Precision Adjustable Shunt Voltage Reference

◆ DESCRIPTION

The MT432 is a low voltage three terminal adjustable shunt regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage can be set to any value between V_{REF} (approximately 1.24 V) to 8V with two external resistors.

This device has a typical output impedance of 0.30 Ω. Active output circuitry provides a very sharp turn on characteristic, making this device excellent replacement for Zener diodes in many applications.

The MT432 is characterized for operation from -40 ℃ to 105 ℃, and two package options (SOT-23-3L and TO-92) allow the designer the opportunity to select the proper package for their applications.

◆ FEATURES

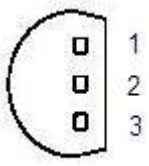
- Low voltage operation (1.24V)
- Adjustable output voltage $V_0 = V_{REF}$ to 8V
- Wide operating current range 60μA to 100mA
- Low dynamic output impedance 0.30 Ω (Typ.)
- Trimmed bandgap design up to ± 0.5 %.
- ESD rating is 2.5KV(Per MIL-STD-883D)

◆ APPLICATIONS

- Linear Regulators
- Adjustable Supplies
- Switching Power Supplies
- Battery Operated Computers
- Instrumentation
- Computer Disk Drives

◆ PIN CONFIGURATIONS

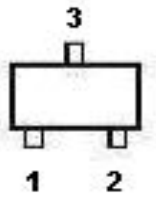
TO-92 (Top View)



MT432Z/BZ

1.Cathode 2.Anode 3.Ref

SOT-23-3 (Top View)



MT432S/BS

1.Ref 2.Cathode 3.Anode

◆ ORDERING INFORMATION

Device	Package		Tolerance	T_{oper} (°C)
MT432Z	Z	TO-92	0.5 %	-40 to 105
MT432BZ			1 %	
MT432S	S	SOT-23-3	0.5 %	
MT432BS			1 %	

◆ ABSOLUTE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Maximum	Unit
Cathode to Anode Voltage (Note 2)	V_{KA}	8	V
Continuous Cathode Current	I_{KA}	150	mA
Reference Input Current	I_{REF}	3	mA
Thermal resistance junction to ambient TO-92 SOT-23-3L	θ_{JA}	 220 230	°C/W
Operating junction temperature	T_J	150	°C
Storage temperature range	T_{STG}	-45 to 150	°C
Lead temperature (soldering) 10sec	T_{LEAD}	260	°C

Note 1:
Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

Note 2:
Voltage values are with respect to the anode terminal unless otherwise noted.

◆ POWER DISSIPATION TABLE

Package	θ_{JA} (°C /W)	Df(mW/°C) $T_A \geq 25$ °C	$T_A \leq 25$ °C Power rating(mW)	$T_A = 50$ °C Power rating(mW)	$T_A = 75$ °C Power rating (mW)
Z	220	6.41	568	455	341
S	230	3.50	543	435	326

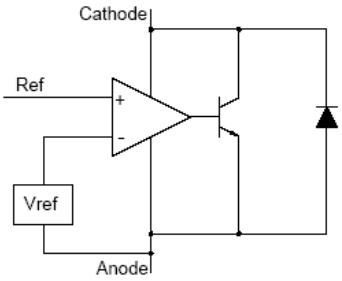
Note :

1. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into Thermal shutdown
2. T_J Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$,
   The θ_{JA} numbers are guidelines for the thermal performance of the device/PC-board system
   All of the above assume no ambient airflow
3. θ_{JA}: Thermal Resistance-Junction to Ambient, D_F: Derating factor, P_O: Power consumption.

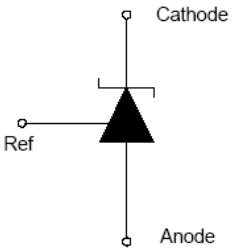
◆ ELECTRICAL CHARACTERISTICS

Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Reference Voltage	0.5%	V_{REF}	$V_{KA} = V_{REF}$, I_{KA} = 10mA Test Circuit #1	1.234	1.240	1.246	V
	1.0%			1.228	1.240	1.252	
	1.5%			1.221	1.240	1.259	
	2.0%			1.215	1.240	1.265	
Deviation of reference voltage over full temperature range		$V_{I(DEV)}$	$V_{KA} = V_{REF}$, I_{KA} = 10mA T_A = -40 ℃ to 105 ℃ Test Circuit #1	-	68	-	mV
Ratio of change in reference voltage to the change in cathode voltage		$\triangle V_{REF}$ /$\triangle V_{KA}$	I_{KA} = 10mA, $\triangle V_{KA}$ = 8 V to V_{REF} Test Circuit #2	-	-1.0	-2.7	mV/V
Reference current		I_{REF}	I_{KA} = 10mA, R1 = 10KΩ, R2 = ∞ Test Circuit #2	-	0.15	2	μA
Deviation of Reference current over full temperature range		$I_{I(DEV)}$	I_{KA} = 10mA, T_A = 0 ℃ to 105 ℃ R1 = 10KΩ, R2 = ∞ Test Circuit #2	-	0.10	-	μA
Minimum cathode current for regulation		I_{MIN}	$V_{KA} = V_{REF}$ Test Circuit #1	-	60	100	μA
Off-state cathode current		I_{OFF}	V_{KA} = 8V, V_{REF} = 0 Test Circuit #3	-	0.04	0.8	μA
Dynamic impedance		$\lvert Z_{KA} \rvert$	I_{KA} = 100μA - 80mA $V_{KA} = V_{REF}$, f ≤ 1KH$_Z$ Test Circuit #1	-	0.3	1.0	Ω

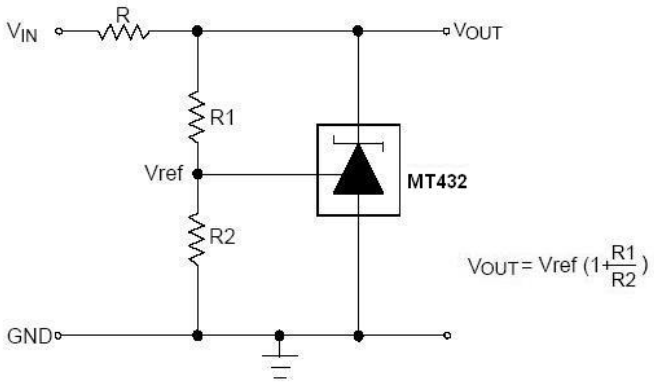
◆ BLOCK DIAGRAM



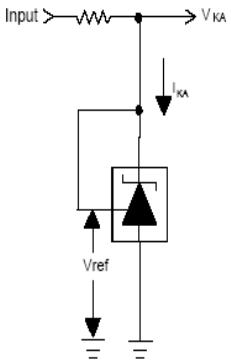
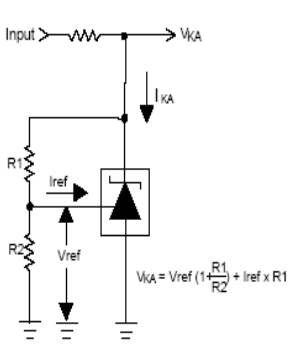
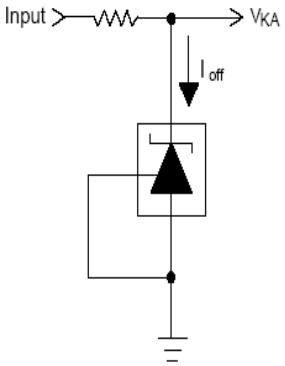
◆ SYMBOL DIAGRAM



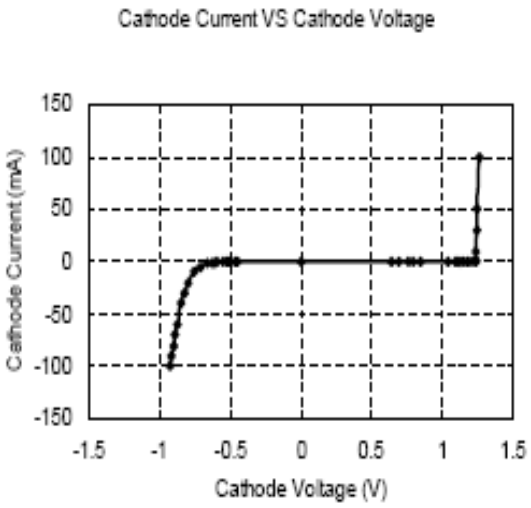
◆ TYPICAL APPLICATIONS

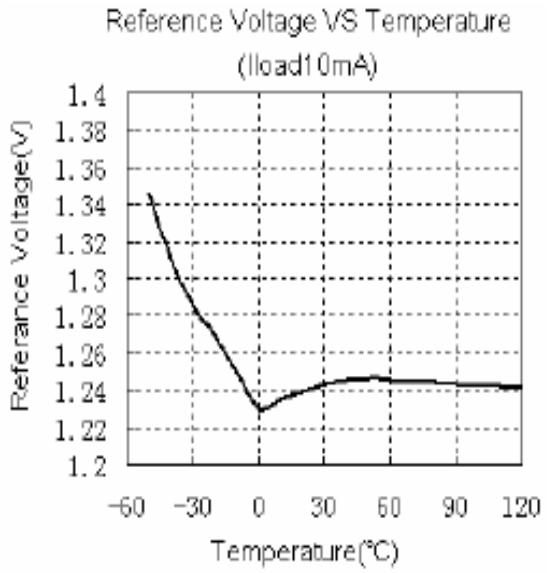


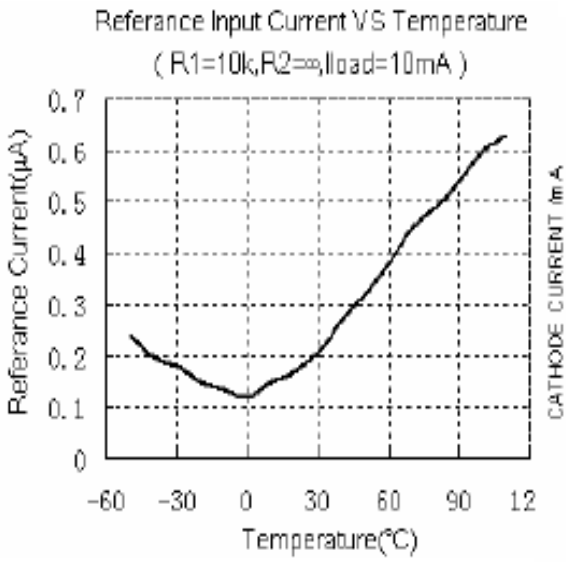
◆ TEST CIRCUITS

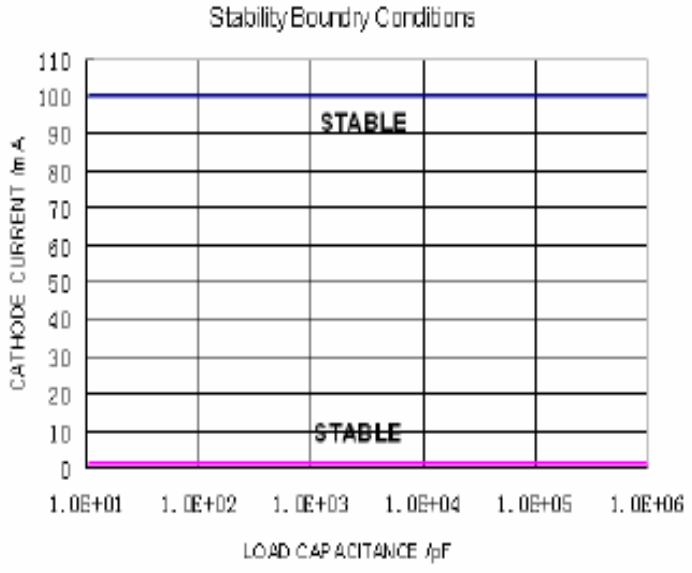
		
Test Circuit 1: $V_{KA} = V_{REF}$	**Test Circuit 2:** $V_{KA} > V_{REF}$	**Test Circuit 3:** Off State Current

◆ Typical Performance Characteristics

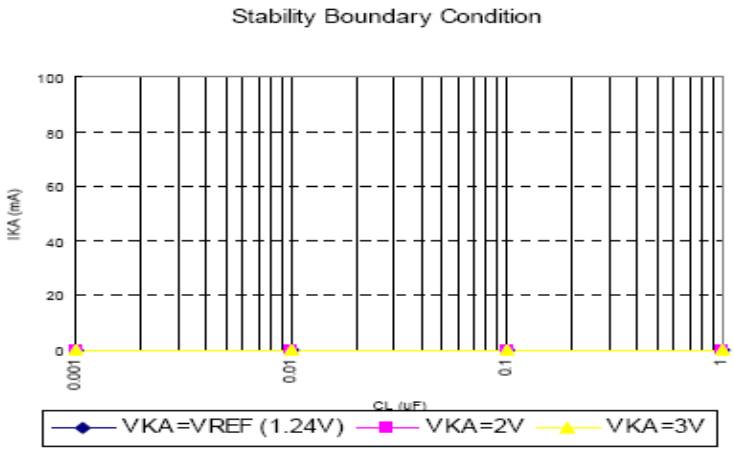


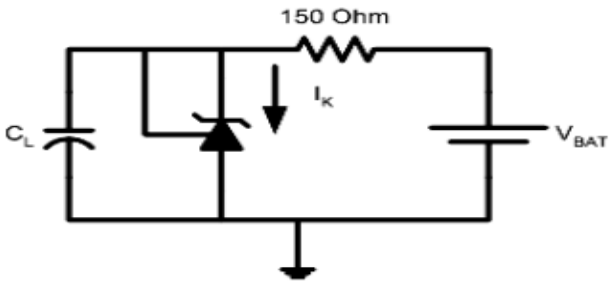




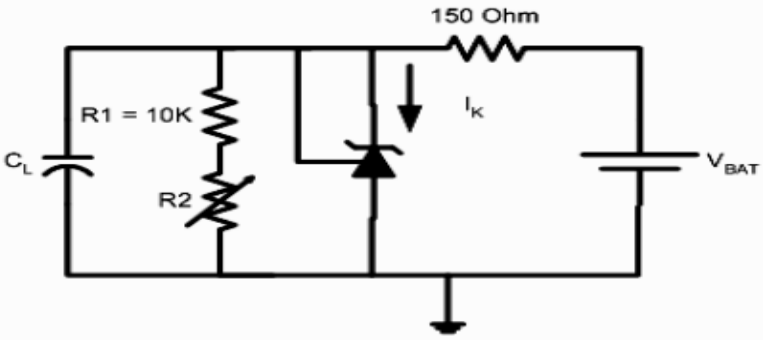


◆ Typical Performance Characteristics





Test Circuit for $V_{KA} = V_{REF}$

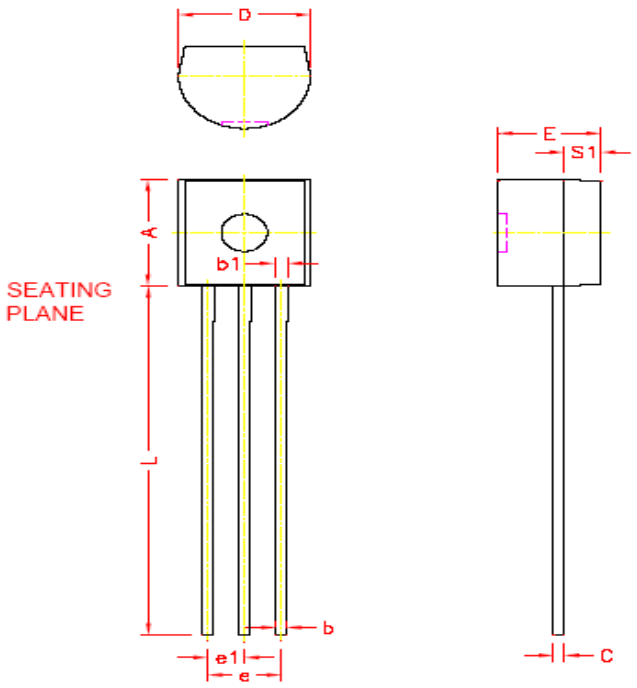


Test Circuit for V_{KA} = 2V, 3V

The areas under the curves represent conditions that may cause the device to oscillate. For V_{KA} = 2V and 3V curves, R2 and V_{BA}T were adjusted to establish the initial V_{KA} and IK conditions with C_L = 0. V_{BAT} and C_L then were adjusted to determine the ranges of stability. As the graph suggested, MT432 is unconditional stable with I_K from 0 to 100mA and with C_L from 0.001uF to 1uF.

◆ PHYSICAL DIMENSIONS

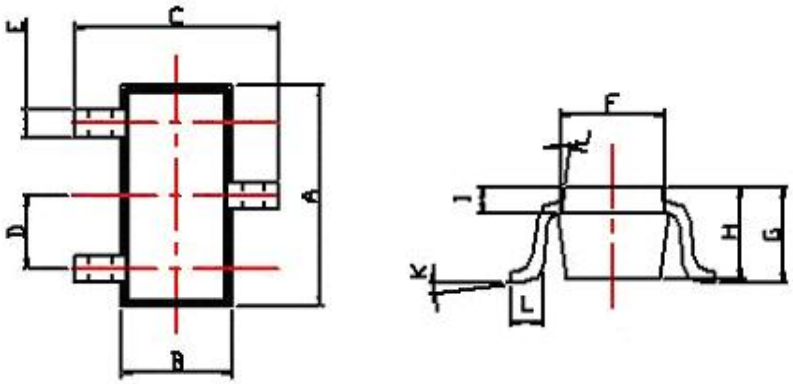
3-Pin Plastic TO-92(Z)



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	4.45	4.70	D	4.44	4.7
S1	1.02	—	E	3.30	3.81
b	0.36	0.51	L	12.70	—
b1	0.36	0.76	e1	1.15	1.39
C	0.36	0.51	e	2.42	2.66

◆ PHYSICAL DIMENSIONS

3-Pin surface Mount SOT-23(S)



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.70	3.10	G	0.9	1.4
B	1.20	1.66	H	0.8	1.30
C	2.37	2.90	I	0.25	0.7
D	0.85	1.15	J	7 ± 2°.	
E	0.350 + 0.15/-0.05		K	0 ~ 10°.	
F	1.07	1.53	L	0.2 (MIN)	