



**ADJUSTABLE PRECISION SHUNT REGULATOR**

**FEATURES**

- Low Voltage Operation (2.5V)
- Adjustable Output Voltage  $V_0 = V_{REF}$  to 18V
- Wide Operating Current Range 0.4mA to 100mA
- Low Dynamic Output Impedance  $0.5 \Omega$  max.
- ESD Rating is 5.5KV(Per MIL-STD-883D).
- Halogen Free Product

**APPLICATIONS**

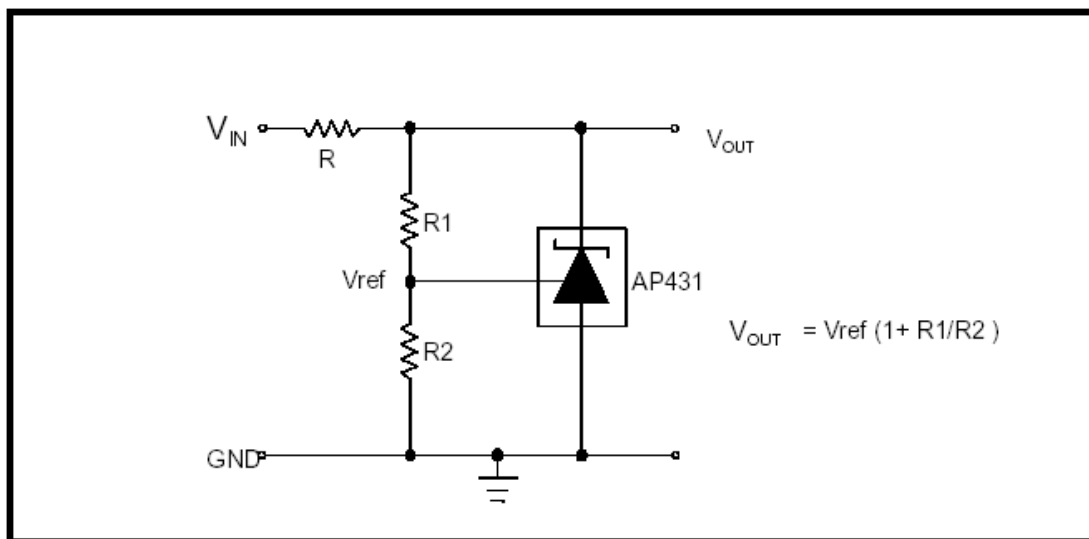
- Linear Regulators
- Adjustable Supplies
- Switching Power Supplies
- Battery Operated Computers
- Instrumentation
- Computer Disk Drives

**DESCRIPTION**

The AP431 is a low voltage three terminal adjustable shunt regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage can be set to any value between  $V_{REF}$  (approximately 2.5 V) to 18V with two external resistors (see application circuit). This device has a typical output impedance of  $0.2 \Omega$ . Active output circuitry provides a very sharp turn on characteristic, making this device excel lent replacement for Zener diodes in many applications.

The AP431 is characterized for operation from  $0^\circ\text{C}$  to  $105^\circ\text{C}$ , and four package options (SOT-23, SOT-89, SO-8 and TO-92) allow the designer the opportunity to select the proper package for their application.

**TYPICAL APPLICATION**

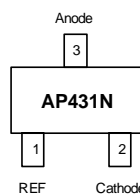


**ORDERING / PACKAGE INFORMATION**

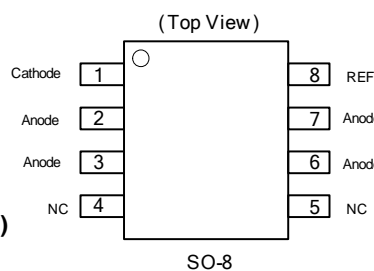
**AP431X**

Package Type

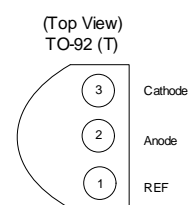
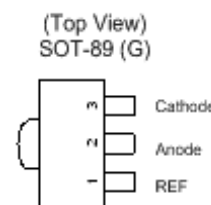
- N : SOT-23
- T : TO-92
- G : SOT-89
- M : SO-8



**SOT-23 (N type)**  
(Top View)



SO-8





**ABSOLUTE MAXIMUM RATINGS**

Cathode Voltage ( $V_{KA}$ )	-----	18V
Continuous Cathode Current ( $I_{KA}$ )	-----	150mA
Reference Input Current ( $I_{REF}$ )	-----	10mA
Power Dissipation ( $P_D$ )	-----	
	SOT-23	----- 0.3W
	SOT-89	----- 0.625W
	SO-8	----- 1.25W
	TO-92	----- 0.64W
Storage Temperature Range ( $T_{ST}$ )	-----	-65 to +150°C
Junction Temperature ( $T_J$ )	-----	+125°C
Thermal Resistance from Junction to ambient ( $R_{th(ja)}$ )		
	SOT-23	----- 336°C/W
	SOT-89	----- 160°C/W
	SO-8	----- 80°C/W
	TO-92	----- 156°C/W
Lead Temperature (Soldering) 10 seconds ( $T_{LEAD}$ )		260°C

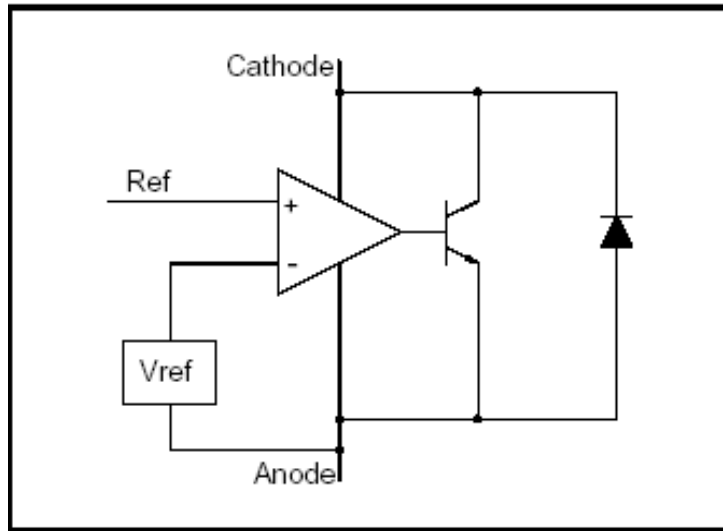
**ELECTRICAL SPECIFICATIONS**

( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Reference Voltage (Test circuit 1)	$V_{REF}$	$V_{KA} = V_{REF}, I_{KA} = 10\text{mA}$	2.47	2.495	2.52	V
Deviation of Reference Input Voltage over full temperature range (Test circuit 1)	$V_{REF(DEV)}$	$V_{KA} = V_{REF},$ $I_{KA} = 10\text{mA},$ $T_A = \text{Full Range}$		4	25	mV
Reference Input Current (Test circuit 2)	$I_{REF}$	$R1 = 10\text{K}\Omega,$ $R2 = \infty, I_{KA} = 10\text{mA}$	-	2	4	$\mu\text{A}$
Deviation of Reference current over full temperature range (Test circuit 2)	$I_{REF(DEV)}$	$R1 = 10\text{K}\Omega,$ $R2 = \infty, I_{KA} = 10\text{mA}$ $T_A = \text{Full Range}$	-	0.4	1.2	$\mu\text{A}$
Ratio of change in reference voltage to the change in cathode voltage (Test circuit 2)	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_{KA} = 10\text{mA}, \delta V_{KA} = 10\text{V} - V_{REF}$	-	-1.4	-2.7	mV/V
Minimum Cathode Current for Regulation (Test circuit 1)	$I_{KA(min)}$	$V_{KA} = V_{REF}$	-	0.4	1	mA
Off-state Cathode Current (Test circuit 3)	$I_{KA(OFF)}$	$V_{KA} = 18\text{V},$ $V_{REF} = 0\text{V}$	-	0.1	1	$\mu\text{A}$
Dynamic Impedance (Test circuit 1)	$ Z_{KA} $	$V_{KA} = V_{REF}, I_{KA} = 1\text{mA} \sim 100\text{mA}$ Frequency $\leq 1\text{KHz}$	-	0.2	0.5	$\Omega$

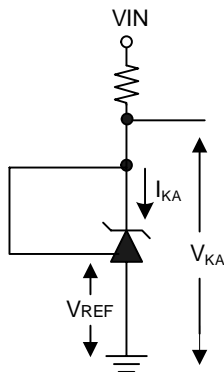


**BLOCK DIAGRAM**

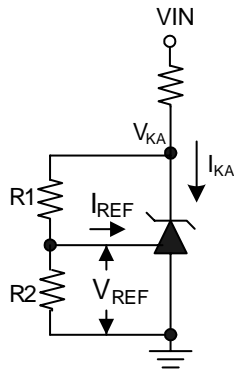


**TEST CIRCUIT**

(1):  $V_{KA} = V_{REF}$

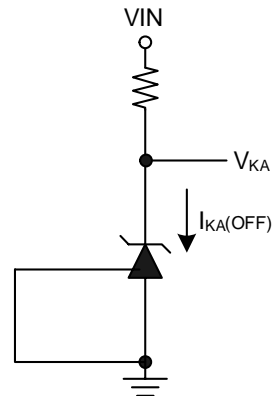


(2):  $V_{KA} > V_{REF}$

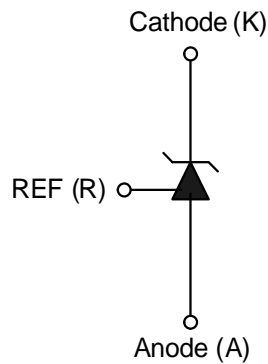


$$V_{KA} = V_{REF} \times (1 + R1/R2) + I_{REF} \times R1$$

(3): Off state current



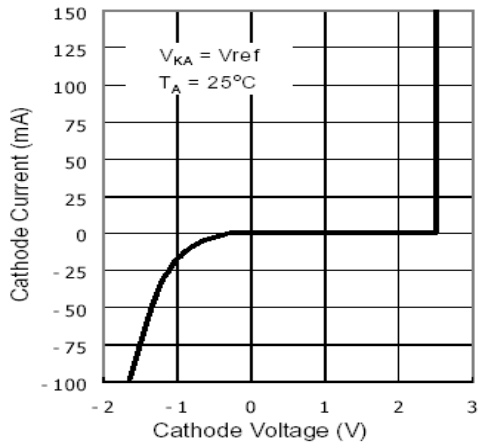
**SYMBOL**



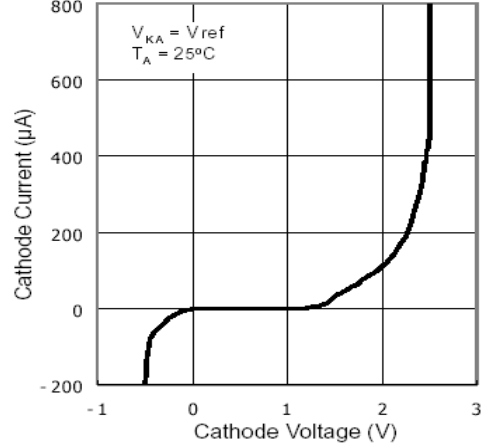


TYPICAL PERFORMANCE CHARACTERISTICS

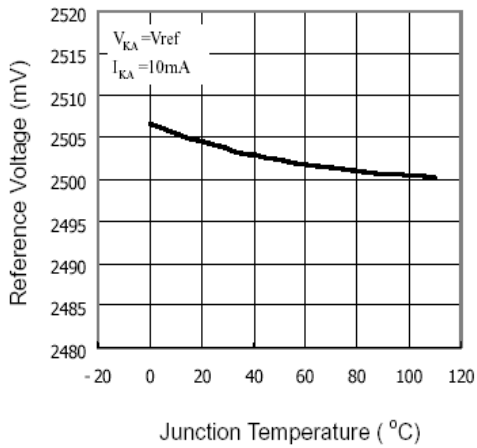
CATHODE CURRENT vs. CATHODE VOLTAGE



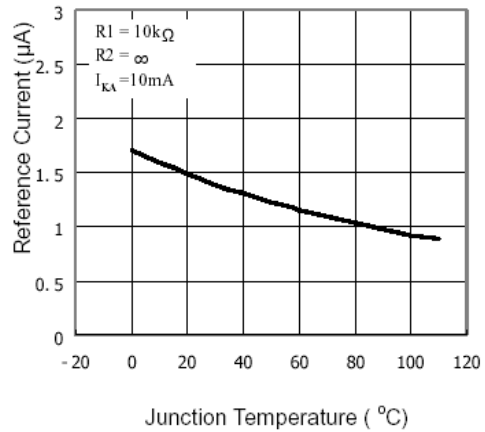
CATHODE CURRENT vs. CATHODE VOLTAGE



REFERENCE VOLTAGE vs.  
JUNCTION TEMPERATURE



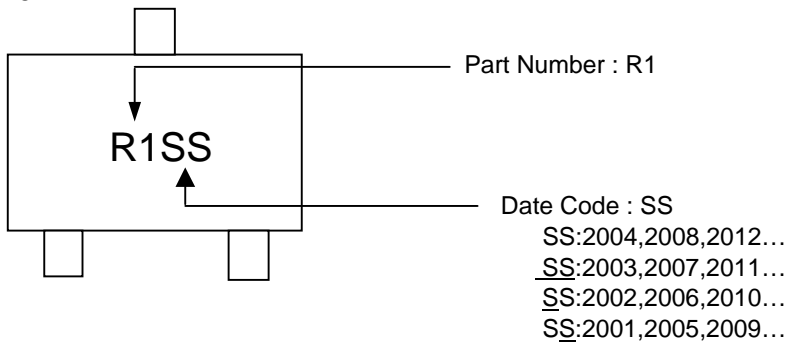
REFERENCE INPUT CURRENT vs.  
JUNCTION TEMPERATURE



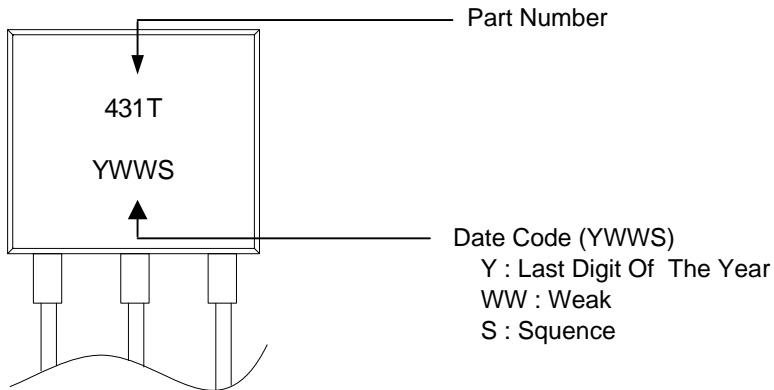


MARKING INFORMATION

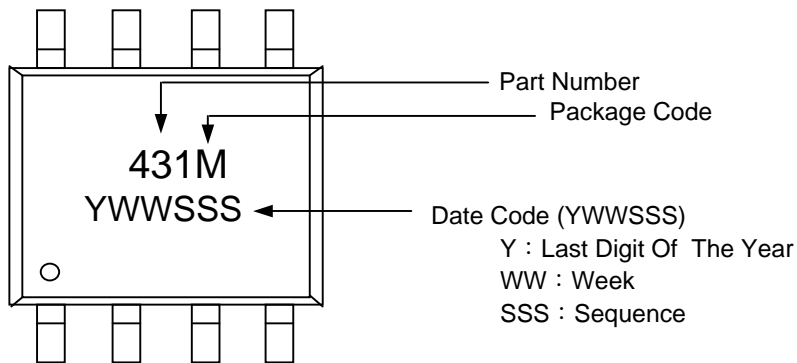
SOT-23



TO-92



SO-8



SOT-89

