

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

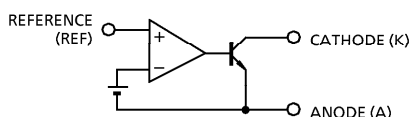
# TA76431AF

## ADJUSTABLE PRECISION SHUNT REGULATOR

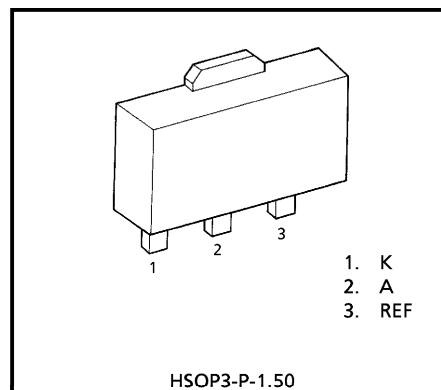
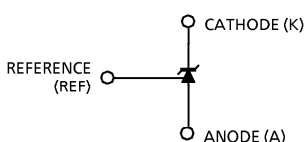
### FEATURES

- Precision Reference Voltage :  $V_{REF} = 2.495\text{ V} \pm 1\%$
- 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.)
- Small Flat Package

### FUNCTIONAL BLOCK DIAGRAM

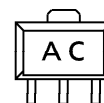


### CIRCUIT SYMBOL



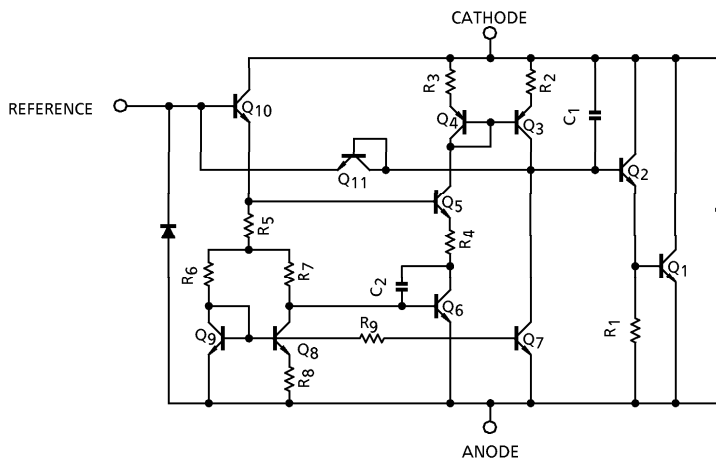
Weight : 0.05 g (Typ.)

### Marking



THIS IC CONTAINS ELECTROSTATIC SENSITIVE ELEMENT.  
PLEASE HANDLE WITH CAUTION.

### EQUIVALENT CIRCUIT



980910EBA1

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## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT	
Cathode Voltage	V <sub>KA</sub>	37	V	
Cathode Current	I <sub>K</sub>	- 100~150	mA	
Reference Voltage	V <sub>REF</sub>	7	V	
Reference Current	I <sub>REF</sub>	50	μA	
Reference-Anode Reverse Current	- I <sub>REF</sub>	10	mA	
Power Dissipation	Ta = 25°C *	P <sub>D</sub>	500	mW
			1000	
Operating Temperature	T <sub>opr</sub>	- 40~85	°C	
Storage Temperature	T <sub>stg</sub>	- 55~150	°C	

\* : Mounted on ceramic substrate (250 mm<sup>2</sup> × 0.8 t)

## RECOMMENDED OPERATING CONDITIONS

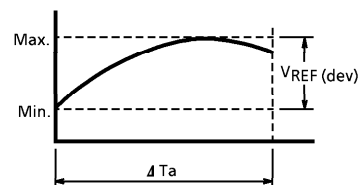
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Cathode Voltage	V <sub>KA</sub>	V <sub>REF</sub>	—	36	V
Cathode Current	I <sub>K</sub>	1	—	100	mA
Operating Temperature	T <sub>opr</sub>	- 40	—	85	°C

**ELECTRICAL CHARACTERISTICS** (Unless otherwise specified, Ta = 25°C, I<sub>K</sub> = 10 mA)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Reference Voltage	V <sub>REF</sub>	—	V <sub>KA</sub> = V <sub>REF</sub>	2.470	2.495	2.520	V
Deviation of Reference Input Voltage Over Temperature	V <sub>REF</sub> (dev) (Note)	—	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</sub> (dev) (Note)	—	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

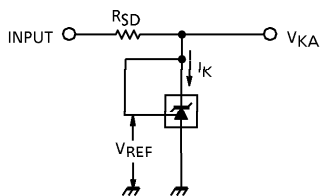
Note : The deviation parameters V<sub>REF</sub> (dev) and I<sub>REF</sub> (dev) are defined as the maximum variation of the V<sub>REF</sub> and I<sub>REF</sub> over the rated temperature range.  
The average temperature coefficient of the V<sub>REF</sub> is defined as ;

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

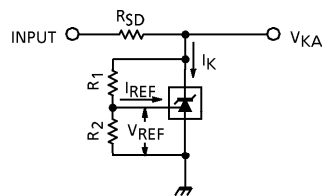


TEST PARAMETER

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

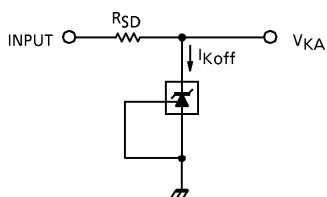


(2)  $V_{KA} > V_{REF}$  MODE



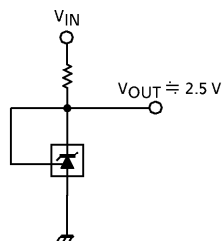
$$V_{KA} = V_{REF} \left( 1 + \frac{R_1}{R_2} \right) + I_{REF} \cdot R_1$$

(3) OFF-STATE MODE

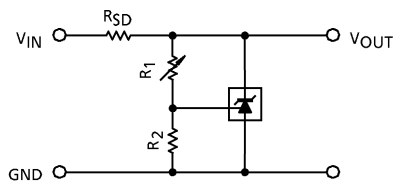


TYPICAL APPLICATIONS

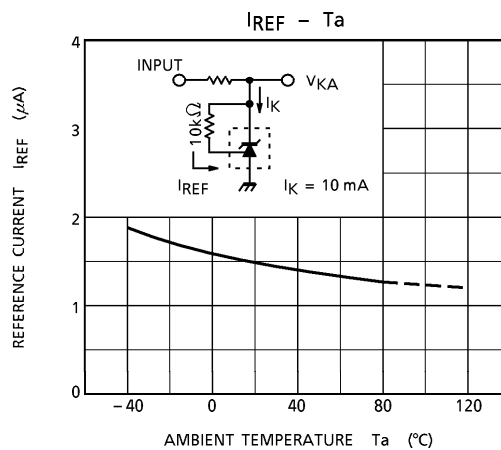
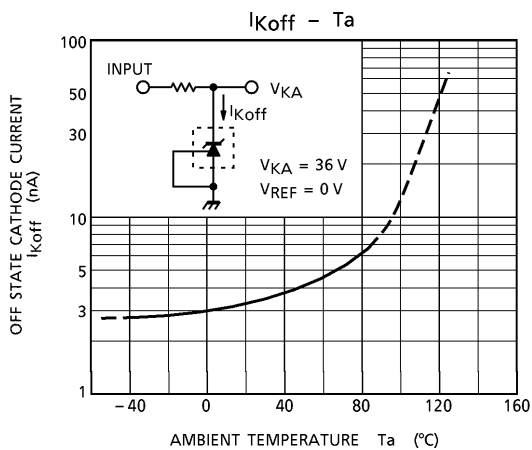
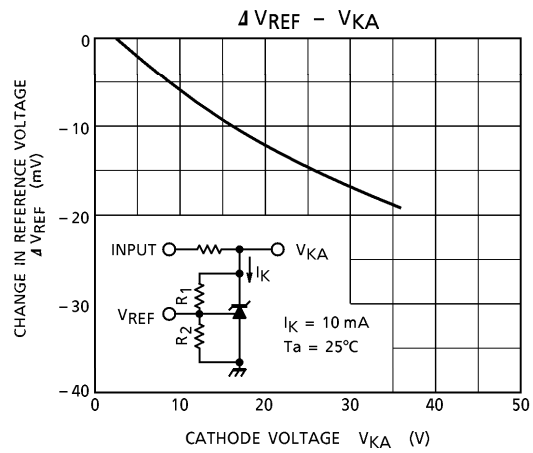
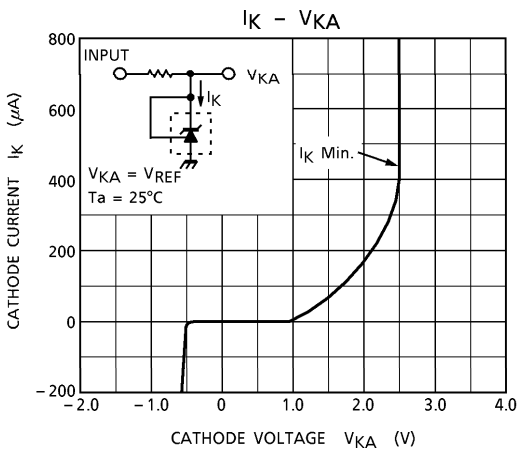
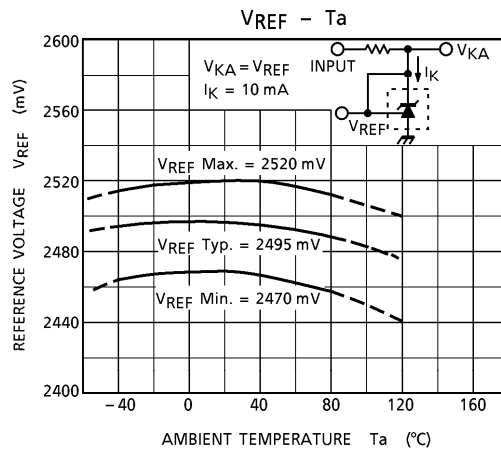
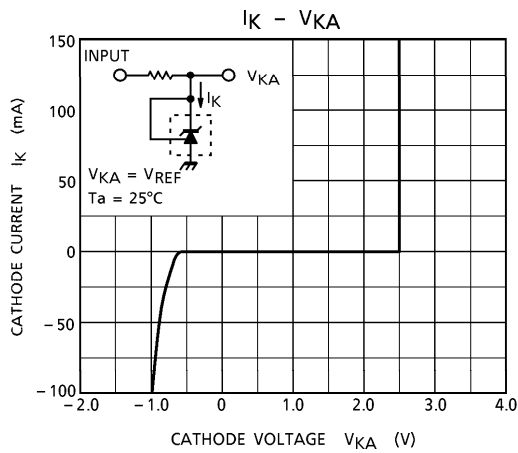
(1) 2.5 V REFERENCE

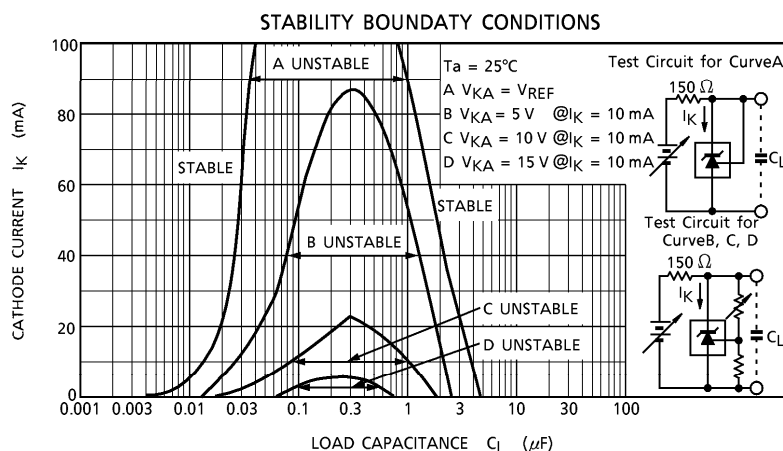
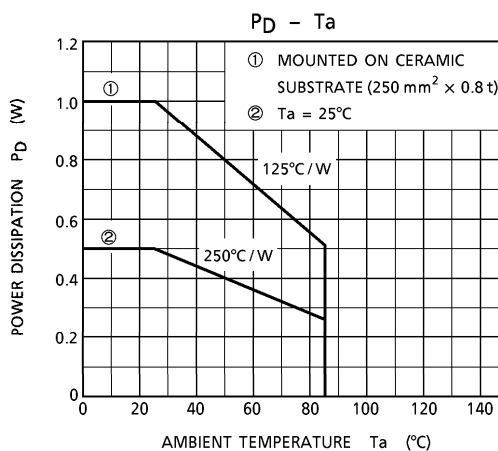
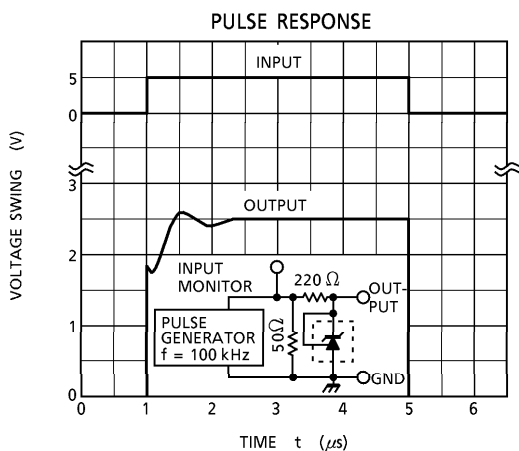
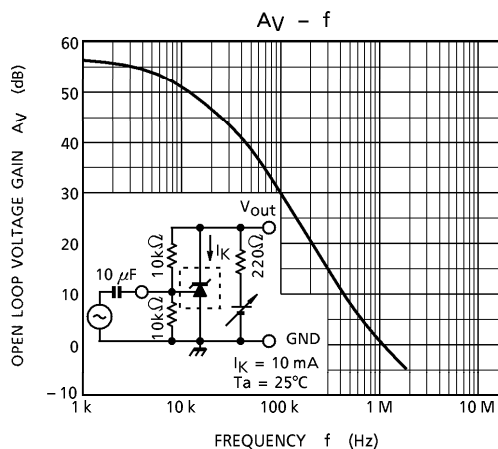
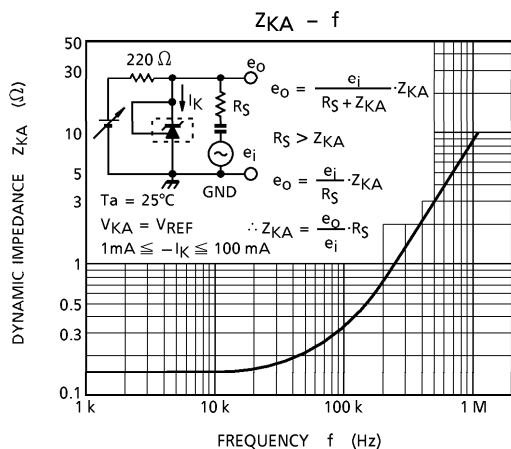


(2) SHUNT REGULATOR



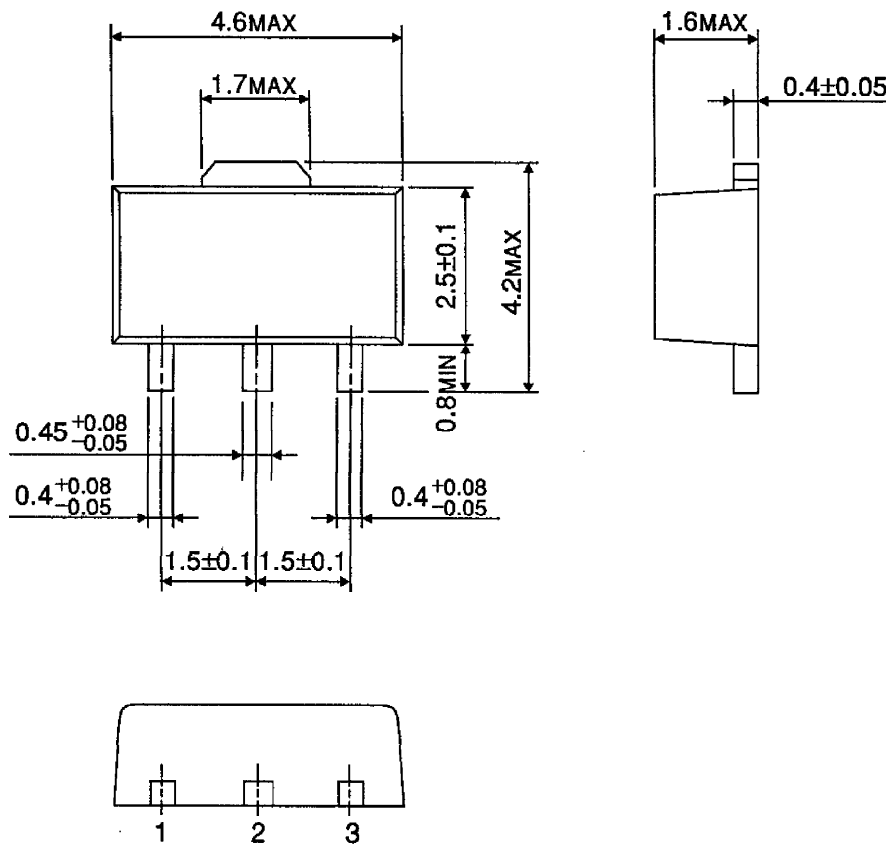
$$V_{OUT} = V_{REF} \left( 1 + \frac{R_1}{R_2} \right) + I_{REF} \cdot R_1$$





OUTLINE DRAWING  
HSOP3-P-1.50

Unit : mm



Weight : 0.05 g (Typ.)