

## LOW VOLTAGE OPERATION BOTH POLES / UNIPOLAR DETECTION TYPE HALL IC

The S-5712 Series, developed by CMOS technology, is a high-accuracy Hall IC that operates at a low voltage and low current consumption.

The output voltage changes when the S-5712 Series detects the intensity level of magnetic flux density. Using the S-5712 Series with a magnet makes it possible to detect the open / close in various devices.

High-density mounting is possible by using the small SOT-23-3 or the super-small SNT-4A package.

Due to its low voltage operation and low current consumption, the S-5712 Series is suitable for battery-operated portable devices. Also, due to its high-accuracy magnetic characteristics, the S-5712 Series can make operation's dispersion in the system combined with magnet smaller.

**Caution** This product is intended to use in general electronic devices such as consumer electronics, office equipment, and communications devices. Before using the product in medical equipment or automobile equipment including car audio, keyless entry and engine control unit, contact to SII is indispensable.

### ■ Features

- Pole detection\*1: Detection of both poles, S pole or N pole
- Detection logic for magnetism\*1: Active "L", active "H"
- Output form\*1: Nch open-drain output, CMOS output
- Magnetic sensitivity\*1:
  - B<sub>OP</sub> = 1.8 mT typ.
  - B<sub>OP</sub> = 3.0 mT typ.
  - B<sub>OP</sub> = 4.5 mT typ.
- Operating cycle (current consumption)\*1:
  - Product with both poles detection
    - t<sub>CYCLE</sub> = 5.70 ms (I<sub>DD</sub> = 12.0 μA) typ.
    - t<sub>CYCLE</sub> = 50.50 ms (I<sub>DD</sub> = 2.0 μA) typ.
    - t<sub>CYCLE</sub> = 204.10 ms (I<sub>DD</sub> = 1.0 μA) typ.
  - Product with S pole or N pole detection
    - t<sub>CYCLE</sub> = 6.05 ms (I<sub>DD</sub> = 6.0 μA) typ.
    - t<sub>CYCLE</sub> = 50.85 ms (I<sub>DD</sub> = 1.4 μA) typ.
- Power supply voltage range: V<sub>DD</sub> = 1.6 V to 3.5 V
- Operation temperature range: Ta = -40°C to +85°C
- Lead-free (Sn 100%), halogen-free

\*1. The option can be selected.

### ■ Applications

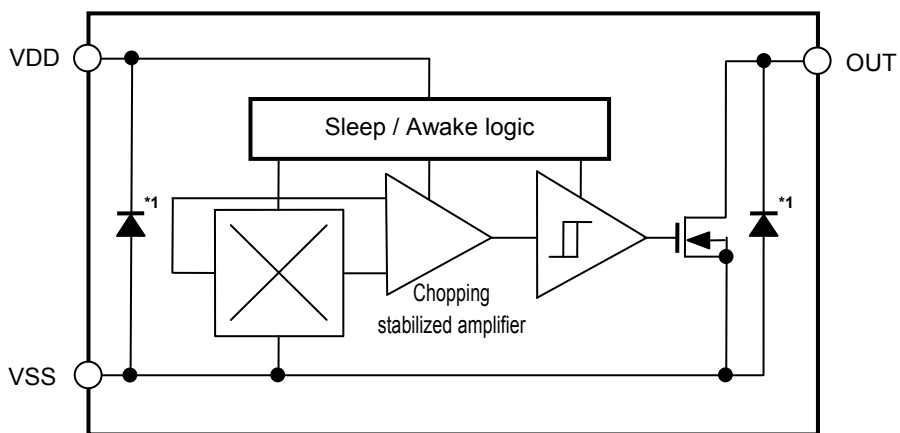
- Mobile phone, smart phone
- Notebook PC, tablet PC
- Digital video camera
- Plaything, portable game
- Home appliance

### ■ Packages

- SOT-23-3
- SNT-4A

■ Block Diagrams

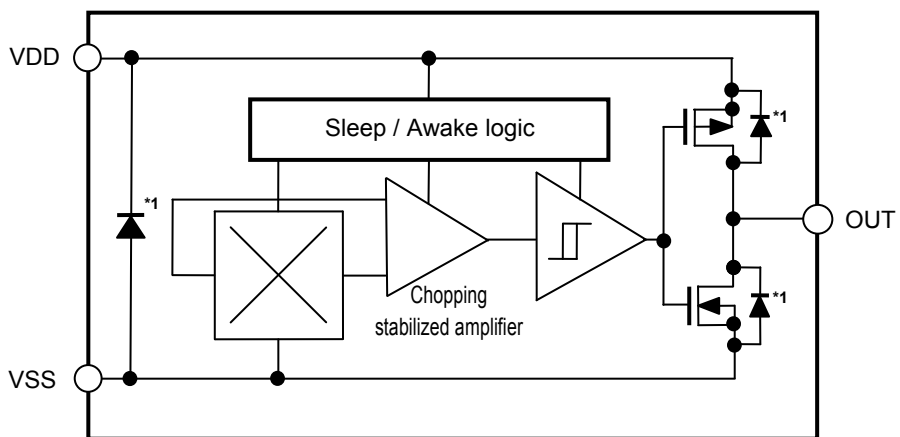
1. Nch open-drain output product



\*1. Parasitic diode

Figure 1

2. CMOS output product

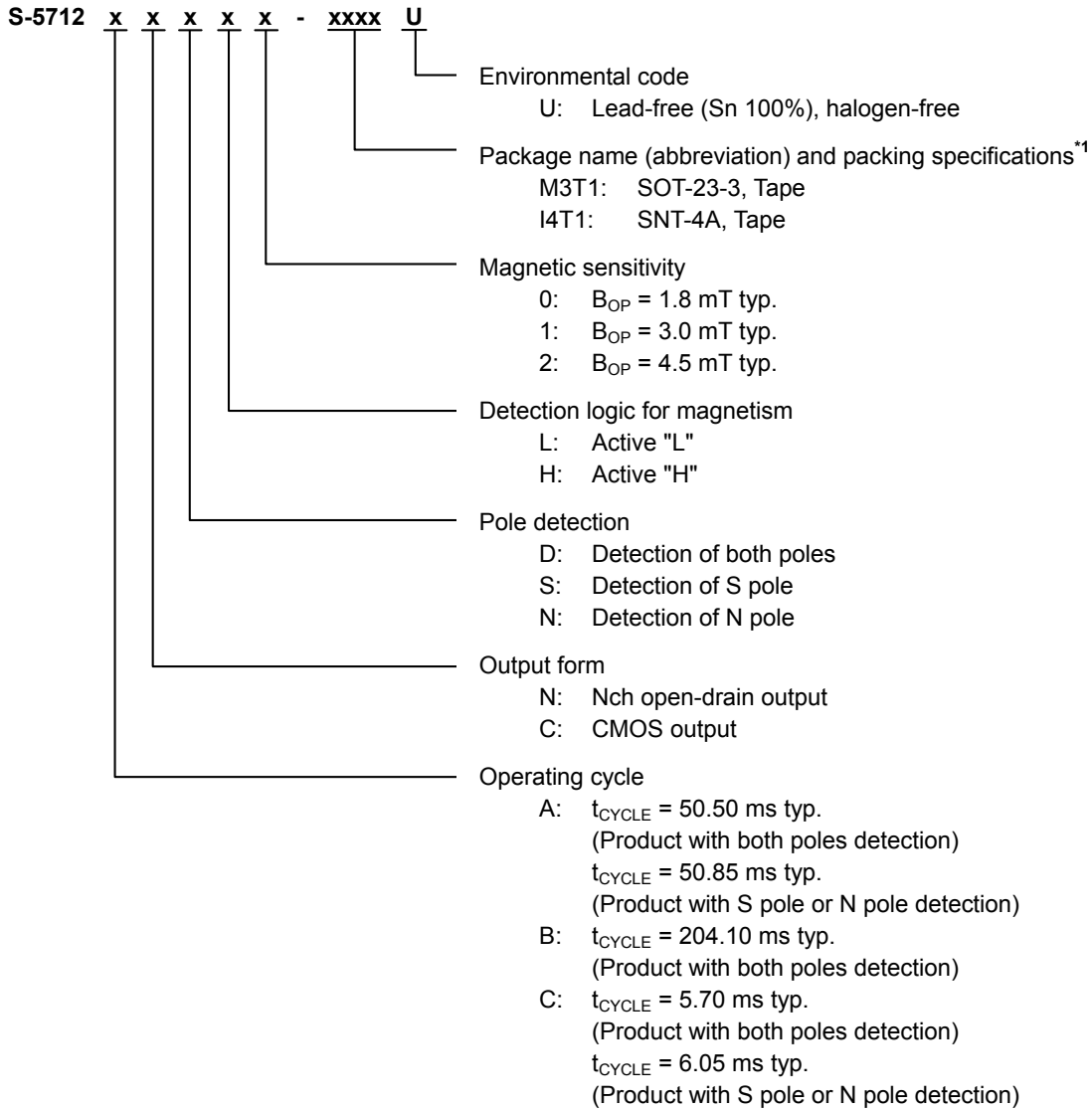


\*1. Parasitic diode

Figure 2

**■ 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         |
|--------------|--------------|--------------|--------------|--------------|
| SOT-23-3     | MP003-C-P-SD | MP003-C-C-SD | MP003-Z-R-SD | -            |
| SNT-4A       | PF004-A-P-SD | PF004-A-C-SD | PF004-A-R-SD | PF004-A-L-SD |

**3. Product name list**

**3.1 SOT-23-3**

**3.1.1 Nch open-drain output product**

**Table 2**

| Product Name      | Operating Cycle<br>( $t_{CYCLE}$ ) | Output Form           | Pole Detection | Detection Logic<br>for Magnetism | Magnetic Sensitivity<br>( $B_{OP}$ ) |
|-------------------|------------------------------------|-----------------------|----------------|----------------------------------|--------------------------------------|
| S-5712ANDL1-M3T1U | 50.50 ms typ.                      | Nch open-drain output | Both poles     | Active "L"                       | 3.0 mT typ.                          |
| S-5712ANDL2-M3T1U | 50.50 ms typ.                      | Nch open-drain output | Both poles     | Active "L"                       | 4.5 mT typ.                          |
| S-5712ANSL1-M3T1U | 50.85 ms typ.                      | Nch open-drain output | S pole         | Active "L"                       | 3.0 mT typ.                          |
| S-5712ANSL2-M3T1U | 50.85 ms typ.                      | Nch open-drain output | S pole         | Active "L"                       | 4.5 mT typ.                          |
| S-5712BNDL2-M3T1U | 204.10 ms typ.                     | Nch open-drain output | Both poles     | Active "L"                       | 4.5 mT typ.                          |

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

**3.1.2 CMOS output product**

**Table 3**

| Product Name      | Operating Cycle<br>( $t_{CYCLE}$ ) | Output Form | Pole Detection | Detection Logic<br>for Magnetism | Magnetic Sensitivity<br>( $B_{OP}$ ) |
|-------------------|------------------------------------|-------------|----------------|----------------------------------|--------------------------------------|
| S-5712ACDL1-M3T1U | 50.50 ms typ.                      | CMOS output | Both poles     | Active "L"                       | 3.0 mT typ.                          |
| S-5712ACDL2-M3T1U | 50.50 ms typ.                      | CMOS output | Both poles     | Active "L"                       | 4.5 mT typ.                          |
| S-5712ACDH1-M3T1U | 50.50 ms typ.                      | CMOS output | Both poles     | Active "H"                       | 3.0 mT typ.                          |
| S-5712ACDH2-M3T1U | 50.50 ms typ.                      | CMOS output | Both poles     | Active "H"                       | 4.5 mT typ.                          |
| S-5712ACSL1-M3T1U | 50.85 ms typ.                      | CMOS output | S pole         | Active "L"                       | 3.0 mT typ.                          |
| S-5712ACSL2-M3T1U | 50.85 ms typ.                      | CMOS output | S pole         | Active "L"                       | 4.5 mT typ.                          |
| S-5712ACNL1-M3T1U | 50.85 ms typ.                      | CMOS output | N pole         | Active "L"                       | 3.0 mT typ.                          |
| S-5712ACNL2-M3T1U | 50.85 ms typ.                      | CMOS output | N pole         | Active "L"                       | 4.5 mT typ.                          |
| S-5712CCDL1-M3T1U | 5.70 ms typ.                       | CMOS output | Both poles     | Active "L"                       | 3.0 mT typ.                          |
| S-5712CCSL1-M3T1U | 6.05 ms typ.                       | CMOS output | S pole         | Active "L"                       | 3.0 mT typ.                          |

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

**LOW VOLTAGE OPERATION BOTH POLES / UNIPOLAR DETECTION TYPE HALL IC**  
**Rev.4.5\_00** **S-5712 Series**

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**3.2 SNT-4A**

**3.2.1 Nch open-drain output product**

**Table 4**

| Product Name      | Operating Cycle<br>( $t_{CYCLE}$ ) | Output Form           | Pole Detection | Detection Logic<br>for Magnetism | Magnetic Sensitivity<br>( $B_{OP}$ ) |
|-------------------|------------------------------------|-----------------------|----------------|----------------------------------|--------------------------------------|
| S-5712ANDL1-I4T1U | 50.50 ms typ.                      | Nch open-drain output | Both poles     | Active "L"                       | 3.0 mT typ.                          |
| S-5712ANDL2-I4T1U | 50.50 ms typ.                      | Nch open-drain output | Both poles     | Active "L"                       | 4.5 mT typ.                          |
| S-5712ANSL1-I4T1U | 50.85 ms typ.                      | Nch open-drain output | S pole         | Active "L"                       | 3.0 mT typ.                          |
| S-5712ANSL2-I4T1U | 50.85 ms typ.                      | Nch open-drain output | S pole         | Active "L"                       | 4.5 mT typ.                          |

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

**3.2.2 CMOS output product**

**Table 5**

| Product Name      | Operating Cycle<br>( $t_{CYCLE}$ ) | Output Form | Pole Detection | Detection Logic<br>for Magnetism | Magnetic Sensitivity<br>( $B_{OP}$ ) |
|-------------------|------------------------------------|-------------|----------------|----------------------------------|--------------------------------------|
| S-5712ACDL0-I4T1U | 50.50 ms typ.                      | CMOS output | Both poles     | Active "L"                       | 1.8 mT typ.                          |
| S-5712ACDL1-I4T1U | 50.50 ms typ.                      | CMOS output | Both poles     | Active "L"                       | 3.0 mT typ.                          |
| S-5712ACDL2-I4T1U | 50.50 ms typ.                      | CMOS output | Both poles     | Active "L"                       | 4.5 mT typ.                          |
| S-5712ACDH1-I4T1U | 50.50 ms typ.                      | CMOS output | Both poles     | Active "H"                       | 3.0 mT typ.                          |
| S-5712ACDH2-I4T1U | 50.50 ms typ.                      | CMOS output | Both poles     | Active "H"                       | 4.5 mT typ.                          |
| S-5712ACSL1-I4T1U | 50.85 ms typ.                      | CMOS output | S pole         | Active "L"                       | 3.0 mT typ.                          |
| S-5712ACSL2-I4T1U | 50.85 ms typ.                      | CMOS output | S pole         | Active "L"                       | 4.5 mT typ.                          |
| S-5712ACSH1-I4T1U | 50.85 ms typ.                      | CMOS output | S pole         | Active "H"                       | 3.0 mT typ.                          |
| S-5712ACSH2-I4T1U | 50.85 ms typ.                      | CMOS output | S pole         | Active "H"                       | 4.5 mT typ.                          |
| S-5712ACNL1-I4T1U | 50.85 ms typ.                      | CMOS output | N pole         | Active "L"                       | 3.0 mT typ.                          |
| S-5712ACNL2-I4T1U | 50.85 ms typ.                      | CMOS output | N pole         | Active "L"                       | 4.5 mT typ.                          |
| S-5712ACNH1-I4T1U | 50.85 ms typ.                      | CMOS output | N pole         | Active "H"                       | 3.0 mT typ.                          |
| S-5712BCDL1-I4T1U | 204.10 ms typ.                     | CMOS output | Both poles     | Active "L"                       | 3.0 mT typ.                          |
| S-5712BCDL2-I4T1U | 204.10 ms typ.                     | CMOS output | Both poles     | Active "L"                       | 4.5 mT typ.                          |
| S-5712BCDH1-I4T1U | 204.10 ms typ.                     | CMOS output | Both poles     | Active "H"                       | 3.0 mT typ.                          |
| S-5712BCDH2-I4T1U | 204.10 ms typ.                     | CMOS output | Both poles     | Active "H"                       | 4.5 mT typ.                          |
| S-5712CCDL1-I4T1U | 5.70 ms typ.                       | CMOS output | Both poles     | Active "L"                       | 3.0 mT typ.                          |
| S-5712CCDH1-I4T1U | 5.70 ms typ.                       | CMOS output | Both poles     | Active "H"                       | 3.0 mT typ.                          |
| S-5712CCSL1-I4T1U | 6.05 ms typ.                       | CMOS output | S pole         | Active "L"                       | 3.0 mT typ.                          |
| S-5712CCNL1-I4T1U | 6.05 ms typ.                       | CMOS output | N pole         | Active "L"                       | 3.0 mT typ.                          |

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

■ Pin Configurations

1. SOT-23-3

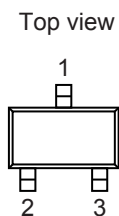


Figure 3

Table 6

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

2. SNT-4A

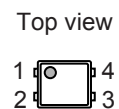


Figure 4

Table 7

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

\*1. The NC pin is electrically open.  
The NC pin can be connected to the VDD pin or the VSS pin.

■ Absolute Maximum Ratings

Table 8

(Ta = +25°C unless otherwise specified)

| Item                          | Symbol                        | Absolute Maximum Rating                        | Unit   |
|-------------------------------|-------------------------------|--|--|
| Power supply voltage          | V <sub>DD</sub>               | V <sub>SS</sub> - 0.3 to V <sub>SS</sub> + 7.0 | V  |
| Output current                | I <sub>OUT</sub>              | ±1.0   | mA   |
| Output voltage                | Nch open-drain output product | V <sub>OUT</sub>                               | V <sub>SS</sub> - 0.3 to V <sub>SS</sub> + 7.0 |
|                               | CMOS output product           |  | V <sub>SS</sub> - 0.3 to V <sub>DD</sub> + 0.3 |
| Power dissipation             | SOT-23-3                      | P <sub>D</sub>                                 | 430 <sup>*1</sup>                              |
|                               | SNT-4A                        |  | 300 <sup>*1</sup>                              |
| Operation ambient temperature | T <sub>opr</sub>              | -40 to +85                                     | °C   |
| Storage temperature           | T <sub>stg</sub>              | -40 to +125                                    | °C   |

\*1. When mounted on board  
 [Mounted board]

- (1) Board size: 114.3 mm × 76.2 mm × t1.6 mm
- (2) Name: JEDEC STANDARD51-7

**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.

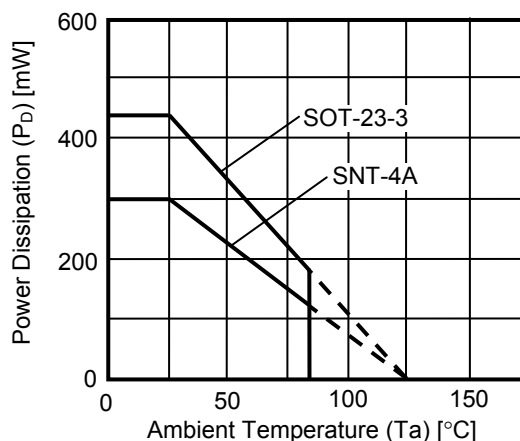


Figure 5 Power Dissipation of Package (When Mounted on Board)

■ **Electrical Characteristics**

**1. Product with both poles detection**

**1.1 S-5712AxDxx**

**Table 9**

(Ta = +25°C, V<sub>DD</sub> = 1.85 V, V<sub>SS</sub> = 0 V unless otherwise specified)

| Item                 | Symbol             | Condition  |   | Min.                  | Typ.  | Max.   | Unit | Test Circuit |
|----------------------|--------------------|--|---|-----------------------|-------|--------|------|--------------|
| Power supply voltage | V <sub>DD</sub>    | -  |   | 1.60                  | 1.85  | 3.50   | V    | -            |
| Current consumption  | I <sub>DD</sub>    | Average value  |   | -                     | 2.0   | 4.0    | μA   | 1            |
| Output voltage       | V <sub>OUT</sub>   | Nch open-drain output product  | Output transistor Nch, I <sub>OUT</sub> = 0.5 mA  | -                     | -     | 0.4    | V    | 2            |
|                      |                    | CMOS output product  | Output transistor Nch, I <sub>OUT</sub> = 0.5 mA  | -                     | -     | 0.4    | V    | 2            |
|                      |                    |  | Output transistor Pch, I <sub>OUT</sub> = -0.5 mA | V <sub>DD</sub> - 0.4 | -     | -      | V    | 3            |
| Leakage current      | I <sub>LEAK</sub>  | Nch open-drain output product<br>Output transistor Nch, V <sub>OUT</sub> = 3.5 V |   | -                     | -     | 1      | μA   | 4            |
| Awake mode time      | t <sub>AW</sub>    | -  |   | -                     | 0.10  | -      | ms   | -            |
| Sleep mode time      | t <sub>SL</sub>    | -  |   | -                     | 50.40 | -      | ms   | -            |
| Operating cycle      | t <sub>CYCLE</sub> | t <sub>AW</sub> + t <sub>SL</sub>  |   | -                     | 50.50 | 100.00 | ms   | -            |

**1.2 S-5712BxDxx**

**Table 10**

(Ta = +25°C, V<sub>DD</sub> = 1.85 V, V<sub>SS</sub> = 0 V unless otherwise specified)

| Item                 | Symbol             | Condition  |   | Min.                  | Typ.   | Max.   | Unit | Test Circuit |
|----------------------|--------------------|--|---|-----------------------|--------|--------|------|--------------|
| Power supply voltage | V <sub>DD</sub>    | -  |   | 1.60                  | 1.85   | 3.50   | V    | -            |
| Current consumption  | I <sub>DD</sub>    | Average value  |   | -                     | 1.0    | 2.0    | μA   | 1            |
| Output voltage       | V <sub>OUT</sub>   | Nch open-drain output product  | Output transistor Nch, I <sub>OUT</sub> = 0.5 mA  | -                     | -      | 0.4    | V    | 2            |
|                      |                    | CMOS output product  | Output transistor Nch, I <sub>OUT</sub> = 0.5 mA  | -                     | -      | 0.4    | V    | 2            |
|                      |                    |  | Output transistor Pch, I <sub>OUT</sub> = -0.5 mA | V <sub>DD</sub> - 0.4 | -      | -      | V    | 3            |
| Leakage current      | I <sub>LEAK</sub>  | Nch open-drain output product<br>Output transistor Nch, V <sub>OUT</sub> = 3.5 V |   | -                     | -      | 1      | μA   | 4            |
| Awake mode time      | t <sub>AW</sub>    | -  |   | -                     | 0.10   | -      | ms   | -            |
| Sleep mode time      | t <sub>SL</sub>    | -  |   | -                     | 204.00 | -      | ms   | -            |
| Operating cycle      | t <sub>CYCLE</sub> | t <sub>AW</sub> + t <sub>SL</sub>  |   | -                     | 204.10 | 400.00 | ms   | -            |

**1.3 S-5712CxDxx**

**Table 11**

(Ta = +25°C, V<sub>DD</sub> = 1.85 V, V<sub>SS</sub> = 0 V unless otherwise specified)

| Item                 | Symbol             | Condition  | Min.   | Typ.                  | Max.  | Unit | Test Circuit |   |
|----------------------|--------------------|--|--|-----------------------|-------|------|--------------|---|
| Power supply voltage | V <sub>DD</sub>    | –  | 1.60   | 1.85                  | 3.50  | V    | –            |   |
| Current consumption  | I <sub>DD</sub>    | Average value  | –  | 12.0                  | 22.0  | μA   | 1            |   |
| Output voltage       | V <sub>OUT</sub>   | Nch open-drain output product<br>Output transistor Nch,<br>I <sub>OUT</sub> = 0.5 mA | –  | –                     | 0.4   | V    | 2            |   |
|                      |                    | CMOS output product  | Output transistor Nch,<br>I <sub>OUT</sub> = 0.5 mA  | –                     | –     | 0.4  | V            | 2 |
|                      |                    |  | Output transistor Pch,<br>I <sub>OUT</sub> = –0.5 mA | V <sub>DD</sub> – 0.4 | –     | –    | V            | 3 |
| Leakage current      | I <sub>LEAK</sub>  | Nch open-drain output product<br>Output transistor Nch, V <sub>OUT</sub> = 3.5 V     | –  | –                     | 1     | μA   | 4            |   |
| Awake mode time      | t <sub>AW</sub>    | –  | –  | 0.10                  | –     | ms   | –            |   |
| Sleep mode time      | t <sub>SL</sub>    | –  | –  | 5.60                  | –     | ms   | –            |   |
| Operating cycle      | t <sub>CYCLE</sub> | t <sub>AW</sub> + t <sub>SL</sub>  | –  | 5.70                  | 12.00 | ms   | –            |   |

**2. Product with S pole and N pole detection**

**2.1 S-5712AxSxx, S-5712AxNxx**

**Table 12**

(Ta = +25°C, V<sub>DD</sub> = 1.85 V, V<sub>SS</sub> = 0 V unless otherwise specified)

| Item                 | Symbol             | Condition  |   | Min.                  | Typ.  | Max.   | Unit | Test Circuit |
|----------------------|--------------------|--|---|-----------------------|-------|--------|------|--------------|
| Power supply voltage | V <sub>DD</sub>    | -  |   | 1.60                  | 1.85  | 3.50   | V    | -            |
| Current consumption  | I <sub>DD</sub>    | Average value  |   | -                     | 1.4   | 3.0    | μA   | 1            |
| Output voltage       | V <sub>OUT</sub>   | Nch open-drain output product  | Output transistor Nch, I <sub>OUT</sub> = 0.5 mA  | -                     | -     | 0.4    | V    | 2            |
|                      |                    | CMOS output product  | Output transistor Nch, I <sub>OUT</sub> = 0.5 mA  | -                     | -     | 0.4    | V    | 2            |
|                      |                    |  | Output transistor Pch, I <sub>OUT</sub> = -0.5 mA | V <sub>DD</sub> - 0.4 | -     | -      | V    | 3            |
| Leakage current      | I <sub>LEAK</sub>  | Nch open-drain output product<br>Output transistor Nch, V <sub>OUT</sub> = 3.5 V |   | -                     | -     | 1      | μA   | 4            |
| Awake mode time      | t <sub>AW</sub>    | -  |   | -                     | 0.05  | -      | ms   | -            |
| Sleep mode time      | t <sub>SL</sub>    | -  |   | -                     | 50.80 | -      | ms   | -            |
| Operating cycle      | t <sub>CYCLE</sub> | t <sub>AW</sub> + t <sub>SL</sub>  |   | -                     | 50.85 | 100.00 | ms   | -            |

**2.2 S-5712CxSxx, S-5712CxNxx**

**Table 13**

(Ta = +25°C, V<sub>DD</sub> = 1.85 V, V<sub>SS</sub> = 0 V unless otherwise specified)

| Item                 | Symbol             | Condition  |   | Min.                  | Typ. | Max.  | Unit | Test Circuit |
|----------------------|--------------------|--|---|-----------------------|------|-------|------|--------------|
| Power supply voltage | V <sub>DD</sub>    | -  |   | 1.60                  | 1.85 | 3.50  | V    | -            |
| Current consumption  | I <sub>DD</sub>    | Average value  |   | -                     | 6.0  | 11.0  | μA   | 1            |
| Output voltage       | V <sub>OUT</sub>   | Nch open-drain output product  | Output transistor Nch, I <sub>OUT</sub> = 0.5 mA  | -                     | -    | 0.4   | V    | 2            |
|                      |                    | CMOS output product  | Output transistor Nch, I <sub>OUT</sub> = 0.5 mA  | -                     | -    | 0.4   | V    | 2            |
|                      |                    |  | Output transistor Pch, I <sub>OUT</sub> = -0.5 mA | V <sub>DD</sub> - 0.4 | -    | -     | V    | 3            |
| Leakage current      | I <sub>LEAK</sub>  | Nch open-drain output product<br>Output transistor Nch, V <sub>OUT</sub> = 3.5 V |   | -                     | -    | 1     | μA   | 4            |
| Awake mode time      | t <sub>AW</sub>    | -  |   | -                     | 0.05 | -     | ms   | -            |
| Sleep mode time      | t <sub>SL</sub>    | -  |   | -                     | 6.00 | -     | ms   | -            |
| Operating cycle      | t <sub>CYCLE</sub> | t <sub>AW</sub> + t <sub>SL</sub>  |   | -                     | 6.05 | 12.00 | ms   | -            |

■ Magnetic Characteristics

1. Product with both poles detection

1.1 Product with  $B_{OP} = 1.8 \text{ mT typ.}$

Table 14

( $T_a = +25^\circ\text{C}$ ,  $V_{DD} = 1.85 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

| Item                           | Symbol | Condition  | Min.                             | Typ. | Max. | Unit | Test Circuit |   |
|--------------------------------|--------|------------|----------------------------------|------|------|------|--------------|---|
| Operation point* <sup>1</sup>  | S pole | $B_{OPS}$  | –                                | 0.6  | 1.8  | 3.0  | mT           | 5 |
|                                | N pole | $B_{OPN}$  | –                                | –3.0 | –1.8 | –0.6 | mT           | 5 |
| Release point* <sup>2</sup>    | S pole | $B_{RPS}$  | –                                | 0.1  | 1.1  | 2.4  | mT           | 5 |
|                                | N pole | $B_{RPN}$  | –                                | –2.4 | –1.1 | –0.1 | mT           | 5 |
| Hysteresis width* <sup>3</sup> | S pole | $B_{HYSS}$ | $B_{HYSS} = B_{OPS} - B_{RPS}$   | –    | 0.7  | –    | mT           | 5 |
|                                | N pole | $B_{HYSN}$ | $B_{HYSN} =  B_{OPN} - B_{RPN} $ | –    | 0.7  | –    | mT           | 5 |

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

Table 15

( $T_a = +25^\circ\text{C}$ ,  $V_{DD} = 1.85 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

| Item                           | Symbol | Condition  | Min.                             | Typ. | Max. | Unit | Test Circuit |   |
|--------------------------------|--------|------------|----------------------------------|------|------|------|--------------|---|
| Operation point* <sup>1</sup>  | S pole | $B_{OPS}$  | –                                | 1.4  | 3.0  | 4.0  | mT           | 5 |
|                                | N pole | $B_{OPN}$  | –                                | –4.0 | –3.0 | –1.4 | mT           | 5 |
| Release point* <sup>2</sup>    | S pole | $B_{RPS}$  | –                                | 1.1  | 2.2  | 3.7  | mT           | 5 |
|                                | N pole | $B_{RPN}$  | –                                | –3.7 | –2.2 | –1.1 | mT           | 5 |
| Hysteresis width* <sup>3</sup> | S pole | $B_{HYSS}$ | $B_{HYSS} = B_{OPS} - B_{RPS}$   | –    | 0.8  | –    | mT           | 5 |
|                                | N pole | $B_{HYSN}$ | $B_{HYSN} =  B_{OPN} - B_{RPN} $ | –    | 0.8  | –    | mT           | 5 |

1.3 Product with  $B_{OP} = 4.5 \text{ mT typ.}$

Table 16

( $T_a = +25^\circ\text{C}$ ,  $V_{DD} = 1.85 \text{ V}$ ,  $V_{SS} = 0 \text{ V}$  unless otherwise specified)

| Item                           | Symbol | Condition  | Min.                             | Typ. | Max. | Unit | Test Circuit |   |
|--------------------------------|--------|------------|----------------------------------|------|------|------|--------------|---|
| Operation point* <sup>1</sup>  | S pole | $B_{OPS}$  | –                                | 2.5  | 4.5  | 6.0  | mT           | 5 |
|                                | N pole | $B_{OPN}$  | –                                | –6.0 | –4.5 | –2.5 | mT           | 5 |
| Release point* <sup>2</sup>    | S pole | $B_{RPS}$  | –                                | 2.0  | 3.5  | 5.5  | mT           | 5 |
|                                | N pole | $B_{RPN}$  | –                                | –5.5 | –3.5 | –2.0 | mT           | 5 |
| Hysteresis width* <sup>3</sup> | S pole | $B_{HYSS}$ | $B_{HYSS} = B_{OPS} - B_{RPS}$   | –    | 1.0  | –    | mT           | 5 |
|                                | N pole | $B_{HYSN}$ | $B_{HYSN} =  B_{OPN} - B_{RPN} $ | –    | 1.0  | –    | mT           | 5 |

**2. Product with S pole detection**

**2.1 Product with  $B_{OP} = 1.8$  mT typ.**

**Table 17**

( $T_a = +25^\circ\text{C}$ ,  $V_{DD} = 1.85$  V,  $V_{SS} = 0$  V unless otherwise specified)

| Item                           |        | Symbol     | Condition                      | Min. | Typ. | Max. | Unit | Test Circuit |
|--------------------------------|--------|------------|--------------------------------|------|------|------|------|--------------|
| Operation point <sup>*1</sup>  | S pole | $B_{OPS}$  | –                              | 0.6  | 1.8  | 3.0  | mT   | 5            |
| Release point <sup>*2</sup>    | S pole | $B_{RPS}$  | –                              | 0.1  | 1.1  | 2.4  | mT   | 5            |
| Hysteresis width <sup>*3</sup> | S pole | $B_{HYSS}$ | $B_{HYSS} = B_{OPS} - B_{RPS}$ | –    | 0.7  | –    | mT   | 5            |

**2.2 Product with  $B_{OP} = 3.0$  mT typ.**

**Table 18**

( $T_a = +25^\circ\text{C}$ ,  $V_{DD} = 1.85$  V,  $V_{SS} = 0$  V unless otherwise specified)

| Item                           |        | Symbol     | Condition                      | Min. | Typ. | Max. | Unit | Test Circuit |
|--------------------------------|--------|------------|--------------------------------|------|------|------|------|--------------|
| Operation point <sup>*1</sup>  | S pole | $B_{OPS}$  | –                              | 1.4  | 3.0  | 4.0  | mT   | 5            |
| Release point <sup>*2</sup>    | S pole | $B_{RPS}$  | –                              | 1.1  | 2.2  | 3.7  | mT   | 5            |
| Hysteresis width <sup>*3</sup> | S pole | $B_{HYSS}$ | $B_{HYSS} = B_{OPS} - B_{RPS}$ | –    | 0.8  | –    | mT   | 5            |

**2.3 Product with  $B_{OP} = 4.5$  mT typ.**

**Table 19**

( $T_a = +25^\circ\text{C}$ ,  $V_{DD} = 1.85$  V,  $V_{SS} = 0$  V unless otherwise specified)

| Item                           |        | Symbol     | Condition                      | Min. | Typ. | Max. | Unit | Test Circuit |
|--------------------------------|--------|------------|--------------------------------|------|------|------|------|--------------|
| Operation point <sup>*1</sup>  | S pole | $B_{OPS}$  | –                              | 2.5  | 4.5  | 6.0  | mT   | 5            |
| Release point <sup>*2</sup>    | S pole | $B_{RPS}$  | –                              | 2.0  | 3.5  | 5.5  | mT   | 5            |
| Hysteresis width <sup>*3</sup> | S pole | $B_{HYSS}$ | $B_{HYSS} = B_{OPS} - B_{RPS}$ | –    | 1.0  | –    | mT   | 5            |

### 3. Product with N pole detection

#### 3.1 Product with $B_{OP} = 1.8 \text{ mT typ.}$

**Table 20**

(Ta = +25°C, V<sub>DD</sub> = 1.85 V, V<sub>SS</sub> = 0 V unless otherwise specified)

| Item                           |        | Symbol            | Condition  | Min. | Typ. | Max. | Unit | Test Circuit |
|--------------------------------|--------|-------------------|--|------|------|------|------|--------------|
| Operation point <sup>*1</sup>  | N pole | B <sub>OPN</sub>  | –  | –3.0 | –1.8 | –0.6 | mT   | 5            |
| Release point <sup>*2</sup>    | N pole | B <sub>RPN</sub>  | –  | –2.4 | –1.1 | –0.1 | mT   | 5            |
| Hysteresis width <sup>*3</sup> | N pole | B <sub>HYSN</sub> | B <sub>HYSN</sub> =  B <sub>OPN</sub> – B <sub>RPN</sub> | –    | 0.7  | –    | mT   | 5            |

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

**Table 21**

(Ta = +25°C, V<sub>DD</sub> = 1.85 V, V<sub>SS</sub> = 0 V unless otherwise specified)

| Item                           |        | Symbol            | Condition  | Min. | Typ. | Max. | Unit | Test Circuit |
|--------------------------------|--------|-------------------|--|------|------|------|------|--------------|
| Operation point <sup>*1</sup>  | N pole | B <sub>OPN</sub>  | –  | –4.0 | –3.0 | –1.4 | mT   | 5            |
| Release point <sup>*2</sup>    | N pole | B <sub>RPN</sub>  | –  | –3.7 | –2.2 | –1.1 | mT   | 5            |
| Hysteresis width <sup>*3</sup> | N pole | B <sub>HYSN</sub> | B <sub>HYSN</sub> =  B <sub>OPN</sub> – B <sub>RPN</sub> | –    | 0.8  | –    | mT   | 5            |

#### 3.3 Product with $B_{OP} = 4.5 \text{ mT typ.}$

**Table 22**

(Ta = +25°C, V<sub>DD</sub> = 1.85 V, V<sub>SS</sub> = 0 V unless otherwise specified)

| Item                           |        | Symbol            | Condition  | Min. | Typ. | Max. | Unit | Test Circuit |
|--------------------------------|--------|-------------------|--|------|------|------|------|--------------|
| Operation point <sup>*1</sup>  | N pole | B <sub>OPN</sub>  | –  | –6.0 | –4.5 | –2.5 | mT   | 5            |
| Release point <sup>*2</sup>    | N pole | B <sub>RPN</sub>  | –  | –5.5 | –3.5 | –2.0 | mT   | 5            |
| Hysteresis width <sup>*3</sup> | N pole | B <sub>HYSN</sub> | B <sub>HYSN</sub> =  B <sub>OPN</sub> – B <sub>RPN</sub> | –    | 1.0  | –    | mT   | 5            |

**\*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 the S-5712 Series 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**

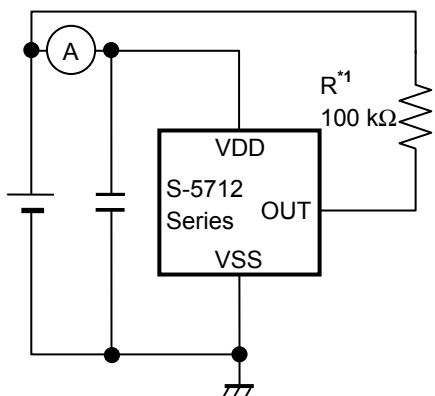
B<sub>RPN</sub> and B<sub>RPS</sub> are the values of magnetic flux density when the output voltage (V<sub>OUT</sub>) changes after the magnetic flux density applied to the S-5712 Series by the magnet (N pole or S pole) is decreased (the magnet is moved further away). Even when the magnetic flux density 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.

**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 the CMOS output product.

Figure 6 Test Circuit 1

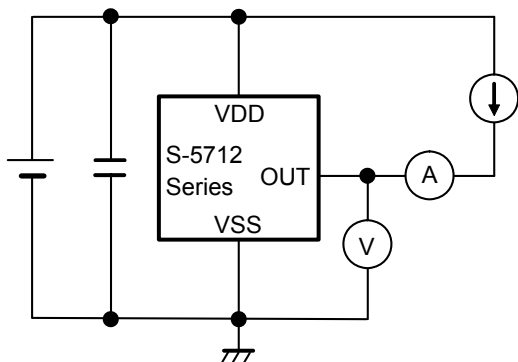


Figure 7 Test Circuit 2

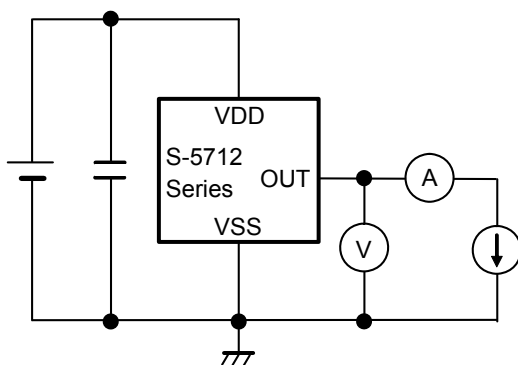


Figure 8 Test Circuit 3

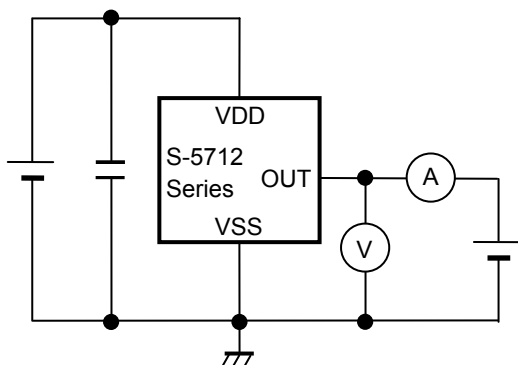
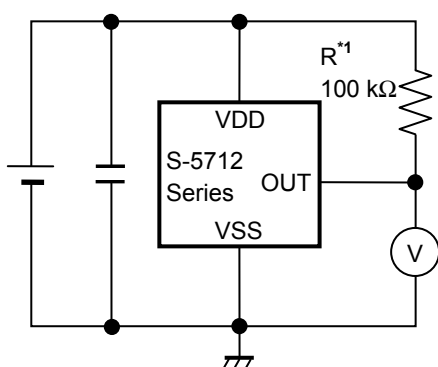


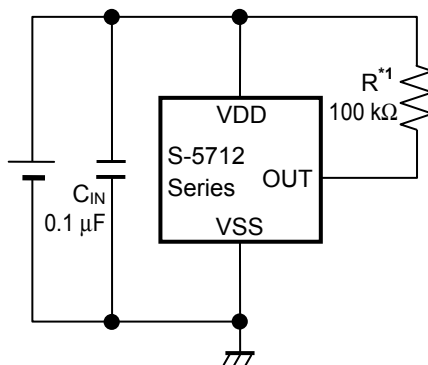
Figure 9 Test Circuit 4



\*1. Resistor (R) is unnecessary for the CMOS output product.

Figure 10 Test Circuit 5

■ Standard Circuit



\*1. Resistor (R) is unnecessary for the CMOS output product.

Figure 11

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

■ Operation

1. Direction of applied magnetic flux

The S-5712 Series detects the flux density which is vertical to the marking surface.

In the product with both poles detection, the output voltage ( $V_{OUT}$ ) is inverted when the S pole or N pole is moved closer to the marking surface.

In the product with S pole detection,  $V_{OUT}$  is inverted when the S pole is moved closer to the marking surface.

In the product with N pole detection,  $V_{OUT}$  is inverted when the N pole is moved closer to the marking surface.

Figure 12 and Figure 13 show the direction in which magnetic flux is being applied.

1.1 SOT-23-3

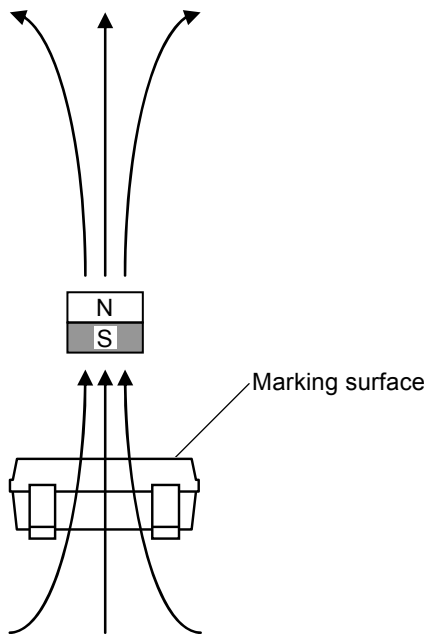


Figure 12

1.2 SNT-4A

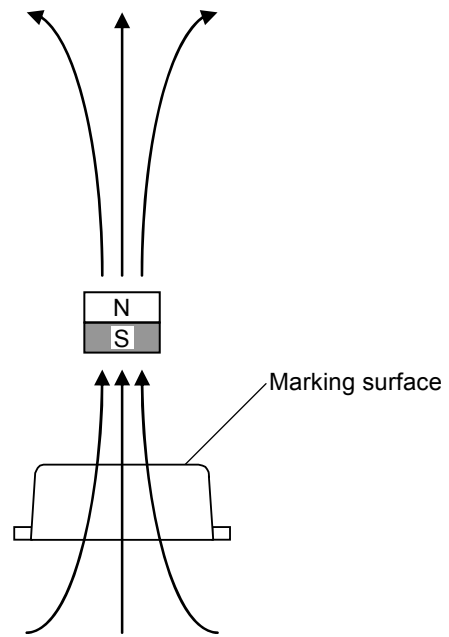


Figure 13

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 SOT-23-3

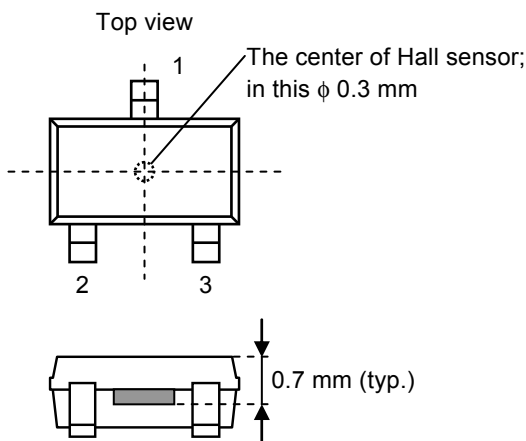


Figure 14

2.2 SNT-4A

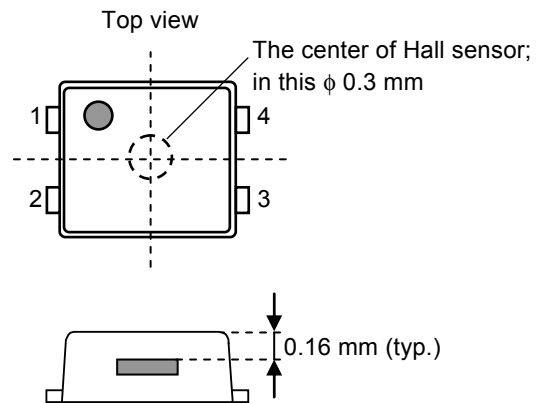


Figure 15

**3. Basic operation**

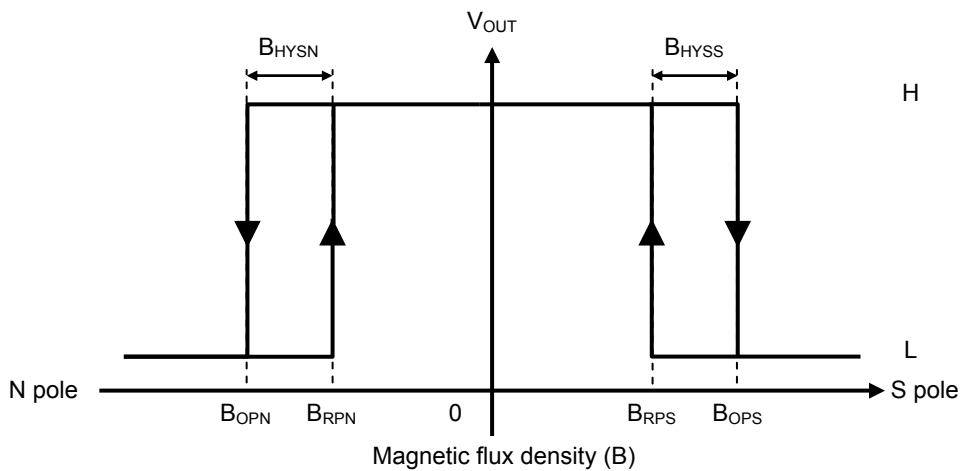
The S-5712 Series changes the output voltage level ( $V_{OUT}$ ) according to the level of the magnetic flux density (N pole or S pole) applied by a magnet.

The following explains the operation when the magnetism detection logic is active "L".

**3.1 Product with both poles detection**

When the magnetic flux density vertical 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 the S-5712 Series,  $V_{OUT}$  changes from "H" to "L". When the S pole or N pole of a magnet is moved further away from the marking surface of the S-5712 Series 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  $V_{OUT}$ .

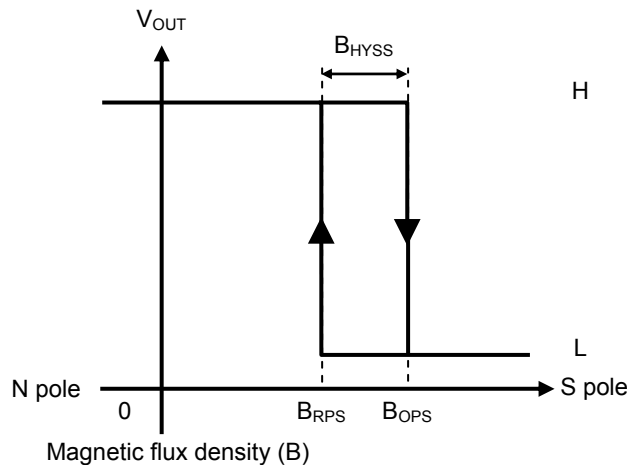


**Figure 16**

**3.2 Product with S pole detection**

When the magnetic flux density vertical to the marking surface exceeds  $B_{OPS}$  after the S pole of a magnet is moved closer to the marking surface of the S-5712 Series,  $V_{OUT}$  changes from "H" to "L". When the S pole of a magnet is moved further away from the marking surface of the S-5712 Series and the magnetic flux density is lower than  $B_{RPS}$ ,  $V_{OUT}$  changes from "L" to "H".

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

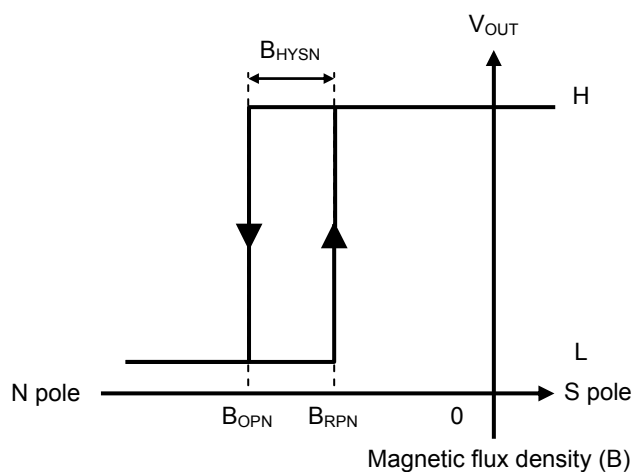


**Figure 17**

**3.3 Product with N pole detection**

When the magnetic flux density vertical to the marking surface exceeds  $B_{OPN}$  after the N pole of a magnet is moved closer to the marking surface of the S-5712 Series,  $V_{OUT}$  changes from "H" to "L". When the N pole of a magnet is moved further away from the marking surface of the S-5712 Series and the magnetic flux density is lower than  $B_{RPN}$ ,  $V_{OUT}$  changes from "L" to "H".

**Figure 18** shows the relationship between the magnetic flux density and  $V_{OUT}$ .



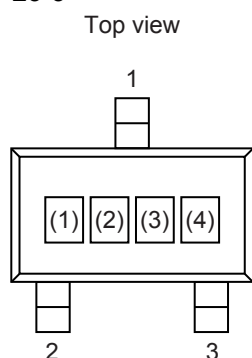
**Figure 18**

■ **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.
- Do not apply an electrostatic discharge to this IC that exceeds the performance ratings of the built-in electrostatic protection circuit.
- Large stress on this IC may affect on the magnetic characteristics. Avoid large stress which is caused by bend and distortion during mounting the IC on a board or handle after mounting.
- SII 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.

## ■ Marking Specifications

### 1. SOT-23-3



(1) to (3): Product code (Refer to **Product name vs. Product code.**)  
 (4): Lot number

#### Product name vs. Product code

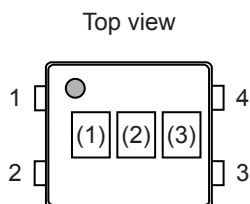
##### 1.1 Nch open-drain output product

| Product Name      | Product Code |     |     |
|-------------------|--------------|-----|-----|
|                   | (1)          | (2) | (3) |
| S-5712ANDL1-M3T1U | X            | A   | B   |
| S-5712ANDL2-M3T1U | X            | A   | C   |
| S-5712ANSL1-M3T1U | X            | A   | J   |
| S-5712ANSL2-M3T1U | X            | A   | K   |
| S-5712BNDL2-M3T1U | X            | C   | C   |

##### 1.2 CMOS output product

| Product Name      | Product Code |     |     |
|-------------------|--------------|-----|-----|
|                   | (1)          | (2) | (3) |
| S-5712ACDL1-M3T1U | X            | B   | B   |
| S-5712ACDL2-M3T1U | X            | B   | C   |
| S-5712ACDH1-M3T1U | X            | B   | F   |
| S-5712ACDH2-M3T1U | X            | B   | G   |
| S-5712ACSL1-M3T1U | X            | B   | J   |
| S-5712ACSL2-M3T1U | X            | B   | K   |
| S-5712ACNL1-M3T1U | X            | B   | R   |
| S-5712ACNL2-M3T1U | X            | B   | S   |
| S-5712CCDL1-M3T1U | X            | F   | B   |
| S-5712CCSL1-M3T1U | X            | F   | J   |

**2. SNT-4A**



(1) to (3): Product code (Refer to **Product name vs. Product code.**)

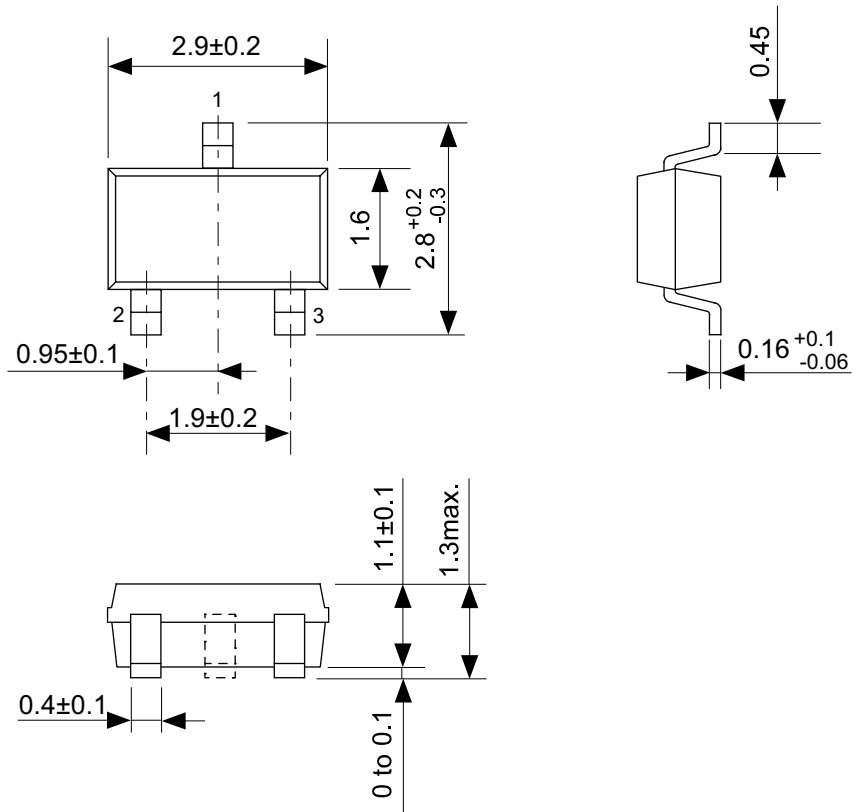
**Product name vs. Product code**

**2.1 Nch open-drain output product**

| Product Name      | Product Code |     |     |
|-------------------|--------------|-----|-----|
|                   | (1)          | (2) | (3) |
| S-5712ANDL1-I4T1U | X            | A   | B   |
| S-5712ANDL2-I4T1U | X            | A   | C   |
| S-5712ANSL1-I4T1U | X            | A   | J   |
| S-5712ANSL2-I4T1U | X            | A   | K   |

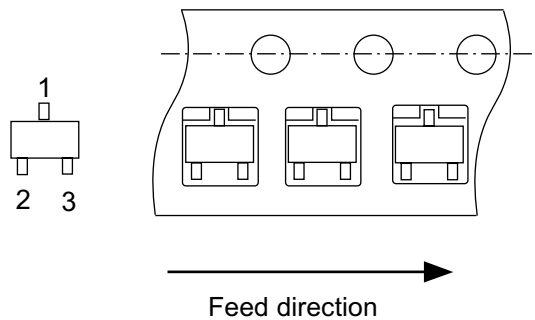
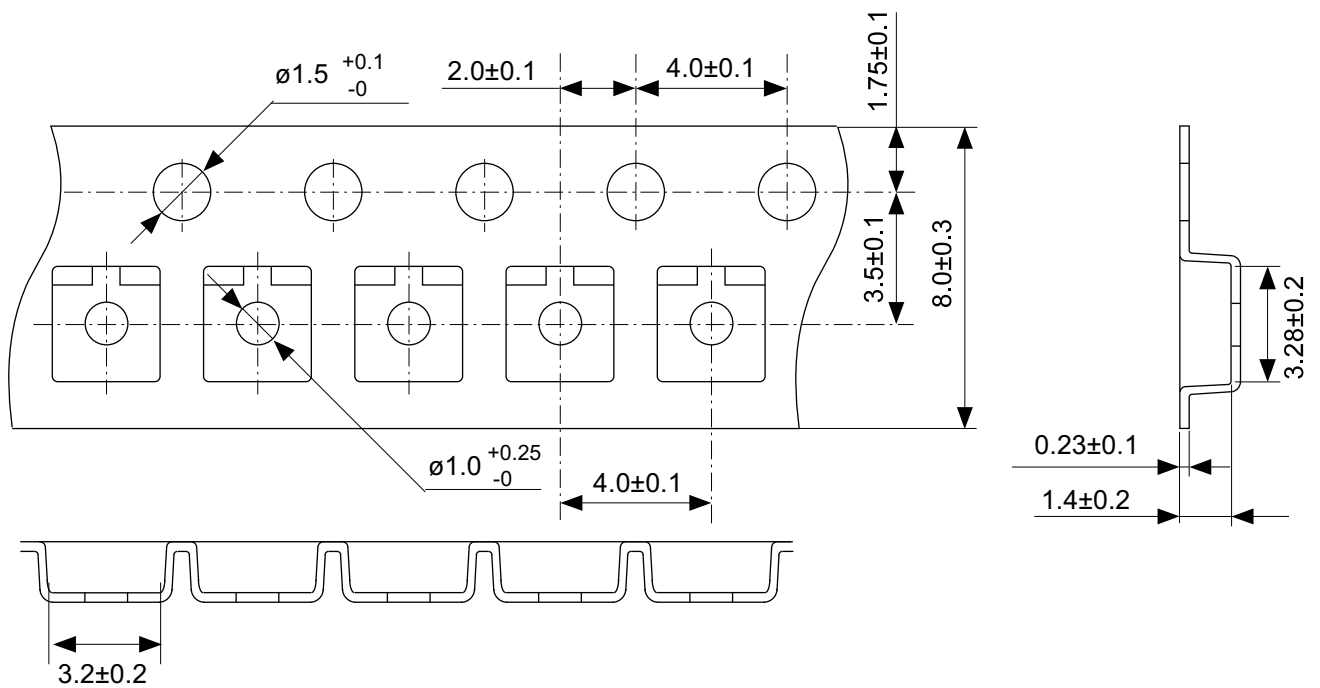
**2.2 CMOS output product**

| Product Name      | Product Code |     |     |
|-------------------|--------------|-----|-----|
|                   | (1)          | (2) | (3) |
| S-5712ACDL0-I4T1U | X            | B   | A   |
| S-5712ACDL1-I4T1U | X            | B   | B   |
| S-5712ACDL2-I4T1U | X            | B   | C   |
| S-5712ACDH1-I4T1U | X            | B   | F   |
| S-5712ACDH2-I4T1U | X            | B   | G   |
| S-5712ACSL1-I4T1U | X            | B   | J   |
| S-5712ACSL2-I4T1U | X            | B   | K   |
| S-5712ACSH1-I4T1U | X            | B   | N   |
| S-5712ACSH2-I4T1U | X            | B   | O   |
| S-5712ACNL1-I4T1U | X            | B   | R   |
| S-5712ACNL2-I4T1U | X            | B   | S   |
| S-5712ACNH1-I4T1U | X            | B   | V   |
| S-5712BCDL1-I4T1U | X            | D   | B   |
| S-5712BCDL2-I4T1U | X            | D   | C   |
| S-5712BCDH1-I4T1U | X            | D   | F   |
| S-5712BCDH2-I4T1U | X            | D   | G   |
| S-5712CCDL1-I4T1U | X            | F   | B   |
| S-5712CCDH1-I4T1U | X            | F   | F   |
| S-5712CCSL1-I4T1U | X            | F   | J   |
| S-5712CCNL1-I4T1U | X            | F   | R   |



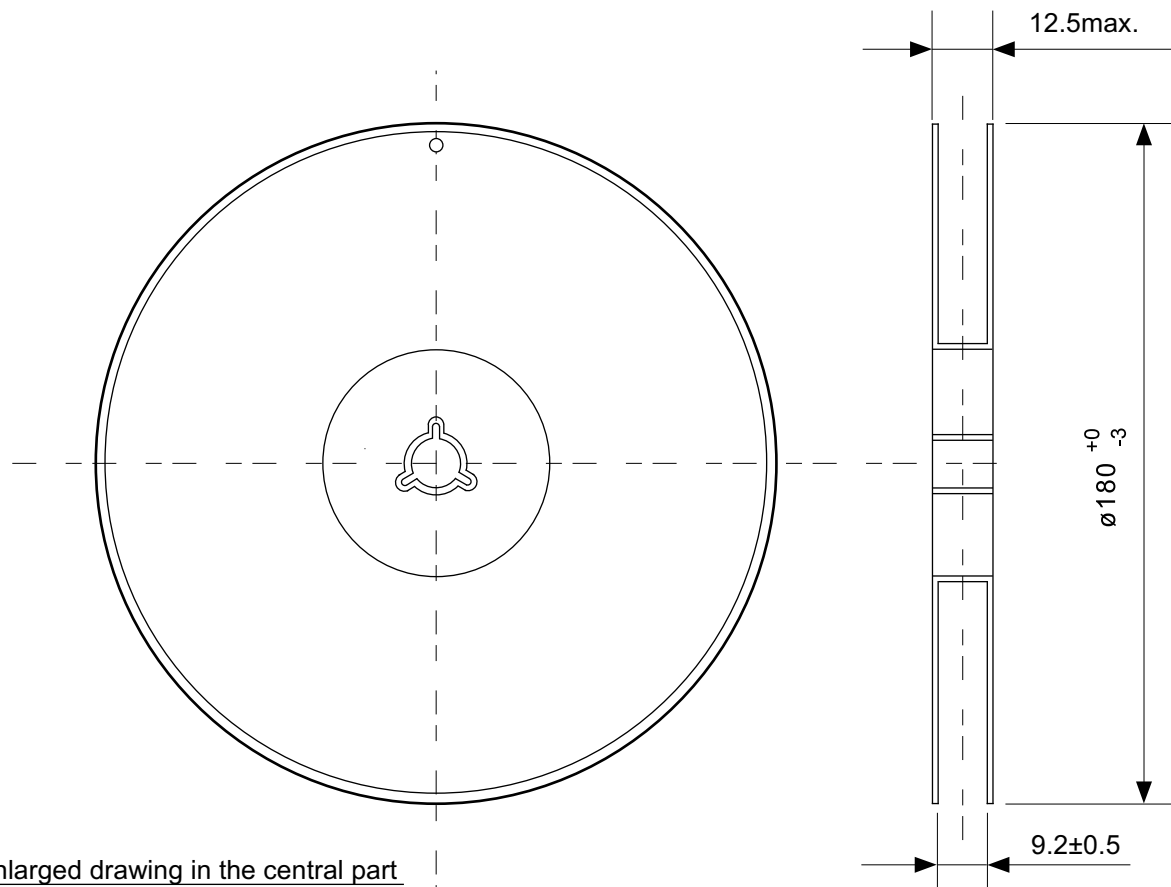
No. MP003-C-P-SD-1.0

|                        |                         |
|------------------------|-------------------------|
| TITLE                  | SOT233-C-PKG Dimensions |
| No.                    | MP003-C-P-SD-1.0        |
| SCALE                  |                         |
| UNIT                   | mm                      |
| Seiko Instruments Inc. |                         |

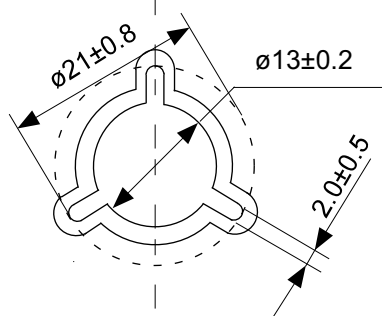


No. MP003-C-C-SD-2.0

|                        |                       |
|------------------------|-----------------------|
| TITLE                  | SOT233-C-Carrier Tape |
| No.                    | MP003-C-C-SD-2.0      |
| SCALE                  |                       |
| UNIT                   | mm                    |
| Seiko Instruments Inc. |                       |



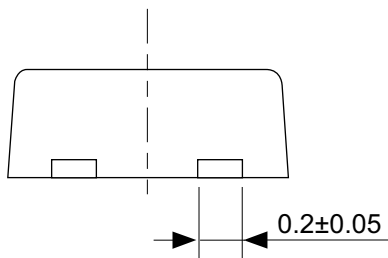
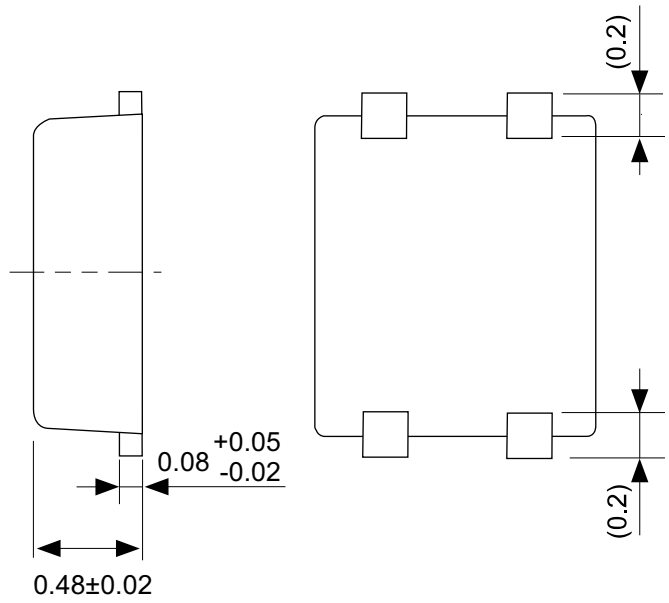
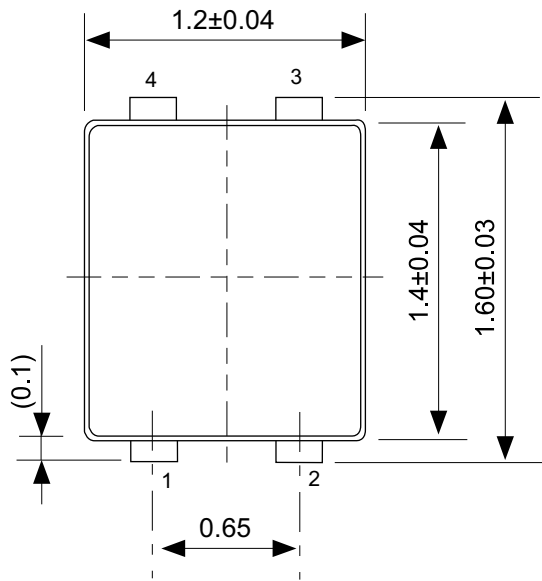
Enlarged drawing in the central part



No. MP003-Z-R-SD-1.0

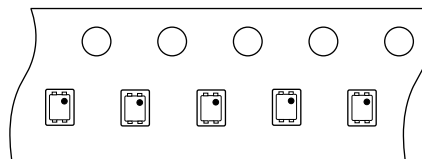
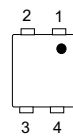
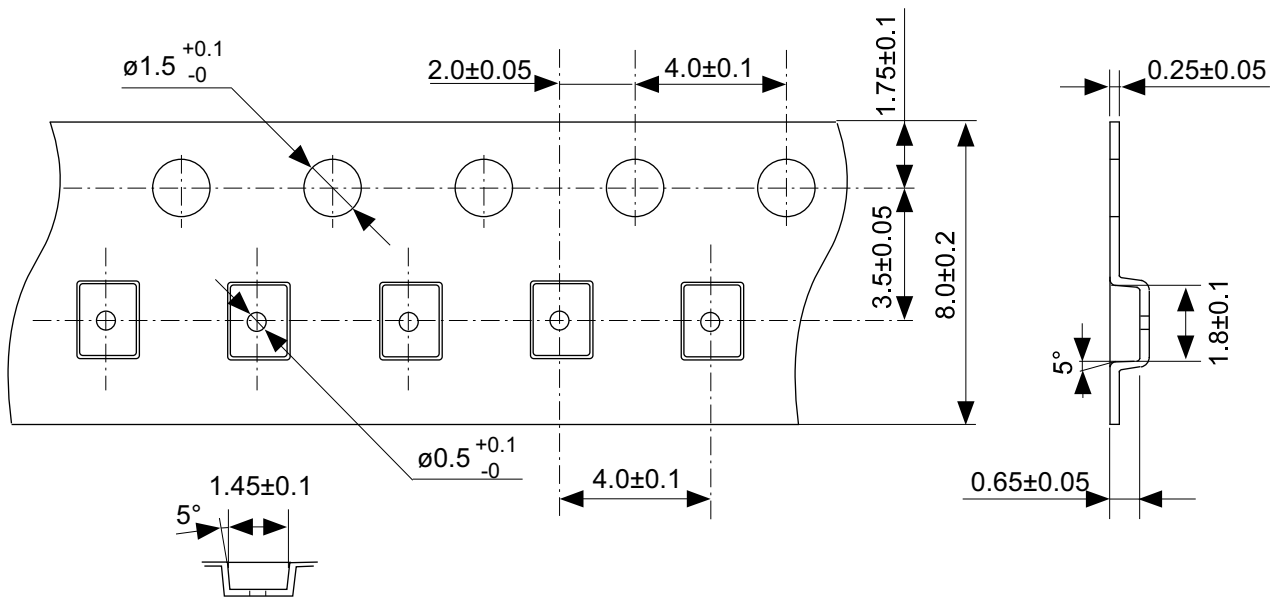
|       |                  |      |       |
|-------|------------------|------|-------|
| TITLE | SOT233-C-Reel    |      |       |
| No.   | MP003-Z-R-SD-1.0 |      |       |
| SCALE |                  | QTY. | 3,000 |
| UNIT  | mm               |      |       |
|       |                  |      |       |

Seiko Instruments Inc.



No. PF004-A-P-SD-4.0

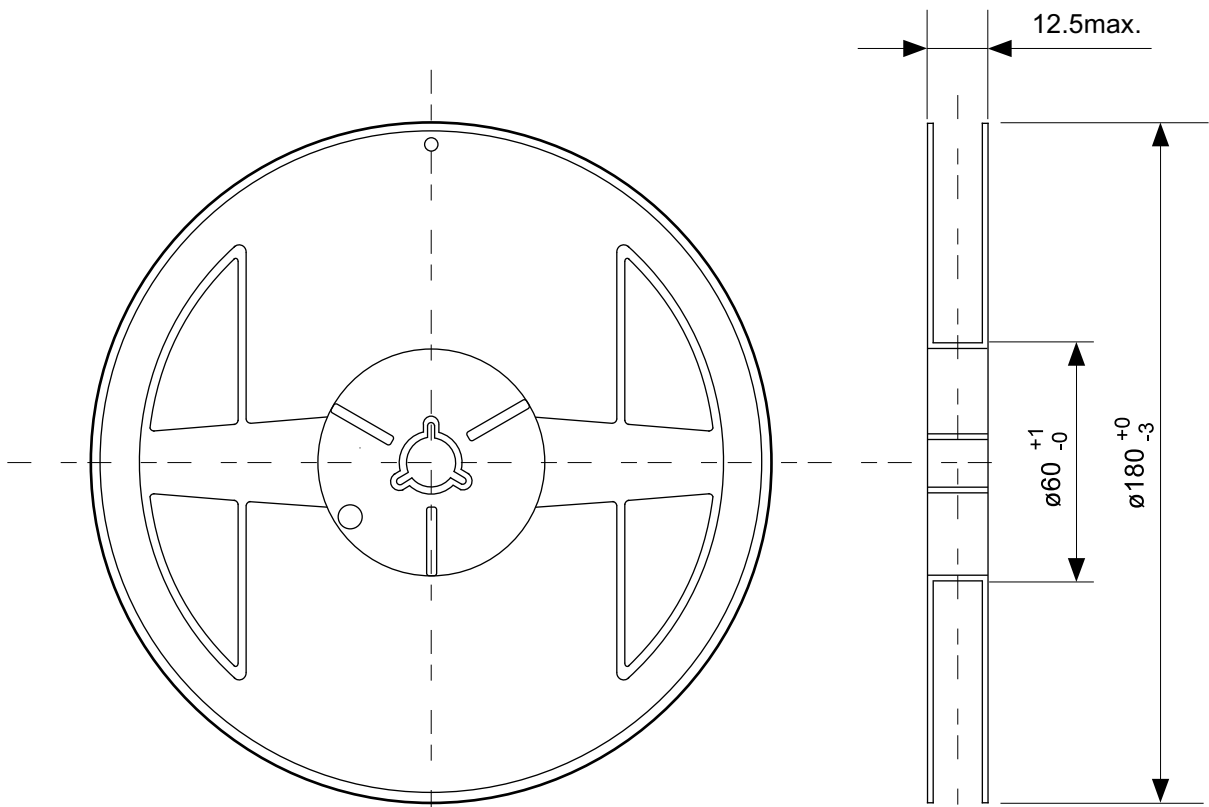
|                        |                         |
|------------------------|-------------------------|
| TITLE                  | SNT-4A-A-PKG Dimensions |
| No.                    | PF004-A-P-SD-4.0        |
| SCALE                  |                         |
| UNIT                   | mm                      |
| Seiko Instruments Inc. |                         |



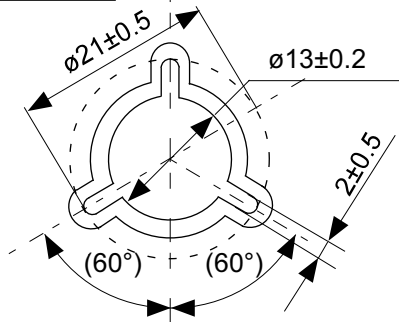
Feed direction

No. PF004-A-C-SD-1.0

|                        |                       |
|------------------------|-----------------------|
| TITLE                  | SNT-4A-A-Carrier Tape |
| No.                    | PF004-A-C-SD-1.0      |
| SCALE                  |                       |
| UNIT                   | mm                    |
| Seiko Instruments Inc. |                       |

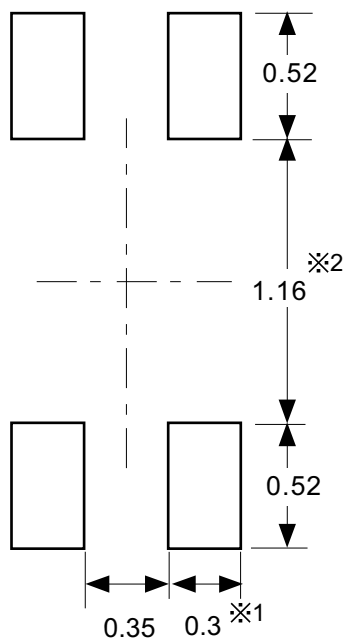


Enlarged drawing in the central part



No. PF004-A-R-SD-1.0

|                        |                  |      |       |
|------------------------|------------------|------|-------|
| TITLE                  | SNT-4A-A-Reel    |      |       |
| No.                    | PF004-A-R-SD-1.0 |      |       |
| SCALE                  |                  | QTY. | 5,000 |
| UNIT                   | mm               |      |       |
|                        |                  |      |       |
| Seiko Instruments Inc. |                  |      |       |



※1. ランドパターンの幅に注意してください (0.25 mm min. / 0.30 mm typ.).

※2. パッケージ中央にランドパターンを広げないでください (1.10 mm ~ 1.20 mm)。

- 注意
1. パッケージのモールド樹脂下にシルク印刷やハンダ印刷などしないでください。
  2. パッケージ下の配線上のソルダーレジストなどの厚みをランドパターン表面から0.03 mm以下にしてください。
  3. マスク開口サイズと開口位置はランドパターンと合わせてください。
  4. 詳細は "SNTパッケージ活用の手引き" を参照してください。

※1. Pay attention to the land pattern width (0.25 mm min. / 0.30 mm typ.).

※2. Do not widen the land pattern to the center of the package (1.10 mm to 1.20 mm).

- Caution**
1. Do not do silkscreen printing and solder printing under the mold resin of the package.
  2. The thickness of the solder resist on the wire pattern under the package should be 0.03 mm or less from the land pattern surface.
  3. Match the mask aperture size and aperture position with the land pattern.
  4. Refer to "SNT Package User's Guide" for details.

※1. 请注意焊盘模式的宽度 (0.25 mm min. / 0.30 mm typ.).

※2. 请勿向封装中间扩展焊盘模式 (1.10 mm ~ 1.20 mm)。

- 注意
1. 请勿在树脂型封装的下面印刷丝网、焊锡。
  2. 在封装下、布线上的阻焊膜厚度 (从焊盘模式表面起) 请控制在 0.03 mm 以下。
  3. 钢网的开口尺寸和开口位置请与焊盘模式对齐。
  4. 详细内容请参阅 "SNT 封装的应用指南"。

No. PF004-A-L-SD-4.1

|                        |                              |
|------------------------|------------------------------|
| TITLE                  | SNT-4A-A-Land Recommendation |
| No.                    | PF004-A-L-SD-4.1             |
| SCALE                  |                              |
| UNIT                   | mm                           |
|                        |                              |
| Seiko Instruments Inc. |                              |



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