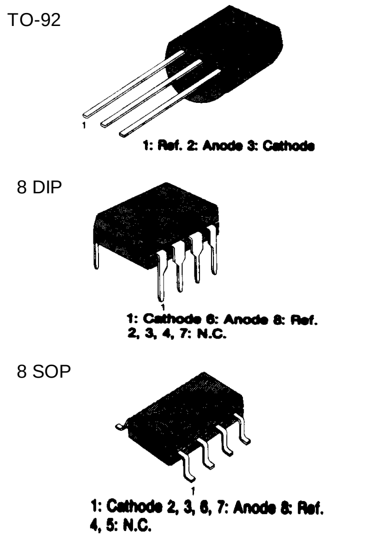
PROGRAMMABLE SHUNT REGULATOR

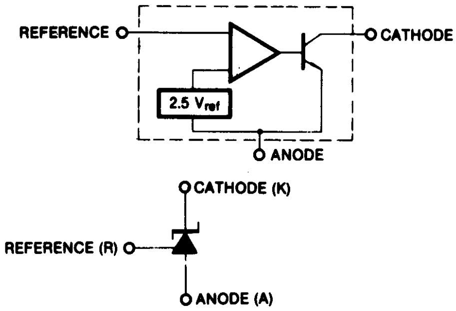
The KA431/A are three-terminal adjustable regulator series with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{REF} (approximately 2.5 volts) and 36 volts with two external resistors These devices have a typical dynamic output impedance of 0.2Ω. Active output circuitry provides a very sharp turn-on characteristic, making these devices excel lent replacement for zener diodes in many applications.



FEATURES

- Programmable output voltage to 36 volts
- Low dynamic output impedance 0.20 typical
- Sink currant capability of 1.0 to 100mA
- Equivalent full-range temperature coefficient of 50ppm/℃ typical
- Temperature compensated for operation over full rated operating temperature range
- Low output noise voltage
- Fast turn on response

BLOCK DIAGRAM



ORDERING INFORMATION

Device	Operating Temperature	Package
KA431Z	0~ + 70℃	TO-92
KA431	0~ + 70℃	8 DIP
KA431D	0~ + 70℃	8 SOP
KA431AZ	0~ + 70℃	TO-92
KA431AD	0~ + 70℃	8 SOP
KA431LZ	0~ + 70℃	TO-92

ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified.)

Characteristic	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		
D, Z Suffix Package		770	mW
N Suffix Package		1000	mW
Operating Temperature Range	T_{OPR}	0 ~+ 70	℃
Storage Temperature Range	T_{STG}	-65 ~ + 150	℃

RECOMMENDED OPERATING CONDITIONS

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

ELECTRICAL CHARACTERISTICS (T_A = 25℃, unless otherwise specified)

Characteristic	Symbol	Test Conditions	KA431			KA431A			KA431L			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Reference Input Voltage	V_{REF}	$V_{KA}=V_{REF}$, I_{KA}=10mA	2.440	2.495	2.550	2.470	2.495	2.520	2.482	2.495	2.508	V
Deviation of Reference Input Voltage Over-Temperature (Note 1)	$\Delta V_{REF}/\Delta T$	$V_{KA}=V_{REF}$, I_{KA}=10mA, $T_{MIN} \leq T_A \leq T_{MAX}$		4.5	17		4.5	17		4.5	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{REF}/\Delta I_{KA}$	I_{KA} =10mA, ΔV_{KA}=10V-V_{REF}		- 10	- 2.7		- 1.0	- 2.7		- 1.0	- 2.7	mV/W
		I_{KA} =10mA, ΔV_{KA}=36V-10V		-0.5	-2.0		-0.5	-2.0		-0.5	-2.0	mV/W
Reference Input Current	I_{REF}	I_{KA}=10mA, R_1=10KΩ, R_2=∞		1.5	4		1.5	4		1.5	4	μA
Deviation of Reference Input Current Over Full Temperature Range	$\Delta I_{REF}/\Delta T$	I_{KA}=10mA, R_1=10KΩ, R_2=∞, T_A=Full Range		0.4	1.2		0.4	1.2		0.4	1.2	μA
Minimum Cathode Current for Regulation	$I_{KA(MIN)}$	$V_{KA}=V_{REF}$		0.45	1.0		0.45	1.0		0.45	1.0	mA
Off - Stage Cathode Current	$I_{KA(OFF)}$	V_{KA}=36V, V_{REF}=0		0.05	1.0		0.05	1.0		0.05	1.0	μA
Dynamic Impedance (Note 2)	Z_{KA}	$V_{KA}=V_{REF}$, I_{KA}=1 to 100mA, f ≥ 1.0KΩ		0.15	0.5		0.15	0.5		0.15	0.5	Ω

T_{MIN}= 0℃, T_{MAX}= +70℃

TEST CIRCUITS

Fig. 1 Test Circuit for V_{KA}=V_{REF}

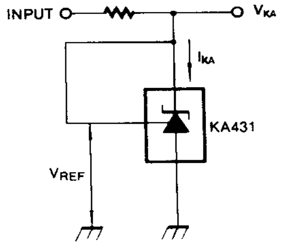


Fig. 2 Test Circuit for $V_{KA} \geq V_{REF}$

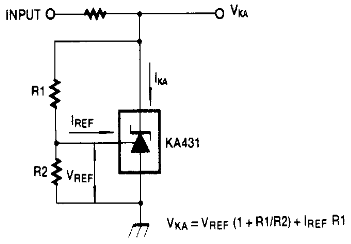
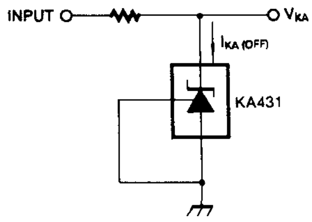


Fig. 3 Test Circuit for $I_{KA(OFF)}$



TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 4 CATHODE CURRENT VS CATHODE VOLTAGE

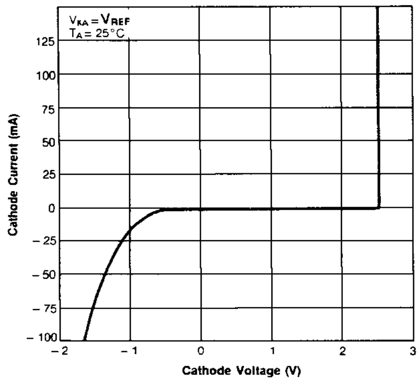


Fig. 5 CATHODE CURRENT VS CATHODE VOLTAGE

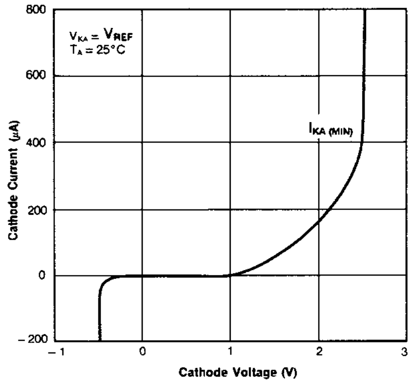


Fig. 6 CHANGE IN REFERENCE INPUT VOLTAGE VS CATHODE VOLTAGE

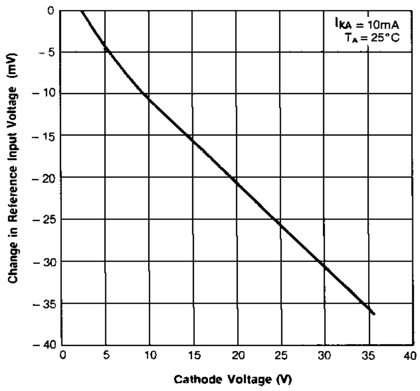


Fig. 7 DYNAMIC IMPEDANCE VS FREQUENCY

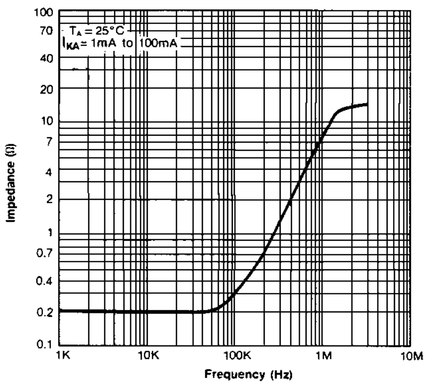
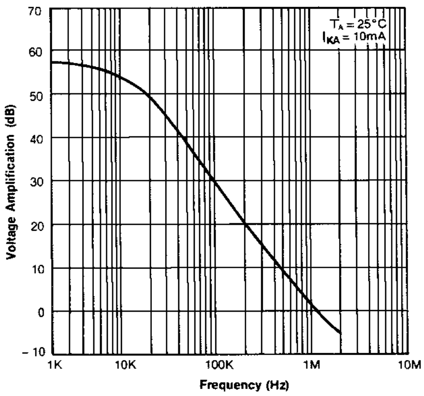
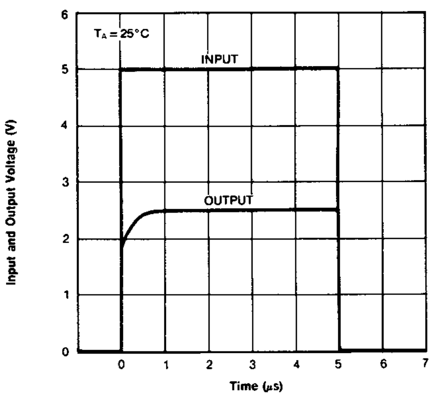


Fig. 8 SMALL SIGNAL VOLTAGE AMPLIFICATION VS FREGUENCY



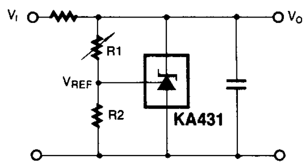
TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 9 PULSE RESPONSE



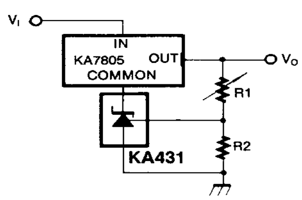
TYPICAL APPLICATIONS

Fig. 10 SHUNT REGULATOR



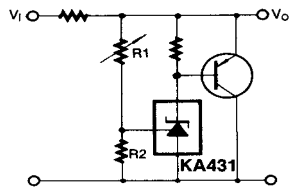
$$V_O = \left(1 + \frac{R1}{R2}\right) V_{REF}$$

Fig. 11 OUTPUT CONTROL OF A THREE-TERMINA L FIXED REGULATOR



$$V_O = V_{REF}\left(1 + \frac{R1}{R2}\right)$$

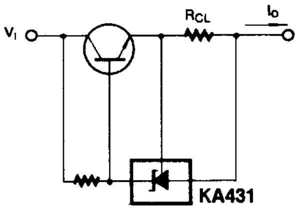
Fig- 2 HIGHERCURRENT SHUNT REGULATOR



$$V_O = \left(1 + \frac{R1}{R2}\right) V_{REF}$$

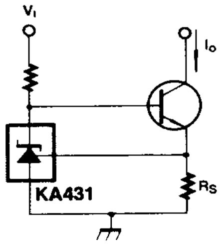
TYPICAL APPLICATIONS

Fig. 13 CURRENT LIMITER OR CURRENT SOURCE



$$I_O = \frac{V_{REF}}{R_{CL}}$$

Fig. 14 CONSTANT-CURRENT SINK



$$I_O = \frac{V_{REF}}{R_S}$$