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# SI-8000SD Series Surface Mount, Separate Excitation Step-down Switching Mode

## ■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

## ■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*1 | V | |
| Power Dissipation*2 | $P_D$ | 3 | W | When mounted on glass-epoxy board 40 × 40 mm (copper area: 100%) |
| Junction Temperature | $T_j$ | +125 | °C | |
| Storage Temperature | $T_{stg}$ | –40 to +125 | °C | |
| Thermal Resistance (Junction to Case) | $\theta_{j\text{-}c}$ | 3 | °C/W | |
| Thermal Resistance (Junction to Ambient Air) | $\theta_{j\text{-}a}$ | 33.3 | °C/W | When mounted on glass-epoxy board 40 × 40 mm (copper area: 100%) |

*1: 35V for SI-8033SD
*2: 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 |

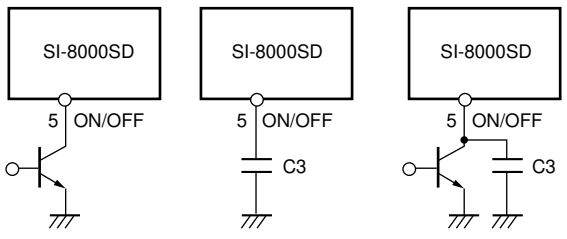
*: Limited by Ta-$P_D$ characteristics.

## ■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 | | $\eta$ | | 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 | | $\Delta V_{OLINE}$ | | 25 | 80 | | 40 | 100 | mV |
| | | Conditions | $V_{IN}$=8 to 28V, $I_O$=1A | | | $V_{IN}$=10 to 30V, $I_O$=1A | | | |
| Load Regulation | | $\Delta V_{OLOAD}$ | | 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 |
| | Outflow Current at Low Voltage | $I_{SSL}$ | 20 | 30 | 40 | 20 | 30 | 40 | μA |
| | | Conditions | $V_{SSL}$=0.2V | | | | | | |

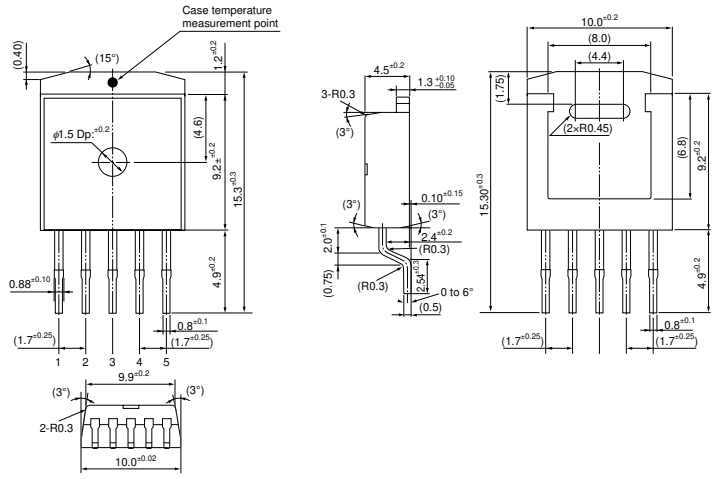
* Pin 5 is a soft start pin. Soft start at power on can be performed with a capacitor connected to this pin.
The output can also be turned ON/OFF with this pin.
The output is stopped by setting the voltage of this pin to $V_{SSL}$ or lower.
Soft-start pin voltage can be changed with an open-collector drive circuit of a transistor.
When using both the soft-start and ON/OFF functions together, the discharge current from $C_3$ flows into the ON/OFF control transistor. Therefore, limit the current securely to protect the transistor if $C_3$ 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.




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

## ■External Dimensions (TO263-5)

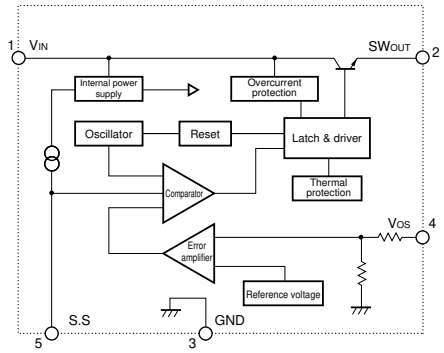
(Unit : mm)




Pin Assignment
① $V_{IN}$
② $SW_{OUT}$
③ GND
④ $V_{OS}$
⑤ S.S

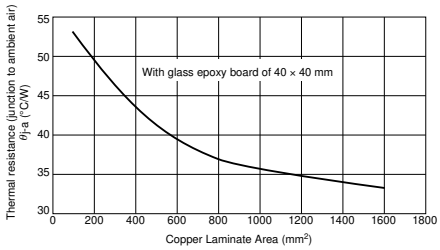
Plastic Mold Package Type
Flammability: 94V-0
Product Mass: Approx. 1.48g

## ■Block Diagram

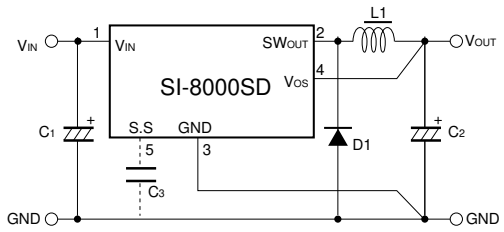



## ■Reference Data

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




## ■Typical Connection Diagram




$C_1$ : 50V/1000$\mu$F
$C_2$ : 50V/1000$\mu$F
$C_3$ : 0.01$\mu$F
(only when soft start function is used)
$L_1$ : 150$\mu$H
$D_1$ : SPB-G56 (Sanken)

Diode $D_1$

- Be sure to use Schottky-barrier diode as $D_1$.
  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 $L_1$

- 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 $C_1$, $C_2$, and $C_3$

- As large ripple currents flow through $C_1$ and $C_2$, use high-frequency and low-impedance capacitors aiming for switching-mode-power-supply use. Especially when the impedance of $C_2$ is high, the switching waveform may become abnormal at low temperatures.
  For $C_2$, 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.
- $C_3$ 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.