

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 (SCI7631M)**

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 SCI7631M/C and the SCI7638M/C operate by the clock signal generated by an on-chip CR oscillation circuit. The SCI7633M/C operate by the clock signal generated by a crystal oscillation circuit. And another feature of the SCI7638M/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 μ A (SCI7635M/C)
- Low stand-by current Typ. 3 μ 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)
- Built-in CR oscillation circuit (SCI7631M/C, SCI7638M/C)
- Power on clear (SCI7631M/C, SCI7638M/C)
- Response compensation inputs (SCI7638M/C)
- Temperature gradient of output voltage for LCD (SCI7638M/C)
- Package SCI7630M: SOP3-8pin (plastic)
SCI7630C: DIP-8pin (plastic)

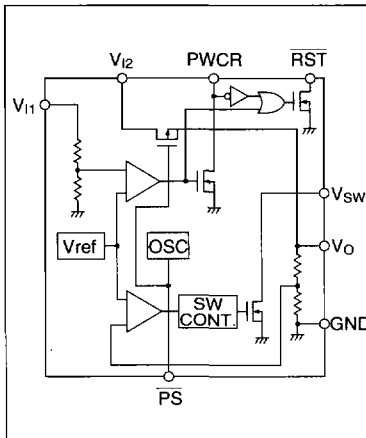
SCI7630M/C Series

LINE UP

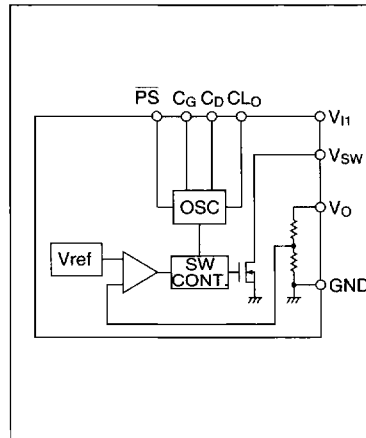
Type No.	Input voltage	Output voltage	Oscillation for booster	Voltage detecting function	Power-on clear	Battery back-up	Ripple noise suppression input	Output voltage temp gradient	Package
SCI7631M _{LA}	1.5V (0.9Vmin.)	2.4V	internal CR oscillation	available	available	available	—	—	SOP3-8pin
SCI7631M _{BA}		3.0V							
SCI7631M _{KA}		3.5V							
SCI7631M _{AA}		5.0V							
SCI7633M _{BA}	1.5V (0.9Vmin.)	3.0V	crystal oscillation	—	—	—	—	—	SOP3-8pin
SCI7638M _{HA}	1.5V (0.9Vmin.)	2.2V	internal CR oscillation	available	available	—	available	-4.5mV/°C -4.0mV/°C	SOP3-8pin
SCI7638M _{LA}		2.4V							

BLOCK DIAGRAM

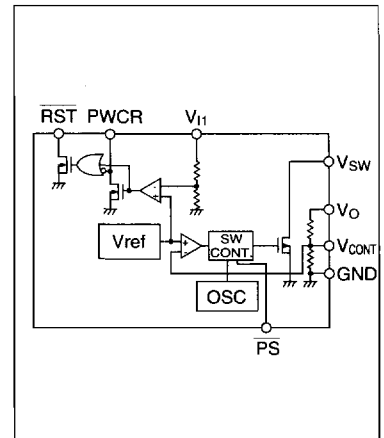
SCI7631M/C



SCI7633M/C

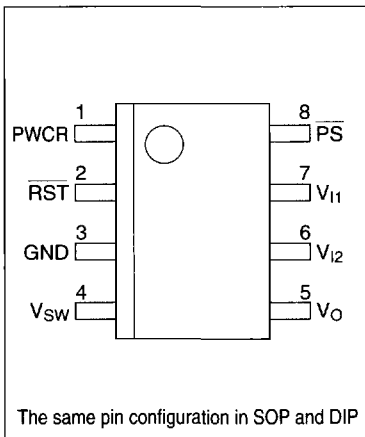


SCI7638M/C

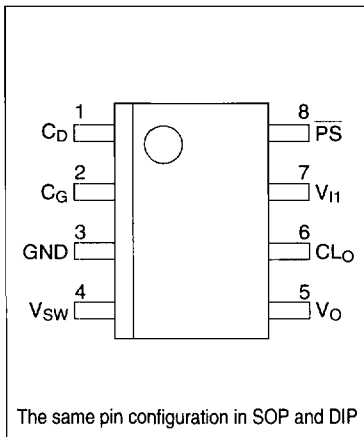


PIN CONFIGURATION

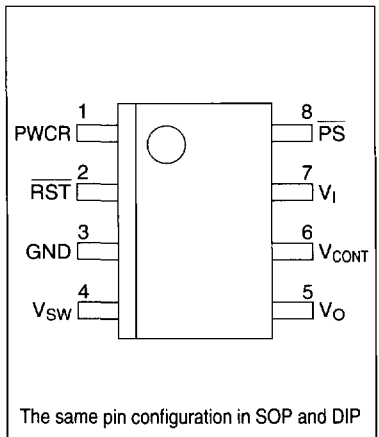
SCI7631M/C



SCI7633M/C



SCI7638M/C



PIN DESCRIPTION

Pin Name	Function	Pin Name	Function
V _{I1}	Power supply for booster (positive)	RST	Reset signal output (voltage detection)
V _{I2}	Power Supply for back-up (positive)	C _D	Crystal oscillator terminal (Drain)
V _O	Output voltage	C _G	Crystal oscillator terminal (Gate)
V _{SW}	Terminal for connection of inductor for booster	CL _O	Clock pulse output
PS	Power save control *1	CL _I	Clock pulse input for booster
V _{DETOU}	Output pin of voltage detection	GND	Power supply (GND)
PWCR	Power on clear *2	V _{CONT}	Comparator input terminal *3

- *1. Stand-by mode and back-up function (back-up function is available to SCI7631M/C).
The device can be set into stand-by mode by connecting the 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_{I2} pin is output to the V_O pin with the boosting operation at rest. The PS pin is internally pulled up, and must be held open when its control is unnecessary. (Connecting the voltage detection output to the PS pin validates the back-up function.)
- *2. 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 R₁ and capacitor C₁ connected to the PWCR pin and a pull-up resistor to the RST pin, a reset pulse whose width can flexibly be selected by R₁ and C₁ is obtained after acquisition of normal output by boosting operation. This enables the system (for example, a microcomputer), connected to the RST pin, to be correctly reset.
With the PWCR pin connected to the V_O pin, the RST pin stays open when V_{I1} exceeds the detection voltage, and develops a GND level output when V_{I1} is smaller than the detection voltage.
- *3. The ripple voltage generated on the boost output voltage can be reduced by connecting response compensation capacitor between the comparator input terminals V_{CONT} and the V_O. (SCI7638M/C)

ABSOLUTE MAXIMUM RATINGS

(GND=0V, Ta=25°C)

Rating	Symbol	Value	Unit
input voltage	V _{I1}	7	V
Output current	I _O	100	mA
Output voltage	V _O	7	V
Power dissipation	P _d	200 (SOP3-8pin) 300 (DIP-8pin)	mW
Operating temperature	T _{opr}	-30 to 85	°C
Storage temperature	T _{stg}	-65 to 150	°C
Soldering temperature and time	T _{sol}	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.

SCI7630M/C Series

■ ELECTRICAL CHARACTERISTICS

● SCI7631M/CAA, SCI7633M/CAA

(GND=0V, Ta=25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
Operating voltage	V _{I1} V _{I2}	V _O >V _{I2}	0.9 0.9	—	2.0 2.0	V	
Output voltage	V _O	V _{I1} =1.5V	4.80	5.00	5.20	V	
Detection voltage*	V _{DET}		1.00	1.05	1.10	V	
Hysteresis difference of* detection voltage	ΔV _{DET}		—	5	—	%	
Operating supply current	I _{DDO}	SCI7631M/CAA	V _{I1} =1.5V	—	10	50	μA
		SCI7633M/CAA	V _{I1} =1.5V	—	6	40	
Stand-by supply current	I _{DDS}	V _{I1} =1.5V	—	3	10	μA	
Switching transistor on resistance	R _{SWON}	V _{I1} =1.5V V _O =5.0V V _{SW} =0.2V	—	5	10	Ω	
Switching transistor leakage current	I _{SWO}	V _{I1} =1.5V V _O =1.5V V _{SW} =7.0V	—	—	0.5	μA	
Back-up switch on resistance*	R _{BSON}	V _{I1} =1.0V V _{I2} =3.0V I _O =1.0mA	—	50	100	Ω	
Back-up switch leakage current*	I _{BSO}	V _{I1} =1.0V V _O =5.0V V _{I2} =3.0V	—	—	0.1	μA	
Output current (RST pin, V _{DETOUT} pin)	I _{OL}	V _{I1} =0.9V V _{DS} =0.2V	0.05	0.15	—	mA	
Pull-up current(PS pin)	I _{IH}	V _{I1} =1.5V	—	—	0.5	μA	
Booster clock frequency	f _{CLK}	SCI7631M/CAA	V _{I1} =1.5V	30	40	50	kHz

* The asterisked characteristic is not applicable to the SCI7633M/CAA.

SCI7630M/C Series

● SCI7631M/C_{BA}, SCI7633M/C_{BA}

(GND=0V, T_a=25°C)

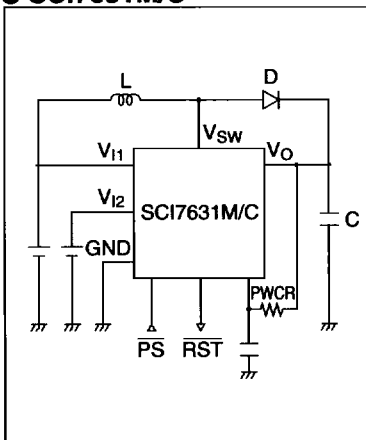
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating voltage	V _{I1} V _{I2}	V _O >V _{I2}	0.9 0.9	—	2.0 2.0	V
Output voltage	V _O	V _{I1} =1.5V	2.90	3.00	3.10	V
Detection voltage *	V _{DET}		1.00	1.05	1.10	V
Hysteresis difference of detection voltage *	ΔV _{DET}		—	5	—	%
Operating supply current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

* The asterisked characteristic is not applicable to the SCI7633M/C_{BA} and SCI7637M/C_{BA}.

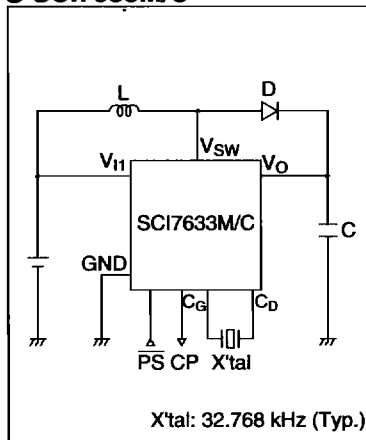
** For another characteristics, please inquire IC sales section.

■ BASIC EXTERNAL CONNECTION

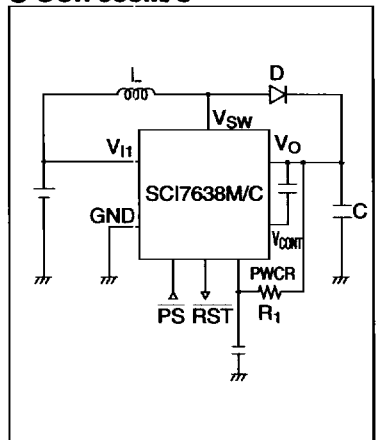
● SCI7631M/C



● SCI7633M/C



● SCI7638M/C



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

SCI7630M/C Series

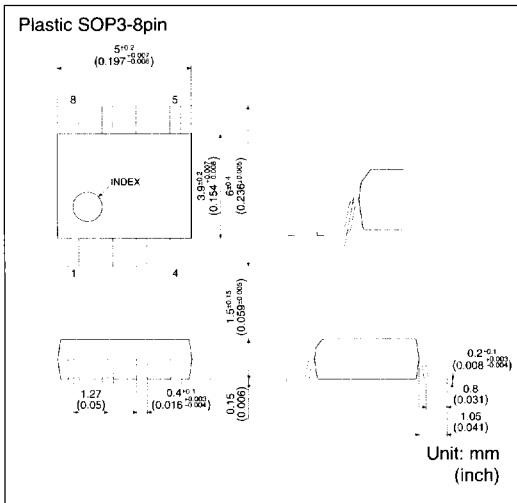
The boosting performance depends on the external parts (such as the inductor) and switching frequency.

- Examples with SCI7631M/C_{AA} and SCI7633M/C_{AA}
 $L=220\mu\text{H}$, $V_{I1}=1.5\text{V}$, $f_{\text{CLK}}=32\text{kHz}$, $I_O=4\text{mA}$, $P_{\text{eff}}=70\%$
 (leadless inductor used)
 $L=220\mu\text{H}$, $V_{I1}=1.5\text{V}$, $f_{\text{CLK}}=32\text{kHz}$, $I_O=6\text{mA}$, $P_{\text{eff}}=75\%$
 (drum type inductor used)
 $L=300\mu\text{H}$, $V_{I1}=1.5\text{V}$, $f_{\text{CLK}}=32\text{kHz}$, $I_O=7\text{mA}$, $P_{\text{eff}}=80\%$
 (toroidal inductor used)

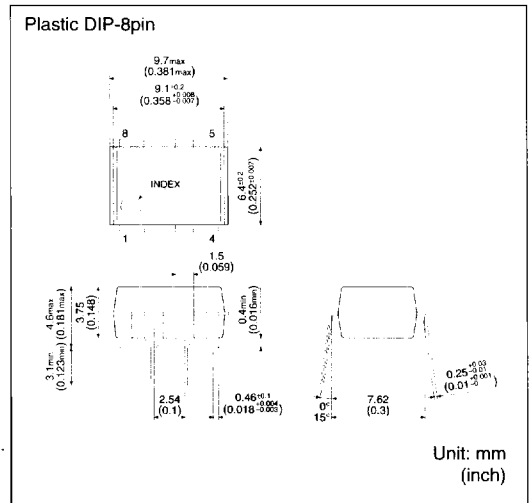
- Examples with SCI7631M/C_{BA}, SCI7633M/C_{BA} and SCI7635M/C_{BA}
 $L=220\mu\text{H}$, $V_{I1}=1.5\text{V}$, $f_{\text{CLK}}=32\text{kHz}$, $I_O=8\text{mA}$, $P_{\text{eff}}=70\%$
 (leadless inductor used)
 $L=220\mu\text{H}$, $V_{I1}=1.5\text{V}$, $f_{\text{CLK}}=32\text{kHz}$, $I_O=9\text{mA}$, $P_{\text{eff}}=75\%$
 (drum type inductor used)
 $L=300\mu\text{H}$, $V_{I1}=1.5\text{V}$, $f_{\text{CLK}}=32\text{kHz}$, $I_O=10\text{mA}$, $P_{\text{eff}}=80\%$
 (toroidal inductor used)

PACKAGE DIMENSIONS

● SCI763xM



● SCI763xC



MARKING

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

