

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, 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.

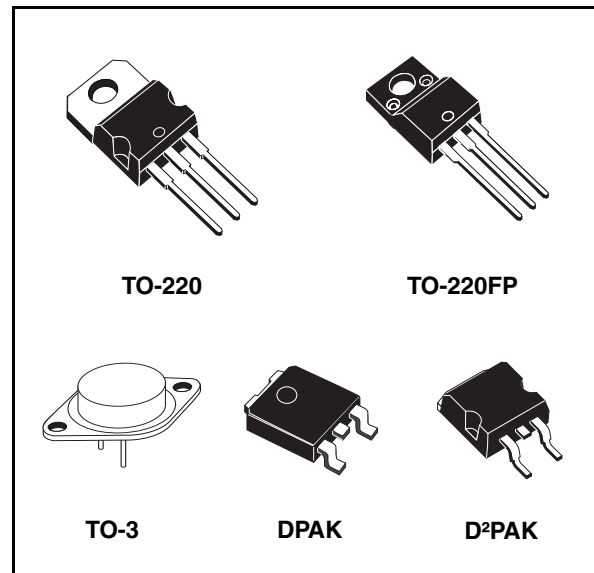


Table 1. Device summary

Part numbers	
L7805	L7809C
L7805C	L7812C
L7806C	L7815C
L7808C	L7818C
L7885C	L7824C

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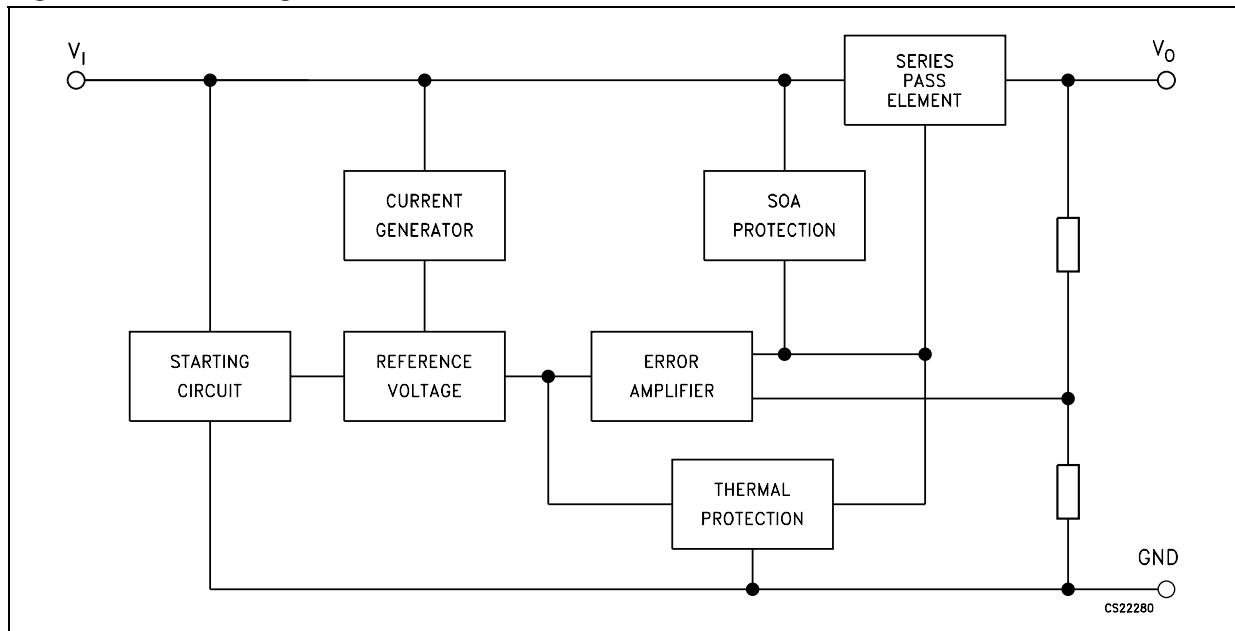
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1 Diagram

Figure 1. Block diagram



2 Pin configuration

Figure 2. Pin connections (top view)

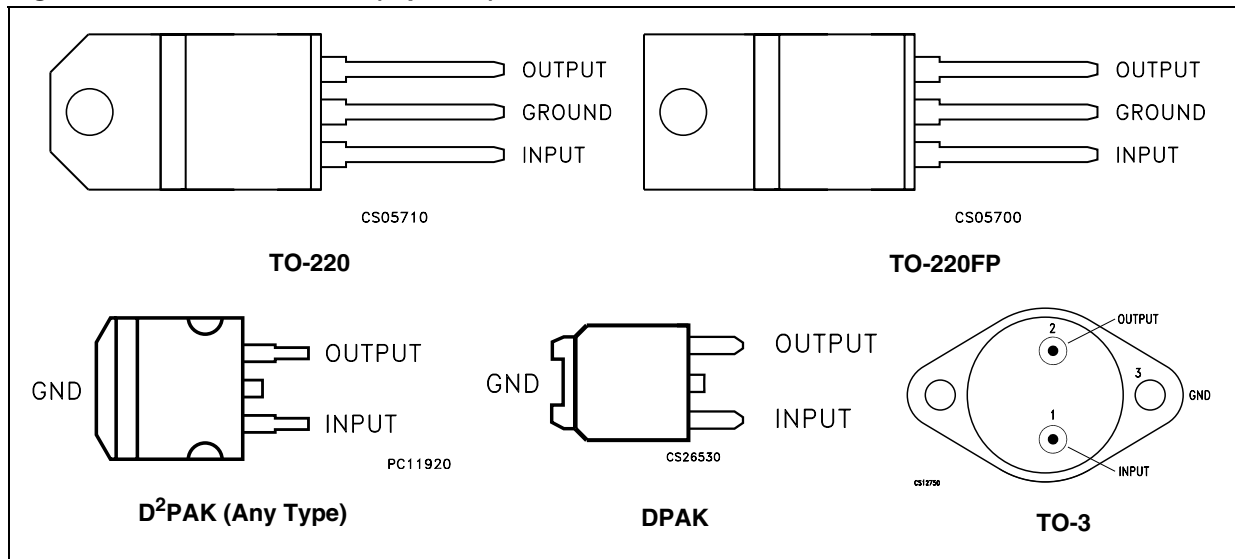
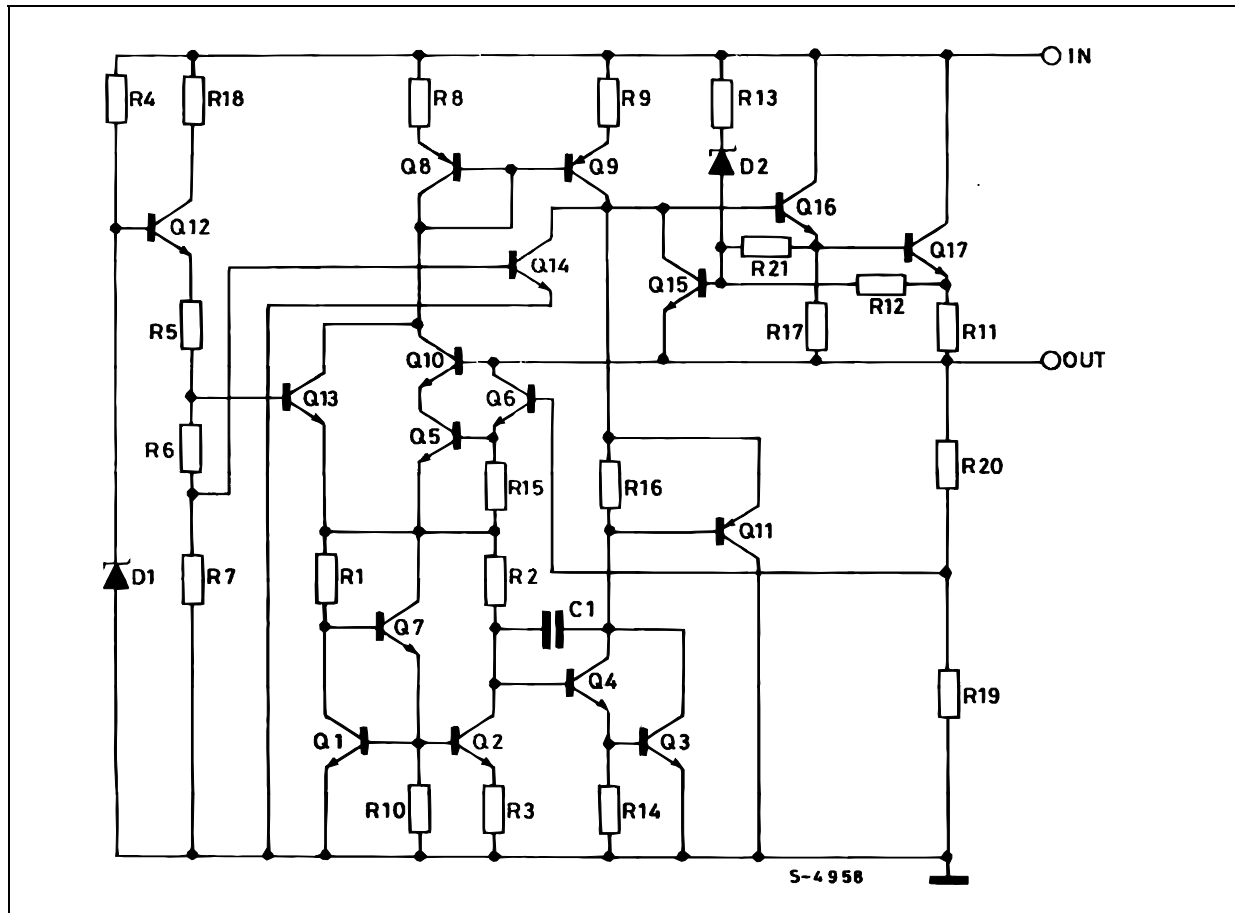


Figure 3. Schematic diagram



3 Maximum ratings

Table 2. Absolute maximum ratings

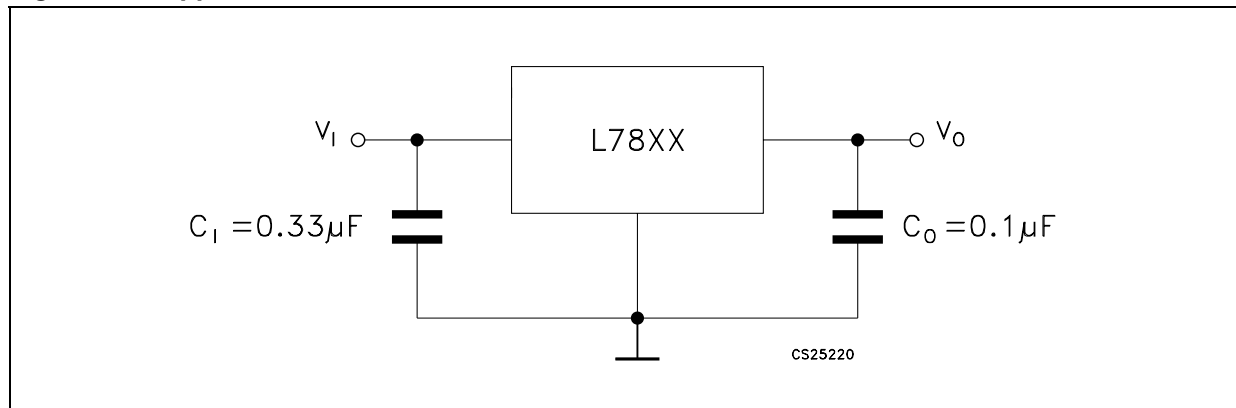
Symbol	Parameter		Value	Unit
V_I	DC input voltage	for $V_O = 5$ to 18 V	35	V
		for $V_O = 20, 24$ V	40	
I_O	Output current		Internally limited	
P_D	Power dissipation		Internally limited	
T_{STG}	Storage temperature range		-65 to 150	°C
T_{OP}	Operating junction temperature range	for L7800	-55 to 150	°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 ² PAK	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



4 Test circuits

Figure 5. DC parameter

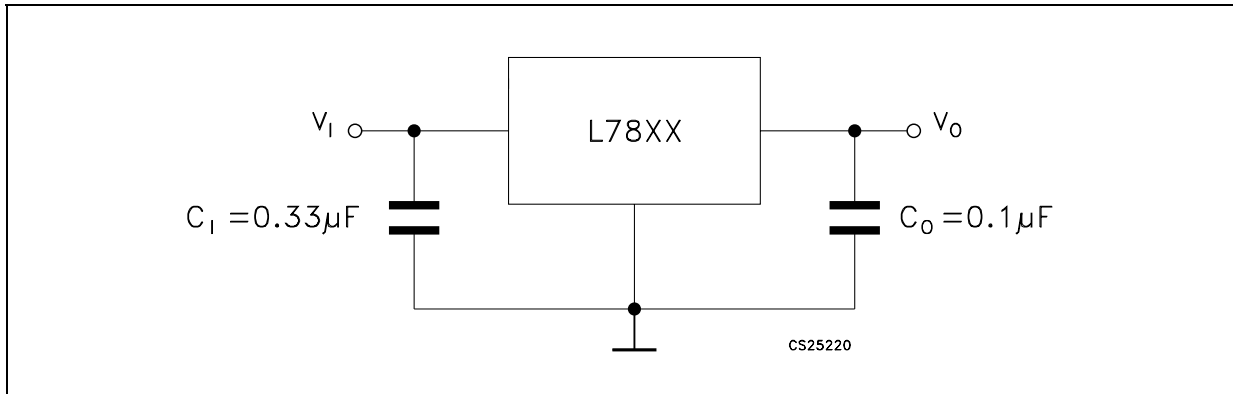


Figure 6. Load regulation

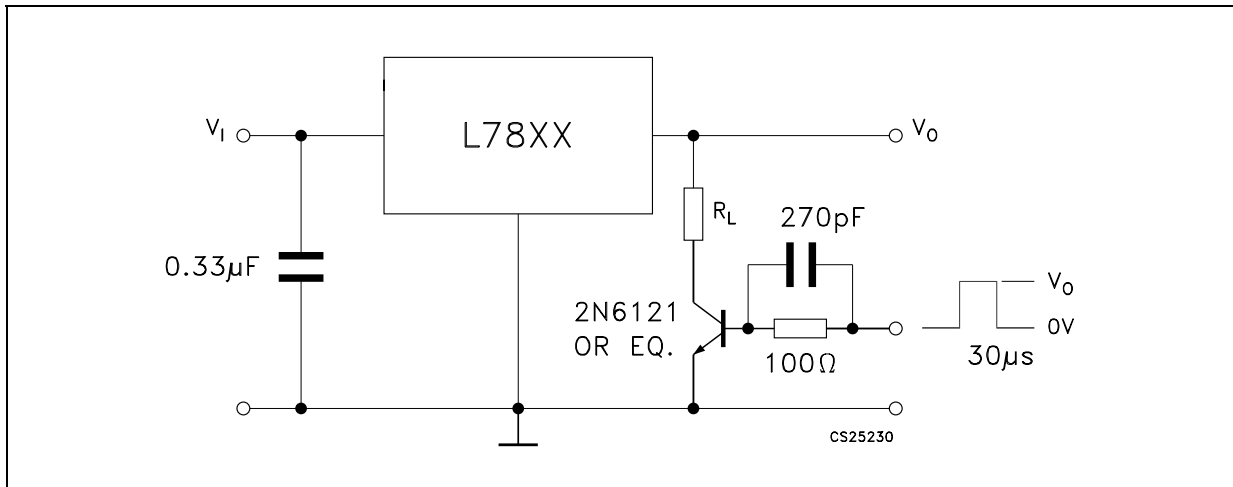
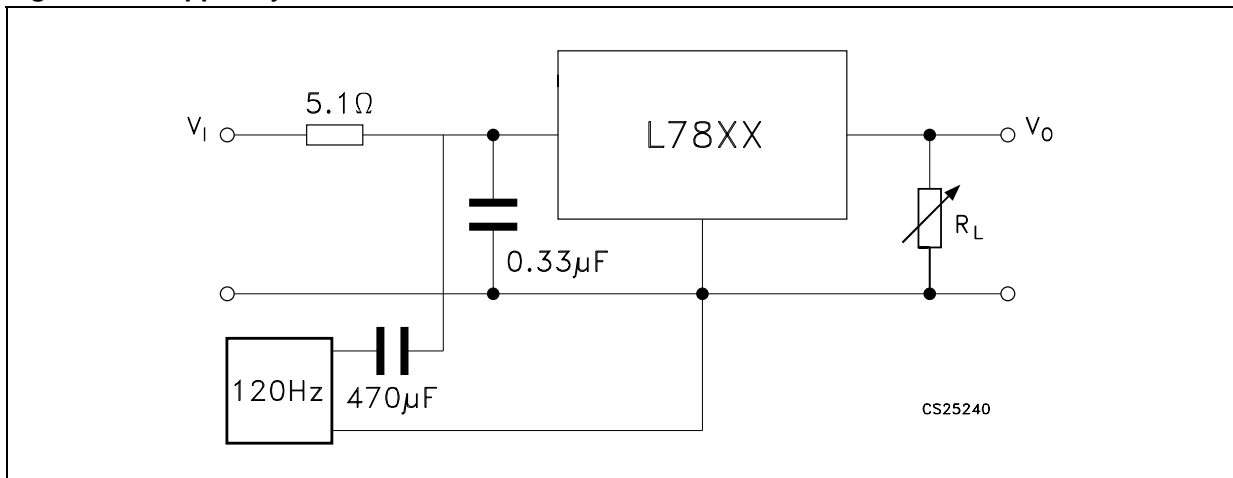


Figure 7. Ripple rejection



5 Electrical characteristics

Table 4. Electrical characteristics of L7805 (refer to the test circuits, $T_J = -55$ to 150 °C, $V_I = 10$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	4.8	5	5.2	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 8$ to 20 V	4.65	5	5.35	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 7$ to 25 V, $T_J = 25^\circ\text{C}$		3	50	mV
		$V_I = 8$ to 12 V, $T_J = 25^\circ\text{C}$		1	25	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			100	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			25	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 8$ to 25 V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		0.6		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 8$ to 18 V, $f = 120$ Hz	68			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2	2.5	V
R_O	Output resistance	$f = 1$ kHz		17		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75	1.2	A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$	1.3	2.2	3.3	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 5. Electrical characteristics of L7806 (refer to the test circuits, $T_J = -55$ to 150 °C, $V_I = 11$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	5.75	6	6.25	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 9$ to 21 V	5.65	6	6.35	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 8$ to 25 V, $T_J = 25^\circ\text{C}$			60	mV
		$V_I = 9$ to 13 V, $T_J = 25^\circ\text{C}$			30	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			100	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			30	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 9$ to 25 V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		0.7		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 9$ to 19 V, $f = 120$ Hz	65			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2	2.5	V
R_O	Output resistance	$f = 1$ kHz		19		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75	1.2	A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$	1.3	2.2	3.3	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 6. Electrical characteristics of L7808 (refer to the test circuits, $T_J = -55$ to 150 °C, $V_I = 14$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	7.7	8	8.3	V
V_O	Output voltage	$I_O = 5$ mA to 1A, $P_O \leq 15$ W $V_I = 11.5$ to 23 V	7.6	8	8.4	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 10.5$ to 25 V, $T_J = 25^\circ\text{C}$			80	mV
		$V_I = 11$ to 17 V, $T_J = 25^\circ\text{C}$			40	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			100	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			40	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 11.5$ to 25 V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		1		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 11.5$ to 21.5 V, $f = 120$ Hz	62			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2	2.5	V
R_O	Output resistance	$f = 1$ kHz		16		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75	1.2	A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$	1.3	2.2	3.3	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 7. Electrical characteristics of L7812 (refer to the test circuits, $T_J = -55$ to 150 °C, $V_I = 19$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	11.5	12	12.5	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 15.5$ to 27 V	11.4	12	12.6	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 14.5$ to 30 V, $T_J = 25^\circ\text{C}$			120	mV
		$V_I = 16$ to 22 V, $T_J = 25^\circ\text{C}$			60	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			100	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			60	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 15$ to 30 V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		1.5		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 15$ to 25 V, $f = 120$ Hz	61			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2	2.5	V
R_O	Output resistance	$f = 1$ kHz		18		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75	1.2	A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$	1.3	2.2	3.3	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 8. Electrical characteristics of L7815 (refer to the test circuits, $T_J = -55$ to 150 °C, $V_I = 23$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	14.4	15	15.6	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 18.5$ to 30 V	14.25	15	15.75	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 17.5$ to 30 V, $T_J = 25^\circ\text{C}$			150	mV
		$V_I = 20$ to 26 V, $T_J = 25^\circ\text{C}$			75	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			150	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			75	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 18.5$ to 30 V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		1.8		mV/°C
eN	Output noise voltage	$B = 10$ Hz to 100 kHz, $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 18.5$ to 28.5 V, $f = 120$ Hz	60			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2	2.5	V
R_O	Output resistance	$f = 1$ kHz		19		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75	1.2	A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$	1.3	2.2	3.3	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 9. Electrical characteristics of L7818 (refer to the test circuits, $T_J = -55$ to 150 °C, $V_I = 26$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	17.3	18	18.7	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 22$ to 33 V	17.1	18	18.9	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 21$ to 33 V, $T_J = 25^\circ\text{C}$			180	mV
		$V_I = 24$ to 30 V, $T_J = 25^\circ\text{C}$			90	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			180	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			90	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 22$ to 33 V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		2.3		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 22$ to 32 V, $f = 120$ Hz	59			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2	2.5	V
R_O	Output resistance	$f = 1$ kHz		22		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75	1.2	A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$	1.3	2.2	3.3	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 10. Electrical characteristics of L7820 (refer to the test circuits, $T_J = -55$ to 150 °C, $V_I = 28$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	19.2	20	20.8	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 24$ to 35 V	19	20	21	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 22.5$ to 35 V, $T_J = 25^\circ\text{C}$			200	mV
		$V_I = 26$ to 32 V, $T_J = 25^\circ\text{C}$			100	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			200	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			100	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 24$ to 35 V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		2.5		mV/°C
eN	Output noise voltage	$B = 10$ Hz to 100 kHz, $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 24$ to 35 V, $f = 120$ Hz	58			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2	2.5	V
R_O	Output resistance	$f = 1$ kHz		24		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75	1.2	A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$	1.3	2.2	3.3	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 11. Electrical characteristics of L7824 (refer to the test circuits, $T_J = -55$ to 150 °C, $V_I = 33$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	23	24	25	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 28$ to 38 V	22.8	24	25.2	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 27$ to 38 V, $T_J = 25^\circ\text{C}$			240	mV
		$V_I = 30$ to 36 V, $T_J = 25^\circ\text{C}$			120	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			240	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			120	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 28$ to 38 V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		3		mV/°C
eN	Output noise voltage	$B = 10$ Hz to 100 kHz, $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 28$ to 38 V, $f = 120$ Hz	56			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2	2.5	V
R_O	Output resistance	$f = 1$ kHz		28		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75	1.2	A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$	1.3	2.2	3.3	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 12. Electrical characteristics of L7805C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 10$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	4.8	5	5.2	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 7$ to 20 V	4.75	5	5.25	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 7$ to 25 V, $T_J = 25^\circ\text{C}$		3	100	mV
		$V_I = 8$ to 12 V, $T_J = 25^\circ\text{C}$		1	50	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			100	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			50	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 7$ to 25 V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		-1.1		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, $T_J = 25^\circ\text{C}$		40		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 8$ to 18 V, $f = 120$ Hz	62			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		17		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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 13. Electrical characteristics of L7852C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 10$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	5.0	5.2	5.4	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 8$ to 20 V	4.95	5.2	5.45	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 7$ to 25 V, $T_J = 25^\circ\text{C}$		3	105	mV
		$V_I = 8$ to 12 V, $T_J = 25^\circ\text{C}$		1	52	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			105	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			52	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 7$ to 25 V			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		-1		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, $T_J = 25^\circ\text{C}$		42		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 8$ to 18 V, $f = 120$ Hz	61			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		17		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.75		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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 14. Electrical characteristics of L7806C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 11$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	5.75	6	6.25	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 8$ to 21 V	5.7	6	6.3	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 8$ to 25 V, $T_J = 25^\circ\text{C}$			120	mV
		$V_I = 9$ to 13 V, $T_J = 25^\circ\text{C}$			60	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			120	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			60	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 8$ to 25 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, $T_J = 25^\circ\text{C}$		45		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 9$ to 19 V, $f = 120$ Hz	59			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		19		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.55		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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 15. Electrical characteristics of L7808C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 14$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	7.7	8	8.3	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 10.5$ to 25 V	7.6	8	8.4	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 10.5$ to 25 V, $T_J = 25^\circ\text{C}$			160	mV
		$V_I = 11$ to 17 V, $T_J = 25^\circ\text{C}$			80	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			160	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			80	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 10.5$ to 25 V			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		-0.8		mV/°C
eN	Output noise voltage	B = 10 Hz to 100 kHz, $T_J = 25^\circ\text{C}$		52		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 11.5$ to 21.5 V, $f = 120$ Hz	56			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		16		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.45		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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 16. Electrical characteristics of L7885C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 14.5$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	8.2	8.5	8.8	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 11$ to 26 V	8.1	8.5	8.9	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 11$ to 27 V, $T_J = 25^\circ\text{C}$			160	mV
		$V_I = 11.5$ to 17.5 V, $T_J = 25^\circ\text{C}$			80	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			160	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			80	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 11$ to 27 V			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5$ mA		-0.8		mV/°C
eN	Output noise voltage	$B = 10$ Hz to 100 kHz, $T_J = 25^\circ\text{C}$		55		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 12$ to 22 V, $f = 120$ Hz	56			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		16		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.45		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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 17. Electrical characteristics of L7809C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 15$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	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
$\Delta V_O^{(1)}$	Line regulation	$V_I = 11.5$ to 26 V, $T_J = 25^\circ\text{C}$			180	mV
		$V_I = 12$ to 18 V, $T_J = 25^\circ\text{C}$			90	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			180	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			90	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			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, $T_J = 25^\circ\text{C}$		70		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 12$ to 23 V, $f = 120$ Hz	55			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		17		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.40		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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 18. Electrical characteristics of L7810C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 15$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	9.6	10	10.4	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 12.5$ to 26 V	9.5	10	10.5	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 12.5$ to 26 V, $T_J = 25^\circ\text{C}$			200	mV
		$V_I = 13.5$ to 19 V, $T_J = 25^\circ\text{C}$			100	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			200	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			100	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 12.5$ 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, $T_J = 25^\circ\text{C}$		70		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 13$ to 23 V, $f = 120$ Hz	55			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		17		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.40		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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 19. Electrical characteristics of L7812C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 19$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	11.5	12	12.5	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 14.5$ to 27 V	11.4	12	12.6	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 14.5$ to 30 V, $T_J = 25^\circ\text{C}$			240	mV
		$V_I = 16$ to 22 V, $T_J = 25^\circ\text{C}$			120	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			240	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			120	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 14.5$ to 30 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, $T_J = 25^\circ\text{C}$		75		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 15$ to 25 V, $f = 120$ Hz	55			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		18		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.35		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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 20. Electrical characteristics of L7815C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 23$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	14.5	15	15.6	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 17.5$ to 30 V	14.25	15	15.75	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 17.5$ to 30 V, $T_J = 25^\circ\text{C}$			300	mV
		$V_I = 20$ to 26 V, $T_J = 25^\circ\text{C}$			150	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			300	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			150	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 17.5$ to 30 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 100kHz, $T_J = 25^\circ\text{C}$		90		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 18.5$ to 28.5 V, $f = 120$ Hz	54			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		19		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.23		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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 21. Electrical characteristics of L7818C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 26$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	17.3	18	18.7	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 21$ to 33 V	17.1	18	18.9	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 21$ to 33 V, $T_J = 25^\circ\text{C}$			360	mV
		$V_I = 24$ to 30 V, $T_J = 25^\circ\text{C}$			180	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			360	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			180	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 21$ to 33 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, $T_J = 25^\circ\text{C}$		110		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 22$ to 32 V, $f = 120$ Hz	53			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		22		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.20		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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.

Table 22. Electrical characteristics of L7820C (refer to the test circuits, $T_J = 0$ to 150 °C, $V_I = 28$ V, $I_O = 500$ mA, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	19.2	20	20.8	V
V_O	Output voltage	$I_O = 5$ mA to 1 A, $P_O \leq 15$ W $V_I = 23$ to 35 V	19	20	21	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 22.5$ to 35 V, $T_J = 25^\circ\text{C}$			400	mV
		$V_I = 26$ to 32 V, $T_J = 25^\circ\text{C}$			200	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			400	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			200	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
ΔI_d	Quiescent current change	$I_O = 5$ mA to 1 A			0.5	mA
		$V_I = 23$ to 35 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, $T_J = 25^\circ\text{C}$		150		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 24$ to 35 V, $f = 120$ Hz	52			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		24		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.18		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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.

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, $C_I = 0.33$ μ F, $C_O = 0.1$ μ F unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	$T_J = 25^\circ\text{C}$	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
$\Delta V_O^{(1)}$	Line regulation	$V_I = 27$ to 38 V, $T_J = 25^\circ\text{C}$			480	mV
		$V_I = 30$ to 36 V, $T_J = 25^\circ\text{C}$			240	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$			480	mV
		$I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$			240	
I_d	Quiescent current	$T_J = 25^\circ\text{C}$			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, $T_J = 25^\circ\text{C}$		170		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 28$ to 38 V, $f = 120$ Hz	50			dB
V_d	Dropout voltage	$I_O = 1$ A, $T_J = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1$ kHz		28		m Ω
I_{sc}	Short circuit current	$V_I = 35$ V, $T_J = 25^\circ\text{C}$		0.15		A
I_{scp}	Short circuit peak current	$T_J = 25^\circ\text{C}$		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.

6 Typical performance

Figure 8. Dropout voltage vs junction temperature

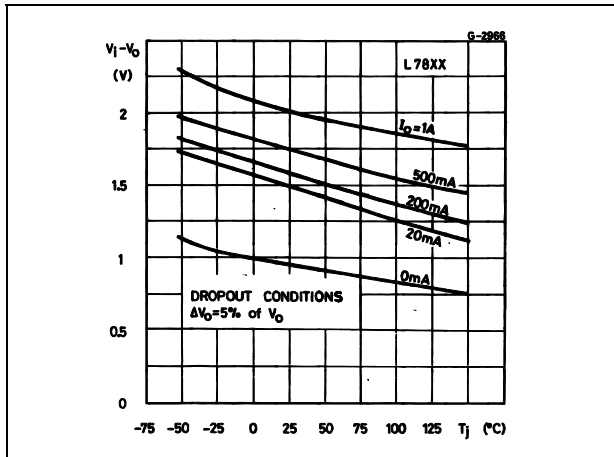


Figure 9. Peak output current vs input/output differential voltage

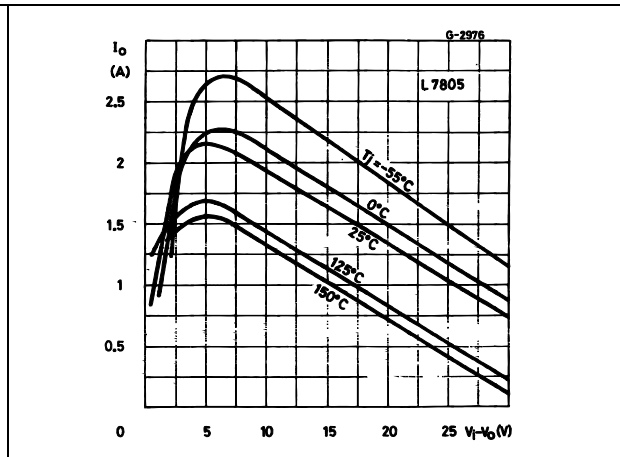


Figure 10. Supply voltage rejection vs frequency

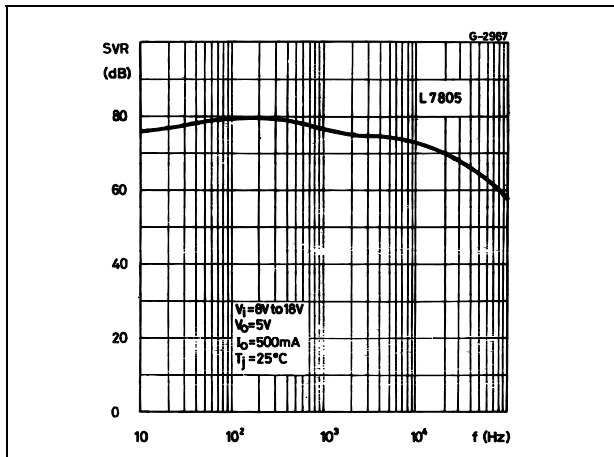


Figure 11. Output voltage vs junction temperature

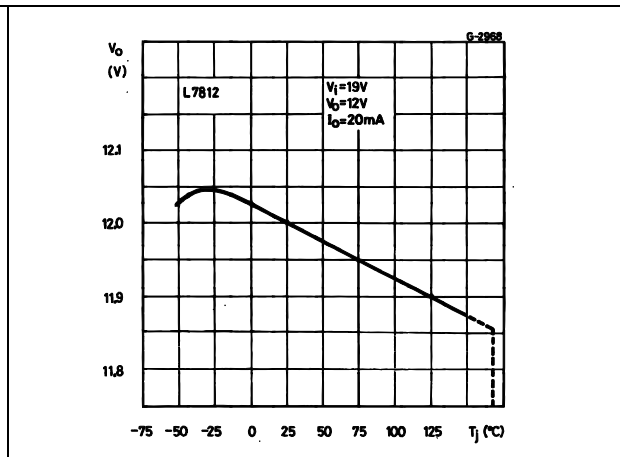


Figure 12. Output impedance vs frequency

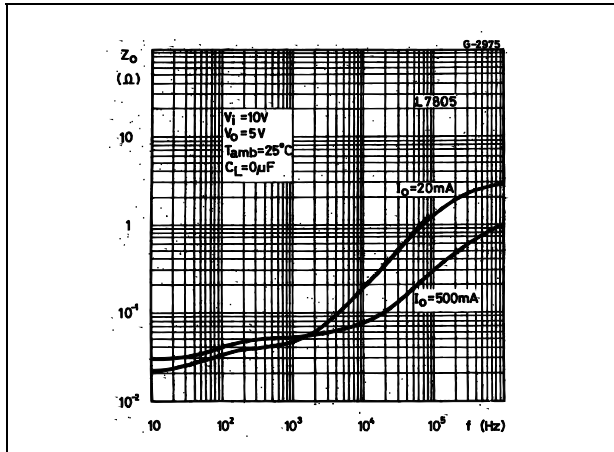


Figure 13. Quiescent current vs junction temp.

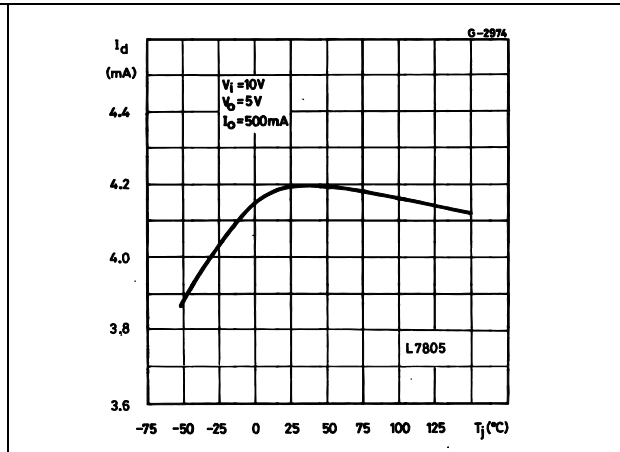


Figure 14. Load transient response

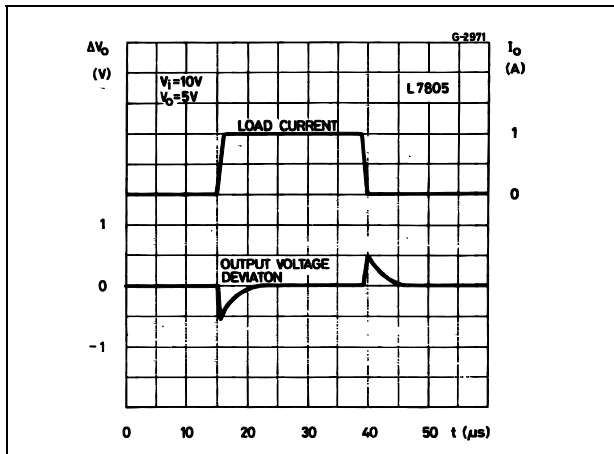


Figure 15. Line transient response

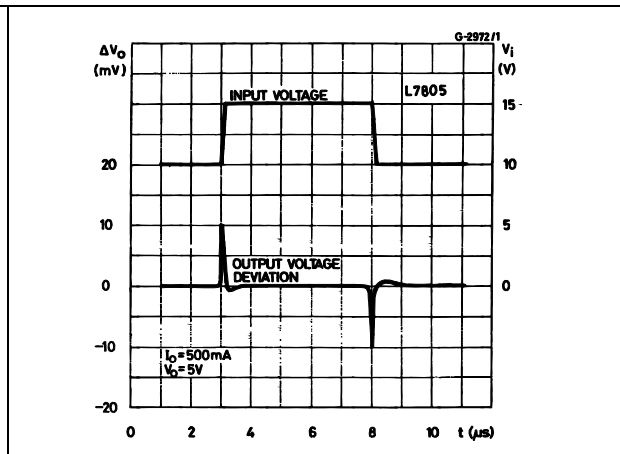


Figure 16. Quiescent current vs input voltage

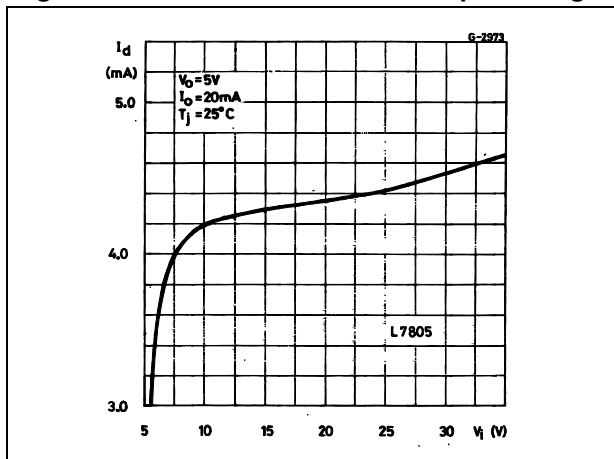
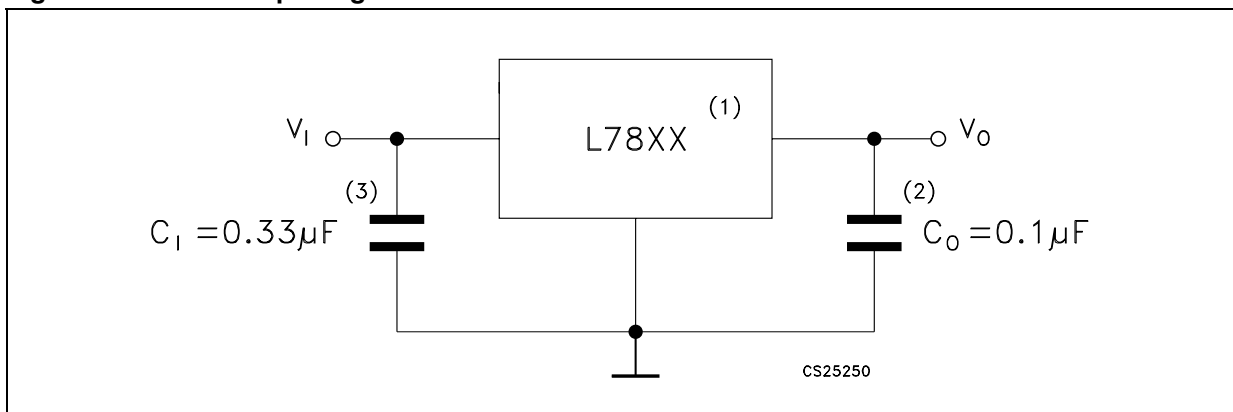


Figure 17. Fixed output regulator



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. Current regulator

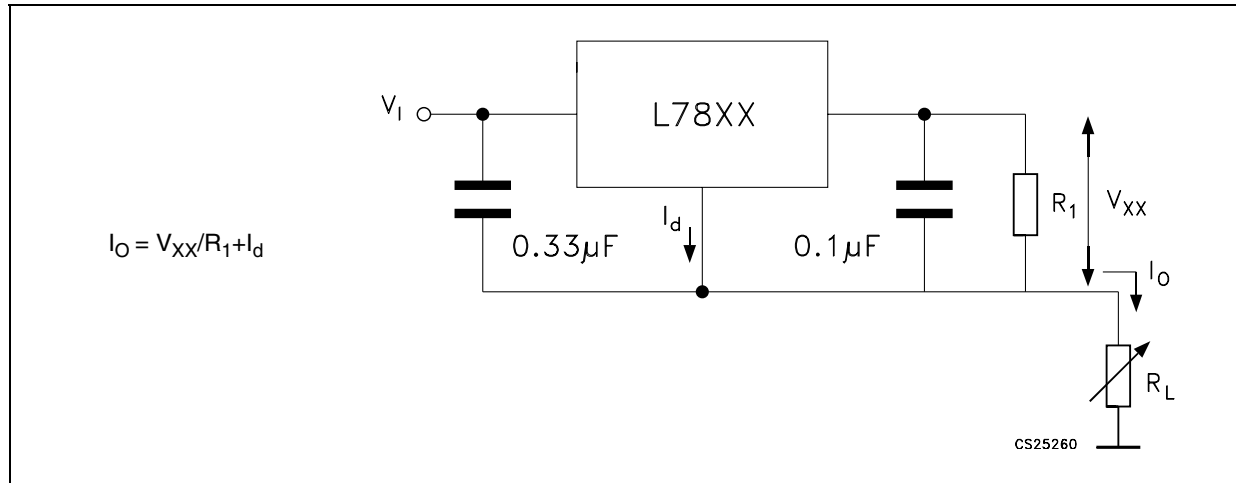


Figure 19. Circuit for increasing output voltage

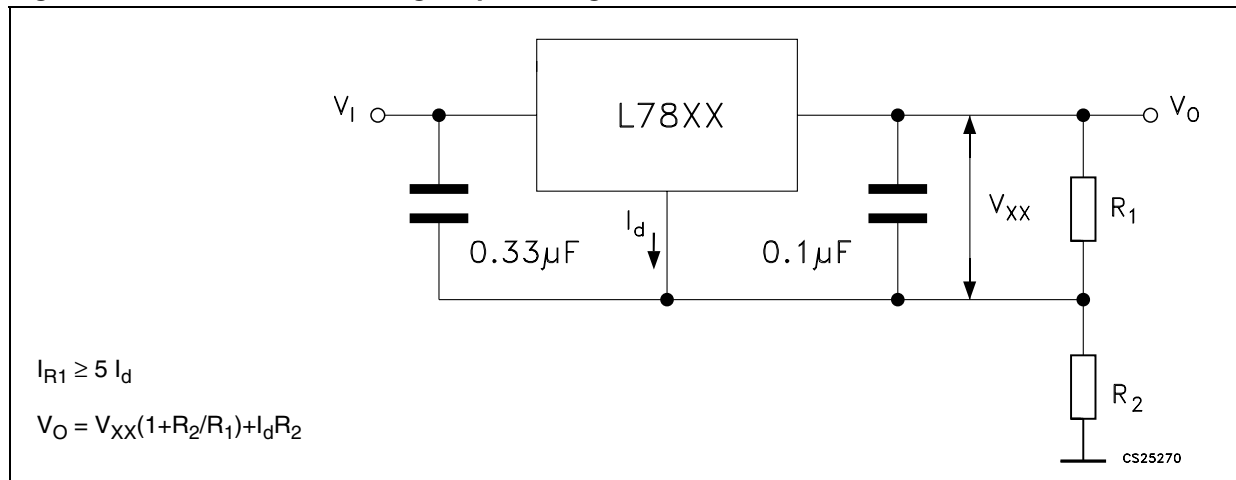


Figure 20. Adjustable output regulator (7 to 30 V)

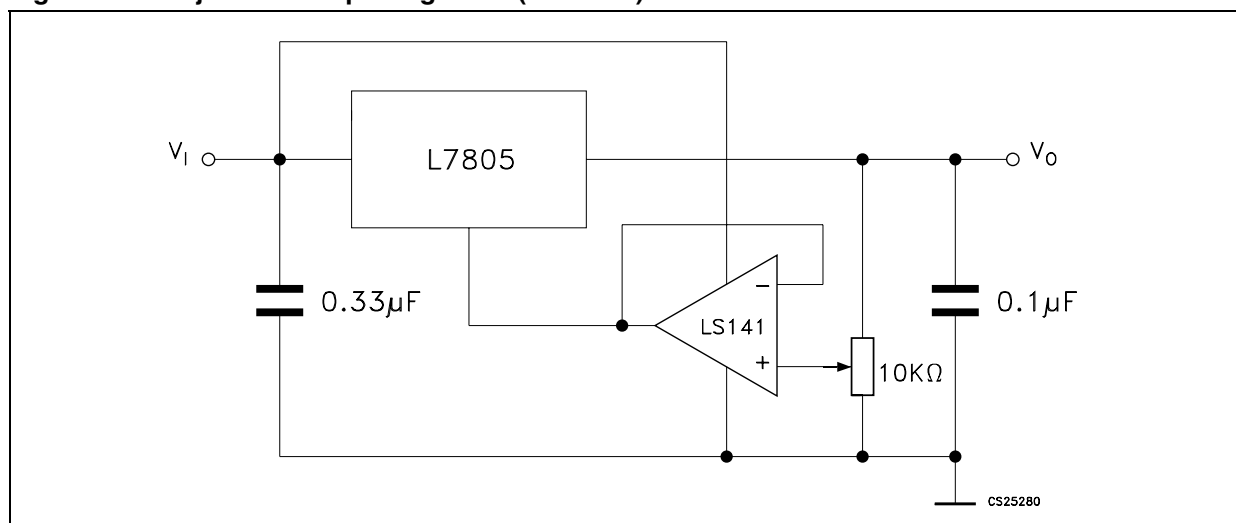


Figure 21. 0.5 to 10 V regulator

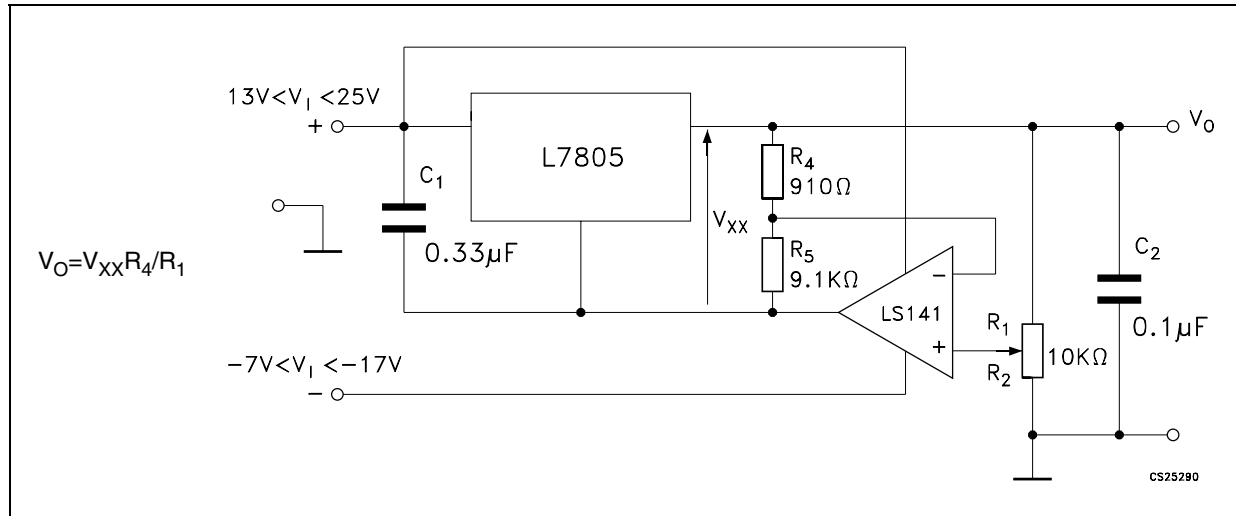


Figure 22. High current voltage regulator

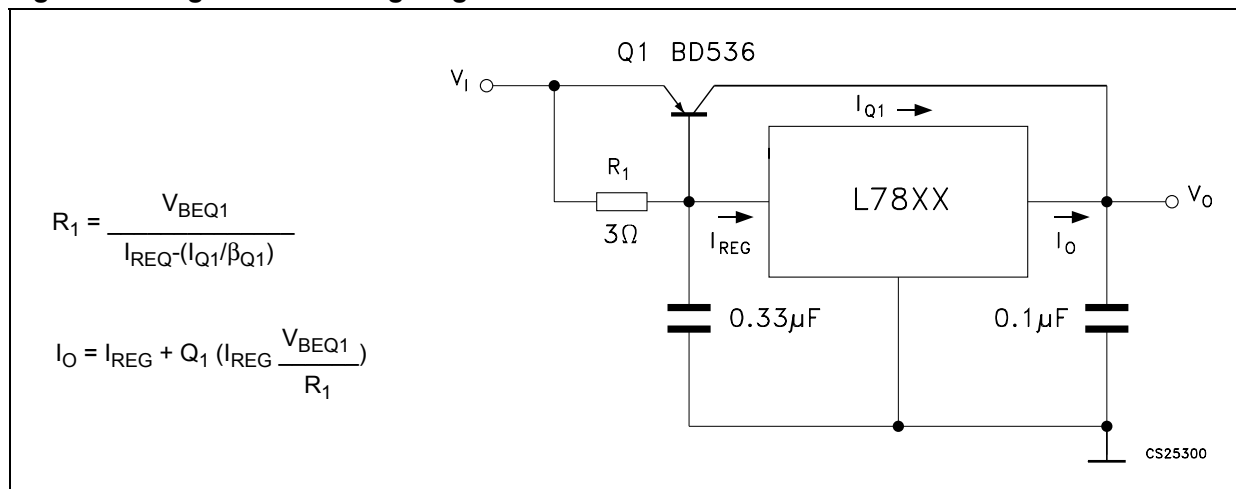


Figure 23. High output current with short circuit protection

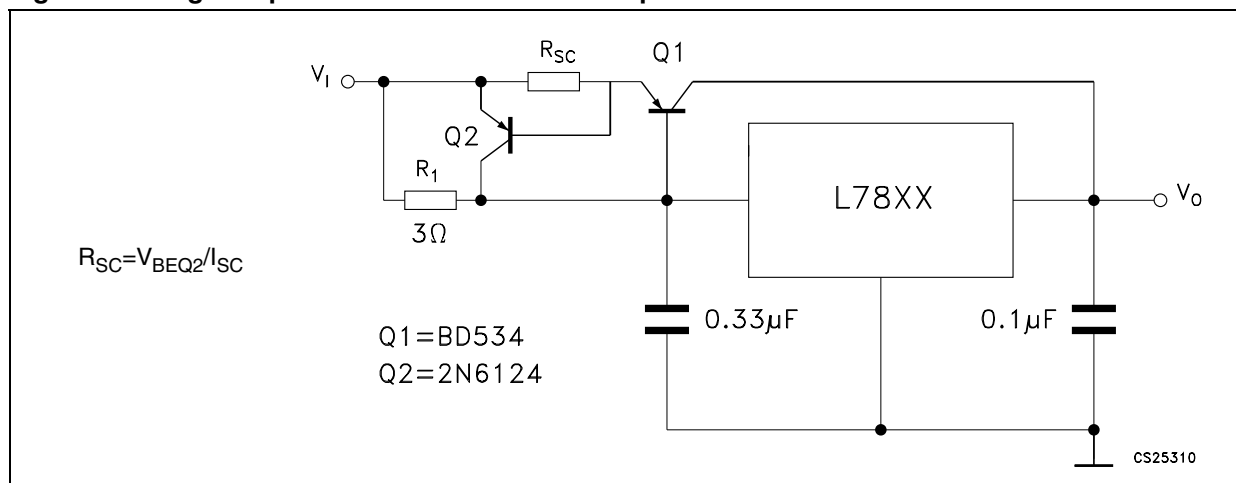


Figure 24. Tracking voltage regulator

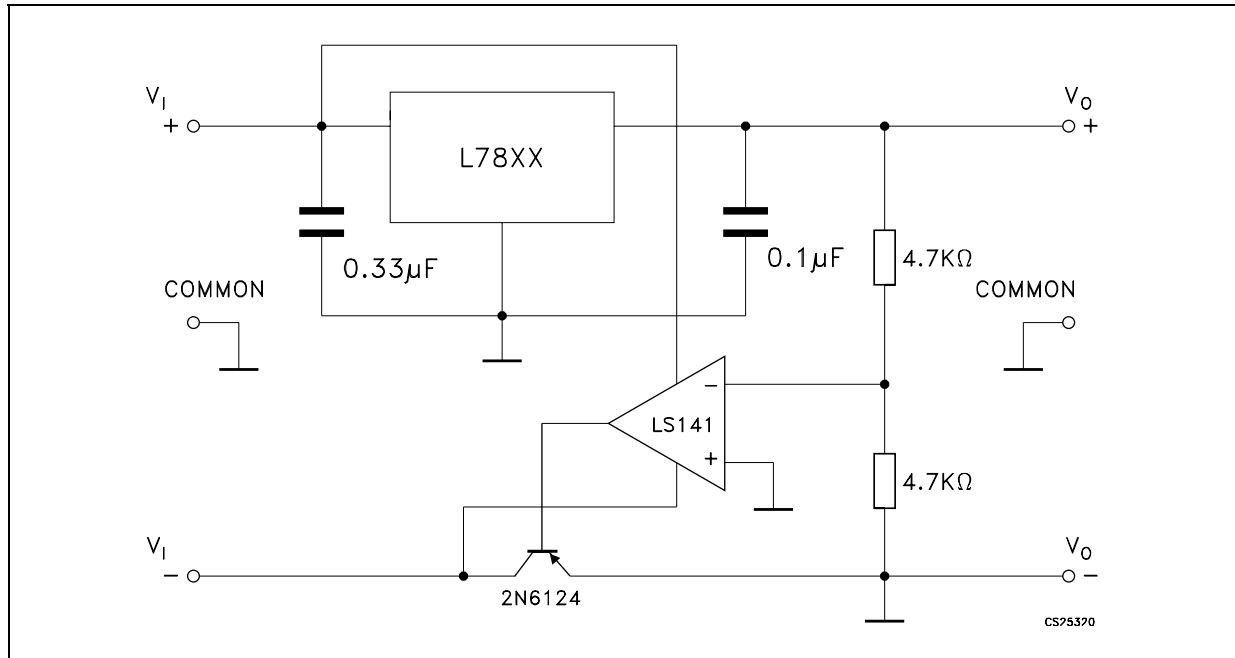
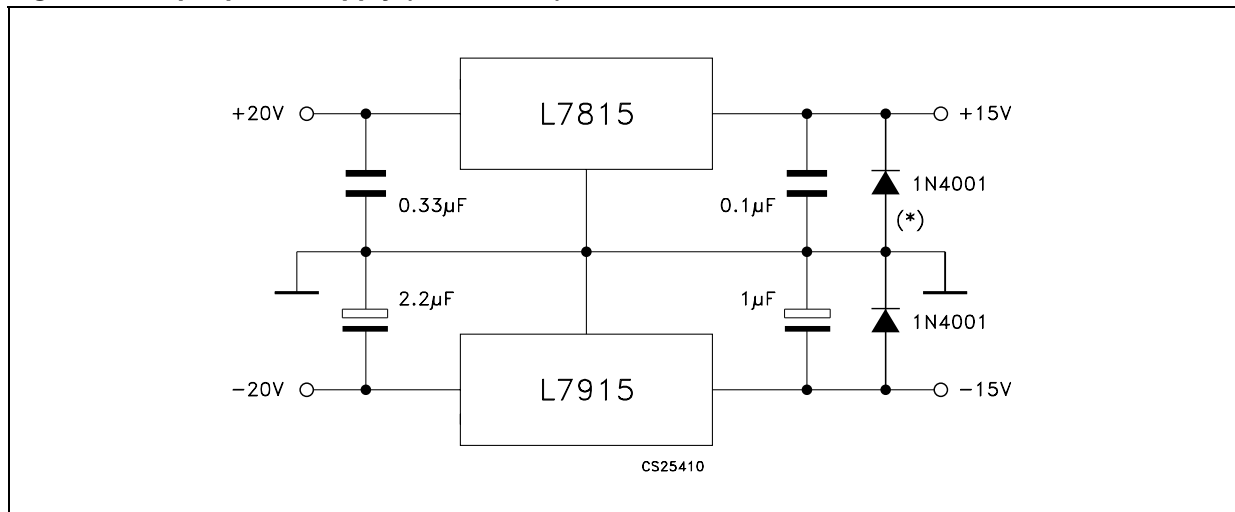


Figure 25. Split power supply ($\pm 15\text{ V} - 1\text{ A}$)



* Against potential latch-up problems.

Figure 26. Negative output voltage circuit

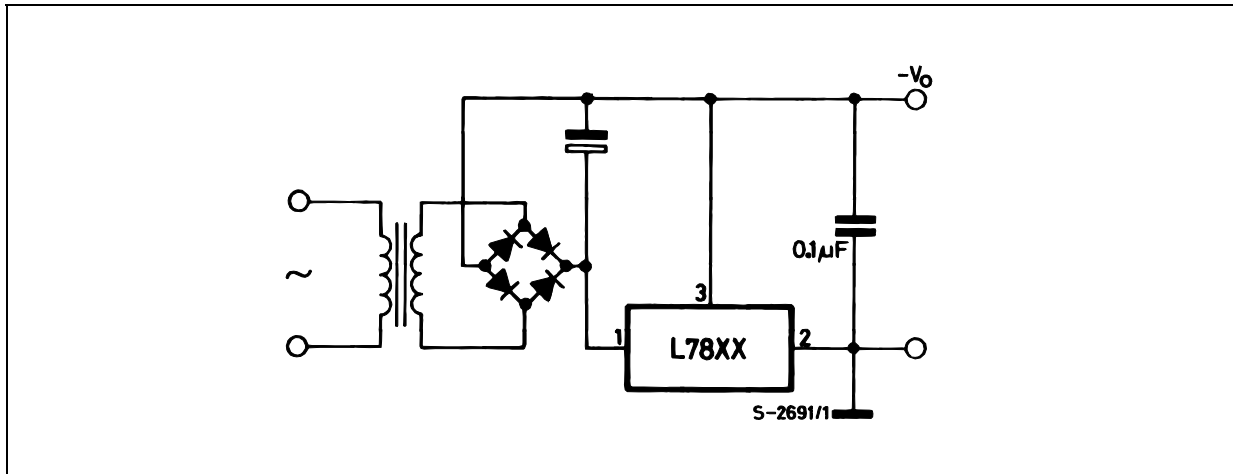


Figure 27. Switching regulator

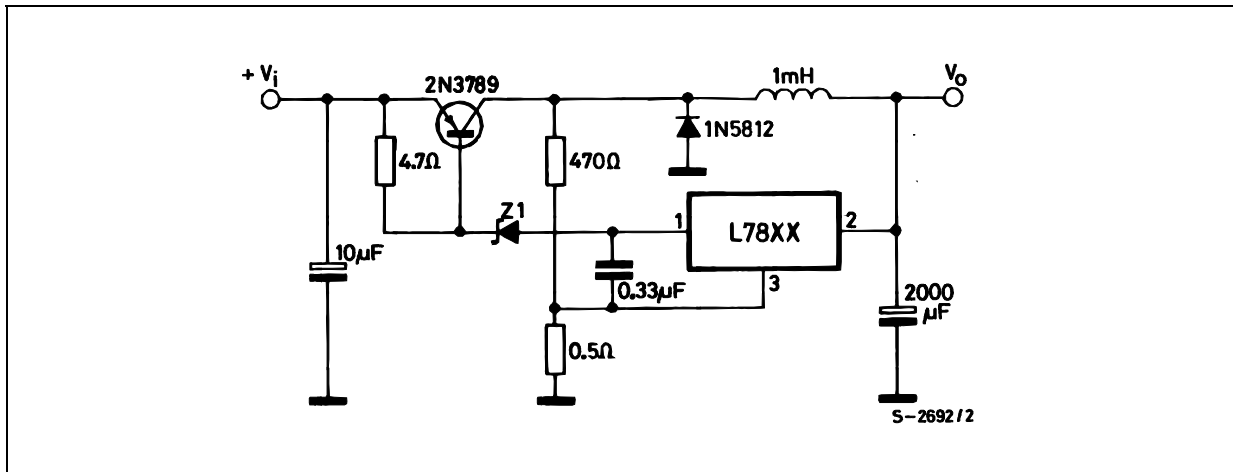


Figure 28. High input voltage circuit

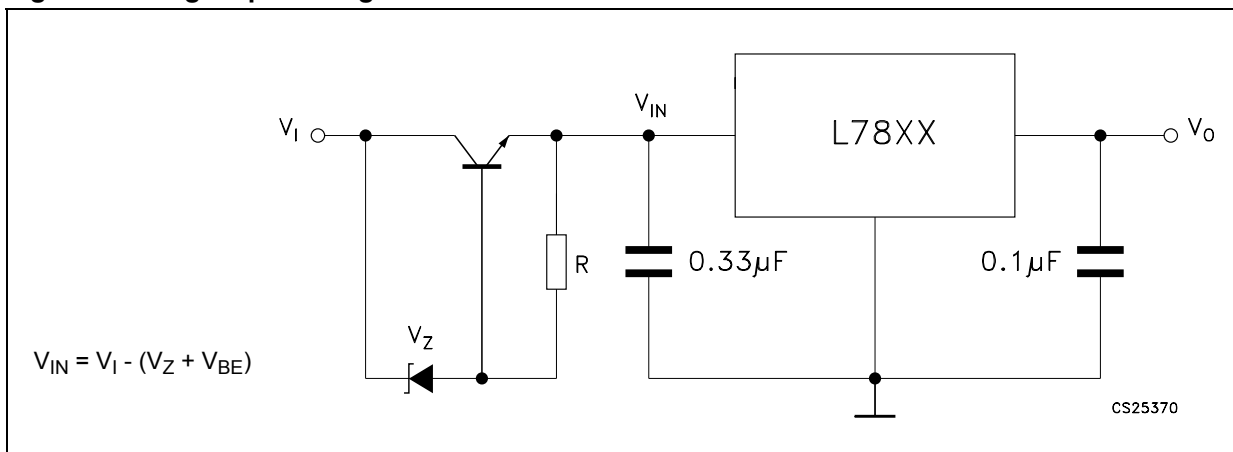


Figure 29. High input voltage circuit

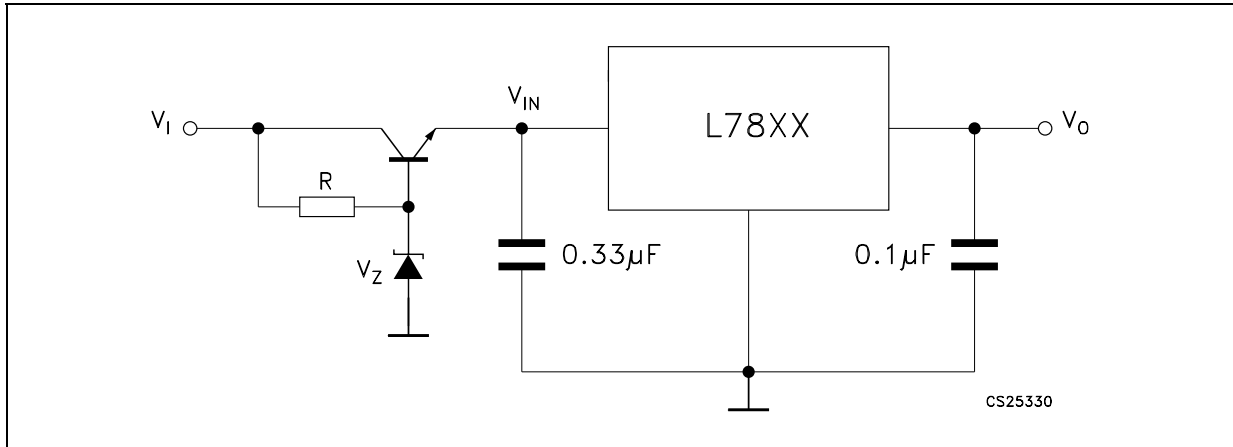


Figure 30. High output voltage regulator

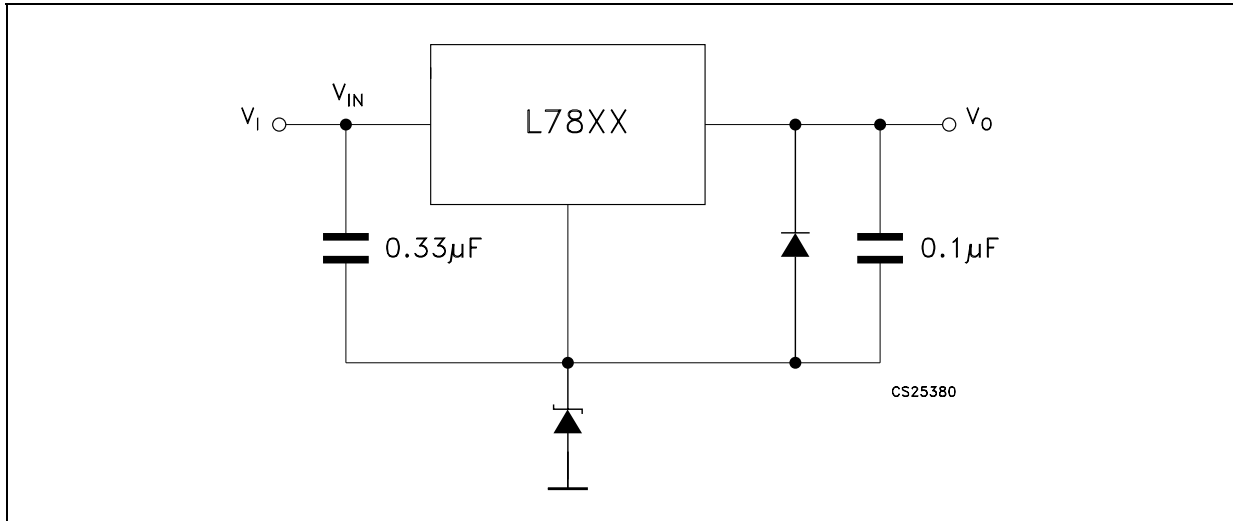


Figure 31. High input and output voltage

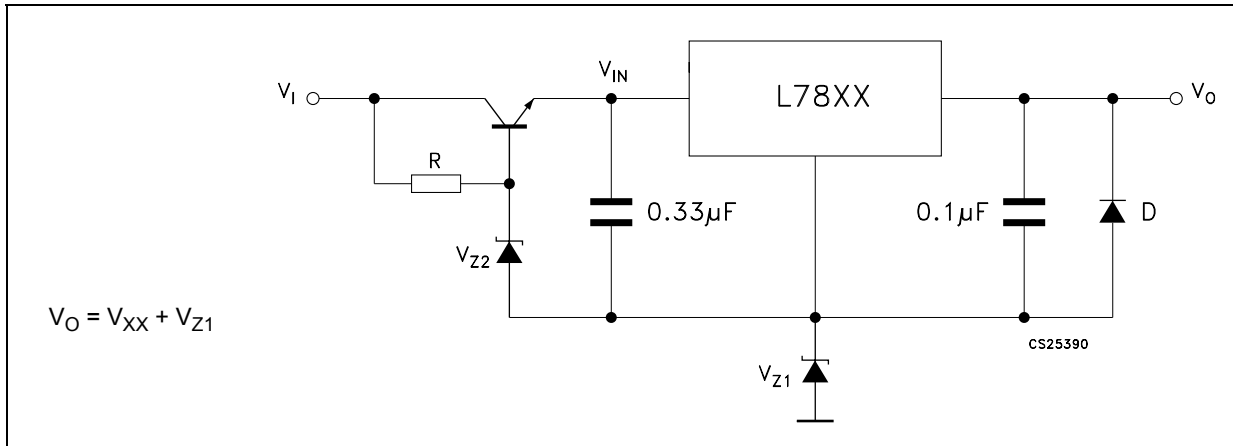


Figure 32. Reducing power dissipation with dropping resistor

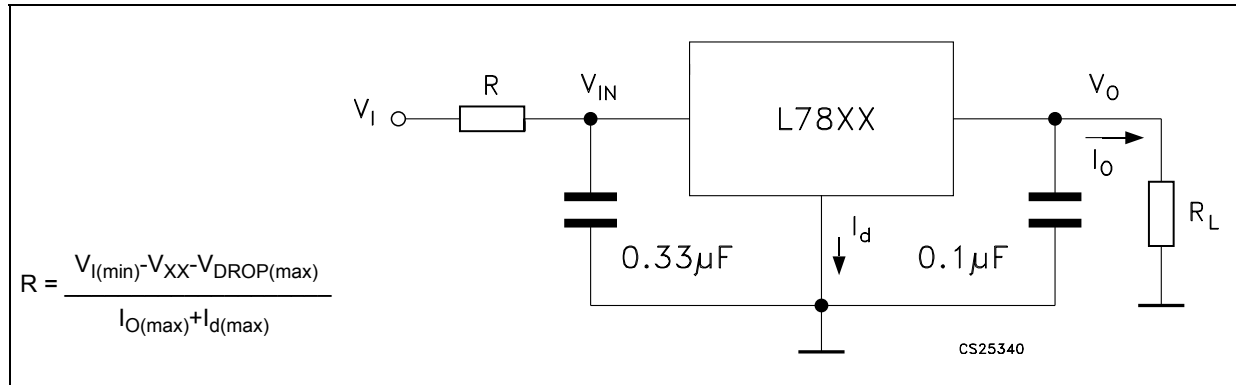


Figure 33. Remote shutdown

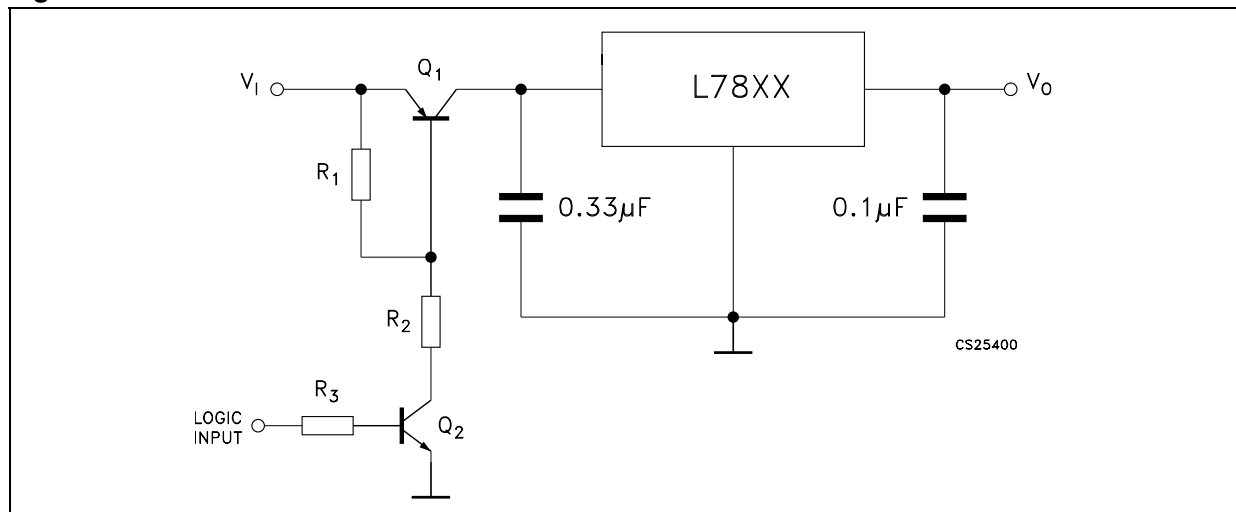
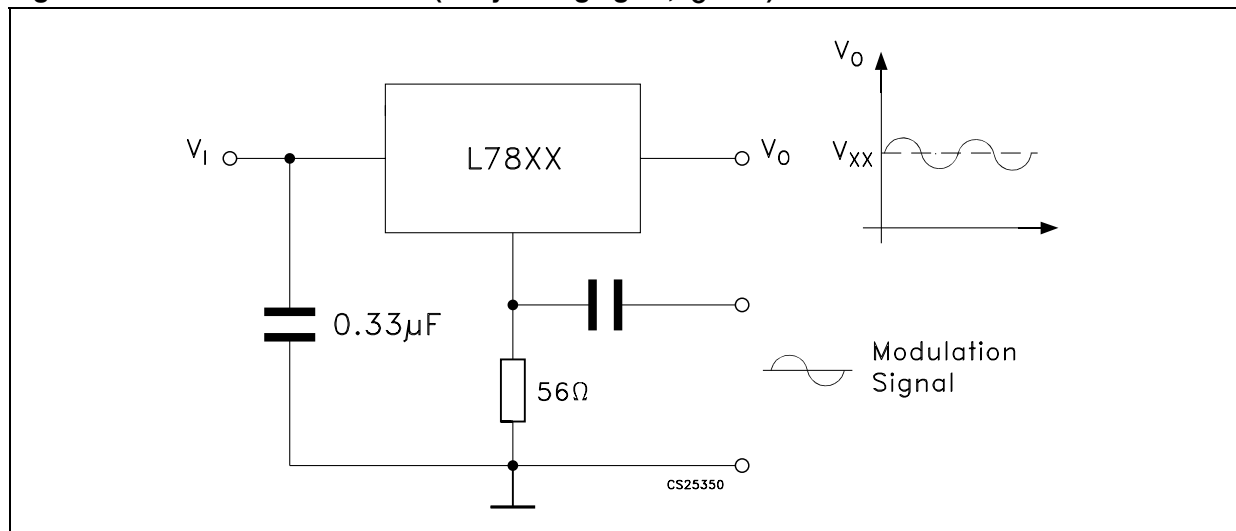
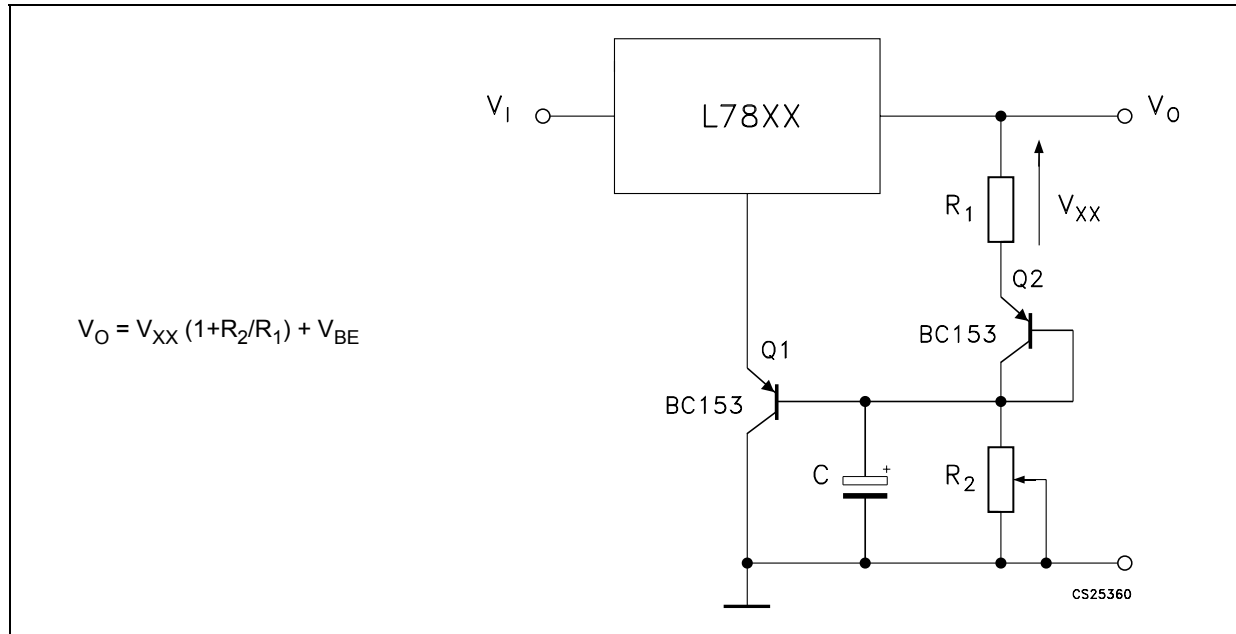


Figure 34. Power AM modulator (unity voltage gain, $I_O \leq 0.5$)



Note: The circuit performs well up to 100 kHz.

Figure 35. 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 .

Figure 36. Light controllers ($V_{Omin} = V_{XX} + V_{BE}$)

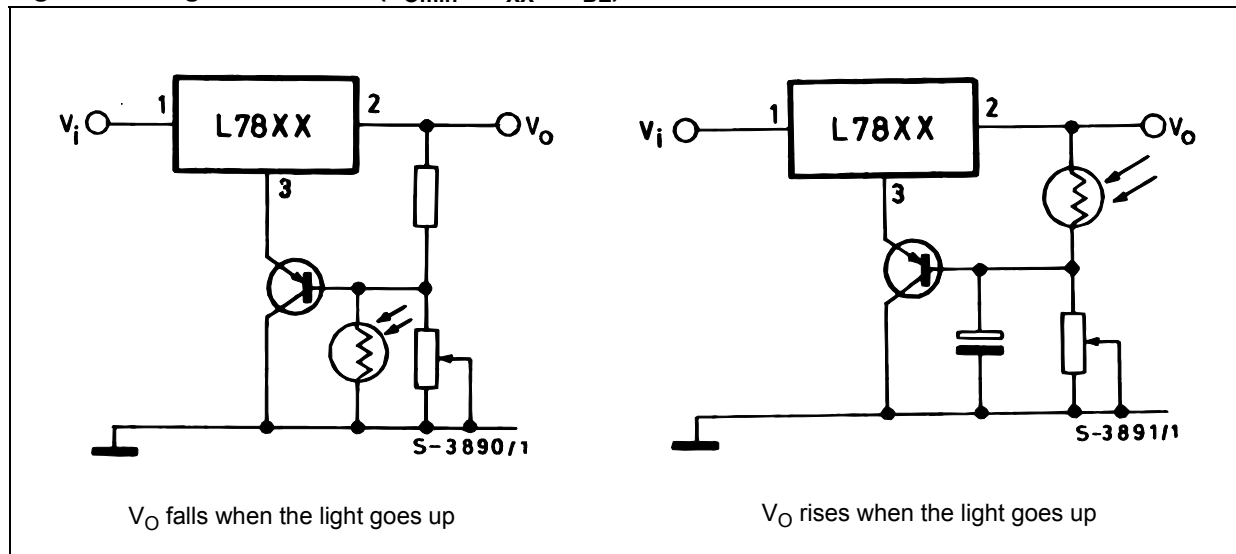
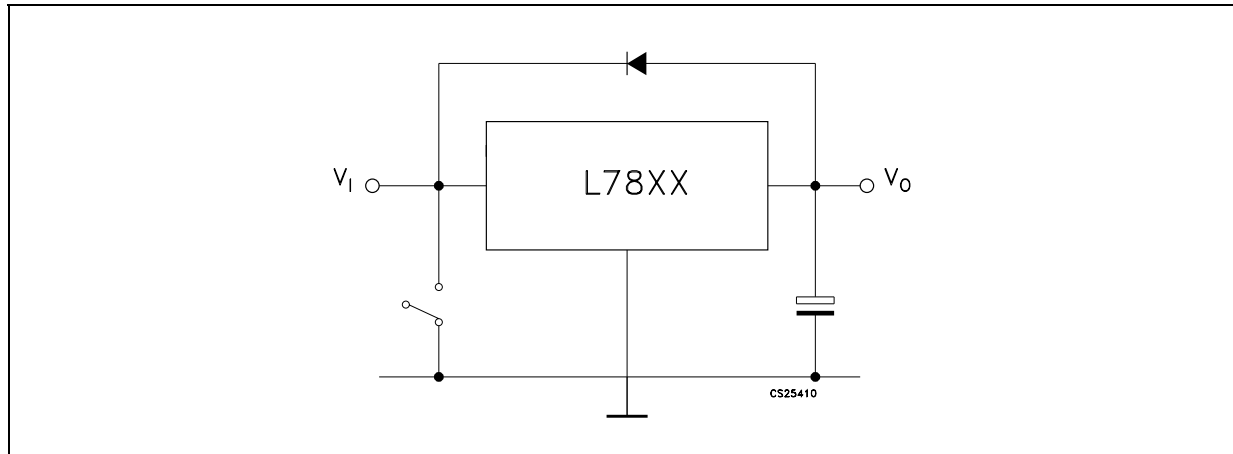


Figure 37. Protection against input short-circuit with high capacitance loads

1. Application with high capacitance loads and an output voltage greater than 6 volts need an external diode (see [Figure 32 on page 36](#)) to protect the device against input short circuit. In this case the input voltage falls rapidly while the output voltage decrease slowly. The capacitance discharges by means of the Base-Emitter junction of the series pass transistor in the regulator. If the energy is sufficiently high, the transistor may be destroyed. The external diode by-passes the current from the IC to ground.

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.

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

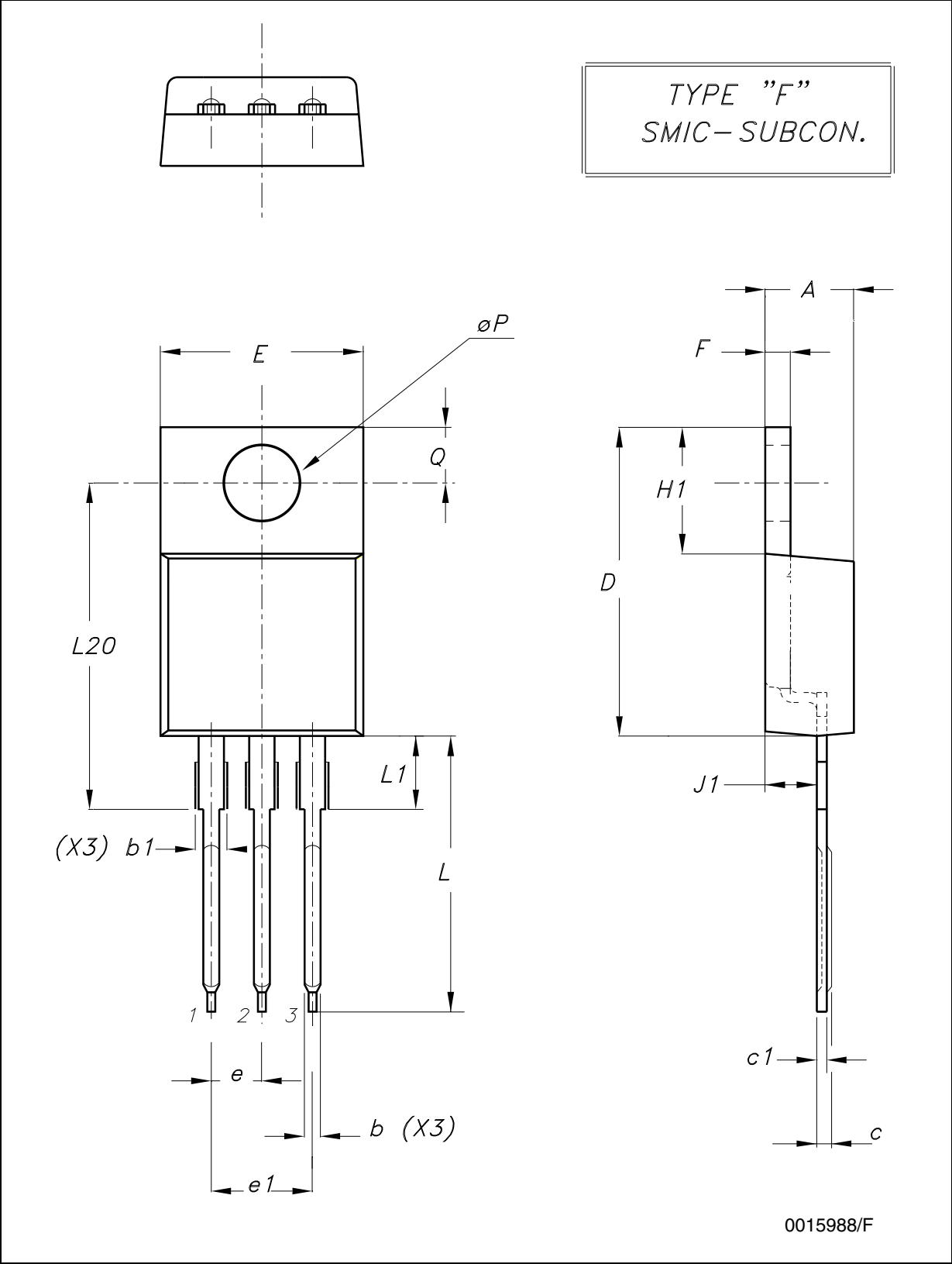


Figure 39. Drawing dimension TO-220 (type STD-ST)

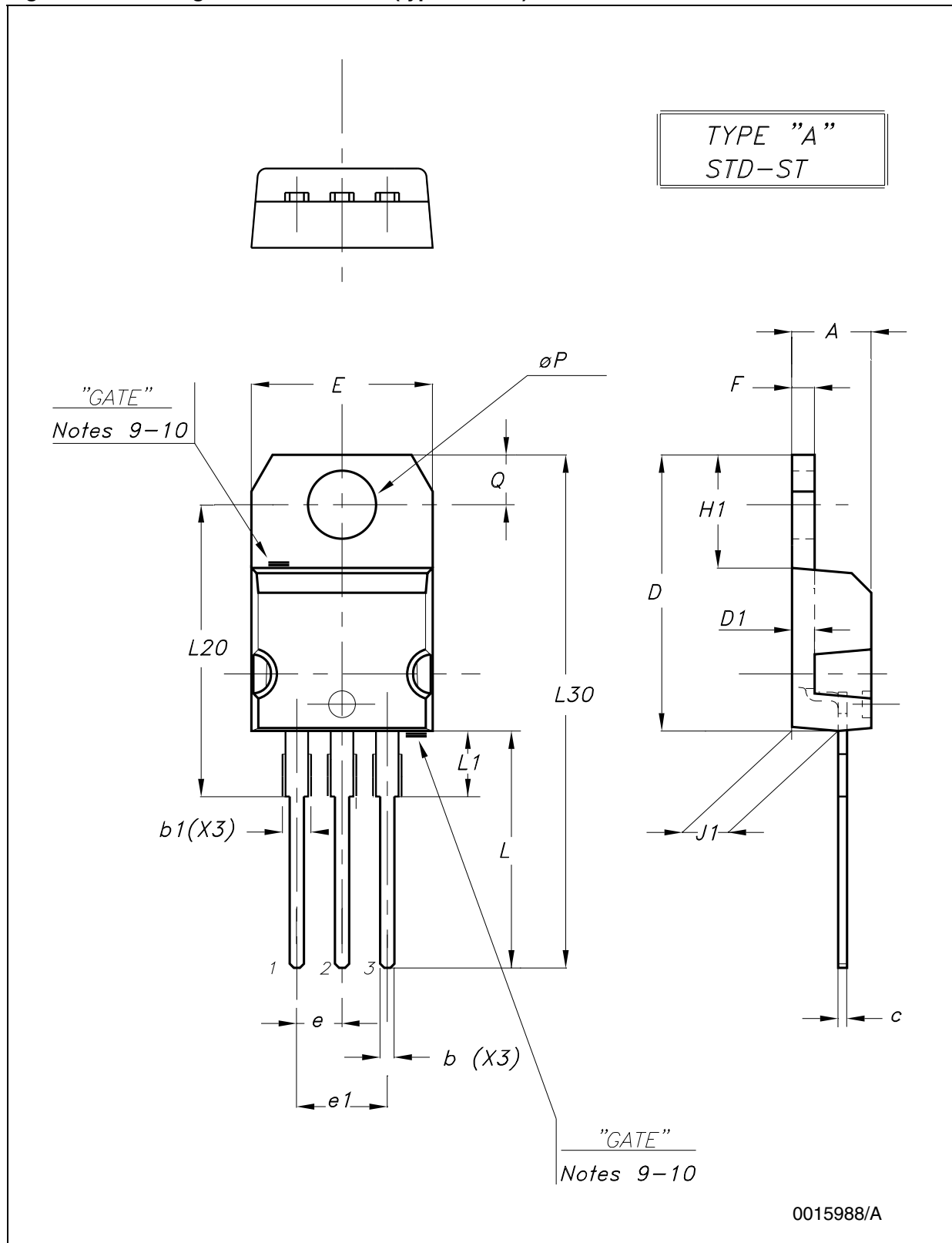
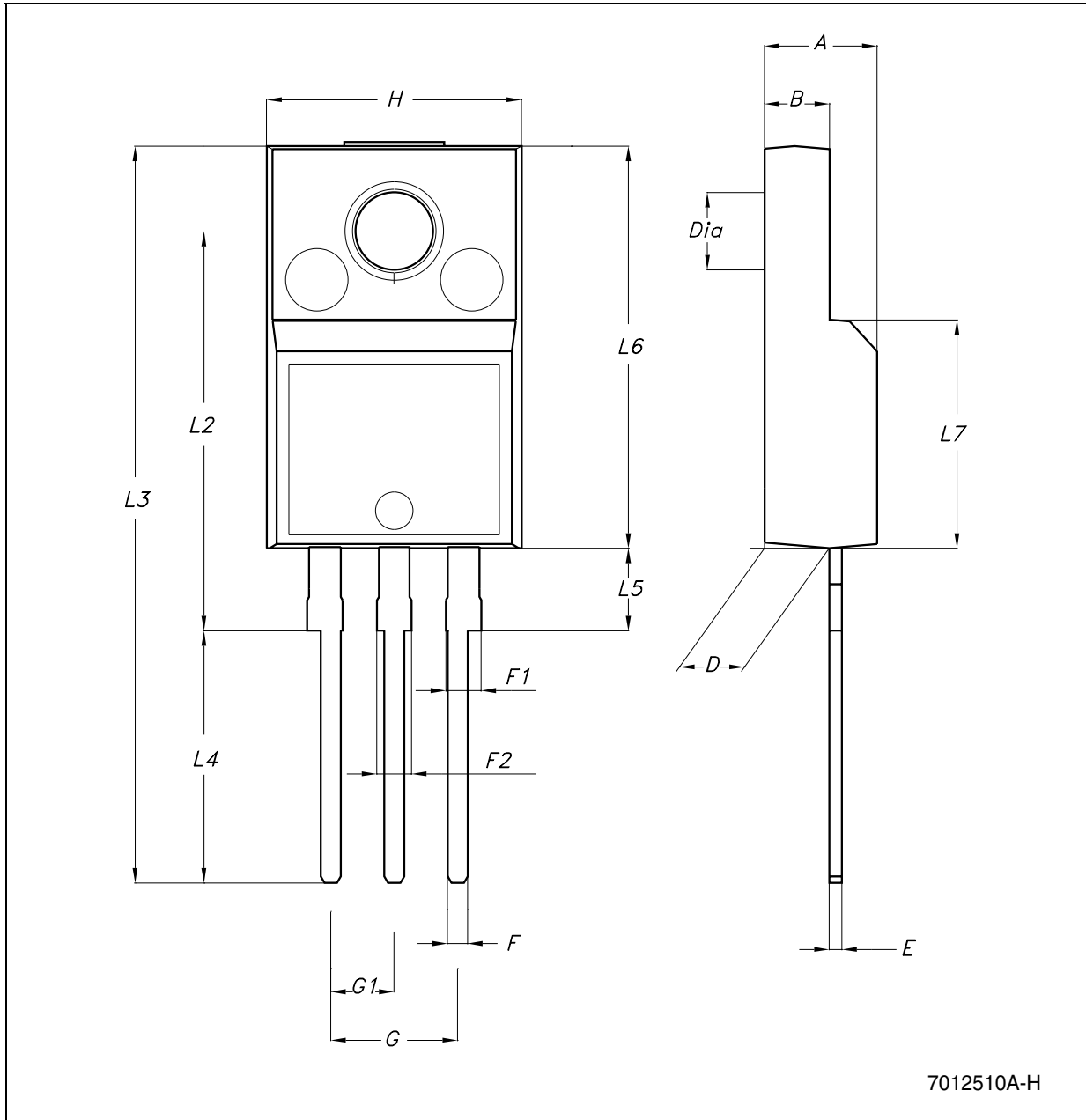


Table 24. TO-220 mechanical data

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	
ØP	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.

Figure 40. Drawing dimension TO-220FP



7012510A-H

Table 25. 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 41. Drawing dimension TO-3

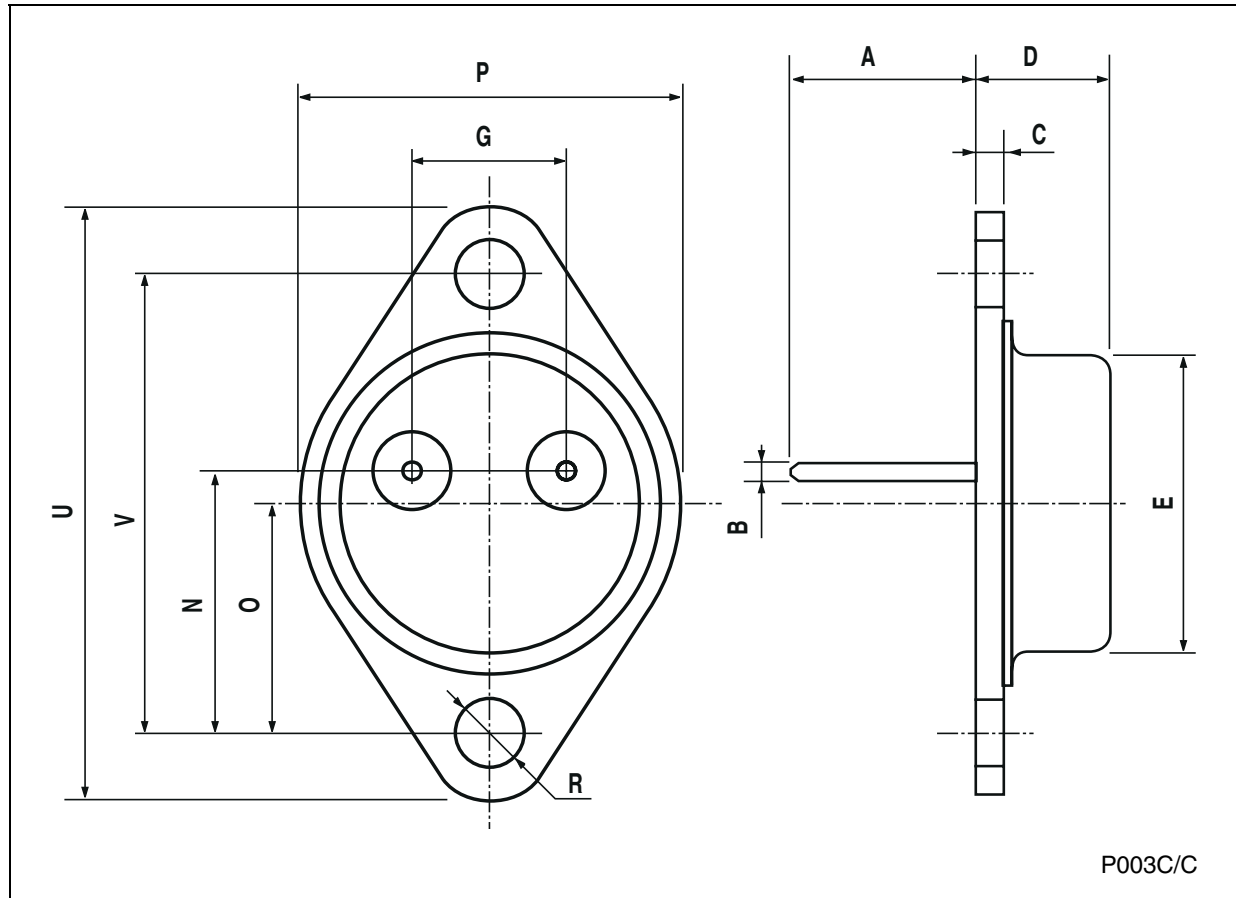
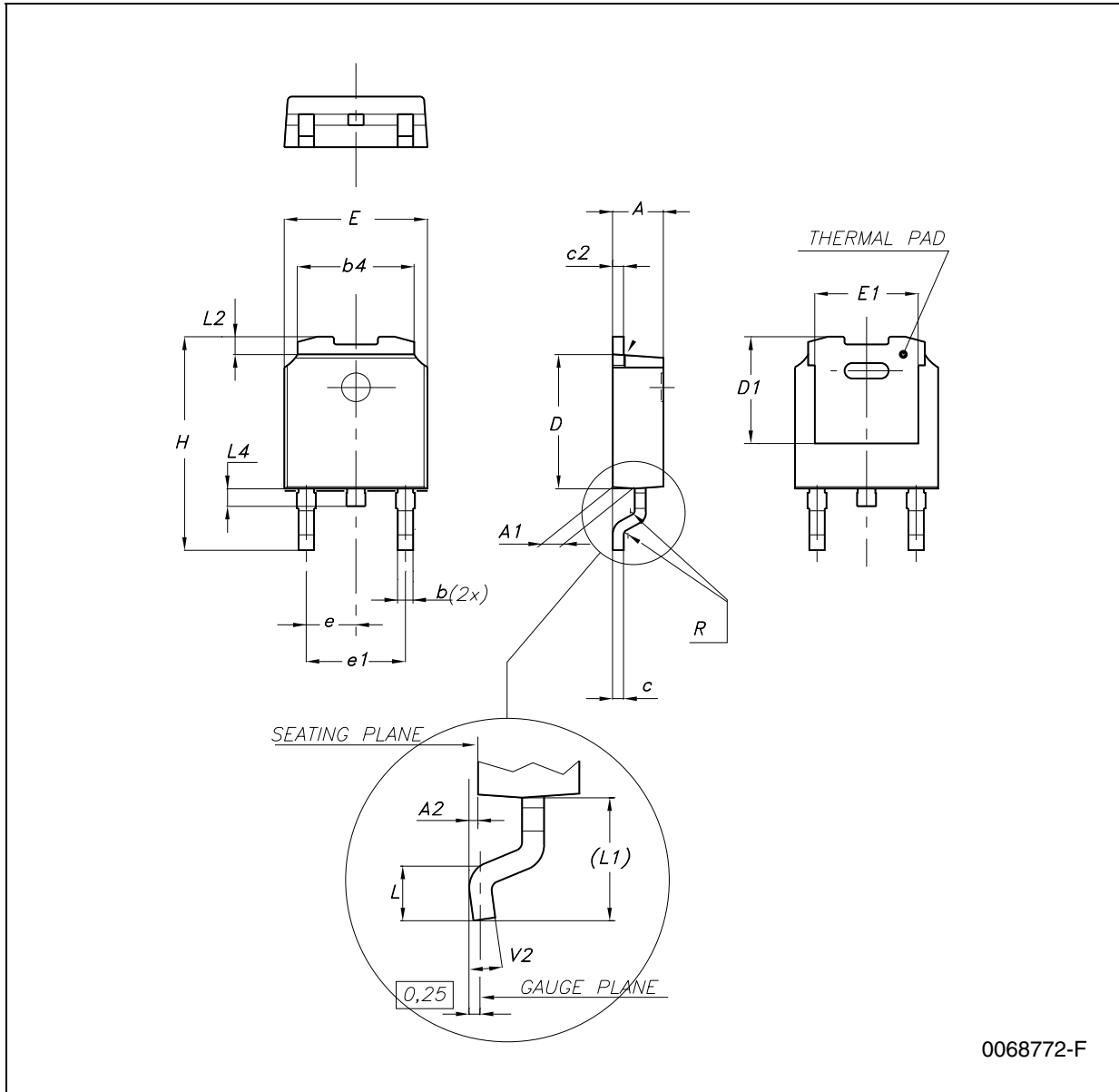


Table 26. TO-3 mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		11.85			0.466	
B	0.96	1.05	1.10	0.037	0.041	0.043
C			1.70			0.066
D			8.7			0.342
E			20.0			0.787
G		10.9			0.429	
N		16.9			0.665	
P			26.2			1.031
R	3.88		4.09	0.152		0.161
U			39.5			1.555
V		30.10			1.185	

Figure 42. Drawing dimension DPAK



0068772-F

Table 27. DPAK 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
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
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
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°

Figure 43. Drawing dimension tape and reel for DPAK

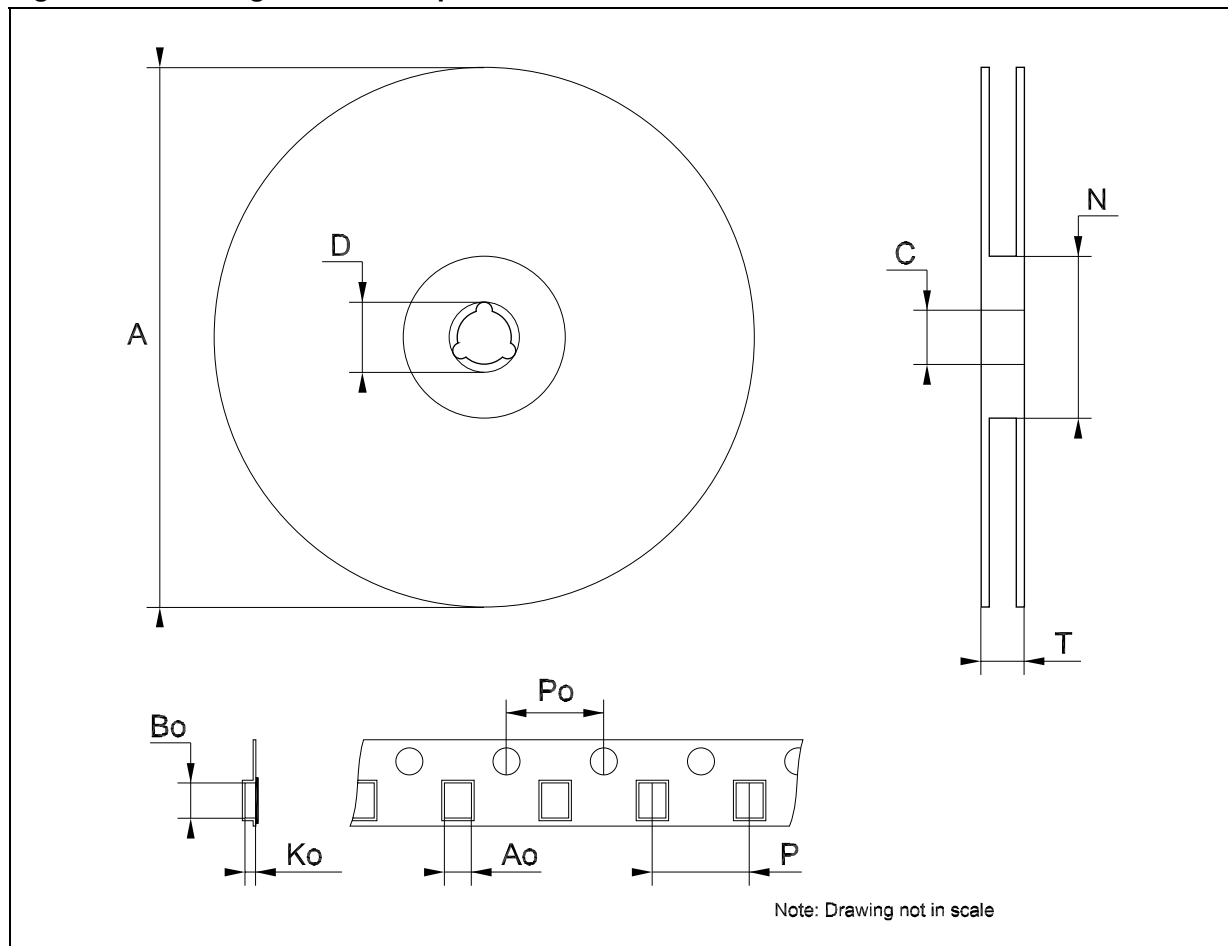


Table 28. Tape and reel DPAK mechanical data

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

Figure 44. Drawing dimension D²PAK (type STD-ST)

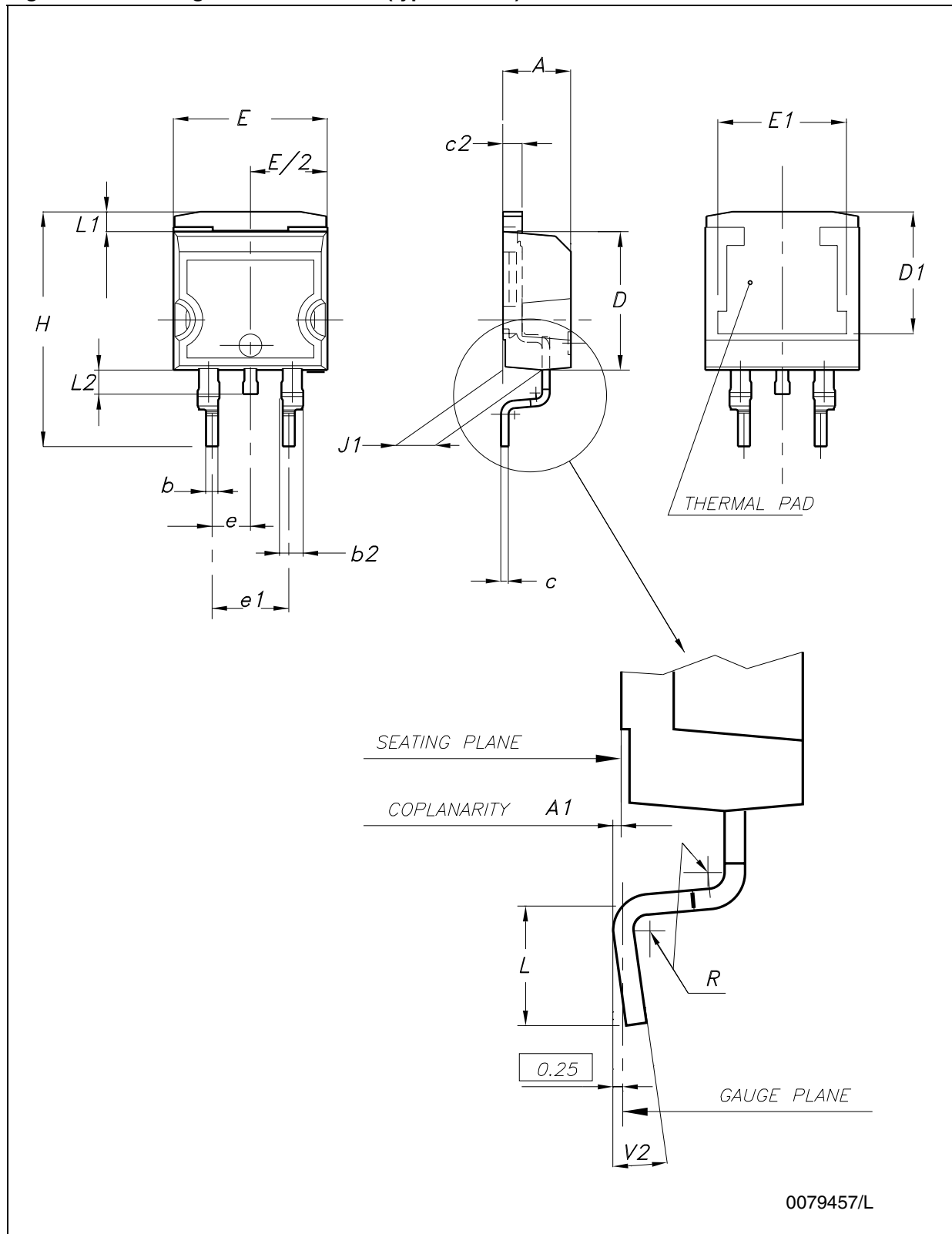


Figure 45. Drawing dimension D²PAK (type WOOSEOK-Subcon.)

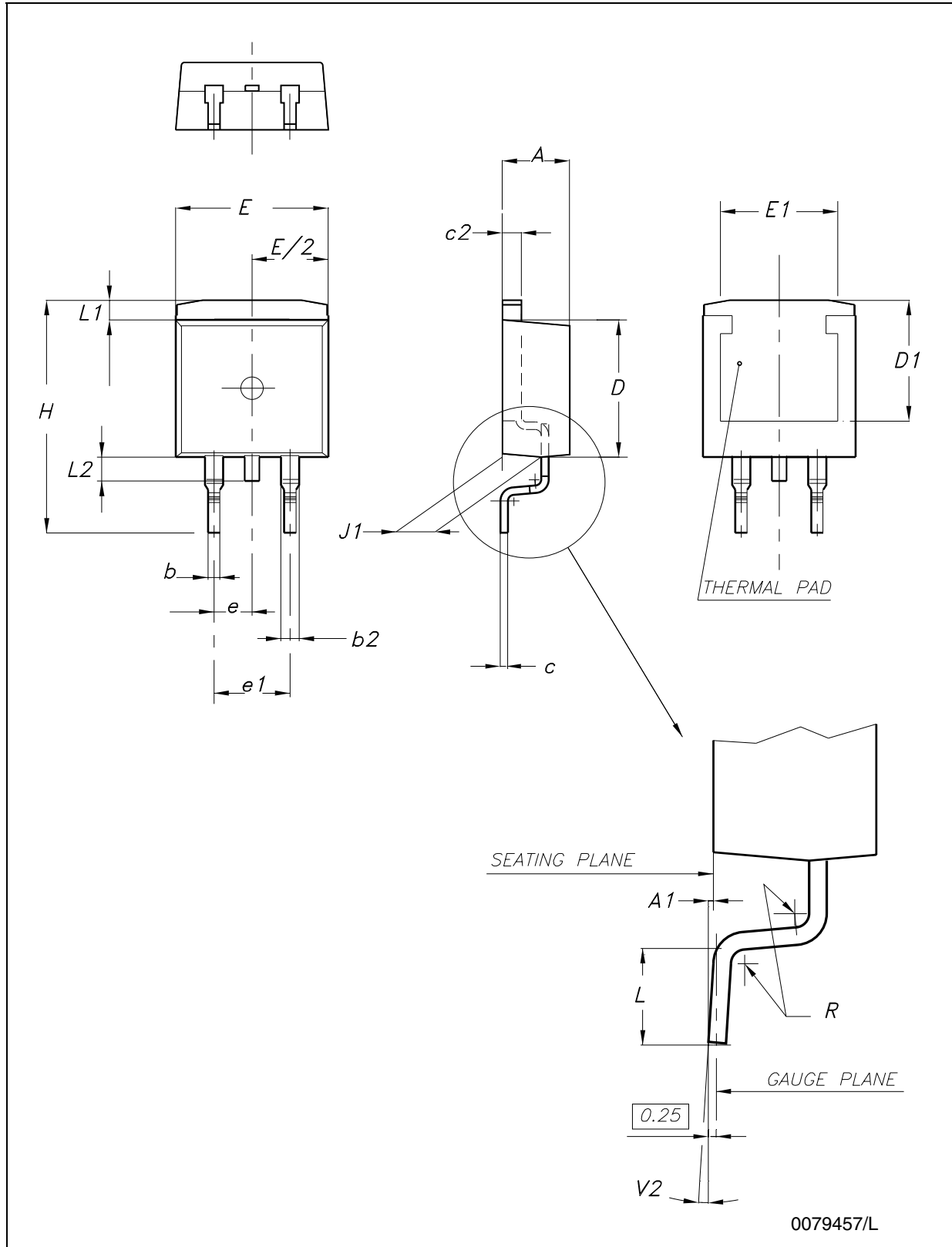


Table 29. D²PAK mechanical data

Dim.	TYPE STD-ST			TYPE WOOSEOK-Subcon.		
	mm.			mm.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	4.30		4.70
A1	0.03		0.23	0		0.20
b	0.70		0.93	0.70		0.90
b2	1.14		1.70	1.17		1.37
c	0.45		0.60	0.45	0.50	0.60
c2	1.23		1.36	1.25	1.30	1.40
D	8.95		9.35	9	9.20	9.40
D1	7.50			7.50		
E	10		10.40	9.80		10.20
E1	8.50			7.50		
e		2.54			2.54	
e1	4.88		5.28		5.08	
H	15		15.85	15	15.30	15.60
J1	2.49		2.69	2.20		2.60
L	2.29		2.79	1.79		2.79
L1	1.27		1.40	1		1.40
L2	1.30		1.75	1.20		1.60
R		0.4			0.30	
V2	0°		8°	0°		3°

Note: The D²PAK package coming from the subcontractor Wooseok is fully compatible with the ST's package suggested footprint.

Figure 46. D²PAK footprint recommended data

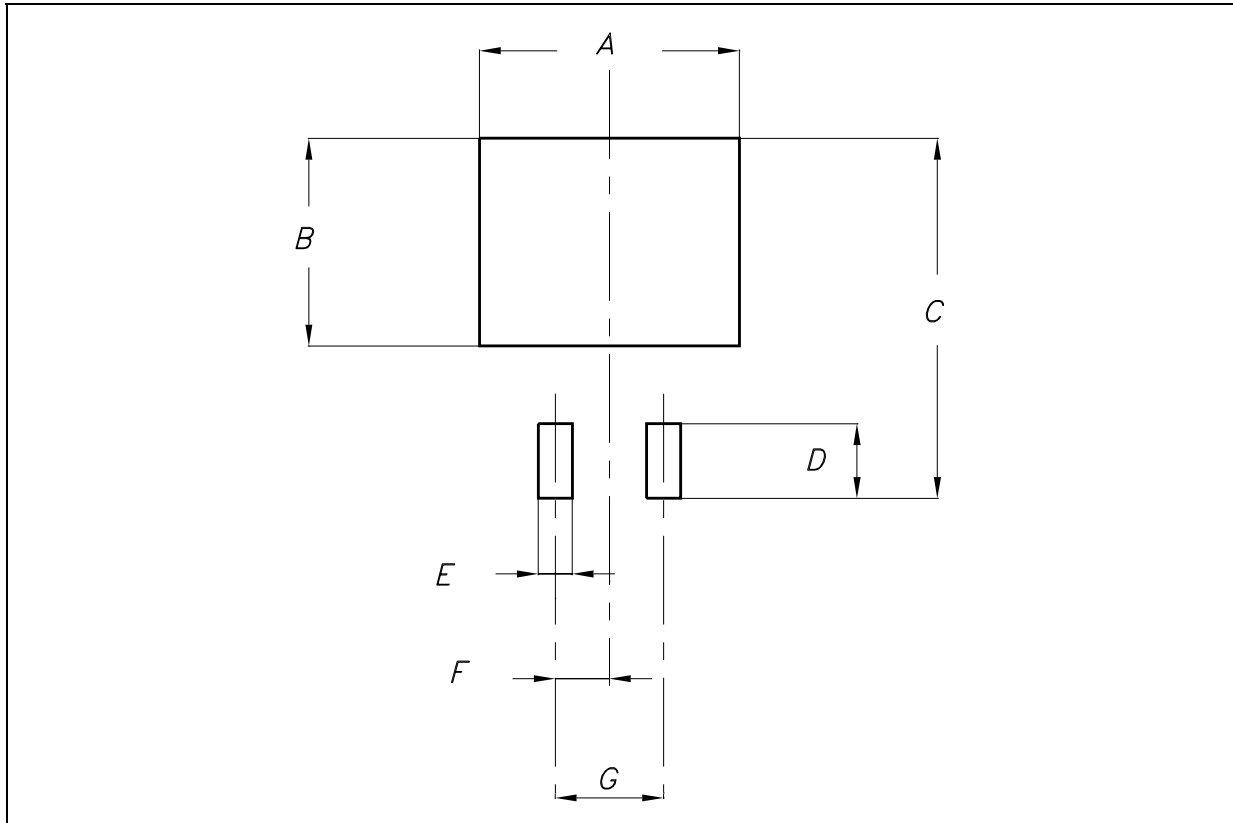


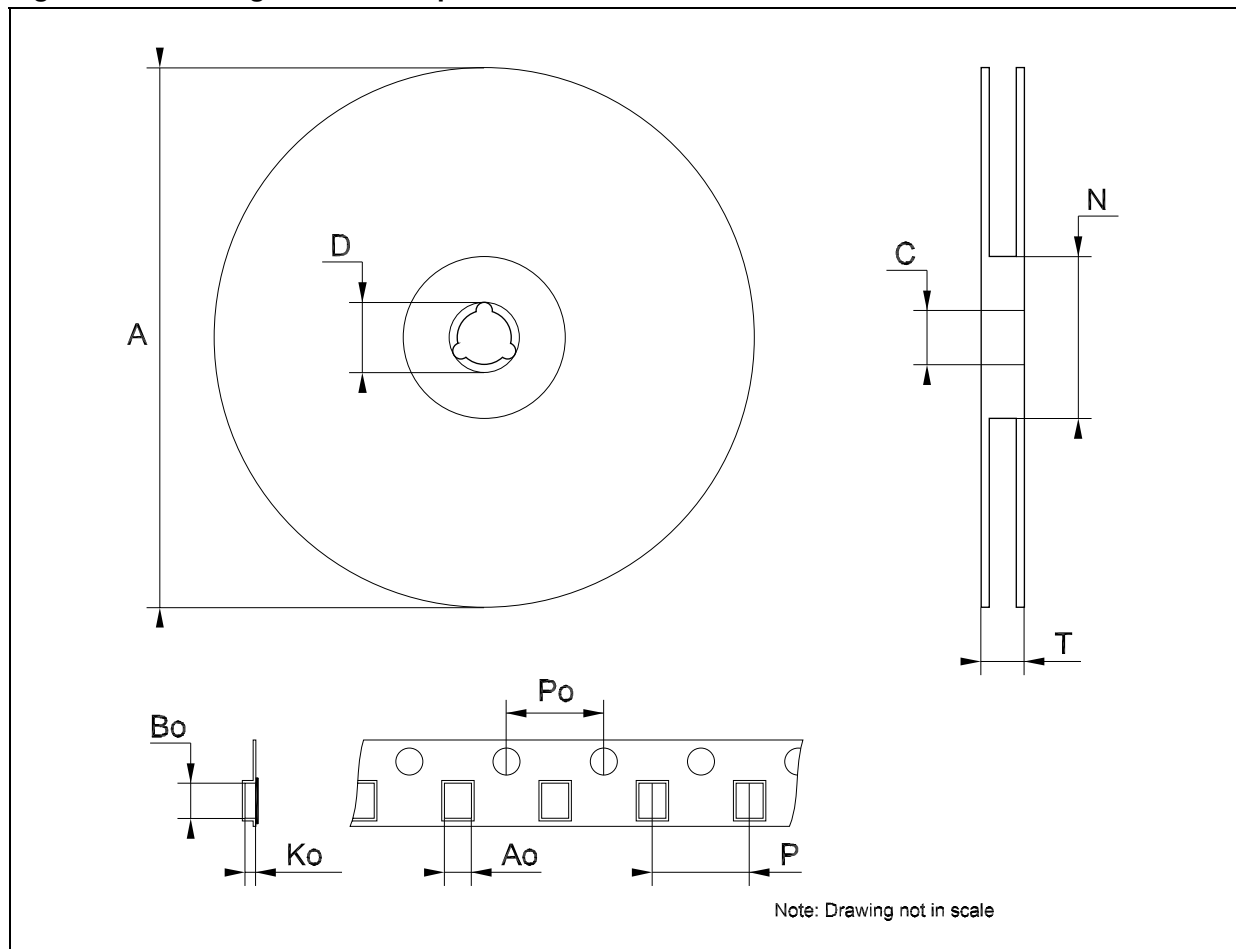
Table 30. D²PAK footprint data

Dim.	Values	
	mm.	inch.
A	12.20	0.480
B	9.75	0.384
C	16.90	0.665
D	3.50	0.138
E	1.60	0.063
F	2.54	0.100
G	5.08	0.200

Table 31. Tape and reel D²PAK mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			180			7.086
C	12.8	13.0	13.2	0.504	0.512	0.519
D	20.2			0.795		
N	60			2.362		
T			14.4			0.567
Ao	10.50	10.6	10.70	0.413	0.417	0.421
Bo	15.70	15.80	15.90	0.618	0.622	0.626
Ko	4.80	4.90	5.00	0.189	0.193	0.197
Po	3.9	4.0	4.1	0.153	0.157	0.161
P	11.9	12.0	12.1	0.468	0.472	0.476

Figure 47. Drawing dimension tape and reel for D²PAK



8 Order codes

Table 32. Order codes

Part numbers	Order codes				
	TO-220	DPAK	D ² PAK	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.

9 Revision history

Table 33. Document revision history

Date	Revision	Changes
21-Jun-2004	12	Document updating.
03-Aug-2006	13	Order codes has been updated and new template.
19-Jan-2007	14	D ² PAK mechanical data has been updated and add footprint data.
31-May-2007	15	Order codes has been updated.
29-Aug-2007	16	Added Table 1 in cover page.
11-Dec-2007	17	Modified: Table 32 .
06-Feb-2008	18	Added: TO-220 mechanical data Figure 38 on page 40 , Figure 39 on page 41 and Table 24 on page 42 . Modified: Table 32 on page 54 .
18-Mar-2008	19	Added: Table 27: DPAK mechanical data on page 47. , Table 28: Tape and reel DPAK mechanical data on page 48 . Modified: Table 32 on page 54 .

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