

LM431A, LM431B, LM431C

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{KA}	Cathode Voltage	37	V
I_{KA}	Cathode Current Range (Continuous)	-100 to +150	mA
I_{REF}	Reference Input Current Range	-0.05 to +10	mA
P_D	Power Dissipation	770	mW
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	160	°C/W
T_{OPR}	Operating Temperature Range – LM431xC	-25 to +85	°C
	Operating Temperature Range – LM431xI	-40 to +85	°C
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{KA}	Cathode Voltage	V_{REF}	36	V
I_{KA}	Cathode Current	1.0	100	mA

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

ELECTRICAL CHARACTERISTICS (Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	LM431A			LM431B			LM431C			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V_{REF}	Reference Input Voltage	$V_{KA} = V_{REF}$, $I_{KA} = 10\text{ mA}$	2.450	2.500	2.550	2.470	2.495	2.520	2.482	2.495	2.508	V
$\Delta V_{REF}/\Delta T$	Deviation of Reference Input Voltage Over-Temperature	$V_{KA} = V_{REF}$, $I_{KA} = 10\text{ mA}$, $T_{MIN} \leq T_A \leq T_{MAX}$ (Note 1)	-	4.5	17.0	-	4.5	17.0	-	4.5	17.0	mV
$\Delta V_{REF}/\Delta V_{KA}$	Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$I_{KA} = 10\text{ mA}$, $\Delta V_{KA} = 10\text{ V} - V_{REF}$	-	-1.0	-2.7	-	-1.0	-2.7	-	-1.0	-2.7	mV/V
		$\Delta V_{KA} = 36\text{ V} - 10\text{ V}$	-	-0.5	-2.0	-	-0.5	-2.0	-	-0.5	-2.0	
I_{REF}	Reference Input Current	$I_{KA} = 10\text{ mA}$, $R_1 = 10\text{ k}\Omega$, $R_2 = \infty$	-	1.5	4.0	-	1.5	4.0	-	1.5	4.0	μA
$\Delta I_{REF}/\Delta T$	Deviation of Reference Input Current Over Full Temperature Range	$I_{KA} = 10\text{ mA}$, $R_1 = 10\text{ k}\Omega$, $R_2 = \infty$, $T_A = \text{Full Range}$	-	0.4	1.2	-	0.4	1.2	-	0.4	1.2	μA
$I_{KA(MIN)}$	Minimum Cathode Current for Regulation	$V_{KA} = V_{REF}$	-	0.45	1.00	-	0.45	1.00	-	0.45	1.00	mA
$I_{KA(OFF)}$	Off - Stage Cathode Current	$V_{KA} = 36\text{ V}$, $V_{REF} = 0$	-	0.05	1.00	-	0.05	1.00	-	0.05	1.00	μA
Z_{KA}	Dynamic Impedance	$V_{KA} = V_{REF}$, $I_{KA} = 1\text{ to }100\text{ mA}$, $f \geq 1.0\text{ kHz}$	-	0.15	0.50	-	0.15	0.50	-	0.15	0.50	Ω

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. LM431xC: $T_{MIN} = -25^\circ\text{C}$, $T_{MAX} = +85^\circ\text{C}$

LM431xI: $T_{MIN} = -40^\circ\text{C}$, $T_{MAX} = +85^\circ\text{C}$

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TEST CIRCUIT

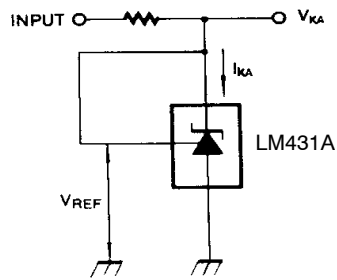


Figure 2. Test Circuit for $V_{KA} = V_{REF}$

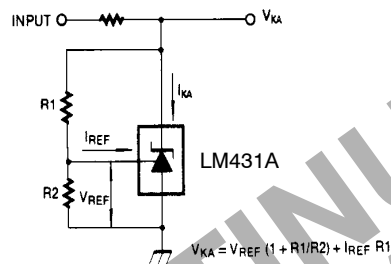


Figure 3. Test Circuit for $V_{KA} > V_{REF}$

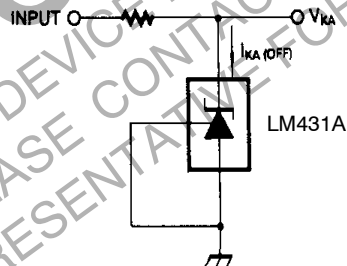


Figure 4. Test Circuit for $I_{KA(OFF)}$

TYPICAL PERFORMANCE CHARACTERISTICS

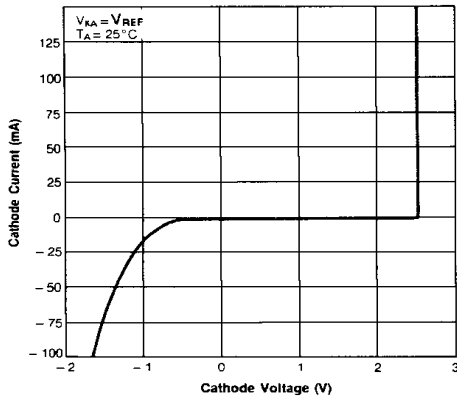


Figure 5. Cathode Current vs. Cathode Voltage

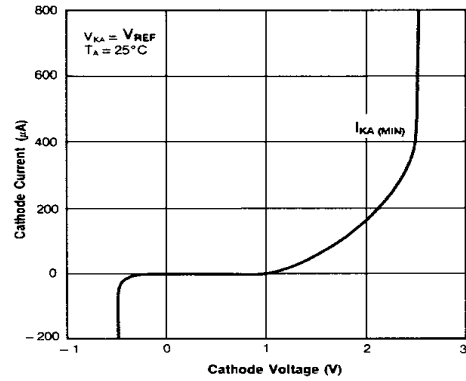


Figure 6. Cathode Current vs. Cathode Voltage

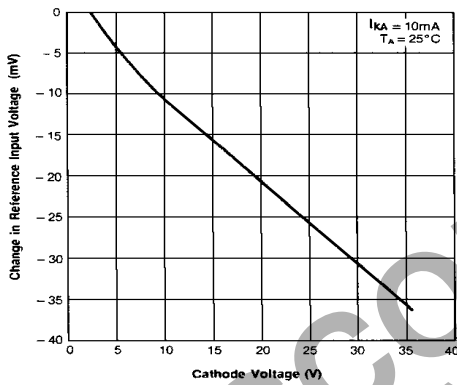


Figure 7. Change in Reference Input Voltage vs. Cathode Voltage

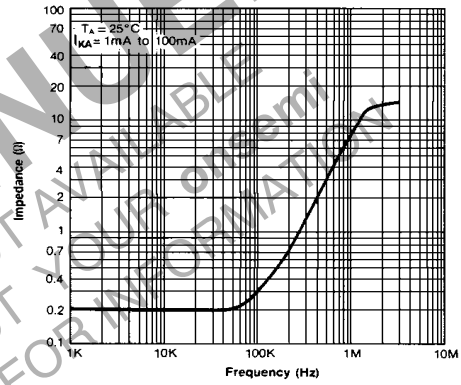


Figure 8. Dynamic Impedance Frequency

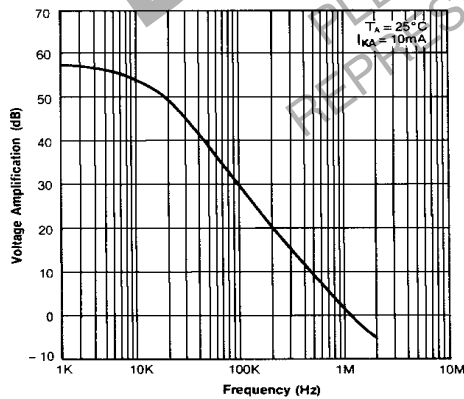


Figure 9. Small Signal Voltage Amplification vs. Frequency

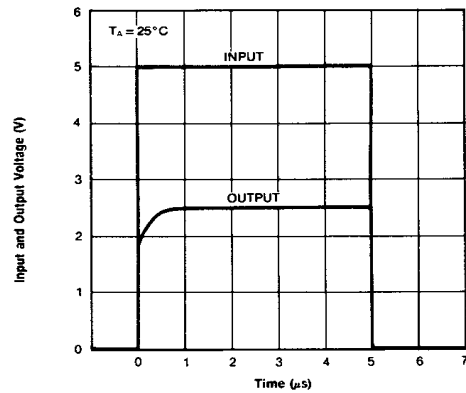


Figure 10. Pulse Response

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TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

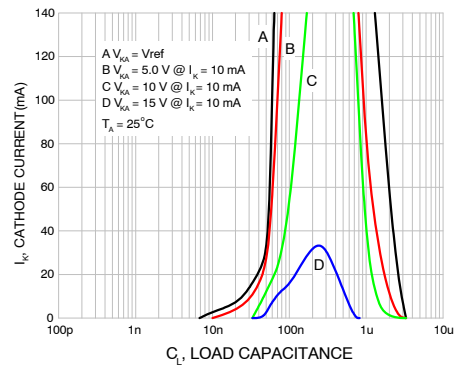


Figure 11. Stability Boundary Conditions

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TYPICAL APPLICATION

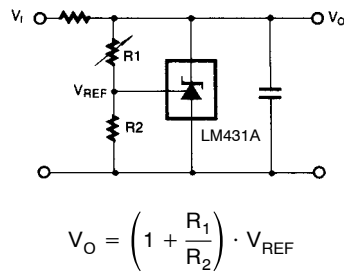


Figure 12. Shunt Regulator

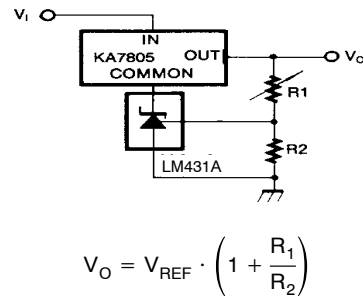


Figure 13. Output Control for Three-Terminal Fixed Regulator

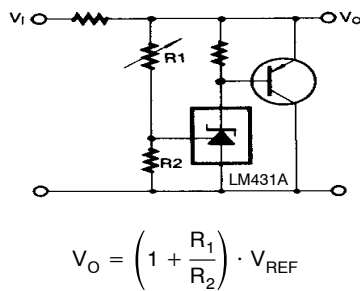


Figure 14. High-Current Shunt Regulator

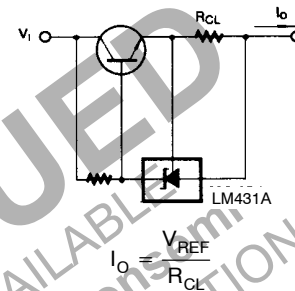


Figure 15. Current Limit or Current Source

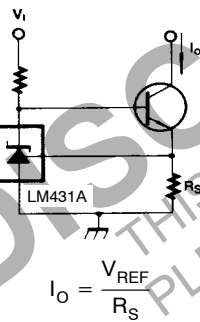


Figure 16. Constant-Current Sink

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ORDERING INFORMATION

DISCONTINUED (Note 2)

Part Number	Operating Temperature Range	Output Voltage Tolerance	Tom Mark	Package	Packing Method [†]
LM431CCZ	-25 ~ +85 °C	0.5%	LM431CCZ	TO-92	Bulk
LM431BCZX		1%	LM431BCZ	TO-92	Tape and Reel
LM431BCZXA			LM431BCZ	TO-92	Ammo
LM431ACZ		2%	LM431ACZ	TO-92	Bulk
LM431ACZX			LM431ACZ	TO-92	Tape and Reel
LM431AIZ	-40 ~ +85 °C	2%	LM431AIZ	TO-92	Bulk
LM431BIZX		1%	LM431BIZ	TO-92	Tape and Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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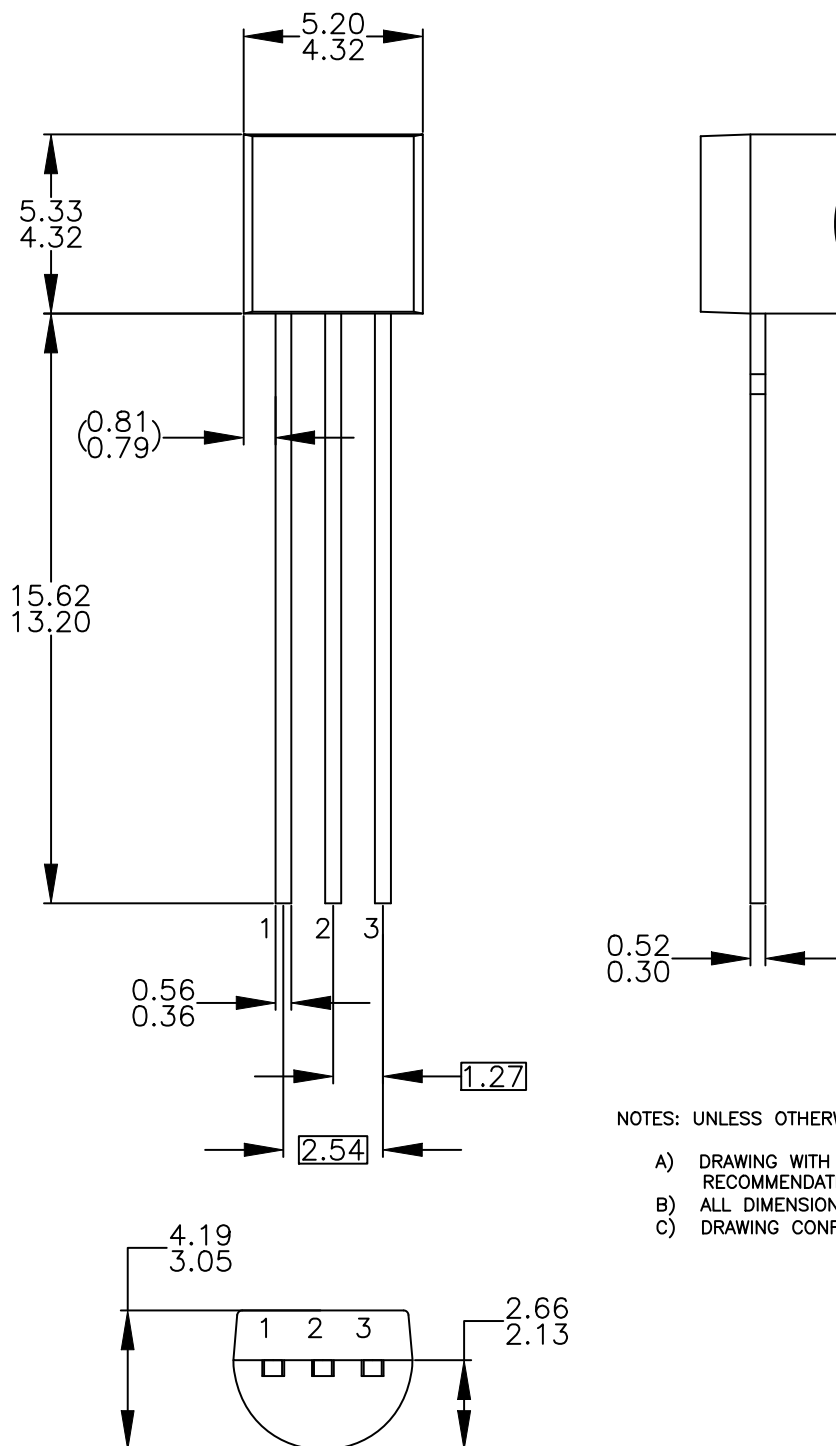
Revision	Description of Changes	Date
5	Document Discontinued.	11/14/2025

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

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CASE 135AN
ISSUE O

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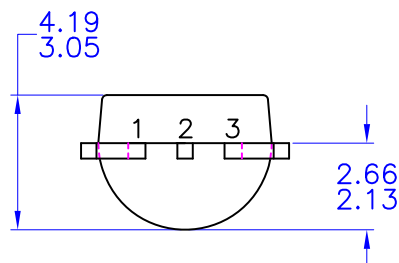
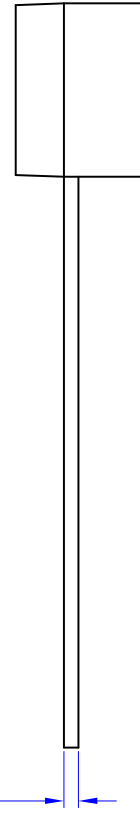
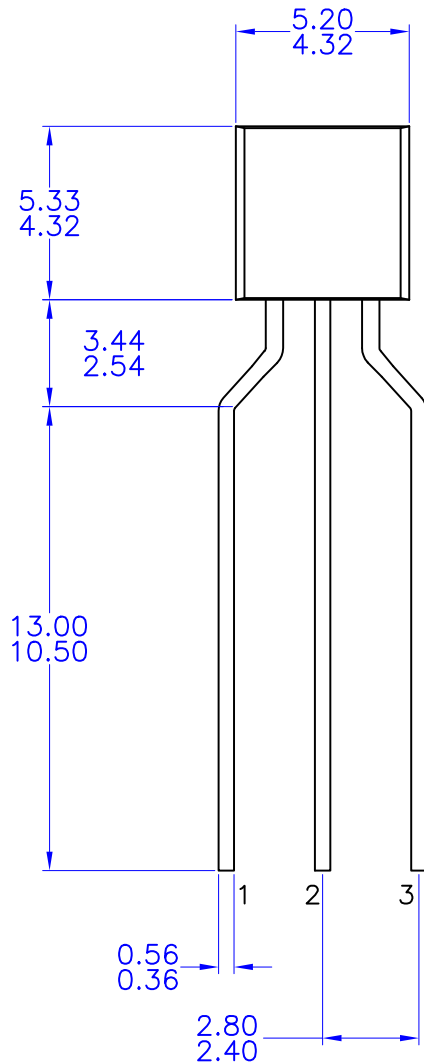
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