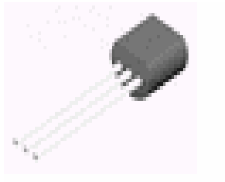
Low Voltage(1.24V) Adjustable Precision Shunt Regulator TL432Z/AZ/CZ

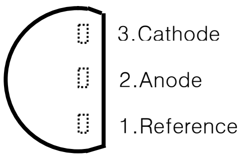
PROGRAMMABLE PRECISION REFERENCES

FEATURES

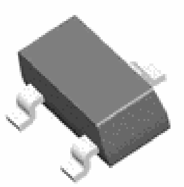
- Low Voltage Operation : 1.24 V
- Programmable Out Voltage to 16V
- Sink Current Capability of 1 mA to 100 mA
- Equivalent Full-Range Temperature Coefficient of 50 ppm/℃
- Temperature Compensated for Operation over Full Rated Operating Temperature Range
- Trimmed Bandgap to 5%
- Moisture Sensitivity Level 3

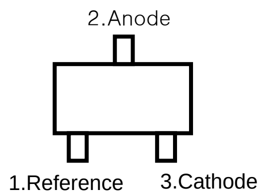
TO-92 PKG





SOT-23 2.90*1.30*1.00





APPLICATION

- Shunt Regulator
- Voltage Monitoring
- Current Source and Sink Circuits
- Anolog 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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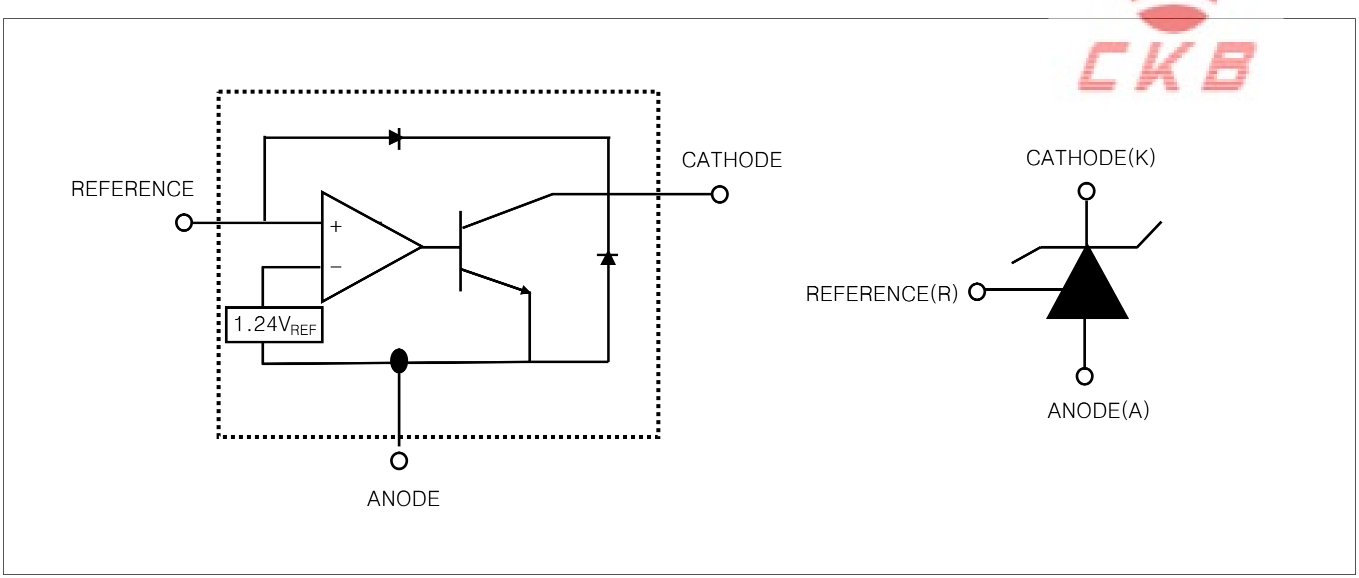
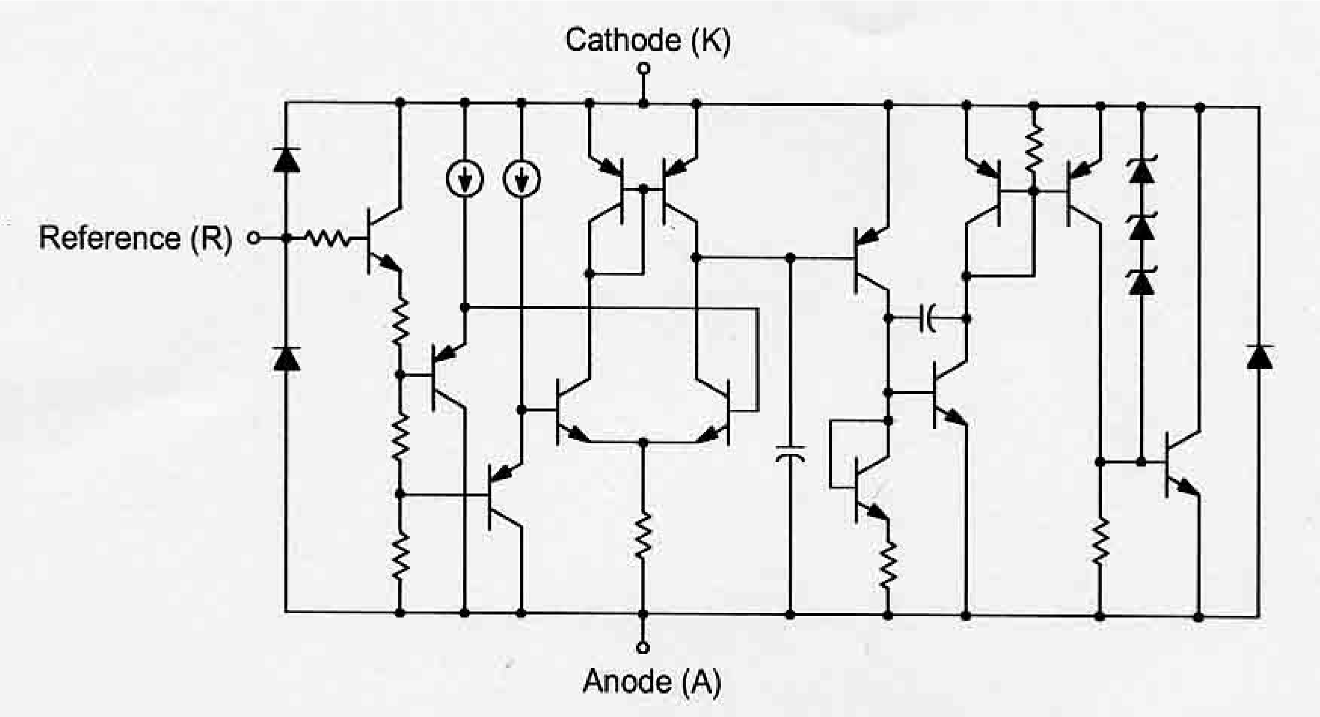
FUNCTION BLOCK DIAGRAM



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℃ Power Rating	Derating Factor Above T_A=25℃	T_A=70℃ Power Rating	T_A=85℃ Power Rating	T_A=125℃ Power Rating
TO-92	770mW	6.2mW/℃	491mW	398mW	-
SOT-23	230mW	1.8mW/℃	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 ~ 150	℃
Operating Temperature	T_{OPR}	0 ~ 70	℃
Storage Temperature	T_{STG}	-65~+150	℃
Total Power Dissipation	P_D	770	mW

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TL432AZ/CZ ELECTRICAL CHARACTERISTICS

(T_A=25℃, unless otherwise specified)

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

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Parameter Measurement Information

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

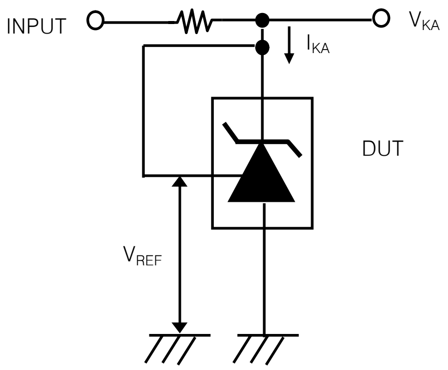


Fig. 2 Test Circuit for $V_{KA} \geq V_{REF}$

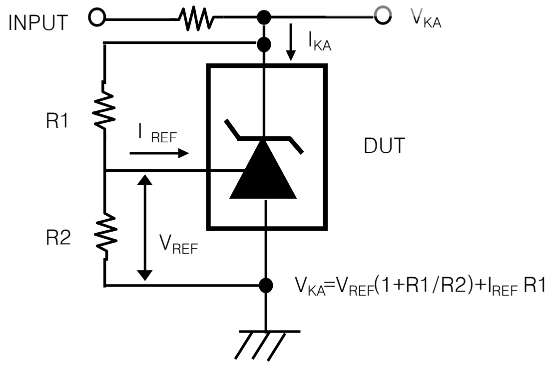
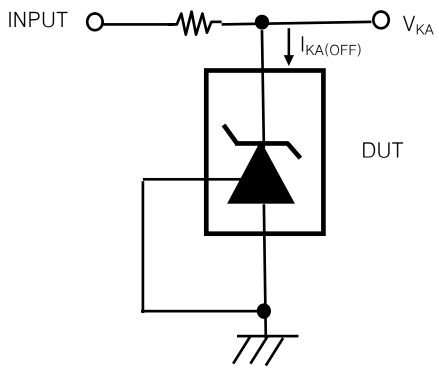


Fig. 3 Test Circuit for I_{KA} (off)



Typical Characteristics

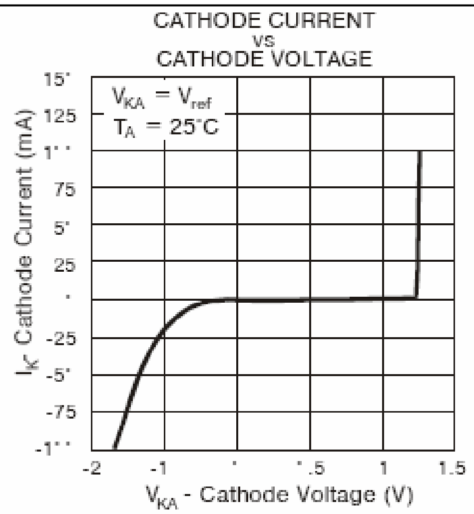


FIGURE 1

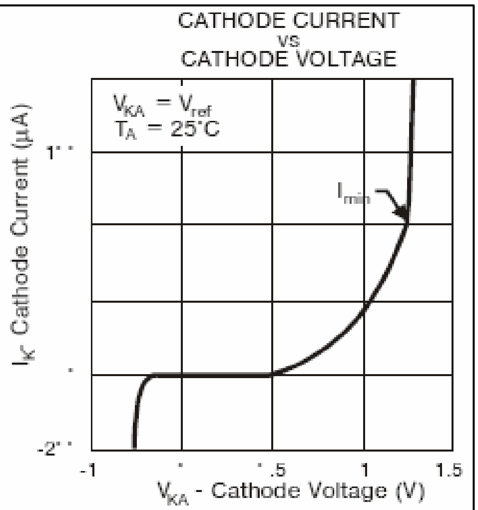
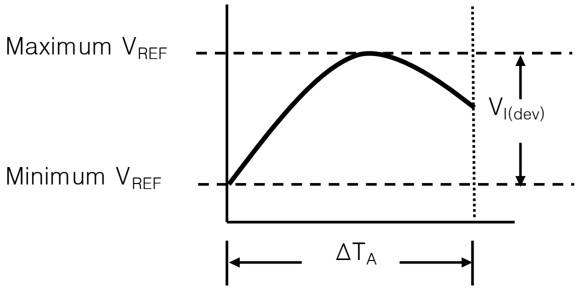


FIGURE 2

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 :

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



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㎷ at 30℃, maximum V_{REF}=1262㎷ at 0℃, V_{REF}=1241㎷ at 25℃, ΔT_A=125℃ for TL432CZ

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

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

Calculating Dynamic Impedance

The dynamic impedance is defined as :

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

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

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