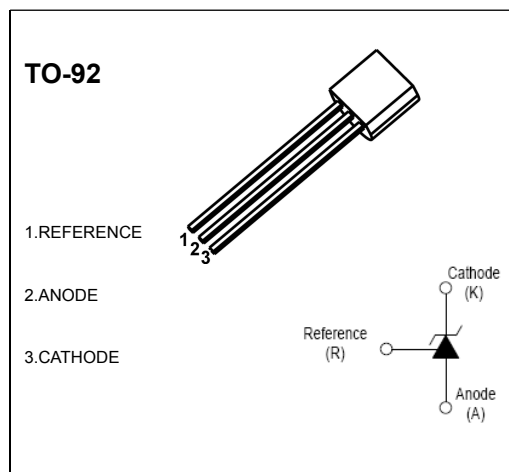


## TO-92 Encapsulate Adjustable Reference Source

**TL431** Adjustable Accurate Reference Source

### 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/°C
- 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	Unit	Value	Symbol
Cathode Voltage	V <sub>KA</sub>	37	V
Cathode Current Range (Continuous)	I <sub>KA</sub>	-100~+150	mA
Reference Input Current Range	I <sub>ref</sub>	0.05~+10	mA
Power Dissipation	P <sub>D</sub>	770	mW
Thermal Resistance from Junction to Ambient	R <sub>θJA</sub>	162	°C/W
Operating Ambient Temperature Range	T <sub>opr</sub>	-25~+85	°C
Storage Temperature Range	T <sub>stg</sub>	-65~+150	°C
Operating Junction Temperature	T <sub>j</sub>	150	°C

### ELECTRICAL CHARACTERISTICS (Ta=25°C unless otherwise specified)

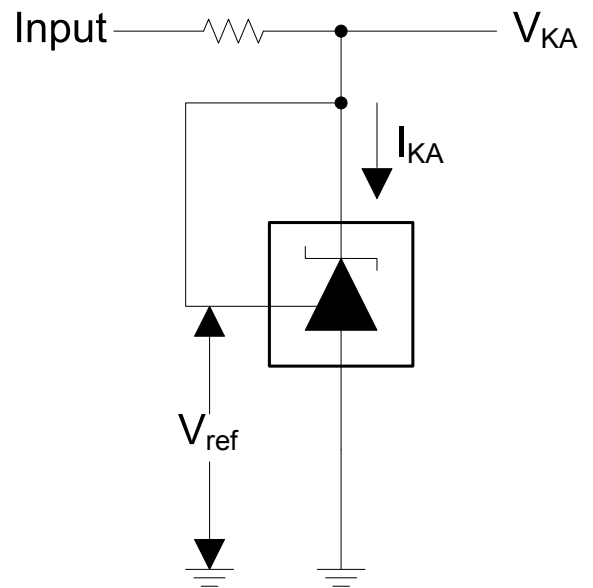
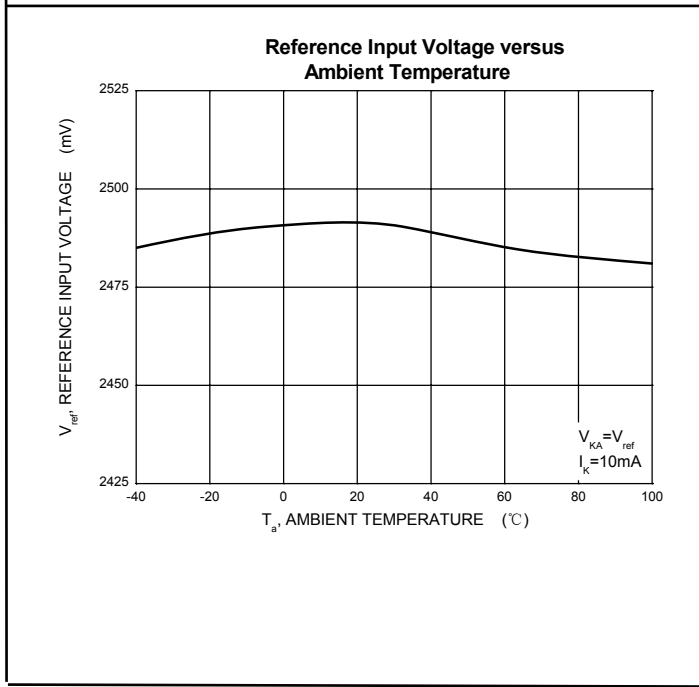
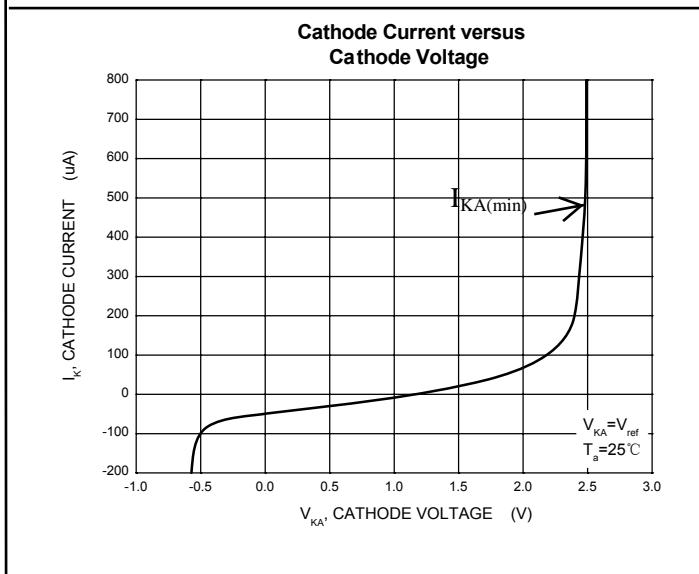
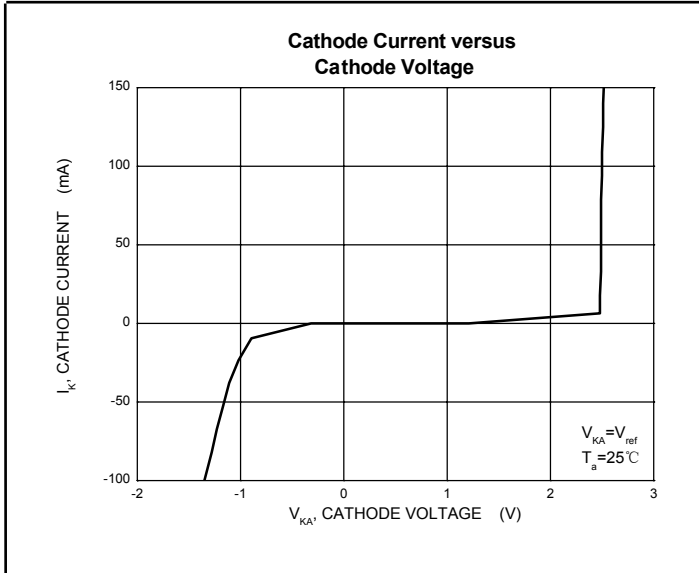
Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Reference Input Voltage	V <sub>ref</sub>	V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =10mA	2.475	2.5	2.525	V
Deviation of Reference Input Voltage Over Temperature (note)	ΔV <sub>ref</sub> /ΔT	V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =10mA T <sub>MIN</sub> ≤T <sub>a</sub> ≤T <sub>MAX</sub>		4.5	17	mV
Ratio Of Change in Reference Input Voltage to the Change in Cathode Voltage	ΔV <sub>ref</sub> /ΔV <sub>KA</sub>	I <sub>KA</sub> =10mA		-1.0	-2.7	mV/V
				-0.5	-2.0	mV/V
Reference Input Current	I <sub>ref</sub>	I <sub>KA</sub> = 10mA, R <sub>1</sub> =10kΩ R <sub>2</sub> =∞		1.5	4	μA
Deviation Of Reference Input Current Over Full Temperature Range	ΔI <sub>ref</sub> /ΔT	I <sub>KA</sub> =10mA, R <sub>1</sub> =10kΩ R <sub>2</sub> =∞ T <sub>A</sub> =-25 to 85°C		0.4	1.2	μA
Minimum Cathode Current for Regulation	I <sub>KA(min)</sub>	V <sub>KA</sub> =V <sub>REF</sub>		0.45	1.0	mA
Off-state Cathode Current	I <sub>KA(OFF)</sub>	V <sub>KA</sub> =36V, V <sub>REF</sub> =0		0.05	1.0	μA
Dynamic Impedance	Z <sub>KA</sub>	V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =1 to 100mA f≤1.0kHz		0.15	0.5	Ω

Note: T<sub>MIN</sub>=-25°C, T<sub>MAX</sub>=+85°C

### CLASSIFICATION cZVref

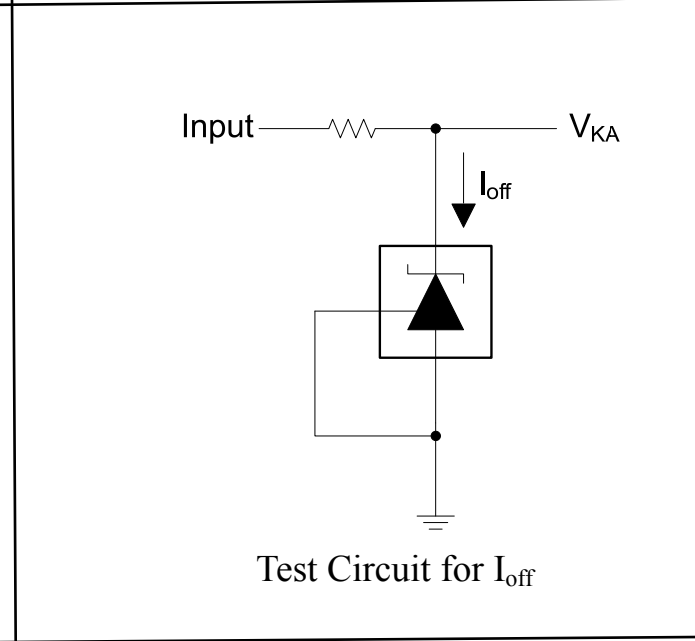
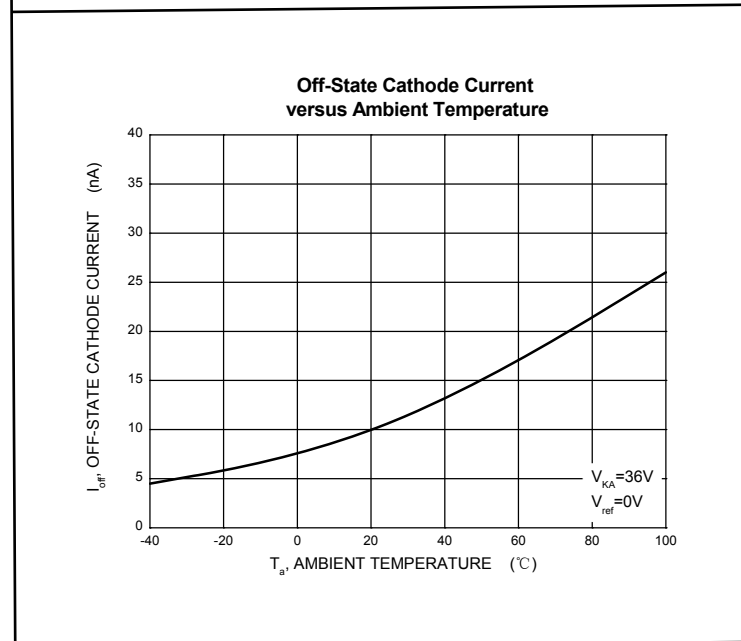
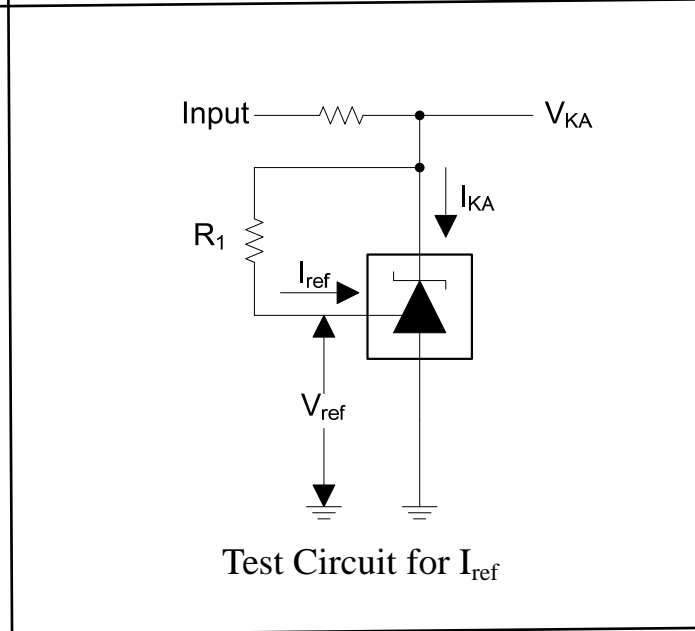
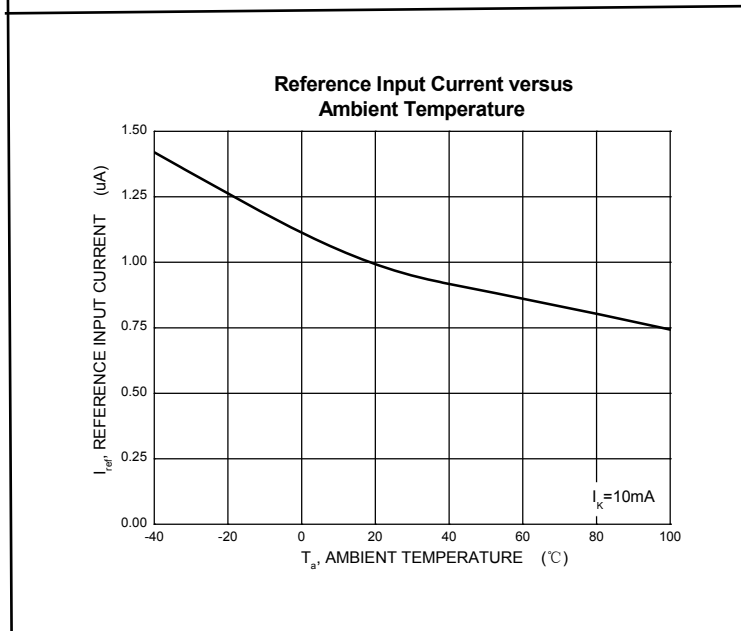
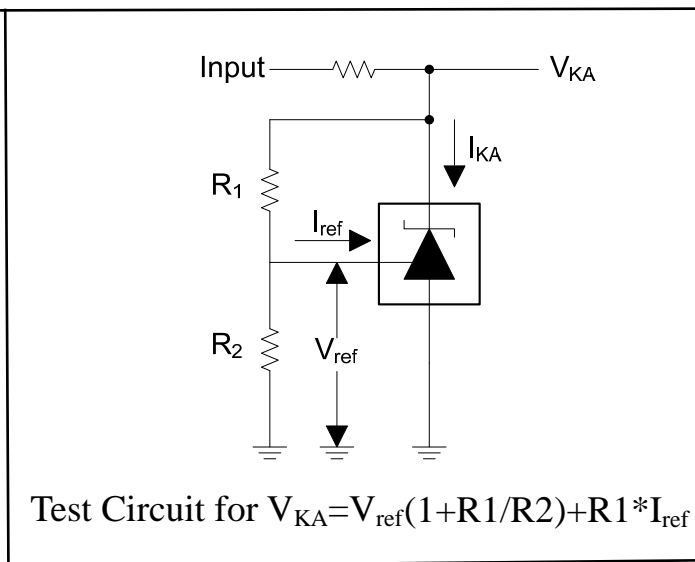
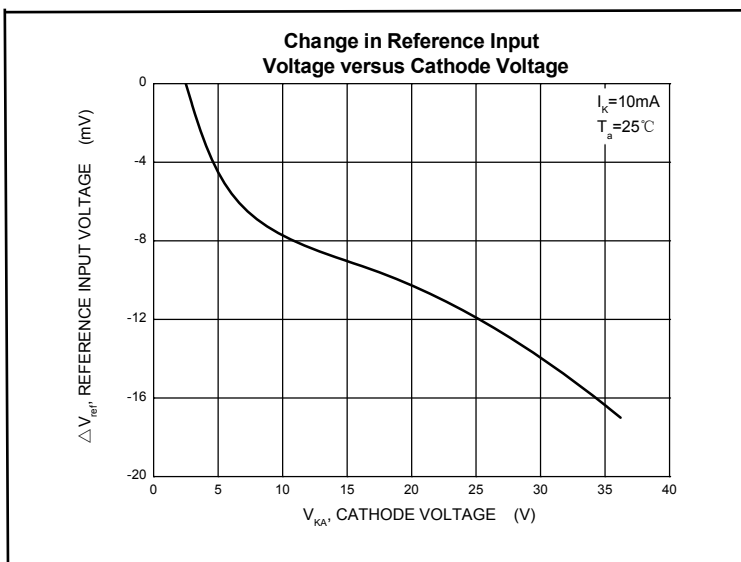
Rank	0.5%	***1%
Range	*****2.487-2.513	** 2.475-2.525

Typical Characteristics

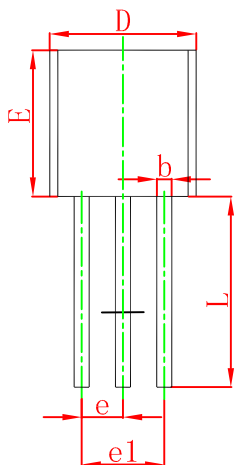
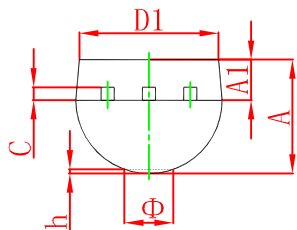


Test Circuit for  $V_{KA} = V_{ref}$

Typical Characteristics

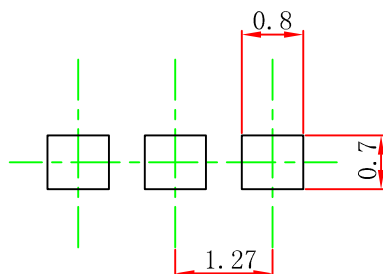


**TO-92 Package Outline Dimensions**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
$\Phi$		1.600		0.063
h	0.000	0.380	0.000	0.015

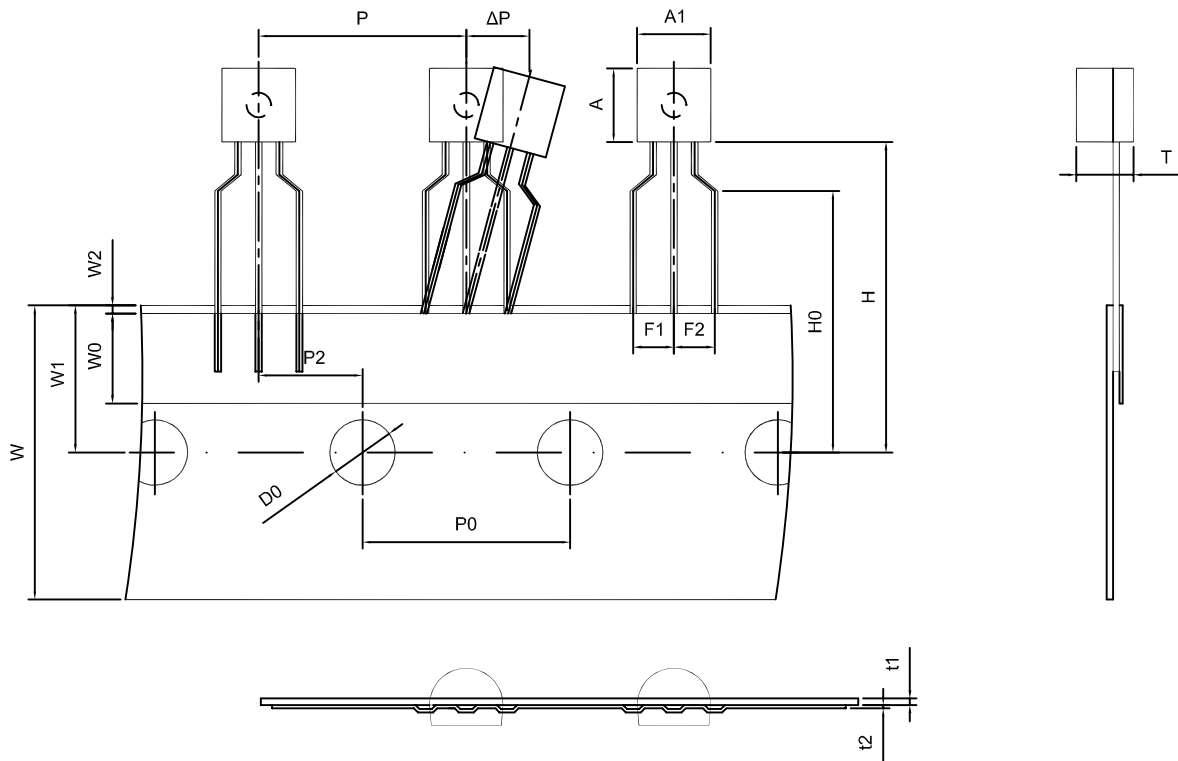
**TO-92 Suggested Pad Layout**



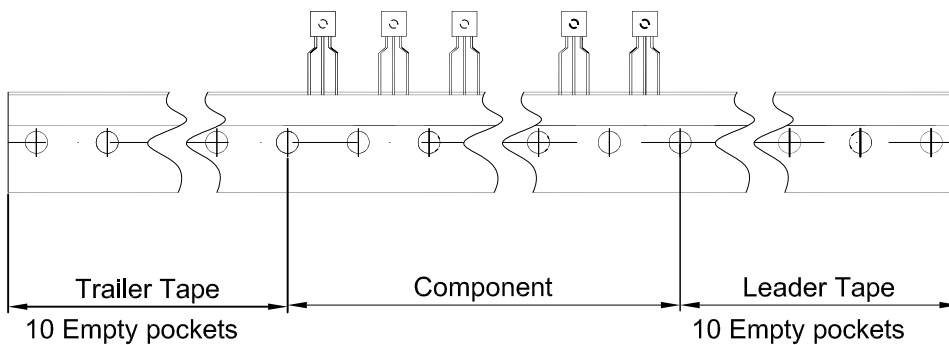
Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05$ mm.
3. The pad layout is for reference purposes only.

TO-92 PACKAGE TAPEING DIMENSION



Dimiensions are in millimeter								
A1	A	T	P	P0	P2	F1	F2	W
4.5±0.2	4.5±0.2	3.5±0.2	12.7±0.3	12.7±0.2	6.35±0.3	2.5±0.3	2.5±0.3	18.0+1.0/-0.5
W0	W1	W2	H	H0	D0	t1	t2	ΔP
6.0±0.5	9.0±0.5	1.0 MAX.	19.0±1.0	16.0±0.5	4.0±0.5	0.4±0.05	0.2±0.05	0 ± 1.0



Package	Box	Box Size(mm)	Carton	Carton Size(mm)
TO-92	2000 pcs	333×162×43	20,000 pcs	350×340×250