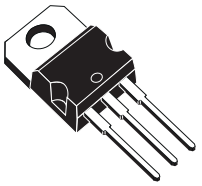
L78Sxx
L78SxxC

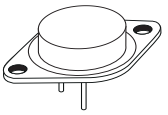
2 A positive voltage regulators

Features

- Output current to 2 A
- Output voltages of 5; 7.5; 9; 10; 12; 15; 18; 24 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection



TO-220



TO-3

Description

The L78Sxx series of three-terminal positive regulators is available in TO-220 and TO-3 packages and with several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 2 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

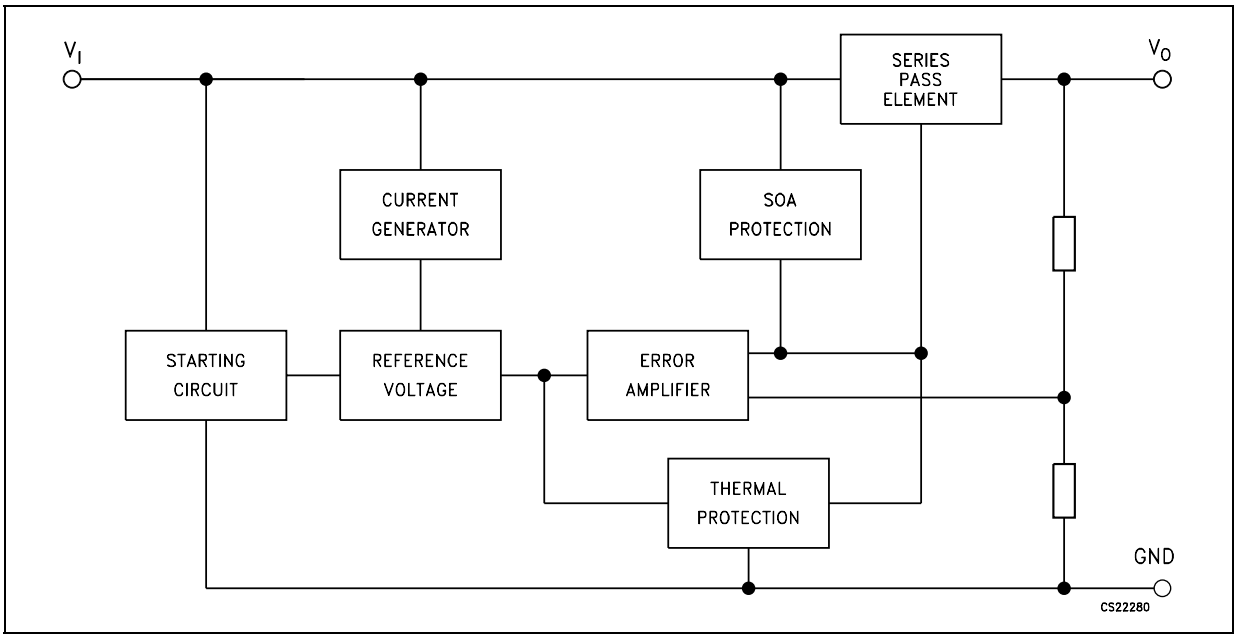
Table 1. Device summary

Part numbers			
L78S05	L78S09	L78S12	L78S18
L78S05C	L78S09C	L78S12C	L78S18C
L78S75	L78S10	L78S15	L78S24
L78S75C	L78S10C	L78S15C	L78S24C

Contents

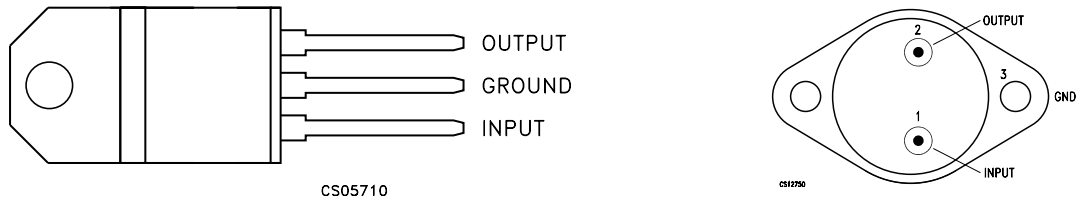
1 Diagram

Figure 1. Block diagram



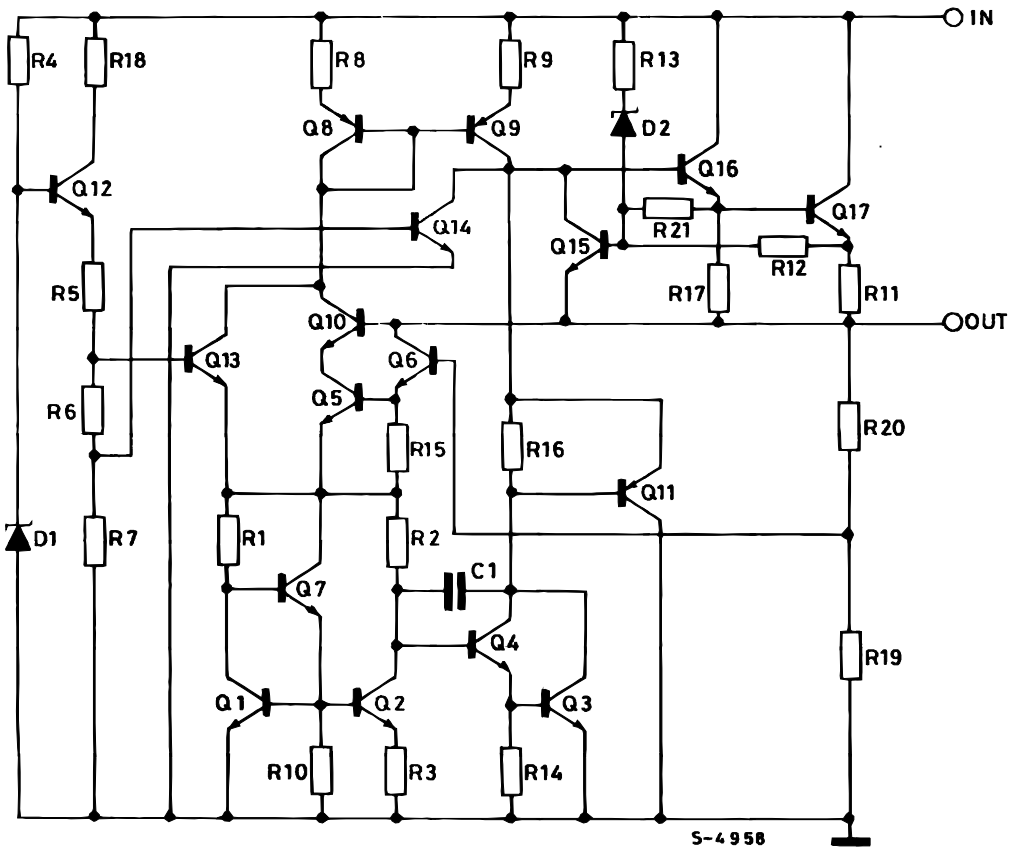
2 Pin configuration

Figure 2. Pin connections (top view)



TO-220 TO-3

Figure 3. Schematic diagram



3 Maximum ratings

Table 2. Absolute maximum ratings

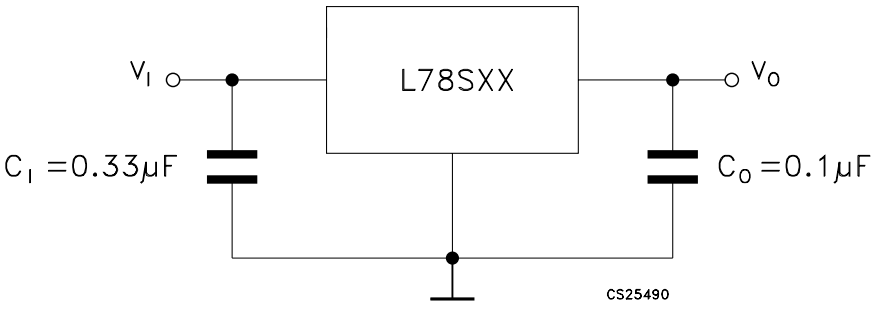
Symbol	Parameter		Value	Unit
V_I	DC input voltage	for V_O= 5 to 18V	35	V
		for V_O= 24V	40	
I_O	Output current		Internally limited	
P_D	Power dissipation		Internally limited	
T_{STG}	Storage temperature range		-65 to 150	°C
T_{OP}	Operating junction temperature range	for L78Sxx	-55 to 150	°C
		for L78SxxC	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	TO-220	TO-3	Unit
R_{thJC}	Thermal resistance junction-case	5	4	°C/W
R_{thJA}	Thermal resistance junction-ambient	50	35	°C/W

Figure 4. Application circuits



4 Test circuits

Figure 5. DC parameter

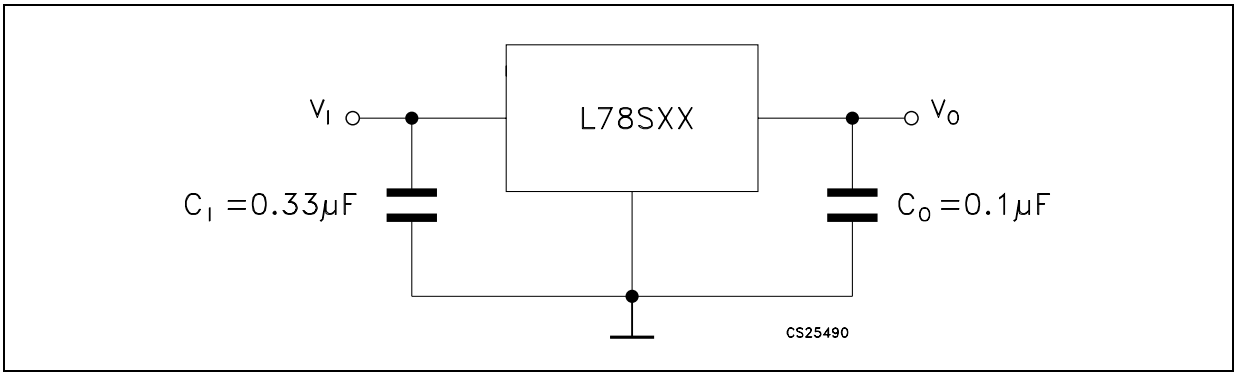


Figure 6. Load regulation

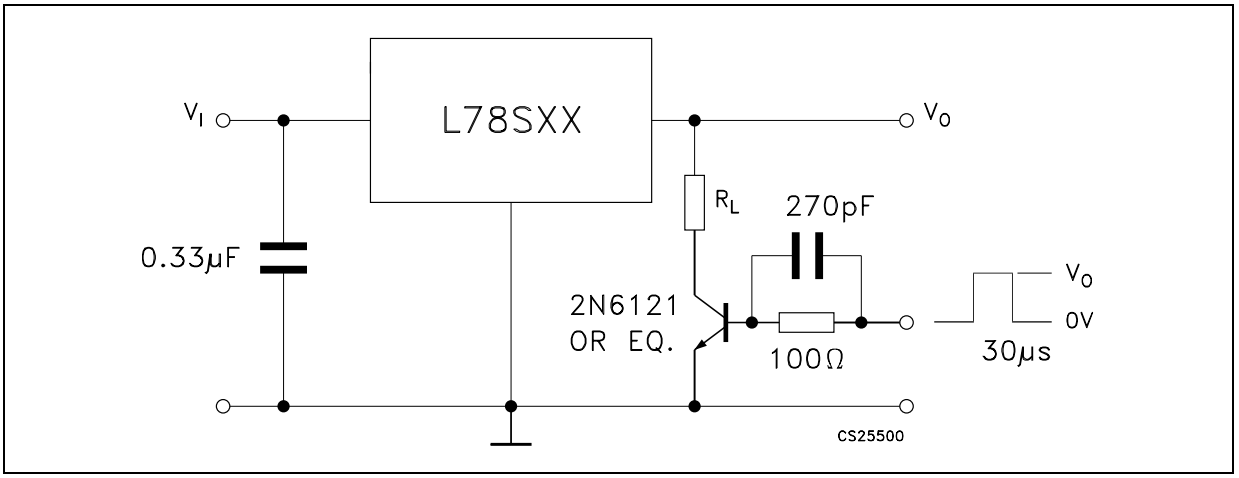
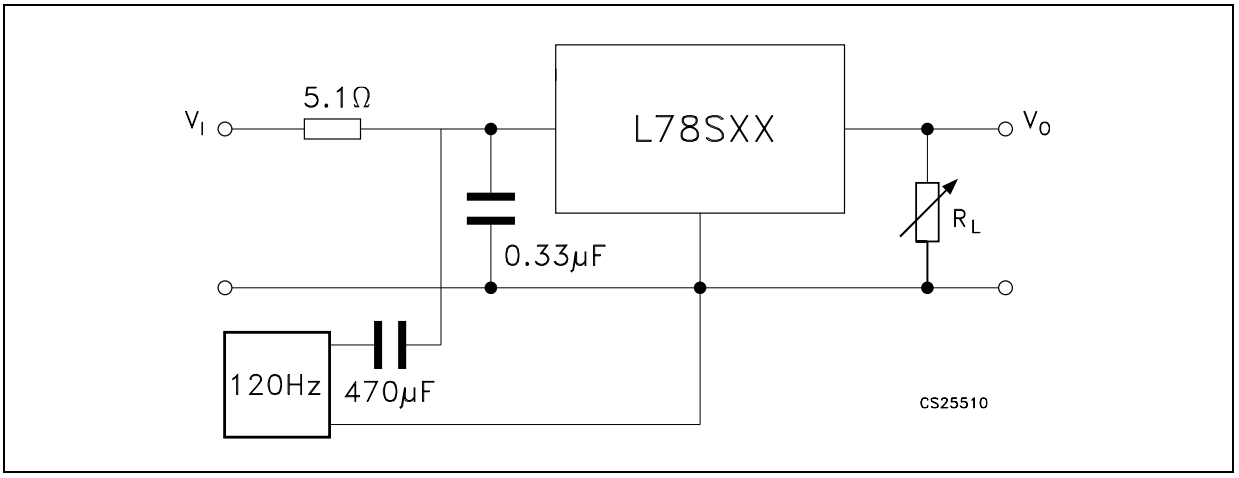


Figure 7. Ripple rejection



5 Electrical characteristics

Table 4. Electrical characteristics of L78S05 (refer to the test circuits, T_J = 25 °C, V_I = 10 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		4.8	5	5.2	V
V_O	Output voltage	I_O = 1A, V_I = 7V	4.75	5	5.25	V
ΔV_O	Line regulation	V_I = 7 to 25V			100	mV
		V_I = 8 to 25V			50	
ΔV_O	Load regulation	I_O = 20 mA to 2A			100	mV
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 7 to 25 V, I_O = 20mA			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = -55°C to 150°C		-1.1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		40		µV
SVR	Supply voltage rejection	f = 120Hz	60			dB
V_I	Operating input voltage	$I_O \leq$1A	8			V
R_O	Output resistance	f = 1 kHz		17		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 5. Electrical characteristics of L78S75 (refer to the test circuits, T_J = 25 °C, V_I = 12.5 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		7.15	7.5	7.9	V
V_O	Output voltage	I_O = 1A, V_I = 9.5V	7.1	7.5	7.95	V
ΔV_O	Line regulation	V_I = 9.5 to 25V			120	mV
		V_I = 10.5 to 20V			60	
ΔV_O	Load regulation	I_O = 20 mA to 2A			120	mV
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		I_O = 20mA, V_I = 9.5 to 25V			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = -55°C to 150°C		-0.8		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		52		µV
SVR	Supply voltage rejection	f = 120Hz	54			dB
V_I	Operating input voltage	I_O ≤1.5A	10.5			V
R_O	Output resistance	f = 1 kHz		16		mΩ
I_{sc}	Short circuit current	V_I =27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 6. Electrical characteristics of L78S09 (refer to the test circuits, T_J = 25 °C, V_I = 14 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		8.65	9	9.35	V
V_O	Output voltage	I_O = 1A, V_I = 11V	8.6	9	9.4	V
ΔV_O	Line regulation	V_I = 11 to 25V			130	mV
		V_I = 11 to 20V			65	
ΔV_O	Load regulation	I_O = 20 mA to 2A			130	mV
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 11 to 25 V, I_O = 20mA			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = -55°C to 150°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		60		µV
SVR	Supply voltage rejection	f = 120Hz	53			dB
V_I	Operating input voltage	I_O ≤1.5A	12			V
R_O	Output resistance	f = 1 kHz		17		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 7. Electrical characteristics of L78S10 (refer to the test circuits, T_J = 25 °C, V_I = 15 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		9.5	10	10.5	V
V_O	Output voltage	I_O = 1A, V_I = 12.5V	9.4	10	10.6	V
ΔV_O	Line regulation	V_I = 12.5 to 30V			200	mV
		V_I = 14 to 22V			100	
ΔV_O	Load regulation	I_O = 20 mA to 2A			150	mV
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 12.5 to 30 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = -55°C to 150°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		65		µV
SVR	Supply voltage rejection	f = 120Hz	53			dB
V_I	Operating input voltage	I_O ≤1.5A	13			V
R_O	Output resistance	f = 1 kHz		17		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 8. Electrical characteristics of L78S12 (refer to the test circuits, T_J = 25 °C, V_I = 19 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		11.5	12	12.5	V
V_O	Output voltage	I_O = 1A, V_I = 14.5V	11.4	12	12.6	V
ΔV_O	Line regulation	V_I = 14.5 to 30V			240	mV
		V_I = 16 to 22V			120	
ΔV_O	Load regulation	I_O = 20 mA to 2A			160	mV
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 14.5 to 30 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = -55°C to 150°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		75		µV
SVR	Supply voltage rejection	f = 120Hz	53			dB
V_I	Operating input voltage	I_O ≤1.5A	15			V
R_O	Output resistance	f = 1 kHz		18		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 9. Electrical characteristics of L78S15 (refer to the test circuits, T_J = 25 °C, V_I = 23 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		14.4	15	15.6	V
V_O	Output voltage	I_O = 1A, V_I = 17.5V	14.25	15	15.75	V
ΔV_O	Line regulation	V_I = 17.5 to 30V			300	mV
		V_I = 20 to 26V			150	
ΔV_O	Load regulation	I_O = 20 mA to 2A			180	mV
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 17.5 to 30 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = -55°C to 150°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		90		µV
SVR	Supply voltage rejection	f = 120Hz	52			dB
V_I	Operating input voltage	I_O ≤1.5A	18			V
R_O	Output resistance	f = 1 kHz		19		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 10. Electrical characteristics of L78S18 (refer to the test circuits, T_J = 25 °C, V_I = 26 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		17.1	18	18.9	V
V_O	Output voltage	I_O = 1A, V_I = 20.5V	17	18	19	V
ΔV_O	Line regulation	V_I = 20.5 to 30V			360	mV
		V_I = 22 to 28V			180	
ΔV_O	Load regulation	I_O = 20 mA to 2A			200	mV
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 20.5 to 30 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = -55°C to 150°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		110		µV
SVR	Supply voltage rejection	f = 120Hz	49			dB
V_I	Operating input voltage	I_O ≤1.5A	21			V
R_O	Output resistance	f = 1 kHz		22		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 11. Electrical characteristics of L78S24 (refer to the test circuits, T_J = 25 °C, V_I = 33 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		23	24	25	V
V_O	Output voltage	I_O = 1A, V_I = 27V	22.8	24	25.2	V
ΔV_O	Line regulation	V_I = 27 to 38V			480	mV
		V_I = 30 to 36V			240	
ΔV_O	Load regulation	I_O = 20 mA to 2A			250	mV
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 27 to 38 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = -55°C to 150°C		-1.5		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		170		µV
SVR	Supply voltage rejection	f = 120Hz	48			dB
V_I	Operating input voltage	I_O ≤1.5A	27			V
R_O	Output resistance	f = 1 kHz		23		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 12. Electrical characteristics of L78S05C (refer to the test circuits, T_J = 25 °C, V_I = 10 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		4.8	5	5.2	V
V_O	Output voltage	I_O = 1A, V_I = 7V	4.75	5	5.25	V
ΔV_O	Line regulation	V_I = 7 to 25V			100	mV
		V_I = 8 to 25V			50	
ΔV_O	Load regulation	I_O = 20 mA to 1.5A			100	mV
		I_O = 2A		80		
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 7 to 25 V, I_O = 20mA			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = 0°C to 70°C		-1.1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		40		µV
SVR	Supply voltage rejection	f = 120Hz	54			dB
V_I	Operating input voltage	I_O ≤1A	8			V
R_O	Output resistance	f = 1 kHz		17		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 13. Electrical characteristics of L78S75C (refer to the test circuits, T_J = 25 °C, V_I = 12.5 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		7.15	7.5	7.9	V
V_O	Output voltage	I_O = 1A, V_I = 9.5V	7.1	7.5	7.95	V
ΔV_O	Line regulation	V_I = 9.5 to 25V			120	mV
		V_I = 10.5 to 20V			60	
ΔV_O	Load regulation	I_O = 20 mA to 1.5A			140	mV
		I_O = 2A		100		
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 9.5 to 25 V, I_O = 20mA			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = 0°C to 70°C		-0.8		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		52		µV
SVR	Supply voltage rejection	f = 120Hz	48			dB
V_I	Operating input voltage	I_O ≤1A	10.5			V
R_O	Output resistance	f = 1 kHz		16		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 14. Electrical characteristics of L78S09C (refer to the test circuits, T_J = 25 °C, V_I = 14 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		8.65	9	9.35	V
V_O	Output voltage	I_O = 1A, V_I = 11V	8.6	9	9.4	V
ΔV_O	Line regulation	V_I = 11 to 25V			130	mV
		V_I = 11 to 20V			65	
ΔV_O	Load regulation	I_O = 20 mA to 1.5A			170	mV
		I_O = 2A		100		
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 11 to 25 V, I_O = 20mA			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = 0°C to 70°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		60		µV
SVR	Supply voltage rejection	f = 120Hz	47			dB
V_I	Operating input voltage	I_O ≤1A	12			V
R_O	Output resistance	f = 1 kHz		17		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 15. Electrical characteristics of L78S10C (refer to the test circuits, T_J = 25 °C, V_I = 15 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		9.5	10	10.5	V
V_O	Output voltage	I_O = 1A, V_I = 12.5V	9.4	10	10.6	V
ΔV_O	Line regulation	V_I = 12.5 to 30V			200	mV
		V_I = 14 to 22V			100	
ΔV_O	Load regulation	I_O = 20 mA to 1.5A			240	mV
		I_O = 2A		150		
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 12.5 to 30 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = 0°C to 70°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		65		µV
SVR	Supply voltage rejection	f = 120Hz	47			dB
V_I	Operating input voltage	I_O ≤1A	13			V
R_O	Output resistance	f = 1 kHz		17		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 16. Electrical characteristics of L78S12C (refer to the test circuits, T_J = 25 °C, V_I = 19 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		11.5	12	12.5	V
V_O	Output voltage	I_O = 1A, V_I = 14.5V	11.4	12	12.6	V
ΔV_O	Line regulation	V_I = 14.5 to 30V			240	mV
		V_I = 16 to 22V			120	
ΔV_O	Load regulation	I_O = 20 mA to 1.5A			240	mV
		I_O = 2A		150		
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 14.5 to 30 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = 0°C to 70°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		75		µV
SVR	Supply voltage rejection	f = 120Hz	47			dB
V_I	Operating input voltage	I_O ≤1A	15			V
R_O	Output resistance	f = 1 kHz		18		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 17. Electrical characteristics of L78S15C (refer to the test circuits, T_J = 25 °C, V_I = 23 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		14.4	15	15.6	V
V_O	Output voltage	I_O = 1A, V_I = 17.5V	14.25	15	15.75	V
ΔV_O	Line regulation	V_I = 17.5 to 30V			300	mV
		V_I = 20 to 26V			150	
ΔV_O	Load regulation	I_O = 20 mA to 1.5A			300	mV
		I_O = 2A		150		
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 17.5 to 30 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = 0°C to 70°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		90		µV
SVR	Supply voltage rejection	f = 120Hz	46			dB
V_I	Operating input voltage	I_O ≤1A	18			V
R_O	Output resistance	f = 1 kHz		19		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 18. Electrical characteristics of L78S18C (refer to the test circuits, T_J = 25 °C, V_I = 26 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		17.1	18	18.9	V
V_O	Output voltage	I_O = 1A, V_I = 20.5V	17	18	19	V
ΔV_O	Line regulation	V_I = 20.5 to 30V			360	mV
		V_I = 22 to 28V			180	
ΔV_O	Load regulation	I_O = 20 mA to 1.5A			360	mV
		I_O = 2A		200		
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 20.5 to 30 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = 0°C to 70°C		-1		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		110		µV
SVR	Supply voltage rejection	f = 120Hz	43			dB
V_I	Operating input voltage	I_O ≤1A	21			V
R_O	Output resistance	f = 1 kHz		22		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

Table 19. Electrical characteristics of L78S24C (refer to the test circuits, T_J = 25 °C, V_I = 33 V, I_O = 500 mA, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage		23	24	25	V
V_O	Output voltage	I_O = 1A, V_I = 27V	22.8	24	25.2	V
ΔV_O	Line regulation	V_I = 27 to 38V			480	mV
		V_I = 30 to 36V			240	
ΔV_O	Load regulation	I_O = 20 mA to 1.5A			480	mV
		I_O = 2A		300		
I_Q	Quiescent current				8	mA
ΔI_Q	Quiescent current change	I_O = 20mA to 1A			0.5	mA
		V_I = 27 to 38 V, I_O = 20mA			1	
$\Delta V_O/\Delta T$	Output voltage drift	I_O = 5mA, T_J = 0°C to 70°C		-1.5		mV/°C
eN	Output noise voltage	B =10Hz to 100kHz		170		µV
SVR	Supply voltage rejection	f = 120Hz	42			dB
V_I	Operating input voltage	$I_O \leq$1A	27			V
R_O	Output resistance	f = 1 kHz		28		mΩ
I_{sc}	Short circuit current	V_I = 27V		500		mA
I_{scp}	Short circuit peak current			3		A

6 Typical performance

Figure 8. Dropout voltage vs junction temperature

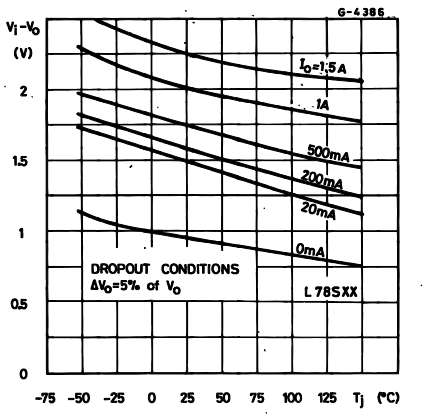


Figure 9. Peak output current vs input/output differential voltage

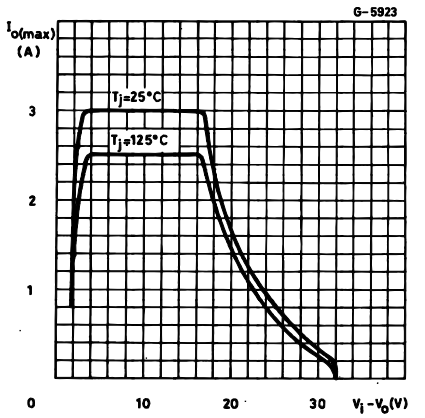


Figure 10. Output impedance vs frequency

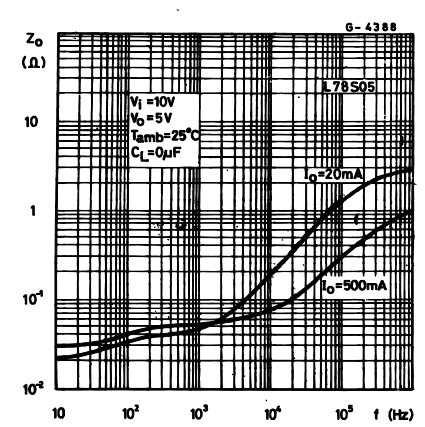


Figure 11. Output voltage vs junction temperature

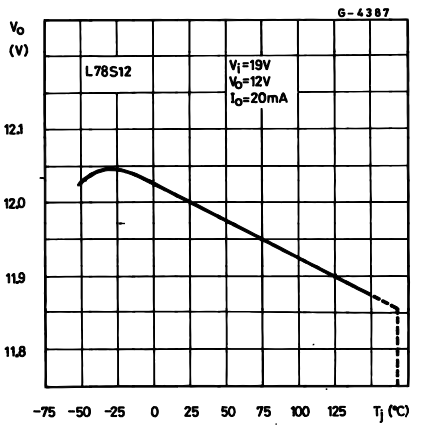


Figure 12. Supply voltage rejection vs frequency

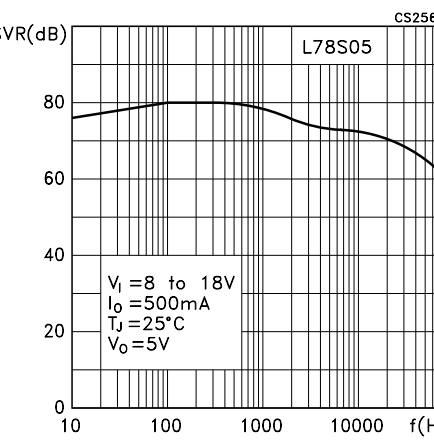


Figure 13. Quiescent current vs junction temperature

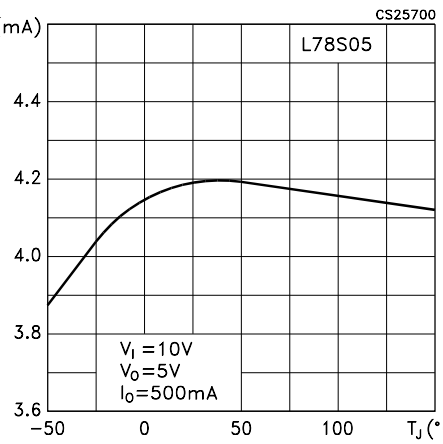


Figure 14. Load transient response

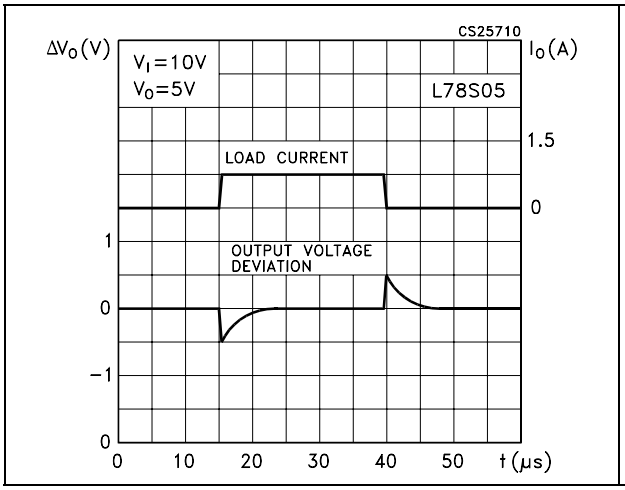


Figure 15. Line transient response

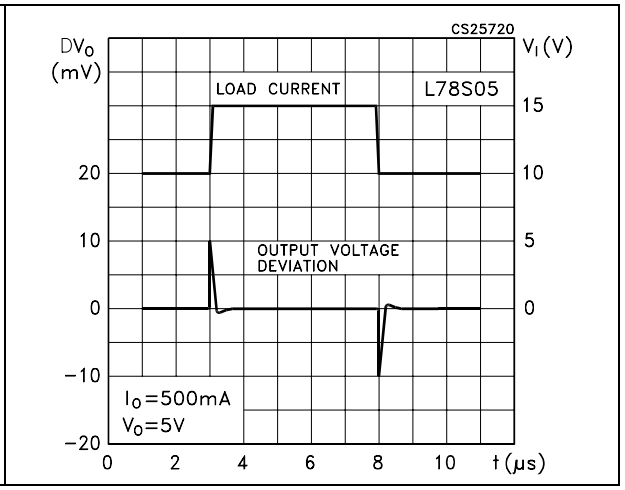


Figure 16. Quiescent current vs input voltage

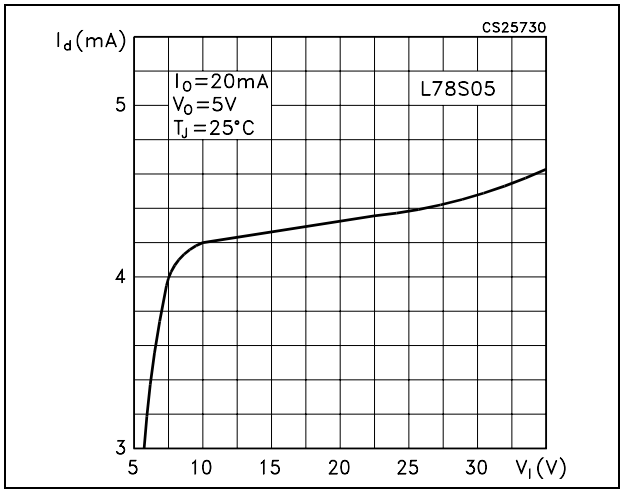
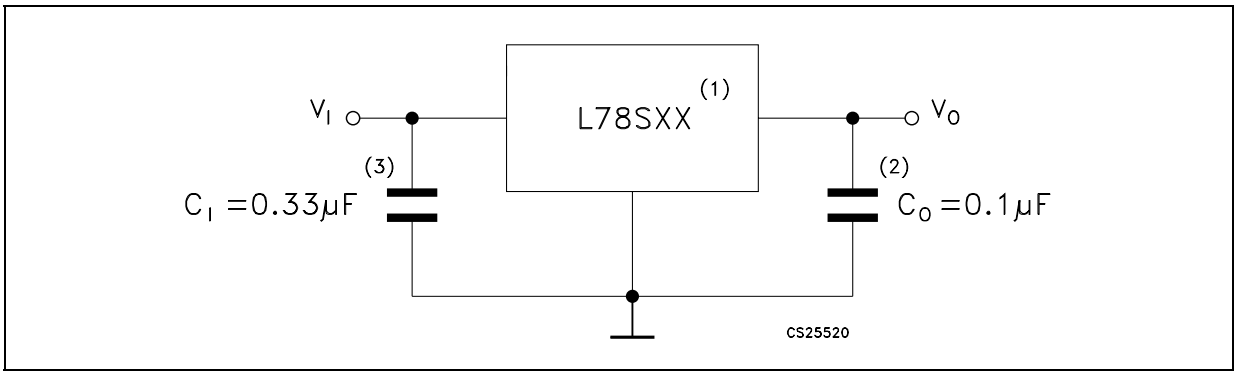


Figure 17. Fixed output regulator



1. To specify an output voltage, substitute voltage value for "XX".
2. Although no output capacitor is need for stability, it does improve transient response.
3. Required if regulator is locate an appreciable distance from power supply filter.

Figure 18. Constant current regulator

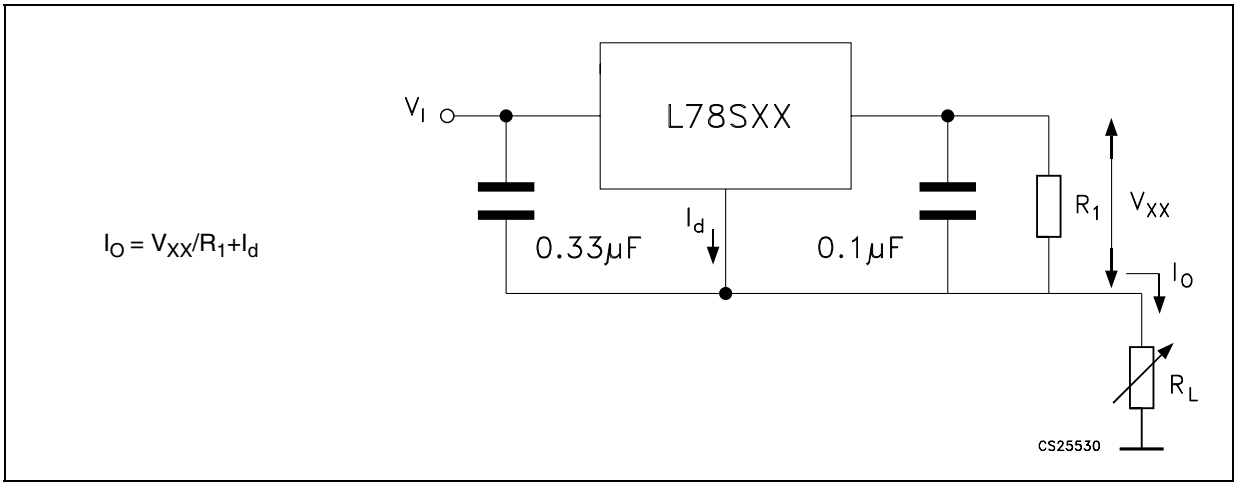


Figure 19. Circuit for increasing output voltage

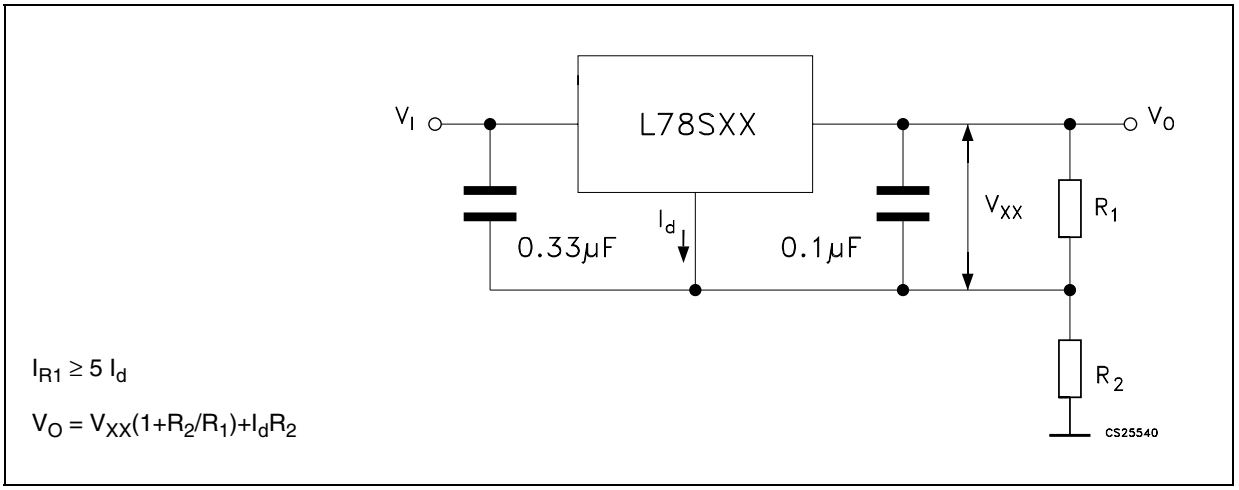


Figure 20. Adjustable output regulator (7 to 30 V)

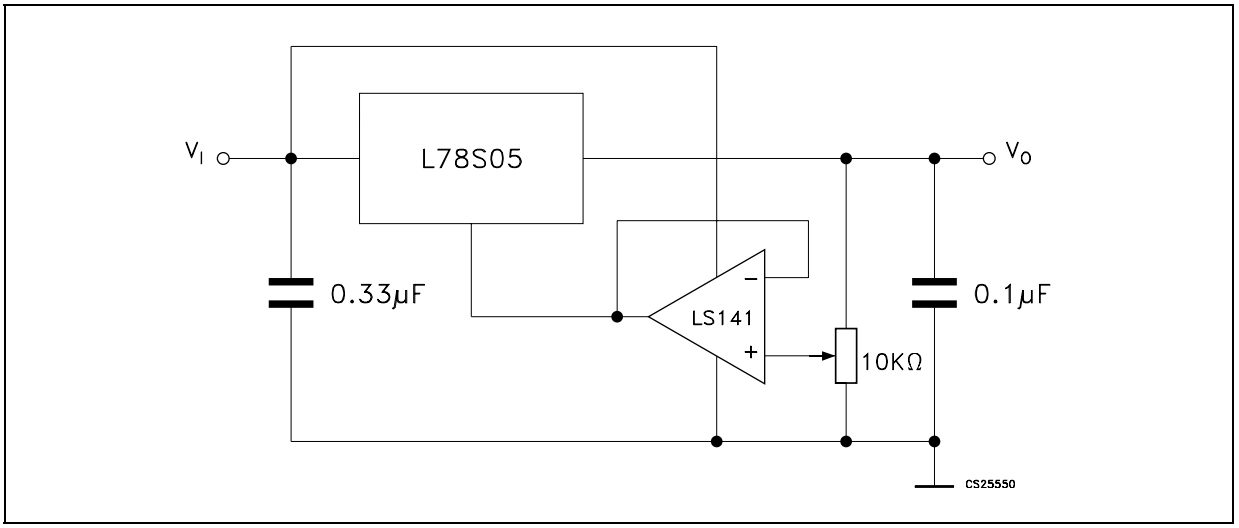


Figure 21. 0.5 to 10 V regulator

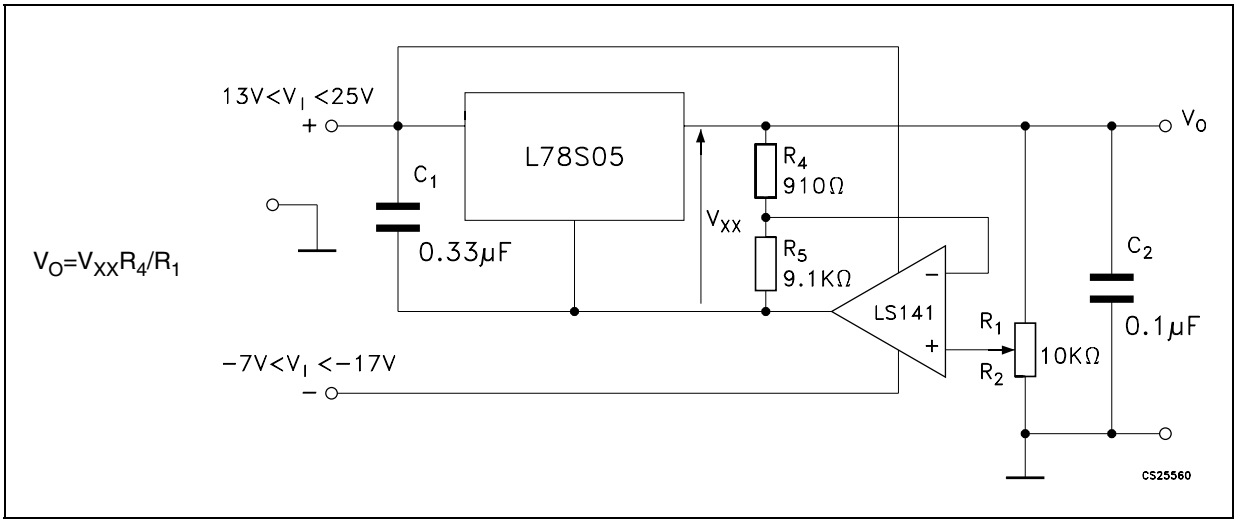


Figure 22. High current voltage regulator

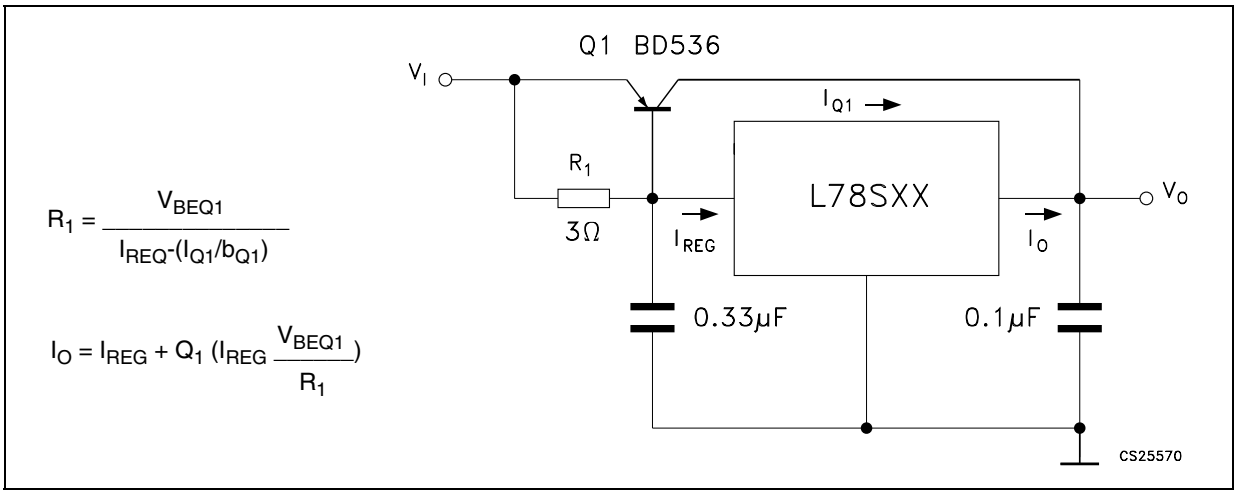


Figure 23. High output current with short circuit protection

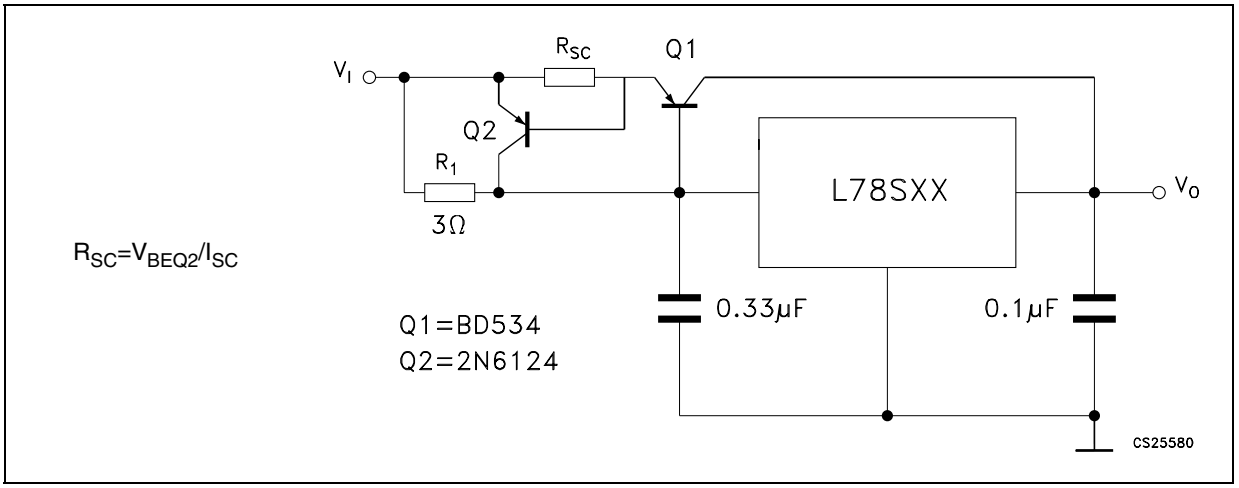


Figure 24. Tracking voltage regulator

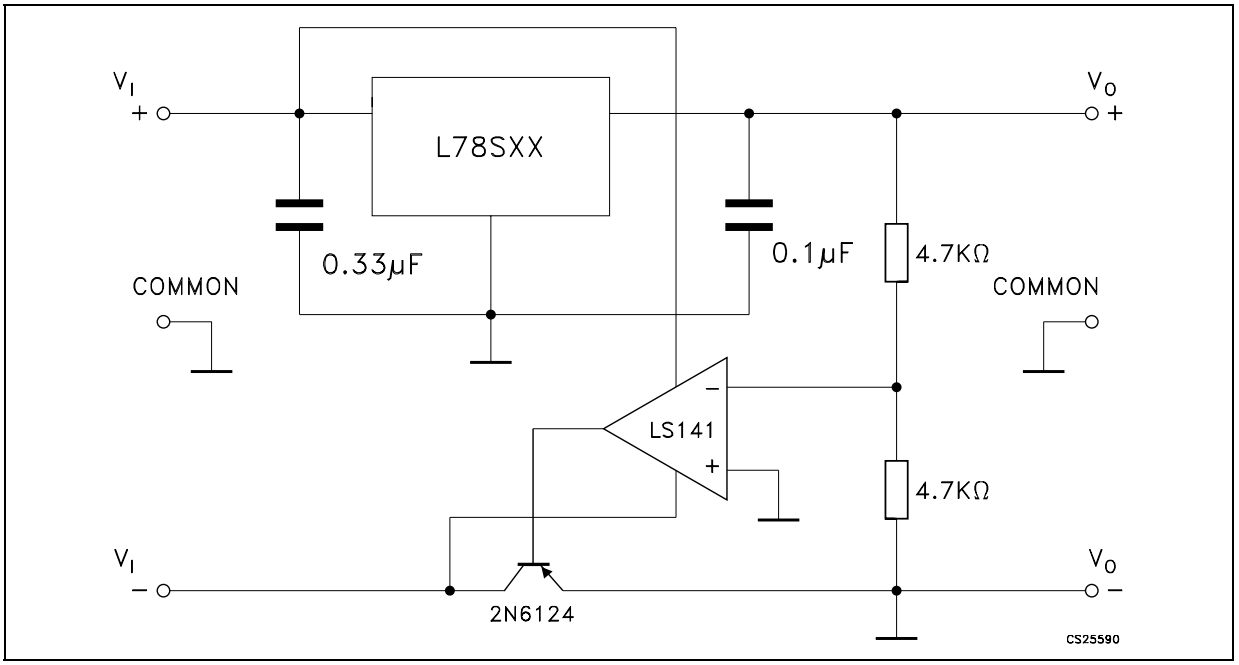


Figure 25. Positive and negative regulator

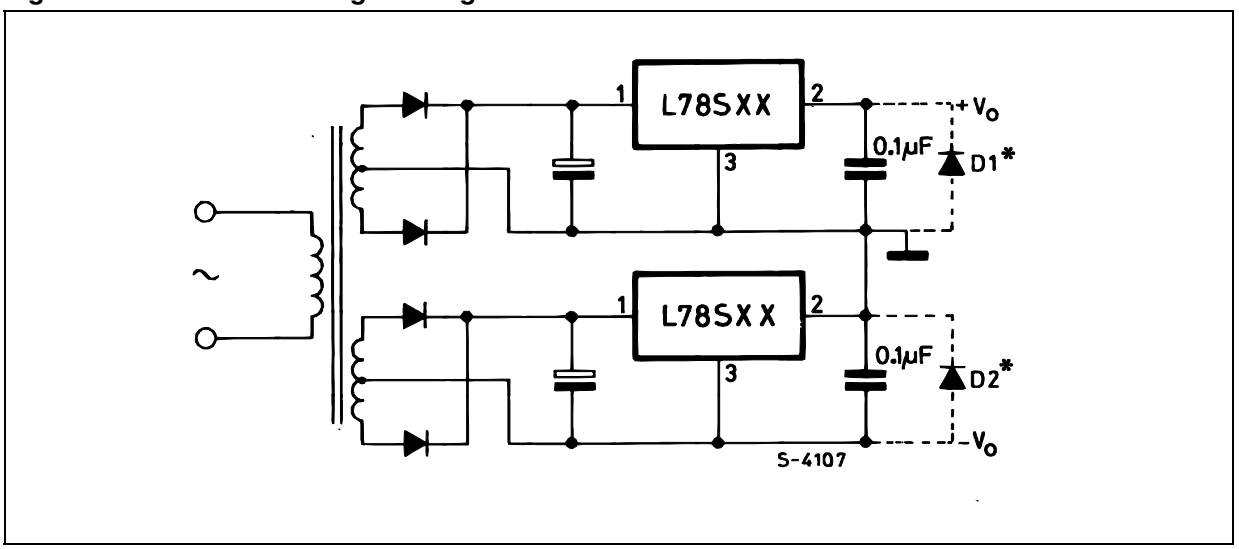


Figure 26. Negative output voltage circuit

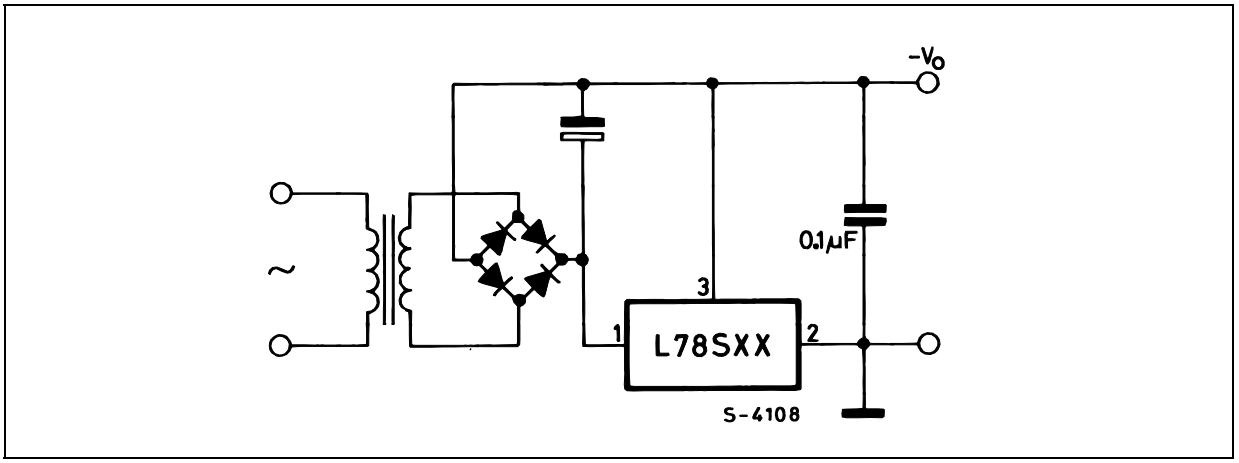


Figure 27. Switching regulator

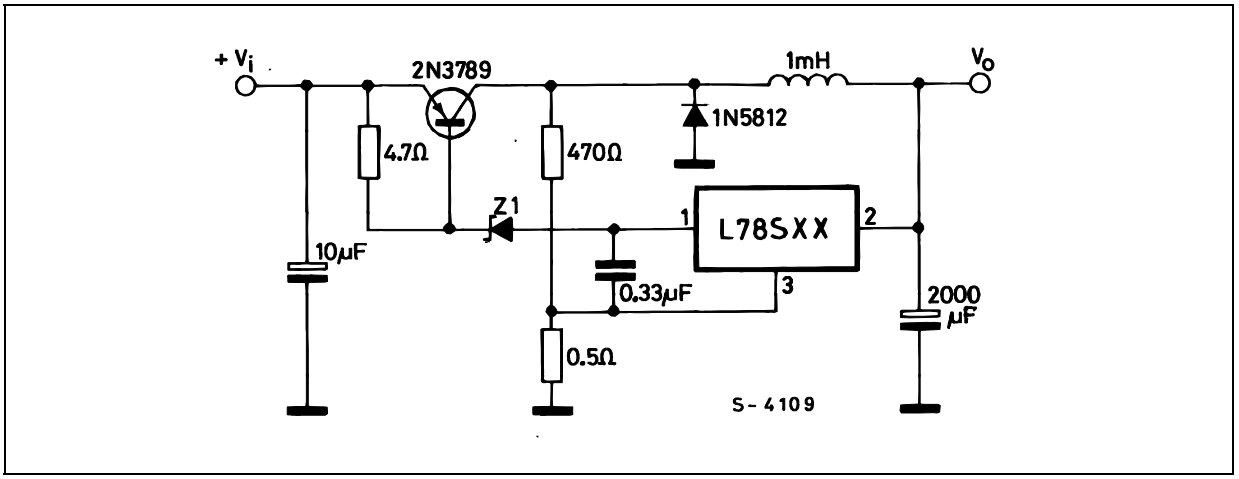


Figure 28. High input voltage circuit

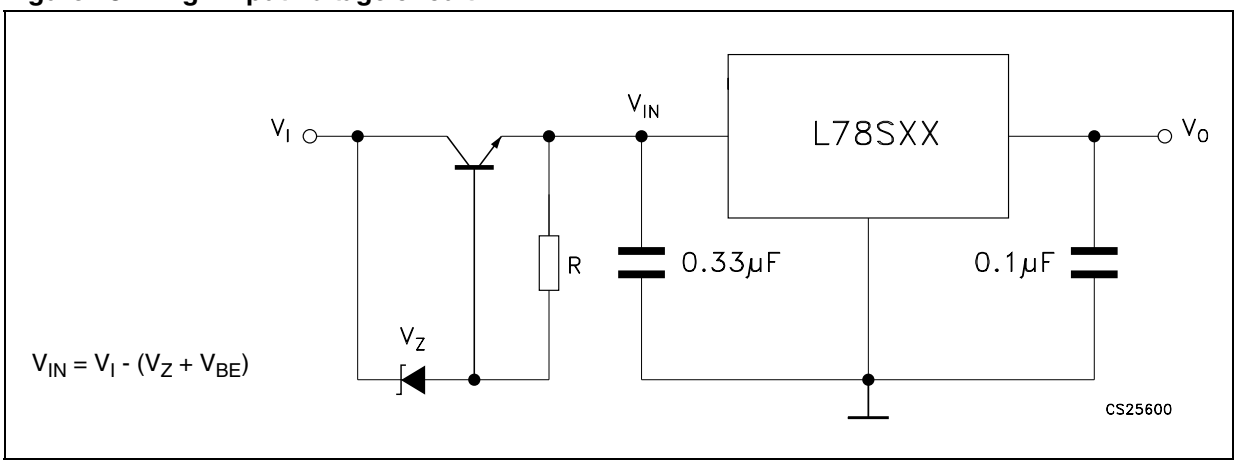


Figure 29. High input voltage circuit

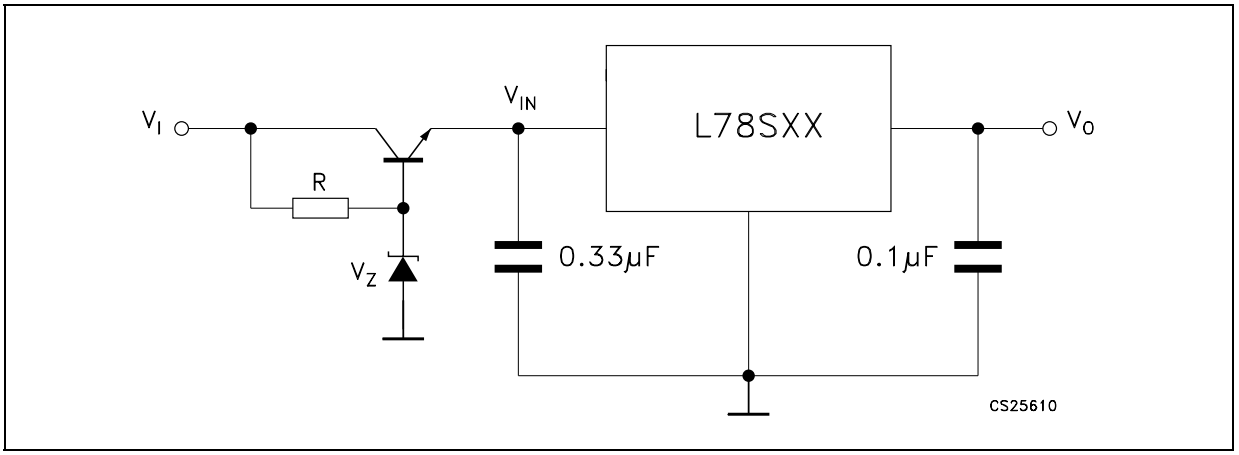


Figure 30. High output voltage regulator

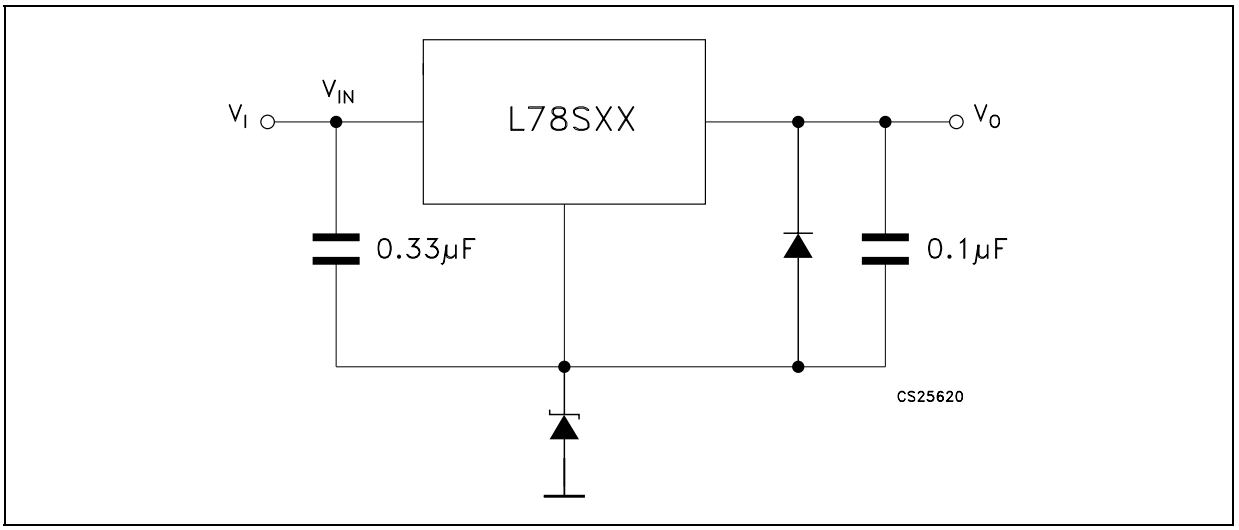


Figure 31. High input and output voltage

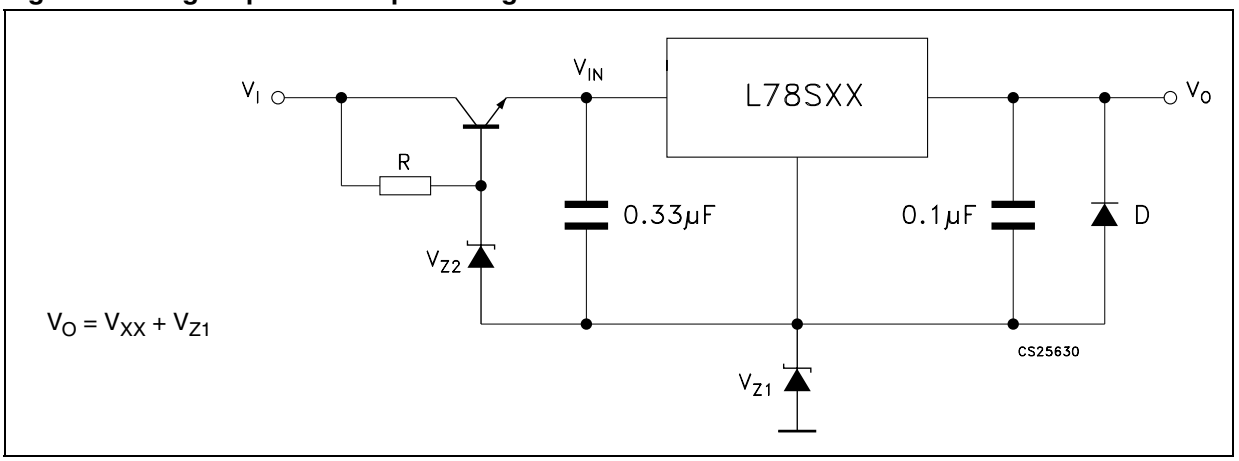


Figure 32. Reducing power dissipation with dropping resistor

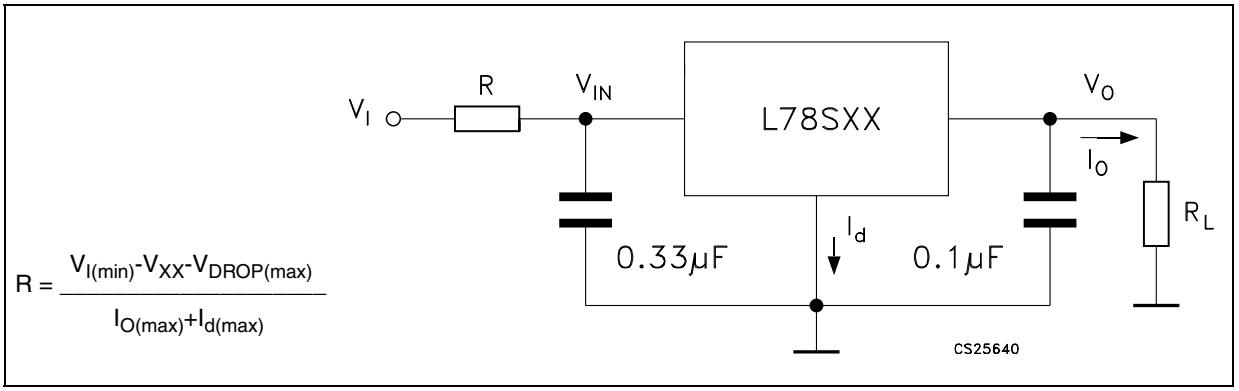


Figure 33. Remote shutdown

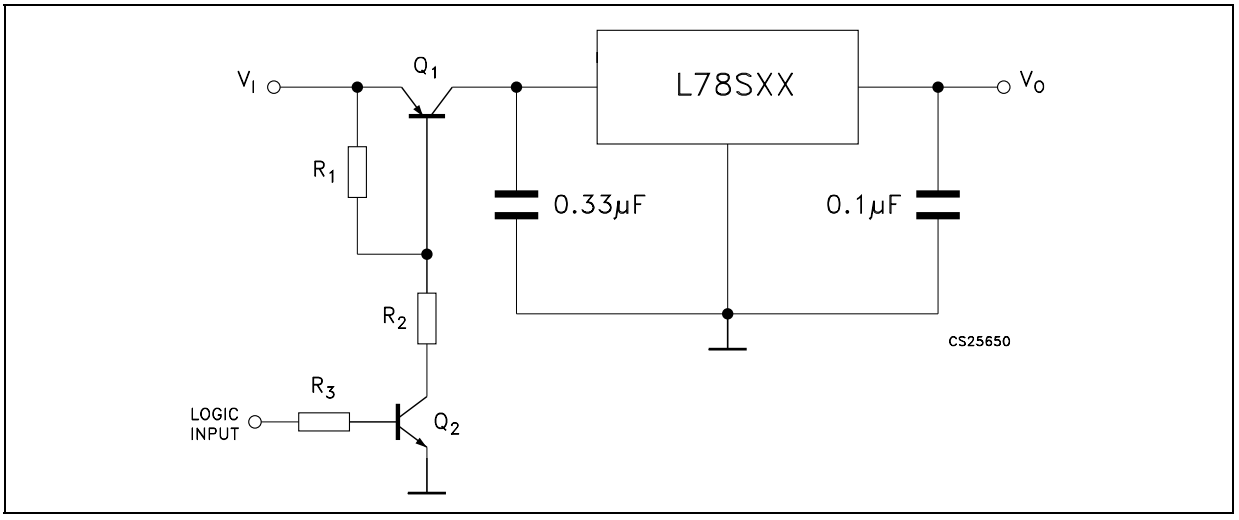
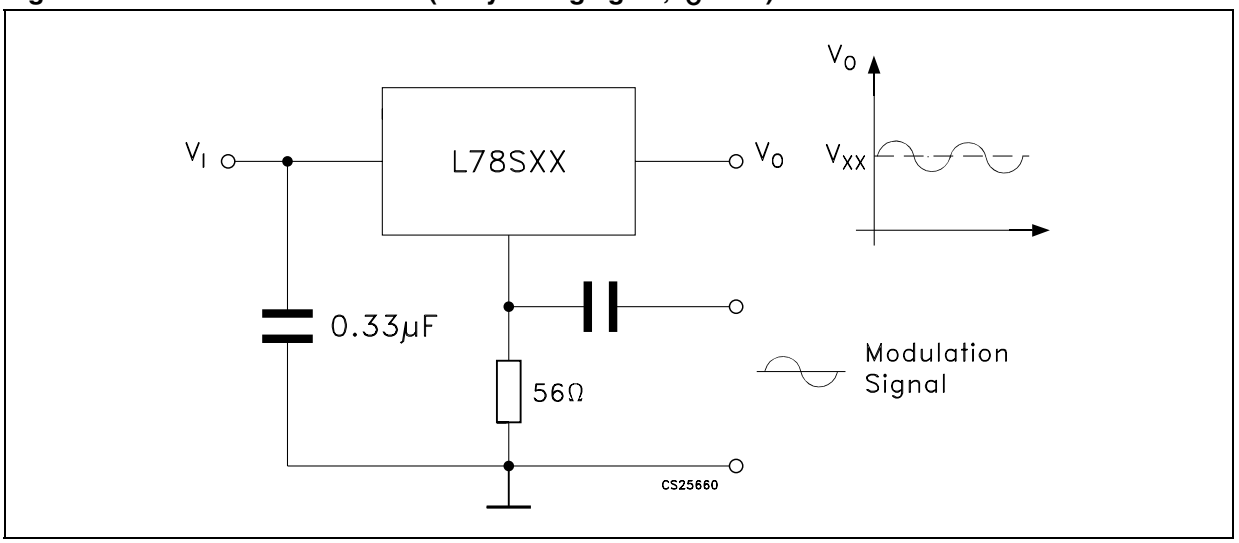
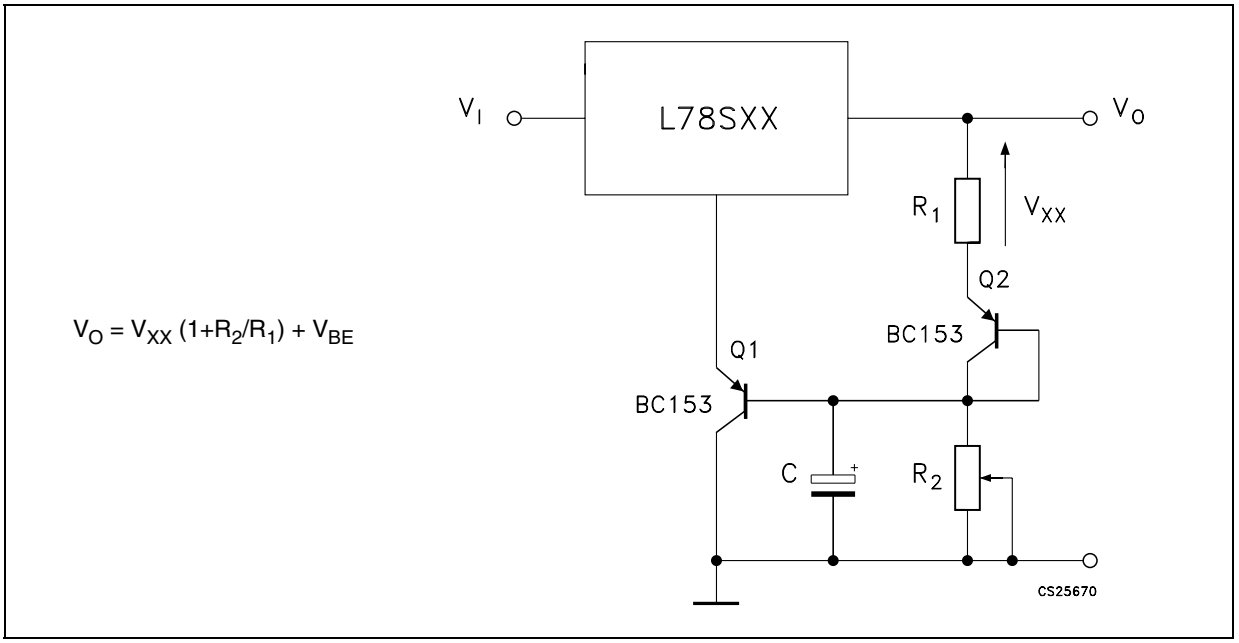


Figure 34. Power AM modulator (unity voltage gain, $I_O \leq 1$ A)



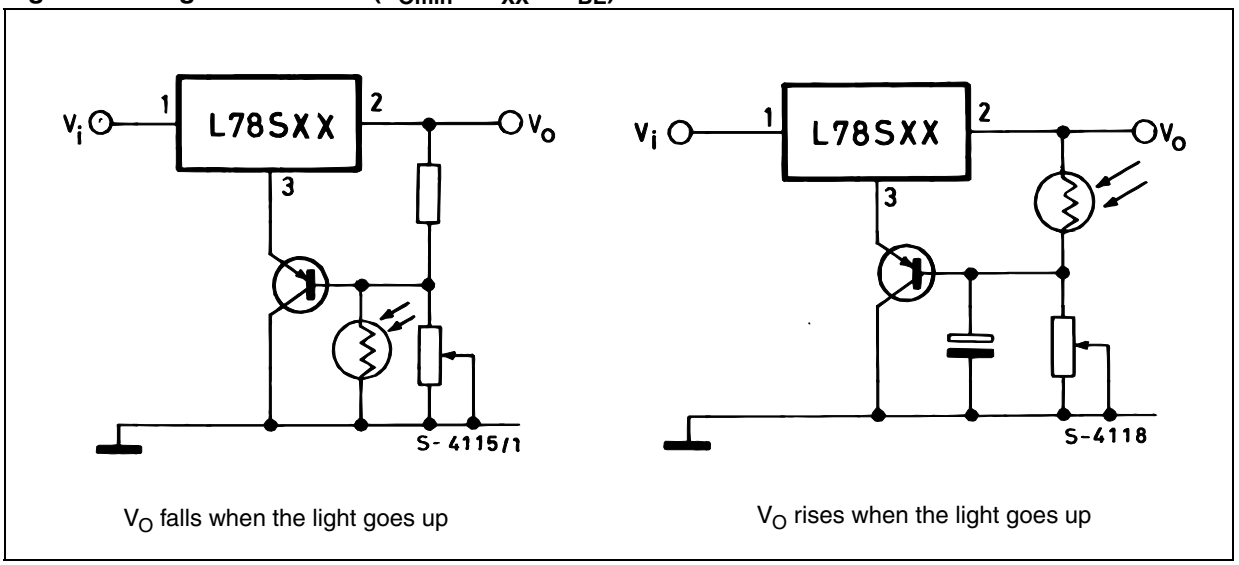
Note: The circuit performs well up to 100 kHz.

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.

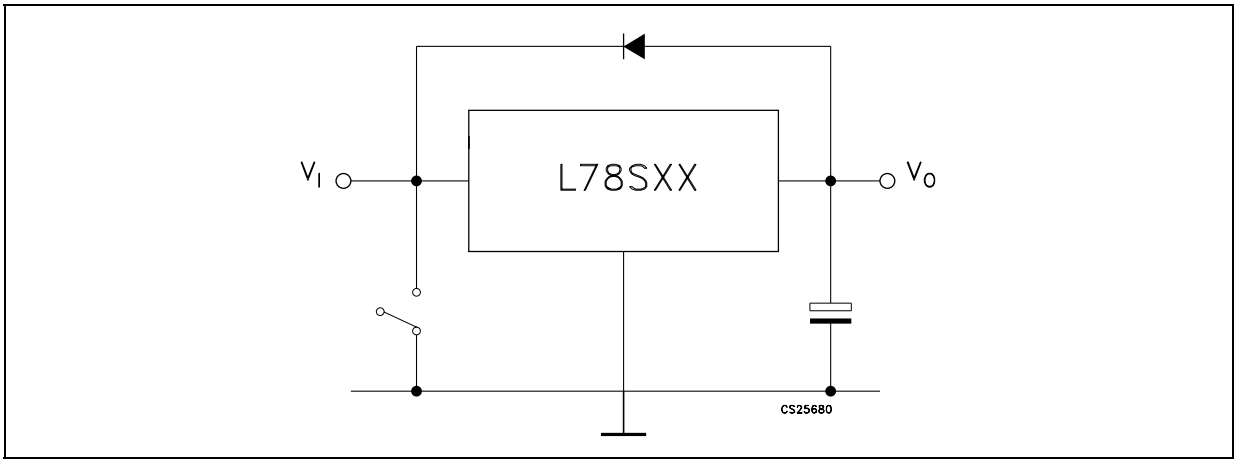
Figure 36. Light controllers ($V_{Omin} = V_{XX} + V_{BE}$)



V_O falls when the light goes up

V_O rises when the light goes up

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



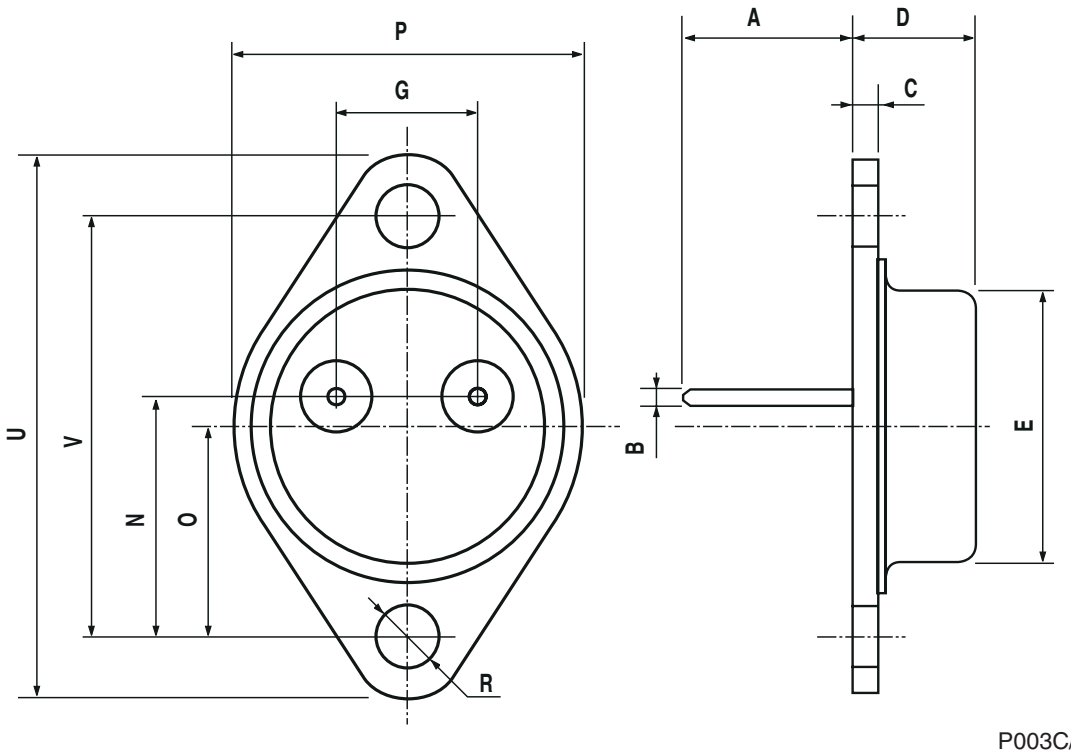
1. Application with high capacitance loads and an output voltage greater than 6 volts need an external diode (see *Figure 30 on page 22*) to protect the device against input short circuit. In this case the input voltage falls rapidly while the output voltage decrease slowly. The capacitance discharges by means of the Base-Emitter junction of the series pass transistor in the regulator. If the energy is sufficiently high, the transistor may be destroyed. The external diode by-passes the current from the IC to ground.

7 Package mechanical data

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

TO-3 mechanical data

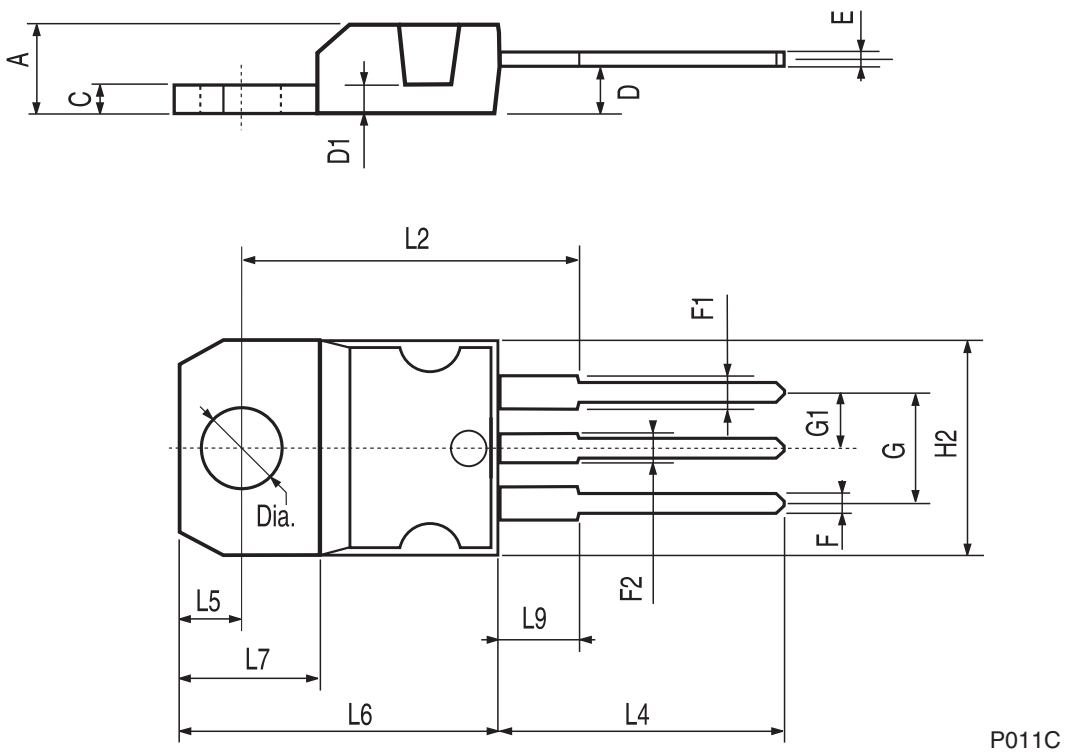
Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		11.85			0.466	
B	0.96	1.05	1.10	0.037	0.041	0.043
C			1.70			0.066
D			8.7			0.342
E			20.0			0.787
G		10.9			0.429	
N		16.9			0.665	
P			26.2			1.031
R	3.88		4.09	0.152		0.161
U			39.5			1.555
V		30.10			1.185	



P003C/C

TO-220 mechanical data

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



8 Order codes

Table 20. Order codes

Part numbers	Packages		Output voltage
	TO-220	T0-3	
L78S05		L78S05T (1)	5 V
L78S05C	L78S05CV	L78S05CT (1)	5 V
L78S75		L78S75T (1)	7.5 V
L78S75C	L78S75CV	L78S75CT (1)	7.5 V
L78S09		L78S09T (1)	9 V
L78S09C	L78S09CV		9 V
L78S10		L78S10T (1)	10 V
L78S10C	L78S10CV	L78S10CT (1)	10 V
L78S12		L78S12T (1)	12 V
L78S12C	L78S12CV	L78S12CT	12 V
L78S15		L78S15T (1)	15 V
L78S15C	L78S15CV		15 V
L78S18		L78S18T (1)	18 V
L78S18C	L78S18CV		18 V
L78S24		L78S24T (1)	24 V
L78S24C	L78S24CV	L78S24CT (1)	24 V

1. Available on request.

9 Revision history

Table 21. Document revision history

Date	Revision	Changes
07-Sep-2006	2	Order codes updated.
20-Mar-2008	3	Added: *Table 1 on page 1*.

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