

VOLTAGE TRIPLER

■ GENERAL DESCRIPTION

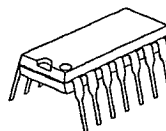
The NJU7670 is a voltage tripler incorporated CR oscillator, voltage converter, reference voltage circuit and voltage regulator.

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

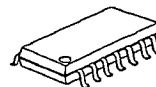
The application circuit of tripler requires three capacitors, and doubler requires only two capacitors.

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

■ PACKAGE OUTLINE



NJU7670D



NJU7670M

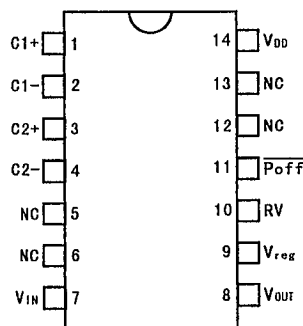


NJU7670V

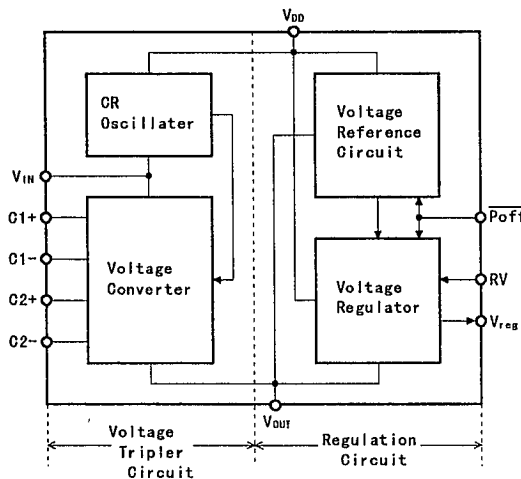
■ FEATURES

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

■ PIN CONFIGURATION



■ BLOCK DIAGRAM



6

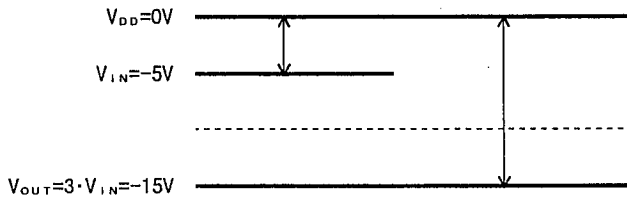
■ TERMINAL DESCRIPTION

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	\overline{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

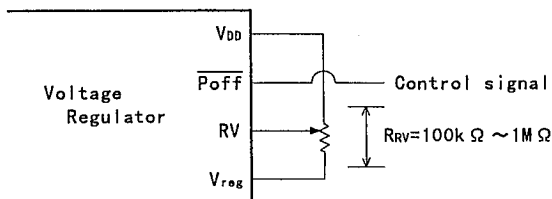
The voltage reference circuit is generating the reference voltage for a voltage regulator.

(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

\overline{Poff} Level	V_{reg} Output
"H" (Connect to V_{DD})	ON
"L" (Connect to V_{IN})	OFF

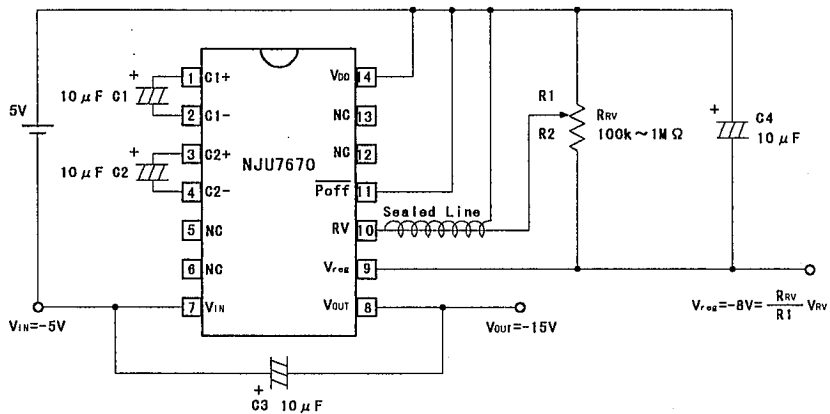
(3-2) Example of the Voltage Regulation

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



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V _{IN}	V _{DD} - V _{OUT} ≤ 20	V
Input Voltage	V _{I1}	V _{IN} -0.5~+0.5 Note 1)	V
	V _{I2}	V _{OUT} -0.5~+0.5 Note 2)	
Output Voltage	V _{OUT}	- 20.0	V
Power Dissipation	P _D	700 (DIP)	mW
		300 (DMP)	
		250 (SSOP)	
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

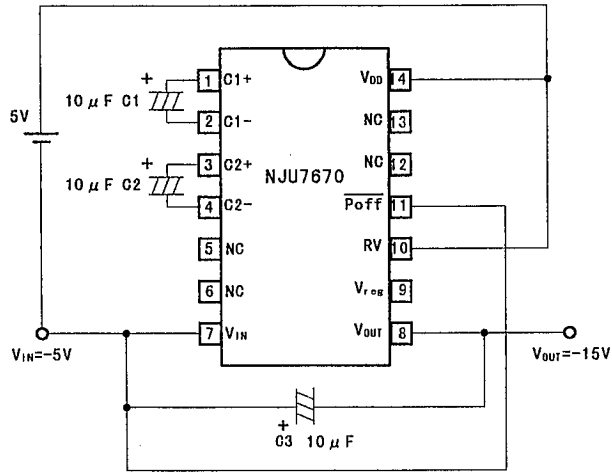
(V_{DD}=0V, V_{IN}=-5V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V _{IN}		-6.0	-	-2.6	V
Output Voltage	V _{OUT}		-18.0	-	-	V
	V _{r,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 _{r,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 _{o11}	I _{OUT} = 5mA, C1=C2=C3=10μF	90	95	-	%
Line Regulation	$\frac{\Delta V_{r,REG}}{\Delta V_{OUT} \cdot V_{r,REG}}$	-18V < V _{OUT} < -8V	-	0.2	-	% / V
		V _{r,REG} =-8V, RL=∞				
Load Conversion	$\frac{\Delta V_{r,REG}}{\Delta I_{r,REG}}$	V _{OUT} =-15V, V _{r,REG} =-8V	-	5.0	-	Ω
		0 < I _{r,REG} < 20mA				
Output Saturation Resistance	R _{SAT}	R _{SAT} =Δ(V _{r,REG} -V _{OUT})/ΔI _{r,REG} 0 < I _{r,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

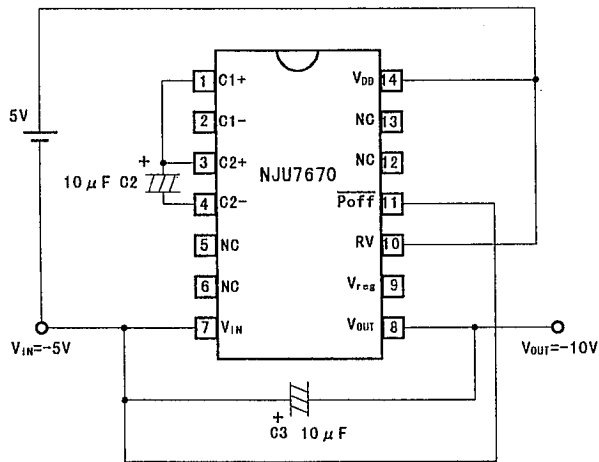
Note 3) Excluding input current on R_{RV}.

APPLICATION CIRCUITS (1)

(1-1) Tripler Operation

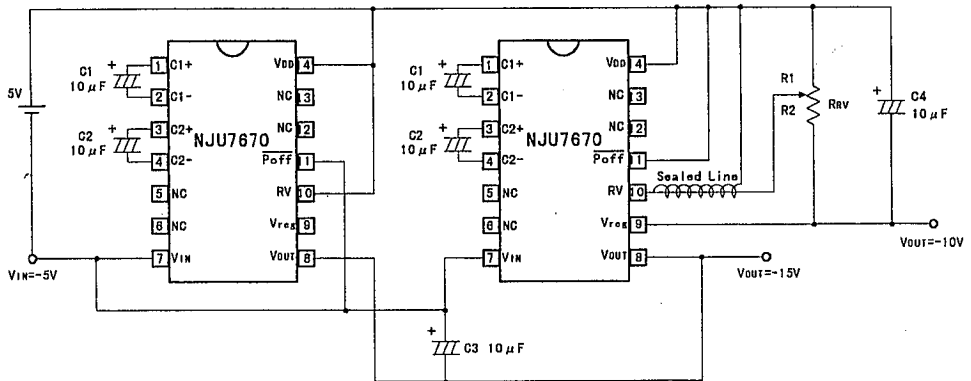


(1-2) Doubler Operation



■ 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.

MEMO

[CAUTION]

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