

VOLTAGE CONVERTER

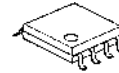
■ GENERAL DESCRIPTION

NJU7660A is a CMOS switched capacitor, voltage converter designed to be an Improved direct replacement of popular 7660/1044.

NJU7660A provides several voltage conversion functions.

The application circuit of negative voltage ($V_{OUT} = -V_{IN}$) converter requires only two capacitors, and positive twofold voltage ($V_{OUT} = 2V_{IN}$) converter requires two capacitors and two diodes as external components.

■ PACKAGE OUTLINE



NJU7660AM

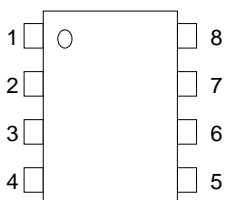


NJU7660AV

■ FEATURES

- Full Compatible with NJU7660
- Correspond to MLCC and electrolytic capacitor
- Twofold positive Output
- Polarity-converted Negative voltage Output
- Operating voltage range
 - :+1.5V to +10V(for Negative voltage converter)
 - :+3.0V to +10V(for Twofold voltage converter)
- High-efficiency voltage conversion rate :99.9%(No load, Negative voltage converter)
- Few external components
 - :2 capacitors(Negative voltage converter)
 - :2 capacitors, 2diode(Twofold voltage converter)
- Package Outline :DMP8, SSOP8
- CMOS Technology

■ PIN CONFIGURATION



NJU7660AM
NJU7660AV

PIN FUNCTION

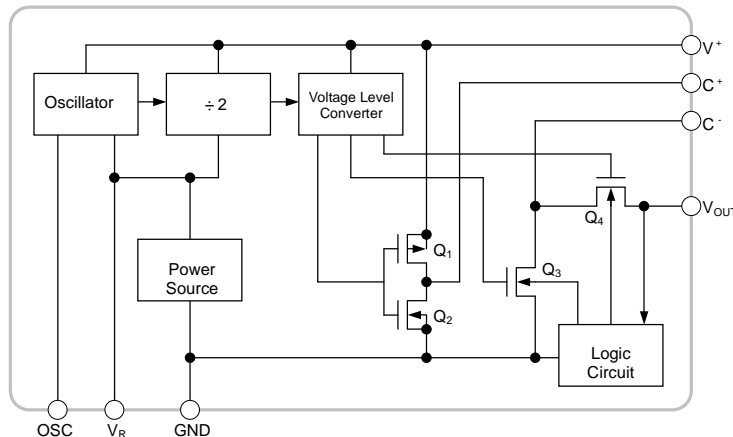
1. N.C. :Non Connection
2. C⁺ :Charge pump Capacitor(+) Connecting pin
3. GND :Ground pin
4. C⁻ :Charge pump Capacitor(-) Connecting pin
5. V_{OUT} :Voltage Output pin
6. V_R :Voltage Regulator Control pin
7. OSC :Oscillation Capacitor Connecting pin
8. V⁺ :Power Supply pin

■ PRODUCT CLASSIFICATION

Device Name	Oscillation Frequency	Output Resistance	Operating Current	C1/C2 capacitor	Status
NJU7660A	5kHz typ.	55Ω typ.	40μA typ.	10μF	M.P
NJU7660B	200kHz typ.	30Ω typ.	800μA typ.	1μF	PLAN

NJU7660A

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT	
Supply Voltage	V ⁺	10.5	V	
OSC Pin Voltage	V _{OSC}	-0.3 ~ (V ⁺ +0.3) @ V ⁺ < 5.5 (V ⁺ -5.5) ~ (V ⁺ +0.3) @ V ⁺ > 5.5	V	
V _R Pin Voltage	V _{VR}	-0.3 ~ (V ⁺ +0.3) @ V ⁺ < 5.5 (V ⁺ -5.5) ~ (V ⁺ +0.3) @ V ⁺ > 5.5	V	
V _R Pin Current (*3)	I _{VR}	20	μA	
Output Short		CONTINUITY @ V ⁺ < 5.5		
Power Dissipation	P _D	DMP8	470(*1) 600(*2)	mW
		SSOP8	410(*1) 510(*2)	
Junction Temperature Range	T _J	- 40 ~ +150	°C	
Operating Temperature Range	T _{opr}	- 40 ~ + 85	°C	
Storage Temperature Range	T _{stg}	- 40 ~ +150	°C	

(*1): Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard, 2Layers)

(*2): Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard, 4Layers,internal Cu area: 74.2 × 74.2mm)

(*3): Connecting any input terminal to voltages greater than V⁺ or less than GND may cause destructive latchup. It is recommended that no inputs from sources operating from external supplies be applied prior to "power-up" of the NJU7660A

■ INPUT VOLTAGE RANGE

V⁺=1.5V to 10V (for Negative Voltage Converter)

V⁺=3.0V to 10V (for Twofold Voltage Converter)

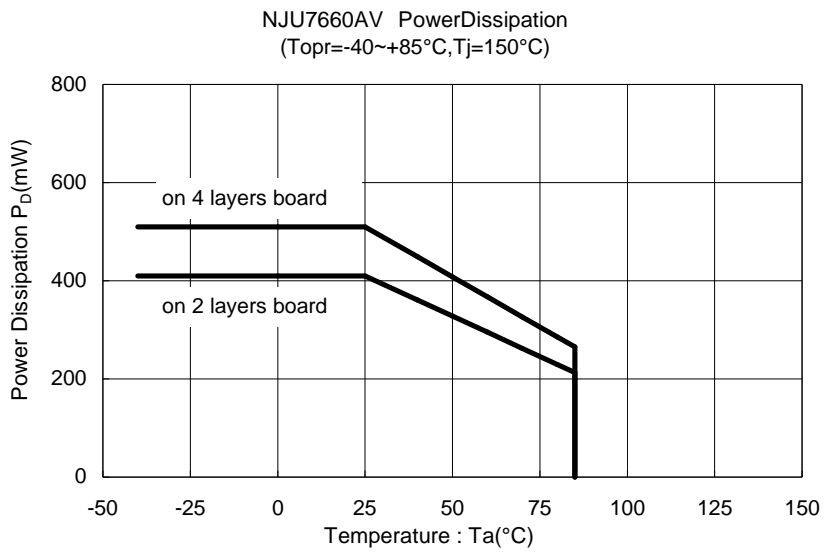
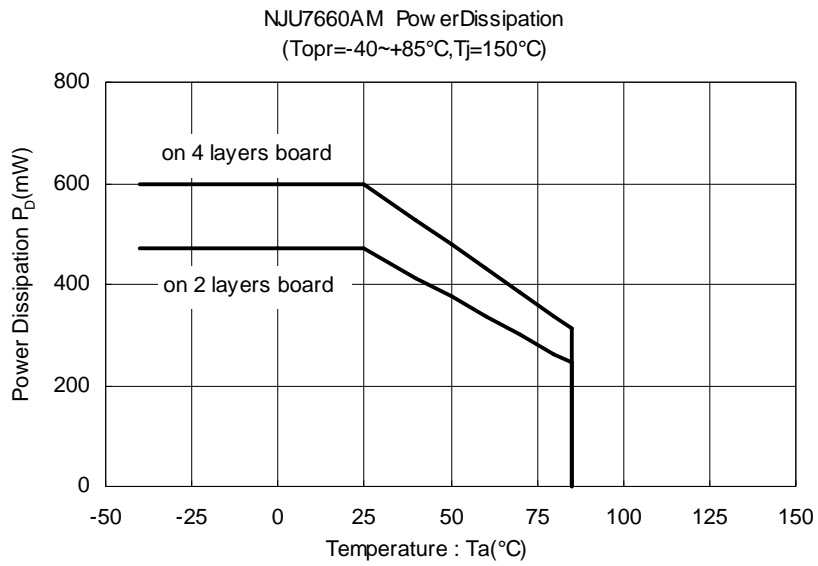
■ ELECTRICAL CHARACTERISTICS

(Unless otherwise noted, $V^+=5.0V$, $C_{OSC}=0$, $T_a=25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Operating Current	I^+	$R_L=\infty$	-	40	130	μA	
Operating Voltage 1 (Without Dx)	V_{H1}^+	$R_L=10k\Omega$	$V_R=OPEN$	3.0	-	6.5	V
	V_{L1}^+		$V_R=GND$	1.5	-	3.5	V
Operating Voltage 2 (With Dx)	V_{H2}^+	$R_L=10k\Omega$	$V_R=OPEN$	3.0	-	10	V
	V_{L2}^+		$V_R=GND$	1.5	-	3.5	V
Output Resistance	R_o	$I_{OUT}=20mA$	-	55	100	Ω	
		$V^+=2V, I_{OUT}=3mA, V_R=GND$	-	-	300	Ω	
Oscillation Frequency	F_o		-	5	-	kHz	
Power Conversion Rate	P_{EF}	$R_L=5k\Omega$	90	98	-	%	
Voltage Conversion Rate	V_{EF}	$R_L=\infty$	97	99.9	-	%	
Oscillation Circuit Impedance	Z_{OSC}	$V^+=2V$	-	1.0	-	M Ω	
		$V^+=5V$	-	0.1	-		

(*4): The twofold voltage converter operates over 3.0V

POWER DISSIPATION vs. AMBIENT TEMPERATURE



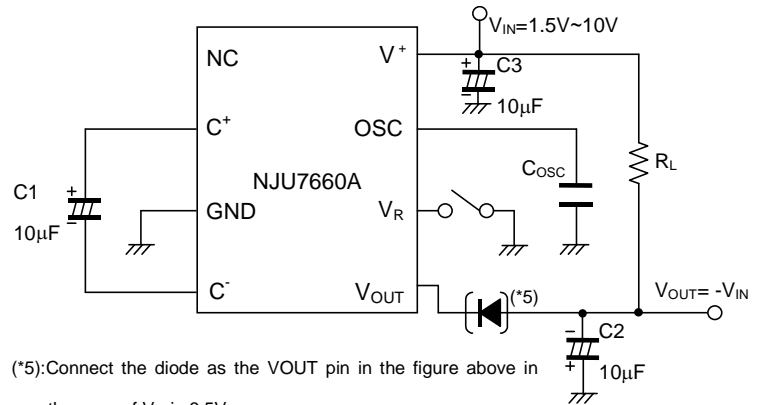
■ TEST CIRCUIT

The measurement circuit diagram of negative voltage is shown below. V_R pin must connect to GND or Open according to the operating voltage as follows:

$V^+ < 3.5V$:Connected to GND

$V^+ \geq 3.5V$:OPEN

The oscillation frequency can be lowered by connected external capacitor to the OSC pin, furthermore it can be also driven by external clock generator.

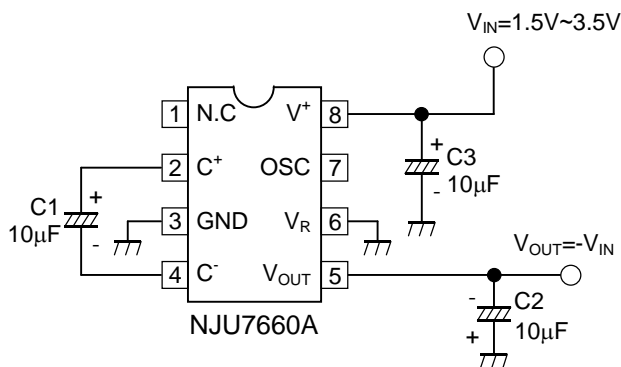


(*5):Connect the diode as the VOUT pin in the figure above in the case of V^+ is 6.5V or more.

In the case of less than 6.5V, V^+ does not require this diode.

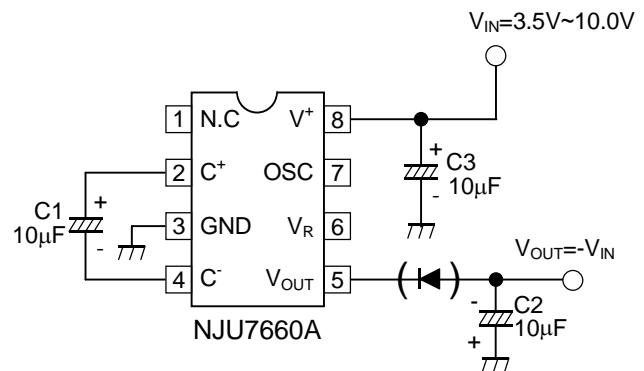
■ TYPICAL APPLICATION

(1-1) Negative Voltage Output 1 1.5V to 3.5V operation



*Its Can also be used ceramic capacitor. (C1,C2,C3)
*Capacitance of C3 is equal to C1,C2 or more.

(1-2) Negative Voltage Output 2 3.5V to 10V operation



*Can also be used ceramic capacitor. (C1,C2,C3)
*Capacitance of C3 is equal to C1,C2 or more.

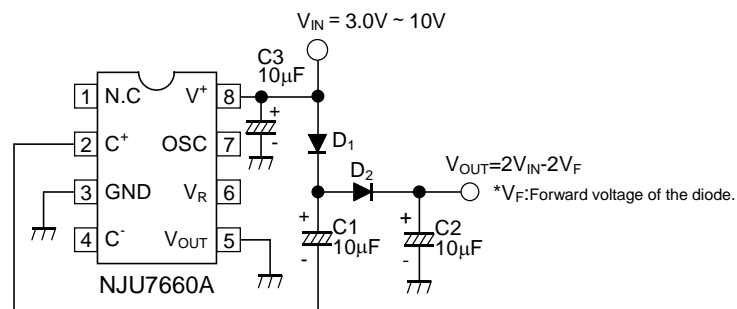
(*6): V_R pin must connect to GND or Open according to the operating voltage as follows:

$V^+ < 3.5V$:Connected to GND

$V^+ \geq 3.5V$:OPEN

(*7): In case of the operation voltage is 6.5V or more, a Diode must be connected to V_{OUT} pin. If it is less than 6.5V, the Diode is not required

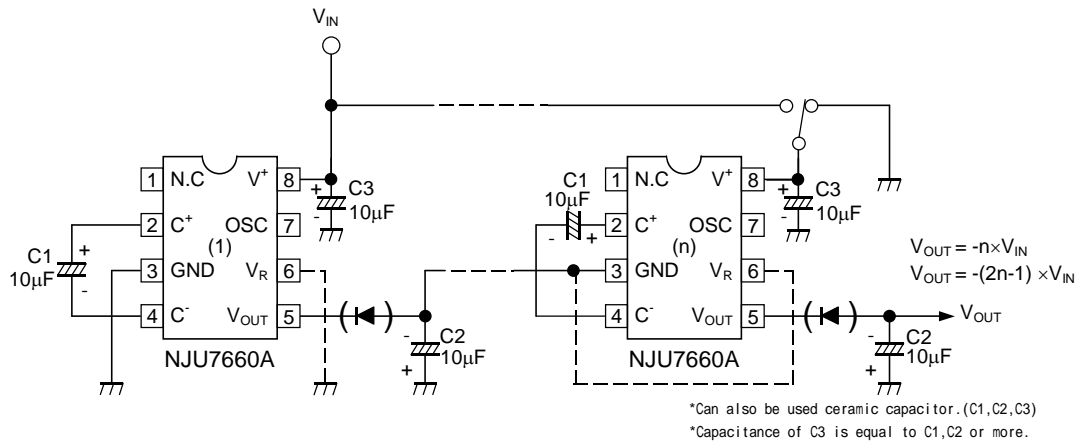
(2) Twofold positive Voltage Output



*Can also be used ceramic capacitor. (C1,C2,C3)
*Capacitance of C3 is equal to C1,C2 or more.

NJU7660A

(3) Cascade Connection (Negative Voltage Output)



(*8): V_R pin must connect to GND or Open according to the operating voltage as follows:

$V^+ < 3.5V$: Connected to GND

$V^+ \geq 3.5V$: OPEN

(*9): In case of the operation voltage is 6.5V or more, a Diode must be connected to V_{OUT} pin. If it is less than 6.5V, the Diode is not required

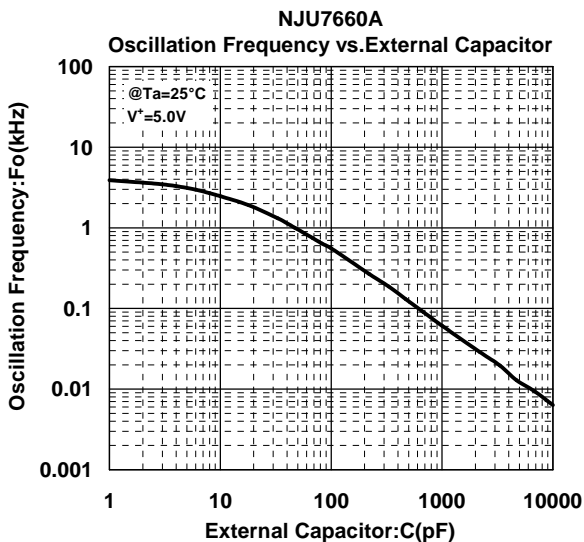
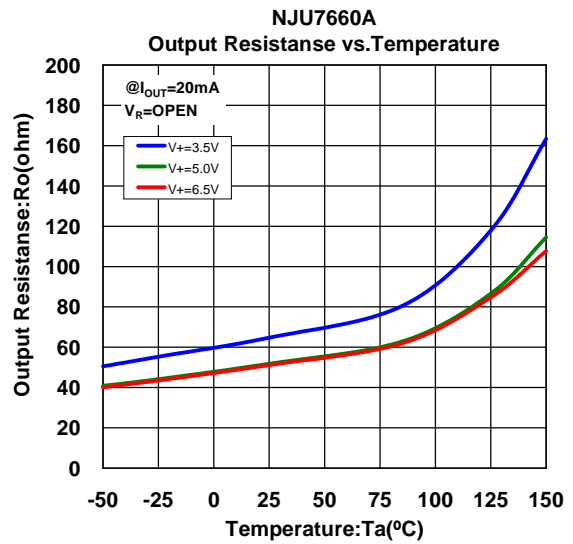
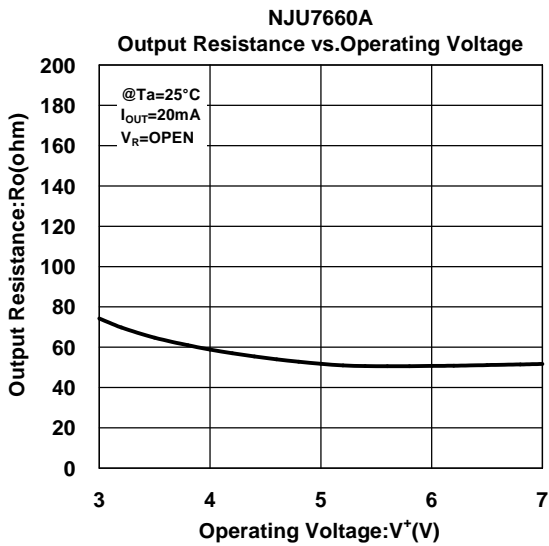
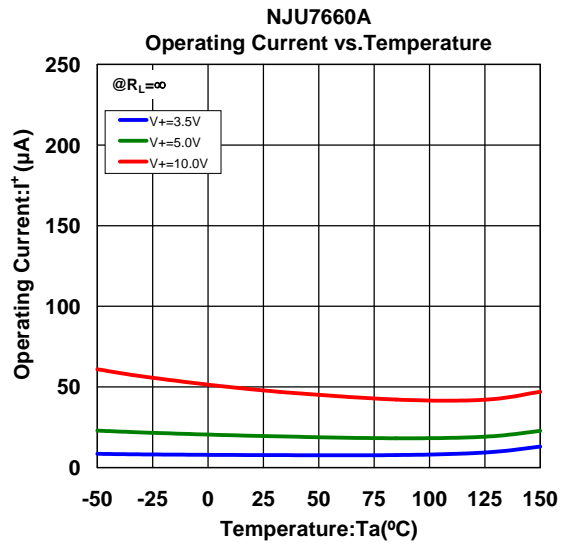
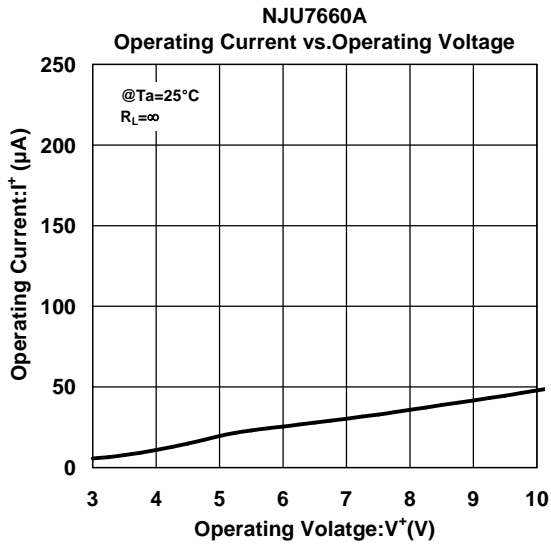
(*10): In case of the cascade connection (Negative Voltage Output), V_R pins (after second IC's) must connect as follows, according to $V^+ - GND$ Voltage.

$V^+ - GND < 3.5V$: Connected to GND

$V^+ - GND \geq 3.5V$: OPEN

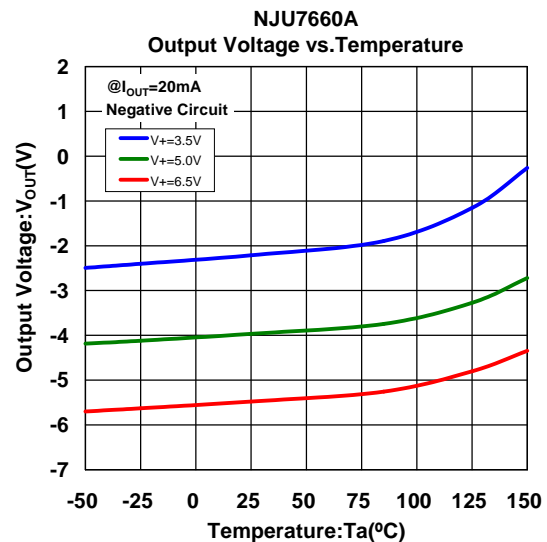
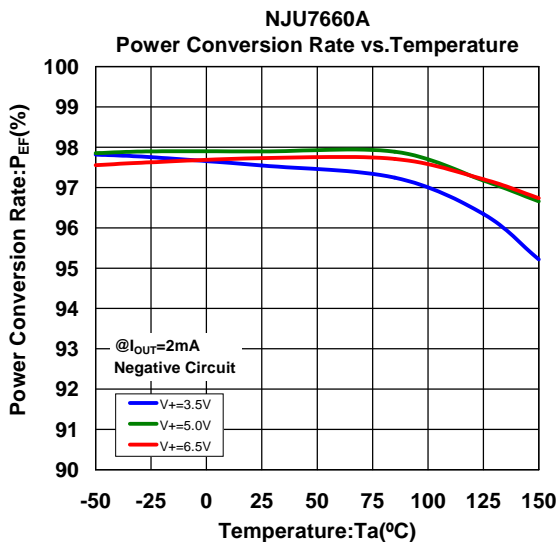
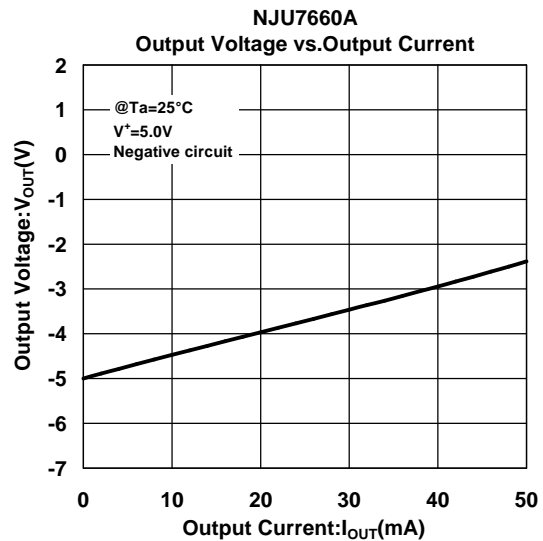
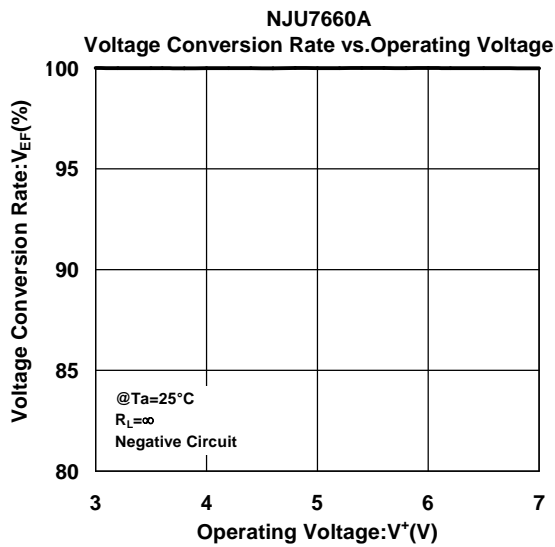
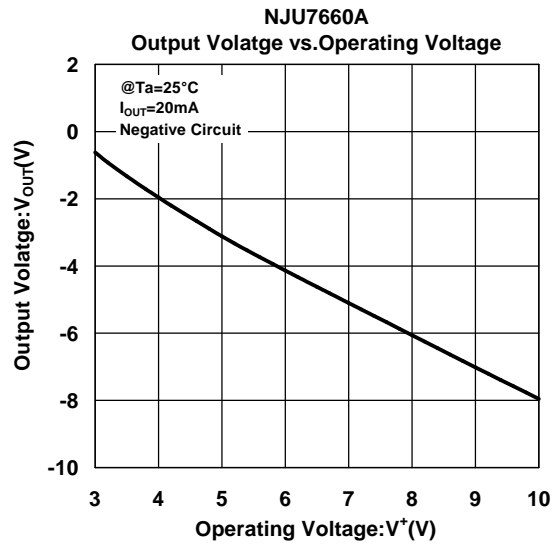
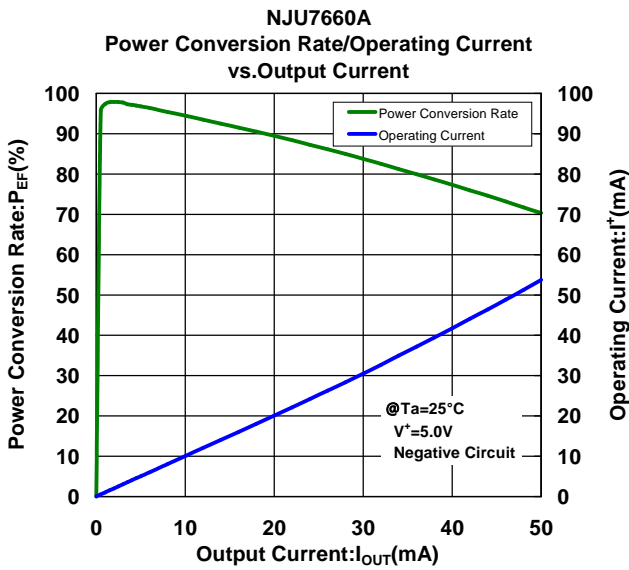
(*11): Output resistance becomes total of the R_o of every NJU7660A

■ TYPICAL CHARACTERISTICS (Common)

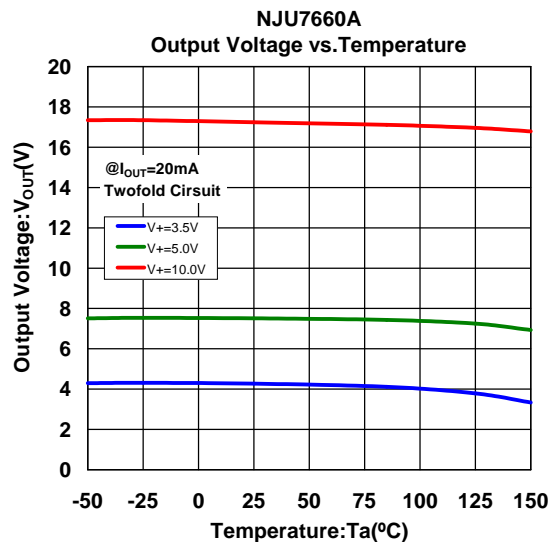
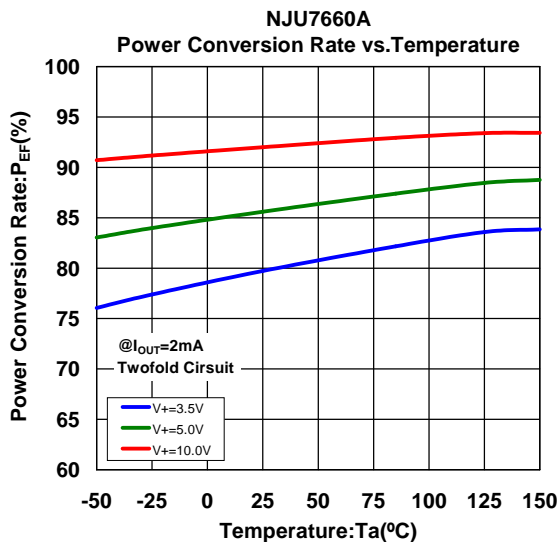
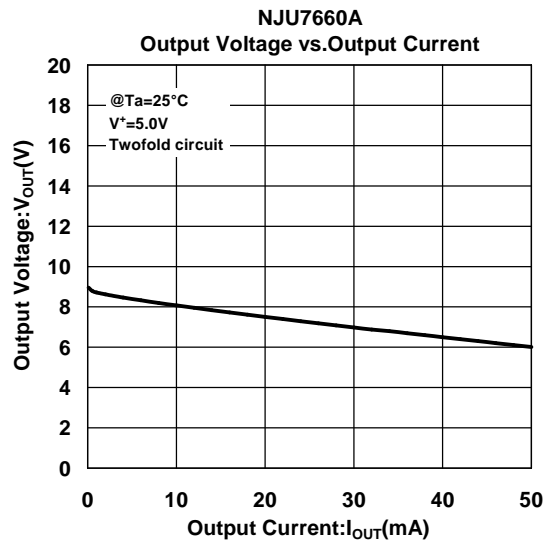
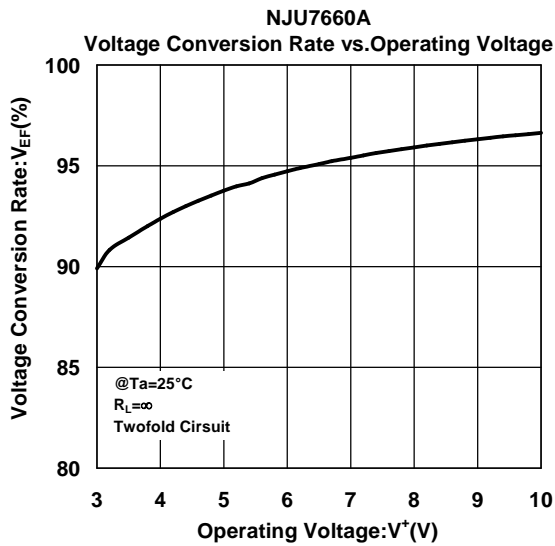
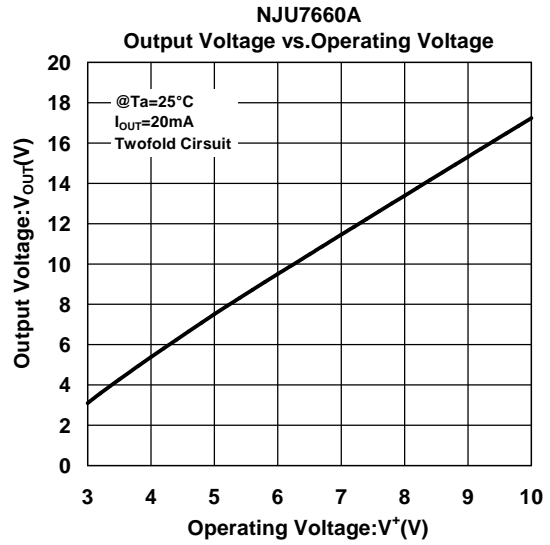
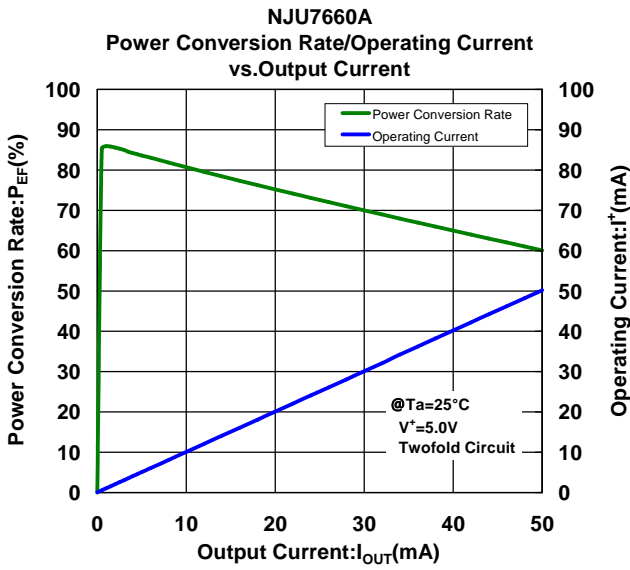


NJU7660A

■ TYPICAL CHARACTERISTICS (Negative Circuit)



■ TYPICAL CHARACTERISTICS (Twofold Circuit)



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