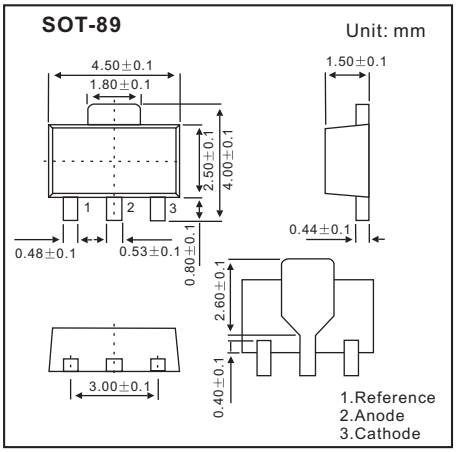
Adjustable Accurate Reference Source

TL431



■ 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	500	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

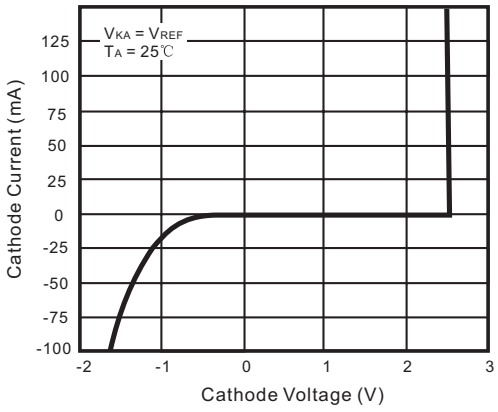
* T_{MIN} = 0℃ , T_{MAX} = +70℃

TL431

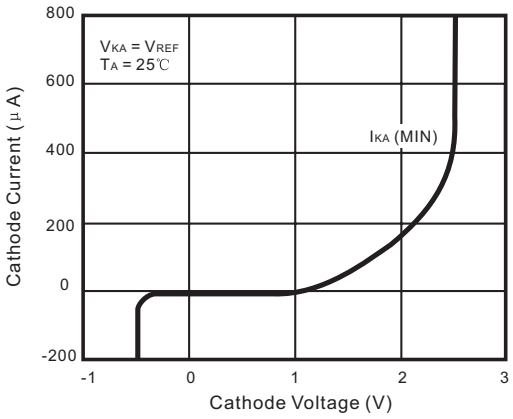
■ Classification Of VREF

Rank	0.5%	1%	2%
Range	2.487 ～ 2.512	2.475 ～ 2.525	2.450 ～ 2.550

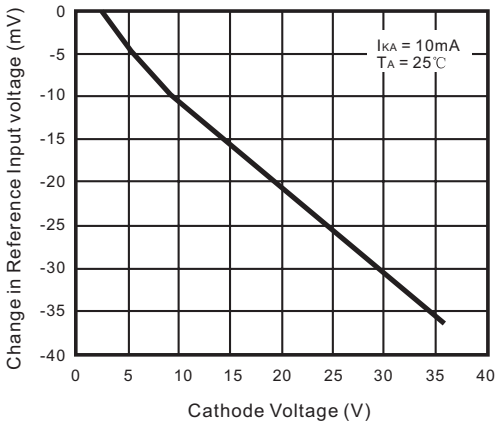
■ Typical Characteristics



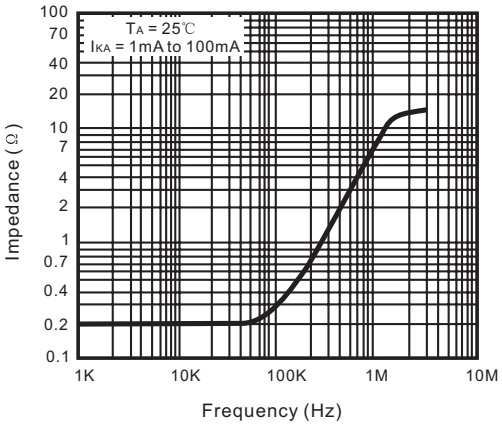
Cathode Current vs. Cathode Voltage



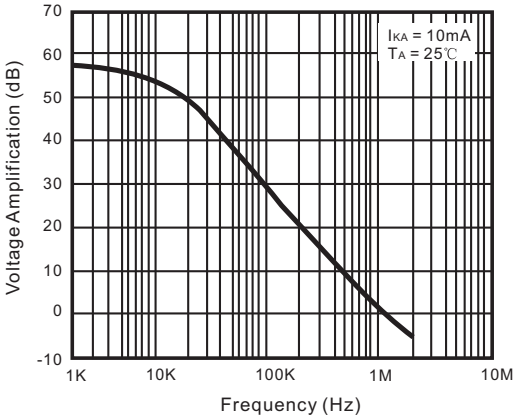
Cathode Current vs. Cathode Voltage



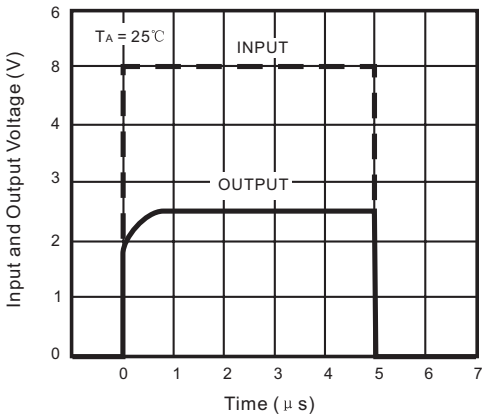
Change in Reference Input Voltage vs. Cathode Voltage



Dynamic Impedance Frequency



Small Signal Voltage Amplification vs. Frequency



Pulse Response