Adjustable Precisionshunt Regulation

Output Voltage to 40V ,
Reference Voltage Tolerance ± 0.5%

● Features

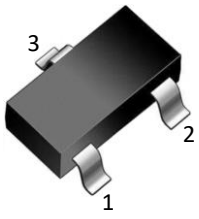
> Programmable Output Voltage to 40V
> Guaranteed 0.5% Reference Voltage Tolerance
> Low Dynamic Output Impedance 0.2Ω(Typ)
> Cathode Current Range (Continuous) -100 ~ 150 mA
> Equivalent Full-Range Temperature Coefficient of 50 ppm/℃
> Temperature Compensated for Operation over Full Rated Operating Temperature Range
> Low Output Noise Voltage
> Fast Turn on Response
> SOT-23 / TO-92 package
> ESD Tolerance (human body model) 2000V
> Operating Temperature Range -60 ~ +125℃

● Applications

> Switching Mode Power Supply
> Voltage Monitoring
> Adjustable Voltage and Current Referencing

● Outline

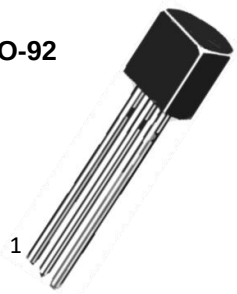
SOT-23



"H431LK" PN = Marking Code

Pin Assignment	
1	R
2	K
3	A

TO-92

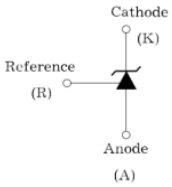


"H431LKA" PN= Marking Code

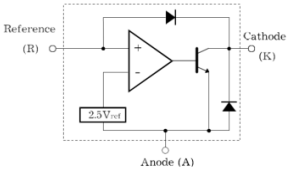
Pin Assignment	
1	R
2	A
3	K

Pb
RoHS

● Symbol



● Functional block diagram



●Absolute Maximum Ratings (T_J=25°C Unless Otherwise Noted)

Symbol	Parameter	Rating	Unit
V_{KA}	Cathode Voltage	42	V
I_K	Cathode Current Range (Continuous)	-100 ~ 150	mA
I_{REF}	Reference Input Current Range	-0.05 ~ +10	mA
P_D	Power Dissipation at 25°C: SOT-23 Package TO-92 Package	 0.2 0.6	W
T_J	Junction Temperature Range	0 ~ 150	℃
T_{OPER}	Operating Temperature Range	-60 ~ +125	℃
T_{STG}	Storage Temperature Range	-65 ~ +150	℃

●Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{KA}	Cathode Voltage	V_{REF}	-	40	V
I_K	Cathode Current	0.5		100	mA

●Electrical Characteristics (Ta = 25℃, V_{KA} = V_{REF}, I_K = 10mA unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{REF}	Reference Input Voltage	V_{KA} = V_{REF}, I_K = 10mA	2.483	2.495	2.507	V
$V_{REF(dev)}$	Deviation of Reference Input Voltage Over Full Temperature Range	Tmin ≦ Ta ≦ Tmax	-	3	17	mV
$\frac{\triangle V_{REF}}{\triangle V_{KA}}$	Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\triangle V_{KA}$=10V-V_{REF} $\triangle V_{KA}$ = 40V - 10V	-	-1.4 -1.0	-2.7 -2.0	mV/V
I_{REF}	Reference Input Current	R1 = 10KΩ, R2 = ∞	-	1.8	4	uA
$I_{REF(dev)}$	Deviation of Reference Input Current Over Full Temperature Range	R1 = 10KΩ, R2 = ∞	-	0.4	1.2	uA
$I_{K(min)}$	Minimum Cathode Current for Regulation		-	-	0.5	mA
$I_{K(off)}$	Off-State Cathode Current	V_{KA} = 40V, I_{REF} = 0	-	0.17	0.9	uA
Z_{KA}	Dynamic Impedance	I_K = 1mA to 100 mA , f≦1.0KHz	-	0.27	0.5	Ω

●Test Circuits

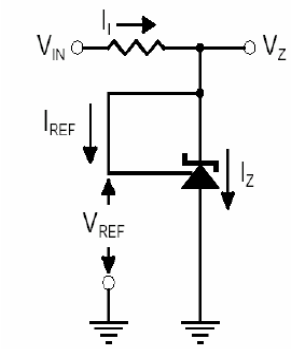


Fig1. Test Circuit for V_Z=V_{REF}

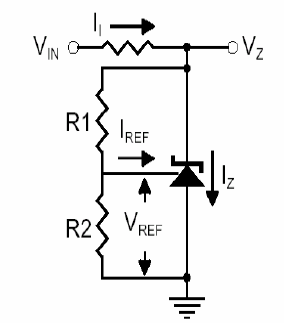


Fig2. Test Circuit for V_Z>V_{REF}
Note: V_Z=V_{REF}(1+R1/R2)+I_{REF}xR1

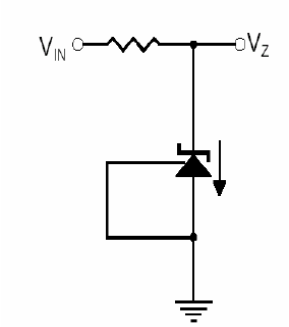
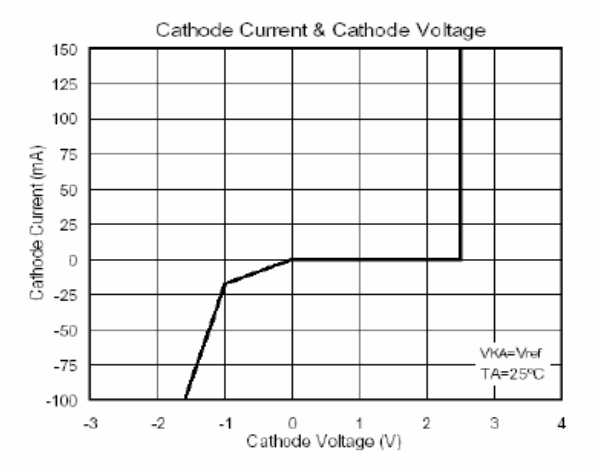
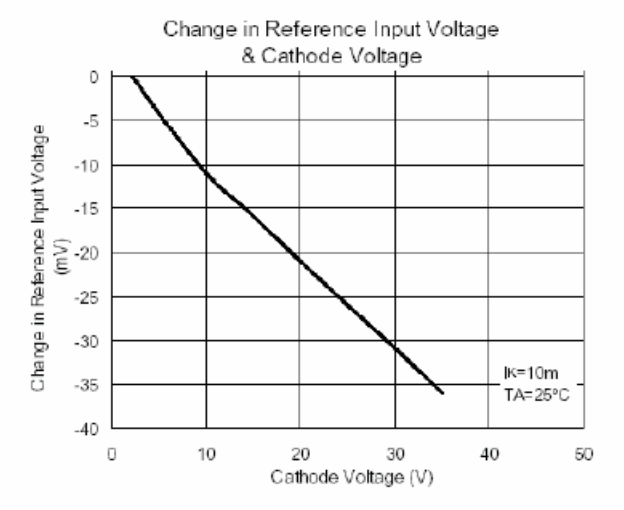
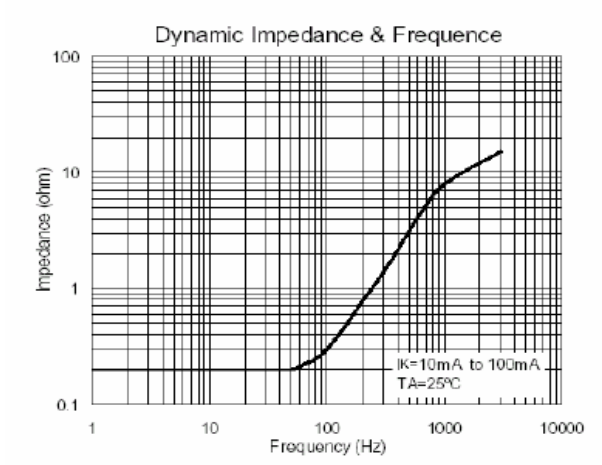


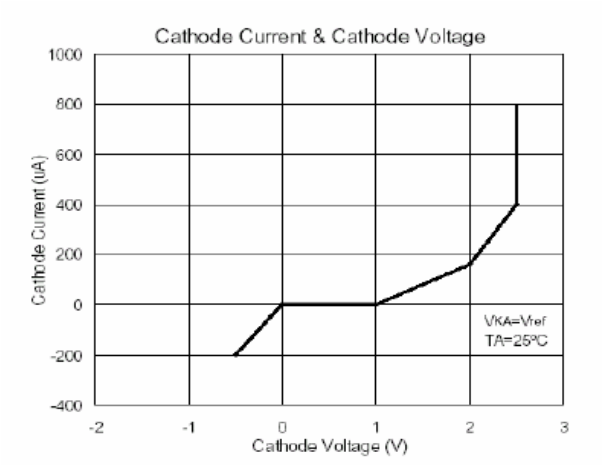
Fig3. Test Circuit for Off-State Current

●Electrical characteristic curves

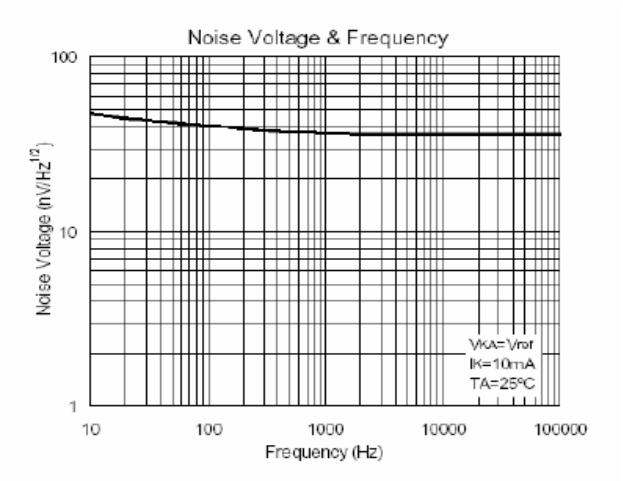


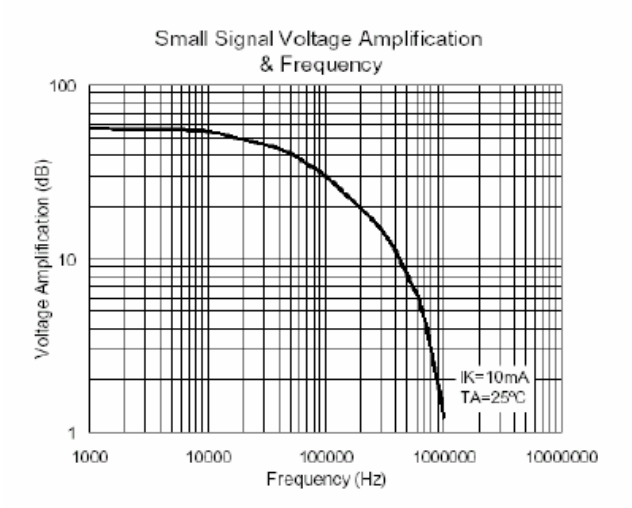


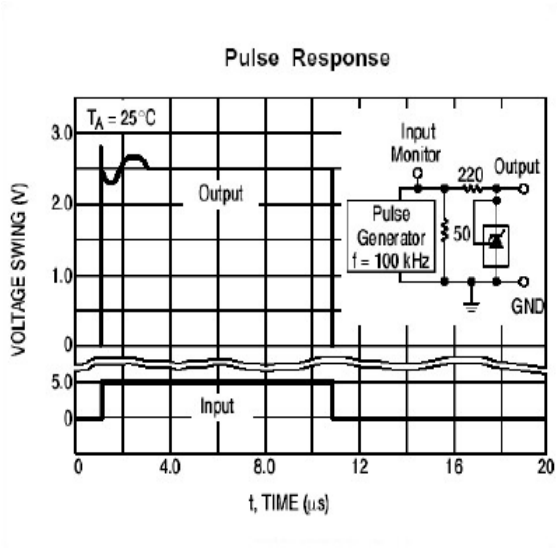




●Electrical characteristic curves







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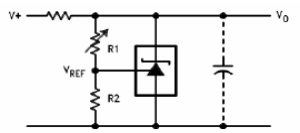
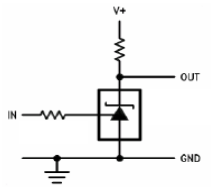
●Typical Application

Shunt Regulator



$$V_O \approx \left(1 + \frac{R1}{R2}\right) V_{REF}$$

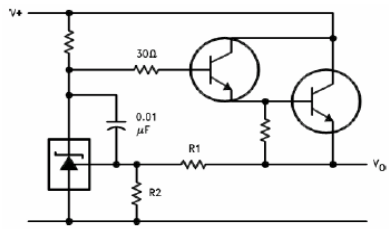
Single Supply Comparator with Temperature Compensated Threshold



$V_{TH} \approx 2.5V$

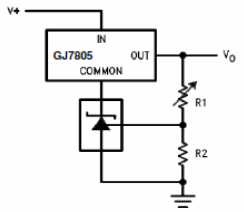
$V_{ON} \approx 2V, V_{OFF} = V^+$

Series Regulator



$$V_O \approx \left(1 + \frac{R1}{R2}\right) V_{REF}$$

Output Control of a Three Terminal Fixed Regulator

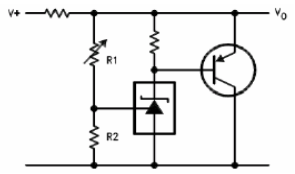


$$V_O \approx \left(1 + \frac{R1}{R2}\right) V_{REF}$$

$V_{O\,MIN} \approx V_{REF} + 5V$

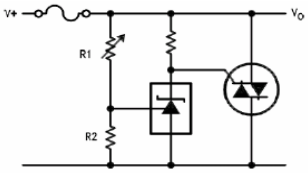
●Typical Application

Higher Current Shunt Regulator



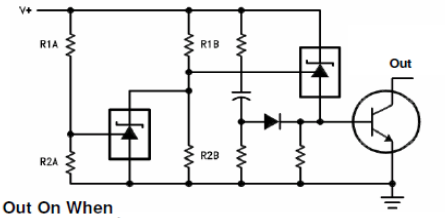
$$V_O \approx \left(1 + \frac{R1}{R2}\right) V_{REF}$$

Crow Bar



$$V_{Limit} \approx \left(1 + \frac{R1}{R2}\right) V_{REF}$$

Over Voltage/under Voltage Protection Circuit



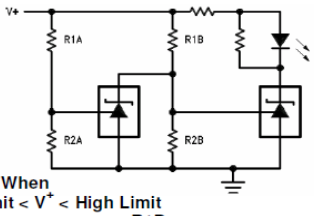
Out On When

Low Limit < V^+ < High Limit

$$\text{Low Limit} \approx V_{REF}\left(1 + \frac{R1B}{R2B}\right) + V_{BE}$$

$$\text{High Limit} \approx V_{REF}\left(1 + \frac{R1A}{R2A}\right)$$

Voltage Monitor



LED On When

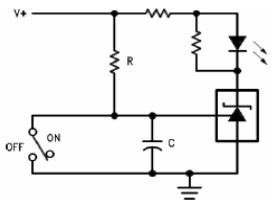
Low Limit < V^+ < High Limit

$$\text{Low Limit} \approx V_{REF}\left(1 + \frac{R1B}{R2B}\right)$$

$$\text{High Limit} \approx V_{REF}\left(1 + \frac{R1A}{R2A}\right)$$

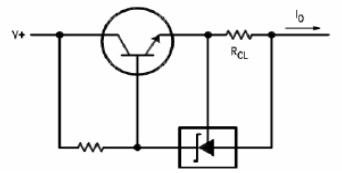
●Typical Application

Delay Timer



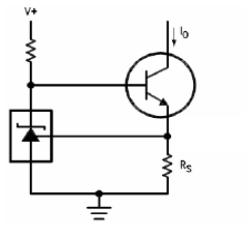
$$\text{Delay} = R \cdot C \cdot \ell n \frac{V^+}{(V^+)-V_{REF}}$$

Current Limiter or Current Source



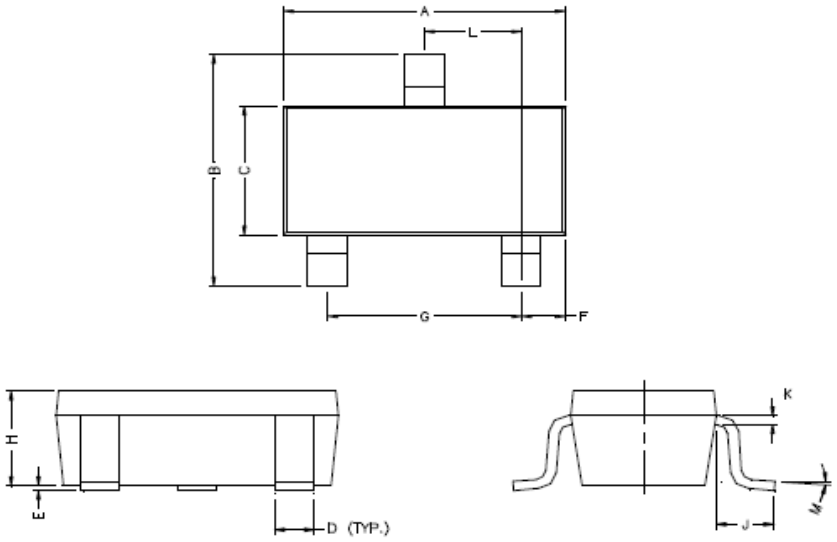
$$Io = \frac{V_{REF}}{R_{CL}}$$

Constant Current Sink

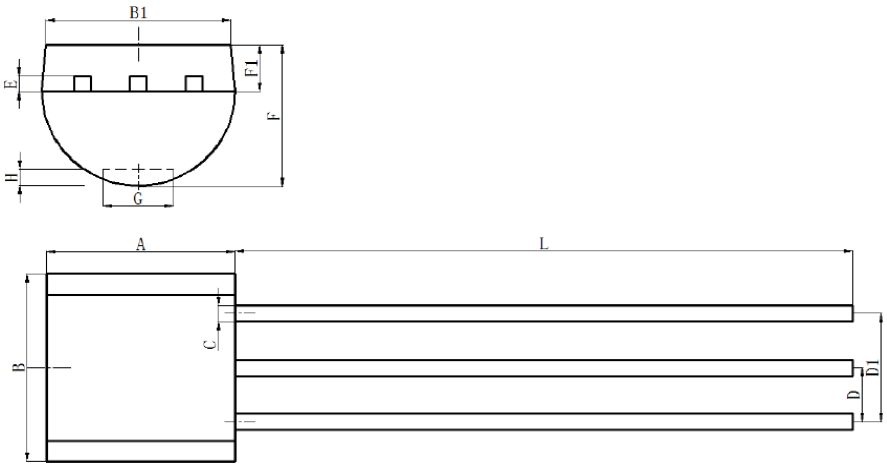


$$Io = \frac{V_{REF}}{R_S}$$

●Package Dimensions



SOT-23 Package		
Dim	Min	Max
A	2.70	3.10
B	2.40	2.80
C	1.40	1.60
D	0.35	0.50
E	0.00	0.10
F	0.45	0.55
G	1.90 REF.	
H	1.00	1.30
K	0.10	0.20
J	0.40	-
L	0.85	1.15
M	0°	10°
All Dimensions in mm		



TO-92 Package		
Dim	Min	Max
A	4.10	4.40
B	4.40	4.70
B1	4.30	4.40
C	0.41	0.51
D	1.27 REF.	
D1	2.44	2.64
E	0.29	0.31
F	3.30	3.70
F1	1.20	1.30
G	1.00	2.00
H	0.38 REF.	
L	13.80	14.80
All Dimensions in mm		

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