

KA78TXX

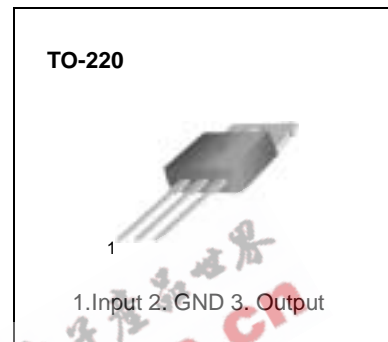
3-Terminal 3A Positive Voltage Regulator

Features

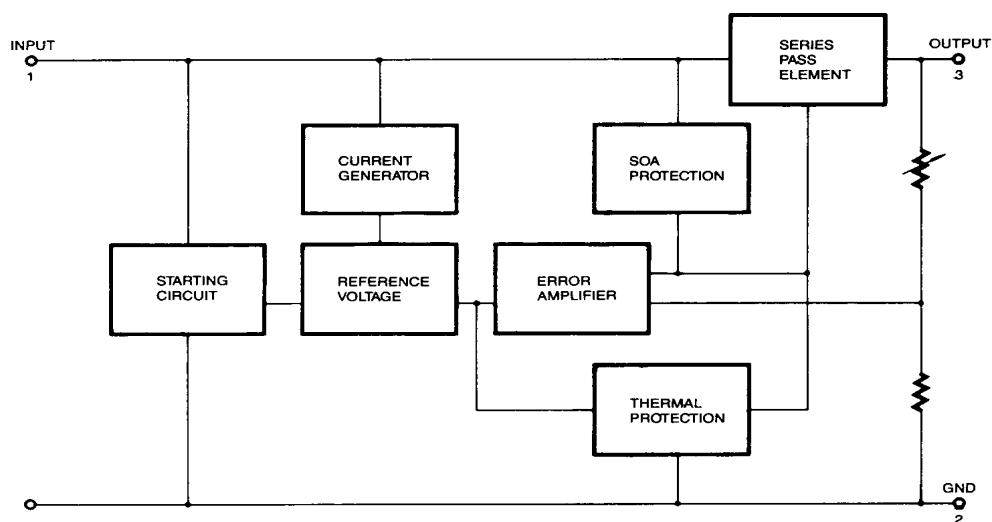
- Output current in excess of 3.0A
- Output transistor safe operating area compensation
- Power dissipation :25W
- Internal short circuit current limiting
- Internal thermal overload protection
- Output voltage offered in 4% tolerance
- No external components required
- Output voltage of 5, 12 and 15V

Description

This family of fixed voltage regulators are monolithic integrated circuit capable of driving loads in excess of 3.0 A.



Internal Block Diagram



Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|--|-----------------|--------------------|--------------------|
| Input Voltage (for $V_O = 5V$ to $12V$) (for $V_O = 15V$) | V_I | 35 40 | V V |
| Power Dissipation | PD | Internally limited | - |
| Thermal Resistance, Junction to Air $T_c = +25\text{ }^\circ\text{C}$ | $R_{\theta JA}$ | 65 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 2.5 | $^\circ\text{C/W}$ |
| Operating Junction Temperature Range | T_J | 0 ~ +150 | $^\circ\text{C}$ |
| Storage Temperature Range | TSTG | -65 ~ +150 | $^\circ\text{C}$ |

Electrical Characteristics(KA78T05)

($V_I = 10V$, $I_O = 3.0\text{ A}$, $0\text{ }^\circ\text{C} \leq T_J \leq +125\text{ }^\circ\text{C}$, $P_O \leq P_{MAX}$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|-----------------------|---|-------------|------------|-------------|----------------------|
| Output Voltage | V_O | $5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25\text{ }^\circ\text{C}$ $7.3\text{V} \leq V_I \leq 20\text{V}$, $5\text{mA} \leq I_O \leq 2.0\text{A}$ | 4.8 4.75 | 5.0 5.0 | 5.2 5.25 | V |
| Line Regulation (Note1) | ΔV_O | $7.2\text{V} \leq V_I \leq 35\text{V}$, $I_O = 5\text{mA}$, $T_J = +25\text{ }^\circ\text{C}$ $7.2\text{V} \leq V_I \leq 35\text{V}$, $I_O = 1.0\text{A}$, $T_J = +25\text{ }^\circ\text{C}$ $7.5\text{V} \leq V_I \leq 20\text{V}$, $I_O = 2.0\text{A}$ $8.0\text{V} \leq V_I \leq 12\text{V}$, $I_O = 3.0\text{A}$ | - | 3.0 | 2.5 | mV |
| Load Regulation (Note1) | ΔV_O | $5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25\text{ }^\circ\text{C}$ $5\text{mA} \leq I_O \leq 3.0\text{A}$ | - | 10 15 | 30 80 | mV mV |
| Thermal Regulation | REGT | Pulse = 10ms, P = 20W $T_A = +25\text{ }^\circ\text{C}$ | - | 0.002 | 0.03 | % V_O/W |
| Quiescent Current | I_Q | $5\text{mA} \leq I_O \leq 3.0\text{A}$, $T_J = +25\text{ }^\circ\text{C}$ $5\text{mA} \leq I_O \leq 3.0\text{A}$ | - | 3.5 4.0 | 5.0 6.0 | mA mA |
| Quiescent Current Change | ΔI_Q | $7.2\text{V} \leq V_I \leq 35\text{V}$, $I_O = 5\text{mA}$ $T_J = +25\text{ }^\circ\text{C}$; $7.5\text{V} \leq V_I \leq 20\text{V}$, $I_O = 2.0\text{A}$; $5\text{mA} \leq I_O \leq 3.0\text{A}$ | - | 0.1 | 0.8 | mA |
| Ripple Rejection | RR | $f = 120\text{Hz}$, $8\text{V} \leq V_I \leq 18\text{V}$, $I_O = 2.0\text{A}$ | - | 75 | - | dB |
| Dropout Voltage | V_D | $I_O = 3\text{A}$, $T_J = +25\text{ }^\circ\text{C}$ | - | 2.2 | 2.5 | V |
| Output Noise Voltage | V_N | $T_A = +25\text{ }^\circ\text{C}$, $10\text{Hz} \leq f \leq 100\text{KHz}$ | - | 10 | - | $\mu\text{V}/V_O$ |
| Peak Output Current | I_{PK} | $T_A = +25\text{ }^\circ\text{C}$ | - | 5.0 | - | A |
| Output Resistance | R_O | $f = 1.0\text{kHz}$ | - | 2.0 | - | m Ω |
| Short Circuit Current Limit | I_{sc} | $V_I = 35\text{V}$, $T_J = +25\text{ }^\circ\text{C}$ | - | 1.5 | 2.5 | A |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O = 5.0\text{mA}$ | - | 0.2 | - | mV/ $^\circ\text{C}$ |

Note:

1. Load and line regulation are specified at constant junction temperature. Change in V_O due heating effects must be taken into account separately. Pulse testing with low duty is used. ($P_{MAX} = 25\text{W}$)

Electrical Characteristics(KA78T12)

($V_I = 19V$, $I_O = 3.0 A$, $0\text{ }^\circ\text{C} \leq T_J \leq +125\text{ }^\circ\text{C}$, $P_O \leq P_{MAX}$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|-----------------------|---|--------------|------------|--------------|---------------------|
| Output Voltage | V_O | $5mA \leq I_O \leq 3.0A$, $T_J = +25\text{ }^\circ\text{C}$ $14.5V \leq V_I \leq 27V$, $5mA \leq I_O \leq 2.0A$ | 11.5 11.4 | 12 12 | 12.5 12.8 | V |
| Line Regulation (Note1) | ΔV_O | $14.5V \leq V_I \leq 35V$, $I_O = 5mA$, $T_J = +25\text{ }^\circ\text{C}$ $14.5V \leq V_I \leq 35V$, $I_O = 1.0A$, $T_J = +25\text{ }^\circ\text{C}$ $14.9V \leq V_I \leq 28V$, $I_O = 2.0A$ $16V \leq V_I \leq 22V$, $I_O = 3.0A$ | - | 6.0 | 45 | mV |
| Load Regulation (Note1) | ΔV_O | $5mA \leq I_O \leq 3.0A$, $T_J = +25\text{ }^\circ\text{C}$ $5mA \leq I_O \leq 3.0A$ | - | 10 15 | 30 80 | mV mV |
| Thermal Regulation | REGT | Pulse = 10ms, $P = 20W$ $T_A = +25\text{ }^\circ\text{C}$ | - | 0.002 | 0.03 | % V_O/W |
| Quiescent Current | I_Q | $5mA \leq I_O \leq 3.0A$, $T_J = +25\text{ }^\circ\text{C}$ $5mA \leq I_O \leq 3.0A$ | - | 3.5 4.0 | 5.0 6.0 | mA mA |
| Quiescent Current Change | ΔI_Q | $14.5V \leq V_I \leq 35V$, $I_O = 5mA$ $T_J = +25\text{ }^\circ\text{C}$; $14.9V \leq V_I \leq 27V$, $I_O = 2.0A$; $5mA \leq I_O \leq 3.0A$ | - | 0.1 | 0.8 | mA |
| Ripple Rejection | RR | $f = 120Hz$, $15V \leq V_I \leq 25V$, $I_O = 2.0A$ | 57 | 67 | - | dB |
| Dropout Voltage | V_D | $I_O = 3A$, $T_J = +25\text{ }^\circ\text{C}$ | - | 2.2 | 2.5 | V |
| Output Noise Voltage | V_N | $T_A = +25\text{ }^\circ\text{C}$, $10Hz \leq f \leq 100kHz$ | - | 10 | - | $\mu V/V_O$ |
| Peak Output Current | I_{PK} | $T_A = +25\text{ }^\circ\text{C}$ | - | 5.0 | - | A |
| Output Resistance | R_O | $f = 1.0kHz$ | - | 2.0 | - | $m\Omega$ |
| Short Circuit Current Limit | I_{SC} | $V_I = 35V$, $T_J = +25\text{ }^\circ\text{C}$ | - | 1.5 | 2.5 | A |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O = 5.0mA$ | - | 0.5 | - | $mV/^\circ\text{C}$ |

Note:

1. Load and line regulation are specified at constant junction temperature. Change in V_O due heating effects must be taken into account separately. Pulse testing with low duty is used. ($P_{MAX} = 25W$)

Electrical Characteristics(KA78T15)

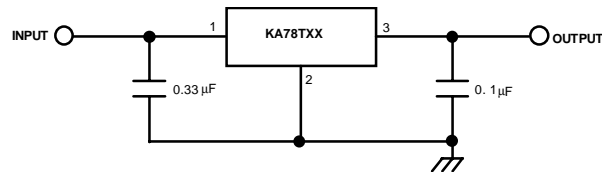
($V_I = 23V$, $I_O = 3.0 A$, $0\text{ }^\circ\text{C} \leq T_J \leq +125\text{ }^\circ\text{C}$, $P_o \leq P_{MAX}$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|-----------------------|---|---------------|------------|---------------|---------------------|
| Output Voltage | V_O | $5mA \leq I_O \leq 3.0A$, $T_J = +25\text{ }^\circ\text{C}$ $17.5V \leq V_I \leq 30V$, $5mA \leq I_O \leq 2.0A$ | 14.4 14.25 | 15 15 | 15.6 15.75 | V |
| Line Regulation (Note1) | ΔV_O | $17.6V \leq V_I \leq 40V$, $I_O = 5mA$, $T_J = +25\text{ }^\circ\text{C}$ $17.6V \leq V_I \leq 40V$, $I_O = 1.0A$, $T_J = +25\text{ }^\circ\text{C}$ $18V \leq V_I \leq 30V$, $I_O = 2.0A$ $20V \leq V_I \leq 26V$, $I_O = 3.0A$ | - | 7.5 | 55 | mV |
| Load Regulation (Note1) | ΔV_O | $5mA \leq I_O \leq 3.0A$, $T_J = +25\text{ }^\circ\text{C}$ $5mA \leq I_O \leq 3.0A$ | - | 10 15 | 30 80 | mV mV |
| Thermal Regulation | REGT | Pulse = 10ms, $P = 20W$ $T_A = +25\text{ }^\circ\text{C}$ | - | 0.002 | 0.03 | % V_O/W |
| Quiescent Current | I_Q | $5mA \leq I_O \leq 3.0A$, $T_J = +25\text{ }^\circ\text{C}$ $5mA \leq I_O \leq 3.0A$ | - | 3.5 4.0 | 5.0 6.0 | mA mA |
| Quiescent Current Change | ΔI_Q | $17.6V \leq V_I \leq 40V$, $I_O = 5mA$ $T_J = +25\text{ }^\circ\text{C}$; $18V \leq V_I \leq 30V$, $I_O = 2.0A$; $5mA \leq I_O \leq 3.0A$ | - | 0.1 | 0.8 | mA |
| Ripple Rejection | RR | $f = 120Hz$, $18.5V \leq V_I \leq 28.5V$, $I_O = 2.0A$ | 55 | 65 | - | dB |
| Dropout Voltage | V_D | $I_O = 3A$, $T_J = +25\text{ }^\circ\text{C}$ | - | 2.2 | 2.5 | V |
| Output Noise Voltage | V_N | $T_A = +25\text{ }^\circ\text{C}$, $10Hz \leq f \leq 100kHz$ | - | 10 | - | $\mu V/V_O$ |
| Peak Output Current | I_{PK} | $T_A = +25\text{ }^\circ\text{C}$ | - | 5.0 | - | A |
| Output Resistance | R_o | $f = 1.0kHz$ | - | 2.0 | - | $m\Omega$ |
| Short Circuit Current Limit | I_{SC} | $V_I = 40V$, $T_J = +25\text{ }^\circ\text{C}$ | - | 1.0 | 2.0 | A |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $I_O = 5.0mA$ | - | 0.5 | - | $mV/^\circ\text{C}$ |

Note:

1. Load and line regulation are specified at constant junction temperature. Change in V_O due heating effects must be taken into account separately. Pulse testing with low duty is used. ($P_{MAX} = 25W$)

Typical Application



Notes:

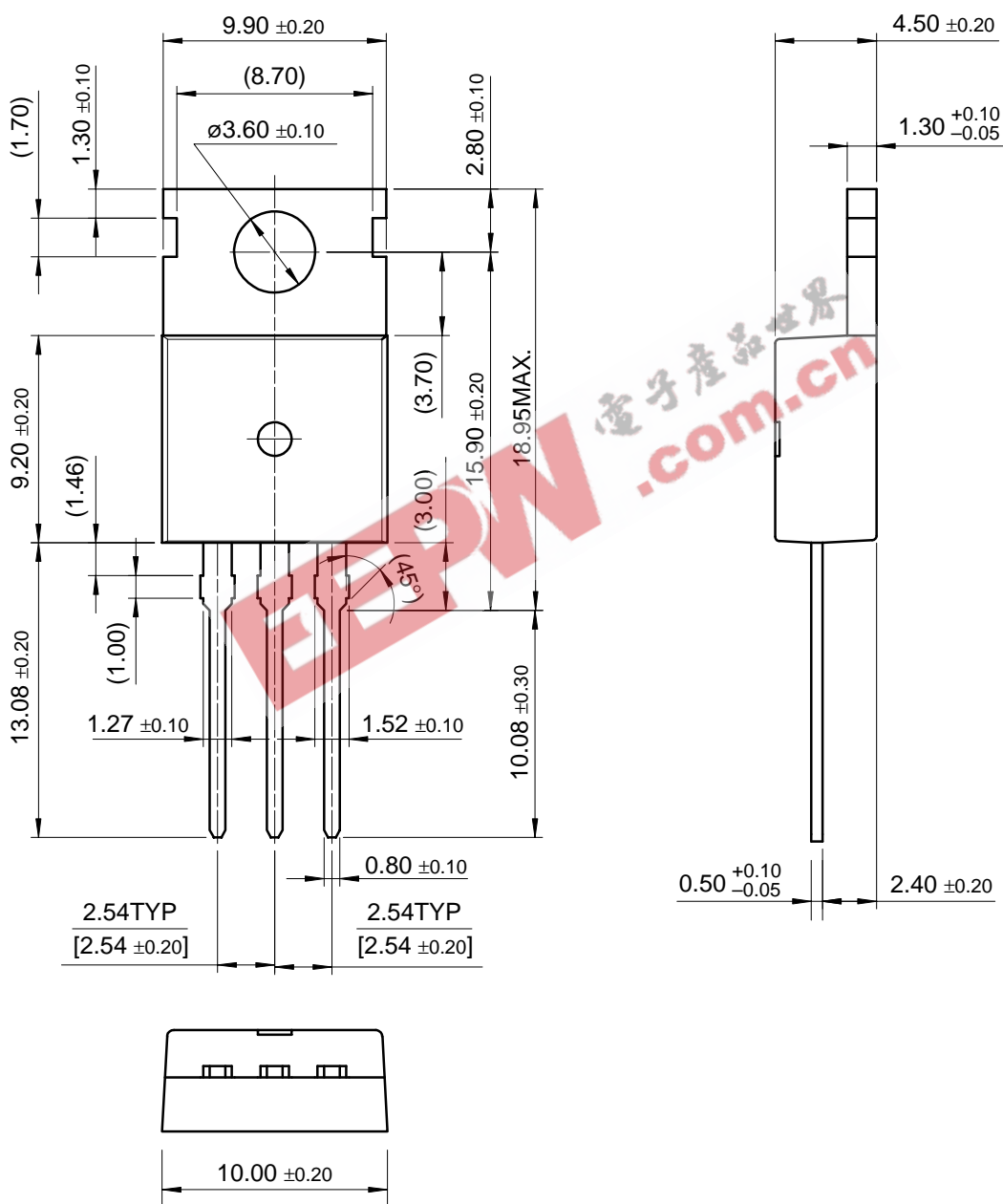
1. To specify an output voltage, substitute voltage value for "XX".
2. Bypass Capacitors are recommend for optimum stability and transient response and should be located as close as possible to the regulator

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Mechanical Dimensions

Package

TO-220



Ordering Information

| Product Number | Package | Operating Temperature |
|----------------|---------|-----------------------|
| KA78T05 | TO-220 | 0 ~ + 125 °C |
| KA78T12 | | |
| KA78T15 | | |

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