

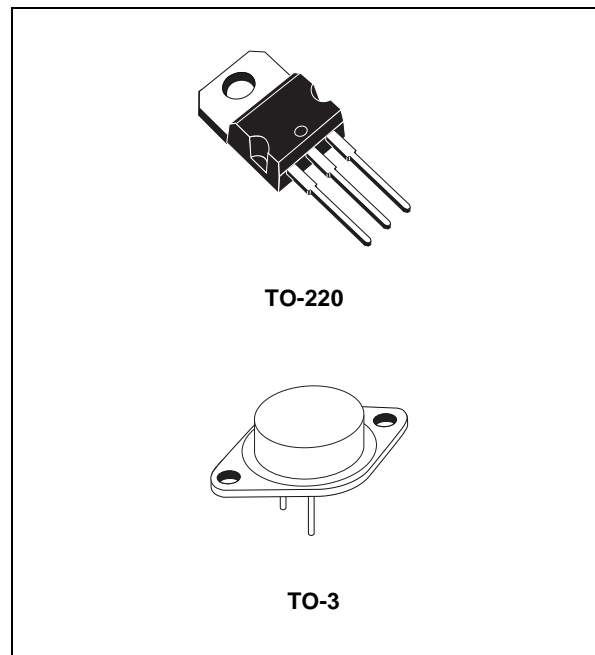


2A POSITIVE VOLTAGE REGULATORS

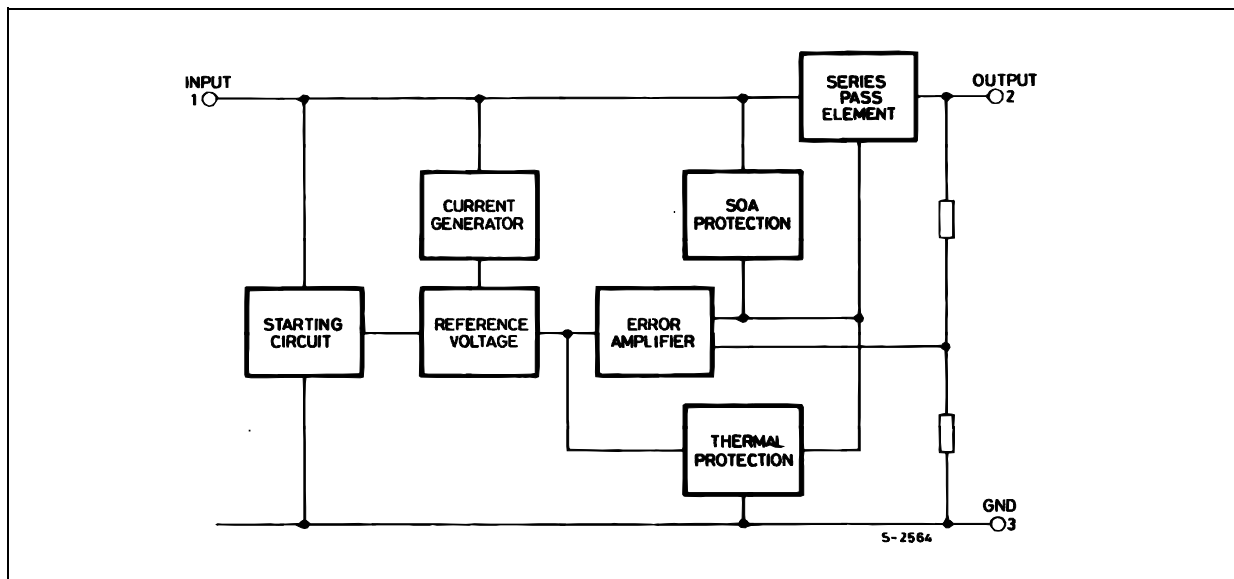
- OUTPUT CURRENT TO 2A
- OUTPUT VOLTAGES OF 5; 7.5; 9; 10; 12; 15; 18; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSITION SOA PROTECTION

DESCRIPTION

The L78S00 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 2A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.



SCHEMATIC DIAGRAM



L78S00 SERIES

ABSOLUTE MAXIMUM RATINGS

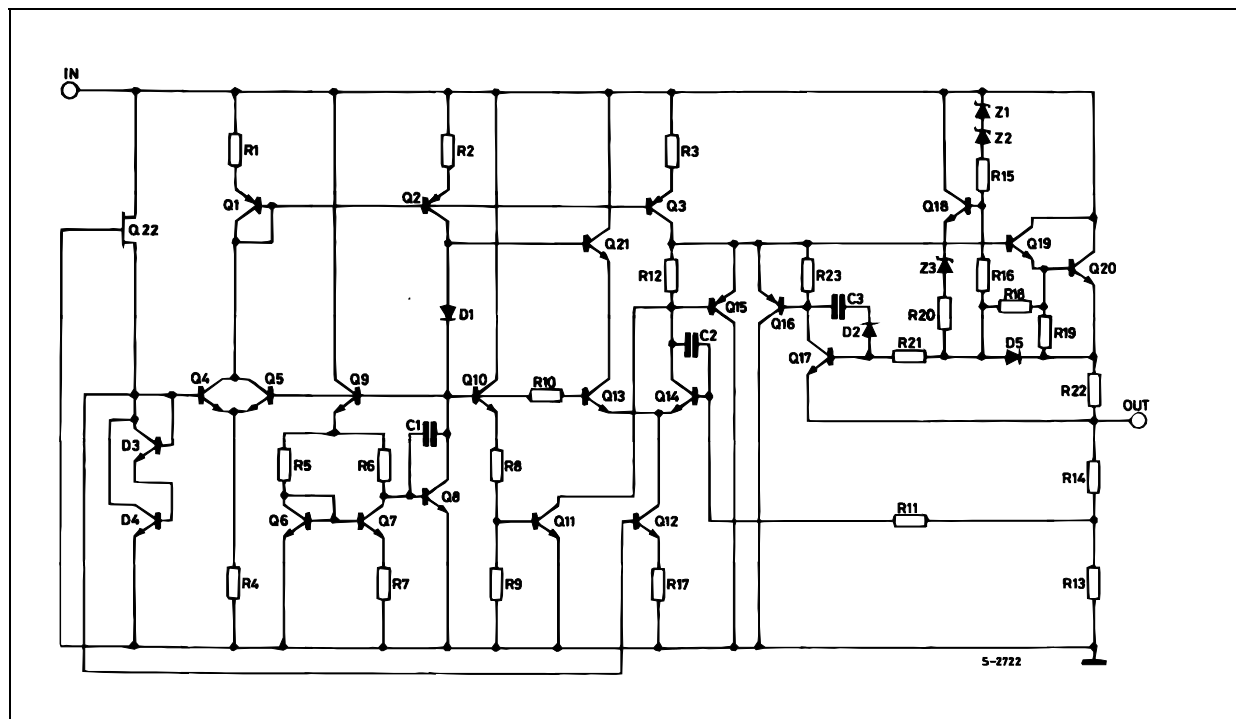
Symbol	Parameter ²		Value	Unit
V _I	DC Input Voltage	for V _O = 5 to 18 V	35	V
		for V _O = 24 V	40	
I _O	Output Current		Internally Limited	
P _{tot}	Power Dissipation		Internally Limited	
T _{stg}	Storage Temperature Range		-65 to 150	°C
T _{op}	Operating Junction Temperature Range	for L78S00	-55 to 150	°C
		for L78S00C	0 to 150	

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

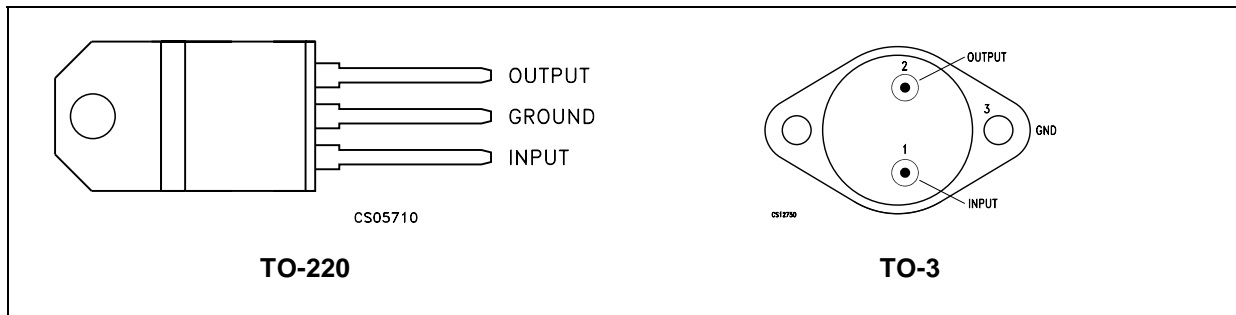
THERMAL DATA

Symbol	Parameter		TO-220	TO-3	Unit
R _{thj-case}	Thermal Resistance Junction-case	Max	5	4	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	50	35	°C/W

SHEMATIC DIAGRAM



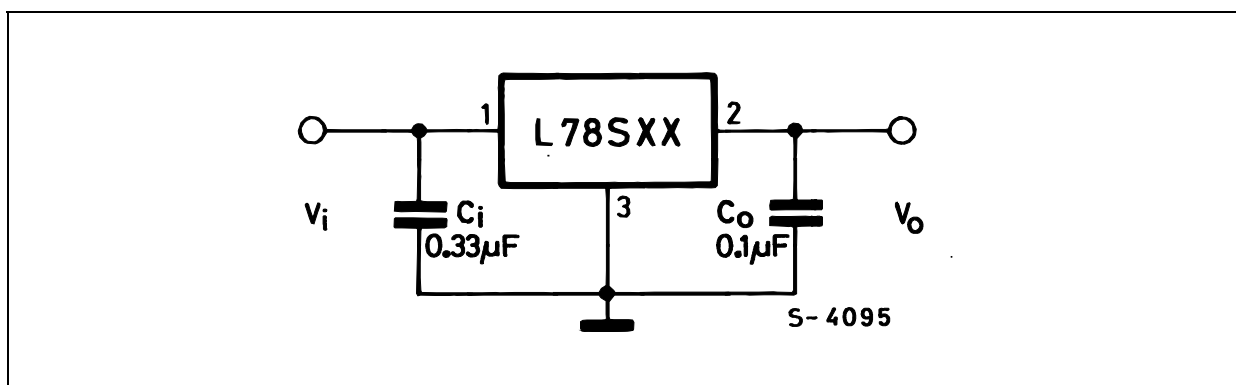
CONNECTION DIAGRAM (top view)



ORDERING CODES

TYPE	TO-220	TO-3	OUTPUT VOLTAGE
L78S05		L78S05T	5 V
L78S05C	L78S05CV	L78S05CT	5 V
L78S75		L78S75T	7.5 V
L78S75C	L78S75CV	L78S75CT	7.5 V
L78S09		L78S09T	9 V
L78S09C	L78S09CV	L78S09CT	9 V
L78S10		L78S10T	10 V
L78S10C	L78S10CV	L78S10CT	10 V
L78S12		L78S12T	12 V
L78S12C	L78S12CV	L78S12CT	12 V
L78S15		L78S15T	15 V
L78S15C	L78S15CV	L78S15CT	15 V
L78S18		L78S18T	18 V
L78S18C	L78S18CV	L78S18CT	18 V
L78S24		L78S24T	24 V
L78S24C	L78S24CV	L78S24CT	24 V

APPLICATION CIRCUIT



TEST CIRCUITS

Figure 1 : DC Parameters

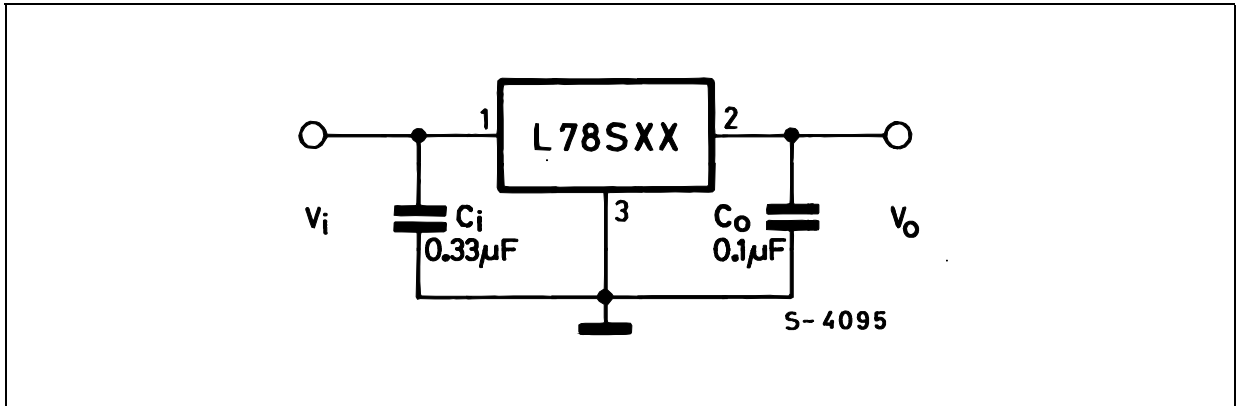


Figure 2 : Load Regulation

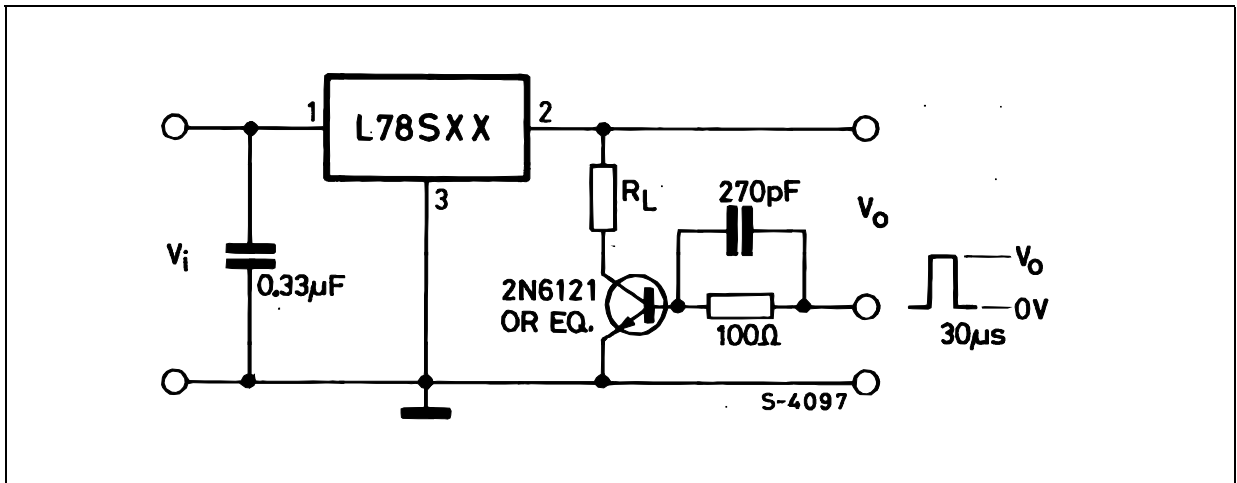
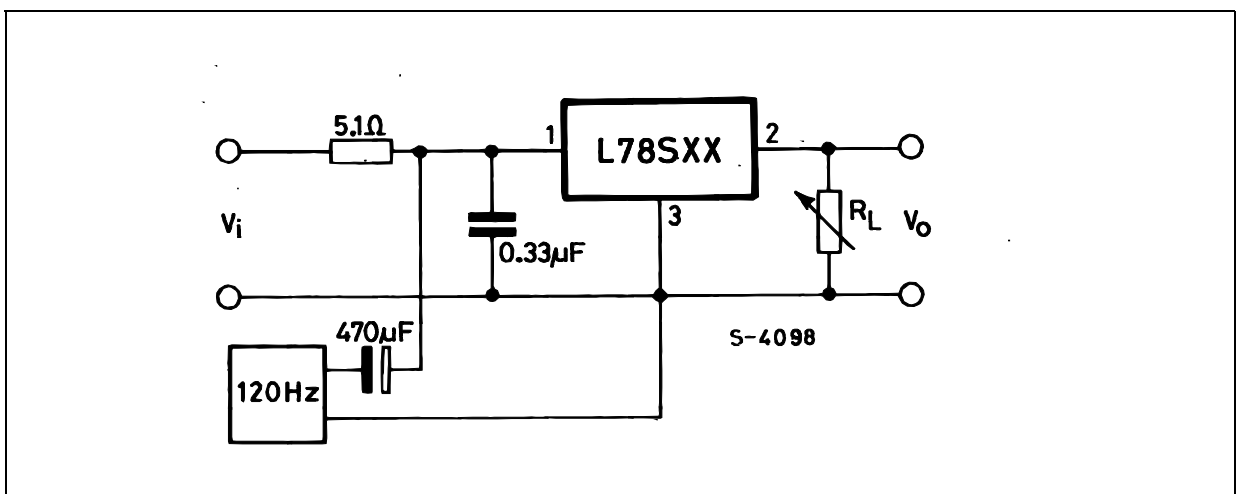


Figure 3 : Ripple Rejection



ELECTRICAL CHARACTERISTICS OF L78S05 (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 10\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 7\text{ V}$	4.75	5	5.25	V
ΔV_O	Line Regulation	$V_I = 7\text{ to }25\text{ V}$			100	mV
		$V_I = 8\text{ to }25\text{ V}$			50	
ΔV_O	Load Regulation	$I_O = 20\text{ mA to }2\text{ A}$			100	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 7\text{ to }25\text{ V}$			1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = -55\text{ to }150^\circ\text{C}$		-1.1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		40		μV
SVR	Supply Voltage Rejection	$f = 120\text{Hz}$	60			dB
V_I	Dropout Voltage	$I_O \leq 1\text{ A}$	8			V
R_O	Output Resistance	$f = 1\text{ KHz}$		17		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S75 (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 12.5\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 9.5\text{ V}$	7.1	7.5	7.95	V
ΔV_O	Line Regulation	$V_I = 9.5\text{ to }25\text{ V}$			120	mV
		$V_I = 10.5\text{ to }20\text{ V}$			60	
ΔV_O	Load Regulation	$I_O = 20\text{ mA to }2\text{ A}$			120	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 9.5\text{ to }25\text{ V}$			1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = -55\text{ to }150^\circ\text{C}$		-0.8		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		52		μV
SVR	Supply Voltage Rejection	$f = 120\text{Hz}$	54			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	10.5			V
R_O	Output Resistance	$f = 1\text{ KHz}$		16		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

L78S00 SERIES

ELECTRICAL CHARACTERISTICS OF L78S09 (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 14\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 11\text{ V}$	8.6	9	9.4	V
ΔV_O	Line Regulation	$V_I = 11\text{ to }25\text{ V}$			130	mV
		$V_I = 11\text{ to }20\text{ V}$			65	
ΔV_O	Load Regulation	$I_O = 20\text{ mA to }2\text{ A}$			130	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 11\text{ to }25\text{ V}$			1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = -55\text{ to }150^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		60		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	53			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	12			V
R_O	Output Resistance	$f = 1\text{ KHz}$		17		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S10 (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 15\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 12.5\text{ V}$	9.4	10	10.6	V
ΔV_O	Line Regulation	$V_I = 12.5\text{ to }30\text{ V}$			200	mV
		$V_I = 14\text{ to }22\text{ V}$			100	
ΔV_O	Load Regulation	$I_O = 20\text{ mA to }2\text{ A}$			150	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 12.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = -55\text{ to }150^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		65		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	53			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	13			V
R_O	Output Resistance	$f = 1\text{ KHz}$		17		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S12 (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 19\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 14.5\text{ V}$	11.4	12	12.6	V
ΔV_O	Line Regulation	$V_I = 14.5\text{ to }30\text{ V}$			240	mV
		$V_I = 16\text{ to }22\text{ V}$			120	
ΔV_O	Load Regulation	$I_O = 20\text{ mA to }2\text{ A}$			160	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 14.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = -55\text{ to }150^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		75		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	53			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	15			V
R_O	Output Resistance	$f = 1\text{ KHz}$		18		$\text{m}\Omega$
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S15 (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 23\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 17.5\text{ V}$	14.25	15	15.75	V
ΔV_O	Line Regulation	$V_I = 17.5\text{ to }30\text{ V}$			300	mV
		$V_I = 20\text{ to }26\text{ V}$			150	
ΔV_O	Load Regulation	$I_O = 20\text{ mA to }2\text{ A}$			180	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 17.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = -55\text{ to }150^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		90		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	52			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	18			V
R_O	Output Resistance	$f = 1\text{ KHz}$		19		$\text{m}\Omega$
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

L78S00 SERIES

ELECTRICAL CHARACTERISTICS OF L78S18 (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 26\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 20.5\text{ V}$	17	18	19	V
ΔV_O	Line Regulation	$V_I = 20.5\text{ to }30\text{ V}$			360	mV
		$V_I = 22\text{ to }28\text{ V}$			180	
ΔV_O	Load Regulation	$I_O = 20\text{ mA to }2\text{ A}$			200	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 20.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = -55\text{ to }150^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		110		μV
SVR	Supply Voltage Rejection	$f = 120\text{Hz}$	49			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	21			V
R_O	Output Resistance	$f = 1\text{ KHz}$		22		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S24 (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 33\text{ V}$, $I_O = 500\text{ mA}$, unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage		23	24	25	V
V_O	Output Voltage	$I_O = 1\text{ A}$ $V_I = 27\text{ V}$	22.8	24	25.2	V
ΔV_O	Line Regulation	$V_I = 27\text{ to }38\text{ V}$			480	mV
		$V_I = 30\text{ to }36\text{ V}$			240	
ΔV_O	Load Regulation	$I_O = 20\text{ mA to }2\text{ A}$			250	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 27\text{ to }38\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = -55\text{ to }150^\circ\text{C}$		-1.5		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		170		μV
SVR	Supply Voltage Rejection	$f = 120\text{Hz}$	48			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	27			V
R_O	Output Resistance	$f = 1\text{ KHz}$		23		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S05C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 10\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 7\text{ V}$	4.75	5	5.25	V
ΔV_O	Line Regulation	$V_I = 7\text{ to }25\text{ V}$			100	mV
		$V_I = 8\text{ to }25\text{ V}$			50	
ΔV_O	Line Regulation	$I_O = 20\text{ mA to }1.5\text{ A}$			100	mV
		$I_O = 2\text{ A}$		80		
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 7\text{ to }25\text{ V}$			1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = 0\text{ to }70^\circ\text{C}$		-1.1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		40		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	54			dB
V_I	Dropout Voltage	$I_O \leq 1\text{ A}$	8			V
R_O	Output Resistance	$f = 1\text{ KHz}$		17		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S75C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 12.5\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 9.5\text{ V}$	7.1	7.5	7.95	V
ΔV_O	Line Regulation	$V_I = 9.5\text{ to }25\text{ V}$			120	mV
		$V_I = 10.5\text{ to }20\text{ V}$			60	
ΔV_O	Line Regulation	$I_O = 20\text{ mA to }1.5\text{ A}$			140	mV
		$I_O = 2\text{ A}$		100		
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 9.5\text{ to }25\text{ V}$			1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = 0\text{ to }70^\circ\text{C}$		-0.8		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		52		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	48			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	10.5			V
R_O	Output Resistance	$f = 1\text{ KHz}$		16		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

L78S00 SERIES

ELECTRICAL CHARACTERISTICS OF L78S09C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 14\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 11\text{ V}$	8.6	9	9.4	V
ΔV_O	Line Regulation	$V_I = 11\text{ to }25\text{ V}$			130	mV
		$V_I = 11\text{ to }20\text{ V}$			65	
ΔV_O	Line Regulation	$I_O = 20\text{ mA to }1.5\text{ A}$			170	mV
		$I_O = 2\text{ A}$		100		
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 11\text{ to }25\text{ V}$			1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = 0\text{ to }70^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		60		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	47			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	12			V
R_O	Output Resistance	$f = 1\text{ KHz}$		17		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S10C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 15\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 12.5\text{ V}$	9.4	10	10.6	V
ΔV_O	Line Regulation	$V_I = 12.5\text{ to }30\text{ V}$			200	mV
		$V_I = 14\text{ to }22\text{ V}$			100	
ΔV_O	Line Regulation	$I_O = 20\text{ mA to }1.5\text{ A}$			240	mV
		$I_O = 2\text{ A}$		150		
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 12.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = 0\text{ to }70^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		65		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	47			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	13			V
R_O	Output Resistance	$f = 1\text{ KHz}$		17		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S12C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 19\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 14.5\text{ V}$	11.4	12	12.6	V
ΔV_O	Line Regulation	$V_I = 14.5\text{ to }30\text{ V}$			240	mV
		$V_I = 16\text{ to }22\text{ V}$			120	
ΔV_O	Line Regulation	$I_O = 20\text{ mA to }1.5\text{ A}$			240	mV
		$I_O = 2\text{ A}$		150		
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 14.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = 0\text{ to }70^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		75		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	47			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	15			V
R_O	Output Resistance	$f = 1\text{ KHz}$		18		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S15C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 23\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 17.5\text{ V}$	14.25	15	15.75	V
ΔV_O	Line Regulation	$V_I = 17.5\text{ to }30\text{ V}$			300	mV
		$V_I = 20\text{ to }26\text{ V}$			150	
ΔV_O	Line Regulation	$I_O = 20\text{ mA to }1.5\text{ A}$			300	mV
		$I_O = 2\text{ A}$		150		
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 17.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = 0\text{ to }70^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		90		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	46			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	18			V
R_O	Output Resistance	$f = 1\text{ KHz}$		19		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

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ELECTRICAL CHARACTERISTICS OF L78S18C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 26\text{ V}$, $I_O = 500\text{ mA}$, 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	$I_O = 1\text{ A}$ $V_I = 20.5\text{ V}$	17	18	19	V
ΔV_O	Line Regulation	$V_I = 20.5\text{ to }30\text{ V}$			360	mV
		$V_I = 22\text{ to }28\text{ V}$			180	
ΔV_O	Line Regulation	$I_O = 20\text{ mA to }1.5\text{ A}$			360	mV
		$I_O = 2\text{ A}$		200		
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 20.5\text{ to }30\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = 0\text{ to }70^\circ\text{C}$		-1		mV/°C
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		110		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	43			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	21			V
R_O	Output Resistance	$f = 1\text{ KHz}$		22		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

ELECTRICAL CHARACTERISTICS OF L78S24C (refer to the test circuits, $T_J = 25^\circ\text{C}$, $V_I = 33\text{ V}$, $I_O = 500\text{ mA}$, unless otherwise specified).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage		23	24	25	V
V_O	Output Voltage	$I_O = 1\text{ A}$ $V_I = 27\text{ V}$	22.8	24	25.2	V
ΔV_O	Line Regulation	$V_I = 27\text{ to }38\text{ V}$			480	mV
		$V_I = 30\text{ to }36\text{ V}$			240	
ΔV_O	Line Regulation	$I_O = 20\text{ mA to }1.5\text{ A}$			480	mV
		$I_O = 2\text{ A}$		300		
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$I_O = 20\text{ mA}$ $V_I = 27\text{ to }38\text{ V}$			1	
$\Delta V_O/\Delta T$	Output Voltage Drift	$I_O = 5\text{ mA}$ $T_J = 0\text{ to }70^\circ\text{C}$		-1.5		mV/°C
eN	Output Noise Voltage	$B = 10\text{ Hz to }100\text{ KHz}$		170		μV
SVR	Supply Voltage Rejection	$f = 120\text{ Hz}$	42			dB
V_I	Dropout Voltage	$I_O \leq 1.5\text{ A}$	27			V
R_O	Output Resistance	$f = 1\text{ KHz}$		28		m Ω
I_{sc}	Short Circuit Current	$V_I = 27\text{ V}$		500		mA
I_{scp}	Short Circuit Peak Current			3		A

Figure 4 : Dropout Voltage vs Junction Temperature

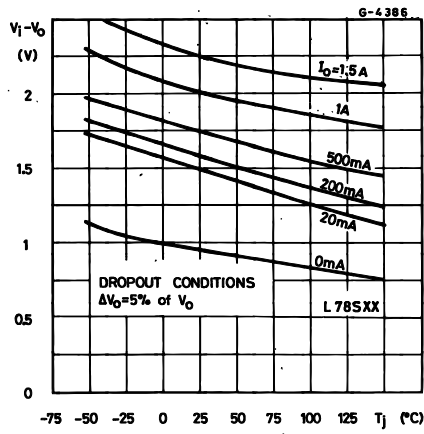


Figure 7 : Output Voltage vs Junction Temperature

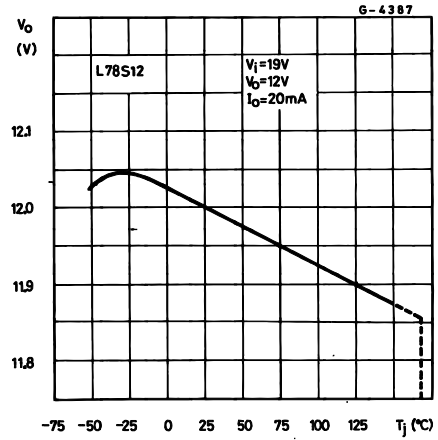


Figure 5 : Peak Output Current vs Input/Output Differential Voltage

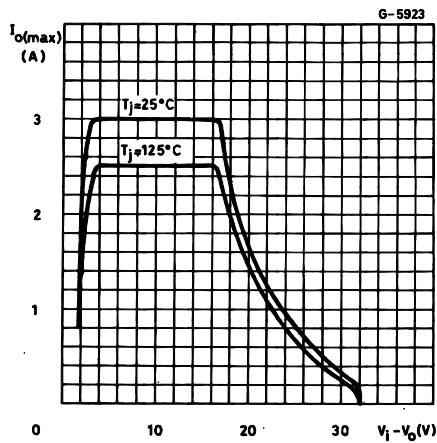


Figure 8 : Output Impedance vs Frequency

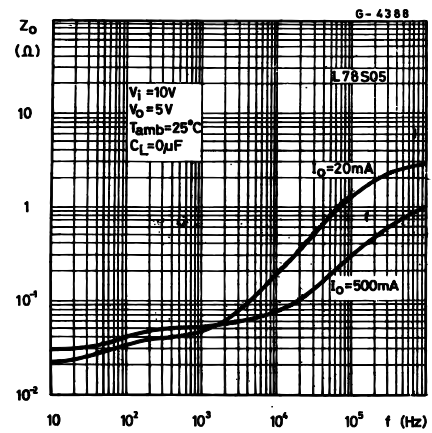


Figure 6 : Supply Voltage Rejection vs Frequency

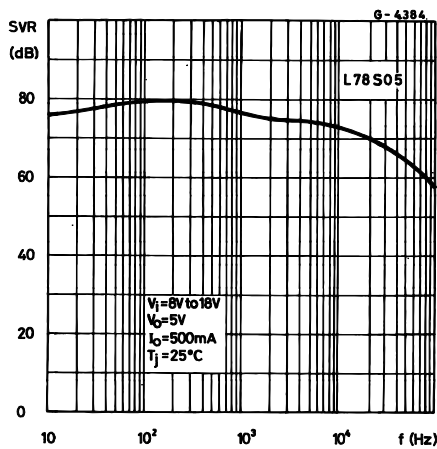


Figure 9 : Quiescent Current vs Junction Temperature

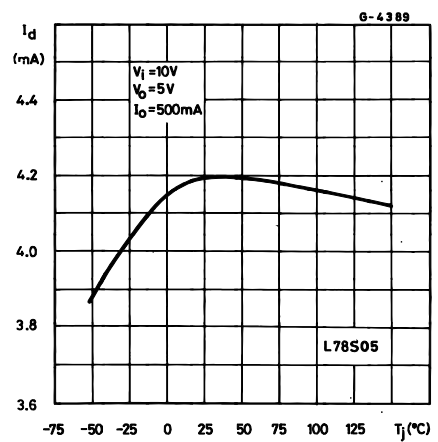


Figure 10 : Load Transient Response

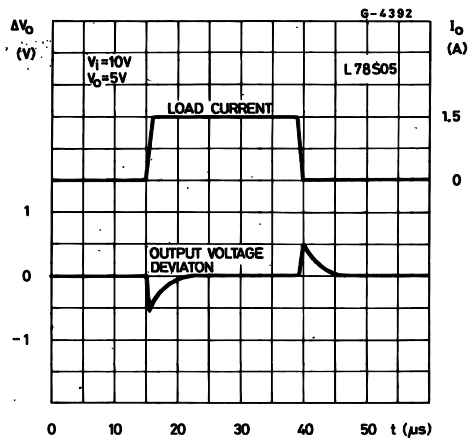


Figure 12 : Quiescent Current vs Input Voltage

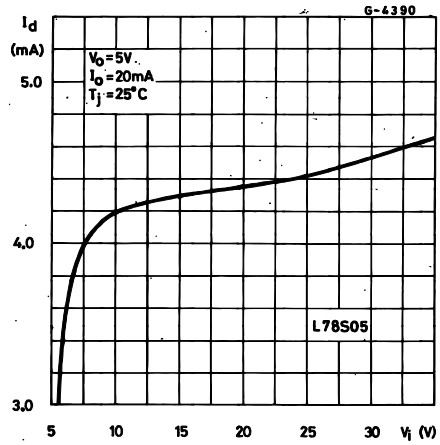


Figure 11 : Line Transient Response

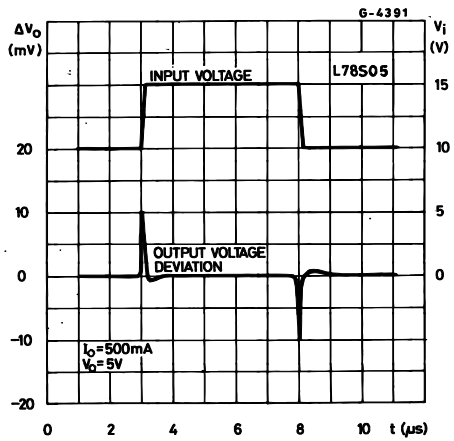
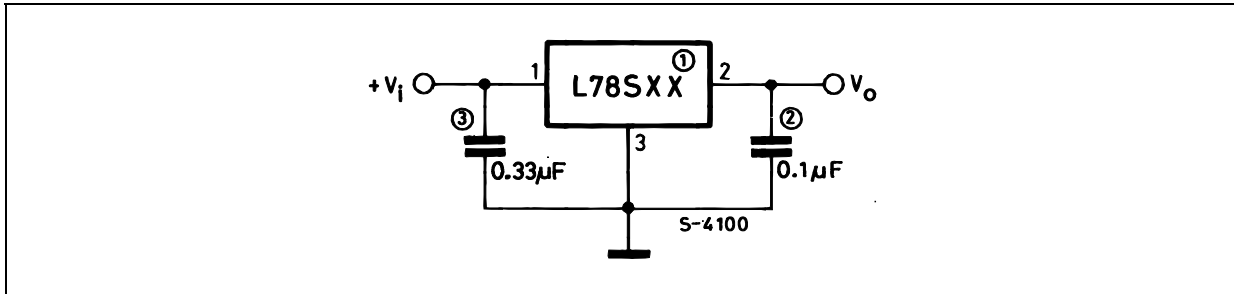


Figure 13 : Fixed Output Regulator



NOTE:

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

Figure 14 : Constant Current Regulator

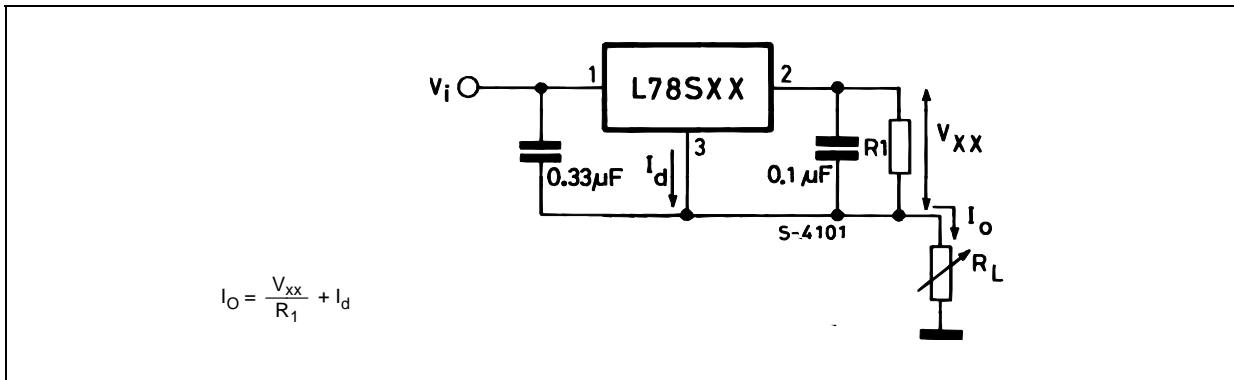
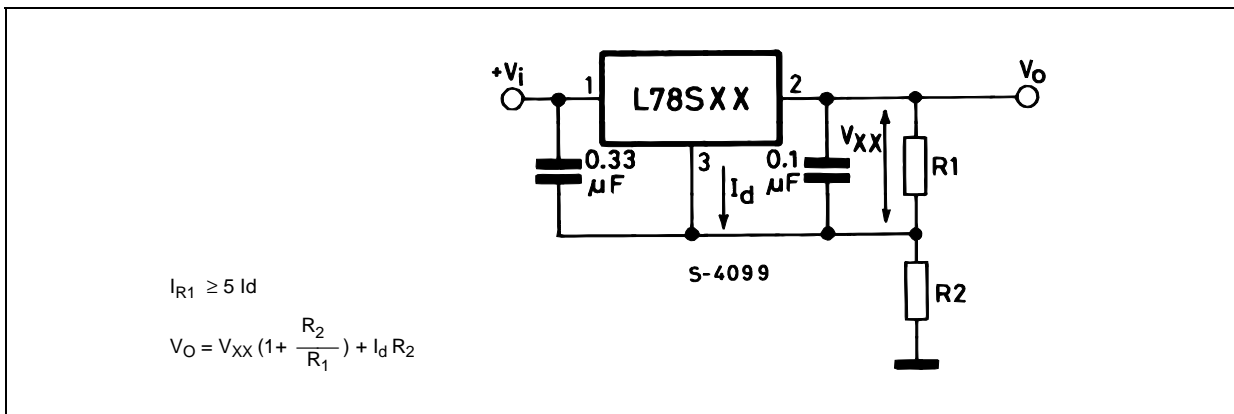


Figure 15 : Circuit for Increasing Output Voltage



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Figure 16 : Adjustable Output Regulator (7 to 30V)

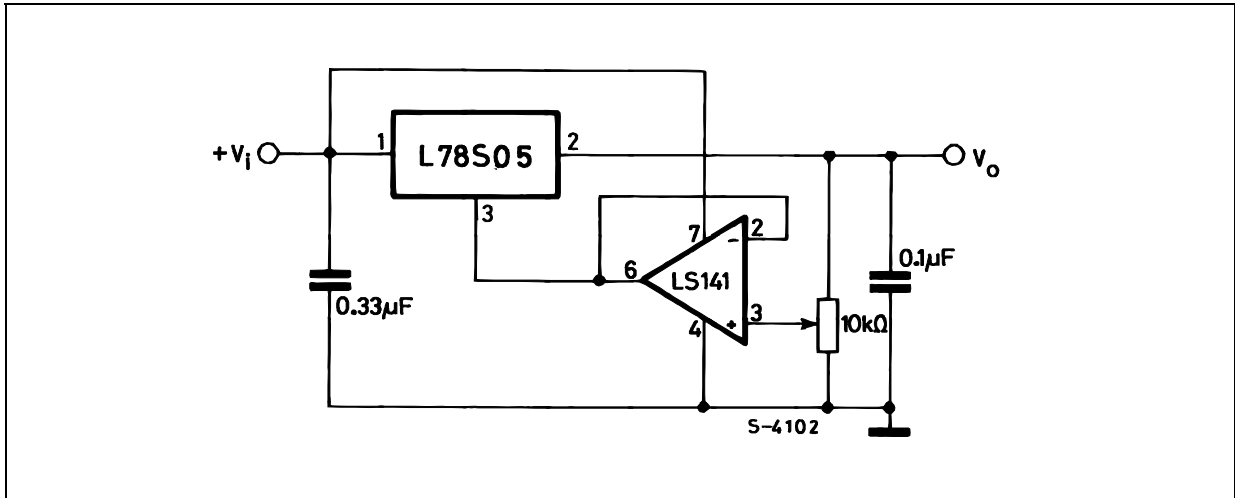


Figure 17 : 0.5 to 10V Regulator

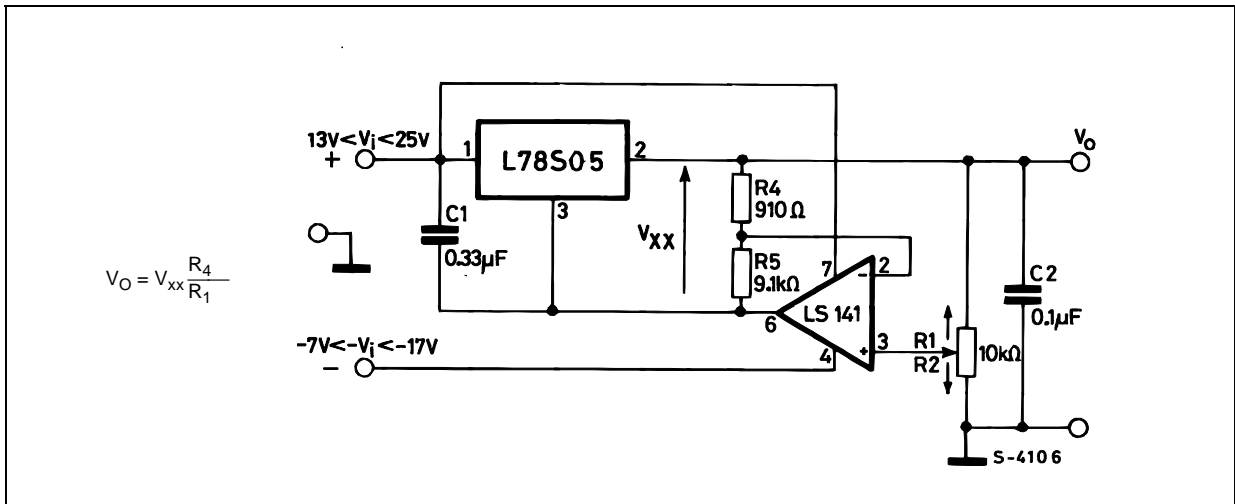
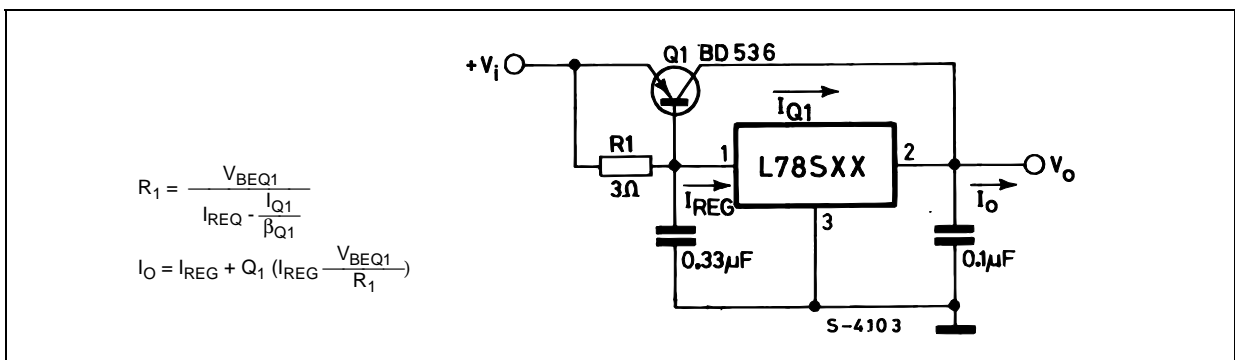


Figure 18 : High Current Voltage Regulator



$$R_1 = \frac{V_{BEQ1}}{I_{REG} - \frac{I_{Q1}}{\beta_{Q1}}}$$

$$I_o = I_{REG} + Q_1 \left(I_{REG} - \frac{V_{BEQ1}}{R_1} \right)$$

Figure 19 : High Output Current with Short Circuit Protection

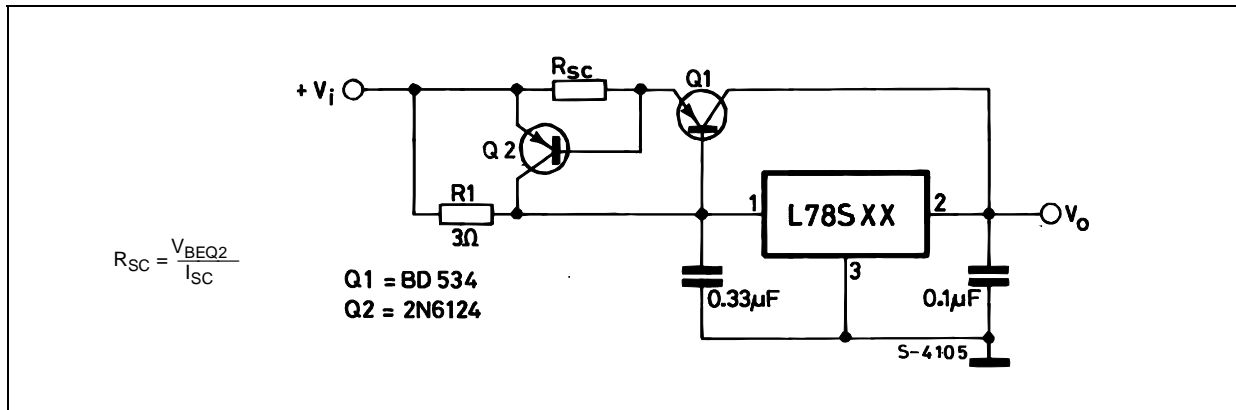


Figure 20 : Tracking Voltage Regulator

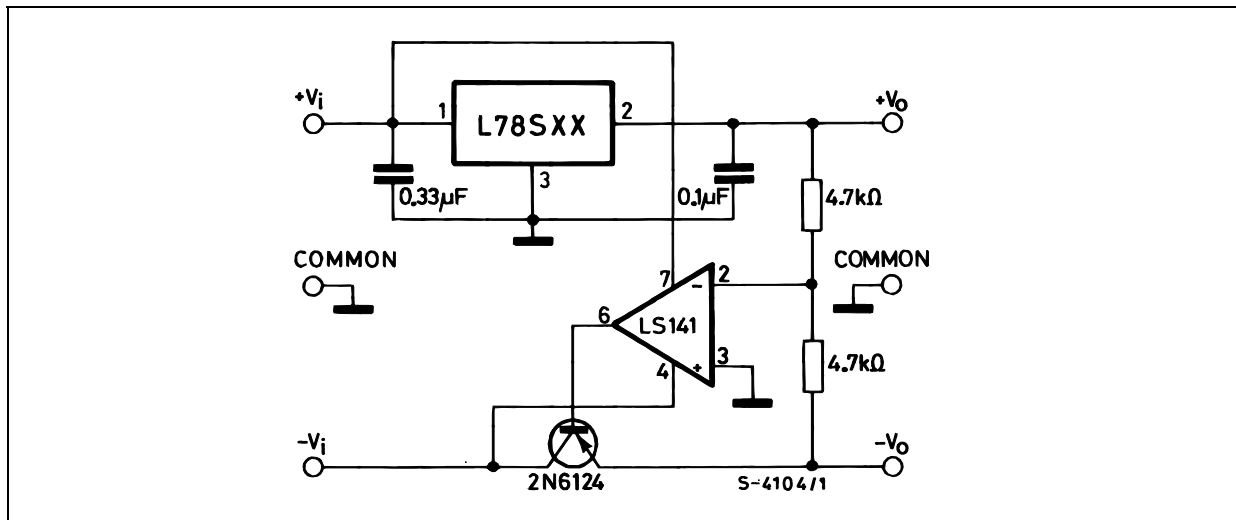
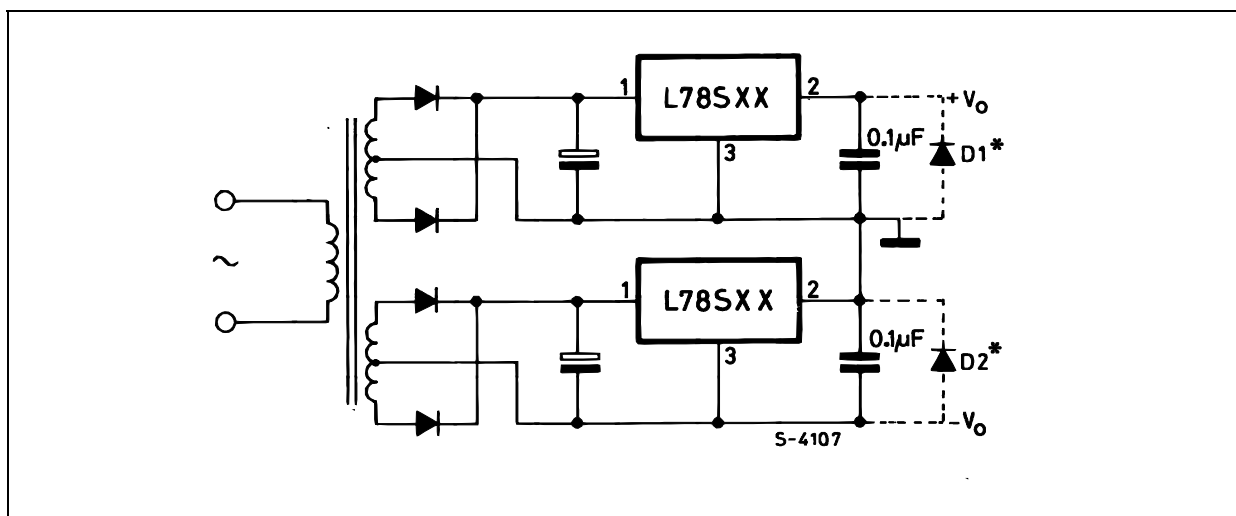


Figure 21 : Positive and Negative Regulator



* D₁ and D₂ are necessary if the load is connected between +V_O and -V_O.

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Figure 22 : Negative Output Voltage Circuit

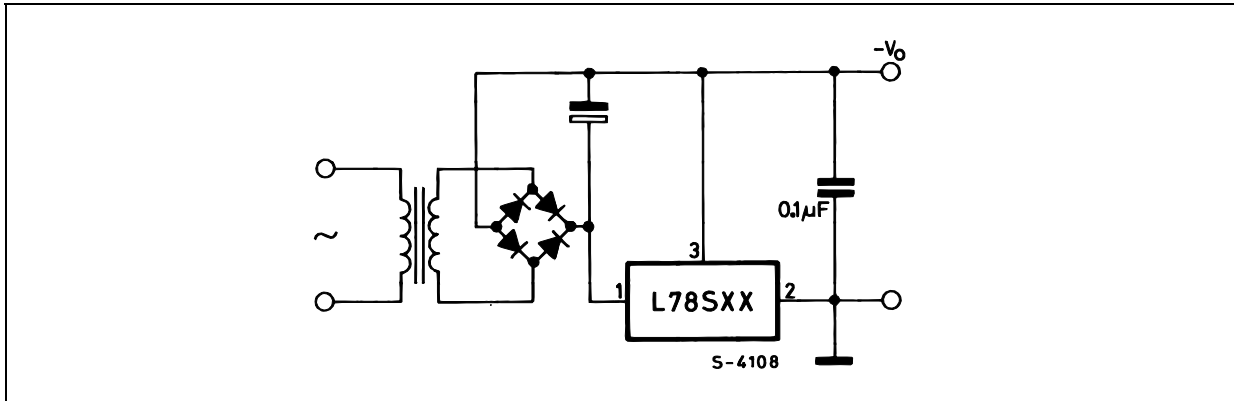


Figure 23 : Switching Regulator

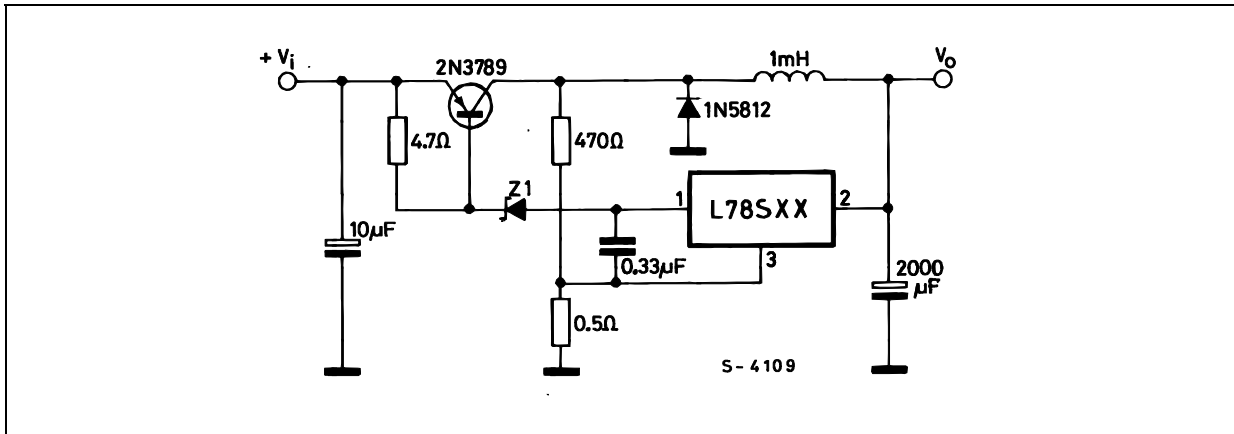


Figure 24 : High Input Voltage Circuit

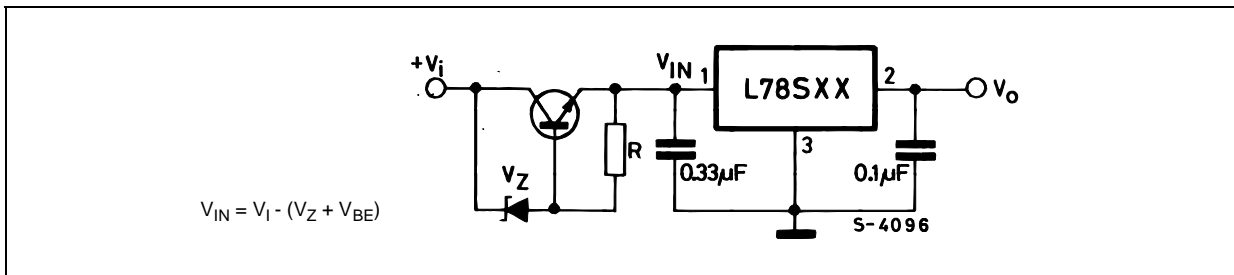


Figure 25 : High Input Voltage Circuit

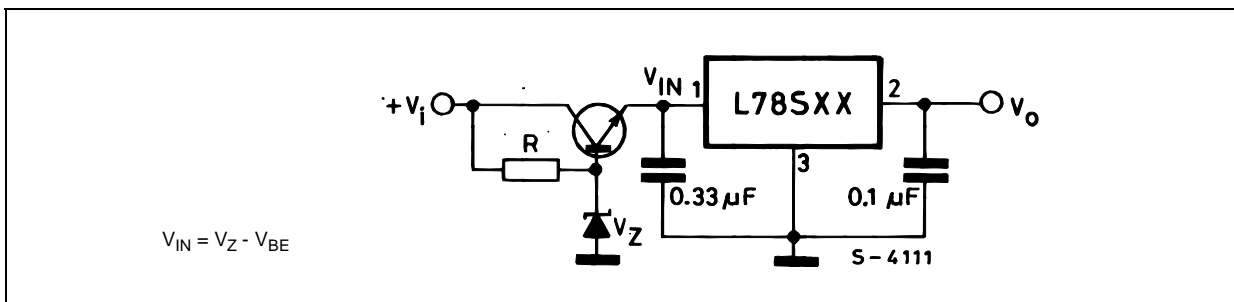


Figure 26 : High Output Voltage Regulator

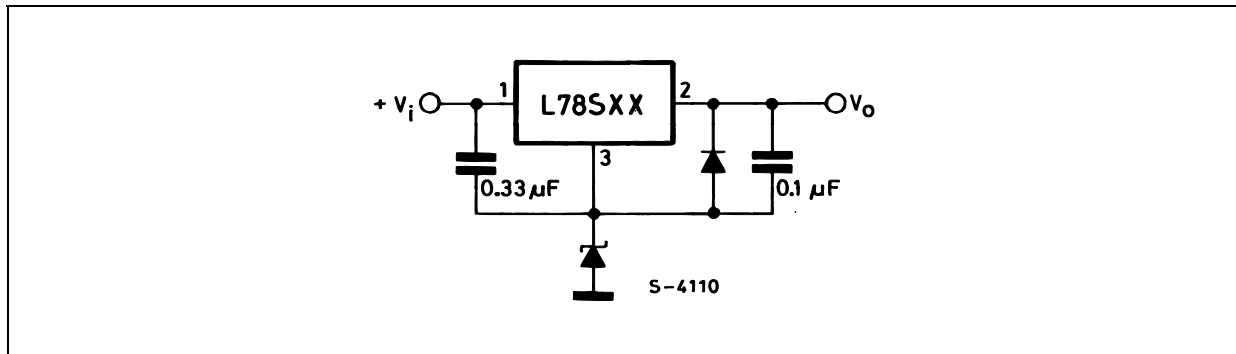


Figure 27 : High Input and Output Voltage

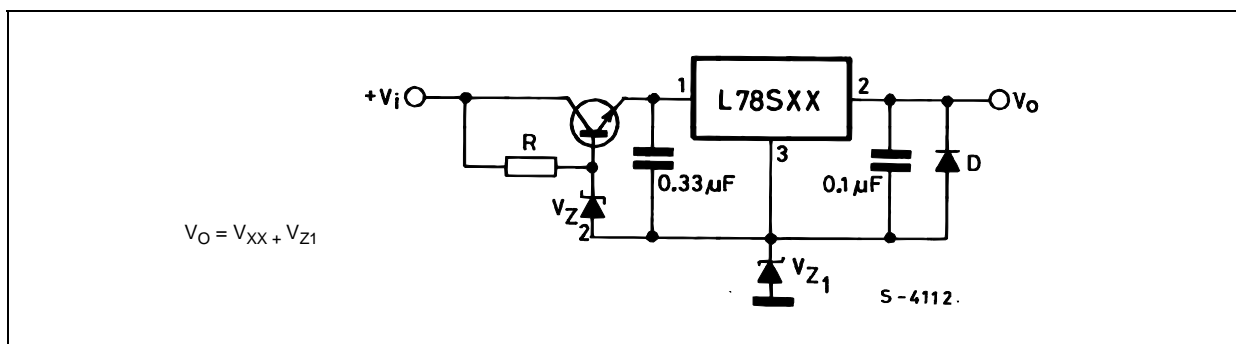


Figure 28 : Reducing Power Dissipation with Dropping Resistor

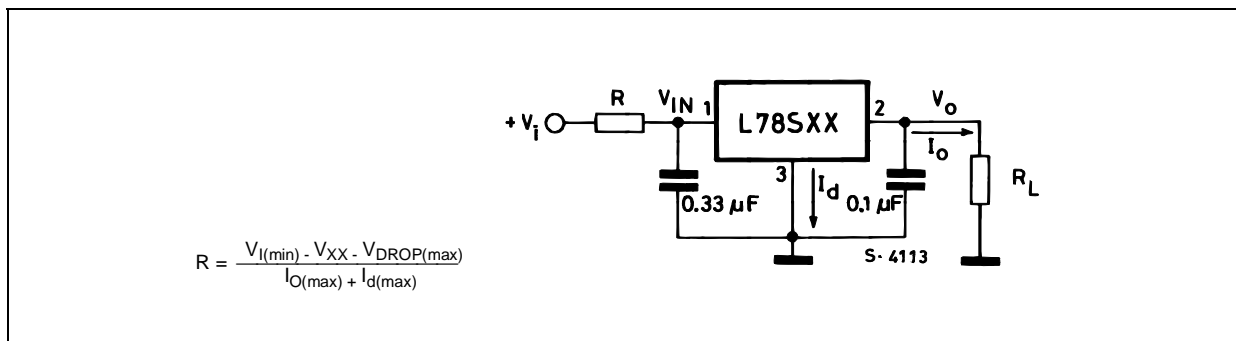
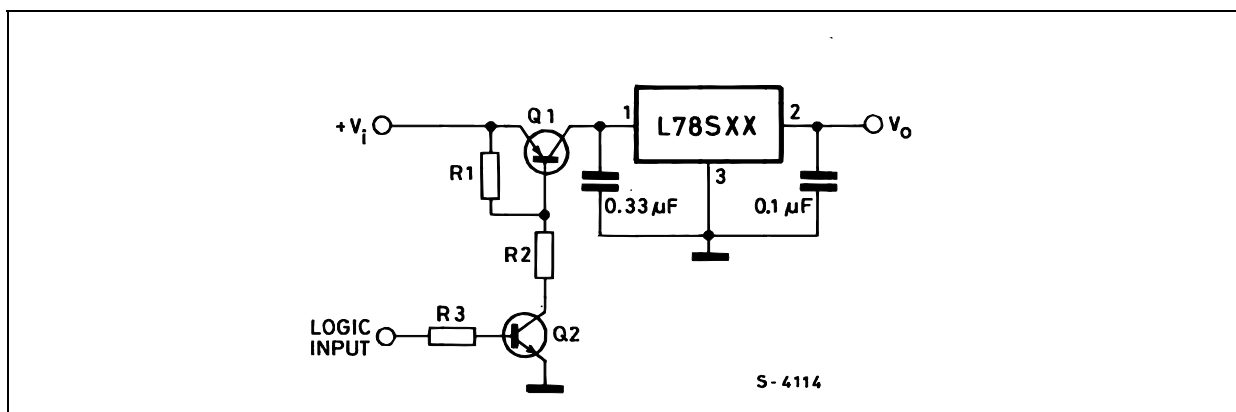
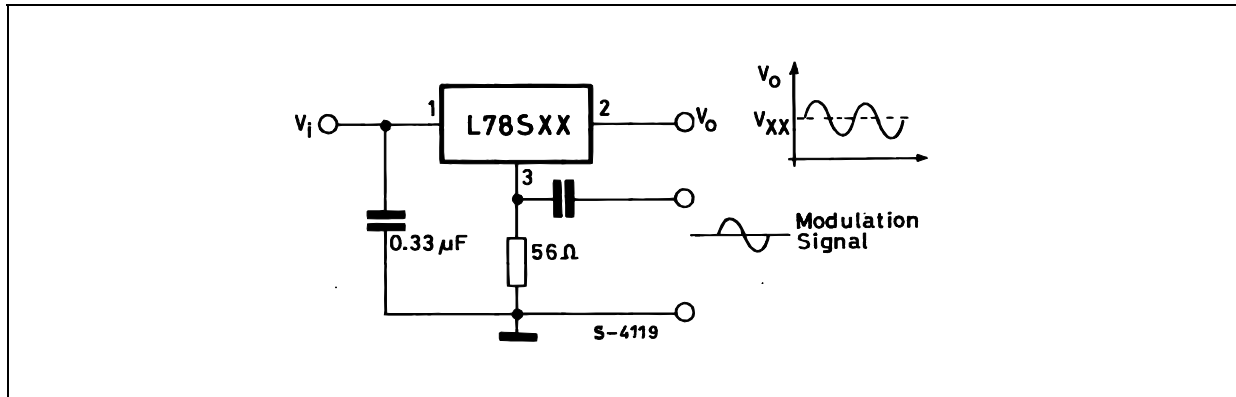


Figure 29 : Remote Shutdown



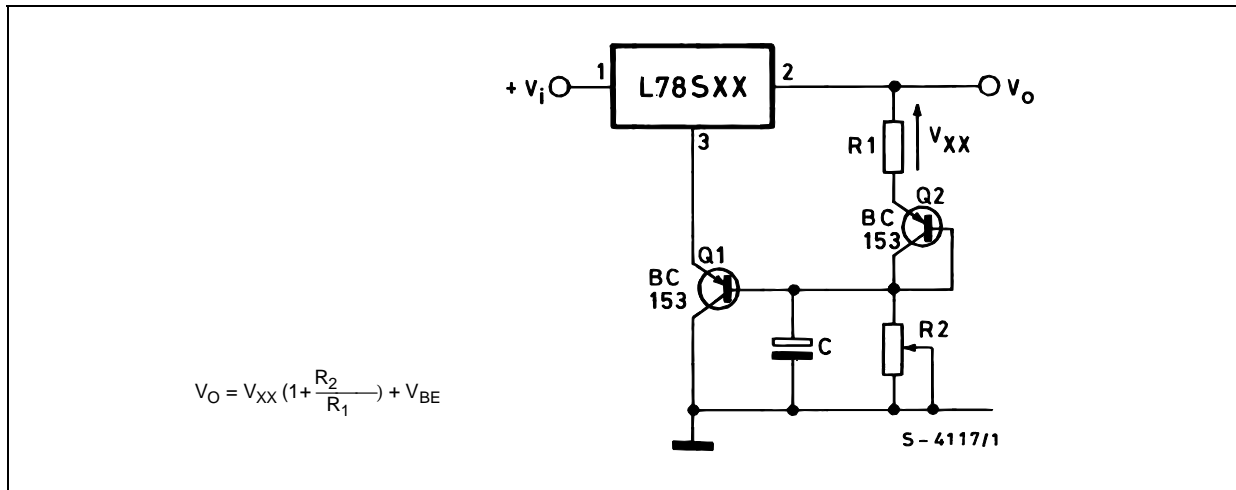
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Figure 30 : Power AM Modulator (unity voltage gain, $I_O \leq 1A$)



NOTE: The circuit performs well up to 100 KHz.

Figure 31 : 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 32 : Light Controllers ($V_{Omin} = V_{XX} + V_{BE}$)

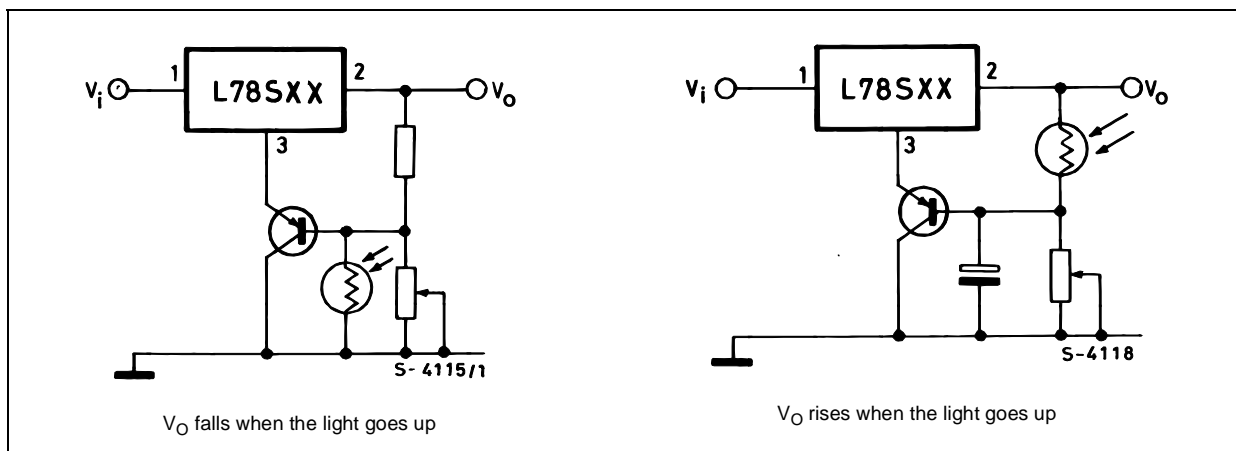
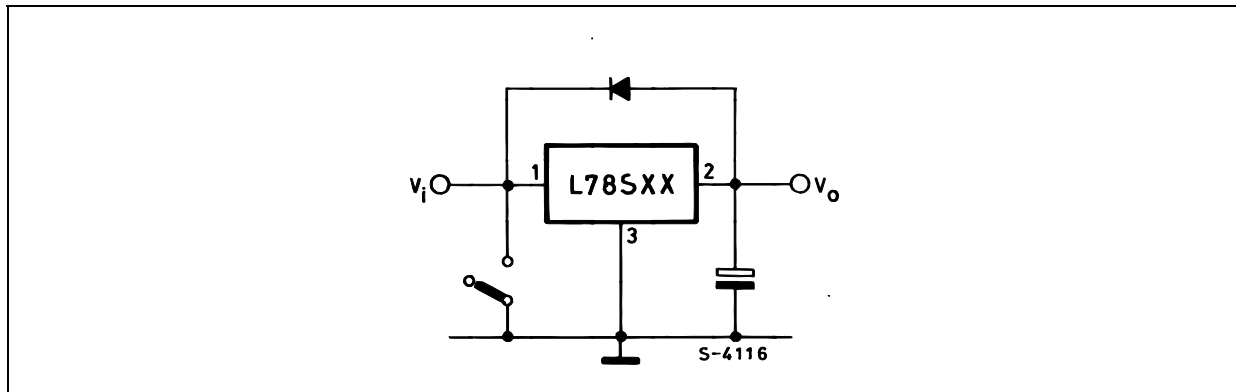
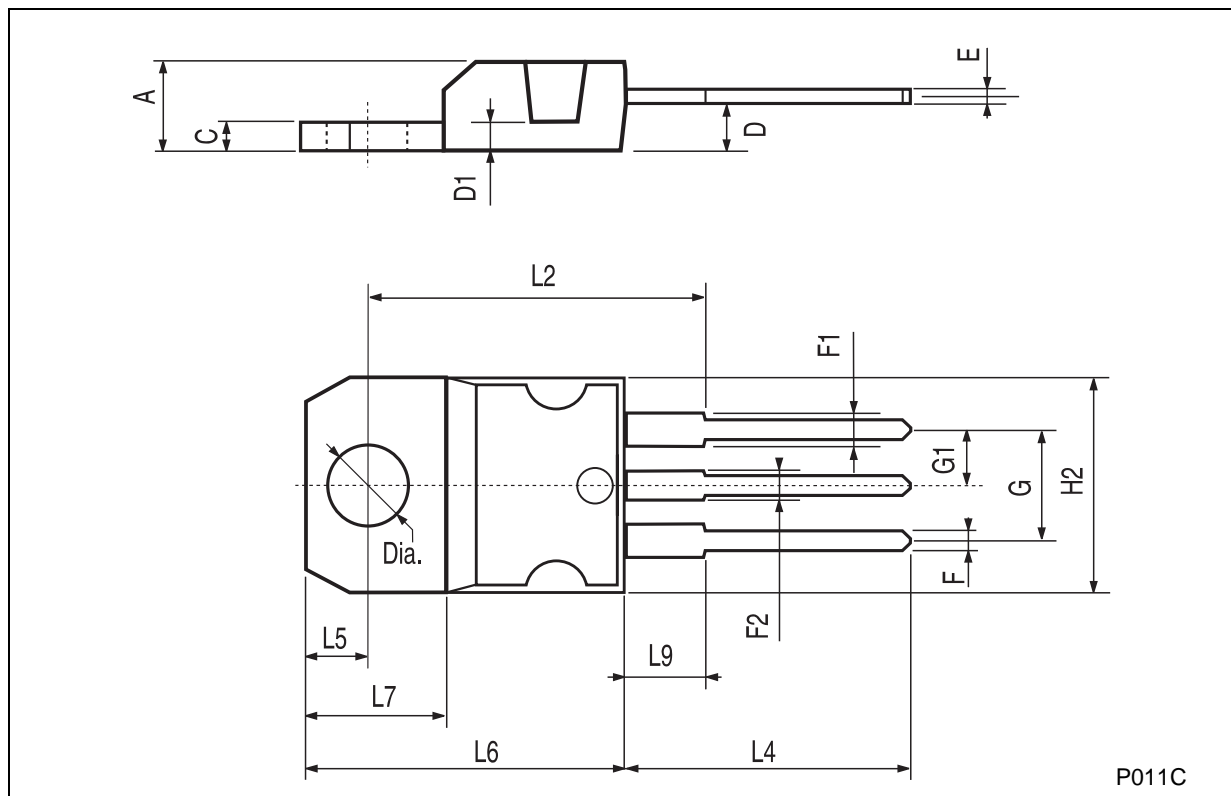


Figure 33 : Protection against Input Short-Circuit with High Capacitance Loads

Application with high capacitance loads and an output voltage greater than 6 volts need an external diode (see fig. 33) 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.

TO-220 MECHANICAL DATA

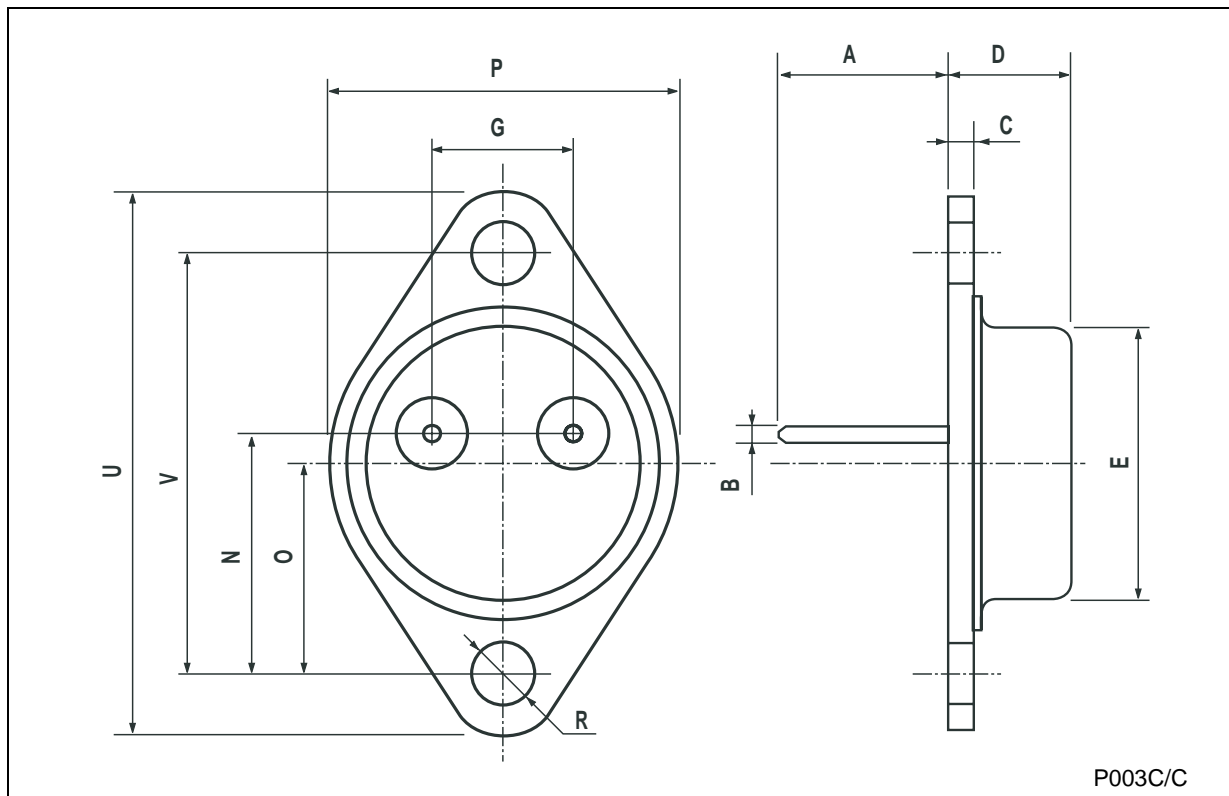
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
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



P011C

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

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