SI-8000GL Series

Compact, Separate Excitation Step-down Switching Mode

■Features

- DIP 8 pin package
- Output current: 1.5A
- High efficiency: 86% (at Vin = 20V, lo = 1A, Vo = 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 (Vref) 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	Vin	53	V
Power Dissipation	P _D *1	1	W
Junction Temperature	Tj	+125	°C
Storage Temperature	Tstg	-40 to +125	°C
Thermal Resistance (junction to case)	$ heta_{ extsf{j-c}}$	28	°C/W
Thermal Resistance (junction to ambient air)	hetaj-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	Linis
		SI-8010GL	Unit
DC Input Voltage Range	Vin	(8 or Vo+3)*1 to 50	V
Output Voltage Range	Vo	1 to 14	V
Output Current Range*2	lo	0.02 to 1.5 ^{*2}	A
Operating Junction Temperature Range	Tjop	-30 to +125	°C
Operating Temperature Range	Тор	-30 to +125	°C

^{*1:} The minimum value of an input voltage range is the higher of either 8V or Vo+3V.

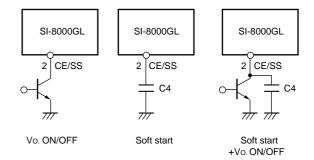
■Electrical Characteristics

(Ta=25°C)

Parameter		Symbol	Ratings					
			SI-8010GL (Variable type)			Unit		
	min.		typ.	max.				
Reference Voltage	VREF	0.97	1.00	1.03	V			
Reference voltage		Conditions				v		
Efficiency		Eff		86		%		
		Conditions		Vin=20V, Io=1A, Vo=5V		70		
Oscillation Frequency		Fosc		250		141-		
		Conditions		Vin=12V, Io=1A		kHz		
Line Description		ΔV oline		20	40			
Line Regulation		Conditions		Vin=10 to 30V, lo=1A		mV		
Load Regulation		ΔV OLOAD		10	30	\/		
		Conditions				mV		
Temperature Coefficient of Reference Voltage		ΔVREF/ΔTa		±0.5		mV/°C		
Overcurrent Protection Starting Current		Is	1.6					
		Conditions				A		
Quiescent Circuit Current		Iq		7				
		Conditions				mA		
Circuit Current at Output OFF	Iq(OFF)			400	μΑ			
	Conditions							
CE/SS* Terminal	Low Level Voltage	Vssl			0.5	V		
	Terminal Outflow Current at Low Voltage	IssL			50	μΑ		
		Conditions		VssL=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 VssL or lower. CE/SS-pin voltage can be changed with an open-collector drive circuit of a transistor.

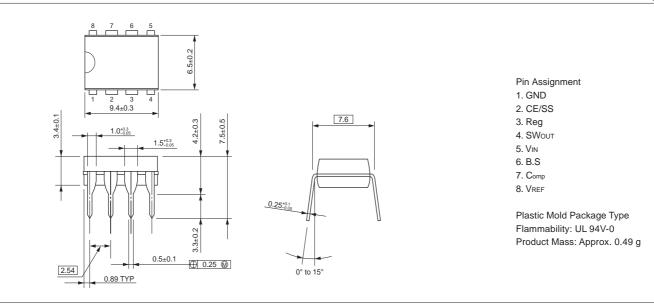
When using both the soft-start and ON/OFF functions together, the discharge current from C4 flows into the ON/OFF control transistor. Therefore, limit the current securely to protect the transistor if C3 capacitance is large. The CE/SS pin is pulled up to the power supply in the IC, so applying the external voltage is prohibited.



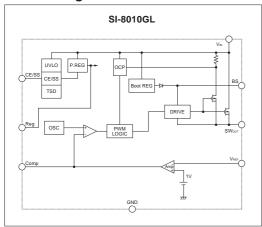
^{*2:} Please be sure to let the output current run more than 20 mA. When using by less than 20 mA, there is a possibility that the output voltage becomes unstable.

■External Dimensions (DIP8)

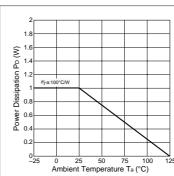
(Unit: mm)



■Block Diagram



■Ta-PD Characteristics



$$P_{D}=V_{O} \bullet I_{O}\left(\frac{100}{\eta \chi} -1\right) - V_{F} \bullet I_{O}\left(1 - \frac{V_{O}}{V_{IN}}\right)$$

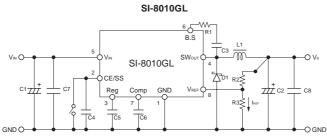
Note 1: The efficiency depends on the input voltage and the output current. Therefore, obtain the value from the efficiency graph and substitute the percentage in the formula above.

Note 2: Thermal design for D₁ must be considered separately.

Vo : Output voltage Vin : Input voltage Io : Output current $\eta \chi$: Efficiency

VF: Diode D1 forward voltage RK16···0.4V(lo=1A)

■Typical Connection Diagram



C1: $220\mu\text{F}/63\text{V}$ C8: $0.1\mu\text{F}$ C2: $470\mu\text{F}/25\text{V}$ R1: 47Ω C3: $0.1\mu\text{F}$ L1: $47\mu\text{H}$ C4: 1000pF D1: RK16 C5: $0.1\mu\text{F}$ (Sanken) C6: $0.047\mu\text{F}$ C7: $0.1\mu\text{F}$

$$R2 = \frac{\text{(Vout-Vref)}}{\text{Iref}} = \frac{\text{(Vout-1)}}{2 \times 10^{-3}} (\Omega), R3 = \frac{\text{Vref}}{\text{Iref}} = \frac{1}{2 \times 10^{-3}} = 500 (\Omega)$$

Diode D₁

• Be sure to use a Schottky-barrier diode as D1. 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 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 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 C₁, C₂

- 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.
- Resistors R2, R3
 R2 and R3 are the resistors to set the output voltage. Set their values so that IREF becomes approx. 2 mA. Obtain R2 and R3 values by the following formula above.
- * To create the optimum operating conditions, place the components as close as possible to each other.