

## Ultra 1.24V Precision Adjustable Shunt Regulator

### FEATURES

- Low Voltage Operation..... 1.24V
- Trimmed Bandgap to.....0.5% / 1%
- Wide Operating Current..... 100 $\mu$ A to 100mA
- Extended Temperature Range.....0°C to 105°C
- Adjustable Output Voltage.....  $V_{REF}$  to 18V
- Low Temperature Coefficient..... 50 ppm/°C
- Offered in TO-92, SOIC, SOT-89, SOT-23-3

### APPLICATIONS

- 3.0V to 3.3V Switching Power Supplies
- Adjustable Supplies
- Error Amplifiers
- Single Supply Amplifier
- Monitors / VCR / TV
- Personal Computers

### PRODUCT DESCRIPTION

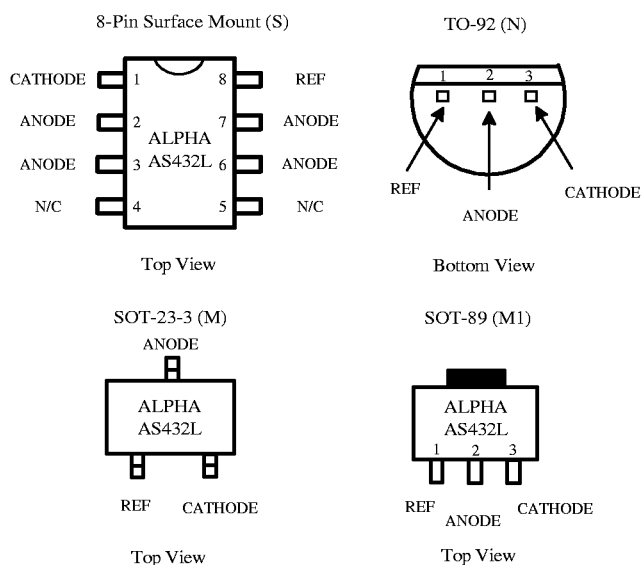
The ALPHA Semiconductor's AS432L is a 3-terminal Adjustable Shunt Voltage Regulator providing a highly accurate 1.24V bandgap reference with 0.5% tolerance. The AS432L thermal stability, wide operating current (100mA) and temperature range (0°C to 105°C) makes it suitable for a broad range of applications. AS432L tolerance of 0.5% is proven to be sufficient to overcome other errors in the system to virtually eliminate the need for trimming in the power supply manufacturers assembly line and contribute a significant cost savings.

The AS432L is an ideal voltage reference in an isolated feedback circuit for 3.0V to 3.3V switching mode power supplies. AS432L offers many advantages over TLV431, such as, wider output voltage up to 18V vs. 6V, output current of 80mA vs. 15mA, and a wider temperature range with tighter tolerance down to 0.5%. ALPHA Semiconductor, is the only manufacture to offer the AS432L equivalent in SOT-23-3 with all above advantages.

### ORDERING INFORMATION

| Part Number | Tolerance | Package Type |
|-------------|-----------|--------------|
| AS432LAN    | 0.5%      | TO-92        |
| AS432LAM1   | 0.5%      | SOT-89       |
| AS432LAS    | 0.5%      | SO-8         |
| AS432LAM    | 0.5%      | SOT-23-3     |
| AS432LN     | 1%        | TO-92        |
| AS432LM1    | 1%        | SOT-89       |
| AS432LS     | 1%        | SO-8         |
| AS432LM     | 1%        | SOT-23-3     |

### PIN CONNECTIONS

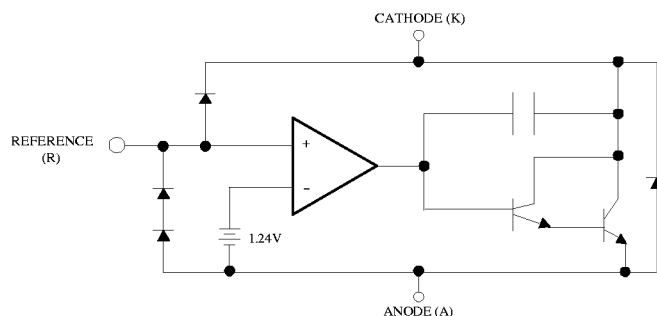


## MARKING INFORMATION

[For SOT-23 (3 and 5 Pin) and SOT-89 only]

| Device  | Marking |
|---------|---------|
| AS432LA | BAXX    |
| AS432L  | BBXX    |

XX is lot number assigned by production



## ABSOLUTE MAXIMUM RATINGS

| Parameter                            | Symbol    | Rating       | Units |
|--------------------------------------|-----------|--------------|-------|
| Cathode-Anode Reverse Breakdown      | $V_{DA}$  | 18           | V     |
| Anode-Cathode Forward Current        | $I_{AK}$  | 1            | A     |
| Operating Cathode Current            | $I_{KA}$  | 100          | mA    |
| Reference Input Current              | $I_{REF}$ | 1            | mA    |
| Continuous Power at 25°C             | $P_D$     |              |       |
| TO-92                                |           | 775          | mW    |
| 8L SOIC                              |           | 750          | mW    |
| SOT-89                               |           | 1000         | mW    |
| SOT-23                               |           | 200          | mW    |
| Junction Temperature                 | $T_J$     | 150          | °C    |
| Storage Temperature                  | $T_{STG}$ | - 65 to +150 | °C    |
| Lead Temperature (Soldering 10 sec.) | TL        | 300          | °C    |

Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## RECOMMENDED CONDITIONS

| Parameter       | Symbol   | Rating          | Unit |
|-----------------|----------|-----------------|------|
| Cathode Voltage | $V_{KA}$ | $V_{REF}$ to 18 | V    |
| Cathode Current | $I_K$    | 500             | μA   |

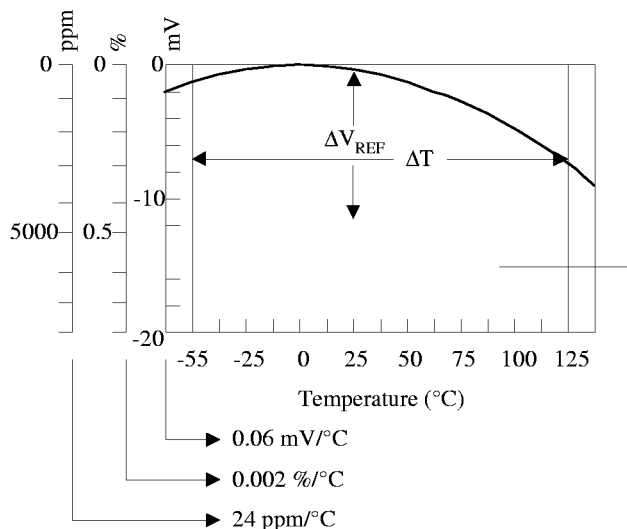
## TYPICAL THERMAL RESISTANCES

| Package | $\theta_{JA}$ | $\theta_{JC}$ | Typical Derating |
|---------|---------------|---------------|------------------|
| TO-92   | 160 °C/W      | 80 °C/W       | 6.3 mW/°C        |
| SOIC    | 175 °C/W      | 45 °C/W       | 5.7 mW/°C        |
| SOT-89  | 110 °C/W      | 8 °C/W        | 9.1 mW/°C        |
| SOT-23  | 575 °C/W      | 150 °C/W      | 1.7 mW/°C        |

**ELECTRICAL CHARACTERISTICS** are guaranteed over the full junction temperature range (0°C to 105°C). Ambient temperature must be derated based upon power dissipation and package thermal characteristics. Unless otherwise specified, test conditions are:  $V_{KA} = V_{REF}$  and  $I_K = 10\text{mA}$ .

| Parameter                                       | Symbol       | Test Circuit | Test Condition                                                            | AS432AL |       |        | AS432L |       |        | Unit          |
|-------------------------------------------------|--------------|--------------|---------------------------------------------------------------------------|---------|-------|--------|--------|-------|--------|---------------|
|                                                 |              |              |                                                                           | Min     | Typ   | Max    | Min    | Typ   | Max    |               |
| Output Voltage                                  | $V_{REF}$    | 1            | $I_K = 500\mu\text{A}$ ,<br>$T_J = 25^\circ\text{C}$ ,<br>$V_K = V_{REF}$ | 1.2338  | 1.240 | 1.2462 | 1.2276 | 1.240 | 1.2524 | V             |
| Line Regulation                                 | $V_{REF}$    | 1            | $V_{KA} = 1.25\text{V to } 15\text{V}$                                    |         | 10    | 30     |        | 10    | 30     | mV            |
| Load Regulation                                 | $V_{REF}$    | 1            | $I_K = 100\mu\text{A to } 80\text{mA}$                                    |         | 10    |        |        | 3     |        | mV            |
| Temperature Deviation                           | $V_{REF}$    | 1            | $0 < T_J < 105^\circ\text{C}$                                             |         | 2     | 6      |        | 2     | 6      | mV            |
| Reference Input Current                         | $I_{REF}$    | 2            |                                                                           |         | 3     | 6      |        | 3     | 6      | $\mu\text{A}$ |
| Reference Input Current Temperature Coefficient | $I_{REF}$    | 2            | $0 < T_J < 105^\circ\text{C}$                                             |         | 0.3   | 0.6    |        | 0.3   | 0.6    | $\mu\text{A}$ |
| Minimum Cathode Current for Regulation          | $I_{K(MIN)}$ | 1            |                                                                           |         | 80    | 100    |        | 80    | 100    | nA            |
| Off State Leakage                               | $I_{K(MIN)}$ | 3            | $V_{REF} = 0\text{V}$ , $V_{KA} = 18\text{V}$                             |         | 0.04  | 500    |        | 0.04  | 500    | nA            |

## Calculating Average Temperature Coefficient (TC)



- $\text{TC in mV}/^\circ\text{C} = \frac{\Delta V_{REF} \text{ (mV)}}{\Delta T_A}$
- $\text{TC in } \%/^\circ\text{C} = \frac{\left( \frac{\Delta V_{REF}}{V_{REF} \text{ at } 25^\circ\text{C}} \right)}{\Delta T_A} \times 100$
- $\text{TC in ppm}/^\circ\text{C} = \frac{\left( \frac{\Delta V_{REF}}{V_{REF} \text{ at } 25^\circ\text{C}} \right)}{\Delta T_A} \times 10^6$

## TEST CIRCUITS

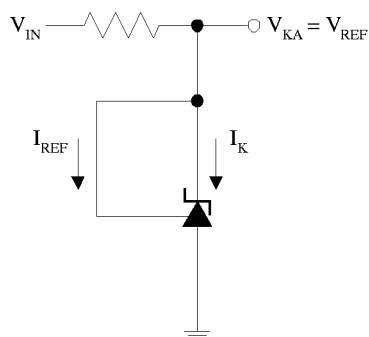


Figure 1a. Test Circuit 1

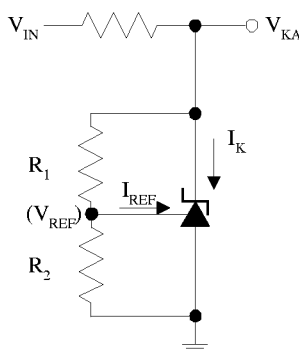


Figure 1b. Test Circuit 2

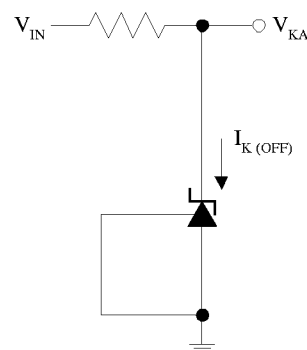
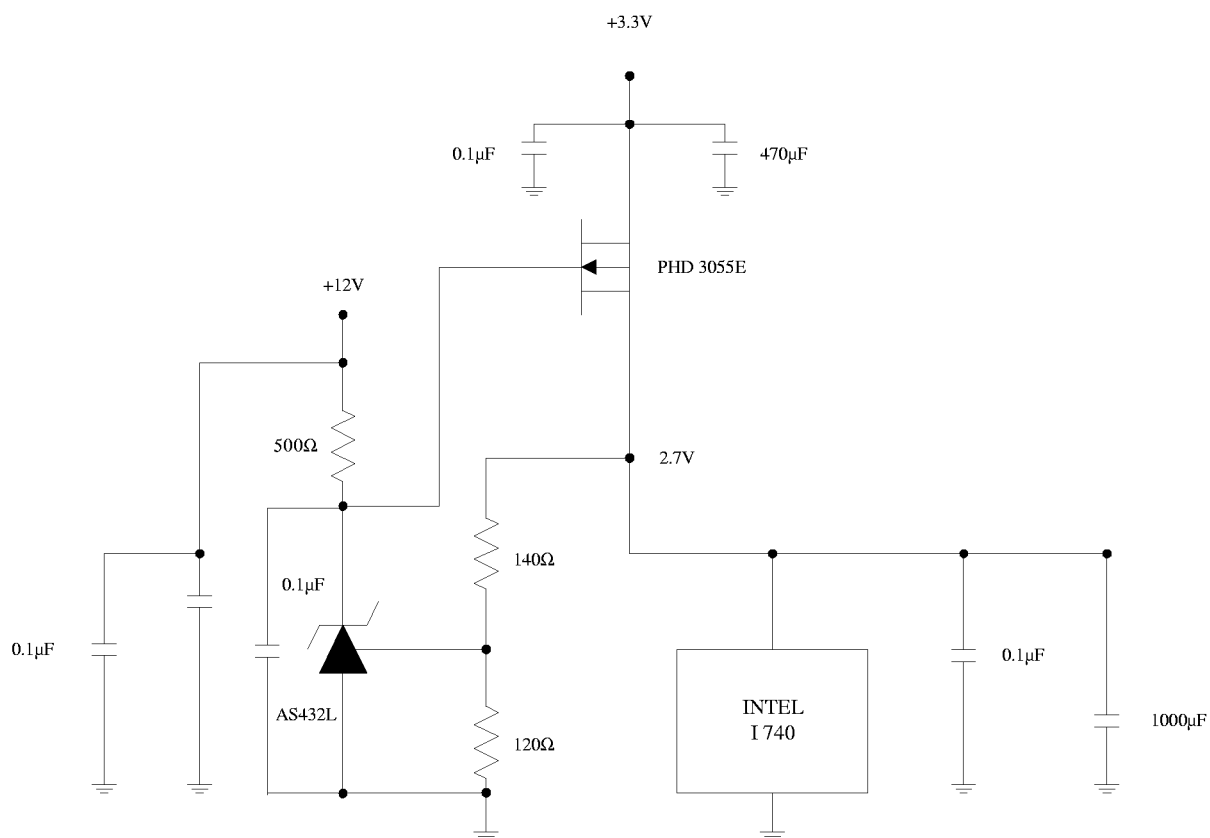
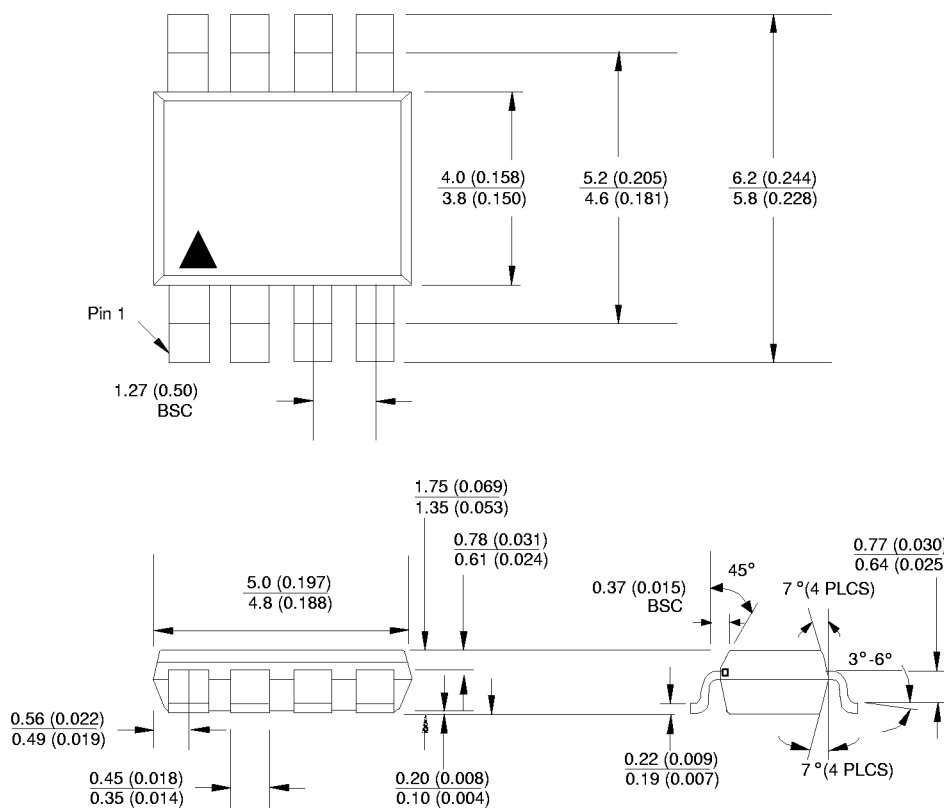


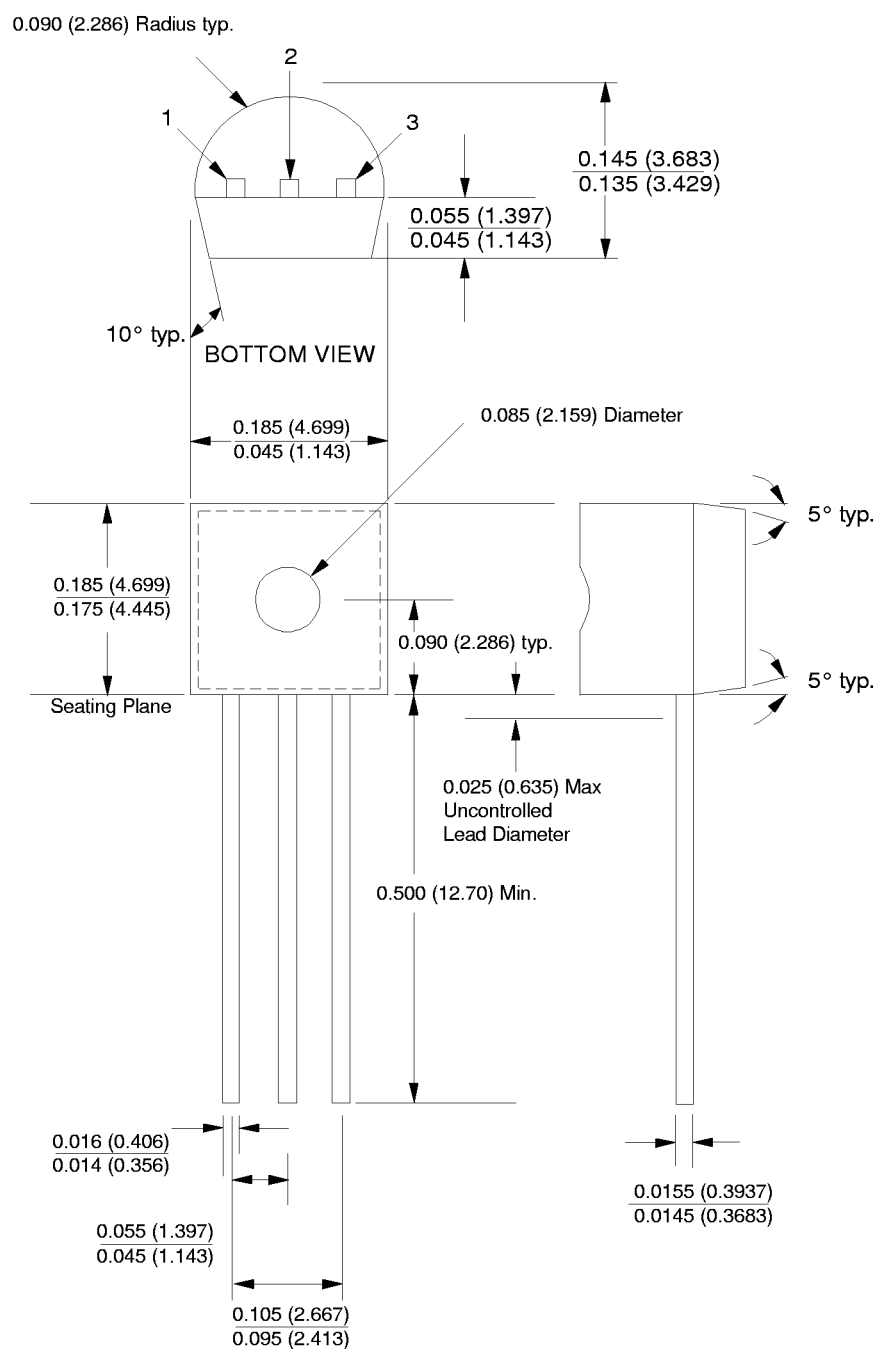
Figure 1c. Test Circuit 3

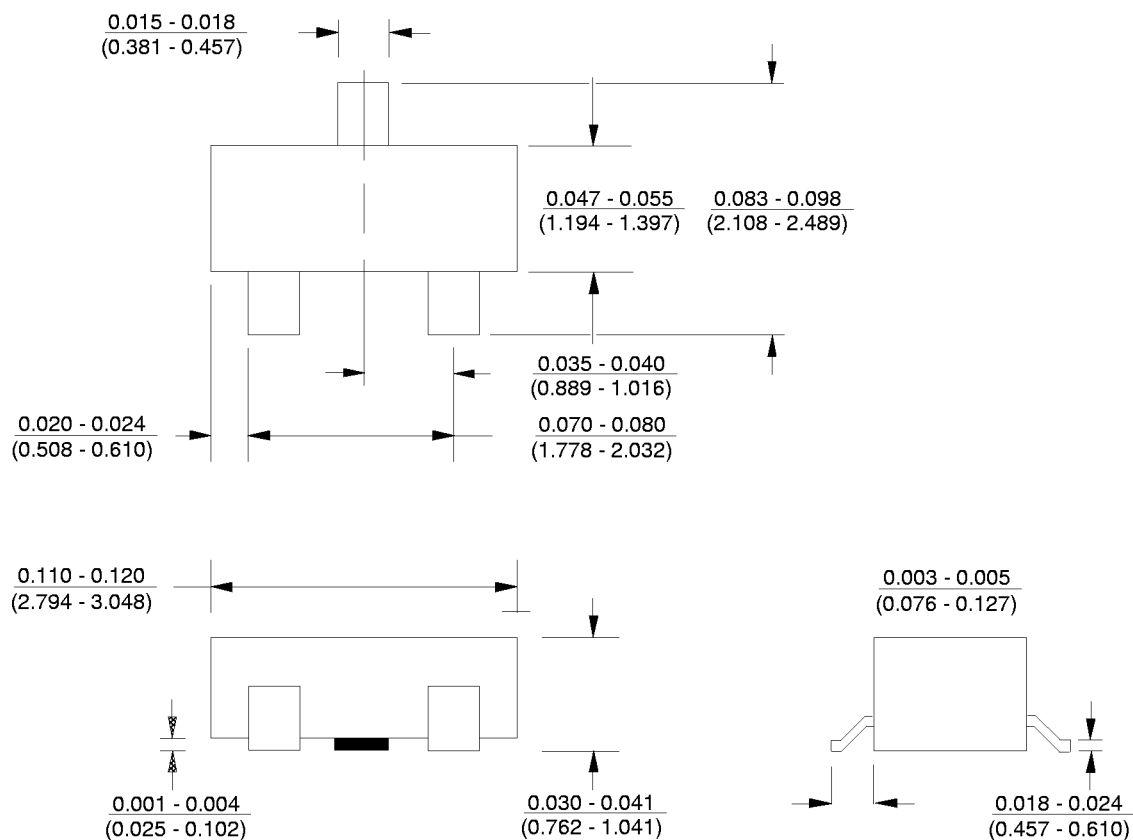
## TYPICAL APPLICATIONS



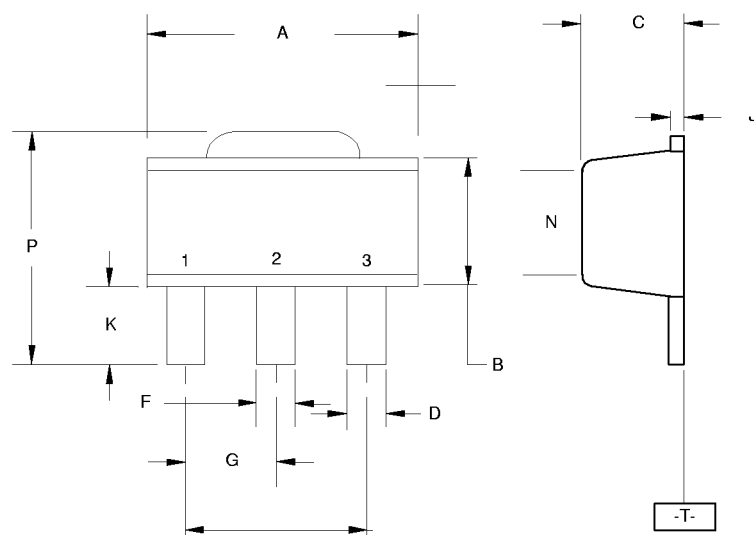
\*If the output voltage has noise, then please add a 0.1μF in between drain and gate of power MOSFET to reduce the noise.

PACKAGE DRAWING  
SOIC-8 (S)

PACKAGE DRAWING  
TO-92 (N)

PACKAGE DRAWING  
SOT-23-3L (M)

PACKAGE DRAWING  
SOT-89 (M1)



## STYLE 1

PIN 1. BASE  
2. COLLECTOR  
3. EMITTER

## STYLE 3

PIN 1. GATE  
2. ANODE  
3. CATHODE

## STYLE 2

PIN 1. ANODE  
2. CATHODE  
3. NO CONNECTION

## STYLE 4

PIN 1. DRAIN  
2. GATE  
3. SOURCE

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.40        | 4.60 | 0.174     | 0.181 |
| B   | 2.29        | 2.60 | 0.091     | 0.102 |
| C   | 140         | 160  | 0.056     | 0.062 |
| D   | 0.36        | 0.48 | 0.015     | 0.018 |
| E   | 1.62        | 1.80 | 0.064     | 0.070 |
| F   | 0.44        | 0.53 | 0.018     | 0.020 |
| G   | 150 BSC     |      | 0.059 BSC |       |
| J   | 0.35        | 0.44 | 0.014     | 0.017 |
| K   | 0.80        | 1.04 | 0.032     | 0.040 |
| L   | 300 BSC     |      | 0.118 BSC |       |
| N   | 2.04        | 2.28 | 0.081     | 0.089 |
| P   | 3.94        | 4.25 | 0.156     | 0.167 |