

KA79MXX

3-Terminal 0.5A Negative Voltage Regulator

Features

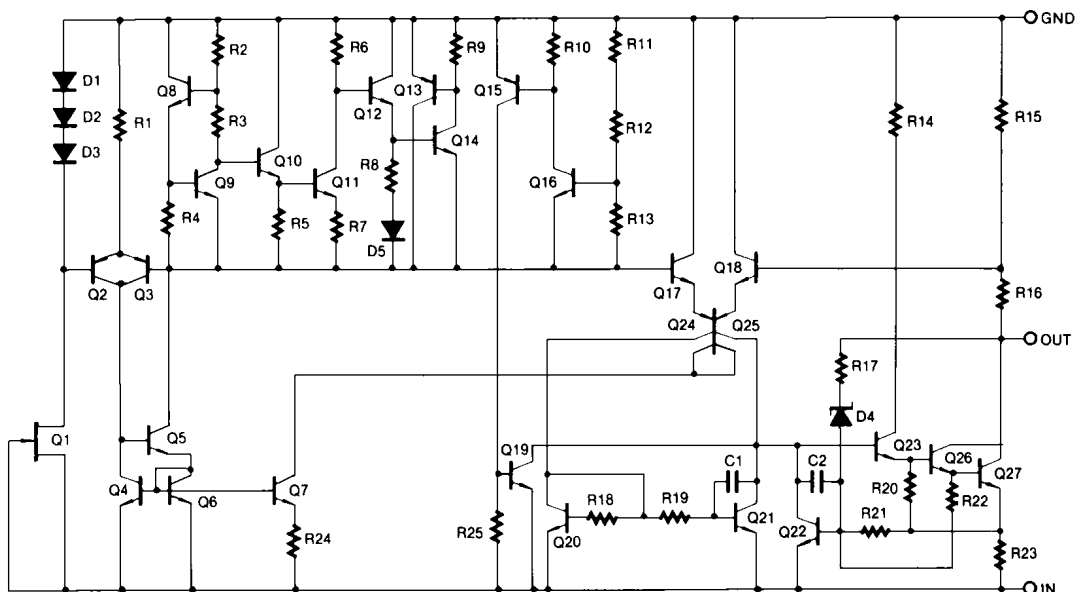
- No external components required
- Output current in excess of 0.5A
- Internal thermal overload
- Internal short circuit current limiting
- Output transistor safe area compensation
- Output voltages of -5V,-6V,-8V, -12V,-15V,-18V,-24V

Description

The KA79MXX series of 3-Terminal medium current negative voltage regulators are monolithic integrated circuits designed as fixed voltage regulators. These regulators employ internal current limiting, thermal shutdown and safe area compensation making them essentially indestructible.



Schematic Diagram



Absolute Maximum Ratings

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

Electrical Characteristics (KA79M05/KA79M05R)

(Refer to test circuit, $0^{\circ}C \leq T_J \leq +125^{\circ}C$, $I_O = 350mA$, $V_I = -10V$, unless otherwise specified, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|--------------------------|-------------------------|---|-----------------------|------|-------|-----------------|----|
| Output Voltage | V_O | $T_J = +25^{\circ}C$ | -4.8 | -5 | -5.2 | V | |
| | | $I_O = 5mA$ to $350mA$ $V_I = -7V$ to $-25V$ | -4.75 | -5 | -5.25 | | |
| Line Regulation (Note1) | ΔV_O | $T_J = +25^{\circ}C$ | $V_I = -7V$ to $-25V$ | - | 7.0 | 50 | mV |
| | | | $V_I = -8V$ to $-25V$ | - | 2.0 | 30 | |
| Load Regulation (Note1) | ΔV_O | $I_O = 5mA$ to $500mA$ $T_J = +25^{\circ}C$ | - | 30 | 100 | mV | |
| Quiescent Current | I_Q | $T_J = +25^{\circ}C$ | - | 3.0 | 6.0 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5mA$ to $350mA$ | - | - | 0.4 | mA | |
| | | $I_O = 200mA$ $V_I = -8V$ to $-25V$ | - | - | 0.4 | | |
| Output Voltage Drift | $\Delta V_O / \Delta T$ | $I_O = 5mA$ | - | -0.2 | - | mV/ $^{\circ}C$ | |
| Output Noise Voltage | V_N | $f = 10Hz, 100KHz$ $T_A = +25^{\circ}C$ | - | 40 | - | μV | |
| Ripple Rejection | RR | $f = 120Hz$ $V_J = -8V$ to $-18V$ | 54 | 60 | - | dB | |
| Dropout Voltage | V_D | $T_J = +25^{\circ}C$, $I_O = 500mA$ | - | 1.1 | - | V | |
| Short Circuit Current | I_{SC} | $T_J = +25^{\circ}C$, $V_I = -35V$ | - | 140 | - | mA | |
| Peak Current | I_{PK} | $T_J = +25^{\circ}C$ | - | 650 | - | mA | |

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 (KA79M06)

(Refer to test circuit, $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = -11\text{V}$, unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|--------------------------|-------------------------|---|-------------------------------------|-------|--------|------------------------|----|
| Output Voltage | V_O | $T_J = +25\text{ }^{\circ}\text{C}$ | - 5.75 | - 6.0 | - 6.25 | V | |
| | | $I_O = 5\text{mA}$ to 350mA $V_I = -8.0\text{V}$ to -25V | - 5.7 | - 6.0 | - 6.3 | | |
| Line Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $V_I = -8\text{V}$ to -25V | - | 7.0 | 60 | mV |
| | | | $V_I = -9\text{V}$ to -19V | - | 2.0 | 40 | |
| Load Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 30 | 120 | mV | |
| Quiescent Current | I_Q | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5\text{mA}$ to 350mA | - | - | 0.4 | mA | |
| | | $V_I = -8\text{V}$ to -25V | - | - | 0.4 | | |
| Output Voltage Drift | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$ | - | 0.4 | - | mV/ $^{\circ}\text{C}$ | |
| Output Noise Voltage | V_N | $f = 10\text{Hz}$ to 100KHz , $T_A = +25\text{ }^{\circ}\text{C}$ | - | 50 | - | μV | |
| Ripple Rejection | RR | $f = 120\text{Hz}$, $V_I = -9\text{V}$ to -19V | 54 | 60 | - | dB | |
| Dropout Voltage | V_D | $I_O = 500\text{mA}$, $T_J = +25\text{ }^{\circ}\text{C}$ | - | 1.1 | - | V | |
| Short Circuit Current | ISC | $V_I = -35\text{V}$, $T_J = +25\text{ }^{\circ}\text{C}$ | - | 140 | - | mA | |
| Peak Current | IPK | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 650 | - | mA | |

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 (KA79M08/KA79M08R)

(Refer to test circuit, $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = -14\text{V}$, unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|--------------------------|-------------------------|--|--|-------|-------|------------------------|----|
| Output Voltage | V_O | $T_J = +25\text{ }^{\circ}\text{C}$ | - 7.7 | - 8.0 | - 8.3 | V | |
| | | $I_O = 5\text{mA}$ to 350mA $V_I = -10.5\text{V}$ to -25V | - 7.6 | - 8.0 | - 8.4 | | |
| Line Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $V_I = -10.5\text{V}$ to -25V | - | 7.0 | 80 | mV |
| | | | $V_I = -11\text{V}$ to -21V | - | 2.0 | 50 | |
| Load Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 30 | 160 | mV | |
| Quiescent Current | I_Q | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5\text{mA}$ to 350mA | - | - | 0.4 | mA | |
| | | $V_I = -8\text{V}$ to -25V | - | - | 0.4 | | |
| Output Voltage Drift | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$ | - | -0.6 | - | mV/ $^{\circ}\text{C}$ | |
| Output Noise Voltage | V_N | $f = 10\text{Hz}$ to 100kHz , $T_A = +25\text{ }^{\circ}\text{C}$ | - | 60 | - | μV | |
| Ripple Rejection | RR | $f = 120\text{Hz}$, $V_I = -9\text{V}$ to -19V | 54 | 59 | - | dB | |
| Dropout Voltage | V_D | $I_O = 500\text{mA}$, $T_J = +25\text{ }^{\circ}\text{C}$ | - | 1.1 | - | V | |
| Short Circuit Current | ISC | $V_I = -35\text{V}$, $T_J = +25\text{ }^{\circ}\text{C}$ | - | 140 | - | mA | |
| Peak Current | IPK | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 650 | - | mA | |

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 (KA79M12)

(Refer to test circuit, $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = -19\text{V}$, unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|--------------------------|-----------------------|--|---------------------------------------|------|-------|------|------------------------|
| Output Voltage | V_O | $T_J = +25\text{ }^{\circ}\text{C}$ | -11.5 | -12 | -12.5 | V | |
| | | $I_O = 5\text{mA to } 350\text{mA}$ $V_I = -14.5\text{V to } -30\text{V}$ | -11.4 | -12 | -12.6 | | |
| Line Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $V_I = -14.5\text{V to } -30\text{V}$ | - | 8.0 | 80 | mV |
| | | | $V_I = -15\text{V to } -25\text{V}$ | - | 3.0 | 50 | |
| Load Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $I_O = 5.0\text{mA to } 500\text{mA}$ | - | 30 | 240 | mV |
| Quiescent Current | I_Q | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5\text{mA to } 350\text{mA}$ | | - | - | 0.4 | mA |
| | | $V_I = -14.5\text{V to } -30\text{V}$ | | - | - | 0.4 | |
| Output Voltage Drift | $\Delta V_O/\Delta T$ | $I_O = 5\text{mA}$ | | - | -0.8 | - | mV/ $^{\circ}\text{C}$ |
| Output Noise Voltage | V_N | $f = 10\text{Hz to } 100\text{kHz}, T_A = +25\text{ }^{\circ}\text{C}$ | | - | 75 | - | μV |
| Ripple Rejection | RR | $f = 120\text{Hz}, V_I = -15\text{V to } -25\text{V}$ | | 54 | 60 | - | dB |
| Dropout Voltage | V_D | $I_O = 500\text{mA}, T_J = +25\text{ }^{\circ}\text{C}$ | | - | 1.1 | - | V |
| Short Circuit Current | ISC | $V_I = -35\text{V}, T_J = +25\text{ }^{\circ}\text{C}$ | | - | 140 | - | mA |
| Peak Current | IPK | $T_J = +25\text{ }^{\circ}\text{C}$ | | - | 650 | - | mA |

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 (KA79M15)

(Refer to test circuit, $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = -23\text{V}$, unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|--------------------------|-------------------------|--|--|------|--------|------------------------|----|
| Output Voltage | V_O | $T_J = +25\text{ }^{\circ}\text{C}$ | - 14.4 | - 15 | - 15.6 | V | |
| | | $I_O = 5\text{mA}$ to 350mA $V_I = -17.5\text{V}$ to -30V | -14.25 | - 15 | -15.75 | | |
| Line Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $V_I = -17.5\text{V}$ to -30V | - | 9.0 | 80 | mV |
| | | | $V_I = -18\text{V}$ to -28V | - | 5.0 | 50 | |
| Load Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $I_O = 5.0\text{mA}$ to 500mA | - | 30 | 240 | mV |
| Quiescent Current | I_Q | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5\text{mA}$ to 350mA | - | - | 0.4 | mA | |
| | | $V_I = -17.5\text{V}$ to -28V | - | - | 0.4 | | |
| Output Voltage Drift | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$ | - | -1.0 | - | mV/ $^{\circ}\text{C}$ | |
| Output Noise Voltage | V_N | $f = 10\text{Hz}$ to 100KHz , $T_A = +25\text{ }^{\circ}\text{C}$ | - | 90 | - | μV | |
| Ripple Rejection | RR | $f = 120\text{Hz}$, $V_I = -18.5\text{V}$ to -28.5V | 54 | 59 | - | dB | |
| Dropout Voltage | V_D | $I_O = 500\text{mA}$, $T_J = +25\text{ }^{\circ}\text{C}$ | - | 1.1 | - | V | |
| Short Circuit Current | ISC | $V_I = -35\text{V}$, $T_J = +25\text{ }^{\circ}\text{C}$ | - | 140 | - | mA | |
| Peak Current | IPK | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 650 | - | mA | |

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 (KA79M18)

(Refer to test circuit, $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = -27\text{V}$, unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|--------------------------|-------------------------|--|---------------------------------------|------|--------|------|------------------------|
| Output Voltage | V_O | $T_J = +25\text{ }^{\circ}\text{C}$ | - 17.3 | - 18 | - 18.7 | V | |
| | | $I_O = 5\text{mA to } 350\text{mA}$ $V_I = -21\text{V to } -33\text{V}$ | - 17.1 | - 18 | - 18.9 | | |
| Line Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $V_I = -21\text{V to } -33\text{V}$ | - | 9.0 | 80 | mV |
| | | | $V_I = -24\text{V to } -30\text{V}$ | - | 5.0 | 80 | |
| Load Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $I_O = 5.0\text{mA to } 500\text{mA}$ | - | 30 | 360 | mV |
| Quiescent Current | I_Q | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5\text{mA to } 350\text{mA}$ | | - | - | 0.4 | mA |
| | | $V_I = -21\text{V to } -33\text{V}$ | | - | - | 0.4 | |
| Output Voltage Drift | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$ | | - | -1.0 | - | mV/ $^{\circ}\text{C}$ |
| Output Noise Voltage | V_N | $f = 10\text{Hz to } 100\text{kHz}, T_A = +25\text{ }^{\circ}\text{C}$ | | - | 110 | - | μV |
| Ripple Rejection | RR | $f = 120\text{Hz}, V_I = -22\text{V to } -32\text{V}$ | | 54 | 59 | - | dB |
| Dropout Voltage | V_D | $I_O = 500\text{mA}, T_J = +25\text{ }^{\circ}\text{C}$ | | - | 1.1 | - | V |
| Short Circuit Current | I_{SC} | $V_I = -35\text{V}, T_J = +25\text{ }^{\circ}\text{C}$ | | - | 140 | - | mA |
| Peak Current | I_{PK} | $T_J = +25\text{ }^{\circ}\text{C}$ | | - | 650 | - | mA |

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 (KA79M24)

(Refer to test circuit, $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = -33\text{V}$, unless otherwise specified)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit | |
|--------------------------|-------------------------|--|---------------------------------------|------|--------|------------------------|----|
| Output Voltage | V_O | $T_J = +25\text{ }^{\circ}\text{C}$ | - 23 | - 24 | - 25 | V | |
| | | $I_O = 5\text{mA to } 350\text{mA}$ $V_I = -27\text{V to } -38\text{V}$ | - 22.8 | - 24 | - 25.2 | | |
| Line Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $V_I = -27\text{V to } -38\text{V}$ | - | 9.0 | 80 | mV |
| | | | $V_I = -30\text{V to } -36\text{V}$ | - | 5.0 | 70 | |
| Load Regulation (Note1) | ΔV_O | $T_J = +25\text{ }^{\circ}\text{C}$ | $I_O = 5.0\text{mA to } 500\text{mA}$ | - | 30 | 300 | mV |
| Quiescent Current | I_Q | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 3 | 6 | mA | |
| Quiescent Current Change | ΔI_Q | $I_O = 5\text{mA to } 350\text{mA}$ | - | - | 0.4 | mA | |
| | | $V_I = -27\text{V to } -38\text{V}$ | - | - | 0.4 | | |
| Output Voltage Drift | $\Delta V_O / \Delta T$ | $I_O = 5\text{mA}$ | - | -1.0 | - | mV/ $^{\circ}\text{C}$ | |
| Output Noise Voltage | V_N | $f = 10\text{Hz to } 100\text{kHz}$, $T_A = +25\text{ }^{\circ}\text{C}$ | - | 180 | - | μV | |
| Ripple Rejection | RR | $f = 120\text{Hz}$, $V_I = -28\text{V to } -38\text{V}$ | 54 | 58 | - | dB | |
| Dropout Voltage | V_D | $I_O = 500\text{mA}$, $T_J = +25\text{ }^{\circ}\text{C}$ | - | 1.1 | - | V | |
| Short Circuit Current | ISC | $V_I = -35\text{V}$, $T_J = +25\text{ }^{\circ}\text{C}$ | - | 140 | - | mA | |
| Peak Current | IPK | $T_J = +25\text{ }^{\circ}\text{C}$ | - | 650 | - | mA | |

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 Applications

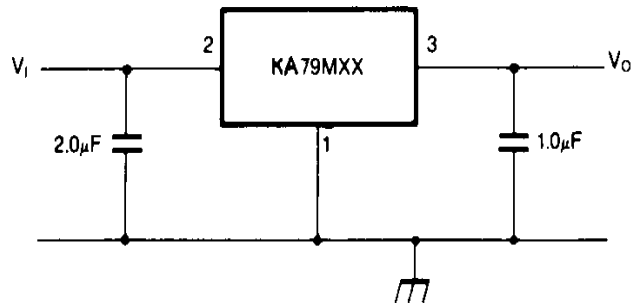


Figure 1. Fixed Output Regulator

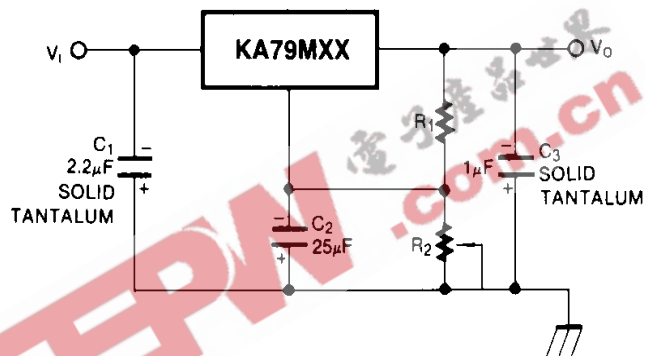


Figure 2. Variable Output

Notes:

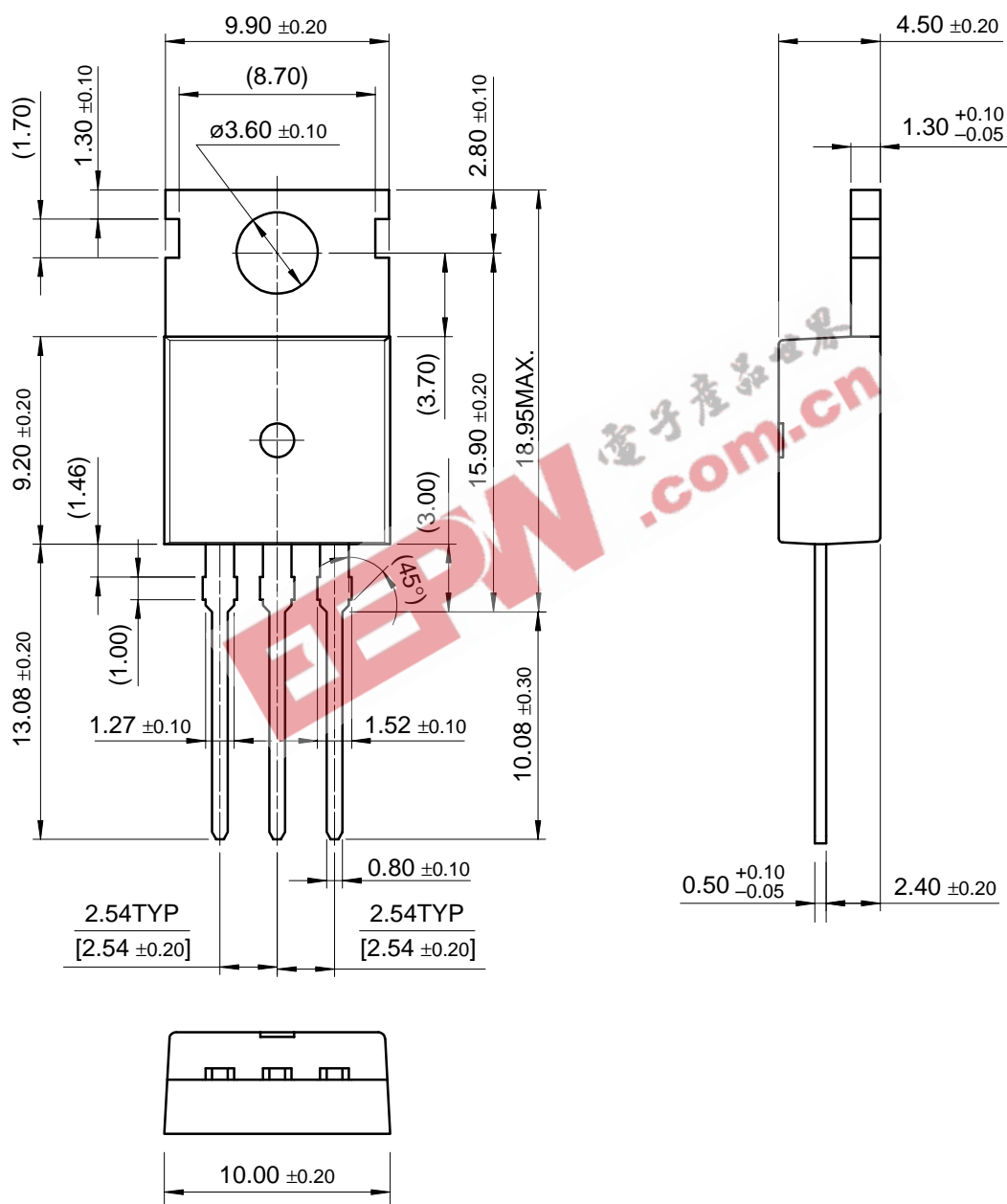
1. Required for stability. For value given, capacitor must be solid tantalum. 25µF aluminum electrolytic may be substituted.
2. C2 improves transient response and ripple rejection. Do not increase beyond 50µF.

Mechanical Dimensions

Package

Dimensions in millimeters

TO-220

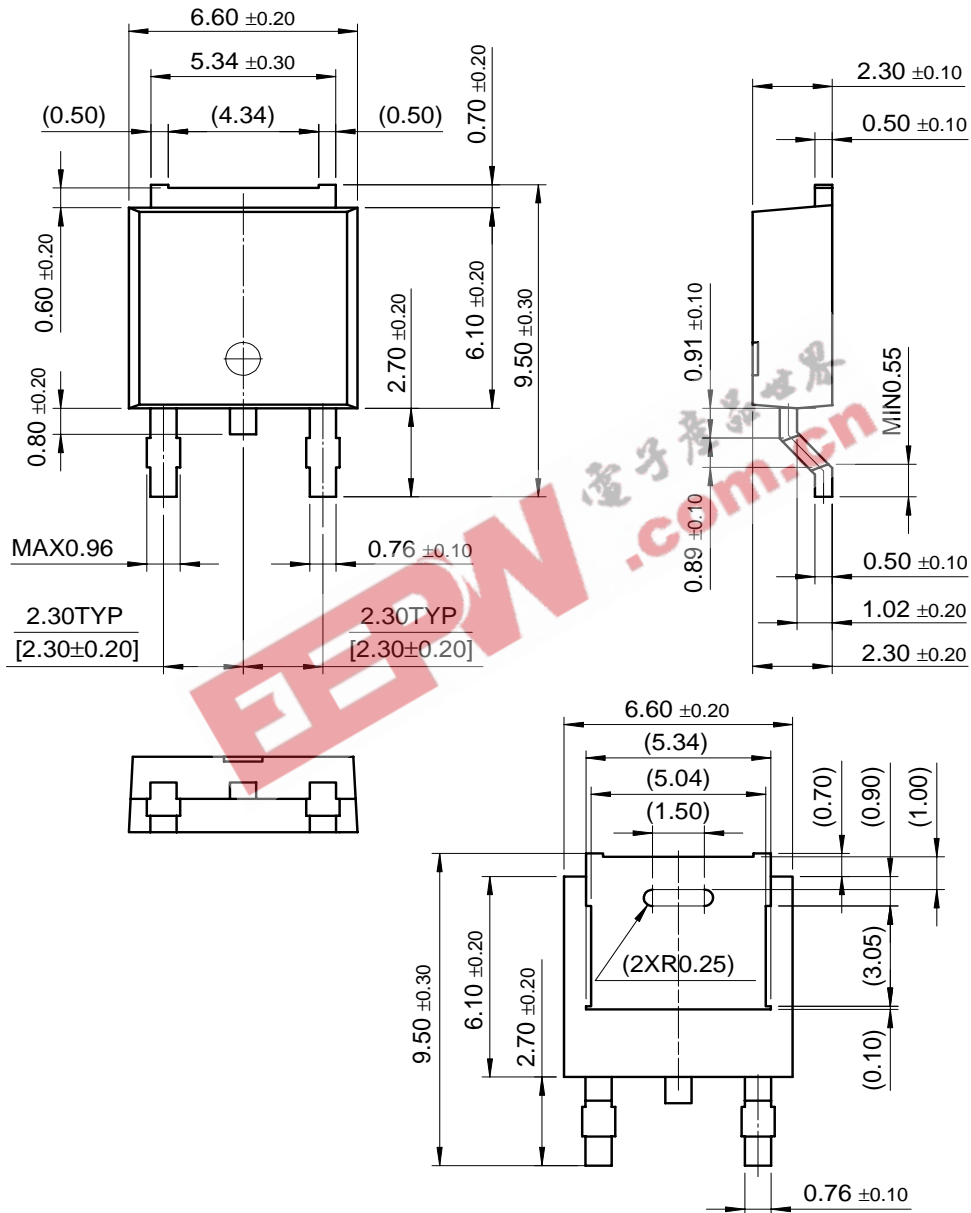


Mechanical Dimensions (Continued)

Package

Dimensions in millimeters

D-PAK



Ordering Information

| Product Number | Package | Operating Temperature |
|----------------|---------|-----------------------|
| KA79M05 | TO-220 | 0 ~ + 125°C |
| KA79M06 | | |
| KA79M08 | | |
| KA79M12 | | |
| KA79M15 | | |
| KA79M18 | | |
| KA79M24 | | |
| KA79M05R | | |
| KA79M08R | | |
| KA79M12R | | |

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