

# SI-3000KM Series Surface Mount, Low Current Consumption, Low Dropout Voltage Linear Regulator ICs

## Features

- Compact surface mount package (TO252-5)
- Output current: 1.0 A
- Low dropout voltage:  $V_{DIF} \leq 0.6 \text{ V}$  (at  $I_o = 1.0 \text{ A}$ )
- Low current consumption:  $I_q \leq 350 \mu\text{A}$  (600  $\mu\text{A}$  for SI-3010KM/SI-3050KM/SI-3090KM/SI-3120KM)
- Low circuit current at output OFF:  $I_q(\text{OFF}) \leq 1 \mu\text{A}$
- Built-in overcurrent and thermal protection circuits
- Output ON/OFF control function
- Compatible with low ESR capacitors (SI-3012KM/SI-3025KM/SI-3033KM)

## Absolute Maximum Ratings

(T<sub>a</sub>=25°C)

Parameter	Symbol	Ratings		Unit
		SI-3012KM/ 3025KM/3033KM	SI-3010KM/3050KM/ 3090KM/3120KM	
DC Input Voltage	V <sub>IN</sub>	17	35 <sup>*1</sup>	V
Output Control Terminal Voltage	V <sub>c</sub>	V <sub>IN</sub>		V
DC Output Current	I <sub>o</sub>	1.0		A
Power Dissipation	P <sub>D</sub> <sup>*2</sup>	1		W
Junction Temperature	T <sub>j</sub>	-30 to +125		°C
Storage Temperature	T <sub>stg</sub>	-30 to +125		°C
Thermal Resistance (Junction to Ambient Air)	θ <sub>JA</sub>	95		°C/W
Thermal Resistance (Junction to case)	θ <sub>JC</sub>	6		°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 900mm<sup>2</sup> (copper laminate area 4.3%).

## Applications

- Secondary stabilized power supply (local power supply)

## Recommended Operating Conditions

Parameter	Symbol	Ratings						Unit	
		SI-3012KM	SI-3025KM	SI-3033KM	SI-3010KM	SI-3050KM	SI-3090KM		SI-3120KM
Input Voltage Range	V <sub>IN</sub>	2.4 <sup>*2</sup> to 6.0 <sup>*1</sup>	2.4 <sup>*2</sup> to 5 <sup>*1</sup>	<sup>*2</sup> to 6 <sup>*1</sup>	2.4 <sup>*2</sup> to 27 <sup>*1</sup>	2.4 <sup>*2</sup> to 17 <sup>*1</sup>	<sup>*2</sup> to 20 <sup>*1</sup>	<sup>*2</sup> to 25 <sup>*1</sup>	V
Output Current Range	I <sub>o</sub>	0 to 1.0						A	
Operating Ambient Temperature	T <sub>op</sub>	-30 to +85						°C	
Operating Junction Temperature	T <sub>j</sub>	-20 to +100						°C	

\*1: V<sub>IN</sub> (max) and I<sub>o</sub> (max) are restricted according to operating conditions due to the relation  $P_D = (V_{IN} - V_O) \times I_o$ . Please calculate these values referring to the Copper Laminate Area vs. Power Dissipation data as shown hereinafter.

\*2: Refer to the Dropout Voltage parameter.

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

Parameter	Symbol	Ratings									Unit	
		SI-3012KM (Variable type)			SI-3025KM			SI-3033KM				
		min.	typ.	max.	min.	typ.	max.	min.	typ.	max.		
Input Voltage	V <sub>IN</sub>	2.4 <sup>*1</sup>			<sup>*1</sup>			<sup>*1</sup>			V	
Output Voltage (Reference voltage V <sub>ADJ</sub> for SI-3012KM)	V <sub>O</sub> (V <sub>ADJ</sub> )	1.24	1.28	1.32	2.45	2.50	2.55	3.234	3.300	3.366	V	
	Conditions	V <sub>IN</sub> =3.3V, I <sub>o</sub> =10mA			V <sub>IN</sub> =3.3V, I <sub>o</sub> =10mA			V <sub>IN</sub> =5V, I <sub>o</sub> =10mA				
Line Regulation	ΔV <sub>OLINE</sub>			15			15			15	mV	
	Conditions	V <sub>IN</sub> =3.3 to 8V, I <sub>o</sub> =10mA (V <sub>O</sub> =2.5V)			V <sub>IN</sub> =3.3 to 8V, I <sub>o</sub> =10mA			V <sub>IN</sub> =5 to 10V, I <sub>o</sub> =10mA				
Load Regulation	ΔV <sub>OLOAD</sub>			40			40			50	mV	
	Conditions	V <sub>IN</sub> =3.3V, I <sub>o</sub> =0 to 1A (V <sub>O</sub> =2.5V)			V <sub>IN</sub> =3.3V, I <sub>o</sub> =0 to 1A			V <sub>IN</sub> =5V, I <sub>o</sub> =0 to 1A				
Dropout Voltage	V <sub>DIF</sub>			0.4			0.4			0.4	V	
	Conditions	I <sub>o</sub> =0.5A (V <sub>O</sub> =2.5V)			I <sub>o</sub> =0.5A			I <sub>o</sub> =0.5A				
	Conditions	I <sub>o</sub> =1A (V <sub>O</sub> =2.5V)			I <sub>o</sub> =1A			I <sub>o</sub> =1A				
Quiescent Circuit Current	I <sub>q</sub>			350			350			350	μA	
	Conditions	V <sub>IN</sub> =3.3V, I <sub>o</sub> =0A, V <sub>C</sub> =2V, R <sub>2</sub> =24kΩ			V <sub>IN</sub> =3.3V, I <sub>o</sub> =0A, V <sub>C</sub> =2V			V <sub>IN</sub> =5V, I <sub>o</sub> =0A, V <sub>C</sub> =2V				
Circuit Current at Output OFF	I <sub>q</sub> (OFF)			1			1			1	μA	
	Conditions	V <sub>IN</sub> =3.3V, V <sub>C</sub> =0V			V <sub>IN</sub> =3.3V, V <sub>C</sub> =0V			V <sub>IN</sub> =5V, V <sub>C</sub> =0V				
Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT <sub>a</sub>			±0.3			±0.3			±0.3	mV/°C	
	Conditions	T <sub>J</sub> =0 to 100°C (V <sub>C</sub> =2.5V)			T <sub>J</sub> =0 to 100°C			T <sub>J</sub> =0 to 100°C				
Ripple Rejection	R <sub>REJ</sub>			55			55			55	dB	
	Conditions	V <sub>IN</sub> =3.3V, f=100 to 120Hz (V <sub>O</sub> =2.5V)			V <sub>IN</sub> =3.3V, f=100 to 120Hz			V <sub>IN</sub> =5V, f=100 to 120Hz				
Overcurrent Protection Starting Current <sup>*2</sup>	I <sub>S1</sub>	1.1			1.1			1.1			A	
	Conditions	V <sub>IN</sub> =3.3V			V <sub>IN</sub> =3.3V			V <sub>IN</sub> =5V				
V <sub>c</sub> Terminal	Control Voltage (Output ON) <sup>*3</sup>	V <sub>c</sub> , I <sub>H</sub>	2.0			2.0			2.0		V	
	Control Voltage (Output OFF)	V <sub>c</sub> , I <sub>L</sub>			0.8		0.8			0.8		
	Control Current (Output ON)	I <sub>c</sub> , I <sub>H</sub>			40		40			40		μA
	Conditions	V <sub>C</sub> =2V			V <sub>C</sub> =2V			V <sub>C</sub> =2V				
	Control Current (Output OFF)	I <sub>c</sub> , I <sub>L</sub>	-5	0		-5	0		-5	0		
Conditions	V <sub>C</sub> =0V			V <sub>C</sub> =0V			V <sub>C</sub> =0V			μA		

\*1: Refer to the Dropout Voltage parameter.

\*2: I<sub>S1</sub> is specified at the 5% drop point of output voltage V<sub>O</sub> on the condition that V<sub>IN</sub>=overcurrent protection starting current, I<sub>o</sub> = 10 mA).

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

## Electrical Characteristics 2 (High Input Voltage type)

Parameter	Symbol	Ratings											Unit	
		SI-3010KM (Variable type)			SI-3050KM			SI-3090KM			SI-3120KM			
		min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.		max.
Input Voltage	$V_{IN}$	2.4 <sup>*1</sup>			1			1			1			V
Output Voltage (Reference voltage $V_{ADJ}$ for SI-3010KM)	$V_O$ ( $V_{ADJ}$ )	0.98	1.00	1.02	4.90	5.00	5.10	8.82	9.00	9.18	11.76	12.00	12.24	V
	Conditions	$V_{IN}=7V, I_O=10mA$			$V_{IN}=7V, I_O=10mA$			$V_{IN}=11V, I_O=10mA$			$V_{IN}=14V, I_O=10mA$			
Line Regulation	$\Delta V_{OLINE}$			30			30			54			72	mV
	Conditions	$V_{IN}=6$ to $11V, I_O=10mA$ ( $V_O=5V$ )			$V_{IN}=6$ to $11V, I_O=10mA$			$V_{IN}=10$ to $15V, I_O=10mA$			$V_{IN}=13$ to $18V, I_O=10mA$			
Load Regulation	$\Delta V_{OLOAD}$			75			75			135			180	mV
	Conditions	$V_{IN}=7V, I_O=0$ to $1A$ ( $V_O=5V$ )			$V_{IN}=7V, I_O=0$ to $1A$			$V_{IN}=11V, I_O=0$ to $1A$			$V_{IN}=14V, I_O=0$ to $1A$			
Dropout Voltage	$V_{DIF}$			0.3			0.3			0.3			0.3	V
	Conditions	$I_O=0.5A$ ( $V_O=5V$ )			$I_O=0.5A$			$I_O=0.5A$			$I_O=0.5A$			
	Conditions	$I_O=1A$ ( $V_O=5V$ )			$I_O=1A$			$I_O=1A$			$I_O=1A$			
Quiescent Circuit Current	$I_q$			600			600			600			600	$\mu A$
	Conditions	$V_{IN}=7V, I_O=0A, V_C=2V, R_2=10k\Omega$			$V_{IN}=7V, I_O=0A, V_C=2V$			$V_{IN}=11V, I_O=0A, V_C=2V$			$V_{IN}=14V, I_O=0A, V_C=2V$			
Circuit Current at Output OFF	$I_q(OFF)$			1			1			1			1	$\mu A$
	Conditions	$V_{IN}=7V, V_C=0V$			$V_{IN}=7V, V_C=0V$			$V_{IN}=11V, V_C=0V$			$V_{IN}=14V, V_C=0V$			
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T_a$			$\pm 0.5$			$\pm 0.5$			$\pm 1.0$			$\pm 1.5$	mV/ $^{\circ}C$
	Conditions	$T_j=0$ to $100^{\circ}C$ ( $V_O=5V$ )			$T_j=0$ to $100^{\circ}C$			$T_j=0$ to $100^{\circ}C$			$T_j=0$ to $100^{\circ}C$			
Ripple Rejection	$R_{REJ}$			75			75			68			66	dB
	Conditions	$V_{IN}=7V, f=100$ to $120Hz$ ( $V_O=5V$ )			$V_{IN}=7V, f=100$ to $120Hz$			$V_{IN}=11V, f=100$ to $120Hz$			$V_{IN}=14V, f=100$ to $120Hz$			
Overcurrent Protection Starting Current <sup>*2</sup>	$I_{S1}$	1.1			1.1			1.1			1.1			A
	Conditions	$V_{IN}=7V$			$V_{IN}=7V$			$V_{IN}=11V$			$V_{IN}=14V$			
Vc Terminal	Control Voltage (Output ON) <sup>*3</sup>	$V_C, I_H$	2.0			2.0			2.0		2.0			V
	Control Voltage (Output OFF) <sup>*3</sup>	$V_C, I_L$			0.8			0.8			0.8		0.8	V
	Control Current (Output ON)	$I_C, I_H$			40			40			40			$\mu A$
	Control Current (Output OFF)	$I_C, I_L$	-5	0		-5	0		-5	0		-5	0	$\mu A$
	Conditions	$V_C=0V$			$V_C=0V$			$V_C=0V$			$V_C=0V$			
Input Overvoltage Shutdown Voltage	$V_{OVP}$	33			26			30			33			V
	Conditions	$I_O=10mA$			$I_O=10mA$			$I_O=10mA$			$I_O=10mA$			

\*1: Refer to the Dropout Voltage parameter.

\*2:  $I_{S1}$  is specified at the 5% drop point of output voltage  $V_O$  on the condition that  $V_{IN}$ =overcurrent protection starting current,  $I_O = 10$  mA.

\*3: Output is OFF when 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.

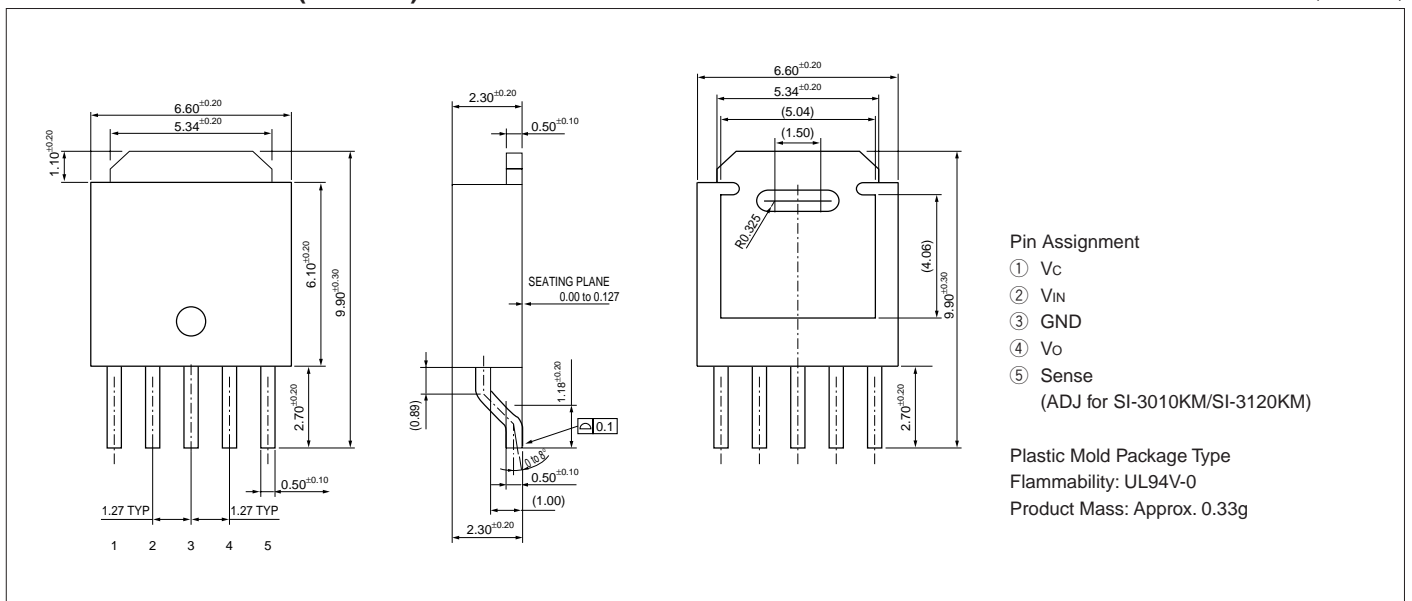
\*4: SI-3010KM, SI-3050KM and SI-3090KM, SI-3120KM cannot be used in the following applications because the built-in foldback-type overcurrent protection may cause errors during start-up stage.

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

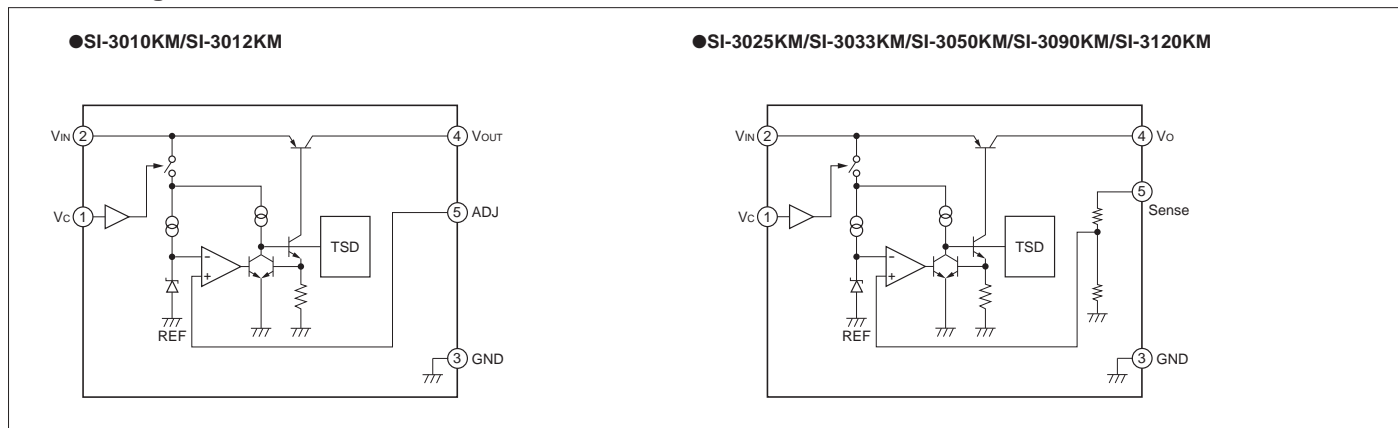
\*5:  $V_{IN}$  (max) and  $I_O$  (max) are restricted by the relation  $P_D = (V_{IN} - V_O) \times I_O$ . Please calculate these values referring to the Copper Laminate Area vs. Power Dissipation data as shown hereinafter.

## External Dimensions (TO252-5)

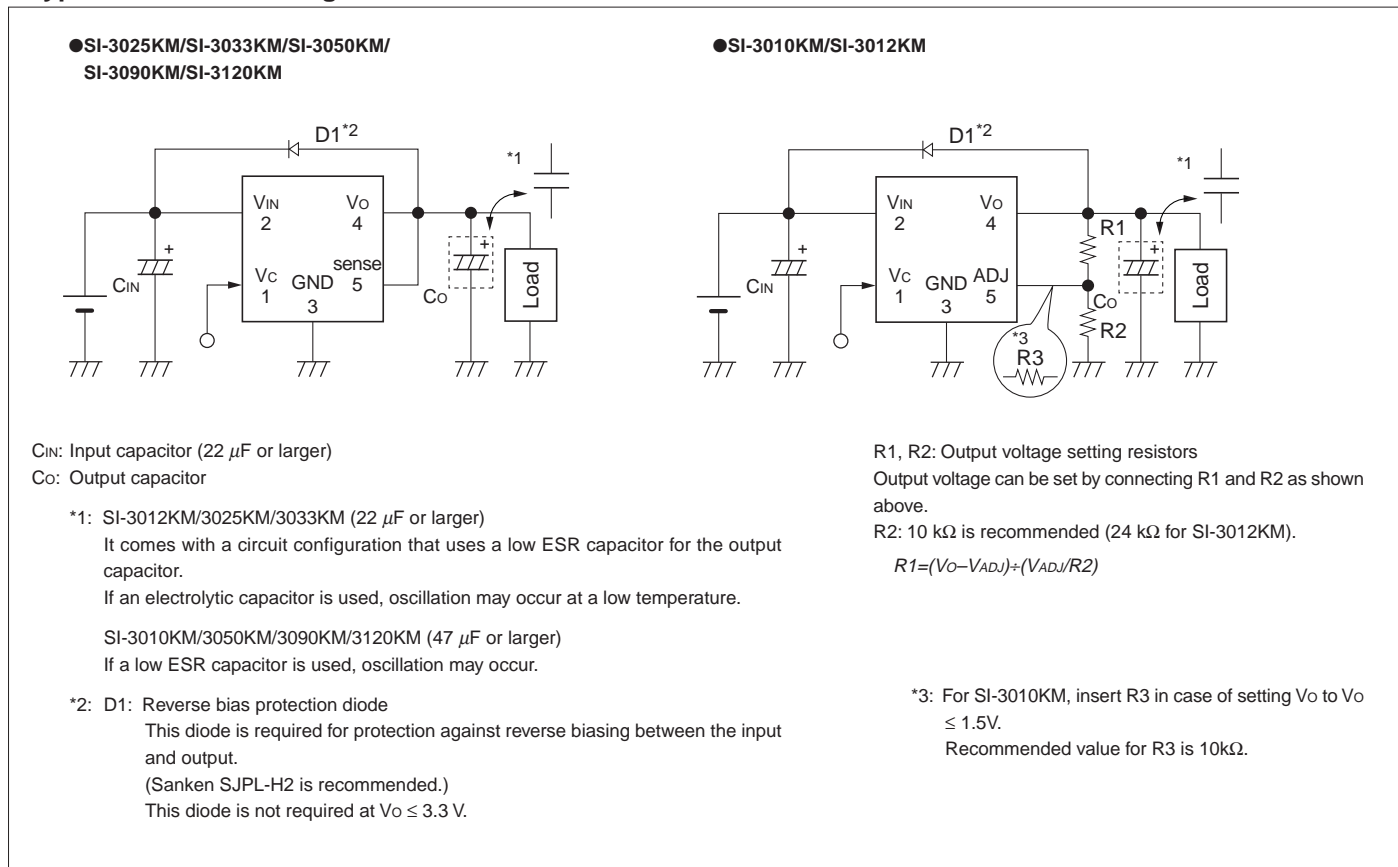
(Unit : mm)



Block Diagram



Typical Connection Diagram



Reference Data

