



### General Description

The AFN432N are three-terminal adjustable shunt regulators with specified thermal stability. The output voltage may be set to any value between  $V_{ref}$  (approximately 1.24V) and 16 V with two external resistors. These devices have a typical output impedance of  $0.05\Omega$ . Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacements for zener diodes in many applications.

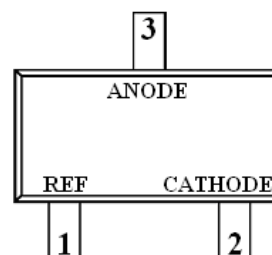
### Features

- ◆ Low voltage operation (down to 1.24V)
- ◆ Wide operating current range  $80\mu A$  to 100Ma
- ◆ Low Dynamic output impedance  $0.05\Omega$  typ.
- ◆ Assembly in SOT-23.

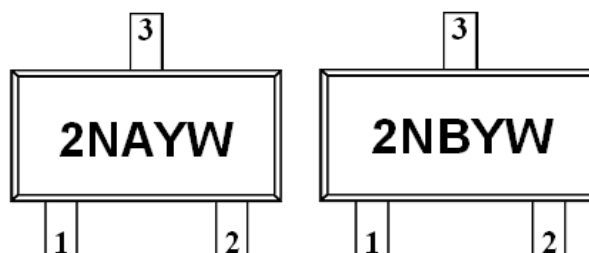
### Application

- Battery Power Equipment
- Linear Regulators
- Switch Power Supply
- Cellular Phone
- Digital Cameras
- Computer Disk Drivers
- Instrumentation

### Pin Define SOT-23

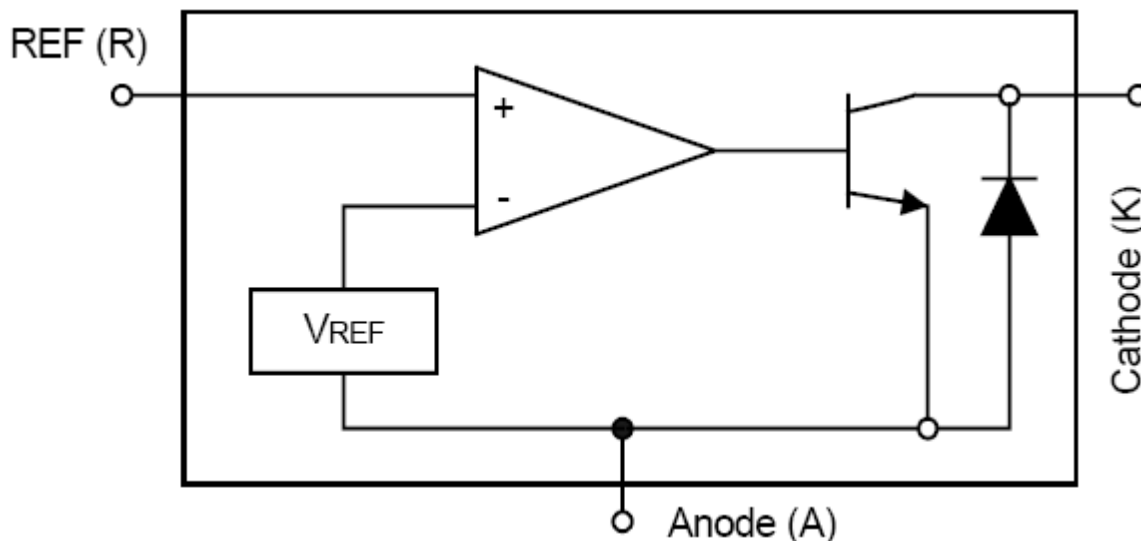


### Marking Information SOT-23





**Block Diagram**



**Pin Description ( SOT-23 )**

Pin	Symbol	Description
R	1	REF
K	2	CATHODE
A	3	ANODE

**Pin Description ( TO-92 )**

Pin	Symbol	Description
R	1	REF
A	2	ANODE
K	3	CATHODE

**Ordering Information**

Part Number	Voltage Tolerance	Package	Part Marking	Unit	Quantity
AF432NAS23RG	0.5%	SOT-23	2NAYW	Tape & Reel	3000 EA
AF432NBS23RG	1.0%	SOT-23	2NBYW	Tape & Reel	3000 EA

- ※ Week Code : A ~ Z ( 1 ~ 26 ) ; a ~ z ( 27 ~ 52 )
- ※ AF432NAS23RG : 7" Tape Reel ; Pb- Free ; Halogen- Free
- ※ AF432NBS23RG : 7" Tape Reel ; Pb- Free ; Halogen- Free



**Absolute Maximum Ratings**

( $T_A=25^{\circ}\text{C}$  Unless otherwise noted)

Parameter	Symbol	Value	Unit
Cathode Voltage	$V_Z$	20	V
Continuous Cathode Current	$I_Z$	100	mA
Reference Current	$I_{REF}$	3	mA
Operation Junction Temperature Range	$T_J$	-40 ~ +150	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-65 ~ +150	$^{\circ}\text{C}$
Lead Temperature Range(Soldering 10sec.)	$T_{SOL}$	260	$^{\circ}\text{C}$
Thermal Resistance	$\Theta_{JA}$	SOT-23	206
		TO-92	140

**Electrical Characteristics**

( $T_A=25^{\circ}\text{C}$  Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Reference Voltage	$V_{REF}$	$V_Z = V_{REF}$ $I_Z = 10\text{Ma}$ (Fig.1)	AF432NAS23RG	1.234	1.24	1.246	V
			AF432NBS23RG	1.228	1.24	1.252	
Deviation of Reference Input Voltage over full temperature range	$V_{REF(DVE)}$	$V_{KA} = V_{REF}$ , $I_{KA} = 10\text{mA}$ , $T_A = -20\sim 85^{\circ}\text{C}$ (Fig.1)		10	25	mV	
Ratio of change in $V_{REF}$ to change in Cathode voltage	$\Delta V_{REF} / \Delta V_{KA}$	$I_{KA} = 10\text{mA}$ (Fig.2)	$V_{KA} = 16\text{V} \sim V_{REF}$	-2.7	-1.0	mV / V	
Reference Input Current	$I_{REF}$	$R1=10\text{K}\Omega$ , $R2 = \infty$ , $I_Z = 10\text{mA}$		0.15	0.5	$\mu\text{A}$	
$I_{REF}$ Temp Deviation	$I_{REF(DEV)}$	$T_A=-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$ $R1=10\text{K}\Omega$ , $R2 = \infty$ , $I_Z = 10\text{mA}$		0.1	0.4	$\mu\text{A}$	
Off state Cathode Current	$I_{KA(OFF)}$	$V_{KA} = 16\text{V}$ , $V_{REF} = 0\text{V}$ (Fig.3)		0.13	15	$\mu\text{A}$	
Dynamic output impedance	$I_{Z(KA)}$	$f < 1\text{KHZ}$ , $V_Z = V_{REF}$ $I_Z = 100\mu\text{A} \sim 100\text{mA}$ (Fig.1)		0.05	0.15	$\Omega$	
Minimum Cathode Current	$I_{Z(MIN)}$	$V_Z = V_{REF}$ (Fig.1)		0.02	0.08	mA	

**Testing Circuit**

Fig1:  $V_{KA}=V_{REF}$

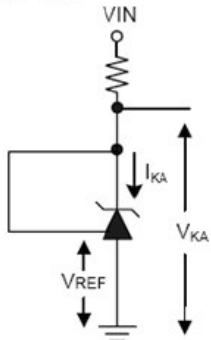


Fig2:  $V_{KA}>V_{REF}$

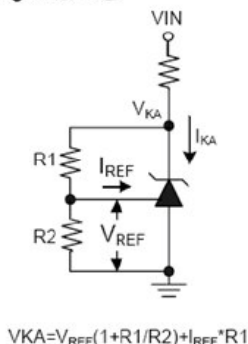
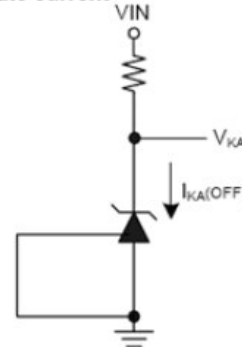


Fig3: Off state current





Application Circuit

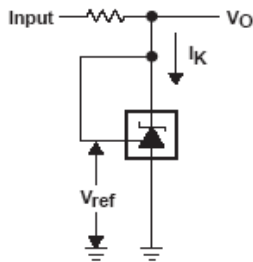


Figure 1. Test Circuit for  $V_{KA} = V_{ref}$ ,  
 $V_O = V_{KA} = V_{ref}$

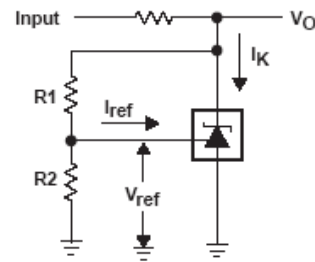


Figure 2. Test Circuit for  $V_{KA} > V_{ref}$ ,  
 $V_O = V_{KA} = V_{ref} \times (1 + R1/R2) + I_{ref} \times R1$

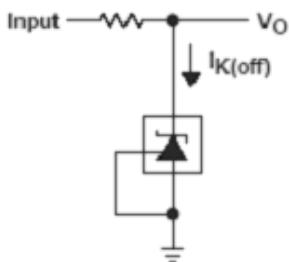


Figure 3. Test Circuit for  $I_{K(off)}$

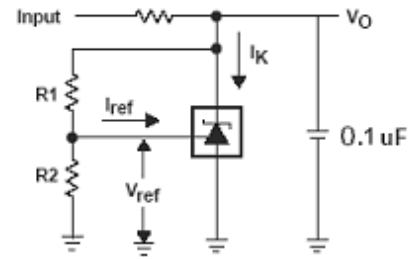


Figure 4. Test Circuit for  $V_{KA} > V_{ref}$ ,  
 $V_O = V_{KA} = V_{ref} \times (1 + R1/R2) + I_{ref} \times R1$

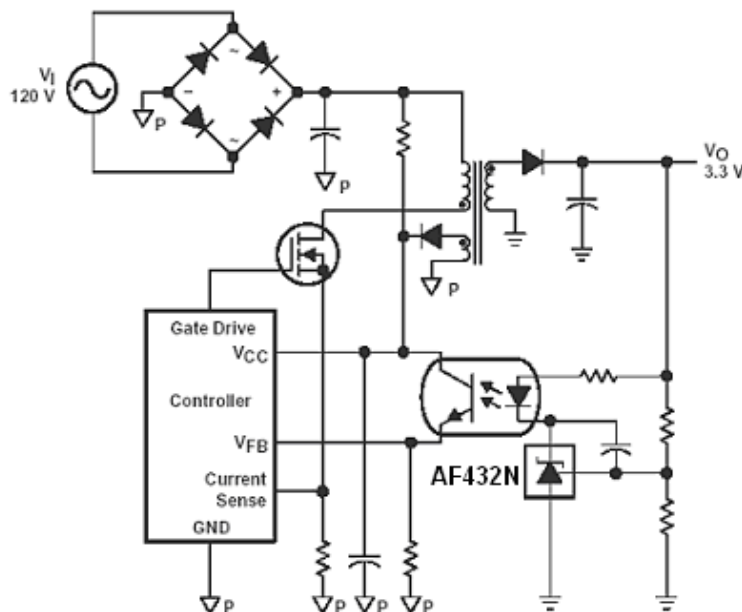
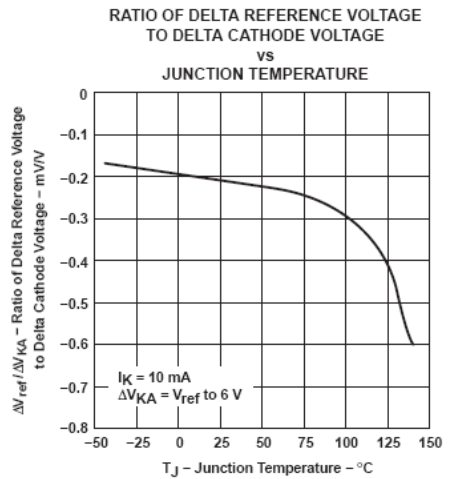
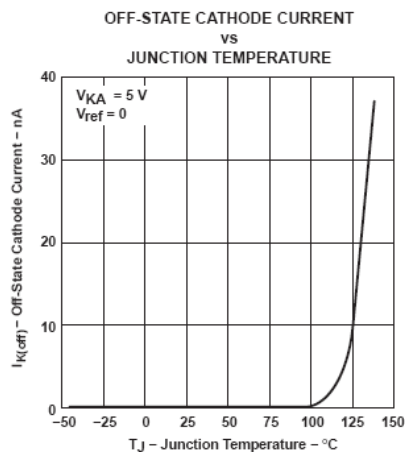
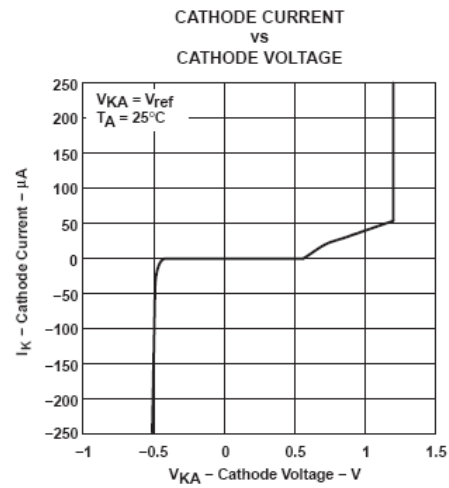
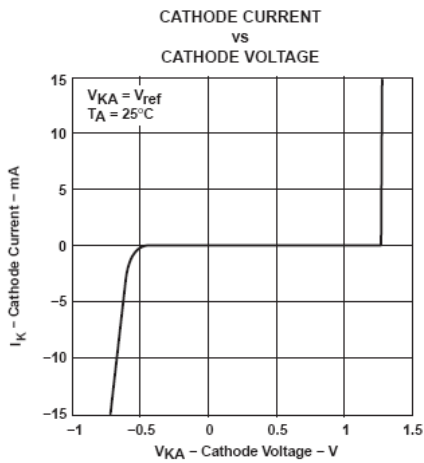
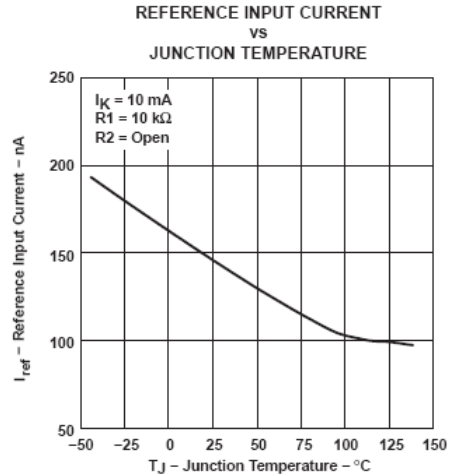
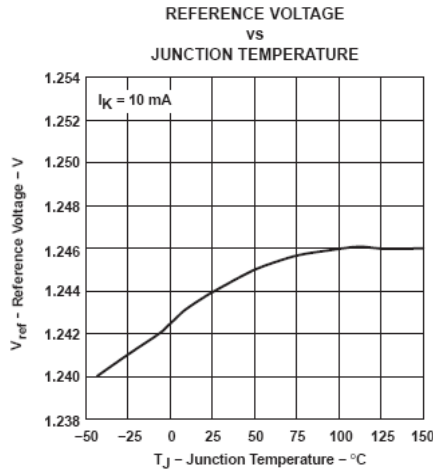


Figure 5. Flyback with isolation using AF432N as voltage reference and error amplifier

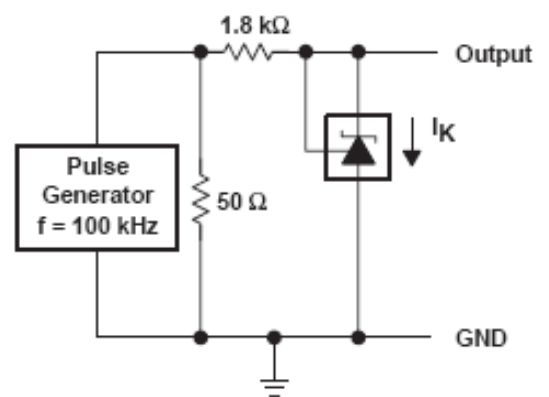
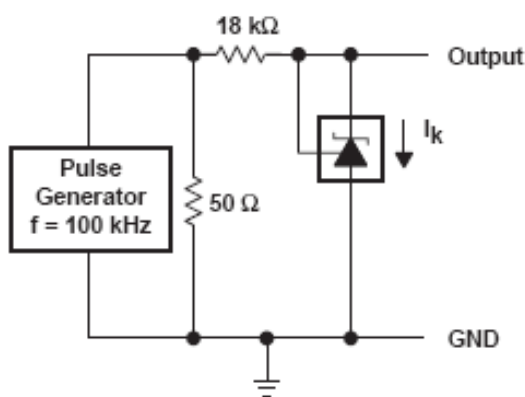
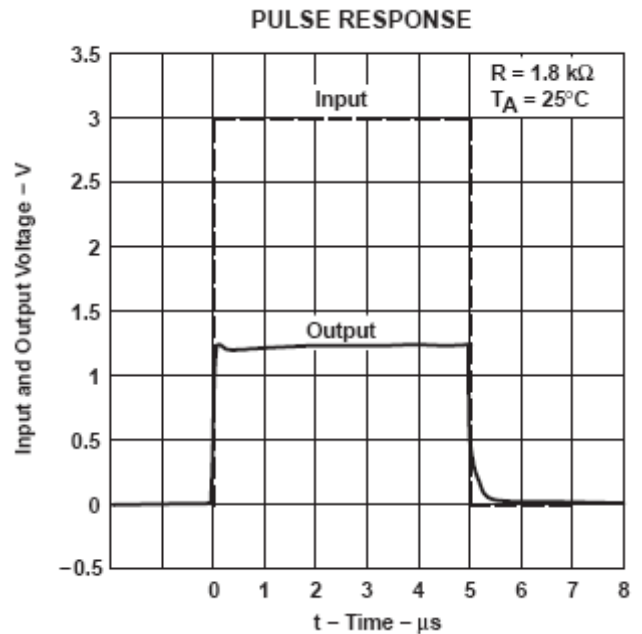
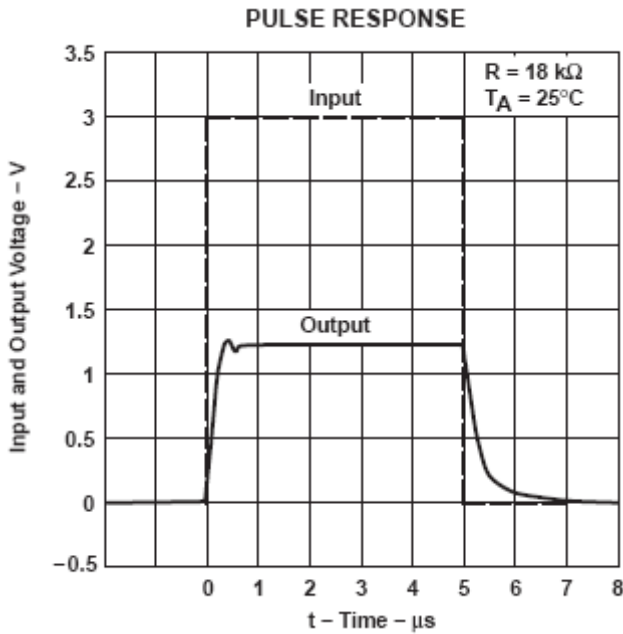


### Performance Characteristics





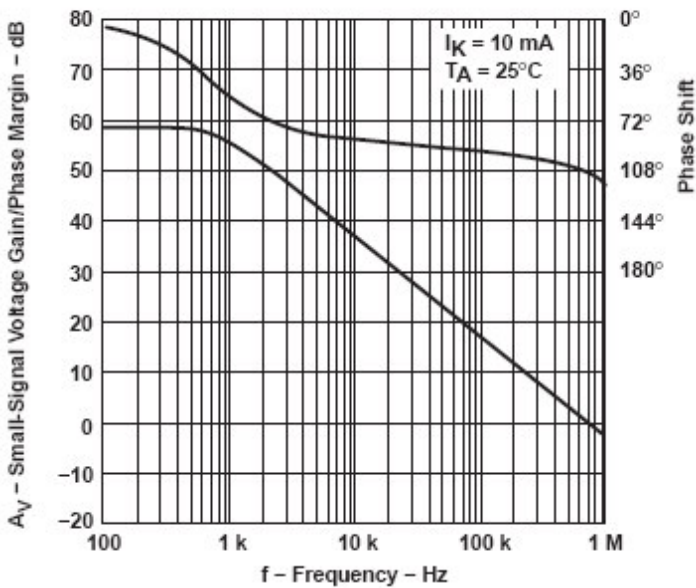
**Performance Characteristics**



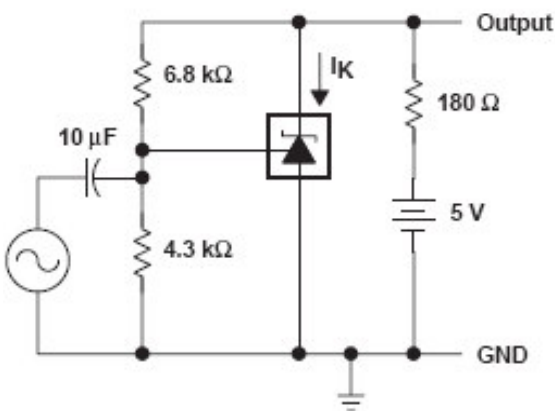
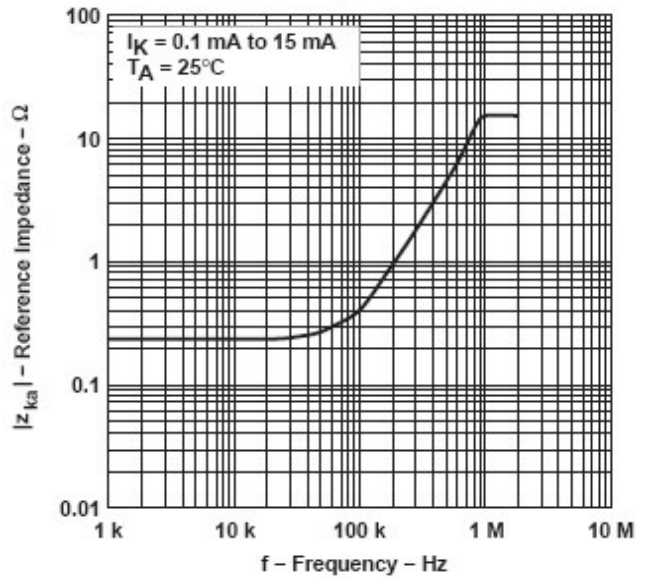


### Performance Characteristics

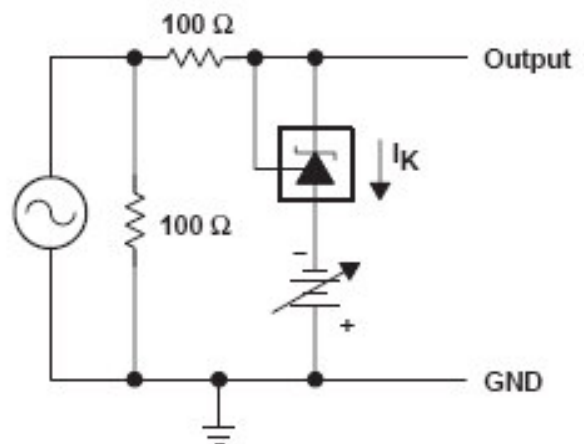
SMALL-SIGNAL VOLTAGE GAIN/PHASE MARGIN  
VS  
FREQUENCY



REFERENCE IMPEDANCE  
VS  
FREQUENCY



TEST CIRCUIT FOR VOLTAGE GAIN  
AND PHASE MARGIN

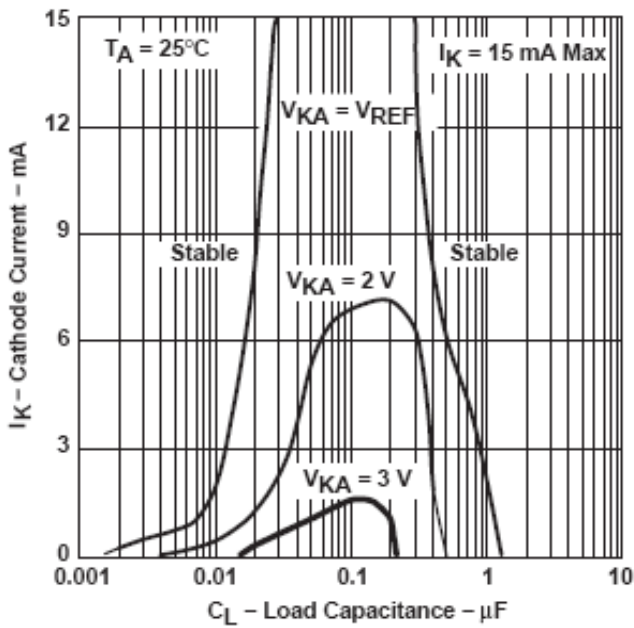


TEST CIRCUIT FOR REFERENCE IMPEDANCE



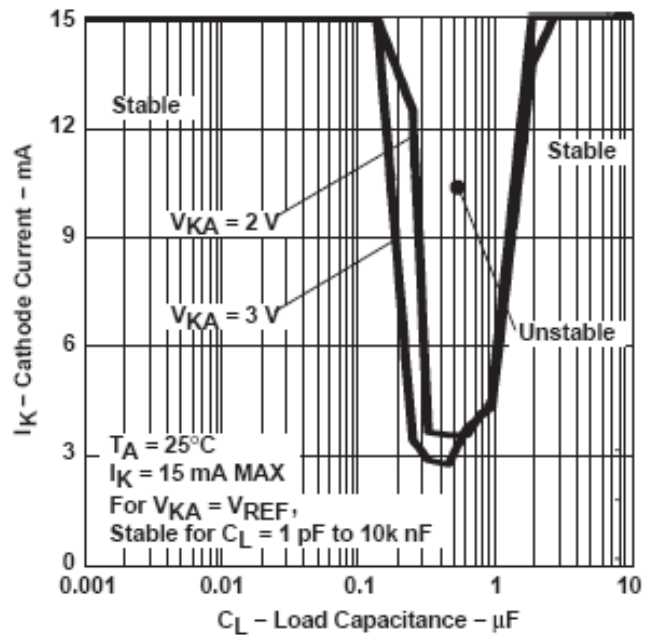
**Performance Characteristics**

**STABILITY BOUNDARY CONDITION**

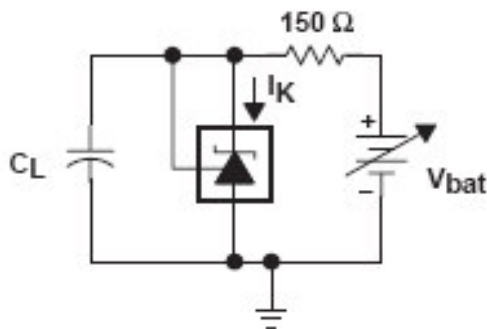


**(For 1.0%)**

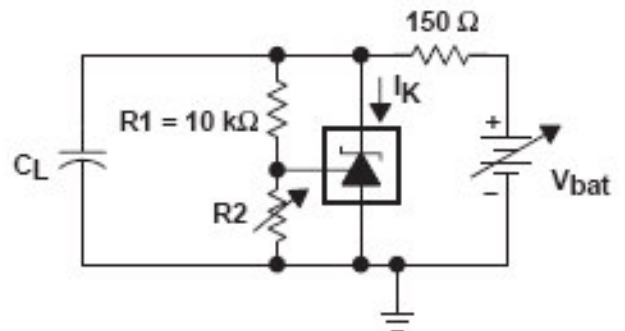
**STABILITY BOUNDARY CONDITION†**



**( For 0.5% )**



**TEST CIRCUIT FOR  $V_{KA} = V_{REF}$**

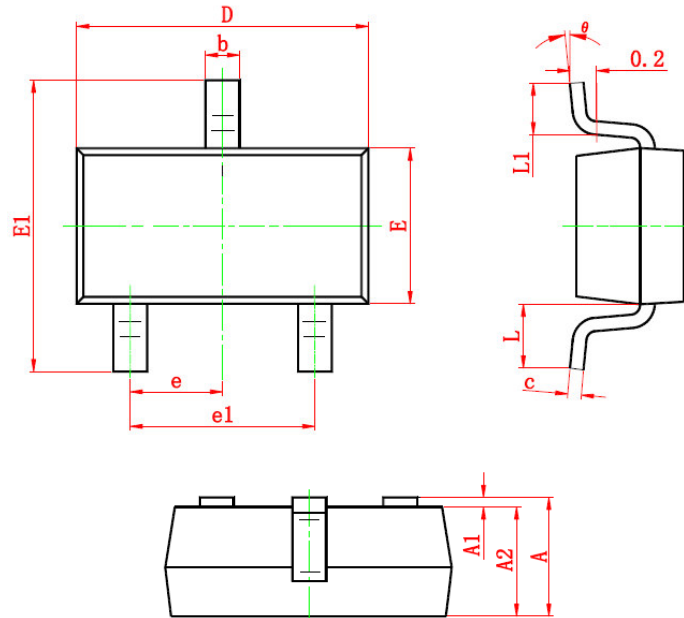


**TEST CIRCUIT FOR  $V_{KA} = 2 \text{ V}, 3 \text{ V}$**





**Package Information ( SOT-23 )**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.200	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.039
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	6°

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