



PRELIMINARY

VOLTAGE TRIPLER

■ GENERAL DESCRIPTION

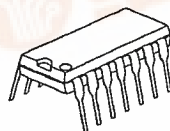
The NJU7670 is a voltage tripler incorporated CR oscillator, voltage converter, reference voltage circuit and voltage regulator.

It can generates triple or double negative voltage of an operating voltage ranging from -2.6V to -6V .

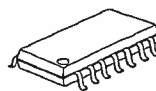
The application circuit of tripler requires three capacitors, and doubler requires only two capacitors.

Furthermore, any kind of output voltage is available by the internal voltage regulator.

■ PACKAGE OUTLINE



NJU7670D



NJU7670M

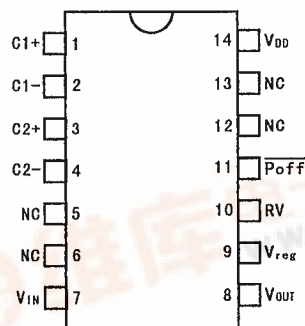


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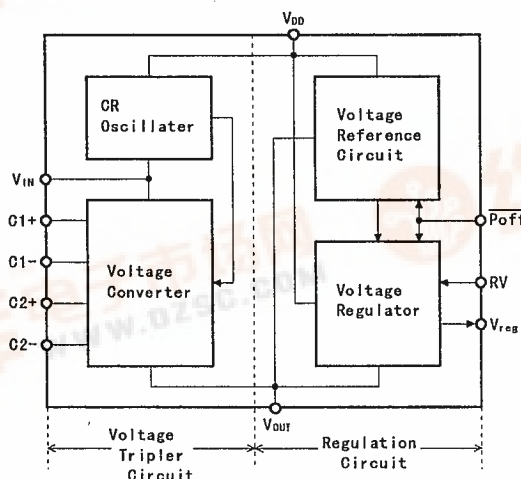
■ FEATURES

- Triple / Double Voltage Output
- Operating Voltage $-2.6\text{V} \sim -6.0\text{V}$
- High-efficiency Voltage Conversion Rate 95% ($I_{OUT} = 5\text{mA}$)
- High Output Current $\text{MAX } 20\text{mA}$ ($V_{IN} = -5\text{V}$)
- CR Oscillator ON-Chip
- Output-OFF Function By External Signal $\text{ON / OFF of } V_{REG}$
- C-MOS Technology
- Package Outline DIP/DMP/SSOP 14

■ PIN CONFIGURATION



■ BLOCK DIAGRAM



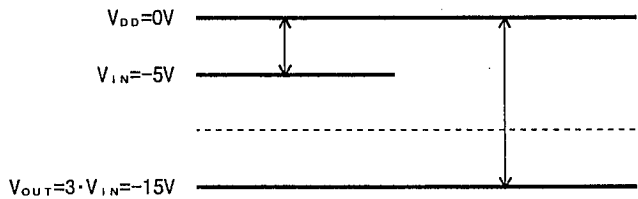
■ TERMINAL DESCRIPTION

NO.	SYMBOL	F U N C T I O N
1	C1+	Charge Pump Capacitor 1(+) Connecting Terminal
2	C1-	Charge Pump Capacitor 1(-) Connecting Terminal
3	C2+	Charge Pump Capacitor 2(+) Connecting Terminal
4	C2-	Charge Pump Capacitor 2(-) Connecting Terminal
5	NC	Non Connection
6	NC	Non Connection
7	V _{IN}	Power Supply Terminal (-)
8	V _{OUT}	Voltage Output Terminal
9	V _{reg}	Voltage Regulator Output Terminal
10	RV	Voltage Regulator Adjustment Terminal
11	Poff	V _{reg} Output ON/OFF Control Terminal
12	NC	Non Connection
13	NC	Non Connection
14	V _{DD}	Power Supply Terminal (+)

■ FUNCTIONAL DESCRIPTION

(1) Voltage Converter

The voltage converter generates double or triple voltage against V_{IN}.



(2) Voltage Reference Circuit

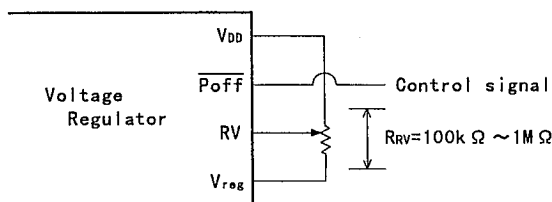
The voltage reference circuit is generating the reference voltage for a voltage regulator.

(3) Voltage Regulator

The voltage regulator output stabilized voltage which regulated by using the external resistor against double or triple voltage of the input voltage.

(3-1) Output-OFF Function

As this circuit incorporated output-off function, the voltage regulator output (ON/OFF) is performed by the signal come from system.



• ON/OFF Control for V_{reg} Terminal

Poff Level	Vreg Output
"H" (Connect to V _{DD})	ON
"L" (Connect to V _{IN})	OFF

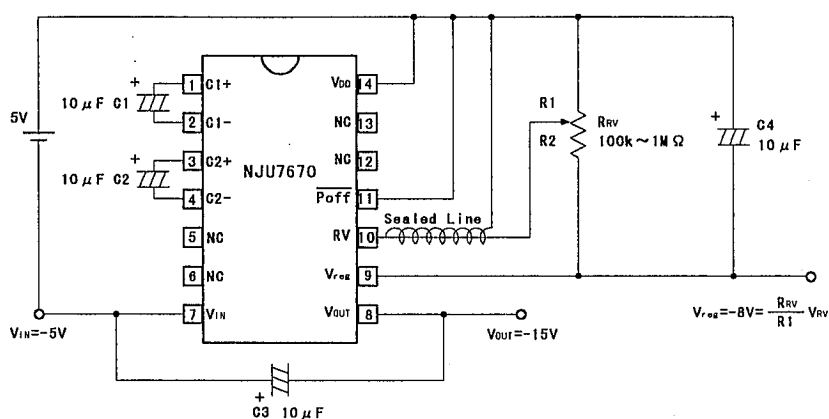
(3-2) Example of the Voltage Regulation

The voltage regulator has a output terminal which can be adjusted the output voltage to any kind of voltage by resistance R_{RV} .

As the RV terminal input impedance is high. Therefore special care against noise is required.

(Use a sealed line or others noise-proof method)

Tripler Operation + Voltage Regulator Operation



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■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{IN}	$ V_{DD} - V_{OUT} \leq 20$	V
Input Voltage	V_{I1}	$V_{IN}-0.5 \sim +0.5$ Note 1)	V
	V_{I2}	$V_{OUT}-0.5 \sim +0.5$ Note 2)	
Output Voltage	V_{OUT}	- 20.0	V
Power Dissipation	P_D	700 (DIP) 300 (DMP) 250 (SSOP)	mW
Operating Temperature Range	T_{OPR}	-20 ~ +75	°C
Storage Temperature Range	T_{STG}	-40 ~ +125	°C

Note 1) Apply to P_{OFF} terminal.

Note 2) Apply to RV terminal.

■ ELECTRICAL CHARACTERISTIC

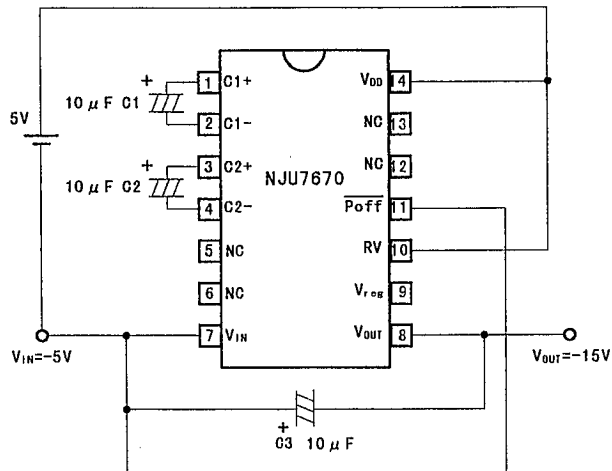
(V_{DD}=0V, V_{IN}=-5V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{IN}		-6.0	-	-2.6	V
Output Voltage	V_{OUT}		-18.0	-	-	V
	V_{REG}	RL=∞, R _{RV} =1MΩ, V _{OUT} =-18V	-18.0	-	-2.6	V
Regulator Operating Voltage	V_{OUT}		-18.0	-	-8.0	V
Current Consumption 1	I_{DD1}	P _{OFF} =“H” Note 3) RL=∞, R _{RV} =1MΩ, V _{REG} =-2.6V	-	75	120	μA
Current Consumption 2	I_{DD2}	P _{OFF} =“L” Note 3) RL=∞, R _{RV} =1MΩ	-	60	100	μA
Output Impedance	R_{OUT}	I _{OUT} =20mA, C1=C2=C3=10μF	-	150	200	Ω
Power Conversion Rate	P_{eff}	I _{OUT} =5mA, C1=C2=C3=10μF	90	95	-	%
Line Regulation	$\frac{\Delta V_{REG}}{\Delta V_{OUT} \cdot V_{REG}}$	-18V < V _{OUT} < -8V V _{REG} =-8V, RL=∞	-	0.2	-	%/V
	$\frac{\Delta V_{REG}}{\Delta I_{REG}}$	V _{OUT} =-15V, V _{REG} =-8V 0 < I _{REG} < 20mA	-	5.0	-	Ω
Load Conversion Resistance	R_{SAT}	$R_{SAT} = \Delta(V_{REG} - V_{OUT}) / \Delta I_{REG}$ 0 < I _{REG} < 20mA, RV=V _{DD}	-	8.0	-	Ω
Reference Voltage	V_{RV}		- 2.3	- 1.5	- 1.0	V
Input Current 1	I_{IN1}	RV Terminal	-	-	1.0	μA
Input Current 2	I_{IN2}	P _{OFF} Terminal	-	-	2.0	μA
Switching Frequency	f_{SW}		-	2.5	-	kHz

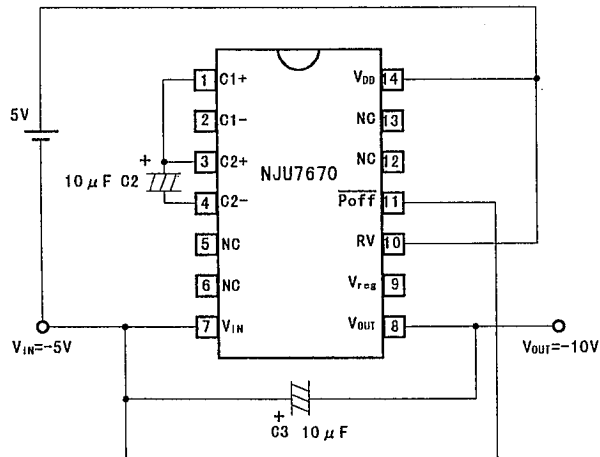
Note 3) Excluding input current on R_{RV}.

■ APPLICATION CIRCUITS (1)

(1-1) Tripler Operation



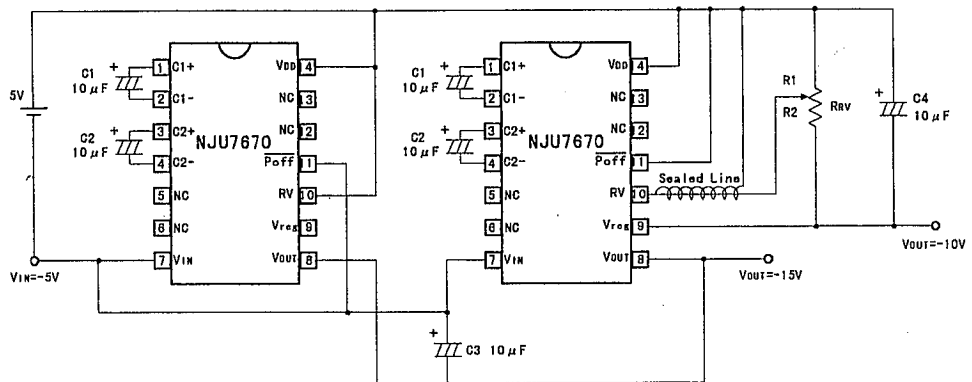
(1-2) Doubler Operation



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■ APPLICATION CIRCUIT (2)

(2) Parallel Connection



- * The output impedance R_{OUT} can be reduced by parallel connection.
- * C3 is a stabilizing capacitor output for stabilized voltage.
- * In the parallel connection, one stabilizing capacitor using is better way.

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MEMO

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