UMW TL431xIDBZR

Precision Adjustable Shunt Regulator

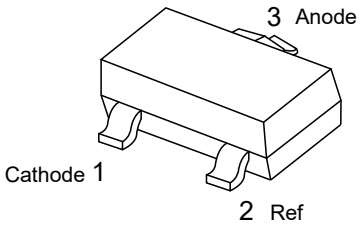
1.Description

The UMW TL431 is an adjustable three-terminal shunt regulator with excellent thermal stability over operating temperature range. The output voltage can be set to any value between Vref (approximately 2.5V) and 36V through external resistors. It provides a very sensitive turn-on characteristic, which makes it possible to replace Zener diodes in many applications.

2.Features

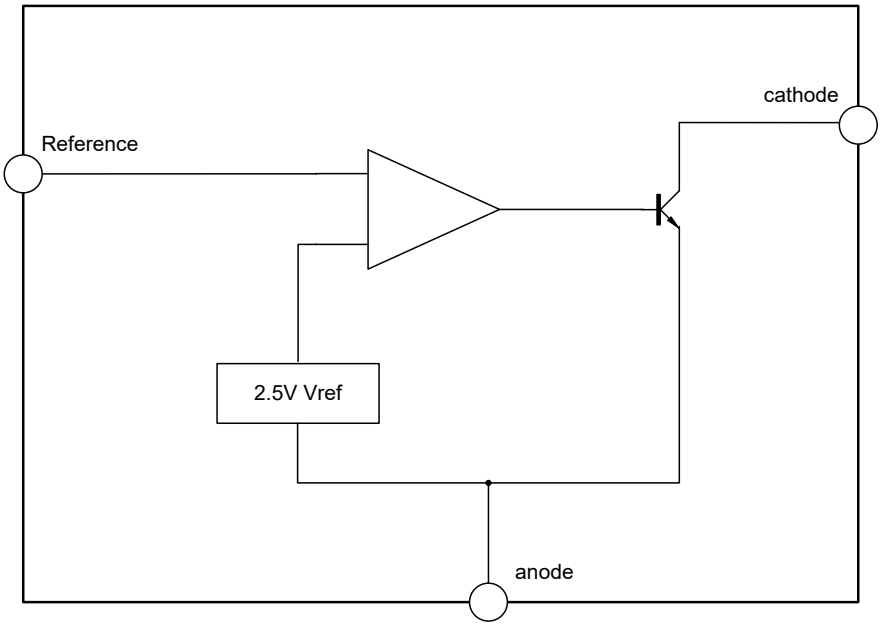
- Adjustable output voltage: up to 36V
- Low dynamic output impedance: 0.3Ω
- Sink current capability: 1.0~100mA
- Equivalent full-scale temperature coefficient: typ. 50ppm/°C
- Temperature compensation in the rated operating temperature range
- Low output noise
- Fast start-up response

3.Pinning Information



SOT-23

4.Block Diagram



5.Absolute Maximum Ratings

Parameter	Symbol	Ratings		Units
Cathode voltage	V_{KA}	37		V
Cathode current (continuous)	I_{KA}	-100 to 150		mA
Reference input current range	I_{ref}	0.05 to 10		mA
Power dissipation	P_D	SOT-23	290	mW
Storage temperature range	T_{STG}	-65 to 150		°C

6.Recommended Operating Condition

Parameter	Symbol	Min	Typ	Max	Units
Cathode voltage	V_{KA}	V_{REF}		36	V
Cathode current	I_{KA}	1		100	mA
Operating temperature tange	T_{opr}	-40		125	°C

7.Electrical Characteristics (Unless Otherwise Specified, T_a=25°C)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Reference voltage	V_{ref}	$V_{KA}=V_{REF}$, I_{KA}=10mA		2.488	2.5	2.512	V
				2.475	2.5	2.525	V
Deviation of reference input voltage over full temperature range (note 1)	ΔV_{ref}	$V_{KA}=V_{REF}$, I_{KA}=10mA, $T_{MIN}\leq T_A\leq T_{MAX}$			14	34	mV
Ratio of change in reference voltage to the change in cathode voltage	$\Delta V_{ref}/\Delta V_{KA}$	I_{KA}=10mA	ΔV_{KA}=10V~V_{REF}		-1	-2.7	mV/V
			ΔV_{KA}=36V~10V		-0.5	-2	mV/V
Reference input current	I_{ref}	I_{KA}=10mA, R1=10kΩ, R2=∞			1.5	4	μA
Deviation of reference input current over full temperature range	ΔI_{ref}	I_{KA}=10mA, R1=10kΩ, R2=∞ T_A=full Temperature			0.4	1.2	μA
Min. cathode current for regulation	$I_{KA(min)}$	$V_{KA}=V_{REF}$			0.45	1	mA
Off-state cathode current	$I_{KA(OFF)}$	V_{KA}=36V, V_{REF}=0			0.05	1	μA
Dynamic impedance	Z_{KA}	$V_{KA}=V_{REF}$,I_{KA}=1 to 100mA,f≤1.0kHz			0.3	0.5	Ω

Note 1: T_{MIN}=-40°C, T_{MAX}=+125°C.

8.Typical Characteristic

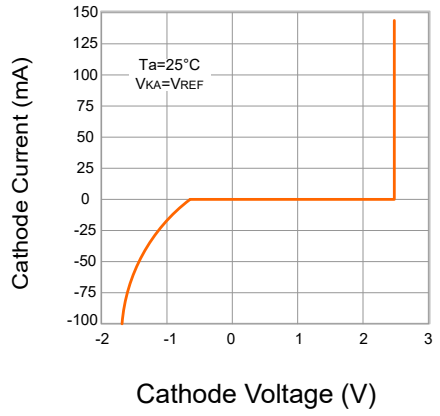


Figure 1: Cathode Current vs. Cathode Voltage

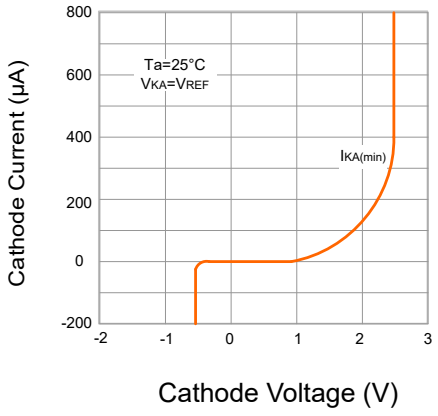


Figure 2: Cathode Current vs.Cathode Voltage

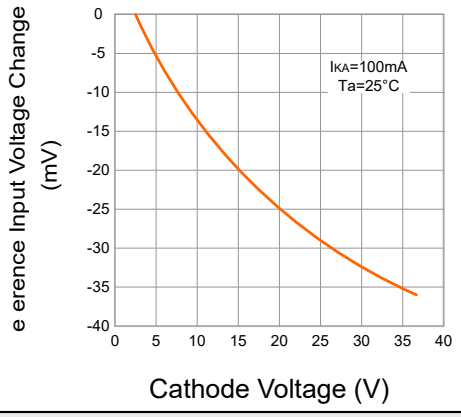


Figure 3: Reference Input voltage Change vs. Cathode Voltage

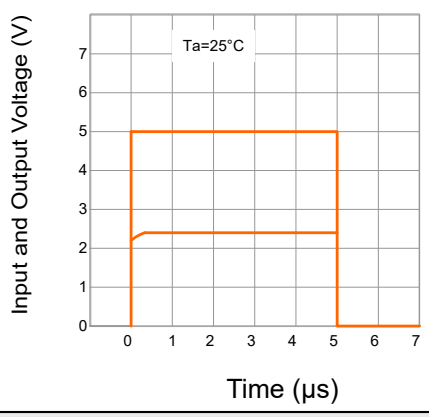


Figure 4: Pulse Response

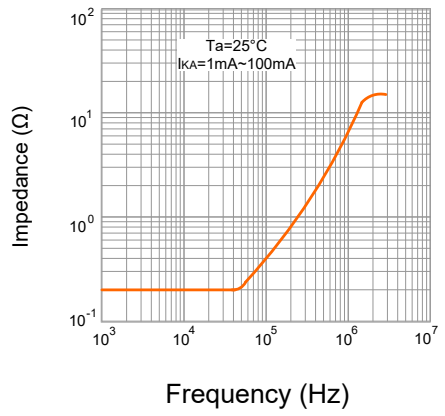


Figure 5: Dynamic Impedance vs. Frequency

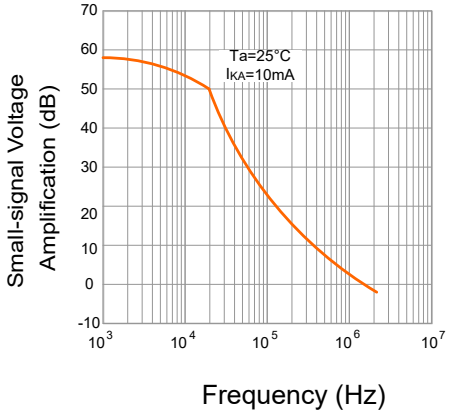
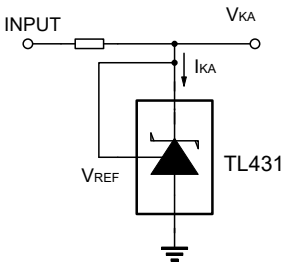
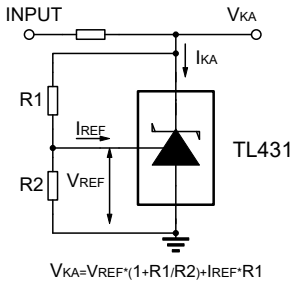


Figure 6: Small-signal Voltage Amplification vs. Frequency

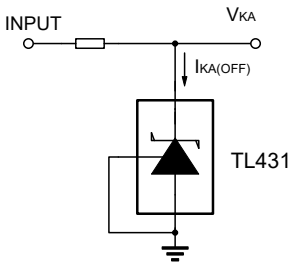
9.Test Circuits



Test Circuit for $V_{KA}=V_{REF}$

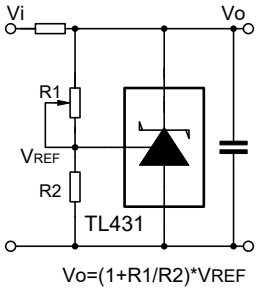


Test Circuit for $V_{KA}\geq V_{REF}$

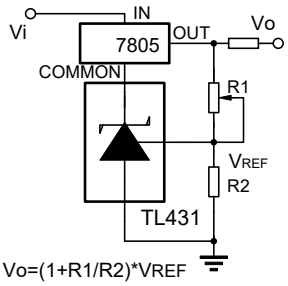


Test Circuit for $I_{KA(OFF)}$

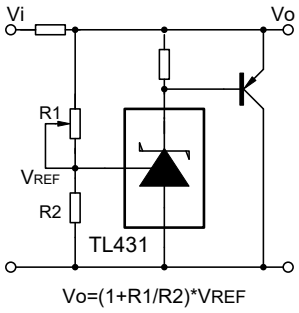
10.Typical Application Circuit



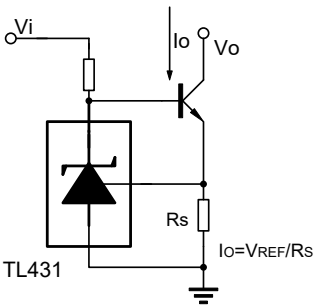
Shunt Regulator



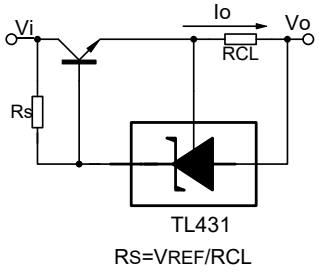
Three-terminal Fixed
Regulator Output Control



High-current Shunt Regulator

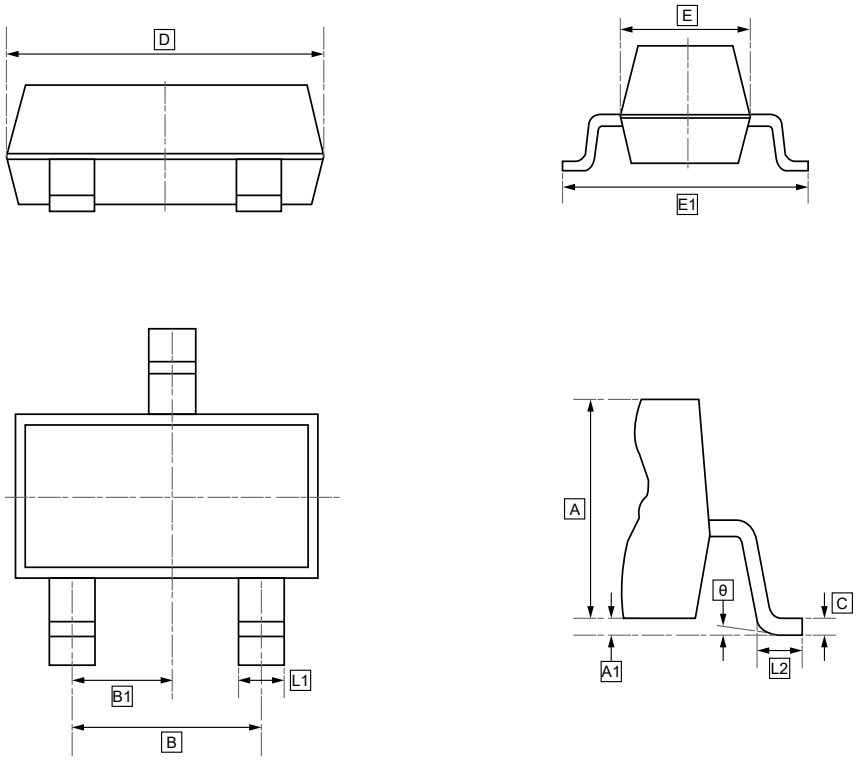


Constant Current Source



Current Limiter or Current Source

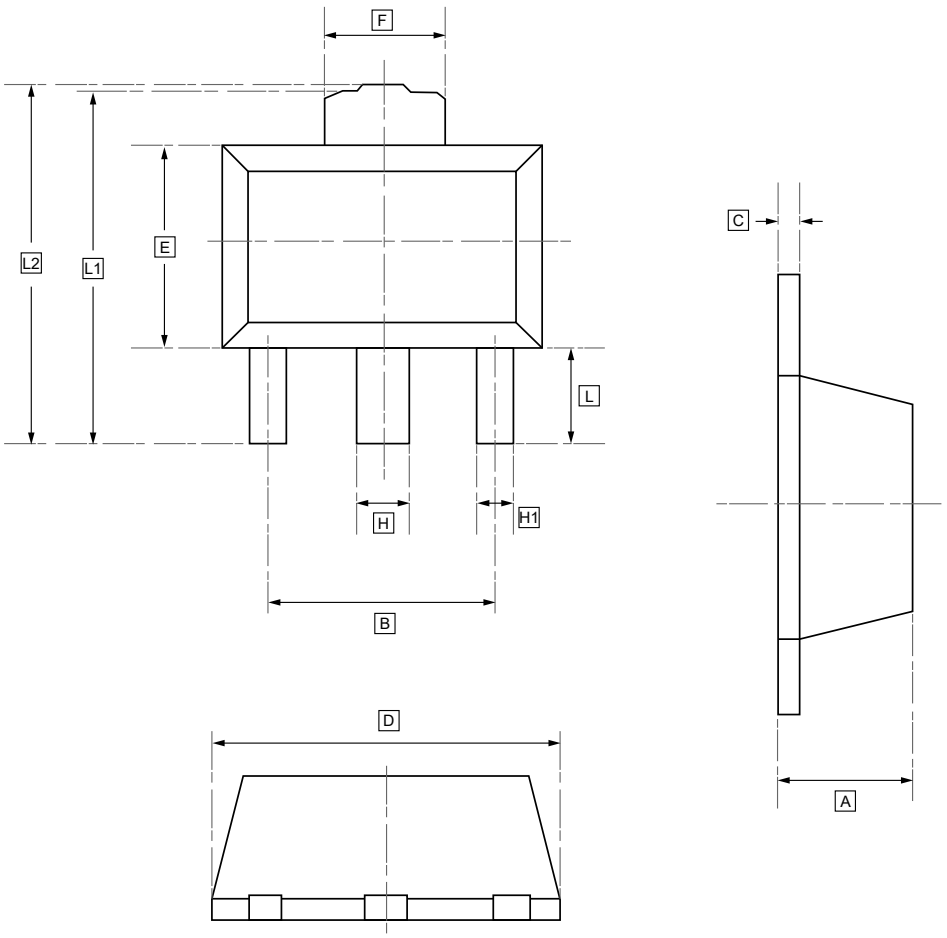
11.1 SOT-23 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	L1	L2	C	D	E	E1	B	B1	θ
Min	0.900	0.020	0.300	0.300	0.100	2.800	1.200	2.300	1.800	0.950	0°
Max	1.100	0.100	0.500	0.500	0.120	3.000	1.400	2.500	2.000	TYP	8°

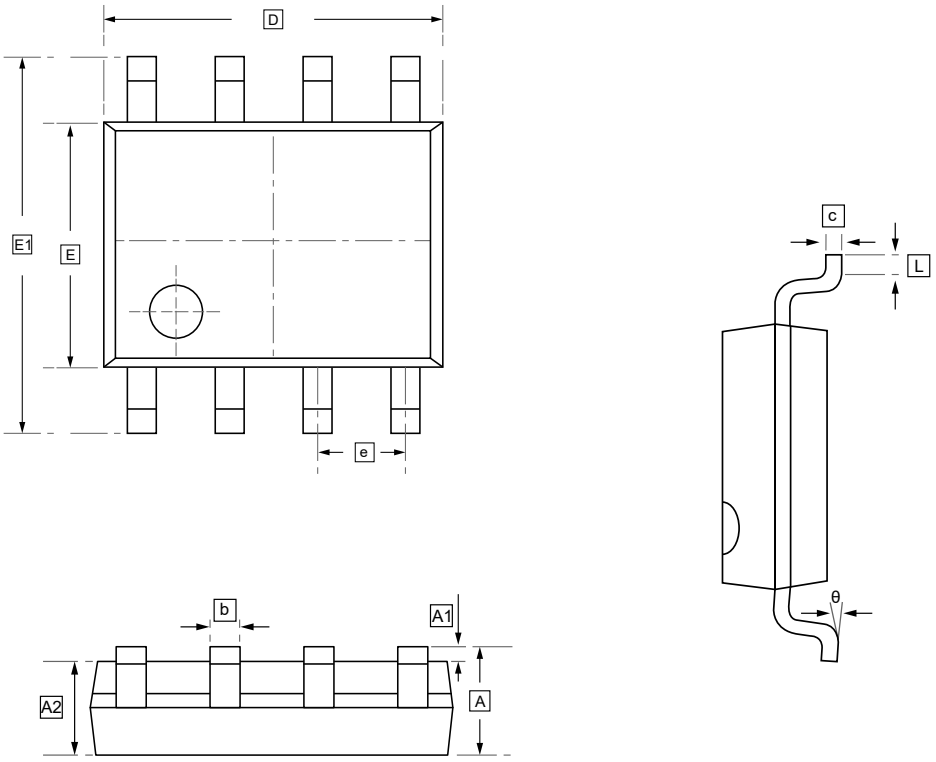
11.2 SOT-89 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	B	C	D	E	F	H	H1	L	L1	L2
Min	1.40	2.90	0.330	4.40	2.30	1.60	0.40	0.320	0.900	3.900	4.100
Max	1.60	3.10	0.430	4.60	2.60	1.80	0.580	0.520	1.200	4.300	4.350

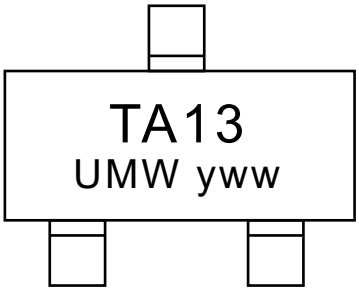
11.3 SOP-8 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	c	D	E	E1	e	L	θ
Min	1.350	0.000	1.350	0.330	0.170	4.700	3.800	5.800	1.270	0.400	0°
Max	1.750	0.100	1.550	0.510	0.250	5.100	4.000	6.200	BSC	1.270	8°

12.Ordering information



yww: Batch Code

Order Code	Marking	Package	Base QTY	Accuracy	Delivery Mode
UMW TL431AIDBZR	TA13	SOT-23	3000	1%	Tape and reel
UMW TL431BIDBZR	T3F3	SOT-23	3000	0.5%	Tape and reel
UMW TL431AIPK	TL431	SOT-89	1000	1%	Tape and reel
UMW TL431BIDR	TL431B	SOP-8	2500	0.5%	Tape and reel
UMW TL431AIDR	TL431A	SOP-8	2500	1%	Tape and reel

13.Disclaimer

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