



KA78LXXA

3-terminal 0.1A positive voltage regulator

Features

- Maximum Output Current of 100mA
- Output Voltage of 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V
- Thermal Overload Protection
- Short Circuit Current Limiting
- Output Voltage Offered in $\pm 5\%$ Tolerance

Description

The KA78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for application that required supply current up to 100mA.

TO-92



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1: Output 2: GND 3: Input

8-SOP

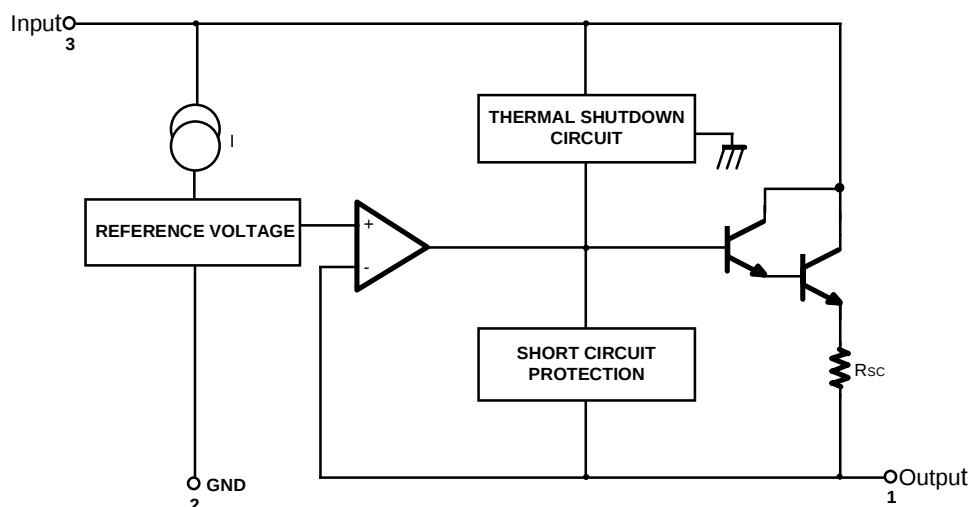


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1: Output 2: GND 3: GND 4: NC

5: NC 6: GND 7: GND 8: Input

Internal Block Diagram



Rev. 5.0

KA78LXXA

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage (for $V_O = 5V, 8V$) (for $V_O = 12V$ to $18V$) (for $V_O = 24V$)	V_I	30 35 40	V V V
Operating Junction Temperature Range	T_J	0 ~ +150	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

Electrical Characteristics(KA78L05A)

($V_I = 10V$, $I_O = 40mA$, $0^\circ C \leq T_J \leq 125^\circ C$, $C_I = 0.33 \mu F$, $C_O = 0.1 \mu F$, unless otherwise specified. (Note 1))

Parameter		Symbol	Conditions		Min.	Typ.	Max.	Unit
Output Voltage		V _O	T _J = 25 °C		4.8	5.0	5.2	V
Line Regulation		ΔV _O	T _J = 25 °C	7V ≤ V _I ≤ 20V	-	8	150	mV
				8V ≤ V _I ≤ 20V	-	6	100	mV
Load Regulation		ΔV _O	T _J = 25 °C	1mA ≤ I _O ≤ 100mA	-	11	60	mV
				1mA ≤ I _O ≤ 40mA	-	5.0	30	mV
Output Voltage		V _O	7V ≤ V _I ≤ 20V	1mA ≤ I _O ≤ 40mA	-	-	5.25	V
			7V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 70mA	4.75	-	5.25	V
Quiescent Current		I _Q	T _J = 25 °C		-	2.0	5.5	mA
Quiescent Current Change	with line	ΔI _Q	8V ≤ V _I ≤ 20V		-	-	1.5	mA
	with load	ΔI _Q	1mA ≤ I _O ≤ 40 mA		-	-	0.1	mA
Output Noise Voltage		V _N	T _A = 25 °C, 10Hz ≤ f ≤ 100KHz		-	40	-	μV
Temperature Coefficient of V _O		ΔV _O /ΔT	I _O = 5mA		-	-0.65	-	mV/ °C
Ripple Rejection		RR	f = 120Hz, 8V ≤ V _I ≤ 18V, T _J = 25 °C		41	80	-	dB
Dropout Voltage		V _D	T _J = 25 °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 represent pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation $\leq 0.75W$.

Electrical Characteristics(KA78L06A)

($V_I = 12V$, $I_O = 40mA$, $0^\circ C \leq T_J \leq 125^\circ C$, $C_I = 0.33 \mu F$, $C_O = 0.1 \mu F$, unless otherwise specified. (Note 1))

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage		V _O	T _J = 25 °C	5.75	6.0	6.25	V	
Line Regulation		ΔV _O	T _J = 25 °C	8.5V < V _I < 20V	-	64	175	mV
				9V ≥ V _I ≥ 20V	-	54	125	mV
Load Regulation		ΔV _O	T _J = 25 °C	1mA < I _O < 100mA	-	12.8	80	mV
				1mA < I _O < 70mA	-	5.8	40	mV
Output Voltage		V _O	8.5 < V _I < 20V, 1mA < I _O < 40mA		5.7	-	6.3	V
			8.5 < V _I < V _{MAX} (Note), 1mA < I _O < 70mA		5.7	-	6.3	V
Quiescent Current		I _Q	T _J = 25 °C	-	-	5.5	mA	
			T _J = 125 °C	-	3.9	6.0	mA	
Quiescent Current Change	with line	ΔI _Q	9 < V _I < 20V	-	-	1.5	mA	
	with load	ΔI _Q	1mA < I _O < 40mA	-	-	0.1	mA	
Output Noise Voltage		V _N	T _A = 25 °C, 10Hz ≤ f ≤ 100KHz	-	40	-	μV	
Temperature Coefficient of V _O		ΔV _O /ΔT	I _O = 5mA	-	0.75	-	mV/ °C	
Ripple Rejection		RR	f = 120Hz, 10V < V _I < 20V, T _J = 25 °C	40	46	-	dB	
Dropout Voltage		V _D	T _J = 25 °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 represent pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation $\leq 0.75W$.

Electrónica S.A. de C.V.

KA78LXXA

Electrical Characteristics(KA78L08A)(V_I = 14V, I_O = 40mA, 0 °C ≤ T_J ≤ 125 °C, C_I = 0.33 μF, C_O = 0.1μF, unless otherwise specified. (Note 1)

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage		V _O	T _J = 25 °C	7.7	8.0	8.3	V
Line Regulation		ΔV _O	T _J = 25 °C	10.5V ≤ V _I ≤ 23V	-	10	175 mV
				11V ≤ V _I ≤ 23V	-	8	125 mV
Load Regulation		ΔV _O	T _J = 25 °C	1mA ≤ I _O ≤ 100mA	-	15	80 mV
				1mA ≤ I _O ≤ 40mA	-	8.0	40 mV
Output Voltage		V _O	10.5V ≤ V _I ≤ 23V	1mA ≤ I _O ≤ 40mA	7.6	-	8.4 V
			10.5V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 70mA	7.6	-	8.4 V
Quiescent Current		I _Q	T _J = 25 °C	-	2.0	5.5	mA
Quiescent Current Change	with line	ΔI _Q	11V ≤ V _I ≤ 23V	-	-	1.5	mA
	with load	ΔI _Q	1mA ≤ I _O ≤ 40mA	-	-	0.1	mA
Output Noise Voltage		V _N	T _A = 25 °C, 10Hz ≤ f ≤ 100KHz	-	60	-	μV
Temperature Coefficient of V _O		ΔV _O /ΔT	I _O = 5mA	-	-0.8	-	mV/ °C
Ripple Rejection		RR	f = 120Hz, 11V ≤ V _I ≤ 21V, T _J = 25 °C	39	70	-	dB
Dropout Voltage		V _D	T _J = 25 °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 represent pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation ≤ 0.75W.

Electrónica S.A. de C.V.

Electrical Characteristics(KA78L09A)

($V_I = 15V$, $I_O = 40mA$, $0\text{ }^{\circ}C \leq T_J \leq 125\text{ }^{\circ}C$, $C_I = 0.33\text{ }\mu F$, $C_O = 0.1\text{ }\mu F$, unless otherwise specified. (Note 1))

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage		V _O	T _J = 25 °C		8.64	9.0	9.36	V
Line Regulation		ΔV _O	T _J = 25 °C	11.5V ≤ V _I ≤ 24V	-	90	200	mV
				13V ≤ V _I ≤ 24V	-	100	150	mV
Load Regulation		ΔV _O	T _J = 25 °C	1mA ≤ I _O ≤ 100mA	-	20	90	mV
				1mA ≤ I _O ≤ 40mA	-	10	45	mV
Output Voltage		V _O	11.5V ≤ V _I ≤ 24V	1mA ≤ I _O ≤ 40mA	8.55	-	9.45	V
			11.5V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 70mA	8.55	-	9.45	V
Quiescent Current		I _Q	T _J = 25 °C		-	2.1	6.0	mA
Quiescent Current Change	with line	ΔI _Q	13V ≤ V _I ≤ 24V		-	-	1.5	mA
	with load	ΔI _Q	1mA ≤ I _O ≤ 40mA		-	-	0.1	mA
Output Noise Voltage		V _N	T _A = 25 °C, 10Hz ≤ f ≤ 100KHz		-	70	-	μV
Temperature Coefficient of V _O		ΔV _O /ΔT	I _O = 5mA		-	-0.9	-	mV/ °C
Ripple Rejection		RR	f = 120Hz, 12V ≤ V _I ≤ 22V, T _J = 25 °C		38	44	-	dB
Dropout Voltage		V _D	T _J = 25 °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 represent pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation $\leq 0.75W$.

Electrónica S.A. de C.V.

KA78LXXA

Electrical Characteristics(KA78L10A)

($V_I = 16V$, $I_O = 40mA$, $0^\circ C \leq T_J \leq 125^\circ C$, $C_I = 0.33 \mu F$, $C_O = 0.1 \mu F$, unless otherwise specified. (Note 1))

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage		V_O	$T_J = 25^\circ C$	9.6	10.0	10.4	V
Line Regulation		ΔV_O	$T_J = 25^\circ C$				
			$12.5 < V_I < 25V$	-	100	220	mV
			$14V \geq V_I \geq 25V$	-	100	170	mV
Load Regulation		ΔV_O	$T_J = 25^\circ C$				
			$1mA \leq I_O \leq 100mA$	-	20	94	mV
			$1mA \leq I_O \leq 70mA$	-	10	47	mV
Output Voltage		V_O	$12.5V < V_I < 25V$, $1mA < I_O < 40mA$	9.5	-	10.5	V
			$12.5V < V_I < V_{MAX}$ (Note2) $1mA < I_O < 70mA$	9.5	-	10.5	
Quiescent Current		I_Q	$T_J = 25^\circ C$	-	-	6.0	mA
			$T_J = 125^\circ C$	-	4.2	6.5	
Quiescent Current Change	with line	ΔI_Q	$12.5 < V_I < 25V$	-	-	1.5	mA
	with load	ΔI_Q	$1mA < I_O < 40mA$	-	-	0.1	mA
Output Noise Voltage		V_N	$T_A = 25^\circ C$, $10Hz < f < 100KHz$	-	74	-	μV
Temperature Coefficient of V_O		$\Delta V_O / \Delta T$	$I_O = 5mA$	-	0.95	-	mV/ $^\circ C$
Ripple Rejection		RR	$f = 120Hz$, $15V < V_I < 25V$, $T_J = 25^\circ C$	38	43	-	dB
Dropout Voltage		V_D	$T_J = 25^\circ C$	-	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 represent pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation $\leq 0.75W$.

Electrónica S.A. de C.V.

Electrical Characteristics(KA78L12A)

($V_I = 19V$, $I_O = 40mA$, $0^\circ C \leq T_J \leq 125^\circ C$, $C_I = 0.33 \mu F$, $C_O = 0.1 \mu F$, unless otherwise specified. (Note 1))

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage		V _O	T _J = 25 °C		11.5	12	12.5	V
Line Regulation		ΔV _O	T _J = 25 °C	14.5V ≤ V _I ≤ 27V	-	20	250	mV
				16V ≤ V _I ≤ 27V	-	15	200	mV
Load Regulation		ΔV _O	T _J = 25 °C	1mA ≤ I _O ≤ 100mA	-	20	100	mV
				1mA ≤ I _O ≤ 40mA	-	10	50	mV
Output Voltage		V _O	14.5V ≤ V _I ≤ 27V	1mA ≤ I _O ≤ 40mA	11.4	-	12.6	V
			14.5V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 70mA	11.4	-	12.6	V
Quiescent Current		I _Q	T _J = 25 °C		-	2.1	6.0	mA
Quiescent Current Change	with line	ΔI _Q	16V ≤ V _I ≤ 27V		-	-	1.5	mA
	with load	ΔI _Q	1mA ≤ I _O ≤ 40mA		-	-	0.1	mA
Output Noise Voltage		V _N	T _A = 25 °C, 10Hz ≤ f ≤ 100KHz		-	80	-	μV
Temperature Coefficient of V _O		ΔV _O /ΔT	I _O = 5mA		-	-1.0	-	mV/ °C
Ripple Rejection		RR	f = 120Hz, 15V ≤ V _I ≤ 25V, T _J = 25 °C		37	65	-	dB
Dropout Voltage		V _D	T _J = 25 °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 represent pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation $\leq 0.75W$.

Electrónica S.A. de C.V.

KA78LXXA

Electrical Characteristics(KA78L15A)

($V_I = 23V$, $I_O = 40mA$, $0\text{ }^{\circ}C \leq T_J \leq 125\text{ }^{\circ}C$, $C_I = 0.33\text{ }\mu F$, $C_O = 0.1\mu F$, unless otherwise specified. (Note 1))

Parameter		Symbol	Conditions		Min.	Typ.	Max.	Unit
Output Voltage		V _O	T _J = 25 °C		14.4	15	15.6	V
Line Regulation		ΔV _O	T _J = 25 °C	17.5V ≤ V _I ≤ 30V	-	25	300	mV
				20V ≤ V _I ≤ 30V	-	20	250	mV
Load Regulation		ΔV _O	T _J = 25 °C	1mA ≤ I _O ≤ 100mA	-	25	150	mV
				1mA ≤ I _O ≤ 40mA	-	12	75	mV
Output Voltage		V _O	17.5V ≤ V _I ≤ 30V	1mA ≤ I _O ≤ 40mA	14.25	-	15.75	V
			17.5V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 70mA	14.25	-	15.75	V
Quiescent Current		I _Q	T _J = 25 °C		-	2.1	6.0	mA
Quiescent Current Change	with line	ΔI _Q	20V ≤ V _I ≤ 30V		-	-	1.5	mA
	with load	ΔI _Q	1mA ≤ I _O ≤ 40mA		-	-	0.1	mA
Output Noise Voltage		V _N	T _A = 25 °C, 10Hz ≤ f ≤ 100KHz		-	90	-	μV
Temperature Coefficient of V _O		ΔV _O /ΔT	I _O = 5mA		-	-1.3	-	mV/ °C
Ripple Rejection		RR	f = 120Hz, 18.5V ≤ V _I ≤ 28.5V, T _J = 25 °C		34	60	-	dB
Dropout Voltage		V _D	T _J = 25 °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 represent pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation $\leq 0.75W$.

Electrónica S.A. de C.V.

Electrical Characteristics(KA78L18A)

($V_I = 27V$, $I_O = 40mA$, $0^\circ C \leq T_J \leq 125^\circ C$, $C_I = 0.33 \mu F$, $C_O = 0.1 \mu F$, unless otherwise specified. (Note 1))

Parameter		Symbol	Conditions		Min.	Typ.	Max.	Unit
Output Voltage		V _O	T _J = 25 °C		17.3	18	18.7	V
Line Regulation		ΔV _O	T _J = 25 °C	21V ≤ V _I ≤ 33V	-	145	300	mV
				22V ≤ V _I ≤ 33V	-	135	250	mV
Load Regulation		ΔV _O	T _J = 25 °C	1mA ≤ I _O ≤100mA	-	30	170	mV
				1mA ≤ I _O ≤ 40mA	-	15	85	mV
Output Voltage		V _O	21V ≤ V _I ≤ 33V	1mA ≤ I _O ≤ 40mA	17.1	-	18.9	V
			21V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 70mA	17.1	-	18.9	V
Quiescent Current		I _Q	T _J = 25 °C		-	2.2	6.0	mA
Quiescent Current Change	with line	ΔI _Q	21V ≤ V _I ≤ 33V		-	-	1.5	mA
	with load	ΔI _Q	1mA ≤ I _O ≤ 40mA		-	-	0.1	mA
Output Noise Voltage		V _N	T _A = 25 °C, 10Hz ≤ f ≤ 100KHz		-	150	-	μV
Temperature Coefficient of V _O		ΔV _O /ΔT	I _O = 5mA		-	-1.8	-	mV/ °C
Ripple Rejection		RR	f = 120Hz, 23V ≤ V _I ≤ 33V, T _J = 25 °C		34	48	-	dB
Dropout Voltage		V _D	T _J = 25 °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 represent pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation $\leq 0.75W$.

Electrónica S.A. de C.V.

KA78LXXA

Electrical Characteristics(KA78L24A)(V_I = 33V, I_O = 40mA, 0 °C ≤ T_J ≤ 125 °C, C_I = 0.33 μF, C_O = 0.1μF, unless otherwise specified. (Note 1))

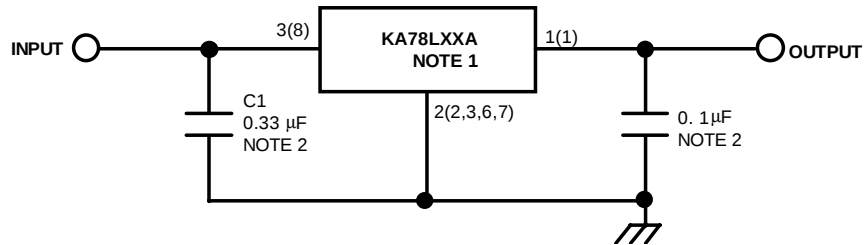
Parameter		Symbol	Conditions		Min.	Typ.	Max.	Unit
Output Voltage		V _O	T _J = 25 °C		23	24	25	V
Line Regulation		ΔV _O	T _J = 25 °C	27V ≤ V _I ≤ 38V	-	160	300	mV
				28V ≤ V _I ≤ 38V	-	150	250	mV
Load Regulation		ΔV _O	T _J = 25 °C	1mA ≤ I _O ≤ 100mA	-	40	200	mV
				1mA ≤ I _O ≤ 40mA	-	20	100	mV
Output Voltage		V _O	27V ≤ V _I ≤ 38V	1mA ≤ I _O ≤ 40mA	22.8	-	25.2	V
			27V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 70mA	22.8	-	25.2	V
Quiescent Current		I _Q	T _J = 25 °C		-	2.2	6.0	mA
Quiescent Current Change	with line	ΔI _Q	28V ≤ V _I ≤ 38V		-	-	1.5	mA
	with load	ΔI _Q	1mA ≤ I _O ≤ 40mA		-	-	0.1	mA
Output Noise Voltage		V _N	T _A = 25 °C, 10Hz ≤ f ≤ 100KHz		-	200	-	μV
Temperature Coefficient of V _O		ΔV _O /ΔT	I _O = 5mA		-	-2.0	-	mV/ °C
Ripple Rejection		RR	f = 120Hz, 28V ≤ V _I ≤ 38V, T _J = 25 °C		34	45	-	dB
Dropout Voltage		V _D	T _J = 25 °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 represent pulse test conditions with junction temperature as indicated at the initiation of tests.
2. Power dissipation ≤ 0.75W.

Electrónica S.A. de C.V.

Typical Application



'(') : 8SOP Type

Notes:

1. To specify an output voltage, substitute voltage value for "XX".
2. Bypass Capacitors are recommend for optimum stability and transient response and should be located as close as possible to the regulator

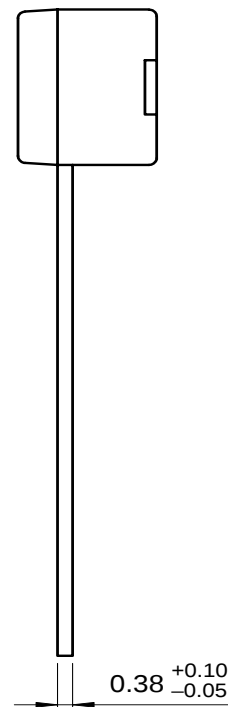
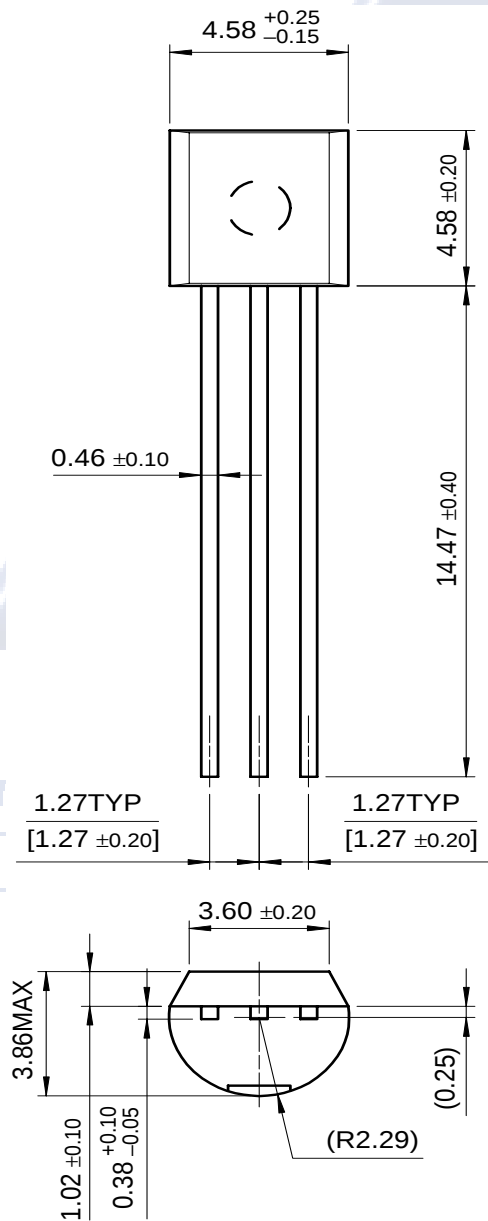
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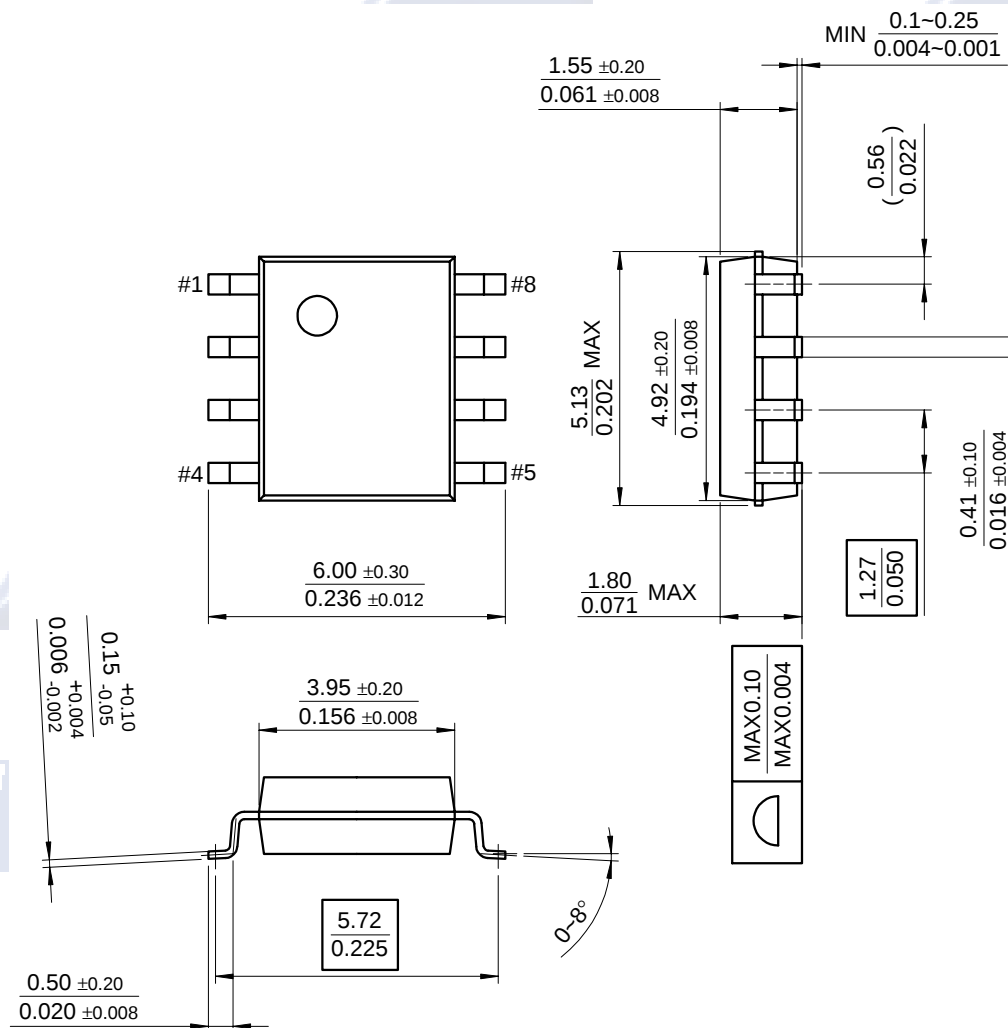
KA78LXXA

Mechanical Dimensions

Package

TO-92



Mechanical Dimensions(Continued)**Package****8-SOP**

KA78LXXA

Ordering Information

Product Number	Package	Operating Temperature
KA78L05AZ	TO-92	0 ~ + 125 °C
KA78L06AZ		
KA78L08AZ		
KA78L09AZ		
KA78L10AZ		
KA78L12AZ		
KA78L15AZ		
KA78L18AZ		
KA78L24AZ		
KA78L05AD	8 SOP	
KA78L08AD		
KA78L12AD		
KA78L24AD		

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KA78LXXA

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