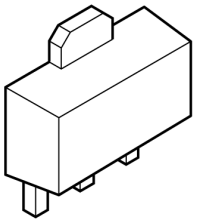
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA76431F, TA76431FR

Adjustable Precision Shunt Regulator

Features

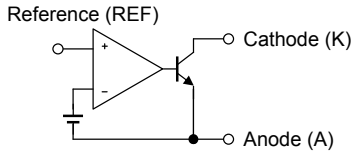
- Precision Reference Voltage: V_{REF} = 2.495 V ± 2%
- Small Temperature Coefficient: $|\alpha V_{REF}|$ = 46 ppm/°C
- Adjustable Output Voltage: $V_{REF} \leq V_{OUT} \leq 36$ V
- Low Dynamic Output Impedance: $|Z_{KA}|$ = 0.15 Ω (Typ.)
- Small Flat Package
- TA76431FR is a new Toshiba shunt regulator.
  This device's pin assignment is the reverse of that of the TA76431F.



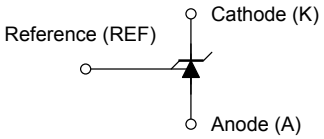
HSOP3-P-1.50

Weight: 0.05 g (typ.)

Functional Block Diagram



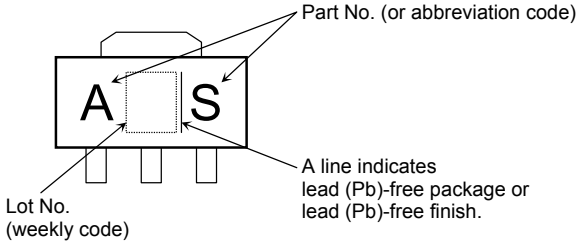
Circuit Symbol



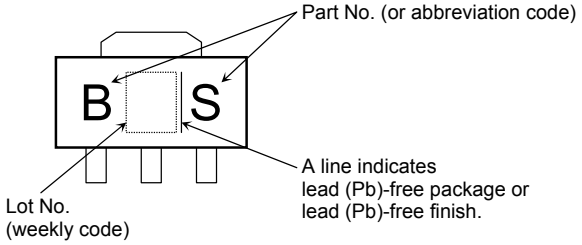
This IC contains electrostatic sensitive elements. Please take care to avoid generating static electricity when handling these devices.

Marking

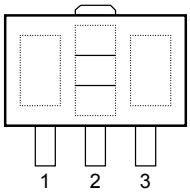
(1) TA76431F



(2) TA76431FR



Pin Assignment

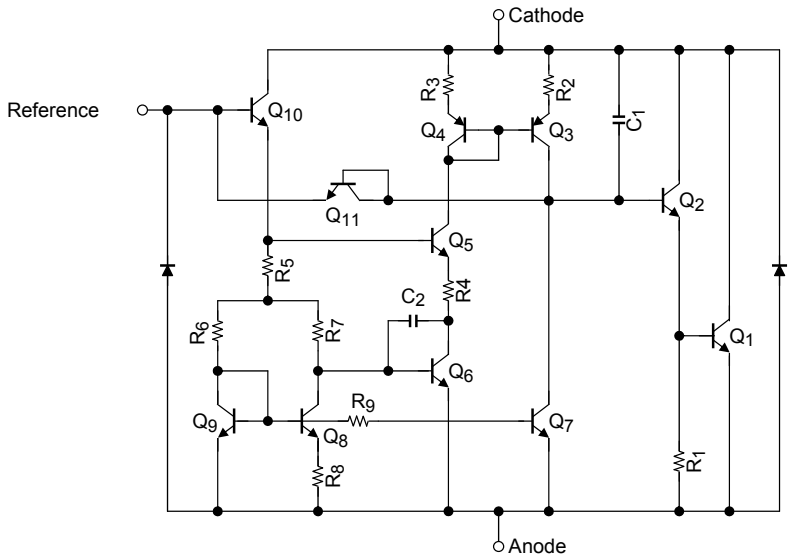


No.	(1) TA76431F	(2) TA76431FR
1	Cathode (K)	Reference (REF)
2	Anode (A)	Anode (A)
3	Reference (REF)	Cathode (K)

How to Order

No.	Product No.	Package Type	Packing Type	Minimum Order
(1)	TA76431F	PW-MINI (SOT-89) (surface-mount type)	On cut tape (TE12L): 100/tape section	100
	TA76431F (TE12L)		Embossed tape: 1000/tape	1 tape
(2)	TA76431FR		On cut tape (TE12L): 100/tape section	100
	TA76431FR (TE12L)		Embossed tape: 1000/tape	1 tape

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	500	mW
		1000 (Note)	
Operating temperature	T_{opr}	−40~85	°C
Storage temperature	T_{stg}	−55~150	°C

Note 1: Mounted on ceramic substrate (250 mm^2 × 0.8 mm t)

Note 2: 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).

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

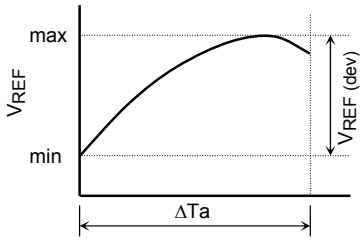
Electrical Characteristics
(Unless otherwise specified, Ta = 25°C, I_K = 10 mA)

Characteristics	Symbol	Test 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	$V_{REF\ (dev)}$	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} ≦ V_{KA} ≦ 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	$I_{REF\ (dev)}$	0°C ≦ Ta ≦ 70°C, $V_{KA} = V_{REF}$, R_1 = 10 kΩ, $R_2 = \infty$	—	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 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

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.

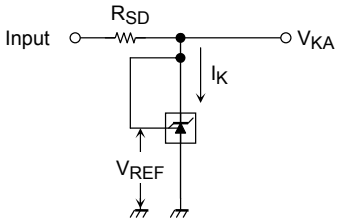
The average temperature coefficient of the V_{REF} is defined as:

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

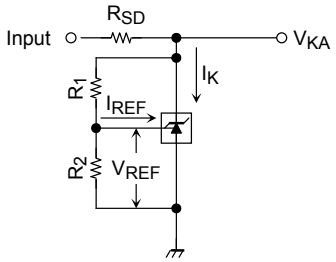


Test Parameter

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

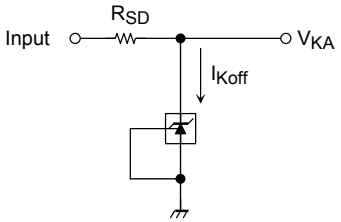


(2) $V_{KA} > V_{REF}$ Mode



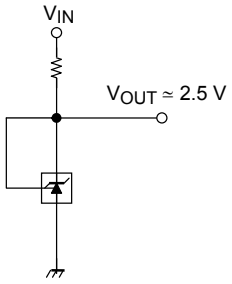
$$V_{KA} = V_{REF}\left(1 + \frac{R_1}{R_2}\right) + I_{REF} \cdot R_1$$

(3) OFF-State Mode

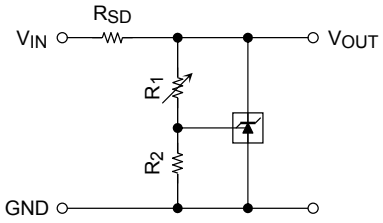


Typical Application Circuits

(1) 2.5 V Reference

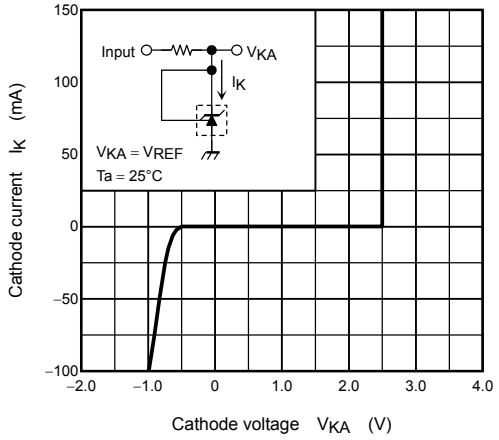


(2) Shunt Regulator

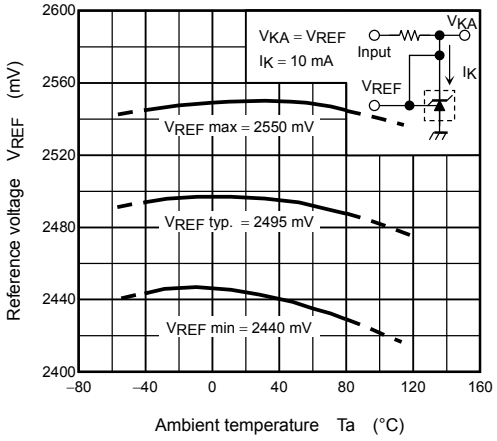


$$V_{OUT} = V_{REF}\left(1 + \frac{R_1}{R_2}\right) + I_{REF} \cdot R_1$$

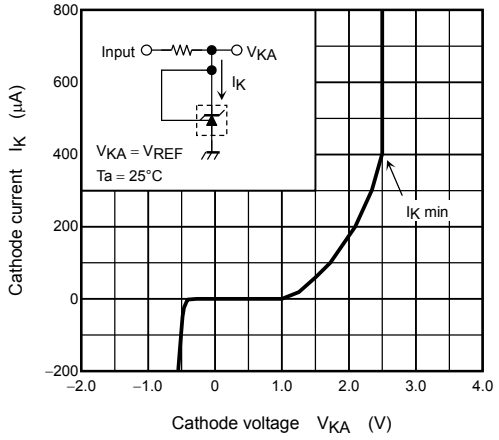
$I_K - V_{KA}$



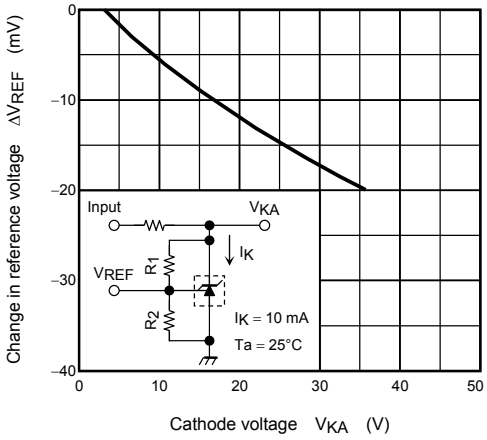
$V_{REF} - Ta$



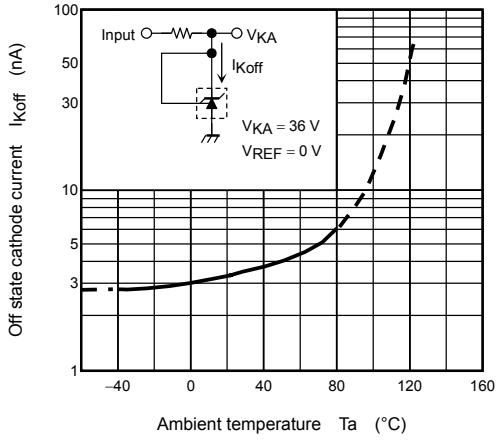
$I_K - V_{KA}$



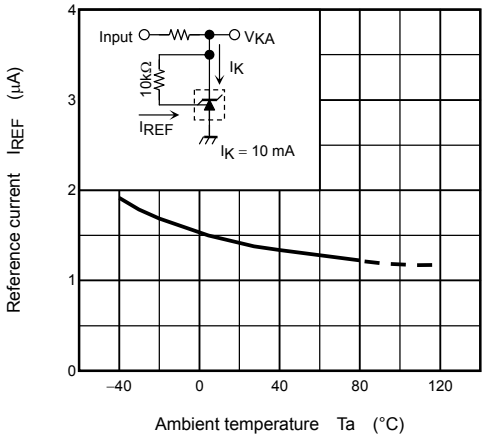
$\Delta V_{REF} - V_{KA}$



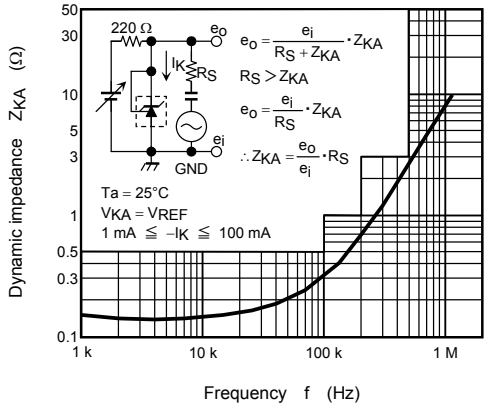
$I_{Koff} - Ta$



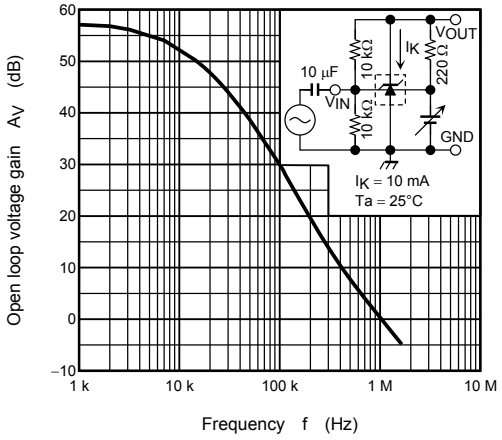
$I_{REF} - Ta$



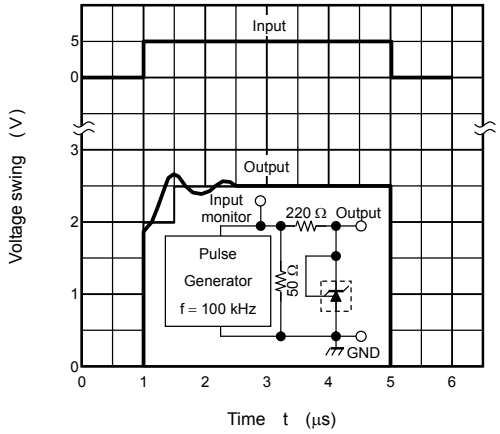
Z_{KA} – f



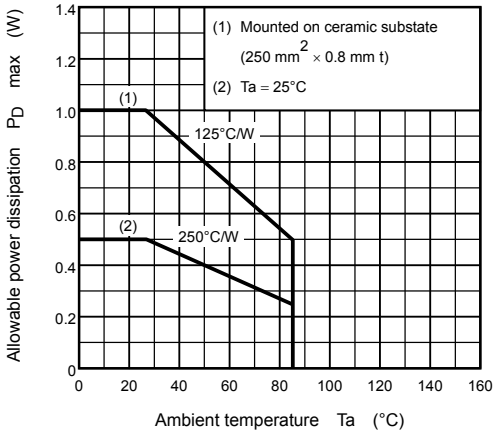
A_V – f



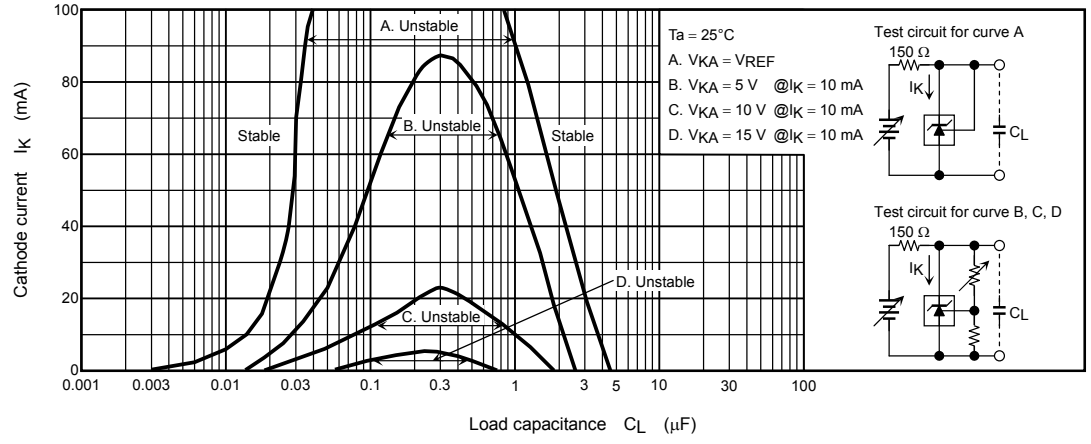
Pulse response



P_D max – Ta

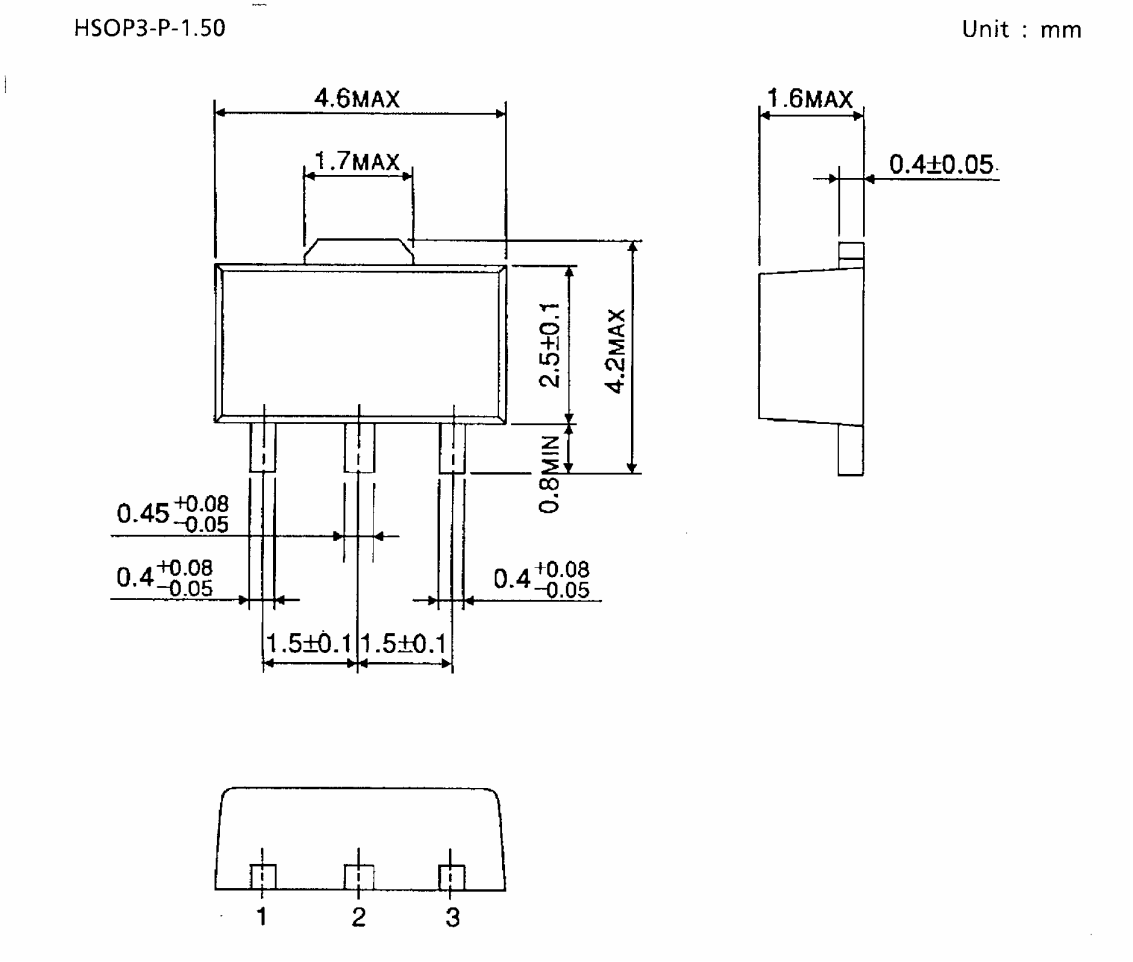


Safe operating area



Package Dimensions

HSOP3-P-1.50 Unit : mm



Weight: 0.05 g (typ.)

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20070701-EN

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