

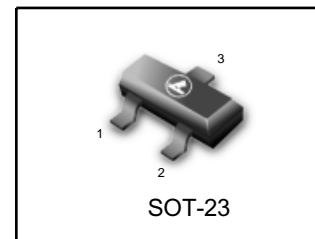
# LINEAR INTEGRATED CIRCUIT

## LTL431

### PROGRAMMABLE PRECISION REFERENCE

#### DESCRIPTION

The LRC LTL431 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.



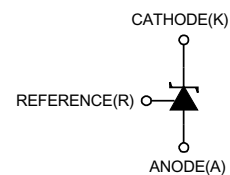
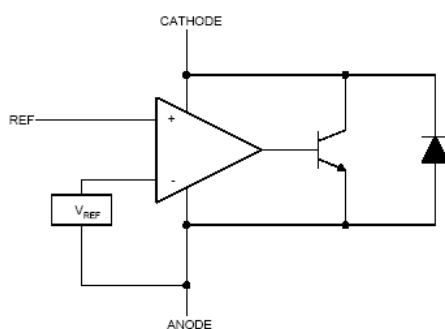
Pin 1: Cathode; 2: Ref; 3: Anode

#### FEATURES

- Programmable output Voltage to 36V.
- Low dynamic output impedance 0.0.
- Sink current capability of 1 to 100mA.
- Equivalent full-range temperature coefficient of 50ppm/°C typical for operation over full rated operating temperature range.

Pb-Free package is available

#### BLOCK DIAGRAM



## LTL431 LINEAR INTEGRATED CIRCUIT

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

| PARAMETER                         | SYMBOL           | VALUE                | UNIT |
|-----------------------------------|------------------|----------------------|------|
| Cathode Voltage                   | V <sub>KA</sub>  | 36                   | V    |
| Cathode Current Range(Continuous) | I <sub>KA</sub>  | -100 ~ +150          | mA   |
| Reference Input Current Range     | I <sub>ref</sub> | -0.05 ~ +10          | mA   |
| Operating Junction Temperature    | T <sub>J</sub>   | 150                  | °C   |
| Operating Ambient Temperature     | T <sub>opr</sub> | 0 ~ +70 / -40 ~ +125 | °C   |
| Storage Temperature               | T <sub>stg</sub> | -65 ~ +150           | °C   |

RECOMMENDED OPERATING CONDITIONS

| PARAMETER       | SYMBOL          | MIN              | TYP | MAX | UNIT |
|-----------------|-----------------|------------------|-----|-----|------|
| Cathode Voltage | V <sub>KA</sub> | V <sub>REF</sub> |     | 36  | V    |
| Cathode Current | I <sub>KA</sub> | 1                |     | 100 | mA   |

ELECTRICAL CHARACTERISTICS (T<sub>a</sub>=25°C, unless otherwise specified)

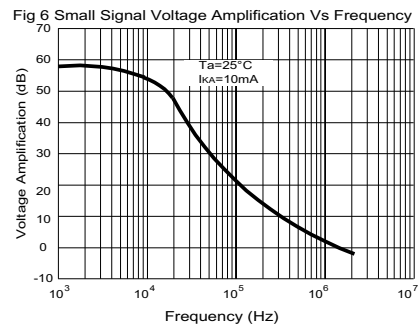
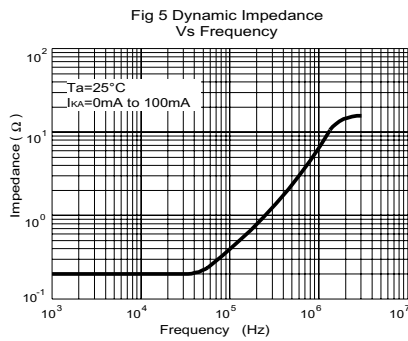
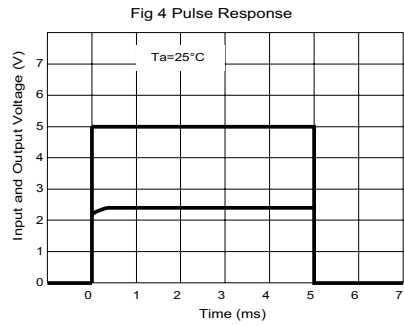
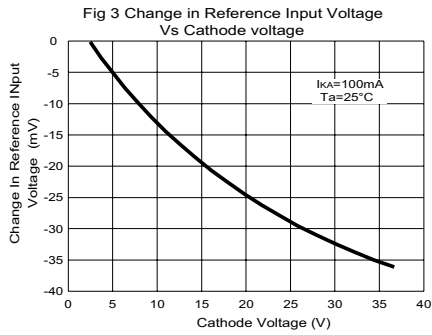
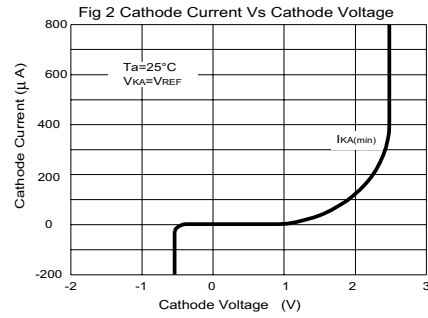
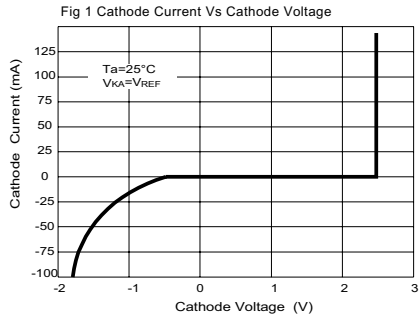
| PARAMETER   | SYMBOL                              | TEST CONDITIONS   | MIN | TYP           | MAX          | UNIT |
|---|-------------------------------------|---|-----|---------------|--------------|------|
| Reference Input Voltage *   | V <sub>ref</sub>                    | V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =10mA   |     | 2.50<br>2.495 |              | V    |
| Deviation of reference Input Voltage Over temperature(note 1)               | ΔV <sub>ref</sub> /ΔT               | V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =10mA<br>T <sub>MIN</sub> ≤T <sub>A</sub> ≤T <sub>MAX</sub> |     | 4.5           | 17           | mV   |
| Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage | ΔV <sub>ref</sub> /ΔV <sub>KA</sub> | I <sub>KA</sub> =10mA<br>ΔV <sub>KA</sub> =10V~V <sub>REF</sub><br>ΔV <sub>KA</sub> =36V~10V                    |     | -1.0<br>-0.5  | -2.7<br>-2.0 | mV/V |
| Reference Input Current   | I <sub>ref</sub>                    | I <sub>KA</sub> =10mA, R <sub>1</sub> =10kΩ, R <sub>2</sub> =∞  |     | 1.5           | 4            | μA   |
| Deviation of Reference Input Current Over Full Temperature Range            | ΔI <sub>ref</sub> /ΔT               | I <sub>KA</sub> =10mA, R <sub>1</sub> =10kΩ, R <sub>2</sub> =∞<br>T <sub>A</sub> =full Temperature              |     | 0.4           | 1.2          | μA   |
| Minimum Cathode Current for Regulation                                      | I <sub>KA</sub> (min)               | V <sub>KA</sub> =V <sub>REF</sub>   |     | 0.45          | 1.0          | mA   |
| Off-State Cathode Current   | I <sub>KA</sub> (OFF)               | V <sub>KA</sub> =36V, V <sub>REF</sub> =0   |     | 0.05          | 1.0          | μA   |
| Dynamic Impedance   | Z <sub>KA</sub>                     | V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =1 to 100mA<br>f≤1.0kHz                                     |     | 0.15          | 0.5          | Ω    |

\* CLASSIFICATION OF V<sub>ref</sub> AND PACKAGE

| Type          | RanK | Range(V)    | Marking | Package | T <sub>opr</sub> |
|---------------|------|-------------|---------|---------|------------------|
| LTL431ALT1G   | 0.5% | 2.487~2.512 | LA      | SOT-23  | 0~+70 °C         |
| LTL431BLT1G   | 1%   | 2.475~2.525 | LB      | SOT-23  | 0~+70 °C         |
| LTL431APLT1G  | 0.5% | 2.482~2.507 | LA1     | SOT-23  | 0~+70 °C         |
| LTL431BPPT1G  | 1%   | 2.470~2.520 | LB1     | SOT-23  | 0~+70 °C         |
| LTL431ATLT1G  | 0.5% | 2.487~2.512 | LA2     | SOT-23  | -40~+125 °C      |
| LTL431BTLT1G  | 1%   | 2.475~2.525 | LB2     | SOT-23  | -40~+125 °C      |
| LTL431APTLT1G | 0.5% | 2.482~2.507 | LA3     | SOT-23  | -40~+125 °C      |
| LTL431BPTLT1G | 1%   | 2.470~2.520 | LB3     | SOT-23  | -40~+125 °C      |

# LTL431 LINEAR INTEGRATED CIRCUIT

## TYPICAL PERFORMANCE CHARACTERISTICS



# LTL431 LINEAR INTEGRATED CIRCUIT

## TEST CIRCUIT

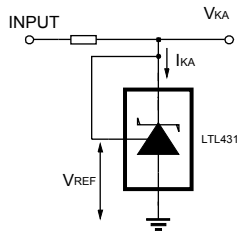


Fig 7 Test Circuit For  $V_{KA}=V_{REF}$

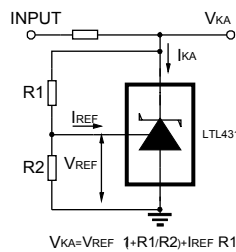


Fig 8 Test Circuit for  $V_{KA} \geq V_{REF}$

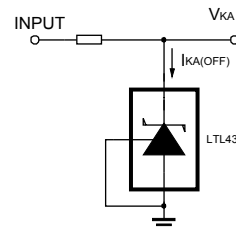


Fig 9 Test Circuit For  $I_{KA(OFF)}$

## APPLICATION CIRCUIT

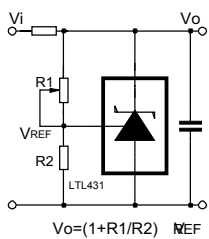


Fig 10 Shutdown Regulator

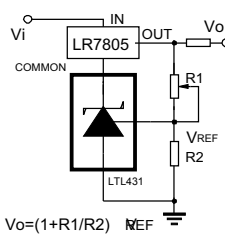


Fig 11 Output Control of a Three-Terminal Fixed Regulator

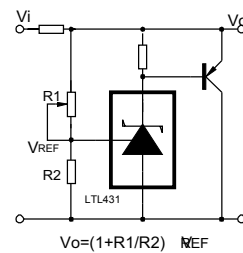


Fig 12 Higher-current Shunt Regulator

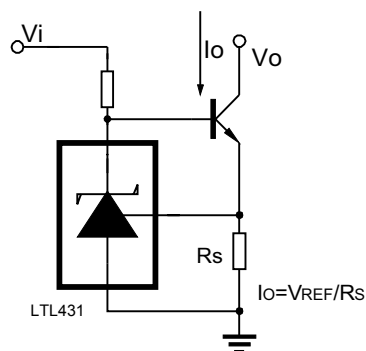


Fig 13 Constant-current Sink

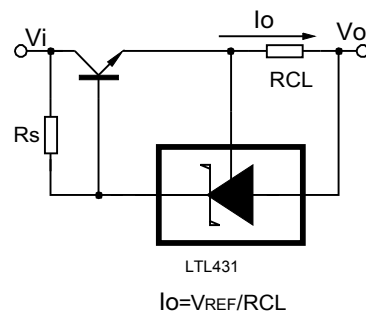
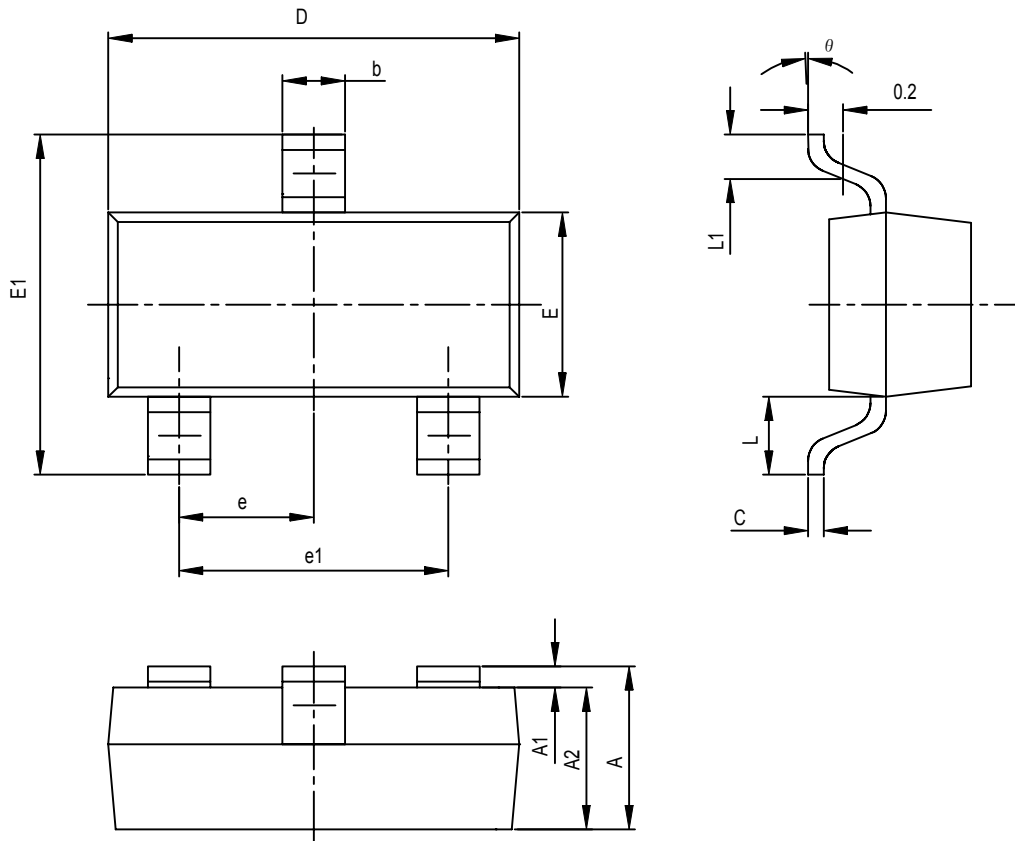


Fig 14 Current Limiting or Current Source

**SOT-23 PACKAGE OUTLINE DIMENSIONS**


| Symbol    | Dimensions In Millimeters |       | Dimensions In Inches |       |
|-----------|---------------------------|-------|----------------------|-------|
|           | Min                       | Max   | Min                  | Max   |
| <b>A</b>  | 0.900                     | 1.100 | 0.035                | 0.043 |
| <b>A1</b> | 0.000                     | 0.100 | 0.000                | 0.004 |
| <b>A2</b> | 0.900                     | 1.000 | 0.035                | 0.039 |
| <b>b</b>  | 0.300                     | 0.500 | 0.012                | 0.020 |
| <b>c</b>  | 0.080                     | 0.150 | 0.003                | 0.006 |
| <b>D</b>  | 2.800                     | 3.100 | 0.110                | 0.118 |
| <b>E</b>  | 1.200                     | 1.610 | 0.047                | 0.055 |
| <b>E1</b> | 2.250                     | 2.550 | 0.089                | 0.100 |
| <b>e</b>  | 0.950TPY                  |       | 0.037TPY             |       |
| <b>e1</b> | 1.800                     | 2.000 | 0.071                | 0.079 |
| <b>L</b>  | 0.550REF                  |       | 0.022REF             |       |
| <b>L1</b> | 0.300                     | 0.500 | 0.012                | 0.020 |
| <b>θ</b>  | 0°                        | 8°    | 0°                   | 8°    |

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[G1](#) [AS431AZTR-G1](#) [AS431BZTR-E1](#) [AN431BN-ATRG1](#)