March 2015



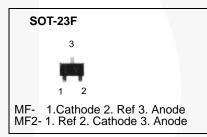
KA431S / KA431SA / KA431SL Programmable Shunt Regulator

Features

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

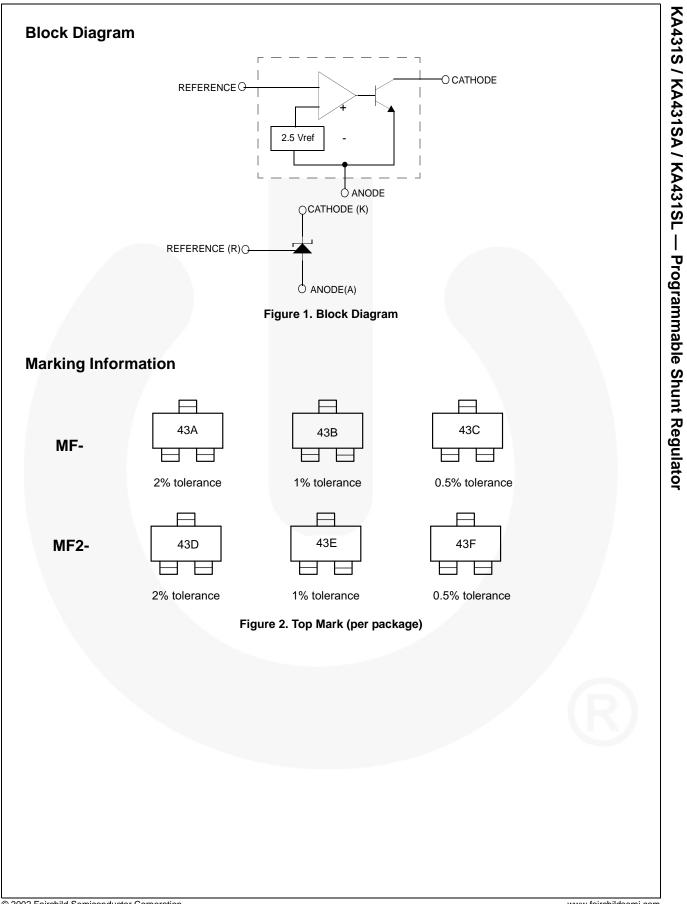
Description

The KA431S / KA431SA / KA431SL are three-terminal adjustable regulator series with a guaranteed thermal stability over the operating temperature range. The output voltage can be set to any value between $V_{\rm REF}$ (approximately 2.5 V) and 36 V with two external resistors. These devices have a typical dynamic output impedance of $0.2\ \Omega$. Active output circuitry provides a sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.



Ordering Information

Part Number	Operating Temperature Range	Output Voltage Tolerance	Top Mark	Package	Packing Method		
KA431SMFTF		2%	43A				
KA431SMF2TF		2 /0	43D	SOT-23F 3L			
KA431SAMFTF		10/	43B		Topo and Dool		
KA431SAMF2TF	-25 to +85°C	1%	43E		Tape and Reel		
KA431SLMFTF		0.5%	43C				
KA431SLMF2TF		0.3%	43F				



Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at $T_A = 25^{\circ}$ C unless otherwise noted.

Symbol	Parameter	Value	Unit	
V _{KA}	Cathode Voltage	37	V	
I _{KA}	Cathode Current Range (Continuous)	-100 ~ +150	mA	
I _{REF}	Reference Input Current Range	-0.05 ~ +10	mA	
$R_{ extsf{ heta}JA}$	Thermal Resistance Junction-Air ^(1,2) MF Suffix Package	350	°C/W	
P _D	Power Dissipation ^(3,4) MF Suffix Package	350	mW	
Τ _J	Junction Temperature	150	°C	
T _{OPR}	Operating Temperature Range	-25 ~ +85	°C	
T _{STG}	Storage Temperature Range	-65 ~ +150	°C	

Notes:

1. Thermal resistance test board

Size: 1.6mm x 76.2mm x 114.3mm (1S0P) JEDEC Standard: JESD51-3, JESD51-7.

JEDEC Standard: JESD51-3, JESD

- 2. Assume no ambient airflow.
- 3. $T_{JMAX} = 150$ °C; Ratings apply to ambient temperature at 25°C.
- 4. Power dissipation calculation: $P_D = (T_J T_A) / R_{\theta JA}$.

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
V _{KA}	Cathode Voltage	V _{REF}	36	V
I _{KA}	Cathode Current	1	100	mA

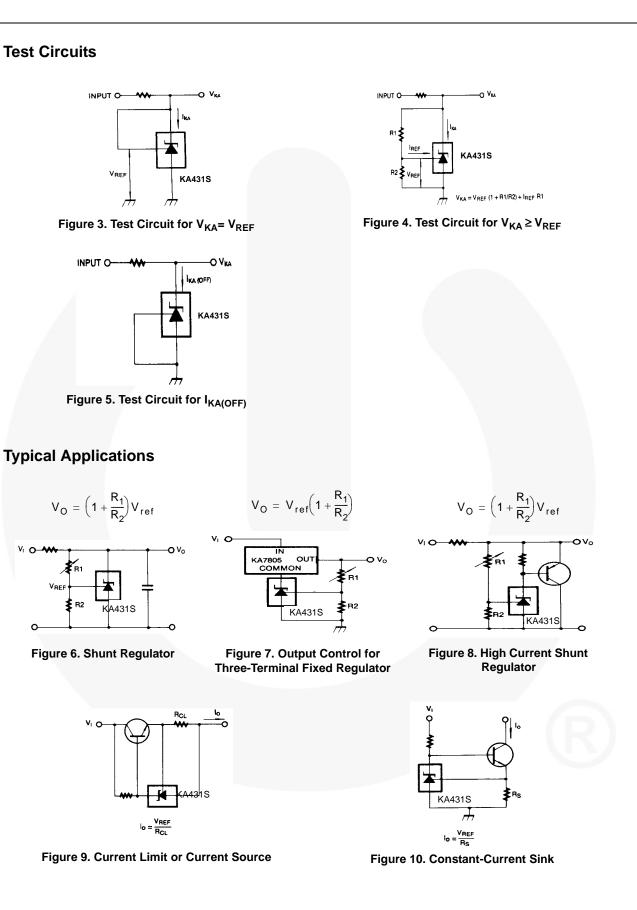
Electrical Characteristics⁽⁵⁾

Symbol	Deremeter	Conditions		KA431S		KA431SA			KA431SL			Unit	
Symbol	Symbol Parameter C		Conditions -		Тур.	Max.	Min.	Тур.	Max.	Min.	Тур.	Max.	Unit
V _{REF}	Reference Input Voltage	V _{KA} = V _{REF} , I _{KA} = 10 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	$V_{KA} = V_{REF},$ $I_{KA} = 10 \text{ mA},$ $T_{MIN} \le T_A \le T_{MAX}$			4.5	17.0		4.5	17.0		4.5	17.0	mV
	Ratio of Change in Reference Input	I _{KA} =	ΔV _{KA} = 10 V - V _{REF}		-1.0	-2.7		-1.0	-2.7		-1.0	-2.7	
$\Delta V_{REF} / \Delta V_{KA}$	Voltage to the Change in Cathode Voltage	$\frac{\Delta V_{KA}}{10 \text{ mA}} = \frac{\Delta V_{KA}}{36 \text{ V} - 10 \text{ V}}$			-0.5	-2.0		-0.5	-2.0		-0.5	-2.0	mV/V
I _{REF}	Reference Input Current		I _{KA} = 10 mA, R1 = 10 kΩ, R2 = ∞		1.5	4.0		1.5	4.0		1.5	4.0	μΑ
ΔΙ _{REF} /ΔΤ	Deviation of Reference Input Current Over Full Temperature Range	I _{KA} = 10 mA, R1 = 10 kΩ, R2 = ∞ T _A = Full Range			0.4	1.2		0.4	1.2		0.4	1.2	μΑ
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 V, V _{REF} = 0			0.05	1.00		0.05	1.00		0.05	1.00	μA
Z _{KA}	Dynamic Impedance	$\label{eq:VKA} \begin{split} V_{KA} &= V_{REF}, \\ I_{KA} &= 1 \text{ to } 100 \text{ mA}, \\ f &\geq 1.0 \text{ kHz} \end{split}$			0.15	0.50		0.15	0.50		0.15	0.50	Ω

Values are at $T_A = 25^{\circ}C$ unless otherwise noted.

Note:

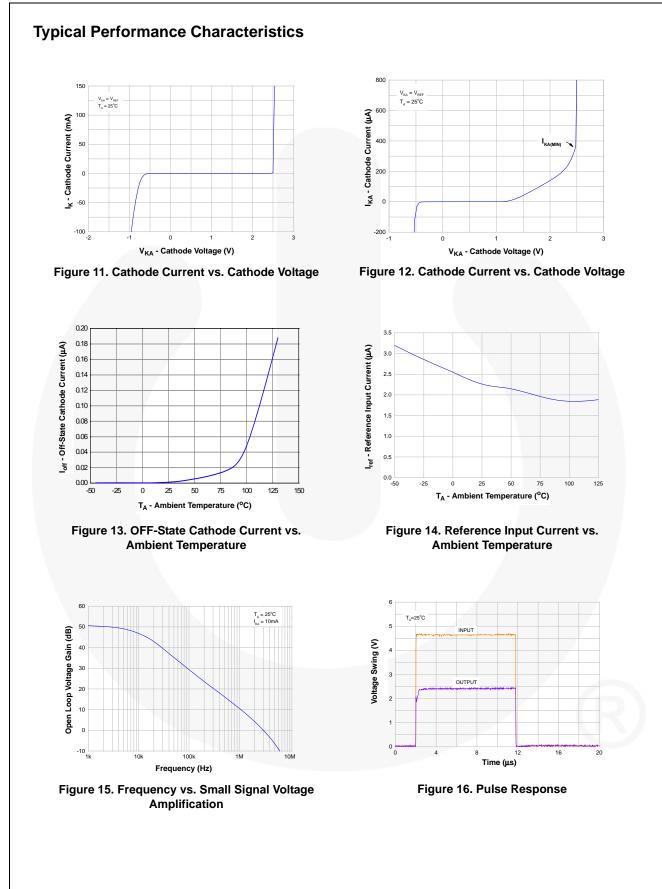
5. $T_{MIN} = -25^{\circ}C$, $T_{MAX} = +85^{\circ}C$



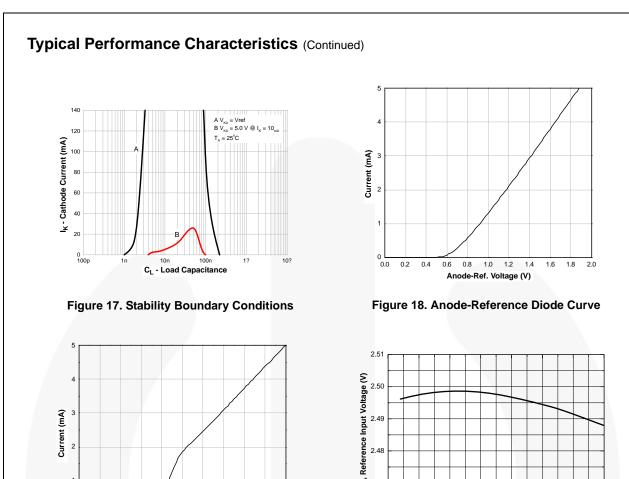
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2.46

-50

-25

0 25 50 75 T_A, Ambient Temperature (°C)

Figure 20. Reference Input Voltage vs. **Ambient Temperature**

100

125

2

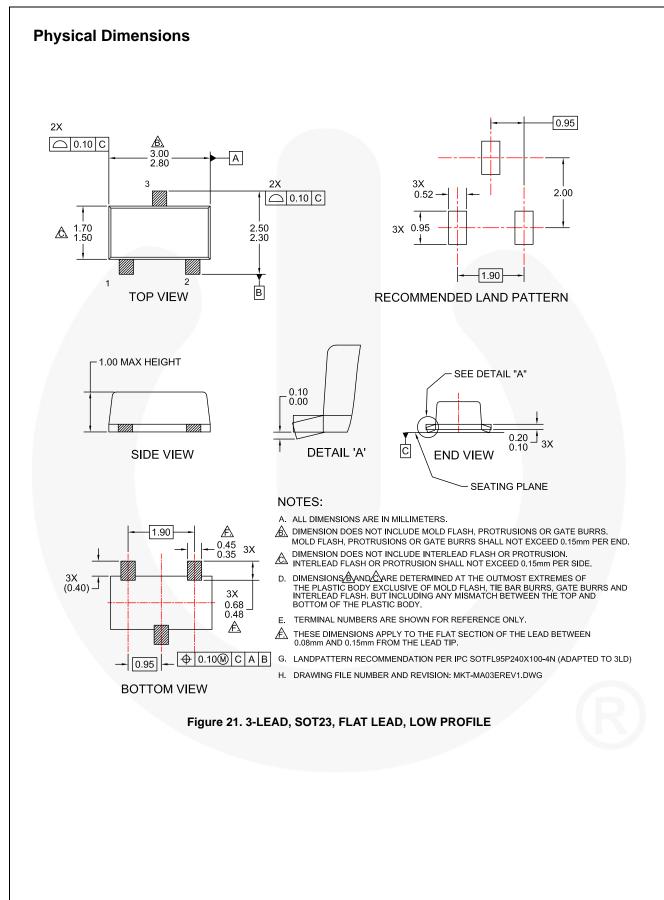
0.0

0.2 0.4 0.6 0.8

1.0 1.2

Ref.-Cathode Voltage (V) Figure 19. Reference-Cathode Diode Curve

1.4 1.6 1.8 2.0



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