

# TA76L431FB

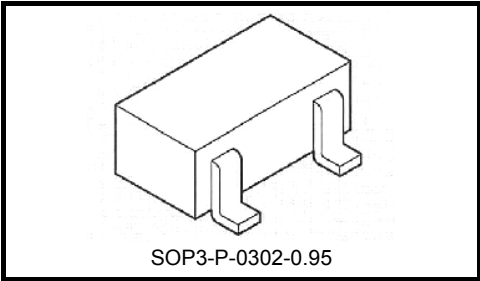
## 2.495 V Adjustable High-Precision Shunt Regulators

These devices are adjustable high-precision shunt regulators whose output voltage ( $V_{KA}$ ) can be set arbitrarily using two external resistors.

The devices have a precise internal reference voltage of 2.495 V, enabling them to operate at low voltage. In addition, they can be used as zener diodes to perform temperature compensation.

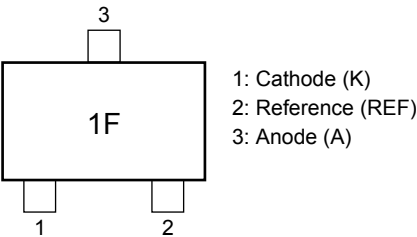
### Features

- Precision reference voltage  
:  $V_{REF} = 2.495\text{ V} \pm 1.0\%$  ( $T_j = 25^\circ\text{C}$ )
- Adjustable output voltage:  $V_{REF} \leq V_{OUT} \leq 19\text{ V}$
- Minimum cathode current for regulation:  $I_{Kmin} = 0.5\text{ mA (max)}$
- Packages: Surface-mount S-Mini



Weight: 0.012 g (typ.)

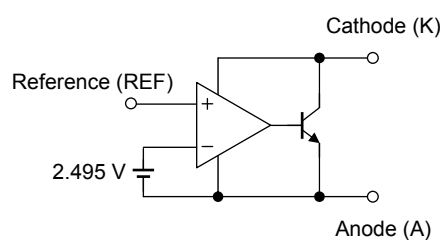
### Pin Assignment/Marking



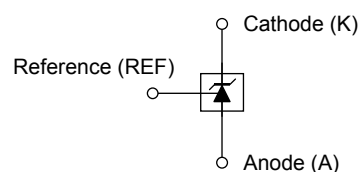
### How to Order

| Product No.         | Package                    | Packing Type and Capacity      |
|---------------------|----------------------------|--------------------------------|
| TA76L431FB(TE85L,F) | S-Mini(surface-mount type) | Embossed tape: 3000 pcs / reel |

## Functional Block Diagram

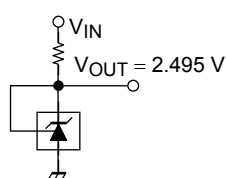


## Circuit Symbol

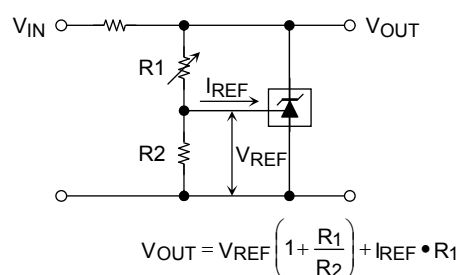


## Typical Application Circuits

### (1) 2.495 V Reference ( $V_{KA} = V_{REF}$ )



### (2) Shunt Regulator ( $V_{KA} > V_{REF}$ )



## Usage Precautions

### 1. TA76L431FB

These products contain MOS elements. Please take care to avoid generating static electricity when handling these devices.

### 2. TA76L431FB

The oscillation frequency of these devices is determined by the value of the capacitor connected between the anode and the cathode.

When establishing maximum operating condition parameters, please derate the absolute maximum rating values specified in these datasheets so as to allow an operational safety margin.

Use of a laminated ceramic capacitor is recommended

## Absolute Maximum Ratings (Ta = 25°C)

| Characteristics                 | Symbol     | Rating       | Unit    |
|---------------------------------|------------|--------------|---------|
| Cathode voltage                 | $V_{KA}$   | 20           | V       |
| Cathode current                 | $I_K$      | 50           | mA      |
| Cathode-anode reverse current   | $-I_K$     | 50           | mA      |
| Reference voltage               | $V_{REF}$  | 7            | V       |
| Reference current               | $I_{REF}$  | 50           | $\mu A$ |
| Reference-anode reverse current | $-I_{REF}$ | 10           | mA      |
| Power dissipation               | $P_D$      | 200 (Note 1) | mW      |
| Thermal resistance              | $R_{th}$   | 625 (Note 1) | °C/W    |
| Operating junction temperature  | $T_{jopr}$ | -40 to 150   | °C      |
| Junction temperature            | $T_j$      | 150          | °C      |
| Storage temperature             | $T_{stg}$  | -55 to 150   | °C      |

Note 1: Glass epoxy substrate mounting: 30 mm × 30 mm × 0.8 mm (t) (Cu pad area 35 mm<sup>2</sup>)

Note 2: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

## Operating Ranges

| Characteristics | Symbol   | Min       | Typ. | Max | Unit |
|-----------------|----------|-----------|------|-----|------|
| Cathode voltage | $V_{KA}$ | $V_{REF}$ | —    | 19  | V    |
| Cathode current | $I_K$    | 0.5       | —    | 40  | mA   |

## Electrical Characteristics (Unless otherwise specified, Tj = 25°C, IK = 10 mA)

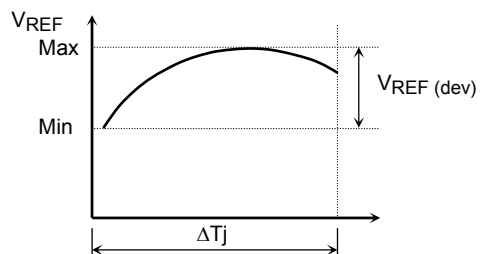
| Characteristics                                                             | Symbol                    | Test Condition                                                                         | Min   | Typ.  | Max   | Unit     |
|-----------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------|-------|-------|-------|----------|
| Reference voltage                                                           | $V_{REF}$                 | $V_{KA} = V_{REF}$                                                                     | 2.470 | 2.495 | 2.520 | V        |
| Deviation of reference input voltage over temperature                       | $V_{REF} (dev)$           | $0^\circ C \leq T_j \leq 70^\circ C, V_{KA} = V_{REF}$                                 | —     | 8     | 18    | mV       |
| Ratio of change in reference input voltage to the change in cathode voltage | $\Delta V_{REF}/\Delta V$ | $V_{REF} \leq V_{KA} \leq 10 V$                                                        | —     | 0.8   | 2.4   | mV/V     |
|                                                                             |                           | $10 V \leq V_{KA} \leq 19 V$                                                           | —     | 0.8   | 2.0   |          |
| Reference input current                                                     | $I_{REF}$                 | $V_{KA} = V_{REF}$                                                                     | —     | 0.6   | 3     | $\mu A$  |
| Deviation of reference input current over temperature                       | $I_{REF} (dev)$           | $0^\circ C \leq T_j \leq 70^\circ C, V_{KA} = V_{REF}, R_1 = 10 k\Omega, R_2 = \infty$ | —     | 0.3   | 1.2   | $\mu A$  |
| Minimum cathode current for regulation                                      | $I_{Kmin}$                | $V_{KA} = V_{REF}$                                                                     | —     | 0.2   | 0.5   | mA       |
| Off-State cathode current                                                   | $I_{Koff}$                | $V_{KA} = 19 V, V_{REF} = 0 V$                                                         | —     | —     | 1.0   | $\mu A$  |
| Dynamic impedance                                                           | $ Z_{KA} $                | $V_{KA} = V_{REF}, f \leq 1 kHz, 0.5 mA \leq I_K \leq 40 mA$                           | —     | 0.2   | 0.5   | $\Omega$ |

## Note on Electrical Characteristics

$T_j = 25^\circ\text{C}$  in the measurement conditions of each item is a regulation for where a pulse test is carried out and any drift in the electrical characteristic due to a rise in the junction temperature of the chip may be disregarded.

The deviation parameters  $V_{\text{REF}}(\text{dev})$  and  $I_{\text{REF}}(\text{dev})$  are defined as the maximum variation of the  $V_{\text{REF}}$  and  $I_{\text{REF}}$  over the rated temperature range ( $T_j = 0$  to  $70^\circ\text{C}$ ).

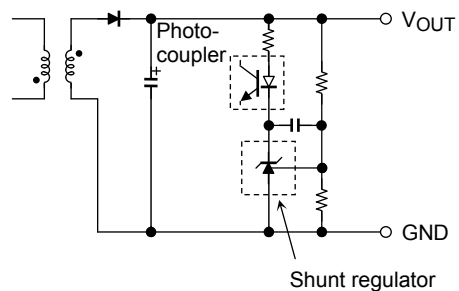
The average temperature coefficient of the  $V_{\text{REF}}$  is defined as:



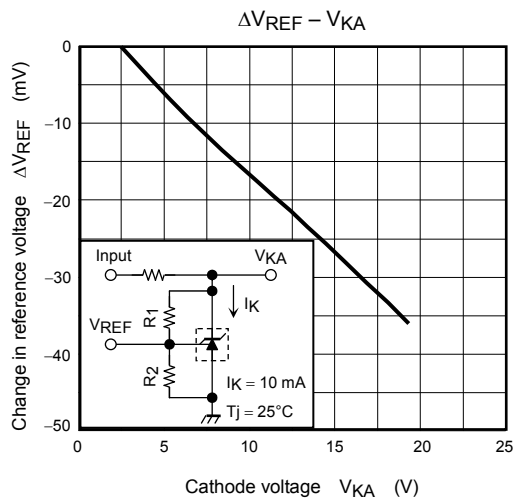
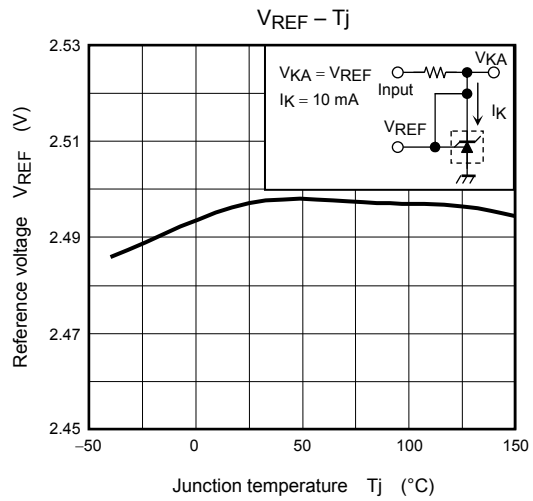
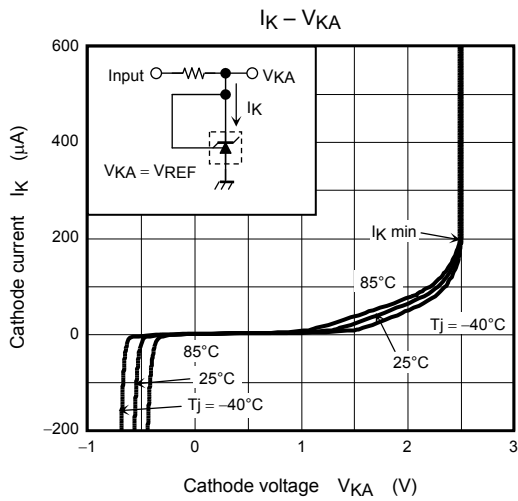
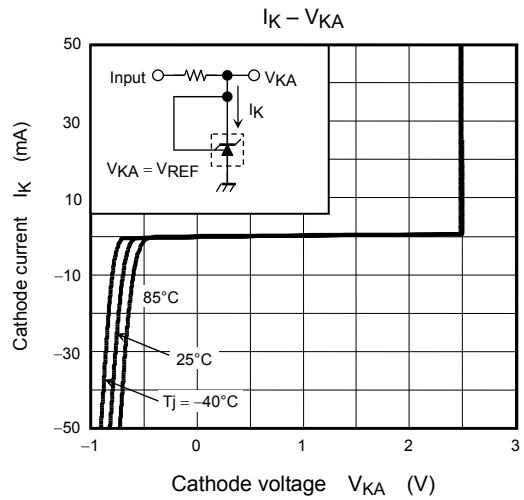
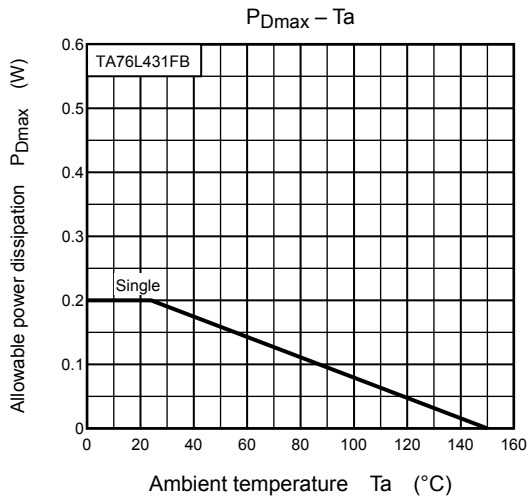
$$|\alpha V_{\text{REF}}| = \frac{\left( \frac{V_{\text{REF}}(\text{dev}) \times 10^6}{V_{\text{REF}} @ 25^\circ\text{C}} \right)}{\Delta T_j} \text{ (ppm/}^\circ\text{C)}$$

## Application Circuit Example

Error amplification circuit for switching power supply



This circuit amplifies the difference between the switching power supply's secondary output voltage and the shunt regulator's reference voltage. It then feeds the amplified voltage back to the primary input voltage via the photocoupler.

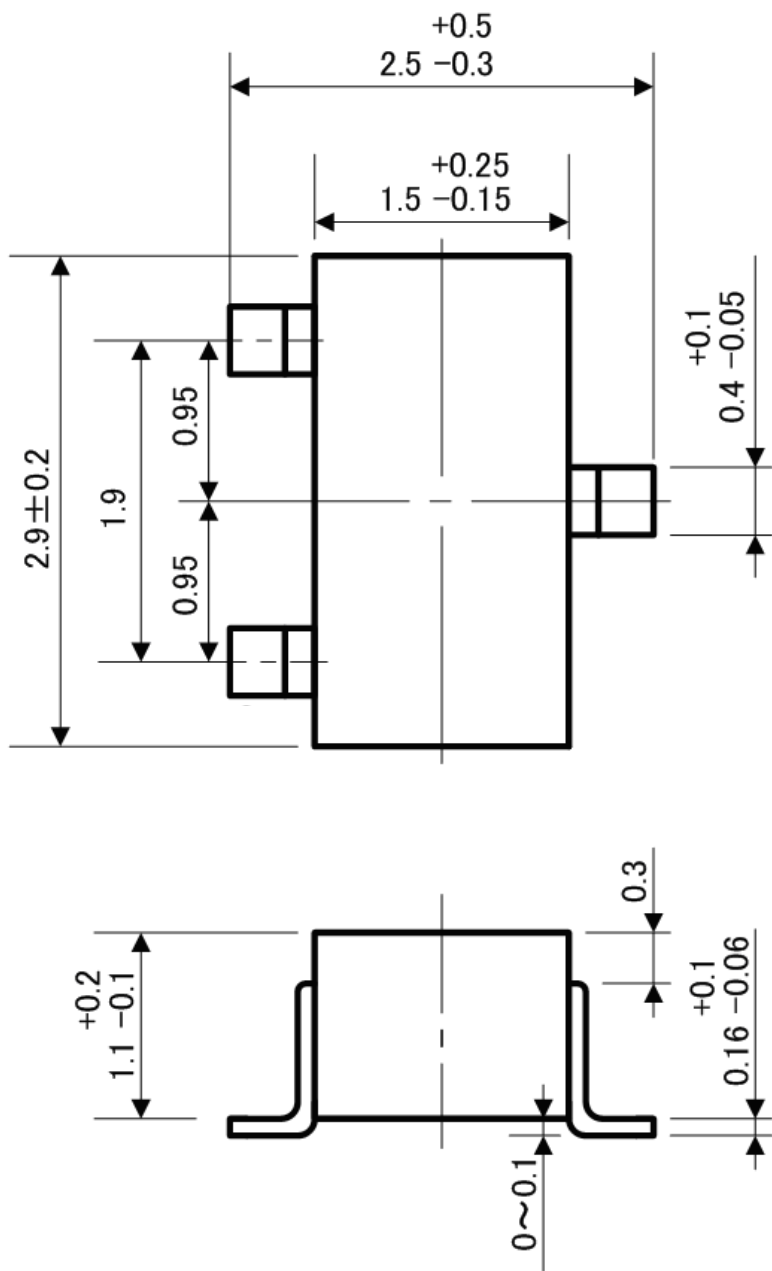




Package Dimensions

SOP3-P-0302-0.95

Unit : mm



Weight: 0.012 g (typ.)

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