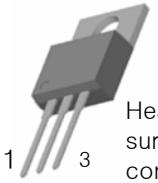
FIXED VOLTAGE REGULATOR LM78XX

3-TERMINAL 1A POSITIVE VOLTAGE REGULATORS

FEATURES

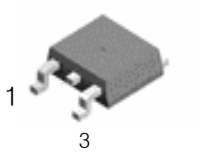
- Output current in excess of 1A
- No external components required
- Internal short circuit current limiting
- Output Voltage of 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 24V
- Internal thermal overload protection
- Output transistor safe-area compensation
- Output voltage offered in 4% tolerance
- Moisture Sensitivity Level 3

TO-220 PKG



Heatsink surface connected

TO-252 PKG



1. Input 2. Gnd 3. Output

DESCRIPTION

The LM78XX series of three-terminal positive regulators, - fixed output voltage and TO-220/TO-252 package - are designed for a wide range of applications.

These applications include on-card regulation for elimination of noise and distribution problems associated with single point regulation. In addition, they can be used with power pass elements to make high current voltage regulators.

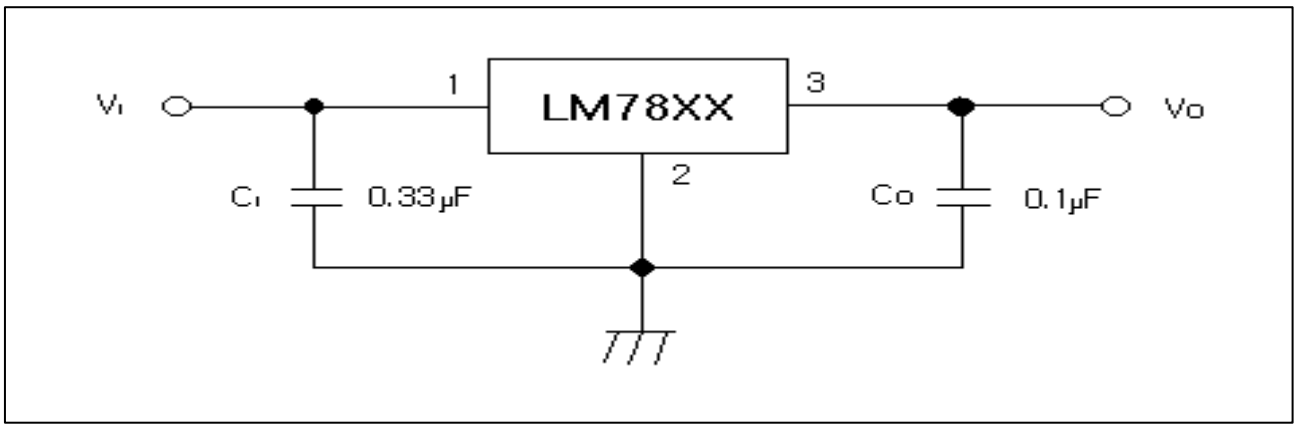
If adequate heat sinking is provided, each of these regulators can deliver up to 1A of output current.

Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

ORDERING INFORMATION		
DEVICE	MARKING	PACKAGE
LM78XXT	LM78XX	TO-220
LM78XXRS	LM78XX	TO-252

XX = Output Voltage 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 24V

TYPICAL APPLICATIONS



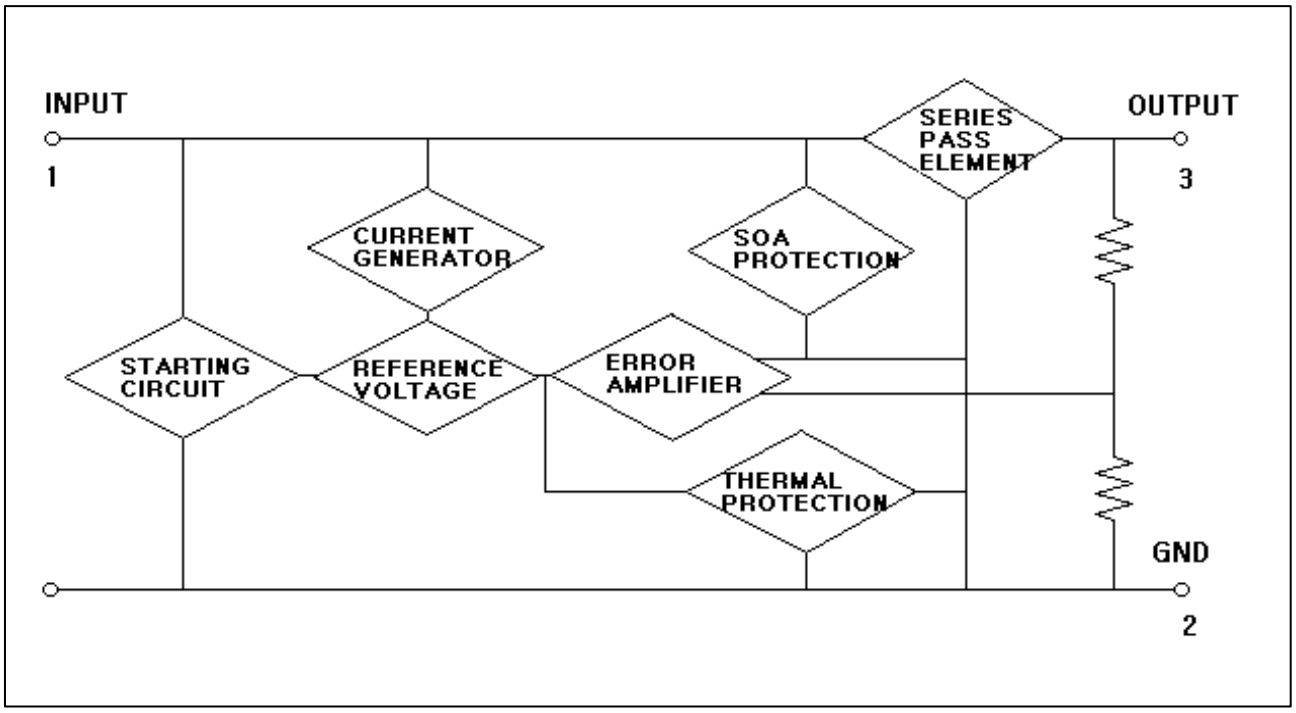
Notes :

(1) To specify an output voltage, substitute voltage value for "XX"

(2) CI is required if regulator is located in appreciable distance from power supply filter.

(3) Co improves stability and transient response.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Characteristic	Device	Symbol	Value	Unit
Input Voltage	LM7805 ~ LM7818	V_I	35	V
	LM7824		40	
Operating junction temperature		Topr	0 ~ +150	℃
Storage temperature		Tstg	−65 ~ +150	℃

LM7805 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN}<T_J<T_{MAX}$, Io=500㎃, V_I=10V, C_I=0.33㎌, Co=0.1㎌, unless otherwise specified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	T_J=25℃		4.8	5.0	5.2	V
		5.0㎃≤Io≤1.0A, P_D≤15W V_I=7V to 20V		4.75	5.0	5.25	
Line Regulation	△Vo	T_J=25℃	Vo=7V to 25V		4.0	100	㎷
			V_I=8V to 12V		1.6	50	
Load Regulation	△Vo	T_J=25℃	Io=5.0㎃ to 1.5A		9	100	㎷
			Io=250㎃ to 750㎃		4	50	
Quiescent Current	△I_Q	Io=5㎃ to 1A			0.03	0.5	㎃
Change		V_I=7V to 25V			0.3	1.3	
		V_I=8V to 25V					
Output Voltage Drift	△Vo/△T	Io=5㎃			-0.8		㎷/℃
Output Noise Voltage	V_N	f=10Hz to 100Khz, T_A=25℃			42		㎶
Ripple Rejection	RR	f=120Hz Vo=8V to 18V		62	73		dB
Dropout Voltage	V_D	Io=1A, T_J=25℃			2		V
Peak Current	I_{PK}	T_J=25℃			2.2		A
Output Resistance	Ro	f=1KHz			15		MΩ
Short Circuit Current	I_{SC}	V_I=35V, T_A=25℃			230		㎃

Notes

* $T_{MIN}<T_J<T_{MAX}$

  LM78XX ; T_{MIN}=0℃, T_{MAX}=125℃

* Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

LM7806 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN}<T_J<T_{MAX}$, Io=500㎃, V_I=11V, C_I=0.33㎌, Co=0.1㎌, unless otherwise specified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	T_J=25℃		5.75	6.0	6.25	V
		5.0㎃≤Io≤1.0A, P_D≤15W V_I=8.0V to 21V		5.7	6.0	6.3	
Line Regulation	△Vo	T_J=25℃	Vo=8V to 25V		5	120	㎷
			VI=9V to 13V		1.5	60	
Load Regulation	△Vo	T_J=25℃	Io=5㎃ to 1.5A		9	120	㎷
			Io=250㎃ to 750㎃		3	60	
Quiescent Current	I_Q	T_J=25℃			5	8	㎃
Quiescent Current Change	△I_Q	Io=5㎃ to 1A				0.5	㎃
		V_I=8V to 25V				1.3	
		V_I=9V to 25V					
Output Voltage Drift	△Vo/△T	Io=5㎃			-0.8		㎷/℃
Output Noise Voltage	V_N	f=10Hz to 100Khz, T_A=25℃			45		㎶
Ripple Rejection	RR	f=120Hz V_I=9V to 19V		59	75		dB
Dropout Voltage	V_D	Io=1A, T_J=25℃			2		V
Peak Current	I_{PK}	T_J=25℃			2.2		A
Output Resistance	Ro	f=1KHz			19		㏁
Short Circuit Current	I_{SC}	V_I=35V, T_A=25℃			250		㎃

Notes

* $T_{MIN}<T_J<T_{MAX}$

  LM78XX ; T_{MIN}=0℃, T_{MAX}=125℃

* Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

LM7808 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN}<T_J<T_{MAX}$, Io=500㎃, V_I=14V, C_I=0.33㎌, Co=0.1㎌, unless otherwise specified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	T_J=25℃		7.7	8.0	8.3	V
		5.0㎃≤Io≤1.0A, Po≤15W V_I=10.5V to 23V V_I=11.5V to 23V		7.6	8.0	8.4	
Line Regulation	△Vo	T_J=25℃	V_I=10.5V to 25V		5.0	160	㎷
			V_I=11.5V to 17V		2.0	80	
Load Regulation	△Vo	T_J=25℃	Io=5.0㎃ to 1.5A		10	160	㎷
			Io=250㎃ to 750㎃		5	80	
Quiescent Current	I_Q	T_J=25℃			5	8	㎃
Quiescent Current Change	△I_Q	Io=5㎃ to 1A			0.05	0.5	㎃
		V_I=10.5V to 25V			0.5	1.0	
		V_I=11.5V to 25V					
Output Voltage Drift	△Vo/△T	Io=5㎃			-0.8		㎷/℃
Output Noise Voltage	V_N	f=10Hz to 100Khz, T_A=25℃			52		㎶
Ripple Rejection	RR	f=120Hz, V_I=11.5V to 21.5V		56	73		dB
Dropout Voltage	V_D	Io=1A, T_J=25℃			2		V
Peak Current	I_{PK}	T_J=25℃			2.2		A
Output Resistance	Ro	f=1Khz			17		MΩ
Short Circuit Current	I_{SC}	V_I=35V, T_J=25℃			230		㎃

Notes

* $T_{MIN}<T_J<T_{MAX}$

  LM78XX ; T_{MIN}=0℃, T_{MAX}=125℃

* Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

LM7809 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN}<T_J<T_{MAX}$, Io=500㎃, V_I=15V, C_I=0.33㎌, Co=0.1㎌, unless otherwise specified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	T_J=25℃		8.65	9.0	9.35	V
		5.0㎃≤Io≤1.0A, P_D≤15W V_I=11.5V to 24V V_I=12.5V to 24V		8.6	9.0	9.4	
Line Regulation	△Vo	T_J=25℃	V_I=11.5V to 25V		6.0	180	㎷
			V_I=12V to 25V		2	90	
Load Regulation	△Vo	T_J=25℃	Io=5㎃ to 1.5A		12	180	㎷
			Io=250㎃ to 750㎃		4	90	
Quiescent Current	I_Q	T_J=25℃			5.0	8	㎃
Quiescent Current Change	$\triangle I_Q$	Io=5㎃ to 1A				0.5	㎃
		V_I=11.5V to 26V				1.3	
		V_I=12.5V to 26V					
Output Voltage Drift	△Vo/△T	Io=5㎃			-1		㎷/℃
Output Noise Voltage	V_N	f=10Hz to 100Khz, T_A=25℃			58		㎶
Ripple Rejection	RR	f=120Hz V_I=13V to 23V		56	71		dB
Dropout Voltage	V_D	Io=1A, T_J=25℃			2		V
Peak Current	I_{PK}	T_J=25℃			2.2		A
Output Resistance	Ro	f=1Khz			17		㏁
Short Circuit Current	I_{SC}	V_I=35V, T_J=25℃			250		㎃

Notes

* $T_{MIN}<T_J<T_{MAX}$

  LM78XX ; T_{MIN}=0℃, T_{MAX}=125℃

* Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

LM7810 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN}<T_J<T_{MAX}$, Io=500㎃, V_I=16V, C_I=0.33㎌, Co=0.1㎌, unless otherwise specified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	T_J=25℃		9.6	10.0	10.4	V
		5.0㎃≤Io≤1.0A, P_D≤15W V_I=12.5V to 25V V_I=13.5V to 25V		9.5	10	10.5	
Line Regulation	△Vo	T_J=25℃	V_I=12.5V to 25V		10	200	㎷
			V_I=13V to 25V		3	100	
Load Regulation	△Vo	T_J=25℃	Io=5㎃ to 1.5A		12	200	㎷
			Io=250㎃ to 750㎃		4	400	
Quiescent Current	I_Q	T_J=25℃			5.1	8	㎃
Quiescent Current Change	△I_Q	Io=5㎃ to 1.0A				0.5	㎃
		V_I=12.5V to 29V				1	
		V_I=13.5V to 29V					
Output Voltage Drift	△Vo/△T	Io=5㎃			-1		㎷/℃
Output Noise Voltage	V_N	f=10Hz to 100Khz, T_A=25℃			58		㎶
Ripple Rejection	RR	f=120Hz V_I=13V to 23V		56	71		dB
Dropout Voltage	V_D	Io=1A, T_J=25℃			2		V
Peak Current	I_{PK}	T_J=25℃			2.2		A
Output Resistance	Ro	f=1Khz			17		㏁
Short Circuit Current	I_{SC}	V_I=35V, T_J=25℃			250		㎃

Notes

* $T_{MIN}<T_J<T_{MAX}$

  LM78XX ; T_{MIN}=0℃, T_{MAX}=125℃

* Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

LM7812 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN}<T_J<T_{MAX}$, Io=500㎃, V_I=19V, C_I=0.33㎌, Co=0.1㎌, unless otherwise specified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	T_J=25℃		11.5	12	12.5	V
		5.0㎃≤Io≤1.0A, P_D≤15W V_I=14.5V to 27V V_I=15.5V to 27V		11.4	12	12.6	
Line Regulation	△Vo	T_J=25℃	V_I=14.5V to 30V		10	240	㎷
			V_I=16V to 22V		3	120	
Load Regulation	△Vo	T_J=25℃	Io=5㎃ to 1.5A		11	240	㎷
			Io=250㎃ to 750㎃		5	120	
Quiescent Current	I_Q	T_J=25℃			5.1	8	㎃
Quiescent Current Change	$\triangle I_Q$	Io=5㎃ to 1A			0.1	0.5	㎃
		V_I=14.5V to 30V			0.5	1.0	
		V_I=15V to 30V					
Output Voltage Drift	△Vo/△T	Io=5㎃			-1		㎷/℃
Output Noise Voltage	V_N	f=10Hz to 100Khz, T_A=25℃			76		㎶
Ripple Rejection	RR	f=120Hz V_I=15V to 25V		55	71		dB
Dropout Voltage	V_D	Io=1A, T_J=25℃			2		V
Peak Current	I_{PK}	T_J=25℃			2.2		A
Output Resistance	Ro	f=1Khz			18		㏁
Short Circuit Current	I_{SC}	V_I=35V, T_J=25℃			230		㎃

Notes

* $T_{MIN}<T_J<T_{MAX}$

  LM78XX ; T_{MIN}=0℃, T_{MAX}=125℃

* Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

LM7815 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN}<T_J<T_{MAX}$, Io=500㎃, V_I=23V, C_I=0.33㎌, Co=0.1㎌, unless otherwise specified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	T_J=25℃		14.4	15	15.6	V
		5.0㎃≤Io≤1.0A, P_D≤15W V_I=17.5V to 30V		14.25	15.0	15.75	
Line Regulation	△Vo	T_J=25℃	V_I=17.5V to 30V		11	300	㎷
			V_I=20V to 26V		3	150	
Load Regulation	△Vo	T_J=25℃	Io=5㎃ to 1.5A		12	300	㎷
			Io=250㎃ to 750㎃		4	150	
Quiescent Current	I_Q	T_J=25℃			5.2	8	㎃
Quiescent Current Change	△I_Q	Io=5㎃ to 1A				0.5	㎃
		V_I=17.5V to 30V				1.0	
		V_I=18.5V to 30V					
Output Voltage Drift	△Vo/△T	Io=5㎃			-1		㎷/℃
Output Noise Voltage	V_N	f=10Hz to 100Khz, T_A=25℃			90		㎶
Ripple Rejection	RR	f=120Hz V_I=18.5V to 28.5V		54	70		dB
Dropout Voltage	V_D	Io=1A, T_J=25℃			2		V
Peak Current	I_{PK}	T_J=25℃			2.2		A
Output Resistance	Ro	f=1KHz			19		㏁
Short Circuit Current	I_{SC}	V_I=35V, T_A=25℃			250		㎃

Notes

* $T_{MIN}<T_J<T_{MAX}$

  LM78XX ; T_{MIN}=0℃, T_{MAX}=125℃

* Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

LM7818 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN}<T_J<T_{MAX}$, Io=500㎃, V_I=27V, C_I=0.33㎌, Co=0.1㎌, unless otherwise specified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	T_J=25℃		17.3	18	18.7	V
		5.0㎃≤Io≤1.0A, P_D≤15W V_I=21V to 33V		17.1	18.0	18.9	
Line Regulation	△Vo	T_J=25℃	V_I=21V to 33V		15	360	㎷
			V_I=24V to 30V		5	180	
Load Regulation	△Vo	T_J=25℃	Io=5㎃ to 1.5A		15	360	㎷
			Io=250㎃ to 750㎃		5	180	
Quiescent Current	I_Q	T_J=25℃			5.2	8	㎃
Quiescent Current Change	△I_Q	Io=5㎃ to 1A				0.5	㎃
		V_I=21V to 33V				1	
		V_I=22V to 33V					
Output Voltage Drift	△Vo/△T	Io=5㎃			-1		㎷/℃
Output Noise Voltage	V_N	f=10Hz to 100Khz, T_A=25℃			110		㎶
Ripple Rejection	RR	f=120Hz V_I=22V to 32V		53	69		dB
Dropout Voltage	V_D	Io=1A, T_J=25℃			2		V
Peak Current	I_{PK}	T_J=25℃			2.2		A
Output Resistance	Ro	f=1KHz			22		㏁
Short Circuit Current	I_{SC}	V_I=35V, T_A=25℃			250		㎃

Notes

* $T_{MIN}<T_J<T_{MAX}$

  LM78XX ; T_{MIN}=0℃, T_{MAX}=125℃

* Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

LM7824 ELECTRICAL CHARACTERISTICS

(Refer to test circuit, $T_{MIN}<T_J<T_{MAX}$, Io=500㎃, V_I=33V, C_I=0.33㎌, Co=0.1㎌, unless otherwise specified)

Characteristic	Symbol	Test condition		Min.	Typ.	Max.	Unit
Output Voltage	Vo	T_J=25℃		23	24	25	V
		5.0㎃≤Io≤1.0A, P_D≤15W V_I=27V to 38V		22.8	24.0	25.2	
Line Regulation	△Vo	T_J=25℃	V_I=27V to 38V		17	480	㎷
			V_I=30V to 36V		6	240	
Load Regulation	△Vo	T_J=25℃	Io=5㎃ to 1.5A		15	480	㎷
			Io=250㎃ to 750㎃		5	240	
Quiescent Current	I_Q	T_J=25℃			5.2	8	㎃
Quiescent Current Change	△I_Q	Io=5㎃ to 1A			0.1	0.5	㎃
		V_I=27V to 38V			0.5	1	
		V_I=28V to 38V					
Output Voltage Drift	△Vo/△T	Io=5㎃			-1.5		㎷/℃
Output Noise Voltage	V_N	f=10Hz to 100Khz, T_A=25℃			60		㎶
Ripple Rejection	RR	f=120Hz V_I=28V to 38V		50	67		dB
Dropout Voltage	V_D	Io=1A, T_J=25℃			2		V
Peak Current	I_{PK}	T_J=25℃			2.2		A
Output Resistance	Ro	f=1KHz			28		㏁
Short Circuit Current	I_{SC}	V_I=35V, T_A=25℃			230		㎃

Notes

* $T_{MIN}<T_J<T_{MAX}$

  LM78XX ; T_{MIN}=0℃, T_{MAX}=125℃

* Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.