

NJM431

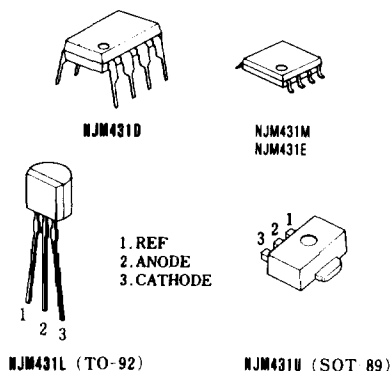
The NJM431 is a three-terminal adjustable shunt regulator. The output voltage may be set to any value between V_{REF} (about 2.5V) and 36V by two resistors. Output circuitry shows a sharp turn-on characteristics. Applications include shunt regulators, series regulators for small power and isolation regulators 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 μA ~ -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 ($T_a = 25^\circ\text{C}$)

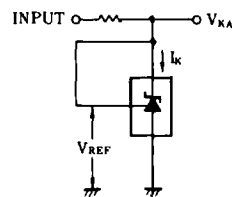
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Reference Voltage	V_{REF}	$V_{KA} = V_{REF}$, $I_K = 10\text{mA}$ (note 1)	2440	2495	2550	mV
Reference Voltage Change (Full Oper. Temp. Range)	V_{REF} (dev)	$V_{KA} = V_{REF}$, $I_K = 10\text{mA}$ (note 1) $T_a = -20^\circ\text{C} \sim +85^\circ\text{C}$	—	8	17	mV
Reference Voltage Change vs. Cathode Voltage Change	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_K = 10\text{mA}$ (note 2), $\Delta V_{KA} = 10\text{V} - V_{REF}$	—	-1.4	-2.7	mV/V
		$\Delta V_{KA} = 36\text{V} - 10\text{V}$	—	-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	μA
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	μA
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	μA
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	Ω

(note 1) TEST CIRCUIT (Fig. 1)

(note 2) TEST CIRCUIT (Fig. 2)

(note 3) TEST CIRCUIT (Fig. 3)

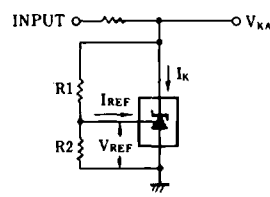
■ Test Circuits



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

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

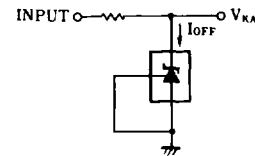
(Fig. 1)



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)

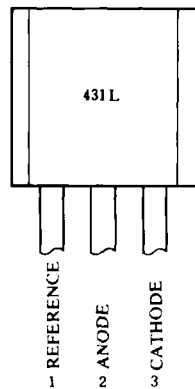


3. I_{OFF}

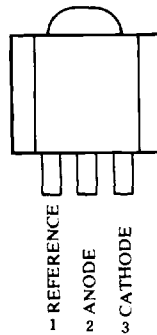
(Fig. 3)

■ Connection Diagram

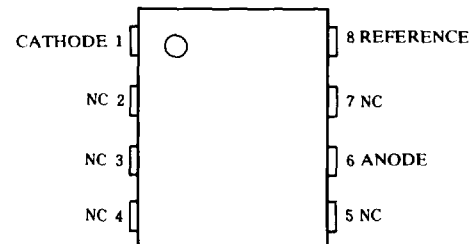
L-Type



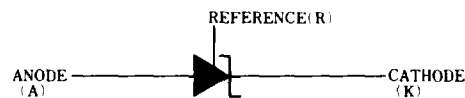
U-Type



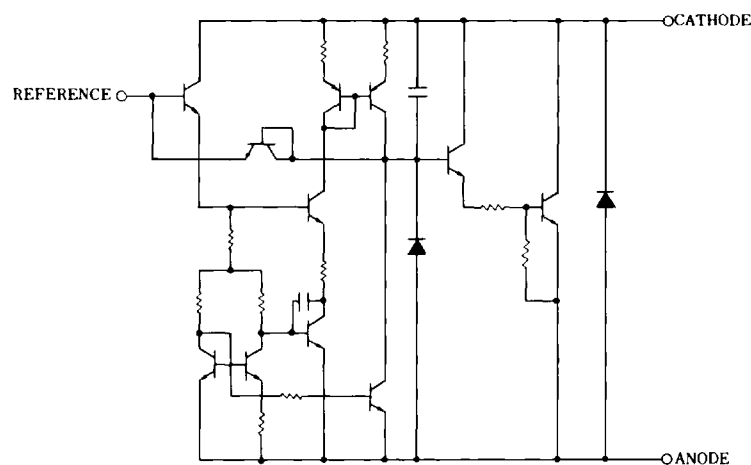
D,M-Type
(Top View)



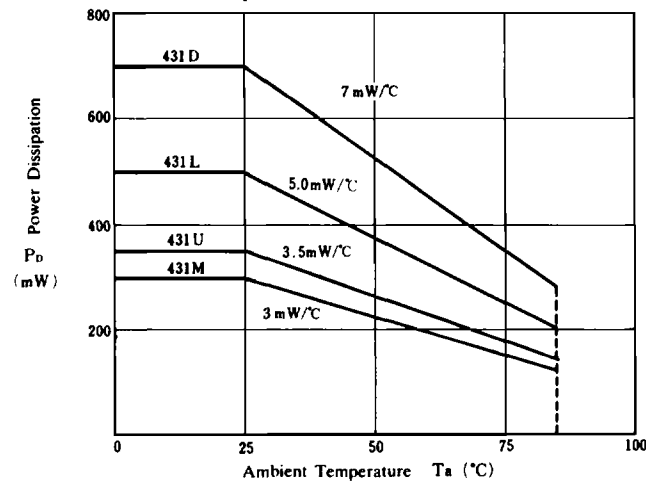
■ Block Diagram



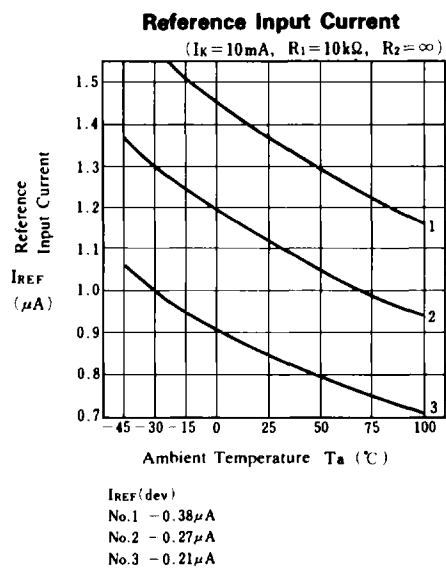
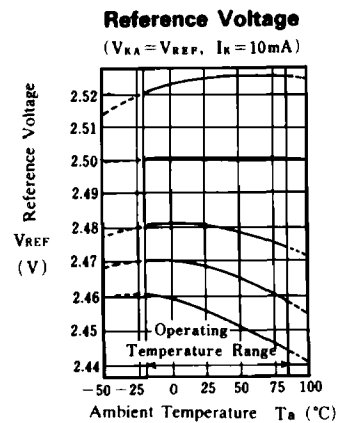
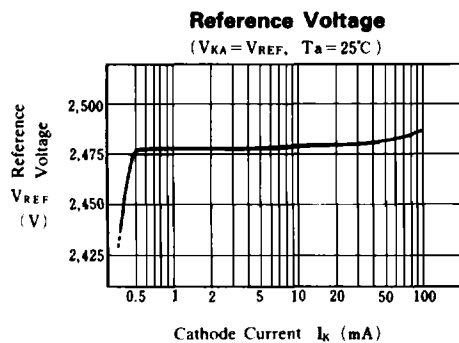
■ Equivalent Circuit



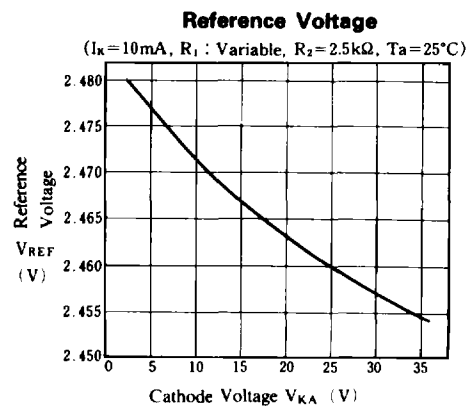
■ Power Dissipation vs. Ambient Temperature



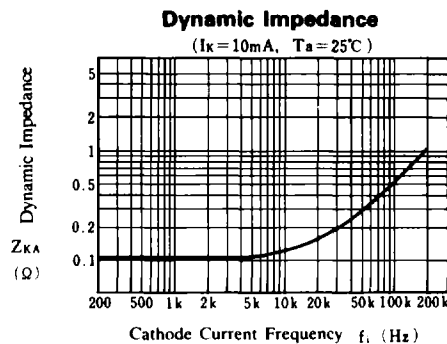
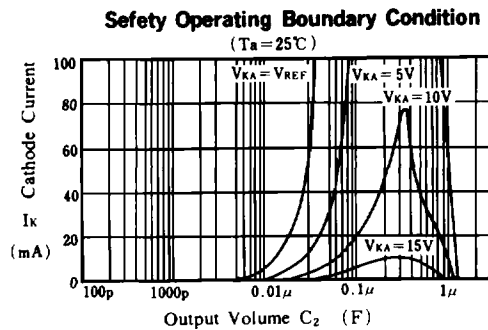
■ Typical Characteristics



$V_{REF}(\text{dev})$	$(T_a = -20 \sim 25^\circ\text{C})$	$(T_a = 25 \sim 85^\circ\text{C})$	$(T_a = 25^\circ\text{C})$
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



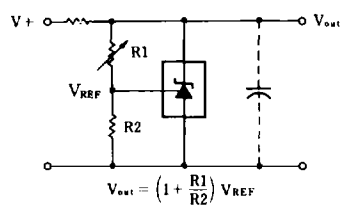
■ Typical Characteristics



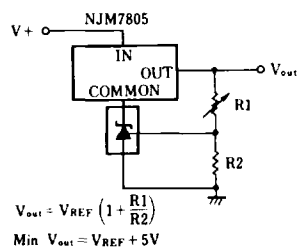
Note) Oscillation might occur while operating within the range of safety curve. So that, it is necessary to make ample margins by taking considerations of fluctuation of the device.

■ Typical Application

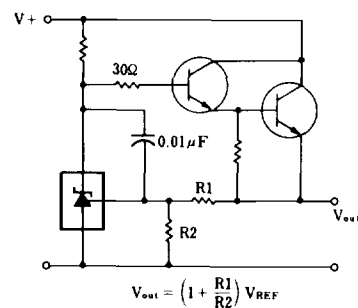
(1) Shunt Regulator



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



(2) Series Regulator



(4) Current Limiter

