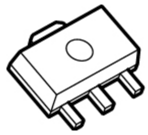
ADJUSTABLE HIGH PRECISION SHUNT REGULATOR

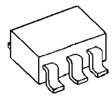
■GENERAL DESCRIPTION

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



NJM1431AU



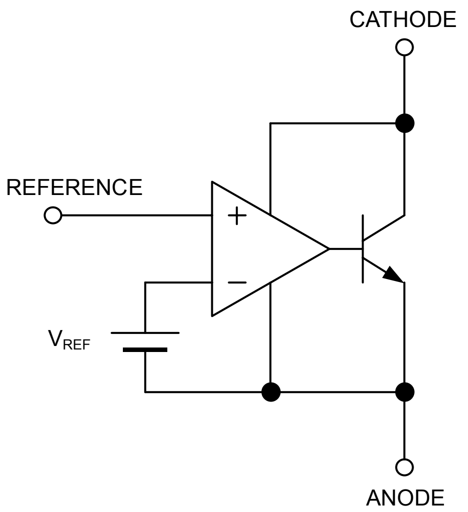
NJM1431AF

NJM1431AKF1

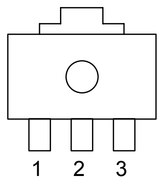
■FEATURES

- Operating Voltage V_{REF} to 36V
- Precision Voltage Reference 2.465V±1%
- 1.6mm × 1.2mm to ESON4 package
- Adjustable Output Voltage
- Bipolar Technology
- Package Outline
  - NJM1431AU : SOT89 (3pin)
  - NJM1431AF : SOT-23-5 (MTP5)
  - NJM1431AKF1 : ESON4-F1

■BLOCK DIAGRAM

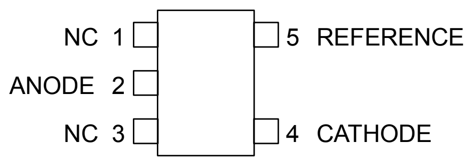


■PIN CONFIGURATION

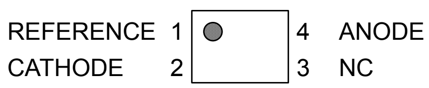


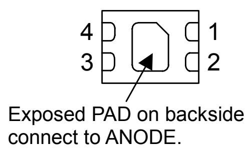
1. REFERENCE
2. ANODE
3. CATHODE

NJM1431AU



NJM1431AF





(Top View) (Bottom View)

NJM1431AKF1

■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	SOT89 (3pin) 350 SOT-23-5 200 ESON4-F1 412 (*1) 1,150 (*2)	mW
Operating Temperature Range	T_{OPR}	-40 ~ +85	°C
Storage Temperature Range	T_{STG}	-40 ~ +150	°C

(*1): Mounted on glass epoxy board based on EIA/JEDEC. (101.5 × 114.57 × 1.6mm: 2Layers)
(*2): Mounted on glass epoxy board based on EIA/JEDEC.
(101.5 × 114.57 × 1.6mm: 4Layers Internal foil area: 99.5 × 99.5mm)

■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}	$V_{KA}=V_{REF}$	(*3)	2.440	2.465	2.490	V
Reference Voltage Change vs. Cathode Voltage Change	$\Delta V_{REF}/\Delta V_{KA}$	$\lvert V_{REF} \rvert \leq V_{KA} \leq 10V$	(*4)	–	±1.4	±2.7	mV/V
		$10V \leq V_{KA} \leq 36V$	(*4)	–	±1.0	±2.0	mV/V
Reference Input Current	I_{REF}	R1=10kΩ, R2=∞	(*4)	–	2	4	uA
Minimum Input Current	I_{MIN}	$V_{KA}=V_{REF}$, ΔV_{REF}=1%	(*3)	–	0.4	1.0	mA
Cathode Current (Off Cond.)	I_{OFF}	V_{KA}=36V, V_{REF}=0V	(*5)	–	0.1	1.0	uA
Dynamic Impedance	$\lvert Z_{KA} \rvert$	$V_{KA}=V_{REF}$, f≤1kHz 1mA ≤ I_K ≤ 100mA	(*3)	–	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	ΔV_{REF}	$V_{KA}=V_{REF}$	(*3)	–	8	17	mV
Reference Input Current Change	ΔI_{REF}	R1=10kΩ, R2=∞	(*4)	–	0.4	1.2	uA

The maximum value of “Dynamic Impedance“, “Reference Voltage Change” and “Reference Input Current Change” are determined based on sampling evaluation from the 5 initial production lots, and thus not tested in the production test.
Therefore, these values are for the reference design purpose only.

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

■TEST CIRCUIT

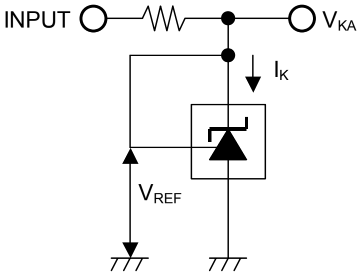


Fig.1 $V_{KA}=V_{REF}$ to test circuit

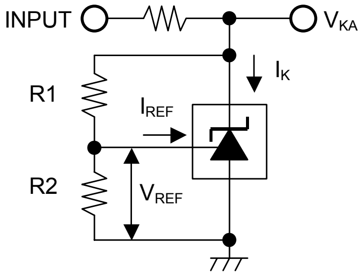


Fig.2 $V_{KA}>V_{REF}$ to test circuit

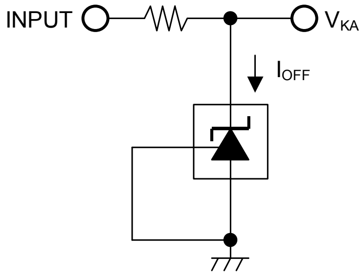
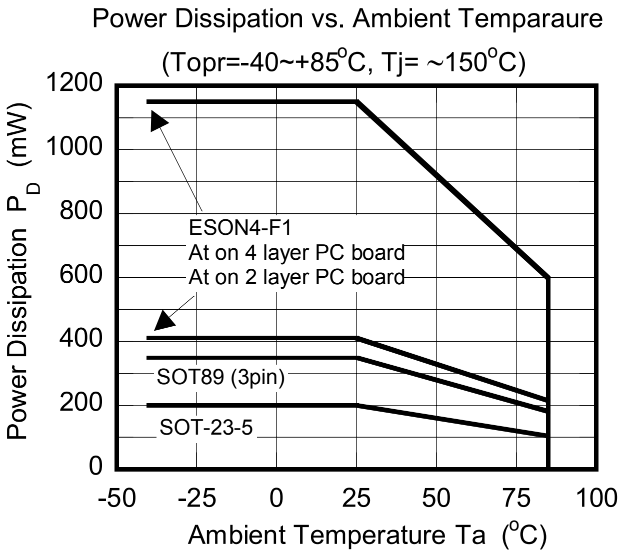


Fig.3 I_{OFF} to test circuit

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

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

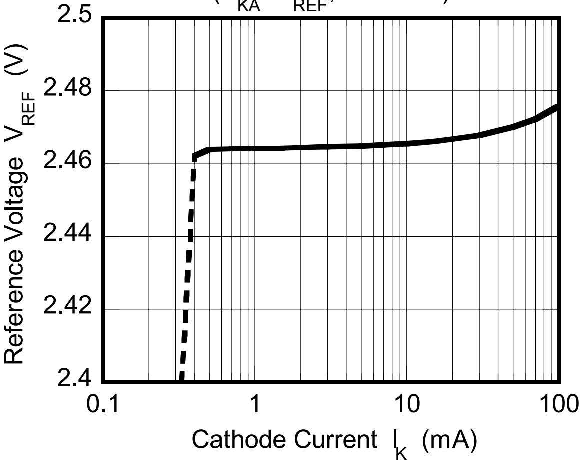
■POWER DISSIPATION VS. AMBIENT TEMPERATURE



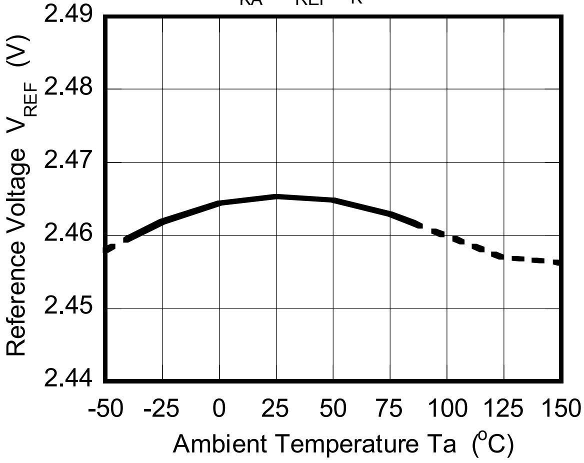
■TYPICAL CHARACTERISTICS

Reference Voltage vs. Cathode Current

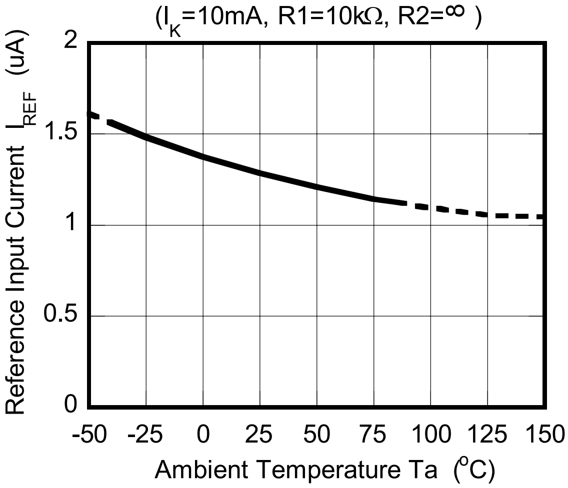
(V_{KA}=V_{REF}, Ta=25°C)



Reference Voltage vs. Temperature
(V_{KA}=V_{REF}, I_K=10mA)

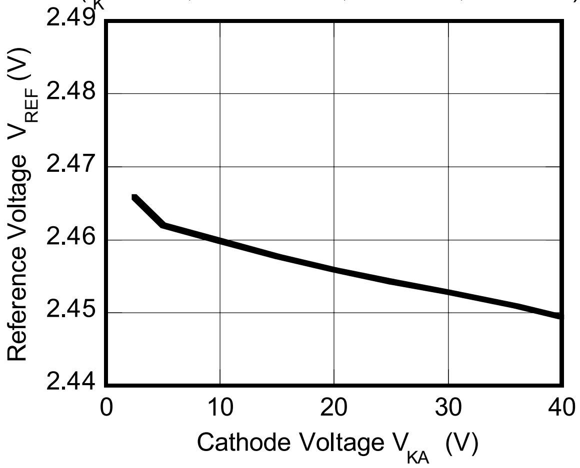


Reference Input Current vs. Temperature
(I_K=10mA, R1=10kΩ, R2=∞)



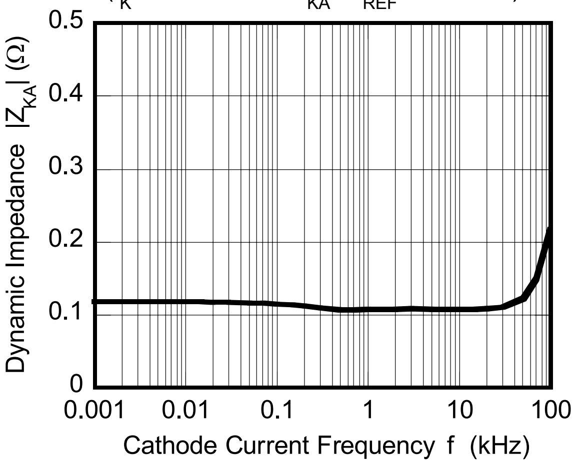
Reference Voltage vs. Cathode Voltage

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

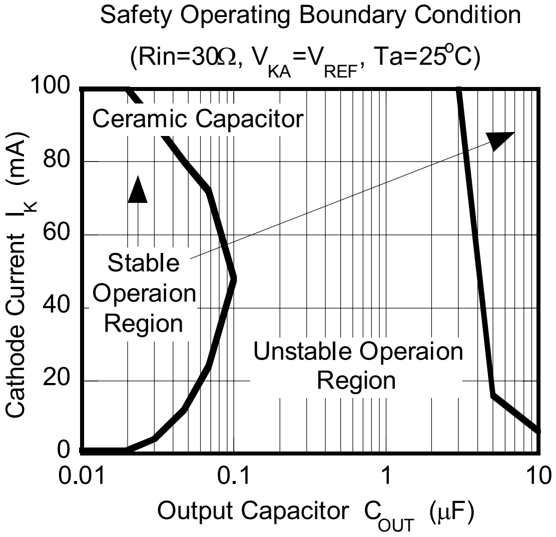


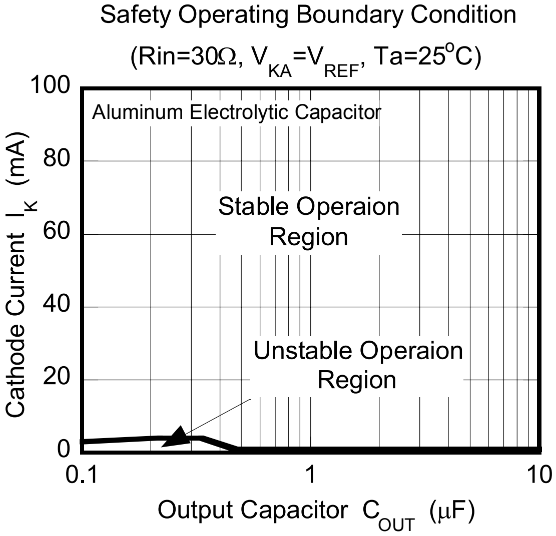
Dynamic Impedance

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

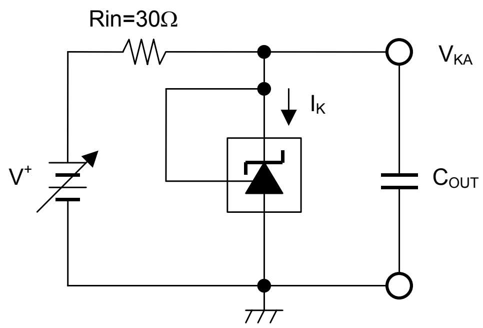


■TYPICAL CHARACTERISTICS





Safety Operating Boundary Condition
Test Circuit



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.

MEMO