



## LM317

### LINEAR INTEGRATED CIRCUIT

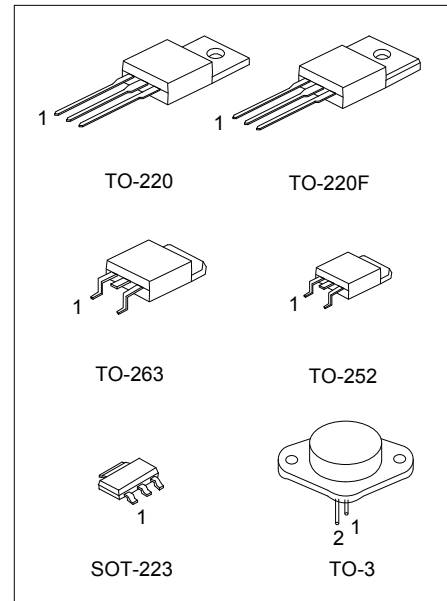
## HIGH CURRENT 1.3V TO 37V ADJUSTABLE VOLTAGE REGULATOR

### DESCRIPTION

The UTC **LM317** is an adjustable 3-terminal positive voltage regulator, designed to supply 1A of output current with voltage adjustable from 1.3V ~ 37V.

### FEATURES

- \*Output voltage adjustable from 1.3V ~ 37V
- \*Output current in excess of 1A
- \*Internal short circuit protection.
- \*Internal over temperature protection.
- \*Output transistor safe area compensation



Lead-free: LM317K

Halogen-free: LM317G

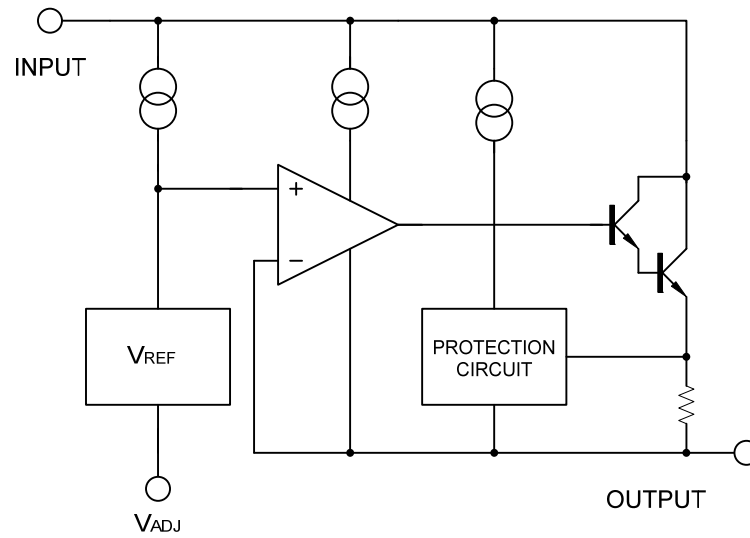
### ORDERING INFORMATION

| Ordering Number |              |              | Package | Pin Assignment |     |   | Packing   |
|-----------------|--------------|--------------|---------|----------------|-----|---|-----------|
| Normal          | Lead Free    | Halogen Free |         | 1              | 2   | 3 |           |
| LM317-AA3-R     | LM317K-AA3-R | LM317G-AA3-R | SOT-223 | ADJ            | O   | I | Tape Reel |
| LM317-TA3-T     | LM317K-TA3-T | LM317G-TA3-T | TO-220  | ADJ            | O   | I | Tube      |
| LM317-TF3-T     | LM317K-TF3-T | LM317G-TF3-T | TO-220F | ADJ            | O   | I | Tube      |
| LM317-TN3-R     | LM317K-TN3-R | LM317G-TN3-R | TO-252  | ADJ            | O   | I | Tape Reel |
| LM317-TN3-T     | LM317K-TN3-T | LM317G-TN3-T | TO-252  | ADJ            | O   | I | Tube      |
| LM317-TQ2-R     | LM317K-TQ2-R | LM317G-TQ2-R | TO-263  | ADJ            | O   | I | Tape Reel |
| LM317-TQ2-T     | LM317K-TQ2-T | LM317G-TQ2-T | TO-263  | ADJ            | O   | I | Tube      |
| LM317-T30-Y     | LM317K-T30-Y | LM317G-T30-Y | TO-3    | I              | ADJ | O | Tray      |

Note: 1. Pin Assignment: I:V<sub>IN</sub> O:V<sub>OUT</sub>  
2. Pin 3 on TO-3 is case

|                                                                                    |                                                                                                                                                                                    |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>LM317K-AA3-R</p> <p>(1)Packing Type<br/>(2)Package Type<br/>(3)Lead Plating</p> | <p>(1) R: Tape Reel, T: Tube, Y: Tray<br/>(2) AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TN3: TO-252, TQ2: TO-263, T30: TO-3<br/>(3) G: Halogen Free, K: Lead Free, Blank: Pb/Sn</p> |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### ■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C, unless otherwise specified)

| PARAMETER                         | SYMBOL           | RATINGS          | UNIT |
|-----------------------------------|------------------|------------------|------|
| Input - Output Voltage Difference | $V_{IN}-V_{OUT}$ | 40               | V    |
| Power Dissipation                 | $P_D$            | Internal limited |      |
| Junction Temperature              | $T_J$            | +125             | °C   |
| Operating Temperature             | $T_{OPR}$        | -40 ~ +85        | °C   |
| Storage Temperature               | $T_{STG}$        | -40 ~ +150       | °C   |

Note:1. Absolute maximum ratings are stress ratings only and functional device operation is not implied. The device could be damaged beyond Absolute maximum ratings.

■ THERMAL DATA

| PARAMETER           |                | SYMBOL        | RATINGS | UNIT |
|---------------------|----------------|---------------|---------|------|
| Junction-to-Ambient | TO-252         | $\theta_{JA}$ | 112     | °C/W |
|                     | TO-220/TO-220F |               | 54      |      |
|                     | TO-263         |               | 64      |      |
|                     | SOT-223        |               | 165     |      |
|                     | TO-3           |               | 35      |      |
| Junction-to-Case    | TO-252         | $\theta_{JC}$ | 12      | °C/W |
|                     | TO-220/TO-220F |               | 5       |      |
|                     | TO-263         |               | 5       |      |
|                     | SOT-223        |               | 23      |      |
|                     | TO-3           |               | 3       |      |

■ ELECTRICAL CHARACTERISTICS

( $V_{IN}-V_{OUT}=5V$ ,  $I_{OUT}=10mA$ ,  $T_a=25^\circ C$ , unless otherwise specified.)

| PARAMETER                           | SYMBOL                   | TEST CONDITIONS                                                                     | MIN               | TYP   | MAX  | UNIT         |
|-------------------------------------|--------------------------|-------------------------------------------------------------------------------------|-------------------|-------|------|--------------|
| Line Regulation                     | $\Delta V_{OUT}/V_{OUT}$ | $3V \leq V_{IN}-V_{OUT} \leq 40V$                                                   |                   | 0.01  | 0.04 | %/V          |
| Load Regulation                     | $\Delta V_{OUT}$         | $10mA \leq I_{OUT} \leq 1A$ , $V_{OUT} \leq 5V$                                     |                   | 5     | 25   | mV           |
|                                     |                          | $V_{OUT} \geq 5V$                                                                   |                   | 0.1   | 0.5  | %            |
| Adjustable Pin Current              | $I_{ADJ}$                |                                                                                     |                   | 50    | 100  | $\mu A$      |
| Adjustable Pin Current Change       | $\Delta I_{ADJ}$         | $3V \leq V_{IN}-V_{OUT} \leq 40V$ ,<br>$10mA \leq I_{OUT} \leq 1A$ , $P_D \leq 20W$ |                   | 0.2   | 5    | $\mu A$      |
| Reference Voltage                   | $V_{REF}$                | $3V \leq V_{IN}-V_{OUT} \leq 40V$ ,<br>$10mA \leq I_{OUT} \leq 1A$ , $P_D \leq 20W$ | 1.20              | 1.25  | 1.30 | V            |
| Temperature Stability               |                          | $T_{MIN} \leq T_J \leq T_{MAX}$                                                     |                   | 0.7   |      | %/ $V_{OUT}$ |
| Minimum Load Current for Regulation | $I_{L(MIN)}$             | $V_{IN}-V_{OUT}=40V$                                                                |                   | 3.5   | 10   | mA           |
| Maximum Output Current              | $I_{O(MAX)}$             | $V_{IN}-V_{OUT}=40V$ , $P_D \leq 20W$                                               | 0.2               | 0.3   |      | A            |
| RMS Noise vs. %of $V_{OUT}$         | eN                       | $10Hz \leq f \leq 10KHz$                                                            |                   | 0.003 |      | %/ $V_{OUT}$ |
| Ripple Rejection                    | RR                       | $V_{OUT}=10V$ , $f=120Hz$                                                           | $C_{ADJ}=0$       |       | 65   | dB           |
|                                     |                          |                                                                                     | $C_{ADJ}=10\mu F$ | 66    | 80   |              |

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

### APPLICATION CIRCUITS

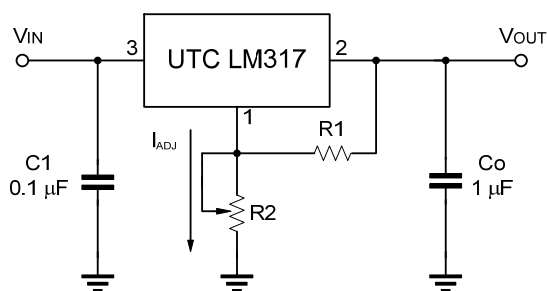


Fig.1 Programmable voltage regulator

$$V_{OUT} = 1.25V \cdot (1 + R2/R1) + I_{ADJ} \cdot R2$$

C1 is required when regulator is located an appreciated distance from power supply. Co is needed to improve transient response.

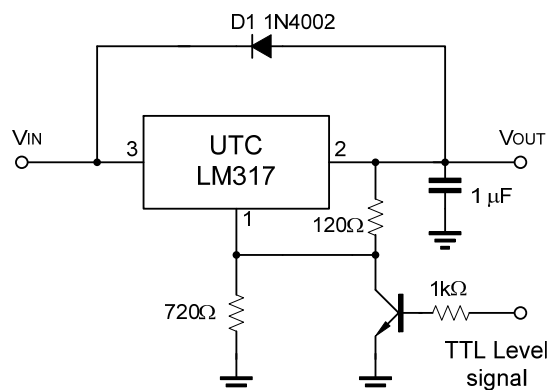


Fig.2 Regulator with On-off control

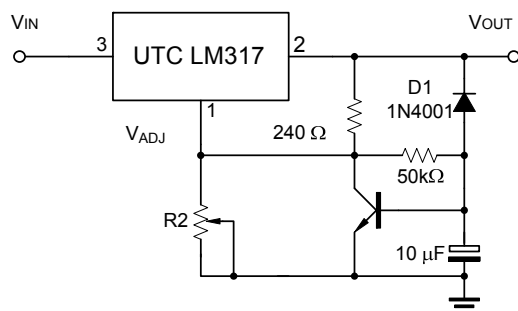
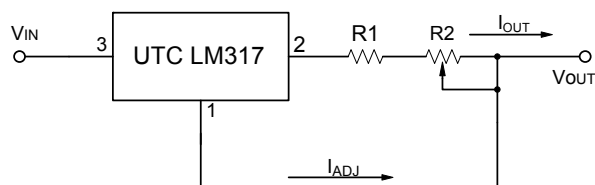


Fig.3 Soft Start Application



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

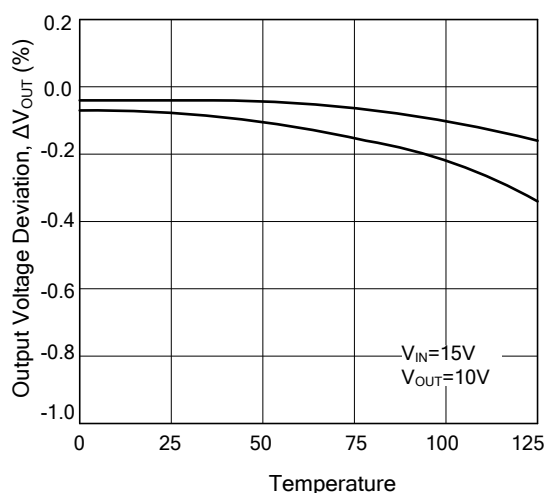
$$I_{O(MIN)} = \left( \frac{V_{REF}}{R1+R2} \right) + I_{ADJ} = \frac{1.25V}{R1+R2}$$

$$5mA < I_{OUT} < 100mA$$

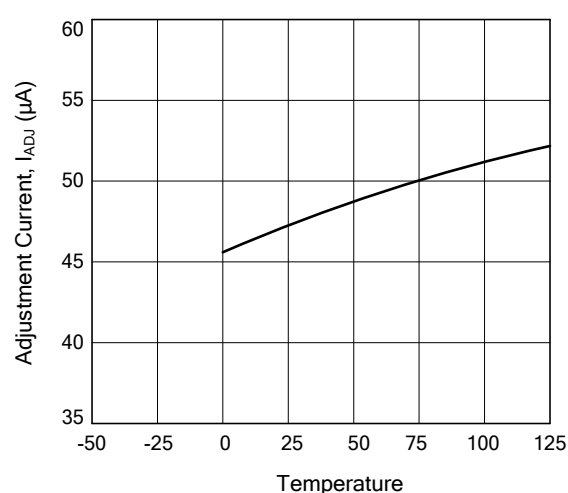
Fig.4 Constant Current Application

# ■ TYPICAL CHARACTERISTICS

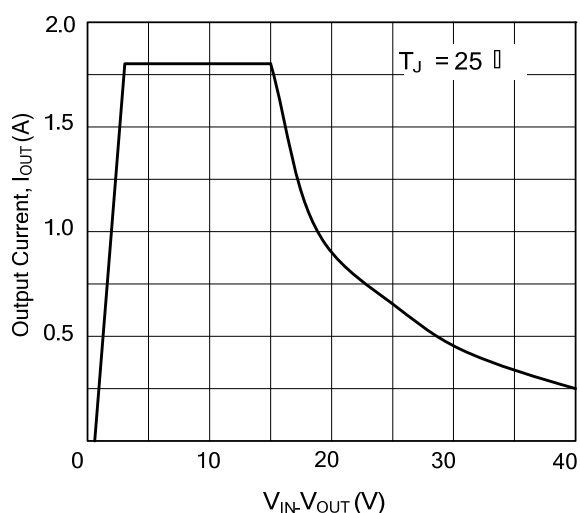
Load Regulation vs. temperature



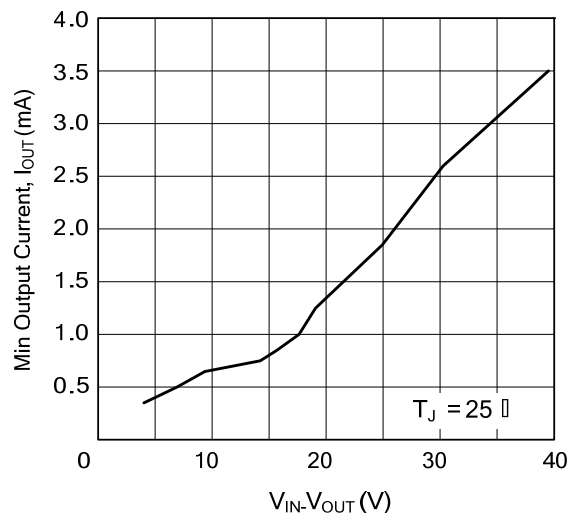
Adjustment Current vs. Temperature



Current Limit



Minimum Operating Current



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