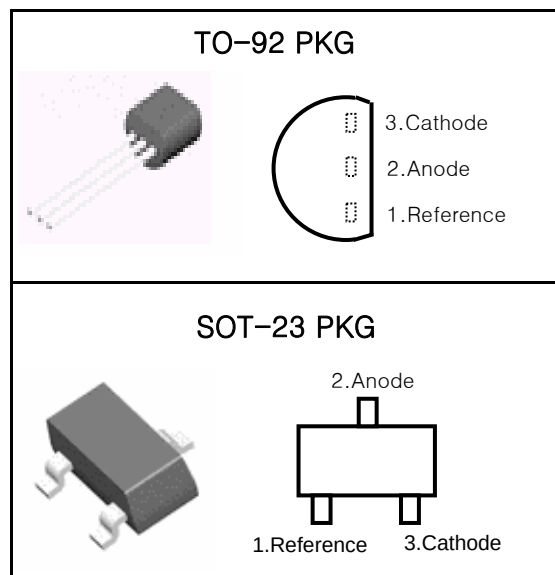


Low Voltage(1.24V) Adjustable Precision Shunt Regulator TL432Z/AZ/CZ

PROGRAMMABLE PRECISION REFERENCES

FEATURES

- Low Voltage Operation : 1.24 V
- Programmable Out Voltage to 16V
- Sink Current Capability of 1 mA to 100 mA
- Equivalent Full-Range Temperature Coefficient of 50 ppm/°C
- Temperature Compensated for Operation over Full Rated Operating Temperature Range
- Trimmed Bandgap to 5%



APPLICATION

- Shunt Regulator
- Voltage Monitoring
- Current Source and Sink Circuits
- Analog and Digital Circuits Requiring Precision Reference
- Low Out Voltage (3.0V to 3.3V) Switching Power Supply Error Amplifier

ORDERING INFORMATION

Device	Marking	Package
TL432-AZ	TL432-AZ	TO-92
TL432-CZ	TL432-CZ	
TL432-AZSF	432	SOT-23
TL432-CZSF		

DESCRIPTION

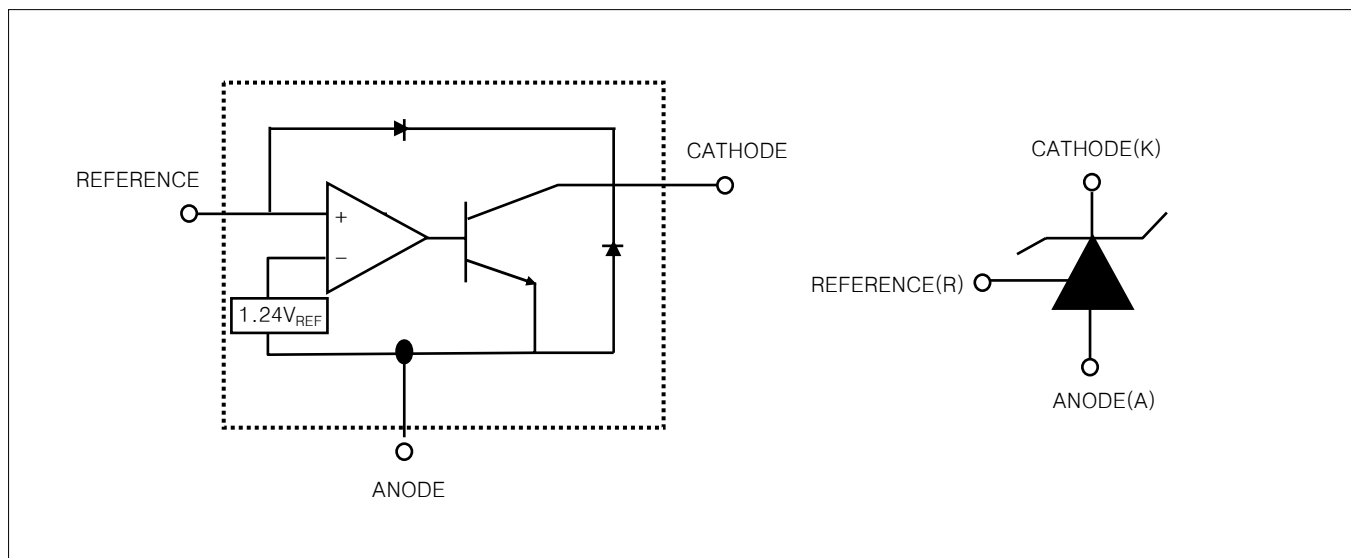
The TL432Z/AZ/CZ is a three-terminal Shunt Voltage Reference providing a highly accuracy 1.24 V, 1.25V bandgap reference with 1.0 % tolerance.

The TL432Z/AZ/CZ thermal stability and wide operating current (100mA), makes is suitable for all variety of applications that are looking for a low cost solution with high performance.

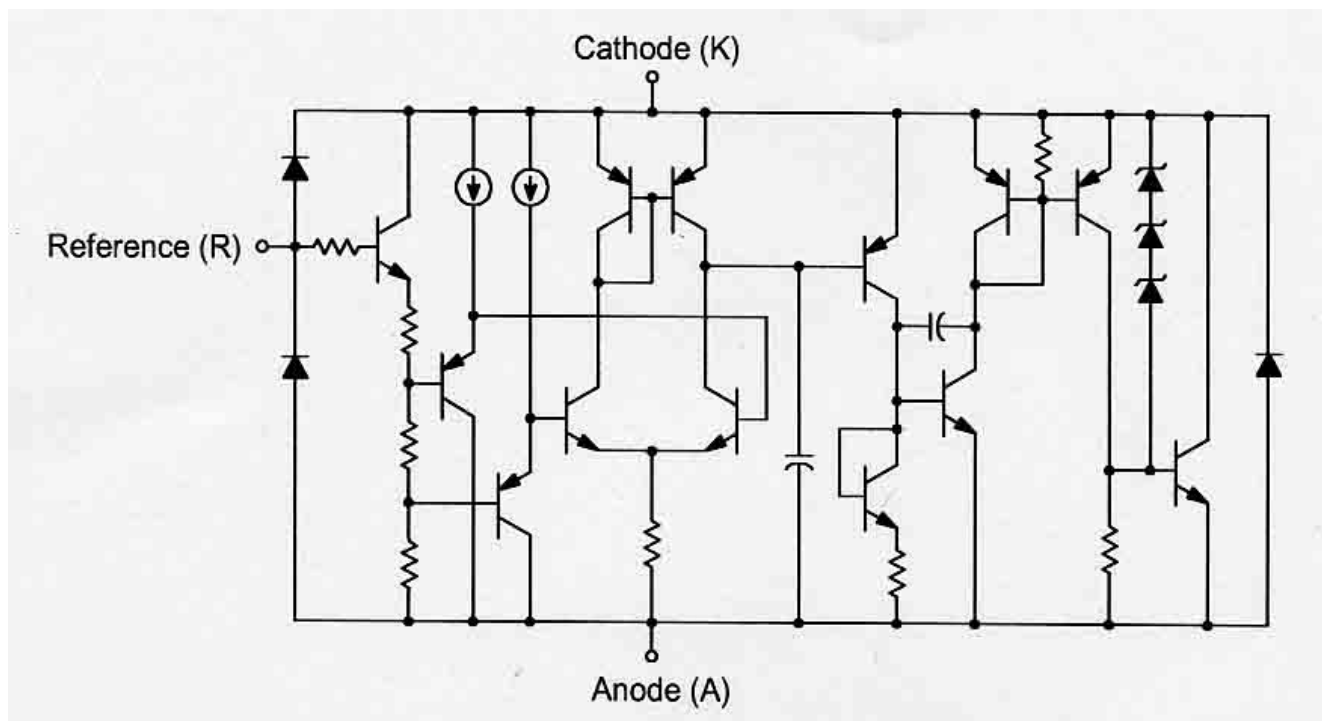
The TL432Z/AZ/CZ is an ideal voltage reference in an isolated feed circuit for 3.0V to 3.3V switching mode power supplies.

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FUNCTION BLOCK DIAGRAM



EQUIVALENT SCHEMATIC



All component values are nominal

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RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Cathode Voltage	V_{KA}	V_{REF}	16	V
Cathode Current	I_K	8	100	mA

DISSIPATION RATING TABLE1–FREE–AIR TEMPERATURE

Package	$T_A=25^{\circ}\text{C}$	Derating Factor	$T_A=70^{\circ}\text{C}$	$T_A=85^{\circ}\text{C}$	$T_A=125^{\circ}\text{C}$
	Power Rating	Above $T_A=25^{\circ}\text{C}$	Power Rating	Power Rating	Power Rating
TO–92	770mW	6.2mW/ $^{\circ}\text{C}$	491mW	398mW	–
SOT–23	230mW	1.8mW/ $^{\circ}\text{C}$	149mW	122mW	–

ABSOLUTE MAXIMUM RATINGS

(Full Operating Ambient Temperature Range Applies Unless Otherwise Noted)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Cathode Voltage	V_{KA}	20	V
Continuous Cathode Current Range	I_{KA}	100	mA
Reference Input Current Range	I_{REF}	3	mA
Junction Temperature	T_J	$-40 \sim 150$	$^{\circ}\text{C}$
Operating Temperature	T_{OPR}	$0 \sim 70$	$^{\circ}\text{C}$
Storage Temperature	T_{STG}	$-65 \sim +150$	$^{\circ}\text{C}$
Total Power Dissipation	P_D	770	mW

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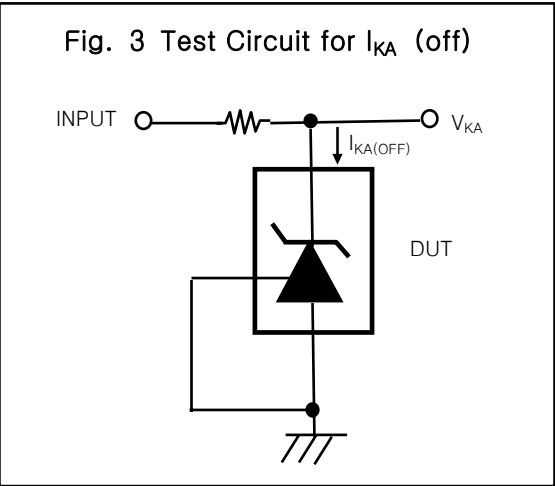
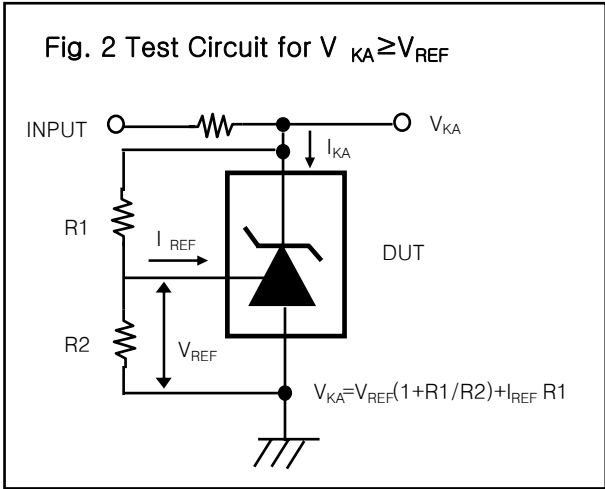
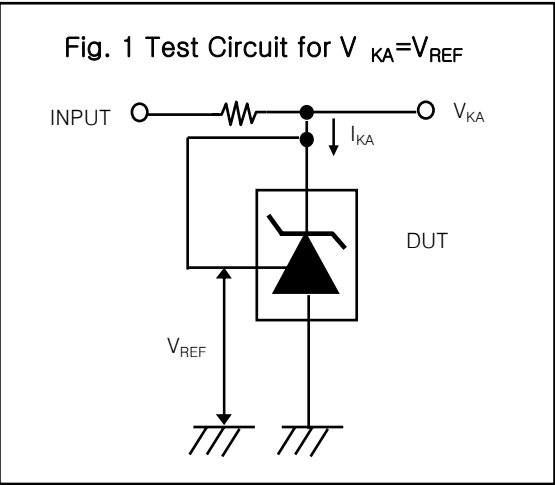
TL432AZ/CZ ELECTRICAL CHARACTERISTICS

(T_A=25°C, unless otherwise specified)

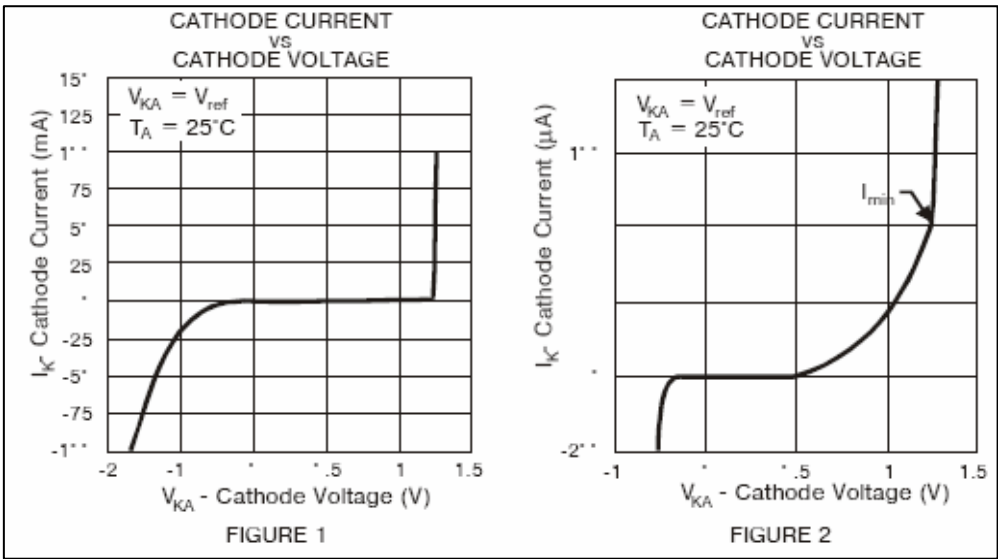
CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Reference Input Voltage	V _{REF}	V _{KA} =V _{REF} , I _K =10mA	TL432AZ	1.228	1.24	1.252	V
			TL432CZ	1.233		1.247	
Deviation of Reference Input Voltage Over Full Temperature Range	ΔV _{REF} /ΔT	V _{KA} =V _{REF} , I _K =10mA			1	25	mV
		T _A =Full Range					
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	ΔV _{REF} /ΔV _{KA}	V _{KA} =1.25V to 14.5V			1.0	2.7	mV/V
Reference Input Current	I _{REF}	R1=10kΩ, R2=∞			0.15	0.5	μA
Deviation of Reference Input Current Over Full Temperature Range	ΔI _{REF} /ΔT	R1=10kΩ, R2=∞, T _A = Full Range			0.10	0.4	μA
Minimum Cathode Current for Regulation	I _{KA} MIN	V _{KA} =V _{REF}			20	80	μA
Off-State Cathode Current	I _{KA} OFF	V _{KA} =16V, V _{REF} =0			0.135	0.15	μA
Dynamic Impedance	Z _{KA}	V _{KA} =V _{REF} , I _K =0.1mA~100mA, f≤1.0kHz			0.05	0.15	Ω

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Parameter Measurement Information



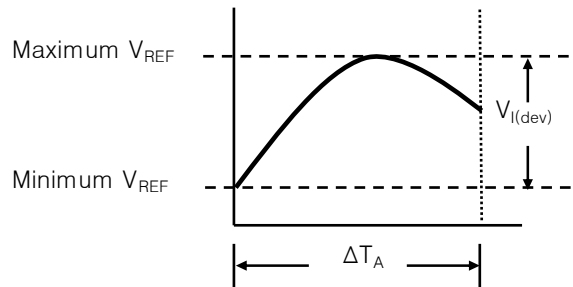
Typical Characteristics



Low Voltage(1.24V) Adjustable Precision Shunt Regulator TL432Z/AZ/CZ

The deviation parameters $V_{REF(DEV)}$ and $I_{REF(DEF)}$ are defined as the differences between the maximum and minimum values obtained over the recommended temperature range. The average full-range temperature coefficient of the reference voltage, αV_{REF} , is defined as :

$$|\alpha V_{REF}| \left(\frac{\text{ppm}}{^\circ\text{C}} \right) = \frac{\left(\frac{V_{I(dev)}}{V_{REF \text{ at } 25^\circ\text{C}}} \right) \times 10^6}{\Delta T_A}$$



Where :

ΔT_A is the recommended operating free-air temperature range of the device.

αV_{REF} can be positive or negative, depending on whether minimum V_{REF} or maximum V_{REF} , respectively, occurs at the lower temperature.

Example : Maximum $V_{REF}=1190\text{mV}$ at 30°C , maximum $V_{REF}=1262\text{mV}$ at 0°C , $V_{REF}=1241\text{mV}$ at 25°C , $\Delta T_A=125^\circ\text{C}$ for TL432CZ

$$|\alpha V_{REF}| = \frac{\left(\frac{7.2\text{mV}}{1241\text{mV}} \right) \times 10^6}{125^\circ\text{C}} \approx 46\text{PPM}/^\circ\text{C}$$

Because minimum V_{REF} occurs at the lower temperature, the coefficient is positive.

Calculating Dynamic Impedance $|Z_{KA}| = \frac{\Delta V_{KA}}{\Delta I_{KA}}$

The dynamic impedance is defined as :

When the device is operating with two external resistors (see Figure 3), the total dynamic impedance of the circuit is given by :

$$|Z'| = \frac{\Delta V}{\Delta I} \approx |Z_{KA}| \left(1 + \frac{R1}{R2} \right)$$