

DESCRIPTION

ST432 is low-voltage three-terminal adjustable voltage references, with specified thermal stability over applicable industrial and commercial temperature ranges. Output voltage can be set to any value between VREF (1.24V) and 20V with two external resistors. These devices have a typical output impedance of 0.25Ω. Active output circuitry provides a very sharp turn-on characteristic, making the ST432 excellent replacements for low-voltage Zener diodes in many applications, including onboard regulation and adjustable power supplies.

FEATURES

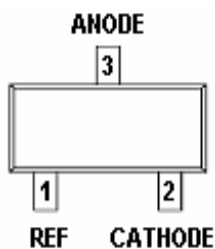
- Low-Voltage Operation down to 1.24 V
- Adjustable Output Voltage, $V_{OUT} = V_{REF}$ to 20 V
- Low Operational Cathode Current 80uA
- 0.25Ω Typical Output Impedance

APPLICATIONS

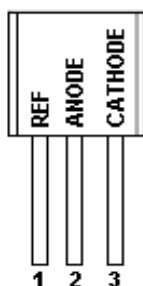
- Battery Power Equipment
- Linear Regulators
- Switch Power Supply
- Cellular Phone
- Digital Camera
- Computer Disk

PIN CONFIGURATION

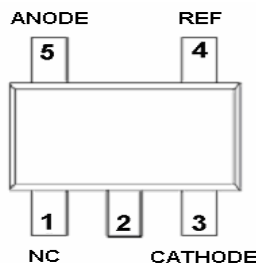
SOT-23



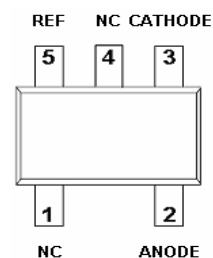
TO-92



SOT-23-5L

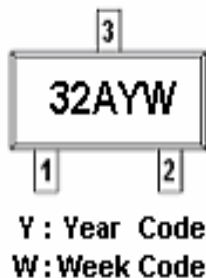


SOT-353 (SC-70)

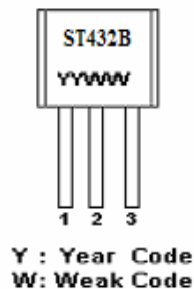


PART MARKING

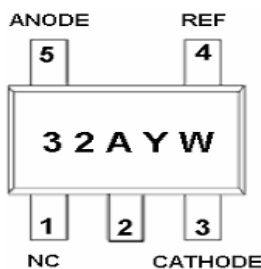
SOT-23



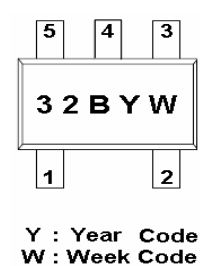
TO-92



SOT-23-5L



SOT-353 (SC-70)





ST432 

Adjustable Precision Shunt Regulator

PIN DESCRIPTION

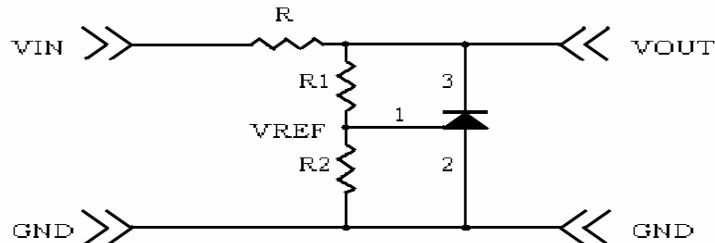
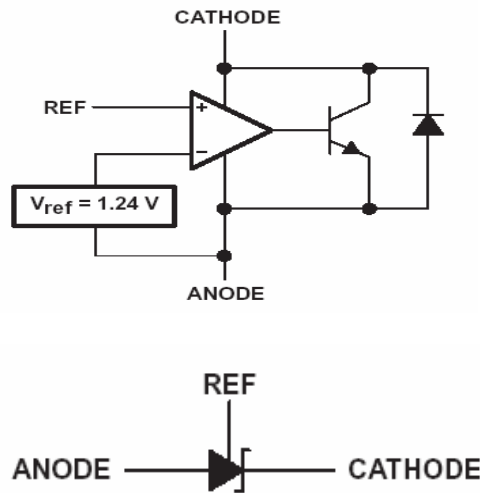
Pin	Symbol	Description
1	R	REF
2	C	CATHODE
3	A	ANODE

ORDERING INFORMATION

Part Number	Voltage Tolerance	Package	Part Marking
ST432AS23RG	0.5%	SOT-23	32AYW
ST432BS23RG	1.0%	SOT-23	32BYW
ST432AS25RG	0.5%	SOT-23-5L	32AYW
ST432BS25RG	1.0%	SOT-23-5L	32BYW
ST432BT92AG	1.0%	TO-92	SP432B
ST432AS35RG	0.5%	SOT-353	32AYW
ST432BS35RG	1.0%	SOT-353	32BYW

Week Code : A ~ Z (1 ~ 26) ; a ~ z (27 ~ 52)

ST432XS23RG : X: Tolerance; R: Tape Reel; A: Tape Ammo; G: Pb - Free

TYPICAL APPLICATION CIRCUIT

BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS ($T_A=25$ unless otherwise specified)

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}	TO-92	140
		SOT-23	206
		SOT-23-5L	206
		SOT-353	252
			/W

The IC has a protection circuit against static electricity. Do not apply high static electricity or high voltage that exceeds the performance of the protection circuit to the IC.

ELECTRICAL CHARACTERISTICS ($T_A=25^\circ\text{C}$, unless otherwise specified)

SP432AS23RG & SP432AS25RG & SP432AS35RG							
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Reference Voltage for 432A	V_{REF}	$V_Z = V_{REF}$ $I_Z = 10\text{mA}$	$T_A=25$	1.234	1.24	1.246	V
			$T_A=-40 \sim +80$	1.222		1.258	
Reference Voltage for 432B	V_{REF}	$V_Z = V_{REF}$ $I_Z = 10\text{mA}$	$T_A=25$	1.228	1.24	1.252	V
			$T_A=-40 \sim +80$	1.215		1.265	
V_{REF} Temp Deviation	V_{DEV}	$T_A=-40 \sim +80$ $V_Z = V_{REF}, I_Z = 10\text{mA}$		10	25	mV	
Ratio of change in V_{REF} to change in Cathode voltage	$\Delta V_{REF} / \Delta V_Z$	$I_Z = 10\text{mA}$ $\Delta V_Z = 16\text{V} \sim V_{REF}$		-1.0	-2.7	mV/V	
Reference Input Current	I_{REF}	$R_1=10\text{K}\Omega, R_2=\infty, I_Z=10\text{mA}$		0.15	0.5	μA	
I_{REF} Temp Deviation	$I_{REF(DEV)}$	$T_A=-40 \sim +80$ $R_1=10\text{K}\Omega, R_2=\infty, I_Z=10\text{mA}$		0.1	0.4	μA	
Off state Cathode Current	$I_{Z(OFF)}$	$V_{REF} = 0\text{V}$	$V_Z = 6\text{V}$		0.5	1.0	μA
			$V_Z = 12\text{V}$				
Dynamic output impedance	R_Z	$f < 1\text{KHZ}, V_Z = V_{REF}$ $I_Z = 1\text{mA} \sim 100\text{mA}$		0.25	0.4	Ω	
Minimum Operation Current	$I_{Z(MIN)}$	$V_Z = V_{REF}$		30	80	μA	

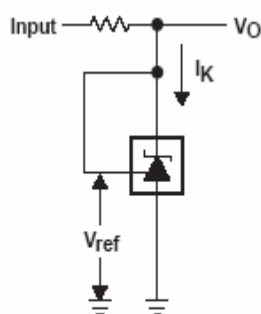
APPLICATION CIRCUIT


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

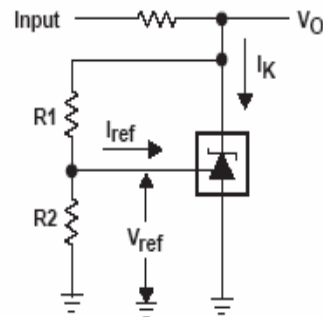


Figure 2. Test Circuit for $V_{KA} > V_{ref}$.
 $V_O = V_{KA} = V_{ref} \times (1 + R_1/R_2) + I_{ref} \times R_1$

APPLICATION CIRCUIT

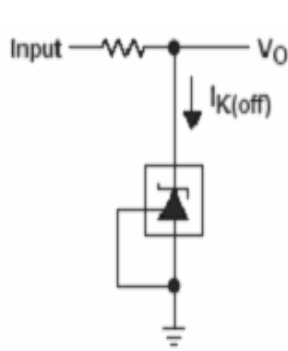


Figure 3. Test Circuit for $I_{K(off)}$

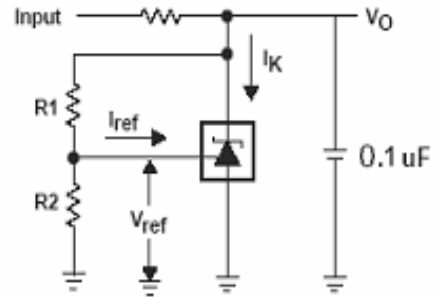


Figure 4. Test Circuit for $V_{KA} > V_{ref}$,
 $V_O = V_{KA} = V_{ref} \times (1 + R1/R2) + I_{ref} \times R1$

To improve the stability of output voltage, a 0.1uF capacitor is recommended between cathodes to anode

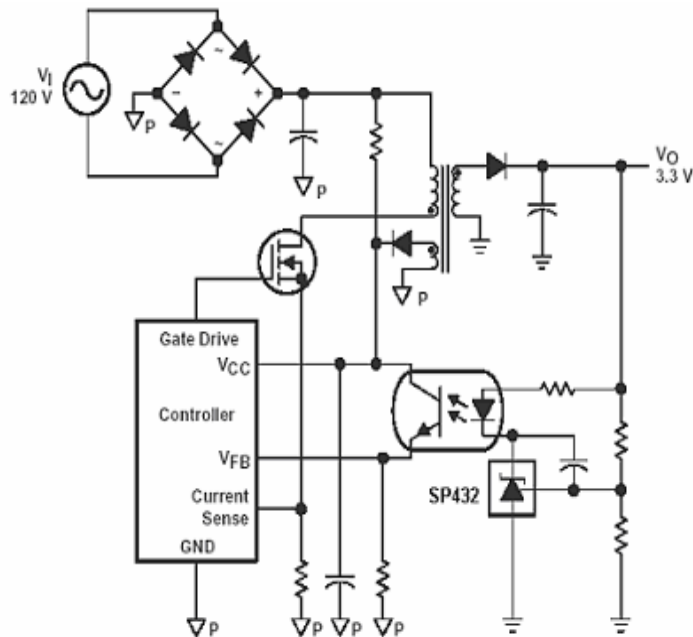
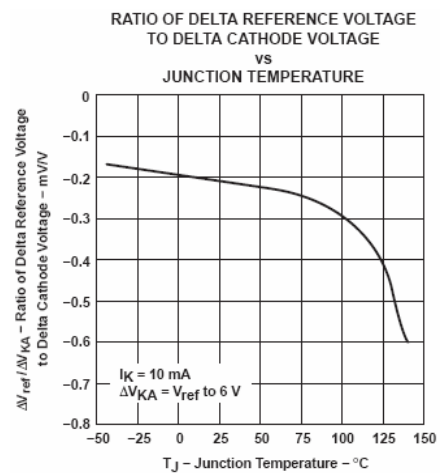
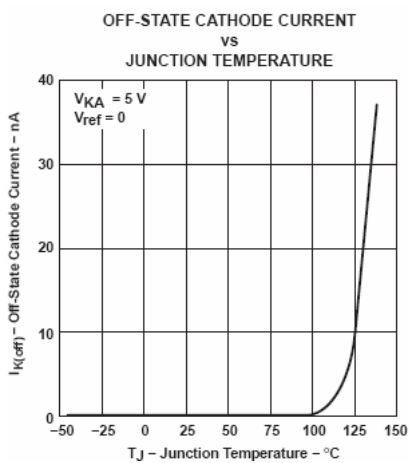
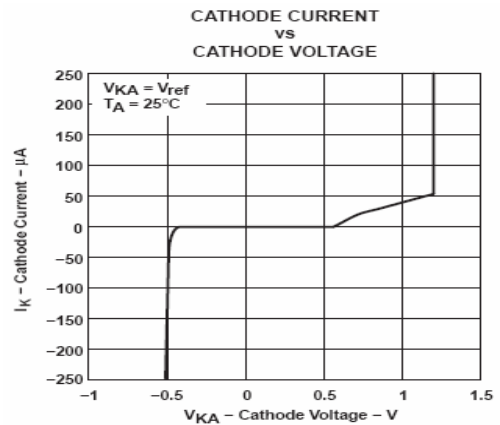
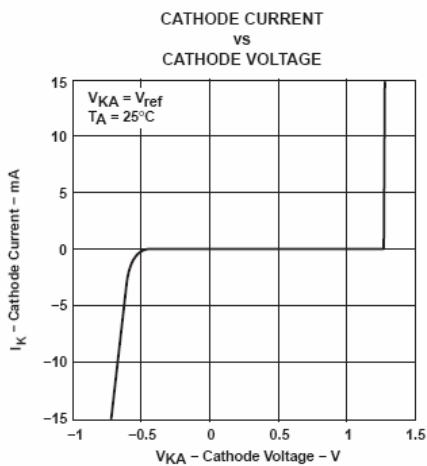
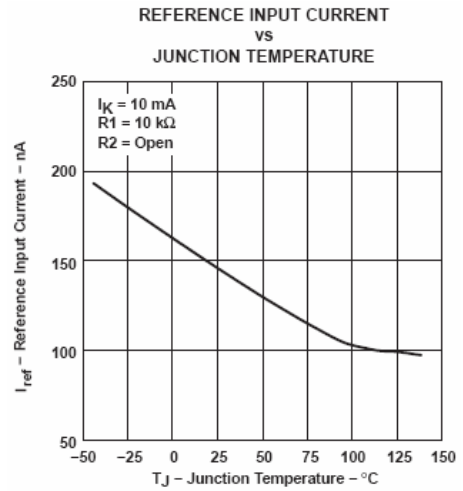
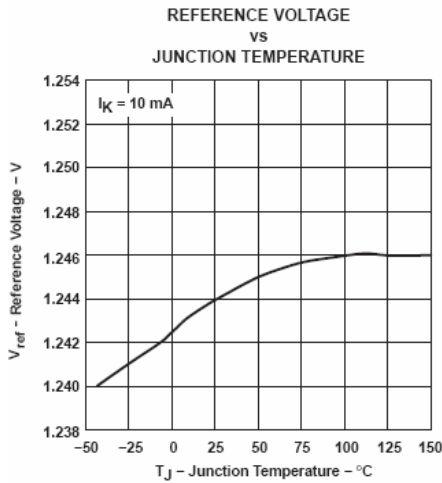
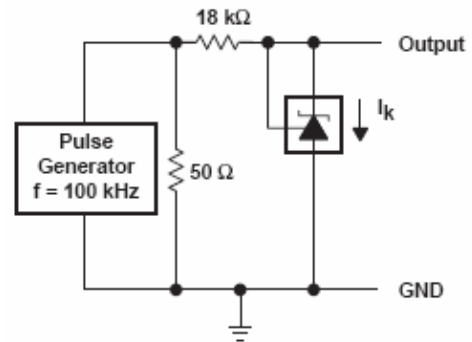
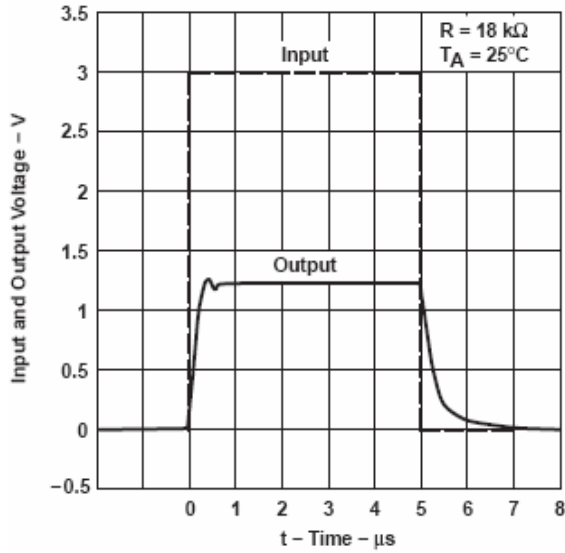


Figure 5. Flyback with isolation using SP432 as voltage reference and error amplifier

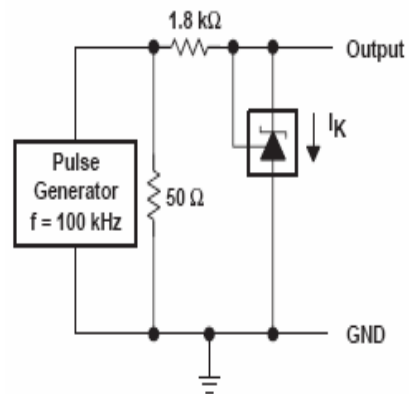
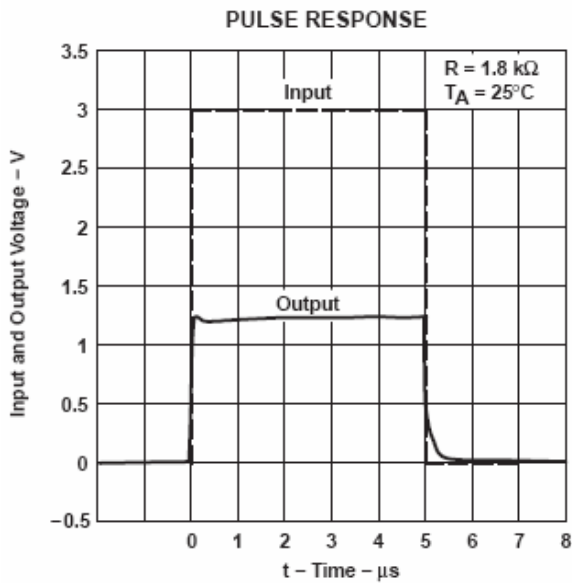
PERFORMANCE CHARACTERISTICS



PERFORMANCE CHARACTERISTICS
PULSE RESPONSE



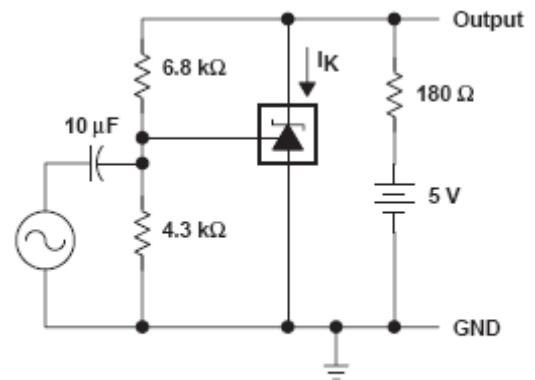
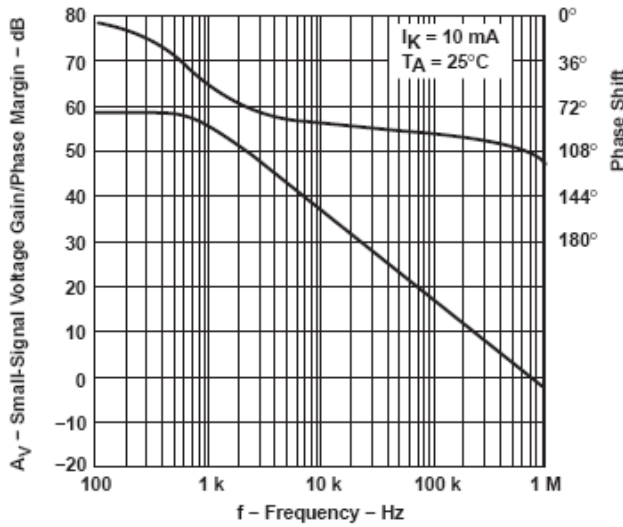
TEST CIRCUIT FOR PULSE RESPONSE



TEST CIRCUIT FOR PULSE RESPONSE

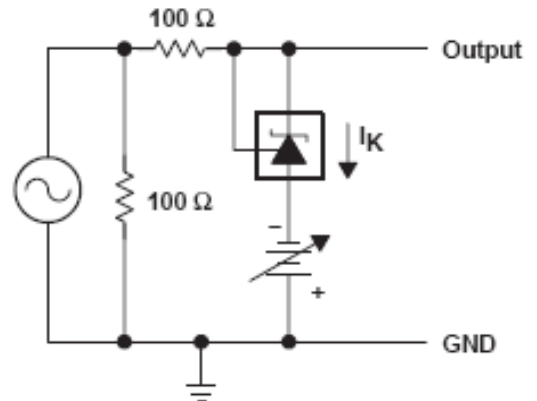
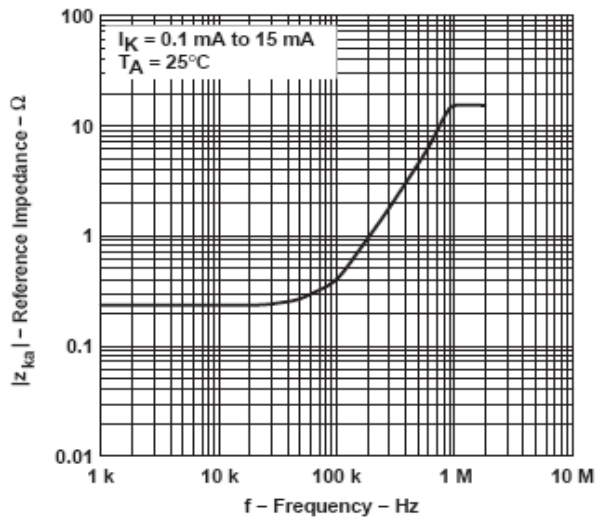
PERFORMANCE CHARACTERISTICS

**SMALL-SIGNAL VOLTAGE GAIN/PHASE MARGIN
VS
FREQUENCY**



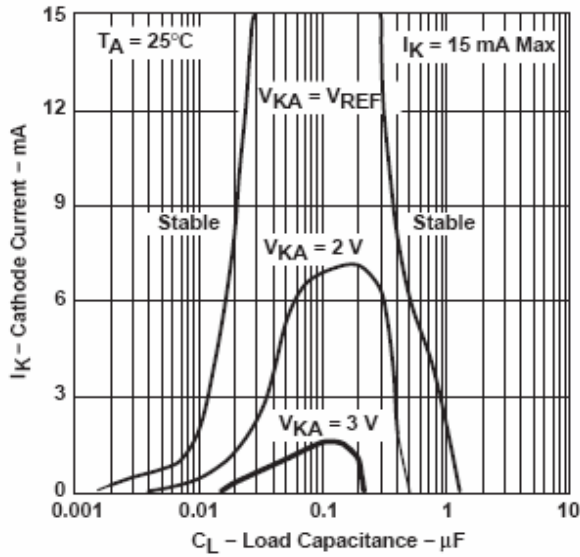
**TEST CIRCUIT FOR VOLTAGE GAIN
AND PHASE MARGIN**

**REFERENCE IMPEDANCE
VS
FREQUENCY**

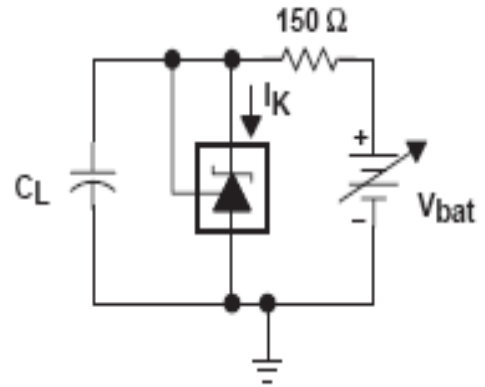


PERFORMANCE CHARACTERISTICS

STABILITY BOUNDARY CONDITION

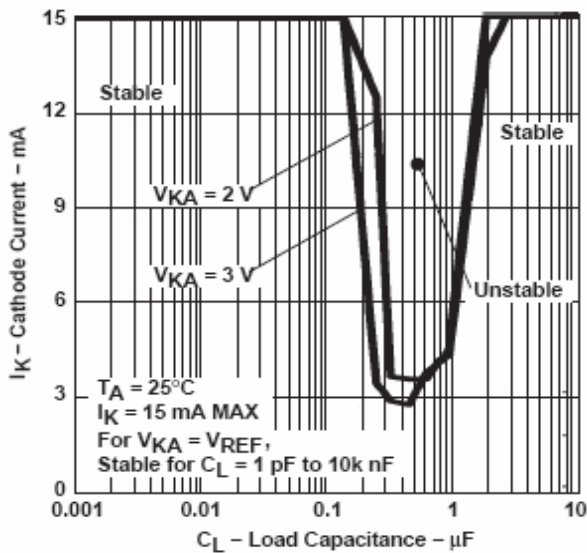


(For 1.0%)

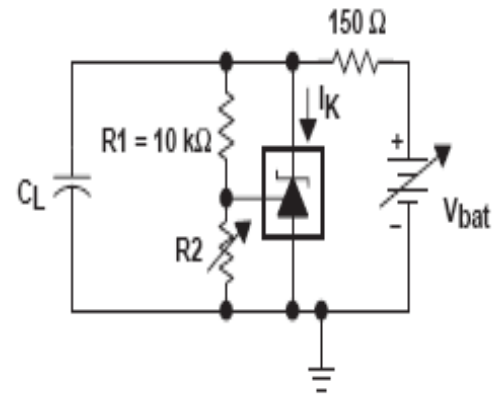


TEST CIRCUIT FOR $V_{KA} = V_{REF}$

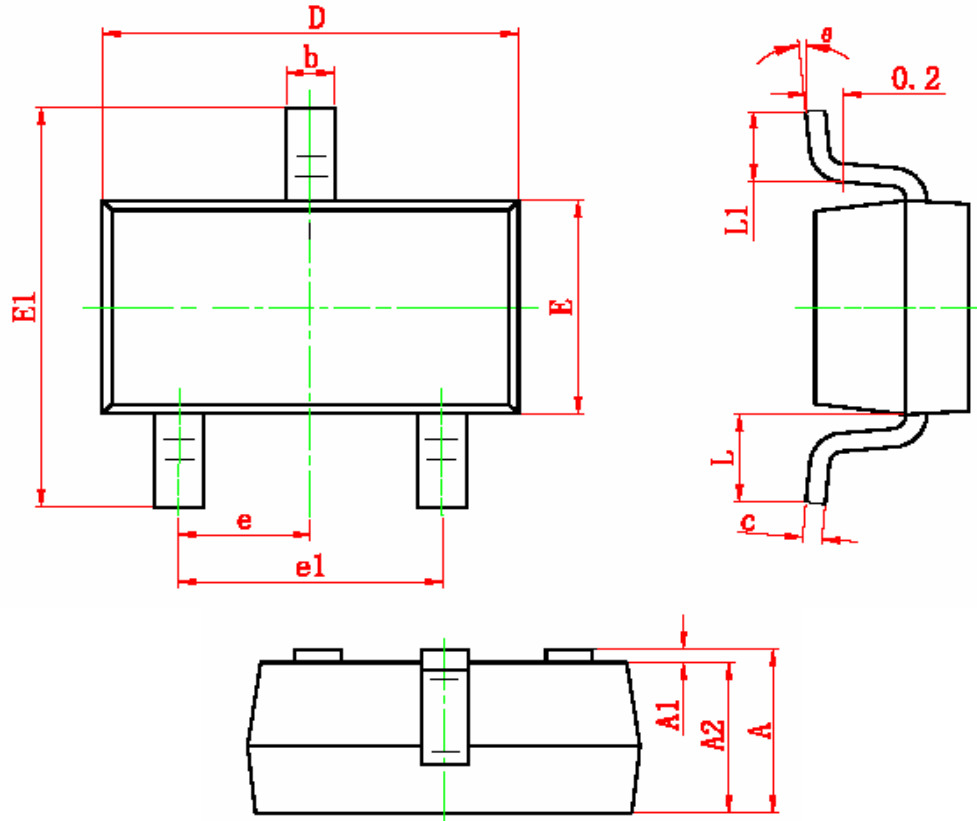
STABILITY BOUNDARY CONDITION†



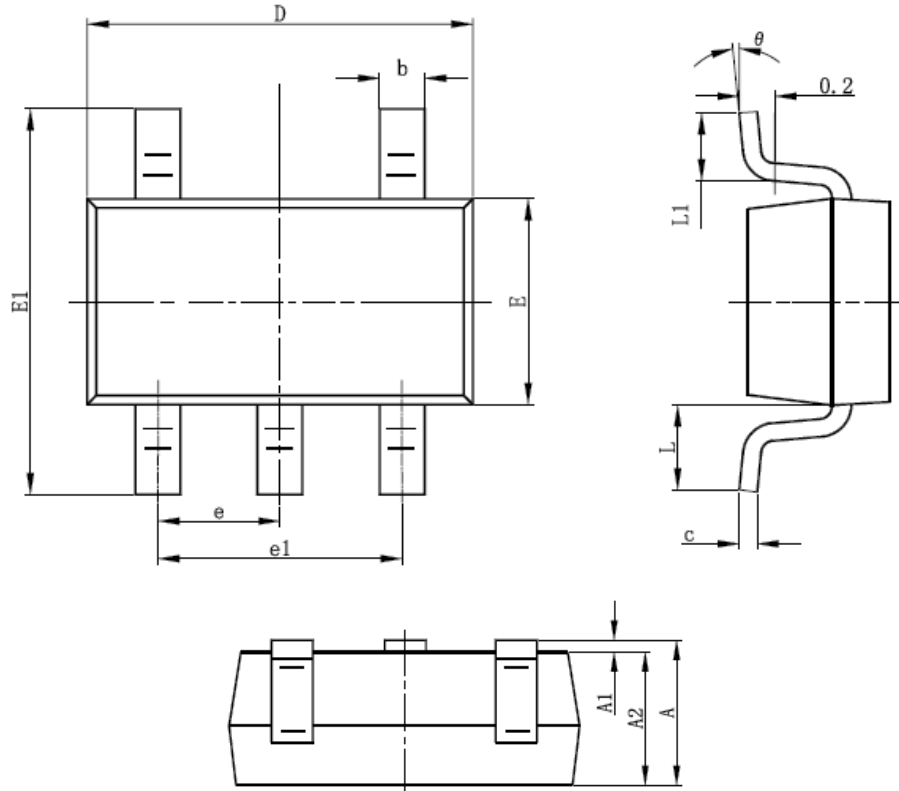
(For 0.5%)



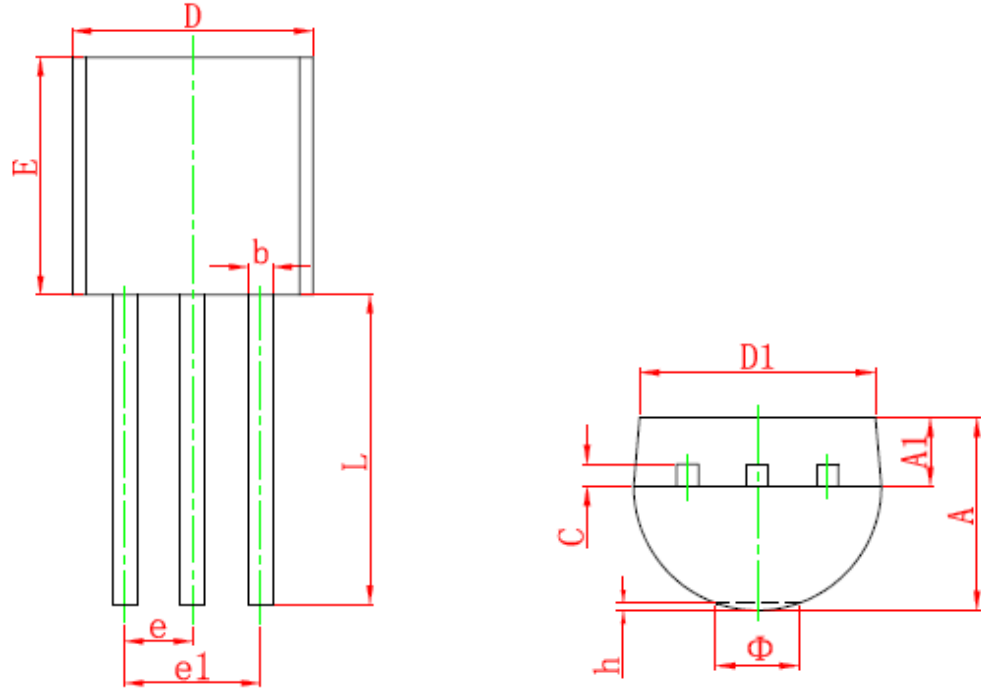
TEST CIRCUIT FOR $V_{KA} = 2V, 3V$

SOT-23 PACKAGE OUTLINE


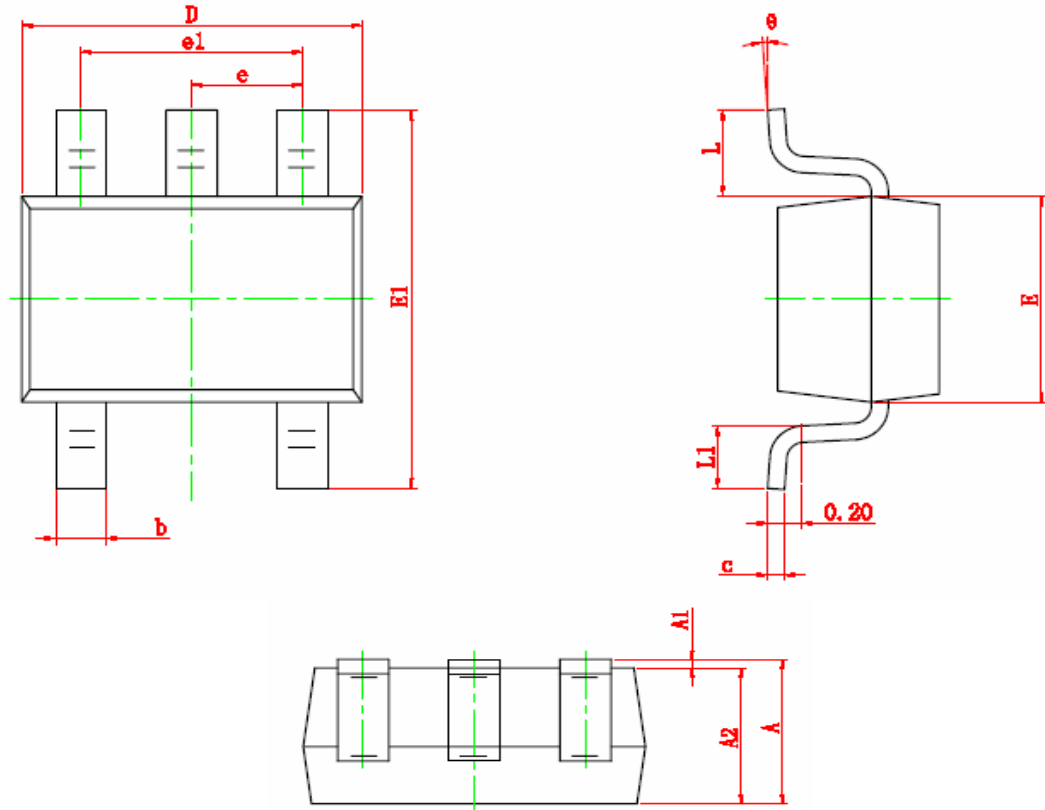
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.200	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.039
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 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°

SOT-23-5L PACKAGE OUTLINE


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

TO-92 PACKAGE OUTLINE


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

SOT-353 PACKAGE OUTLINE


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP		0.026 TYP	
e1	1.200	1.400	0.047	0.055
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°