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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: $VDIF \le 0.6V$ (at IO = 1.0A)
- Low circuit current consumption: Iq \leq 350 μ A (600 μ A for SI-3010KD, SI-3050KD)
- Low circuit current at output OFF: Iq (OFF) \leq 1 $\mu \rm A$
- · Built-in overcurrent, thermal protection circuits
- Compatible with low ESR capacitors (SI-3012KD and SI-3033KD)

■Absolute Maximum Ratings

(Ta=25°C)

Parameter	Symbol	Rati	Unit		
Farameter	Symbol	SI-3012KD/3033KD	SI-3010KD/3050KD	Offit	
DC Input Voltage	VIN	17	35*1	V	
Output Control Terminal Voltage	Vc	V	V		
DC Output Current	lo	1.	А		
Power Dissipation	Pp*2	3		W	
Junction Temperature	Tj	–30 to	-30 to +125		
Storage Temperature	Tstg	-30 to	+125	°C	
Thermal Resistance (Junction to Ambient Air)	hetaj-a	33	3.3	°C/W	
Thermal Resistance (Junction to Case)	<i>Ө</i> ј-с		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.

■Applications

· Secondary stabilized power supply (local power supply)

■Electrical Characteristics 1 (Low Input Voltage type compatible with low ESR output capacitor) (Ta=25°C, Vc=2V, unless otherwise specified)

			Ratings						Unit	
Parameter		Symbol	SI-3012KD (Variable type)			SI-3033KD				
			min.	typ.	max.	min.	typ.	max.		
Input Vol	Itage	Vin	2.4*3		*4	*3		*4	V	
Output V	/oltage	Vo (VADJ)	1.24	1.28	1.32	3.234	3.300	3.366	V	
(Reference Voltage for SI-3012KD)		Conditions	Vin=3.3V, Io=10mA							
Line Bee	vulation	ΔV oline			15			15	mV	
Line Regulation	Conditions	Vin=3.3 to 8V, lo=10mA (Vo=2.5V)			\					
Load Regulation	ΔV OLOAD			40			50	mV		
Ludu negulaliui I		Conditions	VIN	3.3V, lo=0 to 1A (Vo=2	.5V)	Vin=5V, lo=0 to 1A				
		VDIF			0.4			0.4		
Dropout	Voltage	Conditions	lo=0.5A (Vo=2.5V)				lo=0.5A			
Dropout Voltage					0.6			0.6		
		Conditions		lo=1A (Vo=2.5V)		lo=1A				
Quiesce	nt Circuit Current	Iq			350			350	μΑ	
Quicoco	nt Girdait Garrent	Conditions	V _{IN} =3.3V, Io=0A, Vc=2V, R2=2.4kΩ			VIN=5V, Io=0A,Vc=2V				
Circuit C	urrent at Output OFF	Iq (OFF)			1			1	μΑ	
Circuit Current at Output OFF		Conditions	Vin=3.3V, Vc=0V					<u>'</u>		
	ature Coefficient of	ΔVο/ΔΤα		±0.3			±0.3		mV/°C	
Output Voltage		Conditions	T _j =0 to 100°C (Vo=2.5V)			T _j =0 to 100°C			,	
Rinnla R	ejection	Rrej		55			55		dB	
Ripple Rejection		Conditions	Vin=3.3V, f=100 to 120Hz, lo=0.1A (Vo=2.5V)			V _{IN} =5V, f=100 to 120Hz, Io=0.1A				
Overcurrent Protection Starting Current*1		ls ₁	1.1			1.1			_ A	
		Conditions	Vin=3.3V			V _{IN} =5V				
	Control Voltage (Output ON)*2	Vc, IH	2			2			_ v	
	Control Voltage (Output OFF)	Vc, IL			0.8			0.8		
Vc Terminal	Control Current (Output ON)	lc, IH			40			40	μΑ	
		Conditions		Vc=2V		Vc=2V			<u> </u>	
	Control Current (Output OFF)	Ic, IL	– 5	0		-5	0		μΑ	
		Conditions	Vc=0V				Vc=0V			

^{*1:} Is1 is specified at the 5% drop point of output voltage Vo under the condition of Output Voltage parameter.

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

^{*2:} 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.

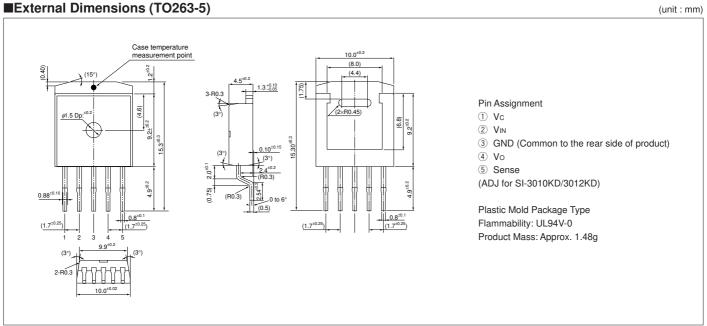
^{*3:} Refer to the Dropout Voltage parameter.

^{*4:} VIN (max) and Io (max) are restricted by the relation PD = (VIN - Vo) × Io. Please calculate these values referring to the Copper laminate area vs. Power dissipation data.

■Electrical Characteristics 2 (High Input Voltage Type)

			Ratings						Unit	
Parameter	Symbol	SI-3010KD (Variable type)			SI-3050KD					
		min.	typ.	max.	min.	typ.	max.			
Input Vo	Itage	Vin	2.4*1		27 ^{*5}	*1		15 ^{*5}	V	
Output V	/oltage	Vo (Vadj)	0.98	1.00	1.02	4.90	5.00	5.10	V	
(Reference	e Voltage VabJ for SI-3010KD)	Conditions		VIN=7V, Io=10mA		V _{IN=7} V, Io=10mA			7 '	
	ΔV OLINE			30			30			
Line Regulation		Conditions	V _{IN=6} to 11V, Io=10mA (Vo=5V)			V _{IN=6} to 11V, lo=10mA			mV	
		ΔVOLOAD			75			75	1	
Load Regulation		Conditions	V _{IN=7} V, Io=0 to 1A (Vo=5V)			Vin=7V, lo=0 to 1A			mV	
		VDIF			0.3			0.3		
_		Conditions		lo=0.5A (Vo=5V)			lo=0.5A		V	
Dropout	Voltage				0.6			0.6	7 v	
		Conditions	Io=1A (Vo=5V)			lo=1A			7	
		lq			600			600	1	
Quiescent Circuit Current		Conditions	V _{IN=} 7V, Io=0A, Vc=2V R2=10kΩ			V _{IN=7} V, lo=0A, V _{C=2} V			μΑ	
		Iq (OFF)			1			1	+ ,	
Circuit Current at Output OFF		Conditions	Vin=7V, Vc=0V			V _{IN=7} V, V _{C=0} V			μΑ	
Tempera	ature Coefficient of	ΔVο/ΔΤα		±0.5			±0.5			
Output V	/oltage	Conditions	T _j =0 to 100°C (Vo=5V)		T _j =0 to 100°C			mV/°C		
	RREJ			75			75			
Ripple Rejection		Conditions	V _{IN=} TV, f=100 to 120Hz, Io=0.1A (Vo=5V)			V _{IN=} 7V, f=100 to 120Hz, lo=0.1A			dB	
Overcurrer	nt Protection Starting Current*2	ls ₁	1.1			1.1			1 ,	
*4		Conditions	V _{IN=7} V			V _{IN=} 7V			Α Α	
	Control Voltage (Output ON)*3	Vc, IH	2.0			2.0			V	
	Control Voltage (Output OFF)*3	Vc, IL			0.8			0.8	v	
Vc Terminal	Control Current (Output ON)	Ic, IH			40			40		
		Conditions	Vc=2V			Vc=2V			μΑ	
	Control Current (Output OFF)	lc, IL	-5	0		-5	0		μΑ	
		Conditions		Vc=0V			Vc=0V			
Input Ov	ervoltage Shutdown	Vovp	33			26			V	
Voltage		Conditions	lo=10mA			Io=10mA			7 v	

 $^{^{\}star}$ 1: Refer to the Dropout Voltage parameter.



^{*2:} ls1 is specified at the 5% drop point of output voltage Vo 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: V_{IN} (max) and Io (max) are restricted by the relation P_D = (V_{IN} - V_O) X Io. Please calculate these values referring to the Copper laminate area vs. Power dissipation data as shown hereinafter.

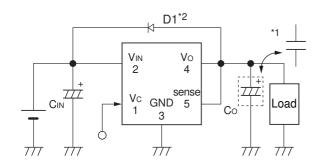
■Block Diagram

●SI-3010KD/SI-3012KD Vin 2 Vc 1 TSD TSD 3 GND

●SI-3033KD/SI-3050KD ViN 2 Vo 1 REF TSD Sense 3 GND

■Typical Connection Diagram

●SI-3033KD/SI-3050KD



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

Co: Output capacitor

*1: SI-3012KD/3033KD (22 µF 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.

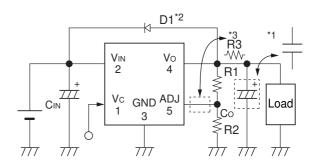
*2: D1: Reverse bias protection diode

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 Vo ≤ 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

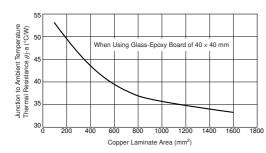
The recommended value for R2 is 10Ω (24k Ω for SI-3012KD).

 $R1=(Vo-Vadj)\div(Vadj/R2)$

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

■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 Tc with a thermocouple, etc. Then, substitute

this value in the following formula to obtain the junction temperature. $T_{j=PD} \times \theta_{j-C} + Tc \ (\ \theta_{j-C} = 3^{\circ}C/W) \quad P_{D} = (V_{IN-VO}) \bullet louT$