

## NJM431

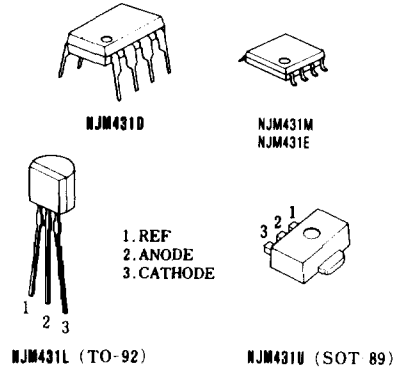
The NJM431 is a three-terminal adjustable shunt regulator. The output voltage may be set to any value between  $V_{REF}$  (about 2.5V) and 36V by two resistors. Output circuitry shows a sharp turn-on characteristics. Applications include shunt regulators, series regulators for small power and isolation regulators with photo couplers.

### ■ Absolute Maximum Ratings ( $T_a=25^\circ\text{C}$ )

Cathode Voltage (note 1)	$V_{KA}$	37V	
Continuous Cathode Current	$I_{KA}$	-100mA~150mA	
Reference Input Current	$I_{REF}$	-50 $\mu\text{A}$ ~10mA	
Power Dissipation	$P_D$	(L-Type)	500mW
		(D-Type)	700mW
		(M-Type)	300mW
		(U-Type)	350mW
Operating Temperature Range	$T_{opr}$	-20 $^\circ\text{C}$ ~+85 $^\circ\text{C}$	
Storage Temperature Range	$T_{stg}$	-40 $^\circ\text{C}$ ~+125 $^\circ\text{C}$	

(note 1) Unless specified, all voltage values are with respect to the anode terminal.

### ■ Package Outline



### ■ Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Cathode Voltage	$V_{KA}$	$V_{REF}$	—	36	V
Cathode Current	$I_K$	1	—	100	mA

### ■ Electrical Characteristics ( $T_a=25^\circ\text{C}$ )

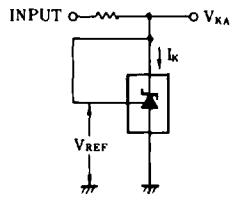
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Reference Voltage	$V_{REF}$	$V_{KA}=V_{REF}$ , $I_K=10\text{mA}$ (note 1)	2440	2495	2550	mV
Reference Voltage Change (Full Oper. Temp. Range)	$V_{REF}$ (dev)	$V_{KA}=V_{REF}$ , $I_K=10\text{mA}$ (note 1) $T_a=-20^\circ\text{C}\sim+85^\circ\text{C}$	—	8	17	mV
Reference Voltage Change vs. Cathode Voltage Change	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_K=10\text{mA}$ (note 2)	—	-1.4	-2.7	mV/V
			—	-1	-2	mV/V
Reference Input Current	$I_{REF}$	$I_K=10\text{mA}$ , $R_1=10\text{k}\Omega$ , $R_2=\infty$ (note 2)	—	2	4	$\mu\text{A}$
Reference Input Current Change (Full Oper. Temp. Range)	$I_{REF}$ (dev)	$I_K=10\text{mA}$ , $R_1=10\text{k}\Omega$ , $R_2=\infty$ (note 2) $T_a=-20^\circ\text{C}\sim+85^\circ\text{C}$	—	0.4	1.2	$\mu\text{A}$
Minimum Input Current	$I_{MIN}$	$V_{KA}=V_{REF}$ (note 1)	—	0.4	1.0	mA
Cathode Current (Off Cond.)	$I_{OFF}$	$V_{KA}=36\text{V}$ , $V_{REF}=0$ (note 3)	—	0.1	1.0	$\mu\text{A}$
Dynamic Impedance	$ Z_{KA} $	$V_{KA}=V_{REF}$ , $I_K=1\text{mA}\sim 100\text{mA}$ , $f\leq 1\text{kHz}$ (note 1)	—	0.2	0.5	$\Omega$

(note 1) TEST CIRCUIT (Fig. 1)

(note 2) TEST CIRCUIT (Fig. 2)

(note 3) TEST CIRCUIT (Fig. 3)

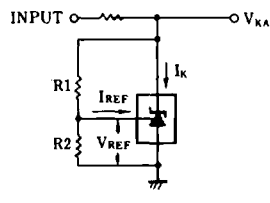
■ Test Circuits



1.  $V_{KA} = V_{REF}$

$$V_O = V_{KA} = V_{REF}$$

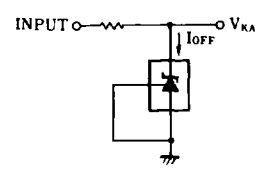
(Fig. 1)



2.  $V_{KA} > V_{REF}$

$$V_O = V_{KA} = V_{REF} \cdot \left(1 + \frac{R_1}{R_2}\right) + I_{REF} \cdot R_1$$

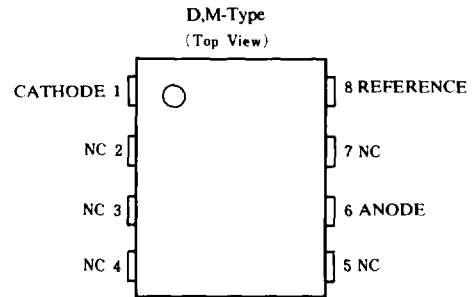
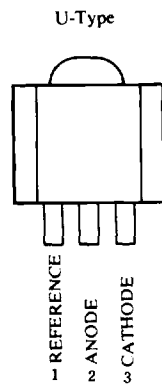
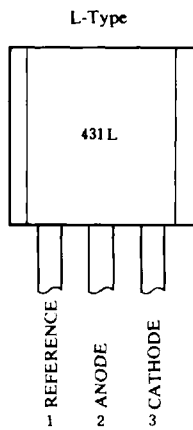
(Fig. 2)



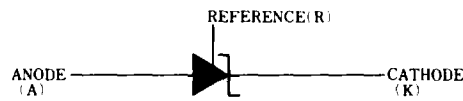
3.  $I_{OFF}$

(Fig. 3)

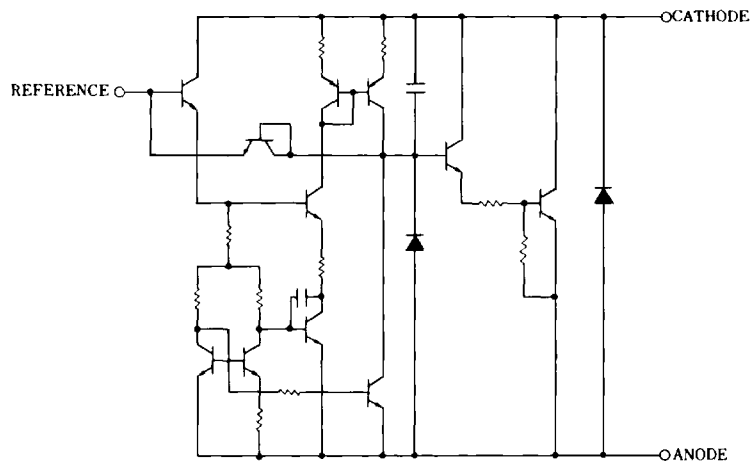
■ Connection Diagram



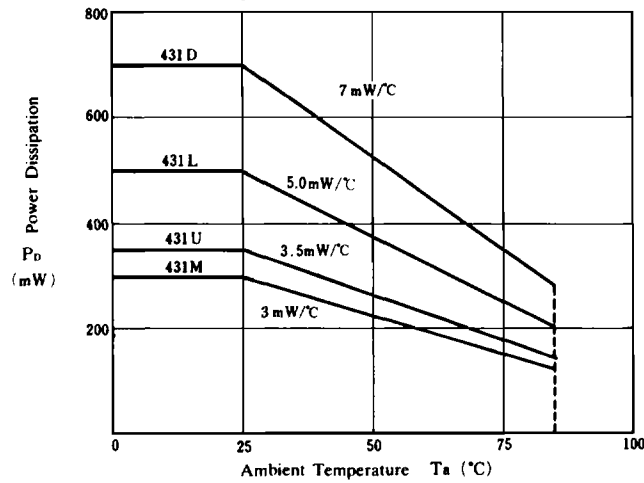
■ Block Diagram



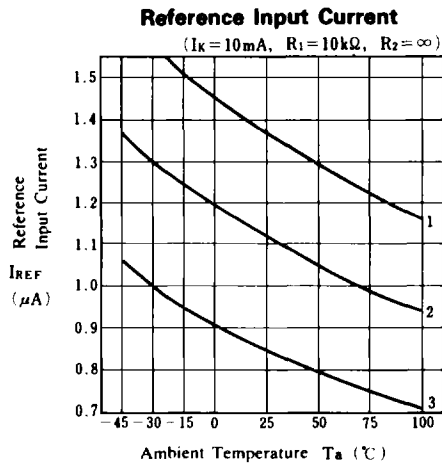
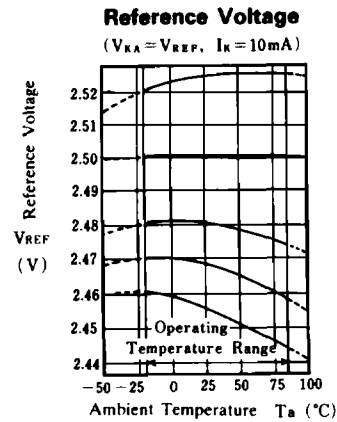
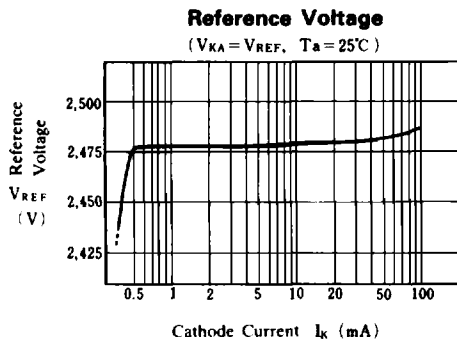
■ Equivalent Circuit



## ■ Power Dissipation vs. Ambient Temperature

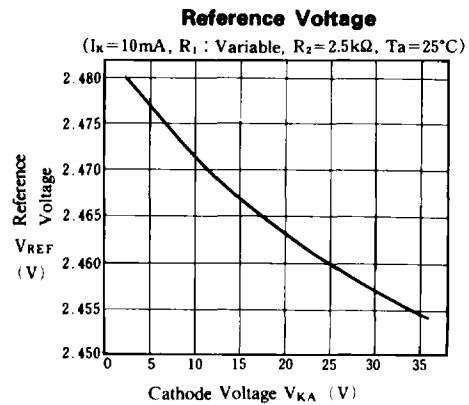


## ■ Typical Characteristics

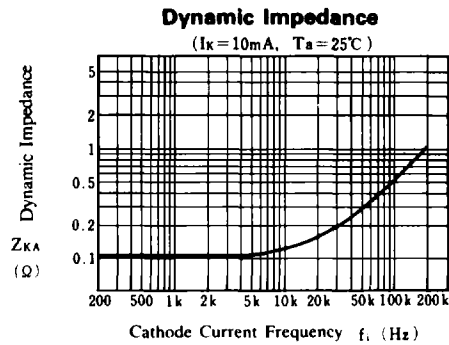
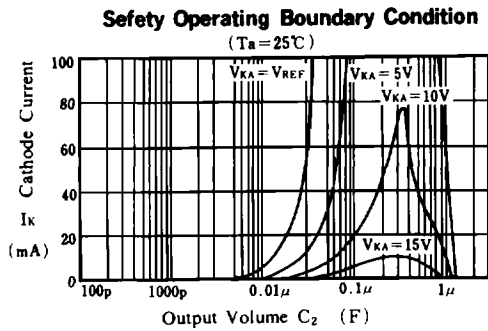


$I_{REF}(dev)$   
 No.1 - 0.38  $\mu A$   
 No.2 - 0.27  $\mu A$   
 No.3 - 0.21  $\mu A$

$V_{REF}(dev)$	( $T_a = -20 \sim 25^{\circ}C$ )	( $T_a = 25 \sim 85^{\circ}C$ )	( $T_a = 25^{\circ}C$ )
No.1	+ 5 mV	+ 1 mV	2525mV
No.2	0 mV	0 mV	2501mV
No.3	0 mV	- 6 mV	2481mV
No.4	- 2 mV	- 9 mV	2468mV
No.5	- 5 mV	-12mV	2456mV



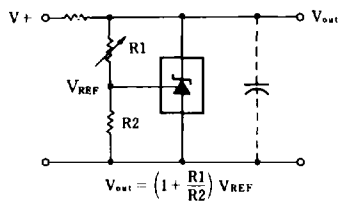
■ Typical Characteristics



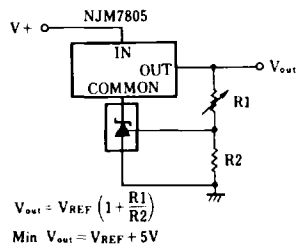
Note) Oscillation might occur while operating within the range of safety curve. So that, it is necessary to make ample margins by taking considerations of fluctuation of the device.

■ Typical Application

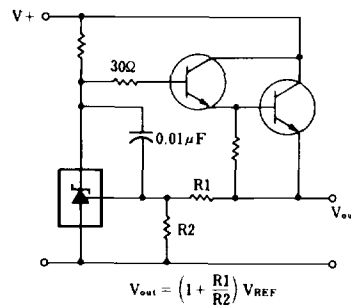
(1) Shunt Regulator



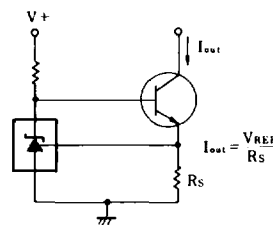
(3) Output Control of a Three-Terminal fixed Regulator



(2) Series Regulator



(4) Current Limiter



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