The S-5843A Series is a temperature switch IC which detects the temperature with a temperature accuracy of ±2.5°C. The output inverts when temperature reaches the detection temperature. This IC restores the output voltage when the temperature drops to the level of release temperature.
The S-5843A Series operates at the lower power supply voltage of 1.65 V and its current consumption is 4.5 μA typ. due to CMOS configuration.
A temperature sensor with the negative temperature coefficient, a reference voltage generation circuit, a comparator and a delay circuit are integrated on one chip, and enclosed into the small packages SNT-6A and SOT-23-5.

■ Features

- Detection temperature : +40°C to +120°C, +1°C step, detection accuracy : ±2.5°C
- Low voltage operation : V_{DD} (min.) = 1.65 V
- Low current consumption : 4.5 μA typ. (Ta = +25°C)
- Hysteresis temperature : selectable in 2°C, 4°C, 10°C or 20°C
- Selectable output logic in active “H” or “L”
- Selectable output form in CMOS or Nch open drain
- Prevent functions for false detection operation and false release operation
- Lead-free, Sn 100%, halogen-free*1

***1.** Refer to “■ **Product Name Structure**” for details.

■ Applications

- Fan control
- Air conditioning system
- Mobile phones
- Game consoles
- Various electronic devices

■ Packages

- SNT-6A
- SOT-23-5

■ Block Diagrams

1. CMOS output product

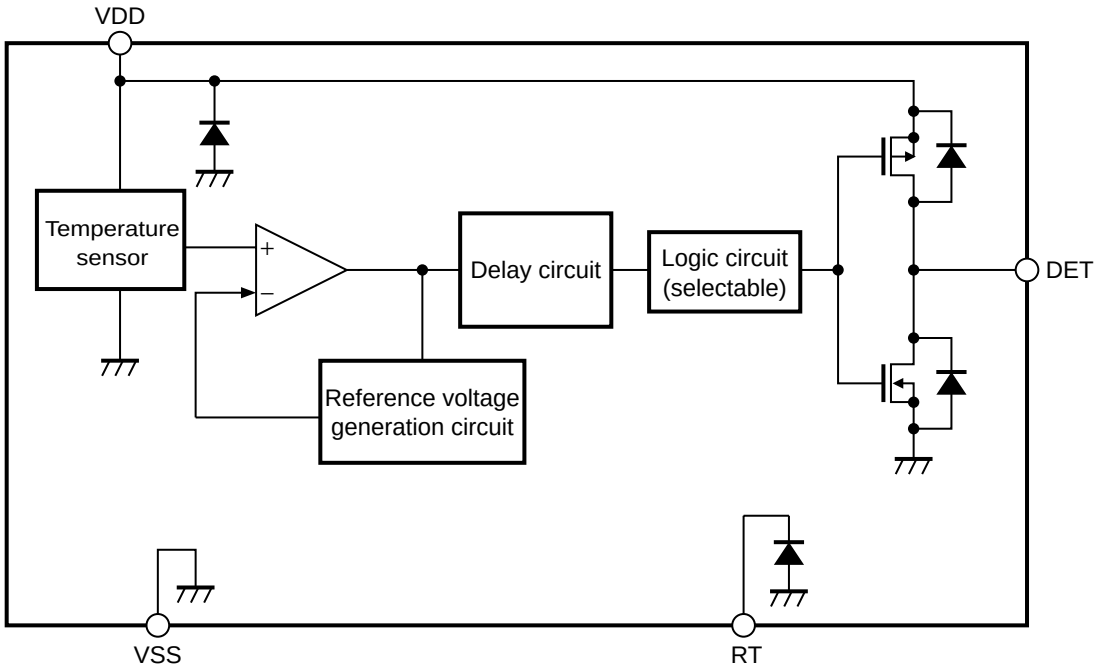


Figure 1

2. Nch open drain output product

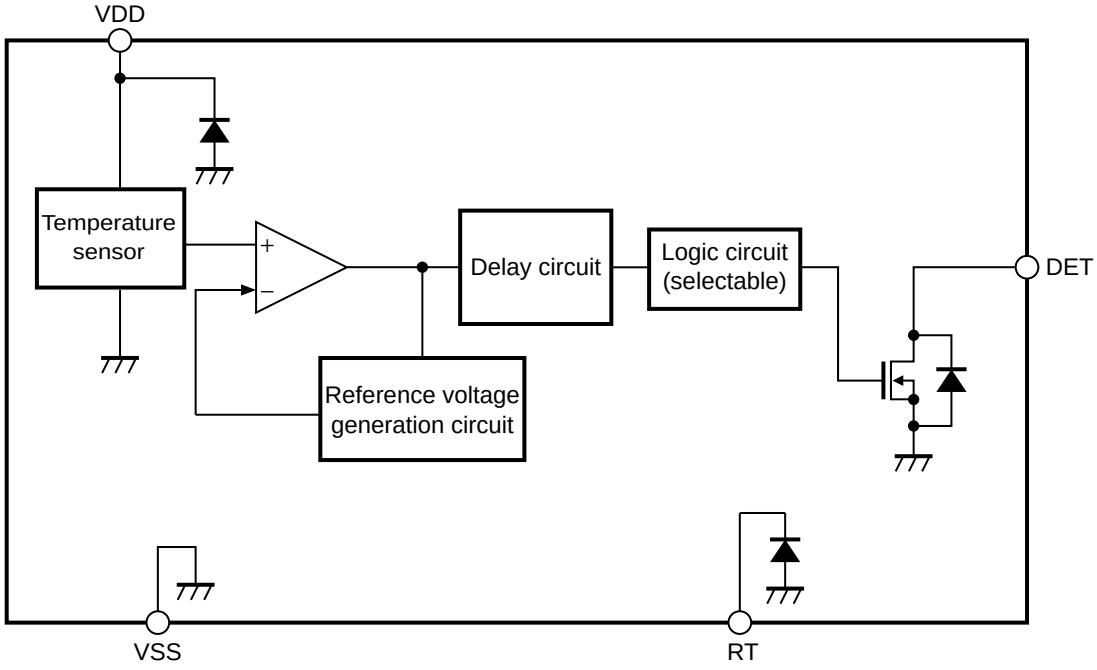


Figure 2

■ Product Name Structure

Users are able to select the detection temperature, output form and logic, hysteresis temperature and package for the S-5843A Series.

1. Product name

(1) SNT-6A

S-5843A xx x x – I6T1 x

- Environmental code
  - U: Lead-free (Sn 100%), halogen-free
  - G: Lead-free (for details, please contact our sales office)
- Package abbreviation and IC packing specifications*1
  - I6T1: SNT-6A, Tape
- Hysteresis temperature*2
  - A: 2°C
  - B: 4°C
  - C: 10°C
  - D: 20°C
- Output form and output logic*3
  - A: CMOS output, active “H”
  - B: CMOS output, active “L”
  - C: Nch open drain output, active “H”
  - D: Nch open drain output, active “L”
- Detection temperature (T_{DET})*4
  - 40 to 99, A0 to A9, B0 to B9, C0

(2) SOT-23-5

S-5843A xx x x – M5T1 x

- Environmental code
  - U: Lead-free (Sn 100%), halogen-free
  - S: Lead-free, halogen-free
- Package abbreviation and IC packing specifications*1
  - M5T1: SOT-23-5, Tape
- Hysteresis temperature*2
  - A: 2°C
  - B: 4°C
  - C: 10°C
  - D: 20°C
- Output form and output logic*3
  - A: CMOS output, active “H”
  - B: CMOS output, active “L”
  - C: Nch open drain output, active “H”
  - D: Nch open drain output, active “L”
- Detection temperature (T_{DET})*4
  - 40 to 99, A0 to A9, B0 to B9, C0

***1.** Refer to the tape specifications.

***2.** Hysteresis temperature is selectable in 2°C, 4°C, 10°C or 20°C.
However, if the detection temperature is +40°C to +49°C, select hysteresis temperature in 2°C, 4°C or 10°C.

***3.** For the DET pin output, selectable the output logic active “H” or “L”.
For the DET pin output, selectable the output form CMOS or Nch open drain.

***4.** Detection temperature (T_{DET}) is settable in +40°C to +120°C, in +1°C step.
40 to 99, when detection temperature is +40°C to +99°C
A0 to A9, when detection temperature is +100°C to +109°C
B0 to B9, when detection temperature is +110°C to +119°C
C0, when the detection temperature is +120°C

2. Package

Package name	Drawing Code			
	Package	Tape	Reel	Land
SNT-6A	PG006-A-P-SD	PG006-A-C-SD	PG006-A-R-SD	PG006-A-L-SD
SOT-23-5	MP005-A-P-SD	MP005-A-C-SD	MP005-A-R-SD	–

3. Product List

(1) SNT-6A

Table 1

Product name	Detection temperature (T_{DET})	DET Pin output form	DET Pin output logic	Hysteresis temperature
S-5843A80CC-I6T1x	+80°C	Nch open drain	Active “H”	10°C
S-5843A90CC-I6T1x	+90°C	Nch open drain	Active “H”	10°C

Remark 1. Please contact our sales office for products with specifications other than the above.
2. x: G or U
3. Please select products of environmental code = U for Sn 100%, halogen-free products.

(2) SOT-23-5

Table 2

Product name	Detection temperature (T_{DET})	DET Pin output form	DET Pin output logic	Hysteresis temperature
S-5843AC0DC-M5T1y	+120°C	Nch open drain	Active “L”	10°C

Remark 1. Please contact our sales office for products with specifications other than the above.
2. y: S or U
3. Please select products of environmental code = U for Sn 100%, halogen-free products.

■ Pin Configurations

SNT-6A
Top view

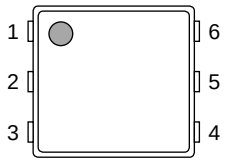


Figure 3

Table 3

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

***1.** Set the RT pin open in use.
***2.** The NC pin is electrically open.
The NC pin can be connected to VDD or VSS.

Remark See Dimensions for details of the package drawings.

SOT-23-5
Top view

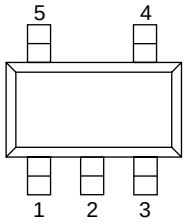


Figure 4

Table 4

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

***1.** The NC pin is electrically open.
The NC pin can be connected to VDD or VSS.
***2.** Set the RT pin open in use.

Remark See Dimensions for details of the package drawings.

■ Absolute Maximum Ratings

Table 5

(Ta = +25°C unless otherwise specified)

Item		Symbol	Absolute Maximum Ratings	Unit
Power supply voltage (V_{SS} = 0 V)		V_{DD}	V_{SS}+7.0	V
Pin voltage		V_{RT}	V_{SS}−0.3 to V_{DD}+0.3	V
Output voltage	CMOS output	V_{DET}	V_{SS}−0.3 to V_{DD}+0.3	V
	Nch open drain output		V_{SS}−0.3 to V_{SS}+7.0	V
Output pin current		I_{DETH}	23.0	mA
		I_{DETL}	9.5	mA
Power dissipation	SNT-6A	P_D	400[*1]	mW
	SOT-23-5		600[*1]	mW
Operating ambient temperature		T_{opr}	−40 to +125	°C
Storage temperature		T_{stg}	−55 to +150	°C

***1.** When mounted on board
[Mounted board]
(1) Board size : 114.3 mm × 76.2 mm × t1.6 mm
(2) Board 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.

■ DC Electrical Characteristics

1. CMOS output product

Table 6

(Ta = +25°C, unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test circuit
Power supply voltage	V_{DD}	–	1.65	–	5.5	V	1
Detection temperature*1	$+T_D$	–	T_{DET}–2.5	T_{DET}	T_{DET}+2.5	°C	1
Hysteresis temperature*2	T_{HYS}	–	–	2, 4, 10, 20	–	°C	1
Output current	I_{DETH}	Output transistor Pch V_{DET} = 2.2 V, V_{DD} = 3.0 V	2	9.4	–	mA	2
	I_{DETL}	Output transistor Nch V_{DET} = 0.4 V, V_{DD} = 3.0 V	0.5	2.3	–	mA	2
Current consumption during operation	I_{DD}	V_{DD} = 3.0 V	–	4.5	7.0	μA	1

***1.** T_{DET} : Set value of detection temperature

***2.** The hysteresis temperature is selectable in 2°C, 4°C, 10°C, or 20°C.
However, if the detection temperature is +40°C to +49°C, select hysteresis temperature in 2°C, 4°C or 10°C.

2. Nch open drain output product

Table 7

(Ta = +25°C, unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test circuit
Power supply voltage	V_{DD}	–	1.65	–	5.5	V	1
Detection temperature*1	$+T_D$	–	T_{DET}–2.5	T_{DET}	T_{DET}+2.5	°C	1
Hysteresis temperature*2	T_{HYS}	–	–	2, 4, 10, 20	–	°C	1
Output current	I_{DETL}	Output transistor Nch V_{DET} = 0.4 V, V_{DD} = 3.0 V	0.5	2.3	–	mA	2
Leakage current	I_{LEAK}	Output transistor Nch V_{DET} = 5.5 V, V_{DD} = 3.0 V	–	–	100	nA	2
Current consumption during operation	I_{DD}	V_{DD} = 3.0 V	–	4.5	7.0	μA	1

***1.** T_{DET} : Set value of detection temperature

***2.** The hysteresis temperature is selectable in 2°C, 4°C, 10°C, or 20°C.
However, if the detection temperature is +40°C to +49°C, select hysteresis temperature in 2°C, 4°C or 10°C.

[Fahrenheit ⇔ Celsius Conversion equation]

°C = (°F – 32) × 5 / 9
°F = 32 + °C × 9 / 5

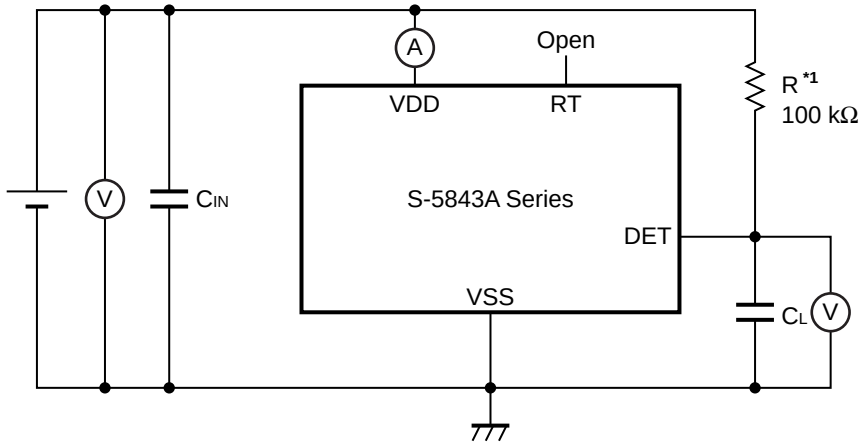
■ AC Electrical Characteristics

Table 8

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test circuit
Noise suppression time	t_{delay}	V_{DD} = 3.0 V, Ta = detection temperature	–	700	–	μs	–

■ Test circuit

1.



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

Figure 5

2.

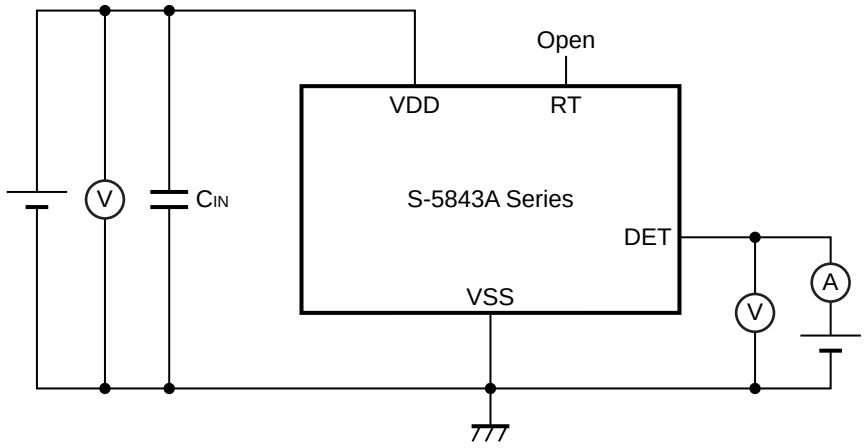


Figure 6

■ Operation

1. Basic operation

The S-5843A Series is a temperature switch IC which detects temperature and sends a signal to an external device. The users can select various combinations of the parameters such as the detection temperature, the output form and logic, and hysteresis temperature.

Following is about the operation when the IC's DET pin output is CMOS and active "H".
After applying the power supply, the S-5843A Series starts to detect the temperature. If the temperature is lower than the detection temperature ($+T_D$), the DET pin output keeps "L". The temperature rises and exceeds the detection temperature, the DET pin output is set to "H".
After the detection, the temperature drops and reaches the release temperature ($+T_D-T_{HYS}$), the DET pin output returns to "L".
Figure 7 is the timing chart.

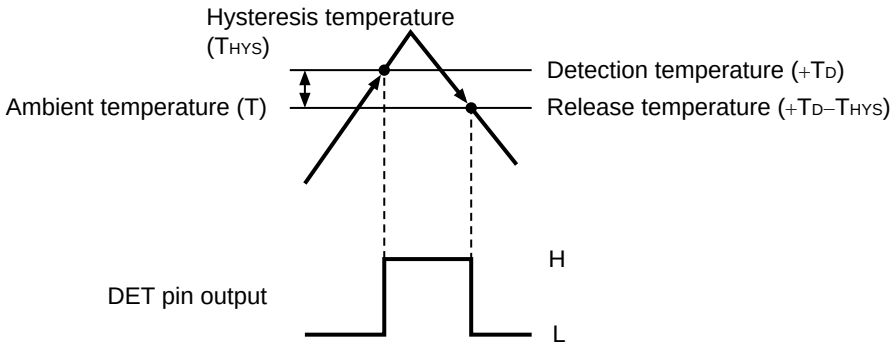


Figure 7 Operation when the DET pin output is CMOS and active "H"

2. Prevention functions for false detection operation and false release operation

The S-5843A Series has the start-up control sequence and the noise suppression time (t_{delay}) by the delay circuit. By this, the S-5843A Series prevents false detection and false release operations which are caused by start-up and power supply fluctuation.
Following is about the operation when the IC's DET pin output is active "H".

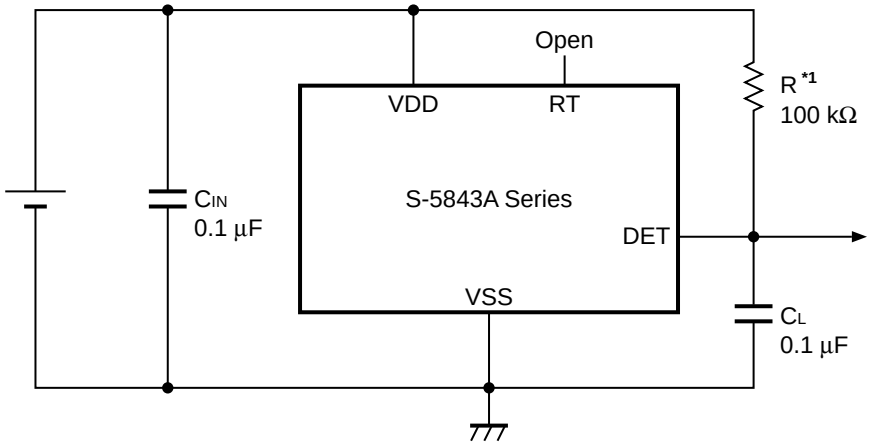
(1) Operation at start-up

By the start-up control sequence, the S-5843A Series fixes the DET pin output "L" until the internal circuits become stable immediately after start-up. After that, the S-5843A Series starts the operation for temperature detection.
The DET pin output keeps "L" if ambient temperature (T) is the detection temperature ($+T_D$) or less. After that, if the temperature rises and exceeds the detection temperature ($+T_D$), and this status is held for the noise suppression time (t_{delay}) or longer, the DET pin output is set to "H".

(2) Operation at power supply fluctuation

The DET pin output is set to "L", if ambient temperature (T) is the detection temperature ($+T_D$) or less. If any power supply fluctuation makes the internal circuit unstable, this status lasts shorter than the noise suppression time (t_{delay}), the DET pin output is not set to "H". Thus, false detection operation by power supply fluctuation can be prevented. This is as well for the release operation.

■ Standard Circuit



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

Figure 8

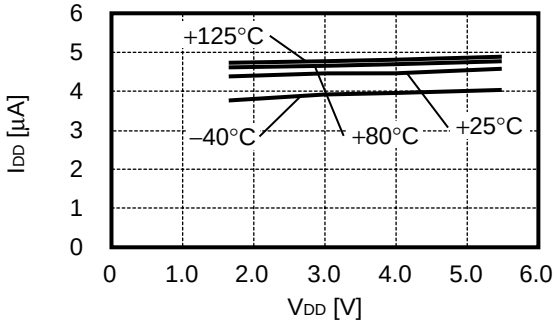
Caution The above connection diagram will not guarantee successful operation. Perform thorough evaluation using actual application to set the constant.

■ Precautions

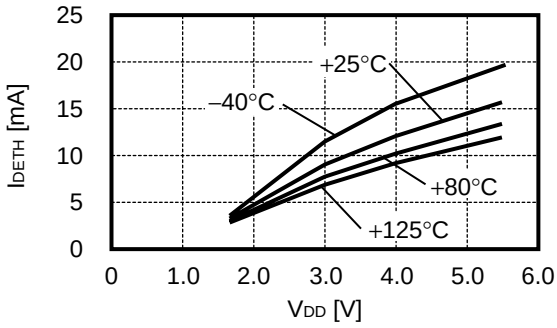
- If impedance in power supply is high, the IC may malfunction due to voltage drop caused by feed-through current. Set wire patterns carefully as to set impedance in power supply low.
- This IC has the noise suppression time to prevent false detection and false release operations, however, the IC may be affected by these operations under the condition with constant power supply noise. Use this IC with a sufficiently stable power supply.
- Set a capacitor (C_{IN}) of about 0.1 μF between the VDD and VSS pin for stabilization.
- Set a capacitor (C_L) of about 0.1 μF for the DET pin to prevent malfunction caused by the noise when the power supply is applied.
- The IC may oscillate by setting a capacitor to the RT pin. Set the RT pin open in use.
- When designing for mass production using an application circuit described herein, the product deviation and temperature characteristics of the external parts should be taken into consideration. SII shall not bear any responsibility for patent infringements related to products using the circuits described herein.
- 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 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)

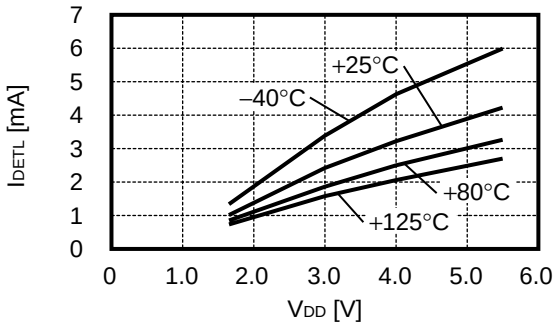
1. Current consumption vs. Power supply voltage characteristics



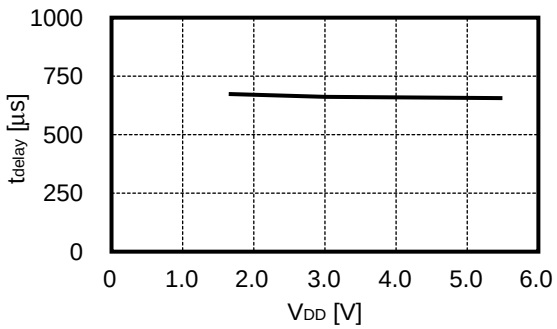
2. DET pin current “H” vs. Power supply voltage characteristics (CMOS output product only)



3. DET pin current “L” vs. Power supply voltage characteristics



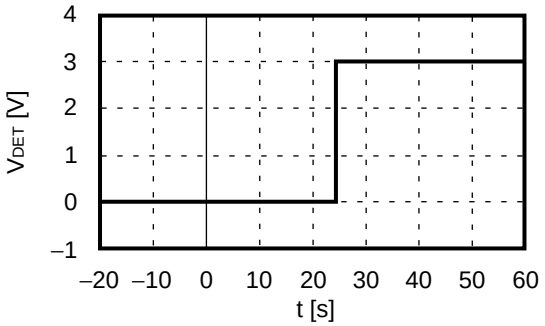
4. Noise suppression time (t_{delay}) vs. Power supply voltage characteristics



5. Response against heat Output voltage (V_{DET}) vs. Time (t)

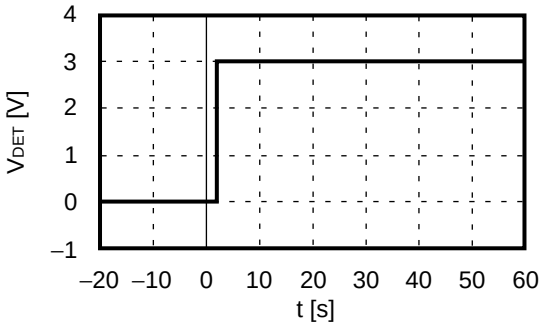
(1) When packages are put into the air of +100 degrees from the air of +25 degrees at t = 0 s

V_{DD} = 3.0 V, C_L = 0 μF, Detection temperature = +80°C, Active "H"



(2) When packages are put into the liquid of +100 degrees from the air of +25 degrees at t = 0 s

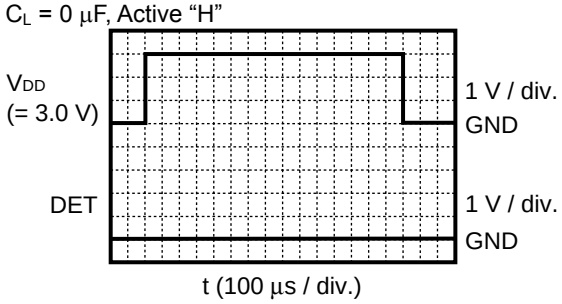
V_{DD} = 3.0 V, C_L = 0 μF, Detection temperature = +80°C, Active "H"



6. Response against startup

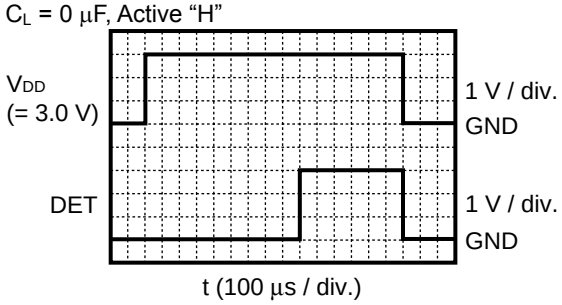
(1) The detection temperature or lower ($T \leq +T_D$)

C_L = 0 μF, Active "H"



(2) Higher than the detection temperature ($T > +T_D$)

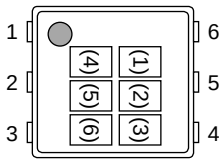
C_L = 0 μF, Active "H"



■ Marking Specifications

1. SNT-6A

SNT-6A
Top view



(1) to (3) : Product code (refer to **Product name vs. Product code**)
(4) to (6) : Lot number

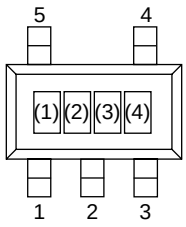
Product name vs. Product code

Product Name	Product Code		
	(1)	(2)	(3)
S-5843A80CC-I6T1x	V	X	A
S-5843A90CC-I6T1x	V	X	B

Remark 1. Please contact our sales office for products with specifications other than the above.
2. x: G or U
3. Please select products of environmental code = U for Sn 100%, halogen-free products.

2. SOT-23-5

SOT-23-5
Top view

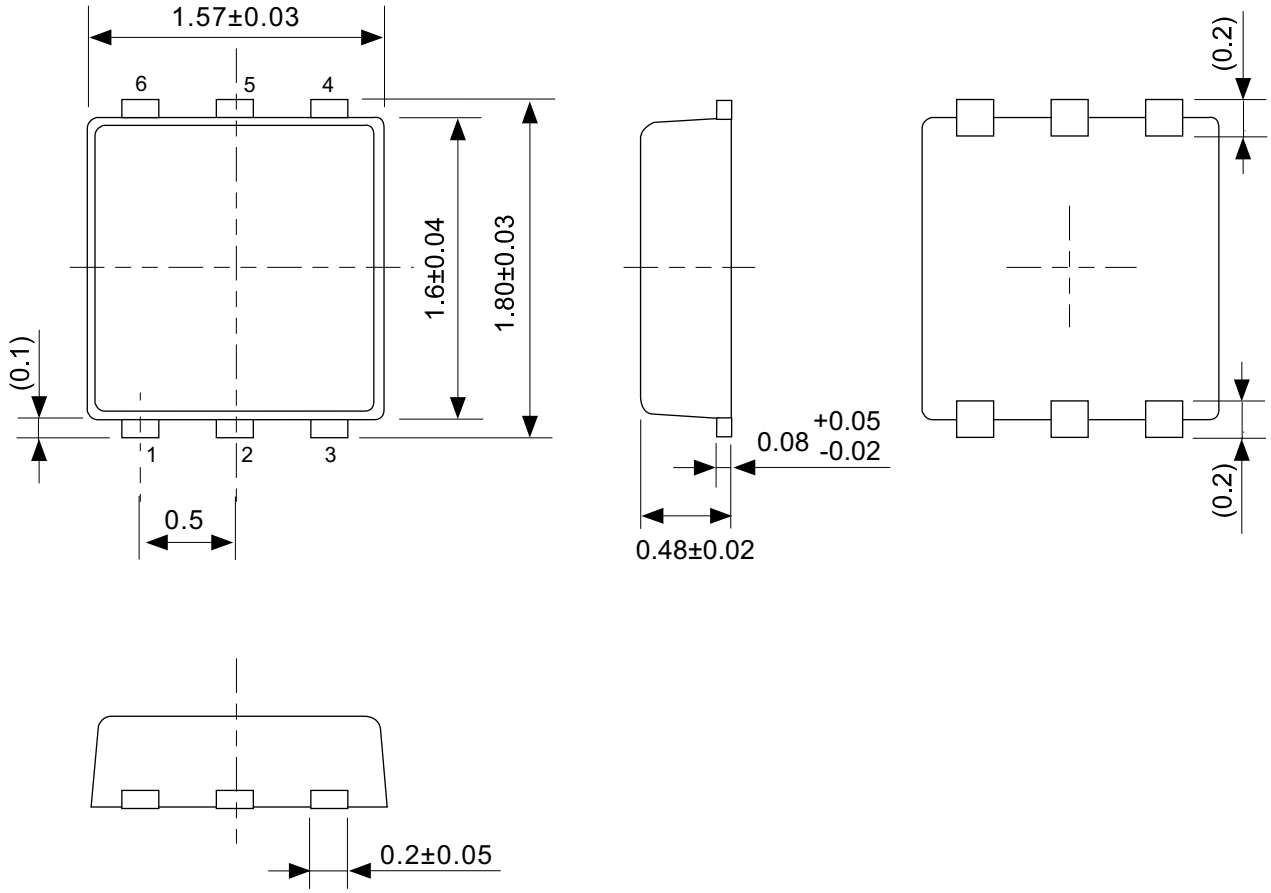


(1) to (3) : Product code (refer to **Product name vs. Product code**)
(4) : Lot number

Product name vs. Product code

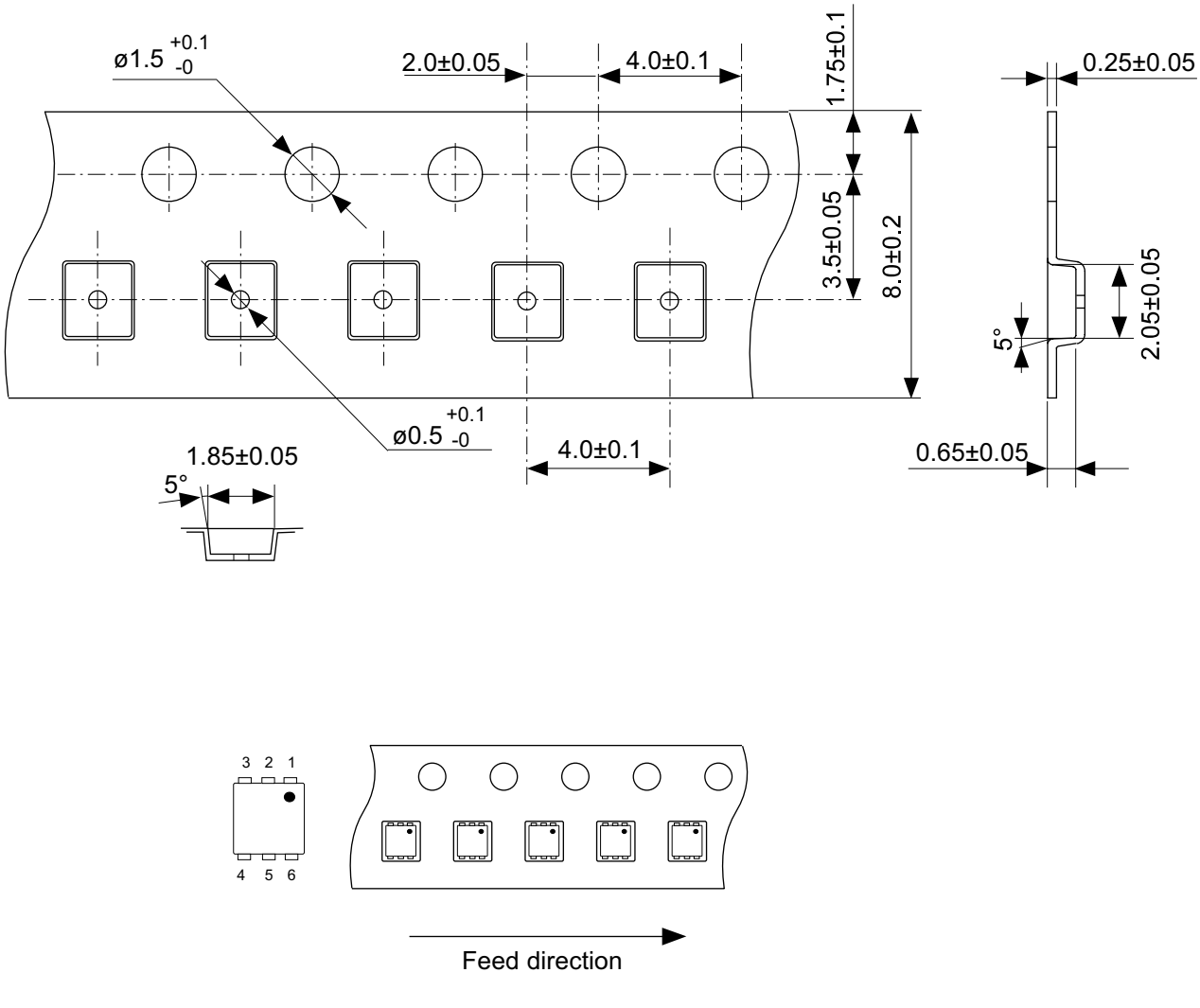
Product name	Product Code		
	(1)	(2)	(3)
S-5843AC0DC-M5T1y	V	X	R

Remark 1. Please contact our sales office for products with specifications other than the above.
2. y: S or U
3. Please select products of environmental code = U for Sn 100%, halogen-free products.



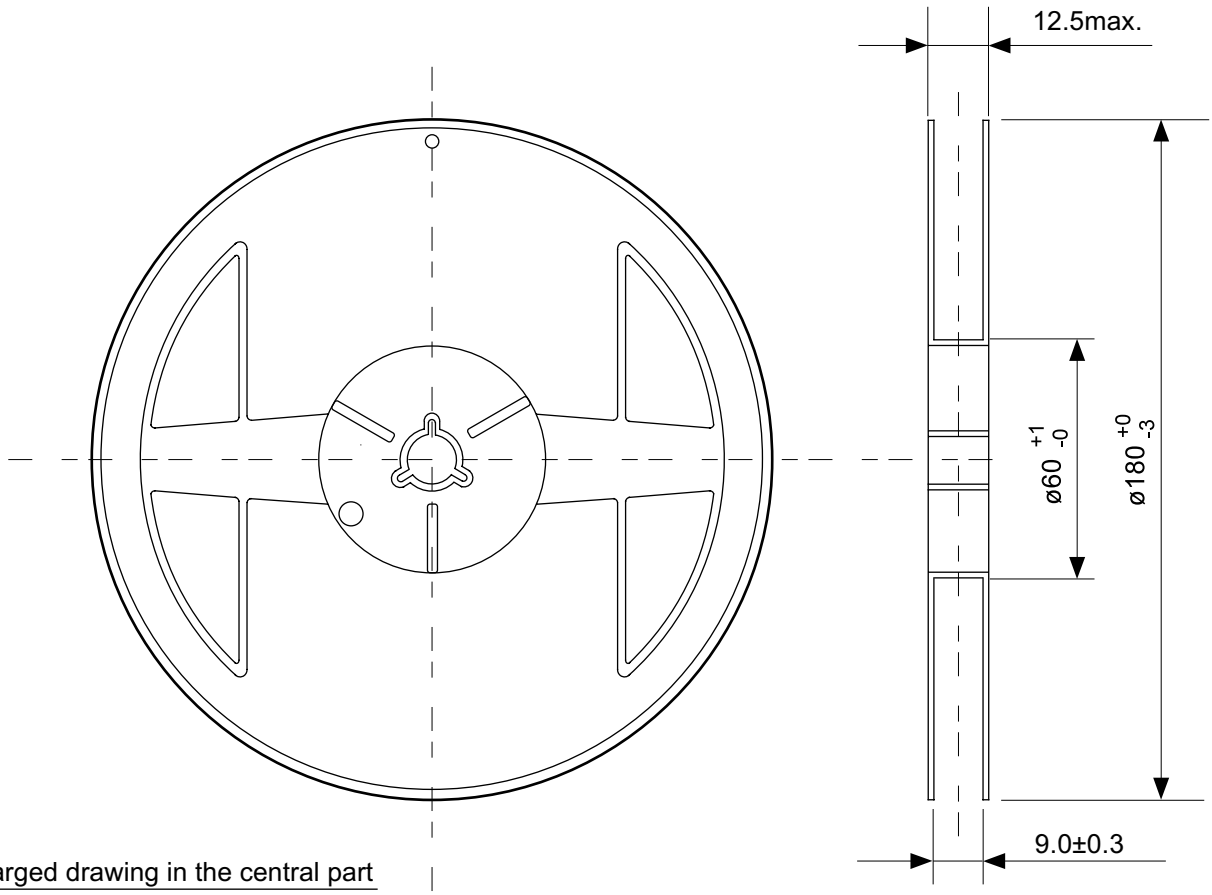
No. PG006-A-P-SD-2.0

TITLE	SNT-6A-A-PKG Dimensions
No.	PG006-A-P-SD-2.0
SCALE	
UNIT	mm
Seiko Instruments Inc.	

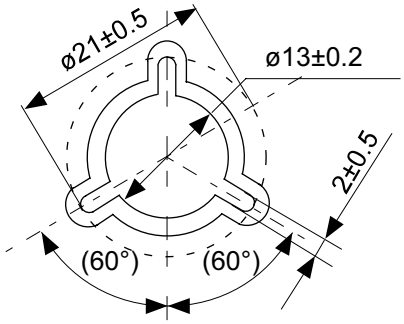


No. PG006-A-C-SD-1.0

TITLE	SNT-6A-A-Carrier Tape
No.	PG006-A-C-SD-1.0
SCALE	
UNIT	mm
Seiko Instruments Inc.	

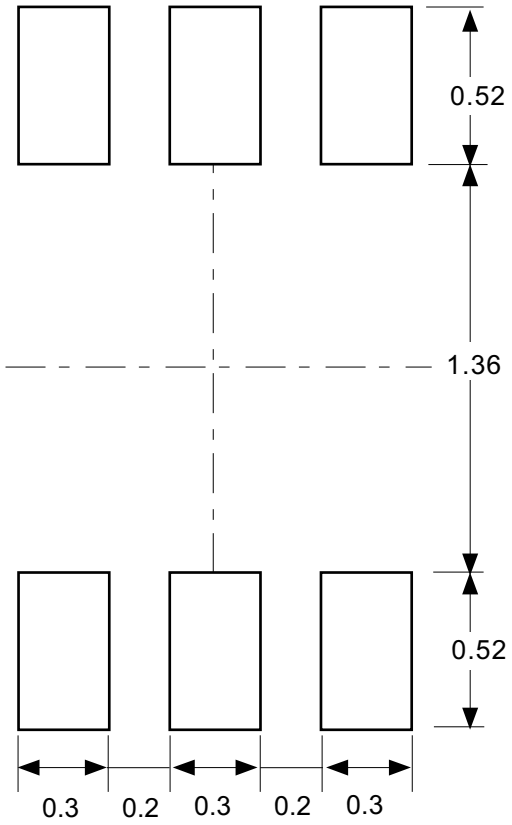


Enlarged drawing in the central part



No. PG006-A-R-SD-1.0

TITLE	SNT-6A-A-Reel		
No.	PG006-A-R-SD-1.0		
SCALE		QTY.	5,000
UNIT	mm		
Seiko Instruments Inc.			

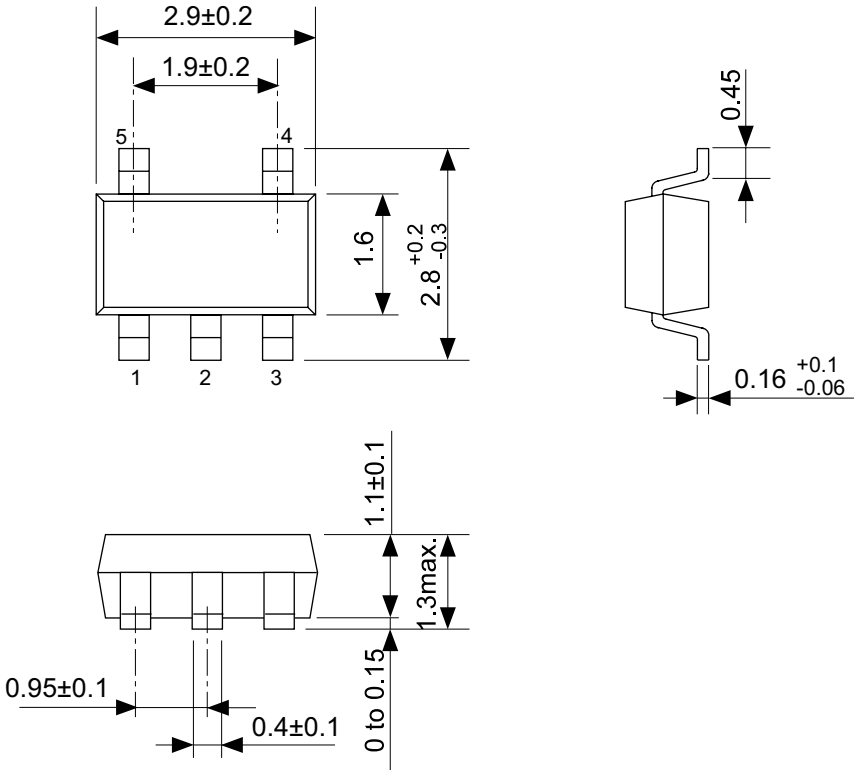


Caution Making the wire pattern under the package is possible. However, note that the package may be upraised due to the thickness made by the silk screen printing and of a solder resist on the pattern because this package does not have the standoff.

注意 パッケージ下への配線パターン形成は可能ですが、本パッケージはスタンドオフが無いので、パターン上のレジスト厚み、シルク印刷の厚みによってパッケージが持ち上がることがありますのでご配慮ください。

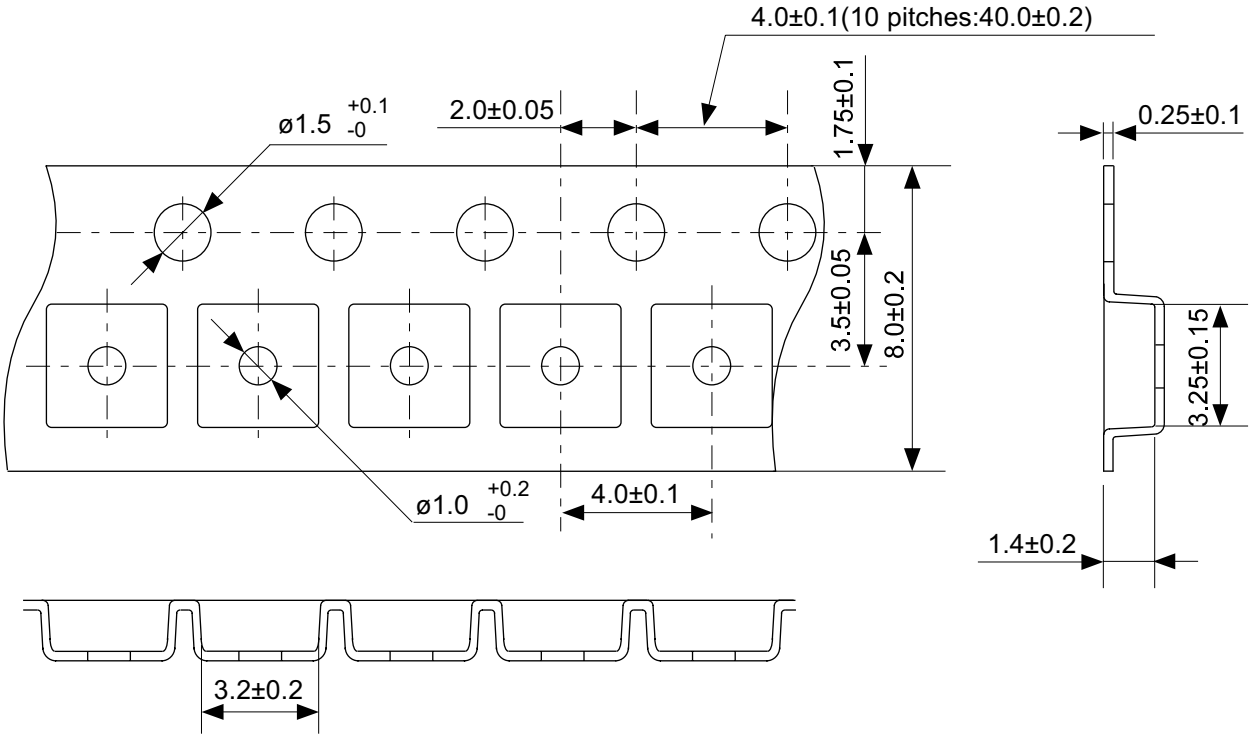
No. PG006-A-L-SD-3.0

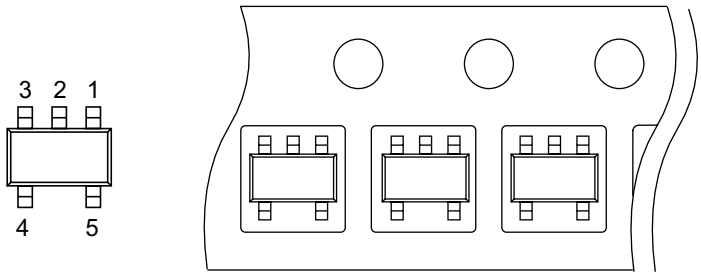
TITLE	SNT-6A-A-Land Recommendation
No.	PG006-A-L-SD-3.0
SCALE	
UNIT	mm
Seiko Instruments Inc.	



No. MP005-A-P-SD-1.2

TITLE	SOT235-A-PKG Dimensions
No.	MP005-A-P-SD-1.2
SCALE	
UNIT	mm
Seiko Instruments Inc.	

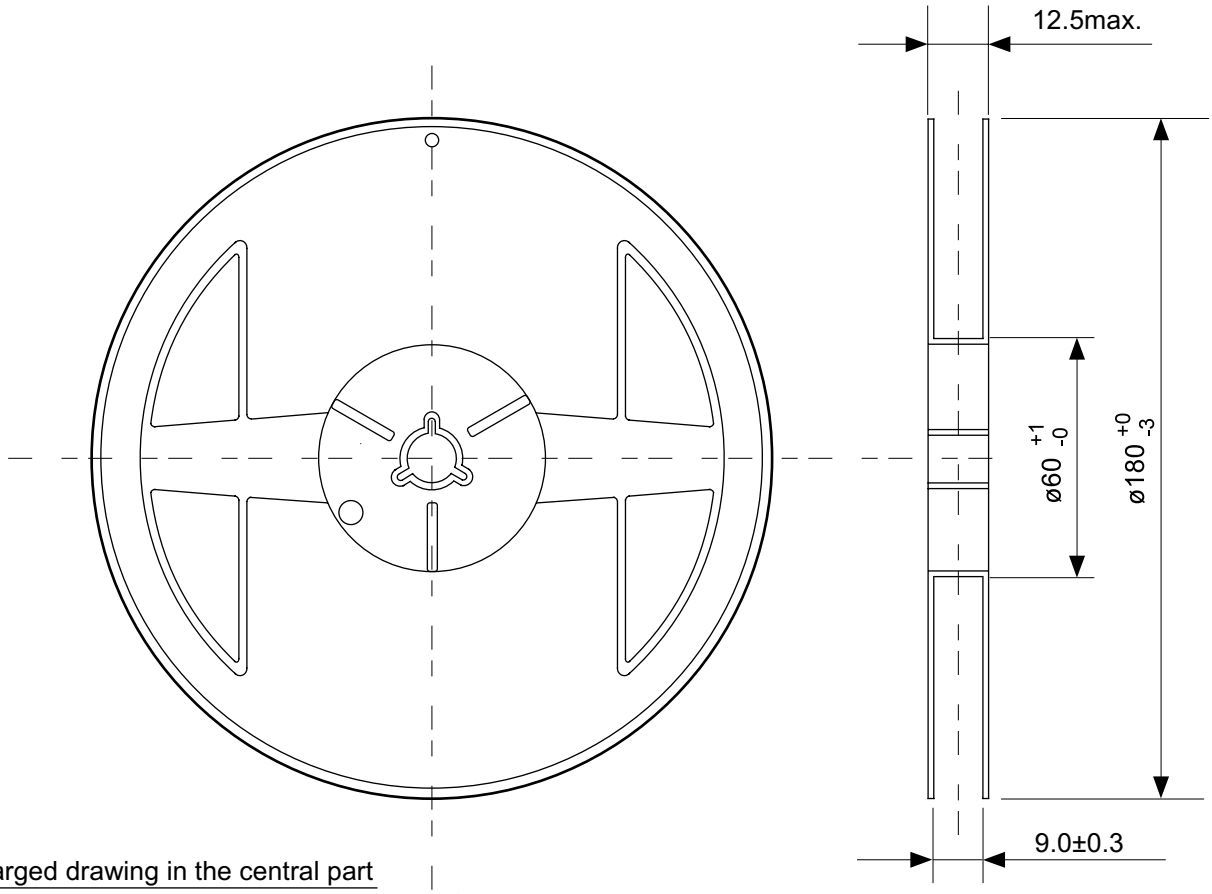




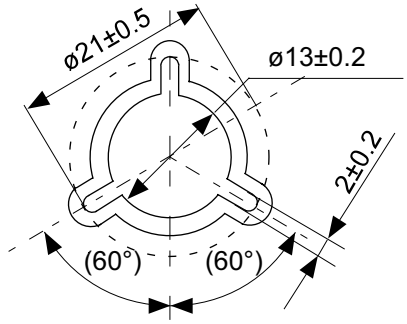
Feed direction

No. MP005-A-C-SD-2.1

TITLE	SOT235-A-Carrier Tape
No.	MP005-A-C-SD-2.1
SCALE	
UNIT	mm
Seiko Instruments Inc.	



Enlarged drawing in the central part



No. MP005-A-R-SD-1.1

TITLE	SOT235-A-Reel		
No.	MP005-A-R-SD-1.1		
SCALE		QTY.	3,000
UNIT	mm		
Seiko Instruments Inc.			

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