



3 TERMINAL 1.0A POSITIVE VOLTAGE REGULATORS

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

| Characteristic | Symbol | Value | Unit |
|-----------------------------------|--------|----------|------|
| Input voltage | Vi | 35 | V |
| Thermal resistance junction-air | R(JA) | 65 | °C/W |
| Thermal resistance junction-cases | RθJC | 5 | °C/W |
| Operating Temperature | Topr | -20~+125 | °C |
| Storage Temperature | Tstg | -65~+150 | °C |

7805 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, 0<Tj<125°C, Io=500mA, Vi=10V, Ci=0.33μF, Co=0.1μF, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|--------------------------|--------|---------------------------------------|------|------|------|-------|
| Output voltage | Vo | Tj=25°C | 4.8 | 5.0 | 5.2 | V |
| | | 5.0mA<Io<1.0A, Po<15W Vi=8V to 20V | 4.75 | 5.00 | 5.25 | V |
| Line regulation | ΔVo | Tj=25°C, Vi=7.5V to 20V | | 4 | 100 | mV |
| | | Tj=25°C, Vi=8V to 12V | | 2 | 50 | mV |
| Load regulation | ΔVo | Tj=25°C, Io=5.0mA to 1.0A | | 9 | 100 | mV |
| | | Tj=25°C, Io=250mA to 750mA | | 4 | 50 | mV |
| Quiescent current | Iq | Tj=25°C | | 4.2 | 8 | mA |
| Quiescent current change | ΔIq | Io=5mA to 1.0A | | 0.03 | 0.5 | mA |
| | | Vi=8V to 25V, Io=500mA | | 0.3 | 0.8 | mA |
| Output voltage drift | ΔVo/ΔT | Io=5mA | | 0.8 | | mV/°C |
| Output noise voltage | VN | f=10Hz to 100kHz, Ta=25°C | | 42 | | μV/Vo |
| Ripple rejection | RR | f=120Hz, Vi=8V to 18V | 62 | 73 | | dB |
| Dropout voltage | Vo | Io=1.0A, Tj=25°C | | 2 | | V |
| Output resistance | Ro | f=1kHz | | 15 | | mΩ |
| Short circuit current | Isc | Vi=35V, Ta=25°C | | 200 | | mA |

7806 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, 0<Tj<125°C, Io=500mA, Vi=11V, Ci=0.33μF, Co=0.1μF, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|--------------------------|--------|---------------------------------------|------|-----|------|-------|
| Output voltage | Vo | Tj=25°C | 5.75 | 6 | 6.25 | V |
| | | 5.0mA<Io<1.0A, Po<15W Vi=9V to 21V | 5.65 | 6 | 6.25 | V |
| Line regulation | ΔVo | Tj=25°C, Vi=8.5V to 25V | | | 120 | mV |
| | | Tj=25°C, Vi=9V to 13V | | | 60 | mV |
| Load regulation | ΔVo | Tj=25°C, Io=5.0mA to 1.0A | | | 120 | mV |
| | | Tj=25°C, Io=250mA to 750mA | | | 60 | mV |
| Quiescent current | Iq | Tj=25°C | | 4.3 | 8 | mA |
| Quiescent current change | ΔIq | Io=5mA to 1.0A | | | 0.5 | mA |
| | | Vi=9V to 25V, Io=500mA | | | 0.8 | mA |
| Output voltage drift | ΔVo/ΔT | Io=5mA | | 0.8 | | mV/°C |
| Output noise voltage | VN | f=10Hz to 100kHz, Ta=25°C | | 42 | | μV/Vo |
| Ripple rejection | RR | f=120Hz, Vi=9V to 19V | | 68 | | dB |
| Dropout voltage | Vo | Io=1.0A, Tj=25°C | | 2 | | V |
| Output resistance | Ro | f=1kHz | | 17 | | mΩ |
| Short circuit current | Isc | Vi=35V, Ta=25°C | | 200 | | mA |





3 TERMINAL 1.0A POSITIVE VOLTAGE REGULATORS

7808 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 14\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|--------------------------|-------------------------|---|------|-----|------|----------------------|
| Output voltage | V_o | $T_j = 25^\circ\text{C}$ | 7.84 | 8 | 8.16 | V |
| | | $5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 11.5\text{V}$ to 23V | 7.7 | 8 | 8.3 | V |
| Line regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $V_i = 10.5\text{V}$ to 25V | | | 160 | mV |
| | | $T_j = 25^\circ\text{C}$, $V_i = 11\text{V}$ to 17V | | | 80 | mV |
| Load regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.0A | | | 160 | mV |
| | | $T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA | | | 80 | mV |
| Quiescent current | I_q | $T_j = 25^\circ\text{C}$ | | 4.3 | 8 | mA |
| Quiescent current change | ΔI_q | $I_o = 5\text{mA}$ to 1.0A | | | 0.5 | mA |
| | | $V_i = 11.5\text{V}$ to 25V , $I_o = 500\text{mA}$ | | | 0.8 | mA |
| Output voltage drift | $\Delta V_o / \Delta T$ | $I_o = 5\text{mA}$ | | 1.0 | | mV/ $^\circ\text{C}$ |
| Output noise voltage | V_N | $f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$ | | 42 | | $\mu\text{V}/V_o$ |
| Ripple rejection | RR | $f = 120\text{Hz}$, $V_i = 11.5\text{V}$ to 21.5V | | 62 | | dB |
| Dropout voltage | V_o | $I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$ | | 2 | | V |
| Output resistance | R_o | $f = 1\text{kHz}$ | | 18 | | $\text{m}\Omega$ |
| Short circuit current | Isc | $V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$ | | 200 | | mA |

7809 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 15\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|--------------------------|-------------------------|---|------|-----|------|----------------------|
| Output voltage | V_o | $T_j = 25^\circ\text{C}$ | 8.82 | 9 | 9.18 | V |
| | | $5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 12.5\text{V}$ to 24V | 8.65 | 9 | 9.35 | V |
| Line regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $V_i = 11.5\text{V}$ to 26V | | | 180 | mV |
| | | $T_j = 25^\circ\text{C}$, $V_i = 12\text{V}$ to 18V | | | 90 | mV |
| Load regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.0A | | | 180 | mV |
| | | $T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA | | | 90 | mV |
| Quiescent current | I_q | $T_j = 25^\circ\text{C}$ | | 4.3 | 8 | mA |
| Quiescent current change | ΔI_q | $I_o = 5\text{mA}$ to 1.0A | | | 0.5 | mA |
| | | $V_i = 12.5\text{V}$ to 25V , $I_o = 500\text{mA}$ | | | 0.8 | mA |
| Output voltage drift | $\Delta V_o / \Delta T$ | $I_o = 5\text{mA}$ | | 1.2 | | mV/ $^\circ\text{C}$ |
| Output noise voltage | V_N | $f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$ | | 42 | | $\mu\text{V}/V_o$ |
| Ripple rejection | RR | $f = 120\text{Hz}$, $V_i = 12.5\text{V}$ to 22.5V | | 61 | | dB |
| Dropout voltage | V_o | $I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$ | | 2 | | V |
| Output resistance | R_o | $f = 1\text{kHz}$ | | 18 | | $\text{m}\Omega$ |
| Short circuit current | Isc | $V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$ | | 200 | | mA |

7810 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 16\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|--------------------------|-------------------------|---|-----|-----|------|----------------------|
| Output voltage | V_o | $T_j = 25^\circ\text{C}$ | 9.7 | 10 | 10.3 | V |
| | | $5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 13.5\text{V}$ to 25V | 9.6 | 10 | 10.4 | V |
| Line regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $V_i = 12.5\text{V}$ to 28V | | 8 | 200 | mV |
| | | $T_j = 25^\circ\text{C}$, $V_i = 14\text{V}$ to 20V | | 4 | 100 | mV |
| Load regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA}$ to 1.0A | | 18 | 200 | mV |
| | | $T_j = 25^\circ\text{C}$, $I_o = 250\text{mA}$ to 750mA | | 8 | 100 | mV |
| Quiescent current | I_q | $T_j = 25^\circ\text{C}$ | | 4.3 | 8 | mA |
| Quiescent current change | ΔI_q | $I_o = 5\text{mA}$ to 1.0A | | | 0.5 | mA |
| | | $V_i = 13\text{V}$ to 28V , $I_o = 500\text{mA}$ | | | 0.8 | mA |
| Output voltage drift | $\Delta V_o / \Delta T$ | $I_o = 5\text{mA}$ | | 1.3 | | mV/ $^\circ\text{C}$ |
| Output noise voltage | V_N | $f = 10\text{Hz}$ to 100kHz , $T_a = 25^\circ\text{C}$ | | 42 | | $\mu\text{V}/V_o$ |
| Ripple rejection | RR | $f = 120\text{Hz}$, $V_i = 13\text{V}$ to 23V | | 61 | | dB |
| Dropout voltage | V_o | $I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$ | | 2 | | V |
| Output resistance | R_o | $f = 1\text{kHz}$ | | 18 | | $\text{m}\Omega$ |
| Short circuit current | Isc | $V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$ | | 200 | | mA |





3 TERMINAL 1.0A POSITIVE VOLTAGE REGULATORS

7812 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 19\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|--------------------------|-------------------------|--|------|-----|------|----------------------|
| Output voltage | V_o | $T_j = 25^\circ\text{C}$ | 11.5 | 12 | 12.5 | V |
| | | $5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 15.5\text{V to } 27\text{V}$ | 11.4 | 12 | 12.6 | V |
| Line regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $V_i = 14.5\text{V to } 30\text{V}$ | | | 240 | mV |
| | | $T_j = 25^\circ\text{C}$, $V_i = 16\text{V to } 22\text{V}$ | | | 120 | mV |
| Load regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA to } 1.0\text{A}$ | | | 240 | mV |
| | | $T_j = 25^\circ\text{C}$, $I_o = 250\text{mA to } 750\text{mA}$ | | | 120 | mV |
| Quiescent current | I_q | $T_j = 25^\circ\text{C}$ | | 4.4 | 8 | mA |
| Quiescent current change | ΔI_q | $I_o = 5\text{mA to } 1.0\text{A}$ | | | 0.5 | mA |
| | | $V_i = 15\text{V to } 30\text{V}$, $I_o = 500\text{mA}$ | | | 0.8 | mA |
| Output voltage drift | $\Delta V_o / \Delta T$ | $I_o = 5\text{mA}$ | | 1.5 | | mV/ $^\circ\text{C}$ |
| Output noise voltage | V_N | $f = 10\text{Hz to } 100\text{kHz}$, $T_a = 25^\circ\text{C}$ | | 42 | | $\mu\text{V}/V_o$ |
| Ripple rejection | RR | $f = 120\text{Hz}$, $V_i = 15\text{V to } 25\text{V}$ | | 60 | | dB |
| Dropout voltage | V_o | $I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$ | | 2 | | V |
| Output resistance | R_o | $f = 1\text{kHz}$ | | 18 | | $\text{m}\Omega$ |
| Short circuit current | I_{sc} | $V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$ | | 200 | | mA |

7815 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $0 < T_j < 125^\circ\text{C}$, $I_o = 500\text{mA}$, $V_i = 21\text{V}$, $C_i = 0.33\mu\text{F}$, $C_o = 0.1\mu\text{F}$, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|--------------------------|-------------------------|--|-------|-----|-------|----------------------|
| Output voltage | V_o | $T_j = 25^\circ\text{C}$ | 14.4 | 15 | 15.6 | V |
| | | $5.0\text{mA} < I_o < 1.0\text{A}$, $P_o < 15\text{W}$ $V_i = 17.5\text{V to } 30\text{V}$ | 14.25 | 15 | 15.75 | V |
| Line regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $V_i = 17.5\text{V to } 30\text{V}$ | | 15 | 300 | mV |
| | | $T_j = 25^\circ\text{C}$, $V_i = 20\text{V to } 26\text{V}$ | | 7 | 150 | mV |
| Load regulation | ΔV_o | $T_j = 25^\circ\text{C}$, $I_o = 5.0\text{mA to } 1.0\text{A}$ | | 25 | 300 | mV |
| | | $T_j = 25^\circ\text{C}$, $I_o = 250\text{mA to } 750\text{mA}$ | | 10 | 150 | mV |
| Quiescent current | I_q | $T_j = 25^\circ\text{C}$ | | 5 | 8 | mA |
| Quiescent current change | ΔI_q | $I_o = 5\text{mA to } 1.0\text{A}$ | | | 0.5 | mA |
| | | $V_i = 18\text{V to } 30\text{V}$, $I_o = 500\text{mA}$ | | | 0.8 | mA |
| Output voltage drift | $\Delta V_o / \Delta T$ | $I_o = 5\text{mA}$ | | 1.8 | | mV/ $^\circ\text{C}$ |
| Output noise voltage | V_N | $f = 10\text{Hz to } 100\text{kHz}$, $T_a = 25^\circ\text{C}$ | | 42 | | $\mu\text{V}/V_o$ |
| Ripple rejection | RR | $f = 120\text{Hz}$, $V_i = 18\text{V to } 28\text{V}$ | | 60 | | dB |
| Dropout voltage | V_o | $I_o = 1.0\text{A}$, $T_j = 25^\circ\text{C}$ | | 2 | | V |
| Output resistance | R_o | $f = 1\text{kHz}$ | | 18 | | $\text{m}\Omega$ |
| Short circuit current | I_{sc} | $V_i = 35\text{V}$, $T_a = 25^\circ\text{C}$ | | 200 | | mA |





TEST CIRCUITS

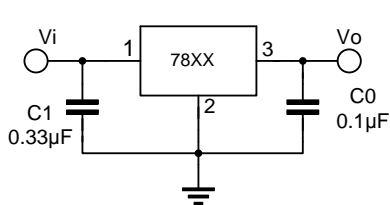


FIG.1 DC PARAMETERS

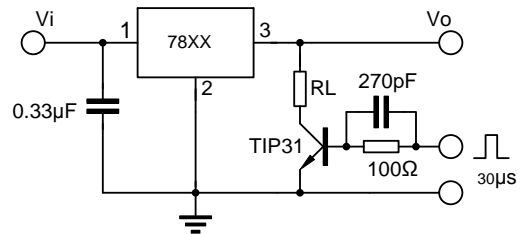


FIG.2 LOAD REGULATION

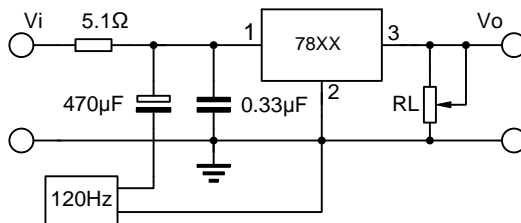


FIG.3 RIPPLE REJECTION



APPLICATION CIRCUITS

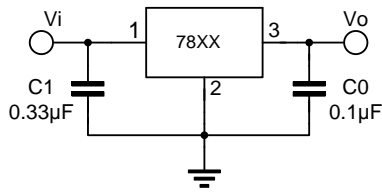


Fig.4 Fixed output regulator

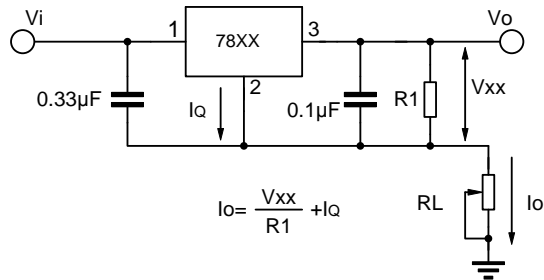


Fig.5 Constant current regulator

$$I_o = \frac{V_{xx}}{R_1} + I_Q$$

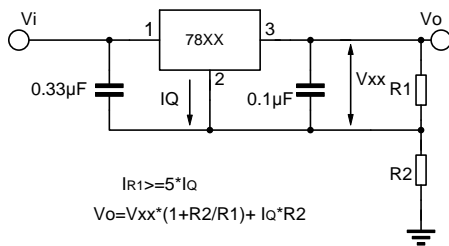


Fig.6 Circuit for increasing Regulator output voltage

$$I_{R1} \geq 5 \cdot I_Q$$

$$V_o = V_{xx} \cdot (1 + R_2/R_1) + I_Q \cdot R_2$$

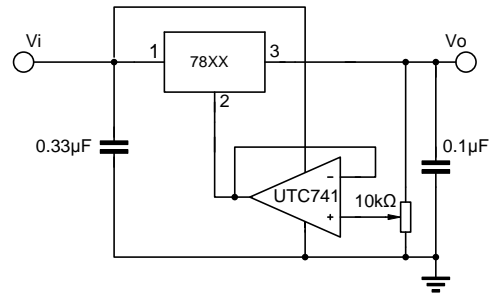


Fig.7 Adjustable output

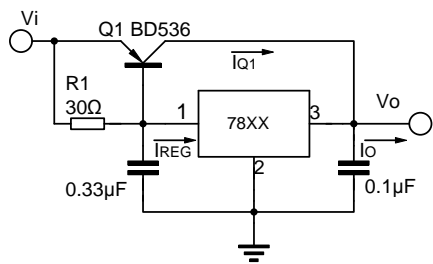


Fig.8 High current with voltage regulator

$$I_o = I_{REG} \cdot (I_{REG} - V_{BEQ1}/R_1)$$

$$R_1 = V_{BEQ1}/I_{REQ} - I_{Q1} \cdot Q_1$$

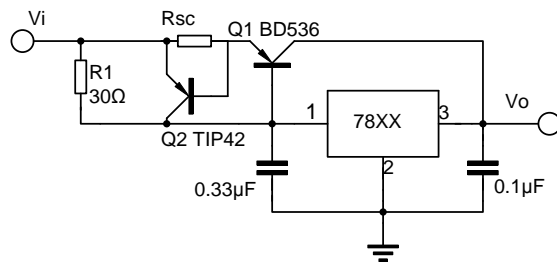


Fig.9 High output current short circuit protection

$$R_{sc} = V_{BEQ2} / I_{sc}$$





3 TERMINAL 1.0A POSITIVE VOLTAGE REGULATORS

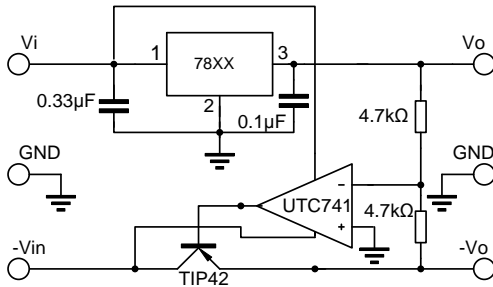


Fig.10 Tracking voltage regulator

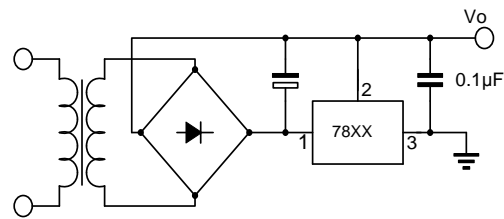


Fig.11 Negative output voltage circuit

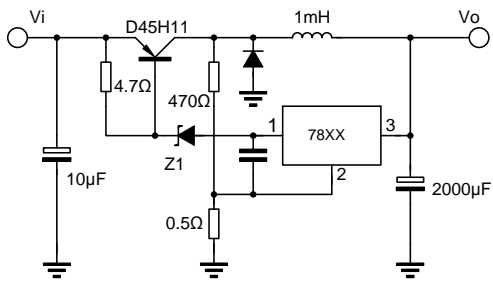


Fig.12 Switching regulator

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