

3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

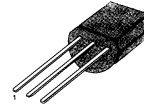
The MC78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for application that required supply up to 100mA.

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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

TO-92



1: Output 2: GND 3: Input

8 SOP

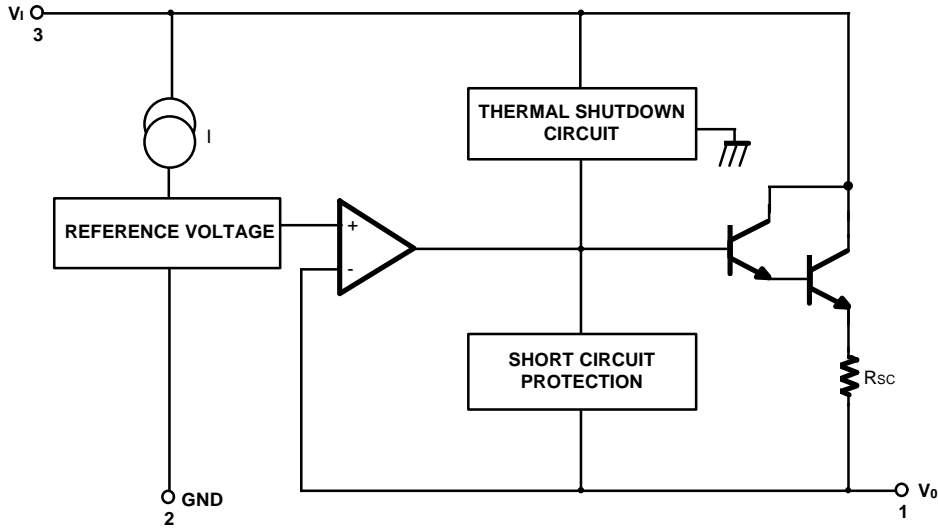


1: Output 2: GND 3: GND 4: NC
5: NC 6: GND 7: GND 8: Input

ORDERING INFORMATION

Device	Package	Operating Temperature
MC78LXXACP (LM78LXXACZ) (KA78LXXAZ)	TO-92	- 45 ~ + 125°C
MC78LXXACD (KA78LXXAD)	8 SOP	0 ~ + 125°C

BLOCK DIAGRAM



Rev. C

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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 V
Operating Junction Temperature Range	T_J	0 ~ +150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 ~ +150	$^\circ\text{C}$

LM78L05 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	$7\text{V} \leq V_I \leq 0\text{V}$ $7\text{V} \leq V_I \leq V_{MAX}$ (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	with line	ΔI_Q	$8\text{V} \leq V_I \leq 20\text{V}$		1.5	mA
Change	with load	ΔI_Q	$1\text{mA} \leq I_O \leq 40\text{mA}$		0.1	mA
Output Noise Voltage	V_N	$T_A = 25^\circ\text{C}$, $10\text{Hz} \leq f \leq 100\text{KHz}$		40		$\mu\text{V}/V_O$
Temperature Coefficient of V_O	$\Delta V_O/\Delta T$	$I_O = 5\text{mA}$		-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

LM78L06 ELECTRICAL CHARACTERISTICS(V_I = 12V, I_O = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33μF, C_O = 0.1μF, 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	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		
Quiescent Current	I _Q	T _J = 25°C		3.9	6.0	mA	
		T _J = 125°C			5.5		
Quiescent Current Change	with line	9 < V _I < 20V			1.5	mA	
	with load				0.1		
Output Noise Voltage	V _N	T _A = 25°C, 10Hz < f < 100KHz		40		μV/V _O	
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	

LM78L08 ELECTRICAL CHARACTERISTICS(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))

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	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	7.6		8.4	V	
		10.5V ≤ V _I ≤ V _{MAX} (Note 2)	7.6		8.4	V	
		1mA ≤ I _O ≤ 70mA					
Quiescent Current	I _Q	T _J = 25°C		2.0	5.5	mA	
Quiescent Current Change	with line	11V ≤ V _I ≤ 23V			1.5	mA	
	with load				0.1		
Output Noise Voltage	V _N	T _A = 25°C, 10Hz ≤ f ≤ 100KHz		60		μV/V _O	
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	

LM78L09 ELECTRICAL CHARACTERISTICS(V_I = 15V, I_O = 40mA, 0°C ≤ T_J ≤ 125°C, C_I = 0.33 μF, C_O = 0.1μF, 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 _Q	T _J = 25°C		2.1	6.0	mA
Quiescent Current	with line	ΔI _Q	13V ≤ V _I ≤ 24V			1.5	mA
Change	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/V _O
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

LM78L10 ELECTRICAL CHARACTERISTICS(V_I = 16V, I_O = 40mA, 0°C < T_J < 125°C, C_I = 0.33 μF, C_O = 0.1μF, 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	V
Quiescent Current		I _Q	T _J = 25°C		4.2	6.5	mA
			T _J = 125°C			6.0	mA
Quiescent Current	with line	ΔI _Q	12.5 < V _I < 25V			1.5	mA
Change	with load	ΔI _Q	1mA < I _O < 40mA			0.1	mA
Output Noise Voltage		V _N	T _A = 25°C, 10Hz < f < 100KHz		74		μV/V _O
Temperature Coefficient of V _O		ΔV _O /ΔT	I _O = 5mA		0.95		mV/°C
Ripple Rejection		RR	f = 120Hz, 15V < V _I < 25V, T _J = 25°C	38	43		dB
Dropout Voltage		V _D	T _J = 25°C		1.7		V

LM78L12 ELECTRICAL CHARACTERISTICS(V_I = 19V, 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	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	ΔI _O	16V ≤ V _I ≤ 27V			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		80		μV/V _O
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

LM78L15 ELECTRICAL CHARACTERISTICS(V_I = 23V, 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	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	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	ΔI _O	20V ≤ V _I ≤ 30V			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		90		μV/V _O
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

LM78L18 ELECTRICAL CHARACTERISTICS(V_I = 27V, 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	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 with line		ΔI _Q	21V ≤ V _I ≤ 33V			1.5	mA
Change 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/V _O
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

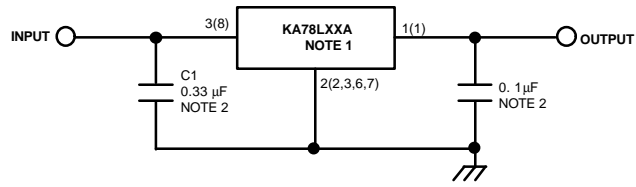
LM78L24 ELECTRICAL CHARACTERISTICS(V_I = 33V, I_O = 40mA, 0 °C ≤ T_J ≤ 125 °C, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic		Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage		V _O	T _J = 25 °C	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 with line		ΔI _Q	28V ≤ V _I ≤ 38V			1.5	mA
Change 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/V _O
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

- 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.
- Power dissipation ≤ 0.75W.

TYPICAL APPLICATION



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'()' : 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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