

# KA78XX/KA78XXA

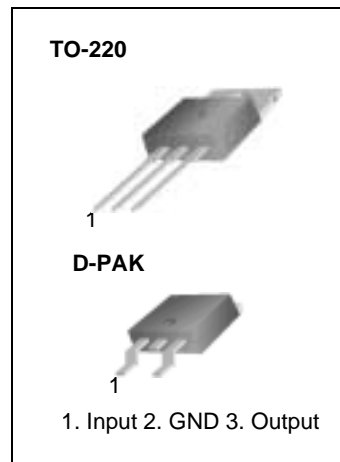
## 3-Terminal 1A Positive Voltage Regulator

### Features

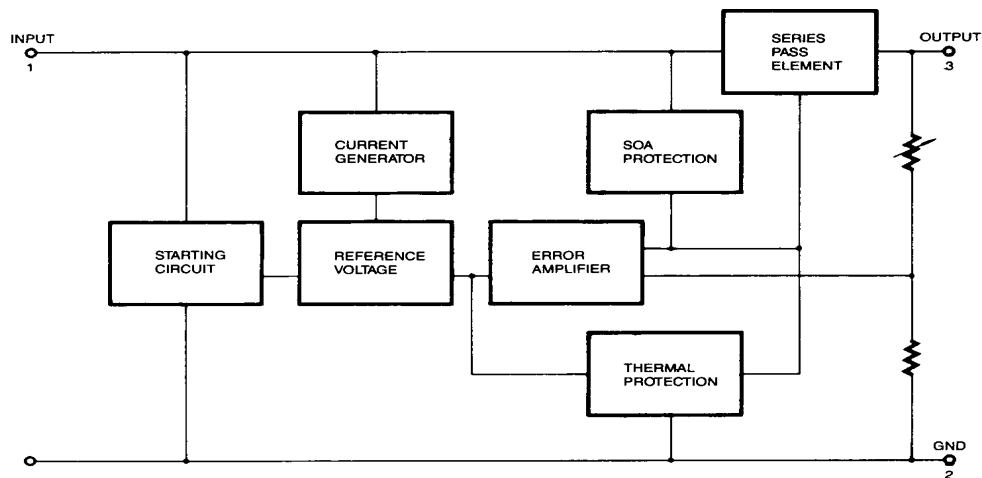
- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

### Description

The KA78XX/KA78XXA series of three-terminal positive regulator are available in the TO-220/D-PAK package and 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 protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.



### Internal Block Diagram



## Absolute Maximum Ratings

| Parameter  | Symbol          | Value      | Unit          |
|--|-----------------|------------|---------------|
| Input Voltage (for $V_O = 5V$ to $18V$ )<br>(for $V_O = 24V$ ) | $V_I$           | 35         | V             |
|  | $V_I$           | 40         | V             |
| Thermal Resistance Junction-Cases (TO-220)                     | $R_{\theta JC}$ | 5          | $^{\circ}C/W$ |
| Thermal Resistance Junction-Air (TO-220)                       | $R_{\theta JA}$ | 65         | $^{\circ}C/W$ |
| Operating Temperature Range (KA78XX/A/R)                       | $T_{OPR}$       | 0 ~ +125   | $^{\circ}C$   |
| Storage Temperature Range                                      | $T_{STG}$       | -65 ~ +150 | $^{\circ}C$   |

## Electrical Characteristics (KA7805/KA7805R)

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

| Parameter                | Symbol                  | Conditions   | KA7805                   |      |      | Unit            |    |
|--------------------------|-------------------------|--|--------------------------|------|------|-----------------|----|
|                          |                         |  | Min.                     | Typ. | Max. |                 |    |
| Output Voltage           | $V_O$                   | $T_J = +25^{\circ}C$   | 4.8                      | 5.0  | 5.2  | V               |    |
|                          |                         | $5.0mA \leq I_O \leq 1.0A$ , $P_O \leq 15W$<br>$V_I = 7V$ to $20V$ | 4.75                     | 5.0  | 5.25 |                 |    |
| Line Regulation (Note1)  | Regline                 | $T_J = +25^{\circ}C$   | $V_O = 7V$ to $25V$      | -    | 4.0  | 100             | mV |
|                          |                         |  | $V_I = 8V$ to $12V$      | -    | 1.6  | 50              |    |
| Load Regulation (Note1)  | Regload                 | $T_J = +25^{\circ}C$   | $I_O = 5.0mA$ to $1.5A$  | -    | 9    | 100             | mV |
|                          |                         |  | $I_O = 250mA$ to $750mA$ | -    | 4    | 50              |    |
| Quiescent Current        | $I_Q$                   | $T_J = +25^{\circ}C$   | -                        | 5.0  | 8.0  | mA              |    |
| Quiescent Current Change | $\Delta I_Q$            | $I_O = 5mA$ to $1.0A$  | -                        | 0.03 | 0.5  | mA              |    |
|                          |                         | $V_I = 7V$ to $25V$  | -                        | 0.3  | 1.3  |                 |    |
| Output Voltage Drift     | $\Delta V_O / \Delta T$ | $I_O = 5mA$  | -                        | -0.8 | -    | mV/ $^{\circ}C$ |    |
| Output Noise Voltage     | $V_N$                   | $f = 10Hz$ to $100KHz$ , $T_A = +25^{\circ}C$                      | -                        | 42   | -    | $\mu V / V_O$   |    |
| Ripple Rejection         | RR                      | $f = 120Hz$<br>$V_O = 8V$ to $18V$                                 | 62                       | 73   | -    | dB              |    |
| Dropout Voltage          | $V_{Drop}$              | $I_O = 1A$ , $T_J = +25^{\circ}C$                                  | -                        | 2    | -    | V               |    |
| Output Resistance        | $r_O$                   | $f = 1KHz$   | -                        | 15   | -    | m $\Omega$      |    |
| Short Circuit Current    | $I_{SC}$                | $V_I = 35V$ , $T_A = +25^{\circ}C$                                 | -                        | 230  | -    | mA              |    |
| Peak Current             | $I_{PK}$                | $T_J = +25^{\circ}C$   | -                        | 2.2  | -    | A               |    |

### Note:

1. 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.

## Electrical Characteristics (KA7806/KA7806R)

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

| Parameter                | Symbol                  | Conditions   | KA7806                                |      |      | Unit                      |    |
|--------------------------|-------------------------|--|---------------------------------------|------|------|---------------------------|----|
|                          |                         |  | Min.                                  | Typ. | Max. |                           |    |
| Output Voltage           | $V_O$                   | $T_J = +25^{\circ}\text{C}$  | 5.75                                  | 6.0  | 6.25 | V                         |    |
|                          |                         | $5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 8.0\text{V to } 21\text{V}$ | 5.7                                   | 6.0  | 6.3  |                           |    |
| Line Regulation (Note1)  | Regline                 | $T_J = +25^{\circ}\text{C}$  | $V_I = 8\text{V to } 25\text{V}$      | -    | 5    | 120                       | mV |
|                          |                         |  | $V_I = 9\text{V to } 13\text{V}$      | -    | 1.5  | 60                        |    |
| Load Regulation (Note1)  | Regload                 | $T_J = +25^{\circ}\text{C}$  | $I_O = 5\text{mA to } 1.5\text{A}$    | -    | 9    | 120                       | mV |
|                          |                         |  | $I_O = 250\text{mA to } 750\text{mA}$ | -    | 3    | 60                        |    |
| Quiescent Current        | $I_Q$                   | $T_J = +25^{\circ}\text{C}$  | -                                     | 5.0  | 8.0  | mA                        |    |
| Quiescent Current Change | $\Delta I_Q$            | $I_O = 5\text{mA to } 1\text{A}$   | -                                     | -    | 0.5  | mA                        |    |
|                          |                         | $V_I = 8\text{V to } 25\text{V}$   | -                                     | -    | 1.3  |                           |    |
| Output Voltage Drift     | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$   | -                                     | -0.8 | -    | mV/<br>$^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$                   | $f = 10\text{Hz to } 100\text{KHz}$ , $T_A = +25^{\circ}\text{C}$                                      | -                                     | 45   | -    | $\mu\text{V}/V_O$         |    |
| Ripple Rejection         | RR                      | $f = 120\text{Hz}$<br>$V_I = 9\text{V to } 19\text{V}$   | 59                                    | 75   | -    | dB                        |    |
| Dropout Voltage          | $V_{\text{Drop}}$       | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$  | -                                     | 2    | -    | V                         |    |
| Output Resistance        | $r_O$                   | $f = 1\text{KHz}$  | -                                     | 19   | -    | $\text{m}\Omega$          |    |
| Short Circuit Current    | $I_{\text{SC}}$         | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$   | -                                     | 250  | -    | mA                        |    |
| Peak Current             | $I_{\text{PK}}$         | $T_J = +25^{\circ}\text{C}$  | -                                     | 2.2  | -    | A                         |    |

### Note:

1. 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.

## Electrical Characteristics (KA7808/KA7808R)

(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)

| Parameter                | Symbol                  | Conditions  | KA7808                                |      |      | Unit                   |    |
|--------------------------|-------------------------|---|---------------------------------------|------|------|------------------------|----|
|                          |                         |   | Min.                                  | Typ. | Max. |                        |    |
| Output Voltage           | $V_O$                   | $T_J = +25^{\circ}\text{C}$   | 7.7                                   | 8.0  | 8.3  | V                      |    |
|                          |                         | $5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 10.5\text{V to } 23\text{V}$ | 7.6                                   | 8.0  | 8.4  |                        |    |
| Line Regulation (Note1)  | Regline                 | $T_J = +25^{\circ}\text{C}$   | $V_I = 10.5\text{V to } 25\text{V}$   | -    | 5.0  | 160                    | mV |
|                          |                         |   | $V_I = 11.5\text{V to } 17\text{V}$   | -    | 2.0  | 80                     |    |
| Load Regulation (Note1)  | Regload                 | $T_J = +25^{\circ}\text{C}$   | $I_O = 5.0\text{mA to } 1.5\text{A}$  | -    | 10   | 160                    | mV |
|                          |                         |   | $I_O = 250\text{mA to } 750\text{mA}$ | -    | 5.0  | 80                     |    |
| Quiescent Current        | $I_Q$                   | $T_J = +25^{\circ}\text{C}$   | -                                     | 5.0  | 8.0  | mA                     |    |
| Quiescent Current Change | $\Delta I_Q$            | $I_O = 5\text{mA to } 1.0\text{A}$  | -                                     | 0.05 | 0.5  | mA                     |    |
|                          |                         | $V_I = 10.5\text{V to } 25\text{V}$   | -                                     | 0.5  | 1.0  |                        |    |
| Output Voltage Drift     | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$  | -                                     | -0.8 | -    | mV/ $^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$                   | $f = 10\text{Hz to } 100\text{KHz}$ , $T_A = +25^{\circ}\text{C}$                                       | -                                     | 52   | -    | $\mu\text{V}/V_O$      |    |
| Ripple Rejection         | RR                      | $f = 120\text{Hz}$ , $V_I = 11.5\text{V to } 21.5\text{V}$  | 56                                    | 73   | -    | dB                     |    |
| Dropout Voltage          | $V_{\text{Drop}}$       | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                     | 2    | -    | V                      |    |
| Output Resistance        | $r_O$                   | $f = 1\text{KHz}$   | -                                     | 17   | -    | $\text{m}\Omega$       |    |
| Short Circuit Current    | ISC                     | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                     | 230  | -    | mA                     |    |
| Peak Current             | $I_{\text{PK}}$         | $T_J = +25^{\circ}\text{C}$   | -                                     | 2.2  | -    | A                      |    |

### Note:

1. 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.

## Electrical Characteristics (KA7809/KA7809R)

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

| Parameter                | Symbol                  | Conditions  | KA7809                                |      |      | Unit                   |    |
|--------------------------|-------------------------|---|---------------------------------------|------|------|------------------------|----|
|                          |                         |   | Min.                                  | Typ. | Max. |                        |    |
| Output Voltage           | $V_O$                   | $T_J = +25^{\circ}\text{C}$   | 8.65                                  | 9    | 9.35 | V                      |    |
|                          |                         | $5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 11.5\text{V to } 24\text{V}$ | 8.6                                   | 9    | 9.4  |                        |    |
| Line Regulation (Note1)  | Regline                 | $T_J = +25^{\circ}\text{C}$   | $V_I = 11.5\text{V to } 25\text{V}$   | -    | 6    | 180                    | mV |
|                          |                         |   | $V_I = 12\text{V to } 17\text{V}$     | -    | 2    | 90                     |    |
| Load Regulation (Note1)  | Regload                 | $T_J = +25^{\circ}\text{C}$   | $I_O = 5\text{mA to } 1.5\text{A}$    | -    | 12   | 180                    | mV |
|                          |                         |   | $I_O = 250\text{mA to } 750\text{mA}$ | -    | 4    | 90                     |    |
| Quiescent Current        | $I_Q$                   | $T_J = +25^{\circ}\text{C}$   | -                                     | 5.0  | 8.0  | mA                     |    |
| Quiescent Current Change | $\Delta I_Q$            | $I_O = 5\text{mA to } 1.0\text{A}$  | -                                     | -    | 0.5  | mA                     |    |
|                          |                         | $V_I = 11.5\text{V to } 26\text{V}$   | -                                     | -    | 1.3  |                        |    |
| Output Voltage Drift     | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$  | -                                     | -1   | -    | mV/ $^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$                   | $f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$                                       | -                                     | 58   | -    | $\mu\text{V}/V_O$      |    |
| Ripple Rejection         | RR                      | $f = 120\text{Hz}$<br>$V_I = 13\text{V to } 23\text{V}$   | 56                                    | 71   | -    | dB                     |    |
| Dropout Voltage          | $V_{\text{Drop}}$       | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                     | 2    | -    | V                      |    |
| Output Resistance        | $r_O$                   | $f = 1\text{kHz}$   | -                                     | 17   | -    | $\text{m}\Omega$       |    |
| Short Circuit Current    | $I_{\text{SC}}$         | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                     | 250  | -    | mA                     |    |
| Peak Current             | $I_{\text{PK}}$         | $T_J = +25^{\circ}\text{C}$   | -                                     | 2.2  | -    | A                      |    |

### Note:

1. 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.

## Electrical Characteristics (KA7810)

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

| Parameter                | Symbol                  | Conditions  | KA7810                                |      |      | Unit                   |    |
|--------------------------|-------------------------|---|---------------------------------------|------|------|------------------------|----|
|                          |                         |   | Min.                                  | Typ. | Max. |                        |    |
| Output Voltage           | $V_O$                   | $T_J = +25^{\circ}\text{C}$   | 9.6                                   | 10   | 10.4 | V                      |    |
|                          |                         | $5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 12.5\text{V to } 25\text{V}$ | 9.5                                   | 10   | 10.5 |                        |    |
| Line Regulation (Note1)  | Regline                 | $T_J = +25^{\circ}\text{C}$   | $V_I = 12.5\text{V to } 25\text{V}$   | -    | 10   | 200                    | mV |
|                          |                         |   | $V_I = 13\text{V to } 25\text{V}$     | -    | 3    | 100                    |    |
| Load Regulation (Note1)  | Regload                 | $T_J = +25^{\circ}\text{C}$   | $I_O = 5\text{mA to } 1.5\text{A}$    | -    | 12   | 200                    | mV |
|                          |                         |   | $I_O = 250\text{mA to } 750\text{mA}$ | -    | 4    | 400                    |    |
| Quiescent Current        | $I_Q$                   | $T_J = +25^{\circ}\text{C}$   | -                                     | 5.1  | 8.0  | mA                     |    |
| Quiescent Current Change | $\Delta I_Q$            | $I_O = 5\text{mA to } 1.0\text{A}$  | -                                     | -    | 0.5  | mA                     |    |
|                          |                         | $V_I = 12.5\text{V to } 29\text{V}$   | -                                     | -    | 1.0  |                        |    |
| Output Voltage Drift     | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$  | -                                     | -1   | -    | mV/ $^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$                   | $f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$                                       | -                                     | 58   | -    | $\mu\text{V}/V_O$      |    |
| Ripple Rejection         | RR                      | $f = 120\text{Hz}$<br>$V_I = 13\text{V to } 23\text{V}$   | 56                                    | 71   | -    | dB                     |    |
| Dropout Voltage          | $V_{\text{Drop}}$       | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                     | 2    | -    | V                      |    |
| Output Resistance        | $r_O$                   | $f = 1\text{kHz}$   | -                                     | 17   | -    | $\text{m}\Omega$       |    |
| Short Circuit Current    | $I_{\text{SC}}$         | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                     | 250  | -    | mA                     |    |
| Peak Current             | $I_{\text{PK}}$         | $T_J = +25^{\circ}\text{C}$   | -                                     | 2.2  | -    | A                      |    |

### Note:

1. 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.

## Electrical Characteristics (KA7812/KA7812R)

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

| Parameter                | Symbol                  | Conditions  | KA7812/KA7812R                        |      |      | Unit                   |    |
|--------------------------|-------------------------|---|---------------------------------------|------|------|------------------------|----|
|                          |                         |   | Min.                                  | Typ. | Max. |                        |    |
| Output Voltage           | $V_O$                   | $T_J = +25^{\circ}\text{C}$   | 11.5                                  | 12   | 12.5 | V                      |    |
|                          |                         | $5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 14.5\text{V to } 27\text{V}$ | 11.4                                  | 12   | 12.6 |                        |    |
| Line Regulation (Note1)  | Regline                 | $T_J = +25^{\circ}\text{C}$   | $V_I = 14.5\text{V to } 30\text{V}$   | -    | 10   | 240                    | mV |
|                          |                         |   | $V_I = 16\text{V to } 22\text{V}$     | -    | 3.0  | 120                    |    |
| Load Regulation (Note1)  | Regload                 | $T_J = +25^{\circ}\text{C}$   | $I_O = 5\text{mA to } 1.5\text{A}$    | -    | 11   | 240                    | mV |
|                          |                         |   | $I_O = 250\text{mA to } 750\text{mA}$ | -    | 5.0  | 120                    |    |
| Quiescent Current        | $I_Q$                   | $T_J = +25^{\circ}\text{C}$   | -                                     | 5.1  | 8.0  | mA                     |    |
| Quiescent Current Change | $\Delta I_Q$            | $I_O = 5\text{mA to } 1.0\text{A}$  | -                                     | 0.1  | 0.5  | mA                     |    |
|                          |                         | $V_I = 14.5\text{V to } 30\text{V}$   | -                                     | 0.5  | 1.0  |                        |    |
| Output Voltage Drift     | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$  | -                                     | -1   | -    | mV/ $^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$                   | $f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$                                       | -                                     | 76   | -    | $\mu\text{V}/V_O$      |    |
| Ripple Rejection         | RR                      | $f = 120\text{Hz}$<br>$V_I = 15\text{V to } 25\text{V}$   | 55                                    | 71   | -    | dB                     |    |
| Dropout Voltage          | $V_{\text{Drop}}$       | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                     | 2    | -    | V                      |    |
| Output Resistance        | $r_O$                   | $f = 1\text{kHz}$   | -                                     | 18   | -    | $\text{m}\Omega$       |    |
| Short Circuit Current    | $I_{\text{SC}}$         | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                     | 230  | -    | mA                     |    |
| Peak Current             | $I_{\text{PK}}$         | $T_J = +25^{\circ}\text{C}$   | -                                     | 2.2  | -    | A                      |    |

### Note:

1. 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.

## Electrical Characteristics (KA7815)

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

| Parameter                | Symbol                  | Conditions  | KA7815                                |      |       | Unit                   |    |
|--------------------------|-------------------------|---|---------------------------------------|------|-------|------------------------|----|
|                          |                         |   | Min.                                  | Typ. | Max.  |                        |    |
| Output Voltage           | $V_O$                   | $T_J = +25^{\circ}\text{C}$   | 14.4                                  | 15   | 15.6  | V                      |    |
|                          |                         | $5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 17.5\text{V to } 30\text{V}$ | 14.25                                 | 15   | 15.75 |                        |    |
| Line Regulation (Note1)  | Regline                 | $T_J = +25^{\circ}\text{C}$   | $V_I = 17.5\text{V to } 30\text{V}$   | -    | 11    | 300                    | mV |
|                          |                         |   | $V_I = 20\text{V to } 26\text{V}$     | -    | 3     | 150                    |    |
| Load Regulation (Note1)  | Regload                 | $T_J = +25^{\circ}\text{C}$   | $I_O = 5\text{mA to } 1.5\text{A}$    | -    | 12    | 300                    | mV |
|                          |                         |   | $I_O = 250\text{mA to } 750\text{mA}$ | -    | 4     | 150                    |    |
| Quiescent Current        | $I_Q$                   | $T_J = +25^{\circ}\text{C}$   | -                                     | 5.2  | 8.0   | mA                     |    |
| Quiescent Current Change | $\Delta I_Q$            | $I_O = 5\text{mA to } 1.0\text{A}$  | -                                     | -    | 0.5   | mA                     |    |
|                          |                         | $V_I = 17.5\text{V to } 30\text{V}$   | -                                     | -    | 1.0   |                        |    |
| Output Voltage Drift     | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$  | -                                     | -1   | -     | mV/ $^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$                   | $f = 10\text{Hz to } 100\text{KHz}$ , $T_A = +25^{\circ}\text{C}$                                       | -                                     | 90   | -     | $\mu\text{V}/V_O$      |    |
| Ripple Rejection         | RR                      | $f = 120\text{Hz}$<br>$V_I = 18.5\text{V to } 28.5\text{V}$   | 54                                    | 70   | -     | dB                     |    |
| Dropout Voltage          | $V_{\text{Drop}}$       | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                     | 2    | -     | V                      |    |
| Output Resistance        | $r_O$                   | $f = 1\text{KHz}$   | -                                     | 19   | -     | $\text{m}\Omega$       |    |
| Short Circuit Current    | $I_{\text{SC}}$         | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                     | 250  | -     | mA                     |    |
| Peak Current             | $I_{\text{PK}}$         | $T_J = +25^{\circ}\text{C}$   | -                                     | 2.2  | -     | A                      |    |

### Note:

1. 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.



## Electrical Characteristics (KA7818)

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

| Parameter                | Symbol                  | Conditions  |                                       | KA7818 |      |      | Unit                   |
|--------------------------|-------------------------|---|---------------------------------------|--------|------|------|------------------------|
|                          |                         |   |                                       | Min.   | Typ. | Max. |                        |
| Output Voltage           | $V_O$                   | $T_J = +25^{\circ}\text{C}$   |                                       | 17.3   | 18   | 18.7 | V                      |
|                          |                         | $5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 21\text{V to } 33\text{V}$ |                                       | 17.1   | 18   | 18.9 |                        |
| Line Regulation (Note1)  | Regline                 | $T_J = +25^{\circ}\text{C}$   | $V_I = 21\text{V to } 33\text{V}$     | -      | 15   | 360  | mV                     |
|                          |                         |   | $V_I = 24\text{V to } 30\text{V}$     | -      | 5    | 180  |                        |
| Load Regulation (Note1)  | Regload                 | $T_J = +25^{\circ}\text{C}$   | $I_O = 5\text{mA to } 1.5\text{A}$    | -      | 15   | 360  | mV                     |
|                          |                         |   | $I_O = 250\text{mA to } 750\text{mA}$ | -      | 5.0  | 180  |                        |
| Quiescent Current        | $I_Q$                   | $T_J = +25^{\circ}\text{C}$   |                                       | -      | 5.2  | 8.0  | mA                     |
| Quiescent Current Change | $\Delta I_Q$            | $I_O = 5\text{mA to } 1.0\text{A}$  |                                       | -      | -    | 0.5  | mA                     |
|                          |                         | $V_I = 21\text{V to } 33\text{V}$   |                                       | -      | -    | 1    |                        |
| Output Voltage Drift     | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$  |                                       | -      | -1   | -    | mV/ $^{\circ}\text{C}$ |
| Output Noise Voltage     | $V_N$                   | $f = 10\text{Hz to } 100\text{kHz}$ , $T_A = +25^{\circ}\text{C}$                                     |                                       | -      | 110  | -    | $\mu\text{V}/V_O$      |
| Ripple Rejection         | RR                      | $f = 120\text{Hz}$<br>$V_I = 22\text{V to } 32\text{V}$   |                                       | 53     | 69   | -    | dB                     |
| Dropout Voltage          | $V_{\text{Drop}}$       | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   |                                       | -      | 2    | -    | V                      |
| Output Resistance        | $r_O$                   | $f = 1\text{kHz}$   |                                       | -      | 22   | -    | $\text{m}\Omega$       |
| Short Circuit Current    | $I_{\text{SC}}$         | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  |                                       | -      | 250  | -    | mA                     |
| Peak Current             | $I_{\text{PK}}$         | $T_J = +25^{\circ}\text{C}$   |                                       | -      | 2.2  | -    | A                      |

### Note:

1. 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.

## Electrical Characteristics (KA7824)

(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)

| Parameter                | Symbol                  | Conditions  | KA7824                                |      |       | Unit                      |    |
|--------------------------|-------------------------|---|---------------------------------------|------|-------|---------------------------|----|
|                          |                         |   | Min.                                  | Typ. | Max.  |                           |    |
| Output Voltage           | $V_O$                   | $T_J = +25^{\circ}\text{C}$   | 23                                    | 24   | 25    | V                         |    |
|                          |                         | $5.0\text{mA} \leq I_O \leq 1.0\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 27\text{V to } 38\text{V}$ | 22.8                                  | 24   | 25.25 |                           |    |
| Line Regulation (Note1)  | Regline                 | $T_J = +25^{\circ}\text{C}$   | $V_I = 27\text{V to } 38\text{V}$     | -    | 17    | 480                       | mV |
|                          |                         |   | $V_I = 30\text{V to } 36\text{V}$     | -    | 6     | 240                       |    |
| Load Regulation (Note1)  | Regload                 | $T_J = +25^{\circ}\text{C}$   | $I_O = 5\text{mA to } 1.5\text{A}$    | -    | 15    | 480                       | mV |
|                          |                         |   | $I_O = 250\text{mA to } 750\text{mA}$ | -    | 5.0   | 240                       |    |
| Quiescent Current        | $I_Q$                   | $T_J = +25^{\circ}\text{C}$   | -                                     | 5.2  | 8.0   | mA                        |    |
| Quiescent Current Change | $\Delta I_Q$            | $I_O = 5\text{mA to } 1.0\text{A}$  | -                                     | 0.1  | 0.5   | mA                        |    |
|                          |                         | $V_I = 27\text{V to } 38\text{V}$   | -                                     | 0.5  | 1     |                           |    |
| Output Voltage Drift     | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$  | -                                     | -1.5 | -     | mV/<br>$^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$                   | $f = 10\text{Hz to } 100\text{KHz}$ , $T_A = +25^{\circ}\text{C}$                                     | -                                     | 60   | -     | $\mu\text{V}/V_O$         |    |
| Ripple Rejection         | RR                      | $f = 120\text{Hz}$<br>$V_I = 28\text{V to } 38\text{V}$   | 50                                    | 67   | -     | dB                        |    |
| Dropout Voltage          | $V_{\text{Drop}}$       | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                     | 2    | -     | V                         |    |
| Output Resistance        | $r_O$                   | $f = 1\text{KHz}$   | -                                     | 28   | -     | $\text{m}\Omega$          |    |
| Short Circuit Current    | $I_{\text{SC}}$         | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                     | 230  | -     | mA                        |    |
| Peak Current             | $I_{\text{PK}}$         | $T_J = +25^{\circ}\text{C}$   | -                                     | 2.2  | -     | A                         |    |

### Note:

1. 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.

## Electrical Characteristics (KA7805A)

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

| Parameter                | Symbol              | Conditions   | Min.   | Typ. | Max.     | Unit                   |
|--------------------------|---------------------|--|--|------|----------|------------------------|
| Output Voltage           | $V_O$               | $T_J = +25^{\circ}\text{C}$  | 4.9  | 5    | 5.1      | V                      |
|                          |                     | $I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 7.5\text{V to } 20\text{V}$ | 4.8  | 5    | 5.2      |                        |
| Line Regulation (Note1)  | Regline             | $V_I = 7.5\text{V to } 25\text{V}$<br>$I_O = 500\text{mA}$                                     | -  | 5    | 50       | mV                     |
|                          |                     | $V_I = 8\text{V to } 12\text{V}$   | -  | 3    | 50       |                        |
|                          |                     | $T_J = +25^{\circ}\text{C}$  | $V_I = 7.3\text{V to } 20\text{V}$<br>$V_I = 8\text{V to } 12\text{V}$ | -    | 5<br>1.5 |                        |
| Load Regulation (Note1)  | Regload             | $T_J = +25^{\circ}\text{C}$<br>$I_O = 5\text{mA to } 1.5\text{A}$                              | -  | 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       |                        |
| Quiescent Current        | $I_Q$               | $T_J = +25^{\circ}\text{C}$  | -  | 5.0  | 6.0      | mA                     |
| Quiescent Current Change | $\Delta I_Q$        | $I_O = 5\text{mA to } 1\text{A}$   | -  | -    | 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      |                        |
| Output Voltage Drift     | $\Delta V/\Delta T$ | $I_O = 5\text{mA}$   | -  | -0.8 | -        | mV/ $^{\circ}\text{C}$ |
| Output Noise Voltage     | $V_N$               | $f = 10\text{Hz to } 100\text{KHz}$<br>$T_A = +25^{\circ}\text{C}$                             | -  | 10   | -        | $\mu\text{V}/V_O$      |
| Ripple Rejection         | RR                  | $f = 120\text{Hz}$ , $I_O = 500\text{mA}$<br>$V_I = 8\text{V to } 18\text{V}$                  | -  | 68   | -        | dB                     |
| Dropout Voltage          | $V_{\text{Drop}}$   | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$  | -  | 2    | -        | V                      |
| Output Resistance        | $r_O$               | $f = 1\text{KHz}$  | -  | 17   | -        | $\text{m}\Omega$       |
| Short Circuit Current    | $I_{\text{SC}}$     | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$   | -  | 250  | -        | mA                     |
| Peak Current             | $I_{\text{PK}}$     | $T_J = +25^{\circ}\text{C}$  | -  | 2.2  | -        | A                      |

### Note:

1. 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.

## Electrical Characteristics (KA7806A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 11\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

| Parameter                | Symbol              | Conditions   | Min.                               | Typ. | Max. | Unit                   |    |
|--------------------------|---------------------|--|------------------------------------|------|------|------------------------|----|
| Output Voltage           | $V_O$               | $T_J = +25^{\circ}\text{C}$  | 5.58                               | 6    | 6.12 | V                      |    |
|                          |                     | $I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 8.6\text{V to } 21\text{V}$ | 5.76                               | 6    | 6.24 |                        |    |
| Line Regulation (Note1)  | Regline             | $V_I = 8.6\text{V to } 25\text{V}$<br>$I_O = 500\text{mA}$                                     | -                                  | 5    | 60   | mV                     |    |
|                          |                     | $V_I = 9\text{V to } 13\text{V}$   | -                                  | 3    | 60   |                        |    |
|                          |                     | $T_J = +25^{\circ}\text{C}$  | $V_I = 8.3\text{V to } 21\text{V}$ | -    | 5    |                        | 60 |
|                          |                     |  | $V_I = 9\text{V to } 13\text{V}$   | -    | 1.5  |                        | 30 |
| Load Regulation (Note1)  | Regload             | $T_J = +25^{\circ}\text{C}$<br>$I_O = 5\text{mA to } 1.5\text{A}$                              | -                                  | 9    | 100  | mV                     |    |
|                          |                     | $I_O = 5\text{mA to } 1\text{A}$   | -                                  | 4    | 100  |                        |    |
|                          |                     | $I_O = 250\text{mA to } 750\text{mA}$  | -                                  | 5.0  | 50   |                        |    |
| Quiescent Current        | $I_Q$               | $T_J = +25^{\circ}\text{C}$  | -                                  | 4.3  | 6.0  | mA                     |    |
| Quiescent Current Change | $\Delta I_Q$        | $I_O = 5\text{mA to } 1\text{A}$   | -                                  | -    | 0.5  | mA                     |    |
|                          |                     | $V_I = 9\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$  | -                                  | -    | 0.8  |                        |    |
|                          |                     | $V_I = 8.5\text{V to } 21\text{V}$ , $T_J = +25^{\circ}\text{C}$                               | -                                  | -    | 0.8  |                        |    |
| Output Voltage Drift     | $\Delta V/\Delta T$ | $I_O = 5\text{mA}$   | -                                  | -0.8 | -    | mV/ $^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$               | $f = 10\text{Hz to } 100\text{KHz}$<br>$T_A = +25^{\circ}\text{C}$                             | -                                  | 10   | -    | $\mu\text{V}/V_O$      |    |
| Ripple Rejection         | RR                  | $f = 120\text{Hz}$ , $I_O = 500\text{mA}$<br>$V_I = 9\text{V to } 19\text{V}$                  | -                                  | 65   | -    | dB                     |    |
| Dropout Voltage          | $V_{\text{Drop}}$   | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$  | -                                  | 2    | -    | V                      |    |
| Output Resistance        | $r_O$               | $f = 1\text{KHz}$  | -                                  | 17   | -    | $\text{m}\Omega$       |    |
| Short Circuit Current    | $I_{\text{SC}}$     | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$   | -                                  | 250  | -    | mA                     |    |
| Peak Current             | $I_{\text{PK}}$     | $T_J = +25^{\circ}\text{C}$  | -                                  | 2.2  | -    | A                      |    |

### Note:

1. 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.

## Electrical Characteristics (KA7808A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 14\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

| Parameter                | Symbol              | Conditions  | Min.                                 | Typ. | Max. | Unit                   |    |
|--------------------------|---------------------|---|--------------------------------------|------|------|------------------------|----|
| Output Voltage           | $V_O$               | $T_J = +25^{\circ}\text{C}$   | 7.84                                 | 8    | 8.16 | V                      |    |
|                          |                     | $I_O = 5\text{mA}$ to $1\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 10.6\text{V}$ to $23\text{V}$ | 7.7                                  | 8    | 8.3  |                        |    |
| Line Regulation (Note1)  | Regline             | $V_I = 10.6\text{V}$ to $25\text{V}$<br>$I_O = 500\text{mA}$                                      | -                                    | 6    | 80   | mV                     |    |
|                          |                     | $V_I = 11\text{V}$ to $17\text{V}$  | -                                    | 3    | 80   |                        |    |
|                          |                     | $T_J = +25^{\circ}\text{C}$   | $V_I = 10.4\text{V}$ to $23\text{V}$ | -    | 6    |                        | 80 |
|                          |                     |   | $V_I = 11\text{V}$ to $17\text{V}$   | -    | 2    |                        | 40 |
| Load Regulation (Note1)  | Regload             | $T_J = +25^{\circ}\text{C}$<br>$I_O = 5\text{mA}$ to $1.5\text{A}$                                | -                                    | 12   | 100  | mV                     |    |
|                          |                     | $I_O = 5\text{mA}$ to $1\text{A}$   | -                                    | 12   | 100  |                        |    |
|                          |                     | $I_O = 250\text{mA}$ to $750\text{mA}$  | -                                    | 5    | 50   |                        |    |
| Quiescent Current        | $I_Q$               | $T_J = +25^{\circ}\text{C}$   | -                                    | 5.0  | 6.0  | mA                     |    |
| Quiescent Current Change | $\Delta I_Q$        | $I_O = 5\text{mA}$ to $1\text{A}$   | -                                    | -    | 0.5  | mA                     |    |
|                          |                     | $V_I = 11\text{V}$ to $25\text{V}$ , $I_O = 500\text{mA}$   | -                                    | -    | 0.8  |                        |    |
|                          |                     | $V_I = 10.6\text{V}$ to $23\text{V}$ , $T_J = +25^{\circ}\text{C}$                                | -                                    | -    | 0.8  |                        |    |
| Output Voltage Drift     | $\Delta V/\Delta T$ | $I_O = 5\text{mA}$  | -                                    | -0.8 | -    | mV/ $^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$               | $f = 10\text{Hz}$ to $100\text{KHz}$<br>$T_A = +25^{\circ}\text{C}$                               | -                                    | 10   | -    | $\mu\text{V}/V_O$      |    |
| Ripple Rejection         | RR                  | $f = 120\text{Hz}$ , $I_O = 500\text{mA}$<br>$V_I = 11.5\text{V}$ to $21.5\text{V}$               | -                                    | 62   | -    | dB                     |    |
| Dropout Voltage          | $V_{\text{Drop}}$   | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                    | 2    | -    | V                      |    |
| Output Resistance        | $r_O$               | $f = 1\text{KHz}$   | -                                    | 18   | -    | $\text{m}\Omega$       |    |
| Short Circuit Current    | $I_{\text{SC}}$     | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                    | 250  | -    | mA                     |    |
| Peak Current             | $I_{\text{PK}}$     | $T_J = +25^{\circ}\text{C}$   | -                                    | 2.2  | -    | A                      |    |

### Note:

1. 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.

## Electrical Characteristics (KA7809A)

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

| Parameter                | Symbol              | Conditions   | Min.                        | Typ. | Max. | Unit                   |    |
|--------------------------|---------------------|--|-----------------------------|------|------|------------------------|----|
| Output Voltage           | $V_O$               | $T_J = +25^{\circ}\text{C}$  | 8.82                        | 9.0  | 9.18 | V                      |    |
|                          |                     | $I_O = 5\text{mA}$ to 1A, $P_O \leq 15\text{W}$<br>$V_I = 11.2\text{V}$ to 24V | 8.65                        | 9.0  | 9.35 |                        |    |
| Line Regulation (Note1)  | Regline             | $V_I = 11.7\text{V}$ to 25V<br>$I_O = 500\text{mA}$                            | -                           | 6    | 90   | mV                     |    |
|                          |                     | $V_I = 12.5\text{V}$ to 19V  | -                           | 4    | 45   |                        |    |
|                          |                     | $T_J = +25^{\circ}\text{C}$  | $V_I = 11.5\text{V}$ to 24V | -    | 6    |                        | 90 |
|                          |                     |  | $V_I = 12.5\text{V}$ to 19V | -    | 2    |                        | 45 |
| Load Regulation (Note1)  | Regload             | $T_J = +25^{\circ}\text{C}$<br>$I_O = 5\text{mA}$ to 1.0A                      | -                           | 12   | 100  | mV                     |    |
|                          |                     | $I_O = 5\text{mA}$ to 1.0A   | -                           | 12   | 100  |                        |    |
|                          |                     | $I_O = 250\text{mA}$ to 750mA  | -                           | 5    | 50   |                        |    |
| Quiescent Current        | $I_Q$               | $T_J = +25^{\circ}\text{C}$  | -                           | 5.0  | 6.0  | mA                     |    |
| Quiescent Current Change | $\Delta I_Q$        | $V_I = 11.7\text{V}$ to 25V, $T_J = +25^{\circ}\text{C}$                       | -                           | -    | 0.8  | mA                     |    |
|                          |                     | $V_I = 12\text{V}$ to 25V, $I_O = 500\text{mA}$                                | -                           | -    | 0.8  |                        |    |
|                          |                     | $I_O = 5\text{mA}$ to 1.0A   | -                           | -    | 0.5  |                        |    |
| Output Voltage Drift     | $\Delta V/\Delta T$ | $I_O = 5\text{mA}$   | -                           | -1.0 | -    | mV/ $^{\circ}\text{C}$ |    |
| Output Noise Voltage     | $V_N$               | $f = 10\text{Hz}$ to 100KHz<br>$T_A = +25^{\circ}\text{C}$                     | -                           | 10   | -    | $\mu\text{V}/V_O$      |    |
| Ripple Rejection         | RR                  | $f = 120\text{Hz}$ , $I_O = 500\text{mA}$<br>$V_I = 12\text{V}$ to 22V         | -                           | 62   | -    | dB                     |    |
| Dropout Voltage          | $V_{\text{Drop}}$   | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$                                | -                           | 2.0  | -    | V                      |    |
| Output Resistance        | $r_O$               | $f = 1\text{KHz}$  | -                           | 17   | -    | $\text{m}\Omega$       |    |
| Short Circuit Current    | $I_{\text{SC}}$     | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$                               | -                           | 250  | -    | mA                     |    |
| Peak Current             | $I_{\text{PK}}$     | $T_J = +25^{\circ}\text{C}$  | -                           | 2.2  | -    | A                      |    |

### Note:

1. 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.

## Electrical Characteristics (KA7810A)

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

| Parameter                | Symbol              | Conditions  | Min.                                | Typ. | Max. | Unit                         |     |
|--------------------------|---------------------|---|-------------------------------------|------|------|------------------------------|-----|
| Output Voltage           | $V_O$               | $T_J = +25^{\circ}\text{C}$   | 9.8                                 | 10   | 10.2 | V                            |     |
|                          |                     | $I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 12.8\text{V to } 25\text{V}$ | 9.6                                 | 10   | 10.4 |                              |     |
| Line Regulation (Note1)  | Regline             | $V_I = 12.8\text{V to } 26\text{V}$<br>$I_O = 500\text{mA}$                                     | -                                   | 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  |
| Load Regulation (Note1)  | Regload             | $T_J = +25^{\circ}\text{C}$<br>$I_O = 5\text{mA to } 1.5\text{A}$                               | -                                   | 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   |                              |     |
| Quiescent Current        | $I_Q$               | $T_J = +25^{\circ}\text{C}$   | -                                   | 5.0  | 6.0  | mA                           |     |
| Quiescent Current Change | $\Delta I_Q$        | $V_I = 13\text{V to } 26\text{V}$ , $T_J = +25^{\circ}\text{C}$                                 | -                                   | -    | 0.5  | mA                           |     |
|                          |                     | $V_I = 12.8\text{V to } 25\text{V}$ , $I_O = 500\text{mA}$                                      | -                                   | -    | 0.8  |                              |     |
|                          |                     | $I_O = 5\text{mA to } 1.0\text{A}$  | -                                   | -    | 0.5  |                              |     |
| Output Voltage Drift     | $\Delta V/\Delta T$ | $I_O = 5\text{mA}$  | -                                   | -1.0 | -    | $\text{mV}/^{\circ}\text{C}$ |     |
| Output Noise Voltage     | $V_N$               | $f = 10\text{Hz to } 100\text{KHz}$<br>$T_A = +25^{\circ}\text{C}$                              | -                                   | 10   | -    | $\mu\text{V}/V_O$            |     |
| Ripple Rejection         | RR                  | $f = 120\text{Hz}$ , $I_O = 500\text{mA}$<br>$V_I = 14\text{V to } 24\text{V}$                  | -                                   | 62   | -    | dB                           |     |
| Dropout Voltage          | $V_{\text{Drop}}$   | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                   | 2.0  | -    | V                            |     |
| Output Resistance        | $r_O$               | $f = 1\text{KHz}$   | -                                   | 17   | -    | $\text{m}\Omega$             |     |
| Short Circuit Current    | ISC                 | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                   | 250  | -    | mA                           |     |
| Peak Current             | $I_{\text{PK}}$     | $T_J = +25^{\circ}\text{C}$   | -                                   | 2.2  | -    | A                            |     |

### Note:

1. 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.

## Electrical Characteristics (KA7812A)

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

| Parameter                | Symbol              | Conditions  | Min.                                 | Typ. | Max.  | Unit                         |     |
|--------------------------|---------------------|---|--------------------------------------|------|-------|------------------------------|-----|
| Output Voltage           | $V_O$               | $T_J = +25^{\circ}\text{C}$   | 11.75                                | 12   | 12.25 | V                            |     |
|                          |                     | $I_O = 5\text{mA}$ to $1\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 14.8\text{V}$ to $27\text{V}$ | 11.5                                 | 12   | 12.5  |                              |     |
| Line Regulation (Note1)  | Regline             | $V_I = 14.8\text{V}$ to $30\text{V}$<br>$I_O = 500\text{mA}$                                      | -                                    | 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  |
| Load Regulation (Note1)  | Regload             | $T_J = +25^{\circ}\text{C}$<br>$I_O = 5\text{mA}$ 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    |                              |     |
| Quiescent Current        | $I_Q$               | $T_J = +25^{\circ}\text{C}$   | -                                    | 5.1  | 6.0   | mA                           |     |
| Quiescent Current Change | $\Delta I_Q$        | $V_I = 15\text{V}$ 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   |                              |     |
| Output Voltage Drift     | $\Delta V/\Delta T$ | $I_O = 5\text{mA}$  | -                                    | -1.0 | -     | $\text{mV}/^{\circ}\text{C}$ |     |
| Output Noise Voltage     | $V_N$               | $f = 10\text{Hz}$ to $100\text{KHz}$<br>$T_A = +25^{\circ}\text{C}$                               | -                                    | 10   | -     | $\mu\text{V}/V_O$            |     |
| Ripple Rejection         | RR                  | $f = 120\text{Hz}$ , $I_O = 500\text{mA}$<br>$V_I = 14\text{V}$ to $24\text{V}$                   | -                                    | 60   | -     | dB                           |     |
| Dropout Voltage          | $V_{\text{Drop}}$   | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                    | 2.0  | -     | V                            |     |
| Output Resistance        | $r_O$               | $f = 1\text{KHz}$   | -                                    | 18   | -     | $\text{m}\Omega$             |     |
| Short Circuit Current    | $I_{\text{SC}}$     | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                    | 250  | -     | mA                           |     |
| Peak Current             | $I_{\text{PK}}$     | $T_J = +25^{\circ}\text{C}$   | -                                    | 2.2  | -     | A                            |     |

### Note:

1. 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.



## Electrical Characteristics (KA7815A)

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

| Parameter                | Symbol              | Conditions  | Min.                                | Typ. | Max. | Unit                         |     |
|--------------------------|---------------------|---|-------------------------------------|------|------|------------------------------|-----|
| Output Voltage           | $V_O$               | $T_J = +25^{\circ}\text{C}$   | 14.7                                | 15   | 15.3 | V                            |     |
|                          |                     | $I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 17.7\text{V to } 30\text{V}$ | 14.4                                | 15   | 15.6 |                              |     |
| Line Regulation (Note1)  | Regline             | $V_I = 17.9\text{V to } 30\text{V}$<br>$I_O = 500\text{mA}$                                     | -                                   | 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  |
| Load Regulation (Note1)  | Regload             | $T_J = +25^{\circ}\text{C}$<br>$I_O = 5\text{mA to } 1.5\text{A}$                               | -                                   | 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   |                              |     |
| Quiescent Current        | $I_Q$               | $T_J = +25^{\circ}\text{C}$   | -                                   | 5.2  | 6.0  | mA                           |     |
| Quiescent Current Change | $\Delta I_Q$        | $V_I = 17.5\text{V to } 30\text{V}$ , $T_J = +25^{\circ}\text{C}$                               | -                                   | -    | 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  |                              |     |
| Output Voltage Drift     | $\Delta V/\Delta T$ | $I_O = 5\text{mA}$  | -                                   | -1.0 | -    | $\text{mV}/^{\circ}\text{C}$ |     |
| Output Noise Voltage     | $V_N$               | $f = 10\text{Hz to } 100\text{KHz}$<br>$T_A = +25^{\circ}\text{C}$                              | -                                   | 10   | -    | $\mu\text{V}/V_O$            |     |
| Ripple Rejection         | RR                  | $f = 120\text{Hz}$ , $I_O = 500\text{mA}$<br>$V_I = 18.5\text{V to } 28.5\text{V}$              | -                                   | 58   | -    | dB                           |     |
| Dropout Voltage          | $V_{\text{Drop}}$   | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                   | 2.0  | -    | V                            |     |
| Output Resistance        | $r_O$               | $f = 1\text{KHz}$   | -                                   | 19   | -    | $\text{m}\Omega$             |     |
| Short Circuit Current    | ISC                 | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                   | 250  | -    | mA                           |     |
| Peak Current             | IPK                 | $T_J = +25^{\circ}\text{C}$   | -                                   | 2.2  | -    | A                            |     |

### Note:

1. 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.

## Electrical Characteristics (KA7818A)

(Refer to the test circuits.  $0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}$ ,  $I_O = 1\text{A}$ ,  $V_I = 27\text{V}$ ,  $C_I = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , unless otherwise specified)

| Parameter                | Symbol              | Conditions  | Min.                                | Typ. | Max.  | Unit                         |     |
|--------------------------|---------------------|---|-------------------------------------|------|-------|------------------------------|-----|
| Output Voltage           | $V_O$               | $T_J = +25^{\circ}\text{C}$   | 17.64                               | 18   | 18.36 | V                            |     |
|                          |                     | $I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 21\text{V to } 33\text{V}$ | 17.3                                | 18   | 18.7  |                              |     |
| Line Regulation (Note1)  | Regline             | $V_I = 21\text{V to } 33\text{V}$<br>$I_O = 500\text{mA}$                                     | -                                   | 15   | 180   | mV                           |     |
|                          |                     | $V_I = 21\text{V to } 33\text{V}$   | -                                   | 5    | 180   |                              |     |
|                          |                     | $T_J = +25^{\circ}\text{C}$   | $V_I = 20.6\text{V to } 33\text{V}$ | -    | 15    |                              | 180 |
|                          |                     |   | $V_I = 24\text{V to } 30\text{V}$   | -    | 5     |                              | 90  |
| Load Regulation (Note1)  | Regload             | $T_J = +25^{\circ}\text{C}$<br>$I_O = 5\text{mA to } 1.5\text{A}$                             | -                                   | 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    |                              |     |
| Quiescent Current        | $I_Q$               | $T_J = +25^{\circ}\text{C}$   | -                                   | 5.2  | 6.0   | mA                           |     |
| Quiescent Current Change | $\Delta I_Q$        | $V_I = 21\text{V to } 33\text{V}$ , $T_J = +25^{\circ}\text{C}$                               | -                                   | -    | 0.8   | mA                           |     |
|                          |                     | $V_I = 21\text{V to } 33\text{V}$ , $I_O = 500\text{mA}$                                      | -                                   | -    | 0.8   |                              |     |
|                          |                     | $I_O = 5\text{mA to } 1.0\text{A}$  | -                                   | -    | 0.5   |                              |     |
| Output Voltage Drift     | $\Delta V/\Delta T$ | $I_O = 5\text{mA}$  | -                                   | -1.0 | -     | $\text{mV}/^{\circ}\text{C}$ |     |
| Output Noise Voltage     | $V_N$               | $f = 10\text{Hz to } 100\text{KHz}$<br>$T_A = +25^{\circ}\text{C}$                            | -                                   | 10   | -     | $\mu\text{V}/V_O$            |     |
| Ripple Rejection         | RR                  | $f = 120\text{Hz}$ , $I_O = 500\text{mA}$<br>$V_I = 22\text{V to } 32\text{V}$                | -                                   | 57   | -     | dB                           |     |
| Dropout Voltage          | $V_{\text{Drop}}$   | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                   | 2.0  | -     | V                            |     |
| Output Resistance        | $r_O$               | $f = 1\text{KHz}$   | -                                   | 19   | -     | $\text{m}\Omega$             |     |
| Short Circuit Current    | ISC                 | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                   | 250  | -     | mA                           |     |
| Peak Current             | IPK                 | $T_J = +25^{\circ}\text{C}$   | -                                   | 2.2  | -     | A                            |     |

### Note:

1. 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.

## Electrical Characteristics (KA7824A)

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

| Parameter                | Symbol              | Conditions  | Min.                                | Typ. | Max. | Unit                         |     |
|--------------------------|---------------------|---|-------------------------------------|------|------|------------------------------|-----|
| Output Voltage           | $V_O$               | $T_J = +25^{\circ}\text{C}$   | 23.5                                | 24   | 24.5 | V                            |     |
|                          |                     | $I_O = 5\text{mA to } 1\text{A}$ , $P_O \leq 15\text{W}$<br>$V_I = 27.3\text{V to } 38\text{V}$ | 23                                  | 24   | 25   |                              |     |
| Line Regulation (Note1)  | Regline             | $V_I = 27\text{V to } 38\text{V}$<br>$I_O = 500\text{mA}$                                       | -                                   | 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 |
| Load Regulation (Note1)  | Regload             | $T_J = +25^{\circ}\text{C}$<br>$I_O = 5\text{mA to } 1.5\text{A}$                               | -                                   | 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   |                              |     |
| Quiescent Current        | $I_Q$               | $T_J = +25^{\circ}\text{C}$   | -                                   | 5.2  | 6.0  | mA                           |     |
| Quiescent Current Change | $\Delta I_Q$        | $V_I = 27.3\text{V to } 38\text{V}$ , $T_J = +25^{\circ}\text{C}$                               | -                                   | -    | 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  |                              |     |
| Output Voltage Drift     | $\Delta V/\Delta T$ | $I_O = 5\text{mA}$  | -                                   | -1.5 | -    | $\text{mV}/^{\circ}\text{C}$ |     |
| Output Noise Voltage     | $V_N$               | $f = 10\text{Hz to } 100\text{KHz}$<br>$T_A = 25^{\circ}\text{C}$                               | -                                   | 10   | -    | $\mu\text{V}/V_O$            |     |
| Ripple Rejection         | RR                  | $f = 120\text{Hz}$ , $I_O = 500\text{mA}$<br>$V_I = 28\text{V to } 38\text{V}$                  | -                                   | 54   | -    | dB                           |     |
| Dropout Voltage          | $V_{\text{Drop}}$   | $I_O = 1\text{A}$ , $T_J = +25^{\circ}\text{C}$   | -                                   | 2.0  | -    | V                            |     |
| Output Resistance        | $r_O$               | $f = 1\text{KHz}$   | -                                   | 20   | -    | $\text{m}\Omega$             |     |
| Short Circuit Current    | $I_{\text{SC}}$     | $V_I = 35\text{V}$ , $T_A = +25^{\circ}\text{C}$  | -                                   | 250  | -    | mA                           |     |
| Peak Current             | $I_{\text{PK}}$     | $T_J = +25^{\circ}\text{C}$   | -                                   | 2.2  | -    | A                            |     |

### Note:

1. 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.

## Typical Performance Characteristics



Figure 1. Quiescent Current



Figure 2. Peak Output Current



Figure 3. Output Voltage



Figure 4. Quiescent Current

## Typical Applications



Figure 5. DC Parameters



Figure 6. Load Regulation



Figure 7. Ripple Rejection



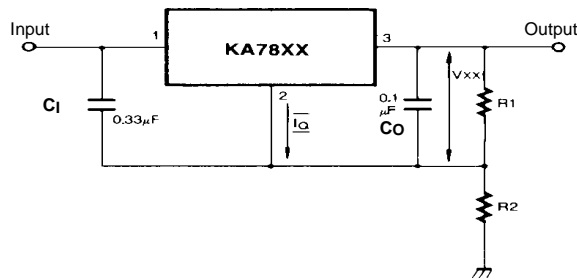
Figure 8. Fixed Output Regulator



Figure 9. Constant Current Regulator

**Notes:**

- (1) 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 2.0V above the output voltage even during the low point on the input ripple voltage.
- (2) C<sub>1</sub> is required if regulator is located an appreciable distance from power Supply filter.
- (3) C<sub>0</sub> improves stability and transient response.



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

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

Figure 10. 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 11. Adjustable Output Regulator (7 to 30V)

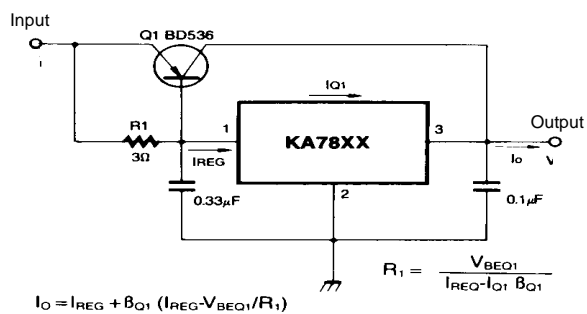


Figure 12. High Current Voltage Regulator

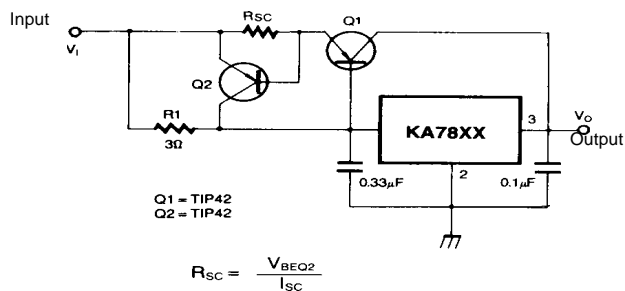


Figure 13. High Output Current with Short Circuit Protection

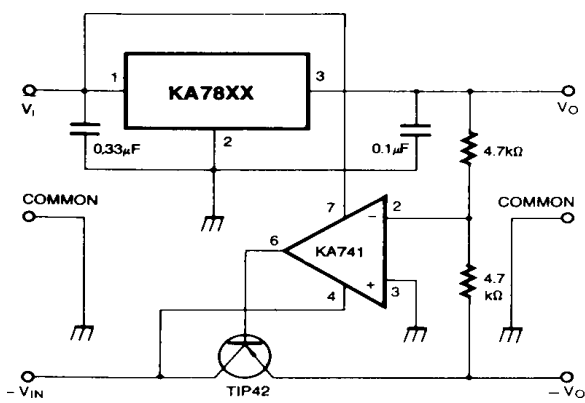


Figure 14. Tracking Voltage Regulator

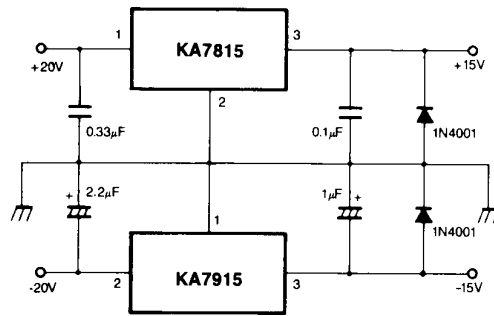


Figure 15. Split Power Supply ( ±15V-1A)

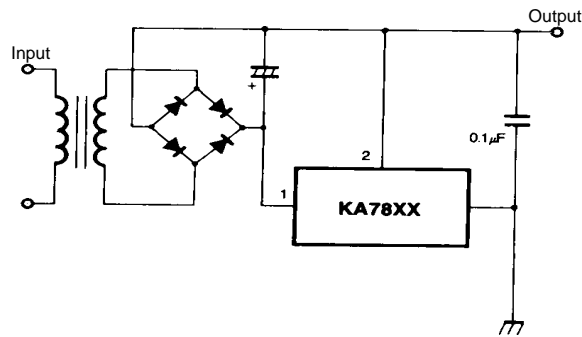


Figure 16. Negative Output Voltage Circuit

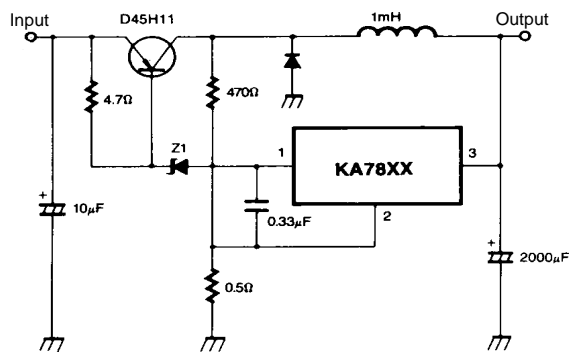


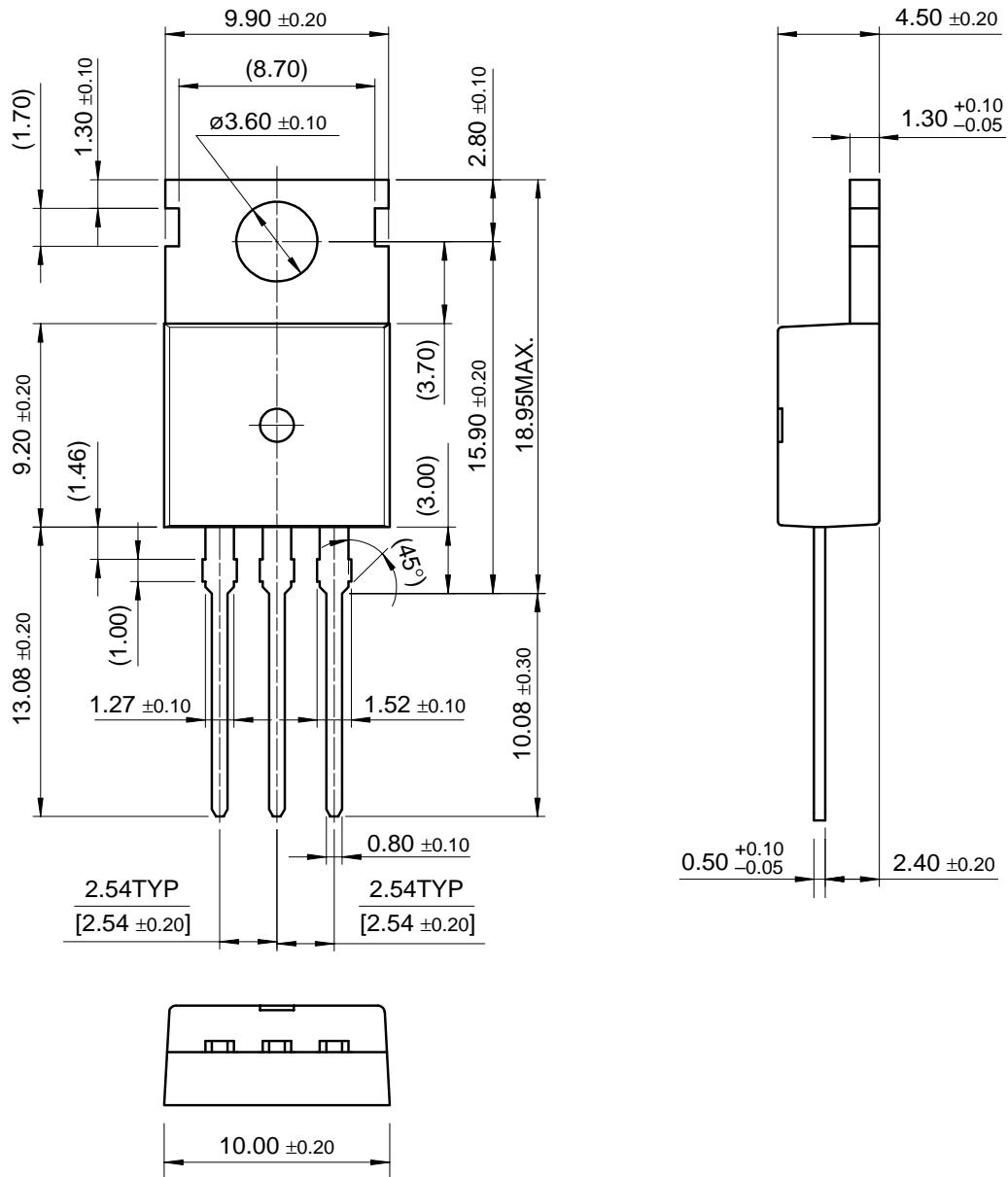
Figure 17. Switching Regulator



# Mechanical Dimensions

## Package

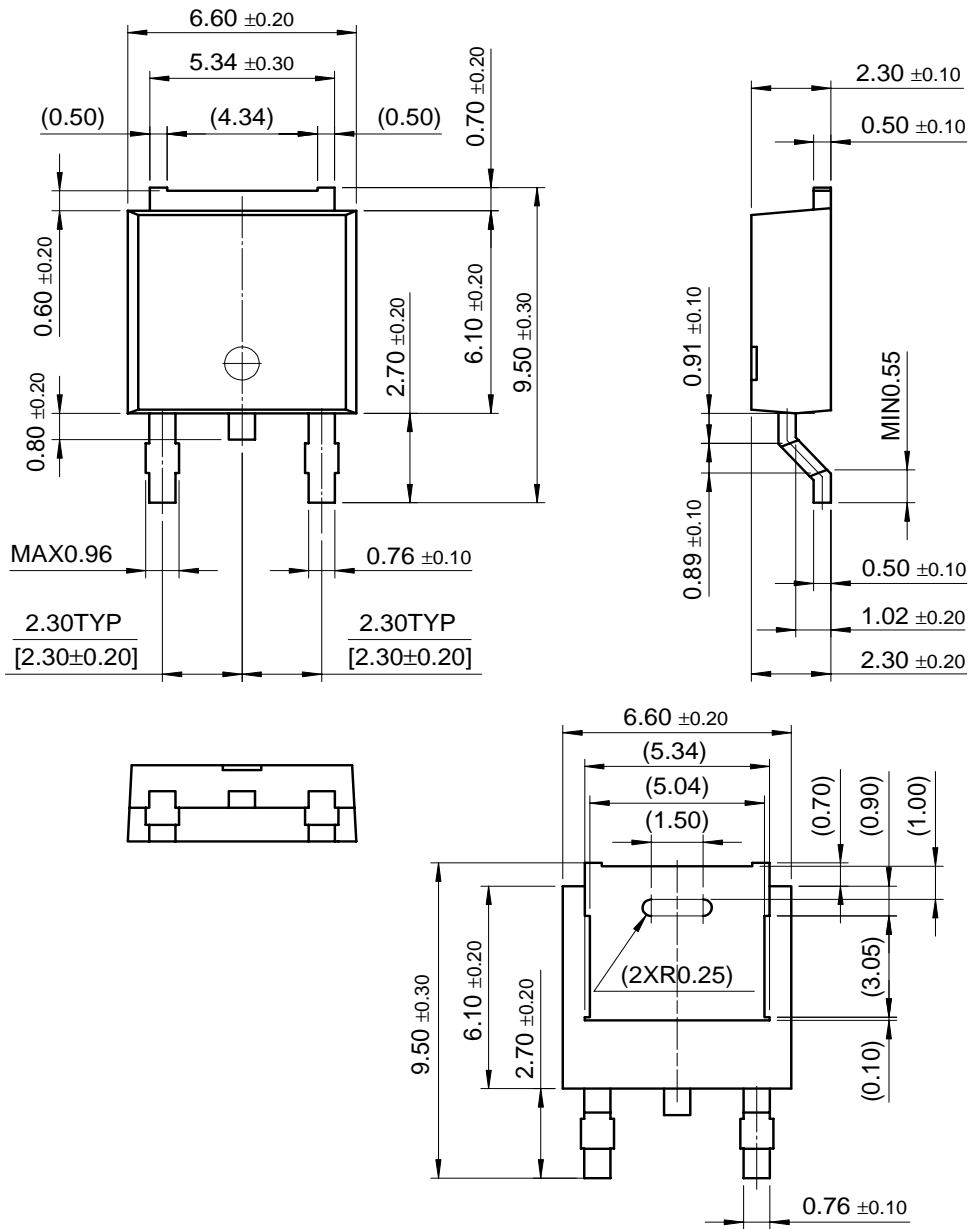
### TO-220



# Mechanical Dimensions (Continued)

## Package

### D-PAK



## Ordering Information

| Product Number    | Output Voltage Tolerance | Package | Operating Temperature |
|-------------------|--------------------------|---------|-----------------------|
| KA7805 / KA7806   | ±4%                      | TO-220  | 0 ~ + 125°C           |
| KA7808 / KA7809   |                          |         |                       |
| KA7810            |                          |         |                       |
| KA7812 / KA7815   |                          |         |                       |
| KA7818 / KA7824   |                          |         |                       |
| KA7805A / KA7806A | ±2%                      |         |                       |
| KA7808A / KA7809A |                          |         |                       |
| KA7810A / KA7812A |                          |         |                       |
| KA7815A / KA7818A |                          |         |                       |
| KA7824A           |                          |         |                       |
| KA7805R / KA7806R | ±4%                      | D-PAK   |                       |
| KA7808R / KA7809R |                          |         |                       |
| KA7812R           |                          |         |                       |

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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