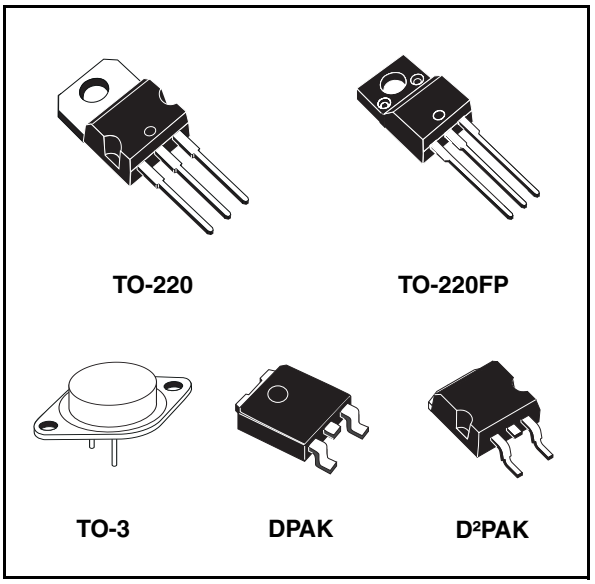
L78xx
L78xxC

Positive voltage regulators

Features

- Output current 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



Description

The L78xx series of three-terminal positive regulators is available in TO-220, TO-220FP, TO-3, D^2PAK 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	L7809C
L7805C	L7812C
L7806C	L7815C
L7808C	L7818C
L7885C	L7824C

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 L7800	-55 to 150	°C
		for L7800C	0 to 150	

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	D^2PAK	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

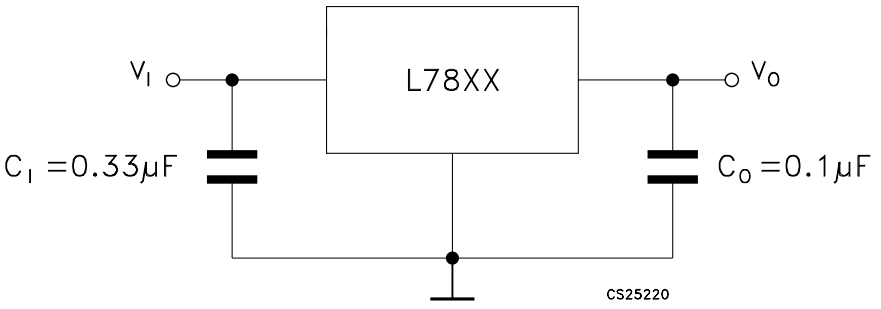


Table 17. Electrical characteristics of L7809C (refer to the test circuits, T_J = 0 to 150 °C, V_I = 15 V, I_O = 500 mA, C_I = 0.33 µF, C_O = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	8.64	9	9.36	V
V_O	Output voltage	I_O = 5 mA to 1 A, $P_O \leq$15 W V_I = 11.5 to 26 V	8.55	9	9.45	V
ΔV_O(1)	Line regulation	V_I = 11.5 to 26 V, T_J = 25°C			180	mV
		V_I = 12 to 18 V, T_J = 25°C			90	
ΔV_O(1)	Load regulation	I_O = 5 mA to 1.5 A, T_J = 25°C			180	mV
		I_O = 250 to 750 mA, T_J = 25°C			90	
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 = 11.5 to 26 V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5 mA		-1		mV/°C
eN	Output noise voltage	B =10 Hz to 100 kHz, T_J = 25°C		70		µV/V_O
SVR	Supply voltage rejection	V_I = 12 to 23 V, f = 120 Hz	55			dB
V_d	Dropout voltage	I_O = 1 A, T_J = 25°C		2		V
R_O	Output resistance	f = 1 kHz		17		mΩ
I_{sc}	Short circuit current	V_I = 35 V, T_J = 25°C		0.40		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.

Table 23. Electrical characteristics of L7824C (refer to the test circuits, T_J = 0 to 150 °C, V_I = 33 V, I_O = 500 mA, C_I = 0.33 µF, C_O = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	23	24	25	V
V_O	Output voltage	I_O = 5 mA to 1 A, $P_O \leq$15 W V_I = 27 to 38 V	22.8	24	25.2	V
ΔV_O(1)	Line regulation	V_I = 27 to 38 V, T_J = 25°C			480	mV
		V_I = 30 to 36 V, T_J = 25°C			240	
ΔV_O(1)	Load regulation	I_O = 5 mA to 1.5 A, T_J = 25°C			480	mV
		I_O = 250 to 750 mA, T_J = 25°C			240	
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 = 27 to 38 V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5 mA		-1.5		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, T_J = 25°C		170		µV/V_O
SVR	Supply voltage rejection	V_I = 28 to 38 V, f = 120 Hz	50			dB
V_d	Dropout voltage	I_O = 1 A, T_J = 25°C		2		V
R_O	Output resistance	f = 1 kHz		28		mΩ
I_{sc}	Short circuit current	V_I = 35 V, T_J = 25°C		0.15		A
I_{scp}	Short circuit peak current	T_J = 25°C		2.1		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.

Figure 38. Drawing dimension TO-220 (type SMIC-subcon.)

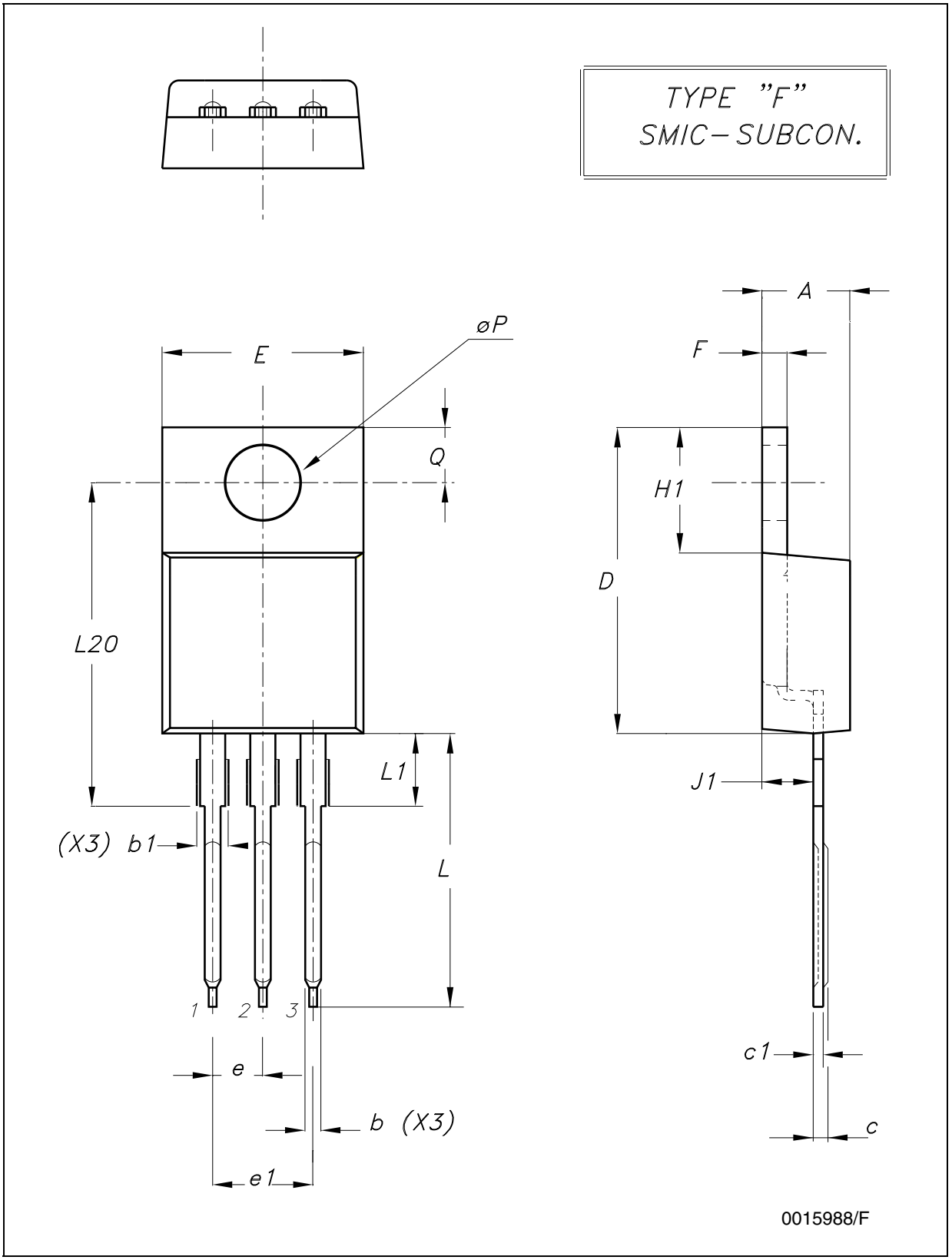


Figure 39. Drawing dimension TO-220 (type STD-ST)

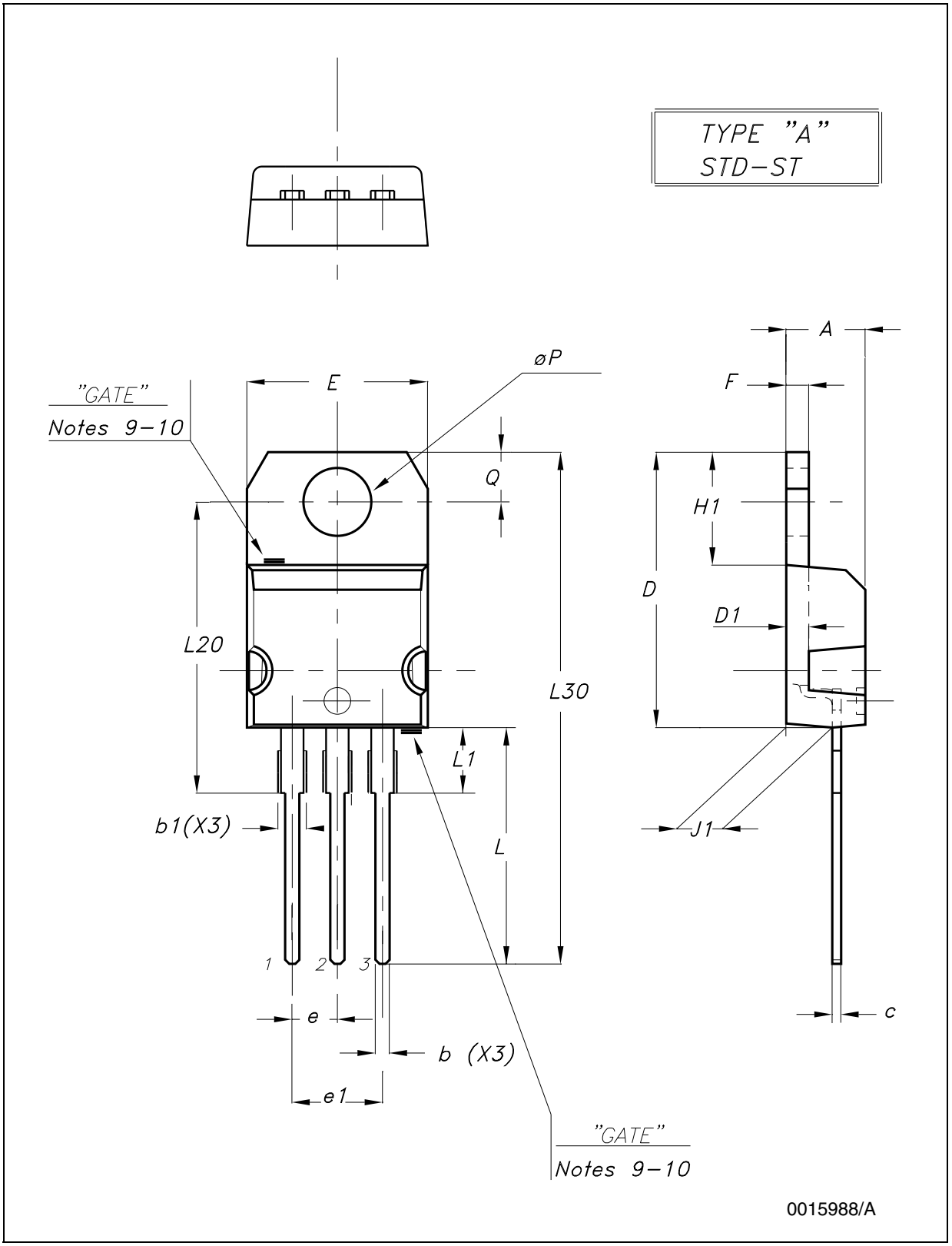


Table 24. TO-220 mechanical data

Dim.	Type STD-ST			Type SMIC-Subcon.		
	mm.			mm.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	4.47	4.57	4.67
A1	0.61		0.88	0.80	0.81	0.86
b1	1.14		1.70	1.15		1.44
c	0.49		0.70		0.56	
c1					0.38	
D	15.25		15.75	15.07	15.24	15.45
D1		1.27				
E	10.00		10.40	10	10.15	10.30
e	2.40		2.70	2.29	2.54	2.79
e1	4.95		5.15	4.83	5.08	5.33
F	1.23		1.32		1.27	
H1	6.20		6.60		6.24	
J1	2.40		2.72	2.04	2.67	2.92
L	13.00		14.00	13.35	13.50	13.65
L1	3.50		3.93		3.90	
L20		16.40		16.25	16.40	16.55
L30		28.90			28.74	
∅P	3.75		3.85		3.83	
Q	2.65		2.95	2.72	2.74	2.80

Note: In spite of some difference in tolerances, the packages are compatible.

8 Order codes

Table 32. Order codes

Part numbers	Order codes				
	TO-220	DPAK	D^2PAK	TO-220FP	TO-3
L7805					L7805T
L7805C	L7805CV	L7805CDT-TR	L7805CD2T-TR	L7805CP	L7805CT
L7806C	L7806CV		L7806CD2T-TR		L7806CT
L7808C	L7808CV		L7808CD2T-TR	L7808CP	
L7885C	L7885CV		L7885CD2T-TR (1)	L7885CP (1)	L7885CT (1)
L7809C	L7809CV		L7809CD2T-TR	L7809CP	
L7812C	L7812CV		L7812CD2T-TR	L7812CP	L7812CT
L7815C	L7815CV		L7815CD2T-TR	L7815CP	L7815CT
L7818C	L7818CV		L7818CD2T-TR (1)		L7818CT
L7824C	L7824CV		L7824CD2T-TR	L7824CP	L7824CT

1. Available on request.