Alfa-MOS Technology

AF432N

20V High Voltage Adjustable Precision Shunt Regulators

General Description

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

Features

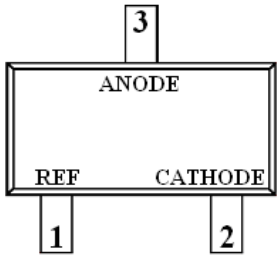
- Low voltage operation (down to 1.24V)
- Wide operating current range 80μA to 100Ma
- Low Dynamic output impedance 0.05 Ω typ.
- Assembly in SOT-23.

Application

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

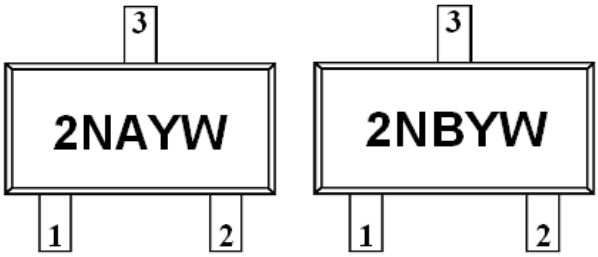
Pin Define

SOT-23

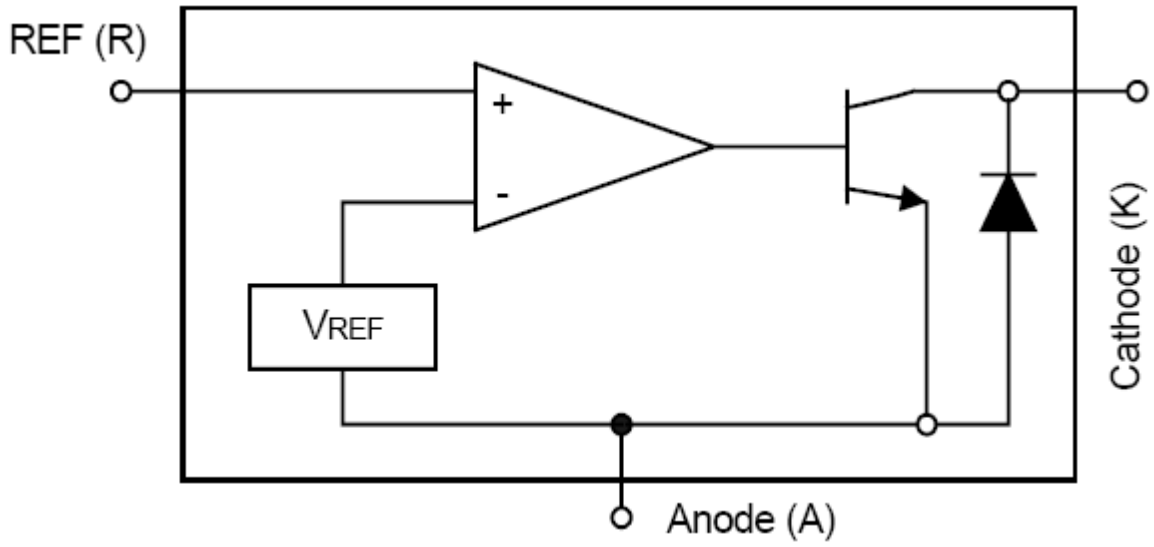


Marking Information

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℃ 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	℃
Storage Temperature Range	T_{STG}		-65 ~ +150	℃
Lead Temperature Range(Soldering 10sec.)	T_{SOL}		260	℃
Thermal Resistance	Θ_{JA}	SOT-23	206	℃/W
		TO-92	140	

Electrical Characteristics

(T_A=25℃ Unless otherwise noted)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Reference Voltage	V_{REF}	$V_Z = V_{REF}$, I_Z = 10Ma (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} = 10mA, T_A = -20~85℃ (Fig.1)			10	25	mV
Ratio of change in V_{REF} to change in Cathode voltage	$\Delta V_{REF} / \Delta V_{KA}$	I_{KA} = 10mA (Fig.2)	V_{KA} = 16V ~V_{REF}	-2.7	-1.0		mV / V
Reference Input Current	I_{REF}	R1=10KΩ , R2 = ∞ , IZ = 10mA			0.15	0.5	uA
I_{REF} Temp Deviation	$I_{REF(DEV)}$	TA=-40℃~+80℃ R1=10KΩ , R2 = ∞ , IZ = 10mA			0.1	0.4	uA
Off state Cathode Current	$I_{KA(OFF)}$	V_{KA} = 16V, V_{REF} = 0V (Fig.3)			0.13	15	uA
Dynamic output impedance	$\lvert Z_{KA} \rvert$	f < 1KHZ , $V_Z = V_{REF}$ I_Z = 100uA ~ 100mA (Fig.1)			0.05	0.15	Ω
Minimum Cathode Current	$I_{Z(MIN)}$	$V_Z = V_{REF}$(Fig.1)			0.02	0.08	mA

Testing Circuit

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

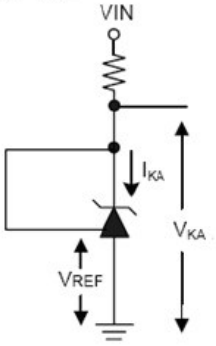
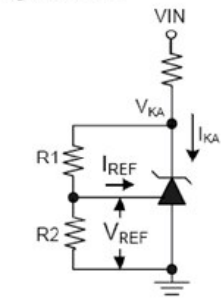
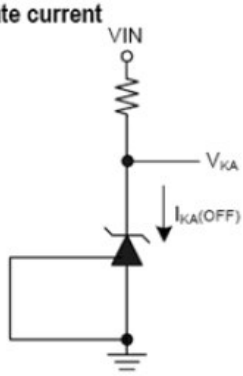


Fig2: $V_{KA}>V_{REF}$



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

Fig3: Off state current



Application Circuit

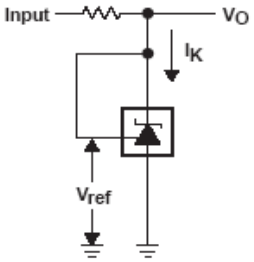


Figure 1. Test Circuit for $V_{KA} = V_{ref}$, $V_O = V_{KA} = V_{ref}$

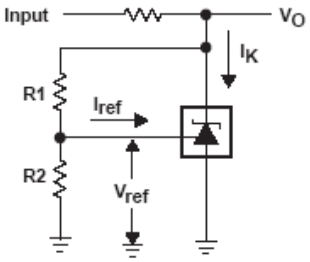


Figure 2. Test Circuit for $V_{KA} > V_{ref}$, $V_O = V_{KA} = V_{ref} \times (1 + R1/R2) + I_{ref} \times R1$

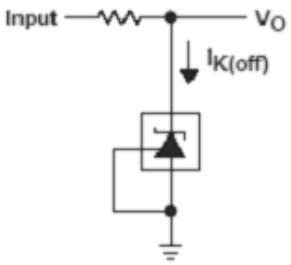


Figure 3. Test Circuit for $I_{K(off)}$

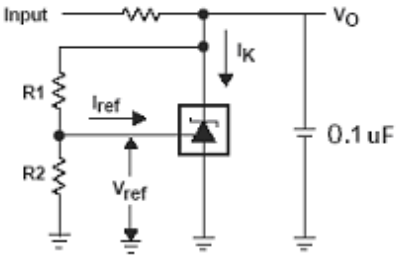


Figure 4. Test Circuit for $V_{KA} > V_{ref}$, $V_O = V_{KA} = V_{ref} \times (1 + R1/R2) + I_{ref} \times R1$

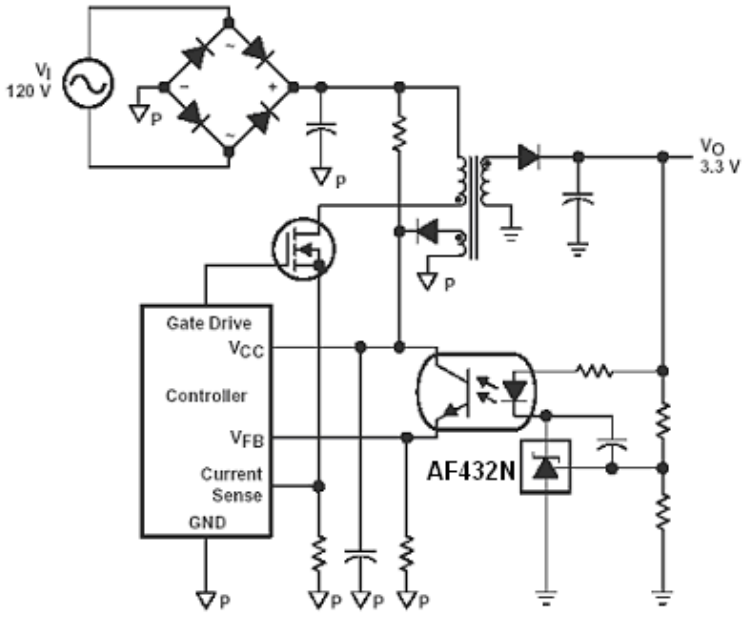
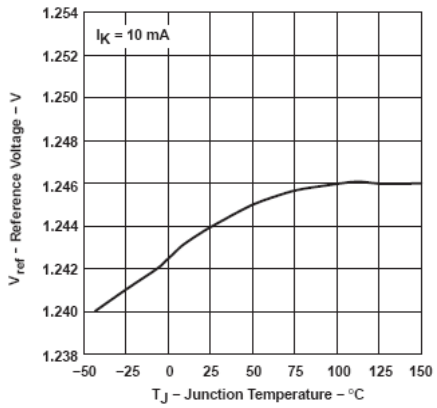


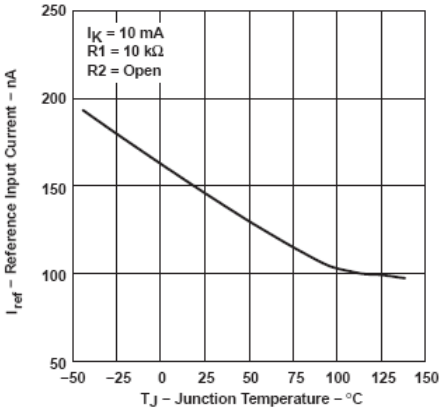
Figure 5. Flyback with isolation using AF432N as voltage reference and error amplifer

Performance Characteristics

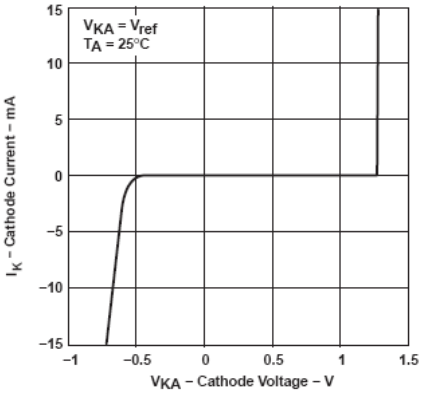
REFERENCE VOLTAGE
vs
JUNCTION TEMPERATURE



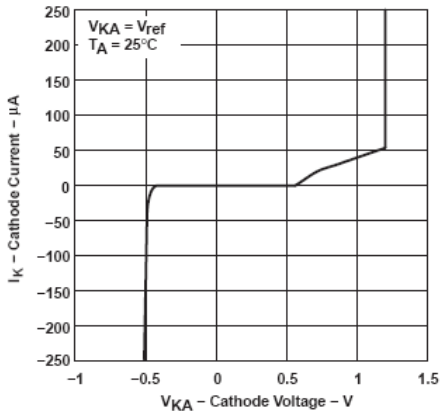
REFERENCE INPUT CURRENT
vs
JUNCTION TEMPERATURE



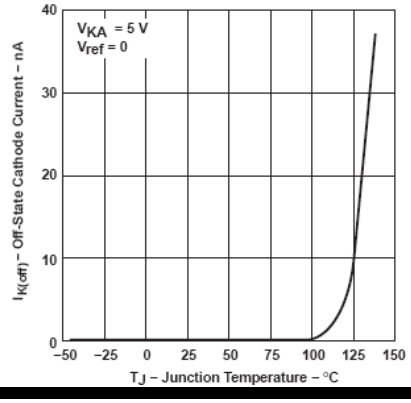
CATHODE CURRENT
vs
CATHODE VOLTAGE



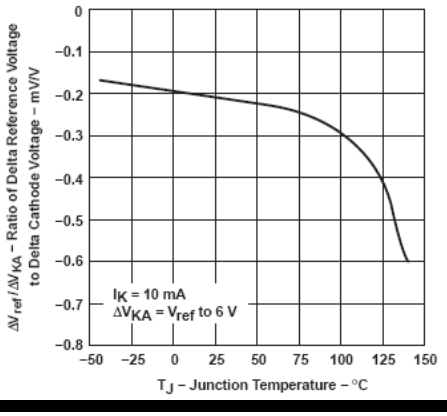
CATHODE CURRENT
vs
CATHODE VOLTAGE



OFF-STATE CATHODE CURRENT
vs
JUNCTION TEMPERATURE

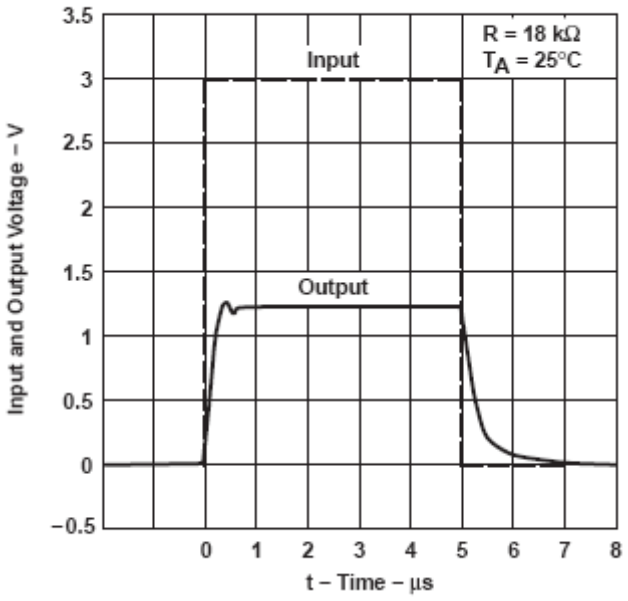


RATIO OF DELTA REFERENCE VOLTAGE
TO DELTA CATHODE VOLTAGE
vs
JUNCTION TEMPERATURE

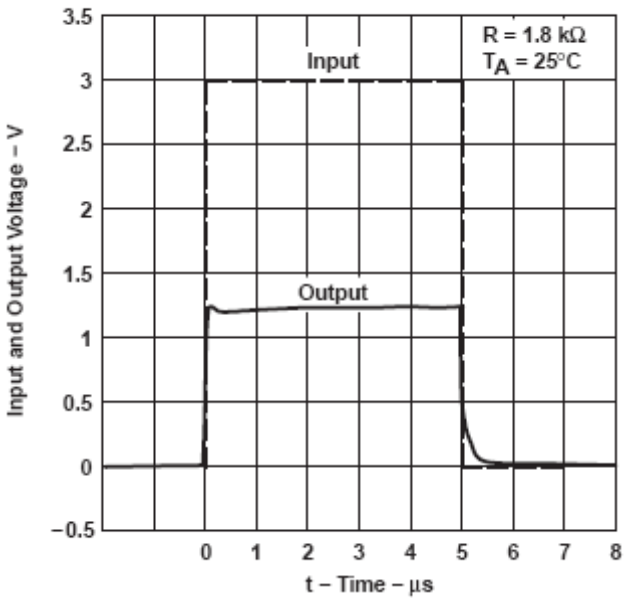


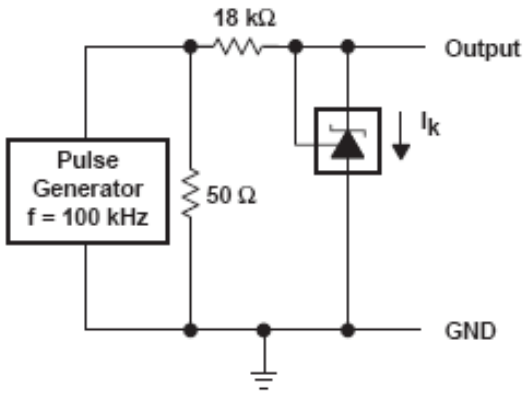
Performance Characteristics

PULSE RESPONSE

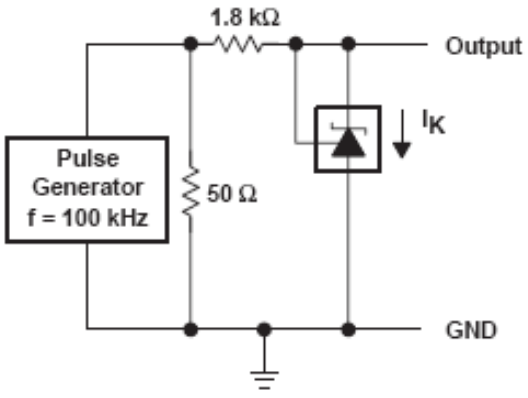


PULSE RESPONSE





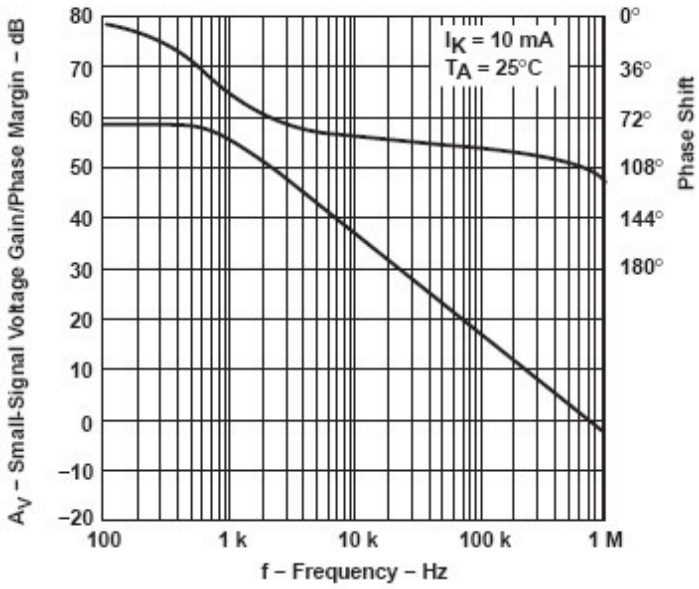
TEST CIRCUIT FOR PULSE RESPONSE



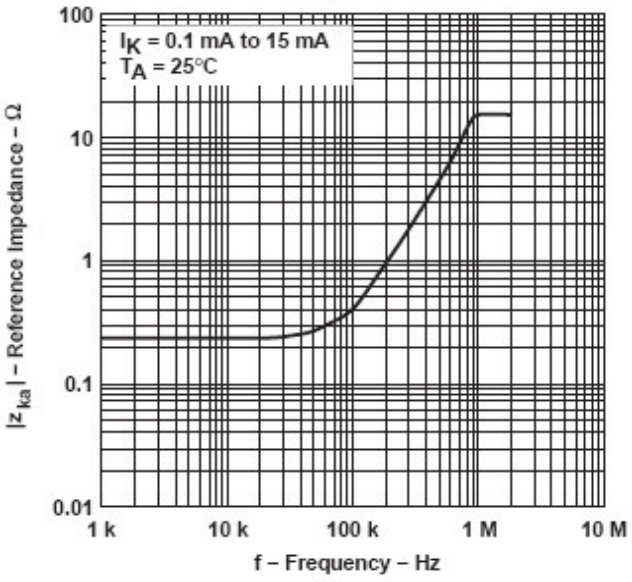
TEST CIRCUIT FOR PULSE RESPONSE

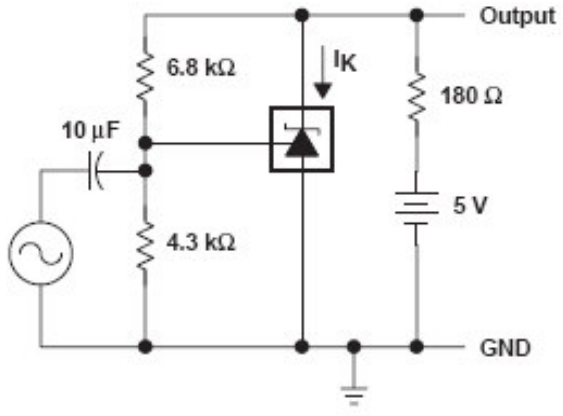
Performance Characteristics

SMALL-SIGNAL VOLTAGE GAIN/PHASE MARGIN
vs
FREQUENCY

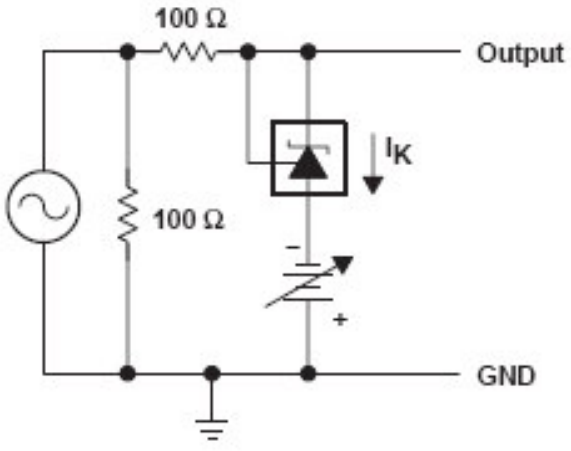


REFERENCE IMPEDANCE
vs
FREQUENCY





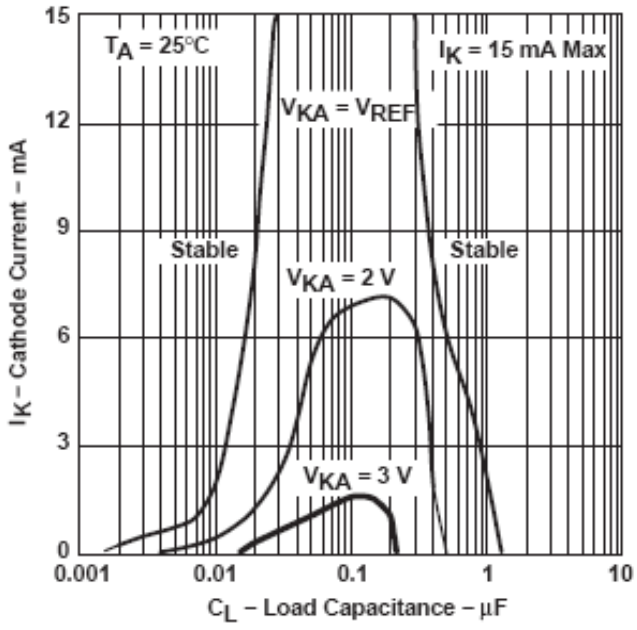
TEST CIRCUIT FOR VOLTAGE GAIN
AND PHASE MARGIN



TEST CIRCUIT FOR REFERENCE IMPEDANCE

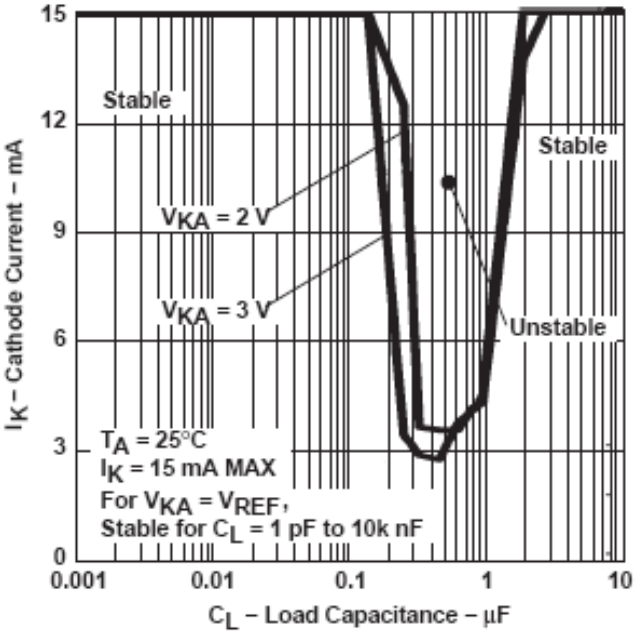
Performance Characteristics

STABILITY BOUNDARY CONDITION

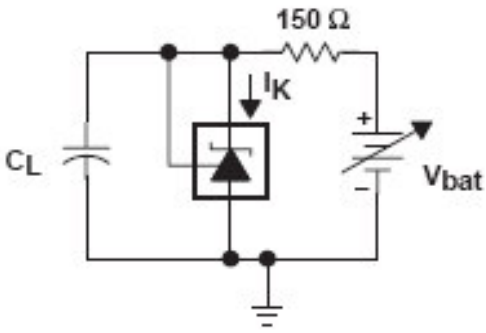


(For 1.0%)

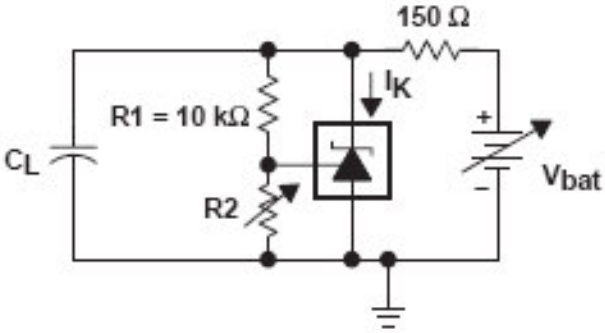
STABILITY BOUNDARY CONDITION‡



(For 0.5%)

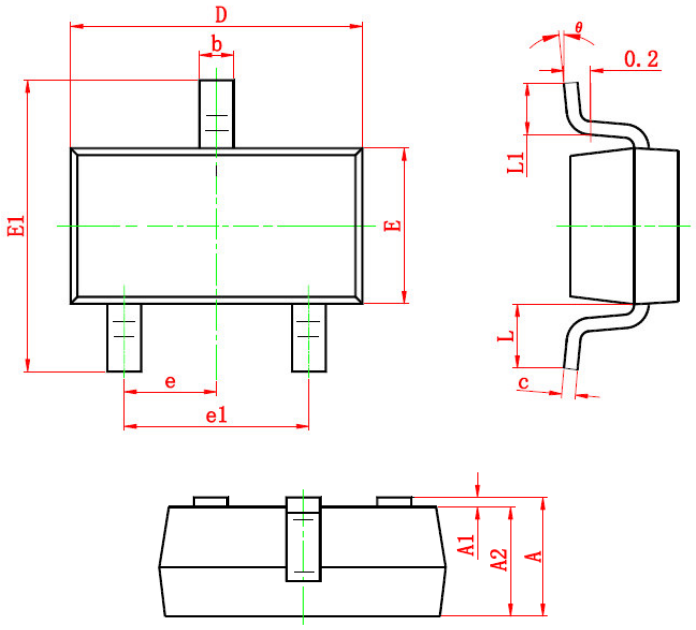


TEST CIRCUIT FOR $V_{KA} = V_{REF}$



TEST CIRCUIT FOR V_{KA} = 2 V, 3 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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