

Adjustable Precision Shunt Regulator

General Description

The MEQ431 series ICs are three-terminal adjustable shunt regulators with guaranteed thermal stability over a full operation range. These ICs feature sharp turn-on characteristics, low temperature coefficient and low output impedance, which make them ideal substitutes for Zener diodes in applications such as switching power supply, charger and other adjustable regulators.

The MEQ431 voltage type is 36V. The output voltage can be set to any value between V_{REF} (2.5V) and the corresponding maximum cathode voltage.

The MEQ431 precision reference is offered in three band gap tolerance: $\pm 0.5\%$.

Features

- Programmable Precise Output Voltage from 2.5V to 36V
- Very Accurate Reference Voltage: Typical 0.15%
- High Stability under Capacitive Load
- Low Temperature Deviation: Typical 4.5mV
- Low Equivalent Full-range Temperature Coefficient with 20PPM/°C Typical
- Low Dynamic Output Resistance: Typical 0.2Ω
- Sink Current Capacity from 1mA to 100 mA
- Low Output Noise
- Wide Operating Range of -40 to 125°C

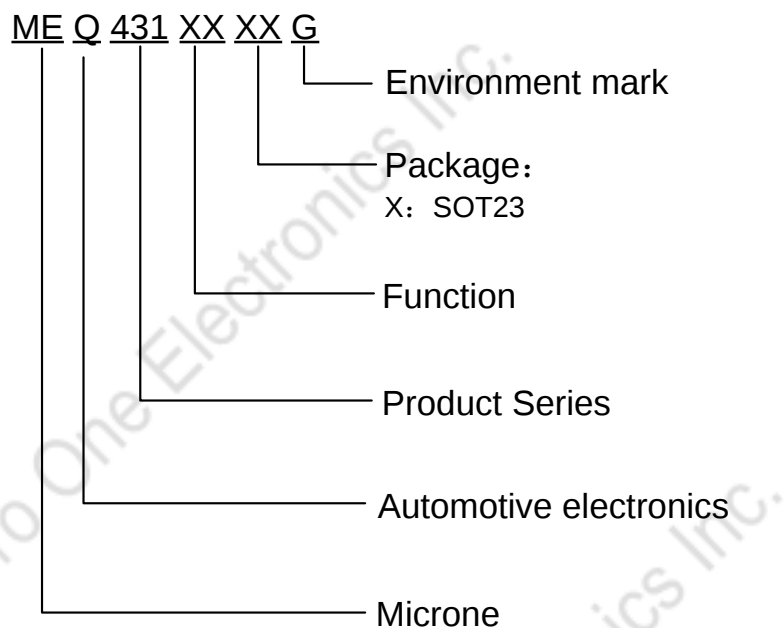
Typical Application

- Charger
- Voltage Adapter
- Switching Power Supply
- Graphic Card
- Precision Voltage Reference

Package

- 3-pin SOT23

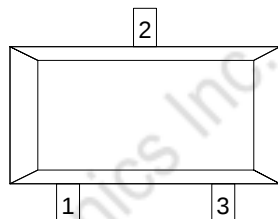
Selection Guide



product series	product description
MEQ431AXG	$V_{REF}=2.5V\pm0.5\%$; Package: SOT23

NOTE: If you need other voltage and package, please contact our sales staff.

PIN Configuration

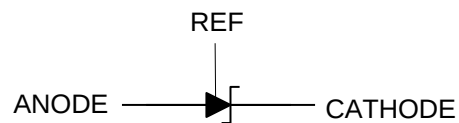
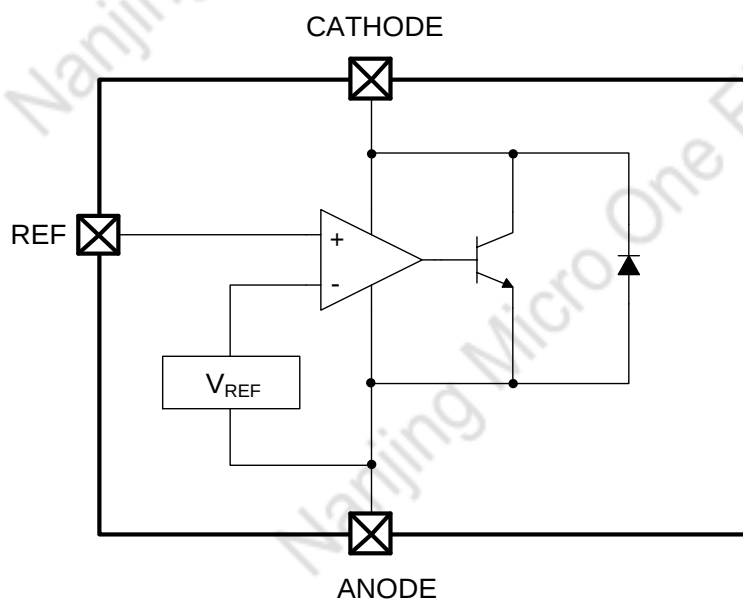


SOT23

Pin Assignment

Pin Number	Symbol	Functions
1	R	reference
2	A	anode
3	K	cathode

Block Diagram and symbol



Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Cathode voltage	V_{KA}	36	V
Cathode current range (continuous)	I_{KA}	-100~+130	mA
Reference input current range	I_{REF}	10	mA
Power Dissipation	P_D	0.4	W
Junction temperature	T_J	-40~+150	°C
Storage Temperature range	T_{STG}	-55~+150	°C
Package thermal impedance (Junction to air)	θ_{JA}	330	°C/W

Note: Use this IC within the stated maximum ratings. Operation beyond these limits may cause degrading or permanent damage to the device.

Recommended Operating Conditions

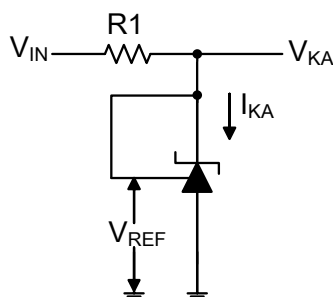
Parameter	Symbol	Min	Max	Unit
Cathode Voltage	V_{KA}	V_{REF}	36	V
Cathode Current	I_{KA}	1.0	100	mA
Operating Ambient Temperature Range		-40	125	°C

Electrical Characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Conditions		Min	Typ.	Max	Unit	Test circuit
Reference voltage	V _{REF}	V _{KA} =V _{REF} , I _{KA} =10mA		2.488	2.50	2.512	V	Fig.1
Deviation of reference voltage over-temperature	ΔV _{REF}	V _{KA} =V _{REF} , I _{KA} =10mA	0 to 70°C	-	7	16	mV	Fig.1
			-40 to 150°C	-	14	34		
Dynamic impedance	Z _{KA}	V _{KA} =V _{REF} , I _{KA} =1 to 100mA, f≤1.0KHz		-	0.15	0.5	Ω	Fig.1
Minimum cathode current for regulation	I _{KA} (MIN)	V _{KA} =V _{REF}		-	0.4	0.6	mA	Fig.1
Ratio of change in reference voltage to the change in cathode voltage	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	I _{KA} =10mA	ΔV _{KA} =10V to V _{REF}	-	-1.4	-2.7	mV/V	Fig.2
			ΔV _{KA} =36V to 10V	-	-1.0	-2.0		
Reference current	I _{REF}	I _{KA} =10mA, R1=10KΩ, R2=∞			2	4	μA	Fig.2
Deviation of reference over full temperature range	ΔI _{REF}	I _{KA} =10mA, R1=10KΩ, R2=∞, T _A =40 to 150°C			0.8	2.5	μA	Fig.2
Off-state cathode current	I _{KA} (OFF)	V _{KA} =36V, V _{REF} =0			0.1	0.5	μA	Fig.3

Note: The dynamic impedance is defined as: $|Z_{KA}| = \Delta V_{KA} / \Delta I_{KA}$

Test Circuit



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

Fig.1: for $V_{KA} = V_{REF}$

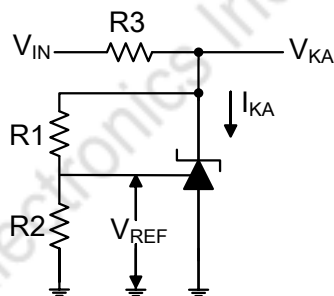


Fig.2: for $V_{KA} > V_{REF}$

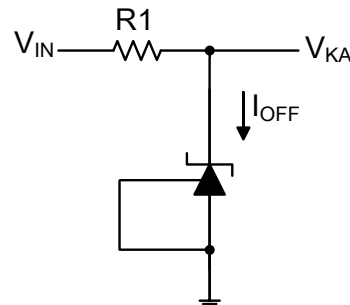
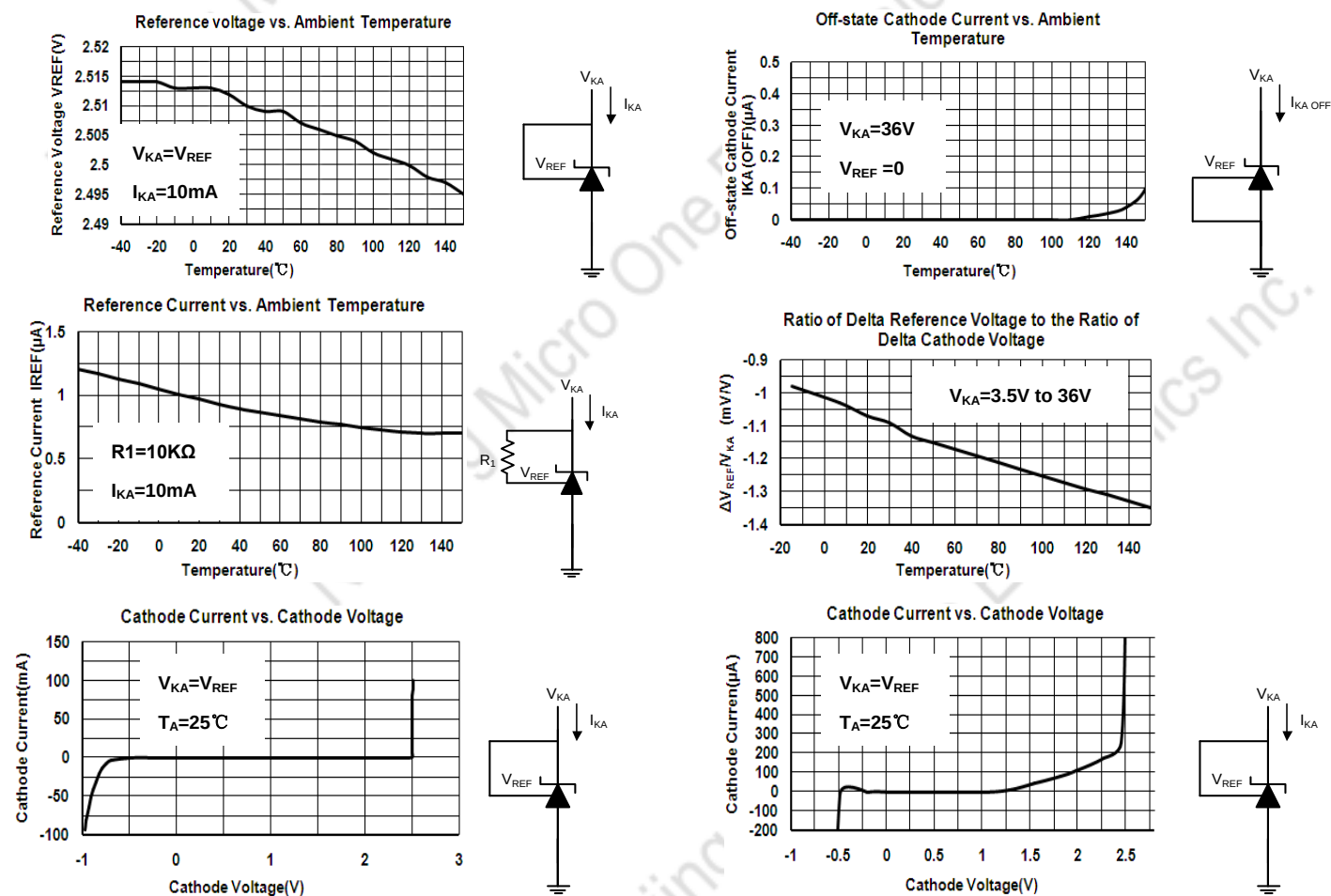
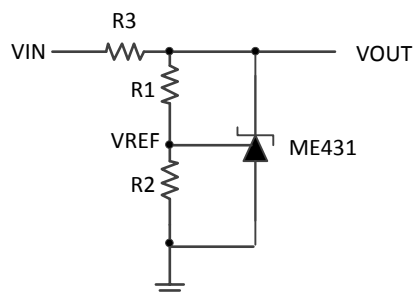


Fig.3: for I_{OFF}

Typical Performance Characteristics

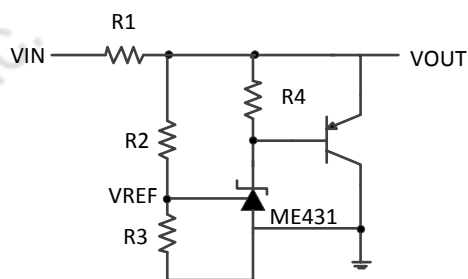


Typical Application



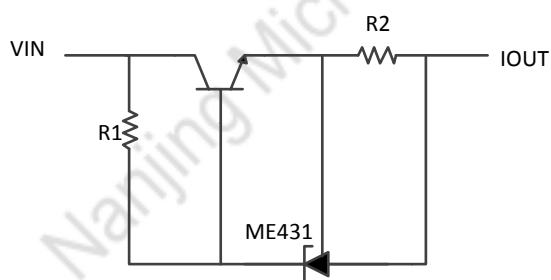
$$V_O = (1 + R1/R2)V_{REF}$$

Fig.4: Shunt Regulator



$$V_O = (1 + R2/R3)V_{REF}$$

Fig.5: High Current Shunt Regulator



$$I_{OUT} = V_{REF}/R2 + I_{KA}$$

Fig.6: Current Source or Current Limit

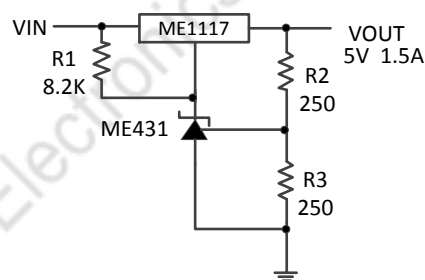
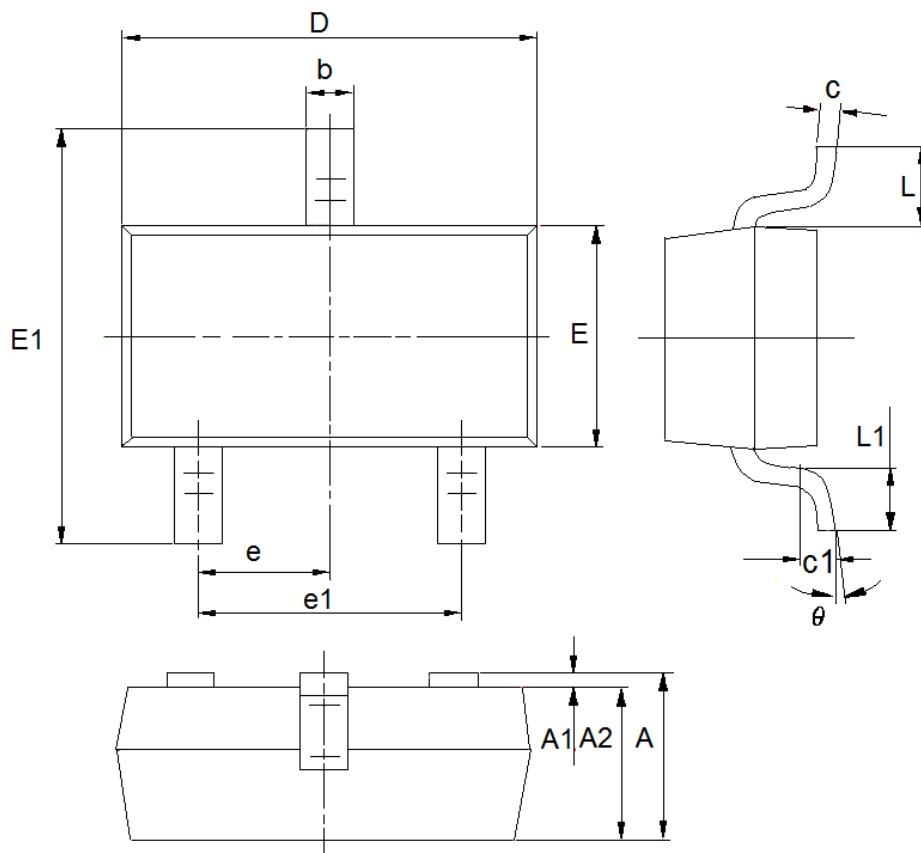


Fig.7: Precision 5V 1.5A Regulator

Packaging Type

- SOT23



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.9	1.15	0.0354	0.0453
A1	0	0.14	0.0000	0.0055
A2	0.9	1.05	0.0354	0.0413
b	0.28	0.52	0.0110	0.0205
c	0.07	0.23	0.0028	0.0091
D	2.8	3.0	0.1102	0.1181
e1	1.8	2.0	0.0709	0.0787
E	1.2	1.4	0.0472	0.0551
E1	2.2	2.6	0.0866	0.1024
e	0.95(TYP)		0.0374(TYP)	
L	0.55(TYP)		0.0217(TYP)	
L1	0.25	0.55	0.0098	0.0217
θ	0	8°	0.0000	8°
c1	0.25(TYP)		0.0098(TYP)	

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