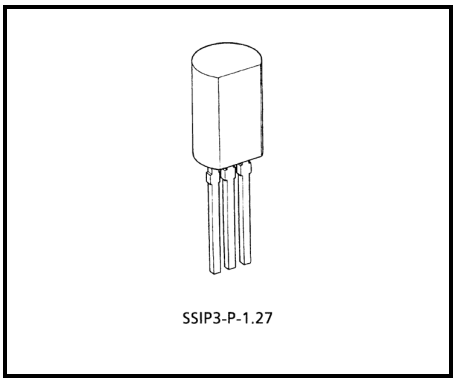
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA76431S

Adjustable Precision Shunt Regulator

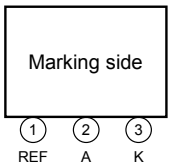
Features

- Precision reference voltage: V_{REF} = 2.495 V ± 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 Ω (Typ.)

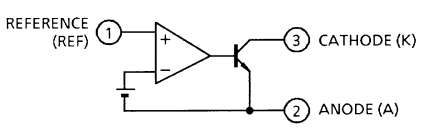


Weight: 0.36 g (Typ.)

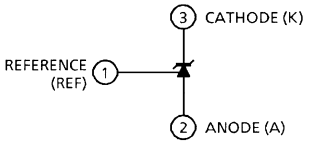
Pin Assignment



Functional Block Diagram

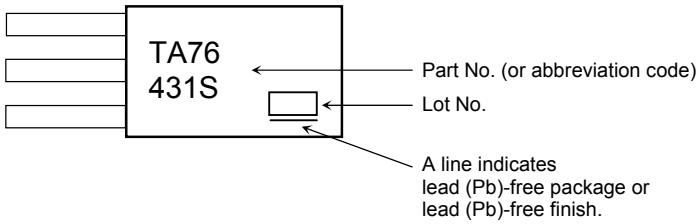


Circuit Symbol

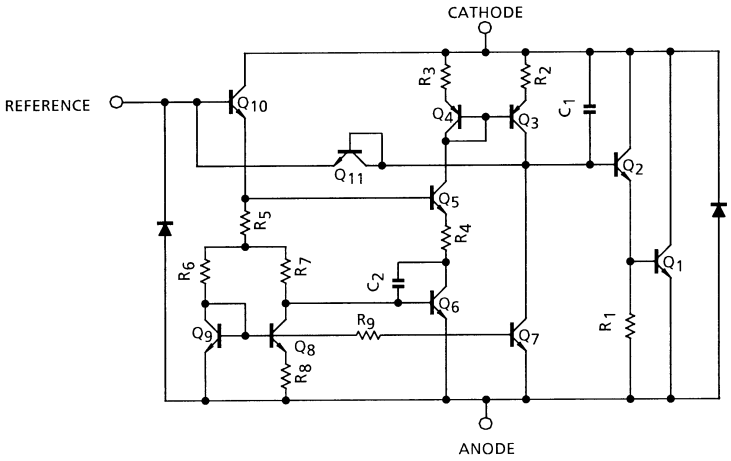


This IC contains electrostatic sensitive elements.
Please handle with caution.

Marking



Equivalent Circuit



Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Cathode voltage		V_{KA}	37	V
Cathode current		I_K	−100~150	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}	−40~85	°C
Storage temperature		T_{stg}	−55~150	°C

Note: 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 Range

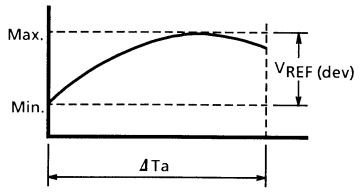
Characteristics	Symbol	Min	Typ.	Max	Unit
Cathode voltage	V_{KA}	V_{REF}	—	36	V
Cathode current	I_K	1	—	100	mA
Operating temperature	T_{opr}	−40	—	85	°C

Electrical Characteristics (Unless otherwise specified, Ta = 25°C, I_K = 10 mA)

Characteristics	Symbol	Test Circuit	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 1)	—	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 1)	—	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

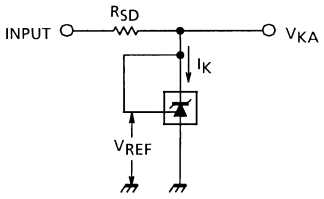
Note 1: The deviation parameters $V_{REF\ (dev)}$ and $I_{REF\ (dev)}$ are defined as the maximum variation of the V_{REF} and I_{REF} over the rated temperature range.
The average temperature coefficient of the V_{REF} is defined as:

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

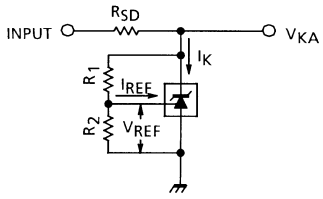


Test Parameter

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

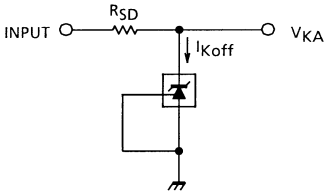


(2) $V_{KA} > V_{REF}$ mode



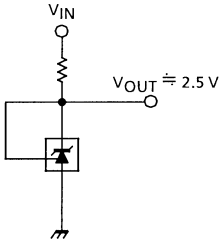
$$V_{KA} = V_{REF}\left(1 + \frac{R_1}{R_2}\right) + I_{REF} \cdot R_1$$

(3) Off-state mode

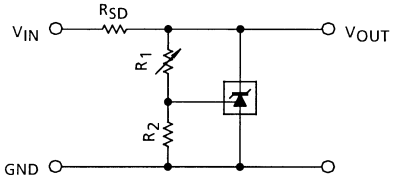


Typical Applications

(1) 2.5 V reference

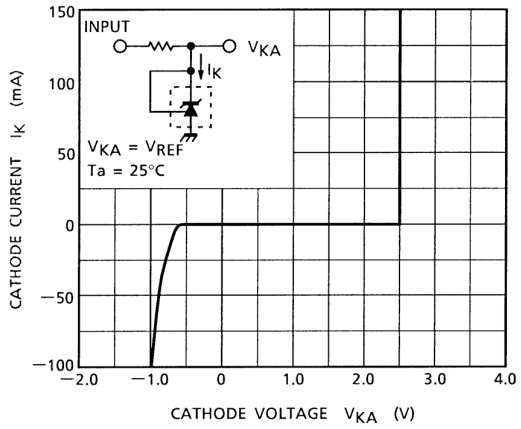


(2) Shunt regulator

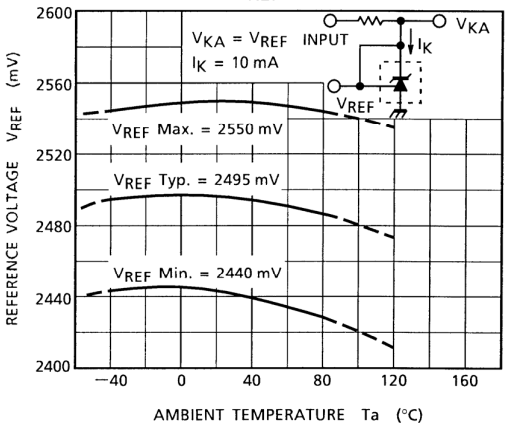


$$V_{OUT} = V_{REF}\left(1 + \frac{R_1}{R_2}\right) + I_{REF} \cdot R_1$$

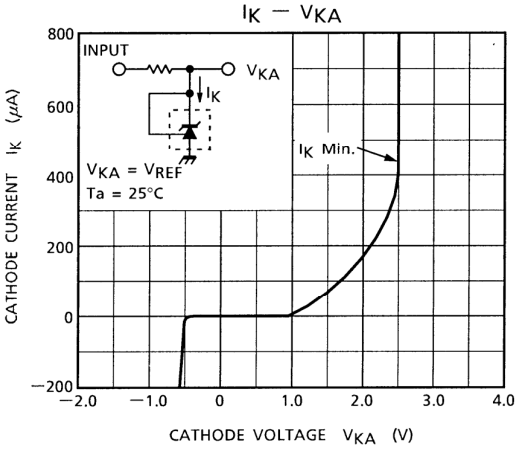
I_K – V_{KA}



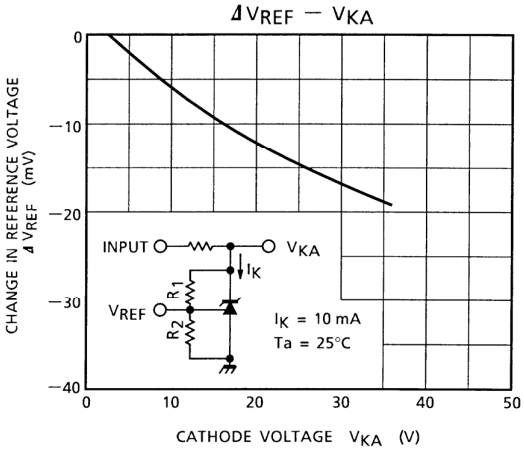
V_{REF} – Ta



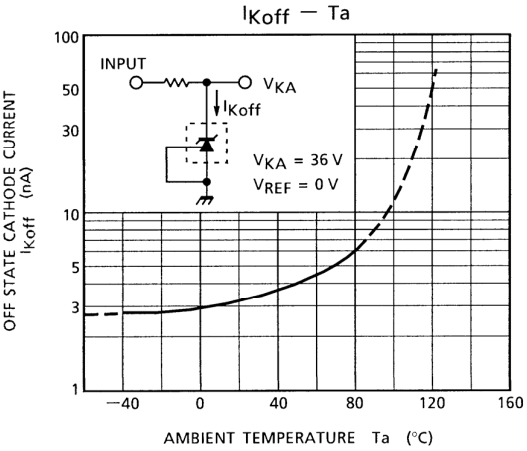
I_K – V_{KA}



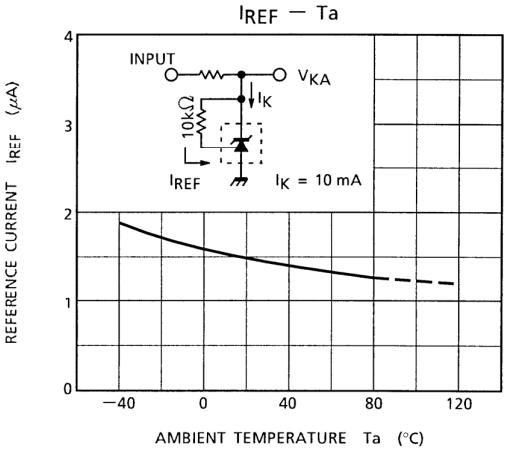
ΔV_{REF} – V_{KA}



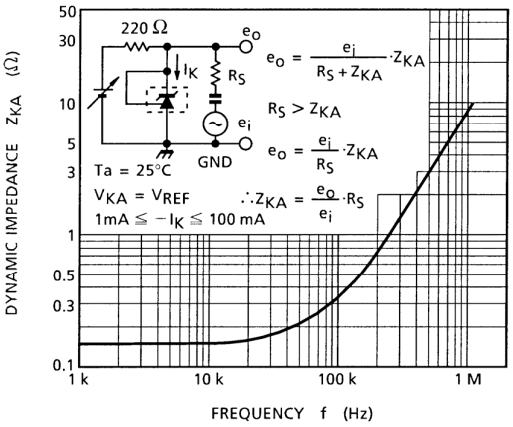
I_{Koff} – Ta



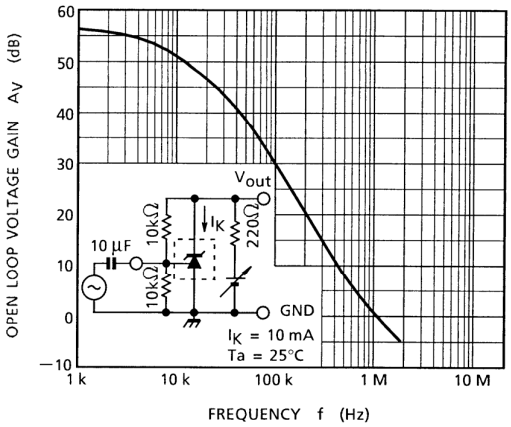
I_{REF} – Ta



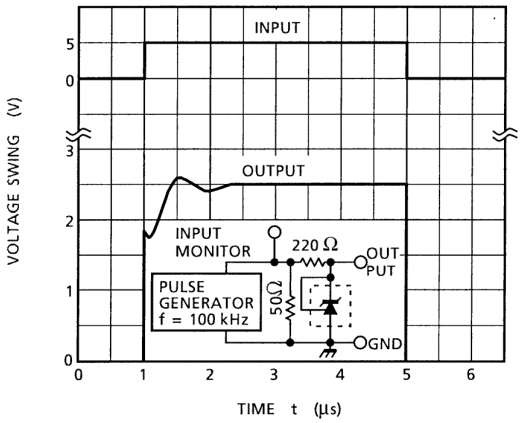
Z_{KA} – f



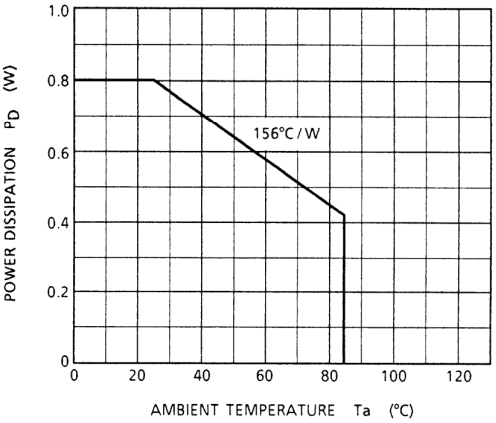
A_V – f



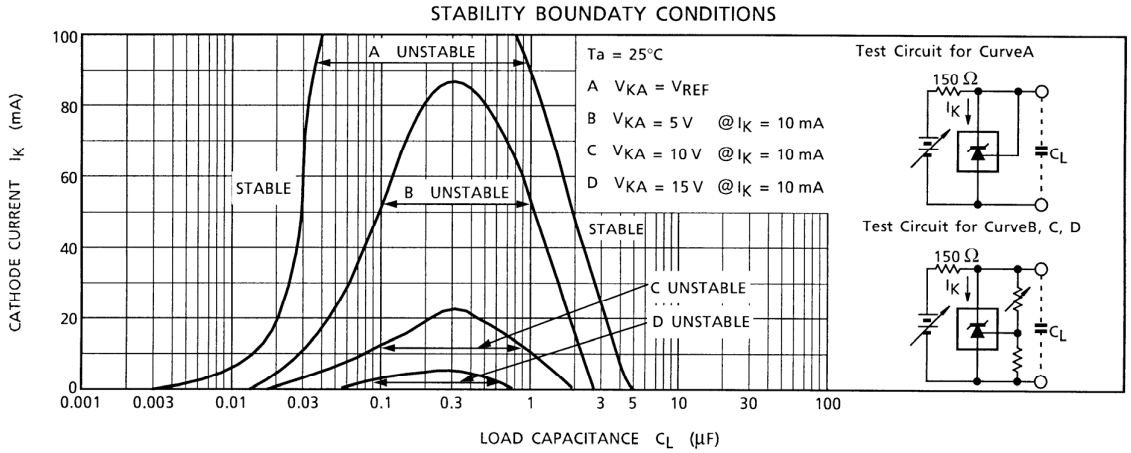
PULSE RESPONSE



P_D – Ta

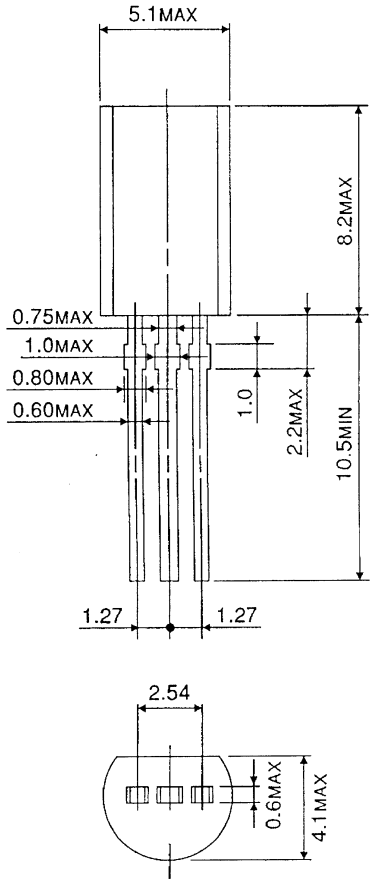


STABILITY BOUNDATY CONDITIONS



Package Dimensions

SSIP3-P-1.27 Unit : mm



Weight : 0.36 g (Typ.)

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20070701-EN

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