



Adjustable Precision Shunt Regulator

General Description

The CYT431A is a programmable shunt voltage reference with guaranteed temperature stability over the entire temperature range of operation.

The output voltage may be set to any value between 2.5V and 40V with two external resistors. This device has a typical output impedance of 0.2Ω. Active output circuitry provides a very sharp turn on characteristic, making this device excellent replacement for Zener diodes in many applications.

The CYT431A is characterized for operation from 0°C to 85°C.

Features

- Adjustable output voltage $V_0 = 2.5V$ to 40V.
- Wide operating current range 100μA to 100mA.
- Low dynamic output impedance 0.2Ω (Typ.).
- Voltage Reference Tolerance: ±0.5%.
- ESD rating is 2.5KV(Per MIL-STD-883G).
- Available in Lead Free Packages.

Applications

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



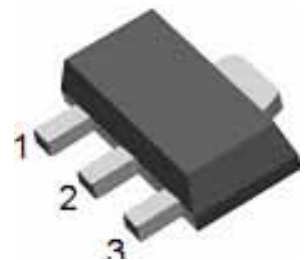
TO-92 Package



SOT-23 Package



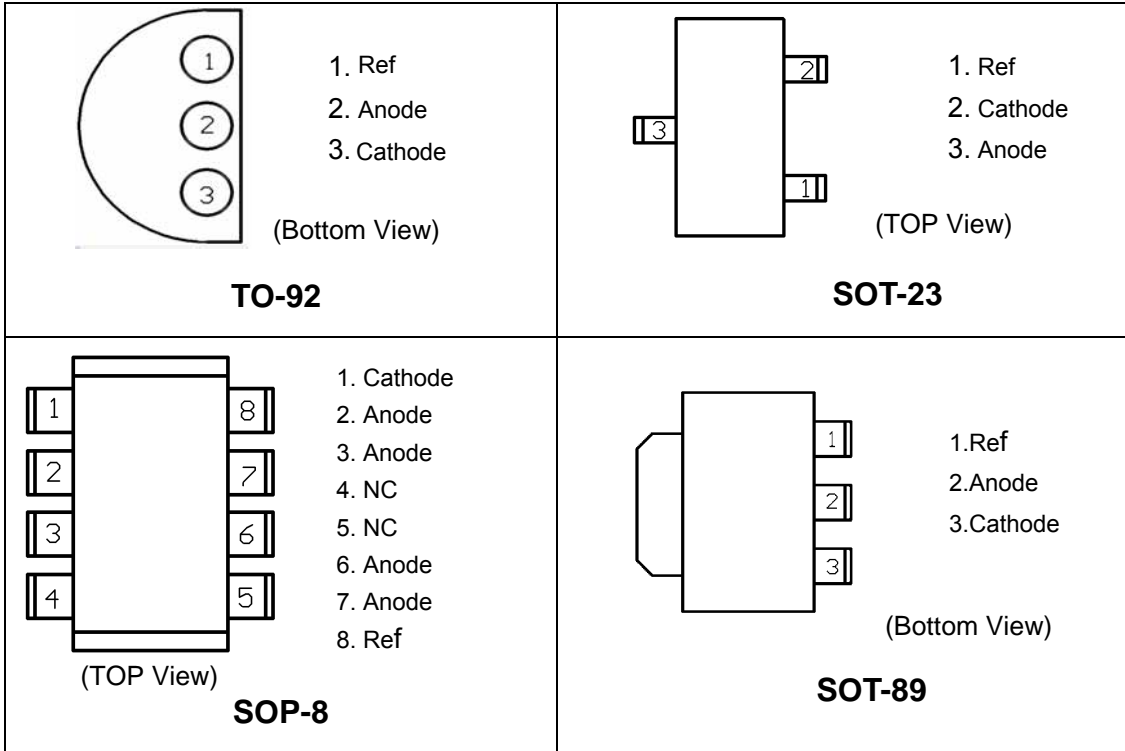
SOP-8 Package



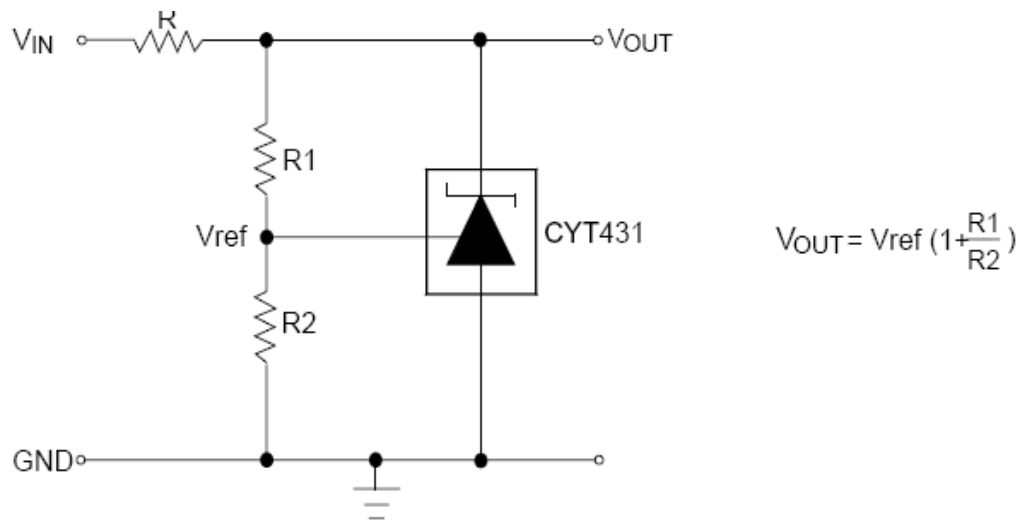
SOT-89 Package



Pin Configuration



Application Diagram





Marking Information

Package	Marking	Production Year Code	Production Week Code	Lead-Free Package
SOT-23-3 SC59-3L	CYT431A	Starting with S, a bar on top of S is for production year 2001, and underlined S is for year 2002. The next character is marked on top for 2003, and underlined for 2004. The naming pattern continues with consecutive characters for later years.	A-Z:1-26 a-z:27-52	Lead-free package is indicated by a dot on top of the week code.
SOP-8	CYT431A YYWW	YY is the year of production. 04 means the product is manufactured in year of 2004.	WW is the week of production. 26 means the product is manufactured in the 26 th week.	Lead-free package is indicated by LF after YYWW.
SOT-89	CYT431A YYWW			
TO-92	CYT/TL431A YYWW			

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{KA}	Cathode to Anode Voltage	40	V
I_{KA}	Continuous Cathode Current	0.5 -- 100	mA
I_{REF}	Reference Current	0.05 -- 10	mA
T_J	Operating Junction Temperature Range	0 -- 150	°C
T_{STG}	Storage Temperature Range	-65 to 150	°C
J_A	Thermal Resistance	220 (TO-92)	°C/W
		230 (SOT-23)	
		150 (SOP-8)	
		120 (SOT-89)	
T_{LEAD}	Lead Temperature (Soldering) 10 seconds	260	°C

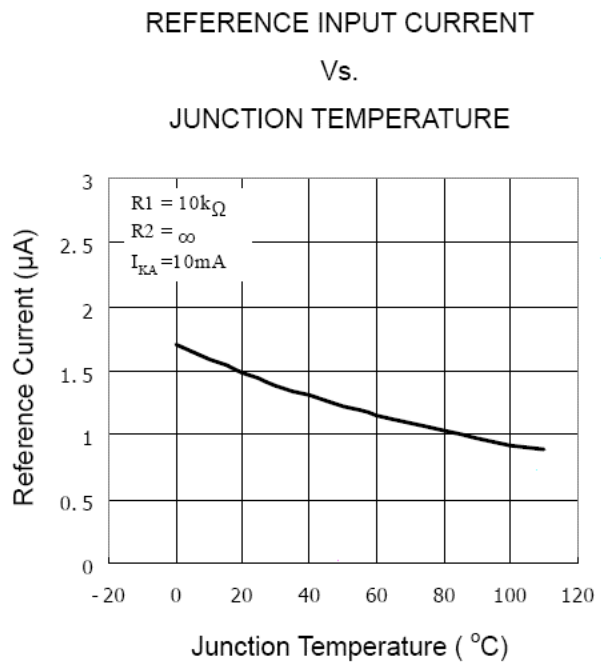
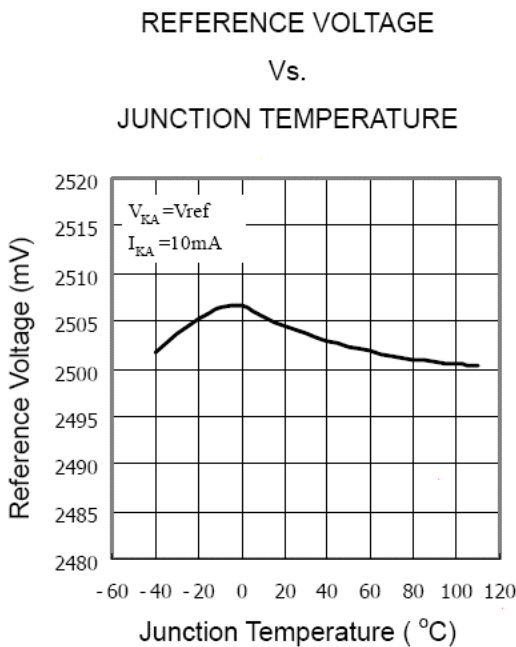
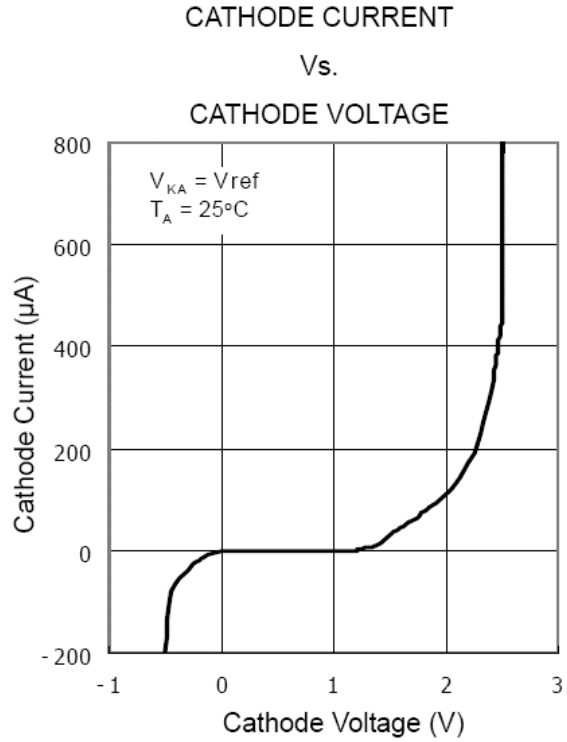
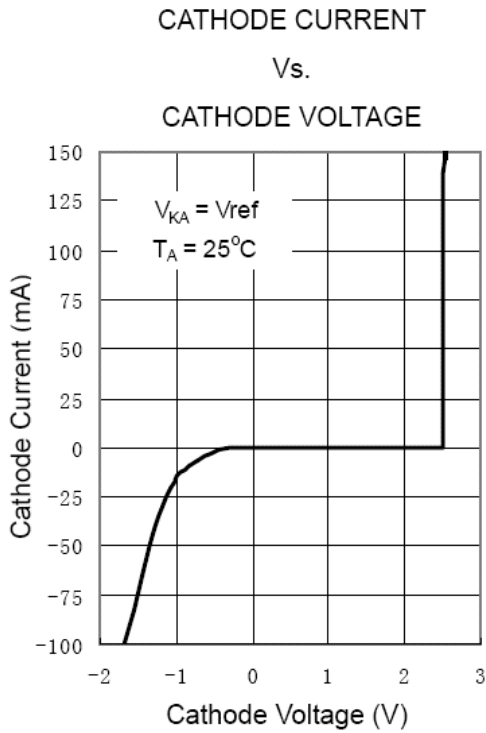


Electrical Characteristics

Parameter		Symbol	Test Circuit	Test Conditions	Min	Typ	Max	Unit
Reference Voltage	0.5%	VREF	1	IKA=1mA VKA=VREF, IKA=10mA IKA=100mA	2483	2495	2507	mV
	1%				2470	2495	2520	
	2%				2445	2495	2545	
Deviation of reference voltage over full temperature range		VI(DEV)	1	VKA=VREF, IKA=10mA TA=0°C to 85°C	--	3	17	mV
Ratio of change in reference voltage to the change in cathode voltage		$\frac{VREF}{VKA}$	2	IKA=10mA, VKA=10V- VREF VKA=36V- 10V	--	-1.4 -1.0	-2.7 -2.0	mV/V
Reference current		IREF	2	IKA=10mA, R1=10KΩ, R2=∞,	--	1.8	4	uA
Deviation of Reference current over full temperature range		II(DEV)	2	IKA=10mA, R1=10KΩ, R2=∞, TA=0°C to 85°C	--	0.4	1.2	uA
Minimum cathode current for regulation		IMIN	1	VKA=VREF	--	0.25	0.5	mA
Off-state cathode current		IOFF	3	VKA=40V, VREF=0	--	0.26	0.9	uA
Dynamic impedance		ZKA	1	IKA=1mA to 100mA, VKA=VREF, f ≤ 1KHz	--	0.22	0.5	Ω



Typical Performance Characteristics





Thermal Consideration

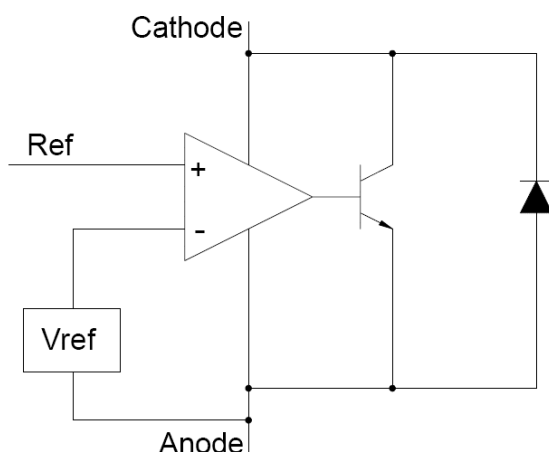
Package	Power Rating ($T_A=25^\circ\text{C}$)	Power Rating ($T_A=50^\circ\text{C}$)	Power Rating ($T_A=85^\circ\text{C}$)
SOT-23-3 ($\theta_{JA}=230^\circ\text{C/W}$)	435mW	326mW	239mW
TO-92 ($\theta_{JA}=220^\circ\text{C/W}$)	455mW	341mW	250mW

1. Maximum junction temperature is 150°C
2. θ_{JA} is measured with packages mounted onboard under still-air condition with 1W power applied.
3. Power rating is calculated using $PD = (T_J - T_A) / \theta_{JA}$, where T_J denotes junction temperature and T_A denotes ambient temperature.

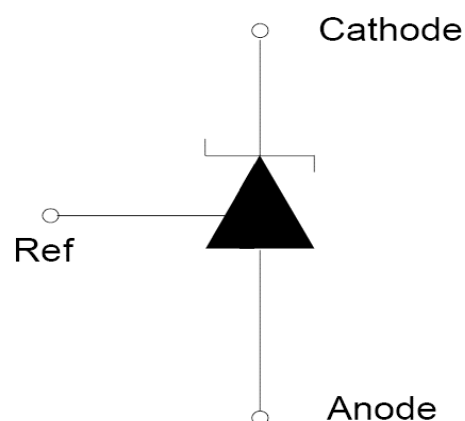
Test Circuits

<p>Test Circuit 1: $V_{KA} = V_{REF}$</p>	<p>Test Circuit 2: $V_{KA} > V_{REF}$</p>	<p>Test Circuit 3: Off State Current</p>

Block Diagram

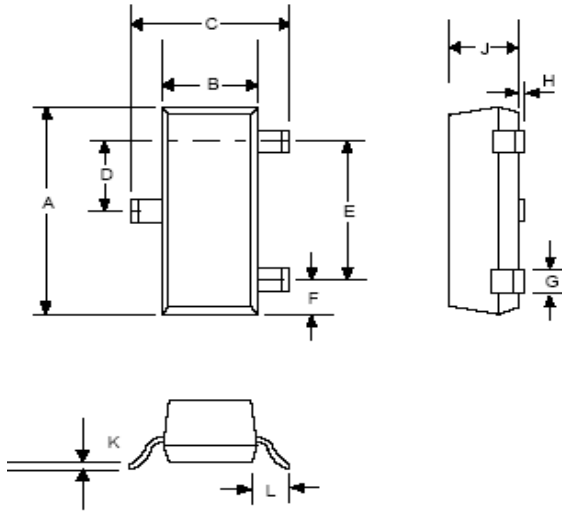


Symbol Diagram



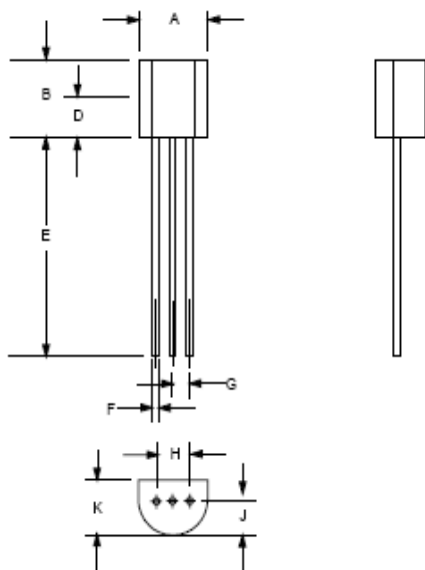


OUTLINE DRAWING SOT-23



DIM ^N	DIMENSIONS			
	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.110	0.120	2.80	3.04
B	0.047	0.055	1.20	1.40
C	0.083	0.104	2.10	2.64
D	0.035	0.040	0.89	1.03
E	0.070	0.080	1.78	2.05
F	0.018	0.024	0.45	0.60
G	0.015	0.020	0.37	0.51
H	0.0005	0.004	0.013	0.10
J	0.034	0.040	0.887	1.02
K	0.003	0.007	0.085	0.18
L	-	0.027	-	0.69

OUTLINE DRAWING TO-92

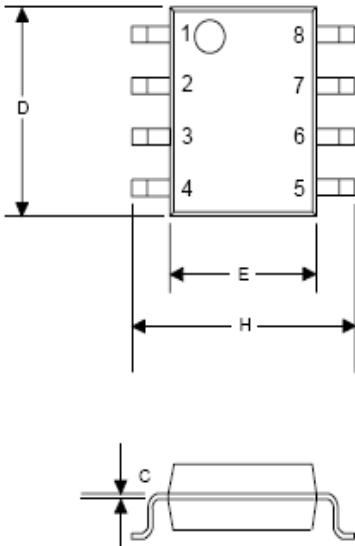


DIM ^N	DIMENSIONS			
	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.445	5.207
B	0.170	0.210	4.318	5.334
E	0.500	0.610	12.70	15.50
F	0.016	0.021	0.407	0.533
G	0.045	0.055	1.143	1.397
H	0.095	0.105	2.413	2.667
J	0.080	0.105	2.032	2.667
K	0.125	0.165	3.175	4.191



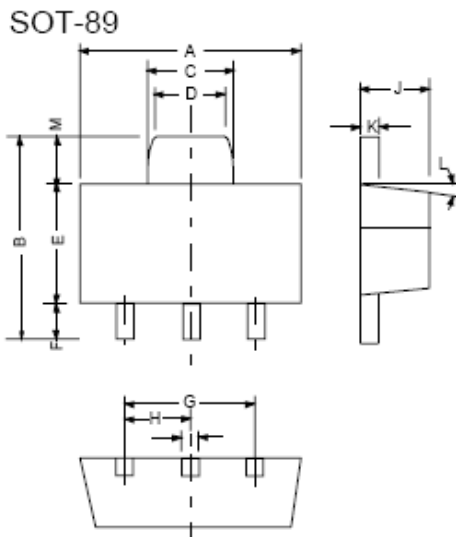
CYT 431A

OUTLINE DRAWING SOP-8



DIMENSIONS				
DIM ^N	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.0532	0.0688	0.35	1.75
A1	0.0040	0.0098	0.10	0.25
B	0.0130	0.0200	0.33	0.51
B1	0.050BSC		1.27BSC	
C	0.0075	0.0098	0.19	0.25
D	0.1890	0.1968	4.80	5.00
H	0.2284	0.2440	5.80	6.20
E	0.1497	0.1574	3.80	4.00

OUTLINE DRAWING SOT-89



DIMENSIONS				
DIM ^N	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.173	0.181	4.400	4.600
B	0.159	0.167	4.050	4.250
C	0.067	0.075	1.700	1.900
D	0.051	0.059	1.300	1.500
E	0.094	0.102	2.400	2.600
F	0.035	0.047	0.890	1.200
G	0.118REF		3.00REF	
H	0.059REF		1.50REF	
I	0.016	0.020	0.400	0.520
J	0.055	0.063	1.400	1.600
K	0.014	0.016	0.350	0.410
L	10 ° TYP		10 ° TYP	
M	0.028REF		0.70REF	