

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)	θ_{J-C}	28	°C/W
Thermal Resistance (junction to ambient air)	θ_{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)* ¹ to 50	V
Output Voltage Range	V_O	1 to 14	V
Output Current Range* ²	I_O	0.02 to 1.5* ²	A
Operating Junction Temperature Range	T_{Jop}	−30 to +125	°C
Operating Temperature Range	T_{op}	−30 to +125	°C

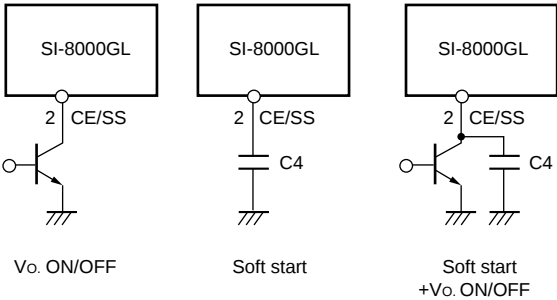
*1: The minimum value of an input voltage range is the higher of either 8V or V_O+3V .
*2: Please be sure to let the output current run more than 20 mA. When using by less than 20 mA, there is a possibility that the output voltage becomes unstable.

Electrical Characteristics

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

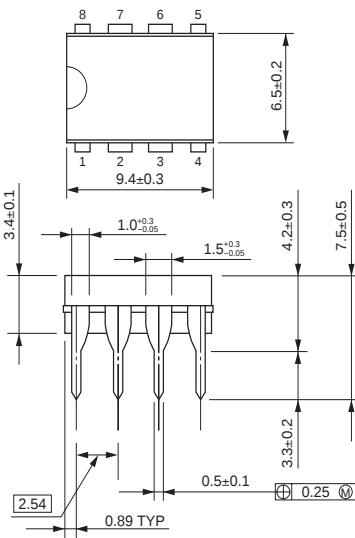
Parameter		Symbol	Ratings			Unit
			SI-8010GL (Variable type)			
			min.	typ.	max.	
Reference Voltage	VREF	0.97	1.00	1.03	V	
	Conditions	VIN=12V, IO=1A				
Efficiency	Eff		86		%	
	Conditions	VIN=20V, IO=1A, VO=5V				
Oscillation Frequency	FOSC		250		kHz	
	Conditions	VIN=12V, IO=1A				
Line Regulation	ΔVOLUME		20	40	mV	
	Conditions	VIN=10 to 30V, IO=1A				
Load Regulation	ΔVLOAD		10	30	mV	
	Conditions	VIN=12V, IO=0.1 to 1.5A				
Temperature Coefficient of Reference Voltage	ΔVREF/ΔTa		±0.5		mV/°C	
Overcurrent Protection Starting Current	IS	1.6			A	
	Conditions	VIN=12V				
Quiescent Circuit Current	Iq		7		mA	
	Conditions	VIN=12V, IO=0A				
Circuit Current at Output OFF	Iq(OFF)			400	μA	
	Conditions	VIN=12V, VON/OFF=0.3V				
CE/SS* Terminal	Low Level Voltage	VSSL		0.5	V	
	Terminal Outflow Current at Low Voltage	ISSL		50	μA	
		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 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 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.



■External Dimensions (DIP8)

(Unit: mm)



Pin Assignment

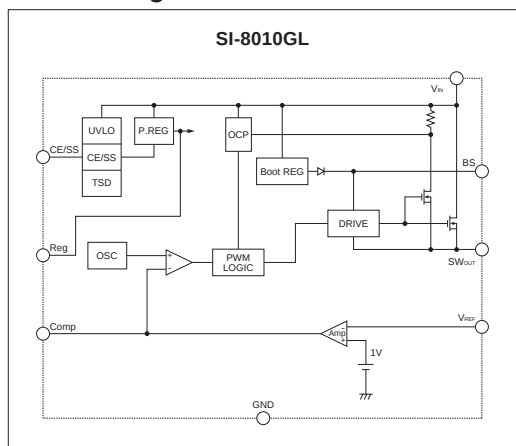
1. GND
2. CE/SS
3. Reg
4. SW_{OUT}
5. V_{IN}
6. B.S
7. Comp
8. V_{REF}

Plastic Mold Package Type

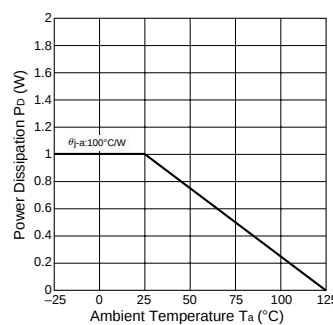
Flammability: UL 94V-0

Product Mass: Approx. 0.49 g

■Block Diagram



■Ta-PD Characteristics



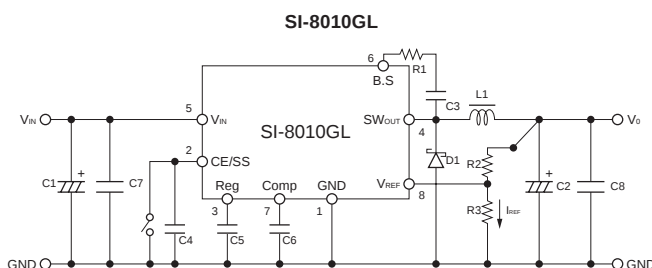
$$P_D = V_O \cdot I_O \left(\frac{100}{\eta\chi} - 1 \right) - V_F \cdot I_O \left(1 - \frac{V_O}{V_{IN}} \right)$$

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 D₁ must be considered separately.

V_O : Output voltage
 V_{IN} : Input voltage
 I_O : Output current
 $\eta\chi$: Efficiency
 V_F : Diode D₁ 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 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 I_{REF} 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.