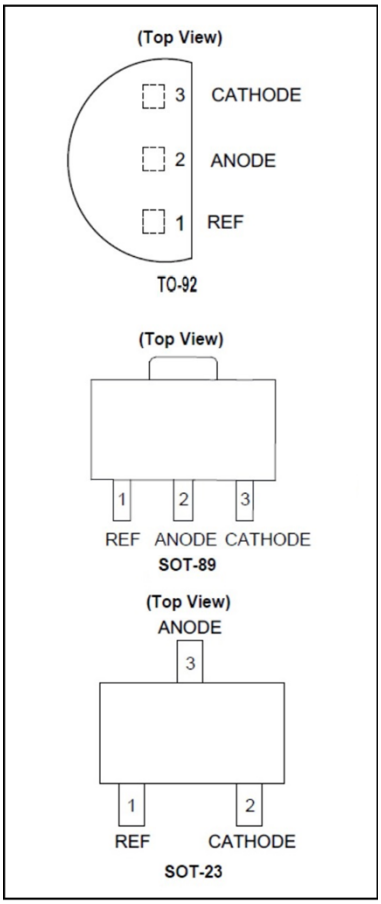
LOW VOLTAGE ADJUSTABLE PRECISION SHUNT REGULATOR

TL432

Description

The TL432 series ICs are low voltage three- terminal adjustable 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, motherboard and other adjustable regulators. The output voltage can be set to any value between 1.25V and 18V with two external resistors.
The TL432 precision reference is offered in two voltage These ICs are available in 4 packages: TO-92, SOT-23, and SOT-89.



Pin Assignments

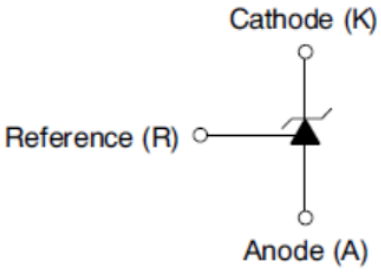
Features

- Wide Programmable Precise Output Voltage from 1.25V to 18V
- High Stability under Capacitive Load
- Low Temperature Deviation: 3mV Typical
- Low Equivalent Full-Range Temperature Coefficient: 20PPM/ ºC Typical
- Low Dynamic Output Resistance: 0.05Ω Typical
- High Sink Current Capacity from 0.1mA to 100mA
- Low Output Noise
- Wide Operating Range of -40 to +125 ºC

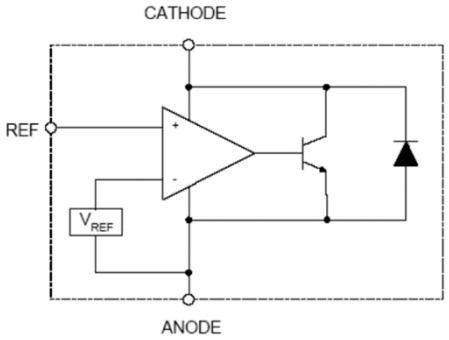
Applications

- Graphic Card
- PC Motherboard
- Switching Power Supply
- Voltage Adapter
- Charger

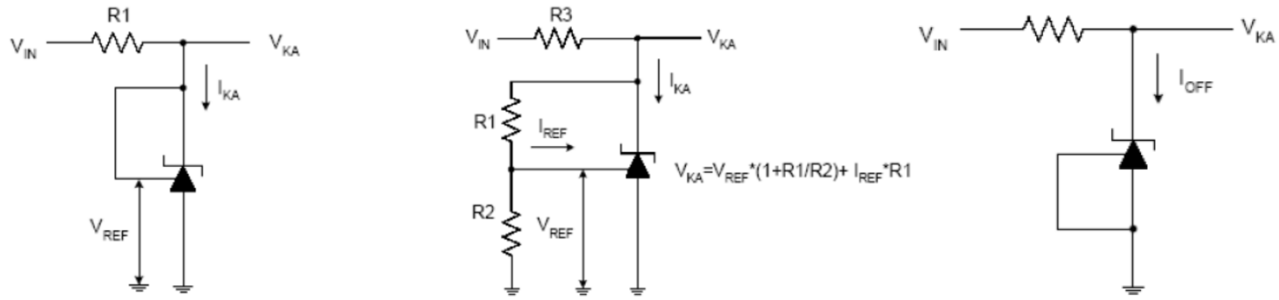
Symbol



Functional Block Diagram



Test Circuit



VKA = VREF　　VKA > VREF　　IOFF

Absolute Maximum Ratings (Note 2)

Symbol	Parameter	Rating		Unit
V_{KA}	Cathode Voltage	20		V
I_{KA}	Cathode Current Range (Continuous)	-100 to 100		mA
I_{REF}	Reference Input Current Range	10		mA
P_D	Power Dissipation	Z, R Package	770	mW
		N, K Package	370	
T_J	Junction Temperature	+150		°C
T_{STG}	Storage Temperature Range	-65 to +150		°C

Note 2: 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

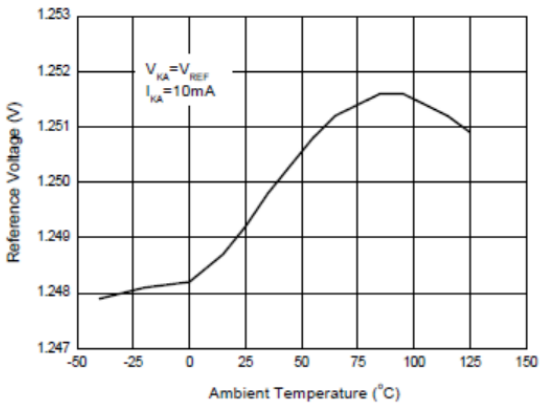
Symbol	Parameter	Min	Max	Unit
V_{KA}	Cathode Voltage	V_{REF}	18	V
I_{KA}	Cathode Current	0.1	100	mA
–	Operating Ambient Temperature Range	-40	+125	°C

Electrical Characteristics (Typical and limits apply for TA = +25 ºC)

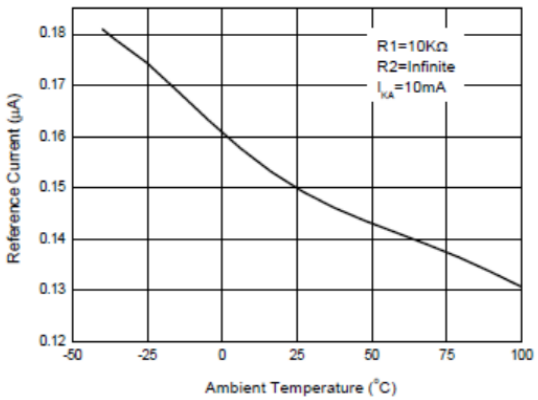
Symbol	Parameter		Test Circuit	Conditions		Min	Typ	Max	Unit
V_{REF}	Reference Voltage	0.5%	4	$V_{KA} = V_{REF}$, I_{KA} = 10mA		1.244	1.250	1.256	V
		1.0%				1.238	1.250	1.262	
ΔV_{REF}	Deviation of Reference Voltage Over Full Temperature Range		4	$V_{KA} = V_{REF}$, I_{KA} = 10mA	0 to +70°C	–	2	10	mV
					-40 to +85°C	–	3	10	
					-40 to +125°C	–	4	15	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of Change in V_{REF} to the Change in Cathode Voltage		5	I_{KA} = 10mA, ΔV_{KA}: V_{REF} to 16V		–	-0.5	-1.5	mV/V
I_{REF}	Reference Input Current		5	I_{KA} = 10mA, R1 = 10KΩ, R2 = ∞		–	0.15	0.4	µA
ΔI_{REF}	Deviation of Reference Current Over Full Temperature Range		5	I_{KA} = 10mA, R1 = 10KΩ, R2 = ∞, T_A = -40 to +125°C		–	0.1	0.4	µA
I_{KA} (Min)	Minimum Cathode Current for Regulation		4	$V_{KA} = V_{REF}$		–	55	80	µA
I_{KA} (Off)	Off-state Cathode Current		6	V_{REF}= 0, V_{KA} = 18V		–	0.04	0.10	µA
				V_{KA} = 6V, V_{REF} = 0		–	0.01	0.05	
Z_{KA}	Dynamic Impedance		4	$V_{KA} = V_{REF}$, I_{KA} = 1 to 100mA, f ≤ 1.0KHz		–	0.05	0.15	Ω
θ_{JC}	Thermal Resistance (Junction to Case)		–	SOT-23		–	84.84	–	°C/W
				SOT-23-5		–	84.84	–	
				TO-92		–	140.80	–	
				SOT-89		–	29.80	–	

Performance Characteristics

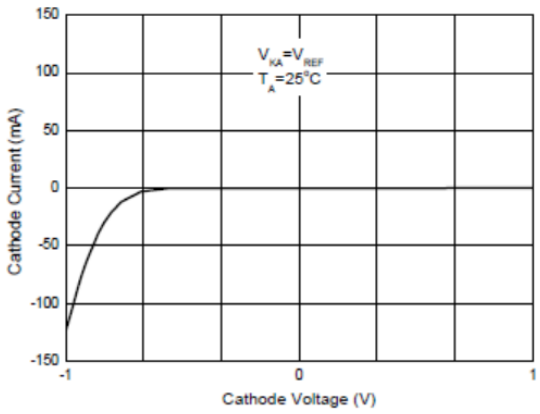
Reference Voltage vs. Ambient Temperature



Reference Current vs. Ambient Temperature



Cathode Current vs. Cathode Voltage



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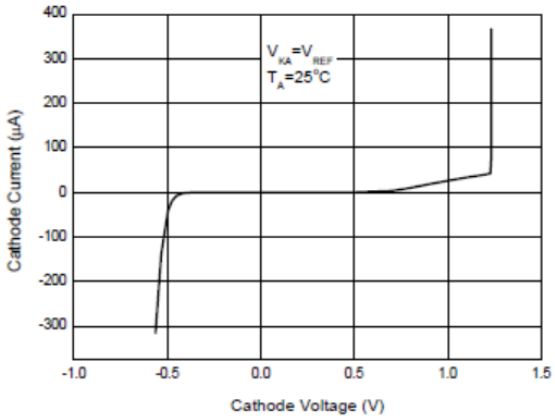
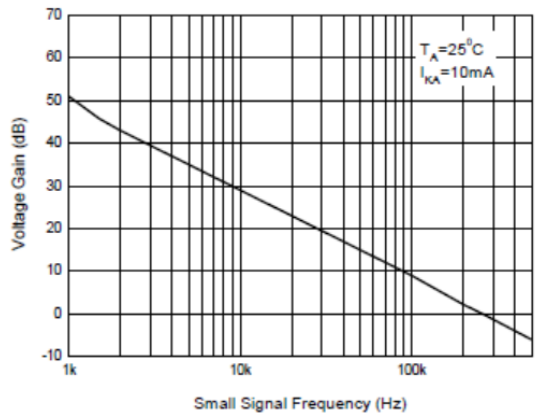
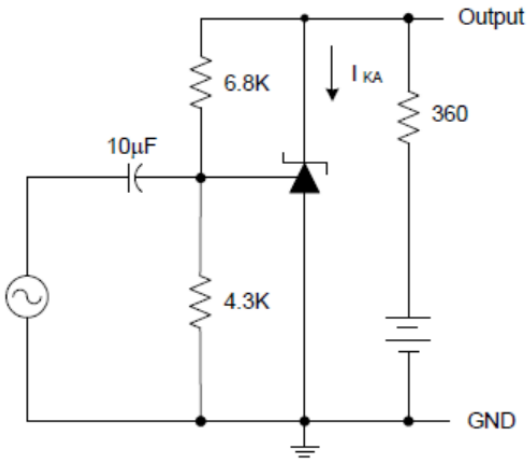
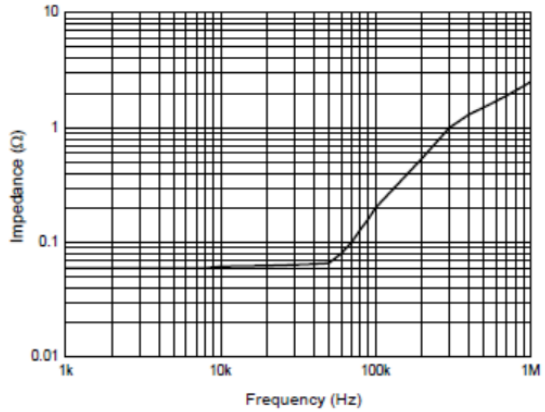


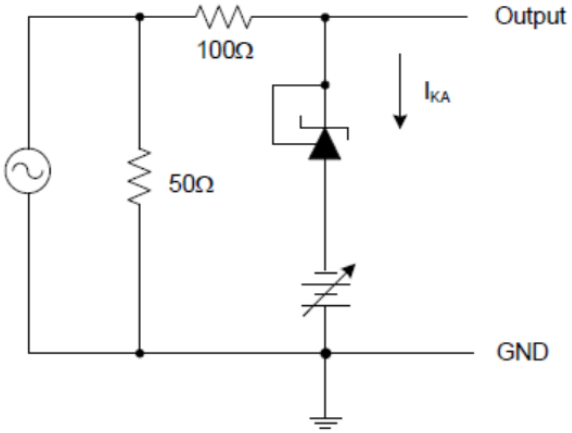
Small Signal Voltage Gain vs. Frequency



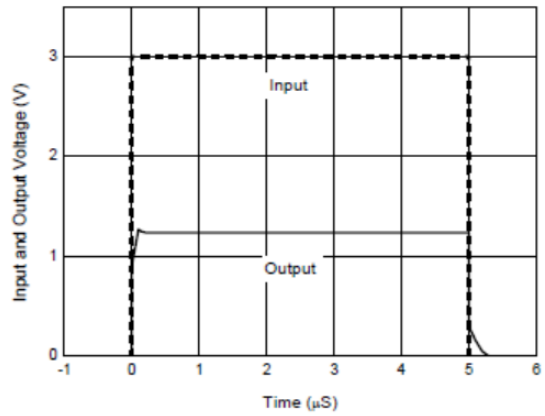


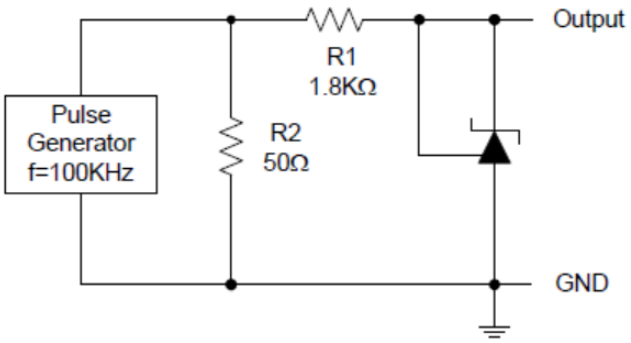
Dynamic Impedance vs. Frequency



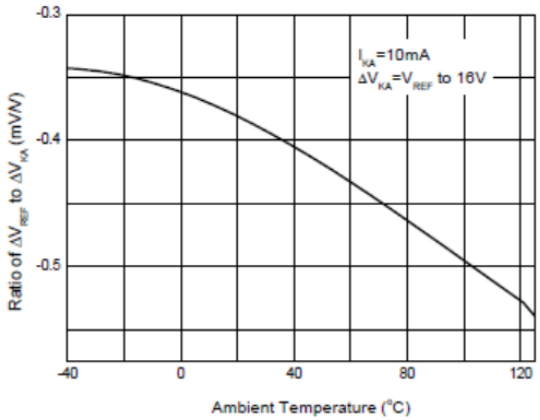


Pulse Response of Input and Output Voltage

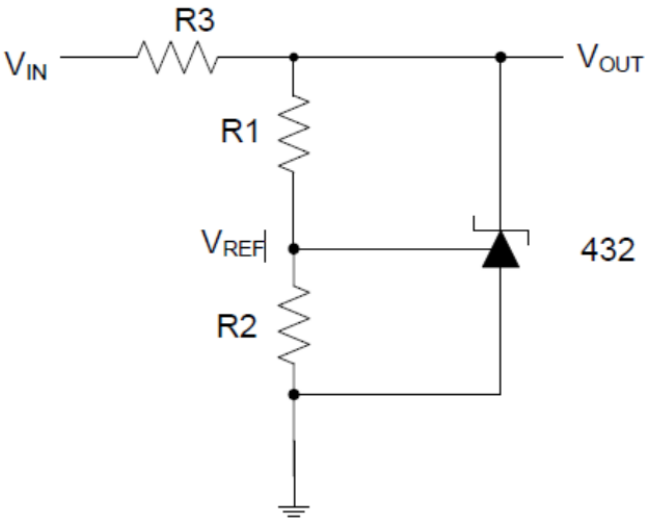




Ratio of Delta Reference Voltage to the Ratio of Delta Cathode Voltage vs. Ambient Temperature

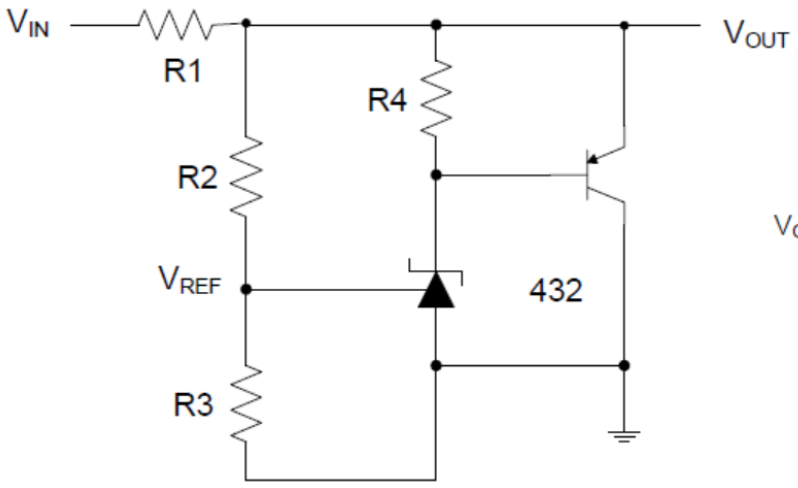


Typical Applications Circuit



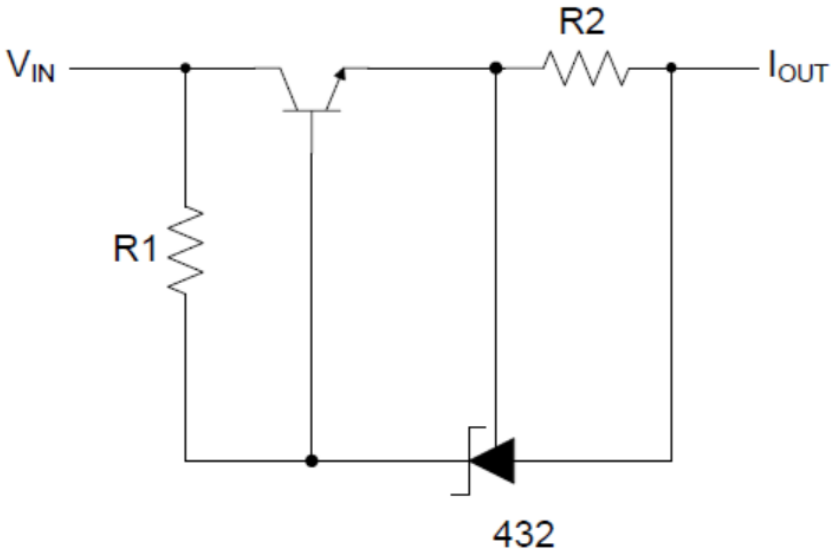
$V_{OUT} = (1+R1/R2)*V_{REF}$

Shunt Regulator



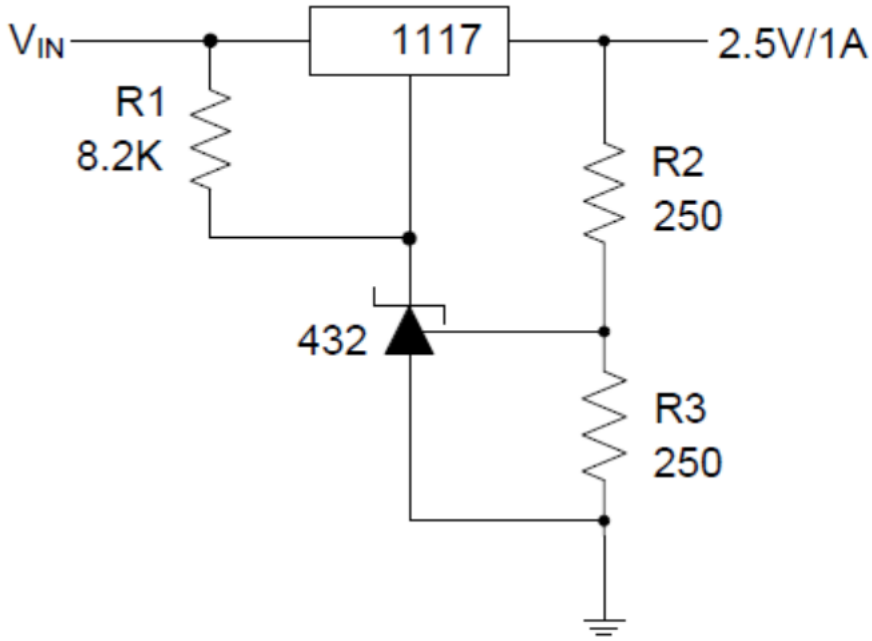
$V_{OUT} = (1+R2/R3)*V_{REF}$

High Current Shunt Regulator

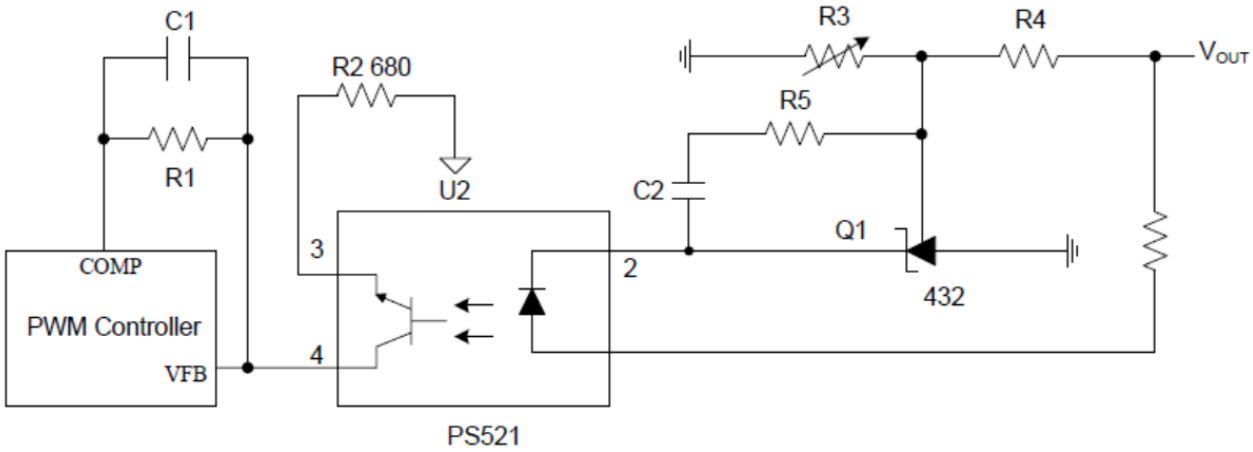


$I_{OUT} = V_{REF}/R2+ I_{KA}$

Current Source or Current Limit



Precision 2.5V/1A Regulator



PWM Converter with Reference