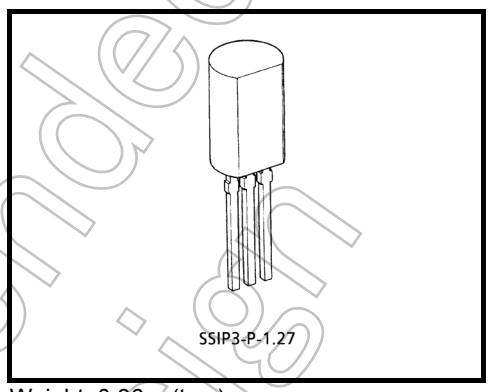
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA76431S

Adjustable Precision Shunt Regulator

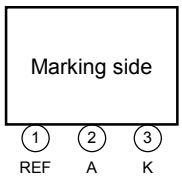
Features

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

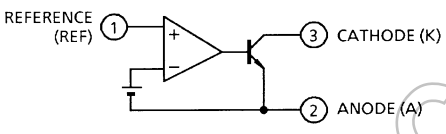


Weight: 0.36 g (typ.)

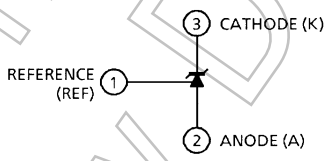
Pin Assignment



Functional Block Diagram

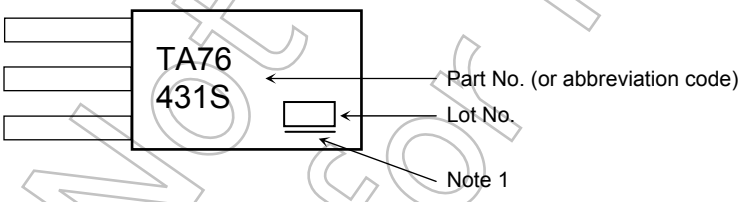


Circuit Symbol



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.

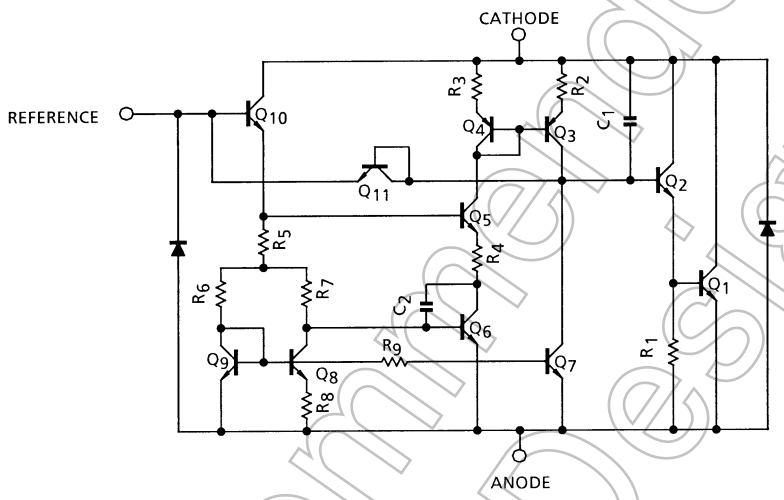
Start of commercial production
1998-11

How to Order

Product No.	Package Type	Packing Type and Capacity
TA76431S (F)	LSTM (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	μA
Reference-anode reverse current		$-I_{REF}$	10	mA
Power dissipation	Ta = 25°C	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

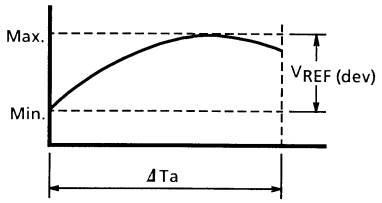
Characteristics	Symbol	Min	Typ.	Max	Unit
Cathode voltage	V_{KA}	V_{REF}	–	36	V
Cathode current	I_K	1	–	100	mA
Operating temperature	T_{opr}	−40	–	85	°C

Electrical Characteristics (Unless otherwise specified, Ta = 25°C, I_K = 10 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	$V_{REF\ (dev)}$ (Note 4)	0°C ≤ Ta ≤ 70°C, $V_{KA} = V_{REF}$	–	8	17	mV
Ratio of change in reference input voltage to the change in cathode voltage	$\Delta V_{REF}/\Delta V$	$V_{REF} \leq V_{KA} \leq 10$ V	–	0.8	2.7	mV/V
		10 V ≤ V_{KA} ≤ 36 V	–	0.5	2.0	
Reference input current	I_{REF}	$V_{KA} = V_{REF}$	–	1.4	4	μA
Deviation of reference input current over temperature	$I_{REF\ (dev)}$ (Note 4)	0°C ≤ Ta ≤ 70°C, $V_{KA} = V_{REF}$, R_1 = 10 kΩ, R_2 = ∞	–	0.3	1.2	μA
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 V, V_{REF} = 0 V	–	–	1.0	μA
Dynamic impedance	$\lvert Z_{KA} \rvert$	$V_{KA} = V_{REF}$, f ≤ 1 kHz, 1 mA ≤ I_K ≤ 100 mA	–	0.15	0.5	Ω

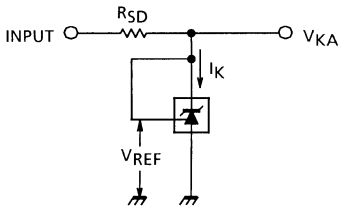
Note 4: The deviation parameters $V_{REF\ (dev)}$ and $I_{REF\ (dev)}$ are defined as the maximum variation of the V_{REF} and I_{REF} over the rated temperature range.
The average temperature coefficient of the V_{REF} is defined as:

$$\lvert \alpha V_{REF} \rvert = \frac{\frac{V_{REF\ (dev)}}{V_{REF@25°C}} \times 10^6}{\Delta Ta} \quad (ppm/°C)$$

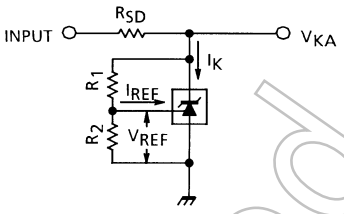


Test Parameter

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

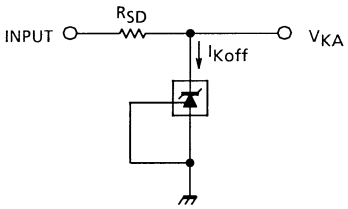


(2) $V_{KA} > V_{REF}$ mode



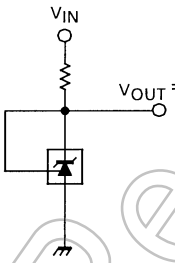
$$V_{KA} = V_{REF}\left(1 + \frac{R_1}{R_2}\right) + I_{REF} \cdot R_1$$

(3) Off-state mode

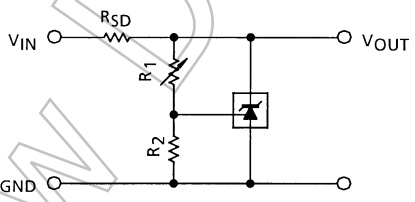


Typical Applications

(1) 2.5 V reference

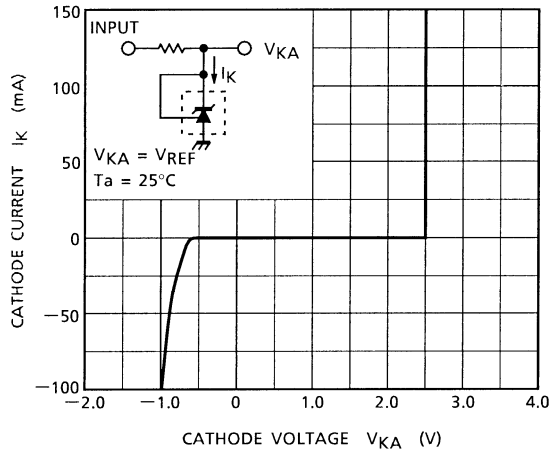


(2) Shunt regulator

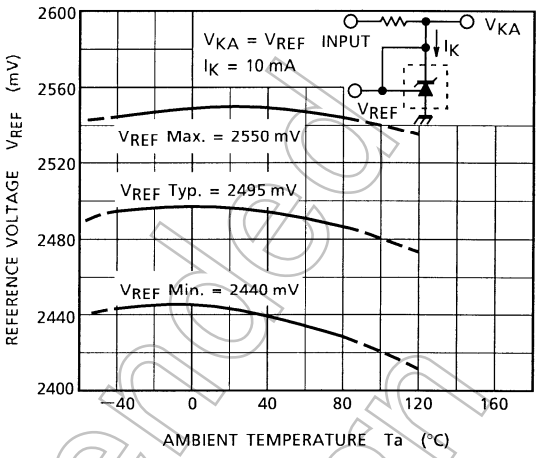


$$V_{OUT} = V_{REF}\left(1 + \frac{R_1}{R_2}\right) + I_{REF} \cdot R_1$$

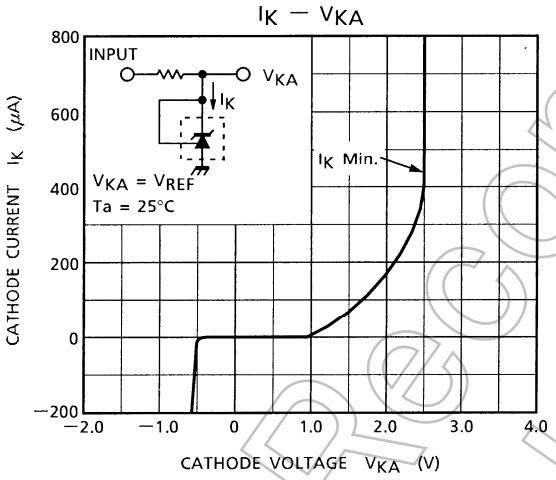
I_K — V_{KA}



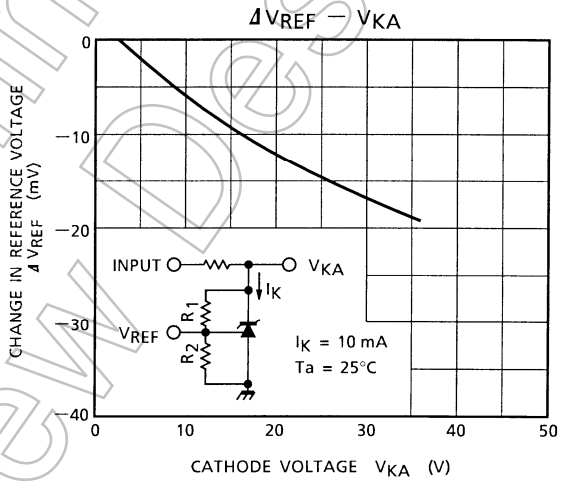
V_{REF} — Ta



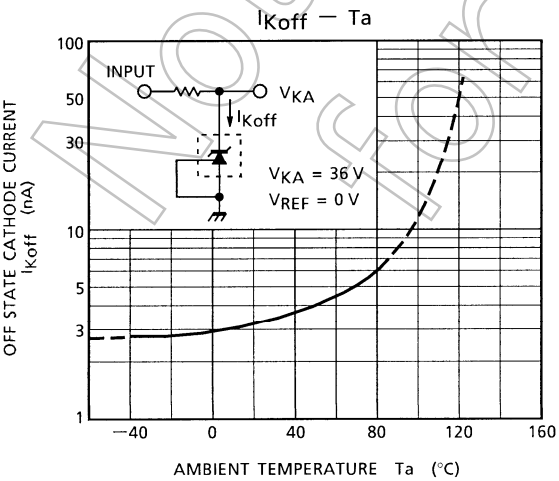
I_K — V_{KA}



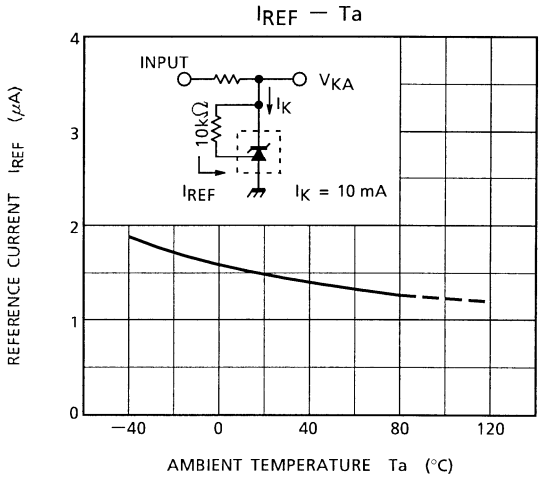
ΔV_{REF} — V_{KA}



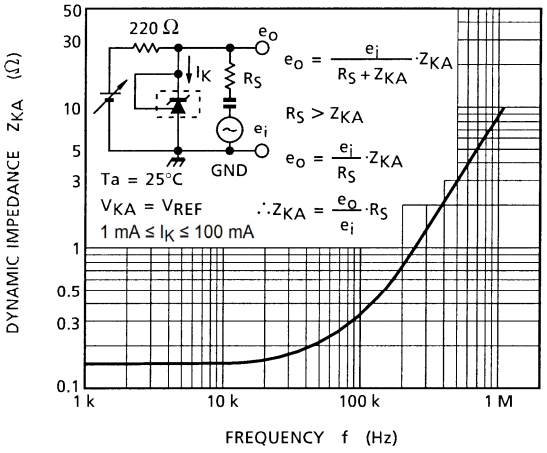
I_{Koff} — Ta



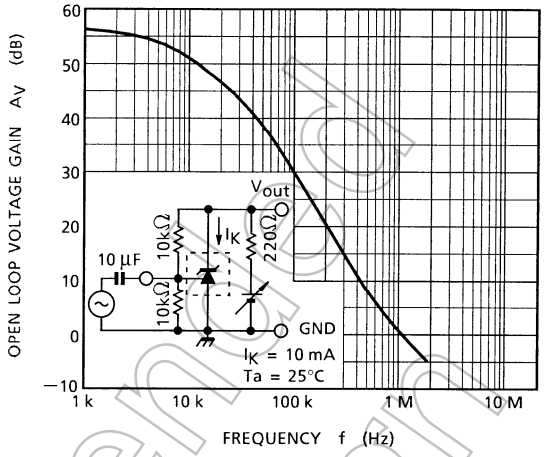
I_{REF} — Ta



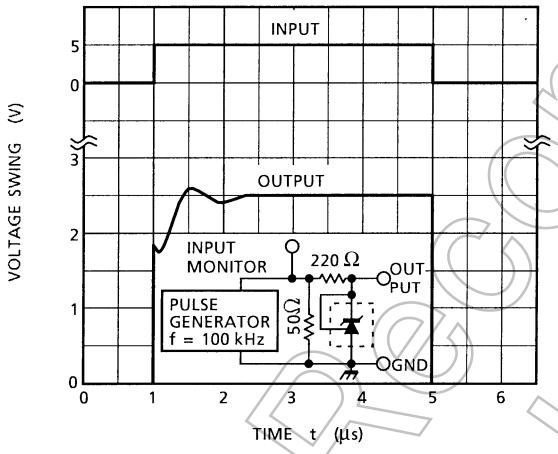
Z_{KA} – f



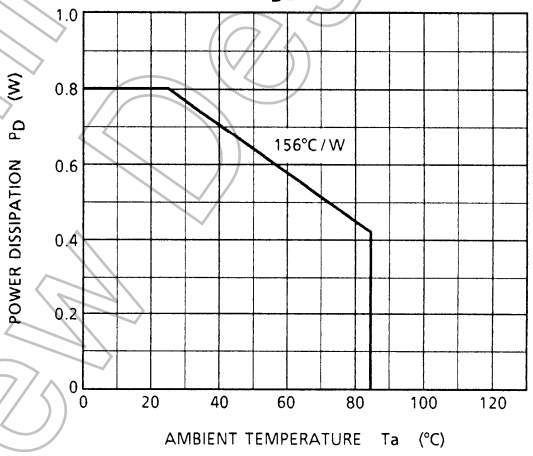
A_V – f



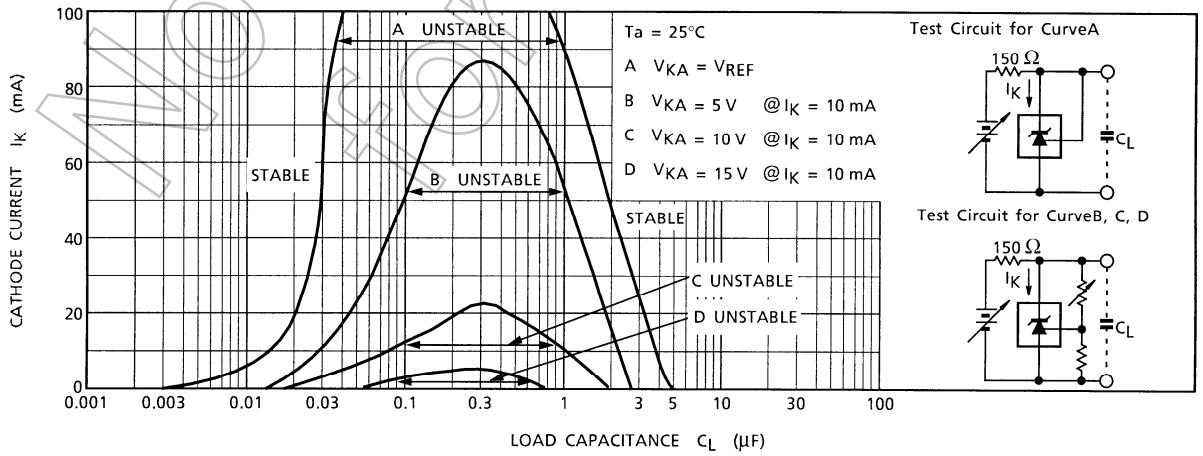
PULSE RESPONSE



P_D – Ta

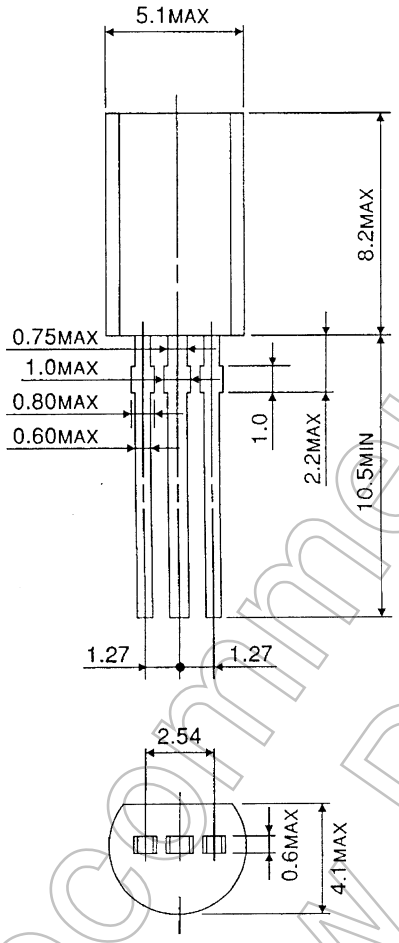


STABILITY BOUNDATY CONDITIONS



Package Dimensions

SSIP3-P-1.27 Unit : mm



Weight : 0.36 g (Typ.)

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