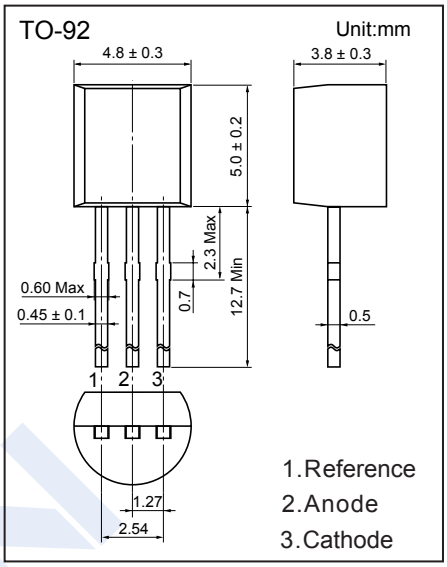
Adjustable Accurate Reference Source

TL431 (KL431)



■ Features

- The output voltage can be adjusted to 36V
- Low dynamic output impedance, its typical value is 0.2Ω
- Trapping current capability is 1 to 100mA
- The typical value of the equivalent temperature factor in the whole temperature scope is 50 ppm/℃
- The effective temperature compensation in the working range of full temperature
- Low output noise voltage
- Fast on-state response

■ Absolute Maximum Ratings (Operating temperature range applies unless otherwise specified)

Parameter	Symbol	Rating	Unit
Cathode Voltage	V_{KA}	37	V
Cathode Current Range (Continuous)	I_{KA}	-100 ～ +150	mA
Reference Input Current Range	I_{REF}	0.05 ～ +10	mA
Power Dissipation	P_D	770	mW
Operating Temperature	T_{OPR}	0 ～ 70	℃
Storage Temperature Range	T_{STG}	-65 ～ +150	℃

■ Electrical Characteristics (Ta = 25℃ unless otherwise specified)

Parameter	Symbol	Testconditons	Min	Typ	Max	Unit
Reference Input Voltage	V_{REF}	V_{KA} = V_{REF} , I_{KA} = 10mA	2.45	2.5	2.55	V
Deviation of Reference Input Voltage Over Temperature (*)	$\triangle V_{REF}/\triangle T$	V_{KA} = V_{REF} , I_{KA} = 10mA $T_{min} \leqslant T_a \leqslant T_{max}$		4.5	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\triangle V_{REF}/\triangle V_{KA}$	I_{KA} = 10mA , $\triangle V_{KA}$ = 10V ～ V_{REF}		-1.0	-2.7	mV/V
		I_{KA} = 10mA , $\triangle V_{KA}$ = 36V ～ 10V		-0.5	-2.0	mV/V
Reference Input Current	I_{REF}	I_{KA} = 10mA , R_1 = 10KΩ , R_2 = ∞		1.5	4	μA
Deviation of Reference Input Current Over Full Temperature Range	$\triangle I_{REF}/\triangle T$	I_{KA} = 10mA , R_1 = 10KΩ , R_2 = ∞ T_A = Full Temperature		0.4	1.2	μA
Minimum Cathode Current for Regulation	$I_{KA(min)}$	V_{KA} = V_{REF}		0.45	1.0	mA
Off-state Cathode Current	$I_{KA(OFF)}$	V_{KA} = 36V, V_{REF} = 0		0.05	1.0	μA
Dynamic Impedance	Z_{KA}	V_{KA} = V_{REF}, I_{KA} = 1 to 100mA, f ⩽ 1.0KHz		0.15	0.5	Ω

* T_{MIN} = 0℃ , T_{MAX} = +70℃

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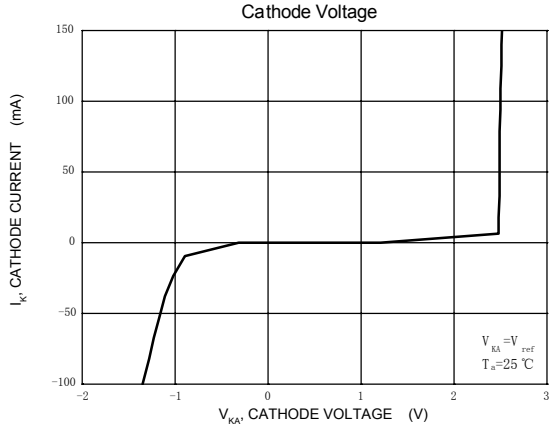
Classification Of VREF

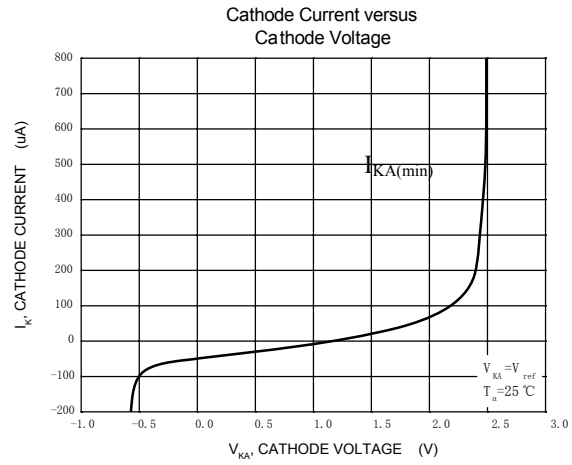
Rank	0.3%	0.5%	1%	2%
Rangfe	2.493~2.508	2.487~2.512	2.475~2.525	2.450~2.550

Typical Characterisitics

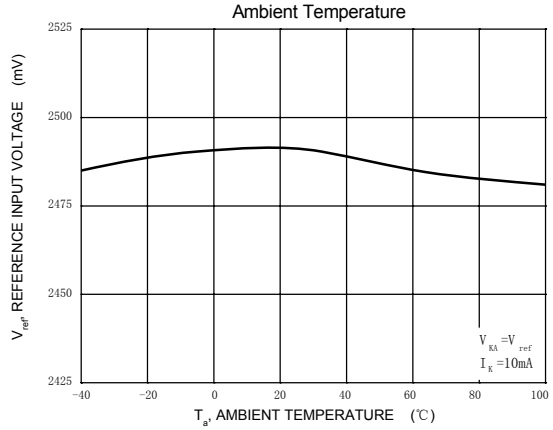
Cathode Current versus Cathode Voltage

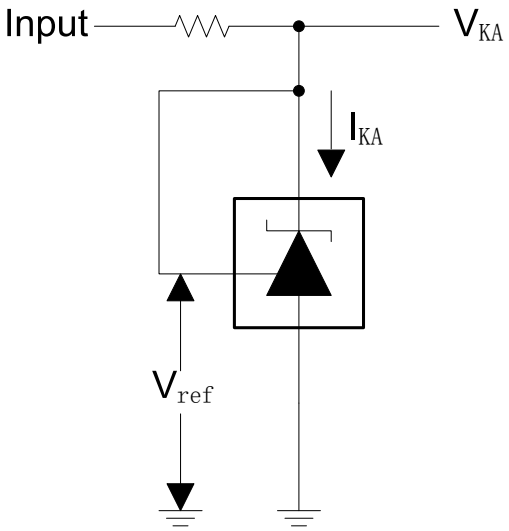


Cathode Current versus Cathode Voltage



Reference Input Voltage versus Ambient Temperature





Test Circuit for $V_{KA}=V_{ref}$

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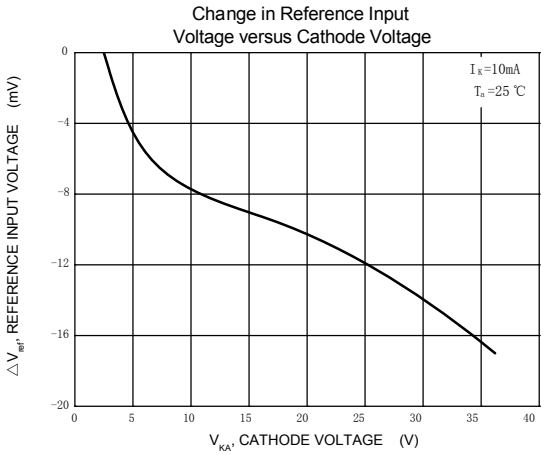
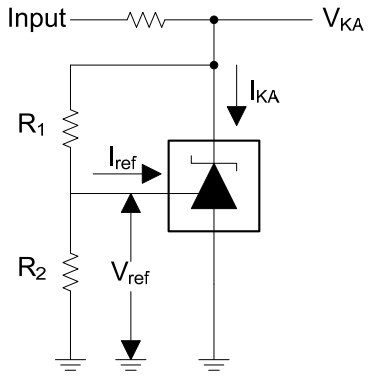
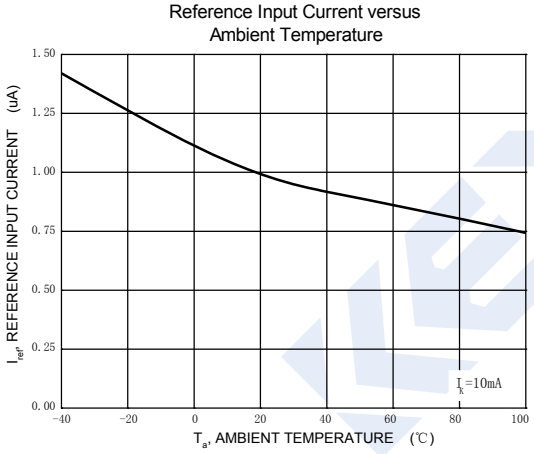
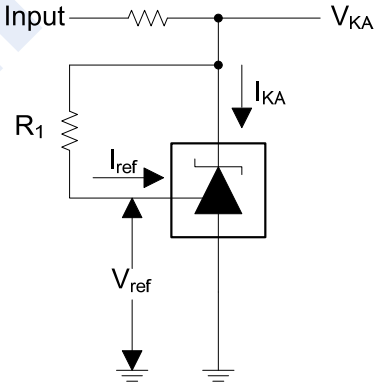
■ Typical Characterisitics



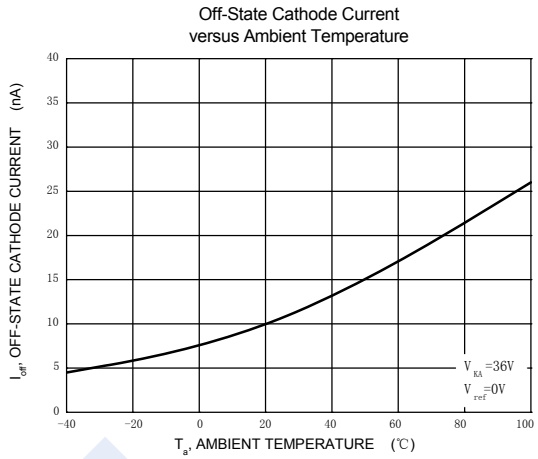


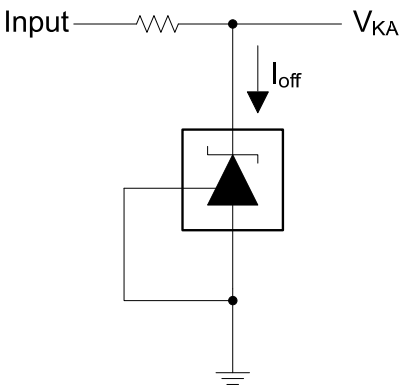
Test Circuit for $V_{KA}=V_{ref}(1+R1/R2)+R1*I_{ref}$





Test Circuit for I_{ref}





Test Circuit for I_{off}