

# PROGRAMMABLE PRECISION SHUNT REGULATOR TJ431/A/C

## FEATURES

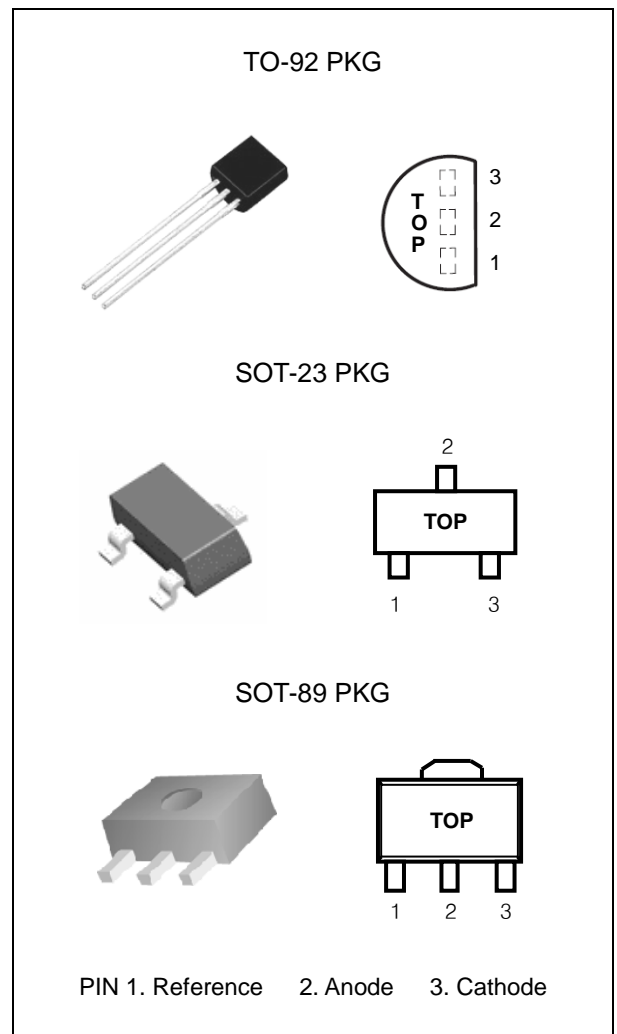
- Programmable Output Voltage to 28V
- Guaranteed 0.5% Reference Voltage Tolerance
- Cathode Current Range(Continuous) 100 mA
- Temperature Compensated For Operation Over Full Rate Operating Temperature Range
- Low Output Noise Voltage
- Fast Turn-on Response
- TO-92, SOT-89 or SOT-23 3L Package

## APPLICATION

- Shunt Regulator
- Precision High-Current Series Regulator
- High-Current Shunt Regulator
- Crowbar Circuit
- PWM Converter With Reference
- Voltage Monitor
- Precision Current Limiter

## DESCRIPTION

The TJ431 is a three-terminal adjustable shunt regulator with specified thermal stability over applicable temperature  $V_{REF}$  (Approx. 2.5V) and 28V with two external resistors. This device has a typical dynamic output impedance of 0.25Ω. Active output circuitry provides a very sharp turn-on characteristic, making this device excellent replacement for zener diodes in many applications. The TJ431 is characterized for operation from -40°C to +125°C.



## ORDERING INFORMATION

| Device  | Package       |
|---------|---------------|
| TJ431   | TO-92(Bulk)   |
| TJ431TA | TO-92(Taping) |
| TJ431SF | SOT-23 3L     |
| TJ431F  | SOT-89 3L     |

\* Refer to the page 2 for detailed ordering Information,

## Absolute Maximum Ratings

(Operating temperature range applies unless otherwise specified)

| CHARACTERISTIC                    | SYMBOL    | MIN.  | MAX. | UNIT |
|-----------------------------------|-----------|-------|------|------|
| Cathode Voltage                   | $V_{KA}$  | -     | 37   | V    |
| Cathode Current Range(Continuous) | $I_K$     | -100  | 150  | mA   |
| Reference Input Current Range     | $I_{REF}$ | -0.05 | 10   | mA   |
| Junction Temperature Range        | $T_J$     | -40   | 150  | °C   |
| Operating Temperature Range       | $T_{OPR}$ | -40   | 125  | °C   |
| Storage Temperature Range         | $T_{STG}$ | -65   | 150  | °C   |

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## RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC  | SYMBOL   | MIN.      | MAX. | UNIT |
|-----------------|----------|-----------|------|------|
| Cathode Voltage | $V_{KA}$ | $V_{REF}$ | 28   | V    |
| Cathode Current | $I_K$    | 1.0       | 100  | mA   |

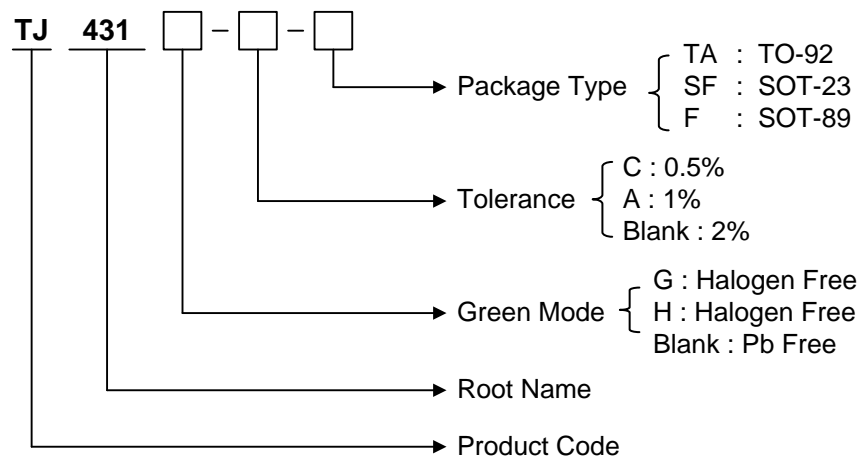
## Ordering Information

| $V_{REF}$ | Package | Tolerance | Order No. | Package Marking | Supplied As |
|-----------|---------|-----------|-----------|-----------------|-------------|
| 2.495V    | TO-92   | 0.5%      | TJ431C    | -               | Bulk        |
|           |         |           | TJ431GC   | -               |             |
|           |         |           | TJ431CTA  | -               | Tape        |
|           |         |           | TJ431GCTA | -               |             |
|           |         | 1%        | TJ431A    | -               | Bulk        |
|           |         |           | TJ431GA   | -               |             |
|           |         |           | TJ431ATA  | -               | Tape        |
|           |         |           | TJ431GATA | -               |             |
|           |         | 2%        | TJ431     | -               | Bulk        |
|           |         |           | TJ431G    | -               |             |
|           |         |           | TJ431TA   | -               | Tape        |
|           |         |           | TJ431GTA  | -               |             |
|           | SOT-23  | 0.5%      | TJ431CSF  | -               | Reel        |
|           |         |           | TJ431GCSF | -               |             |
|           |         | 1%        | TJ431ASF  | -               | Reel        |
|           |         |           | TJ431GASF | -               |             |
|           |         | 2%        | TJ431SF   | -               | Reel        |
|           |         |           | TJ431GSF  | -               |             |
|           | SOT-89  | 0.5%      | TJ431CF   | -               | Reel        |
|           |         | 1%        | TJ431AF   | -               | Reel        |
| 2%        |         | TJ431F    | -         | Reel            |             |

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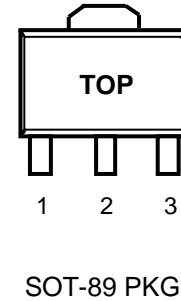
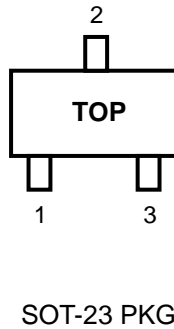
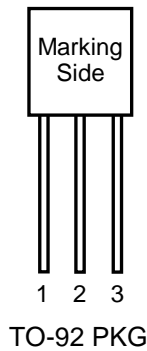
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## Ordering Information (continued)



# PROGRAMMABLE PRECISION SHUNT REGULATOR TJ431/A/C

## PIN CONFIGURATION



## PIN DESCRIPTION

| Pin No. | TO-92 / SOT-23 / SOT-89 |                      |
|---------|-------------------------|----------------------|
|         | Name                    | Function             |
| 1       | Reference               | Reference Voltage    |
| 2       | Anode                   | Ground               |
| 3       | Cathode                 | Input Supply Voltage |

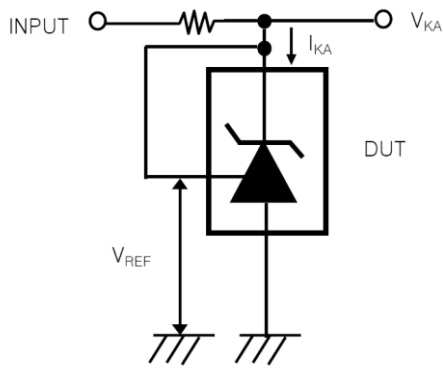
## TJ431 ELECTRICAL CHARACTERISTICS

( $T_A=25^\circ\text{C}$ , unless otherwise specified)

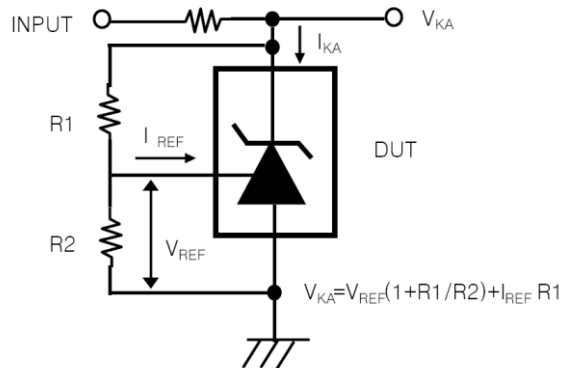
| CHARACTERISTIC  | SYMBOL                         | TEST CONDITION   | MIN.                                     | TYP.  | MAX.  | UNIT          |      |
|---|--------------------------------|--|--|-------|-------|---------------|------|
| Reference Input Voltage   | $V_{REF}$                      | $V_{KA}=V_{REF}$ ,<br>$I_K=10\text{mA}$  | TJ431C                                   | 2.483 | 2.495 | 2.507         | V    |
|   |                                |  | TJ431A                                   | 2.470 | 2.495 | 2.520         |      |
|   |                                |  | TJ431                                    | 2.440 | 2.495 | 2.550         |      |
| Deviation of Reference Input Voltage  | $\Delta V_{REF}/\Delta T$      | $V_{KA}=V_{REF}$ , $I_K=10\text{mA}$<br>$T_A=\text{Full Range}$                      |  | 24    |       | mV            |      |
| Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage | $\Delta V_{REF}/\Delta V_{KA}$ | $I_K=10\text{mA}$  | $\Delta V_{KA}=10\text{V to }V_{REF}$    | -2.7  | -1.0  |               | mV/V |
|   |                                |  | $\Delta V_{KA}=28\text{V to }10\text{V}$ | -2    | -0.4  |               |      |
| Reference Input Current   | $I_{REF}$                      | $I_{KA}=10\text{mA}$ , $R_1=10\text{k}\Omega$ , $R_2=\infty$                         |  | 0.5   | 1.2   | $\mu\text{A}$ |      |
| Deviation of Reference Input Current  | $\Delta I_{REF}/\Delta T$      | $I_K=10\text{mA}$ , $R_1=10\text{k}\Omega$ , $R_2=\infty$<br>$T_A=\text{Full Range}$ |  | 0.4   | 1.2   | $\mu\text{A}$ |      |
| Minimum Cathode Current for Regulation                                      | $I_{K(MIN)}$                   | $V_{KA}=V_{REF}$   |  | 0.4   | 1.0   | mA            |      |
| Off-State Cathode Current   | $I_{K(OFF)}$                   | $V_{KA}=28\text{V}$ , $V_{REF}=0$  |  | 0.1   | 1.0   | $\mu\text{A}$ |      |
| Dynamic Impedance   | $Z_{KA}$                       | $V_{KA}=V_{REF}$ , $I_K=1\text{mA}\sim 100\text{mA}$<br>$f \leq 1\text{kHz}$         |  | 0.25  | 0.50  | $\Omega$      |      |

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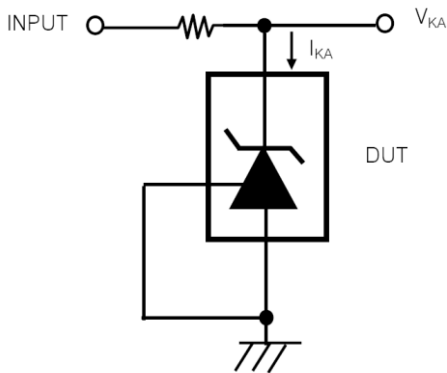
## TEST CIRCUITS



< Fig 1. Test circuit for  $V_{KA} = V_{REF}$  >



< Fig 2. Test circuit for  $V_{KA} \geq V_{REF}$  >



< Fig 3. Test circuit for  $I_{KA(OFF)}$  >