

**KK432**

# Low Voltage Adjustable Precision Shunt Regulator

**Features:**

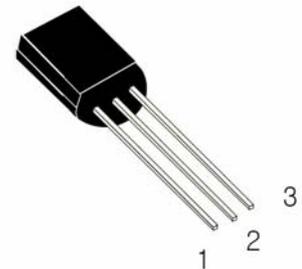
- Precise Reference Voltage to 1.24V
- Guaranteed 1% Reference Voltage Tolerance
- Sink Current Capability, 80μA to 100mA
- Quick Turn-on
- Adjustable Output Voltage,  $V_o = V_{REF}$  to 15V
- 0.2 Ω Typical Output Impedance

**Applications**

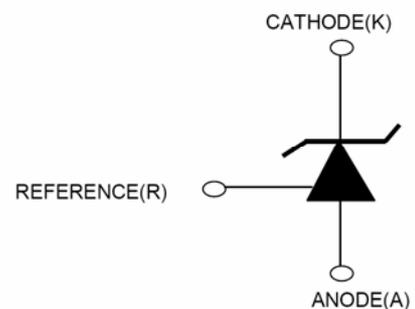
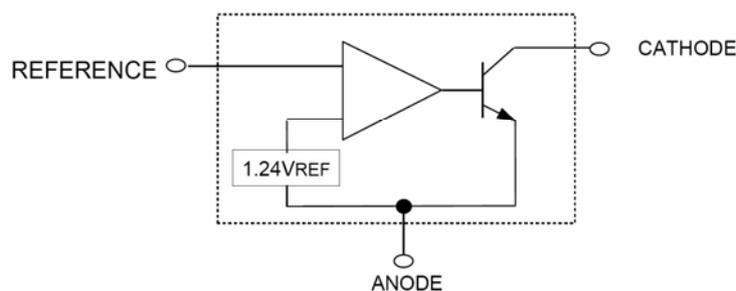
- Linear Regulator
- Adjustable Supplies
- Switching Power Supplies
- Battery Charger
- Instrumentation
- Computer Disk Drives

**TO-92**

- 1. Reference
- 2. Anode
- 3. Cathode



**Block Diagram**



### Absolute Maximum Ratings

Symbol	Parameter	Symbol	Rating	Unit
$V_{KA}$	Cathode voltage	$V_{KA}$	18	V
$I_K$	Continuous cathode current range	$I_K$	100	mA
$I_{REF}$	Reference current range	$I_{REF}$	3	mA
$T_j$	Operating Junction Temperature Range	$T_j$	- 40 to 150	°C

Pad #	Description
1	REF
2	ANODE
3	CATHODE

### Electrical Characteristics $T_A = 25^\circ\text{C}$ ( unless otherwise noted)

Symbol	Parameter	Test Conditions	KK432			Unit
			Min	Typ	Max	
$V_{RFF}$	Reference voltage	$V_{KA}=V_{REF}, I_K=10\text{mA}$ (Fig. 1) $T_A=25^\circ\text{C}$	1.228	1.240	1.252	V
$V_{DEV}$	$V_{REF}$ Temp Deviation	$T_A$ =full range(see Note1) $V_{KA}=V_{REF}, I_K=10\text{mA}$ (Fig. 1)		10	25	mV
$\Delta V_{REF}/\Delta V_{KA}$	Ratio of Change in $V_{REF}$ to Change in Cathode Voltage	$I_K=10\text{mA}, V_{KA}=15\text{V}$ to $V_{REF}$ (Fig. 2)		-1	-2.7	mV / V
$I_{REF}$	Reference Input Current	$I_K=10\text{mA}, R_1 = 10\text{k}\Omega, R_2=\infty$ (Fig.2)		0.5	1.0	$\mu\text{A}$
$I_{REF(DEV)}$	$I_{REF}$ Temp Deviation	$T_K$ =full range (see Note 1), $R_1 = 10\text{k}\Omega, R_2=\infty, I_K=10\text{mA}$ (Fig. 2)		0.05	0.3	$\mu\text{A}$
$I_{k(off)}$	Off-state cathode current	$V_{REF}=0\text{V}$ , (Fig.3) $V_K=15\text{V}$		0.04	0.5	$\mu\text{A}$
$Z_{ka}$	Dynamic Output Impedance	$V_{ka}=V_{ref}, I_k=1\text{mA}$ to $100\text{mA}$ $F \leq 1\text{kHz}$ (Fig. 1)		0.2	0.4	$\Omega$
$I_{K(MIN)}$	Minimum Operating Current	$V_{KA}=V_{REF}$ (Fig. 1)		60	80	$\mu\text{A}$

Notes: 1. Full temperature range is  $-40^\circ\text{C}$  to  $105^\circ\text{C}$  for KK432

TEST CIRCUITS

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

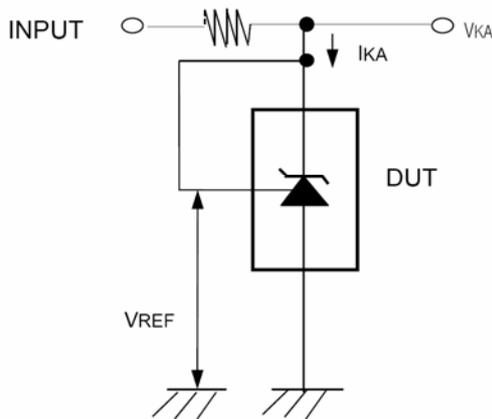


Fig. 2 Test Circuit for  $V_{KA} \geq V_{REF}$

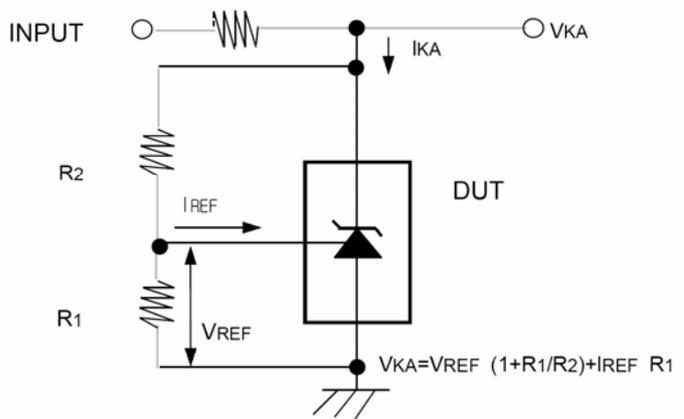
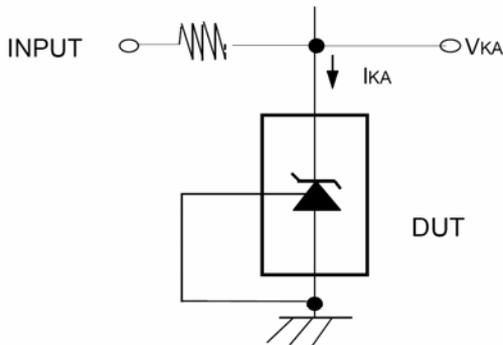
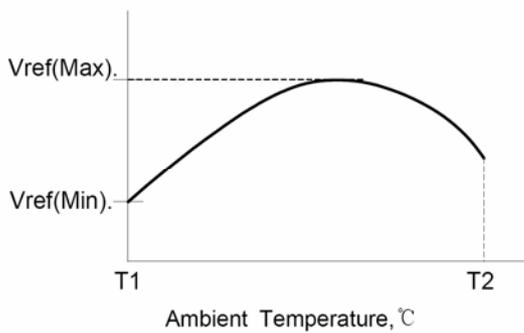


Fig. 3 Test Circuit for  $I_{KA}(\text{off})$



**Note1]** The deviation parameter  $\Delta V_{ref}$  is defined as the differences between the maximum and minimum values obtained over the full operating ambient temperature range that applies.



$$\Delta V_{ref} = V_{ref}(\text{Max.}) - V_{ref}(\text{Min.})$$

$$T_a = T_2 - T_1$$

The average temperature coefficient of the Reference input voltage,  $\alpha V_{ref}$ . is defined as:

$$\alpha V_{ref} = \frac{\text{ppm}}{^{\circ}\text{C}} = \frac{\left( \frac{\Delta V_{ref}}{V_{ref} @ 25^{\circ}\text{C}} \right) \times 10^6}{\Delta T_a} = \frac{\Delta V_{ref} \times 10^6}{\Delta T_a (V_{ref} @ 25^{\circ}\text{C})}$$

$\alpha V_{ref}$ . is can be positive or negative depending on whether  $V_{ref.Min.}$  or  $V_{ref.Max.}$  occurs at the lower ambient temperature.

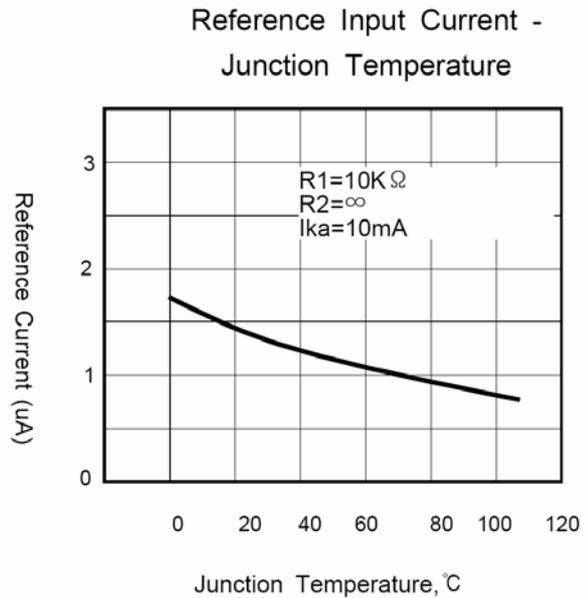
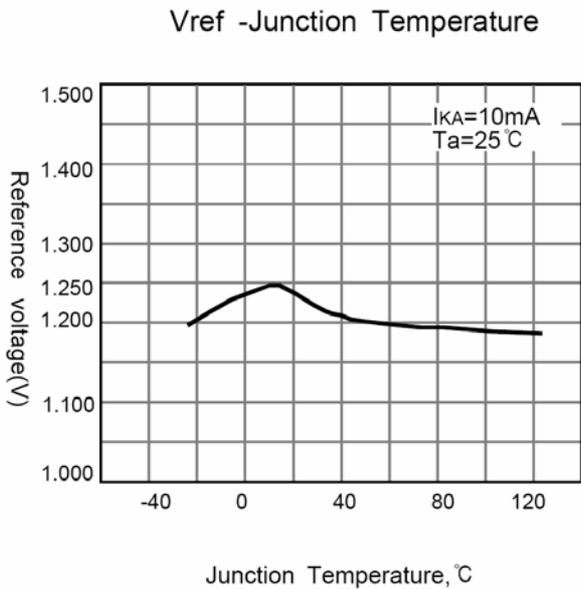
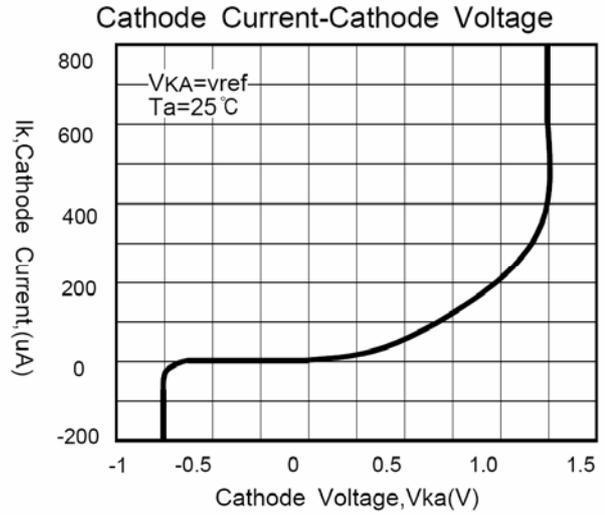
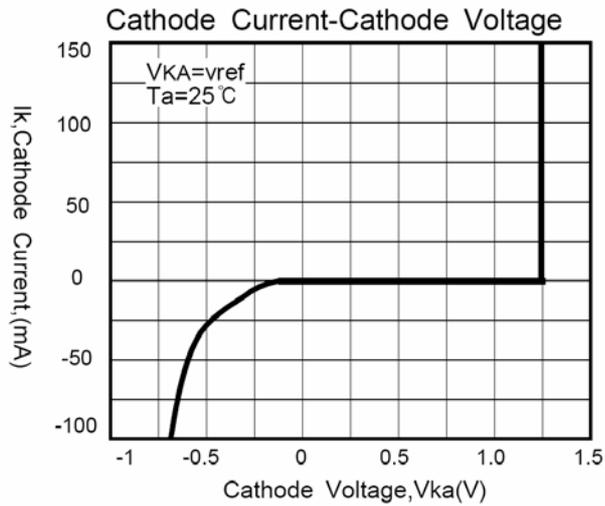
**Note2]** The dynamic impedance  $Z_{ka}$  is defined as:

$$|Z_{ka}| = \frac{\Delta V_{KA}}{\Delta I_K}$$

When the device is programmed with two external resistors,  $R_1$  an  $R_2$ , (Refer to Fig.2) the total dynamic impedance of the circuit is defined as :

$$|Z_{ka}'| = |Z_{ka}| \left( 1 + \frac{R_1}{R_2} \right)$$

TYPICAL PERFORMANCE CHARACTERISTICS



**TO-92**

