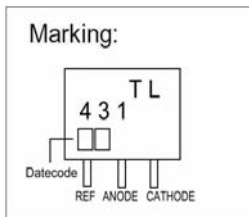
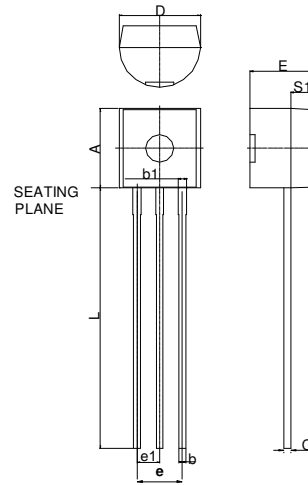


TO-92

**Description**

The TL431 series are three-terminal adjustable regulators with guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between  $V_{REF}$  (approximately 2.495V) and 36V with two external resistors. It provides very wide applications, including shunt regulator, series regulator, switching regulator, voltage reference and others.



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	4.45	4.7	D	4.44	4.7
S1	1.02	-	E	3.30	3.81
b	0.36	0.51	L	12.70	-
b1	0.36	0.76	e1	1.150	1.390
C	0.36	0.51	e	2.42	2.66

**Absolute Maximum Ratings at  $T_A=25^\circ\text{C}$**

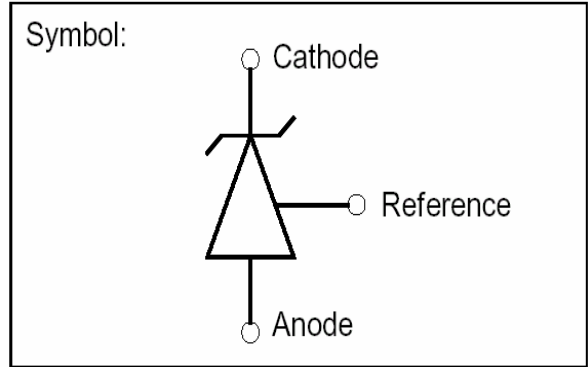
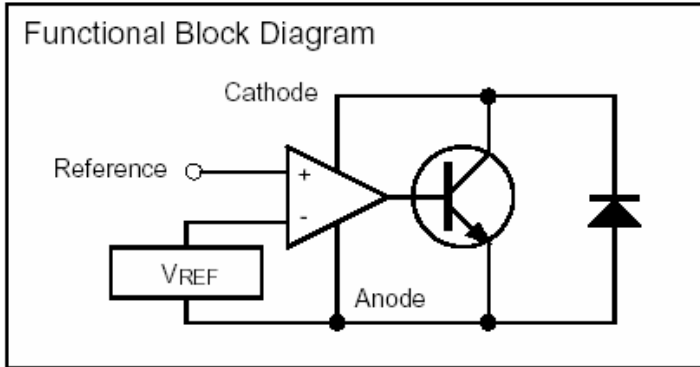
Parameter	Symbol	Ratings	Unit
Cathode Voltage	$V_{KA}$	37	V
Cathode Current Range (Continuous)	$I_{KA}$	-100~+150	mA
Reference Input Current Range	$I_{REF}$	-0.05~+10	mA
Operating Junction And Storage Temperature Range	$T_J, T_{stg}$	150, -65~+150	$^\circ\text{C}$
Total Power Dissipation	$P_D$	625	mW

**Characteristics at  $T_a = 25^\circ\text{C}$**

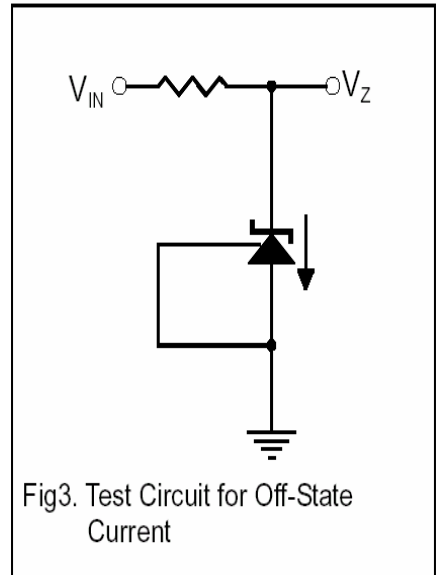
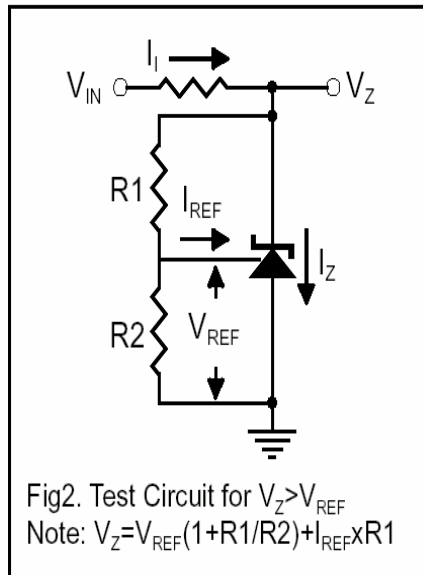
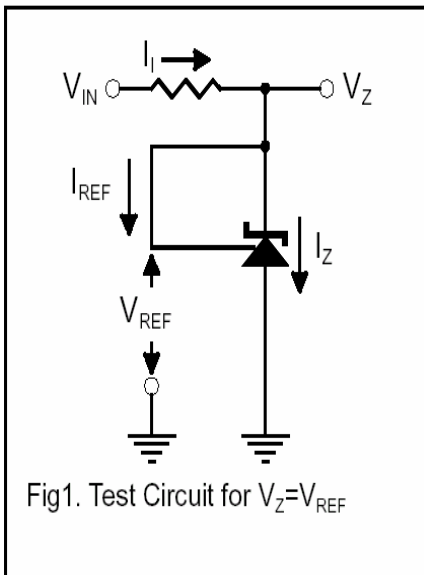
Parameter	Symbol	Min	Typ.	Max.	Unit	Test Conditions
Cathode Voltage	$V_{KA}$	$V_{REF}$	-	36	V	
Cathode Current	$I_{KA}$	1	-	100	mA	
Reference Input Voltage	$V_{REF}$	2.445	2.495	2.545	V	$V_{KA} = V_{REF}, I_K = 10\text{mA}$
		2.470	2.495	2.520		
		2.483	2.495	2.507		
Deviation of reference Input Voltage Over temperature(note)	$\Delta V_{REF}/\Delta T$	-	4.5	17	mV	$V_{KA} = V_{REF}, I_K = 10\text{mA}$ $T_{min} \leq T_a \leq T_{max}$
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{REF}/\Delta V_{KA}$	-	-1.0	-2.7	mV/V	$I_K = 10\text{mA}$ $\Delta V_{KA} = 10\text{V} \sim V_{REF}$ $\Delta V_{KA} = 36\text{V} \sim 10\text{V}$
Reference Input Current	$I_{REF}$	-	1.5	4	$\mu\text{A}$	$I_K = 10\text{mA}, R_1 = 10\text{K}\Omega, R_2 = \infty$
Deviation of reference Input Current Over Full Temperature Range	$\Delta I_{REF}/\Delta T$	-	0.4	1.2	$\mu\text{A}$	$I_K = 10\text{mA}, R_1 = 10\text{K}\Omega, R_2 = \infty$ $T_A = \text{Full Temperature}$
Minimum Cathode Current for Regulation	$I_{KA}(\text{min})$	-	0.45	1.0	mA	$V_{KA} = V_{REF}$
Off-State Cathode Current	$I_{KA}(\text{off})$	-	0.05	1.0	$\mu\text{A}$	$V_{KA} = 36\text{V}, V_{REF} = 0$
Dynamic Impedance	$ Z_{KA} $	-	0.15	0.5	$\Omega$	$V_{KA} = V_{REF}, I_K = 1 \text{ to } 100\text{mA}, F \leq 1.0\text{KHz}$

Note:  $T_{min} = 0^\circ\text{C}, T_{max} = +70^\circ\text{C}$

**Functional Block Diagram & Symbol**



**Test Circuits**



**Characteristics Curve**

