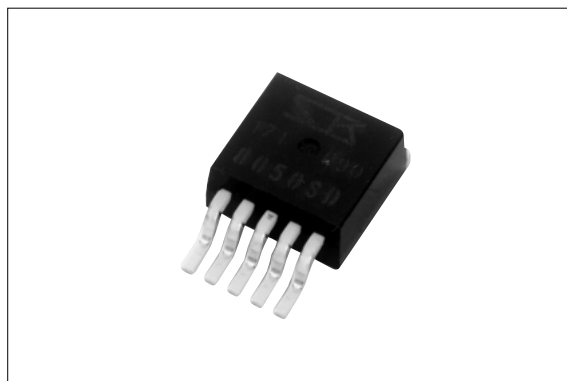


SI-8000SD Series

Surface Mount, Separate Excitation Switching Type

■Features

- Surface-mount package (TO263-5)
- Output current: 3.0 A
- High efficiency: 79% typ. (SI-8033SD), 84% typ. (SI-8050SD)
- Requires 4 external components
- Phase correction and output voltage adjustment performed internally
- Built-in reference oscillator (60 kHz)
- Built-in overcurrent protection, thermal protection circuit
- Output ON/OFF capable
- Soft start possible via ON/OFF pin



■Applications

- Power supplies for telecommunication equipment
- Onboard local power supplies

■Lineup

Part Number	SI-8033SD	SI-8050SD
V_o (V)	3.3	5.0
I_o (A)	3	

■Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
DC Input Voltage	V_{IN}	43	V	
Power Dissipation*	P_D	3	W	Glass epoxy board mounting in a 40 x 40 mm (copper area: 100%)
Junction Temperature	T_j	+125	°C	
Storage Temperature	T_{stg}	-40 to +125	°C	
Thermal Resistance (Junction to Case)	$R_{th(j-c)}$	3	°C/W	
Thermal Resistance (Junction to Ambient Air)	$R_{th(j-a)}$	33.3	°C/W	Glass epoxy board mounting in a 40 x 40 mm (copper area: 100%)

*: Limited by thermal protection circuit.

■Recommended Operating Conditions

Parameter	Symbol	Ratings		Unit
		SI-8033SD	SI-8050SD	
DC Input Voltage Range	V_{IN1}	5.5 to 28	7 to 40	V
Output Current Range*	I_o	0 to 3.0		A
Operating Junction Temperature Range	T_{jop}	-30 to +125		°C
Operating Temperature Range*	T_{op}	-30 to +125		°C

*: Limited by T_a - P_D characteristics.

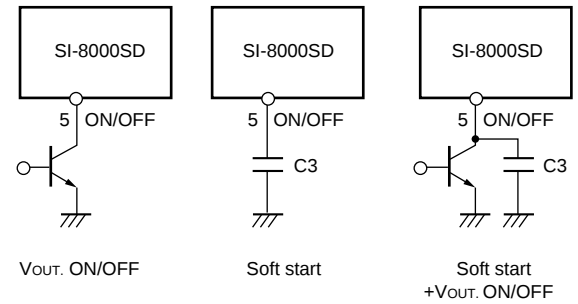
Electrical Characteristics

(Ta=25°C)

Parameter		Symbol	Ratings						Unit
			SI-8033SD			SI-8050SD			
			min.	typ.	max.	min.	typ.	max.	
Output Voltage		V _O	3.17	3.3	3.43	4.8	5.0	5.2	V
		Conditions	V _{IN} =15V, I _O =1A			V _{IN} =20V, I _O =1A			
Efficiency		η		79			84		%
		Conditions	V _{IN} =15V, I _O =1A			V _{IN} =20V, I _O =1A			
Switching Frequency		f		60			60		kHz
		Conditions	V _{IN} =15V, I _O =1A			V _{IN} =20V, I _O =1A			
Line Regulation		ΔV _{OLINE}		25	80		40	100	mV
		Conditions	V _{IN} =8 to 28V, I _O =1A			V _{IN} =10 to 30V, I _O =1A			
Load Regulation		ΔV _{OLOAD}		10	30		10	40	mV
		Conditions	V _{IN} =15V, I _O =0.5 to 1.5A			V _{IN} =20V, I _O =0.5 to 1.5A			
Temperature Coefficient of Output Voltage		ΔV _O /ΔT _a		±0.5			±0.5		mV/°C
Overcurrent Protection Starting Current		I _{S1}	3.1			3.1			A
		Conditions	V _{IN} =15V			V _{IN} =20V			
Soft Start Pin*	Low-Level Voltage	V _{SSL}		0.2			0.2		V
	Low-State Output Current	I _{SSL}	20	30	40	20	30	40	μA
Conditions		V _{SSL} =0.2V							

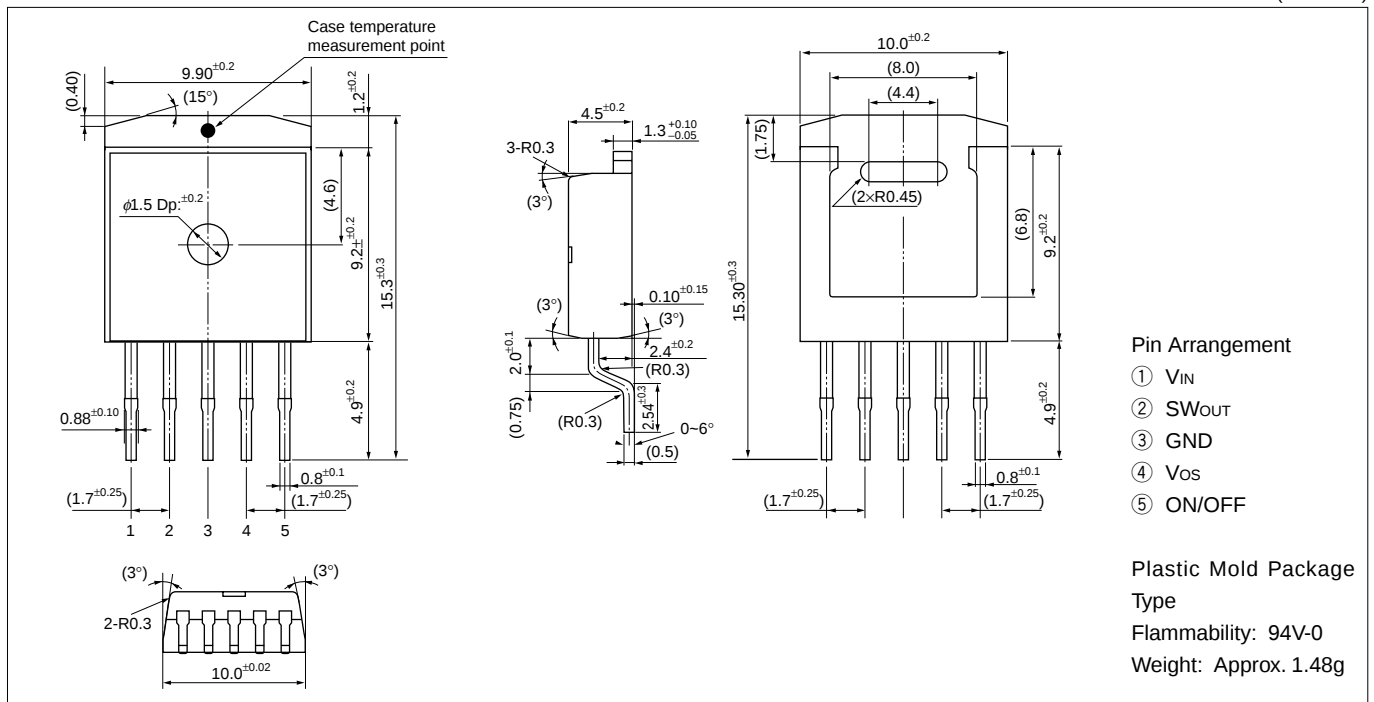
* Pin 5 is a soft start pin. Connecting a capacitor to this pin enables a soft start at power-on. By using this pin, the output can also be turned on or off. By setting the voltage of this pin to VSSL or lower, the output is stopped. Driving a transistor with an open collector can perform switching of the potential of the soft start pin.

When using both the soft-start and ON/OFF functions together, the discharge current from C3 flows to the ON/OFF control transistor, so ensure that this current is limited for protection. The soft start pin is pulled up to the power supply in the IC, so no external voltage can be applied. If this pin is not used, leave it open.



External Dimensions

(Unit : mm)



The block diagram illustrates the internal components of the UC1845B controller. The input V_{IN} (pin 1) is connected to an internal power supply and an overcurrent protection circuit. The power supply feeds an oscillator, which provides a clock signal to a reset circuit and a comparator. The reset circuit also receives feedback from the output SWOut (pin 2) and provides a control signal to a latch and driver. The latch and driver controls the output SWOut. The comparator compares the oscillator signal with a feedback signal from the error amplifier. The error amplifier's output is also fed back to the reset circuit. A thermal protection circuit is connected to the latch and driver. The output SWOut is connected to a load resistor and a reference voltage source. The reference voltage source is connected to the error amplifier. The error amplifier's output is also connected to a feedback resistor and a reference voltage source. The reference voltage source is connected to the error amplifier. The error amplifier's output is also connected to a feedback resistor and a reference voltage source. The reference voltage source is connected to the error amplifier.

The diagram shows the SI-8000SD converter with the following connections:

- Input:** VIN is connected to pin 1. A capacitor C1 is connected between pin 1 and GND.
- Output:** VOUT is connected to pin 2. A capacitor C2 is connected between pin 2 and GND. A diode D1 is connected between pin 2 and GND.
- Internal Pins:**
 - Pin 3 is connected to GND.
 - Pin 4 is connected to VOS.
 - Pin 5 (S.S) is connected to GND via capacitor C3.
- Inductor:** L1 is connected between pin 2 and pin 4.

Component Specifications:

- C1: 50V/1000 μ F
- C2: 50V/1000 μ F
- C3: 0.01 μ F (only when soft start function is used)
- L1: 150 μ H
- D1: SPB-G56 (Sanken)

Diode D1

- Be sure to use Schottky-barrier diode as D1.

If you use a fast recovery diode or any other diode, supplying a reverse voltage generated from the recovery or ON voltage of the diode may damage the IC.

Choke coil L1

- If the winding resistance of the choke coil is too high, the efficiency may drop below the rated value.
- Because the overcurrent protection start current is about 3.5 A, take care concerning heat radiation from the choke coil due to magnetic saturation in the case of overloading or short-circuiting of the load.

Capacitors C1, C2, and C3

- Use high-frequency, low-impedance capacitors for switching power supplies as C1 and C2 because a large ripple current flows through them. If the impedance of C2 is high, the switching waveform may be abnormal at low temperatures. Do not use a capacitor with an extremely low equivalent series resistance (ESR), such as an OS capacitor or tantalum capacitor, as C2, because such a capacitor may cause abnormal oscillation.
- C3 is a capacitor for soft start. Leave pin 5 open if the soft start function is not used. This pin is pulled up inside the IC.

© To create the optimum operating conditions, place each component as closely as possible.

Recommended pattern

The recommended pattern shows the placement of components on a PCB. Components include: GND, SI-8000SD, C1, Vins, C2, C3, S1, Vin, SPB-G56S, SW, L1, Vout, and Vos. The SI-8000SD is a large component with multiple pins. The SPB-G56S is a smaller component. The SW is a switch. The L1 is an inductor. The C1, C2, and C3 are capacitors. The S1 is a multi-pin connector. The Vins, Vos, and Vout are voltage inputs/outputs. The Vin is the main power input. The GND is the ground connection. The pattern is labeled with "SI-8000SD" and "SanKen".

Recommended land pattern

The recommended land pattern shows the dimensions for the components. The SI-8000SD has a width of 11 ± 0.2 mm and a height of 9 ± 0.2 mm. The SPB-G56S has a width of 9 ± 0.1 mm and a height of 6.8 ± 0.1 mm. The SW has a width of 3.7 ± 0.05 mm and a height of 4 ± 0.1 mm. The L1 has a width of 1.7 ± 0.1 mm and a height of 1 ± 0.05 mm. The C1, C2, and C3 have a width of 1.7 ± 0.1 mm and a height of 1 ± 0.05 mm. The S1 has a width of 1.7 ± 0.1 mm and a height of 1 ± 0.05 mm. The Vins, Vos, and Vout have a width of 1.7 ± 0.1 mm and a height of 1 ± 0.05 mm. The Vin has a width of 1.7 ± 0.1 mm and a height of 1 ± 0.05 mm. The GND has a width of 1.7 ± 0.1 mm and a height of 1 ± 0.05 mm.

Unit : mm

* For the optimum operating conditions, use one-point GND wiring centering on pin 3, and place each component as closely as possible.

Area of copper on glass epoxy board vs. thermal resistance (junction to ambient air) (typical value)

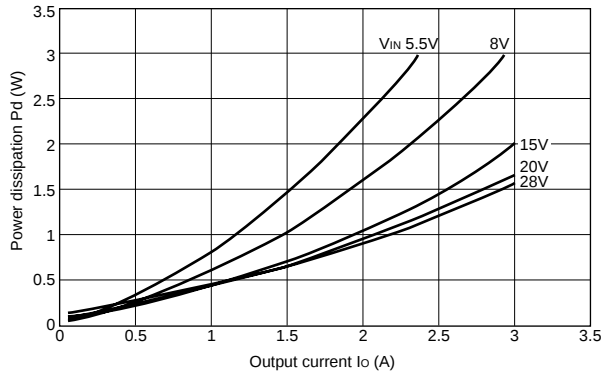
With glass epoxy board measuring 40×40 mm

The graph shows the relationship between the area of copper on a glass epoxy board and the thermal resistance from the junction to ambient air. The x-axis represents the copper area in mm^2 , ranging from 0 to 1800. The y-axis represents the thermal resistance θ_{j-a} in $^{\circ}\text{C/W}$, ranging from 30 to 55. The curve shows that as the copper area increases, the thermal resistance decreases. The data points are as follows:

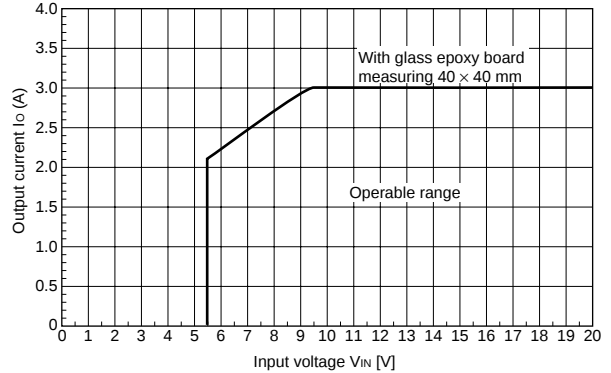
Copper area (mm^2)	Thermal resistance θ_{j-a} ($^{\circ}\text{C/W}$)
100	53
200	48
400	42
600	38
800	36
1000	35
1200	34
1400	33
1600	32

■SI-8033SD

Power dissipation vs. Output current (typical value)

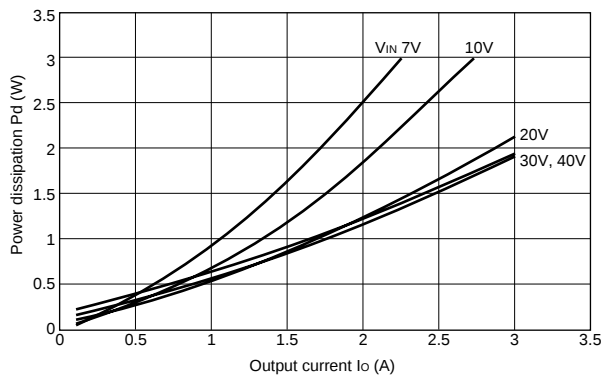


Output current vs. Input voltage (typical value)

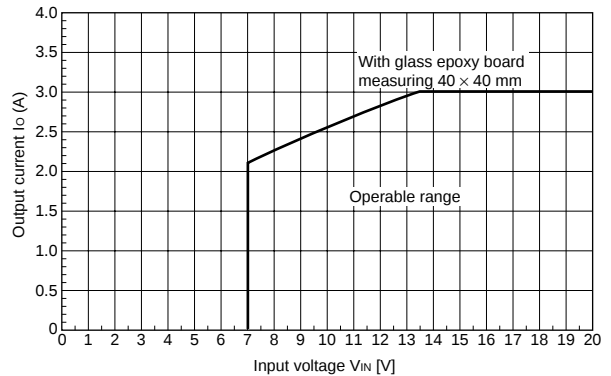


■SI-8050SD

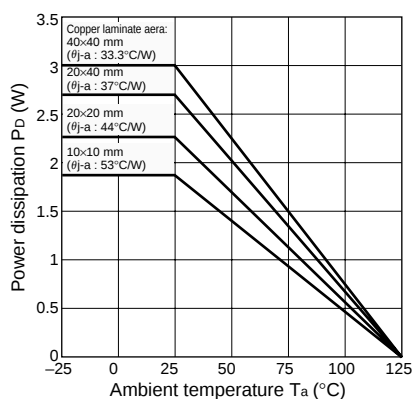
Power dissipation vs. Output current (typical value)



Output current vs. Input voltage (typical value)



■PD-Ta Characteristics



When mounted on glass epoxy board
measuring 40 × 40 mm

$$P_D = V_O \cdot I_O \left(\frac{100}{\eta\chi} - 1 \right) - V_F \cdot I_O \left(1 - \frac{V_O}{V_{IN}} \right)$$

Find the efficiency from the efficiency curve and substitute in the percentage, because the efficiency varies depending on the input voltage and output current.

V_O : Output voltage

V_{IN} : Input voltage

I_O : Output current

$\eta\chi$: Efficiency

V_F : Forward voltage of D1

0.4V ($I_O=2A$) ... SPB-G56S (Sanken)

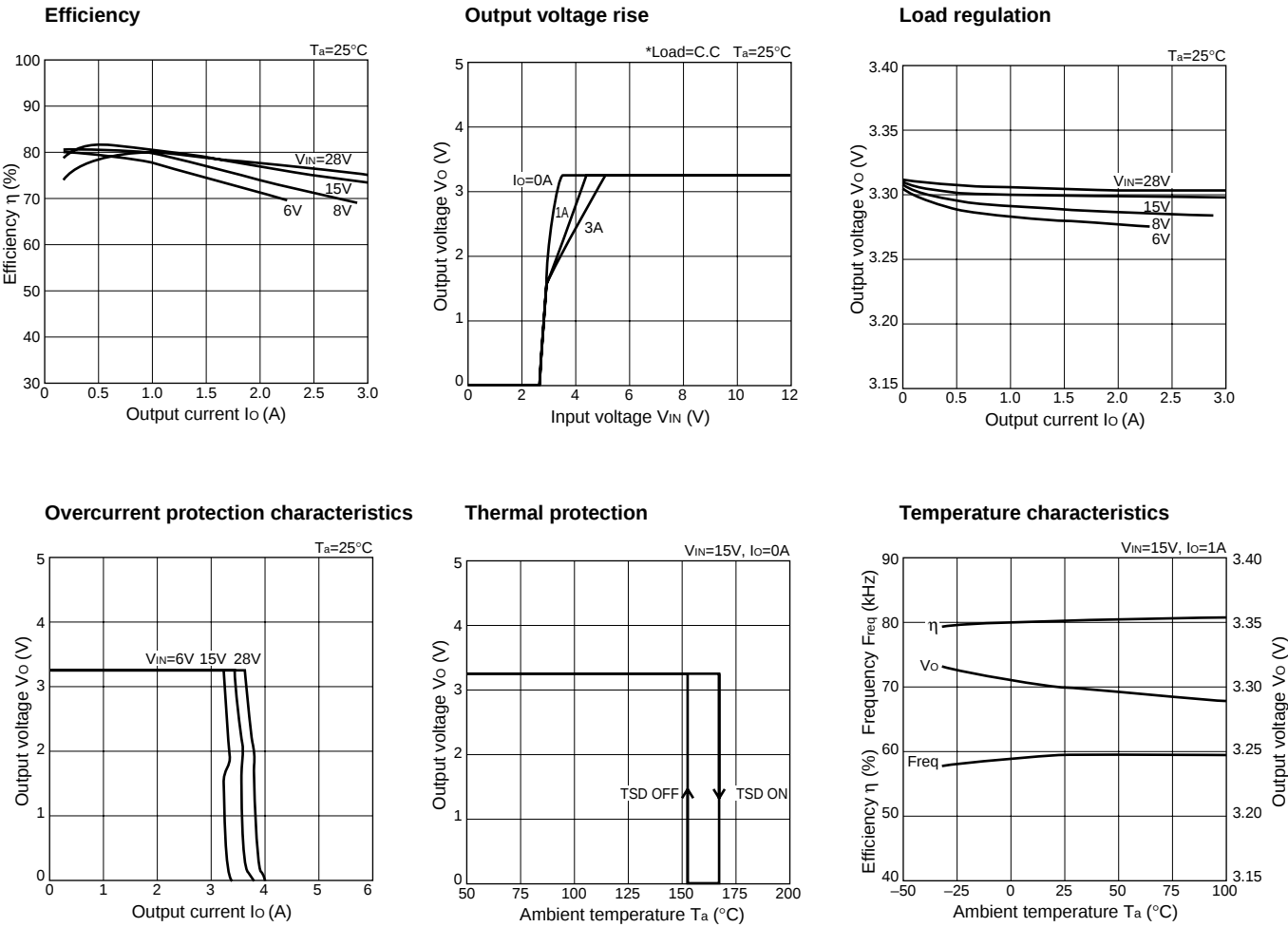
Thermal design for D1 must be performed separately.

Applications

Varying output voltage

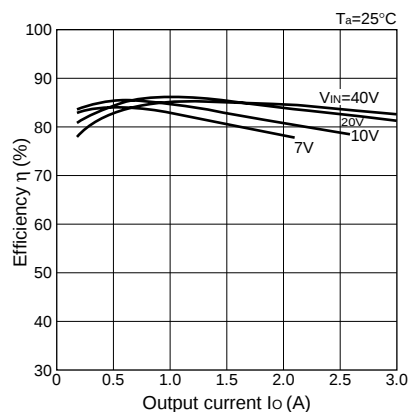
The output voltage can be varied in the same manner as SI-8000S. Refer of the catalog.

■Typical Characteristics Examples (SI-8033SD)

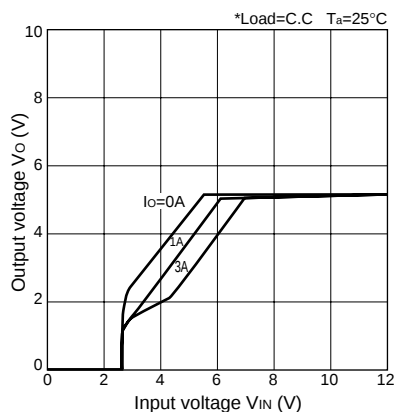


■Typical Characteristics Example (SI-8050SD)

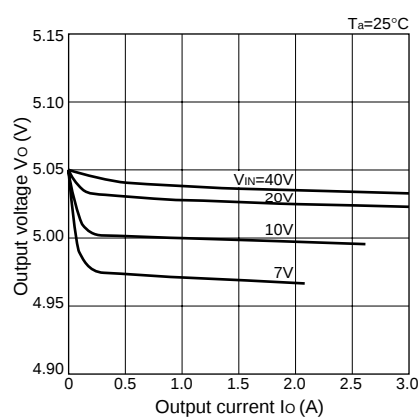
Efficiency



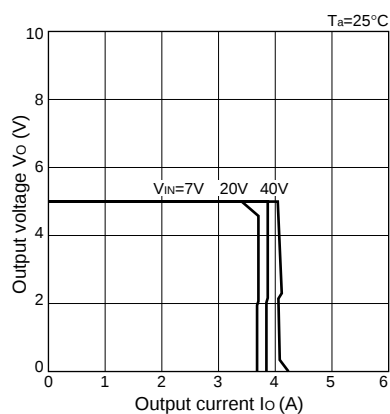
Output voltage rise



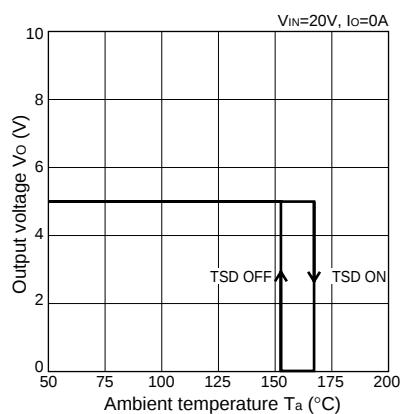
Load regulation



Overcurrent protection characteristics



Thermal protection



Temperature characteristics

