

SI-3000KD Series**Surface-Mount, Low Current Consumption, Low Dropout Voltage****■Features**

- Compact surface-mount package (TO263-5)
- Output current: 1.0A
- Low dropout voltage: $V_{DIF} \leq 0.6V$ (at $I_o = 1.0A$)
- Low circuit current consumption: $I_q \leq 350 \mu A$ (600 μA for SI-3010KD, SI-3050KD)
- Low circuit current at output OFF: $I_q (\text{OFF}) \leq 1 \mu A$
- Built-in overcurrent, thermal protection circuits
- Compatible with low ESR capacitors (SI-3012KD and SI-3033KD)

■Absolute Maximum Ratings

Parameter	Symbol	Ratings		(Ta=25°C)
		SI-3012KD/3033KD	SI-3010KD/3050KD	
DC Input Voltage	V _{IN}	17	35 ¹	V
DC Output Current	I _O		1.0	A
Power Dissipation	P _D ²		3	W
Junction Temperature	T _j		-30 to +125	°C
Storage Temperature	T _{stg}		-30 to +125	°C
Thermal Resistance (Junction to Ambient Air)	θ _{j-a}		33.3	°C/W
Thermal Resistance (Junction to Case)	θ _{j-c}		3	°C/W

*1: A built-in input-overvoltage-protection circuit shuts down the output voltage at the Input Overvoltage Shutdown Voltage of the electrical characteristics.

*2: When mounted on glass-epoxy board of 1600mm² (copper laminate area 100%).

■Applications

- Secondary stabilized power supply (local power supply)

■Electrical Characteristics 1 (Low Input Voltage type compatible with low ESR output capacitor)

(Ta=25°C, V_C=2V, unless otherwise specified)

Parameter	Symbol	Ratings						Unit
		SI-3012KD (Variable type)			SI-3033KD			
min.	typ.	max.	min.	typ.	max.			
Input Voltage	V _{IN}	2.4 ³		⁴	³	⁴		V
Output Voltage (Reference Voltage for SI-3012KD)	V _O (V _{adj})	1.24	1.28	1.32	3.234	3.300	3.366	V
Line Regulation	ΔV _{OLINE}			15			15	mV
Load Regulation	ΔV _{OLOAD}			40			50	mV
Dropout Voltage	V _{DIF}			0.4			0.4	V
Quiescent Circuit Current	I _Q			350			350	μA
Circuit Current at Output OFF	I _Q (OFF)			1			1	μA
Temperature Coefficient of Output Voltage	ΔV _O /ΔT _a	±0.3			±0.3			mV/°C
Ripple Rejection	R _{REJ}	55			55			dB
Overcurrent Protection Starting Current ¹	I _{S1}	1.1			1.1			A
V _c Terminal	Control Voltage (Output ON) ²	V _c , I _H	2		2			V
	Control Voltage (Output OFF)	V _c , I _L		0.8			0.8	μA
	Control Current (Output ON)	I _c , I _H		40			40	μA
	Control Current (Output OFF)	I _c , I _L	-5	0	-5	0		μA

*1: I_{S1} is specified at the 5% drop point of output voltage V_O under the condition of Output Voltage parameter.

*2: Output is OFF when the output control terminal (V_c terminal) is open. Each input level is equivalent to LS-TTL level. Therefore, the device can be driven directly by LS-TTLs.

*3: Refer to the Dropout Voltage parameter.

*4: V_{IN} (max) and I_O (max) are restricted by the relation P_D = (V_{IN} - V_O) × I_O. Please calculate these values referring to the Copper laminate area vs. Power dissipation data.

■ Electrical Characteristics 2 (High Input Voltage Type)

Parameter	Symbol	Ratings						Unit	
		SI-3010KD (Variable type)			SI-3050KD				
		min.	typ.	max.	min.	typ.	max.		
Input Voltage	V _{IN}	2.4 ^{*1}		27 ^{*5}	*1		15 ^{*5}	V	
Output Voltage (Reference Voltage V _{ADJ} for SI-3010KD)	V _O (V _{ADJ})	0.98	1.00	1.02	4.90	5.00	5.10	V	
	Conditions	V _{IN} =7V, I _O =10mA			V _{IN} =7V, I _O =10mA				
Line Regulation	ΔV _{OLINE}			30			30	mV	
	Conditions	V _{IN} =6 to 11V, I _O =10mA (V _O =5V)			V _{IN} =6 to 11V, I _O =10mA				
Load Regulation	ΔV _{OLOAD}			75			75	mV	
	Conditions	V _{IN} =7V, I _O =0 to 1A (V _O =5V)			V _{IN} =7V, I _O =0 to 1A				
Dropout Voltage	V _{DIF}			0.3			0.3	V	
	Conditions	I _O =0.5A (V _O =5V)			I _O =0.5A				
	Conditions			0.6			0.6		
	Conditions	I _O =1A (V _O =5V)			I _O =1A				
Quiescent Circuit Current	I _Q			600			600	μA	
	Conditions	V _{IN} =7V, I _O =0A, V _C =2V R ₂ =10kΩ			V _{IN} =7V, I _O =0A, V _C =2V				
Circuit Current at Output OFF	I _Q (OFF)			1			1	μA	
	Conditions	V _{IN} =7V, V _C =0V			V _{IN} =7V, V _C =0V				
Temperature Coefficient of Output Voltage	ΔV _O /ΔT _A		±0.5			±0.5		mV/°C	
	Conditions	T _j =0 to 100°C (V _O =5V)			T _j =0 to 100°C				
Ripple Rejection	R _{REJ}		75			75		dB	
	Conditions	V _{IN} =7V, f=100 to 120Hz, I _O =0.1A (V _O =5V)			V _{IN} =7V, f=100 to 120Hz, I _O =0.1A				
Overcurrent Protection Starting Current ^{*2}	I _{S1}	1.1			1.1			A	
^{*4}	Conditions	V _{IN} =7V			V _{IN} =7V				
V _C Terminal	Control Voltage (Output ON) ^{*3}	V _C , I _H	2.0			2.0		V	
	Control Voltage (Output OFF) ^{*3}	V _C , I _L			0.8				
	Control Current (Output ON)	I _C , I _H			40			μA	
	Conditions	V _C =2V			V _C =2V				
	Control Current (Output OFF)	I _C , I _L	-5	0		-5	0	μA	
	Conditions	V _C =0V			V _C =0V				
Input Overvoltage Shutdown Voltage	V _{OVP}	33			26			V	
	Conditions	I _O =10mA			I _O =10mA				

*1: Refer to the Dropout Voltage parameter.

*2: I_{S1} is specified at the 5% drop point of output voltage V_o under the condition of Output Voltage parameter.

*3: Output is OFF when the output control terminal (Vc terminal) is open. Each input level is equivalent to LS-TTL level. Therefore, the device can be driven directly by LS-TTLs.

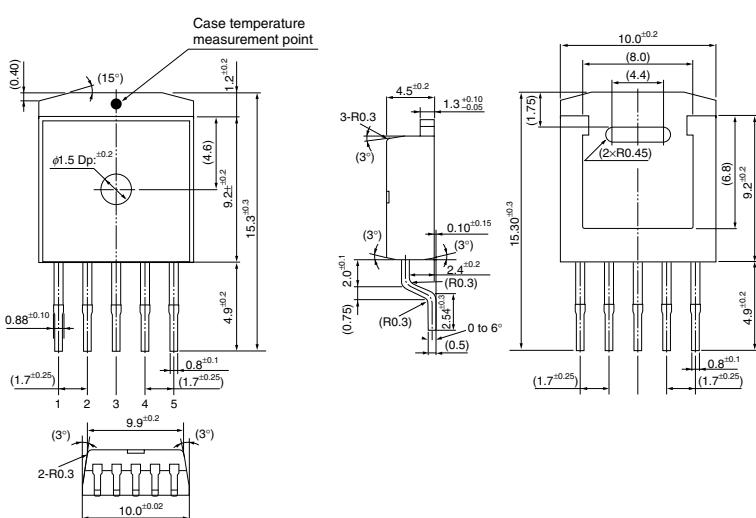
*4: SI-3010KD, SI-3050KD, cannot be used in the following applications because the built-in foldback-type overcurrent protection may cause errors during start-up stage.

(1) Constant current load (2) Positive and negative power supply (3) Series-connected power supply (4) Vo adjustment by raising ground voltage

*5: VIN (max) and IO (max) are restricted by the relation PD = (VIN - VO) X IO. Please calculate these values referring to the Copper laminate area vs. Power dissipation data as shown hereinafter.

■ External Dimensions (TO263-5)

(unit : mm)



Pin Assignment

- ① Vc
 - ② VIN
 - ③ GND (Common to the rear side of product)
 - ④ Vo
 - ⑤ Sense

(ADJ for SI-3010KD/3012KD)

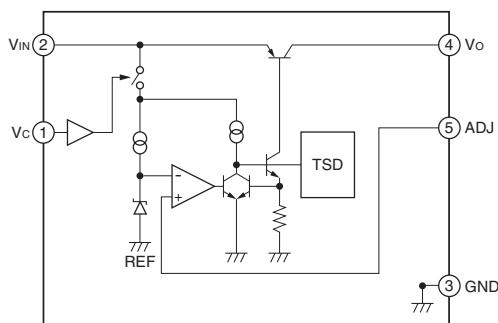
Plastic Mold Package Type

Flammability: UL 94V-0

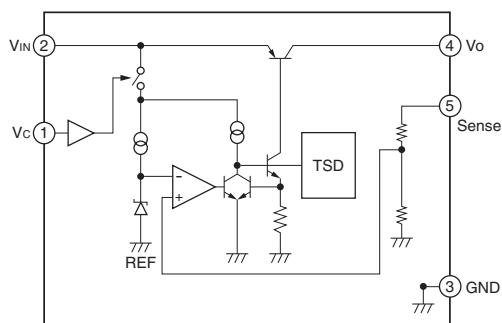
Product Mass: Approx. 1.48g

■Block Diagram

●SI-3010KD/SI-3012KD

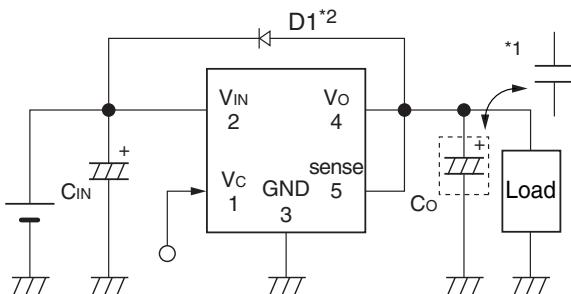


●SI-3033KD/SI-3050KD



■Typical Connection Diagram

●SI-3033KD/SI-3050KD



C_{IN}: Input capacitor (22 μ F or larger)

C_O: Output capacitor

*1: SI-3012KD/3033KD (22 μ F or larger)

Co has to be a low ESR capacitor such as a ceramic capacitor.

When using the electrolytic capacitor, oscillation may occur at a low temperature.

SI-3010KD/3050KD/ (47 μ F or larger)

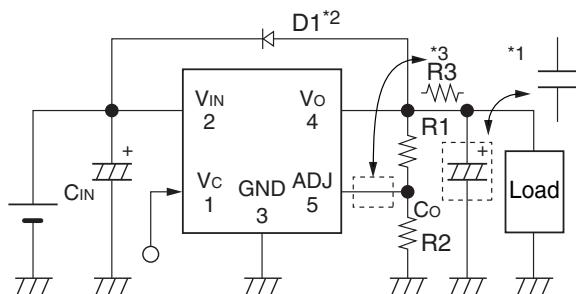
If a low ESR capacitor is used, oscillation may occur.

*2: D1: Reverse bias protection diode

This diode is required for protection against reverse biasing between the input and output.
(Sanken SJPL-H2 is recommended.)

This diode is not required at $V_o \leq 3.3V$.

●SI-3010KD/SI-3012KD



R1, R2: Output voltage setting resistors

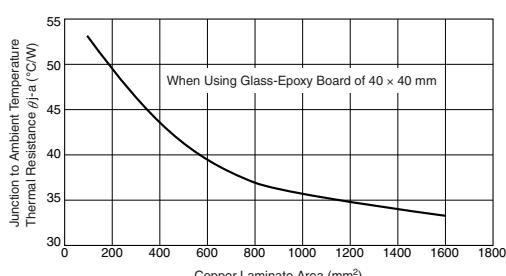
The output voltage can be set by connecting R1 and R2 as shown above.
The recommended value for R2 is 10Ω (24kΩ for SI-3012KD).

$$R1 = (V_o - V_{ADJ}) / (V_{ADJ} / R2)$$

*3: For SI-3010KD, insert R3 in case of setting V_o to $V_o \leq 1.5V$.
The recommended value for R3 is 10kΩ.

■Reference Data

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



- A higher heat radiation effect can be achieved by enlarging the copper laminate area connected to the inner frame to which a monolithic ICs is mounted.
- Obtaining the junction temperature
Measure the case temperature T_c with a thermocouple, etc. Then, substitute this value in the following formula to obtain the junction temperature.

$$T_j = P_D \times \theta_{j-c} + T_c \quad (\theta_{j-c} = 3^\circ C/W) \quad P_D = (V_{IN} - V_o) \cdot I_{OUT}$$