

# AN78M00/AN78M00F Series

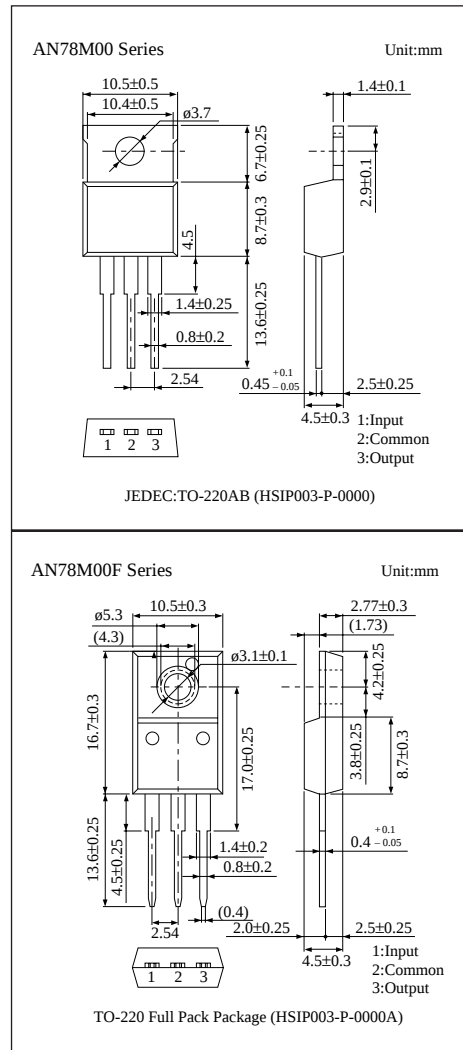
### 3-pin Positive Output Voltage Regulators (500mA Type)

## ■ Overview

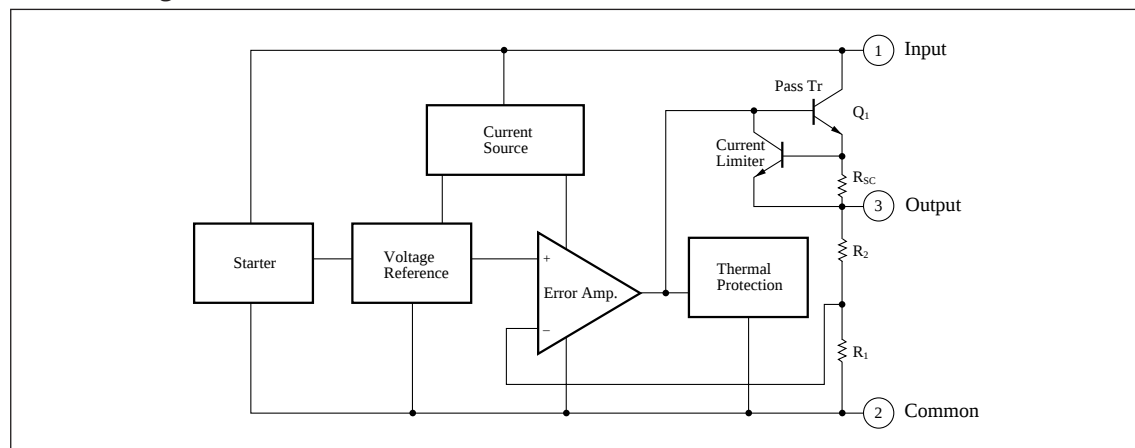
The AN78M00 and the AN78M00F series are 3-pin fixed positive output voltage regulators. Stabilized fixed output voltage is obtained from unstable DC input voltage without using any external components. 11 types of fixed output voltage are available; 5V, 6V, 7V, 8V, 9V, 10V, 12V, 15V, 18V, 20V and 24V. They can be used widely in power circuits with current capacitance up to 500mA.

## ■ Features

- No external components
- Output voltage: 5V, 6V, 7V, 8V, 9V, 10V, 12V, 15V, 18V, 20V, 24V
- Short-circuit current limiting built-in
- Thermal overload protection built-in
- Output transistor safe area compensation



### ■ Block Diagram



■ Absolute Maximum Ratings (Ta=25°C)

| Parameter                     |                | Symbol           | Rating               | Unit |
|-------------------------------|----------------|------------------|----------------------|------|
| Input voltage                 |                | V <sub>I</sub>   | 35 * <sup>1</sup>    | V    |
|                               |                |                  | 40 * <sup>2</sup>    | V    |
| Power dissipation             | AN7800 Series  | P <sub>D</sub>   | 15 * <sup>3</sup>    | W    |
|                               | AN7800F Series |                  | 10.25 * <sup>3</sup> |      |
| Operating ambient temperature |                | T <sub>opr</sub> | −20 to +80           | °C   |
| Storage temperature           |                | T <sub>stg</sub> | −55 to +150          | °C   |

\*<sup>1</sup> AN78M05/F, AN78M06/F, AN78M07/F, AN78M08/F, AN78M09/F, AN78M10/F, AN78M12/F, AN78M15/F, AN78M18/F

\*<sup>2</sup> AN78M20/F, AN78M24/F

\*<sup>3</sup> Follow the derating curve. When T<sub>j</sub> exceeds 150°C, the internal circuit cuts off the output.

■ Electrical Characteristics (Ta=25°C)

• AN78M05/78M05F (5V Type)

| Parameter                               | Symbol                  | Condition                                                                                       | min  | typ   | max  | Unit  |
|-----------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------|------|-------|------|-------|
| Output voltage                          | V <sub>O</sub>          | T <sub>j</sub> =25°C                                                                            | 4.8  | 5     | 5.2  | V     |
| Output voltage tolerance                | V <sub>O</sub>          | V <sub>I</sub> =7.5 to 20V, I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C, P <sub>D</sub> ≤* | 4.75 | —     | 5.25 | V     |
| Line regulation                         | REG <sub>IN</sub>       | V <sub>I</sub> =7.5 to 25V, T <sub>j</sub> =25°C                                                | —    | 3     | 100  | mV    |
|                                         |                         | V <sub>I</sub> =8 to 25V, T <sub>j</sub> =25°C                                                  | —    | 1     | 50   | mV    |
| Load regulation                         | REG <sub>L</sub>        | I <sub>O</sub> =5 to 500mA, T <sub>j</sub> =25°C                                                | —    | 20    | 100  | mV    |
|                                         |                         | I <sub>O</sub> =5 to 200mA, T <sub>j</sub> =25°C                                                | —    | 10    | 50   | mV    |
| Bias current                            | I <sub>bias</sub>       | T <sub>j</sub> =25°C                                                                            | —    | 4     | 6    | mA    |
| Input bias current fluctuation          | ΔI <sub>bias (IN)</sub> | V <sub>I</sub> =8 to 25V, T <sub>j</sub> =25°C                                                  | —    | —     | 0.8  | mA    |
| Load bias current fluctuation           | ΔI <sub>bias (L)</sub>  | I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C                                                | —    | —     | 0.5  | mA    |
| Output noise voltage                    | V <sub>no</sub>         | f=10Hz to 100kHz                                                                                | —    | 40    | —    | μV    |
| Ripple rejection ratio                  | RR                      | V <sub>I</sub> =8 to 18V, I <sub>O</sub> =100mA, f=120Hz                                        | 62   | —     | —    | dB    |
| Minimum input/output voltage difference | V <sub>DIF (min.)</sub> | I <sub>O</sub> =500mA, T <sub>j</sub> =25°C                                                     | —    | 2     | —    | V     |
| Output short circuit current            | I <sub>O (Short)</sub>  | V <sub>I</sub> =35V, T <sub>j</sub> =25°C                                                       | —    | 300   | —    | mA    |
| Peak output current                     | I <sub>O (Peak)</sub>   | T <sub>j</sub> =25°C                                                                            | —    | 700   | —    | mA    |
| Output voltage temperature coefficient  | ΔV <sub>O</sub> /Ta     | I <sub>O</sub> =5mA, T <sub>j</sub> =0 to 125°C                                                 | —    | − 0.5 | —    | mV/°C |

Note 1) The specified condition T<sub>j</sub>=25°C means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified, V<sub>I</sub>=10V, I<sub>O</sub>=350mA, C<sub>I</sub>=0.33μF and C<sub>O</sub>=0.1μF.

\* AN78M00 Series:15W, AN78M00F Series:10.25W

■ Electrical Characteristics (Ta=25°C)

• AN78M06/78M06F (6V Type)

| Parameter                               | Symbol                  | Condition                                                                                       | min  | typ   | max  | Unit  |
|-----------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------|------|-------|------|-------|
| Output voltage                          | V <sub>O</sub>          | T <sub>j</sub> =25°C                                                                            | 5.75 | 6     | 6.25 | V     |
| Output voltage tolerance                | V <sub>O</sub>          | V <sub>I</sub> =8.5 to 21V, I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C, P <sub>D</sub> ≤* | 5.7  | —     | 6.3  | V     |
| Line regulation                         | REG <sub>IN</sub>       | V <sub>I</sub> =8.5 to 25V, T <sub>j</sub> =25°C                                                | —    | 5     | 100  | mV    |
|                                         |                         | V <sub>I</sub> =9 to 25V, T <sub>j</sub> =25°C                                                  | —    | 1.5   | 50   | mV    |
| Load regulation                         | REG <sub>L</sub>        | I <sub>O</sub> =5 to 500mA, T <sub>j</sub> =25°C                                                | —    | 20    | 120  | mV    |
|                                         |                         | I <sub>O</sub> =5 to 200mA, T <sub>j</sub> =25°C                                                | —    | 10    | 60   | mV    |
| Bias current                            | I <sub>bias</sub>       | T <sub>j</sub> =25°C                                                                            | —    | 4     | 6    | mA    |
| Input bias current fluctuation          | ΔI <sub>bias</sub> (IN) | V <sub>I</sub> =9 to 25V, T <sub>j</sub> =25°C                                                  | —    | —     | 0.8  | mA    |
| Load bias current fluctuation           | ΔI <sub>bias</sub> (L)  | I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C                                                | —    | —     | 0.5  | mA    |
| Output noise voltage                    | V <sub>no</sub>         | f=10Hz to 100kHz                                                                                | —    | 45    | —    | μV    |
| Ripple rejection ratio                  | RR                      | V <sub>I</sub> =9 to 19V, I <sub>O</sub> =100mA, f=120Hz                                        | 59   | —     | —    | dB    |
| Minimum input/output voltage difference | V <sub>DIF</sub> (min.) | I <sub>O</sub> =500mA, T <sub>j</sub> =25°C                                                     | —    | 2     | —    | V     |
| Output short circuit current            | I <sub>O</sub> (Short)  | V <sub>I</sub> =35V, T <sub>j</sub> =25°C                                                       | —    | 300   | —    | mA    |
| Peak output current                     | I <sub>O</sub> (Peak)   | T <sub>j</sub> =25°C                                                                            | —    | 700   | —    | mA    |
| Output voltage temperature coefficient  | ΔV <sub>O</sub> /Ta     | I <sub>O</sub> =5mA, T <sub>j</sub> =0 to 125°C                                                 | —    | − 0.5 | —    | mV/°C |

Note 1) The specified condition T<sub>j</sub>=25°C means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified, V<sub>I</sub>=11V, I<sub>O</sub>=350mA, C<sub>I</sub>=0.33μF and C<sub>O</sub>=0.1μF.

\* AN78M00 Series:15W, AN78M00F Series:10.25W

• AN78M07/78M07F (7V Type)

| Parameter                               | Symbol                  | Condition                                                                                       | min  | typ   | max  | Unit  |
|-----------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------|------|-------|------|-------|
| Output voltage                          | V <sub>O</sub>          | T <sub>j</sub> =25°C                                                                            | 6.7  | 7     | 7.3  | V     |
| Output voltage tolerance                | V <sub>O</sub>          | V <sub>I</sub> =9.5 to 22V, I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C, P <sub>D</sub> ≤* | 6.65 | —     | 7.35 | V     |
| Line regulation                         | REG <sub>IN</sub>       | V <sub>I</sub> =9.5 to 25V, T <sub>j</sub> =25°C                                                | —    | 6     | 100  | mV    |
|                                         |                         | V <sub>I</sub> =10 to 25V, T <sub>j</sub> =25°C                                                 | —    | 2     | 50   | mV    |
| Load regulation                         | REG <sub>L</sub>        | I <sub>O</sub> =5 to 500mA, T <sub>j</sub> =25°C                                                | —    | 20    | 140  | mV    |
|                                         |                         | I <sub>O</sub> =5 to 200mA, T <sub>j</sub> =25°C                                                | —    | 10    | 70   | mV    |
| Bias current                            | I <sub>bias</sub>       | T <sub>j</sub> =25°C                                                                            | —    | 4     | 6    | mA    |
| Input bias current fluctuation          | ΔI <sub>bias</sub> (IN) | V <sub>I</sub> =10 to 25V, T <sub>j</sub> =25°C                                                 | —    | —     | 0.8  | mA    |
| Load bias current fluctuation           | ΔI <sub>bias</sub> (L)  | I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C                                                | —    | —     | 0.5  | mA    |
| Output noise voltage                    | V <sub>no</sub>         | f=10Hz to 100kHz                                                                                | —    | 48    | —    | μV    |
| Ripple rejection ratio                  | RR                      | V <sub>I</sub> =10 to 20V, I <sub>O</sub> =100mA, f=120Hz                                       | 57   | —     | —    | dB    |
| Minimum input/output voltage difference | V <sub>DIF</sub> (min.) | I <sub>O</sub> =500mA, T <sub>j</sub> =25°C                                                     | —    | 2     | —    | V     |
| Output short circuit current            | I <sub>O</sub> (Short)  | V <sub>I</sub> =35V, T <sub>j</sub> =25°C                                                       | —    | 300   | —    | mA    |
| Peak output current                     | I <sub>O</sub> (Peak)   | T <sub>j</sub> =25°C                                                                            | —    | 700   | —    | mA    |
| Output voltage temperature coefficient  | ΔV <sub>O</sub> /Ta     | I <sub>O</sub> =5mA, T <sub>j</sub> =0 to 125°C                                                 | —    | − 0.5 | —    | mV/°C |

Note 1) The specified condition T<sub>j</sub>=25°C means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified, V<sub>I</sub>=12V, I<sub>O</sub>=350mA, C<sub>I</sub>=0.33μF and C<sub>O</sub>=0.1μF.

\* AN78M00 Series:15W, AN78M00F Series:10.25W

■ Electrical Characteristics (Ta=25°C)

• AN78M08/78M08F (8V Type)

| Parameter                               | Symbol                  | Condition                                                                                        | min | typ  | max | Unit  |
|-----------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------|-----|------|-----|-------|
| Output voltage                          | V <sub>O</sub>          | T <sub>j</sub> =25°C                                                                             | 7.7 | 8    | 8.3 | V     |
| Output voltage tolerance                | V <sub>O</sub>          | V <sub>I</sub> =10.5 to 23V, I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C, P <sub>D</sub> ≤* | 7.6 | —    | 8.4 | V     |
| Line regulation                         | REG <sub>IN</sub>       | V <sub>I</sub> =10.5 to 25V, T <sub>j</sub> =25°C                                                | —   | 6    | 100 | mV    |
|                                         |                         | V <sub>I</sub> =11 to 25V, T <sub>j</sub> =25°C                                                  | —   | 2    | 50  | mV    |
| Load regulation                         | REG <sub>L</sub>        | I <sub>O</sub> =5 to 500mA, T <sub>j</sub> =25°C                                                 | —   | 25   | 160 | mV    |
|                                         |                         | I <sub>O</sub> =5 to 200mA, T <sub>j</sub> =25°C                                                 | —   | 10   | 80  | mV    |
| Bias current                            | I <sub>bias</sub>       | T <sub>j</sub> =25°C                                                                             | —   | 4.1  | 6   | mA    |
| Input bias current fluctuation          | ΔI <sub>bias</sub> (IN) | V <sub>I</sub> =10.5 to 25V, T <sub>j</sub> =25°C                                                | —   | —    | 0.8 | mA    |
| Load bias current fluctuation           | ΔI <sub>bias</sub> (L)  | I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C                                                 | —   | —    | 0.5 | mA    |
| Output noise voltage                    | V <sub>no</sub>         | f=10Hz to 100kHz                                                                                 | —   | 52   | —   | μV    |
| Ripple rejection ratio                  | RR                      | V <sub>I</sub> =11.5 to 21.5V, I <sub>O</sub> =100mA, f=120Hz                                    | 56  | —    | —   | dB    |
| Minimum input/output voltage difference | V <sub>DIF</sub> (min.) | I <sub>O</sub> =500mA, T <sub>j</sub> =25°C                                                      | —   | 2    | —   | V     |
| Output short circuit current            | I <sub>O</sub> (Short)  | V <sub>I</sub> =35V, T <sub>j</sub> =25°C                                                        | —   | 300  | —   | mA    |
| Peak output current                     | I <sub>O</sub> (Peak)   | T <sub>j</sub> =25°C                                                                             | —   | 700  | —   | mA    |
| Output voltage temperature coefficient  | ΔV <sub>O</sub> /Ta     | I <sub>O</sub> =5mA, T <sub>j</sub> =0 to 125°C                                                  | —   | −0.5 | —   | mV/°C |

Note 1) The specified condition T<sub>j</sub>=25°C means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified, V<sub>I</sub>=14V, I<sub>O</sub>=350mA, C<sub>I</sub>=0.33μF and C<sub>O</sub>=0.1μF.

\* AN78M00 Series:15W, AN78M00F Series:10.25W

• AN78M09/78M09F (9V Type)

| Parameter                               | Symbol                  | Condition                                                                                        | min  | typ  | max  | Unit  |
|-----------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------|------|------|------|-------|
| Output voltage                          | V <sub>O</sub>          | T <sub>j</sub> =25°C                                                                             | 8.65 | 9    | 9.35 | V     |
| Output voltage tolerance                | V <sub>O</sub>          | V <sub>I</sub> =11.5 to 24V, I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C, P <sub>D</sub> ≤* | 8.55 | —    | 9.45 | V     |
| Line regulation                         | REG <sub>IN</sub>       | V <sub>I</sub> =11.5 to 25V, T <sub>j</sub> =25°C                                                | —    | 7    | 100  | mV    |
|                                         |                         | V <sub>I</sub> =12 to 25V, T <sub>j</sub> =25°C                                                  | —    | 2    | 50   | mV    |
| Load regulation                         | REG <sub>L</sub>        | I <sub>O</sub> =5 to 500mA, T <sub>j</sub> =25°C                                                 | —    | 25   | 180  | mV    |
|                                         |                         | I <sub>O</sub> =5 to 200mA, T <sub>j</sub> =25°C                                                 | —    | 10   | 90   | mV    |
| Bias current                            | I <sub>bias</sub>       | T <sub>j</sub> =25°C                                                                             | —    | 4.1  | 6    | mA    |
| Input bias current fluctuation          | ΔI <sub>bias</sub> (IN) | V <sub>I</sub> =12 to 25V, T <sub>j</sub> =25°C                                                  | —    | —    | 0.8  | mA    |
| Load bias current fluctuation           | ΔI <sub>bias</sub> (L)  | I <sub>O</sub> =5 to 350mA, T <sub>j</sub> =25°C                                                 | —    | —    | 0.5  | mA    |
| Output noise voltage                    | V <sub>no</sub>         | f=10Hz to 100kHz                                                                                 | —    | 60   | —    | μV    |
| Ripple rejection ratio                  | RR                      | V <sub>I</sub> =12 to 22V, I <sub>O</sub> =100mA, f=120Hz                                        | 56   | —    | —    | dB    |
| Minimum input/output voltage difference | V <sub>DIF</sub> (min.) | I <sub>O</sub> =500mA, T <sub>j</sub> =25°C                                                      | —    | 2    | —    | V     |
| Output short circuit current            | I <sub>O</sub> (Short)  | V <sub>I</sub> =35V, T <sub>j</sub> =25°C                                                        | —    | 300  | —    | mA    |
| Peak output current                     | I <sub>O</sub> (Peak)   | T <sub>j</sub> =25°C                                                                             | —    | 700  | —    | mA    |
| Output voltage temperature coefficient  | ΔV <sub>O</sub> /Ta     | I <sub>O</sub> =5mA, T <sub>j</sub> =0 to 125°C                                                  | —    | −0.5 | —    | mV/°C |

Note 1) The specified condition T<sub>j</sub>=25°C means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified, V<sub>I</sub>=15V, I<sub>O</sub>=350mA, C<sub>I</sub>=0.33μF and C<sub>O</sub>=0.1μF.

\* AN78M00 Series:15W, AN78M00F Series:10.25W

■ Electrical Characteristics (Ta=25°C)

• AN78M10/78M10F (10V Type)

| Parameter                               | Symbol                        | Condition                                                                                      | min | typ  | max  | Unit                       |
|-----------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------|-----|------|------|----------------------------|
| Output voltage                          | $V_O$                         | $T_j=25^\circ\text{C}$                                                                         | 9.6 | 10   | 10.4 | V                          |
| Output voltage tolerance                | $V_O$                         | $V_I=12.5$ to $25\text{V}$ , $I_O=5$ to $350\text{mA}$ , $T_j=25^\circ\text{C}$ , $P_D \leq *$ | 9.5 | —    | 10.5 | V                          |
| Line regulation                         | $\text{REG}_{\text{IN}}$      | $V_I=12.5$ to $30\text{V}$ , $T_j=25^\circ\text{C}$                                            | —   | 7    | 100  | mV                         |
|                                         |                               | $V_I=13$ to $25\text{V}$ , $T_j=25^\circ\text{C}$                                              | —   | 2    | 50   | mV                         |
| Load regulation                         | $\text{REG}_L$                | $I_O=5$ to $500\text{mA}$ , $T_j=25^\circ\text{C}$                                             | —   | 25   | 200  | mV                         |
|                                         |                               | $I_O=5$ to $200\text{mA}$ , $T_j=25^\circ\text{C}$                                             | —   | 10   | 100  | mV                         |
| Bias current                            | $I_{\text{bias}}$             | $T_j=25^\circ\text{C}$                                                                         | —   | 4.1  | 6    | mA                         |
| Input bias current fluctuation          | $\Delta I_{\text{bias (IN)}}$ | $V_I=13$ to $25\text{V}$ , $T_j=25^\circ\text{C}$                                              | —   | —    | 0.8  | mA                         |
| Load bias current fluctuation           | $\Delta I_{\text{bias (L)}}$  | $I_O=5$ to $350\text{mA}$ , $T_j=25^\circ\text{C}$                                             | —   | —    | 0.5  | mA                         |
| Output noise voltage                    | $V_{\text{no}}$               | $f=10\text{Hz}$ to $100\text{kHz}$                                                             | —   | 65   | —    | $\mu\text{V}$              |
| Ripple rejection ratio                  | RR                            | $V_I=13$ to $23\text{V}$ , $I_O=100\text{mA}$ , $f=120\text{Hz}$                               | 56  | —    | —    | dB                         |
| Minimum input/output voltage difference | $V_{\text{DIF (min.)}}$       | $I_O=500\text{mA}$ , $T_j=25^\circ\text{C}$                                                    | —   | 2    | —    | V                          |
| Output short circuit current            | $I_{O (\text{Short})}$        | $V_I=35\text{V}$ , $T_j=25^\circ\text{C}$                                                      | —   | 300  | —    | mA                         |
| Peak output current                     | $I_{O (\text{Peak})}$         | $T_j=25^\circ\text{C}$                                                                         | —   | 700  | —    | mA                         |
| Output voltage temperature coefficient  | $\Delta V_O/T_a$              | $I_O=5\text{mA}$ , $T_j=0$ to $125^\circ\text{C}$                                              | —   | -0.5 | —    | $\text{mV}/^\circ\text{C}$ |

Note 1) The specified condition  $T_j=25^\circ\text{C}$  means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified,  $V_I=16\text{V}$ ,  $I_O=350\text{mA}$ ,  $C_I=0.33\mu\text{F}$  and  $C_O=0.1\mu\text{F}$ .

\* AN78M00 Series:15W, AN78M00F Series:10.25W

• AN78M12/78M12F (12V Type)

| Parameter                               | Symbol                        | Condition                                                                                      | min  | typ  | max  | Unit                       |
|-----------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------|------|------|------|----------------------------|
| Output voltage                          | $V_O$                         | $T_j=25^\circ\text{C}$                                                                         | 11.5 | 12   | 12.5 | V                          |
| Output voltage tolerance                | $V_O$                         | $V_I=14.5$ to $27\text{V}$ , $I_O=5$ to $350\text{mA}$ , $T_j=25^\circ\text{C}$ , $P_D \leq *$ | 11.4 | —    | 12.6 | V                          |
| Line regulation                         | $\text{REG}_{\text{IN}}$      | $V_I=14.5$ to $30\text{V}$ , $T_j=25^\circ\text{C}$                                            | —    | 8    | 100  | mV                         |
|                                         |                               | $V_I=16$ to $30\text{V}$ , $T_j=25^\circ\text{C}$                                              | —    | 2    | 50   | mV                         |
| Load regulation                         | $\text{REG}_L$                | $I_O=5$ to $500\text{mA}$ , $T_j=25^\circ\text{C}$                                             | —    | 25   | 240  | mV                         |
|                                         |                               | $I_O=5$ to $200\text{mA}$ , $T_j=25^\circ\text{C}$                                             | —    | 10   | 120  | mV                         |
| Bias current                            | $I_{\text{bias}}$             | $T_j=25^\circ\text{C}$                                                                         | —    | 4.3  | 6    | mA                         |
| Input bias current fluctuation          | $\Delta I_{\text{bias (IN)}}$ | $V_I=14.5$ to $30\text{V}$ , $T_j=25^\circ\text{C}$                                            | —    | —    | 0.8  | mA                         |
| Load bias current fluctuation           | $\Delta I_{\text{bias (L)}}$  | $I_O=5$ to $350\text{mA}$ , $T_j=25^\circ\text{C}$                                             | —    | —    | 0.5  | mA                         |
| Output noise voltage                    | $V_{\text{no}}$               | $f=10\text{Hz}$ to $100\text{kHz}$                                                             | —    | 75   | —    | $\mu\text{V}$              |
| Ripple rejection ratio                  | RR                            | $V_I=15$ to $25\text{V}$ , $I_O=100\text{mA}$ , $f=120\text{Hz}$                               | 55   | —    | —    | dB                         |
| Minimum input/output voltage difference | $V_{\text{DIF (min.)}}$       | $I_O=500\text{mA}$ , $T_j=25^\circ\text{C}$                                                    | —    | 2    | —    | V                          |
| Output short circuit current            | $I_{O (\text{Short})}$        | $V_I=35\text{V}$ , $T_j=25^\circ\text{C}$                                                      | —    | 300  | —    | mA                         |
| Peak output current                     | $I_{O (\text{Peak})}$         | $T_j=25^\circ\text{C}$                                                                         | —    | 700  | —    | mA                         |
| Output voltage temperature coefficient  | $\Delta V_O/T_a$              | $I_O=5\text{mA}$ , $T_j=0$ to $125^\circ\text{C}$                                              | —    | -0.8 | —    | $\text{mV}/^\circ\text{C}$ |

Note 1) The specified condition  $T_j=25^\circ\text{C}$  means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified,  $V_I=19\text{V}$ ,  $I_O=350\text{mA}$ ,  $C_I=0.33\mu\text{F}$  and  $C_O=0.1\mu\text{F}$ .

\* AN78M00 Series:15W, AN78M00F Series:10.25W

■ Electrical Characteristics (Ta=25°C)

• AN78M15/78M15F (15V Type)

| Parameter                               | Symbol                        | Condition                                                                                        | min   | typ | max   | Unit                         |
|-----------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------|-------|-----|-------|------------------------------|
| Output voltage                          | $V_O$                         | $T_J=25^{\circ}\text{C}$                                                                         | 14.4  | 15  | 15.6  | V                            |
| Output voltage tolerance                | $V_O$                         | $V_I=17.5$ to $30\text{V}$ , $I_O=5$ to $350\text{mA}$ , $T_J=25^{\circ}\text{C}$ , $P_D \leq *$ | 14.25 | —   | 15.75 | V                            |
| Line regulation                         | $\text{REG}_{\text{IN}}$      | $V_I=17.5$ to $30\text{V}$ , $T_J=25^{\circ}\text{C}$                                            | —     | 10  | 100   | mV                           |
|                                         |                               | $V_I=20$ to $30\text{V}$ , $T_J=25^{\circ}\text{C}$                                              | —     | 3   | 50    | mV                           |
| Load regulation                         | $\text{REG}_{\text{L}}$       | $I_O=5$ to $500\text{mA}$ , $T_J=25^{\circ}\text{C}$                                             | —     | 25  | 300   | mV                           |
|                                         |                               | $I_O=5$ to $200\text{mA}$ , $T_J=25^{\circ}\text{C}$                                             | —     | 10  | 150   | mV                           |
| Bias current                            | $I_{\text{bias}}$             | $T_J=25^{\circ}\text{C}$                                                                         | —     | 4.3 | 6     | mA                           |
| Input bias current fluctuation          | $\Delta I_{\text{bias (IN)}}$ | $V_I=17.5$ to $30\text{V}$ , $T_J=25^{\circ}\text{C}$                                            | —     | —   | 0.8   | mA                           |
| Load bias current fluctuation           | $\Delta I_{\text{bias (L)}}$  | $I_O=5$ to $350\text{mA}$ , $T_J=25^{\circ}\text{C}$                                             | —     | —   | 0.5   | mA                           |
| Output noise voltage                    | $V_{\text{no}}$               | $f=10\text{Hz}$ to $100\text{kHz}$                                                               | —     | 90  | —     | $\mu\text{V}$                |
| Ripple rejection ratio                  | RR                            | $V_I=18.5$ to $28.5\text{V}$ , $I_O=100\text{mA}$ , $f=120\text{Hz}$                             | 54    | —   | —     | dB                           |
| Minimum input/output voltage difference | $V_{\text{DIF (min.)}}$       | $I_O=500\text{mA}$ , $T_J=25^{\circ}\text{C}$                                                    | —     | 2   | —     | V                            |
| Output short circuit current            | $I_{\text{O (Short)}}$        | $V_I=35\text{V}$ , $T_J=25^{\circ}\text{C}$                                                      | —     | 300 | —     | mA                           |
| Peak output current                     | $I_{\text{O (Peak)}}$         | $T_J=25^{\circ}\text{C}$                                                                         | —     | 700 | —     | mA                           |
| Output voltage temperature coefficient  | $\Delta V_O/T_a$              | $I_O=5\text{mA}$ , $T_J=0$ to $125^{\circ}\text{C}$                                              | —     | -1  | —     | $\text{mV}/^{\circ}\text{C}$ |

Note 1) The specified condition  $T_J=25^{\circ}\text{C}$  means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified,  $V_I=23\text{V}$ ,  $I_O=350\text{mA}$ ,  $C_I=0.33\mu\text{F}$  and  $C_O=0.1\mu\text{F}$ .

\* AN78M00 Series:15W, AN78M00F Series:10.25W

• AN78M18/78M18F (18V Type)

| Parameter                               | Symbol                        | Condition                                                                                      | min  | typ  | max  | Unit                         |
|-----------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------|------|------|------|------------------------------|
| Output voltage                          | $V_O$                         | $T_J=25^{\circ}\text{C}$                                                                       | 17.3 | 18   | 18.7 | V                            |
| Output voltage tolerance                | $V_O$                         | $V_I=21$ to $33\text{V}$ , $I_O=5$ to $350\text{mA}$ , $T_J=25^{\circ}\text{C}$ , $P_D \leq *$ | 17.1 | —    | 18.9 | V                            |
| Line regulation                         | $\text{REG}_{\text{IN}}$      | $V_I=21$ to $33\text{V}$ , $T_J=25^{\circ}\text{C}$                                            | —    | 10   | 100  | mV                           |
|                                         |                               | $V_I=22$ to $33\text{V}$ , $T_J=25^{\circ}\text{C}$                                            | —    | 5    | 50   | mV                           |
| Load regulation                         | $\text{REG}_{\text{L}}$       | $I_O=5$ to $500\text{mA}$ , $T_J=25^{\circ}\text{C}$                                           | —    | 30   | 360  | mV                           |
|                                         |                               | $I_O=5$ to $200\text{mA}$ , $T_J=25^{\circ}\text{C}$                                           | —    | 10   | 180  | mV                           |
| Bias current                            | $I_{\text{bias}}$             | $T_J=25^{\circ}\text{C}$                                                                       | —    | 4.4  | 6    | mA                           |
| Input bias current fluctuation          | $\Delta I_{\text{bias (IN)}}$ | $V_I=21$ to $33\text{V}$ , $T_J=25^{\circ}\text{C}$                                            | —    | —    | 0.8  | mA                           |
| Load bias current fluctuation           | $\Delta I_{\text{bias (L)}}$  | $I_O=5$ to $350\text{mA}$ , $T_J=25^{\circ}\text{C}$                                           | —    | —    | 0.5  | mA                           |
| Output noise voltage                    | $V_{\text{no}}$               | $f=10\text{Hz}$ to $100\text{kHz}$                                                             | —    | 100  | —    | $\mu\text{V}$                |
| Ripple rejection ratio                  | RR                            | $V_I=22$ to $32\text{V}$ , $I_O=100\text{mA}$ , $f=120\text{Hz}$                               | 53   | —    | —    | dB                           |
| Minimum input/output voltage difference | $V_{\text{DIF (min.)}}$       | $I_O=500\text{mA}$ , $T_J=25^{\circ}\text{C}$                                                  | —    | 2    | —    | V                            |
| Output short circuit current            | $I_{\text{O (Short)}}$        | $V_I=35\text{V}$ , $T_J=25^{\circ}\text{C}$                                                    | —    | 300  | —    | mA                           |
| Peak output current                     | $I_{\text{O (Peak)}}$         | $T_J=25^{\circ}\text{C}$                                                                       | —    | 700  | —    | mA                           |
| Output voltage temperature coefficient  | $\Delta V_O/T_a$              | $I_O=5\text{mA}$ , $T_J=0$ to $125^{\circ}\text{C}$                                            | —    | -1.0 | —    | $\text{mV}/^{\circ}\text{C}$ |

Note 1) The specified condition  $T_J=25^{\circ}\text{C}$  means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified,  $V_I=27\text{V}$ ,  $I_O=350\text{mA}$ ,  $C_I=0.33\mu\text{F}$  and  $C_O=0.1\mu\text{F}$ .

\* AN78M00 Series:15W, AN78M00F Series:10.25W

■ Electrical Characteristics (Ta=25°C)

• AN78M20/78M20F (20V Type)

| Parameter                               | Symbol                        | Condition                                                                                    | min  | typ  | max  | Unit                       |
|-----------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------|------|------|------|----------------------------|
| Output voltage                          | $V_O$                         | $T_j=25^\circ\text{C}$                                                                       | 19.2 | 20   | 20.8 | V                          |
| Output voltage tolerance                | $V_O$                         | $V_I=23$ to $35\text{V}$ , $I_O=5$ to $350\text{mA}$ , $T_j=25^\circ\text{C}$ , $P_D \leq *$ | 19   | —    | 21   | V                          |
| Line regulation                         | $\text{REG}_{\text{IN}}$      | $V_I=23$ to $35\text{V}$ , $T_j=25^\circ\text{C}$                                            | —    | 10   | 100  | mV                         |
|                                         |                               | $V_I=24$ to $35\text{V}$ , $T_j=25^\circ\text{C}$                                            | —    | 5    | 50   | mV                         |
| Load regulation                         | $\text{REG}_{\text{L}}$       | $I_O=5$ to $500\text{mA}$ , $T_j=25^\circ\text{C}$                                           | —    | 30   | 400  | mV                         |
|                                         |                               | $I_O=5$ to $200\text{mA}$ , $T_j=25^\circ\text{C}$                                           | —    | 10   | 200  | mV                         |
| Bias current                            | $I_{\text{bias}}$             | $T_j=25^\circ\text{C}$                                                                       | —    | 4.4  | 6    | mA                         |
| Input bias current fluctuation          | $\Delta I_{\text{bias (IN)}}$ | $V_I=23$ to $35\text{V}$ , $T_j=25^\circ\text{C}$                                            | —    | —    | 0.8  | mA                         |
| Load bias current fluctuation           | $\Delta I_{\text{bias (L)}}$  | $I_O=5$ to $350\text{mA}$ , $T_j=25^\circ\text{C}$                                           | —    | —    | 0.5  | mA                         |
| Output noise voltage                    | $V_{\text{no}}$               | $f=10\text{Hz}$ to $100\text{kHz}$                                                           | —    | 110  | —    | $\mu\text{V}$              |
| Ripple rejection ratio                  | RR                            | $V_I=24$ to $34\text{V}$ , $I_O=100\text{mA}$ , $f=120\text{Hz}$                             | 53   | —    | —    | dB                         |
| Minimum input/output voltage difference | $V_{\text{DIF (min.)}}$       | $I_O=500\text{mA}$ , $T_j=25^\circ\text{C}$                                                  | —    | 2    | —    | V                          |
| Output short circuit current            | $I_{\text{O (Short)}}$        | $V_I=35\text{V}$ , $T_j=25^\circ\text{C}$                                                    | —    | 300  | —    | mA                         |
| Peak output current                     | $I_{\text{O (Peak)}}$         | $T_j=25^\circ\text{C}$                                                                       | —    | 700  | —    | mA                         |
| Output voltage temperature coefficient  | $\Delta V_O/T_a$              | $I_O=5\text{mA}$ , $T_j=0$ to $125^\circ\text{C}$                                            | —    | -1.0 | —    | $\text{mV}/^\circ\text{C}$ |

Note 1) The specified condition  $T_j=25^\circ\text{C}$  means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

Note 2) When not specified,  $V_I=29\text{V}$ ,  $I_O=350\text{mA}$ ,  $C_I=0.33\mu\text{F}$  and  $C_O=0.1\mu\text{F}$ .

\* AN78M00 Series:15W, AN78M00F Series:10.25W

• AN78M24/78M24F (24V Type)

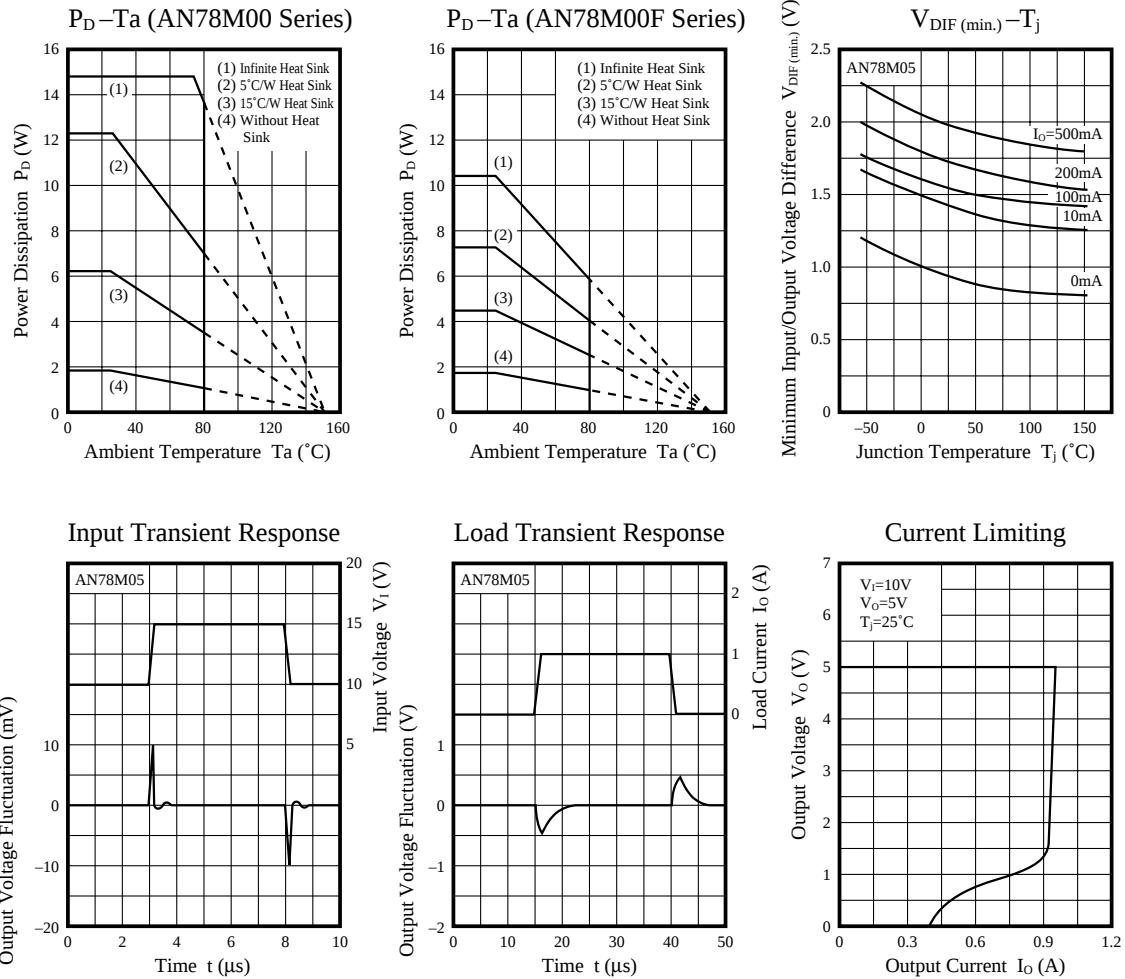
| Parameter                               | Symbol                        | Condition                                                                                    | min  | typ  | max  | Unit                       |
|-----------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------|------|------|------|----------------------------|
| Output voltage                          | $V_O$                         | $T_j=25^\circ\text{C}$                                                                       | 23   | 24   | 25   | V                          |
| Output voltage tolerance                | $V_O$                         | $V_I=27$ to $38\text{V}$ , $I_O=5$ to $350\text{mA}$ , $T_j=25^\circ\text{C}$ , $P_D \leq *$ | 22.8 | —    | 25.2 | V                          |
| Line regulation                         | $\text{REG}_{\text{IN}}$      | $V_I=27$ to $38\text{V}$ , $T_j=25^\circ\text{C}$                                            | —    | 10   | 100  | mV                         |
|                                         |                               | $V_I=28$ to $38\text{V}$ , $T_j=25^\circ\text{C}$                                            | —    | 5    | 50   | mV                         |
| Load regulation                         | $\text{REG}_{\text{L}}$       | $I_O=5$ to $500\text{mA}$ , $T_j=25^\circ\text{C}$                                           | —    | 30   | 480  | mV                         |
|                                         |                               | $I_O=5$ to $200\text{mA}$ , $T_j=25^\circ\text{C}$                                           | —    | 10   | 240  | mV                         |
| Bias current                            | $I_{\text{bias}}$             | $T_j=25^\circ\text{C}$                                                                       | —    | 4.5  | 6    | mA                         |
| Input bias current fluctuation          | $\Delta I_{\text{bias (IN)}}$ | $V_I=27$ to $38\text{V}$ , $T_j=25^\circ\text{C}$                                            | —    | —    | 0.8  | mA                         |
| Load bias current fluctuation           | $\Delta I_{\text{bias (L)}}$  | $I_O=5$ to $350\text{mA}$ , $T_j=25^\circ\text{C}$                                           | —    | —    | 0.5  | mA                         |
| Output noise voltage                    | $V_{\text{no}}$               | $f=10\text{Hz}$ to $100\text{kHz}$                                                           | —    | 170  | —    | $\mu\text{V}$              |
| Ripple rejection ratio                  | RR                            | $V_I=28$ to $38\text{V}$ , $I_O=100\text{mA}$ , $f=120\text{Hz}$                             | 50   | —    | —    | dB                         |
| Minimum input/output voltage difference | $V_{\text{DIF (min.)}}$       | $I_O=500\text{mA}$ , $T_j=25^\circ\text{C}$                                                  | —    | 2    | —    | V                          |
| Output short circuit current            | $I_{\text{O (Short)}}$        | $V_I=35\text{V}$ , $T_j=25^\circ\text{C}$                                                    | —    | 300  | —    | mA                         |
| Peak output current                     | $I_{\text{O (Peak)}}$         | $T_j=25^\circ\text{C}$                                                                       | —    | 700  | —    | mA                         |
| Output voltage temperature coefficient  | $\Delta V_O/T_a$              | $I_O=5\text{mA}$ , $T_j=0$ to $125^\circ\text{C}$                                            | —    | -1.2 | —    | $\text{mV}/^\circ\text{C}$ |

Note 1) The specified condition  $T_j=25^\circ\text{C}$  means that the test should be carried out with the test time so short (within 10ms) that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

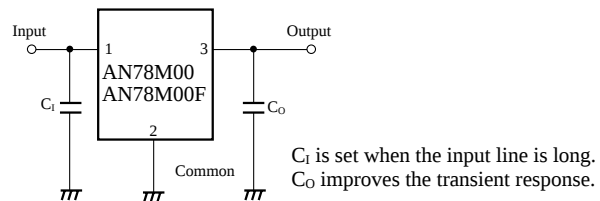
Note 2) When not specified,  $V_I=33\text{V}$ ,  $I_O=350\text{mA}$ ,  $C_I=0.33\mu\text{F}$  and  $C_O=0.1\mu\text{F}$ .

\* AN78M00 Series:15W, AN78M00F Series:10.25W

## ■ Characteristic Curve



## ■ Basic Regulator Circuit



■ Application Circuit

