SemTron Microtech Corporation

TL431X

Adjustable Precision Shunt Regulatror

DESCRIPTION

The TL431 is high-voltage three-terminal adjustable voltage references, with specified thermal stability over applicable industrial and commercial temperature ranges. Output voltage can be set to any value between VREF (2.5V) and 36V with two external resistors. These devices have
a typical output impedance of 0.2Ω. Active output circuitry provides a very sharp turn-on characteristic making the TL431 excellent replacements for low-voltage zener diodes in many applications, including onboard regulation and adjustable power supplies.

TL431XS-TRG ROHS Compliant This is Halogen Free

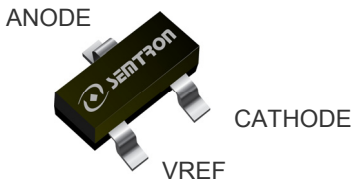
FEATURE

- Voltage Reference Accuracy of 1%,0.5%
- Sink Current Capability from 1mA to 100mA
- Adjustable Output Voltage from VREF to 36V
- Low Output Noise
- Typical Output Dynamic Impedance Less Than 0.2Ω
- Available in SOT23 and TO-92 package
- Full RoHS compliance

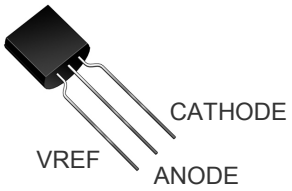
APPLICATIONS

- Battery Power Equipment
- Linear Regulators
- Switch Power Supply
- Cellular Phone
- Digital Cameras
- Computer Disk Drivers
- Instrumentation

PIN CONFIGURATION



SOT-23
Top View



TO-92
Top View

PART NUMBER INFORMATION

TL 431 X X - XX G a b c d e f	**a : Product Type name.** **b : Product Serial number.** **c : Accuracy Code.** **A : 0.5% B : 1%** **d : Package Code** **e : Handling Code.** **f : Lead Plating Code** G : Lead-free product. ***This product is Halogen Free***

■ORDERING INFORMATION

Part Number	V_{REF}=2.495V	Package Code	Handling Code	Shipping
TL431AS-TRG	0.5%	S : SOT-23	TR : Tape&Reel	3K/Reel
TL431BS-TRG	1%			
TL431AT-TBG	0.5%	T : TO-92	TB : Tape&Box	2K/Box
TL431BT-TBG	1%			

※ SOT-23 : Only available in tape and reel packaging. ※ TO-92 : Only available in tape and box packaging.

■ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Maximum	Unit
Power Dissipation	SOT-23	P_D	280	mW
	TO-92		750	
Cathode Voltage		V_{KA}	40	V
Continuous Cathode Current Range		I_{KA}	-100~150	mA
Reference Current Range		I_{REF}	0.05~10	mA
Operating Junction Temperature Range		$T_{J\ Mmx}$	-40~+150	°C
Storage Temperature Range		T_{STG}	-65~+150	°C

Note: The power dissipation values are based on the condition that temperature Tj and ambient temperature TA difference is 100°C
Stresses beyond those listed under “absolute maximum rating” may cause permanent damage to the device.
These are stress rating only, and function operation of the device at these or any other conditions beyond those indicated under
“ “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

■ESD MAXIMUM RATINGS (T_A = 25°C Unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Electrostatic Discharge Voltage	V_{ESD}	MIL-STD-883 (Human Body Model)			2.5	KV

■RECOMMENDED OPERATING CONDITIONS

Characteristic	Symbol	Min	Typ	Max	Unit
Cathode Voltage	V_{AK}	V_{REF}		36	V
Cathode Current	I_K	0.5		100	mA

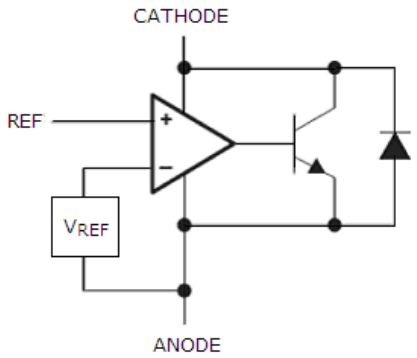
■ELECTRICAL CHARACTERISTICS (T_A = 25°C, $V_{KA}=V_{REF}$, I_K=10mA unless otherwise specified)

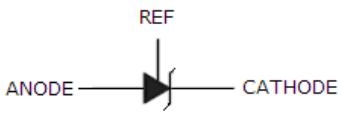
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Reference Input Voltage	V_{REF}	TL431A	2.483	2.495	2.507	V
		TL431B	2.470	2.495	2.520	V
V_{REF} Temp Deviation	V_{DEV}	T_A=-40°C~+80°C $V_K=V_{REF}$ I_K=10mA	-	5	17	mV
Ratio Of Change In REF To Change In Cathode Voltage	$\triangle V_{REF}/\triangle V_K$	I_K=10mA, $\triangle V_K$=36V~10V	-	1.0	2.0	mV/V
Reference Input Current	I_{REF}	I_K=10mA R_1=10kΩ R_2=∞	-	0.3	4	μA
I_{REF} Temp Deviation	$I_{REF(DEV)}$	T_A=-40℃~+80℃ R_1=10KΩ , R_2=∞ I_K=10mA	-	0.15	1.2	μA
Off-State Cathode Current	$I_{K(OFF)}$	V_{REF}=0V , V_K=36V	-	0.05	0.9	μA
Minimum Operating Current	$I_{K(MIN)}$	$V_K=V_{REF}$	-	0.07	0.5	mA
Dynamic Output Impedance	Z_K	f≦1kHz , $V_K=V_{REF}$ I_K=1~100mA	-	0.22	0.5	Ω

Note : The deviation parameters $V_{REF(DEV)}$ and $I_{REF(DEV)}$ are defined as the difference between the maximum and minimum values obtained over the rated temperature range.

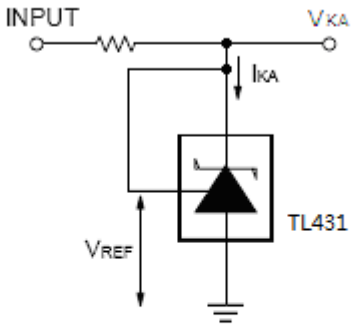
$V_{REF(DEV)} = V_{REF(MAX)} - V_{REF(MIN)}$

■FUNCTION BLOCK DIAGRAM

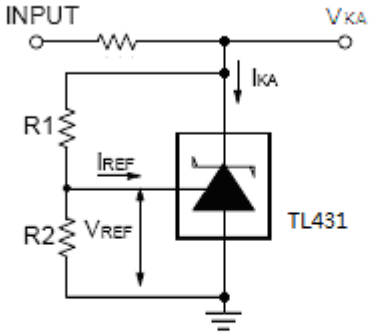




■TEST APPLICATIONS

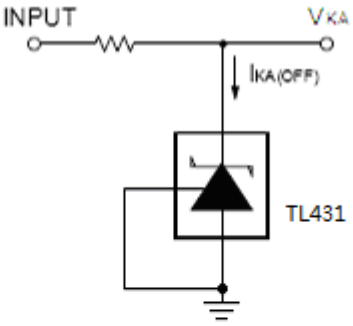


Firgure1. Test Circuit $V_{KA}=V_{REF}$

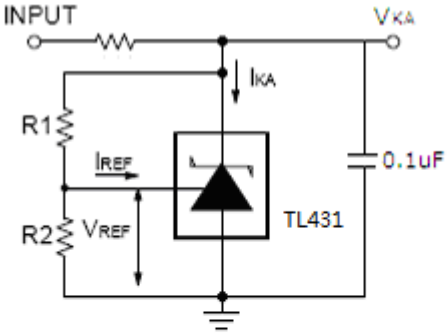


Firgure2. Test Circuit $V_{KA}>V_{REF}$

$V_{KA}=V_{REF}X(1+R1/R2)I_{REF}XR1$



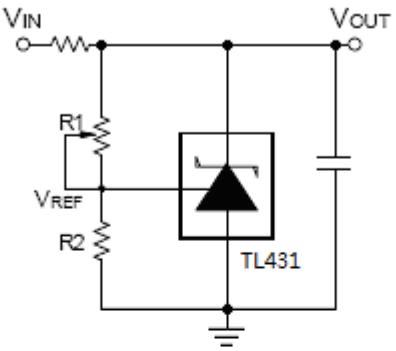
Firguie3. Test Circuit $I_{K(OFF)}$



Firgure4. Test Circuit $V_{KA}>V_{REF}$

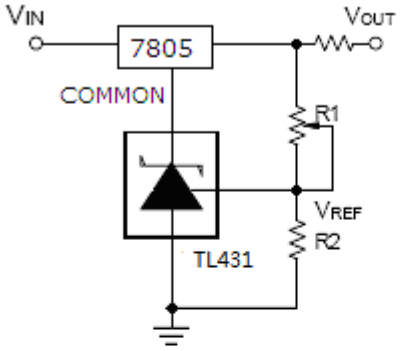
$V_{KA}=V_{REF}X(1+R1/R2)I_{REF}XR1$

■TYPICAL APPLICATIONS



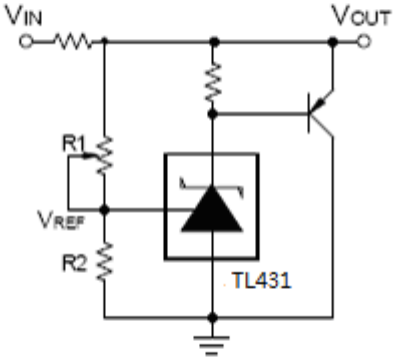
VOUT=(1+R1/R2)*VREF

Shutdown Regulator



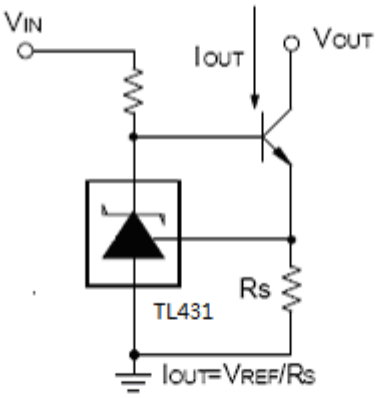
VOUT=(1+R1/R2)*VREF

Output Control of Three-Terminal Fixed Regulator

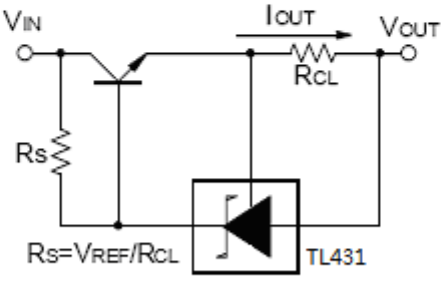


VOUT=(1+R1/R2)*VREF

Higher Current Shunt Regulator



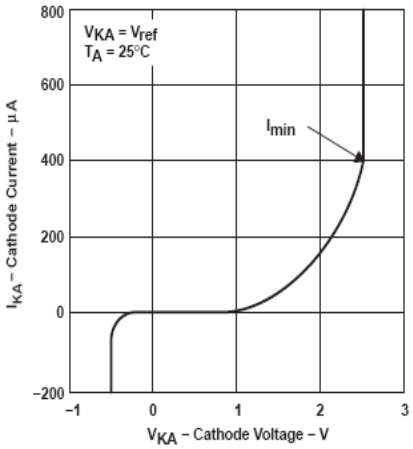
Constant Current Sink



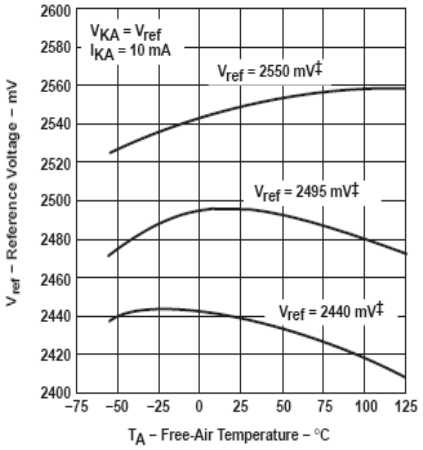
Current Limiting or Current Source

TYPICAL CHARACTERISTICS

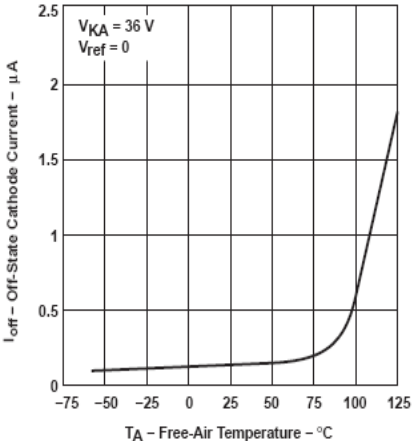
CATHODE CURRENT vs CATHODE VOLTAGE



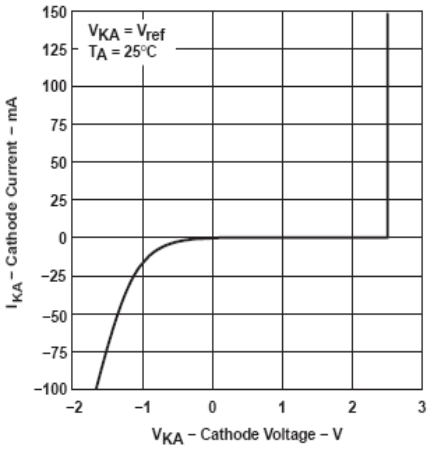
REFERENCE VOLTAGE vs FREE-AIR TEMPERATURE



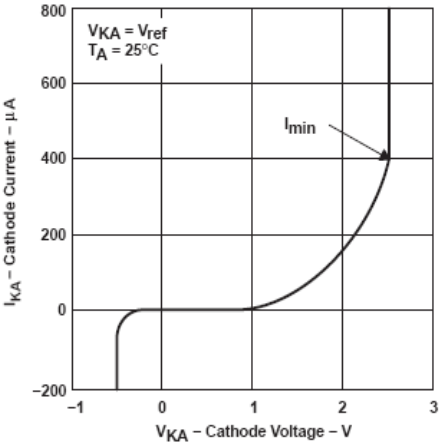
OFF-STATE CATHODE CURRENT vs FREE-AIR TEMPERATURE



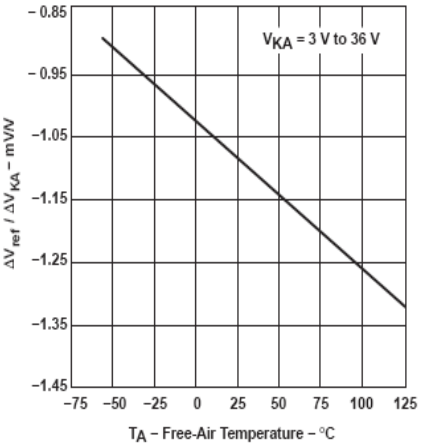
CATHODE CURRENT vs CATHODE VOLTAGE



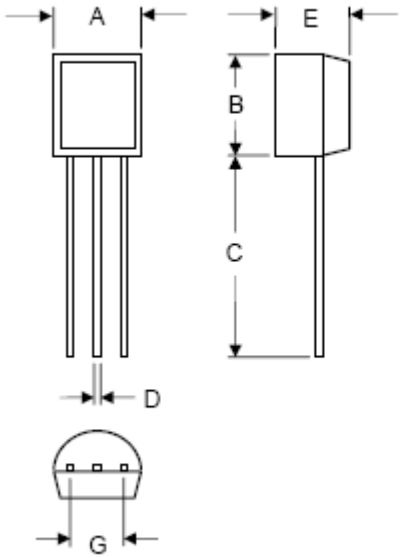
CATHODE CURRENT vs CATHODE VOLTAGE



RATIO OF DELTA REFERENCE VOLTAGE TO DELTA CATHODE VOLTAGE vs FREE-AIR TEMPERATURE

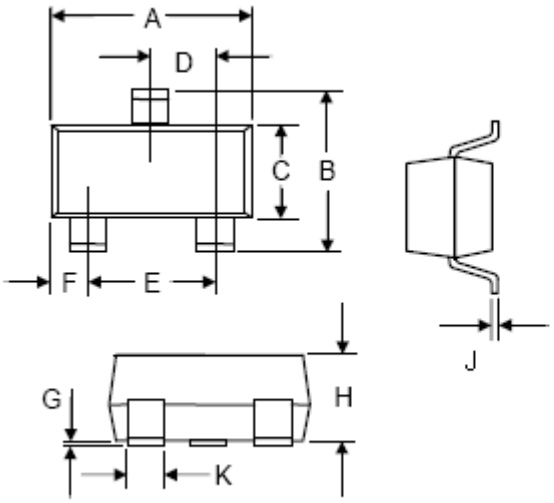


TO-92 PACKAGE DIMENSIONS



Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	.175	.185	4.45	4.70
B	.175	.185	4.45	4.70
C	.500	-----	12.70	-----
D	.016	.020	0.41	0.63
E	.135	.145	3.43	3.68
G	.095	.105	2.42	2.67

SOT-23 PACKAGE DIMENSIONS



Dimensions				
Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	0.110	0.120	2.80	3.04
B	0.83	0.098	2.10	2.64
C	0.47	0.055	1.20	1.40
D	0.35	0.041	0.89	1.03
E	0.70	0.081	1.78	2.05
F	0.18	0.024	0.45	0.60
G	0.001	0.0039	0.013	0.100
H	0.035	0.044	0.89	1.12
J	0.003	0.007	0.085	0.18
K	0.015	0.02	0.37	0.51