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TL431-1
Encapsulate Adjustable Reference Source

www.sot23.com.tw

Features

- The output voltage can be adjusted to 36V.
- Low dynamic output impedance, its typical value is 0.2Ω
- Trapping current capability is 1 to 100mA
- Low output noise voltage
- Fast on-state response
- The effective temperature compensation in the working range of full temperature
- The typical value of the equivalent temperature factor in the whole temperature scope is 50 ppm/˚C

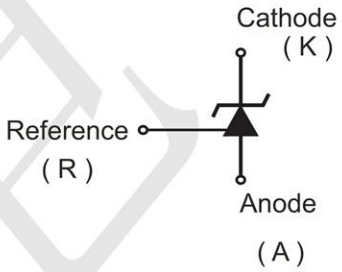
Mechanical data

- Case: SOT-23, molded plastic.
- Terminals: solderable per MIL-STD-750, method 2026.

Package and Pin Configuration

SOT-23

Circuit diagram



Absolute Maximum Ratings

(operating temperature range applies unless otherwise specified)

Parameter	Symbol	Value	Unit
Cathode voltage	V_{KA}	37	V
Cathode current range (continuous)	I_{KA}	-100~+150	mA
Reference input current range	I_{ref}	0.05~+10	mA
Power dissipation	P_D	300	mW
Thermal resistance from junction to ambient	$R_{\theta JA}$	417	°C/W
Operating junction temperature	T_J	150	°C
Operating ambient temperature range	T_{opr}	-40~+85	°C
Storage temperature range	T_{stg}	-65~+150	°C

Electrical Characteristics (Ta=25°C unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Reference input voltage (Fig.1)	V_{ref}	$V_{KA} = V_{REF}$, I_{KA} = 10mA		2.470		2.520	V
Deviation of reference input voltage over temperature (note) (Fig.1)	$\triangle V_{ref} / \triangle T$	$V_{KA} = V_{REF}$, I_{KA} = 10mA Tmin ≤ Ta ≤ Tmax			4.5	17	mV
Ratio of change in reference input voltage to the change in cathode voltage (Fig.2)	$\triangle V_{ref} / \triangle V_{KA}$	I_{KA} = 10mA	$\triangle V_{KA}$ = 10V~V_{REF}		-1.0	-2.7	mV/V
			$\triangle V_{KA}$ = 36V~10V		-0.5	-2.0	mV/V
Reference input current (Fig.2)	I_{ref}	I_{KA} = 10mA, R_1 = 10 kΩ R_2 = ∞			1.5	4	μA
Deviation of reference input current over full temperature range (Fig.2)	$\triangle I_{ref} / \triangle T$	I_{KA} = 10mA, R_1 = 10 kΩ R_2 = ∞ Ta = full Temperature			0.4	1.2	μA
Minimum cathode current for regulation (Fig.1)	$I_{KA(min)}$	$V_{KA} = V_{REF}$			0.45	1.0	mA
Off-state cathode current (Fig.3)	$I_{KA(OFF)}$	V_{KA} = 40V, V_{REF} = 0			0.05	0.5	μA
Dynamic impedance	Z_{KA}	$V_{KA} = V_{REF}$, I_{KA} = 1 to 100mA f ≤ 1.0kHz			0.15	0.5	Ω

Note: T_{MIN}= 0°C, T_{MAX}= +70°C

Classification of Vref

Rank	0.5%	1%
Range	2.482 - 2.508	2.47 - 2.52

Fig.1 - Test Circuit for $V_{KA} = V_{ref}$

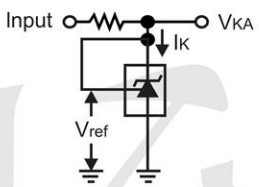
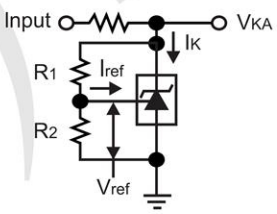
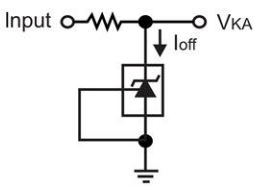


Fig.2 - Test Circuit for $V_{KA} > V_{ref}$



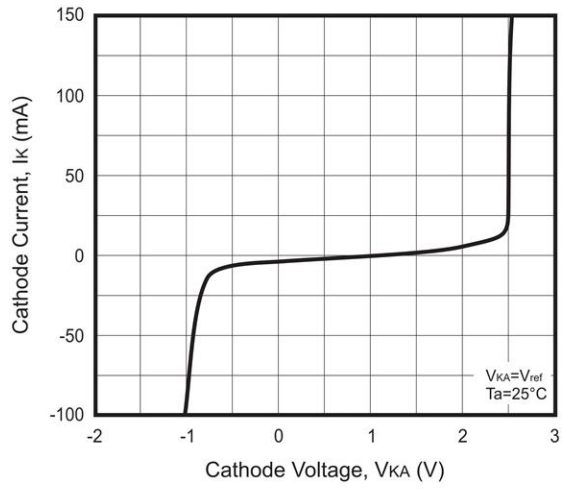
$V_{KA} = V_{ref} (1+R1/R2) + I_{ref} \cdot R1$

Fig.3 - Test Circuit for I_{off}

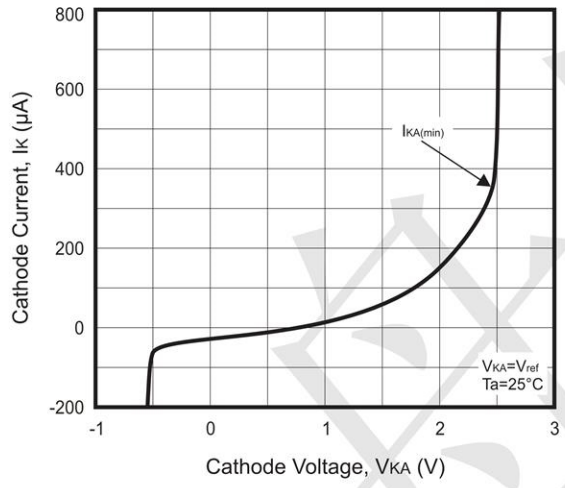


Typical Electrical and Thermal Characteristics

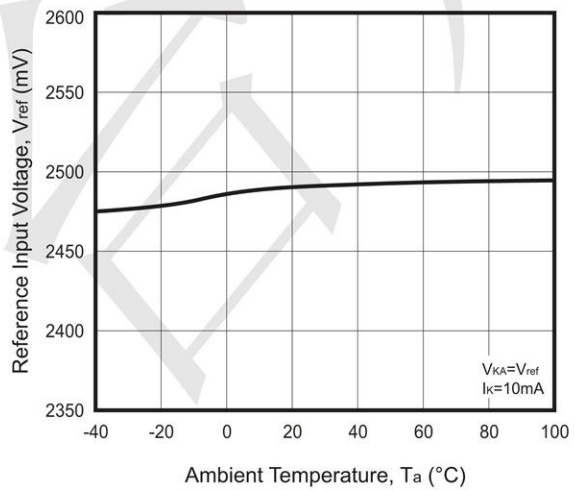
Cathode Current versus Cathode Voltage

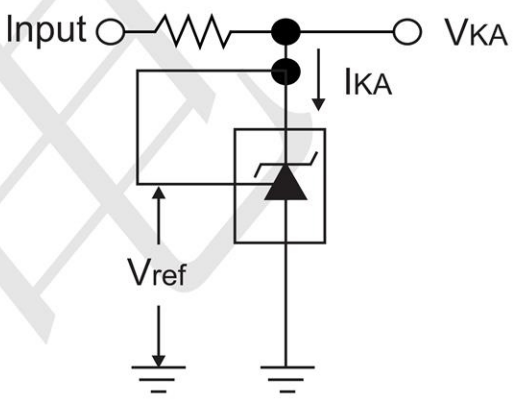


Cathode Current Versus Cathode Voltage



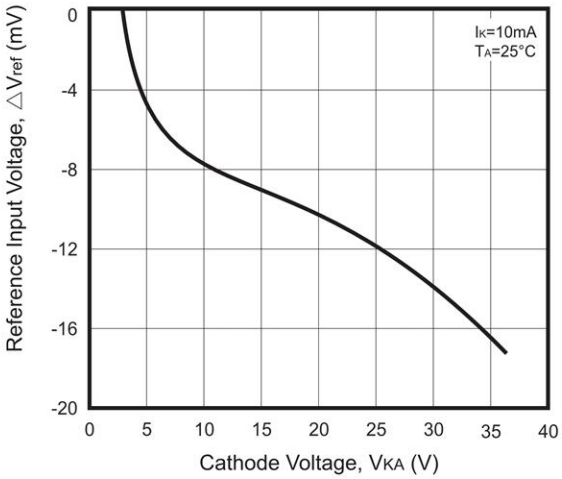
Reference Input Voltage Versus Ambient Temperature

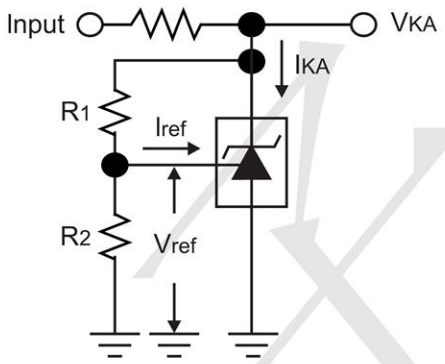




Test Circuit for VKA = Vref

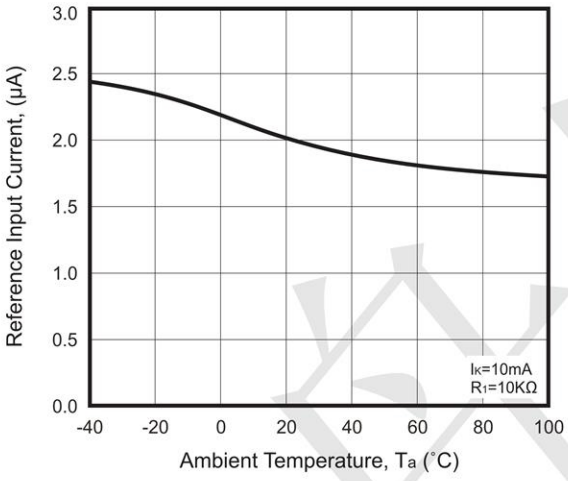
Change In Reference Input Voltage Versus Cathode Voltage

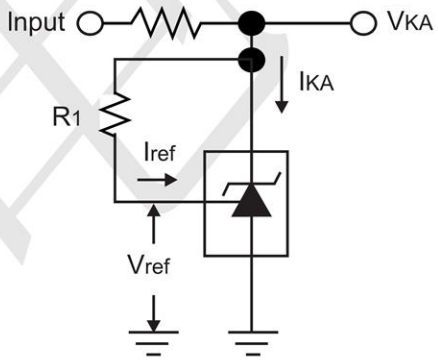




Test Circuit for $V_{KA} = V_{ref} (1+R1/R2)+ I_{ref} \cdot R1$

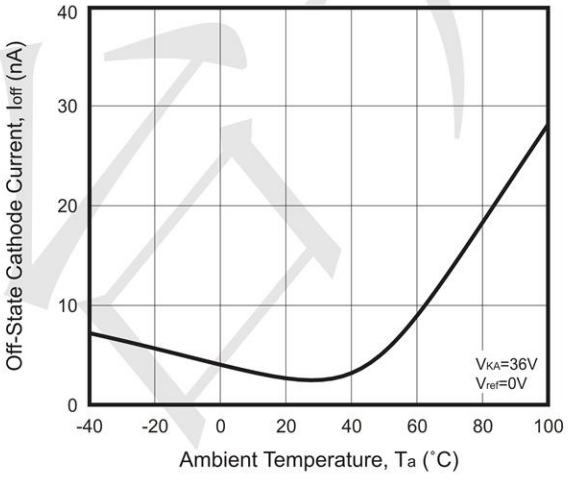
Reference Input Current Versus Ambient Temperature

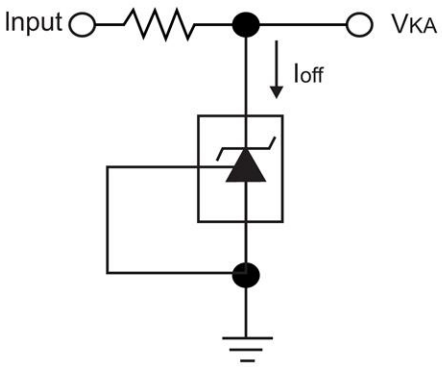




Test Circuit for I_{ref}

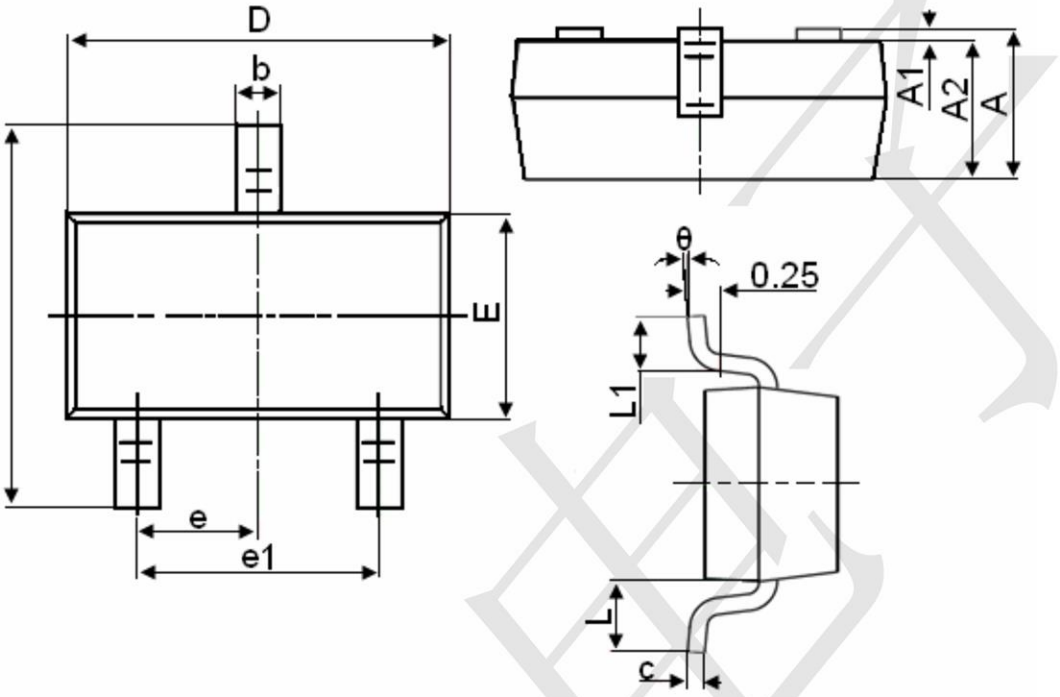
Off-State Cathode Current Versus Ambient Temperature





Test Circuit for I_{off}

SOT-23 Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

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