

# MC79LXXA/LM79LXXA

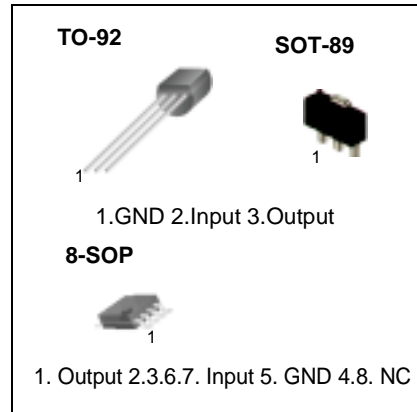
## 3-Terminal 0.1A Negative Voltage Regulator

### Features

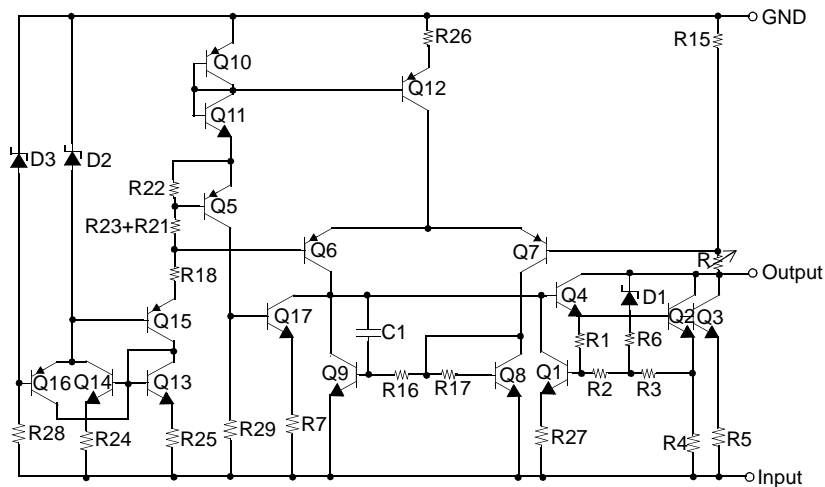
- Output Current up to 100mA
- No External Components
- Internal Thermal Over Load Protection
- Internal Short Circuit Current Limiting
- Output Voltage Offered in  $\pm 5\%$  Tolerance
- Output Voltage of -5V, -8V, -12V, -15V, -18V, -24V

### Description

These regulators employ internal current limiting and thermal shutdown, making them essentially indestructible.



### Internal Block Diagram



## Absolute Maximum Ratings

| Parameter   | Symbol | Value             | Unit |
|---|--------|-------------------|------|
| Input Voltage (for $V_O = -5V$ to $-8V$ )<br>(for $V_O = -12V$ to $-18V$ )<br>(for $V_O = -24V$ ) | $V_I$  | -30<br>-35<br>-40 | V    |
| Operating Temperature Range   | TOPR   | 0 ~ +125          | °C   |
| Storage Temperature Range   | TSTG   | -65 ~ +150        | °C   |

## Electrical Characteristics(MC79L05A/LM79L05A)

( $V_I = -10V$ ,  $I_O = 40mA$ ,  $C_I = 0.33\mu F$ ,  $C_O = 0.1\mu F$ ,  $0^\circ C \leq T_J \leq +125^\circ C$ , unless otherwise specified)

| Parameter                | Symbol       | Conditions  | Min.                        | Typ. | Max.  | Unit    |    |
|--------------------------|--------------|---|-----------------------------|------|-------|---------|----|
| Output Voltage           | $V_O$        | $T_J = +25^\circ C$   | -4.8                        | -5.0 | -5.2  | V       |    |
| Line Regulation (Note1)  | $\Delta V_O$ | $T_J = +25^\circ C$   | $-7.0V \geq V_I \geq -20V$  | -    | 15    | 150     | mV |
|                          |              |   | $-8V \geq V_I \geq -20V$    | -    | -     | 100     | mV |
| Load Regulation (Note1)  | $\Delta V_O$ | $T_J = +25^\circ C$   | $1.0mA \leq I_O \leq 100mA$ | -    | 20    | 60      | mV |
|                          |              |   | $1.0mA \leq I_O \leq 40mA$  | -    | 10    | 30      | mV |
| Output Voltage           | $V_O$        | $-7.0V \geq V_I \geq -20V$ , $1.0mA \leq I_O \leq 40mA$       | -4.75                       | -    | -5.25 | V       |    |
|                          |              | $V_I = -10V$ , $1.0mA \leq I_O \leq 70mA$                     | -4.75                       | -    | -5.25 | V       |    |
| Quiescent Current        | $I_Q$        | $T_J = +25^\circ C$   | -                           | 2.0  | 5.5   | mA      |    |
|                          |              | $T_J = +125^\circ C$  | -                           | -    | 6.0   |         |    |
| Quiescent Current Change | With Line    | $\Delta I_Q$  | -                           | -    | 1.5   | mA      |    |
|                          | With Load    | $\Delta I_Q$  | -                           | -    | 0.1   |         |    |
| Output Noise Voltage     | $V_N$        | $T_A = +25^\circ C$ , $10Hz \leq f \leq 100kHz$               | -                           | 30   | -     | $\mu V$ |    |
| Ripple Rejection         | RR           | $f = 120Hz$ , $-8V \geq V_I \geq -18V$<br>$T_J = +25^\circ C$ | 41                          | 60   | -     | dB      |    |
| Dropout Voltage          | $V_D$        | $T_J = +25^\circ C$   | -                           | 1.7  | -     | V       |    |

### 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 (MC79L08A)** (Continued)(V<sub>I</sub> = -14V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF, 0°C ≤ T<sub>J</sub> ≤ +125°C, unless otherwise specified)

| Parameter                | Symbol          | Conditions  | Min.                           | Typ. | Max. | Unit |    |
|--------------------------|-----------------|---|--------------------------------|------|------|------|----|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = +25°C  | -7.7                           | -8.0 | -8.3 | V    |    |
| Line Regulation(Note1)   | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | -10.3V ≥ V <sub>I</sub> ≥ -23V | -    | -    | 175  | mV |
|                          |                 |   | -12V ≥ V <sub>I</sub> ≥ -23V   | -    | -    | 125  | mV |
| Load Regulation (Note1)  | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | 1.0mA ≤ I <sub>O</sub> ≤ 100mA | -    | -    | 80   | mV |
|                          |                 |   | 1.0mA ≤ I <sub>O</sub> ≤ 40mA  | -    | -    | 40   | mV |
| Output Voltage           | V <sub>O</sub>  | -10.3V ≥ V <sub>I</sub> ≥ -23V, 1.0mA ≤ I <sub>O</sub> ≤ 40mA     | -7.6                           | -    | -8.4 | V    |    |
|                          |                 | V <sub>I</sub> = -14V, 1.0mA ≤ I <sub>O</sub> ≤ 70mA              | -7.6                           | -    | -8.4 |      |    |
| Quiescent Current        | I <sub>q</sub>  | T <sub>J</sub> = +25°C  | -                              | -    | 6.0  | mA   |    |
|                          |                 | T <sub>J</sub> = +125°C   | -                              | -    | 5.5  |      |    |
| Quiescent Current Change | With Line       | ΔI <sub>Q</sub>   | -11.7V ≥ V <sub>I</sub> ≥ -23V | -    | -    | 1.5  | mA |
|                          | With Load       |   |                                |      |      |      |    |
| Output Noise Voltage     | V <sub>N</sub>  | T <sub>J</sub> = +25°C, 10Hz ≤ f ≤ 100kHz                         | -                              | 50   | -    | μV   |    |
| Ripple Rejection         | RR              | f = 120Hz, -11V ≥ V <sub>I</sub> ≥ -21V<br>T <sub>J</sub> = +25°C | 39                             | 55   | -    | dB   |    |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = +25°C  | -                              | 1.7  | -    | V    |    |

**Note:**

1. Load and line regulation are specified at constant junction temperature. Change in V<sub>O</sub> due to heating effects must be taken into account separately. Pulse testing with low duty is used.

**Electrical Characteristics(MC79L12A)** (Continued)(V<sub>I</sub> = -19V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF, 0°C ≤ T<sub>J</sub> ≤ +125°C, unless otherwise specified)

| Parameter                | Symbol          | Conditions  | Min.                           | Typ.  | Max.  | Unit |    |
|--------------------------|-----------------|---|--------------------------------|-------|-------|------|----|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = +25°C  | -11.5                          | -12.0 | -12.5 | V    |    |
| Line Regulation (Note1)  | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | -14.5V ≥ V <sub>I</sub> ≥ -27V | -     | -     | 250  | mV |
|                          |                 |   | -16V ≥ V <sub>I</sub> ≥ -27V   | -     | -     | 200  | mV |
| Load Regulation (Note1)  | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | 1.0mA ≤ I <sub>O</sub> ≤ 100mA | -     | -     | 100  | mV |
|                          |                 |   | 1.0mA ≤ I <sub>O</sub> ≤ 40mA  | -     | -     | 50   | mV |
| Output Voltage           | V <sub>O</sub>  | -14.5V > V <sub>I</sub> > -27V, 1.0mA ≤ I <sub>O</sub> ≤ 40mA     | -11.4                          | -     | -12.6 | V    |    |
|                          |                 | V <sub>I</sub> = -19V, 1.0mA ≤ I <sub>O</sub> ≤ 70mA              | -11.4                          | -     | -12.6 | V    |    |
| Quiescent Current        | I <sub>Q</sub>  | T <sub>J</sub> = +25°C  | -                              | -     | 6.0   | mA   |    |
|                          |                 | T <sub>J</sub> = +125°C   | -                              | -     | 6.5   |      |    |
| Quiescent Current Change | With Line       | ΔI <sub>Q</sub>   | -16V ≥ V <sub>I</sub> ≥ -27V   | -     | -     | 1.5  | mA |
|                          | With Load       | ΔI <sub>Q</sub>   | 1.0mA ≤ I <sub>O</sub> ≤ 40mA  | -     | -     | 0.1  |    |
| Output Noise Voltage     | V <sub>N</sub>  | T <sub>A</sub> = +25°C, 10Hz ≤ f ≤ 100kHz                         | -                              | 80    | -     | μV   |    |
| Ripple Rejection         | RR              | f = 120Hz, -15V ≥ V <sub>I</sub> ≥ -25V<br>T <sub>J</sub> = +25°C | 37                             | 42    | -     | dB   |    |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = +25°C  | -                              | 1.7   | -     | V    |    |

**Note:**

1. Load and line regulation are specified at constant junction temperature. Change in V<sub>O</sub> due to heating effects must be taken into account separately. Pulse testing with low duty is used.

**Electrical Characteristics(MC79L15A)** (Continued)(V<sub>I</sub> = -23V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF, 0°C ≤ T<sub>J</sub> ≤ +125°C, unless otherwise specified)

| Parameter                | Symbol          | Conditions  | Min.                           | Typ.  | Max.   | Unit |    |
|--------------------------|-----------------|---|--------------------------------|-------|--------|------|----|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = +25°C  | -14.4                          | -15.0 | -15.6  | V    |    |
| Line Regulation (Note1)  | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | -17.5V ≥ V <sub>I</sub> ≥ -30V | -     | -      | 300  | mV |
|                          |                 |   | -20V ≥ V <sub>I</sub> ≥ -30V   | -     | -      | 250  | mV |
| Load Regulation (Note1)  | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | 1.0mA ≤ I <sub>O</sub> ≤ 100mA | -     | -      | 150  | mV |
|                          |                 |   | 1.0mA ≤ I <sub>O</sub> ≤ 40mA  | -     | -      | 75   | mV |
| Output Voltage           | V <sub>O</sub>  | -17.5V ≥ V <sub>I</sub> ≥ -30V, 1.0mA ≤ I <sub>O</sub> ≤ 40mA         | -14.25                         | -     | -15.75 | V    |    |
|                          |                 | V <sub>I</sub> = -23V, 1.0mA ≤ I <sub>O</sub> ≤ 70mA                  | -14.25                         | -     | -15.75 | V    |    |
| Quiescent Current        | I <sub>Q</sub>  | T <sub>J</sub> = +25°C  | -                              | -     | 6.0    | mA   |    |
|                          |                 | T <sub>J</sub> = +125°C   | -                              | -     | 6.5    |      |    |
| Quiescent Current Change | With Line       | ΔI <sub>Q</sub>   | -20V ≥ V <sub>I</sub> ≥ -30V   | -     | -      | 1.5  | mA |
|                          | With Load       | ΔI <sub>Q</sub>   | 1.0mA ≤ I <sub>O</sub> ≤ 40mA  | -     | -      | 0.1  |    |
| Output Noise Voltage     | V <sub>N</sub>  | T <sub>A</sub> = +25°C, 10Hz ≤ f ≤ 100kHz                             | -                              | 90    | -      | μV   |    |
| Ripple Rejection         | RR              | f = 120Hz, -18.5V ≥ V <sub>I</sub> ≥ -28.5V<br>T <sub>J</sub> = +25°C | 34                             | 39    | -      | dB   |    |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = +25°C  | -                              | 1.7   | -      | V    |    |

**Note:**

1. Load and line regulation are specified at constant junction temperature. Change in V<sub>O</sub> due to heating effects must be taken into account separately. Pulse testing with low duty is used.

**Electrical Characteristics(MC79L18A)** (Continued)(V<sub>I</sub> = -27V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF, 0°C ≤ T<sub>J</sub> ≤ +125°C, unless otherwise specified)

| Parameter                | Symbol          | Conditions  | Min.                           | Typ.  | Max.  | Unit |    |
|--------------------------|-----------------|---|--------------------------------|-------|-------|------|----|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = +25°C  | -17.3                          | -18.0 | -18.7 | V    |    |
| Line Regulation (Note1)  | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | -20.7V ≥ V <sub>I</sub> ≥ -33V | -     | -     | 325  | mV |
|                          |                 |   | -21V ≥ V <sub>I</sub> ≥ -33V   | -     | -     | 275  | mV |
| Load Regulation (Note1)  | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | 1.0mA ≤ I <sub>O</sub> ≤ 100mA | -     | -     | 170  | mV |
|                          |                 |   | 1.0mA ≤ I <sub>O</sub> ≤ 40mA  | -     | -     | 85   | mV |
| Output Voltage           | V <sub>O</sub>  | -20.7V > V <sub>I</sub> > -33V, 1.0mA ≤ I <sub>O</sub> ≤ 40mA     | -17.1                          | -     | -18.9 | V    |    |
|                          |                 | V <sub>I</sub> = -27V, 1.0mA ≤ I <sub>O</sub> ≤ 70mA              | -17.1                          | -     | -18.9 | V    |    |
| Quiescent Current        | I <sub>Q</sub>  | T <sub>J</sub> = +25°C  | -                              | -     | 6.5   | mA   |    |
|                          |                 | T <sub>J</sub> = +125°C   | -                              | -     | 6.0   |      |    |
| Quiescent Current Change | With Line       | ΔI <sub>Q</sub>   | -21V ≥ V <sub>I</sub> ≥ -33V   | -     | -     | 1.5  | mA |
|                          | With Load       | ΔI <sub>Q</sub>   | 1.0mA ≤ I <sub>O</sub> ≤ 40mA  | -     | -     | 0.1  |    |
| Output Noise Voltage     | V <sub>N</sub>  | T <sub>A</sub> = +25°C, 10Hz ≤ f ≤ 100kHz                         | -                              | 150   | -     | μV   |    |
| Ripple Rejection         | RR              | f = 120Hz, -23V ≥ V <sub>I</sub> ≥ -33V<br>T <sub>J</sub> = +25°C | 33                             | 48    | -     | dB   |    |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = +25°C  | -                              | 1.7   | -     | V    |    |

**Note:**

1. Load and line regulation are specified at constant junction temperature. Change in V<sub>O</sub> due to heating effects must be taken into account separately. Pulse testing with low duty is used.

**Electrical Characteristics(MC79L24A)** (Continued)(V<sub>I</sub> = -33V, I<sub>O</sub> = 40mA, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF, 0°C ≤ T<sub>J</sub> ≤ +125°C, unless otherwise specified)

| Parameter                | Symbol          | Conditions  | Min.                           | Typ. | Max.  | Unit |    |
|--------------------------|-----------------|---|--------------------------------|------|-------|------|----|
| Output Voltage           | V <sub>O</sub>  | T <sub>J</sub> = +25°C  | -23                            | -24  | -25   | V    |    |
| Line Regulation (Note1)  | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | -27V ≥ V <sub>I</sub> ≥ -38V   | -    | -     | 350  | mV |
|                          |                 |   | -28V ≥ V <sub>I</sub> ≥ -38V   | -    | -     | 300  | mV |
| Load Regulation (Note1)  | ΔV <sub>O</sub> | T <sub>J</sub> = +25°C  | 1.0mA ≤ I <sub>O</sub> ≤ 100mA | -    | -     | 200  | mV |
|                          |                 |   | 1.0mA ≤ I <sub>O</sub> ≤ 40mA  | -    | -     | 100  | mV |
| Output Voltage           | V <sub>O</sub>  | -27V ≥ V <sub>I</sub> ≥ -38V, 1.0mA ≤ I <sub>O</sub> ≤ 40mA       | -22.8                          | -    | -25.2 | V    |    |
|                          |                 | V <sub>I</sub> = -33V, 1.0mA ≤ I <sub>O</sub> ≤ 70mA              | -22.8                          | -    | -25.2 | V    |    |
| Quiescent Current        | I <sub>Q</sub>  | T <sub>J</sub> = +25°C  | -                              | -    | 6.5   | mA   |    |
|                          |                 | T <sub>J</sub> = +125°C   | -                              | -    | 6.0   |      |    |
| Quiescent Current Change | With Line       | ΔI <sub>Q</sub>   | -28V ≥ V <sub>I</sub> ≥ -38V   | -    | -     | 1.5  | mA |
|                          | With Load       | ΔI <sub>Q</sub>   | 1.0mA ≤ I <sub>O</sub> ≤ 40mA  | -    | -     | 0.1  |    |
| Output Noise Voltage     | V <sub>N</sub>  | T <sub>A</sub> = +25°C, 10Hz ≤ f ≤ 100kHz                         | -                              | 200  | -     | μV   |    |
| Ripple Rejection         | RR              | f = 120Hz, -29V ≥ V <sub>I</sub> ≥ -35V<br>T <sub>J</sub> = +25°C | 31                             | 47   | -     | dB   |    |
| Dropout Voltage          | V <sub>D</sub>  | T <sub>J</sub> = +25°C  | -                              | 1.7  | -     | V    |    |

**Note:**

1. Load and line regulation are specified at constant junction temperature. Change in V<sub>O</sub> due to heating effects must be taken into account separately. Pulse testing with low duty is used.

## Typical Application

### Design Considerations

The MC79LXXA/LM79LXXA Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition. Internal Short Circuit Protection that limits the maximum current the circuit will pass. In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A  $0.33\mu\text{F}$  or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulator's input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead. Bypassing the output is also recommended.

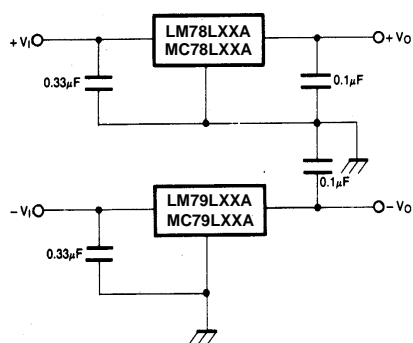


Figure 1. Positive And Negative Regulator

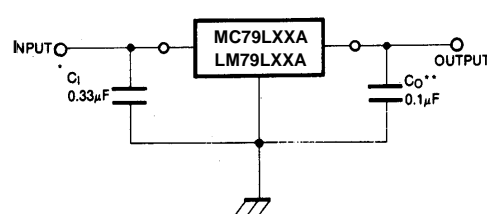


Figure 2. Typical Application

A common ground is required between the Input and the output voltages. The input voltage must remain typically 2.0V above the output voltage even during the low point on the input ripple voltage.

- \*  $C_1$  is required if regulator is located an appreciable distance from power supply filter.
- \*  $C_0$  improves stability and transient response.

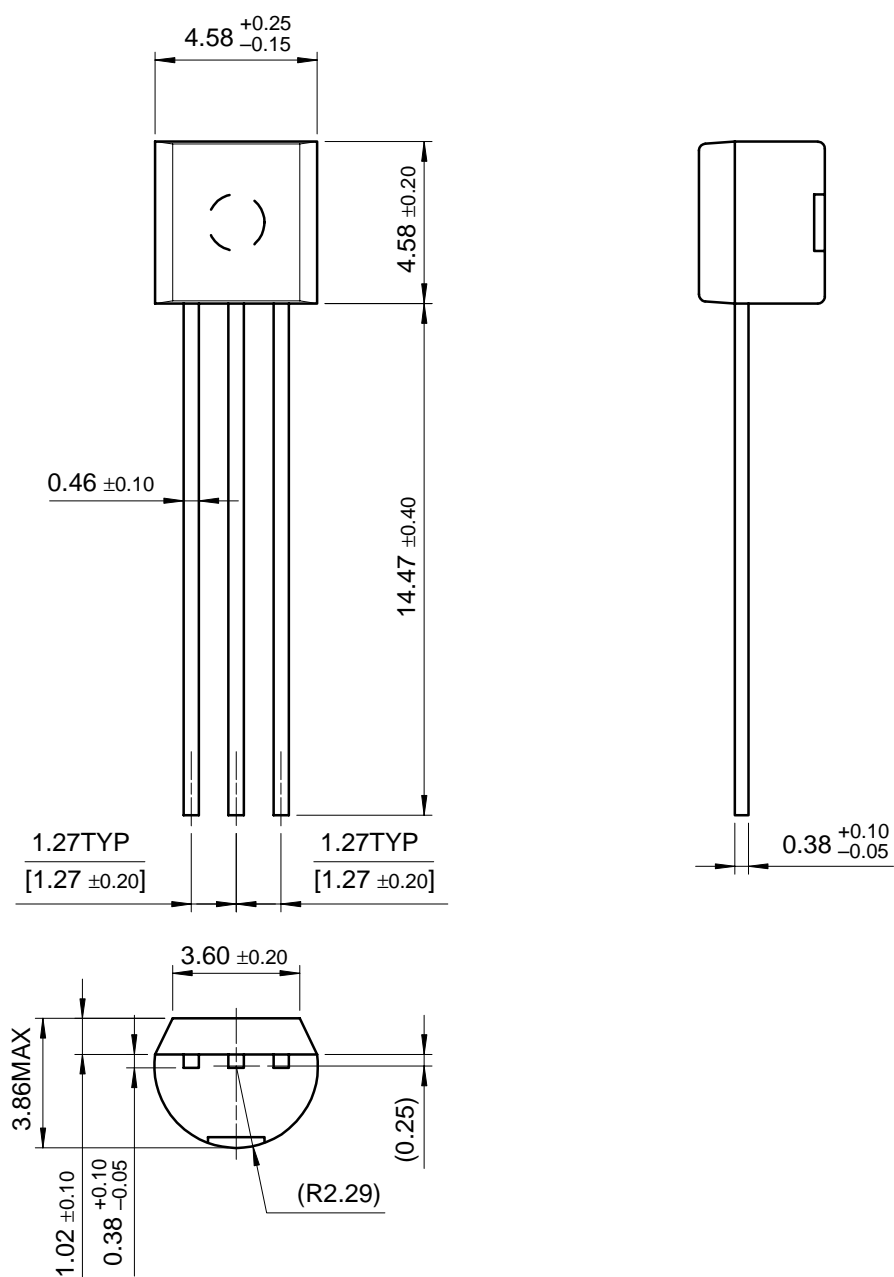


## Mechanical Dimensions

### Package

Dimensions in millimeters

### TO-92

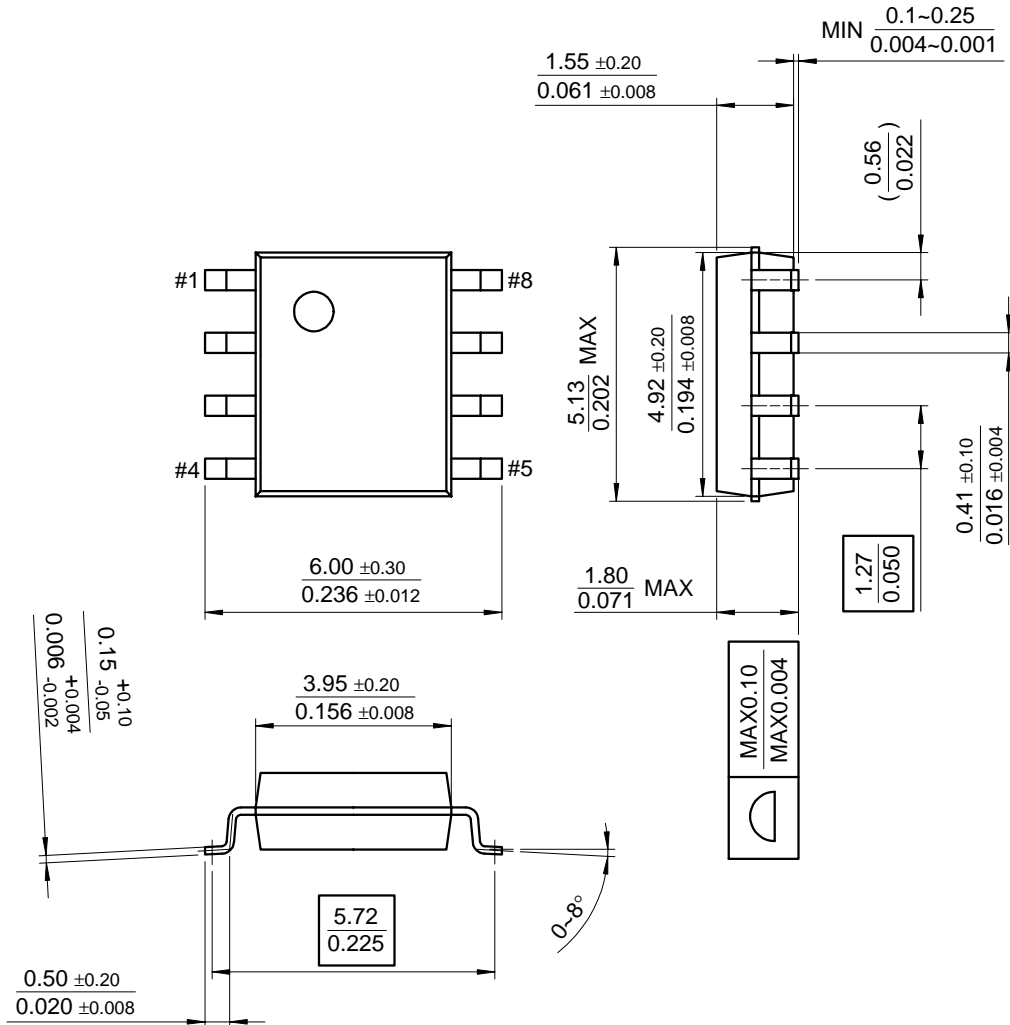


# Mechanical Dimensions (Continued)

## Package

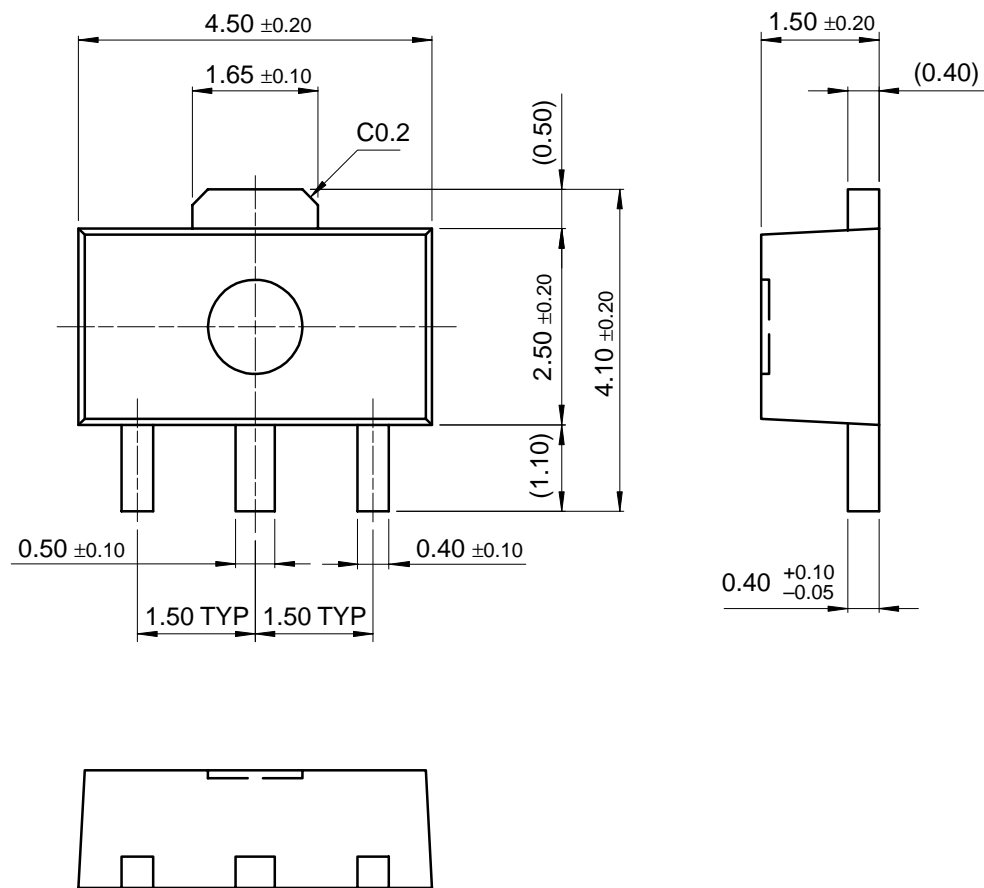
Dimensions in millimeters

### 8-SOP



**Mechanical Dimensions** (Continued)**Package**

Dimensions in millimeters

**SOT-89**

## Ordering Information

| Product Number | Package | Operating Temperature |
|----------------|---------|-----------------------|
| LM79L05ACZ     | TO-92   | 0 ~ +125°C            |
| Product Number | Package | Operating Temperature |
| MC79L05ACP     | TO-92   | 0 ~ +125°C            |
| MC79L08ACP     |         |                       |
| MC79L12ACP     |         |                       |
| MC79L15ACP     |         |                       |
| MC79L18ACP     |         |                       |
| MC79L24ACP     |         |                       |
| MC79L05ACD     | 8-SOP   |                       |
| MC79L15ACD     |         |                       |
| MC79L05ACH     | SOT-89  |                       |

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