

LM78LXX (KA78LXX, MC78LXX) FIXED VOLTAGE REGULATOR (POSITIVE)

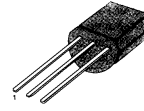
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

The LM78LXX 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
- Output Voltage Offered in $\pm 5\%$ Tolerance

TO-92



1: Output 2: GND 3: Input

8 SOP

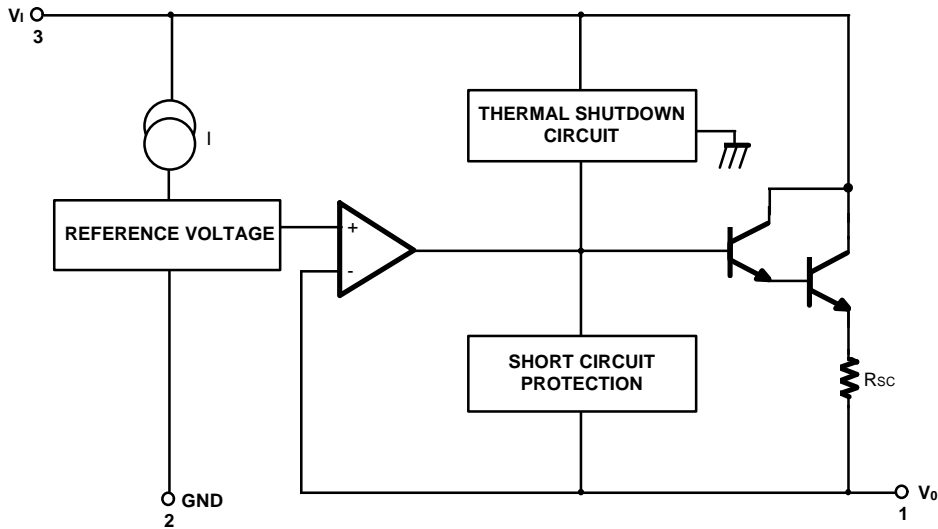


1: Output 2: GND 3: GND 4: NC
5: NC 6: GND 7: GND 8: Input

ORDERING INFORMATION

Device	Package	Operating Temperature
LM78LXXACZ	TO-92	-45 ~ +125°C
LM78LXXM	8 SOP	0 ~ +125°C

BLOCK DIAGRAM



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Rev. B

LM78LXX (KA78LXX, MC78LXX) FIXED VOLTAGE REGULATOR (POSITIVE)

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise specified)

Characteristic	Symbol	Value	Unit
Input Voltage (for V _O = 5V, 8V) (for V _O = 12V, 15V)	V _I	30 35	V
Operating Junction Temperature Range	T _J	0 ~ +150	°C
Storage Temperature Range	T _{STG}	-65 ~ +150	°C

LM78L05 ELECTRICAL CHARACTERISTICS

(V_I = 10V, 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	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 ≤ 0V	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 ≤ 40mA		0.1	mA
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		-0.65		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

LM78LXX (KA78LXX, MC78LXX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM78L06 ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V_O	$T_J = 25^\circ C$	5.75	6.0	6.25	V	
Line Regulation	ΔV_O	$T_J = 25^\circ C$	$8.5V < V_I < 20V$		64	175	mV
			$9V \geq V_I \geq 20V$		54	125	mV
Load Regulation	ΔV_O	$T_J = 25^\circ C$	$1mA < I_O < 100mA$		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	
		$8.5 < V_I < V_{MAX}(\text{Note})$, $1mA < I_O < 70mA$	5.7		6.3		
Quiescent Current	I_Q	$T_J = 25^\circ C$		3.9	6.0	mA	
		$T_J = 125^\circ C$			5.5		
Quiescent Current Change	with line	$9 < V_I < 20V$			1.5	mA	
	with load				$1mA < I_O < 40mA$		0.1
Output Noise Voltage	V_N	$T_A = 25^\circ C$, $10Hz < f < 100KHz$		40		$\mu V/V_O$	
Temperature Coefficient of V_O	$\Delta V_O/\Delta T$	$I_O = 5mA$		0.75		$mV/^\circ C$	
Ripple Rejection	RR	$f = 120Hz$, $10V < V_I < 20V$, $T_J = 25^\circ C$	40	46		dB	
Dropout Voltage	V_D	$T_J = 25^\circ C$		1.7		V	

LM78L08 ELECTRICAL CHARACTERISTICS

($V_I = 14V$, $I_O = 40mA$, $0^\circ C \leq T_J \leq 125^\circ C$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified. (Note 1))

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V_O	$T_J = 25^\circ C$	7.7	8.0	8.3	V	
Line Regulation	ΔV_O	$T_J = 25^\circ C$	$10.5V \leq V_I \leq 23V$		10	175	mV
			$11V \leq V_I \leq 23V$		8	125	mV
Load Regulation	ΔV_O	$T_J = 25^\circ C$	$1mA \leq I_O \leq 100mA$		15	80	mV
			$1mA \leq I_O \leq 40mA$		8.0	40	mV
Output Voltage	V_O	$10.5V \leq V_I \leq 23V$ $10.5V \leq V_I \leq V_{MAX}$ (Note 2)	$1mA \leq I_O \leq 40mA$	7.6		8.4	V
			$1mA \leq I_O \leq 70mA$	7.6		8.4	V
Quiescent Current	I_Q	$T_J = 25^\circ C$		2.0	5.5	mA	
Quiescent Current Change	with line	$11V \leq V_I \leq 23V$			1.5	mA	
	with load				$1mA \leq I_O \leq 40mA$		0.1
Output Noise Voltage	V_N	$T_A = 25^\circ C$, $10Hz \leq f \leq 100KHz$		60		$\mu V/V_O$	
Temperature Coefficient of V_O	$\Delta V_O/\Delta T$	$I_O = 5mA$		-0.8		$mV/^\circ C$	
Ripple Rejection	RR	$f = 120Hz$, $11V \leq V_I \leq 21V$, $T_J = 25^\circ C$	39	70		dB	
Dropout Voltage	V_D	$T_J = 25^\circ C$		1.7		V	

LM78LXX (KA78LXX, MC78LXX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM78L09 ELECTRICAL CHARACTERISTICS

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

Characteristic		Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage		V_O	$T_J = 25^\circ C$	8.64	9.0	9.36	V	
Line Regulation		ΔV_O	$T_J = 25^\circ C$	$11.5V \leq V_I \leq 24V$		90	200	mV
				$13V \leq V_I \leq 24V$		100	150	mV
Load Regulation		ΔV_O	$T_J = 25^\circ C$	$1mA \leq I_O \leq 100mA$		20	90	mV
				$1mA \leq I_O \leq 40mA$		10	45	mV
Output Voltage		V_O	$11.5V \leq V_I \leq 24V$	$1mA \leq I_O \leq 40mA$	8.55		9.45	V
			$11.5V \leq V_I \leq V_{MAX}$ (Note 2)	$1mA \leq I_O \leq 70mA$	8.55		9.45	V
Quiescent Current		I_Q	$T_J = 25^\circ C$		2.1	6.0	mA	
Quiescent Current Change	with line	ΔI_Q	$13V \leq V_I \leq 24V$			1.5	mA	
	with load	ΔI_Q	$1mA \leq I_O \leq 40mA$			0.1	mA	
Output Noise Voltage		V_N	$T_A = 25^\circ C$, $10Hz \leq f \leq 100KHz$		70		$\mu V/V_O$	
Temperature Coefficient of V_O		$\Delta V_O/\Delta T$	$I_O = 5mA$		-0.9		mV/ $^\circ C$	
Ripple Rejection		RR	$f = 120Hz$, $12V \leq V_I \leq 22V$, $T_J = 25^\circ C$	38	44		dB	
Dropout Voltage		V_D	$T_J = 25^\circ C$		1.7		V	

LM78L10 ELECTRICAL CHARACTERISTICS

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

Characteristic		Symbol	Test 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	$T_J = 25^\circ C$	$1mA < I_O < 100mA$		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	
			$12.5 < V_I < V_{MAX}(\text{Note})$, $1mA < I_O < 70mA$	9.5		10.5		
Quiescent Current		I_Q	$T_J = 25^\circ C$		4.2	6.5	mA	
			$T_J = 125^\circ C$			6.0		
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		
Output Noise Voltage		V_N	$T_A = 25^\circ C$, $10Hz < f < 100KHz$		74		$\mu V/V_O$	
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	

LM78LXX (KA78LXX, MC78LXX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM78L12 ELECTRICAL CHARACTERISTICS

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

Characteristic		Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage		V_O	$T_J = 25^\circ C$	11.5	12	12.5	V	
Line Regulation		ΔV_O	$T_J = 25^\circ C$	$14.5V \leq V_I \leq 27V$		20	250	mV
				$16V \leq V_I \leq 27V$		15	200	mV
Load Regulation		ΔV_O	$T_J = 25^\circ C$	$1mA \leq I_O \leq 100mA$		20	100	mV
				$1mA \leq I_O \leq 40mA$		10	50	mV
Output Voltage		V_O	$14.5V \leq V_I \leq 27V$	$1mA \leq I_O \leq 40mA$	11.4		12.6	V
				$14.5V \leq V_I \leq V_{MAX}$ (Note 2)	$1mA \leq I_O \leq 70mA$	11.4		12.6
Quiescent Current		I_Q	$T_J = 25^\circ C$		2.1	6.0	mA	
Quiescent Current Change	with line	ΔI_Q	$16V \leq V_I \leq 27V$			1.5	mA	
	with load	ΔI_Q	$1mA \leq I_O \leq 40mA$			0.1	mA	
Output Noise Voltage		V_N	$T_A = 25^\circ C$, $10Hz \leq f \leq 100KHz$		80		$\mu V/V_O$	
Temperature Coefficient of V_O		$\Delta V_O/\Delta T$	$I_O = 5mA$		-1.0		mV/ $^\circ C$	
Ripple Rejection		RR	$f = 120Hz$, $15V \leq V_I \leq 25V$, $T_J = 25^\circ C$	37	65		dB	
Dropout Voltage		V_D	$T_J = 25^\circ C$		1.7		V	

LM78L15 ELECTRICAL CHARACTERISTICS

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

Characteristic		Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage		V_O	$T_J = 25^\circ C$	14.4	15	15.6	V	
Line Regulation		ΔV_O	$T_J = 25^\circ C$	$17.5V \leq V_I \leq 30V$		25	300	mV
				$20V \leq V_I \leq 30V$		20	250	mV
Load Regulation		ΔV_O	$T_J = 25^\circ C$	$1mA \leq I_O \leq 100mA$		25	150	mV
				$1mA \leq I_O \leq 40mA$		12	75	mV
Output Voltage		V_O	$17.5V \leq V_I \leq 30V$	$1mA \leq I_O \leq 40mA$	14.25		15.75	V
				$17.5V \leq V_I \leq V_{MAX}$ (Note 2)	$1mA \leq I_O \leq 70mA$	14.25		15.75
Quiescent Current		I_Q	$T_J = 25^\circ C$		2.1	6.0	mA	
Quiescent Current Change	with line	ΔI_Q	$20V \leq V_I \leq 30V$			1.5	mA	
	with load	ΔI_Q	$1mA \leq I_O \leq 40mA$			0.1	mA	
Output Noise Voltage		V_N	$T_A = 25^\circ C$, $10Hz \leq f \leq 100KHz$		90		$\mu V/V_O$	
Temperature Coefficient of V_O		$\Delta V_O/\Delta T$	$I_O = 5mA$		-1.3		mV/ $^\circ C$	
Ripple Rejection		RR	$f = 120Hz$, $18.5V \leq V_I \leq 28.5V$, $T_J = 25^\circ C$	34	60		dB	
Dropout Voltage		V_D	$T_J = 25^\circ C$		1.7		V	

LM78LXX (KA78LXX, MC78LXX) FIXED VOLTAGE REGULATOR (POSITIVE)

LM78L18 ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V_O	$T_J = 25^\circ C$	17.3	18	18.7	V	
Line Regulation	ΔV_O	$T_J = 25^\circ C$	$21V \leq V_I \leq 33V$		145	300	mV
			$22V \leq V_I \leq 33V$		135	250	mV
Load Regulation	ΔV_O	$T_J = 25^\circ C$	$1mA \leq I_O \leq 100mA$		30	170	mV
			$1mA \leq I_O \leq 40mA$		15	85	mV
Output Voltage	V_O	$21V \leq V_I \leq 33V$	$1mA \leq I_O \leq 40mA$	17.1		18.9	V
		$21V \leq V_I \leq V_{MAX}$ (Note 2)	$1mA \leq I_O \leq 70mA$	17.1		18.9	V
Quiescent Current	I_Q	$T_J = 25^\circ C$		2.2	6.0	mA	
Quiescent Current Change	with line	$21V \leq V_I \leq 33V$			1.5	mA	
	with load						$1mA \leq I_O \leq 40mA$
Output Noise Voltage	V_N	$T_A = 25^\circ C$, $10Hz \leq f \leq 100KHz$		150		$\mu V/V_O$	
Temperature Coefficient of V_O	$\Delta V_O/\Delta T$	$I_O = 5mA$		-1.8		$mV/^\circ C$	
Ripple Rejection	RR	$f = 120Hz$, $23V \leq V_I \leq 33V$, $T_J = 25^\circ C$	34	48		dB	
Dropout Voltage	V_D	$T_J = 25^\circ C$		1.7		V	

LM78L24 ELECTRICAL CHARACTERISTICS

($V_I = 33V$, $I_O = 40mA$, $0^\circ C \leq T_J \leq 125^\circ C$, $C_I = 0.33 \mu F$, $C_O = 0.1 \mu F$, unless otherwise specified. (Note 1))

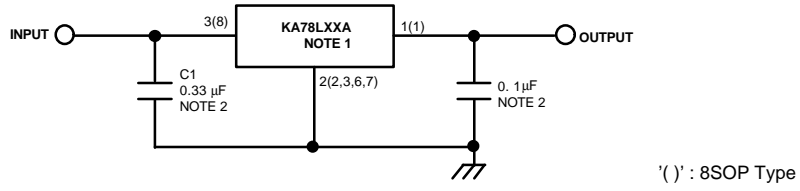
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V_O	$T_J = 25^\circ C$	23	24	25	V	
Line Regulation	ΔV_O	$T_J = 25^\circ C$	$27V \leq V_I \leq 38V$		160	300	mV
			$28V \leq V_I \leq 38V$		150	250	mV
Load Regulation	ΔV_O	$T_J = 25^\circ C$	$1mA \leq I_O \leq 100mA$		40	200	mV
			$1mA \leq I_O \leq 40mA$		20	100	mV
Output Voltage	V_O	$27V \leq V_I \leq 38V$	$1mA \leq I_O \leq 40mA$	22.8		25.2	V
		$27V \leq V_I \leq V_{MAX}$ (Note 2)	$1mA \leq I_O \leq 70mA$	22.8		25.2	V
Quiescent Current	I_Q	$T_J = 25^\circ C$		2.2	6.0	mA	
Quiescent Current Change	with line	$28V \leq V_I \leq 38V$			1.5	mA	
	with load						$1mA \leq I_O \leq 40mA$
Output Noise Voltage	V_N	$T_A = 25^\circ C$, $10Hz \leq f \leq 100KHz$		200		$\mu V/V_O$	
Temperature Coefficient of V_O	$\Delta V_O/\Delta T$	$I_O = 5mA$		-2.0		$mV/^\circ C$	
Ripple Rejection	RR	$f = 120Hz$, $28V \leq V_I \leq 38V$, $T_J = 25^\circ C$	34	45		dB	
Dropout Voltage	V_D	$T_J = 25^\circ C$		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 $\leq 0.75W$.

LM78LXX (KA78LXX, MC78LXX) FIXED VOLTAGE REGULATOR (POSITIVE)

TYPICAL APPLICATION



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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