Precision Adjustable Shunt Regulator
Monolithic IC MM1431 AT/AN

Outline

The MM1431AT/AN is 3-termial adjustable shunt regulator, which provides a highly accurate 0.8% bandgap reference voltage. The output voltage can be adjusted to any value between reference voltage V_{REF} and 35 volts with two external resistors. Moreover, there are a lot of ranges of the application as a zener diode besides the replacement is possible because it has steep turn-on characteristics.

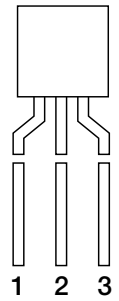
Features

1. Reference voltage tolerance	V_{REF}=2.495V±0.8%
2. Output voltage can be adjusted	$V_{REF} \leq Vo \leq 35V$
3. Low Dynamic Output Impedance	$\|Z_{KA}\| \leq 0.2\Omega$ typ.

Package

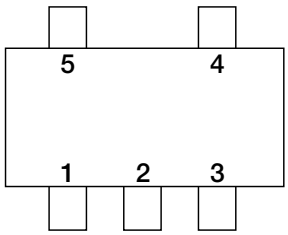
TO-92
SOT-25

Pin Assignment



TO-92

1	Reference
2	Anode
3	Cathode

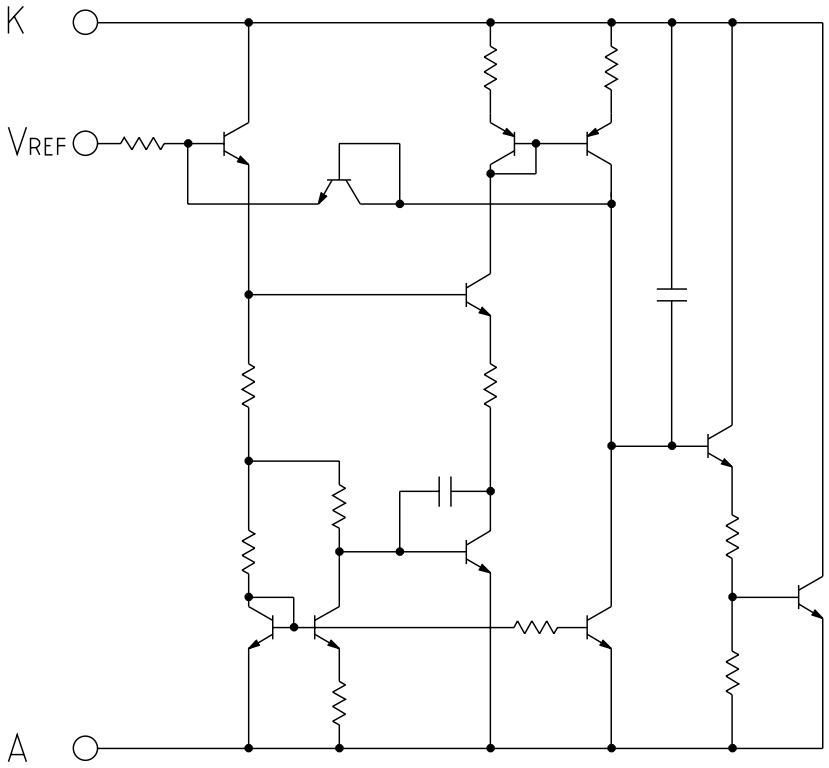


SOT-25
(TOP VIEW)

1	NC
2	SUB
3	Cathode
4	Reference
5	Anode

note:The second terminal is SUB, so connect the terminal to GND.

Equivalent Circuit Diagram



Absolute Maximum Ratings (Ambient Temperature, Ta=25°C)

Item	Symbol	Ratings	Unit
Operating Temperature	T_{OPR}	–30~+85	°C
Storage Temperature	T_{STG}	–40~+125	°C
Cathode to Anode voltage	V_{KA}	35	V
Cathode current	I_K	–100~100	mA
Reference input current	I_{REF}	–0.05~10	mA
Allowable loss	Pd	500 (TO-92) 150 (SOT-25)	mW

Recommended Operating Conditions (Ambient Temperature, Ta=25°C)

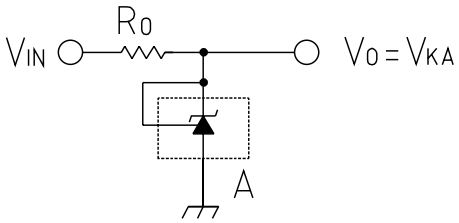
Cathode to Anode voltage	V_{KA}	V_{REF}~35	V
Cathode current	I_K	0.6~50	mA

Electrical Characteristics (Ambient Temperature, Ta=25°C)

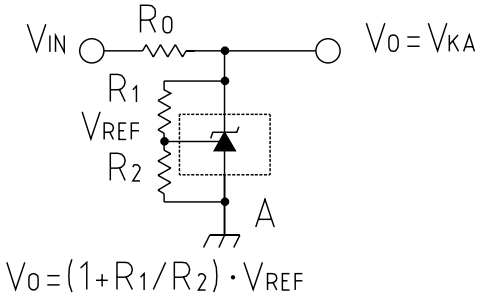
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Reference voltage	V_{REF}	$V_{KA}=V_{REF}$, I_K=10mA	2.475	2.495	2.515	V
Reference voltage deviation over temperature range	$\Delta V_{REF}/\Delta Ta$	$V_{KA}=V_{REF}$, I_K=10mA Ta=–30~+85°C		±10		mV
Lord regulation	ΔV_{REF}	$\Delta V_{KA}=V_{REF}$~10V I_K=10mA		–1.4	–2.7	mV/V
	$/\Delta V_{KA}$	ΔV_{KA}=10V~35V I_K=10mA		–1	–2	mV/V
Reference input current	I_{REF}	I_K=10mA R_1=10K, R_2=∞		1	4	µA
Reference input current deviation over temperature range	$\Delta I_{REF}/\Delta Ta$	I_K=10mA R_1=10K, R_2=∞ Ta=–30~+85°C		±0.5		µA
Minimum Cathode Current	$I_{Kmin.}$	$V_{KA}=V_{REF}$		0.3	0.6	mA
Off-state Cathode Current	I_{OFF}	V_{KA}=35V, V_{REF}=0V		0.1	1.0	µA
Dynamic Impedance	$\lvert Z_{KA}\rvert$	$V_{KA}=V_{REF}$, f ≦ 1kHz I_K=1~50mA		0.2	0.5	Ω

Measuring Circuit

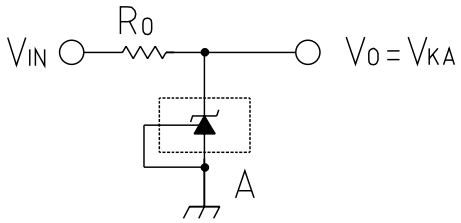
(1) $V_{KA}=V_{REF}$



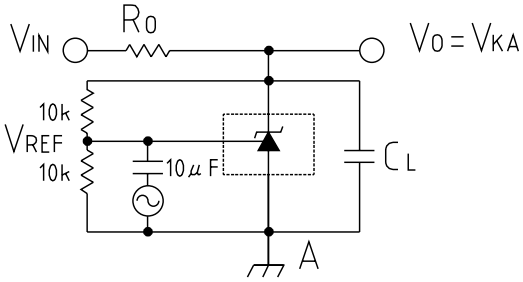
(2) $V_{KA} \geq V_{REF}$ $V_O=V_{KA}=V_{REF}$



(3) I_{OFF}

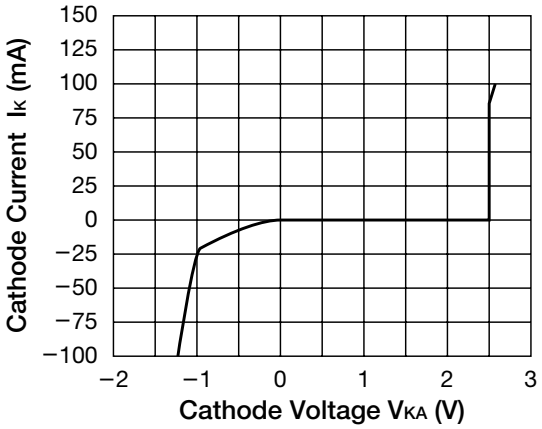


(4) Open Loop Voltage Gain

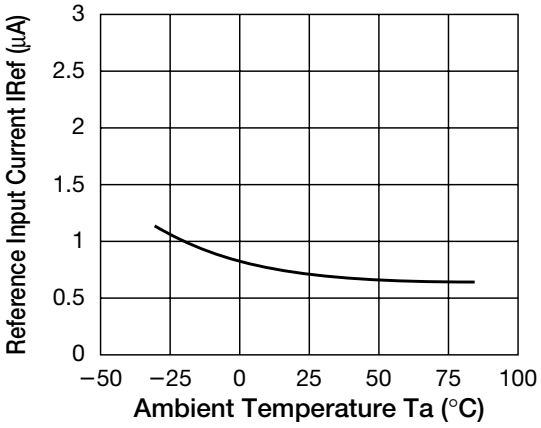


Characteristics

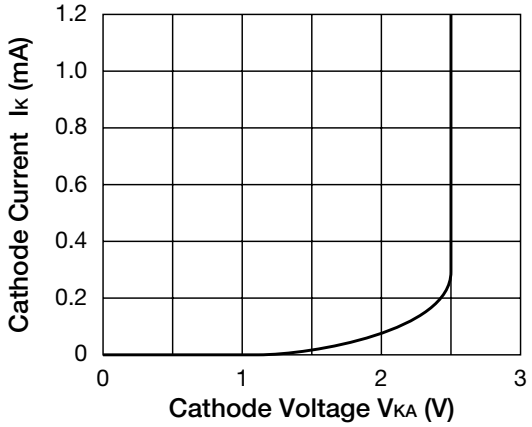
High Voltage Operating Characteristics



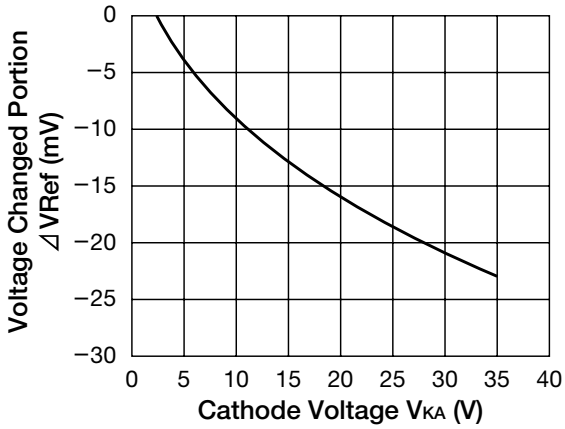
Reference Input Current



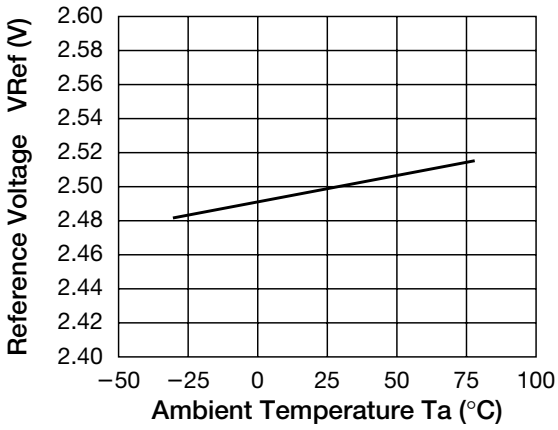
Low Current Operating Characteristics



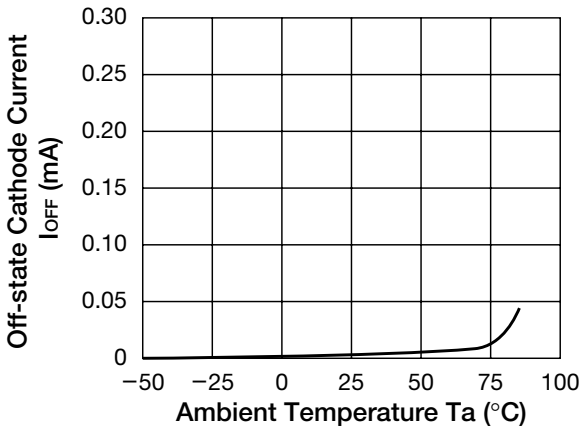
Reference Voltage



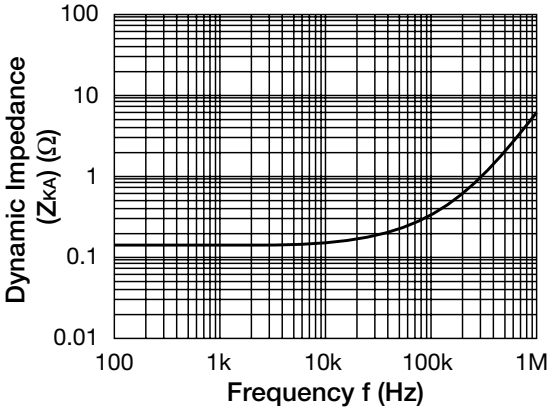
Reference Voltage



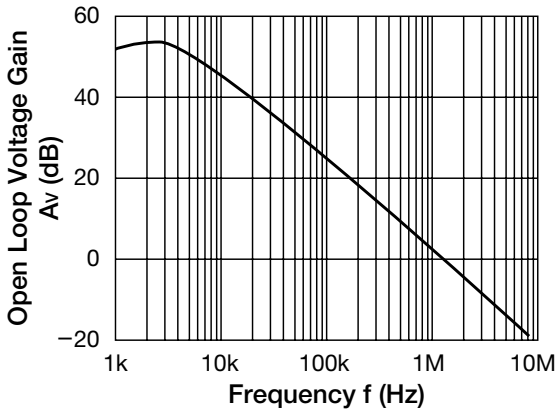
Off State Leakage



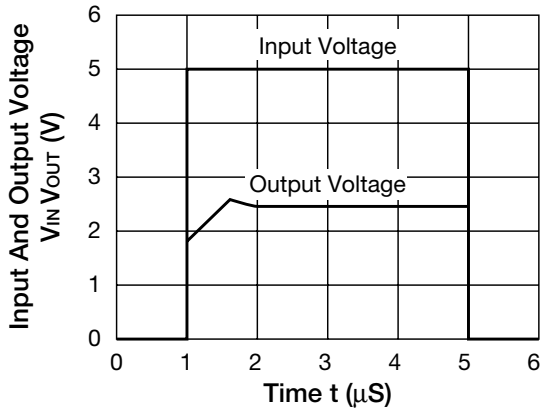
Dynamic Output Impedance



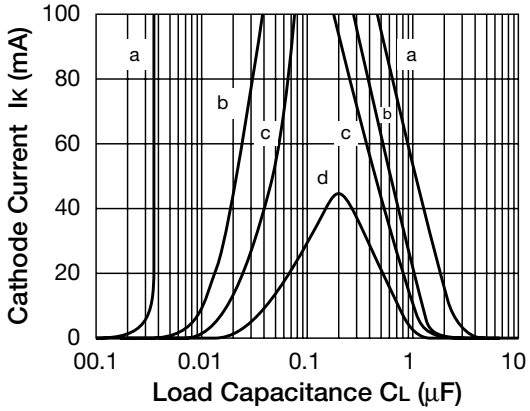
Open loop Voltage Gain VKA=5V



Pulse Response



Stability Boundary Conditions



a: V_{KA}=VREF b: V_{KA}=5V C: V_{KA}=10V

d: V_{KA}=15V

Cathode voltage temperature Ta=25°C

I_{KA}=10mA C_L=: Ceramic capacitor

Notes concerning stability operation region

The MM1431AT/AN requires external capasitors for regulator stability. These capacitors must be correctly selected for good performance.