

KA79LXXA

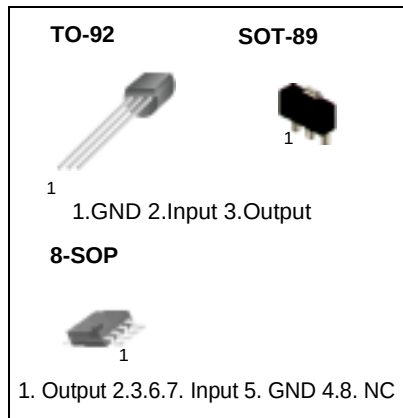
3-Terminal 0.1A Negative Voltage Regulator

Features

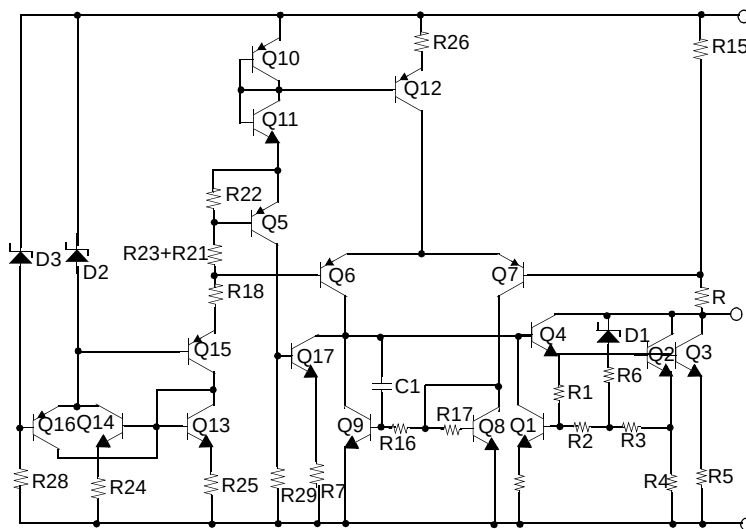
- Output Current up to 100mA
- No External Components
- Internal Thermal Over Load Protection
- Internal Short Circuit Current Limiting
- Output Voltage Offered in $\pm 5\%$ Tolerance
- Output Voltage of -5V, -8V, -12V, -15V, -18V and -24V

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	TOPR	0 ~ +125	°C
Storage Temperature Range	TSTG	-65 ~ +150	°C

Electrical Characteristics(KA79L05A)

($V_I = -10V$, $I_O = 40mA$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $0^\circ C \leq T_J \leq +125^\circ C$, 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)		ΔV_O	$T_J = +25^\circ C$	-	15	150	mV
			$-7.0V \geq V_I \geq -20V$ $-8V \geq V_I \geq -20V$	-	-	100	mV
Load Regulation (Note1)		ΔV_O	$T_J = +25^\circ C$	-	20	60	mV
			$1.0mA \leq I_O \leq 100mA$ $1.0mA \leq I_O \leq 40mA$	-	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	ΔI_Q	$-8V \geq V_I \geq -20V$	-	-	1.5	mA
	With Load	ΔI_Q	$1.0mA \leq I_O \leq 40mA$	-	-	0.1	mA
Output Noise Voltage		V_N	$T_A = +25^\circ C$, $10Hz \leq f \leq 100kHz$	-	30	-	μV
Ripple Rejection		RR	$f = 120Hz$, $-8V \geq V_I \geq -18V$, $T_J = +25^\circ C$	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 (KA79L08A) (Continued)(V_I = -14V, I_O = 40mA, C_I = 0.33μF, C_O = 0.1μF, 0°C ≤ T_J ≤ +125°C, unless otherwise specified)

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage		V _O	T _J = +25°C	-7.7	-8.0	-8.3	V
Line Regulation (Note1)		ΔV _O	T _J = +25°C	-10.3V ≥ V _I ≥ -23V	-	-	175 mV
				-12V ≥ V _I ≥ -23V	-	-	125 mV
Load Regulation (Note1)		ΔV _O	T _J = +25°C	1.0mA ≤ I _O ≤ 100mA	-	-	80 mV
				1.0mA ≤ I _O ≤ 40mA	-	-	40 mV
Output Voltage		V _O	-10.3V ≥ V _I ≥ -23V, 1.0mA ≤ I _O ≤ 40mA		-7.6	-	-8.4 V
			V _I = -14V, 1.0mA ≤ I _O ≤ 70mA		-7.6	-	-8.4
Quiescent Current		I _Q	T _J = +25°C	-	-	6.0	mA
			T _J = +125°C	-	-	5.5	
Quiescent Current Change	With Line	ΔI _Q	-11.7V ≥ V _I ≥ -23V		-	-	1.5 mA
	With Load		1.0mA ≤ I _O ≤ 40mA		-	-	0.1 mA
Output Noise Voltage		V _N	T _J = +25°C, 10Hz ≤ f ≤ 100kHz		-	50	μV
Ripple Rejection		RR	f = 120Hz, -11V ≥ V _I ≥ -21V, T _J = +25°C		39	55	dB
Dropout Voltage		V _D	T _J = +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(KA79L12A) (Continued)(V_I = -19V, I_O = 40mA, C_I = 0.33μF, C_O = 0.1μF, 0°C ≤ T_J ≤ +125°C, unless otherwise specified)

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage		V _O	T _J = +25°C	-11.5	-12.0	-12.5	V
Line Regulation (Note1)		ΔV _O	T _J = +25°C	-14.5V ≥ V _I ≥ -27V	-	-	250 mV
				-16V ≥ V _I ≥ -27V	-	-	200 mV
Load Regulation (Note1)		ΔV _O	T _J = +25°C	1.0mA ≤ I _O ≤ 100mA	-	-	100 mV
				1.0mA ≤ I _O ≤ 40mA	-	-	50 mV
Output Voltage		V _O	-14.5V > V _I > -27V, 1.0mA ≤ I _O ≤ 40mA	-11.4	-	-12.6	V
			V _I = -19V, 1.0mA ≤ I _O ≤ 70mA	-11.4	-	-12.6	V
Quiescent Current		I _Q	T _J = +25°C	-	-	6.0	mA
			T _J = +125°C	-	-	6.5	
Quiescent Current Change	With Line	ΔI _Q	-16V ≥ V _I ≥ -27V	-	-	1.5	mA
	With Load	ΔI _Q	1.0mA ≤ I _O ≤ 40mA	-	-	0.1	mA
Output Noise Voltage		V _N	T _A = +25°C, 10Hz ≤ f ≤ 100kHz	-	80	-	μV
Ripple Rejection		RR	f = 120Hz, -15V ≥ V _I ≥ -25V T _J = +25°C	37	42	-	dB
Dropout Voltage		V _D	T _J = +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(KA79L15A) (Continued)(V_I = -23V, I_O = 40mA, C_I = 0.33μF, C_O = 0.1μF, 0°C ≤ T_J ≤ +125°C, unless otherwise specified)

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage		V _O	T _J = +25°C	-14.4	-15.0	-15.6	V	
Line Regulation (Note1)		ΔV _O	T _J = +25°C	-17.5V ≥ V _I ≥ -30V	-	-	300	mV
				-20V ≥ V _I ≥ -30V	-	-	250	mV
Load Regulation (Note1)		ΔV _O	T _J = +25°C	1.0mA ≤ I _O ≤ 100mA	-	-	150	mV
				1.0mA ≤ I _O ≤ 40mA	-	-	75	mV
Output Voltage		V _O	-17.5V ≥ V _I ≥ -30V, 1.0mA ≤ I _O ≤ 40mA	-14.25	-	-15.75	V	
			V _I = -23V, 1.0mA ≤ I _O ≤ 70mA	-14.25	-	-15.75	V	
Quiescent Current		I _Q	T _J = +25°C	-	-	6.0	mA	
			T _J = +125°C	-	-	6.5		
Quiescent Current Change	With Line	ΔI _Q	-20V ≥ V _I ≥ -30V	-	-	1.5	mA	
	With Load	ΔI _Q	1.0mA ≤ I _O ≤ 40mA	-	-	0.1	mA	
Output Noise Voltage		V _N	T _A = +25°C, 10Hz ≤ f ≤ 100kHz	-	90	-	μV	
Ripple Rejection		RR	f = 120Hz, -18.5V ≥ V _I ≥ -28.5V T _J = +25°C	34	39	-	dB	
Dropout Voltage		V _D	T _J = +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(KA79L18A) (Continued)(V_I = -27V, I_O = 40mA, C_I = 0.33μF, C_O = 0.1μF, 0°C ≤ T_J ≤ +125°C, unless otherwise specified)

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage		V _O	T _J = +25°C	-17.3	-18.0	-18.7	V
Line Regulation (Note1)		ΔV _O	T _J = +25°C	-20.7V ≥ V _I ≥ -33V	-	-	325 mV
				-21V ≥ V _I ≥ -33V	-	-	275 mV
Load Regulation (Note1)		ΔV _O	T _J = +25°C	1.0mA ≤ I _O ≤ 100mA	-	-	170 mV
				1.0mA ≤ I _O ≤ 40mA	-	-	85 mV
Output Voltage		V _O	-20.7V > V _I > -33V, 1.0mA ≤ I _O ≤ 40mA	-17.1	-	-18.9	V
			V _I = -27V, 1.0mA ≤ I _O ≤ 70mA	-17.1	-	-18.9	V
Quiescent Current		I _Q	T _J = +25°C	-	-	6.5	mA
			T _J = +125°C	-	-	6.0	
Quiescent Current Change	With Line	ΔI _Q	-21V ≥ V _I ≥ -33V	-	-	1.5	mA
	With Load	ΔI _Q	1.0mA ≤ I _O ≤ 40mA	-	-	0.1	mA
Output Noise Voltage		V _N	T _A = +25°C, 10Hz ≤ f ≤ 100kHz	-	150	-	μV
Ripple Rejection		RR	f = 120Hz, -23V ≥ V _I ≥ -33V T _J = +25°C	33	48	-	dB
Dropout Voltage		V _D	T _J = +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(KA79L24A) (Continued)(V_I = -33V, I_O = 40mA, C_I = 0.33μF, C_O = 0.1μF, 0°C ≤ T_J ≤ +125°C, unless otherwise specified)

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage		V _O	T _J = +25°C	-23	-24	-25	V
Line Regulation (Note1)		ΔV _O	T _J = +25°C	-27V ≥ V _I ≥ -38V	-	-	350 mV
				-28V ≥ V _I ≥ -38V	-	-	300 mV
Load Regulation (Note1)		ΔV _O	T _J = +25°C	1.0mA ≤ I _O ≤ 100mA	-	-	200 mV
				1.0mA ≤ I _O ≤ 40mA	-	-	100 mV
Output Voltage		V _O	-27V ≥ V _I ≥ -38V, 1.0mA ≤ I _O ≤ 40mA	-22.8	-	-25.2	V
			V _I = -33V, 1.0mA ≤ I _O ≤ 70mA	-22.8	-	-25.2	V
Quiescent Current		I _Q	T _J = +25°C	-	-	6.5	mA
			T _J = +125°C	-	-	6.0	
Quiescent Current Change	With Line	ΔI _Q	-28V ≥ V _I ≥ -38V	-	-	1.5	mA
	With Load	ΔI _Q	1.0mA ≤ I _O ≤ 40mA	-	-	0.1	mA
Output Noise Voltage		V _N	T _A = +25°C, 10Hz ≤ f ≤ 100kHz	-	200	-	μV
Ripple Rejection		RR	f = 120Hz, -29V ≥ V _I ≥ -35V T _J = +25°C	31	47	-	dB
Dropout Voltage		V _D	T _J = +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.

Typical Application

Design Considerations

The KA79LXXA 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.

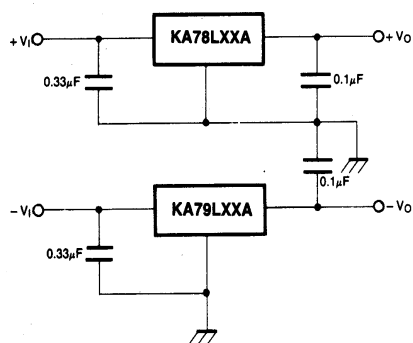


Figure 1. Positive And Negative Regulator

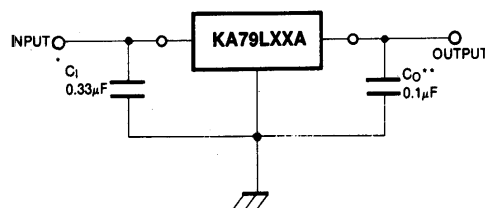


Figure 2. Typical Application

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.

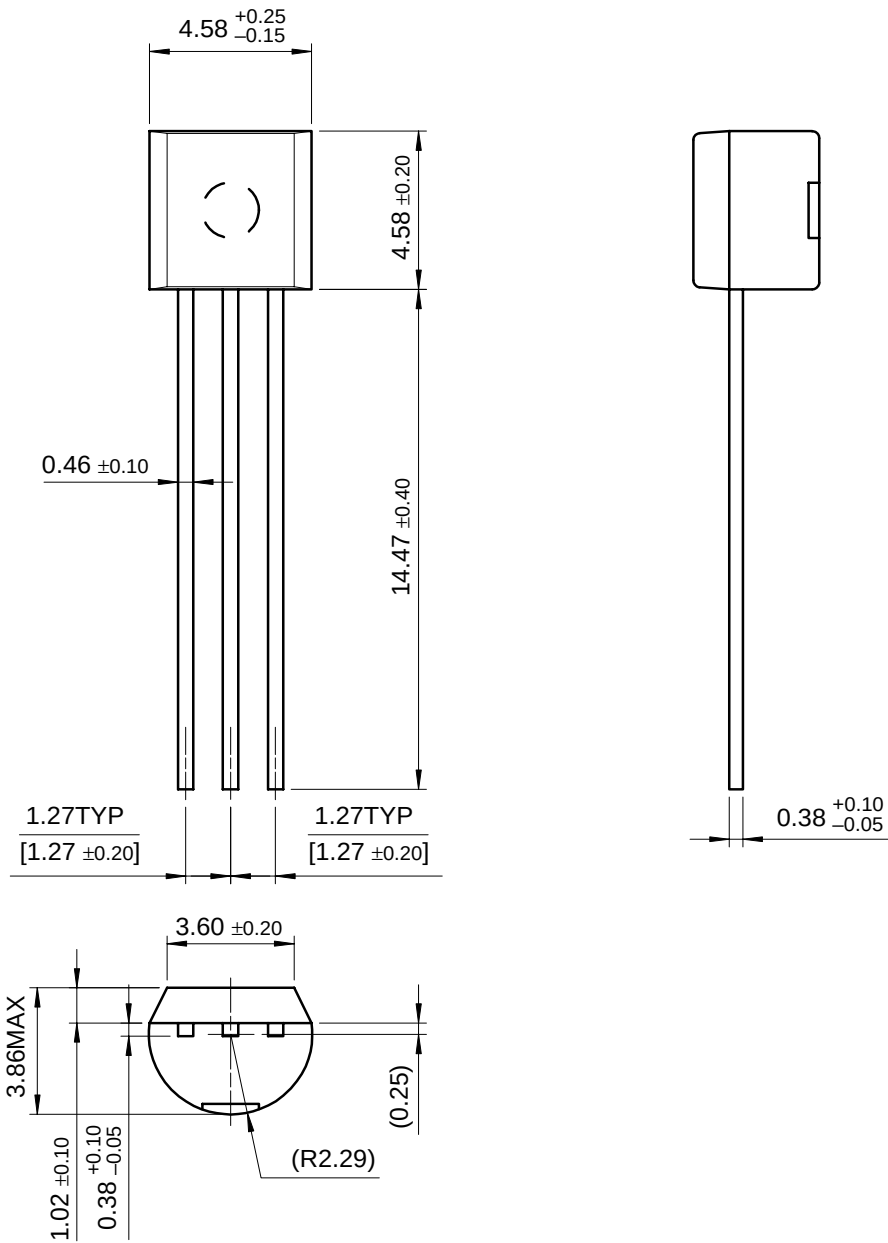
* C_O improves stability and transient response.

Mechanical Dimensions

Package

Dimensions in millimeters

TO-92

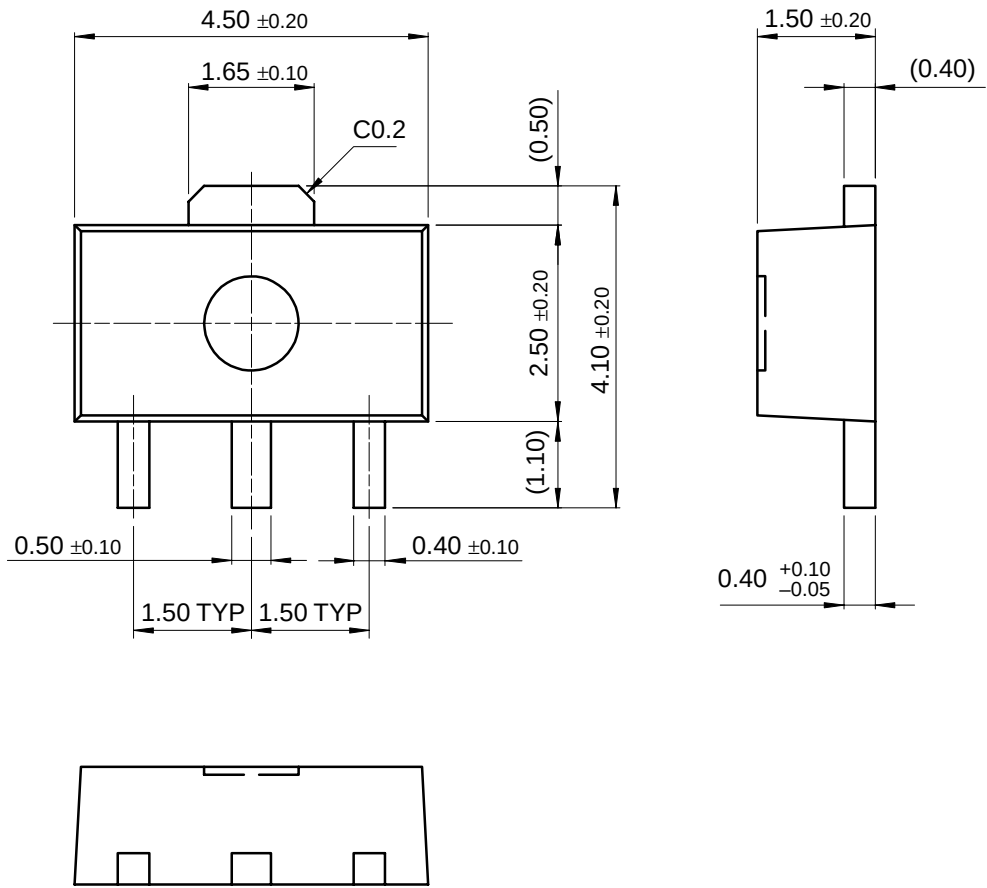


Mechanical Dimensions (Continued)

Package

Dimensions in millimeters

SOT-89



Ordering Information

Product Number	Package	Operating Temperature
KA79L05AZ	TO-92	0 ~ +125°C
KA79L08AZ		
KA79L12AZ		
KA79L15AZ		
KA79L18AZ		
KA79L24AZ		
KA79L05AD	8-SOP	
KA79L05AM	SOT-89	

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