SUPER-SMALL PACKAGE 2-CIRCUIT HIGH RIPPLE-REJECTION LOW CURRENT CONSUMPTION LOW DROPOUT CMOS VOLTAGE REGULATOR

S-1721 Series

S-1721 Series, developed using the CMOS technology, is a 2-channel positive voltage regulator IC which has the low dropout voltage, the high-accuracy output voltage and the low output current consumption of 150mA.
Users are able to use a small ceramic capacitor of 1.0 μF for this IC. This IC includes two regulator circuits in the package SOT-23-6 or super-small SNT-6A.
S-1721 Series has much lower current consumption than S-1711 Series, this IC is ideal for mobile devices.

■ Features

- Output voltage: 1.2 V to 5.0 V, selectable in 0.05 V step.
- A ceramic capacitor of 1.0 μF or more can be used as the I/O capacitor.
- Wide input voltage range: 1.7 V to 6.5 V
- High-accuracy output voltage: ±1.0%
- Low dropout voltage: 130 mV typ. (products having the output of 3.0 V, I_{OUT} = 100 mA)
- Low current consumption: During operation: 25 μA typ., 45 μA max. (products having the output of 3.0 V, per circuit)
  During shutdown: 0.1 μA typ., 1.0 μA max.
- Output current: Possible to output 150 mA (at $V_{IN} \geq V_{OUT(S)} + 1.0$ V)*1 (per circuit)
- High ripple rejection: 80 dB typ. (products having the output under 1.8 V, at 1.0 kHz)
- Built-in overcurrent protector: limits overcurrent of output transistor
- Built-in ON/OFF circuit: Ensures long battery life.
- Pull-up or pull-down resistor can be selected.
- Small package: SNT-6A, SOT-23-6
- Lead-free product

***1.** Attention should be paid to the power dissipation of the package when the output current is large.

■ Applications

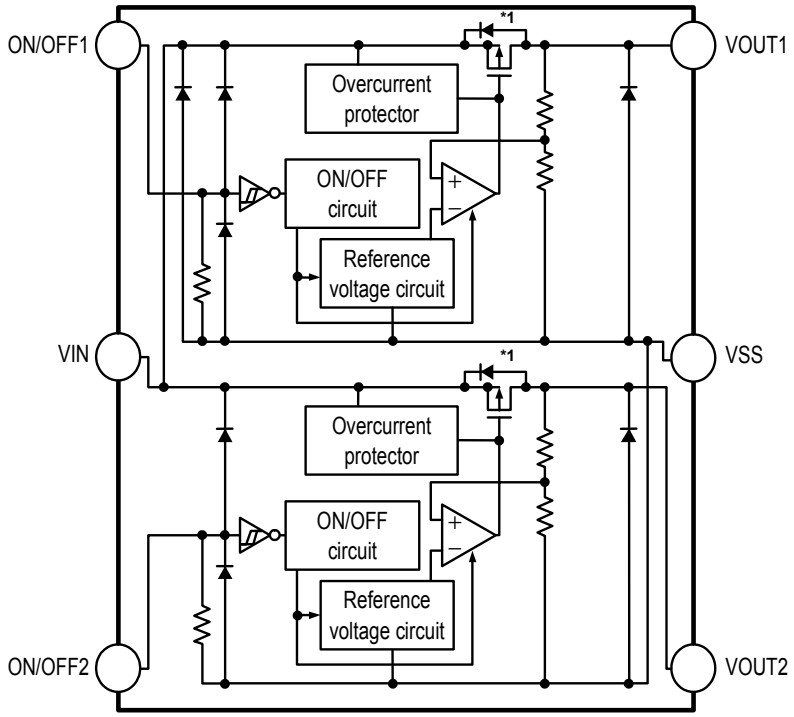
- Power supply for cellular phones
- Power supply for battery-powered devices

■ Packages

Package Name	Drawing Code			
	Package	Tape	Reel	Land
SNT-6A	PG006-A	PG006-A	PG006-A	PG006-A
SOT-23-6	MP006-A	MP006-A	MP006-A	–

■ Block Diagrams

1. S-1721 Series A type

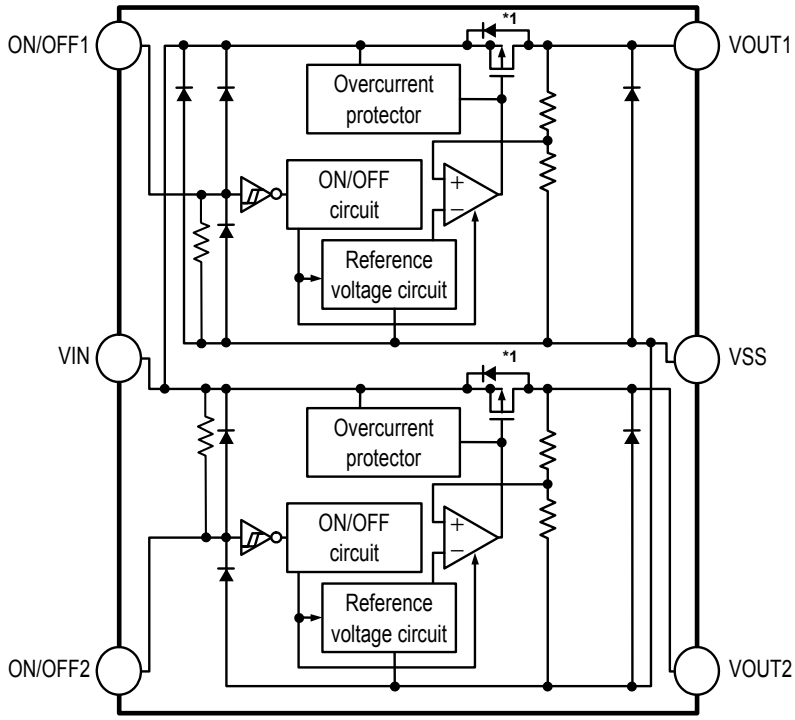


Function		Status
ON/OFF logic	1ch	Active “H”
	2ch	Active “H”
Pull-up resistor	1ch	None
	2ch	None
Pull-down resistor	1ch	Available
	2ch	Available

***1.** Parasitic diode

Figure 1

2. S-1721 Series B type

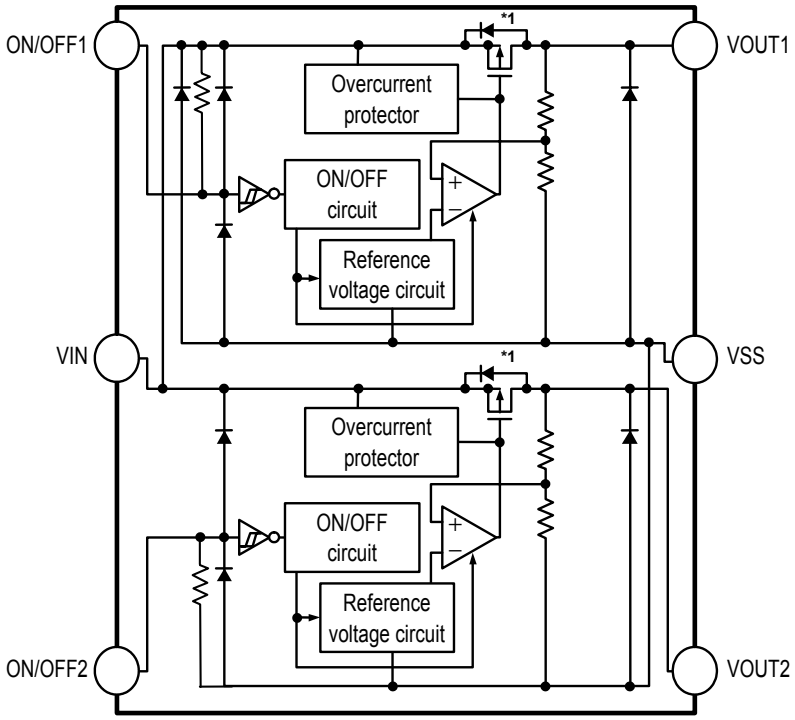


Function		Status
ON/OFF logic	1ch	Active “H”
	2ch	Active “L”
Pull-up resistor	1ch	None
	2ch	Available
Pull-down resistor	1ch	Available
	2ch	None

***1.** Parasitic diode

Figure 2

3. S-1721 Series C type

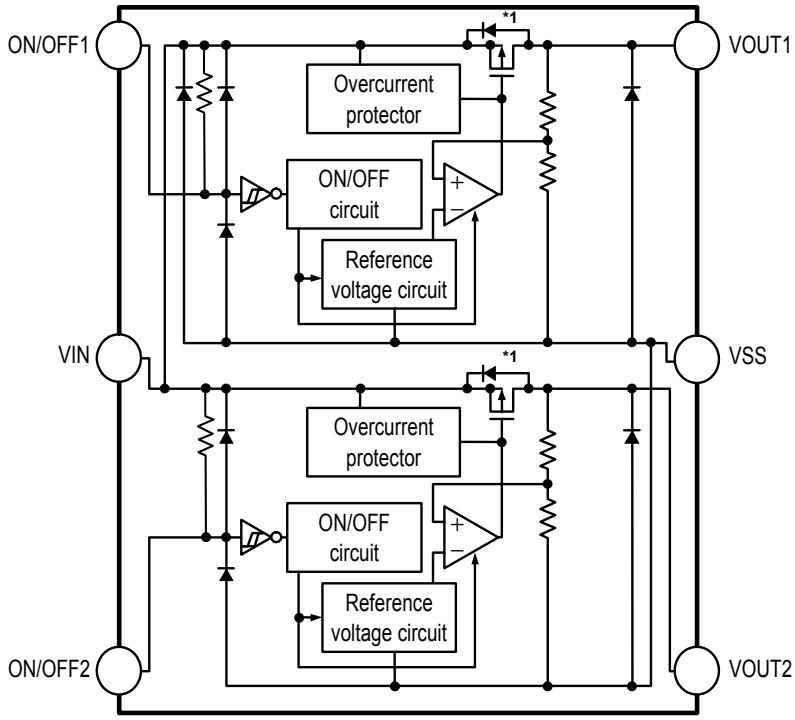


Function		Status
ON/OFF logic	1ch	Active “L”
	2ch	Active “H”
Pull-up resistor	1ch	Available
	2ch	None
Pull-down resistor	1ch	None
	2ch	Available

***1.** Parasitic diode

Figure 3

4. S-1721 Series D type

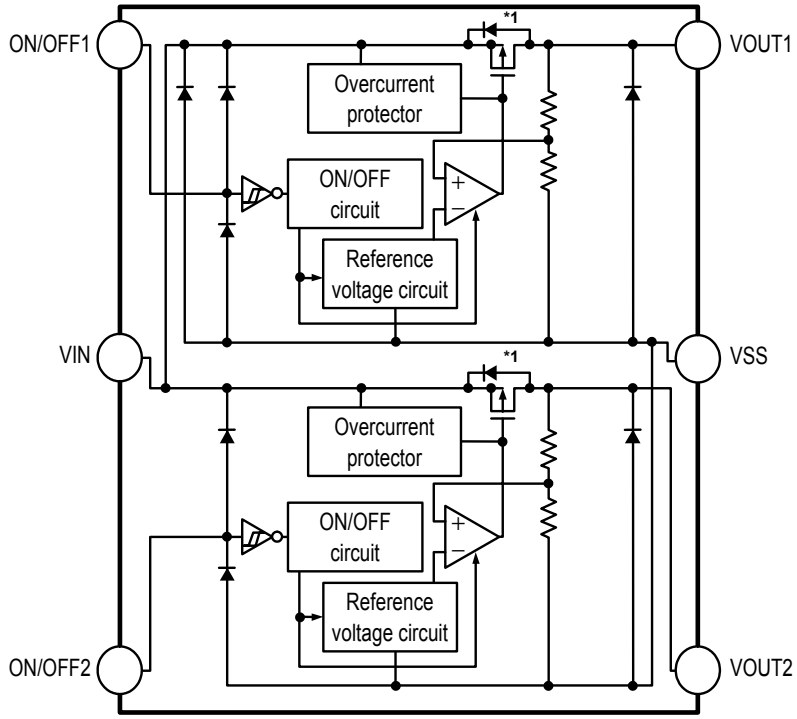


Function		Status
ON/OFF logic	1ch	Active “L”
	2ch	Active “L”
Pull-up resistor	1ch	Available
	2ch	Available
Pull-down resistor	1ch	None
	2ch	None

***1.** Parasitic diode

Figure 4

5. S-1721 Series E type

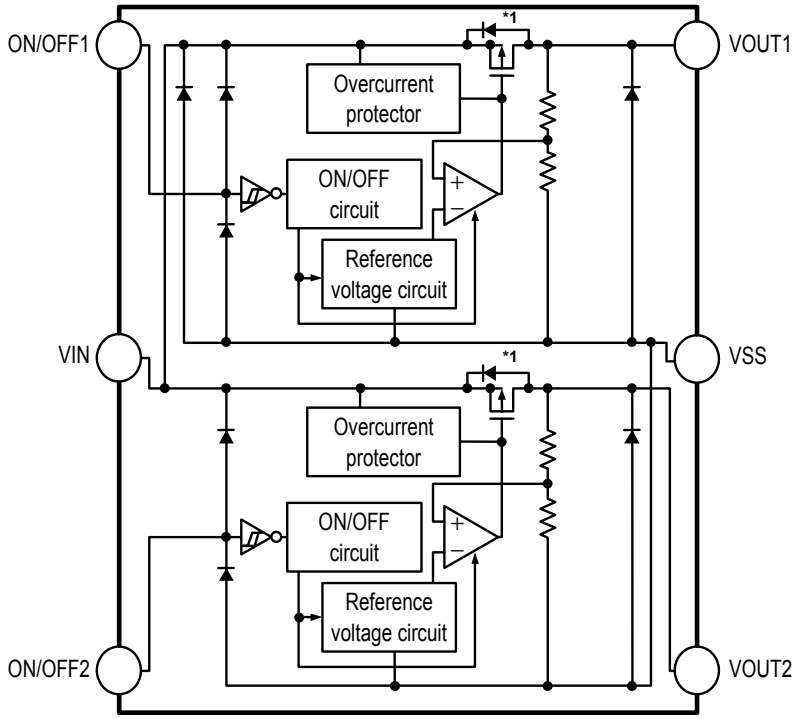


Function		Status
ON/OFF logic	1ch	Active “H”
	2ch	Active “H”
Pull-up resistor	1ch	None
	2ch	None
Pull-down resistor	1ch	None
	2ch	None

***1.** Parasitic diode

Figure 5

6. S-1721 Series F type

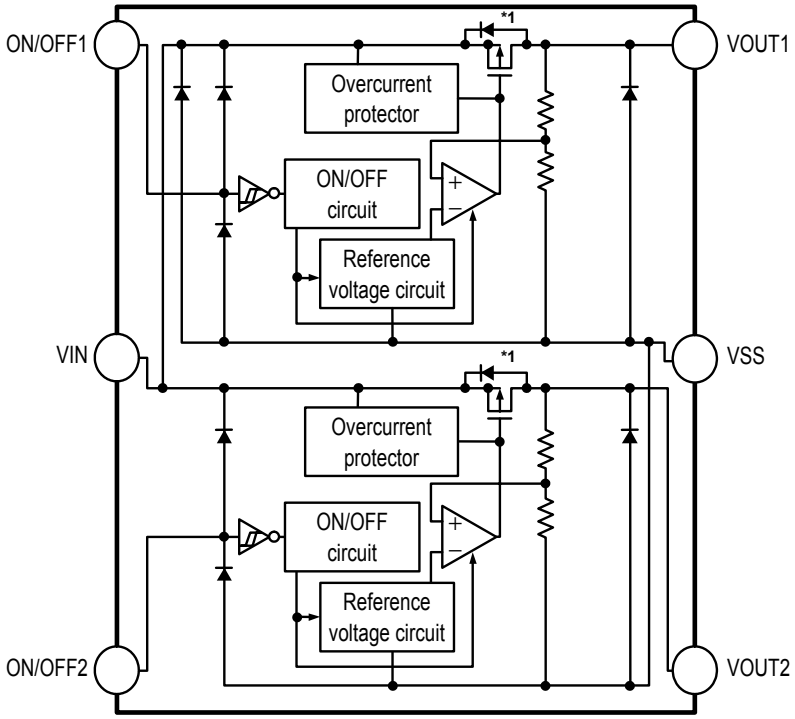


Function		Status
ON/OFF logic	1ch	Active “H”
	2ch	Active “L”
Pull-up resistor	1ch	None
	2ch	None
Pull-down resistor	1ch	None
	2ch	None

***1.** Parasitic diode

Figure 6

7. S-1721 Series G type

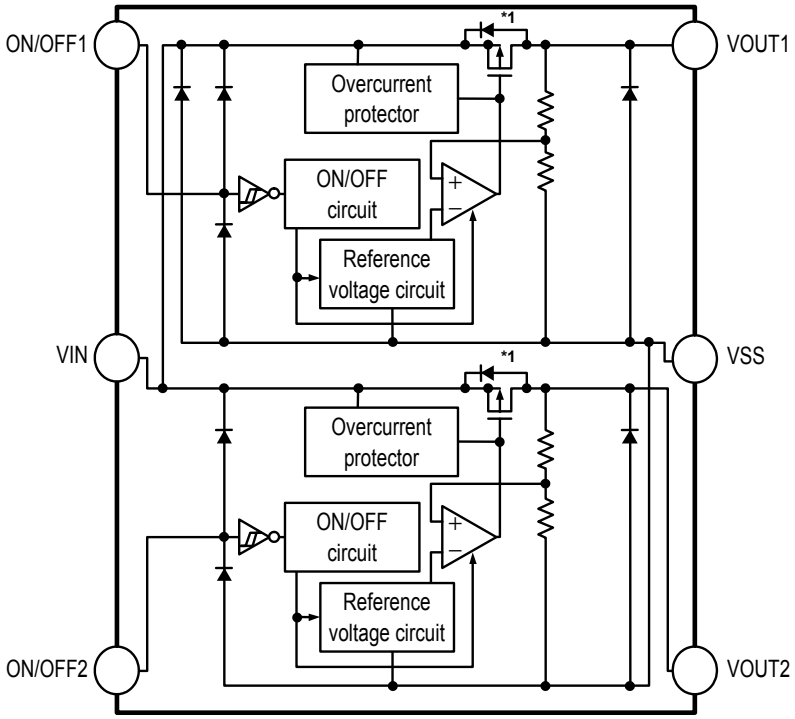


Function		Status
ON/OFF logic	1ch	Active “L”
	2ch	Active “H”
Pull-up resistor	1ch	None
	2ch	None
Pull-down resistor	1ch	None
	2ch	None

***1.** Parasitic diode

Figure 7

8. S-1721 Series H type



Function		Status
ON/OFF logic	1ch	Active “L”
	2ch	Active “L”
Pull-up resistor	1ch	None
	2ch	None
Pull-down resistor	1ch	None
	2ch	None

***1.** Parasitic diode

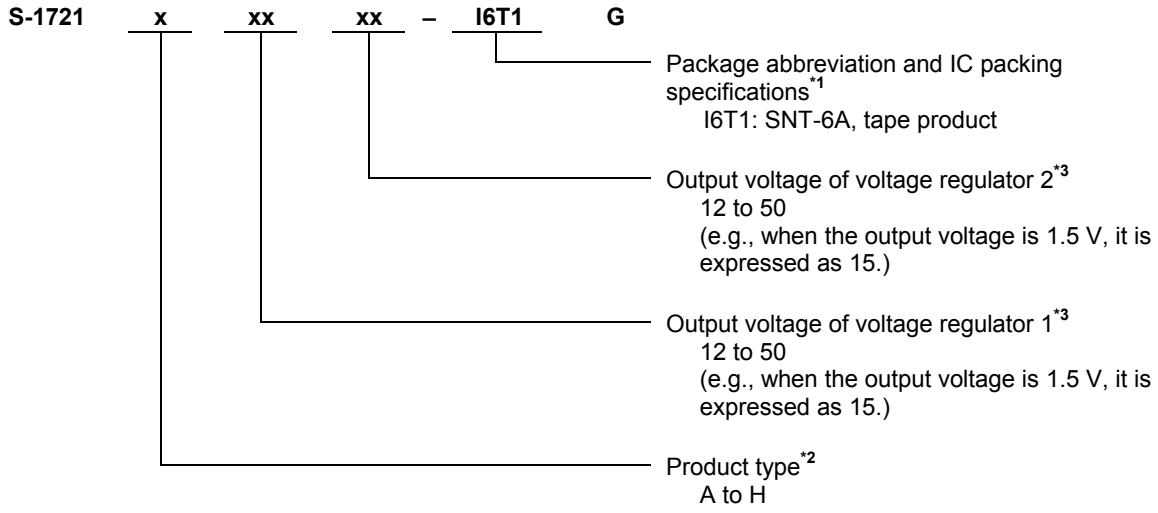
Figure 8

■ Product Name Structure

Users can select the product type, output voltage, and package type for the S-1721 Series. Refer to "**1. Product name**" regarding the contents of product name, "**2. Function list of product type**" regarding the product type.

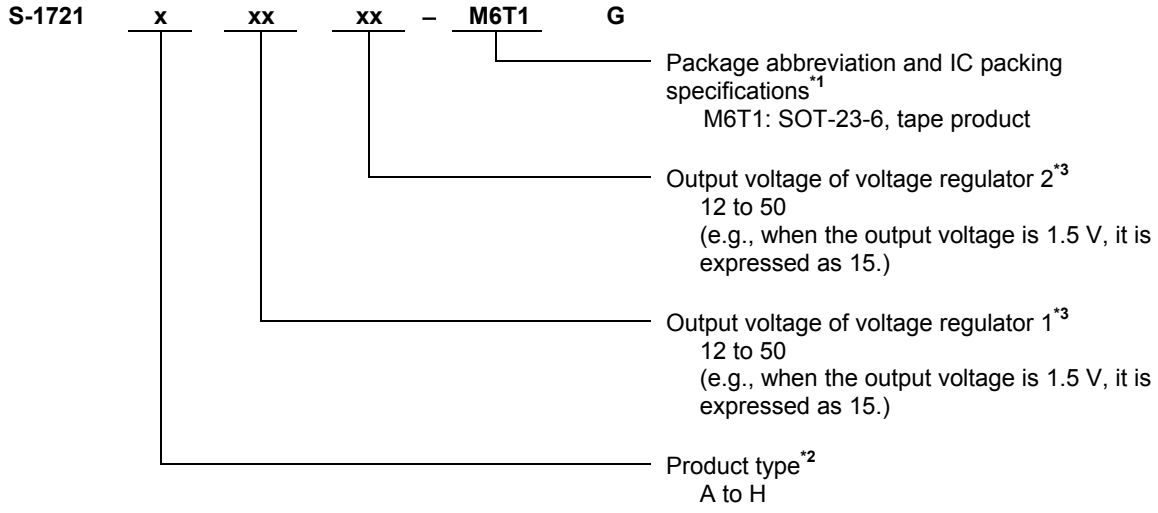
1. Product name

1. 1 SNT-6A



***1.** Refer to the taping specifications.
***2.** Refer to "**2. Function list of product type**".
***3.** If you request the product which has 0.05 V step, contact our sales office.

1. 2 SOT-23-6



***1.** Refer to the taping specifications.
***2.** Refer to "**2. Function list of product type**".
***3.** If you request the product which has 0.05 V step, contact our sales office.

2. Function list of product type

Table 1

Product Type	ON/OFF Logic	Pull-up Resistor	Pull-down Resistor
A type	1ch Active "H" 2ch Active "H"	1ch None 2ch None	1ch Available 2ch Available
B type	1ch Active "H" 2ch Active "L"	1ch None 2ch Available	1ch Available 2ch None
C type	1ch Active "L" 2ch Active "H"	1ch Available 2ch None	1ch None 2ch Available
D type	1ch Active "L" 2ch Active "L"	1ch Available 2ch Available	1ch None 2ch None
E type	1ch Active "H" 2ch Active "H"	1ch None 2ch None	1ch None 2ch None
F type	1ch Active "H" 2ch Active "L"	1ch None 2ch None	1ch None 2ch None
G type	1ch Active "L" 2ch Active "H"	1ch None 2ch None	1ch None 2ch None
H type	1ch Active "L" 2ch Active "L"	1ch None 2ch None	1ch None 2ch None

3. Product name list

3.1 S-1721 series A type

ON/OFF logic : 1ch : Active “H”, 2ch : Active “H”
Pull-up resistor : 1ch : None, 2ch : None
Pull-down resistor : 1ch : Available, 2ch : Available

Table 2

Voltage Regulator 1 Output Voltage	Voltage Regulator 2 Output Voltage	SNT-6A	SOT-23-6
1.2 V ±15 mV	1.2 V ±15 mV	S-1721A1212-I6T1G	S-1721A1212-M6T1G
1.2 V ±15 mV	1.5 V ±1%	S-1721A1215-I6T1G	S-1721A1215-M6T1G
2.0 V ±1%	2.0 V ±1%	S-1721A2020-I6T1G	S-1721A2020-M6T1G
2.8 V ±1%	2.8 V ±1%	S-1721A2828-I6T1G	S-1721A2828-M6T1G

3.2 S-1721 series E type

ON/OFF logic : 1ch : Active “H”, 2ch : Active “H”
Pull-up resistor : 1ch : None, 2ch : None
Pull-down resistor : 1ch : None, 2ch : None

Table 3

Voltage Regulator 1 Output Voltage	Voltage Regulator 2 Output Voltage	SNT-6A	SOT-23-6
1.8 V ±1%	2.8 V ±1%	S-1721E1828-I6T1G	S-1721E1828-M6T1G
2.8 V ±1%	1.8 V ±1%	S-1721E2818-I6T1G	S-1721E2818-M6T1G
2.8 V ±1%	3.3 V ±1%	S-1721E2833-I6T1G	S-1721E2833-M6T1G
2.85 V ±1%	2.5 V ±1%	S-1721E2J25-I6T1G	S-1721E2J25-M6T1G

■ Pin Configurations

SNT-6A
Top view

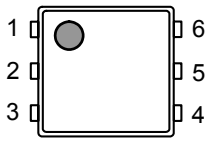


Figure 9

Table 4

Pin No.	Symbol	Description
1	ON/OFF2	ON/OFF pin 2
2	VIN	Input voltage pin
3	ON/OFF1	ON/OFF pin 1
4	VSS	GND pin
5	VOUT1	Output voltage pin 1
6	VOUT2	Output voltage pin 2

SOT-23-6
Top view

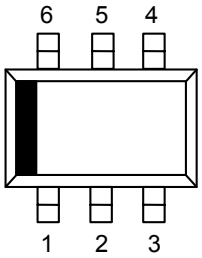


Figure 10

Table 5

Pin No.	Symbol	Description
1	ON/OFF1	ON/OFF pin 1
2	VIN	Input voltage pin
3	ON/OFF2	ON/OFF pin 2
4	VOUT2	Output voltage pin 2
5	VSS	GND pin
6	VOUT1	Output voltage pin 1

■ Absolute Maximum Ratings

Table 6

(Ta = 25°C unless otherwise specified)

Item		Symbol	Absolute Maximum Rating	Unit
Input voltage		V_{IN}	V_{SS} − 0.3 to V_{SS} + 7.0	V
		$V_{ON/OFF1, 2}$	V_{SS} − 0.3 to V_{IN} + 0.3	V
Output voltage		$V_{OUT1, 2}$	V_{SS} − 0.3 to V_{IN} + 0.3	V
Power dissipation	SNT-6A	P_D	400*1	mW
	SOT-23-6		650*1	mW
Operating ambient temperature		T_{opr}	−40 to +85	°C
Storage temperature		T_{stg}	−40 to +125	°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.

When mounted on board

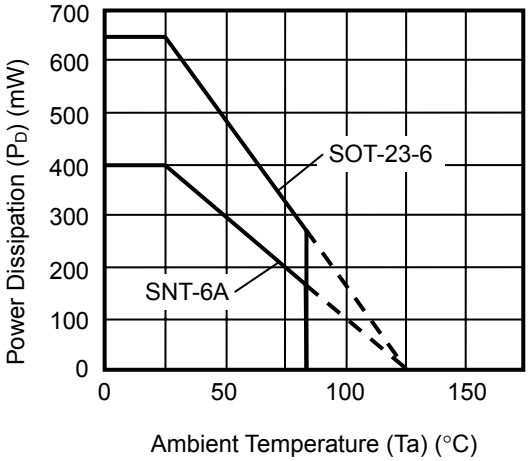


Figure 11 Power Dissipation of Package

■ Electrical Characteristics

Table 7

Voltage regulator 1 and voltage regulator 2 (per circuit) (Ta = 25°C unless otherwise specified)

Item	Symbol	Conditions		Min.	Typ.	Max.	Unit	Test Circuit
Output voltage[*1]	$V_{OUT(E)}$	$V_{IN} = V_{OUT(S)} + 1.0$ V, I_{OUT} = 30 mA	1.2 V ≤ $V_{OUT(S)}$ < 1.5 V	$V_{OUT(S)} - 0.015$	$V_{OUT(S)}$	$V_{OUT(S)} + 0.015$	V	2, 3
			1.5 V ≤ $V_{OUT(S)}$ ≤ 5.0 V	$V_{OUT(S)} \times 0.99$	$V_{OUT(S)}$	$V_{OUT(S)} \times 1.01$	V	2, 3
Output current[*2]	I_{OUT}	$V_{IN} \geq V_{OUT(S)} + 1.0$ V		150[*5]	—	—	mA	4, 5
Dropout voltage[*3]	V_{drop}	I_{OUT} = 100 mA	1.2 V ≤ $V_{OUT(S)}$ < 1.3 V	0.50	0.54	0.58	V	2, 3
			1.3 V ≤ $V_{OUT(S)}$ < 1.4 V	0.40	0.44	0.48	V	2, 3
			1.4 V ≤ $V_{OUT(S)}$ < 1.5 V	0.30	0.34	0.39	V	2, 3
			1.5 V ≤ $V_{OUT(S)}$ < 1.7 V	—	0.26	0.39	V	2, 3
			1.7 V ≤ $V_{OUT(S)}$ < 2.0 V	—	0.20	0.35	V	2, 3
			2.0 V ≤ $V_{OUT(S)}$ < 2.8 V	—	0.16	0.24	V	2, 3
			2.8 V ≤ $V_{OUT(S)}$ ≤ 5.0 V	—	0.13	0.23	V	2, 3
Line regulation	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}}$	$V_{OUT(S)} + 0.5$ V ≤ V_{IN} ≤ 6.5 V, I_{OUT} = 30 mA		—	0.05	0.2	%/V	2, 3
Load regulation	ΔV_{OUT2}	$V_{IN} = V_{OUT(S)} + 1.0$ V, 100 µA ≤ I_{OUT} ≤ 100 mA		—	20	40	mV	2, 3
Output voltage temperature coefficient[*4]	$\frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}$	$V_{IN} = V_{OUT(S)} + 1.0$ V, I_{OUT} = 30 mA, −40°C ≤ Ta ≤ +85°C		—	±120	—	ppm/°C	2, 3
Current consumption during operation (per circuit)	I_{SS1}	$V_{IN} = V_{OUT(S)} + 1.0$ V, ON/OFF pin = ON, no load	1.2 V ≤ $V_{OUT(S)}$ < 1.5 V	—	35	45	µA	1
		$V_{IN} = V_{OUT(S)} + 1.0$ V, ON/OFF pin = ON, no load	1.5 V ≤ $V_{OUT(S)}$ < 1.8 V	—	32	45	µA	1
		$V_{IN} = V_{OUT(S)} + 1.0$ V, ON/OFF pin = ON, no load	1.8 V ≤ $V_{OUT(S)}$ ≤ 5.0 V	—	25	45	µA	1
Current consumption during shutdown	I_{SS2}	$V_{IN} = V_{OUT(S)} + 1.0$ V, ON/OFF pin = OFF, no load		—	0.1	1.0	µA	1
Input voltage	V_{IN}	—		1.7	—	6.5	V	1
ON/OFF pin input voltage "H"	V_{SH}	$V_{IN} = V_{OUT(S)} + 1.0$ V, R_L = 1.0 kΩ		1.2	—	—	V	6, 7
ON/OFF pin input voltage "L"	V_{SL}	$V_{IN} = V_{OUT(S)} + 1.0$ V, R_L = 1.0 kΩ		—	—	0.3	V	6, 7
ON/OFF pin input current "H"	I_{SH}	V_{IN} = 6.5 V, $V_{ON/OFF}$ = 6.5 V	B (2ch)/C (1ch)/D/E/F/G/H type	−0.1	—	0.1	µA	6, 7
			A/B (1ch)/C (2ch) type	1.0	2.5	4.2	µA	
ON/OFF pin input current "L"	I_{SL}	V_{IN} = 6.5 V, $V_{ON/OFF}$ = 0 V	A/B (1ch)/C (2ch)/E/F/G/H type	−0.1	—	0.1	µA	6, 7
			B (2ch)/C (1ch)/D type	1.0	2.5	4.2	µA	
Ripple rejection	$\lvert RR \rvert$	$V_{IN} = V_{OUT(S)} + 1.0$ V, f = 1.0 kHz, ΔV_{rip} = 0.5 Vrms, I_{OUT} = 30 mA	1.2 V ≤ $V_{OUT(S)}$ < 1.8 V	—	80	—	dB	8, 9
			1.8 V ≤ $V_{OUT(S)}$ < 3.1 V	—	75	—	dB	8, 9
			3.1 V ≤ $V_{OUT(S)}$ ≤ 5.0 V	—	70	—	dB	8, 9
Short-circuit current	I_{short}	$V_{IN} = V_{OUT(S)} + 1.0$ V, ON/OFF pin = ON, V_{OUT} = 0 V		—	150	—	mA	4, 5
Shutdown pull-up/pull-down resistor	R_{PD}	—		1.5	2.6	6.5	MΩ	6, 7

***1.** $V_{OUT(S)}$: Specified output voltage
$V_{OUT(E)}$: Actual output voltage at the fixed load
Output voltage when fixing I_{OUT}(= 30 mA) and inputting $V_{OUT(S)}$ +1.0 V

***2.** The output current at which the output voltage becomes 95% of $V_{OUT(E)}$ after gradually increasing the output current.

***3.** $V_{drop} = V_{IN1} - (V_{OUT3} \times 0.98)$
V_{OUT3} is the output voltage when $V_{IN} = V_{OUT(S)} + 1.0$ V and I_{OUT} = 100 mA.
V_{IN1} is the input voltage at which the output voltage becomes 98% of V_{OUT3} after gradually decreasing the input voltage.

***4.** The change in temperature [mV/°C] is calculated using the following equation.

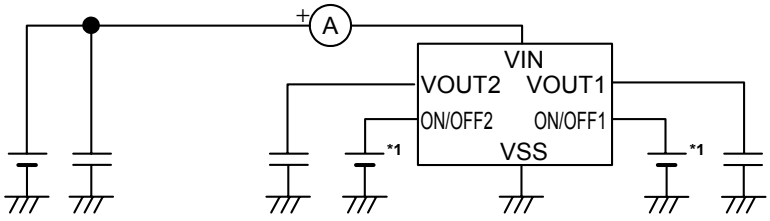
$$\frac{\Delta V_{OUT}}{\Delta Ta}\left[\text{mV/°C}\right]^{*1} = V_{OUT(S)}\left[\text{V}\right]^{*2} \times \frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}\left[\text{ppm/°C}\right]^{*3} \div 1000$$

***1.** Change in temperature of the output voltage
***2.** Specified output voltage
***3.** Output voltage temperature coefficient

***5.** The output current can be at least this value.
Due to restrictions on the package power dissipation, this value may not be satisfied. Attention should be paid to the power dissipation of the package when the output current is large.
This specification is guaranteed by design.

■ Test Circuit

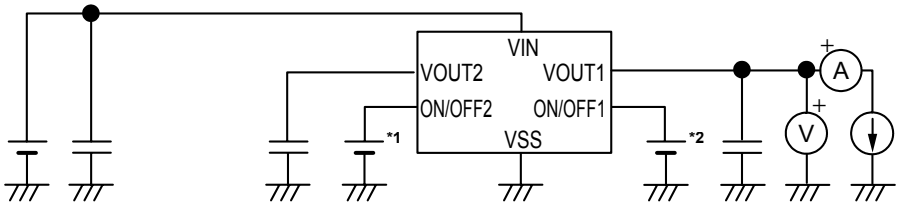
1.



1. Set to V_{IN} or GND

Figure 12

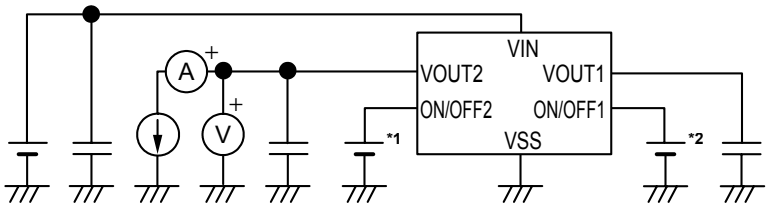
2.



1. Set to power-off
2. Set to power-on

Figure 13

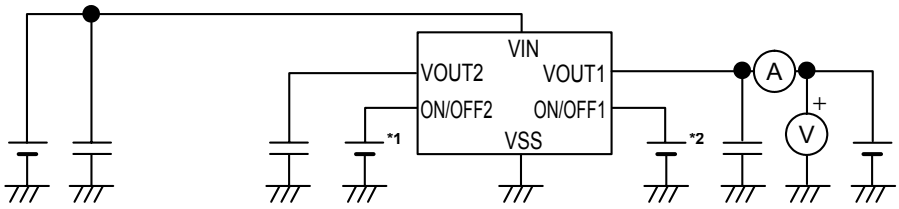
3.



1. Set to power-on
2. Set to power-off

Figure 14

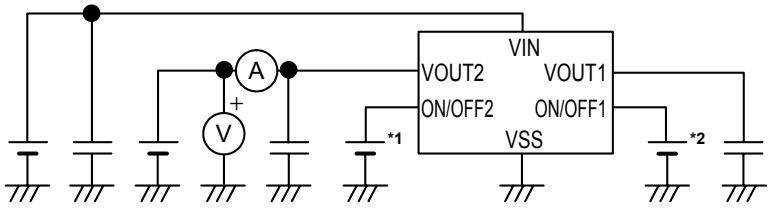
4.



1. Set to power-off
2. Set to V_{IN} or GND

Figure 15

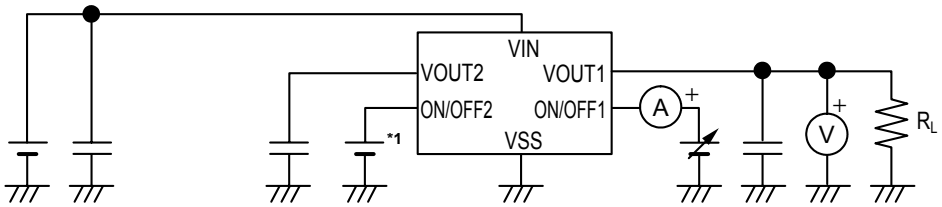
5.



1. Set to V_{IN} or GND
2. Set to power-off

Figure 16

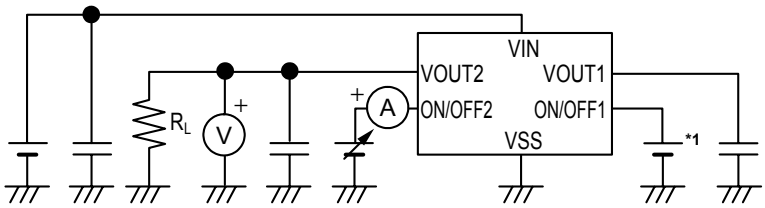
6.



***1.** Set to power-off

Figure 17

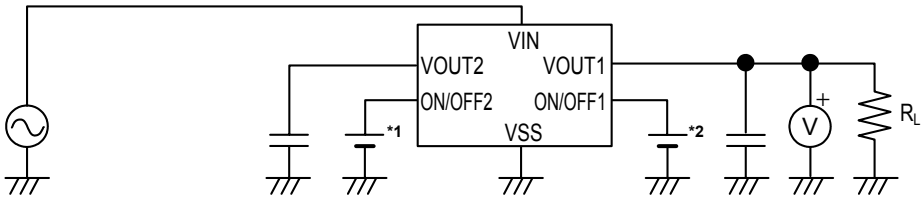
7.



***1.** Set to power-off

Figure 18

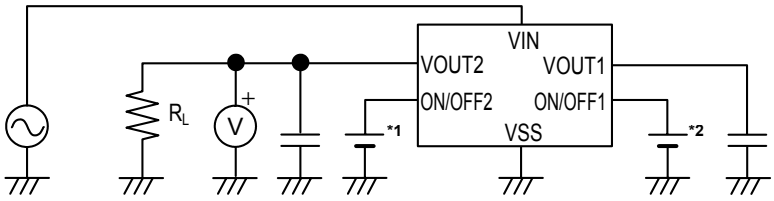
8.



***1.** Set to power-off
***2.** Set to power-on

Figure 19

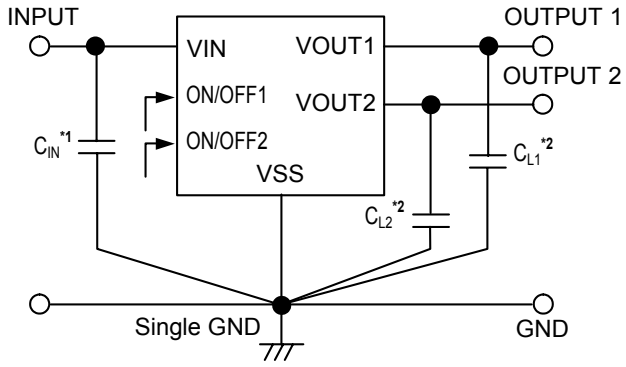
9.



***1.** Set to power-on
***2.** Set to power-off

Figure 20

■ Standard Circuit



***1.** C_{IN} is a capacitor for stabilizing the input.
***2.** A ceramic capacitor of 1.0 μF or more can be used for C_{L1} and C_{L2}.

Figure 21

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

■ Condition of Application

Input capacitor (C_{IN}) : 1.0 μF or more
Output capacitor (C_{L1}, C_{L2}) : 1.0 μF or more (ceramic capacitor)

Caution A general series regulator may oscillate, depending on the external components. Confirm that no oscillation occurs in the application for which the above capacitors are used.

■ Selection of Input and Output Capacitors (C_{IN}, C_{L1}, C_{L2})

The S-1721 Series requires an output capacitor between the VOUT and VSS pin for phase compensation. Operation is stabilized by a ceramic capacitor with an output capacitance of 1.0 μF or more over the entire temperature range. When using an OS capacitor, tantalum capacitor, or aluminum electrolytic capacitor, the capacitance must be 1.0 μF or more.

The value of the output overshoot or undershoot transient response varies depending on the value of the output capacitor. The required capacitance of the input capacitor differs depending on the application.

The recommended capacitance for an application is $C_{IN} \geq 1.0$ μF, $C_{L1} \geq 1.0$ μF, $C_{L2} \geq 1.0$ μF; however, when selecting the output capacitor, perform sufficient evaluation, including evaluation of temperature characteristics, on the actual device.

■ Explanation of Terms

1. Low dropout voltage regulator

This IC's voltage regulator has the low dropout voltage due to its built-in low on-resistance transistor.

2. Output voltage (V_{OUT})

The accuracy of the output voltage is ensured at ±1.0% under the specified conditions of fixed input voltage[*1], fixed output current, and fixed temperature.

***1.** Differs depending on the product.

Caution **If the above conditions change, the output voltage value may vary and exceed the accuracy range of the output voltage. See "■ Electrical Characteristics" and "■ Characteristics (Typical Data) (Per Circuit)" for details.**

3. Line regulation $\left(\dfrac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}} \right)$

Indicates the dependency of the output voltage on the input voltage. That is, the values show how much the output voltage changes due to a change in the input voltage with the output current remaining unchanged.

4. Load regulation (ΔV_{OUT2})

Indicates the dependency of the output voltage on the output current. That is, the values show how much the output voltage changes due to a change in the output current with the input voltage remaining unchanged.

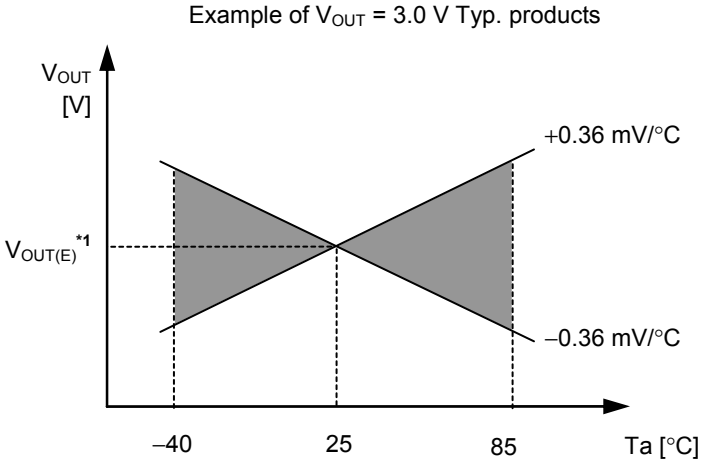
5. Dropout voltage (V_{drop})

Indicates the difference between input voltage V_{IN} and the output voltage when; decreasing input voltage V_{IN} gradually until the output voltage has dropped out to the value of 98% of output voltage V_{OUT3}, which is at V_{IN} = $V_{OUT(S)}$ + 1.0 V.

$V_{drop} = V_{IN1} - (V_{OUT3} \times 0.98)$

6. Temperature coefficient of output voltage $\left(\frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}\right)$

The shaded area in **Figure 22** is the range where V_{OUT} varies in the operating temperature range when the temperature coefficient of the output voltage is ±120 ppm/°C.



***1.** $V_{OUT(E)}$ is the value of the output voltage measured at 25°C.

Figure 22

A change in the temperature of the output voltage [mV/°C] is calculated using the following equation.

$$\frac{\Delta V_{OUT}}{\Delta Ta}\left[mV/°C\right]^{*1} = V_{OUT(S)}\left[V\right]^{*2} \times \frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}\left[ppm/°C\right]^{*3} \div 1000$$

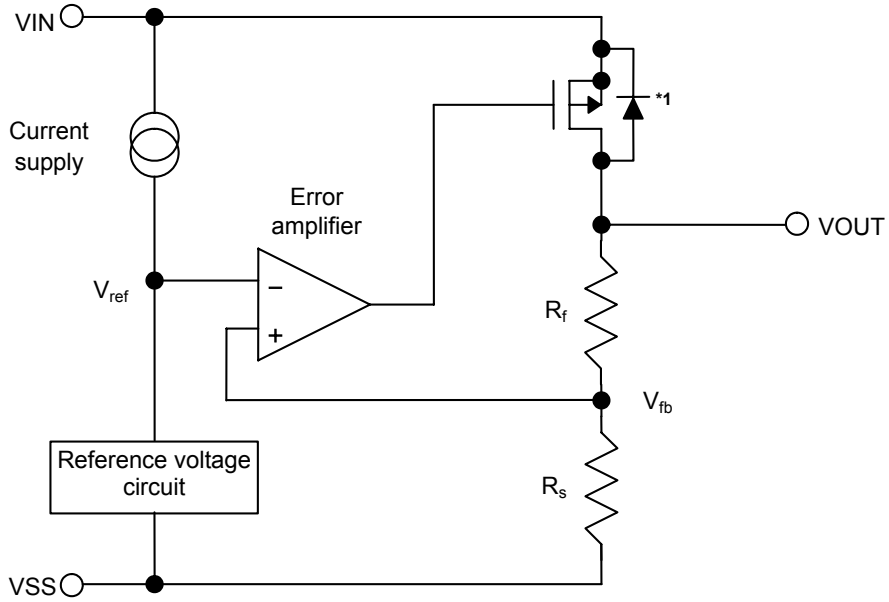
***1.** Change in temperature of output voltage
***2.** Specified output voltage
***3.** Output voltage temperature coefficient

■ Operation

1. Basic operation

Figure 23 shows the block diagram of S-1721 Series.

The error amplifier compares the reference voltage (V_{ref}) with V_{fb}, which is the output voltage resistance-divided by feedback resistors R_s and R_f. It supplies the gate voltage necessary to maintain the constant output voltage which is not influenced by the input voltage and temperature change, to the output transistor.



***1**. Parasitic diode

Figure 23

2. Output transistor

In the S-1721 Series, a low on-resistance P-channel MOS FET is used as the output transistor.
Be sure that V_{OUT} does not exceed V_{IN} + 0.3 V to prevent the voltage regulator from being damaged due to inverse current flowing from the VOUT pin through a parasitic diode to the VIN pin.

3. ON/OFF pin 1 and 2

These pins start and stop the regulator.

When the ON/OFF pin is set to the power-off level, the entire internal circuit stops operating, and the built-in P-channel MOS FET output transistor between the VIN and VOUT pin is turned off, in order to reduce the current consumption significantly. The VOUT pin is set to the VSS level by the internal dividing resistor of several hundred kΩ which is placed between the VOUT and VSS pin. Note that the current consumption increases when a voltage of 0.3 V to 1.2 V (@Ta = 25°C) is applied to the ON/OFF pin.

The ON/OFF pin is configured as shown in **Figures 24** and **25**. In the S-1721 Series A, B C, and D types, the ON/OFF pin is internally pulled up to VIN or pulled down to VSS when in the floating status, so the VOUT pin is set to the VSS level.
In the S-1721 Series E, F, G and H types, do not use S-1721 Series in the floating status because the ON/OFF pin is not internally pulled up or pulled down.
When not using the ON/OFF pin in the S-1721 Series E, F, G, and H types, connect the ON/OFF pin to the VIN pin in the E, F (1ch only), and G (2ch only) types. In the F (2ch only), G (1ch only) and H types, connect the ON/OFF pin to the VSS pin.

Table 8

Logic Type	ON/OFF Pin	Internal Circuits	VOUT Pin Voltage	Current Consumption
A	1ch "H": Power on 2ch "H": Power on	Operate Operate	Set value Set value	I_{SS1} I_{SS1}
B	1ch "H": Power on 2ch "L": Power on	Operate Operate	Set value Set value	I_{SS1} I_{SS1}
C	1ch "L": Power on 2ch "H": Power on	Operate Operate	Set value Set value	I_{SS1} I_{SS1}
D	1ch "L": Power on 2ch "L": Power on	Operate Operate	Set value Set value	I_{SS1} I_{SS1}
E	1ch "L": Power off 2ch "L": Power off	Stop Stop	V_{SS} level V_{SS} level	I_{SS2} I_{SS2}
F	1ch "L": Power off 2ch "H": Power off	Stop Stop	V_{SS} level V_{SS} level	I_{SS2} I_{SS2}
G	1ch "H": Power off 2ch "L": Power off	Stop Stop	V_{SS} level V_{SS} level	I_{SS2} I_{SS2}
H	1ch "H": Power off 2ch "H": Power off	Stop Stop	V_{SS} level V_{SS} level	I_{SS2} I_{SS2}

(1) S-1721 Series A, B, C, D Types

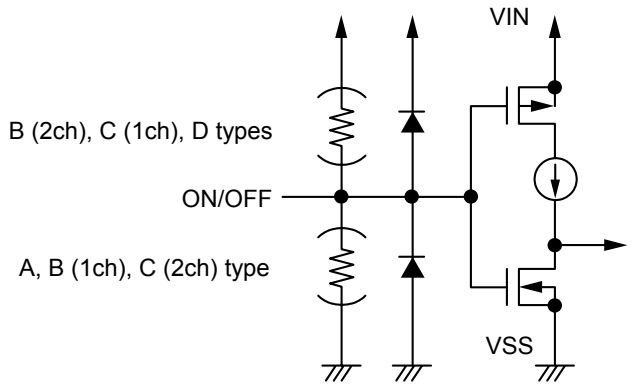


Figure 24

(2) S-1721 Series E, F, G, H Types

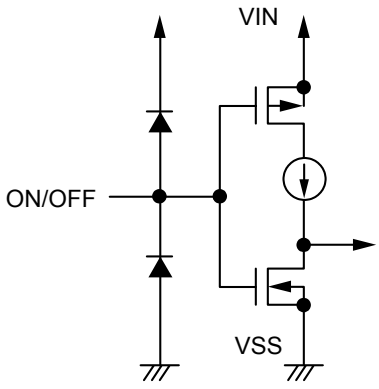


Figure 25

4. Overcurrent protector

The S-1721 Series has a built-in overcurrent protector having the characteristics shown in (1) Output Voltage vs. Output Current (Ta = 25°C) in "■ **Characteristics (Typical Data) (Per Circuit)**" to protect the output transistor against an excessive output current and short circuiting between the VOUT and VSS pin.

The current (I_{short}) when the output pin is short-circuited is internally set at approximately 150 mA (Typ.), and the initial value is restored for the output voltage, if releasing a short circuit once.

Note that the overcurrent protect circuit does not provide a thermal protection function, therefore pay attention to the conditions of input voltage and load current so that the IC's loss under the usage conditions, including the short circuit conditions, does not exceed the package power dissipation if the condition in which a short circuiting continues for a long time.

5. Pull-down/pull-up resistor (S-1721 Series A, B, C, and D types)

In the S-1721 Series A, B, C, and D types, the ON/OFF pin is internally pulled up to VIN or pulled down to VSS, so the VOUT pin is in the VSS level when in the floating status.

In A/B (1ch only) and C (2ch only), the ON/OFF pin is connected to VIN,
In B (2ch only)/C (1ch only)/D type, the ON/OFF pin is connected to VSS;
Note that during operation in these cases, the current consumption of the IC is generated as much as the current which flows into a pull-up resistor of 2.6 MΩ or a pull-down resistor of 2.6 MΩ.

■ Precautions

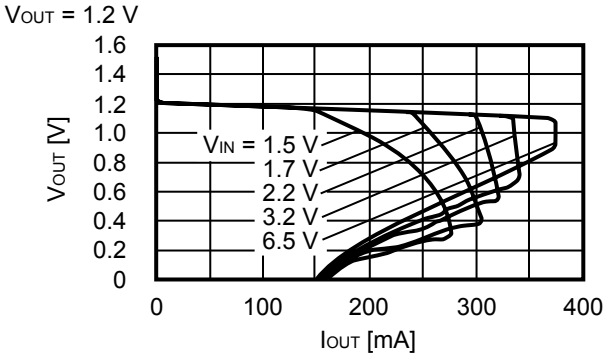
- Wiring patterns for the VIN, VOUT and GND pins should be designed so that the impedance is low. When mounting an output capacitor between the VOUT and VSS pin (C_{L1}, C_{L2}) and a capacitor for stabilizing the input between VIN and VSS pin (C_{IN}), the distance from the capacitors to these pins should be as short as possible.
- Note that the output voltage may increase when a series regulator is used at low load current (1.0 mA or less).
- Note that the output voltage may increase due to the leakage current from a driver when a series regulator is used at high temperature.
- Generally a series regulator may cause oscillation, depending on the selection of external parts. The following conditions are recommended for this IC. However, be sure to perform sufficient evaluation under the actual usage conditions for selection, including evaluation of temperature characteristics. See "**(5) Example of Equivalent Series Resistance vs. Output Current Characteristics (Ta = 25°C)**" in "■ **Reference Data (Per Circuit)**" for the equivalent series resistance (R_{ESR}) of the output capacitor.

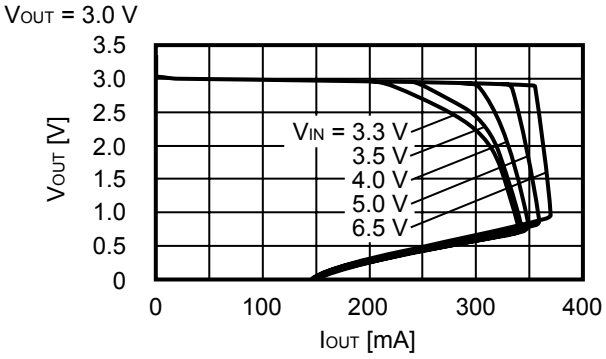
  Input capacitor (C_{IN}) : 1.0 µF or more
  Output capacitor (C_{L1}, C_{L2}) : 1.0 µF or more

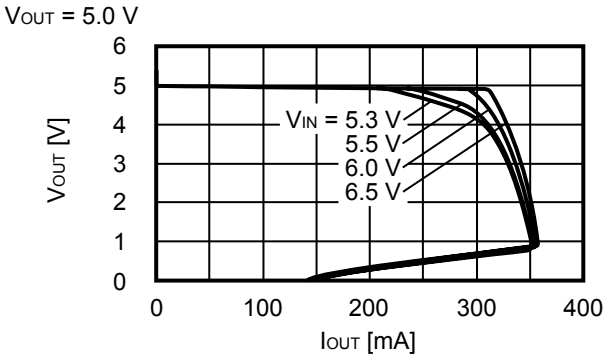
- The voltage regulator may oscillate when the impedance of the power supply is high and the input capacitor is small or an input capacitor is not connected. Note that, if the capacitance of the output capacitor is greater than that of the input capacitor, the voltage regulator may oscillate.
- Note that an oscillation may occur when the load current is high (100 mA or higher) and the difference between the voltage input and output is around the dropout voltage if the inductance of the power supply is high. Perform sufficient evaluation including electrical characteristics under the actual use conditions to select an input capacitor.
- Concerning the fluctuation of output voltage due to power-supplying and load, confirm with the actual device.
- If the power supply suddenly increases, a momentary overshoot may be output. It is therefore important to sufficiently evaluate the output voltage at power application in the actual equipment.
- The application conditions for the input voltage, output voltage, and load current should not exceed the package power dissipation.
- Do not apply an electrostatic discharge to this IC that exceeds the performance ratings of the built-in electrostatic protection circuit.
- In determining the output current, attention should be paid to the output current value specified in **Table 7** in "■ **Electrical Characteristics**" and footnote ***5** of the table.
- 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) (Per Circuit)

(1) Output Voltage vs. Output Current (When Load Current Increases) (Ta = 25°C)

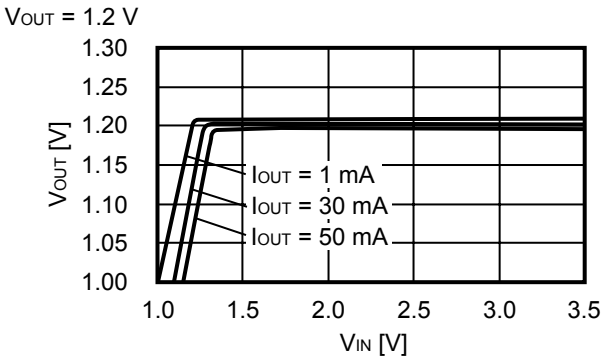


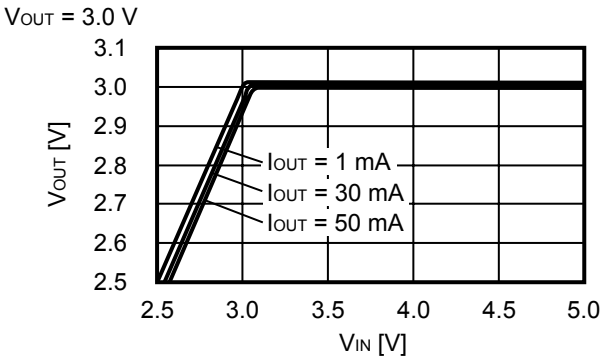


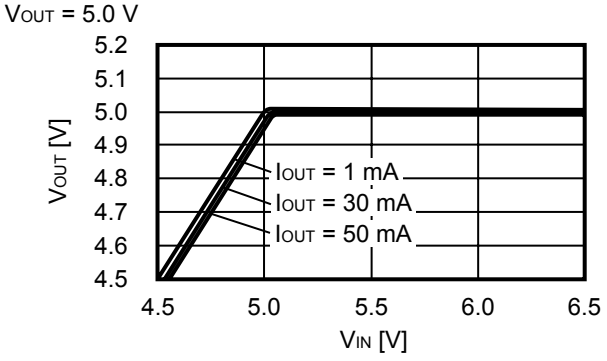


Remark In determining the output current, attention should be paid to the following.
1. The minimum output current value and footnote ***5** in **Table 7** in the "■ **Electrical Characteristics**"
2. The package power dissipation

(2) Output Voltage vs. Input Voltage (Ta = 25°C)

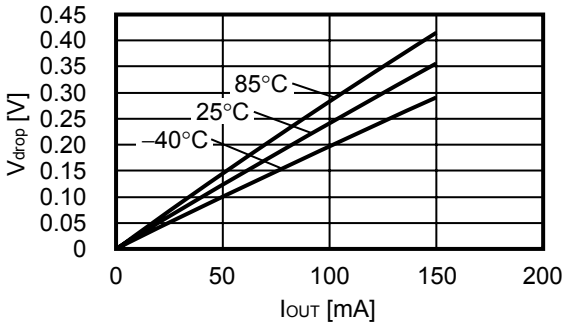




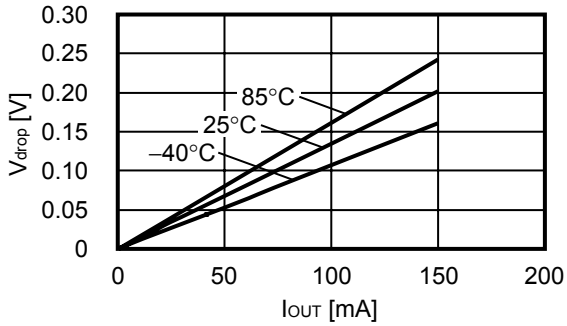


(3) Dropout Voltage vs. Output Current

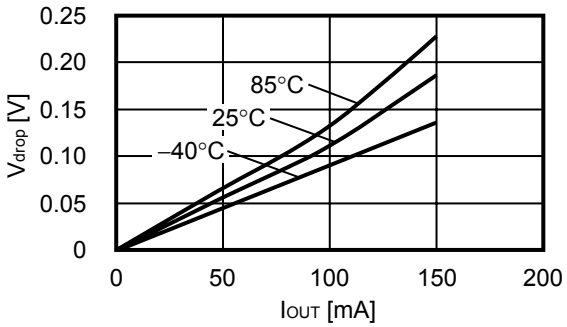
V_{OUT} = 1.2 V



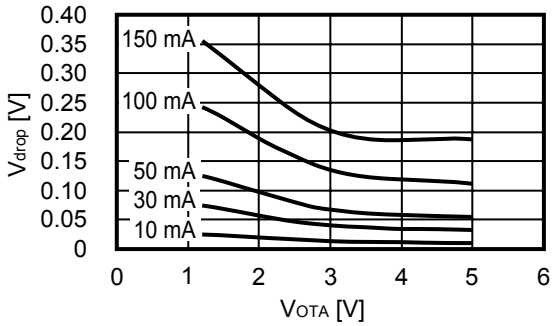
V_{OUT} = 3.0 V



V_{OUT} = 5.0 V

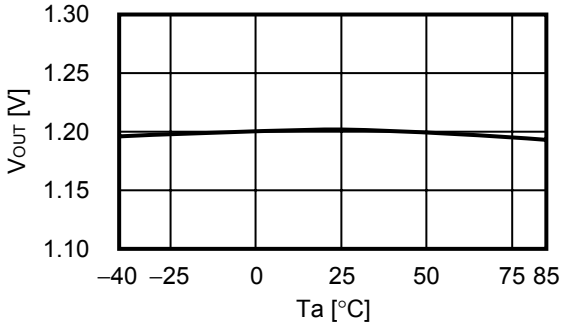


(4) Dropout Voltage vs. Set Output Voltage

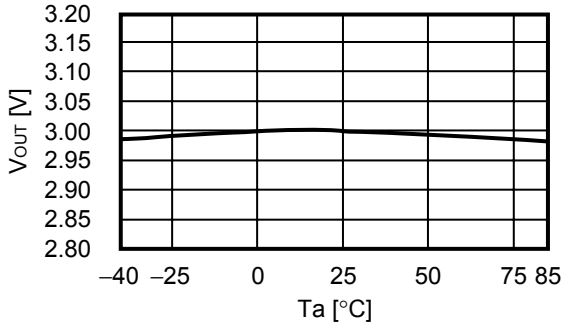


(5) Output Voltage vs. Ambient Temperature

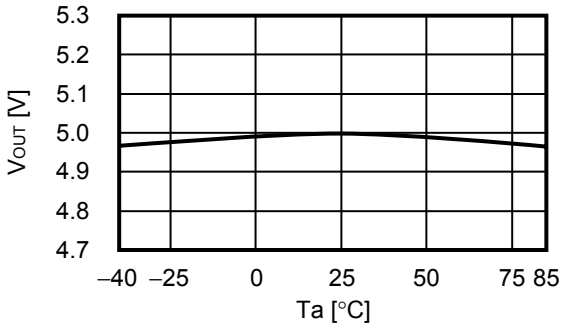
V_{OUT} = 1.2 V



V_{OUT} = 3.0 V

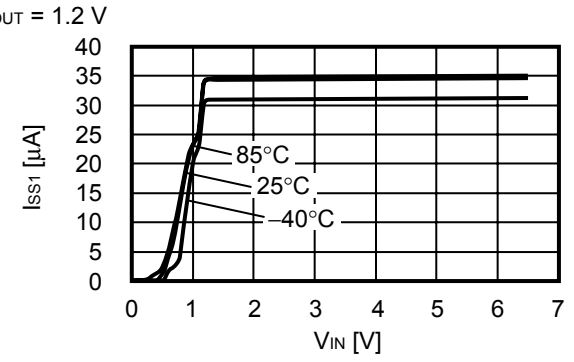


V_{OUT} = 5.0 V

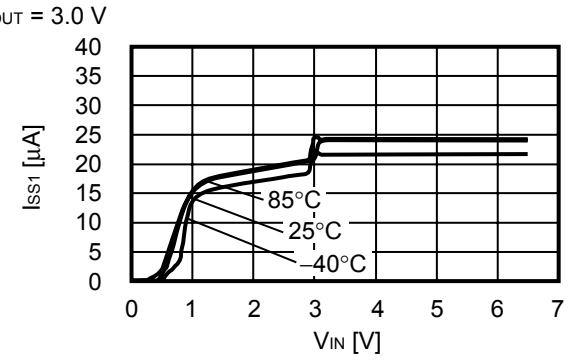


(6) Current Consumption vs. Input Voltage

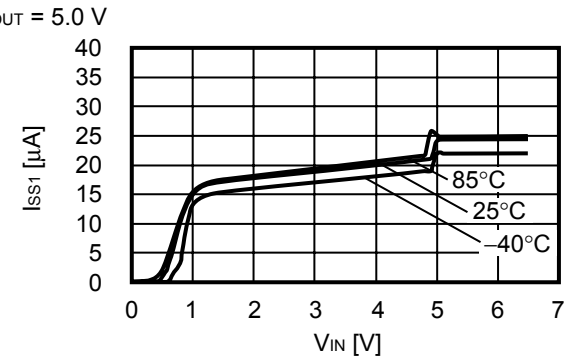
V_{OUT} = 1.2 V



V_{OUT} = 3.0 V

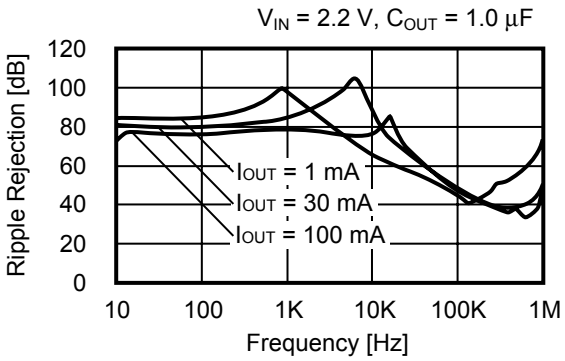


V_{OUT} = 5.0 V

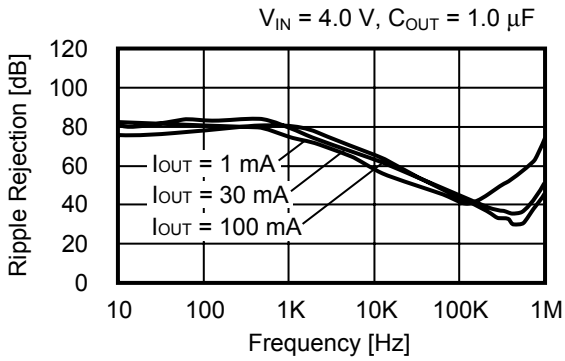


(7) Ripple Rejection (Ta = 25°C)

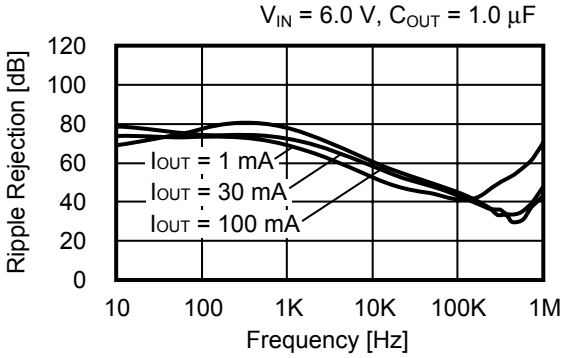
V_{OUT} = 1.2 V



V_{OUT} = 3.0 V



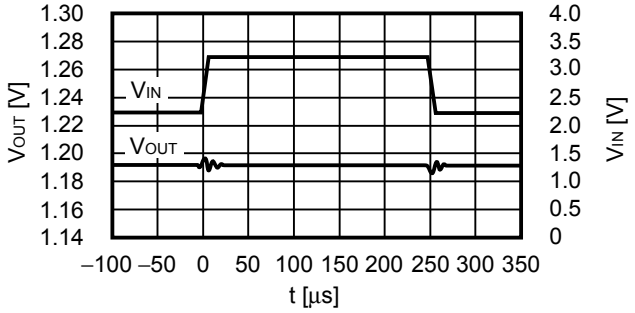
V_{OUT} = 5.0 V



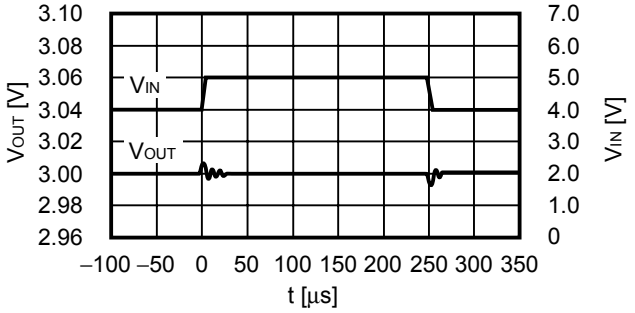
■ Reference Data (Per Circuit)

(1) Transient Response Characteristics when Input (Ta = 25°C) Common to VR1 and VR2

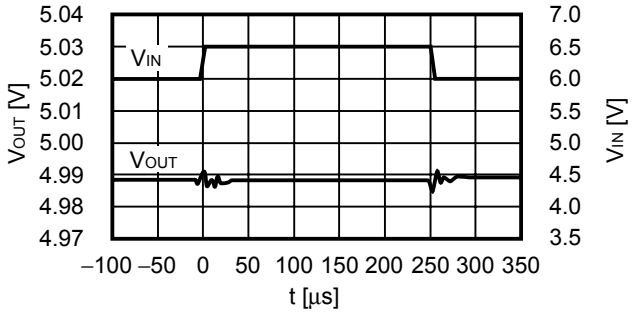
V_{OUT} = 1.2 V
I_{OUT} = 30 mA, tr = tf = 5.0 µs, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF



V_{OUT} = 3.0 V
I_{OUT} = 30 mA, tr = tf = 5.0 µs, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF

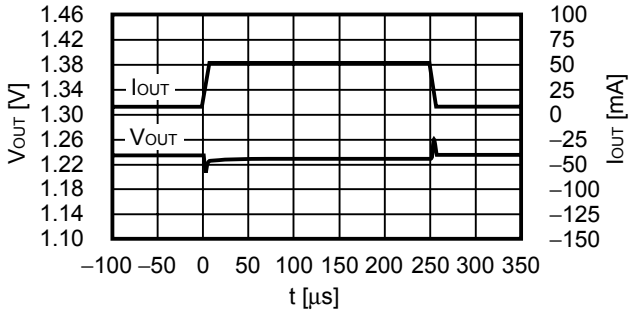


V_{OUT} = 5.0 V
I_{OUT} = 30 mA, tr = tf = 5.0 µs, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF

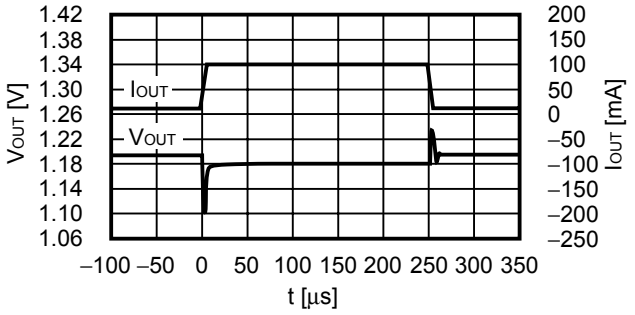


(2) Transient Response Characteristics of Load (Ta = 25°C)

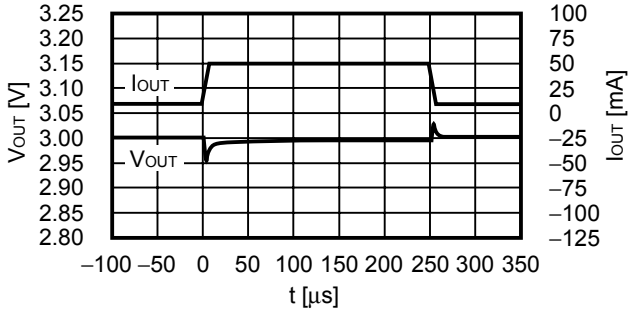
V_{OUT} = 1.2 V
V_{IN} = 2.2 V, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF, I_{OUT} = 10 ↔ 50 mA



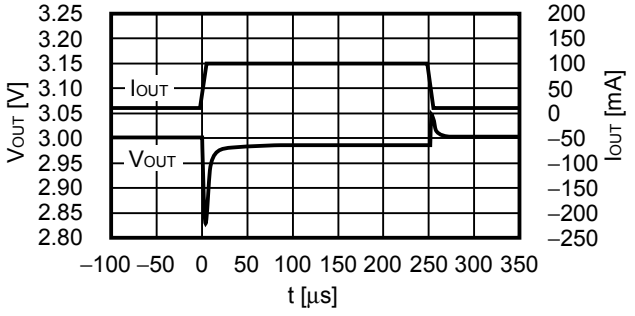
V_{OUT} = 1.2 V
V_{IN} = 2.2 V, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF, I_{OUT} = 10 ↔ 100 mA



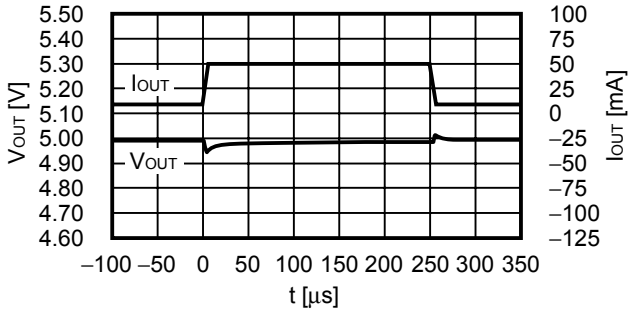
V_{OUT} = 3.0 V
V_{IN} = 4.0 V, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF, I_{OUT} = 10 ↔ 50 mA



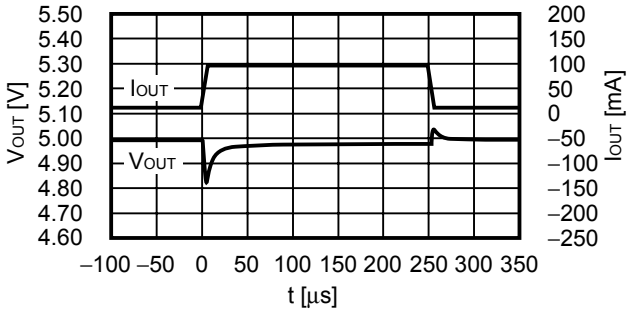
V_{OUT} = 3.0 V
V_{IN} = 4.0 V, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF, I_{OUT} = 10 ↔ 100 mA



V_{OUT} = 5.0 V
V_{IN} = 6.0 V, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF, I_{OUT} = 10 ↔ 50 mA

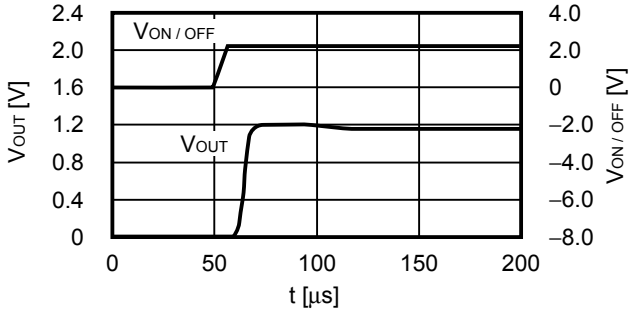


V_{OUT} = 5.0 V
V_{IN} = 6.0 V, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF, I_{OUT} = 10 ↔ 100 mA

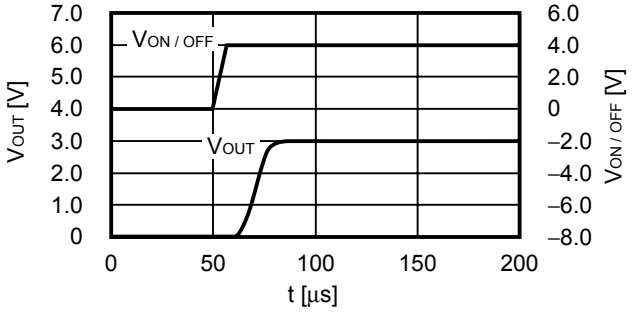


(3) Transient Response Characteristics of ON/OFF Pin (Ta = 25°C)

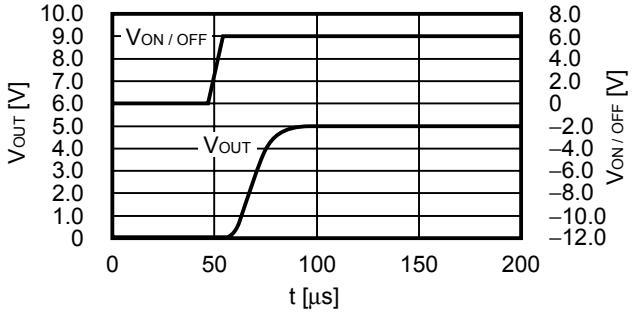
V_{OUT} = 1.2 V
V_{IN} = 2.2 V, tr = 5.0 µs, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF, I_{OUT} = 100 mA



V_{OUT} = 3.0 V
V_{IN} = 4.0 V, tr = 5.0 µs, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF, I_{OUT} = 100 mA

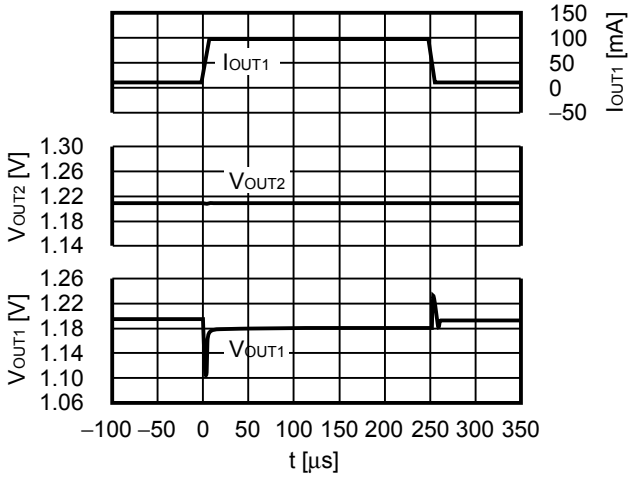


V_{OUT} = 5.0 V
V_{IN} = 6.0 V, tr = 5.0 µs, C_{OUT} = 1.0 µF, C_{IN} = 1.0 µF, I_{OUT} = 100 mA

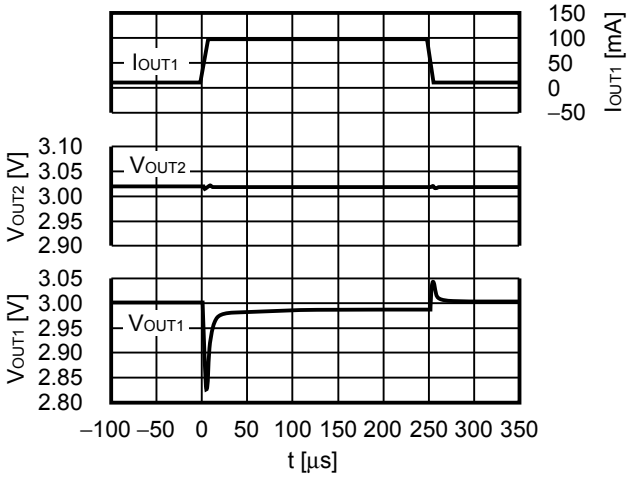


(4) Transient Response Characteristics of Load's Mutual Interference (Ta = 25°C)

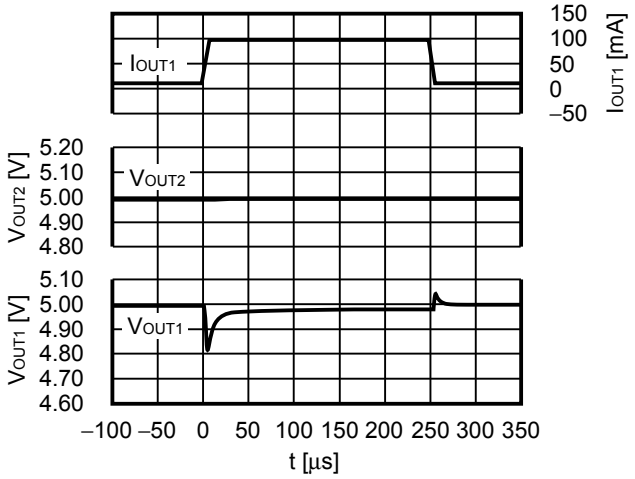
$V_{OUT1} = V_{OUT2} = 1.2$ V
$V_{IN} = 2.2$ V, $C_{L1} = C_{L2} = 1.0$ µF, $C_{IN} = 1.0$ µF,
$I_{OUT1} = 10 \leftrightarrow 100$ mA, I_{OUT2} = no load



$V_{OUT1} = V_{OUT2} = 3.0$ V
$V_{IN} = 4.0$ V, $C_{L1} = C_{L2} = 1.0$ µF, $C_{IN} = 1.0$ µF,
$I_{OUT1} = 10 \leftrightarrow 100$ mA, I_{OUT2} = no load

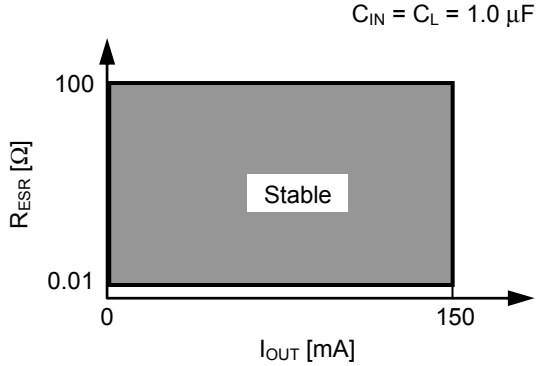


$V_{OUT1} = V_{OUT2} = 5.0$ V
$V_{IN} = 6.0$ V, $C_{L1} = C_{L2} = 1.0$ µF, $C_{IN} = 1.0$ µF,
$I_{OUT1} = 10 \leftrightarrow 100$ mA, I_{OUT2} = no load



(5) Example of Equivalent Series Resistance vs. Output Current Characteristics (Ta = 25°C)

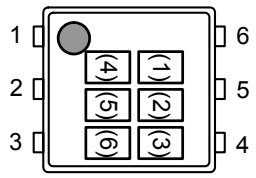
$C_{IN} = C_L = 1.0$ µF



■ 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

(a) S-1721 Series A type

Product Name	Product code		
	(1)	(2)	(3)
S-1721A1212-I6T1G	S	2	B
S-1721A1215-I6T1G	S	2	D
S-1721A2020-I6T1G	S	2	C
S-1721A2828-I6T1G	S	2	A

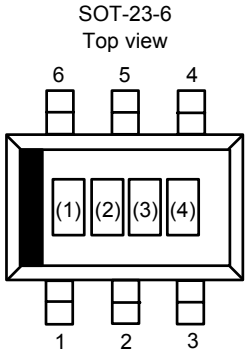
Remark Please contact our sales office for products with specifications other than the above.

(b) S-1721 Series E type

Product Name	Product code		
	(1)	(2)	(3)
S-1721E1828-I6T1G	S	5	D
S-1721E2818-I6T1G	S	5	G
S-1721E2833-I6T1G	S	5	H
S-1721E2J25-I6T1G	S	5	K

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

(2) SOT-23-6



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

Product name vs. Product code

(a) S-1721 Series A type

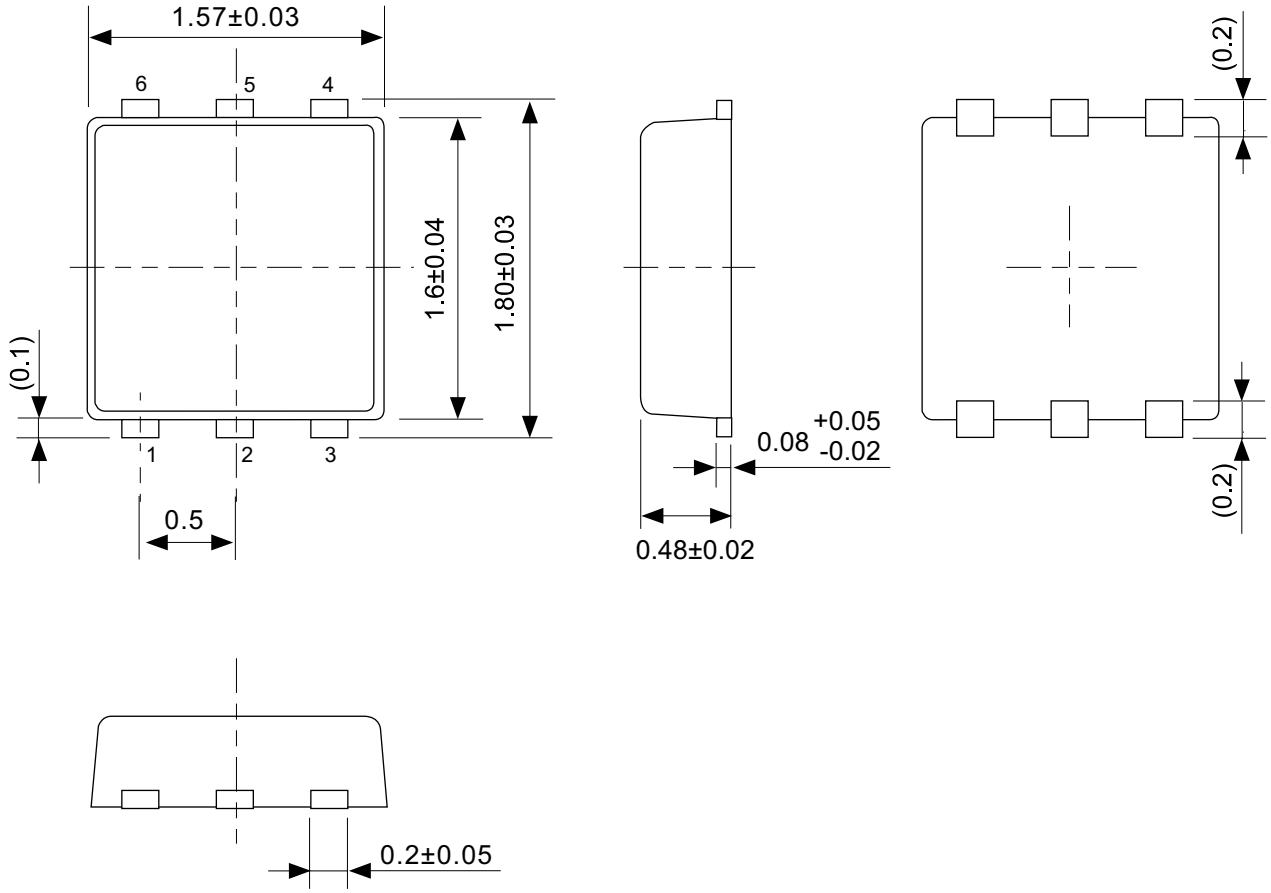
Product Name	Product code		
	(1)	(2)	(3)
S-1721A1212-M6T1G	S	2	B
S-1721A1215-M6T1G	S	2	D
S-1721A2020-M6T1G	S	2	C
S-1721A2828-M6T1G	S	2	A

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

(b) S-1721 Series E type

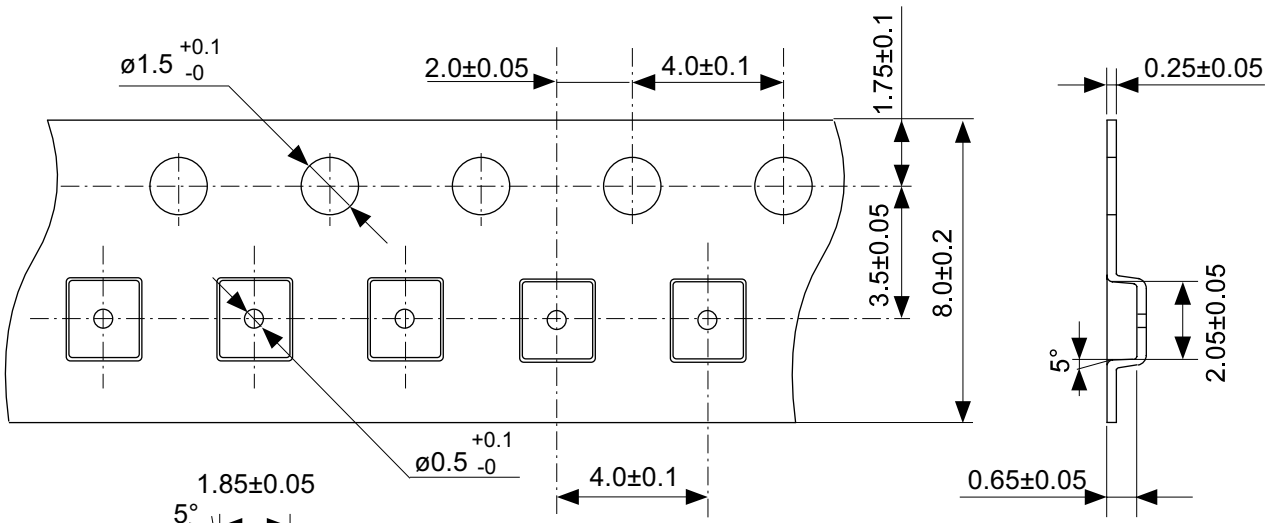
Product Name	Product code		
	(1)	(2)	(3)
S-1721E1828-M6T1G	S	5	D
S-1721E2818-M6T1G	S	5	G
S-1721E2833-M6T1G	S	5	H
S-1721E2J25-M6T1G	S	5	K

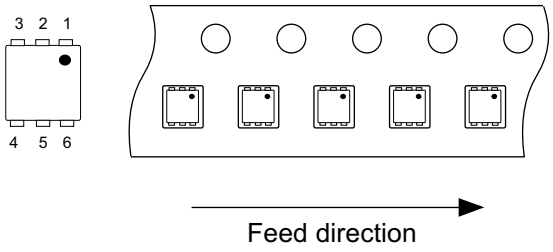
Remark Please contact our sales offices for products with specifications other than the above.



No. PG006-A-P-SD-2.0

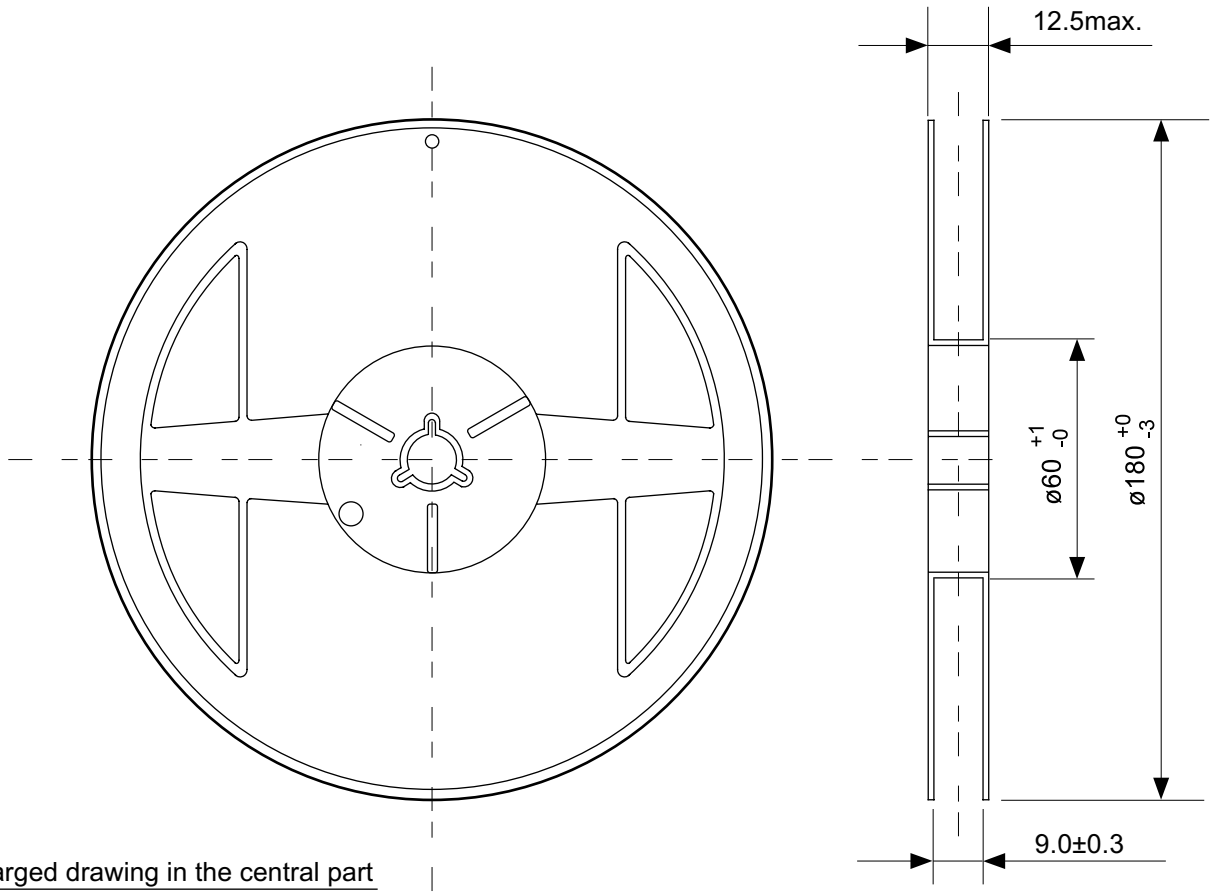
TITLE	SNT-6A-A-PKG Dimensions
No.	PG006-A-P-SD-2.0
SCALE	
UNIT	mm
Seiko Instruments Inc.	



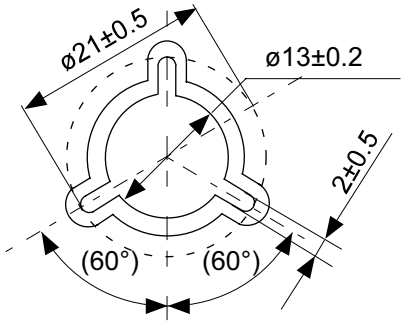


No. PG006-A-C-SD-1.0

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

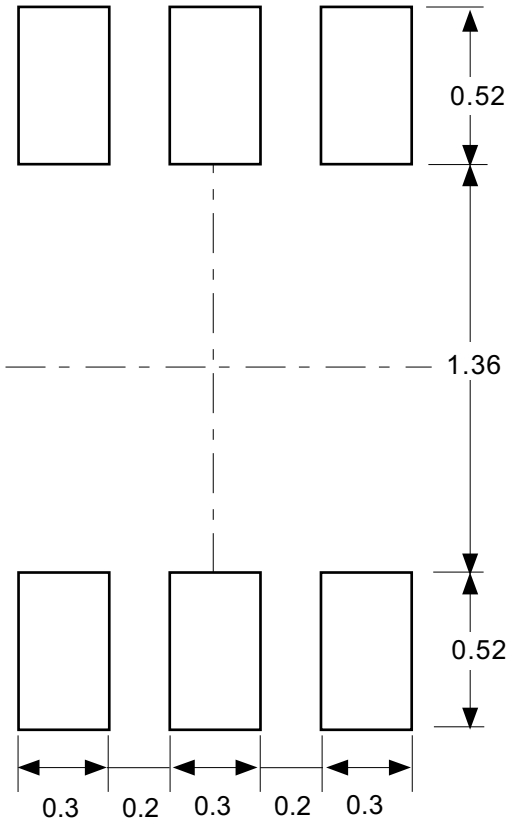


Enlarged drawing in the central part



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.			

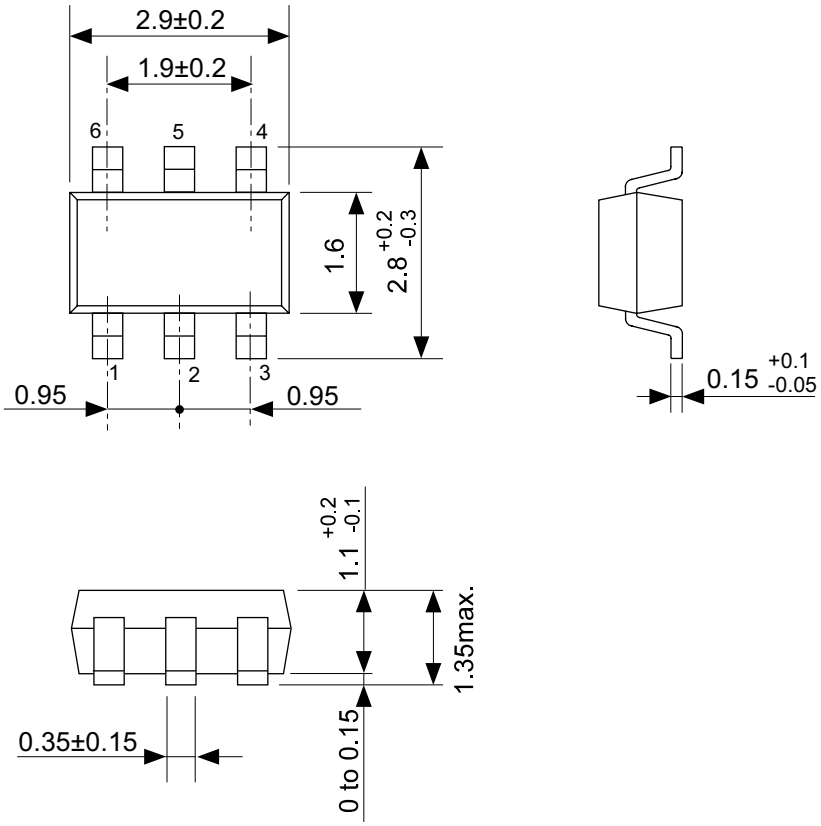


Caution Making the wire pattern under the package is possible. However, note that the package may be upraised due to the thickness made by the silk screen printing and of a solder resist on the pattern because this package does not have the standoff.

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。

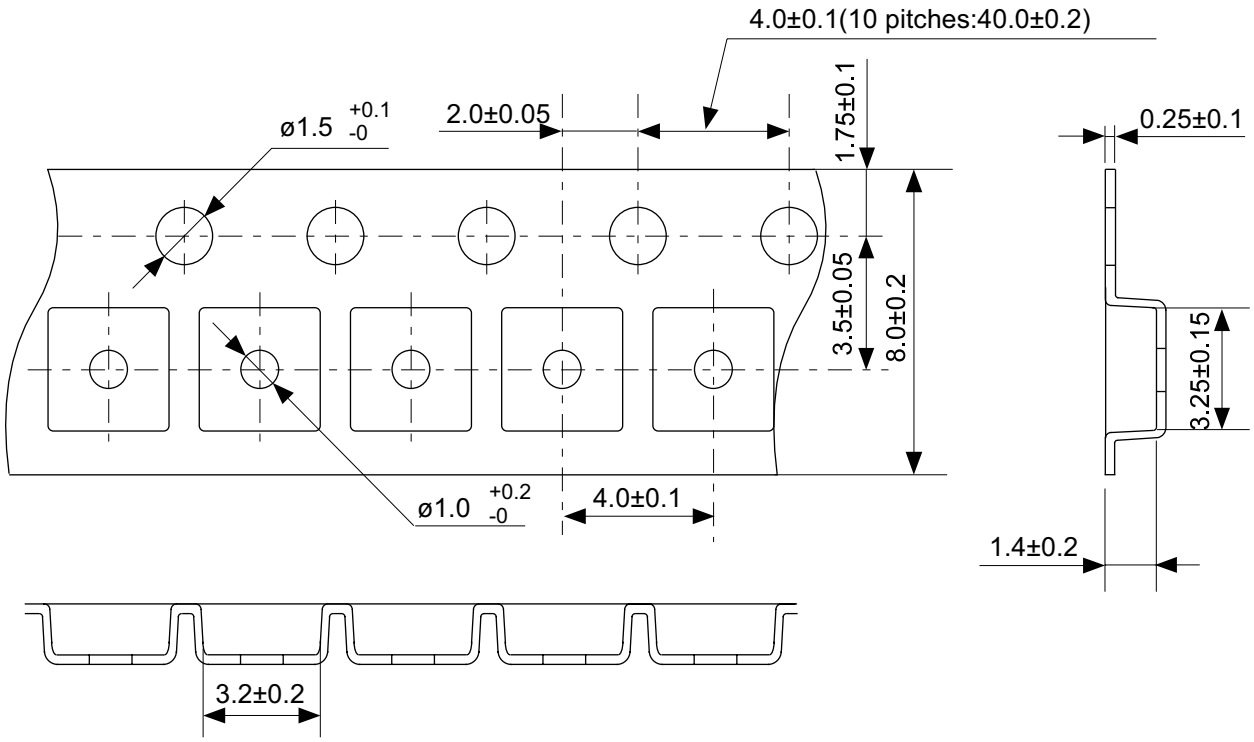
No. PG006-A-L-SD-3.0

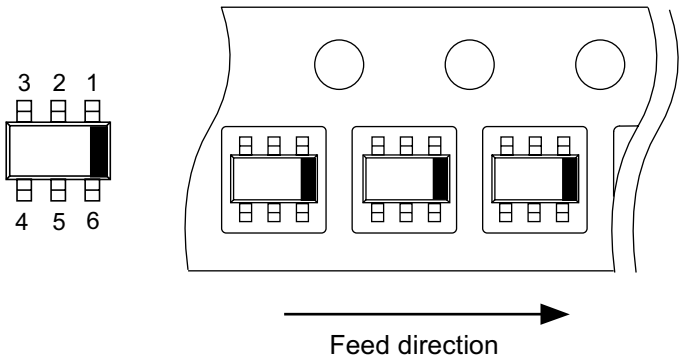
TITLE	SNT-6A-A-Land Recommendation
No.	PG006-A-L-SD-3.0
SCALE	
UNIT	mm
Seiko Instruments Inc.	



No. MP006-A-P-SD-1.1

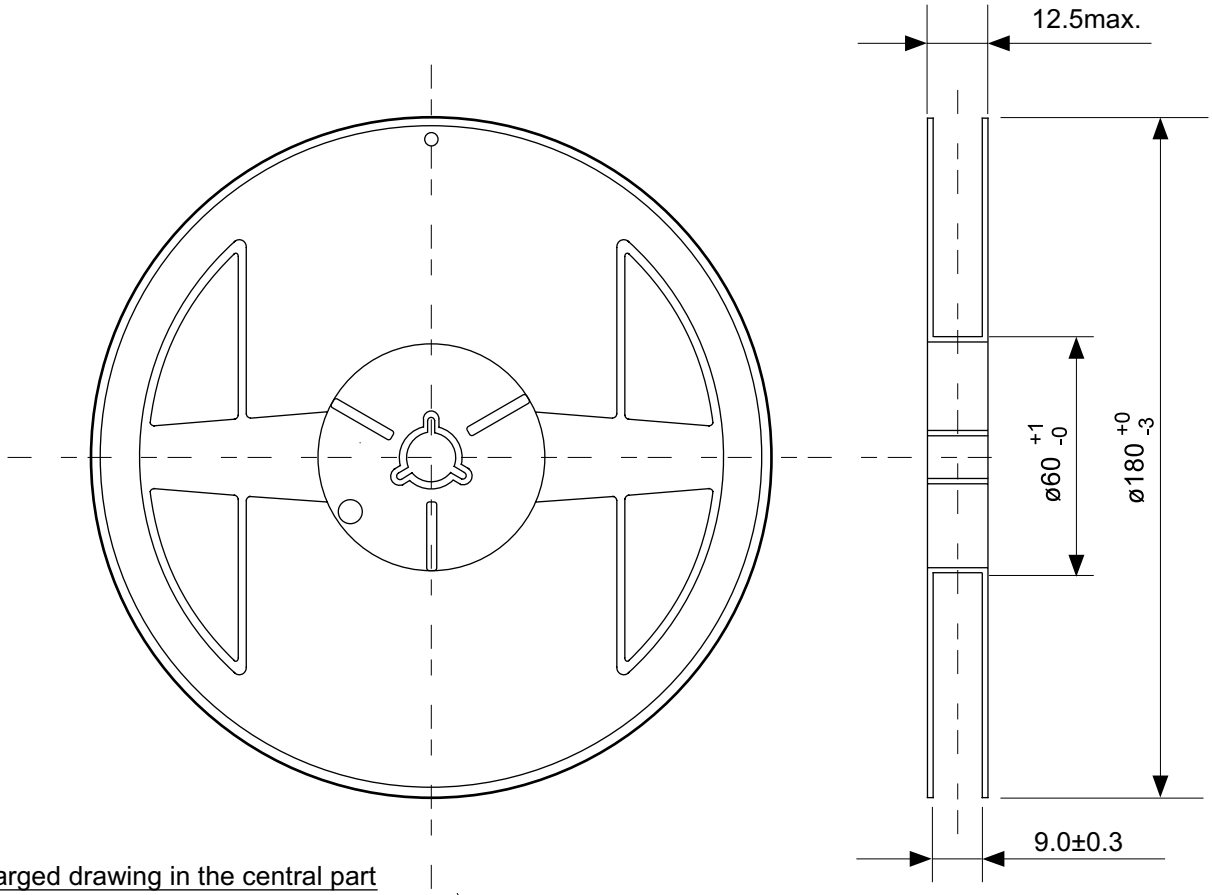
TITLE	SOT236-A-PKG Dimensions
No.	MP006-A-P-SD-1.1
SCALE	
UNIT	mm
Seiko Instruments Inc.	



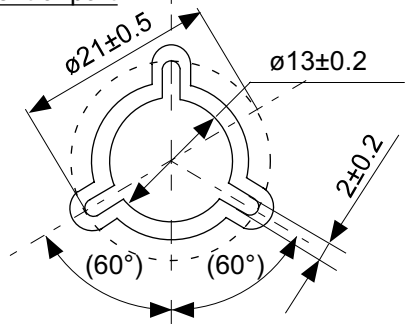


No. MP006-A-C-SD-3.1

TITLE	SOT236-A-Carrier Tape
No.	MP006-A-C-SD-3.1
SCALE	
UNIT	mm
Seiko Instruments Inc.	



Enlarged drawing in the central part



No. MP006-A-R-SD-2.1

TITLE	SOT236-A-Reel		
No.	MP006-A-R-SD-2.1		
SCALE		QTY	3,000
UNIT	mm		
Seiko Instruments Inc.			

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