

SI-8000SD Series

Surface Mount, Separate Excitation Step-down Switching Mode Regulator ICs

Features

- Surface-mount package (TO263-5)
- Output current: 3.0A
- High efficiency: 79% typ. (SI-8033SD), 84% typ. (SI-8050SD)
- Requires only 4 discrete external components
- Internally-adjusted phase correction and output voltage
- Built-in reference oscillator (60kHz)
- Built-in overcurrent and thermal protection circuits
- Output ON/OFF available
- Soft start available by S.S pin

Applications

- Power supplies for telecommunication equipment
- Onboard local power supplies

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

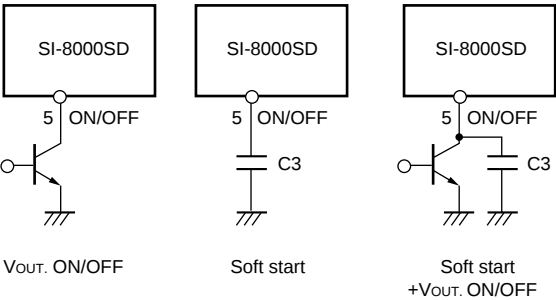
*: Limited by Ta-P_D characteristics.

Electrical Characteristics

(Ta=25°C)

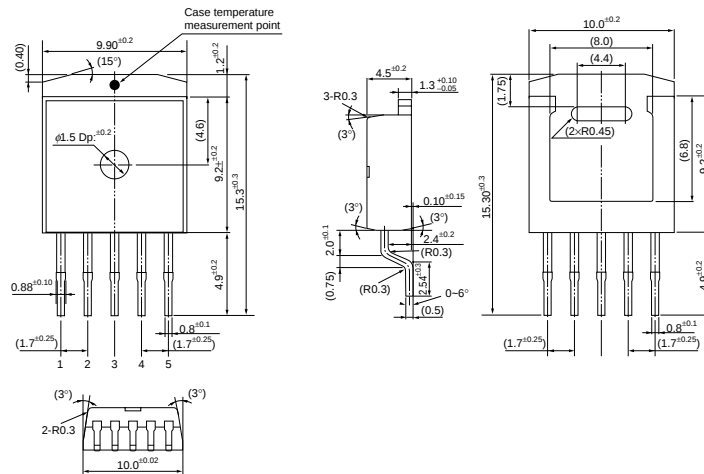
Parameter		Symbol	Ratings						Unit
			SI-8033SD			SI-8050SD			
			min.	typ.	max.	min.	typ.	max.	
Output Voltage		V _O	3.17	3.3	3.43	4.8	5.0	5.2	V
		Conditions	V _{IN} =15V, I _O =1A			V _{IN} =20V, I _O =1A			
Efficiency		η		79			84		%
		Conditions	V _{IN} =15V, I _O =1A			V _{IN} =20V, I _O =1A			
Oscillation 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 _{SL}	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
	Outflow Current at Low Voltage	I _{SSL}	20	30	40	20	30	40	μA
	Conditions	V _{SSL} =0.2V							

* Pin 5 is a soft start pin. Soft start at power on can be performed with a capacitor connected to this pin.
The output can also be turned ON/OFF with this pin.
The output is stopped by setting the voltage of this pin to V_{SSL} or lower.
Soft-start pin voltage can be changed with an open-collector drive circuit of a transistor.
When using both the soft-start and ON/OFF functions together, the discharge current from C₃ flows into the ON/OFF control transistor. Therefore, limit the current securely to protect the transistor if C₃ capacitance is large.
The ON/OFF pin is pulled up to the power supply in the IC, so applying the external voltage is prohibited.
If this pin is not used, leave it open.



External Dimensions (TO263-5)

(Unit : mm)

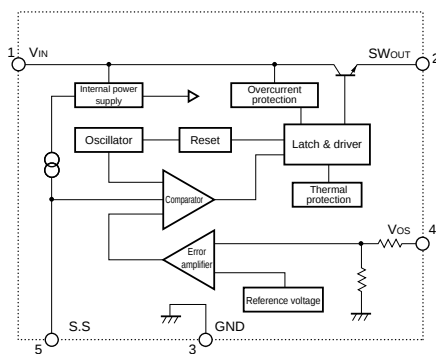


Pin Assignment

- ① V_{IN}
- ② SW_{OUT}
- ③ GND
- ④ V_{OS}
- ⑤ S.S

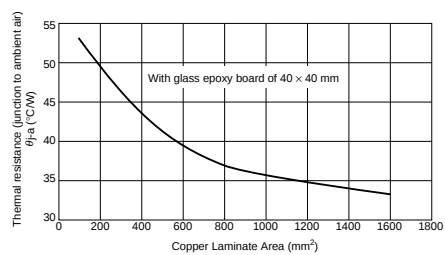
Plastic Mold Package Type
Flammability: 94V-0
Product Mass: Approx. 1.48g

Block Diagram



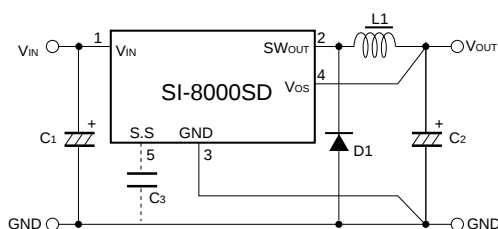
Reference Data

Copper Laminate Area on Glass Epoxy Board vs.
thermal resistance (junction to ambient air) (Typical Value)



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Typical Connection Diagram



- 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 other diodes like fast recovery diodes are used, ICs may be destroyed because of the reverse voltage generated by the recovery voltage or ON voltage.

Choke coil L1

- If the winding resistance of the choke coil is too high, the efficiency may drop below the rated value.
- As the overcurrent protection starting current is about 3.5 A, take care concerning heat radiation from the choke coil caused by magnetic saturation due to overload or short-circuited load.

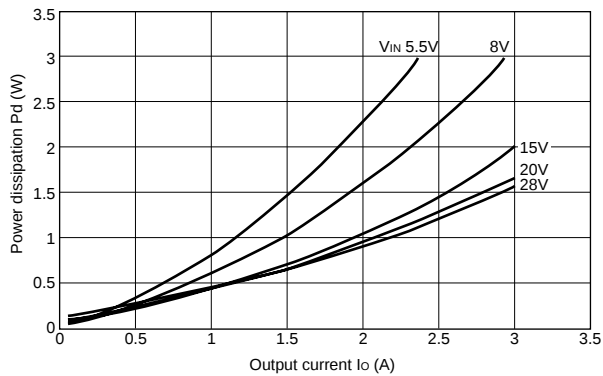
Capacitors C1, C2, and C3

- As large ripple currents flow through C1 and C2, use high-frequency and low-impedance capacitors aiming for switching-mode-power-supply use. Especially when the impedance of C2 is high, the switching waveform may become abnormal at low temperatures.
For C2, do not use a capacitor with an extremely low equivalent series resistance (ESR) such as an OS capacitor or a tantalum capacitor, which may cause an 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 with a pull-up resistor inside the ICs.

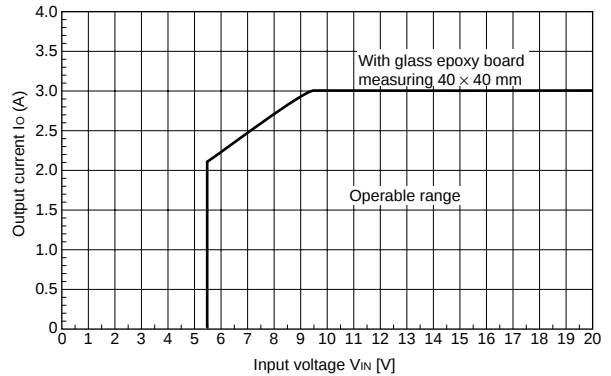
◎To create the optimum operating conditions, place the components as close as possible to each other.

SI-8033SD

Power dissipation vs. Output current (typical value)

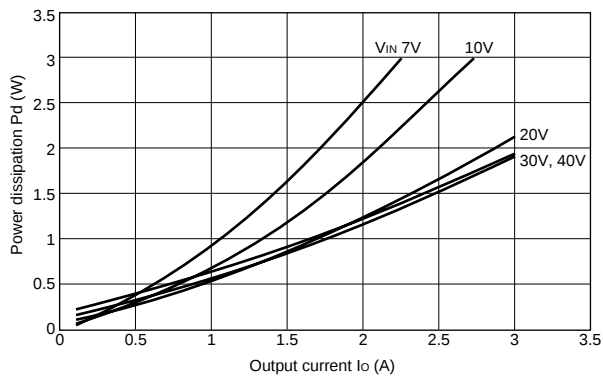


Output current vs. Input voltage (typical value)

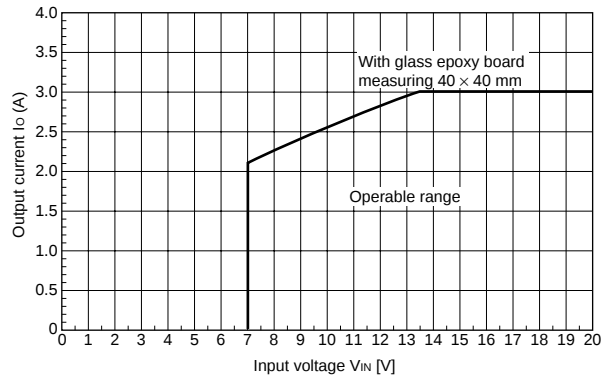


SI-8050SD

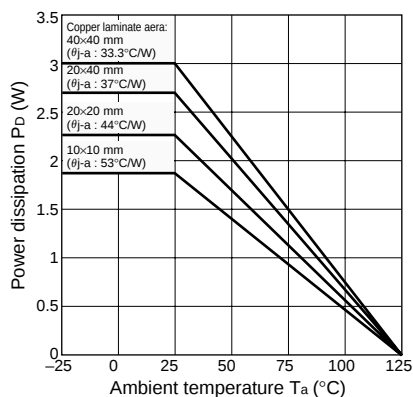
Power dissipation vs. Output current (typical value)



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)

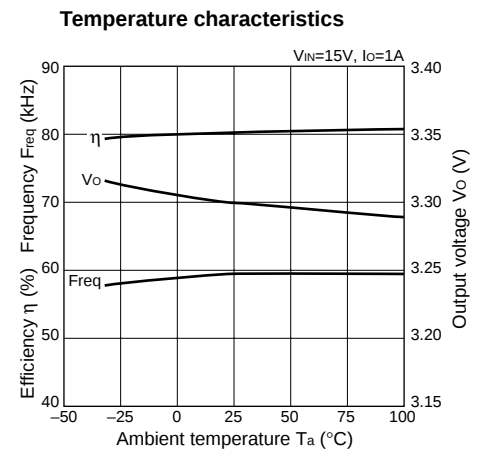
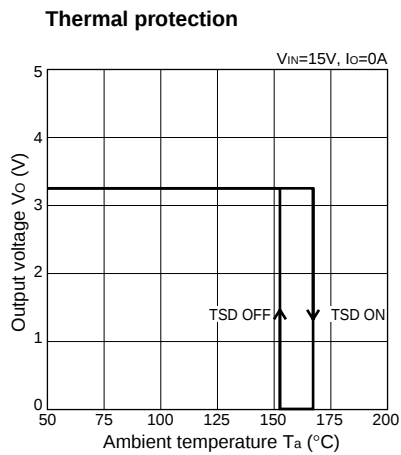
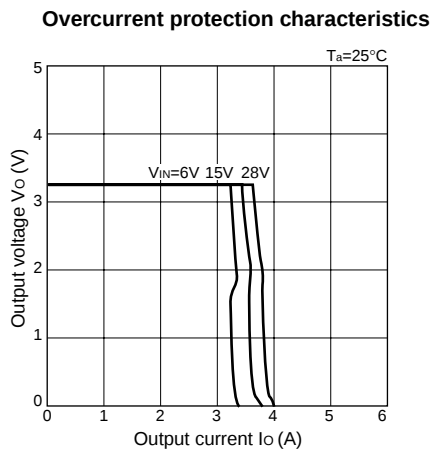
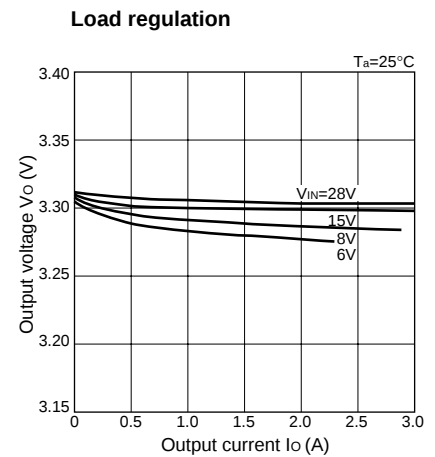
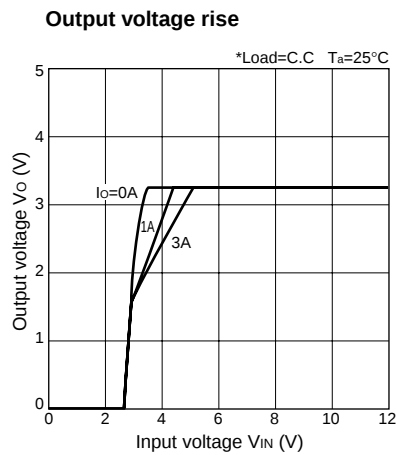
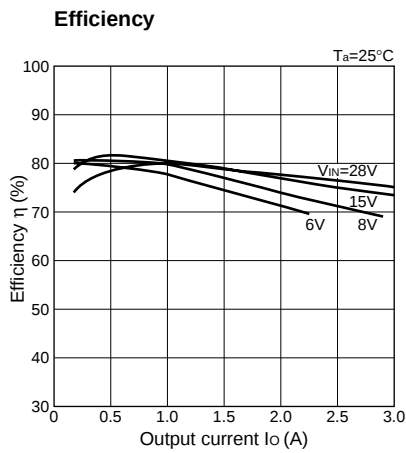
Thermal design for D1 must be performed separately.

Applications

Varying output voltage

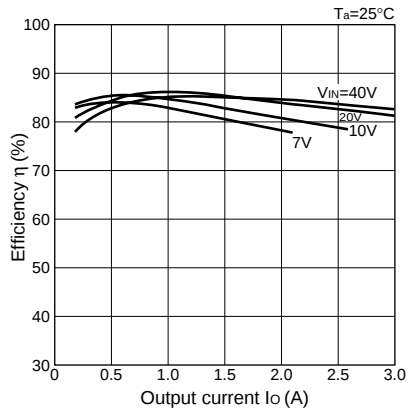
The output voltage can be varied in the same manner as SI-8000S. Refer of the catalog.

■Typical Characteristics Examples (SI-8033SD)

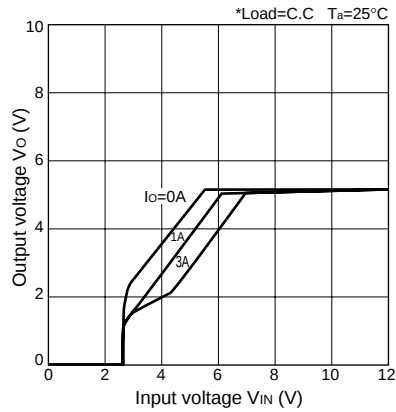


Typical Characteristics Example (SI-8050SD)

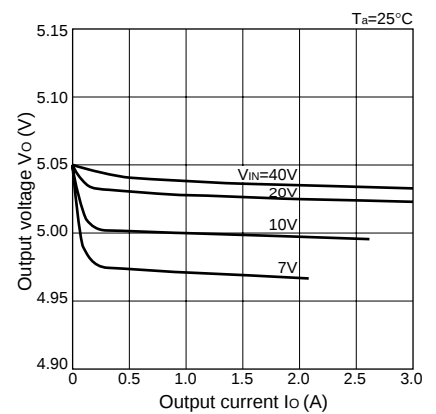
Efficiency



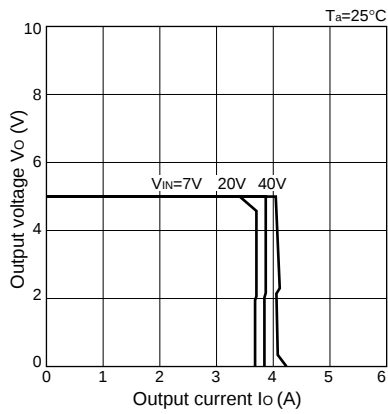
Output voltage rise



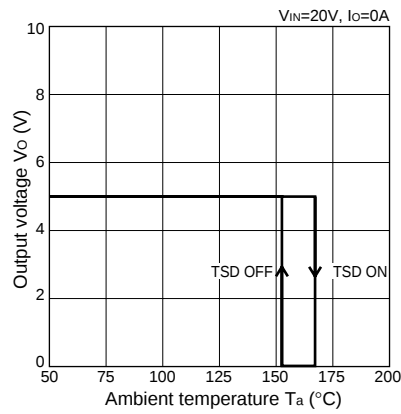
Load regulation



Overcurrent protection characteristics



Thermal protection



Temperature characteristics

