

Boca Semiconductor Corp. (BSC)

MC78LXXA (LM78LXX, KA78LXXA)

FIXED VOLTAGE REGULATOR (POSITIVE)

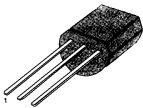
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

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

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

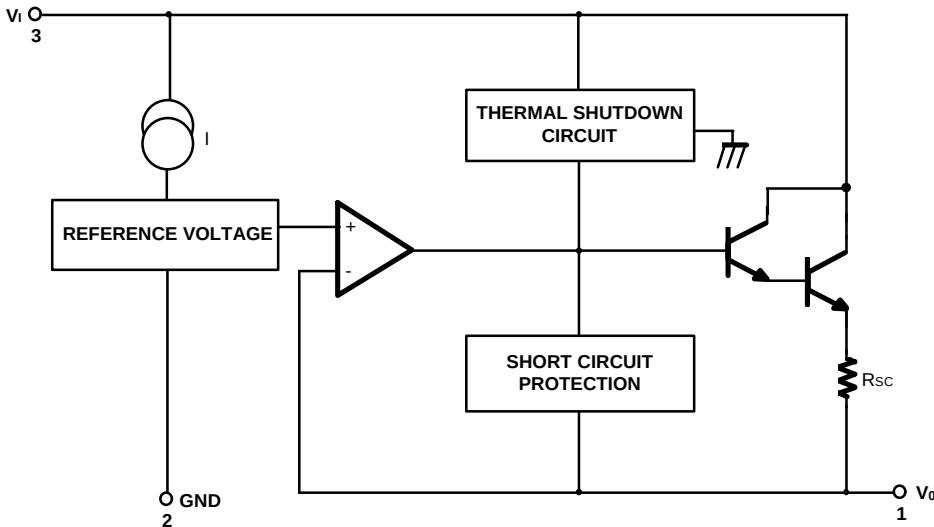


1: Output 2: GND 3: GND 4: NC
5: NC 6: GND 7: GND 8: Input

ORDERING INFORMATION

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

BLOCK DIAGRAM



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	V
		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 = 0.1μF, 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 7V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 40mA			5.25	V
				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

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	$T_J = 25^\circ C$		64	175	mV
		$8.5V < V_I < 20V$ $9V \geq V_I \geq 20V$		54	125	mV
Load Regulation	ΔV_O	$T_J = 25^\circ C$		12.8	80	mV
		$1mA < I_O < 100mA$ $1mA < I_O < 70mA$		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	ΔI_Q	$9 < V_I < 20V$		1.5	mA
	with load	ΔI_Q	$1mA < I_O < 40mA$		0.1	
Output Noise Voltage	V_N	$T_A = 25^\circ C$, $10Hz < f < 100KHz$		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	175	mV
		$10.5V \leq V_I \leq 23V$ $11V \leq V_I \leq 23V$		8	125	mV
Load Regulation	ΔV_O	$T_J = 25^\circ C$		15	80	mV
		$1mA \leq I_O \leq 100mA$ $1mA \leq I_O \leq 40mA$		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)	7.6		8.4	V
		$1mA \leq I_O \leq 40mA$ $1mA \leq I_O \leq 70mA$	7.6		8.4	V
Quiescent Current	I_Q	$T_J = 25^\circ C$		2.0	5.5	mA
Quiescent Current Change	with line	ΔI_Q	$11V \leq V_I \leq 23V$		1.5	mA
	with load	ΔI_Q	$1mA \leq I_O \leq 40mA$		0.1	mA
Output Noise Voltage	V_N	$T_A = 25^\circ C$, $10Hz \leq f \leq 100KHz$		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

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 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/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	
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/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 = 0.1μF, 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 14.5V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 40mA	11.4		12.6	V
				1mA ≤ I _O ≤ 70mA	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 = 0.1μF, 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 17.5V ≤ V _I ≤ V _{MAX} (Note 2)	1mA ≤ I _O ≤ 40mA	14.25		15.75	V
				1mA ≤ I _O ≤ 70mA	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 = 0.1μF, 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 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/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

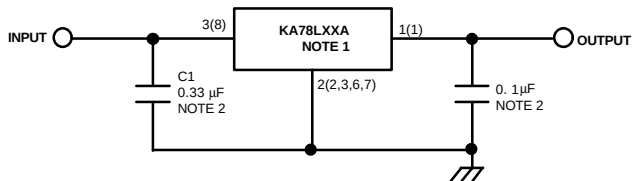
(V_I = 33V, I_O = 40mA, 0 °C ≤ T_J ≤ 125 °C, C_I = 0.33 μF, C_O = 0.1μF, unless otherwise specified. (Note 1)

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 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/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



'(') : 8SOP Type

Notes

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

<http://www.bocasemi.com>