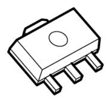
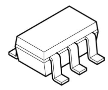
ADJUSTABLE PRECISION SHUNT REGULATOR

■ GENERAL DESCRIPTION

The NJM431S/NJM432S are adjustable precision shunt regulators. The output voltage may be set to any value between V_{REF} (about 2.5V) and 36V by two resistors.
Compared to the conventional 431, the NJM431S/NJM432S are improved the voltage accuracy. And they have smaller package option to support a wide range of applications.
The NJM432S is the pin assignment option.

■ PACKAGE OUTLINE

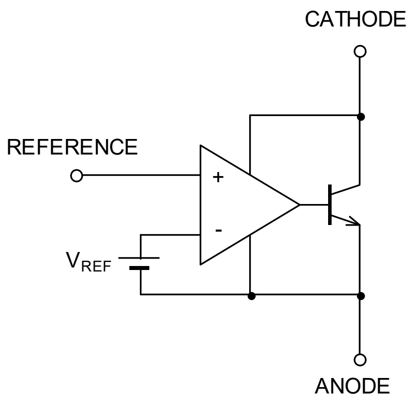

NJM431SU
NJM432SU
(SOT-89-3)

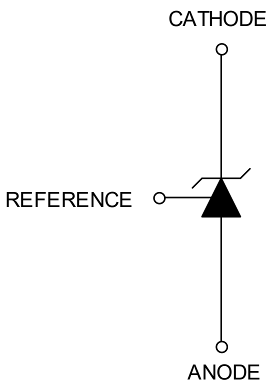

NJM431SF
NJM432SF
(SOT-23-5)

■ FEATURES

- Operating Voltage: V_{REF} to 36V
- Precision Voltage Reference: 2.495±1.8%
- Adjustable Output Voltage
- Bipolar Technology
- Package Outline: NJM431SU / NJM432SU SOT-89-3
  NJM431SF / NJM432SF SOT-23-5

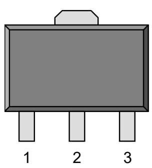
■ BLOCK DIAGRAM / SYMBOL





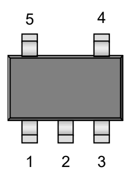
■ PIN CONFIGURATION

NJM431SU



1.REFERENCE
2.ANODE
3.CATHODE

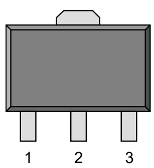
NJM431SF



1.N.C.
2.ANODE*
3.CATHODE
4.REFERENCE
5.ANODE

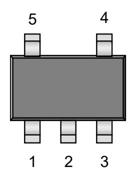
* Pin 2 is attached to Substrate and must be connected to ANODE or left open.

NJM432SU



1.CATHODE
2.ANODE
3.REFERENCE

NJM432SF



1.N.C.
2.ANODE
3.N.C.
4.CATHODE
5.REFERENCE

■ ABSOLUTE MAXIMUM RATINGS

(T_a=25ºC)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Cathode Voltage	V_{KA}	37 (*1)	V
Continuous Cathode Current	I_K	-100 to 150	mA
Reference Input Current	I_{REF}	-0.05 to 10	mA
Power Dissipation	P_D	SOT-89-3 : 625(*2) : 1300(*3)	mW
		SOT-23-5 : 480(*4) : 650(*5)	
Operating Temperature Range	T_{opr}	-40 to +125	°C
Storage Temperature Range	T_{stg}	-50 to +150	°C

(*1) Unless specified, all voltage value are with respect to the anode pin.

(*2) Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm: EIA/JEDEC standard size, 2Layers, Cu area 100mm^2)

(*3) Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm: EIA/JEDEC standard, 4Layers)
(For 4Layers: Applying 74.2×74.2mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)

(*4) Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm: EIA/JEDEC standard size, 2Layers)

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

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Cathode Voltage	V_{KA}	V_{REF}	-	36	V
Cathode Current	I_K	0.7	-	100	mA

■ ELECTRICAL CHARACTERISTICS

(I_K=10mA, T_a=25ºC)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Reference Voltage	V_{REF}	V_{KA}=V_{REF} (*6)	2450	2495	2540	mV
Reference Input Voltage Change Over Temperature Range	ΔV_{REF} (dev)	V_{KA}=V_{REF} (*6) T_a=-40˚C to +85˚C	-	8	17	mV
Reference Voltage Change vs. Cathode Voltage Change	ΔV_{REF}/ ΔV_{KA}	(*7) ΔV_{KA}=10V-V_{REF} ΔV_{KA}=36V-10V	-	-1.4 -1	-2.7 -2	mV/V
Reference Input Current	I_{REF}	R1=10kΩ, R2=∞(*7)	-	2	4	μA
Reference Input Current Change Over Temperature Range	ΔI_{REF} (dev)	R1=10kΩ, R2=∞(*7) T_a=-40˚C to +85˚C	-	0.4	1.2	μA
Minimum Cathode Current	I_{MIN}	V_{KA}=V_{REF}(*6)	-	0.4	0.7	mA
OFF State Cathode Current	I_{OFF}	V_{KA}=36V, V_{REF}=0V(*8)	-	0.1	1.0	μA
Dynamic Impedance	$\|Z_{KA}\|$	V_{KA}=V_{REF}, I_K=1mA to 100mA, f≤1kHz(*6)	-	0.2	0.5	Ω

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

(*6) Test Circuit Fig.1
(*7) Test Circuit Fig.2
(*8) Test Circuit Fig.3

■ TEST CIRCUIT

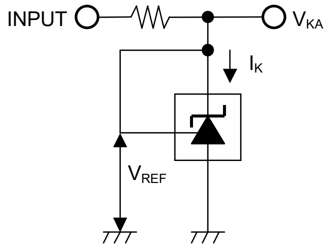


Fig.1 Test Circuit for V_{KA}=V_{REF}

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

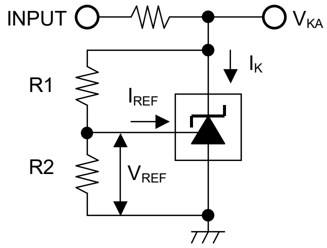


Fig. 2 Test Circuit for V_{KA} >V_{REF}

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

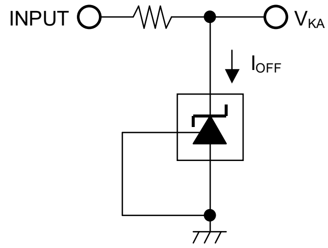
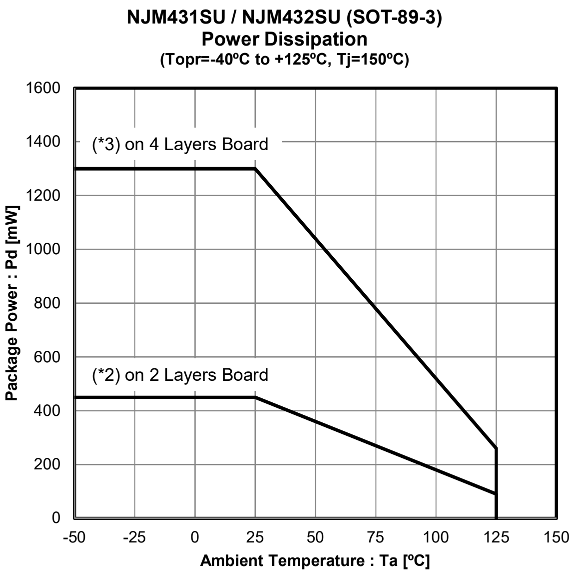
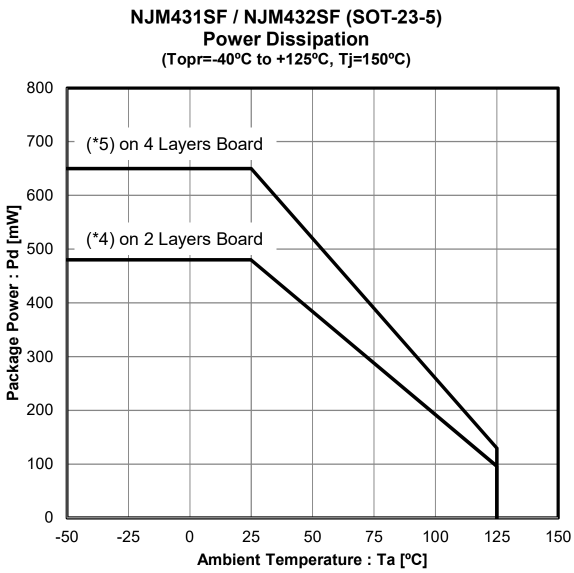


Fig.3 Test Circuit for I_{OFF}

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE





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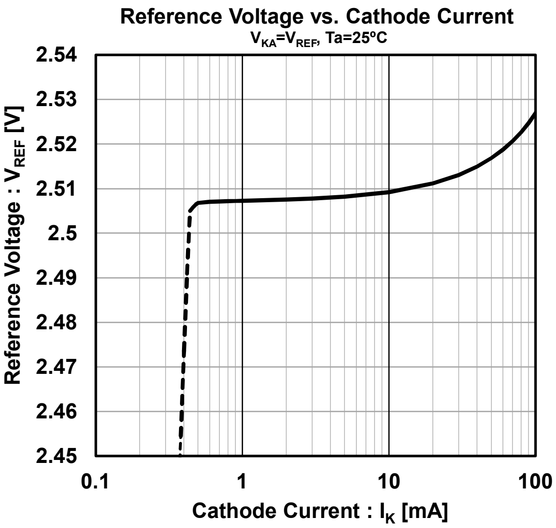
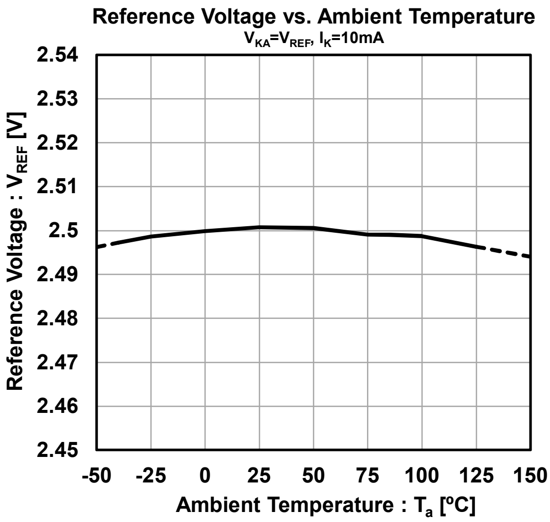
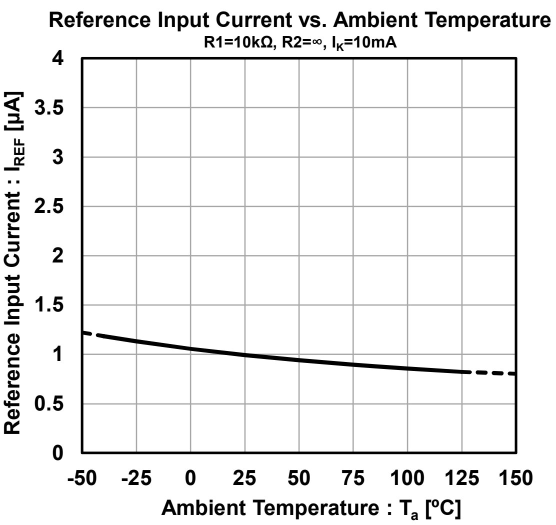
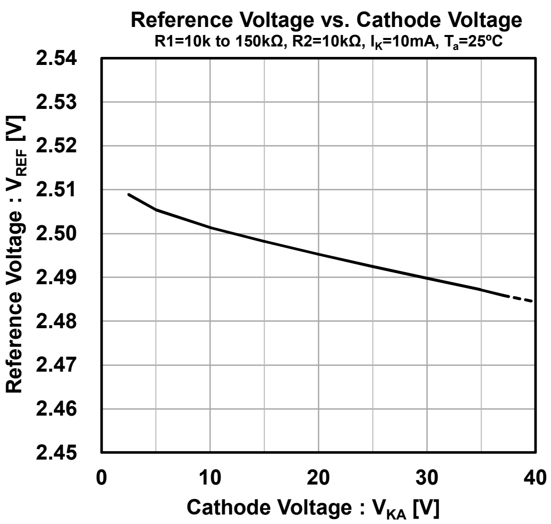
(*5) Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm: EIA/JEDEC standard size, 4Layers),
internal Cu area: 74.2 × 74.2mm

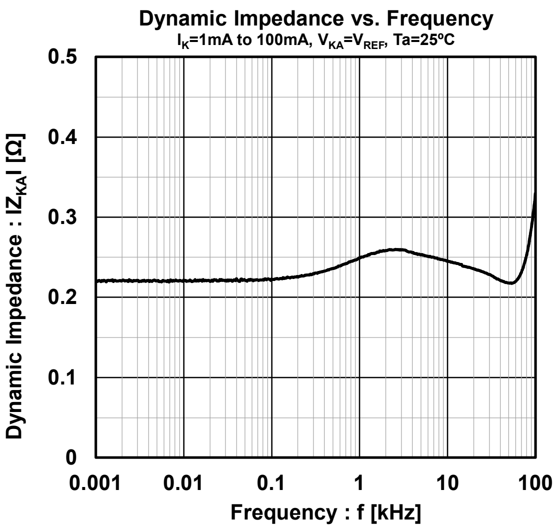
■ TYPICAL CHARACTERISTICS



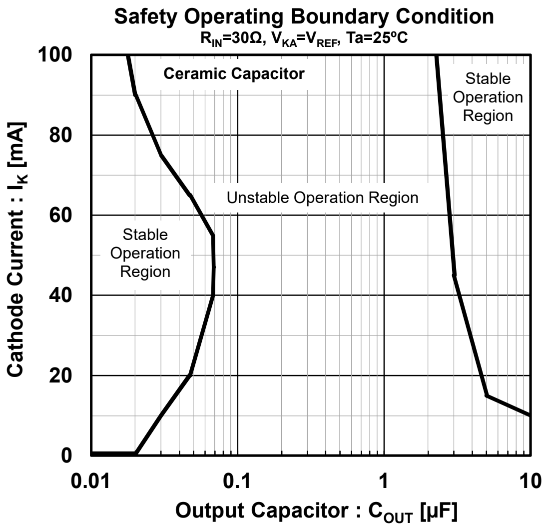


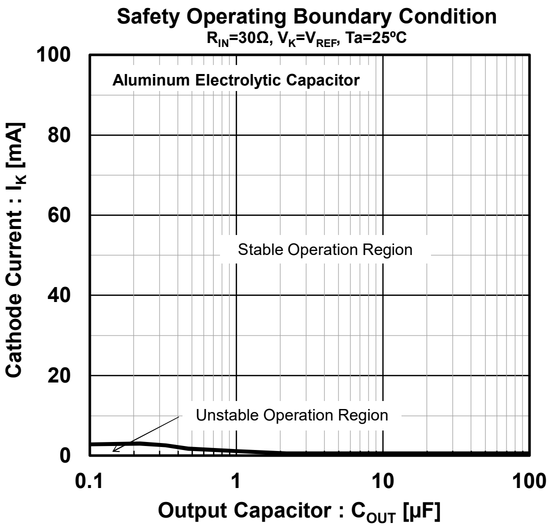




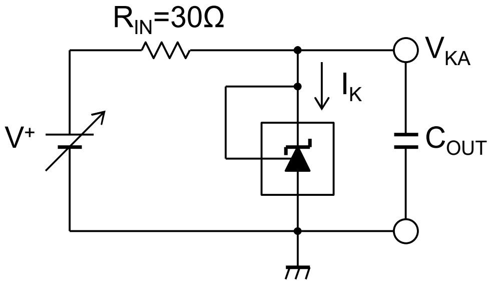


■ TYPICAL CHARACTERISTICS





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.

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