



# AiP431/AiP432

## Adjustable Precision Shunt

### Regulators(Precision=1%、0.5%、2%)

## Product Specification

#### Specification Revision History:

| Version    | Date    | Description                                                 |
|------------|---------|-------------------------------------------------------------|
| 2021-06-A1 | 2021-06 | New                                                         |
| 2021-11-A2 | 2021-11 | Modify the pin configuration of SOT23                       |
| 2021-12-A3 | 2021-12 | Modify the ordering information                             |
| 2022-08-A4 | 2022-08 | Add the part number                                         |
| 2022-10-A5 | 2022-10 | Modify the reference voltage tolerance                      |
| 2023-03-B1 | 2023-03 | Update the template                                         |
| 2023-10-B2 | 2023-10 | Modify the ordering information                             |
| 2025-08-B3 | 2025-08 | Modify the pin configurations                               |
| 2026-04-B4 | 2026-04 | Update ordering information and package information of TO92 |



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## 1、General Description

AiP431-AiP432 is a three terminal adjustable parallel regulator with guaranteed thermal stability over applicable extended commercial temperature ranges. It can set the output voltage through two external resistors between  $V_{ref}$  (about 2.5V) and 36V any value. It also features a typical output impedance of  $0.2\Omega$ . AiP431/ AiP432 is an excellent adjustable replacement for Zener diodes in many applications such as operational amplifier circuits, adjustable power supplies, and switching power supplies. The AiP432 offers identical functionality and electrical characteristics to the AiP431, but with a different pin configuration.

### Features:

- Reference voltage tolerance at 25°C:
  - AiP431A/ AiP432A: 0.5%
  - AiP431/ AiP432: 1%
  - AiP431B/ AiP432B: 2%
- Adjustable output voltage range:  $V_{ref}$  to 36V
- Wide temperature range: -40°C to 85°C
- Low voltage temperature drift: Maximum 16mV
- Low output noise
- $0.2\Omega$  output impedance
- Sink current capacity range: 1mA to 100mA
- Packaging form: TO92/SOT23

**Ordering Information:****Bag packing specifications:**

| Part number    | Packaging form | Marking code | Bag quantity | Boxed bag quantity | Boxed quantity | Notes                                                              |
|----------------|----------------|--------------|--------------|--------------------|----------------|--------------------------------------------------------------------|
| AiP431JA92.TB  | TO92           | AiP431       | 1000 PCS/bag | 10 bag/box         | 10000 PCS/box  | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing:1.27mm |
| AiP431AJA92.TB | TO92           | AiP431A      | 1000 PCS/bag | 10 bag/box         | 10000 PCS/box  | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing:1.27mm |
| AiP431BJA92.TB | TO92           | AiP431B      | 1000 PCS/bag | 10 bag/box         | 10000 PCS/box  | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing:1.27mm |
| AiP432JA92.TB  | TO92           | AiP432       | 1000 PCS/bag | 10 bag/box         | 10000 PCS/box  | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing:1.27mm |
| AiP432AJA92.TB | TO92           | AiP432A      | 1000 PCS/bag | 10 bag/box         | 10000 PCS/box  | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing:1.27mm |
| AiP432BJA92.TB | TO92           | AiP432B      | 1000 PCS/bag | 10 bag/box         | 10000 PCS/box  | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing:1.27mm |



## Reel packing specifications:

| Part number    | Packaging form | Marking code | Reel quantity | Boxed reel quantity | Notes                                                               |
|----------------|----------------|--------------|---------------|---------------------|---------------------------------------------------------------------|
| AiP431JA92.TR  | TO92           | AiP431       | 2000PCS/reel  | 2000PCS/box         | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing: 2.50mm |
| AiP431AJA92.TR | TO92           | AiP431A      | 2000PCS/reel  | 2000PCS/box         | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing: 2.50mm |
| AiP431BJA92.TR | TO92           | AiP431B      | 2000PCS/reel  | 2000PCS/box         | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing: 2.50mm |
| AiP432JA92.TR  | TO92           | AiP432       | 2000PCS/reel  | 2000PCS/box         | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing: 2.50mm |
| AiP432AJA92.TR | TO92           | AiP432A      | 2000PCS/reel  | 2000PCS/box         | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing: 2.50mm |
| AiP432BJA92.TR | TO92           | AiP432B      | 2000PCS/reel  | 2000PCS/box         | Dimensions of plastic enclosure: 4.6mm×4.6mm<br>Pin spacing: 2.50mm |
| AiP431GA23.TR  | SOT23          | 431XX        | 3000PCS/reel  | 30000PCS/box        | Dimensions of plastic enclosure: 2.9mm×1.3mm<br>Pin spacing: 1.90mm |
| AiP431AGA23.TR | SOT23          | 431AXX       | 3000PCS/reel  | 30000PCS/box        | Dimensions of plastic enclosure: 2.9mm×1.3mm<br>Pin spacing: 1.90mm |
| AiP431BGA23.TR | SOT23          | 431BXX       | 3000PCS/reel  | 30000PCS/box        | Dimensions of plastic enclosure: 2.9mm×1.3mm<br>Pin spacing: 1.90mm |
| AiP432GA23.TR  | SOT23          | 432XX        | 3000PCS/reel  | 30000PCS/box        | Dimensions of plastic enclosure: 2.9mm×1.3mm<br>Pin spacing: 1.90mm |
| AiP432AGA23.TR | SOT23          | 432AXX       | 3000PCS/reel  | 30000PCS/box        | Dimensions of plastic enclosure: 2.9mm×1.3mm<br>Pin spacing: 1.90mm |
| AiP432BGA23.TR | SOT23          | 432BXX       | 3000PCS/reel  | 30000PCS/box        | Dimensions of plastic enclosure: 2.9mm×1.3mm<br>Pin spacing: 1.90mm |

Note 1: “XX” refers to variable content, meaning package batch serial number.



Tab: 835-12-B5

## Wuxi I-CORE Electronics Co., Ltd.

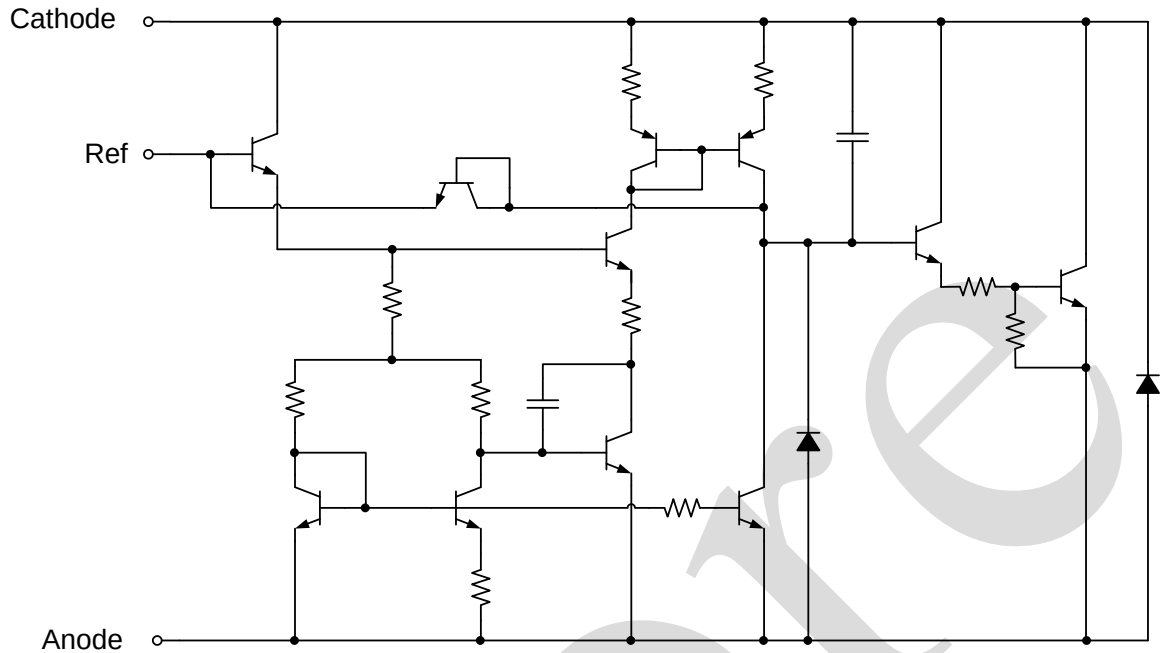
Note 2: If the physical information is inconsistent with the ordering information, please refer to the actual product.

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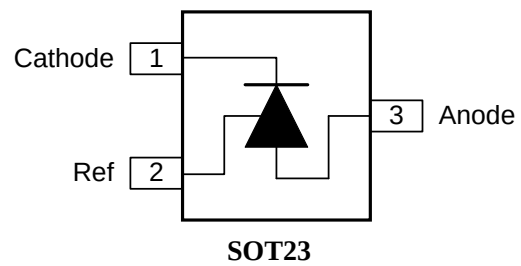
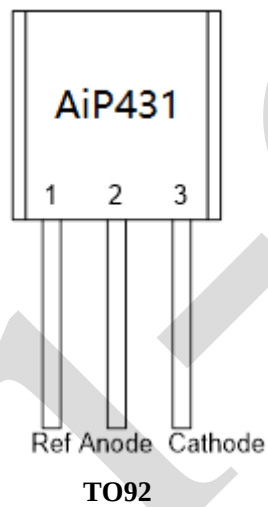
## 2、Block Diagram And Pin Description

### 2.1、Block Diagram



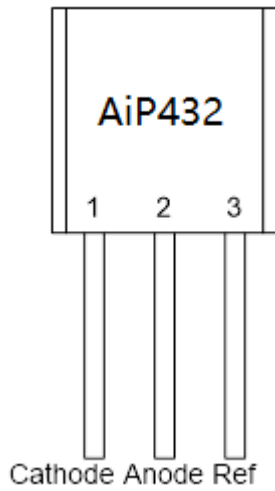
### 2.2、Pin Configurations

#### 2.2.1、AiP431

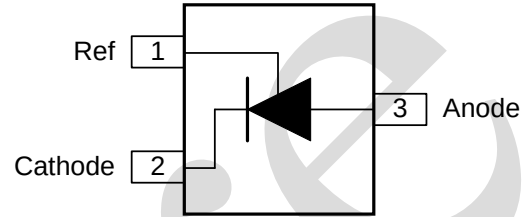




## 2.2.2、AiP432



TO92



SOT23

## 2.3、Pin Description

| Pin No.   | Pin Name | Description |        |        |        |
|-----------|----------|-------------|--------|--------|--------|
|           |          | TO92        |        | SOT23  |        |
|           |          | AiP431      | AiP432 | AiP431 | AiP432 |
| Cathode   | Cathode  | 3           | 1      | 1      | 2      |
| Reference | Ref      | 1           | 3      | 2      | 1      |
| Anode     | Anode    | 2           | 2      | 3      | 3      |

## 3、Electrical Parameter

### 3.1、Absolute Maximum Ratings

(T<sub>amb</sub>=25℃, unless otherwise specified)

| Parameter                                 |       | Symbol               | Conditions | Value |      | Unit |
|-------------------------------------------|-------|----------------------|------------|-------|------|------|
|                                           |       |                      |            | Min.  | Max. |      |
| Cathode voltage                           |       | V <sub>KA</sub>      | -          | -     | 37   | V    |
| Continuous cathode current                |       | I <sub>KA</sub>      | -          | -100  | 150  | mA   |
| Reference input current                   |       | I <sub>I (ref)</sub> | -          | -0.05 | 10   | mA   |
| Storage temperature                       |       | T <sub>stg</sub>     | -          | -65   | 150  | °C   |
| Thermal resistance<br>junction to ambient | TO92  | θ <sub>JA</sub>      | -          | 143.6 |      | °C/W |
|                                           | SOT23 |                      | -          | 206   |      |      |
| Thermal resistance<br>junction to case    | TO92  | θ <sub>JC</sub>      | -          | 74.4  |      | °C/W |
|                                           | SOT23 |                      | -          | 145.2 |      |      |
| Soldering<br>temperature                  | TO92  | T <sub>L</sub>       | 10s        | 250   |      | °C   |
|                                           | SOT23 |                      |            | 260   |      |      |



## 3.2、Recommended Operating Conditions

| Parameter                  | Symbol    | Min.      | Typ. | Max. | Unit |
|----------------------------|-----------|-----------|------|------|------|
| Cathode voltage            | $V_{KA}$  | $V_{ref}$ | -    | 36   | V    |
| Continuous cathode current | $I_{KA}$  | 1         | -    | 100  | mA   |
| Ambient temperature        | $T_{amb}$ | -40       | -    | 85   | °C   |

## 3.3、Electrical Characteristics

### 3.3.1、AiP431A/AiP432A

( $T_{amb}=25^{\circ}\text{C}$ , unless otherwise specified)

| Parameter                                                                 | Symbol                                  | Testing circuit | Conditions                                                                   |                                              | Min. | Typ. | Max. | Unit |
|---------------------------------------------------------------------------|-----------------------------------------|-----------------|------------------------------------------------------------------------------|----------------------------------------------|------|------|------|------|
| Reference voltage                                                         | V <sub>ref</sub>                        | Fig. 1          | V <sub>KA</sub> =V <sub>ref</sub> , I <sub>KA</sub> =10mA                    |                                              | 2483 | 2495 | 2507 | mV   |
| Deviation of reference voltage over full temperature range                | V <sub>I (dev)</sub>                    | Fig. 1          | V <sub>KA</sub> =V <sub>ref</sub> ,<br>I <sub>KA</sub> =10mA                 | -                                            | -    | 6    | 16   | mV   |
| Ratio of the change in reference voltage to the change in cathode voltage | ΔV <sub>ref</sub> /<br>ΔV <sub>KA</sub> | Fig. 2          | I <sub>KA</sub> =10mA                                                        | ΔV <sub>KA</sub> =10V<br>to V <sub>ref</sub> | -    | -1.4 | -2.7 | mV/V |
|                                                                           |                                         |                 |                                                                              | ΔV <sub>KA</sub> =36V<br>to 10V              | -    | -1   | -2   |      |
| Reference input current                                                   | I <sub>ref</sub>                        | Fig. 2          | I <sub>KA</sub> =10mA, R1=10kΩ,<br>R2=∞                                      |                                              | -    | 2    | 4    | μA   |
| Deviation of reference current over full temperature range                | I <sub>I (dev)</sub>                    | Fig. 2          | I <sub>KA</sub> =10mA, R1=10kΩ,<br>R2=∞                                      |                                              | -    | 0.8  | 1.2  | μA   |
| Minimum cathode current for regulation                                    | I <sub>min</sub>                        | Fig. 1          | V <sub>KA</sub> =V <sub>ref</sub>                                            |                                              | -    | 0.4  | 0.7  | mA   |
| Off-state cathode current                                                 | I <sub>off</sub>                        | Fig. 3          | V <sub>KA</sub> =36V, V <sub>ref</sub> =0                                    |                                              | -    | 0.1  | 0.5  | μA   |
| Dynamic output impedance                                                  | Z <sub>KA</sub>                         | Fig. 1          | V <sub>KA</sub> =V <sub>ref</sub> , f≤1kHz,<br>I <sub>KA</sub> =1mA to 100mA |                                              | -    | 0.2  | 0.5  | Ω    |



## 3.3.2、AiP431/AiP432

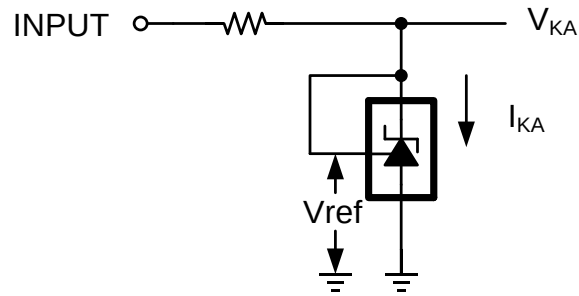
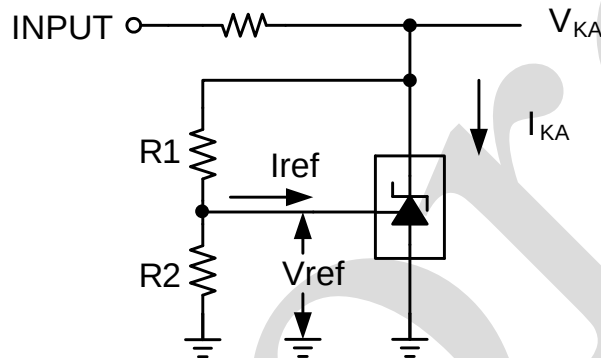
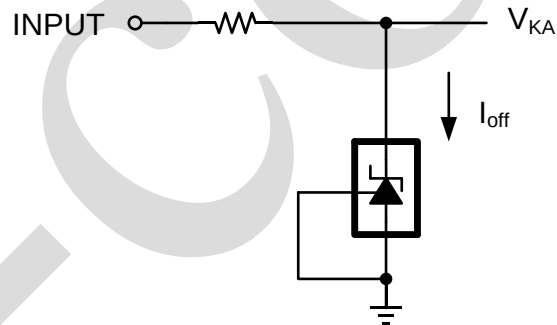
(T<sub>amb</sub>=25℃, unless otherwise specified)

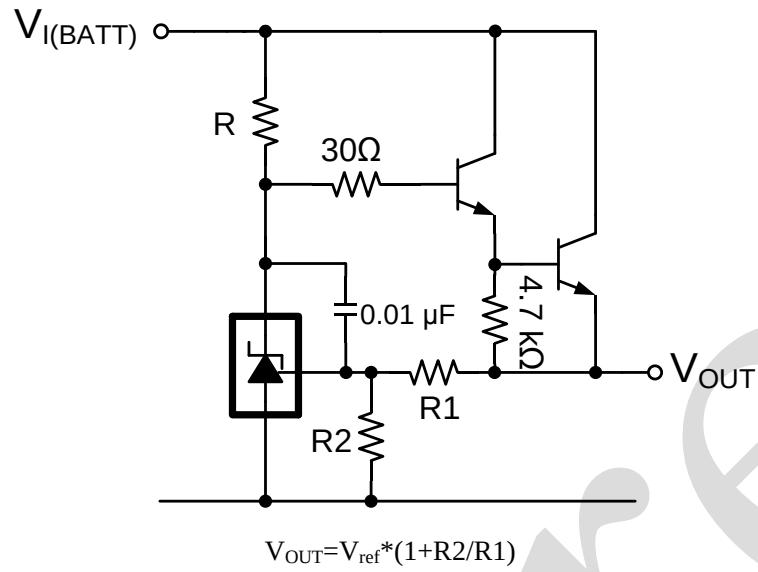
| Parameter                                                                 | Symbol                                 | Test circuit | Conditions                                                                | Min.                                                                                              | Typ.       | Max.       | Unit |
|---------------------------------------------------------------------------|----------------------------------------|--------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------|------------|------|
| Reference voltage                                                         | V <sub>ref</sub>                       | Fig.1        | V <sub>KA</sub> =V <sub>ref</sub> , I <sub>KA</sub> =10mA                 | 2470                                                                                              | 2495       | 2520       | mV   |
| Deviation of reference voltage over full temperature range                | V <sub>I (dev)</sub>                   | Fig.1        | V <sub>KA</sub> =V <sub>ref</sub> , I <sub>KA</sub> =10mA                 | -                                                                                                 | 6          | 16         | mV   |
| Ratio of the change in reference voltage to the change in cathode voltage | $\frac{\Delta V_{ref}}{\Delta V_{KA}}$ | Fig.2        | I <sub>KA</sub> =10mA                                                     | $\frac{\Delta V_{KA}=10V}{\text{to } V_{ref}}$<br>-<br>$\frac{\Delta V_{KA}=36V}{\text{to } 10V}$ | -1.4<br>-1 | -2.7<br>-2 | mV/V |
| Reference input current                                                   | I <sub>ref</sub>                       | Fig.2        | I <sub>KA</sub> =10mA, R1=10kΩ, R2=∞                                      | -                                                                                                 | 2          | 4          | μA   |
| Deviation of reference voltage over full temperature range                | I <sub>I (dev)</sub>                   | Fig.2        | I <sub>KA</sub> =10mA, R1=10kΩ, R2=∞                                      | -                                                                                                 | 0.8        | 1.2        | μA   |
| Minimum cathode current for regulation                                    | I <sub>min</sub>                       | Fig.1        | V <sub>KA</sub> =V <sub>ref</sub>                                         | -                                                                                                 | 0.4        | 1          | mA   |
| Off-state cathode current                                                 | I <sub>off</sub>                       | Fig.3        | V <sub>KA</sub> =36V, V <sub>ref</sub> =0                                 | -                                                                                                 | 0.1        | 1          | μA   |
| Dynamic output impedance                                                  | Z <sub>KA</sub>                        | Fig.1        | V <sub>KA</sub> =V <sub>ref</sub> , f≤1kHz, I <sub>KA</sub> =1mA to 100mA | -                                                                                                 | 0.2        | 0.5        | Ω    |

## 3.3.3、AiP431B/AiP432B

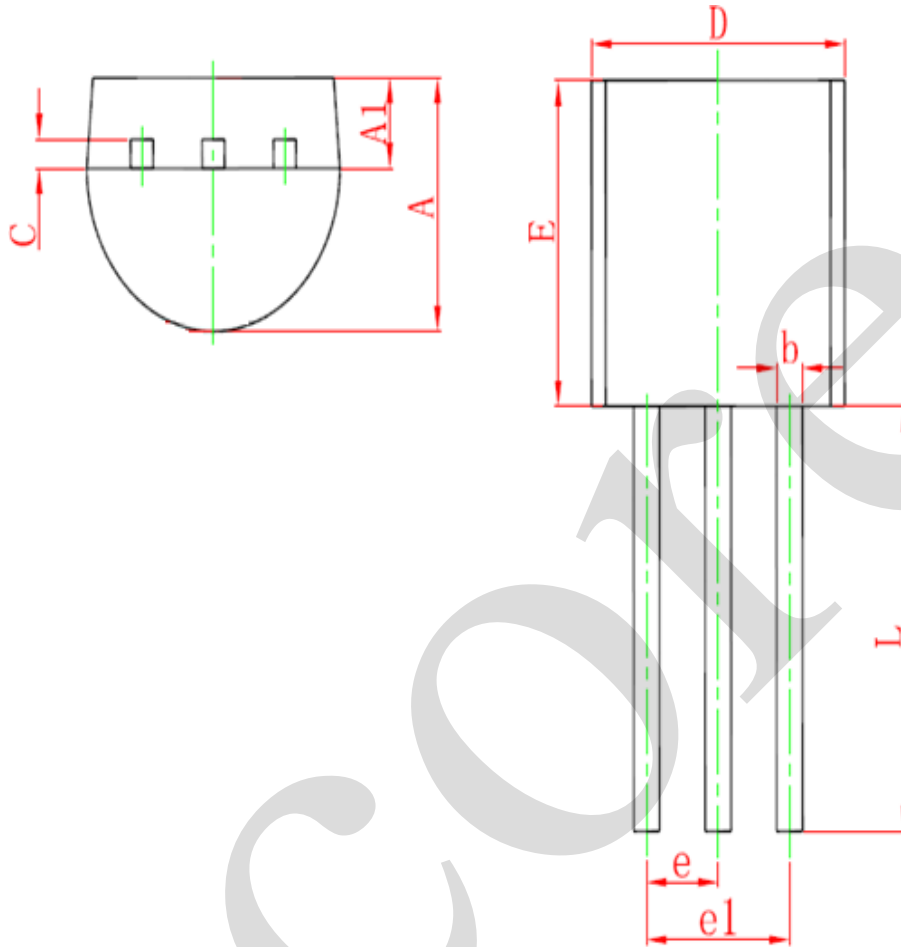
(T<sub>amb</sub>=25℃, unless otherwise specified)

| Parameter                                                                   | Symbol                                 | Test circuit | Conditions                                                                | Min.                                                                                              | Typ.       | Max.       | Unit |
|-----------------------------------------------------------------------------|----------------------------------------|--------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------|------------|------|
| Reference voltage                                                           | V <sub>ref</sub>                       | Fig.1        | V <sub>KA</sub> =V <sub>ref</sub> , I <sub>KA</sub> =10mA                 | 2440                                                                                              | 2495       | 2550       | mV   |
| Deviation of input current over full temperature range                      | V <sub>I (dev)</sub>                   | Fig.1        | V <sub>KA</sub> =V <sub>ref</sub> , I <sub>KA</sub> =10mA                 | -                                                                                                 | 6          | 16         | mV   |
| Ratio of the change in reference voltage to the change in cathode reference | $\frac{\Delta V_{ref}}{\Delta V_{KA}}$ | Fig.2        | I <sub>KA</sub> =10mA                                                     | $\frac{\Delta V_{KA}=10V}{\text{to } V_{ref}}$<br>-<br>$\frac{\Delta V_{KA}=36V}{\text{to } 10V}$ | -1.4<br>-1 | -2.7<br>-2 | mV/V |
| Reference input current                                                     | I <sub>ref</sub>                       | Fig.2        | I <sub>KA</sub> =10mA, R1=10kΩ, R2=∞                                      | -                                                                                                 | 2          | 4          | μA   |
| Deviation of reference current over full temperature range                  | I <sub>I (dev)</sub>                   | Fig.2        | I <sub>KA</sub> =10mA, R1=10kΩ, R2=∞                                      | -                                                                                                 | 0.8        | 1.2        | μA   |
| Minimum cathode current for regulation                                      | I <sub>min</sub>                       | Fig.1        | V <sub>KA</sub> =V <sub>ref</sub>                                         | -                                                                                                 | 0.4        | 1          | mA   |
| Off-state cathode current                                                   | I <sub>off</sub>                       | Fig.3        | V <sub>KA</sub> =36V, V <sub>ref</sub> =0                                 | -                                                                                                 | 0.1        | 1          | μA   |
| Dynamic output impedance                                                    | Z <sub>KA</sub>                        | Fig.1        | V <sub>KA</sub> =V <sub>ref</sub> , f≤1kHz, I <sub>KA</sub> =1mA to 100mA | -                                                                                                 | 0.2        | 0.5        | Ω    |

**4、Testing Circuit**Figure 1. Testing circuit when  $V_{KA}=V_{ref}$ Figure 2. Testing circuit when  $V_{KA}>V_{ref}$ Figure 3.  $I_{off}$  Testing circuit

**5、Typical Application Circuit And Application Note**

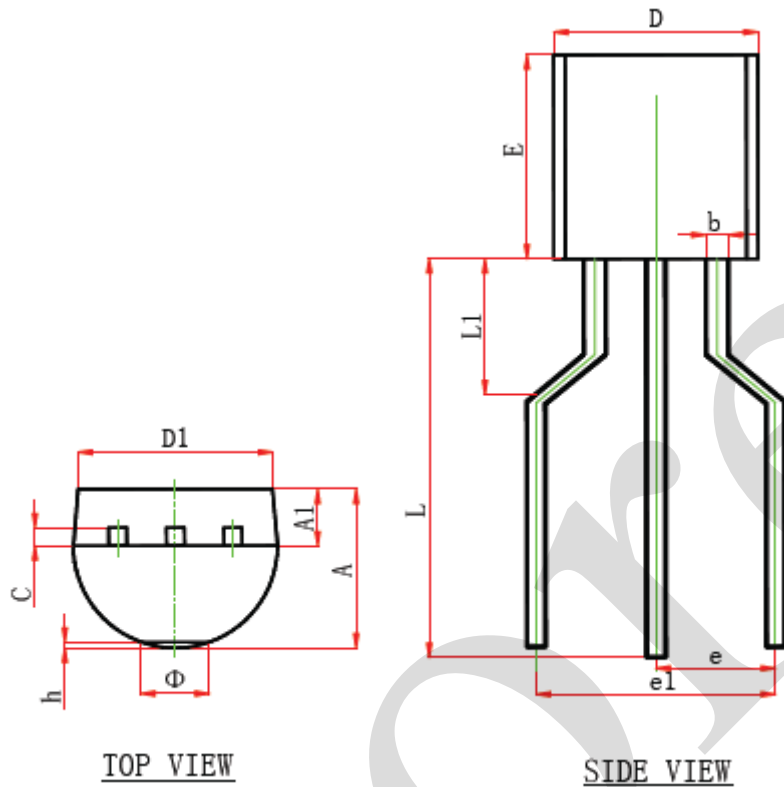
Note: A. R should provide cathode current ( $> 1\text{mA}$ ) to AiP431/432 under the minimum current  $V_{(BATT)}$ .

**6、Package Information****6.1、TO92****Bagged package information:**

| 2023/12/A | Dimensions In Millimeters |       |
|-----------|---------------------------|-------|
| Symbol    | Min                       | Max   |
| A         | 3.30                      | 3.75  |
| A1        | 1.10                      | 1.40  |
| b         | 0.38                      | 0.56  |
| c         | 0.36                      | 0.51  |
| D         | 4.30                      | 4.70  |
| E         | 4.30                      | 4.70  |
| e         | 1.27                      |       |
| e1        | 2.44                      | 2.64  |
| L         | 13.50                     | 15.30 |



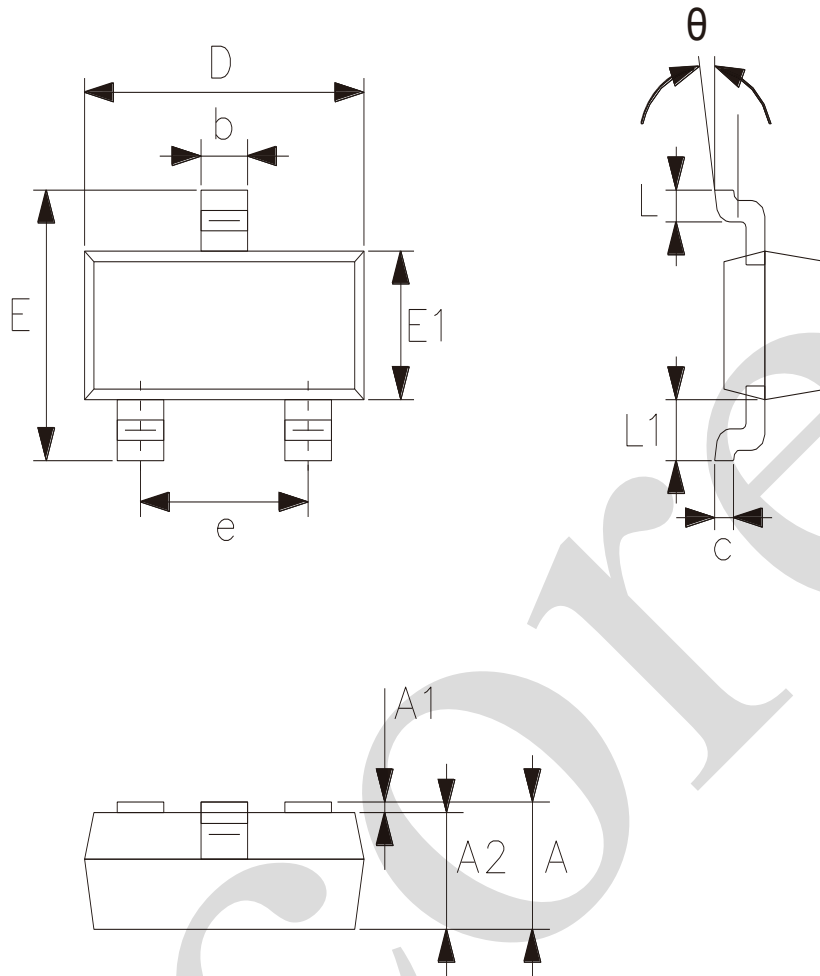
## Reel package information:



| 2026/03/A | Dimensions In Millimeters |       |
|-----------|---------------------------|-------|
| Symbol    | Min.                      | Max.  |
| A         | 3.30                      | 3.70  |
| A1        | 1.10                      | 1.40  |
| b         | 0.38                      | 0.55  |
| c         | 0.36                      | 0.51  |
| D         | 4.30                      | 4.70  |
| D1        | 3.43                      | —     |
| E         | 4.30                      | 4.70  |
| e         | 2.50                      |       |
| e1        | 4.50                      | 5.50  |
| L         | 13.80                     | 15.20 |
| L1        | 2.70                      | 3.30  |
| $\phi$    | —                         | 1.60  |
| h         | 0.00                      | 0.38  |



## 6.2、SOT23



| 2023/12/A | Dimensions In Millimeters |       |
|-----------|---------------------------|-------|
| Symbol    | Min.                      | Max.  |
| A         | —                         | 1.15  |
| A1        | 0.00                      | 0.10  |
| A2        | 0.90                      | 1.10  |
| b         | 0.30                      | 0.50  |
| c         | 0.132                     | 0.202 |
| D         | 2.80                      | 3.00  |
| E         | 2.25                      | 2.55  |
| E1        | 1.20                      | 1.40  |
| e         | 1.80                      | 2.00  |
| L         | 0.30                      | 0.50  |
| L1        | 0.55                      |       |
| $\theta$  | 0°                        | 8°    |



## 7、Statements And Notes

### 7.1、The name and content of Hazardous substances or Elements in the product

| Part name               | Hazardous substances or Elements                                                                                                                                                                                                                                                 |                               |                               |                               |                          |                                |                   |                       |                           |                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------------|-------------------|-----------------------|---------------------------|----------------------|
|                         | Lead and lead compounds                                                                                                                                                                                                                                                          | Mercury and mercury compounds | Cadmium and cadmium compounds | Hexavalent chromium compounds | Polybrominated biphenyls | Polybrominated biphenyl ethers | Dibutyl phthalate | Butylbenzyl phthalate | Di-2-ethylhexyl phthalate | Diisobutyl phthalate |
| Lead frame              | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| Plastic resin           | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| Chip                    | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| The lead                | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| Plastic sheet installed | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| explanation             | <p>○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard.</p> <p>×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.</p> |                               |                               |                               |                          |                                |                   |                       |                           |                      |

### 7.2、Notes

We recommend you to read this chapter carefully before using this product.

The information in this chapter is provided for reference only and i-Core disclaims any express or implied warranties, including but not limited to applicability, special application or non-infringement of third party rights.

This product is not suitable for critical equipment such as life-saving, life-sustaining or safety equipment. It is also not suitable for applications that may result in personal injury, death, or serious property or environmental damage due to product malfunction or failure. I-Core will not be liable for any damages incurred by the customers at their own risk for such applications.

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