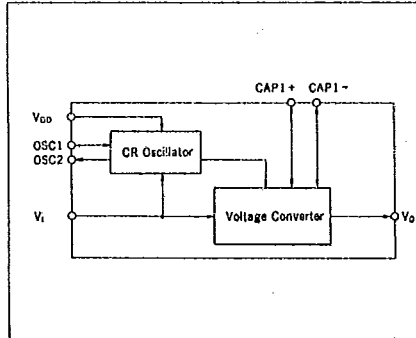# SCI7660C

CMOS DC/DC CONVERTER

T-57-11

■DESCRIPTION

The SCI7660C CMOS DC/DC Converter features high operational performance with low power dissipation. The booster generates a doubled output voltage from the input.

It is possible to drive the LSI that need another power supply than main power supply. (LCD drivers・Analog LSI etc.) Its very low power requirement makes it ideal to supply handy equipments with power.
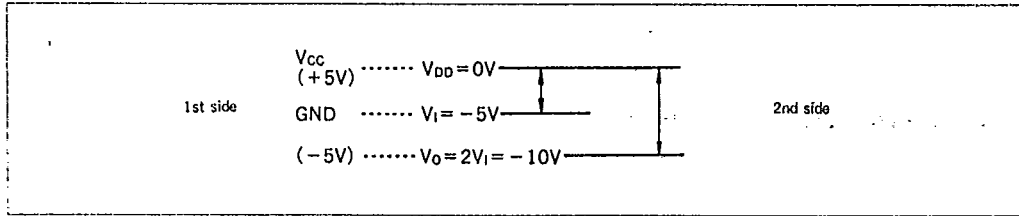
■FEATURES

- ●High performance with low power dissipation
- ●Simple conversion of $V_{DD}(+5V)$ to $-V_I(-5V)$, $+2V_I$ ($+10V$)
- ●Output current ·····················30mA Max ($V_{DD}=5V$)
- ●Power conversion efficiency ······95% Typ
- ●Cascade connection (two device connected $V_{DD}=5V$, $V_O=-10V$)
- ●Low power·····························Ideal for dry cell battery
- ●On-chip CR oscillator
- ●Package·····························8 pin DIP (plastic)

■BLOCK DIAGRAM

■VOLTAGE RELATIONS

■PIN CONFIGURATION

■PIN DESCRIPTION

Pin Name	Pin No.	Functions
OSC1	3	Oscillation resistor connection terminal
OSC2	2	
V_{DD}	4	Power supply terminal (positive, system supply V_{CC})
CAP1+	5	Terminal for connection of capacitor for booster (positive)
CAP1-	6	Terminal for connection of capacitor for booster (negative)
V_O	7	Output terminal at doubling
V_I	8	Power supply terminal (negative, system supply GND)

■ABSOLUTE MAXIMUM RATINGS

($V_{DD}=0V$, $Ta=25°C$)

Parameter	Symbol	Ratings	Unit
Input voltage	V_I	-10.0 to 0.5	V
Output voltage	V_O	-20.0 to V_I	V
Power dissipation	P_D	300	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)	—

■ELECTRICAL CHARACTERISTICS

($V_{DD}=0V$, $Ta=-30$ to $85°C$)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input voltage	V_I		-8.0	—	-1.2	V
Output voltage	V_O		-16.0	—	—	V
Booster current consumption	I_{opr}	$R_L=\infty$, $R_{OSC}=1M\Omega$, $V_I=-5V$	—	40	70	μA
Stationary current	I_Q	$R_L=\infty$, $V_I=-8V$	—	—	2.0	μA
Output impedance	R_O	$I_O=10mA$, $V_I=-5V$	—	80	120	Ω
Booster power conversion efficiency	P_{eff}	$I_O=5mA$, $V_I=-5V$	90	95	—	%
Input leakage current	I_{LI}	OSC1 terminal, $V_I=-8V$	—	—	2.0	μA
Oscillation frequency	f_{osc}	$R_{OSC}=1M\Omega$, $V_I=-5V$	16	20	24	kHz

■RECOMMENDED OPERATING CONDITIONS

($V_{DD}=0V$, $Ta=-30$ to $85°C$)

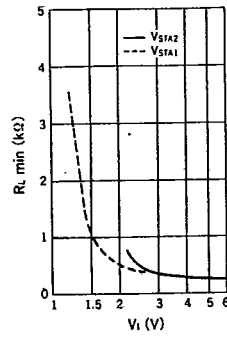| Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Booster start voltage	V_{STA1}	$R_{OSC}=1M\Omega$, $C_L/C_2\leq 1/20$ [*1] $C_2\geq 10\mu F$ $Ta=-20$ to $85°C$	—	—	-1.2	V
	V_{STA2}	$R_{OSC}=1M\Omega$	—	—	-2.2	V
Booster stop voltage	V_{STP}	$R_{OSC}=1M\Omega$	-1.2	—	—	V
Output load resistance	R_L		R_L min [*2]	—	—	Ω
Output current	I_O		—	—	30	mA
Oscillation frequency	f_{osc}		10	—	30	kHz
External resistance for oscillation	R_{OSC}		680	—	2000	$k\Omega$
Capacitor for booster	C_1, C_2, C_3		3.3	—	—	μF

*1 Recommended circuity in low voltage operation is shown below.
*2 R_L min depends on input voltage as shown below.

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Recommended circuit in low voltage operation

*D1 (VF(1F=1mA) ≦ 0.6V)

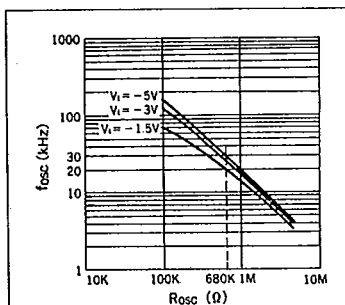■ TYPICAL PERFORMANCE CHARACTERISTICS

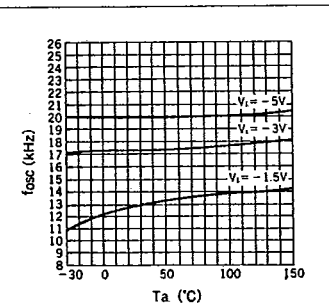Fig. 1 Oscillation Frequency (f_{OSC}) vs. External-Resistance (R_{OSC})

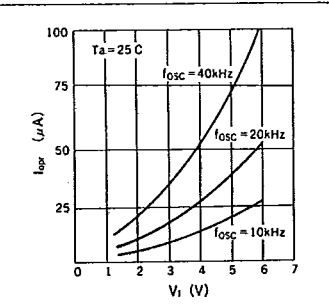Fig. 2 Oscillation Frequency (f_{OSC}) vs. Temperature (Ta)

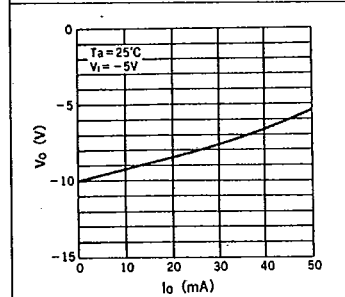Fig. 3 Booster Current Consumption (I_{opr}) vs. Input Voltage (V_I)
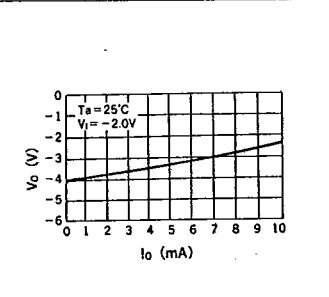
Fig. 4 Output Voltage (V_O) vs. Output Current (I_O)
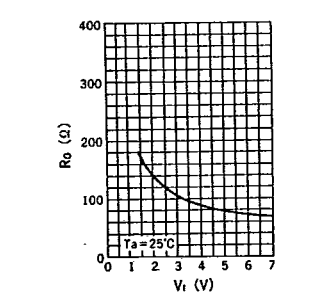
Fig. 5 Output Voltage (V_O) vs. Output Current (I_O)

Fig. 6 Output Impedance (R_O) vs. Input Voltage (V_I)

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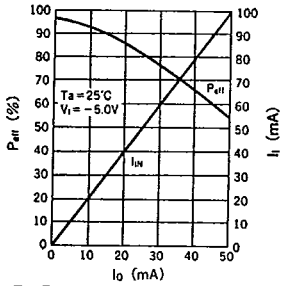

Fig. 7   Power Conversion Efficiency (P_{eff})/Input Current (I_I) vs. Output Current (I_O)
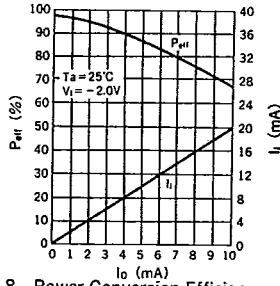
Fig. 8   Power Conversion Efficiency (P_{eff})/Input Current (I_I) vs. Output Current (I_O)
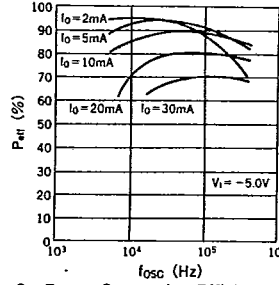
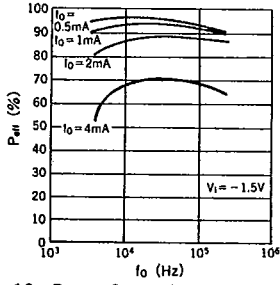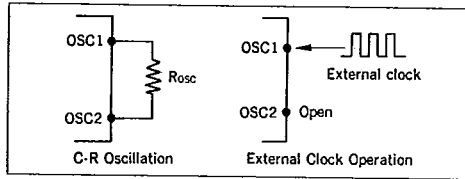Fig. 9   Power Conversion Efficiency (P_{eff}) vs. Oscillation Frequency (f_{osc})

Fig. 10   Power Conversion Efficiency (P_{eff}) vs. Oscillation Frequency (f_{osc})
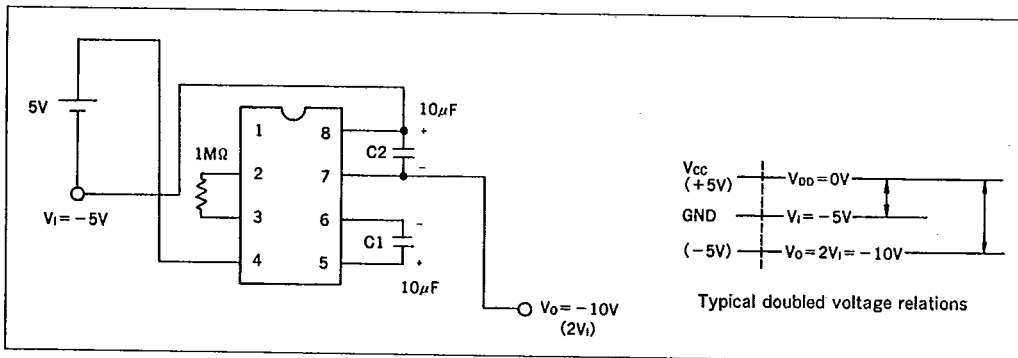
■CIRCUIT DESCRIPTION

● C-R Oscillator

The SCI7660C contains a C-R oscillator for internal oscillation. It consists of an external resistor R_{osc} connected between the OSC1 pin and OSC2 pin.
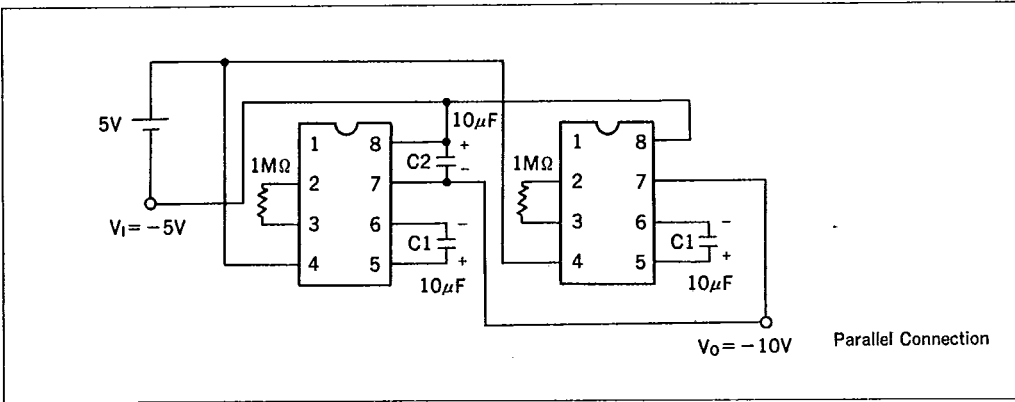

● Voltage Converters

The voltage converters double the input supply voltage (V_I) using clocks generated by the C-R oscillator. A doubled voltage can be obtained with a booster capacitor between CAP+ and CAP−, and with a external smoothing capacitor between V_I and V_O.
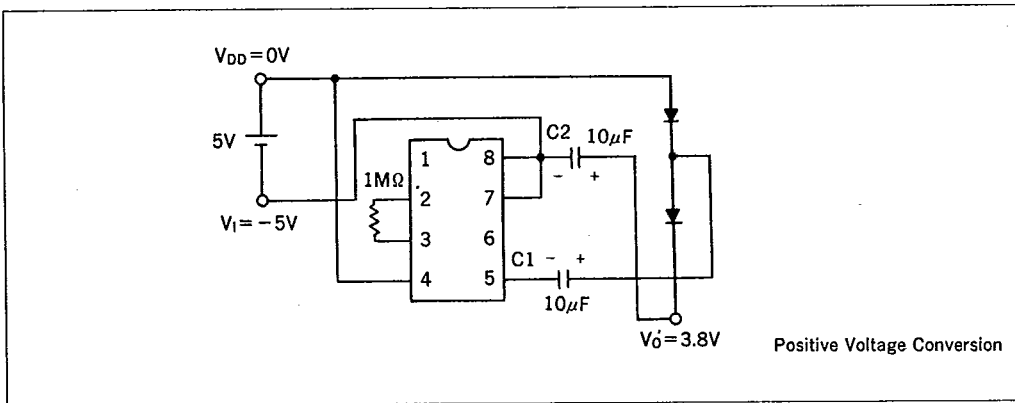
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■EXAMPLE OF APPLICATIONS

● **Parallel Connection** (Output impedance can be reduced by parallel connections.)

Parallel Connection

● **Positive Voltage Conversion** (Input voltage can be doubled toward the positive side with diode.)

Positive Voltage Conversion

● **Cascade Connection** (Cascade connection of SCI7660 further increase the output voltage. Note, however, that the cascade connection increase the output impedance.)

Cascade Connection

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● **Negative Voltage Conversion+Positive Voltage Conversion** (This circuit produces outputs of −10V and +3.8V from the −5V input by combination of voltage doubler circuit and positive voltage conversion circuit.)

$V_{DD}=0V$

5V

$V_I=-5V$

1MΩ

```
    1    8
    2    7
    3    6
    4    5
```

C4 10μF

C2 10μF

$V_{O1}=-10V$

C1 10μF

C3 10μF

$V_{O2}=3.8V$

$V_{O2}=3.8V$

$V_{DD}=0V$

$V_I=-5V$

$V_{O1}=-10V$

Negative Voltage Conversion +
Positive Voltage Conversion

■ **PACKAGE DIMENSIONS**

C8

8-pin DIP

0.382Max
(9.7Max)

0.358±0.004
(9.1±0.1)

0.252±0.004
(6.4±0.1)

Index

0.051
(1.3)

0.300
(7.62)

0.031±0.004
(0.8±0.1)

0.173±0.004
(4.4±0.1)

0.010 +0.001
−0.0004

(0.25 +0.03
−0.01)

0.130±0.002
(3.3±0.05)

0.100±0.010
(2.54±0.25)

0.018±0.004
(0.46±0.1)

0.300~0.355
(7.62~9.02)

unit : inch
(mm)