



# L78xx L78xxC

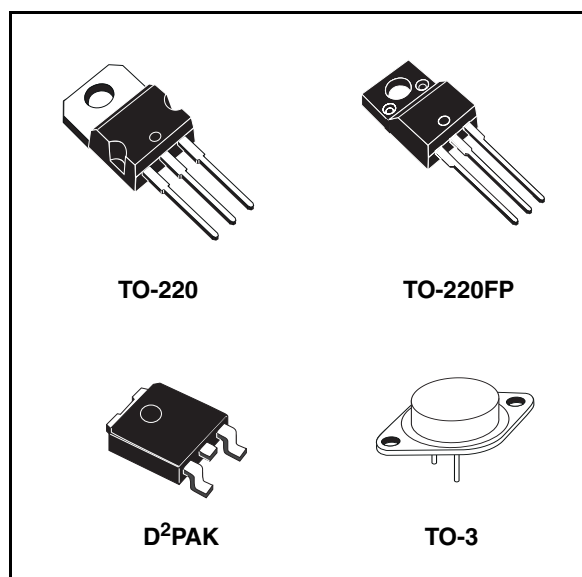
## Positive voltage regulators

### Features

- Output current to 1.5 A
- Output voltages of 5; 5.2; 6; 8; 8.5; 9; 10; 12; 15; 18; 20; 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 and D<sup>2</sup>PAK 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**

Order codes	
L7805	L7810C
L7805C	L7812C
L7852C	L7815C
L7806C	L7818C
L7808C	L7820C
L7885C	L7824C
L7809C	

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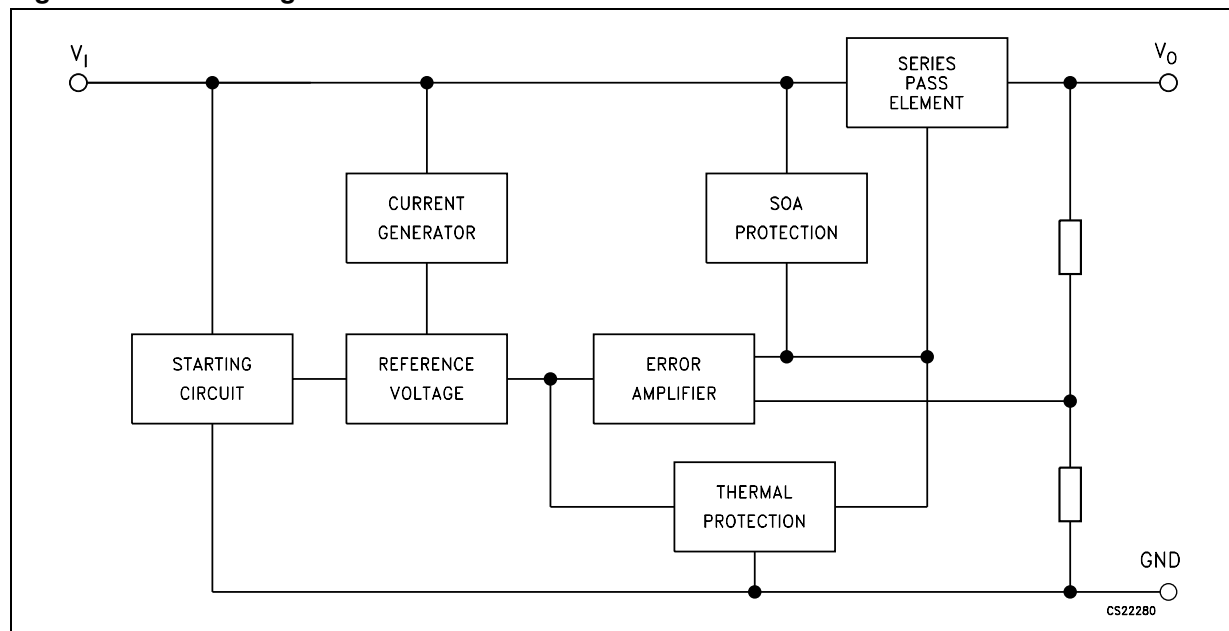
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# 1 Diagram

Figure 1. Block diagram



## 2 Pin configuration

Figure 2. Pin connections (top view)

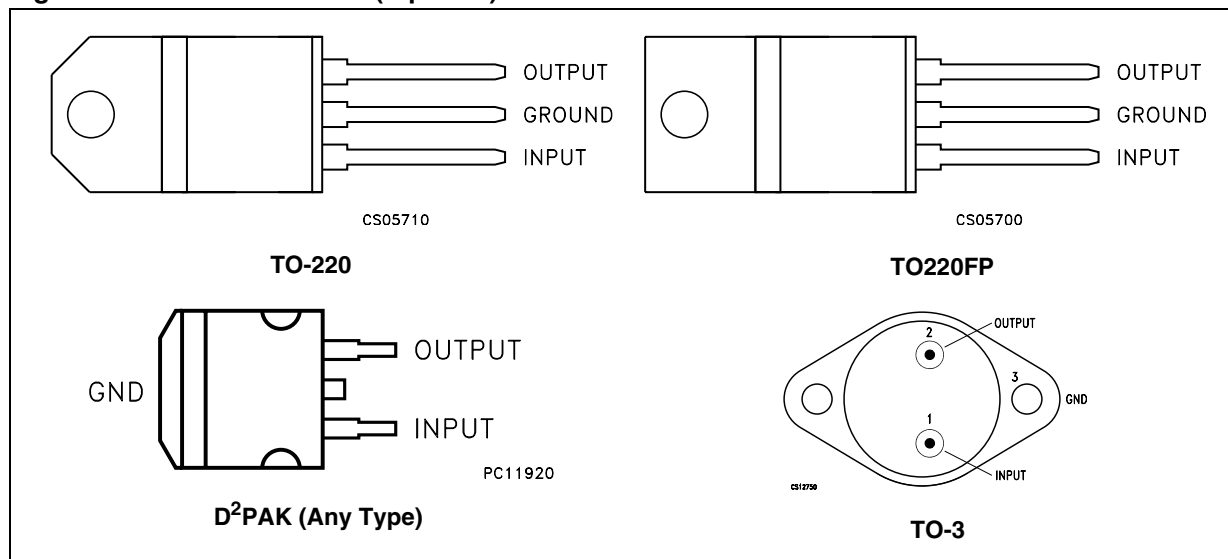
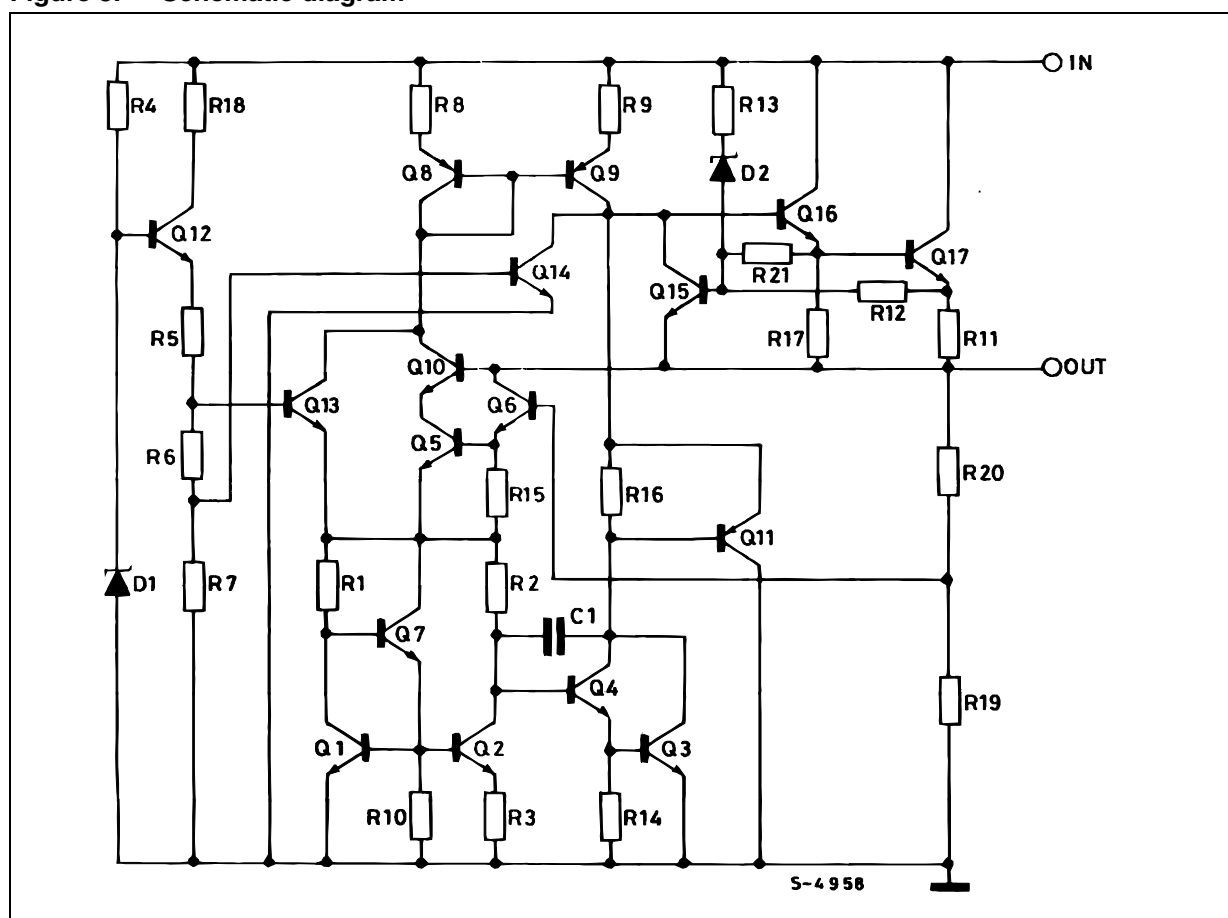


Figure 3. Schematic diagram



### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

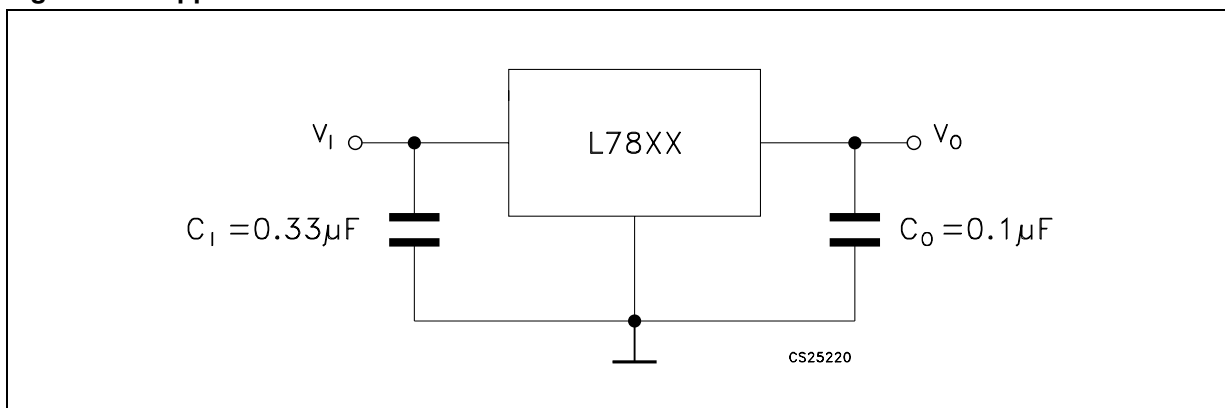
Symbol	Parameter		Value	Unit
$V_I$	DC Input voltage	for $V_O = 5$ to 18 V	35	V
		for $V_O = 20, 24$ V	40	
$I_O$	Output current		Internally Limited	
$P_D$	Power dissipation		Internally Limited	
$T_{STG}$	Storage temperature range		-65 to 150	°C
$T_{OP}$	Operating junction temperature range	for L7800	-55 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 <sup>2</sup> PAK	TO-220	TO-220FP	TO-3	Unit
$R_{thJC}$	Thermal resistance junction-case	3	5	5	4	°C/W
$R_{thJA}$	Thermal resistance junction-ambient	62.5	50	60	35	°C/W

Figure 4. Application circuits





## 4 Test circuits

Figure 5. DC Parameter

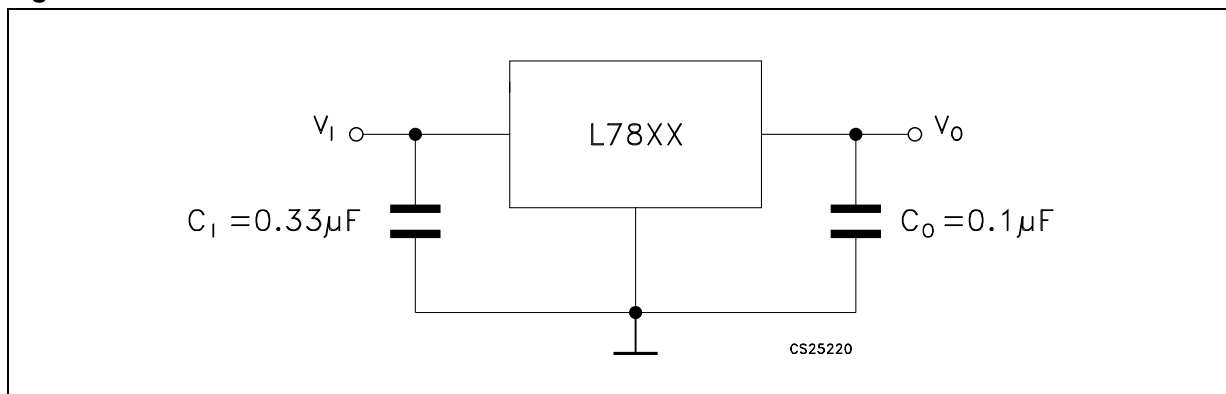


Figure 6. Load regulation

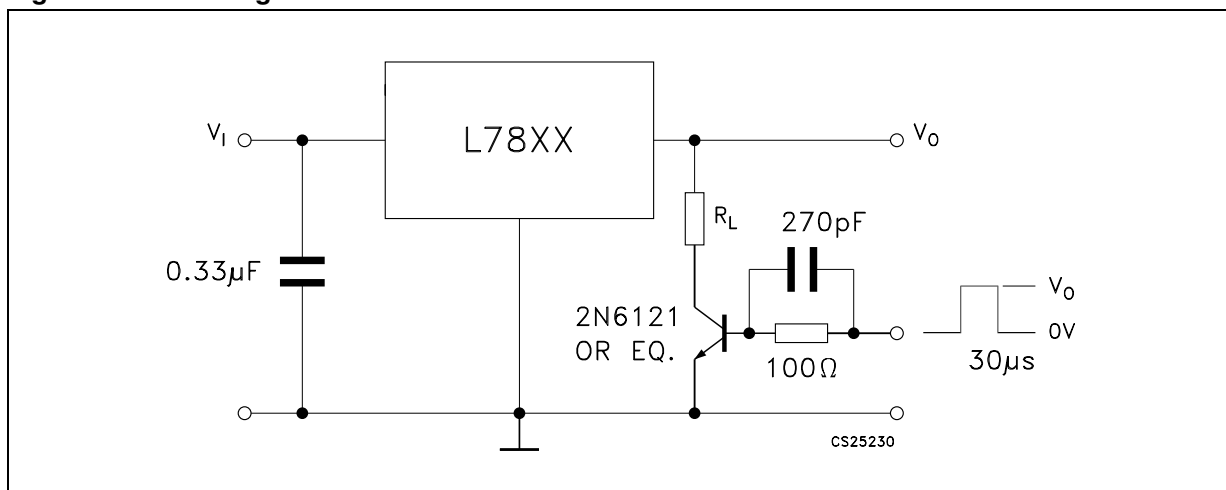
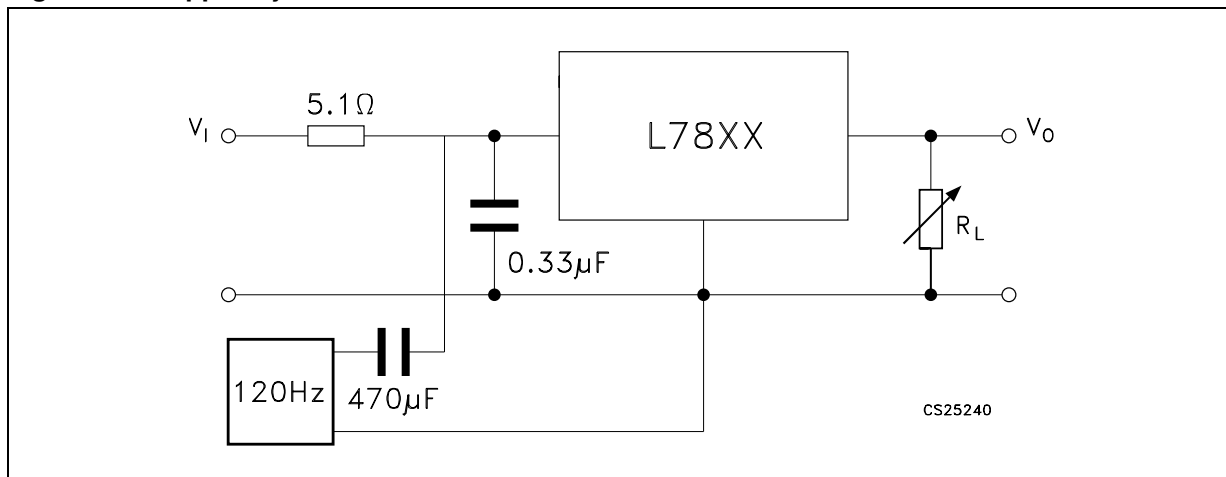


Figure 7. Ripple rejection



## 5 Electrical characteristics

**Table 4. Electrical characteristics of L7805** (refer to the test circuits,  $T_J = -55$  to  $150^\circ\text{C}$ ,  $V_I = 10\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	4.8	5	5.2	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 8\text{ to }20\text{ V}$	4.65	5	5.35	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 7\text{ to }25\text{ V}$ , $T_J = 25^\circ\text{C}$		3	50	mV
		$V_I = 8\text{ to }12\text{ V}$ , $T_J = 25^\circ\text{C}$		1	25	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			100	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			25	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 8\text{ to }25\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		0.6		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 8\text{ to }18\text{ V}$ , $f = 120\text{ Hz}$	68			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2	2.5	V
$R_O$	Output resistance	$f = 1\text{ KHz}$		17		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 5. Electrical characteristics of L7806** (refer to the test circuits,  $T_J = -55$  to  $150^\circ\text{C}$ ,  $V_I = 11\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	7.7	8	8.3	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 11.5\text{ to }23\text{ V}$	7.6	8	8.4	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 10.5\text{ to }25\text{ V}$ , $T_J = 25^\circ\text{C}$			80	mV
		$V_I = 11\text{ to }17\text{ V}$ , $T_J = 25^\circ\text{C}$			40	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			100	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			40	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 11.5\text{ to }25\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 11.5\text{ to }21.5\text{ V}$ , $f = 120\text{ Hz}$	62			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2	2.5	V
$R_O$	Output resistance	$f = 1\text{ KHz}$		16		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 7. Electrical characteristics of L7812** (refer to the test circuits,  $T_J = -55$  to  $150^\circ\text{C}$ ,  $V_I = 19\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	14.4	15	15.6	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 18.5\text{ to }30\text{ V}$	14.25	15	15.75	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 17.5\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$			150	mV
		$V_I = 20\text{ to }26\text{ V}$ , $T_J = 25^\circ\text{C}$			75	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			150	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			75	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 18.5\text{ to }30\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		1.8		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 18.5\text{ to }28.5\text{ V}$ , $f = 120\text{ Hz}$	60			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2	2.5	V
$R_O$	Output resistance	$f = 1\text{ KHz}$		19		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 9. Electrical characteristics of L7818** (refer to the test circuits,  $T_J = -55$  to  $150^\circ\text{C}$ ,  $V_I = 26\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	17.3	18	18.7	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 22\text{ to }33\text{ V}$	17.1	18	18.9	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 21\text{ to }33\text{ V}$ , $T_J = 25^\circ\text{C}$			180	mV
		$V_I = 24\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$			90	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			180	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			90	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 22\text{ to }33\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		2.3		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 22\text{ to }32\text{ V}$ , $f = 120\text{ Hz}$	59			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2	2.5	V
$R_O$	Output resistance	$f = 1\text{ KHz}$		22		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.



**L78xx - L78xxC**

**Electrical characteristics**

**Table 10. Electrical characteristics of L7820** (refer to the test circuits,  $T_J = -55$  to  $150^\circ\text{C}$ ,  $V_I = 28\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	19.2	20	20.8	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 24\text{ to }35\text{ V}$	19	20	21	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 22.5\text{ to }35\text{ V}$ , $T_J = 25^\circ\text{C}$			200	mV
		$V_I = 26\text{ to }32\text{ V}$ , $T_J = 25^\circ\text{C}$			100	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			200	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			100	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			6	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 24\text{ to }35\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		2.5		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$			40	$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 24\text{ to }35\text{ V}$ , $f = 120\text{ Hz}$	58			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2	2.5	V
$R_O$	Output resistance	$f = 1\text{ KHz}$		24		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 11. Electrical characteristics of L7824** (refer to the test circuits,  $T_J = -55$  to  $150^\circ\text{C}$ ,  $V_I = 33\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	4.8	5	5.2	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 7\text{ to }20\text{ V}$	4.75	5	5.25	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 7\text{ to }25\text{ V}$ , $T_J = 25^\circ\text{C}$		3	100	mV
		$V_I = 8\text{ to }12\text{ V}$ , $T_J = 25^\circ\text{C}$		1	50	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			100	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			50	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 7\text{ to }25\text{ V}$			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-1.1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		40		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 8\text{ to }18\text{ V}$ , $f = 120\text{ Hz}$	62			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		17		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 13. Electrical characteristics of L7852C** (refer to the test circuits,  $T_J = 0$  to  $150^\circ\text{C}$ ,  $V_I = 10\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	5.75	6	6.25	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 8\text{ to }21\text{ V}$	5.7	6	6.3	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 8\text{ to }25\text{ V}$ , $T_J = 25^\circ\text{C}$			120	mV
		$V_I = 9\text{ to }13\text{ V}$ , $T_J = 25^\circ\text{C}$			60	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			120	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			60	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 8\text{ to }25\text{ V}$			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-0.8		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		45		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 9\text{ to }19\text{ V}$ , $f = 120\text{ Hz}$	59			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		19		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 15. Electrical characteristics of L7808C** (refer to the test circuits,  $T_J = 0$  to  $150^\circ\text{C}$ ,  $V_I = 14\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	8.2	8.5	8.8	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 11\text{ to }26\text{ V}$	8.1	8.5	8.9	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 11\text{ to }27\text{ V}$ , $T_J = 25^\circ\text{C}$			160	mV
		$V_I = 11.5\text{ to }17.5\text{ V}$ , $T_J = 25^\circ\text{C}$			80	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			160	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			80	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 11\text{ to }27\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-0.8		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		55		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 12\text{ to }22\text{ V}$ , $f = 120\text{ Hz}$	56			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		16		$\text{m}\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 17. Electrical characteristics of L7809C** (refer to the test circuits,  $T_J = 0$  to  $150^\circ\text{C}$ ,  $V_I = 15\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	8.64	9	9.36	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 11.5\text{ to }26\text{ V}$	8.55	9	9.45	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 11.5\text{ to }26\text{ V}$ , $T_J = 25^\circ\text{C}$			180	mV
		$V_I = 12\text{ to }18\text{ V}$ , $T_J = 25^\circ\text{C}$			90	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			180	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			90	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 11.5\text{ to }26\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		70		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 12\text{ to }23\text{ V}$ , $f = 120\text{ Hz}$	55			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		17		$\text{m}\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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  $150^\circ\text{C}$ ,  $V_I = 15\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	9.6	10	10.4	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 12.5\text{ to }26\text{ V}$	9.5	10	10.5	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 12.5\text{ to }26\text{ V}$ , $T_J = 25^\circ\text{C}$			200	mV
		$V_I = 13.5\text{ to }19\text{ V}$ , $T_J = 25^\circ\text{C}$			100	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			200	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			100	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 12.5\text{ to }26\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		70		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 13\text{ to }23\text{ V}$ , $f = 120\text{ Hz}$	55			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		17		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 19. Electrical characteristics of L7812C** (refer to the test circuits,  $T_J = 0$  to  $150^\circ\text{C}$ ,  $V_I = 19\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	11.5	12	12.5	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 14.5\text{ to }27\text{ V}$	11.4	12	12.6	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 14.5\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$			240	mV
		$V_I = 16\text{ to }22\text{ V}$ , $T_J = 25^\circ\text{C}$			120	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			240	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			120	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 14.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		75		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 15\text{ to }25\text{ V}$ , $f = 120\text{ Hz}$	55			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		18		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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  $150^\circ\text{C}$ ,  $V_I = 23\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	14.5	15	15.6	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 17.5\text{ to }30\text{ V}$	14.25	15	15.75	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 17.5\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$			300	mV
		$V_I = 20\text{ to }26\text{ V}$ , $T_J = 25^\circ\text{C}$			150	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			300	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			150	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 17.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		90		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 18.5\text{ to }28.5\text{ V}$ , $f = 120\text{ Hz}$	54			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		19		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 21. Electrical characteristics of L7818C** (refer to the test circuits,  $T_J = 0$  to  $150^\circ\text{C}$ ,  $V_I = 26\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	17.3	18	18.7	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 21\text{ to }33\text{ V}$	17.1	18	18.9	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 21\text{ to }33\text{ V}$ , $T_J = 25^\circ\text{C}$			360	mV
		$V_I = 24\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$			180	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			360	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			180	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 21\text{ to }33\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		110		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 22\text{ to }32\text{ V}$ , $f = 120\text{ Hz}$	53			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		22		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**L78xx - L78xxC**

**Electrical characteristics**

**Table 22. Electrical characteristics of L7820C** (refer to the test circuits,  $T_J = 0$  to  $150^\circ\text{C}$ ,  $V_I = 28\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	19.2	20	20.8	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 23\text{ to }35\text{ V}$	19	20	21	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 22.5\text{ to }35\text{ V}$ , $T_J = 25^\circ\text{C}$			400	mV
		$V_I = 26\text{ to }32\text{ V}$ , $T_J = 25^\circ\text{C}$			200	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			400	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			200	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 23\text{ to }35\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		150		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 24\text{ to }35\text{ V}$ , $f = 120\text{ Hz}$	52			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		24		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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.

**Electrical characteristics**

**L78xx - L78xxC**

**Table 23. Electrical characteristics of L7824C** (refer to the test circuits,  $T_J = 0$  to  $150^\circ\text{C}$ ,  $V_I = 33\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage	$T_J = 25^\circ\text{C}$	23	24	25	V
$V_O$	Output voltage	$I_O = 5\text{ mA to }1\text{ A}$ , $P_O \leq 15\text{ W}$ $V_I = 27\text{ to }38\text{ V}$	22.8	24	25.2	V
$\Delta V_O^{(1)}$	Line regulation	$V_I = 27\text{ to }38\text{ V}$ , $T_J = 25^\circ\text{C}$			480	mV
		$V_I = 30\text{ to }36\text{ V}$ , $T_J = 25^\circ\text{C}$			240	
$\Delta V_O^{(1)}$	Load regulation	$I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$			480	mV
		$I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$			240	
$I_d$	Quiescent current	$T_J = 25^\circ\text{C}$			8	mA
$\Delta I_d$	Quiescent current change	$I_O = 5\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 27\text{ to }38\text{ V}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$		-1.5		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ KHz}$ , $T_J = 25^\circ\text{C}$		170		$\mu\text{V}/V_O$
SVR	Supply voltage rejection	$V_I = 28\text{ to }38\text{ V}$ , $f = 120\text{ Hz}$	50			dB
$V_d$	Dropout voltage	$I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$		2		V
$R_O$	Output resistance	$f = 1\text{ KHz}$		28		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$		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

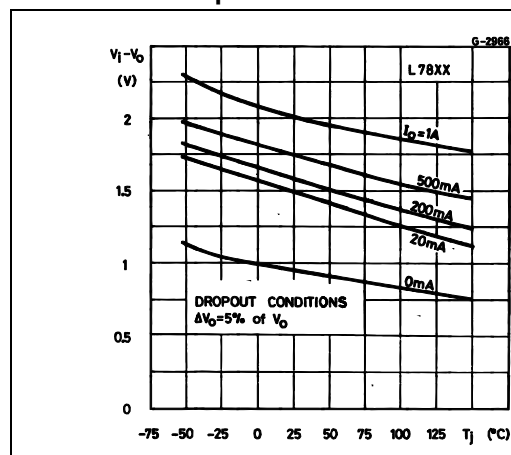


Figure 9. Peak output current vs input/output differential voltage

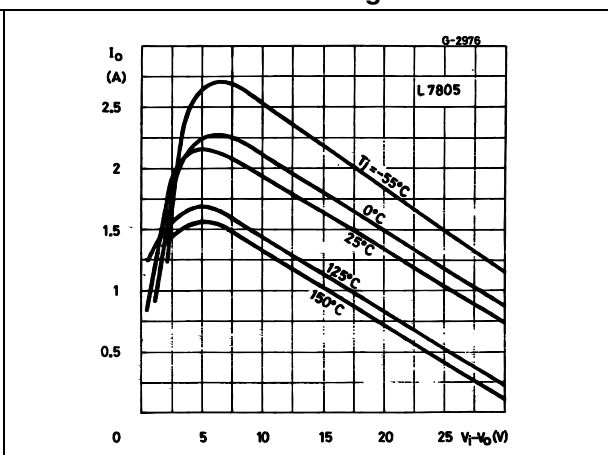


Figure 10. Supply voltage rejection vs frequency

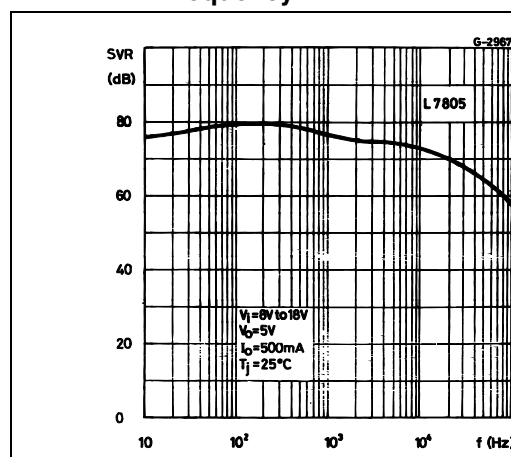


Figure 11. Output voltage vs junction temperature

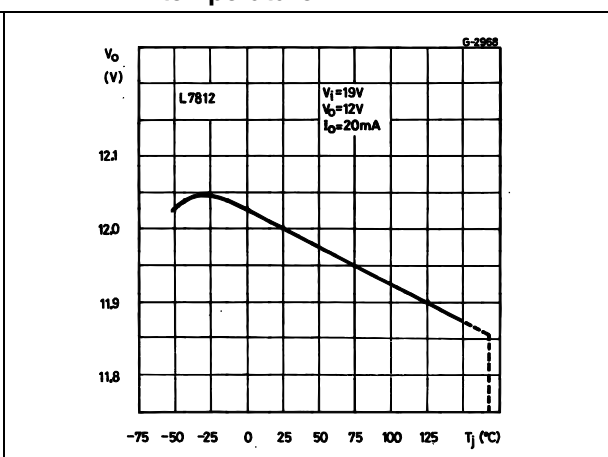


Figure 12. Output impedance vs frequency

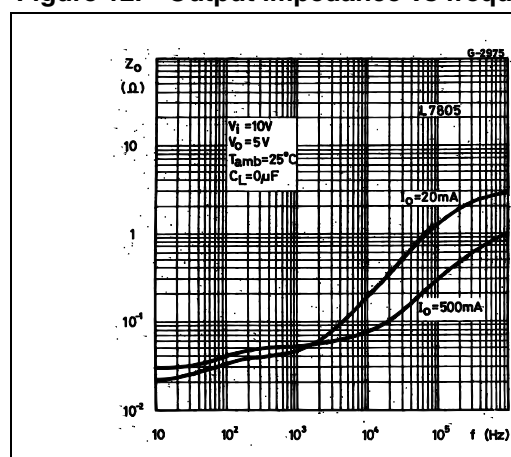


Figure 13. Quiescent current vs junction temp.

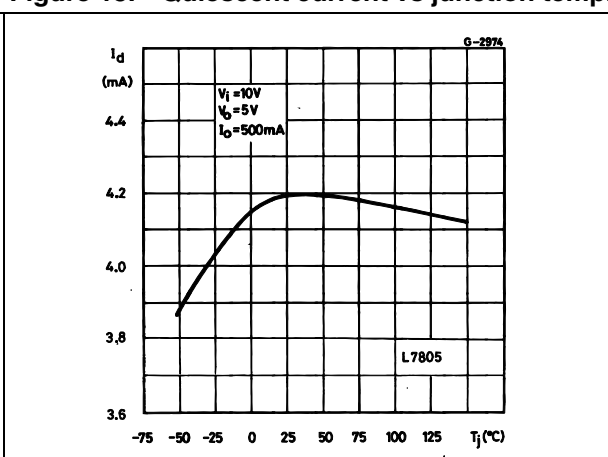


Figure 14. Load transient response

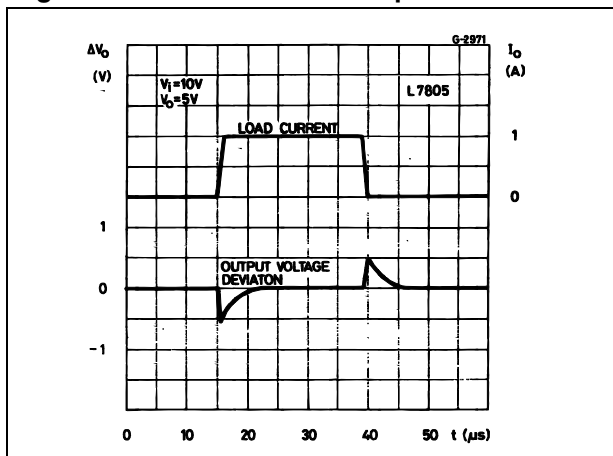


Figure 15. Line transient response

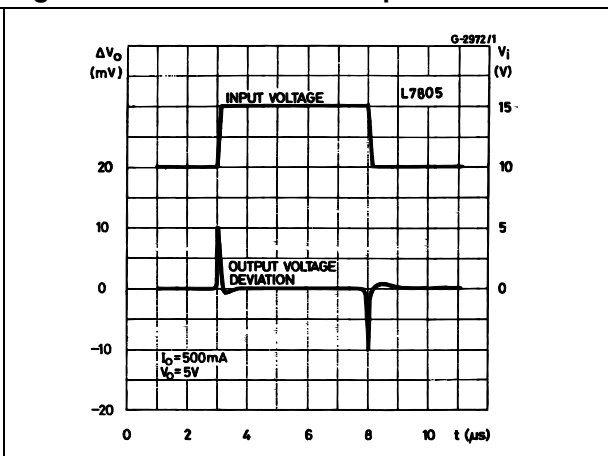


Figure 16. Quiescent current vs input voltage

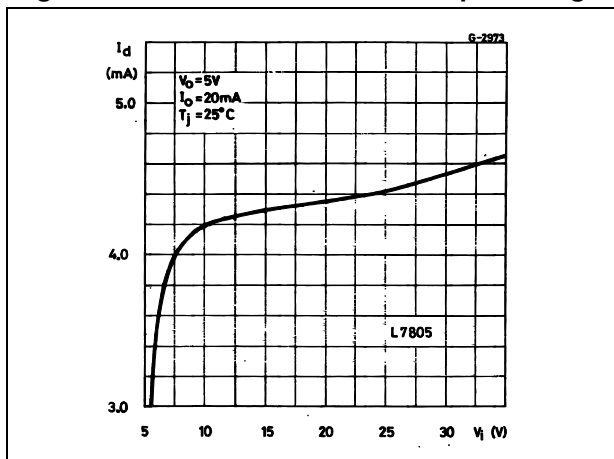
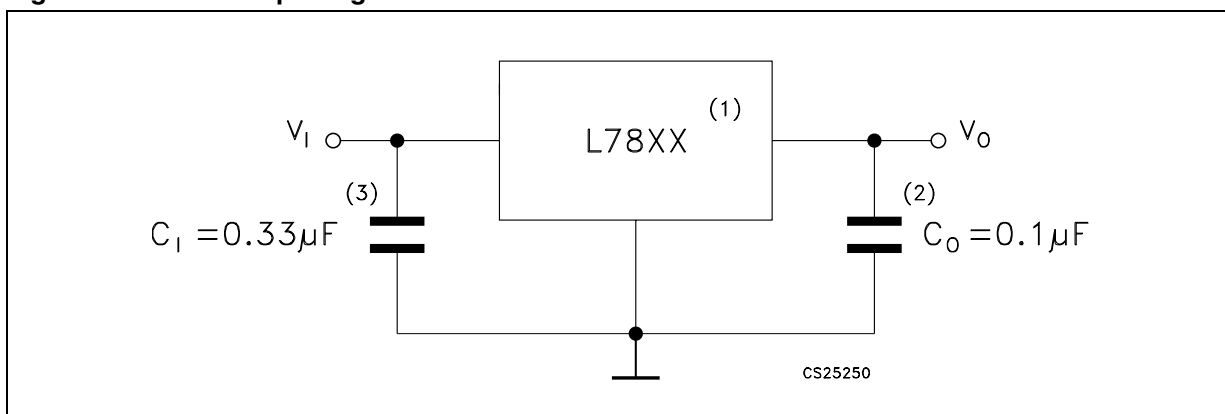


Figure 17. Fixed output regulator



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

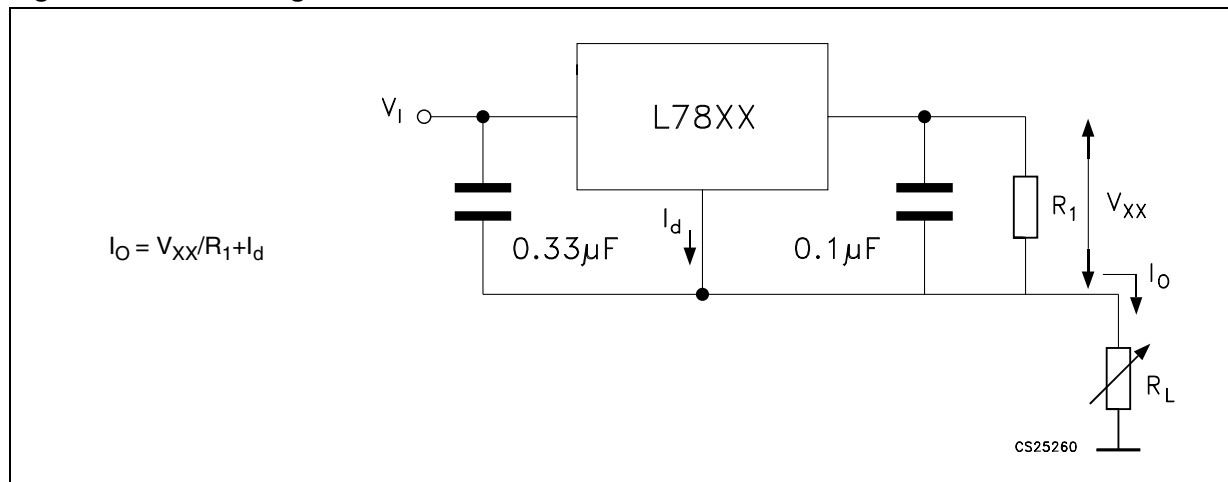


Figure 19. Circuit for increasing output voltage

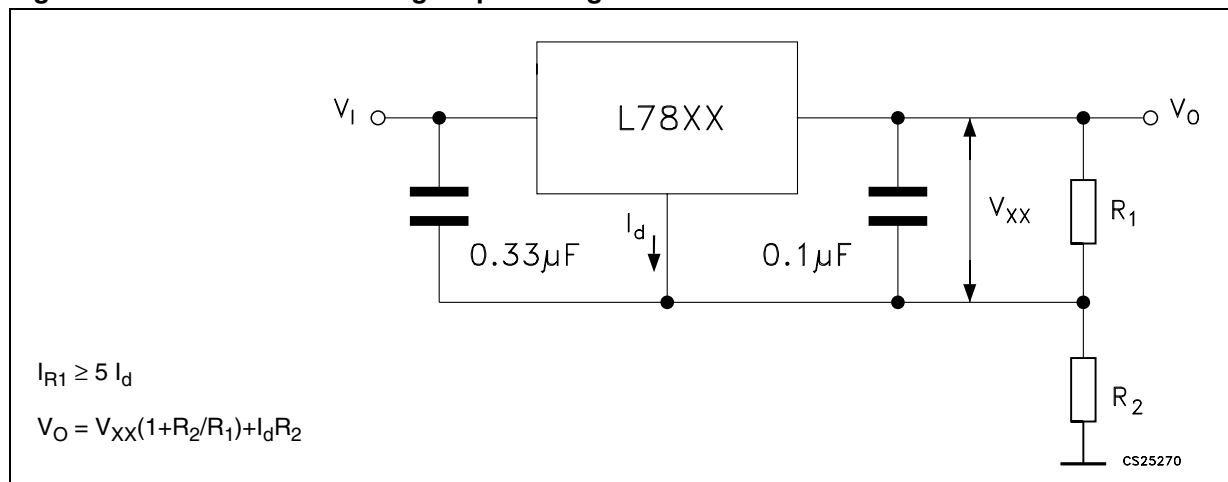


Figure 20. Adjustable output regulator (7 to 30V)

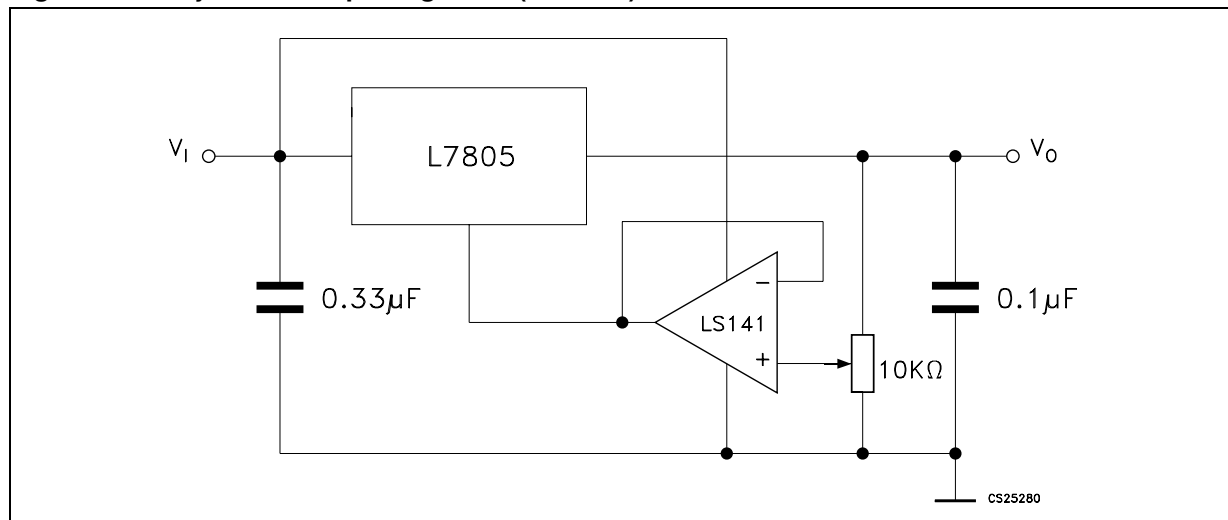


Figure 21. 0.5 to 10V Regulator

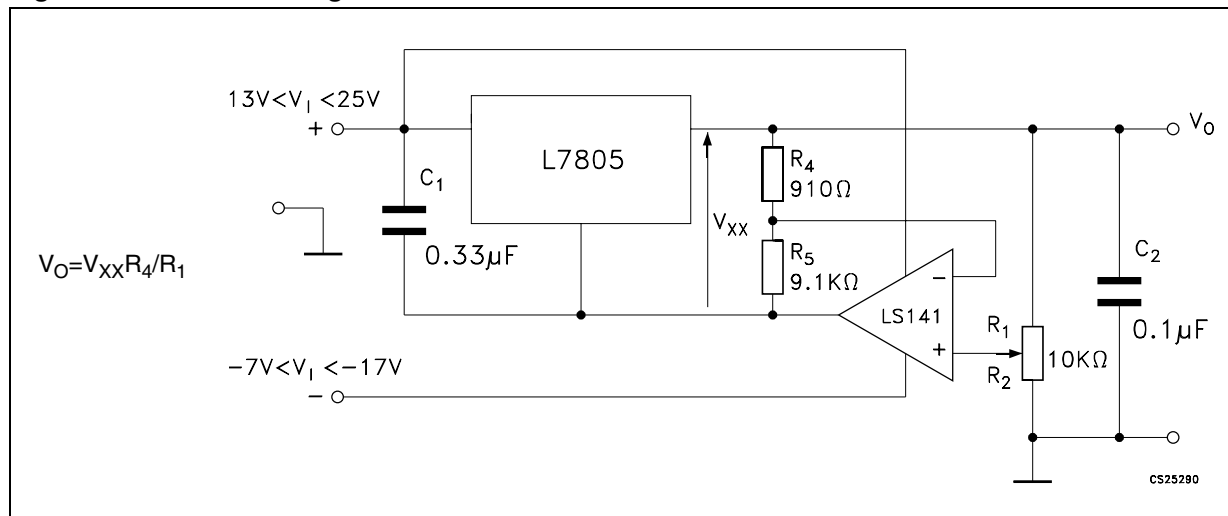


Figure 22. High current voltage regulator

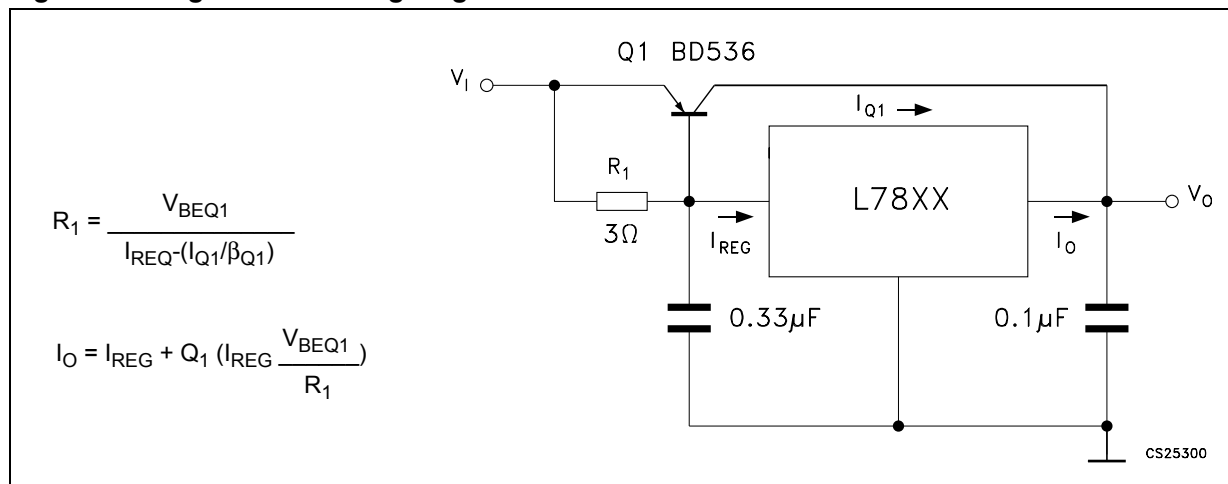


Figure 23. High output current with short circuit protection

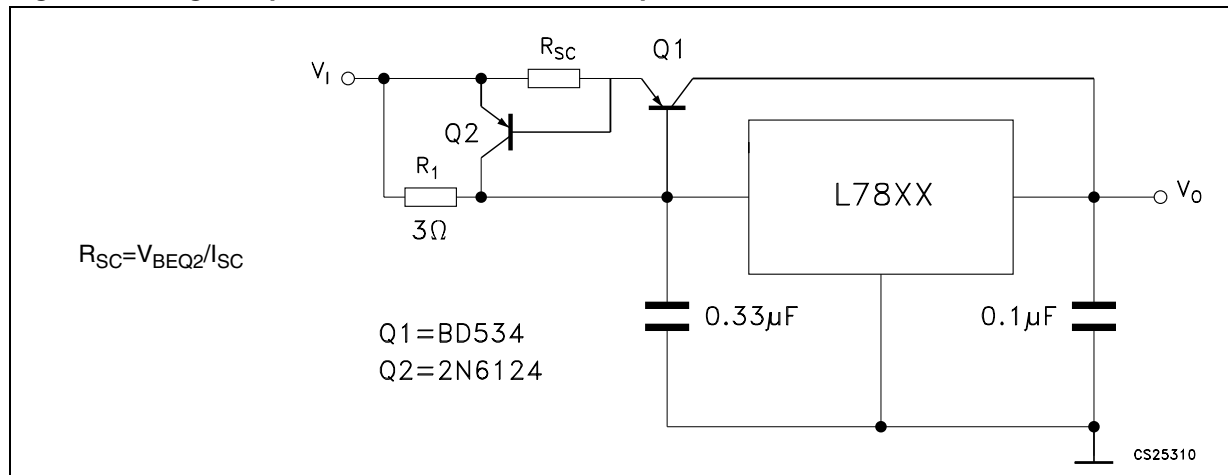




Figure 26. Negative output voltage circuit

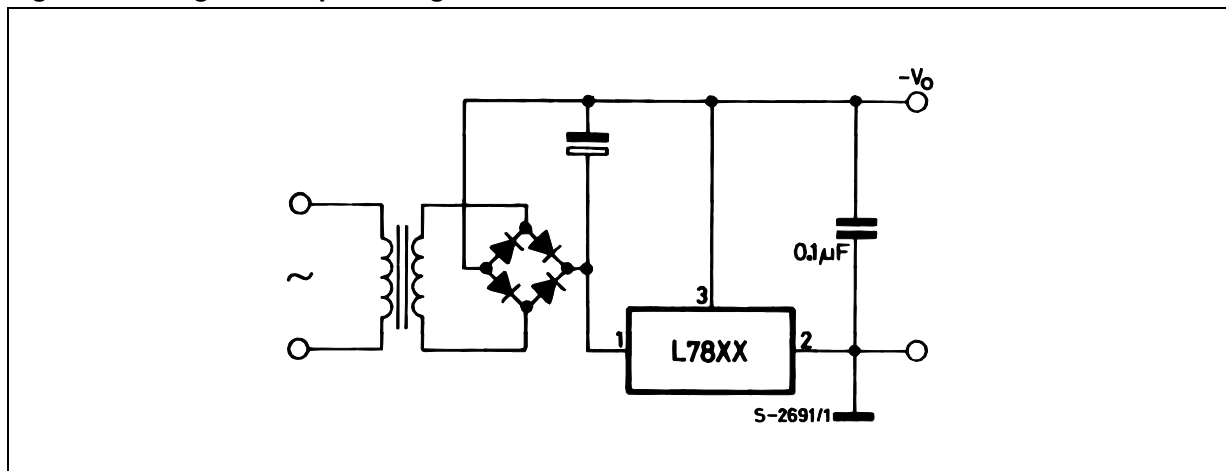


Figure 27. Switching regulator

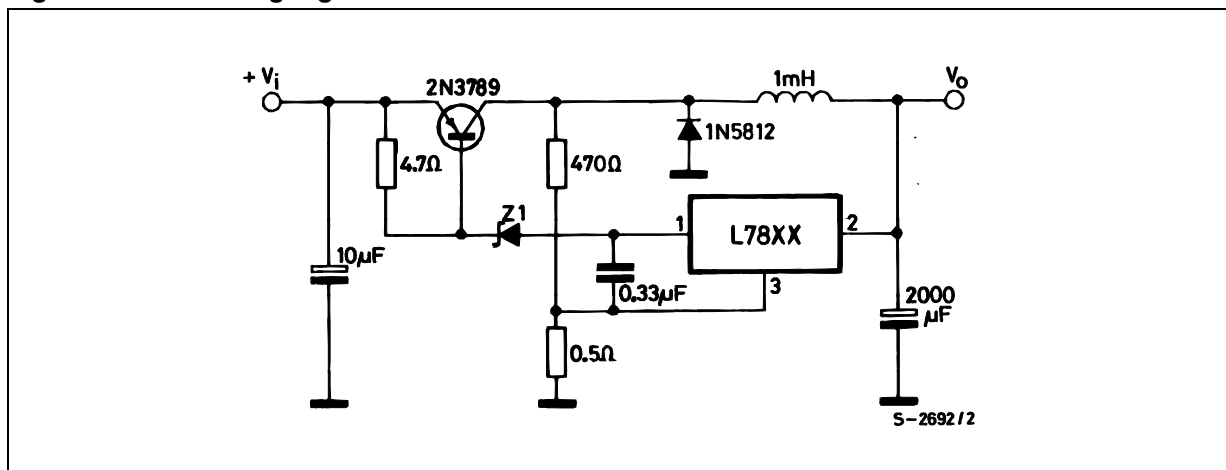


Figure 28. High input voltage circuit

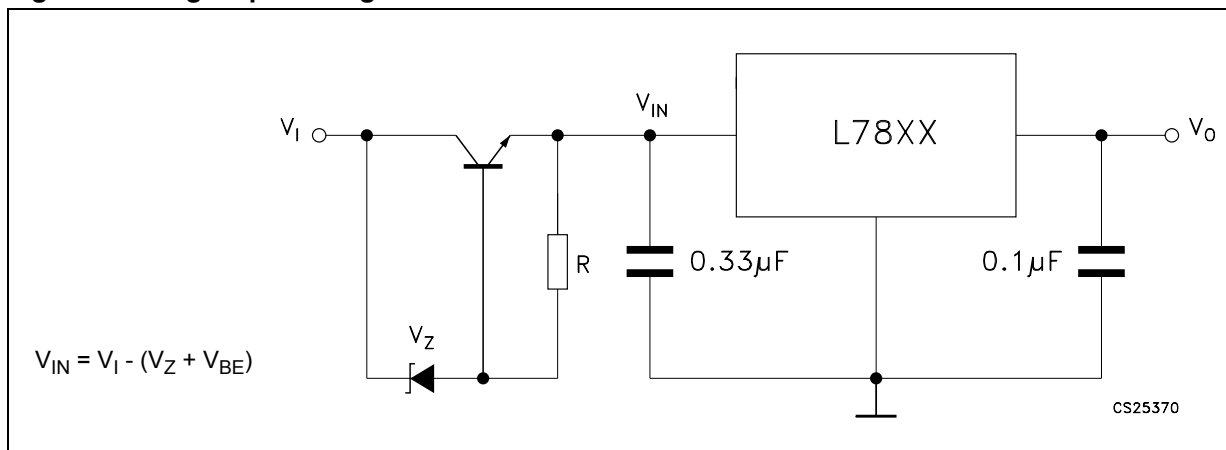


Figure 29. High input voltage circuit

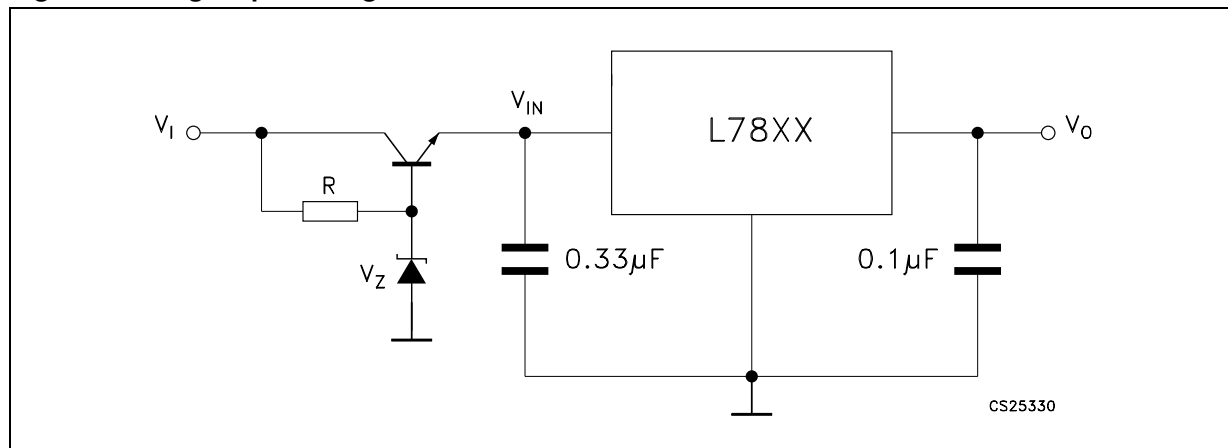


Figure 30. High output voltage regulator

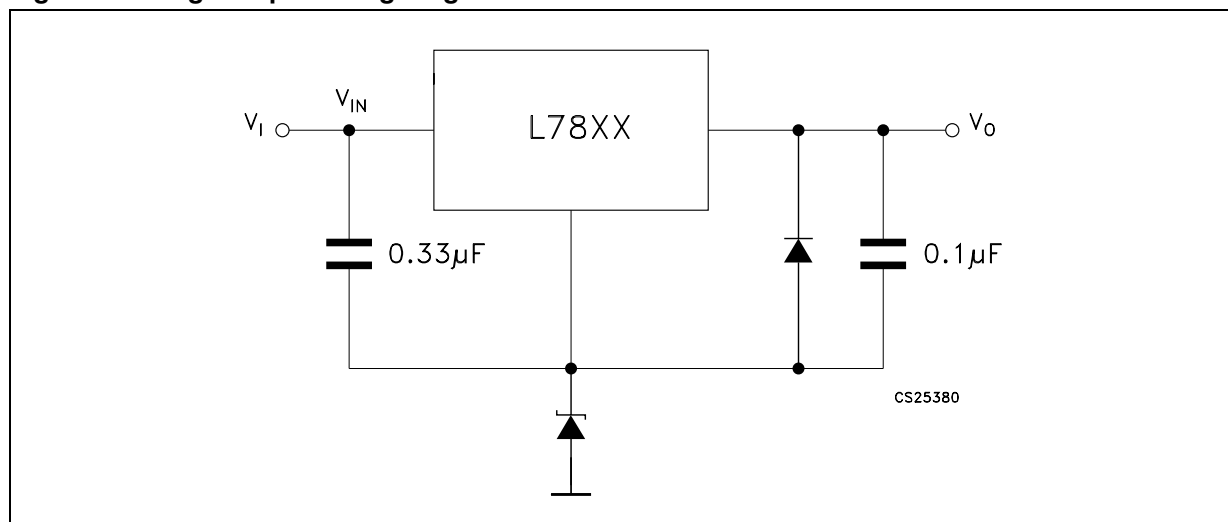
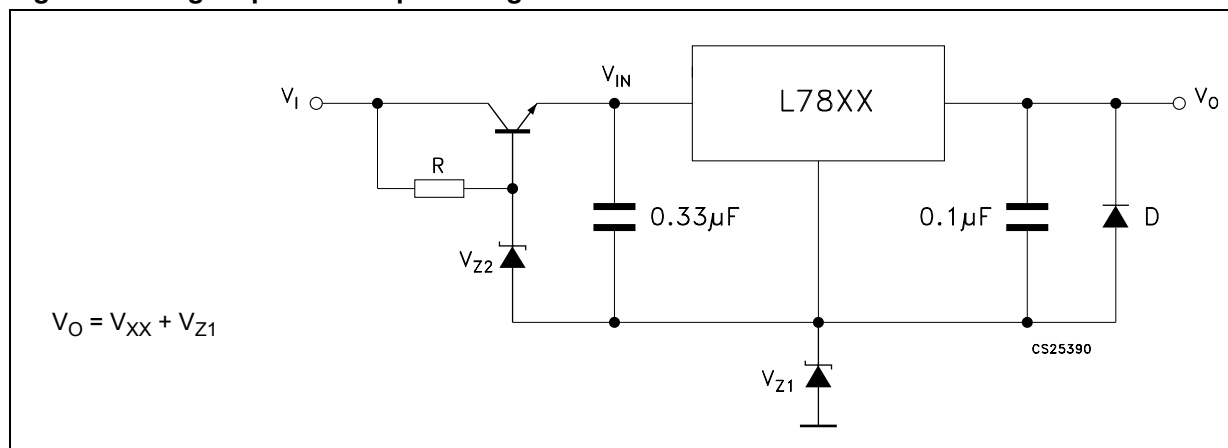
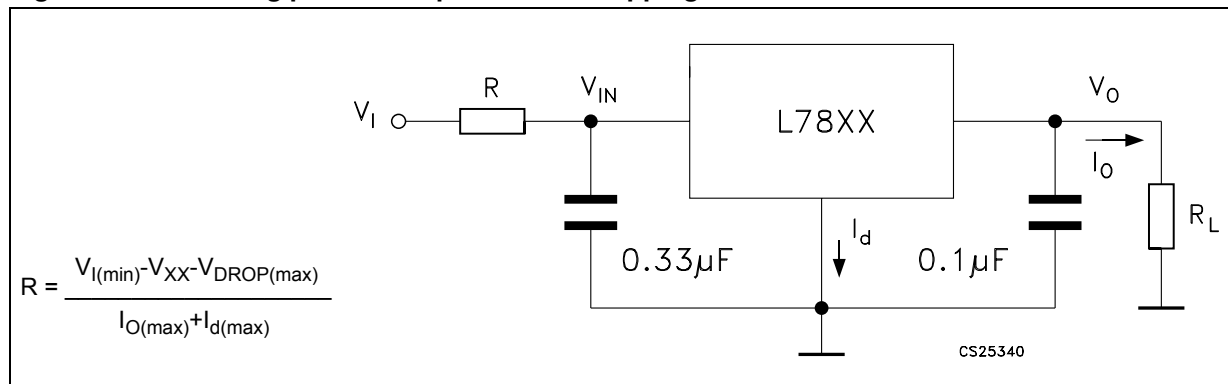


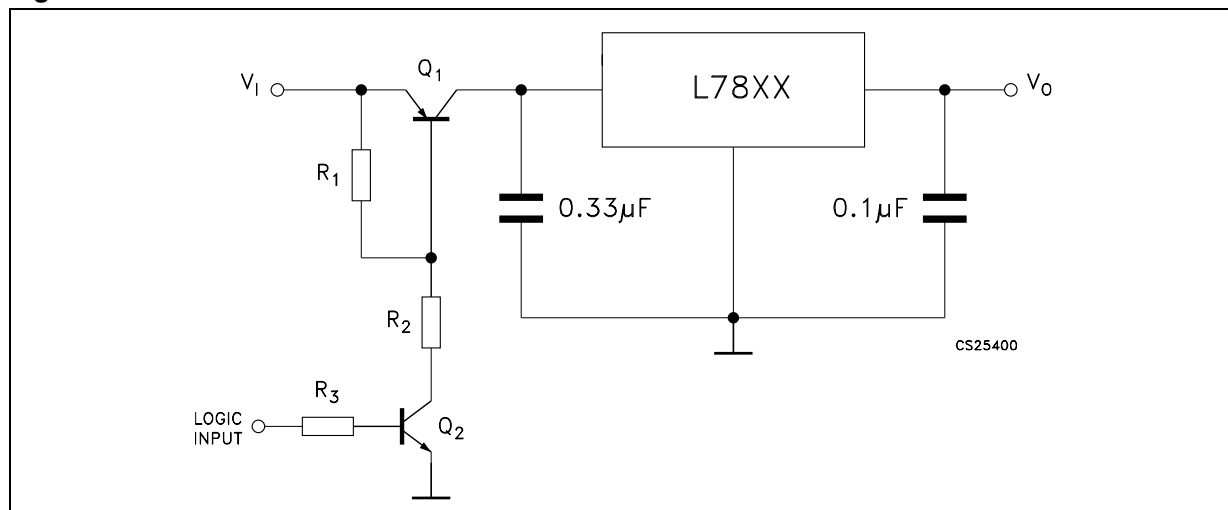
Figure 31. High input and output voltage



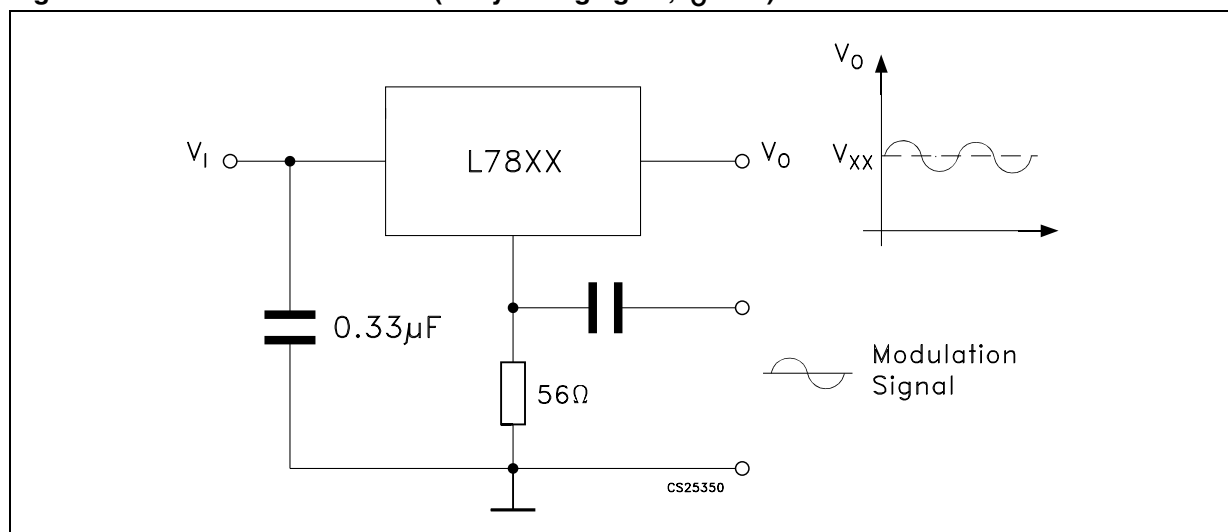
**Figure 32. Reducing power dissipation with dropping resistor**



**Figure 33. Remote shutdown**

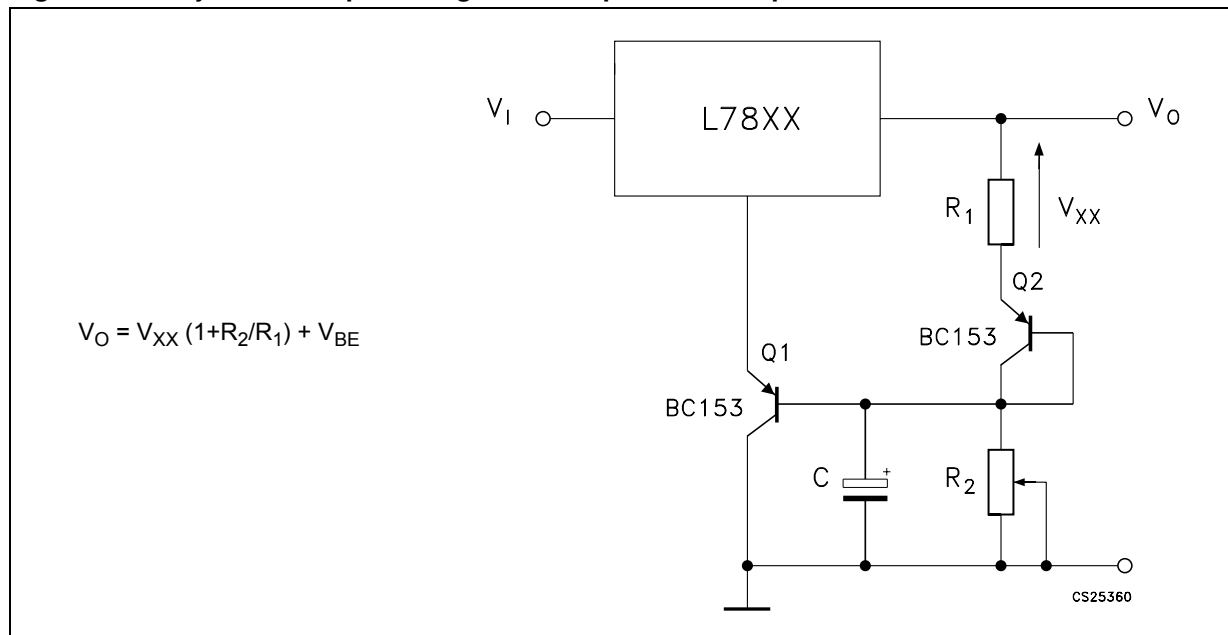


**Figure 34. Power AM modulator (unity voltage gain,  $I_O \leq 0.5$ )**



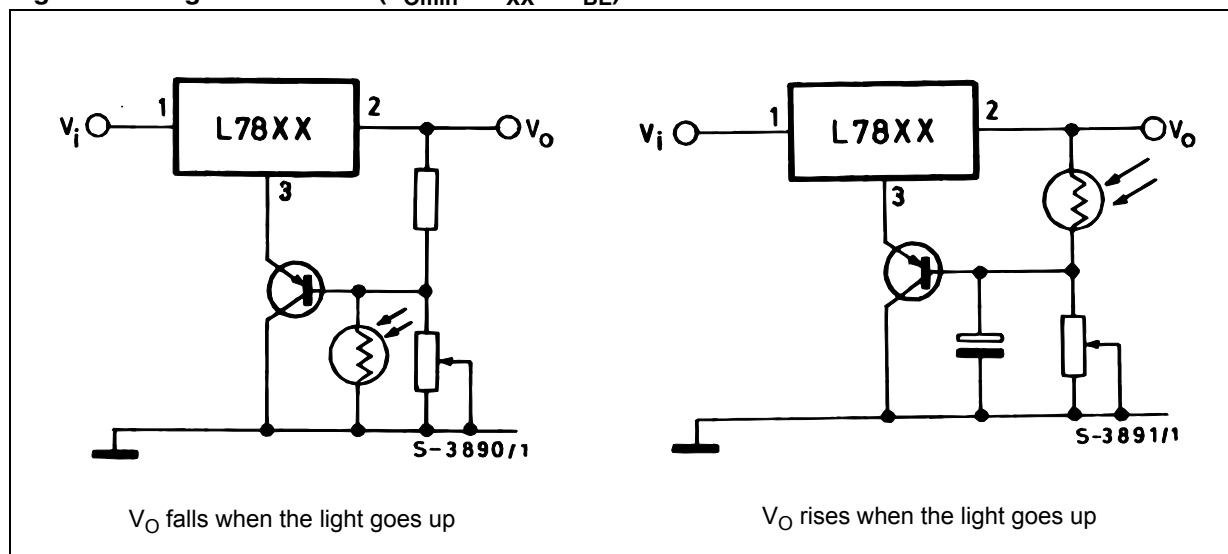
**Note:** The circuit performs well up to 100 KHz.

Figure 35. Adjustable output voltage with temperature compensation

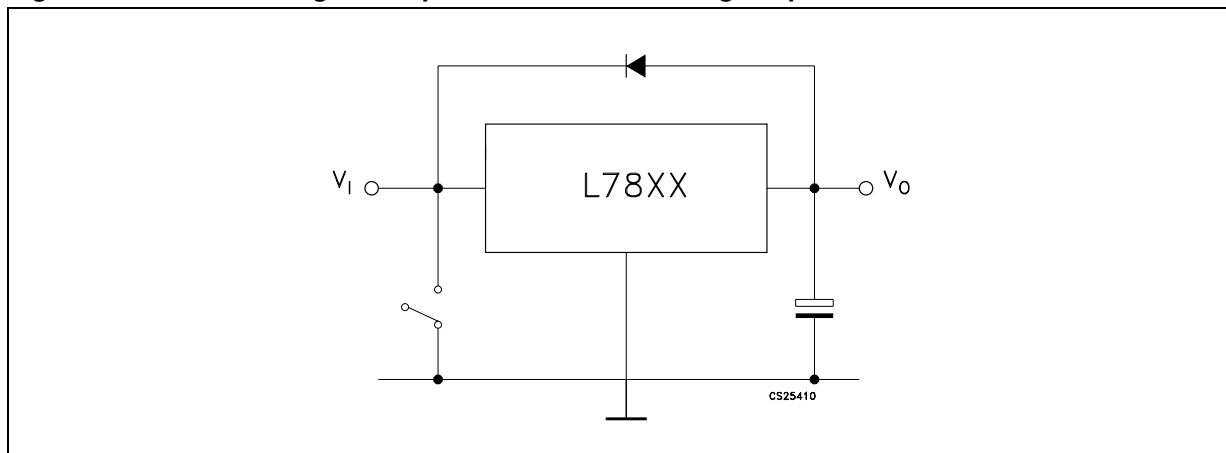


Note:  $Q_2$  is connected as a diode in order to compensate the variation of the  $Q_1$   $V_{BE}$  with the temperature.  $C$  allows a slow rise time of the  $V_O$ .

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 fig. 32) 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.

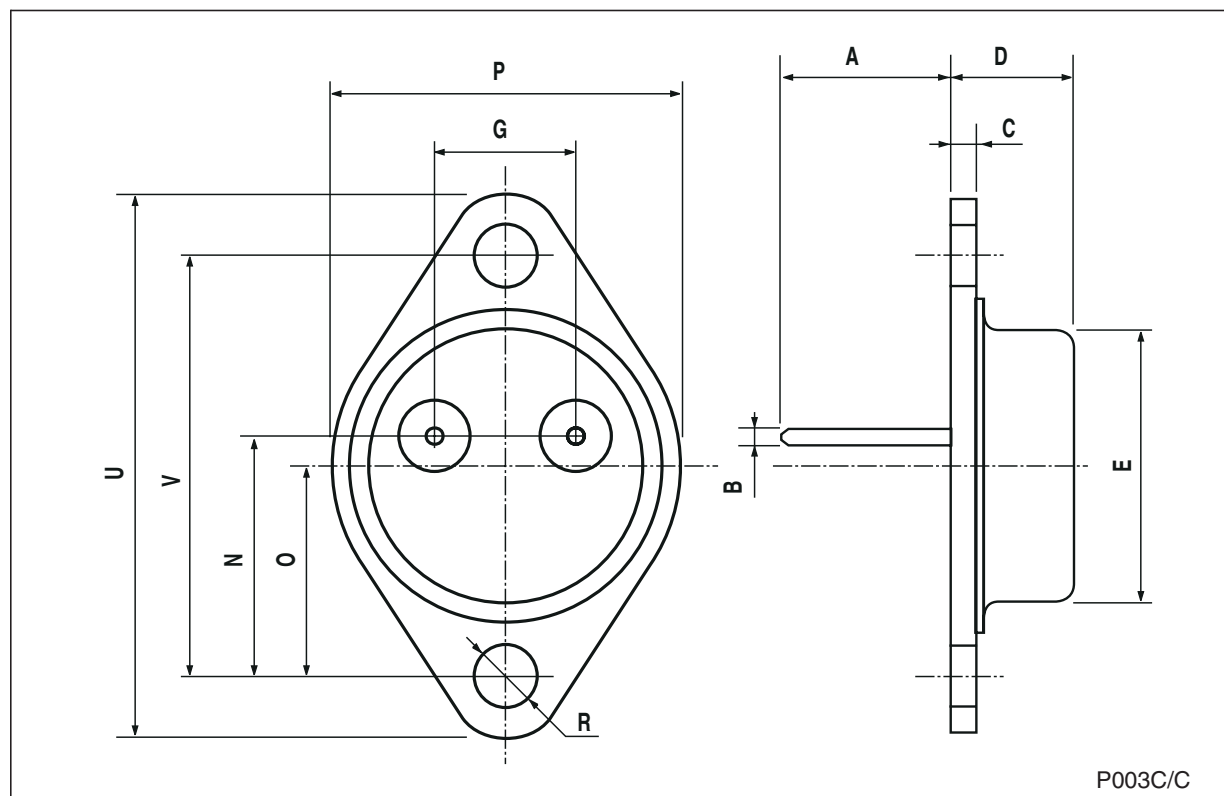


## 7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK<sup>®</sup> 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](http://www.st.com).

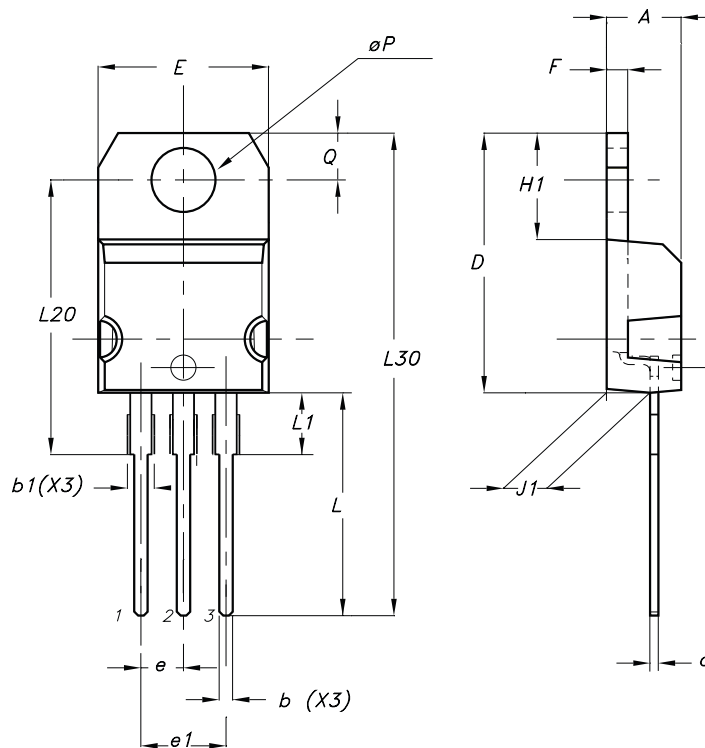
**TO-3 mechanical data**

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	



**TO-220 (A type) mechanical data**

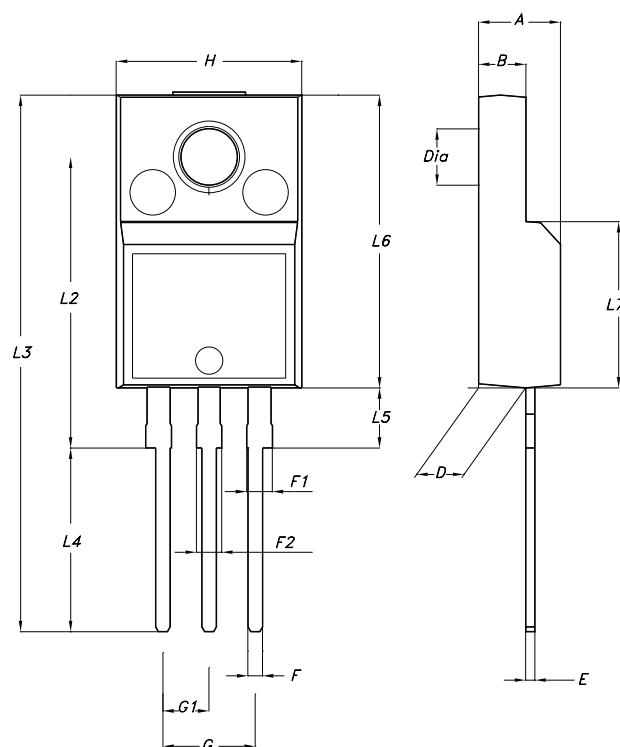
Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.035
b1	1.15		1.70	0.045		0.067
c	0.49		0.70	0.019		0.028
D	15.25		15.75	0.600		0.620
E	10.0		10.40	0.394		0.409
e	2.4		2.7	0.094		0.106
e1	4.95		5.15	0.195		0.203
F	1.23		1.32	0.048		0.052
H1	6.2		6.6	0.244		0.260
J1	2.40		2.72	0.094		0.107
L	13.0		14.0	0.512		0.551
L1	3.5		3.93	0.138		0.155
L20		16.4			0.646	
L30		28.9			1.138	
φP	3.75		3.85	0.148		0.152
Q	2.65		2.95	0.104		0.116



0015988/N

**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



7012510A-H

Figure 38. Drawing dimension D<sup>2</sup>PAK (type STD-ST)

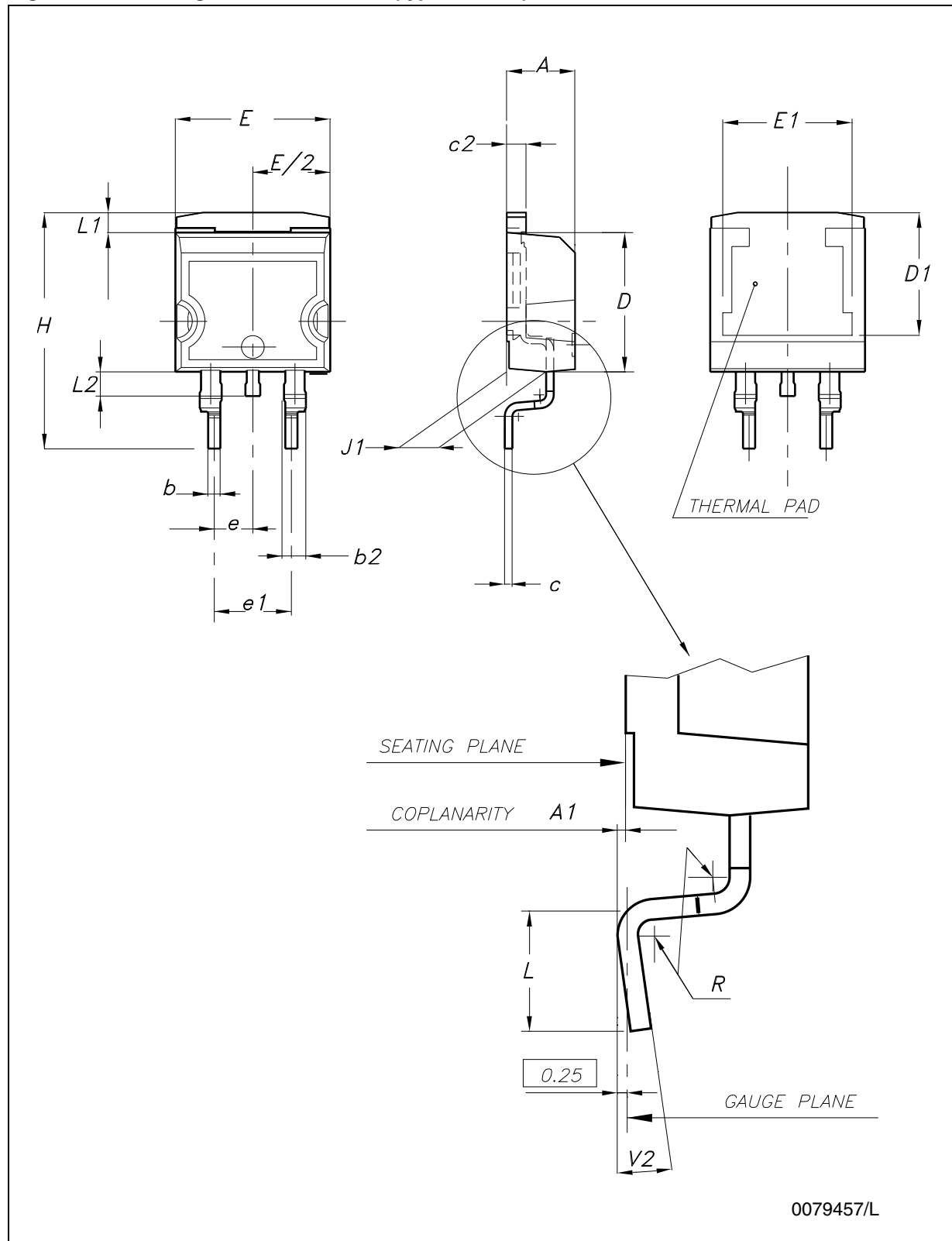


Figure 39. Drawing dimension D<sup>2</sup>PAK (type WOOSEOK-SUBCON.)

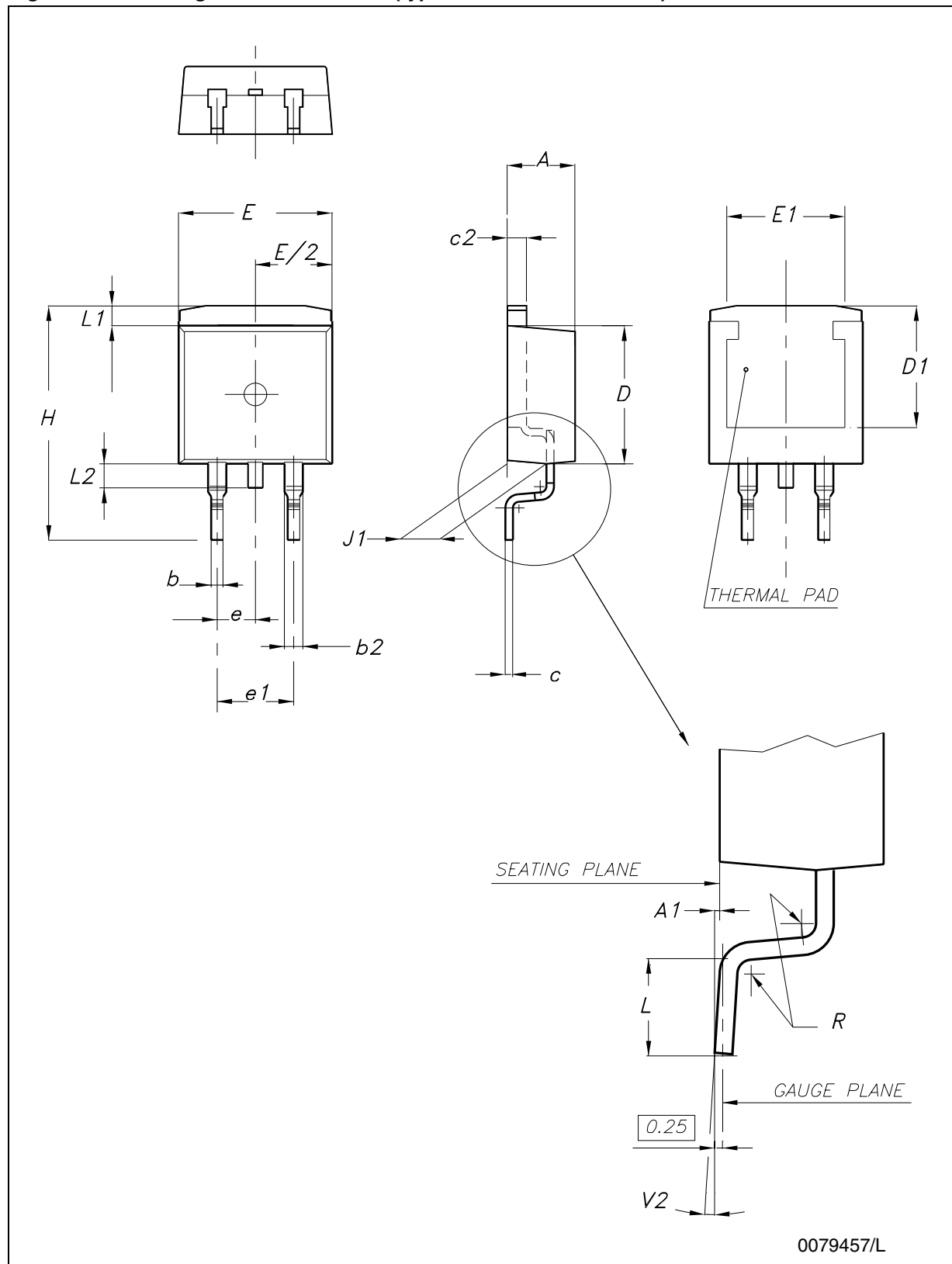


Table 24. D<sup>2</sup>PAK mechanical data

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 D<sup>2</sup>PAK package coming from the subcontractor Wooseok is fully compatible with the ST's package suggested footprint.

Figure 40. D<sup>2</sup>PAK footprint recommended data

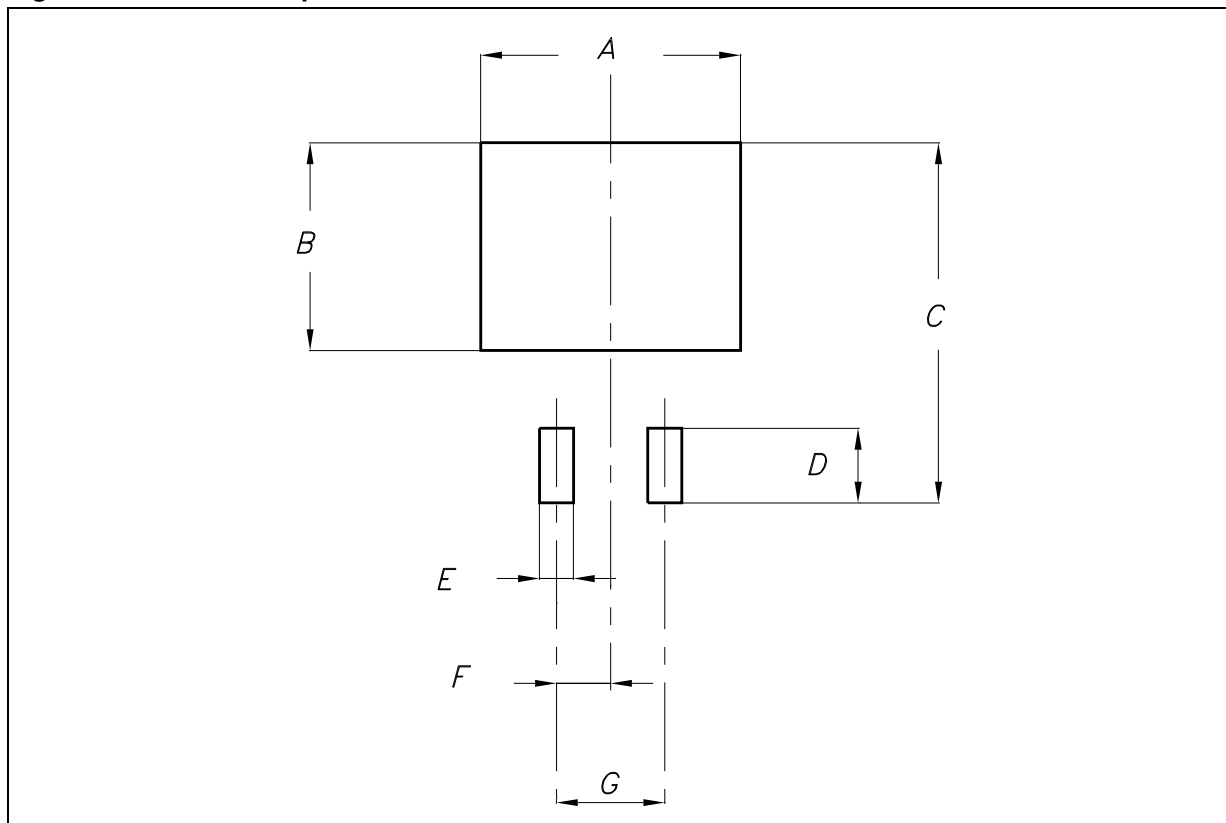


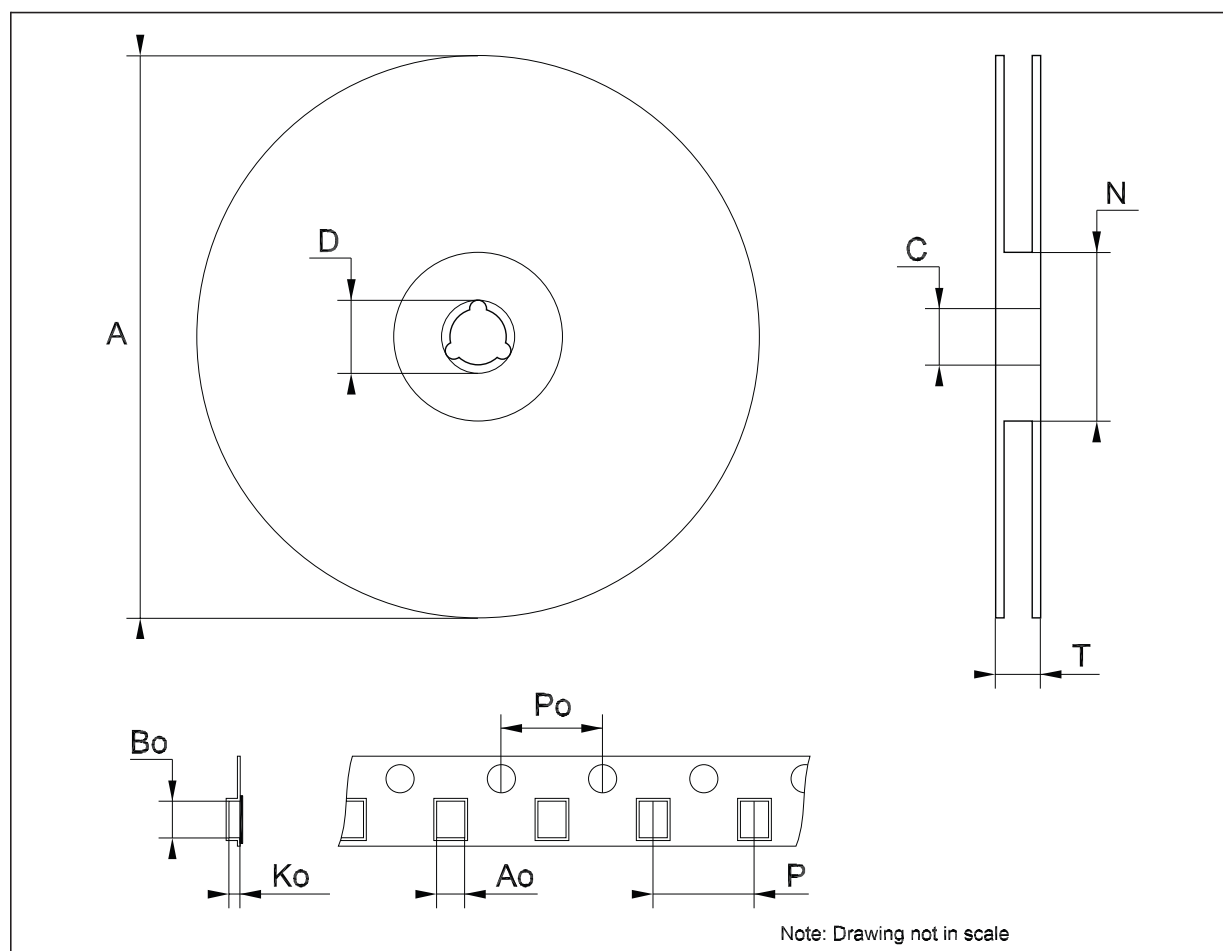
Table 25. Footprint data

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



**Tape & reel D<sup>2</sup>PAK-P<sup>2</sup>PAK-D<sup>2</sup>PAK/A-P<sup>2</sup>PAK/A 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



Order code

L78xx - L78xxC

## 8 Order code

Table 26. Order code

Part numbers	Packaging			
	TO-220 (A Type)	D <sup>2</sup> PAK	TO-220FP	TO-3
L7805				L7805T
L7805C	L7805CV	L7805CD2T-TR	L7805CP	L7805CT
L7852C	L7852CV	L7852CD2T-TR <sup>(1)</sup>	L7852CP <sup>(1)</sup>	L7852CT <sup>(1)</sup>
L7806C	L7806CV	L7806CD2T-TR		L7806CT
L7808C	L7808CV	L7808CD2T-TR	L7808CP	L7808CT
L7885C	L7885CV	L7885CD2T-TR <sup>(1)</sup>	L7885CP <sup>(1)</sup>	L7885CT <sup>(1)</sup>
L7809C	L7809CV	L7809CD2T-TR	L7809CP	L7809CT
L7810C	L7810CV	L7810CD2T-TR <sup>(1)</sup>		
L7812C	L7812CV	L7812CD2T-TR	L7812CP	L7812CT
L7815C	L7815CV	L7815CD2T-TR	L7815CP	L7815CT
L7818C	L7818CV	L7818CD2T-TR <sup>(1)</sup>		L7818CT
L7820C	L7820CV	L7820CD2T-TR <sup>(1)</sup>	L7820CP <sup>(1)</sup>	L7820CT <sup>(1)</sup>
L7824C	L7824CV	L7824CD2T-TR	L7824CP	L7824CT

1. Available on request.

## 9 Revision history

**Table 27. 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 <sup>2</sup> PAK mechanical data has been updated and add footprint data.
31-May-2007	15	Order codes has been updated.
29-Aug-2007	16	Added <a href="#">Table 1</a> . in cover page.

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