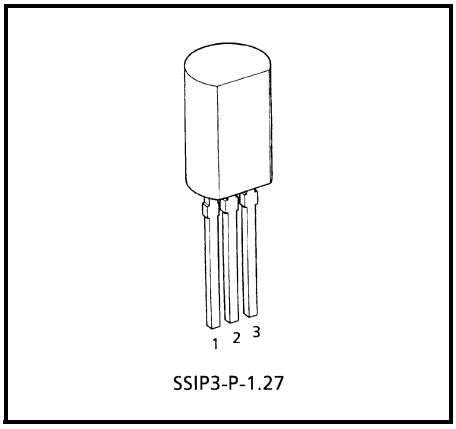
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA76431S

Adjustable Precision Shunt Regulator

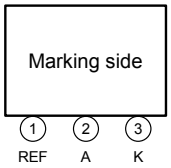
Features

- 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.)

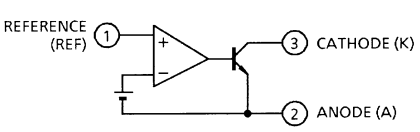


Weight: 0.36 g (Typ.)

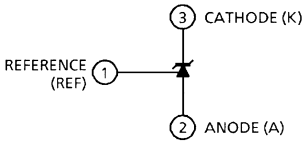
Pin Assignment



Functional Block Diagram

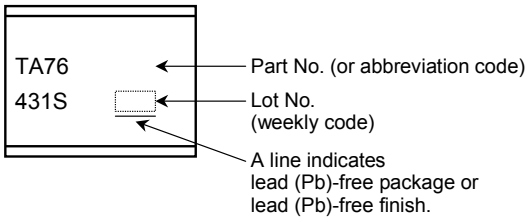


Circuit Symbol

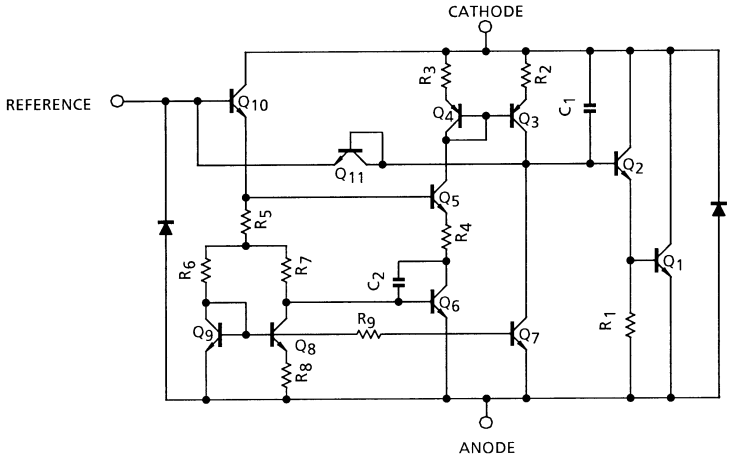


This IC contains electrostatic sensitive elements.
Please handle with caution.

Marking



Equivalent Circuit



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

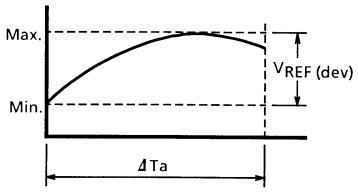
Recommended Operating Conditions

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	$\Delta V_{REF}/\Delta V$	—	$V_{REF} \le V_{KA} \le 10$ 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

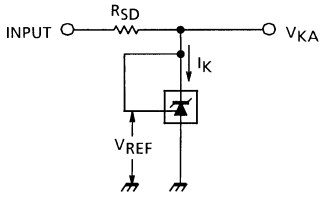
Note 1: The deviation parameters $V_{REF\ (dev)}$ and $I_{REF\ (dev)}$ are defined as the maximum variation of the V_{REF} and I_{REF} over the rated temperature range.
The average temperature coefficient of the V_{REF} is defined as:



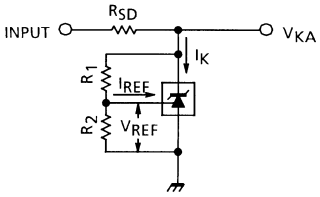
$$|\alpha V_{REF}| = \frac{\frac{V_{REF\ (dev)}}{V_{REF@25°C}} \times 10^6}{\Delta Ta} \ (ppm/°C)$$

Test Parameter

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

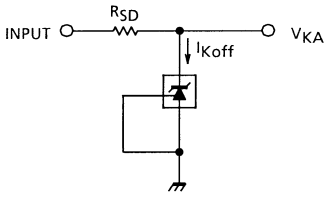


(2) $V_{KA} > V_{REF}$ mode



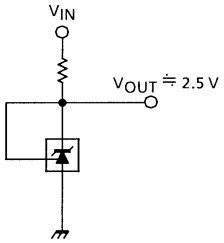
$$V_{KA} = V_{REF}\left(1 + \frac{R_1}{R_2}\right) + I_{REF} \cdot R_1$$

(3) Off-state mode

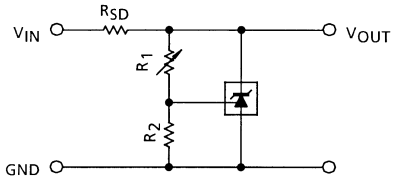


Typical Applications

(1) 2.5 V reference

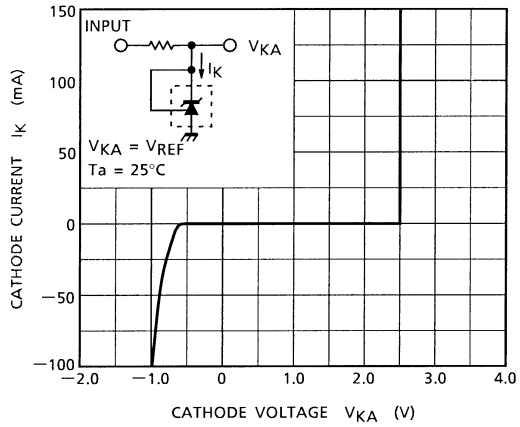


(2) Shunt regulator

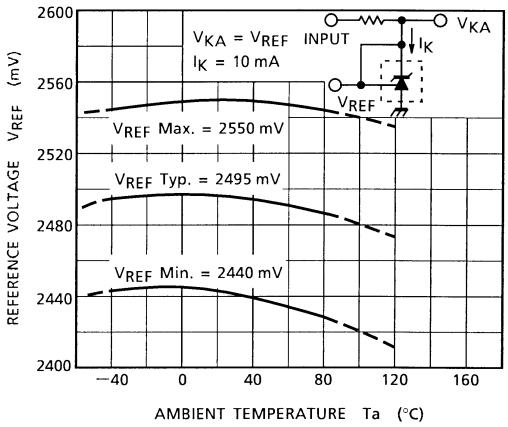


$$V_{OUT} = V_{REF}\left(1 + \frac{R_1}{R_2}\right) + I_{REF} \cdot R_1$$

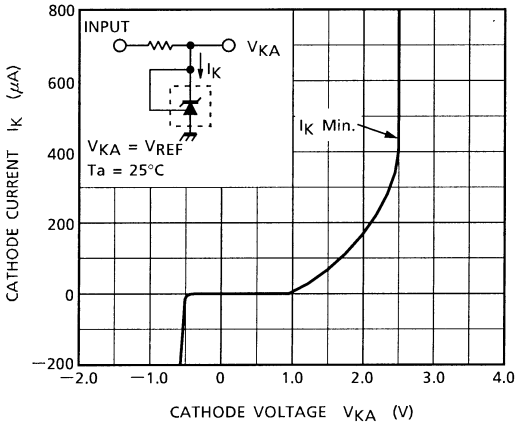
I_K – V_{KA}



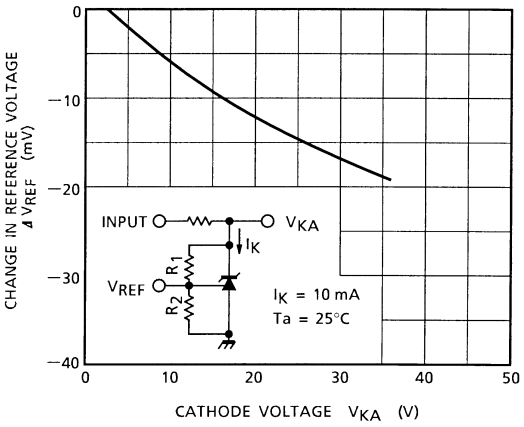
V_{REF} – Ta



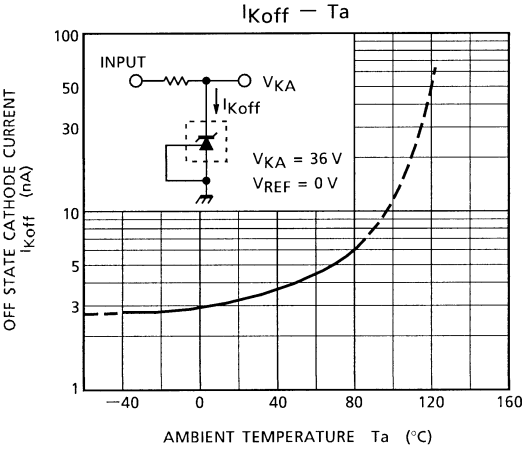
I_K – V_{KA}



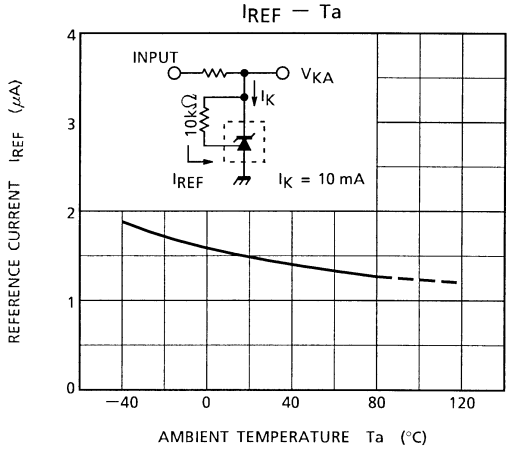
ΔV_{REF} – V_{KA}



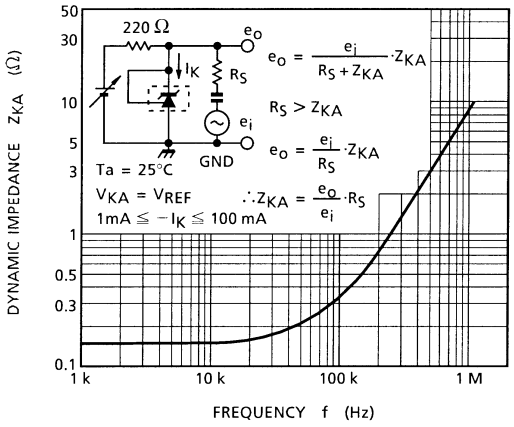
I_{Koff} – Ta



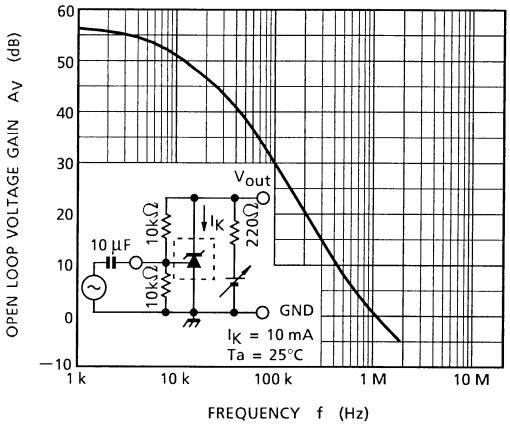
I_{REF} – Ta



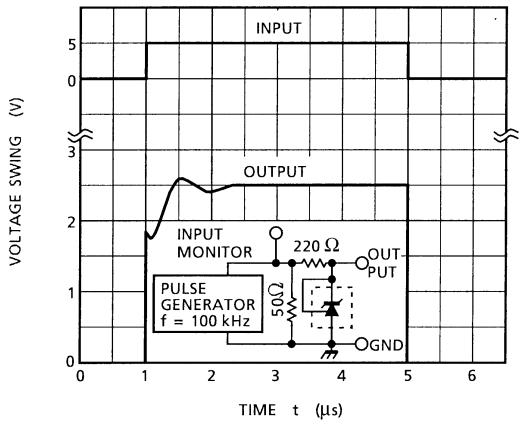
Z_{KA} – f



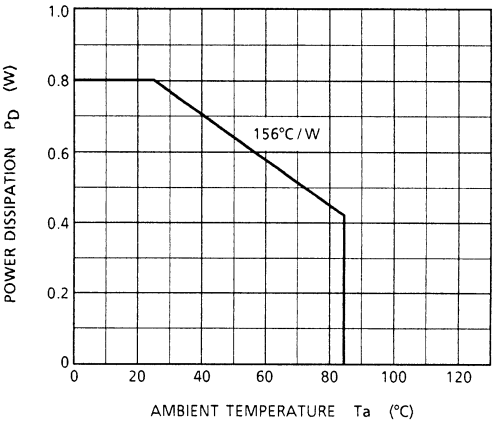
A_V – f



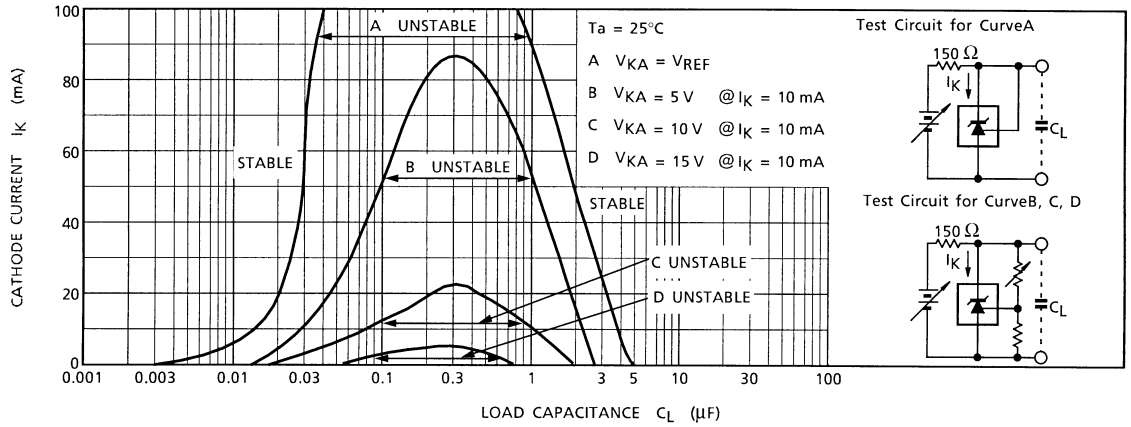
PULSE RESPONSE



P_D – Ta

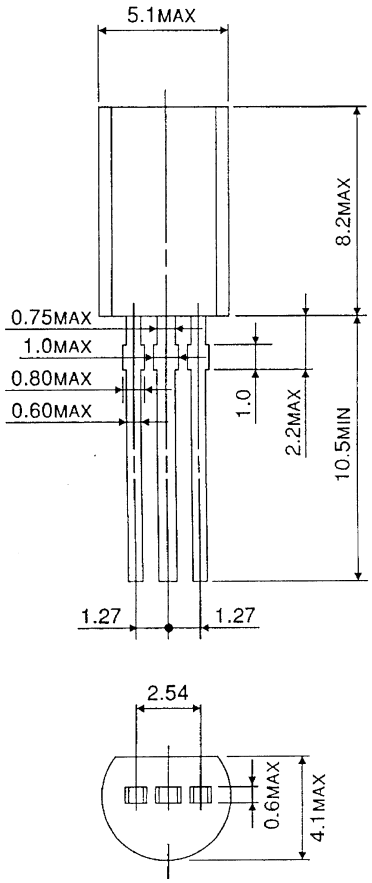


STABILITY BOUNDATY CONDITIONS



Package Dimensions

SSIP3-P-1.27 Unit : mm



Weight : 0.36 g (Typ.)

RESTRICTIONS ON PRODUCT USE

030619EBA

- The information contained herein is subject to change without notice.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer’s own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- TOSHIBA products should not be embedded to the downstream products which are prohibited to be produced and sold, under any law and regulations.