

# SI-8000GL Series Compact, Separate Excitation Step-down Switching Mode

## ■Features

- DIP 8 pin package
- Output current: 1.5A
- High efficiency: 86% (at  $V_{IN} = 20V$ ,  $I_O = 1A$ ,  $V_O = 5V$ )
- Capable of downsize a choke-coil due to IC's high switching frequency (250kHz). (Compared with conventional Sanken devices)
- The output-voltage-variable type can vary its output voltage from 1V to 14V because of its low reference voltage ( $V_{REF}$ ) of 1V.
- Wide Input Voltage Range (8 to 50V)
- Output ON/OFF available
- Built-in overcurrent protection and thermal protection circuits

## ■Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
DC Input Voltage	$V_{IN}$	53	V
Power Dissipation	$P_D^{*1}$	1	W
Junction Temperature	$T_j$	+125	°C
Storage Temperature	$T_{stg}$	-40 to +125	°C
Thermal Resistance (junction to case)	$\theta_{j-c}$	28	°C/W
Thermal Resistance (junction to ambient air)	$\theta_{j-a}$	100	°C/W

\*1: Limited by thermal protection.

## ■Applications

- Onboard local power supplies
- OA equipment
- For stabilization of the secondary-side output voltage of switching power supplies

## ■Recommended Operating Conditions

Parameter	Symbol	Ratings	Unit
		SI-8010GL	
DC Input Voltage Range	$V_{IN}$	(8 or $V_O+3$ )* <sup>1</sup> to 50	V
Output Voltage Range	$V_O$	1 to 14	V
Output Current Range* <sup>2</sup>	$I_O$	0.02 to 1.5* <sup>2</sup>	A
Operating Junction Temperature Range	$T_{jop}$	-30 to +125	°C
Operating Temperature Range	$T_{op}$	-30 to +125	°C

\*1: The minimum value of an input voltage range is the higher of either 8V or  $V_O+3V$ .

\*2: Please be sure to let the output current run more than 20 mA. When using by less than 20 mA, there is a possibility that the output voltage becomes unstable.

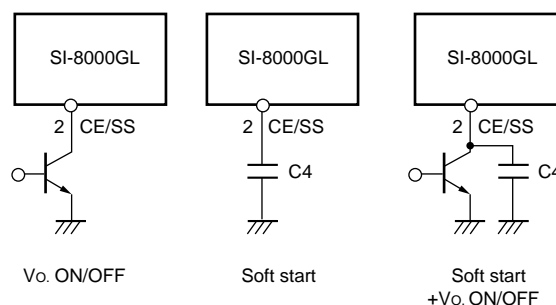
## ■Electrical Characteristics

( $T_a=25^\circ\text{C}$ )

Parameter		Symbol	Ratings			Unit
			SI-8010GL (Variable type)			
			min.	typ.	max.	
Reference Voltage		V <sub>REF</sub>	0.97	1.00	1.03	V
		Conditions	V <sub>IN</sub> =12V, I <sub>O</sub> =1A			
Efficiency		Eff		86		%
		Conditions	V <sub>IN</sub> =20V, I <sub>O</sub> =1A, V <sub>O</sub> =5V			
Oscillation Frequency		F <sub>OSC</sub>		250		kHz
		Conditions	V <sub>IN</sub> =12V, I <sub>O</sub> =1A			
Line Regulation		ΔV <sub>OLINE</sub>		20	40	mV
		Conditions	V <sub>IN</sub> =10 to 30V, I <sub>O</sub> =1A			
Load Regulation		ΔV <sub>OLOAD</sub>		10	30	mV
		Conditions	V <sub>IN</sub> =12V, I <sub>O</sub> =0.1 to 1.5A			
Temperature Coefficient of Reference Voltage		ΔV <sub>REF</sub> /ΔT <sub>a</sub>		±0.5		mV/°C
Overcurrent Protection Starting Current		I <sub>S</sub>	1.6			A
		Conditions	V <sub>IN</sub> =12V			
Quiescent Circuit Current		I <sub>q</sub>		7		mA
		Conditions	V <sub>IN</sub> =12V, I <sub>O</sub> =0A			
Circuit Current at Output OFF		I <sub>q</sub> (OFF)			400	μA
		Conditions	V <sub>IN</sub> =12V, V <sub>ON</sub> (OFF)=0.3V			
CE/SS* Terminal	Low Level Voltage	V <sub>SSL</sub>			0.5	V
	Terminal Outflow Current at Low Voltage	I <sub>SSL</sub>			50	μA
Conditions		V <sub>SSL</sub> =0V				

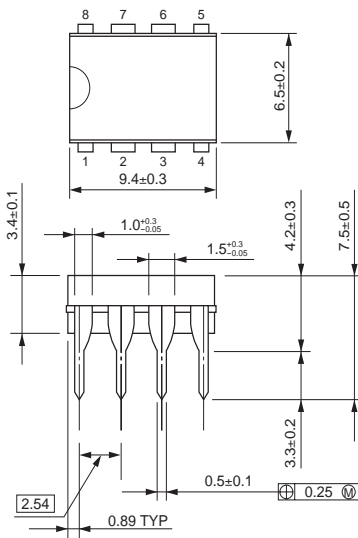
\*: Pin 2 is the CE/SS pin. Soft start at power on can be performed with a capacitor connected to this pin. The output can also be turned ON/OFF with this pin. The output is stopped by setting the voltage of this pin to  $V_{SSL}$  or lower. CE/SS-pin voltage can be changed with an open-collector drive circuit of a transistor.

When using both the soft-start and ON/OFF functions together, the discharge current from  $C_4$  flows into the ON/OFF control transistor. Therefore, limit the current securely to protect the transistor if  $C_4$  capacitance is large. The CE/SS pin is pulled up to the power supply in the IC, so applying the external voltage is prohibited.



## ■External Dimensions (DIP8)

(Unit: mm)



## Pin Assignment

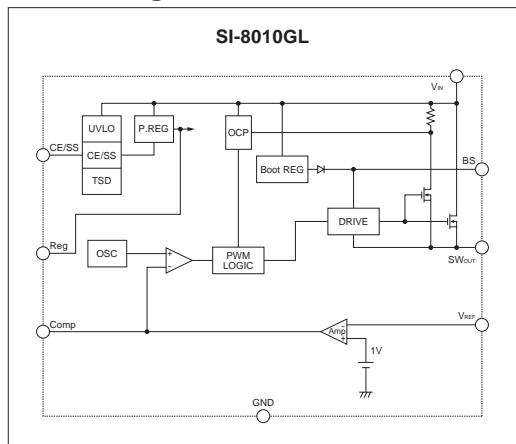
1. GND
2. CE/SS
3. Reg
4. SW<sub>OUT</sub>
5. V<sub>IN</sub>
6. B.S
7. Comp
8. V<sub>REF</sub>

Plastic Mold Package Type

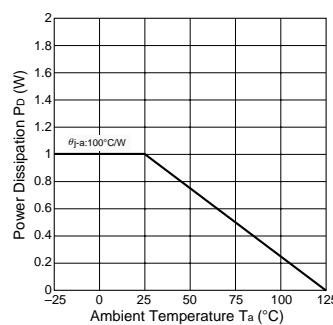
Flammability: UL 94V-0

Product Mass: Approx. 0.49 g

## ■Block Diagram



## ■Ta-PD Characteristics



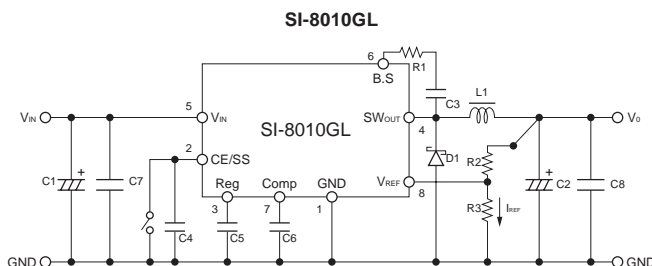
$$P_D = V_O \cdot I_O \left( \frac{100}{\eta\chi} - 1 \right) - V_F \cdot I_O \left( 1 - \frac{V_O}{V_{IN}} \right)$$

Note 1: The efficiency depends on the input voltage and the output current. Therefore, obtain the value from the efficiency graph and substitute the percentage in the formula above.

Note 2: Thermal design for D<sub>1</sub> must be considered separately.

$V_O$  : Output voltage  
 $V_{IN}$  : Input voltage  
 $I_O$  : Output current  
 $\eta\chi$  : Efficiency  
 $V_F$  : Diode D<sub>1</sub> forward voltage  
 RK16...0.4V( $I_O=1A$ )

## ■Typical Connection Diagram



C1: 220μF/63V  
 C2: 470μF/25V  
 C3: 0.1μF  
 C4: 1000pF  
 C5: 0.1μF  
 C6: 0.047μF  
 C7: 0.1μF  
 C8: 0.1μF  
 R1: 47Ω  
 L1: 47μH  
 D1: RK16 (Sanken)

$$R_2 = \frac{(V_{OUT} - V_{REF})}{I_{REF}} = \frac{(V_{OUT} - 1)}{2 \times 10^{-3}} (\Omega), R_3 = \frac{V_{REF}}{I_{REF}} = \frac{1}{2 \times 10^{-3}} \approx 500(\Omega)$$

Diode D<sub>1</sub>

- Be sure to use a Schottky-barrier diode as D<sub>1</sub>. If other diodes like fast recovery diodes are used, IC may be destroyed because of the reverse voltage generated by the recovery voltage or ON voltage.

Choke coil L<sub>1</sub>

- 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 approx. 2.5 A, take care concerning heat radiation from the choke coil caused by magnetic saturation due to overload or short-circuited load.

Capacitor C<sub>1</sub>, C<sub>2</sub>

- As large ripple currents flow through C<sub>1</sub> and C<sub>2</sub>, use high-frequency and low-impedance capacitors aiming for switching-mode-power-supply use. Especially when the impedance of C<sub>2</sub> is high, the switching waveform may become abnormal at low temperatures. For C<sub>2</sub>, 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.

Resistors R<sub>2</sub>, R<sub>3</sub>

- R<sub>2</sub> and R<sub>3</sub> are the resistors to set the output voltage. Set their values so that I<sub>REF</sub> becomes approx. 2 mA. Obtain R<sub>2</sub> and R<sub>3</sub> values by the following formula above.

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