Adjustable Precision Zener Shunt Regulators

CJ432E and CJ432F Series Voltage References

1 Introduction

The CJ432E/F is a three terminal adjustable precision Zener shunt regulator with guaranteed thermal stability over a full operation range. It has sharp turn-on characteristics, low temperature coefficient and low output impedance, and the output voltage can be set to any value between V_{REF} and maximum cathode voltage by selecting two external resistors acting as voltage divider networks, which makes them ideal substitutes for Zener diodes in applications such as switching power supplies, chargers and other adjustable regulators.

2 Available Packages

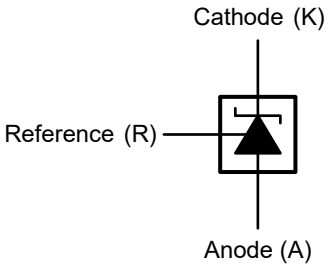
PART NUMBER	PACKAGE
CJ432E/F	SOT-23
	SOT-89-3L
	TO-92

3 Features

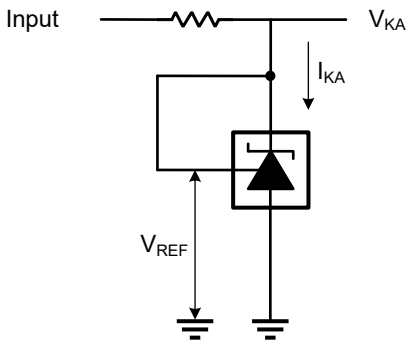
- Adjustable Output Voltage: V_{REF} to 18 V
- Reference Voltage Tolerance at 25°C:
  Available in ±0.5% or ±1.0% Grade
- Sink-current Capability: 0.1 ~ 100mA
- Excellent Temperature Performance:
  Op T_A: -40 ~ 125°C
  Low Drift: 6mV (Typ.)
  Temperature Coefficient: 30 ppm/°C
- Low Dynamic Output Resistance:
  0.07Ω (Typ.)
- Minimum cathode current: 90μA(Max.)
- Fast Turn-on Response
- Low Output Noise
- High Stability under Capacitive Load

4 Applications

- Adjustable Voltage and Current Referencing
- Comparator with Integrated Reference
- Secondary Side Regulation in Flyback SMPSs
- Voltage Monitoring
- Zener Replacement



Symbol



Simplified Schematic

5 Orderable Information

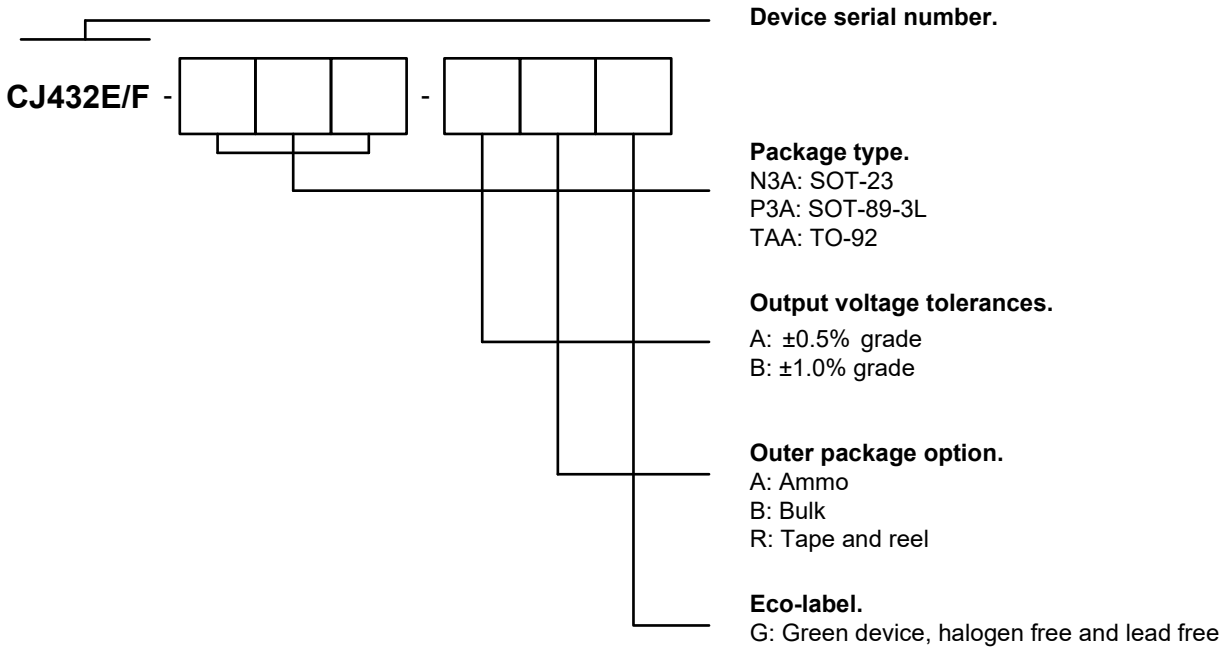


Figure 5-1. CJ432E/F Naming Convention

MODEL	DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
432E ±0.5% grade	CJ432E-N3A-ARG	SOT-23	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
	CJ432E-P3A-ARG	SOT-89-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 1000 Units / Reel	Active
	CJ432E-TAA-AAG	TO-92	-40 ~ 125°C	RoHS & Green	N / A for Pkg Type	Ammo 2000 Units / Box	Active
	CJ432E-TAA-ABG	TO-92	-40 ~ 125°C	RoHS & Green	N / A for Pkg Type	Bulk 1000 Units / Bag	Active
432E ±1.0% grade	CJ432E-N3A-BRG	SOT-23	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
	CJ432E-P3A-BRG	SOT-89-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 1000 Units / Reel	Active
	CJ432E-TAA-BAG	TO-92	-40 ~ 125°C	RoHS & Green	N / A for Pkg Type	Ammo 2000 Units / Box	Active
	CJ432E-TAA-BBG	TO-92	-40 ~ 125°C	RoHS & Green	N / A for Pkg Type	Bulk 1000 Units / Bag	Active

5 Orderable Information

MODEL	DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
432F ±0.5% grade	CJ432F-N3A-ARG	SOT-23	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
	CJ432F-P3A-ARG	SOT-89-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 1000 Units / Reel	Active
	CJ432F-TAA-AAG	TO-92	-40 ~ 125°C	RoHS & Green	N / A for Pkg Type	Ammo 2000 Units / Box	Active
	CJ432F-TAA-ABG	TO-92	-40 ~ 125°C	RoHS & Green	N / A for Pkg Type	Bulk 1000 Units / Bag	Active
432F ±1.0% grade	CJ432F-N3A-BRG	SOT-23	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
	CJ432F-P3A-BRG	SOT-89-3L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 1000 Units / Reel	Active
	CJ432F-TAA-BAG	TO-92	-40 ~ 125°C	RoHS & Green	N / A for Pkg Type	Ammo 2000 Units / Box	Active
	CJ432F-TAA-BBG	TO-92	-40 ~ 125°C	RoHS & Green	N / A for Pkg Type	Bulk 1000 Units / Bag	Active

Note:

ECO PLAN: For the RoHS and Green certification standards of this product, please refer to the official report provided by SZCJ .

MSL: Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

SORT: Specifically defined as follows:

Active: Recommended for new products;

Customized: Products manufactured to meet the specific needs of customers;

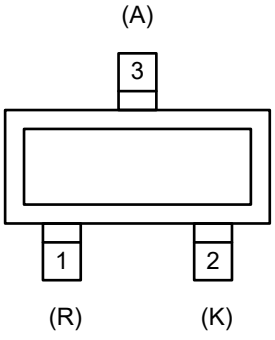
Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;

NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;

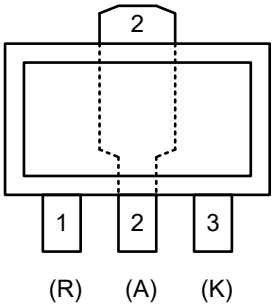
Obsolete: The device has been discontinued.

6 Pin Configuration and Marking Information

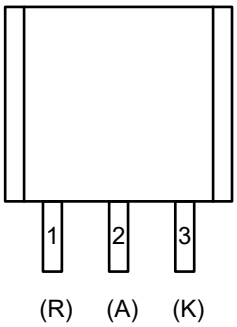
6.1 Pin Configuration and Function



CJ432E-N3A-xxx
CJ432F-N3A-xxx
SOT-23



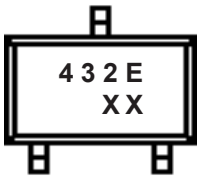
CJ432E-P3A-xxx
CJ432F-P3A-xxx
SOT-89-3L



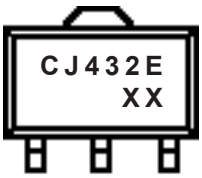
CJ432E-TAA-xxx
CJ432F-TAA-xxx
TO-92

PIN NAME	CJ432E/CJ432F			I / O	PIN FUNCTION
	SOT-23	SOT-89-3L	TO-92		
Reference (R)	1	1	1	I	Reference pin for adjustable output voltage.
Cathode (K)	2	3	3	I / O	Shunt current / output voltage.
Anode (A)	3	2	2	O	Anode pin, normally grounded.

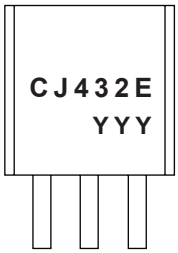
6.2 Marking Information



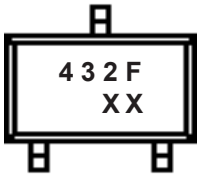
CJ432E SOT-23



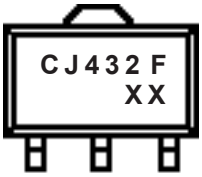
CJ432E SOT-89-3L



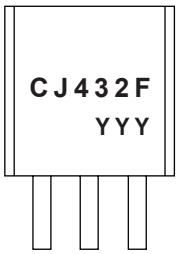
CJ432E TO-92



CJ432F SOT-23



CJ432F SOT-89-3L



CJ432F TO-92

"XX" ,"YYY": Code.

7 Specifications

7.1 Absolute Maximum Ratings

(T_A = 25°C, unless otherwise specified)(1)

CHARACTERISTIC	SYMBOL	VALUE	UNIT
Cathode voltage(2)	V_{KA}	20	V
Cathode current range (continuous)	I_{KA}	100	mA
Reference input current range	I_{REF}	3	mA
Maximum junction temperature	$T_{J\ Max}$	150	°C
Storage temperature	T_{stg}	-65 ~ 150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum rated conditions for extended periods may affect device reliability.
(2) All voltages are with respect to network Anode terminal.

7.2 Recommended Operating Conditions

PARAMETER	SYMBOL	MIN.	NOM.	MAX.	UNIT
Cathode voltage	V_{KA}	V_{REF}	-	18	V
Cathode current	I_{KA}	0.1	-	100	mA
Operating ambient temperature	T_A	-40	-	125	°C

7.3 ESD Ratings

ESD RATINGS		SYMBOL	VALUE	UNIT
Electrostatic discharge(3)	Human body model	$V_{ESD-HBM}$	3000	V

(3) ESD testing is conducted in accordance with the relevant specifications formulated by the Joint Electronic Equipment Engineering Commission (JEDEC). The human body model (HBM) electrostatic discharge test is based on the JESD22-A114D test standard, using a 100pF capacitor and discharging to each pin of the device through a resistance of 1.5kΩ.

7 Specifications

7.4 Thermal Information

THERMAL METRIC(4)	SYMBOL	CJ432E/CJ432F			UNIT
		SOT-23	SOT-89-3L	TO-92	
Junction-to-ambient thermal resistance	$R_{\Theta JA}$	356.4	198.4	181.9	°C/W
Junction-to-case thermal resistance	$R_{\Theta JC}$	133.5	52.5	46.2	°C/W
Reference maximum power dissipation for continuous operation	$P_{D\ Ref}$	0.35	0.63	0.68	W

(4) Thermal metric is measured in still air with T_A = 25°C and installed on a 1 in^2 FR-4 board covered with 2 ounces of copper.

7.5 Electrical Characteristics

CJ432E (T_A = 25°C, unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS			MIN.	TYP.(5)	MAX.	UNIT
Reference voltage	V_{REF}	Figure. 1	V_{KA} = V_{REF}, I_{KA} = 10mA	±0.5% grade	1.244	1.250	1.256	V
				±1.0% grade	1.238		1.262	
Deviation of reference voltage over full temperature range(6)	ΔV_{REF}	Figure. 1	V_{KA} = V_{REF}, I_{KA} = 10mA	T_A = -40 to 85°C	-	4	12	mV
				T_A = -40 to 125°C	-	6	12	
Ratio of change in reference voltage to the change in cathode voltage	ΔV_{REF} / ΔV_{KA}	Figure. 2	I_{KA} = 10mA	ΔV_{KA} = 16V to V_{REF}	-	-0.2	-1.5	mV / V
Reference current	I_{REF}	Figure. 2	I_{KA} = 10mA, R_1 = 10kΩ, R_2 = ∞		-	0.12	0.4	μA
Deviation of reference current over full temperature range(7)	ΔI_{REF}	Figure. 2	I_{KA} = 10mA, R_1 = 10kΩ, R_2 = ∞, T_A = -40 to 125°C		-	0.1	0.5	μA
Minimum cathode current for regulation	$I_{KA\ MIN}$	Figure. 1	V_{KA} = V_{REF}		-	60	90	μA
Off-state cathode current	$I_{KA\ OFF}$	Figure. 3	V_{KA} = 18V, V_{REF} = 0V		-	0.01	0.1	μA
Dynamic impedance(8)	Z_{KA}	Figure. 1	V_{KA} = V_{REF}, I_{KA} = 1 to 100mA, f ≤ 1.0kHz		-	0.07	0.15	Ω

7 Specifications

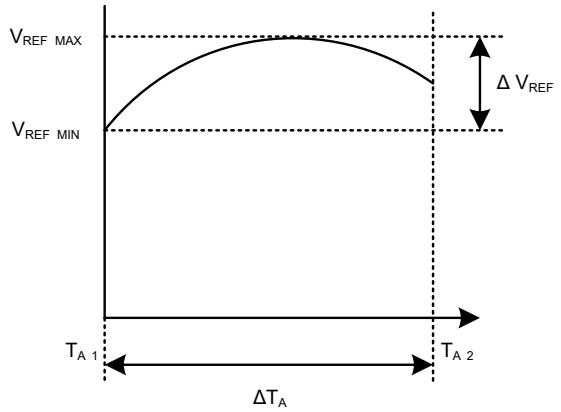
7.5 Electrical Characteristics (continued)

CJ432F (T_A = 25°C, unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS			MIN.	TYP.(5)	MAX.	UNIT
Reference voltage	V_{REF}	Figure. 1	V_{KA} = V_{REF}, I_{KA} = 10mA	±0.5% grade	1.234	1.240	1.246	V
				±1.0% grade	1.228		1.252	
Deviation of reference voltage over full temperature range(6)	ΔV_{REF}	Figure. 1	V_{KA} = V_{REF}, I_{KA} = 10mA	T_A = -40 to 85°C	-	4	12	mV
				T_A = -40 to 125°C	-	6	12	
Ratio of change in reference voltage to the change in cathode voltage	ΔV_{REF} / ΔV_{KA}	Figure. 2	I_{KA} = 10mA	ΔV_{KA} = 16V to V_{REF}	-	-0.2	-1.5	mV / V
Reference current	I_{REF}	Figure. 2	I_{KA} = 10mA, R_1 = 10kΩ, R_2 = ∞		-	0.12	0.4	μA
Deviation of reference current over full temperature range(7)	ΔI_{REF}	Figure. 2	I_{KA} = 10mA, R_1 = 10kΩ, R_2 = ∞, T_A = -40 to 125°C		-	0.1	0.5	μA
Minimum cathode current for regulation	$I_{KA\ MIN}$	Figure. 1	V_{KA} = V_{REF}		-	60	90	μA
Off-state cathode current	$I_{KA\ OFF}$	Figure. 3	V_{KA} = 18V, V_{REF} = 0V		-	0.01	0.1	μA
Dynamic impedance(8)	Z_{KA}	Figure. 1	V_{KA} = V_{REF}, I_{KA} = 1 to 100mA, f ≤ 1.0kHz		-	0.07	0.15	Ω

(5) Typical numbers are at 25°C and represent the most likely norm.

(6) The deviation parameters ΔV_{REF} and ΔI_{REF} are defined as the differences between the maximum and minimum values obtained over the rated temperature range.



$$\Delta V_{REF} = V_{REF\ MAX} - V_{REF\ MIN}$$

$$\Delta T_A = T_{A2} - T_{A1}$$

The average full-range temperature coefficient of the reference input voltage αV_{REF} is defined as:

$$|\propto V_{REF}|(\frac{ppm}{°C}) = \frac{[\frac{\Delta V_{REF}}{V_{REF}(at\ 25°C)}] \times 10^6}{\Delta T_A} = \frac{[\frac{\Delta V_{REF}}{V_{REF}(at\ 25°C)}] \times 10^6}{\Delta T_A}$$

αV_{REF} is positive or negative, depending on whether $V_{REF\ MIN}$ or $V_{REF\ MAX}$ respectively, occurs at the lower temperature.

7 Specifications

7.5 Electrical Characteristics (continued)

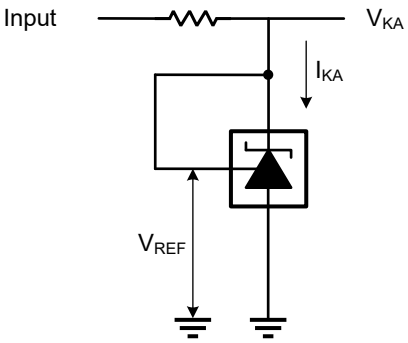
(7) The dynamic impedance is defined as:

$$|Z_{KA}| = \frac{\Delta V_{KA}}{\Delta I_{KA}}$$

When the device is operating with two external resistors (see test figure. 2), the total dynamic impedance of the circuit is given by:

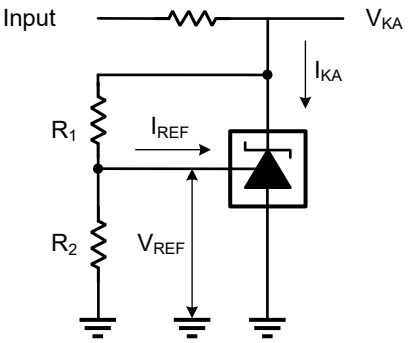
$$|Z'| = \frac{\Delta V}{\Delta I} \approx [|Z_{KA}| \times \left(1 + \frac{R_1}{R_2}\right)]$$

7.6 Test Figures and Typical Characteristics



Test Figure. 1

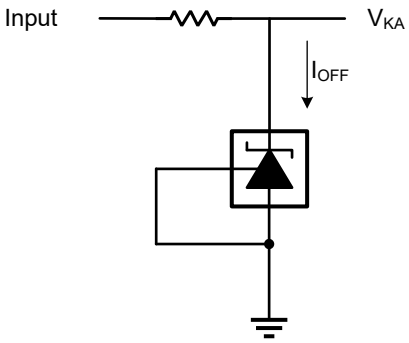
For $V_{KA} = V_{REF}$



$$V_{KA} = V_{REF} \times \left(1 + \frac{R_1}{R_2}\right) + I_{REF} \times R_1$$

Test Figure. 2

For $V_{KA} > V_{REF}$



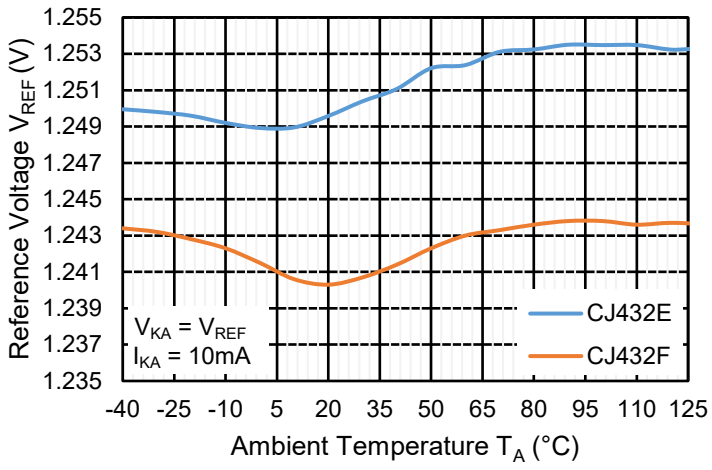
Test Figure. 3

For I_{OFF}

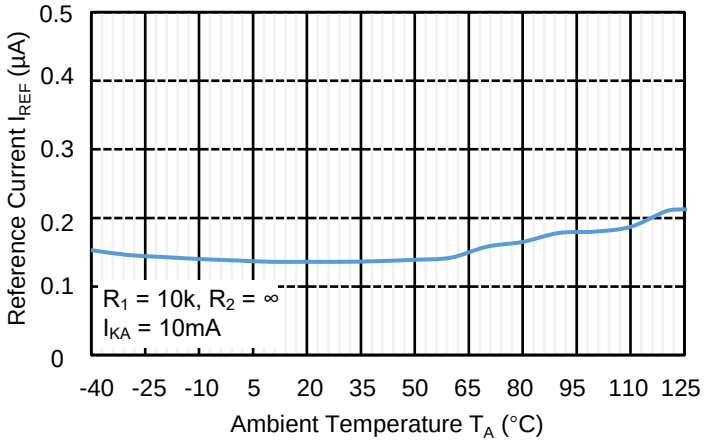
7 Specifications

7.6 Test Figures and Typical Characteristics (continued)

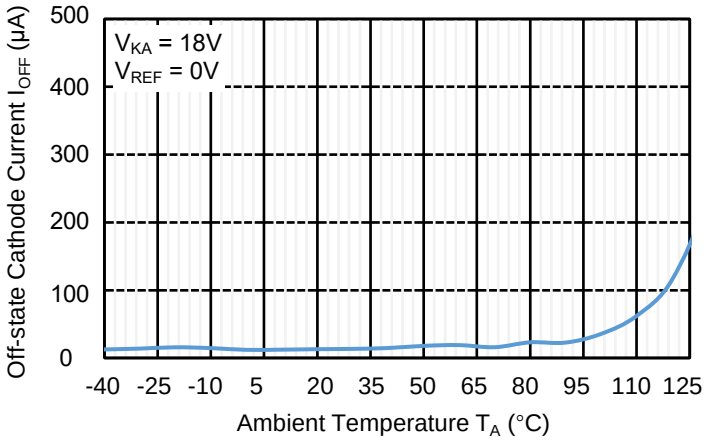
Reference Voltage vs. T_A



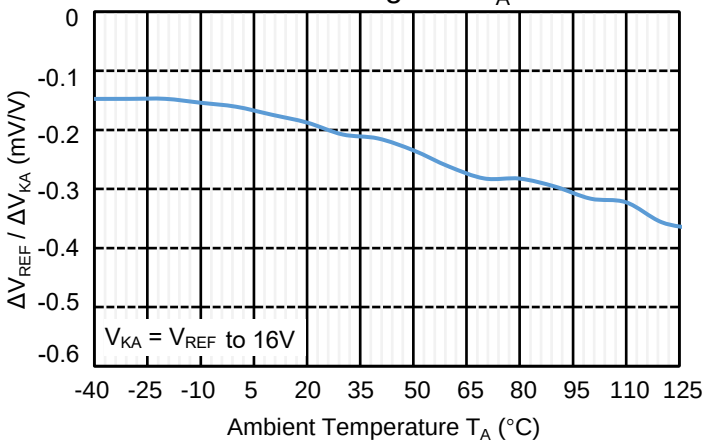
Reference Current vs. T_A



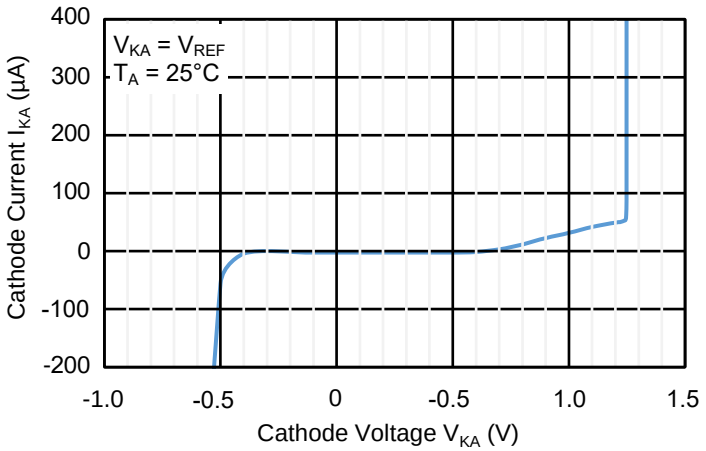
Off-state Cathode Current vs. T_A



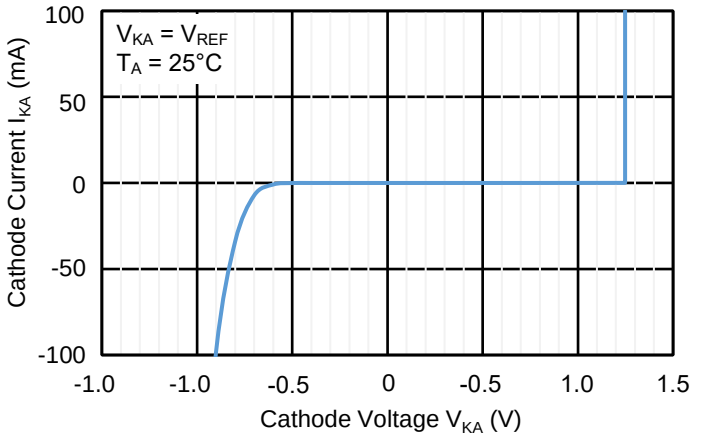
Ratio of Delta Reference Voltage to Delta Cathode Voltage vs. T_A



Cathode Current vs. V_{KA}



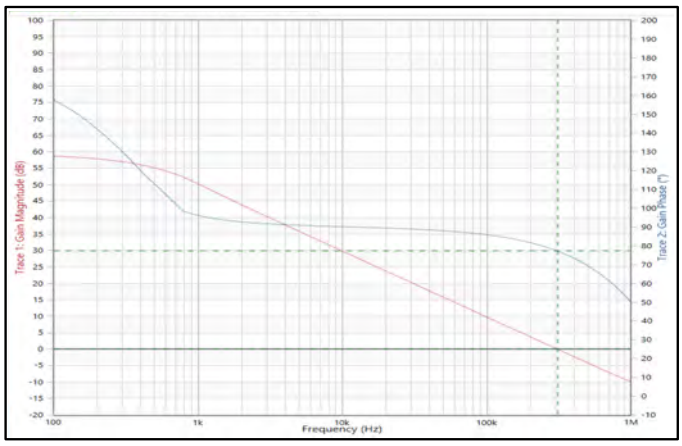
Cathode Current vs. V_{KA}



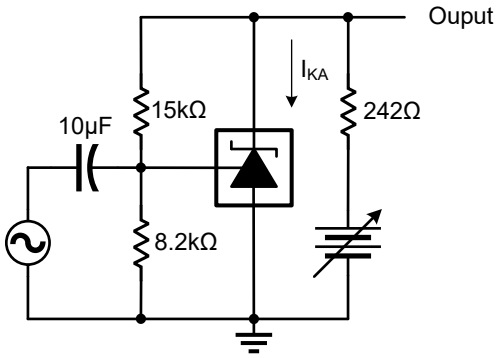
7 Specifications

7.6 Test Figures and Typical Characteristics (continued)

Small Signal Voltage Gain

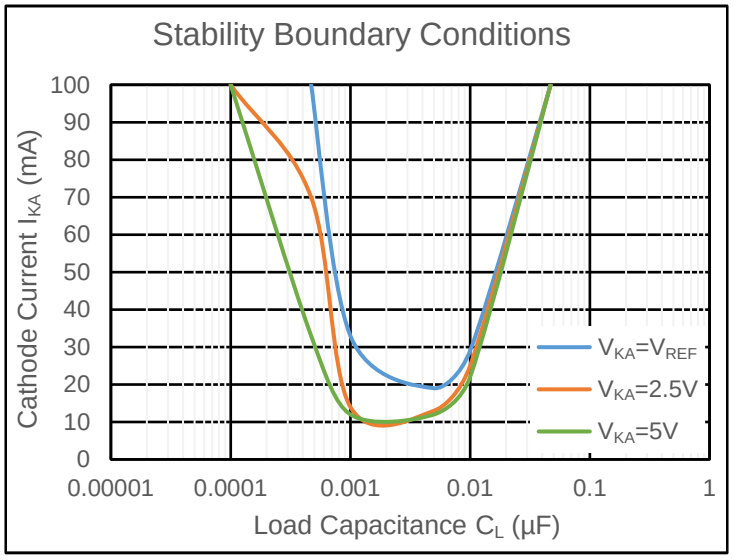


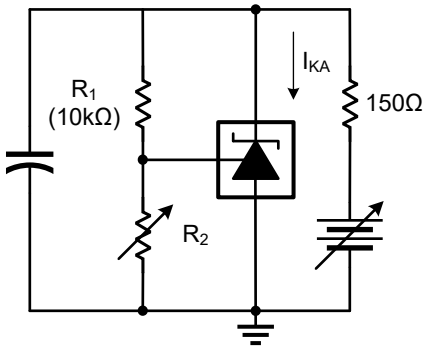
T_A = 25°C, I_{KA} = 10mA



Test Figure. 4

Stability Boundary Conditions vs. Load Capacitance





Test Figure. 5

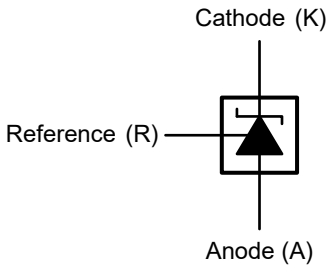
8 Detailed Description

8.1 Description

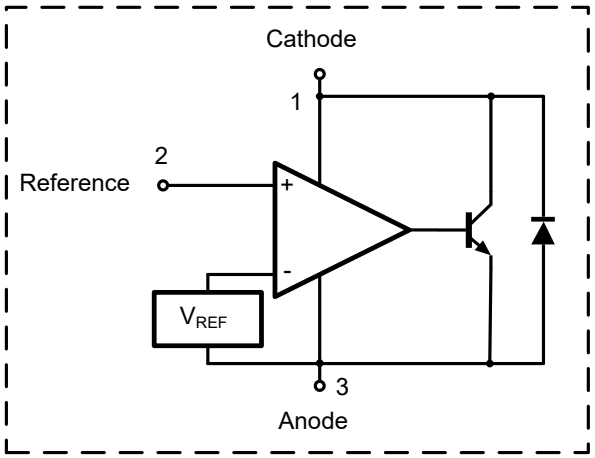
The CJ432E/F is an adjustable precision shunt voltage regulator. Its internal circuit module contains a precise voltage reference source and operational amplifier, which can support operation and adjustment within the cathode voltage range of V_{REF} to 18V, and has good temperature stability within the entire operating temperature range.

The CJ432E/F can be used with peripheral components as a single voltage reference, error amplifier, voltage clamp or comparator with integrated reference. The CJ432E/F has two reference voltage output tolerance levels to choose from: ±0.5% and ±1.0%, and supports SOT-23 packaging to meet the requirements of small size equipment.

8.2 Representative Schematic Diagram



Symbol



Block Diagram

8 Detailed Description

8.3 Feature Description

Basic Operation

The CJ432E/F is an adjustable precision shunt voltage regulator. With sufficient cathode voltage input V_{KA} and cathode current I_{KA}, the voltage between the Reference and Anode of the device will be maintained at V_{REF}. The simplest function realization circuit of the CJ432E/F is shown in Test Figure 1.

External Components

The only external component requirement of the CJ432E/F is the resistor between the cathode and the input voltage to set the input current. In the absence of output capacitor between cathode and anode, the CJ432E/F can still conduct internal compensation to maintain output stability, which is different from many linear regulators. Therefore, the external capacitor can be used for input or output, but it is not necessary. If the output capacitor is needed, the correct capacitor should be selected to maintain stability.

Sink Current

The internal part of the CJ432E/F is composed of a reference voltage source and an amplifier. The Reference pin and internal virtual pin of the amplifier will output a sink current, which is generated by the Darlington pair in the internal circuit of the amplifier. The conditions for sink current must be met, otherwise the device cannot operate normally. For the requirements of sink current $I_{KA\ MIN}$, see *Electrical Characteristics*.

Reference Pin

During normal operation of the CJ432E/F, there will be a small current I_{REF} flowing into the Reference. The Reference cannot be floated because the Reference is driven to the base of the internal triode, which requires the base current to work properly.

Open Loop

When the cathode / output voltage or current of the CJ432E/F is not fed back to the Reference / input pin in any form, the device operates in an open loop. If appropriate cathode current I_{KA} is applied to the device, the CJ432E/F will have the characteristics shown in the *Representative Schematic Diagram*. This circuit configuration has very high gain, so this circuit configuration of the CJ432E/F is usually used as a comparator. When users try to monitor a certain level of a single signal, the integrated reference makes the CJ432E/F the first choice.

Closed Loop

When the cathode / output voltage or current of the CJ432E/F is fed back to the Reference / input pin in any form, the device operates in a closed loop. Most applications involving 432 series use it to adjust fixed voltage or current in this way. Feedback enables the device to act as an error amplifier, calculate part of the output voltage and adjust it to maintain the desired adjustment. This is achieved by feedback the output voltage to the reference pin in the way that the output voltage is equal to the internal reference voltage, which can be achieved through resistance or direct feedback.

9 Application Information and Implementation

9.1 Application Information

Setting the Shunt Voltage

As an adjustable precision Zener parallel regulator, the CJ432E/F can set the shunt voltage V_{KA} to any value between the reference voltage V_{REF} and the maximum rated voltage by setting the resistance values of two feedback resistors R_1 and R_2. In the ideal common anode shunt regulating circuit (as shown in Figure 9-1), the shunt voltage V_{KA} can be obtained from the following formula:

$$V_{KA} = V_{REF} \times (1 + \frac{R_1}{R_2})$$

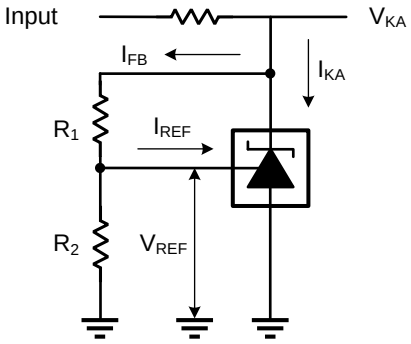


Figure 9-1. Common Anode Shunt Regulating Circuit

However, in the actual circuit design, the above formula cannot accurately reflect the relationship between V_{KA} and R_1, R_2, because the following parameters of shunt regulator also affect the V_{KA}:

1. Dynamic impedance Z_{KA}. In any case, the Z_{KA} will offsets the V_{REF} in direct proportion to the cathode current, and the typical value of V_{REF} in the data table is only expressed as the typical value under the specific current.

2. Reference pin current I_{REF}. In the shunt regulating circuit of the common anode, when V_{KA} is greater than V_{REF}, the current flowing into the reference pin I_{REF} will cause the current flowing through R_1 and R_2 to be unequal, which will affect the effective DC feedback ratio. The V_{KA} formula in the data table usually includes this factor, as shown in the following formula:

$$V_{KA} = V_{REF} \times \left(1 + \frac{R_1}{R_2}\right) + I_{REF} \times R_1$$

3. Ratio of reference voltage change to cathode voltage change ΔV_{REF} / ΔV_{KA}. When V_{KA} is greater than V_{REF}, V_{REF} will change to a certain extent when cathode voltage changes. Although this factor may have a significant impact on V_{REF}, it is often ignored by designers.

In the common anode parallel regulating circuit, the V_{REF} will be subject to R_1, R_2, Z_{KA}, I_{REF}, ΔV_{REF} / ΔV_{KA} is affected by these parameters. When V_{KA} = V_{REF} and I_{KA} = 10mA, the nominal V_{REF} is 1.250V, the nominal I_{KA} and V_{REF} is represented by I_{NOM} and V_{NOM} in the following text. The reference pin current I_{REF} is 0.12μA. The ΔV_{REF} / ΔV_{KA} at two different rates: it is -0.2mV/V from V_{REF} to 16V. Therefore, V_{REF} should be determined by the following formula:

$$V_{REF} = V_{NOM} + (I_{KA} - I_{NOM}) \times Z_{KA} + (V_{KA} - V_{NOM}) \times (-0.2\ mV/V)$$

9 Application Information and Implementation

9.1 Application Information (continued)

Setting the Shunt Voltage (continued)

After V_{REF} is obtained from the above two formulas, the resistance values of the two feedback resistors can be obtained, and the resistance values of R_1 and R_2 can be obtained from the following formula:

$$R_1 = \frac{V_{KA} - V_{REF}}{I_{FB}}$$

$$R_2 = \frac{V_{REF}}{I_{FB} - I_{REF}}$$

Note that R_2 has less current than R_1.

Boundary Stability Condition

As a shunt regulator, the CJ432E/F is designed with wide bandwidth and can ensure stability without external frequency compensation, which makes the CJ432E/F very suitable for application in control circuit and reference voltage generator without external capacitance.

In the application of reference voltage generator, adding an external capacitor between the cathode and anode (usually grounded) of the CJ432E/F may cause some problems in output stability. The external capacitor will produce an output pole and reduce the phase margin, which may destroy the stability of the output and make the output oscillate. Therefore, attention should be paid to the selection of external capacitance during circuit design. The capacitance value can be determined according to the *Stability Boundary Conditions* in the data sheet. The stability boundary conditions show the corresponding stability under different external capacitance and cathode current conditions when the CJ432E/F is used as a reference voltage generator (Test Figure. 6). The curve includes the stability of four series of V_{KA} voltage conditions: V_{KA} = V_{REF}, V_{KA} = 2.5V, V_{KA} = 5V, other V_{KA} voltages can be interpolated between these four series visually. According to the intersection point of the stability curve under the condition of cathode current and V_{KA} voltage, the corresponding stability allowable external capacitance boundary value under this condition can be found. Using the capacitance in the internal range of the intersection (between two intersections) will cause device oscillation, while using the capacitance in the external range of the intersection (less than the relatively small intersection capacitance value, or greater than the relatively large intersection capacitance value) will not cause device oscillation.

However, the curve displayed in the *Stability Boundary Conditions* only represents the typical device characteristics with an application temperature of 25°C, which means that the actual boundary stability of a randomly selected the CJ432E/F sample may not be consistent with the curve shown, and the effect of temperature on stability must also be taken into account. Therefore, it is necessary to provide sufficient phase margin for all devices in circuit design to prevent transient oscillation or ringing. The recommended capacitance is less than 1/10 of the left boundary or more than 10 times of the right boundary.

9 Application Information and Implementation

9.2 Power Supply and Layout Recommendations

When using the CJ432E/F for circuit design, the designer should pay attention to the following recommendations:

1. The cathode current needs to meet the sinking current condition to make the device output normal, and also pay attention to the maximum rated range of the cathode current and the reference pin current to ensure that they are limited within the rated range.
2. The trace width of the cathode and anode on the PCB should match the current intensity flowing through the application. For applications shunting high currents, the trace length of cathode and anode should also be noticed.
3. When using an bypass capacitor, it should be ensured that the capacitor meets the boundary stability, and the capacitor should be placed as close as possible to the device.

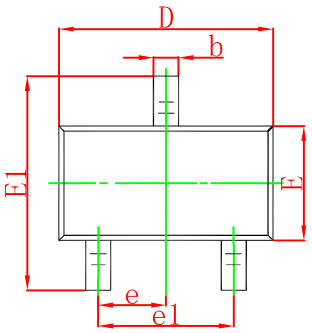
NOTE

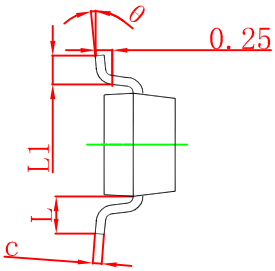
The application information in this section is not part of the data sheet component specification, and SZCJ makes no commitment or statement to guarantee its accuracy or completeness. Customers are responsible for determining the rationality of corresponding components in their circuit design and making tests and verifications to ensure the normal realization of their circuit design.

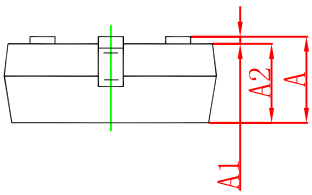
10 Mechanical Information

10.1 SOT-23 Mechanical Information

SOT-23 Outline Dimension

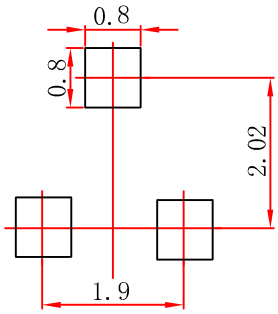






Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 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°	8°

SOT-23 Suggested Pad Layout



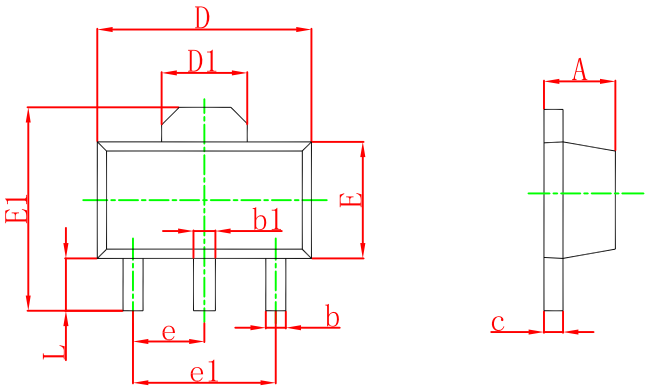
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purpose only.

10 Mechanical Information

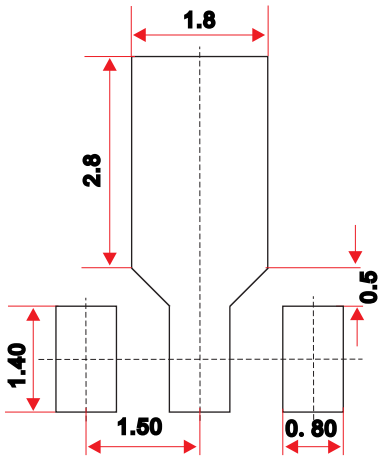
10.2 SOT-89-3L Mechanical Information

SOT-89-3L Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047

SOT-89-3L Suggested Pad Layout



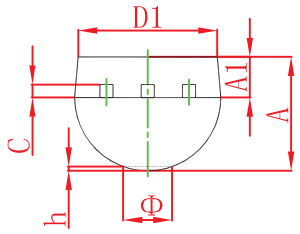
Note:

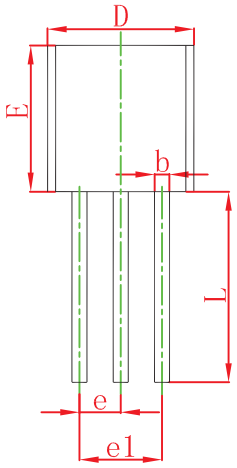
1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purpose only.

10 Mechanical Information

10.3 TO-92 Mechanical Information

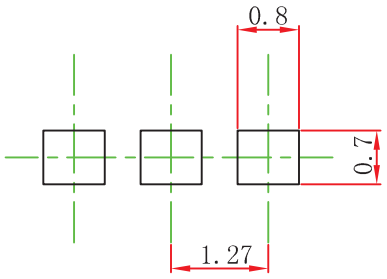
TO-92 Outline Dimension





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
K		1.600		0.063
h	0.000	0.380	0.000	0.015

TO-92 Suggested Pad Layout



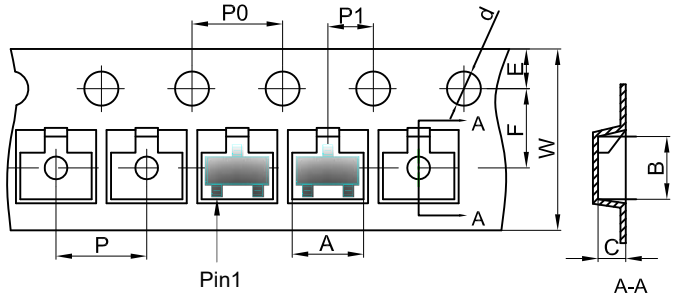
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purpose only.

11 Packaging Information

11.1 SOT-23 Tape and Reel Information

SOT-23 Embossed Carrier Tape

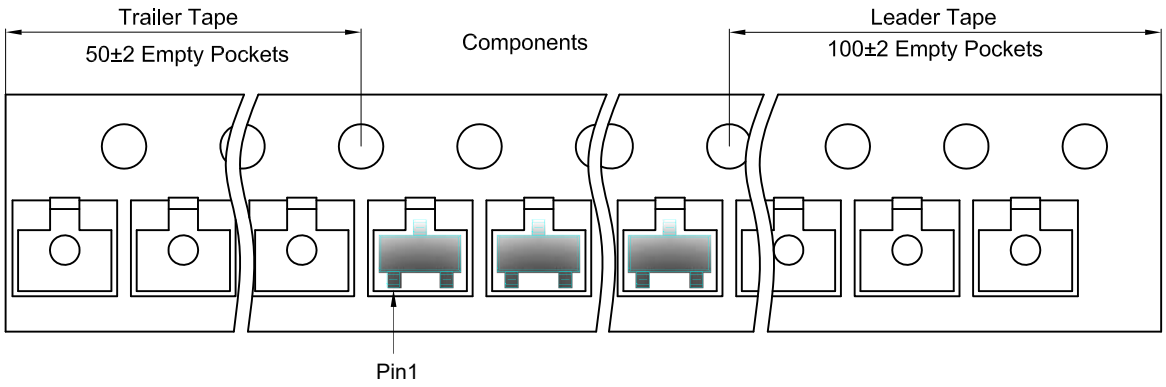


Packaging Description:

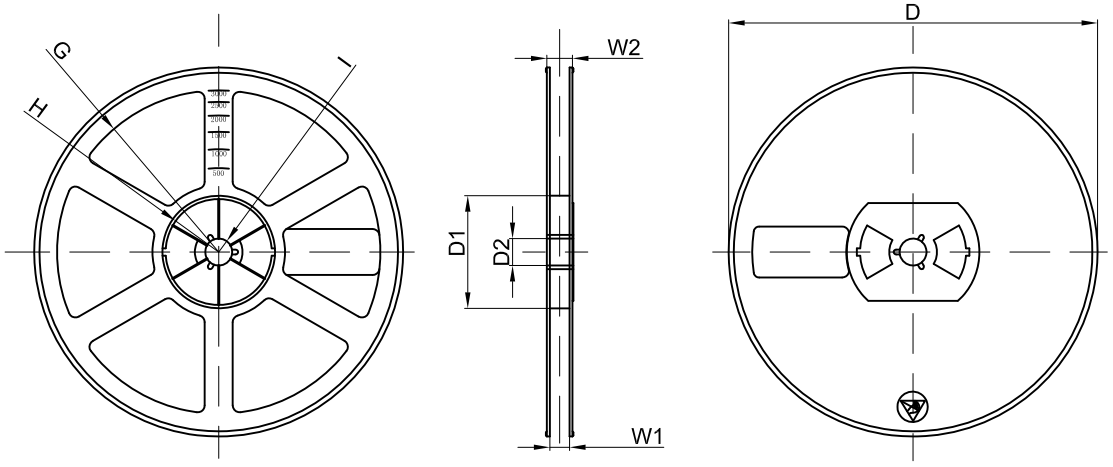
SOT-23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-23	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23 Tape Leader and Trailer



SOT-23 Reel



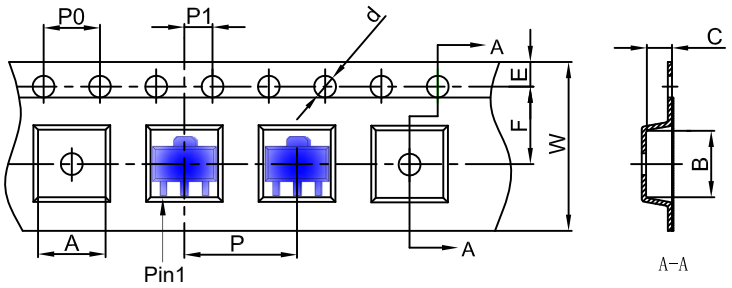
Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	45,000 pcs	203×203×195	180,000 pcs	438×438×220	

11 Packaging Information

11.2 SOT-89-3L Tape and Reel Information

SOT-89-3L Embossed Carrier Tape

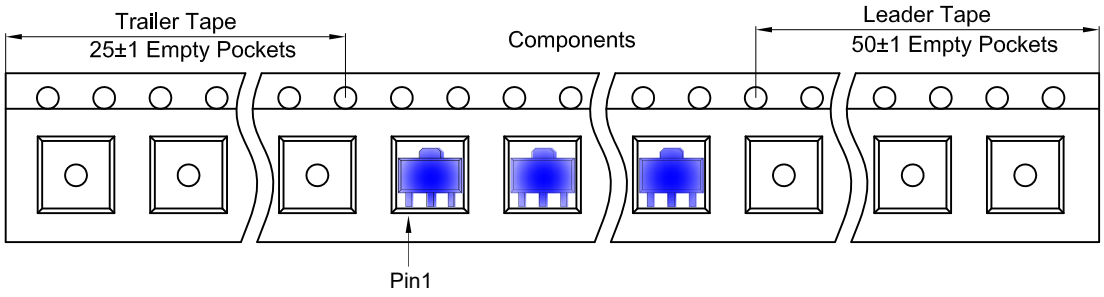


Packaging Description:

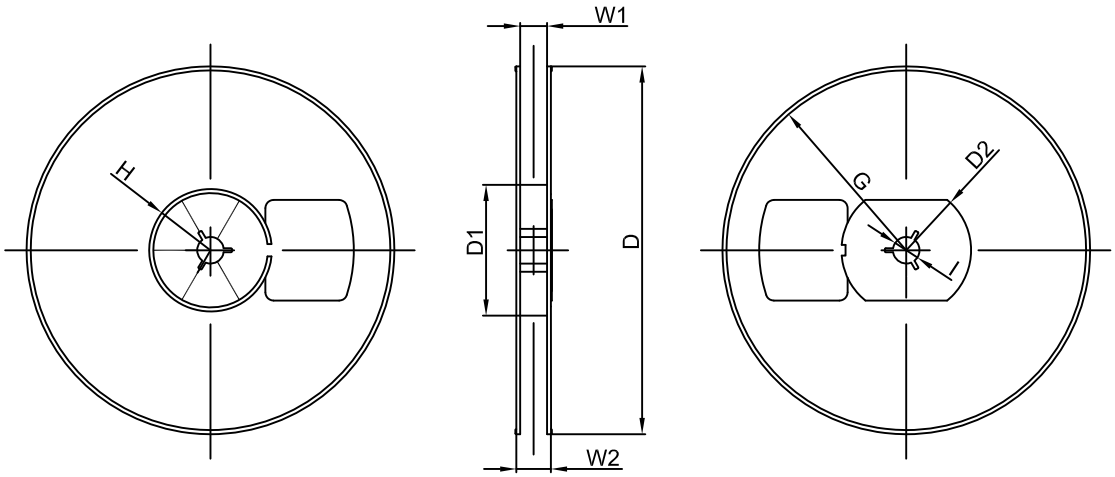
SOT-89-3L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 1,000 units per 7" or 18.0 cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-89-3L	4.85	4.45	1.85	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00

SOT-89-3L Tape Leader and Trailer



SOT-89-3L Reel



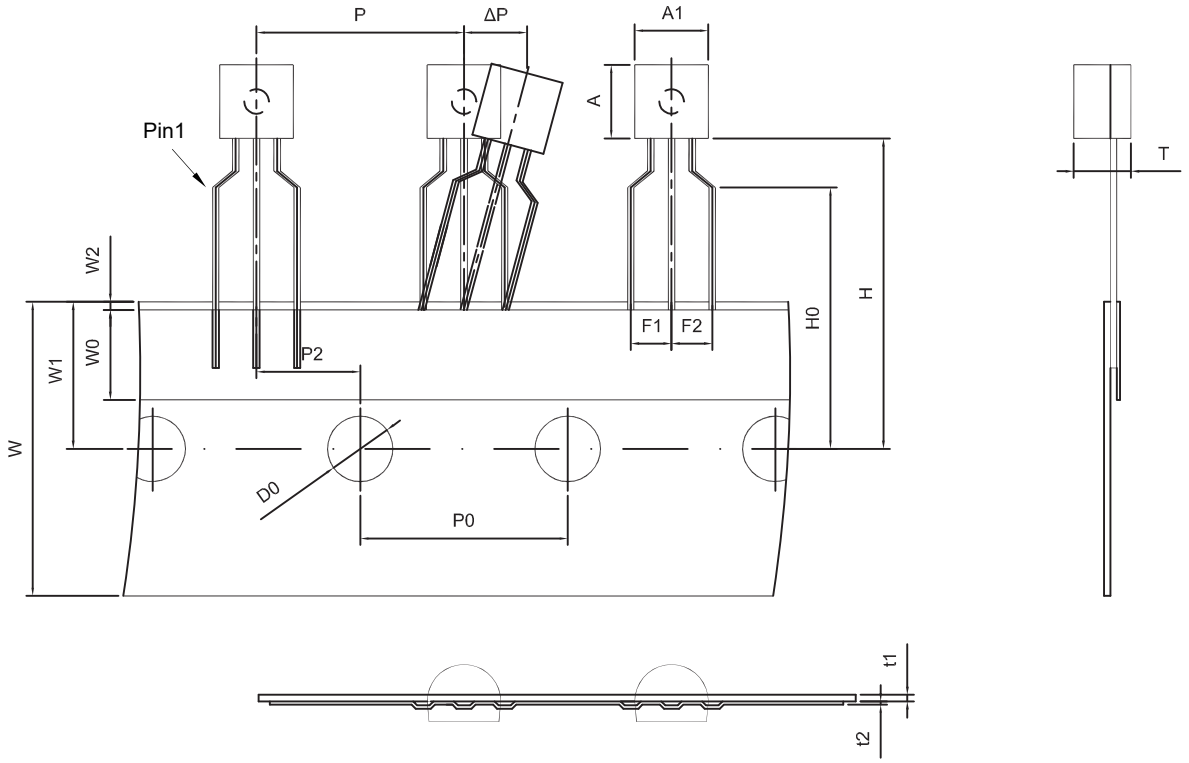
Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø180.00	60.00	R32.00	R86.50	R30.00	Ø13.00	13.20	16.50

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
1000 pcs	7 inch	10,000 pcs	203×203×195	40,000 pcs	438×438×220	

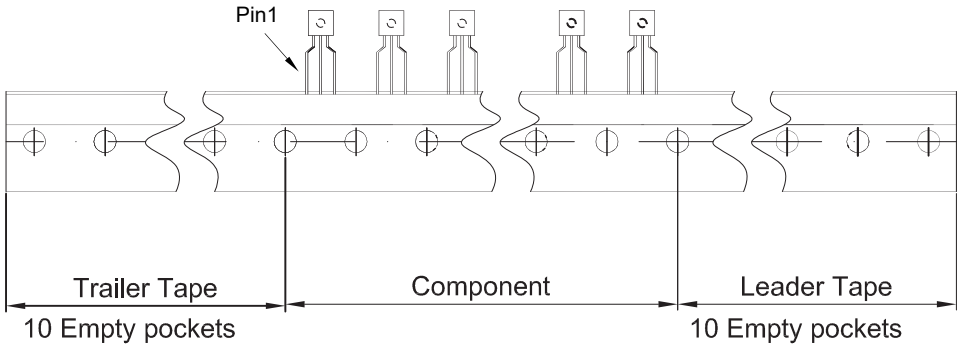
11 Packaging Information

11.3 TO-92 Tape and Reel Information

TO-92 Embossed Carrier Tape



Dimiensions are in millimeter								
A1	A	T	P	P0	P2	F1	F2	W
4.5	4.5	3.5	12.7	12.7	6.35	2.5	2.5	18.0
W0	W1	W2	H	H0	D0	t1	t2	ΔP
6.0	9.0	1.0 MAX.	19.0	16.0	4.0	0.4	0.2	0



Package	Box	Box Size(mm)	Carton	Carton Size(mm)
TO-92	2000 pcs	333×162×43	20,000 pcs	350×340×250

12 Notes and Revision History

12.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of SZCJ -- https: **www.szcjsemi.com** for more details.

12.2 Notes

Electrostatic Discharge Caution



This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

12.3 Revision History

April, 2025: added the information of CJ432F rev - 2.0.

- All pages, add the description of CJ432F.

July, 2024: released CJ432E rev - 1.0.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

The information in this data sheet is intended to describe the operation and characteristics of our products. SZCJ has the right to make any modification, enhancement, improvement, correction or other changes to any content in this data sheet, including but not limited to specification parameters, circuit design and application information, without prior notice.

Any person who purchases or uses SZCJ products for design shall: 1. Select products suitable for circuit application and design; 2. Design, verify and test the rationality of circuit design; 3. Procedures to ensure that the design complies with relevant laws and regulations and the requirements of such laws and regulations. SZCJ makes no warranty or representation as to the accuracy or completeness of the information contained in this data sheet and assumes no responsibility for the application or use of any of the products described in this data sheet.

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