nch driver + built-in pull-up resistor (1.2 kΩ typ.)

\*3. Contact our sales representatives for details.

■ **Block Diagrams**

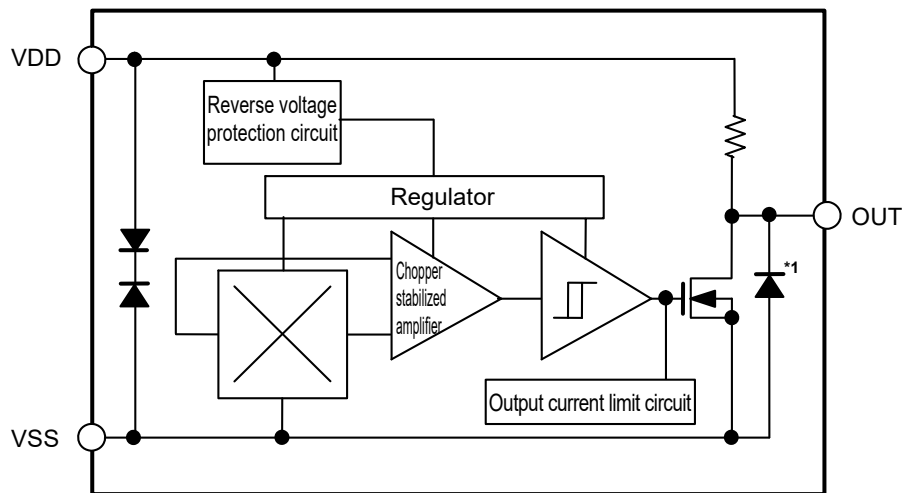
1. **Nch open-drain output product**



\*1. Parasitic diode

**Figure 1**

2. **Nch driver + built-in pull-up resistor product**



\*1. Parasitic diode

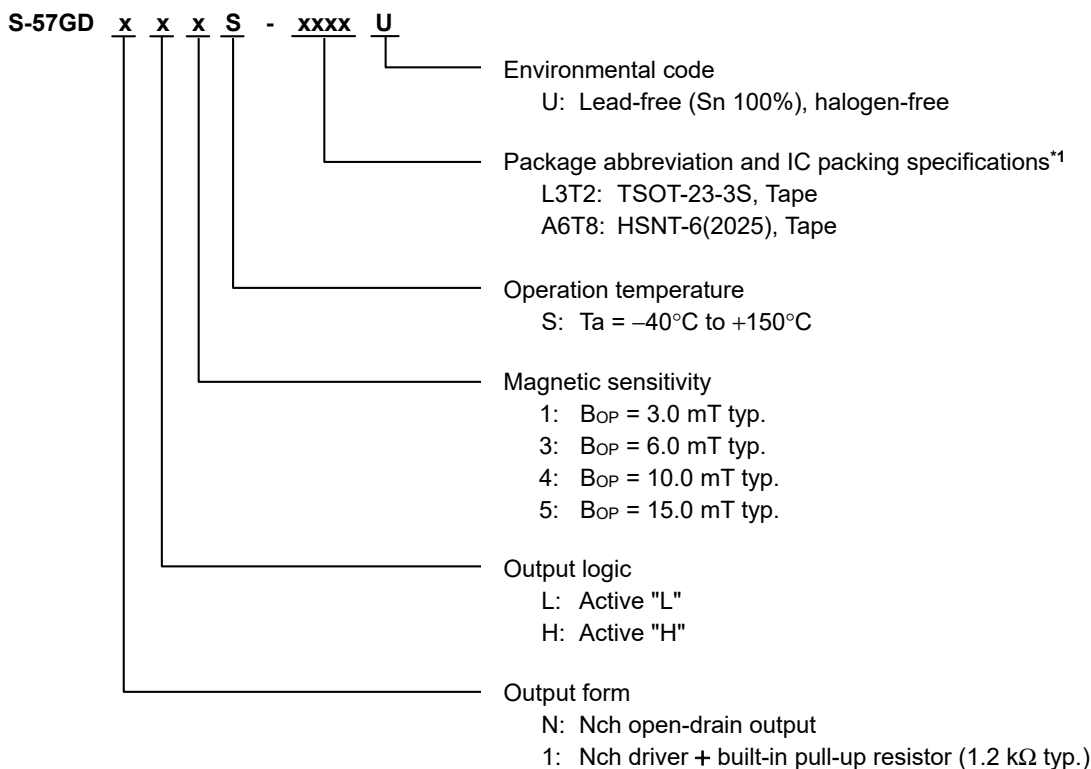
**Figure 2**

## ■ AEC-Q100 Qualified

This IC supports AEC-Q100 for operation temperature grade 0.  
 Contact our sales representatives for details of AEC-Q100 reliability specification.

## ■ Product Name Structure

### 1. Product name



\*1. Refer to the tape drawing.

### 2. Packages

**Table 1 Package Drawing Codes**

Package Name	Dimension	Tape	Reel	Land	Stencil Opening
TSOT-23-3S	MP003-E-P-SD	MP003-E-C-SD	MP003-E-R-SD	-	-
HSNT-6(2025)	PJ006-B-P-SD	PJ006-B-C-SD	PJ006-B-R-SD	PJ006-B-LM-SD	PJ006-B-LM-SD

### 3. Product name list

#### 3.1 TSOT-23-3S

**Table 2**

Product Name	Output Form	Power Supply Voltage Range	Output Logic	Magnetic Sensitivity (B <sub>OP</sub> )
S-57GDNL1S-L3T2U	Nch open-drain output	V <sub>DD</sub> = 2.7 V to 26.0 V	Active "L"	3.0 mT typ.
S-57GDNL3S-L3T2U	Nch open-drain output	V <sub>DD</sub> = 2.7 V to 26.0 V	Active "L"	6.0 mT typ.
S-57GDNL5S-L3T2U	Nch open-drain output	V <sub>DD</sub> = 2.7 V to 26.0 V	Active "L"	15.0 mT typ.

**Remark** Please contact our sales representatives for products other than the above.

#### 3.2 HSNT-6(2025)

**Table 3**

Product Name	Output Form	Power Supply Voltage Range	Output Logic	Magnetic Sensitivity (B <sub>OP</sub> )
S-57GDNL1S-A6T8U	Nch open-drain output	V <sub>DD</sub> = 2.7 V to 26.0 V	Active "L"	3.0 mT typ.
S-57GDNL3S-A6T8U	Nch open-drain output	V <sub>DD</sub> = 2.7 V to 26.0 V	Active "L"	6.0 mT typ.
S-57GDNL5S-A6T8U	Nch open-drain output	V <sub>DD</sub> = 2.7 V to 26.0 V	Active "L"	15.0 mT typ.

**Remark** Please contact our sales representatives for products other than the above.

## ■ Pin Configurations

### 1. TSOT-23-3S

Top view

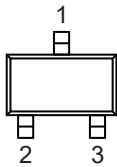


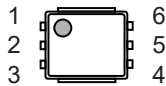
Figure 3

Table 4

Pin No.	Symbol	Description
1	VSS	GND pin
2	VDD	Power supply pin
3	OUT	Output pin

### 2. HSNT-6(2025)

Top view



Bottom view

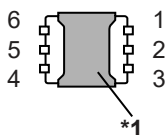


Figure 4

Table5

Pin No.	Symbol	Description
1	VDD	Power supply pin
2	NC*2	No connection
3	OUT	Output pin
4	NC*2	No connection
5	VSS	GND pin
6	NC*2	No connection

\*1. Connect the heatsink of backside at shadowed area to the board, and set electric potential open or GND. However, do not use it as the function of electrode.

\*2. The NC pin is electrically open.  
 The NC pin can be connected to the VDD pin or the VSS pin.

■ **Absolute Maximum Ratings**

Table 6

Item		Symbol	Absolute Maximum Rating	Unit
Power supply voltage	Nch open-drain output product	V <sub>DD</sub>	V <sub>SS</sub> – 28.0 to V <sub>SS</sub> + 28.0	V
	Nch driver + built-in pull-up resistor (1.2 kΩ typ.) product		V <sub>SS</sub> – 9.0 to V <sub>SS</sub> + 9.0	V
Power supply current		I <sub>DD</sub>	±10	mA
Output current		I <sub>OUT</sub>	±10	mA
Output voltage	Nch open-drain output product	V <sub>OUT</sub>	V <sub>SS</sub> – 0.3 to V <sub>SS</sub> + 28.0	V
	Nch driver + built-in pull-up resistor (1.2 kΩ typ.) product		V <sub>SS</sub> – 0.3 to V <sub>DD</sub> + 0.3	V
Junction temperature		T <sub>j</sub>	–40 to +170	°C
Operation ambient temperature		T <sub>opr</sub>	–40 to +150	°C
Storage temperature		T <sub>stg</sub>	–40 to +170	°C

**Caution** The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

■ **Thermal Resistance Value**

Table 7

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Junction-to-ambient thermal resistance*1	θ <sub>JA</sub>	TSOT-23-3S	Board A	–	225	–	°C/W
			Board B	–	190	–	°C/W
			Board C	–	–	–	°C/W
			Board D	–	–	–	°C/W
			Board E	–	–	–	°C/W
		HSNT-6(2025)	Board A	–	180	–	°C/W
			Board B	–	128	–	°C/W
			Board C	–	43	–	°C/W
			Board D	–	44	–	°C/W
			Board E	–	36	–	°C/W

\*1. Test environment: compliance with JEDEC STANDARD JESD51-2A

**Remark** Refer to "■ Power Dissipation" and "Test Board" for details.

## ■ Electrical Characteristics

### 1. Nch open-drain output product

Table 8

(Ta = -40°C to +150°C, V<sub>DD</sub> = 2.7 V to 26.0 V, V<sub>SS</sub> = 0 V unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.*1	Max.	Unit	Test Circuit
Power supply voltage	V <sub>DD</sub>	–	2.7	12.0	26.0	V	–
Current consumption	I <sub>DD</sub>	–	–	4.0	4.5	mA	1
Current consumption during reverse connection	I <sub>DDREV</sub>	V <sub>DD</sub> = -26.0 V	-0.1	–	–	mA	1
Low level output voltage	V <sub>OL</sub>	I <sub>OUT</sub> = 5 mA, V <sub>OUT</sub> = "L"	–	–	0.4	V	2
Leakage current	I <sub>LEAK</sub>	V <sub>OUT</sub> = "H"	–	–	10	μA	3
Output limit current	I <sub>OM</sub>	V <sub>OUT</sub> = 12.0 V	11	–	35	mA	3
Output delay time*2	t <sub>D</sub>	–	–	16	32	μs	–
Chopping frequency*2	f <sub>C</sub>	–	250	500	–	kHz	–
Start up time*2	t <sub>PON</sub>	–	–	25	40	μs	4
Output rise time*2	t <sub>R</sub>	C = 20 pF, R = 820 Ω	–	–	1.0	μs	5
Output fall time*2	t <sub>F</sub>	C = 20 pF, R = 820 Ω	–	–	1.0	μs	5

\*1. Typ. value when Ta = +25°C, V<sub>DD</sub> = 12.0 V.

\*2. This item is guaranteed by design.

### 2. Nch driver + built-in pull-up resistor (1.2 kΩ typ.) product

Table 9

(Ta = -40°C to +150°C, V<sub>DD</sub> = 2.7 V to 5.5 V, V<sub>SS</sub> = 0 V unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.*1	Max.	Unit	Test Circuit
Power supply voltage	V <sub>DD</sub>	–	2.7	5.0	5.5	V	–
Current consumption	I <sub>DD</sub>	V <sub>OUT</sub> = "H"	–	4.0	4.5	mA	1
Low level output voltage	V <sub>OL</sub>	I <sub>OUT</sub> = 0 mA, V <sub>OUT</sub> = "L"	–	–	0.4	V	2
High level output voltage	V <sub>OH</sub>	I <sub>OUT</sub> = 0 mA, V <sub>OUT</sub> = "H"	V <sub>DD</sub> × 0.9	–	–	V	2
Output limit current	I <sub>OM</sub>	V <sub>DD</sub> = V <sub>OUT</sub> = 5.0 V	11	–	35	mA	3
Output delay time*2	t <sub>D</sub>	–	–	16	32	μs	–
Chopping frequency*2	f <sub>C</sub>	–	250	500	–	kHz	–
Start up time*2	t <sub>PON</sub>	–	–	25	40	μs	4
Output rise time*2	t <sub>R</sub>	C = 20 pF	–	–	1.0	μs	5
Output fall time*2	t <sub>F</sub>	C = 20 pF	–	–	1.0	μs	5
Pull-up resistor	R <sub>L</sub>	–	0.9	1.2	1.5	kΩ	–

\*1. Typ. value when Ta = +25°C, V<sub>DD</sub> = 5.0 V.

\*2. This item is guaranteed by design.

**Caution** Due to limitation of the power dissipation, these values may not be satisfied. Attention should be paid to the power dissipation when using in high temperature operation environments.

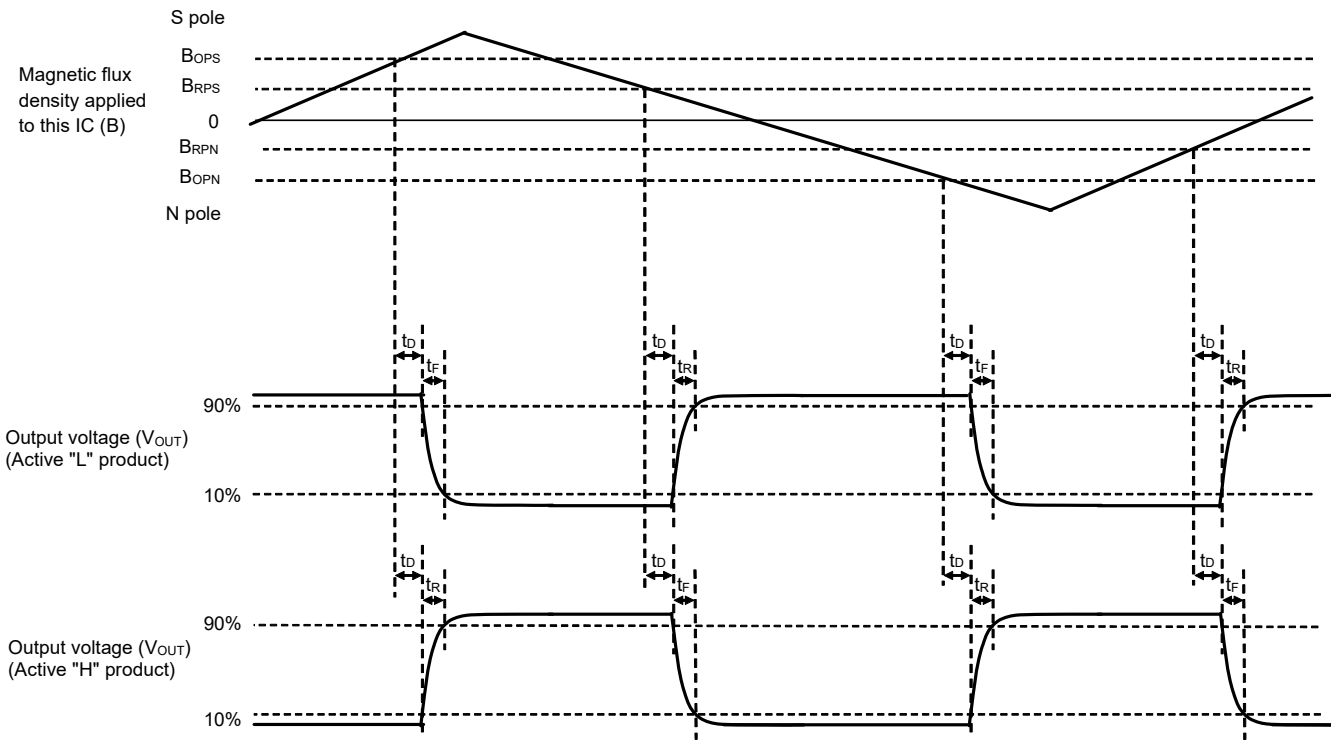


Figure 5 Operation Timing



■ Magnetic Characteristics

1. TSOT-23-3S

1.1 Product with  $B_{OP} = 3.0 \text{ mT typ.}$

1.1.1  $T_a = +25^\circ\text{C}$

Table 10

( $V_{DD} = 5.0 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	$B_{OPS}$	-	2.0	3.0	4.3	mT	4
	N pole	$B_{OPN}$	-	-4.3	-3.0	-2.0	mT	4
Release point*2	S pole	$B_{RPS}$	-	1.2	2.2	3.2	mT	4
	N pole	$B_{RPN}$	-	-3.2	-2.2	-1.2	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	-	0.8	-	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	-	0.8	-	mT	4

1.1.2  $T_a = -40^\circ\text{C to } +150^\circ\text{C}^4$

Table 11

( $V_{DD} = 2.7 \text{ V to } 26.0 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	$B_{OPS}$	-	1.5	3.0	6.0	mT	4
	N pole	$B_{OPN}$	-	-6.0	-3.0	-1.5	mT	4
Release point*2	S pole	$B_{RPS}$	-	0.5	2.2	4.5	mT	4
	N pole	$B_{RPN}$	-	-4.5	-2.2	-0.5	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	-	0.8	-	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	-	0.8	-	mT	4

1.2 Product with  $B_{OP} = 6.0 \text{ mT typ.}$

1.2.1  $T_a = +25^\circ\text{C}$

Table 12

( $V_{DD} = 5.0 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	$B_{OPS}$	-	4.0	6.0	8.0	mT	4
	N pole	$B_{OPN}$	-	-8.0	-6.0	-4.0	mT	4
Release point*2	S pole	$B_{RPS}$	-	3.0	4.5	6.0	mT	4
	N pole	$B_{RPN}$	-	-6.0	-4.5	-3.0	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	-	1.5	-	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	-	1.5	-	mT	4

1.2.2  $T_a = -40^\circ\text{C to } +150^\circ\text{C}^4$

Table 13

( $V_{DD} = 2.7 \text{ V to } 26.0 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	$B_{OPS}$	-	3.0	6.0	9.0	mT	4
	N pole	$B_{OPN}$	-	-9.0	-6.0	-3.0	mT	4
Release point*2	S pole	$B_{RPS}$	-	2.0	4.5	7.0	mT	4
	N pole	$B_{RPN}$	-	-7.0	-4.5	-2.0	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	-	1.5	-	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	-	1.5	-	mT	4

**1.3 Product with  $B_{OP} = 10.0$  mT typ.**

**1.3.1  $T_a = +25^\circ\text{C}$**

**Table 14**

( $V_{DD} = 5.0$  V,  $V_{SS} = 0$  V unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	$B_{OPS}$	–	7.2	10.0	12.6	mT	4
	N pole	$B_{OPN}$	–	-12.6	-10.0	-7.2	mT	4
Release point*2	S pole	$B_{RPS}$	–	5.2	7.5	9.8	mT	4
	N pole	$B_{RPN}$	–	-9.8	-7.5	-5.2	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	–	2.5	–	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	–	2.5	–	mT	4

**1.3.2  $T_a = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ \*4**

**Table 15**

( $V_{DD} = 2.7$  V to 26.0 V,  $V_{SS} = 0$  V unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	$B_{OPS}$	–	5.6	10.0	13.8	mT	4
	N pole	$B_{OPN}$	–	-13.8	-10.0	-5.6	mT	4
Release point*2	S pole	$B_{RPS}$	–	4.0	7.5	10.8	mT	4
	N pole	$B_{RPN}$	–	-10.8	-7.5	-4.0	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	–	2.5	–	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	–	2.5	–	mT	4

**1.4 Product with  $B_{OP} = 15.0$  mT typ.**

**1.4.1  $T_a = +25^\circ\text{C}$**

**Table 16**

( $V_{DD} = 5.0$  V,  $V_{SS} = 0$  V unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	$B_{OPS}$	–	11.2	15.0	19.2	mT	4
	N pole	$B_{OPN}$	–	-19.2	-15.0	-11.2	mT	4
Release point*2	S pole	$B_{RPS}$	–	8.4	12.0	15.0	mT	4
	N pole	$B_{RPN}$	–	-15.0	-12.0	-8.4	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	–	3.0	–	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	–	3.0	–	mT	4

**1.4.2  $T_a = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ \*4**

**Table 17**

( $V_{DD} = 2.7$  V to 26.0 V,  $V_{SS} = 0$  V unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	$B_{OPS}$	–	8.8	15.0	21.4	mT	4
	N pole	$B_{OPN}$	–	-21.4	-15.0	-8.8	mT	4
Release point*2	S pole	$B_{RPS}$	–	6.8	12.0	16.8	mT	4
	N pole	$B_{RPN}$	–	-16.8	-12.0	-6.8	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	–	3.0	–	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	–	3.0	–	mT	4

## 2. HSNT-6(2025)

### 2.1 Product with $B_{OP} = 3.0 \text{ mT}$ typ.

#### 2.1.1 $T_a = +25^\circ\text{C}$

**Table 18**

( $V_{DD} = 5.0 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit
Operation point*1	S pole	$B_{OPS}$	–	1.7	3.0	4.7	mT	4
	N pole	$B_{OPN}$	–	–4.7	–3.0	–1.7	mT	4
Release point*2	S pole	$B_{RPS}$	–	0.7	2.2	3.6	mT	4
	N pole	$B_{RPN}$	–	–3.6	–2.2	–0.7	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	–	0.8	–	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	–	0.8	–	mT	4

#### 2.1.2 $T_a = -40^\circ\text{C}$ to $+150^\circ\text{C}$ \*4

**Table 19**

( $V_{DD} = 2.7 \text{ V}$  to  $26.0 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit
Operation point*1	S pole	$B_{OPS}$	–	1.0	3.0	6.2	mT	4
	N pole	$B_{OPN}$	–	–6.2	–3.0	–1.0	mT	4
Release point*2	S pole	$B_{RPS}$	–	0.2	2.2	5.0	mT	4
	N pole	$B_{RPN}$	–	–5.0	–2.2	–0.2	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	–	0.8	–	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	–	0.8	–	mT	4

### 2.2 Product with $B_{OP} = 6.0 \text{ mT}$ typ.

#### 2.2.1 $T_a = +25^\circ\text{C}$

**Table 20**

( $V_{DD} = 5.0 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit
Operation point*1	S pole	$B_{OPS}$	–	3.7	6.0	8.3	mT	4
	N pole	$B_{OPN}$	–	–8.3	–6.0	–3.7	mT	4
Release point*2	S pole	$B_{RPS}$	–	2.5	4.5	6.5	mT	4
	N pole	$B_{RPN}$	–	–6.5	–4.5	–2.5	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	–	1.5	–	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	–	1.5	–	mT	4

#### 2.2.2 $T_a = -40^\circ\text{C}$ to $+150^\circ\text{C}$ \*4

**Table 21**

( $V_{DD} = 2.7 \text{ V}$  to  $26.0 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit
Operation point*1	S pole	$B_{OPS}$	–	2.9	6.0	9.1	mT	4
	N pole	$B_{OPN}$	–	–9.1	–6.0	–2.9	mT	4
Release point*2	S pole	$B_{RPS}$	–	1.7	4.5	7.3	mT	4
	N pole	$B_{RPN}$	–	–7.3	–4.5	–1.7	mT	4
Hysteresis width*3	S pole	$B_{HYSS}$	$B_{HYSS} = B_{OPS} - B_{RPS}$	–	1.5	–	mT	4
	N pole	$B_{HYSN}$	$B_{HYSN} =  B_{OPN} - B_{RPN} $	–	1.5	–	mT	4

**2.3 Product with B<sub>OP</sub> = 10.0 mT typ.**

**2.3.1 Ta = +25°C**

**Table 22**

(V<sub>DD</sub> = 5.0 V, V<sub>SS</sub> = 0 V unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	B <sub>OPS</sub>	–	7.4	10.0	13.1	mT	4
	N pole	B <sub>OPN</sub>	–	–13.1	–10.0	–7.4	mT	4
Release point*2	S pole	B <sub>RPS</sub>	–	5.1	7.5	10.1	mT	4
	N pole	B <sub>RPN</sub>	–	–10.1	–7.5	–5.1	mT	4
Hysteresis width*3	S pole	B <sub>HYSS</sub>	B <sub>HYSS</sub> = B <sub>OPS</sub> – B <sub>RPS</sub>	–	2.5	–	mT	4
	N pole	B <sub>HYSN</sub>	B <sub>HYSN</sub> =  B <sub>OPN</sub> – B <sub>RPN</sub>	–	2.5	–	mT	4

**2.3.2 Ta = –40°C to +150°C\*4**

**Table 23**

(V<sub>DD</sub> = 2.7 V to 26.0 V, V<sub>SS</sub> = 0 V unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	B <sub>OPS</sub>	–	3.8	10.0	16.1	mT	4
	N pole	B <sub>OPN</sub>	–	–16.1	–10.0	–3.8	mT	4
Release point*2	S pole	B <sub>RPS</sub>	–	2.7	7.5	12.5	mT	4
	N pole	B <sub>RPN</sub>	–	–12.5	–7.5	–2.7	mT	4
Hysteresis width*3	S pole	B <sub>HYSS</sub>	B <sub>HYSS</sub> = B <sub>OPS</sub> – B <sub>RPS</sub>	–	2.5	–	mT	4
	N pole	B <sub>HYSN</sub>	B <sub>HYSN</sub> =  B <sub>OPN</sub> – B <sub>RPN</sub>	–	2.5	–	mT	4

**2.4 Product with B<sub>OP</sub> = 15.0 mT typ.**

**2.4.1 Ta = +25°C**

**Table 24**

(V<sub>DD</sub> = 5.0 V, V<sub>SS</sub> = 0 V unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	B <sub>OPS</sub>	–	10.6	15.0	19.9	mT	4
	N pole	B <sub>OPN</sub>	–	–19.9	–15.0	–10.6	mT	4
Release point*2	S pole	B <sub>RPS</sub>	–	8.1	12.0	15.8	mT	4
	N pole	B <sub>RPN</sub>	–	–15.8	–12.0	–8.1	mT	4
Hysteresis width*3	S pole	B <sub>HYSS</sub>	B <sub>HYSS</sub> = B <sub>OPS</sub> – B <sub>RPS</sub>	–	3.0	–	mT	4
	N pole	B <sub>HYSN</sub>	B <sub>HYSN</sub> =  B <sub>OPN</sub> – B <sub>RPN</sub>	–	3.0	–	mT	4

**2.4.2 Ta = –40°C to +150°C\*4**

**Table 25**

(V<sub>DD</sub> = 2.7 V to 26.0 V, V<sub>SS</sub> = 0 V unless otherwise specified)

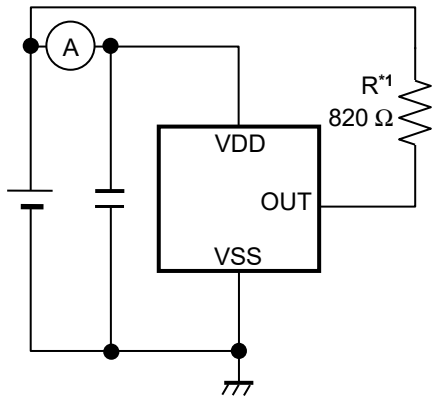
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Operation point*1	S pole	B <sub>OPS</sub>	–	6.4	15.0	23.5	mT	4
	N pole	B <sub>OPN</sub>	–	–23.5	–15.0	–6.4	mT	4
Release point*2	S pole	B <sub>RPS</sub>	–	4.6	12.0	19.6	mT	4
	N pole	B <sub>RPN</sub>	–	–19.6	–12.0	–4.6	mT	4
Hysteresis width*3	S pole	B <sub>HYSS</sub>	B <sub>HYSS</sub> = B <sub>OPS</sub> – B <sub>RPS</sub>	–	3.0	–	mT	4
	N pole	B <sub>HYSN</sub>	B <sub>HYSN</sub> =  B <sub>OPN</sub> – B <sub>RPN</sub>	–	3.0	–	mT	4

- \*1. B<sub>OPN</sub>, B<sub>OPS</sub>: Operation points  
B<sub>OPN</sub> and B<sub>OPS</sub> are the values of magnetic flux density when the output voltage (V<sub>OUT</sub>) changes after the magnetic flux density applied to this IC by the magnet (N pole or S pole) is increased (by moving the magnet closer).  
Even when the magnetic flux density exceeds B<sub>OPN</sub> or B<sub>OPS</sub>, V<sub>OUT</sub> retains the status.
- \*2. B<sub>RPN</sub>, B<sub>RPS</sub>: Release points  
B<sub>RPN</sub> and B<sub>RPS</sub> are the values of magnetic flux density when the output voltage (V<sub>OUT</sub>) changes after the magnetic flux density applied to this IC by the magnet (N pole or S pole) is decreased (the magnet is moved further away).  
Even when the magnetic flux density falls below B<sub>RPN</sub> or B<sub>RPS</sub>, V<sub>OUT</sub> retains the status.
- \*3. B<sub>HYSN</sub>, B<sub>HYS</sub>: Hysteresis widths  
B<sub>HYSN</sub> and B<sub>HYS</sub> are the difference between B<sub>OPN</sub> and B<sub>RPN</sub>, and B<sub>OPS</sub> and B<sub>RPS</sub>, respectively.
- \*4. This item is guaranteed by design.

**Caution** Due to limitation of the power dissipation, these values may not be satisfied. Attention should be paid to the power dissipation when using in high temperature operation environments.

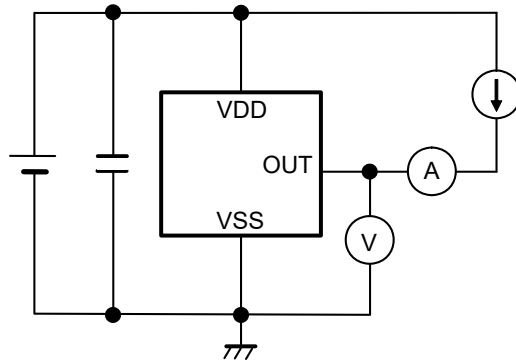
**Remark** The unit of magnetic density mT can be converted by using the formula 1 mT = 10 Gauss.

■ Test Circuits

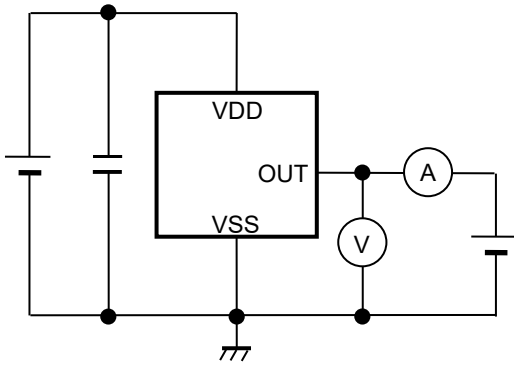


\*1. Resistor (R) is unnecessary for Nch driver + built-in pull-up resistor product.

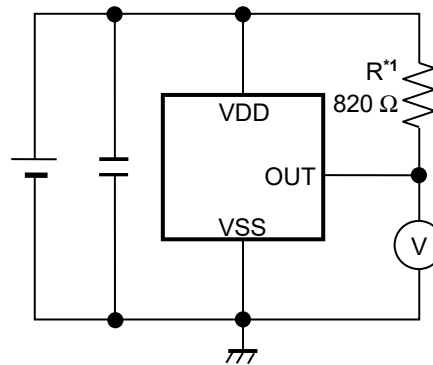
**Figure 6 Test Circuit 1**



**Figure 7 Test Circuit 2**

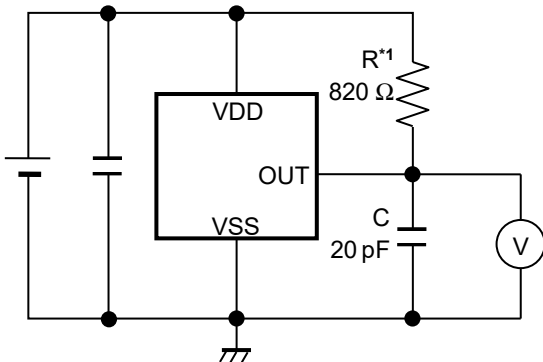


**Figure 8 Test Circuit 3**



\*1. Resistor (R) is unnecessary for Nch driver + built-in pull-up resistor product.

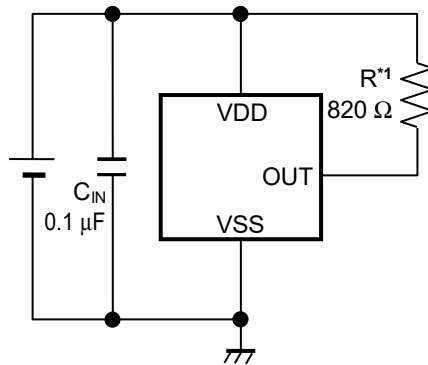
**Figure 9 Test Circuit 4**



\*1. Resistor (R) is unnecessary for Nch driver + built-in pull-up resistor product.

**Figure 10 Test Circuit 5**

■ Standard Circuit



\*1. Resistor (R) is unnecessary for Nch driver + built-in pull-up resistor product.

Figure 11

**Caution** The above connection diagram and constants will not guarantee successful operation. Perform thorough evaluation using the actual application to set the constants.

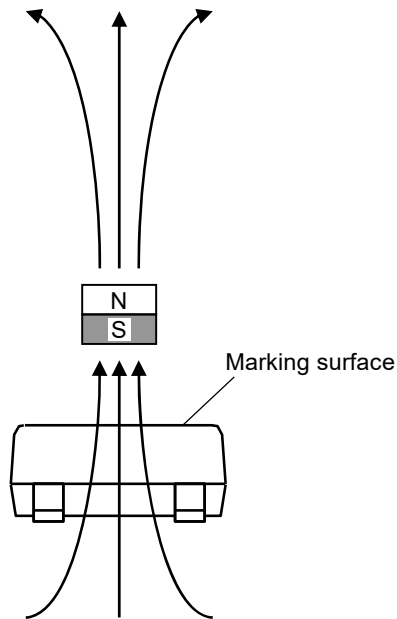
## ■ Operation

### 1. Direction of applied magnetic flux

This IC detects the magnetic flux density which is perpendicular to the package marking surface. A magnetic field is defined as positive when marking side of the package is the S pole, and negative when it is the N pole.

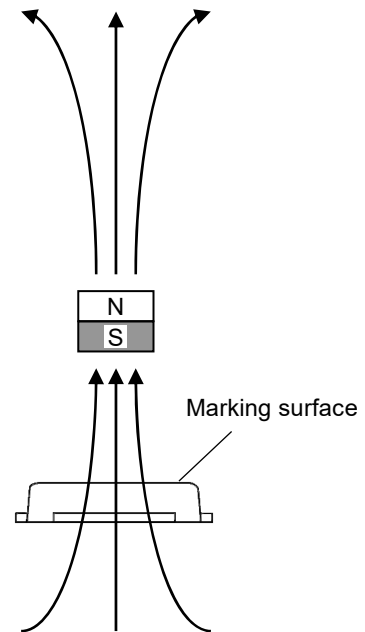
**Figure 12** and **Figure 13** show polarity in a magnetic field and direction in which magnetic flux is being applied.

#### 1.1 TSOT-23-3S



**Figure 12**

#### 1.2 HSNT-6(2025)



**Figure 13**

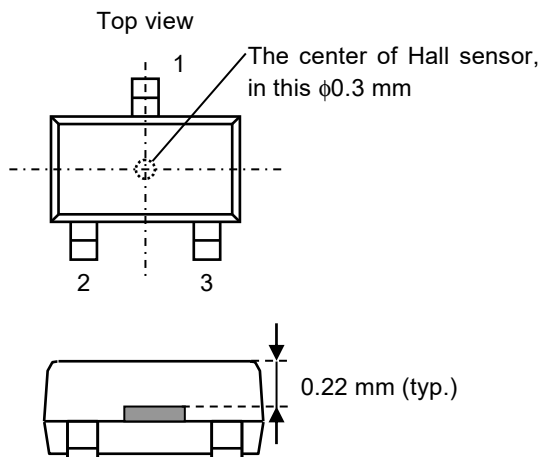
### 2. Position of Hall sensor

**Figure 14** and **Figure 15** show the position of Hall sensor.

The center of this Hall sensor is located in the area indicated by a circle, which is in the center of a package as described below.

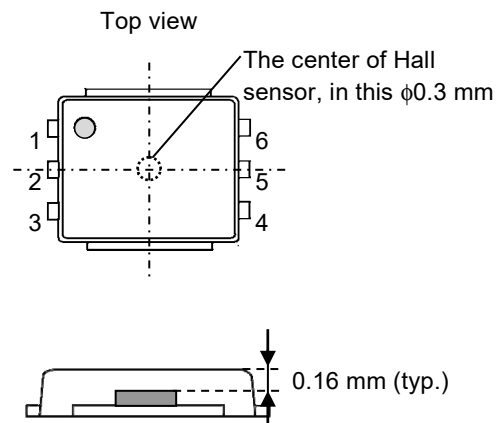
The following also shows the distance (typ. value) between the marking surface and the chip surface of a package.

#### 2.1 TSOT-23-3S



**Figure 14**

#### 2.2 HSNT-6(2025)



**Figure 15**



### 3. Basic operation

This IC changes the output voltage ( $V_{OUT}$ ) according to the level of the magnetic flux density (N pole or S pole) applied by a magnet.

#### 3.1 Active "L" product

When the magnetic flux density perpendicular to the marking surface exceeds the operation point ( $B_{OPN}$  or  $B_{OPS}$ ) after the S pole or N pole of a magnet is moved closer to the marking surface of this IC,  $V_{OUT}$  changes from "H" to "L". When the S pole or N pole of a magnet is moved further away from the marking surface of this IC and the magnetic flux density is lower than the release point ( $B_{RPN}$  or  $B_{RPS}$ ),  $V_{OUT}$  changes from "L" to "H".

Figure 16 shows the relationship between the magnetic flux density and  $V_{OUT}$ .

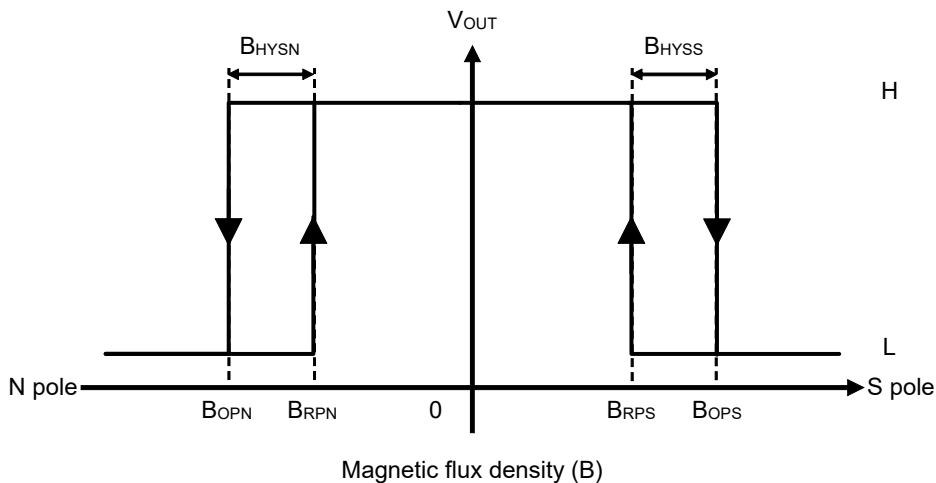


Figure 16

#### 3.2 Active "H" product

When the magnetic flux density perpendicular to the marking surface exceeds the operation point ( $B_{OPN}$  or  $B_{OPS}$ ) after the S pole or N pole of a magnet is moved closer to the marking surface of this IC,  $V_{OUT}$  changes from "L" to "H". When the S pole or N pole of a magnet is moved further away from the marking surface of this IC and the magnetic flux density is lower than the release point ( $B_{RPN}$  or  $B_{RPS}$ ),  $V_{OUT}$  changes from "H" to "L".

Figure 17 shows the relationship between the magnetic flux density and  $V_{OUT}$ .

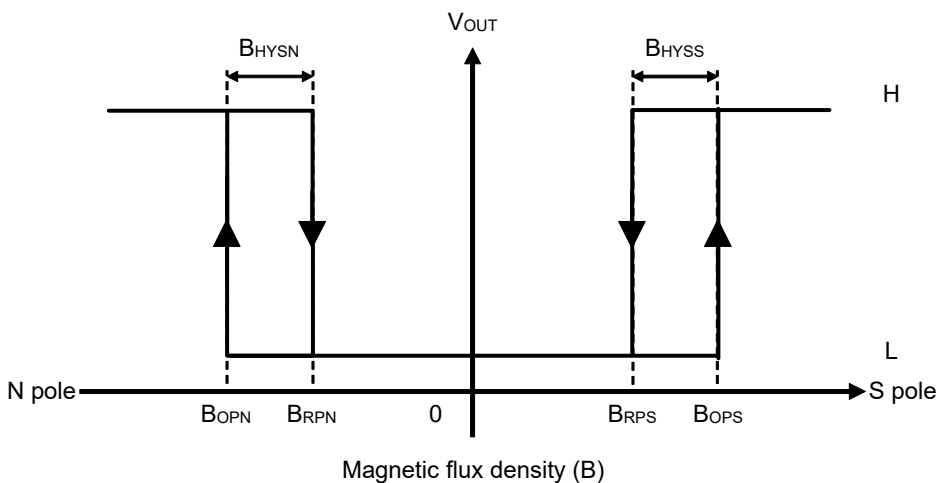


Figure 17

#### 4. Power-on operation

The output voltage ( $V_{OUT}$ ) of this IC immediately after power-on is "H". After the start up time ( $t_{PON}$ ) is passed, the IC changes  $V_{OUT}$  according to the level of the magnetic flux density (N pole or S pole) applied by a magnet.

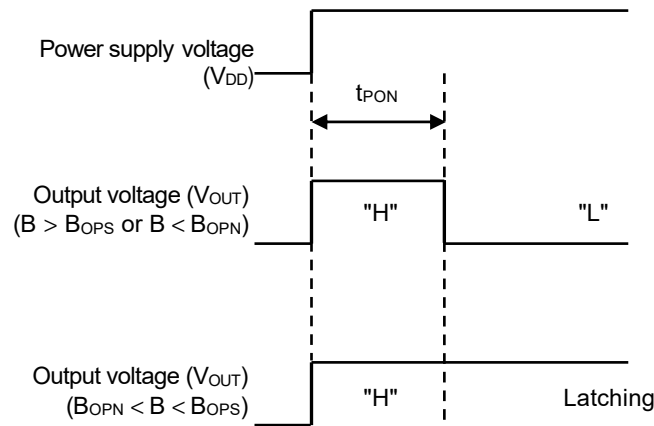
##### 4.1 Active "L" product

**Figure 18** shows the timing chart at power-on for active "L" product.

The initial output voltage at rising of power supply voltage ( $V_{DD}$ ) is "H".

In case of  $B > B_{OPS}$  or  $B < B_{OPN}$  at the time when  $t_{PON}$  is passed after rising of  $V_{DD}$ ,  $V_{OUT}$  changes from "H" to "L".

In case of  $B_{OPN} < B < B_{OPS}$  at the time when  $t_{PON}$  is passed after rising of  $V_{DD}$ ,  $V_{OUT}$  retains "H".



**Figure 18**

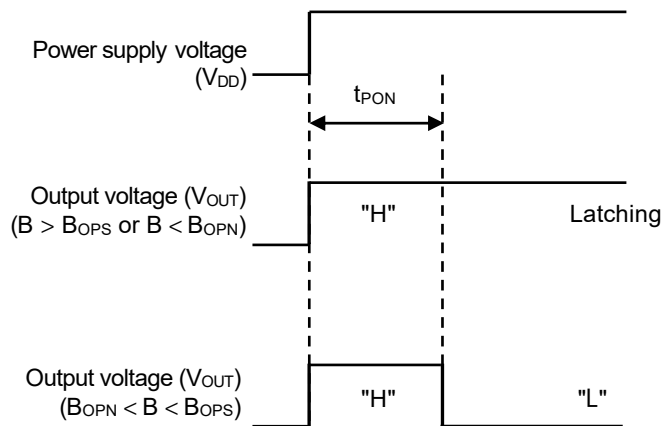
##### 4.2 Active "H" product

**Figure 19** shows the timing chart at power-on for active "H" product.

The initial output voltage at rising of power supply voltage ( $V_{DD}$ ) is "H".

In case of  $B > B_{OPS}$  or  $B < B_{OPN}$  at the time when  $t_{PON}$  is passed after rising of  $V_{DD}$ ,  $V_{OUT}$  retains "H".

In case of  $B_{OPN} < B < B_{OPS}$  at the time when  $t_{PON}$  is passed after rising of  $V_{DD}$ ,  $V_{OUT}$  changes from "H" to "L".



**Figure 19**

## ■ Precautions

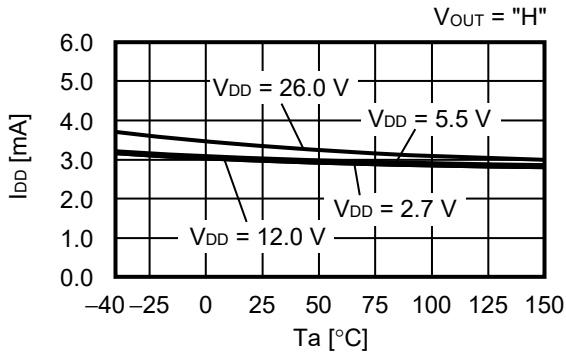
- If the impedance of the power supply is high, the IC may malfunction due to a supply voltage drop caused by feed-through current. Take care with the pattern wiring to ensure that the impedance of the power supply is low.
- Note that the IC may malfunction if the power supply voltage rapidly changes. When the IC is used under the environment where the power supply voltage rapidly changes, it is recommended to judge the output voltage of the IC by reading it multiple times.
- Do not apply an electrostatic discharge to this IC that exceeds the performance ratings of the built-in electrostatic protection circuit.
- Note that the output voltage may rarely change if the magnetic flux density between the operation point and the release point is applied to this IC continuously for a long time.
- Although this IC has a built-in output current limit circuit, it may suffer physical damage such as product deterioration under the environment where the absolute maximum ratings are exceeded.
- Although this IC has a built-in reverse voltage protection circuit, it may suffer physical damage such as product deterioration under the environment where the absolute maximum ratings are exceeded.
- The application conditions for the power supply voltage, the pull-up voltage, and the pull-up resistor should not exceed the power dissipation.
- Large stress on this IC may affect the magnetic characteristics. Avoid large stress which is caused by the handling during or after mounting the IC on a board.
- Since the package heat radiation differs according to the conditions of the application, perform thorough evaluation with actual applications to confirm no problems occur.
- ABLIC Inc. claims no responsibility for any disputes arising out of or in connection with any infringement by products including this IC of patents owned by a third party.

■ **Characteristics (Typical Data)**

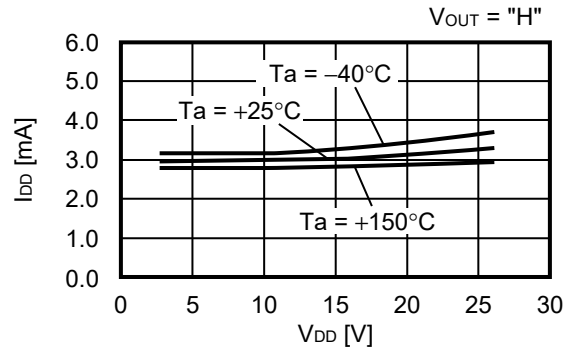
**1. Electrical Characteristics**

**1.1 S-57GDxxxS**

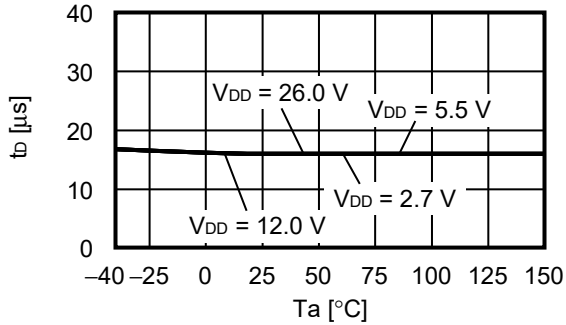
**1.1.1 Current consumption ( $I_{DD}$ ) vs. Temperature ( $T_a$ )**



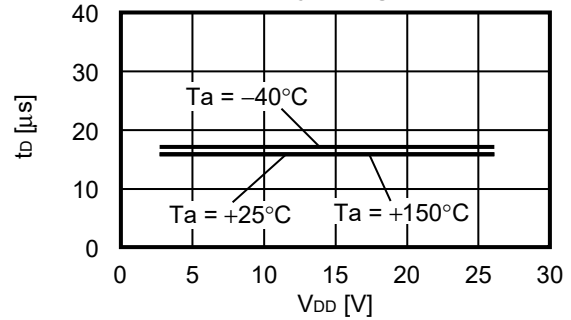
**1.1.2 Current consumption ( $I_{DD}$ ) vs. Power supply voltage ( $V_{DD}$ )**



**1.1.3 Output delay time ( $t_D$ ) vs. Temperature ( $T_a$ )**



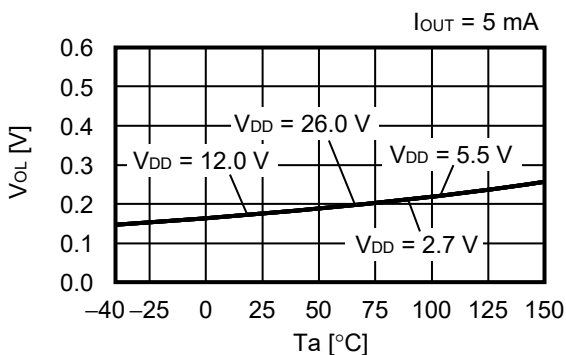
**1.1.4 Output delay time ( $t_D$ ) vs. Power supply voltage ( $V_{DD}$ )**



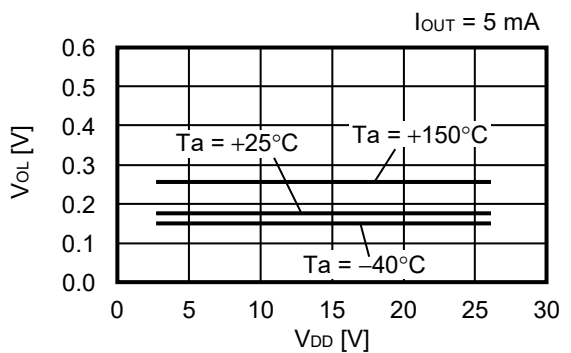
**Caution**  $V_{DD} = 2.7$  V to 5.5 V when output form is Nch driver + built-in pull-up resistor (1.2 k $\Omega$  typ.).  
 Comply with power supply voltage range and do not exceed absolute maximum ratings.

**1.2 S-57GDNxxS**

**1.2.1 Low level output voltage ( $V_{OL}$ ) vs. Temperature ( $T_a$ )**

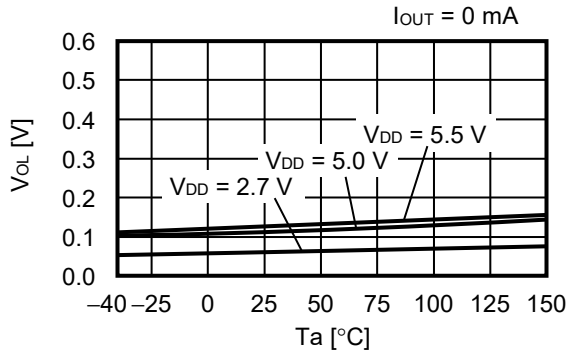


**1.2.2 Low level output voltage ( $V_{OL}$ ) vs. Power supply voltage ( $V_{DD}$ )**

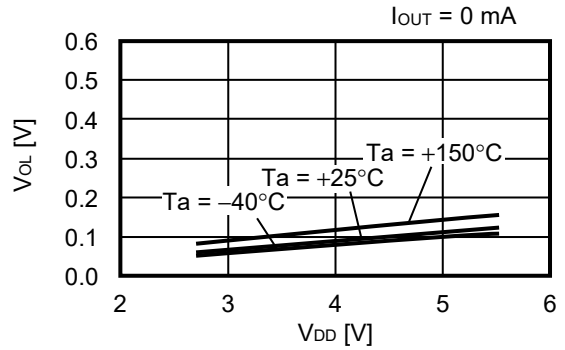


1.3 S-57GD1xxS

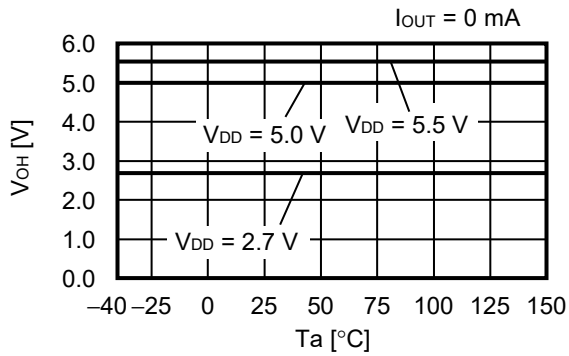
1.3.1 Low level output voltage ( $V_{OL}$ ) vs. Temperature ( $T_a$ )



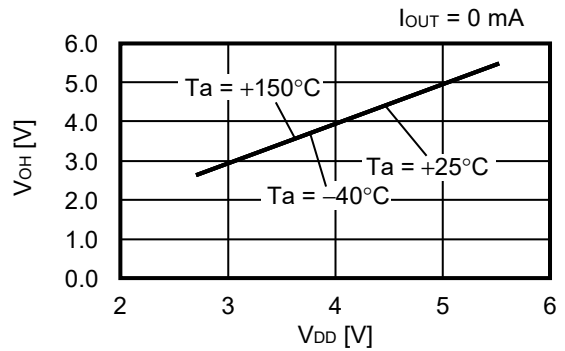
1.3.2 Low level output voltage ( $V_{OL}$ ) vs. Power supply voltage ( $V_{DD}$ )



1.3.3 High level output voltage ( $V_{OH}$ ) vs. Temperature ( $T_a$ )



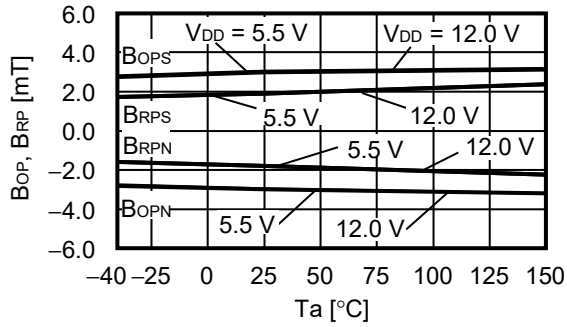
1.3.4 High level output voltage ( $V_{OH}$ ) vs. Power supply voltage ( $V_{DD}$ )



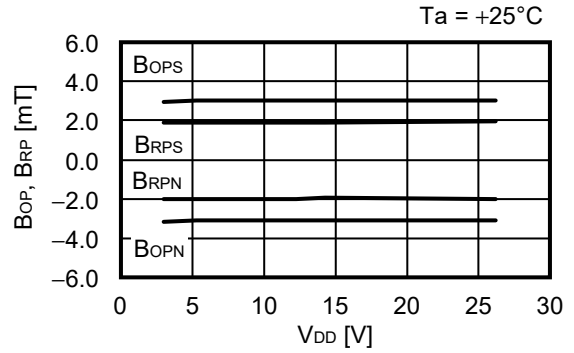
## 2. Magnetic Characteristics

### 2.1 S-57GDxx1S-L3T2U

2.1.1 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Temperature ( $T_a$ )

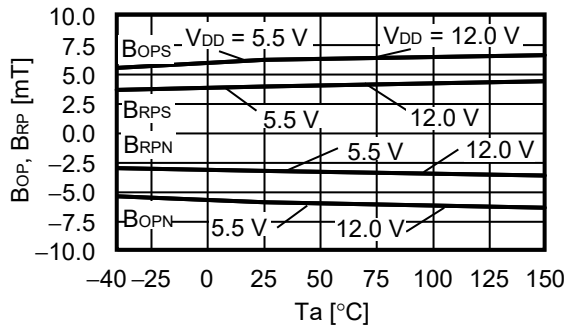


2.1.2 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Power supply voltage ( $V_{DD}$ )

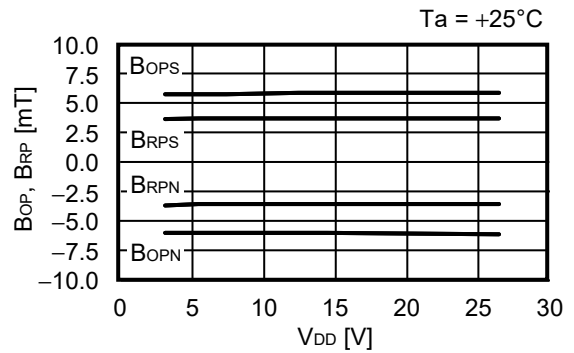


### 2.2 S-57GDxx3S-L3T2U

2.2.1 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Temperature ( $T_a$ )



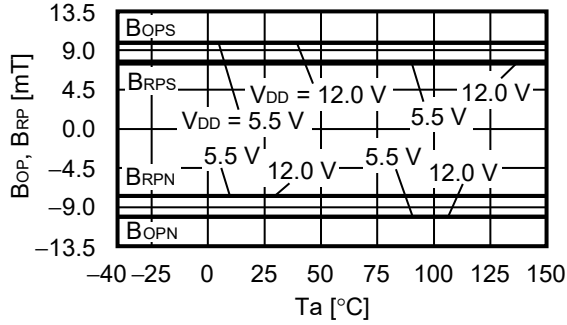
2.2.2 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Power supply voltage ( $V_{DD}$ )



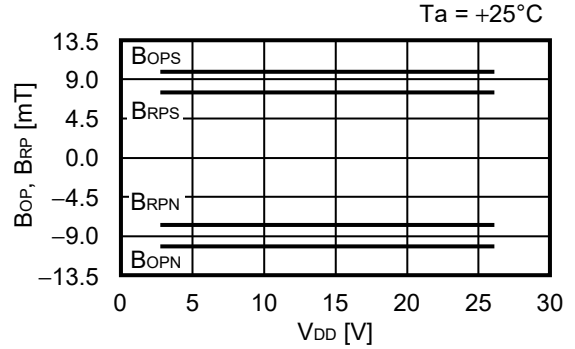
**Caution**  $V_{DD} = 2.7\text{ V to }5.5\text{ V}$  when output form is Nch driver + built-in pull-up resistor (1.2 kΩ typ.).  
 Comply with power supply voltage range and do not exceed absolute maximum ratings.

**2.3 S-57GDxx4S-L3T2U**

**2.3.1 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Temperature ( $T_a$ )**

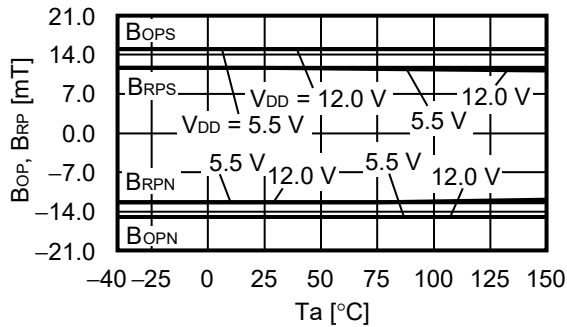


**2.3.2 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Power supply voltage ( $V_{DD}$ )**

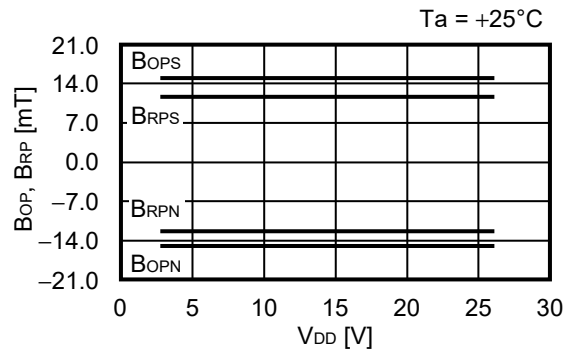


**2.4 S-57GDxx5S-L3T2U**

**2.4.1 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Temperature ( $T_a$ )**



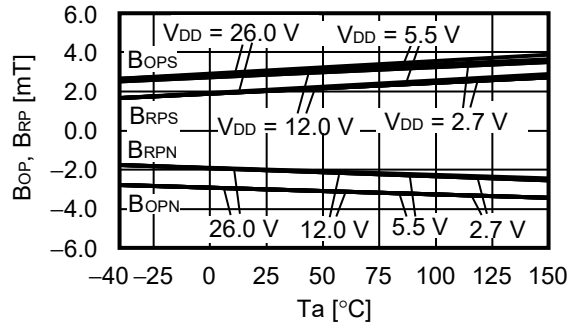
**2.4.2 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Power supply voltage ( $V_{DD}$ )**



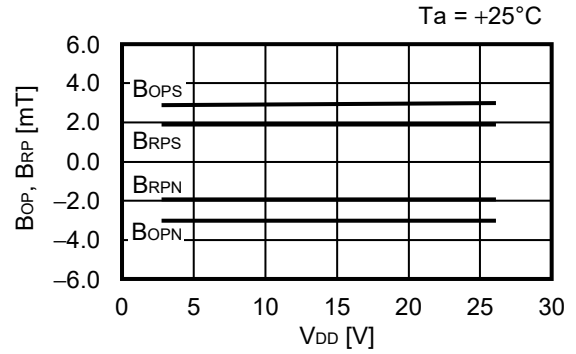
**Caution**  $V_{DD} = 2.7V$  to  $5.5V$  when output form is Nch driver + built-in pull-up resistor ( $1.2k\Omega$  typ.).  
 Comply with power supply voltage range and do not exceed absolute maximum ratings.

**2.5 S-57GDxx1S-A6T8U**

**2.5.1 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Temperature ( $T_a$ )**

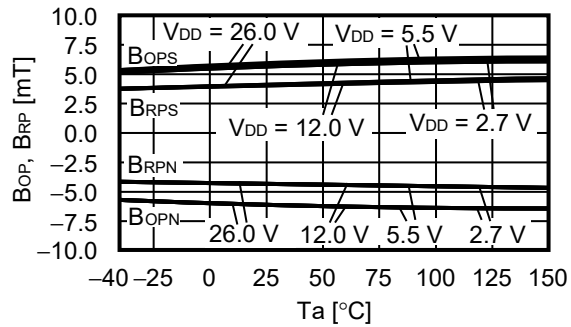


**2.5.2 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Power supply voltage ( $V_{DD}$ )**

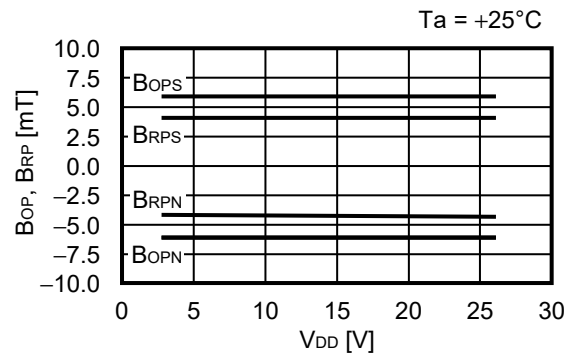


**2.6 S-57GDxx3S-A6T8U**

**2.6.1 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Temperature ( $T_a$ )**



**2.6.2 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Power supply voltage ( $V_{DD}$ )**

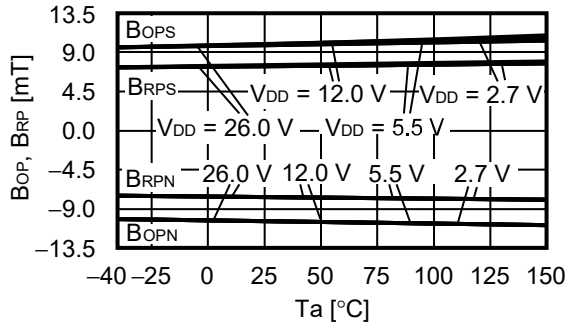


**Caution**  $V_{DD} = 2.7\text{ V to }5.5\text{ V}$  when output form is Nch driver + built-in pull-up resistor (1.2 kΩ typ.).  
 Comply with power supply voltage range and do not exceed absolute maximum ratings.

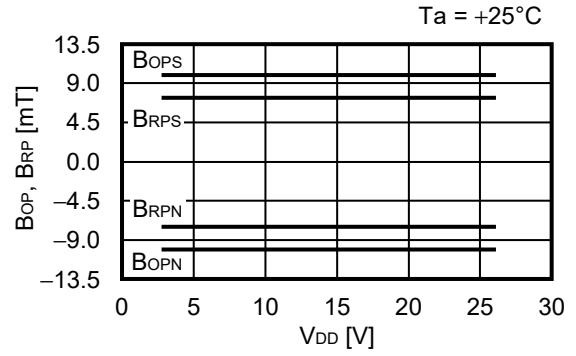


**2.7 S-57GDxx4S-A6T8U**

**2.7.1 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Temperature ( $T_a$ )**

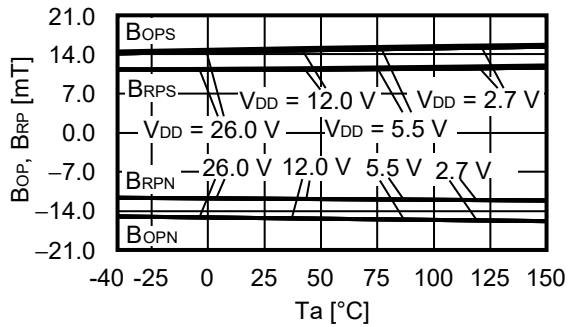


**2.7.2 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Power supply voltage ( $V_{DD}$ )**

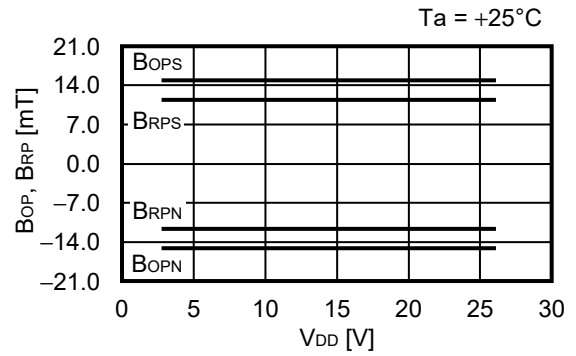


**2.8 S-57GDxx5S-A6T8U**

**2.8.1 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Temperature ( $T_a$ )**



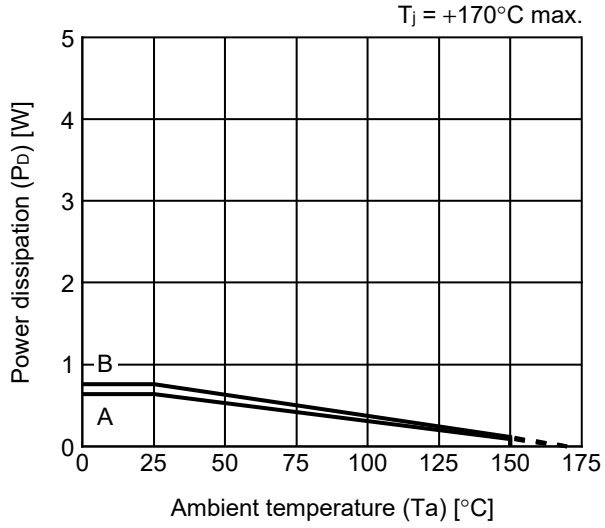
**2.8.2 Operation point, release point ( $B_{OP}$ ,  $B_{RP}$ ) vs. Power supply voltage ( $V_{DD}$ )**



**Caution**  $V_{DD} = 2.7\text{ V}$  to  $5.5\text{ V}$  when output form is Nch driver + built-in pull-up resistor ( $1.2\text{ k}\Omega$  typ.).  
 Comply with power supply voltage range and do not exceed absolute maximum ratings.

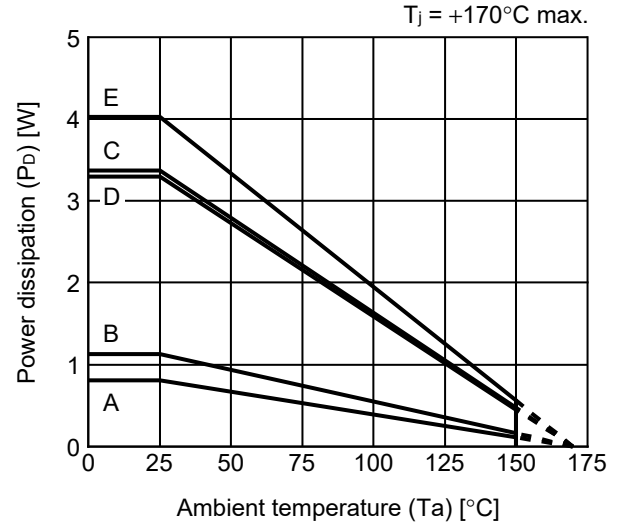
■ Power Dissipation

**TSOT-23-3S**



Board	Power Dissipation ( $P_D$ )
A	0.64 W
B	0.76 W
C	–
D	–
E	–

**HSNT-6(2025)**

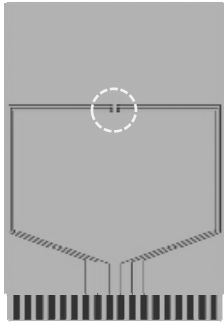


Board	Power Dissipation ( $P_D$ )
A	0.81 W
B	1.13 W
C	3.37 W
D	3.30 W
E	4.03 W

# TSOT-23-3S Test Board

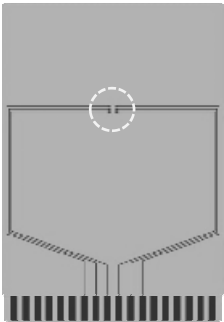
 IC Mount Area

(1) Board A



Item		Specification
Size [mm]		114.3 x 76.2 x t1.6
Material		FR-4
Number of copper foil layer		2
Copper foil layer [mm]	1	Land pattern and wiring for testing: t0.070
	2	-
	3	-
	4	74.2 x 74.2 x t0.070
Thermal via		-


(2) Board B



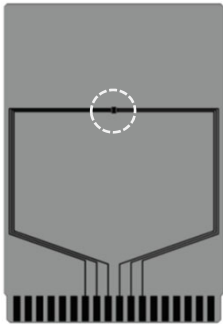
Item		Specification
Size [mm]		114.3 x 76.2 x t1.6
Material		FR-4
Number of copper foil layer		4
Copper foil layer [mm]	1	Land pattern and wiring for testing: t0.070
	2	74.2 x 74.2 x t0.035
	3	74.2 x 74.2 x t0.035
	4	74.2 x 74.2 x t0.070
Thermal via		-

No. TSOT23x-A-Board-SD-1.0

# HSNT-6(2025) Test Board

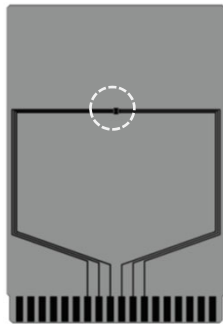
 IC Mount Area

(1) Board A



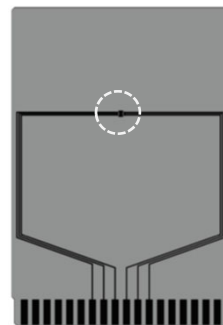
Item	Specification	
Size [mm]	114.3 x 76.2 x t1.6	
Material	FR-4	
Number of copper foil layer	2	
Copper foil layer [mm]	1	Land pattern and wiring for testing: t0.070
	2	-
	3	-
	4	74.2 x 74.2 x t0.070
Thermal via	-	

(2) Board B



Item	Specification	
Size [mm]	114.3 x 76.2 x t1.6	
Material	FR-4	
Number of copper foil layer	4	
Copper foil layer [mm]	1	Land pattern and wiring for testing: t0.070
	2	74.2 x 74.2 x t0.035
	3	74.2 x 74.2 x t0.035
	4	74.2 x 74.2 x t0.070
Thermal via	-	

(3) Board C



Item	Specification	
Size [mm]	114.3 x 76.2 x t1.6	
Material	FR-4	
Number of copper foil layer	4	
Copper foil layer [mm]	1	Land pattern and wiring for testing: t0.070
	2	74.2 x 74.2 x t0.035
	3	74.2 x 74.2 x t0.035
	4	74.2 x 74.2 x t0.070
Thermal via	Number: 4 Diameter: 0.3 mm	



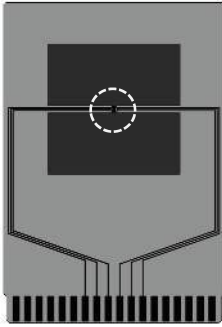
enlarged view

No. HSNT6-B-Board-SD-1.0

# HSNT-6(2025) Test Board

 IC Mount Area

## (4) Board D

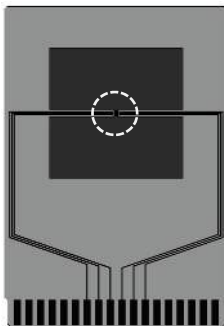


Item	Specification	
Size [mm]	114.3 x 76.2 x t1.6	
Material	FR-4	
Number of copper foil layer	4	
Copper foil layer [mm]	1	Pattern for heat radiation: 2000mm <sup>2</sup> t0.070
	2	74.2 x 74.2 x t0.035
	3	74.2 x 74.2 x t0.035
	4	74.2 x 74.2 x t0.070
Thermal via	-	



enlarged view

## (5) Board E

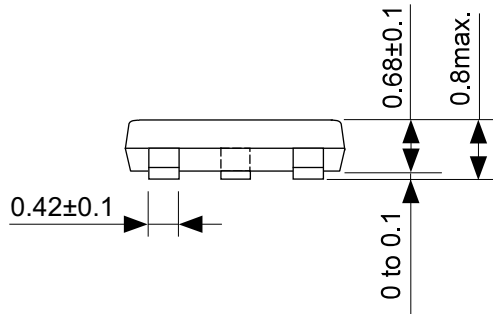
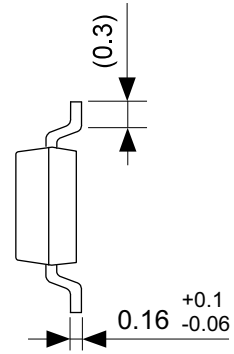
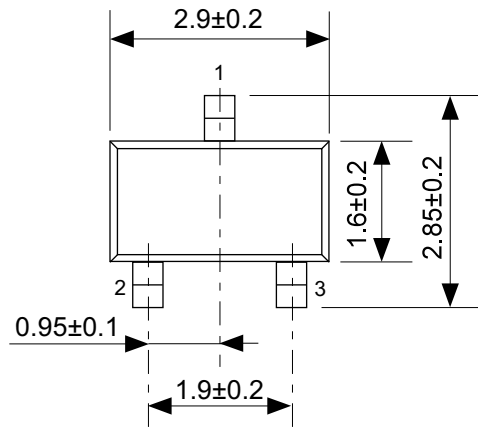


Item	Specification	
Size [mm]	114.3 x 76.2 x t1.6	
Material	FR-4	
Number of copper foil layer	4	
Copper foil layer [mm]	1	Pattern for heat radiation: 2000mm <sup>2</sup> t0.070
	2	74.2 x 74.2 x t0.035
	3	74.2 x 74.2 x t0.035
	4	74.2 x 74.2 x t0.070
Thermal via	Number: 4 Diameter: 0.3 mm	



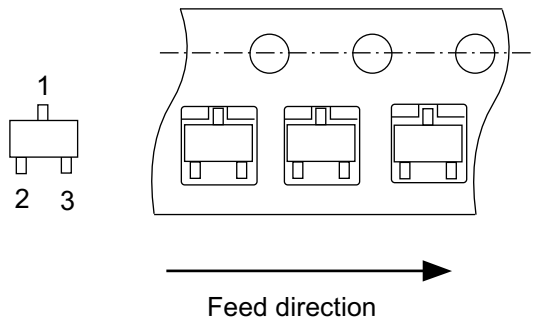
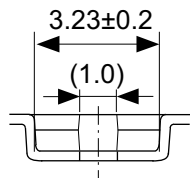
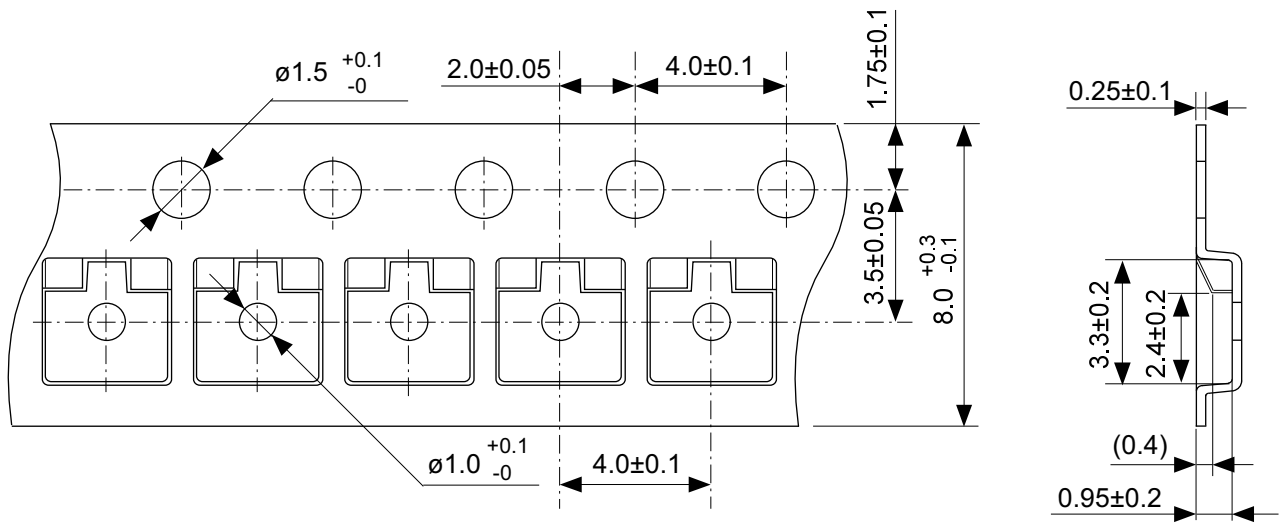
enlarged view

No. HSNT6-B-Board-SD-1.0



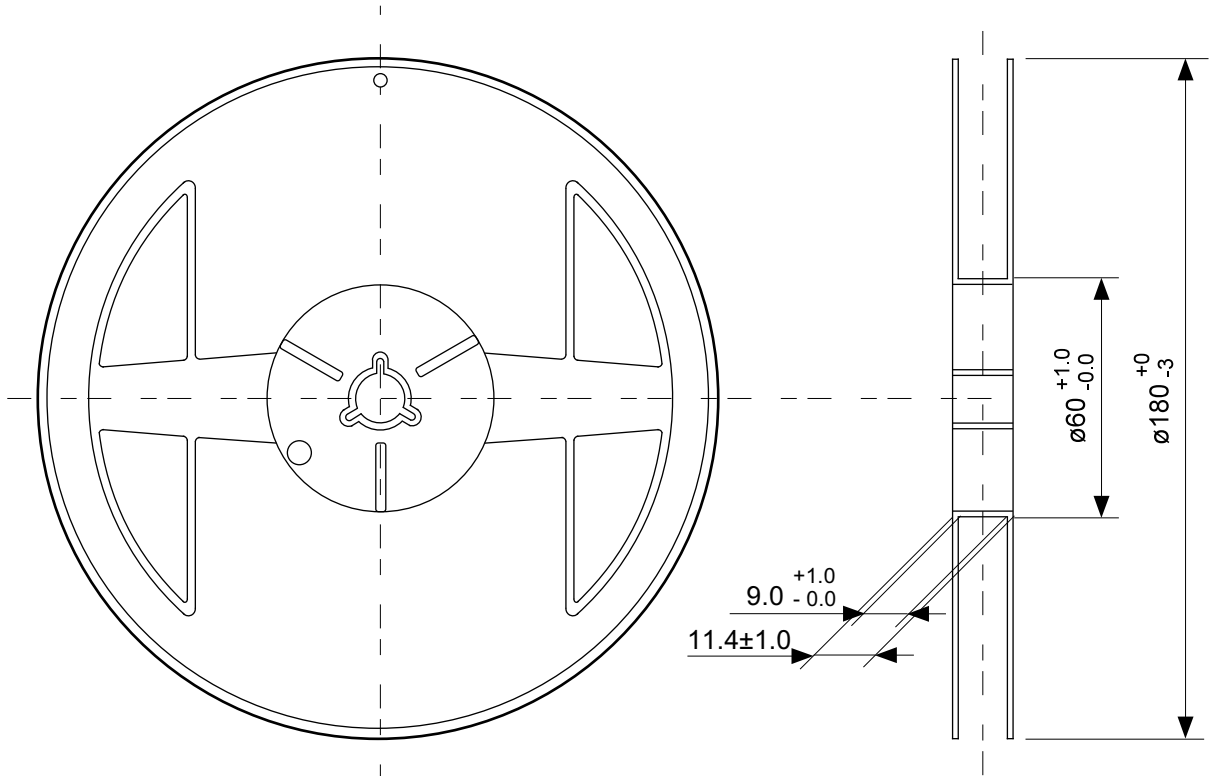
No. MP003-E-P-SD-1.0

TITLE	TSOT233S-A-PKG Dimensions
No.	MP003-E-P-SD-1.0
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	

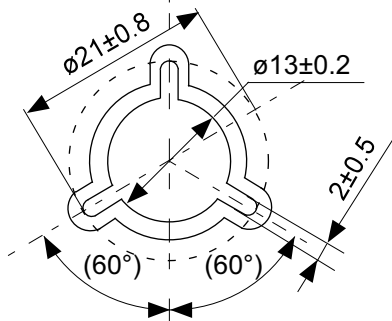


No. MP003-E-C-SD-1.0

TITLE	TSOT233S-A-Carrier Tape
No.	MP003-E-C-SD-1.0
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	



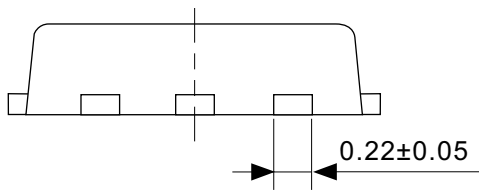
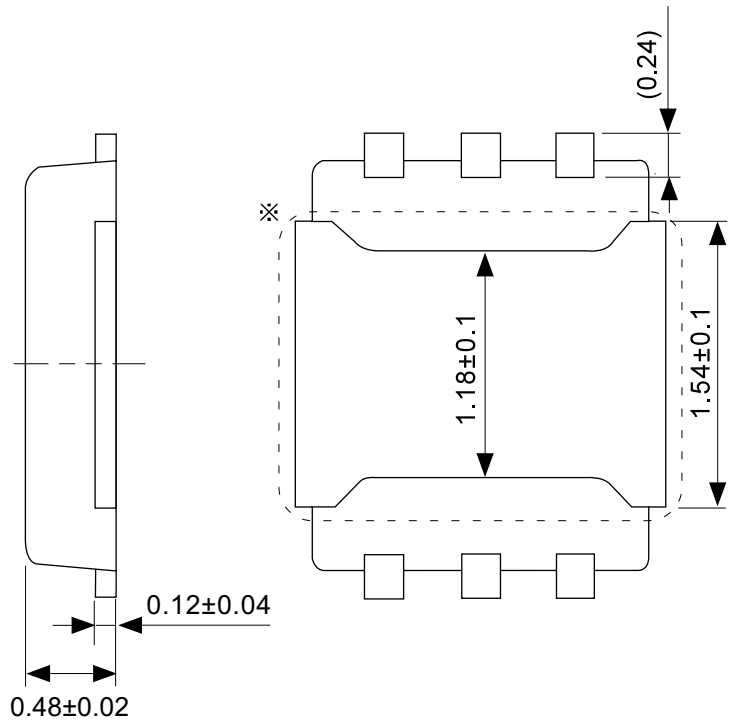
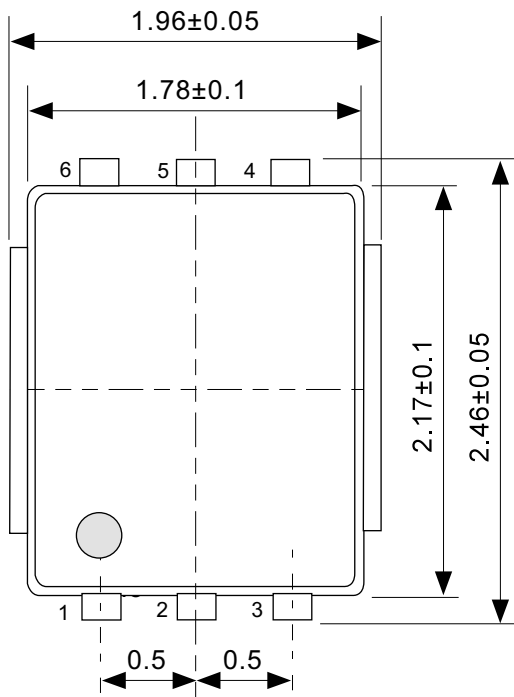
Enlarged drawing in the central part



No. MP003-E-R-SD-1.0

TITLE	TSOT233S-A-Reel		
No.	MP003-E-R-SD-1.0		
ANGLE		QTY.	3,000
UNIT	mm		
<b>ABLIC Inc.</b>			

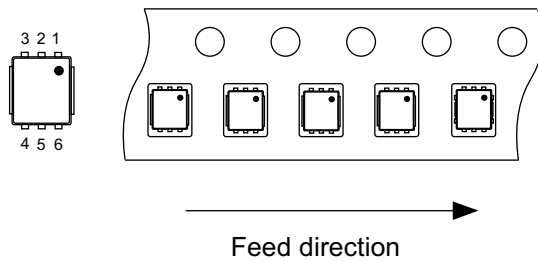
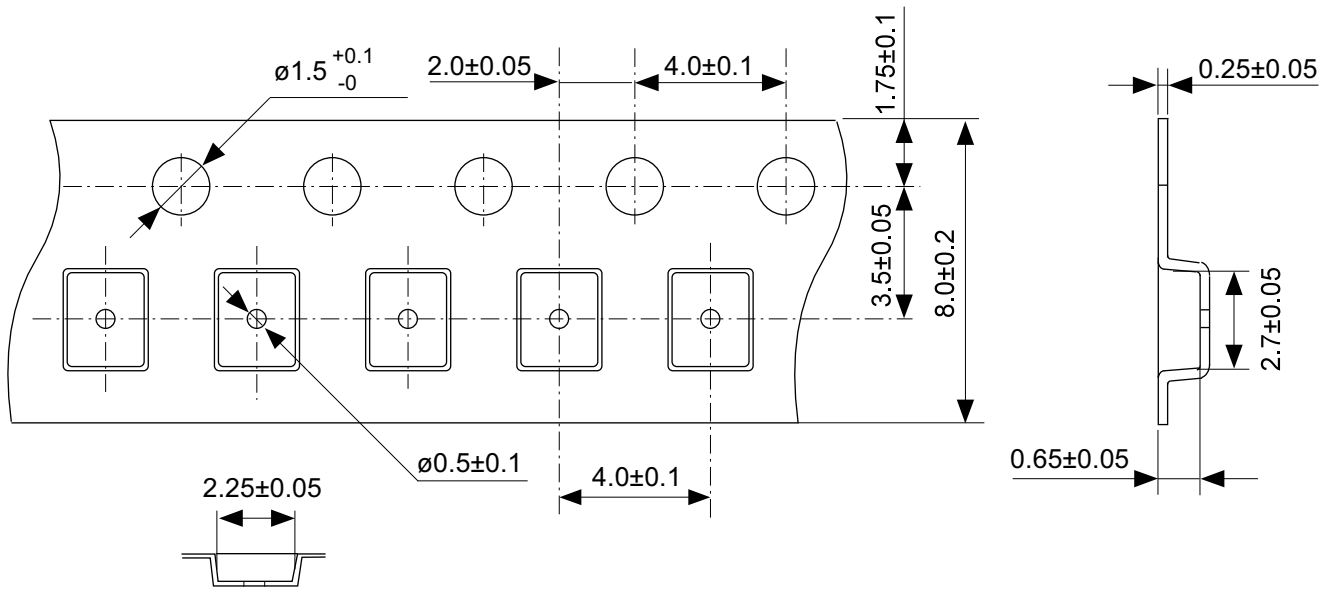




※ The heat sink of back side has different electric potential depending on the product.  
 Confirm specifications of each product.  
 Do not use it as the function of electrode.

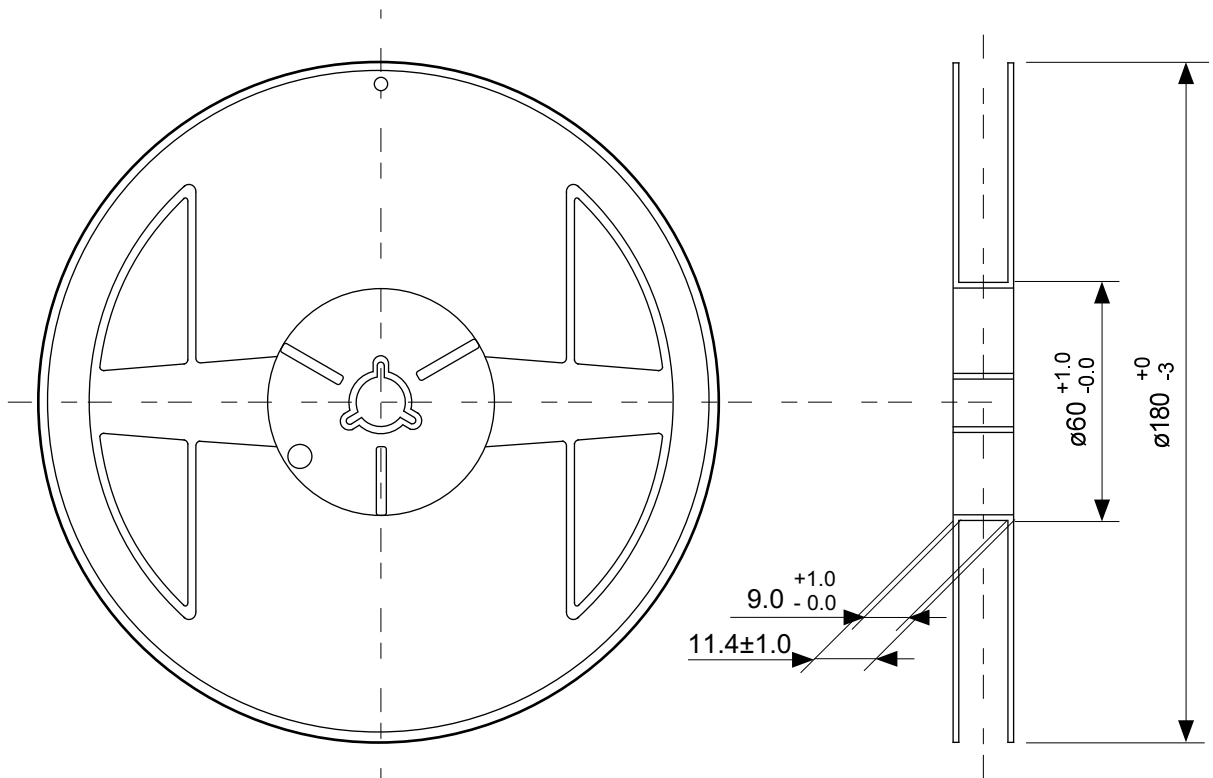
No. PJ006-B-P-SD-1.0

TITLE	HSNT-6-C-PKG Dimensions
No.	PJ006-B-P-SD-1.0
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	

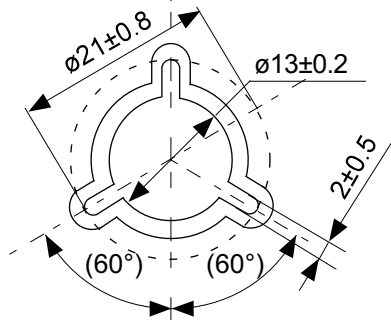


No. PJ006-B-C-SD-1.0

TITLE	HSNT-6-C-Carrier Tape
No.	PJ006-B-C-SD-1.0
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	



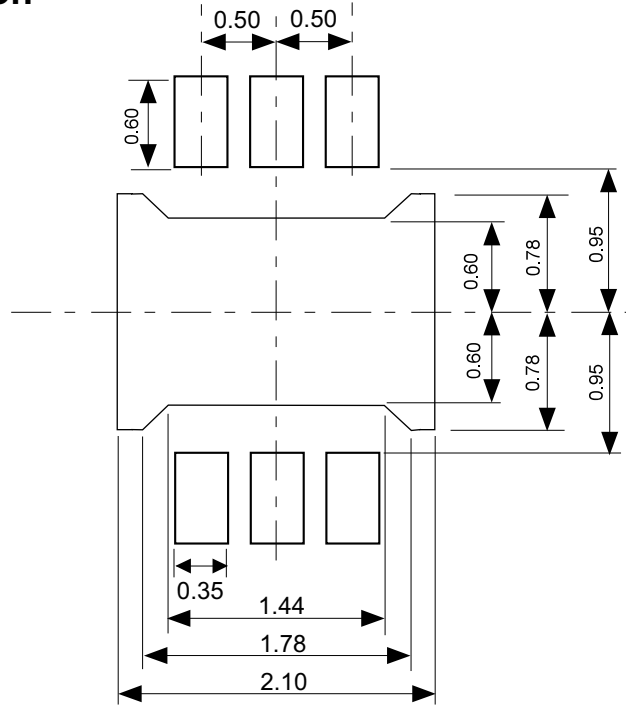
Enlarged drawing in the central part



No. PJ006-B-R-SD-1.0

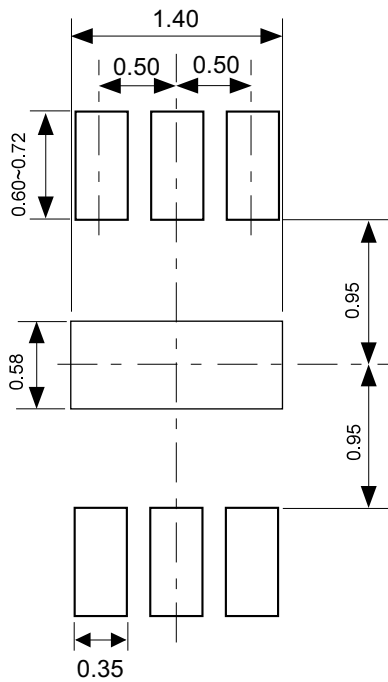
TITLE	HSNT-6-C-Reel		
No.	PJ006-B-R-SD-1.0		
ANGLE		QTY.	5,000
UNIT	mm		
<b>ABLIC Inc.</b>			

## Land Recommendation



Caution It is recommended to solder the heat sink to a board in order to ensure the heat radiation.  
 注意 放熱性を確保する為に、PKGの裏面放熱板(ヒートシンク)を基板に半田付けする事を推奨いたします。

## Stencil Opening



No. PJ006-B-LM-SD-1.0

Caution ① Mask aperture ratio of the lead mounting part is 100~120%.  
 ② Mask aperture ratio of the heat sink mounting part is 30%.  
 ③ Mask thickness: t0.12 mm  
 ④ Reflow atmosphere: Nitrogen atmosphere is recommended.  
 (Oxygen concentration: 1000ppm or less)

注意 ①リード実装部のマスク開口率は100~120%です。  
 ②放熱板実装のマスク開口率は30%です。  
 ③マスク厚み : t0.12 mm  
 ④リフロー雰囲気・窒素雰囲気(酸素濃度1000ppm以下) 推奨

TITLE	HSNT-6-C -Land & Stencil Opening
No.	PJ006-B-LM-SD-1.0
ANGLE	
UNIT	mm
ABLIC Inc.	

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2.4-2019.07