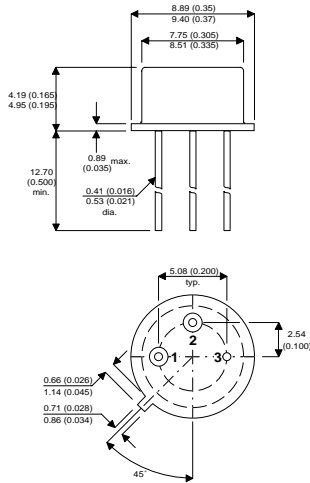


**MECHANICAL DATA**

Dimensions in mm (inches)



**TO39 PACKAGE**

PIN 1 = REF    PIN 2 = CATHODE    PIN 3 = ANODE

**FEATURES**

- VOLTAGE REFERENCE TOLERANCE  $\pm 1\%$
- PROGRAMMABLE OUTPUT VOLTAGE TO 36V
- EQUIVALENT FULL RANGE TEMPERATURE COEFFICIENT OF 30ppm/ $^{\circ}\text{C}$  TYPICAL
- TEMPERATURE COMPENSATED FOR OPERATION OVER FULL RATED OPERATING TEMPERATURE RANGE
- SINK CURRENT CAPABILITY 1 TO 100 mA
- FAST TURN-ON RESPONSE
- LOW DYNAMIC OUTPUT IMPEDANCE (0.2 $\Omega$  typical)
- LOW OUTPUT NOISE VOLTAGE

**DESCRIPTION**

The IP431A circuit is a monolithic three terminal programmable shunt regulator diode. This voltage reference operates as a low temperature coefficient zener which is programmable between  $V_{ref}$  (2.5V) and 36 volts using two external resistors. The device has a wide operating current range of 1mA to 100mA and a typical dynamic impedance of 0.2 $\Omega$ . Active output circuitry provides a very sharp turn-on characteristic making these devices excellent replacements for Zener Diodes in many applications. Being a shunt regulator it can be used as either a positive or negative voltage reference.

**ABSOLUTE MAXIMUM RATINGS** ( $T_{case} = 25^{\circ}\text{C}$  unless otherwise stated)

$V_{KA}$	Cathode To Anode Voltage	37V
$I_K$	Cathode Current Range	- 100 to +150mA
$I_{REF}$	Reference Input Current Range	- 0.05 to +10mA
$P_D$	Power Dissipation @ $T_A = 25^{\circ}\text{C}$	1.5W
	Derate Above 25 $^{\circ}\text{C}$	15mW/ $^{\circ}\text{C}$
$T_J$	Maximum Operating Junction Temperature	150 $^{\circ}\text{C}$
$T_A$	Operating Ambient Temperature Range	- 55 to +125 $^{\circ}\text{C}$
$T_{STG}$	Storage Temperature Range	- 65 to 150 $^{\circ}\text{C}$

**THERMAL CONDITIONS**

$R_{\theta JA}$	Thermal resistance, junction to Ambient,	160°C/W
$R_{\theta JC}$	Thermal resistance, junction to Case	20°C/W

**RECOMMENDED OPERATING CONDITIONS**

$V_{KA}$	Cathode To Anode Voltage	$V_{REF}$ to 36V
$I_K$	Cathode Current Range	1.0 to 100mA

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise stated)

Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{REF}$ Reference Input Voltage	$V_{KA} = V_{REF}$	2.47	2.495	2.52	V
	$I_K = 10\text{mA}$ $T_A = -55$ to $+125^\circ\text{C}^*$	2.426		2.564	
$\Delta V_{REF}$ Reference Input Voltage Over Temperature Range <sup>1</sup>	$V_{KA} = V_{REF}$ $I_K = 10\text{mA}$ $T_A = -55$ to $+125^\circ\text{C}^*$		15	44	mV
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$ Ratio of Reference Voltage Change to Change in Cathode to Anode Voltage	$I_K = 10\text{mA}$	$\Delta V_{KA} = 10\text{V}$ to $V_{REF}$	-1.5	-2.7	mV/V
		$\Delta V_{KA} = 36\text{V}$ to $10\text{V}$	-0.7	-2	
$I_{REF}$ Reference Input Current	$R1 = 10\text{k}\Omega$ $R2 = \infty$		1	4	$\mu\text{A}$
	$I_K = 10\text{mA}$ $T_A = -55$ to $+125^\circ\text{C}^*$			7	
$\Delta I_{REF}$ Reference Input Current Deviation Over Temperature Range	$R1 = 10\text{k}\Omega$ $R2 = \infty$ $I_K = 10\text{mA}$ $T_A = -55$ to $+125^\circ\text{C}^*$		1	3	$\mu\text{A}$
$I_{MIN}$ Minimum Cathode Current For Regulation	$V_{KA} = V_{REF}$		0.5	1	mA
$I_{OFF}$ Off-State Cathode Current	$V_{KA} = 36\text{V}$ $V_{REF} = 0$		3	1000	nA
$ Z_{ka} $ Dynamic Impedance <sup>2</sup>	$V_{KA} = V_{REF}$ $f \leq 1\text{kHz}$ $\Delta I_K = 1\text{mA}$ to $100\text{mA}$		0.2	0.5	$\Omega$