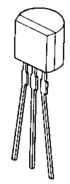
# ADJUSTABLE HIGH PRECISION SHUNT REGULATOR

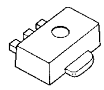
## ■GENERAL DESCRIPTION

The **NJM1431A** is a precision shunt regulator.
Compared to the conventional 431, The **NJM1431A** offers higher voltage accuracy and small package availability to support a wide range of applications.

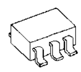
## ■PACKAGE OUTLINE



**NJM1431AL1**



**NJM1431AU**

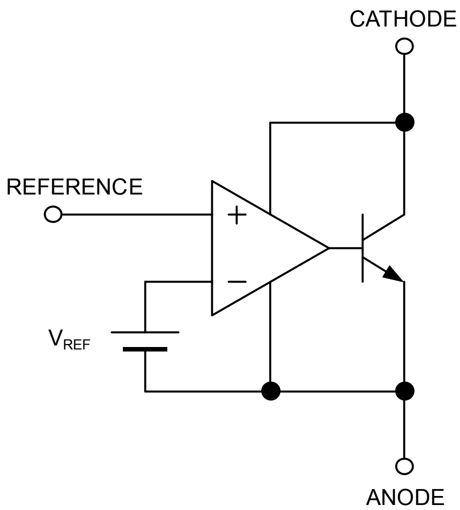


**NJM1431AF**

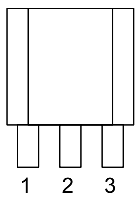
## ■FEATURES

- Operating Voltage $V_{REF}$ to 36V
- Precision Voltage Reference 2.465V±1%
- 2.9mm × 1.5mm to MTP (SOT23) package
- Adjustable Output Voltage For External Resistance two Parts.
- Bipolar Technology
- Package Outline TO-92, SOT-89 (3pin), MTP5

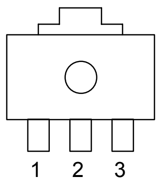
## ■BLOCK DIAGRAM




## ■PIN CONFIGURATION

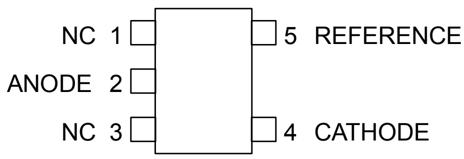



NJM1431AL1




NJM1431AU

1. REFERENCE
2. ANODE
3. CATHODE




NJM1431AF

■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER | SYMBOL | MAXIMUM RATINGS | UNIT |
|---|---|---|---|
| Cathode Voltage | $V_{KA}$ | +37 | V |
| Continuous Cathode Current | $I_K$ | -100 ~ 150 | mA |
| Reference Input Current | $I_{REF}$ | -0.05 ~ 10 | mA |
| Power Dissipation | $P_D$ | (TO-92) 500<br>(SOT-89) 350<br>(MTP5) 200 | mW |
| Operating Temperature Range | $T_{OPR}$ | -40 ~ +85 | °C |
| Storage Temperature Range | $T_{STG}$ | -40 ~ +150 | °C |

■RECOMMENDED OPERATING CONDITIONS (Ta=25°C)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| Cathode Voltage | $V_{KA}$ | $V_{REF}$ | – | 36 | V |
| Cathode Current | $I_K$ | 1 | – | 100 | mA |

■ELECTRICAL CHARACTERISTICS ($I_K$=10mA, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Reference Voltage | $V_{REF}$ | $V_{KA}=V_{REF}$ | (*1) | 2.440 | 2.465 | 2.490 | V |
| Reference Voltage Change vs. Cathode Voltage Change | $\Delta V_{REF}/\Delta V_{KA}$ | $\lvert V_{REF} \rvert \leq V_{KA} \leq 10V$ | (*2) | – | ±1.4 | ±2.7 | mV/V |
| | | $10V \leq V_{KA} \leq 36V$ | (*2) | – | ±1.0 | ±2.0 | mV/V |
| Reference Input Current | $I_{REF}$ | R1=10kΩ, R2=∞ | (*2) | – | 2 | 4 | uA |
| Minimum Input Current | $I_{MIN}$ | $V_{KA}=V_{REF}$, $\Delta V_{REF}$=1% | (*1) | – | 0.4 | 1.0 | mA |
| Cathode Current (Off Cond.) | $I_{OFF}$ | $V_{KA}$=36V, $V_{REF}$=0V | (*3) | – | 0.1 | 1.0 | uA |
| Dynamic Impedance | $\lvert Z_{KA} \rvert$ | $V_{KA}=V_{REF}$, f≤1kHz<br>1mA ≤ $I_K$ ≤ 100mA | (*1) | – | 0.2 | 0.5 | Ω |

■TEMPERATURE CHARACTERISTICS ($I_K$=10mA, Ta= -40°C ~ 85°C)

| PARAMETER | SYMBOL | TEST CONDITION | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Reference Voltage Change | $\Delta V_{REF}$ | $V_{KA}=V_{REF}$ | (*1) | – | 8 | 17 | mV |
| Reference Input Current Change | $\Delta I_{REF}$ | R1=10kΩ, R2=∞ | (*2) | – | 0.4 | 1.2 | uA |

The "Dynamic Impedance", "Reference Voltage Change" and "Reference Input Current Change" is tested to using some samples of the first five lots. These "TEMPERATURE CHARACTERISTICS" are not guaranteed.

$\lvert V_{REF} \rvert$ ···Reference voltage includes error.
(*1): Test Circuit (Fig.1)
(*2): Test Circuit (Fig.2)
(*3): Test Circuit (Fig.3)

■TEST CIRCUIT

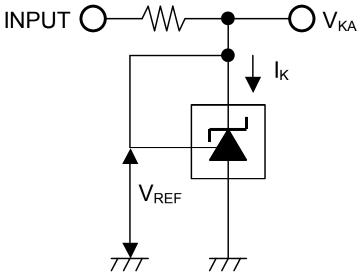



Fig.1 $V_{KA}=V_{REF}$ to test circuit

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

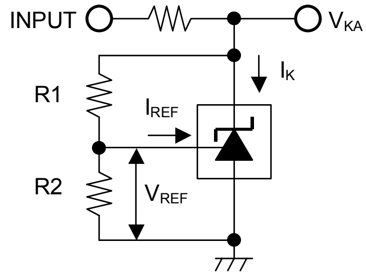



Fig.2 $V_{KA}>V_{REF}$ to test circuit

$$V_O = V_{KA} = V_{REF}\left(1+\frac{R1}{R2}\right)+I_{REF}\times R1$$

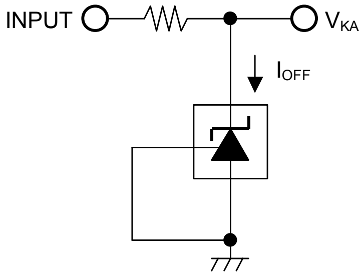
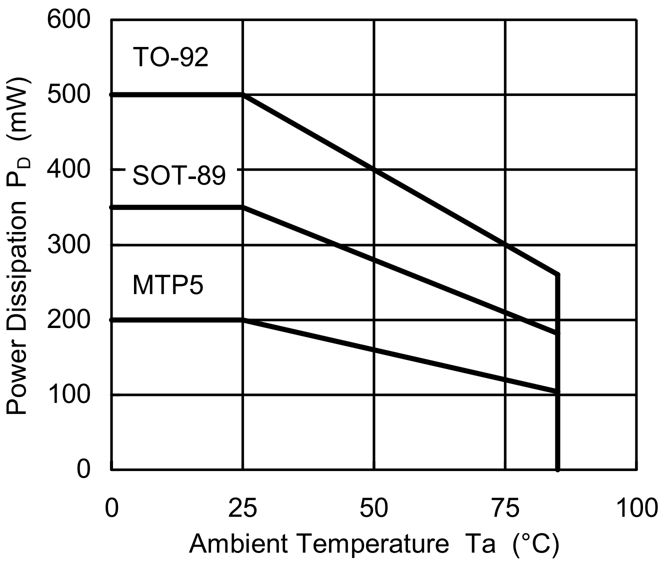



Fig.3 $I_{OFF}$ to test circuit

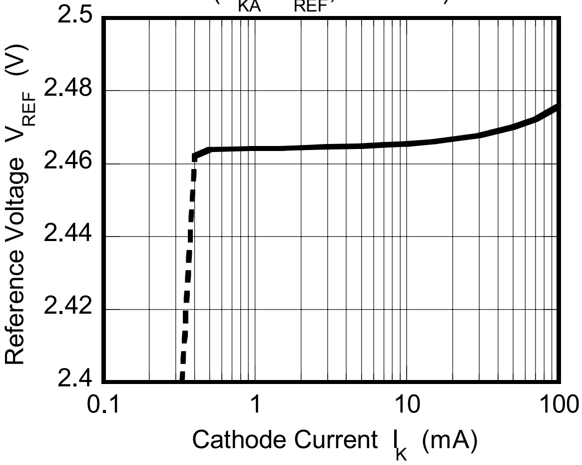
■POWER DISSIPATION VS. AMBIENT TEMPERATURE



■TYPICAL CHARACTERISTICS

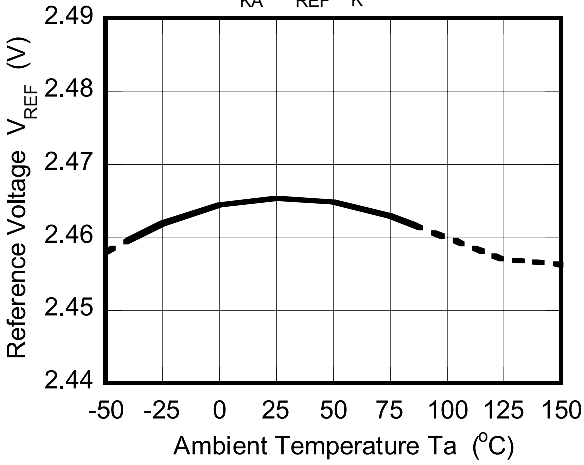
Reference Voltage vs. Cathode Current

($V_{KA}$=$V_{REF}$, Ta=25°C)



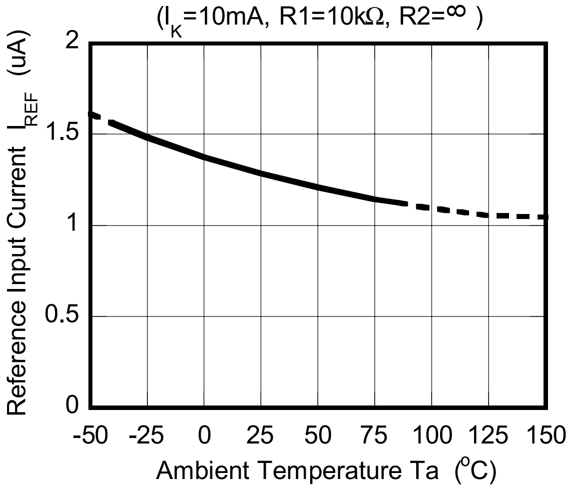

Reference Voltage vs. Temperature

($V_{KA}$=$V_{REF}$, $I_K$=10mA)



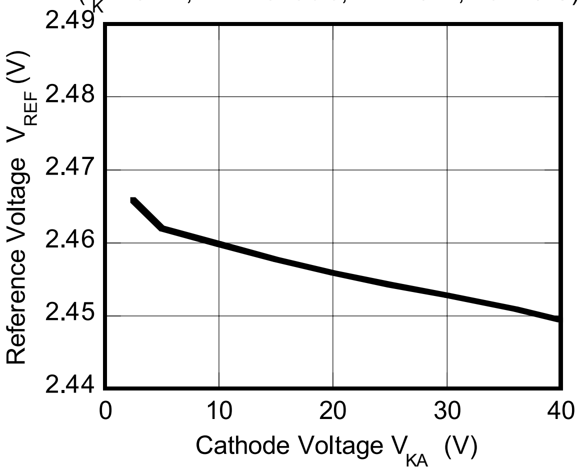

Reference Input Current vs. Temperature

($I_K$=10mA, R1=10kΩ, R2=∞ )



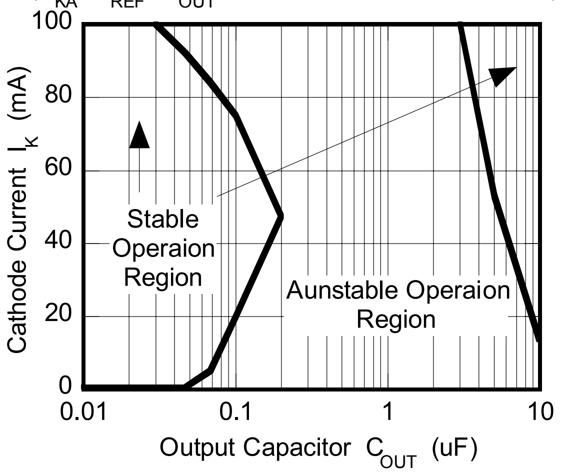

Reference Voltage vs. Cathode Voltage

($I_K$=10mA, R1=Variable, R2=10kΩ, Ta=25°C)




Safety Operating Boundary Condition

($V_{KA}$=$V_{REF}$, $C_{OUT}$=Ceramic Capacitor, Ta=25°C)

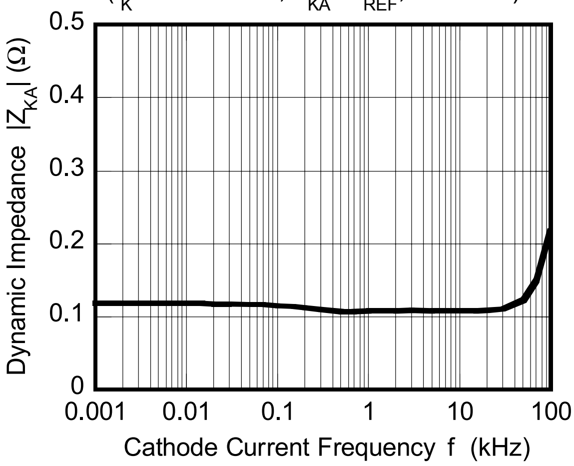



Note) Oscillation might occur while operating within the range of safety curve.

So that, it is necessary to make ample margins by taking considerations of fluctuation of the device.

Dynamic Impedance

($I_K$=1 to 100mA, $V_{KA}$=$V_{REF}$, Ta=25°C)



# MEMO