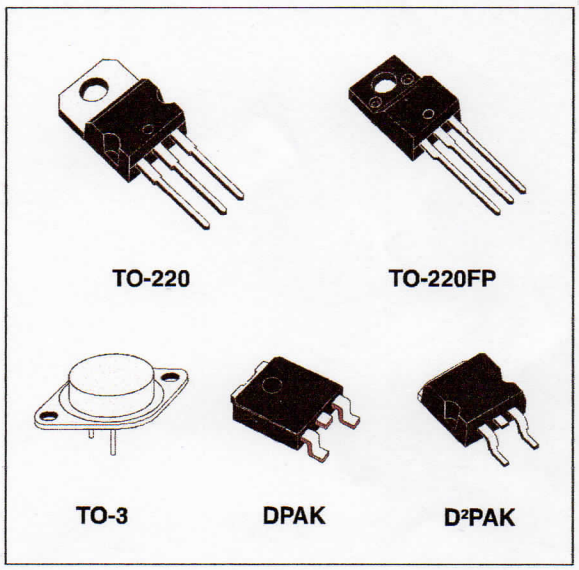
L78xx, L78xxC
L78xxAB, L78xxAC

Positive voltage regulator ICs

Datasheet – production data

Features

- Output current up to 1.5 A
- Output voltages of 5; 6; 8; 8.5; 9; 12; 15; 18; 24 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection
- 2 % output voltage tolerance (A version)
- Guaranteed in extended temperature range (A version)



Description

The L78xx series of three-terminal positive regulators is available in TO-220, TO-220FP, TO-3, D²PAK and DPAK packages and several fixed output voltages, making it useful in a wide range of applications.

These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. 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 to obtain adjustable voltage and currents.

Table 1. Device summary

Part numbers			
L7805	L7806AC	L7809AB	L7815AB
L7805C	L7808C	L7809AC	L7815AC
L7805AB	L7808AB	L7812C	L7818C
L7805AC	L7808AC	L7812AB	L7824C
L7806C	L7885C	L7812AC	L7824AB
L7806AB	L7809C	L7815C	L7824AC

This is information on a product in full production.

2 Pin configuration

Figure 2. Pin connections (top view)

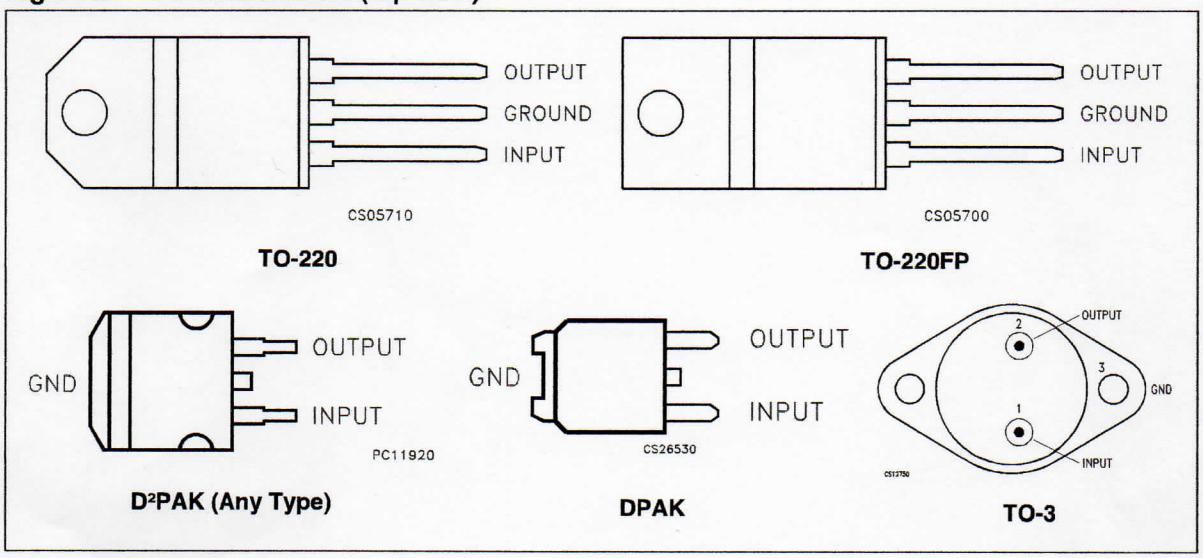
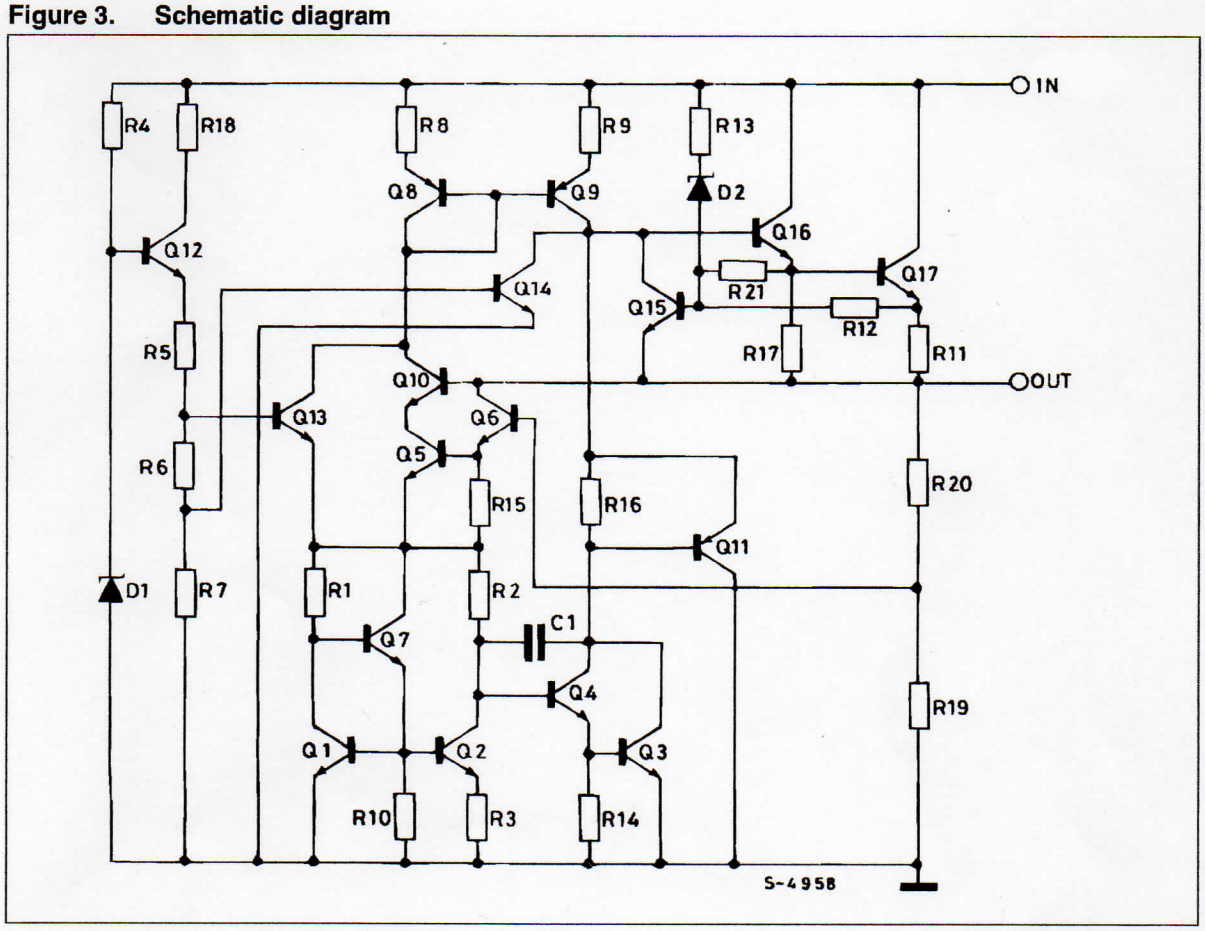
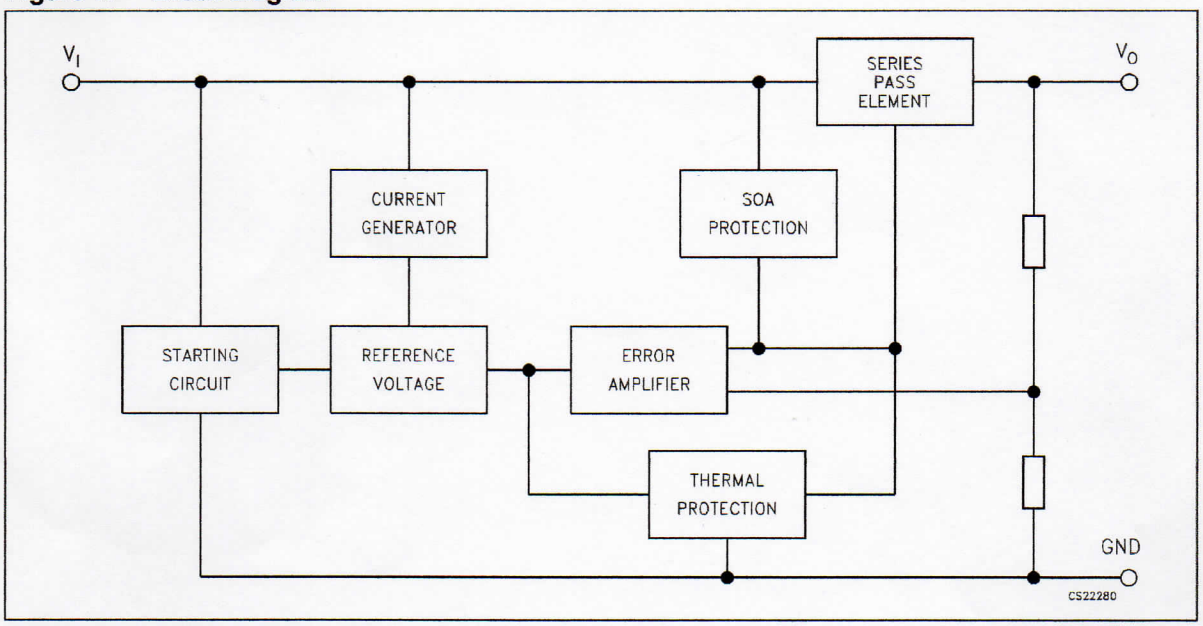


Figure 3. Schematic diagram



1 Diagram

Figure 1. Block diagram



Refer to the test circuits, T_J = 0 to 125 °C, V_I = 11 V, I_O = 500 mA, C_I = 0.33 µF, C_O = 0.1 µF unless otherwise specified.

Table 13. Electrical characteristics of L7806C

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	5.75	6	6.25	V
V_O	Output voltage	I_O = 5 mA to 1 A, V_I = 8 to 19 V	5.7	6	6.3	V
V_O	Output voltage	I_O = 1 A, V_I = 19 to 21 V, T_J = 25°C	5.7	6	6.3	V
ΔV_O(1)	Line regulation	V_I = 8 to 25 V, T_J = 25°C			120	mV
		V_I = 9 to 13 V, T_J = 25°C			60	
ΔV_O(1)	Load regulation	I_O = 5 mA to 1.5 A, T_J = 25°C			120	mV
		I_O = 250 to 750 mA, T_J = 25°C			60	
I_d	Quiescent current	T_J = 25°C			8	mA
ΔI_d	Quiescent current change	I_O = 5 mA to 1 A			0.5	mA
		V_I = 8 to 24 V			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5 mA		-0.8		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, T_J = 25°C		45		µV/V_O
SVR	Supply voltage rejection	V_I = 9 to 19 V, f = 120 Hz	59			dB
V_d	Dropout voltage	I_O = 1 A, T_J = 25°C		2		V
R_O	Output resistance	f = 1 kHz		19		mΩ
I_{sc}	Short circuit current	V_I = 35 V, T_J = 25°C		0.55		A
I_{scp}	Short circuit peak current	T_J = 25°C		2.2		A

1. 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 cycle is used.

3 Maximum ratings

Table 2. Absolute maximum ratings

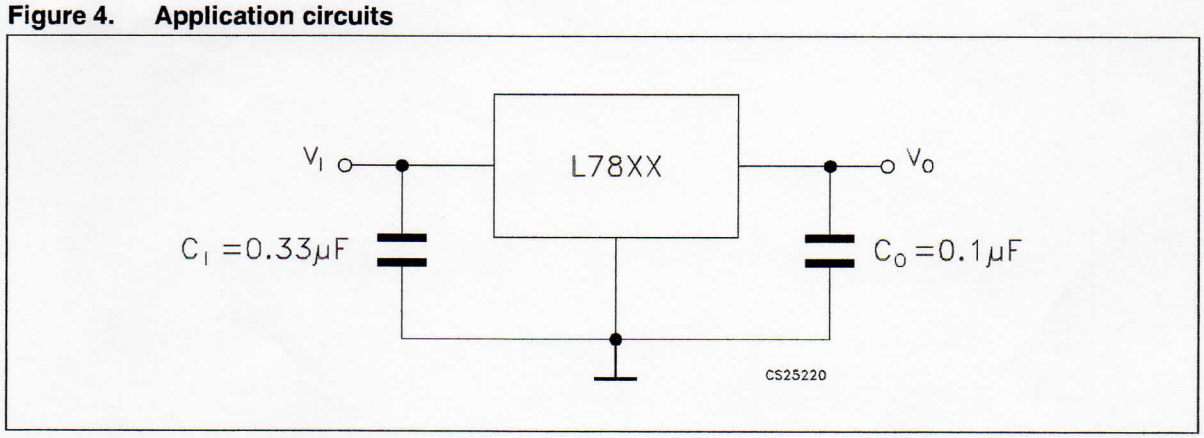
Symbol	Parameter		Value	Unit
V_I	DC input voltage	for V_O= 5 to 18 V	35	V
		for V_O= 20, 24 V	40	
I_O	Output current		Internally limited	
P_D	Power dissipation		Internally limited	
T_{STG}	Storage temperature range		-65 to 150	°C
T_{OP}	Operating junction temperature range	for L78xx	-55 to 150	°C
		for L78xxC, L78xxAC	0 to 125	
		for L78xxAB	-40 to 125	

Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 3. Thermal data

Symbol	Parameter	D²PAK	DPAK	TO-220	TO-220FP	TO-3	Unit
R_{thJC}	Thermal resistance junction-case	3	8	5	5	4	°C/W
R_{thJA}	Thermal resistance junction-ambient	62.5	100	50	60	35	°C/W

Figure 4. Application circuits



6 Application information

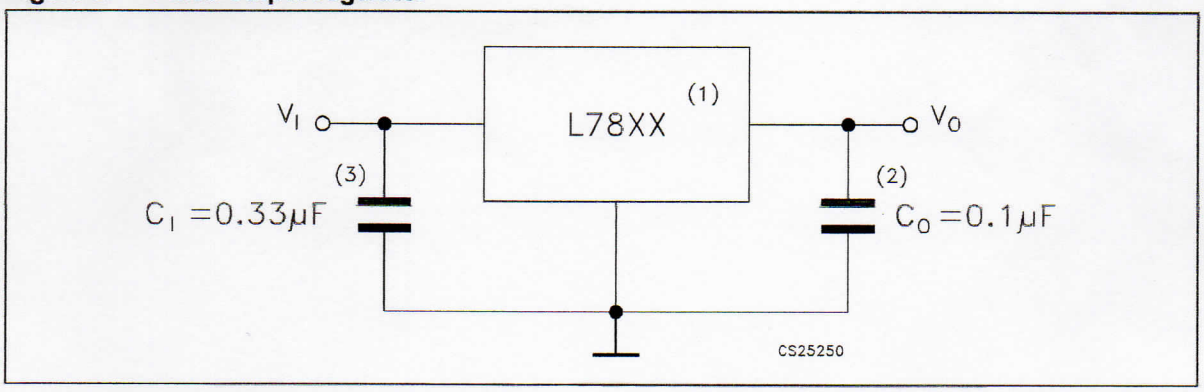
6.1 Design consideration

The L78xx Series of fixed voltage regulators are designed with thermal overload protection that shuts down the circuit when subjected to an excessive power overload condition, internal short-circuit protection that limits the maximum current the circuit will pass, and output transistor safe-area compensation that reduces the output short-circuit current as the voltage across the pass transistor is increased. In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with capacitor if the regulator is connected to the power supply filter with long lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A 0.33 µF or larger tantalum, mylar or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

The addition of an operational amplifier allows adjustment to higher or intermediate values while retaining regulation characteristics. The minimum voltage obtained with the arrangement is 2 V greater than the regulator voltage.

The circuit of *Figure 13* can be modified to provide supply protection against short circuit by adding a short circuit sense resistor, RSC, and an additional PNP transistor. The current sensing PNP must be able to handle the short circuit current of the three terminal regulator Therefore a four ampere plastic power transistor is specified.

Figure 8. Fixed output regulator



1. To specify an output voltage, substitute voltage value for "XX".
2. Although no output capacitor is need for stability, it does improve transient response.
3. Required if regulator is locate an appreciable distance from power supply filter.

Figure 9. Current regulator

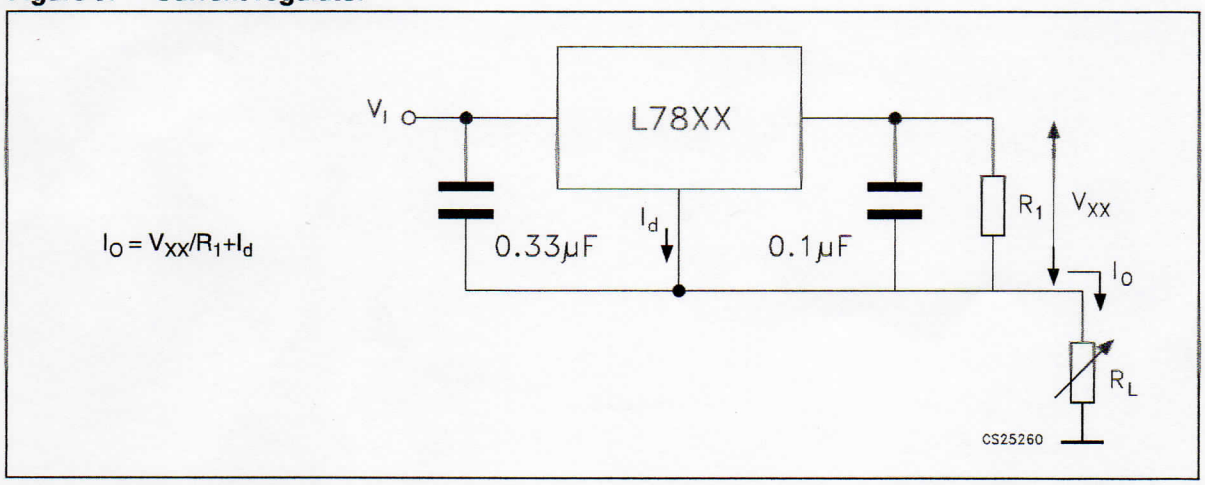


Figure 10. Circuit for increasing output voltage

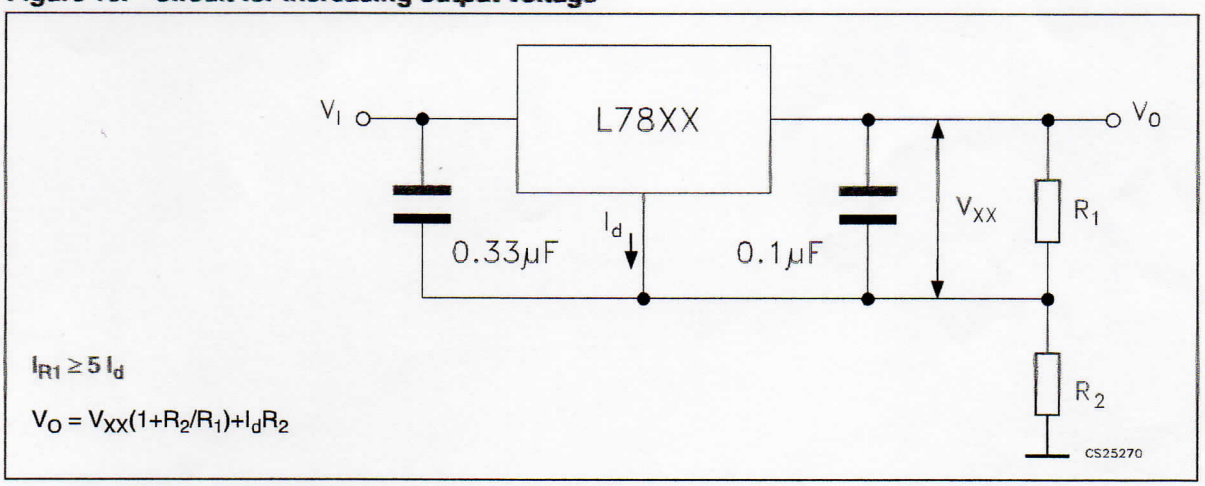


Figure 11. Adjustable output regulator (7 to 30 V)