



# LM78XX

## LINEAR INTEGRATED CIRCUIT

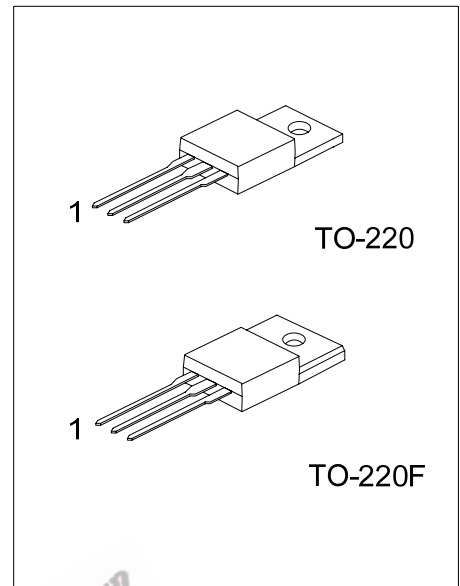
### 3-TERMINAL 1A POSITIVE VOLTAGE REGULATOR

■ DESCRIPTION

The UTC **LM78XX** family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 1 A.

■ FEATURES

- \* Output current up to 1A
- \* Fixed output voltage of 3.3V,4.7V,5V, 6V, 7V, 8V, 9V, 10V, 12V, 15V, 18V and 24V available
- \* Thermal overload shutdown protection
- \* Short circuit current limiting
- \* Output transistor SOA protection



\*Pb-free plating product number: LM78XXL

■ ORDERING INFORMATION

| Order Number   |                   | Pin Assignment |   |   | Package | Packing |
|----------------|-------------------|----------------|---|---|---------|---------|
| Normal         | Lead Free Plating | 1              | 2 | 3 |         |         |
| LM78xx-TA3-D-T | LM78xxL-TA3-D-T   | I              | G | O | TO-220  | Tube    |
| LM78xx-TF3-D-T | LM78xxL-TF3-D-T   | I              | G | O | TO-220F | Tube    |

Note: O: Output G: GND I: Input

|                        |  |  |
|------------------------|--|--|
| <p>LM78xxL-TA3-D-T</p> | <p>(1) Packing Type<br/>(2) Pin Assignment<br/>(3) Package Type<br/>(4) Lead Plating<br/>(5) Output Voltage Code</p> | <p>(1) T: Tube<br/>(2) refer to Pin Assignment<br/>(3) TA3: TO-220, TF3: TO-220F<br/>(4) L: Lead Free Plating, Blank: Pb/Sn<br/>(5) xx: refer to Marking Information</p> |
|------------------------|--|--|

■ MARKING INFORMATION

| PACKAGE           | VOLTAGE CODE | VOLTAGE CODE | MARKING |
|-------------------|--------------|--------------|---------|
| TO-220<br>TO-220F | 33:3.3V      | 10:10V       |         |
|                   | 47:4.7V      | 12:12V       |         |
|                   | 05:5.0V      | 15:15V       |         |
|                   | 06:6.0V      | 18:18V       |         |
|                   | 07:7.0V      | 24:24V       |         |
|                   | 08:8.0V      |              |         |
|                   | 09:9.0V      |              |         |

## ■ TEST CIRCUIT



### ■ ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified)

| PARAMETER                      | SYMBOL    | RATING                | UNIT |   |
|--------------------------------|-----------|-----------------------|------|---|
| Input voltage                  | $V_{IN}$  | $V_{OUT}=3.3\sim 18V$ | 35   | V |
|                                |           | $V_{OUT}=24V$         | 40   | V |
| Output Current                 | $I_{OUT}$ | 1                     | A    |   |
| Power Dissipation              | $P_D$     | Internally Limited    | W    |   |
| Operating Junction Temperature | $T_{OPR}$ | -20 ~ +150            | °C   |   |
| Storage Temperature            | $T_{STG}$ | -55 ~ +150            | °C   |   |

Note Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ THERMAL DATA

| PARAMETER          | SYMBOL        | RATING | UNIT |
|--------------------|---------------|--------|------|
| Thermal Resistance | $\theta_{JA}$ | 65     | °C/W |
|                    | $\theta_{JC}$ | 5      | °C/W |

### ■ ELECTRICAL CHARACTERISTICS

( $I_{OUT}=0.5A$ ,  $T_J=0^\circ C - 125^\circ C$ ,  $C_1=0.33\mu F$ ,  $C_o=0.1\mu F$ , unless otherwise specified)(Note 1)

**For UTC LM7833** ( $V_{IN}=5.8V$ )

| PARAMETER                        | SYMBOL                | TEST CONDITIONS   | MIN   | TYP  | MAX   | UNIT    |
|----------------------------------|-----------------------|---|-------|------|-------|---------|
| Output Voltage                   | $V_{OUT}$             | $T_J=25^\circ C$ , $I_{OUT}=5mA - 1.0A$                             | 3.168 | 3.30 | 3.432 | V       |
|                                  |                       | $V_{IN}=5.8V \sim 18.3V$ ,<br>$I_{OUT}=5mA - 1.0A$ , $P_D \leq 15W$ | 3.135 |      | 3.465 | V       |
| Dropout Voltage                  | $V_D$                 | $T_J=25^\circ C$  |       | 2.0  |       | V       |
| Load Regulation                  | $\Delta V_{OUT}$      | $T_J=25^\circ C$ , $I_{OUT}=5mA - 1.0A$                             |       |      | 33    | mV      |
|                                  |                       | $T_J=25^\circ C$ , $I_{OUT}=0.25A - 0.75A$                          |       |      | 17    | mV      |
| Line regulation                  | $\Delta V_{OUT}$      | $V_{IN}=5.8V \sim 18.3V$ , $T_J=25^\circ C$                         |       |      | 33    | mV      |
|                                  |                       | $V_{IN}=5.8V \sim 18.3V$ , $T_J=25^\circ C$ , $I_{OUT}=1.0A$        |       |      | 33    | mV      |
| Quiescent Current                | $I_Q$                 | $T_J=25^\circ C$ , $I_{OUT} \leq 1.0A$                              |       |      | 8.0   | mA      |
| Quiescent Current Change         | $\Delta I_Q$          | $V_{IN}=5.8V \sim 18.3V$  |       |      | 1.0   | mA      |
|                                  |                       | $I_{OUT}=5mA - 1.0A$  |       |      | 0.5   | mA      |
| Output Noise Voltage             | eN                    | $10Hz \leq f \leq 100kHz$   |       | 55   |       | $\mu V$ |
| Temperature Coefficient of $V_o$ | $\Delta V_o/\Delta T$ | $I_{OUT}=5mA$   |       | -0.4 |       | mV/°C   |
| Ripple Rejection                 | RR                    | $V_{IN}=6.3V \sim 16.3V$ , $f=120Hz$ , $T_J=25^\circ C$             |       | 57   |       | dB      |
| Peak Output Current              | $I_{PEAK}$            | $T_J=25^\circ C$  |       | 1.8  |       | A       |
| Short-Circuit Current            | $I_{SC}$              | $V_{IN}=35V$ , $T_J=25^\circ C$                                     |       | 250  |       | mA      |

**For UTC LM7847** ( $V_{IN}=9.7V$ )

| PARAMETER                        | SYMBOL                | TEST CONDITIONS   | MIN   | TYP  | MAX   | UNIT    |
|----------------------------------|-----------------------|---|-------|------|-------|---------|
| Output Voltage                   | $V_{OUT}$             | $T_J=25^\circ C$ , $I_{OUT}=5mA - 1.0A$                             | 4.512 | 4.70 | 4.888 | V       |
|                                  |                       | $V_{IN}=7.2V \sim 19.7V$ ,<br>$I_{OUT}=5mA - 1.0A$ , $P_D \leq 15W$ | 4.465 |      | 4.935 | V       |
| Dropout Voltage                  | $V_D$                 | $T_J=25^\circ C$  |       | 2.0  |       | V       |
| Load Regulation                  | $\Delta V_{OUT}$      | $T_J=25^\circ C$ , $I_{OUT}=5mA - 1.0A$                             |       |      | 47    | mV      |
|                                  |                       | $T_J=25^\circ C$ , $I_{OUT}=0.25A - 0.75A$                          |       |      | 24    | mV      |
| Line regulation                  | $\Delta V_{OUT}$      | $V_{IN}=7.2V \sim 19.7V$ , $T_J=25^\circ C$                         |       |      | 47    | mV      |
|                                  |                       | $V_{IN}=7.2V \sim 19.7V$ , $T_J=25^\circ C$ , $I_{OUT}=1.0A$        |       |      | 47    | mV      |
| Quiescent Current                | $I_Q$                 | $T_J=25^\circ C$ , $I_{OUT} \leq 1.0A$                              |       |      | 8.0   | mA      |
| Quiescent Current Change         | $\Delta I_Q$          | $V_{IN}=7.2V \sim 19.7V$  |       |      | 1.0   | mA      |
|                                  |                       | $I_{OUT}=5mA - 1.0A$  |       |      | 0.5   | mA      |
| Output Noise Voltage             | eN                    | $10Hz \leq f \leq 100kHz$   |       | 40   |       | $\mu V$ |
| Temperature Coefficient of $V_o$ | $\Delta V_o/\Delta T$ | $I_{OUT}=5mA$   |       | -0.6 |       | mV/°C   |
| Ripple Rejection                 | RR                    | $V_{IN}=7.7V - 17.7V$ , $f=120Hz$ , $T_J=25^\circ C$                | 62    | 80   |       | dB      |
| Peak Output Current              | $I_{PEAK}$            | $T_J=25^\circ C$  |       | 1.8  |       | A       |
| Short-Circuit Current            | $I_{SC}$              | $V_{IN}=35V$ , $T_J=25^\circ C$                                     |       | 250  |       | mA      |

■ ELECTRICAL CHARACTERISTICS(Cont.)

For UTC LM7805 ( $V_{IN} = 10V$ )

| PARAMETER                        | SYMBOL                  | TEST CONDITIONS   | MIN  | TYP  | MAX  | UNIT           |
|----------------------------------|-------------------------|---|------|------|------|----------------|
| Output Voltage                   | $V_{OUT}$               | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                          | 4.80 | 5.0  | 5.20 | V              |
|                                  |                         | $V_{IN} = 7.5V \sim 20V,$<br>$I_{OUT} = 5mA - 1.0A, P_D \leq 15W$ | 4.75 |      | 5.25 | V              |
| Dropout Voltage                  | $V_D$                   | $T_J = 25^\circ C$  |      | 2.0  |      | V              |
| Load Regulation                  | $\Delta V_{OUT}$        | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                          |      |      | 50   | mV             |
|                                  |                         | $T_J = 25^\circ C, I_{OUT} = 0.25A - 0.75A$                       |      |      | 25   | mV             |
| Line regulation                  | $\Delta V_{OUT}$        | $V_{IN} = 7V \sim 25V, T_J = 25^\circ C$                          |      |      | 50   | mV             |
|                                  |                         | $V_{IN} = 7.5V \sim 20V, T_J = 25^\circ C, I_{OUT} = 1.0A$        |      |      | 50   | mV             |
| Quiescent Current                | $I_Q$                   | $T_J = 25^\circ C, I_{OUT} \leq 1.0A$                             |      |      | 8.0  | mA             |
| Quiescent Current Change         | $\Delta I_Q$            | $V_{IN} = 7.5V \sim 20V$  |      |      | 1.0  | mA             |
|                                  |                         | $I_{OUT} = 5mA - 1.0A$  |      |      | 0.5  | mA             |
| Output Noise Voltage             | eN                      | $10Hz \leq f \leq 100kHz$   |      | 40   |      | $\mu V$        |
| Temperature Coefficient of $V_o$ | $\Delta V_o / \Delta T$ | $I_{OUT} = 5mA$   |      | -0.6 |      | mV/ $^\circ C$ |
| Ripple Rejection                 | RR                      | $V_{IN} = 8V - 18V, f = 120Hz, T_J = 25^\circ C$                  | 62   | 80   |      | dB             |
| Peak Output Current              | $I_{PEAK}$              | $T_J = 25^\circ C$  |      | 1.8  |      | A              |
| Short-Circuit Current            | $I_{SC}$                | $V_{IN} = 35V, T_J = 25^\circ C$                                  |      | 250  |      | mA             |

For UTC LM7806 ( $V_{IN} = 11V$ )

| PARAMETER                        | SYMBOL                  | TEST CONDITIONS   | MIN  | TYP  | MAX  | UNIT           |
|----------------------------------|-------------------------|---|------|------|------|----------------|
| Output Voltage                   | $V_{OUT}$               | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                          | 5.76 | 6.0  | 6.24 | V              |
|                                  |                         | $V_{IN} = 8.5V \sim 21V,$<br>$I_{OUT} = 5mA - 1.0A, P_D \leq 15W$ | 5.70 |      | 6.30 | V              |
| Dropout Voltage                  | $V_D$                   | $T_J = 25^\circ C$  |      | 2.0  |      | V              |
| Load Regulation                  | $\Delta V_{OUT}$        | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                          |      |      | 60   | mV             |
|                                  |                         | $T_J = 25^\circ C, I_{OUT} = 0.25A - 0.75A$                       |      |      | 30   | mV             |
| Line regulation                  | $\Delta V_{OUT}$        | $V_{IN} = 8V \sim 25V, T_J = 25^\circ C$                          |      |      | 60   | mV             |
|                                  |                         | $V_{IN} = 8.5V \sim 21V, T_J = 25^\circ C, I_{OUT} = 1.0A$        |      |      | 60   | mV             |
| Quiescent Current                | $I_Q$                   | $T_J = 25^\circ C, I_{OUT} \leq 1.0A$                             |      |      | 8.0  | mA             |
| Quiescent Current Change         | $\Delta I_Q$            | $V_{IN} = 8.5V \sim 21V$  |      |      | 1.0  | mA             |
|                                  |                         | $I_{OUT} = 5mA - 1.0A$  |      |      | 0.5  | mA             |
| Output Noise Voltage             | eN                      | $10Hz \leq f \leq 100kHz$   |      | 45   |      | $\mu V$        |
| Temperature Coefficient of $V_o$ | $\Delta V_o / \Delta T$ | $I_{OUT} = 5mA$   |      | -0.7 |      | mV/ $^\circ C$ |
| Ripple Rejection                 | RR                      | $V_{IN} = 9V - 19V, f = 120Hz, T_J = 25^\circ C$                  | 59   | 75   |      | dB             |
| Peak Output Current              | $I_{PEAK}$              | $T_J = 25^\circ C$  |      | 1.8  |      | A              |
| Short-Circuit Current            | $I_{SC}$                | $V_{IN} = 35V, T_J = 25^\circ C$                                  |      | 250  |      | mA             |

■ ELECTRICAL CHARACTERISTICS(Cont.)

For UTC LM7807 ( $V_{IN} = 13V$ )

| PARAMETER                        | SYMBOL                  | TEST CONDITIONS   | MIN  | TYP  | MAX  | UNIT           |
|----------------------------------|-------------------------|---|------|------|------|----------------|
| Output Voltage                   | $V_{OUT}$               | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                          | 6.72 | 7.0  | 7.28 | V              |
|                                  |                         | $V_{IN} = 9.5V \sim 22V,$<br>$I_{OUT} = 5mA - 1.0A, P_D \leq 15W$ | 6.65 |      | 7.35 | V              |
| Dropout Voltage                  | $V_D$                   | $T_J = 25^\circ C$  |      | 2.0  |      | V              |
| Load Regulation                  | $\Delta V_{OUT}$        | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                          |      |      | 70   | mV             |
|                                  |                         | $T_J = 25^\circ C, I_{OUT} = 0.25A - 0.75A$                       |      |      | 35   | mV             |
| Line regulation                  | $\Delta V_{OUT}$        | $V_{IN} = 9V \sim 25V, T_J = 25^\circ C$                          |      |      | 70   | mV             |
|                                  |                         | $V_{IN} = 9.5V \sim 22V, T_J = 25^\circ C, I_{OUT} = 1.0A$        |      |      | 70   | mV             |
| Quiescent Current                | $I_Q$                   | $T_J = 25^\circ C, I_{OUT} \leq 1.0A$                             |      |      | 8.0  | mA             |
| Quiescent Current Change         | $\Delta I_Q$            | $V_{IN} = 9.5V \sim 22V$  |      |      | 1.0  | mA             |
|                                  |                         | $I_{OUT} = 5mA - 1.0A$  |      |      | 0.5  | mA             |
| Output Noise Voltage             | eN                      | $10Hz \leq f \leq 100kHz$   |      | 50   |      | $\mu V$        |
| Temperature Coefficient of $V_o$ | $\Delta V_o / \Delta T$ | $I_{OUT} = 5mA$   |      | -0.8 |      | mV/ $^\circ C$ |
| Ripple Rejection                 | RR                      | $V_{IN} = 10V - 20V, f = 120Hz, T_J = 25^\circ C$                 | 59   | 75   |      | dB             |
| Peak Output Current              | $I_{PEAK}$              | $T_J = 25^\circ C$  |      | 1.7  |      | A              |
| Short-Circuit Current            | $I_{SC}$                | $V_{IN} = 35V, T_J = 25^\circ C$                                  |      | 250  |      | mA             |

For UTC LM7808 ( $V_{IN} = 14V$ )

| PARAMETER                        | SYMBOL                  | TEST CONDITIONS  | MIN  | TYP  | MAX  | UNIT           |
|----------------------------------|-------------------------|--|------|------|------|----------------|
| Output Voltage                   | $V_{OUT}$               | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           | 7.68 | 8.0  | 8.32 | V              |
|                                  |                         | $V_{IN} = 10.5V \sim 23V,$<br>$I_{OUT} = 5mA - 1.0A, P_D \leq 15W$ | 7.60 |      | 8.40 | V              |
| Dropout Voltage                  | $V_D$                   | $T_J = 25^\circ C$   |      | 2.0  |      | V              |
| Load Regulation                  | $\Delta V_{OUT}$        | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           |      |      | 80   | mV             |
|                                  |                         | $T_J = 25^\circ C, I_{OUT} = 0.25A - 0.75A$                        |      |      | 40   | mV             |
| Line regulation                  | $\Delta V_{OUT}$        | $V_{IN} = 10.5V \sim 25V, T_J = 25^\circ C$                        |      |      | 80   | mV             |
|                                  |                         | $V_{IN} = 10.5V \sim 23V, T_J = 25^\circ C, I_{OUT} = 1.0A$        |      |      | 80   | mV             |
| Quiescent Current                | $I_Q$                   | $T_J = 25^\circ C, I_{OUT} \leq 1.0A$                              |      |      | 8.0  | mA             |
| Quiescent Current Change         | $\Delta I_Q$            | $V_{IN} = 10.5V \sim 23V$  |      |      | 1.0  | mA             |
|                                  |                         | $I_{OUT} = 5mA - 1.0A$   |      |      | 0.5  | mA             |
| Output Noise Voltage             | eN                      | $10Hz \leq f \leq 100kHz$  |      | 58   |      | $\mu V$        |
| Temperature Coefficient of $V_o$ | $\Delta V_o / \Delta T$ | $I_{OUT} = 5mA$  |      | -0.9 |      | mV/ $^\circ C$ |
| Ripple Rejection                 | RR                      | $V_{IN} = 11.5V \sim 21.5V,$<br>$f = 120Hz, T_J = 25^\circ C$      | 56   | 72   |      | dB             |
| Peak Output Current              | $I_{PEAK}$              | $T_J = 25^\circ C$   |      | 1.8  |      | A              |
| Short-Circuit Current            | $I_{SC}$                | $V_{IN} = 35V, T_J = 25^\circ C$                                   |      | 250  |      | mA             |

■ ELECTRICAL CHARACTERISTICS(Cont.)

For UTC LM7809 ( $V_{IN} = 15V$ )

| PARAMETER                        | SYMBOL                  | TEST CONDITIONS  | MIN  | TYP  | MAX  | UNIT           |
|----------------------------------|-------------------------|--|------|------|------|----------------|
| Output Voltage                   | $V_{OUT}$               | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           | 8.64 | 9.0  | 9.36 | V              |
|                                  |                         | $V_{IN} = 11.5V \sim 24V,$<br>$I_{OUT} = 5mA - 1.0A, P_D \leq 15W$ | 8.55 |      | 9.45 | V              |
| Dropout Voltage                  | $V_D$                   | $T_J = 25^\circ C$   |      | 2.0  |      | V              |
| Load Regulation                  | $\Delta V_{OUT}$        | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           |      |      | 90   | mV             |
|                                  |                         | $T_J = 25^\circ C, I_{OUT} = 0.25A - 0.75A$                        |      |      | 45   | mV             |
| Line regulation                  | $\Delta V_{OUT}$        | $V_{IN} = 11.5V \sim 25V, T_J = 25^\circ C$                        |      |      | 90   | mV             |
|                                  |                         | $V_{IN} = 11.5V \sim 24V, T_J = 25^\circ C, I_{OUT} = 1.0A$        |      |      | 90   | mV             |
| Quiescent Current                | $I_Q$                   | $T_J = 25^\circ C, I_{OUT} \leq 1.0A$                              |      |      | 8.0  | mA             |
| Quiescent Current Change         | $\Delta I_Q$            | $V_{IN} = 11.5V \sim 24V$  |      |      | 1.0  | mA             |
|                                  |                         | $I_{OUT} = 5mA - 1.0A$   |      |      | 0.5  | mA             |
| Output Noise Voltage             | eN                      | $10Hz \leq f \leq 100kHz$  |      | 58   |      | $\mu V$        |
| Temperature Coefficient of $V_o$ | $\Delta V_o / \Delta T$ | $I_{OUT} = 5mA$  |      | -1.1 |      | mV/ $^\circ C$ |
| Ripple Rejection                 | RR                      | $V_{IN} = 12.5V \sim 22.5V, f = 120Hz, T_J = 25^\circ C$           | 56   | 72   |      | dB             |
| Peak Output Current              | $I_{PEAK}$              | $T_J = 25^\circ C$   |      | 1.8  |      | A              |
| Short-Circuit Current            | $I_{SC}$                | $V_{IN} = 35V, T_J = 25^\circ C$                                   |      | 250  |      | mA             |

For UTC LM7810 ( $V_{IN} = 16V$ )

| PARAMETER                        | SYMBOL                  | TEST CONDITIONS  | MIN  | TYP  | MAX   | UNIT           |
|----------------------------------|-------------------------|--|------|------|-------|----------------|
| Output Voltage                   | $V_{OUT}$               | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           | 9.60 | 10.0 | 10.40 | V              |
|                                  |                         | $V_{IN} = 12.5V \sim 25V,$<br>$I_{OUT} = 5mA - 1.0A, P_D \leq 15W$ | 9.50 |      | 10.50 | V              |
| Dropout Voltage                  | $V_D$                   | $T_J = 25^\circ C$   |      | 2.0  |       | V              |
| Load Regulation                  | $\Delta V_{OUT}$        | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           |      |      | 100   | mV             |
|                                  |                         | $T_J = 25^\circ C, I_{OUT} = 0.25A - 0.75A$                        |      |      | 50    | mV             |
| Line regulation                  | $\Delta V_{OUT}$        | $V_{IN} = 13V \sim 25V, T_J = 25^\circ C$                          |      |      | 100   | mV             |
|                                  |                         | $V_{IN} = 13V \sim 25V, T_J = 25^\circ C, I_{OUT} = 1.0A$          |      |      | 100   | mV             |
| Quiescent Current                | $I_Q$                   | $T_J = 25^\circ C, I_{OUT} \leq 1.0A$                              |      |      | 8.0   | mA             |
| Quiescent Current Change         | $\Delta I_Q$            | $V_{IN} = 12.6V \sim 25V$  |      |      | 1.0   | mA             |
|                                  |                         | $I_{OUT} = 5mA - 1.0A$   |      |      | 0.5   | mA             |
| Output Noise Voltage             | eN                      | $10Hz \leq f \leq 100kHz$  |      | 58   |       | $\mu V$        |
| Temperature coefficient of $V_o$ | $\Delta V_o / \Delta T$ | $I_{OUT} = 5mA$  |      | -1.1 |       | mV/ $^\circ C$ |
| Ripple Rejection                 | RR                      | $V_{IN} = 13V - 23V, f = 120Hz, T_J = 25^\circ C$                  | 56   | 72   |       | dB             |
| Peak Output Current              | $I_{PEAK}$              | $T_J = 25^\circ C$   |      | 1.8  |       | A              |
| Short-Circuit Current            | $I_{SC}$                | $V_{IN} = 35V, T_J = 25^\circ C$                                   |      | 250  |       | mA             |

■ ELECTRICAL CHARACTERISTICS(Cont.)

For UTC LM7812 ( $V_{IN} = 19V$ )

| PARAMETER                        | SYMBOL                  | TEST CONDITIONS  | MIN   | TYP  | MAX   | UNIT          |
|----------------------------------|-------------------------|--|-------|------|-------|---------------|
| Output Voltage                   | $V_{OUT}$               | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           | 11.52 | 12.0 | 12.48 | V             |
|                                  |                         | $V_{IN} = 14.5V \sim 27V,$<br>$I_{OUT} = 5mA - 1.0A, P_D \leq 15W$ | 11.40 |      | 12.60 | V             |
| Dropout Voltage                  | $V_D$                   | $T_J = 25^\circ C$   |       | 2.0  |       | V             |
| Load Regulation                  | $\Delta V_{OUT}$        | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           |       |      | 120   | mV            |
|                                  |                         | $T_J = 25^\circ C, I_{OUT} = 0.25A - 0.75A$                        |       |      | 60    | mV            |
| Line regulation                  | $\Delta V_{OUT}$        | $V_{IN} = 14.5V \sim 30V, T_J = 25^\circ C$                        |       |      | 120   | mV            |
|                                  |                         | $V_{IN} = 14.6V \sim 27V, T_J = 25^\circ C, I_{OUT} = 1.0A$        |       |      | 120   | mV            |
| Quiescent Current                | $I_Q$                   | $T_J = 25^\circ C, I_{OUT} \leq 1.0A$                              |       |      | 8.0   | mA            |
| Quiescent Current Change         | $\Delta I_Q$            | $V_{IN} = 14.5V \sim 30V$  |       |      | 1.0   | mA            |
|                                  |                         | $I_{OUT} = 5mA - 1.0A$   |       |      | 0.5   | mA            |
| Output Noise Voltage             | eN                      | $10Hz \leq f \leq 100kHz$  |       | 75   |       | $\mu V$       |
| Temperature Coefficient of $V_o$ | $\Delta V_o / \Delta T$ | $I_{OUT} = 5mA$  |       | -1.5 |       | $mV/^\circ C$ |
| Ripple Rejection                 | RR                      | $V_{IN} = 15V - 25V, f = 120Hz, T_J = 25^\circ C$                  | 55    | 72   |       | dB            |
| Peak Output Current              | $I_{PEAK}$              | $T_J = 25^\circ C$   |       | 1.8  |       | A             |
| Short-Circuit Current            | $I_{SC}$                | $V_{IN} = 35V, T_J = 25^\circ C$                                   |       | 250  |       | mA            |

For UTC LM7815 ( $V_{IN} = 23V$ )

| PARAMETER                        | SYMBOL                  | TEST CONDITIONS  | MIN   | TYP  | MAX   | UNIT          |
|----------------------------------|-------------------------|--|-------|------|-------|---------------|
| Output Voltage                   | $V_{OUT}$               | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           | 14.40 | 15.0 | 15.60 | V             |
|                                  |                         | $V_{IN} = 17.5V \sim 30V,$<br>$I_{OUT} = 5mA - 1.0A, P_D \leq 15W$ | 14.25 |      | 15.75 | V             |
| Dropout Voltage                  | $V_D$                   | $T_J = 25^\circ C$   |       | 2.0  |       | V             |
| Load Regulation                  | $\Delta V_{OUT}$        | $T_J = 25^\circ C, I_{OUT} = 5mA - 1.0A$                           |       |      | 150   | mV            |
|                                  |                         | $T_J = 25^\circ C, I_{OUT} = 0.25A - 0.75A$                        |       |      | 75    | mV            |
| Line regulation                  | $\Delta V_{OUT}$        | $V_{IN} = 18.5V \sim 30V, T_J = 25^\circ C$                        |       |      | 150   | mV            |
|                                  |                         | $V_{IN} = 17.7V \sim 30V, T_J = 25^\circ C, I_{OUT} = 1.0A$        |       |      | 150   | mV            |
| Quiescent Current                | $I_Q$                   | $T_J = 25^\circ C, I_{OUT} \leq 1.0A$                              |       |      | 8.0   | mA            |
| Quiescent Current Change         | $\Delta I_Q$            | $V_{IN} = 17.5V \sim 30V$  |       |      | 1.0   | mA            |
|                                  |                         | $I_{OUT} = 5mA - 1.0A$   |       |      | 0.5   | mA            |
| Output Noise Voltage             | eN                      | $10Hz \leq f \leq 100kHz$  |       | 90   |       | $\mu V$       |
| Temperature Coefficient of $V_o$ | $\Delta V_o / \Delta T$ | $I_{OUT} = 5mA$  |       | -1.8 |       | $mV/^\circ C$ |
| Ripple Rejection                 | RR                      | $V_{IN} = 18.5V \sim 28.5V, f = 120Hz, T_J = 25^\circ C$           | 54    | 70   |       | dB            |
| Peak Output Current              | $I_{PEAK}$              | $T_J = 25^\circ C$   |       | 1.8  |       | A             |
| Short-Circuit Current            | $I_{SC}$                | $V_{IN} = 35V, T_J = 25^\circ C$                                   |       | 250  |       | mA            |

■ ELECTRICAL CHARACTERISTICS(Cont.)

For UTC LM7818 ( $V_{IN}=27V$ )

| PARAMETER                        | SYMBOL                | TEST CONDITIONS  | MIN   | TYP  | MAX   | UNIT           |
|----------------------------------|-----------------------|--|-------|------|-------|----------------|
| Output Voltage                   | $V_{OUT}$             | $T_J=25^{\circ}C, I_{OUT}=5mA - 1.0A$                        | 17.28 | 18.0 | 18.72 | V              |
|                                  |                       | $V_{IN}=21V \sim 33V,$<br>$I_{OUT}=5mA - 1.0A, P_D \leq 15W$ | 17.10 |      | 18.90 | V              |
| Dropout Voltage                  | $V_D$                 | $T_J=25^{\circ}C$  |       | 2.0  |       | V              |
| Load Regulation                  | $\Delta V_{OUT}$      | $T_J=25^{\circ}C, I_{OUT}=5mA - 1.0A$                        |       |      | 180   | mV             |
|                                  |                       | $T_J=25^{\circ}C, I_{OUT}=0.25A - 0.75A$                     |       |      | 90    | mV             |
| Line regulation                  | $\Delta V_{OUT}$      | $V_{IN}=21V \sim 33V, T_J=25^{\circ}C$                       |       |      | 180   | mV             |
|                                  |                       | $V_{IN}=21V \sim 33V,$<br>$T_J=25^{\circ}C, I_{OUT}=1.0A$    |       |      | 180   | mV             |
| Quiescent Current                | $I_Q$                 | $T_J=25^{\circ}C, I_{OUT} \leq 1.0A$                         |       |      | 8.0   | mA             |
| Quiescent Current Change         | $\Delta I_Q$          | $V_{IN}=21.5V \sim 33V$                                      |       |      | 1.0   | mA             |
|                                  |                       | $I_{OUT}=5mA - 1.0A$   |       |      | 0.5   | mA             |
| Output Noise Voltage             | eN                    | $10Hz \leq f \leq 100kHz$                                    |       | 110  |       | $\mu V$        |
| Temperature Coefficient of $V_o$ | $\Delta V_o/\Delta T$ | $I_{OUT}=5mA$  |       | -2.2 |       | $mV/^{\circ}C$ |
| Ripple Rejection                 | RR                    | $V_{IN}=22V - 32V, f=120Hz, T_J=25^{\circ}C$                 | 53    | 69   |       | dB             |
| Peak Output Current              | $I_{PEAK}$            | $T_J=25^{\circ}C$  |       | 1.8  |       | A              |
| Short-Circuit Current            | $I_{SC}$              | $V_{IN}=35V, T_J=25^{\circ}C$                                |       | 250  |       | mA             |

For UTC LM7824 ( $V_{IN}=33V$ )

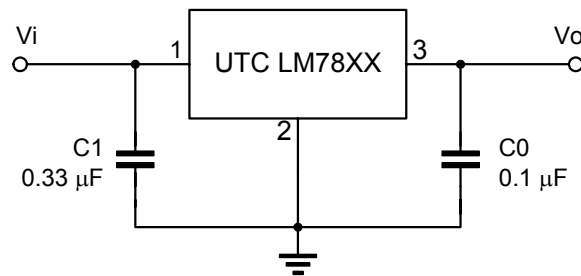
| PARAMETER                        | SYMBOL                | TEST CONDITIONS  | MIN   | TYP  | MAX   | UNIT           |
|----------------------------------|-----------------------|--|-------|------|-------|----------------|
| Output Voltage                   | $V_{OUT}$             | $T_J=25^{\circ}C, I_{OUT}=5mA - 1.0A$                        | 23.04 | 24.0 | 24.96 | V              |
|                                  |                       | $V_{IN}=27V \sim 38V,$<br>$I_{OUT}=5mA - 1.0A, P_D \leq 15W$ | 22.80 |      | 25.20 | V              |
| Dropout Voltage                  | $V_D$                 | $T_J=25^{\circ}C$  |       | 2.0  |       | V              |
| Load Regulation                  | $\Delta V_{OUT}$      | $T_J=25^{\circ}C, I_{OUT}=5mA - 1.0A$                        |       |      | 240   | mV             |
|                                  |                       | $T_J=25^{\circ}C, I_{OUT}=0.25A - 0.75A$                     |       |      | 120   | mV             |
| Line regulation                  | $\Delta V_{OUT}$      | $V_{IN}=27V \sim 38V, T_J=25^{\circ}C$                       |       |      | 240   | mV             |
|                                  |                       | $V_{IN}=27V \sim 38V, T_J=25^{\circ}C, I_{OUT}=1.0A$         |       |      | 240   | mV             |
| Quiescent Current                | $I_Q$                 | $T_J=25^{\circ}C, I_{OUT} \leq 1.0A$                         |       |      | 8.0   | mA             |
| Quiescent Current Change         | $\Delta I_Q$          | $V_{IN}=28V \sim 38V$  |       |      | 1.0   | mA             |
|                                  |                       | $I_{OUT}=5mA - 1.0A$   |       |      | 0.5   | mA             |
| Output Noise Voltage             | eN                    | $10Hz \leq f \leq 100kHz$                                    |       | 170  |       | $\mu V$        |
| Temperature Coefficient of $V_o$ | $\Delta V_o/\Delta T$ | $I_{OUT}=5mA$  |       | -2.8 |       | $mV/^{\circ}C$ |
| Ripple Rejection                 | RR                    | $V_{IN}=28V - 38V, f=120Hz, T_J=25^{\circ}C$                 | 50    | 66   |       | dB             |
| Peak Output Current              | $I_{PEAK}$            | $T_J=25^{\circ}C$  |       | 1.8  |       | A              |
| Short-Circuit Current            | $I_{SC}$              | $V_{IN}=35V, T_J=25^{\circ}C$                                |       | 250  |       | mA             |

Note 1: The Maximum steady state usable output current are dependent on input voltage, heat sinking, lead length of the package and copper pattern of PCB. The data above represents pulse test conditions with junction temperatures specified at the initiation of test.

Note 2: Power dissipation < 0.5W



### ■ APPLICATION CIRCUIT



Note 1: To specify an output voltage, substitute voltage value for "XX".

2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

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## TYPICAL CHARACTERISTICS

Fig.1 Ambient temperature vs. Power dissipation



Fig.2 Output Voltage vs. Ambient temperature



Fig.3 Dropout Voltage



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