

The S-1312 Series, developed by using the CMOS technology, is a positive voltage regulator IC which has low current consumption, high ripple-rejection and low dropout voltage.

Even with low current consumption of 20  $\mu\text{A}$  typ., it has high ripple-rejection of 75 dB typ., and a ceramic capacitor of 0.22  $\mu\text{F}$  or more can be used as the input and output capacitors.

It also has high-accuracy output voltage of  $\pm 1.0\%$ .

## ■

- Output voltage: 1.0 V to 3.5 V, selectable in 0.05 V step
- Input voltage: 1.5 V to 5.5 V
- Output voltage accuracy:  $\pm 1.0\%$  (1.0 V to 1.45 V output product:  $\pm 15$  mV)
- Dropout voltage: 160 mV typ. (2.8 V output product,  $I_{\text{OUT}} = 100$  mA)
- Current consumption:
  - During operation: 20  $\mu\text{A}$  typ., 30  $\mu\text{A}$  max.
  - During power-off: 0.1  $\mu\text{A}$  typ., 1.0  $\mu\text{A}$  max.
- Output current: Possible to output 150 mA ( $V_{\text{IN}} \geq V_{\text{OUT(S)}} + 1.0$  V)
- Input and output capacitors: A ceramic capacitor of 0.22  $\mu\text{F}$  or more can be used.
- Ripple rejection:
  - 75 dB typ. (1.2 V output product,  $f = 1.0$  kHz)
  - 70 dB typ. (2.85 V output product,  $f = 1.0$  kHz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Prevents damage caused by heat.
- Built-in ON / OFF circuit: Ensures long battery life.
- Pull-down resistor is selectable.
- Discharge shunt function is selectable.
- Operation temperature range:  $T_a = -40^\circ\text{C}$  to  $+85^\circ\text{C}$
- Lead-free (Sn 100%), halogen-free

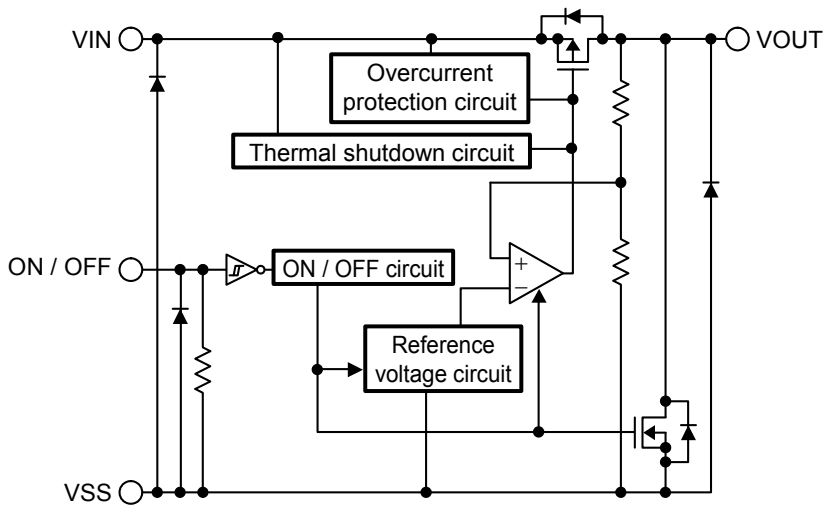
Attention should be paid to the power dissipation of the package when the output current is large.

## ■

- Constant-voltage power supply for portable communication device, digital camera, and digital audio player
- Constant-voltage power supply for battery-powered device
- Constant-voltage power supply for home electric appliance

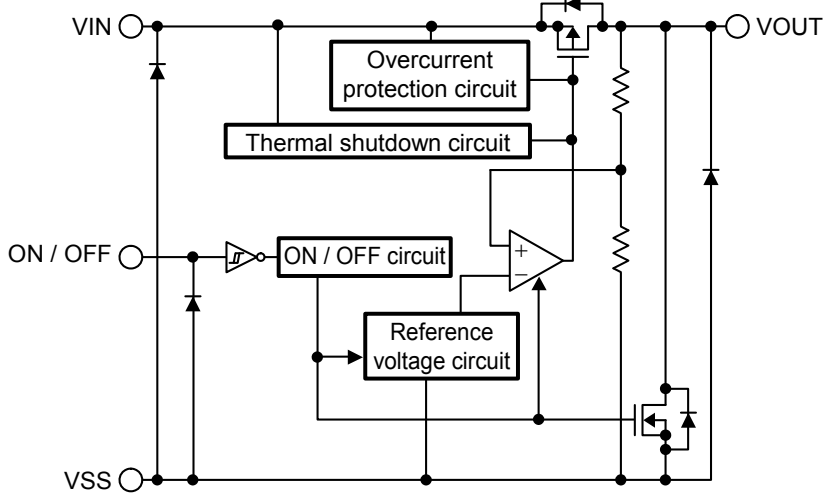
## ■

- SOT-23-5
- HSNT-4 (1010)
- HSNT-4 (0808)



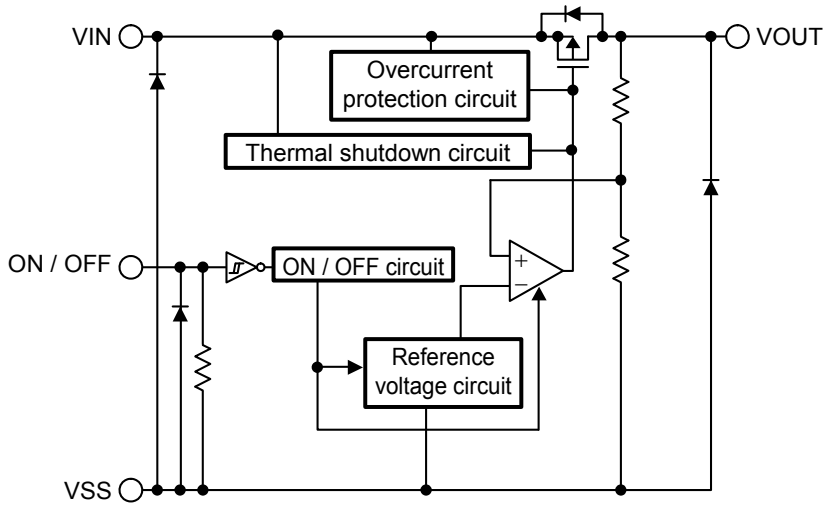
Parasitic diode

Function	Status
ON / OFF logic	Active "H"
Discharge shunt function	Available
Pull-down resistor	Available



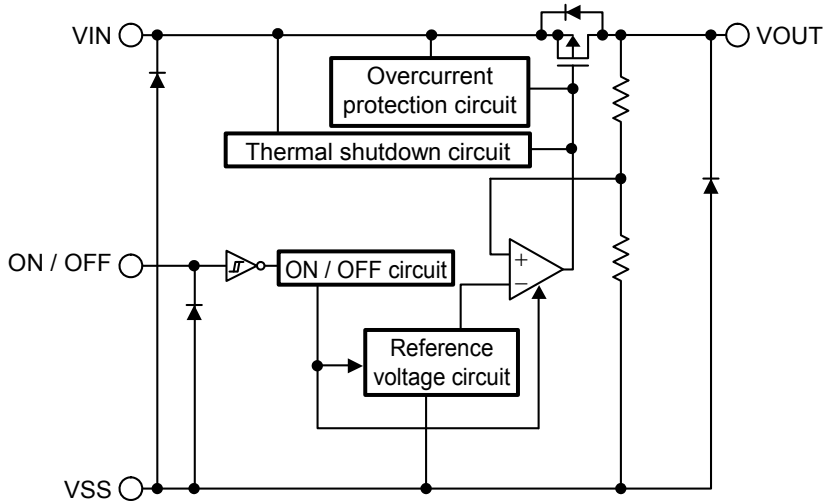
Parasitic diode

Function	Status
ON / OFF logic	Active "H"
Discharge shunt function	Available
Pull-down resistor	Unavailable



Parasitic diode

Function	Status
ON / OFF logic	Active "H"
Discharge shunt function	Unavailable
Pull-down resistor	Available

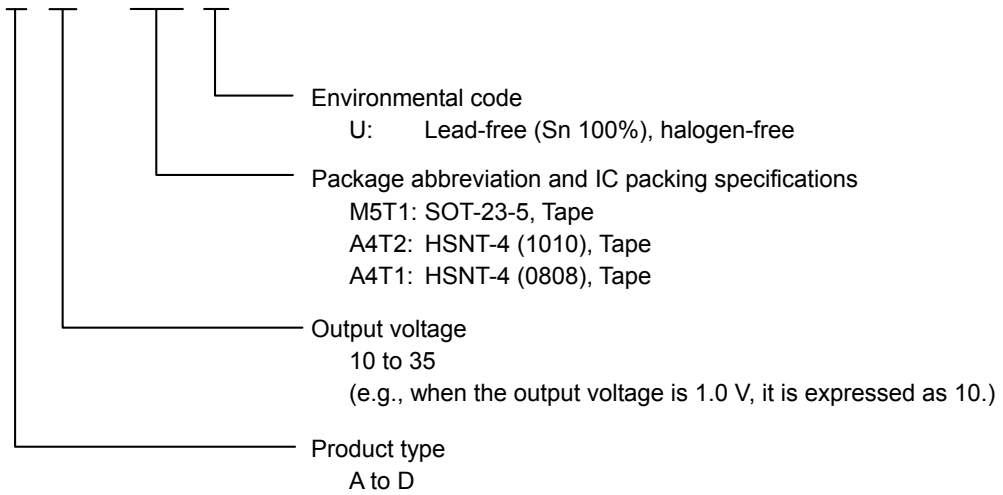


Parasitic diode

Function	Status
ON / OFF logic	Active "H"
Discharge shunt function	Unavailable
Pull-down resistor	Unavailable



Users can select the product type, output voltage, and package type for the S-1312 Series. Refer to " " regarding the contents of product name, " " regarding the product type, " " regarding the package drawings, " " regarding details of the product name.



Refer to the tape drawing.  
 If you request the product which has 0.05 V step, contact our sales office.  
 Refer to " " .

Product Type	ON / OFF Logic	Discharge Shunt Function	Pull-down Resistor
A	Active "H"	Available	Available
B	Active "H"	Available	Unavailable
C	Active "H"	Unavailable	Available
D	Active "H"	Unavailable	Unavailable

Package Name	Dimension	Tape	Reel	Land
SOT-23-5	MP005-A-P-SD	MP005-A-C-SD	MP005-A-R-SD	-
HSNT-4 (1010)	PL004-A-P-SD	PL004-A-C-SD	PL004-A-R-SD	PL004-A-L-SD
HSNT-4 (0808)	PK004-A-P-SD	PK004-A-C-SD	PK004-A-R-SD	PK004-A-L-SD

ON / OFF logic: Active "H"  
 Discharge shunt function: Available Pull-down resistor: Available

Output Voltage	SOT-23-5	HSNT-4 (1010)	HSNT-4 (0808)
1.0 V ± 15 mV	S-1312A10-M5T1U3	S-1312A10-A4T2U3	S-1312A10-A4T1U3
1.1 V ± 15 mV	S-1312A11-M5T1U3	S-1312A11-A4T2U3	S-1312A11-A4T1U3
1.2 V ± 15 mV	S-1312A12-M5T1U3	S-1312A12-A4T2U3	S-1312A12-A4T1U3
1.25 V ± 15 mV	S-1312A1C-M5T1U3	S-1312A1C-A4T2U3	S-1312A1C-A4T1U3
1.3 V ± 15 mV	S-1312A13-M5T1U3	S-1312A13-A4T2U3	S-1312A13-A4T1U3
1.4 V ± 15 mV	S-1312A14-M5T1U3	S-1312A14-A4T2U3	S-1312A14-A4T1U3
1.5 V ± 1.0%	S-1312A15-M5T1U3	S-1312A15-A4T2U3	S-1312A15-A4T1U3
1.6 V ± 1.0%	S-1312A16-M5T1U3	S-1312A16-A4T2U3	S-1312A16-A4T1U3
1.7 V ± 1.0%	S-1312A17-M5T1U3	S-1312A17-A4T2U3	S-1312A17-A4T1U3
1.8 V ± 1.0%	S-1312A18-M5T1U3	S-1312A18-A4T2U3	S-1312A18-A4T1U3
1.85 V ± 1.0%	S-1312A1J-M5T1U3	S-1312A1J-A4T2U3	S-1312A1J-A4T1U3
1.9 V ± 1.0%	S-1312A19-M5T1U3	S-1312A19-A4T2U3	S-1312A19-A4T1U3
2.0 V ± 1.0%	S-1312A20-M5T1U3	S-1312A20-A4T2U3	S-1312A20-A4T1U3
2.1 V ± 1.0%	S-1312A21-M5T1U3	S-1312A21-A4T2U3	S-1312A21-A4T1U3
2.2 V ± 1.0%	S-1312A22-M5T1U3	S-1312A22-A4T2U3	S-1312A22-A4T1U3
2.3 V ± 1.0%	S-1312A23-M5T1U3	S-1312A23-A4T2U3	S-1312A23-A4T1U3
2.4 V ± 1.0%	S-1312A24-M5T1U3	S-1312A24-A4T2U3	S-1312A24-A4T1U3
2.5 V ± 1.0%	S-1312A25-M5T1U3	S-1312A25-A4T2U3	S-1312A25-A4T1U3
2.6 V ± 1.0%	S-1312A26-M5T1U3	S-1312A26-A4T2U3	S-1312A26-A4T1U3
2.7 V ± 1.0%	S-1312A27-M5T1U3	S-1312A27-A4T2U3	S-1312A27-A4T1U3
2.8 V ± 1.0%	S-1312A28-M5T1U3	S-1312A28-A4T2U3	S-1312A28-A4T1U3
2.85 V ± 1.0%	S-1312A2J-M5T1U3	S-1312A2J-A4T2U3	S-1312A2J-A4T1U3
2.9 V ± 1.0%	S-1312A29-M5T1U3	S-1312A29-A4T2U3	S-1312A29-A4T1U3
3.0 V ± 1.0%	S-1312A30-M5T1U3	S-1312A30-A4T2U3	S-1312A30-A4T1U3
3.1 V ± 1.0%	S-1312A31-M5T1U3	S-1312A31-A4T2U3	S-1312A31-A4T1U3
3.2 V ± 1.0%	S-1312A32-M5T1U3	S-1312A32-A4T2U3	S-1312A32-A4T1U3
3.3 V ± 1.0%	S-1312A33-M5T1U3	S-1312A33-A4T2U3	S-1312A33-A4T1U3
3.4 V ± 1.0%	S-1312A34-M5T1U3	S-1312A34-A4T2U3	S-1312A34-A4T1U3
3.5 V ± 1.0%	S-1312A35-M5T1U3	S-1312A35-A4T2U3	S-1312A35-A4T1U3

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

ON / OFF logic: Active "H"  
 Discharge shunt function: Available Pull-down resistor: Unavailable

Output Voltage	SOT-23-5	HSNT-4 (1010)	HSNT-4 (0808)
1.0 V ± 15 mV	S-1312B10-M5T1U3	S-1312B10-A4T2U3	S-1312B10-A4T1U3
1.1 V ± 15 mV	S-1312B11-M5T1U3	S-1312B11-A4T2U3	S-1312B11-A4T1U3
1.2 V ± 15 mV	S-1312B12-M5T1U3	S-1312B12-A4T2U3	S-1312B12-A4T1U3
1.3 V ± 15 mV	S-1312B13-M5T1U3	S-1312B13-A4T2U3	S-1312B13-A4T1U3
1.4 V ± 15 mV	S-1312B14-M5T1U3	S-1312B14-A4T2U3	S-1312B14-A4T1U3
1.5 V ± 1.0%	S-1312B15-M5T1U3	S-1312B15-A4T2U3	S-1312B15-A4T1U3
1.6 V ± 1.0%	S-1312B16-M5T1U3	S-1312B16-A4T2U3	S-1312B16-A4T1U3
1.7 V ± 1.0%	S-1312B17-M5T1U3	S-1312B17-A4T2U3	S-1312B17-A4T1U3
1.8 V ± 1.0%	S-1312B18-M5T1U3	S-1312B18-A4T2U3	S-1312B18-A4T1U3
1.85 V ± 1.0%	S-1312B1J-M5T1U3	S-1312B1J-A4T2U3	S-1312B1J-A4T1U3
1.9 V ± 1.0%	S-1312B19-M5T1U3	S-1312B19-A4T2U3	S-1312B19-A4T1U3
2.0 V ± 1.0%	S-1312B20-M5T1U3	S-1312B20-A4T2U3	S-1312B20-A4T1U3
2.1 V ± 1.0%	S-1312B21-M5T1U3	S-1312B21-A4T2U3	S-1312B21-A4T1U3
2.2 V ± 1.0%	S-1312B22-M5T1U3	S-1312B22-A4T2U3	S-1312B22-A4T1U3
2.3 V ± 1.0%	S-1312B23-M5T1U3	S-1312B23-A4T2U3	S-1312B23-A4T1U3
2.4 V ± 1.0%	S-1312B24-M5T1U3	S-1312B24-A4T2U3	S-1312B24-A4T1U3
2.5 V ± 1.0%	S-1312B25-M5T1U3	S-1312B25-A4T2U3	S-1312B25-A4T1U3
2.6 V ± 1.0%	S-1312B26-M5T1U3	S-1312B26-A4T2U3	S-1312B26-A4T1U3
2.7 V ± 1.0%	S-1312B27-M5T1U3	S-1312B27-A4T2U3	S-1312B27-A4T1U3
2.8 V ± 1.0%	S-1312B28-M5T1U3	S-1312B28-A4T2U3	S-1312B28-A4T1U3
2.85 V ± 1.0%	S-1312B2J-M5T1U3	S-1312B2J-A4T2U3	S-1312B2J-A4T1U3
2.9 V ± 1.0%	S-1312B29-M5T1U3	S-1312B29-A4T2U3	S-1312B29-A4T1U3
3.0 V ± 1.0%	S-1312B30-M5T1U3	S-1312B30-A4T2U3	S-1312B30-A4T1U3
3.1 V ± 1.0%	S-1312B31-M5T1U3	S-1312B31-A4T2U3	S-1312B31-A4T1U3
3.2 V ± 1.0%	S-1312B32-M5T1U3	S-1312B32-A4T2U3	S-1312B32-A4T1U3
3.3 V ± 1.0%	S-1312B33-M5T1U3	S-1312B33-A4T2U3	S-1312B33-A4T1U3
3.4 V ± 1.0%	S-1312B34-M5T1U3	S-1312B34-A4T2U3	S-1312B34-A4T1U3
3.5 V ± 1.0%	S-1312B35-M5T1U3	S-1312B35-A4T2U3	S-1312B35-A4T1U3

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

ON / OFF logic: Active "H"  
 Discharge shunt function: Unavailable Pull-down resistor: Available

Output Voltage	SOT-23-5	HSNT-4 (1010)	HSNT-4 (0808)
1.0 V ± 15 mV	S-1312C10-M5T1U3	S-1312C10-A4T2U3	S-1312C10-A4T1U3
1.1 V ± 15 mV	S-1312C11-M5T1U3	S-1312C11-A4T2U3	S-1312C11-A4T1U3
1.2 V ± 15 mV	S-1312C12-M5T1U3	S-1312C12-A4T2U3	S-1312C12-A4T1U3
1.3 V ± 15 mV	S-1312C13-M5T1U3	S-1312C13-A4T2U3	S-1312C13-A4T1U3
1.4 V ± 15 mV	S-1312C14-M5T1U3	S-1312C14-A4T2U3	S-1312C14-A4T1U3
1.5 V ± 1.0%	S-1312C15-M5T1U3	S-1312C15-A4T2U3	S-1312C15-A4T1U3
1.6 V ± 1.0%	S-1312C16-M5T1U3	S-1312C16-A4T2U3	S-1312C16-A4T1U3
1.7 V ± 1.0%	S-1312C17-M5T1U3	S-1312C17-A4T2U3	S-1312C17-A4T1U3
1.8 V ± 1.0%	S-1312C18-M5T1U3	S-1312C18-A4T2U3	S-1312C18-A4T1U3
1.85 V ± 1.0%	S-1312C1J-M5T1U3	S-1312C1J-A4T2U3	S-1312C1J-A4T1U3
1.9 V ± 1.0%	S-1312C19-M5T1U3	S-1312C19-A4T2U3	S-1312C19-A4T1U3
2.0 V ± 1.0%	S-1312C20-M5T1U3	S-1312C20-A4T2U3	S-1312C20-A4T1U3
2.1 V ± 1.0%	S-1312C21-M5T1U3	S-1312C21-A4T2U3	S-1312C21-A4T1U3
2.2 V ± 1.0%	S-1312C22-M5T1U3	S-1312C22-A4T2U3	S-1312C22-A4T1U3
2.3 V ± 1.0%	S-1312C23-M5T1U3	S-1312C23-A4T2U3	S-1312C23-A4T1U3
2.4 V ± 1.0%	S-1312C24-M5T1U3	S-1312C24-A4T2U3	S-1312C24-A4T1U3
2.5 V ± 1.0%	S-1312C25-M5T1U3	S-1312C25-A4T2U3	S-1312C25-A4T1U3
2.6 V ± 1.0%	S-1312C26-M5T1U3	S-1312C26-A4T2U3	S-1312C26-A4T1U3
2.7 V ± 1.0%	S-1312C27-M5T1U3	S-1312C27-A4T2U3	S-1312C27-A4T1U3
2.8 V ± 1.0%	S-1312C28-M5T1U3	S-1312C28-A4T2U3	S-1312C28-A4T1U3
2.85 V ± 1.0%	S-1312C2J-M5T1U3	S-1312C2J-A4T2U3	S-1312C2J-A4T1U3
2.9 V ± 1.0%	S-1312C29-M5T1U3	S-1312C29-A4T2U3	S-1312C29-A4T1U3
3.0 V ± 1.0%	S-1312C30-M5T1U3	S-1312C30-A4T2U3	S-1312C30-A4T1U3
3.1 V ± 1.0%	S-1312C31-M5T1U3	S-1312C31-A4T2U3	S-1312C31-A4T1U3
3.2 V ± 1.0%	S-1312C32-M5T1U3	S-1312C32-A4T2U3	S-1312C32-A4T1U3
3.3 V ± 1.0%	S-1312C33-M5T1U3	S-1312C33-A4T2U3	S-1312C33-A4T1U3
3.4 V ± 1.0%	S-1312C34-M5T1U3	S-1312C34-A4T2U3	S-1312C34-A4T1U3
3.5 V ± 1.0%	S-1312C35-M5T1U3	S-1312C35-A4T2U3	S-1312C35-A4T1U3

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

ON / OFF logic: Active "H"  
 Discharge shunt function: Unavailable Pull-down resistor: Unavailable

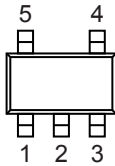
Output Voltage	SOT-23-5	HSNT-4 (1010)	HSNT-4 (0808)
1.0 V ± 15 mV	S-1312D10-M5T1U3	S-1312D10-A4T2U3	S-1312D10-A4T1U3
1.1 V ± 15 mV	S-1312D11-M5T1U3	S-1312D11-A4T2U3	S-1312D11-A4T1U3
1.2 V ± 15 mV	S-1312D12-M5T1U3	S-1312D12-A4T2U3	S-1312D12-A4T1U3
1.3 V ± 15 mV	S-1312D13-M5T1U3	S-1312D13-A4T2U3	S-1312D13-A4T1U3
1.4 V ± 15 mV	S-1312D14-M5T1U3	S-1312D14-A4T2U3	S-1312D14-A4T1U3
1.5 V ± 1.0%	S-1312D15-M5T1U3	S-1312D15-A4T2U3	S-1312D15-A4T1U3
1.6 V ± 1.0%	S-1312D16-M5T1U3	S-1312D16-A4T2U3	S-1312D16-A4T1U3
1.7 V ± 1.0%	S-1312D17-M5T1U3	S-1312D17-A4T2U3	S-1312D17-A4T1U3
1.8 V ± 1.0%	S-1312D18-M5T1U3	S-1312D18-A4T2U3	S-1312D18-A4T1U3
1.85 V ± 1.0%	S-1312D1J-M5T1U3	S-1312D1J-A4T2U3	S-1312D1J-A4T1U3
1.9 V ± 1.0%	S-1312D19-M5T1U3	S-1312D19-A4T2U3	S-1312D19-A4T1U3
2.0 V ± 1.0%	S-1312D20-M5T1U3	S-1312D20-A4T2U3	S-1312D20-A4T1U3
2.1 V ± 1.0%	S-1312D21-M5T1U3	S-1312D21-A4T2U3	S-1312D21-A4T1U3
2.2 V ± 1.0%	S-1312D22-M5T1U3	S-1312D22-A4T2U3	S-1312D22-A4T1U3
2.3 V ± 1.0%	S-1312D23-M5T1U3	S-1312D23-A4T2U3	S-1312D23-A4T1U3
2.4 V ± 1.0%	S-1312D24-M5T1U3	S-1312D24-A4T2U3	S-1312D24-A4T1U3
2.5 V ± 1.0%	S-1312D25-M5T1U3	S-1312D25-A4T2U3	S-1312D25-A4T1U3
2.6 V ± 1.0%	S-1312D26-M5T1U3	S-1312D26-A4T2U3	S-1312D26-A4T1U3
2.7 V ± 1.0%	S-1312D27-M5T1U3	S-1312D27-A4T2U3	S-1312D27-A4T1U3
2.8 V ± 1.0%	S-1312D28-M5T1U3	S-1312D28-A4T2U3	S-1312D28-A4T1U3
2.85 V ± 1.0%	S-1312D2J-M5T1U3	S-1312D2J-A4T2U3	S-1312D2J-A4T1U3
2.9 V ± 1.0%	S-1312D29-M5T1U3	S-1312D29-A4T2U3	S-1312D29-A4T1U3
3.0 V ± 1.0%	S-1312D30-M5T1U3	S-1312D30-A4T2U3	S-1312D30-A4T1U3
3.1 V ± 1.0%	S-1312D31-M5T1U3	S-1312D31-A4T2U3	S-1312D31-A4T1U3
3.2 V ± 1.0%	S-1312D32-M5T1U3	S-1312D32-A4T2U3	S-1312D32-A4T1U3
3.3 V ± 1.0%	S-1312D33-M5T1U3	S-1312D33-A4T2U3	S-1312D33-A4T1U3
3.4 V ± 1.0%	S-1312D34-M5T1U3	S-1312D34-A4T2U3	S-1312D34-A4T1U3
3.5 V ± 1.0%	S-1312D35-M5T1U3	S-1312D35-A4T2U3	S-1312D35-A4T1U3

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





Top view



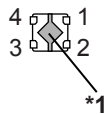
Pin No.	Symbol	Description
1	VIN	Input voltage pin
2	VSS	GND pin
3	ON / OFF	ON / OFF pin
4	NC	No connection
5	VOUT	Output voltage pin

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

Top view



Bottom view



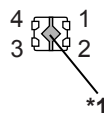
Pin No.	Symbol	Description
1	VOUT	Output voltage pin
2	VSS	GND pin
3	ON / OFF	ON / OFF pin
4	VIN	Input voltage pin

Connect the heat sink of backside at shadowed area to the board, and set electric potential GND.  
 However, do not use it as the function of electrode.

Top view



Bottom view



Pin No.	Symbol	Description
1	VOUT	Output voltage pin
2	VSS	GND pin
3	ON / OFF	ON / OFF pin
4	VIN	Input voltage pin

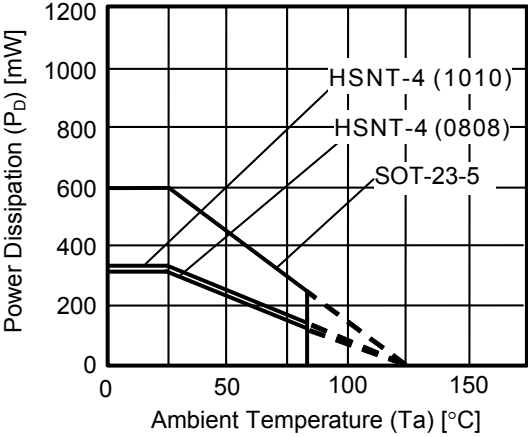
Connect the heat sink of backside at shadowed area to the board, and set electric potential GND.  
 However, do not use it as the function of electrode.

(Ta = +25°C unless otherwise specified)

Item	Symbol	Absolute Maximum Rating	Unit
Input voltage	$V_{IN}$	$V_{SS} - 0.3$ to $V_{SS} + 6.0$	V
	$V_{ON/OFF}$	$V_{SS} - 0.3$ to $V_{SS} + 6.0$	V
Output voltage	$V_{OUT}$	$V_{SS} - 0.3$ to $V_{IN} + 0.3$	V
Output current	$I_{OUT}$	180	mA
Power dissipation	SOT-23-5	600	mW
	HSNT-4 (1010)	340	mW
	HSNT-4 (0808)	335	mW
Operation ambient temperature	$T_{opr}$	-40 to +85	°C
Storage temperature	$T_{stg}$	-40 to +125	°C

When mounted on board  
 [Mounted board]

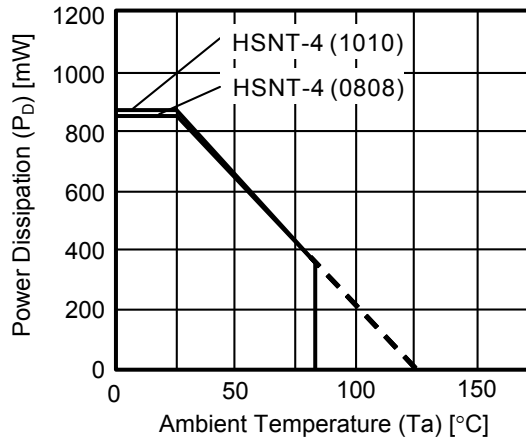
- (1) Board size: 114.3 mm × 76.2 mm × t1.6 mm
- (2) Name: JEDEC STANDARD51-7



Power dissipation of package differs depending on the mounting conditions.  
 Consider the power dissipation characteristics under the following conditions as reference.

[Mounted board]

- (1) Board size: 40 mm × 40 mm × t0.8 mm
  - (2) Board material: Glass epoxy resin (four layers)
  - (3) Wiring ratio: 50%
  - (4) Test conditions: When mounted on board (wind speed: 0 m/s)
  - (5) Land pattern: Refer to the recommended land pattern
- Drawing code: PL004-A-L-SD (HSNT-4 (1010)), PK004-A-L-SD (HSNT-4 (0808))



Condition	Power Dissipation (Reference)	Thermal Resistance Value ( $\theta_j-a$ )
HSNT-4 (1010) (When mounted on board)	870 mW	115°C/W
HSNT-4 (0808) (When mounted on board)	850 mW	117°C/W

(Ta = +25°C unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Output voltage	$V_{OUT(E)}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , $I_{OUT} = 30 \text{ mA}$	$1.0 \text{ V} \leq V_{OUT(S)} < 1.5 \text{ V}$	$V_{OUT(S)} - 0.015$	$V_{OUT(S)}$	$V_{OUT(S)} + 0.015$	V	1
			$1.5 \text{ V} \leq V_{OUT(S)} \leq 3.5 \text{ V}$	$V_{OUT(S)} \times 0.99$	$V_{OUT(S)}$	$V_{OUT(S)} \times 1.01$	V	1
Output current	$I_{OUT}$	$V_{IN} \geq V_{OUT(S)} + 1.0 \text{ V}$	150	–	–	mA	3	
Dropout voltage	$V_{drop}$	$I_{OUT} = 100 \text{ mA}$	$1.0 \text{ V} \leq V_{OUT(S)} < 1.1 \text{ V}$	0.50	0.68	0.86	V	1
			$1.1 \text{ V} \leq V_{OUT(S)} < 1.2 \text{ V}$	–	0.52	0.71	V	1
			$1.2 \text{ V} \leq V_{OUT(S)} < 1.3 \text{ V}$	–	0.31	0.63	V	1
			$1.3 \text{ V} \leq V_{OUT(S)} < 1.4 \text{ V}$	–	0.28	0.56	V	1
			$1.4 \text{ V} \leq V_{OUT(S)} < 1.5 \text{ V}$	–	0.26	0.50	V	1
			$1.5 \text{ V} \leq V_{OUT(S)} < 1.7 \text{ V}$	–	0.24	0.47	V	1
			$1.7 \text{ V} \leq V_{OUT(S)} < 2.0 \text{ V}$	–	0.22	0.43	V	1
			$2.0 \text{ V} \leq V_{OUT(S)} < 2.5 \text{ V}$	–	0.18	0.36	V	1
			$2.5 \text{ V} \leq V_{OUT(S)} < 3.0 \text{ V}$	–	0.16	0.32	V	1
			$3.0 \text{ V} \leq V_{OUT(S)} < 3.3 \text{ V}$	–	0.15	0.28	V	1
$3.3 \text{ V} \leq V_{OUT(S)} \leq 3.5 \text{ V}$	–	0.14	0.27	V	1			
Line regulation	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \cdot V_{OUT}}$	$1.0 \text{ V} \leq V_{OUT(S)} < 1.1 \text{ V}$ $1.6 \text{ V} \leq V_{IN} \leq 5.5 \text{ V}$ , $I_{OUT} = 30 \text{ mA}$	–	0.02	0.1	%/V	1	
	$\frac{\Delta V_{OUT2}}{\Delta V_{IN} \cdot V_{OUT}}$	$1.1 \text{ V} \leq V_{OUT(S)} \leq 3.5 \text{ V}$ $V_{OUT(S)} + 0.5 \text{ V} \leq V_{IN} \leq 5.5 \text{ V}$ , $I_{OUT} = 30 \text{ mA}$	–	0.02	0.1	%/V	1	
Load regulation	$\Delta V_{OUT2}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , $100 \mu\text{A} \leq I_{OUT} \leq 100 \text{ mA}$	–	20	40	mV	1	
Output voltage temperature coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a \cdot V_{OUT}}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , $I_{OUT} = 30 \text{ mA}$ , $-40^\circ\text{C} \leq T_a \leq +85^\circ\text{C}$	–	$\pm 130$	–	ppm/°C	1	
Current consumption during operation	$I_{SS1}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , ON / OFF pin = ON, no load	–	20	30	$\mu\text{A}$	2	
Current consumption during power-off	$I_{SS2}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , ON / OFF pin = OFF, no load	–	0.1	1.0	$\mu\text{A}$	2	
Input voltage	$V_{IN}$	–	1.5	–	5.5	V	–	
ON / OFF pin input voltage "H"	$V_{SH}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , $R_L = 1.0 \text{ k}\Omega$ determined by $V_{OUT}$ output level	1.0	–	–	V	4	
ON / OFF pin input voltage "L"	$V_{SL}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , $R_L = 1.0 \text{ k}\Omega$ determined by $V_{OUT}$ output level	–	–	0.25	V	4	
ON / OFF pin input current "H"	$I_{SH}$	$V_{IN} = 5.5 \text{ V}$ , $V_{ON/OFF} = 5.5 \text{ V}$	B / D type (without pull-down resistor)	–0.1	–	0.1	$\mu\text{A}$	4
			A / C type (with pull-down resistor)	1.0	2.5	5.0	$\mu\text{A}$	4
ON / OFF pin input current "L"	$I_{SL}$	$V_{IN} = 5.5 \text{ V}$ , $V_{ON/OFF} = 0 \text{ V}$	–0.1	–	0.1	$\mu\text{A}$	4	
Ripple rejection	$ RR $	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , $f = 1.0 \text{ kHz}$ , $\Delta V_{rip} = 0.5 \text{ Vrms}$ , $I_{OUT} = 30 \text{ mA}$	$1.0 \text{ V} \leq V_{OUT(S)} \leq 1.2 \text{ V}$	–	75	–	dB	5
			$1.2 \text{ V} < V_{OUT(S)} \leq 2.85 \text{ V}$	–	70	–	dB	5
			$2.85 \text{ V} < V_{OUT(S)} \leq 3.5 \text{ V}$	–	65	–	dB	5
Short-circuit current	$I_{short}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , ON / OFF pin = ON, $V_{OUT} = 0 \text{ V}$	–	50	–	mA	3	
Thermal shutdown detection temperature	$T_{SD}$	Junction temperature	–	150	–	°C	–	
Thermal shutdown release temperature	$T_{SR}$	Junction temperature	–	120	–	°C	–	
Discharge shunt resistance during power-off	$R_{LOW}$	$V_{OUT} = 0.1 \text{ V}$ , $V_{IN} = 5.5 \text{ V}$	–	35	–	$\Omega$	3	
Power-off pull-down resistance	$R_{PD}$	–	1.0	2.2	5.0	M $\Omega$	4	

$V_{OUT(S)}$ : Set output voltage

$V_{OUT(E)}$ : Actual output voltage

Output voltage when fixing  $I_{OUT}$  (= 30 mA) and inputting  $V_{OUT(S)} + 1.0$  V

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

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

$V_{OUT3}$  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.

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

$$\frac{\Delta V_{OUT}}{\Delta T_a} \text{ [mV/°C]} = V_{OUT(S)} \text{ [V]} \times \frac{\Delta V_{OUT}}{\Delta T_a \cdot V_{OUT}} \text{ [ppm/°C]} \div 1000$$

Change in temperature of output voltage

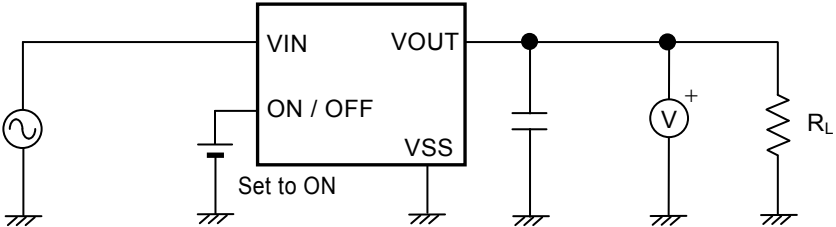
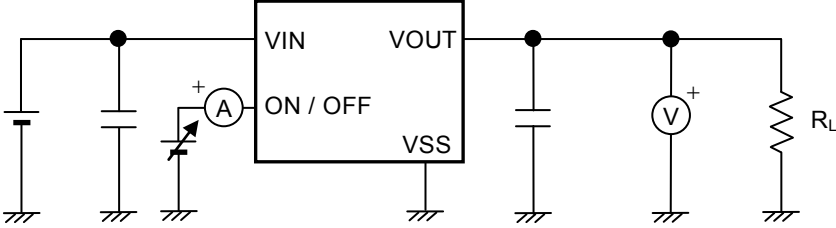
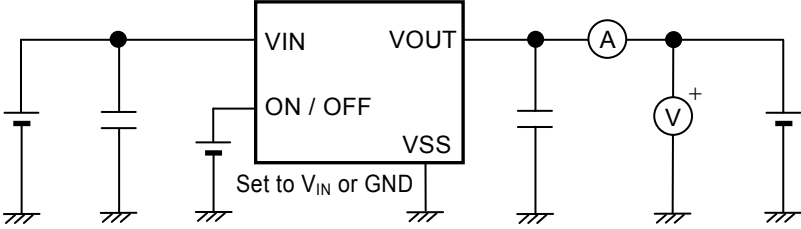
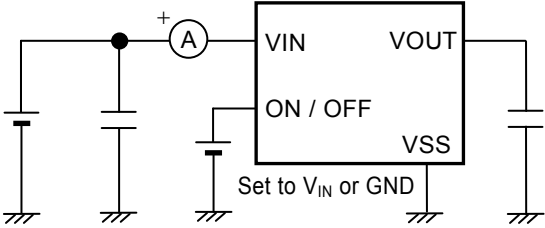
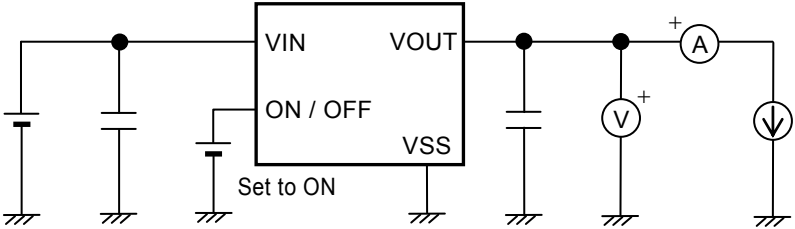
Set output voltage

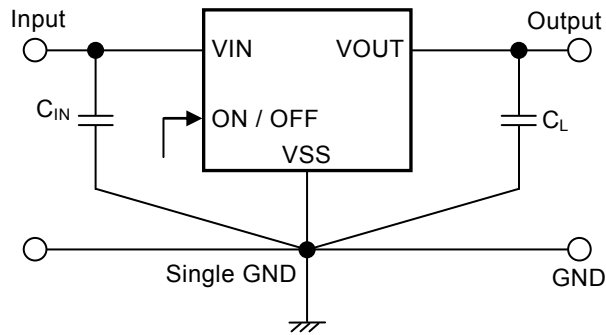
Output voltage temperature coefficient

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.





$C_{IN}$  is a capacitor for stabilizing the input.  
 A ceramic capacitor of  $0.22 \mu\text{F}$  or more can be used as  $C_L$ .

Input capacitor ( $C_{IN}$ ):  $0.22 \mu\text{F}$  or more  
 Output capacitor ( $C_L$ ):  $0.22 \mu\text{F}$  or more

The S-1312 Series requires an output capacitor between the VOUT pin and the VSS pin for phase compensation. Operation is stabilized by a ceramic capacitor with an output capacitance of  $0.22 \mu\text{F}$  or more over the entire temperature range. When using an OS capacitor, a tantalum capacitor, or an aluminum electrolytic capacitor, the capacitance must be  $0.22 \mu\text{F}$  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  $C_{IN} \geq 0.22 \mu\text{F}$ ,  $C_L \geq 0.22 \mu\text{F}$ ; however, when selecting the output capacitor, perform sufficient evaluation, including evaluation of temperature characteristics, on the actual device.



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

The accuracy of the output voltage is ensured at ±1.0% or ±15 mV under the specified conditions of fixed input voltage, fixed output current, and fixed temperature.

When  $V_{OUT} < 1.5 \text{ V}$ : ±15 mV, when  $V_{OUT} \geq 1.5 \text{ V}$ : ±1.0%  
Differs depending on the product.

■ " ■ " ■ "

$$\left( \frac{\Delta}{\Delta \bullet} \right)$$

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.

Δ

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.

Indicates the difference between input voltage ( $V_{IN1}$ ) 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  $V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ .

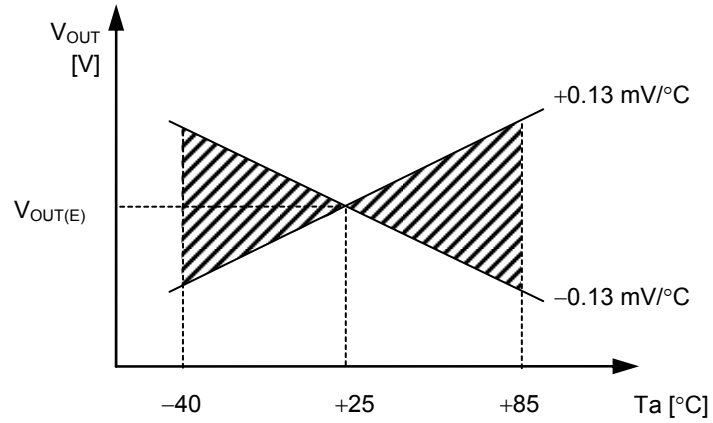
$$V_{drop} = V_{IN1} - (V_{OUT3} \times 0.98)$$



$$\left( \frac{\Delta}{\Delta \bullet} \right)$$

The shaded area in is the range where  $V_{OUT}$  varies in the operation temperature range when the output voltage temperature coefficient is  $\pm 130 \text{ ppm}/^\circ\text{C}$ .

Example of S-1312A10 typ. product



$V_{OUT(E)}$  is the value of the output voltage measured at  $T_a = +25^\circ\text{C}$ .

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

$$\frac{\Delta V_{OUT}}{\Delta T_a} \text{ [mV}/^\circ\text{C}] = V_{OUT(S)} \text{ [V]} \times \frac{\Delta V_{OUT}}{\Delta T_a \bullet V_{OUT}} \text{ [ppm}/^\circ\text{C}] \div 1000$$

- Change in temperature of output voltage
- Set output voltage
- Output voltage temperature coefficient



This pin starts and stops the regulator.

When the ON / OFF pin is set to OFF level, the entire internal circuit stops operating, and the built-in P-channel MOS FET output transistor between the VIN pin and the VOUT pin is turned off, reducing current consumption significantly.

Note that the current consumption increases when a voltage of 0.25 V to  $V_{IN} - 0.3$  V is applied to the ON / OFF pin. The ON / OFF pin is configured as shown in and .

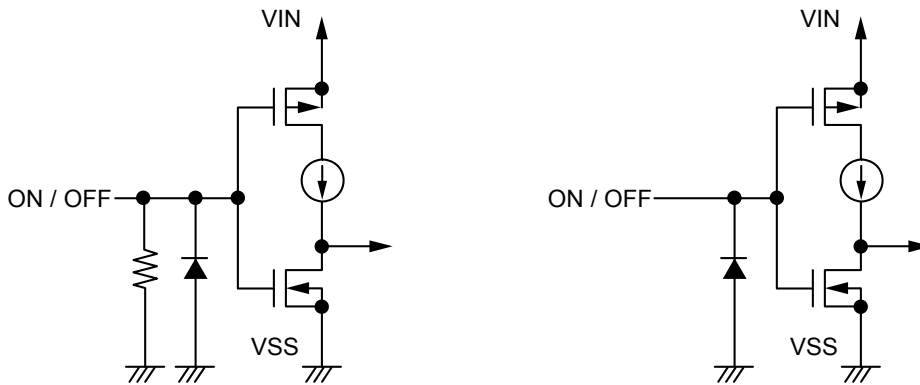
The ON / OFF pin is internally pulled down to the VSS pin in the floating status, so the VOUT pin is set to the  $V_{SS}$  level.

For the ON / OFF pin current, refer to the A / C type of the ON / OFF pin input current "H" in "■".

The ON / OFF pin is internally not pulled up or pulled down, so do not use this pin in the floating status. When not using the ON / OFF pin, connect the pin to the VIN pin.

Product Type	ON / OFF Pin	Internal Circuit	VOUT Pin Voltage	Current Consumption
A / B / C / D	"H": ON	Operate	Set value	$I_{SS1}$
A / B / C / D	"L": OFF	Stop	$V_{SS}$ level	$I_{SS2}$

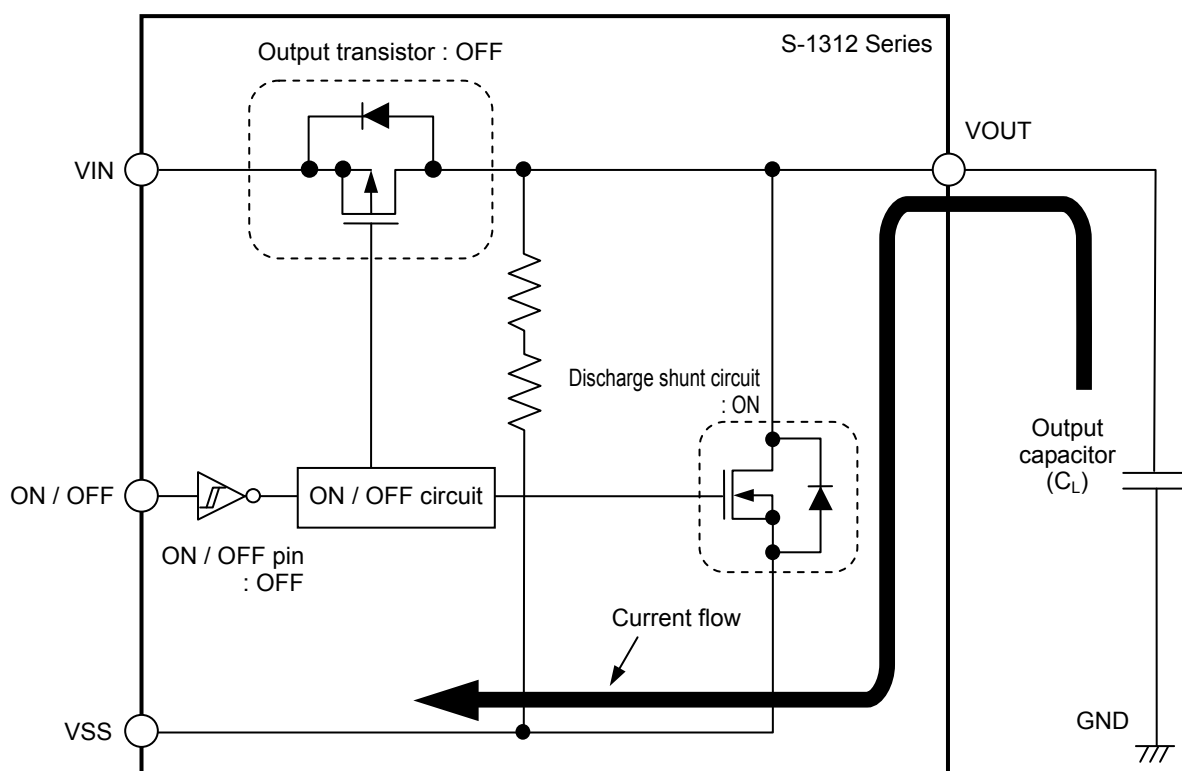
Note that the IC's current consumption increases as much as current flows into the pull-down resistor when the ON / OFF pin is connected to the VIN pin and the S-1312 Series A / C type is operating (refer to ).



The S-1312 Series A / B type has a built-in discharge shunt circuit to discharge the output capacitance. The output capacitance is discharged as follows so that the VOUT pin reaches the  $V_{SS}$  level.

- (1) The ON / OFF pin is set to OFF level.
- (2) The output transistor is turned off.
- (3) The discharge shunt circuit is turned on.
- (4) The output capacitor discharges.

Since the S-1312 Series C / D type does not have a discharge shunt circuit, the VOUT pin is set to the  $V_{SS}$  level through several hundred  $k\Omega$  internal divided resistors between the VOUT pin and the VSS pin. The S-1312 Series A / B type allows the VOUT pin to reach the  $V_{SS}$  level rapidly due to the discharge shunt circuit.



. Parasitic diode

The ON / OFF pin is internally pulled down to the VSS pin in the floating status, so the VOUT pin is set to the  $V_{SS}$  level.

Note that the IC's current consumption increases as much as current flows into the pull-down resistor of  $2.2\text{ M}\Omega$  typ. when the ON / OFF pin is connected to the VIN pin and the S-1312 Series A / C type is operating.

The S-1312 Series includes an overcurrent protection circuit having the characteristics shown in " + ° " in "■", in order to protect the output transistor against an excessive output current and short circuiting between the VOUT pin and the VSS pin. The current when the output pin is short-circuited ( $I_{short}$ ) is internally set at approx. 50 mA typ., and the normal value is restored for the output voltage, if releasing a short circuit once.

The S-1312 Series has a thermal shutdown circuit to protect the device from damage due to overheat. When the junction temperature rises to 150°C typ., the thermal shutdown circuit operates to stop regulating. When the junction temperature drops to 120°C typ., the thermal shutdown circuit is released to restart regulating. Due to self-heating of the S-1312 Series, if the thermal shutdown circuit starts operating, it stops regulating so that the output voltage drops. When regulation stops, the S-1312 Series does not itself generate heat and the IC's temperature drops. When the temperature drops, the thermal shutdown circuit is released to restart regulating, thus the S-1312 Series generates heat again. Repeating this procedure makes the waveform of the output voltage into a pulse-like form. Stop or restart of regulation continues unless decreasing either or both of the input voltage and the output current in order to reduce the internal power consumption, or decreasing the ambient temperature.

Thermal Shutdown Circuit	VOUT Pin Voltage
Operate: 150°C typ.	$V_{SS}$ level
Release: 120°C typ.	Set value

Junction temperature



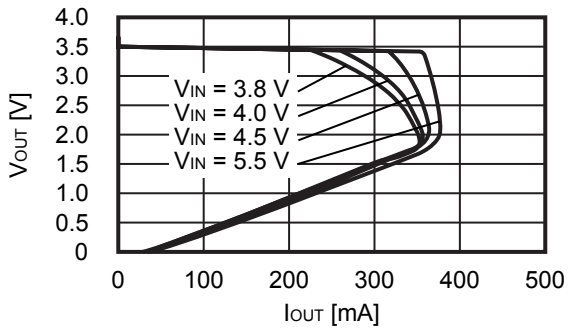
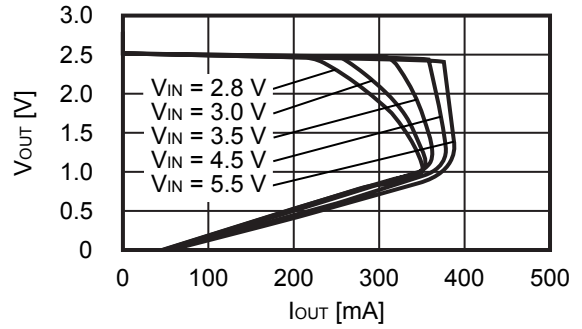
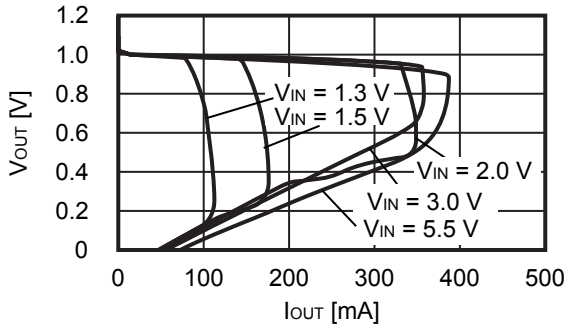
- Wiring patterns for the VIN pin, the VOUT pin and GND should be designed so that the impedance is low. When mounting an output capacitor between the VOUT pin and the VSS pin ( $C_L$ ) and a capacitor for stabilizing the input between the VIN pin and the VSS pin ( $C_{IN}$ ), the distance from the capacitors to these pins should be as short as possible.
- Note that generally the output voltage may increase when a series regulator is used at low load current (1.0 mA or less).
- Note that generally the output voltage may increase due to the leakage current from an output driver when a series regulator is used at high temperature.
- Note that the output voltage may increase due to the leakage current from an output driver even if the ON / OFF pin is at OFF level 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 the S-1312 Series. However, be sure to perform sufficient evaluation under the actual usage conditions for selection, including evaluation of temperature characteristics. Refer to " + ° " in "■" " for the equivalent series resistance ( $R_{ESR}$ ) of the output capacitor.

Input capacitor ( $C_{IN}$ ):	0.22 $\mu$ F or more
Output capacitor ( $C_L$ ):	0.22 $\mu$ F or more

- The voltage regulator may oscillate when the impedance of the power supply is high and the input capacitance is small or an input capacitor is not connected.
- If the output capacitance is small, power supply's fluctuation and the characteristics of load fluctuation become worse. Sufficiently evaluate the output voltage's fluctuation with the actual device.
- Overshoot may occur in the output voltage momentarily if the voltage is rapidly raised at power-on or when the power supply fluctuates. Sufficiently evaluate the output voltage at power-on with the actual device.
- The application conditions for the input voltage, the output voltage, and the 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 in



+ °



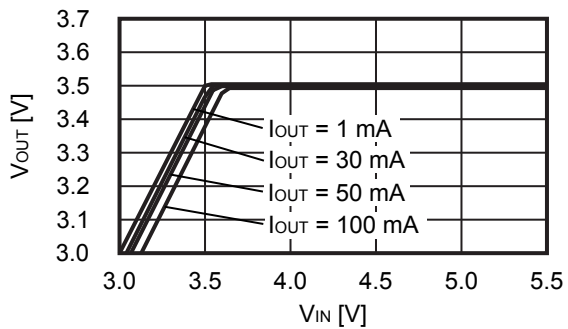
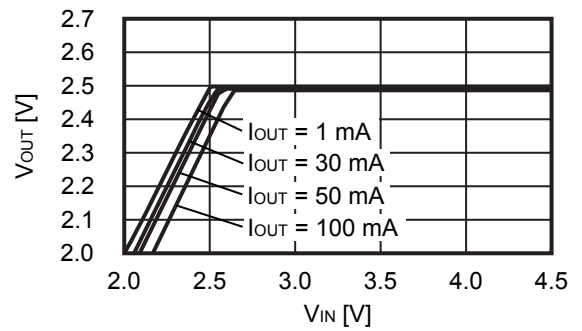
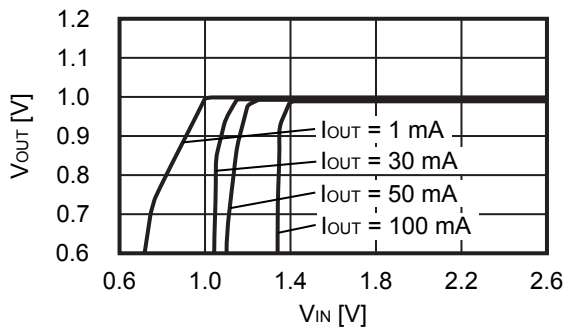
In determining the output current, attention should be paid to the following.

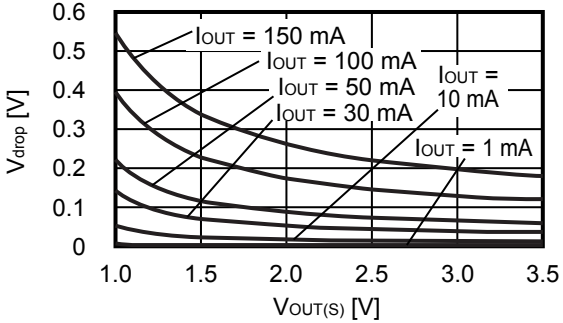
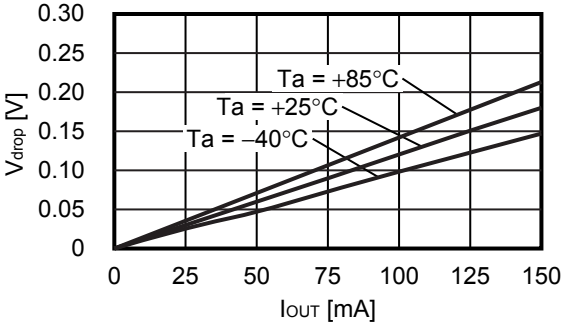
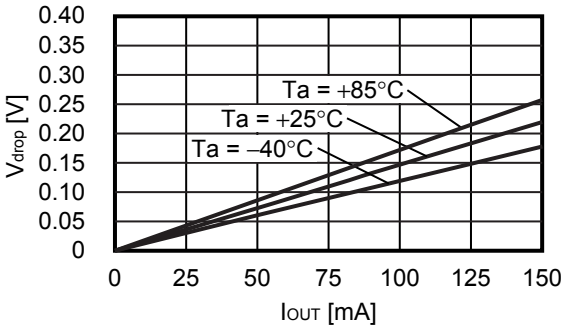
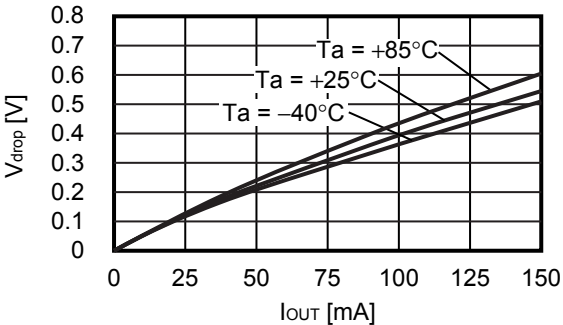
The minimum output current value and footnote in "■"

"

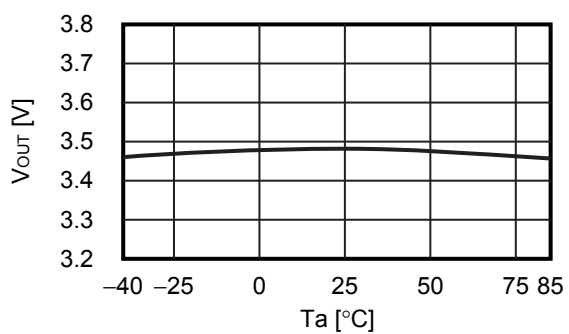
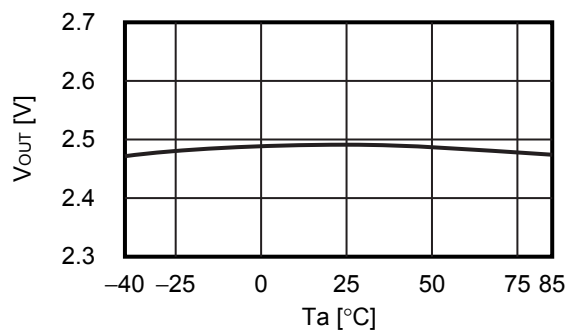
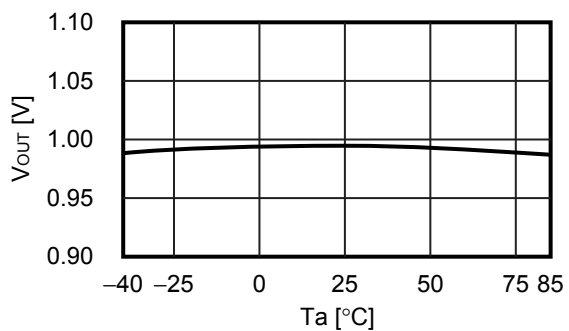
The package power dissipation

+ °



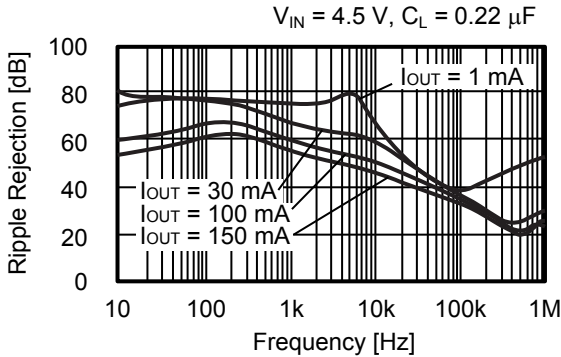
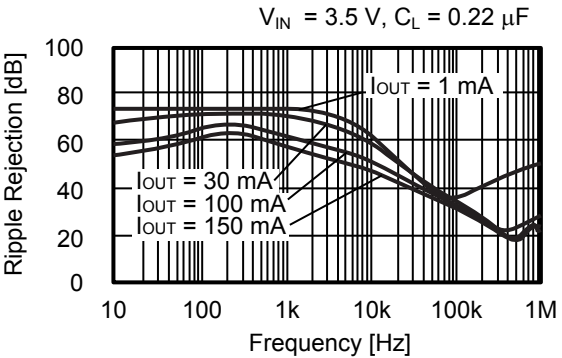
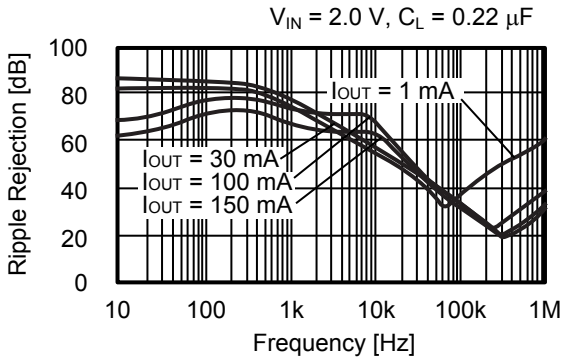






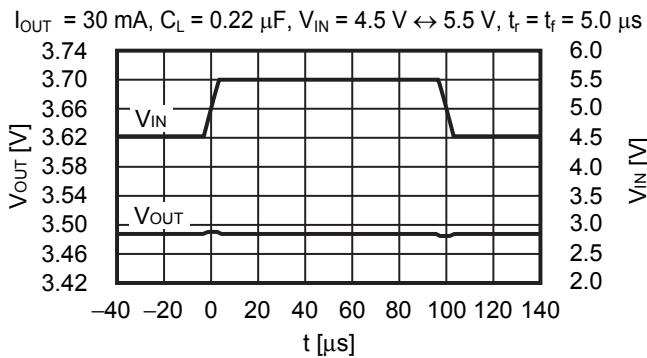
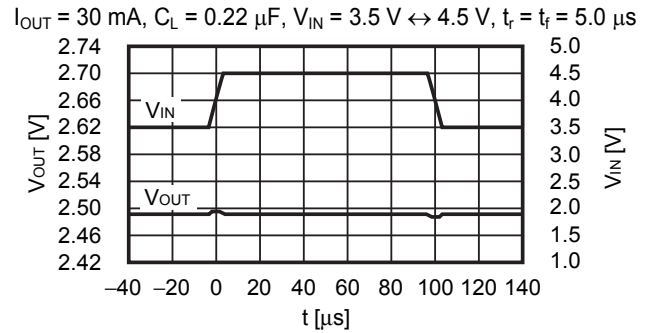
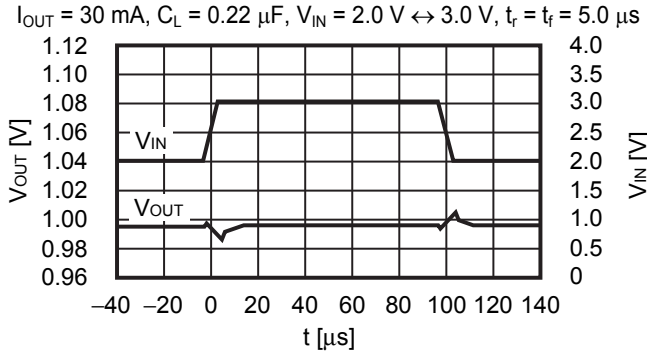
§

+

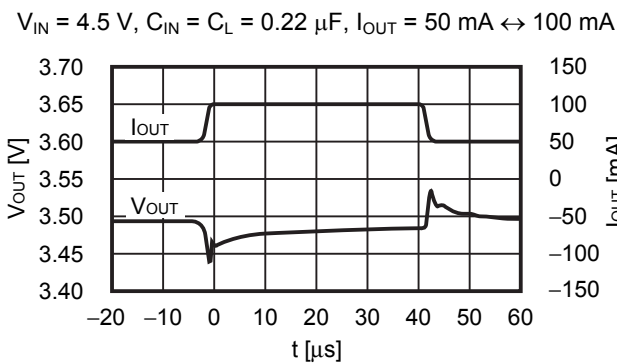
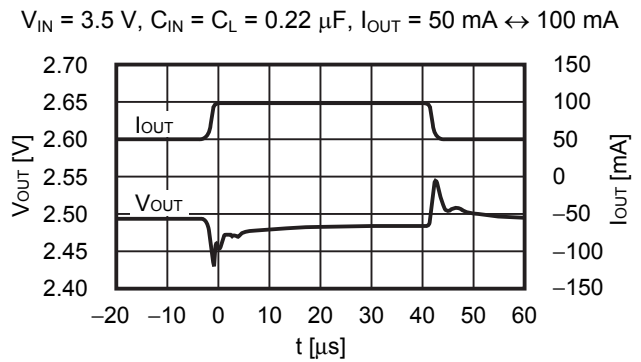
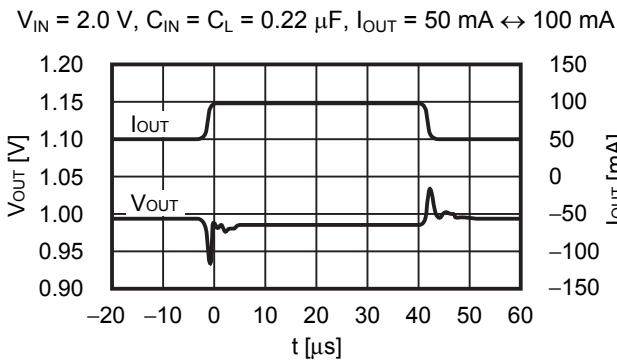




+

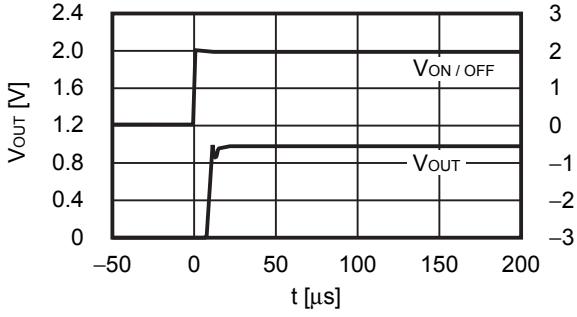


+

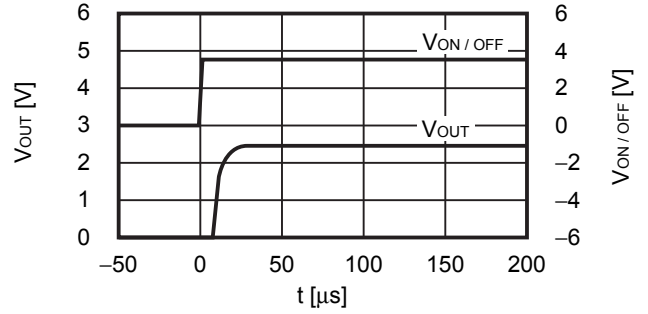


+

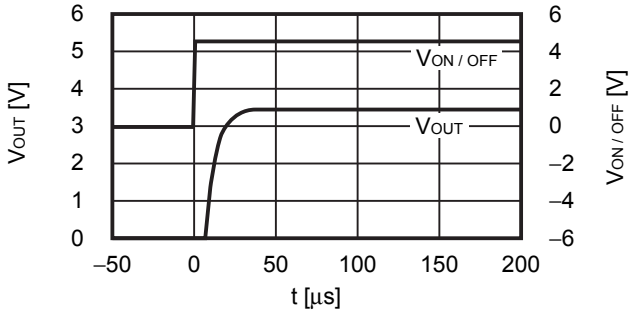
$V_{IN} = 2.0\text{ V}$ ,  $C_{IN} = C_L = 0.22\ \mu\text{F}$ ,  $I_{OUT} = 100\text{ mA}$ ,  
 $V_{ON/OFF} = 0\text{ V} \rightarrow 2.0\text{ V}$ ,  $t_r = 1.0\ \mu\text{s}$

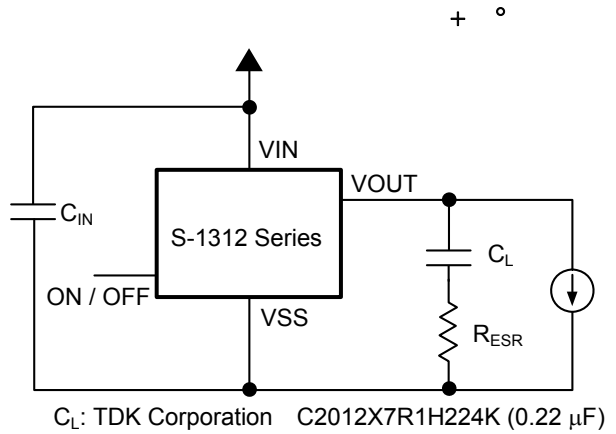
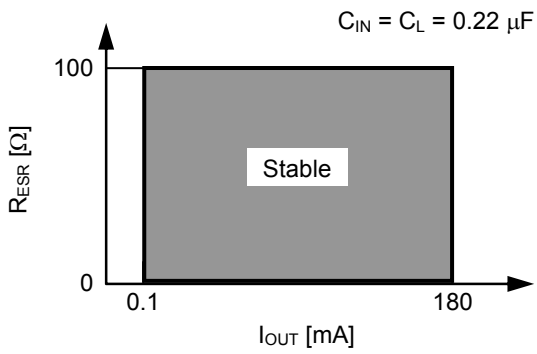
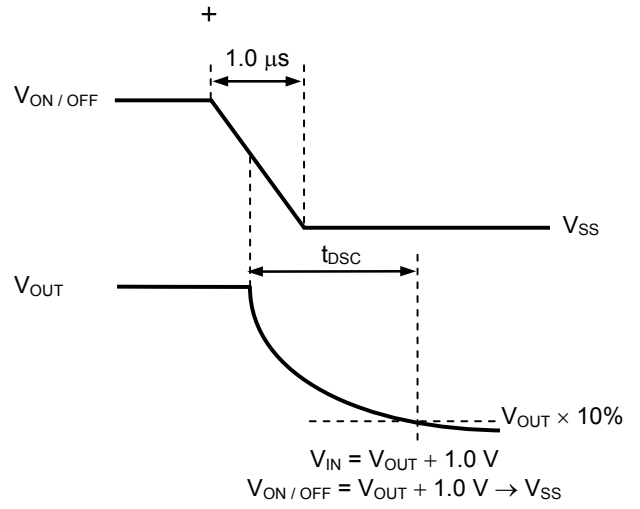
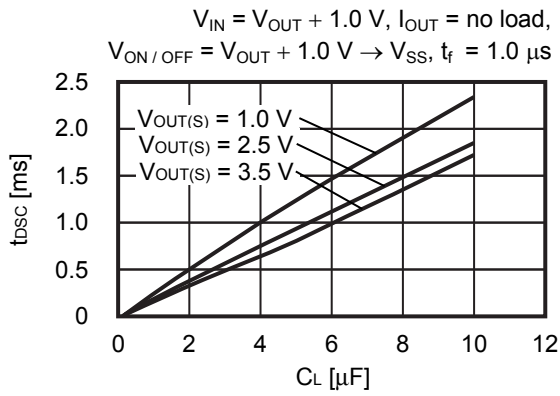


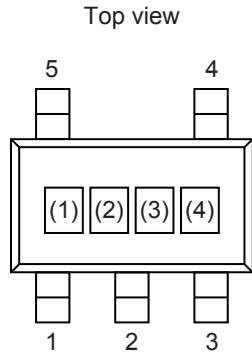
$V_{IN} = 3.5\text{ V}$ ,  $C_{IN} = C_L = 0.22\ \mu\text{F}$ ,  $I_{OUT} = 100\text{ mA}$ ,  
 $V_{ON/OFF} = 0\text{ V} \rightarrow 3.5\text{ V}$ ,  $t_r = 1.0\ \mu\text{s}$



$V_{IN} = 4.5\text{ V}$ ,  $C_{IN} = C_L = 0.22\ \mu\text{F}$ ,  $I_{OUT} = 100\text{ mA}$ ,  
 $V_{ON/OFF} = 0\text{ V} \rightarrow 4.5\text{ V}$ ,  $t_r = 1.0\ \mu\text{s}$







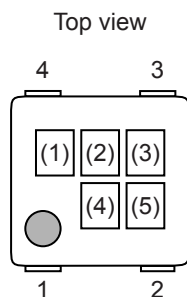
(1) to (3): Product code (Refer to )  
 (4): Lot number

Product Name	Product Code		
	(1)	(2)	(3)
S-1312A10-M5T1U3	1	D	A
S-1312A11-M5T1U3	1	D	B
S-1312A12-M5T1U3	1	D	C
S-1312A1C-M5T1U3	1	D	4
S-1312A13-M5T1U3	1	D	D
S-1312A14-M5T1U3	1	D	E
S-1312A15-M5T1U3	1	D	F
S-1312A16-M5T1U3	1	D	G
S-1312A17-M5T1U3	1	D	H
S-1312A18-M5T1U3	1	D	J
S-1312A1J-M5T1U3	1	D	K
S-1312A19-M5T1U3	1	D	L
S-1312A20-M5T1U3	1	D	M
S-1312A21-M5T1U3	1	D	N
S-1312A22-M5T1U3	1	D	O
S-1312A23-M5T1U3	1	D	P
S-1312A24-M5T1U3	1	D	Q
S-1312A25-M5T1U3	1	D	R
S-1312A26-M5T1U3	1	D	S
S-1312A27-M5T1U3	1	D	T
S-1312A28-M5T1U3	1	D	U
S-1312A2J-M5T1U3	1	D	V
S-1312A29-M5T1U3	1	D	W
S-1312A30-M5T1U3	1	D	X
S-1312A31-M5T1U3	1	D	Y
S-1312A32-M5T1U3	1	D	Z
S-1312A33-M5T1U3	1	D	1
S-1312A34-M5T1U3	1	D	2
S-1312A35-M5T1U3	1	D	3

Product Name	Product Code		
	(1)	(2)	(3)
S-1312B10-M5T1U3	1	E	A
S-1312B11-M5T1U3	1	E	B
S-1312B12-M5T1U3	1	E	C
S-1312B13-M5T1U3	1	E	D
S-1312B14-M5T1U3	1	E	E
S-1312B15-M5T1U3	1	E	F
S-1312B16-M5T1U3	1	E	G
S-1312B17-M5T1U3	1	E	H
S-1312B18-M5T1U3	1	E	J
S-1312B1J-M5T1U3	1	E	K
S-1312B19-M5T1U3	1	E	L
S-1312B20-M5T1U3	1	E	M
S-1312B21-M5T1U3	1	E	N
S-1312B22-M5T1U3	1	E	O
S-1312B23-M5T1U3	1	E	P
S-1312B24-M5T1U3	1	E	Q
S-1312B25-M5T1U3	1	E	R
S-1312B26-M5T1U3	1	E	S
S-1312B27-M5T1U3	1	E	T
S-1312B28-M5T1U3	1	E	U
S-1312B2J-M5T1U3	1	E	V
S-1312B29-M5T1U3	1	E	W
S-1312B30-M5T1U3	1	E	X
S-1312B31-M5T1U3	1	E	Y
S-1312B32-M5T1U3	1	E	Z
S-1312B33-M5T1U3	1	E	1
S-1312B34-M5T1U3	1	E	2
S-1312B35-M5T1U3	1	E	3

Product Name	Product Code		
	(1)	(2)	(3)
S-1312C10-M5T1U3	1	F	A
S-1312C11-M5T1U3	1	F	B
S-1312C12-M5T1U3	1	F	C
S-1312C13-M5T1U3	1	F	D
S-1312C14-M5T1U3	1	F	E
S-1312C15-M5T1U3	1	F	F
S-1312C16-M5T1U3	1	F	G
S-1312C17-M5T1U3	1	F	H
S-1312C18-M5T1U3	1	F	J
S-1312C1J-M5T1U3	1	F	K
S-1312C19-M5T1U3	1	F	L
S-1312C20-M5T1U3	1	F	M
S-1312C21-M5T1U3	1	F	N
S-1312C22-M5T1U3	1	F	O
S-1312C23-M5T1U3	1	F	P
S-1312C24-M5T1U3	1	F	Q
S-1312C25-M5T1U3	1	F	R
S-1312C26-M5T1U3	1	F	S
S-1312C27-M5T1U3	1	F	T
S-1312C28-M5T1U3	1	F	U
S-1312C2J-M5T1U3	1	F	V
S-1312C29-M5T1U3	1	F	W
S-1312C30-M5T1U3	1	F	X
S-1312C31-M5T1U3	1	F	Y
S-1312C32-M5T1U3	1	F	Z
S-1312C33-M5T1U3	1	F	1
S-1312C34-M5T1U3	1	F	2
S-1312C35-M5T1U3	1	F	3

Product Name	Product Code		
	(1)	(2)	(3)
S-1312D10-M5T1U3	1	G	A
S-1312D11-M5T1U3	1	G	B
S-1312D12-M5T1U3	1	G	C
S-1312D13-M5T1U3	1	G	D
S-1312D14-M5T1U3	1	G	E
S-1312D15-M5T1U3	1	G	F
S-1312D16-M5T1U3	1	G	G
S-1312D17-M5T1U3	1	G	H
S-1312D18-M5T1U3	1	G	J
S-1312D1J-M5T1U3	1	G	K
S-1312D19-M5T1U3	1	G	L
S-1312D20-M5T1U3	1	G	M
S-1312D21-M5T1U3	1	G	N
S-1312D22-M5T1U3	1	G	O
S-1312D23-M5T1U3	1	G	P
S-1312D24-M5T1U3	1	G	Q
S-1312D25-M5T1U3	1	G	R
S-1312D26-M5T1U3	1	G	S
S-1312D27-M5T1U3	1	G	T
S-1312D28-M5T1U3	1	G	U
S-1312D2J-M5T1U3	1	G	V
S-1312D29-M5T1U3	1	G	W
S-1312D30-M5T1U3	1	G	X
S-1312D31-M5T1U3	1	G	Y
S-1312D32-M5T1U3	1	G	Z
S-1312D33-M5T1U3	1	G	1
S-1312D34-M5T1U3	1	G	2
S-1312D35-M5T1U3	1	G	3



(1) to (3): Product code (Refer to )  
 (4), (5): Lot number

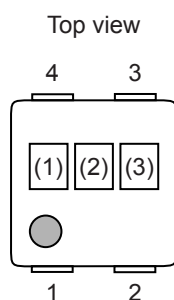
Product Name	Product Code		
	(1)	(2)	(3)
S-1312A10-A4T2U3	1	D	A
S-1312A11-A4T2U3	1	D	B
S-1312A12-A4T2U3	1	D	C
S-1312A1C-A4T2U3	1	D	4
S-1312A13-A4T2U3	1	D	D
S-1312A14-A4T2U3	1	D	E
S-1312A15-A4T2U3	1	D	F
S-1312A16-A4T2U3	1	D	G
S-1312A17-A4T2U3	1	D	H
S-1312A18-A4T2U3	1	D	J
S-1312A1J-A4T2U3	1	D	K
S-1312A19-A4T2U3	1	D	L
S-1312A20-A4T2U3	1	D	M
S-1312A21-A4T2U3	1	D	N
S-1312A22-A4T2U3	1	D	O
S-1312A23-A4T2U3	1	D	P
S-1312A24-A4T2U3	1	D	Q
S-1312A25-A4T2U3	1	D	R
S-1312A26-A4T2U3	1	D	S
S-1312A27-A4T2U3	1	D	T
S-1312A28-A4T2U3	1	D	U
S-1312A2J-A4T2U3	1	D	V
S-1312A29-A4T2U3	1	D	W
S-1312A30-A4T2U3	1	D	X
S-1312A31-A4T2U3	1	D	Y
S-1312A32-A4T2U3	1	D	Z
S-1312A33-A4T2U3	1	D	1
S-1312A34-A4T2U3	1	D	2
S-1312A35-A4T2U3	1	D	3

Product Name	Product Code		
	(1)	(2)	(3)
S-1312B10-A4T2U3	1	E	A
S-1312B11-A4T2U3	1	E	B
S-1312B12-A4T2U3	1	E	C
S-1312B13-A4T2U3	1	E	D
S-1312B14-A4T2U3	1	E	E
S-1312B15-A4T2U3	1	E	F
S-1312B16-A4T2U3	1	E	G
S-1312B17-A4T2U3	1	E	H
S-1312B18-A4T2U3	1	E	J
S-1312B1J-A4T2U3	1	E	K
S-1312B19-A4T2U3	1	E	L
S-1312B20-A4T2U3	1	E	M
S-1312B21-A4T2U3	1	E	N
S-1312B22-A4T2U3	1	E	O
S-1312B23-A4T2U3	1	E	P
S-1312B24-A4T2U3	1	E	Q
S-1312B25-A4T2U3	1	E	R
S-1312B26-A4T2U3	1	E	S
S-1312B27-A4T2U3	1	E	T
S-1312B28-A4T2U3	1	E	U
S-1312B2J-A4T2U3	1	E	V
S-1312B29-A4T2U3	1	E	W
S-1312B30-A4T2U3	1	E	X
S-1312B31-A4T2U3	1	E	Y
S-1312B32-A4T2U3	1	E	Z
S-1312B33-A4T2U3	1	E	1
S-1312B34-A4T2U3	1	E	2
S-1312B35-A4T2U3	1	E	3



Product Name	Product Code		
	(1)	(2)	(3)
S-1312C10-A4T2U3	1	F	A
S-1312C11-A4T2U3	1	F	B
S-1312C12-A4T2U3	1	F	C
S-1312C13-A4T2U3	1	F	D
S-1312C14-A4T2U3	1	F	E
S-1312C15-A4T2U3	1	F	F
S-1312C16-A4T2U3	1	F	G
S-1312C17-A4T2U3	1	F	H
S-1312C18-A4T2U3	1	F	J
S-1312C1J-A4T2U3	1	F	K
S-1312C19-A4T2U3	1	F	L
S-1312C20-A4T2U3	1	F	M
S-1312C21-A4T2U3	1	F	N
S-1312C22-A4T2U3	1	F	O
S-1312C23-A4T2U3	1	F	P
S-1312C24-A4T2U3	1	F	Q
S-1312C25-A4T2U3	1	F	R
S-1312C26-A4T2U3	1	F	S
S-1312C27-A4T2U3	1	F	T
S-1312C28-A4T2U3	1	F	U
S-1312C2J-A4T2U3	1	F	V
S-1312C29-A4T2U3	1	F	W
S-1312C30-A4T2U3	1	F	X
S-1312C31-A4T2U3	1	F	Y
S-1312C32-A4T2U3	1	F	Z
S-1312C33-A4T2U3	1	F	1
S-1312C34-A4T2U3	1	F	2
S-1312C35-A4T2U3	1	F	3

Product Name	Product Code		
	(1)	(2)	(3)
S-1312D10-A4T2U3	1	G	A
S-1312D11-A4T2U3	1	G	B
S-1312D12-A4T2U3	1	G	C
S-1312D13-A4T2U3	1	G	D
S-1312D14-A4T2U3	1	G	E
S-1312D15-A4T2U3	1	G	F
S-1312D16-A4T2U3	1	G	G
S-1312D17-A4T2U3	1	G	H
S-1312D18-A4T2U3	1	G	J
S-1312D1J-A4T2U3	1	G	K
S-1312D19-A4T2U3	1	G	L
S-1312D20-A4T2U3	1	G	M
S-1312D21-A4T2U3	1	G	N
S-1312D22-A4T2U3	1	G	O
S-1312D23-A4T2U3	1	G	P
S-1312D24-A4T2U3	1	G	Q
S-1312D25-A4T2U3	1	G	R
S-1312D26-A4T2U3	1	G	S
S-1312D27-A4T2U3	1	G	T
S-1312D28-A4T2U3	1	G	U
S-1312D2J-A4T2U3	1	G	V
S-1312D29-A4T2U3	1	G	W
S-1312D30-A4T2U3	1	G	X
S-1312D31-A4T2U3	1	G	Y
S-1312D32-A4T2U3	1	G	Z
S-1312D33-A4T2U3	1	G	1
S-1312D34-A4T2U3	1	G	2
S-1312D35-A4T2U3	1	G	3



(1) to (3): Product code (Refer to )

Product Name	Product Code		
	(1)	(2)	(3)
S-1312A10-A4T1U3	1	D	A
S-1312A11-A4T1U3	1	D	B
S-1312A12-A4T1U3	1	D	C
S-1312A1C-A4T1U3	1	D	4
S-1312A13-A4T1U3	1	D	D
S-1312A14-A4T1U3	1	D	E
S-1312A15-A4T1U3	1	D	F
S-1312A16-A4T1U3	1	D	G
S-1312A17-A4T1U3	1	D	H
S-1312A18-A4T1U3	1	D	J
S-1312A1J-A4T1U3	1	D	K
S-1312A19-A4T1U3	1	D	L
S-1312A20-A4T1U3	1	D	M
S-1312A21-A4T1U3	1	D	N
S-1312A22-A4T1U3	1	D	O
S-1312A23-A4T1U3	1	D	P
S-1312A24-A4T1U3	1	D	Q
S-1312A25-A4T1U3	1	D	R
S-1312A26-A4T1U3	1	D	S
S-1312A27-A4T1U3	1	D	T
S-1312A28-A4T1U3	1	D	U
S-1312A2J-A4T1U3	1	D	V
S-1312A29-A4T1U3	1	D	W
S-1312A30-A4T1U3	1	D	X
S-1312A31-A4T1U3	1	D	Y
S-1312A32-A4T1U3	1	D	Z
S-1312A33-A4T1U3	1	D	1
S-1312A34-A4T1U3	1	D	2
S-1312A35-A4T1U3	1	D	3

Product Name	Product Code		
	(1)	(2)	(3)
S-1312B10-A4T1U3	1	E	A
S-1312B11-A4T1U3	1	E	B
S-1312B12-A4T1U3	1	E	C
S-1312B13-A4T1U3	1	E	D
S-1312B14-A4T1U3	1	E	E
S-1312B15-A4T1U3	1	E	F
S-1312B16-A4T1U3	1	E	G
S-1312B17-A4T1U3	1	E	H
S-1312B18-A4T1U3	1	E	J
S-1312B1J-A4T1U3	1	E	K
S-1312B19-A4T1U3	1	E	L
S-1312B20-A4T1U3	1	E	M
S-1312B21-A4T1U3	1	E	N
S-1312B22-A4T1U3	1	E	O
S-1312B23-A4T1U3	1	E	P
S-1312B24-A4T1U3	1	E	Q
S-1312B25-A4T1U3	1	E	R
S-1312B26-A4T1U3	1	E	S
S-1312B27-A4T1U3	1	E	T
S-1312B28-A4T1U3	1	E	U
S-1312B2J-A4T1U3	1	E	V
S-1312B29-A4T1U3	1	E	W
S-1312B30-A4T1U3	1	E	X
S-1312B31-A4T1U3	1	E	Y
S-1312B32-A4T1U3	1	E	Z
S-1312B33-A4T1U3	1	E	1
S-1312B34-A4T1U3	1	E	2
S-1312B35-A4T1U3	1	E	3

Product Name	Product Code		
	(1)	(2)	(3)
S-1312C10-A4T1U3	1	F	A
S-1312C11-A4T1U3	1	F	B
S-1312C12-A4T1U3	1	F	C
S-1312C13-A4T1U3	1	F	D
S-1312C14-A4T1U3	1	F	E
S-1312C15-A4T1U3	1	F	F
S-1312C16-A4T1U3	1	F	G
S-1312C17-A4T1U3	1	F	H
S-1312C18-A4T1U3	1	F	J
S-1312C1J-A4T1U3	1	F	K
S-1312C19-A4T1U3	1	F	L
S-1312C20-A4T1U3	1	F	M
S-1312C21-A4T1U3	1	F	N
S-1312C22-A4T1U3	1	F	O
S-1312C23-A4T1U3	1	F	P
S-1312C24-A4T1U3	1	F	Q
S-1312C25-A4T1U3	1	F	R
S-1312C26-A4T1U3	1	F	S
S-1312C27-A4T1U3	1	F	T
S-1312C28-A4T1U3	1	F	U
S-1312C2J-A4T1U3	1	F	V
S-1312C29-A4T1U3	1	F	W
S-1312C30-A4T1U3	1	F	X
S-1312C31-A4T1U3	1	F	Y
S-1312C32-A4T1U3	1	F	Z
S-1312C33-A4T1U3	1	F	1
S-1312C34-A4T1U3	1	F	2
S-1312C35-A4T1U3	1	F	3

Product Name	Product Code		
	(1)	(2)	(3)
S-1312D10-A4T1U3	1	G	A
S-1312D11-A4T1U3	1	G	B
S-1312D12-A4T1U3	1	G	C
S-1312D13-A4T1U3	1	G	D
S-1312D14-A4T1U3	1	G	E
S-1312D15-A4T1U3	1	G	F
S-1312D16-A4T1U3	1	G	G
S-1312D17-A4T1U3	1	G	H
S-1312D18-A4T1U3	1	G	J
S-1312D1J-A4T1U3	1	G	K
S-1312D19-A4T1U3	1	G	L
S-1312D20-A4T1U3	1	G	M
S-1312D21-A4T1U3	1	G	N
S-1312D22-A4T1U3	1	G	O
S-1312D23-A4T1U3	1	G	P
S-1312D24-A4T1U3	1	G	Q
S-1312D25-A4T1U3	1	G	R
S-1312D26-A4T1U3	1	G	S
S-1312D27-A4T1U3	1	G	T
S-1312D28-A4T1U3	1	G	U
S-1312D2J-A4T1U3	1	G	V
S-1312D29-A4T1U3	1	G	W
S-1312D30-A4T1U3	1	G	X
S-1312D31-A4T1U3	1	G	Y
S-1312D32-A4T1U3	1	G	Z
S-1312D33-A4T1U3	1	G	1
S-1312D34-A4T1U3	1	G	2
S-1312D35-A4T1U3	1	G	3



No. MP005-A-P-SD-1.3

TITLE	SOT235-A-PKG Dimensions
No.	MP005-A-P-SD-1.3
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	



Feed direction →

No. MP005-A-C-SD-2.1

TITLE	SOT235-A-Carrier Tape
No.	MP005-A-C-SD-2.1
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	

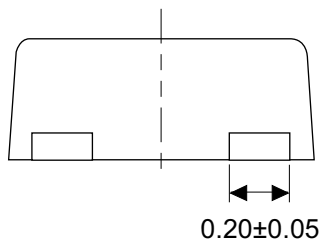
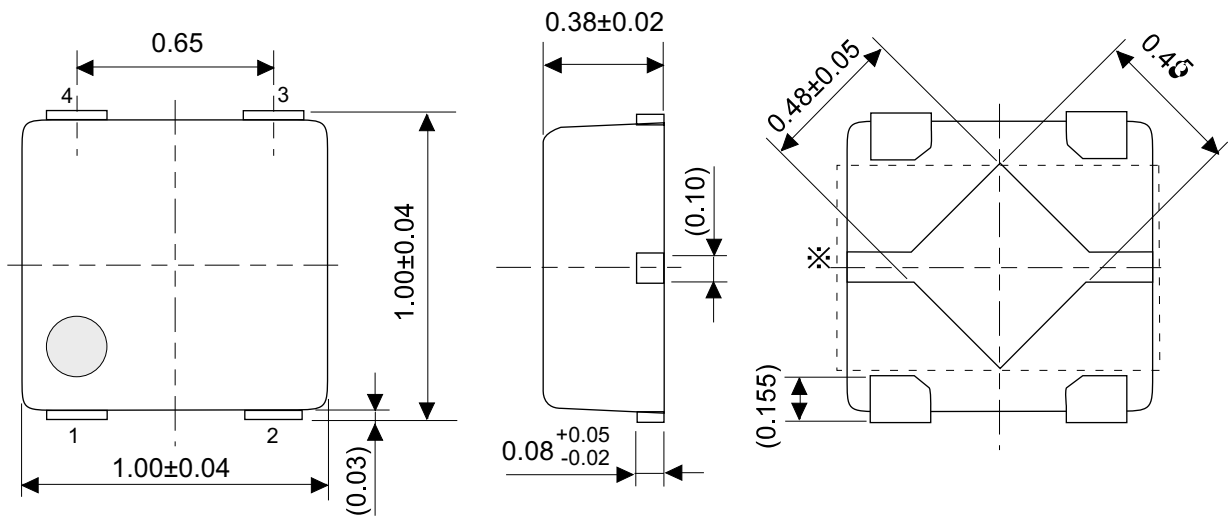


Enlarged drawing in the central part



No. MP005-A-R-SD-1.1

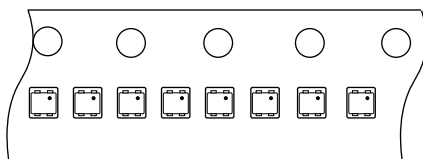
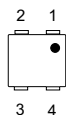
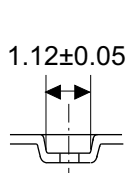
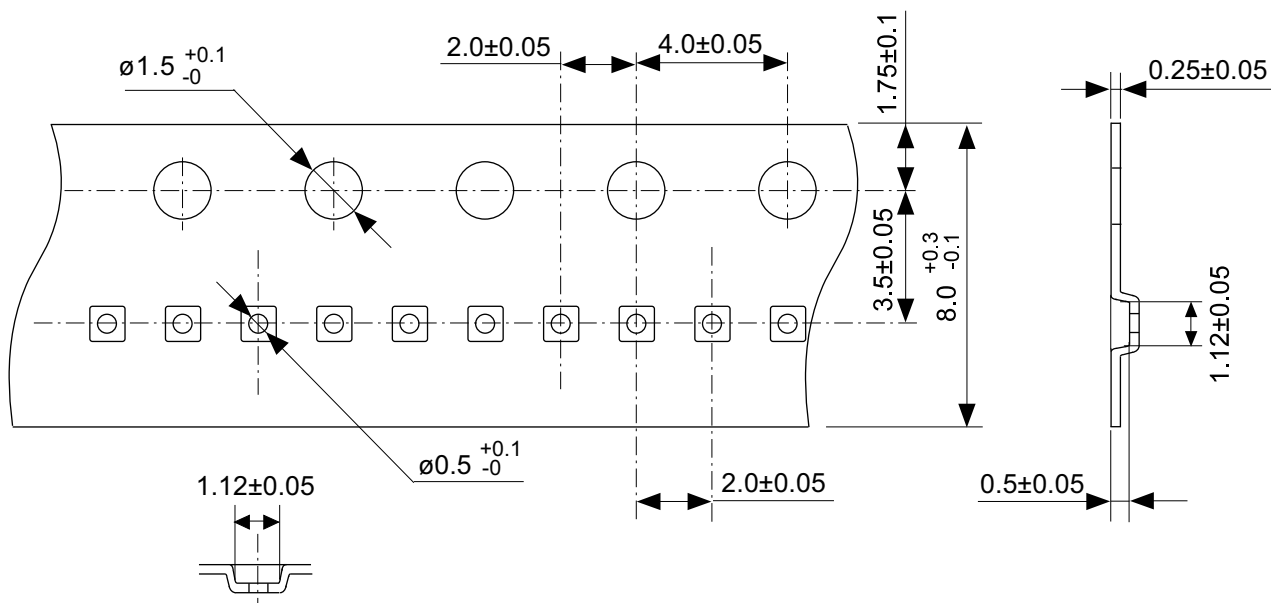
TITLE	SOT235-A-Reel		
No.	MP005-A-R-SD-1.1		
ANGLE		QTY.	3,000
UNIT	mm		
<b>ABLIC Inc.</b>			



※ The heat sink of back side has different electric potential depending on the product.  
 Confirm specifications of each product.  
 Do not use it as the function of electrode.

No. PL004-A-P-SD-1.1

TITLE	HSNT-4-B-PKG Dimensions
No.	PL004-A-P-SD-1.1
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	

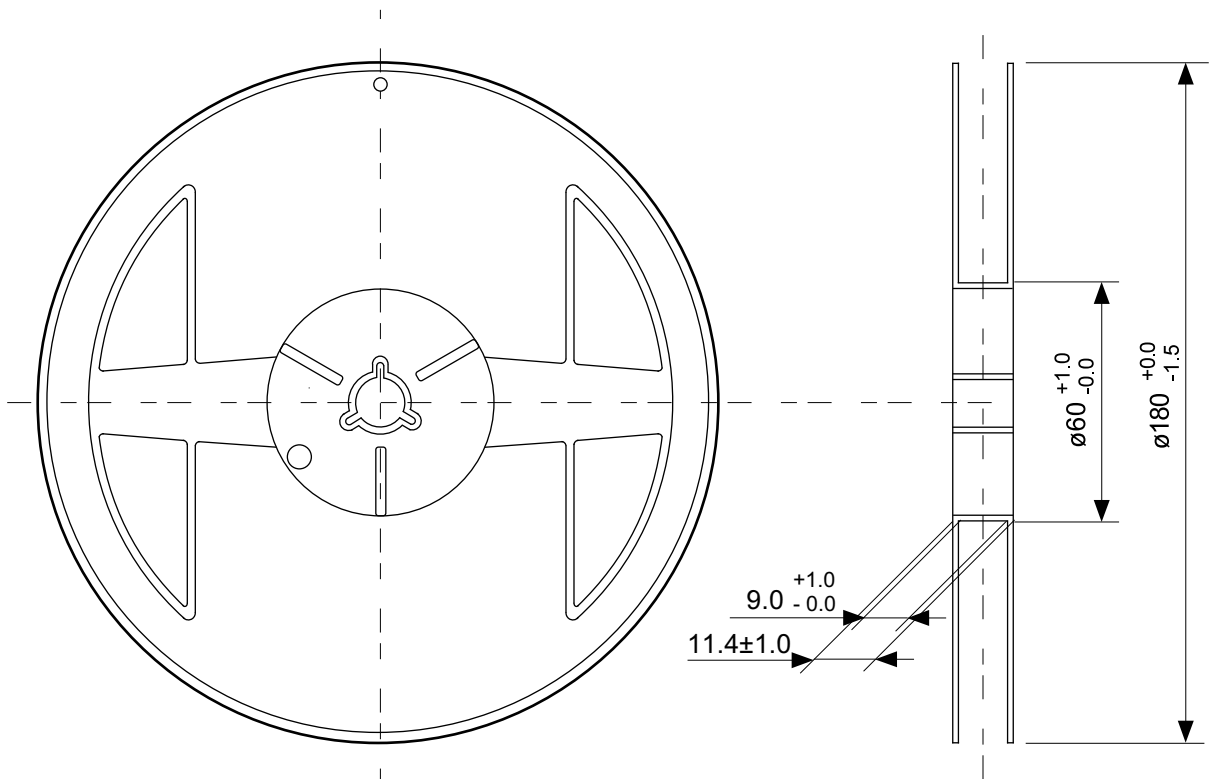


→  
Feed direction

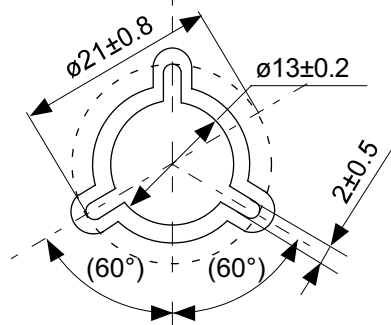
No. PL004-A-C-SD-2.0

TITLE	HSNT-4-B-Carrier Tape
No.	PL004-A-C-SD-2.0
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	





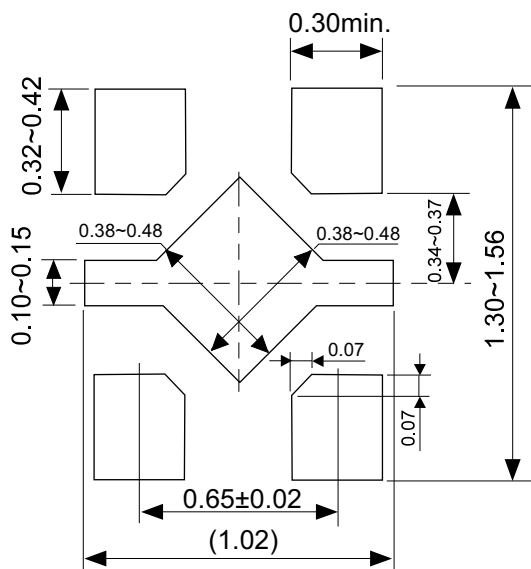
Enlarged drawing in the central part



No. PL004-A-R-SD-1.0

TITLE	HSNT-4-B-Reel		
No.	PL004-A-R-SD-1.0		
ANGLE		QTY.	10,000
UNIT	mm		
<b>ABLIC Inc.</b>			

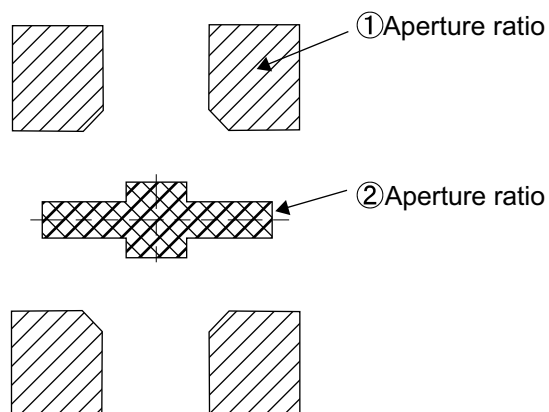
## Land Pattern



Caution It is recommended to solder the heat sink to a board in order to ensure the heat radiation.

注意 放熱性を確保する為に、PKGの裏面放熱板(ヒートシンク)を基板に半田付けする事を推奨いたします。

## Metal Mask Pattern

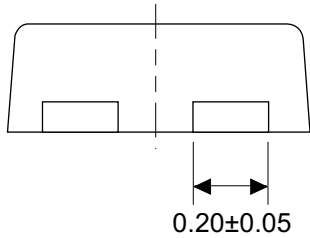
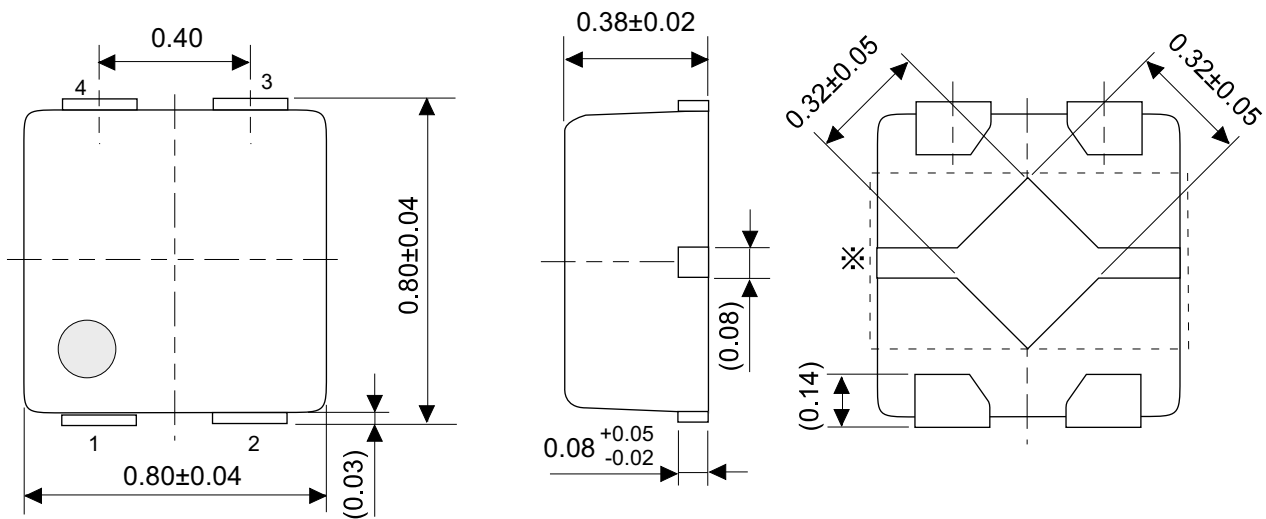


- Caution
- ① Mask aperture ratio of the lead mounting part is 100%.
  - ② Mask aperture ratio of the heat sink mounting part is 40%.
  - ③ Mask thickness: t0.10mm to 0.12 mm

- 注意
- ①リード実装部のマスク開口率は100%です。
  - ②放熱板実装のマスク開口率は40%です。
  - ③マスク厚み : t0.10mm ~ 0.12 mm

No. PL004-A-L-SD-2.0

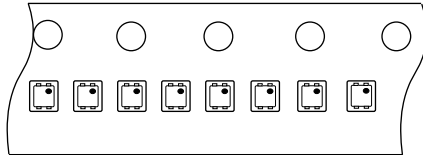
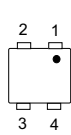
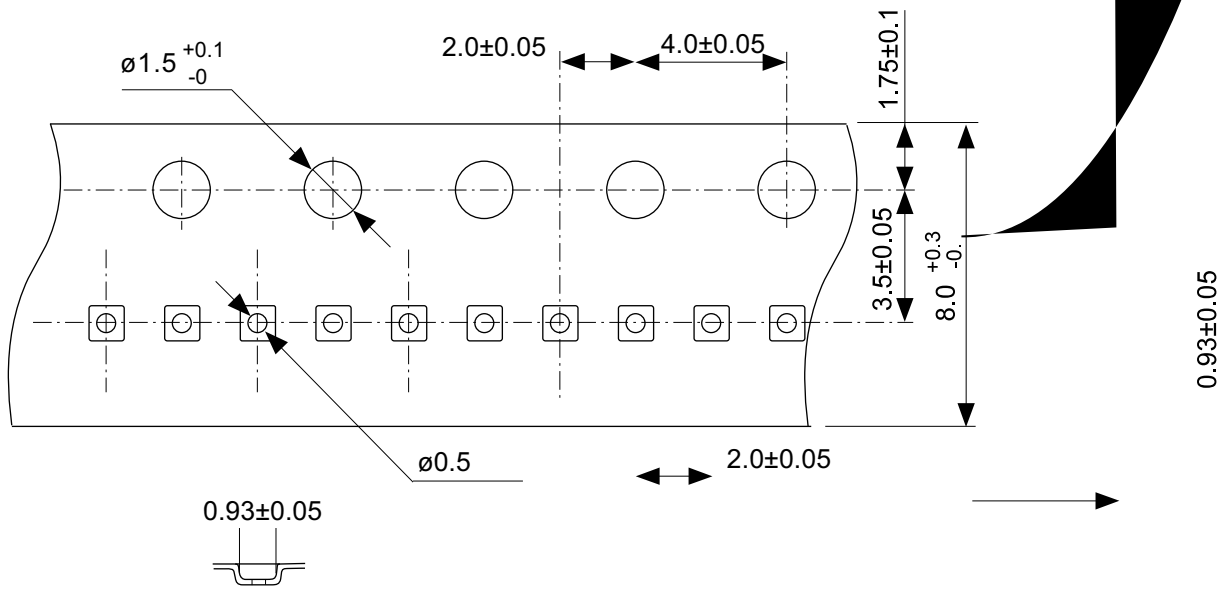
TITLE	HSNT-4-B -Land Recommendation
No.	PL004-A-L-SD-2.0
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	



※ The heat sink of back side has different electric potential depending on the product. Confirm specifications of each product. Do not use it as the function of electrode.

No. PK004-A-P-SD-2.1

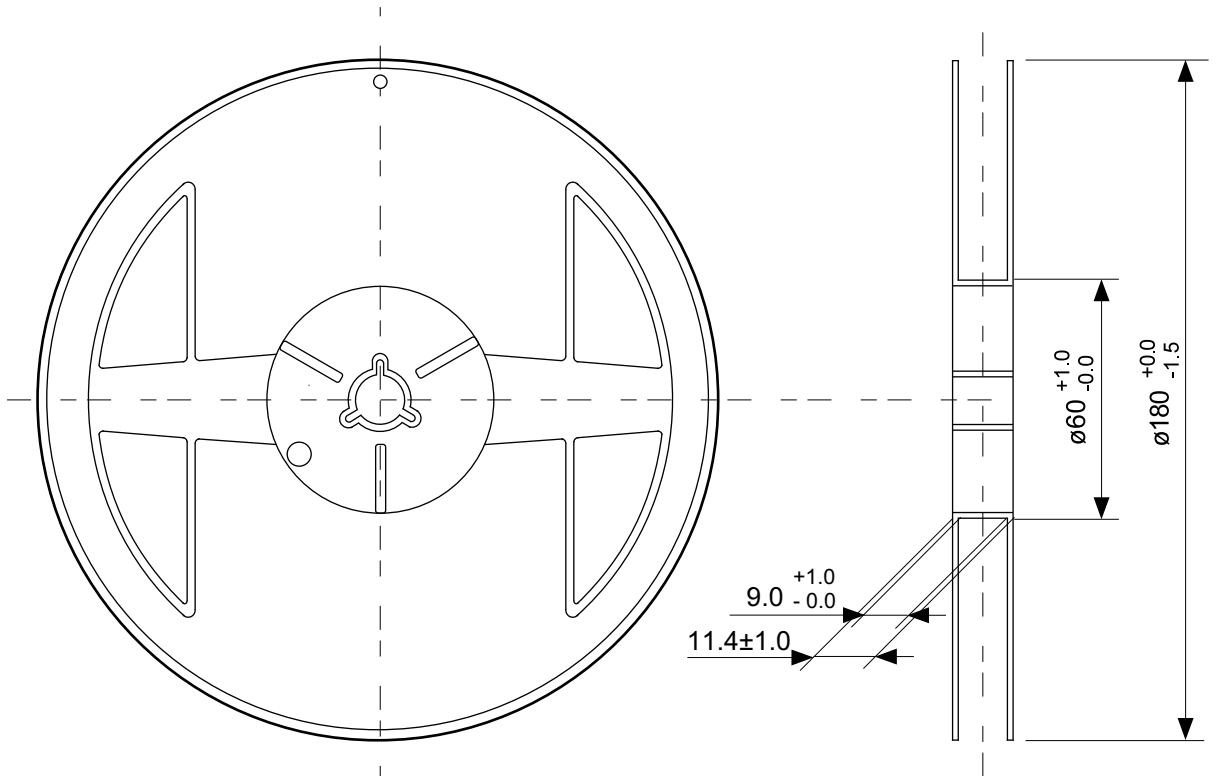
TITLE	HSNT-4-A-PKG Dimensions
No.	PK004-A-P-SD-2.1
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	



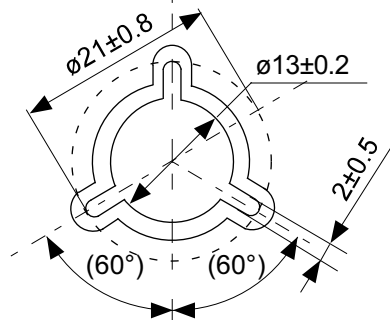
→  
Feed direction

No. PK004-A-C-SD-3.0

TITLE	HSNT-4-A-Carrier Tape
No.	PK004-A-C-SD-3.0
ANGLE	
UNIT	mm
<b>ABLIC Inc.</b>	



Enlarged drawing in the central part



No. PK004-A-R-SD-2.0

TITLE	HSNT-4-A-Reel		
No.	PK004-A-R-SD-2.0		
ANGLE		QTY.	10,000
UNIT	mm		
<b>ABLIC Inc.</b>			



1. All the information described herein (product data, specifications, figures, tables, programs, algorithms and application circuit examples, etc.) is current as of publishing date of this document and is subject to change without notice.
2. The circuit examples and the usages described herein are for reference only, and do not guarantee the success of any specific mass-production design.  
ABLIC Inc. is not responsible for damages caused by the reasons other than the products described herein (hereinafter "the products") or infringement of third-party intellectual property right and any other right due to the use of the information described herein.
3. ABLIC Inc. is not responsible for damages caused by the incorrect information described herein.
4. Be careful to use the products within their specified ranges. Pay special attention to the absolute maximum ratings, operation voltage range and electrical characteristics, etc.  
ABLIC Inc. is not responsible for damages caused by failures and / or accidents, etc. that occur due to the use of the products outside their specified ranges.
5. When using the products, confirm their applications, and the laws and regulations of the region or country where they are used and verify suitability, safety and other factors for the intended use.
6. When exporting the products, comply with the Foreign Exchange and Foreign Trade Act and all other export-related laws, and follow the required procedures.
7. The products must not be used or provided (exported) for the purposes of the development of weapons of mass destruction or military use. ABLIC Inc. is not responsible for any provision (export) to those whose purpose is to develop, manufacture, use or store nuclear, biological or chemical weapons, missiles, or other military use.
8. The products are not designed to be used as part of any device or equipment that may affect the human body, human life, or assets (such as medical equipment, disaster prevention systems, security systems, combustion control systems, infrastructure control systems, vehicle equipment, traffic systems, in-vehicle equipment, aviation equipment, aerospace equipment, and nuclear-related equipment), excluding when specified for in-vehicle use or other uses. Do not apply the products to the above listed devices and equipments without prior written permission by ABLIC Inc. Especially, the products cannot be used for life support devices, devices implanted in the human body and devices that directly affect human life, etc.  
Prior consultation with our sales office is required when considering the above uses.  
ABLIC Inc. is not responsible for damages caused by unauthorized or unspecified use of our products.
9. Semiconductor products may fail or malfunction with some probability.  
The user of the products should therefore take responsibility to give thorough consideration to safety design including redundancy, fire spread prevention measures, and malfunction prevention to prevent accidents causing injury or death, fires and social damage, etc. that may ensue from the products' failure or malfunction.  
The entire system must be sufficiently evaluated and applied on customer's own responsibility.
10. The products are not designed to be radiation-proof. The necessary radiation measures should be taken in the product design by the customer depending on the intended use.
11. The products do not affect human health under normal use. However, they contain chemical substances and heavy metals and should therefore not be put in the mouth. The fracture surfaces of wafers and chips may be sharp. Be careful when handling these with the bare hands to prevent injuries, etc.
12. When disposing of the products, comply with the laws and ordinances of the country or region where they are used.
13. The information described herein contains copyright information and know-how of ABLIC Inc.  
The information described herein does not convey any license under any intellectual property rights or any other rights belonging to ABLIC Inc. or a third party. Reproduction or copying of the information from this document or any part of this document described herein for the purpose of disclosing it to a third-party without the express permission of ABLIC Inc. is strictly prohibited.
14. For more details on the information described herein, contact our sales office.

2.2-2018.06