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

■Features

- Surface-mount package (TO263-5)
- Output current: 1.5A
- High efficiency: 77 to 88%
- Requires only 4 discrete components
- Internally-adjusted phase correction and output voltage
- Capable of downsizing a choke-coil due to IC's high switching frequency (125 kHz). (Compared with conventional Sanken devices)
- Built-in foldback-overcurrent and thermal protection circuits
- Output ON/OFF available (Circuit current at output OFF: 200μA max)
- Soft start available by ON/OFF pin Conditions

■Lineup

Part Number	SI-8033JD	SI-8050JD	SI-8090JD	SI-8120JD
V_O(V)	3.3	5.0	9.0	12.0
I_O(A)	1.5			

■Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
DC Input Voltage	V_{IN}	43	V	
Output Current	I_O	1.5	A	
Power Dissipation*	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)	θ_{j-c}	3	°C/W	
Thermal Resistance (Junction to Ambient Air)	θ_{j-a}	33.3	°C/W	When mounted on glass-epoxy board 40 × 40 mm (copper area 100%)

*: Limited by thermal protection circuit

■Applications

- Power supplies for telecommunication equipment
- Onboard local power supplies, etc.

■Recommended Operating Conditions

Parameter	Symbol	Ratings				Unit	Conditions
		SI-8033JD	SI-8050JD	SI-8090JD	SI-8120JD		
DC Input Voltage Range	V_{IN1}	5.3 to 40	7 to 40	11 to 40	14 to 40	V	I_O=0 to 1A
	V_{IN2}	6.3 to 40	8 to 40	12 to 40	15 to 40		I_O=0 to 1.5A
DC Output Current Range*	I_O	0 to 1.5				A	V_{IN}≥V_O+3V
Operating Junction Temperature Range	T_{jop}	–30 to +125				°C	
Operating Temperature Range*	T_{op}	–30 to +125				°C	

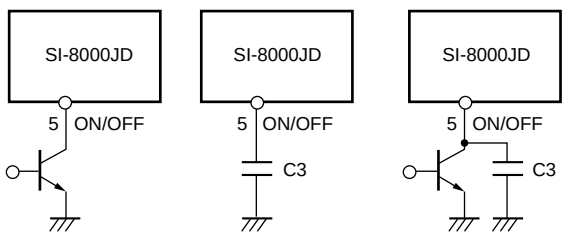
*: Limited by Ta–P_D characteristics

■Electrical Characteristics

(T_a=25°C)

Parameter		Symbol	SI-8033JD			SI-8050JD			SI-8090JD			SI-8120JD			Unit
			min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	
Output Voltage		V_O	3.234	3.30	3.366	4.90	5.00	5.10	8.82	9.00	9.18	11.76	12.00	12.24	V
		Conditions	V_{IN}=15V, I_O=0.5A			V_{IN}=20V, I_O=0.5A			V_{IN}=21V, I_O=0.5A			V_{IN}=24V, I_O=0.5A			
Efficiency		η		77			82			86			88		%
		Conditions	V_{IN}=15V, I_O=0.5A			V_{IN}=20V, I_O=0.5A			V_{IN}=21V, I_O=0.5A			V_{IN}=24V, I_O=0.5A			
Oscillation Frequency		f		125			125			125			125		kHz
		Conditions	V_{IN}=15V, I_O=0.5A			V_{IN}=20V, I_O=0.5A			V_{IN}=21V, I_O=0.5A			V_{IN}=24V, I_O=0.5A			
Line Regulation		ΔV_{OLINE}		25	80		40	100		50	120		60	130	mV
		Conditions	V_{IN}=8 to 30V, I_O=0.5A			V_{IN}=10 to 30V, I_O=0.5A			V_{IN}=15 to 30V, I_O=0.5A			V_{IN}=18 to 30V, I_O=0.5A			
Load Regulation		ΔV_{OLOAD}		10	30		10	40		10	40		10	40	mV
		Conditions	V_{IN}=15V, I_O=0.2 to 0.8A			V_{IN}=20V, I_O=0.2 to 0.8A			V_{IN}=21V, I_O=0.2 to 0.8A			V_{IN}=24V, I_O=0.2 to 0.8A			
Temperature Coefficient of Output Voltage		$\Delta V_O/\Delta T_a$		±0.5			±0.5			±1.0			±1.0		mV/°C
Overcurrent Protection Starting Current		I_{S1}	1.6			1.6			1.6			1.6			A
		Conditions	V_{IN}=15V			V_{IN}=20V			V_{IN}=21V			V_{IN}=24V			
ON/OFF* Pin	Low Level Voltage	V_{SSL}			0.5			0.5			0.5			0.5	V
	Outflow Current at Low Voltage	I_{SSL}			100			100			100			100	μA
		Conditions	V_{SSL}=0V												
Quiescent Circuit Current		I_q		7			7			7			7		mA
		Conditions	V_{IN}=15V, Io=0A			V_{IN}=20V, Io=0A			V_{IN}=21V, Io=0A			V_{IN}=24V, Io=0A			
		$I_{q(OFF)}$			200			200			200			200	μA
		Conditions	V_{IN}=15V, $V_{ON/OFF}$=0.3V			V_{IN}=20V, $V_{ON/OFF}$=0.3V			V_{IN}=21V, $V_{ON/OFF}$=0.3V			V_{IN}=24V, $V_{ON/OFF}$=0.3V			

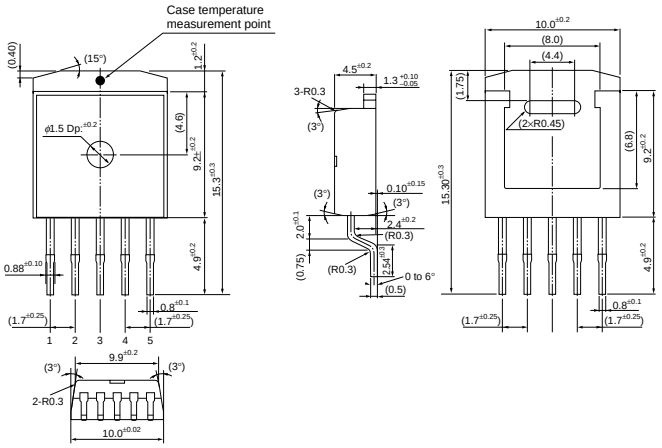
*: Pin 5 is the ON/OFF pin. Soft start at power on can be performed with a capacitor connected to this pin.
The output can also be turned ON/OFF with this pin.
The output is stopped by setting the voltage of this pin to V_{SSL} or lower.
ON/OFF-pin voltage can be changed with an open-collector drive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



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

■External Dimensions (TO263-5)

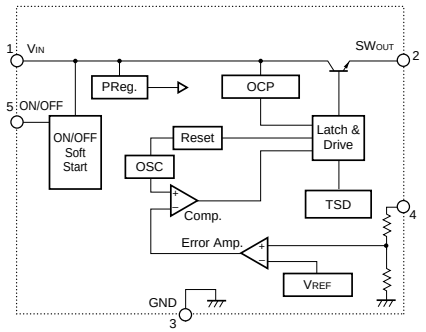
(Unit : mm)



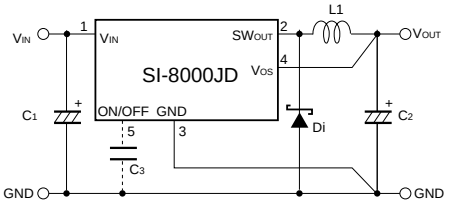
Pin Assignment
① V_{IN}
② SW_{OUT}
③ GND
④ V_{OS}
⑤ ON/OFF

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

■Block Diagram



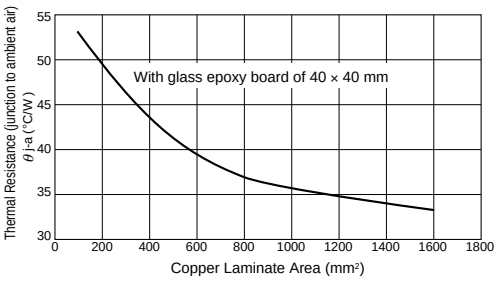
■Typical Connection Diagram



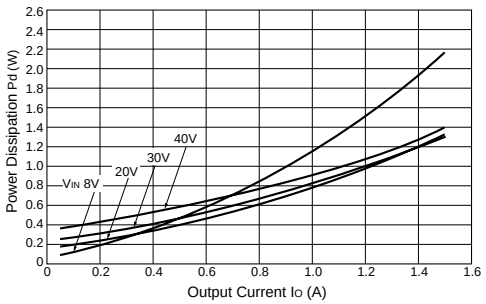
C_1 : 50V/220μF
C_2 : 25V/470μF
C_3 : 10V/0.47μF (Only when using soft-start function)
L_1 : 100μH
Di : SJPB-H6 (Sanken)

■Reference Data

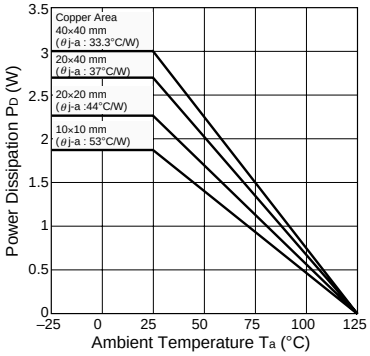
Copper Laminate Area on Glass Epoxy Board vs. Thermal Resistance (Junction to Ambient Air) (Typical Value)



Output Current vs. Power Dissipation (Typical)



■T_a-P_D Characteristics



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

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 : D_1 forward voltage
0.4V(I_O=2A)(SJPB-H6)

Thermal design for D_1 must be considered separately.