

Positive voltage regulators

Features

- Output current to 0.5 A
- Output voltages of 5; 6; 8; 9; 12; 15; 18; 24 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection

Description

The L78Mxx 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 shut-down 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.

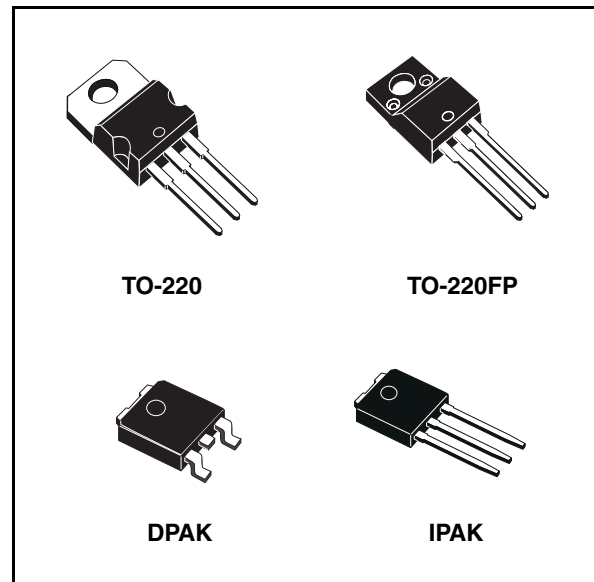


Table 1. Device summary

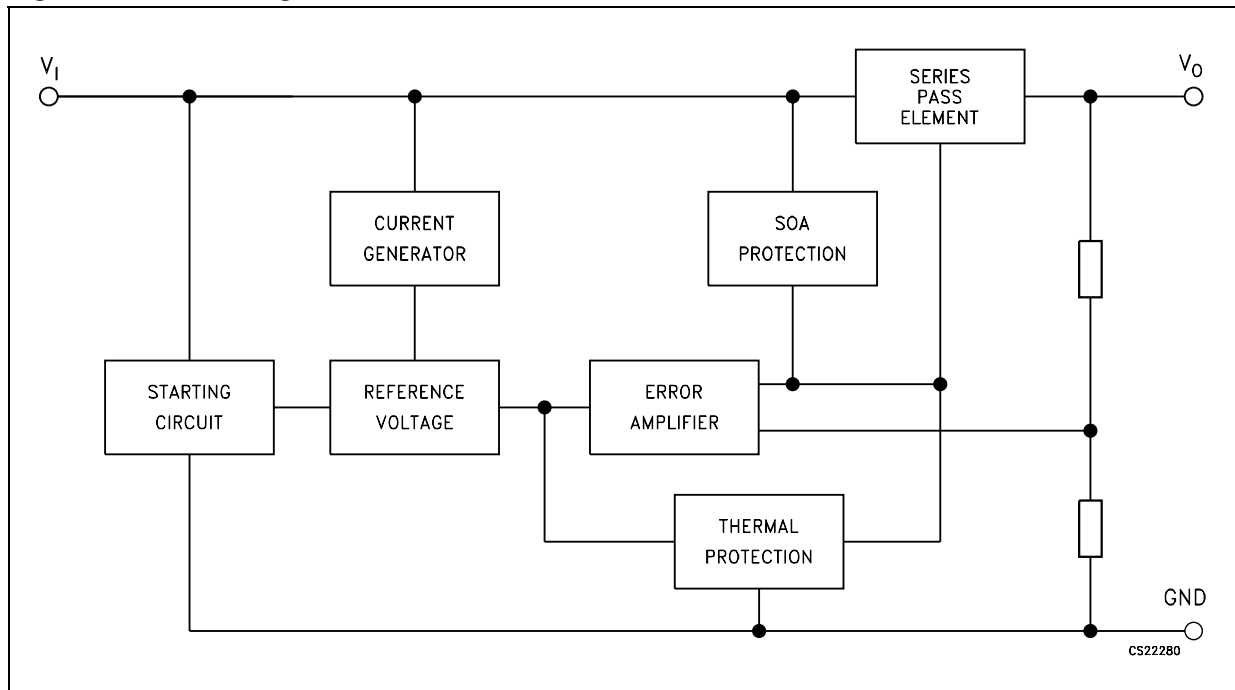
Part numbers	
L78M05C	L78M12C
L78M06C	L78M15C
L78M08C	L78M18C
L78M09C	L78M24C

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1 Diagram

Figure 1. Block diagram



2 Pin configuration

Figure 2. Pin connections (top view)

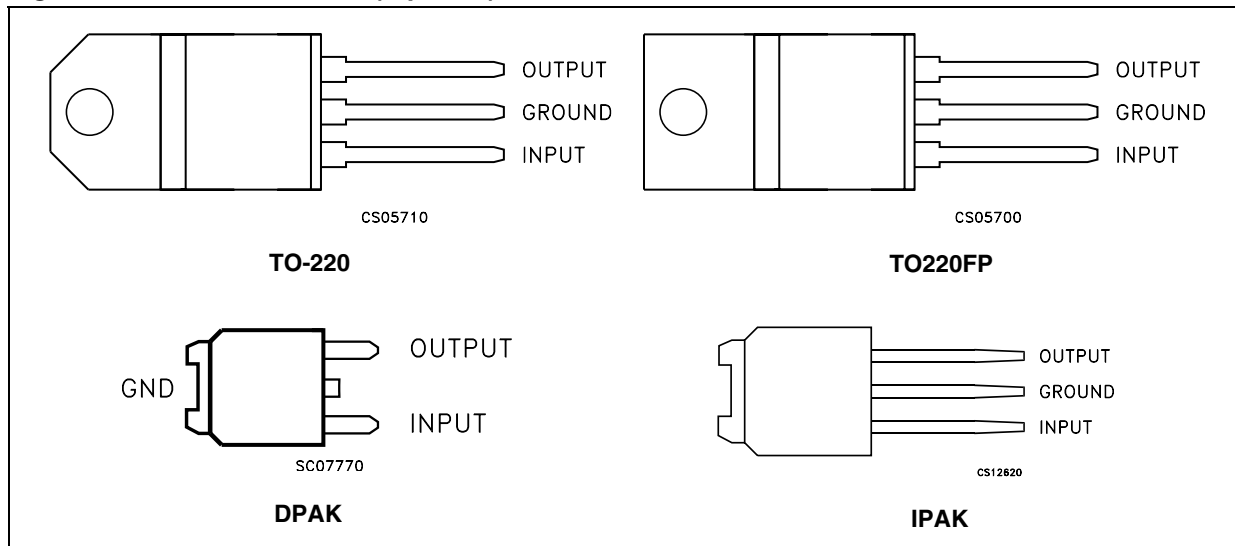
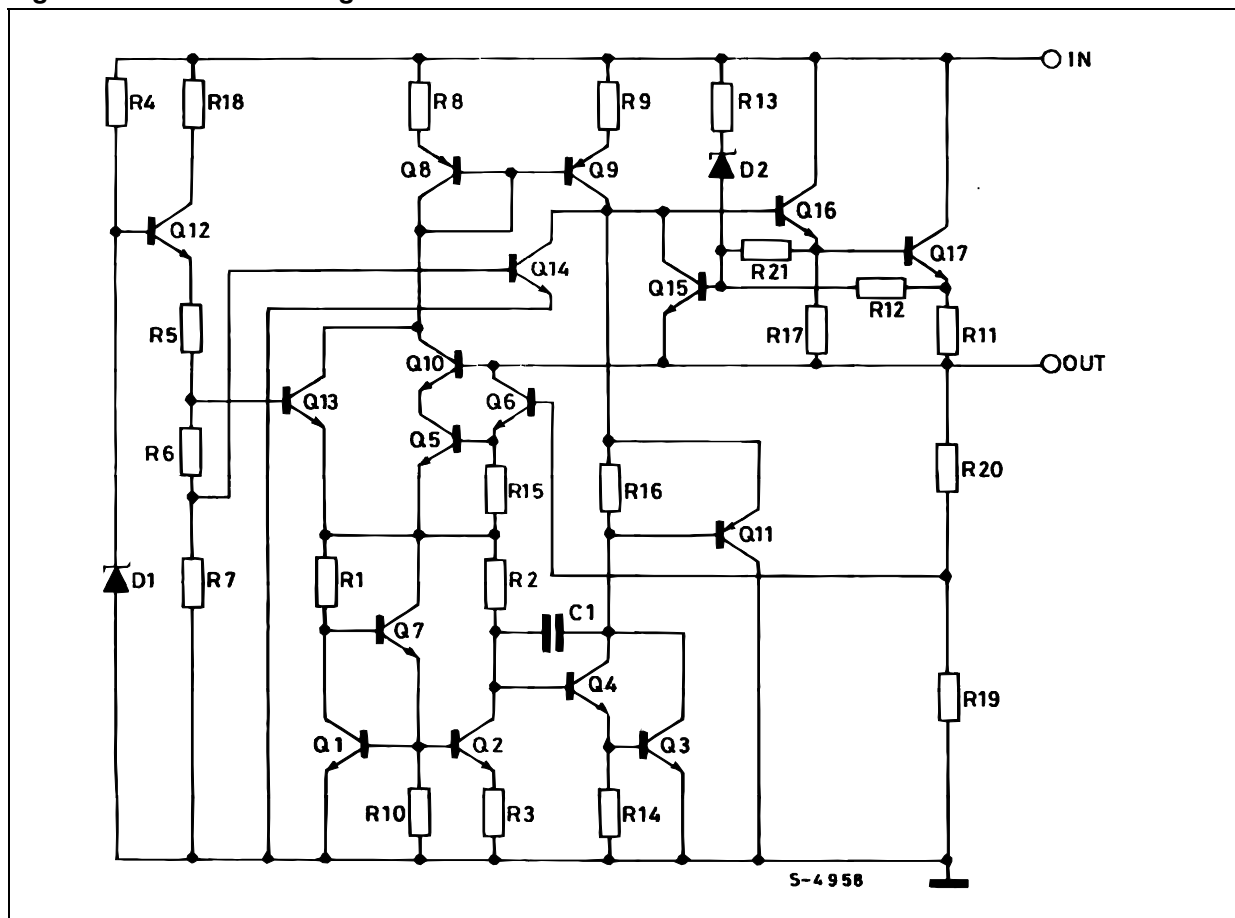


Figure 3. Schematic diagram



3 Maximum ratings

Table 2. Absolute maximum ratings

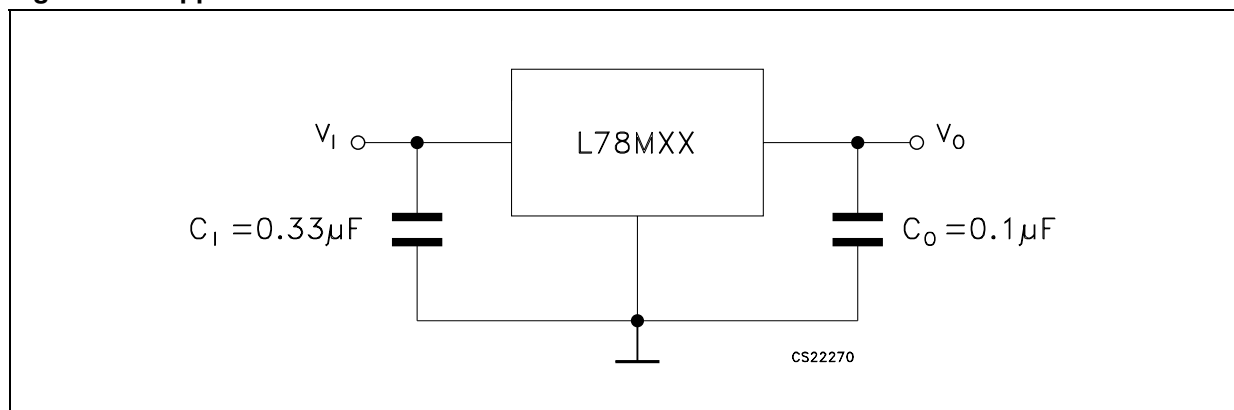
Symbol	Parameter		Value	Unit
V_I	DC input voltage	for $V_O = 5$ to $18V$	35	V
		for $V_O = 20, 24V$	40	
I_O	Output current		Internally limited	mA
P_D	Power dissipation		Internally limited	mW
T_{STG}	Storage temperature range		-65 to 150	°C
T_{OP}	Operating junction temperature range		0 to 150	°C

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	3	5	8		°C/W
R_{thJA}	Thermal resistance junction-ambient	50	60	100		°C/W

Figure 4. Application circuits



4 Test circuits

Figure 5. DC parameter

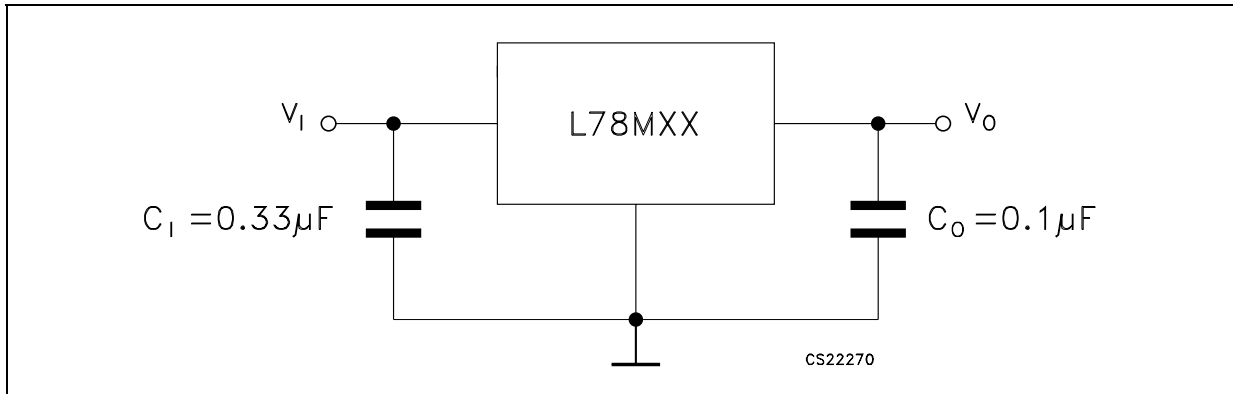


Figure 6. Load regulation

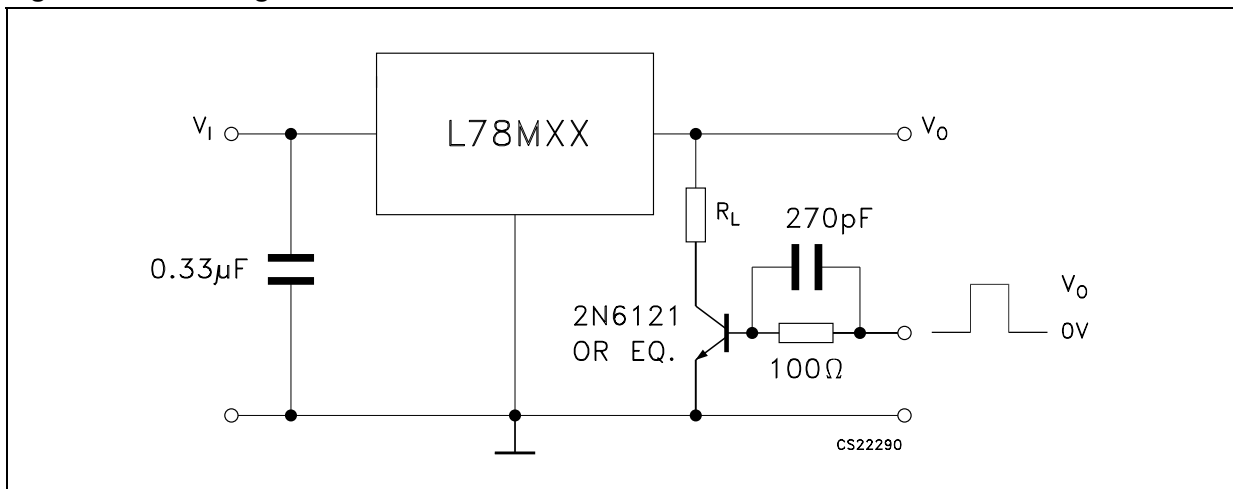
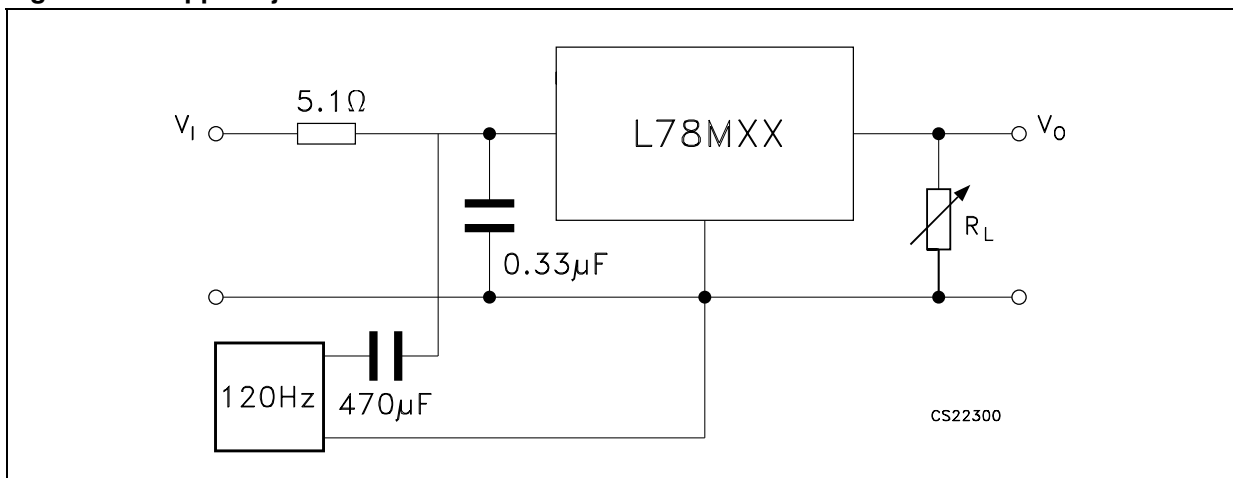


Figure 7. Ripple rejection



5 Electrical characteristics

Table 4. Electrical characteristics of L78M05C (refer to the test circuits, $T_J = 25\text{ }^\circ\text{C}$, $V_I = 10\text{ V}$, $I_O = 350\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		4.8	5	5.2	V
V_O	Output voltage	$I_O = 5\text{ to }350\text{ mA}$, $V_I = 7\text{ to }20\text{ V}$	4.75	5	5.25	V
ΔV_O	Line regulation	$V_I = 7\text{ to }25\text{ V}$, $I_O = 200\text{ mA}$			100	mV
		$V_I = 8\text{ to }25\text{ V}$, $I_O = 200\text{ mA}$			50	
ΔV_O	Load regulation	$I_O = 5\text{ to }500\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			100	mV
		$I_O = 5\text{ to }200\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			50	
I_d	Quiescent current				6	mA
ΔI_d	Quiescent current change	$I_O = 5\text{ to }350\text{ mA}$			0.5	mA
		$I_O = 200\text{ mA}$, $V_I = 8\text{ to }25\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$, $T_J = 0\text{ to }125\text{ }^\circ\text{C}$		-0.5		mV/°C
SVR	Supply voltage rejection	$V_I = 8\text{ to }18\text{ V}$, $f = 120\text{ Hz}$, $I_O = 300\text{ mA}$	62			dB
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		40		μV
V_d	Dropout voltage			2		V
I_{sc}	Short circuit current	$V_I = 35\text{ V}$		300		mA

Table 5. Electrical characteristics of L78M06C (refer to the test circuits, $T_J = 25\text{ }^\circ\text{C}$, $V_I = 11\text{ V}$, $I_O = 350\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		5.75	6	6.25	V
V_O	Output voltage	$I_O = 5\text{ to }350\text{ mA}$, $V_I = 8\text{ to }21\text{ V}$	5.7	6	6.3	V
ΔV_O	Line regulation	$V_I = 8\text{ to }25\text{ V}$, $I_O = 200\text{ mA}$			100	mV
		$V_I = 9\text{ to }25\text{ V}$, $I_O = 200\text{ mA}$			50	
ΔV_O	Load regulation	$I_O = 5\text{ to }500\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			120	mV
		$I_O = 5\text{ to }200\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			60	
I_d	Quiescent current				6	mA
ΔI_d	Quiescent current change	$I_O = 5\text{ to }350\text{ mA}$			0.5	mA
		$I_O = 200\text{ mA}$, $V_I = 9\text{ to }25\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$, $T_J = 0\text{ to }125\text{ }^\circ\text{C}$		-0.5		mV/°C
SVR	Supply voltage rejection	$V_I = 9\text{ to }19\text{ V}$, $f = 120\text{ Hz}$, $I_O = 300\text{ mA}$	59			dB
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		45		μV
V_d	Dropout voltage			2		V
I_{sc}	Short circuit current	$V_I = 35\text{ V}$		270		mA

Table 6. Electrical characteristics of L78M08C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 14\text{ V}$, $I_O = 350\text{ mA}$, $C_I = 0.33\ \mu\text{F}$, $C_O = 0.1\ \mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	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	$V_I = 10.5\text{ to }25\text{ V}$, $I_O = 200\text{ mA}$			100	mV
		$V_I = 11\text{ to }25\text{ V}$, $I_O = 200\text{ mA}$			50	
ΔV_O	Load regulation	$I_O = 5\text{ to }500\text{ mA}$, $T_J = 25^\circ\text{C}$			160	mV
		$I_O = 5\text{ to }200\text{ mA}$, $T_J = 25^\circ\text{C}$			80	
I_d	Quiescent current				6	mA
ΔI_d	Quiescent current change	$I_O = 5\text{ to }350\text{ mA}$			0.5	mA
		$I_O = 200\text{ mA}$, $V_I = 10.5\text{ to }25\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$, $T_J = 0\text{ to }125^\circ\text{C}$		-0.5		mV/ $^\circ\text{C}$
SVR	Supply voltage rejection	$V_I = 11.5\text{ to }21.5\text{ V}$, $f = 120\text{ Hz}$, $I_O = 300\text{ mA}$	56			dB
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		52		μV
V_d	Dropout voltage			2		V
I_{sc}	Short circuit current	$V_I = 35\text{ V}$		250		mA

Table 7. Electrical characteristics of L78M09C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 15\text{ V}$, $I_O = 350\text{ mA}$, $C_I = 0.33\ \mu\text{F}$, $C_O = 0.1\ \mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		8.65	9	9.35	V
V_O	Output voltage	$I_O = 5\text{ to }350\text{ mA}$, $V_I = 11.5\text{ to }24\text{ V}$	8.55	9	9.45	V
ΔV_O	Line regulation	$V_I = 11.5\text{ to }25\text{ V}$, $I_O = 200\text{ mA}$			100	mV
		$V_I = 12\text{ to }25\text{ V}$, $I_O = 200\text{ mA}$			50	
ΔV_O	Load regulation	$I_O = 5\text{ to }500\text{ mA}$, $T_J = 25^\circ\text{C}$			180	mV
		$I_O = 5\text{ to }200\text{ mA}$, $T_J = 25^\circ\text{C}$			90	
I_d	Quiescent current				6	mA
ΔI_d	Quiescent current change	$I_O = 5\text{ to }350\text{ mA}$			0.5	mA
		$I_O = 200\text{ mA}$, $V_I = 11.5\text{ to }25\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$, $T_J = 0\text{ to }125^\circ\text{C}$		-0.5		mV/ $^\circ\text{C}$
SVR	Supply voltage rejection	$V_I = 12.5\text{ to }23\text{ V}$, $f = 120\text{ Hz}$, $I_O = 300\text{ mA}$	56			dB
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		58		μV
V_d	Dropout voltage			2		V
I_{sc}	Short circuit current	$V_I = 35\text{ V}$		250		mA

Table 8. Electrical characteristics of L78M12C (refer to the test circuits, $T_J = 25\text{ }^\circ\text{C}$, $V_I = 19\text{ V}$, $I_O = 350\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		11.5	12	12.5	V
V_O	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
ΔV_O	Line regulation	$V_I = 14.5\text{ to }30\text{ V}$, $I_O = 200\text{ mA}$			100	mV
		$V_I = 16\text{ to }30\text{ V}$, $I_O = 200\text{ mA}$			50	
ΔV_O	Load regulation	$I_O = 5\text{ to }500\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			240	mV
		$I_O = 5\text{ to }200\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			120	
I_d	Quiescent current				6	mA
ΔI_d	Quiescent current change	$I_O = 5\text{ to }350\text{ mA}$			0.5	mA
		$I_O = 200\text{ mA}$, $V_I = 14.5\text{ to }30\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$, $T_J = 0\text{ to }125\text{ }^\circ\text{C}$		-1		mV/°C
SVR	Supply voltage rejection	$V_I = 15\text{ to }25\text{ V}$, $f = 120\text{ Hz}$, $I_O = 300\text{ mA}$	55			dB
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		75		μV
V_d	Dropout voltage			2		V
I_{sc}	Short circuit current	$V_I = 35\text{ V}$		240		mA

Table 9. Electrical characteristics of L78M15C (refer to the test circuits, $T_J = 25\text{ }^\circ\text{C}$, $V_I = 23\text{ V}$, $I_O = 350\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		14.4	15	15.6	V
V_O	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
ΔV_O	Line regulation	$V_I = 17.5\text{ to }30\text{ V}$, $I_O = 200\text{ mA}$			100	mV
		$V_I = 20\text{ to }30\text{ V}$, $I_O = 200\text{ mA}$			50	
ΔV_O	Load regulation	$I_O = 5\text{ to }500\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			300	mV
		$I_O = 5\text{ to }200\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			150	
I_d	Quiescent current				6	mA
ΔI_d	Quiescent current change	$I_O = 5\text{ to }350\text{ mA}$			0.5	mA
		$I_O = 200\text{ mA}$, $V_I = 17.5\text{ to }30\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$, $T_J = 0\text{ to }125\text{ }^\circ\text{C}$		-1		mV/°C
SVR	Supply voltage rejection	$V_I = 18.5\text{ to }28.5\text{ V}$, $f = 120\text{ Hz}$, $I_O = 300\text{ mA}$	54			dB
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		90		μV
V_d	Dropout voltage			2		V
I_{sc}	Short circuit current	$V_I = 35\text{ V}$		240		mA

Table 10. Electrical characteristics of L78M18C (refer to the test circuits, $T_J = 25\text{ }^\circ\text{C}$, $V_I = 26\text{ V}$, $I_O = 350\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		17.3	18	18.7	V
V_O	Output voltage	$I_O = 5\text{ to }350\text{ mA}$, $V_I = 20.5\text{ to }33\text{ V}$	17.1	18	18.9	V
ΔV_O	Line regulation	$V_I = 21\text{ to }33\text{ V}$, $I_O = 200\text{ mA}$			100	mV
		$V_I = 24\text{ to }33\text{ V}$, $I_O = 200\text{ mA}$			50	
ΔV_O	Load regulation	$I_O = 5\text{ to }500\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			360	mV
		$I_O = 5\text{ to }200\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			180	
I_d	Quiescent current				6	mA
ΔI_d	Quiescent current change	$I_O = 5\text{ to }350\text{ mA}$			0.5	mA
		$I_O = 200\text{ mA}$, $V_I = 21\text{ to }33\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$, $T_J = 0\text{ to }125\text{ }^\circ\text{C}$		-1.1		mV/ $^\circ\text{C}$
SVR	Supply voltage rejection	$V_I = 22\text{ to }32\text{ V}$, $f = 120\text{ Hz}$, $I_O = 300\text{ mA}$	53			dB
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		100		μV
V_d	Dropout voltage			2		V
I_{sc}	Short circuit current	$V_I = 35\text{ V}$		240		mA

Table 11. Electrical characteristics of L78M24C (refer to the test circuits, $T_J = 25\text{ }^\circ\text{C}$, $V_I = 23\text{ V}$, $I_O = 350\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		23	24	25	V
V_O	Output voltage	$I_O = 5\text{ to }350\text{ mA}$, $V_I = 27\text{ to }38\text{ V}$	22.8	24	25.2	V
ΔV_O	Line regulation	$V_I = 27\text{ to }38\text{ V}$, $I_O = 200\text{ mA}$			100	mV
		$V_I = 28\text{ to }38\text{ V}$, $I_O = 200\text{ mA}$			50	
ΔV_O	Load regulation	$I_O = 5\text{ to }500\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			480	mV
		$I_O = 5\text{ to }200\text{ mA}$, $T_J = 25\text{ }^\circ\text{C}$			240	
I_d	Quiescent current				6	mA
ΔI_d	Quiescent current change	$I_O = 5\text{ to }350\text{ mA}$			0.5	mA
		$I_O = 200\text{ mA}$, $V_I = 27\text{ to }38\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$, $T_J = 0\text{ to }125\text{ }^\circ\text{C}$		-1.2		mV/ $^\circ\text{C}$
SVR	Supply voltage rejection	$V_I = 28\text{ to }38\text{ V}$, $f = 120\text{ Hz}$, $I_O = 300\text{ mA}$	50			dB
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		170		μV
V_d	Dropout voltage			2		V
I_{sc}	Short circuit current	$V_I = 35\text{ V}$		240		mA

6 Typical performance

Figure 8. Dropout voltage vs junction temp.

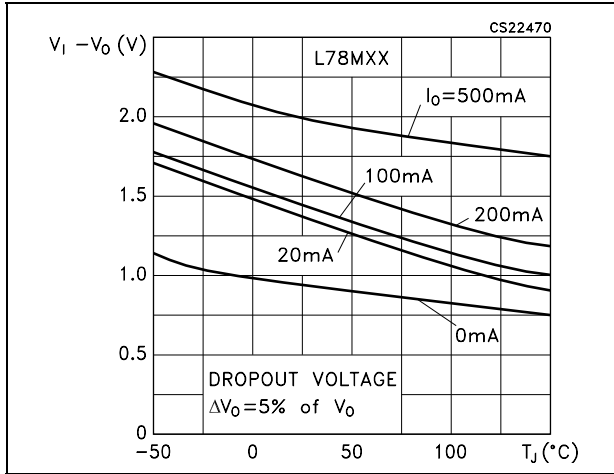


Figure 9. Dropout characteristics

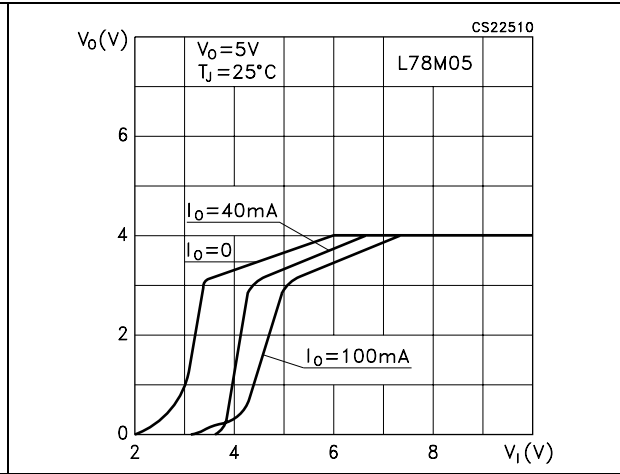


Figure 10. Peak output current vs input-output differential voltage

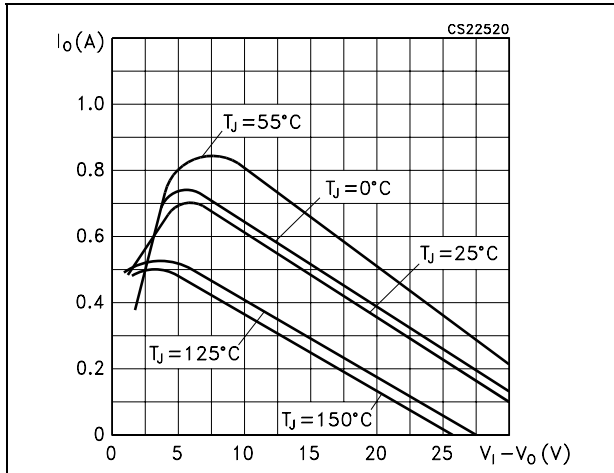


Figure 11. Output voltage vs junction temperature

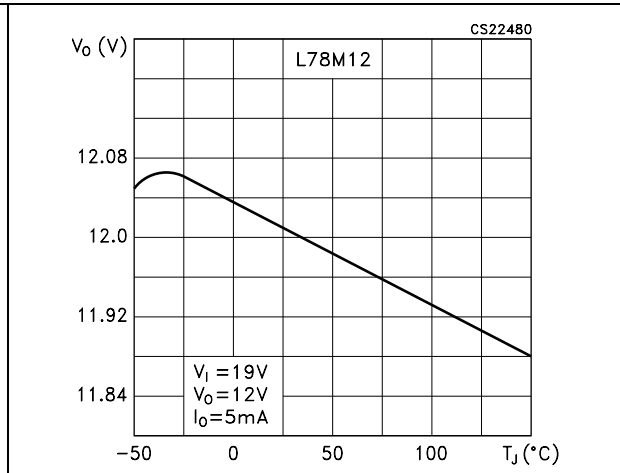


Figure 12. Supply voltage rejection vs freq.

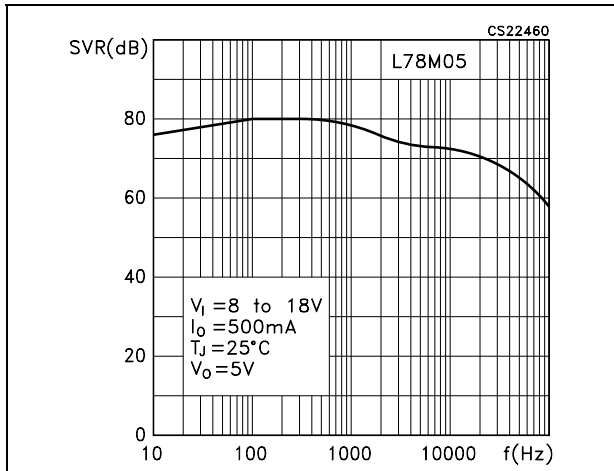


Figure 13. Quiescent current vs junction temp.

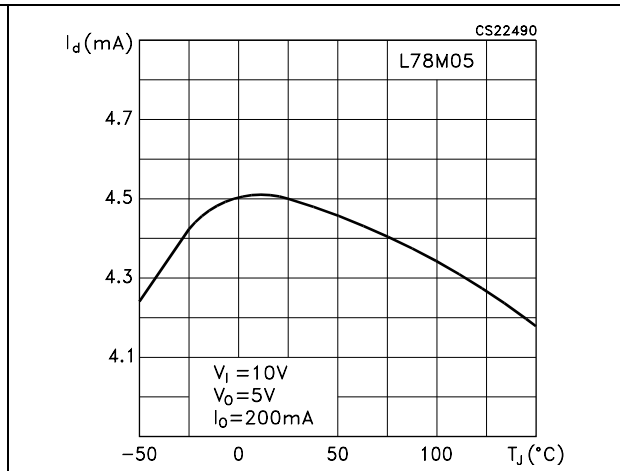


Figure 14. Load transient response

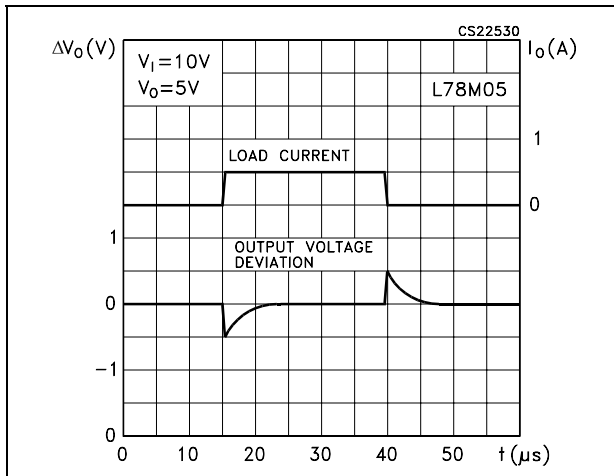


Figure 15. Line transient response

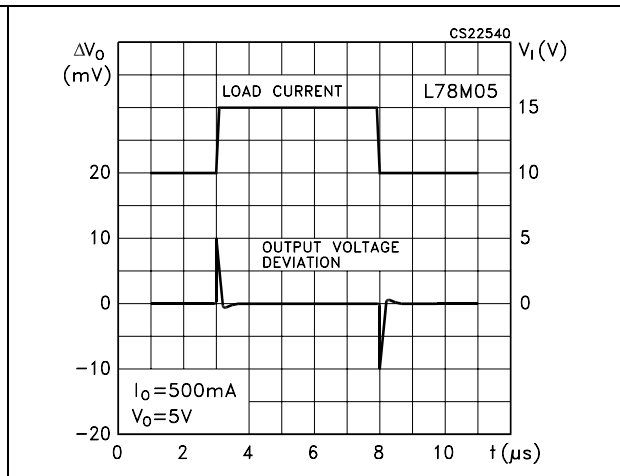


Figure 16. Quiescent current vs input voltage

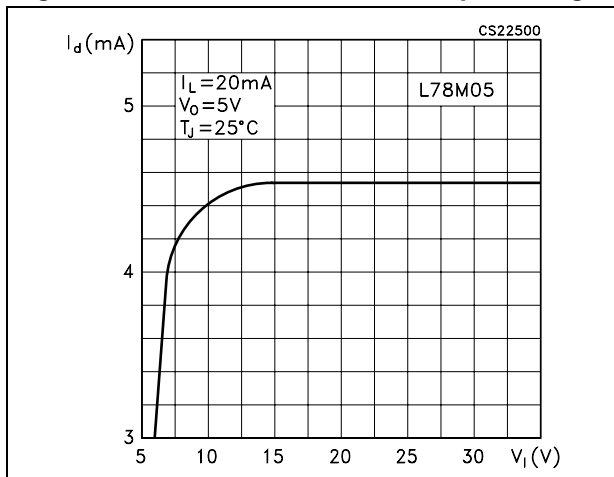
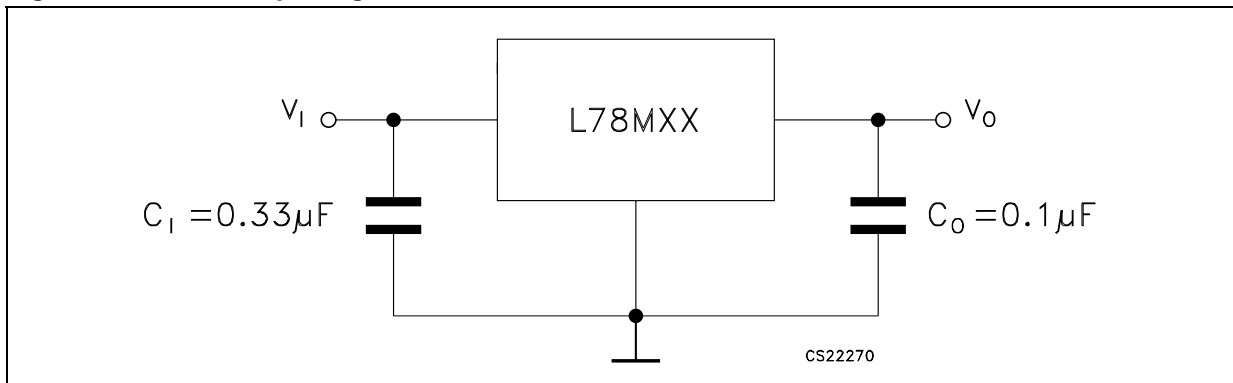


Figure 17. Fixed output regulator



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.

Figure 18. Constant current regulator

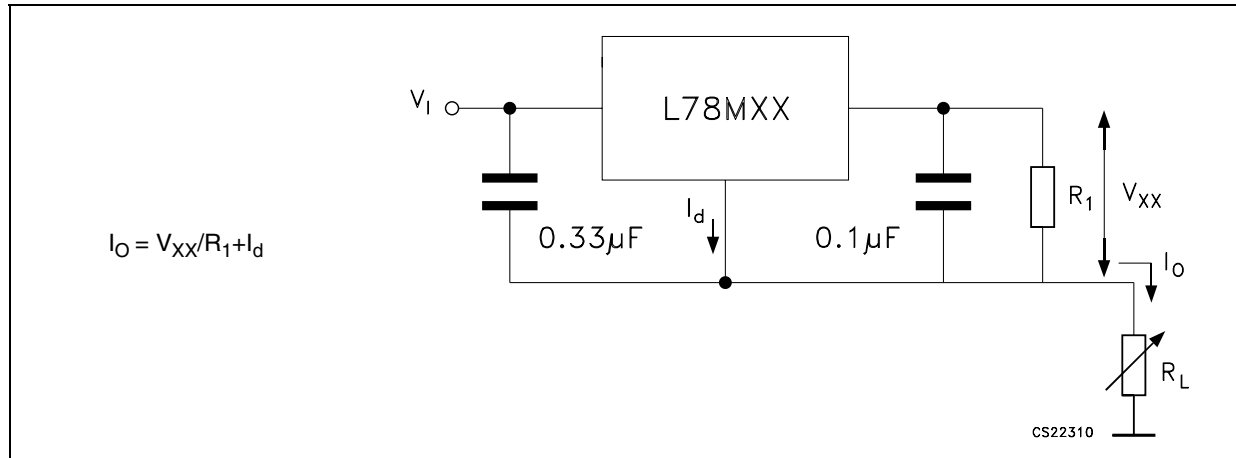


Figure 19. Circuit for increasing output voltage

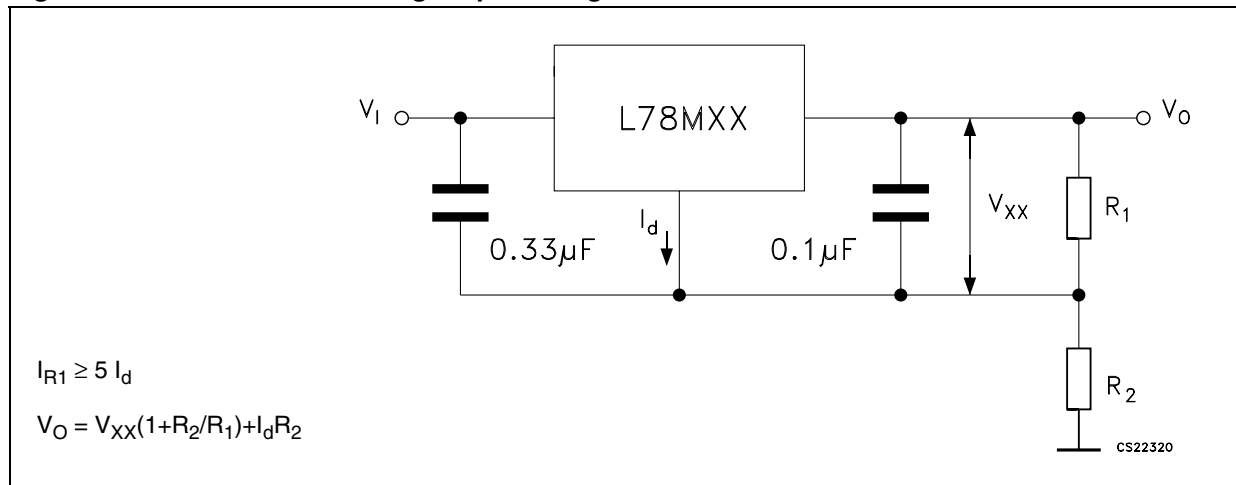


Figure 20. Adjustable output regulator (7 to 30 V)

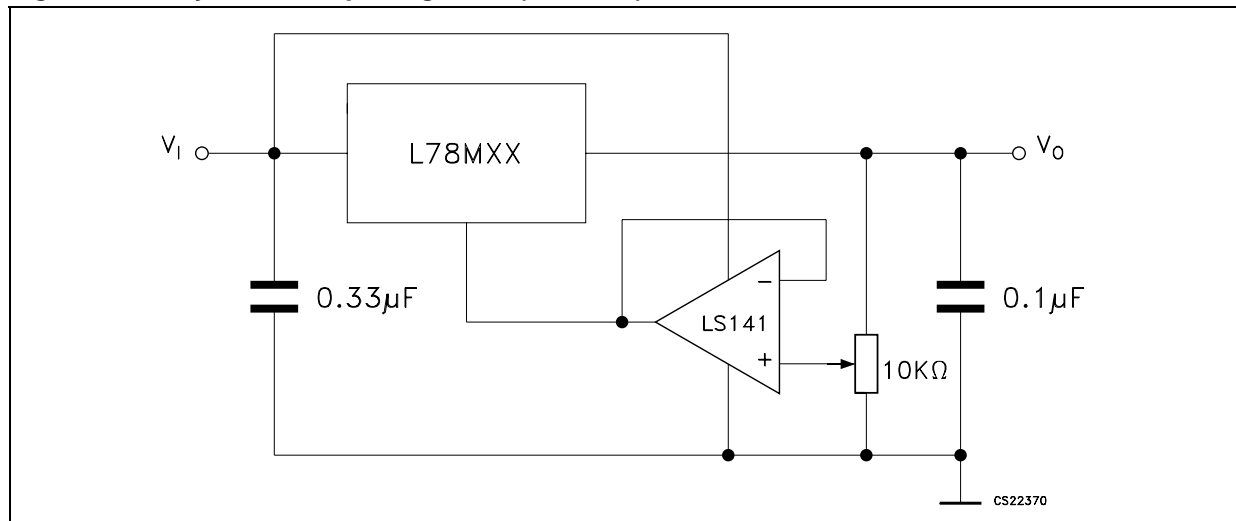


Figure 21. 0.5 to 10 V regulator

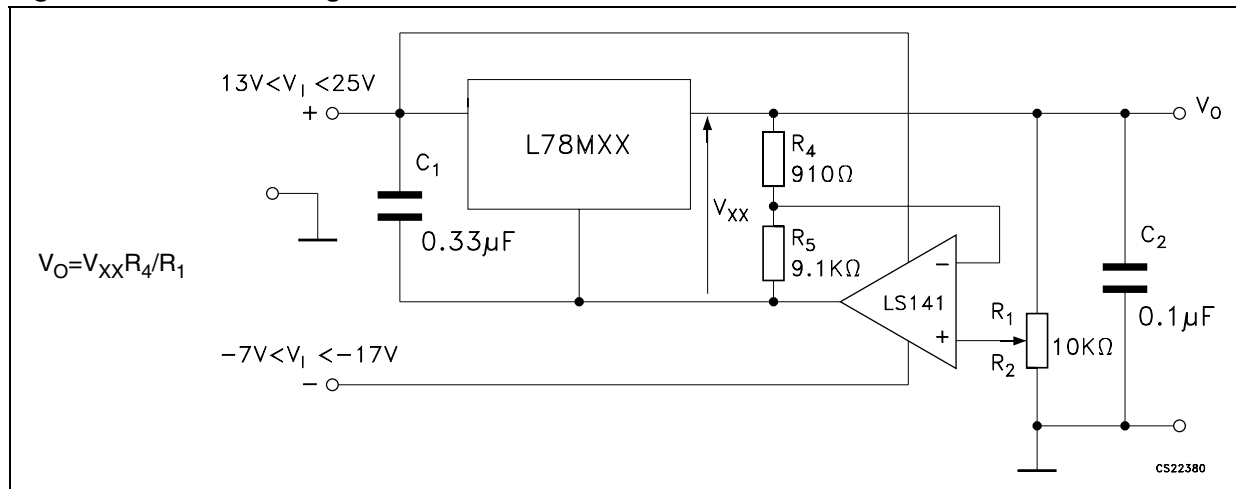


Figure 22. High current voltage regulator

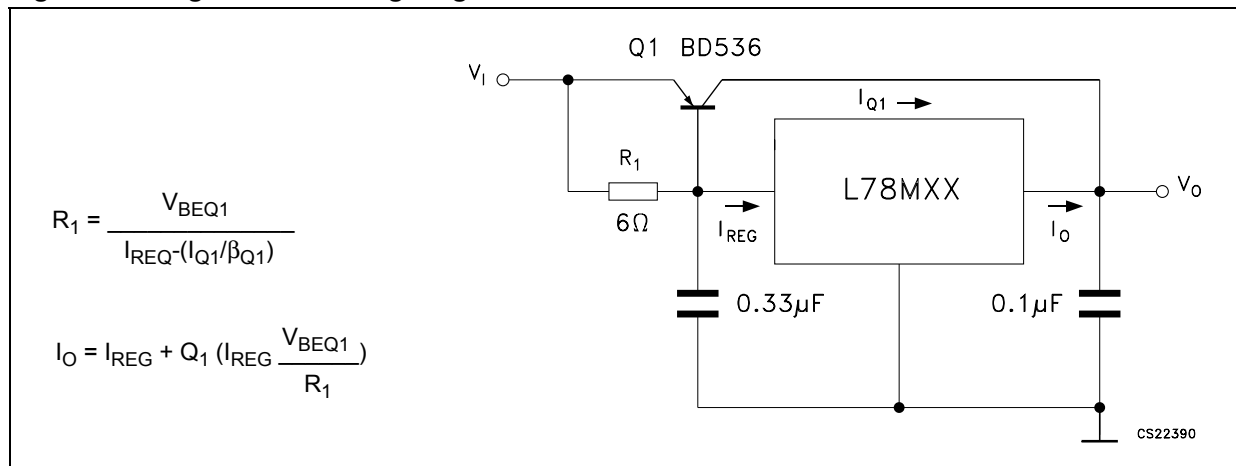


Figure 23. High output current with short circuit protection

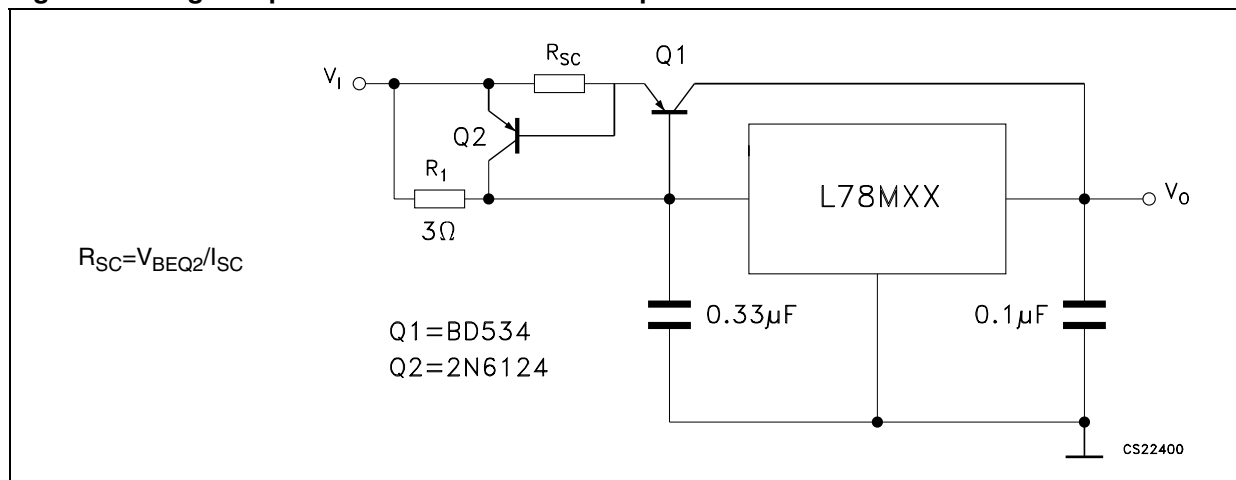


Figure 24. Tracking voltage regulator

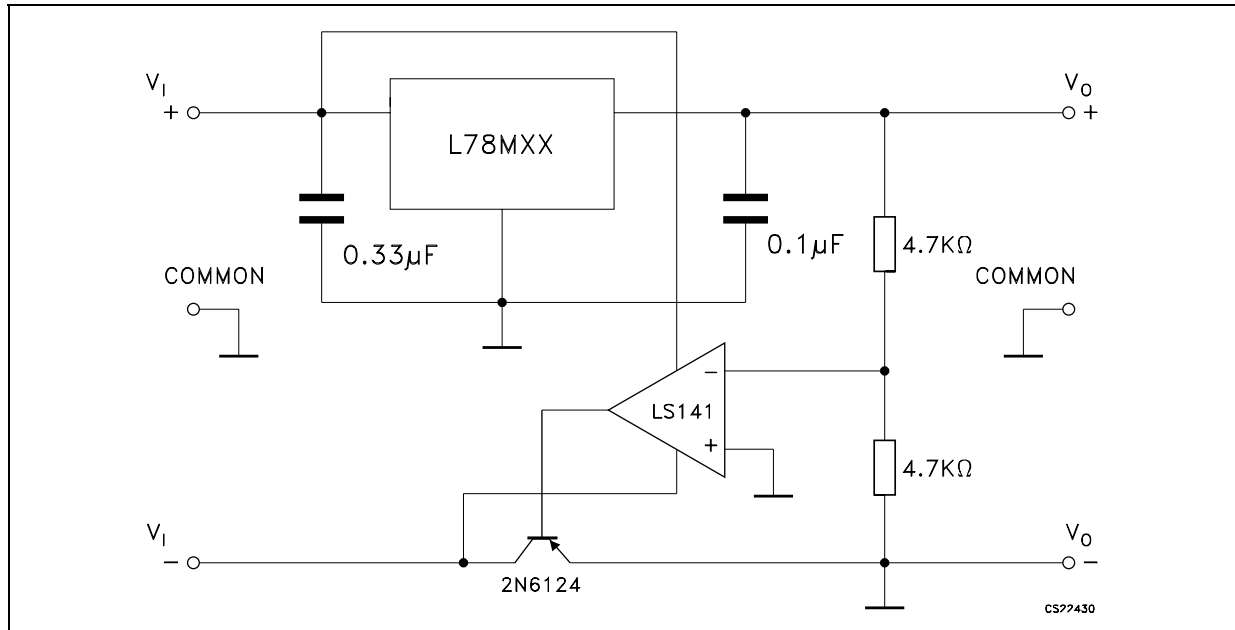


Figure 25. High input voltage circuit

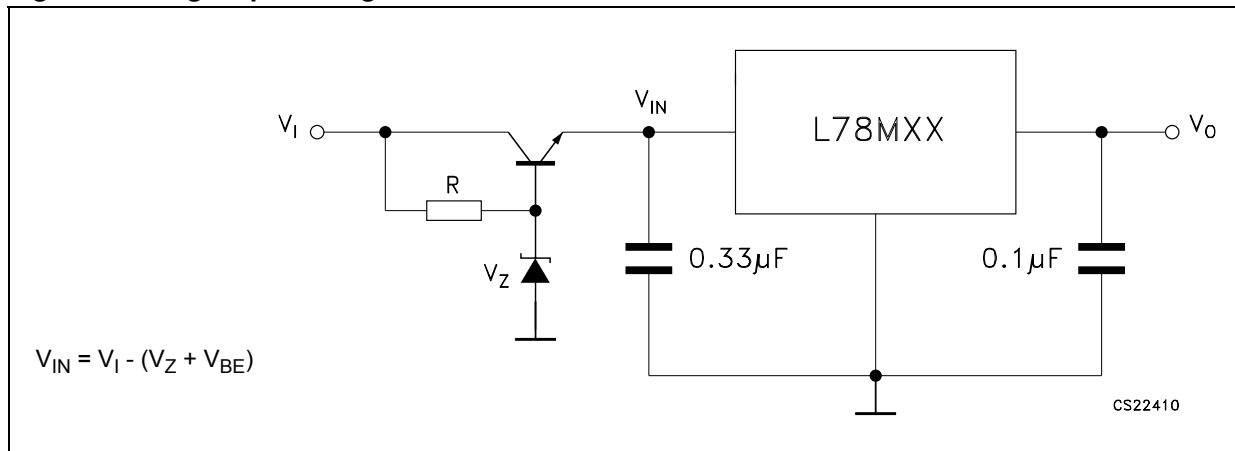


Figure 26. Reducing power dissipation with dropping resistor

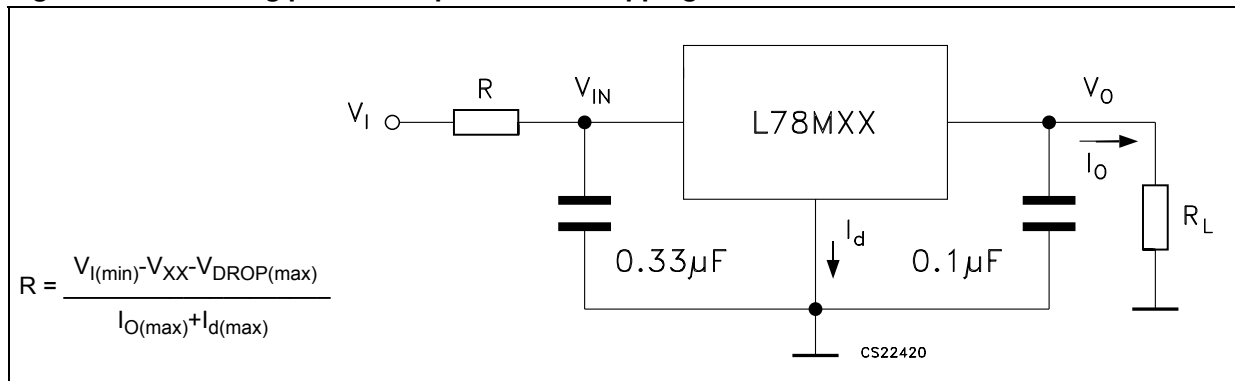
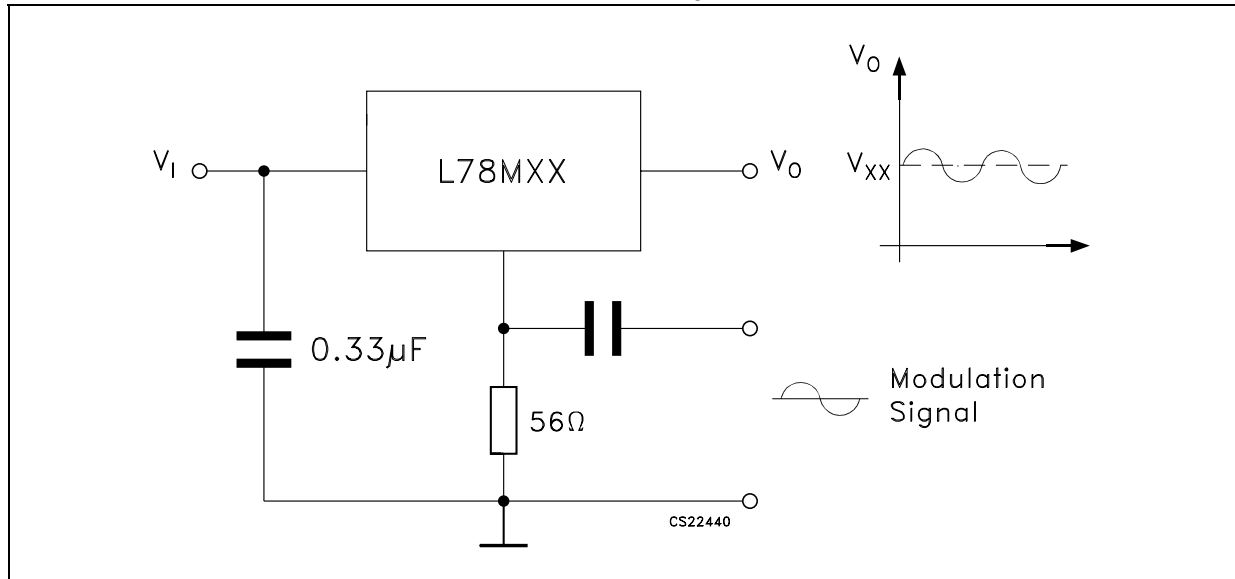
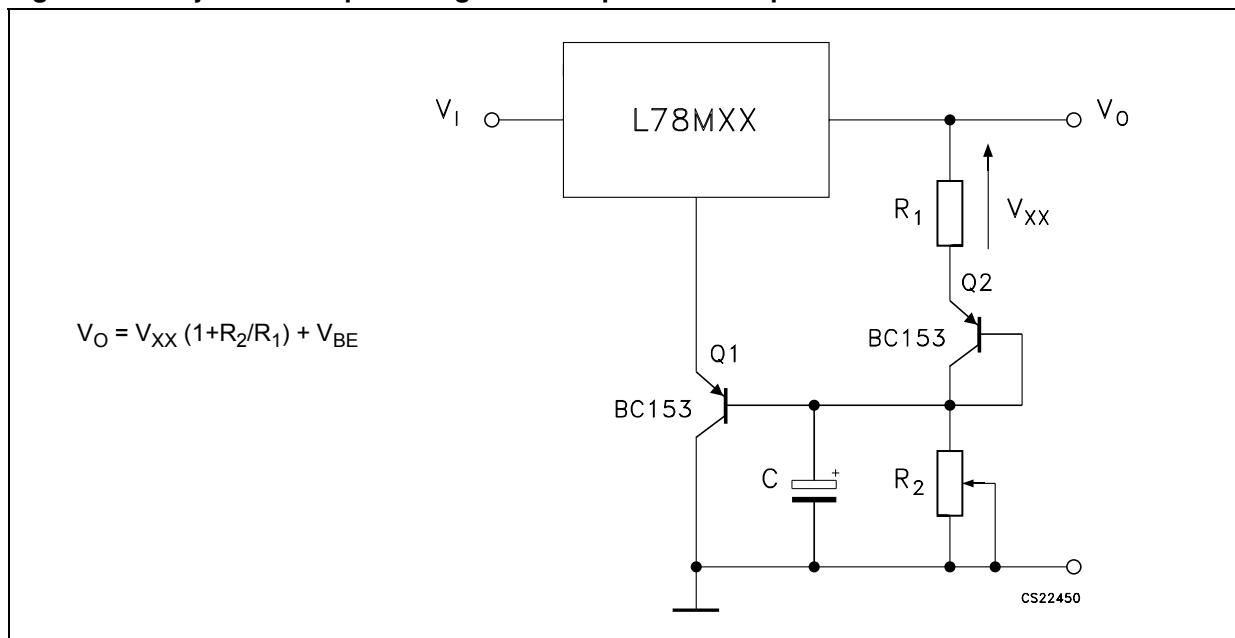


Figure 27. Power AM modulator (unity voltage gain, $I_O \leq 0.5$)



Note: The circuit performs well up to 100 kHz.

Figure 28. Adjustable output voltage with temperature compensation



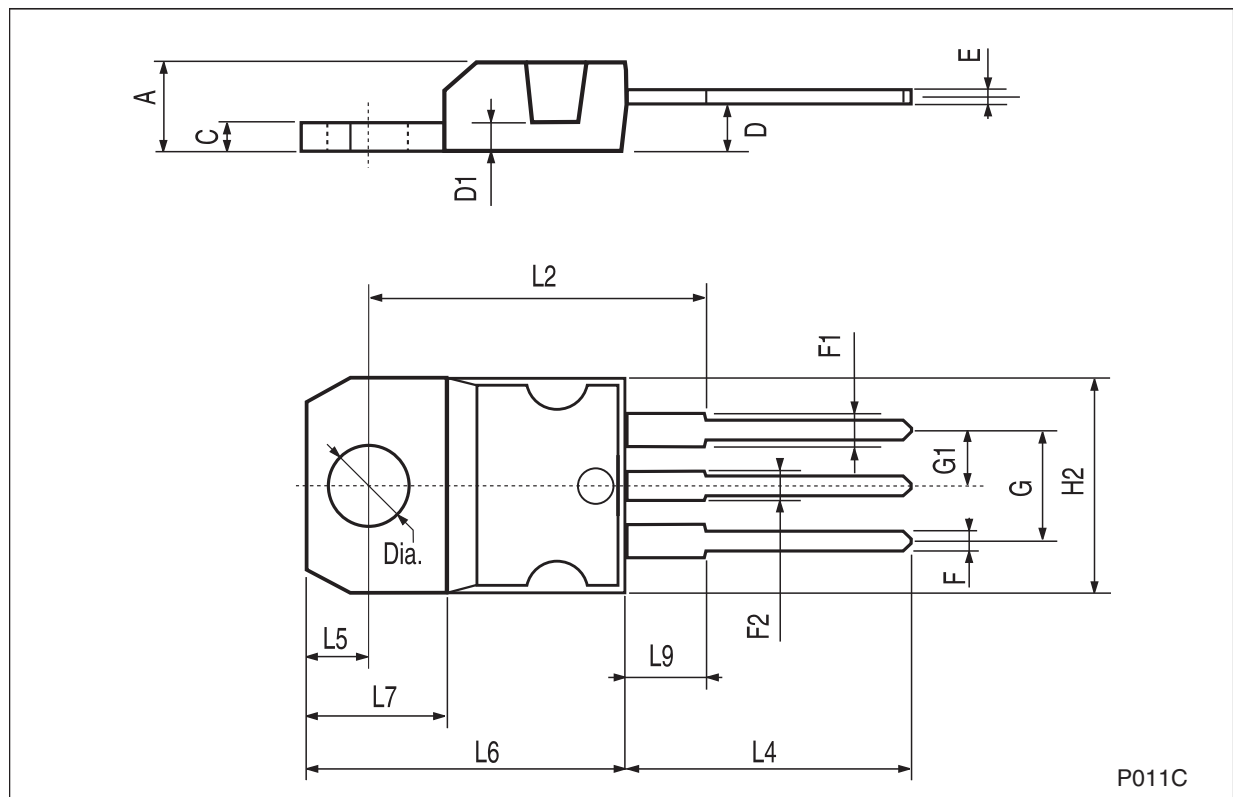
Note: Q_2 is connected as a diode in order to compensate the variation of the $Q_1 V_{BE}$ with the temperature. C allows a slow rise time of the V_O .

7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

TO-220 mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



TO-220FP mechanical data

Dim.	mm.			inch.		
	Min.	Typ	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	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
H	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

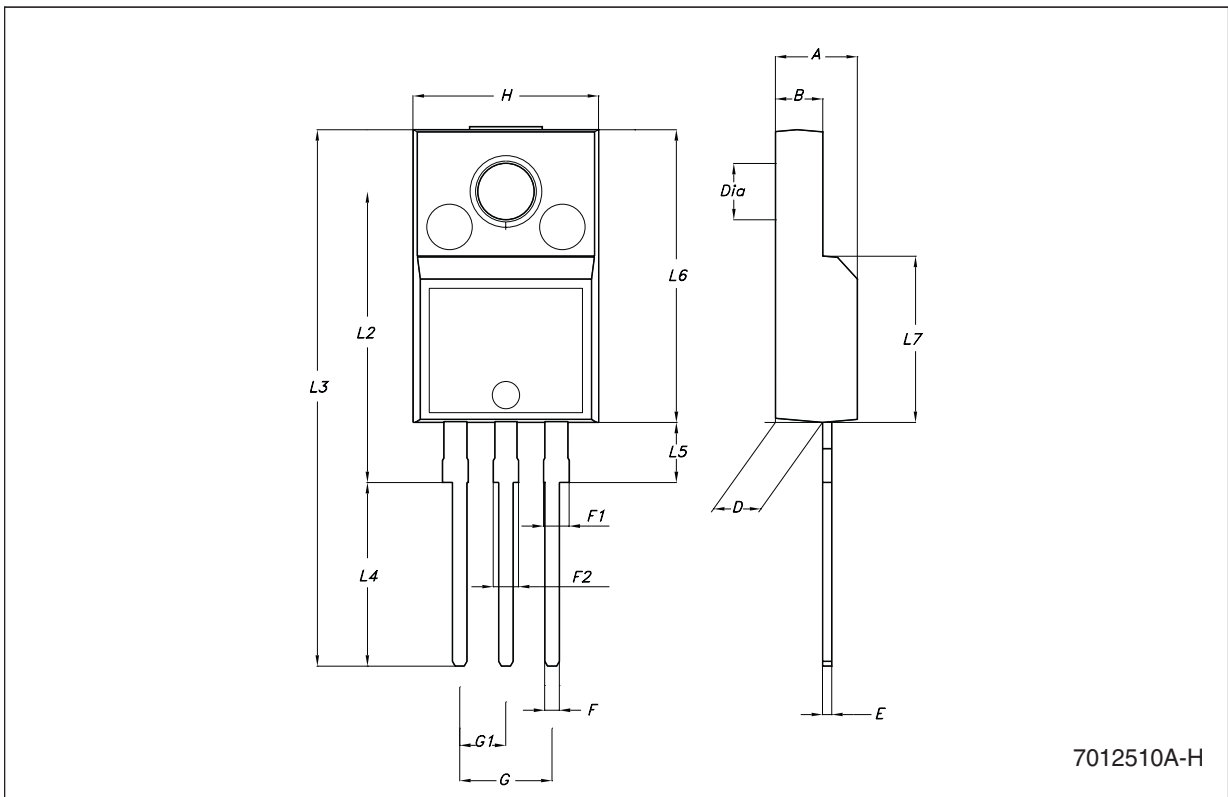


Figure 29. Drawing dimension DPAK (type STD-ST)

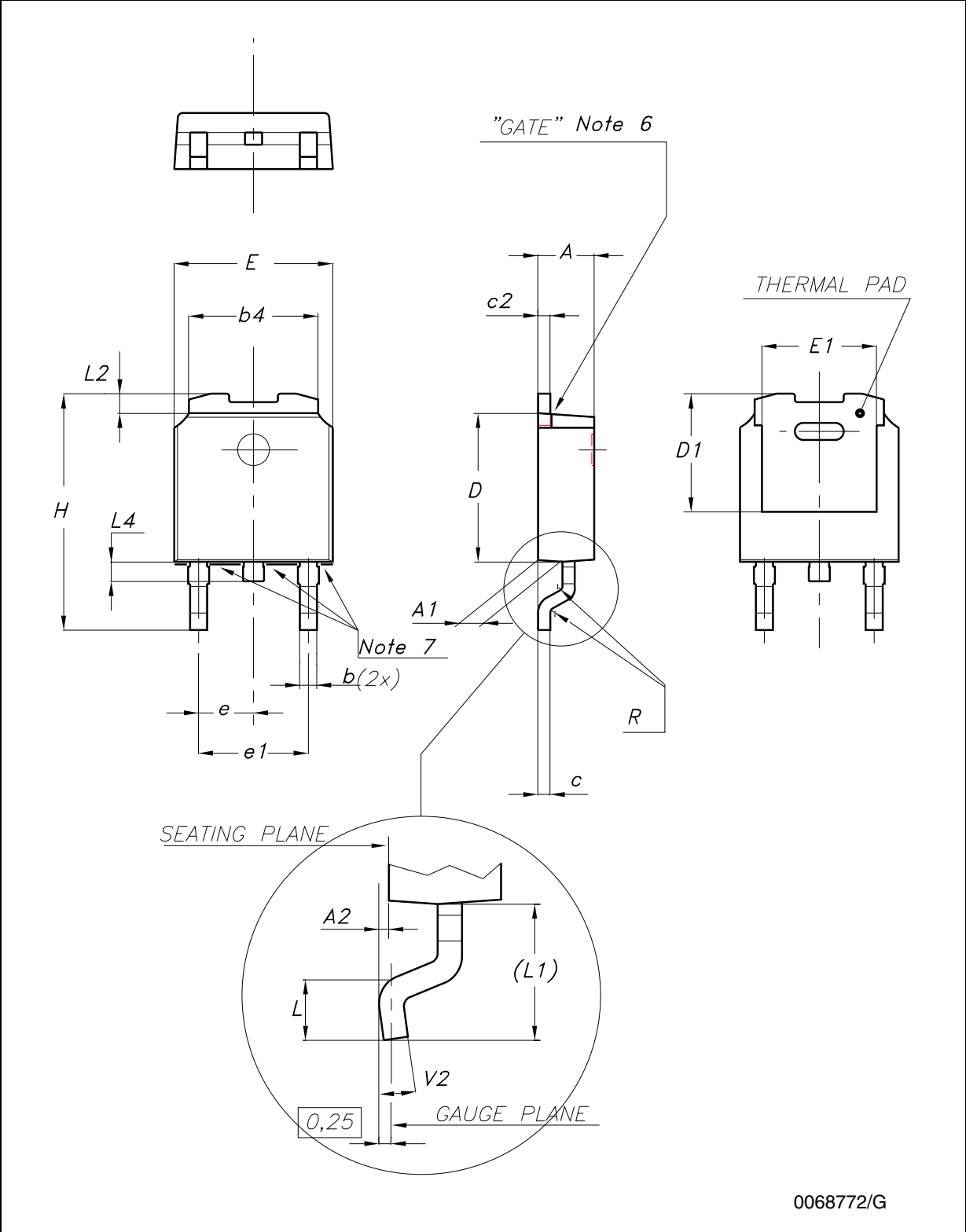
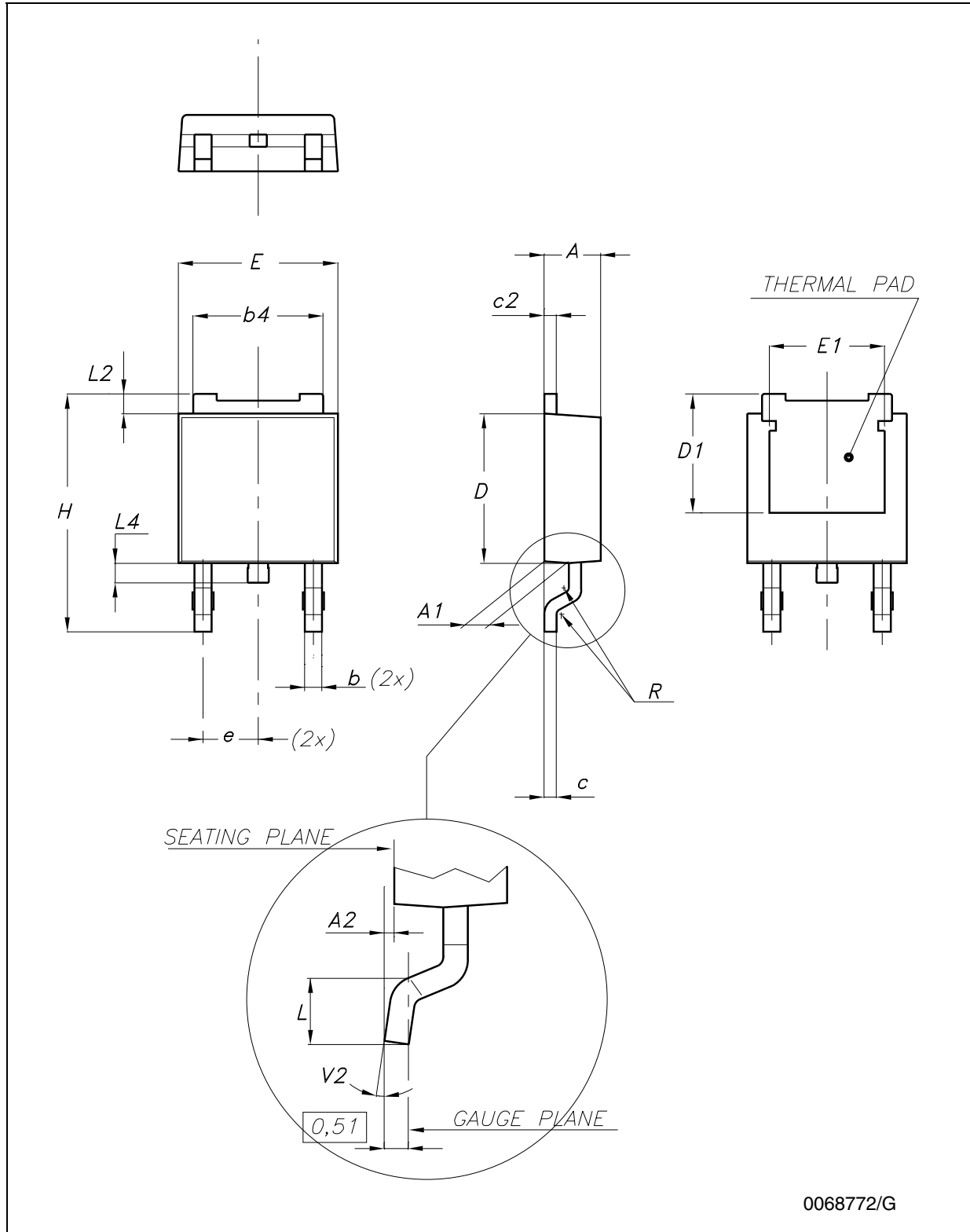
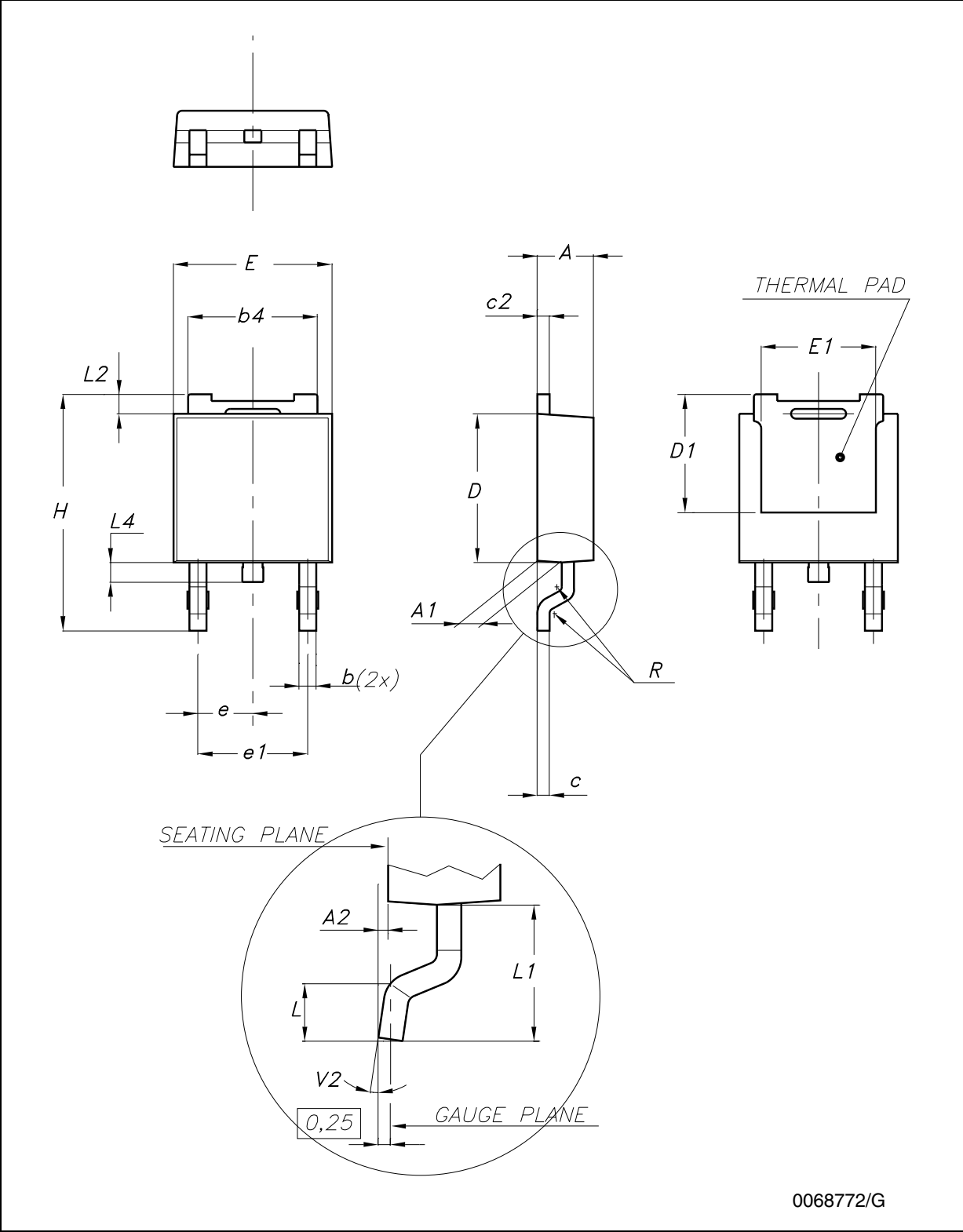


Figure 30. Drawing dimension DPAK (type FUJITSU-subcon.)



0068772/G

Figure 31. Drawing dimension DPAK (type IDS-subcon.)



0068772/G

Table 12. DPAK mechanical data

Dim.	Type STD-ST			Type FUJITSU-SUBCON.			Type IDS-SUBCON		
	mm.			mm.			mm.		
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
A	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
c	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	
E	6.40		6.60	6.55	6.60	6.65	6.35		6.73
E1		4.70			4.77			4.70	
e		2.28		2.23	2.28	2.33		2.28	
e1	4.40		4.60				4.51		4.61
H	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 32. DPAK footprint recommended data

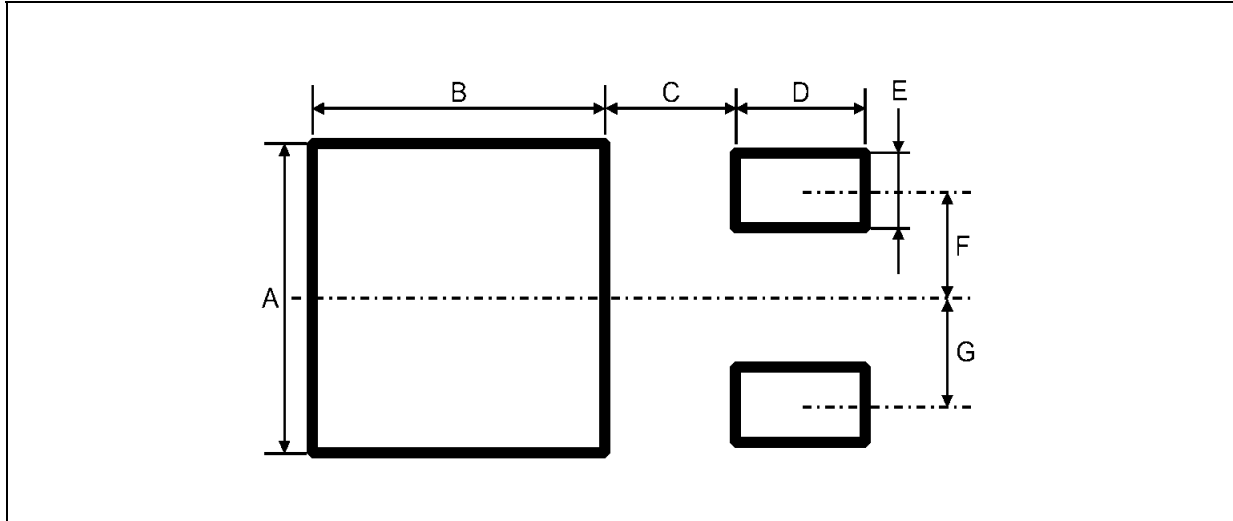
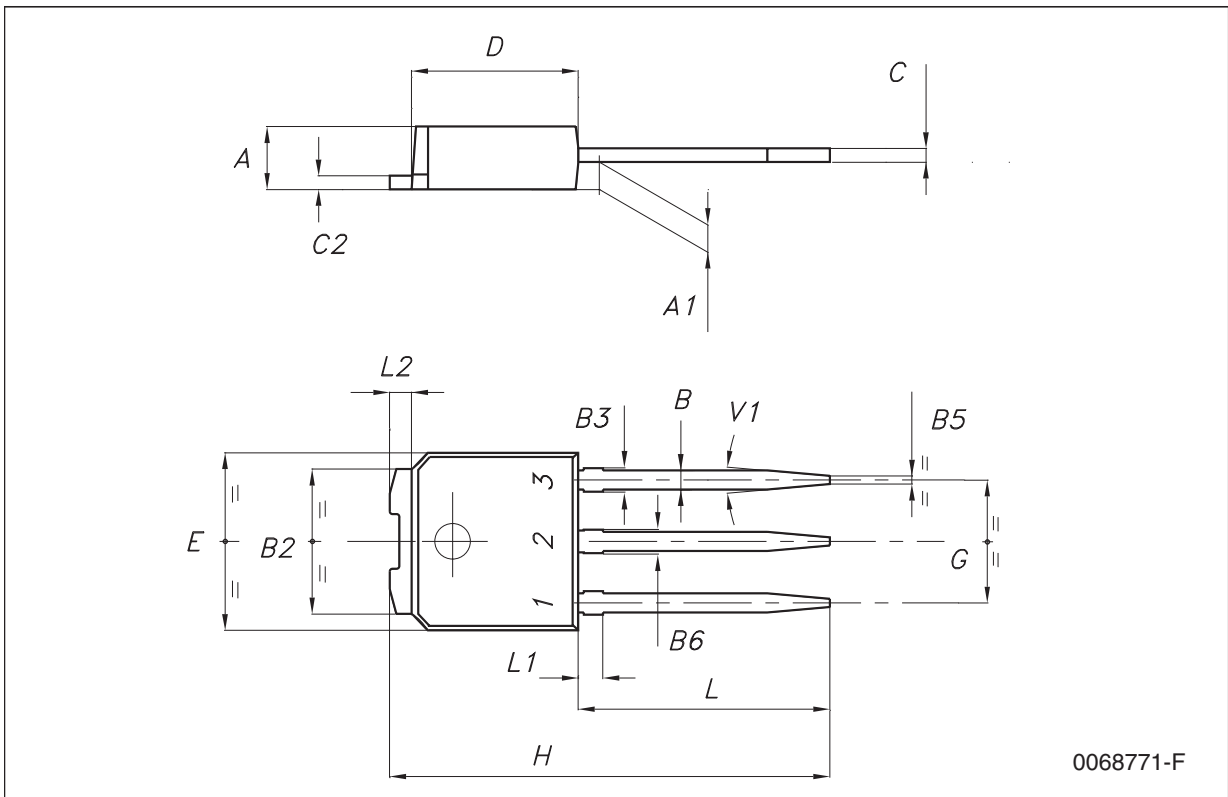


Table 13. Footprint data

Dim.	Values	
	mm.	inch.
A	6.70	0.264
B	6.70	0.64
C	1.8	0.070
D	3.0	0.118
E	1.60	0.063
F	2.30	0.091
G	2.30	0.091

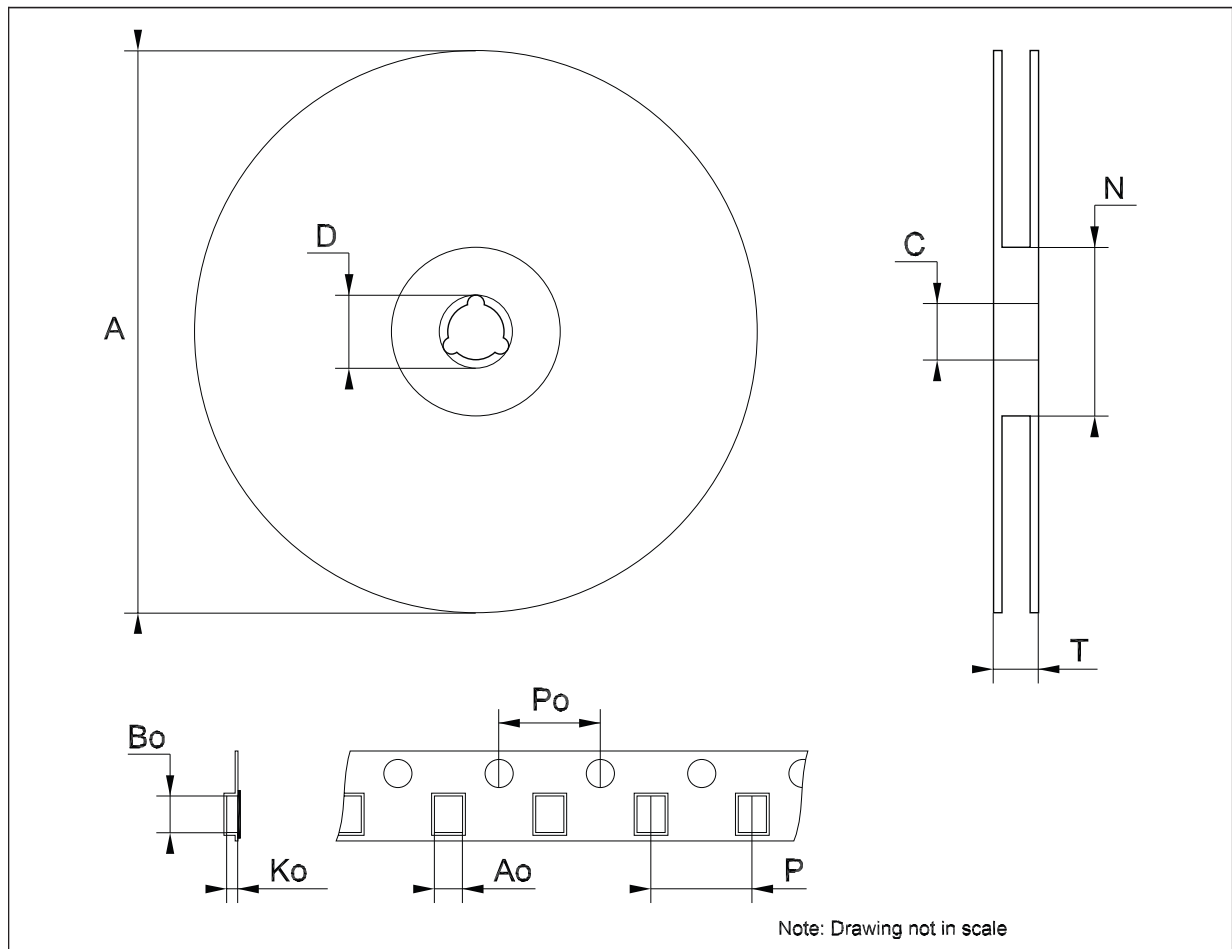
IPAK mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
B3			0.95			0.037
B5		0.3			0.012	
B6			0.95			0.037
C	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
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	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



Tape & reel DPAK-PPAK mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			330			12.992
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.80	6.90	7.00	0.268	0.272	0.276
Bo	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
P	7.9	8.0	8.1	0.311	0.315	0.319



8 Order codes

Table 14. Order codes

Packages				
TO-220	TO-220FP	DKAK	IPAK	Output voltage
L78M05CV	L78M05CP	L78M05CDT-TR	L78M05CDT-1	5 V
		L78M06CDT-TR	L78M06CDT-1 ⁽¹⁾	6 V
L78M08CV		L78M08CDT-TR	L78M08CDT-1 ⁽¹⁾	8 V
L78M09CV	L78M09CP	L78M09CDT-TR	L78M09CDT-1 ⁽¹⁾	9 V
L78M12CV		L78M12CDT-TR		12 V
L78M15CV		L78M15CDT-TR		15 V
		L78M18CDT-TR		18 V
L78M24CV	L78M24CP ⁽¹⁾	L78M24CDT-TR	L78M24CDT-1 ⁽¹⁾	24 V

1. Available on request

9 Revision history

Table 15. Document revision history

Date	Revision	Changes
21-Jun-2004	6	Document updating.
30-Aug-2006	7	Order codes has been updated and new template.
29-Nov-2006	8	DPAK mechanical data has been updated and add footprint data.
06-Jun-2007	9	Order codes has been updated.
10-Dec-2007	10	Added Table 1 .
19-Feb-2008	11	Modified: Table 1 on page 1 .

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