Three-terminal Adjustable Shunt Regulator

General Description

The ET431B / ET432B device is a three-terminal adjustable shunt regulator, with specified thermal stability over applicable industry and automotive temperature range. The output voltage can be set to any value between V_{REF}(Typical 2.495 V) and 36 V with two external resistors.

These high performances make it very suitable for multiple applications, such as onboard regulation, adjustable power supplies, and switching power supplies.

The ET431B / ET432B devices are offered in two grades, with initial tolerances (at 25 °C) of 0.5%, for the B grade, respectively. In addition, low output drift versus temperature ensures good stability over the entire temperature range.

ET431B / ET432B is specified for the wide operating temperature range of -40 to +125 °C.

Features

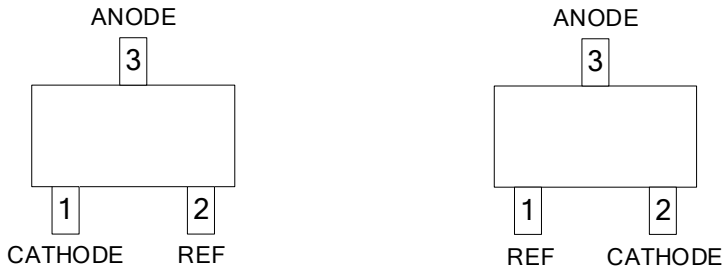
- Adjustable Output Voltage from V_{REF} to 36V
- Reference Voltage Tolerance at 25°C : 0.5% (B grade)
- Equivalent Full – Range Temperature Coefficient of 50 ppm/ °C (Typical)
- 0.5 Ω Typical Output Impedance
- Sink-current Capability: I_{KA} = 1 to 100 mA
- Low Output Noise
- Wide Operating Range of -40°C to 125°C
- Package No. and MSL Level:

Part No.	Initial Accuracy	Package	Packing Option	MSL
ET431B	0.5%	SOT23	Tape and Reel , 3K	3
ET432B	0.5%	SOT23	Tape and Reel , 3K	3

Applications

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

Pin Configuration



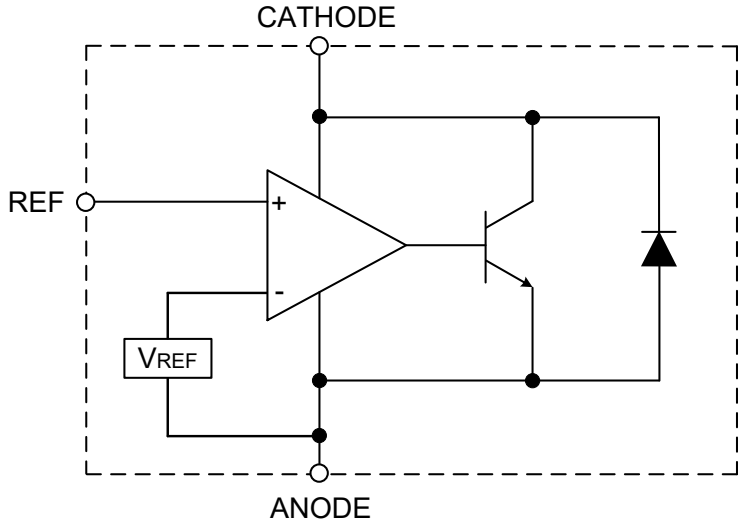
ET431B ET432B

TOP VIEW

Pin Function

Pin Number		Symbol	Descriptions
ET431B	ET432B		
1	2	CATHODE	Shunt Current/Voltage input
2	1	REF	Common pin, normally connected to ground
3	3	ANODE	Threshold relative to common anode

Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Rating	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	500	mW
θ_{JA}	Thermal Resistance Junction-Air	250	°C/W
T_J	Junction Temperature	+150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C
V_{ESD}	ESD (Human Body Model)	2000	V

Note: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

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

Electrical Characteristics

(Operating Conditions: T_A = +25°C, unless otherwise specified.)

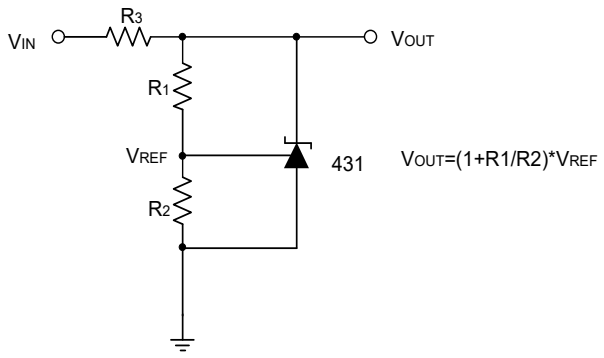
Symbol	Parameter	Test Circuit	Conditions		Min	Typ	Max	Unit
V_{REF}	Reference Voltage	1	$V_{KA} = V_{REF}$, I_{KA} = 10mA		2.482	2.495	2.508	V
ΔV_{REF}	Deviation of Reference Voltage Over Full Temperature Range (1)	1	$V_{KA} = V_{REF}$, I_{KA} = 10mA		–	5	25	mV
$\frac{\Delta V_{REF}}{\Delta V_{VKA}}$	Ratio of Change inference Voltage to the Change in Cathode Voltage	2	I_{KA} = 10mA	ΔV_{KA} = 10V to V_{REF}	–	±1.5	±2.2	mV/V
				ΔV_{KA} = 36V to 10V	–	±1.5	±1.8	
I_{REF}	Reference Current	2	I_{KA} = 10mA, R1 = 10kΩ, R2 = ∞		–	1	2	μA
ΔI_{REF}	Deviation of Reference Current Over Full Temperature Range (1)	2	I_{KA} = 10mA, R1 = 10kΩ, R2 = ∞, T_A = -40 to +125°C		–	0.8	2	μA
$I_{KA(Min)}$	Minimum Cathode Current for Regulation	1	$V_{KA} = V_{REF}$		–	0.3	0.5	mA
$I_{KA(Off)}$	Off-state Cathode Current	3	V_{KA} = 36V, V_{REF} = 0		–	0.1	1	μA
Z_{KA}	Dynamic Impedance (2)	1	$V_{KA} = V_{REF}$, I_{KA} = 1 to 100mA, f ≤ 1.0KHz		–	0.5	1	Ω

Notes:

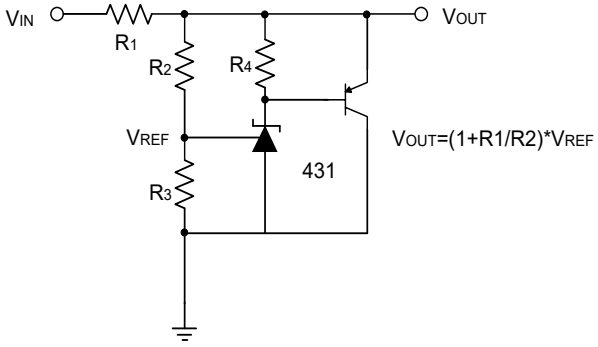
(1) The deviation parameters ΔV_{REF} and ΔI_{REF} are defined as the differences between the maximum and minimum values obtained over the rated temperature range.

(2) The dynamic impedance is defined by $Z_{KA}=\Delta V_{KA}/\Delta I_{KA}$.

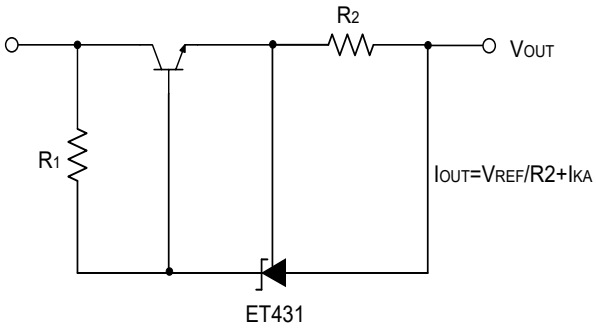
Typical Applications Circuit



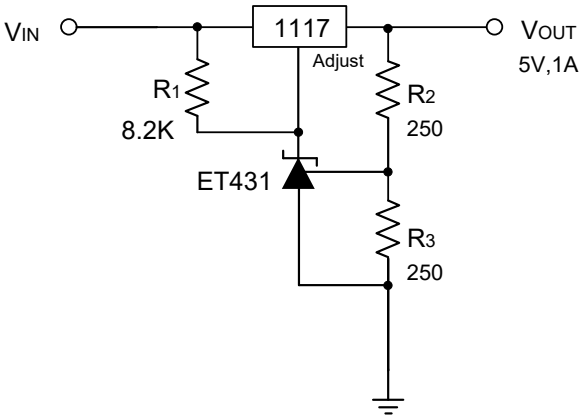
Shunt Regulator



High Current Shunt Regulator

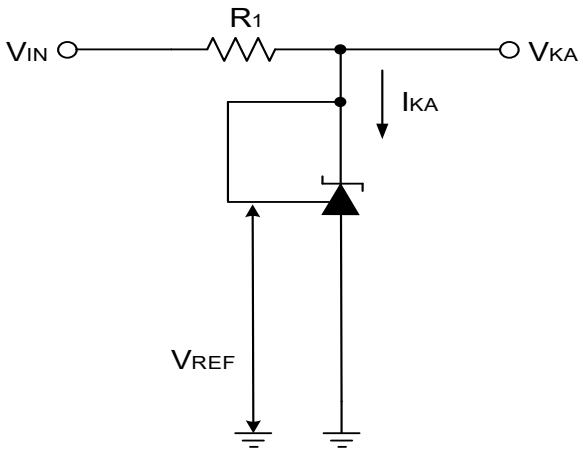


Current Source or Current Limit

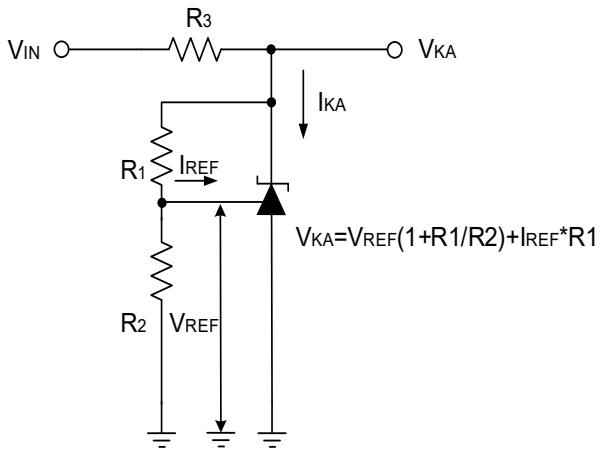


Precision 5V 1A Regulator

Electrical Characteristics

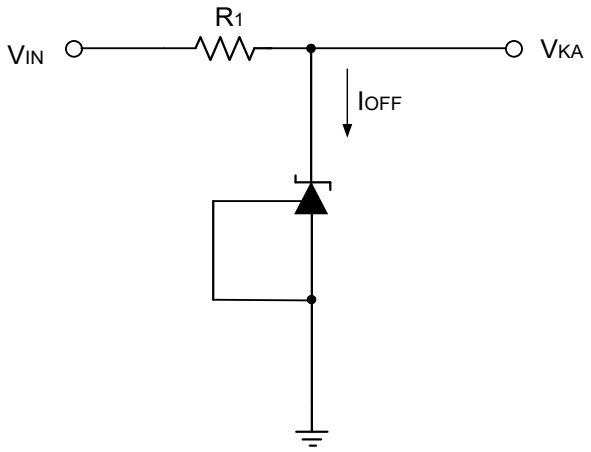


Test Circuit 1 for $V_{KA} = V_{REF}$



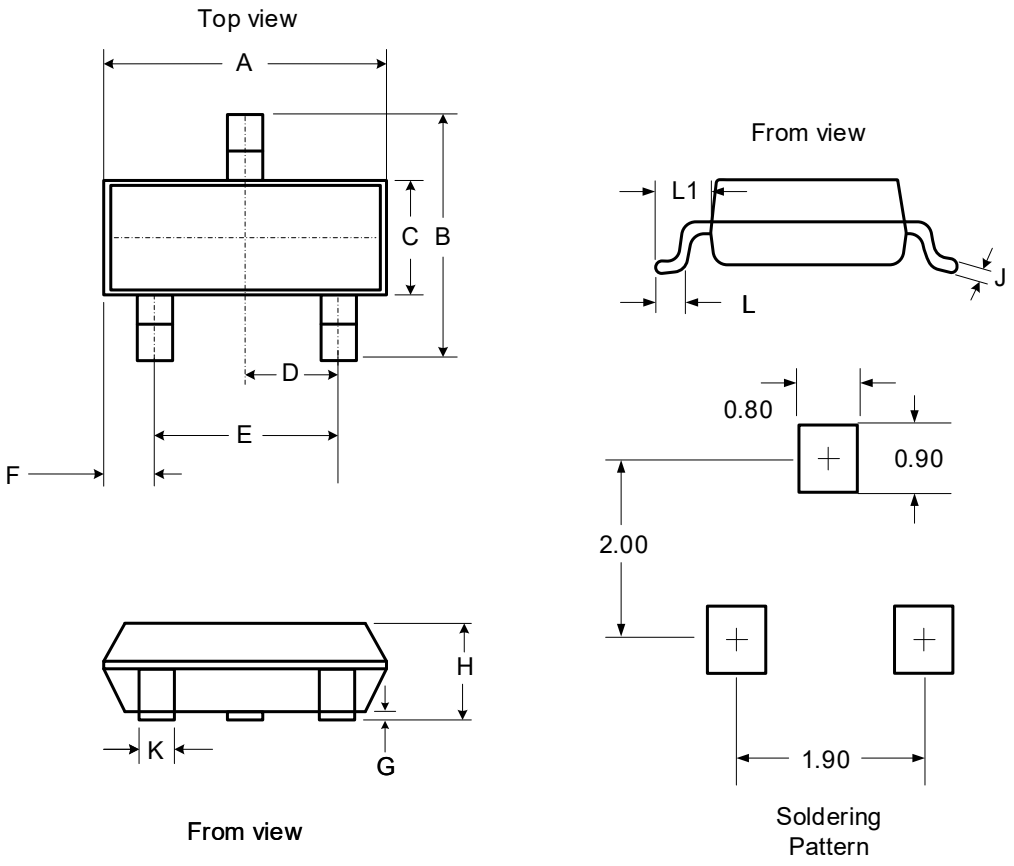
Test Circuit 2 for $V_{KA} > V_{REF}$

Electrical Characteristics(Continued)



Test Circuit 3 for IOFF

Package Outline Dimensions

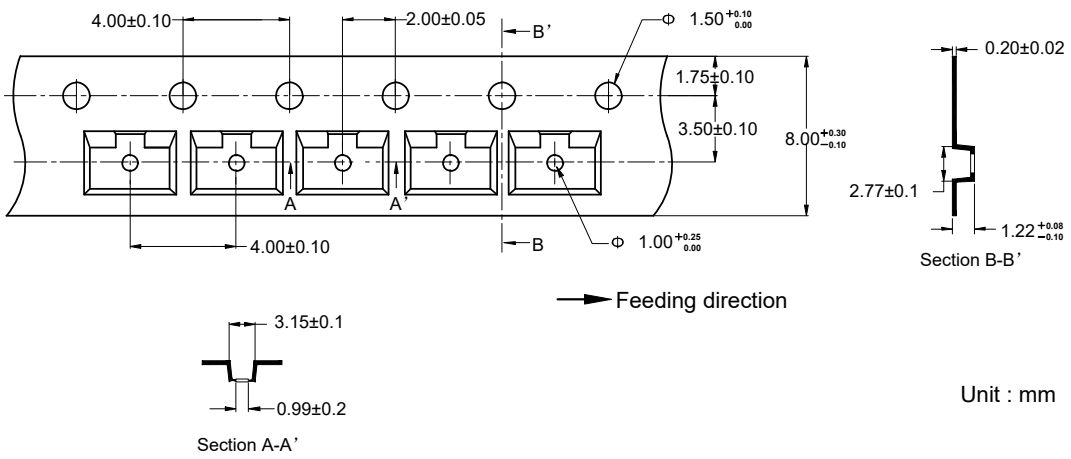


COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

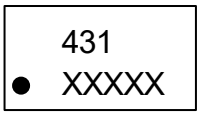
SYMBOL	MIN	MAX
A	2.80	3.00
B	2.10	2.50
C	1.20	1.40
D	0.95 TYP	
E	1.90 TYP	
F	N/A	N/A
G	0.00	0.10
H	0.90	1.10
J	0.09	0.15
K	0.38	0.48
L	0.15	0.45
L1	N/A	N/A

Tape Information



Marking Information

ET431B

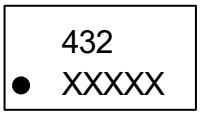


431 - Part Number

XXXXX - Tracking Number

Note: X (Tracking Number) is variable, according to the wafer lot number.

ET432B



432 - Part Number

XXXXX - Tracking Number

Note: X (Tracking Number) is variable, according to the wafer lot number.

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2020-12-20	Initial version	Liu Jia Ying	Wang Guo Peng	Liu Jia Ying
1.1	2023-01-18	Update Typeset	Wu Hesong	Wang Guo Peng	Liu Jia Ying
1.2	2025-06-20	Add Tape Information	Li Changxiao	Wang Guo Peng	Liu Jia Ying