

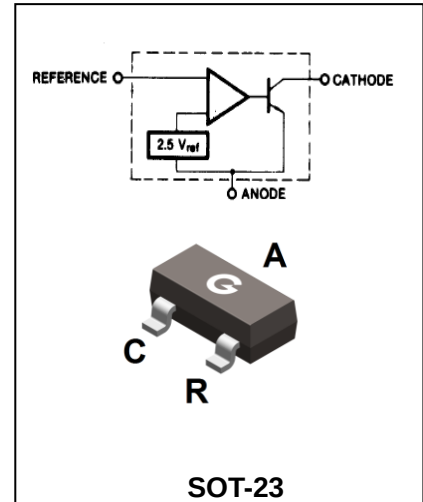
## Programmable Shunt Regulator

## BL431R

### FEATURES

- Programmable output voltage to 36 volts
- Low dynamic output impedance 0.20 typical
- Sink current capability of 1.0 to 100mA
- Equivalent full-range temperature coefficient of 50ppm/°C typical
- Temperature compensated for operation over full rated Operating temperature range
- Low output noise voltage
- Fast turn-on response
- RoHS compliant with Halogen-free

HF



### ORDERING INFORMATION

| Type No. | Marking | Package Code |
|----------|---------|--------------|
| BL431R   | 431R    | SOT-23       |
| BL431R-A | 431R    | SOT-23       |
| BL431R-B | 431R    | SOT-23       |

### MAXIMUM RATING @ Ta=25°C unless otherwise specified

| Parameter                                                                                                      | symbol          | limits       | unit |
|----------------------------------------------------------------------------------------------------------------|-----------------|--------------|------|
| Electrostatic discharge<br>Human-body model(HBM),per<br>ANSI/ESDA/JEDEC JS-001 <sup>(Note1)</sup>              | $V_{(ESD)}$     | ±2000        | V    |
| Electrostatic discharge<br>Charged-device model(CDM), per JEDEC<br>specification JESD22C101 <sup>(Note2)</sup> |                 | ±1000        |      |
| Cathode Voltage                                                                                                | $V_{KA}$        | 37           | V    |
| Cathode current Range(Continuous)                                                                              | $I_{KA}$        | -100 to +150 | mA   |
| Reference Input Current Range                                                                                  | $I_{REF}$       | 0.05 to 10   | mA   |
| Power dissipation                                                                                              | $P_D$           | 350          | mW   |
| Thermal Resistance Junction-to-Ambient                                                                         | $R_{\theta JA}$ | 350          | °C/W |
| Thermal Resistance, Junction-to-Case                                                                           | $R_{\theta JC}$ | 155          | °C/W |
| Operating temperature Range                                                                                    | $T_{OPR}$       | -40 to +105  | °C   |
| Storage temperature Range                                                                                      | $T_{STG}$       | -65 to +150  | °C   |

Notes:

1. JEDEC document JEP155 states that 500-v HBM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 500-v HBM is possible with the necessary precautions.

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2. JEDEC document JEP157 states that 250-v CDM allows safe manufacturing with a standard ESD control process.

Manufacturing with less than 250-v CDM is possible with the necessary precautions.

### Recommended Operating Conditions

| Parameter       | symbol   | Min       | Typ | Max | Unit |
|-----------------|----------|-----------|-----|-----|------|
| Cathode Voltage | $V_{KA}$ | $V_{REF}$ | -   | 36  | V    |
| Cathode Current | $I_{KA}$ | 1.0       | -   | 100 | mA   |

### ELECTRICAL CHARACTERISTICS @ $T_a=25^{\circ}\text{C}$ unless otherwise specified

| Parameter                                                                   | symbol                         | conditions                                                                              | Min.                    | Typ.              | Max.                    | unit          |
|-----------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------|-------------------------|-------------------|-------------------------|---------------|
| Reference Input voltage                                                     | $V_{REF}$                      | $V_{KA}=V_{REF}, I_{KA}=10\text{mA}$<br>BL431R-A (0.5%)<br>BL431R (1%)<br>BL431R-B (2%) | 2.488<br>2.475<br>2.450 | 2.5<br>2.5<br>2.5 | 2.512<br>2.525<br>2.550 | V             |
| Deviation of Reference Input Voltage Over-Temperature (Note1)               | $\Delta V_{REF}/\Delta T$      | $V_{KA}=V_{REF}, I_{KA}=10\text{mA},$<br>$T_{MIN}\leq T_A\leq T_{MAX}$                  |                         | 4.5               | 17                      | mV            |
| Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage | $\Delta V_{REF}/\Delta V_{KA}$ | $I_{KA}=10\text{mA}$<br>$\Delta V_{KA}=10\text{V}-V_{REF}$                              | -2.7                    | -1.0              |                         | mV/V          |
|                                                                             |                                | $\Delta V_{KA}=36\text{V}-10\text{V}$                                                   | -2.0                    | -0.5              |                         | V             |
| Reverse Input current                                                       | $I_{REF}$                      | $I_{KA}=10\text{mA},$<br>$R_1=10\text{K}\Omega, R_2=\infty$                             |                         | 1.5               | 4                       | $\mu\text{A}$ |
| Deviation of Reference Input Current Over Full Temperature Range            | $\Delta I_{REF}/\Delta T$      | $I_{KA}=10\text{mA},$<br>$R_1=10\text{K}\Omega, R_2=\infty$<br>$T_A=\text{Full Range}$  |                         | 0.4               | 1.2                     | $\mu\text{A}$ |
| Minimum Cathode Current for Regulation                                      | $I_{KA(MIN)}$                  | $V_{KA}=V_{REF}$                                                                        |                         | 0.19              | 0.5                     | mA            |
| Off-Stage Cathode Current                                                   | $I_{KA(OFF)}$                  | $V_{KA}=36\text{V},$<br>$V_{REF}=0$                                                     |                         | 0.05              | 1.0                     | $\mu\text{A}$ |
| Dynamic Impedance(Note2)                                                    | $Z_{ZA}$                       | $V_{KA}=V_{REF},$<br>$I_{KA}=1\text{ to }100\text{mA}$<br>$f\geq 1.0\text{KHz}$         |                         | 0.15              | 0.5                     | $\Omega$      |

•  $T_{MIN}=-25^{\circ}\text{C}, T_{MAX}=+85^{\circ}\text{C}$

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TYPICAL CHARACTERISTICS @  $T_a=25^\circ\text{C}$  unless otherwise specified

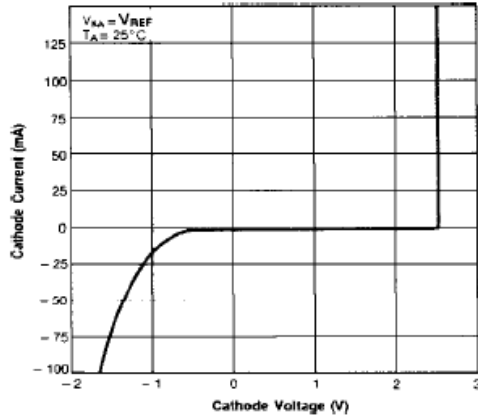


Figure 1. Cathode Current vs. Cathode Voltage

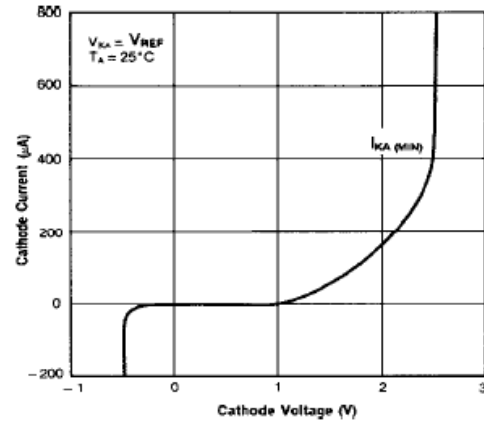


Figure 2. Cathode Current vs. Cathode Voltage

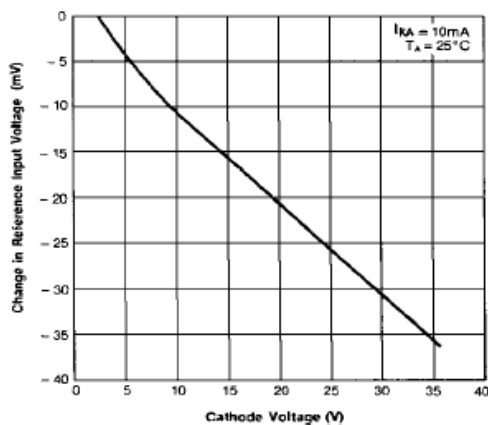


Figure 3. Change In Reference Input Voltage vs. Cathode Voltage

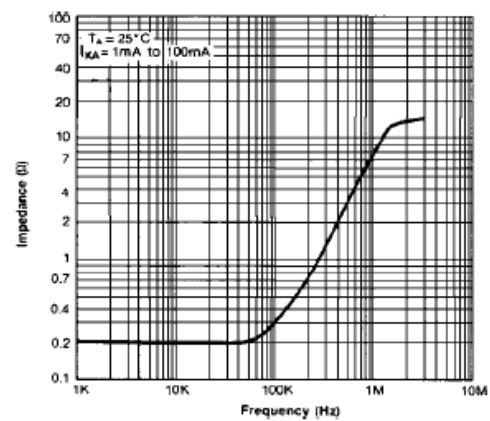


Figure 4. Dynamic Impedance Frequency

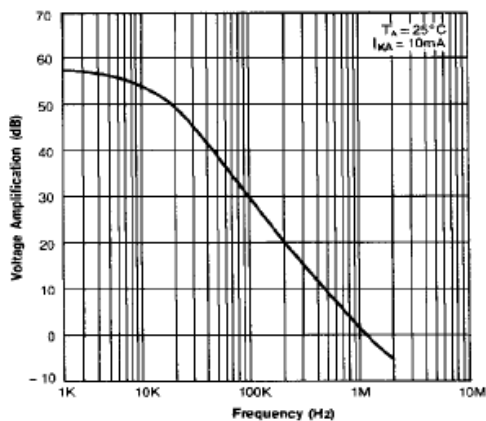


Figure 5. Small Signal Voltage Amplification vs. Frequency

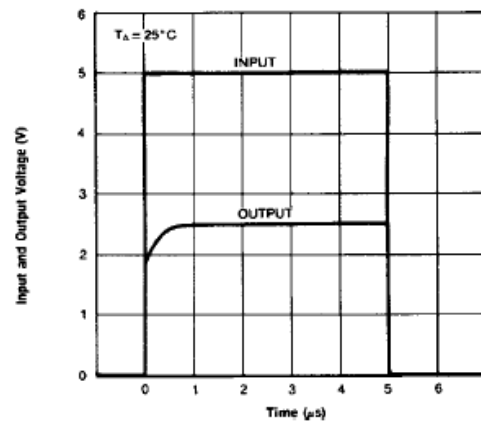


Figure 6. Pulse Response

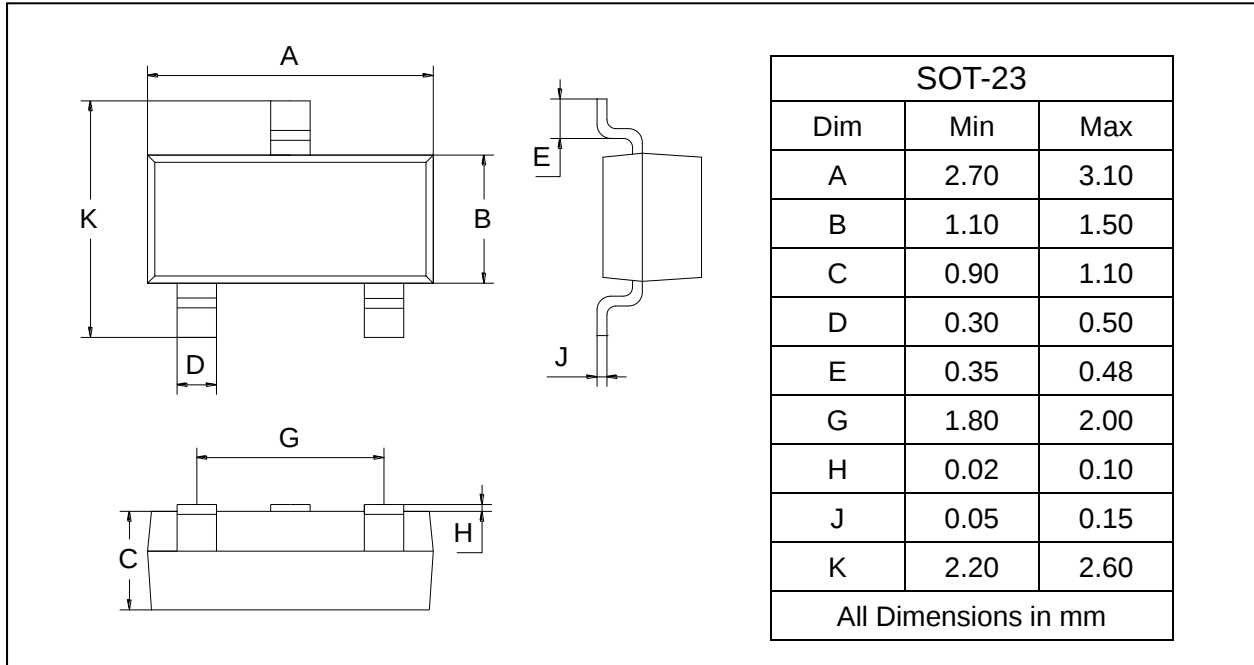
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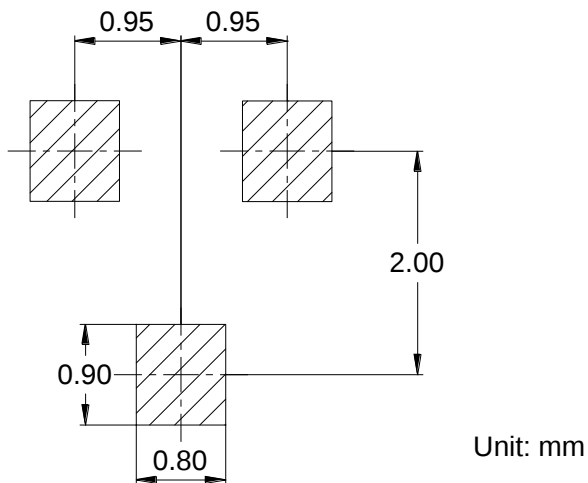
### PACKAGE OUTLINE

Plastic surface mounted package

SOT-23



### SOLDERING FOOTPRINT



### PACKAGE INFORMATION

| Device                    | Package | Shipping               |
|---------------------------|---------|------------------------|
| BL431R/BL431R-A/ BL431R-B | SOT-23  | 3000 pcs / Tape & Reel |