

Precision Adjustable Shunt Regulator Monolithic IC MM1530 AT/AN

Outline

The MM1530AT/AN is 3-terminal 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 12 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.

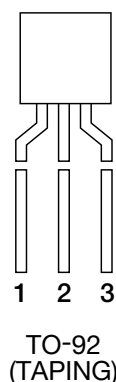
Features

- | | |
|-----------------------------------|----------------------------|
| 1. Reference voltage tolerance | $V_{REF}=1.260V\pm0.8\%$ |
| 2. Output voltage can be adjusted | $V_{REF}\leq V_o\leq 12V$ |
| 3. Low Dynamic Output Impedance | $ Z_{KA} =0.13\Omega$ typ. |

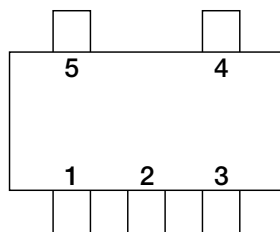
Package

TO-92 (TAPING)
 SOT-25A

Pin Assignment



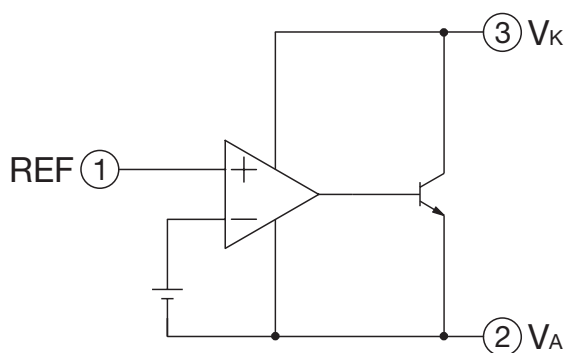
1	Reference
2	Anode
3	Cathode



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



* TO-92 Package

Absolute Maximum Ratings (Ambient Temperature, $T_a=25^{\circ}\text{C}$)

Item	Symbol	Ratings	Unit
Operating Temperature	T_{OPR}	$-30\sim+85$	$^{\circ}\text{C}$
Storage Temperature	T_{STG}	$-40\sim+125$	$^{\circ}\text{C}$
Cathode to Anode voltage	V_{KA}	12	V
Cathode current	I_{K}	50	mA
Reference input current	I_{REF}	50	μA
Allowable loss	P_d	500 (TO-92) 150 (SOT-25A)	mW

Recommended Operating Conditions (Ambient Temperature, $T_a=25^{\circ}\text{C}$)

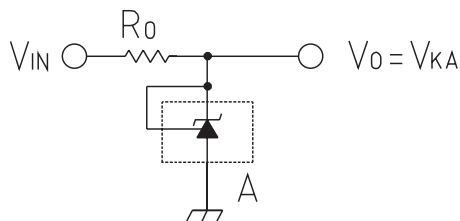
Cathode to Anode voltage	V_{KA}	$V_{\text{REF}}\sim 12$	V
Cathode current	I_{K}	1~30	mA

Electrical Characteristics (Ambient Temperature, $T_a=25^{\circ}\text{C}$)

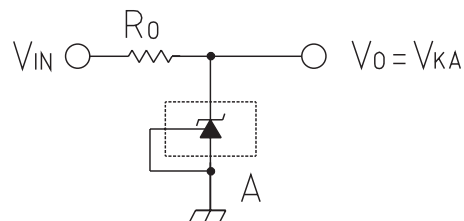
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Reference voltage	V_{REF}	$V_{\text{KA}}=V_{\text{REF}}$	1.250	1.260	1.270	V
Reference voltage deviation over temperature range	$\Delta V_{\text{REF}}/\Delta T_a$	$V_{\text{KA}}=V_{\text{REF}} \quad T_a=0\sim+70^{\circ}\text{C}$		3	12	mV
Load regulation	$\Delta V_{\text{REF}}/\Delta V_{\text{KA}}$	$\Delta V_{\text{KA}}=V_{\text{REF}}, V_{\text{REF}} \leq V_{\text{KA}}\leq 5\text{V}$		1.0	2.7	mV/V
		$5\text{V}\leq V_{\text{KA}}\leq 12\text{V}$		1.0	2.0	mV/V
Reference input current	I_{REF}	$V_{\text{KA}}=V_{\text{REF}} \quad R_1=10\text{K}, R_2=\infty$		2	4	μA
Reference input current deviation over temperature range	$\Delta I_{\text{REF}}/\Delta T_a$	$V_{\text{KA}}=V_{\text{REF}}, R_1=10\text{K}, R_2=\infty \quad T_a=0\sim+70^{\circ}\text{C}$		0.3	1.2	μA
Minimum Cathode Current	$I_{\text{Kmin.}}$	$V_{\text{KA}}=V_{\text{REF}}, \Delta V_{\text{REF}}=2\%$		0.15	0.3	mA
Off-state Cathode Current	I_{OFF}	$V_{\text{KA}}=12\text{V}, V_{\text{REF}}=0\text{V}$		0.1	1.0	μA
Dynamic Impedance	$ Z_{\text{KA}} $	$V_{\text{KA}}=V_{\text{REF}}, f\leq 1\text{kHz} \quad I_{\text{K}}=1\sim 30\text{mA}$		0.13	0.5	Ω

Measuring Circuit

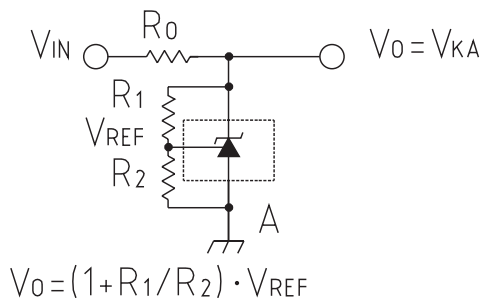
(1) $V_{\text{KA}}=V_{\text{REF}}$



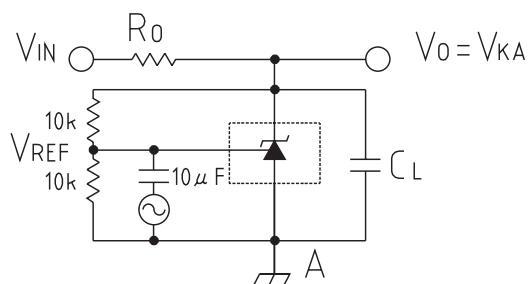
(3) I_{OFF}



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

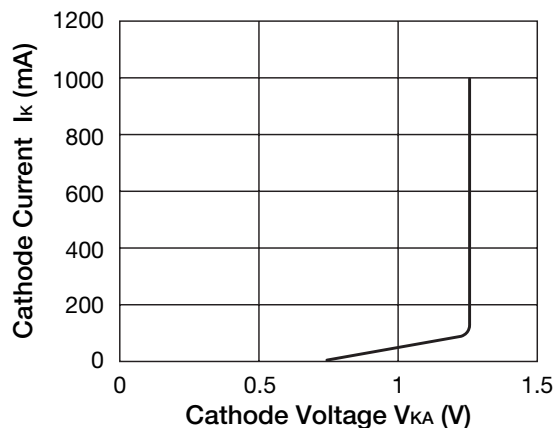


(4) Open Loop Voltage Gain

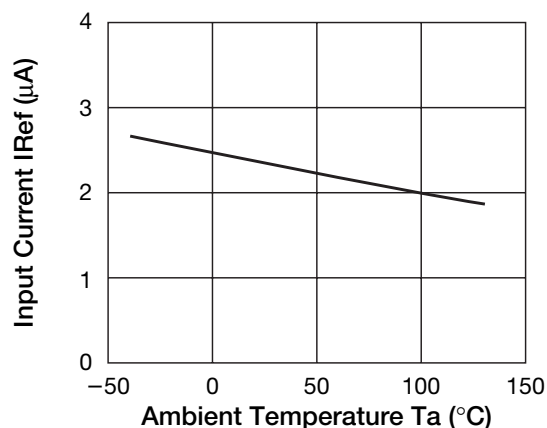


Characteristics

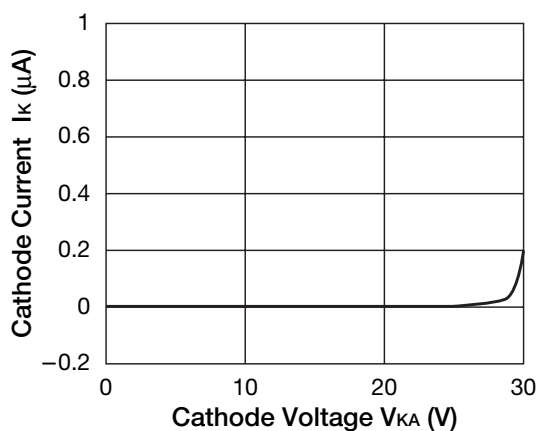
High Voltage Operating Characteristics



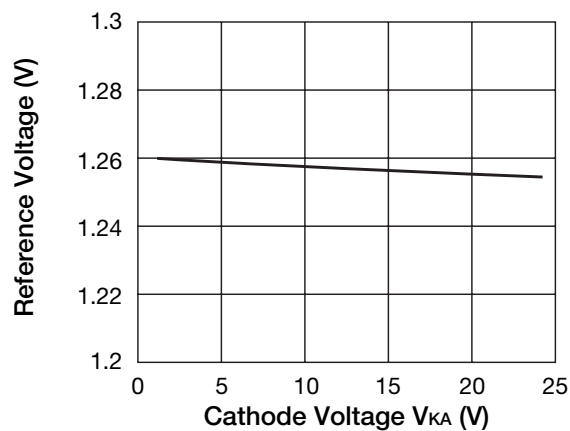
Input Current



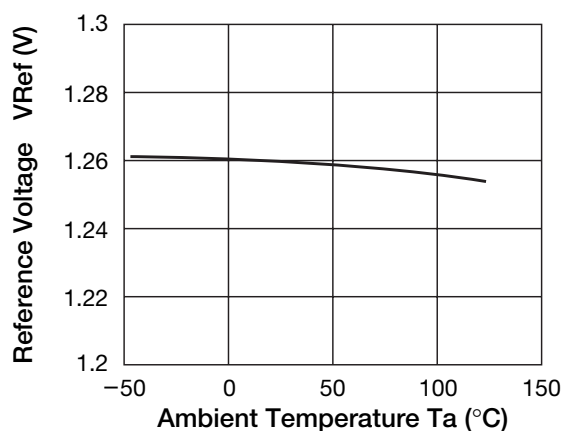
Low Current Operating Characteristics



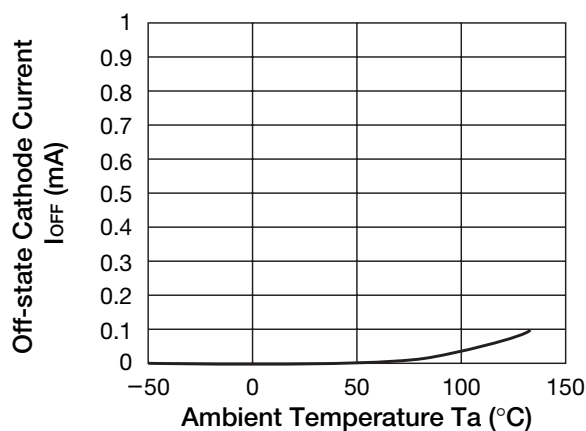
Reference Voltage



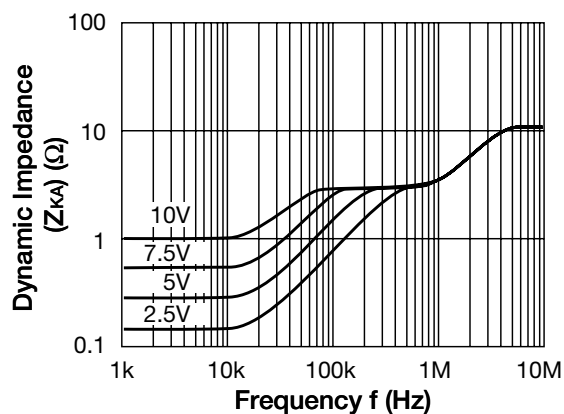
Detection Voltage Character



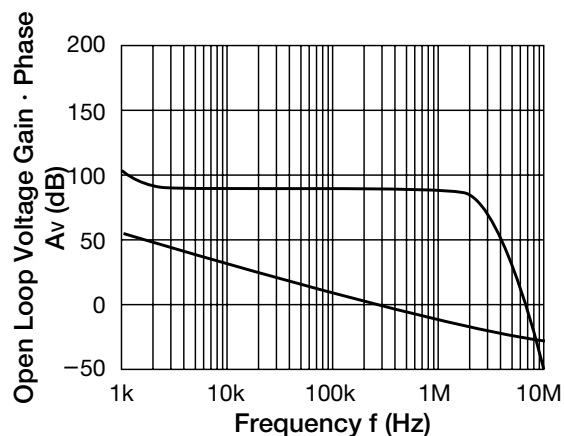
Off State Leakage



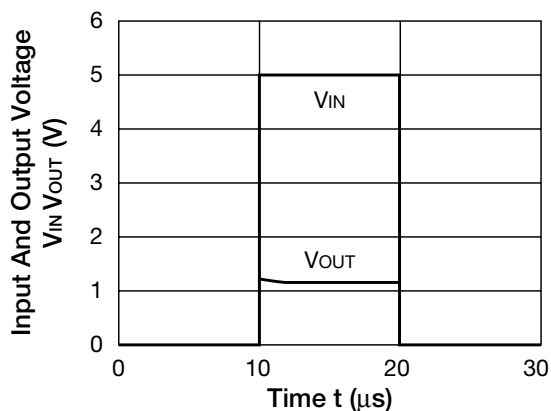
■ Dynamic Output Impedance



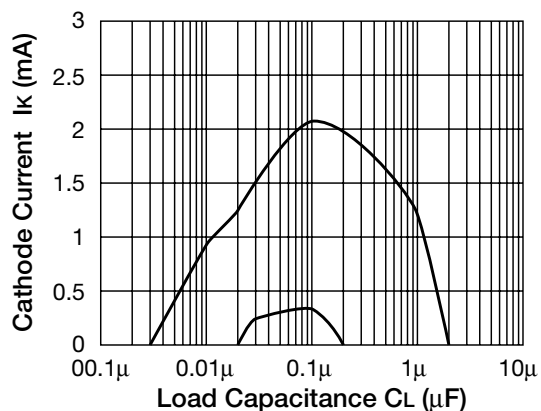
■ Open loop Voltage Gain · Phase



■ Pulse Response



■ Stability Boundary Conditions



Notes concerning stability operation region

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