TDSEMIC
拓電半導體

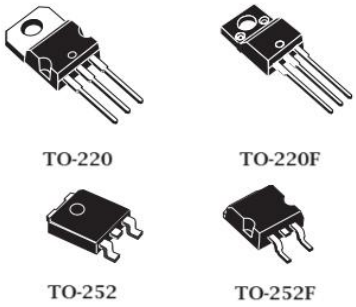
自主封測 品質把控 售後保障

WEB | WWW.TDSEMIC.COM

L7812-TD

產品規格說明書

Description



The L78XX series of three-terminal positive regulators is available in TO-220,TO-220F, TO-252 and TO-252F 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 embeds 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.

Features

- Output current up 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
- 2 % output voltage tolerance (A version)
- Guaranteed in extended temperature range (A version)

Diagram

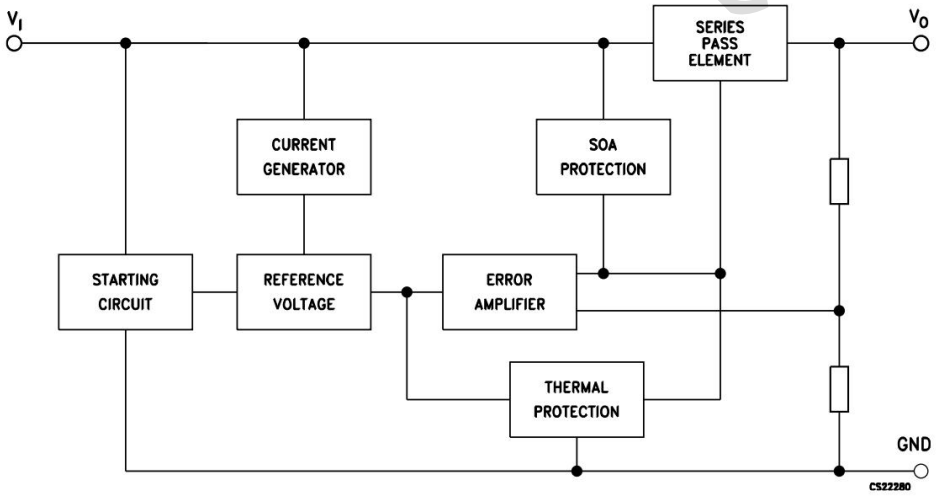


Figure 2. Block diagram

Pin Configuration and Functions

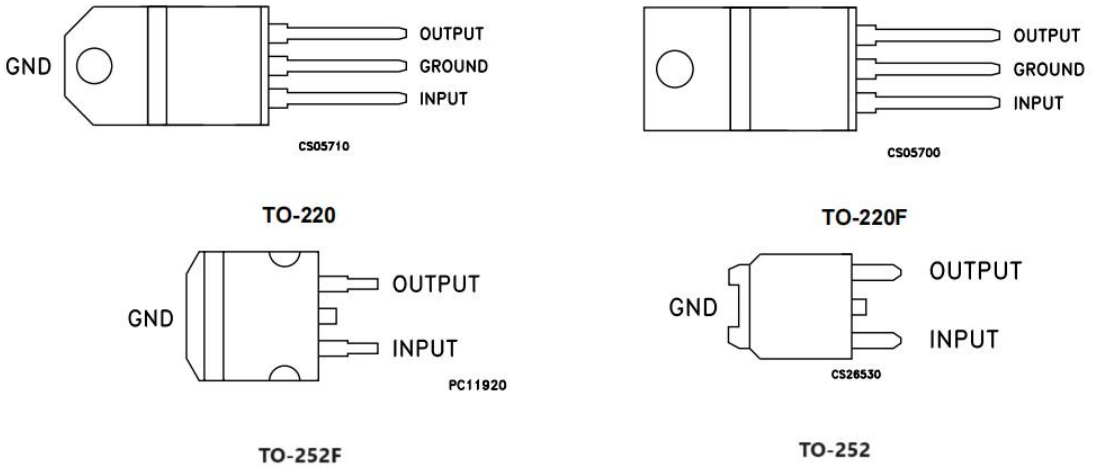


Figure 3. Pin connections(top view)

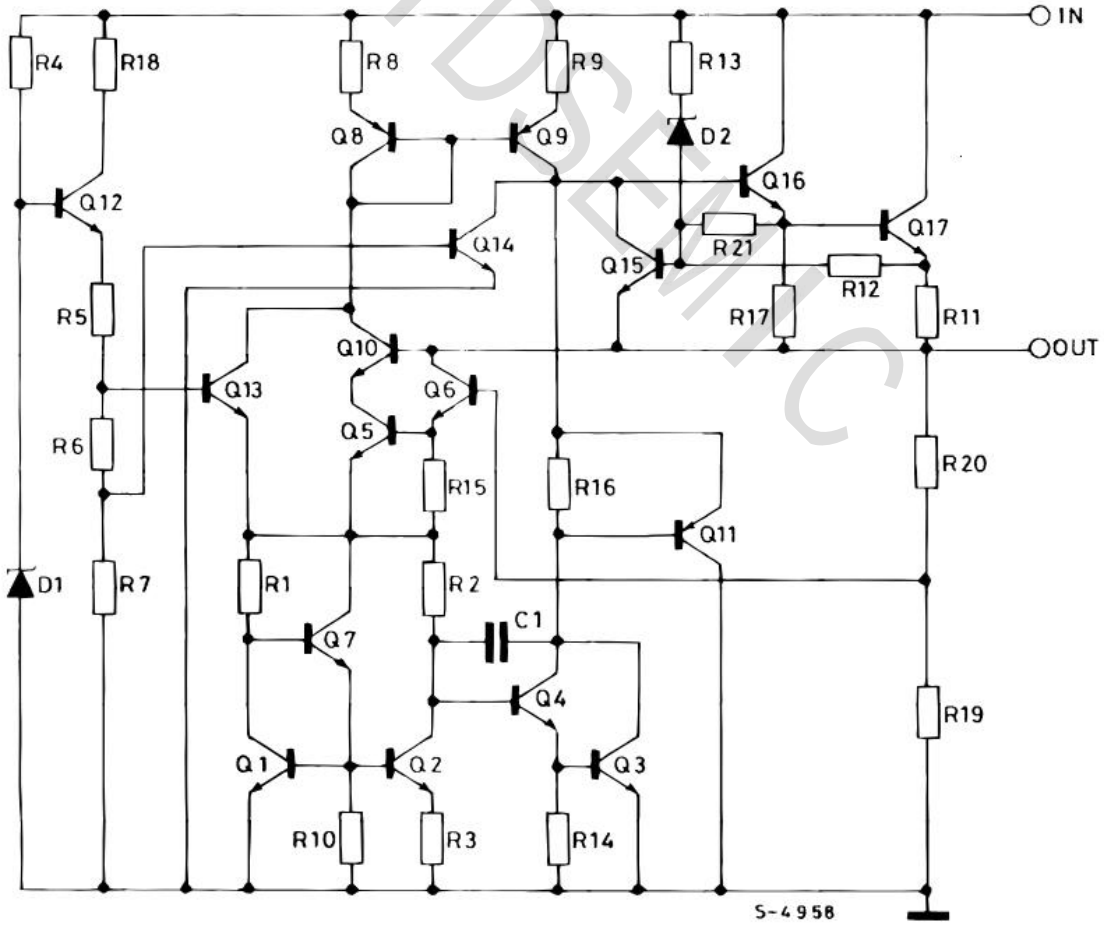


Figure 4. Schematic diagram

Symbol	Parameter		Value	Unit
V_I	DC input voltage	For V_O=5 to 18V	35	V
		For V_O=20,24V	40	
I_O	Output current		Internally limited	
P_D	Power dissipation		Internally limited	
T_{STG}	Storage temperature range		-65 to 150	℃
T_{OP}	Operating junction temperature range	For L78XXC,L78XXAC	0 to 125	℃
		For L78XXAB	-40 to 125	

Table1. Absolute maximum ratings

Note: Absolute maximum ratings are those values beyond which damage to the device may occur.

Functional operation under these condition is not implied.

Symbol	Parameter	TO-252F	TO-252	TO-220	TO-220F	Unit
R_{thJC}	Thermal resistance junction-case	3	8	5	5	℃/W
R_{thJA}	Thermal resistance junction-ambient	62.5	100	50	60	℃/W

Table1. Thermal data

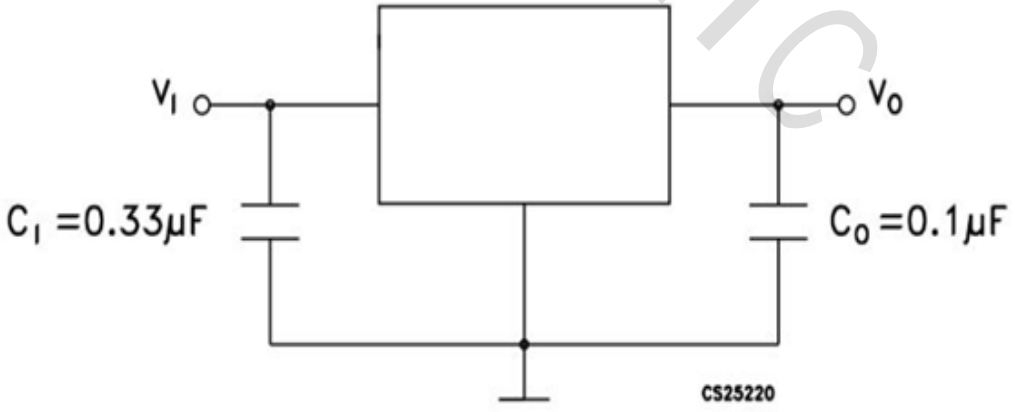


Figure 5. Application circuits

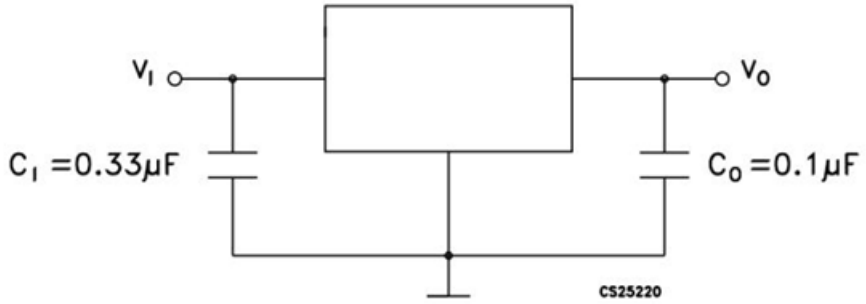


Figure 6. DC parameter

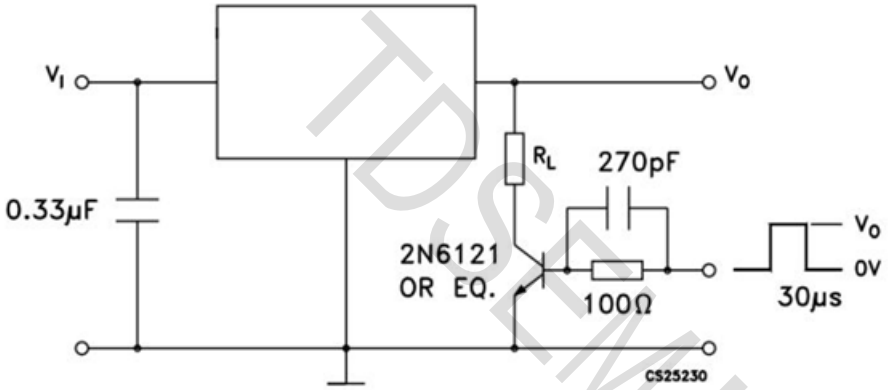


Figure 7. Load regulation

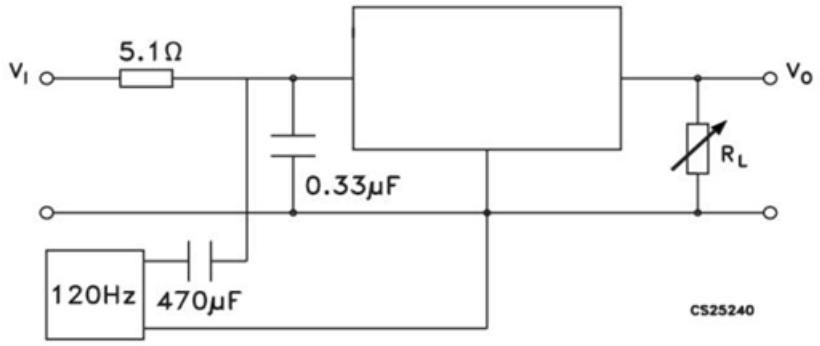


Figure 8. Ripple rejection

Electraical characteristics

V_I=10V, I_O=1A,T_J=0 to 125 ℃ (L7805AC),T_J=-40 to 125 ℃ (L7805AB),unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	4.9	5	5.1	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=7.5 to 18V	4.8	5	5.2	V
V_O	Ouput voltage	I_O=1A, V_I=18 to 20V, T_J=25℃	4.8	5	5.2	V
ΔV_O(1)	Line regulation	V_I=7.5 to 25V, I_O=500mA, T_J=25℃		7	50	mV
		V_I=8 to 12V		10	50	mV
		V_I=8 to 12V, T_J=25℃		2	25	mV
		V_I=7.3 to 20V, T_J=25℃		7	50	mV
ΔV_O(1)	Load regulation	I_O=5mA to 1A		25	100	mV
		I_O=5mA to 1.5A, T_J=25℃		30	100	
		I_O=250 to 750mA		8	50	
I_q	Quiescent current	T_J=25℃		4.3	6	mV
					6	mV
ΔI_q	Quiescent current change	V_I=8 to 23V, I_O=500mA			0.8	mV
		V_I=7.5 to 20V, T_J=25℃			0.8	mV
		I_O=5mA to 1A			0.5	mV
SVR	Supply voltage rejection	V_I=8 to 18V, f=120Hz, I_O=500mA		68		dB
V_d	Dropout voltage	I_O=1A,T_J=25℃		2		V
eN	Output noise voltage	T_A=25℃, B=10Hz to 100kHz		10		μV/V_O
R_O	Output resistance	f=1kHZ		17		mΩ
I_{SC}	Short circuit current	V_I=35V, T_A=25℃		0.2		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A
$\Delta V_O/\Delta T$	Output voltage drift			-1.1		mV/℃

Table 3. Electrical characteristics of L7805A

Note: Minimum load current for regulation is 5 mA.

V_I=11V, I_O=1A,T_J=0 to 125 ℃ (L7806AC),T_J=-40 to 125 ℃ (L7806AB),unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	5.88	6	6.12	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=8.6 to 19V	5.76	6	6.24	V
V_O	Ouput voltage	I_O=1A, V_I=19 to 21V, T_J=25℃	5.76	6	6.24	V
ΔV_O(1)	Line regulation	V_I=8.6 to 25V, I_O=500mA, T_J=25℃		9	60	mV
		V_I=9 to 13V		11	60	mV
		V_I=9 to 13V, T_J=25℃		3	30	mV
		V_I=8.3 to 21V, T_J=25℃		9	60	mV
ΔV_O(1)	Load regulation	I_O=5mA to 1A		25	100	mV
		I_O=5mA to 1.5A, T_J=25℃		30	100	
		I_O=250 to 750mA		10	50	
I_q	Quiescent current	T_J=25℃		4.3	6	mV
					6	mV
ΔI_q	Quiescent current change	V_I=9 to 24V, I_O=500mA			0.8	mV
		V_I=8.6 to 21V, T_J=25℃			0.8	mV
		I_O=5mA to 1A			0.5	mV
SVR	Supply voltage rejection	V_I=9 to 19V, f=120Hz, I_O=500mA		65		dB
V_d	Dropout voltage	I_O=1A,T_J=25℃		2		V
eN	Output noise voltage	T_A=25℃, B=10Hz to 100kHz		10		μV/V_O
R_O	Output resistance	f=1kHZ		17		mΩ
I_{SC}	Short circuit current	V_I=35V, T_A=25℃		0.2		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A
$\Delta V_O/\Delta T$	Output voltage drift			-0.8		mV/℃

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	7.84	8	8.16	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=10.6 to 21V	7.7	8	8.3	V
V_O	Ouput voltage	I_O=1A, V_I=21 to 23V, T_J=25℃	7.7	8	8.3	V
ΔV_O(1)	Line regulation	V_I=10.6 to 25V, I_O=500mA, T_J=25℃		12	80	mV
		V_I=11 to 17V		15	80	mV
		V_I=11 to 17V, T_J=25℃		5	40	mV
		V_I=10.4 to 23V, T_J=25℃		12	80	mV
ΔV_O(1)	Load regulation	I_O=5mA to 1A		25	100	mV
		I_O=5mA to 1.5A, T_J=25℃		30	100	
		I_O=250 to 750mA		10	50	
I_q	Quiescent current	T_J=25℃		4.3	6	mV
					6	mV
ΔI_q	Quiescent current change	V_I=11 to 23V, I_O=500mA			0.8	mV
		V_I=10.6 to 23V, T_J=25℃			0.8	mV
		I_O=5mA to 1A			0.5	mV
SVR	Supply voltage rejection	V_I=11.5 to 21.5V, f=120Hz, I_O=500mA		65		dB
V_d	Dropout voltage	I_O=1A,T_J=25℃		2		V
eN	Output noise voltage	T_A=25℃, B=10Hz to 100kHz		10		μV/V_O
R_O	Output resistance	f=1kHZ		17		mΩ
I_{SC}	Short circuit current	V_I=35V, T_A=25℃		0.2		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A
$\Delta V_O/\Delta T$	Output voltage drift			-0.8		mV/℃

Table 5. Electrical characteristics of L7808A

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	8.82	9	9.18	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=10.6 to 22V	8.65	9	9.35	V
V_O	Ouput voltage	I_O=1A, V_I=22 to 24V, T_J=25℃	8.65	9	9.35	V
ΔV_O(1)	Line regulation	V_I=10.6 to 25V, I_O=500mA, T_J=25℃		12	90	mV
		V_I=11 to 17V		15	90	mV
		V_I=11 to 17V, T_J=25℃		5	45	mV
		V_I=11.4 to 23V, T_J=25℃		12	90	mV
ΔV_O(1)	Load regulation	I_O=5mA to 1A		25	100	mV
		I_O=5mA to 1.5A, T_J=25℃		30	100	
		I_O=250 to 750mA		10	50	
I_q	Quiescent current	T_J=25℃		4.3	6	mV
					6	mV
ΔI_q	Quiescent current change	V_I=11 to 25V, I_O=500mA			0.8	mV
		V_I=10.6 to 23V, T_J=25℃			0.8	mV
		I_O=5mA to 1A			0.5	mV
SVR	Supply voltage rejection	V_I=11.5 to 21.5V, f=120Hz, I_O=500mA		61		dB
V_d	Dropout voltage	I_O=1A,T_J=25℃		2		V
eN	Output noise voltage	T_A=25℃, B=10Hz to 100kHz		10		μV/V_O
R_O	Output resistance	f=1kHZ		18		mΩ
I_{SC}	Short circuit current	V_I=35V, T_A=25℃		0.2		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A

$\Delta V_O/\Delta T$	Output voltage drift			-0.8		mV/℃

Table 6. Electrical characteristics of L7809A

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.

Note: Minimum load current for regulation is 5 mA.

V_I=19V, I_O=1A,T_J=0 to 125 ℃ (L7812AC),T_J=-40 to 125 ℃ (L7812AB),unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	11.75	12	12.25	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=14.8 to 25V	11.5	12	12.5	V
V_O	Ouput voltage	I_O=1A, V_I=25 to 27V, T_J=25℃	11.5	12	12.5	V
ΔV_O(1)	Line regulation	V_I=14.8 to 30V, I_O=500mA, T_J=25℃		13	120	mV
		V_I=16 to 12V		16	120	mV
		V_I=16 to 12V, T_J=25℃		6	60	mV
		V_I=14.5 to 27V, T_J=25℃		13	120	mV
ΔV_O(1)	Load regulation	I_O=5mA to 1A		25	100	mV
		I_O=5mA to 1.5A, T_J=25℃		30	100	
		I_O=250 to 750mA		10	50	
I_q	Quiescent current	T_J=25℃		4.4	6	mV
					6	mV
ΔI_q	Quiescent current change	V_I=15 to 30V, I_O=500mA			0.8	mV
		V_I=14.8 to 27V, T_J=25℃			0.8	mV
		I_O=5mA to 1A			0.5	mV
SVR	Supply voltage rejection	V_I=15 to 25V, f=120Hz, I_O=500mA		60		dB
V_d	Dropout voltage	I_O=1A,T_J=25℃		2		V
eN	Output noise voltage	T_A=25℃, B=10Hz to 100kHz		10		μV/V_O
R_O	Output resistance	f=1kHZ		18		mΩ
I_{SC}	Short circuit current	V_I=35V, T_A=25℃		0.2		A

I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A
$\Delta V_O/\Delta T$	Output voltage drift			-1		mV/℃

Table 7. Electrical characteristics of L7812A

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.

Note: Minimum load current for regulation is 5 mA.

V_I=23V,I_O=1A,T_J=0 to 125℃ (L7815AC),T_J=-40 to 125℃ (L7815AB),unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	14.7	15	15.3	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=17.9 to 28V	14.4	15	15.6	V
V_O	Ouput voltage	I_O=1A, V_I=28 to 30V, T_J=25℃	14.4	15	15.6	V
ΔV_O(1)	Line regulation	V_I=17.9 to 30V, I_O=500mA, T_J=25℃		13	150	mV
		V_I=20 to 26V		16	150	mV
		V_I=20 to 26V, T_J=25℃		6	75	mV
		V_I=17.5 to 30V, T_J=25℃		13	150	mV
ΔV_O(1)	Load regulation	I_O=5mA to 1A		25	100	mV
		I_O=5mA to 1.5A, T_J=25℃		30	100	
		I_O=250 to 750mA		10	50	
I_q	Quiescent current	T_J=25℃		4.4	6	mV
					6	mV
ΔI_q	Quiescent current change	V_I=17.5 to 30V, I_O=500mA			0.8	mV
		V_I=17.5 to 30V, T_J=25℃			0.8	mV
		I_O=5mA to 1A			0.5	mV
SVR	Supply voltage rejection	V_I=18.5 to 28.5V, f=120Hz, I_O=500mA		58		dB
V_d	Dropout voltage	I_O=1A,T_J=25℃		2		V
eN	Output noise voltage	T_A=25℃, B=10Hz to 100kHz		10		μV/V_O
R_O	Output resistance	f=1kHZ		19		mΩ

I_{SC}	Short circuit current	V_I=35V, T_A=25℃		0.2		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A
$\Delta V_O/\Delta T$	Output voltage drift			-1		mV/℃

Table 8. Electrical characteristics of L7815A

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.

Note: Minimum load current for regulation is 5 mA.

V_I=33V, I_O=1A,T_J=0 to 125 ℃ (L7824AC),T_J=-40 to 125 ℃ (L7824AB),unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	23.5	24	24.5	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=27.3 to 37V	23	24	25	V
V_O	Ouput voltage	I_O=1A, V_I=37 to 38V, T_J=25℃	23	24	25	V
ΔV_O(1)	Line regulation	V_I=27 to 38V, I_O=500mA, T_J=25℃		31	240	mV
		V_I=30 to 36V		35	200	mV
		V_I=30 to 36V, T_J=25℃		14	120	mV
		V_I=26.7 to 38V, T_J=25℃		31	240	mV
ΔV_O(1)	Load regulation	I_O=5mA to 1A		25	100	mV
		I_O=5mA to 1.5A, T_J=25℃		30	100	
		I_O=250 to 750mA		10	50	
I_q	Quiescent current	T_J=25℃		4.6	6	mV
					6	mV
ΔI_q	Quiescent current change	V_I=27.3 to 38V, I_O=500mA			0.8	mV
		V_I=27.3 to 38V, T_J=25℃			0.8	mV
		I_O=5mA to 1A			0.5	mV
SVR	Supply voltage rejection	V_I=28 to 38V, f=120Hz, I_O=500mA		54		dB
V_d	Dropout voltage	I_O=1A,T_J=25℃		2		V
eN	Output noise voltage	T_A=25℃, B=10Hz to 100kHz		10		μV/V_O

R_O	Output resistance	f=1kHZ		20		mΩ
I_{SC}	Short circuit current	V_I=35V, T_A=25℃		0.2		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A
$\Delta V_O/\Delta T$	Output voltage drift			-1.5		mV/℃

Table 9. Electrical characteristics of L7824A

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.

Note: Minimum load current for regulation is 5 mA.

Refer to the test circuits, T_J=0 to 125℃, V_I=10V, I_O=500mA, C_I=0.33μF, C_O=0.1μF, unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	4.8	5	5.2	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=7 to 18V	4.75	5	5.25	V
V_O	Ouput voltage	I_O=1A, V_I=18 to 20V, T_J=25℃	4.75	5	5.25	V
ΔV_O(1)	Line regulation	V_I=7 to 25V, T_J=25℃		3	100	mV
		V_I=8 to 12V, T_J=25℃		1	50	
ΔV_O(1)	Load regulation	I_O=5mA to 1.5A, T_J=25℃			100	mV
		I_O=250 to 750mA, T_J=25℃			50	
I_d	Quiescent current	T_J=25℃			8	mA
ΔI_d	Quiescent current change	I_O=5mA to 1A			0.5	mA
		V_I=7 to 23V			0.8	
$\Delta V_O/\Delta T$	Output voltage drift	I_O=5mA		-1.1		mV/℃
eN	Output noise voltage	B=10Hz to 100kHz, T_J=25℃		40		μV/V_O
SVR	Supply voltage rejection	V_I=8 to 18V, f=120Hz	62			dB
V_d	Dropout voltage	I_O=1A, T_J=25℃		2		V
R_O	Output resistance	f=1kHZ		17		mΩ
I_{SC}	Short circuit current	V_I=35V, T_J=25℃		0.75		A
I_{SCP}	Short circuit peak current	T_J=25℃		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.

Note: Minimum load current for regulation is 5 mA.

Refer to the test circuits, T_J=0 to 125℃, V_I=11V, I_O=500mA, C_I=0.33μF, C_O=0.1μF, unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	5.75	6	6.25	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=8 to 19V	5.7	6	6.3	V
V_O	Ouput voltage	I_O=1A, V_I=19 to 21V, T_J=25℃	5.7	6	6.3	V
ΔV_O(1)	Line regulation	V_I=8 to 25V, T_J=25℃			120	mV
		V_I=9 to 13V, T_J=25℃			60	
ΔV_O(1)	Load regulation	I_O=5mA to 1.5A, T_J=25℃			120	mV
		I_O=250 to 750mA, T_J=25℃			60	
I_d	Quiescent current	T_J=25℃			8	mA
ΔI_d	Quiescent current change	I_O=5mA to 1A			0.5	mA
		V_I=8 to 24V			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	I_O=5mA		-0.8		mV/℃
eN	Output noise voltage	B=10Hz to 100kHz, T_J=25℃		45		μV/V_O
SVR	Supply voltage rejection	V_I=9 to 19V, f=120Hz	59			dB
V_d	Dropout voltage	I_O=1A, T_J=25℃		2		V
R_O	Output resistance	f=1kHZ		19		mΩ
I_{SC}	Short circuit current	V_I=35V, T_J=25℃		0.55		A

Table 11. Electrical characteristics of L7806C

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.

Note: Minimum load current for regulation is 5 mA.

Refer to the test circuits, T_J=0 to 125℃, V_I=14V, I_O=500mA, C_I=0.33μF, C_O=0.1μF, unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	7.7	8	8.3	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=10.5 to 21V	7.6	8	8.4	V
V_O	Ouput voltage	I_O=1A, V_I=21 to 25V, T_J=25℃	7.6	8	8.4	V
ΔV_O(1)	Line regulation	V_I=10.5 to 25V, T_J=25℃			160	mV
		V_I=11 to 17V, T_J=25℃			80	
ΔV_O(1)	Load regulation	I_O=5mA to 1.5A, T_J=25℃			160	mV
		I_O=250 to 750mA, T_J=25℃			80	
I_d	Quiescent current	T_J=25℃			8	mA
ΔI_d	Quiescent current change	I_O=5mA to 1A			0.5	mA
		V_I=10.5 to 25V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O=5mA		-0.8		mV/℃
eN	Output noise voltage	B=10Hz to 100kHz, T_J=25℃		52		μV/V_O
SVR	Supply voltage rejection	V_I=11.5 to 21.5V, f=120Hz	56			dB
V_d	Dropout voltage	I_O=1A, T_J=25℃		2		V
R_O	Output resistance	f=1kHZ		16		mΩ

I_{SC}	Short circuit current	V_I=35V, T_J=25℃		0.45		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A

Table 12. Electrical characteristics of L7808C

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.

Note: Minimum load current for regulation is 5 mA.

Refer to the test circuits, T_J=0 to 125℃, V_I=14.5V, I_O=500mA, C_I=0.33μF, C_O=0.1μF, unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	8.2	8.5	8.8	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=11 to 21.5V	8.1	8.5	8.9	V
V_O	Ouput voltage	I_O=1A, V_I=21.5 to 26V, T_J=25℃	8.1	8.5	8.9	V
ΔV_O(1)	Line regulation	V_I=11 to 27V, T_J=25℃			160	mV
		V_I=11.5 to 17.5V, T_J=25℃			80	
ΔV_O(1)	Load regulation	I_O=5mA to 1.5A, T_J=25℃			160	mV
		I_O=250 to 750mA, T_J=25℃			80	
I_d	Quiescent current	T_J=25℃			8	mA
ΔI_d	Quiescent current change	I_O=5mA to 1A			0.5	mA
		V_I=11 to 26V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O=5mA		-0.8		mV/℃
eN	Output noise voltage	B=10Hz to 100kHz, T_J=25℃		55		μV/V_O
SVR	Supply voltage rejection	V_I=12 to 22V, f=120Hz	56			dB
V_d	Dropout voltage	I_O=1A, T_J=25℃		2		V

R_O	Output resistance	f=1kHZ		16		mΩ
I_{SC}	Short circuit current	V_I=35V, T_J=25℃		0.45		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A

Table 13. Electrical characteristics of L7885C

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.

Note: Minimum load current for regulation is 5 mA.

Refer to the test circuits, T_J=0 to 125℃, V_I=15V, I_O=500mA, C_I=0.33μF, C_O=0.1μF, unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	8.64	9	9.36	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=11.5 to 22V	8.55	9	9.45	V
V_O	Ouput voltage	I_O=1A, V_I=22 to 26V, T_J=25℃	8.55	9	9.45	V
ΔV_O(1)	Line regulation	V_I=11.5 to 26V, T_J=25℃			180	mV
		V_I=12 to 18V, T_J=25℃			90	
ΔV_O(1)	Load regulation	I_O=5mA to 1.5A, T_J=25℃			180	mV
		I_O=250 to 750mA, T_J=25℃			90	
I_d	Quiescent current	T_J=25℃			8	mA
ΔI_d	Quiescent current change	I_O=5mA to 1A			0.5	mA
		V_I=11.5 to 26V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O=5mA		-1		mV/℃
eN	Output noise voltage	B=10Hz to 100kHz, T_J=25℃		70		μV/V_O
SVR	Supply voltage rejection	V_I=12 to 23V, f=120Hz	55			dB

V_d	Dropout voltage	I_O=1A, T_J=25℃		2		V
R_O	Output resistance	f=1kHZ		17		mΩ
I_{SC}	Short circuit current	V_I=35V, T_J=25℃		0.40		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A

Table 14. Electrical characteristics of L7809C

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.

Note: Minimum load current for regulation is 5 mA.

Refer to the test circuits, T_J=0 to 125℃, V_I=19V, I_O=500mA, C_I=0.33μF, C_O=0.1μF, unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	11.5	12	12.5	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=14.5 to 25V	11.4	12	12.6	V
V_O	Ouput voltage	I_O=1A, V_I=25 to 27V, T_J=25℃	11.4	12	12.6	V
ΔV_O(1)	Line regulation	V_I=14.5 to 30V, T_J=25℃			240	mV
		V_I=16 to 22V, T_J=25℃			120	
ΔV_O(1)	Load regulation	I_O=5mA to 1.5A, T_J=25℃			240	mV
		I_O=250 to 750mA, T_J=25℃			120	
I_d	Quiescent current	T_J=25℃			8	mA
ΔI_d	Quiescent current change	I_O=5mA to 1A			0.5	mA
		V_I=14.5 to 30V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O=5mA		-1		mV/℃
eN	Output noise voltage	B=10Hz to 100kHz, T_J=25℃		75		μV/V_O

SVR	Supply voltage rejection	V_I=15 to 25V, f=120Hz	55			dB
V_d	Dropout voltage	I_O=1A, T_J=25℃		2		V
R_O	Output resistance	f=1kHZ		18		mΩ
I_{SC}	Short circuit current	V_I=35V, T_J=25℃		0.35		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A

Table 15. Electrical characteristics of L7812C

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.

Note: Minimum load current for regulation is 5 mA.

Refer to the test circuits, T_J=0 to 125℃, V_I=23V, I_O=500mA, C_I=0.33μF, C_O=0.1μF, unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	14.4	15	15.6	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=17.5 to 28V	14.25	15	15.75	V
V_O	Ouput voltage	I_O=1A, V_I=28 to 30V, T_J=25℃	14.25	15	15.75	V
ΔV_O(1)	Line regulation	V_I=17.5 to 30V, T_J=25℃			300	mV
		V_I=20 to 26V, T_J=25℃			150	
ΔV_O(1)	Load regulation	I_O=5mA to 1.5A, T_J=25℃			300	mV
		I_O=250 to 750mA, T_J=25℃			150	
I_d	Quiescent current	T_J=25℃			8	mA
ΔI_d	Quiescent current change	I_O=5mA to 1A			0.5	mA
		V_I=17.5 to 30V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O=5mA		-1		mV/℃

eN	Output noise voltage	B=10Hz to 100kHz, T_J=25℃		90		μV/V_O
SVR	Supply voltage rejection	V_I=18.5 to 28.5V, f=120Hz	54			dB
V_d	Dropout voltage	I_O=1A, T_J=25℃		2		V
R_O	Output resistance	f=1kHZ		19		mΩ
I_{SC}	Short circuit current	V_I=35V, T_J=25℃		0.23		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A

Table 16. Electrical characteristics of L7815C

1. Load and line regulation are specified at constant junction temperature. Changes in VO due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

Note: Minimum load current for regulation is 5 mA.

Refer to the test circuits, T_J=0 to 125℃, V_I=26V, I_O=500mA, C_I=0.33μF, C_O=0.1μF, unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	17.3	18	18.7	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=21 to 31V	17.1	18	18.9	V
V_O	Ouput voltage	I_O=1A, V_I=31 to 33V, T_J=25℃	17.1	18	18.9	V
ΔV_O(1)	Line regulation	V_I=21 to 33V, T_J=25℃			360	mV
		V_I=24 to 30V, T_J=25℃			180	
ΔV_O(1)	Load regulation	I_O=5mA to 1.5A, T_J=25℃			360	mV
		I_O=250 to 750mA, T_J=25℃			180	
I_d	Quiescent current	T_J=25℃			8	mA
ΔI_d	Quiescent current change	I_O=5mA to 1A			0.5	mA
		V_I=21 to 33V			1	

$\Delta V_O/\Delta T$	Output voltage drift	I_O=5mA		-1		mV/℃
eN	Output noise voltage	B=10Hz to 100kHz, T_J=25℃		110		μV/V_O
SVR	Supply voltage rejection	V_I=22 to 32V, f=120Hz	53			dB
V_d	Dropout voltage	I_O=1A, T_J=25℃		2		V
R_O	Output resistance	f=1kHZ		22		mΩ
I_{SC}	Short circuit current	V_I=35V, T_J=25℃		0.20		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.2		A

Table 17. Electrical characteristics of L7818C

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.

Note: Minimum load current for regulation is 5 mA.

Refer to the test circuits, T_J=0 to 125℃, V_I=33V, I_O=500mA, C_I=0.33μF, C_O=0.1μF, unless otherwise specified

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_O	Ouput voltage	T_J=25℃	23	24	25	V
V_O	Ouput voltage	I_O=5mA to 1A, V_I=27 to 37V	22.8	24	25.2	V
V_O	Ouput voltage	I_O=1A, V_I=37 to 38V, T_J=25℃	22.8	24	25.2	V
ΔV_O(1)	Line regulation	V_I=27 to 38V, T_J=25℃			480	mV
		V_I=30 to 36V, T_J=25℃			240	
ΔV_O(1)	Load regulation	I_O=5mA to 1.5A, T_J=25℃			480	mV
		I_O=250 to 750mA, T_J=25℃			240	
I_d	Quiescent current	T_J=25℃			8	mA
ΔI_d	Quiescent current change	I_O=5mA to 1A			0.5	mA

		V_I=27 to 38V			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O=5mA		-1.5		mV/℃
eN	Output noise voltage	B=10Hz to 100kHz, T_J=25℃		170		μV/V_O
SVR	Supply voltage rejection	V_I=28 to 38V, f=120Hz	50			dB
V_d	Dropout voltage	I_O=1A, T_J=25℃		2		V
R_O	Output resistance	f=1kHZ		28		mΩ
I_{SC}	Short circuit current	V_I=35V, T_J=25℃		0.15		A
I_{SCP}	Short circuit peak current	T_J=25℃		2.1		A

Table 18. Electrical characteristics of L7824C

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.

Note: Minimum load current for regulation is 5 mA.

Application information

Design consideration

The L78XX Series of fixed voltage regulators are designed with thermal overload protection that shuts down the circuit when subjected to an excessive power overload condition, internal short-circuit protection that limits the maximum current the circuit will pass, and output transistor safe-area compensation that reduces the output shortcircuit current as the voltage across the pass transistor is increased. In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with capacitor if the regulator is connected to the power supply filter with long lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A 0.33 μF or larger tantalum, mylar or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input

terminals.Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

The addition of an operational amplifier allows adjustment to higher or intermediate values while retaining regulation characteristics. The minimum voltage obtained with the arrangement is 2 V greater than the regulator voltage.

The circuit of Figure 14. High current voltage regulator can be modified to provide supply protection against short circuit by adding a short circuit sense resistor, RSC, and an additional PNP transistor. The current sensing PNP must be able to handle the short circuit current of the three terminal regulator Therefore a four ampere plastic power transistor is specified.

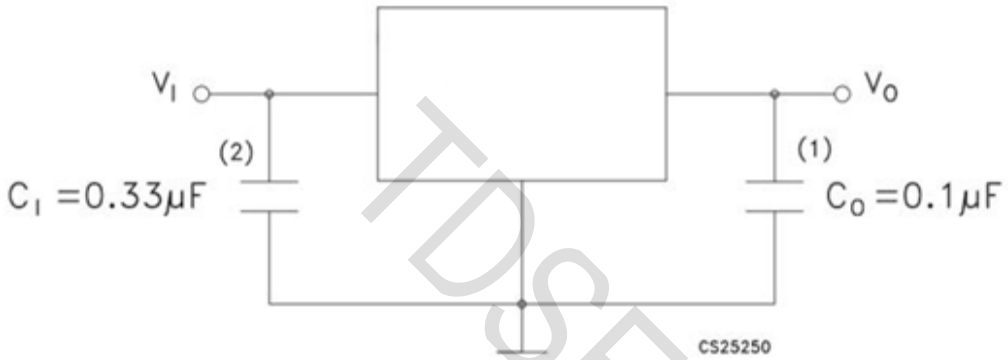


Figure 9. Fixed output regulator

1. Although no output capacitor is need for stability, it does improve transient response.
2. Required if regulator is located an appreciable distance from power supply filter.

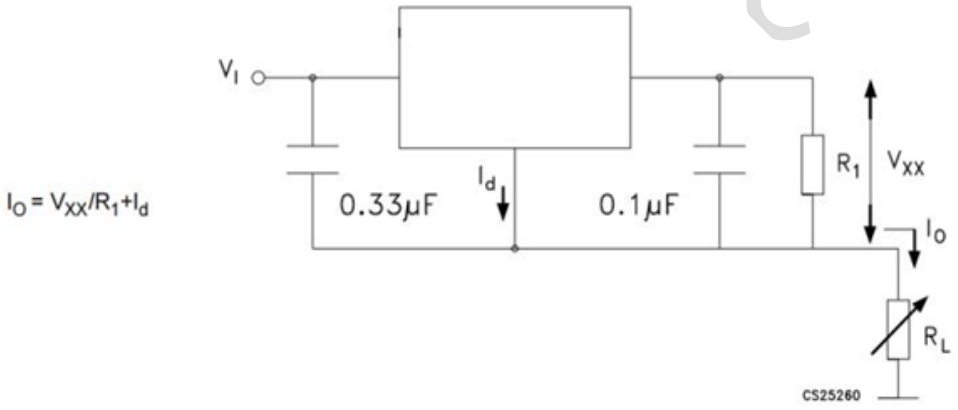


Figure 10. Current regulator

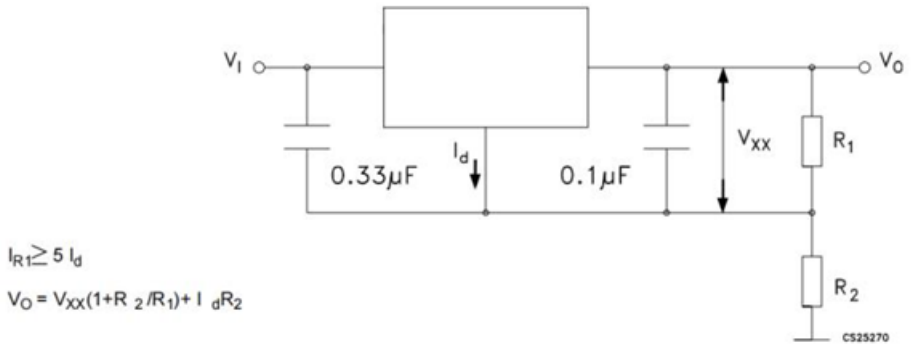


Figure 11. Circuit for increasing output voltage

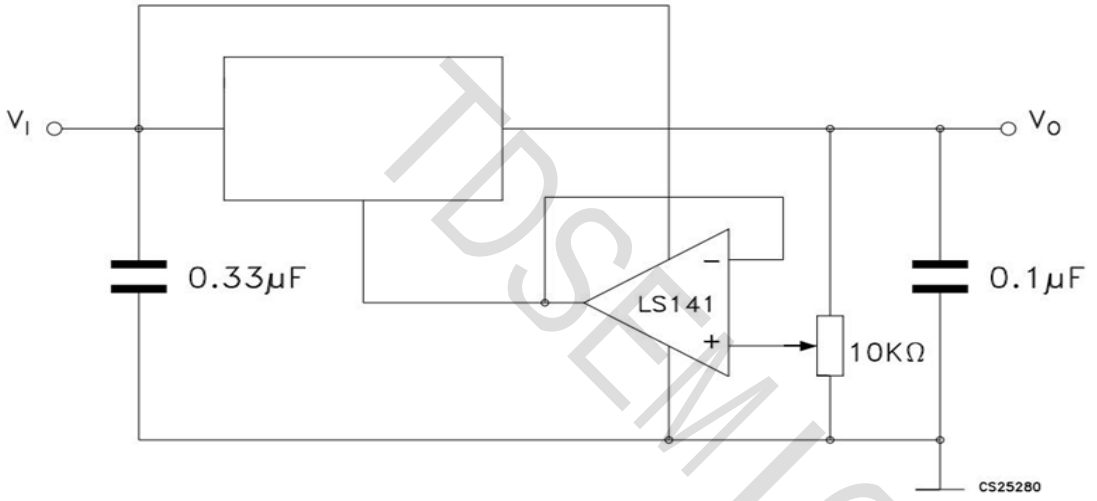


Figure 12. Adjustable output regulator (7 to 30 V)

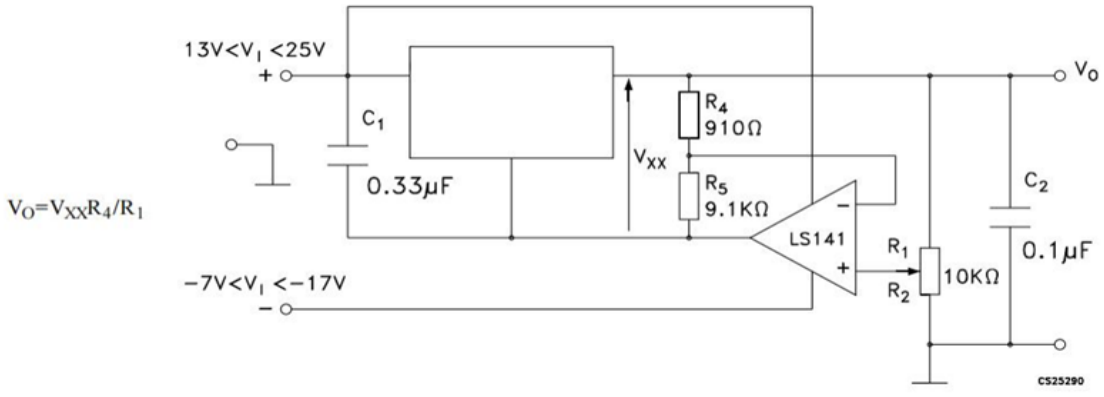


Figure 13. 0.5 to 10 V regulator

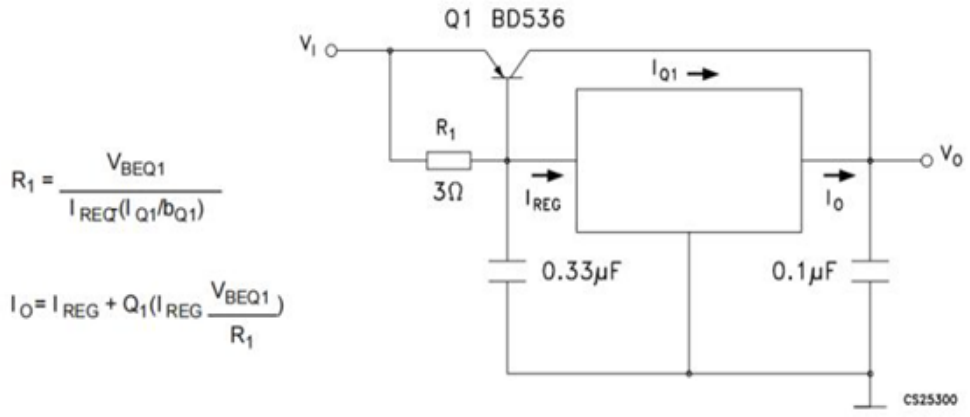


Figure 14. High current voltage regulator

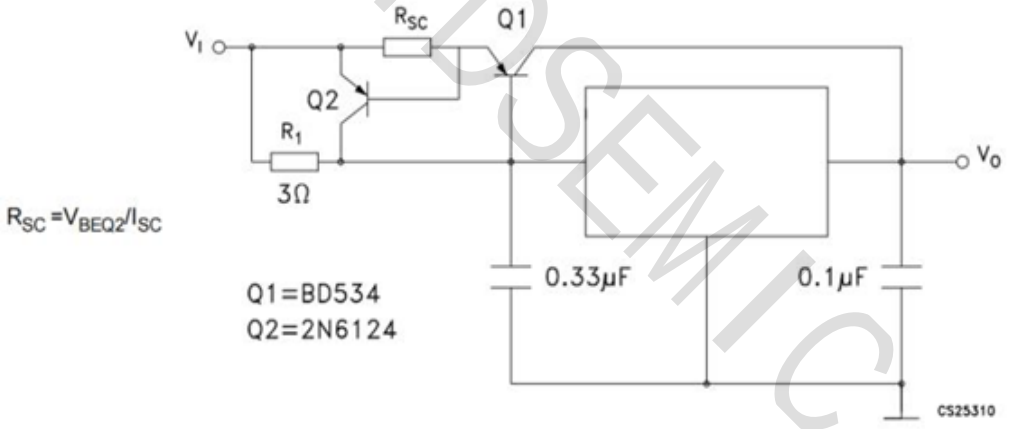


Figure 15. High output current with short circuit protection

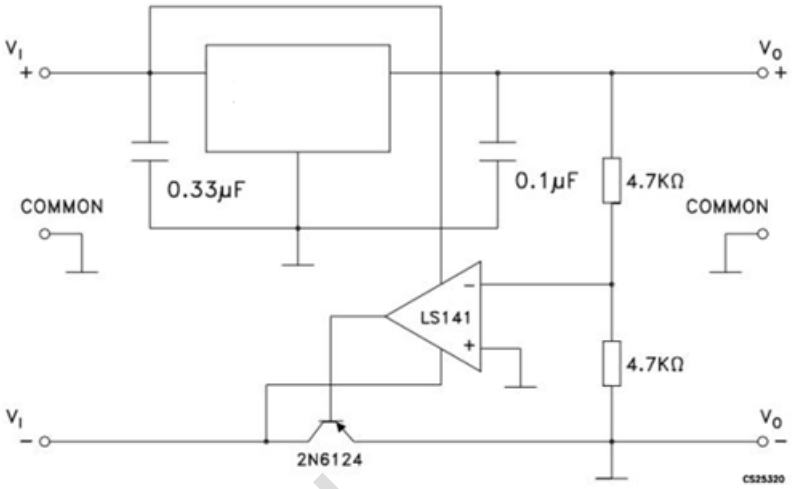


Figure 16. Tracking voltage regulator

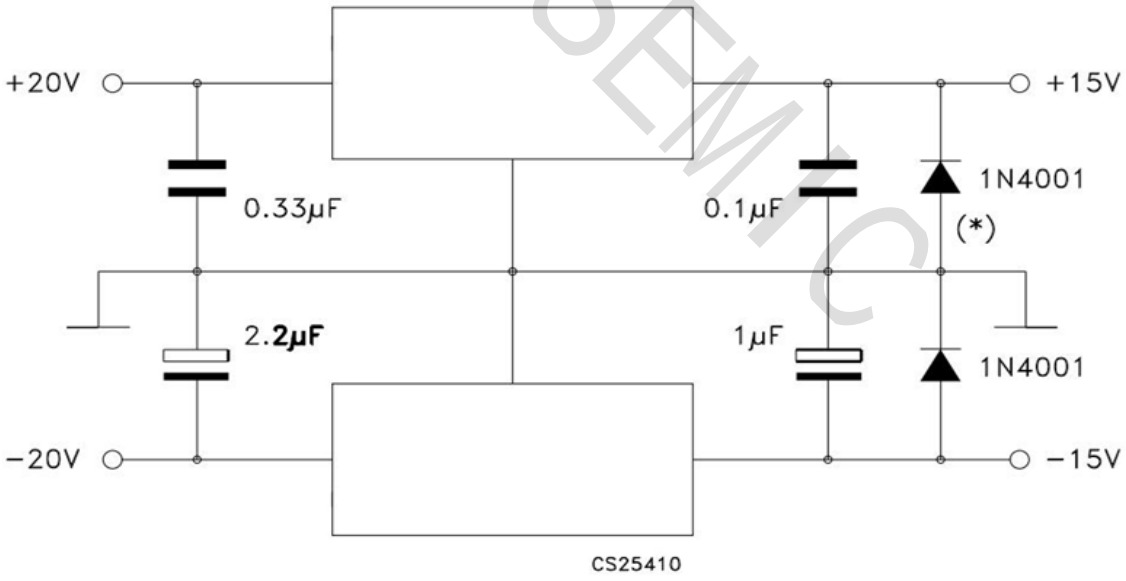


Figure 17. Split power supply (± 15 V - 1 A)

Note: * Against potential latch-up problems.

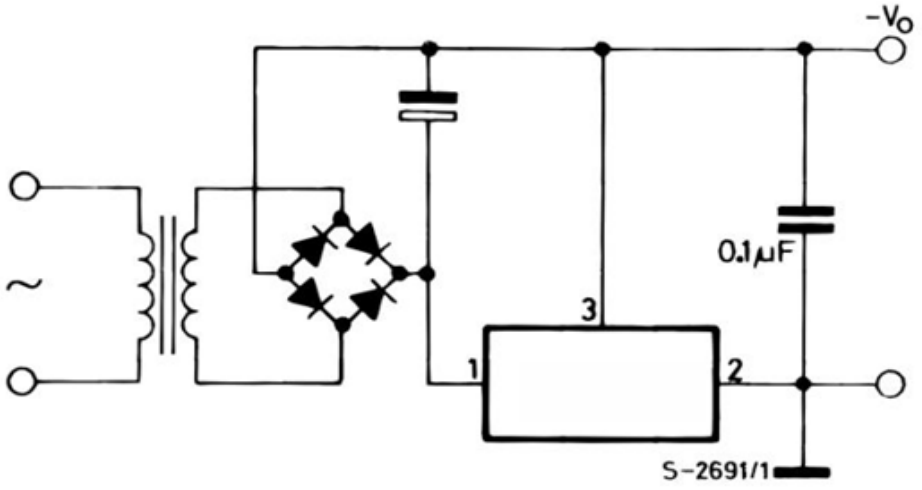


Figure 18. Negative output voltage circuit

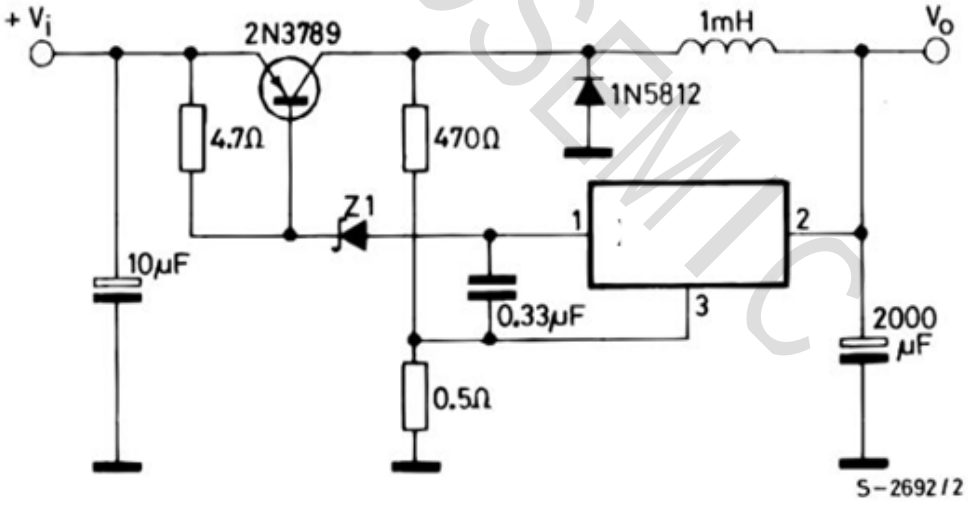


Figure 19. Switching regulator

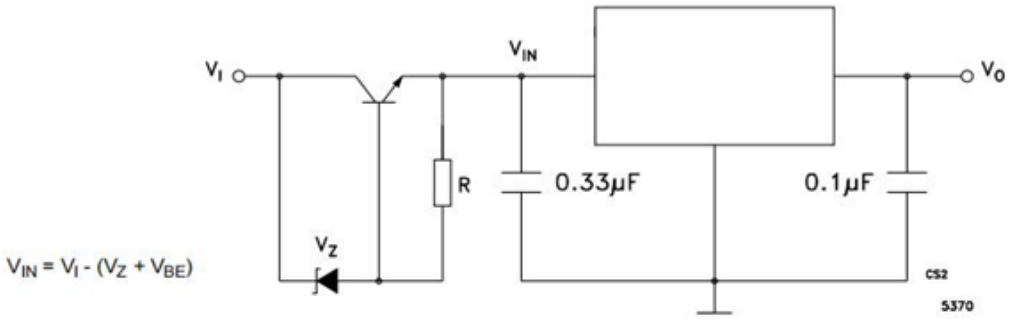


Figure 20. High input voltage circuit (configuration 1)

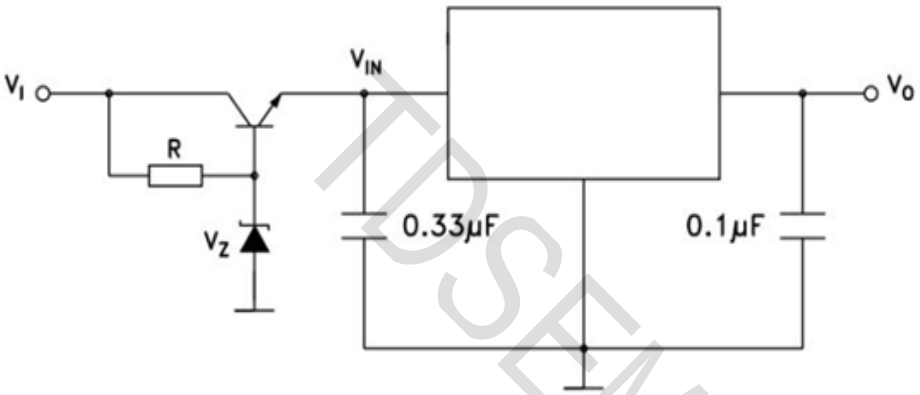


Figure 21. High input voltage circuit (configuration 2)

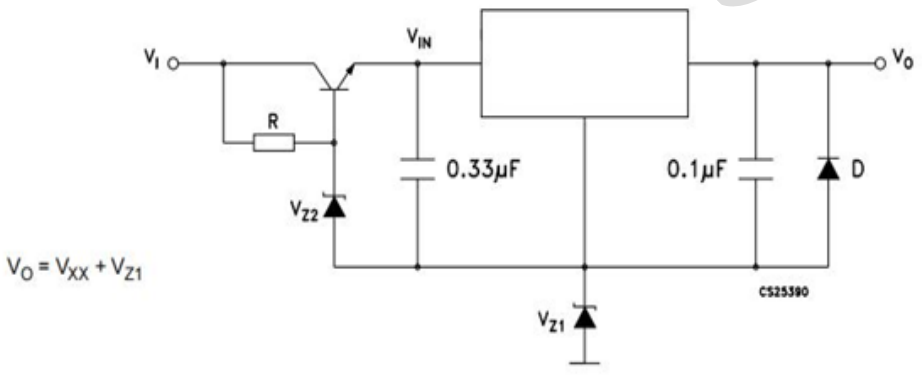


Figure 22. High input and output voltage

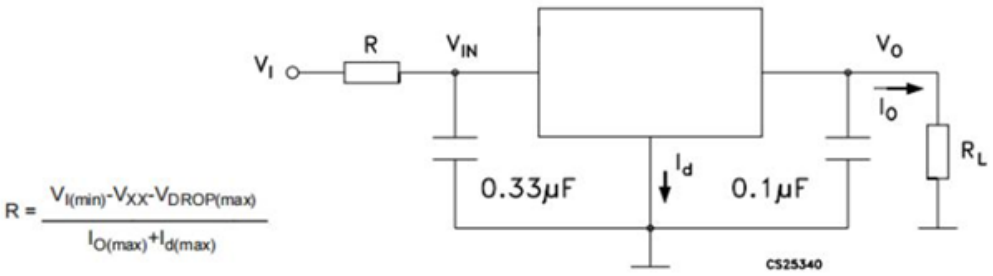


Figure 23. Reducing power dissipation with dropping resistor

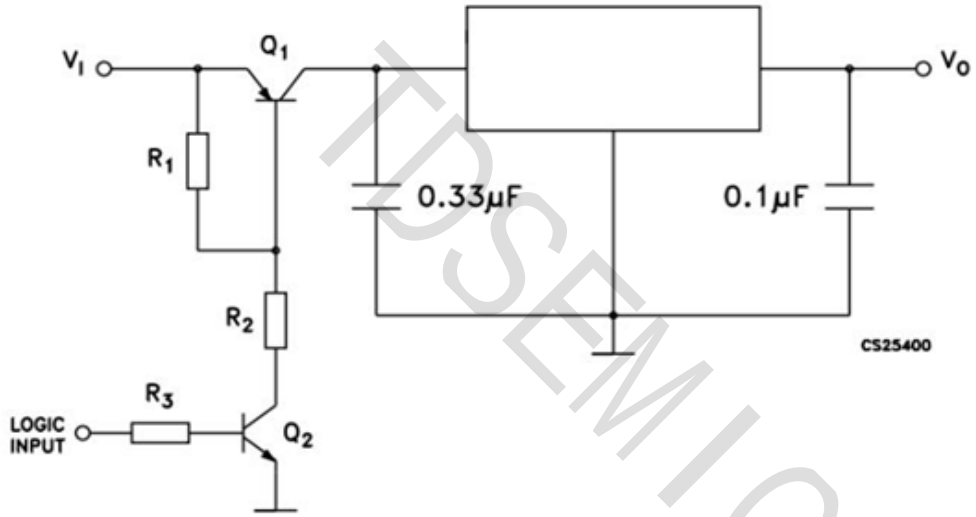


Figure 24. Remote shutdown

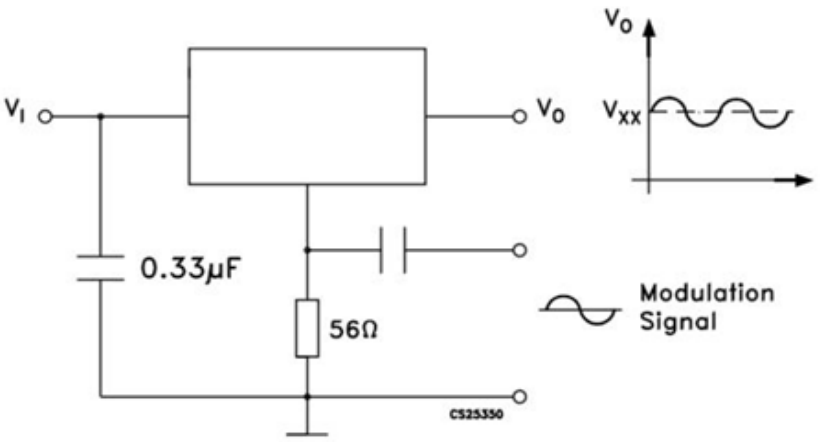


Figure 25. Power AM modulator (unity voltage gain, IO ≤ 0.5)

Note: The circuit performs well up to 100 kHz.

$V_O = V_{XX}(1+R_2/R_1) + V_{BE}$

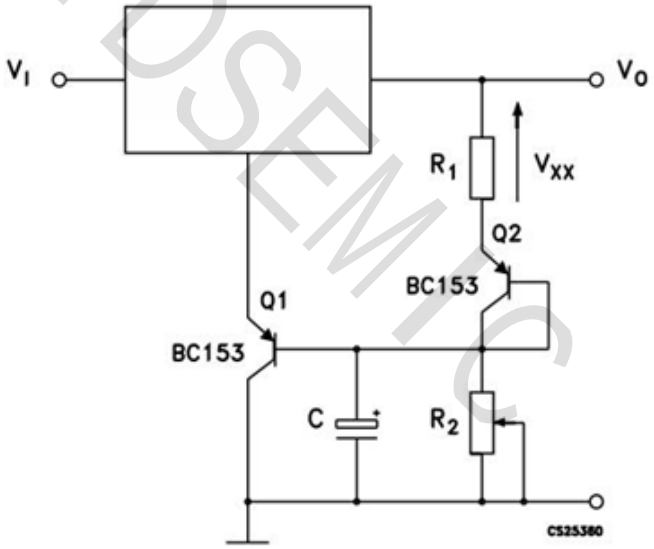


Figure 26. Adjustable output voltage with temperature compensation

Note: Q2 is connected as a diode in order to compensate the variation of the Q1 VBE with the temperature. C allows a slow rise time of the VO.

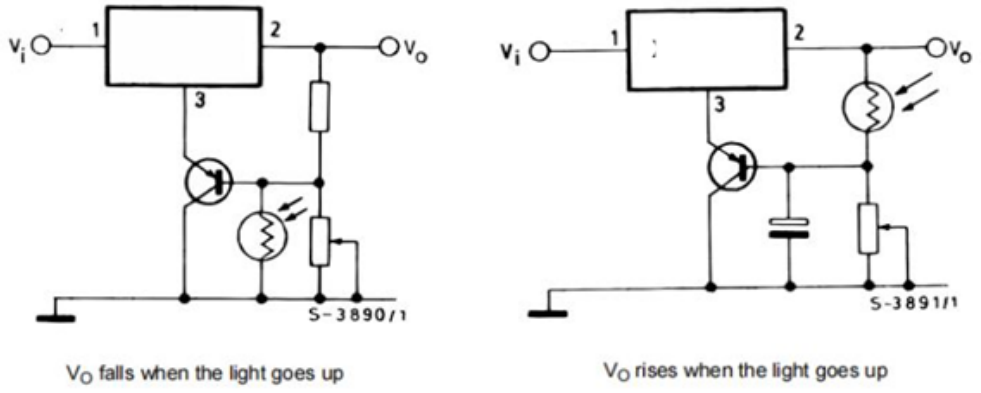


Figure 27. Light controllers (VO(min) = VXX + VBE)

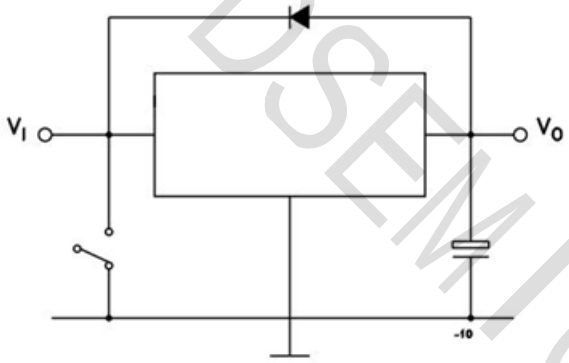


Figure 28. Protection against input short-circuit with high capacitance loads

Note: Application with high capacitance loads and an output voltage greater than 6 volts need an external diode (see Figure 23. Reducing power dissipation with dropping resistor) 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.

Typical performance

Figure 29. Dropout voltage vs junction temperature

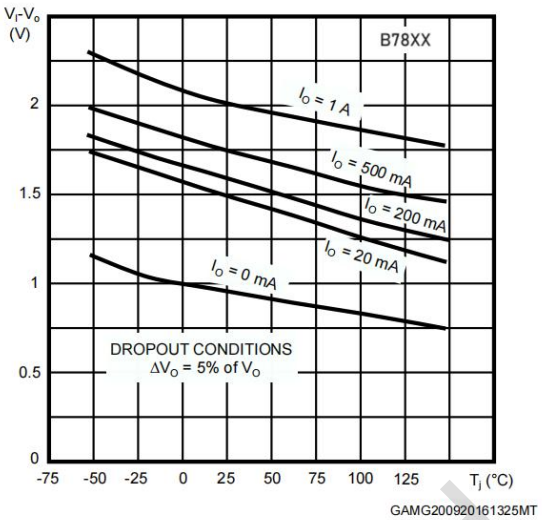


Figure 30. Peak output current vs input/output differential voltage

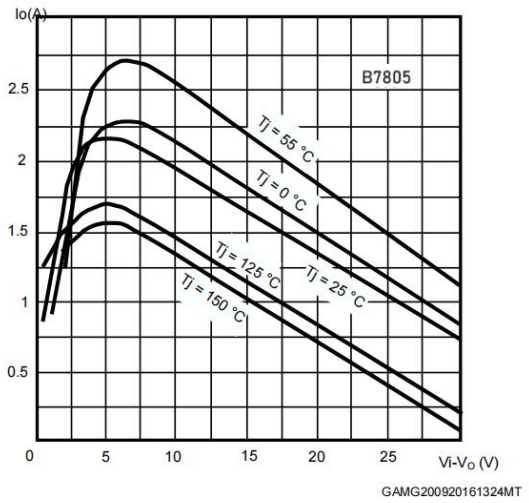


Figure 31. Supply voltage rejection vs frequency

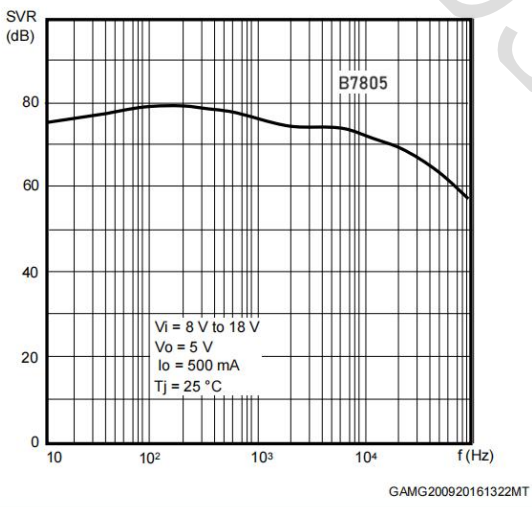


Figure 32. Output voltage vs junction temperature

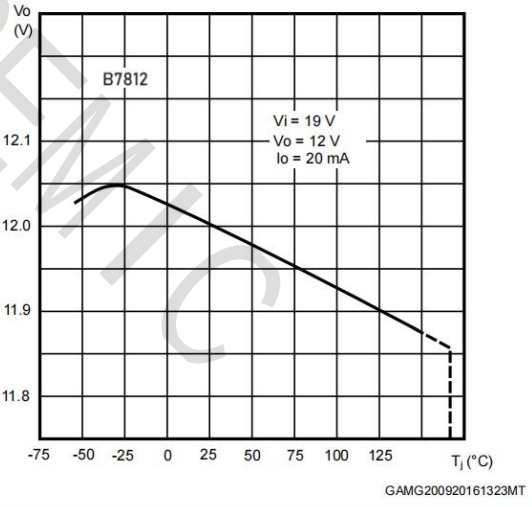
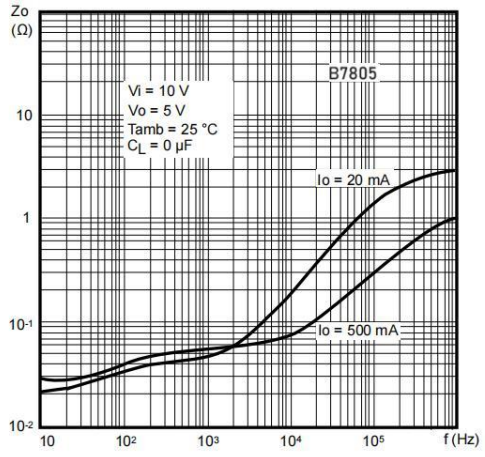
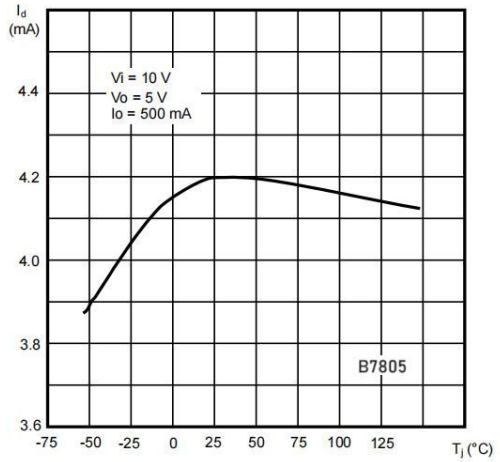


Figure 33. Output impedance vs frequency



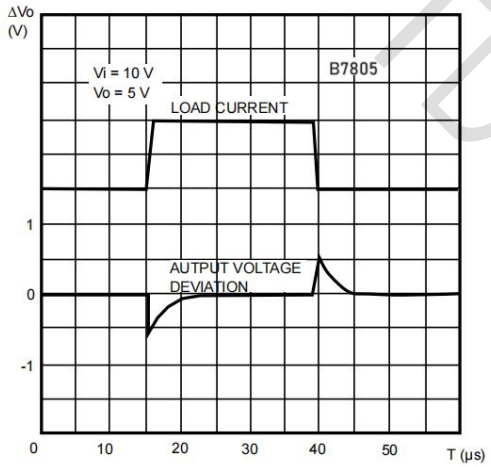
GAMG200920161320MT

Figure 34. Quiescent current vs junction temp.



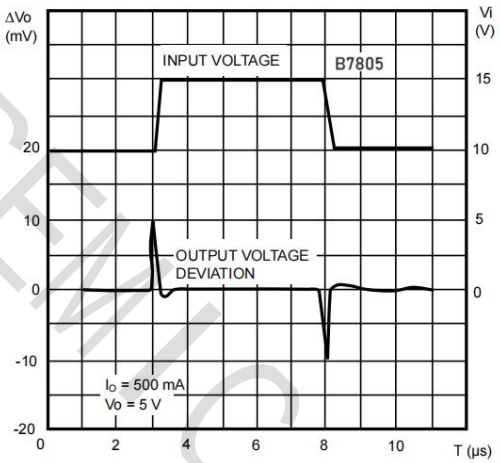
GAMG200920161321MT

Figure 35. Load transient response



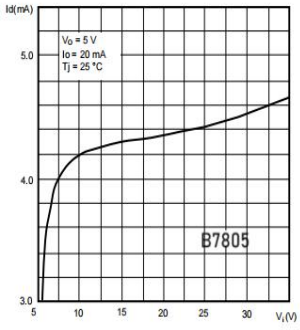
GAMG200920161326MT

Figure 36. Line transient response



GAMG200920161328MT

Figure 37. Quiescent current vs. input voltage



GAMG200920161329MT

Package information

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

TO-220 (dual gauge) package information

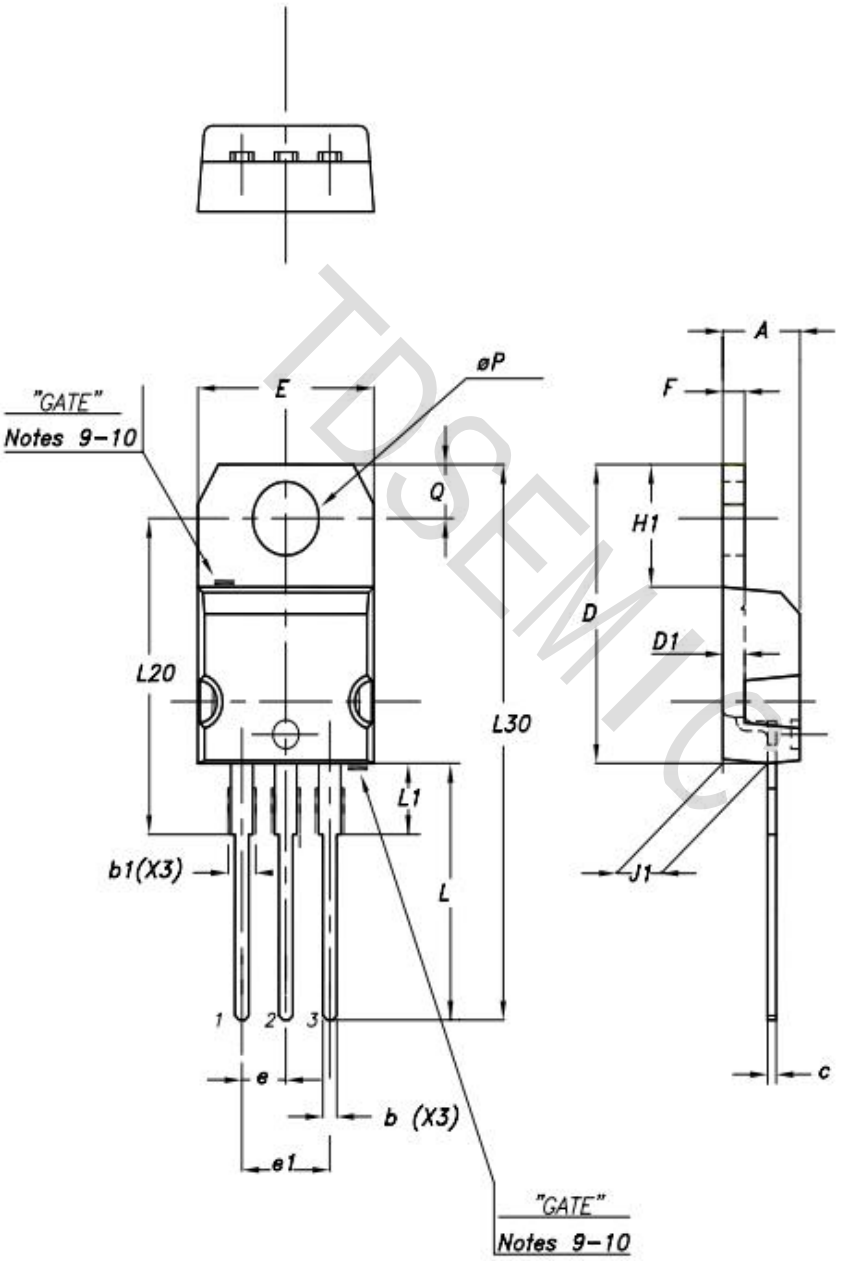


Figure 38. TO-220 (dual gauge) package outline

Dim	mm		
	Min	Typ	Max
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.4	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95

Table 19. TO-220 (dual gauge) mechanical data

TO-220 (single gauge) package information

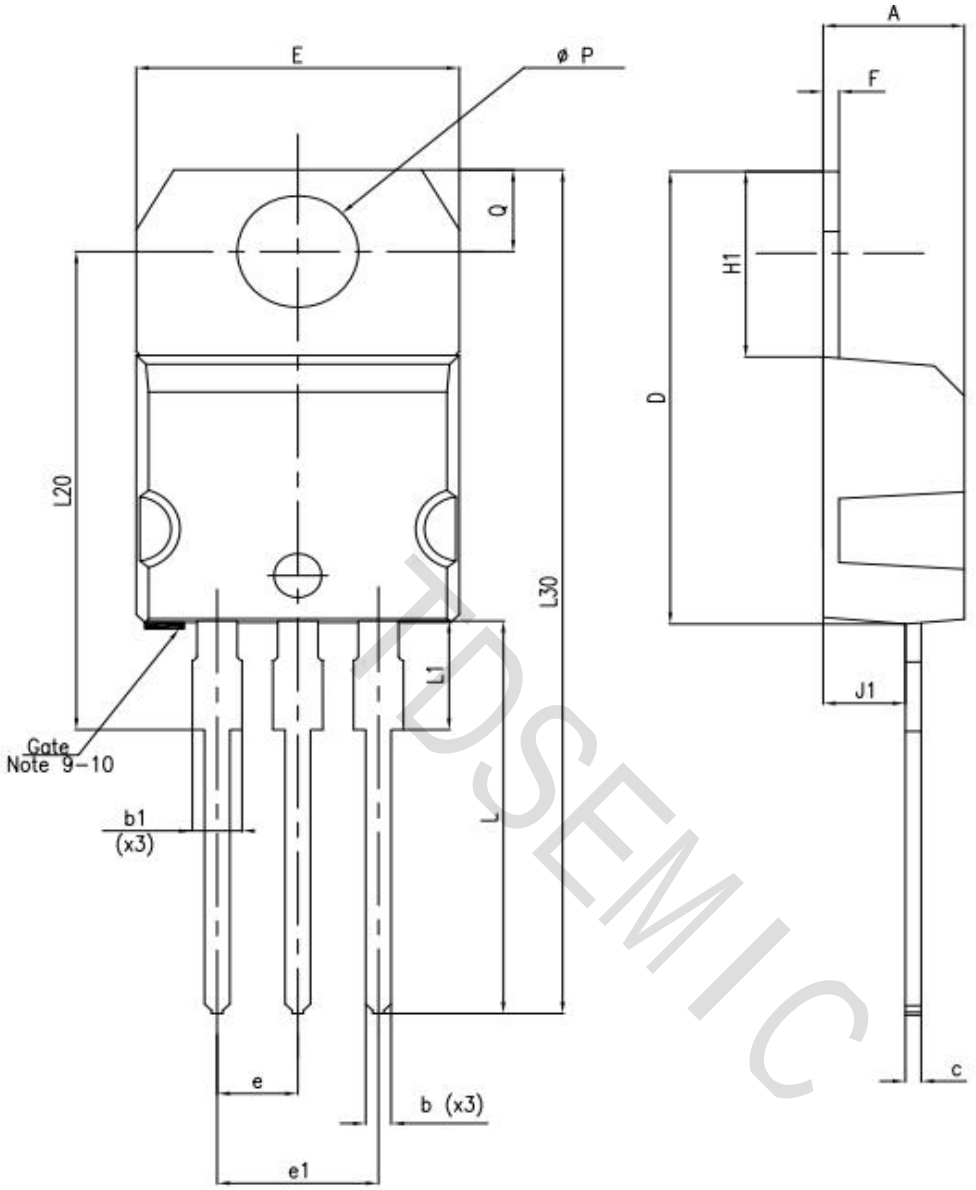


Figure 39. TO-220 (single gauge) package outline

Dim	mm		
	Min	Typ	Max
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	0.51		0.60
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.4	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95

Table 20. TO-220 (single gauge) mechanical data

TO-220F type A package information

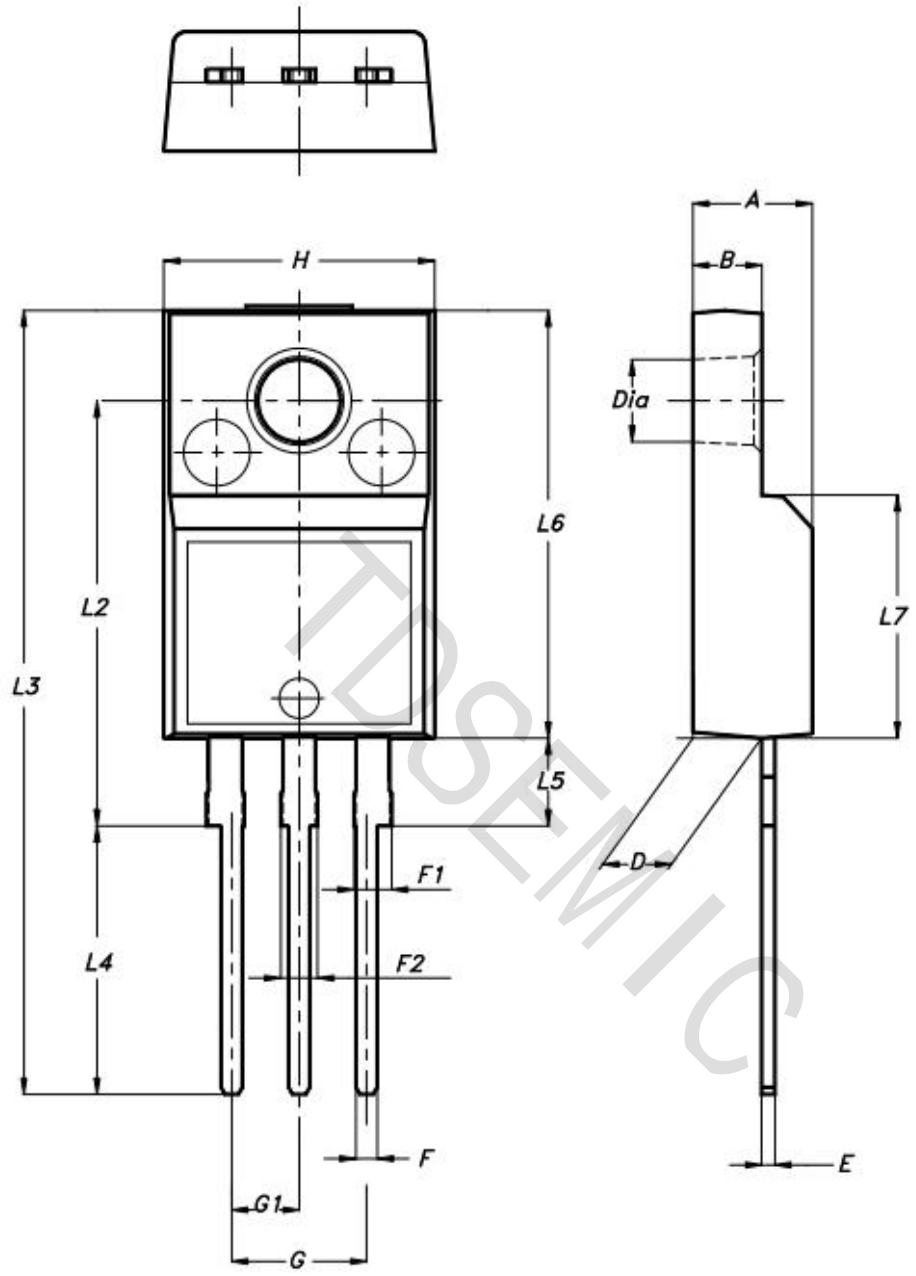


Figure 40. TO-220F package outline

Dim	mm		
	Min	Typ	Max
A	4.40		4.60
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

Table 21. TO-220F package mechanical data

TO-220 (single/dual) packing information

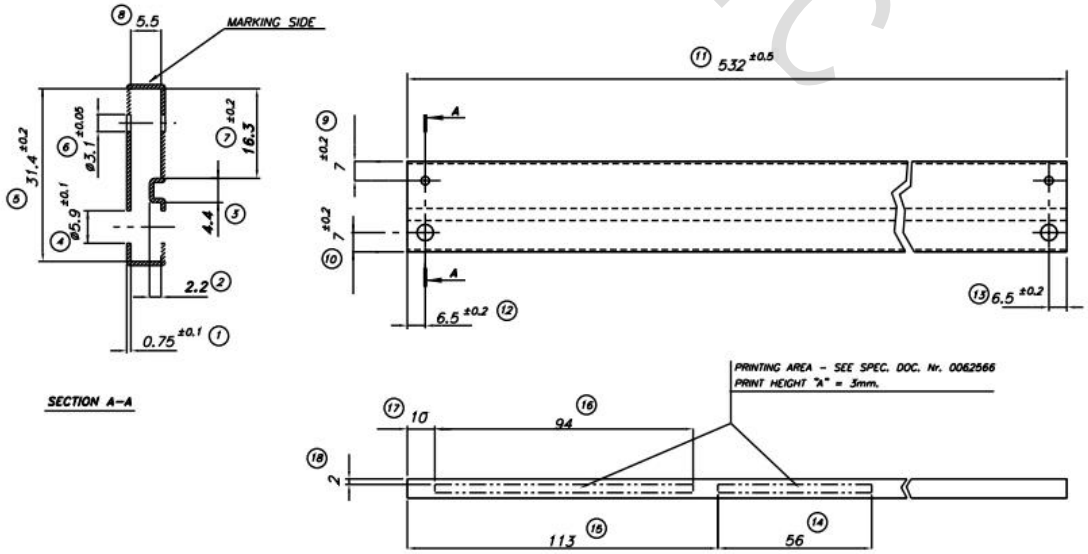


Figure 41. Tube for TO-220 (dual gauge) (mm.)

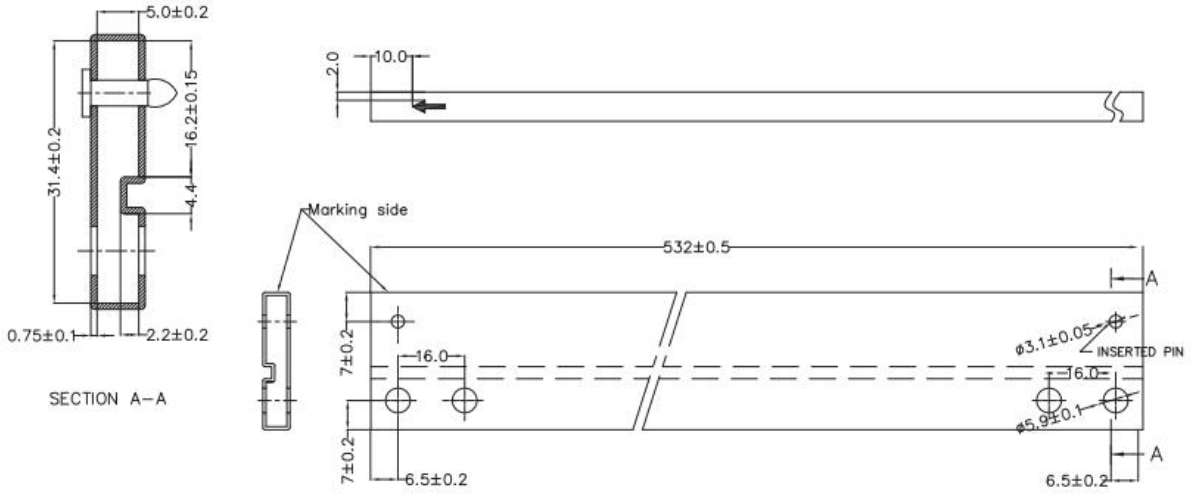


Figure 42. Tube for TO-220 (single gauge) (mm.)

TO-252 package information

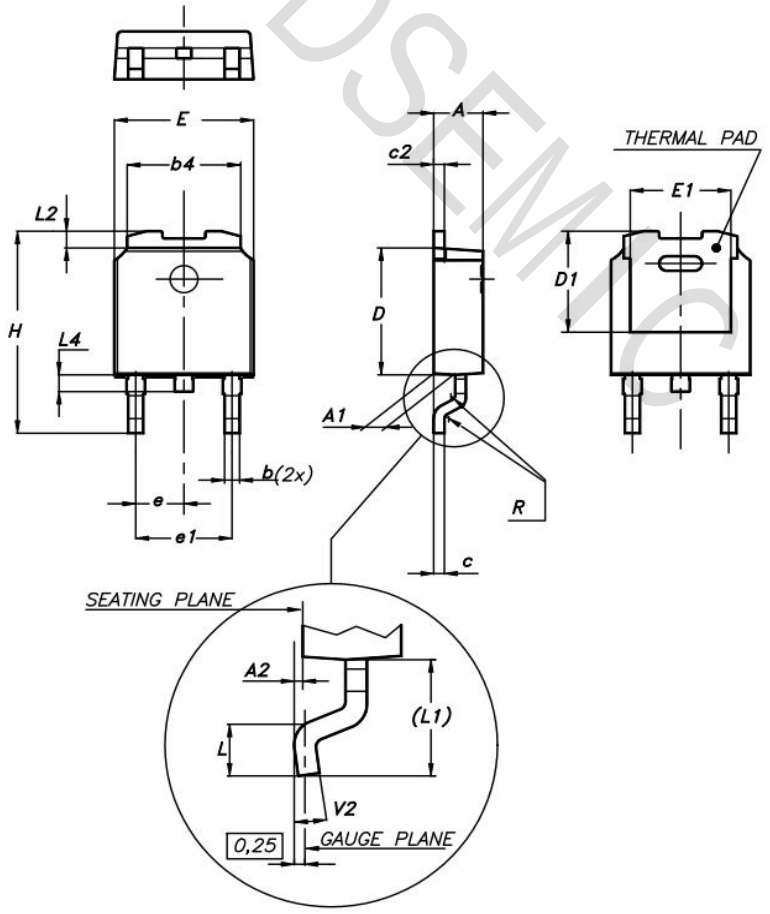


Figure 43. TO-252 package outline

Dim	mm		
	Min	Typ	Max
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1.00		1.50
(L1)		2.80	
L2		0.80	
L4	0.60		1.00
R		0.20	
V2	0°		8°

Table 22. TO-252 mechanical data

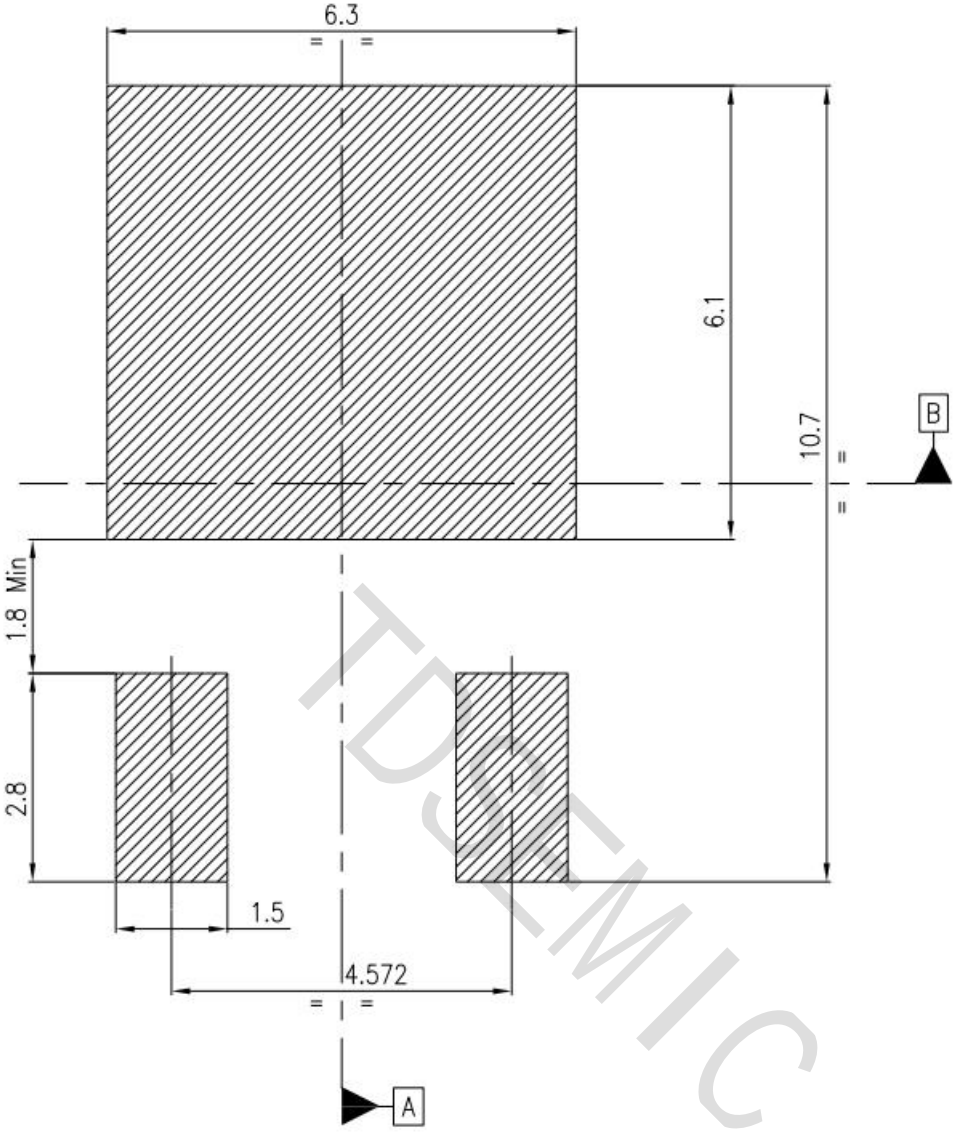


Figure 44. TO-252 recommended footprint (dimensions are in mm)

TO-252F (SMD 2L SL-ST) type A package information

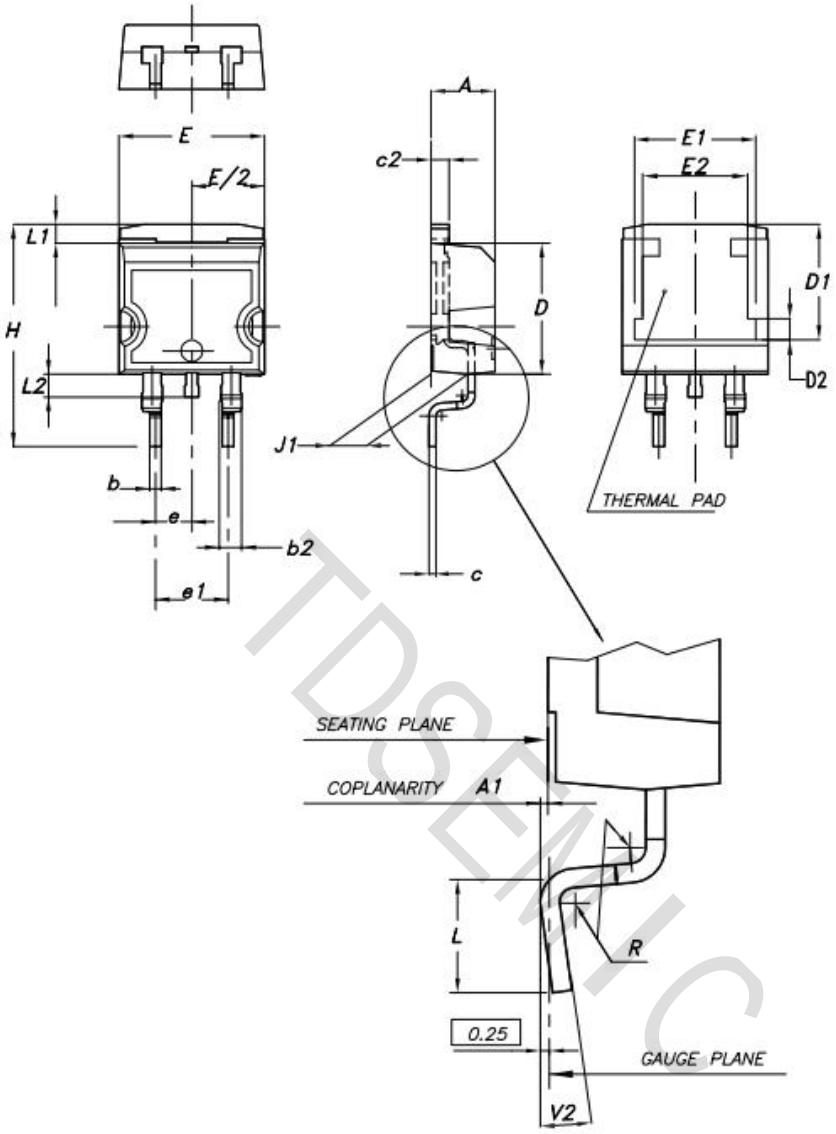


Figure 45. TO-252F (SMD 2L SL-ST) type A package outline

Dim	mm		
	Min	Typ	Max
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10		10.40
E1	8.50	8.70	8.90
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Table 23. TO-252F (SMD 2L SL-ST) mechanical data

TO-252F (ASE) type B package information

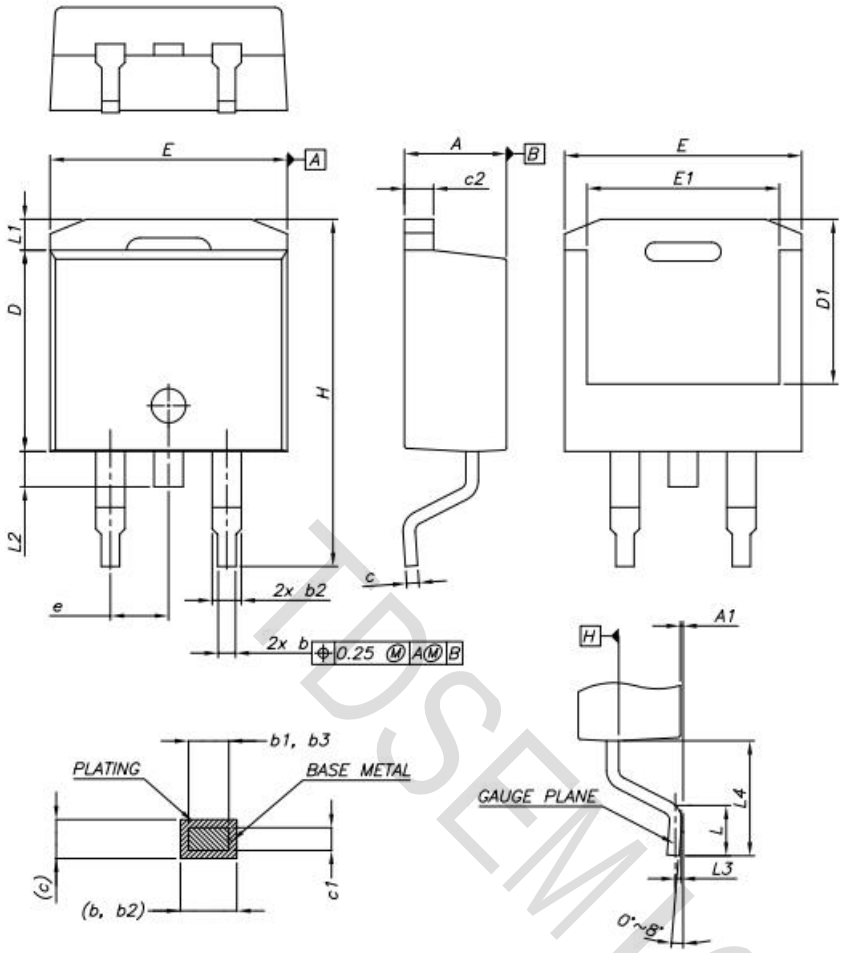


Figure 46. TO-252F (ASE subcon) type B package outline

Dim	mm		
	Min	Typ	Max
A	4.36		4.56
A1	0		0.25
b	0.70		0.90
b1	0.51		0.89
b2	1.17		1.37
b3	1.36		1.46
c	0.38		0.694
c1	0.38		0.534
c2	1.19		1.34
D	8.60		9.00
D1	6.90		7.50
E	10.15		10.55
E1	8.10		8.70
e		2.54	
H	15.00		15.6
L	1.90		2.50
L1			1.65
L2			1.78
L3		0.25	
L4	4.78		5.28

Table 24. TO-252F (ASE) type B mechanical data

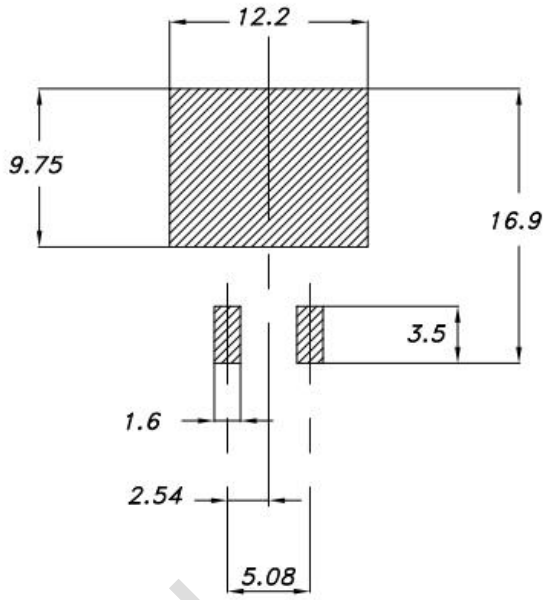


Figure 47. TO-252F recommended footprint (dimensions are in mm)

TO-252F and TO-252 packing information

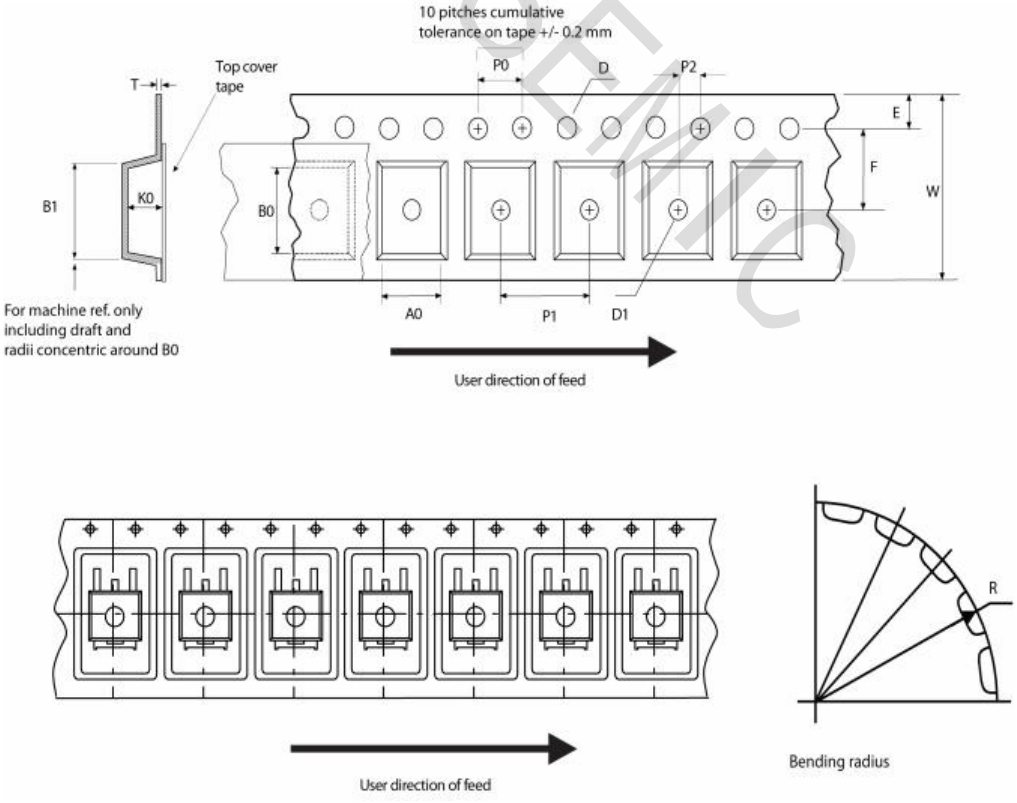


Figure 48. Tape outline

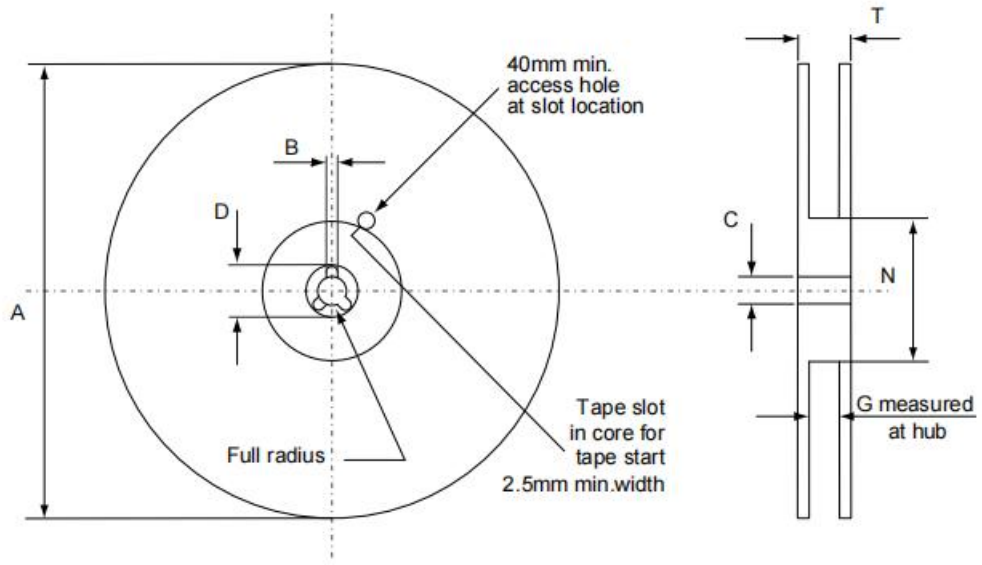


Figure 49. Reel outline

Tape			Reel		
Dim	mm		Dim	mm	
	Min	Max		Min	Max
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Table 25. TO-252F tape and reel mechanical data

Tape			Reel		
Dim	mm		Dim	mm	
	Min	Max		Min	Max
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base quantity		2500
P1	7.9	8.1	Bulk quantity		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

Table 26. TO-252 tape and reel mechanical data

Part number	Order codes					
	TO-220 (single guage)	TO-220 (dual guage)	TO-252	TO-252F	TO-220F	Output voltages
L7805	L7805-TD	L7805-TD	L7805 DT-TR	L7805CD2T- TD	L7805	5V
L7805AB	L7805-TD	L7805-TD		L7805ABD2T- TD	L7805ABP	5V
L7805AC	L7805A-TD	L7805A-TD		L7805ACD2T- TD	L7805A	5V
L7806C	L7806-TD	L7806-TD		L7806CD2T- TD		6V
L7806AB	L7806-TD	L7806-TD		L7806ABD2T- TD		6V
L7806AC	L7806A-TD	L7806A-TD				6V
L7808C	L7808-TD	L7808-TD		L7808CD2T- TD		8V
L7808AB	L7808-TD	L7808-TD		L7808ABD2T- TD		8V
L7808AC	L7808A-TD	L7808A-TD				8V
L7885C	L7885-TD					8.5V
L7809C	L7809-TD	L7809-TD		L7809CD2T- TD	L7809	9V
L7809AB	L7809-TD	L7809-TD		L7809ABD2T- TD		9V
L7809AC	L7809A-TD					9V
L7812C	L7812-TD	L7812-TD		L7812CD2T- TD	L7812	12V
L7812AB	L7812-TD	L7812-TD		L7812ABD2T- TD		12V
L7812AC	L7812A-TD	L7812A-TD		L7812ACD2T- TD		12V
L7815C	L7815-TD	L7815-TD		L7815CD2T- TD	L7815	15V
L7815AB	L7815-TD	L7815-TD		L7815ABD2T- TD		15V
L7815AC	L7815A-TD	L7815A-TD		L7815ACD2T- TD		15V
L7818C	L7818-TD	L7818-TD				18V
L7824C	L7824-TD	L7824-TD		L7824CD2T- TD	L7824	24V
L7824AB	L7824-TD	L7824-TD				24V
L7824AC	L7824A-TD	L7824A-TD				24V

Table 27. Order codes