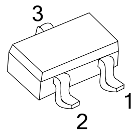
LOW CATHODE CURRENT ADJUSTABLE PRECISION SHUNT REGULATOR



SOT-23-3
(JEDEC TO-236)

■ DESCRIPTION

The UTC **TL431LL** is an adjustable shunt regulator with three-terminal and thermal stable with full operation range. It features include sharp turn-on characteristics, low output impedance and low temperature coefficient, so Zener diode can be replaced by UTC **TL431LL** in many applications, for example, charger devices, switching power supply and other adjustable regulators.

Any value between V_{REF} (2.5V) and the corresponding maximum cathode voltage (36V) can be set to by UTC **TL431LL**.

The UTC **TL431LL** is offered in two grade initial voltage tolerance at 25°C, 0.5%, and 1%.

■ FEATURES

* High stability under capacitive load
* Programmable precise output voltage from 2.5V to 36V
* Sink current capacity from 50μA to 100mA
* Low minimum cathode current for regulation:
  10μA (Typ.), 50μA (Max.)
* Low temperature deviation: 4.5mV typical
* Low output noise
* Wide operating range: -40°C~125°C

■ ORDERING INFORMATION

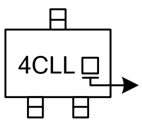
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
TL431LLK-AE2-R	TL431LLG-AE2-R	SOT-23-3	K	R	A	Tape Reel

Note: Pin Code: K: Cathode R: Reference A: Anode

TL431LLK-AE2-R

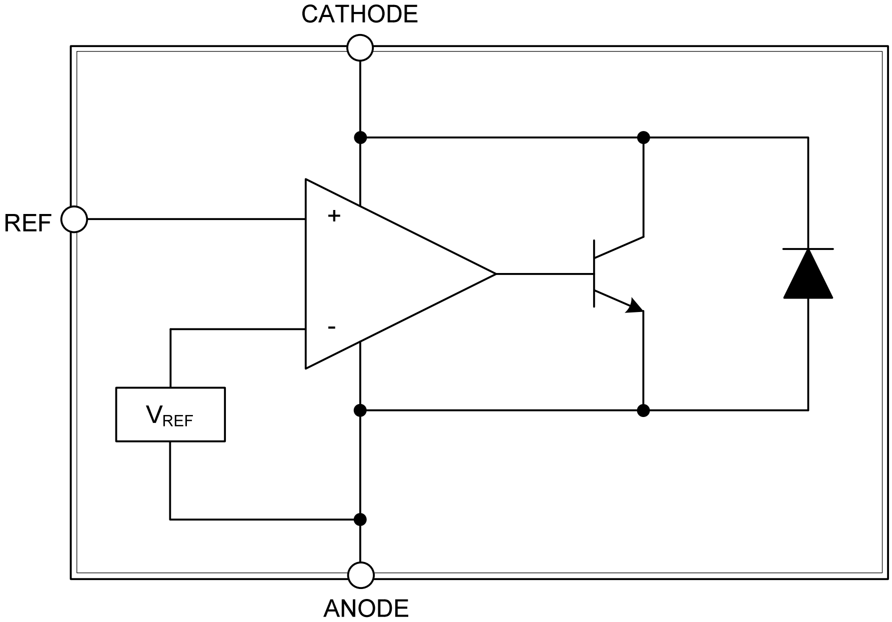
(1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) AE2: SOT-23-3
(3)Lead Free	(3) K: Lead Free, G: Halogen Free

■ MARKING



L: Lead Free
G: Halogen Free

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Cathode Voltage	V_{KA}	40	V
Cathode Current Range (Continuous)	I_{KA}	-100~150	mA
Reference Input Current Range	I_{REF}	10	mA
Power Dissipation	P_D	370	mW
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-65~150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Cathode Voltage	V_{KA}	V_{REF}~36	V
Cathode Current	I_{KA}	0.05~100	mA
Operating Ambient Temperature Range	T_A	-40~125	°C

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Case	θ_{JC}	113	°C/W

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified.)

PARAMETER		Test Circuit	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Reference Voltage	0.5%	1	V_{REF}	$V_{KA}=V_{REF}$, I_{KA}=10mA		2.487	2.500	2.512	V
	1.0%					2.475	2.500	2.525	V
Deviation of Reference Voltage Over Full Temperature Range		1	ΔV_{REF}	$V_{KA}=V_{REF}$, I_{KA}=10mA	0~70°C		4.5	8	mV
					-40~85°C		4.5	10	mV
					-40~125°C		4.5	16	mV
Ratio of Change in Reference Voltage to the Change in Cathode Voltage		2	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	I_{KA}=10mA	ΔV_{KA}=10V~V_{REF}		-1.0	-2.7	mV/V
					ΔV_{KA}=36V~10V		-0.5	-2.0	mV/V
Reference Current		2	I_{REF}	I_{KA}=10mA, R1=10kΩ, R2=∞			0.035	0.5	μA
Deviation of Reference Current Over Full Temperature Range		2	ΔI_{REF}	I_{KA}=10mA, R1=10kΩ, R2=∞, T_A=-40~125°C			0.03	0.3	μA
Minimum Cathode Current for Regulation		1	I_{KA} (Min)	$V_{KA}=V_{REF}$			10	50	μA
Off-state Cathode Current		3	I_{KA} (Off)	V_{KA}=36V, V_{REF}=0			0.05	1.0	μA
Dynamic Impedance		1	Z_{KA}	$V_{KA}=V_{REF}$, I_{KA}=1~100mA, f≤1.0kHz			0.5		Ω

■ TEST CIRCUIT

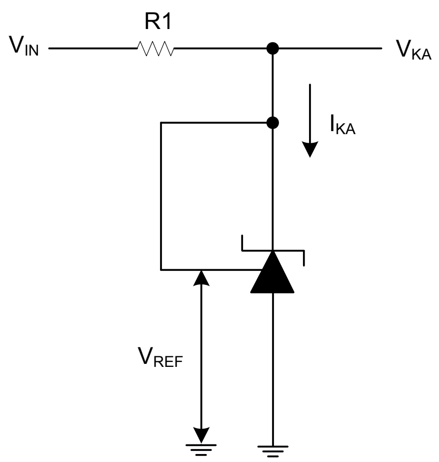


Figure 1. Test Circuit 4 for $V_{KA}=V_{REF}$

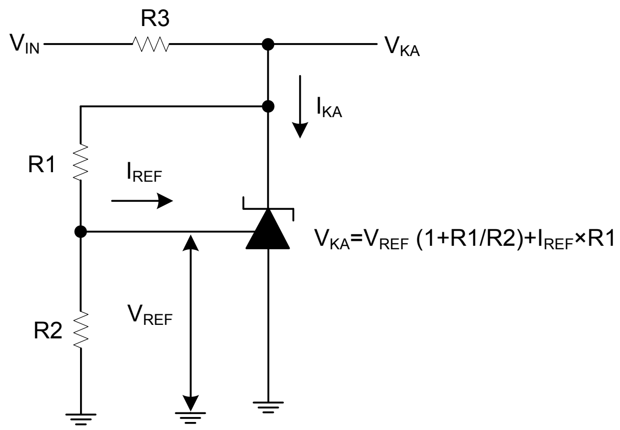


Figure 2. Test Circuit 5 for $V_{KA}>V_{REF}$

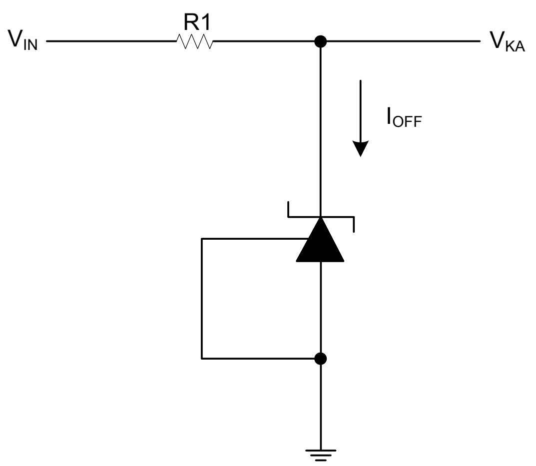


Figure 3. Test Circuit 6 for I_{OFF}

■ TYPICAL APPLICATION CIRCUIT

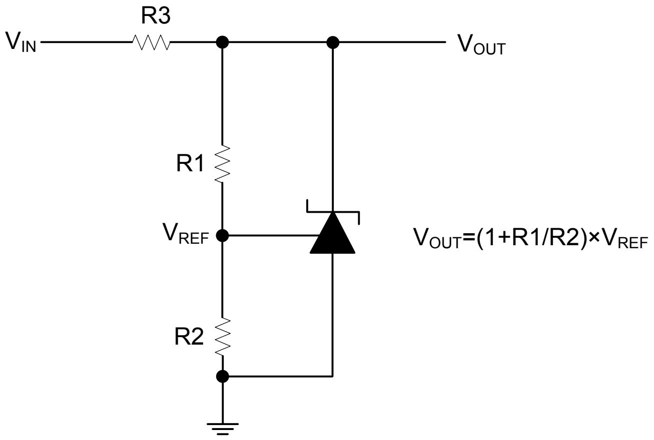


Figure 4. Shunt Regulator

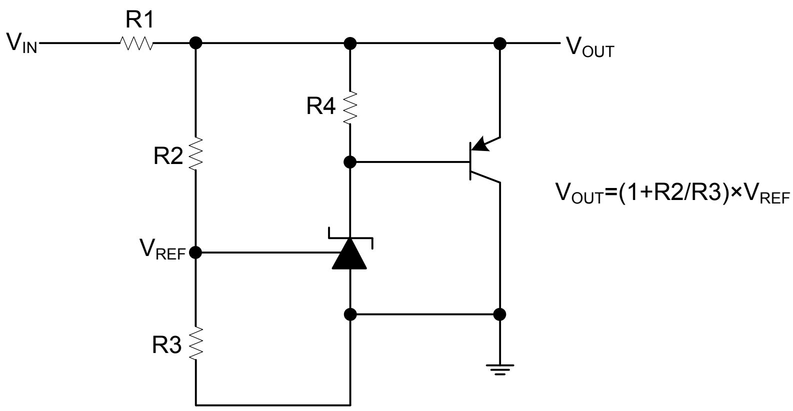


Figure 5. High Current Shunt Regulator

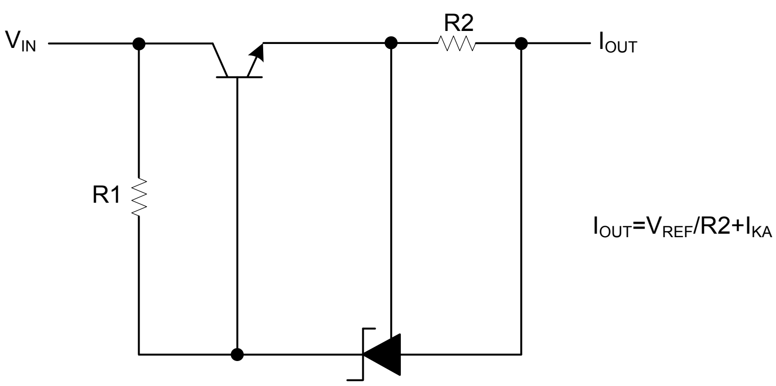


Figure 6. Current Source or Current Limit