

# MC79LXXA/LM79LXXA

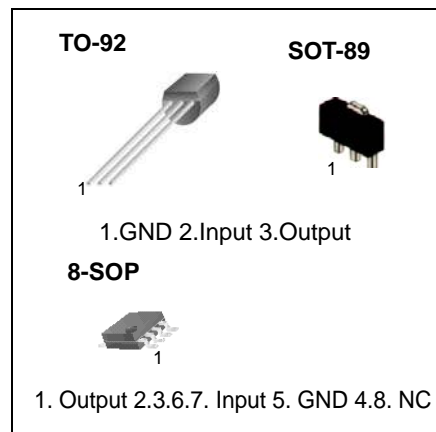
## 3-Terminal 0.1A Negative Voltage Regulator

### Features

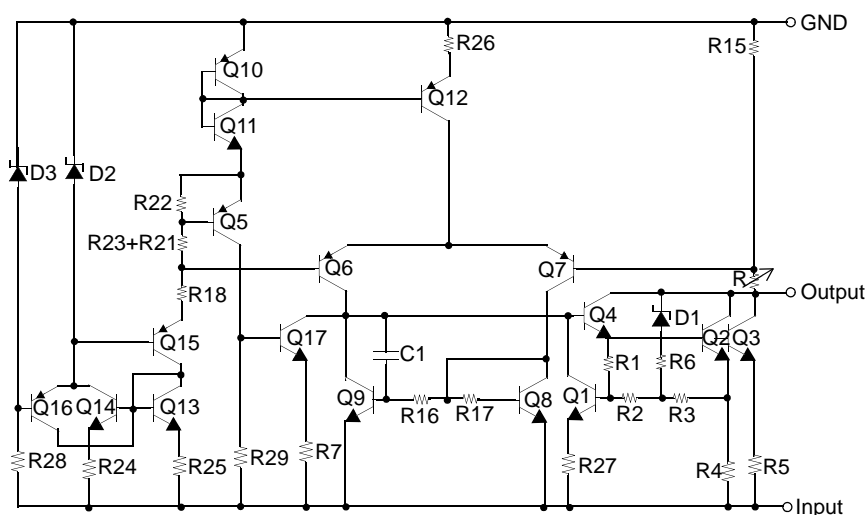
- Output Current up to 100mA
- No External Components
- Internal Thermal Over Load Protection
- Internal Short Circuit Current Limiting
- Output Voltage Offered in  $\pm 5\%$  Tolerance
- Output Voltage of -5V, -8V, -12V, -15V, -18V, -24V

### 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 $-8V$ ) (for $V_O = -12V$ to $-18V$ ) (for $V_O = -24V$ )	$V_I$	-30 -35 -40	V
Operating Temperature Range	$T_{OPR}$	0 ~ +125	°C
Storage Temperature Range	$T_{STG}$	-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		VO	TJ = +25°C	-4.8	-5.0	-5.2	V	
Line Regulation (Note1)		ΔVO	TJ =+25°C	-7.0V ≥ VI ≥ -20V	-	15	150	mV
				-8V ≥ VI ≥ -20V	-	-	100	mV
Load Regulation (Note1)		ΔVO	TJ =+25°C	1.0mA ≤ IO ≤ 100mA	-	20	60	mV
				1.0mA ≤ IO ≤ 40mA	-	10	30	mV
Output Voltage		VO	-7.0V ≥ VI ≥ -20V, 1.0mA ≤ IO ≤ 40mA	-4.75	-	-5.25	V	
			VI = -10V, 1.0mA ≤ IO ≤ 70mA	-4.75	-	-5.25	V	
Quiescent Current		IQ	TJ =+25°C	-	2.0	5.5	mA	
			TJ = +125°C	-	-	6.0		
Quiescent Current Change	With Line	ΔIQ	-8V ≥ VI ≥ -20V	-	-	1.5	mA	
	With Load	ΔIQ	1.0mA ≤ IO ≤ 40mA	-	-	0.1	mA	
Output Noise Voltage		VN	TA = +25°C,10Hz ≤ f ≤ 100kHz	-	30	-	μV	
Ripple Rejection		RR	f = 120Hz, -8V ≥ VI ≥ -18V TJ = +25°C	41	60	-	dB	
Dropout Voltage		VD	TJ = +25°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		1.0mA ≤ I <sub>O</sub> ≤ 40mA		-	-	0.1 mA
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 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	mA
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 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	mA
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 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	mA	
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 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	mA
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 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.

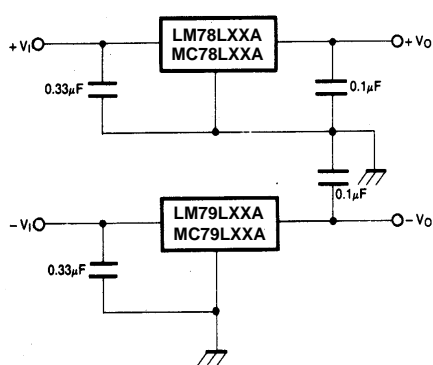


Figure 1. Positive And Negative Regulator

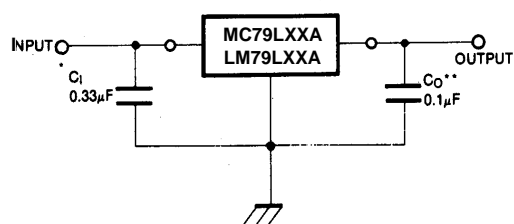


Figure 2. Typical Application

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.

\*  $C_I$  is required if regulator is located an appreciable distance from power supply filter.

\*  $C_O$  improves stability and transient response.

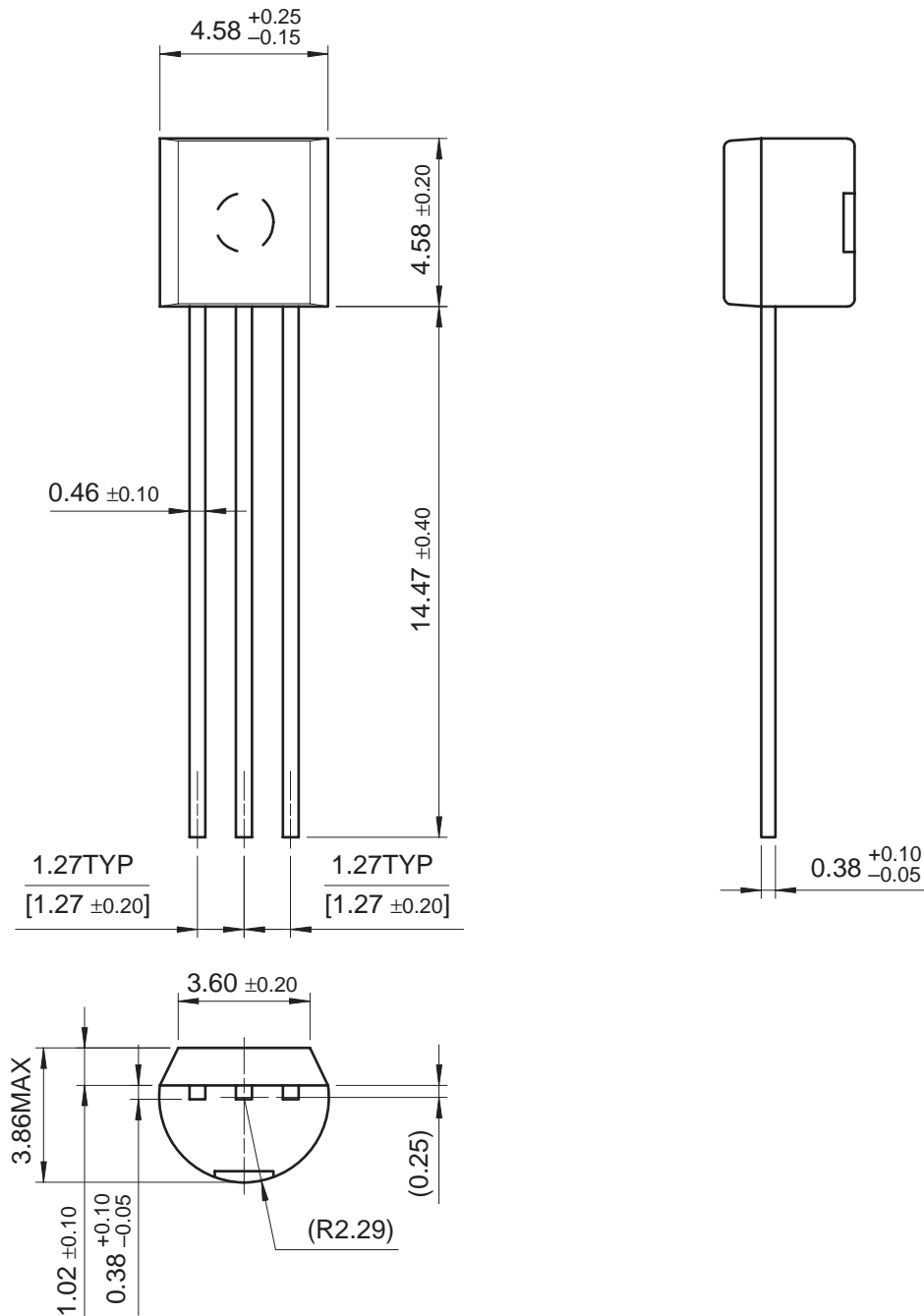


## Mechanical Dimensions

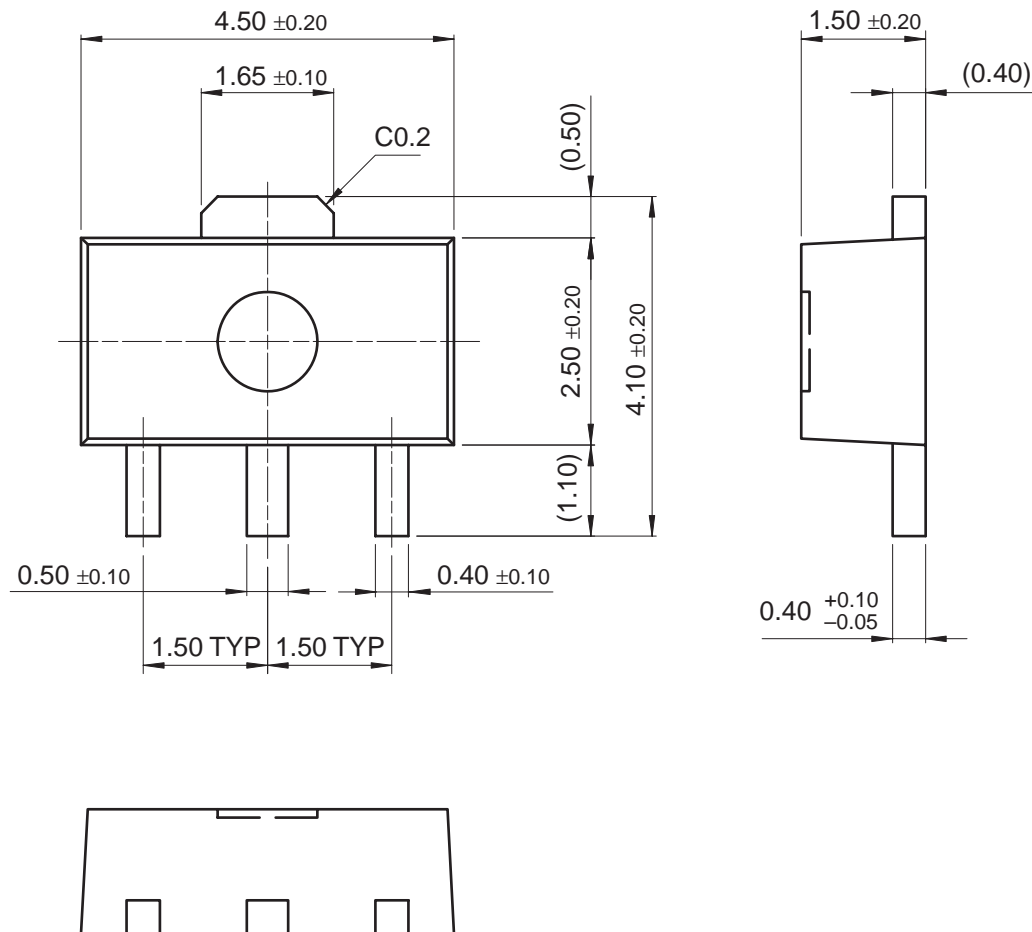
### Package

Dimensions in millimeters

### TO-92





**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		
MC79L15ACD	8-SOP	0 ~ +125°C
MC79L05ACH	SOT-89	

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