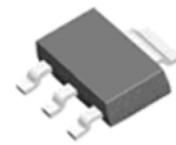


## Adjustable Positive Voltage Regulator

### General Description

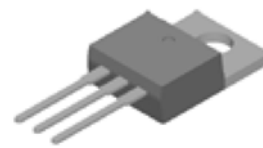
- The LM317 is an adjustable 3-terminal positive voltage regulator, designed to supply 1A of output current with voltage adjustable from 1.3V ~ 37V.
- The LM317 is available in SOT-223, D-PACK, TO-220 and D2-PACK packages.



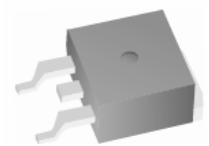
SOT-223



D-PACK  
(TO-252)



TO-220



D2-PACK  
(TO-263)

### Features

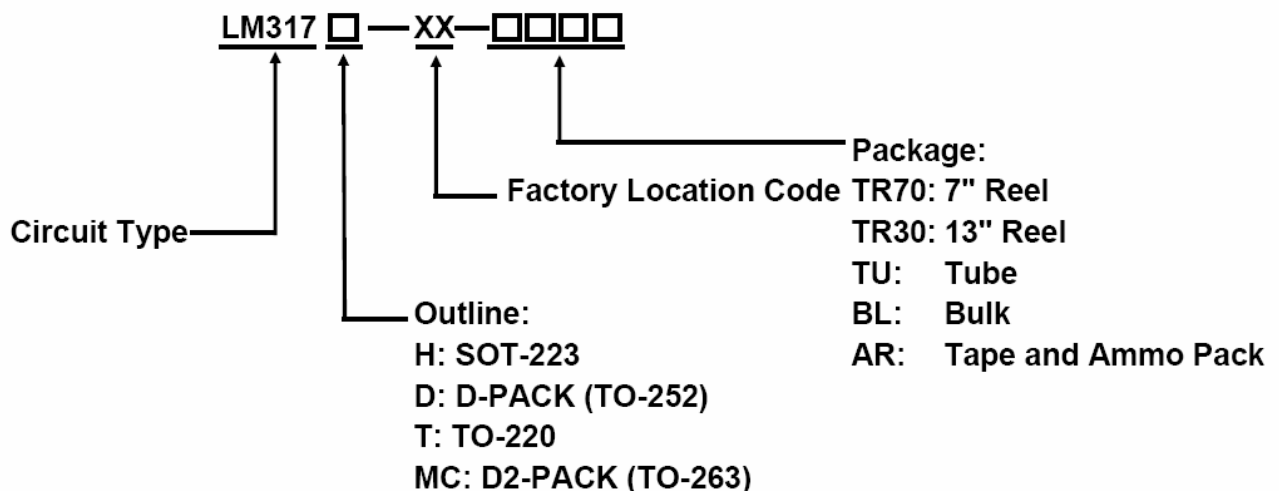
- Output Voltage adjustable from 1.3V ~ 37V
- Output current in excess of 1A
- Internal short circuit protection
- Internal over temperature protection
- Output transistors safe area compensation
- RoHS Compliance

### Applications

- PC Motherboard
- LCD Monitor
- Graphic Card
- DVD Player
- Network Interface Card/Switch
- Telecom Equipment
- Printer and other Peripheral Equipment



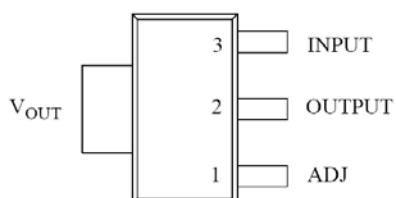
### Ordering Information



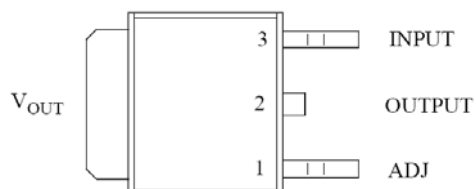
# Adjustable Positive Voltage Regulator

## LM317

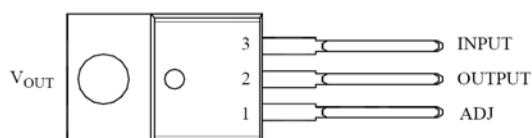
### Pin Configuration



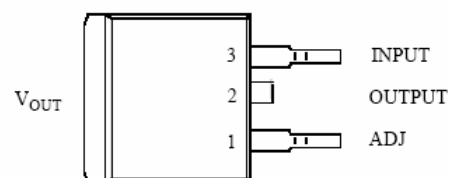
**Outline: H  
SOT-223**



**Outline: D  
D-PACK (TO-252)**

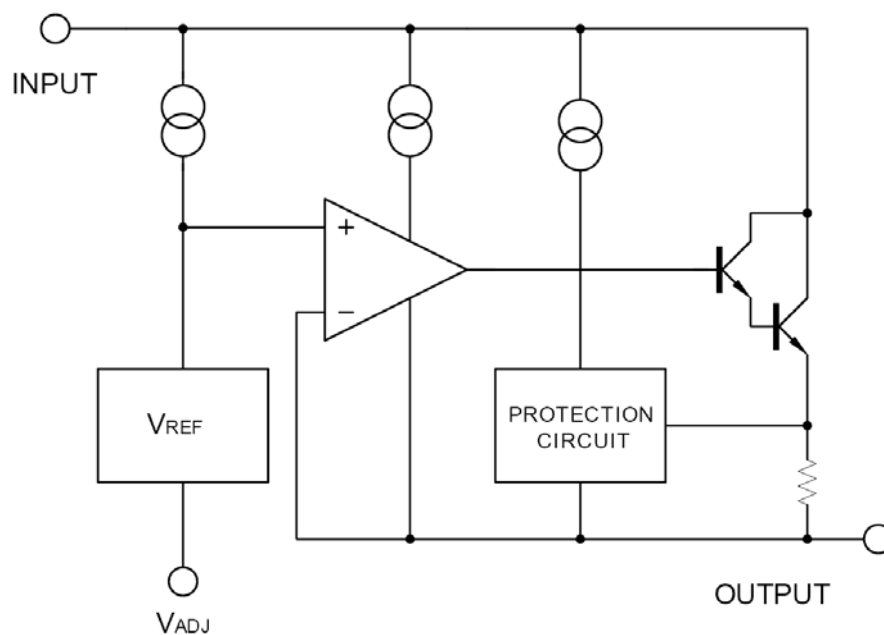


**Outline: T  
TO-220**



**Outline: MC  
D2-PACK (TO-263)**

### Block Diagram



# Adjustable Positive Voltage Regulator

## LM317

### Absolute Maximum Ratings (Ta=25° C, unless otherwise specified)

| Symbol                          | Description                         | Ratings              | Unit |       |
|---------------------------------|-------------------------------------|----------------------|------|-------|
| V <sub>IN-V<sub>OUT</sub></sub> | Input - Output Voltage Differential | 40                   | V    |       |
| I <sub>O</sub>                  | Max. Output Current                 | 1.0                  | A    |       |
| T <sub>J</sub>                  | Operating Junction Temperature      | 125                  | ° C  |       |
| T <sub>OPR</sub>                | Operating Temperature Range         | -40 ~ 85             | ° C  |       |
| T <sub>STG</sub>                | Storage Temperature Range           | -40 ~ 150            | ° C  |       |
| P <sub>D</sub>                  | Power Dissipation                   | Internal limited     | mW   |       |
| R <sub>thJC</sub>               | Thermal Resistance Junction-Case    | T: TO-220            | 5    | ° C/W |
|                                 |                                     | MC: D2-PACK (TO-263) | 5    |       |
|                                 |                                     | D: D-PACK (TO-252)   | 12   |       |
|                                 |                                     | H: SOT-223           | 23   |       |
| R <sub>thJA</sub>               | Thermal Resistance Junction-Ambient | T: TO-220            | 54   | ° C/W |
|                                 |                                     | MC: D2-PACK (TO-263) | 64   |       |
|                                 |                                     | D: D-PACK (TO-252)   | 112  |       |
|                                 |                                     | H: SOT-223           | 165  |       |

**Note:** Absolute maximum ratings are stress ratings only and functional device operation is not implied. The device could be damaged beyond Absolute maximum ratings.

### Electrical Characteristics

(V<sub>IN-V<sub>OUT</sub></sub>=5V, I<sub>OUT</sub>=10mA, T<sub>A</sub>=25°C, unless otherwise specified)

| Symbol                              | Description                   | LM317 |      |      | Unit               | Conditions  |
|-------------------------------------|-------------------------------|-------|------|------|--------------------|---|
|                                     |                               | Min.  | Typ. | Max. |                    |   |
| ΔV <sub>OUT</sub> /V <sub>OUT</sub> | Line Regulation               | -     | 0.01 | 0.04 | %/V                | 3V ≤ V <sub>IN-V<sub>OUT</sub></sub> ≤ 40V  |
| ΔV <sub>OUT</sub>                   | Load Regulation               | -     | 5    | 25   | mV                 | 10mA ≤ I <sub>OUT</sub> ≤ 1A, V <sub>OUT</sub> ≤ 5V   |
|                                     |                               | -     | 0.1  | 0.5  | mV                 | 10mA ≤ I <sub>OUT</sub> ≤ 1A, V <sub>OUT</sub> ≥ 5V   |
| I <sub>ADJ</sub>                    | Adjustable Pin Current        | -     | 50   | 100  | μA                 | -   |
| ΔI <sub>ADJ</sub>                   | Adjustable Pin Current Change | -     | 0.2  | 5    | μA                 | 3V ≤ V <sub>IN-V<sub>OUT</sub></sub> ≤ 40V,<br>10mA ≤ I <sub>OUT</sub> ≤ 1A, P <sub>D</sub> ≤ 20W |
| V <sub>REF</sub>                    | Reference Input Voltage       | 1.20  | 1.25 | 1.30 | V                  | 3V ≤ V <sub>IN-V<sub>OUT</sub></sub> ≤ 40V,<br>10mA ≤ I <sub>OUT</sub> ≤ 1A, P <sub>D</sub> ≤ 20W |
| -                                   | Temperature Stability         | -     | 0.7  | -    | %/V <sub>OUT</sub> | T <sub>MIN</sub> ≤ T <sub>J</sub> ≤ T <sub>MAX</sub>  |

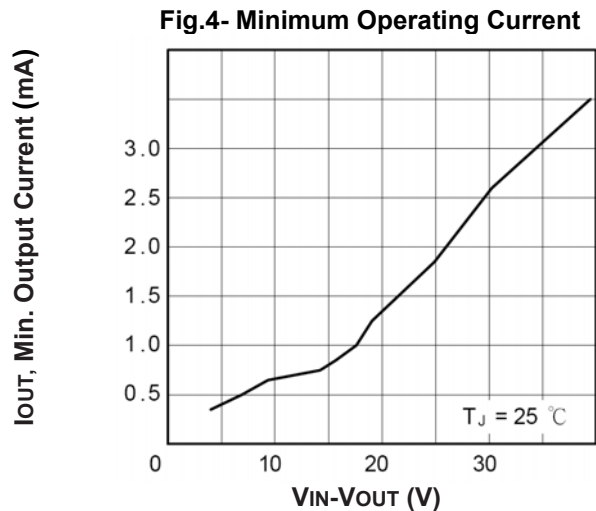
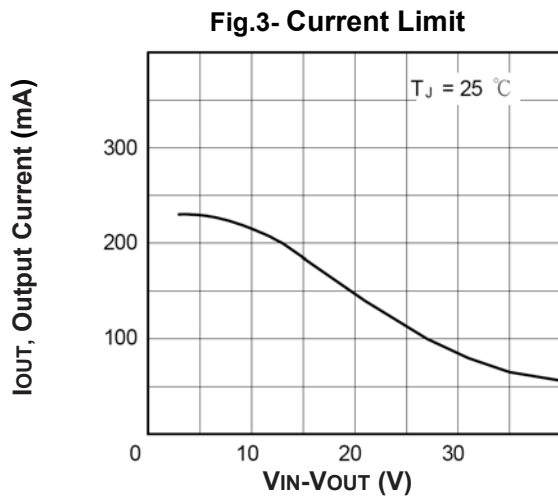
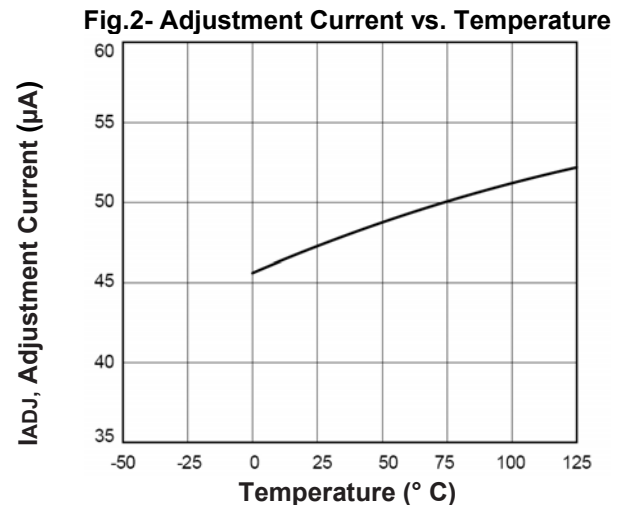
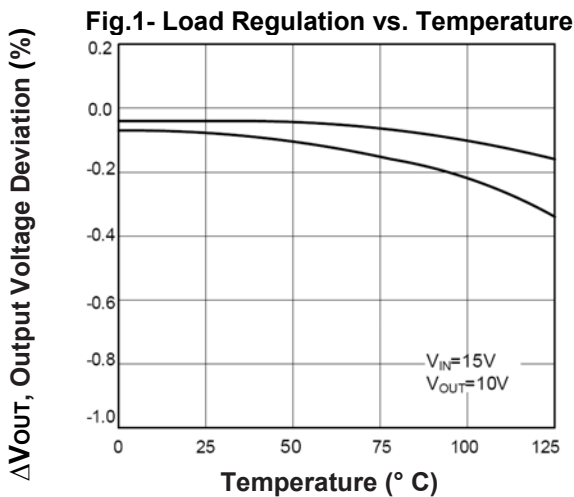
# Adjustable Positive Voltage Regulator

## LM317

| Symbol       | Description                         | LM317             |       |      | Unit         | Conditions                         |                        |
|--------------|-------------------------------------|-------------------|-------|------|--------------|------------------------------------|------------------------|
|              |                                     | Min.              | Typ.  | Max. |              |                                    |                        |
| $I_{L(MIN)}$ | Minimum Load Current for Regulation | -                 | 3.5   | 10   | mA           | $V_{IN}-V_{OUT}=40V$               |                        |
| $I_{O(MAX)}$ | Maximum Output Current              | 0.3               | 0.4   | -    | A            | $V_{IN}-V_{OUT}=40V, P_D \leq 20W$ |                        |
| eN           | RMS Noise vs. % of $V_{OUT}$        | -                 | 0.003 | -    | %/ $V_{OUT}$ | $10Hz \leq f \leq 10KHz$           |                        |
| RR           | Ripple Rejection                    | $C_{ADJ}=0$       | -     | 65   | -            | dB                                 | $V_{OUT}=10V, f=120Hz$ |
|              |                                     | $C_{ADJ}=10\mu F$ | 66    | 80   | -            |                                    |                        |

**Note:**  $C_{ADJ}$  is connected between Adjust pin and Ground.

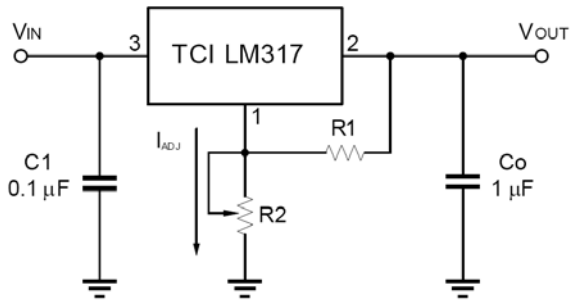
### Typical Characteristics Curves



# Adjustable Positive Voltage Regulator

## LM317

### Typical Application



$V_{OUT} = 1.25V * (1 + R2/R1) + I_{ADJ} * R2$   
 C 1 is required when regulator is an appreciated distance from pow supply . Co is needed to improve transient response .

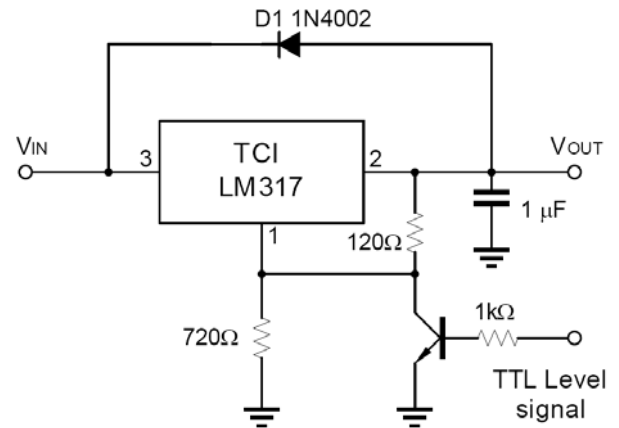


Fig.5-Programmable Voltage Regulator

Fig.6- Regulator with On-off Control

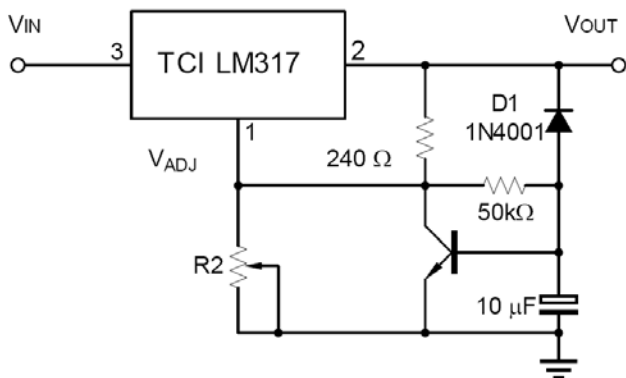
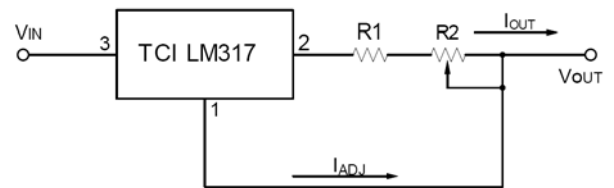


Fig.7- Soft Start Application



$$I_{O(MAX)} = \left( \frac{V_{REF}}{R1} \right) + I_{ADJ} = \frac{1.25V}{R1}$$

$$I_{O(MIN)} = \left( \frac{V_{REF}}{R1+R2} \right) + I_{ADJ} = \frac{1.25V}{R1+R2}$$

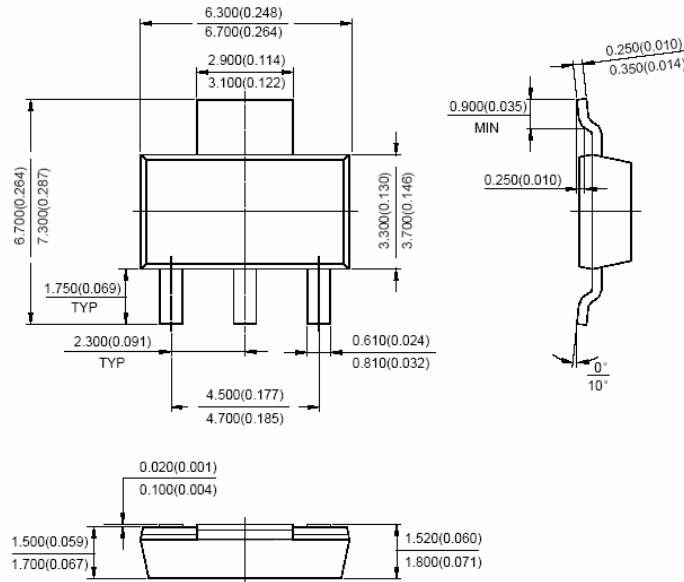
5mA < I<sub>OUT</sub> < 100mA

Fig.8- Constant Current Application

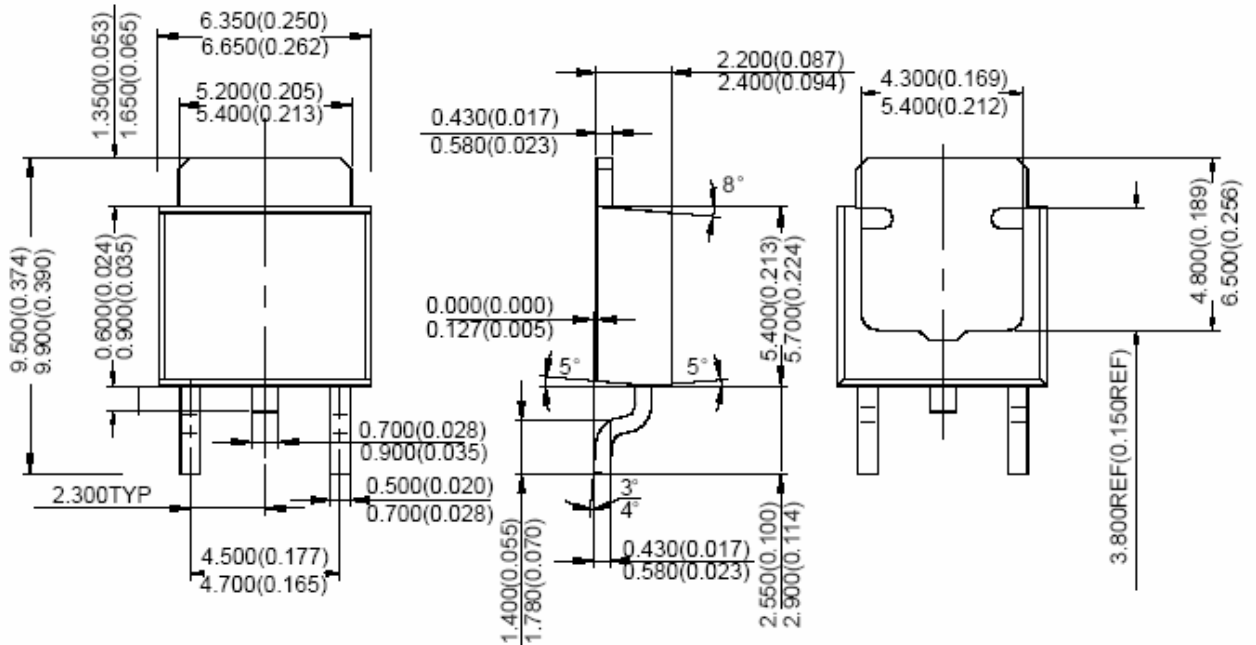
# Adjustable Positive Voltage Regulator

## LM317

### Dimensions in inches (mm)



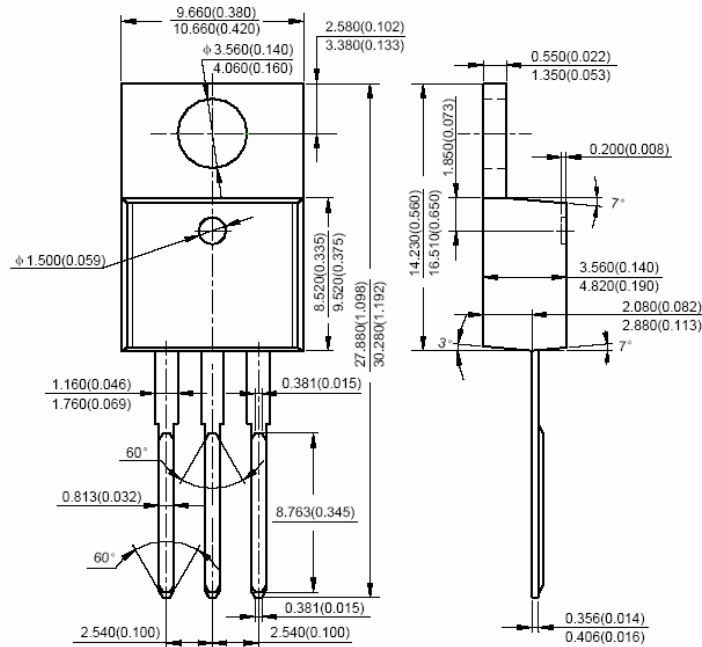
SOT-223



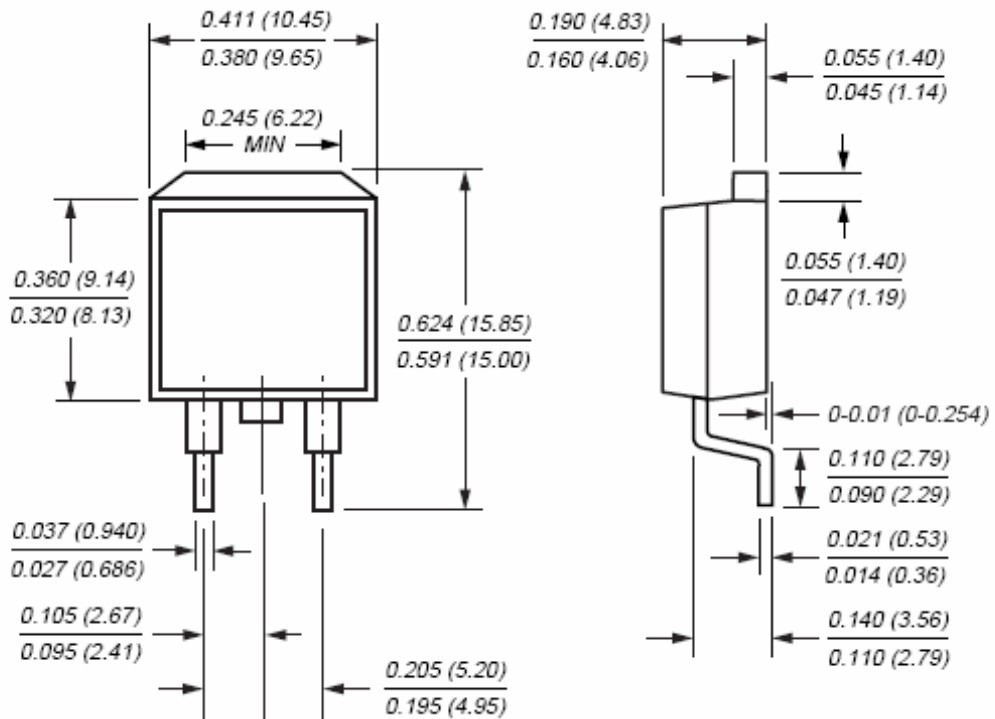
D-PACK  
(TO-252)

# Adjustable Positive Voltage Regulator

## LM317



TO-220



D2-PACK  
(TO-263)

# Adjustable Positive Voltage Regulator

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LM317

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