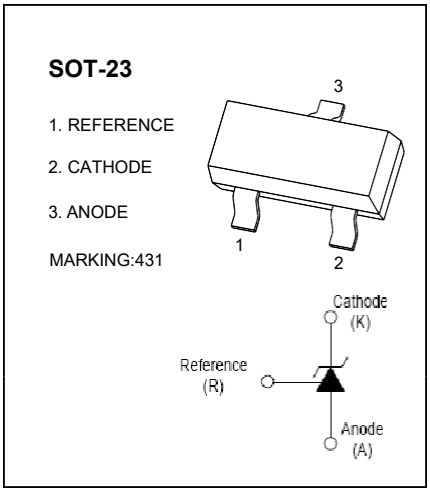
MMTL431A

Programmable Precision References

The 431 is three-terminal adjustable regulator with a guaranteed thermal stability over applicable temperature ranges. The output Voltage may be set to any value between Vref(approximately 2.495V) and 36 V with two external resistors; These devices have provides a very sharp turn-on c h a r acteristic , making these devices excellent replacement for zener diodes in many applications.



FEATURES

- The output voltage can be adjusted to 36V
- Low dynamic output impedance, its typical value is 0.2Ω
- Trapping current capability is 0.5 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/℃

Parameter	Symbol	Value	Unit
Cathode Voltage	V_{KA}	37	V
Cathode Current Range (Continuous)	I_{KA}	- 100 to + 150	mA
Reference Input Current Range	I_{REF}	- 0.05 to + 10	mA
Power Dissipation	P_D	350	mW
Operating Temperature Range	T_{opr}	- 40 to + 125	°C
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_{stg}	- 65 to + 150	°C

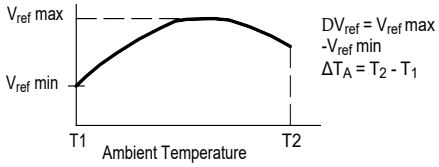
Recmmended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Cathode Voltage	V_{KA}	V_{REF}	36	V
Cathode Current	I_{KA}	0.5	100	mA

Characteristics at T_a = 25 °C

Parameter	Symbol	Min.	Typ.	Max.	Unit
Reference Input Voltage at $V_{KA} = V_{REF}$, I_{KA} = 10 mA 0.5%	V_{REF}	2.483	2.495	2.507	V
Reference Input Voltage at $V_{KA} = V_{REF}$, I_{KA} = 10 mA 1%	V_{REF}	2.470	2.495	2.520	V
Reference Input Voltage at $V_{KA} = V_{REF}$, I_{KA} = 10 mA 2%	V_{REF}	2.445	2.495	2.545	V
Deviation of Reference Input Voltage Over Temperatue at $V_{KA} = V_{REF}$, I_{KA} = 10 mA, - 25 °C ≤ T_a ≤ + 125 °C	$\Delta V_{REF}/\Delta T$	-	4.5	25	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage at I_{KA} = 10 mA ΔV_{KA} = 10 V to V_{REF} ΔV_{KA} = 36 V to 10 V	$\Delta V_{REF}/\Delta V_{KA}$	- -	-1.0 -0.5	-2.7 -2	mV/V
Reference Input Current at I_{KA} = 10 mA, R1 = 10 KΩ, R2 = ∞	I_{REF}	-	1.5	4	μA
Deviation of Reference Input Current Over Full Temperatue at I_{KA} = 10 mA, R1 = 10 KΩ, R2 = ∞, - 25 °C ≤ T_a ≤ + 125 °C	$\Delta I_{REF}/\Delta T$	-	0.2	0.4	μA
Minimum Cathode Current for Regulation at $V_{KA} = V_{REF}$	$I_{KA(min)}$	-	0.3	0.5	mA
Off-Stage Cathode Current at V_{KA} = 36 V, V_{REF} = 0	$I_{KA(OFF)}$	-	0.05	0.5	μA
Dynamic Impedance at $V_{KA} = V_{REF}$, I_{KA} = 1 to 100 mA, f ≤ 1 KHz	Z_{KA}	-	0.15	0.5	Ω

1. The deviation parameter ΔV_{ref} is defined as the difference between the maximum and minimum values obtained over the full operating ambient temperature range that applies.



The average temperature coefficient of the reference input voltage, αV_{ref} is defined as:

$$V_{ref}\ \frac{ppm}{^\circ C} = \frac{\left(\frac{\Delta V_{ref}}{V_{ref}\ @\ 25^\circ C}\right) X\ 10^6}{\Delta T_A} = \frac{\Delta V_{ref} \times 10^6}{\Delta T_A\ (V_{ref}\ @\ 25^\circ C)}$$

αV_{ref} can be positive or negative depending on whether V_{ref} Min or V_{ref} Max occurs at the lower ambient temperature. (Refer to Figure 6.)

Example : ΔV_{ref} = 8.0 mV and slope is positive,
V_{ref} @ 25°C = 2.495 V, ΔT_A = 70°C

$$\alpha V_{ref} = \frac{0.008 \times 10^6}{70\ (2.495)} = 45.8\ ppm/^\circ C$$

2. The dynamic impedance Z_{KA} is defined as: $|Z_{KA}| = \frac{\Delta V_{KA}}{\Delta I_K}$. When the device is programmed with two external resistors, R1 and R2, (refer to Figure 2) the total dynamic impedance of the circuit is defined as: $|Z_{KA}'| \approx |Z_{KA}| \left(1 + \frac{R1}{R2}\right)$

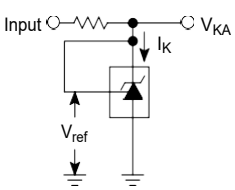


Figure 1. Test Circuit for $V_{KA} = V_{ref}$

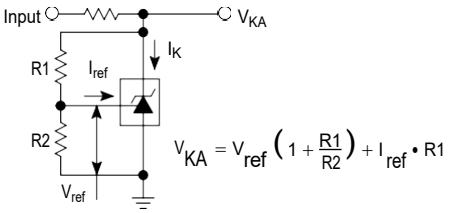


Figure 2. Test Circuit for $V_{KA} > V_{ref}$

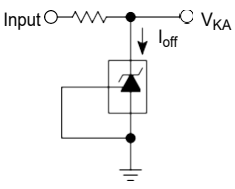


Figure 3. Test Circuit for I_{off}

Typical Characteristics

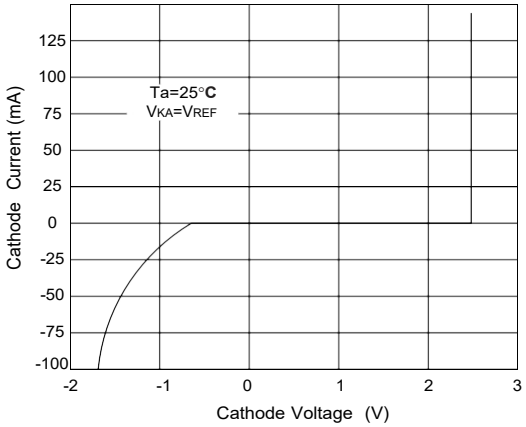


Figure 4. Cathode Current Vs Cathode Voltage

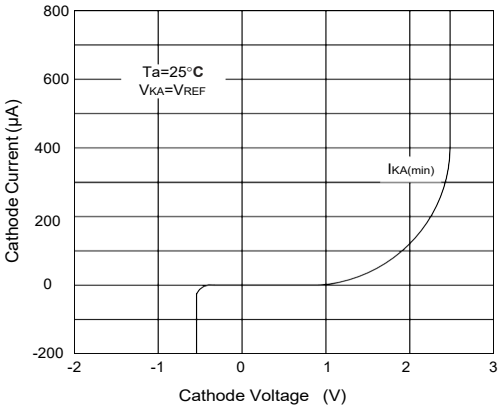


Figure 5. Cathode Current Vs Cathode Voltage

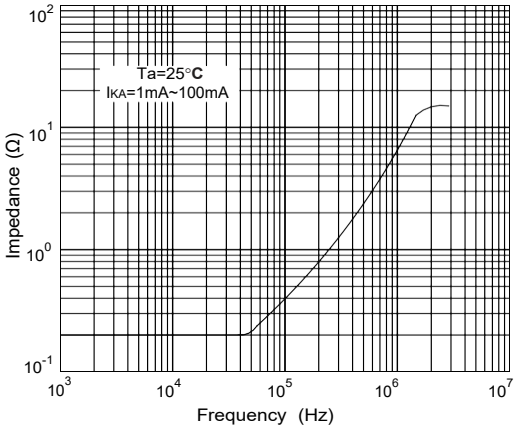


Figure 6. Dynamic Impedance Vs Frequency

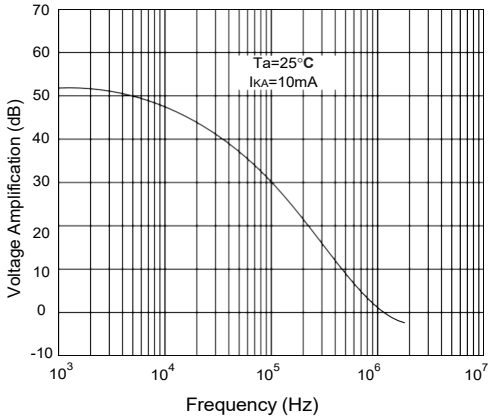


Figure 7. Small Signal Voltage Amplification Vs Frequency

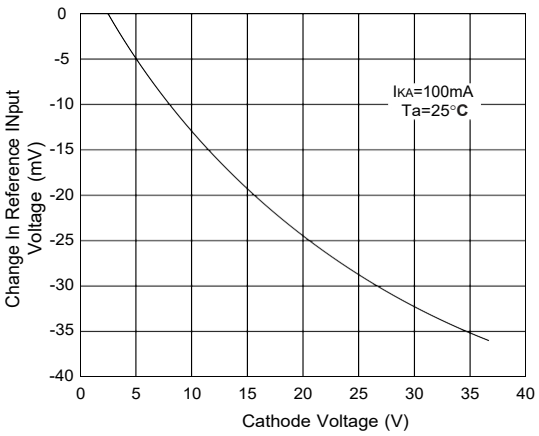


Figure 8. Change in Reference Input Voltage Vs Cathode Voltage

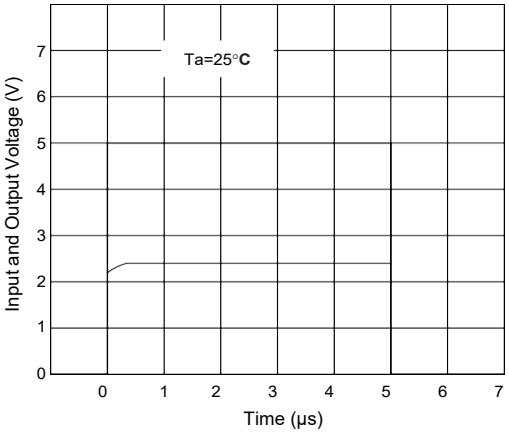


Figure 9. Pulse Response

Typical Characteristics

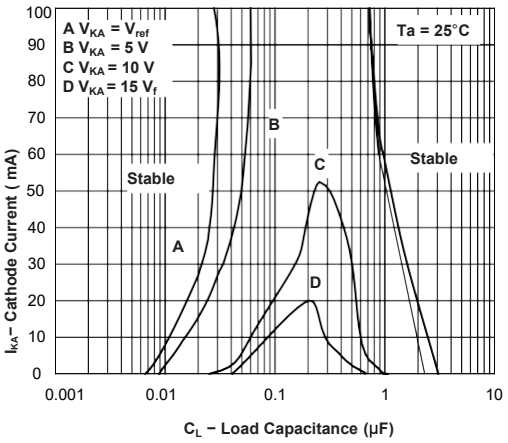
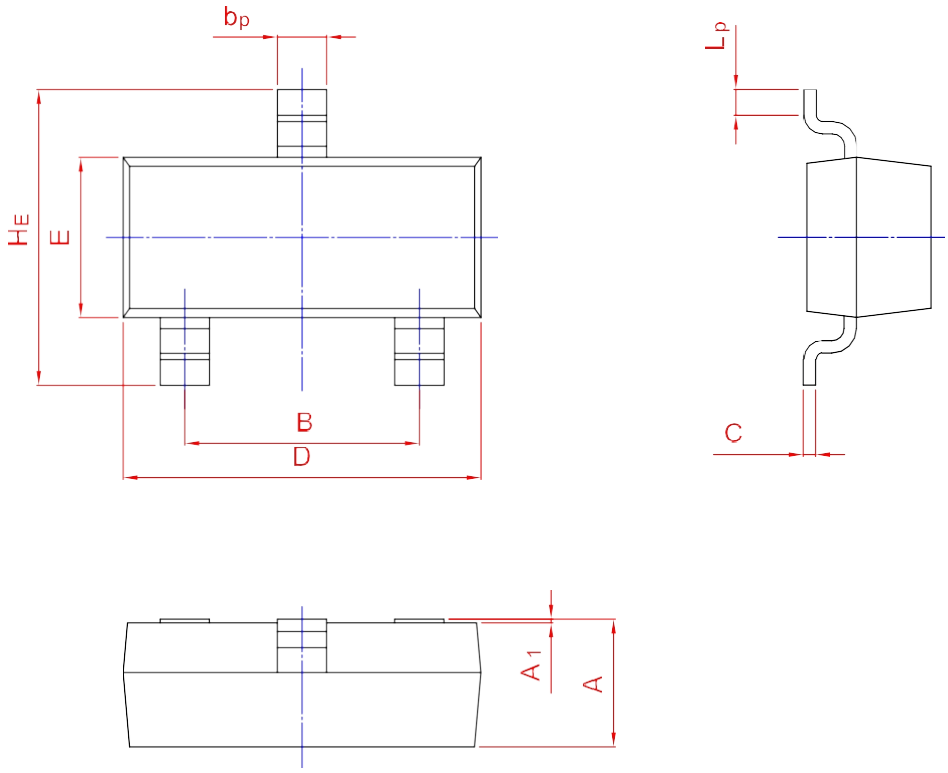


Figure 10. Cathode Current Vs Load Capacitance

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads **SOT-23**



UNIT	A	B	bp	C	D	E	HE	A1	Lp
mm	1.40 0.95	2.04 1.78	0.50 0.35	0.19 0.08	3.10 2.70	1.65 1.20	3.00 2.20	0.100 0.013	0.50 0.20

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