

LM431A/LM431B/LM431C

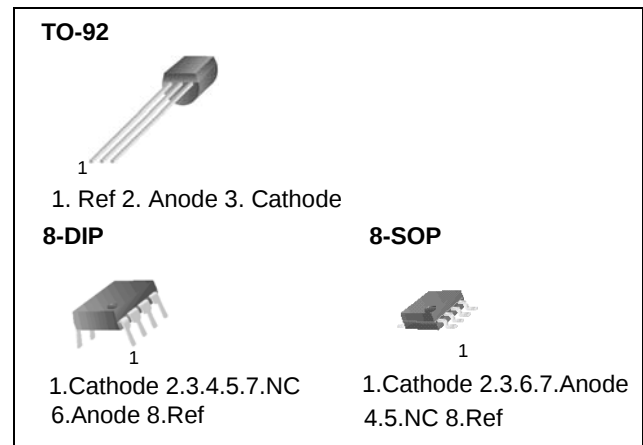
Programmable Shunt Regulator

Features

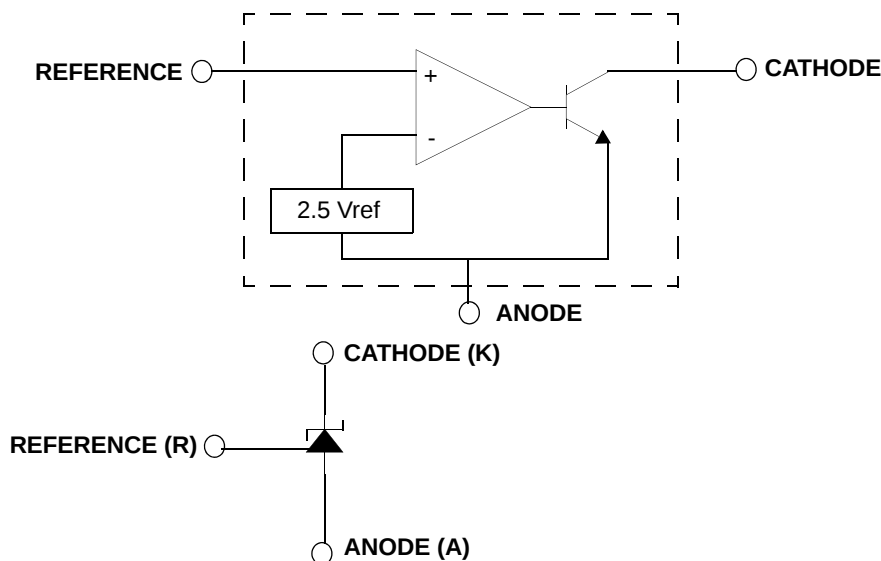
- Programmable Output Voltage to 36 Volts
- Low Dynamic Output Impedance 0.2Ω Typical
- Sink Current Capability of 1.0 to 100mA
- Equivalent Full-Range Temperature Coefficient of 50ppm/°C Typical
- Temperature Compensated for Operation Over Full Rated Operating Temperature Range
- Low Output Noise Voltage
- Fast Turn-on Response

Description

The LM431A/LM431B/LM431C are three terminal output adjustable regulators with thermal stability over operating temperature range. The output voltage can be set any value between VREF (approximately 2.5 volts) and 36 volts with two external resistors. These devices have a typical dynamic output impedance of 0.2Ω . Active output circuit provides a sharp turn-on characteristic, making these devices excellent replacement for Zener Diodes in many applications.



Internal Block 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 M, Z Suffix Package N Suffix Package	P _D	770 1000	mW
Operating Temperature Range			
LM431xC	T _{OPR}	-25 ~ +85	°C
LM431xI		-40 ~ +85	°C
Junction Temperature	T _J	150	°C
Storage Temperature Range	T _{STG}	-65 ~ +150	°C

Recommended Operating Conditions

Parameter	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°C, unless otherwise specified)

Parameter	Symbol	Conditions		LM431A			LM431B			LM431C			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Reference Input Voltage	V _{REF}	V _{KA} = V _{REF} , I _{KA} = 10mA		2.450	2.500	2.550	2.470	2.495	2.520	2.482	2.495	2.508	V
Deviation of Reference Input Voltage Over-Temperature	ΔV _{REF} /ΔT	V _{KA} =V _{REF} , I _{KA} =10mA T _{MIN} ≤T _A ≤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	ΔV _{REF} /ΔV _{KA}	I _{KA} = 10mA	ΔV _{KA} =10V-V _{REF}	-	-1.0	-2.7	-	-1.0	-2.7	-	-1.0	-2.7	mV/V
			ΔV _{KA} =36V-10V	-	-0.5	-2.0	-	-0.5	-2.0	-	-0.5	-2.0	
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	ΔI _{REF} /ΔT	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	Z _{KA}	V _{KA} =V _{REF} , I _{KA} =1 to 100mA f ≥ 1.0kHz		-	0.15	0.5	-	0.15	0.5	-	0.15	0.5	Ω

Note1

- LM431xC : T_{MIN} = -25 °C, T_{MAX} = +85 °C
- LM431xI : T_{MIN} = -40 °C, T_{MAX} = +85 °C

Test Circuits

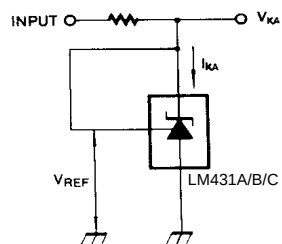


Figure 1. Test Circuit for $V_{KA} = V_{REF}$

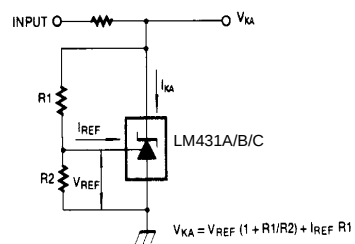


Figure 2. Test Circuit for $V_{KA} \geq V_{REF}$

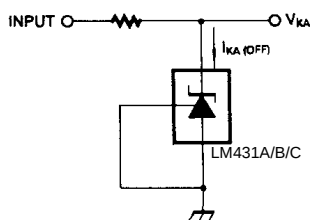


Figure 3. Test Circuit for $I_{KA} (OFF)$

Typical Performance Characteristics

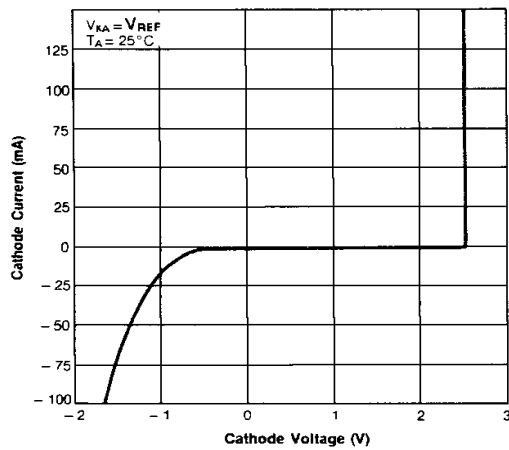


Figure 4. Cathode Current vs. Cathode Voltage

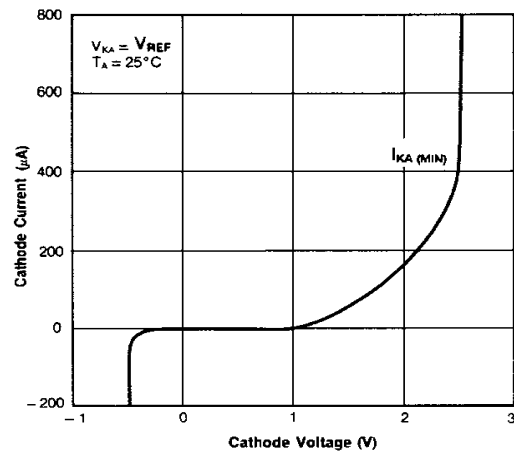


Figure 5. Cathode Current vs. Cathode Voltage

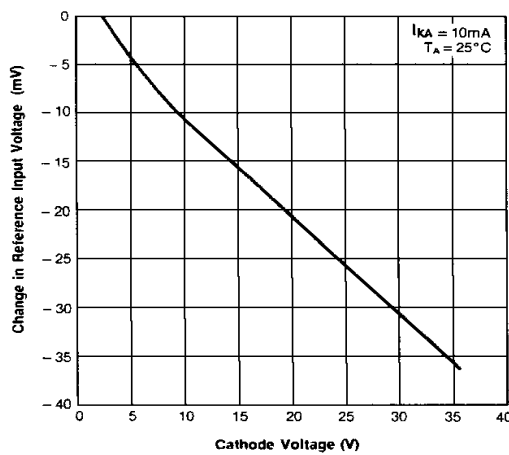


Figure 6. Change In Reference Input Voltage vs. Cathode Voltage

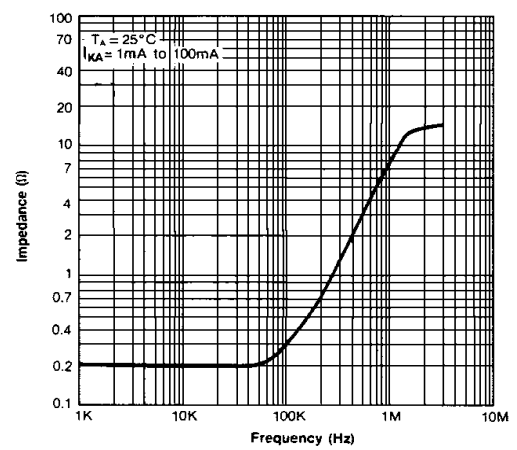


Figure 7. Dynamic Impedance Frequency

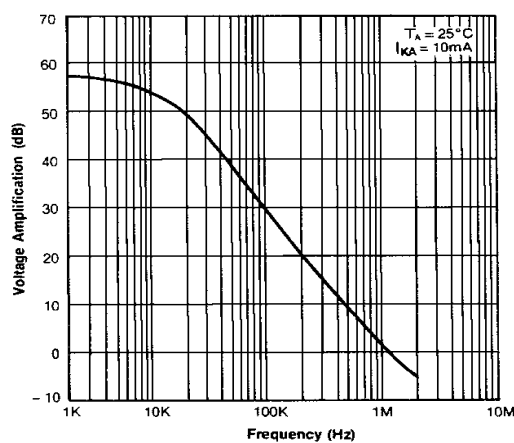


Figure 8. Small Signal Voltage Amplification vs. Frequency

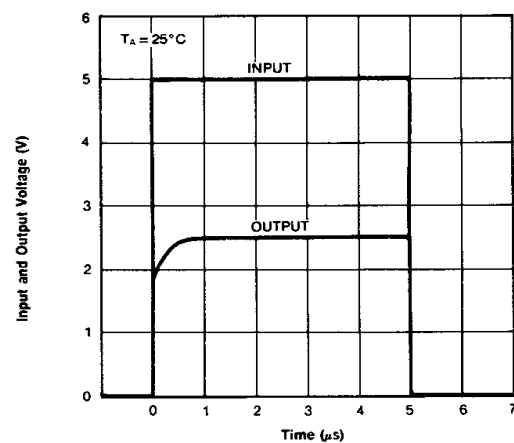


Figure 9. Pulse Response

Typical Performance Characteristics (Continued)

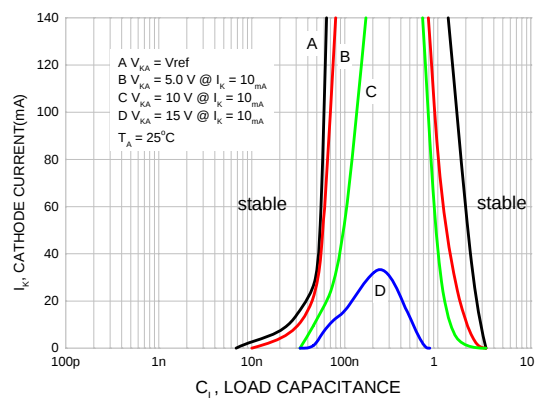


Figure 10. Stability Boundary Conditions

Typical Application

$$V_O = \left(1 + \frac{R_1}{R_2}\right) V_{\text{ref}}$$

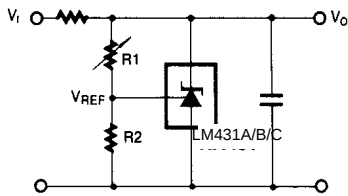


Figure 11. Shunt Regulator

$$V_O = V_{\text{ref}} \left(1 + \frac{R_1}{R_2}\right)$$

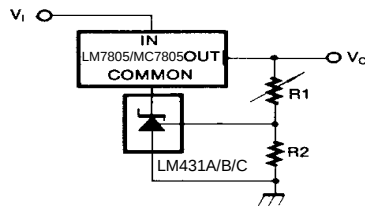


Figure 12. Output Control for Three-Terminal Fixed Regulator

$$V_O = \left(1 + \frac{R_1}{R_2}\right) V_{\text{ref}}$$

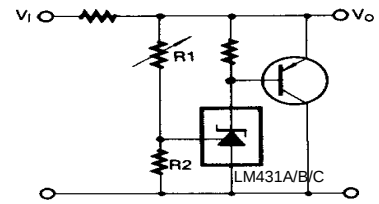


Figure 13. High Current Shunt Regulator

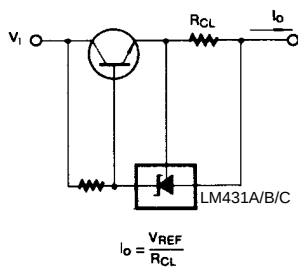


Figure 14. Current Limit or Current Source

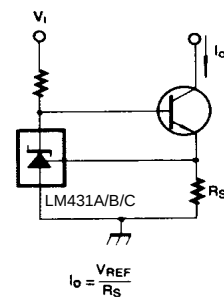


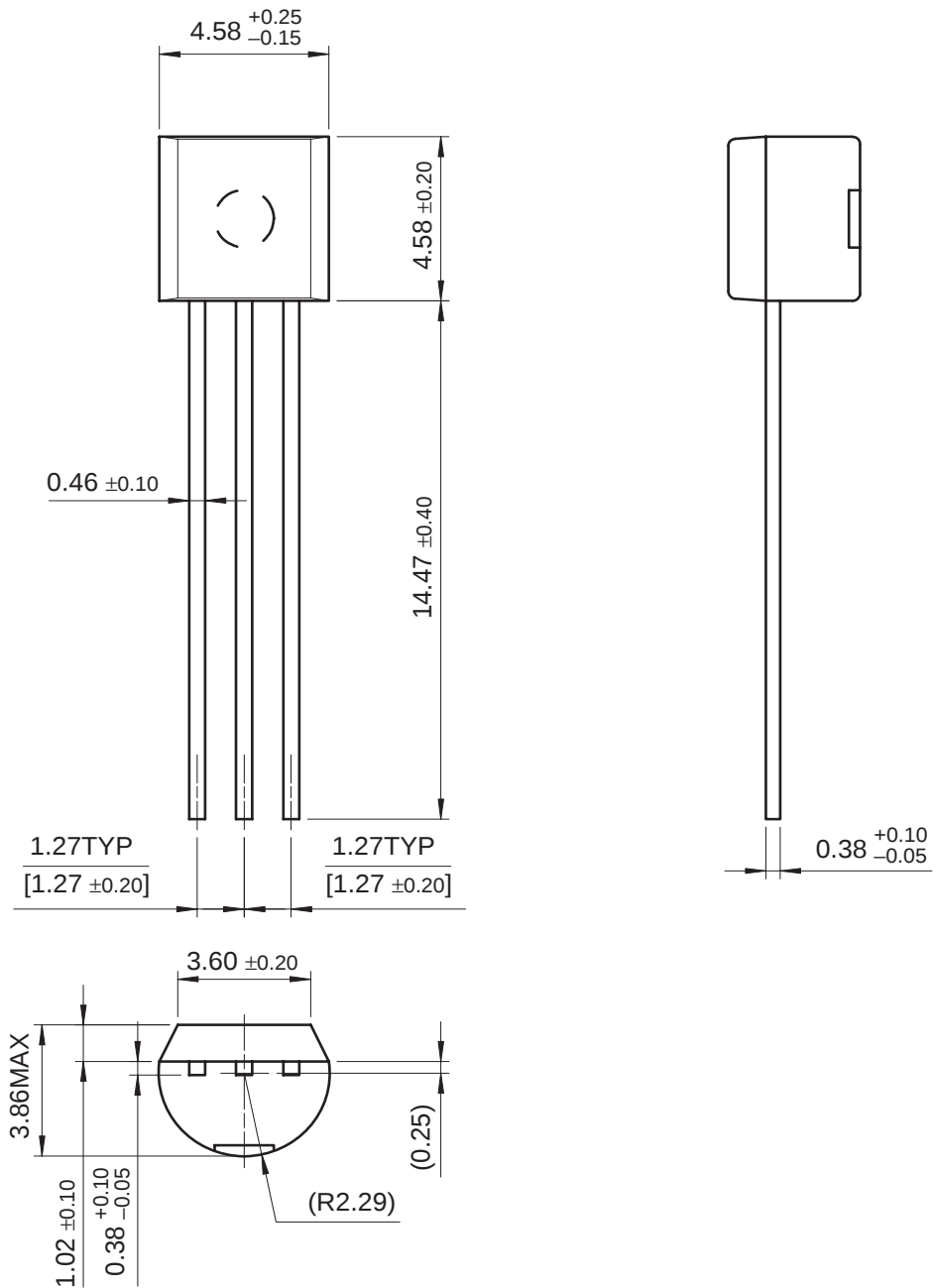
Figure 15. Constant-Current Sink

Mechanical Dimensions

Package

Dimensions in millimeters

TO-92



Ordering Information

Product Number	Output Voltage Tolerance	Package	Operating Temperature
LM431CCZ	0.5%	TO-92	-25 ~ +85°C
LM431CCM		8-SOP	
LM431BCZ	1%	TO-92	
LM431BCM		8-SOP	
LM431ACN	2%	8-DIP	
LM431ACZ		TO-92	
LM431ACM		8-SOP	
LM431CIZ	0.5%	TO-92	-40 ~ +85°C
LM431CIM		8-SOP	
LM431BIZ	1%	TO-92	
LM431BIM		8-SOP	
LM431AIZ	2%	TO-92	
LM431AIM		8-SOP	

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru

www.lifeelectronics.ru