

KA78LXXA

FIXED VOLTAGE REGULATOR (POSITIVE)

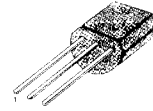
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

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

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

TO-92



1: Output 2: GND 3: Input

8 SOP

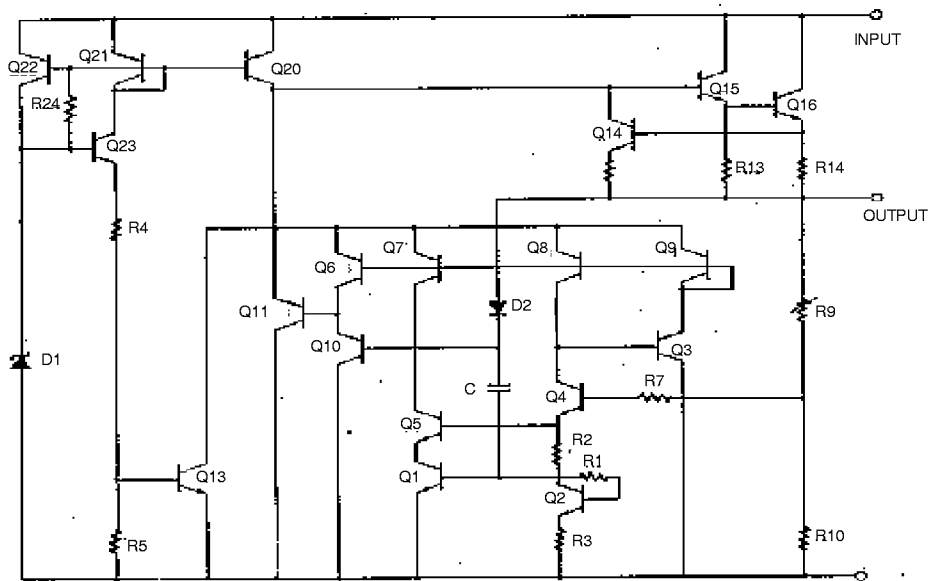


1: Output 2: GND 3: GND 4: NC
5: NC 6: GND 7: GND 8: Input

ORDERING INFORMATION

Device	Package	Operating Temperature
KA78LXXAZ	TO-92	0 ~ + 125 °C
KA78LXXAD	8 SOP	0 ~ + 125 °C

SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

Characteristic	Symbol	Value	Unit
Input Voltage (for $V_O = 5\text{V}, 8\text{V}$) (for $V_O = 12\text{V}, 15\text{V}$)	V_I	30 35	V
Operating Junction Temperature Range	T_{OPR}	0 ~ +125	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 ~ +150	$^\circ\text{C}$

KA78L05A ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V_O	$T_J = 25^\circ\text{C}$	4.8	5.0	5.2	V	
Line Regulation	ΔV_O	$T_J = 25^\circ\text{C}$	$7\text{V} \leq V_I \leq 20\text{V}$		8	150	mV
			$8\text{V} \leq V_I \leq 20\text{V}$		6	100	mV
Load Regulation	ΔV_O	$T_J = 25^\circ\text{C}$	$1\text{mA} \leq I_O \leq 100\text{mA}$		11	60	mV
			$1\text{mA} \leq I_O \leq 40\text{mA}$		5.0	30	mV
Output Voltage	V_O	$7\text{V} \leq V_I \leq 0\text{V}$ $7\text{V} \leq V_I \leq V_{\text{MAX}}$ (Note 2)	$1\text{mA} \leq I_O \leq 40\text{mA}$			5.25	V
			$1\text{mA} \leq I_O \leq 70\text{mA}$	4.75		5.25	V
Quiescent Current	I_Q	$T_J = 25^\circ\text{C}$		2.0	5.5	mA	
Quiescent Current Change	with line	$8\text{V} \leq V_I \leq 20\text{V}$ $1\text{mA} \leq I_O \leq 40\text{mA}$			1.5	mA	
	with load						0.1
Output Noise Voltage	V_N	$T_A = 25^\circ\text{C}$, $10\text{Hz} \leq f \leq 100\text{KHz}$		40		μV	
Temperature Coefficient of V_O	$\frac{\Delta V_O}{\Delta T}$	$I_O = 5\text{mA}$		-0.65		$\text{mV}/^\circ\text{C}$	
Ripple Rejection	RR	$f = 120\text{Hz}$, $8\text{V} \leq V_I \leq 18\text{V}$, $T_J = 25^\circ\text{C}$	41	80		dB	
Dropout Voltage	V_D	$T_J = 25^\circ\text{C}$		1.7		V	

KA78L06A ELECTRICAL CHARACTERISTICS(V_I = 12V, I_o = 40mA, 0°C ≤ T_J ≤ 125°C, C₁ = 0.33 μF, C_o = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic		Symbol	Test 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
				9V < V _I < 20V		54	125
Load Regulation		ΔV _o	T _J = 25°C	1mA < I _o < 100mA		12.8	80
				mA < I _o < 70mA		5.8	40
Output Voltage		V _o	8.5 < V _I < 20V, 1mA < I _o < 40mA		5.7	6.3	
			8.5 < V _I < V _{MAX} (Note), 1mA < I _o < 70mA		5.7	6.3	
Quiescent Current		I _o	T _J = 25°C		3.9	6.0	
			T _J = 125°C			5.5	
Quiescent Current Change	with line	ΔI _o	9 < V _I < 20V			1.5	
	with load	ΔI _o	1mA < I _o < 40mA			0.1	
Output Noise Voltage		V _N	T _A = 25°C, 10Hz < f < 100KHz		40		μV
Temperature Coefficient of V _o		$\frac{\Delta V_o}{\Delta T}$	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

KA78L08A ELECTRICAL CHARACTERISTICS(V_I = 14V, I_o = 40mA, 0°C ≤ T_J ≤ 125°C, C₁ = 0.33 μF, C_o = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic		Symbol	Test 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
				11V ≤ V _I ≤ 23V		8	125
Load Regulation		ΔV _o	T _J = 25°C	1mA ≤ I _o ≤ 100mA		15	80
				1mA ≤ I _o ≤ 40mA		8.0	40
Output Voltage		V _o	10.5V ≤ V _I ≤ 23V		7.6	8.4	
			10.5V ≤ V _I ≤ V _{MAX} (Note 2)		7.6	8.4	
Quiescent Current		I _o	T _J = 25°C		2.0	5.5	mA
Quiescent Current Change	with line	ΔI _o	11V ≤ V _I ≤ 23V			1.5	
	with load	ΔI _o	1mA ≤ I _o ≤ 40mA			0.1	
Output Noise Voltage		V _N	T _A = 25°C, 10Hz ≤ f ≤ 100KHz		60		μV
Temperature Coefficient of V _o		$\frac{\Delta V_o}{\Delta T}$	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

KA78L09A ELECTRICAL CHARACTERISTICS(V_I = 15V, I_o = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic	Symbol	Test 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 _o	T _J = 25°C		2.1	6.0	mA	
Quiescent Current Change	with line	ΔI _o	13V ≤ V _I ≤ 24V			1.5	mA
	with load	ΔI _o	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	$\frac{\Delta V_O}{\Delta T}$	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	

KA78L10A ELECTRICAL CHARACTERISTICS(V_I = 16V, I_o = 40mA, 0°C < T_J < 125°C, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V _O	T _J = 25°C	9.6	10.0	10.4	V	
Line Regulation	ΔV _O	T _J = 25°C	12.5 < V _I < 25V		100	220	mV
			14V < V _I < 25V		100	170	mV
Load Regulation	ΔV _O	T _J = 25°C	1mA < I _o < 100mA		20	94	mV
			1mA < I _o < 70mA		10	47	mV
Output Voltage	V _O	12.5 < V _I < 25V, 1mA < I _o < 40mA	9.5		10.5	V	
		12.5 < V _I < V _{MAX} (Note), 1mA < I _o < 70mA	9.5		10.5		
Quiescent Current	I _o	T _J = 25°C		4.2	6.5	mA	
		T _J = 125°C			6.0		
Quiescent Current Change	with line	ΔI _o	12.5 < V _I < 25V			1.5	mA
	with load	ΔI _o	1mA < I _o < 40mA			0.1	
Output Noise Voltage	V _N	T _A = 25°C, 10Hz < f < 100KHz		74		μV	
Temperature Coefficient of V _O	$\frac{\Delta V_O}{\Delta T}$	I _o = 5mA		0.95		mV/°C	
Ripple Rejection	RR	f = 120Hz, 15V < V _I < 25V, T _J = 25°C	38	43		dB	
Drop Voltage	V _D	T _J = 25°C		1.7		V	

KA78L12A ELECTRICAL CHARACTERISTICS(V_I = 19V, I_o = 40mA, 0°C ≤ T_J ≤ 125°C, C₁ = 0.33 μF, C_o = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic		Symbol	Test 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	11.4		12.6	V
			14.5V ≤ V _I ≤ V _{MAX} (Note 2)	11.4		12.6	V
Quiescent Current		I _o	T _J = 25°C		2.1	6.0	mA
Quiescent Current Change		with line with load	ΔI _o	16V ≤ V _I ≤ 27V		1.5	mA
			ΔI _o	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		$\frac{\Delta V_o}{\Delta T}$	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

KA78L15A ELECTRICAL CHARACTERISTICS(V_I = 23V, I_o = 40mA, 0°C ≤ T_J ≤ 125°C, C₁ = 0.33 μF, C_o = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic		Symbol	Test 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 ≤ 20V	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	14.25		15.75	V
			17.5V ≤ V _I ≤ V _{MAX} (Note 2)	14.25		15.75	V
Quiescent Current		I _o	T _J = 25°C		2.1	6.0	mA
Quiescent Current Change		with line with load	ΔI _o	20V ≤ V _I ≤ 30V		1.5	mA
			ΔI _o	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		$\frac{\Delta V_o}{\Delta T}$	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

KA78L18A ELECTRICAL CHARACTERISTICS(V_I = 27V, I_o = 40mA, 0°C ≤ T_J ≤ 125°C, C₁ = 0.33 μF, C_o = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic		Symbol	Test 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	17.1		18.9	V
			21V ≤ V _I ≤ V _{MAX} (Note 2)	17.1		18.9	V
Quiescent Current		I _o	T _J = 25°C		2.2	6.0	mA
Quiescent Current Change		ΔI _o	with line	21V ≤ V _I ≤ 33V		1.5	mA
			with load	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		$\frac{\Delta V_o}{\Delta T}$	I _o = 5mA		-1.8		mV/°C
Ripple Rejection		RR	f = 120Hz, 23V ≤ V _I ≤ 33V, T _J = 25°C	34	48		dB
Drop Voltage		V _D	T _J = 25°C		1.7		V

KA78L24A ELECTRICAL CHARACTERISTICS(V_I = 33V, I_o = 40mA, 0°C ≤ T_J ≤ 125°C, C₁ = 0.33 μF, C_o = 0.1 μF, unless otherwise specified. (Note 1))

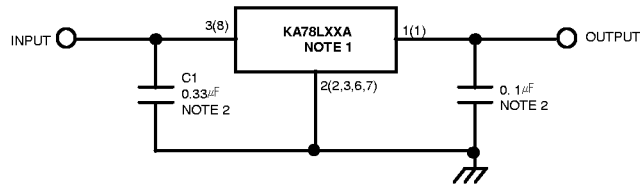
Characteristic		Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage		V _o	T _J = 25°C	23	24	25	V
Line Regulation		ΔV _o	T _J = 25°C	27V ≤ V _I ≤ 38V	160	300	mV
				28V ≤ V _I ≤ 38V	150	250	mV
Load Regulation		ΔV _o	T _J = 25°C	1mA ≤ I _o ≤ 100mA	40	200	mV
				1mA ≤ I _o ≤ 40mA	20	100	mV
Output Voltage		V _o	27V ≤ V _I ≤ 38V	22.8		25.2	V
			27V ≤ V _I ≤ V _{MAX} (Note 2)	22.8		25.2	V
Quiescent Current		I _o	T _J = 25°C		2.2	6.0	mA
Quiescent Current Change		ΔI _o	with line	28V ≤ V _I ≤ 38V		1.5	mA
			with load	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		$\frac{\Delta V_o}{\Delta T}$	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.

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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PRODUCT STATUS DEFINITIONS

Definition of Terms

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Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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