



General Description

The AF431 is high-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 (2.5V) and 36V 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 AF431 excellent replacements for low-voltage Zener diodes in many applications, including onboard regulation and adjustable power supplies.

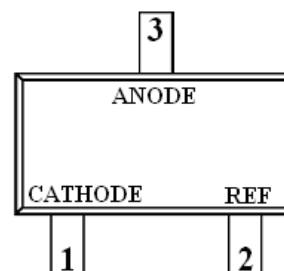
Features

- ◆ Low Output Noise
- ◆ Adjustable Output Voltage, $V_O = V_{ref}$ to 36 V
- ◆ Low Operational Cathode Current
- ◆ 0.2Ω Typical Output Impedance

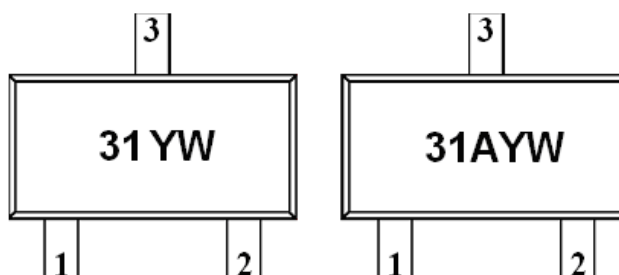
Application

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

Pin Define SOT-23

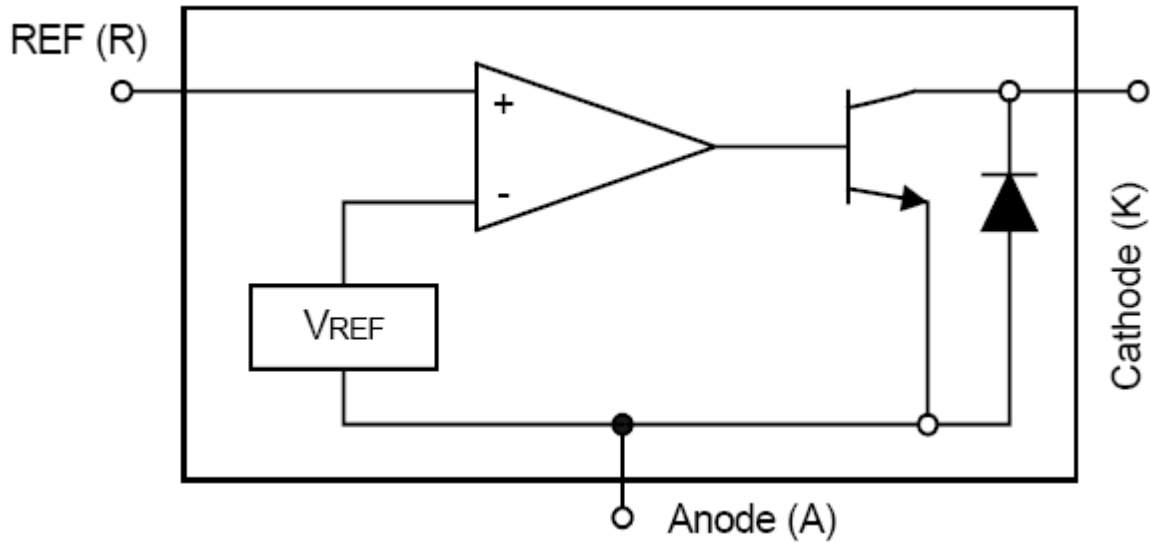


Marking Information SOT-23





Block Diagram



Pin Description (SOT-23)

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

Ordering Information

Part Number	Voltage Tolerance	Package	Part Marking	Unit	Quantity
AF431S23RG	0.4%	SOT-23	31YW	Tape & Reel	3000 EA
AF431AS23RG	0.5%	SOT-23	31AYW	Tape & Reel	3000 EA

- ※ Week Code : A ~ Z (1 ~ 26) ; a ~ z (27 ~ 52)
- ※ AF431S23RG : 7" Tape Reel ; Pb- Free ; Halogen- Free
- ※ AF431AS23RG : 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	36	V
Continuous Cathode Current	I_Z	250	mA
Reference Current	I_{REF}	10	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	Θ_{JA}	SOT-23	$^{\circ}\text{C}/\text{W}$

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)	AF431S23RG(0.4%) 2.49 AF431AS23RG(0.5%) 2.487	2.5 2.5	2.51 2.512	V
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)		6	20	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)	$V_{KA} = 10\text{V} \sim V_{REF}$ $V_{KA} = 36\text{V} \sim 10\text{V}$	-2.0 -2.0	-1.2 -1.0	mV / V
Reference Input Current	I_{REF}	$R_1=10\text{K}\Omega, R_2 = \infty, I_{KA}= 10\text{mA}$ (Fig.2)		1.5	3.5	μA
I_{REF} Temp Deviation	$I_{REF(DEV)}$	$R_1=10\text{K}\Omega, R_2 = \infty, I_{KA}= 10\text{mA}$ $T_A = -20\sim 85^{\circ}\text{C}$ (Fig.2)		0.4	1.2	μA
Off state Cathode Current	$I_{KA(OFF)}$	$V_{KA} = 36\text{V}, V_{REF} = 0\text{V}$ (Fig.3)		0.1	1	μA
Dynamic output impedance	$I_{Z_{KA}}$	$f < 1\text{KHZ}, V_Z = V_{REF}$ $I_Z = 1\text{mA} \sim 100\text{mA}$ (Fig.1)		0.2	0.5	Ω
Minimum Cathode Current	$I_{Z(MIN)}$	$V_Z = V_{REF}$ (Fig.1)		0.2	0.5	mA

Testing Circuit

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

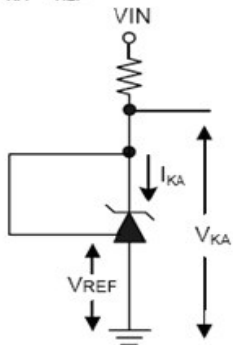


Fig2: $V_{KA}>V_{REF}$

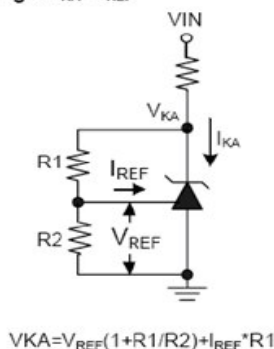
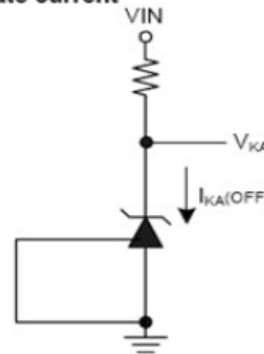
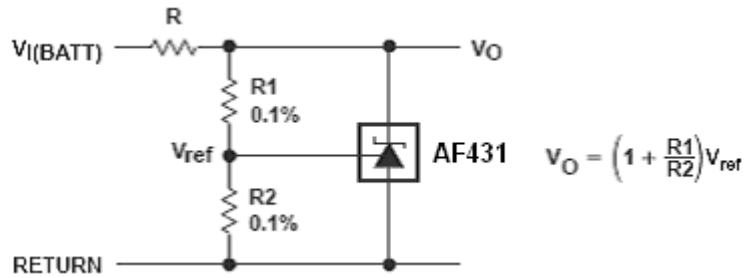


Fig3: Off state current

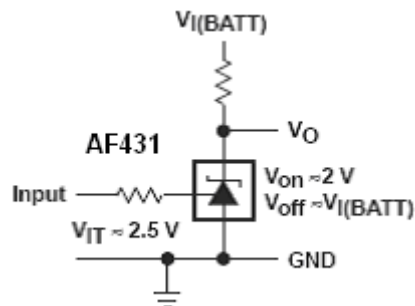




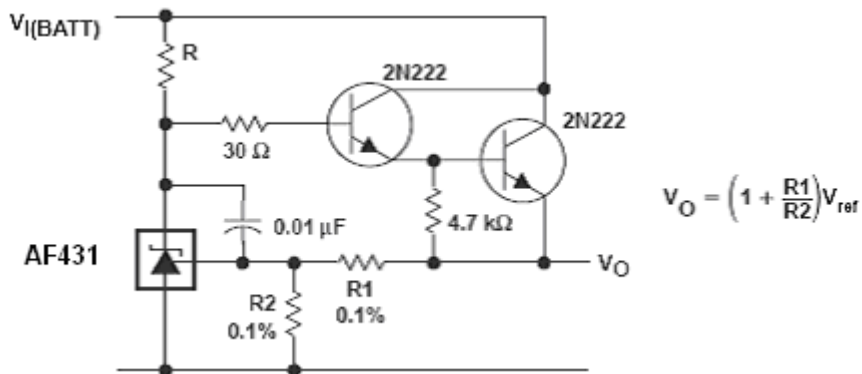
Application Circuit



Shunt Regulator



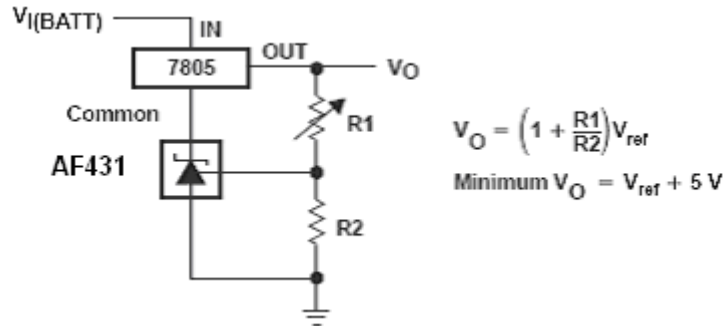
Single-Supply Comparator With Temperature-Compensated Threshold



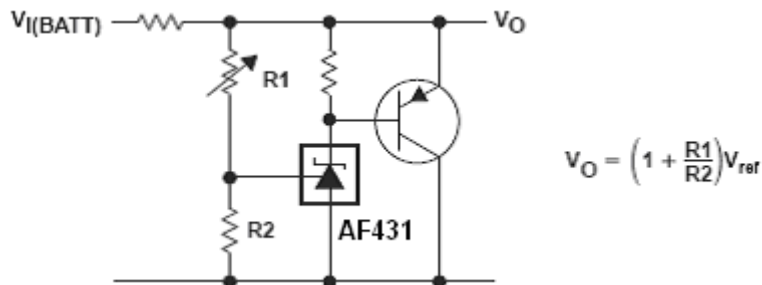
Precision High-Current Series Regulator



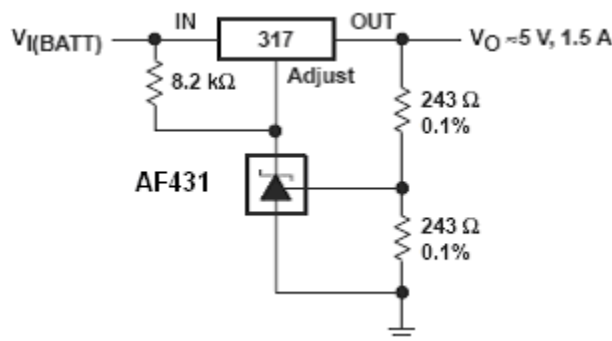
Application Circuit



Output Control of a Three-Terminal Fixed Regulator



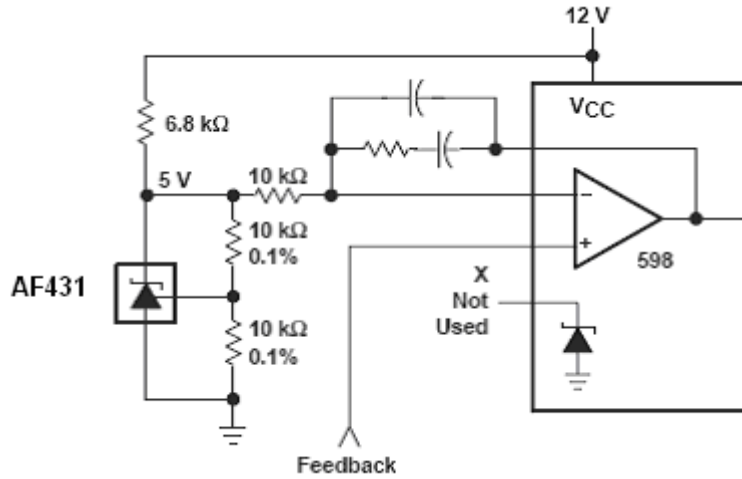
High-Current Shunt Regulator



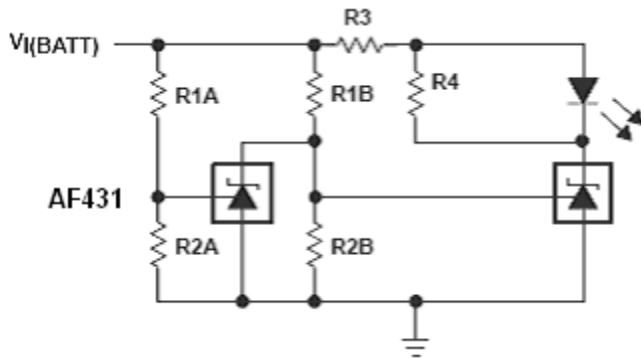
Precision 5-V 1.5-A Regulator



Application Circuit



PWM Converter With Reference

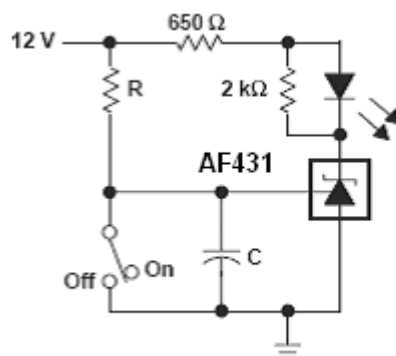


$$\text{Low Limit} = \left(1 + \frac{R1B}{R2B}\right) V_{ref}$$

$$\text{High Limit} = \left(1 + \frac{R1A}{R2A}\right) V_{ref}$$

LED on When Low Limit < V_{I(BATT)} < High Limit

Voltage Monitor

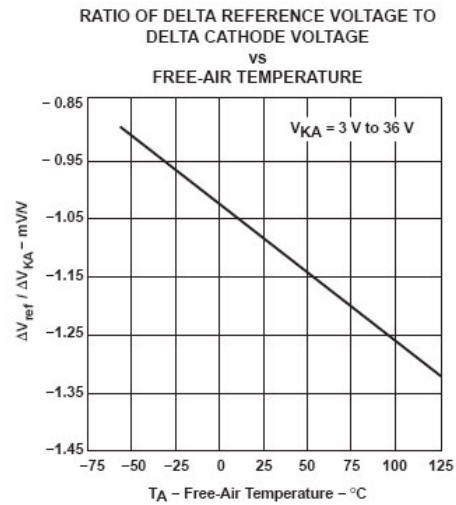
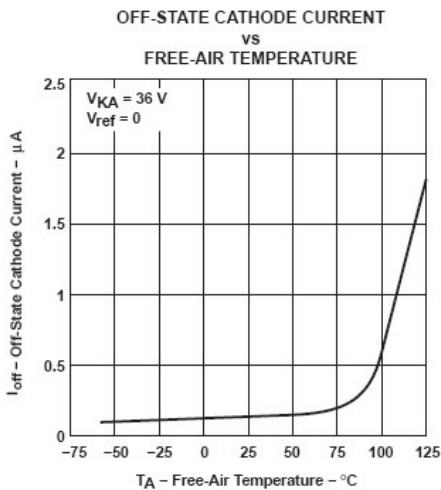
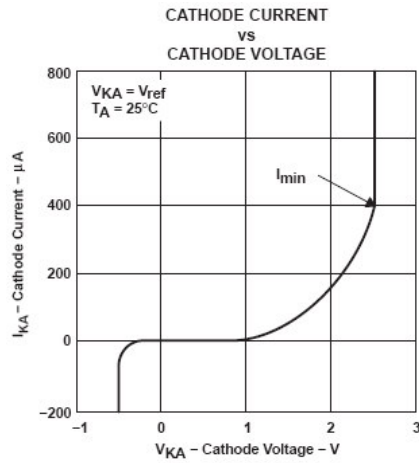
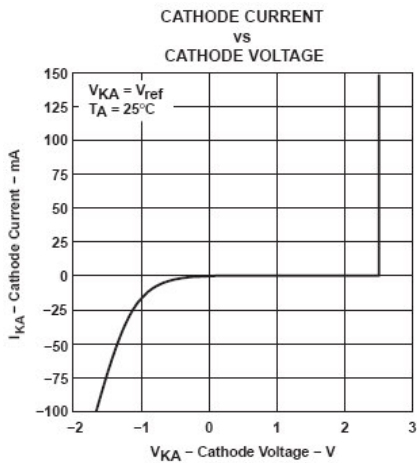
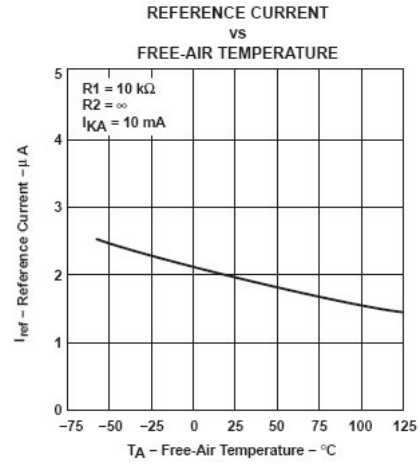
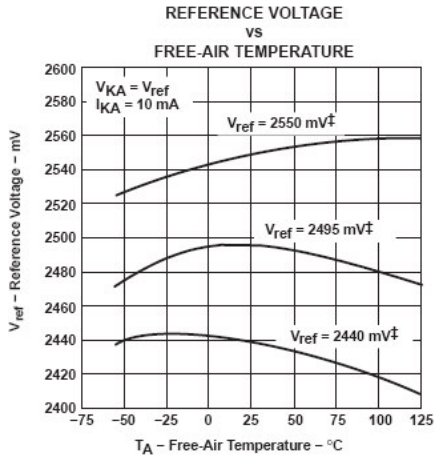


$$\text{Delay} = R \times C \times I_n \left(\frac{12V}{12V - V_{ref}} \right)$$

Delay Timer

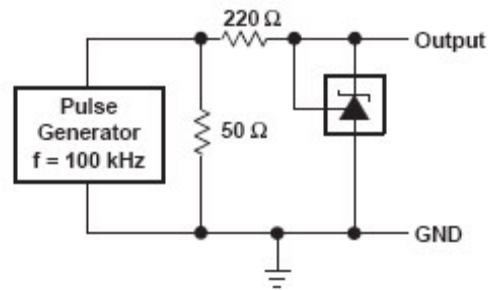
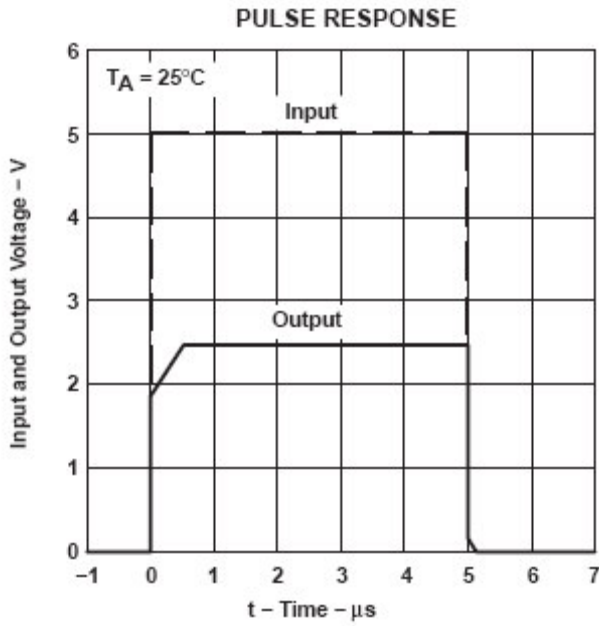


Typical Performance Characteristics

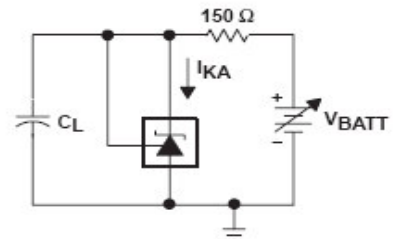
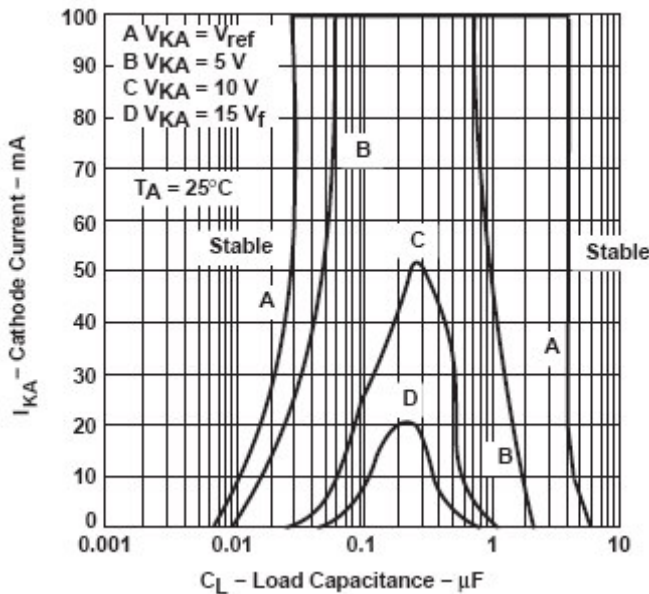




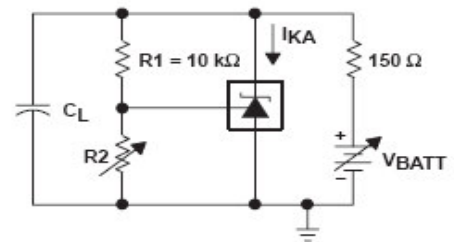
Typical Performance Characteristics



TEST CIRCUIT FOR PULSE RESPONSE



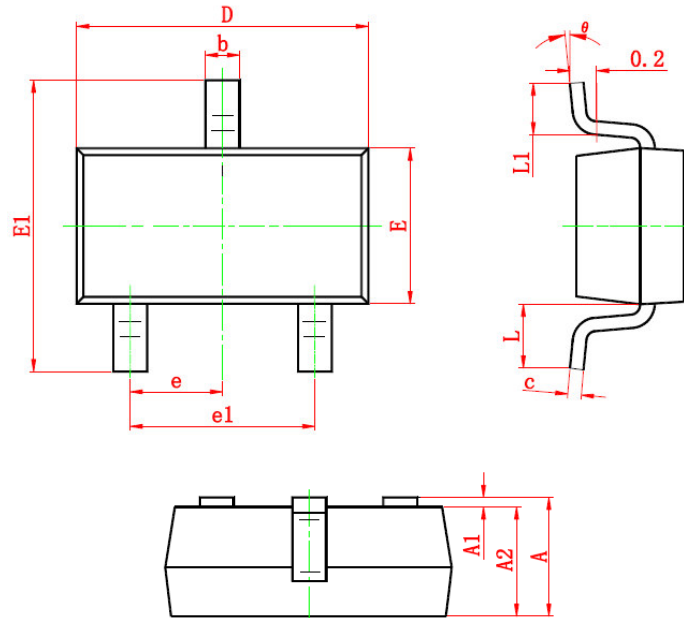
TEST CIRCUIT FOR CURVE A



TEST CIRCUIT FOR CURVES B, C, AND D



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
theta	0°	8°	0°	6°

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