

TL432 Series

Adjustable Precision Shunt Regulator

Description

The TL432 series are three-terminal adjustable regulators with guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{REF} (1.24 or 1.25 volts) and 18 volts with two external resistors. These devices have a typical dynamic output impedance of 0.2Ω . Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.

Features

- Programmable Precise Output Voltage from 1.24 or 1.25V to 16V
- High Stability under Capacitive Load
- Fast turn on response
- Low Dynamic Output Resistance: 0.2Ω Typical
- SOT-23 Packages
- Low Output Noise
- Wide Operating Range of -40 to $125\text{ }^{\circ}\text{C}$
- Low Equivalent Full-range Temperature Coefficient with 50PPM/ $^{\circ}\text{C}$ Typical

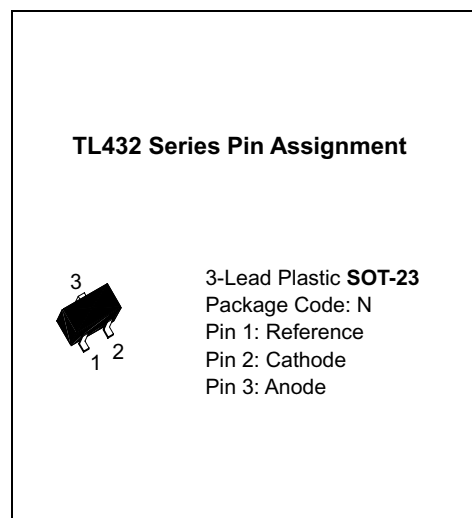
Absolute Maximum Ratings

(Operating temperature range applies unless otherwise specified)

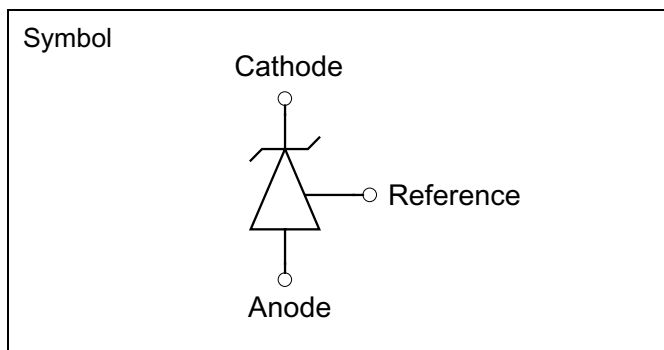
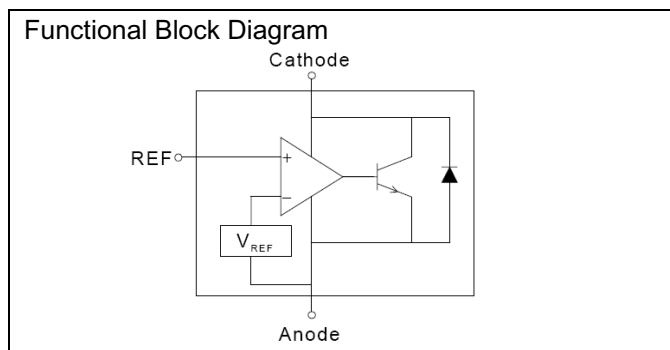
| Characteristics | Symbol | Value | | Unit |
|------------------------------------|-----------|---------------|-----|--------------------|
| Cathode Voltage | V_{KA} | 18 | | V |
| Cathode Current Range (Continuous) | I_K | 20 | | mA |
| Reference Input Current Range | I_{REF} | 10 | | mA |
| Power Dissipation | P_D | SOT-23 | 370 | mW |
| | | -- | -- | |
| | | -- | -- | |
| | | -- | -- | |
| Operating Temperature Range (Max.) | T_{opr} | $-40\sim+125$ | | $^{\circ}\text{C}$ |
| Storage Temperature Range | T_{stg} | $-65\sim+150$ | | $^{\circ}\text{C}$ |

Operating Conditions

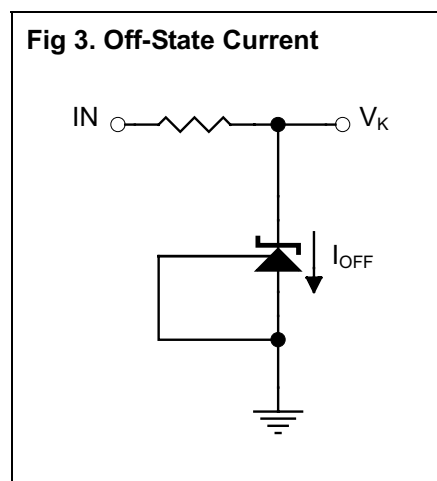
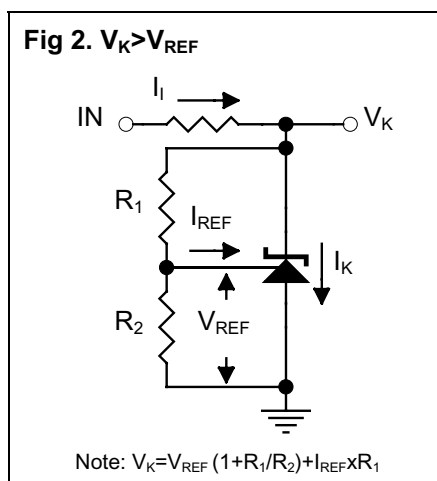
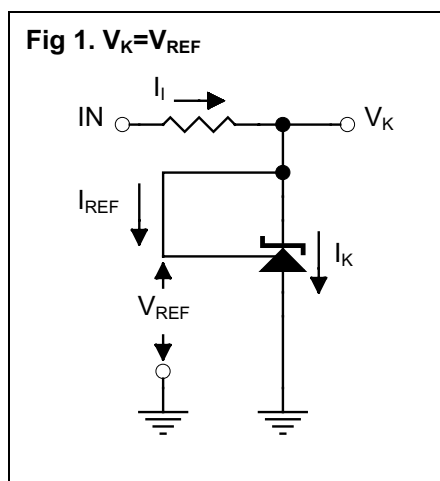
| Characteristics | Symbol | Min. | Max. | Unit |
|-------------------------------------|-----------|-----------|------|--------------------|
| Cathode Voltage | V_{KA} | V_{REF} | 16 | V |
| Cathode Current Range (Continuous) | I_K | 0.1 | 20 | mA |
| Operating Ambient Temperature Range | T_{OPB} | -40 | 125 | $^{\circ}\text{C}$ |



Functional Block Diagram & Symbol



Test Circuits



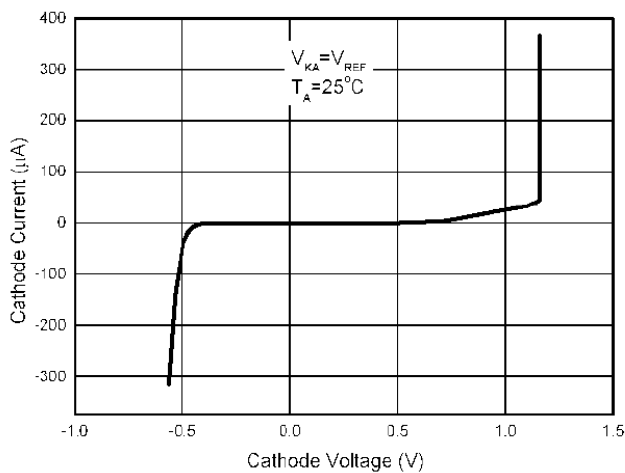
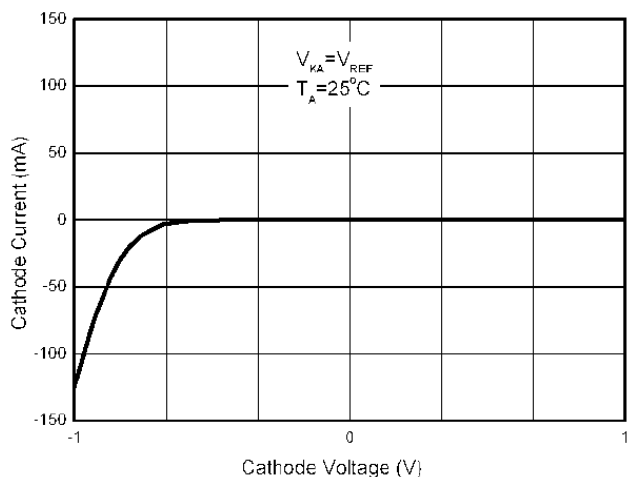
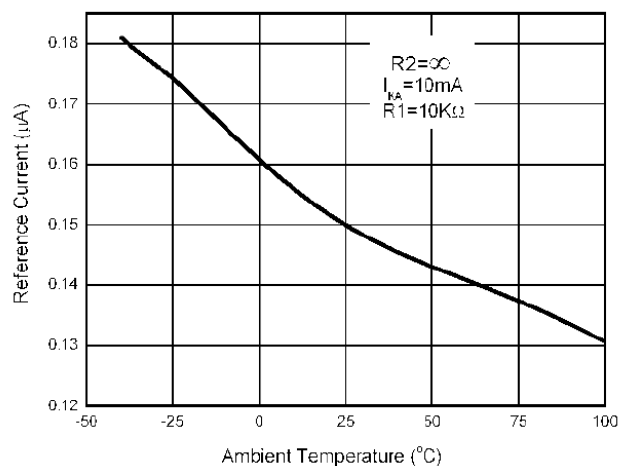
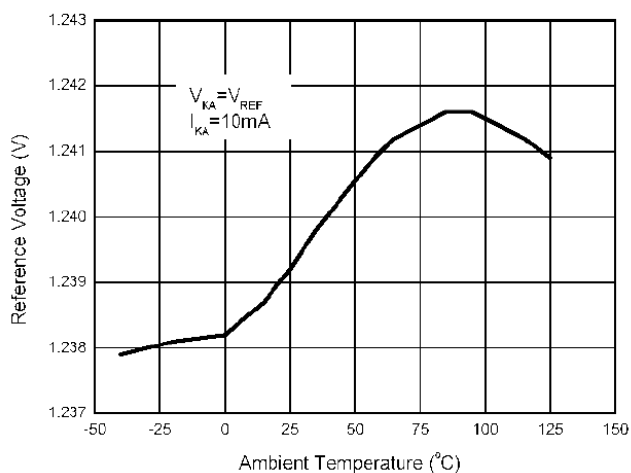
Electrical Characteristics (T_A=25°C unless otherwise specified)

| Characteristics | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|--|-----------------------------|---|-------------|-------|------|-------|---|
| Reference Input Voltage (Fig1) | V_{REF} | $V_K = V_{REF}, I_K = 10\text{mA}$ | 1.24V ±2.0% | 1.215 | 1.24 | 1.265 | V |
| | | | 1.24V ±1.0% | 1.228 | 1.24 | 1.252 | |
| | | | 1.24V ±0.5% | 1.234 | 1.24 | 1.246 | |
| | | | 1.25V ±2.0% | 1.225 | 1.25 | 1.275 | |
| | | | 1.25V ±1.0% | 1.238 | 1.25 | 1.262 | |
| | | | 1.25V ±0.5% | 1.244 | 1.25 | 1.256 | |
| Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage (Fig2) | $\Delta V_{REF}/\Delta V_K$ | $I_K = 10\text{mA}, \Delta V_K = 18\text{V to } V_{REF}$ | - | 1.0 | 2.7 | mV/V | |
| Reference Input Current (Fig2) | I_{REF} | $I_K = 10\text{mA}, R_1 = 10\text{K}\Omega, R_2 = \infty$ | - | 0.15 | 0.5 | μA | |
| Minimum Cathode Current for Regulation (Fig1) | $I_{K(\text{min})}$ | $V_K = V_{REF}$ | - | 20 | 80 | μA | |
| Off-State Cathode Current (Fig3) | $I_{K(\text{off})}$ | $V_K = 6\text{V}, V_{REF} = 0$ | - | 0.01 | 0.05 | μA | |
| | | $V_K = 16\text{V}, V_{REF} = 0$ | | 0.04 | 0.15 | | |
| Dynamic Output Impedance (Fig1) | Z_K | $V_K = V_{REF}, f \leq 1\text{kHz}, I_K = 100\mu\text{A to } 20\text{mA}$ | - | 0.2 | 0.4 | Ω | |

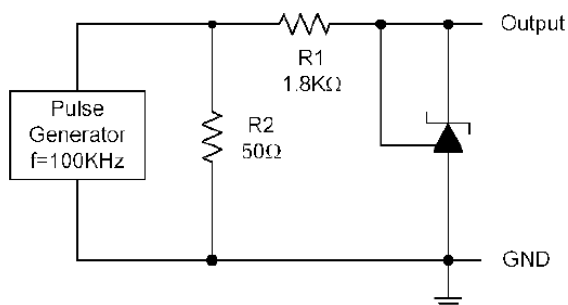
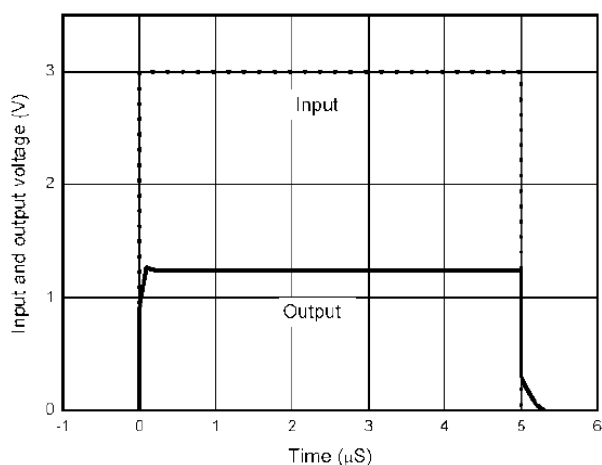
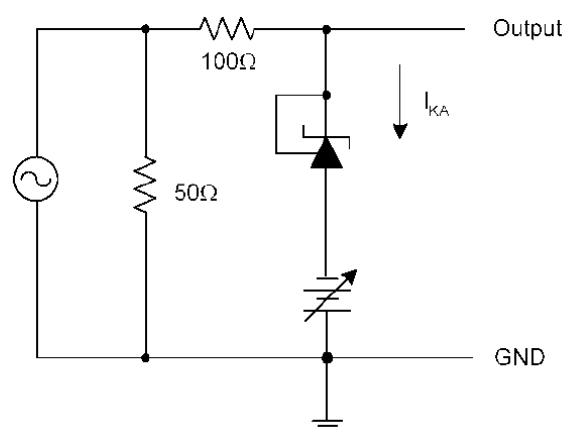
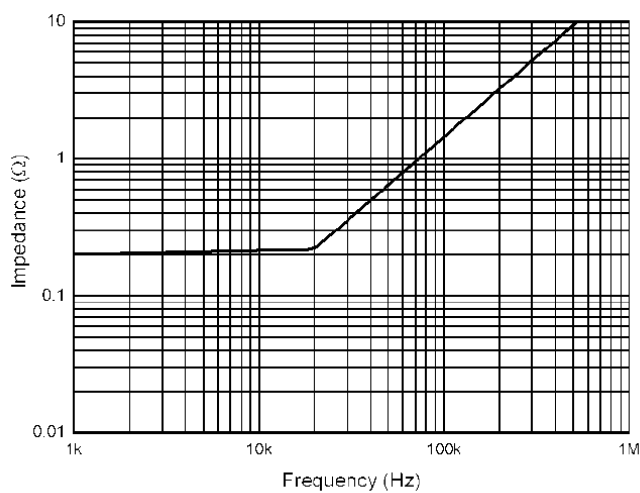
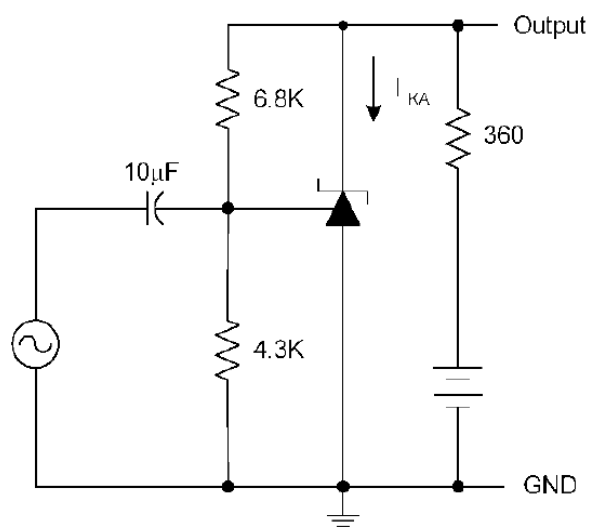
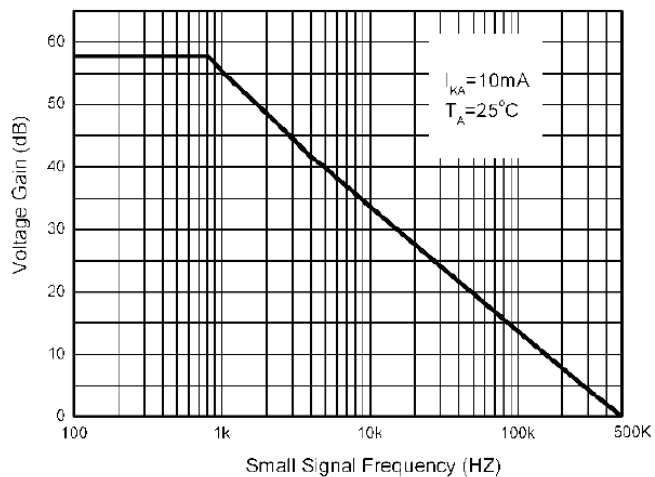
Ordering Information

| DEVICE | DEVICE CODE |
|------------|---|
| TL432 XY ● | <p>X is Reference voltage precision designator: A: 1.24V ±2.0% B: 1.24V ±1.0% C: 1.24V ±0.5% D: 1.25V ±2.0% E: 1.25V ±1.0% F: 1.25V ±0.5%</p> <p>Y is package designator : N: SOT-23</p> <p>Pb Free Mark Pb-Free: "●" Normal: None</p> |

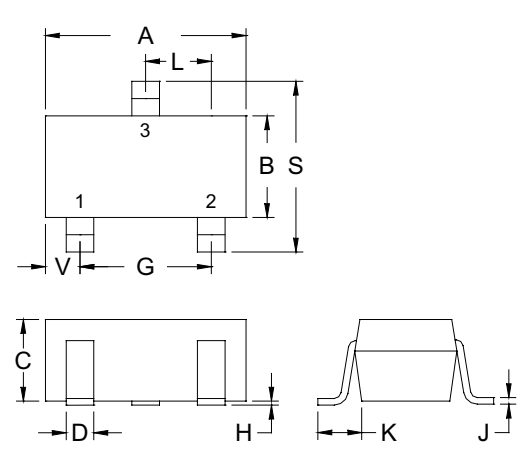
Typical Performance Characteristics



Typical Performance Characteristics (Continued)

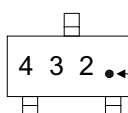


SOT-23 Dimension



3-Lead SOT-23 Plastic
Surface Mounted Package
Package Code: N

Marking:



Pb Free Mark
Pb-Free: "●" (Note)
Normal: None

Note: Pb-free product can distinguish by the green label or the extra description on the right side of the label.

Pin Style: 1.Reference 2.Cathode 3.Anode

Material:

- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

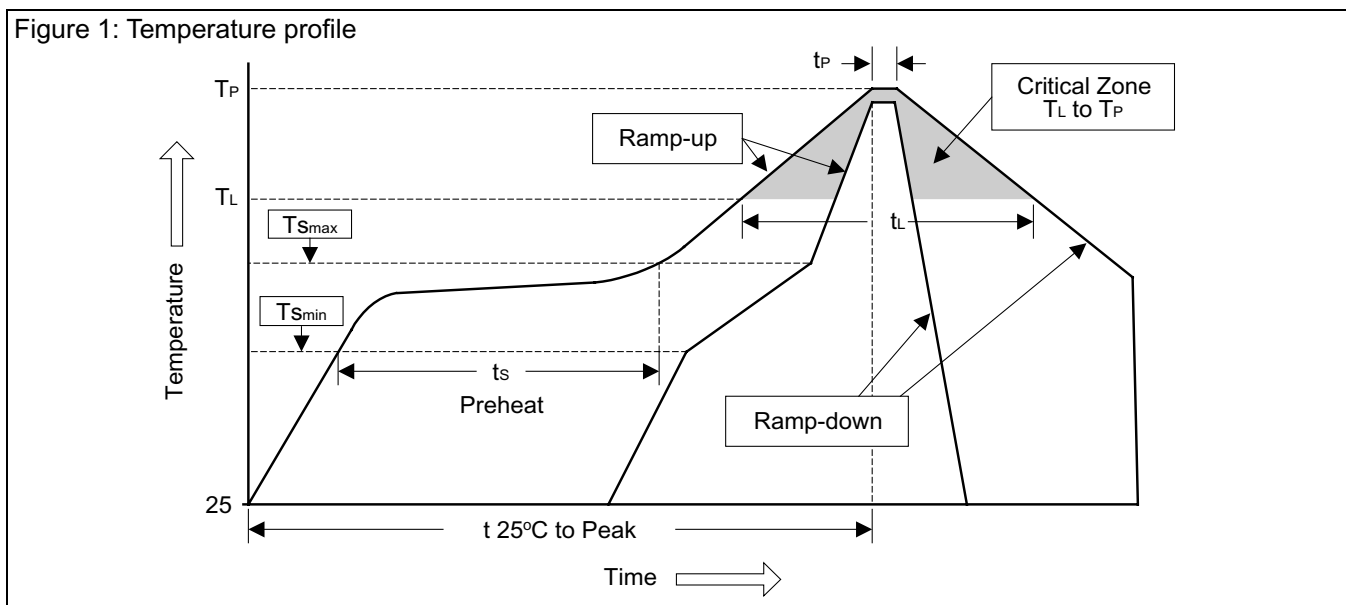
| DIM | Min. | Max. |
|-----|-------|-------|
| A | 2.80 | 3.04 |
| B | 1.20 | 1.60 |
| C | 0.89 | 1.30 |
| D | 0.30 | 0.50 |
| G | 1.70 | 2.30 |
| H | 0.013 | 0.10 |
| J | 0.085 | 0.177 |
| K | 0.32 | 0.67 |
| L | 0.85 | 1.15 |
| S | 2.10 | 2.75 |
| V | 0.25 | 0.65 |

*: Typical, Unit: mm

Pin style: 1.Reference 2.Cathode 3.Anode

Soldering Methods for CTC Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices



| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|--|---------------------------------|---------------------------------|
| Average ramp-up rate (T_L to T_P) | $<3^{\circ}\text{C}/\text{sec}$ | $<3^{\circ}\text{C}/\text{sec}$ |
| Preheat | | |
| - Temperature Min (T_{Smin}) | 100°C | 150°C |
| - Temperature Max (T_{Smax}) | 150°C | 200°C |
| - Time (min to max) (t_s) | 60~120 sec | 60~180 sec |
| T_{Smax} to T_L | | |
| - Ramp-up Rate | $<3^{\circ}\text{C}/\text{sec}$ | $<3^{\circ}\text{C}/\text{sec}$ |
| Time maintained above: | | |
| - Temperature (T_L) | 183°C | 217°C |
| - Time (t_L) | 60~150 sec | 60~150 sec |
| Peak Temperature (T_P) | 240°C +0/-5°C | 260°C +0/-5°C |
| Time within 5°C of actual Peak Temperature (t_P) | 10~30 sec | 20~40 sec |
| Ramp-down Rate | $<6^{\circ}\text{C}/\text{sec}$ | $<6^{\circ}\text{C}/\text{sec}$ |
| Time 25°C to Peak Temperature | <6 minutes | <8 minutes |

3. Flow (wave) soldering (solder dipping)

| Products | Peak temperature | Dipping time |
|------------------|------------------|--------------|
| Pb devices. | 245°C ±5°C | 5sec ±1sec |
| Pb-Free devices. | 260°C +0/-5°C | 5sec ±1sec |