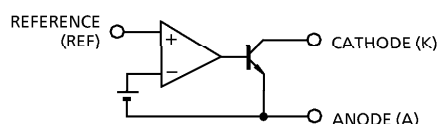
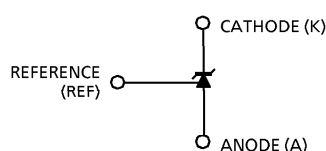


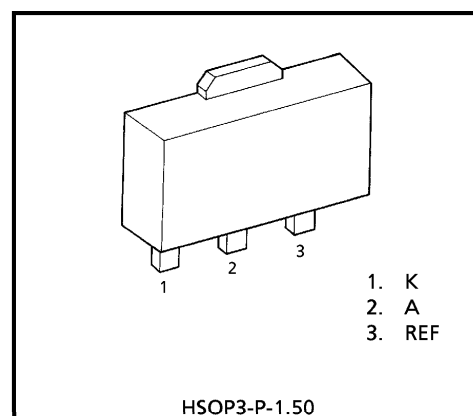
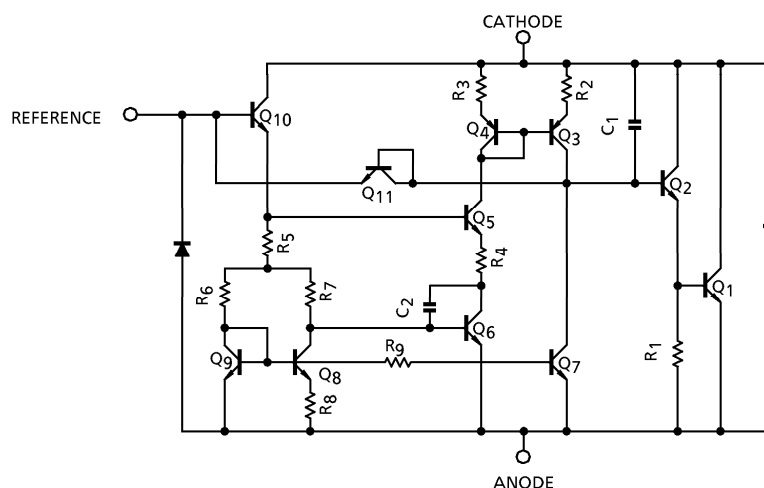
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA76431AF**ADJUSTABLE PRECISION SHUNT REGULATOR****FEATURES**

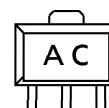
- Precision Reference Voltage : $V_{REF} = 2.495\text{ V} \pm 1\%$
- Small Temperature Coefficient : $|\alpha V_{REF}| = 46\text{ ppm}/^\circ\text{C}$
- Adjustable Output Voltage : $V_{REF} \leq V_{OUT} \leq 36\text{ V}$
- Low Dynamic Output Impedance : $|Z_{KA}| = 0.15\ \Omega\ (\text{Typ.})$
- Small Flat Package

FUNCTIONAL BLOCK DIAGRAM**CIRCUIT SYMBOL**

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

EQUIVALENT CIRCUIT

Weight : 0.05 g (Typ.)

Marking

980910EBA1

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- The information contained herein is subject to change without notice.

MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC		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	$T_a = 25^\circ\text{C}$	P_D	500	mW
	*		1000	
Operating Temperature		T_{opr}	- 40~85	$^\circ\text{C}$
Storage Temperature		T_{stg}	- 55~150	$^\circ\text{C}$

* : Mounted on ceramic substrate ($250\text{ mm}^2 \times 0.8\text{ t}$)

RECOMMENDED OPERATING CONDITIONS

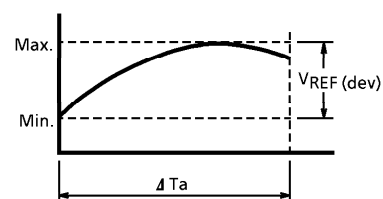
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Cathode Voltage	V_{KA}	V_{REF}	—	36	V
Cathode Current	I_K	1	—	100	mA
Operating Temperature	T_{opr}	- 40	—	85	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, $T_a = 25^\circ\text{C}$, $I_K = 10\text{ mA}$)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Reference Voltage	V_{REF}	—	$V_{KA} = V_{REF}$	2.470	2.495	2.520	V
Deviation of Reference Input Voltage Over Temperature	$V_{REF}(\text{dev})$ (Note)	—	$0^\circ\text{C} \leq T_a \leq 70^\circ\text{C}$ $V_{KA} = V_{REF}$	—	8	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{REF} / \Delta V$	—	$V_{REF} \leq V_{KA} \leq 10\text{ V}$	—	0.8	2.7	mV / V
		—	$10\text{ V} \leq V_{KA} \leq 36\text{ V}$	—	0.5	2.0	
Reference Input Current	I_{REF}	—	$V_{KA} = V_{REF}$	—	1.4	4	μA
Deviation of Reference Input Current Over Temperature	$I_{REF}(\text{dev})$ (Note)	—	$0^\circ\text{C} \leq T_a \leq 70^\circ\text{C}$, $V_{KA} = V_{REF}$ $R_1 = 10\text{ k}\Omega$, $R_2 = \infty$	—	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}	—	$V_{KA} = 36\text{ V}$, $V_{REF} = 0\text{ V}$	—	—	1.0	μA
Dynamic Impedance	$ Z_{KA} $	—	$V_{KA} = V_{REF}$, $f \leq 1\text{ kHz}$ $1\text{ mA} \leq I_K \leq 100\text{ mA}$	—	0.15	0.5	Ω

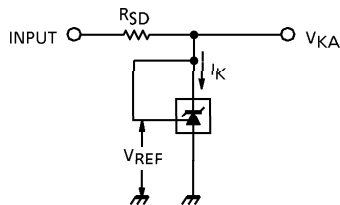
Note : The deviation parameters $V_{REF}(\text{dev})$ and $I_{REF}(\text{dev})$ are defined as the maximum variation of the V_{REF} and I_{REF} over the rated temperature range.
The average temperature coefficient of the V_{REF} is defined as ;

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

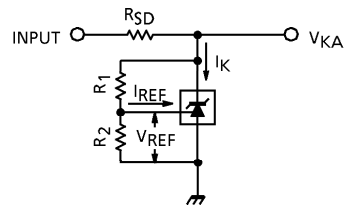


TEST PARAMETER

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

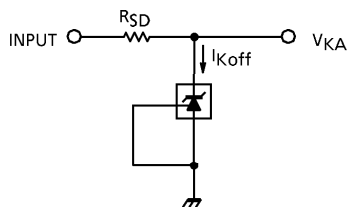


(2) $V_{KA} > V_{REF}$ MODE



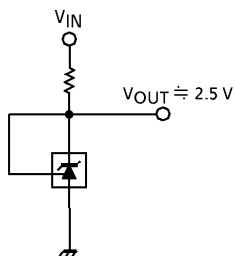
$$V_{KA} = V_{REF} \left(1 + \frac{R_1}{R_2} \right) + I_{REF} \cdot R_1$$

(3) OFF-STATE MODE

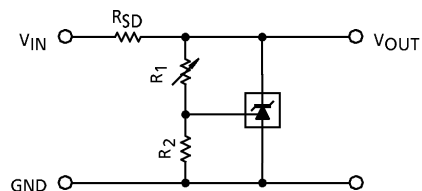


TYPICAL APPLICATIONS

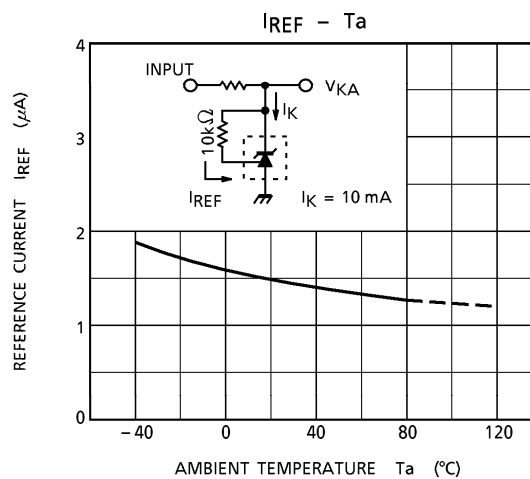
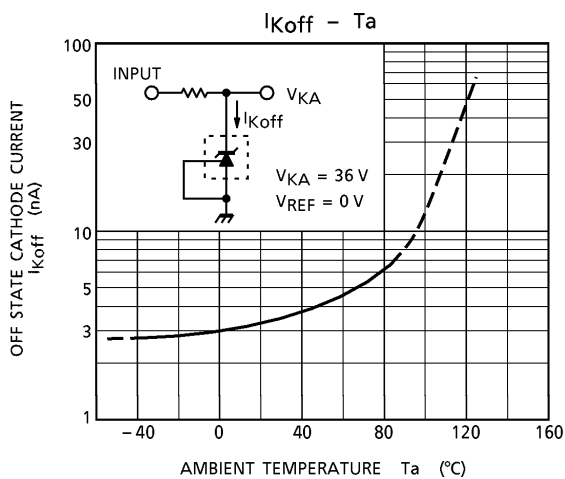
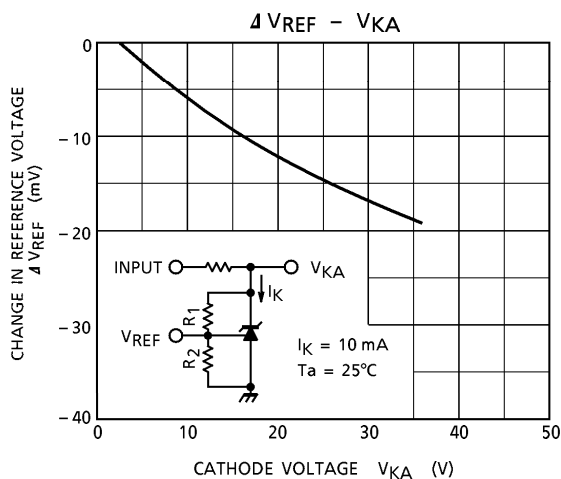
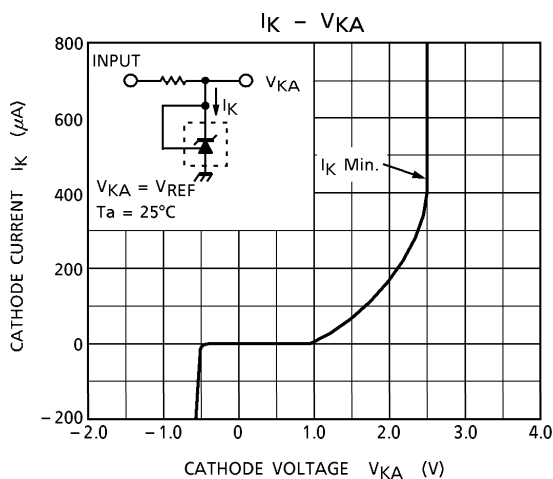
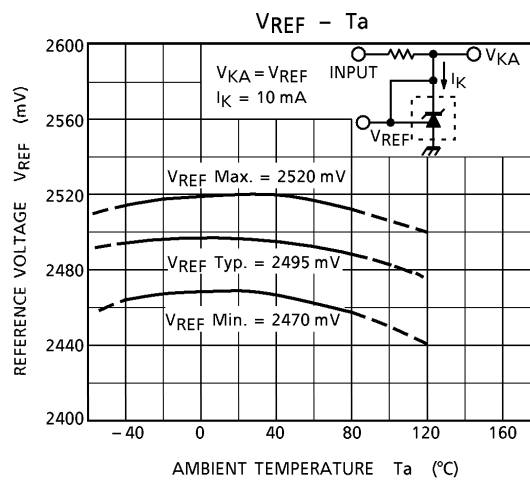
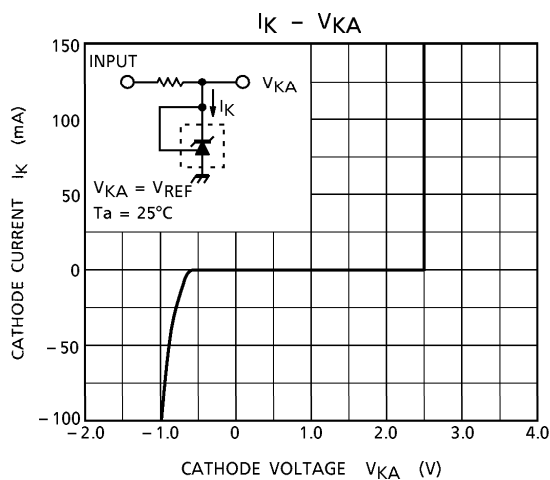
(1) 2.5 V REFERENCE

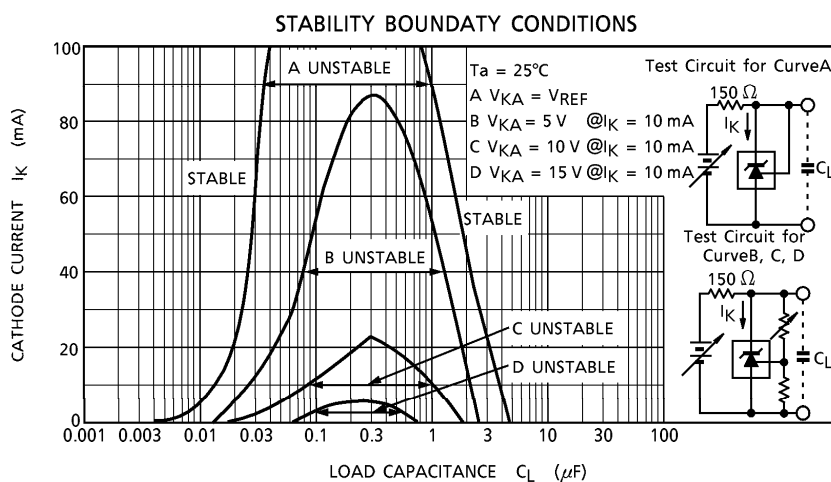
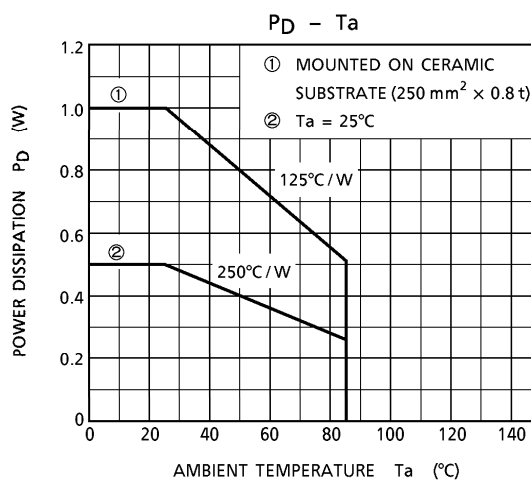
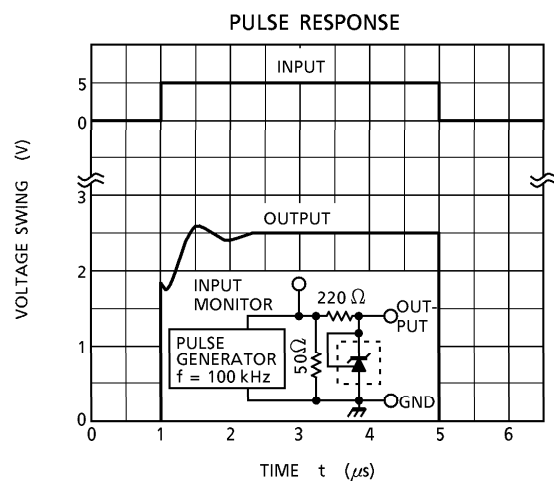
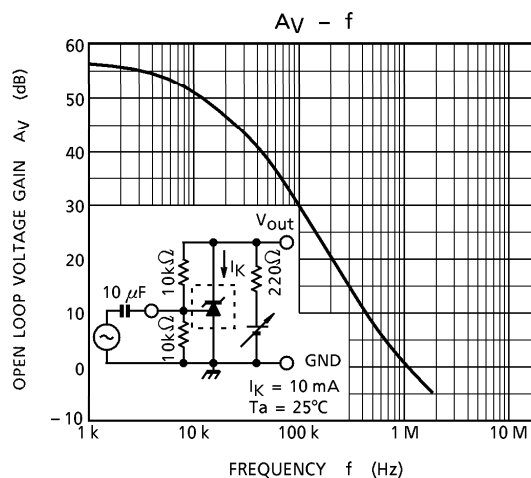
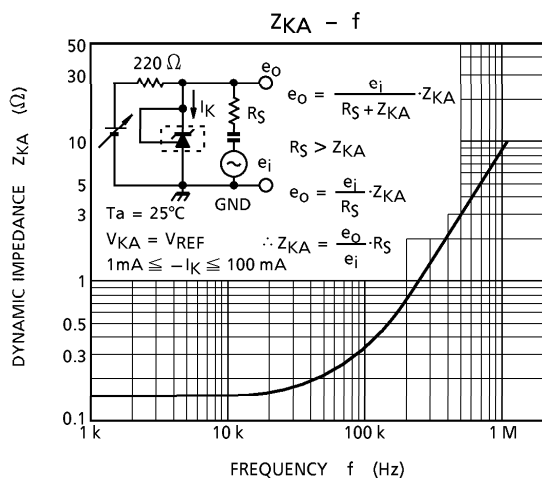


(2) SHUNT REGULATOR



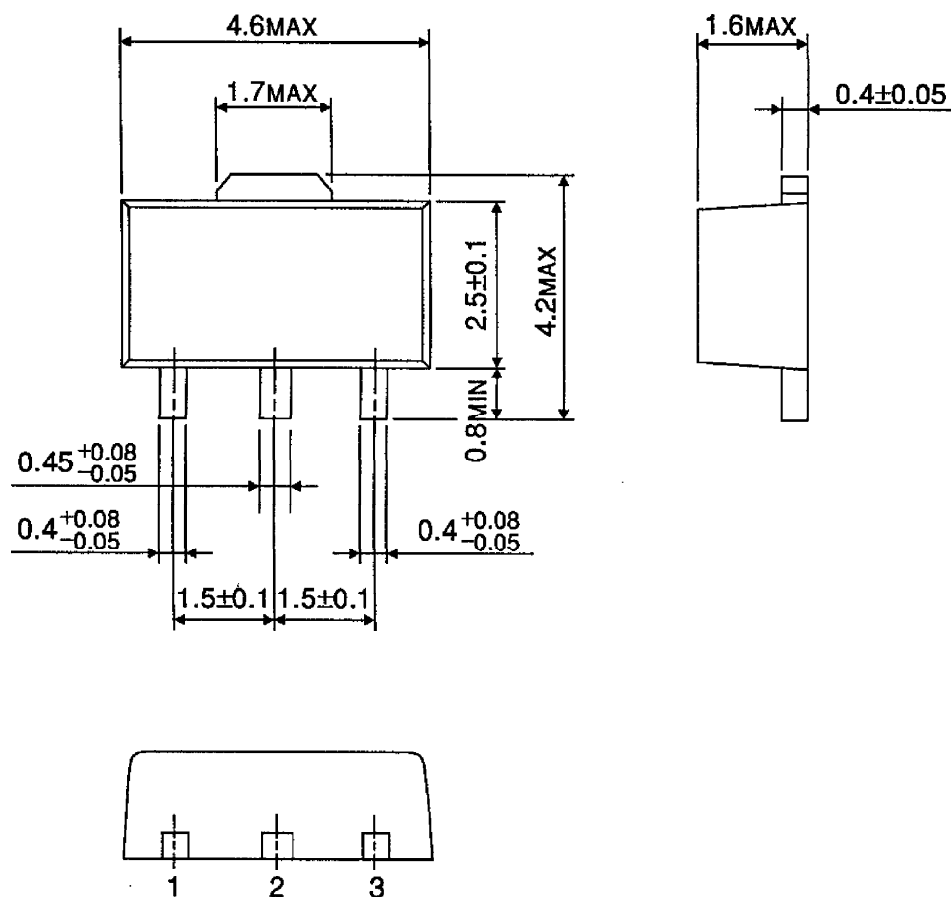
$$V_{OUT} = V_{REF} \left(1 + \frac{R_1}{R_2} \right) + I_{REF} \cdot R_1$$





OUTLINE DRAWING
HSOP3-P-1.50

Unit : mm



Weight : 0.05 g (Typ.)