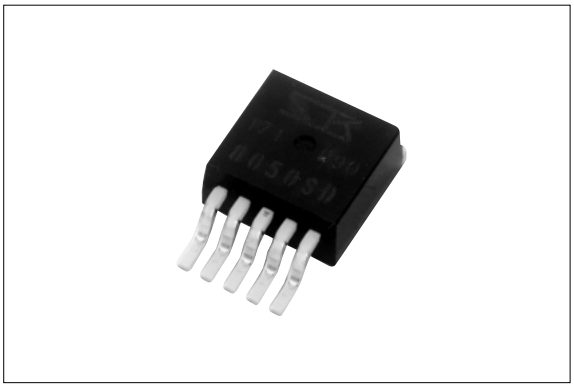
SI-8000SD Series

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 Ta-P_D characteristics.

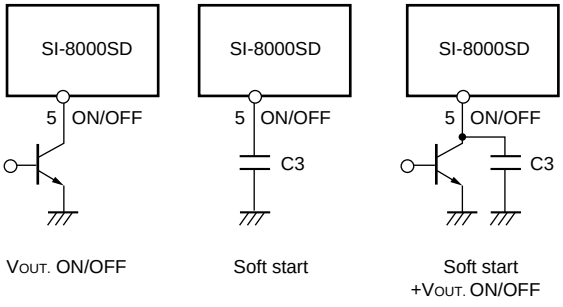
■Electrical Characteristics

(T_a=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		$\Delta V_O/\Delta T_a$		±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 V_{SSL} or lower, the output is stopped. Driving a transistor with an open collector can perform switching of the potential of the soft start pin.

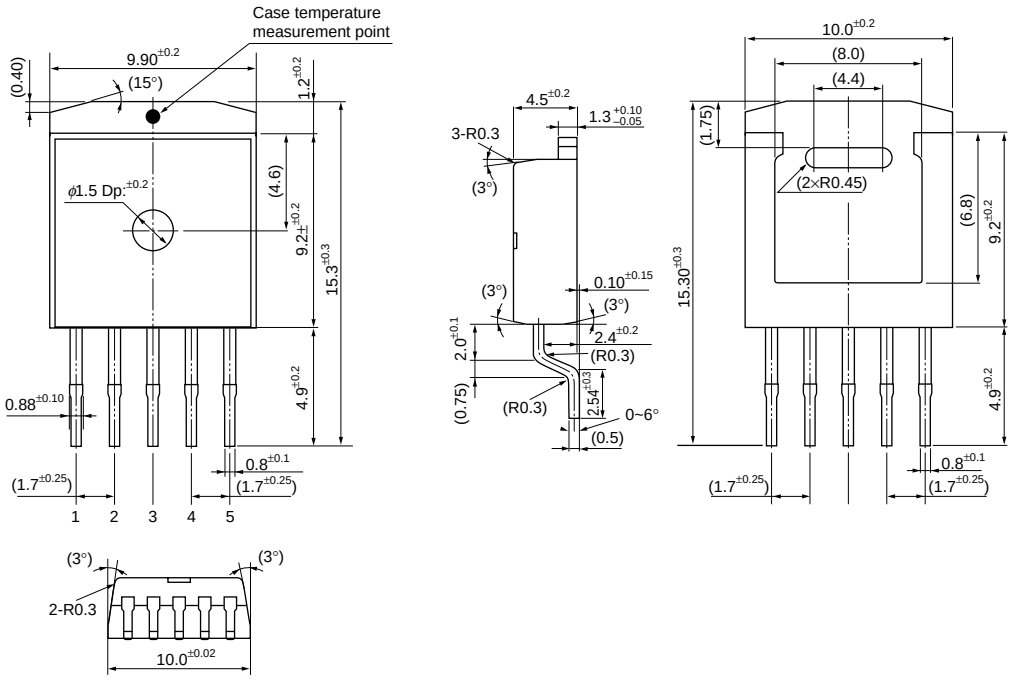
When using both the soft-start and ON/OFF functions together, the discharge current from C3 flows to the ON/OFF control transistor, so ensure that this current is limited for protection. The soft start pin is pulled up to the power supply in the IC, so no external voltage can be applied. If this pin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



$V_{OUT.}$ ON/OFF　　Soft start　　Soft start +$V_{OUT.}$ ON/OFF

■External Dimensions

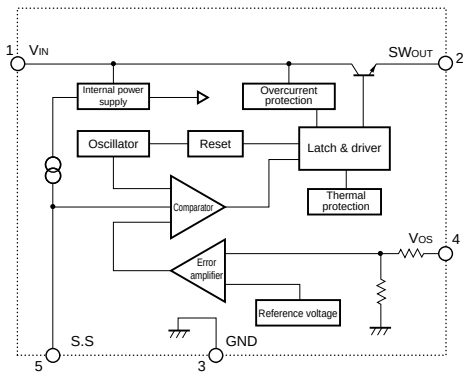
(Unit : mm)



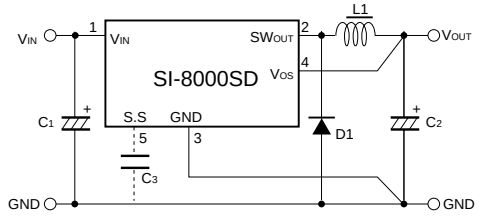
Pin Arrangement
① V_{IN}
② SW_{OUT}
③ GND
④ V_{OS}
⑤ ON/OFF

Plastic Mold Package Type
Flammability: 94V-0
Weight: Approx. 1.48g

■Block Diagram



■Standard Connection Circuit Diagram



C1: 50V/1000μF
C2: 50V/1000μF
C3: 0.01μF
(only when soft start function is used)
L1 : 150μH
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.

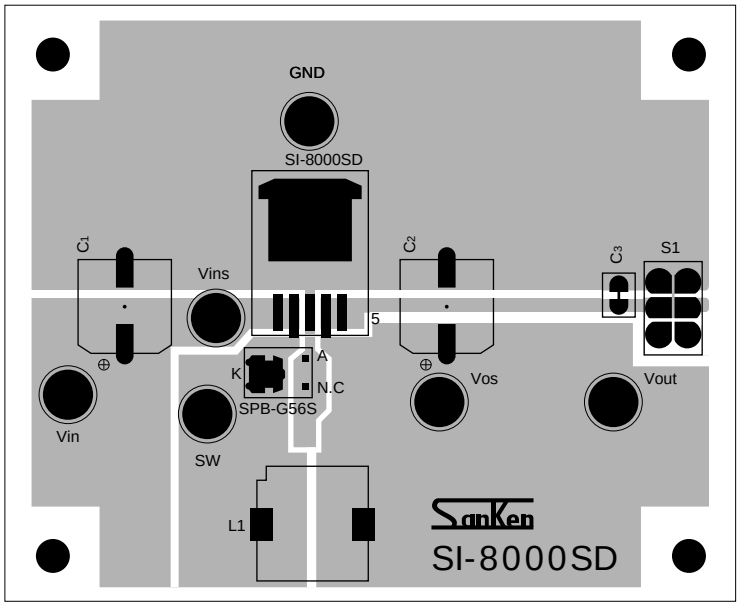
Capacitors C1, C2, and C3

- 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.

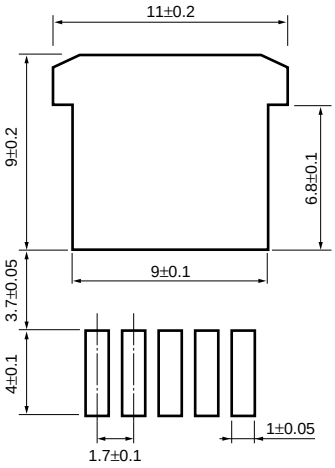
© To create the optimum operating conditions, place each component as closely as possible.

■Example of Pattern on PC Board

Recommended pattern



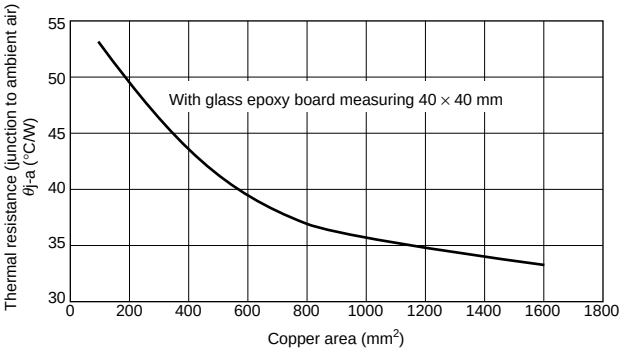
Recommended land pattern



Unit : mm

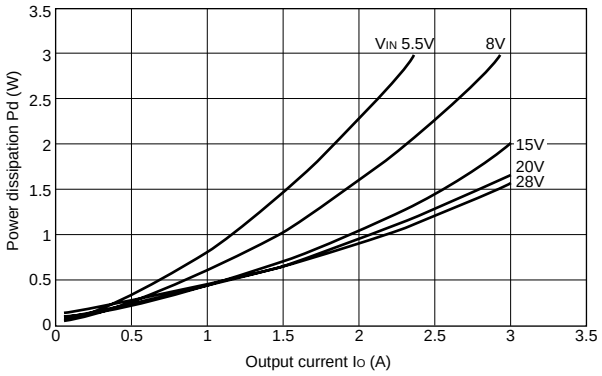
* For the optimum operating conditions, use one-point GND wiring centering on pin 3, and place each component as closely as possible.

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

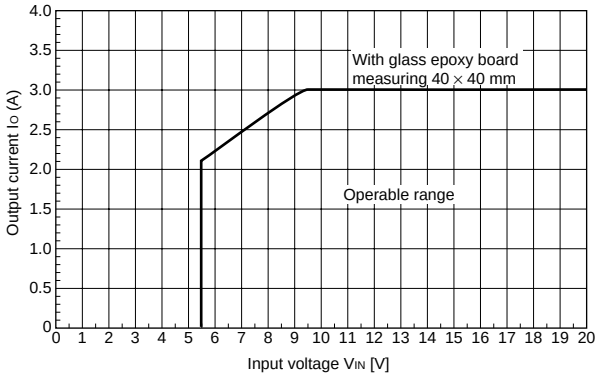


■SI-8033SD

Power dissipation vs. Output current (typical value)

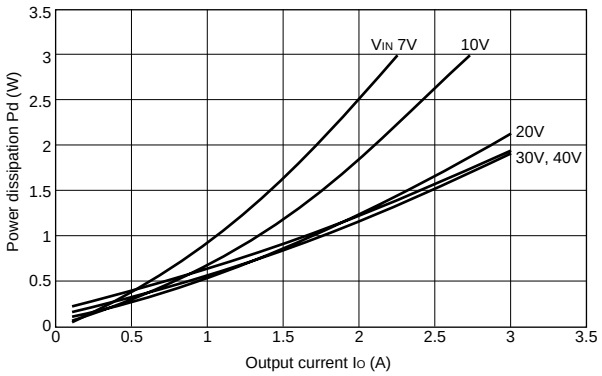


Output current vs. Input voltage (typical value)

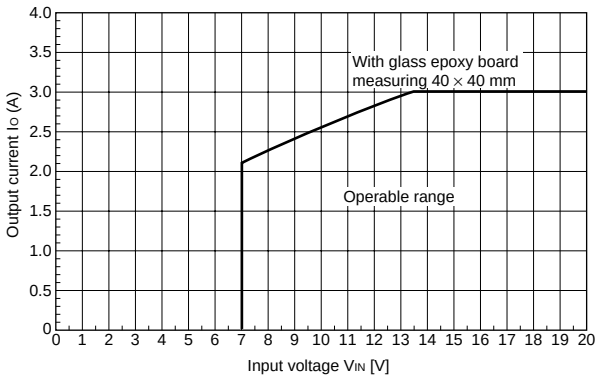


■SI-8050SD

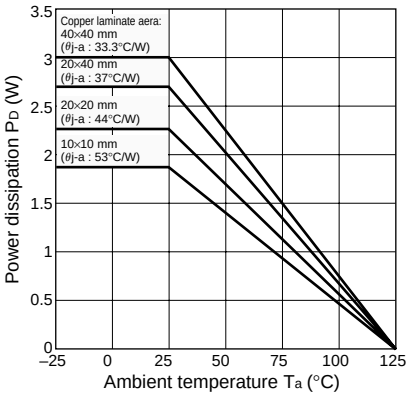
Power dissipation vs. Output current (typical value)



Output current vs. Input voltage (typical value)



■PD-Ta Characteristics



When mounted on glass epoxy board measuring 40 × 40 mm

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

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 D_1
0.4V (I_O=2A) ··· SPB-G56S (Sanken)

Thermal design for D_1 must be performed separately.

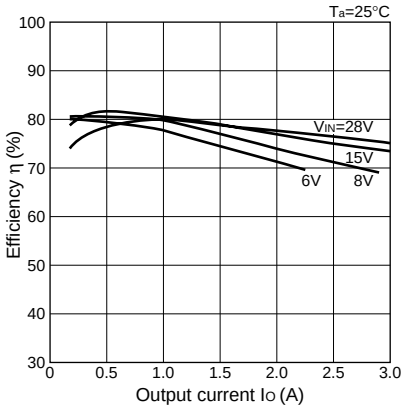
Applications

Varying output voltage

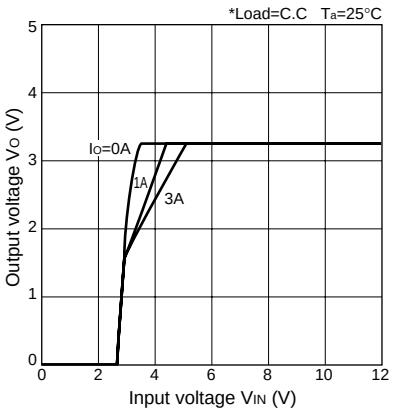
The output voltage can be varied in the same manner as SI-8000S. Refer of the catalog.

■Typical Characteristics Examples (SI-8033SD)

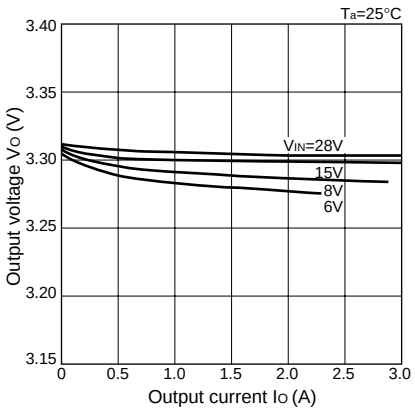
Efficiency



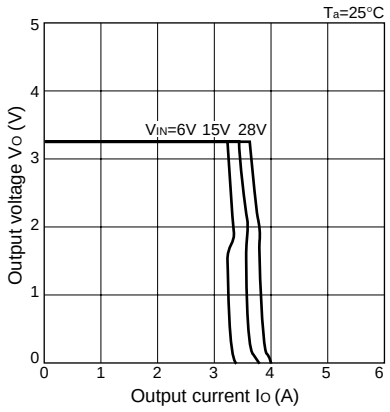
Output voltage rise



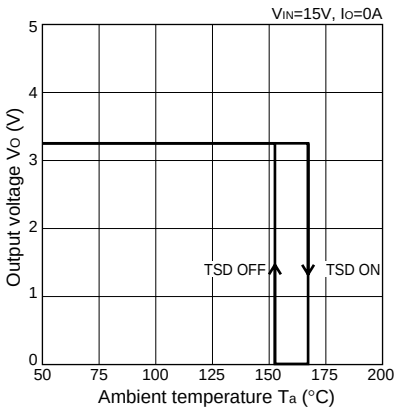
Load regulation



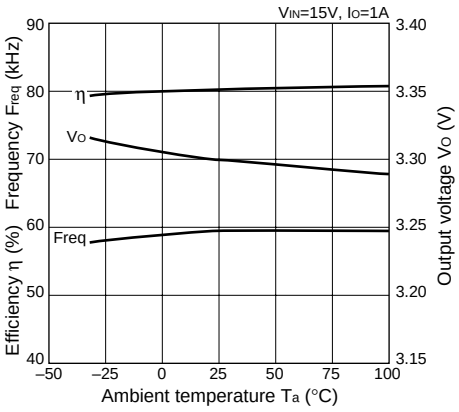
Overcurrent protection characteristics



Thermal protection

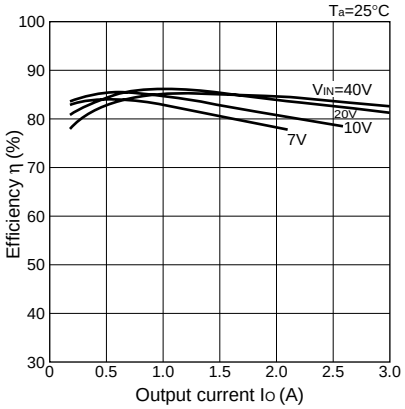


Temperature characteristics

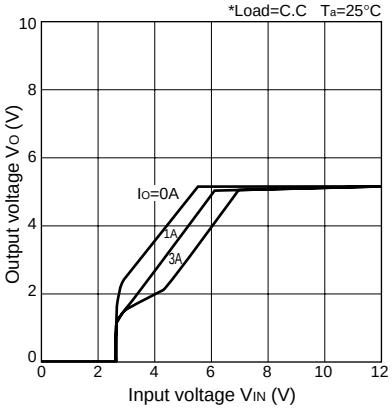


■Typical Characteristics Example (SI-8050SD)

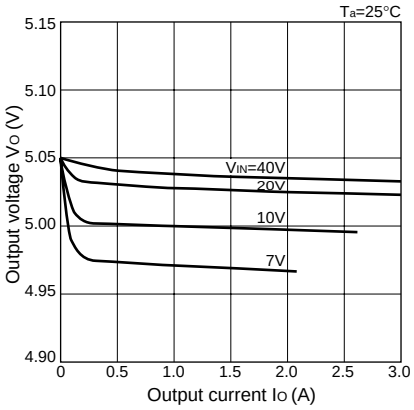
Efficiency



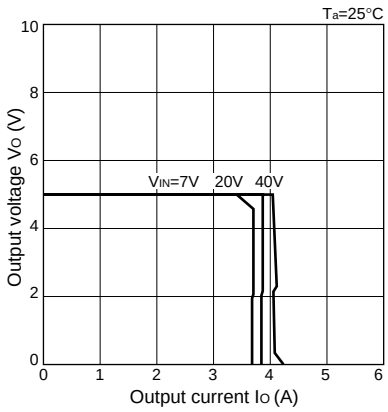
Output voltage rise



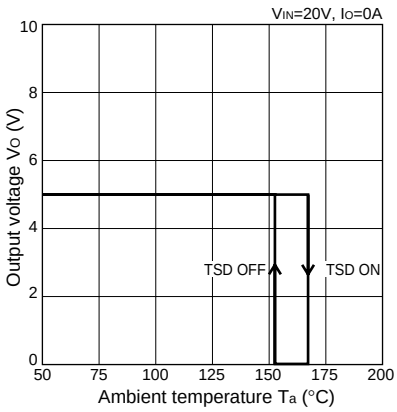
Load regulation



Overcurrent protection characteristics



Thermal protection



Temperature characteristics