

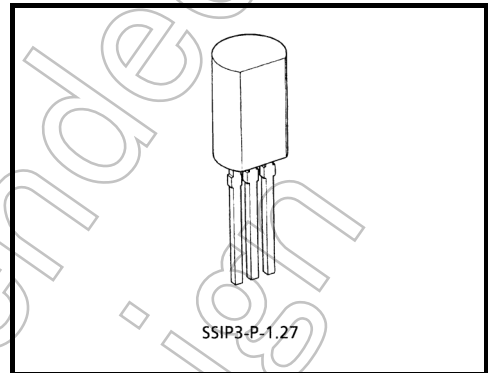
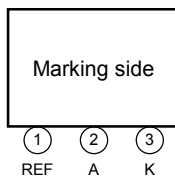
# TA76431S

## Adjustable Precision Shunt Regulator

### Features

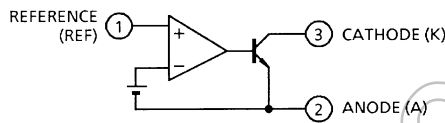
- Precision reference voltage:  $V_{REF} = 2.495\text{ V} \pm 2.2\%$
- Small temperature coefficient:  $|\alpha V_{REF}| = 46\text{ ppm}/^\circ\text{C}$
- Adjustable output voltage:  $V_{REF} \leq V_{OUT} \leq 36\text{ V}$
- Low dynamic output impedance:  $|Z_{KA}| = 0.15\ \Omega$  (Typ.)

### Pin Assignment

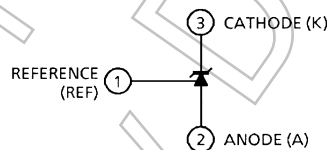


Weight: 0.36 g (typ.)

### Functional Block Diagram

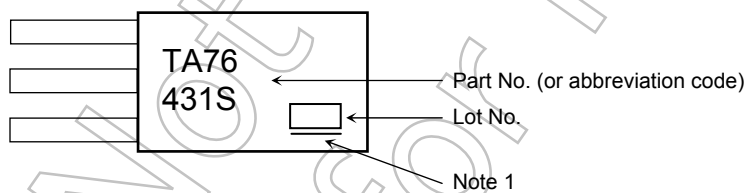


### Circuit Symbol



This IC contains electrostatic sensitive elements.  
Please handle with caution.

### Marking



Note 1: A line under a Lot No. identifies the indication of product Labels.  
Not underlined:  $[[\text{Pb}]]/\text{INCLUDES} > \text{MCV}$   
Underlined:  $[[\text{G}]]/\text{RoHS COMPATIBLE}$  or  $[[\text{G}]]/\text{RoHS} [[\text{Pb}]]$

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

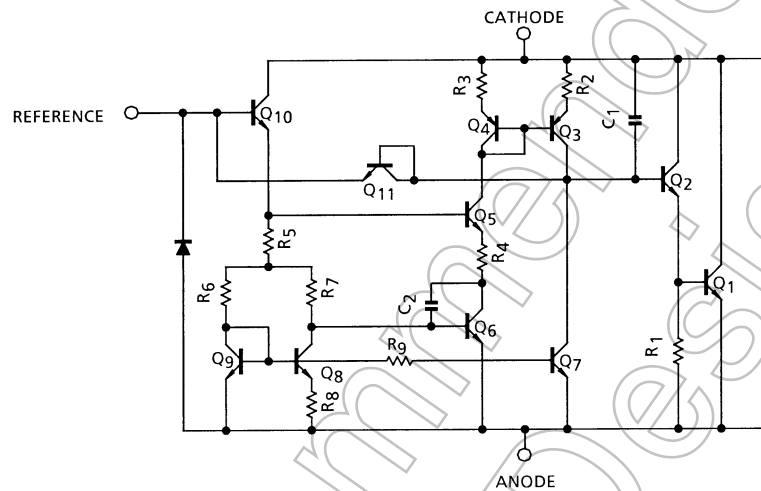
Start of commercial production  
1998-11

## How to Order

Product No.	Package Type	Packing Type and Capacity
TA76431S (F)	LSTM	Loose in bag: 200 pcs/bag
TA76431S (TPE6,F)	(lead type)	Radial tape: 2000 pcs/reel

Note 2: The product supplied as TA76431S(TPE6,F) is different from TA76431S(F) in the lead pitch between the terminal.

## Equivalent Circuit



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

Characteristics	Symbol	Rating	Unit
Cathode voltage	$V_{KA}$	37	V
Cathode current	$I_K$	-100 to 150	mA
Reference voltage	$V_{REF}$	7	V
Reference current	$I_{REF}$	50	$\mu$ A
Reference-anode reverse current	$-I_{REF}$	10	mA
Power dissipation	$P_D$	800	mW
Operating temperature	$T_{opr}$	-40 to 85	°C
Storage temperature	$T_{stg}$	-55 to 150	°C

Note 3: 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	$V_{KA}$	$V_{REF}$	–	36	V
Cathode current	$I_K$	1	–	100	mA
Operating temperature	$T_{opr}$	-40	–	85	°C

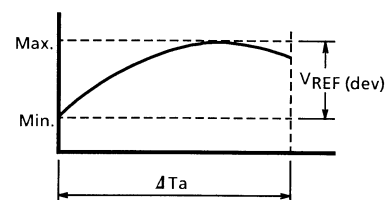
## Electrical Characteristics (Unless otherwise specified, $T_a = 25^\circ\text{C}$ , $I_K = 10\text{ mA}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Reference voltage	$V_{REF}$	$V_{KA} = V_{REF}$	2.440	2.495	2.550	V
Deviation of reference input voltage over temperature	$V_{REF}(\text{dev})$ (Note 4)	$0^\circ\text{C} \leq T_a \leq 70^\circ\text{C}$ , $V_{KA} = V_{REF}$	–	8	17	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	2.7	mV/V
		$10\text{ V} \leq V_{KA} \leq 36\text{ V}$	–	0.5	2.0	
Reference input current	$I_{REF}$	$V_{KA} = V_{REF}$	–	1.4	4	$\mu\text{A}$
Deviation of reference input current over temperature	$I_{REF}(\text{dev})$ (Note 4)	$0^\circ\text{C} \leq T_a \leq 70^\circ\text{C}$ , $V_{KA} = V_{REF}$ $R_1 = 10\text{ k}\Omega$ , $R_2 = \infty$	–	0.3	1.2	$\mu\text{A}$
Minimum cathode current for regulation	$I_{Kmin}$	$V_{KA} = V_{REF}$	–	0.4	1.0	mA
Off-state cathode current	$I_{Koff}$	$V_{KA} = 36\text{ V}$ , $V_{REF} = 0\text{ V}$	–	–	1.0	$\mu\text{A}$
Dynamic impedance	$ Z_{KA} $	$V_{KA} = V_{REF}$ , $f \leq 1\text{ kHz}$ $1\text{ mA} \leq I_K \leq 100\text{ mA}$	–	0.15	0.5	$\Omega$

Note 4: 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.

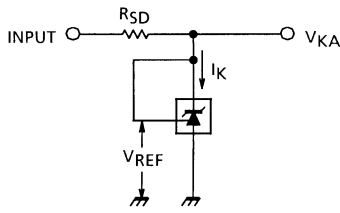
The average temperature coefficient of the  $V_{REF}$  is defined as:

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

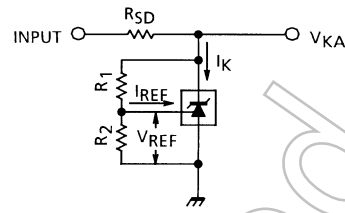


**Test Parameter**

**(1)  $V_{KA} = V_{REF}$  mode**

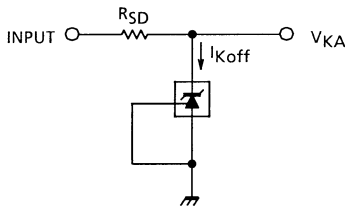


**(2)  $V_{KA} > V_{REF}$  mode**



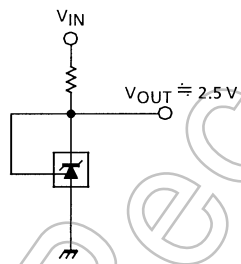
$$V_{KA} = V_{REF} \left( 1 + \frac{R_1}{R_2} \right) + I_{REF} \cdot R_1$$

**(3) Off-state mode**

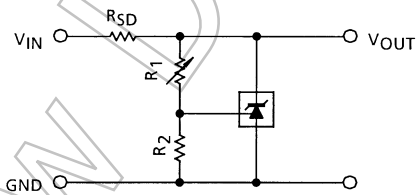


**Typical Applications**

**(1) 2.5 V reference**

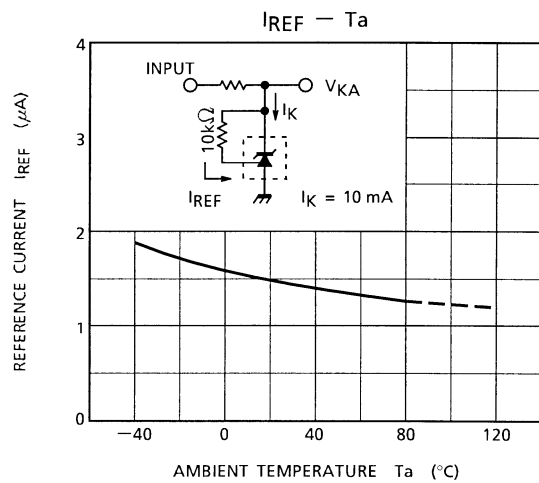
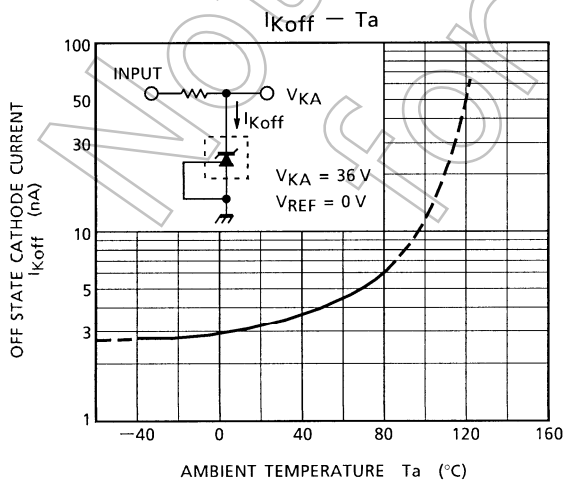
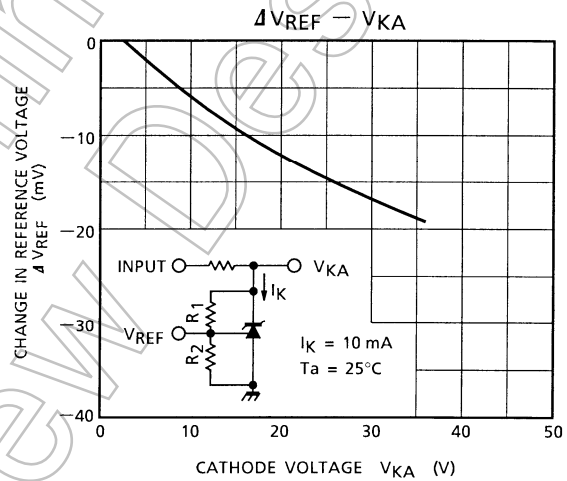
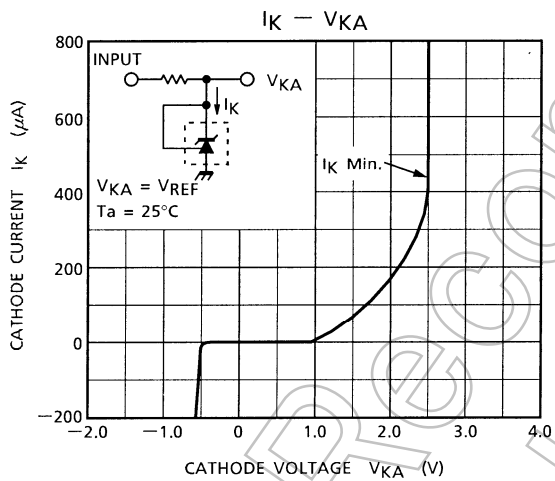
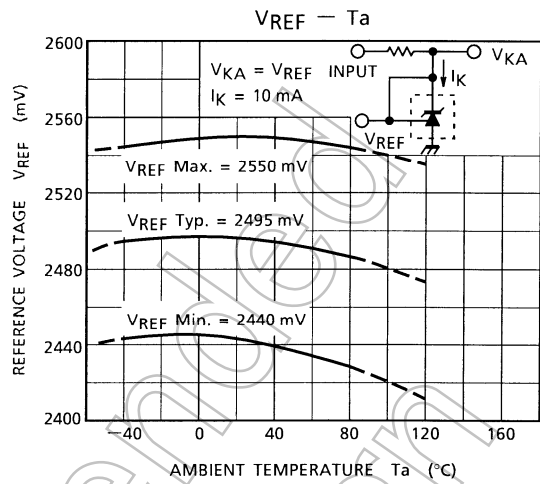
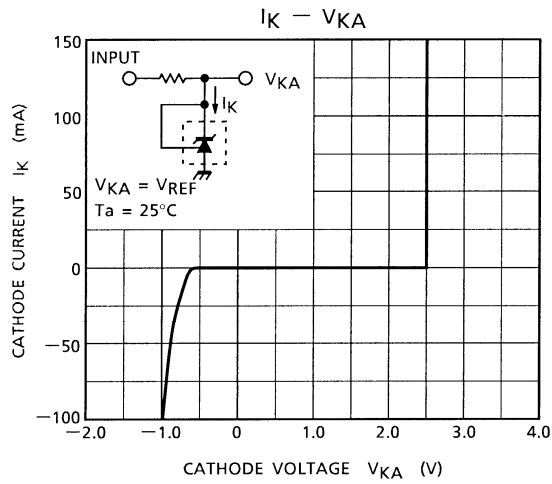


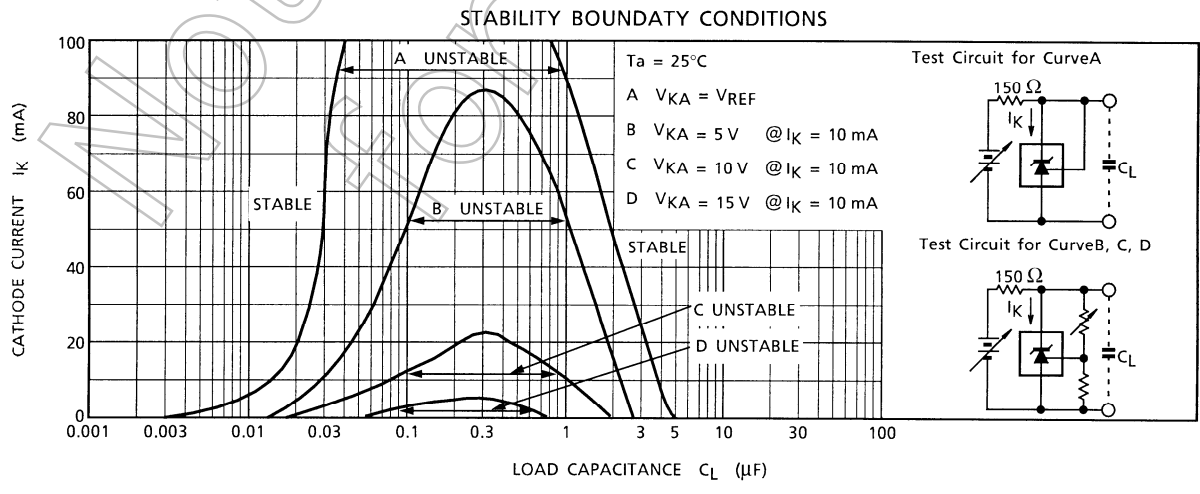
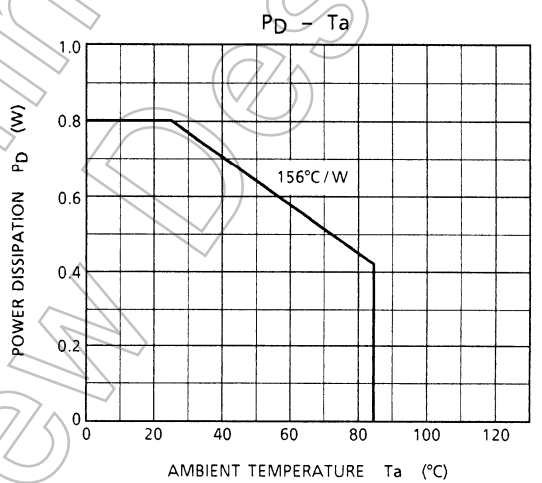
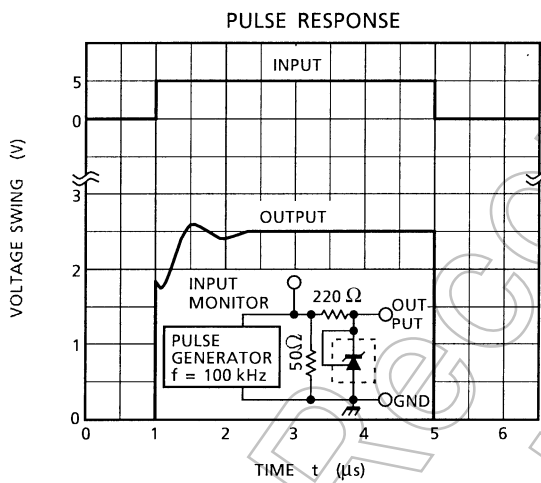
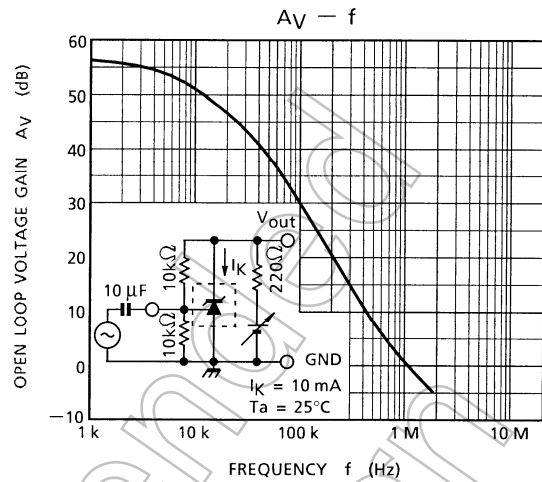
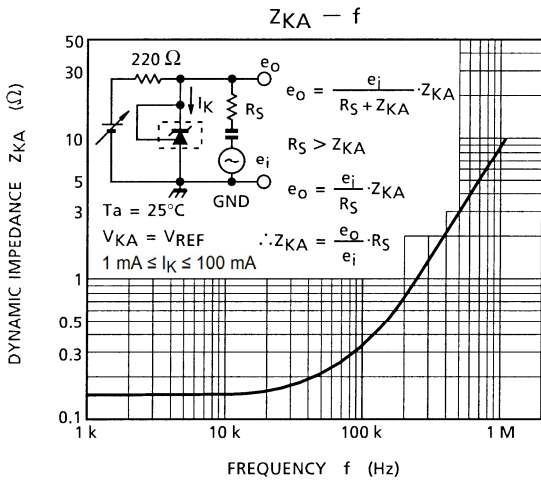
**(2) Shunt regulator**



$$V_{OUT} = V_{REF} \left( 1 + \frac{R_1}{R_2} \right) + I_{REF} \cdot R_1$$

Not Recommended for New Design

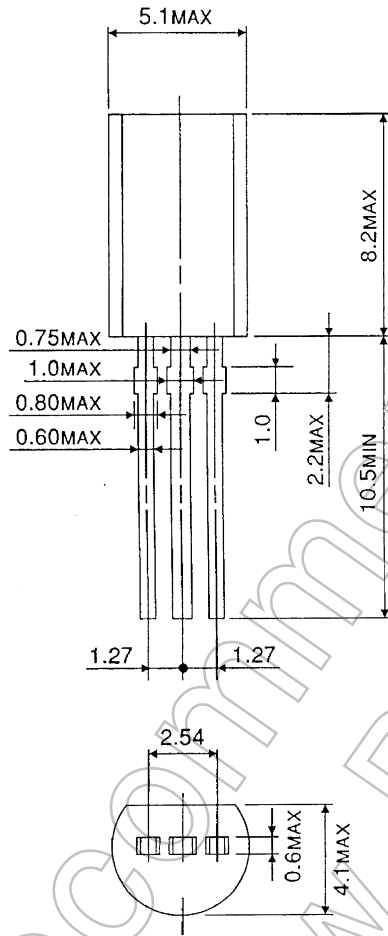




**Package Dimensions**

SSIP3-P-1.27

Unit : mm



Weight : 0.36 g (Typ.)

Not Recommended for New Design

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