TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

# **TA76431S**

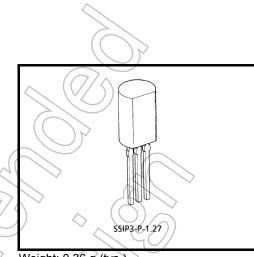
#### Adjustable Precision Shunt Regulator

#### **Features**

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

#### **Pin Assignment**

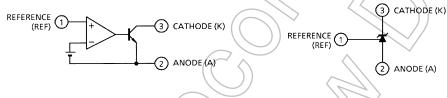




Weight: 0.36 g (typ.)

#### **Functional Block Diagram**

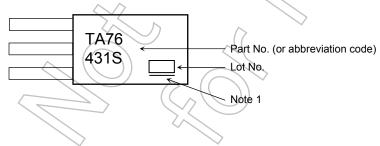
# Circuit Symbol



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 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.

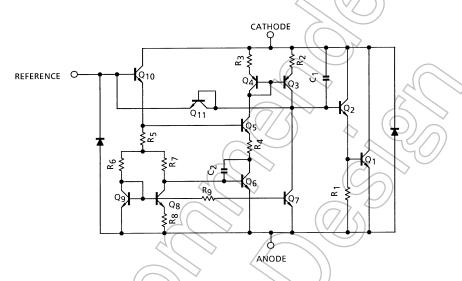
Start of commercial production 1998-11

#### **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	((	<b>7</b> /√ <b>V</b> KA	37	V
Cathode current	1/	U/ĸ	-100 to 150	mA
Reference voltage	/_	V <sub>REF</sub>	7	V
Reference current		IREF	50	μА
Reference-anode reverse cur	rent	-I <sub>REF</sub>	10	mA
Power dissipation Ta	= 25°C	PD	800	mW
Operating temperature		Topr	−40 to 85	°C
Storage temperature		Tstg	-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**

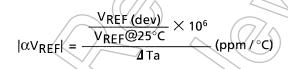
Characteristics	Symbol	Min	Тур.	Max	Unit
Cathode voltage	$V_{KA}$	$V_{REF}$	-	36	V
Cathode current	ΙK	1	-	100	mA
Operating temperature	T <sub>opr</sub>	-40	-	85	°C

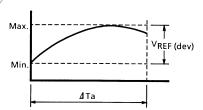
## Electrical Characteristics (Unless otherwise specified, Ta = 25°C, I<sub>K</sub> = 10 mA)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Reference voltage	$V_{REF}$	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 4)	0°C ≤ Ta ≤ 70°C, V <sub>KA</sub> = V <sub>REF</sub>	) -	8	17	mV
Ratio of change in reference input	ΔV <sub>REF</sub> /ΔV	V <sub>REF</sub> ≤ V <sub>KA</sub> ≤ 10 V	_	0.8	2.7	>//\/
voltage to the change in cathode voltage		10 V ≤ V <sub>KA</sub> ≤ 36 V		0.5	2.0	» mV/V
Reference input current	I <sub>REF</sub>	V <sub>KA</sub> = V <sub>REF</sub>	-	(1.4)	(4)	μА
Deviation of reference input current over temperature	I <sub>REF (dev)</sub> (Note 4)	$0^{\circ}$ C ≤ Ta ≤ $70^{\circ}$ C, V <sub>KA</sub> = V <sub>REF</sub> R <sub>1</sub> = 10 kΩ, R <sub>2</sub> = ∞	-((	0.3	1.2	μΑ
Minimum cathode current for regulation	I <sub>Kmin</sub>	VKA = VREF		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	μΑ
Dynamic impedance	IZKAI	$V_{KA} = V_{REF}, f \le 1 \text{ kHz}$ 1 mA $\le I_K \le 100 \text{ mA}$	\ <u>-</u>	0.15	0.5	Ω

Note 4: The deviation parameters V<sub>REF</sub> (dev) and I<sub>REF</sub> (dev) are defined as the maximum variation of the V<sub>REF</sub> and I<sub>REF</sub> over the rated temperature range.

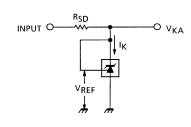
The average temperature coefficient of the V<sub>REF</sub> is defined as:



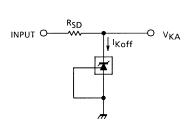


### **Test Parameter**

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

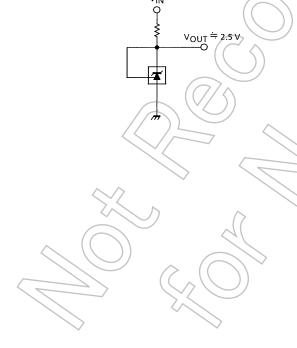


### (3) Off-state mode

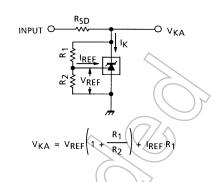


## **Typical Applications**

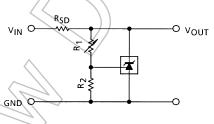
### (1) 2.5 V reference



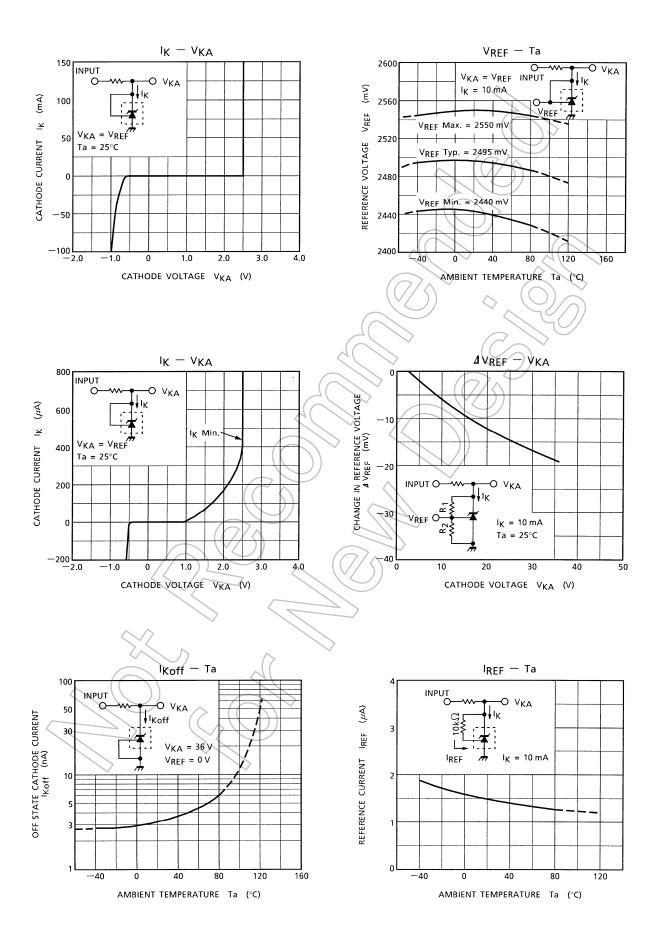
## (2) V<sub>KA</sub> > V<sub>REF</sub> mode



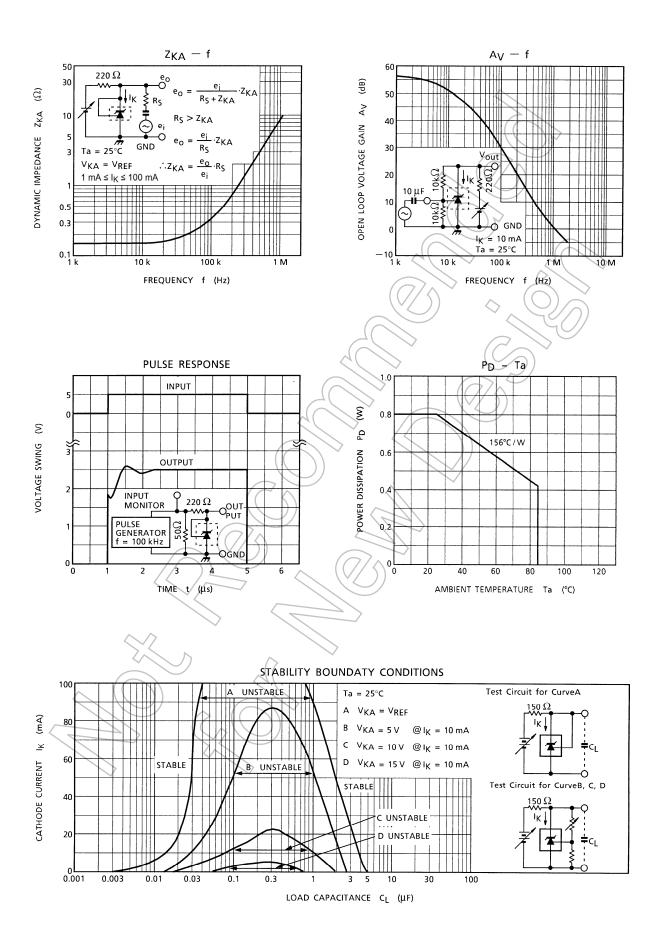
## (2) Shunt regulator



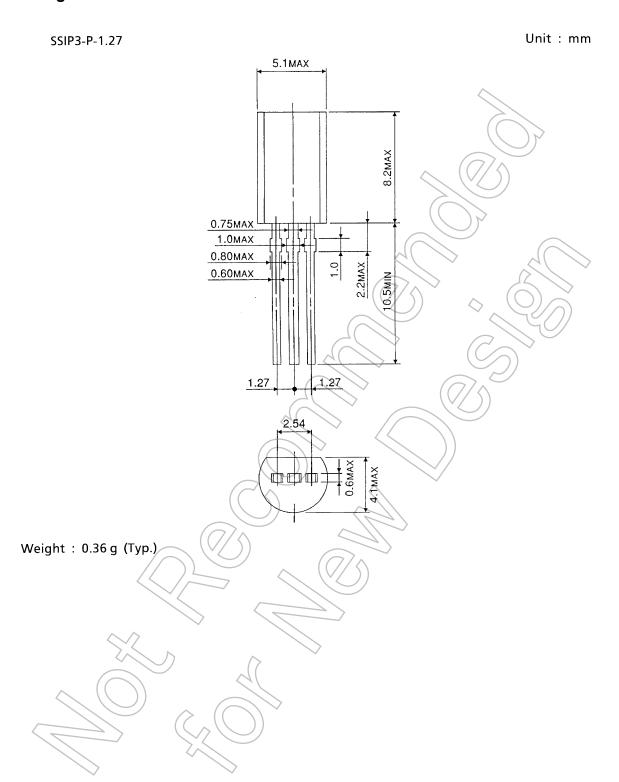
$$V_{OUT} = V_{REF} \left( 1 + \frac{R_1}{R_2} \right) + I_{REF} \cdot R_1$$



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## **Package Dimensions**



7 2013-11-01

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