S-5852A Series

HIGH-ACCURACY DIGITAL TEMPERATURE SENSOR WITH THERMOSTAT FUNCTION

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Rev.1.0_00

The S-5852A Series is a high-accuracy digital temperature sensor with thermostat function, which operates in 1.7 V to 3.6 V voltage ranges. The S-5852A Series interfaces with exteriors via I^2C-bus and operates at 1.0 MHz maximum. The temperature detection signal is output by using the thermostat function which can be set by the I^2C-bus. Moreover, a substantial reduction in current consumption may be achieved by using the shutdown mode which can be set by the I^2C-bus.

The operation of the S-5852A Series is explained in the user's manual. Contact our sales office for more information.

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

- Temperature accuracy*1: ±0.5°C typ. / ±1.0°C max. (Ta = 0°C to +65°C)
  ±0.5°C typ. / ±1.0°C max. (Ta = +75°C to +95°C)
- Temperature resolution: 0.5°C, 0.25°C, 0.125°C, 0.0625°C
  (Selectable by the resolution register)
- Temperature sample rate: 7 samples / s min.
- Selectable hysteresis width: No hysteresis, 1.5°C, 3.0°C, 6.0°C
- Current consumption:
  Shutdown mode at serial bus non-active: 0.3 μA typ., 3.0 μA max.
  Active mode at serial bus non-active: 40 μA typ., 100 μA max.
- Operation voltage range: 1.7 V to 3.6 V
- Operation frequency: 1.0 MHz max. (V_{DD} = 2.2 V to 3.6 V)
  400 kHz max. (V_{DD} = 1.7 V to 2.2 V)
- Thermostat function: Dual trip mode, single trip mode, OFF
  (Selectable by the configuration register)
- Noise suppression: Schmitt trigger and noise filter on input pins (SCL, SDA)
- Operation temperature range: Ta = –40°C to +125°C
- Lead-free (Sn 100%), halogen-free

***1.** The option can be selected.

■ Applications

- Solid state drive
- Hard disk drive
- Notebook PC, tablet PC
- Refrigerator
- Air conditioning system

■ Package

- HSNT-8(2030)

■ Block Diagram

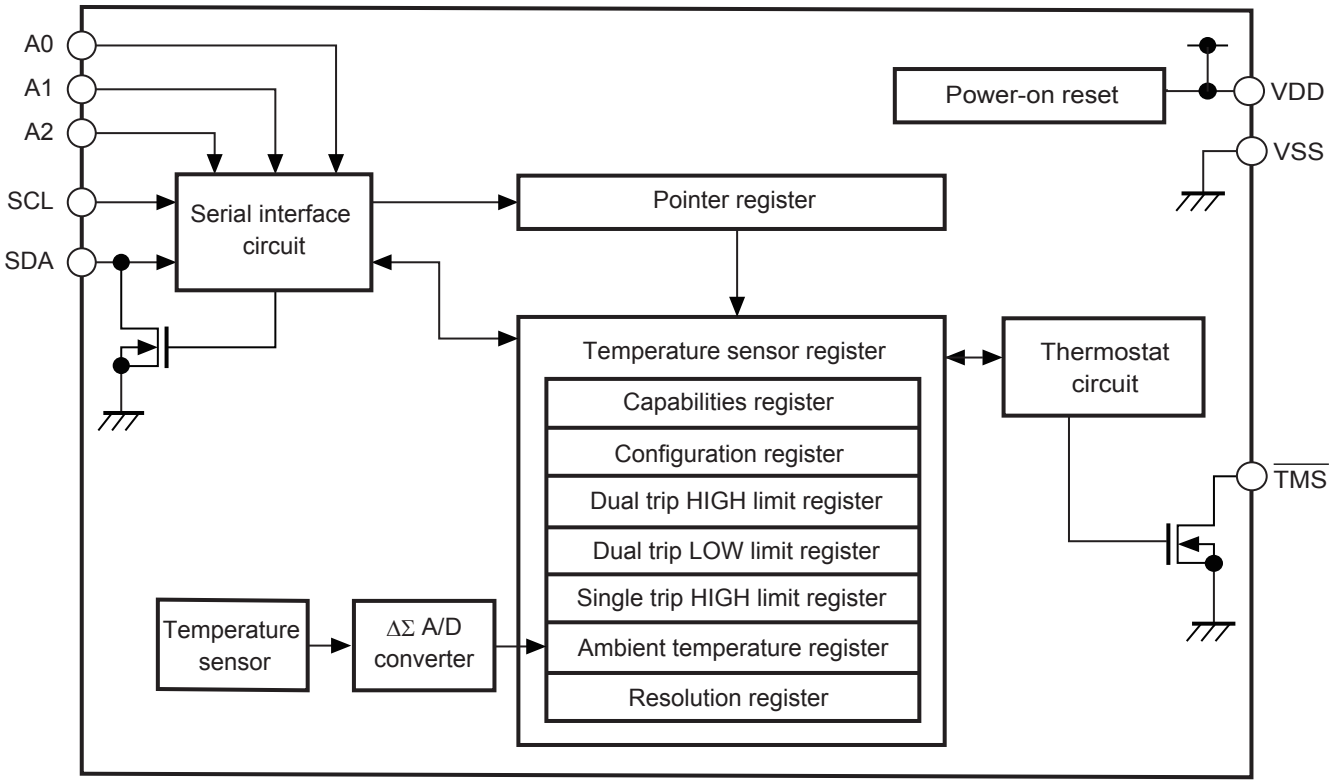
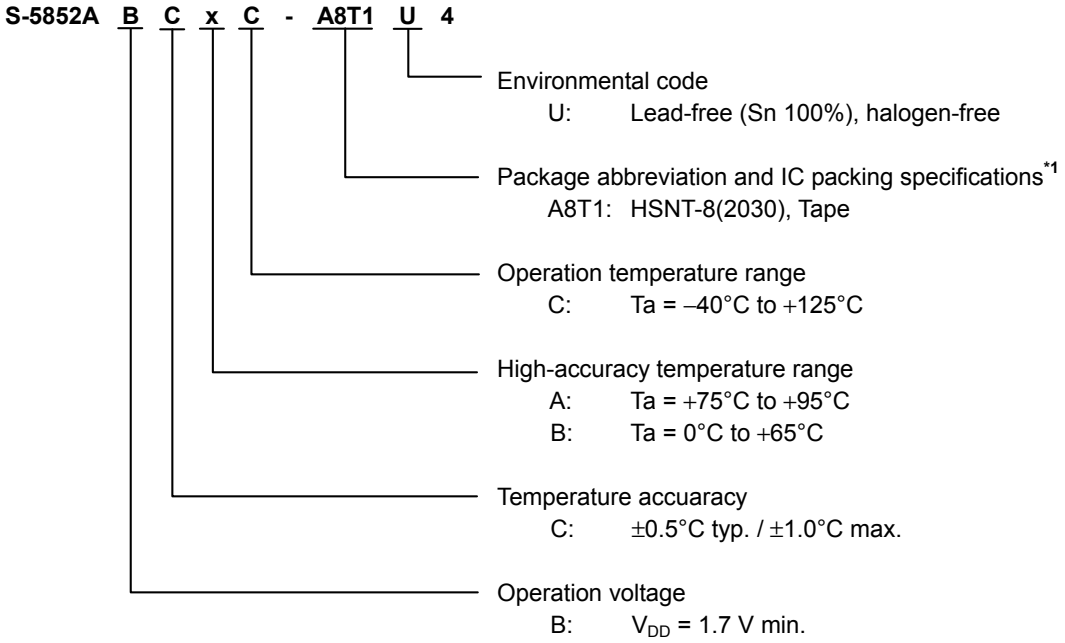


Figure 1

■ Product Name Structure

1. Product name



***1.** Refer to the tape drawing.

2. Package

Table 1 Package Drawing Codes

Package Name	Dimension	Tape	Reel	Land
HSNT-8(2030)	PP008-A-P-SD	PP008-A-C-SD	PP008-A-R-SD	PP008-A-L-SD

3. Product name list

Table 2

Product Name	Operation Voltage	Temperature Accuracy	High-accuracy Temperature Range	Operation Temperature
S-5852ABCBC-A8T1U4	1.7 V min.	±0.5°C typ. / ±1.0°C max.	0°C to +65°C	–40°C to +125°C

Remark Please contact our sales office for S-5852ABCAC-A8T1U4.

■ Pin Configuration

1. HSNT-8(2030)

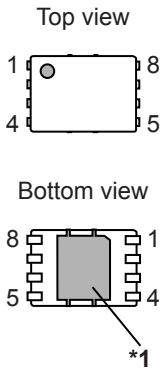


Figure 2

Table 3

Pin No.	Symbol	Description
1	A0	Slave address input pin
2	A1	Slave address input pin
3	A2	Slave address input pin
4	VSS	GND pin
5	SDA*2	Serial data I/O pin
6	SCL*2	Serial clock input pin
7	$\overline{TMS}$	Temperature switch output (Thermostat output) pin
8	VDD	Power supply pin

***1.** For HSNT-8(2030) package, connect the heat sink of back side to the board, and set electric potential open or V_{SS}. However, do not use it as the function of electrode.

***2.** Do not use it in "High-Z".

■ Absolute Maximum Ratings

Table 4

Item	Symbol	Absolute Maximum Rating	Unit
Power supply voltage	V_{DD}	−0.3 to +4.3	V
Input voltage (SCL, A0, A1, A2)	V_{IN}	−0.3 to +4.3	V
I/O voltage (SDA)	V_{IO}	−0.3 to +4.3	V
Output voltage ($\overline{TMS}$)	V_{OUT}	−0.3 to +4.3	V
Operation ambient temperature	T_{opr}	−40 to +125	°C
Storage temperature	T_{stg}	−65 to +150	°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.

■ Recommended Operation Conditions

Table 5

Item	Symbol	Min.	Max.	Unit
Power supply voltage	V_{DD}	1.7	3.6	V
Operation ambient temperature	T_{opr}	−40	+125	°C
High level input voltage	V_{IH}	$0.7 \times V_{DD}$	3.6	V
Low level input voltage	V_{IL}	−0.3	$0.3 \times V_{DD}$	V

■ Pin Capacitance

Table 6

(Ta = +25°C, f_{SCL} = 1.0 MHz, V_{DD} = 2.5 V)

Item	Symbol	Condition	Min.	Max.	Unit
Input capacitance	C_{IN}	V_{IN} = 0 V (SCL, A0, A1, A2)	−	6	pF
I/O capacitance	$C_{I/O}$	$V_{I/O}$ = 0 V ($\overline{SDA}$)	−	8	pF
Output capacitance	C_{OUT}	V_{OUT} = 0 V ($\overline{TMS}$)	−	8	pF

■ DC Electrical Characteristics

Table 7

Item	Symbol	Condition	Min.	Max.	Unit
Current consumption at active mode	I_{DD1}	Active mode Serial bus non-active	–	100.0	μA
	I_{DD2}	Active mode Serial bus active	–	400.0	μA
Current consumption at shutdown mode	I_{DD3}	Shutdown mode Serial bus non-active	–	3.0	μA
	I_{DD4}	Shutdown mode Serial bus active	–	400.0	μA
Input leakage current	I_{LI}	SCL, SDA $V_{IN} = V_{SS}$ to V_{DD}	–	1.0	μA
Output leakage current	I_{LO}	SDA, $\overline{TMS}$ $V_{OUT} = V_{SS}$ to V_{DD}	–	1.0	μA
Input current 1	I_{IL}	A0, A1, A2 $V_{IN} < 0.3 \times V_{DD}$	–	50.0	μA
Input current 2	I_{IH}	A0, A1, A2 $V_{IN} > 0.7 \times V_{DD}$	–	2.0	μA
Input impedance 1	Z_{IL}	A0, A1, A2 $V_{IN} = 0.3 \times V_{DD}$	30	–	kΩ
Input impedance 2	Z_{IH}	A0, A1, A2 $V_{IN} = 0.7 \times V_{DD}$	800	–	kΩ
Low level output voltage	V_{OL}	SDA, $\overline{TMS}$ $I_{OL} = 3.0$ mA	–	0.4	V
Low level output current 1	I_{OL1}	SDA, $\overline{TMS}$ $V_{OL} = 0.4$ V, $2.2\ V \leq V_{DD} \leq 3.6$ V	20	–	mA
Low level output current 2	I_{OL2}	SDA, $\overline{TMS}$ $V_{OL} = 0.6$ V, $1.7\ V \leq V_{DD} \leq 2.2$ V	6	–	mA

■ AC Electrical Characteristics

Table 8 Measurement Conditions

Input pulse voltage	$0.2 \times V_{DD}$ to $0.8 \times V_{DD}$
Input pulse rising / falling time	20 ns or less
Output reference voltage	$0.3 \times V_{DD}$ to $0.7 \times V_{DD}$
Output load	100 pF + 1 kΩ pull-up reisitance

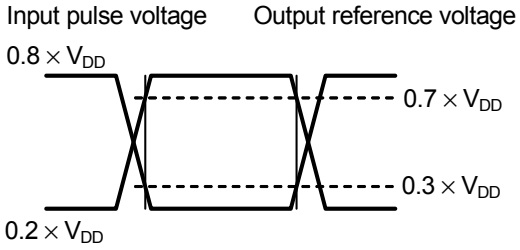


Figure 3 Input / Output Waveform during AC Measurement

Table 9

Item	Symbol	V_{DD} = 1.7 V to 3.6 V		V_{DD} = 2.2 V to 3.6 V		Unit
		Min.	Max.	Min.	Max.	
SCL clock frequency	f_{SCL}	0	400	0	1000	kHz
SCL clock time "L"	t_{LOW}	1.3	–	0.5	–	µs
SCL clock time "H"	t_{HIGH}	0.6	–	0.26	–	µs
SDA output delay time	t_{AA}	0.1	0.9	0.1	0.45	µs
SDA output hold time	t_{DH}	50	–	50	–	ns
SCL, SDA rising time	t_R	0.02	0.3	–	0.12	µs
SCL, SDA falling time	t_F	0.02	0.3	–	0.12	µs
Data input setup time	$t_{SU.DAT}$	100	–	50	–	ns
Data input hold time	$t_{HD.DAT}$	0	–	0	–	ns
Start condition setup time	$t_{SU.STA}$	0.6	–	0.26	–	µs
Start condition hold time	$t_{HD.STA}$	0.6	–	0.26	–	µs
Stop condition setup time	$t_{SU.STO}$	0.6	–	0.26	–	µs
Bus release time	t_{BUF}	1.3	–	0.5	–	µs
Noise suppression time	t_I	–	50	–	50	ns

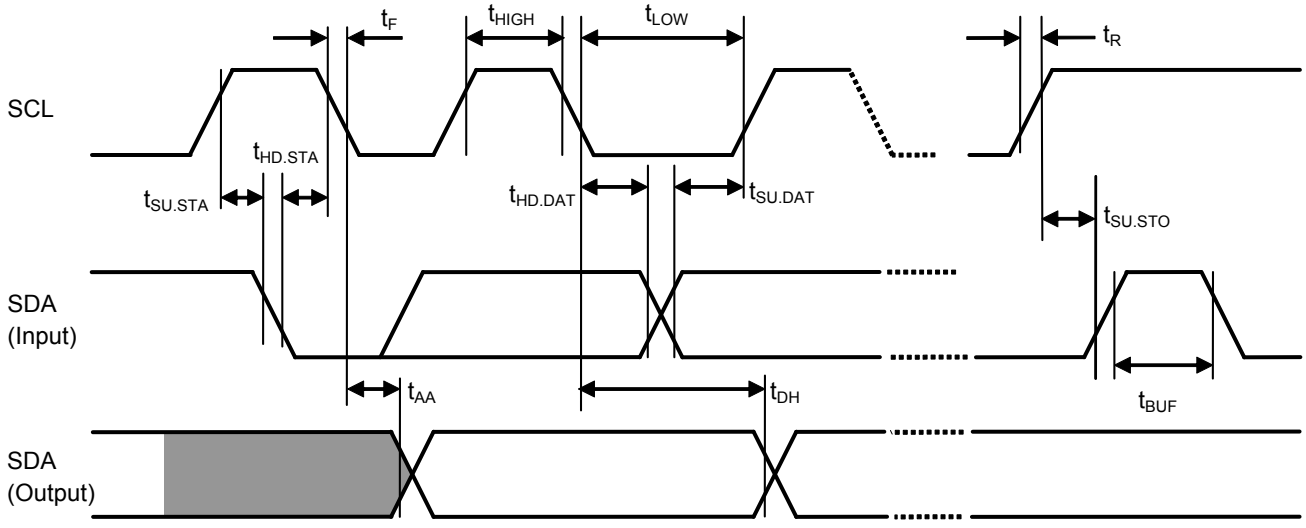


Figure 4 Bus Timing

■ Temperature Characteristics

Table 10

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Temperature accuracy*1	T_{ACC1}	Ta = 0°C to +65°C	–	±0.5	±1.0	°C
	T_{ACC2}	Ta = −40°C to +125°C	–	–	±3.0	°C
Temperature resolution	T_{RES}	Default value	–	0.25	–	°C
Temperature conversion time	t_{CONV1}	TRES[1:0] = "00" setting LSB = 0.5°C	–	–	35	ms
	t_{CONV2}	TRES[1:0] = "01" setting LSB = 0.25°C	–	–	70	ms
	t_{CONV3}	TRES[1:0] = "10" setting LSB = 0.125°C	–	–	140	ms
	t_{CONV4}	TRES[1:0] = "11" setting LSB = 0.0625°C	–	–	140	ms

***1.** TRES[1:0] = "11" setting

■ Precautions

- Do not operate these ICs in excess of the absolute maximum ratings. Attention should be paid to the power supply voltage, especially. The surge voltage which exceeds the absolute maximum ratings can cause latch-up and malfunction. Perform operations after confirming the detailed operation condition in the datasheet.

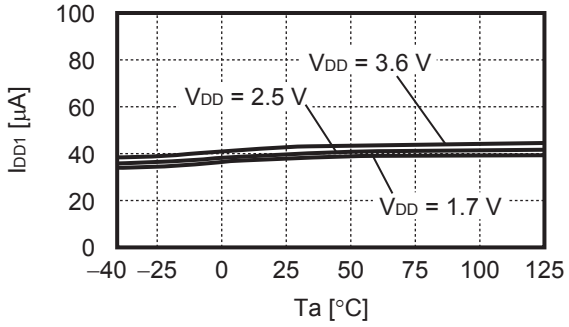
- Operations with moisture on this IC's pins may occur malfunction by short-circuit between pins. Especially, in occasions like picking this IC up from low temperature tank during the evaluation. Be sure that there is no frost on this IC's pins to prevent malfunction by short-circuit.
  Also attention should be paid in using on environment, which is easy to dew for the same reason.

- Do not apply an electrostatic discharge to this IC that exceeds the performance ratings of the built-in electrostatic protection circuit.

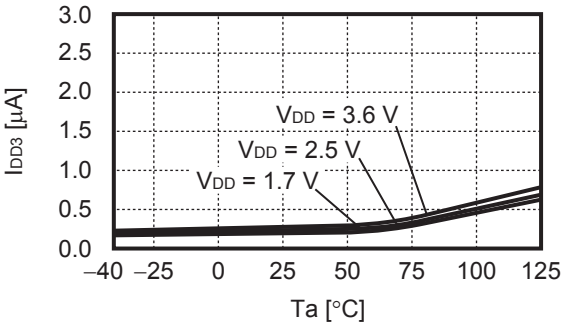
- SII claims no responsibility for any and all disputes arising out of or in connection with any infringement of the products including this IC upon patents owned by a third party.

■ Characteristics (Typical Data)

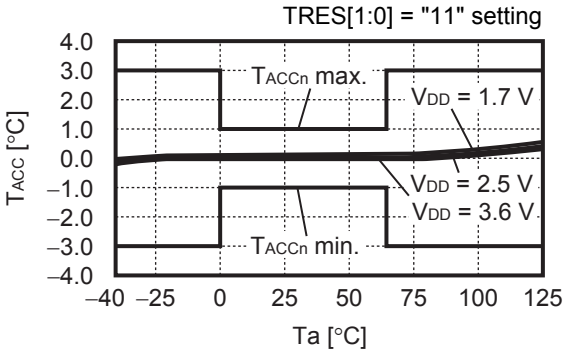
1. Current consumption at active mode (I_{DD1}) vs. Temperature (Ta)

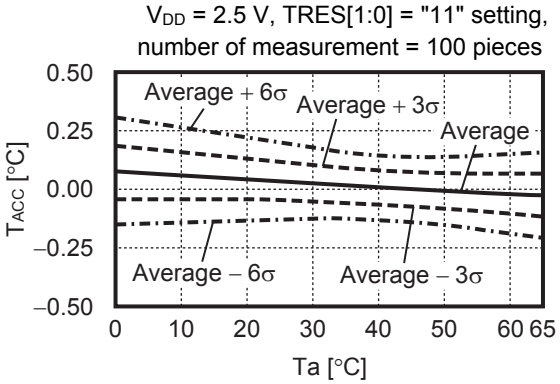


2. Current consumption at shutdown mode (I_{DD3}) vs. Temperature (Ta)



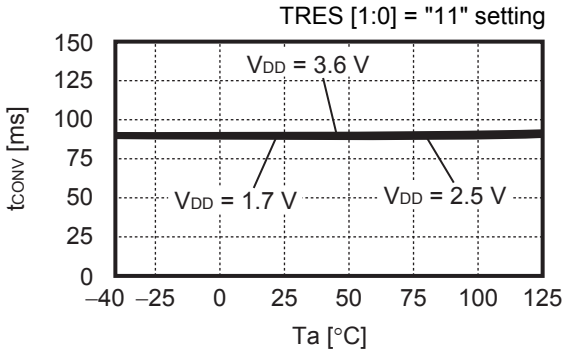
3. Temperature accuracy (T_{ACC}) vs. Temperature (Ta)



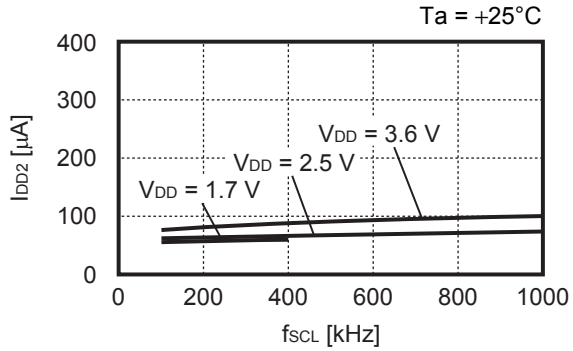


Remark n = 1, 2

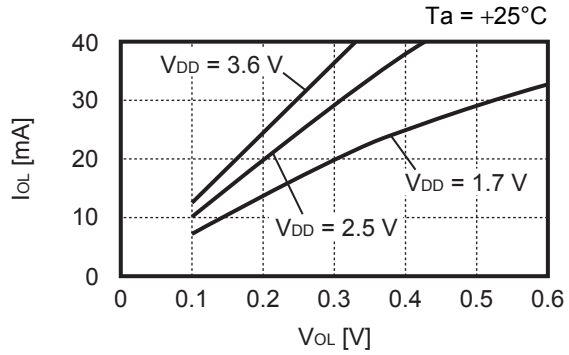
4. Temperature conversion time (t_{CONV}) vs. Temperature (Ta)

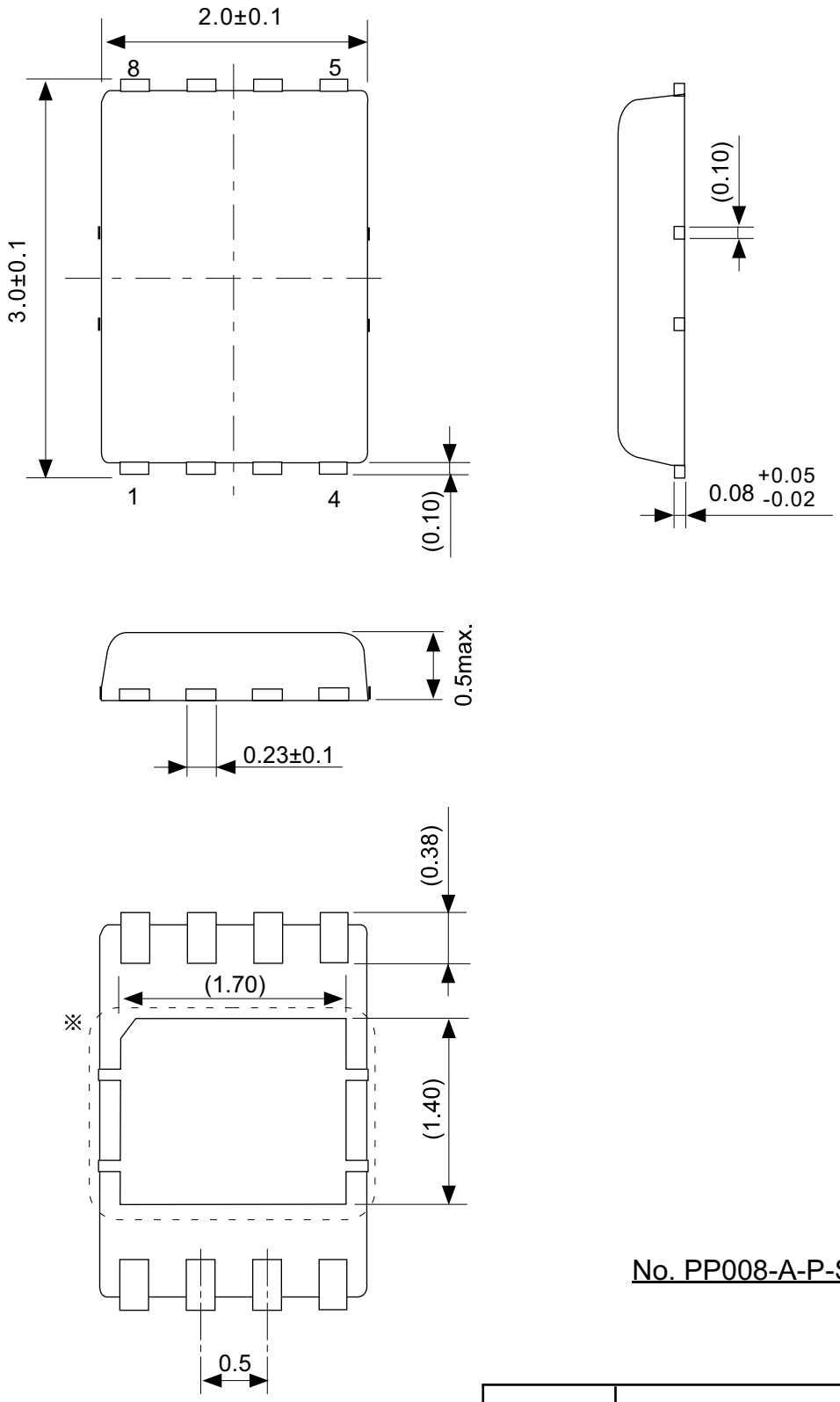


5. Current consumption at active mode (I_{DD2}) vs. Clock frequency (f_{SCL})



6. Low level output current (I_{OL}) vs. Low level output voltage (V_{OL})



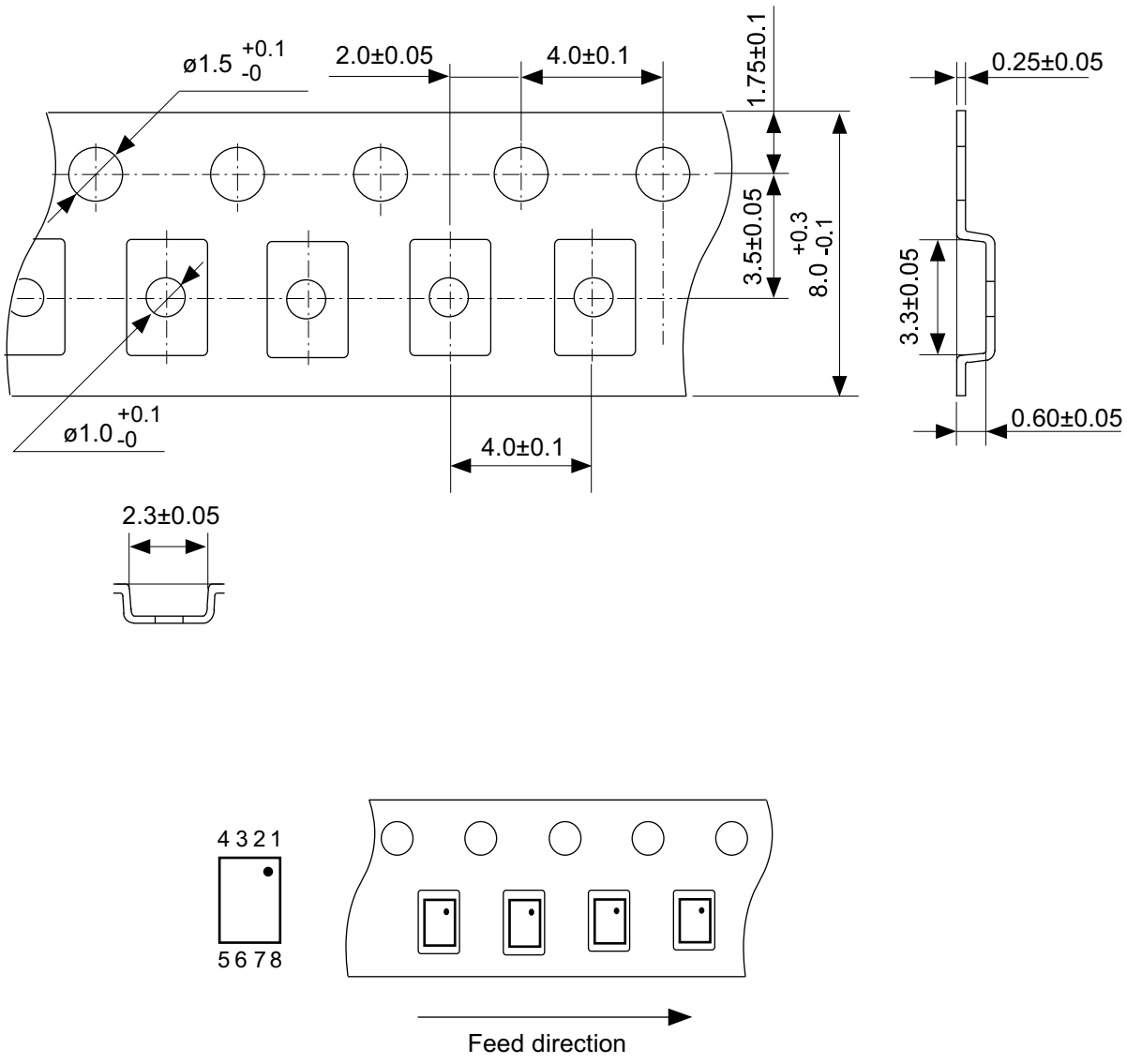


No. PP008-A-P-SD-1.1

※ 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.

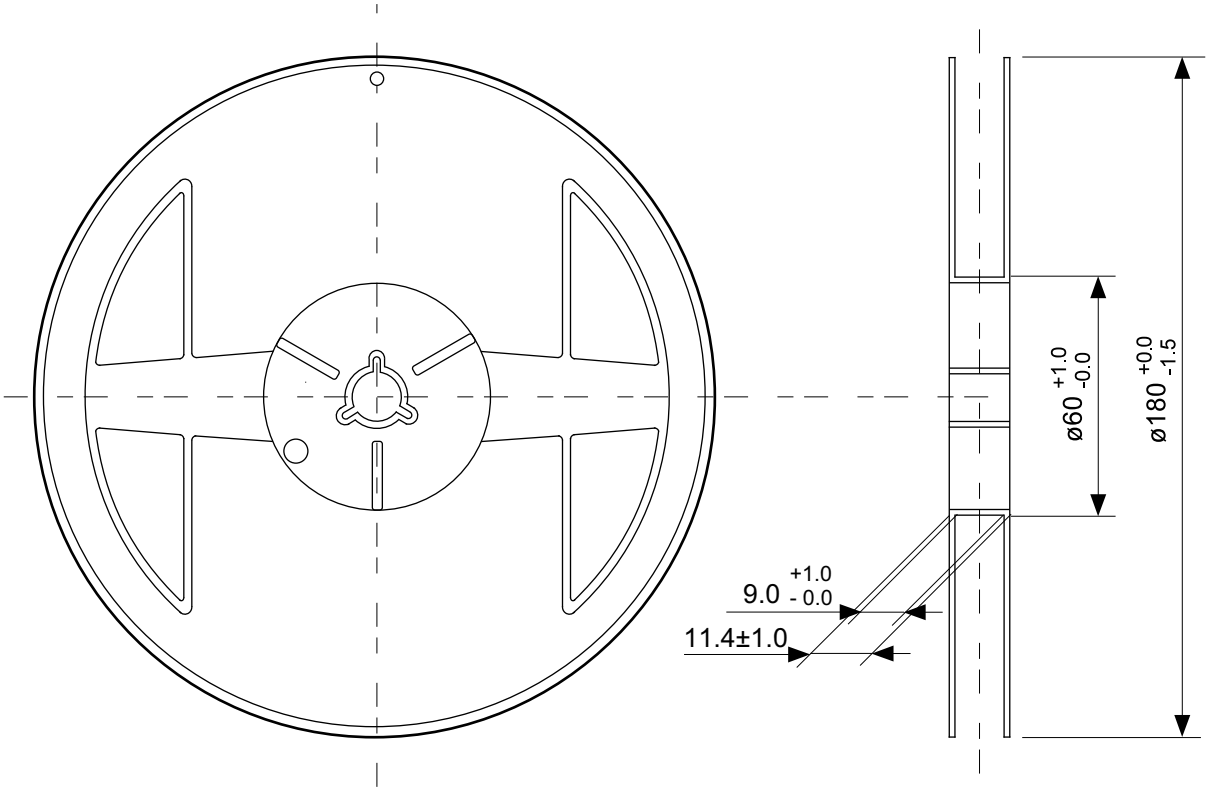
TITLE	DFN-8/HSNT-8-A-PKG Dimensions
No.	PP008-A-P-SD-1.1
SCALE	
UNIT	mm

Seiko Instruments Inc.

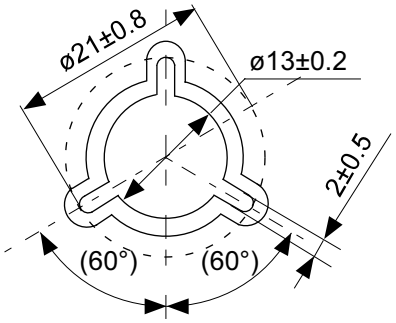


No. PP008-A-C-SD-1.0

TITLE	DFN-8/HSNT-8-A-Carrier Tape
No.	PP008-A-C-SD-1.0
SCALE	
UNIT	mm
Seiko Instruments Inc.	



Enlarged drawing in the central part



No. PP008-A-R-SD-1.0

TITLE	DFN-8/HSNT-8-A-Reel		
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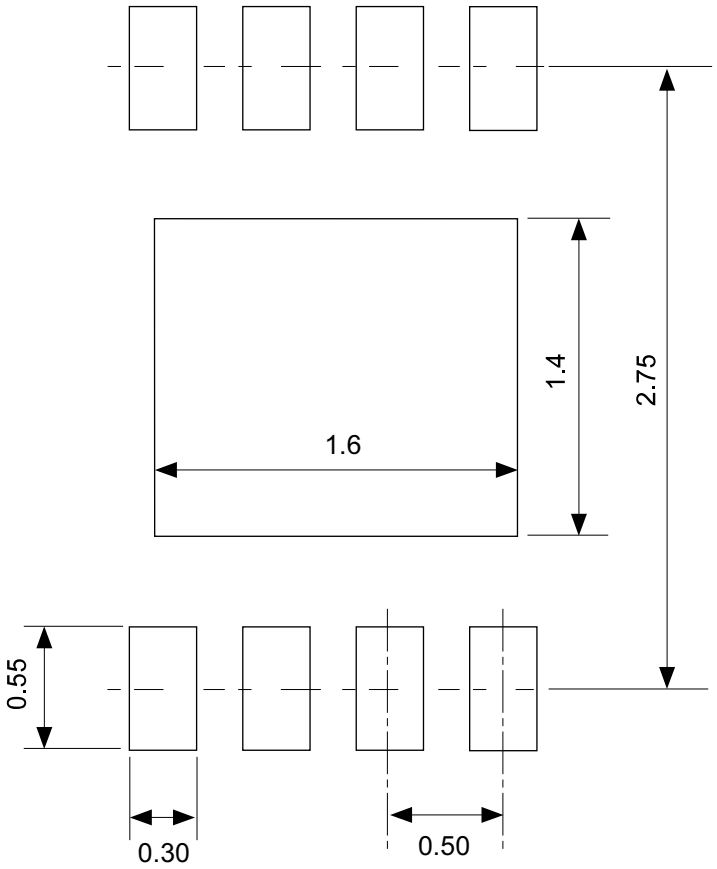
SCALE		QTY.	5,000
UNIT	mm		
Seiko Instruments Inc.			



No. PP008-A-L-SD-1.0

TITLE	DFN-8/HSNT-8-A -Land Recommendation
No.	PP008-A-L-SD-1.0
SCALE	
UNIT	mm
Seiko Instruments Inc.	

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