

## VOLTAGE CONVERTER

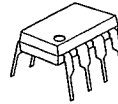
### ■ GENERAL DESCRIPTION

The NJU7662 is a voltage converter incorporated CR oscillator, voltage-level-shifter and power-MOS, which generates a polarity-converted negative voltage or twofold voltage of an operating voltage ranging from +1.5 to +10V.

The application circuit of negative voltage converter requires only two capacitors, and positive twofold voltage converter requires two capacitors, two resistors and one diode as external components.

The oscillation frequency of the internal oscillator is 10kHz and the negative voltage converter (on no-load condition) achieves extremely high-efficiency voltage conversion rate of 99.9%.

### ■ PACKAGE OUTLINE



NJU7662D

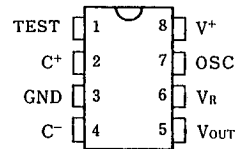


NJU7662M

### ■ FEATURES

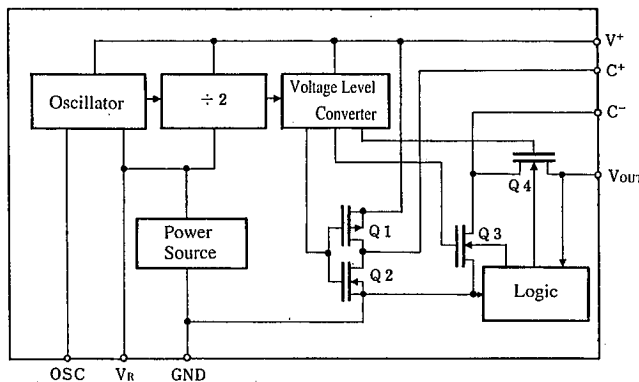
- Polarity-converted Negative Voltage Output
- Twofold Positive Voltage Output
- Operating Voltage --- + 4.5 to +20.0V
- High-efficiency Voltage Conversion Rate-- 99.9%  
(No-load, Negative Voltage Converter)
- High-efficiency Power Conversion Rate-- 96%  
(Negative Voltage Converter)
- Cascade Connection Available  
2n-1 times voltage outputs for negative voltage  
2n times voltage outputs for positive voltage
- Few External Components  
--- 2 Capacitors, (Negative Voltage Converter)  
--- 2 Capacitors, 2 Resistors and 1 Diode  
(Positive Voltage Converter)
- Package Outline DIP / DMP 8
- C-MOS Technology

### ■ PIN CONFIGURATION



NJU7662

### ■ BLOCK DIAGRAM



## ■ TERMINAL DESCRIPTION

NO.	SYMBOL	FUNCTION
1	TEST	Testing Terminal (Normally, non connection)
2	C <sup>+</sup>	Charge Pump Capacitor (+) Connecting Terminal
3	GND	Ground Terminal
4	C <sup>-</sup>	Charge Pump Capacitor (-) Connecting Terminal
5	V <sub>OUT</sub>	Voltage Output Terminal
6	V <sub>R</sub>	Voltage Regulator Control Terminal
7	OSC	Oscillation Capacitor Connecting Terminal
8	V <sup>+</sup>	Power Supply Terminal (+)

## ■ ABSOLUTE MAXIMUM RATINGS

(T<sub>a</sub>=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sup>+</sup>	22	V
Input Voltage	V <sub>IN</sub>	-0.3 ~ (V <sup>+</sup> +0.3) @ V <sup>+</sup> <7 (V <sup>+</sup> -7) ~ (V <sup>+</sup> +0.3) @ V <sup>+</sup> >7	V
Output Short		CONTINUITY @ V <sup>+</sup> <5.5	
Power Dissipation	P <sub>D</sub>	(DIP-8) 500 (DMP-8) 300	mW
Operating Temperature Range	T <sub>opr</sub>	-40 ~ 85	°C
Storage Temperature Range	T <sub>stg</sub>	-65 ~ +150	°C

## ■ ELECTRICAL CHARACTERISTICS (Negative Voltage Output)

(T<sub>a</sub>=25°C, V<sup>+</sup>=15V, C<sub>OSC</sub>=0)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating Current	I <sup>+</sup> <sub>1</sub>	R <sub>L</sub> =∞, V <sub>R</sub> =OPEN		250	600	μA
	I <sup>+</sup> <sub>2</sub>	V <sup>+</sup> =5V, R <sub>L</sub> =∞ V <sub>R</sub> =GND		20	150	μA
Operating Voltage	V <sup>+</sup> <sub>HI</sub>	R <sub>L</sub> =10kΩ V <sub>R</sub> =OPEN	5.5		20	V
	V <sup>+</sup> <sub>LO</sub>	V <sub>R</sub> =GND	4.5		6	V
Output Resistance (Note 1)	R <sub>o1</sub>	I <sub>OUT</sub> =20mA V <sub>R</sub> =OPEN		60	100	Ω
	R <sub>o2</sub>	V <sup>+</sup> =5V, I <sub>OUT</sub> =3mA, V <sub>R</sub> =GND		125	200	Ω
Oscillation Frequency	F <sub>O</sub>			10		kHz
Power Conversion Rate	P <sub>EF</sub>	R <sub>L</sub> =2kΩ	93	96		%
Voltage Conversion Rate	V <sub>EF</sub>	R <sub>L</sub> =∞	97	99.9		%
Oscillation Terminal Input Current	I <sub>osc1</sub>	V <sup>+</sup> =15V, (V <sub>OSC</sub> =8~15V)		4.0		μA
	I <sub>osc2</sub>	V <sup>+</sup> =5V, (V <sub>OSC</sub> =0~5)		0.5		μA

(Note 1) The twofold positive converter requires 100Ω series resistor on power source terminal, therefore the output resistance increases to 200Ω.

## ■ MEASUREMENT CIRCUIT

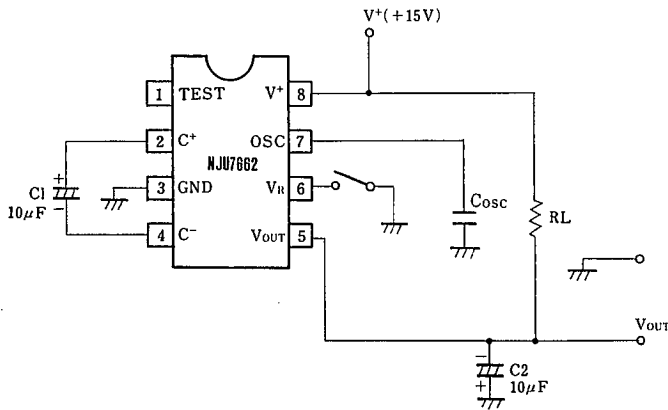
The measurement circuit diagram of negative voltage converter is shown below.

No. 6 terminal must connect to GND or Open according to the operating voltage as follows :

$V^+ < 6V$ .....Connect to GND

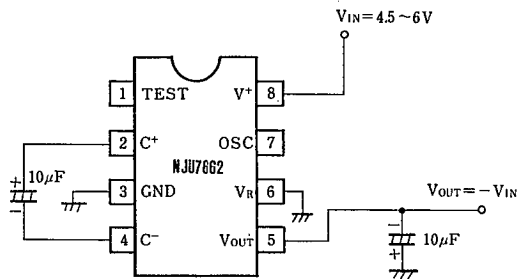
$V^+ \geq 6V$ .....OPEN

The oscillation frequency can be lowered by connecting external capacitor on the No.7 terminal, furthermore it can be also driven by external clock generator.

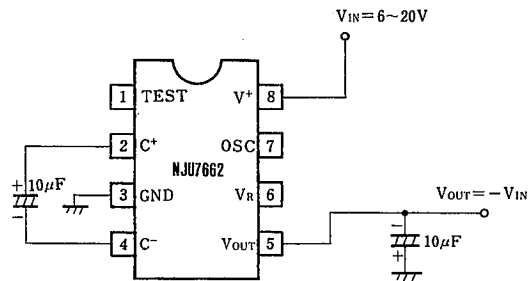


## ■ APPLICATION CIRCUITS

(1-1) Negative Voltage Output 1  
4.5 to 6.0V operation



(1-2) Negative Voltage Output 2  
6.0 to 20.0V operation



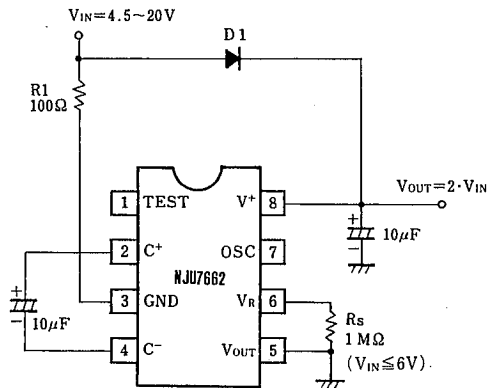
(Note 2) No.6 terminal must connect to GND or Open according to the operating voltage as follows :

$V^+ < 6V$ .....Connect to GND

$V^+ \geq 6V$ .....OPEN

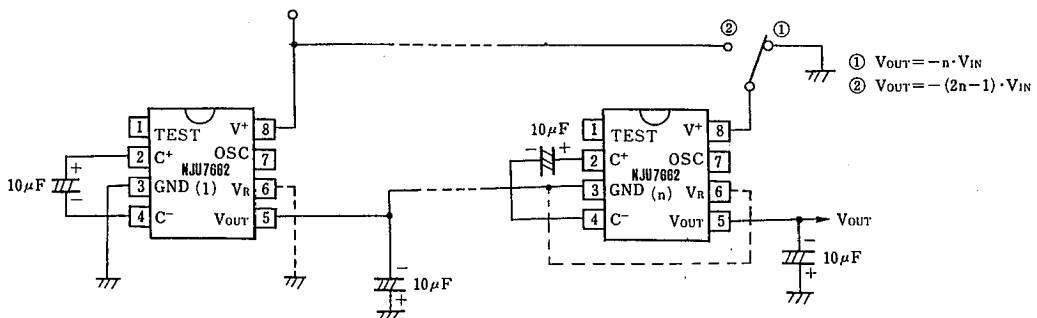
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## (2) Twofold Positive Voltage Output



(Note 3) In the twofold positive voltage output application, R<sub>1</sub>, R<sub>S</sub> and D<sub>1</sub> are required for start-up.

## (3) Cascade Connection (Negative Voltage Output)



(Note 4) No.6 terminal must connect to GND or Open according to the operating voltage as follows :

$V^+ < 6V$ .....Connect to GND

$V^+ \geq 6V$ .....OPEN

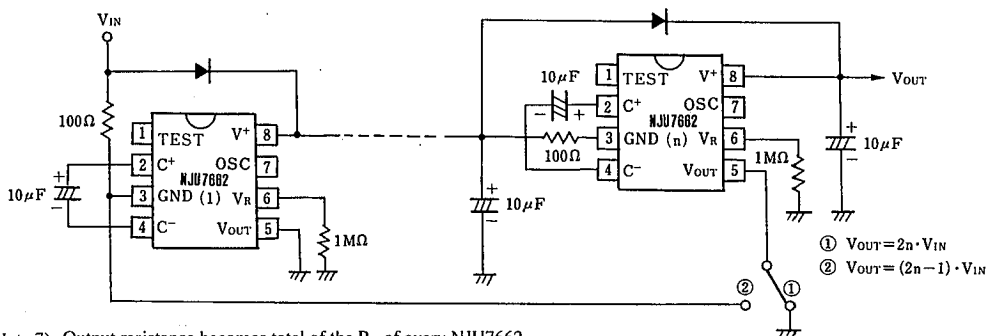
(Note 5) Output resistance becomes total of the R<sub>o</sub> of every NJU7662.

(Note 6) In case of the cascade connection (Negative Voltage Output), No.6 terminals (after second IC's ) must connect as follows, according to V<sup>+</sup> - GND Voltage.

$V^+ - GND < 6.0V$ .....GND

$V^+ - GND \geq 6.0V$ .....OPEN

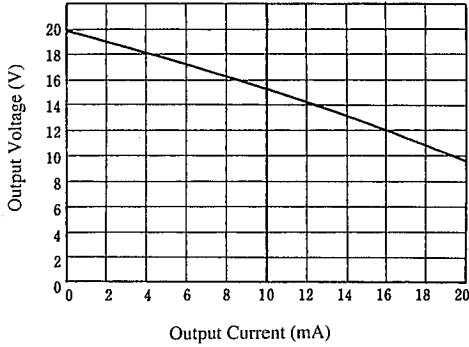
## (4) Cascade Connection (Positive Voltage Output)



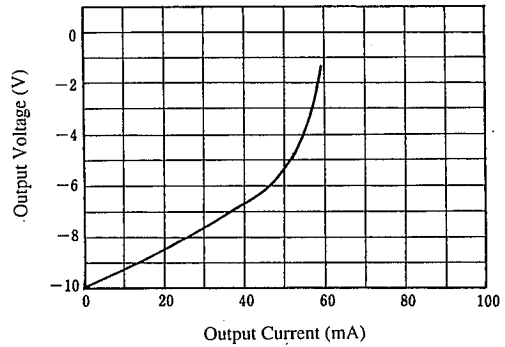
(Note 7) Output resistance becomes total of the R<sub>o</sub> of every NJU7662.

■ TYPICAL CHARACTERISTICS

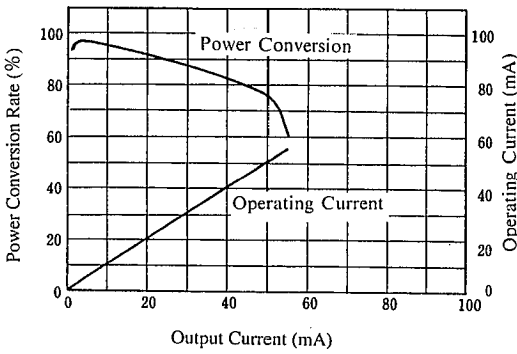
Output Voltage vs. Output Current  
 $V_{IN}=10V$  (Twofold Voltage)



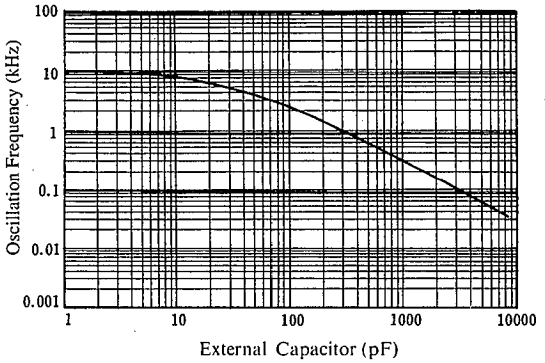
Output Voltage vs. Output Current  
 $V_{IN}=10V$  (Negative Voltage)



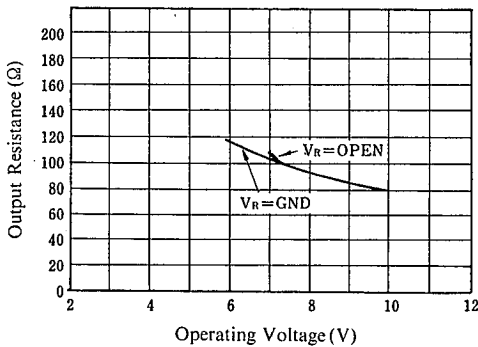
Power Conversion Rate vs. Output Current  
 $V_{IN}=10V$



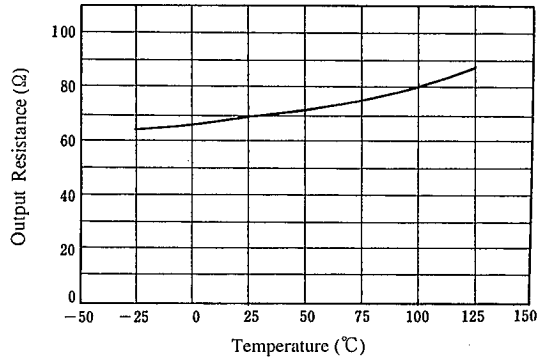
Oscillation Frequency vs. External Capacitor  
 $V_{DD}=15V$



Output Resistance vs. Operating Voltage  
 $I_O=20mA$



Output Resistance vs. Temperature  
 $V_{DD}=15V, I_O=20mA$



## MEMO

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