SI-8000S Series Full-Mold, Separate Excitation Step-down Switching Mode

■Features

- Compact full-mold package (equivalent to TO220)
- Output current: 3.0A
- High efficiency: 79 to 91%
- Requires only 4 discrete components
- Internally-adjusted phase correction and output voltage
- Built-in reference oscillator (60kHz)
- Built-in overcurrent and thermal protection circuits
- Built-in soft start circuit (Output ON/OFF available)

■Applications

- Power supplies for telecommunication equipment
- Onboard local power supplies

■Lineup

Part Number	SI-8033S	SI-8050S	SI-8090S	SI-8120S	SI-8150S
V_O(V)	3.3	5.0	9.0	12.0	15.0
I_O(A)	3.0				

■Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
DC Input Voltage	V_{IN}	43*	V
Power Dissipation	P_{D1}	18(With infinite heatsink)	W
	P_{D2}	1.5(Without heatsink, stand-alone operation)	W
Junction Temperature	T_j	+125	°C
Storage Temperature	T_{stg}	–40 to +125	°C
SW Terminal Applied Reverse Voltage	V_{SW}	–1	V
Thermal Resistance(junction to case)	$\theta_{j\text{-}c}$	5.5	°C/W

*35V for SI-8033S

■Recommended Operating Conditions

Parameter	Symbol	Ratings					Unit
		SI-8033S	SI-8050S	SI-8090S	SI-8120S	SI-8150S	
DC Input Voltage Range	V_{IN}	5.5 to 28	7 to 40	12 to 40	15 to 40	18 to 40	V
Output Current Range	I_O	0 to 3.0					A
Operating Junction Temperature Range	T_{jop}	–30 to +125					°C

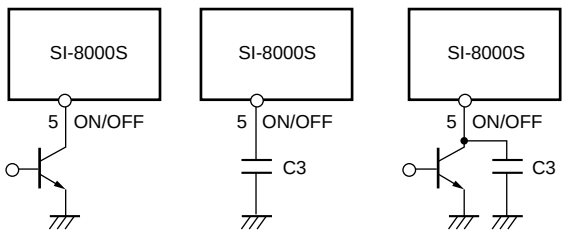
■Electrical Characteristics

(T_a=25°C)

Parameter		Symbol	Ratings															Unit
			SI-8033S			SI-8050S			SI-8090S			SI-8120S			SI-8150S			
			min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	
Output Voltage	SI-8000S*1	V_O	3.17	3.30	3.43	4.80	5.00	5.20	8.55	9.00	9.45	11.50	12.00	12.50	14.25	15.00	15.75	V
	SI-8000SS		3.234	3.30	3.366	4.90	5.00	5.10	———			———			———			
		Conditions	V_{IN}=15V, I_O=1.0A			V_{IN}=20V, I_O=1.0A			V_{IN}=21V, I_O=1.0A			V_{IN}=24V, I_O=1.0A			V_{IN}=25V, I_O=1.0A			
Efficiency		η		79			84			88			90			91		%
		Conditions	V_{IN}=15V, I_O=1.0A			V_{IN}=20V, I_O=1.0A			V_{IN}=21V, I_O=1.0A			V_{IN}=24V, I_O=1.0A			V_{IN}=25V, I_O=1.0A			
Oscillation Frequency		f		60			60			60			60			60		kHz
		Conditions	V_{IN}=15V, I_O=1.0A			V_{IN}=20V, I_O=1.0A			V_{IN}=21V, I_O=1.0A			V_{IN}=24V, I_O=1.0A			V_{IN}=25V, I_O=1.0A			
Line Regulation		ΔV_{OLINE}		25	80		40	100		50	120		60	130		60	130	mV
		Conditions	V_{IN}=8 to 28V, I_O=1.0A			V_{IN}=10 to 30V, I_O=1.0A			V_{IN}=15 to 30V, I_O=1.0A			V_{IN}=18 to 30V, I_O=1.0A			V_{IN}=21 to 30V, I_O=1.0A			
Load Regulation		ΔV_{OLOAD}		10	30		10	40		10	40		10	40		10	40	mV
		Conditions	V_{IN}=15V, I_O=0.5 to 1.5A			V_{IN}=20V, I_O=0.5 to 1.5A			V_{IN}=21V, I_O=0.5 to 1.5A			V_{IN}=24V, I_O=0.5 to 1.5A			V_{IN}=25V, I_O=0.5 to 1.5A			
Temperature Coefficient of Output Voltage		$\Delta V_O/\Delta T_a$		±0.5			±0.5			±1.0			±1.0			±1.0		mV/°C
Overcurrent Protection Starting Current		I_{S1}	3.1			3.1			3.1			3.1			3.1			A
		Conditions	V_{IN}=15V			V_{IN}=20V			V_{IN}=21V			V_{IN}=24V			V_{IN}=25V			
Soft Start Pin*2	Low-Level Voltage	V_{SSL}		0.2			0.2			0.2			0.2			0.2		V
	Outflow Current at Low Voltage	I_{SSL}	15	25	35	15	25	35	15	25	35	15	25	35	15	25	35	μA
		Conditions	V_{SSL}=0.2V															

*1:"S" may be printed to the right of the marking (except SI-8090S, SI-8120S, SI-8150S).

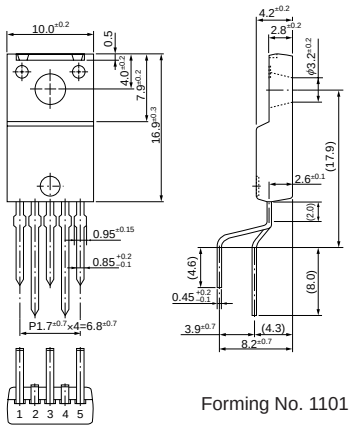
*2:Pin 5 is a soft start pin. Soft start at power on can be performed with a capacitor connected to this pin.
The output can also be turned ON/OFF with this pin.
The output is stopped by setting the voltage of this pin to V_{SSL} or lower.
Soft-start pin voltage can be changed with an open-collector 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 (TO220F-5)

(Unit : mm)

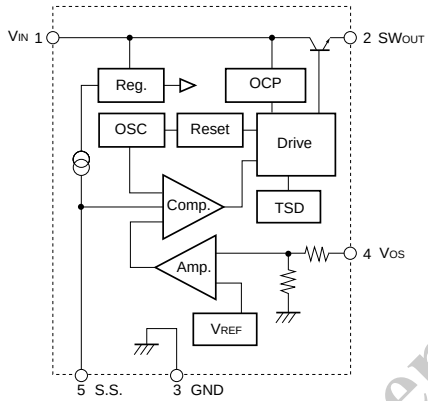


Forming No. 1101

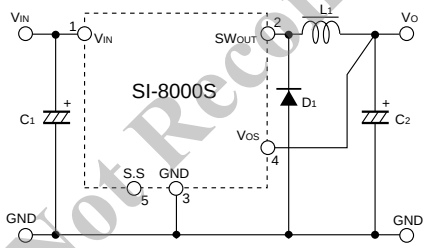
Pin Assignment
① V_{IN}
② SW_{OUT}
③ GND
④ V_{OS}
⑤ S.S

Plastic Mold Package Type
Flammability: UL94V-0
Product Mass: Approx. 2.3g

■Block Diagram

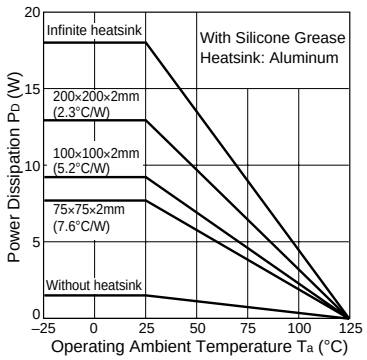


■Typical Connection Diagram



$C_{1,2}$: 1000μF
L_1 : 150μH
D_1 : RK46(Sanken)

■T_a-P_D Characteristics



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

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.

V_O : Output voltage
V_{IN} : Input voltage
I_O : Output current
$\eta\chi$: Efficiency (%)
V_F : Diode D_1 forward voltage
0.5V(RK46)

Thermal design for D_1 must be considered separately.