

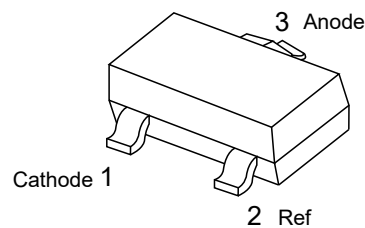
1.Description

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 V_{ref} (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

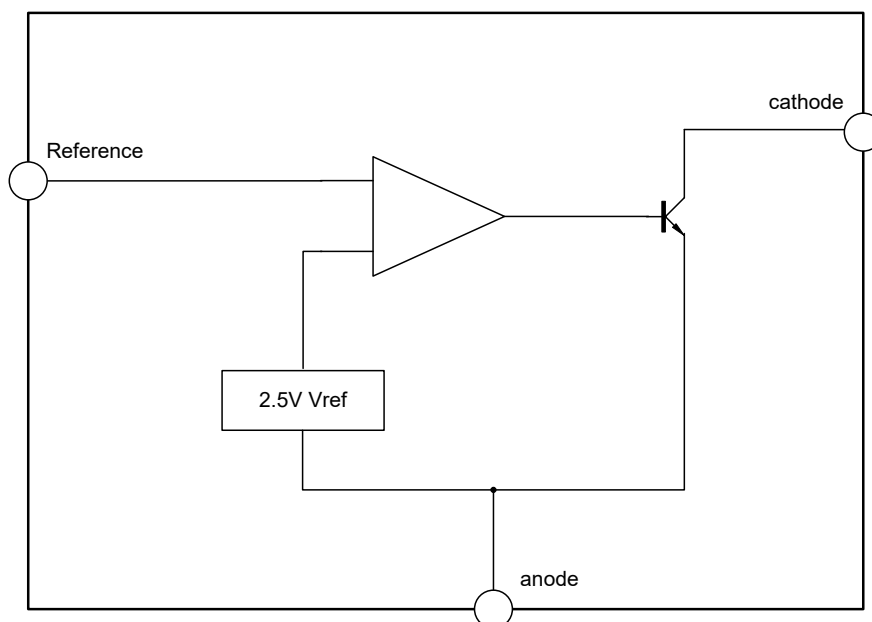
3.Pinning Information



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, $T_a=25^\circ\text{C}$)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Reference voltage	V_{ref}	$V_{\text{KA}}=V_{\text{REF}}, I_{\text{KA}}=10\text{mA}$	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}	$V_{\text{KA}}=V_{\text{REF}}, I_{\text{KA}}=10\text{mA}, T_{\text{MIN}} \leq T_a \leq T_{\text{MAX}}$		14	34	mV
Ratio of change in reference voltage to the change in cathode voltage	$\Delta V_{\text{ref}}/\Delta V_{\text{KA}}$	$I_{\text{KA}}=10\text{mA}$	$\Delta V_{\text{KA}}=10\text{V} \sim V_{\text{REF}}$	-1	-2.7	mV/V
			$\Delta V_{\text{KA}}=36\text{V} \sim 10\text{V}$	-0.5	-2	mV/V
Reference input current	I_{ref}	$I_{\text{KA}}=10\text{mA}, R_1=10\text{k}\Omega, R_2=\infty$		1.5	4	μA
Deviation of reference input current over full temperature range	ΔI_{ref}	$I_{\text{KA}}=10\text{mA}, R_1=10\text{k}\Omega, R_2=\infty$ $T_a=\text{full Temperature}$		0.4	1.2	μA
Min. cathode current for regulation	$I_{\text{KA(min)}}$	$V_{\text{KA}}=V_{\text{REF}}$		0.45	1	mA
Off-state cathode current	$I_{\text{KA(OFF)}}$	$V_{\text{KA}}=36\text{V}, V_{\text{REF}}=0$		0.05	1	μA
Dynamic impedance	Z_{KA}	$V_{\text{KA}}=V_{\text{REF}}, I_{\text{KA}}=1 \text{ to } 100\text{mA}, f \leq 1.0\text{kHz}$		0.3	0.5	Ω

Note 1: $T_{\text{MIN}}=-40^\circ\text{C}$, $T_{\text{MAX}}=+125^\circ\text{C}$.



8. Typical Characteristic

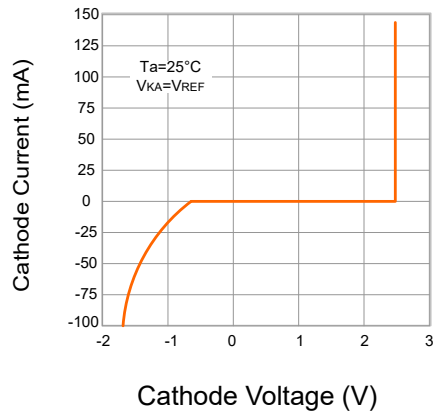


Figure 1: Cathode Current vs. Cathode Voltage

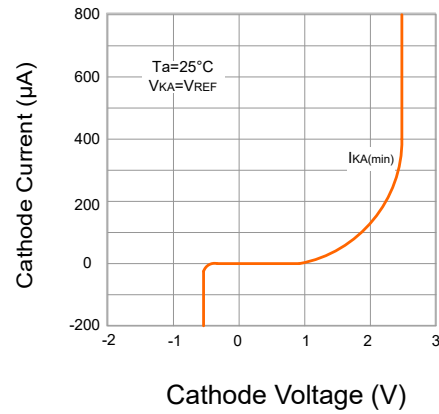


Figure 2: Cathode Current vs. Cathode Voltage

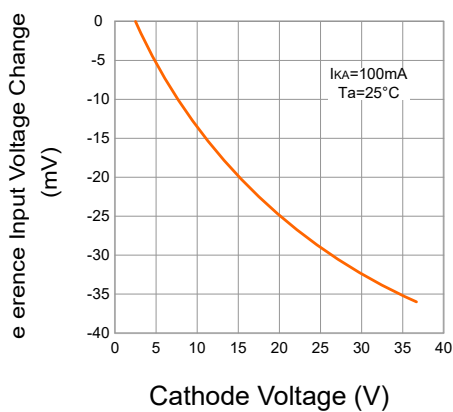


Figure 3: Reference Input voltage Change vs. Cathode Voltage

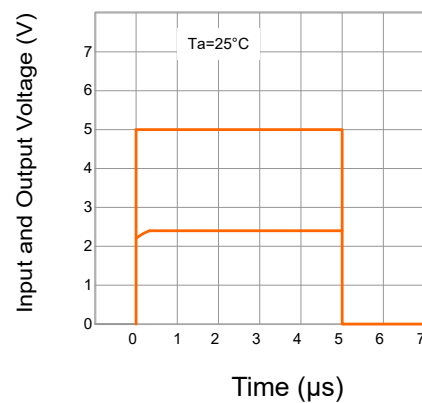


Figure 4: Pulse Response

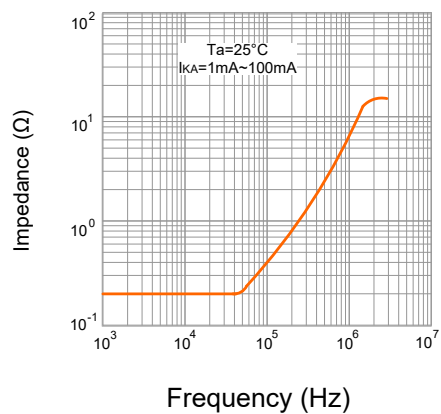


Figure 5: Dynamic Impedance vs. Frequency

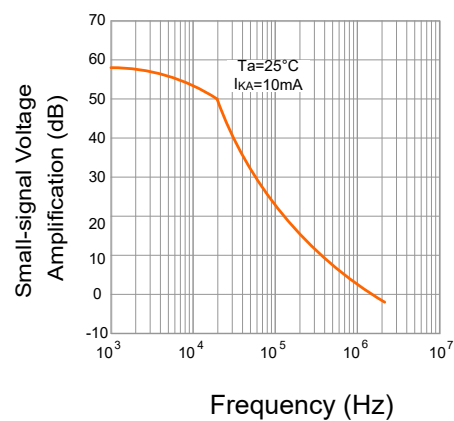
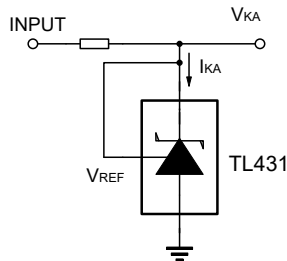
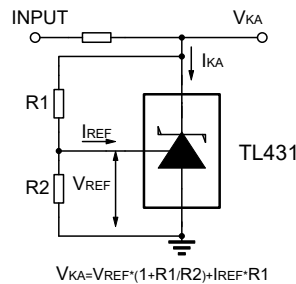
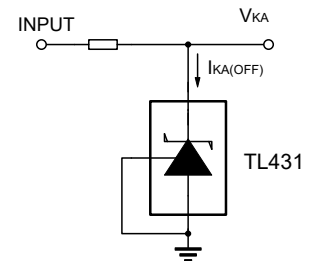


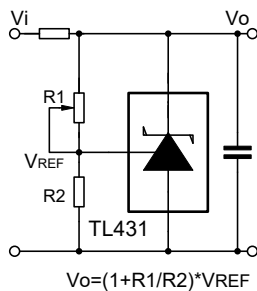
Figure 6: Small-signal Voltage Amplification vs. Frequency



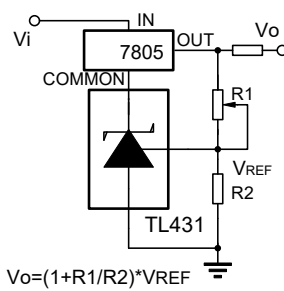
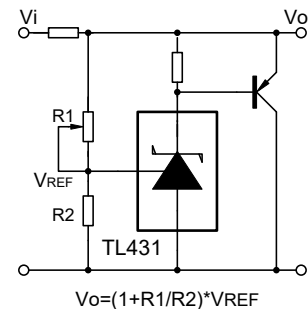
9. Test Circuits

Test Circuit for $V_{KA} = V_{REF}$ Test Circuit for $V_{KA} \geq V_{REF}$ Test Circuit for $I_{KA(OFF)}$

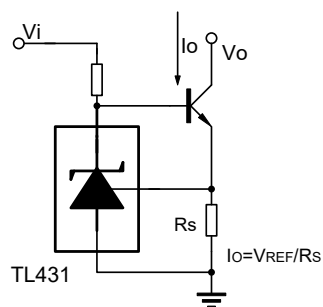
10. Typical Application Circuit



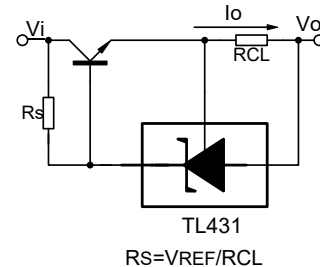
Shunt Regulator

Three-terminal Fixed
Regulator Output Control

High-current Shunt Regulator



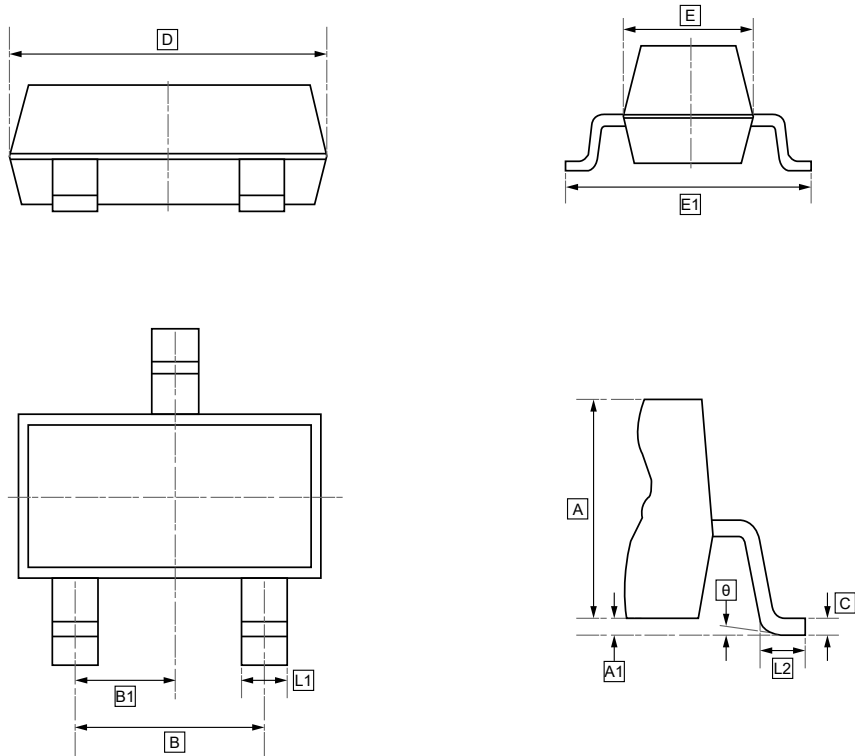
Constant Current Source



Current Limiter or Current Source



11.1 SOT-23 Package Outline Dimensions

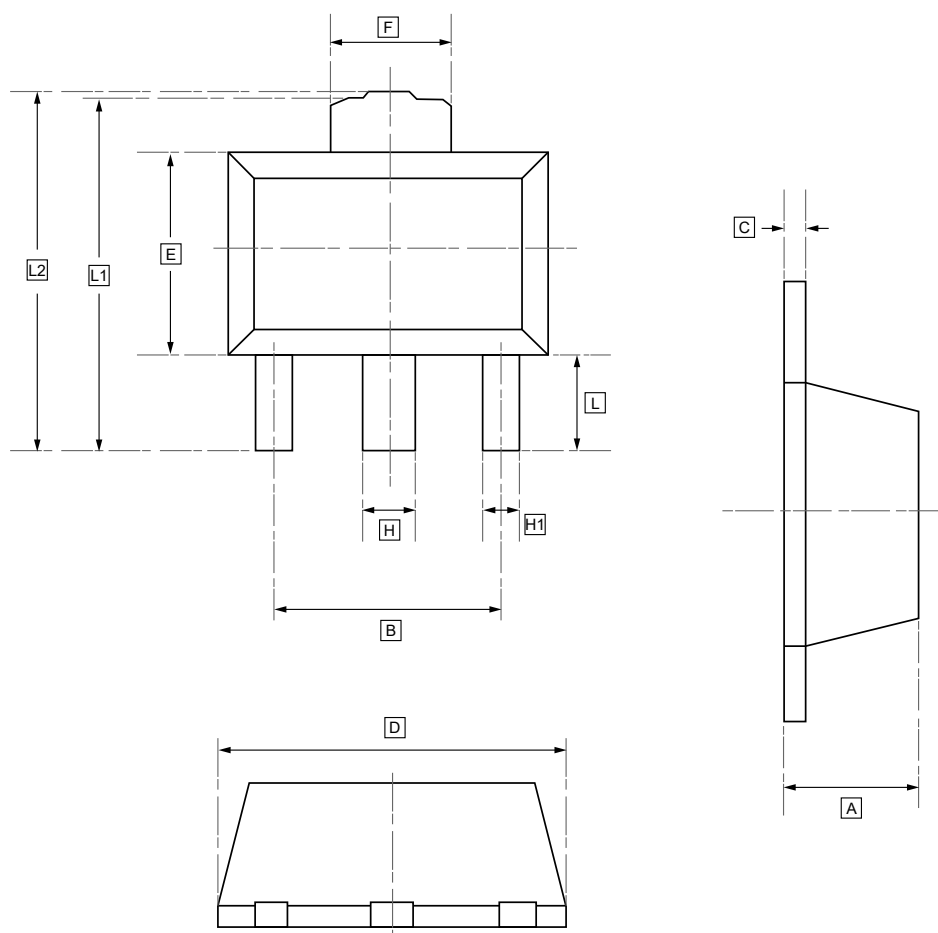


DIMENSIONS (mm are the original dimensions)

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

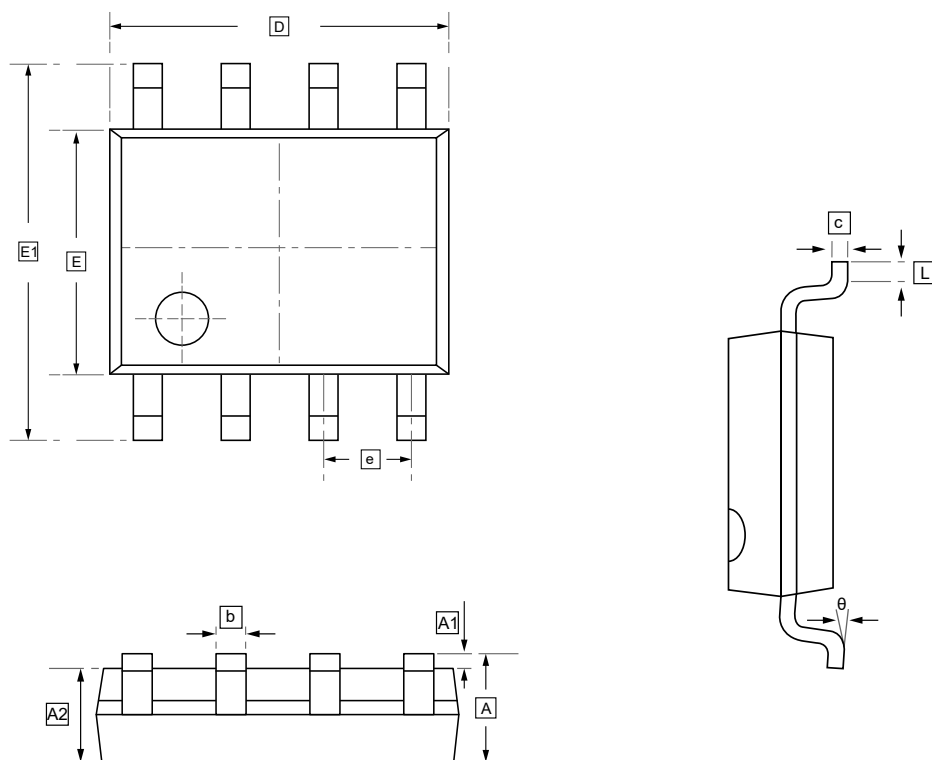


DIMENSIONS (mm are the original dimensions)

Symbol	A	B	C	D	E	F	H	H1	L	L1	L2
Min	1.450	2.950	0.330	4.450	2.450	1.650	0.450	0.370	0.900	4.100	4.100
Max	1.550	3.050	0.430	4.550	2.550	1.750	0.580	0.480	1.000	4.300	4.350



11.3 SOP-8 Package Outline Dimensions

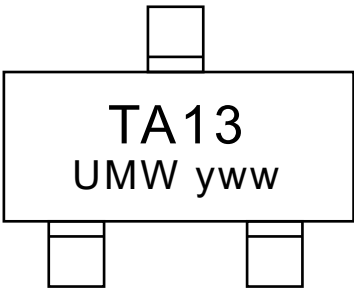


DIMENSIONS (mm are the original dimensions)

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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