

Positive voltage regulators

Datasheet - production data

Features

- Output current to 0.5 A
- Output voltages of 5; 6; 8; 9; 12; 15; 24 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection

Description

The L78MxxC series of three-terminal positive regulators is available in TO-220, TO-220FP, DPAK and IPAK packages and with 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 shutdown and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 0.5 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

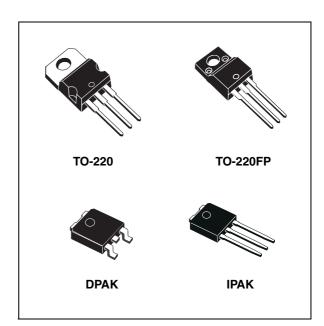


Table 1. Device summary

Part numbers	Order codes						
Part Humbers	TO-220	TO-220 ⁽¹⁾	TO-220FP	DPAK	IPAK	voltages	
L78M05C	L78M05CV	L78M05CV-DG	L78M05CP	L78M05CDT-TR	L78M05CDT-1	5 V	
L78M06C				L78M06CDT-TR	L78M06CDT-1 (2)	6 V	
L78M08C	L78M08CV	L78M08CV-DG		L78M08CDT-TR	L78M08CDT-1 (2)	8 V	
L78M09C	L78M09CV	L78M09CV-DG		L78M09CDT-TR	L78M09CDT-1 (2)	9 V	
L78M12C	L78M12CV	L78M12CV-DG		L78M12CDT-TR		12 V	
L78M15C	L78M15CV	L78M15CV-DG		L78M15CDT-TR		15 V	
L78M24C	L78M24CV	L78M24CV-DG	L78M24CP (2)	L78M24CDT-TR	L78M24CDT-1 (2)	24 V	

- 1. TO-220 Dual Gauge frame
- 2. Available on request

Contents L78MxxC

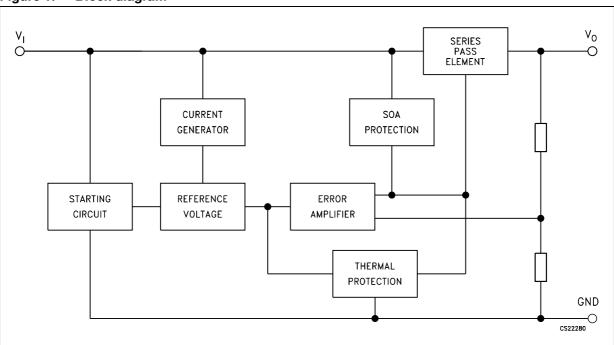
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L78MxxC Diagram

1 Diagram

Figure 1. Block diagram



Pin configuration L78MxxC

2 Pin configuration

Figure 2. Pin connections (top view)

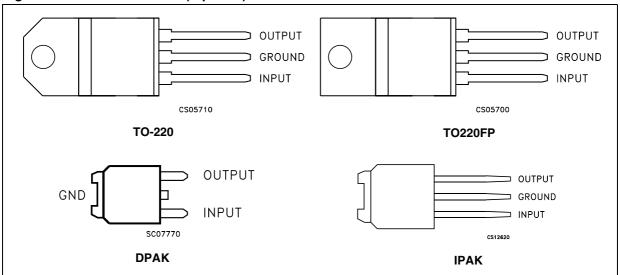
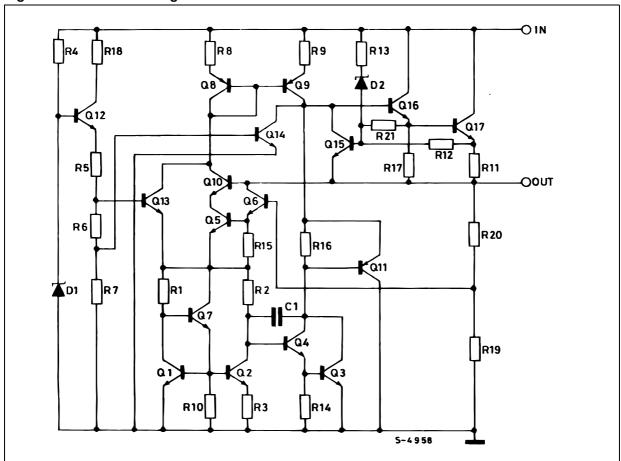


Figure 3. Schematic diagram



L78MxxC Maximum ratings

3 Maximum ratings

Table 2. Absolute maximum ratings

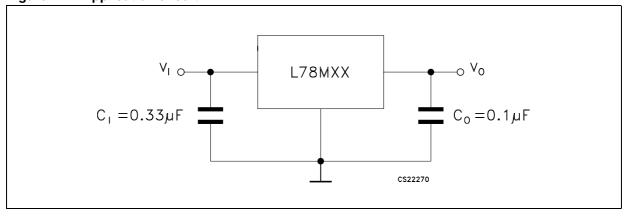
Symbol	Parameter		Value	Unit
V	DC input voltage	for V _O = 5 to 18 V	35	V
V _I	DC input voltage	for V _O = 20, 24 V	40	V
Io	Output current		Internally limited	mA
P _D	Power dissipation		Internally limited	mW
T _{STG}	Storage temperature range		- 65 to 150	°C
T _{OP}	Operating junction temperature range		0 to 150	°C

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	TO-220	TO-220FP	DPAK	IPAK	Unit
R _{thJC}	Thermal resistance junction-case	5	5	8		°C/W
R _{thJA}	Thermal resistance junction-ambient	50	60	100		°C/W

Figure 4. Application circuit



Test circuits L78MxxC

4 Test circuits

Figure 5. DC parameter

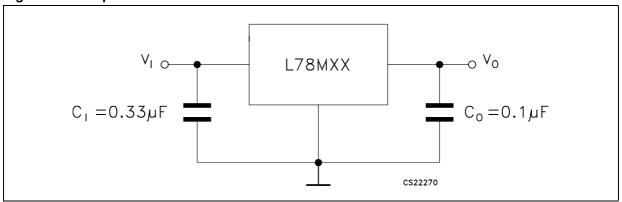


Figure 6. Load regulation

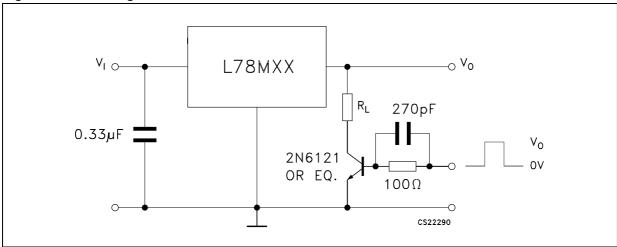
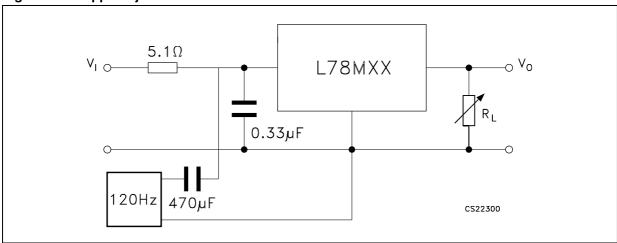


Figure 7. Ripple rejection



5 Electrical characteristics

Refer to the test circuits, T $_J$ = 25 °C, V $_I$ = 10 V, I $_O$ = 350 mA, C $_I$ = 0.33 $\mu\text{F},$ C $_O$ = 0.1 μF unless otherwise specified.

Table 4. Electrical characteristics of L78M05C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Vo	Output voltage		4.8	5	5.2	٧
V _O	Output voltage	I _O = 5 to 350 mA, V _I = 7 to 20 V	4.75	5	5.25	V
ΔV _O	Line regulation	$V_1 = 7 \text{ to } 25 \text{ V}, I_0 = 200 \text{ mA}$			100	- mV
Δν _Ο	Line regulation	V _I = 8 to 25 V, I _O = 200 mA			50	IIIV
AV.	Load regulation	I_O = 5 to 500 mA, T_J = 25 °C			100	mV
ΔV _O	Load regulation	I_O = 5 to 200 mA, T_J = 25 °C			50	IIIV
I _d	Quiescent current				6	mA
Al	Quiescent current change	I _O = 5 to 350 mA			0.5	mA.
Δl _d	Quiescent current change	I _O = 200 mA, V _I = 8 to 25 V			0.8	IIIA
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA, $T_J = 0$ to 125 °C		-0.5		mV/°C
SVR	Supply voltage rejection	$V_1 = 8 \text{ to } 18 \text{ V}, f = 120 \text{ Hz}, I_0 = 300 \text{ mA}$	62			dB
eN	Output noise voltage	B = 10 Hz to 100 kHz		40		μV
V _d	Dropout voltage			2		V
I _{sc}	Short circuit current	V _I = 35 V		300		mA

Electrical characteristics L78MxxC

Refer to the test circuits, T $_J$ = 25 °C, V $_I$ = 11 V, I $_O$ = 350 mA, C $_I$ = 0.33 $\mu\text{F},$ C $_O$ = 0.1 μF unless otherwise specified.

Table 5. Electrical characteristics of L78M06C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _O	Output voltage		5.75	6	6.25	V
V _O	Output voltage	I _O = 5 to 350 mA, V _I = 8 to 21 V	5.7	6	6.3	V
A\/ .	Line regulation	V _I = 8 to 25 V, I _O = 200 mA			100	mV
ΔV _O	Line regulation	$V_1 = 9 \text{ to } 25 \text{ V}, I_0 = 200 \text{ mA}$			50	1110
A\/ .	Load regulation	I_O = 5 to 500 mA, T_J = 25 °C			120	mV
ΔV _O	Load regulation	I_O = 5 to 200 mA, T_J = 25 °C			60	1110
I _d	Quiescent current				6	mA
Al	Quiescent current change	I _O = 5 to 350 mA			0.5	mA
Δl_d	Quiescent current change	I _O = 200 mA, V _I = 9 to 25 V			0.8	IIIA
$\Delta V_{O}/\Delta T$	Output voltage drift	$I_O = 5$ mA, $T_J = 0$ to 125 °C		-0.5		mV/°C
SVR	Supply voltage rejection	$V_1 = 9 \text{ to } 19 \text{ V}, f = 120 \text{ Hz}, I_O = 300 \text{ mA}$	59			dB
eN	Output noise voltage	B = 10 Hz to 100 kHz		45		μV
V _d	Dropout voltage			2		V
I _{sc}	Short circuit current	V _I = 35 V		270		mA

Refer to the test circuits, T $_J$ = 25 °C, V $_I$ = 14 V, I $_O$ = 350 mA, C $_I$ = 0.33 $\mu\text{F},$ C $_O$ = 0.1 μF unless otherwise specified.

Table 6. Electrical characteristics of L78M08C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _O	Output voltage		7.7	8	8.3	V
V _O	Output voltage	$I_O = 5 \text{ to } 350 \text{ mA}, V_I = 10.5 \text{ to } 23 \text{ V}$	7.6	8	8.4	V
ΔV_{O}	Line regulation	V _I = 10.5 to 25 V, I _O = 200 mA			100	mV
Δ v O	Line regulation	V _I = 11 to 25 V, I _O = 200 mA			50	IIIV
ΔV_{O}	Load regulation	I_O = 5 to 500 mA, T_J = 25 °C			160	mV
ΔνΟ	Load regulation	I_O = 5 to 200 mA, T_J = 25 °C			80	IIIV
I _d	Quiescent current				6	mA
41	Quiescent current change	I _O = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent current change	$I_O = 200 \text{ mA}, V_I = 10.5 \text{ to } 25 \text{ V}$			0.8	IIIA
$\Delta V_{O}/\Delta T$	Output voltage drift	$I_O = 5$ mA, $T_J = 0$ to 125 °C		-0.5		mV/°C
SVR	Supply voltage rejection	V _I = 11.5 to 21.5 V, f = 120 Hz, I _O = 300 mA	56			dB
eN	Output noise voltage	B = 10 Hz to 100 kHz		52		μV
V _d	Dropout voltage			2		V
I _{sc}	Short circuit current	V _I = 35 V		250		mA

Refer to the test circuits, T $_J$ = 25 °C, V $_I$ = 15 V, I $_O$ = 350 mA, C $_I$ = 0.33 $\mu\text{F},$ C $_O$ = 0.1 μF unless otherwise specified.

Table 7. Electrical characteristics of L78M09C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Vo	Output voltage		8.65	9	9.35	V
Vo	Output voltage	$I_O = 5$ to 350 mA, $V_I = 11.5$ to 24 V	8.55	9	9.45	V
4)/	Line regulation	V _I = 11.5 to 25 V, I _O = 200 mA			100	mV
ΔV _O	Line regulation	V _I = 12 to 25 V, I _O = 200 mA			50	IIIV
4)/	Load regulation	I_O = 5 to 500 mA, T_J = 25 °C			180	mV
ΔV _O	Load regulation	I_O = 5 to 200 mA, T_J = 25 °C			90	IIIV
I _d	Quiescent current				6	mA
Al	Quiescent current change	I _O = 5 to 350 mA			0.5	mA
Δl _d	Quiescent current change	I _O = 200 mA, V _I = 11.5 to 25 V			0.8	IIIA
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA, $T_J = 0$ to 125 °C		-0.5		mV/°C
SVR	Supply voltage rejection	V _I = 12.5 to 23 V, f = 120 Hz, I _O = 300 mA	56			dB
eN	Output noise voltage	B = 10 Hz to 100 kHz		58		μV
V _d	Dropout voltage			2		V
I _{sc}	Short circuit current	V _I = 35 V		250		mA

Refer to the test circuits, T_J = 25 °C, V_I = 19 V, I_O = 350 mA, C_I = 0.33 μ F, C_O = 0.1 μ F unless otherwise specified.

Table 8. Electrical characteristics of L78M12C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Vo	Output voltage		11.5	12	12.5	V
Vo	Output voltage	$I_{O} = 5 \text{ to } 350 \text{ mA}, V_{I} = 14.5 \text{ to } 27 \text{ V}$	11.4	12	12.6	V
AV.	Line regulation	V _I = 14.5 to 30 V, I _O = 200 mA			100	mV
ΔV _O	Line regulation	V _I = 16 to 30 V, I _O = 200 mA			50	IIIV
AV.	Load regulation	I_O = 5 to 500 mA, T_J = 25 °C			240	mV
ΔV _O	Load regulation	I_O = 5 to 200 mA, T_J = 25 °C			120	IIIV
I _d	Quiescent current				6	mA
Al	Quiescent current change	I _O = 5 to 350 mA			0.5	mA
Δl _d	Quiescent current change	$I_O = 200 \text{ mA}, V_I = 14.5 \text{ to } 30 \text{ V}$			0.8	IIIA
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA, $T_J = 0$ to 125 °C		-1		mV/°C
SVR	Supply voltage rejection	$V_1 = 15 \text{ to } 25 \text{ V}, f = 120 \text{ Hz}, I_0 = 300 \text{ mA}$	55			dB
eN	Output noise voltage	B = 10 Hz to 100 kHz		75		μV
V _d	Dropout voltage			2		V
I _{sc}	Short circuit current	V _I = 35 V		240		mA

Electrical characteristics L78MxxC

Refer to the test circuits, T $_J$ = 25 °C, V $_I$ = 23 V, I $_O$ = 350 mA, C $_I$ = 0.33 $\mu F,$ C $_O$ = 0.1 μF unless otherwise specified.

Table 9. Electrical characteristics of L78M15C

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Vo	Output voltage		14.4	15	15.6	V
Vo	Output voltage	$I_{O} = 5 \text{ to } 350 \text{ mA}, V_{I} = 17.5 \text{ to } 30 \text{ V}$	14.25	15	15.75	V
4)/	Line regulation	V _I = 17.5 to 30 V, I _O = 200 mA			100	mV
ΔV _O	Line regulation	V _I = 20 to 30 V, I _O = 200 mA			50	IIIV
4)/	Load regulation	I_O = 5 to 500 mA, T_J = 25 °C			300	mV
ΔV _O	Load regulation	I_O = 5 to 200 mA, T_J = 25 °C			150	IIIV
I _d	Quiescent current				6	mA
Al	Quiescent current change	I _O = 5 to 350 mA			0.5	mA
Δl _d	Quiescent current change	I _O = 200 mA, V _I = 17.5 to 30 V			0.8	IIIA
$\Delta V_{O}/\Delta T$	Output voltage drift	I_O = 5 mA, T_J = 0 to 125 °C		-1		mV/°C
SVR	Supply voltage rejection	V _I = 18.5 to 28.5 V, f = 120 Hz, I _O = 300 mA	54			dB
eN	Output noise voltage	B = 10 Hz to 100 kHz		90		μV
V _d	Dropout voltage			2		V
I _{sc}	Short circuit current	V _I = 35 V		240		mA

Refer to the test circuits, T $_J$ = 25 °C, V $_I$ = 23 V, I $_O$ = 350 mA, C $_I$ = 0.33 $\mu F,$ C $_O$ = 0.1 μF unless otherwise specified.

Table 10. Electrical characteristics of L78M24C

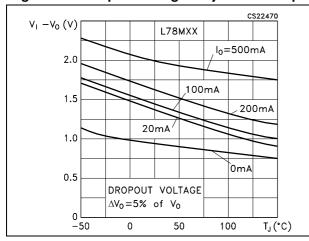
Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Vo	Output voltage		23	24	25	V
Vo	Output voltage	I _O = 5 to 350 mA, V _I = 27 to 38 V	22.8	24	25.2	٧
AV.	Line regulation	V _I = 27 to 38 V, I _O = 200 mA			100	mV
ΔV _O	Line regulation	$V_{I} = 28 \text{ to } 38 \text{ V}, I_{O} = 200 \text{ mA}$			50	IIIV
AV.	Load regulation	I_O = 5 to 500 mA, T_J = 25 °C			480	mV
ΔV_{O}	Load regulation	I_O = 5 to 200 mA, T_J = 25 °C			240	IIIV
I _d	Quiescent current				6	mA
Al	Quiescent current change	I _O = 5 to 350 mA			0.5	mA
Δl _d	Quiescent current change	I _O = 200 mA, V _I = 27 to 38 V			0.8	IIIA
$\Delta V_{O}/\Delta T$	Output voltage drift	$I_O = 5$ mA, $T_J = 0$ to 125 °C		-1.2		mV/°C
SVR	Supply voltage rejection	$V_1 = 28 \text{ to } 38 \text{ V}, f = 120 \text{ Hz}, I_0 = 300 \text{ mA}$	50			dB
eN	Output noise voltage	B = 10 Hz to 100 kHz		170		μV
V _d	Dropout voltage			2		٧
I _{sc}	Short circuit current	V _I = 35 V		240		mA

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L78MxxC Typical performance

6 Typical performance

Figure 8. Dropout voltage vs. junction temp. Figure 9. Dropout characteristics



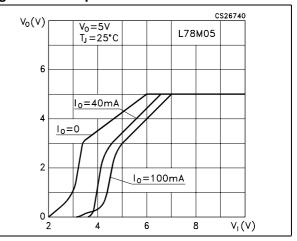
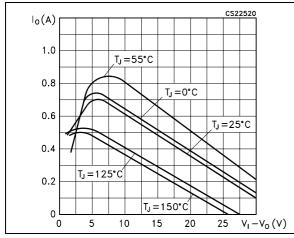


Figure 10. Peak output current vs. inputoutput differential voltage

Figure 11. Output voltage vs. junction temperature



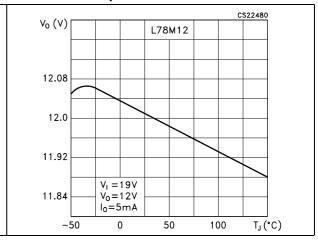
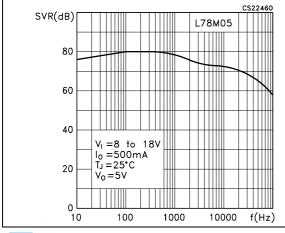
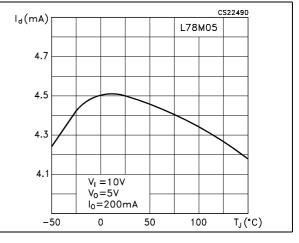


Figure 12. Supply voltage rejection vs. frequency

Figure 13. Quiescent current vs. junction temperature

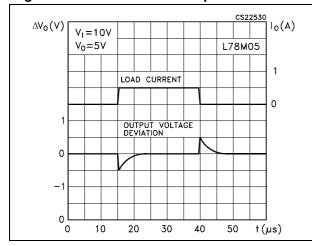




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Figure 14. Load transient response

Figure 15. Line transient response



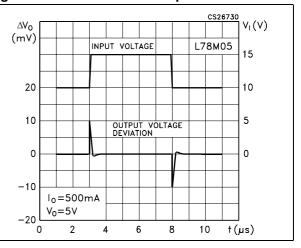


Figure 16. Quiescent current vs. input voltage

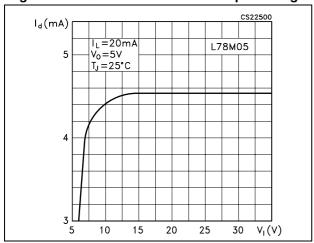
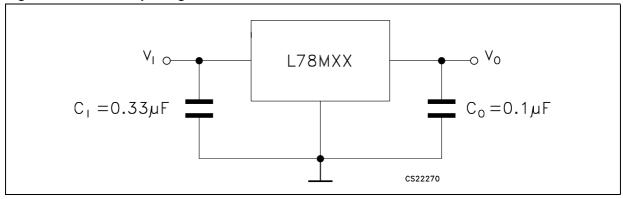


Figure 17. Fixed output regulator



- 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.

L78MxxC Typical performance

Figure 18. Constant current regulator

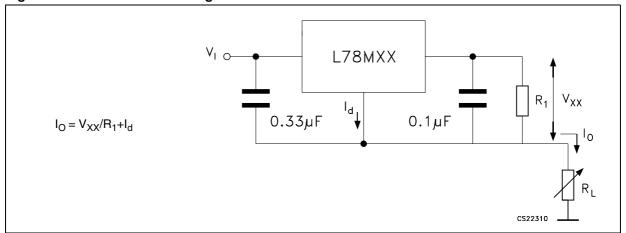


Figure 19. Circuit for increasing output voltage

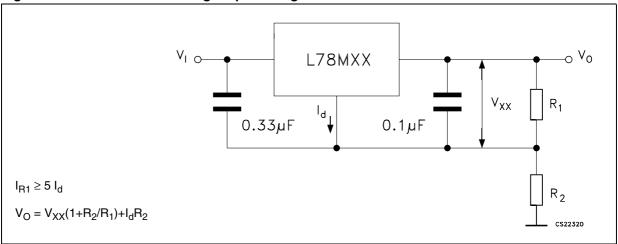
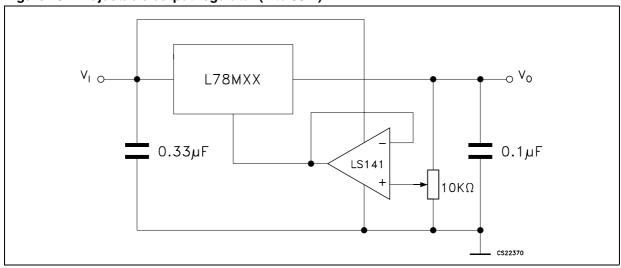


Figure 20. Adjustable output regulator (7 to 30 V)



Typical performance L78MxxC

Figure 21. 0.5 to 10 V regulator

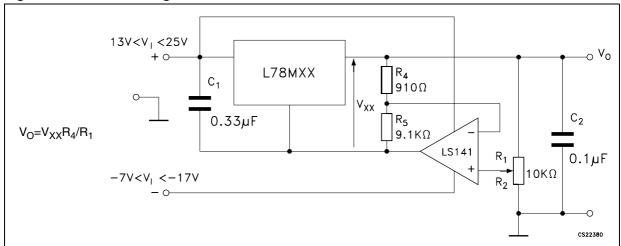


Figure 22. High current voltage regulator

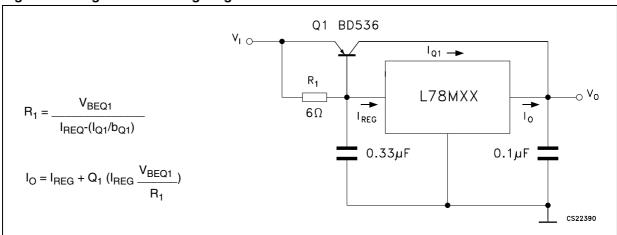
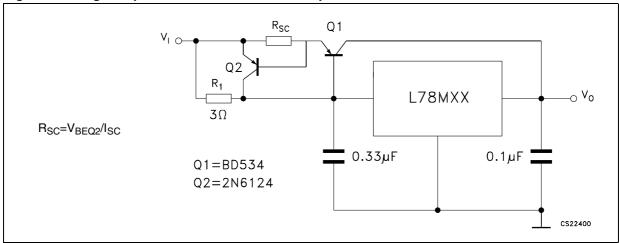


Figure 23. High output current with short circuit protection



L78MxxC Typical performance

Figure 24. Tracking voltage regulator

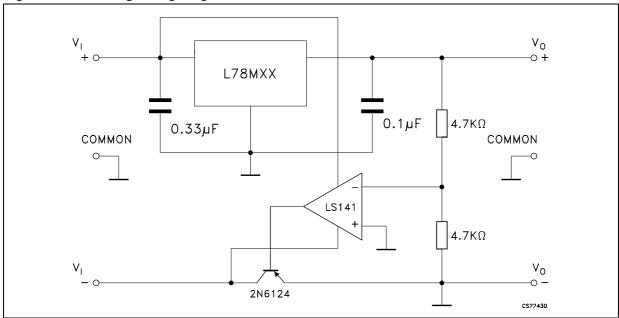


Figure 25. High input voltage circuit

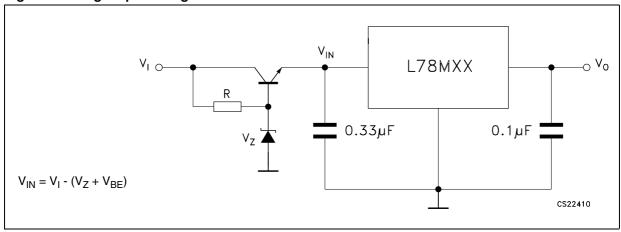
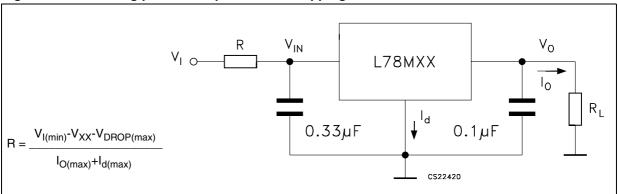
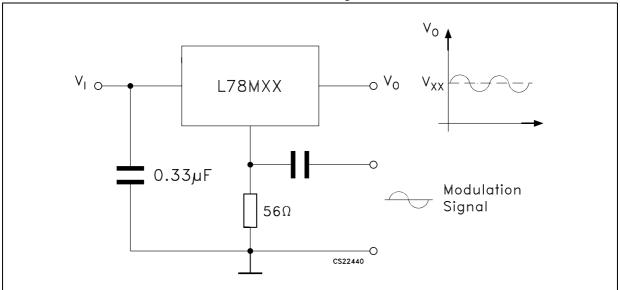


Figure 26. Reducing power dissipation with dropping resistor



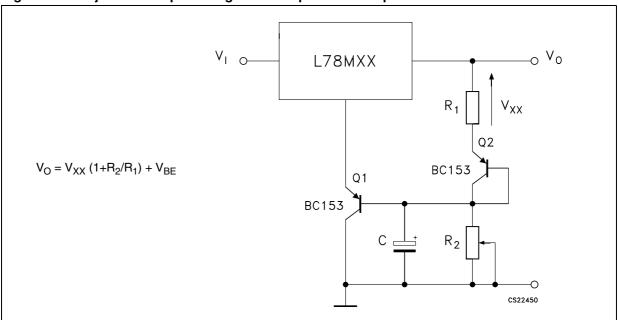
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Figure 27. Power AM modulator (unity voltage gain, $\rm I_{O} \le 0.5)$



Note: The circuit performs well up to 100 kHz.

Figure 28. Adjustable output voltage with temperature compensation



Note: Q_2 is connected as a diode in order to compensate the variation of the Q_1 V_{BE} with the temperature. C allows a slow rise time of the V_O .

7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

Table 11. TO-220 mechanical data

	Туре	STD - ST Dual (Gauge	Type S	STD - ST Single	Gauge
Dim.		mm.			mm.	
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α	4.40		4.60	4.40		4.60
b	0.61		0.88	0.61		0.88
b1	1.14		1.70	1.14		1.70
С	0.48		0.70	0.48		0.70
D	15.25		15.75	15.25		15.75
D1		1.27				
Е	10.00		10.40	10.00		10.40
е	2.40		2.70	2.40		2.70
e1	4.95		5.15	4.95		5.15
F	1.23		1.32	0.51		0.60
H1	6.20		6.60	6.20		6.60
J1	2.40		2.72	2.40		2.72
L	13.00		14.00	13.00		14.00
L1	3.50		3.93	3.50		3.93
L20		16.40			16.40	
L30		28.90			28.90	
ØP	3.75		3.85	3.75		3.85
Q	2.65		2.95	2.65		2.95

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

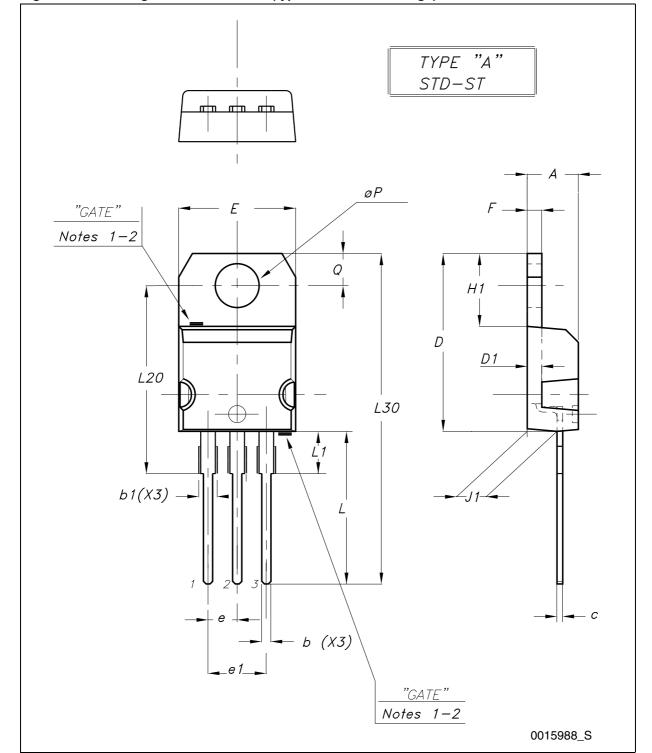


Figure 29. Drawing dimension TO-220 (type STD-ST Dual Gauge)

Note: 1 Maximum resin gate protrusion: 0.5 mm.

2 Resin gate position is accepted in each of the two positions shown on the drawing, or their symmetrical.

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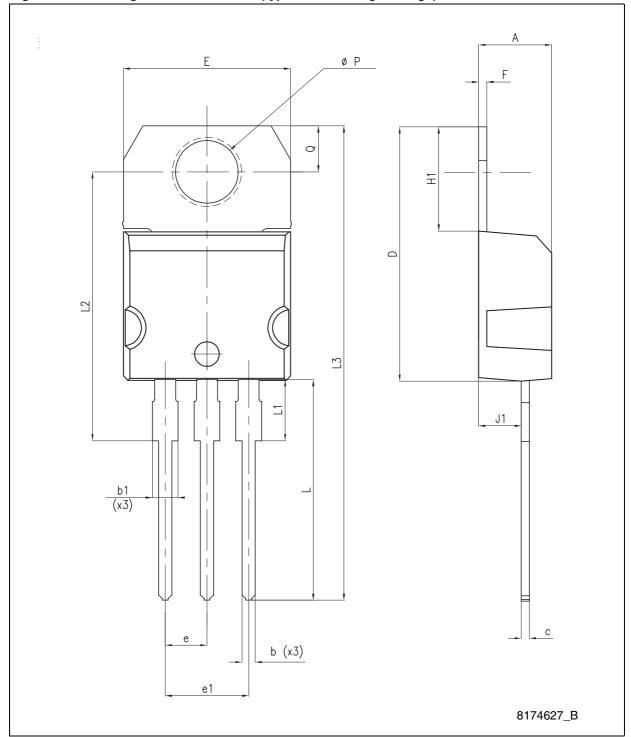
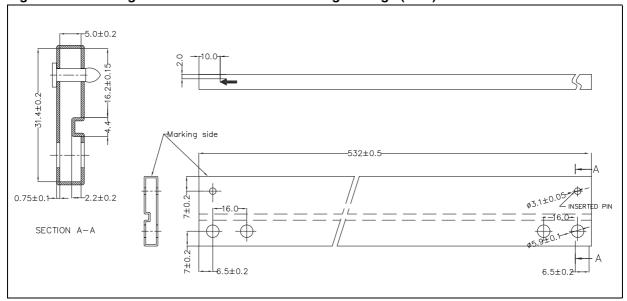


Figure 30. Drawing dimension TO-220 (type STD-ST Single Gauge)

** SECTION A-A

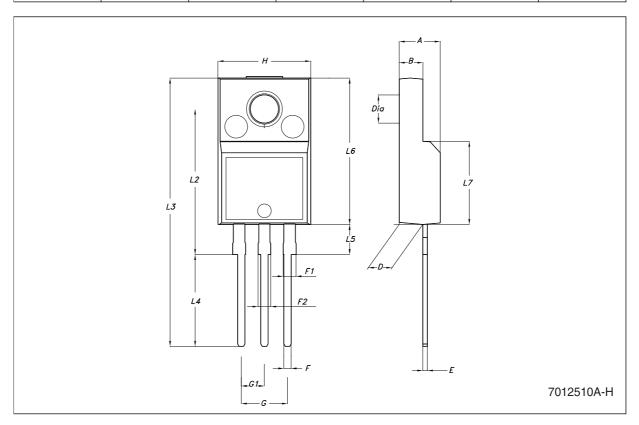
Figure 31. Drawing dimension tube for TO-220 Dual Gauge (mm.)





TO-220FP mechanical data

Dim.		mm.		inch.		
	Min.	Тур	Max.	Min.	Тур.	Max.
А	4.40		4.60	0.173		0.181
В	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
Е	0.45		0.70	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.50	0.045		0.059
F2	1.15		1.50	0.045		0.059
G	4.95		5.2	0.194		0.204
G1	2.4		2.7	0.094		0.106
Н	10.0		10.40	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L5	2.9		3.6	0.114		0.142
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
DIA.	3		3.2	0.118		0.126



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"GATE" Note 1 STD-ST Ε THERMAL PAD <u>c</u>2 E1 -L2 $\vec{D1}$ D Н L4 Note 2 b(2x)R - e 1-С SEATING PLANE (L1)*V2* **GAUGE** 0,25 0068772/G

Figure 33. Drawing dimension DPAK (type STD-ST)

Note: 1 Max resin gate protrusion: 0.5 mm.

2 Max resin protrusion: 0.25 mm.

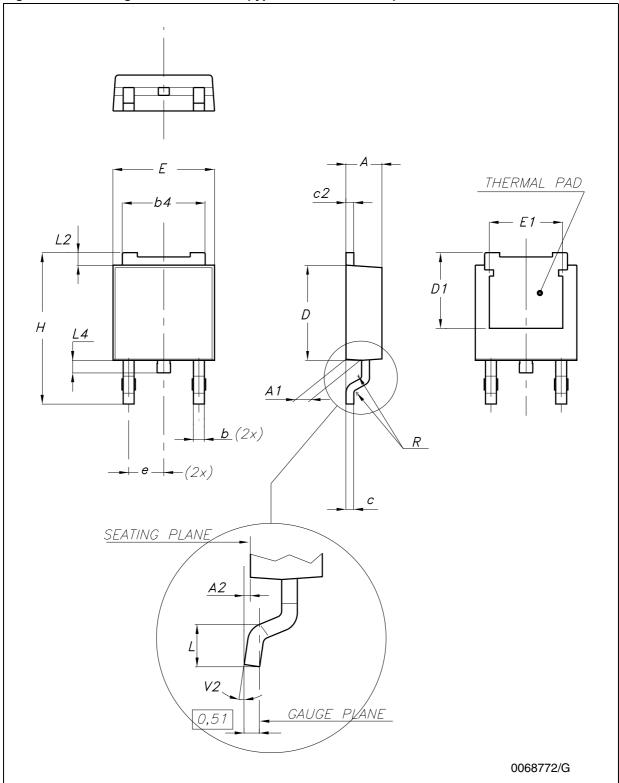


Figure 34. Drawing dimension DPAK (type FUJITSU-subcon.)

THERMAL PAD c2 E1 L2 D1 D A 1 R **b**(2x) – e 1-С SEATING PLANE L1 0,25 0068772/G

Figure 35. Drawing dimension DPAK (type IDS-subcon.)

Table 12. DPAK mechanical data

	Type STD-ST			Type FUJITSU-Subcon.			Type IDS-Subcon		
Dim.	mm.			mm.			mm.		
	Min.	Тур.	Max.	Min.	Тур.	Max.	Min.	Тур.	Max.
Α	2.20		2.40	2.25	2.30	2.35	2.19		2.38
A1	0.90		1.10	0.96		1.06	0.89		1.14
A2	0.03		0.23	0		0.10	0.03		0.23
b	0.64		0.90	0.76		0.86	0.64		0.88
b4	5.20		5.40	5.28		5.38	5.21		5.46
С	0.45		0.60	0.46		0.56	0.46		0.58
c2	0.48		0.60	0.46		0.56	0.46		0.58
D	6.00		6.20	6.05		6.15	5.97		6.22
D1		5.10		5.27		5.47		5.20	
Е	6.40		6.60	6.55	6.60	6.65	6.35		6.73
E1		4.70			4.77			4.70	
е		2.28		2.23	2.28	2.33		2.28	
e1	4.40		4.60				4.51		4.61
Н	9.35		10.10	9.90		10.30	9.40		10.42
L	1.00			1.40		1.60	0.90		
L1		2.80					2.50		2.65
L2		0.80		1.03		1.13	0.89		1.27
L4	0.60		1.00	0.70		0.90	0.64		1.02
R		0.20			0.40			0.20	
V2	0°		8°	0°		8°	0°		8°

Note: The DPAK package coming from the two subcontractors (Fujitsu and IDS) are fully compatible with the ST's package suggested footprint.

Figure 36. DPAK footprint recommended data

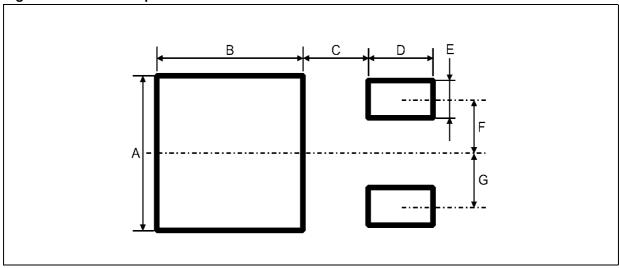
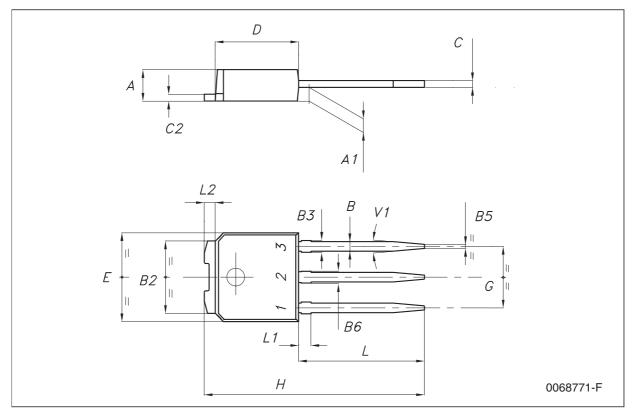


Table 13. Footprint data

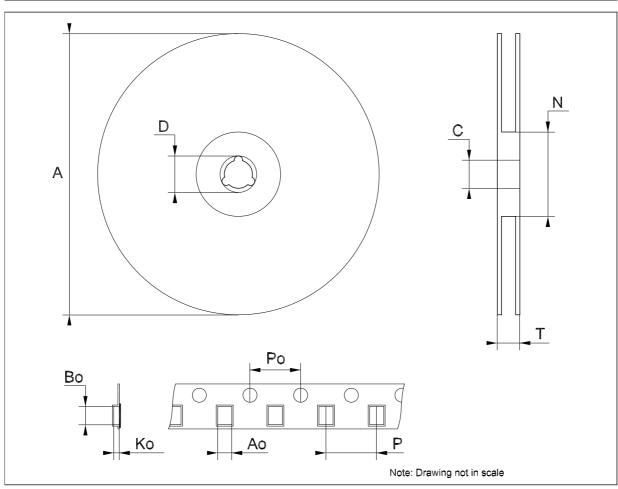
Values					
Dim.	mm.	inch.			
А	6.70	0.264			
В	6.70	0.64			
С	1.8	0.070			
D	3.0	0.118			
E	1.60	0.063			
F	2.30	0.091			
G	2.30	0.091			

IPAK mechanical data

Dim.		mm.		inch.		
	Min.	Тур.	Max.	Min.	Тур.	Max.
А	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
В	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
В3			0.95			0.037
B5		0.3			0.012	
B6			0.95			0.037
С	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
Е	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
Н	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



Dim.	mm.			inch.		
	Min.	Тур.	Max.	Min.	Тур.	Max.
А			330			12.992
С	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
Т			22.4			0.882
Ao	6.80	6.90	7.00	0.268	0.272	0.2.76
Во	10.40	10.50	10.60	0.409	0.413	0.417
Ko	2.55	2.65	2.75	0.100	0.104	0.105
Po	3.9	4.0	4.1	0.153	0.157	0.161
Р	7.9	8.0	8.1	0.311	0.315	0.319



L78MxxC Revision history

8 Revision history

Table 14. Document revision history

Date	Revision	Changes
21-Jun-2004	6	Document updating.
30-Aug-2006	7	Order codes updated.
29-Nov-2006	8	DPAK mechanical data updated and add footprint data.
06-Jun-2007	9	Order codes updated.
10-Dec-2007	10	Added Table 1.
19-Feb-2008	11	Modified: Table 1 on page 1.
15-Jul-2008	12	Modified: Table 1 on page 1 and Table 14 on page 29.
07-Apr-2009	13	Modified: Figure 9 on page 11 and Figure 15 on page 12.
14-Jun-2010	14	Added: Table 11 on page 17, Figure 29 on page 18, Figure 30 on page 19, Figure 31 and Figure 32 on page 20.
11-Nov-2010	15	Modified: R _{thJC} value for TO-220 <i>Table 3 on page 5</i> .
08-Feb-2012	16	Added: order codes L78M05CV-DG, L78M12CV-DG and L78M15CV-DG Table 1 on page 1.
09-Mar-2012	17	Added: order codes L78M08CV-DG and L78M09CV-DG Table 1 on page 1.
15-May-2012	18	Added: order codes L78M24CV-DG Table 1 on page 1.

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