

NH431AK,BK

Three-terminal precision voltage regulator



VOLTAGE: 36 Volts

CURRENT: 150 mA

SOT-23

Marking and Polarity

FEATURES

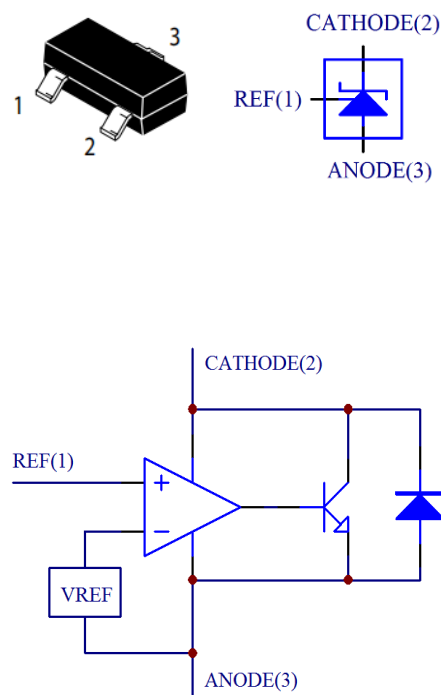
- Programmable output Voltage to 36V.
- Sink current capability of 1 to 100mA.
- ESD:HBM 4000V

DESCRIPTION

The NH431 series is a Three-terminal precision voltage regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{ref} (app. 2.5V) and 36V with two external resistors. It provides very wide applications, including shunt regulator, series regulator, switching regulator, voltage reference and others.

DEVICE MARKING

Device	RanK	Marking
NH431AK	$\pm 0.5\%$	RAS
NH432BK	$\pm 1\%$	RBS



Absolute Maximum Ratings (Ratings at 25°C ambient temperature unless otherwise specified.)

Parameter	Symbol	Value	Unit
Cathode Voltage	V_{KA}	36	V
Cathode Current(Continuous)	I_{KA}	-100~+150	mAdc
Reference Input Current Range	I_{REF}	-0.05~+10	mAdc

Recommended Operating Conductions

Parameter	Symbol	NH431AK,BK			Unit
		Min.	Typ.	Max.	
Cathode Voltage	V_{KA}	2.5	-	36	V
Cathode Current	I_{KA}	0.5	-	100	mAdc

Thermal Characteristics

Parameter	Symbol	NH431AK,BK	Unit
Thermal Resistance,Junction to Ambient	$R_{\theta JA}$	206	°C/W
Operating Ambient Temperature	T_{OPR}	-40 to +125	°C
Junction Temperature	T_J	150	
Storage Temperature	T_{Stg}	-65 to +150	

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ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

Characteristic	Test Condition	Symbol	Min.	Typ.	Max.	Unit
Reference Input Voltage	Vka=Vref, IKA=10mA	V_{REF}	2.488	2.5	2.512	Vdc
			2.475	2.5	2.525	
Deviation of reference Input Voltage Over Temperature	Vka=Vref, IKA=10mA, . $\leq T_a \leq T_{max}$.	ΔV_{REF}	-	4.5	25	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	IKA=10mA, $\Delta V_{KA}=10V-V_{REF}$	$\Delta V_{REF} / \Delta V_{KA}$	-	-1	-2.7	mV/V
	IKA=10mA, $\Delta V_{KA}=36V-10V$		-	-0.5	-2.0	
Reference Input Current	IKA=10mA, R1=10K Ω , R2= ∞	I_{REF}	-	1	2	μA_{dc}
Deviation of reference Input Current Over Full Temperature Range	IKA=10mA, R1=10K Ω , R2= ∞	$\Delta I_{REF} / \Delta T$	-	0.2	0.4	
Min. Cathode Current for regulation	VKA=Vref	$I_{KA} (min.)$	-	0.3	0.5	mA
Off-state Cathode Current	VKA=36V, Vref=0V	$I_{KA} (OFF)$		0.05	0.5	μA
Dynamic Impedance	VKA=Vref, IKA=1~100mA, f $\leq$ 1KHz	Z_{KA}		0.15	0.5	Ω

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RATING AND CHARACTERISTIC CURVES

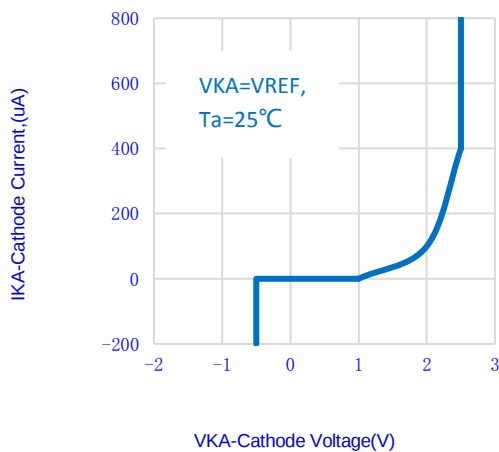


Fig.1-Cathode Current Vs Cathode Voltage

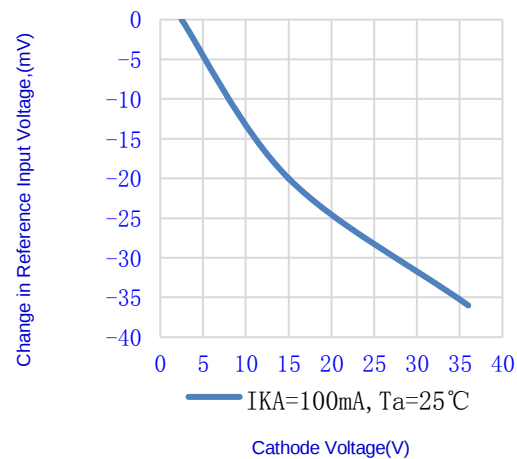


Fig.2-CHANGE IN REFERENCE INPUT VOLTAGE VS CATHODE VOLTAGE

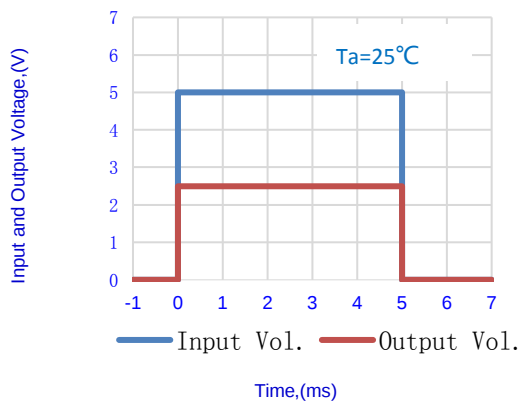


Fig.3- PULSE RESPONSE

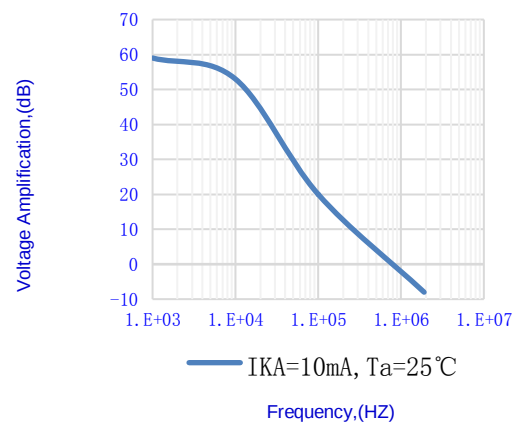


Fig.4- SMALL SIGNAL VOLTAGE AMPLIFICATION VS FREQUENCY

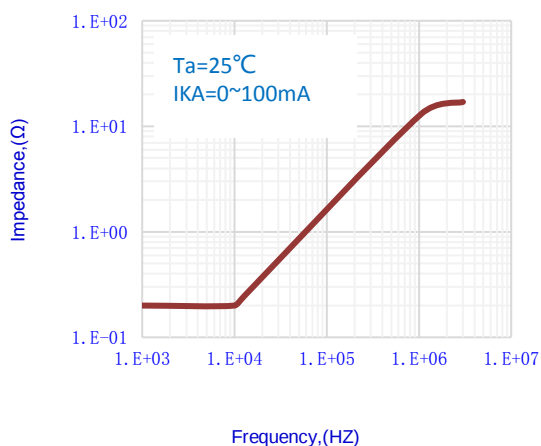


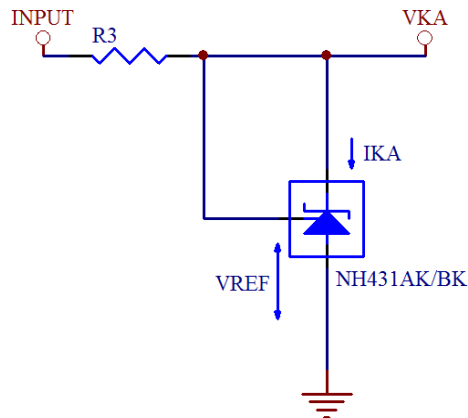
Fig.5--DYNAMIC IMPEDANCE VS FREQUENCY

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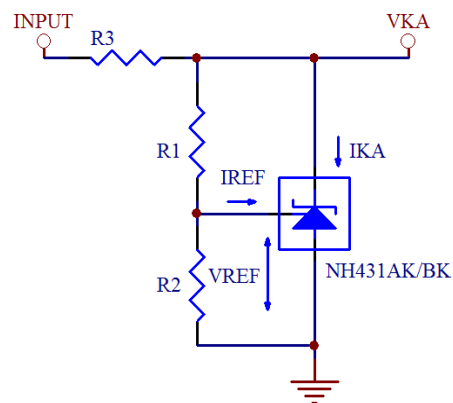


TEST CIRCUIT



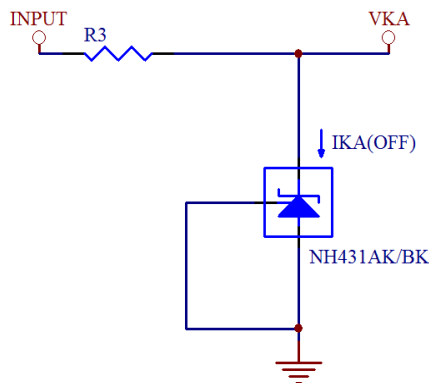
FOR $V_{KA}=V_{REF}$

Fig.7-TEST CIRCUIT



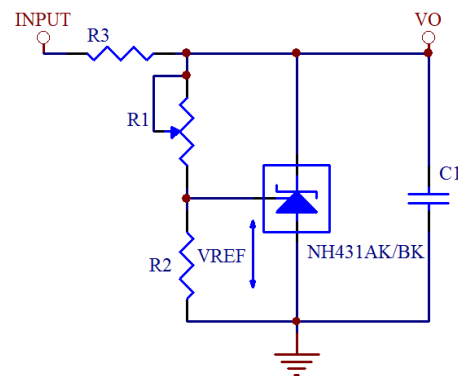
FOR $V_{KA} \geq V_{REF}$, $V_{KA}=V_{REF}(1+R_1/R_2)+I_{REF} \cdot R_1$

Fig.8-TEST CIRCUIT



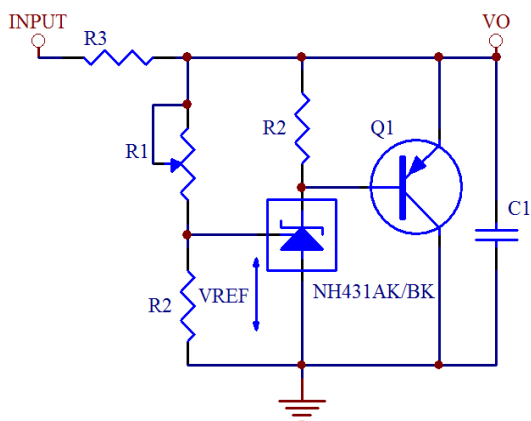
FOR $I_{KA}(\text{OFF})$

Fig.9-TEST CIRCUIT



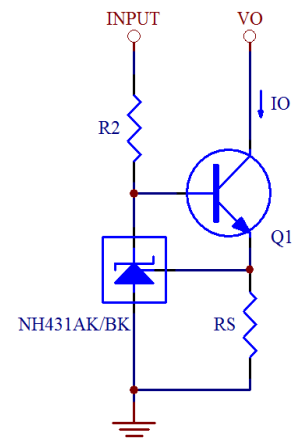
$V_O=V_{REF}(1+R_1/R_2)$

Fig.10- APPLICATION CIRCUIT, SHORTDOWN REGULATOR



$V_O=V_{REF}(1+R_1/R_2)$

Fig.11- APPLICATION CIRCUIT, HIGH-CURRENT
SHORTDOWN REGULATOR



$I_O=V_{REF}/R_5$

Fig.12- APPLICATION CIRCUIT, CONSTANT-CURRENT SINK

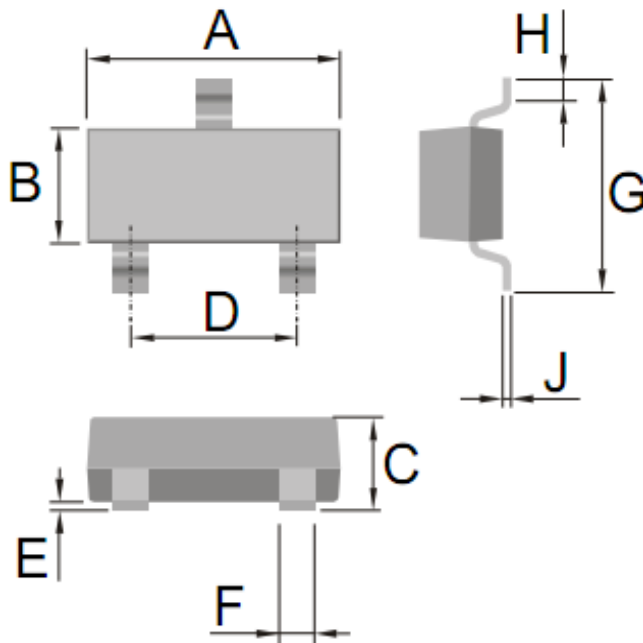
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OUTLINE DRAWINGS

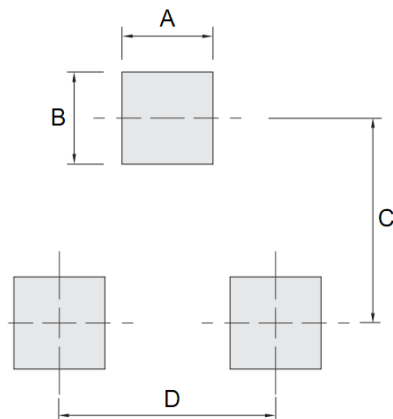
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OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.800	-	3.020	0.1102	-	0.1189
B	1.200	-	1.400	0.0472	-	0.0551
C	0.890	-	1.110	0.0350	-	0.0437
D	1.780	-	2.040	0.0701	-	0.0803
E	0.000	-	0.100	0.0000	-	0.0039
F	0.300	-	0.500	0.0118	-	0.0197
G	2.100	-	2.640	0.0827	-	0.1039
H	0.300	-	0.600	0.0118	-	0.0236
J	0.100	-	0.200	0.0039	-	0.0079

RECOMMENDED LAYOUT DRAWINGS

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RECOMMENDED MOUNTING PAD DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	0.600	-	-	0.0236	-
B	-	0.800	-	-	0.0315	-
C	-	2.000	-	-	0.0787	-
D	-	1.900	-	-	0.0748	-

PACKING INFORMATION

SOT-23

Package Method	Reel Size (mm)	Quantity (pcs/reel)	Inner Box Size L×W×H(mm)	Quantity (pcs/Inner Box)	Carton Size L×W×H(mm)	Quantity (pcs/carton)
Tape Reel	Φ180	3000	201×190×70	15000	455×455×240	180000

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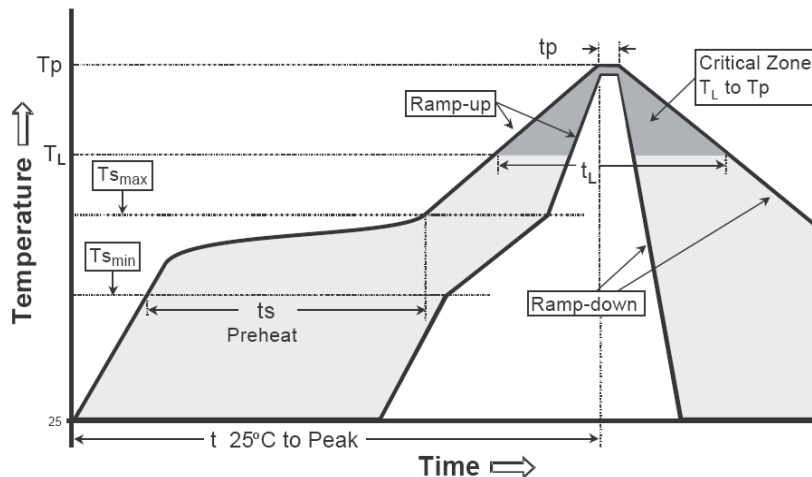
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Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to TP)	3°C/second max.	3°C/second max.
Preheat -Temperature Min(TS min) -Temperature Max(TS max) -Time(ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (TL) - Time (tL)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(TP)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

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