

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.

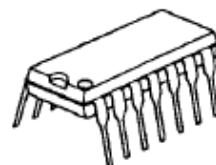
The application circuit of tripler requires three capacitors, and doubler requires only two capacitors.

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

■ FEATURES

- Triple / Double Voltage Output
- Operating Voltage — -2.6V to -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

■ PACKAGE OUTLINE



NJU7670D

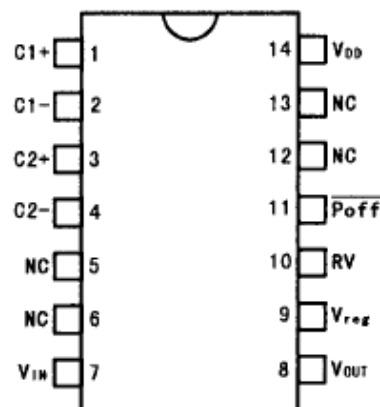


NJU7670M

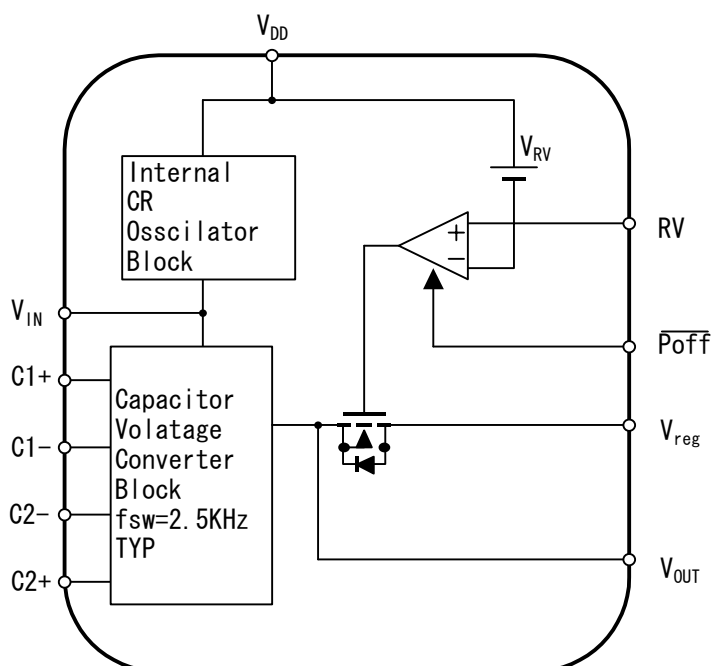


NJU7670V

■ PIN CONFIGURATION



■ BLOCK DIAGRAM



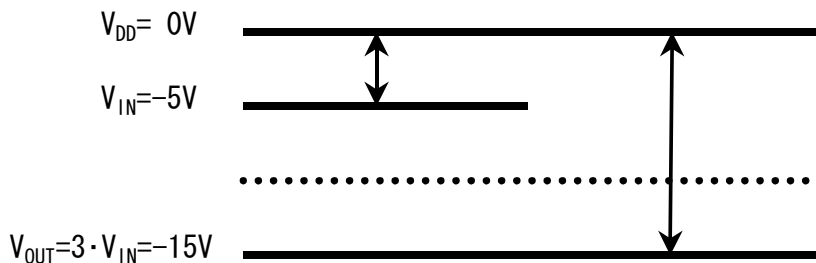
■ TERMINAL DESCRIPTION

No.	SYMBOL	FUNCTION
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	$\overline{\text{Poff}}$	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

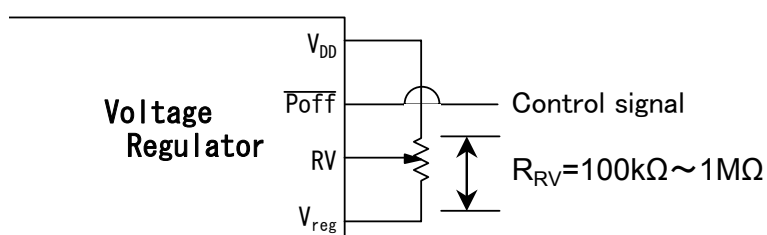
The voltage reference circuit is generating the reference voltage for a voltage regulator.

(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

$\overline{\text{Poff}}$ Level	V _{reg} Output
"H" (Connect to V _{DD})	ON
"L" (Connect to V _{IN})	OFF

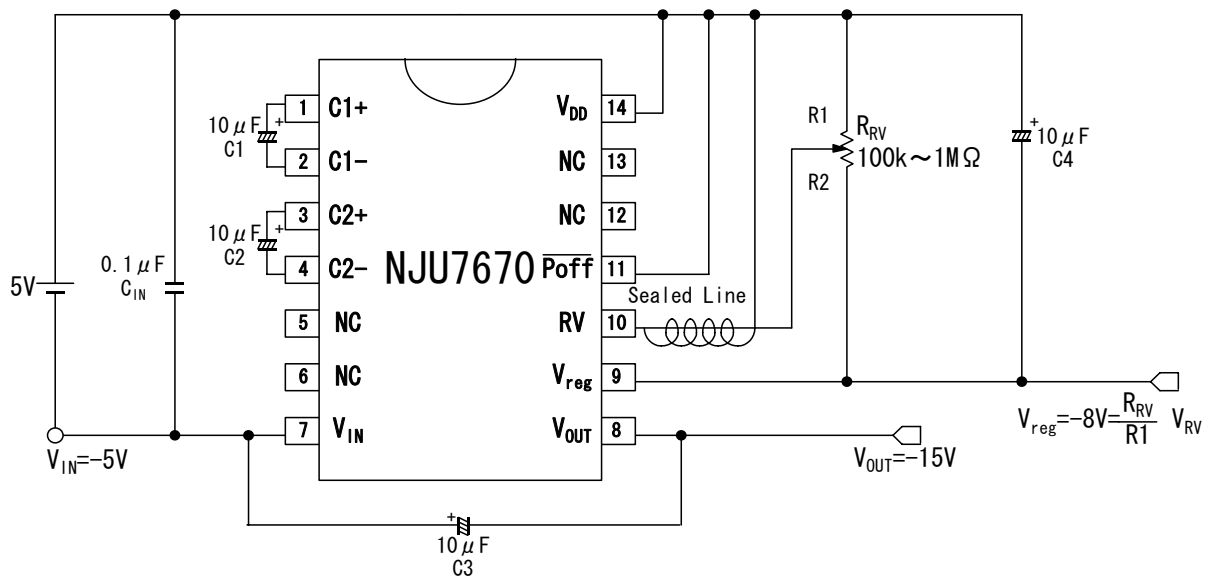
(3-2) Example of the Voltage Regulation

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



The IC may have a possibility not to operate properly with unstable supply voltage due to large transient current when the capacitor is charged or discharged.

The decoupling capacitor (C_{IN}) connect as close as possible to the IC.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{IN}	$ V_{DD} - V_{DD} \leq 20$	V
Input Voltage	V_{I1}	$V_{IN} -0.5$ to $+0.5$ Note1)	V
	V_{I2}	$V_{OUT} -0.5$ to $+0.5$ Note2)	
Output Voltage	V_{OUT}	-20.0	V
Power Dissipation	P_D	700 DIP	mW
		300 DMP	
		250 SSOP	
Operating Temperature Range	Topr	-20 to +75	°C
Storage Temperature	Tstg	-40 to +125	°C

Note1): Apply to Poff terminal

Note2): Apply to RV terminal

■ ELECTRICAL CHARACTERISTICS

($V_{DD}=0V$, $V_{IN}=-5V$, $C_{IN}=0.1\mu F$, $T_a=25^\circ C$) Note3)

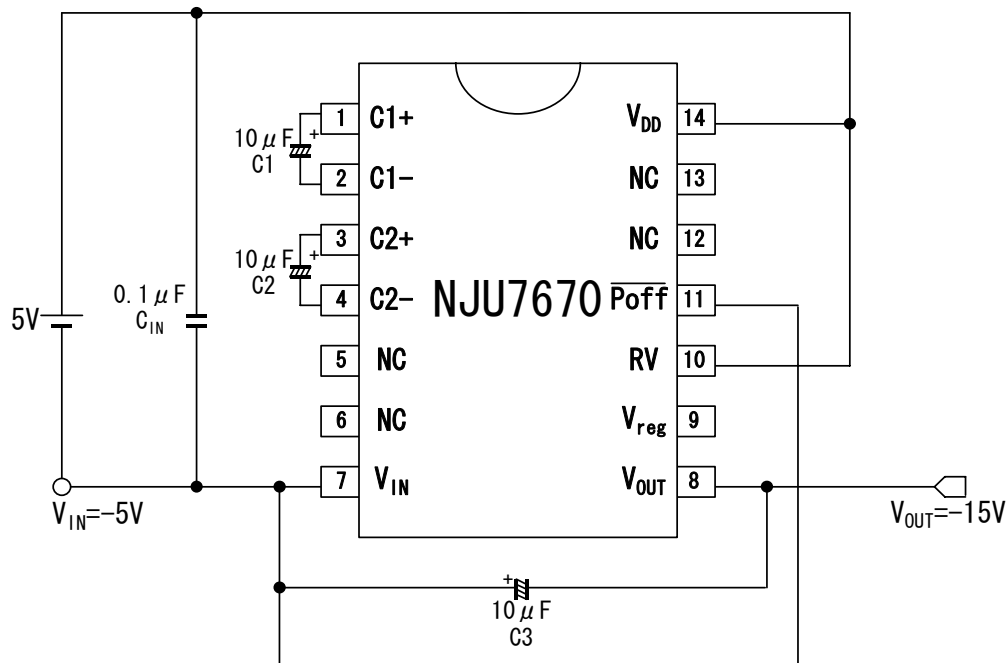
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{IN}		-6.0	—	-2.6	V
Output Voltage	V_{OUT}		-18.0	—	—	V
	V_{reg}	$RL = \infty$, $R_{RV} = 1M\Omega$, $V_{OUT} = -18V$	-18.0	—	-2.6	
Regulator Operating Voltage	$V_{(OUT)}$		-18.0	—	-8.0	V
Current Consumption 1	I_{DD1}	Poff="H" note4) $RL = \infty$, $R_{RV} = 1M\Omega$, $V_{reg} = -2.6V$	—	75	120	μA
Current Consumption 2	I_{DD2}	Poff="L" note4) $RL = \infty$, $R_{RV} = 1M\Omega$	—	60	100	μA
Output Impedance	R_{OUT}	$I_{OUT} = 20mA$, $C1 = C2 = C3 = 10\mu A$	—	150	200	Ω
Power Conversion Rate	P_{eff}	$I_{OUT} = 5mA$, $C1 = C2 = C3 = 10\mu A$	90	95	—	%
Line Regulation	$\frac{\Delta V_{reg}}{\Delta V_{OUT} \cdot V_{reg}}$	$-18V < V_{OUT} < -8V$ $V_{reg} = -8V$, $RL = \infty$	—	0.2	—	%V
Load Regulation	$\frac{\Delta V_{reg}}{\Delta I_{reg}}$	$V_{OUT} = -15V$, $V_{reg} = -8V$ $0 < I_{reg} < 20mA$	—	5.0	—	Ω
Output Saturation 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}	Poff Terminal	—	—	2.0	μA
Switching Frequency	f_{sw}		—	2.5	—	kHz

Note3): To achieve the best operation, select the input capacitor (C_{IN}) with enough margin according to the stability of supply voltage.

Note4): Excluding input current on R_{RV}

■ APPLICATION CIRCUITS (1)

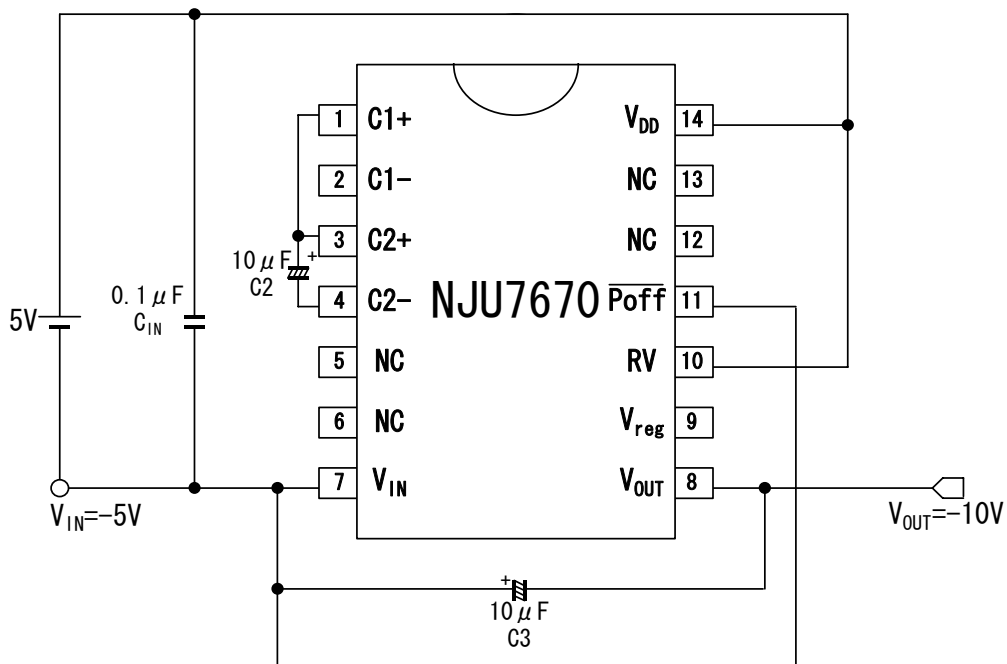
(1-1) Tripler Operation



The IC may have a possibility not to operate properly with unstable supply voltage due to large transient current when the capacitor is charged or discharged.

The decoupling capacitor (C_{IN}) connect as close as possible to the IC.

(1-2) Doubler Operation

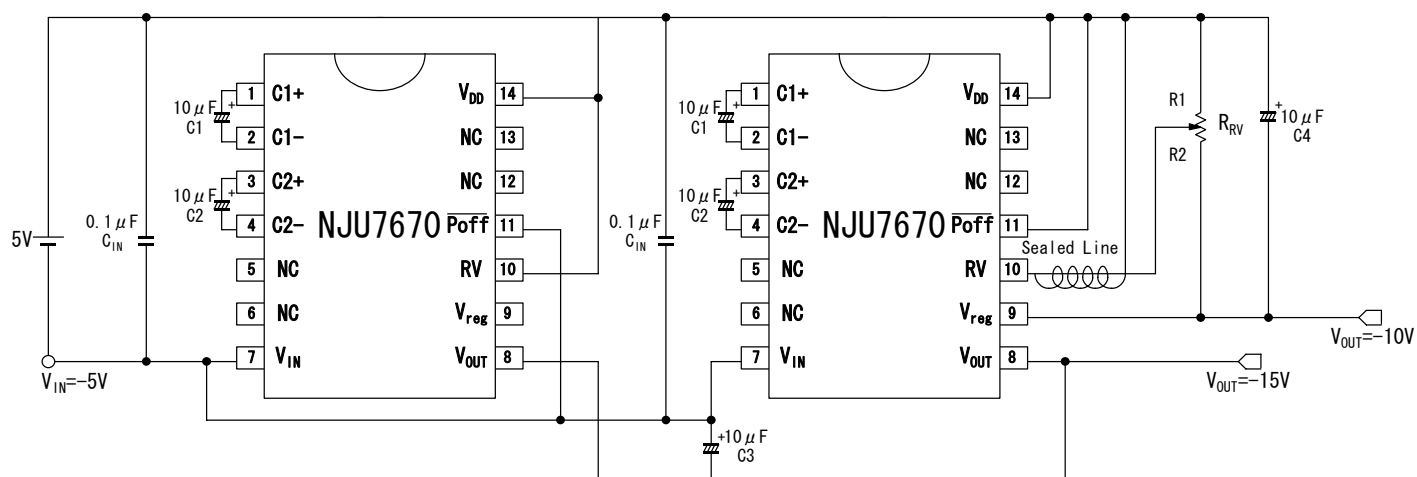


The IC may have a possibility not to operate properly with unstable supply voltage due to large transient current when the capacitor is charged or discharged.

The decoupling capacitor (C_{IN}) connect as close as possible to the IC.

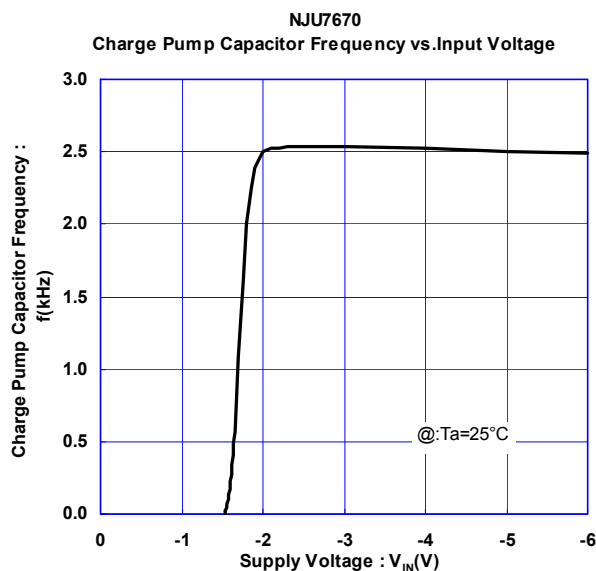
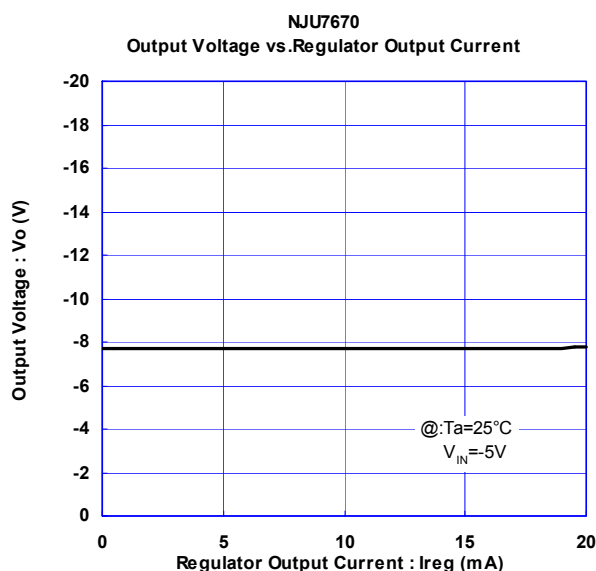
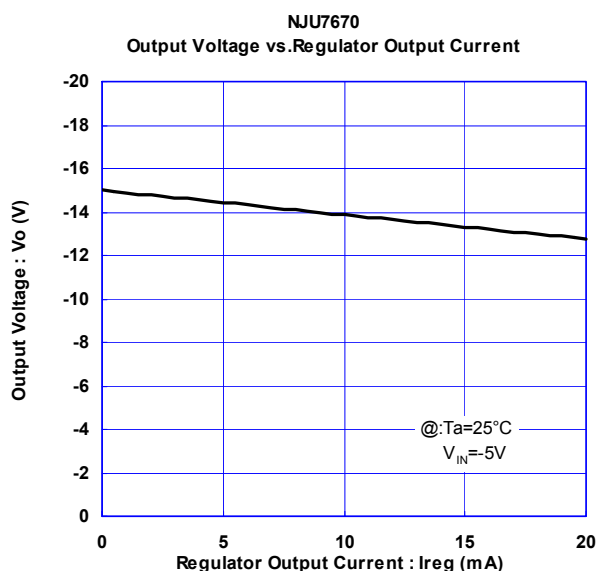
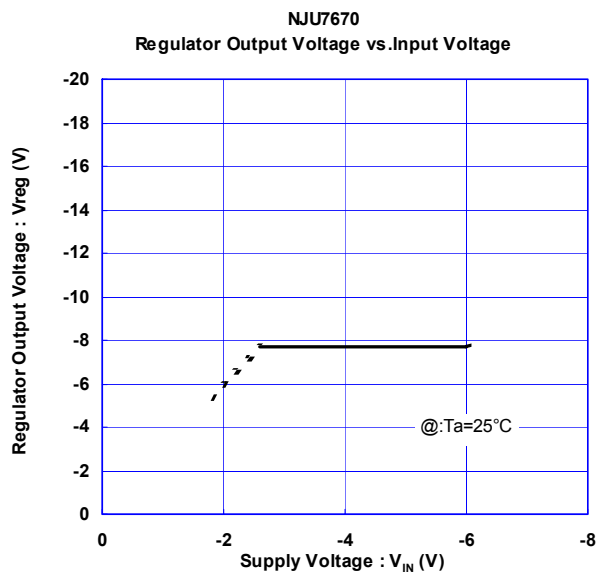
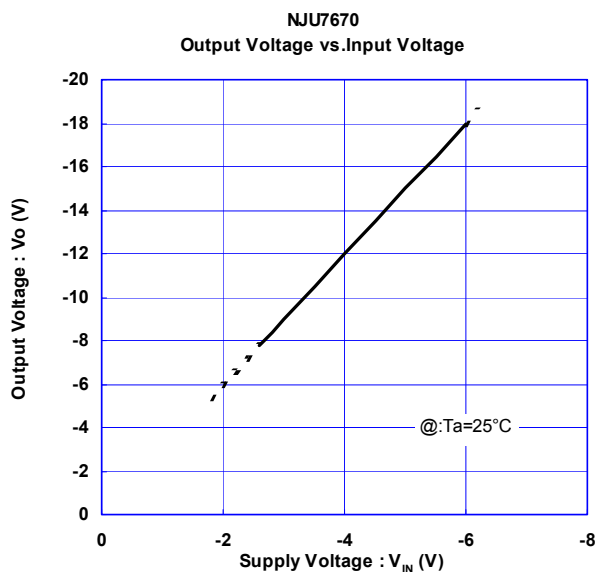
■ APPLICATION CIRCUITS (2)

(2) Parallel Connection



- * The output impedance R_{OUT} can be reduced by parallel connection.
 - * C_3 is a stabilizing capacitor output for stabilized voltage.
 - * In the parallel connection, one stabilizing capacitor using is better way.
 - * The IC may have a possibility not to operate properly with unstable supply voltage due to large transient current when the capacitor is charged or discharged.
- The decoupling capacitor (C_{IN}) connect as close as possible to the IC.

■ TYPICAL CHARACTERISTICS (CIRCUITS CONDITION : Tripler Operation + Voltage Regulator Operation)



[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[NJR:](#)

[NJU7670M-TE1](#) [NJU7670D](#) [NJU7670M](#) [NJU7670V-TE1](#) [NJU#7670D](#)