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April 2015

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

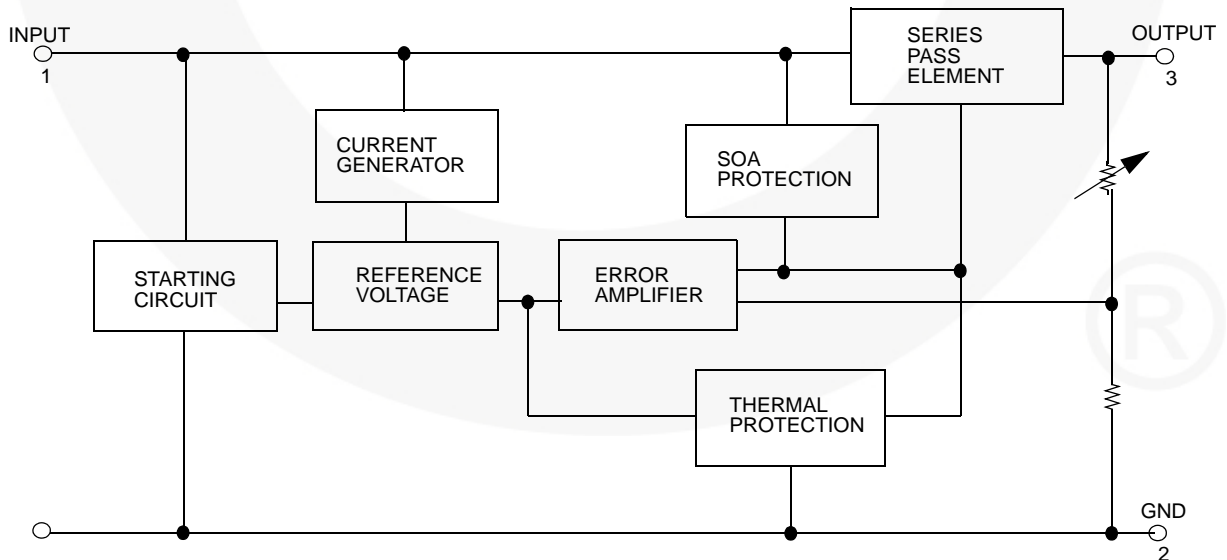


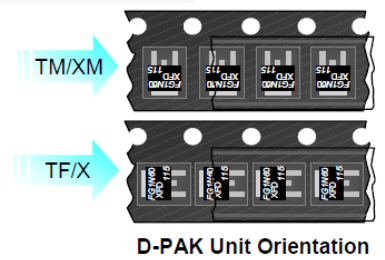
Figure 1. Block Diagram

Ordering Information

| Product Number | Output Voltage Tolerance ⁽¹⁾ | Package | Operating Temperature | Parking Method |
|----------------|---|----------------------|-----------------------|----------------|
| KA7805ETU | ±4% | TO-220 (Dual Gauge) | -40°C to +125°C | Rail |
| KA7806ETU | | | | |
| KA7808ETU | | | | |
| KA7809ETU | | | | |
| KA7810ETU | | | | |
| KA7812ETU | | | | |
| KA7815ETU | | | | |
| KA7818ETU | | | | |
| KA7824ETU | | | | |
| KA7805ERTF | | | | |
| KA7805ERTM | ±2% | D-PAK ⁽²⁾ | 0°C to +125°C | Tape and Reel |
| KA7808ERTM | | | | |
| KA7809ERTM | | | | |
| KA7812ERTM | | | | |
| KA7805AETU | ±2% | TO-220 (Dual Gauge) | 0°C to +125°C | Rail |
| KA7809AETU | | | | |
| KA7810AETU | | | | |
| KA7812AETU | | | | |
| KA7815AETU | | | | |
| KA7824AETU | | | | |

Notes:

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. Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted.

| 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-Case (TO-220) | 5 | $^\circ\text{C/W}$ | |
| $R_{\theta JA}$ | Thermal Resistance Junction-Air (TO-220) | 65 | $^\circ\text{C/W}$ | |
| T_{OPR} | Operating Temperature Range | KA78XXE / KA78XXER | -40 to +125 | $^\circ\text{C}$ |
| | | KA78XXAE | 0 to +125 | |
| T_{STG} | Storage Temperature Range | -65 to +150 | $^\circ\text{C}$ | |

Electrical Characteristics (KA7805E / KA7805ER)

Refer to test circuit, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 10 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, 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 | |
| | | $5.0 \text{ mA } I_O \text{ 1.0 A, } P_O \text{ 15 W, } V_I = 7 \text{ V to } 20 \text{ V}$ | 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 | 8 | 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 | | μV | |
| 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, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 11 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-----------------------|-------------------------------------|--|---|------|------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 5.75 | 6.00 | 6.25 | V | |
| | | 5.0 mA I_O 1.0 A, P_O 15 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 | 8 | 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 | | μV | |
| 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, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 14 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, 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 | | μV | |
| 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, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 15 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, unless otherwise specified.

| 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 | | μV | |
| 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, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{ mA}$, $V_I = 16\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, 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 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to } 100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 58 | | μV | |
| RR | Ripple Rejection ⁽¹²⁾ | $f = 120\text{ Hz}$, $V_I = 13\text{ V to } 23\text{ V}$ | 56 | 71 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽¹²⁾ | $f = 1\text{ kHz}$ | | 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 ⁽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, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500\text{ mA}$, $V_I = 19\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, 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 | 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 | | μV | |
| 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, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 23 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------|--------------------------------------|---|---|-------|-------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 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 | $I_O = 5 \text{ mA to } 1.0 \text{ A}$ | | | 0.5 | mA | |
| | | $V_I = 17.5 \text{ V to } 30 \text{ V}$ | | | 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 | | μV | |
| 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, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 27 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------|--------------------------------------|---|---|------|------|------------------------|----|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 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 | | μV | |
| 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, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 500 \text{ mA}$, $V_I = 33 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$, 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 | 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 | $f = 10 \text{ Hz to } 100 \text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 120 | | μV | |
| 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, $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$, $I_O = 1\text{ A}$, $V_I = 10\text{ V}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit | |
|---------------------|--------------------------------------|---|-------------------------------------|------|------|------------------------|------|
| V_O | Output Voltage | $T_J = +25^{\circ}\text{C}$ | 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 | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 42 | | μV | |
| 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 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 58 | | μV | |
| 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 | | 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 | 100 | mV | |
| | | $V_I = 13\text{ V to }20\text{ V}$ | | 4 | 50 | | |
| | | $T_J = +25^{\circ}\text{C}$ | $V_I = 12.5\text{ V to }25\text{ V}$ | | 8 | | 100 |
| | | | $V_I = 13\text{ V to }20\text{ V}$ | | 3 | | 50 |
| 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 | 6 | 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 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 58 | | μV | |
| RR | Ripple Rejection ⁽²⁶⁾ | $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$, $V_I = 14\text{ V to }24\text{ V}$ | | 62 | | dB | |
| V_{Drop} | Dropout Voltage | $I_O = 1\text{ A}$, $T_J = +25^{\circ}\text{C}$ | | 2 | | V | |
| R_O | Output Resistance ⁽²⁶⁾ | $f = 1\text{ kHz}$ | | 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 ⁽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 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 76 | | μV | |
| 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 | | 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 | | mV/ $^{\circ}\text{C}$ | |
| V_N | Output Noise Voltage | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 90 | | μV | |
| 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 | | 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 | $f = 10\text{ Hz to }100\text{ kHz}$, $T_A = +25^{\circ}\text{C}$ | | 120 | | μV | |
| 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 | | 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

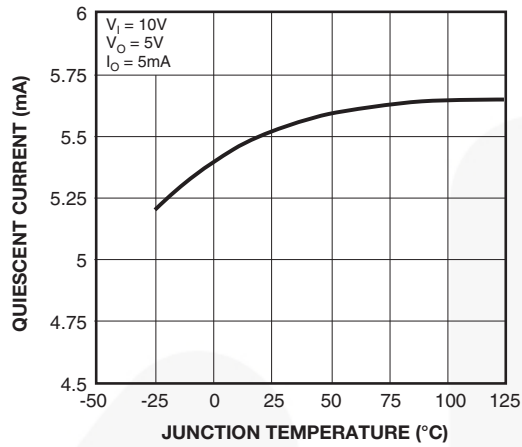


Figure 2. Quiescent Current

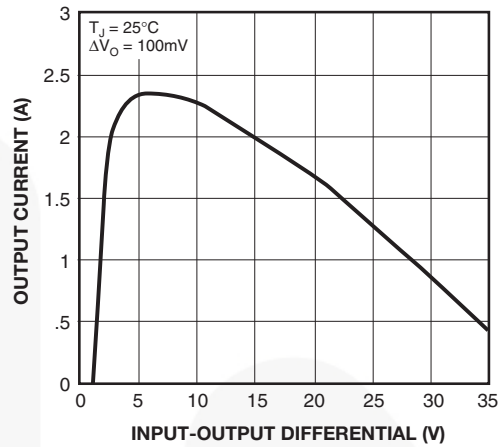


Figure 3. Peak Output Current

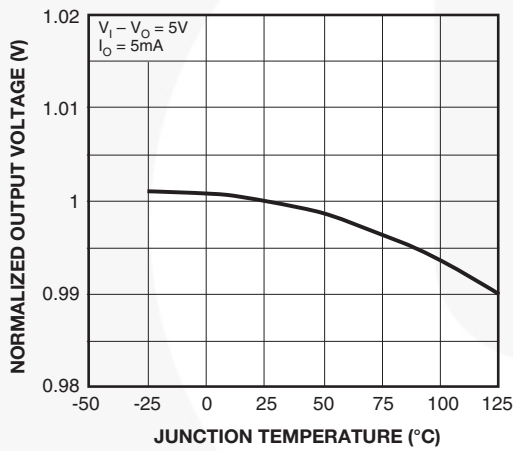


Figure 4. Output Voltage

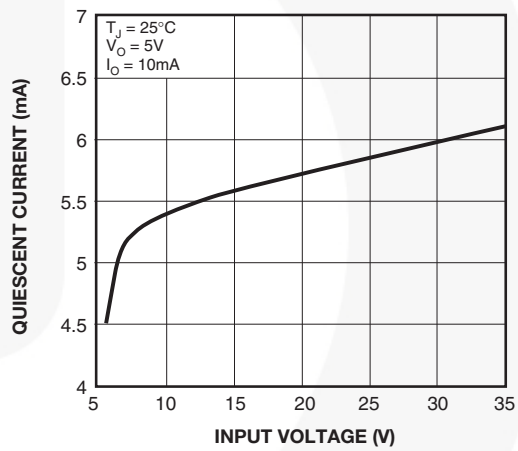


Figure 5. Quiescent Current

Typical Applications

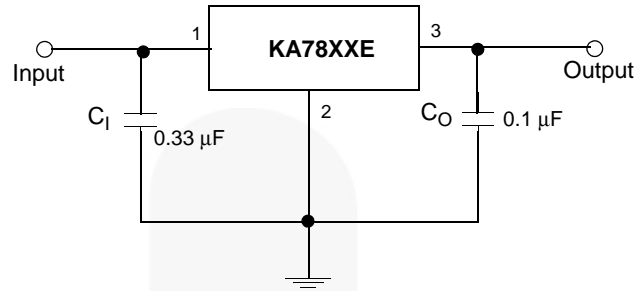


Figure 6. DC Parameters



Figure 7. Load Regulation

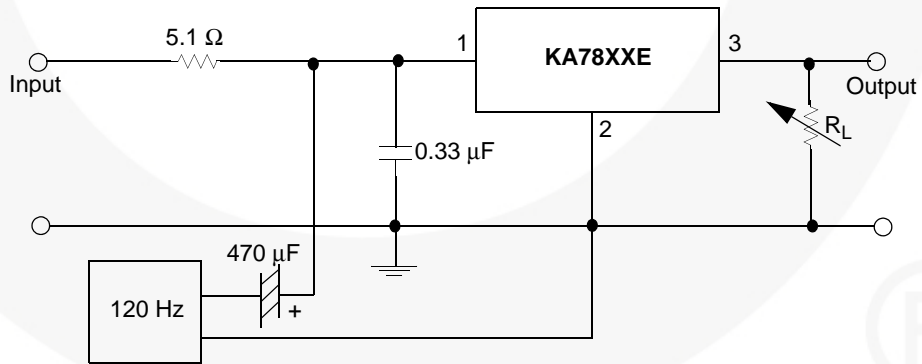


Figure 8. Ripple Rejection

Typical Applications (Continued)



Figure 9. Fixed Output Regulator

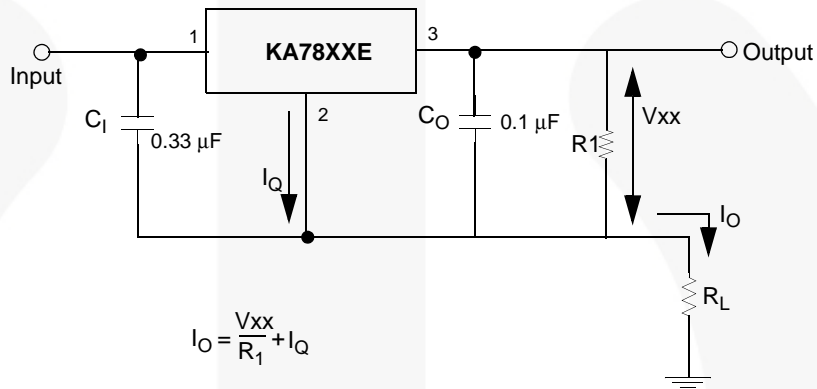
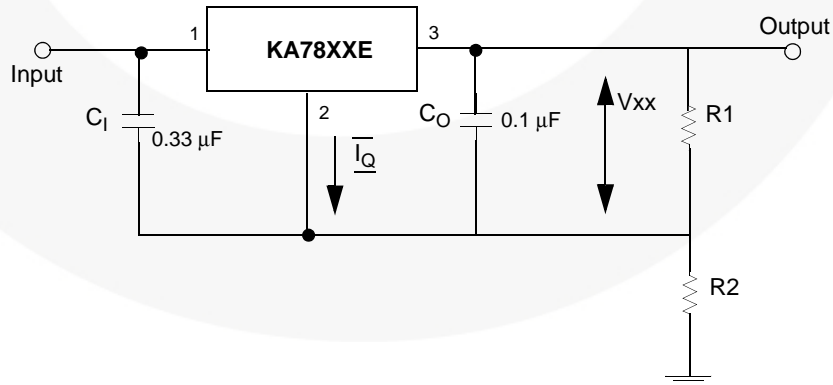


Figure 10. Constant Current Regulator

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. C_O improves stability and transient response.

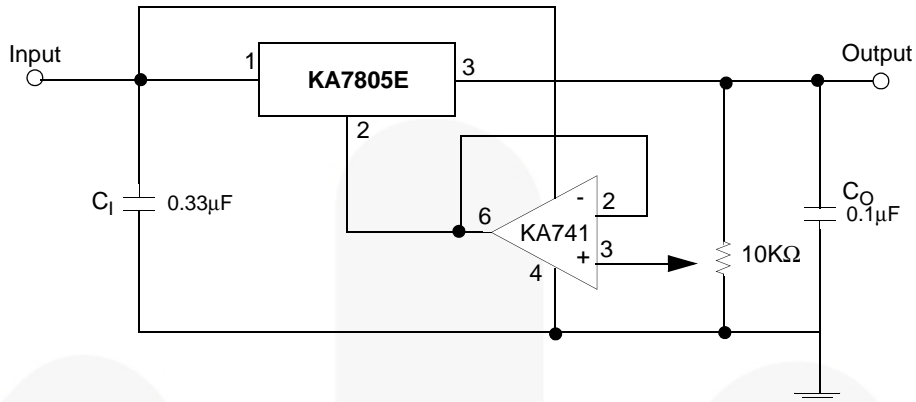


$$I_{R1} \geq 5I_Q$$

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

Figure 11. Circuit for Increasing Output Voltage

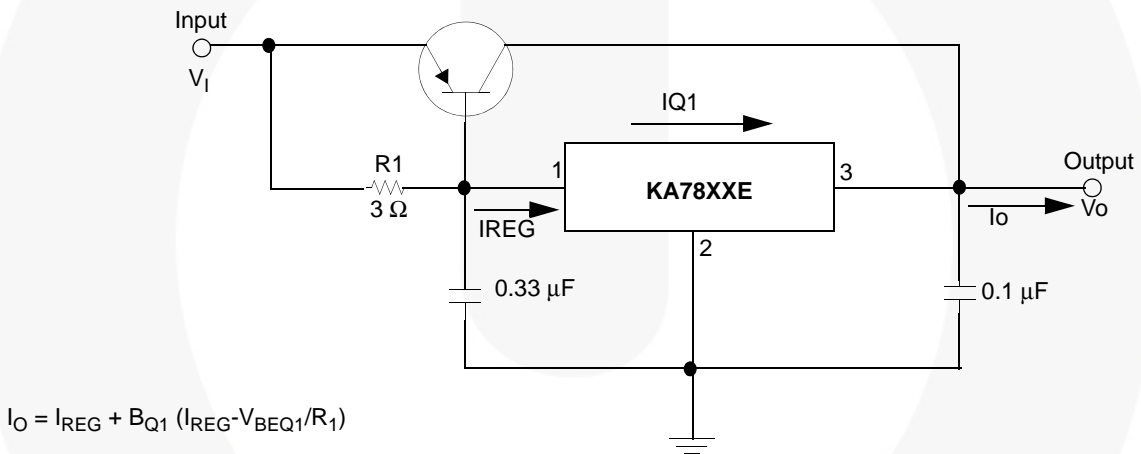
Typical Applications (Continued)



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

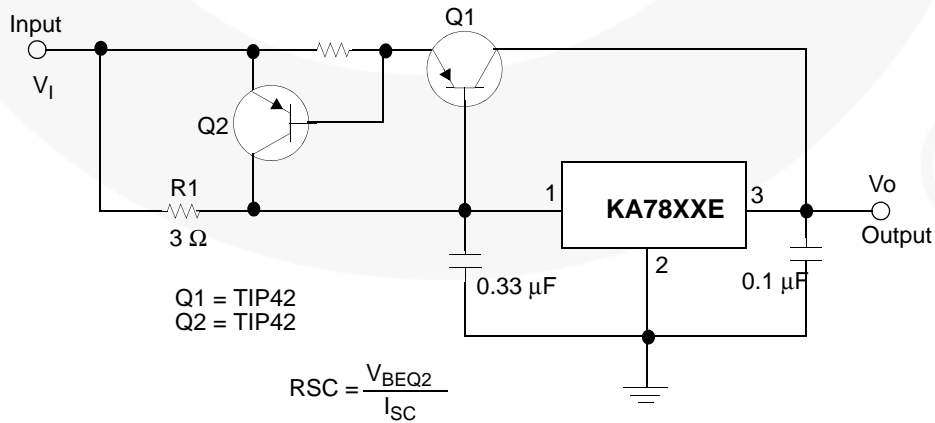
$$V_O = V_{XX}(1+R_2/R_1) + I_Q R_2$$

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

Typical Applications (Continued)



Figure 15. Tracking Voltage Regulator

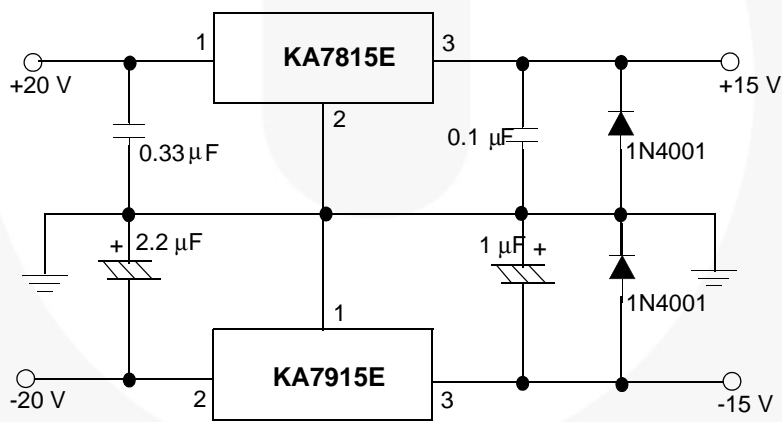


Figure 16. Split-Power Supply (± 15 V - 1 A)

Typical Applications (Continued)

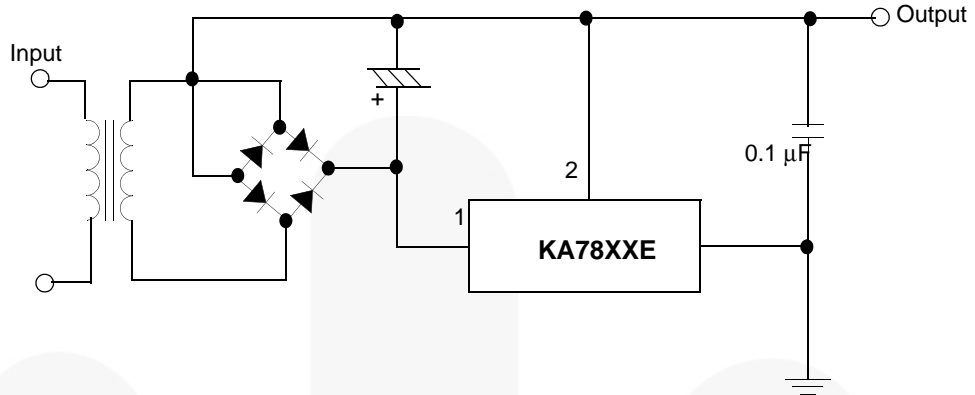


Figure 17. Negative Output Voltage Circuit

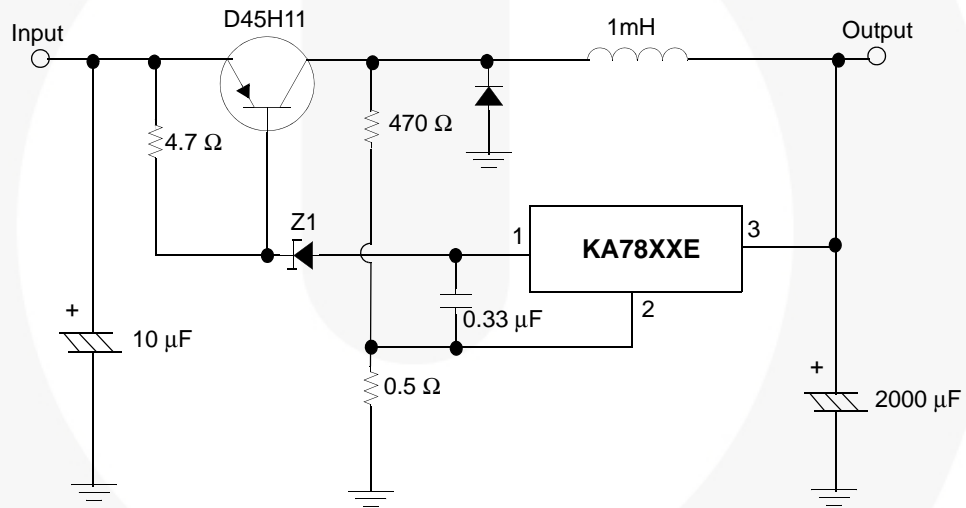


Figure 18. Switching Regulator

Physical Dimensions



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

Physical Dimensions (Continued)

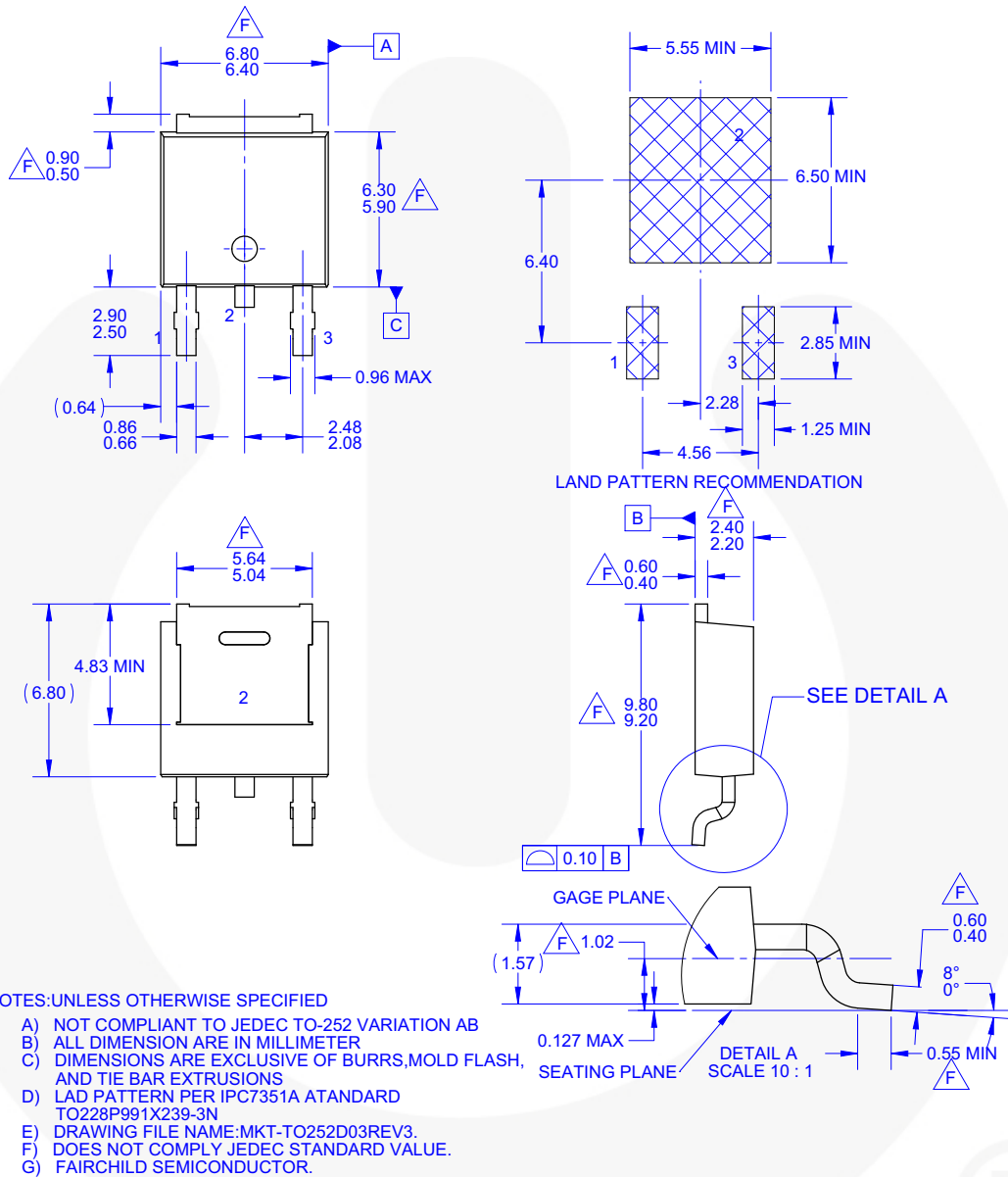







Figure 20. 3-LEAD, TO-252, NOT COMPLIANT TO JEDEC TO-252 VAR. AB, SURFACE MOUNT (DPAK)



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