

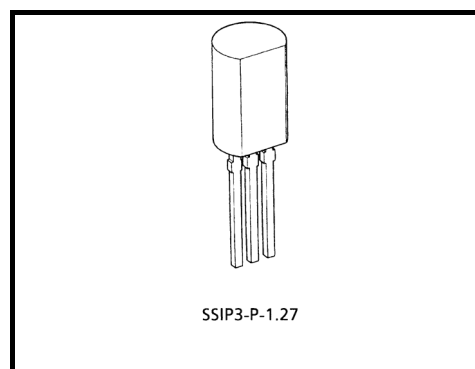
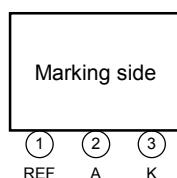
# TA76431S

## Adjustable Precision Shunt Regulator

### Features

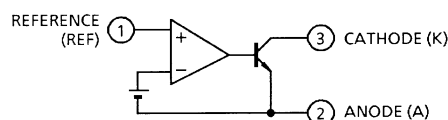
- Precision reference voltage:  $V_{REF} = 2.495 \text{ V} \pm 2.2\%$
- Small temperature coefficient:  $|\alpha V_{REF}| = 46 \text{ ppm}/^\circ\text{C}$
- Adjustable output voltage:  $V_{REF} \leq V_{OUT} \leq 36 \text{ V}$
- Low dynamic output impedance:  $|Z_{KA}| = 0.15 \Omega$  (Typ.)

### Pin Assignment

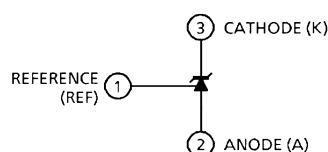


Weight: 0.36 g (typ.)

### Functional Block Diagram

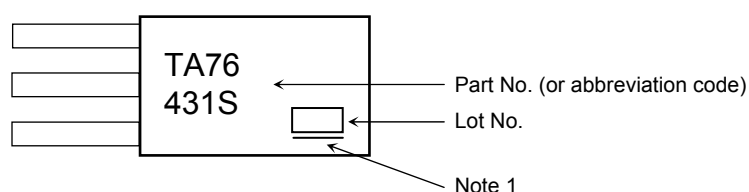


### Circuit Symbol



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

### Marking



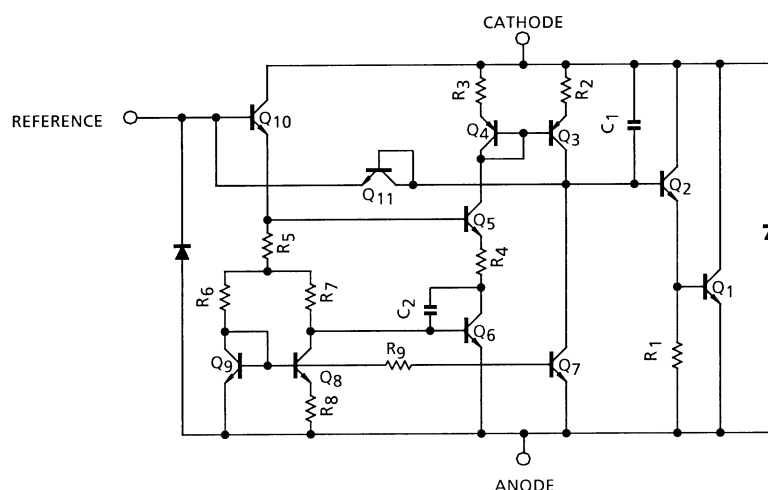
Note 1: A line under a Lot No. identifies the indication of product Labels.

Not underlined:  $[[Pb]]/INCLUDES > MCV$

Underlined:  $[[G]]/RoHS COMPATIBLE$  or  $[[G]]/RoHS [[Pb]]$

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.

## 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	$T_a = 25^\circ C$ $P_D$	800	mW
Operating temperature	$T_{opr}$	-40 to 85	$^\circ C$
Storage temperature	$T_{stg}$	-55 to 150	$^\circ C$

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	$V_{KA}$	$V_{REF}$	—	36	V
Cathode current	$I_K$	1	—	100	mA
Operating temperature	$T_{opr}$	-40	—	85	$^\circ C$

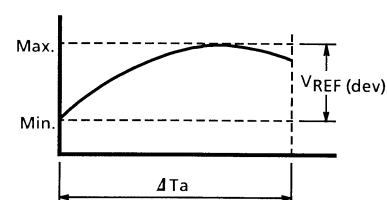
## Electrical Characteristics (Unless otherwise specified, Ta = 25°C, I<sub>K</sub> = 10 mA)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Reference voltage	V <sub>REF</sub>	V <sub>KA</sub> = V <sub>REF</sub>	2.440	2.495	2.550	V
Deviation of reference input voltage over temperature	V <sub>REF (dev)</sub> (Note 3)	0°C ≤ Ta ≤ 70°C, V <sub>KA</sub> = V <sub>REF</sub>	—	8	17	mV
Ratio of change in reference input voltage to the change in cathode voltage	ΔV <sub>REF</sub> /ΔV	V <sub>REF</sub> ≤ V <sub>KA</sub> ≤ 10 V	—	0.8	2.7	mV/V
		10 V ≤ V <sub>KA</sub> ≤ 36 V	—	0.5	2.0	
Reference input current	I <sub>REF</sub>	V <sub>KA</sub> = V <sub>REF</sub>	—	1.4	4	μA
Deviation of reference input current over temperature	I <sub>REF (dev)</sub> (Note 3)	0°C ≤ Ta ≤ 70°C, V <sub>KA</sub> = V <sub>REF</sub> R <sub>1</sub> = 10 kΩ, R <sub>2</sub> = ∞	—	0.3	1.2	μA
Minimum cathode current for regulation	I <sub>Kmin</sub>	V <sub>KA</sub> = V <sub>REF</sub>	—	0.4	1.0	mA
Off-state cathode current	I <sub>Koff</sub>	V <sub>KA</sub> = 36 V, V <sub>REF</sub> = 0 V	—	—	1.0	μA
Dynamic impedance	Z <sub>KA</sub>	V <sub>KA</sub> = V <sub>REF</sub> , f ≤ 1 kHz 1 mA ≤ I <sub>K</sub> ≤ 100 mA	—	0.15	0.5	Ω

Note 3: The deviation parameters V<sub>REF (dev)</sub> and I<sub>REF (dev)</sub> are defined as the maximum variation of the V<sub>REF</sub> and I<sub>REF</sub> over the rated temperature range.

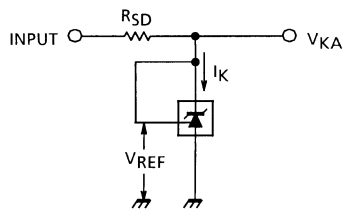
The average temperature coefficient of the V<sub>REF</sub> is defined as:

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

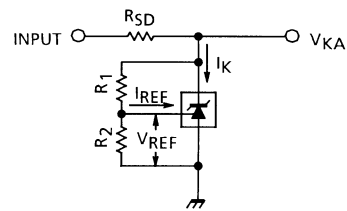


## Test Parameter

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

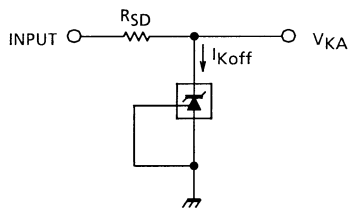


### (2) $V_{KA} > V_{REF}$ mode



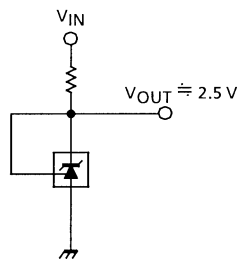
$$V_{KA} = V_{REF} \left( 1 + \frac{R_1}{R_2} \right) + I_{REF} \cdot R_1$$

### (3) Off-state mode

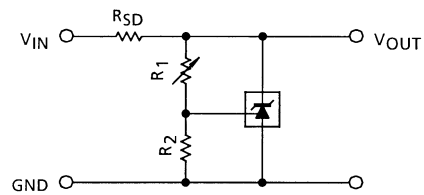


## Typical Applications

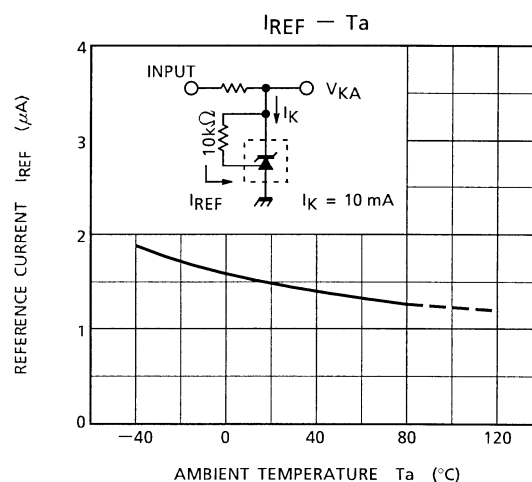
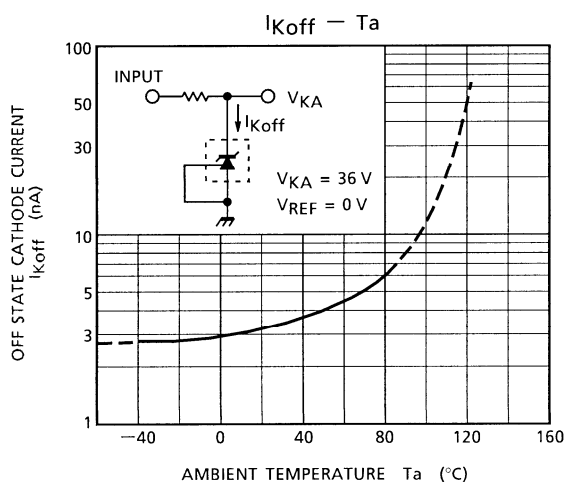
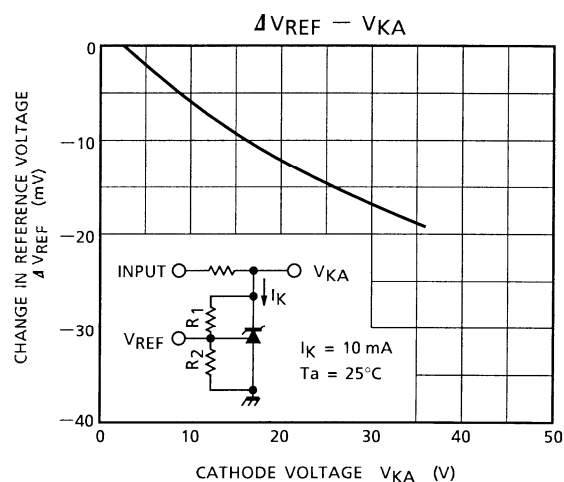
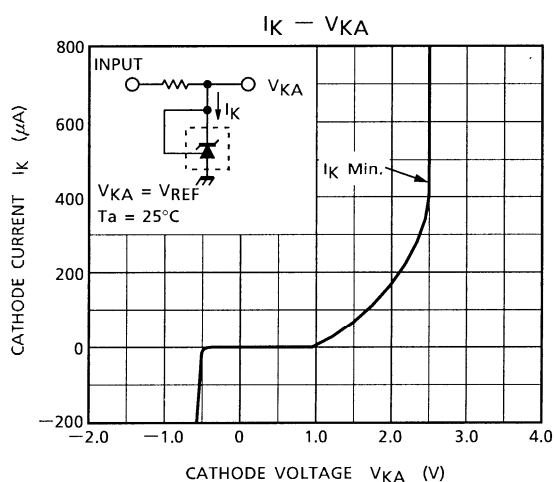
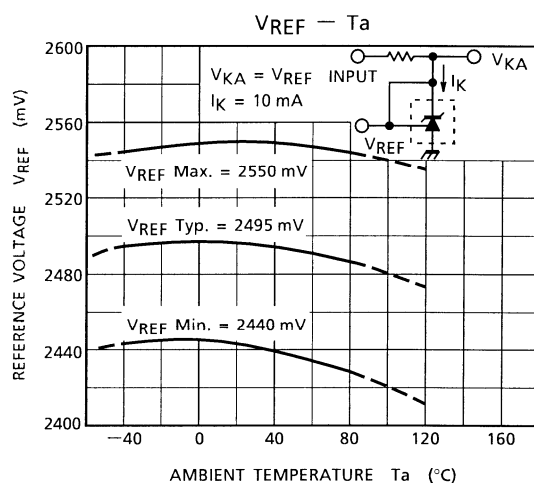
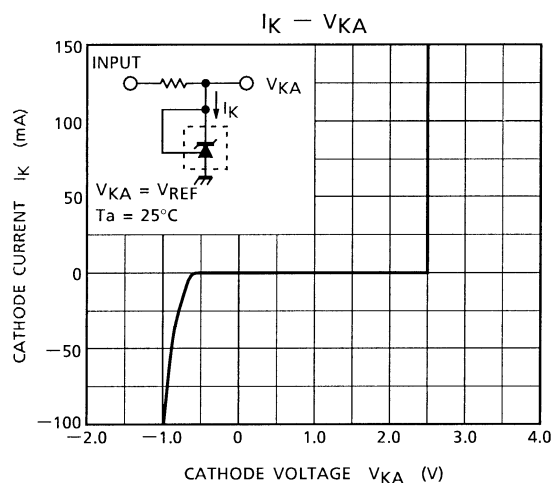
### (1) 2.5 V reference

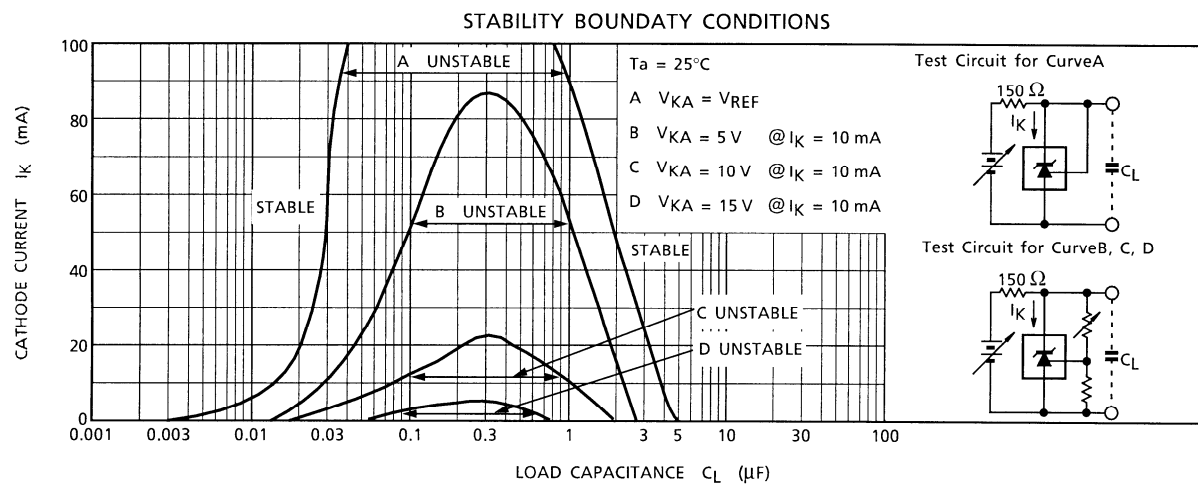
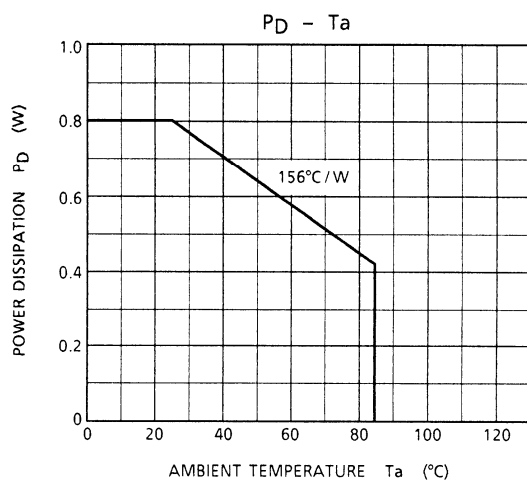
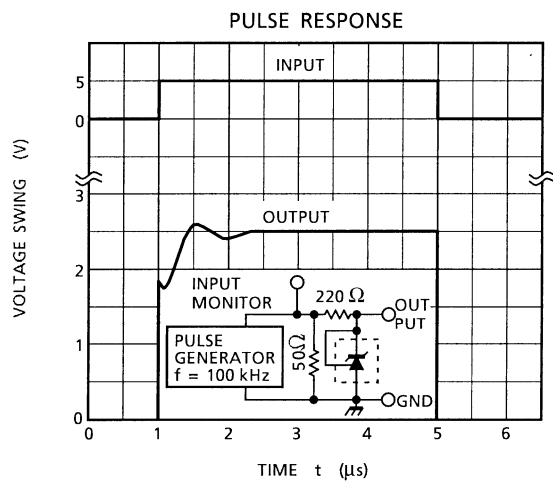
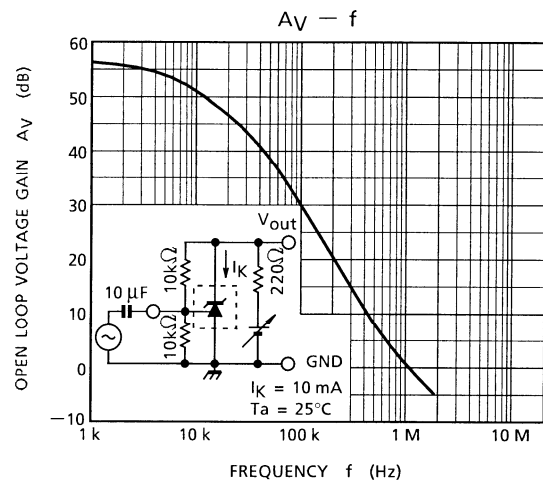
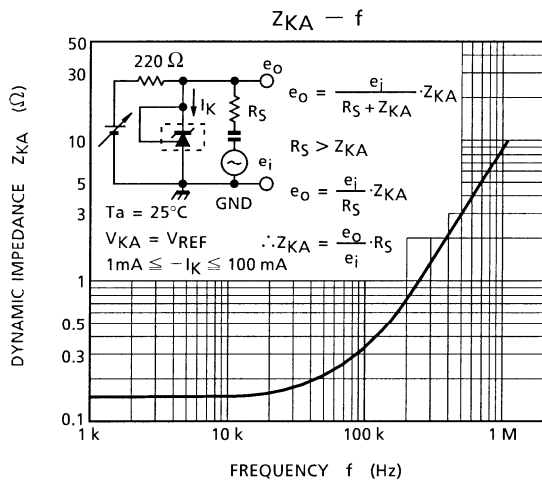


### (2) Shunt regulator



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

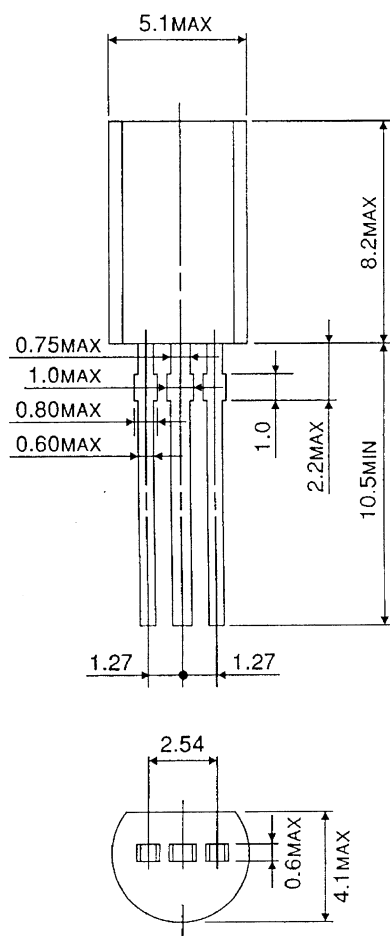




## Package Dimensions

SSIP3-P-1.27

Unit : mm



Weight : 0.36 g (Typ.)

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