

TA76L431FT,TA76L431S

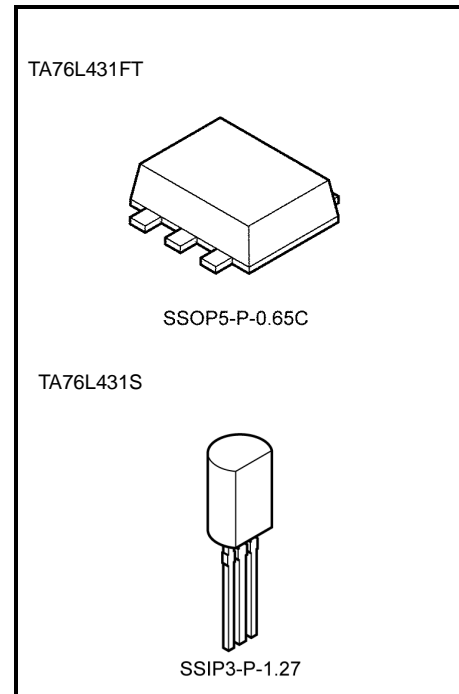
2.49-V Adjustable High-Precision Shunt Regulators

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 2.49 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
: $V_{REF} = 2.49V \pm 1.0\%$ ($T_a = 25^\circ C$)
- Adjustable output voltage
: $V_{REF} \leq V_{OUT} \leq 19 V$
- Minimum cathode current for regulation
: $I_{kmin} = 0.5 \text{ mA (max.)}$
- Operating temperature: $T_a = -40 \sim 85^\circ C$
- Packages: UFV (TA76L431FT),
TO-92MOD (TA76L431S)
- The TA76L431FT is housed in an ultra-thin UFV package.
(thickness: 0.7 mm typ.)



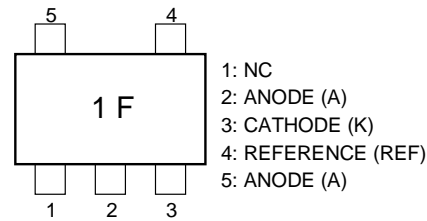
Weight

SSOP5-P-0.65C : 0.007 g (typ.)

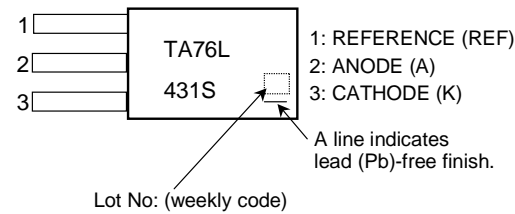
SSIP3-P-1.27 : 0.36 g (typ.)

Pin Assignment/Marking

TA76L431FT



TA76L431S

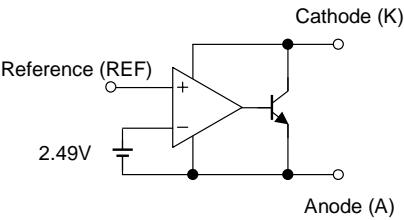


How to Order

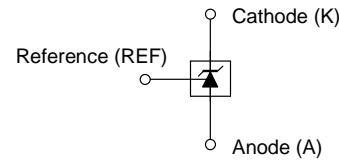
| Product No. | Package Type | Packing Type and Capacity | Minimum Order |
|----------------------|-----------------------------|---------------------------|---------------|
| TA76L431FT (TE85L,F) | UFV (surface-mount type) | Embossed tape: 3000/tape | 1 tape |
| TA76L431S(Q) | TO-92MOD (lead type) | Loose in bag: 200/bag | 1 bag |
| TA76L431S (TPE6,Q) | | Radial tape: 2000/tape | 1 tape |

Note: The lead pitch for the TA76L431S(Q) and TA76L431S(TPE6,Q) may vary.

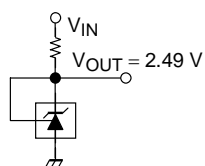
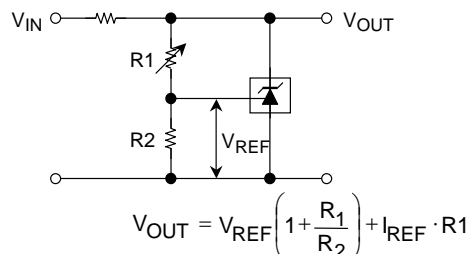
Functional Block Diagram



Circuit Symbol



Typical Application Circuits

(1) 2.49 V Reference ($V_{KA} = V_{REF}$)(2) Shunt regulator ($V_{KA} > V_{REF}$)

Precautions during Use

1. TA76L431FT, TA76L431S

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

2. TA76L431FT, TA76L431S

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 maximum rating values specified in these datasheets so as to allow an operational safety margin.

Use of a laminated ceramic capacitor is recommended

3. Precautions when handling anode pin of TA76L431FT

Pin 2 and pin 5 should normally be shorted together. If only pin 5 is used, pin 2 should either be left open or always kept at a lower potential than pin 5. Do not leave pin 5 open and use pin 2 only.

Maximum Ratings ($T_a = 25^\circ\text{C}$)

| 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 | μA |
| Reference-anode reverse current | $-I_{REF}$ | 10 | mA |
| Power dissipation | TA76L431FT | P_D | W |
| | TA76L431S | | |
| Thermal resistance | TA76L431FT | R_{th} | $^\circ\text{C/W}$ |
| | TA76L431S | | |
| Operating temperature | T_{opr} | -40~85 | $^\circ\text{C}$ |
| Junction temperature | T_j | 150 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | -55~150 | $^\circ\text{C}$ |

Note 1: Glass epoxy substrate mounting: 30 mm × 30 mm × 0.8 mm (Cu pad area 35 mm²)

Recommended Operating Conditions

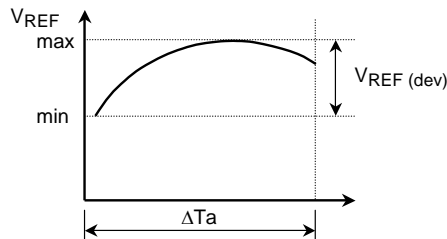
| Characteristics | Symbol | Min | Typ. | Max | Unit |
|-----------------------|-----------|-----------|------|-----|------|
| Cathode voltage | V_{KA} | V_{REF} | — | 19 | V |
| Cathode current | I_K | 0.5 | — | 40 | mA |
| Operating temperature | T_{opr} | -40 | — | 85 | °C |

Electrical Characteristics (Unless otherwise specified, $T_a = 25^\circ\text{C}$, $I_K = 10\text{ mA}$)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------------------|--|-------|------|-------|---------------|
| Reference voltage | V_{REF} | $V_{KA} = V_{REF}$ | 2.465 | 2.49 | 2.515 | V |
| Deviation of reference input voltage over temperature | $V_{REF}(\text{dev})$ | $0^\circ\text{C} \leq T_a \leq 70^\circ\text{C}$, $V_{KA} = V_{REF}$ | — | 5 | 15 | mV |
| Ratio of change in reference input voltage to the change in cathode voltage | $\Delta V_{REF}/\Delta V$ | $V_{REF} \leq V_{KA} \leq 10\text{ V}$ | — | 0.8 | 2.4 | mV/V |
| | | $10\text{ V} \leq V_{KA} \leq 19\text{ V}$ | — | 0.8 | 2.0 | |
| Reference Input current | I_{REF} | $V_{KA} = V_{REF}$ | — | 0.6 | 3 | μA |
| Deviation of reference input current over temperature | $I_{REF}(\text{dev})$ | $0^\circ\text{C} \leq T_a \leq 70^\circ\text{C}$, $V_{KA} = V_{REF}$, $R_1 = 10\text{ k}\Omega$, $R_2 = \infty$ | — | 0.3 | 1.2 | μA |
| Minimum cathode current for regulation | I_{Kmin} | $V_{KA} = V_{REF}$ | — | 0.2 | 0.5 | mA |
| Off-State cathode current | I_{Koff} | $V_{KA} = 19\text{ V}$, $V_{REF} = 0\text{ V}$ | — | — | 1.0 | μA |
| Dynamic impedance | $ Z_{KA} $ | $V_{KA} = V_{REF}$, $f \leq 1\text{ kHz}$, $0.5\text{ mA} \leq I_K \leq 40\text{ mA}$ | — | 0.2 | 0.5 | Ω |

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

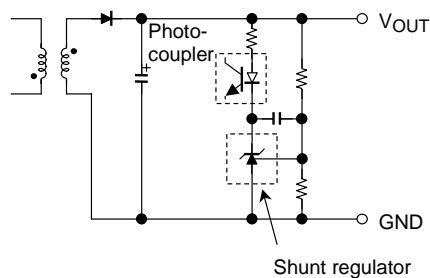
The average temperature coefficient of the V_{REF} is defined as:



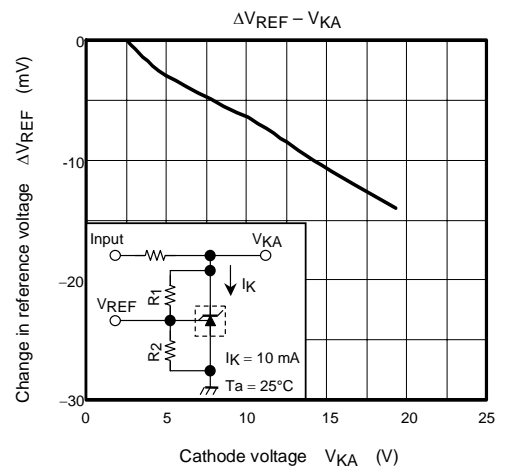
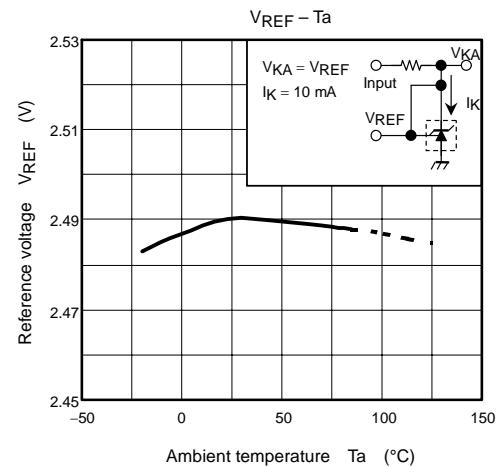
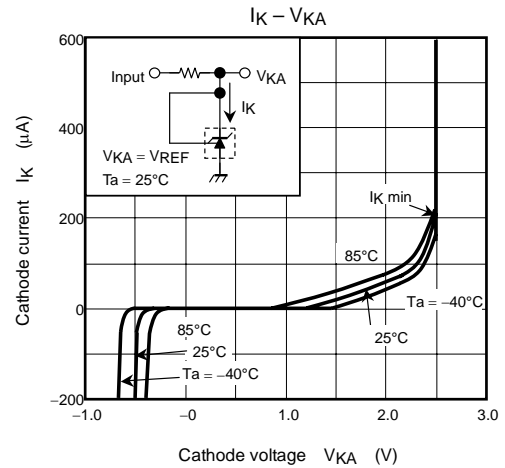
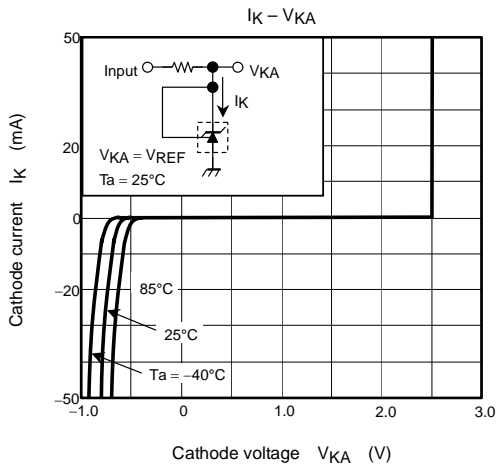
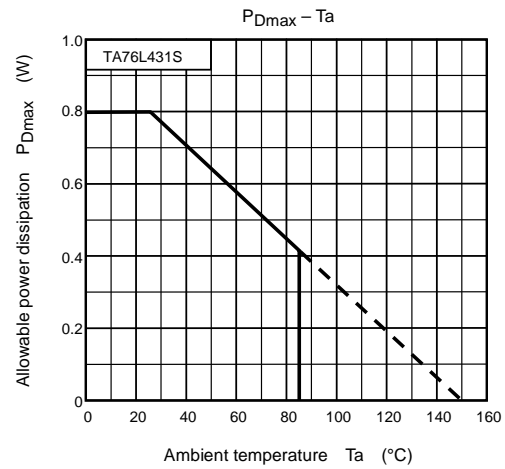
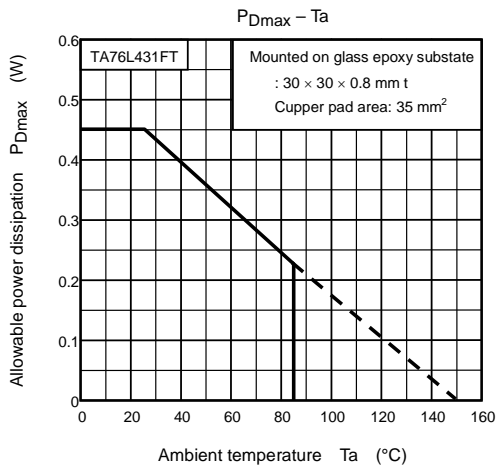
$$|\alpha V_{REF}| = \frac{\left(\frac{V_{REF}(\text{dev}) \times 10^6}{V_{REF} @ 25^\circ\text{C}} \right)}{\Delta T_a} \text{ (ppm/}^\circ\text{C)}$$

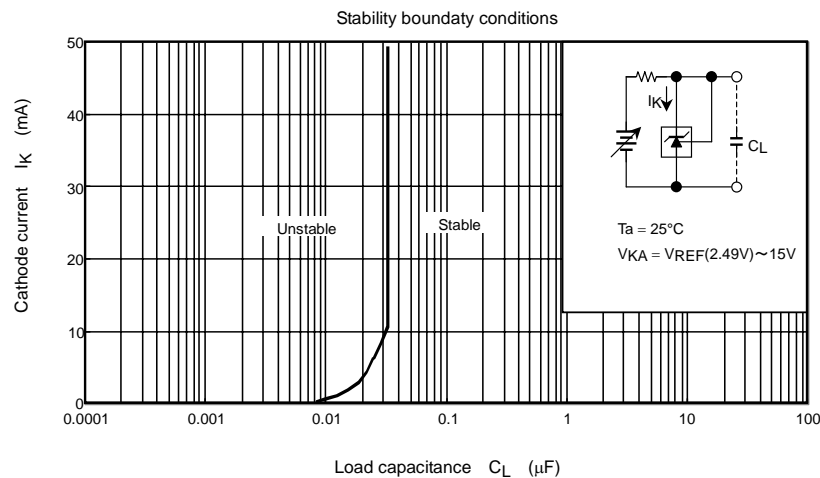
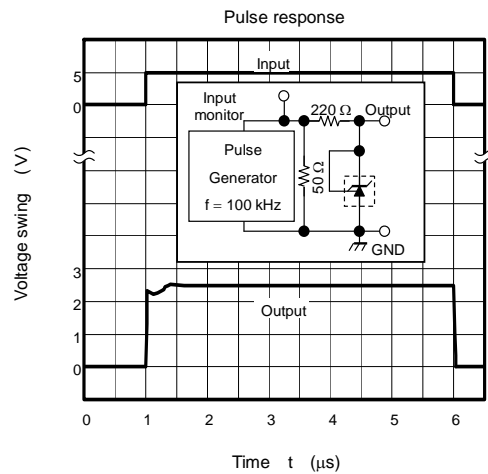
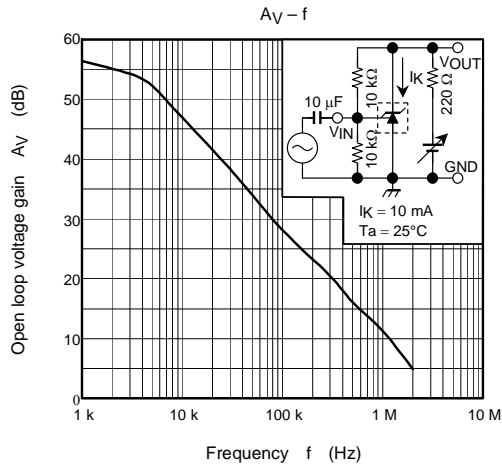
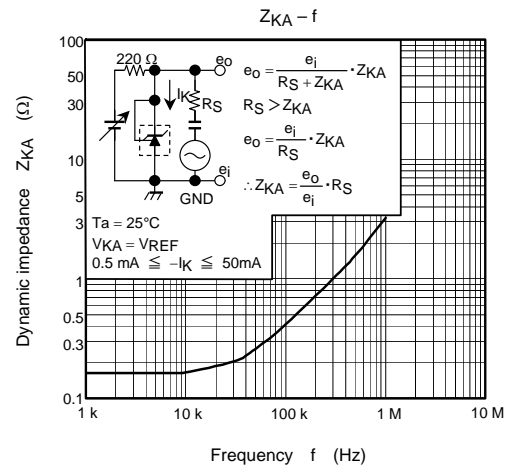
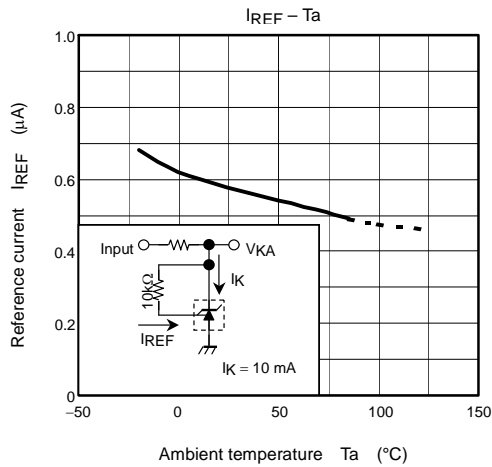
Application Circuit Example

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.

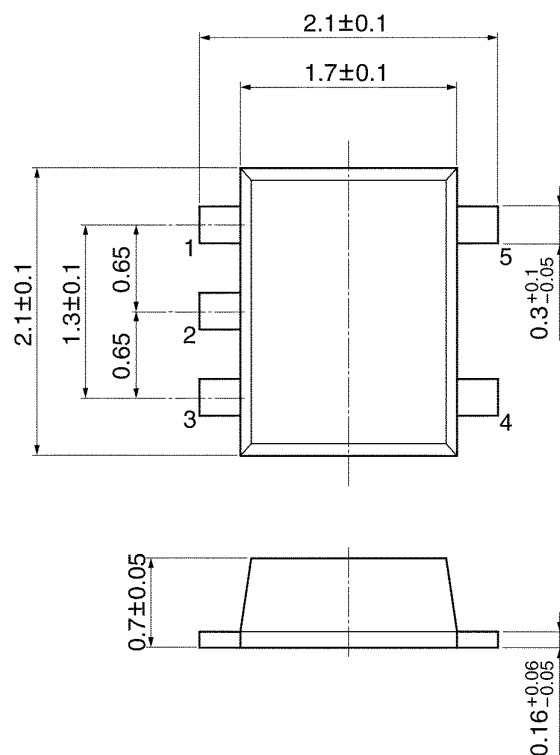




Package Dimensions

SSOP5-P-0.65C

Unit: mm

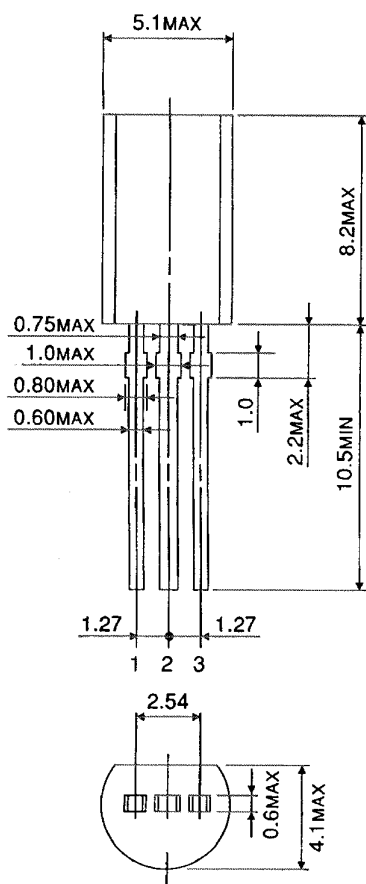


TA76L431FT (UFV)

Weight: 0.007 g (typ.)

Package Dimensions

SSIP3-P-1.27



TA76L431S (TO-92MOD)

Weight: 0.36 g (typ.)

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