

KA78XXE / KA78XXAE

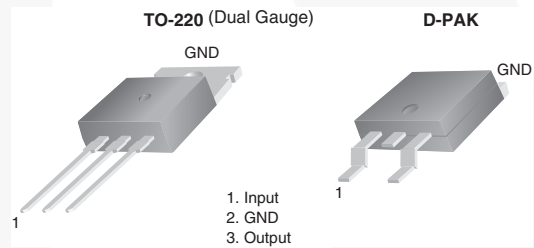
3-Terminal 1 A Positive Voltage Regulator

Features

- Output Current up to 1 A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24 V
- Thermal Overload Protection
- Short-Circuit Protection
- Output Transistor Safe Operating Area Protection

Description

The KA78XXE / KA78XXAE series of three-terminal positive regulators is available in the TO-220 / D-PAK package with several fixed-output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut-down, and safe operating area. If adequate heat sinking is provided, they can deliver over 1 A output current. Although designed primarily as fixed-voltage regulators, these devices can be used with external components for adjustable voltages and currents.



Block Diagram

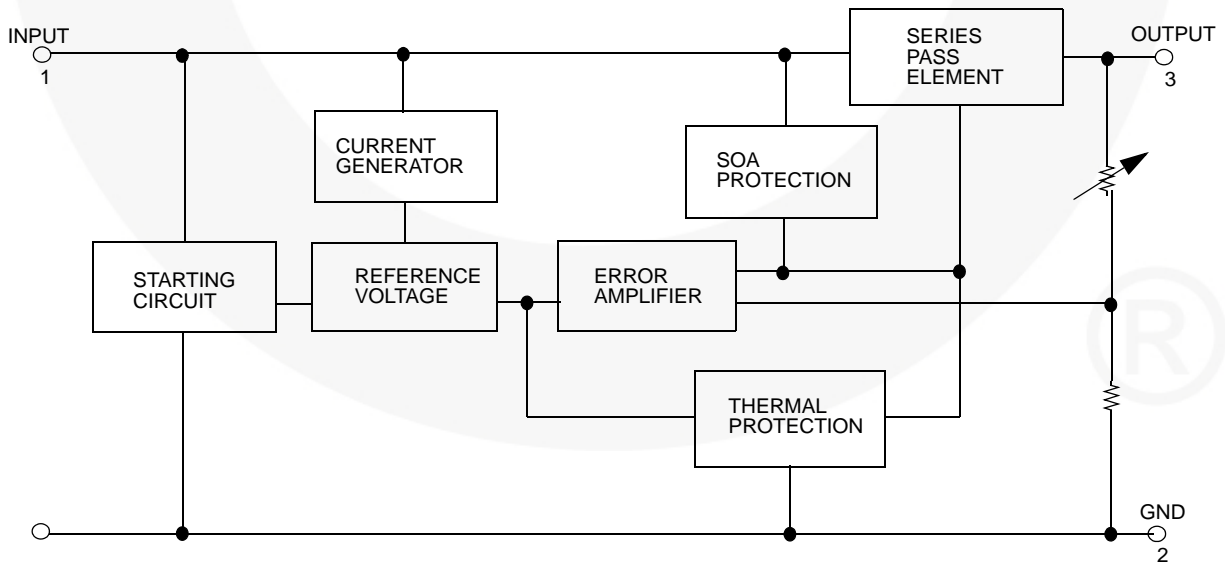


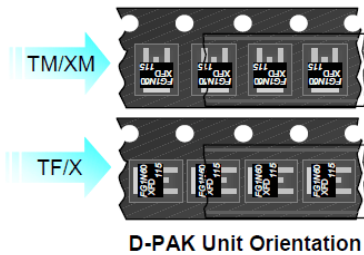
Figure 1. Block Diagram

Ordering Information

| Product Number | Output Voltage Tolerance | Package | Operating Temperature | Parking Method |
|----------------|--------------------------|---------------------|-----------------------|----------------|
| KA7805ETU | ±4% | TO-220 (Dual Gauge) | 0°C to +125°C | Rail |
| KA7806ETU | | | | |
| KA7808ETU | | | | |
| KA7809ETU | | | | |
| KA7810ETU | | | | |
| KA7812ETU | | | | |
| KA7815ETU | | | | |
| KA7818ETU | | | | |
| KA7824ETU | | | | |
| KA7805AETU | ±2% | | | |
| KA7809AETU | | | | |
| KA7810AETU | | | | |
| KA7812AETU | | | | |
| KA7815AETU | | | | |
| KA7824AETU | ±4% | D-PAK | | Tape and Reel |
| KA7805ERTF | | | | |
| KA7805ERTM | | | | |
| KA7808ERTM | | | | |
| KA7809ERTM | | | | |
| KA7812ERTM | | | | |

Note:

1. Above output voltage tolerance is available at 25°C.
2. Refer to below figure for TM / TF Suffix for DPAK.



Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Parameter | Value | Unit | |
|-----------------|---|-----------------------------------|------|---|
| V_I | Input Voltage | $V_O = 5\text{ V to }18\text{ V}$ | 35 | V |
| | | $V_O = 24\text{ V}$ | 40 | V |
| $R_{\theta JC}$ | Thermal Resistance Junction-Cases (TO-220) | 5 | °C/W | |
| $R_{\theta JA}$ | Thermal Resistance Junction-Air (TO-220) | 65 | °C/W | |
| T_{OPR} | Operating Temperature Range (KA78XXE / AE / ER) | 0 to +125 | °C | |
| T_{STG} | Storage Temperature Range | -65 to +150 | °C | |

Electrical Characteristics (KA7805E / KA7805ER)

Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 10 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------|-------------------------------------|---|---|------|-------|------------------------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 4.80 | 5.00 | 5.20 | V |
| | | $5.0 \text{ mA} < I_O < 1.0 \text{ A}$, $P_O = 15 \text{ W}$, $V_I = 7 \text{ V to } 20 \text{ V}$ | 4.75 | 5.00 | 5.25 | |
| Regline | Line Regulation ⁽³⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 7 \text{ V to } 25 \text{ V}$ | 4.0 | 100.0 | mV |
| | | | $V_I = 8 \text{ V to } 12 \text{ V}$ | 1.6 | 50.0 | |
| Regload | Load Regulation ⁽³⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5.0 \text{ mA to } 1.5 \text{ A}$ | 9 | 100 | mV |
| | | | $I_O = 250 \text{ mA to } 750 \text{ mA}$ | 4 | 50 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.0 | 8.0 | mA |
| ΔI_Q | Quiescent Current Change | $I_O = 5 \text{ mA to } 1.0 \text{ A}$ | | 0.03 | 0.50 | mA |
| | | $V_I = 7 \text{ V to } 25 \text{ V}$ | | 0.30 | 1.30 | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽⁴⁾ | $I_O = 5 \text{ mA}$ | | -0.8 | | mV/ $^{\circ}\text{C}$ |
| V_N | Output Noise Voltage | $f = 10 \text{ Hz to } 100 \text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 42 | | $\mu\text{V}/V_O$ |
| RR | Ripple Rejection ⁽⁴⁾ | $f = 120 \text{ Hz}$, $V_I = 8 \text{ V to } 18 \text{ V}$ | 62 | 73 | | dB |
| V_{Drop} | Dropout Voltage | $I_O = 1 \text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2 | | V |
| R_O | Output Resistance ⁽⁴⁾ | $f = 1 \text{ kHz}$ | | 15 | | m Ω |
| I_{SC} | Short-Circuit Current | $V_I = 35 \text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 230 | | mA |
| I_{PK} | Peak Current ⁽⁴⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A |

Notes:

- Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
- These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7806E)

Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{ mA}$, $V_I = 11\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-----------------------|-------------------------------------|--|---|------|------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 5.75 | 6.00 | 6.25 | V | |
| | | $5.0\text{ mA } I_O \text{ } 1.0\text{ A}, P_O \text{ } 15\text{ W}, V_I = 8.0\text{ V to } 21\text{ V}$ | 5.70 | 6.00 | 6.30 | | |
| Regline | Line Regulation ⁽⁵⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 8\text{ V to } 25\text{ V}$ | | 5.0 | 120.0 | mV |
| | | | $V_I = 9\text{ V to } 13\text{ V}$ | | 1.5 | 60.0 | |
| Regload | Load Regulation ⁽⁵⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5\text{ mA to } 1.5\text{ A}$ | | 9 | 120 | mV |
| | | | $I_O = 250\text{ mA to } 750\text{ mA}$ | | 3 | 60 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.0 | 8.0 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{ mA to } 1\text{ A}$ $V_I = 8\text{ V to } 25\text{ V}$ | | | 0.5 | mA | |
| | | | | | 1.3 | | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift ⁽⁶⁾ | $I_O = 5\text{ mA}$ | | -0.8 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to } 100\text{ kHz}, T_A = +25^{\circ}\text{C}$ | | 45 | | $\mu\text{V}/V_O$ | |
| RR | Ripple Rejection ⁽⁶⁾ | $f = 120\text{ Hz}, V_I = 9\text{ V to } 19\text{ V}$ | 59 | 75 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}, T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽⁶⁾ | $f = 1\text{ kHz}$ | | 19 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}, T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽⁶⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

5. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
6. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7808E / KA7808ER)

Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 14 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------|-------------------------------------|--|---|------|------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 7.7 | 8.0 | 8.3 | V | |
| | | $5.0 \text{ mA } I_O \text{ } 1.0 \text{ A}, P_O \text{ } 15 \text{ W}, V_I = 10.5 \text{ V to } 23 \text{ V}$ | 7.6 | 8.0 | 8.4 | | |
| Regline | Line Regulation ⁽⁷⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 10.5 \text{ V to } 25 \text{ V}$ | | 5 | 160 | mV |
| | | | $V_I = 11.5 \text{ V to } 17 \text{ V}$ | | 2 | 80 | |
| Regload | Load Regulation ⁽⁷⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5.0 \text{ mA to } 1.5 \text{ A}$ | | 10 | 160 | mV |
| | | | $I_O = 250 \text{ mA to } 750 \text{ mA}$ | | 5 | 80 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5 | 8 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5 \text{ mA to } 1.0 \text{ A}$ | | 0.05 | 0.50 | mA | |
| | | $V_I = 10.5 \text{ V to } 25 \text{ V}$ | | 0.50 | 1.00 | | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽⁸⁾ | $I_O = 5 \text{ mA}$ | | -0.8 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10 \text{ Hz to } 100 \text{ kHz}, T_A = +25^{\circ}\text{C}$ | | 52 | | $\mu\text{V}/V_O$ | |
| RR | Ripple Rejection ⁽⁸⁾ | $f = 120 \text{ Hz}, V_I = 11.5 \text{ V to } 21.5 \text{ V}$ | 56 | 73 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1 \text{ A}, T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽⁸⁾ | $f = 1 \text{ kHz}$ | | 17 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35 \text{ V}, T_A = +25^{\circ}\text{C}$ | | 230 | | mA | |
| I_{PK} | Peak Current ⁽⁸⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

7. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
8. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7809E / KA7809ER)

Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{ mA}$, $V_I = 15\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------|--------------------------------------|--|---|------|------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 8.65 | 9.00 | 9.35 | V | |
| | | $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 11.5\text{ V to } 24\text{ V}$ | 8.60 | 9.00 | 9.40 | | |
| Regline | Line Regulation ⁽⁹⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 11.5\text{ V to } 25\text{ V}$ | | 6 | 180 | mV |
| | | | $V_I = 12\text{ V to } 17\text{ V}$ | | 2 | 90 | |
| Regload | Load Regulation ⁽⁹⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5\text{ mA to } 1.5\text{ A}$ | | 12 | 180 | mV |
| | | | $I_O = 250\text{ mA to } 750\text{ mA}$ | | 4 | 90 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5 | 8 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{ mA to } 1.0\text{ A}$ | | | 0.5 | mA | |
| | | $V_I = 11.5\text{ V to } 26\text{ V}$ | | | 1.3 | | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽¹⁰⁾ | $I_O = 5\text{ mA}$ | | -1 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to } 100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 58 | | $\mu\text{V}/V_o$ | |
| RR | Ripple Rejection ⁽¹⁰⁾ | $f = 120\text{ Hz}$, $V_I = 13\text{ V to } 23\text{ V}$ | 56 | 71 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽¹⁰⁾ | $f = 1\text{ kHz}$ | | 17 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽¹⁰⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

9. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

10. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7810E)

Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{ mA}$, $V_I = 16\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-----------------------|--------------------------------------|--|---|------|------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 9.6 | 10.0 | 10.4 | V | |
| | | $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 12.5\text{ V to } 25\text{ V}$ | 9.5 | 10.0 | 10.5 | | |
| Regline | Line Regulation ⁽¹¹⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 12.5\text{ V to } 25\text{ V}$ | | 10 | 200 | mV |
| | | | $V_I = 13\text{ V to } 25\text{ V}$ | | 3 | 100 | |
| Regload | Load Regulation ⁽¹¹⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5\text{ mA to } 1.5\text{ A}$ | | 12 | 200 | mV |
| | | | $I_O = 250\text{ mA to } 750\text{ mA}$ | | 4 | 400 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.1 | 8.0 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{ mA to } 1.0\text{ A}$ | | | 0.5 | mA | |
| | | $V_I = 12.5\text{ V to } 29\text{ V}$ | | | 1.0 | | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift ⁽¹²⁾ | $I_O = 5\text{ mA}$ | | -1.0 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to } 100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 58.0 | | $\mu\text{V}/V_o$ | |
| RR | Ripple Rejection ⁽¹²⁾ | $f = 120\text{ Hz}$, $V_I = 13\text{ V to } 23\text{ V}$ | 56.0 | 71.0 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2.0 | | V | |
| R_O | Output Resistance ⁽¹²⁾ | $f = 1\text{ kHz}$ | | 17.0 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽¹²⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

11. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
12. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7812E / KA7812ER)Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{ mA}$, $V_I = 19\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-----------------------|--------------------------------------|--|---|------|------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 11.5 | 12.0 | 12.5 | V | |
| | | $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 14.5\text{ V to } 27\text{ V}$ | 11.4 | 12.0 | 12.6 | | |
| Regline | Line Regulation ⁽¹³⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 14.5\text{ V to } 30\text{ V}$ | | 10 | 240 | mV |
| | | | $V_I = 16\text{ V to } 22\text{ V}$ | | 3 | 120 | |
| Regload | Load Regulation ⁽¹³⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5\text{ mA to } 1.5\text{ A}$ | | 11 | 240 | mV |
| | | | $I_O = 250\text{ mA to } 750\text{ mA}$ | | 5.0 | 120 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.1 | 8.0 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{ mA to } 1.0\text{ A}$ | | 0.1 | 0.5 | mA | |
| | | $V_I = 14.5\text{ V to } 30\text{ V}$ | | 0.5 | 1.0 | | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift ⁽¹⁴⁾ | $I_O = 5\text{ mA}$ | | -1 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to } 100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 76 | | $\mu\text{V}/V_O$ | |
| RR | Ripple Rejection ⁽¹⁴⁾ | $f = 120\text{ Hz}$, $V_I = 15\text{ V to } 25\text{ V}$ | 55 | 71 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽¹⁴⁾ | $f = 1\text{ kHz}$ | | 18 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 230 | | mA | |
| I_{PK} | Peak Current ⁽¹⁴⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

13. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

14. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7815E)

Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{ mA}$, $V_I = 23\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-----------------------|--------------------------------------|---|--|-------|-------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 14.40 | 15.00 | 15.60 | V | |
| | | $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 17.5\text{ V to }30\text{ V}$ | 14.25 | 15.00 | 15.75 | | |
| Regline | Line Regulation ⁽¹⁵⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 17.5\text{ V to }30\text{ V}$ | | 11 | 300 | mV |
| | | | $V_I = 20\text{ V to }26\text{ V}$ | | 3 | 150 | |
| Regload | Load Regulation ⁽¹⁵⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5\text{ mA to }1.5\text{ A}$ | | 12 | 300 | mV |
| | | | $I_O = 250\text{ mA to }750\text{ mA}$ | | 4 | 150 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.2 | 8.0 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{ mA to }1.0\text{ A}$ $V_I = 17.5\text{ V to }30\text{ V}$ | | | 0.5 | mA | |
| | | | | | 1.0 | | |
| $\Delta V_O/\Delta T$ | Output Voltage Drift ⁽¹⁶⁾ | $I_O = 5\text{ mA}$ | | -1 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 90 | | $\mu\text{V}/V_O$ | |
| RR | Ripple Rejection ⁽¹⁶⁾ | $f = 120\text{ Hz}$, $V_I = 18.5\text{ V to }28.5\text{ V}$ | 54 | 70 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽¹⁶⁾ | $f = 1\text{ kHz}$ | | 19 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽¹⁶⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

15. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
16. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7818E)

Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{ mA}$, $V_I = 27\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------|--------------------------------------|--|---|------|------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 17.3 | 18.0 | 18.7 | V | |
| | | $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 21\text{ V to } 33\text{ V}$ | 17.1 | 18.0 | 18.9 | | |
| Regline | Line Regulation ⁽¹⁷⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 21\text{ V to } 33\text{ V}$ | | 15 | 360 | mV |
| | | | $V_I = 24\text{ V to } 30\text{ V}$ | | 5 | 180 | |
| Regload | Load Regulation ⁽¹⁷⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5\text{ mA to } 1.5\text{ A}$ | | 15 | 360 | mV |
| | | | $I_O = 250\text{ mA to } 750\text{ mA}$ | | 5 | 180 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.2 | 8.0 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{ mA to } 1.0\text{ A}$ | | | 0.5 | mA | |
| | | $V_I = 21\text{ V to } 33\text{ V}$ | | | 1.0 | | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽¹⁸⁾ | $I_O = 5\text{ mA}$ | | -1 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to } 100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 110 | | $\mu\text{V}/V_O$ | |
| RR | Ripple Rejection ⁽¹⁸⁾ | $f = 120\text{ Hz}$, $V_I = 22\text{ V to } 32\text{ V}$ | 53 | 69 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽¹⁸⁾ | $f = 1\text{ kHz}$ | | 22 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽¹⁸⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

17. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
18. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7824E)

Refer to test circuit, $0^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 33 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------|--------------------------------------|---|---|-------|-------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 23.00 | 24.00 | 25.00 | V | |
| | | $5.0 \text{ mA} \leq I_O \leq 1.0 \text{ A}$, $P_O \leq 15 \text{ W}$, $V_I = 27 \text{ V to } 38 \text{ V}$ | 22.80 | 24.00 | 25.25 | | |
| Regline | Line Regulation ⁽¹⁹⁾ | $T_J = +25^{\circ}\text{C}$ | $V_I = 27 \text{ V to } 38 \text{ V}$ | | 17 | 480 | mV |
| | | | $V_I = 30 \text{ V to } 36 \text{ V}$ | | 6 | 240 | |
| Regload | Load Regulation ⁽¹⁹⁾ | $T_J = +25^{\circ}\text{C}$ | $I_O = 5 \text{ mA to } 1.5 \text{ A}$ | | 15 | 480 | mV |
| | | | $I_O = 250 \text{ mA to } 750 \text{ mA}$ | | 5.0 | 240 | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.2 | 8.0 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5 \text{ mA to } 1.0 \text{ A}$ | | 0.1 | 0.5 | mA | |
| | | $V_I = 27 \text{ V to } 38 \text{ V}$ | | 0.5 | 1.0 | | |
| $\Delta V_O / \Delta T$ | Output Voltage Drift ⁽²⁰⁾ | $I_O = 5 \text{ mA}$ | | -1.5 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10 \text{ Hz to } 100 \text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 60 | | $\mu\text{V}/V_O$ | |
| RR | Ripple Rejection ⁽²⁰⁾ | $f = 120 \text{ Hz}$, $V_I = 28 \text{ V to } 38 \text{ V}$ | 50 | 67 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1 \text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽²⁰⁾ | $f = 1 \text{ kHz}$ | | 28 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35 \text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 230 | | mA | |
| I_{PK} | Peak Current ⁽²⁰⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

19. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

20. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7805AE)

Refer to the test circuit, $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{ A}$, $V_I = 10\text{ V}$, $C_I = 0.33\ \mu\text{F}$, $C_O = 0.1\ \mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|---------------------|--------------------------------------|---|-------------------------------------|------|------|------------------------|------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 4.9 | 5.0 | 5.1 | V | |
| | | $I_O = 5\text{ mA to }1\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 7.5\text{ V to }20\text{ V}$ | 4.8 | 5.0 | 5.2 | | |
| Regline | Line Regulation ⁽²¹⁾ | $V_I = 7.5\text{ V to }25\text{ V}$, $I_O = 500\text{ mA}$ | | 5.0 | 50.0 | mV | |
| | | $V_I = 8\text{ V to }12\text{ V}$ | | 3.0 | 50.0 | | |
| | | $T_J = +25^{\circ}\text{C}$ | $V_I = 7.3\text{ V to }20\text{ V}$ | | 5.0 | | 50.0 |
| | | | $V_I = 8\text{ V to }12\text{ V}$ | | 1.5 | | 25.0 |
| Regload | Load Regulation ⁽²¹⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{ mA to }1.5\text{ A}$ | | 9 | 100 | mV | |
| | | $I_O = 5\text{ mA to }1\text{ A}$ | | 9 | 100 | | |
| | | $I_O = 250\text{ mA to }750\text{ mA}$ | | 4 | 50 | | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5 | 6 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{ mA to }1\text{ A}$ | | | 0.5 | mA | |
| | | $V_I = 8\text{ V to }25\text{ V}$, $I_O = 500\text{ mA}$ | | | 0.8 | | |
| | | $V_I = 7.5\text{ V to }20\text{ V}$, $T_J = +25^{\circ}\text{C}$ | | | 0.8 | | |
| $\Delta V/\Delta T$ | Output Voltage Drift ⁽²²⁾ | $I_O = 5\text{ mA}$ | | -0.8 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 10 | | $\mu\text{V}/V_O$ | |
| RR | Ripple Rejection ⁽²²⁾ | $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$, $V_I = 8\text{ V to }18\text{ V}$ | | 68 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽²²⁾ | $f = 1\text{ kHz}$ | | 17 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽²²⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

21. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
22. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7809AE)

Refer to the test circuit, $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{ A}$, $V_I = 15\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|---------------------|--------------------------------------|--|--------------------------------------|------|------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 8.82 | 9.00 | 9.18 | V | |
| | | $I_O = 5\text{ mA to }1\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 11.2\text{ V to }24\text{ V}$ | 8.65 | 9.00 | 9.35 | | |
| Regline | Line Regulation ⁽²³⁾ | $V_I = 11.7\text{ V to }25\text{ V}$, $I_O = 500\text{ mA}$ | | 6 | 90 | mV | |
| | | $V_I = 12.5\text{ V to }19\text{ V}$ | | 4 | 45 | | |
| | | $T_J = +25^{\circ}\text{C}$ | $V_I = 11.5\text{ V to }24\text{ V}$ | | 6 | | 90 |
| | | | $V_I = 12.5\text{ V to }19\text{ V}$ | | 2 | | 45 |
| Regload | Load Regulation ⁽²³⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{ mA to }1.0\text{ A}$ | | 12 | 100 | mV | |
| | | $I_O = 5\text{ mA to }1.0\text{ A}$ | | 12 | 100 | | |
| | | $I_O = 250\text{ mA to }750\text{ mA}$ | | 5 | 50 | | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5 | 6 | mA | |
| ΔI_Q | Quiescent Current Change | $V_I = 11.7\text{ V to }25\text{ V}$, $T_J = +25^{\circ}\text{C}$ | | | 0.8 | mA | |
| | | $V_I = 12\text{ V to }25\text{ V}$, $I_O = 500\text{ mA}$ | | | 0.8 | | |
| | | $I_O = 5\text{ mA to }1.0\text{ A}$ | | | 0.5 | | |
| $\Delta V/\Delta T$ | Output Voltage Drift ⁽²⁴⁾ | $I_O = 5\text{ mA}$ | | -1.0 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 10 | | $\mu\text{V}/V_o$ | |
| RR | Ripple Rejection ⁽²⁴⁾ | $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$, $V_I = 12\text{ V to }22\text{ V}$ | | 62 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2.0 | | V | |
| R_O | Output Resistance ⁽²⁴⁾ | $f = 1\text{ kHz}$ | | 17 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽²⁴⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

23. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
24. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7810AE)

Refer to the test circuit, $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{ A}$, $V_I = 16\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|---------------------|--------------------------------------|--|--------------------------------------|------|-------|------------------------|-------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 9.8 | 10.0 | 10.2 | V | |
| | | $I_O = 5\text{ mA to }1\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 12.8\text{ V to }25\text{ V}$ | 9.6 | 10.0 | 10.4 | | |
| Regline | Line Regulation ⁽²⁵⁾ | $V_I = 12.8\text{ V to }26\text{ V}$, $I_O = 500\text{ mA}$ | | 8.0 | 100.0 | mV | |
| | | $V_I = 13\text{ V to }20\text{ V}$ | | 4.0 | 50.0 | | |
| | | $T_J = +25^{\circ}\text{C}$ | $V_I = 12.5\text{ V to }25\text{ V}$ | | 8.0 | | 100.0 |
| | | | $V_I = 13\text{ V to }20\text{ V}$ | | 3.0 | | 50.0 |
| Regload | Load Regulation ⁽²⁵⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{ mA to }1.5\text{ A}$ | | 12 | 100 | mV | |
| | | $I_O = 5\text{ mA to }1\text{ mA}$ | | 12 | 100 | | |
| | | $I_O = 250\text{ mA to }750\text{ mA}$ | | 5 | 50 | | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.0 | 6.0 | mA | |
| ΔI_Q | Quiescent Current Change | $I_O = 5\text{ mA to }1.0\text{ A}$ | | | 0.5 | mA | |
| | | $V_I = 12.8\text{ V to }25\text{ V}$, $I_O = 500\text{ mA}$ | | | 0.8 | | |
| | | $V_I = 13\text{ V to }26\text{ V}$, $T_J = +25^{\circ}\text{C}$ | | | 0.5 | | |
| $\Delta V/\Delta T$ | Output Voltage Drift ⁽²⁶⁾ | $I_O = 5\text{ mA}$ | | -1.0 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 10.0 | | $\mu\text{V}/V_O$ | |
| RR | Ripple Rejection ⁽²⁶⁾ | $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$, $V_I = 14\text{ V to }24\text{ V}$ | | 62.0 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2.0 | | V | |
| R_O | Output Resistance ⁽²⁶⁾ | $f = 1\text{ kHz}$ | | 17.0 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽²⁶⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

25. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
26. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7812AE)Refer to the test circuit, $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{ A}$, $V_I = 19\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|---------------------|--------------------------------------|--|--------------------------------------|-------|-------|------------------------|-----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 11.75 | 12.00 | 12.25 | V | |
| | | $I_O = 5\text{ mA to }1\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 14.8\text{ V to }27\text{ V}$ | 11.50 | 12.00 | 12.50 | | |
| Regline | Line Regulation ⁽²⁷⁾ | $V_I = 14.8\text{ V to }30\text{ V}$, $I_O = 500\text{ mA}$ | | 10 | 120 | mV | |
| | | $V_I = 16\text{ V to }22\text{ V}$ | | 4 | 120 | | |
| | | $T_J = +25^{\circ}\text{C}$ | $V_I = 14.5\text{ V to }27\text{ V}$ | | 10 | | 120 |
| | | | $V_I = 16\text{ V to }22\text{ V}$ | | 3 | | 60 |
| Regload | Load Regulation ⁽²⁷⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{ mA to }1.5\text{ A}$ | | 12 | 100 | mV | |
| | | $I_O = 5\text{ mA to }1.0\text{ A}$ | | 12 | 100 | | |
| | | $I_O = 250\text{ mA to }750\text{ mA}$ | | 5 | 50 | | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.1 | 6.0 | mA | |
| ΔI_Q | Quiescent Current Change | $V_I = 15\text{ V to }30\text{ V}$, $T_J = +25^{\circ}\text{C}$ | | | 0.8 | mA | |
| | | $V_I = 14\text{ V to }27\text{ V}$, $I_O = 500\text{ mA}$ | | | 0.8 | | |
| | | $I_O = 5\text{ mA to }1.0\text{ A}$ | | | 0.5 | | |
| $\Delta V/\Delta T$ | Output Voltage Drift ⁽²⁸⁾ | $I_O = 5\text{ mA}$ | | -1.0 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 10 | | $\mu\text{V}/V_o$ | |
| RR | Ripple Rejection ⁽²⁸⁾ | $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$, $V_I = 14\text{ V to }24\text{ V}$ | | 60 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2.0 | | V | |
| R_O | Output Resistance ⁽²⁸⁾ | $f = 1\text{ kHz}$ | | 18 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽²⁸⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

27. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
28. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7815AE)

Refer to the test circuit, $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{ A}$, $V_I = 23\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|---------------------|--------------------------------------|--|--------------------------------------|------|------|------------------------|-----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 14.7 | 15.0 | 15.3 | V | |
| | | $I_O = 5\text{ mA to }1\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 17.7\text{ V to }30\text{ V}$ | 14.4 | 15.0 | 15.6 | | |
| Regline | Line Regulation ⁽²⁹⁾ | $V_I = 17.9\text{ V to }30\text{ V}$, $I_O = 500\text{ mA}$ | | 10 | 150 | mV | |
| | | $V_I = 20\text{ V to }26\text{ V}$ | | 5 | 150 | | |
| | | $T_J = +25^{\circ}\text{C}$ | $V_I = 17.5\text{ V to }30\text{ V}$ | | 11 | | 150 |
| | | | $V_I = 20\text{ V to }26\text{ V}$ | | 3 | | 75 |
| Regload | Load Regulation ⁽²⁹⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{ mA to }1.5\text{ A}$ | | 12 | 100 | mV | |
| | | $I_O = 5\text{ mA to }1.0\text{ A}$ | | 12 | 100 | | |
| | | $I_O = 250\text{ mA to }750\text{ mA}$ | | 5 | 50 | | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.2 | 6.0 | mA | |
| ΔI_Q | Quiescent Current Change | $V_I = 17.5\text{ V to }30\text{ V}$, $T_J = +25^{\circ}\text{C}$ | | | 0.8 | mA | |
| | | $V_I = 17.5\text{ V to }30\text{ V}$, $I_O = 500\text{ mA}$ | | | 0.8 | | |
| | | $I_O = 5\text{ mA to }1.0\text{ A}$ | | | 0.5 | | |
| $\Delta V/\Delta T$ | Output Voltage Drift ⁽³⁰⁾ | $I_O = 5\text{ mA}$ | | -1.0 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 10 | | $\mu\text{V}/V_O$ | |
| RR | Ripple Rejection ⁽³⁰⁾ | $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$, $V_I = 18.5\text{ V to }28.5\text{ V}$ | | 58 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2.0 | | V | |
| R_O | Output Resistance ⁽³⁰⁾ | $f = 1\text{ kHz}$ | | 19 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽³⁰⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

29. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
30. These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (KA7824AE)

Refer to the test circuit, $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{ A}$, $V_I = 33\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|---------------------|--------------------------------------|--|--------------------------------------|------|------|------------------------|-----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 23.5 | 24.0 | 24.5 | V | |
| | | $I_O = 5\text{ mA to }1\text{ A}$, $P_O \leq 15\text{ W}$, $V_I = 27.3\text{ V to }38\text{ V}$ | 23.0 | 24.0 | 25.0 | | |
| Regline | Line Regulation ⁽³¹⁾ | $V_I = 27\text{ V to }38\text{ V}$, $I_O = 500\text{ mA}$ | | 18 | 240 | mV | |
| | | $V_I = 21\text{ V to }33\text{ V}$ | | 6 | 240 | | |
| | | $T_J = +25^{\circ}\text{C}$ | $V_I = 26.7\text{ V to }38\text{ V}$ | | 18 | | 240 |
| | | | $V_I = 30\text{ V to }36\text{ V}$ | | 6 | | 120 |
| Regload | Load Regulation ⁽³¹⁾ | $T_J = +25^{\circ}\text{C}$, $I_O = 5\text{ mA to }1.5\text{ A}$ | | 15 | 100 | mV | |
| | | $I_O = 5\text{ mA to }1.0\text{ A}$ | | 15 | 100 | | |
| | | $I_O = 250\text{ mA to }750\text{ mA}$ | | 7 | 50 | | |
| I_Q | Quiescent Current | $T_J = +25^{\circ}\text{C}$ | | 5.2 | 6.0 | mA | |
| ΔI_Q | Quiescent Current Change | $V_I = 27.3\text{ V to }38\text{ V}$, $T_J = +25^{\circ}\text{C}$ | | | 0.8 | mA | |
| | | $V_I = 27.3\text{ V to }38\text{ V}$, $I_O = 500\text{ mA}$ | | | 0.8 | | |
| | | $I_O = 5\text{ mA to }1.0\text{ A}$ | | | 0.5 | | |
| $\Delta V/\Delta T$ | Output Voltage Drift ⁽³²⁾ | $I_O = 5\text{ mA}$ | | -1.5 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 10 | | $\mu\text{V}/V_o$ | |
| RR | Ripple Rejection ⁽³²⁾ | $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$, $V_I = 28\text{ V to }38\text{ V}$ | | 54 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2.0 | | V | |
| R_O | Output Resistance ⁽³²⁾ | $f = 1\text{ kHz}$ | | 20 | | m Ω | |
| I_{SC} | Short-Circuit Current | $V_I = 35\text{ V}$, $T_A = +25^{\circ}\text{C}$ | | 250 | | mA | |
| I_{PK} | Peak Current ⁽³²⁾ | $T_J = +25^{\circ}\text{C}$ | | 2.2 | | A | |

Notes:

31. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.
32. These parameters, although guaranteed, are not 100% tested in production.

Typical Performance Characteristics

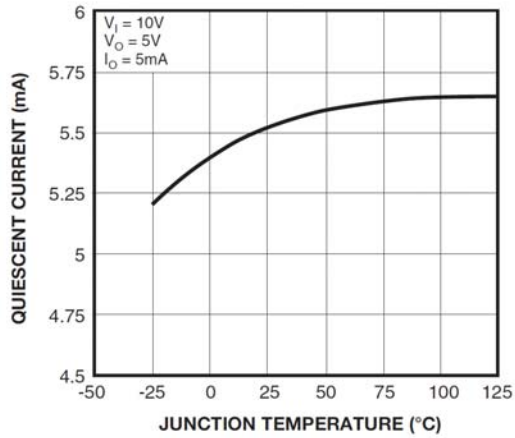


Figure 2. Quiescent Current

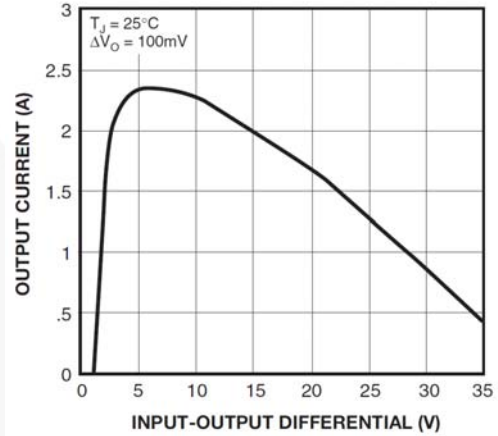


Figure 3. Peak Output Current

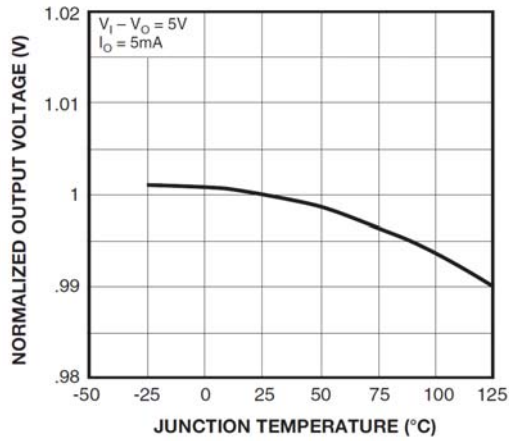


Figure 4. Output Voltage

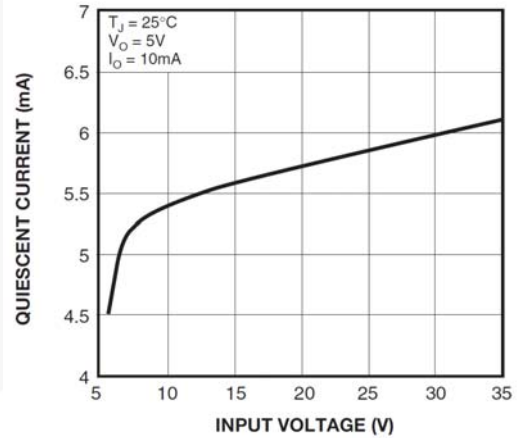


Figure 5. Quiescent Current

Typical Applications

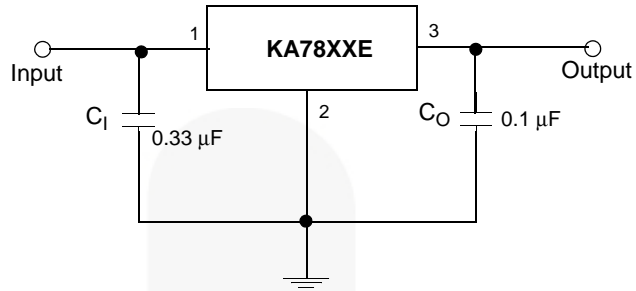


Figure 6. DC Parameters

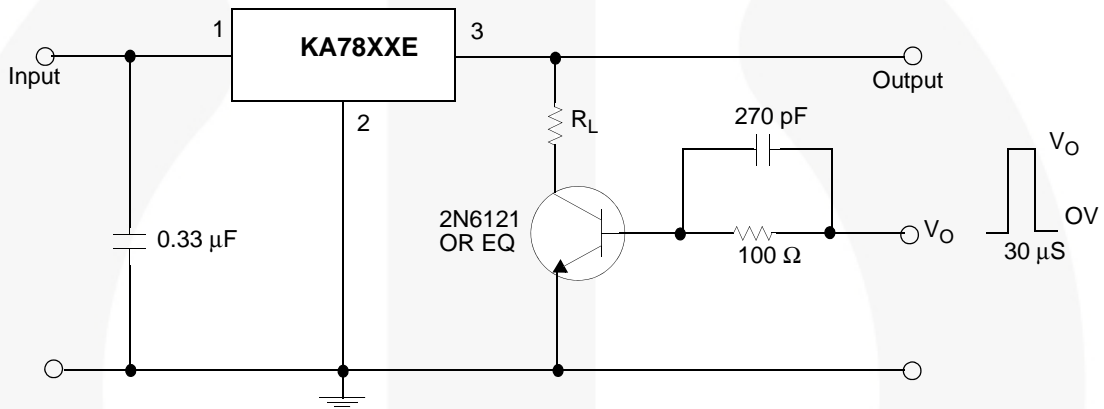


Figure 7. Load Regulation

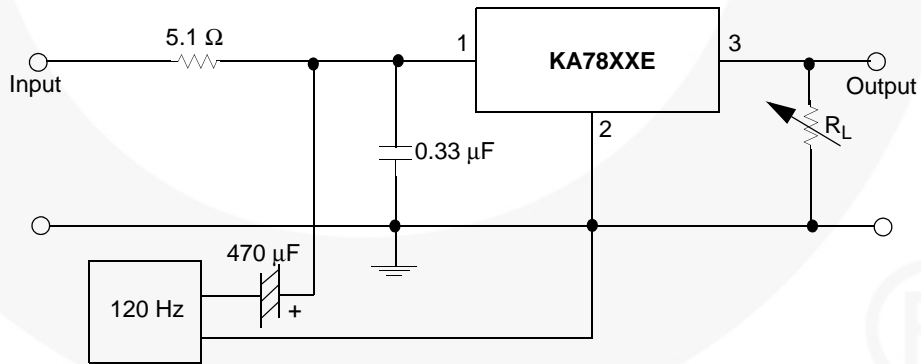


Figure 8. Ripple Rejection

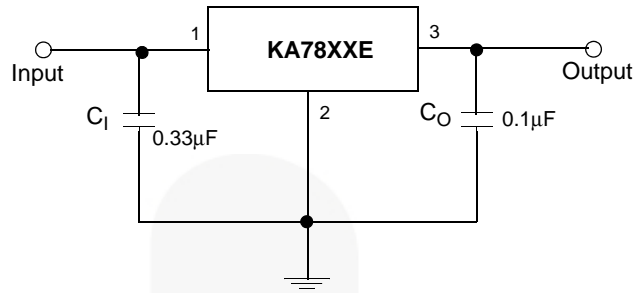


Figure 9. Fixed Output Regulator

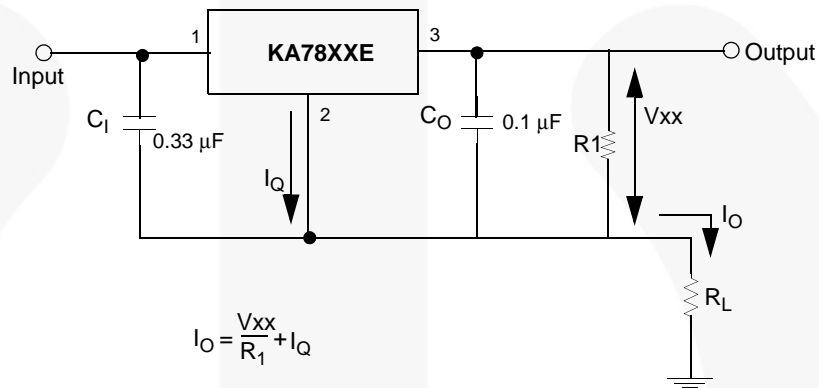
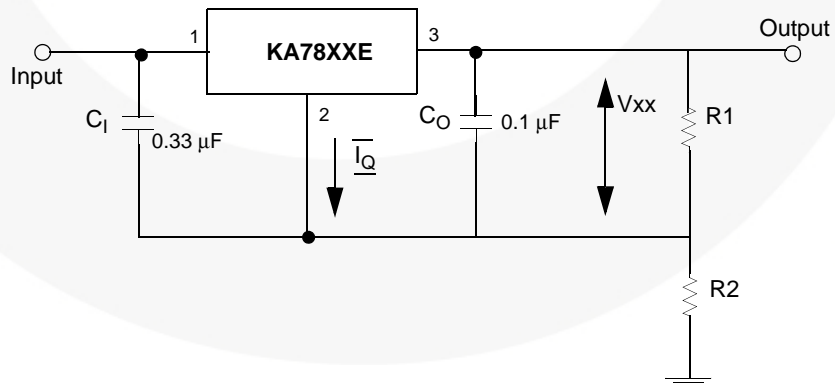


Figure 10. Constant Current Regulator

Notes:

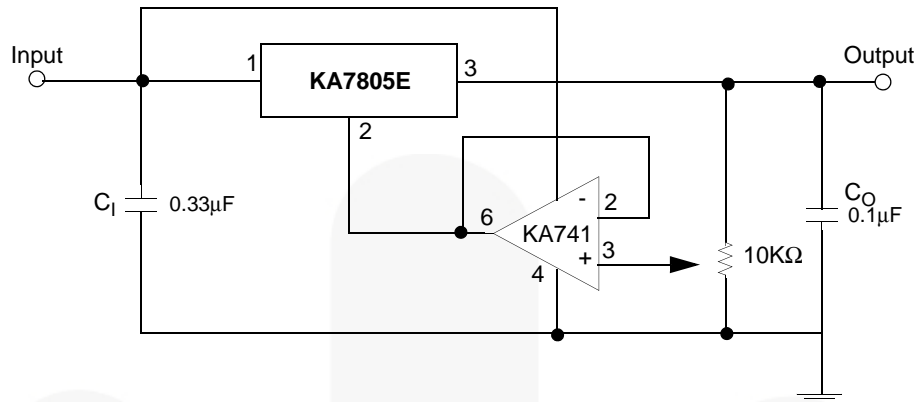
- 33. To specify an output voltage, substitute voltage value for “XX”. A common ground is required between the input and the output voltage. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.
- 34. C₁ is required if regulator is located an appreciable distance from power supply filter.
- 35. C₀ improves stability and transient response.



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

$$V_O = V_{XX}(1+R_2/R_1) + I_Q R_2$$

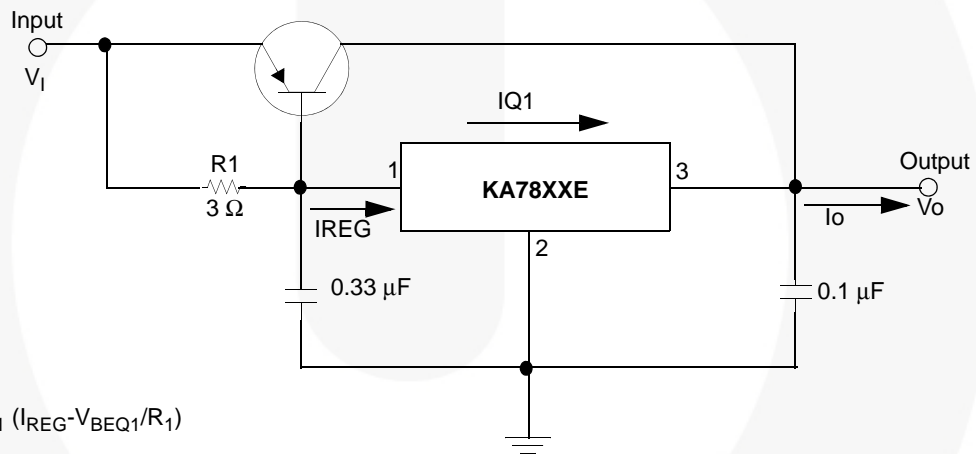
Figure 11. Circuit for Increasing Output Voltage



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

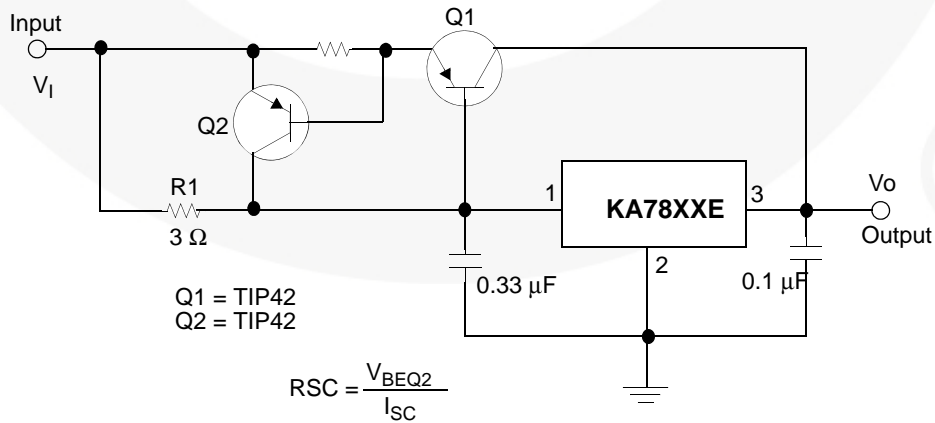
$$V_O = V_{XX}(1+R_2/R_1) + I_Q R_2$$

Figure 12. Adjustable Output Regulator (7 V to 30 V)



$$I_O = I_{REG} + B_{Q1} (I_{REG} - V_{BEQ1}/R_1)$$

Figure 13. High-Current Voltage Regulator



Q1 = TIP42
Q2 = TIP42

$$R_{SC} = \frac{V_{BEQ2}}{I_{SC}}$$

Figure 14. High Output Current with Short-Circuit Protection

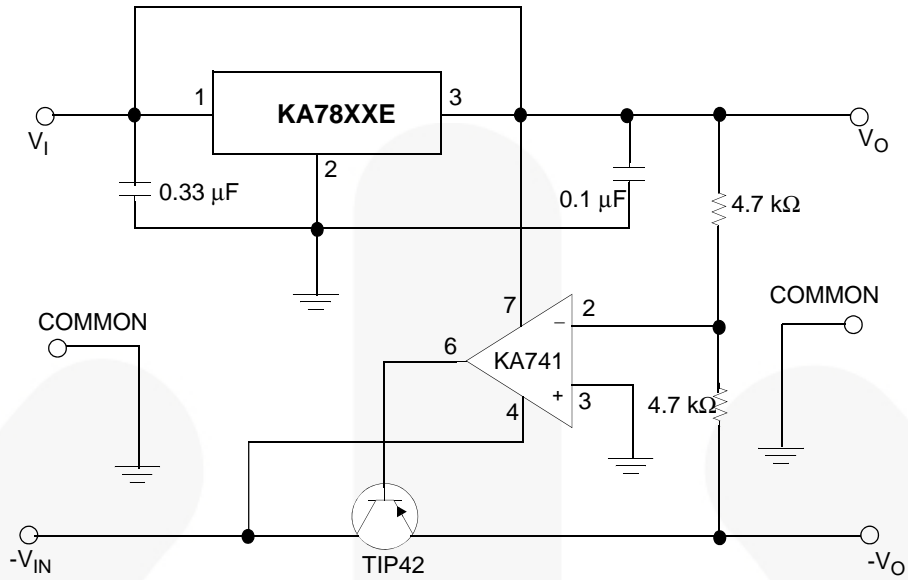


Figure 15. Tracking Voltage Regulator

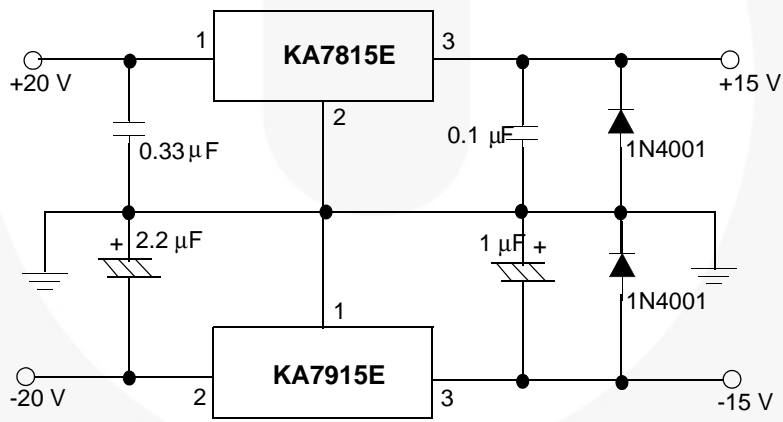


Figure 16. Split-Power Supply (± 15 V - 1 A)

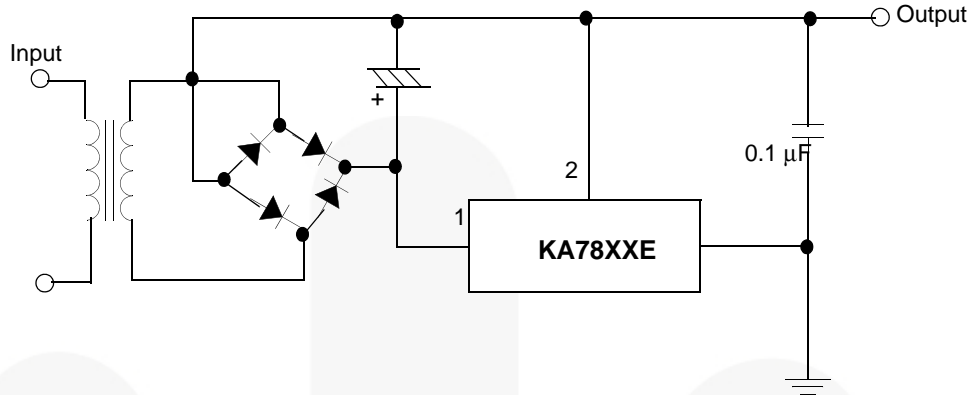


Figure 17. Negative Output Voltage Circuit

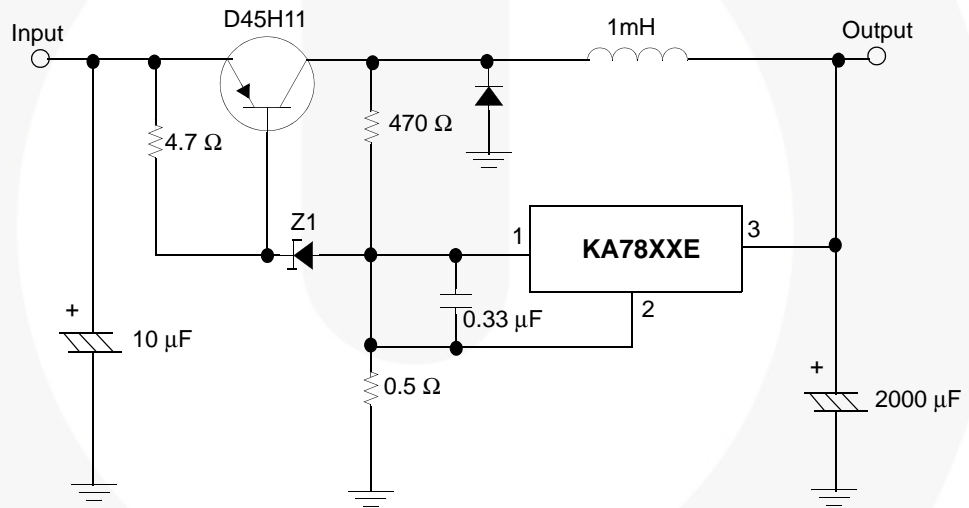


Figure 18. Switching Regulator

Physical Dimensions

TO-220 (DUAL GAUGE)

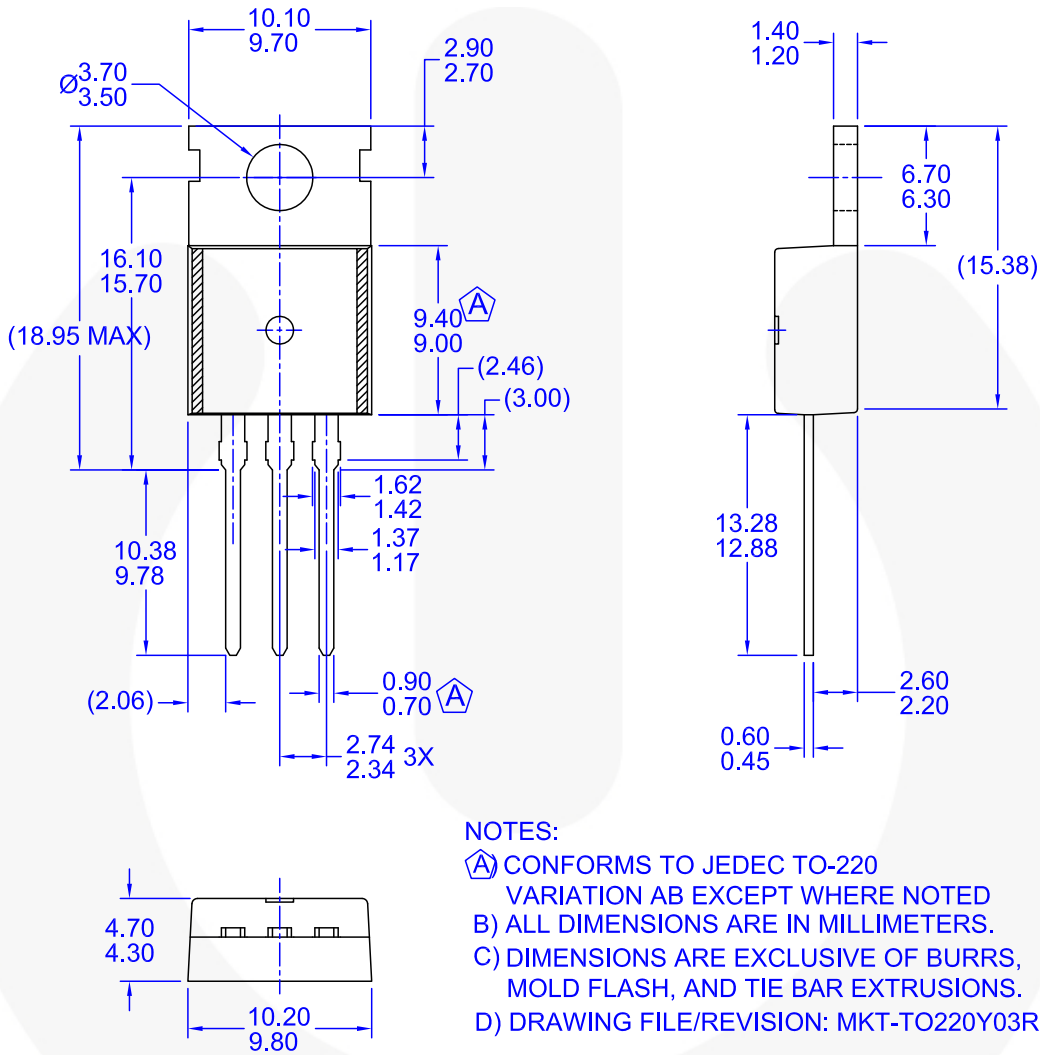


Figure 19. TO-220, MOLDED, 3-LEAD, NON-JEDEC, VARIATION AB (DUAL GAUGE)

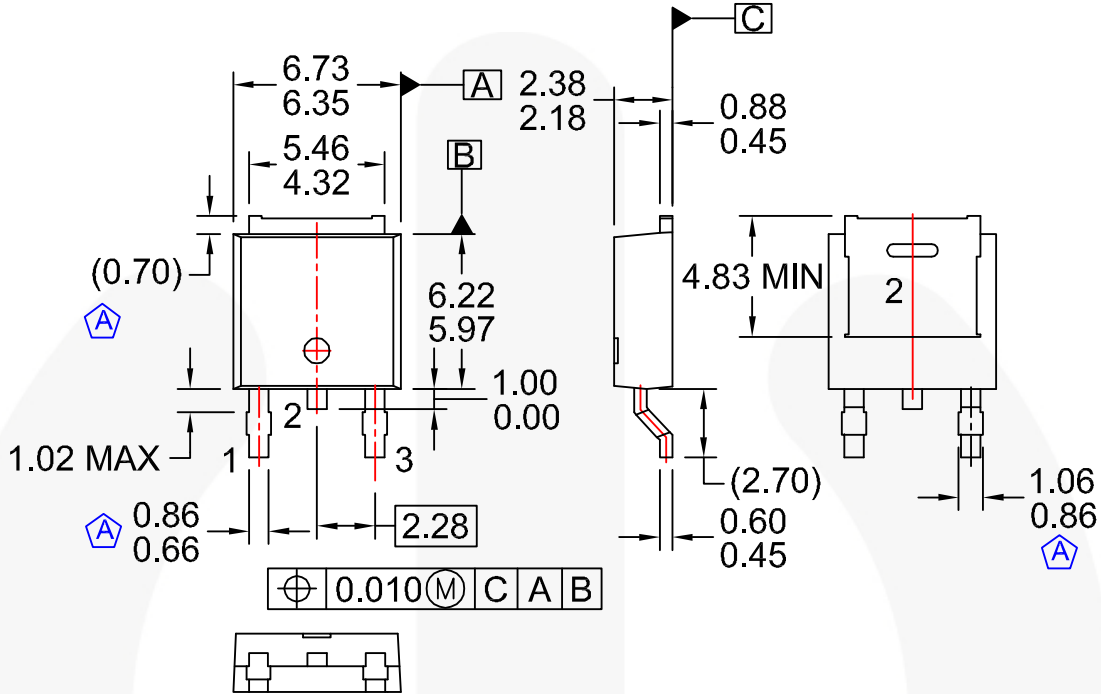
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Physical Dimensions

D-PAK



- NOTES: UNLESS OTHERWISE SPECIFIED
- A) CONFORMS TO JEDEC TO-252 VARIATION AB EXCEPT WHERE NOTED
 - B) ALL DIMENSIONS ARE IN MILLIMETERS.
 - C) DRAWING CONFORMS TO ASME Y14.5M-1994
 - D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
 - E) FORMERLY NAMED BD1733
 - F) DRAWING FILE NAME: MKT-TO252D03REV1

Figure 20. 3-LEAD, TO-252, JEDEC TO-252 VAR. AB, SURFACE MOUNT (DPAK)

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
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