

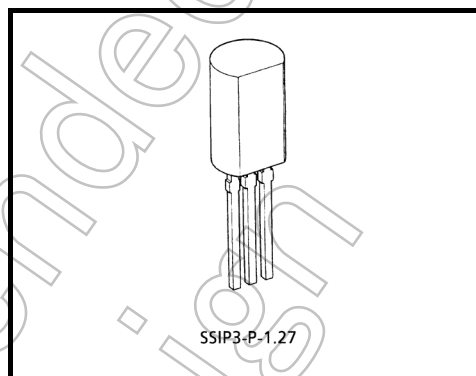
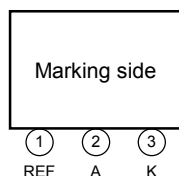
# TA76431S

## Adjustable Precision Shunt Regulator

### Features

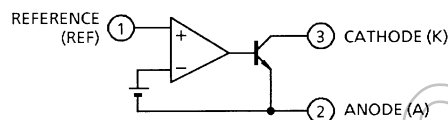
- Precision reference voltage:  $V_{REF} = 2.495 \text{ V} \pm 2.2\%$
- Small temperature coefficient:  $|\alpha V_{REF}| = 46 \text{ ppm}/^\circ\text{C}$
- Adjustable output voltage:  $V_{REF} \leq V_{OUT} \leq 36 \text{ V}$
- Low dynamic output impedance:  $|Z_{KA}| = 0.15 \Omega \text{ (Typ.)}$

### Pin Assignment

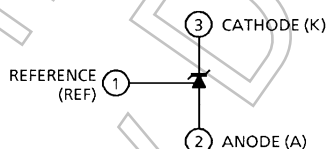


Weight: 0.36 g (typ.)

### Functional Block Diagram

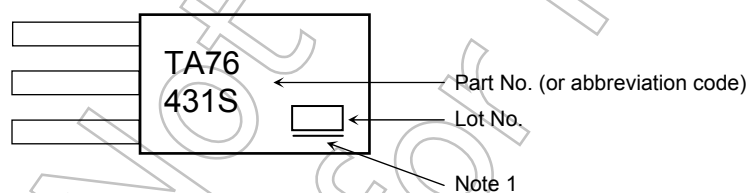


### Circuit Symbol



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 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

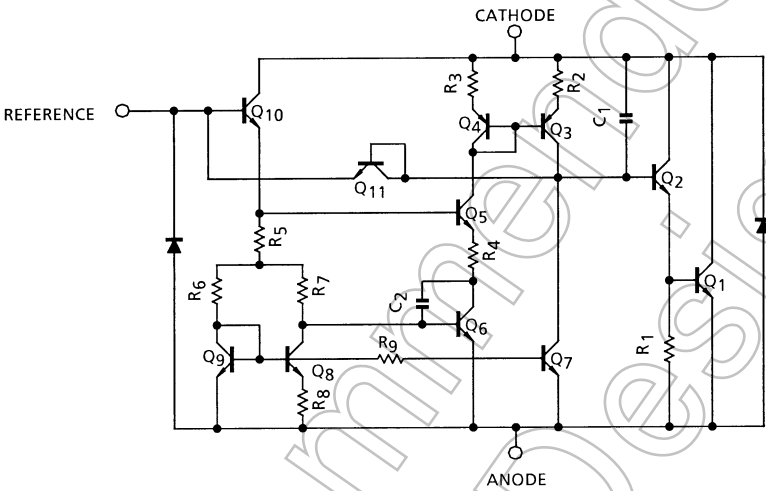
Start of commercial production  
1998-11

How to Order

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

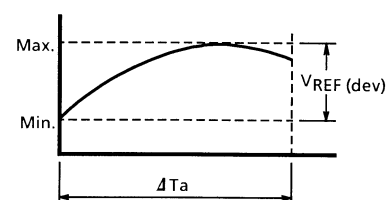
## Electrical Characteristics (Unless otherwise specified, $T_a = 25^\circ\text{C}$ , $I_K = 10\text{ mA}$ )

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.

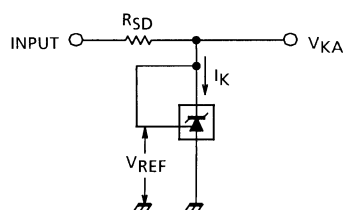
The average temperature coefficient of the  $V_{REF}$  is defined as:

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

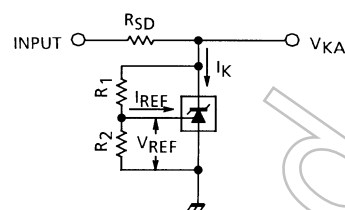


## Test Parameter

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

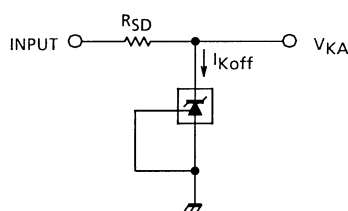


### (2) $V_{KA} > V_{REF}$ mode



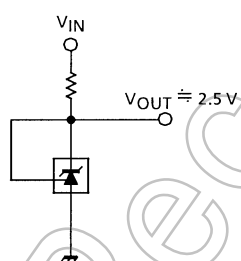
$$V_{KA} = V_{REF} \left( 1 + \frac{R_1}{R_2} \right) + I_{REF} \cdot R_1$$

### (3) Off-state mode

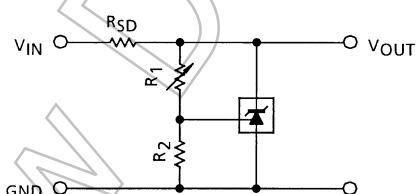


## Typical Applications

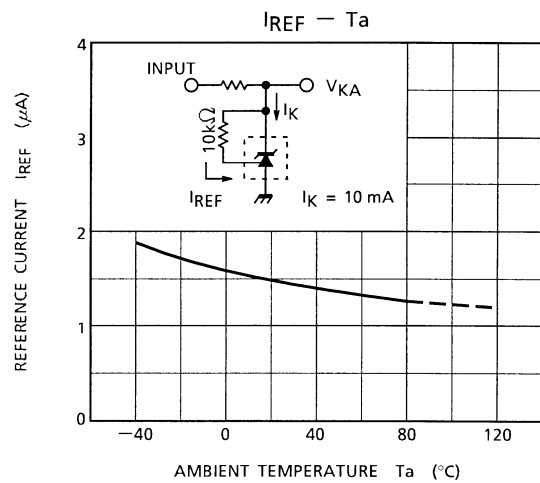
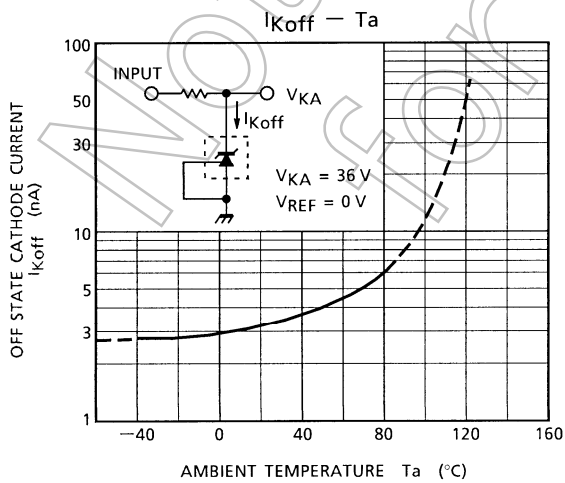
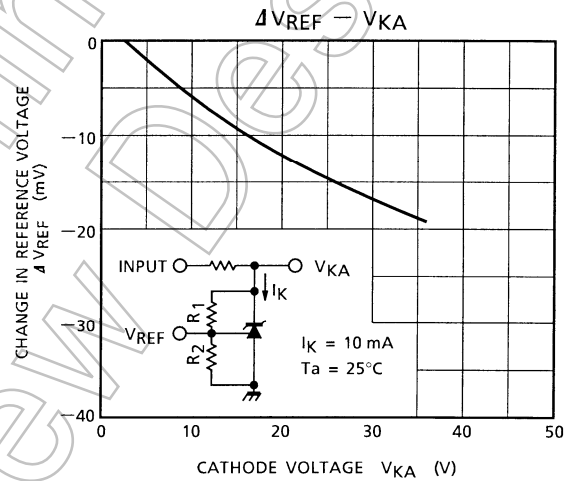
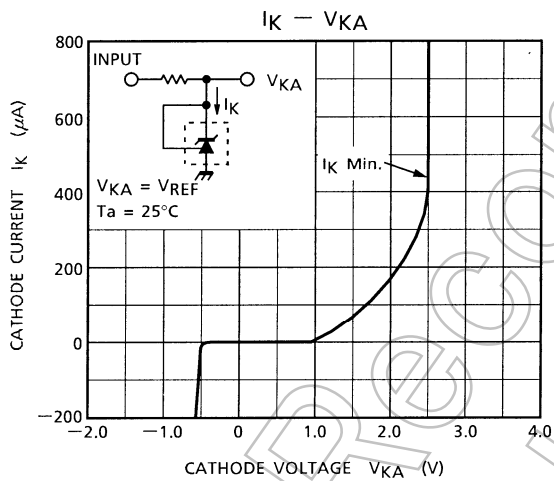
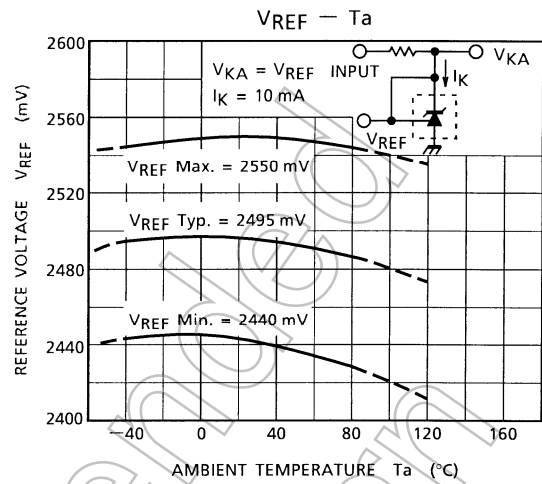
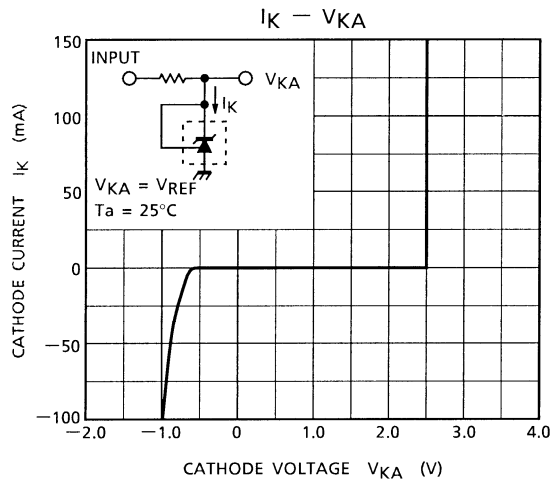
### (1) 2.5 V reference

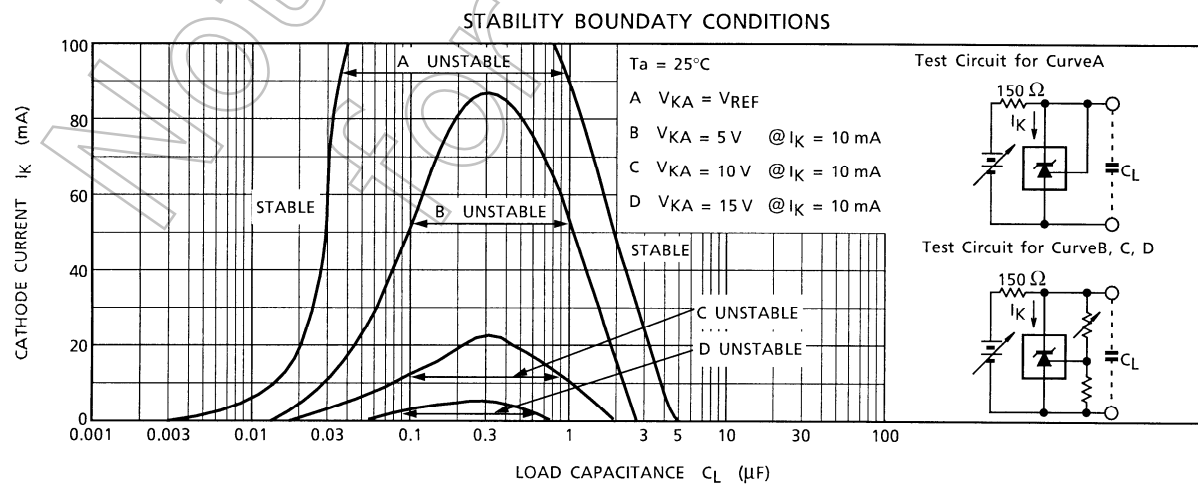
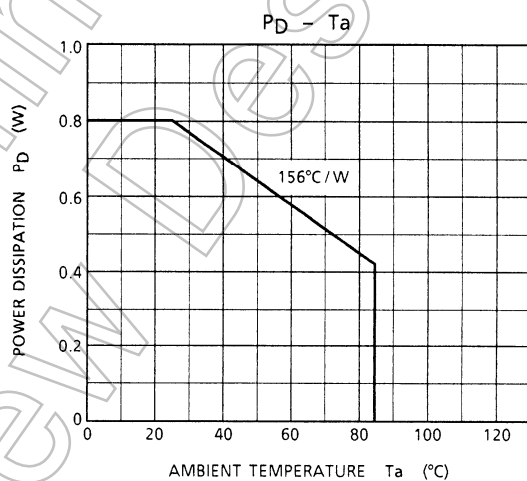
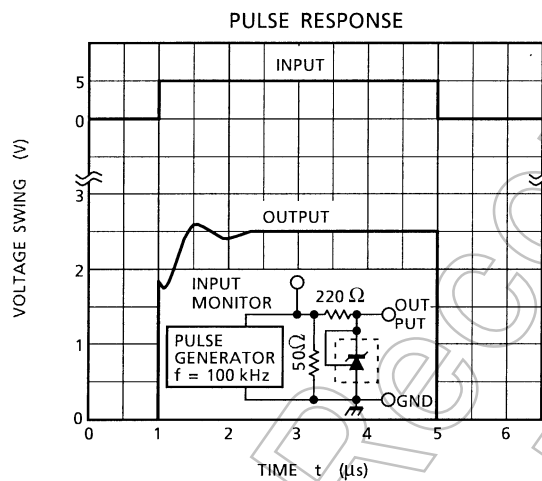
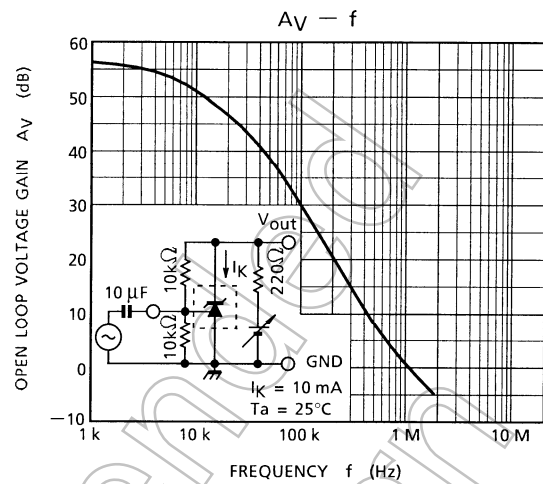
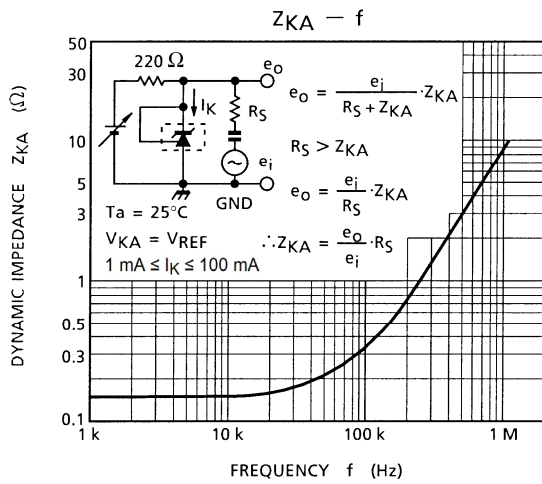


### (2) Shunt regulator



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

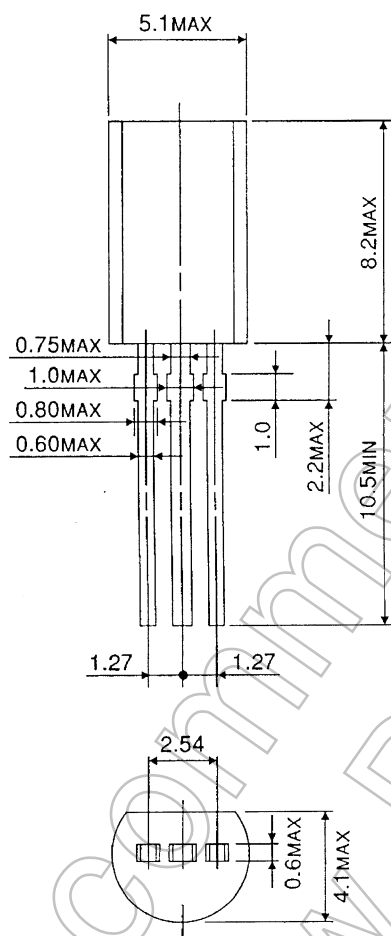




## Package Dimensions

SSIP3-P-1.27

Unit : mm



Weight : 0.36 g (Typ.)

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