# HIGH RIPPLE-REJECTION LOW DROPOUT CMOS VOLTAGE REGULATOR

# S-1111/1121 Series

The S-1111/1121 Series is a positive voltage regulator with a low dropout voltage, high output voltage accuracy, and low current consumption developed based on CMOS technology.
A built-in low on-resistance transistor provides a low dropout voltage and large output current, and a built-in overcurrent protector prevents the load current from exceeding the current capacitance of the output transistor. An ON/OFF circuit ensures a long battery life, and small SOT-23-5 and 5-Pin SON(A) packages realize high-density mounting. The lineup includes the S-1111 and S-1121 Series, which differ in pin configuration.

## ■ Features

- Output voltage: 1.5 V to 5.5 V, selectable in 0.1 V steps.
- High-accuracy output voltage: ±1.0%
- Low dropout voltage: 200 mV typ. (3.0 V output product, $I_{OUT}$ = 100 mA)
- Low current consumption: During operation: 35 μA typ., 65 μA max.
  During shutdown: 0.1 μA typ., 1.0 μA max.
- High peak current capability: 150 mA output is possible (@ $V_{IN} \geq V_{OUT(S)} + 1.0$ V)*1
- Built-in ON/OFF circuit: Ensures long battery life.
- High ripple rejection: 70 dB typ. (@ 1.0 kHz)
- Built-in overcurrent protector: Overcurrent of output transistor can be restricted.
- Small package: SOT-23-5, 5-Pin SON(A)

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

## ■ Applications

- Power supply for battery-powered devices
- Power supply for personal communication devices
- Power supply for home electric/electronic appliances
- Power supply for cellular phones

## ■ Packages

- SOT-23-5 (Package drawing code: MP005-A)
- 5-Pin SON(A) (Package drawing code: PN005-A)

■ Block Diagram

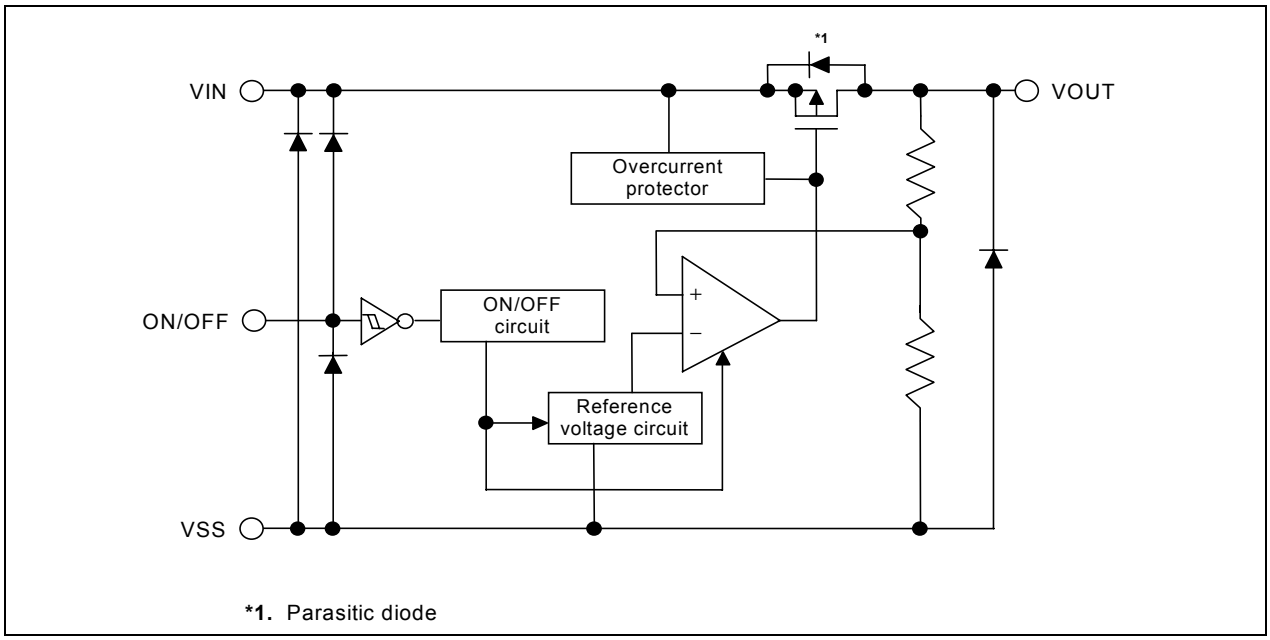
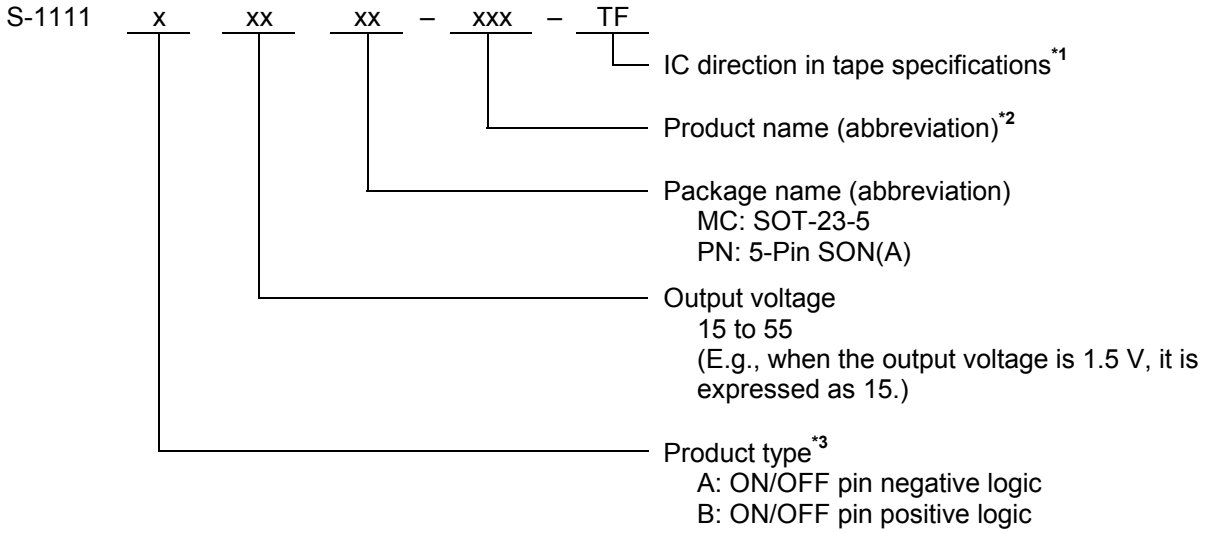



Figure 1

## ■ Selection Guide

- The product types and output voltage for the S-1111/1121 Series can be selected at the user's request. Refer to the "Product name selection guide" for the meanings of the characters in the product name and "Product name list" for the full product names.

1. Product name selection guide (S-1111 Series)




***1.** Refer to the taping specifications at the end of this book.
***2.** Refer to the product name list.
***3.** Refer to 3. Shutdown (ON/OFF pin) under the Operation.

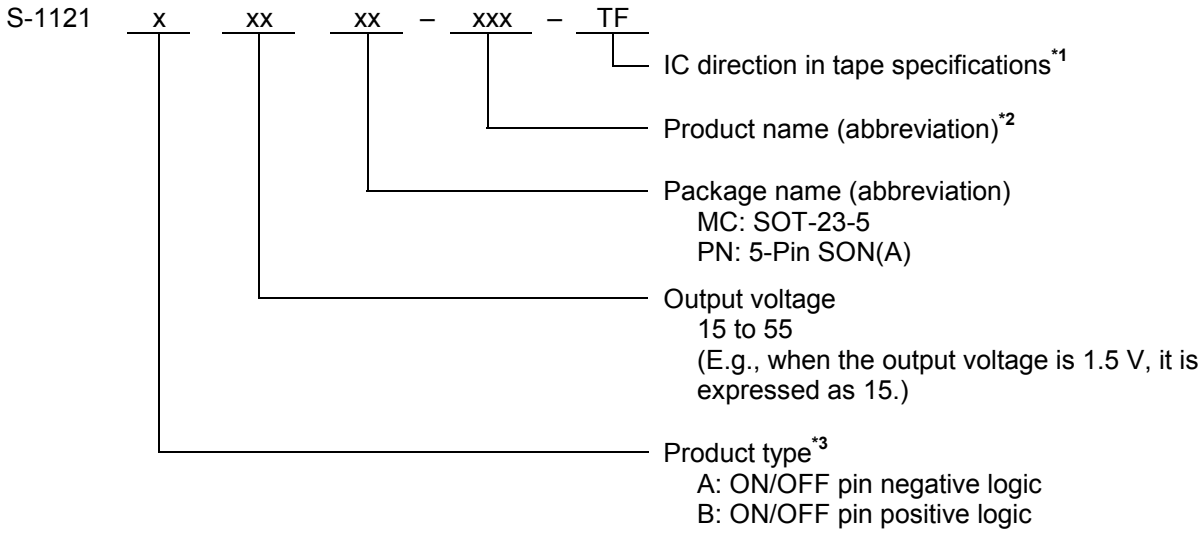
2. Product name list (S-1111 Series)

Table 1

| Output Voltage | SOT-23-5 | 5-Pin SON(A) |
|---|---|---|
| 1.5 V ±1.0% | S-1111B15MC-NYA-TF | S-1111B15PN-NYA-TF |
| 1.8 V ±1.0% | S-1111B18MC-NYD-TF | S-1111B18PN-NYD-TF |
| 2.5 V ±1.0% | S-1111B25MC-NYK-TF | S-1111B25PN-NYK-TF |
| 2.6 V ±1.0% | S-1111B26MC-NYL-TF | S-1111B26PN-NYL-TF |
| 2.7 V ±1.0% | S-1111B27MC-NYM-TF | S-1111B27PN-NYM-TF |
| 2.8 V ±1.0% | S-1111B28MC-NYN-TF | S-1111B28PN-NYN-TF |
| 2.9 V ±1.0% | S-1111B29MC-NYO-TF | S-1111B29PN-NYO-TF |
| 3.0 V ±1.0% | S-1111B30MC-NYP-TF | S-1111B30PN-NYP-TF |
| 3.1 V ±1.0% | S-1111B31MC-NYQ-TF | S-1111B31PN-NYQ-TF |
| 3.3 V ±1.0% | S-1111B33MC-NYS-TF | S-1111B33PN-NYS-TF |
| 5.0 V ±1.0% | S-1111B50MC-NZJ-TF | S-1111B50PN-NZJ-TF |

**Remark** Please contact the SII marketing department for products with an output voltage other than those specified above or type A products.

3. Product name selection guide (S-1121 Series)




***1.** Refer to the taping specifications at the end of this book.
***2.** Refer to the product name list.
***3.** Refer to 3. Shutdown pin (ON/OFF pin) under the Operation.

4. Product name list (S-1121 Series)

Table 2

| Output Voltage | SOT-23-5 | 5-Pin SON(A) |
|---|---|---|
| 1.5 V ±1.0% | S-1121B15MC-N2A-TF | S-1121B15PN-N2A-TF |
| 1.8 V ±1.0% | S-1121B18MC-N2D-TF | S-1121B18PN-N2D-TF |
| 2.5 V ±1.0% | S-1121B25MC-N2K-TF | S-1121B25PN-N2K-TF |
| 2.6 V ±1.0% | S-1121B26MC-N2L-TF | S-1121B26PN-N2L-TF |
| 2.7 V ±1.0% | S-1121B27MC-N2M-TF | S-1121B27PN-N2M-TF |
| 2.8 V ±1.0% | S-1121B28MC-N2N-TF | S-1121B28PN-N2N-TF |
| 2.9 V ±1.0% | S-1121B29MC-N2O-TF | S-1121B29PN-N2O-TF |
| 3.0 V ±1.0% | S-1121B30MC-N2P-TF | S-1121B30PN-N2P-TF |
| 3.1 V ±1.0% | S-1121B31MC-N2Q-TF | S-1121B31PN-N2Q-TF |
| 3.3 V ±1.0% | S-1121B33MC-N2S-TF | S-1121B33PN-N2S-TF |
| 5.0 V ±1.0% | S-1121B50MC-N3J-TF | S-1121B50PN-N3J-TF |

**Remark** Please contact the SII marketing department for products with an output voltage other than those specified above or type A products.

## ■ Pin Configuration

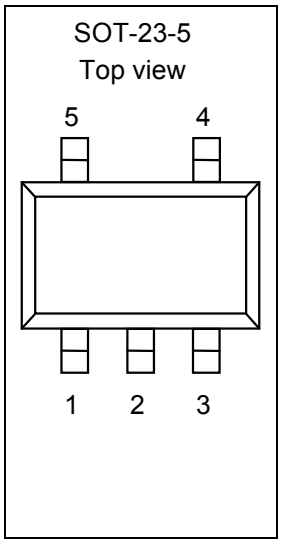



Figure 2

Table 3

(S-1111 Series)

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VIN | Input voltage pin |
| 2 | VSS | GND pin |
| 3 | ON/OFF | Shutdown pin |
| 4 | NC | No connection*1 |
| 5 | VOUT | Output voltage pin |

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

Table 4

(S-1121 Series)

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VOUT | Output voltage pin |
| 2 | VSS | GND pin |
| 3 | VIN | Input voltage pin |
| 4 | ON/OFF | Shutdown pin |
| 5 | NC | No connection*1 |

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

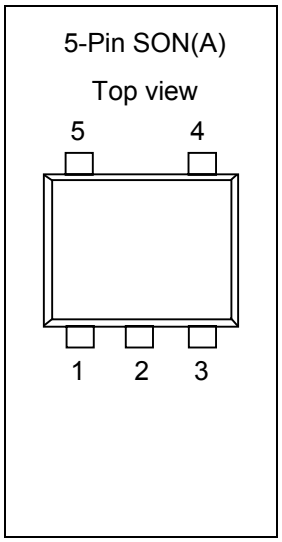



Figure 3

Table 5

(S-1111 Series)

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | ON/OFF | Shutdown pin |
| 2 | VSS | GND pin |
| 3 | VIN | Input voltage pin |
| 4 | VOUT | Output voltage pin |
| 5 | NC | No connection*1 |

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

Table 6

(S-1121 Series)

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VOUT | Output voltage pin |
| 2 | VSS | GND pin |
| 3 | NC | No connection*1 |
| 4 | ON/OFF | Shutdown pin |
| 5 | VIN | Input voltage pin |

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

## ■ Absolute Maximum Ratings

Table 7

($Ta = 25°C$ unless otherwise specified)

| Item | Symbol | Absolute Maximum Rating | | Unit |
|---|---|---|---|---|
| Input voltage | $V_{IN}$ | $V_{SS} - 0.3$ to $V_{SS} + 7$ | | V |
| | $V_{ON/OFF}$ | $V_{SS} - 0.3$ to $V_{IN} + 0.3$ | | |
| Output voltage | $V_{OUT}$ | $V_{SS} - 0.3$ to $V_{IN} + 0.3$ | | |
| Power dissipation | $P_D$ | SOT-23-5 | 300 | mW |
| | | 5-Pin SON(A) | 150 | |
| Operating ambient temperature | $T_{opr}$ | −40 to +85 | | °C |
| Storage ambient temperature | $T_{stg}$ | −40 to +125 | | |

**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.**

## ■ Electrical Characteristics

Table 8

(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 | | $V_{OUT(S)} \times 0.99$ | $V_{OUT(S)}$ | $V_{OUT(S)} \times 1.01$ | V | 1 |
| Output current[*2] | $I_{OUT}$ | $V_{IN} \geq V_{OUT(S)} + 1.0$ V | | 150[*5] | — | — | mA | 3 |
| Dropout voltage[*3] | $V_{drop}$ | $I_{OUT}$ = 100 mA | 1.5 V ≤ $V_{OUT(S)}$ ≤ 1.9 V | — | 0.60 | 1.40 | V | 1 |
| | | | 2.0 V ≤ $V_{OUT(S)}$ ≤ 2.4 V | — | 0.35 | 0.70 | | |
| | | | 2.5 V ≤ $V_{OUT(S)}$ ≤ 2.7 V | — | 0.24 | 0.35 | | |
| | | | 2.8 V ≤ $V_{OUT(S)}$ ≤ 3.3 V | — | 0.20 | 0.30 | | |
| | | | 3.4 V ≤ $V_{OUT(S)}$ ≤ 5.5 V | — | 0.17 | 0.26 | | |
| 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 | |
| Load regulation | $\Delta V_{OUT2}$ | $V_{IN} = V_{OUT(S)} + 1.0$ V, 1.0 mA ≤ $I_{OUT}$ ≤ 80 mA | | — | 20 | 40 | mV | |
| Output voltage temperature coefficient[*4] | $\frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}$ | $V_{IN} = V_{OUT(S)} + 1.0$ V, $I_{OUT}$ = 10 mA, −40°C ≤ Ta ≤ 85°C | | — | ±100 | — | ppm / °C | |
| Current consumption during operation | $I_{SS1}$ | $V_{IN} = V_{OUT(S)} + 1.0$ V, ON/OFF pin = ON, no load | | — | 35 | 65 | μA | 2 |
| Current consumption during shutdown | $I_{SS2}$ | $V_{IN} = V_{OUT(S)} + 1.0$ V, ON/OFF pin = OFF, no load | | — | 0.1 | 1.0 | | |
| Input voltage | $V_{IN}$ | — | | 2.0 | — | 6.5 | V | — |
| Shutdown pin input voltage “H” | $V_{SH}$ | $V_{IN} = V_{OUT(S)} + 1.0$ V, $R_L$ = 1.0 kΩ | | 1.5 | — | — | | 4 |
| Shutdown pin input voltage “L” | $V_{SL}$ | $V_{IN} = V_{OUT(S)} + 1.0$ V, $R_L$ = 1.0 kΩ | | — | — | 0.3 | | |
| Shutdown pin input current “H” | $I_{SH}$ | $V_{IN}$ = 6.5 V, $V_{ON/OFF}$ = 6.5 V | | −0.1 | — | 0.1 | μA | |
| Shutdown pin input current “L” | $I_{SL}$ | $V_{IN}$ = 6.5 V, $V_{ON/OFF}$ = 0 V | | −0.1 | — | 0.1 | | |
| Ripple rejection | $\lvert RR \rvert$ | $V_{IN} = V_{OUT(S)} + 1.0$ V, f = 1.0 kHz, $\Delta V_{rip}$ = 0.5 Vrms, $I_{OUT}$ = 30 mA | | — | 70 | — | dB | 5 |
| Short-circuit current | $I_{short}$ | $V_{IN} = V_{OUT(S)} + 1.0$ V, ON/OFF pin = ON, $V_{OUT}$ = 0 V | | — | 250 | — | mA | 3 |

***1.** $V_{OUT(S)}$: Specified output voltage
$V_{OUT(E)}$: Actual output voltage at the fixed load
The 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.

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

***1.** The 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.

## ■ Test Circuits

1.

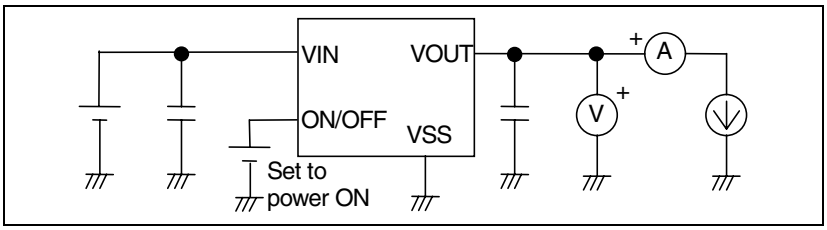



Figure 4

2.

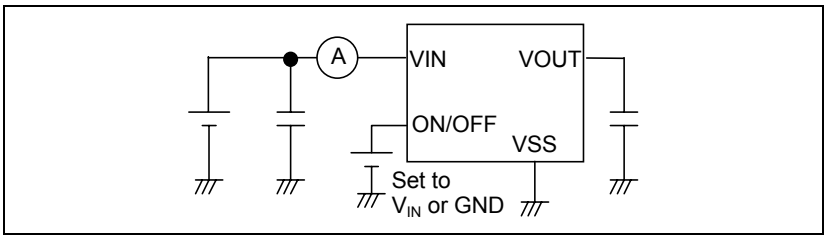



Figure 5

3.

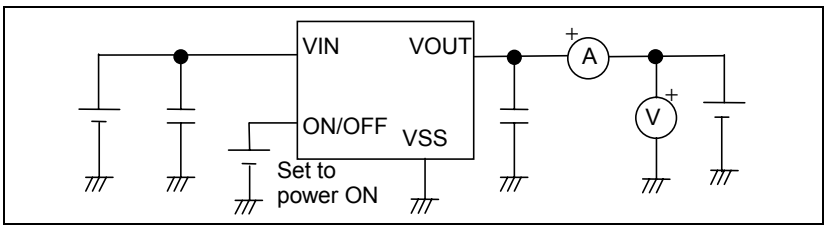



Figure 6

4.

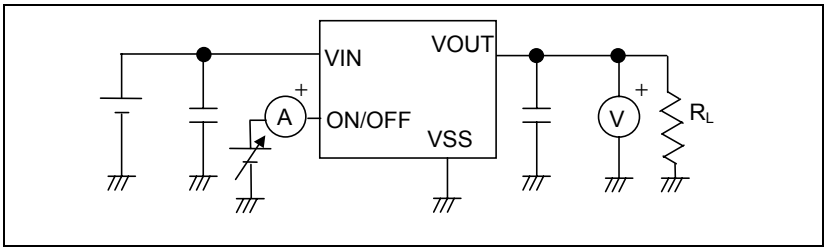



Figure 7

5.

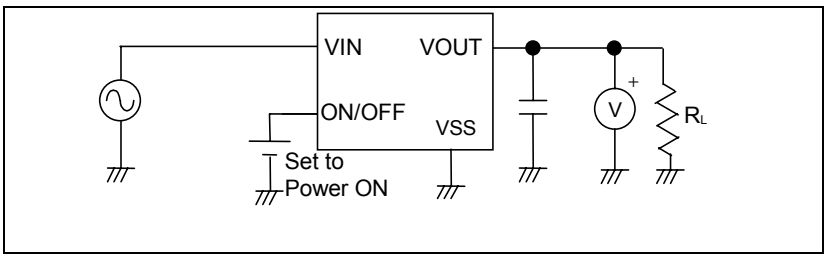
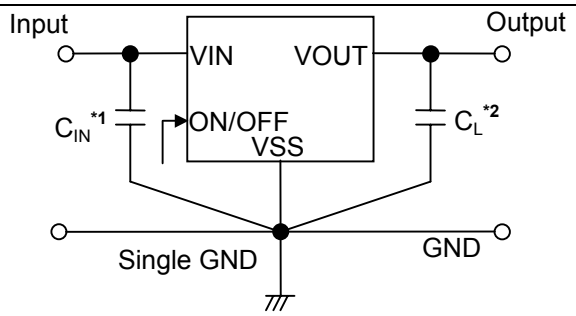



Figure 8

## ■ Standard Circuit




***1.*** $C_{IN}$ is a capacitor for stabilizing the input.
***2.*** A tantalum capacitor (2.2 μF or more) can be used.

Figure 9

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

## ■ Application Conditions

Input capacitor ($C_{IN}$): 1.0 μF or more
Output capacitor ($C_L$): 2.2 μF or more (tantalum capacitor)

**Caution A general series regulator may oscillate, depending on the external components selected. Check that no oscillation occurs with the application using the above capacitor.**

## ■ Explanation of Terms

1. Low dropout voltage regulator

   The low dropout voltage regulator is a voltage regulator whose dropout voltage is low 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 the product.

   **Caution If the above conditions change, the output voltage value may vary and exceed the accuracy range of the output voltage. Please see the electrical characteristics and attached characteristics data for details.**

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

   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 ($\Delta V_{OUT2}$)

   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 the input voltage $V_{IN1}$, which is the input voltage ($V_{IN}$) at the point where the output voltage has fallen to 98% of the output voltage value $V_{OUT3}$ after $V_{IN}$ was gradually decreased from $V_{IN} = V_{OUT(S)} + 1.0$ V, and the output voltage at that point ($V_{OUT3} \times 0.98$).

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

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

The shadowed area in Figure 10 is the range where $V_{OUT}$ varies in the operating temperature range when the temperature coefficient of the output voltage is ±100 ppm/°C.

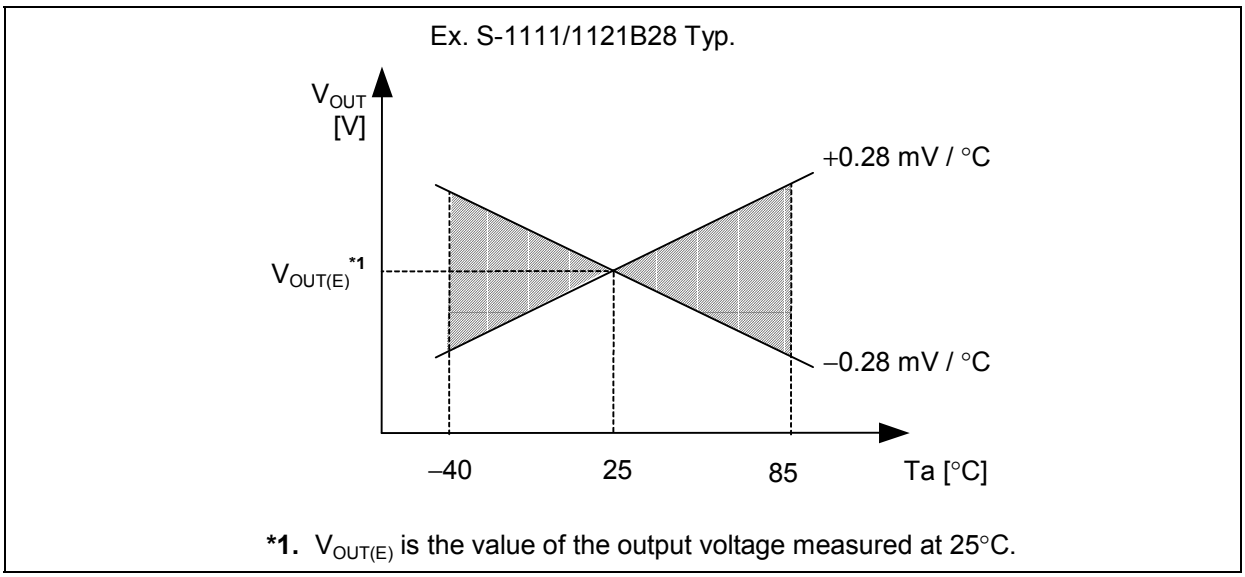



Figure 10

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

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

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

## ■ Operation

### 1. Basic operation

Figure 11 shows the block diagram of the S-1111/1121 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 output transistor with the gate voltage necessary to ensure a certain output voltage free of any fluctuations of input voltage and temperature.

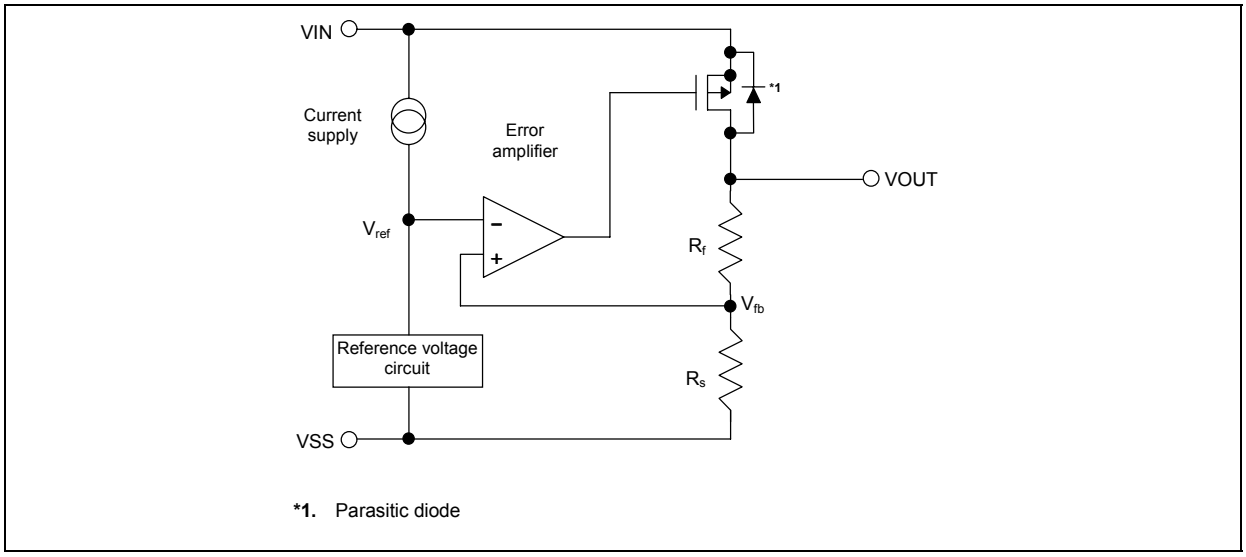



Figure 11

### 2. Output transistor

The S-1111/1121 Series uses a low on-resistance P-channel MOSFET 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 VOUT pin through a parasitic diode to VIN pin.

3. Shutdown pin (ON/OFF pin)

This pin starts and stops the regulator.

When the ON/OFF pin is set to the shutdown level, the operation of all internal circuits stops, and the built-in P-channel MOSFET output transistor between the VIN pin and VOUT pin is turned off to substantially reduce the current consumption. The VOUT pin becomes the $V_{SS}$ level due to the internally divided resistance of several MΩ between the VOUT pin and VSS pin.
The structure of the ON/OFF pin is as shown in Figure 12. Since the ON/OFF pin is neither pulled down nor pulled up internally, do not use it in the floating state. In addition, note that the current consumption increases if a voltage of 0.3 V to $V_{IN}$ – 0.3 V is applied to the ON/OFF pin. When the ON/OFF pin is not used, connect it to the VSS pin if the logic type is "A" and to the VIN pin if it is "B".

Table 9

| Logic Type | ON/OFF Pin | Internal Circuits | VOUT Pin Voltage | Current Consumption |
|---|---|---|---|---|
| A | "L": Power on | Operating | Set value | $I_{SS1}$ |
| A | "H": Power off | Stopped | $V_{SS}$ level | $I_{SS2}$ |
| B | "L": Power off | Stopped | $V_{SS}$ level | $I_{SS2}$ |
| B | "H": Power on | Operating | Set value | $I_{SS1}$ |

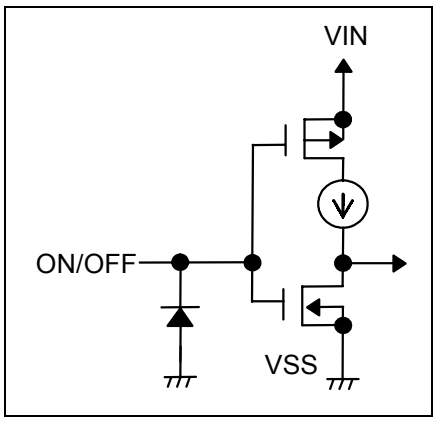



Figure 12

■ Selection of Output Capacitor ($C_L$)

The S-1111/1121 Series performs phase compensation using the internal phase compensator in the IC and the ESR (Equivalent Series Resistance) of the output capacitor to enable stable operation independent of changes in the output load. Therefore, always place a capacitor ($C_L$) of 2.2 μF or more between VOUT and VSS.
For stable operation of the S-1111/1121 Series, it is essential to employ a capacitor whose ESR is within an optimum range. Using a capacitor whose ESR is outside the optimum range (approximately 0.5 to 5 Ω), whether larger or smaller, may cause an unstable output, resulting in oscillation. For this reason, a tantalum electrolytic capacitor is recommended.
When a ceramic capacitor or an OS capacitor with a low ESR is used, it is necessary to connect an additional resistor that serves as the ESR in series with the output capacitor. The required resistance value is approximately 0.5 to 5 Ω, which varies depending on the usage conditions, so perform sufficient evaluation for selection. Ordinarily, around 1.0 Ω is recommended.
Note that an aluminum electrolytic capacitor may increase the ESR at a low temperature, causing oscillation. When using this kind of capacitor, perform thorough evaluation, including evaluation of temperature characteristics.

## ■ Precautions

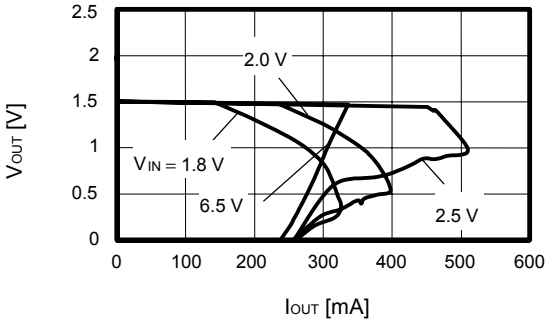
- Wiring patterns for the VIN, VOUT and GND pins should be designed so that the impedance is low. When mounting an output capacitor, the distance from the capacitor to the VOUT pin and to the VSS pin should be as short as possible.
- Note that the output voltage may increase when a series regulator is used at low load current (1.0 mA or less).
- This IC performs phase compensation by using an internal phase compensator and the ESR of an output capacitor. Therefore, always place a capacitor of 2.2 μF or more between VOUT and VSS. A tantalum type capacitor is recommended. Moreover, to secure stable operation of the S-1111/1121 Series, it is necessary to employ a capacitor with an ESR within an optimum range (0.5 to 5 Ω). Using a capacitor whose ESR is outside the optimum range (approximately 0.5 to 5 Ω), whether larger or smaller, may cause an unstable output, resulting in oscillation. Perform sufficient evaluation under the actual usage conditions for selection.
- 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 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 8 in the 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.

## ■ Typical Characteristics

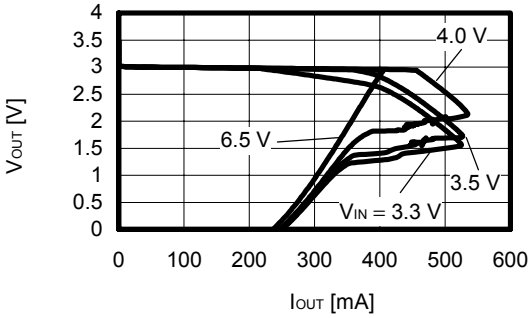
**Remark** The following, which describes the S-1111 Series as the typical product, shows typical data common to the S-1121 Series.

(1) Output Voltage vs. Output current (when load current increases)

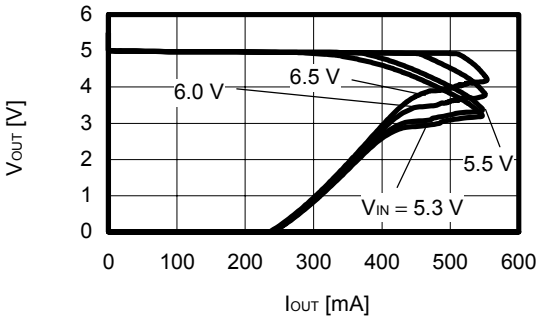
S-1111B15 (Ta = 25°C)




S-1111B30 (Ta = 25°C)



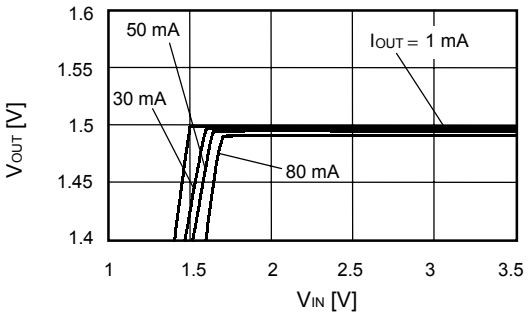

S-1111B50 (Ta = 25°C)



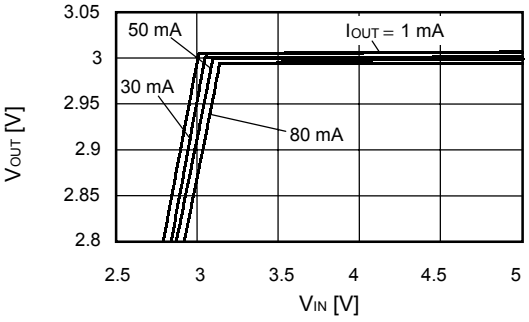

**Remark** In determining the output current, attention should be paid to the following.
1) The minimum output current value and footnote *5 in the electrical characteristics
2) The package power dissipation

(2) Output voltage vs. Input voltage

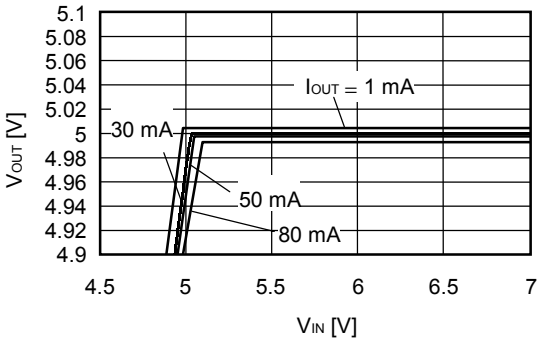
S-1111B15 (Ta = 25°C)




S-1111B30 (Ta = 25°C)

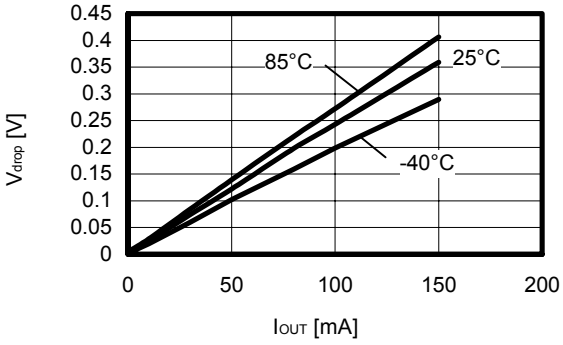



S-1111B50 (Ta = 25°C)

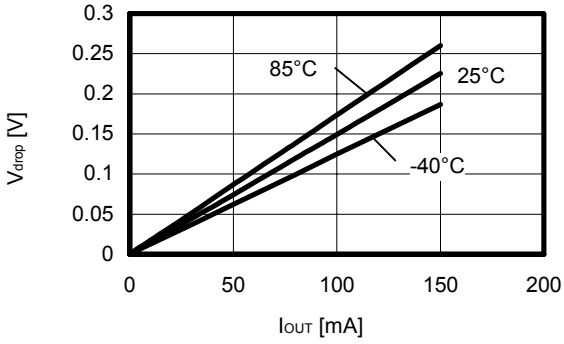


(3) Dropout voltage vs. Output current

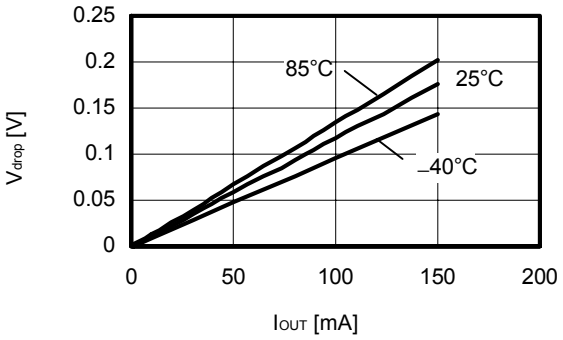
S-1111B15



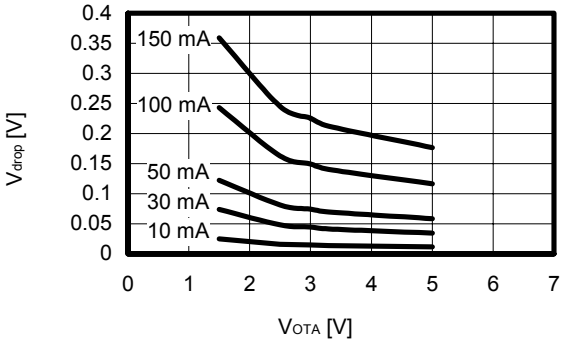

S-1111B30




S-1111B50

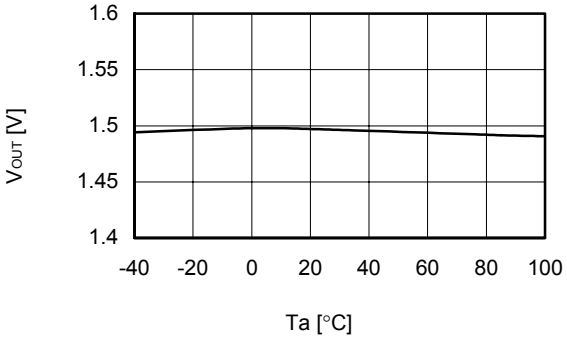



(4) Dropout voltage vs. Set output voltage

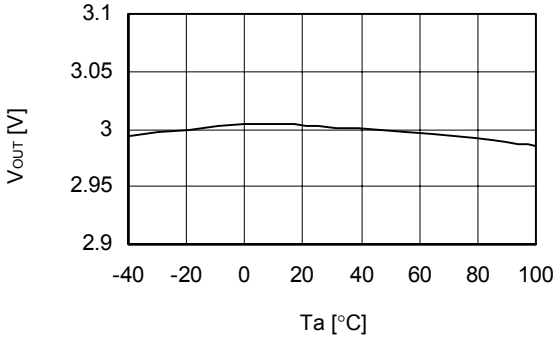


(5) Output voltage vs. Ambient temperature

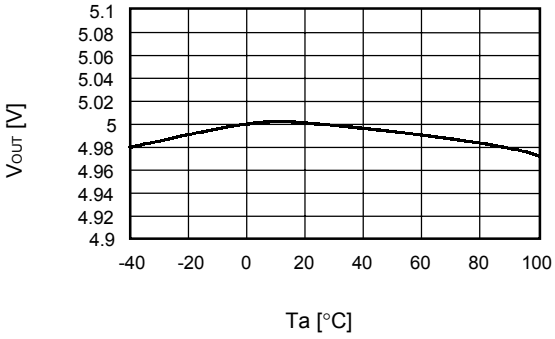
S-1111B15




S-1111B30

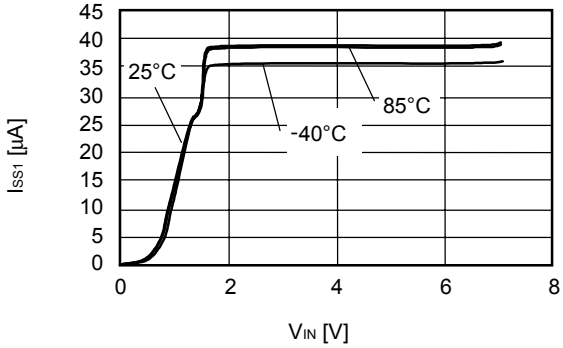



S-1111B50

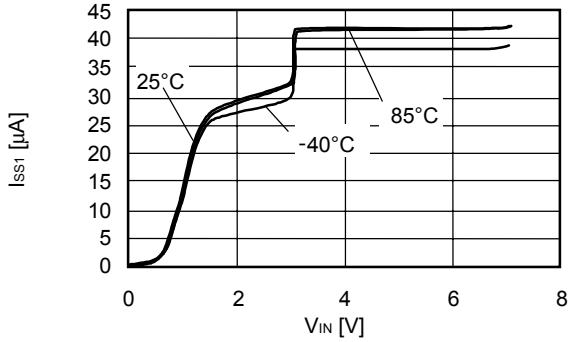



(6) Current consumption vs. Input voltage

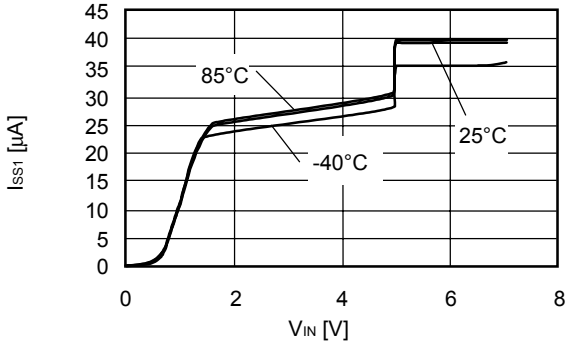
S-1111B15




S-1111B30

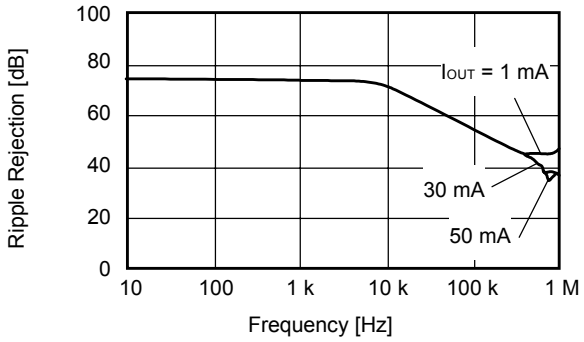



S-1111B50

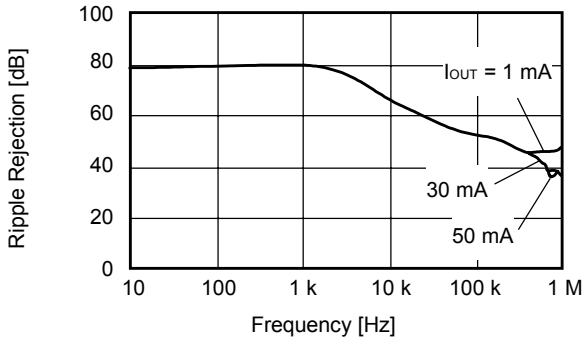


(7) Ripple rejection

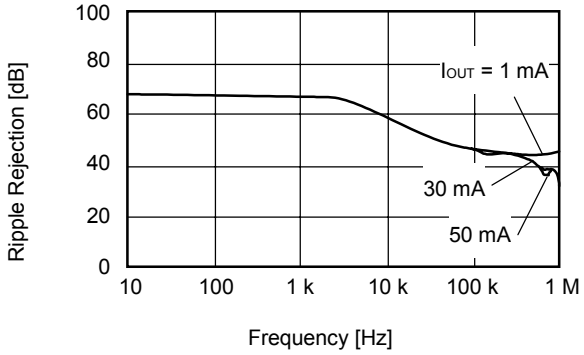
S-1111B15 (Ta = 25°C)
$V_{IN}$ = 2.5 V, $C_{OUT}$ = 2.2 µF




S-1111B30 (Ta = 25°C)
$V_{IN}$ = 4.0 V, $C_{OUT}$ = 2.2 µF



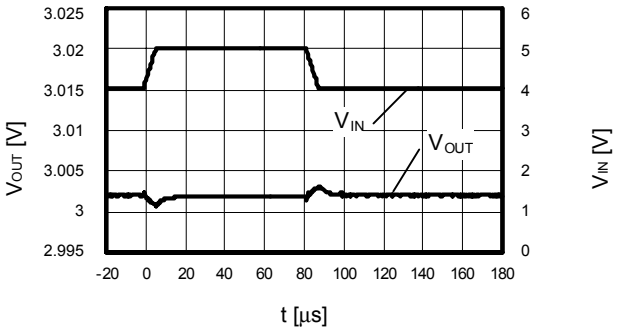

S-1111B50 (Ta = 25°C)
$V_{IN}$ = 6.0 V, $C_{OUT}$ = 2.2 µF



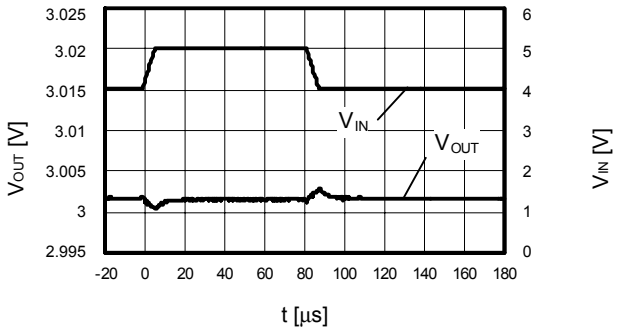
## ■ Reference Data

### (1) Input transient response characteristics

$I_{OUT}$ = 30 mA, tr = tf = 5.0 µF, $C_{OUT}$ = 2.2 µF, $C_{IN}$ = 0 µF

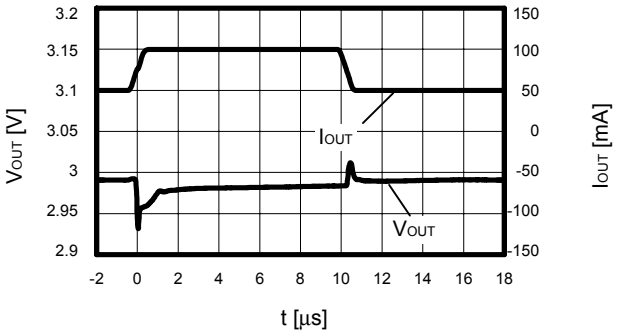



$I_{OUT}$ = 30 mA, tr = tf = 5.0 µF, $C_{OUT}$ = 4.7 µF, $C_{IN}$ = 0 µF

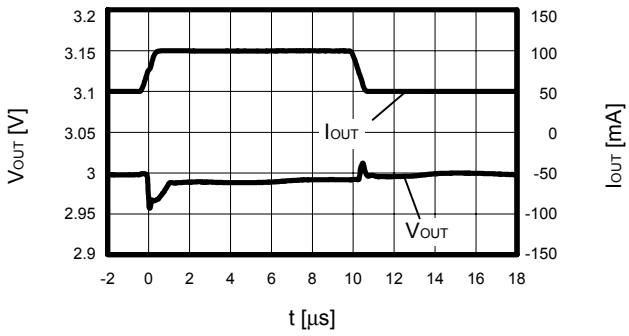



### (2) Load transient response characteristics

$V_{IN}$ = 4.0 V, $C_{OUT}$ = 2.2 µF, $C_{IN}$ = 1.0 µF,
$I_{OUT}$ = 50↔100 mA



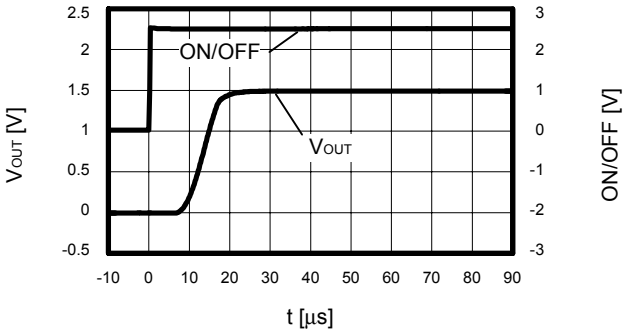

$V_{IN}$ = 4.0 V, $C_{OUT}$ = 4.7 µF, $C_{IN}$ = 1.0 µF,
$I_{OUT}$ = 50↔100 mA




### (3) Shutdown pin transient response characteristics

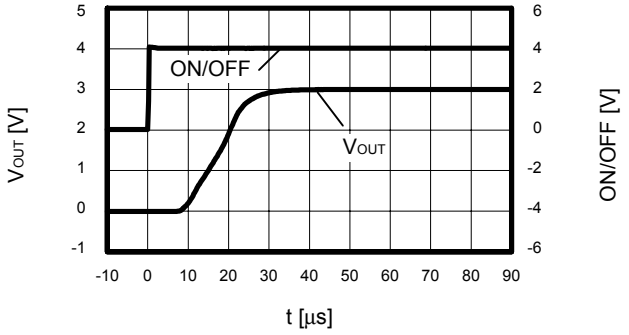
S-1111B15 (Ta = 25°C)

$V_{IN}$ = 2.5 V, $C_{OUT}$ = 2.2 µF, $C_{IN}$ = 1.0 µF



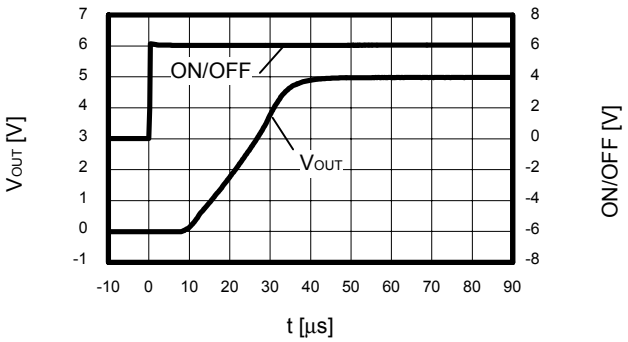

S-1111B30 (Ta = 25°C)

$V_{IN}$ = 4.0 V, $C_{OUT}$ = 2.2 µF, $C_{IN}$ = 1.0 µF




S-1111B50 (Ta = 25°C)

$V_{IN}$ = 6.0 V, $C_{OUT}$ = 2.2 µF, $C_{IN}$ = 1.0 µF

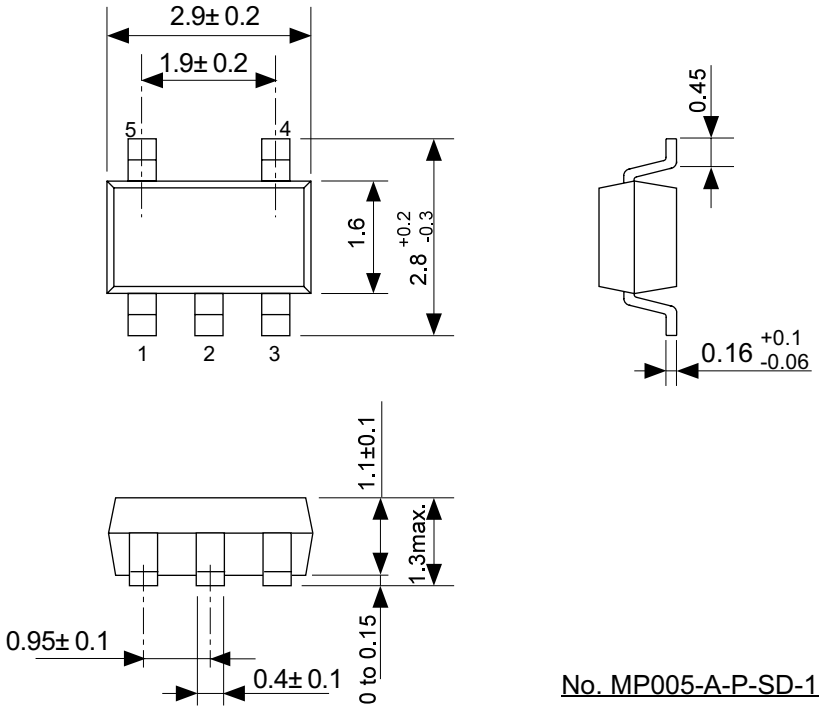


# ■ SOT-23-5

**MP005-A** 020924

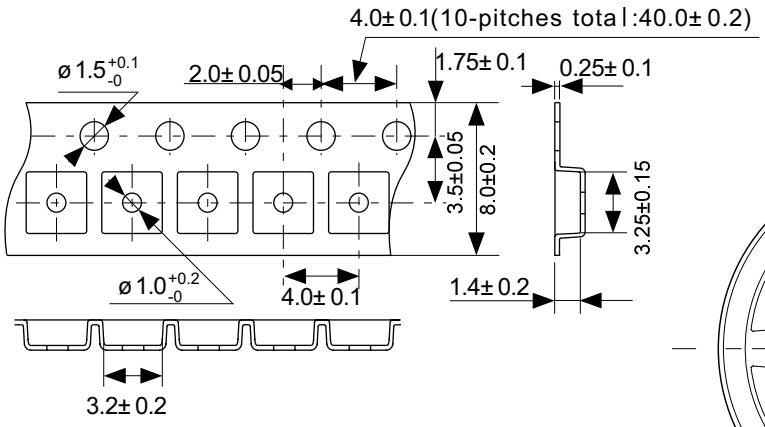
## ● Dimensions

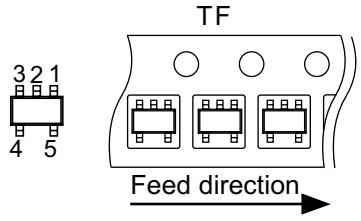
Unit : mm




No. MP005-A-P-SD-1.1

## ● Tape Specifications

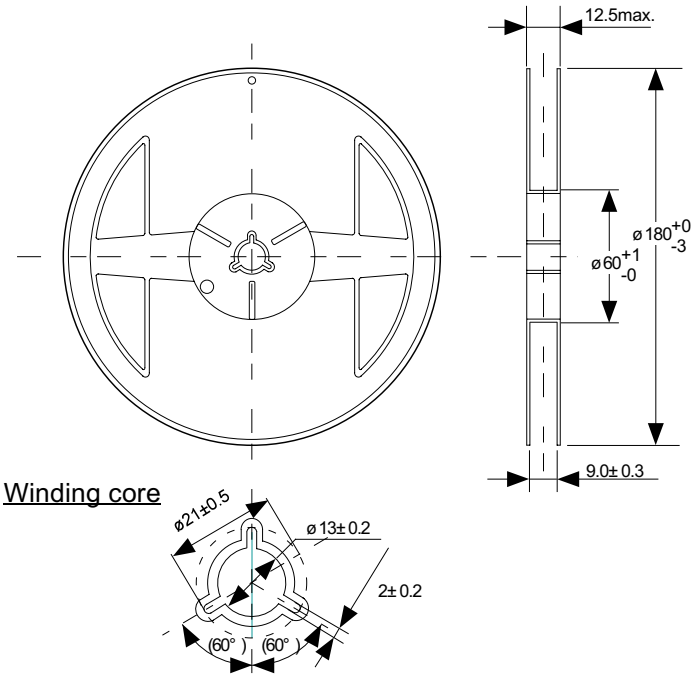



No. : MP005-A-C-SD-2.0

## ● Reel Specifications

3000 pcs. / reel



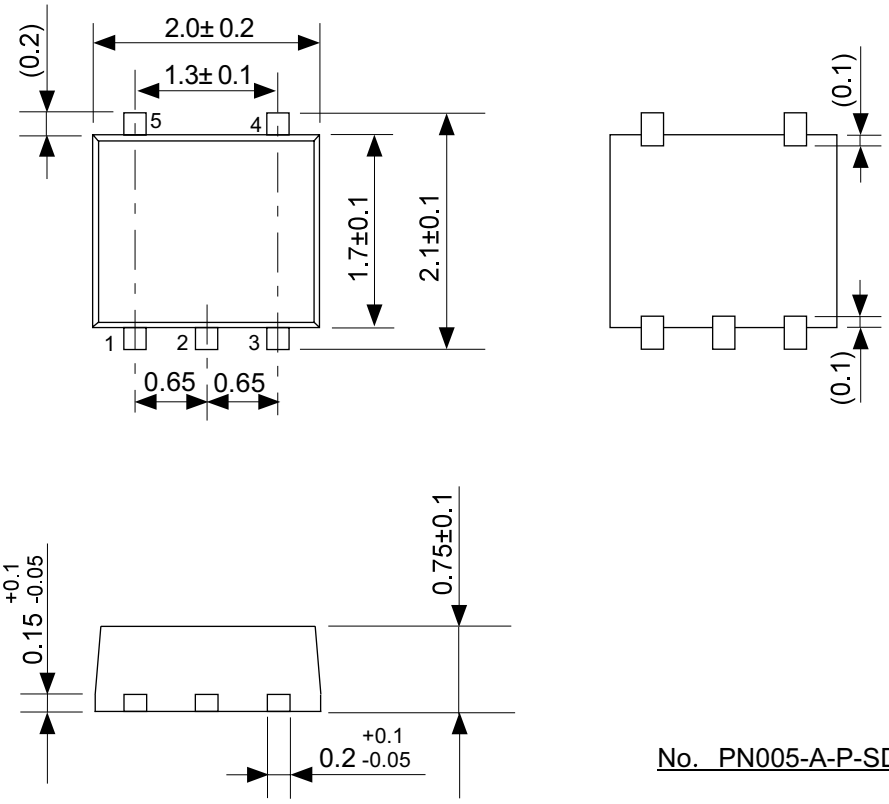

No. MP005-A-R-SD-1. 0

# ■ 5-Pin SON(A) [SON5A(2017)]

**PN005-A Rev.1.0** 020921

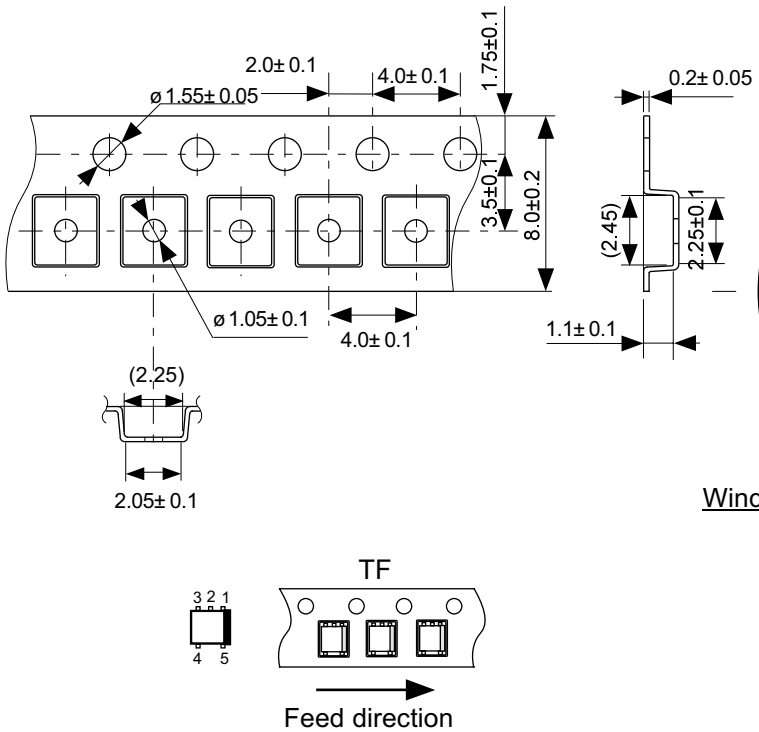
## ●Dimensions

Unit:mm




No. PN005-A-P-SD-1.0

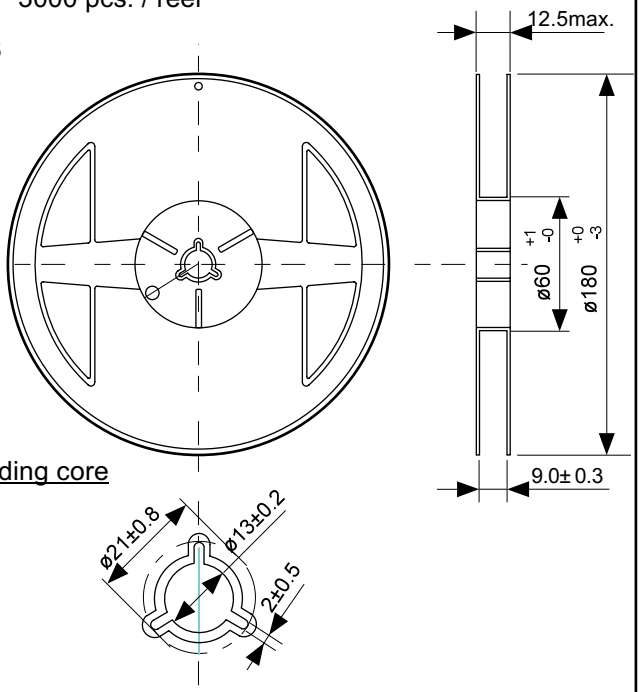
## ●Taping Specifications




No. PN005-A-C-SD-1.0

## ●Reel Specifications

3000 pcs. / reel




No. PN005-A-R-SD-1.0

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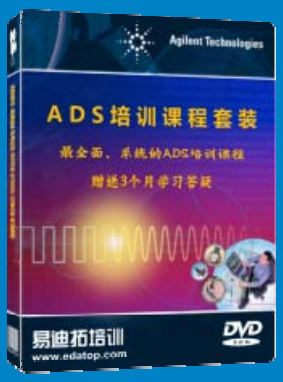
课程网址：http://www.edatop.com/peixun/rfe/110.html

## ADS 学习培训课程套装

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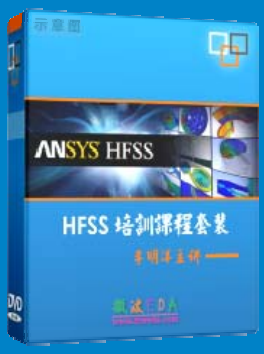
课程网址： http://www.edatop.com/peixun/ads/13.html




## HFSS 学习培训课程套装

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**课程网址**：http://www.edatop.com/peixun/hfss/122.html

## 13.56MHz NFC/RFID 线圈天线设计培训课程套装

套装包含 4 门视频培训课程，培训将 13.56MHz 线圈天线设计原理和仿真设计实践相结合，全面系统地讲解了 13.56MHz 线圈天线的工作原理、设计方法、设计考量以及使用 HFSS 和 CST 仿真分析线圈天线的具体操作，同时还介绍了 13.56MHz 线圈天线匹配电路的设计和调试。通过该套课程的学习，可以帮助您快速学习掌握 13.56MHz 线圈天线及其匹配电路的原理、设计和调试…

**详情浏览**：http://www.edatop.com/peixun/antenna/116.html

## 我们的课程优势：

※ 成立于 2004 年，10 多年丰富的行业经验，

※ 一直致力并专注于微波射频和天线设计工程师的培养，更了解该行业对人才的要求

※ 经验丰富的一线资深工程师讲授，结合实际工程案例，直观、实用、易学

## 联系我们：

※ 易迪拓培训官网：http://www.edatop.com

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