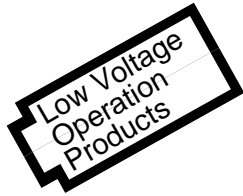


# SCI7630M/C Series

## Switching Regulator



- **Step-up Switching Regulator**  
(1.5V → 2.0, 2.2, 2.35, 2.4, 2.7, 2.8, 3.0, 3.1, 3.5, 3.7, 4.2, 5.0V)
- **Low Operating Voltage (Min 0.9V)**
- **Voltage Detecting function, Battery Back-up function**  
(SCI7363/7632/7635/7636/7639M/C)

### ■ DESCRIPTION

The SCI7630M/C Series offers a variety of high-efficiency and low current dissipation switching regulators produced by the silicon gate CMOS process. (An external inductor is used to implement the boosting function.) Each SCI7630M/C basically consists of a reference voltage supply, comparator, and inductor driving transistors. Its output voltage is fixed internally.

The SCI7630M/C Series operates with low current dissipation and low voltage. Its optional features include voltage detecting function, battery back-up function, and stand-by function. It is thus suited for controlling the power supply of portable or small size equipment that requires high operating efficiency.

The SCI7630M/C series has four major variation. The SCI7635M/C, the SCI7636M/C and the SCI7637M/C are driven by external clock signals. The SCI7631M/C, the SCI7632M/C, the SCI7638M/C and the SCI7639M/C operate by the clock signal generated by an on-chip CR oscillation circuit. The SCI7633M/C and the SCI7634M/C operate by the clock signal generated by a crystal oscillation circuit. And another feature of the SCI7636M/C, the SCI7638M/C and the SCI7639M/C is its output voltage which has temperature characteristics matching the properties of an LCD, making it suitable as the power supply of a product using an LCD.

### ■ FEATURES

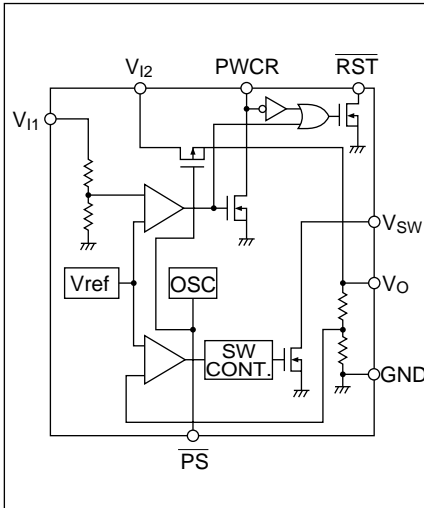
- Low operating voltage ..... Min. 0.9V
- Low current dissipation ..... Typ. 5 $\mu$ A (SCI7635M/C)
- Low stand-by current ..... Typ. 3 $\mu$ A
- High accurate voltage detection ..... 1.05V (0.05V (SCI7631M/C, SCI7632M/C, SCI7635M/C, SCI7636M/C, SCI7638M/C, SCI7639M/C, SCI763AM/C))
- Be able to power off
- Battery back-up function (SCI7631M/C, SCI7632M/C, SCI7635M/C, SCI7636M/C, SCI7637M/C, SCI7639M/C)
- Built-in CR oscillation circuit (SCI7631M/C, SCI7632M/C, SCI7638M/C, SCI7639M/C)
- Power on clean (SCI7631M/C, SCI7638M/C)
- Response compensation inputs (SCI7632M/C, SCI7638M/C, SCI7639M/C, SCI763AM/C)
- Temperature gradient of output voltage for LCD (SCI7636M/C, SCI7638M/C, SCI7639M/C)
- Package ..... SCI763M: SOP3-8pin(plastic)  
SCI763C: DIP-8pin(plastic)

## LINE UP

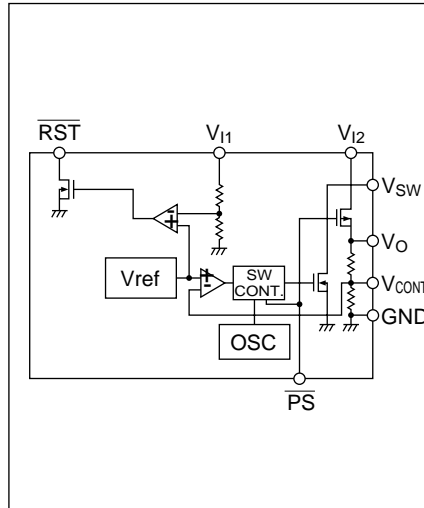
Type No.	Input voltage	Output voltage	Oscillation for booster	Voltage detecting function	Power-on clear	Battery back-up	Ripple noise suppression input	Output voltage temp gradient	Package
SCI7631C <sub>CA</sub>	1.5V (0.9Vmin.)	2.0V	internal CR oscillation	available	available	available	-	-	DIP-8pin
SCI7631M <sub>CA</sub>		SOP3-8pin							
SCI7631C <sub>HA</sub>		2.2V							DIP-8pin
SCI7631M <sub>HA</sub>		SOP3-8pin							
SCI7631C <sub>LA</sub>		2.4V							DIP-8pin
SCI7631M <sub>LA</sub>		SOP3-8pin							
SCI7631C <sub>BA</sub>		3.0V							DIP-8pin
SCI7631M <sub>BA</sub>		SOP3-8pin							
SCI7631C <sub>KA</sub>		3.5V							DIP-8pin
SCI7631M <sub>KA</sub>		SOP3-8pin							
SCI7631C <sub>AA</sub>		5.0V							DIP-8pin
SCI7631M <sub>AA</sub>		SOP3-8pin							
SCI7632C <sub>RA</sub>	1.5V (0.9Vmin.)	2.8V	internal CR oscillation	available	-	available	available	-	DIP-8pin
SCI7632M <sub>RA</sub>		SOP3-8pin							
SCI7632C <sub>AA</sub>		5.0V							DIP-8pin
SCI7632M <sub>AA</sub>		SOP3-8pin							
SCI7633C <sub>BA</sub>	1.5V (0.9Vmin.)	3.0V	crystal oscillation	-	-	-	-	-	DIP-8pin
SCI7633M <sub>BA</sub>		SOP3-8pin							
SCI7633C <sub>AA</sub>		5.0V							DIP-8pin
SCI7633M <sub>AA</sub>		SOP3-8pin							
SCI7634C <sub>NA</sub>	1.5V (0.9Vmin.)	2.35V	crystal oscillation	-	-	-	available	-	DIP-8pin
SCI7634M <sub>NA</sub>									SOP3-8pin
SCI7635C <sub>CA</sub>	1.5V (0.9Vmin.)	2.0V	external clock input	available	-	available	-	-	DIP-8pin
SCI7635M <sub>CA</sub>		SOP3-8pin							
SCI7635C <sub>FA</sub>		2.7V							DIP-8pin
SCI7635M <sub>FA</sub>		SOP3-8pin							
SCI7635C <sub>BA</sub>		3.0V							DIP-8pin
SCI7635M <sub>BA</sub>		SOP3-8pin							
SCI7635C <sub>AA</sub>		5.0V							DIP-8pin
SCI7635M <sub>AA</sub>		SOP3-8pin							
SCI7636C <sub>BA</sub>	1.5V (0.9Vmin.)	3.0V	external clock input	available	-	available	-	-3.0mV/°C	DIP-8pin
SCI7636M <sub>BA</sub>		SOP3-8pin							
SCI7636C <sub>JA</sub>		3.1V						-6.0mV/°C	DIP-8pin
SCI7636M <sub>JA</sub>		SOP3-8pin							
SCI7636C <sub>AA</sub>		5.0V						-5.0mV/°C	DIP-8pin
SCI7636M <sub>AA</sub>		SOP3-8pin							
SCI7637C <sub>NA</sub>	1.5V (0.9Vmin.)	2.35V	external clock input	-	-	available	available	-	DIP-8pin
SCI7637M <sub>NA</sub>		SOP3-8pin							
SCI7637C <sub>FA</sub>		2.7V							DIP-8pin
SCI7637M <sub>FA</sub>		SOP3-8pin							
SCI7637C <sub>BA</sub>		3.0V							DIP-8pin
SCI7637M <sub>BA</sub>		SOP3-8pin							
SCI7638C <sub>HA</sub>	1.5V (0.9Vmin.)	2.2V	internal CR oscillation	available	available	-	available	-4.5mV/°C	DIP-8pin
SCI7638M <sub>HA</sub>		SOP3-8pin							
SCI7638C <sub>LA</sub>		2.4V						-4.0mV/°C	DIP-8pin
SCI7638M <sub>LA</sub>		SOP3-8pin							
SCI7638C <sub>FA</sub>		2.7V						-6.0mV/°C	DIP-8pin
SCI7638M <sub>FA</sub>		SOP3-8pin							
SCI7639C <sub>RA</sub>	1.5V (0.9Vmin.)	2.8V	internal CR oscillation	available	-	available	available	-5.5mV/°C	DIP-8pin
SCI7639M <sub>RA</sub>									SOP3-8pin
SCI763AM <sub>SA</sub>	1.5V	3.7V	internal CR oscillation	available	-	-	available	-	SOP3-8pin
SCI763AM <sub>PA</sub>	(0.9Vmin.)	4.2V							SOP3-8pin

## ■ BLOCK DIAGRAM

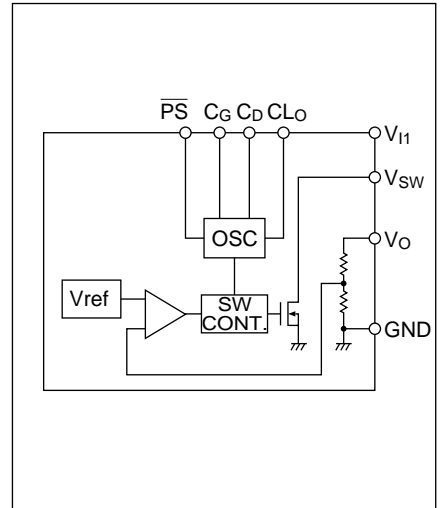
● SCI7631M/C



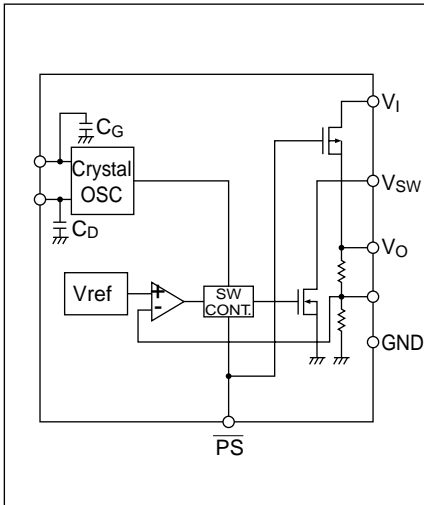
● SCI7632M/C



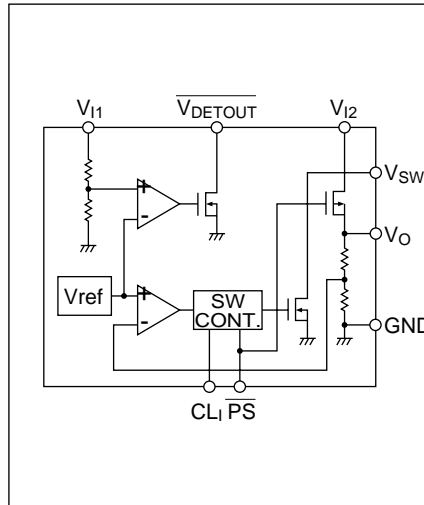
● SCI7633M/C



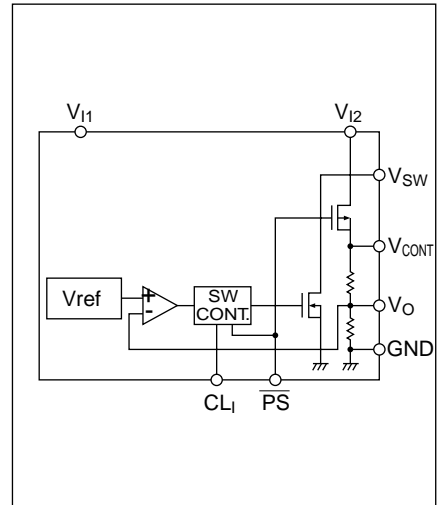
● SCI7634M/C



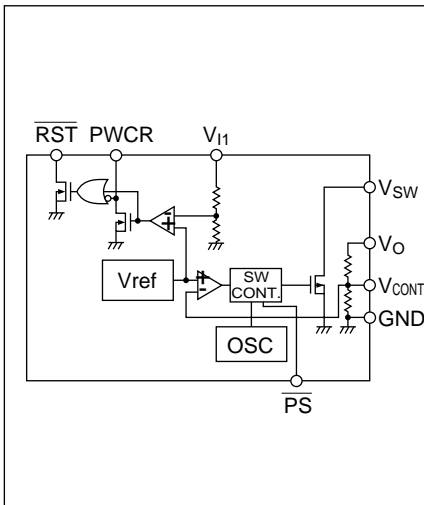
● SCI7635M/C, SCI7636M/C



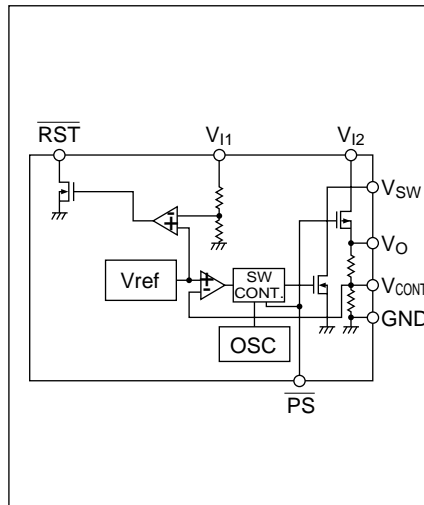
● SCI7637M/C



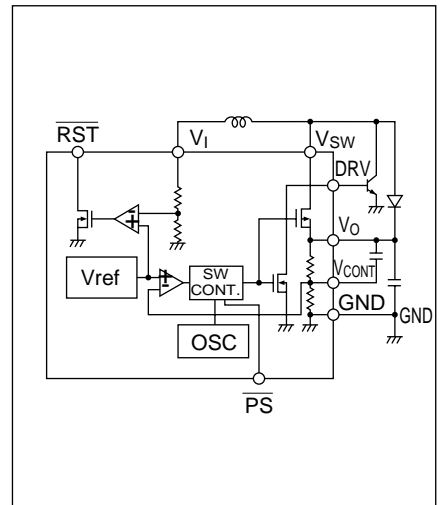
● SCI7638M/C



● SCI7639M/C

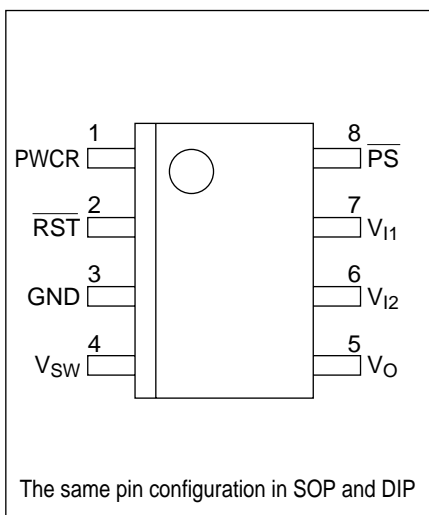


● SCI763AM

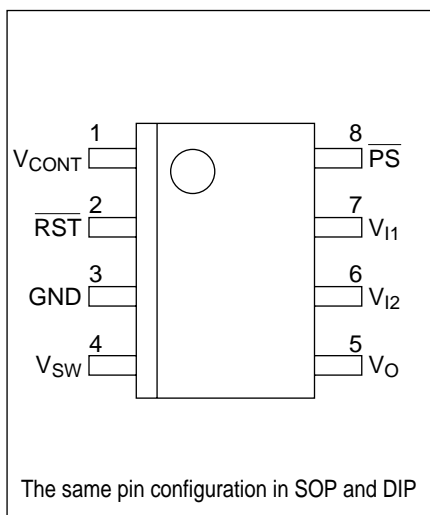


## ■ PIN CONFIGURATION

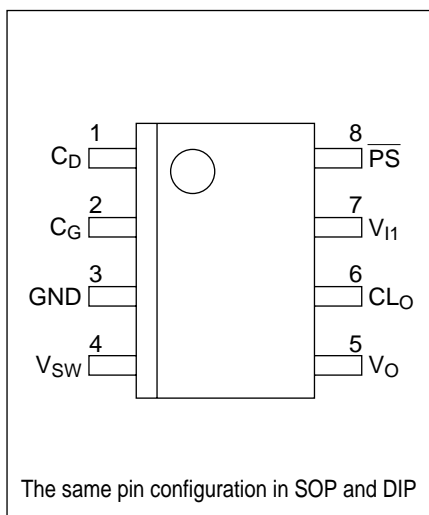
### ● SCI7631M/C



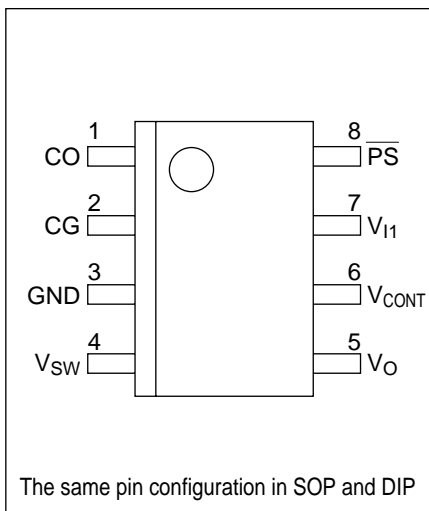
### ● SCI7632M/C



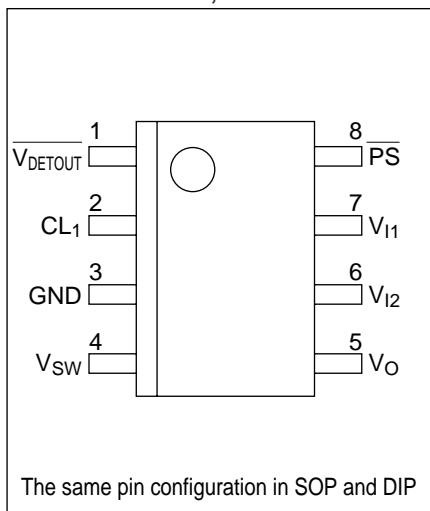
### ● SCI7633M/C



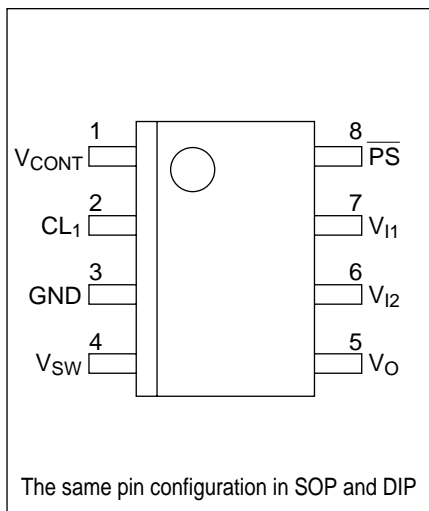
### ● SCI7634M/C



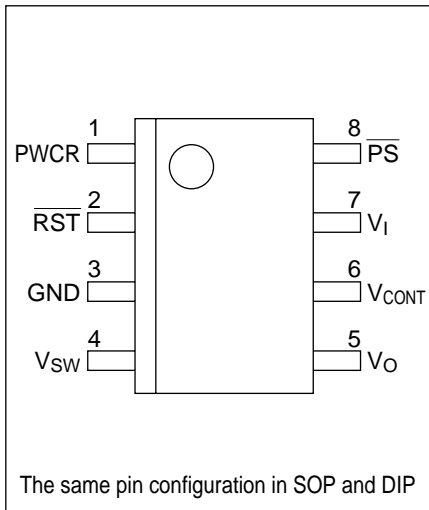
### ● SCI7635M/C, SCI7636M/C



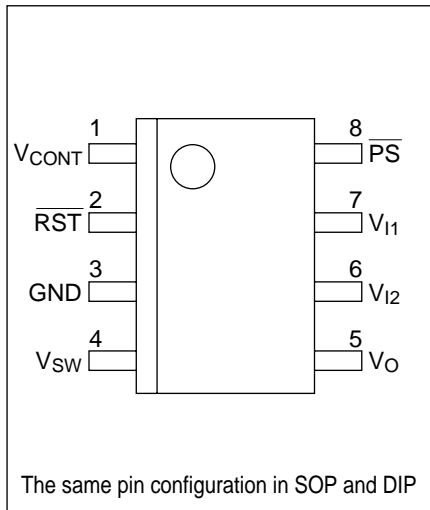
### ● SCI7637M/C



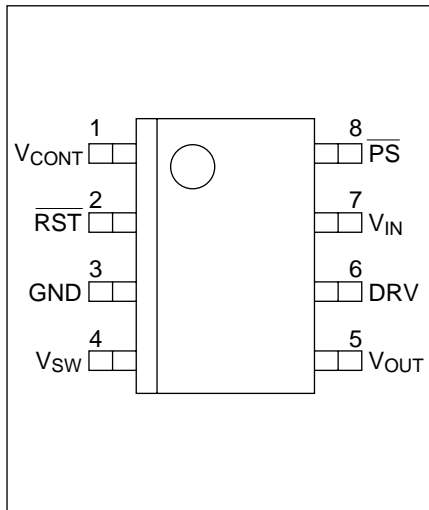
### ● SCI7638M/C



### ● SCI7639M/C



### ● SCI763AM



## ■ PIN DESCRIPTION

Pin Name	Function	Pin Name	Function
V <sub>I1</sub>	Power supply for booster(positive)	RST	Reset signal output(voltage detection)
V <sub>I2</sub>	Power Supply for back-up(positive)	C <sub>D</sub>	Crystal oscillator terminal(Drain)
V <sub>O</sub>	Output voltage	C <sub>G</sub>	Crystal oscillator terminal(Gate)
V <sub>SW</sub>	Terminal for connection of inductor for booster	CL <sub>O</sub>	Clock pulse output
PS	Power save control	CL <sub>I</sub>	Clock pulse input for booster
V <sub>DETOU</sub>	Output pin of voltage detection	GND	Power supply(GND)
PWCR	Power on clear	V <sub>CONT</sub>	Comparator input terminal

- \*1. Stand-by mode and back-up function (back-up function is available to SCI7631M/C, SCI7632M/C, SCI7635M/C, SCI7636M/C, SCI7637M/C, SCI7639M/C).  
The device can be set into stand-by mode by connecting the  $\overline{\text{PS}}$  pin to GND level. In the stand-by mode, the on-chip back-up switch turns on and the input voltage connected to the V<sub>I2</sub> pin is output to the V<sub>O</sub> pin with the boosting operation at rest. The  $\overline{\text{PS}}$  pin is internally pulled up, and must be held open when its control is unnecessary. (Connecting the voltage detection output to the  $\overline{\text{PS}}$  pin validates the back-up function.)
- \*2. Voltage detecting function (SCI7632M/C, SCI7635M/C, SCI7636M/C, SCI7639M/C)  
The RST/V<sub>DETOU</sub> pin provides an N-channel open drain output. It is in open state when the voltage to the V<sub>I1</sub> pin exceeds the detection voltage. If the voltage to the V<sub>I1</sub> pin decreases below the detection voltage, the N-channel transistor of the output turns on to develop GND level. The detection voltage is 1.05V ±0.05V, which is fixed internally.
- \*3. Power on clear function (SCI7631M/C, SCI7638M/C) (voltage detection function)  
See the SCI7631M/C example of application. For a system with an external resistor R<sub>1</sub> and capacitor C<sub>1</sub> connected to the PWCR pin and a pull-up resistor to the  $\overline{\text{RST}}$  pin, a reset pulse whose width can flexibly be selected by R<sub>1</sub> and C<sub>1</sub> is obtained after acquisition of normal output by boosting operation. This enables the system (for example, a microcomputer), connected to the  $\overline{\text{RST}}$  pin, to be correctly reset.  
With the PWCR pin connected to the V<sub>O</sub> pin, the  $\overline{\text{RST}}$  pin stays open when V<sub>I1</sub> exceeds the detection voltage, and develops a GND level output when V<sub>I1</sub> is smaller than the detection voltage.
- \*4. The ripple voltage generated on the boost output voltage can be reduced by connecting response compensation capacitor between the comparator input terminals V<sub>CONT</sub> and the V<sub>O</sub>. (SCI7632M/C, SCI7634M/C, SCI7637M/C, SCI7638M/C, SCI7639M/C)

## ■ ABSOLUTE MAXIMUM RATINGS

(GND=0V, Ta=25°C)

Rating	Symbol	Value	Unit
input voltage	V <sub>I1</sub>	7	V
Output current	I <sub>O</sub>	100	mA
Output voltage	V <sub>O</sub>	7	V
Power dissipation	P <sub>d</sub>	200(SOP3-8pin) 300(DIP-8pin)	mW
Operating temperature	T <sub>opr</sub>	- 30 to 85	°C
Storage temperature	T <sub>stg</sub>	- 65 to 150	°C
Soldering temperature and time	T <sub>sol</sub>	260°C, 10s(at lead)	-

Note: When SOP 3-8pin is soldered in the solder-reflow process, be sure to maintain the reflow furnace temperature at the curve shown in "Fig. 3-5 Reflow Furnace Temperature Curve" of DATA BOOK. And SOP3-8pin can not be exposed to high temperature of the solder dipping.

## ■ ELECTRICAL CHARACTERISTICS

●SCI7631M/C<sub>AA</sub>, SCI7632M/C<sub>AA</sub>, SCI7633M/C<sub>AA</sub>, SCI7635M/C<sub>AA</sub>, SCI7636M/C<sub>AA</sub>

(GND=0V, T<sub>a</sub>=25±0.5°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
Operating voltage	V <sub>I1</sub> V <sub>I2</sub>	V <sub>O</sub> <V <sub>I2</sub>	0.9	—	2.0	V	
			0.9		2.0		
Output voltage	V <sub>O</sub>	V <sub>I1</sub> =1.5V	4.80	5.00	5.20	V	
Detection voltage*	V <sub>DET</sub>		1.00	1.05	1.10	V	
Hysteresis difference of* detection voltage	ΔV <sub>DET</sub>		—	5	—	%	
Operating supply current	I <sub>DDO</sub>	SCI7631M/C <sub>AA</sub> SCI7632M/C <sub>AA</sub>	V <sub>I1</sub> =1.5V I <sub>O</sub> =1.0mA	—	10	50	μA
		SCI7633M/C <sub>AA</sub>		—	—	—	
		SCI7635M/C <sub>AA</sub> SCI7636M/C <sub>AA</sub>	V <sub>I1</sub> =1.5V f <sub>CLK</sub> =32kHz I <sub>O</sub> =1.0mA	—	5	30	
Stand-by supply current	I <sub>DDS</sub>	V <sub>I1</sub> =1.5V	—	3	10	μA	
Switching transistor on resistance	R <sub>SWON</sub>	V <sub>I1</sub> =1.5V V <sub>O</sub> =5.0V V <sub>SW</sub> =0.2V	—	5	10	Ω	
Switching transistor leakage current	I <sub>SWO</sub>	V <sub>I1</sub> =1.5V V <sub>O</sub> =1.5V V <sub>SW</sub> =7.0V	—	—	0.5	μA	
Back-up switch on resistance*	R <sub>BSON</sub>	V <sub>I1</sub> =1.0V V <sub>I2</sub> =3.0V I <sub>O</sub> =1.0mA	—	50	100	Ω	
Back-up switch leakage current*	I <sub>BSO</sub>	V <sub>I1</sub> =1.0V V <sub>O</sub> =5.0V V <sub>I2</sub> =3.0V	—	—	0.1	μA	
Output current (RST pin, V <sub>DETOUT</sub> pin)	I <sub>OL</sub>	V <sub>I1</sub> =0.9V V <sub>DS</sub> =0.2V	0.05	0.15	—	mA	
Pull-up current (PS pin)	I <sub>IH</sub>	V <sub>I1</sub> =1.5V	—	—	0.5	μA	
Booster clock frequency	f <sub>CLK</sub>	SCI7631M/C <sub>AA</sub>	V <sub>I1</sub> =1.5V	30	40	50	kHz
		SCI7632M/C <sub>AA</sub>		30	45	55	

\*The asterisked characteristic is not applicable to the SCI7633M/C<sub>AA</sub>.

# SCI7630M/C

●SCI7631M/C<sub>BA</sub>, SCI7633M/C<sub>BA</sub>, SCI7635M/C<sub>BA</sub>, SCI7636M/C<sub>BA</sub>, SCI7637M/C<sub>BA</sub>  
(GND=0V, Ta=25°C)

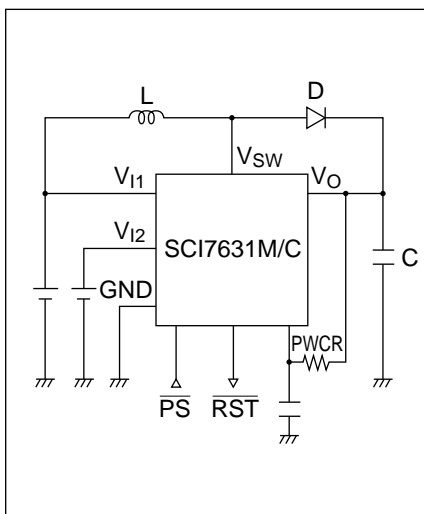
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
Operating voltage	V <sub>I1</sub> V <sub>I2</sub>	V <sub>O</sub> > V <sub>I2</sub>	0.9 0.9	—	2.0 2.0	V	
Output voltage	V <sub>O</sub>	V <sub>I1</sub> =1.5V	2.90	3.00	3.10	V	
Detection voltage *	V <sub>DET</sub>		1.00	1.05	1.10	V	
Hysteresis difference of detection voltage *	ΔV <sub>DET</sub>		—	5	-	%	
Operating supply current	I <sub>DDO</sub>	SCI7631M/C <sub>BA</sub>	V <sub>I1</sub> =1.5V I <sub>OUT</sub> =1.0mA	—	8	40	μA
		SCI7633M/C <sub>BA</sub>		—	-	-	
		SCI7635M/C <sub>BA</sub> SCI7636M/C <sub>BA</sub> SCI7637M/C <sub>BA</sub>	V <sub>I1</sub> =1.5V f <sub>CLK</sub> =32kHz I <sub>O</sub> =1.0mA	—	4	20	
Stand-by supply current	I <sub>DDS</sub>	V <sub>I1</sub> =1.5V	—	3	10	μA	
Switching transistor on resistance	R <sub>SWON</sub>	V <sub>I1</sub> =1.5V V <sub>O</sub> =3.0V V <sub>SW</sub> =0.2V	—	6	12	Ω	
Switching transistor leakage current	I <sub>SWQ</sub>	V <sub>I1</sub> =1.5V V <sub>O</sub> =1.5V V <sub>SW</sub> =7.0V	-	-	0.5	μA	
Back-up switch on resistance*	R <sub>BSON</sub>	V <sub>I1</sub> =1.0V V <sub>I2</sub> =2.0V I <sub>O</sub> =1.0mA	-	70	160	Ω	
Back-up switch leakage current*	I <sub>BSQ</sub>	V <sub>I1</sub> =1.0V V <sub>O</sub> =3.0V V <sub>I2</sub> =2.0V	-	-	0.1	μA	
Output current (RST pin, V <sub>DETOU</sub> pin)	I <sub>OL</sub>	V <sub>I1</sub> =0.9V V <sub>DS</sub> =0.2V	0.05	0.15	-	mA	
Pull-up current (PS pin)	I <sub>IH</sub>	V <sub>I1</sub> =1.5V	-	-	0.5	μA	
Booster clock frequency	f <sub>CLK</sub>	SCI7631M/C <sub>BA</sub>	V <sub>I1</sub> =1.5V	30	40	50	kHz

\* The asterisked characteristic is not applicable to the SCI7633M/C<sub>BA</sub> and SCI7637M/C<sub>BA</sub>.

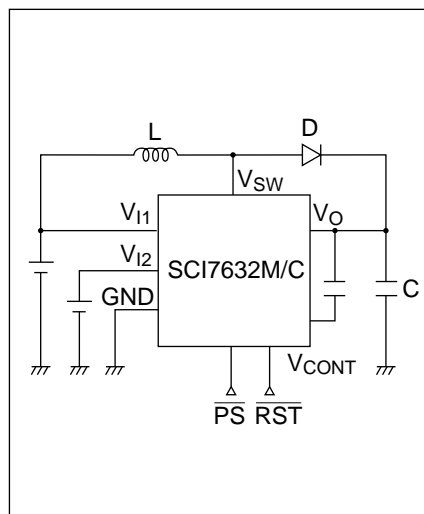
\*\*For another characteristics, please inquire IC sales section.

## ■ BASIC EXTERNAL CONNECTION

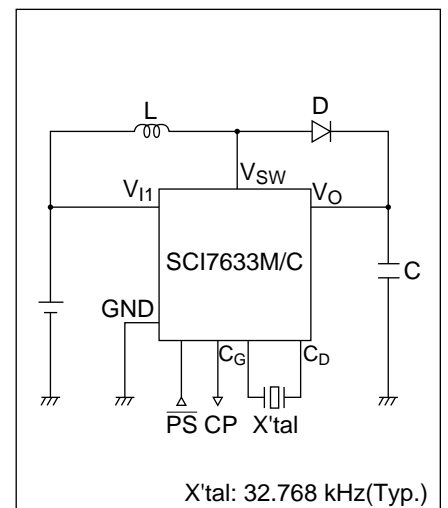
### ●SCI7631M/C



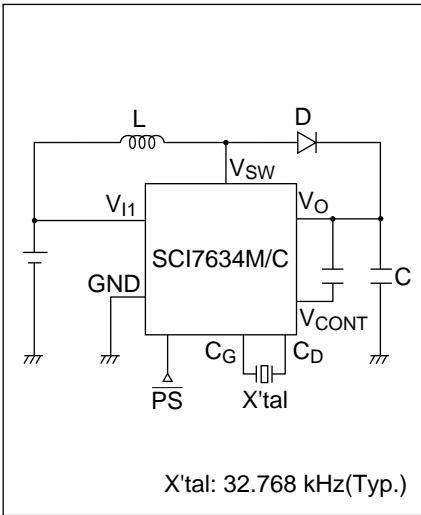
### ●SCI7632M/C



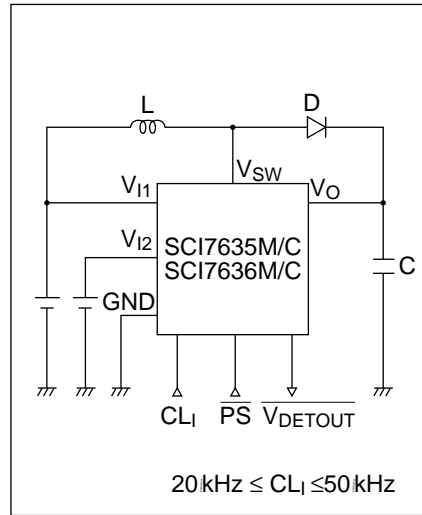
### ●SCI7633M/C



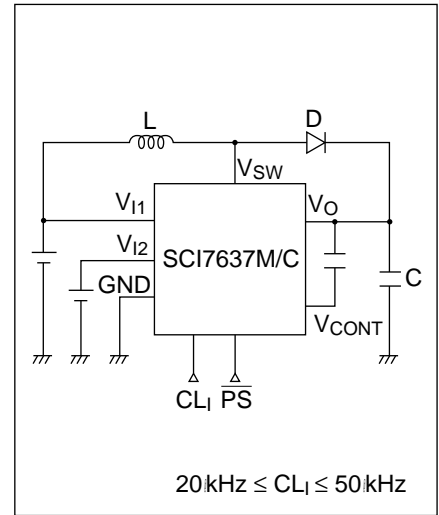
●SCI7634M/C



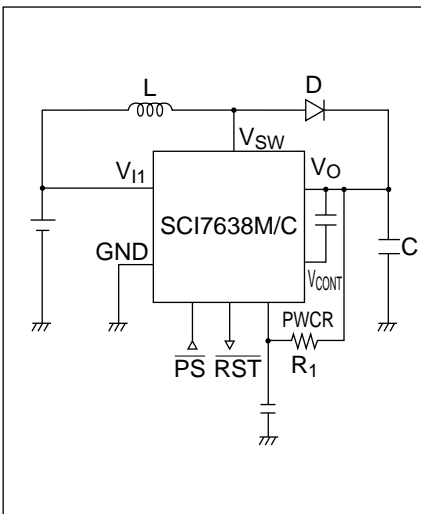
●SCI7635M/C, SCI7636M/C



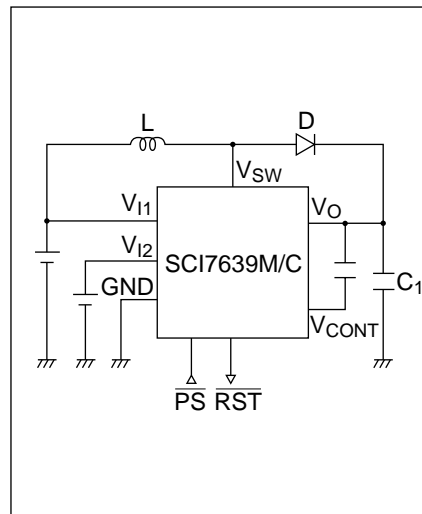
●SCI7637M/C



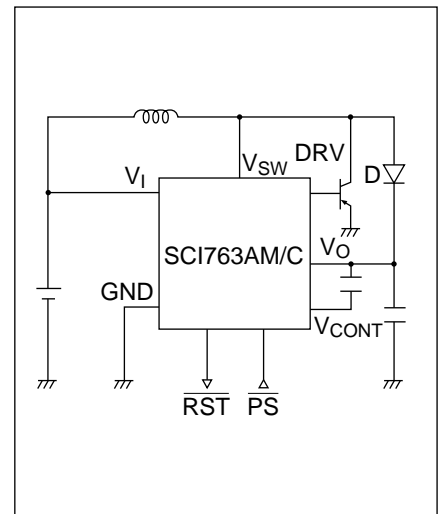
●SCI7638M/C



●SCI7639M/C



●SCI763AM



\*100μH≤L≤1mH, C≥10μF, D: Schottky diode

The boosting performance depends on the external parts(such as the inductor)and switching frequency.

Examples with SCI7631M/C AA, SCI7633M/C AA, SCI7635M/C AA and SCI7636M/C AA

L=220μH, V11=1.5V, fCLK=32kHz, IO=4mA, P<sub>eff</sub>=70%

(leadless inductor used)

L=220μH, V11=1.5V, fCLK=32kHz, IO=6mA, P<sub>eff</sub>=75%

(drum type inductor used)

L=300μH, V11=1.5V, fCLK=32kHz, IO=7mA, P<sub>eff</sub>=80%

(toroidal inductor used)

Examples with SCI7631M/C BA, SCI7633M/C BA, SCI7635M/C BA and SCI7636M/C BA

L=220μH, V11=1.5V, fCLK=32kHz, IO=8mA, P<sub>eff</sub>=70%

(leadless inductor used)

L=220μH, V11=1.5V, fCLK=32kHz, IO=9mA, P<sub>eff</sub>=75%

(drum type inductor used)

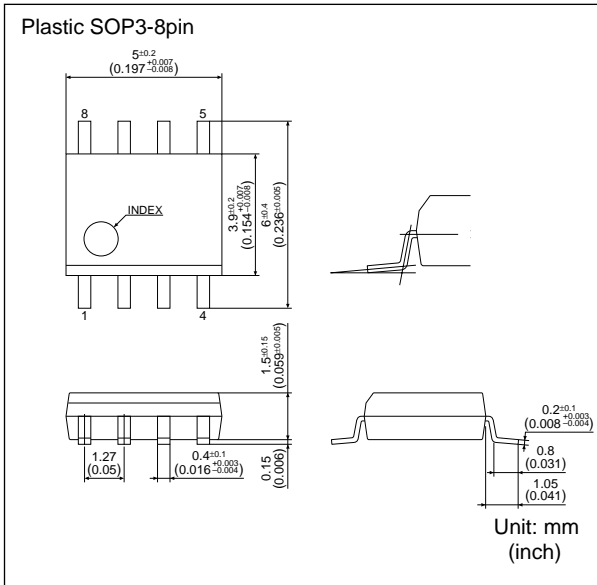
L=300μH, V11=1.5V, fCLK=32kHz, IO=10mA, P<sub>eff</sub>=80%

(toroidal inductor used)

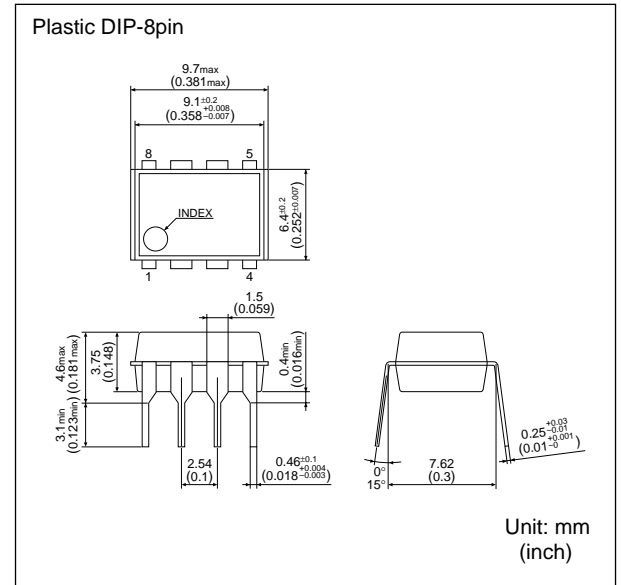


## ■ PACKAGE DIMENSIONS

### ●SCI763xM

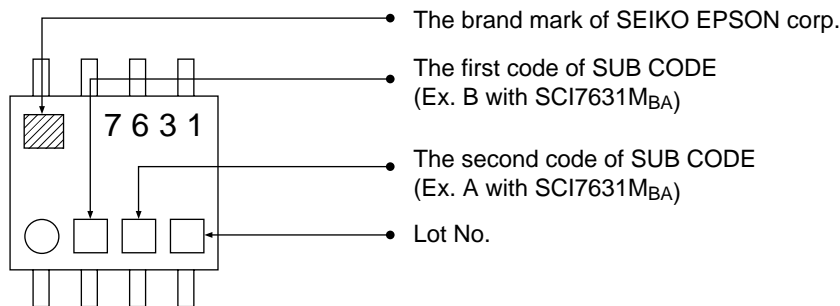


### ●SCI763xC



## ■ MARKING

A subcode is printed on SCI763xM below, because its package is very small.



### NOTICE:

No part of this material may be reproduced or duplicated in any form or by any means without the written permission of Seiko Epson. Seiko Epson reserves the right to make changes to this material without notice. Seiko Epson does not assume any liability of any kind arising out of any inaccuracies contained in this material or due to its application or use in any product or circuit and, further, there is no representation that this material is applicable to products requiring high level reliability, such as, medical products. Moreover, no license to any intellectual property rights is granted by implication or otherwise, and there is no representation or warranty that anything made in accordance with this material will be free from any patent or copyright infringement of a third party. This material or portions thereof may contain technology or the subject relating to strategic products under the control of the Foreign Exchange and Foreign Trade Control Law of Japan and may require an export license from the Ministry of International Trade and Industry or other approval from another government agency.

© Seiko Epson Corporation 1997 All right reserved.

## SEIKO EPSON CORPORATION

### ELECTRONIC DEVICE MARKETING DEPARTMENT

IC Marketing & Engineering Group  
421-8 Hino, Hino-shi, Tokyo 191, JAPAN  
Phone: 0425-87-5816 FAX: 0425-87-5624

#### International Marketing Department I (Europe, U.S.A.)

421-8 Hino, Hino-shi, Tokyo 191, JAPAN  
Phone: 0425-87-5812 FAX: 0425-87-5564

#### International Marketing Department II (Asia)

421-8 Hino, Hino-shi, Tokyo 191, JAPAN  
Phone: 0425-87-5814 FAX: 0425-87-5110