



TL431TV

Preliminary

LINEAR INTEGRATED CIRCUIT

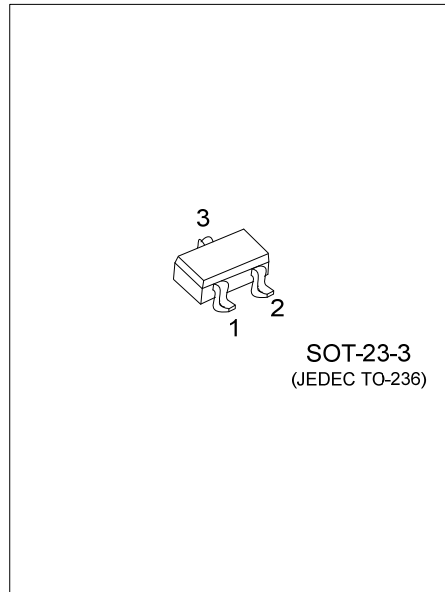
PROGRAMMABLE PRECISION REFERENCE

DESCRIPTION

The UTC **TL431TV** is a three-terminal adjustable regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{REF} (approximately 2.5V) and 36V with two external resistors. It provides very wide applications, including shunt regulator, series regulator, switching regulator, voltage reference and others.

FEATURES

- * Programmable output Voltage to 36V.
- * Low dynamic output impedance 0.2Ω.
- * Sink current capability of 1.0 to 100mA.
- * Equivalent full-range temperature coefficient of 50ppm/°C typical for operation over full rated operating temperature range.



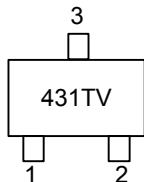
ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|-----------------|----------------|----------|----------------|---|---|-----------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| TL431TVL-AE2-R | TL431TVG-AE2-R | SOT-23-3 | R | K | A | Tape Reel |

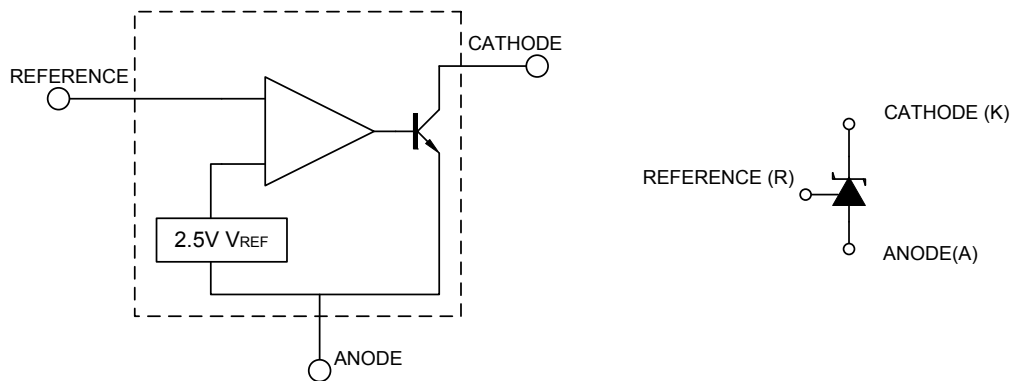
Note: Pin Code: R: Reference K: Cathode A: Anode

| | |
|--|---|
| <p>TL431TVG-AE3-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p> | <p>(1) R: Tape Reel (2) AE2: SOT-23-3 (3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|---|

MARKING



■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (Operating temperature range applies, unless otherwise specified)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|-----------------------------------|-----------|-------------|------|
| Cathode Voltage | V_{KA} | 37 | V |
| Cathode Current Range(Continuous) | I_{KA} | -100 ~ +150 | mA |
| Reference Input Current Range | I_{REF} | -0.05 ~ +10 | mA |
| Power Dissipation | P_D | 300 | mW |
| Operating Junction | T_J | +150 | °C |
| Operating Ambient | T_{OPR} | -40 ~ +85 | °C |
| Storage Temperature | T_{STG} | -65 ~ +150 | °C |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

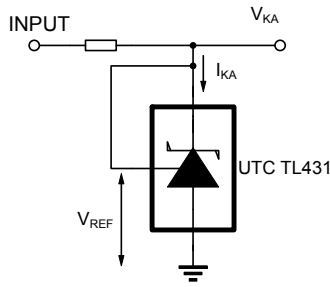
■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|-----------------|----------|-----------|-----|-----|------|
| Cathode Voltage | V_{KA} | V_{REF} | | 36 | V |
| Cathode Current | I_{KA} | 1 | | 100 | mA |

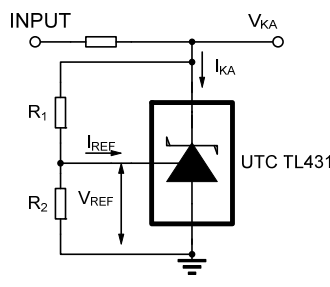
■ ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$, unless otherwise specified.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|---|--|---|--|-------|-------|---------------|------|
| Reference Input Voltage | V_{REF} | $V_{KA}=V_{REF}, I_{KA}=10\text{mA}$ | TL431TV-A | 2.483 | 2.495 | 2.507 | V |
| | | | TL431TV-1 | 2.470 | 2.495 | 2.520 | V |
| | | | TL431TV-2 | 2.520 | - | 2.545 | V |
| | | | TL431TV-3 | 2.445 | - | 2.470 | V |
| Deviation of reference Input Voltage Over temperature | $\frac{\Delta V_{REF}}{\Delta T}$ | $V_{KA}=V_{REF}, I_{KA}=10\text{mA}, 0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$ | | 4.5 | | mV | |
| Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage | $\frac{\Delta V_{REF}}{\Delta V_{KA}}$ | $I_{KA}=10\text{mA}$ | $\Delta V_{KA}=10\text{V} \sim V_{REF}$ | | -1.0 | -2.7 | mV/V |
| | | | $\Delta V_{KA}=36\text{V} \sim 10\text{V}$ | | -0.5 | -2.0 | mV/V |
| Reference Input Current | I_{REF} | $I_{KA}=10\text{mA}, R_1=10\text{k}\Omega, R_2=\infty$ | | 4.0 | 6.0 | μA | |
| Deviation of Reference Input Current Over Full Temperature Range | $\frac{\Delta I_{REF}}{\Delta T}$ | $I_{KA}=10\text{mA}, R_1=10\text{k}\Omega, R_2=\infty, T_A = \text{full Temperature}$ | | 0.4 | | μA | |
| Minimum Cathode Current for Regulation | $I_{KA(MIN)}$ | $V_{KA}=V_{REF}$ | 0.4 | 0.5 | 1.0 | mA | |
| Off-State Cathode Current | $I_{KA(OFF)}$ | $V_{KA}=36\text{V}, V_{REF}=0$ | | 0.05 | 1.0 | μA | |
| Dynamic Impedance | Z_{KA} | $V_{KA}=V_{REF}, I_{KA}=1 \sim 100\text{mA}, f \leq 1.0\text{kHz}$ | | 0.15 | 0.5 | Ω | |

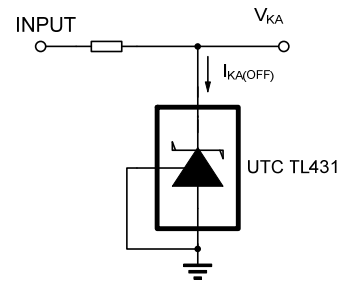
TEST CIRCUIT



For $V_{KA} = V_{REF}$

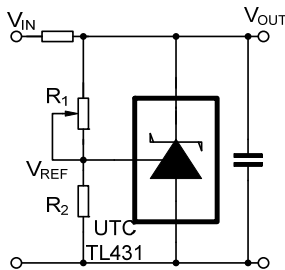


$V_{KA} = V_{REF} \times (1 + R_1/R_2) + I_{REF} \times R_1$
For $V_{KA} \geq V_{REF}$



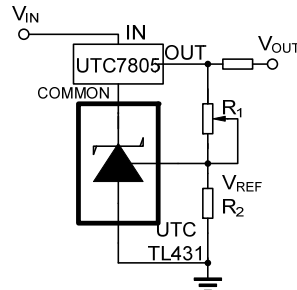
For $I_{KA(OFF)}$

APPLICATION CIRCUIT



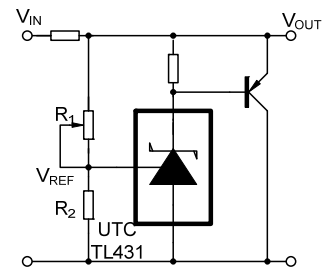
$$V_{OUT} = (1 + R_1/R_2) \times V_{REF}$$

Shutdown Regulator



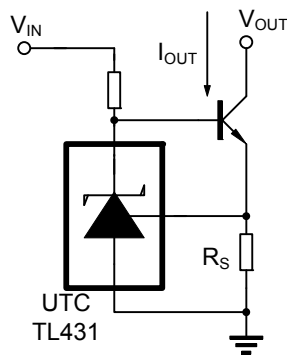
$$V_{OUT} = (1 + R_1/R_2) \times V_{REF}$$

Minimum $V_{OUT} = V_{REF} + 5V$
Output Control of a Three-Terminal Fixed Regulator



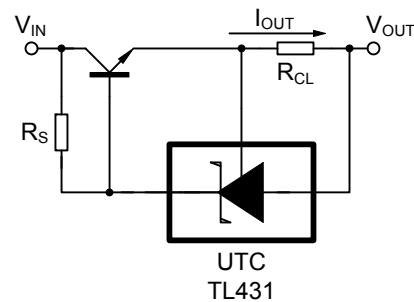
$$V_{OUT} = (1 + R_1/R_2) \times V_{REF}$$

Higher-current Shunt Regulator



$$I_{OUT} = V_{REF}/R_S$$

Constant-current Sink



$$I_{OUT} = V_{REF}/R_{CL}$$

Current Limiting or Current Source

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