

DESCRIPTION

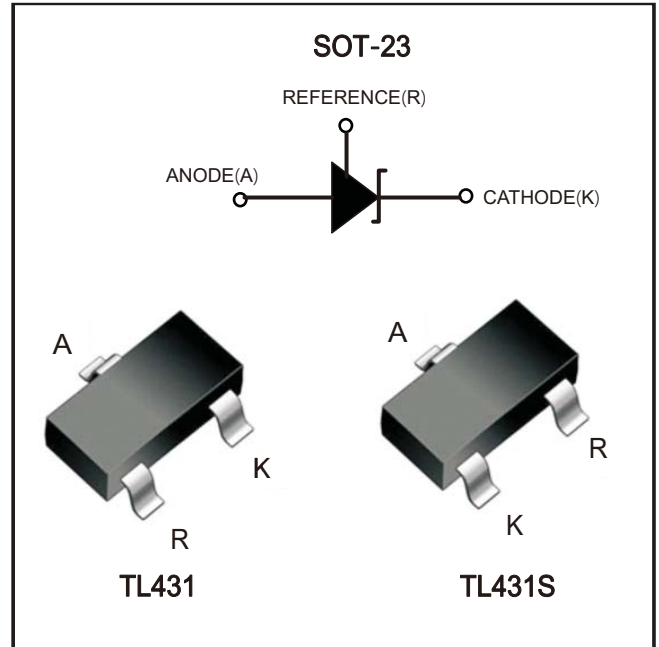
The TL431/TL431S are three-terminal adjustable shunt regulators with specified thermal stability. The output voltage may be set to any value between V_{ref} and 36V with two external resistors. Active output circuitry provides a very sharp turnon characteristic, making these devices excellent replacements for zener diodes in many applications.

FEATURES

- High Performance & Reliability best suited for Automotive application
- The output voltage can be adjusted 2.5V to 36V
- The TL431/TL431S precision reference is offered in two voltage tolerance: 0.4% and 0.8%.
- Fast turn-on response
- Sink current capability 1mA to 100mA
- Low output noise
- Industrial temperature range

APPLICATION

- Shunt regulator
- High-current shunt regulator
- Precision current limiter



Absolute Maximum Ratings (Note 1)

Symbol	Parameter		Rating	Unit
V_{KA}	Cathode Voltage		40	V
I_{KA}	Cathode Current Range (Continuous)		-100 to 150	mA
I_{REF}	Reference Input Current Range		10	mA
P_D	Power Dissipation		Z, R Package: 770	mW
			N Package: 370	
θ_{JA}	Thermal Resistance (Junction to Ambient)	SOT-23	380	$^{\circ}\text{C}/\text{W}$
T_J	Junction Temperature		+150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range		-65 to +150	$^{\circ}\text{C}$
ESD	ESD (Human Body Model)		2000	V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{KA}	Cathode Voltage	V_{REF}	36	V
I_{KA}	Cathode Current	1.0	100	mA
T_A	Operating Ambient Temperature Range	-40	+125	°C

Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Symbol	Parameter		Conditions	Min	Typ	Max	Unit	
V_{REF}	Reference Voltage	0.4%	TL431A	$V_{KA} = V_{REF}, I_{KA} = 10\text{mA}$	2.490	2.500	2.510	
			TL431SA					
		0.8%	TL431B		2.480	2.500	2.520	
			TL431SB					
ΔV_{REF}	Deviation of Reference Voltage Over Full Temperature Range		$V_{KA} = V_{REF}$ $I_{KA} = 10\text{mA}$	0 to +70°C	—	4.5	8	mV
			-40 to +85°C	—	4.5	10		
			-40 to +125°C	—	4.5	16		
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of Change in Reference Voltage to the Change in Cathode Voltage		$I_{KA} = 10\text{mA}$	$\Delta V_{KA} = 10\text{V to } V_{REF}$	—	-1.0	-2.7	mV/V
				$\Delta V_{KA} = 36\text{V to } 10\text{V}$	—	-0.5	-2.0	
I_{REF}	Reference Current		$I_{KA} = 10\text{mA}, R_1 = 10\text{k}\Omega, R_2 = \infty$	—	0.7	4	μA	
ΔI_{REF}	Deviation of Reference Current Over Full Temperature Range		$I_{KA} = 10\text{mA}, R_1 = 10\text{k}\Omega, R_2 = \infty, T_A = -40 \text{ to } +125^\circ\text{C}$	—	0.4	1.2	μA	
$I_{KA}(\text{Min})$	Minimum Cathode Current for Regulation		$V_{KA} = V_{REF}$	—	0.4	1.0	mA	
$I_{KA}(\text{Off})$	Off-state Cathode Current		$V_{KA} = 36\text{V}, V_{REF} = 0$	—	0.05	1.0	μA	
Z_{KA}	Dynamic Impedance		$V_{KA} = V_{REF}, I_{KA} = 1 \text{ to } 100\text{mA}, f \leq 1.0\text{kHz}$	—	0.15	0.5	Ω	
θ_{JC}	Thermal Resistance		SOT-23	—	135.48	—	°C/W	

FIGURE 1. TEST CIRCUIT FOR $V_{KA} = V_{REF}$

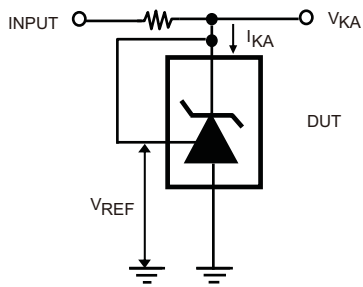


FIGURE 2. TEST CIRCUIT FOR $V_{KA} > V_{REF}$

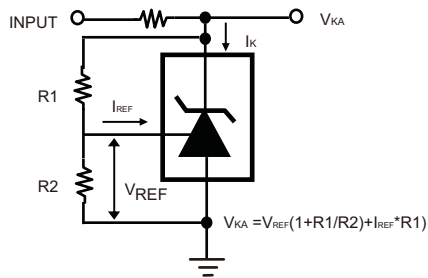


FIGURE 3. TEST CIRCUIT FOR I_{KA} (OFF)

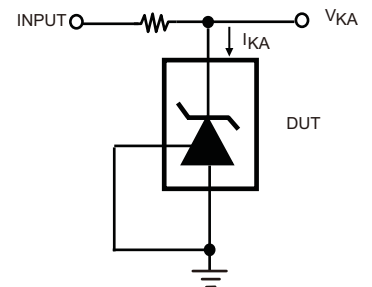


FIGURE 4. TEST CIRCUIT FOR PULSE RESPONSE

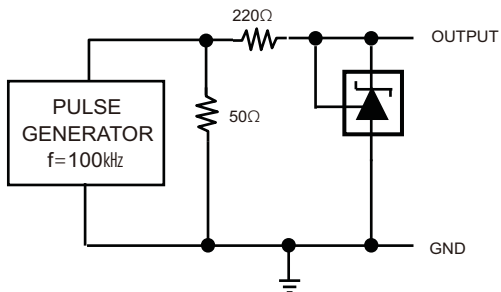
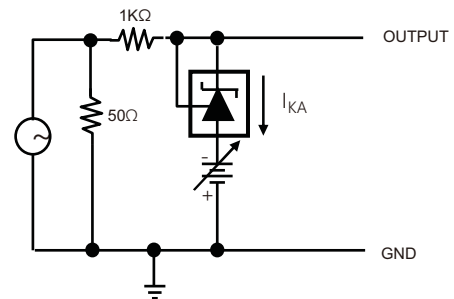
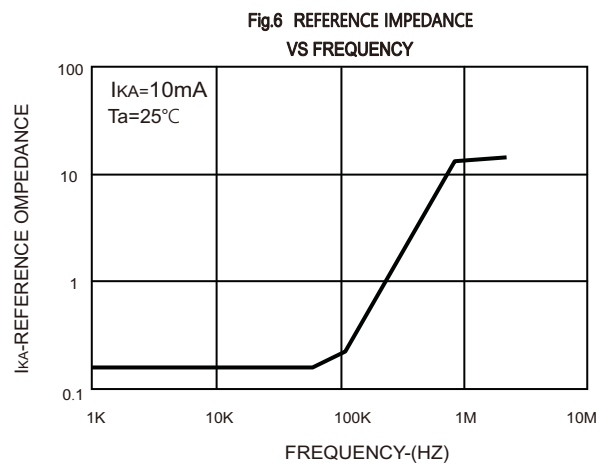
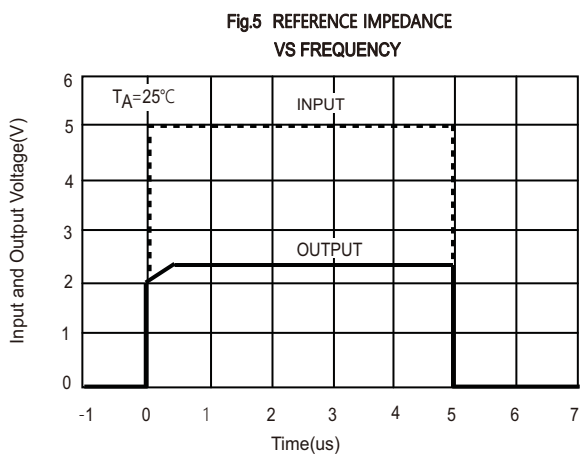
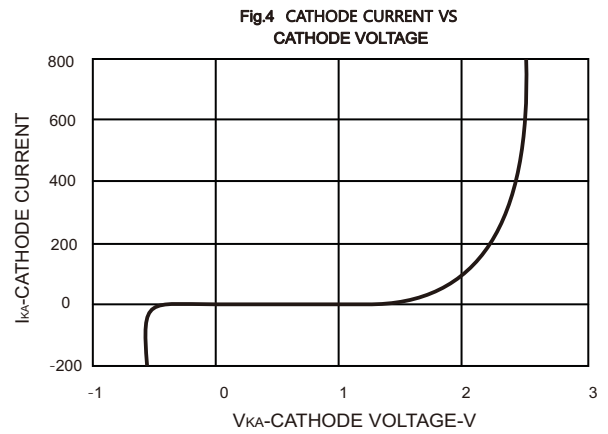
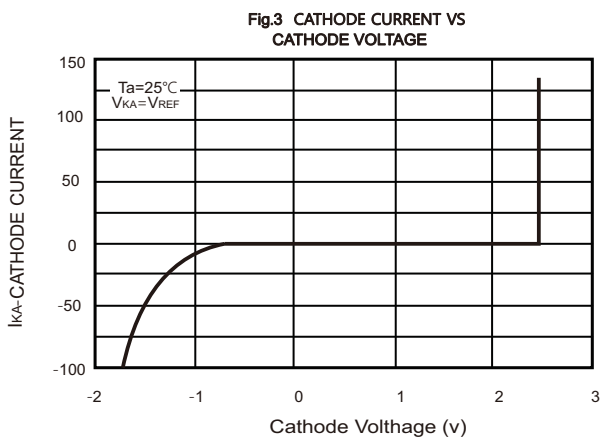
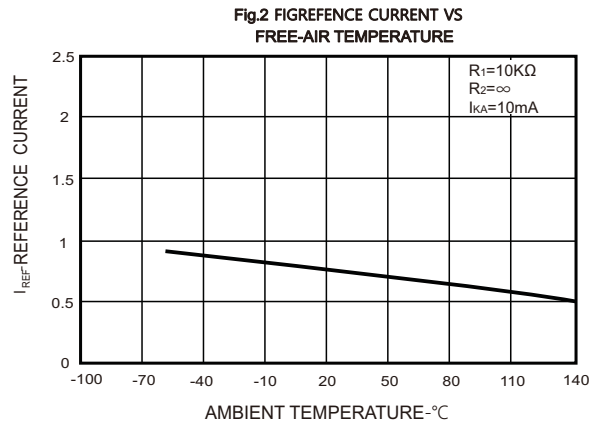
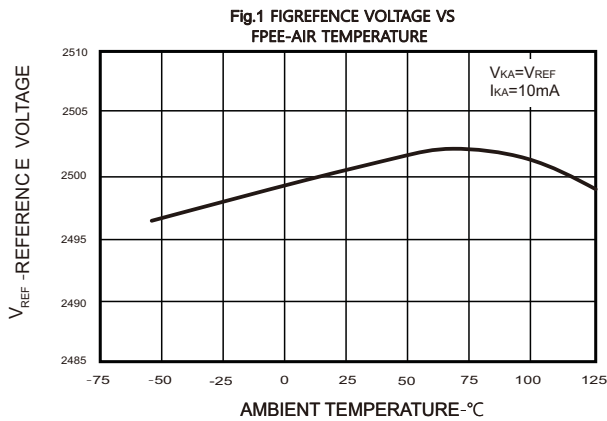


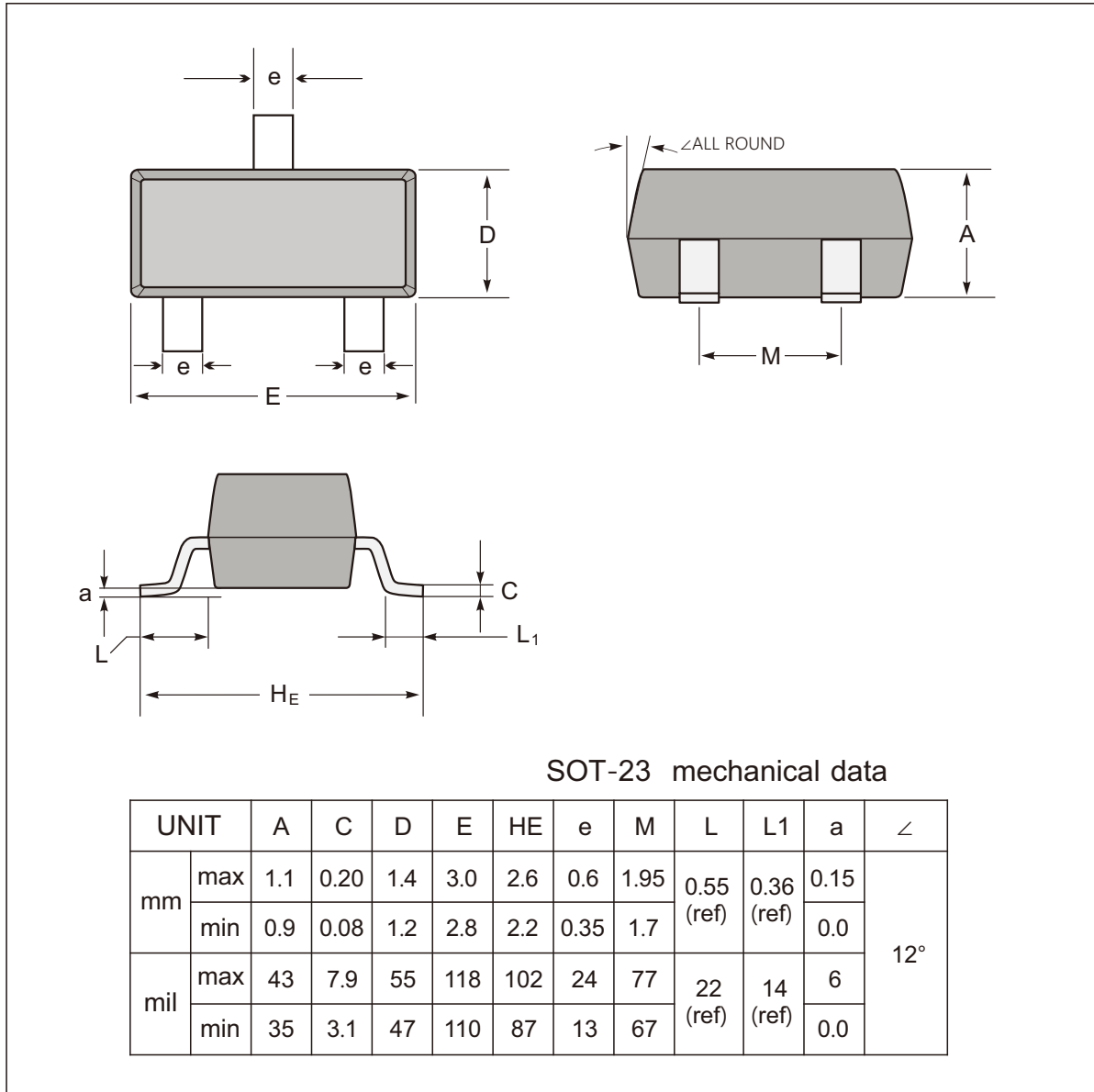
FIGURE 5. TEST CIRCUIT REFERENCE IMPEDANCE



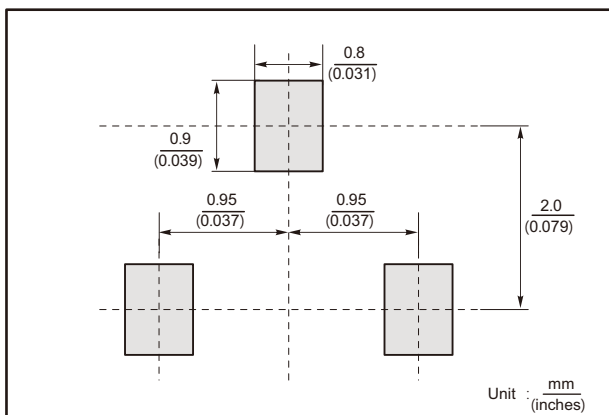
Typical Characteristics



SOT-23 Package Outline Dimensions



The recommended mounting pad size



Marking

Number/Type	Marking code
TL431A	431A
TL431B	431B
TL431SA	431SA
TL431SB	431SB

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