LOW DROPOUT CMOS VOLTAGE REGULATOR

www.sii-ic.com

 Rev.3.0_00

The S-814 Series is a low dropout voltage, high output voltage accuracy and low current consumption positive voltage regulator developed utilizing CMOS technology.
Built-in low ON-resistance transistors provide low dropout voltage and large output current. A shutdown circuit ensures long battery life.
Various types of output capacitors can be used in the S-814 Series compared with the past CMOS voltage regulators. (i.e., Small ceramic capacitors can also be used in the S-814 Series.)
The SOT-23-5 miniaturized package and the SOT-89-5 packages are recommended to use for configuring portable devices and large output current applications, respectively.

■ Features

- Low current consumption
  At operation mode: Typ. 30 μA, Max. 40 μA
  At shutdown mode: Typ. 100 nA, Max. 500 nA
- Output voltage: 0.1 V steps between 2.0 and 6.0 V
- High accuracy output voltage: ±2.0 %
- Output current: 110 mA capable: 3.0 V output product, at V_{IN}=4 V*1
  180 mA capable: 5.0 V output product, at V_{IN}=6 V*1
- Low dropout voltage: Typ. 170 mV: 5.0 V output product, at I_{OUT}=60 mA
- Built-in shutdown circuit
- Built-in short-circuit protection
- Low ESR capacitor, e.g. a ceramic capacitor of 0.47 μF or more, can be used as the output capacitor.
- Lead-free, Sn 100%, halogen-free*2

***1.** Attention should be paid to the power dissipation of the package when the output current is large.
***2.** Refer to "■ **Product Name Structure**" for details.

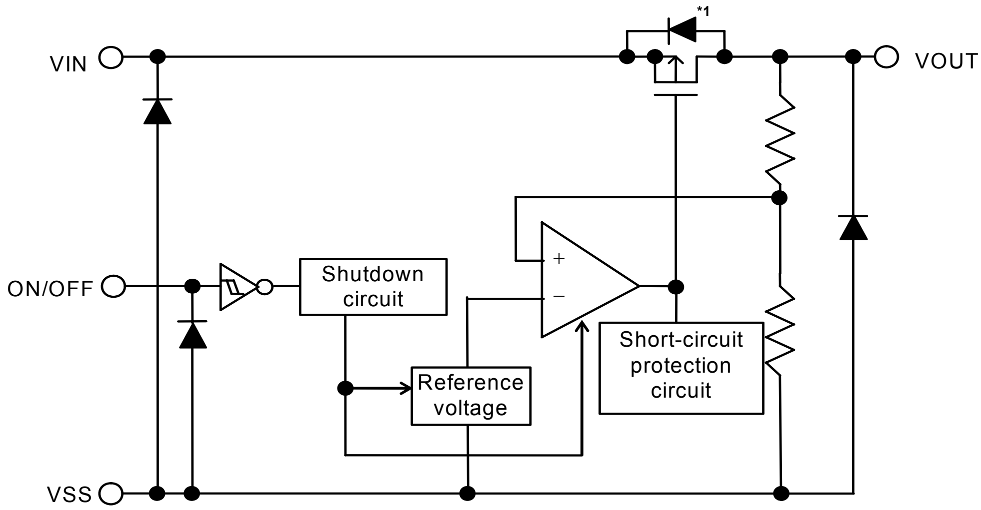
■ Applications

- Power source for battery-powered devices, personal communication devices, and home electric/electronic appliances.

■ Packages

- SOT-23-5
- SOT-89-5

■ Block Diagram



***1.** Parasitic diode

Figure 1

■ Product Name Structure

1. Product Name

S-814 x xx A xx- xxx T2 x

- x (last): Environmental code
  - U: Lead-free (Sn 100%), halogen-free
  - G: Lead-free (for details, please contact our sales office)
- T2: IC direction in tape specifications*1
- xxx: Product name (Abbreviation)*2
- xx-: Package name (Abbreviation)
  - MC: SOT-23-5
  - UC: SOT-89-5
- xx: Output voltage
  - 20 to 60
  - (e.g., When output voltage is 2.0 V, it is expressed as 20.)
- x (first): Product type*3
  - A: ON/$\overline{\text{OFF}}$ pin positive logic
  - B: $\overline{\text{ON}}$/OFF pin negative logic

***1.** Refer to the tape specifications at the end of this book.
***2.** Refer to the **Table 1** in "**3. Product Name List**".
***3.** Refer to "**3. ON/OFF pin (Shutdown pin)**" in "■ **Operation**".

2. Package

Package Name	Drawing Code		
	Package	Tape	Reel
SOT-23-5	MP005-A-P-SD	MP005-A-C-SD	MP005-A-R-SD
SOT-89-5	UP005-A-P-SD	UP005-A-C-SD	UP005-A-R-SD

3. Product Name List

Table1

Output voltage	SOT-23-5	SOT-89-5
2.0 V±2.0 %	S-814A20AMC-BCKT2x	S-814A20AUC-BCKT2x
2.1 V±2.0 %	S-814A21AMC-BCLT2x	S-814A21AUC-BCLT2x
2.2 V±2.0 %	S-814A22AMC-BCMT2x	S-814A22AUC-BCMT2x
2.3 V±2.0 %	S-814A23AMC-BCNT2x	S-814A23AUC-BCNT2x
2.4 V±2.0 %	S-814A24AMC-BCOT2x	S-814A24AUC-BCOT2x
2.5 V±2.0 %	S-814A25AMC-BCPT2x	S-814A25AUC-BCPT2x
2.6 V±2.0 %	S-814A26AMC-BCQT2x	S-814A26AUC-BCQT2x
2.7 V±2.0 %	S-814A27AMC-BCRT2x	S-814A27AUC-BCRT2x
2.8 V±2.0 %	S-814A28AMC-BCST2x	S-814A28AUC-BCST2x
2.9 V±2.0 %	S-814A29AMC-BCTT2x	S-814A29AUC-BCTT2x
3.0 V±2.0 %	S-814A30AMC-BCUT2x	S-814A30AUC-BCUT2x
3.1 V±2.0 %	S-814A31AMC-BCVT2x	S-814A31AUC-BCVT2x
3.2 V±2.0 %	S-814A32AMC-BCWT2x	S-814A32AUC-BCWT2x
3.3 V±2.0 %	S-814A33AMC-BCXT2x	S-814A33AUC-BCXT2x
3.4 V±2.0 %	S-814A34AMC-BCYT2x	S-814A34AUC-BCYT2x
3.5 V±2.0 %	S-814A35AMC-BCZT2x	S-814A35AUC-BCZT2x
3.6 V±2.0 %	S-814A36AMC-BDAT2x	S-814A36AUC-BDAT2x
3.7 V±2.0 %	S-814A37AMC-BDBT2x	S-814A37AUC-BDBT2x
3.8 V±2.0 %	S-814A38AMC-BDCT2x	S-814A38AUC-BDCT2x
3.9 V±2.0 %	S-814A39AMC-BDDT2x	S-814A39AUC-BDDT2x
4.0 V±2.0 %	S-814A40AMC-BDET2x	S-814A40AUC-BDET2x
4.1 V±2.0 %	S-814A41AMC-BDFT2x	S-814A41AUC-BDFT2x
4.2 V±2.0 %	S-814A42AMC-BDGT2x	S-814A42AUC-BDGT2x
4.3 V±2.0 %	S-814A43AMC-BDHT2x	S-814A43AUC-BDHT2x
4.4 V±2.0 %	S-814A44AMC-BDIT2x	S-814A44AUC-BDIT2x
4.5 V±2.0 %	S-814A45AMC-BDJT2x	S-814A45AUC-BDJT2x
4.6 V±2.0 %	S-814A46AMC-BDKT2x	S-814A46AUC-BDKT2x
4.7 V±2.0 %	S-814A47AMC-BDLT2x	S-814A47AUC-BDLT2x
4.8 V±2.0 %	S-814A48AMC-BDMT2x	S-814A48AUC-BDMT2x
4.9 V±2.0 %	S-814A49AMC-BDNT2x	S-814A49AUC-BDNT2x
5.0 V±2.0 %	S-814A50AMC-BDOT2x	S-814A50AUC-BDOT2x
5.1 V±2.0 %	S-814A51AMC-BDPT2x	S-814A51AUC-BDPT2x
5.2 V±2.0 %	S-814A52AMC-BDQT2x	S-814A52AUC-BDQT2x
5.3 V±2.0 %	S-814A53AMC-BDRT2x	S-814A53AUC-BDRT2x
5.4 V±2.0 %	S-814A54AMC-BDST2x	S-814A54AUC-BDST2x
5.5 V±2.0 %	S-814A55AMC-BDTT2x	S-814A55AUC-BDTT2x
5.6 V±2.0 %	S-814A56AMC-BDUT2x	S-814A56AUC-BDUT2x
5.7 V±2.0 %	S-814A57AMC-BDVT2x	S-814A57AUC-BDVT2x
5.8 V±2.0 %	S-814A58AMC-BDWT2x	S-814A58AUC-BDWT2x
5.9 V±2.0 %	S-814A59AMC-BDXT2x	S-814A59AUC-BDXT2x
6.0 V±2.0 %	S-814A60AMC-BDYT2x	S-814A60AUC-BDYT2x

Remark 1. Please contact the SII marketing department for type B products.
2. x: G or U
3. Please select products of environmental code = U for Sn 100%, halogen-free products.

■ Pin Configurations

SOT-23-5
Top view

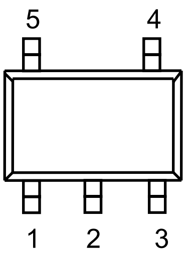


Figure 2

Table 2

Pin No.	Symbol	Pin description
1	VIN	Voltage input pin
2	VSS	GND pin
3	ON/OFF	Shutdown pin
4	NC*1	No connection
5	VOUT	Voltage output pin

***1.** The NC pin is electrically open.
The NC pin can be connected to VIN or VSS.

SOT-89-5
Top view

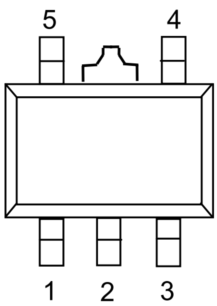


Figure 3

Table 3

Pin No.	Symbol	Pin description
1	VOUT	Voltage output pin
2	VSS	GND pin
3	NC*1	No connection
4	ON/OFF	Shutdown pin
5	VIN	Voltage input pin

***1.** The NC pin is electrically open.
The NC pin can be connected to VIN or VSS.

■ Absolute Maximum Ratings

Table 4

(Ta=25°C unless otherwise specified)

Item		Symbol	Absolute maximum rating	Unit
Input voltage		V_{IN}	V_{SS}−0.3 to V_{SS}+12	V
		$V_{ON/OFF}$	V_{SS}−0.3 to V_{SS}+12	V
Output voltage		V_{OUT}	V_{SS}−0.3 to V_{IN}+0.3	V
Power dissipation	SOT-23-5	P_D	250 (When not mounted on board)	mW
			600*1	mW
	SOT-89-5		500 (When not mounted on board)	mW
			1000*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 on 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.

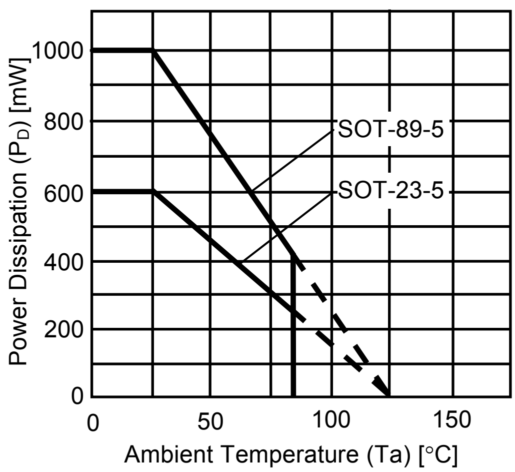


Figure 4 Power Dissipation of Package (When Mounted on Board)

■ Electrical Characteristics

Table 5

(Ta=25°C unless otherwise specified)

Item	Symbol	Conditions		Min.	Typ.	Max.	Units	Test circuit
Output voltage*1	$V_{OUT(E)}$	$V_{IN}=V_{OUT(S)}+1$ V, $I_{OUT}=30$ mA		$V_{OUT(S)}$ ×0.98	$V_{OUT(S)}$	$V_{OUT(S)}$ ×1.02	V	1
Output current*2	I_{OUT}	$V_{OUT(S)}+1$ V$\leq V_{IN}\leq$10 V	2.0 V$\leq V_{OUT(S)}\leq$2.9 V	100*3	—	—	mA	3
			3.0 V$\leq V_{OUT(S)}\leq$3.9 V	110*3	—	—	mA	3
			4.0 V$\leq V_{OUT(S)}\leq$4.9 V	135*3	—	—	mA	3
			5.0 V$\leq V_{OUT(S)}\leq$6.0 V	180*3	—	—	mA	3
Dropout voltage*4	V_{drop}	$I_{OUT}=60$ mA	2.0 V$\leq V_{OUT(S)}\leq$2.4 V	—	0.51	0.87	V	1
			2.5 V$\leq V_{OUT(S)}\leq$2.9 V	—	0.38	0.61	V	1
			3.0 V$\leq V_{OUT(S)}\leq$3.4 V	—	0.30	0.44	V	1
			3.5 V$\leq V_{OUT(S)}\leq$3.9 V	—	0.24	0.33	V	1
			4.0 V$\leq V_{OUT(S)}\leq$4.4 V	—	0.20	0.26	V	1
			4.5 V$\leq V_{OUT(S)}\leq$4.9 V	—	0.18	0.22	V	1
			5.0 V$\leq V_{OUT(S)}\leq$5.4 V	—	0.17	0.21	V	1
			5.5 V$\leq V_{OUT(S)}\leq$6.0 V	—	0.17	0.20	V	1
Line regulation 1	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}}$	$V_{OUT(S)}+0.5$ V$\leq V_{IN}\leq$10 V, $I_{OUT}=30$ mA		—	0.05	0.2	%/V	1
Line regulation 2	$\frac{\Delta V_{OUT2}}{\Delta V_{IN} \bullet V_{OUT}}$	$V_{OUT(S)}+0.5$ V$\leq V_{IN}\leq$10 V, $I_{OUT}=10$ μA		—	0.05	0.2	%/V	1
Load regulation	ΔV_{OUT3}	$V_{IN}=V_{OUT(S)}+1$ V, 10 μA$\leq I_{OUT}\leq$80 mA		—	30	50	mV	1
Output voltage temperature cofficient*5	$\frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}$	$V_{IN}=V_{OUT(S)}+1$ V, $I_{OUT}=30$ mA, −40°C≤Ta≤85°C		—	±100	—	ppm/°C	1
Current consumption during operation	I_{SS1}	$V_{IN}=V_{OUT(S)}+1$ V, ON/OFF pin=ON, No load		—	30	40	μA	2
Current consumption during shutdown	I_{SS2}	$V_{IN}=V_{OUT(S)}+1$ V, ON/OFF pin=OFF, No load		—	0.1	0.5	μA	2
Input voltage	V_{IN}	—		—	—	10	V	1
ON/OFF pin input voltage "H"	V_{SH}	$V_{IN}=V_{OUT(S)}+1$ V, $R_L=1$ kΩ, Judged at V_{OUT} level		1.5	—	—	V	4
ON/OFF pin input voltage "L"	V_{SL}	$V_{IN}=V_{OUT(S)}+1$ V, $R_L=1$ kΩ, Judged at V_{OUT} level		—	—	0.3	V	4
ON/OFF pin input current "H"	I_{SH}	$V_{IN}=V_{OUT(S)}+1$ V, $V_{ON/OFF}=7$ V		−0.1	—	0.1	μA	4
ON/OFF pin input current "L"	I_{SL}	$V_{IN}=V_{OUT(S)}+1$ V, $V_{ON/OFF}=0$ V		−0.1	—	0.1	μA	4
Short current limit	I_{OS}	$V_{IN}=V_{OUT(S)}+1$ V, VOUT pin=0 V		—	70	—	mA	3
Ripple rejection	$\lvert RR \rvert$	$V_{IN}=V_{OUT(S)}+1$ V, f=100 Hz, ΔVrip=0.5 Vrms, $I_{OUT}=30$ mA		—	45	—	dB	5

***1.** $V_{OUT(E)}$: Effective output voltage
i.e., The output voltage when fixing I_{OUT}(=30 mA) and inputting $V_{OUT(S)}$+1.0 V.
$V_{OUT(S)}$: Specified output voltage

***2.** Output amperage when output voltage goes below 95 % of $V_{OUT(E)}$ after gradually increasing output current.

***3.** The output current can be at least this value.
Use load amperage not exceeding this value.

***4.** $V_{drop}=V_{IN1}^{*1}-(V_{OUT(E)}\times 0.98)$

***1.** Input voltage at which the output voltage falls 98 % of $V_{OUT(E)}$ after gradually decreasing the input voltage.

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

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

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

■ Test Circuits

1.

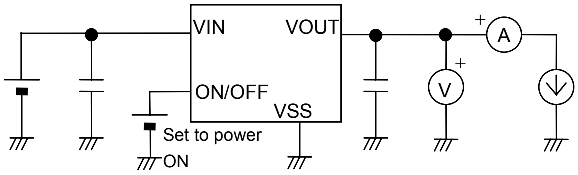


Figure 5

2.

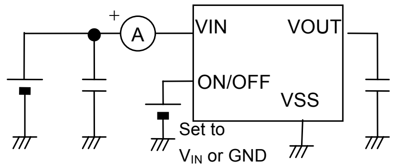


Figure 6

3.

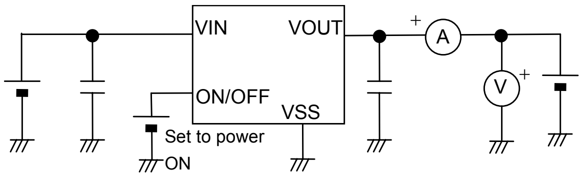


Figure 7

4.

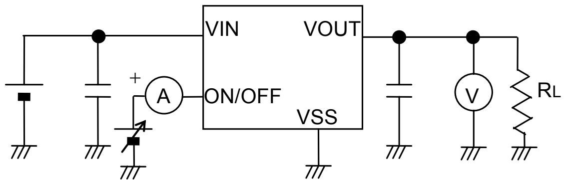


Figure 8

5.

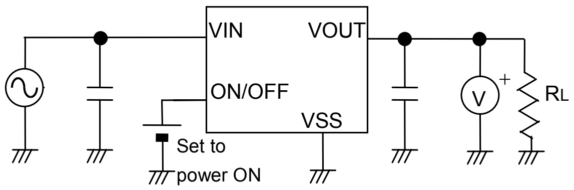
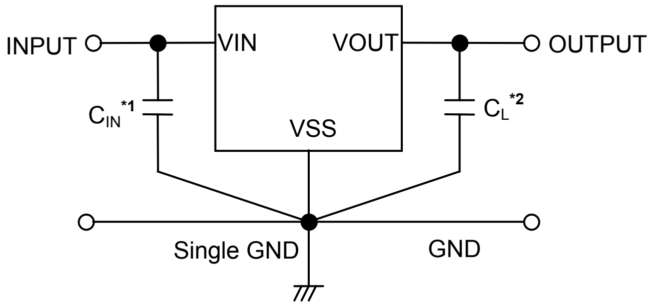


Figure 9

■ Standard Circuit



***1.** C_{IN} is a capacitor used to stabilize input.
***2.** In addition to a tantalum capacitor, a ceramic capacitor of 0.47 μF or more can be used in C_L.

Figure 10

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

■ Technical Terms

1. Low dropout voltage regulator

The low dropout voltage regulator is a voltage regulator featuring a low dropout voltage characteristic due to its internal low ON-resistance characteristic transistors.

2. Low ESR

ESR is the abbreviation for Equivalent Series Resistance. The low ESR output capacitor (C_L) can be used in the S-814 Series.

3. Output voltage (V_{OUT})

The accuracy of the output voltage is ensured at ±2.0 % under the specified conditions[*1] of input voltage, output current, and temperature, which differ depending upon the product items.

***1.** The condition differs depending upon each product.

Caution If you change the above conditions, the output voltage value may vary out of the accuracy range of the output voltage. Refer to the "■ Electrical Characteristics" and "■ Characteristics" for details.

4. Line regulation 1 (ΔV_{OUT1}) and Line regulation 2 (ΔV_{OUT2})

Indicate the input voltage dependencies of output voltage. That is, the value shows how much the output voltage changes due to a change in the input voltage with the output current remained unchanged.

5. Load regulation (ΔV_{OUT3})

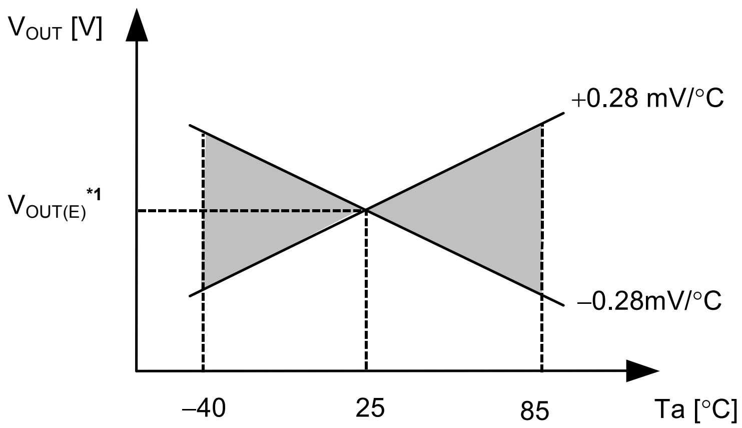
Indicates the output current dependencies of output voltage. That is, the value shows how much the output voltage changes due to a change in the output current with the input voltage remained unchanged.

6. Dropout voltage (V_{drop})

Indicates a difference between input voltage (V_{IN1}) and output voltage when output voltage falls by 98 % of $V_{OUT(E)}$ by gradually decreasing the input voltage.
$V_{drop}=V_{IN1}-(V_{OUT(E)}\times 0.98)$

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

The shadowed area in **Figure 11** is the range where V_{OUT} varies in the operating temperature range when the temperature coefficient of the output voltage is ±100 ppm/°C.



***1.** The mesurement value of output voltage at 25°C.

Figure 11 Typical example of S-814A28A

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

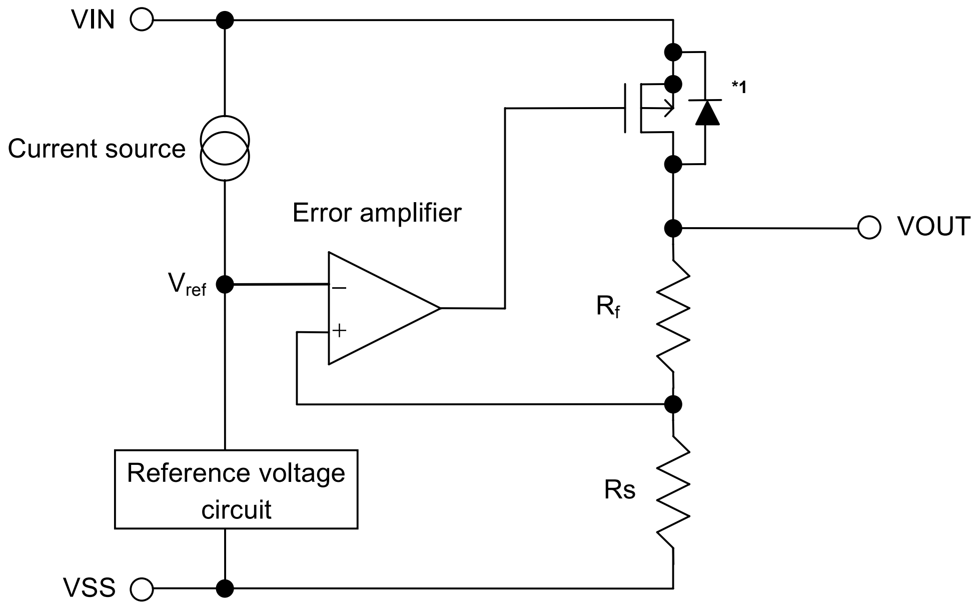
$$\frac{\Delta V_{OUT}}{\Delta Ta}\left[mV/^{\circ}C\right]^{*1} = V_{OUT(S)}\left[V\right]^{*2} \times \frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}\left[ppm/^{\circ}C\right]^{*3} \div 1000$$

***1.** The change in temperature of the dropout voltage
***2.** Specified output voltage
***3.** Output voltage temperature coefficient

■ Operation

1. Basic operation

Figure 12 shows the block diagram of the S-814 Series.
The error amplifier compares a reference voltage V_{ref} with part of the output voltage divided by the feedback resistors R_s and R_f. It supplies the output transistor with the gate voltage, necessary to ensure certain output voltage free of any fluctuations of input voltage and temperature.



***1**. Parasitic diode

Figure 12

2. Output transistor

The S-814 Series uses a low on-resistance Pch MOS FET as the output transistor.
Be sure that V_{OUT} does not exceed V_{IN}+0.3 V to prevent the voltage regulator from being broken due to inverse current flowing from VOUT pin through a parasitic diode to VIN pin.

3. **ON/OFF pin (Shutdown pin)**

This pin starts and stops the regulator.
When the shutdown pin is switched to the shutdown level, the operation of all internal circuits stops, the built-in Pch MOSFET output transistor between VIN pin and VOUT pin is shutdown, allowing current consumption to be drastically reduced. The VOUT pin enters the Vss level due to internally divided resistance of several MΩ between VOUT pin and VSS pin.
Furthermore, the structure of the ON/OFF pin is as shown in **Figure 13**. Since the ON/OFF pin is neither pulled down nor pulled up internally, do not use it in the floating state. In addition, please note that current consumption increases if a voltage of 0.3 V to V_{IN}–0.3 V is applied to the shutdown pin. When the ON/OFF pin is not used, connect it to the VIN pin in case of the product type is '"A" and to the VSS pin in case of "B".

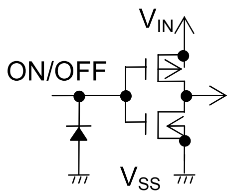


Figure 13

Table 6

Product type	ON/OFF pin	Internal circuit	VOUT pin voltage	Current consumption
A	"H": Power on	Operating	Set value	I_{SS1}
A	"L": Shutdown	Stop	V_{SS} level	I_{SS2}
B	"H": Shutdown	Stop	V_{SS} level	I_{SS2}
B	"L": Power on	Operating	Set value	I_{SS1}

4. **Short-circuit protection circuit**

The S-814 Series incorporates a short-circuit protection circuit to protect the output transistor against short-circuiting between VOUT pin and VSS pin.
The short-circuit protection circuit controls output current as shown in "**1. Output voltage vs. Output current (When load current increases)**" curve in "**■ Characteristics**", and prevents output current of approx. 70 mA or more from flowing even if VOUT pin and VSS pin are shorted. However, the short-circuit protection circuit does not protect thermal shutdown. Be sure that input voltage and load current do not exceed the specified power dissipation level.
When output current is large and a difference between input and output voltages is large even if not shorted, the short-circuit protection circuit may start functioning and the output current may be controlled to the specified amperage. For details, refer to "**3. Maximum output current vs. Input voltage**" curve in "**■ Characteristics**".

■ Selection of Output Capacitor (C_L)

Mount an output capacitor between VOUT pin and VSS pin for phase compensation. The S-814 Series enables customers to use a ceramic capacitor as well as a tantalum or an aluminum electrolytic capacitor.

- A ceramic capacitor or an OS capacitor:
  Use a capacitor of 0.47 μF or more.
- A tantalum or an aluminum electrolytic capacitor:
  Use a capacitor of 0.47 μF or more and ESR of 10 Ω or less.

Pay special attention not to cause an oscillation due to an increase in ESR at low temperatures, when you use the aluminum electrolytic capacitor. Evaluate the capacitor taking into consideration its performance including temperature characteristics.

Overshoot and undershoot characteristics differ depending upon the type of the output capacitor you select. Refer to "**C_L dependencies of overshoot**" and "**C_L dependencies of undershoot**" in "**■ Transient Response Characteristics**".

■ Precautions

- Wiring patterns for VIN pin, VOUT pin and GND pin should be designed so that the impedance is low. When mounting an output capacitor, the distance from the capacitor to the VOUT pin and the VSS pin should be as short as possible.
- Note that output voltage may increase when a series regulator is used at low load current (Less than 10 μA).
- 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 to select the series regulator.

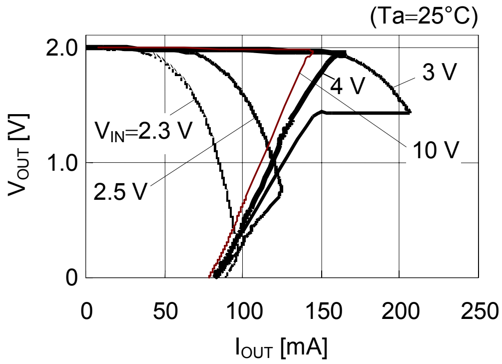
Output capacitor (C_L):	0.47 μF or more
Equivalent Series Resistance (ESR):	10 Ω or less
Input series resistance (R_{IN}):	10 Ω or less

- 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.
- The application conditions for input voltage and load current do not exceed the power dissipation level of the package.
- In determining the output current, attention should be paid to the output current value specified and footnote ***3** in **Table 5** in the "**■ Electrical Characteristics**".
- 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 by products including this IC of patents owned by a third party.

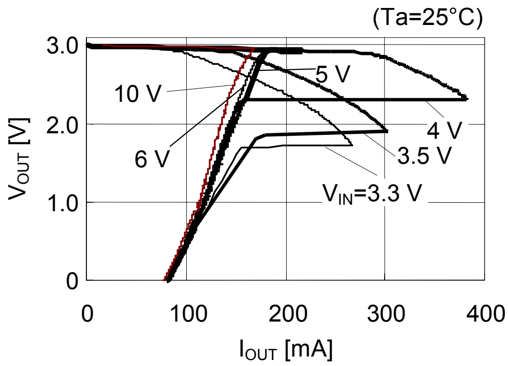
■ Characteristics (Typical data)

1. Output voltage (V_{OUT}) vs. Output current (I_{OUT}) (When load current increases)

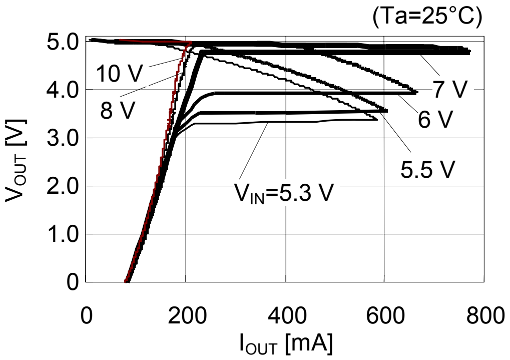
S-814A20A



S-814A30A



S-814A50A

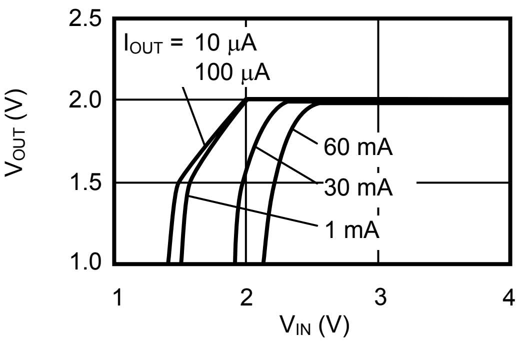


Remark In determining the output current, attention should be paid to the following.

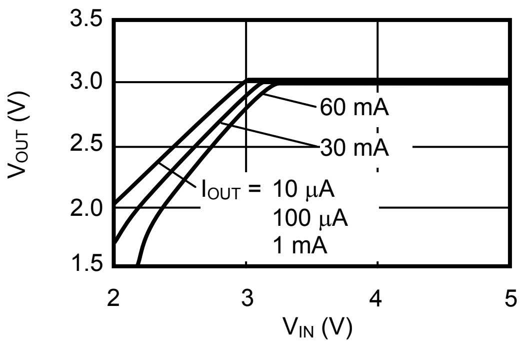
1. The minimum output current value and footnote ***3** in **Table 5** in the **"■ Electrical characteristics"**.
2. The package power dissipation.

2. Output voltage (V_{OUT}) vs. Input voltage (V_{IN})

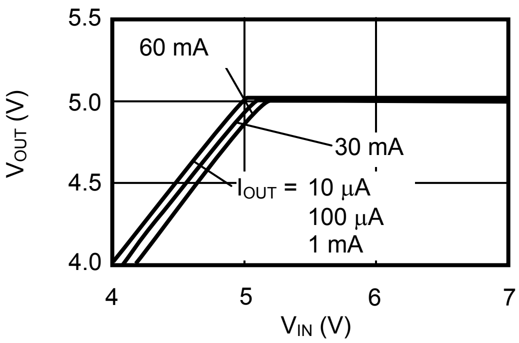
S-814A20A (Ta = 25°C)



S-814A30A (Ta = 25°C)

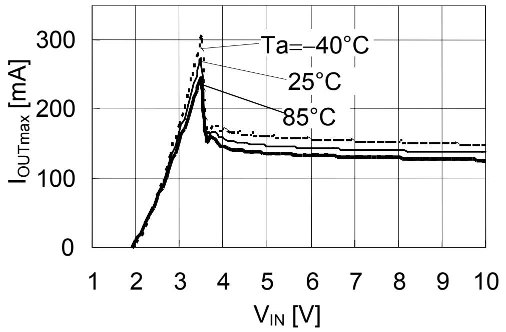


S-814A50A (Ta = 25°C)

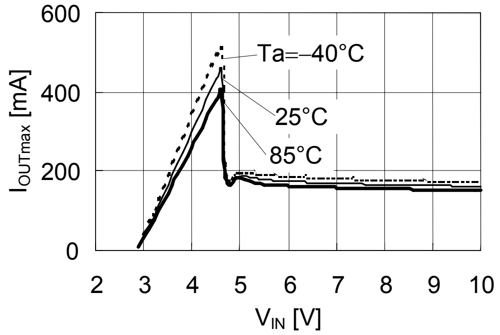


3. Maximum output current (I_{OUTmax}) vs. Input voltage (V_{IN})

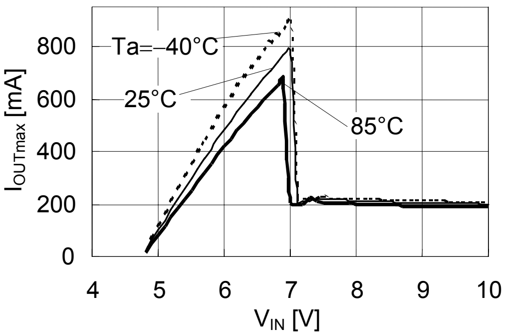
S-814A20A



S-814A30A



S-814A50A

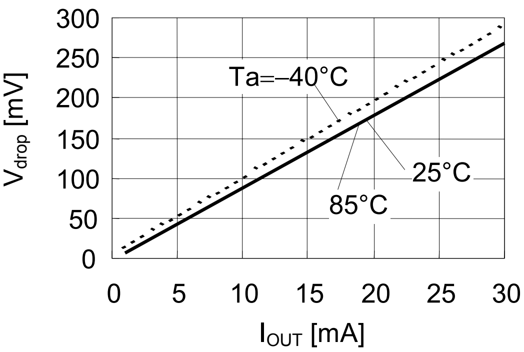


Remark In determining the output current, attention should be paid to the following.

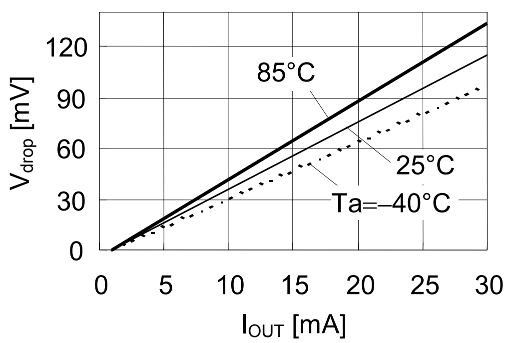
1. The minimum output current value and footnote ***3** in **Table 5** in the **"■ Electrical characteristics"**.
2. The package power dissipation.

4. Dropout voltage (V_{drop}) vs. Output current (I_{OUT})

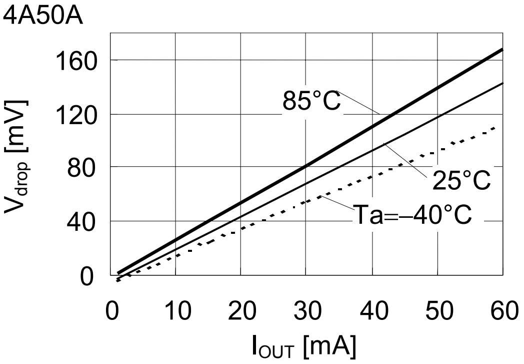
S-814A20A



S-814A30A

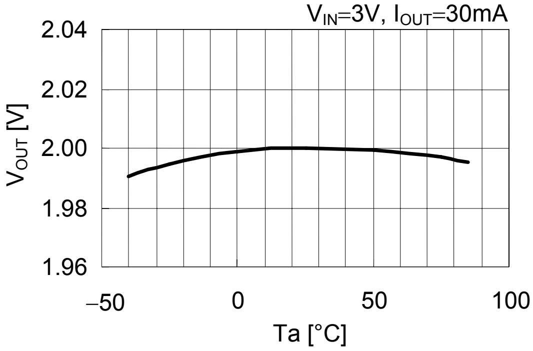


S-814A50A

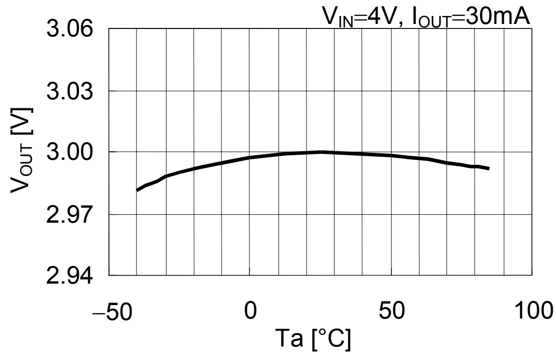


5. Output voltage (V_{OUT}) vs. Ambient temperature (Ta)

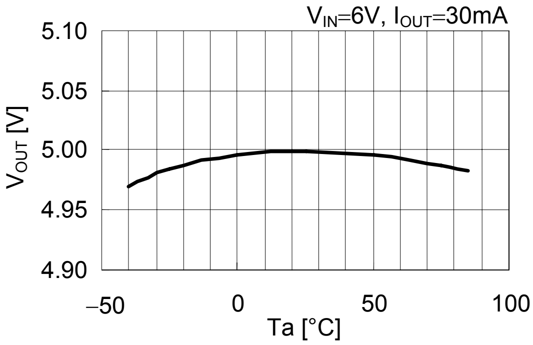
S-814A20A



S-814A30A

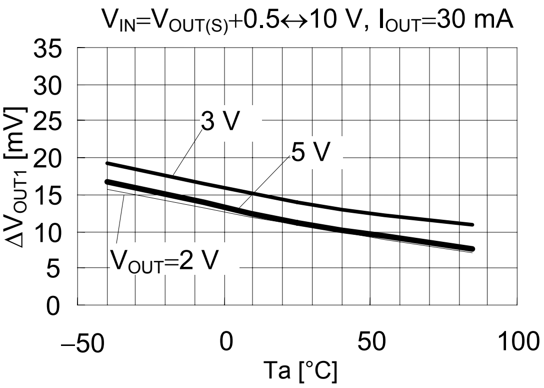


S-814A50A



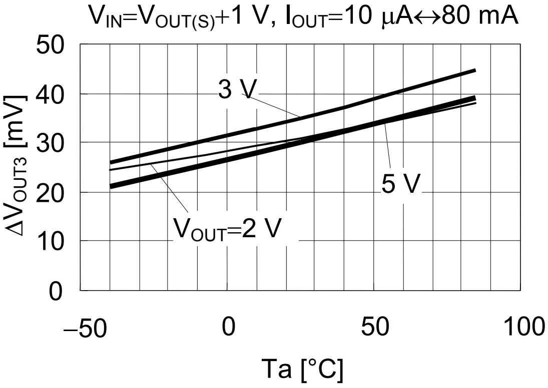
6. Line regulation (ΔV_{OUT1}) vs. Ambient temperature (Ta)

S-814A20A/S-814A30A/S-814A50A



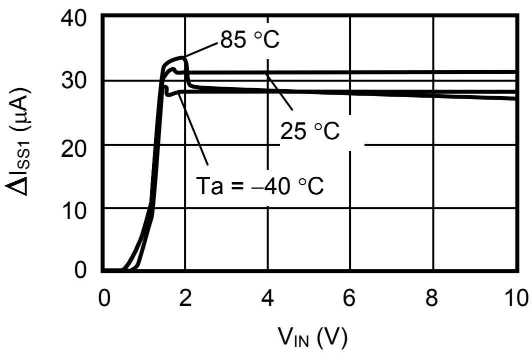
7. Load regulation (ΔV_{OUT3}) vs. Ambient temperature (Ta)

S-814A20A/S-814A30A/S-814A50A

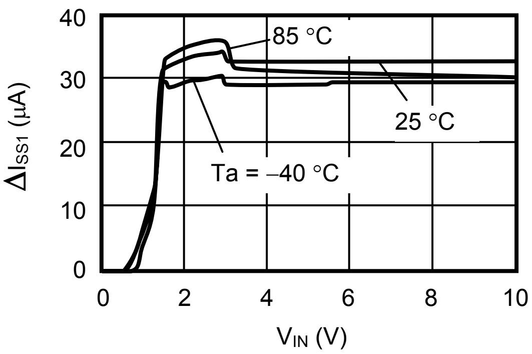


8. Current consumption (ΔI_{SS1}) vs. Input voltage (V_{IN})

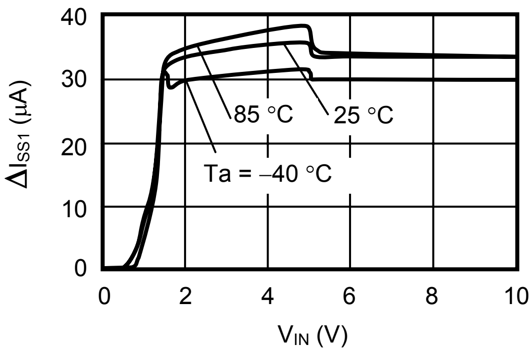
S-814A20A



S-814A30A

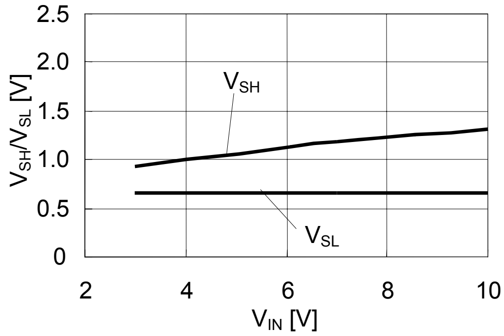


S-814A50A

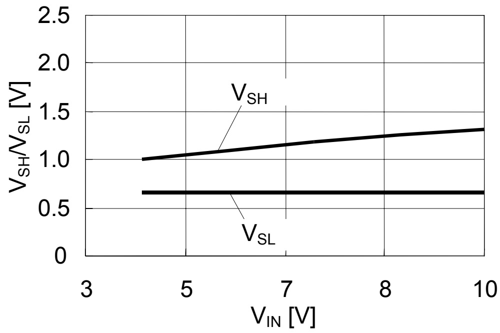


9. Threshold voltage of shutdown pin (V_{SH}/V_{SL}) vs. Input voltage (V_{IN})

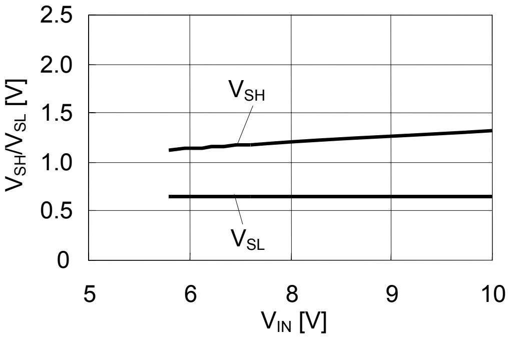
S-814A20A



S-814A30A

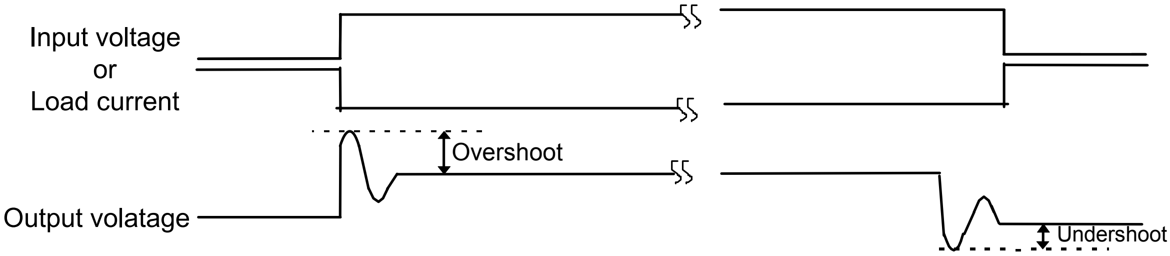


S-814A50A



■ Reference Data

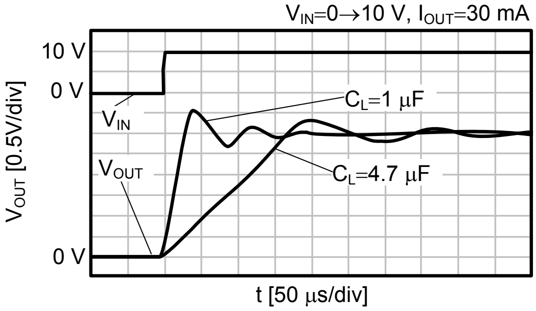
1. Transient Response Characteristics (S-814A30A, Typical data, Ta=25°C)



1-1. At power on

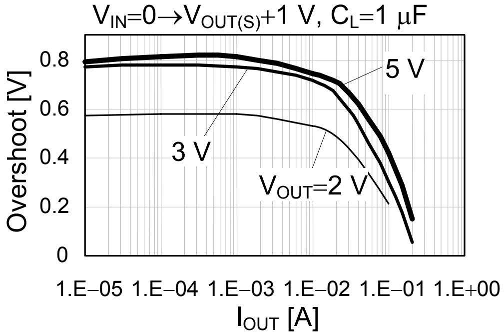
Output voltage (V_{OUT}) – Time (t)

V_{IN}=0→10 V, I_{OUT}=30 mA



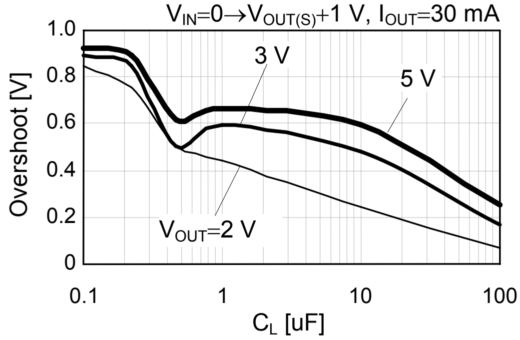
Load dependencies of overshoot

V_{IN}=0→$V_{OUT(S)}$+1 V, C_L=1 µF



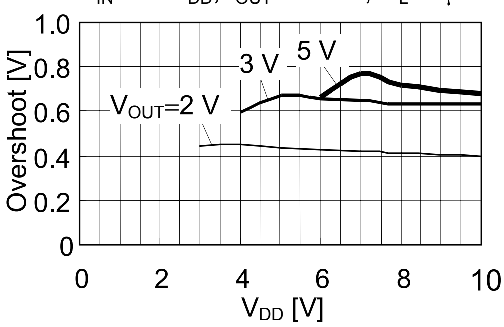
C_L dependencies of overshoot

V_{IN}=0→$V_{OUT(S)}$+1 V, I_{OUT}=30 mA



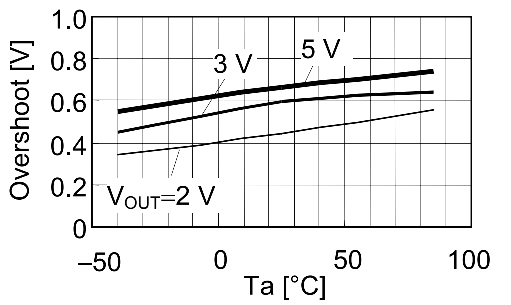
V_{DD} dependencies of overshoot

V_{IN}=0→V_{DD}, I_{OUT}=30 mA, C_L=1 µF



Temperature dependencies of overshoot

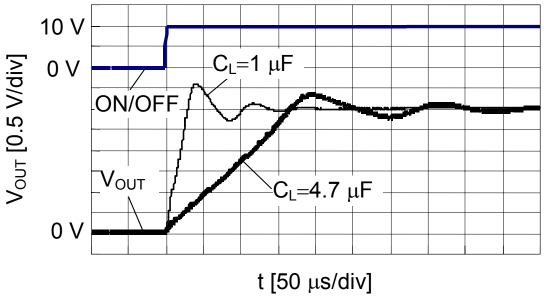
V_{IN}=0→$V_{OUT(S)}$+1 V, I_{OUT}=30 mA, C_L=1 µF



1-2. At power on/off control

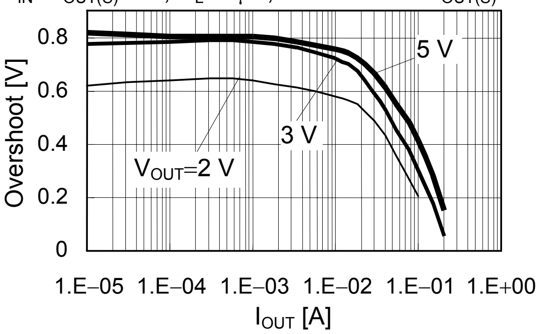
Output voltage (V_{OUT}) – Time (t)

V_{IN}=10 V, ON/OFF=0→10 V, I_{OUT}=30 mA



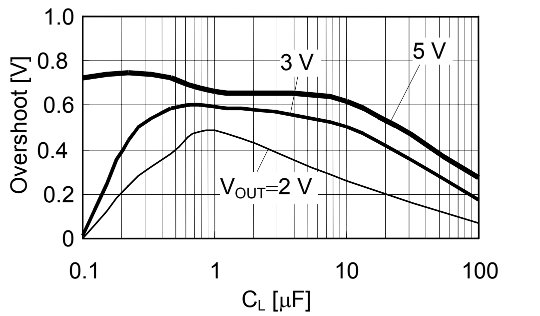
Load dependencies of overshoot

V_{IN}=$V_{OUT(S)}$+1 V, C_L=1 μF, ON/OFF=0→$V_{OUT(S)}$+1 V



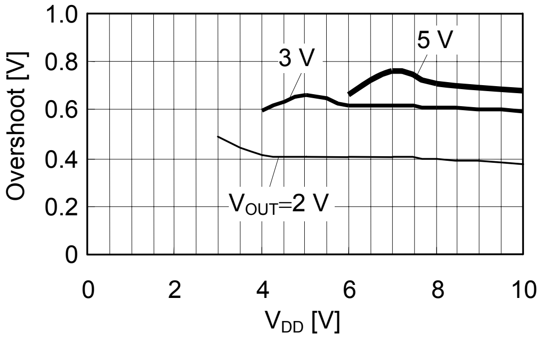
C_L dependencies of overshoot

V_{IN}=$V_{OUT(S)}$+1 V, I_{OUT}=30 mA, ON/OFF=0→$V_{OUT(S)}$+1V



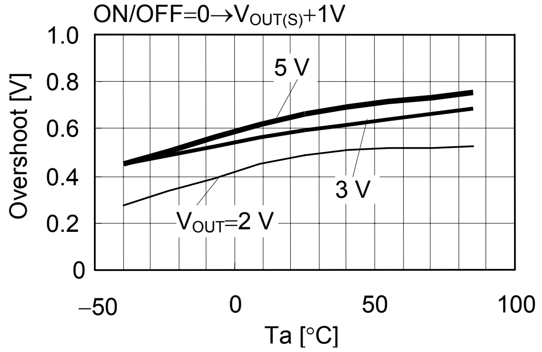
V_{DD} dependencies of overshoot

V_{IN}=V_{DD}, I_{OUT}=30 mA, C_L=1 μF, ON/OFF=0→V_{DD}



Temperature dependencies of overshoot

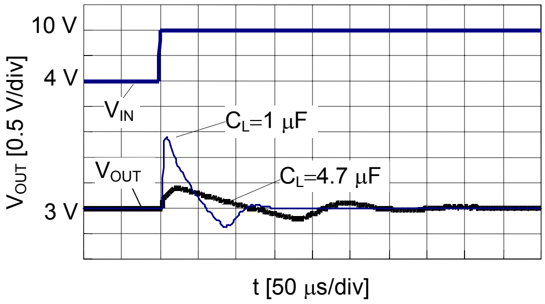
V_{IN}=$V_{OUT(S)}$+1 V, I_{OUT}=30 mA, C_L=1 μF, ON/OFF=0→$V_{OUT(S)}$+1V



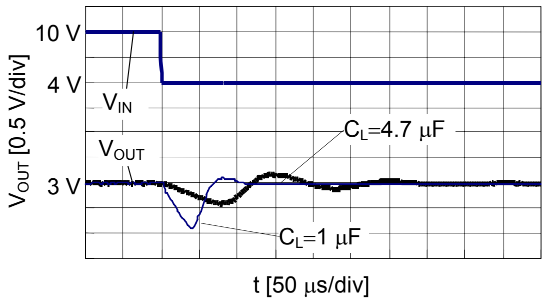
1-3. At power fluctuation

Output voltage (V_{OUT}) – Time (t)

V_{IN}=4.0→10 V, I_{OUT}=30 mA

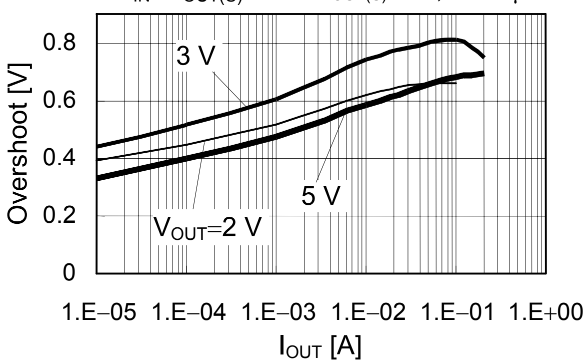


V_{IN}=10→4.0 V, I_{OUT}=30 mA



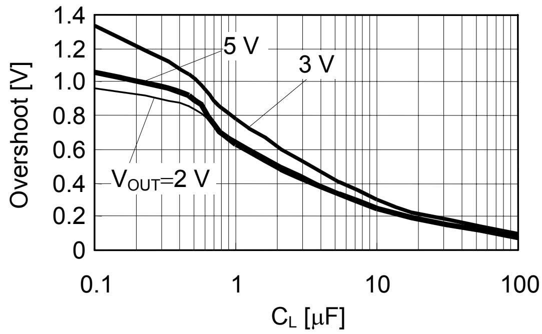
Load dependencies of overshoot

$V_{IN}=V_{OUT(S)}$+1 V→$V_{OUT(S)}$+2 V, C_L=1 μF



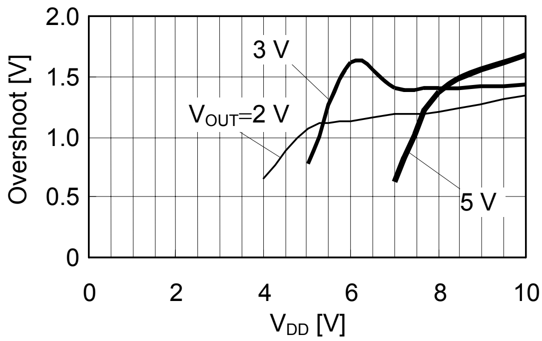
C_L dependencies of overshoot

$V_{IN}=V_{OUT(S)}$+1 V→$V_{OUT(S)}$+2 V, I_{OUT}=30 mA



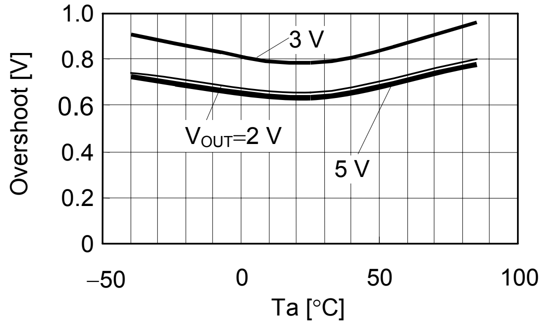
V_{DD} dependencies of overshoot

$V_{IN}=V_{OUT(S)}$+1 V→V_{DD}, I_{OUT}=30 mA, C_L=1 μF



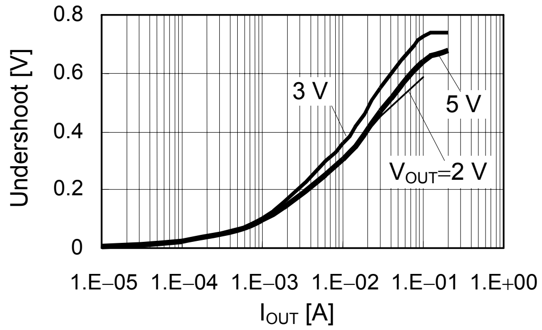
Temperature dependencies of overshoot

$V_{IN}=V_{OUT(S)}$+1 V→$V_{OUT(S)}$+2 V, I_{OUT}=30 mA, C_L=1 μF



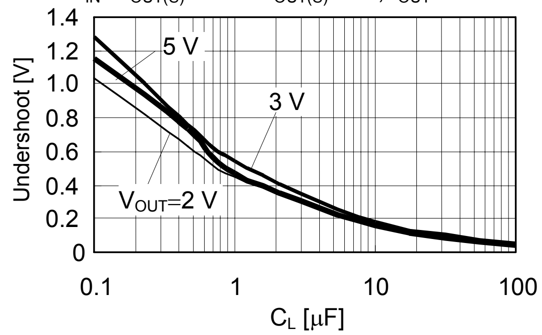
Load dependencies of undershoot

$V_{IN}=V_{OUT(S)}$+2 V→$V_{OUT(S)}$+1 V, C_L=1 μF



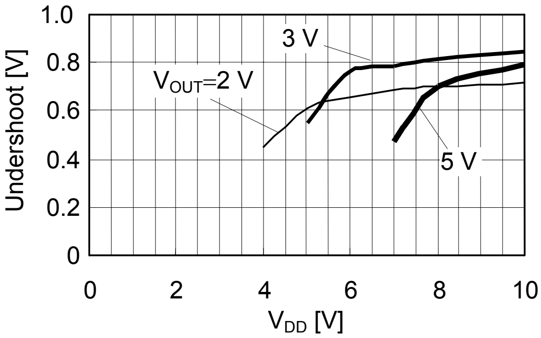
C_L dependencies of undershoot

$V_{IN}=V_{OUT(S)}$+2 V→$V_{OUT(S)}$+1 V, I_{OUT}=30 mA



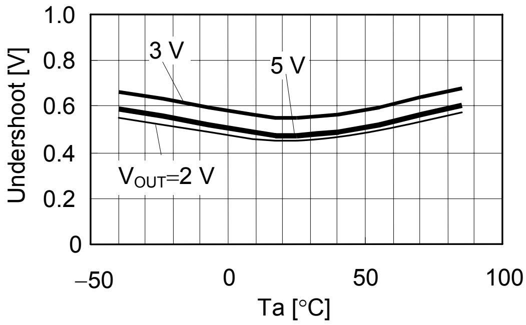
V_{DD} dependencies of undershoot

$V_{IN}=V_{DD}\rightarrow V_{OUT(S)}+1$ V, $I_{OUT}=30$ mA, $C_L=1$ μF



Temperature dependencies of undershoot

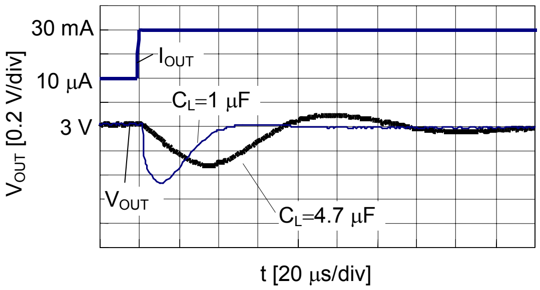
$V_{IN}=V_{OUT(S)}+2$ V$\rightarrow V_{OUT(S)}+1$ V, $I_{OUT}=30$ mA, $C_L=1$ μF



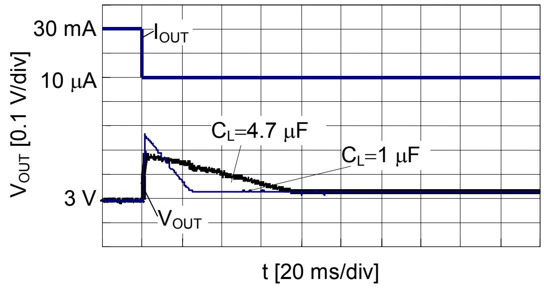
1-4. At load fluctuation

Output voltage (V_{OUT}) – Time (t)

I_{OUT}=10 µA→30 mA, V_{IN}=4 V

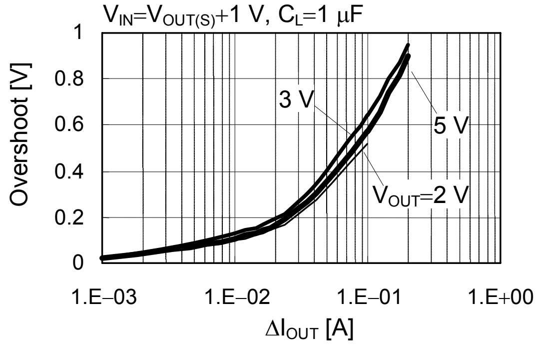


I_{OUT}=30 mA→10 µA, V_{IN}=4 V



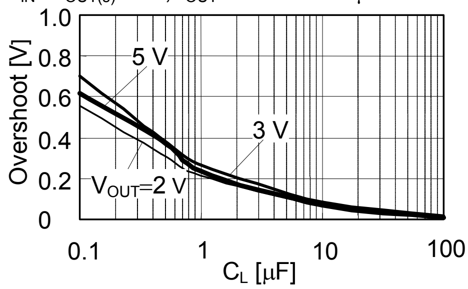
Load current dependencies of overshoot

$V_{IN}=V_{OUT(S)}$+1 V, C_L=1 µF



C_L dependencies of overshoot

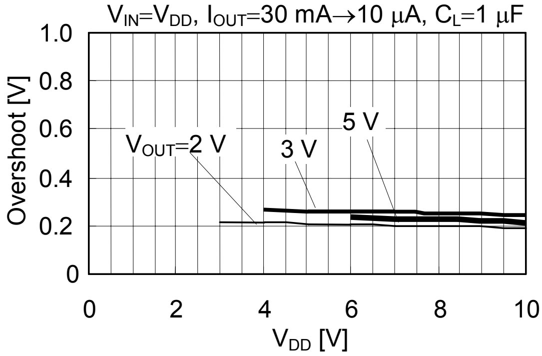
$V_{IN}=V_{OUT(s)}$+1 V, I_{OUT}=30 mA→10 µA



Remark ΔI_{OUT} shows larger load current at load current fluctuation. Smaller current at load current fluctuation is fixed to 10 µA.
i.e. ΔI_{OUT}=1.E–02 [A] means load current fluctuation from 10 mA to 10 µA.

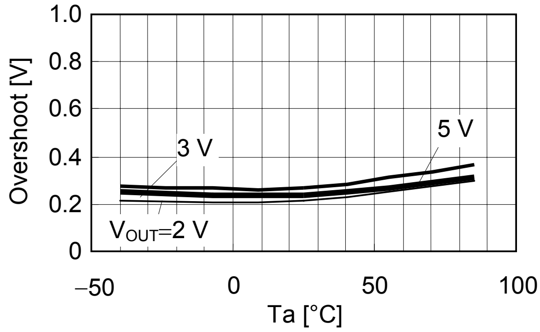
V_{DD} dependencies of overshoot

$V_{IN}=V_{DD}$, I_{OUT}=30 mA→10 µA, C_L=1 µF

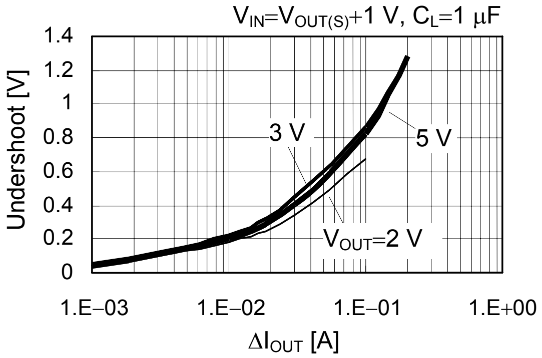


Temperature dependencies of overshoot

$V_{IN}=V_{OUT(S)}$+1 V, I_{OUT}=30 mA→10 µA, C_L=1 µF

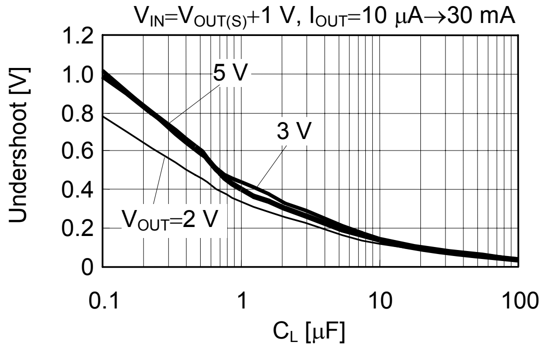


Load current dependencies of undershoot

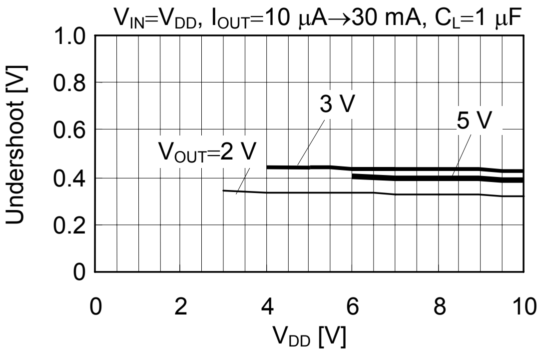


Remark ΔI_{OUT} shows larger load current at load current fluctuation. Lower current at load current fluctuation is fixed to 10 μA.
i.e. ΔI_{OUT}=1.E−02 [A] means load current fluctuation from 10 μA to 10 mA.

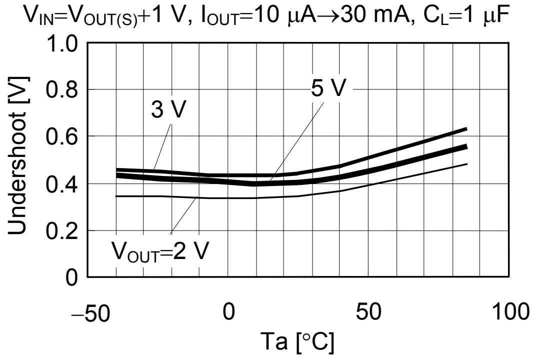
C_L dependence of undershoot

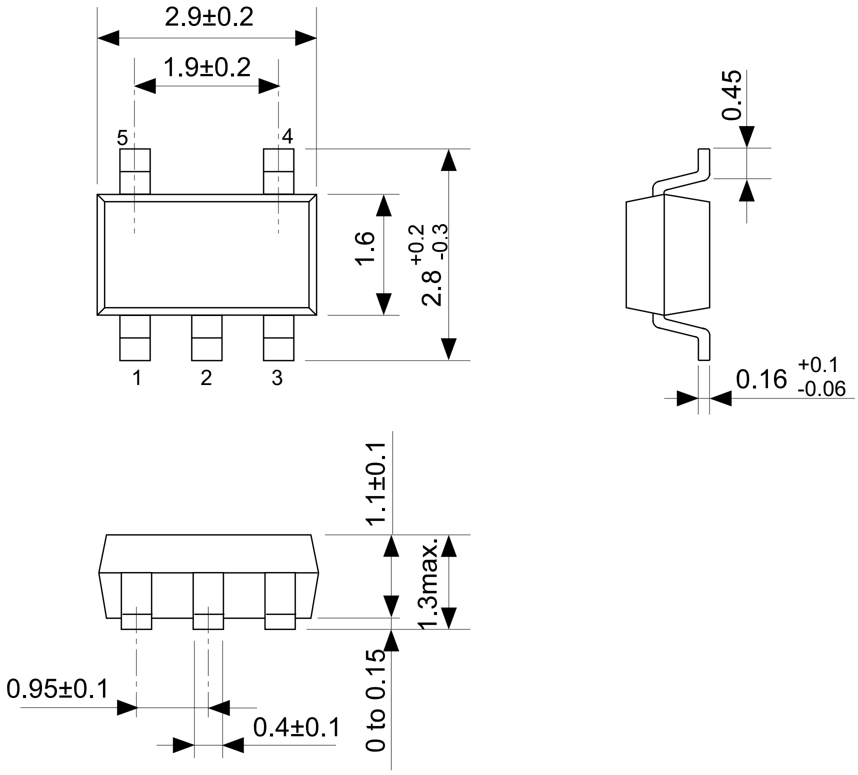


V_{DD} dependencies of undershoot



Temperature dependencies of undershoot

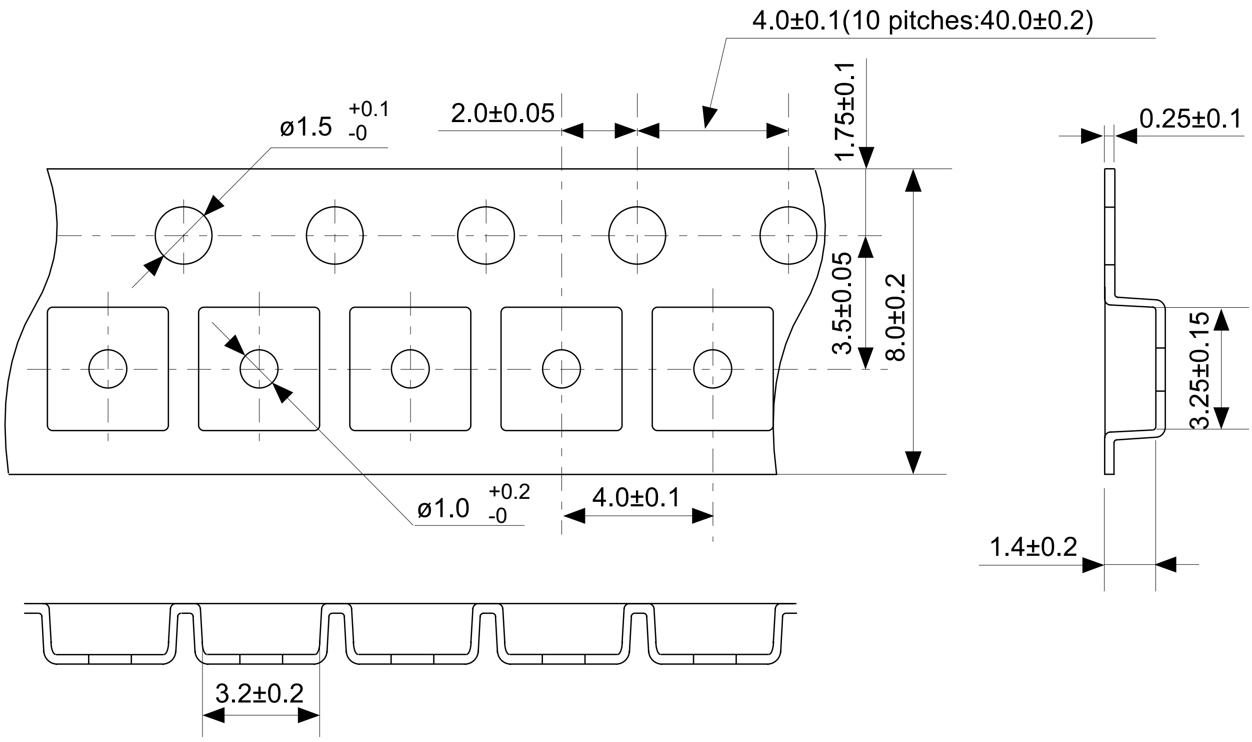


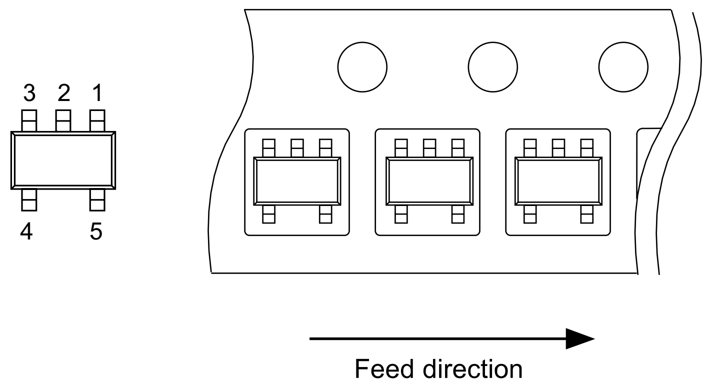


No. MP005-A-P-SD-1.2

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

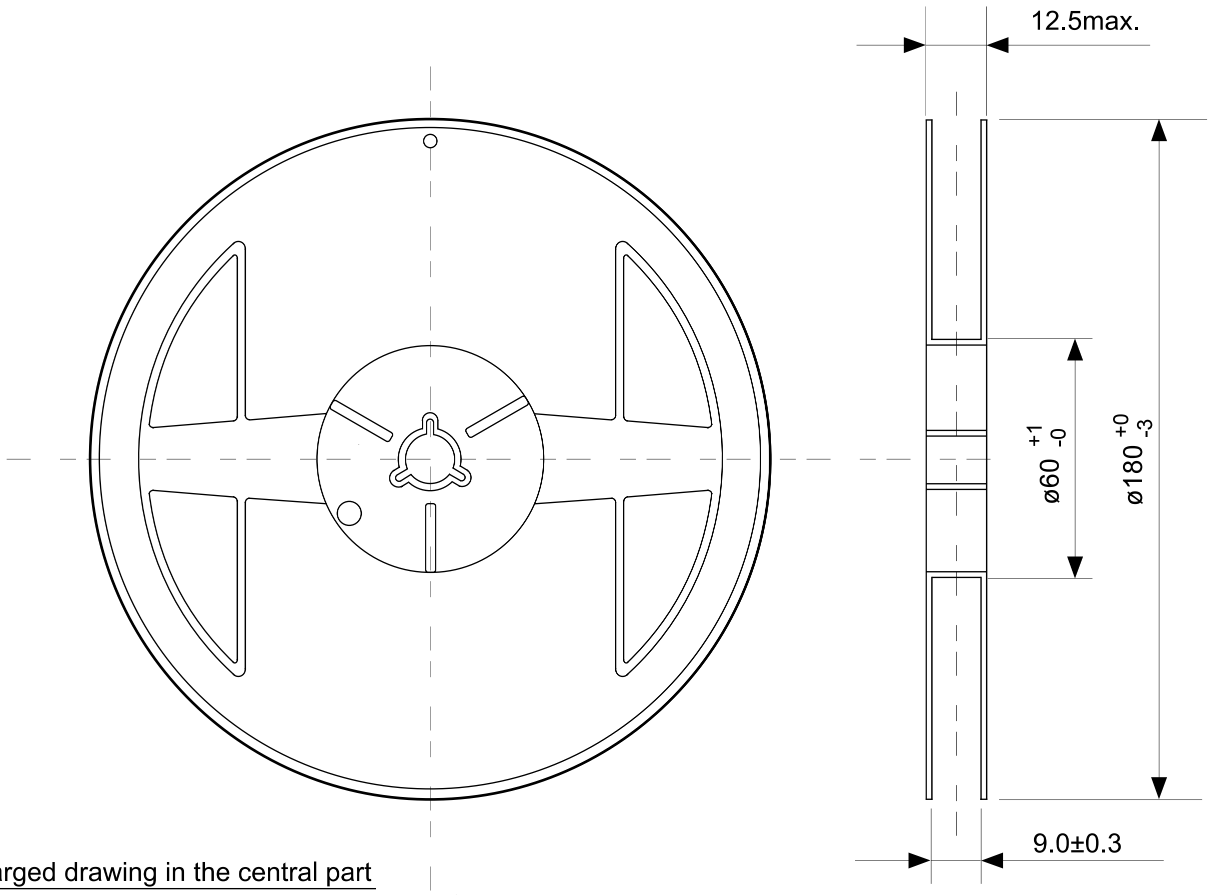
Seiko Instruments Inc.



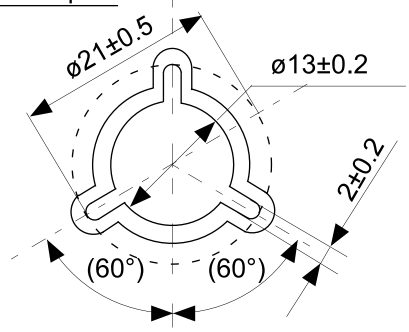


No. MP005-A-C-SD-2.1

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

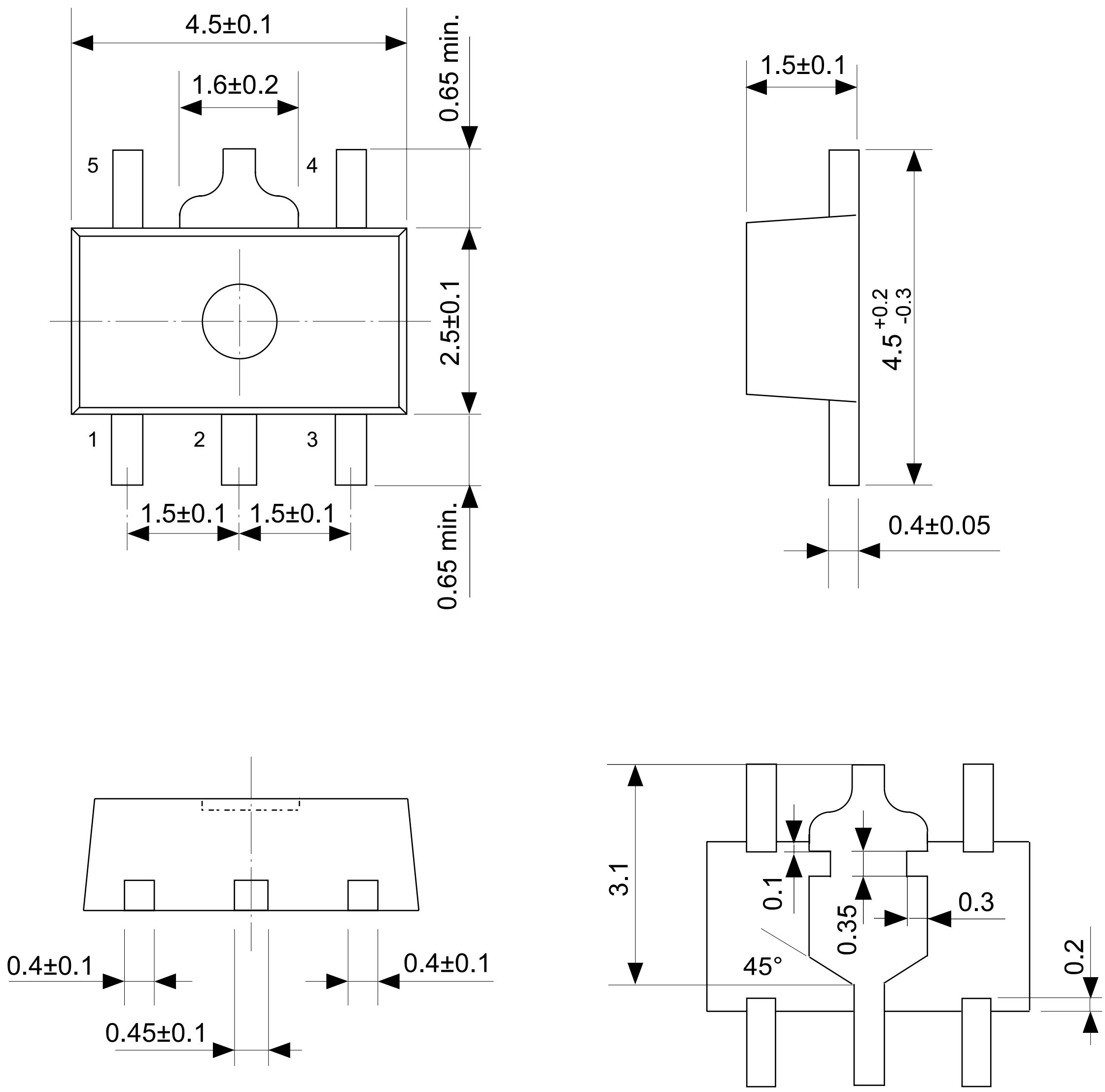


Enlarged drawing in the central part



No. MP005-A-R-SD-1.1

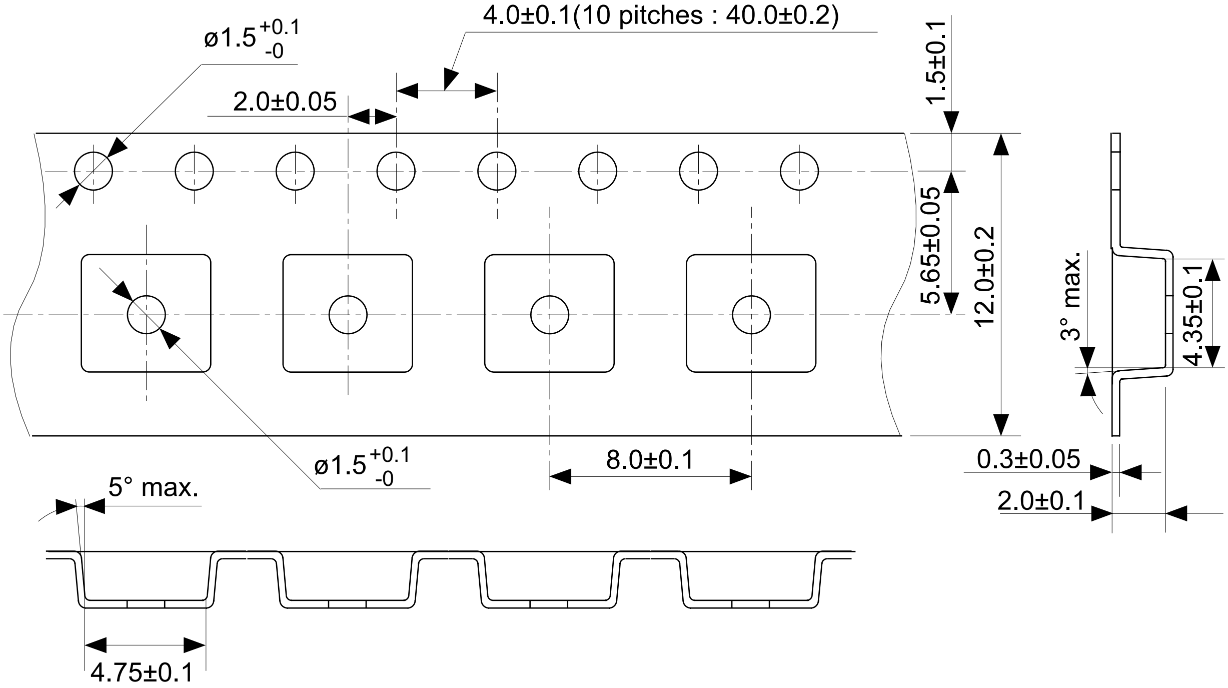
TITLE	SOT235-A-Reel		
No.	MP005-A-R-SD-1.1		
SCALE		QTY.	3,000
UNIT	mm		
Seiko Instruments Inc.			

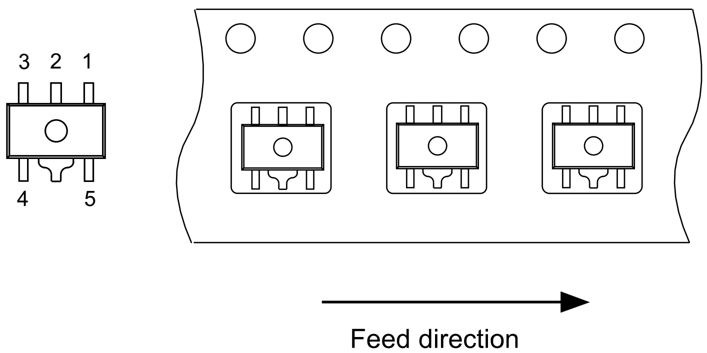


No. UP005-A-P-SD-1.1

TITLE	SOT895-A-PKG Dimensions
No.	UP005-A-P-SD-1.1
SCALE	
UNIT	mm

Seiko Instruments Inc.

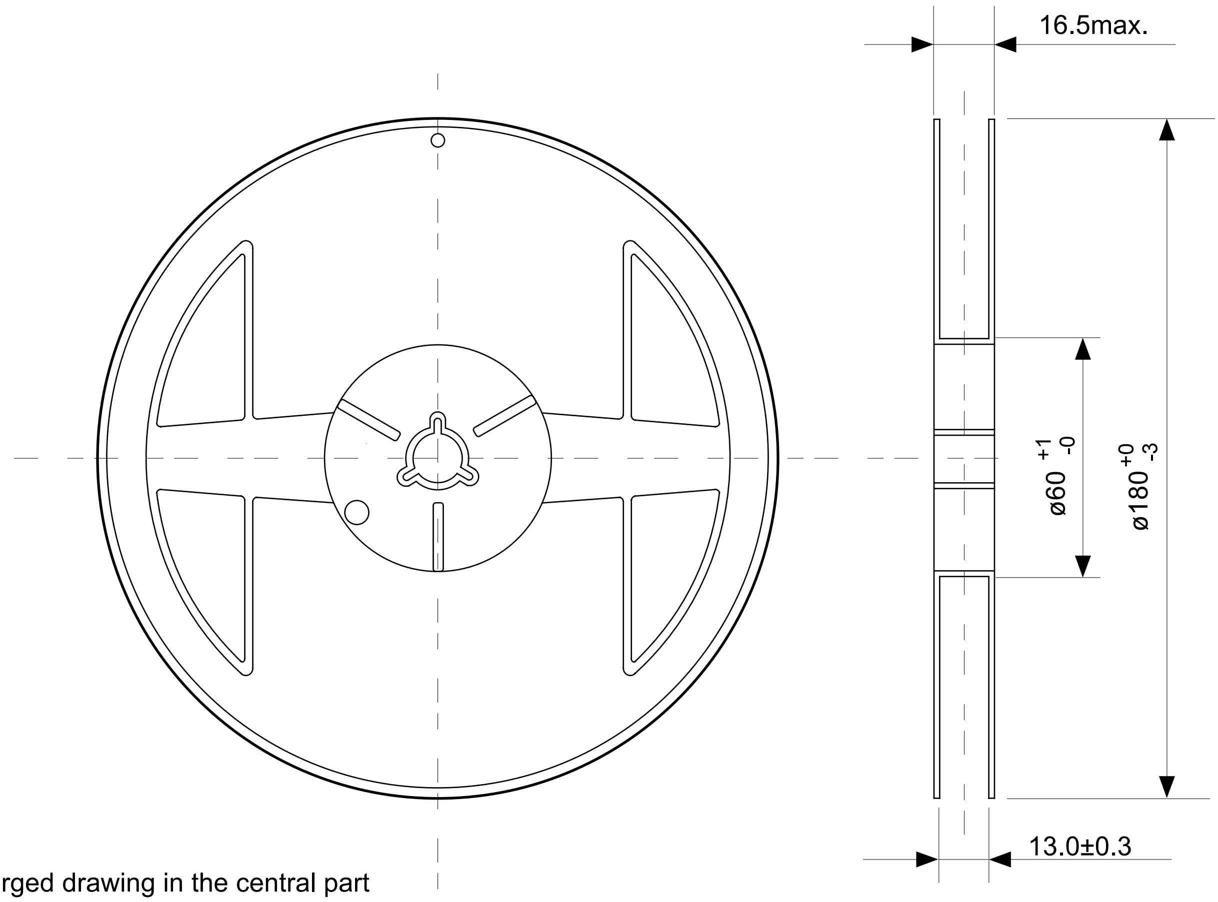




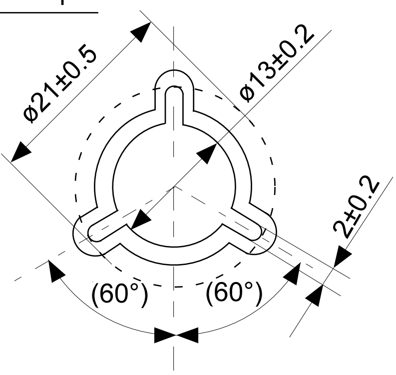
No. UP005-A-C-SD-1.1

TITLE	SOT895-A-Carrier Tape
No.	UP005-A-C-SD-1.1
SCALE	
UNIT	mm

Seiko Instruments Inc.



Enlarged drawing in the central part



No. UP005-A-R-SD-1.1

TITLE	SOT895-A-Reel		
No.	UP005-A-R-SD-1.1		
SCALE		QTY.	1,000
UNIT	mm		
Seiko Instruments Inc.			

Seiko Instruments Inc.
www.sii-ic.com