

## Description

The Bay Linear LM78XX is integrated linear positive regulator with three terminals. The LM78XX offer several fixed output voltages making them useful in wide range of applications. When used as a zener diode/resistor combination replacement, the LM78XX usually results in an effective output impedance improvement of two orders of magnitude, lower quiescent current.

The LM78XX is available in the TO-252, TO-220 & TO-263 packages,

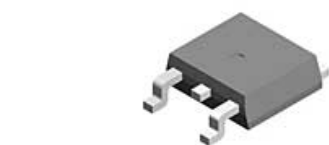
## Features

- **Output Current of 1.5A**
- **Output Voltage Tolerance of 5%**
- **Internal thermal overload protection**
- **Internal Short-Circuit Limited**
- **No External Component**
- **Output Voltage 5.0V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 24V**
- **Offer in plastic TO-252, TO-220 & TO-263**
- **Direct Replacement for LM78XX**

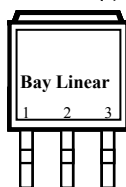
## Applications

- **Post regulator for switching DC/DC converter**
- **Bias supply for analog circuits**

## Packaging Information



**TO-263-3 (S)**



**Top View**

1. Input
2. GND
3. Output

## Ordering Information

| Device | Operating Voltage | Temp.       |
|--------|-------------------|-------------|
| LM7805 | 7 to 20           | 0 to 125 °C |
| LM7806 | 8 to 20           | 0 to 125 °C |
| LM7808 | 10.5 to 23        | 0 to 125 °C |
| LM7809 | 11.5 to 24        | 0 to 125 °C |
| LM7810 | 12.5 to 25        | 0 to 125 °C |
| LM7812 | 14.5 to 27        | 0 to 125 °C |
| LM7815 | 17.5 to 30        | 0 to 125 °C |
| LM7818 | 20.5 to 33        | 0 to 125 °C |
| LM7824 | 26.5 to 39        | 0 to 125 °C |

TO-220 (T)  
TO-263 (S)  
TO-252 (D)

## Absolute Maximum Rating

| Parameter                                        | LM78--                       | Unit |
|--------------------------------------------------|------------------------------|------|
| Input Voltage                                    | LM7824, LM7827<br>All Others | V    |
| Operating Free-Air, Case, Virtual Junction Temp. | 0 to 150                     | °C   |
| Storage Temperature Range                        | -65 to 150                   |      |
| Lead temperature 1.6 mm from case for sec.       | 260                          |      |

## Electrical Characteristics (LM7805)

( $V_I=10V$ ,  $I_O=500mA$ ,  $0^\circ C \leq T_J \leq 125^\circ C$ , unless otherwise specified. (Note 1))

| Parameter                | Symbol       | Conditions                                      | MIN | TYP | MAX | UNIT    |
|--------------------------|--------------|-------------------------------------------------|-----|-----|-----|---------|
| Output Voltage           | $V_O$        | $T_J = 25^\circ C$                              | 4.8 | 5.0 | 5.2 | V       |
| Line Regulation          | $\Delta V_O$ | $V_I = 7V \text{ to } 25V$ $T_J = 25^\circ C$   |     | 3   | 100 | mV      |
|                          |              | $V_I = 8V \text{ to } 12V$ $T_J = 25^\circ C$   |     | 1   | 50  |         |
| Load Regulation          | $\Delta V_O$ | $I_O = 5mA \text{ to } 1.5A$ , $25^\circ C$     |     | 15  | 100 | mV      |
|                          |              | $I_O = 250mA \text{ to } 750mA$ , $25^\circ C$  |     | 5   | 50  |         |
| Ripple Rejection         | RR           | $V_I = 8V \text{ to } 18V$ , $f=120Hz$          | 62  | 78  |     | dB      |
| Output Noise Voltage     | $V_N$        | $F=10Hz \text{ to } 100Hz$ $T_J = 25^\circ C$   |     | 40  |     | $\mu V$ |
| Dropout Voltage          | $V_D$        | $T_J = 25^\circ C$                              |     | 2.0 |     | V       |
| Quiescent Current        |              | $T_J = 25^\circ C$                              |     | 4.2 | 8   | mA      |
| Quiescent Current Change | $\Delta I_Q$ | $V_I = 7V \text{ to } 25V$ , $T_J = 25^\circ C$ |     |     | 1.3 | mA      |
|                          |              | $I_O = 5mA \text{ to } 1A$ , $T_J = 25^\circ C$ |     |     | 0.5 |         |

## Electrical Characteristics (LM7806)

( $V_I=11V$ ,  $I_O=500mA$ ,  $0^\circ C \leq T_J \leq 125^\circ C$ , unless otherwise specified. (Note 1))

| Parameter                | Symbol       | Conditions                                      | MIN  | TYP | MAX  | UNIT    |
|--------------------------|--------------|-------------------------------------------------|------|-----|------|---------|
| Output Voltage           | $V_O$        | $T_J = 25^\circ C$                              | 5.75 | 6.0 | 6.25 | V       |
| Line Regulation          | $\Delta V_O$ | $V_I = 8V \text{ to } 25V$ $T_J = 25^\circ C$   |      | 5   | 120  | mV      |
|                          |              | $V_I = 9V \text{ to } 25V$ $T_J = 25^\circ C$   |      | 1.5 | 60   |         |
| Load Regulation          | $\Delta V_O$ | $I_O = 5mA \text{ to } 1.5A$ , $25^\circ C$     |      | 14  | 120  | mV      |
|                          |              | $I_O = 250mA \text{ to } 750mA$ , $25^\circ C$  |      | 4   | 60   |         |
| Ripple Rejection         | RR           | $V_I = 9V \text{ to } 19V$ , $f=120Hz$          | 59   | 75  |      | dB      |
| Output Noise Voltage     | $V_N$        | $F=10Hz \text{ to } 100Hz$ $T_J = 25^\circ C$   |      | 45  |      | $\mu V$ |
| Dropout Voltage          | $V_D$        | $T_J = 25^\circ C$                              |      | 2.0 |      | V       |
| Quiescent Current        |              | $T_J = 25^\circ C$                              |      | 4.3 | 8.0  | mA      |
| Quiescent Current Change | $\Delta I_Q$ | $V_I = 8V \text{ to } 25V$ , $T_J = 25^\circ C$ |      |     | 1.3  | mA      |
|                          |              | $I_O = 5mA \text{ to } 1A$ , $T_J = 25^\circ C$ |      |     | 0.5  |         |

**Electrical Characteristics (LM7808)**(V<sub>I</sub>=14V, I<sub>O</sub>=500mA, 0°C ≤ T<sub>J</sub> ≤ 125 °C, unless otherwise specified. (Note 1))

| Parameter                | Symbol          | Conditions                                            | MIN | TYP | MAX | UNIT |
|--------------------------|-----------------|-------------------------------------------------------|-----|-----|-----|------|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = 25 °C                                | 7.7 | 8.0 | 8.3 | V    |
| Line Regulation          | ΔV <sub>O</sub> | V <sub>I</sub> = 10.5V to 25V T <sub>J</sub> = 25 °C  |     | 6   | 160 | mV   |
|                          |                 | V <sub>I</sub> = 11V to 17V T <sub>J</sub> = 25 °C    |     | 2   | 80  |      |
| Load Regulation          | ΔV <sub>O</sub> | I <sub>O</sub> = 5mA to 1.5A, 25 °C                   |     | 12  | 160 | mV   |
|                          |                 | I <sub>O</sub> = 250mA to 750mA, 25 °C                |     | 4   | 80  |      |
| Ripple Rejection         | RR              | V <sub>I</sub> = 11.5V to 21.5V, f=120Hz              | 55  | 72  |     | dB   |
| Output Noise Voltage     | V <sub>N</sub>  | F= 10Hz to 100Hz T <sub>J</sub> = 25 °C               |     | 52  |     | μV   |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = 25 °C                                |     | 2.0 |     | V    |
| Quiescent Current        |                 | T <sub>J</sub> = 25 °C                                |     | 4.3 | 8   | mA   |
| Quiescent Current Change | ΔI <sub>Q</sub> | V <sub>I</sub> = 10.5V to 25V, T <sub>J</sub> = 25 °C |     |     | 1   | mA   |
|                          |                 | I <sub>O</sub> = 5mA to 1A, T <sub>J</sub> = 25 °C    |     |     | 0.5 |      |

**Electrical Characteristics (LM7809)**(V<sub>I</sub>=16V, I<sub>O</sub>=500mA, 0°C ≤ T<sub>J</sub> ≤ 125 °C, unless otherwise specified. (Note 1))

| Parameter                | Symbol          | Conditions                                            | MIN | TYP | MAX  | UNIT |
|--------------------------|-----------------|-------------------------------------------------------|-----|-----|------|------|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = 25 °C                                | 8.6 | 9.0 | 9.40 | V    |
| Line Regulation          | ΔV <sub>O</sub> | V <sub>I</sub> = 11.5V to 27V T <sub>J</sub> = 25 °C  |     | 7   | 180  | mV   |
|                          |                 | V <sub>I</sub> = 13V to 19V T <sub>J</sub> = 25 °C    |     | 2   | 90   |      |
| Load Regulation          | ΔV <sub>O</sub> | I <sub>O</sub> = 5mA to 1.5A, 25 °C                   |     | 12  | 180  | mV   |
|                          |                 | I <sub>O</sub> = 250mA to 750mA, 25 °C                |     | 4   | 90   |      |
| Ripple Rejection         | RR              | V <sub>I</sub> = 12V to 19V, f=120Hz                  | 55  | 70  |      | dB   |
| Output Noise Voltage     | V <sub>N</sub>  | F= 10Hz to 100Hz T <sub>J</sub> = 25 °C               |     | 60  |      | μV   |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = 25 °C                                |     | 2.0 |      | V    |
| Quiescent Current        |                 | T <sub>J</sub> = 25 °C                                |     | 4.3 | 8    | mA   |
| Quiescent Current Change | ΔI <sub>Q</sub> | V <sub>I</sub> = 11.5V to 27V, T <sub>J</sub> = 25 °C |     |     | 1.0  | mA   |
|                          |                 | I <sub>O</sub> = 5mA to 1A, T <sub>J</sub> = 25 °C    |     |     | 0.5  |      |

**Electrical Characteristics (LM7810)**(V<sub>I</sub>=17V, I<sub>O</sub>=500mA, 0°C ≤ T<sub>J</sub> ≤ 125 °C, , unless otherwise specified. (Note 1)

| Parameter                | Symbol          | Conditions                                            | MIN | TYP | MAX  | UNIT |
|--------------------------|-----------------|-------------------------------------------------------|-----|-----|------|------|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = 25 °C                                | 9.6 | 10  | 10.4 | V    |
| Line Regulation          | ΔV <sub>O</sub> | V <sub>I</sub> = 12.5V to 28V T <sub>J</sub> = 25 °C  |     | 7   | 200  | mV   |
|                          |                 | V <sub>I</sub> = 14V to 20V T <sub>J</sub> = 25 °C    |     | 2   | 100  |      |
| Load Regulation          | ΔV <sub>O</sub> | I <sub>O</sub> = 5mA to 1.5A, 25 °C                   |     | 12  | 200  | mV   |
|                          |                 | I <sub>O</sub> = 250mA to 750mA, 25 °C                |     | 4   | 100  |      |
| Ripple Rejection         | RR              | V <sub>I</sub> = 13V to 23V, f=120Hz                  | 55  | 71  |      | dB   |
| Output Noise Voltage     | V <sub>N</sub>  | F= 10Hz to 100Hz T <sub>J</sub> = 25 °C               |     | 70  |      | μV   |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = 25 °C                                |     | 2.0 |      | V    |
| Quiescent Current        |                 | T <sub>J</sub> = 25 °C                                |     | 4.3 | 8    | mA   |
| Quiescent Current Change | ΔI <sub>Q</sub> | V <sub>I</sub> = 12.5V to 28V, T <sub>J</sub> = 25 °C |     |     | 1.0  | mA   |
|                          |                 | I <sub>O</sub> = 5mA to 1A, T <sub>J</sub> = 25 °C    |     |     | 0.5  |      |

**Electrical Characteristics (LM7812)**(V<sub>I</sub>=19V, I<sub>O</sub>=500mA, 0°C ≤ T<sub>J</sub> ≤ 125 °C, unless otherwise specified. (Note 1)

| Parameter                | Symbol          | Conditions                                            | MIN   | TYP | MAX  | UNIT |
|--------------------------|-----------------|-------------------------------------------------------|-------|-----|------|------|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = 25 °C                                | 11.50 | 12  | 12.5 | V    |
| Line Regulation          | ΔV <sub>O</sub> | V <sub>I</sub> = 14.5V to 30V T <sub>J</sub> = 25 °C  |       | 10  | 240  | mV   |
|                          |                 | V <sub>I</sub> = 16V to 22V T <sub>J</sub> = 25 °C    |       | 3.0 | 120  |      |
| Load Regulation          | ΔV <sub>O</sub> | I <sub>O</sub> = 5mA to 1.5A, 25 °C                   |       | 12  | 240  | mV   |
|                          |                 | I <sub>O</sub> = 250mA to 750mA, 25 °C                |       | 4   | 120  |      |
| Ripple Rejection         | RR              | V <sub>I</sub> = 15V to 25V, f=120Hz                  | 55    | 71  |      | dB   |
| Output Noise Voltage     | V <sub>N</sub>  | F= 10Hz to 100Hz T <sub>J</sub> = 25 °C               |       | 75  |      | μV   |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = 25 °C                                |       | 2.0 |      | V    |
| Quiescent Current        |                 | T <sub>J</sub> = 25 °C                                |       | 4.3 | 8.0  | mA   |
| Quiescent Current Change | ΔI <sub>Q</sub> | V <sub>I</sub> = 14.5V to 30V, T <sub>J</sub> = 25 °C |       |     | 1.0  | mA   |
|                          |                 | I <sub>O</sub> = 5mA to 1A, T <sub>J</sub> = 25 °C    |       |     | 0.5  |      |

**Electrical Characteristics (LM7815)**(V<sub>I</sub>=23V, I<sub>O</sub>=500mA, 0°C ≤ T<sub>J</sub> ≤ 125 °C, unless otherwise specified. (Note 1)

| Parameter                | Symbol          | Conditions                                            | MIN   | TYP | MAX   | UNIT |
|--------------------------|-----------------|-------------------------------------------------------|-------|-----|-------|------|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = 25 °C                                | 14.40 | 15  | 15.60 | V    |
| Line Regulation          | ΔV <sub>O</sub> | V <sub>I</sub> = 17.5V to 30V T <sub>J</sub> = 25 °C  |       | 12  | 300   | mV   |
|                          |                 | V <sub>I</sub> = 20V to 26V T <sub>J</sub> = 25 °C    |       | 3   | 150   |      |
| Load Regulation          | ΔV <sub>O</sub> | I <sub>O</sub> = 5mA to 1.5A, 25 °C                   |       | 12  | 300   | mV   |
|                          |                 | I <sub>O</sub> = 250mA to 750mA, 25 °C                |       | 4   | 150   |      |
| Ripple Rejection         | RR              | V <sub>I</sub> = 18.5V to 28.5V, f=120Hz              | 54    | 70  |       | dB   |
| Output Noise Voltage     | V <sub>N</sub>  | F= 10Hz to 100Hz T <sub>J</sub> = 25 °C               |       | 90  |       | μV   |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = 25 °C                                |       | 2.0 |       | V    |
| Quiescent Current        |                 | T <sub>J</sub> = 25 °C                                |       | 4.3 | 8.0   | mA   |
| Quiescent Current Change | ΔI <sub>Q</sub> | V <sub>I</sub> = 17.5V to 30V, T <sub>J</sub> = 25 °C |       |     | 1.0   | mA   |
|                          |                 | I <sub>O</sub> = 5mA to 1A, T <sub>J</sub> = 25 °C    |       |     | 0.5   |      |

**Electrical Characteristics (LM7818)**(V<sub>I</sub>=27V, I<sub>O</sub>=500mA, 0°C ≤ T<sub>J</sub> ≤ 125 °C, unless otherwise specified. (Note 1)

| Parameter                | Symbol          | Conditions                                          | MIN   | TYP | MAX  | UNIT |
|--------------------------|-----------------|-----------------------------------------------------|-------|-----|------|------|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = 25 °C                              | 17.30 | 18  | 18.7 | V    |
| Line Regulation          | ΔV <sub>O</sub> | V <sub>I</sub> = 21V to 33V T <sub>J</sub> = 25 °C  |       | 15  | 360  | mV   |
|                          |                 | V <sub>I</sub> = 24V to 33V T <sub>J</sub> = 25 °C  |       | 5   | 180  |      |
| Load Regulation          | ΔV <sub>O</sub> | I <sub>O</sub> = 5mA to 1.5A, 25 °C                 |       | 12  | 360  | mV   |
|                          |                 | I <sub>O</sub> = 250mA to 750mA, 25 °C              |       | 4   | 180  |      |
| Ripple Rejection         | RR              | V <sub>I</sub> = 22V to 32V, f=120Hz                | 53    | 69  |      | dB   |
| Output Noise Voltage     | V <sub>N</sub>  | F= 10Hz to 100Hz T <sub>J</sub> = 25 °C             |       | 110 |      | μV   |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = 25 °C                              |       | 2.0 |      | V    |
| Quiescent Current        |                 | T <sub>J</sub> = 25 °C                              |       | 4.5 | 8.0  | mA   |
| Quiescent Current Change | ΔI <sub>Q</sub> | V <sub>I</sub> = 21V to 33V, T <sub>J</sub> = 25 °C |       |     | 1.0  | mA   |
|                          |                 | I <sub>O</sub> = 5mA to 1A, T <sub>J</sub> = 25 °C  |       |     | 0.5  |      |

**Electrical Characteristics (LM7824)**(V<sub>I</sub>=33V, I<sub>O</sub>=500mA, 0°C ≤ T<sub>J</sub> ≤ 125 °C, unless otherwise specified. (Note 1)

| Parameter                | Symbol          | Conditions                                           | MIN | TYP | MAX | UNIT |
|--------------------------|-----------------|------------------------------------------------------|-----|-----|-----|------|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = 25 °C                               | 23  | 24  | 25  | V    |
| Line Regulation          | ΔV <sub>O</sub> | V <sub>I</sub> = 27V to 38V T <sub>J</sub> = 25 °C   |     | 18  | 480 | mV   |
|                          |                 | V <sub>I</sub> = 30V to 36V T <sub>J</sub> = 25 °C   |     | 6   | 240 |      |
| Load Regulation          | ΔV <sub>O</sub> | I <sub>O</sub> = 5mA to 1.5A, 25 °C                  |     | 12  | 480 | mV   |
|                          |                 | I <sub>O</sub> = 250mA to 750mA, 25 °C               |     | 4   | 240 |      |
| Ripple Rejection         | RR              | V <sub>I</sub> = 28V to 38V, f=120Hz                 | 50  | 66  |     | dB   |
| Output Noise Voltage     | V <sub>N</sub>  | F= 10Hz to 100Hz T <sub>J</sub> = 25 °C              |     | 170 |     | μV   |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = 25 °C                               |     | 2.0 |     | V    |
| Quiescent Current        |                 | T <sub>J</sub> = 25 °C                               |     | 4.6 | 8.0 | mA   |
| Quiescent Current Change | ΔI <sub>Q</sub> | V <sub>I</sub> = 27V to 38V, T <sub>J</sub> = 25 °C  |     |     | 1.0 | mA   |
|                          |                 | I <sub>O</sub> = 5mA to 1.0A, T <sub>J</sub> = 25 °C |     |     | 0.5 |      |

**Advance Information-** These data sheets contain descriptions of products that are in development. The specifications are based on the engineering calculations, computer simulations and/ or initial prototype evaluation.

**Preliminary Information-** These data sheets contain minimum and maximum specifications that are based on the initial device characterizations. These limits are subject to change upon the completion of the full characterization over the specified temperature and supply voltage ranges.

The application circuit examples are only to explain the representative applications of the devices and are not intended to guarantee any circuit design or permit any industrial property right to other rights to execute. Bay Linear takes no responsibility for any problems related to any industrial property right resulting from the use of the contents shown in the data book. Typical parameters can and do vary in different applications. Customer's technical experts must validate all operating parameters including "Typical" for each customer application.

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