

# LM78XX / LM78XXA

## 3-Terminal 1 A Positive Voltage Regulator

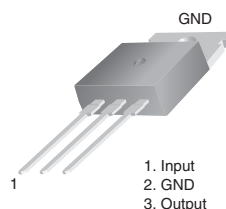
### Features

- Output Current up to 1 A
- Output Voltages: 5, 6, 8, 9, 10, 12, 15, 18, 24 V
- Thermal Overload Protection
- Short-Circuit Protection
- Output Transistor Safe Operating Area Protection

### Description

The LM78XX series of three-terminal positive regulators is available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut-down, and safe operating area protection. If adequate heat sinking is provided, they can deliver over 1 A output current. Although designed primarily as fixed-voltage regulators, these devices can be used with external components for adjustable voltages and currents.

TO-220 (Single Gauge)



### Ordering Information<sup>(1)</sup>

Product Number	Output Voltage Tolerance	Package	Operating Temperature	Packing Method
LM7805CT	±4%	TO-220 (Single Gauge)	-40°C to +125°C	Rail
LM7806CT				
LM7808CT				
LM7809CT				
LM7810CT				
LM7812CT				
LM7815CT				
LM7818CT				
LM7824CT				
LM7805ACT	±2%		0°C to +125°C	
LM7809ACT				
LM7810ACT				
LM7812ACT				
LM7815ACT				

### Note:

1. Above output voltage tolerance is available at 25°C.

## Block Diagram

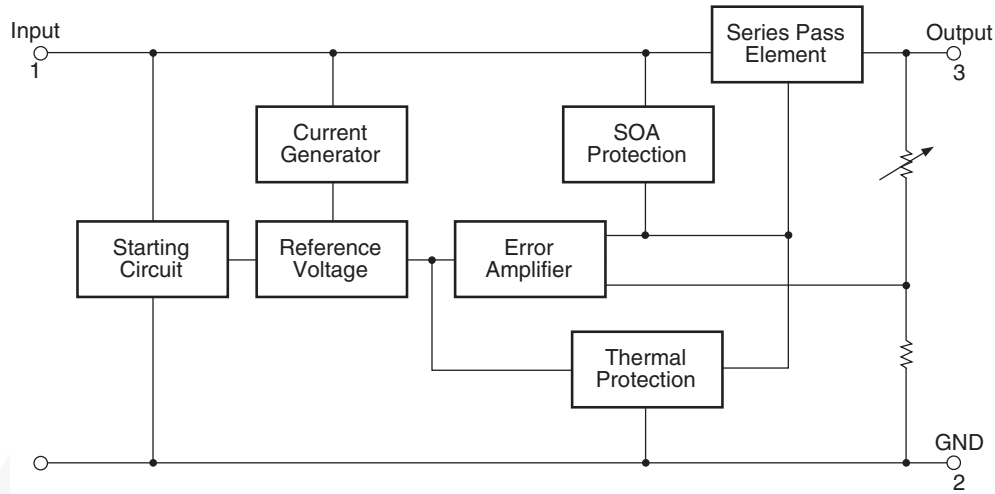


Figure 1. Block Diagram

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter		Value	Unit
$V_I$	Input Voltage	$V_O = 5\text{ V to }18\text{ V}$	35	V
		$V_O = 24\text{ V}$	40	
$R_{\theta JC}$	Thermal Resistance, Junction-Case (TO-220)		5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-Air (TO-220)		65	$^\circ\text{C/W}$
$T_{OPR}$	Operating Temperature Range	LM78xx	-40 to +125	$^\circ\text{C}$
		LM78xxA	0 to +125	
$T_{STG}$	Storage Temperature Range		- 65 to +150	$^\circ\text{C}$

**Electrical Characteristics (LM7805)**

Refer to the test circuit,  $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$ ,  $I_O = 500\text{ mA}$ ,  $V_I = 10\text{ V}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ , unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = +25^{\circ}\text{C}$	4.80	5.00	5.20	V
		$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ , $V_I = 7\text{ V to }20\text{ V}$	4.75	5.00	5.25	
Regline	Line Regulation <sup>(2)</sup>	$T_J = +25^{\circ}\text{C}$	$V_I = 7\text{ V to }25\text{ V}$	4.0	100.0	mV
			$V_I = 8\text{ V to }12\text{ V}$	1.6	50.0	
Regload	Load Regulation <sup>(2)</sup>	$T_J = +25^{\circ}\text{C}$	$I_O = 5\text{ mA to }1.5\text{ A}$	9.0	100.0	mV
			$I_O = 250\text{ mA to }750\text{ mA}$	4.0	50.0	
$I_Q$	Quiescent Current	$T_J = +25^{\circ}\text{C}$		5.0	8.0	mA
$\Delta I_Q$	Quiescent Current Change	$I_O = 5\text{ mA to }1\text{ A}$		0.03	0.50	mA
		$V_I = 7\text{ V to }25\text{ V}$		0.30	1.30	
$\Delta V_O / \Delta T$	Output Voltage Drift <sup>(3)</sup>	$I_O = 5\text{ mA}$		-0.8		mV/ $^{\circ}\text{C}$
$V_N$	Output Noise Voltage	$f = 10\text{ Hz to }100\text{ kHz}$ , $T_A = +25^{\circ}\text{C}$		42.0		$\mu\text{V}/V_O$
RR	Ripple Rejection <sup>(3)</sup>	$f = 120\text{ Hz}$ , $V_I = 8\text{ V to }18\text{ V}$	62.0	73.0		dB
$V_{\text{DROP}}$	Dropout Voltage	$T_J = +25^{\circ}\text{C}$ , $I_O = 1\text{ A}$		2.0		V
$R_O$	Output Resistance <sup>(3)</sup>	$f = 1\text{ kHz}$		15.0		m $\Omega$
$I_{\text{SC}}$	Short-Circuit Current	$T_J = +25^{\circ}\text{C}$ , $V_I = 35\text{ V}$		230		mA
$I_{\text{PK}}$	Peak Current <sup>(3)</sup>	$T_J = +25^{\circ}\text{C}$		2.2		A

**Notes:**

- Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.
- These parameters, although guaranteed, are not 100% tested in production.

## Typical Applications

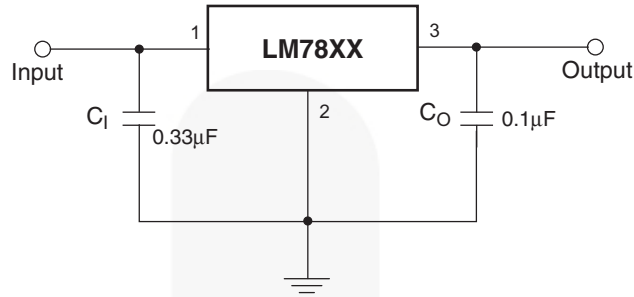


Figure 6. DC Parameters

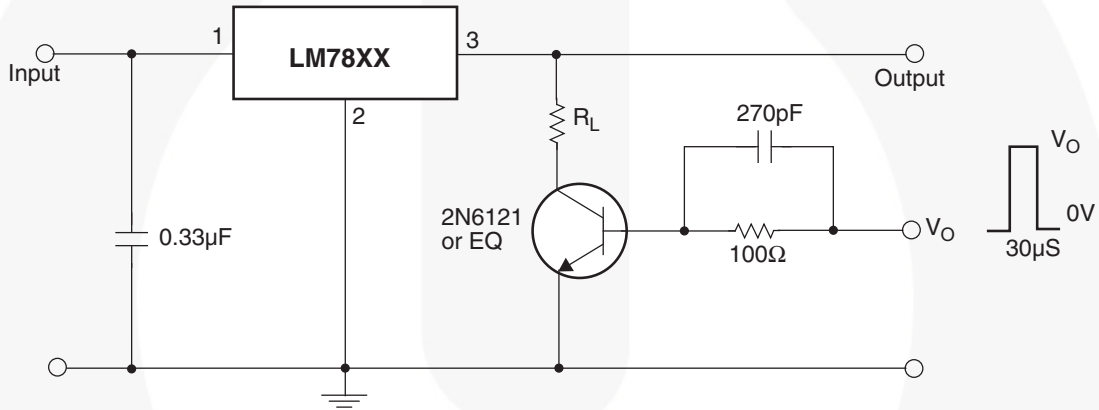


Figure 7. Load Regulation

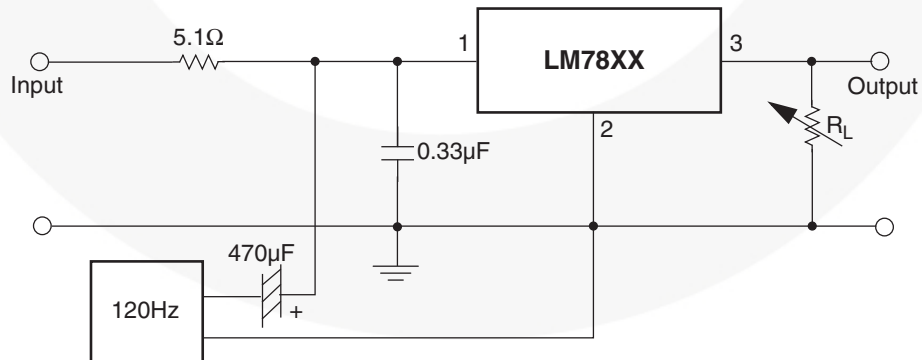


Figure 8. Ripple Rejection

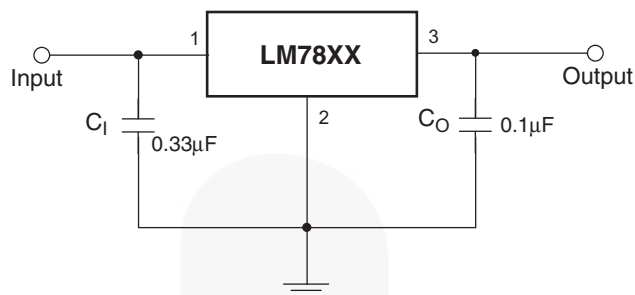
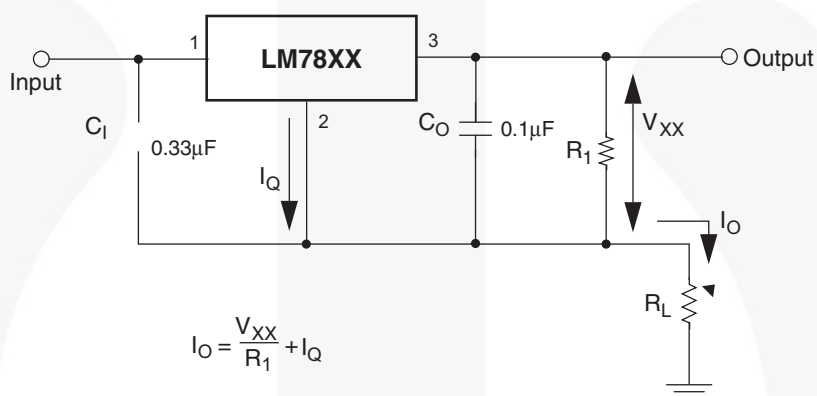


Figure 9. Fixed-Output Regulator

**Notes:**

29. To specify an output voltage, substitute voltage value for "XX". A common ground is required between the input and the output voltage. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

30.  $C_1$  is required if regulator is located an appreciable distance from power supply filter.

31.  $C_0$  improves stability and transient response.

Figure 10.

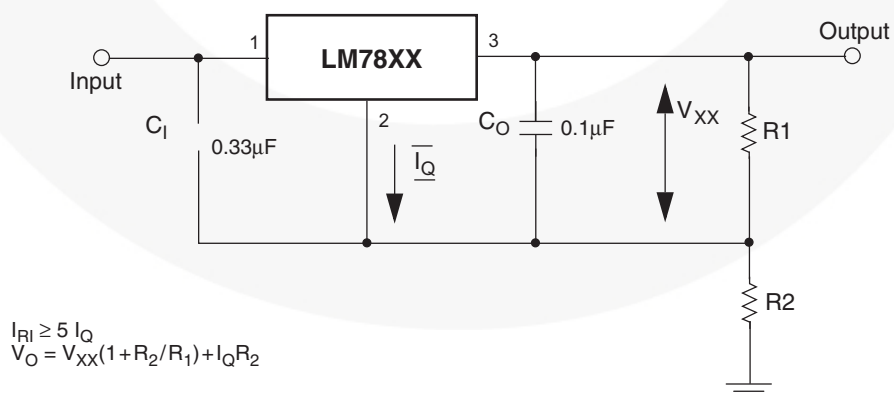


Figure 11. Circuit for Increasing Output Voltage

## Physical Dimensions

## TO-220 (SINGLE GAUGE)

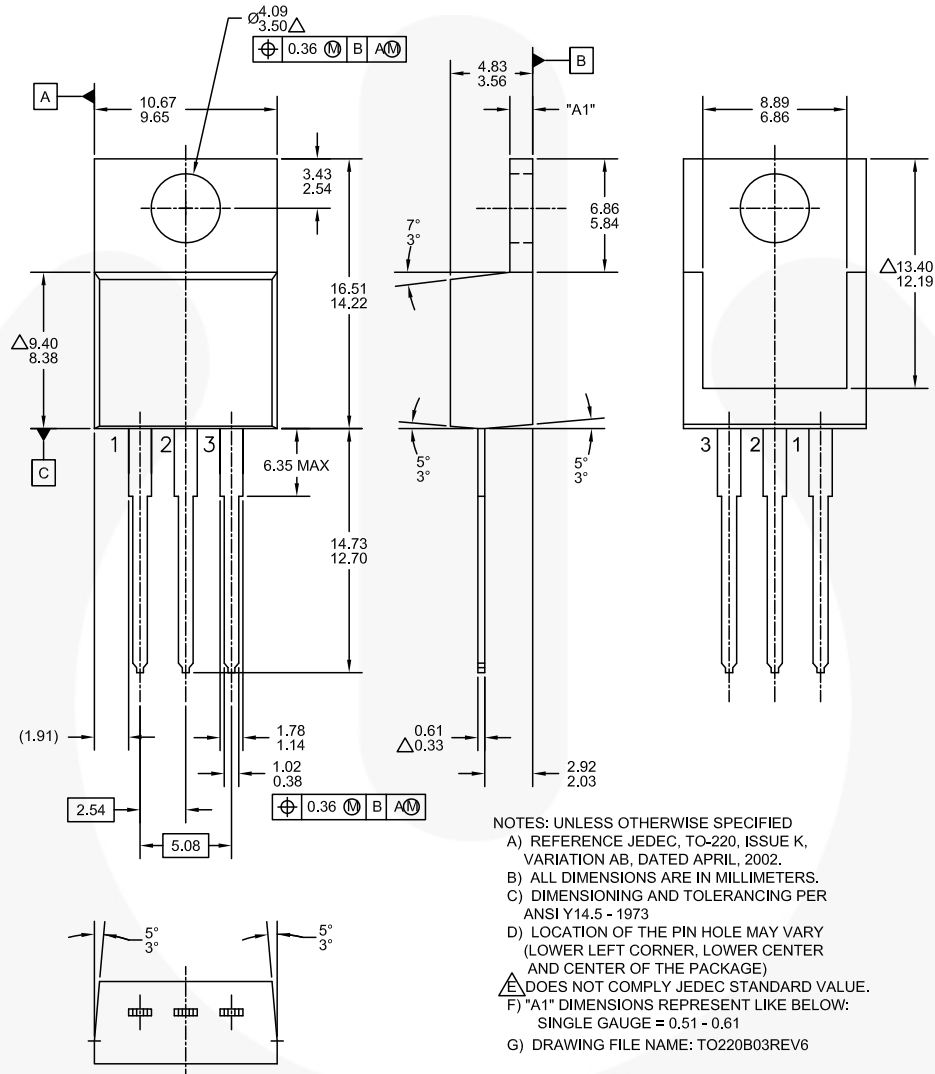


Figure 19. TO-220, MOLDED, 3-LEAD, JEDEC VARIATION AB (ACTIVE)

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