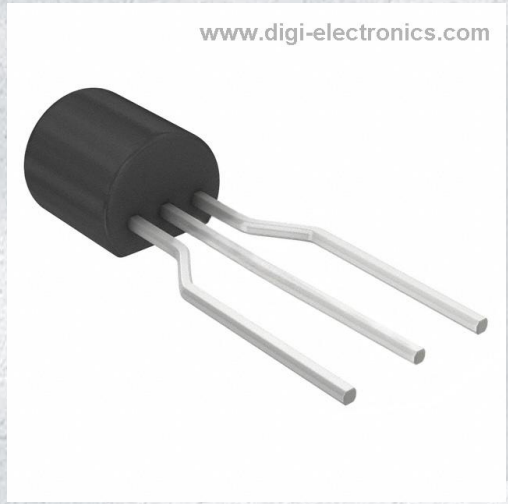
# FAN431ZXA Datasheet




| | |
|---|---|
| DiGi Electronics Part Number | FAN431ZXA-DG |
| Manufacturer | onsemi |
| Manufacturer Product Number | FAN431ZXA |
| Description | IC VREF SHUNT ADJ 2% TO92-3 |
| Detailed Description | Shunt Voltage Reference IC Adjustable 2.495V 36 V V ±2% 100 mA TO-92-3 |

https://www.DiGi-Electronics.com

This model FAN431ZXA is available at DiGi Electronics.

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## Purchase and inquiry

| Manufacturer Product Number: | Manufacturer: |
| --- | --- |
| FAN431ZXA | onsemi |
| Series: | Product Status: |
| - | Obsolete |
| Reference Type: | Output Type: |
| Shunt | Adjustable |
| Voltage - Output (Min/Fixed): | Voltage - Output (Max): |
| 2.495V | 36 V |
| Current - Output: | Tolerance: |
| 100 mA | ±2% |
| Temperature Coefficient: | Noise - 0.1Hz to 10Hz: |
| 50ppm/°C Typical | - |
| Noise - 10Hz to 10kHz: | Voltage - Input: |
| - | - |
| Current - Supply: | Current - Cathode: |
| - | 1 mA |
| Operating Temperature: | Mounting Type: |
| -25°C ~ 85°C (TA) | Through Hole |
| Package / Case: | Supplier Device Package: |
| TO-226-3, TO-92-3 (TO-226AA) Formed Leads | TO-92-3 |
| Base Product Number: | |
| FAN431 | |

## Environmental & Export classification

| Moisture Sensitivity Level (MSL): | REACH Status: |
| --- | --- |
| 1 (Unlimited) | REACH Unaffected |
| ECCN: | HTSUS: |
| EAR99 | 8542.39.0001 |

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FAIRCHILD SEMICONDUCTOR®

May 2007

# FAN431/FAN431A/FAN431L

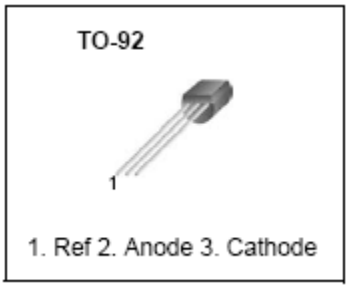
## Programmable Shunt Regulator

### Features

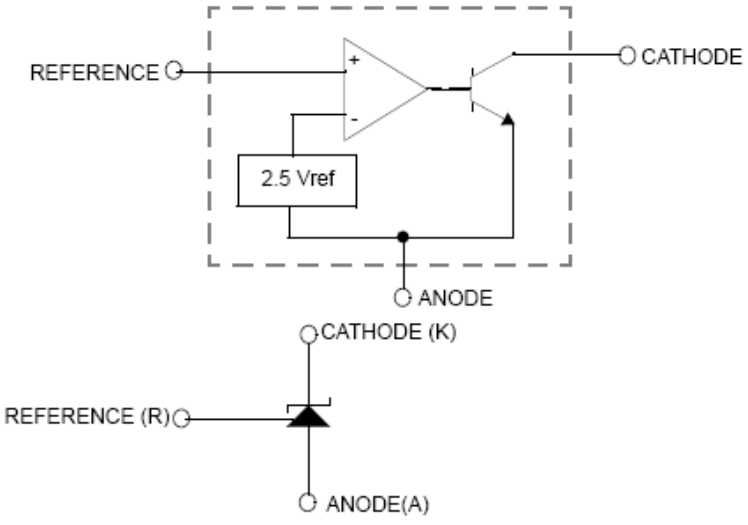
- Programmable Output Voltage to 36 Volts
- Low Dynamic Output Impedance 0.20 Typical
- Sink Current Capability of 1.0 to 100mA
- Equivalent Full-Range Temperature Coefficient of 50ppm/°C Typical
- Temperature Compensated for Operation Over Full Rated Operating Temperature Range
- Low Output Noise Voltage
- Fast Turn-on Response

### Description

The FAN431/FAN431A/FAN431L are three terminal output adjustable regulators with thermal stability over operating temperature range. The output voltage can be set any value between $V_{REF}$ (approximately 2.5 volts) and 36 volts with two external resistors. These devices have a typical dynamic output impedance of 0.2Ω Active output circuit provides a sharp turn-on characteristic, making these devices excellent replacement for Zener Diodes in many applications




### Internal Block Diagram

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## Absolute Maximum Ratings

(Operating temperature range applies unless otherwise specified.)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Cathode Voltage | $V_{KA}$ | 37 | V |
| Cathode current Range (Continuous) | $I_{KA}$ | -100 ~ +150 | mA |
| Reference Input Current Range | $I_{REF}$ | -0.05 ~ +10 | mA |
| Thermal Resistance Junction-Air (Note1,2)<br>Z Suffix Package | $R_{\theta JA}$ | 132 | °C/W |
| Power Dissipation (Note3,4)<br>Z Suffix Package | $P_D$ | 940 | mW |
| Junction Temperature | $T_J$ | 150 | °C |
| Operating Temperature Range | $T_{OPR}$ | -25 ~ +85 | °C |
| Storage Temperature Range | $T_{STG}$ | -65 ~ +150 | °C |

**Note:**

1. Thermal resistance test board
   Size: 76.2mm * 114.3mm * 1.6mm (1S0P)
   JEDEC Standard: JESD51-3, JESD51-7
2. Assume no ambient airflow.
3. $T_{JMAX}$ = 150°C, Ratings apply to ambient temperature at 25°C
4. Power dissipation calculation: $P_D = (T_J - T_A)/R_{\theta JA}$

## Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Cathode Voltage | $V_{KA}$ | $V_{REF}$ | - | 36 | V |
| Cathode Current | $I_{KA}$ | 1.0 | - | 100 | mA |

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# Electrical Characteristics

(TA = +25°C, unless otherwise specified)

| Parameter | Symbol | Conditions | | FAN431 | | | FAN431A | | | FAN431L | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| Reference Input Voltage | VREF | VKA=VREF, IKA=10mA | | 2.450 | 2.500 | 2.550 | 2.470 | 2.495 | 2.520 | 2.482 | 2.495 | 2.508 | V |
| Deviation of Reference Input Voltage Over-Temperature | ΔVREF/ ΔT | VKA=VREF, IKA=10mA TMIN≤TA≤TMAX | | - | 4.5 | 17.0 | - | 4.5 | 17.0 | - | 4.5 | 17.0 | mV |
| Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage | ΔVREF/ ΔVKA | IKA =10mA | ΔVKA=10V-VREF | - | -1.0 | -2.7 | - | -1.0 | -2.7 | - | -1.0 | -2.7 | mV/V |
| | | | ΔVKA=36V-10V | - | -0.5 | -2.0 | - | -0.5 | -2.0 | - | -0.5 | -2.0 | |
| Reference Input Current | IREF | IKA=10mA, R1=10kΩ,R2=∞ | | - | 1.5 | 4.0 | - | 1.5 | 4.0 | - | 1.5 | 4.0 | μA |
| Deviation of Reference Input Current Over Full Temperature Range | ΔIREF/ΔT | IKA=10mA, R1=10kΩ,R2=∞, TA=Full Range | | - | 0.4 | 1.2 | - | 0.4 | 1.2 | - | 0.4 | 1.2 | μA |
| Minimum Cathode Current for Regulation | IKA(MIN) | VKA=VREF | | - | 0.45 | 1.0 | - | 0.45 | 1.0 | - | 0.45 | 1.0 | mA |
| Off -Stage Cathode Current | IKA(OFF) | VKA=36V, VREF=0 | | - | 0.05 | 1.0 | - | 0.05 | 1.0 | - | 0.05 | 1.0 | μA |
| Dynamic Impedance | ZKA | VKA=VREF, IKA=1 to 100mA ,f ≥1.0kHz | | - | 0.15 | 0.5 | - | 0.15 | 0.5 | - | 0.15 | 0.5 | Ω |

**Note1**

TMIN = -25°C, TMAX = +85°C

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## Test Circuits

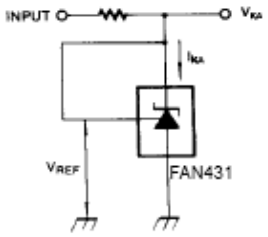


Figure 1. Test Circuit for $V_{KA}=V_{REF}$

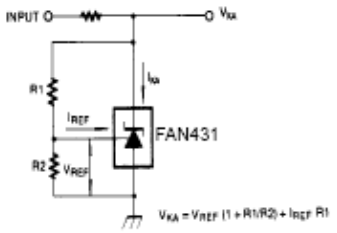


Figure 2. Test Circuit for $V_{KA} \geq V_{REF}$

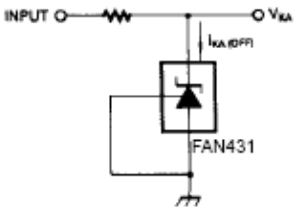


Figure 3. Test Circuit for $I_{KA(OFF)}$

# Typical Performance Characteristics

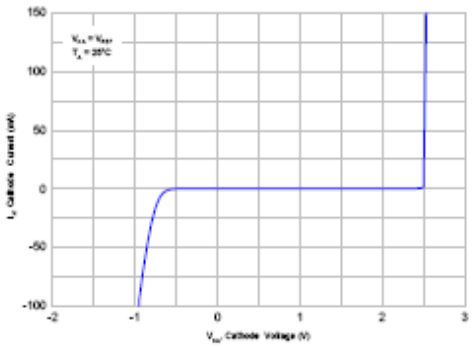

Figure 4. Cathode Current vs. Cathode Voltage

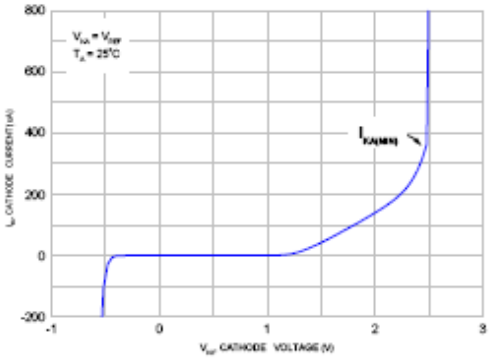

Figure 5. Cathode Current vs. Cathode Voltage

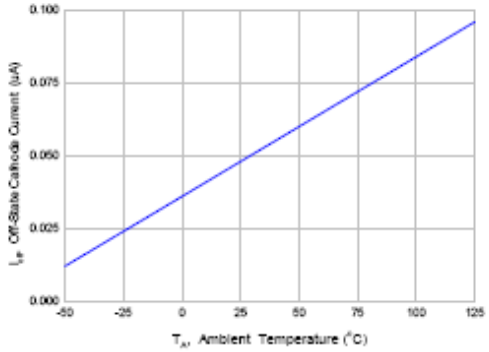

Figure 6. OFF-State Cathode Current vs. Ambient Temperature

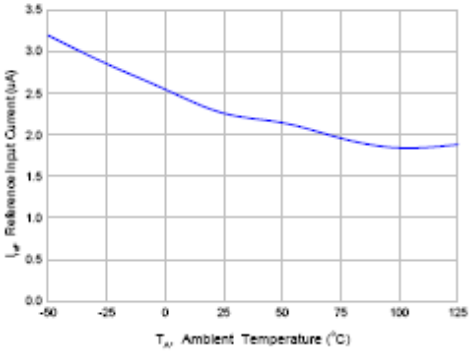

Figure7. Reference Input Current vs. Ambient Temperature

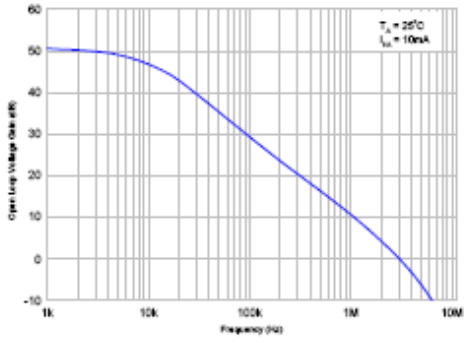

Figure 8. Small Signal Voltage Amplification vs. Frequency

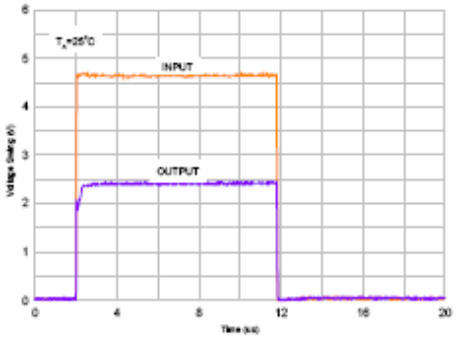

Figure 9. Pulse Response

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## Typical Performance Characteristics (Continued)

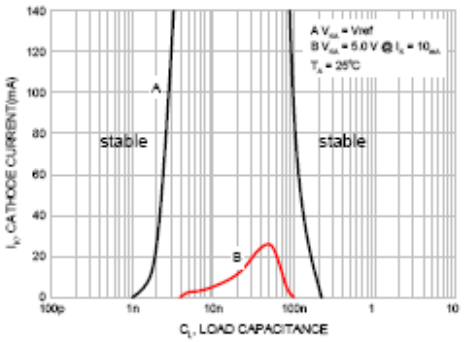


Figure 10. Stability Boundary Conditions

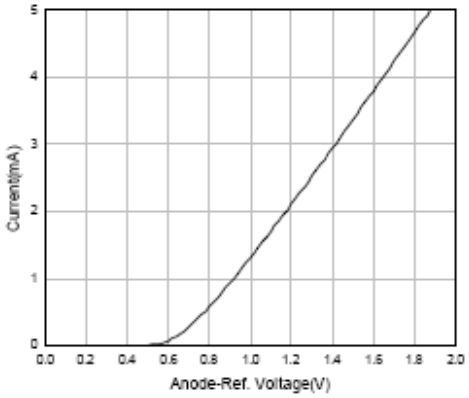


Figure 11. Anode-Reference Diode Curve

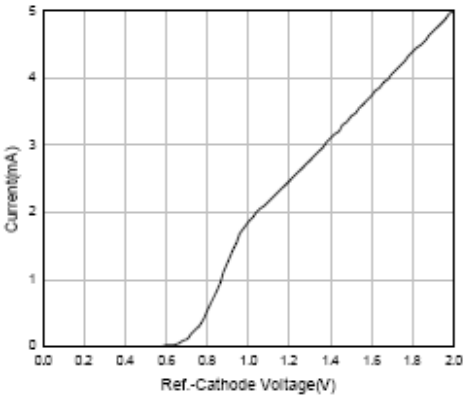


Figure 12. Reference-Cathode Diode Curve

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## Typical Application

$$V_O = \left(1 + \frac{R_1}{R_2}\right) V_{ref}$$

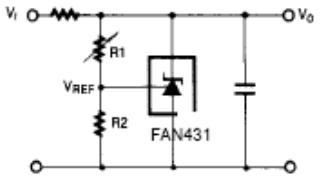



Figure 13. Shunt Regulator

$$V_O = V_{ref}\left(1 + \frac{R_1}{R_2}\right)$$

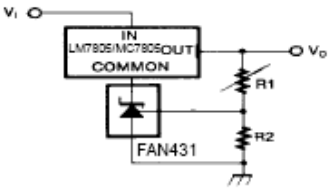



Figure 14. Output Control for Three-Termianl Fixed Regulator

$$V_O = \left(1 + \frac{R_1}{R_2}\right) V_{ref}$$

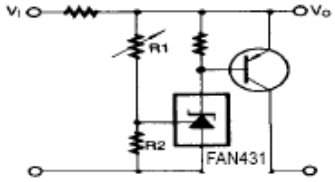



Figure 15. High Current Shunt Regulator

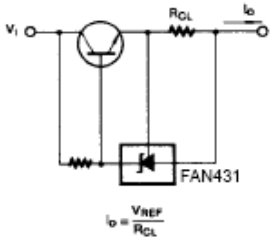



Figure 16. Current Limit or Current Source

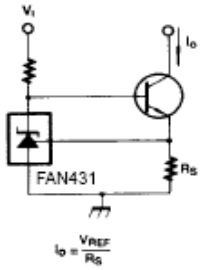


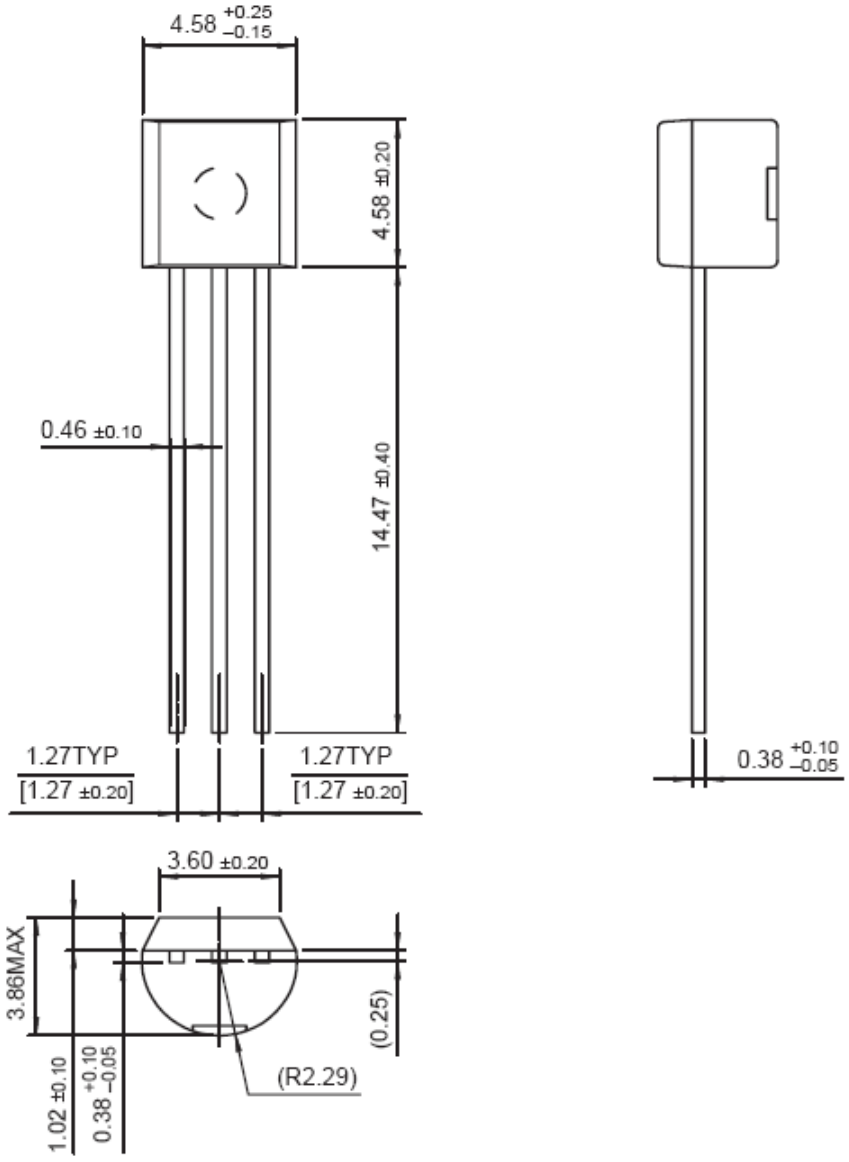

Figure 17. Constant-Current Sink

## Mechanical Dimensions

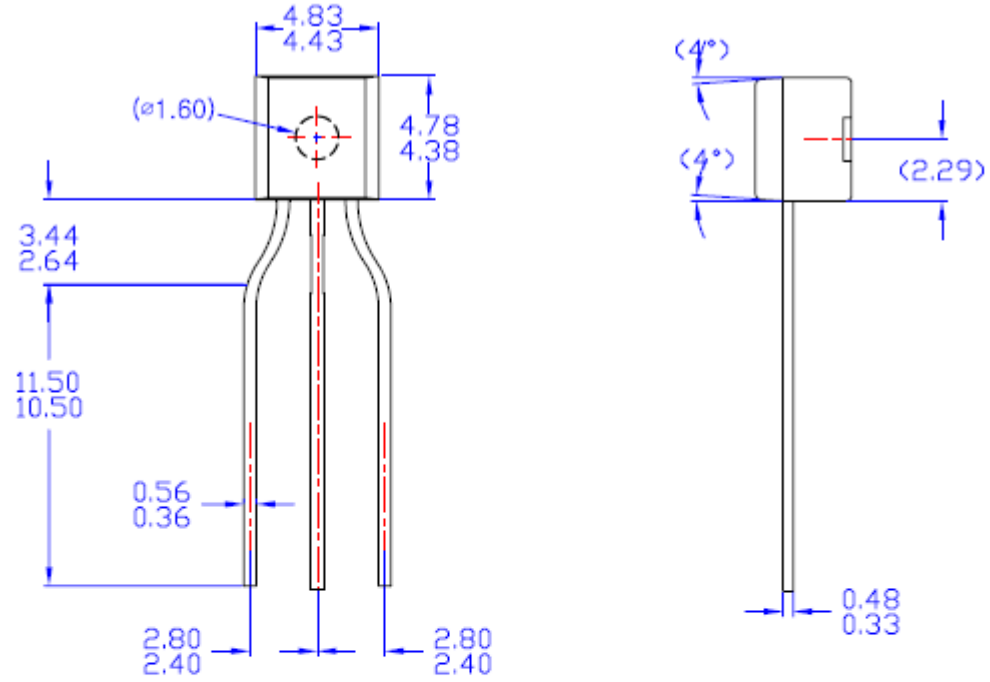
**Package**

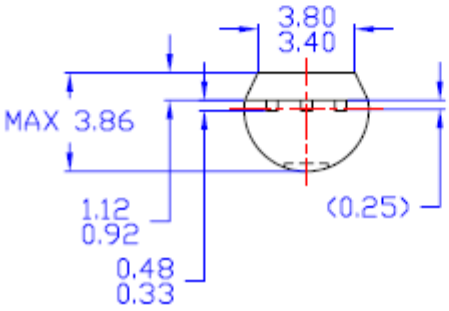
**Dimensions in millimeters**

### TO-92 Bulk Type



# TO-92 Ammo Type & Tape And Reel Type




NOTES:

A) THIS PACKAGE DOES NOT COMPLY TO ANY CURRENT PACKAGING STANDARD.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DRAWING CONFORMS TO ASME Y14.5M-1994
D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

FILE NAME:MKT-TO-92J61Z

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## Ordering Information

| Product Number | Output Voltage Tolerance | Package | Operating Temperature | Shipping |
|---|---|---|---|---|
| FAN431ZXA | 2% | TO-92 | -25 ~ +85°C | Ammo Pack |
| FAN431AZXA | 1% | | | |
| FAN431LZXA | 0.5% | | | |

- For information on tape & reel and ammo pack specifications, including part orientation and tape sizes, please refer to our tape and reel data, http://www.fairchildsemi.com/products/analog/packaging/to92r.html

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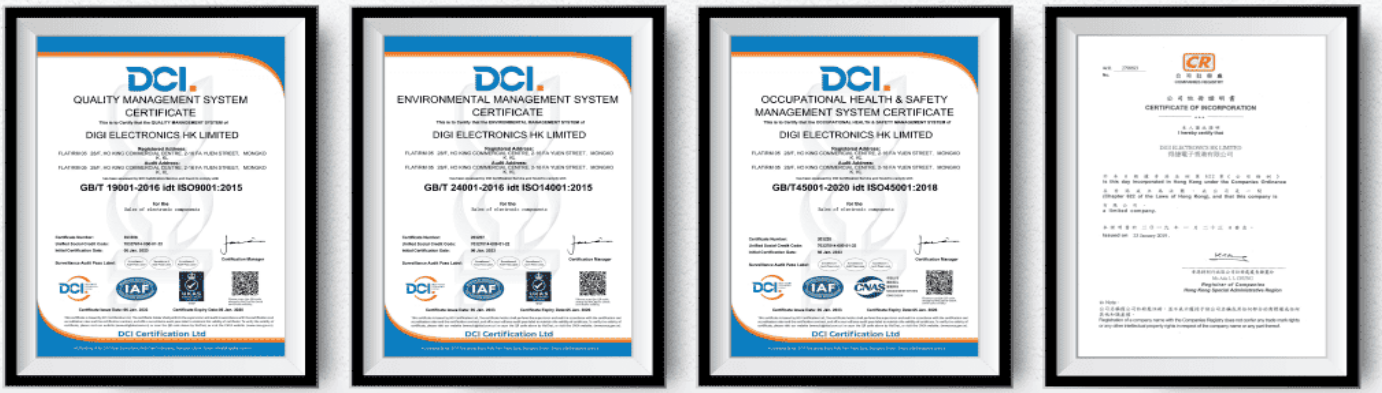

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