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July 2015

# KA78LXXA / KA78L05AA

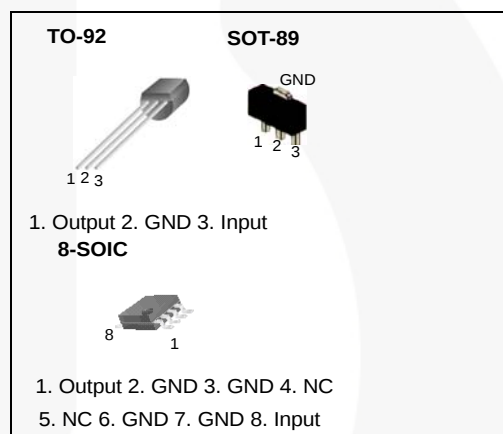
## 3-Terminal 0.1 A Positive Voltage Regulator

### Features

- Maximum Output Current of 100 mA
- Output Voltage of 5 V, 6 V, 8 V, 9 V, 10 V, 12 V, 15 V and 18 V
- Thermal Overload Protection
- Short-Circuit Current Limiting
- Output Voltage Offered in  $\pm 5\%$  Tolerance

### Description

The KA78LXXA / KA78L05AA series of fixed-voltage, monolithic, integrated circuit, voltage regulators are suitable for applications that require supply current up to 100 mA.



### Ordering Information

| Product Number | Package | Packing Method | Output Voltage Tolerance | Operating Temperature |
|----------------|---------|----------------|--------------------------|-----------------------|
| KA78L05AZTA    | TO-92   | Ammo           | $\pm 5\%$                | -40 to +125 °C        |
| KA78L05AZBU    |         | Bulk           |                          |                       |
| KA78L06AZTA    |         | Ammo           |                          |                       |
| KA78L08AZTA    |         | Ammo           |                          |                       |
| KA78L09AZTA    |         | Ammo           |                          |                       |
| KA78L10AZTA    |         | Ammo           |                          |                       |
| KA78L12AZTA    |         | Ammo           |                          |                       |
| KA78L15AZTA    |         | Ammo           |                          |                       |
| KA78L18AZTA    |         | Ammo           |                          |                       |
| KA78L05AMTF    | SOT-89  | Tape & Reel    | $\pm 5\%$                | -40 to +125 °C        |
| KA78L08AMTF    |         | Tape & Reel    |                          |                       |
| KA78L12AMTF    |         | Tape & Reel    |                          |                       |
| KA78L05ADTF    | 8-SOIC  | Tape & Reel    | $\pm 3\%$                | 0 to +125 °C          |
| KA78L05AAZTA   | TO-92   | Ammo           |                          |                       |

## Block Diagram

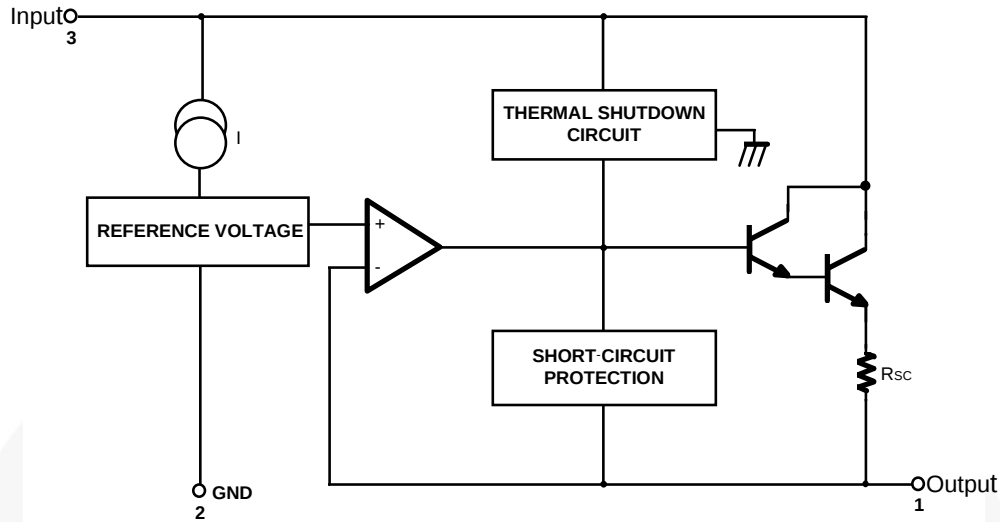


Figure 1. Block Diagram

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol                | Parameter                         |                                    | Value       | Unit               |
|-----------------------|-----------------------------------|------------------------------------|-------------|--------------------|
| $V_I$                 | Input Voltage                     | $V_O = 5\text{ V to }8\text{ V}$   | 30          | V                  |
|                       |                                   | $V_O = 12\text{ V to }18\text{ V}$ | 35          | V                  |
| $T_{\text{OPR}}$      | Operating Temperature Range       | KA78LXXA                           | -40 to +125 | $^\circ\text{C}$   |
|                       |                                   | KA78L05AA                          | 0 to +125   |                    |
| $T_{\text{J(MAX)}}$   | Maximum Junction Temperature      |                                    | 150         | $^\circ\text{C}$   |
| $T_{\text{STG}}$      | Storage Temperature Range         |                                    | -65 to +150 | $^\circ\text{C}$   |
| $R_{\theta\text{JC}}$ | Thermal Resistance, Junction-Case | TO-92                              | 50          | $^\circ\text{C/W}$ |
| $R_{\theta\text{JA}}$ | Thermal Resistance, Junction-Air  | TO-92                              | 150         | $^\circ\text{C/W}$ |
|                       |                                   | SOT-89                             | 225         | $^\circ\text{C/W}$ |
|                       |                                   | 8-SOIC                             | 160         | $^\circ\text{C/W}$ |

**Electrical Characteristics (KA78L05A)**

$V_I = 10\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $-40^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ , unless otherwise specified.

| Symbol                | Parameter                        |           | Conditions                                                                              | Min. | Typ.  | Max. | Unit                 |
|-----------------------|----------------------------------|-----------|-----------------------------------------------------------------------------------------|------|-------|------|----------------------|
| $V_O$                 | Output Voltage                   |           | $T_J = 25^\circ\text{C}$                                                                | 4.8  | 5.0   | 5.2  | V                    |
| $\Delta V_O$          | Line Regulation <sup>(1)</sup>   |           | $T_J = 25^\circ\text{C}$                                                                |      | 8     | 150  | mV                   |
|                       |                                  |           |                                                                                         |      | 6     | 100  | mV                   |
| $\Delta V_O$          | Load Regulation <sup>(1)</sup>   |           | $T_J = 25^\circ\text{C}$                                                                |      | 11    | 60   | mV                   |
|                       |                                  |           |                                                                                         |      | 5.0   | 30   | mV                   |
| $V_O$                 | Output Voltage                   |           | $7\text{ V} \leq V_I \leq 20\text{ V}$                                                  |      |       | 5.25 | V                    |
|                       |                                  |           | $7\text{ V} \leq V_I \leq V_{\text{MAX}}^{(2)}$                                         | 4.75 |       | 5.25 | V                    |
| $I_Q$                 | Quiescent Current                |           | $T_J = 25^\circ\text{C}$                                                                |      | 2.0   | 5.5  | mA                   |
| $\Delta I_Q$          | Quiescent Current Change         | With Line | $8\text{ V} \leq V_I \leq 20\text{ V}$                                                  |      |       | 1.5  | mA                   |
| $\Delta I_Q$          |                                  | With Load | $1\text{ mA} \leq I_O \leq 40\text{ mA}$                                                |      |       | 0.1  | mA                   |
| $V_N$                 | Output Noise Voltage             |           | $T_A = 25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                    |      | 40    |      | $\mu\text{V}/V_O$    |
| $\Delta V_O/\Delta T$ | Temperature Coefficient of $V_O$ |           | $I_O = 5\text{ mA}$                                                                     |      | -0.65 |      | mV/ $^\circ\text{C}$ |
| RR                    | Ripple Rejection                 |           | $f = 120\text{ Hz}$ , $8\text{ V} \leq V_I \leq 18\text{ V}$ , $T_J = 25^\circ\text{C}$ | 41   | 80    |      | dB                   |
| $V_D$                 | Dropout Voltage                  |           | $T_J = 25^\circ\text{C}$                                                                |      | 1.7   |      | V                    |

**Notes:**

1. The maximum steady-state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represents pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation:  $P_D \leq 0.75\text{ W}$ .

**Electrical Characteristics (KA78L06A)**

$V_I = 12\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $-40^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ , unless otherwise specified.

| Symbol                | Parameter                        |           | Conditions                                                                                   | Min. | Typ. | Max. | Unit                       |
|-----------------------|----------------------------------|-----------|----------------------------------------------------------------------------------------------|------|------|------|----------------------------|
| $V_O$                 | Output Voltage                   |           | $T_J = 25^\circ\text{C}$                                                                     | 5.75 | 6.00 | 6.25 | V                          |
| $\Delta V_O$          | Line Regulation <sup>(3)</sup>   |           | $T_J = 25^\circ\text{C}$                                                                     |      | 64   | 175  | mV                         |
|                       |                                  |           | $9\text{ V} \leq V_I \leq 20\text{ V}$                                                       |      | 54   | 125  | mV                         |
| $\Delta V_O$          | Load Regulation <sup>(3)</sup>   |           | $T_J = 25^\circ\text{C}$                                                                     |      | 12.8 | 80.0 | mV                         |
|                       |                                  |           | $1\text{ mA} \leq I_O \leq 70\text{ mA}$                                                     |      | 5.8  | 40.0 | mV                         |
| $V_O$                 | Output Voltage                   |           | $8.5\text{ V} \leq V_I \leq 20\text{ V}$ , $1\text{ mA} \leq I_O \leq 40\text{ mA}$          |      |      | 6.3  | V                          |
|                       |                                  |           | $8.5\text{ V} \leq V_I \leq V_{\text{MAX}}^{(4)}$ , $1\text{ mA} \leq I_O \leq 70\text{ mA}$ | 5.7  |      | 6.3  | V                          |
| $I_Q$                 | Quiescent Current                |           | $T_J = 25^\circ\text{C}$                                                                     |      |      | 5.5  | mA                         |
|                       |                                  |           | $T_J = 125^\circ\text{C}$                                                                    |      | 3.9  | 6.0  | mA                         |
| $\Delta I_Q$          | Quiescent Current Change         | With Line | $9\text{ V} \leq V_I \leq 20\text{ V}$                                                       |      |      | 1.5  | mA                         |
| $\Delta I_Q$          |                                  | With Load | $1\text{ mA} \leq I_O \leq 40\text{ mA}$                                                     |      |      | 0.1  | mA                         |
| $V_N$                 | Output Noise Voltage             |           | $T_A = 25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                         |      | 40   |      | $\mu\text{V}/V_O$          |
| $\Delta V_O/\Delta T$ | Temperature Coefficient of $V_O$ |           | $I_O = 5\text{ mA}$                                                                          |      | 0.75 |      | $\text{mV}/^\circ\text{C}$ |
| RR                    | Ripple Rejection                 |           | $f = 120\text{ Hz}$ , $10\text{ V} \leq V_I \leq 20\text{ V}$ , $T_J = 25^\circ\text{C}$     | 40   | 46   |      | dB                         |
| $V_D$                 | Dropout Voltage                  |           | $T_J = 25^\circ\text{C}$                                                                     |      | 1.7  |      | V                          |

**Notes:**

- The maximum steady-state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represents pulse test conditions with junction temperature as indicated at the initiation of tests.
- Power dissipation:  $P_D \leq 0.75\text{ W}$ .

**Electrical Characteristics (KA78L08A)**

$V_I = 14\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $-40^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ , unless otherwise specified.

| Symbol              | Parameter                                 |           | Conditions                                                      |                                | Min. | Typ. | Max. | Unit              |
|---------------------|-------------------------------------------|-----------|-----------------------------------------------------------------|--------------------------------|------|------|------|-------------------|
| V <sub>O</sub>      | Output Voltage                            |           | T <sub>J</sub> = 25°C                                           |                                | 7.7  | 8.0  | 8.3  | V                 |
| ΔV <sub>O</sub>     | Line Regulation <sup>(5)</sup>            |           | T <sub>J</sub> = 25°C                                           | 10.5 V ≤ V <sub>I</sub> ≤ 23 V |      | 10   | 175  | mV                |
|                     |                                           |           |                                                                 | 11 V ≤ V <sub>I</sub> ≤ 23 V   |      | 8    | 125  | mV                |
| ΔV <sub>O</sub>     | Load Regulation <sup>(5)</sup>            |           | T <sub>J</sub> = 25°C                                           | 1 mA ≤ I <sub>O</sub> ≤ 100 mA |      | 15   | 80   | mV                |
|                     |                                           |           |                                                                 | 1 mA ≤ I <sub>O</sub> ≤ 40 mA  |      | 8    | 40   | mV                |
| V <sub>O</sub>      | Output Voltage                            |           | 10.5 V ≤ V <sub>I</sub> ≤ 23 V                                  | 1 mA ≤ I <sub>O</sub> ≤ 40 mA  | 7.6  |      | 8.4  | V                 |
|                     |                                           |           | 10.5 V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> <sup>(6)</sup>       | 1 mA ≤ I <sub>O</sub> ≤ 70 mA  | 7.6  |      | 8.4  | V                 |
| I <sub>Q</sub>      | Quiescent Current                         |           | T <sub>J</sub> = 25°C                                           |                                |      | 2.0  | 5.5  | mA                |
| ΔI <sub>Q</sub>     | Quiescent Current Change                  | With Line | 11 V ≤ V <sub>I</sub> ≤ 23 V                                    |                                |      |      | 1.5  | mA                |
| ΔI <sub>Q</sub>     |                                           | With Load | 1 mA ≤ I <sub>O</sub> ≤ 40 mA                                   |                                |      |      | 0.1  | mA                |
| V <sub>N</sub>      | Output Noise Voltage                      |           | T <sub>A</sub> = 25°C, 10 Hz ≤ f ≤100 kHz                       |                                |      | 60   |      | μV/V <sub>o</sub> |
| ΔV <sub>O</sub> /ΔT | Temperature Coefficient of V <sub>O</sub> |           | I <sub>O</sub> = 5 mA                                           |                                |      | -0.8 |      | mV/°C             |
| RR                  | Ripple Rejection                          |           | f = 120 Hz, 11 V ≤ V <sub>I</sub> ≤ 21 V, T <sub>J</sub> = 25°C |                                | 39   | 70   |      | dB                |
| V <sub>D</sub>      | Dropout Voltage                           |           | T <sub>J</sub> = 25°C                                           |                                |      | 1.7  |      | V                 |

**Notes:**

- The maximum steady-state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represents pulse test conditions with junction temperature as indicated at the initiation of tests.
- Power dissipation:  $P_D \leq 0.75\text{ W}$ .

**Electrical Characteristics (KA78L09A)**

$V_I = 15\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $-40^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ , unless otherwise specified.

| Symbol              | Parameter                                 |           | Conditions                                                      |                                | Min. | Typ. | Max. | Unit              |
|---------------------|-------------------------------------------|-----------|-----------------------------------------------------------------|--------------------------------|------|------|------|-------------------|
| V <sub>O</sub>      | Output Voltage                            |           | T <sub>J</sub> = 25°C                                           |                                | 8.64 | 9.00 | 9.36 | V                 |
| ΔV <sub>O</sub>     | Line Regulation <sup>(7)</sup>            |           | T <sub>J</sub> = 25°C                                           | 11.5 V ≤ V <sub>I</sub> ≤ 24 V |      | 90   | 200  | mV                |
|                     |                                           |           |                                                                 | 13 V ≤ V <sub>I</sub> ≤ 24 V   |      | 100  | 150  | mV                |
| ΔV <sub>O</sub>     | Load Regulation <sup>(7)</sup>            |           | T <sub>J</sub> = 25°C                                           | 1 mA ≤ I <sub>O</sub> ≤ 100 mA |      | 20   | 90   | mV                |
|                     |                                           |           |                                                                 | 1 mA ≤ I <sub>O</sub> ≤ 40 mA  |      | 10   | 45   | mV                |
| V <sub>O</sub>      | Output Voltage                            |           | 11.5 V ≤ V <sub>I</sub> ≤ 24 V                                  | 1 mA ≤ I <sub>O</sub> ≤ 40 mA  | 8.55 |      | 9.45 | V                 |
|                     |                                           |           | 11.5 V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> <sup>(8)</sup>       | 1 mA ≤ I <sub>O</sub> ≤ 70 mA  | 8.55 |      | 9.45 | V                 |
| I <sub>Q</sub>      | Quiescent Current                         |           | T <sub>J</sub> = 25°C                                           |                                |      | 2.1  | 6.0  | mA                |
| ΔI <sub>Q</sub>     | Quiescent Current Change                  | With Line | 13 V ≤ V <sub>I</sub> ≤ 24 V                                    |                                |      |      | 1.5  | mA                |
| ΔI <sub>Q</sub>     |                                           | With Load | 1 mA ≤ I <sub>O</sub> ≤ 40 mA                                   |                                |      |      | 0.1  | mA                |
| V <sub>N</sub>      | Output Noise Voltage                      |           | T <sub>A</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz                      |                                |      | 70   |      | μV/V <sub>O</sub> |
| ΔV <sub>O</sub> /ΔT | Temperature Coefficient of V <sub>O</sub> |           | I <sub>O</sub> = 5 mA                                           |                                |      | -0.9 |      | mV/°C             |
| RR                  | Ripple Rejection                          |           | f = 120 Hz, 12 V ≤ V <sub>I</sub> ≤ 22 V, T <sub>J</sub> = 25°C |                                | 38   | 44   |      | dB                |
| V <sub>D</sub>      | Dropout Voltage                           |           | T <sub>J</sub> = 25°C                                           |                                |      | 1.7  |      | V                 |

**Notes:**

7. The maximum steady-state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represents pulse test conditions with junction temperature as indicated at the initiation of tests.
8. Power dissipation:  $P_D \leq 0.75\text{ W}$ .

**Electrical Characteristics (KA78L10A)**

$V_I = 16\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $-40^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ , unless otherwise specified.

| Symbol                | Parameter                        |           | Conditions                                                                                 | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------------|-----------|--------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output Voltage                   |           | $T_J = 25^\circ\text{C}$                                                                   | 9.6  | 10.0 | 10.4 | V                    |
| $\Delta V_O$          | Line Regulation <sup>(9)</sup>   |           | $T_J = 25^\circ\text{C}$ $12.5\text{ V} \leq V_I \leq 25\text{ V}$                         |      | 100  | 220  | mV                   |
|                       |                                  |           | $14\text{ V} \leq V_I \leq 25\text{ V}$                                                    |      | 100  | 170  | mV                   |
| $\Delta V_O$          | Load Regulation <sup>(9)</sup>   |           | $T_J = 25^\circ\text{C}$ $1\text{ mA} \leq I_O \leq 100\text{ mA}$                         |      | 20   | 94   | mV                   |
|                       |                                  |           | $1\text{ mA} \leq I_O \leq 70\text{ mA}$                                                   |      | 10   | 47   | mV                   |
| $V_O$                 | Output Voltage                   |           | $12.5\text{ V} \leq V_I \leq 25\text{ V}$ , $1\text{ mA} \leq I_O \leq 40\text{ mA}$       | 9.5  |      | 10.5 | V                    |
|                       |                                  |           | $12.5\text{ V} \leq V_I \leq V_{MAX}^{(10)}$ ,<br>$1\text{ mA} \leq I_O \leq 70\text{ mA}$ | 9.5  |      | 10.5 |                      |
| $I_Q$                 | Quiescent Current                |           | $T_J = 25^\circ\text{C}$                                                                   |      |      | 6.0  | mA                   |
|                       |                                  |           | $T_J = 125^\circ\text{C}$                                                                  |      | 4.2  | 6.5  |                      |
| $\Delta I_Q$          | Quiescent Current Change         | With Line | $12.5\text{ V} \leq V_I \leq 25\text{ V}$                                                  |      |      | 1.5  | mA                   |
| $\Delta I_Q$          |                                  | With Load | $1\text{ mA} \leq I_O \leq 40\text{ mA}$                                                   |      |      | 0.1  | mA                   |
| $V_N$                 | Output Noise Voltage             |           | $T_A = 25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                       |      | 74   |      | $\mu\text{V}/V_O$    |
| $\Delta V_O/\Delta T$ | Temperature Coefficient of $V_O$ |           | $I_O = 5\text{ mA}$                                                                        |      | 0.95 |      | mV/ $^\circ\text{C}$ |
| RR                    | Ripple Rejection                 |           | $f = 120\text{ Hz}$ , $15\text{ V} \leq V_I \leq 25\text{ V}$ , $T_J = 25^\circ\text{C}$   | 38   | 43   |      | dB                   |
| $V_D$                 | Dropout Voltage                  |           | $T_J = 25^\circ\text{C}$                                                                   |      | 1.7  |      | V                    |

**Notes:**

9. The maximum steady-state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represents pulse test conditions with junction temperature as indicated at the initiation of tests.
10. Power dissipation:  $P_D \leq 0.75\text{ W}$ .

**Electrical Characteristics (KA78L12A)**

$V_I = 19\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $-40^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ , unless otherwise specified.

| Symbol              | Parameter                                 |           | Conditions                                                      |                                | Min. | Typ. | Max. | Unit              |
|---------------------|-------------------------------------------|-----------|-----------------------------------------------------------------|--------------------------------|------|------|------|-------------------|
| V <sub>O</sub>      | Output Voltage                            |           | T <sub>J</sub> = 25°C                                           |                                | 11.5 | 12.0 | 12.5 | V                 |
| ΔV <sub>O</sub>     | Line Regulation <sup>(11)</sup>           |           | T <sub>J</sub> = 25°C                                           | 14.5 V ≤ V <sub>I</sub> ≤ 27 V |      | 20   | 250  | mV                |
|                     |                                           |           |                                                                 | 16 V ≤ V <sub>I</sub> ≤ 27 V   |      | 15   | 200  | mV                |
| ΔV <sub>O</sub>     | Load Regulation <sup>(11)</sup>           |           | T <sub>J</sub> = 25°C                                           | 1 mA ≤ I <sub>O</sub> ≤ 100 mA |      | 20   | 100  | mV                |
|                     |                                           |           |                                                                 | 1 mA ≤ I <sub>O</sub> ≤ 40 mA  |      | 10   | 50   | mV                |
| V <sub>O</sub>      | Output Voltage                            |           | 14.5 V ≤ V <sub>I</sub> ≤ 27 V                                  | 1 mA ≤ I <sub>O</sub> ≤ 40 mA  | 11.4 |      | 12.6 | V                 |
|                     |                                           |           | 14.5 V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> <sup>(12)</sup>      | 1 mA ≤ I <sub>O</sub> ≤ 70 mA  | 11.4 |      | 12.6 | V                 |
| I <sub>Q</sub>      | Quiescent Current                         |           | T <sub>J</sub> = 25°C                                           |                                |      | 2.1  | 6.0  | mA                |
| ΔI <sub>Q</sub>     | Quiescent Current Change                  | With Line | 16 V ≤ V <sub>I</sub> ≤ 27 V                                    |                                |      |      | 1.5  | mA                |
| ΔI <sub>Q</sub>     |                                           | With Load | 1 mA ≤ I <sub>O</sub> ≤ 40 mA                                   |                                |      |      | 0.1  | mA                |
| V <sub>N</sub>      | Output Noise Voltage                      |           | T <sub>A</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz                      |                                |      | 80   |      | μV/V <sub>O</sub> |
| ΔV <sub>O</sub> /ΔT | Temperature Coefficient of V <sub>O</sub> |           | I <sub>O</sub> = 5 mA                                           |                                |      | -1.0 |      | mV/°C             |
| RR                  | Ripple Rejection                          |           | f = 120 Hz, 15 V ≤ V <sub>I</sub> ≤ 25 V, T <sub>J</sub> = 25°C |                                | 37   | 65   |      | dB                |
| V <sub>D</sub>      | Dropout Voltage                           |           | T <sub>J</sub> = 25°C                                           |                                |      | 1.7  |      | V                 |

**Notes:**

11. The maximum steady-state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represents pulse test conditions with junction temperature as indicated at the initiation of tests.

12. Power dissipation:  $P_D \leq 0.75\text{ W}$ .

**Electrical Characteristics (KA78L15A)**

$V_I = 23\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $-40^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ , unless otherwise specified.

| Symbol                | Parameter                        |           | Conditions                                                                                   | Min.  | Typ. | Max.  | Unit                 |
|-----------------------|----------------------------------|-----------|----------------------------------------------------------------------------------------------|-------|------|-------|----------------------|
| $V_O$                 | Output Voltage                   |           | $T_J = 25^\circ\text{C}$                                                                     | 14.4  | 15.0 | 15.6  | V                    |
| $\Delta V_O$          | Line Regulation <sup>(13)</sup>  |           | $T_J = 25^\circ\text{C}$                                                                     |       | 25   | 300   | mV                   |
|                       |                                  |           |                                                                                              |       | 20   | 250   | mV                   |
| $\Delta V_O$          | Load Regulation <sup>(13)</sup>  |           | $T_J = 25^\circ\text{C}$                                                                     |       | 25   | 150   | mV                   |
|                       |                                  |           |                                                                                              |       | 12   | 75    | mV                   |
| $V_O$                 | Output Voltage                   |           | $17.5\text{ V} \leq V_I \leq 30\text{ V}$                                                    | 14.25 |      | 15.75 | V                    |
|                       |                                  |           | $17.5\text{ V} \leq V_I \leq V_{MAX}^{(14)}$                                                 | 14.25 |      | 15.75 | V                    |
| $I_Q$                 | Quiescent Current                |           | $T_J = 25^\circ\text{C}$                                                                     |       | 2.1  | 6.0   | mA                   |
| $\Delta I_Q$          | Quiescent Current Change         | With Line | $20\text{ V} \leq V_I \leq 30\text{ V}$                                                      |       |      | 1.5   | mA                   |
| $\Delta I_Q$          |                                  | With Load | $1\text{ mA} \leq I_O \leq 40\text{ mA}$                                                     |       |      | 0.1   | mA                   |
| $V_N$                 | Output Noise Voltage             |           | $T_A = 25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                         |       | 90   |       | $\mu\text{V}/V_O$    |
| $\Delta V_O/\Delta T$ | Temperature Coefficient of $V_O$ |           | $I_O = 5\text{ mA}$                                                                          |       | -1.3 |       | mV/ $^\circ\text{C}$ |
| RR                    | Ripple Rejection                 |           | $f = 120\text{ Hz}$ , $18.5\text{ V} \leq V_I \leq 28.5\text{ V}$ , $T_J = 25^\circ\text{C}$ | 34    | 60   |       | dB                   |
| $V_D$                 | Dropout Voltage                  |           | $T_J = 25^\circ\text{C}$                                                                     |       | 1.7  |       | V                    |

**Notes:**

13. The maximum steady-state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represents pulse test conditions with junction temperature as indicated at the initiation of tests.

14. Power dissipation:  $P_D \leq 0.75\text{ W}$ .

**Electrical Characteristics (KA78L18A)**

$V_I = 27V$ ,  $I_O = 40mA$ ,  $-40^\circ C \leq T_J \leq 125^\circ C$ ,  $C_I = 0.33 \mu F$ ,  $C_O = 0.1 \mu F$ , unless otherwise specified.

| Symbol                | Parameter                        | Conditions                                                   | Min.                        | Typ. | Max. | Unit           |
|-----------------------|----------------------------------|--------------------------------------------------------------|-----------------------------|------|------|----------------|
| $V_O$                 | Output Voltage                   | $T_J = 25^\circ C$                                           | 17.3                        | 18.0 | 18.7 | V              |
| $\Delta V_O$          | Line Regulation <sup>(15)</sup>  | $T_J = 25^\circ C$                                           | $21 V \leq V_I \leq 33 V$   | 145  | 300  | mV             |
|                       |                                  |                                                              | $22 V \leq V_I \leq 33 V$   | 135  | 250  | mV             |
| $\Delta V_O$          | Load Regulation <sup>(15)</sup>  | $T_J = 25^\circ C$                                           | $1 mA \leq I_O \leq 100 mA$ | 30   | 170  | mV             |
|                       |                                  |                                                              | $1 mA \leq I_O \leq 40 mA$  | 15   | 85   | mV             |
| $V_O$                 | Output Voltage                   | $21 V \leq V_I \leq 33 V$                                    | $1 mA \leq I_O \leq 40 mA$  | 17.1 | 18.9 | V              |
|                       |                                  | $21 V \leq V_I \leq V_{MAX}^{(16)}$                          | $1 mA \leq I_O \leq 70 mA$  | 17.1 | 18.9 | V              |
| $I_Q$                 | Quiescent Current                | $T_J = 25^\circ C$                                           |                             | 2.2  | 6.0  | mA             |
| $\Delta I_Q$          | Quiescent Current Change         | With Line                                                    | $21 V \leq V_I \leq 33 V$   |      | 1.5  | mA             |
| $\Delta I_Q$          |                                  | With Load                                                    | $1 mA \leq I_O \leq 40 mA$  |      | 0.1  | mA             |
| $V_N$                 | Output Noise Voltage             | $T_A = 25^\circ C$ , $10 Hz \leq f \leq 100 kHz$             |                             | 150  |      | $\mu V/V_O$    |
| $\Delta V_O/\Delta T$ | Temperature Coefficient of $V_O$ | $I_O = 5 mA$                                                 |                             | -1.8 |      | mV/ $^\circ C$ |
| RR                    | Ripple Rejection                 | $f = 120 Hz$ , $23 V \leq V_I \leq 33V$ , $T_J = 25^\circ C$ | 34                          | 48   |      | dB             |
| $V_D$                 | Dropout Voltage                  | $T_J = 25^\circ C$                                           |                             | 1.7  |      | V              |

**Notes:**

15. The maximum steady-state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represents pulse test conditions with junction temperature as indicated at the initiation of tests.

16. Power dissipation:  $P_D \leq 0.75 W$ .

**Electrical Characteristics (KA78L05AA)**

$V_I = 10\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ , unless otherwise specified.

| Symbol                | Parameter                        |           | Conditions                                                                              | Min.                                      | Typ.  | Max. | Unit                 |
|-----------------------|----------------------------------|-----------|-----------------------------------------------------------------------------------------|-------------------------------------------|-------|------|----------------------|
| $V_O$                 | Output Voltage                   |           | $T_J = 25^\circ\text{C}$                                                                | 4.9                                       | 5.0   | 5.1  | V                    |
| $\Delta V_O$          | Line Regulation <sup>(17)</sup>  |           | $T_J = 25^\circ\text{C}$                                                                | $7\text{ V} \leq V_I \leq 20\text{ V}$    | 8     | 150  | mV                   |
|                       |                                  |           |                                                                                         | $8\text{ V} \leq V_I \leq 20\text{ V}$    | 6     | 100  | mV                   |
| $\Delta V_O$          | Load Regulation <sup>(17)</sup>  |           | $T_J = 25^\circ\text{C}$                                                                | $1\text{ mA} \leq I_O \leq 100\text{ mA}$ | 11    | 50   | mV                   |
|                       |                                  |           |                                                                                         | $1\text{ mA} \leq I_O \leq 40\text{ mA}$  | 5.0   | 25   | mV                   |
| $V_O$                 | Output Voltage                   |           | $7\text{ V} \leq V_I \leq 20\text{ V}$                                                  | $1\text{ mA} \leq I_O \leq 40\text{ mA}$  |       | 5.15 | V                    |
|                       |                                  |           | $7\text{ V} \leq V_I \leq V_{\text{MAX}}^{(18)}$                                        | $1\text{ mA} \leq I_O \leq 70\text{ mA}$  | 4.85  | 5.15 | V                    |
| $I_Q$                 | Quiescent Current                |           | $T_J = 25^\circ\text{C}$                                                                |                                           | 2.0   | 5.5  | mA                   |
| $\Delta I_Q$          | Quiescent Current Change         | With Line | $8\text{ V} \leq V_I \leq 20\text{ V}$                                                  |                                           |       | 1.5  | mA                   |
| $\Delta I_Q$          |                                  | With Load | $1\text{ mA} \leq I_O \leq 40\text{ mA}$                                                |                                           |       | 0.1  | mA                   |
| $V_N$                 | Output Noise Voltage             |           | $T_A = 25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                    |                                           | 40    |      | $\mu\text{V}/V_O$    |
| $\Delta V_O/\Delta T$ | Temperature Coefficient of $V_O$ |           | $I_O = 5\text{ mA}$                                                                     |                                           | -0.65 |      | mV/ $^\circ\text{C}$ |
| RR                    | Ripple Rejection                 |           | $f = 120\text{ Hz}$ , $8\text{ V} \leq V_I \leq 18\text{ V}$ , $T_J = 25^\circ\text{C}$ | 41                                        | 80    |      | dB                   |
| $V_D$                 | Dropout Voltage                  |           | $T_J = 25^\circ\text{C}$                                                                |                                           | 1.7   |      | V                    |

**Notes:**

17. The maximum steady-state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represents pulse test conditions with junction temperature as indicated at the initiation of tests.

18. Power dissipation:  $P_D \leq 0.75\text{ W}$ .

## Typical Application

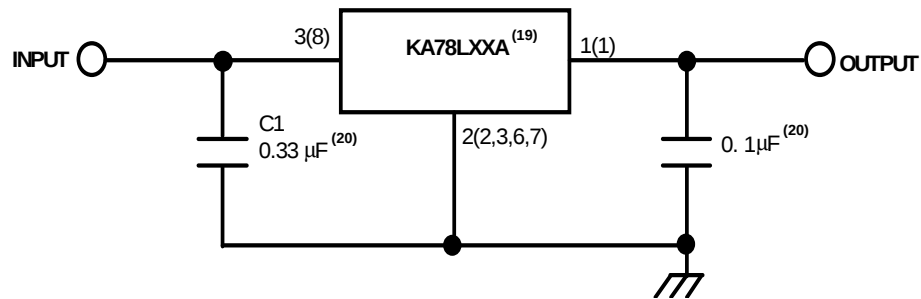
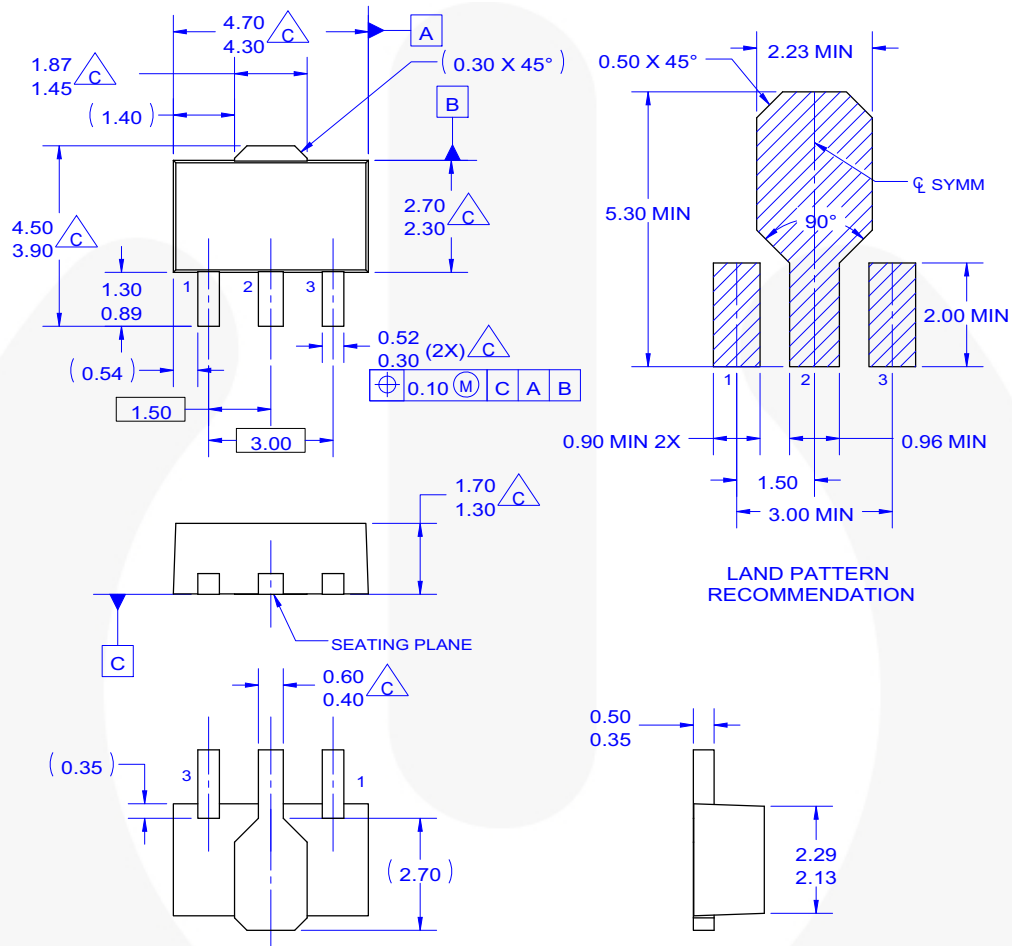


Figure 2. Typical Application

**Notes:**

- 19. To specify an output voltage, substitute voltage value for "XX".
- 20. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulator.

# Physical Dimensions



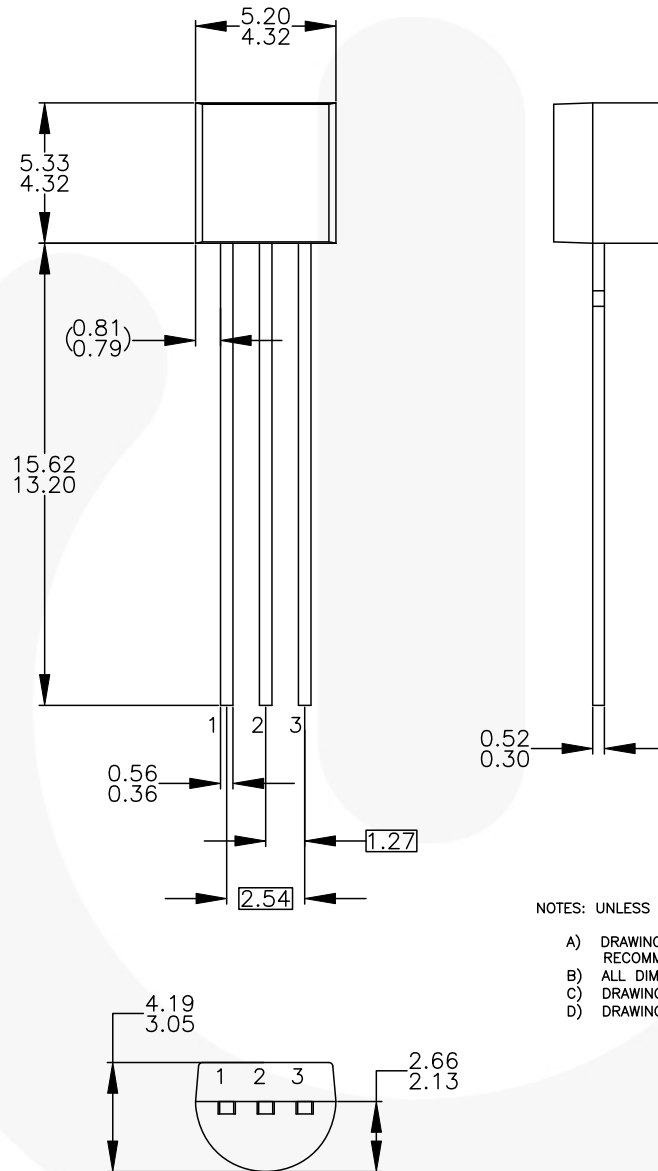
NOTES: UNLESS OTHERWISE SPECIFIED.

A. REFERENCE TO JEDEC TO-243 VARIATION AA.  
B. ALL DIMENSIONS ARE IN MILLIMETERS.

C. DOES NOT COMPLY JEDEC STANDARD VALUE.  
D. DIMENSIONS ARE EXCLUSIVE OF BURRS,  
MOLD FLASH AND TIE BAR PROTRUSION.  
E. DIMENSION AND TOLERANCE AS PER ASME  
Y14.5-1994.  
F. DRAWING FILE NAME: MA03CREV3

Figure 3. 3-LEAD, SOT-89, JEDEC TO-243, OPTION AA

Physical Dimensions (Continued)



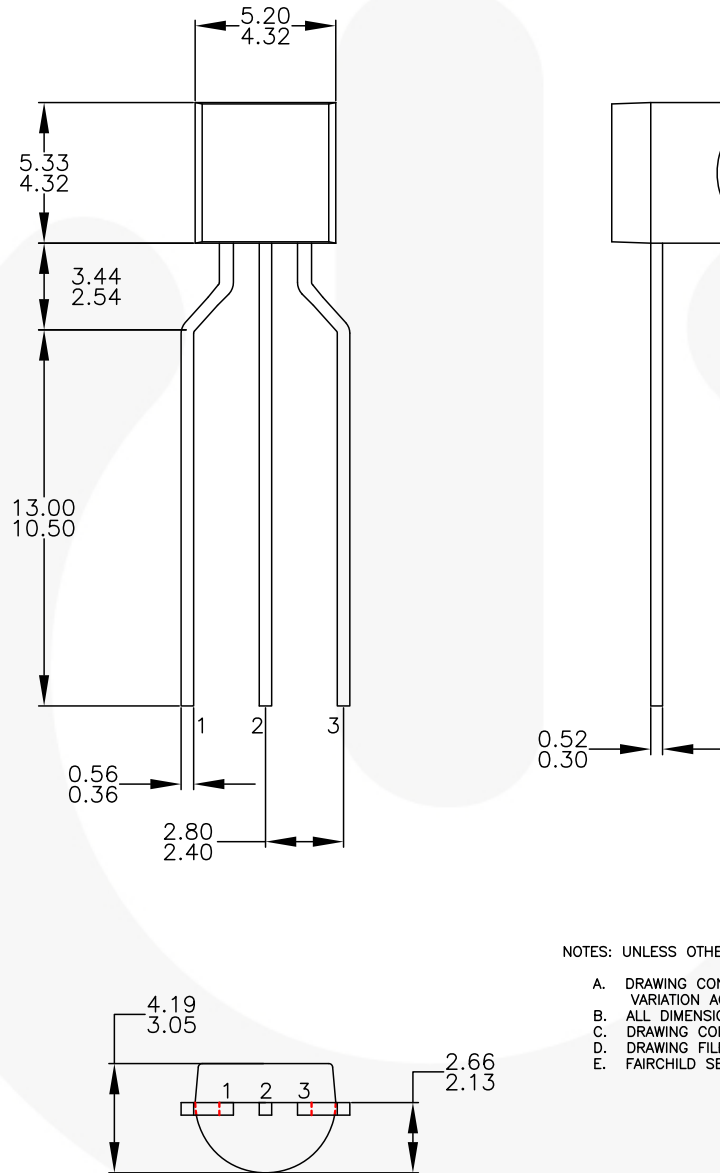
NOTES: UNLESS OTHERWISE SPECIFIED

- A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-2009.
- D) DRAWING FILENAME: MKT-ZA03DREV4.



Figure 4. 3-LEAD, TO-92, JEDEC TO-92 COMPLIANT STRAIGHT LEAD CONFIGURATION, BULK TYPE

Physical Dimensions (Continued)



NOTES: UNLESS OTHERWISE SPECIFIED

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Figure 5. 3-LEAD, TO-92, MOLDED 0.200 IN LINE SPACING LEAD FORM, AMMO TYPE

# Physical Dimensions (Continued)

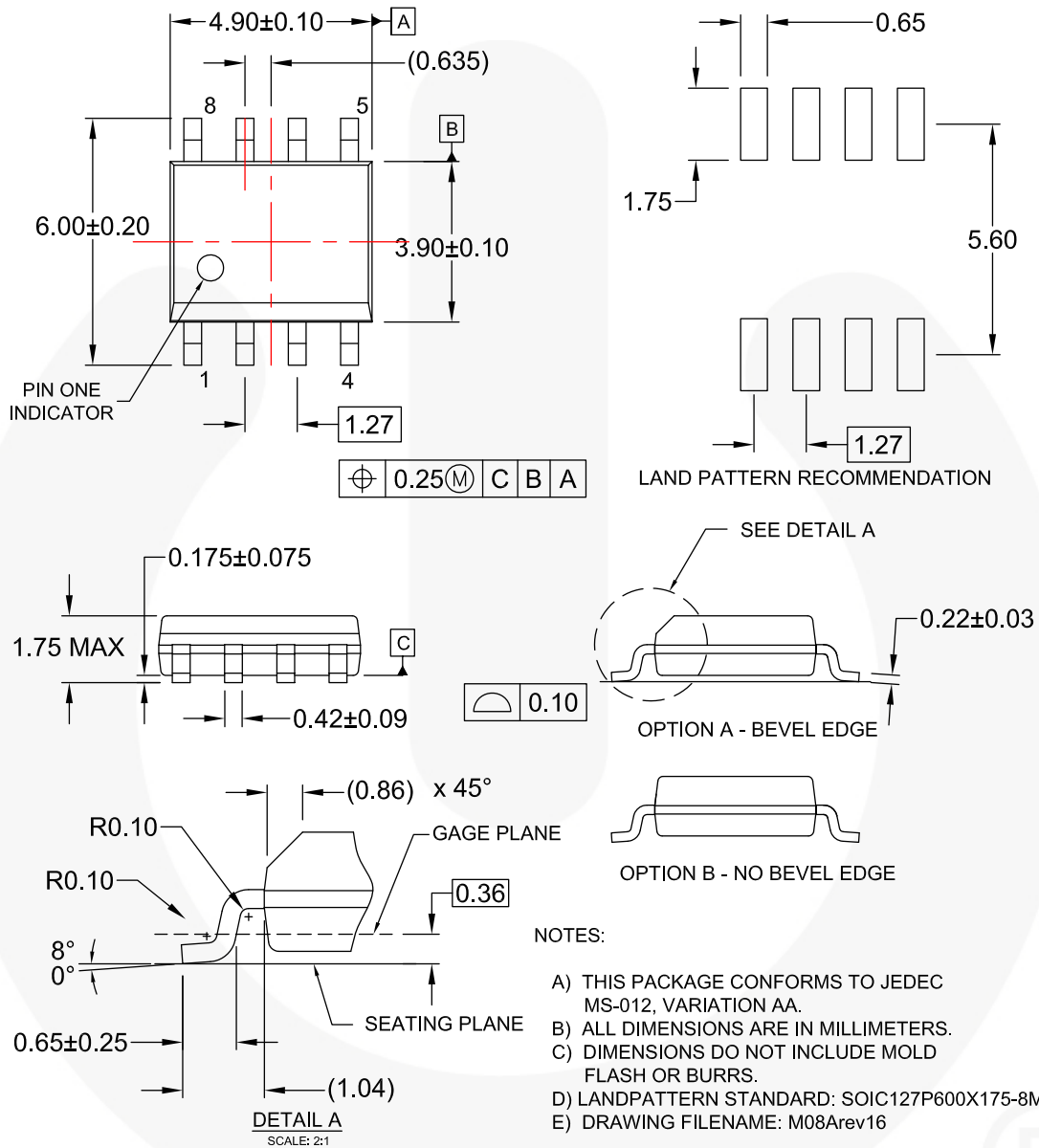


Figure 6. 8-LEAD, SOIC, JEDEC MS-012, 0.150" NARROW BODY



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