AUK Semiconductor

SL432xSF

Programmable Voltage Reference

Description

The SL432 series are 3-terminal precision shunt regulators that are programmable over a wide voltage range of 1.24V to 16V with ±1.0%, ±2.0% tolerance. The SL432 series have a low dynamic impedance of 0.25Ω. These features make the SL432 series an excellent replacement for zener diodes in numerous applications circuits that require a precision reference voltage.

Features

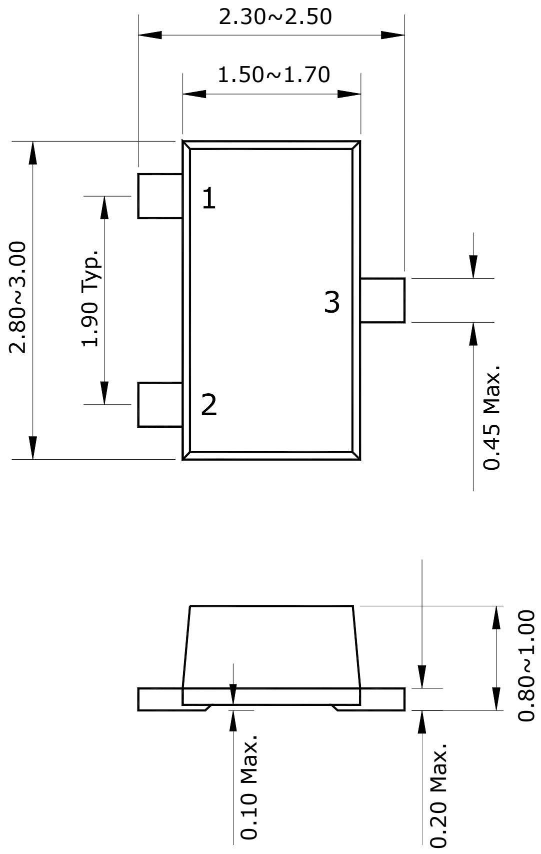
- Programmable output voltage from 1.24V to 16V
- Voltage reference tolerance : ±1.0%, ±2.0%
- Sink current capability of 80 ㎂ to 30 ㎃

Ordering Information

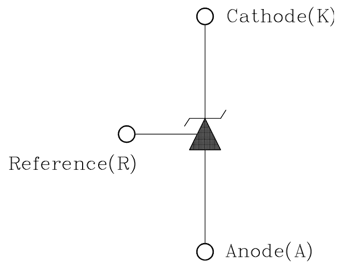
Type NO.	Marking	Package Code
SL432xSF	42□	SOT-23F

□: Grade => 3:±2% , A:±1%

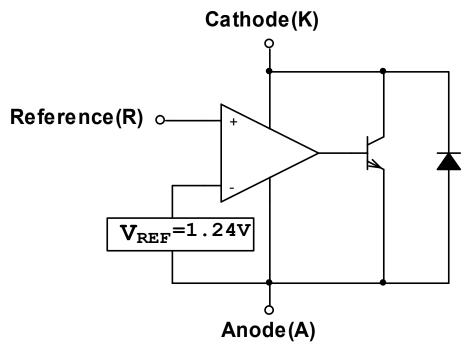
Outline Dimensions (Unit : mm)



Symbol



Functional block diagram



PIN Connections

1. Reference
2. Cathode
3. Anode

Absolute maximum ratings

[Ta=25℃]

Characteristic	Symbol	Rating	Unit
Cathode to Anode voltage	V_{KA}	18	V
Cathode Current	I_K	30	mA
Reference Input Current	I_{ref}	3	mA
Power Dissipation	$P_D{}^*$	350	mW
Junction Temperature	T_J	150	℃
Operating Temperature Range	T_{opr}	-40 ~ +85	℃
Storage Temperature Range	T_{stg}	-55 ~ +150	℃

* With PCB(8×8mm copper area) at glass epoxy board(t=1.7mm, area : 20×20mm)

Recommended operating conditions

Characteristic	Symbol	Rating		Unit
		Min.	Max.	
Cathode voltage	V_{KA}	V_{ref}	16	V
Cathode current	I_K	0.1	30	mA

Electrical Characteristics (Ta=25℃, unless otherwise noted.)

Characteristic	Symbol	Condition		Min.	Typ.	Max.	Unit
Reference voltage (Fig.1)	V_{ref}	$V_{KA}=V_{ref}$, $I_K=10mA$	SL432ASF	1.228	1.240	1.252	V
			SL432SF	1.215		1.265	
Reference input voltage deviation over temperature (Fig.1, Note1,2)	ΔV_{ref}	$V_{KA}=V_{ref}$, $I_K=10mA$ @ $-40^\circ C \le Ta \le 85^\circ C$		-	10	20	mV
Ratio of delta reference input voltage to delta cathode voltage (Fig.2)	$\frac{\Delta V_{ref}}{\Delta V_{KA}}$	$I_K=10mA$ $Vref \le V_{KA} \le 16V$		-	-1.0	-2.7	mV/V
Reference current (Fig,2)	I_{ref}	$I_K=10mA$ $R1=10K\Omega$, $R2=\infty$		-	0.15	0.3	µA
Reference input current deviation over temperature (Fig.2, Note 1,2)	ΔI_{ref}	$I_K=10mA$ $R1=10K\Omega$, $R2=\infty$		-	0.04	0.08	µA
Minimum cathode current for Regulation	$I_K(_{MIN})$	$V_{KA}=V_{ref}$		-	55	80	µA
Off-state cathode current (Fig.3)	$I_{K(off)}$	$V_{KA}=16V$, $V_{ref}=0V$		-	5	50	nA
Dynamic impedance (Fig.1, Note3)	Z_{KA}	$V_{KA}=V_{ref}$, $f \le 1.0KHz$ $0.1mA \le I_K \le 30mA$		-	0.25	0.4	Ω

Fig. 1 Test circuit for V_{KA}=V_{ref}

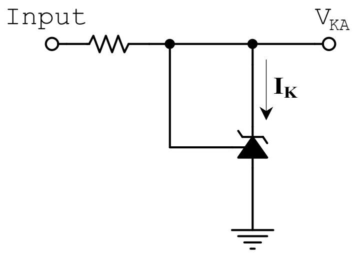


Fig. 2 Test circuit for V_{KA}>V_{ref}

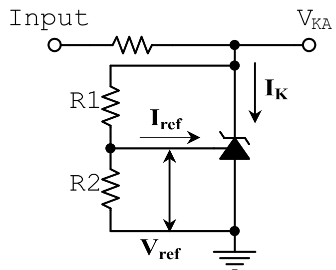
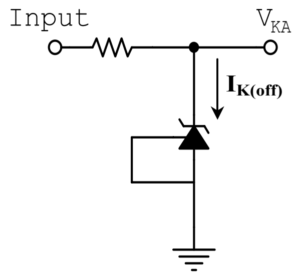


Fig. 3 Test circuit for $I_{K(off)}$

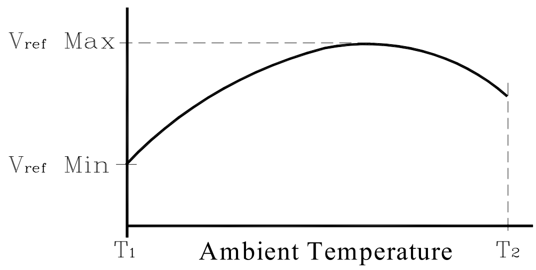


$$V_{ref} = V_{ref} \times (1 + \frac{R_1}{R_2}) + I_{ref} \times R_1$$

Note.

1. Ambient temperature range: T_{LOW} = -40℃, T_{High} = 85℃

2. The deviation parameters △V_{ref} and △I_{ref} are defined as the difference between the maximum value and minimum value obtained over the full operating ambient temperature range that applied.



$\Delta V_{ref} = V_{ref}\ Max - V_{ref}\ Min$

$\Delta Ta = T_2 - T_1$

The average temperature coefficient of the reference input voltage, αV_{ref} is defined as:

$$\alpha V_{ref}(\frac{ppm}{℃}) = \frac{(\frac{\Delta V_{ref}}{V_{ref}(T_a = 25℃)} \times 10^6)}{T_a}$$

αV_{ref} can be positive or negative depending on whether V_{ref} Min or V_{ref} Max occurs at the lower ambient temperature, refer to Fig. 8

Example : △V_{ref} = 10mV and the slope is positive,

△V_{ref} @ 25℃ = 1.24V

△Ta = 125℃

$$\alpha V_{ref}(\frac{ppm}{℃}) = \frac{(\frac{0.010}{1.241}) \times 10^6}{125} = 65ppm/℃$$

3. The dynamic impedance Z_{KA} is defined as:

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

When the device is operating with two external resistors, R1 and R2, (refer to Fig.2) the total dynamic impedance of the circuit is given by:

$$|Z_{KA}'| = |Z_{KA}| \times (1 + \frac{R_1}{R_2})$$

Electrical Characteristics Curves (Continue)

Fig.4 I_K vs V_{KA} (1)

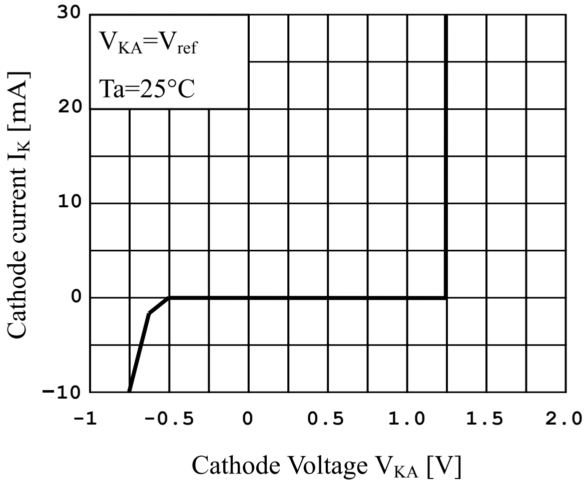


Fig.5 I_K vs V_{KA} (2)

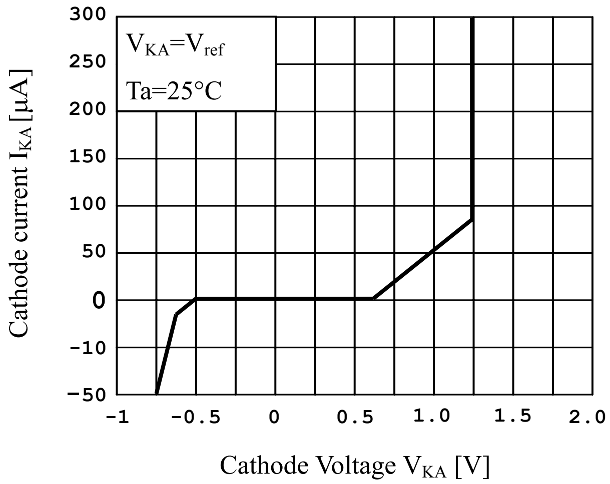


Fig.6 $I_{K(off)}$ vs V_{KA}

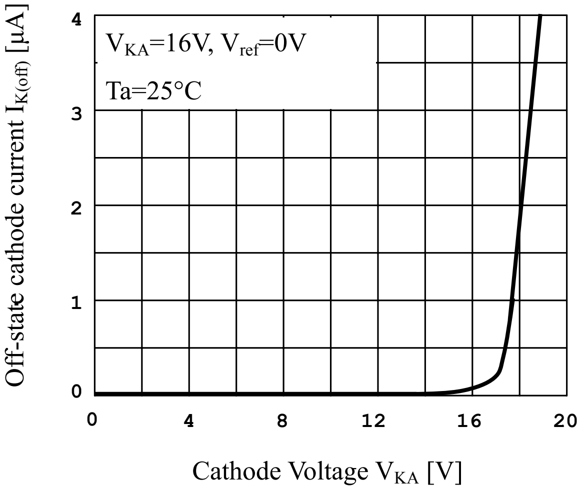


Fig.7 $\Delta V_{ref}/\Delta V_{KA}$ vs T_a

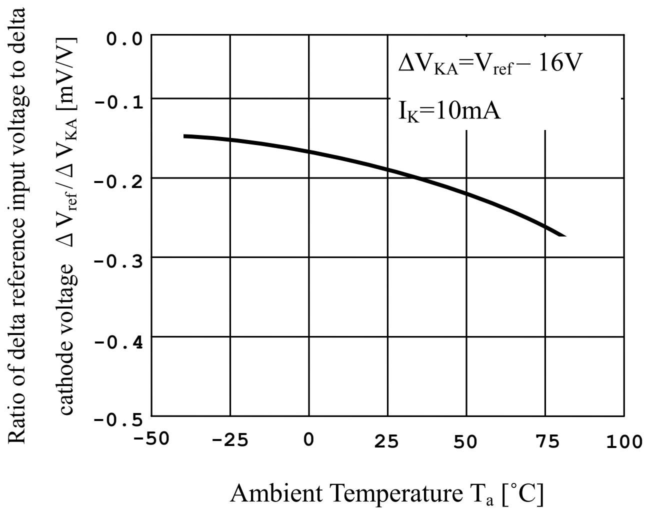


Fig.8 V_{ref} vs T_a

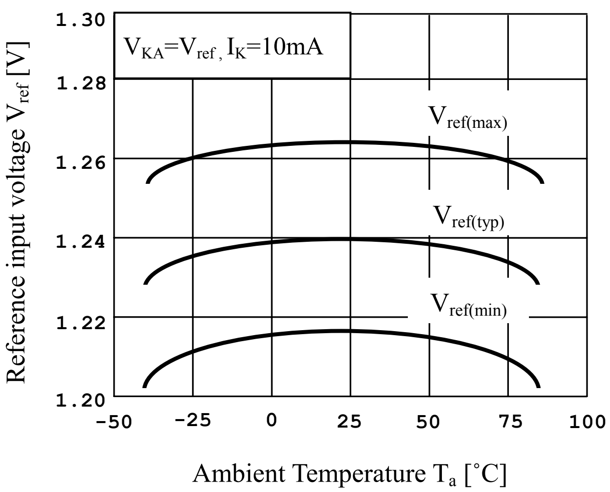
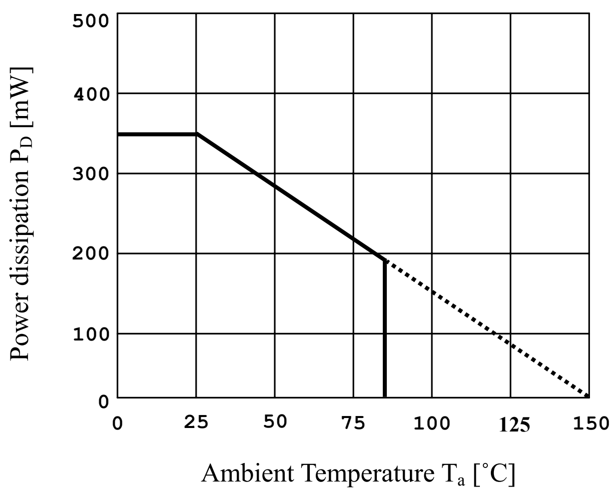
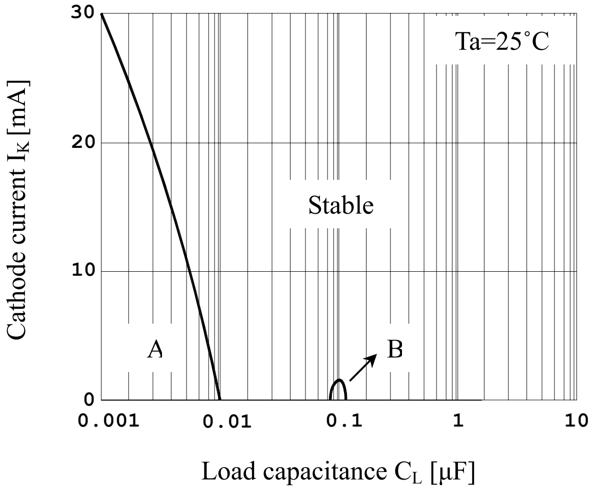


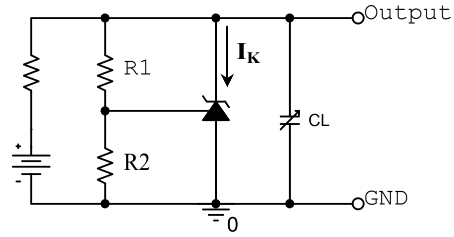
Fig.9 P_D vs T_a



Electrical Characteristics Curves

Fig.10 Stability Boundary Conditions





Unstable Regions	V_{KA}	R_1 [KΩ]	R_2 [KΩ]
A, B	V_{ref}	0	∞
A	10V	10	1.415

Fig.11 Test circuit for Fig. 10

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