

**TO-220**

**ITO-220**

**TO-263  
(D<sup>2</sup>PAK)**

**Pin Definition:**

1. Input
2. Ground (tab)
3. Output

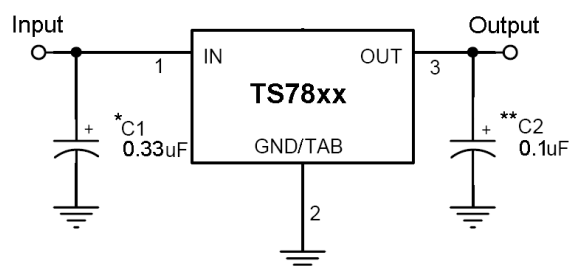
### General Description

The TS7800 series voltage regulators are monolithic integrated circuits designed as fixed-voltage regulators for a wide variety of applications including local, on-card regulation. These regulators employ internal current limiting, thermal shutdown, and safe-area compensation. With adequate heatsink they can deliver output currents up to 1 ampere. Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

### Features

- Output Voltage Range 5 to 24V
- Output current up to 1A
- No external components required
- Internal thermal overload protection
- Internal short-circuit current limiting
- Output transistor safe-area compensation
- Output voltage offered in 4% tolerance

### Standard Application Circuit



A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0V above the output voltage even during the low point on the Input ripple voltage.

XX = these two digits of the type number indicate voltage.

\* = Cin is required if regulator is located an appreciable distance from power supply filter.

\*\* = Co is not needed for stability; however, it does improve transient response.

### Ordering Information

| Part No.    | Package | Packing           |
|-------------|---------|-------------------|
| TS78xxCZ C0 | TO-220  | 50pcs / Tube      |
| TS78xxCI C0 | ITO-220 | 50pcs / Tube      |
| TS78xxCM RN | TO-263  | 800pcs / 13" Reel |

Note: Where **xx** denote voltage option

### Absolute Maximum Rating (Ta = 25°C unless otherwise noted)

| Parameter                                |                             | Symbol           | Limit            | Unit |
|------------------------------------------|-----------------------------|------------------|------------------|------|
| Input Voltage                            | V <sub>OUT</sub> =5~18V     | V <sub>IN</sub>  | 35               | V    |
|                                          | V <sub>OUT</sub> =24V       |                  | 40               |      |
| Output Current                           |                             | I <sub>OUT</sub> | Internal Limited |      |
| Power Dissipation                        |                             | P <sub>D</sub>   | Internal Limited |      |
| Operating Junction Temperature           |                             | T <sub>J</sub>   | 0~+125           | °C   |
| Storage Temperature Range                |                             | T <sub>STG</sub> | -65~+150         | °C   |
| Thermal Resistance - Junction to Case    | TO-220                      | R <sub>θJC</sub> | 5                | °C/W |
|                                          | ITO-220                     |                  | 5                |      |
|                                          | TO-263 (D <sup>2</sup> PAK) |                  | 3                |      |
| Thermal Resistance - Junction to Ambient | TO-220                      | R <sub>θJA</sub> | 50               | °C/W |
|                                          | ITO-220                     |                  | 60               |      |
|                                          | TO-263 (D <sup>2</sup> PAK) |                  | 62.5             |      |

**Note:** Absolute maximum ratings are those values beyond which damage to the device may occur.

Functional operation under these condition is not implied.

# TS7800 Series

## 3-Terminal Fixed Positive Voltage Regulator

### TS7805 Electrical Characteristics

( $V_{in}=10V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

| Parameter                                 | Symbol                        | Test Condition                                                               | Min  | Typ  | Max  | Unit           |
|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------|------|------|------|----------------|
| Output voltage                            | $V_{out}$                     | $T_j=25^{\circ}C$                                                            | 4.80 | 5    | 5.20 | V              |
|                                           |                               | $7.5V \leq V_{in} \leq 20V$ ,<br>$10mA \leq I_{out} \leq 1A$ , $PD \leq 15W$ | 4.75 | 5    | 5.25 |                |
| Line Regulation                           | REGline                       | $T_j=25^{\circ}C$                                                            |      |      |      | mV             |
|                                           |                               | $7.5V \leq V_{in} \leq 25V$                                                  | --   | 3    | 100  |                |
|                                           |                               | $8V \leq V_{in} \leq 12V$                                                    | --   | 1    | 50   |                |
| Load Regulation                           | REGload                       | $T_j=25^{\circ}C$                                                            |      |      |      |                |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                  | --   | 15   | 100  |                |
|                                           |                               | $250mA \leq I_{out} \leq 750mA$                                              | --   | 5    | 50   |                |
| Quiescent Current                         | $I_q$                         | $I_{out}=0$ , $T_j=25^{\circ}C$                                              | --   | 4.2  | 8    | mA             |
| Quiescent Current Change                  | $\Delta I_q$                  | $7.5V \leq V_{in} \leq 25V$                                                  | --   | --   | 1.3  |                |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                  | --   | --   | 0.5  |                |
| Output Noise Voltage                      | $V_n$                         | $10Hz \leq f \leq 100KHz$ , $T_j=25^{\circ}C$                                | --   | 40   | --   | $\mu V$        |
| Ripple Rejection Ratio                    | RR                            | $f=120Hz$ , $8V \leq V_{in} \leq 18V$                                        | 62   | 78   | --   | dB             |
| Voltage Drop                              | $V_{drop}$                    | $I_{out}=1.0A$ , $T_j=25^{\circ}C$                                           | --   | 2    | --   | V              |
| Output Resistance                         | $R_{out}$                     | $f=1KHz$                                                                     | --   | 17   | --   | $m\Omega$      |
| Output Short Circuit Current              | $I_{os}$                      | $T_j=25^{\circ}C$                                                            | --   | 750  | --   | mA             |
| Peak Output Current                       | $I_{o peak}$                  | $T_j=25^{\circ}C$                                                            | --   | 2.2  | --   | A              |
| Temperature Coefficient of Output Voltage | $\Delta V_{out} / \Delta T_j$ | $I_{out}=10mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$                     | --   | -0.6 | --   | $mV/^{\circ}C$ |

### TS7806 Electrical Characteristics

( $V_{in}=11V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

| Parameter                                 | Symbol                        | Test Condition                                                               | Min  | Typ  | Max  | Unit           |
|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------|------|------|------|----------------|
| Output Voltage                            | $V_{out}$                     | $T_j=25^{\circ}C$                                                            | 5.75 | 6    | 6.25 | V              |
|                                           |                               | $8.5V \leq V_{in} \leq 21V$ ,<br>$10mA \leq I_{out} \leq 1A$ , $PD \leq 15W$ | 5.7  | 6    | 6.3  |                |
| Line Regulation                           | REGline                       | $T_j=25^{\circ}C$                                                            |      |      |      | mV             |
|                                           |                               | $8.5V \leq V_{in} \leq 25V$                                                  | --   | 5    | 120  |                |
|                                           |                               | $9V \leq V_{in} \leq 13V$                                                    | --   | 1.5  | 60   |                |
| Load Regulation                           | REGload                       | $T_j=25^{\circ}C$                                                            |      |      |      |                |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                  | --   | 14   | 120  |                |
|                                           |                               | $250mA \leq I_{out} \leq 750mA$                                              | --   | 4    | 60   |                |
| Quiescent Current                         | $I_q$                         | $I_{out}=0$ , $T_j=25^{\circ}C$                                              | --   | 4.3  | 8    | mA             |
| Quiescent Current Change                  | $\Delta I_q$                  | $8.5V \leq V_{in} \leq 25V$                                                  | --   | --   | 1.3  |                |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                  | --   | --   | 0.5  |                |
| Output Noise Voltage                      | $V_n$                         | $10Hz \leq f \leq 100KHz$ , $T_j=25^{\circ}C$                                | --   | 45   | --   | $\mu V$        |
| Ripple Rejection Ratio                    | RR                            | $f=120Hz$ , $9V \leq V_{in} \leq 19V$                                        | 59   | 75   | --   | dB             |
| Voltage Drop                              | $V_{drop}$                    | $I_{out}=1.0A$ , $T_j=25^{\circ}C$                                           | --   | 2    | --   | V              |
| Output Resistance                         | $R_{out}$                     | $f=1KHz$                                                                     | --   | 19   | --   | $m\Omega$      |
| Output Short Circuit Current              | $I_{os}$                      | $T_j=25^{\circ}C$                                                            | --   | 550  | --   | mA             |
| Peak Output Current                       | $I_{o peak}$                  | $T_j=25^{\circ}C$                                                            | --   | 2.2  | --   | A              |
| Temperature Coefficient of Output Voltage | $\Delta V_{out} / \Delta T_j$ | $I_{out}=10mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$                     | --   | -0.7 | --   | $mV/^{\circ}C$ |

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

# TS7800 Series

## 3-Terminal Fixed Positive Voltage Regulator

### TS7808 Electrical Characteristics

$V_{in}=14V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

| Parameter                                 | Symbol                        | Test Condition                                                                | Min  | Typ  | Max  | Unit             |
|-------------------------------------------|-------------------------------|-------------------------------------------------------------------------------|------|------|------|------------------|
| Output voltage                            | $V_{out}$                     | $T_j=25^{\circ}C$                                                             | 7.69 | 8    | 8.32 | V                |
|                                           |                               | $10.5V \leq V_{in} \leq 23V$ ,<br>$10mA \leq I_{out} \leq 1A$ , $PD \leq 15W$ | 7.61 | 8    | 8.40 |                  |
| Line Regulation                           | REG <sub>line</sub>           | $T_j=25^{\circ}C$                                                             |      |      |      | mV               |
|                                           |                               | $10.5V \leq V_{in} \leq 25V$                                                  | --   | 6    | 160  |                  |
| Load Regulation                           | REG <sub>load</sub>           | $T_j=25^{\circ}C$                                                             |      |      |      |                  |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                   | --   | 12   | 160  |                  |
| Quiescent Current                         | $I_q$                         | $I_{out}=0$ , $T_j=25^{\circ}C$                                               | --   | 4.3  | 8    | mA               |
|                                           |                               | $10.5V \leq V_{in} \leq 25V$                                                  | --   | --   | 1    |                  |
| Quiescent Current Change                  | $\Delta I_q$                  | $10mA \leq I_{out} \leq 1A$                                                   | --   | --   | 0.5  |                  |
| Output Noise Voltage                      | $V_n$                         | $10Hz \leq f \leq 100KHz$ , $T_j=25^{\circ}C$                                 | --   | 52   | --   | $\mu V$          |
| Ripple Rejection Ratio                    | RR                            | $f=120Hz$ , $11V \leq V_{in} \leq 21V$                                        | 56   | 72   | --   | dB               |
| Voltage Drop                              | $V_{drop}$                    | $I_{out}=1.0A$ , $T_j=25^{\circ}C$                                            | --   | 2    | --   | V                |
| Output Resistance                         | $R_{out}$                     | $f=1KHz$                                                                      | --   | 16   | --   | $m\Omega$        |
| Output Short Circuit Current              | $I_{os}$                      | $T_j=25^{\circ}C$                                                             | --   | 450  | --   | mA               |
| Peak Output Current                       | $I_{o peak}$                  | $T_j=25^{\circ}C$                                                             | --   | 2.2  | --   | A                |
| Temperature Coefficient of Output Voltage | $\Delta V_{out} / \Delta T_j$ | $I_{out}=10mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$                      | --   | -0.8 | --   | $mV / ^{\circ}C$ |

### TS7809 Electrical Characteristics

( $V_{in}=15V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

| Parameter                                 | Symbol                        | Test Condition                                                                | Min  | Typ | Max  | Unit             |
|-------------------------------------------|-------------------------------|-------------------------------------------------------------------------------|------|-----|------|------------------|
| Output Voltage                            | $V_{out}$                     | $T_j=25^{\circ}C$                                                             | 8.65 | 9   | 9.36 | V                |
|                                           |                               | $11.5V \leq V_{in} \leq 23V$ ,<br>$10mA \leq I_{out} \leq 1A$ , $PD \leq 15W$ | 8.57 | 9   | 9.45 |                  |
| Line Regulation                           | REG <sub>line</sub>           | $T_j=25^{\circ}C$                                                             |      |     |      | mV               |
|                                           |                               | $11.5V \leq V_{in} \leq 26V$                                                  | --   | 6   | 180  |                  |
| Load Regulation                           | REG <sub>load</sub>           | $T_j=25^{\circ}C$                                                             |      |     |      |                  |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                   | --   | 12  | 180  |                  |
| Quiescent Current                         | $I_q$                         | $I_{out}=0$ , $T_j=25^{\circ}C$                                               | --   | 4.3 | 8    | mA               |
|                                           |                               | $11.5V \leq V_{in} \leq 26V$                                                  | --   | --  | 1    |                  |
| Quiescent Current Change                  | $\Delta I_q$                  | $10mA \leq I_{out} \leq 1A$                                                   | --   | --  | 0.5  |                  |
| Output Noise Voltage                      | $V_n$                         | $10Hz \leq f \leq 100KHz$ , $T_j=25^{\circ}C$                                 | --   | 52  | --   | $\mu V$          |
| Ripple Rejection Ratio                    | RR                            | $f=120Hz$ , $12V \leq V_{in} \leq 22V$                                        | 55   | 72  | --   | dB               |
| Voltage Drop                              | $V_{drop}$                    | $I_{out}=1.0A$ , $T_j=25^{\circ}C$                                            | --   | 2   | --   | V                |
| Output Resistance                         | $R_{out}$                     | $f=1KHz$                                                                      | --   | 16  | --   | $m\Omega$        |
| Output Short Circuit Current              | $I_{os}$                      | $T_j=25^{\circ}C$                                                             | --   | 450 | --   | mA               |
| Peak Output Current                       | $I_{o peak}$                  | $T_j=25^{\circ}C$                                                             | --   | 2.2 | --   | A                |
| Temperature Coefficient of Output Voltage | $\Delta V_{out} / \Delta T_j$ | $I_{out}=10mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$                      | --   | -1  | --   | $mV / ^{\circ}C$ |

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

# TS7800 Series

## 3-Terminal Fixed Positive Voltage Regulator

### TS7810 Electrical Characteristics

$V_{in}=16V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

| Parameter                                 | Symbol                        | Test Condition                                                                |                                 | Min | Typ | Max  | Unit            |
|-------------------------------------------|-------------------------------|-------------------------------------------------------------------------------|---------------------------------|-----|-----|------|-----------------|
| Output voltage                            | $V_{out}$                     | $T_j=25^{\circ}C$                                                             |                                 | 9.6 | 10  | 10.4 | V               |
|                                           |                               | $12.5V \leq V_{in} \leq 25V$ ,<br>$10mA \leq I_{out} \leq 1A$ , $PD \leq 15W$ |                                 | 9.5 | 10  | 10.5 |                 |
| Line Regulation                           | REG <sub>line</sub>           | $T_j=25^{\circ}C$                                                             | $12.5V \leq V_{in} \leq 28V$    | --  | 7   | 200  | mV              |
|                                           |                               |                                                                               | $13V \leq V_{in} \leq 17V$      | --  | 2   | 100  |                 |
| Load Regulation                           | REG <sub>load</sub>           | $T_j=25^{\circ}C$                                                             | $10mA \leq I_{out} \leq 1A$     | --  | 12  | 200  |                 |
|                                           |                               |                                                                               | $250mA \leq I_{out} \leq 750mA$ | --  | 4   | 100  |                 |
| Quiescent Current                         | $I_q$                         | $I_{out}=0$ , $T_j=25^{\circ}C$                                               |                                 | --  | 4.3 | 8    | mA              |
| Quiescent Current Change                  | $\Delta I_q$                  | $12.5V \leq V_{in} \leq 28V$                                                  |                                 | --  | --  | 1    |                 |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                   |                                 | --  | --  | 0.5  |                 |
| Output Noise Voltage                      | $V_n$                         | $10Hz \leq f \leq 100KHz$ , $T_j=25^{\circ}C$                                 |                                 | --  | 70  | --   | $\mu V$         |
| Ripple Rejection Ratio                    | RR                            | $f=120Hz$ , $13V \leq V_{in} \leq 23V$                                        |                                 | 55  | 71  | --   | dB              |
| Voltage Drop                              | $V_{drop}$                    | $I_{out}=1.0A$ , $T_j=25^{\circ}C$                                            |                                 | --  | 2   | --   | V               |
| Output Resistance                         | $R_{out}$                     | $f=1KHz$                                                                      |                                 | --  | 18  | --   | $m\Omega$       |
| Output Short Circuit Current              | $I_{os}$                      | $T_j=25^{\circ}C$                                                             |                                 | --  | 400 | --   | mA              |
| Peak Output Current                       | $I_{o peak}$                  | $T_j=25^{\circ}C$                                                             |                                 | --  | 2.2 | --   | A               |
| Temperature Coefficient of Output Voltage | $\Delta V_{out} / \Delta T_j$ | $I_{out}=10mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$                      |                                 | --  | -1  | --   | mV/ $^{\circ}C$ |

### TS7812 Electrical Characteristics

( $V_{in}=19V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

| Parameter                                 | Symbol                        | Test Condition                                                                |                                 | Min   | Typ | Max   | Unit            |
|-------------------------------------------|-------------------------------|-------------------------------------------------------------------------------|---------------------------------|-------|-----|-------|-----------------|
| Output Voltage                            | $V_{out}$                     | $T_j=25^{\circ}C$                                                             |                                 | 11.53 | 12  | 12.48 | V               |
|                                           |                               | $14.5V \leq V_{in} \leq 27V$ ,<br>$10mA \leq I_{out} \leq 1A$ , $PD \leq 15W$ |                                 | 11.42 | 12  | 12.60 |                 |
| Line Regulation                           | REG <sub>line</sub>           | $T_j=25^{\circ}C$                                                             | $14.5V \leq V_{in} \leq 30V$    | --    | 10  | 240   | mV              |
|                                           |                               |                                                                               | $15V \leq V_{in} \leq 19V$      | --    | 3   | 120   |                 |
| Load Regulation                           | REG <sub>load</sub>           | $T_j=25^{\circ}C$                                                             | $10mA \leq I_{out} \leq 1A$     | --    | 12  | 240   |                 |
|                                           |                               |                                                                               | $250mA \leq I_{out} \leq 750mA$ | --    | 4   | 120   |                 |
| Quiescent Current                         | $I_q$                         | $T_j=25^{\circ}C$ , $I_{out}=0$                                               |                                 | --    | 4.3 | 8     | mA              |
| Quiescent Current Change                  | $\Delta I_q$                  | $14.5V \leq V_{in} \leq 30V$                                                  |                                 | --    | --  | 1     |                 |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                   |                                 | --    | --  | 0.5   |                 |
| Output Noise Voltage                      | $V_n$                         | $10Hz \leq f \leq 100KHz$ , $T_j=25^{\circ}C$                                 |                                 | --    | 75  | --    | $\mu V$         |
| Ripple Rejection Ratio                    | RR                            | $f=120Hz$ , $15V \leq V_{in} \leq 25V$                                        |                                 | 55    | 71  | --    | dB              |
| Voltage Drop                              | $V_{drop}$                    | $I_{out}=1.0A$ , $T_j=25^{\circ}C$                                            |                                 | --    | 2   | --    | V               |
| Output Resistance                         | $R_{out}$                     | $f=1KHz$                                                                      |                                 | --    | 18  | --    | $m\Omega$       |
| Output Short Circuit Current              | $I_{os}$                      | $T_j=25^{\circ}C$                                                             |                                 | --    | 350 | --    | mA              |
| Peak Output Current                       | $I_{o peak}$                  | $T_j=25^{\circ}C$                                                             |                                 | --    | 2.2 | --    | A               |
| Temperature Coefficient of Output Voltage | $\Delta V_{out} / \Delta T_j$ | $I_{out}=10mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$                      |                                 | --    | -1  | --    | mV/ $^{\circ}C$ |

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

# TS7800 Series

## 3-Terminal Fixed Positive Voltage Regulator

### TS7815 Electrical Characteristics

$V_{in}=23V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

| Parameter                                 | Symbol                        | Test Condition                                                                | Min                             | Typ | Max   | Unit             |
|-------------------------------------------|-------------------------------|-------------------------------------------------------------------------------|---------------------------------|-----|-------|------------------|
| Output voltage                            | $V_{out}$                     | $T_j=25^{\circ}C$                                                             | 14.42                           | 15  | 15.60 | V                |
|                                           |                               | $17.5V \leq V_{in} \leq 30V$ ,<br>$10mA \leq I_{out} \leq 1A$ , $PD \leq 15W$ | 14.28                           | 15  | 15.75 |                  |
| Line Regulation                           | REGline                       | $T_j=25^{\circ}C$                                                             | $17.5V \leq V_{in} \leq 30V$    | --  | 12    | mV               |
|                                           |                               |                                                                               | $18V \leq V_{in} \leq 22V$      | --  | 3     |                  |
| Load Regulation                           | REGload                       | $T_j=25^{\circ}C$                                                             | $10mA \leq I_{out} \leq 1A$     | --  | 12    |                  |
|                                           |                               |                                                                               | $250mA \leq I_{out} \leq 750mA$ | --  | 4     |                  |
| Quiescent Current                         | $I_q$                         | $T_j=25^{\circ}C$ , $I_{out}=0$                                               | --                              | 4.3 | 8     | mA               |
| Quiescent Current Change                  | $\Delta I_q$                  | $17.5V \leq V_{in} \leq 30V$                                                  | --                              | --  | 1     |                  |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                   | --                              | --  | 0.5   |                  |
| Output Noise Voltage                      | $V_n$                         | $10Hz \leq f \leq 100KHz$ , $T_j=25^{\circ}C$                                 | --                              | 90  | --    | $\mu V$          |
| Ripple Rejection Ratio                    | RR                            | $f=120Hz$ , $18V \leq V_{in} \leq 28V$                                        | 54                              | 70  | --    | dB               |
| Voltage Drop                              | $V_{drop}$                    | $I_{out}=1.0A$ , $T_j=25^{\circ}C$                                            | --                              | 2   | --    | V                |
| Output Resistance                         | $R_{out}$                     | $f=1KHz$                                                                      | --                              | 19  | --    | $m\Omega$        |
| Output Short Circuit Current              | $I_{os}$                      | $T_j=25^{\circ}C$                                                             | --                              | 230 | --    | mA               |
| Peak Output Current                       | $I_{o peak}$                  | $T_j=25^{\circ}C$                                                             | --                              | 2.2 | --    | A                |
| Temperature Coefficient of Output Voltage | $\Delta V_{out} / \Delta T_j$ | $I_{out}=10mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$                      | --                              | -1  | --    | $mV / ^{\circ}C$ |

### TS7818 Electrical Characteristics

( $V_{in}=24V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

| Parameter                                 | Symbol                        | Test Condition                                                              | Min                             | Typ | Max   | Unit             |
|-------------------------------------------|-------------------------------|-----------------------------------------------------------------------------|---------------------------------|-----|-------|------------------|
| Output Voltage                            | $V_{out}$                     | $T_j=25^{\circ}C$                                                           | 17.30                           | 18  | 18.72 | V                |
|                                           |                               | $21V \leq V_{in} \leq 33V$ , $10mA \leq I_{out} \leq 1A$ ,<br>$PD \leq 15W$ | 17.14                           | 18  | 18.90 |                  |
| Line Regulation                           | REGline                       | $T_j=25^{\circ}C$                                                           | $21V \leq V_{in} \leq 33V$      | --  | 15    | mV               |
|                                           |                               |                                                                             | $22V \leq V_{in} \leq 26V$      | --  | 5     |                  |
| Load Regulation                           | REGload                       | $T_j=25^{\circ}C$                                                           | $10mA \leq I_{out} \leq 1A$     | --  | 12    |                  |
|                                           |                               |                                                                             | $250mA \leq I_{out} \leq 750mA$ | --  | 4     |                  |
| Quiescent Current                         | $I_q$                         | $T_j=25^{\circ}C$ , $I_{out}=0$                                             | --                              | 4.5 | 8     | mA               |
| Quiescent Current Change                  | $\Delta I_q$                  | $21V \leq V_{in} \leq 33V$                                                  | --                              | --  | 1     |                  |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                                 | --                              | --  | 0.5   |                  |
| Output Noise Voltage                      | $V_n$                         | $10Hz \leq f \leq 100KHz$ , $T_j=25^{\circ}C$                               | --                              | 110 | --    | $\mu V$          |
| Ripple Rejection Ratio                    | RR                            | $f=120Hz$ , $21V \leq V_{in} \leq 31V$                                      | 54                              | 70  | --    | dB               |
| Voltage Drop                              | $V_{drop}$                    | $I_{out}=1.0A$ , $T_j=25^{\circ}C$                                          | --                              | 2   | --    | V                |
| Output Resistance                         | $R_{out}$                     | $f=1KHz$                                                                    | --                              | 22  | --    | $m\Omega$        |
| Output Short Circuit Current              | $I_{os}$                      | $T_j=25^{\circ}C$                                                           | --                              | 200 | --    | mA               |
| Peak Output Current                       | $I_{o peak}$                  | $T_j=25^{\circ}C$                                                           | --                              | 2.2 | --    | A                |
| Temperature Coefficient of Output Voltage | $\Delta V_{out} / \Delta T_j$ | $I_{out}=10mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$                    | --                              | -1  | --    | $mV / ^{\circ}C$ |

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

# TS7800 Series

## 3-Terminal Fixed Positive Voltage Regulator

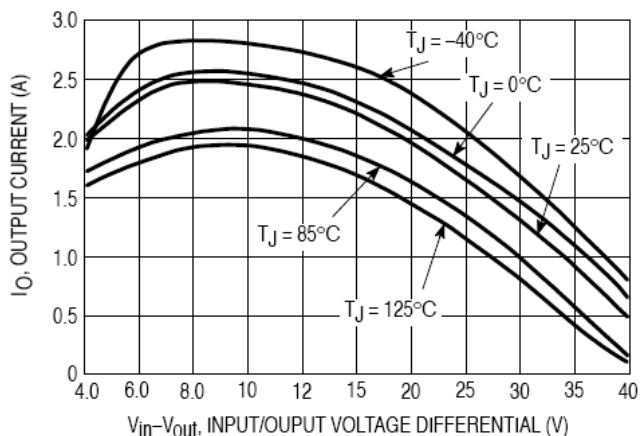
### TS7824 Electrical Characteristics

$V_{in}=33V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

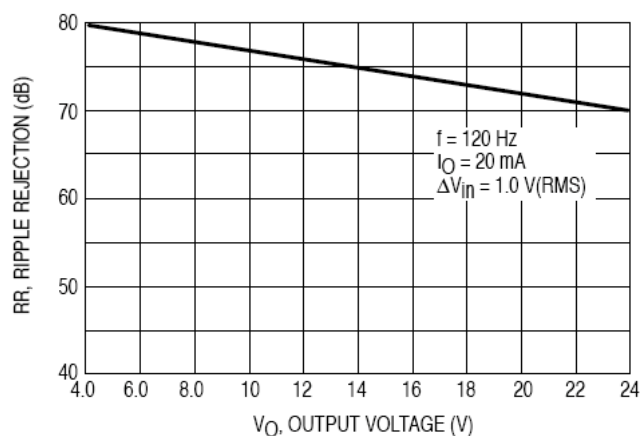
| Parameter                                 | Symbol                        | Test Condition                                                           | Min   | Typ  | Max   | Unit             |
|-------------------------------------------|-------------------------------|--------------------------------------------------------------------------|-------|------|-------|------------------|
| Output voltage                            | $V_{out}$                     | $T_j=25^{\circ}C$                                                        | 23.07 | 24   | 24.96 | V                |
|                                           |                               | $27V \leq V_{in} \leq 38V$ , $10mA \leq I_{out} \leq 1A$ , $PD \leq 15W$ | 22.85 | 24   | 25.20 |                  |
| Line Regulation                           | REG <sub>line</sub>           | $T_j=25^{\circ}C$                                                        |       |      |       | mV               |
|                                           |                               | $27V \leq V_{in} \leq 38V$                                               | --    | 18   | 480   |                  |
|                                           |                               | $28V \leq V_{in} \leq 32V$                                               | --    | 6    | 240   |                  |
| Load Regulation                           | REG <sub>load</sub>           | $T_j=25^{\circ}C$                                                        |       |      |       |                  |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                              | --    | 12   | 480   |                  |
|                                           |                               | $250mA \leq I_{out} \leq 750mA$                                          | --    | 4    | 240   |                  |
| Quiescent Current                         | $I_q$                         | $I_{out}=0$ , $T_j=25^{\circ}C$                                          | --    | 4.6  | 8     | mA               |
| Quiescent Current Change                  | $\Delta I_q$                  | $27V \leq V_{in} \leq 38V$                                               | --    | --   | 1     |                  |
|                                           |                               | $10mA \leq I_{out} \leq 1A$                                              | --    | --   | 0.5   |                  |
| Output Noise Voltage                      | $V_n$                         | $10Hz \leq f \leq 100KHz$ , $T_j=25^{\circ}C$                            | --    | 170  | --    | $\mu V$          |
| Ripple Rejection Ratio                    | RR                            | $f=120Hz$ , $27V \leq V_{in} \leq 37V$                                   | 54    | 70   | --    | dB               |
| Voltage Drop                              | $V_{drop}$                    | $I_{out}=1.0A$ , $T_j=25^{\circ}C$                                       | --    | 2    | --    | V                |
| Output Resistance                         | $R_{out}$                     | $f=1KHz$                                                                 | --    | 28   | --    | $m\Omega$        |
| Output Short Circuit Current              | $I_{os}$                      | $T_j=25^{\circ}C$                                                        | --    | 150  | --    | mA               |
| Peak Output Current                       | $I_{o peak}$                  | $T_j=25^{\circ}C$                                                        | --    | 2.2  | --    | A                |
| Temperature Coefficient of Output Voltage | $\Delta V_{out} / \Delta T_j$ | $I_{out}=10mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$                 | --    | -1.5 | --    | $mV / ^{\circ}C$ |

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

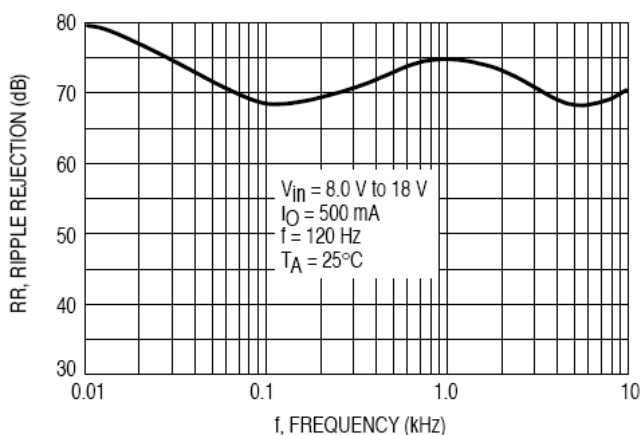
### Electrical Characteristics Curve



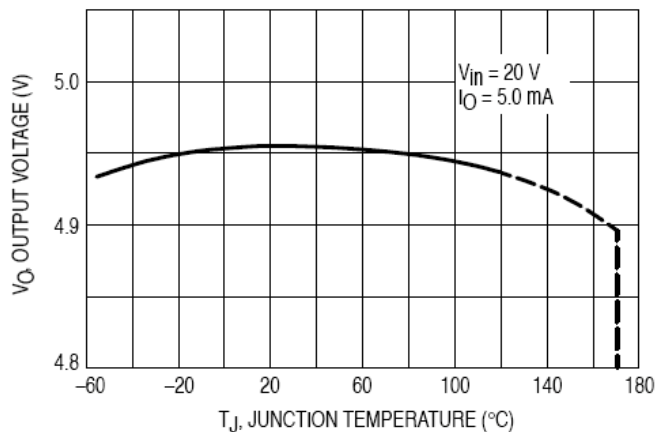
**Figure 1. Peak Output Current as a Function of Input-Output Differential Voltage**



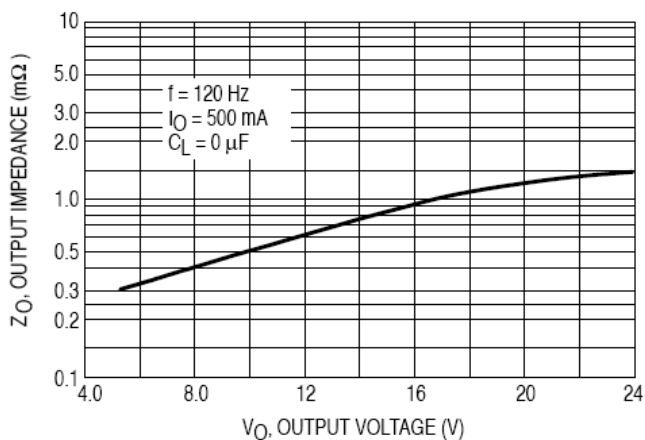
**Figure 2. Ripple Rejection as a Function of Output Voltage**



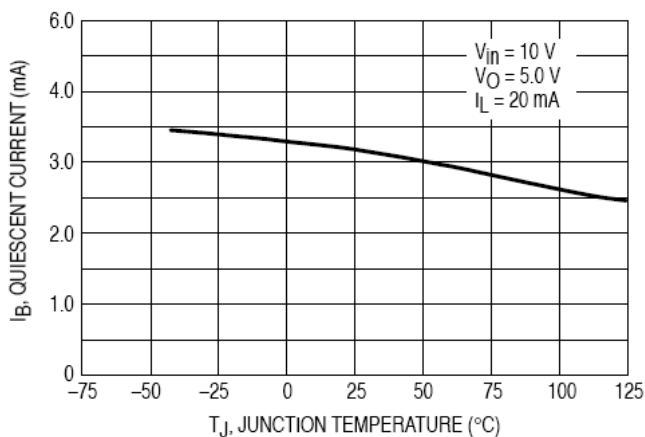
**Figure 3. Ripple Rejection as a Function of Frequency**



**Figure 4. Output Voltage as a Function of Junction Temperature**

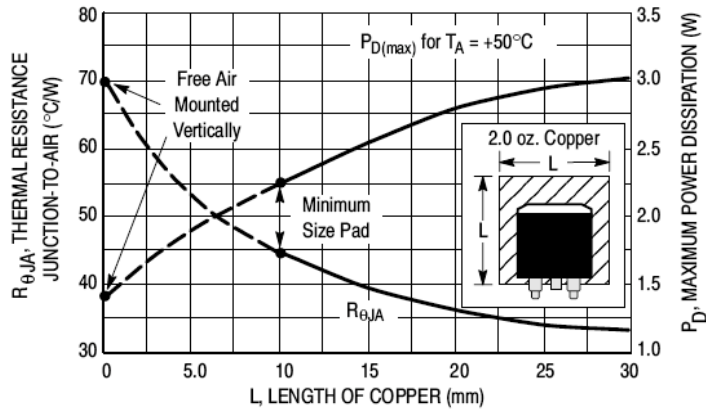


**Figure 5. Output Impedance as a Function of Output Voltage**



**Figure 6. Quiescent Current as a Function of Temperature**

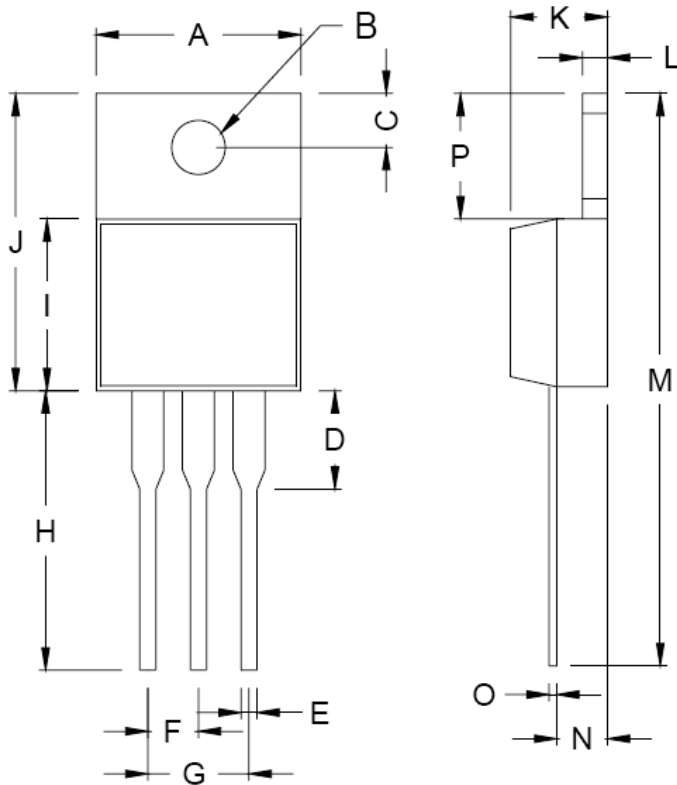
### Application Information



**Figure 7. D²PAK Thermal Resistance and Maximum Power Dissipation vs. P.C.B Copper Length**

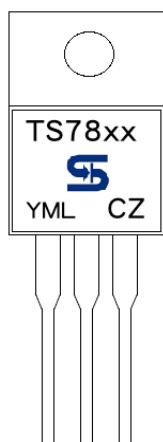


### TO-220 Mechanical Drawing



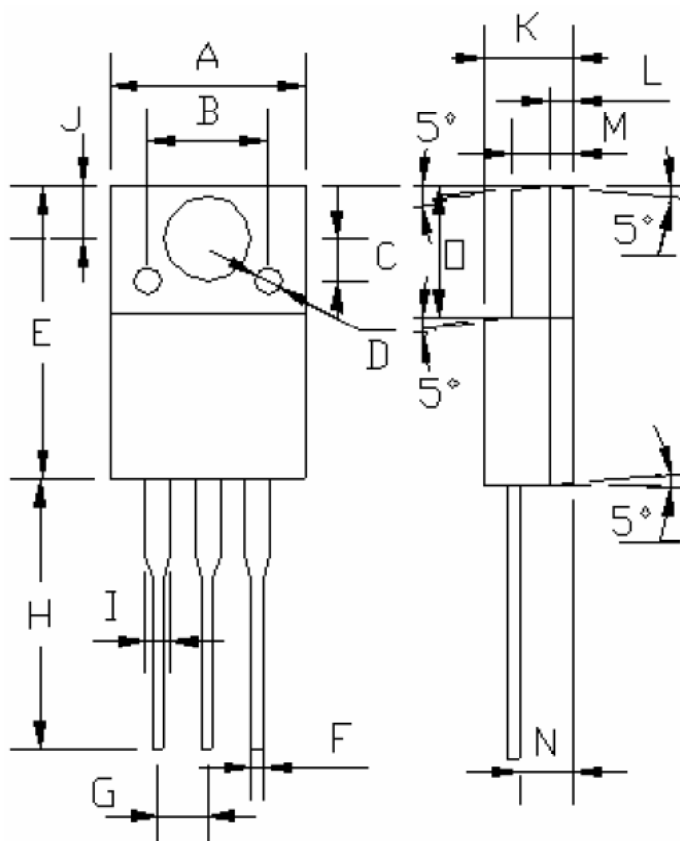
| DIM | TO-220 DIMENSION |       |        |       |
|-----|------------------|-------|--------|-------|
|     | MILLIMETERS      |       | INCHES |       |
|     | MIN              | MAX   | MIN    | MAX   |
| A   | 9.31             | 10.50 | 0.367  | 0.413 |
| B   | 3.74             | 3.91  | 0.147  | 0.154 |
| C   | 2.36             | 3.24  | 0.093  | 0.128 |
| D   | 2.22             | 3.22  | 0.087  | 0.127 |
| E   | 0.78             | 0.98  | 0.031  | 0.039 |
| F   | --               | 2.65  | --     | 0.104 |
| G   | --               | 5.30  | --     | 0.209 |
| H   | 12.32            | 13.88 | 0.485  | 0.546 |
| I   | 8.74             | 9.26  | 0.344  | 0.365 |
| J   | 15.07            | 16.47 | 0.593  | 0.648 |
| K   | 4.35             | 4.65  | 0.171  | 0.183 |
| L   | 1.16             | 1.40  | 0.046  | 0.055 |
| M   | 28.37            | 30.35 | 1.117  | 1.195 |
| N   | 1.78             | 2.67  | 0.070  | 0.105 |
| O   | 0.255            | 0.610 | 0.010  | 0.024 |
| P   | 5.75             | 7.65  | 0.226  | 0.301 |

### Marking Diagram



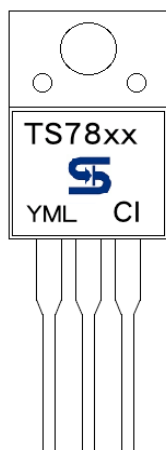
- XX** = Output Voltage  
(05=5V, 06=6V, 08=8V, 09=9V, 10=10V, 12=12V, 15=15V, 18=18V, 24=24V)
- Y** = Year Code
- M** = Month Code  
(A=Jan, B=Feb, C=Mar, D=Apl, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code
- CZ** = Package Code for TO-220

### ITO-220 Mechanical Drawing



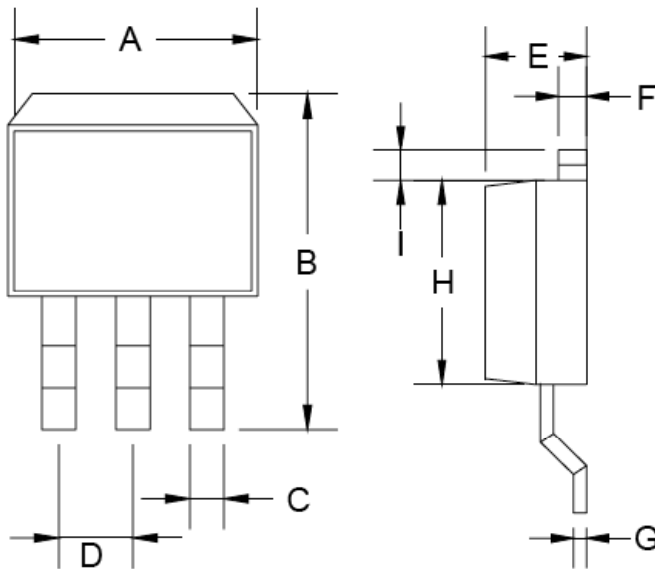
| ITO-220 DIMENSION |               |       |                |       |
|-------------------|---------------|-------|----------------|-------|
| DIM               | MILLIMETERS   |       | INCHES         |       |
|                   | MIN           | MAX   | MIN            | MAX   |
| A                 | 9.96          | 10.36 | 0.392          | 0.407 |
| B                 | 6.20 (typ.)   |       | 0.244 (typ.)   |       |
| C                 | 2.20 (typ.)   |       | 0.087 (typ.)   |       |
| D                 | ± 1.40 (typ.) |       | ± 0.055 (typ.) |       |
| E                 | 15.07         | 16.07 | 0.593          | 0.632 |
| F                 | 0.80 (typ.)   |       | 0.031 (typ.)   |       |
| G                 | 2.44          | 2.64  | 0.096          | 0.104 |
| H                 | 13.08         | 13.48 | 0.514          | 0.530 |
| I                 | 1.47 (max.)   |       | 0.057 (max.)   |       |
| J                 | 3.20          | 3.40  | 0.125          | 0.133 |
| K                 | 4.60          | 4.80  | 0.181          | 0.188 |
| L                 | 1.15 (typ.)   |       | 0.045 (typ.)   |       |
| M                 | 2.44          | 2.64  | 0.096          | 0.104 |
| N                 | 2.60          | 2.80  | 0.102          | 0.110 |
| O                 | 6.55          | 6.65  | 0.258          | 0.262 |

### Marking Diagram



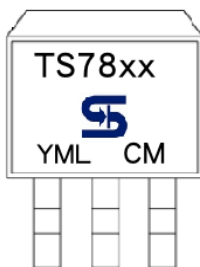
- XX** = Output Voltage  
(05=5V, 06=6V, 08=8V, 09=9V, 10=10V, 12=12V, 15=15V, 18=18V, 24=24V)
- Y** = Year Code
- M** = Month Code  
(A=Jan, B=Feb, C=Mar, D=Apl, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code
- CI** = Package Code for ITO-220

### TO-263 Mechanical Drawing



| DIM | TO-263 DIMENSION |        |        |       |
|-----|------------------|--------|--------|-------|
|     | MILLIMETERS      |        | INCHES |       |
|     | MIN              | MAX    | MIN    | MAX   |
| A   | 10.000           | 10.500 | 0.394  | 0.413 |
| B   | 14.605           | 15.875 | 0.575  | 0.625 |
| C   | 0.508            | 0.991  | 0.020  | 0.039 |
| D   | 2.420            | 2.660  | 0.095  | 0.105 |
| E   | 4.064            | 4.830  | 0.160  | 0.190 |
| F   | 1.118            | 1.400  | 0.045  | 0.055 |
| G   | 0.450            | 0.730  | 0.018  | 0.029 |
| H   | 8.280            | 8.800  | 0.325  | 0.346 |
| I   | 1.140            | 1.400  | 0.044  | 0.055 |
| J   | 1.480            | 1.520  | 0.058  | 0.060 |

### Marking Diagram



- XX** = Output Voltage  
(05=5V, 06=6V, 08=8V, 09=9V, 10=10V, 12=12V, 15=15V, 18=18V, 24=24V)
- Y** = Year Code
- M** = Month Code  
(A=Jan, B=Feb, C=Mar, D=Apr, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code
- CM** = Package Code for TO-263

# **TS7800 Series**

## **3-Terminal Fixed Positive Voltage Regulator**

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