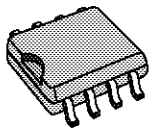
SGS-THOMSON MICROELECTRONICS

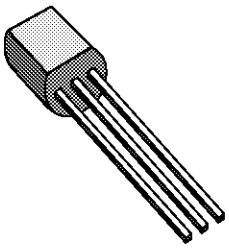
C78L00 SERIES

CMOS POSITIVE VOLTAGE REGULATORS VERY LOW DROP - VERY LOW QUIESCENT

- LOW CURRENT CONSUMPTION (TYP. 19µA)
- WIDE OPERATING VOLTAGE RANGE
- VERY LOW DROP OUT VOLTAGE (V_i - V_o < 0.2 V, I_o = 40 mA)
- CMOS TECHNOLOGY



SO-8



TO-92

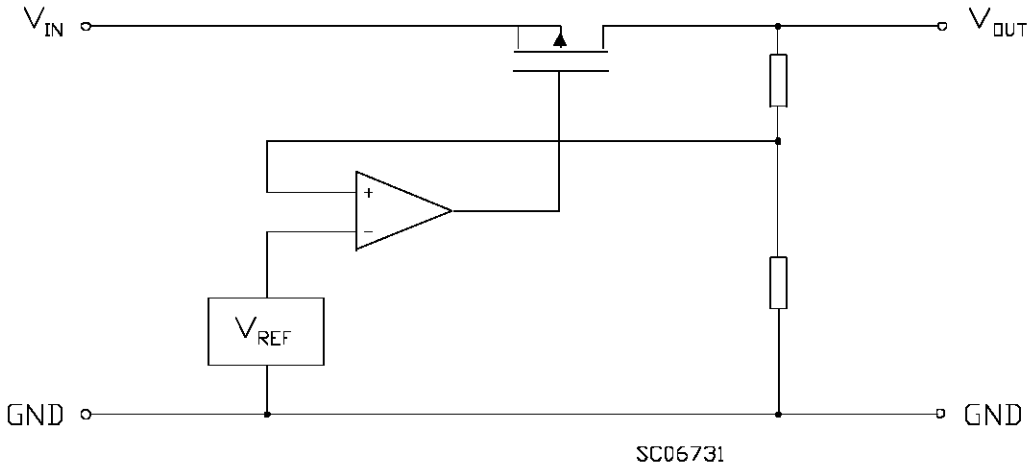
DESCRIPTION

The C78L00 series is a CMOS Positive Voltage Regulators. These regulators contains internal precision voltage reference, error amplifier, control transistor and output voltage setting resistor.

The regulation voltage is fixed by internal circuits and the following lines of different output voltages are available.

This series is suitable for battery operated items and battery back-up systems because of low current consumption and low drop out voltage.

SCHEMATIC DIAGRAM

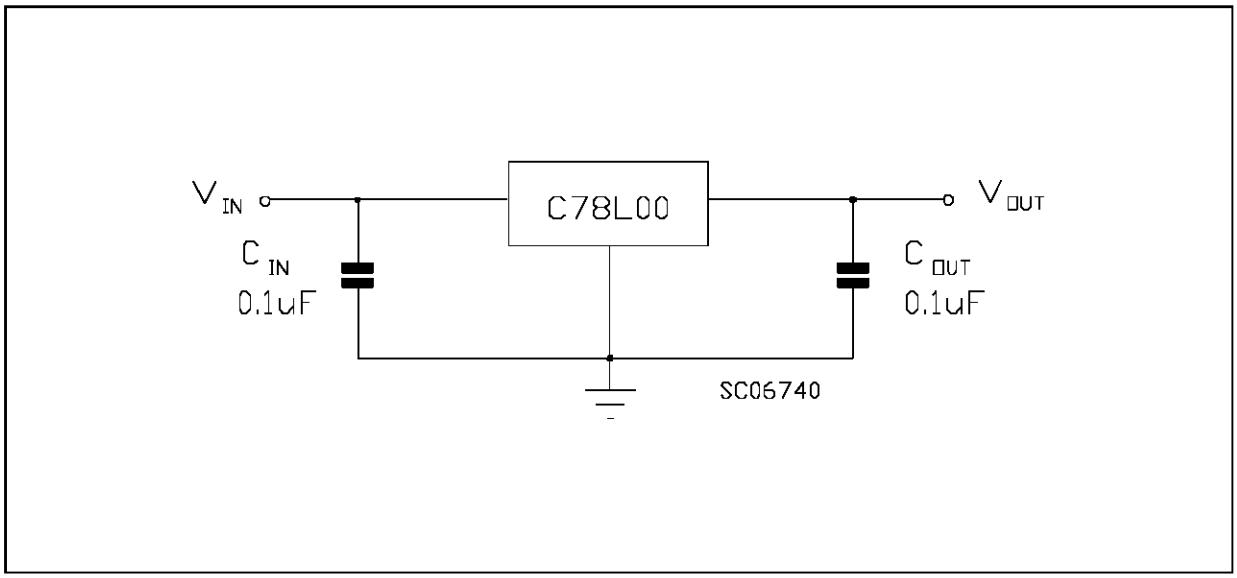


ABSOLUTE MAXIMUM RATING

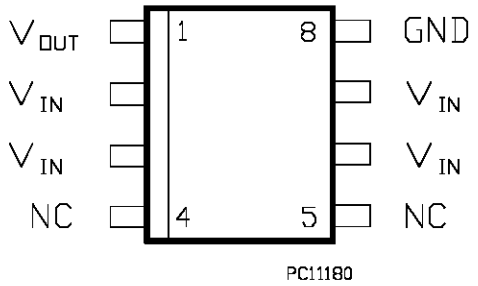
Symbol	Parameter		Value	Unit
V_i	DC Input Voltage		14	V
V_O	Maximum Output Voltage		5.5	V
I_o	Output Current		100	mA
P_{tot}	Power Dissipation		Internally limited (*)	
T_{stg}	Storage Temperature Range		- 40 to 150	^oC
T_{op}	Operating Junction Temperature Range	For C78L00B For C78L00C	- 40 to 150 0 to 125	^oC ^oC
T_{sold}	Soldering Temperature		260	^oC
t_{sold}	Soldering Time		10	sec

(*) Our SO-8 packageused for Voltage Regulators is modified internally to have pins 2, 3, 6 and 7 electrically commoned to the die attach flag. This particular frame decreases the total thermal resistance of the package and increases its ability to dissipate power when an appropriate are of copper on the printed circuit board is available for the heatsinking. The external dimensions are the same as for the standard SO-8

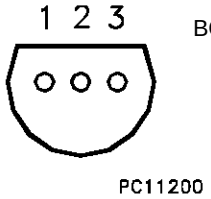
TEST CIRCUITS



CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



SO-8



BOTTOM VIEW

pin 1 = GND
pin 2 = IN
pin 3 = OUT

TO-92

Type	SO-8	TO-92	Output Voltage	Note
C78L03B	C78L03BD	C78L03BZ	3 V	Available
C78L03C	C78L03CD	C78L03CZ	3 V	Available
C78L05B	C78L05BD	C78L05BZ	5 V	Available
C78L05C	C78L05CD	C78L05CZ	5 V	Available
C78L12B	C78L12BD	C78L12BZ	1.2 V	On Request
C78L12C	C78L12CD	C78L12CZ	1.2 V	On Request
C78L15B	C78L15BD	C78L15BZ	1.5 V	On Request
C78L15C	C78L15CD	C78L15CZ	1.5 V	On Request
C78L25B	C78L25BD	C78L25BZ	2.5 V	On Request
C78L25C	C78L25CD	C78L25CZ	2.5 V	On Request
C78L27B	C78L27BD	C78L27BZ	2.7 V	On Request
C78L27C	C78L27CD	C78L27CZ	2.7 V	On Request
C78L32B	C78L32BD	C78L32BZ	3.2 V	On Request
C78L32C	C78L32CD	C78L32CZ	3.2 V	On Request
C78L35B	C78L35BD	C78L35BZ	3.5 V	On Request
C78L35C	C78L35CD	C78L35CZ	3.5 V	On Request
C78L40B	C78L40BD	C78L40BZ	4 V	On Request
C78L40C	C78L40CD	C78L40CZ	4 V	On Request
C78L45B	C78L45BD	C78L45BZ	4.5 V	On Request
C78L45C	C78L45CD	C78L45CZ	4.5 V	On Request
C78L52B	C78L52BD	C78L52BZ	5.2 V	On Request
C78L52C	C78L52CD	C78L52CZ	5.2 V	On Request
C78L55B	C78L55BD	C78L55BZ	5.5 V	On Request
C78L55C	C78L55CD	C78L55CZ	5.5 V	On Request

ELECTRICAL CHARACTERISTICS FOR C78L12 (refer to the test circuits, T_a = 25 °C, V_i = 3V, C_i = 0.1 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	I_o = 5 mA	1.1	1.2	1.3	V
V_i	Input Voltage				12	V
ΔV_o	Line Regulation	V_i = 1.5 to 12 V I_o = 5 mA		0.1		%/V
ΔV_o	Load Regulation	I_o = 1 to 15 mA		10	180	mV
I_d	Quiescent Current			14	30	µA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		30		µV
SVR	Supply Voltage Rejection	I_o = 5 mA f = 120 Hz T_j = 25 °C V_i = 2.5 to 3.5 V		45		dB
V_d	Dropout Voltage	I_o = 0.5 mA		0.02	0.3	V

ELECTRICAL CHARACTERISTICS FOR C78L03 (refer to the test circuits, T_a = 25 °C, V_i = 5V, C_i = 0.1 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	I_o = 10 mA	2.85	3	3.15	V
V_i	Input Voltage				12	V
ΔV_o	Line Regulation	V_i = 4 to 12 V I_o = 5 mA		0.1		%/V
ΔV_o	Load Regulation	I_o = 1 to 20 mA		15	180	mV
I_d	Quiescent Current			16	30	µA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		35		µV
SVR	Supply Voltage Rejection	I_o = 5 mA f = 120 Hz T_j = 25 °C V_i = 4.5 to 5.5 V		43		dB
V_d	Dropout Voltage	I_o = 20 mA		0.2	0.6	V

ELECTRICAL CHARACTERISTICS FOR C78L05 (refer to the test circuits, T_a = 25 °C, V_i = 7V, C_i = 0.1 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	I_o = 30 mA	4.75	5	5.25	V
V_i	Input Voltage				12	V
ΔV_o	Line Regulation	V_i = 6 to 12 V I_o = 5 mA		0.1		%/V
ΔV_o	Load Regulation	I_o = 1 to 40 mA		35	120	mV
I_d	Quiescent Current			19	30	µA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		50		µV
SVR	Supply Voltage Rejection	I_o = 5 mA f = 120 Hz T_j = 25 °C V_i = 6.5 to 7.5 V		40		dB
V_d	Dropout Voltage	I_o = 40 mA		0.3	0.6	V

Figure 1: Output Voltage vs Input Voltage

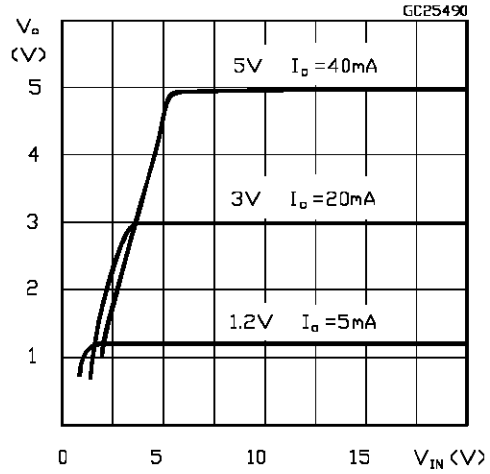


Figure 2 : Output Voltage vs Output Current

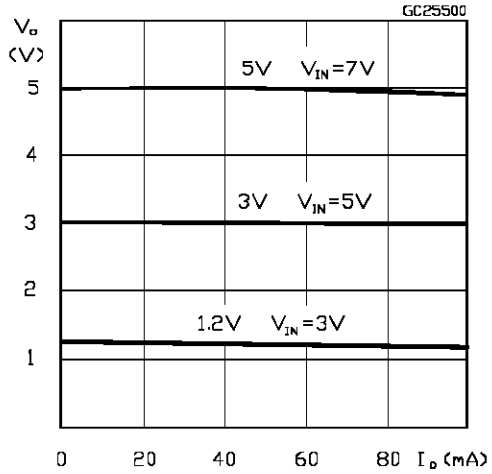


Figure 3 : Quiescent Current

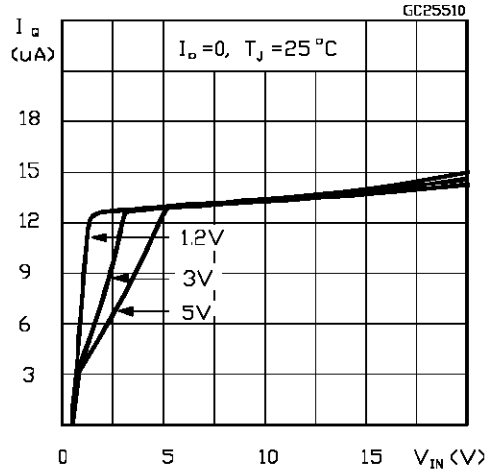


Figure 4 : Dropout Voltage

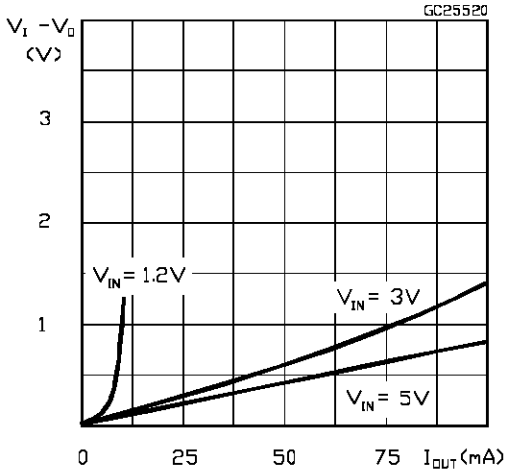


Figure 5 : Quiescent Current

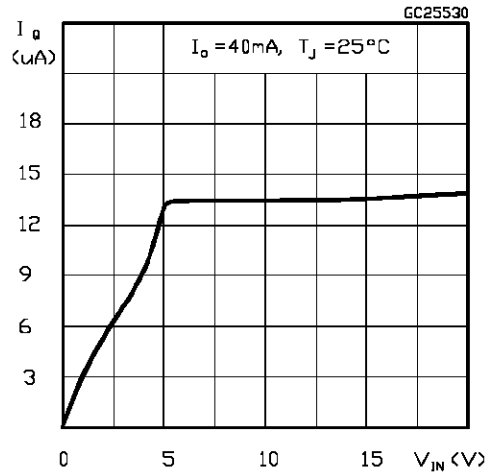
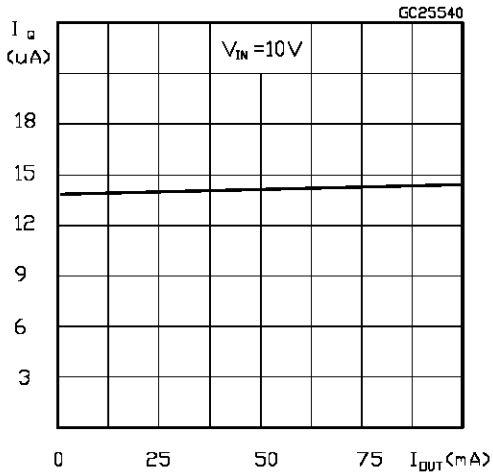
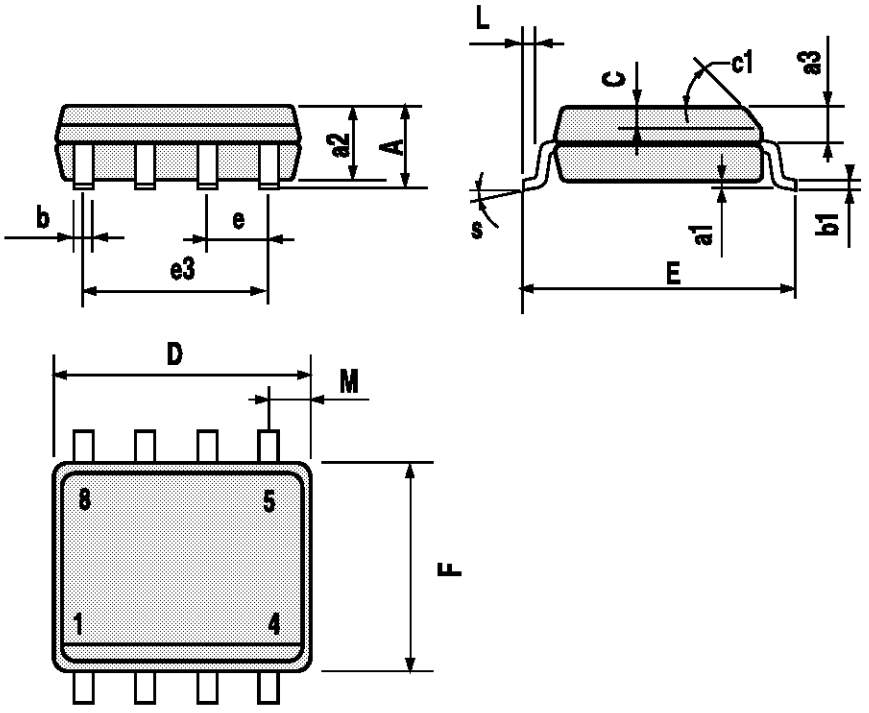


Figure 6 : Quiescent Current



SO8 MECHANICAL DATA

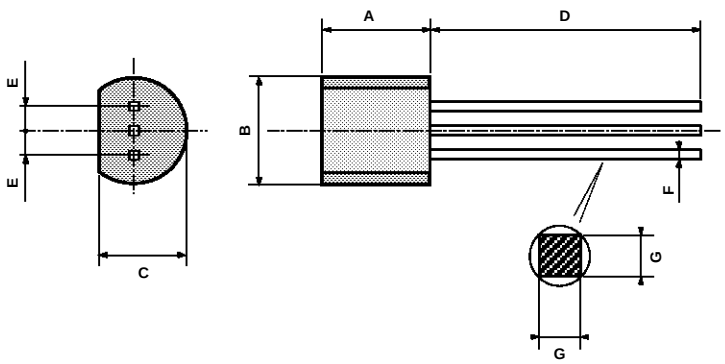
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45° (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8° (max.)					



P013M

TO-92 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.58		5.33	0.180		0.210
B	4.45		5.2	0.175		0.204
C	3.2		4.2	0.126		0.165
D	12.7			0.500		
E		1.27			0.050	
F	0.4		0.51	0.016		0.020
G	0.35			0.14		



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsability for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may results from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied.
SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectonics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

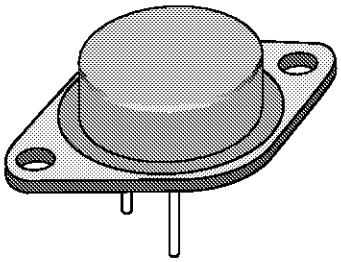
SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A

SGS-THOMSON MICROELECTRONICS

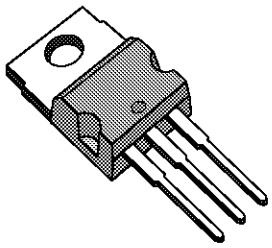
L7800 SERIES

POSITIVE VOLTAGE REGULATORS

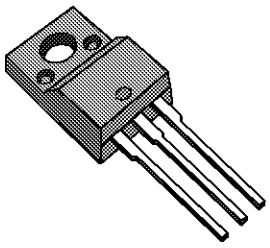
- OUTPUT CURRENT UP TO 1.5A
- OUTPUT VOLTAGES OF 5; 5.2; 6; 8; 8.5; 9; 12; 15; 18; 20; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION



TO-3



TO-220

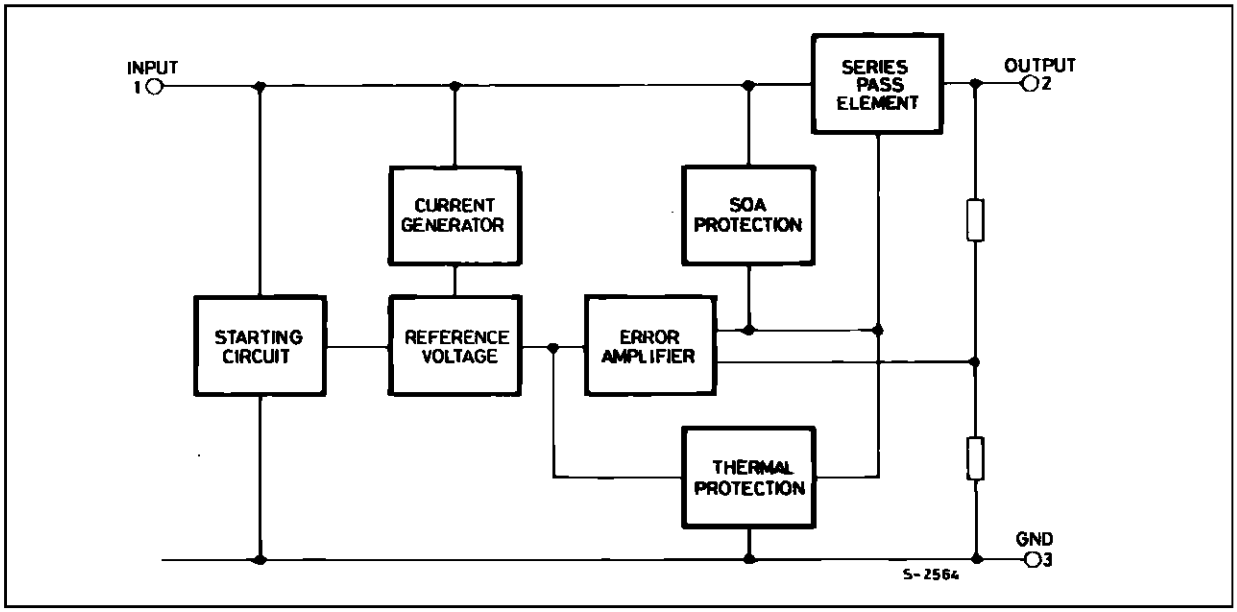


ISOWATT220

DESCRIPTION

The L7800 series of three-terminal positive regulator is available in TO-220, ISOWATT220 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 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

BLOCK DIAGRAM



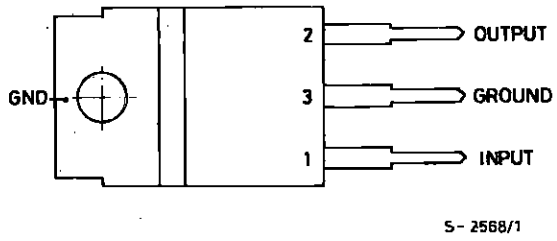
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_i	DC Input Voltage (for V_o = 5 to 18V) (for V_o = 20, 24V)	35 40	V V
I_o	Output Current	Internally limited	
P_{tot}	Power Dissipation	Internally limited	
T_{op}	Operating Junction Temperature (for **L7800**) (for **L7800C**)	– 55 to + 150 0 to + 150	°C °C
T_{stg}	Storage Temperature	– 65 to + 150	°C

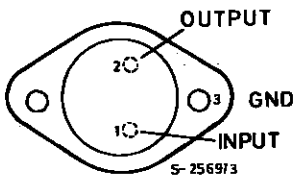
THERMAL DATA

Symbol	Parameter		TO-220	ISOWATT220	TO-3	Unit
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	3	4	4	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	50	60	35	°C/W

CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



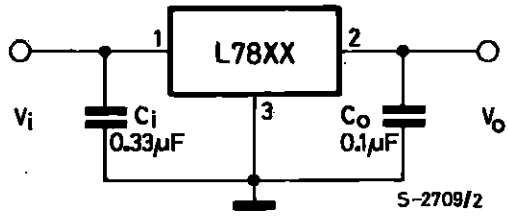
TO-220 & ISOWATT220



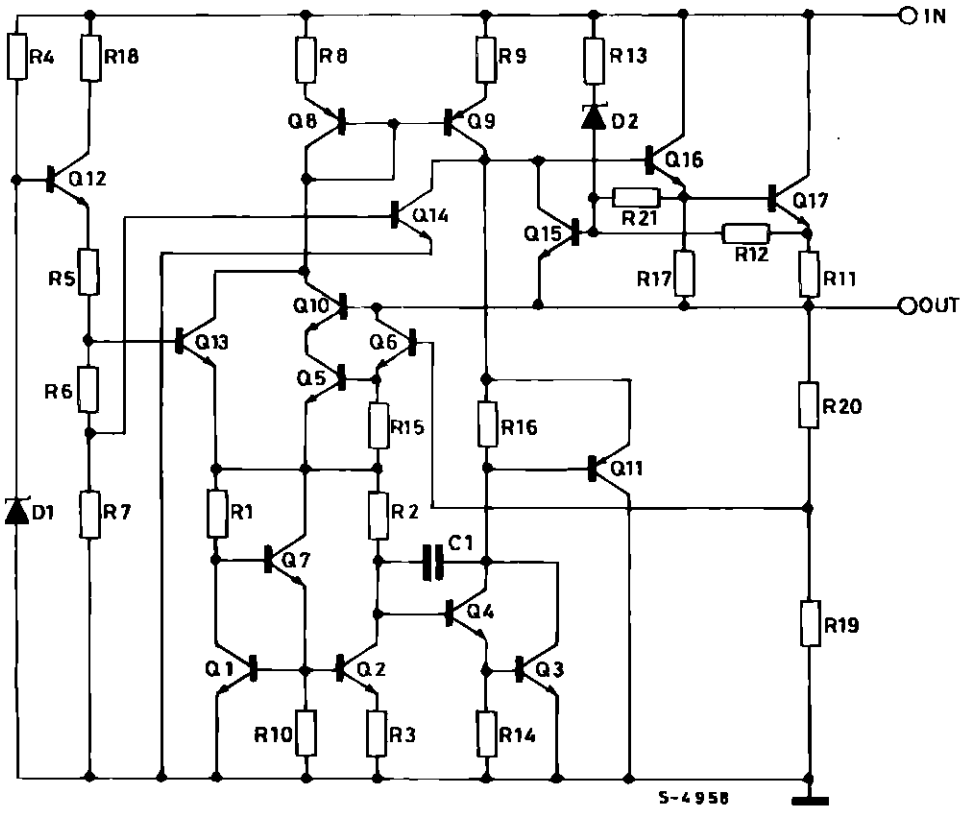
TO-3

Type	TO-220	ISOWATT220	TO-3	Output Voltage
L7805			L7805T	5V
L7805C	L7805CV	L7805CP	L7805CT	5V
L7852C	L7852CV	L7852CP	L7852CT	5.2V
L7806			L7806T	6V
L7806C	L7806CV	L7806CP	L7806CT	6V
L7808			L7808T	8V
L7808C	L7808CV	L7808CP	L7808CT	8V
L7885C	L7885CV	L7885CP	L7885CT	8.5V
L7809C	L7809CV	L7809CP	L7809CT	9V
L7812			L7812T	12V
L7812C	L7812CV	L7812CP	L7812CT	12V
L7815			L7815T	15V
L7815C	L7815CV	L7815CP	L7815CT	15V
L7818			L7818T	18V
L7818C	L7818CV	L7818CP	L7818CT	18V
L7820			L7820T	20V
L7820C	L7820CV	L7820CP	L7820CT	20V
L7824			L7824T	24V
L7824C	L7824CV	L7824CP	L7824CT	24V

APPLICATION CIRCUIT



SCHEMATIC DIAGRAM



TEST CIRCUITS

Figure 1 : DC Parameters.

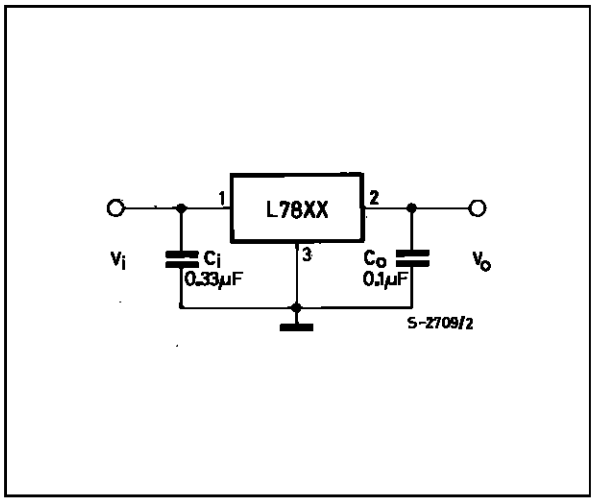


Figure 2 : Load Regulation.

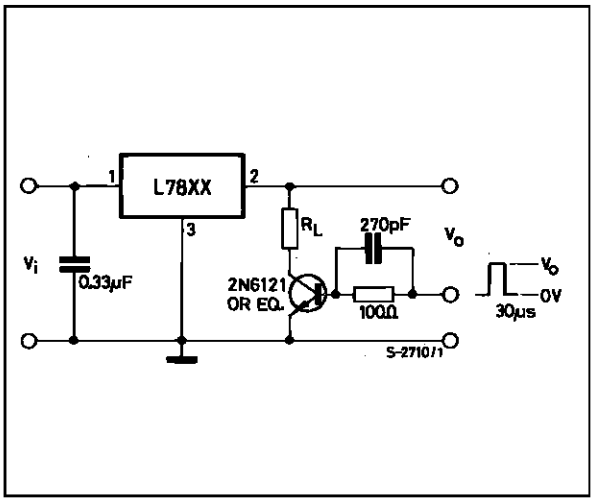
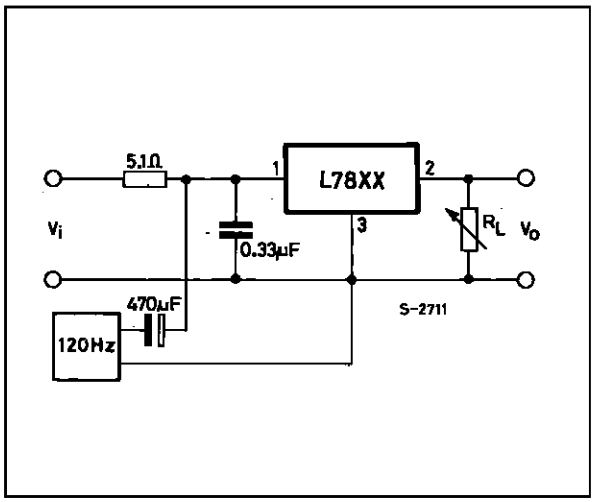


Figure 3 : Ripple Rejection.



ELECTRICAL CHARACTERISTICS FOR L7805 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 10V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	4.8	5	5.2	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 8 to 20 V	4.65	5	5.35	V
ΔV_o*	Line Regulation	V_i = 7 to 25 V T_j = 25 °C V_i = 8 to 12 V T_j = 25 °C		3 1	50 25	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 25	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 8 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		0.6		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 8 to 18 V f = 120 Hz	68			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

ELECTRICAL CHARACTERISTICS FOR L7806 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 15V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	5.75	6	6.25	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 9 to 21 V	5.65	6	6.35	V
ΔV_o*	Line Regulation	V_i = 8 to 25 V T_j = 25 °C V_i = 9 to 13 V T_j = 25 °C			60 30	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 30	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 9 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		0.7		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 9 to 19 V f = 120 Hz	65			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

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

ELECTRICAL CHARACTERISTICS FOR L7808 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 14V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	7.7	8	8.3	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 11.5 to 23 V	7.6	8	8.4	V
ΔV_o*	Line Regulation	V_i = 10.5 to 25 V T_j = 25 °C V_i = 11 to 17 V T_j = 25 °C			80 40	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 40	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 11.5 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 11.5 to 21.5 V f = 120 Hz	62			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

ELECTRICAL CHARACTERISTICS FOR L7812 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 19V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	11.5	12	12.5	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 15.5 to 27 V	11.4	12	12.6	V
ΔV_o*	Line Regulation	V_i = 14.5 to 30 V T_j = 25 °C V_i = 16 to 22 V T_j = 25 °C			120 60	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 60	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 15 to 30 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		1.5		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 15 to 25 V f = 120 Hz	61			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		18		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

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

ELECTRICAL CHARACTERISTICS FOR L7815 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 23V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	14.4	15	15.6	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 18.5 to 30 V	14.25	15	15.75	V
ΔV_o*	Line Regulation	V_i = 17.5 to 30 V T_j = 25 °C V_i = 20 to 26 V T_j = 25 °C			150 75	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			150 75	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 18.5 to 30 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		1.8		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 18.5 to 28.5 V f = 120 Hz	60			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

ELECTRICAL CHARACTERISTICS FOR L7818 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 26V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	17.3	18	18.7	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 22 to 33 V	17.1	18	18.9	V
ΔV_o*	Line Regulation	V_i = 21 to 33 V T_j = 25 °C V_i = 24 to 30 V T_j = 25 °C			180 90	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			180 90	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 22 to 33 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		2.3		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 22 to 32 V f = 120 Hz	59			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		22		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

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

ELECTRICAL CHARACTERISTICS FOR L7820 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 28V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	19.2	20	20.8	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 24 to 35 V	19	20	21	V
ΔV_o*	Line Regulation	V_i = 22.5 to 35 V T_j = 25 °C V_i = 26 to 32 V T_j = 25 °C			200 100	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			200 100	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 24 to 35 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		2.5		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 24 to 35 V f = 120 Hz	58			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		24		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

ELECTRICAL CHARACTERISTICS FOR L7824 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 33V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	23	24	25	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 28 to 38 V	22.8	24	25.2	V
ΔV_o*	Line Regulation	V_i = 27 to 38 V T_j = 25 °C V_i = 30 to 36 V T_j = 25 °C			240 120	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			240 120	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 28 to 38 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		3		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 28 to 38 V f = 120 Hz	56			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		28		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

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

ELECTRICAL CHARACTERISTICS FOR L7805C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 10V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	4.8	5	5.2	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 7 to 20 V	4.75	5	5.25	V
ΔV_o*	Line Regulation	V_i = 7 to 25 V T_j = 25 °C V_i = 8 to 12 V T_j = 25 °C		3 1	100 50	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 50	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 7 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		40		µV
SVR	Supply Voltage Rejection	V_i = 8 to 18 V f = 120 Hz	62			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		750		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7852C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 10V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	5.0	5.2	5.4	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 8 to 20 V	4.95	5.2	5.45	V
ΔV_o*	Line Regulation	V_i = 7 to 25 V T_j = 25 °C V_i = 8 to 12 V T_j = 25 °C		3 1	105 52	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			105 52	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 7 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.0		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		42		µV
SVR	Supply Voltage Rejection	V_i = 8 to 18 V f = 120 Hz	61			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		750		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

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

ELECTRICAL CHARACTERISTICS FOR L7806C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 11V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	5.75	6	6.25	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 8 to 21 V	5.7	6	6.3	V
ΔV_o*	Line Regulation	V_i = 8 to 25 V T_j = 25 °C V_i = 9 to 13 V T_j = 25 °C			120 60	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			120 60	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 8 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.8		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		45		µV
SVR	Supply Voltage Rejection	V_i = 9 to 19 V f = 120 Hz	59			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		550		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7808C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 14V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	7.7	8	8.3	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 10.5 to 25 V	7.6	8	8.4	V
ΔV_o*	Line Regulation	V_i = 10.5 to 25 V T_j = 25 °C V_i = 11 to 17 V T_j = 25 °C			160 80	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			160 80	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 10.5 to 25 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.8		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		52		µV
SVR	Supply Voltage Rejection	V_i = 11.5 to 21.5 V f = 120 Hz	56			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		450		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

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

ELECTRICAL CHARACTERISTICS FOR L7885C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 14.5V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	8.2	8.5	8.8	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 11 to 26 V	8.1	8.5	8.9	V
ΔV_o*	Line Regulation	V_i = 11 to 27 V T_j = 25 °C V_i = 11.5 to 17.5 V T_j = 25 °C			160 80	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			160 80	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 11 to 27 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.8		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		55		µV
SVR	Supply Voltage Rejection	V_i = 12 to 22 V f = 120 Hz	56			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		450		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7809C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 15V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	8.65	9	9.35	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 11.5 to 26 V	8.55	9	9.45	V
ΔV_o*	Line Regulation	V_i = 11.5 to 26 V T_j = 25 °C V_i = 12 to 18 V T_j = 25 °C			180 90	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			180 90	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 11.5 to 26 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.0		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		70		µV
SVR	Supply Voltage Rejection	V_i = 12 to 23 V f = 120 Hz	55			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		400		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

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

ELECTRICAL CHARACTERISTICS FOR L7812C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 19V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	11.5	12	12.5	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 14.5 to 27 V	11.4	12	12.6	V
ΔV_o*	Line Regulation	V_i = 14.5 to 30 V T_j = 25 °C V_i = 16 to 22 V T_j = 25 °C			240 120	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			240 120	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 14.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		75		µV
SVR	Supply Voltage Rejection	V_i = 15 to 25 V f = 120 Hz	55			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		18		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		350		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7815C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 23V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	14.4	15	15.6	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 17.5 to 30 V	14.25	15	15.75	V
ΔV_o*	Line Regulation	V_i = 17.5 to 30 V T_j = 25 °C V_i = 20 to 26 V T_j = 25 °C			300 150	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			300 150	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 17.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		90		µV
SVR	Supply Voltage Rejection	V_i = 18.5 to 28.5 V f = 120 Hz	54			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		230		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.1		A

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

ELECTRICAL CHARACTERISTICS FOR L7818C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 26V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	17.3	18	18.7	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 21 to 33 V	17.1	18	18.9	V
ΔV_o*	Line Regulation	V_i = 21 to 33 V T_j = 25 °C V_i = 24 to 30 V T_j = 25 °C			360 180	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			360 180	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 21 to 33 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		110		µV
SVR	Supply Voltage Rejection	V_i = 22 to 32 V f = 120 Hz	53			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		22		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		200		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.1		A

ELECTRICAL CHARACTERISTICS FOR L7820C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 28V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	19.2	20	20.8	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 23 to 35 V	19	20	21	V
ΔV_o*	Line Regulation	V_i = 22.5 to 35 V T_j = 25 °C V_i = 26 to 32 V T_j = 25 °C			400 200	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			400 200	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 23 to 35 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		150		µV
SVR	Supply Voltage Rejection	V_i = 24 to 35 V f = 120 Hz	52			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		24		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		180		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.1		A

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

ELECTRICAL CHARACTERISTICS FOR L7824C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 33V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	23	24	25	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 27 to 38 V	22.8	24	25.2	V
ΔV_o*	Line Regulation	V_i = 27 to 38 V T_j = 25 °C V_i = 30 to 36 V T_j = 25 °C			480 240	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			480 240	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 27 to 38 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.5		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		170		µV
SVR	Supply Voltage Rejection	V_i = 28 to 38 V f = 120 Hz	50			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		28		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		150		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.1		A

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

Figure 4 : Dropout Voltage vs. Junction Temperature.

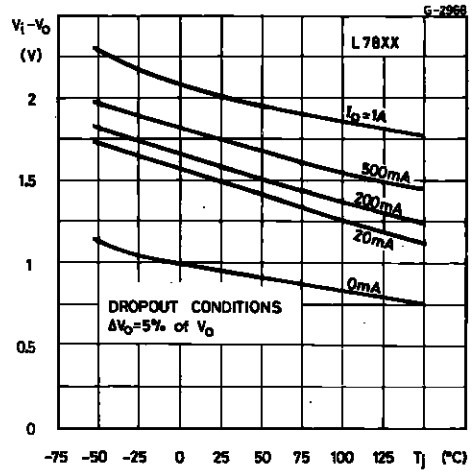


Figure 5 : Peak Output Current vs. Input/output Differential Voltage.

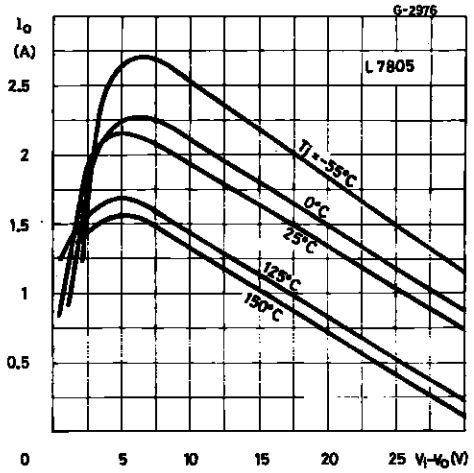


Figure 6 : Supply Voltage Rejection vs. Frequency.

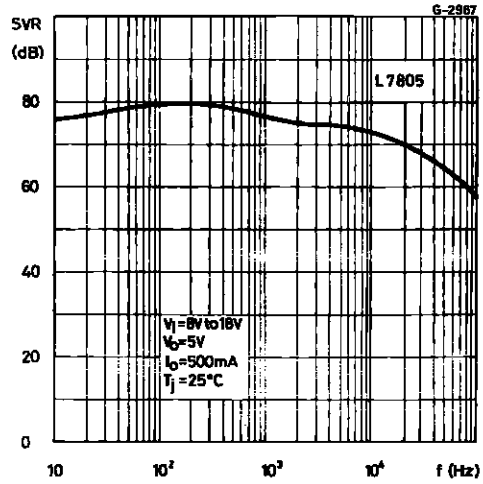


Figure 7 : Output Voltage vs. Junction Temperature.

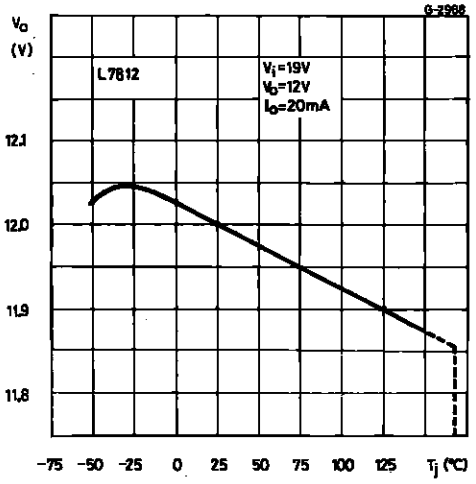


Figure 8 : Output Impedance vs. Frequency.

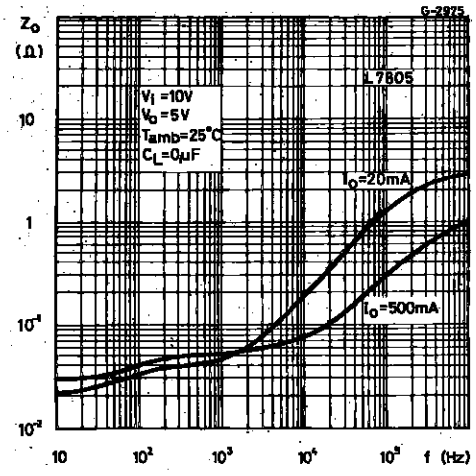


Figure 9 : Quiescent Current vs. Junction Temperature.

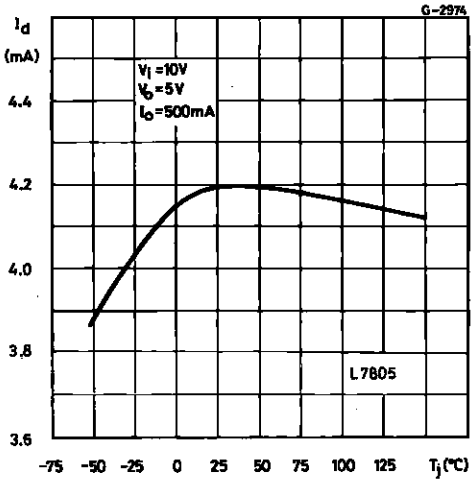


Figure 10 : Load Transient Response.

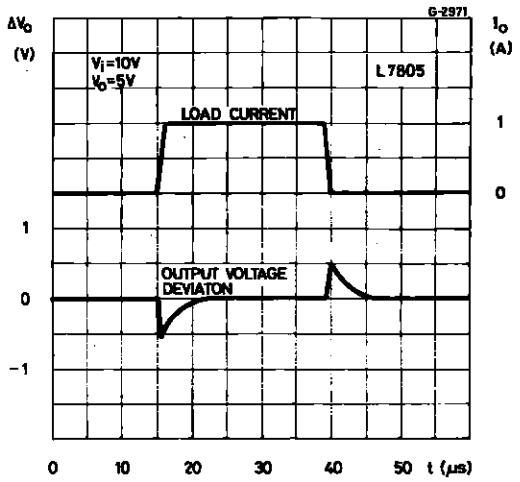


Figure 11 : Line Transient Response.

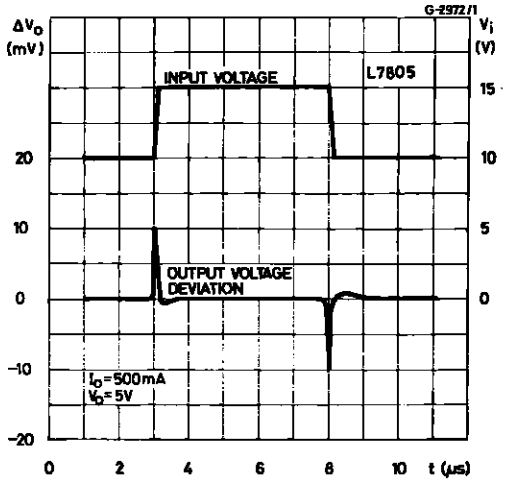


Figure 12 : Quiescent Current vs. Input Voltage.

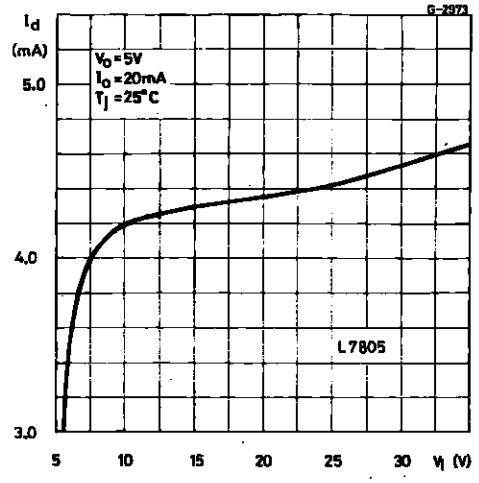


Figure 13 : Fixed Output Regulator.

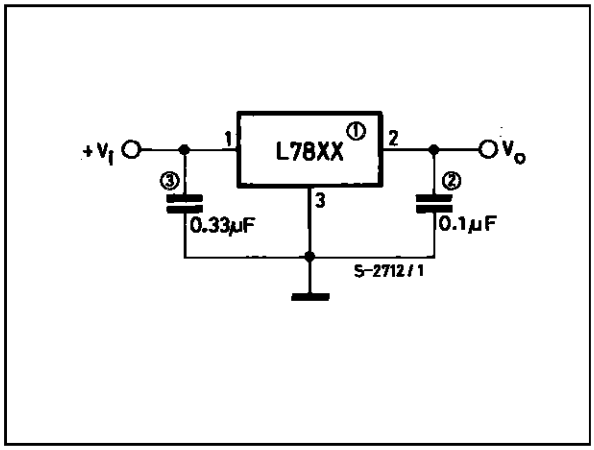
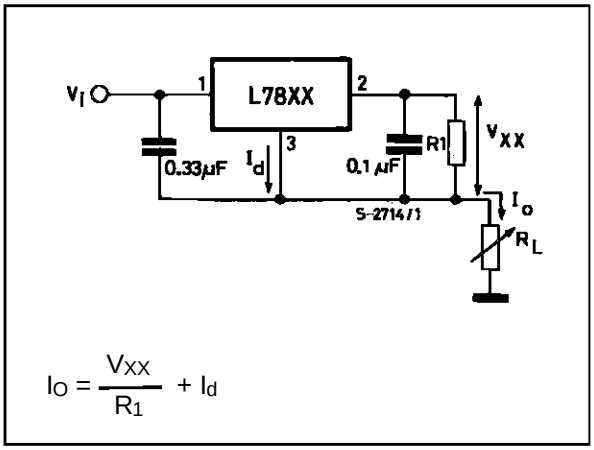
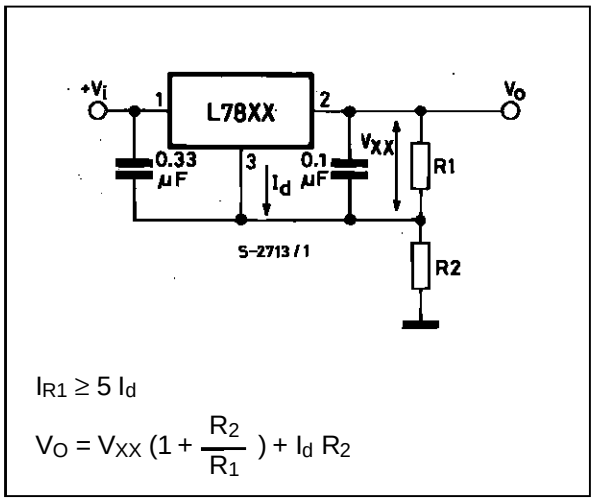


Figure 14 : Current Regulator.



Notes : 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 dis-tance from power supply filter.

Figure 15 : Circuit for Increasing Output Voltage.



$I_{R1} \geq 5\ I_d$

$$V_O = V_{XX}\left(1 + \frac{R_2}{R_1}\right) + I_d R_2$$

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

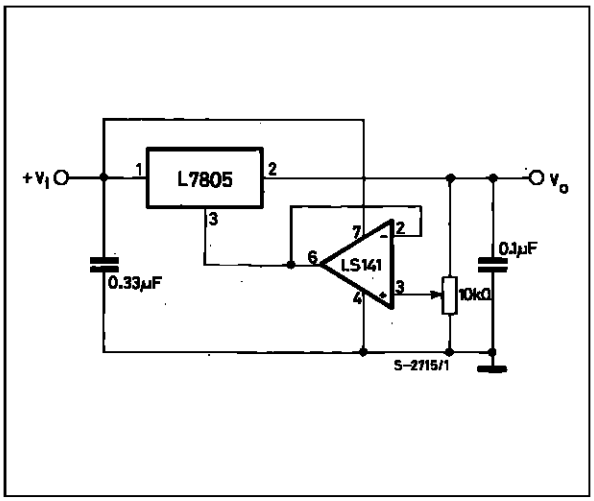
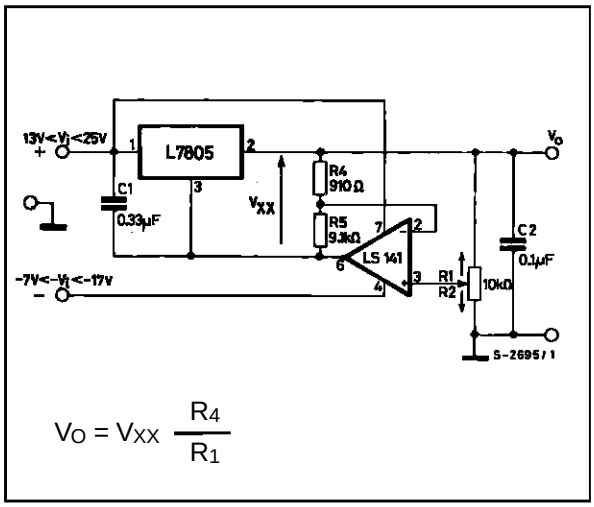
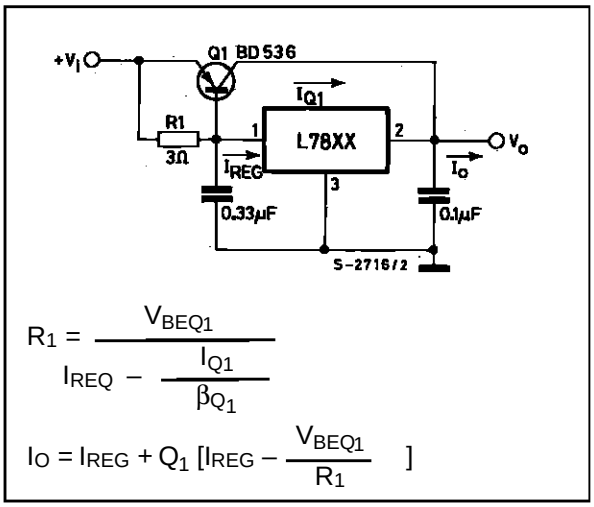


Figure 17 : 0.5 to 10V Regulator.



$$V_O = V_{XX}\ \frac{R_4}{R_1}$$

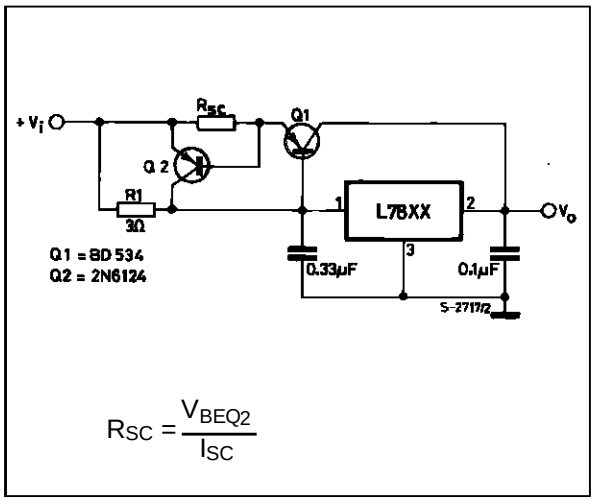
Figure 18 : High Current Voltage Regulator.



$$R_1 = \frac{V_{BEQ1}}{I_{REQ} - \frac{I_{Q1}}{\beta_{Q_1}}}$$

$$I_O = I_{REG} + Q_1\left[I_{REG} - \frac{V_{BEQ1}}{R_1}\right]$$

Figure 19 : High Output Current with Short Circuit Protection.



$$R_{SC} = \frac{V_{BEQ2}}{I_{SC}}$$

Figure 20 : Tracking Voltage Regulator.

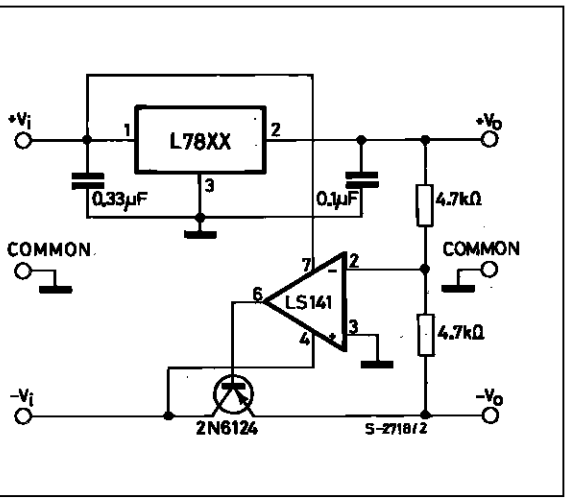
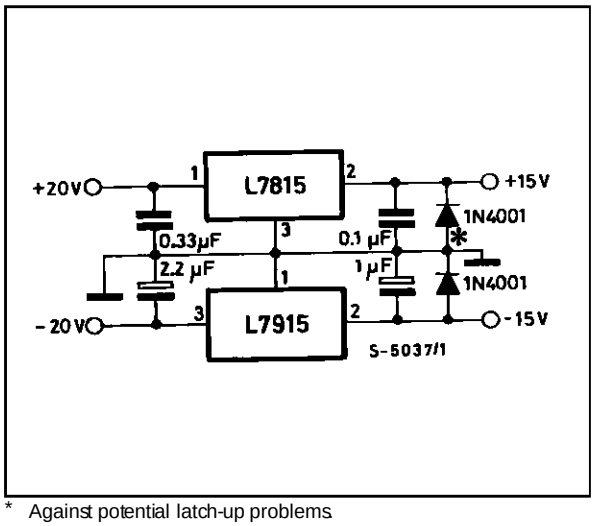


Figure 21 : Split Power Supply (± 15V – 1A).



* Against potential latch-up problems.

Figure 22 : Negative Output Voltage Circuit.

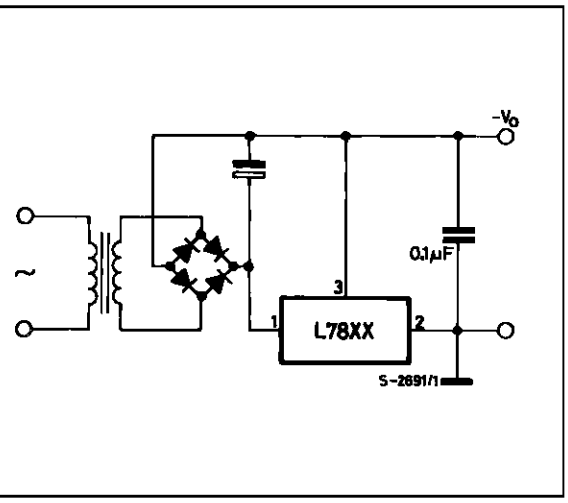


Figure 23 : Switching Regulator.

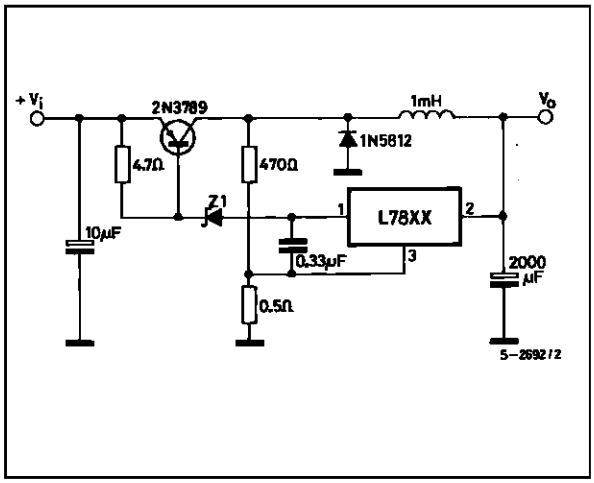
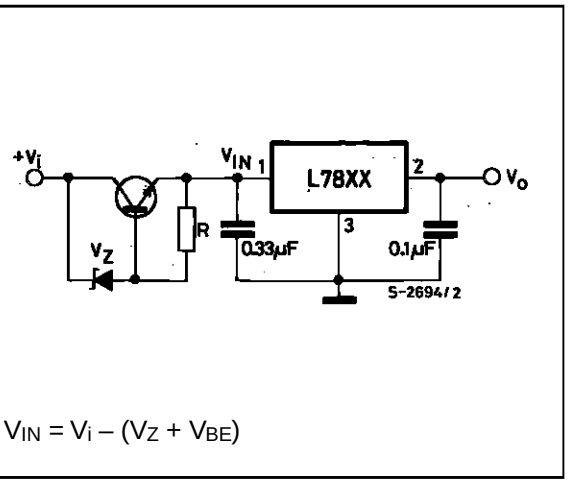


Figure 24 : High Input Voltage Circuit.



$$V_{IN} = V_i - (V_Z + V_{BE})$$

Figure 25 : High Input Voltage Circuit.

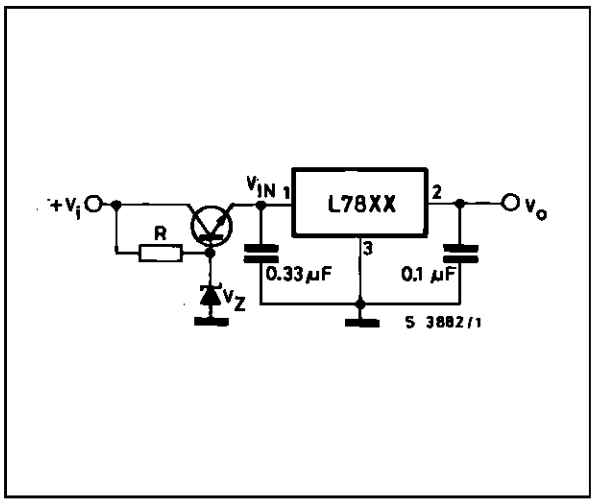


Figure 26 : High Output Voltage Regulator.

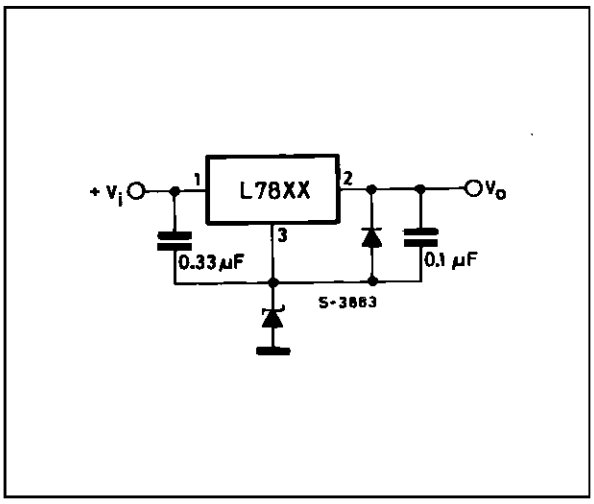
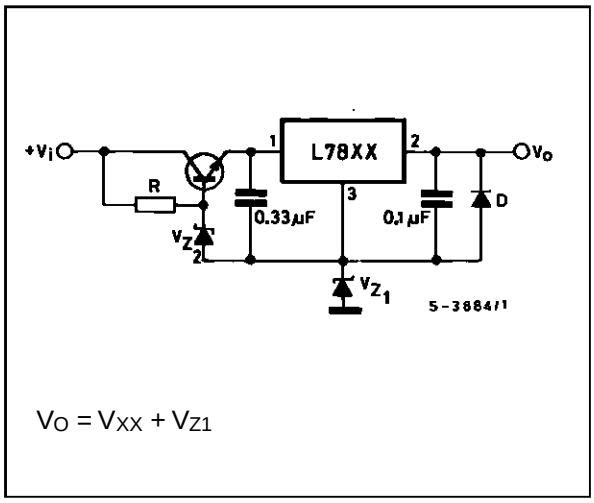
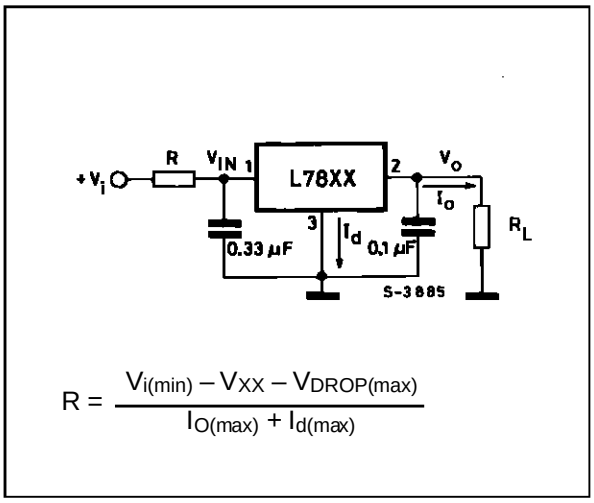


Figure 27 : High Input and Output Voltage.



$V_O = V_{XX} + V_{Z1}$

Figure 28 : Reducing Power Dissipation with Dropping Resistor.



$$R = \frac{V_{i(min)} - V_{XX} - V_{DROP(max)}}{I_{O(max)} + I_{d(max)}}$$

Figure 29 : Remote Shutdown.

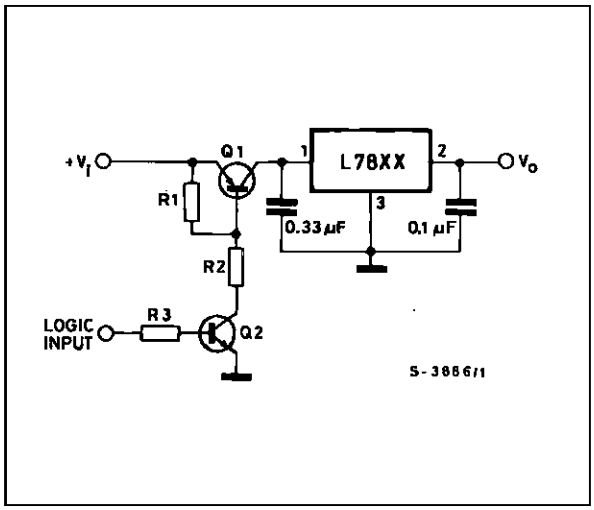
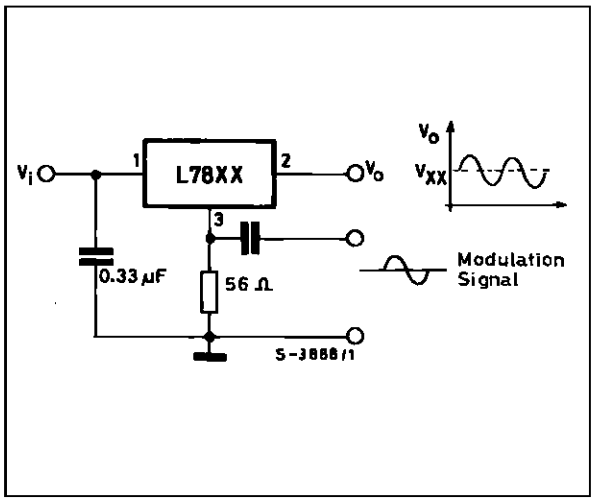
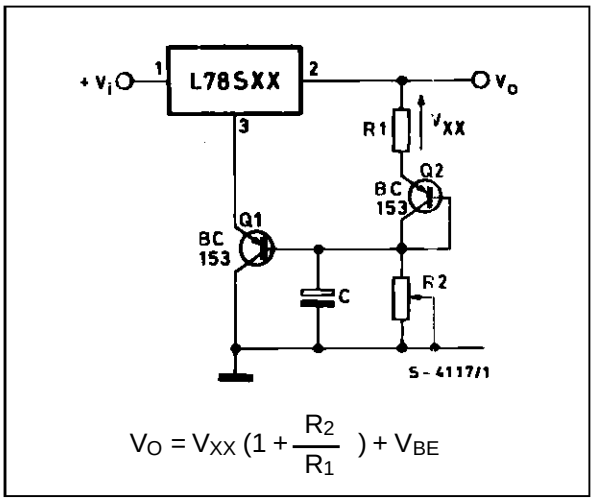


Figure 30 : Power AM Modulator (unity voltage gain, Io ≤ 1A).



Note : The circuit performs well up to 100KHz.

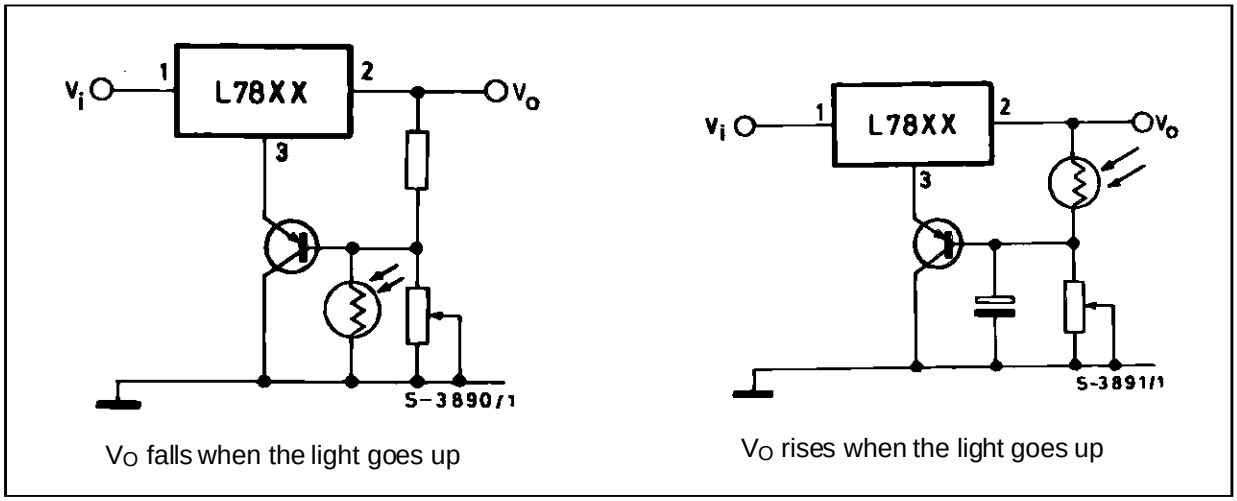
Figure 31 : Adjustable Output Voltage with Temperature Compensation.



$$V_O = V_{XX}\,(1 + \frac{R_2}{R_1}) + V_{BE}$$

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

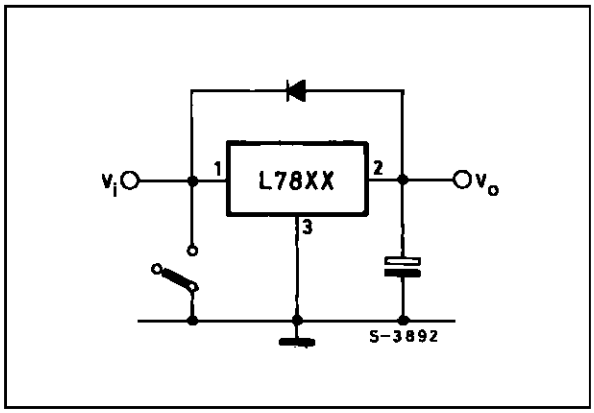
Figure 32 : Light Controllers ($V_{O\,min} = V_{XX} + V_{BE}$).



V_O falls when the light goes up

V_O rises when the light goes up

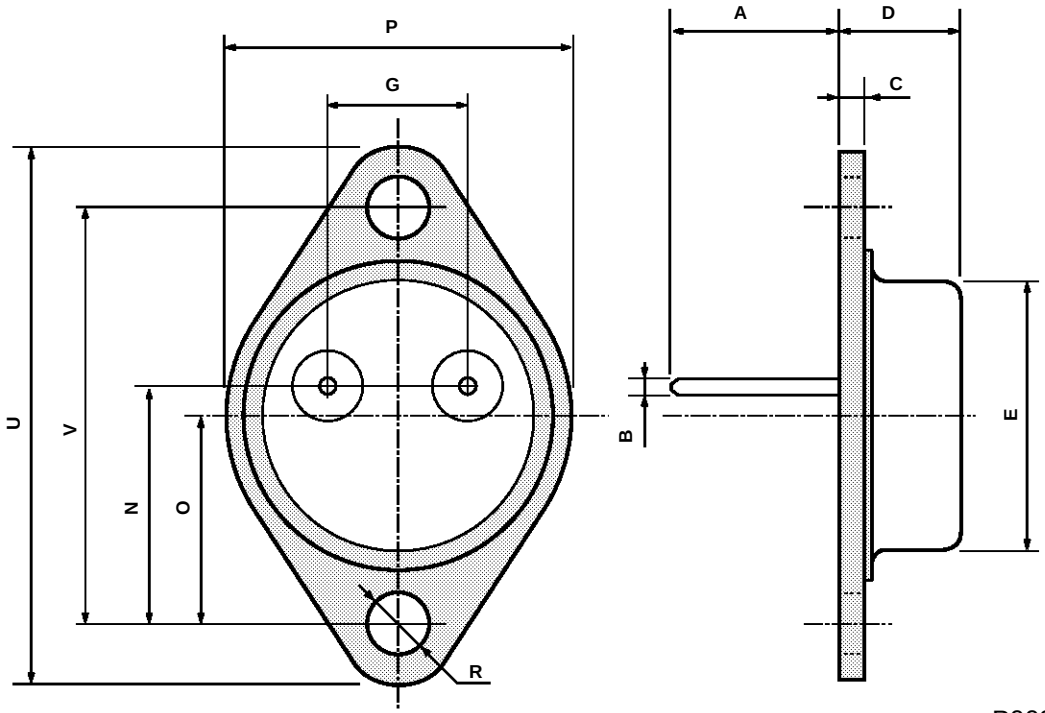
Figure 33 : Protection against Input Short-circuit with High Capacitance Loads.



Applications 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 decreases showly. 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 tran-sistor

TO-3 MECHANICAL DATA

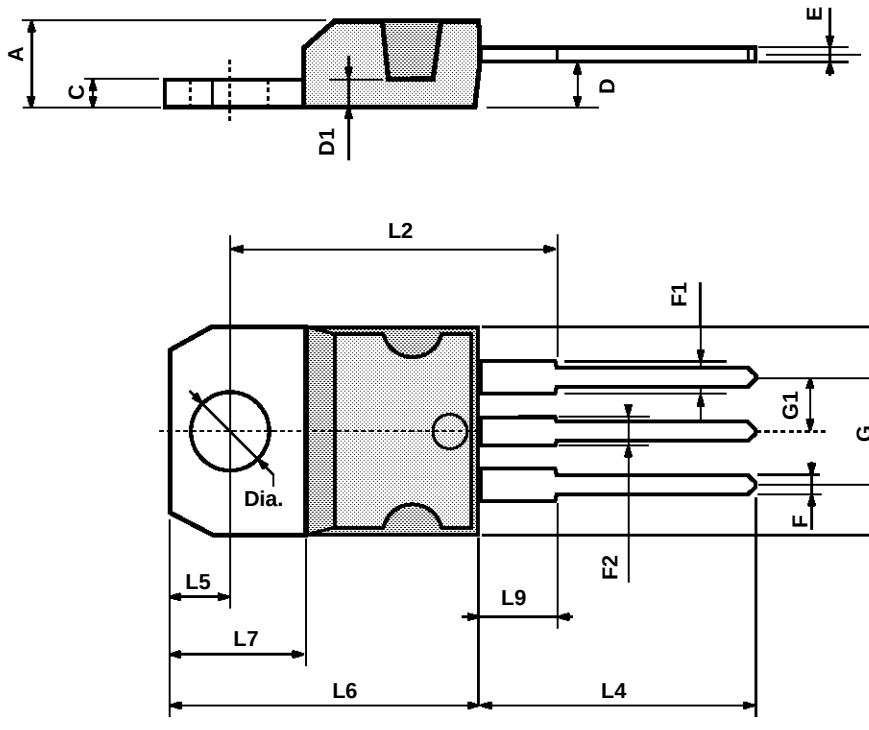
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.00		13.10	0.433		0.516
B	0.97		1.15	0.038		0.045
C	1.50		1.65	0.059		0.065
D	8.32		8.92	0.327		0.351
E	19.00		20.00	0.748		0.787
G	10.70		11.10	0.421		0.437
N	16.50		17.20	0.649		0.677
P	25.00		26.00	0.984		1.023
R	4.00		4.09	0.157		0.161
U	38.50		39.30	1.515		1.547
V	30.00		30.30	1.187		1.193



P003F

TO-220 MECHANICAL DATA

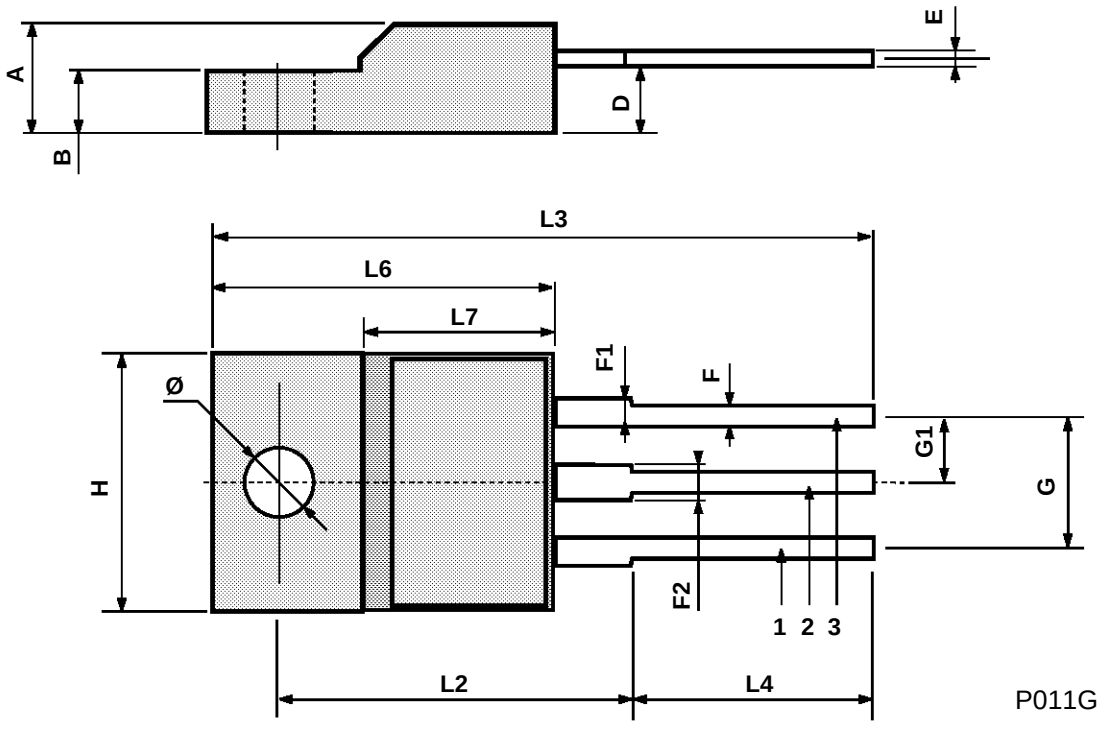
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
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	15.2		15.9	0.598		0.625
L7	6.2		6.6	0.244		0.260
L9	3.5		4.2	0.137		0.165
DIA.	3.75		3.85	0.147		0.151



P011C

ISOWATT220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.4		0.7	0.015		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		3.66
Ø	3		3.2	0.118		0.126



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsability for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may results from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied.
SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectonics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

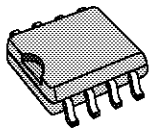
SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A

SGS-THOMSON MICROELECTRONICS

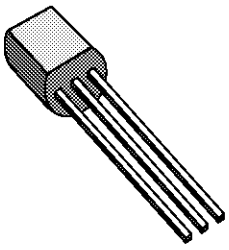
L78L00 SERIES

POSITIVE VOLTAGE REGULATORS

- OUTPUT CURRENT UP TO 100 mA
- OUTPUT VOLTAGES OF 5; 6; 8; 9; 12; 15; 18; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- NO EXTERNAL COMPONENTS ARE REQUIRED
- AVAILABLE IN EITHER ± 5% (AC) OR ± 10% (C) SELECTION



SO-8



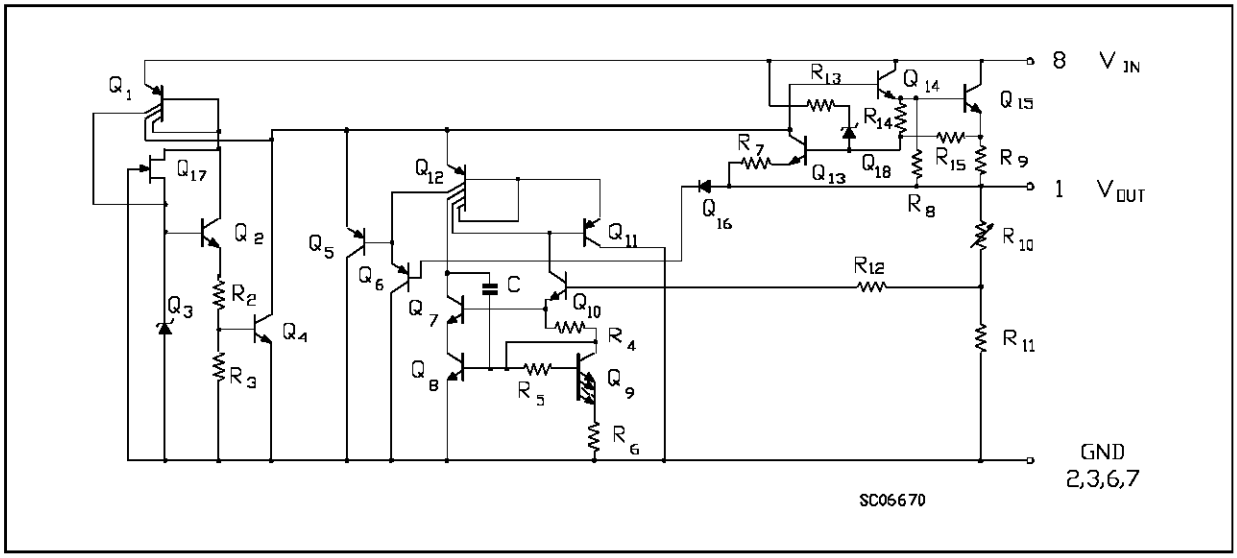
TO-92

DESCRIPTION

The L78L00 series of three-terminal positive regulators employ internal current limiting and thermal shutdown, making them essentially indestructible. If adequate heatsink is provided, they can deliver up to 100 mA output current. They are intended as fixed voltage regulators in a wide range of applications including local or on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power pass elements to make high-current voltage regulators.

The L78L00 series used as Zener diode/resistor combination replacement, offers an effective output impedance improvement of typically two orders of magnetude, along with lower quiescent current and lower noise.

SCHEMATIC DIAGRAM

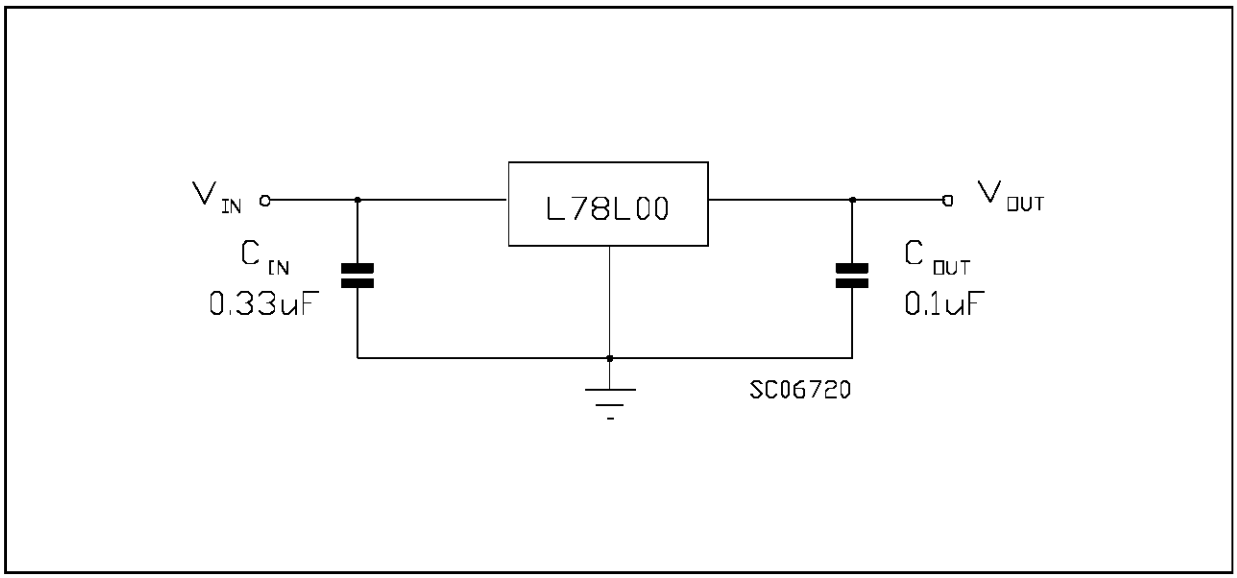


ABSOLUTE MAXIMUM RATING

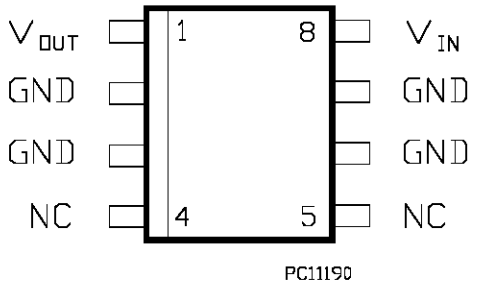
Symbol	Parameter		Value	Unit
V_i	DC Input Voltage	V_o = 5 V to 9 V	30	V
		V_o = 12 V to 15 V	35	V
		V_o = 18 V to 24 V	40	V
I_o	Output Current		100	mA
P_{tot}	Power Dissipation		Internally limited (*)	
T_{stg}	Storage Temperature Range		- 40 to 150	^oC
T_{op}	Operating Junction Temperature Range	For L78L00C, L78L00AC	0 to 125	^oC
		For L78L00AB	- 40 to 125	^oC

(*) Our SO-8 package used for Voltage Regulators is modified internally to have pins 2, 3, 6 and 7 electrically commoned to the die attach flag. This particular frame decreases the total thermal resistance of the package and increases its ability to dissipate power when an appropriate area of copper on the printed circuit board is available for heatsinking. The external dimensions are the same as for the standard SO-8

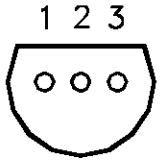
TEST CIRCUITS



CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



SO-8



pin 1 = OUT
pin 2 = GND
pin 3 = IN

TO-92

ORDERING NUMBERS

Type	SO-8	TO-92	Output Voltage
L78L05C	L78L05CD	L78L05CZ	5 V
L78L05AC	L78L05ACD	L78L05ACZ	5 V
L78L05AB	L78L05ABD	L78L05ABZ	5 V
L78L06C	L78L06CD	L78L06CZ	6 V
L78L06AC	L78L06ACD	L78L06ACZ	6 V
L78L06AB	L78L06ABD	L78L06ABZ	6 V
L78L08C	L78L08CD	L78L08CZ	8 V
L78L08AC	L78L08ACD	L78L08ACZ	8 V
L78L08AB	L78L08ABD	L78L08ABZ	8 V
L78L09C	L78L09CD	L78L09CZ	9 V
L78L09AC	L78L09ACD	L78L09ACZ	9 V
L78L09AB	L78L09ABD	L78L09ABZ	9 V
L78L12C	L78L12CD	L78L12CZ	12 V
L78L12AC	L78L12ACD	L78L12ACZ	12 V
L78L12AB	L78L12ABD	L78L12ABZ	12 V
L78L15C	L78L15CD	L78L15CZ	15 V
L78L15AC	L78L15ACD	L78L15ACZ	15 V
L78L15AB	L78L15ABD	L78L15ABZ	15 V
L78L18C	L78L18CD	L78L18CZ	18 V
L78L18AC	L78L18ACD	L78L18ACZ	18 V
L78L18AB	L78L18ABD	L78L18ABZ	18 V
L78L24C	L78L24CD	L78L24CZ	24 V
L78L24AC	L78L24ACD	L78L24ACZ	24 V
L78L24AB	L78L24ABD	L78L24ABZ	24 V

ELECTRICAL CHARACTERISTICS FOR L78L05 (refer to the test circuits, T_j = 0 to 125 °C, V_i = 10V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	4.6	5	5.4	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 7 to 20 V I_o = 1 to 70 mA V_i = 10 V	4.5 4.5		5.5 5.5	V V
ΔV_o	Line Regulation	V_i = 7 to 20 V T_j = 25 °C V_i = 8 to 20 V T_j = 25 °C			200 150	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			60 30	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = 8 to 20 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		40		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 8 to 18 V	40	49		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L06 (refer to the test circuits, T_j = 0 to 125 °C, V_i = 12V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	5.52	6	6.48	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 8.5 to 20 V I_o = 1 to 70 mA V_i = 12 V	5.4 5.4		6.6 6.6	V V
ΔV_o	Line Regulation	V_i = 8.5 to 20 V T_j = 25 °C V_i = 9 to 20 V T_j = 25 °C			200 150	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			60 30	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = 8 to 20 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		50		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 9 to 20 V	38	46		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L08 (refer to the test circuits, T_j = 0 to 125 °C, V_i = 14V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	7.36	8	8.64	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 10.5 to 23 V I_o = 1 to 70 mA V_i = 14 V	7.2 7.2		8.8 8.8	V V
ΔV_o	Line Regulation	V_i = 10.5 to 23 V T_j = 25 °C V_i = 11 to 23 V T_j = 25 °C			200 150	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			80 40	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = 11 to 23 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		60		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 12 to 23 V	36	45		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L09 (refer to the test circuits, T_j = 0 to 125 °C, V_i = 15V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	8.28	9	9.72	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 11.5 to 23 V I_o = 1 to 70 mA V_i = 15 V	8.1 8.1		9.9 9.9	V V
ΔV_o	Line Regulation	V_i = 11.5 to 23 V T_j = 25 °C V_i = 12 to 23 V T_j = 25 °C			250 200	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			80 40	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = 12 to 23 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		70		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 12 to 23 V	36	44		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L12 (refer to the test circuits, T_j = 0 to 125 °C, V_i = 19V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	11.1	12	12.9	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 14.5 to 27 V I_o = 1 to 70 mA V_i = 19 V	10.8 10.8		13.2 13.2	V V
ΔV_o	Line Regulation	V_i = 14.5 to 27 V T_j = 25 °C V_i = 16 to 27 V T_j = 25 °C			250 200	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			100 50	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = 16 to 27 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		80		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 15 to 25 V	36	42		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L15 (refer to the test circuits, T_j = 0 to 125 °C, V_i = 23V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	13.8	15	16.2	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 17.5 to 30 V I_o = 1 to 70 mA V_i = 23 V	13.5 13.5		16.5 16.5	V V
ΔV_o	Line Regulation	V_i = 17.5 to 30 V T_j = 25 °C V_i = 20 to 30 V T_j = 25 °C			300 250	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			150 75	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = 20 to 30 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		90		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 18.5 to 28.5 V	33	39		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L18 (refer to the test circuits, T_j = 0 to 125 °C, V_i = 27V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	16.6	18	19.4	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 22 to 33 V I_o = 1 to 70 mA V_i = 27 V	16.2 16.2		19.8 19.8	V V
ΔV_o	Line Regulation	V_i = 22 to 33 V T_j = 25 °C V_i = 22 to 33 V T_j = 25 °C			320 270	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			170 85	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = 23 to 33 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		120		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 23 to 33 V	32	38		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L24 (refer to the test circuits, T_j = 0 to 125 °C, V_i = 33V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	22.1	24	25.9	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 27 to 38 V I_o = 1 to 70 mA V_i = 33 V	21.6 21.6		26.4 26.4	V V
ΔV_o	Line Regulation	V_i = 27 to 38 V T_j = 25 °C V_i = 28 to 38 V T_j = 25 °C			350 300	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			200 100	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = 28 to 38 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		200		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 29 to 35 V	30	37		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L05AB AND L78L05AC

(refer to the test circuits, V_i = 10V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L05AC, T_j = -40 to 125 °C for L78L05AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	4.8	5	5.2	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 7 to 20 V I_o = 1 to 70 mA V_i = 10 V	4.75 4.75		5.25 5.25	V V
ΔV_o	Line Regulation	V_i = 7 to 20 V T_j = 25 °C V_i = 8 to 20 V T_j = 25 °C			150 100	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			60 30	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = 8 to 20 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		40		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 8 to 18 V	41	49		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L06AB AND L78L06AC

(refer to the test circuits, V_i = 12V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L06AC, T_j = -40 to 125 °C for L78L06AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	5.76	6	6.24	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 8.5 to 20 V I_o = 1 to 70 mA V_i = 12 V	5.7 5.7		6.3 6.3	V V
ΔV_o	Line Regulation	V_i = 8.5 to 20 V T_j = 25 °C V_i = 9 to 20 V T_j = 25 °C			150 100	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			60 30	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = 9 to 20 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		50		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 9 to 20 V	39	46		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L08AB AND L78L08AC

(refer to the test circuits, V_i = 14V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L08AC, T_j = -40 to 125 °C for L78L08AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	7.68	8	8.32	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 10.5 to 23 V I_o = 1 to 70 mA V_i = 14 V	7.6 7.6		8.4 8.4	V V
ΔV_o	Line Regulation	V_i = 10.5 to 23 V T_j = 25 °C V_i = 11 to 23 V T_j = 25 °C			175 125	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			80 40	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = 11 to 23 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		60		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 12 to 23 V	37	45		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L09AB AND L78L09AC

(refer to the test circuits, V_i = 15V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L09AC, T_j = -40 to 125 °C for L78L09AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	8.64	9	9.36	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 11.5 to 23 V I_o = 1 to 70 mA V_i = 15 V	8.55 8.55		9.45 9.45	V V
ΔV_o	Line Regulation	V_i = 11.5 to 23 V T_j = 25 °C V_i = 12 to 23 V T_j = 25 °C			225 150	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			80 40	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = 12 to 23 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		70		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 12 to 23 V	37	44		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L12AB AND L78L12AC

(refer to the test circuits, V_i = 19V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L12AC, T_j = -40 to 125 °C for L78L12AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	11.5	12	12.5	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 14.5 to 27 V I_o = 1 to 70 mA V_i = 19 V	11.4 11.4		12.6 12.6	V V
ΔV_o	Line Regulation	V_i = 14.5 to 27 V T_j = 25 °C V_i = 16 to 27 V T_j = 25 °C			250 200	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			100 50	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = 16 to 27 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		80		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 15 to 25 V	37	42		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L15AB AND L78L15AC

(refer to the test circuits, V_i = 23V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L15AC, T_j = -40 to 125 °C for L78L15AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	14.4	15	15.6	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 17.5 to 30 V I_o = 1 to 70 mA V_i = 23 V	14.25 14.25		15.75 15.75	V V
ΔV_o	Line Regulation	V_i = 17.5 to 30 V T_j = 25 °C V_i = 20 to 30 V T_j = 25 °C			300 250	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			150 75	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = 20 to 30 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		90		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 18.5 to 28.5 V	34	39		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L18AB AND L78L18AC

(refer to the test circuits, V_i = 27V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L18AC, T_j = -40 to 125 °C for L78L18AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	17.3	18	18.7	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 22 to 33 V I_o = 1 to 70 mA V_i = 27 V	17.1 17.1		18.9 18.9	V V
ΔV_o	Line Regulation	V_i = 22 to 33 V T_j = 25 °C V_i = 22 to 33 V T_j = 25 °C			320 270	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			170 85	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = 23 to 33 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		120		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 23 to 33 V	33	38		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L78L24AB AND L78L24AC

(refer to the test circuits, V_i = 33V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L24AC, T_j = -40 to 125 °C for L78L24AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	23	24	25	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = 27 to 38 V I_o = 1 to 70 mA V_i = 33 V	22.8 22.8		25.2 25.2	V V
ΔV_o	Line Regulation	V_i = 27 to 38 V T_j = 25 °C V_i = 28 to 38 V T_j = 25 °C			350 300	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			200 100	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = 28 to 38 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		200		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = 29 to 35 V	31	37		dB
V_d	Dropout Voltage			1.7		V

Figure 1: L78L05/12 Output Voltage vs Ambient Temperature

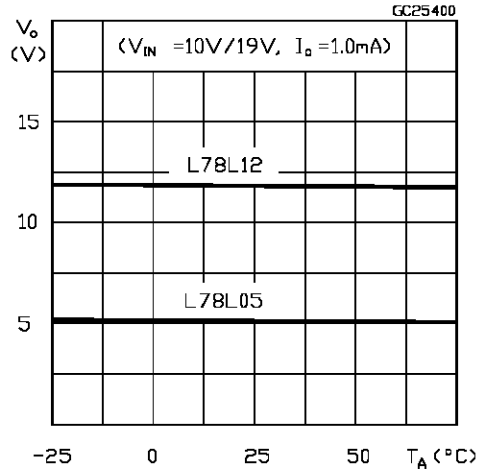


Figure 2 : L78L05/12/24 Load Characteristics.

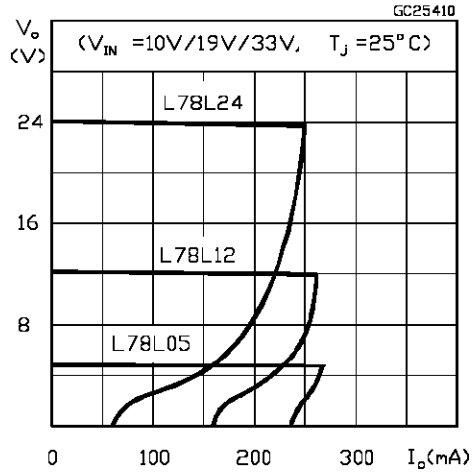


Figure 3 : L78L05/12/24 Thermal Shutdown.

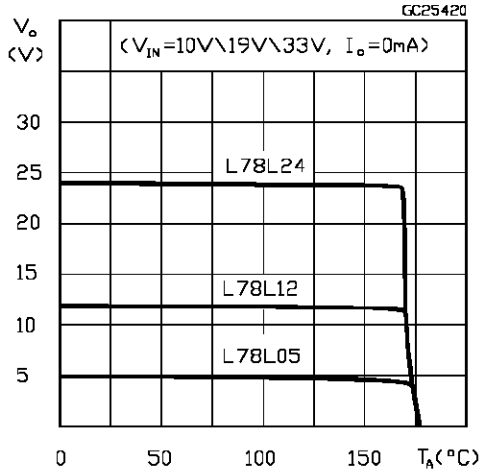


Figure 4 : L78L05/12 Quiescent Current vs Output Current

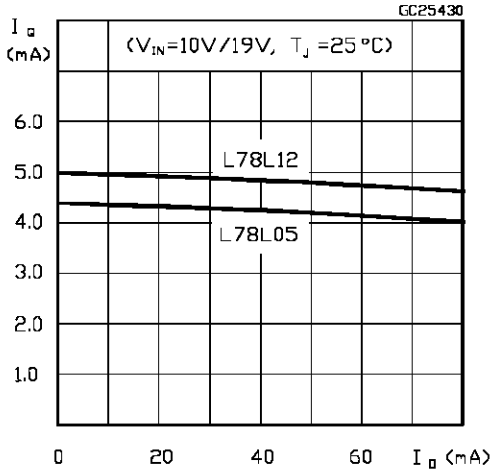


Figure 5 : L78L05 Quiescent Current vs Input Voltage.

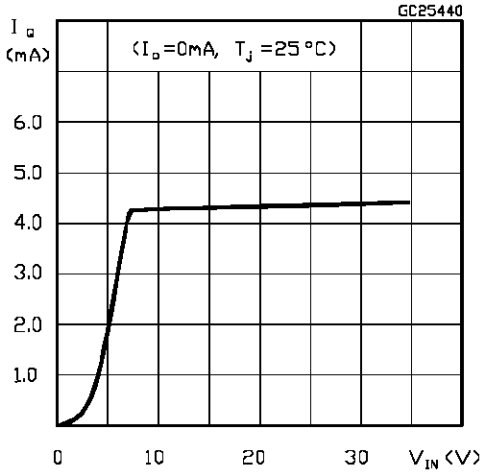


Figure 6 : L78L05/12/24 Output Characteristics.

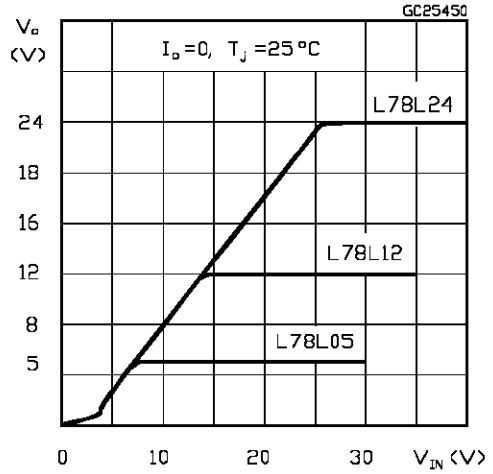


Figure 7 : L78L05/12/24 Ripple Rejection.

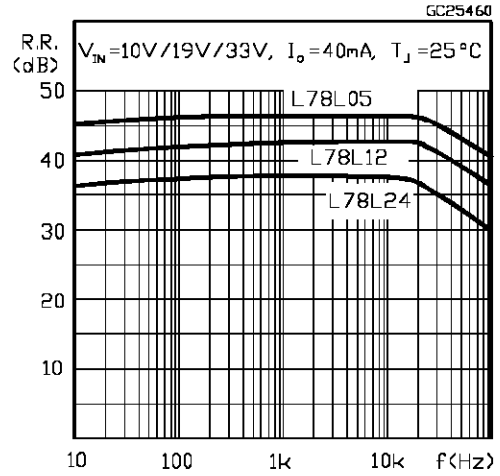


Figure 8 : L78L05 Dropout Characteristics.

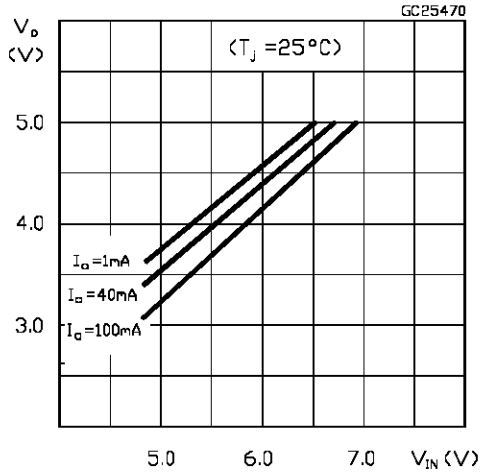
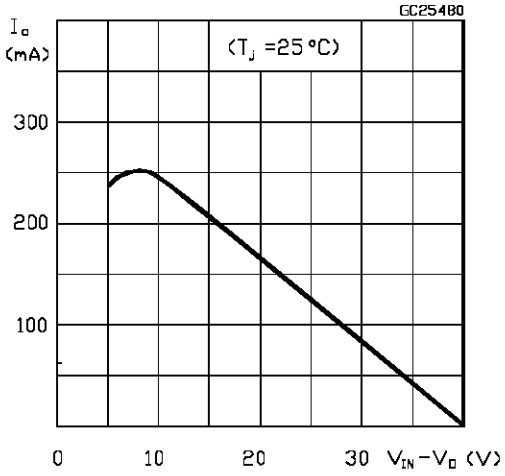


Figure 9 : L78L00 Series Short Circuit Output Current.



TYPICAL APPLICATIONS:

Figure 10: High Output Current Short Circuit Protected

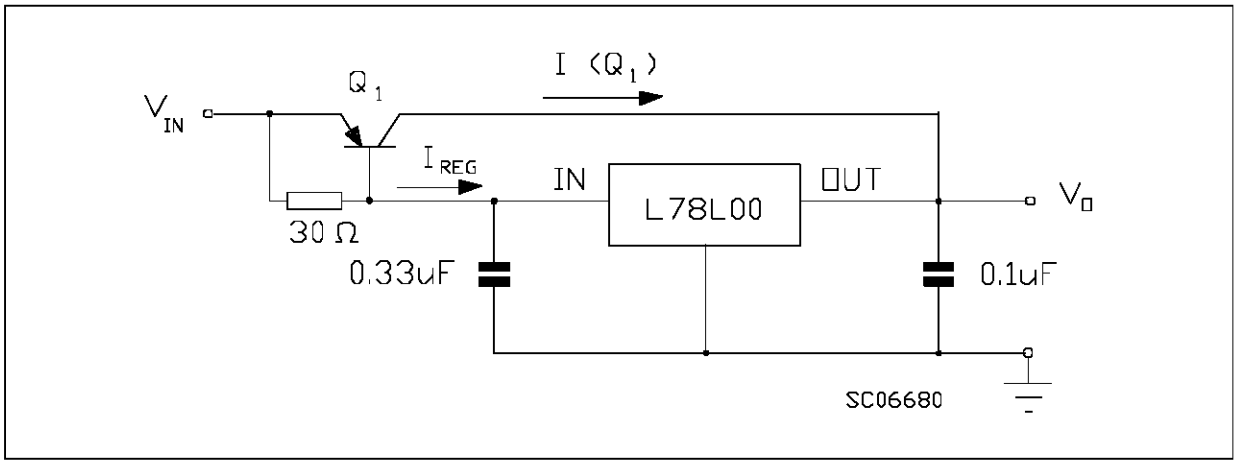


Figure 11 : Output Boost Circuit.

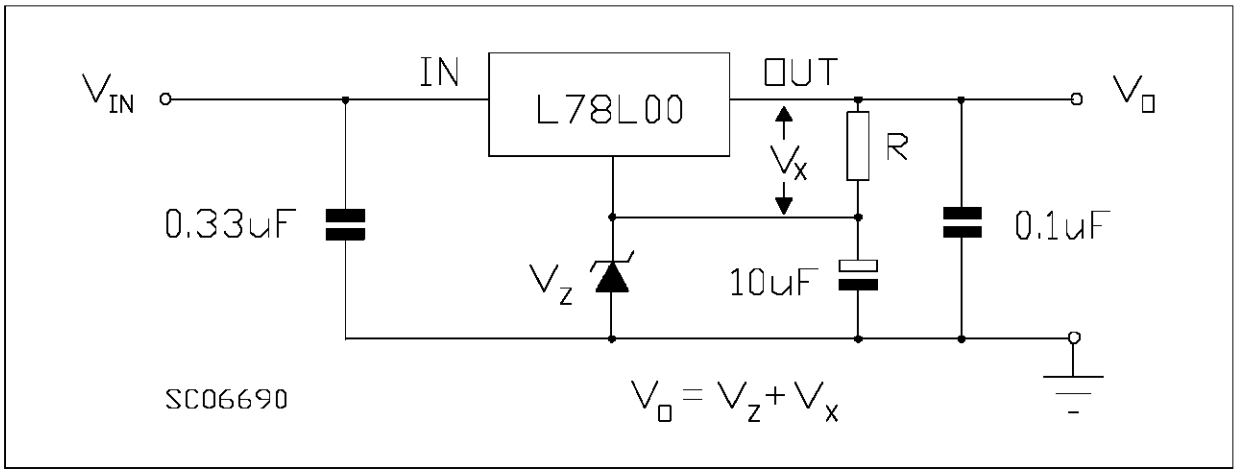


Figure 12 : Current Regulator.

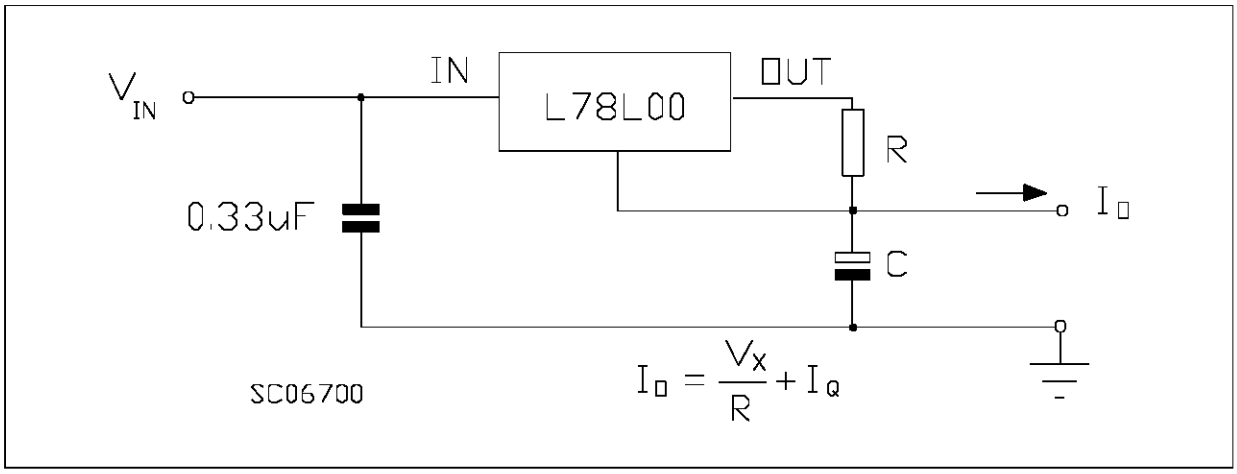
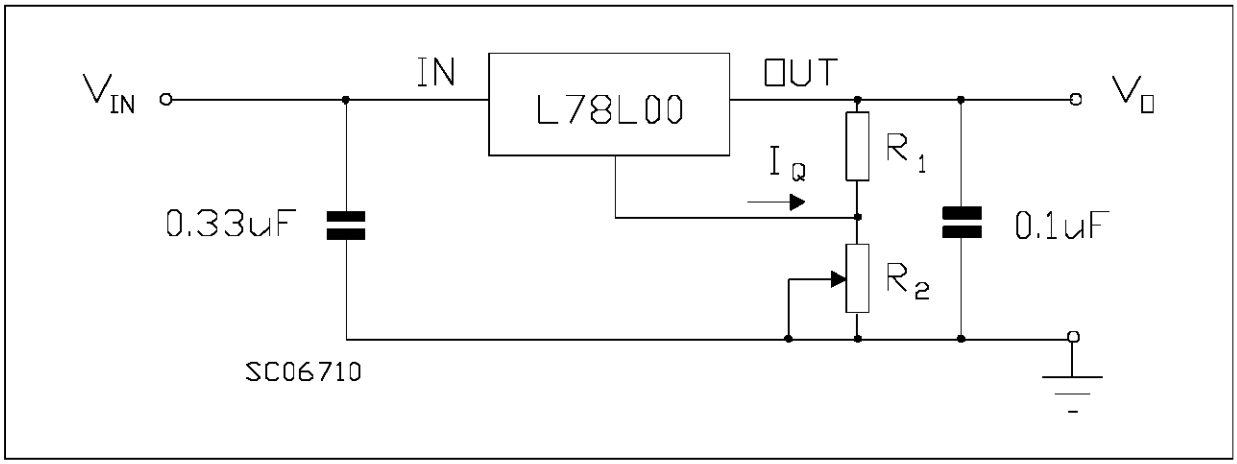
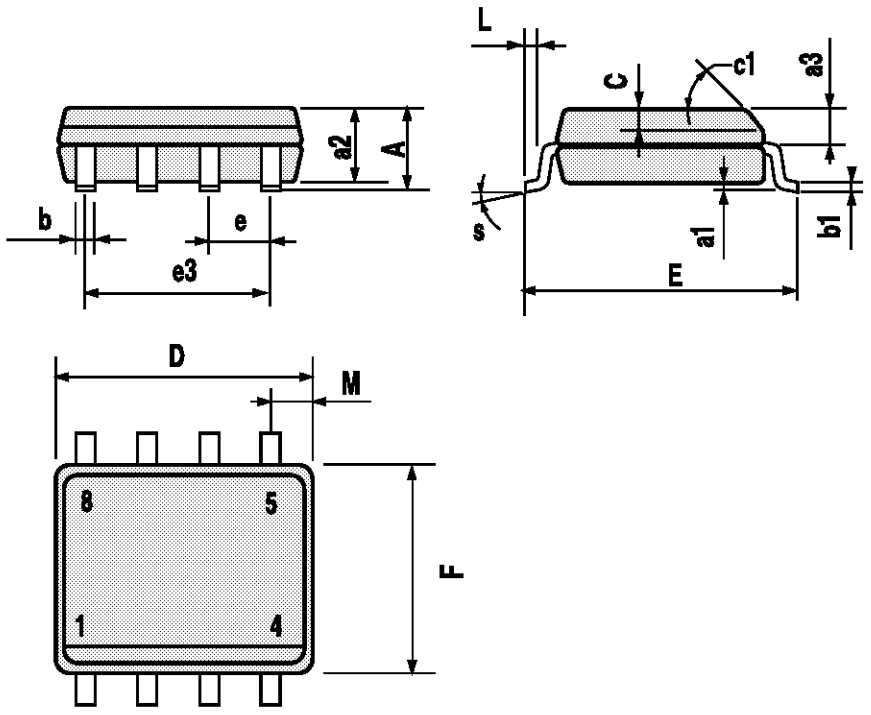


Figure 13: Adjustable Output Regulator



SO8 MECHANICAL DATA

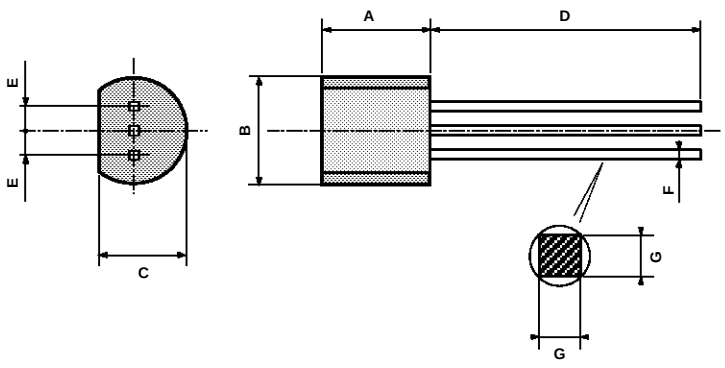
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45° (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8° (max.)					



P013M

TO-92 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.58		5.33	0.180		0.210
B	4.45		5.2	0.175		0.204
C	3.2		4.2	0.126		0.165
D	12.7			0.500		
E		1.27			0.050	
F	0.4		0.51	0.016		0.020
G	0.35			0.14		



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsability for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may results from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied.
SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectonics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

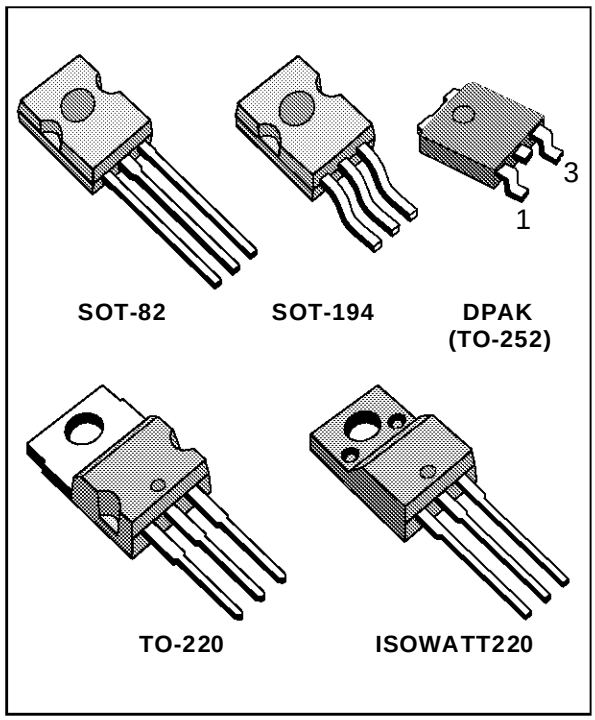
SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A

SGS-THOMSON MICROELECTRONICS

L78M00 SERIES

POSITIVE VOLTAGE REGULATORS

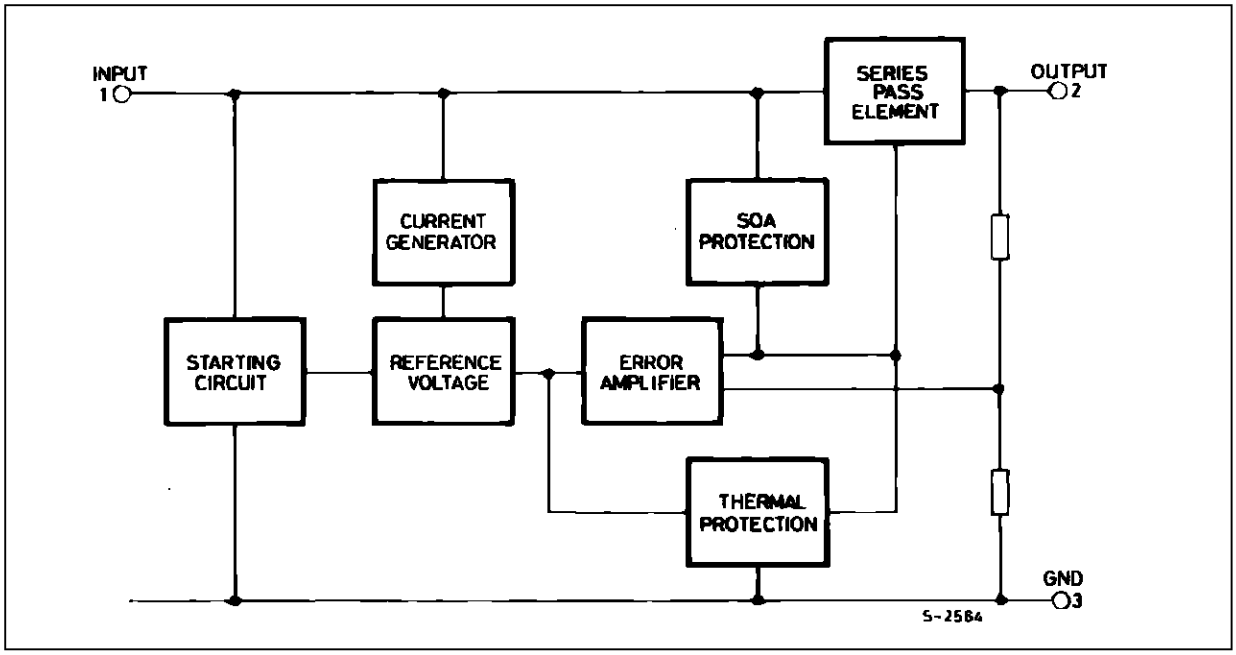
- OUTPUT CURRENT TO 0.5A
- OUTPUT VOLTAGES OF 5; 6; 8; 9; 10; 12; 15; 18; 20; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION



DESCRIPTION

The L78M00 series of three-terminal positive regulators is available in TO-220, ISOWATT220, SOT-82, SOT-194 and DPAK 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 0.5A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

BLOCK DIAGRAM



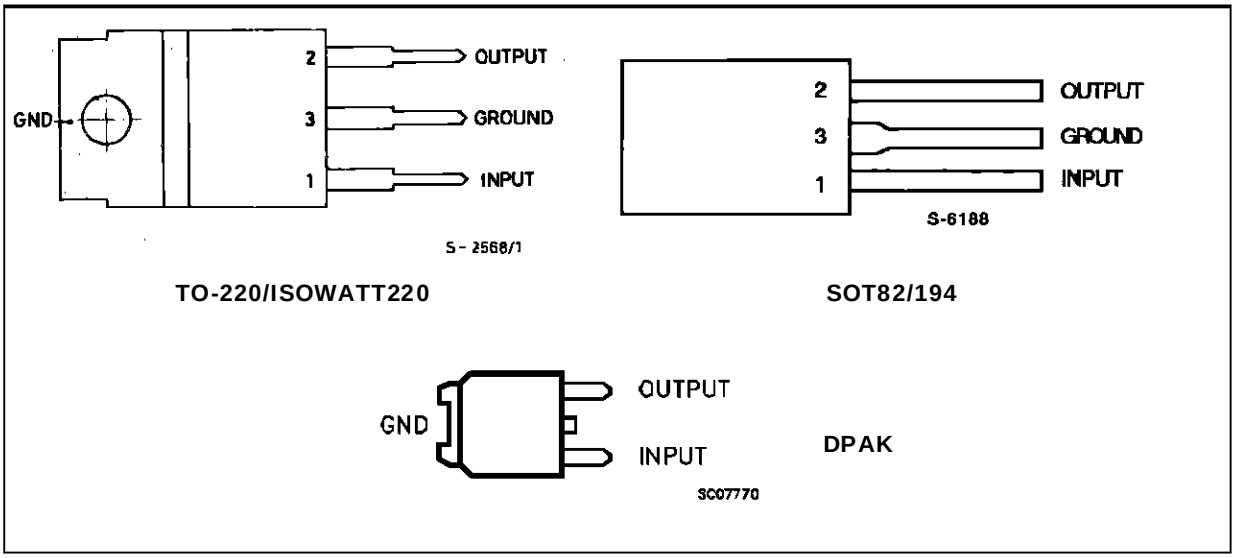
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_i	DC Input Voltage (for V_o = 5 to 18V) (for V_o = 20, 24V)	35 40	V V
I_o	Output Current	Internally limited	
P_{tot}	Power Dissipation	Internally limited	
T_{stg}	Storage Temperature	– 65 to + 150	°C
T_{op}	Operating Junction Temperature	0 to + 150	°C

THERMAL DATA

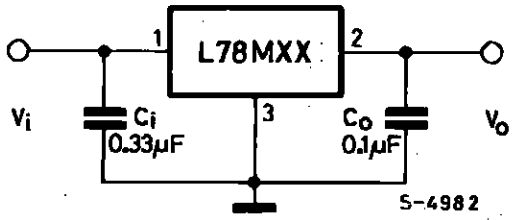
Symbol	Parameter		SOT-82 SOT-194 DPAK	TO-220	ISOWATT220	Unit
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	8	3	4	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	100	50	60	°C/W

CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)

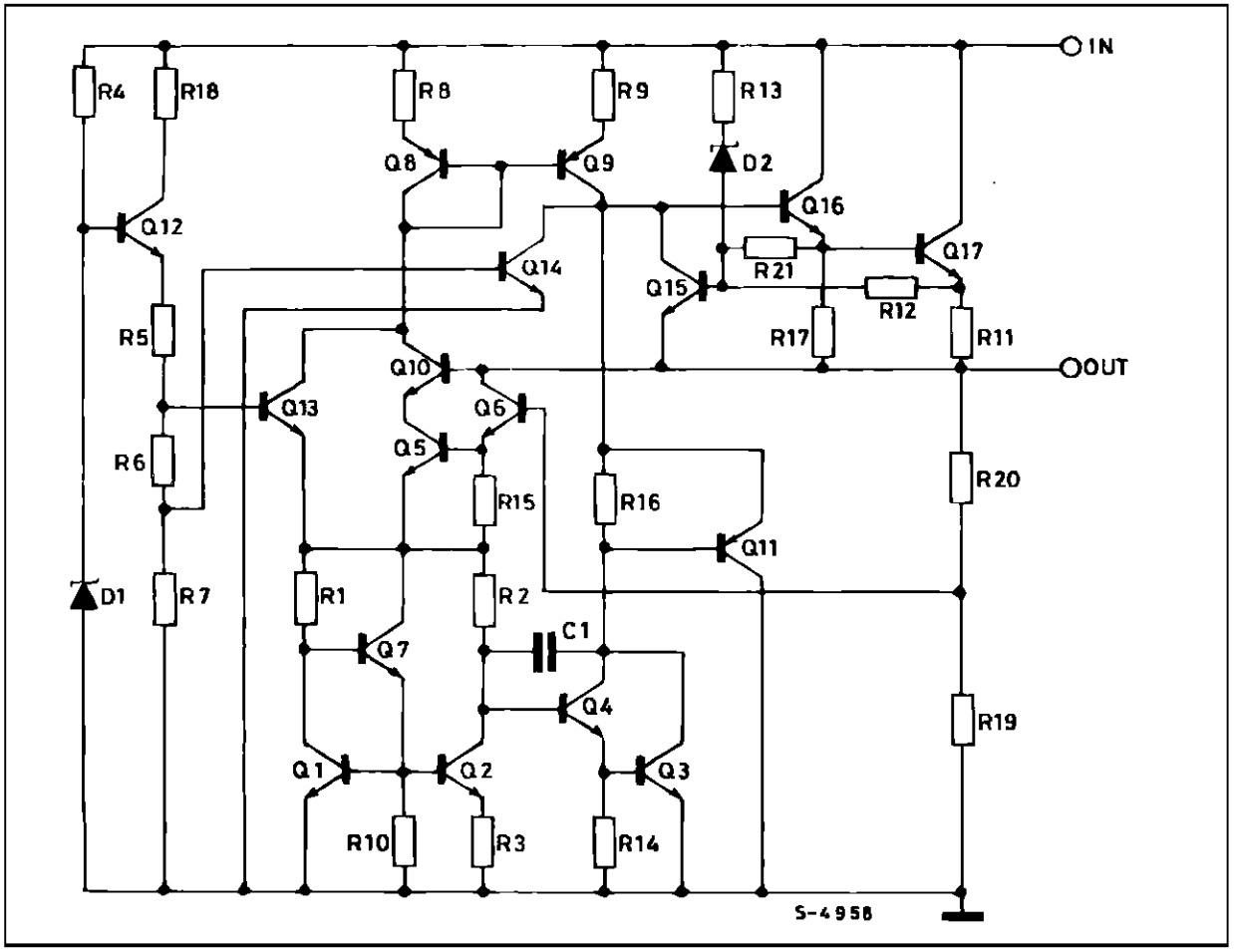


Order Code					Output Voltage
TO-220	ISOWATT220	SOT-82	SOT-194	DPAK	
L78M05CV	L78M05CP	L78M05CX	L78M05CS	L78M05CDT	5V
L78M06CV	L78M06CP	L78M06CX	L78M06CS	L78M06CDT	6V
L78M08CV	L78M08CP	L78M08CX	L78M08CS	L78M08CDT	8V
L78M09CV	L78M09CP	L78M09CX	L78M09CS	L78M09CDT	9V
L78M10CV	L78M10CP	L78M10CX	L78M10CS	L78M10CDT	10V
L78M12CV	L78M12CP	L78M12CX	L78M12CS	L78M12CDT	12V
L78M15CV	L78M15CP	L78M15CX	L78M15CS	L78M15CDT	15V
L78M18CV	L78M18CP	L78M18CX	L78M18CS	L78M18CDT	18V
L78M20CV	L78M20CP	L78M20CX	L78M20CS	L78M20CDT	20V
L78M24CV	L78M24CP	L78M24CX	L78M24CS	L78M24CDT	24V

APPLICATION CIRCUIT



SCHEMATIC DIAGRAM



TEST CIRCUITS

Figure 1 : DC Parameters.

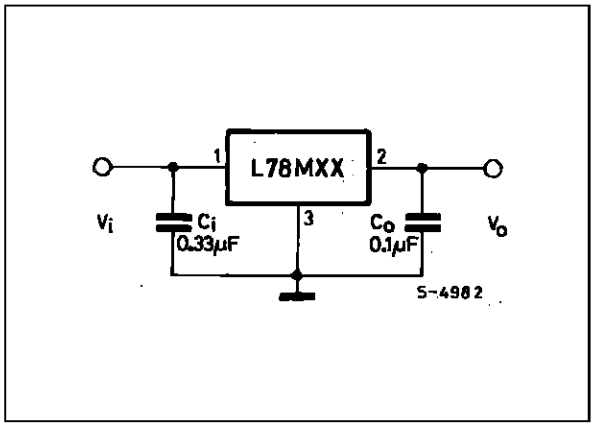


Figure 2 : Load Regulation.

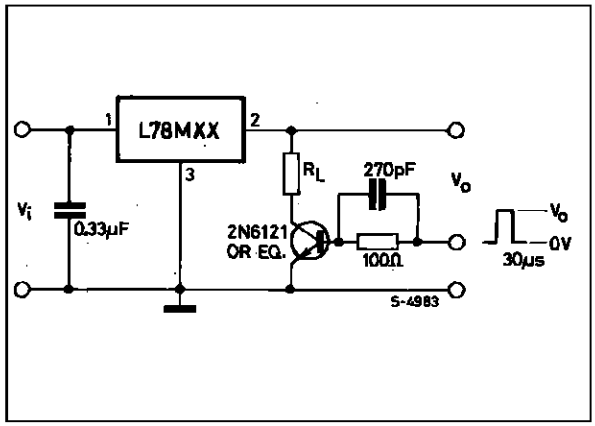
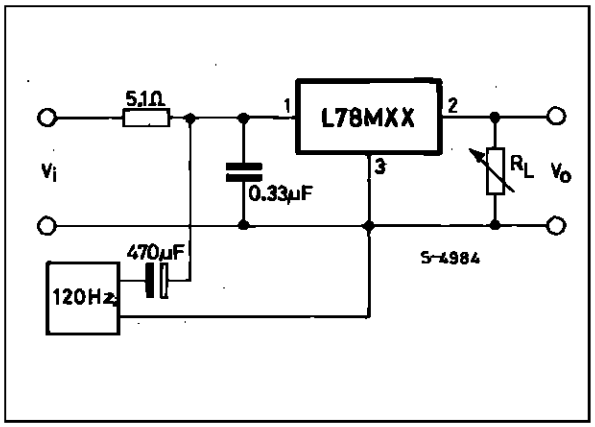


Figure 3 : Ripple Rejection.



ELECTRICAL CHARACTERISTICS FOR L78M05C (refer to the test circuits, T_j = 25 °C, V_i = 10V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF 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 = 5 mA to 350 mA V_i = 7 to 20 V	4.75	5	5.25	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 7 to 25 V I_o = 200 mA V_i = 8 to 25 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			100 50	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 8 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-0.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		40		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 8 to 18 V	62			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		300		mA
I_{scp}	Short Circuit Peack Current			700		mA

ELECTRICAL CHARACTERISTICS FOR L78M06C (refer to the test circuits, T_j = 25 °C, V_i = 11V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		5.75	6	6.25	V
V_o	Output Voltage	I_o = 5 mA to 350 mA V_i = 8 to 21 V	5.7	6	6.3	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 8 to 25 V I_o = 200 mA V_i = 9 to 25 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			120 60	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 9 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-0.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		45		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 9 to 19 V	59			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		270		mA
I_{scp}	Short Circuit Peack Current			700		mA

ELECTRICAL CHARACTERISTICS FOR L78M08C (refer to the test circuits, T_j = 25 °C, V_i = 14V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		7.7	8	8.3	V
V_o	Output Voltage	I_o = 5 mA to 350 mA V_i = 10.5 to 23 V	7.6	8	8.4	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 10.5 to 25 V I_o = 200 mA V_i = 11 to 25 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			160 80	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 10.5 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-0.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		52		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 11.5 to 21.5 V	56			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		250		mA
I_{scp}	Short Circuit Peack Current			700		mA

ELECTRICAL CHARACTERISTICS FOR L78M09C (refer to the test circuits, T_j = 25 °C, V_i = 15V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF 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 = 5 mA to 350 mA V_i = 11.5 to 24 V	8.55	9	9.45	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 11.5 to 25 V I_o = 200 mA V_i = 12 to 25 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			180 90	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 11.5 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-0.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		58		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 12.5 to 23 V	56			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		250		mA
I_{scp}	Short Circuit Peack Current			700		mA

ELECTRICAL CHARACTERISTICS FOR L78M10C (refer to the test circuits, T_j = 25 °C, V_i = 16V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		9.6	10	10.4	V
V_o	Output Voltage	I_o = 5 mA to 350 mA V_i = 12.5 to 25 V	9.5	10	10.5	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 12.5 to 30 V I_o = 200 mA V_i = 13 to 30 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			200 100	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 12.5 to 30 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-0.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		64		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 13.5 to 24 V	56			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		245		mA
I_{scp}	Short Circuit Peack Current			700		mA

ELECTRICAL CHARACTERISTICS FOR L78M12C (refer to the test circuits, T_j = 25 °C, V_i = 19V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF 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 = 5 mA to 350 mA V_i = 14.5 to 27 V	11.4	12	12.6	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 14.5 to 30 V I_o = 200 mA V_i = 16 to 30 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			240 120	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 14.5 to 30 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		75		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 15 to 25 V	55			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		240		mA
I_{scp}	Short Circuit Peack Current			700		mA

ELECTRICAL CHARACTERISTICS FOR L78M15C (refer to the test circuits, T_j = 25 °C, V_i = 23V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF 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 = 5 mA to 350 mA V_i = 17.5 to 30 V	14.25	15	15.75	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 17.5 to 30 V I_o = 200 mA V_i = 20 to 30 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			300 150	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 17.5 to 30 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		90		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 18.5 to 28.5 V	54			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		240		mA
I_{scp}	Short Circuit Peack Current			700		mA

ELECTRICAL CHARACTERISTICS FOR L78M18C (refer to the test circuits, T_j = 25 °C, V_i = 26V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		17.3	18	18.7	V
V_o	Output Voltage	I_o = 5 mA to 350 mA V_i = 20.5 to 33 V	17.1	18	18.9	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 21 to 33 V I_o = 200 mA V_i = 24 to 33 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			360 180	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 21 to 33 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-1.1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		100		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 22 to 32 V	53			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		240		mA
I_{scp}	Short Circuit Peack Current			700		mA

ELECTRICAL CHARACTERISTICS FOR L78M20C (refer to the test circuits, T_j = 25 °C, V_i = 29V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage		19.2	20	20.8	V
V_o	Output Voltage	I_o = 5 mA to 350 mA V_i = 23 to 35 V	19	20	21	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 23 to 35 V I_o = 200 mA V_i = 24 to 35 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			400 200	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 23 to 35 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-1.1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		110		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 24 to 34 V	53			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		240		mA
I_{scp}	Short Circuit Peack Current			700		mA

ELECTRICAL CHARACTERISTICS FOR L78M24C (refer to the test circuits, T_j = 25 °C, V_i = 33V, I_o = 350 mA, C_i = 0.33 µF, C_o = 0.1 µF 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 = 5 mA to 350 mA V_i = 27 to 38 V	22.8	24	25.2	V
ΔV_o	Line Regulation	I_o = 200 mA V_i = 27 to 38 V I_o = 200 mA V_i = 28 to 38 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 5 to 500 mA T_j = 25 °C I_o = 5 to 200 mA T_j = 25 °C			480 240	mV mV
I_d	Quiescent Current				6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 350 mA			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 200 mA V_i = 27 to 38 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 125 °C		-1.2		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		170		µV
SVR	Supply Voltage Rejection	I_o = 300 mA f = 120 Hz V_i = 28 to 38 V	50			dB
V_d	Dropout Voltage			2		V
I_{sc}	Short Circuit Current	V_i = 35 V		240		mA
I_{scp}	Short Circuit Peack Current			700		mA

Figure 4 : Dropout Voltage vs. Junction Temperature.

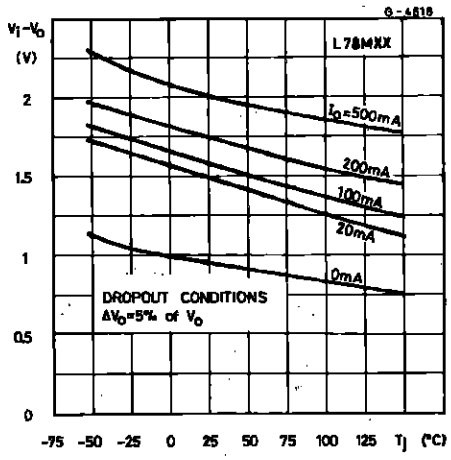


Figure 5 : Dropout Characteristics.

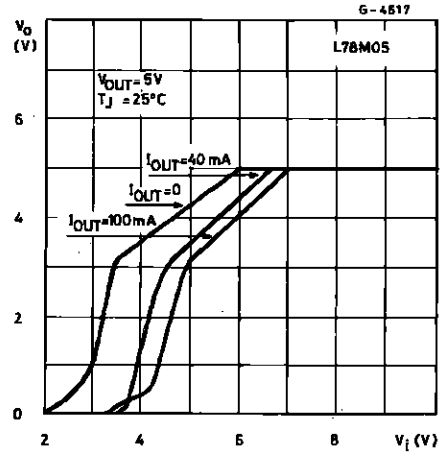


Figure 6 : Peak Output Current vs. Input-Output Differential Voltage.

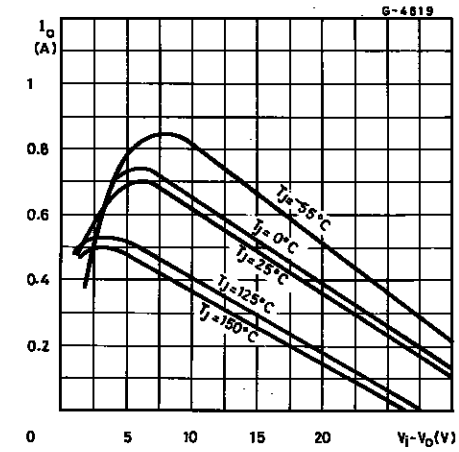


Figure 7 : Output Voltage vs. Junction Temperature.

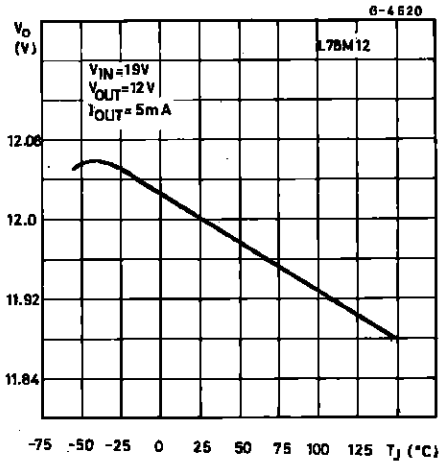


Figure 8 : Supply Voltage Rejection vs. Frequency.

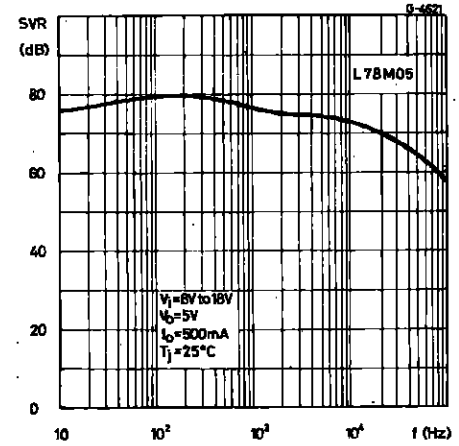


Figure 9 : Quiescent Current vs. Junction Temperature.

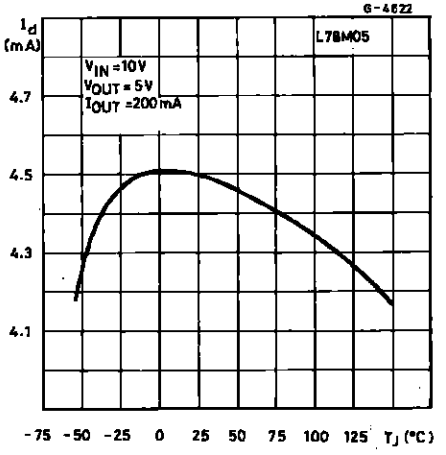


Figure 10 : Load Transient Response.

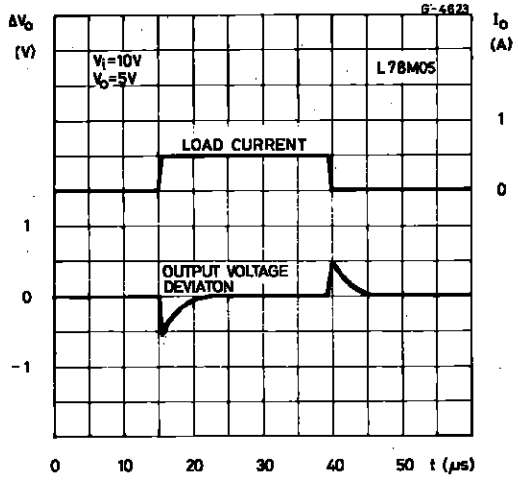


Figure 11 : Line Transient Response.

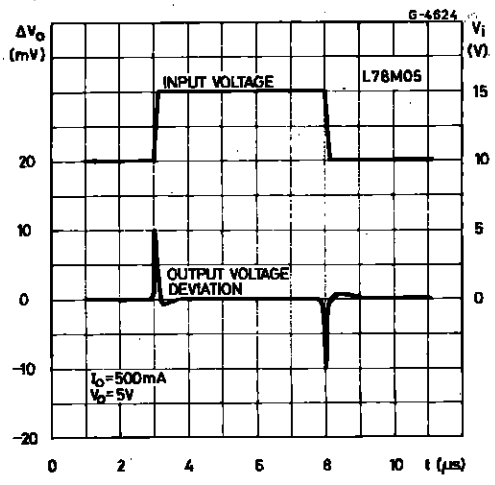


Figure 12 : Quiescent Current vs. Input Voltage.

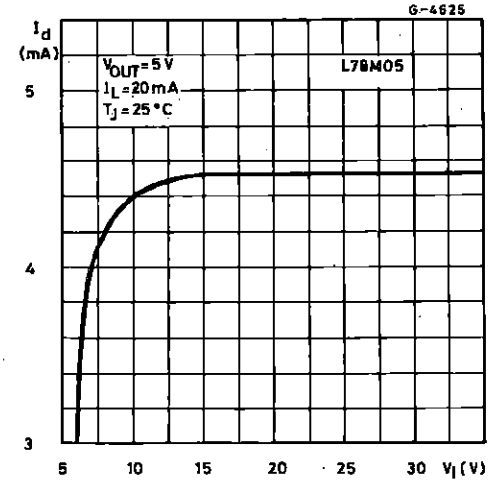
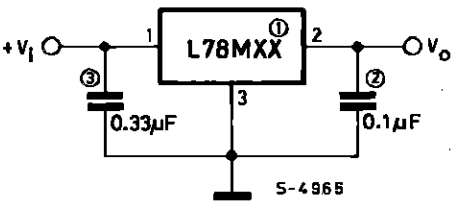
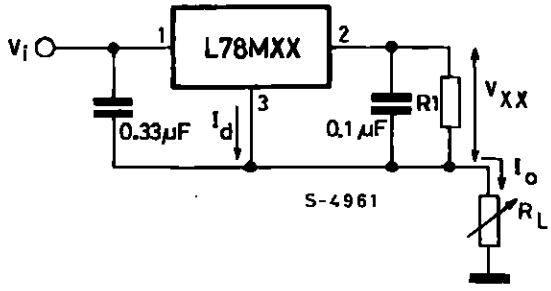


Figure 13 : Fixed Output Regulator.



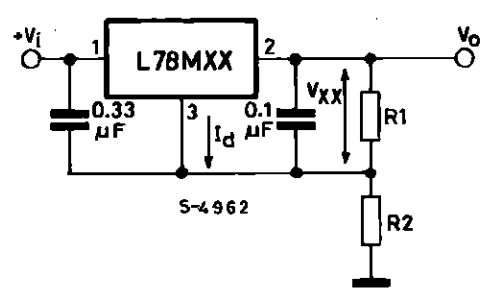
Notes : 1. To specify an output voltage, substitute voltage value for "XX".
2. Although no output capacitor is needed for stability, it does improve transient response.
3. Required if regulator is located an appreciable dis-tance from power supply filter.

Figure 14 : Constant Current Regulator.



$$I_O = \frac{V_{XX}}{R_1} + I_d$$

Figure 15 : Circuit for Increasing Output Voltage.



$$I_{R1} \geq 5\ I_d$$

$$V_O = V_{XX}\ (1 + \frac{R_2}{R_1}) + I_d\ R_2$$

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

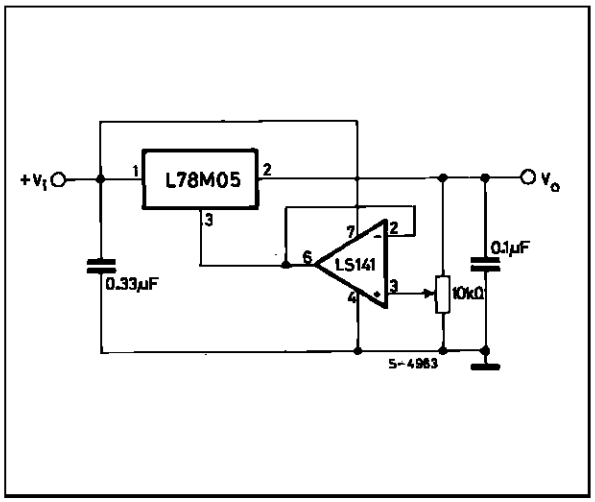
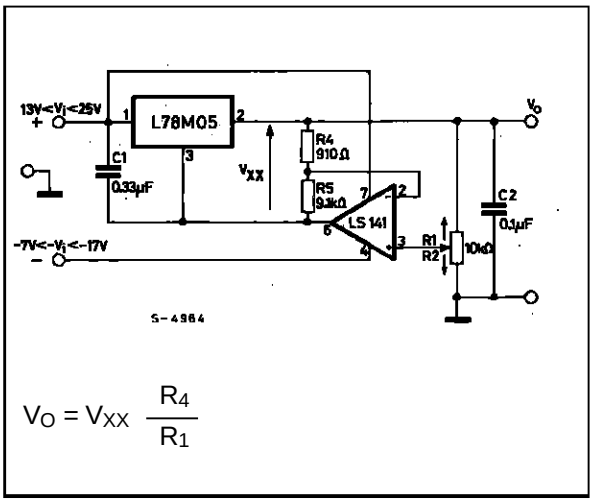
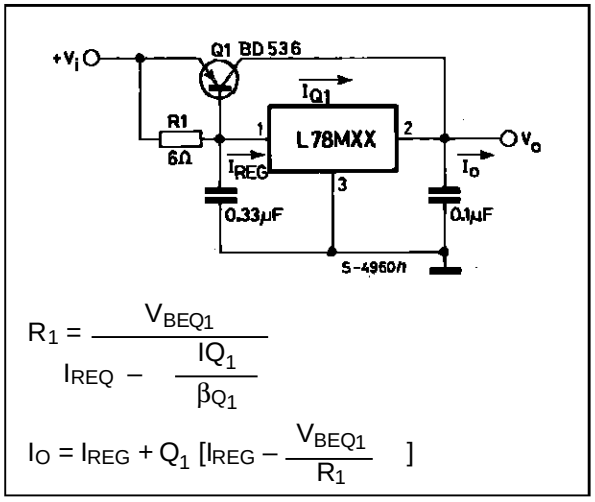


Figure 17 : 0.5 to 10V Regulator.



$$V_O = V_{XX} \frac{R_4}{R_1}$$

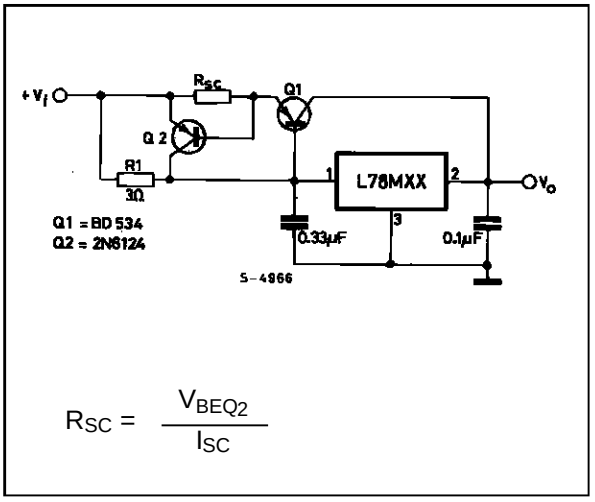
Figure 18 : High Current Voltage Regulator.



$$R_1 = \frac{V_{BEQ1}}{I_{REQ} - \frac{IQ_1}{\beta Q_1}}$$

$$I_O = I_{REG} + Q_1 \left[I_{REG} - \frac{V_{BEQ1}}{R_1} \right]$$

Figure 19 : High Output Current with Short Circuit Protection.



$$R_{SC} = \frac{V_{BEQ2}}{I_{SC}}$$

Figure 20 : Tracking Voltage Regulator.

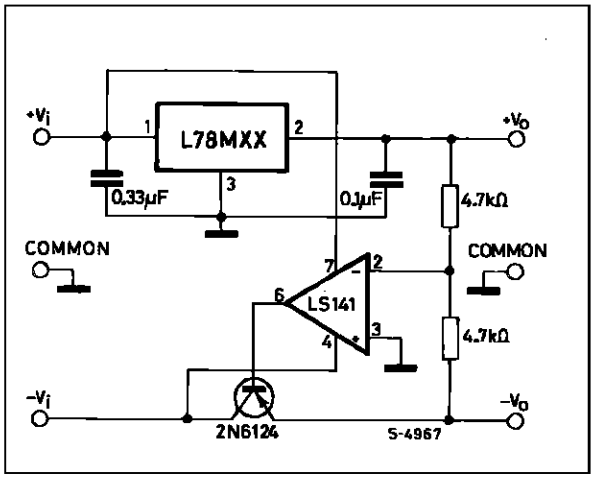
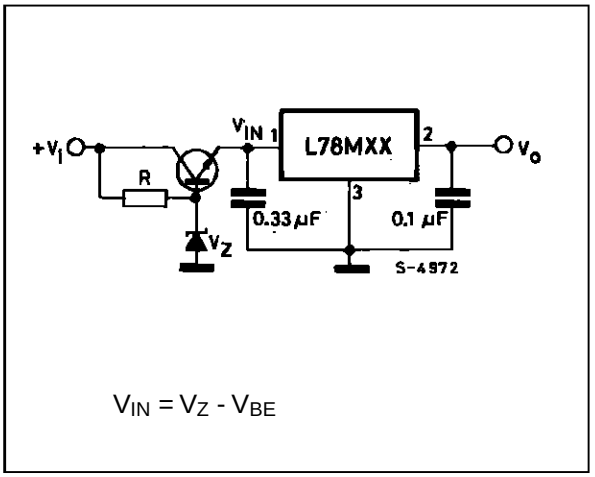
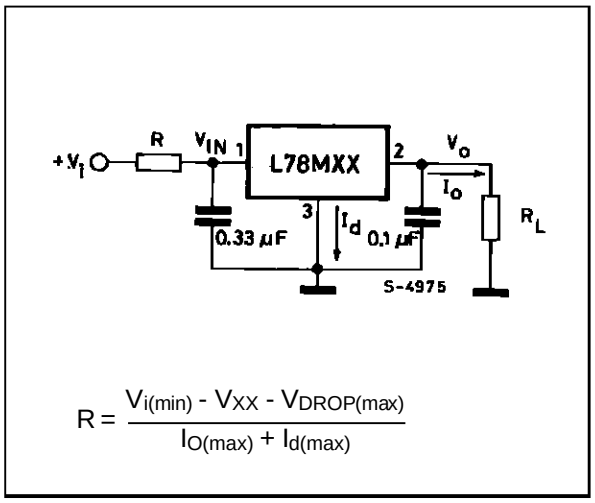


Figure 21 : High Input Voltage Circuit.



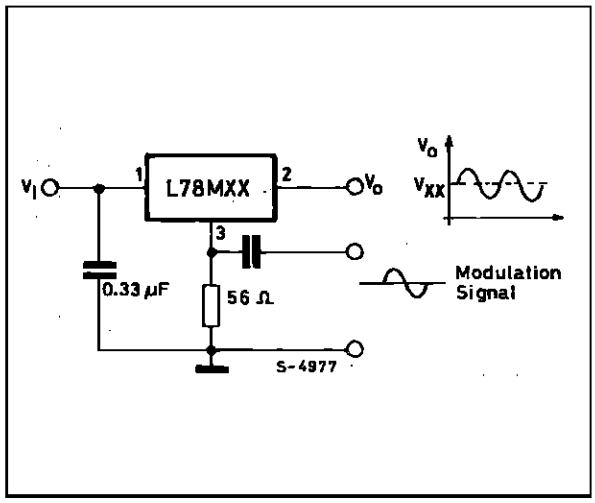
$$V_{IN} = V_Z - V_{BE}$$

Figure 22 : Reducing Power Dissipation with Dropping Resistor.



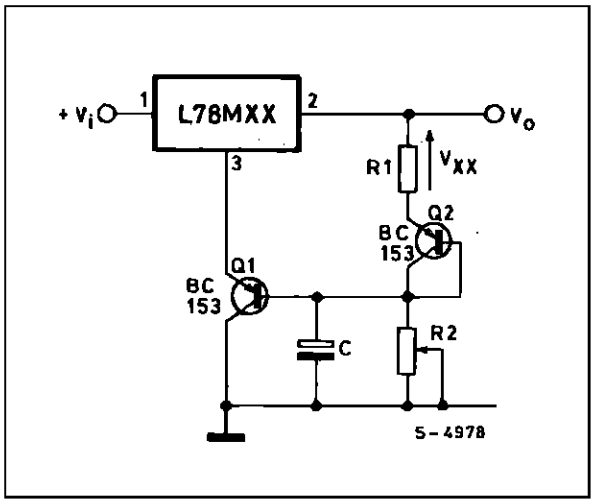
$$R = \frac{V_{i(min)} - V_{XX} - V_{DROP(max)}}{I_{O(max)} + I_{d(max)}}$$

Figure 23 : Power AM Modulator (unity voltage gain, Io ≤ 0.5).



Note : The circuit performs well up to 100KHz.

Figure 24 : Adjustable Output Voltage with Temperature Compensation.

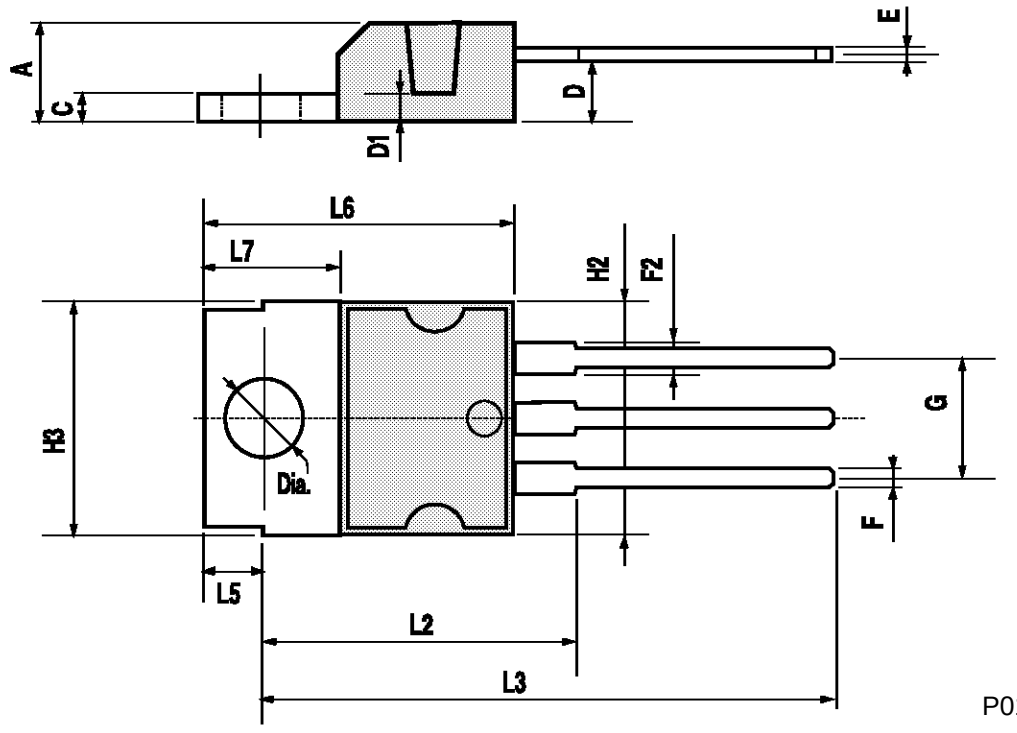


Note : Q_2 is connected as a diode in order to compensate the variation of the Q_1 V_{BE} with the temperature. C allows a slow rise-time of the V_O

$$V_O = V_{XX}\left(1 + \frac{R_2}{R_1}\right) + V_{BE}$$

TO-220 MECHANICAL DATA

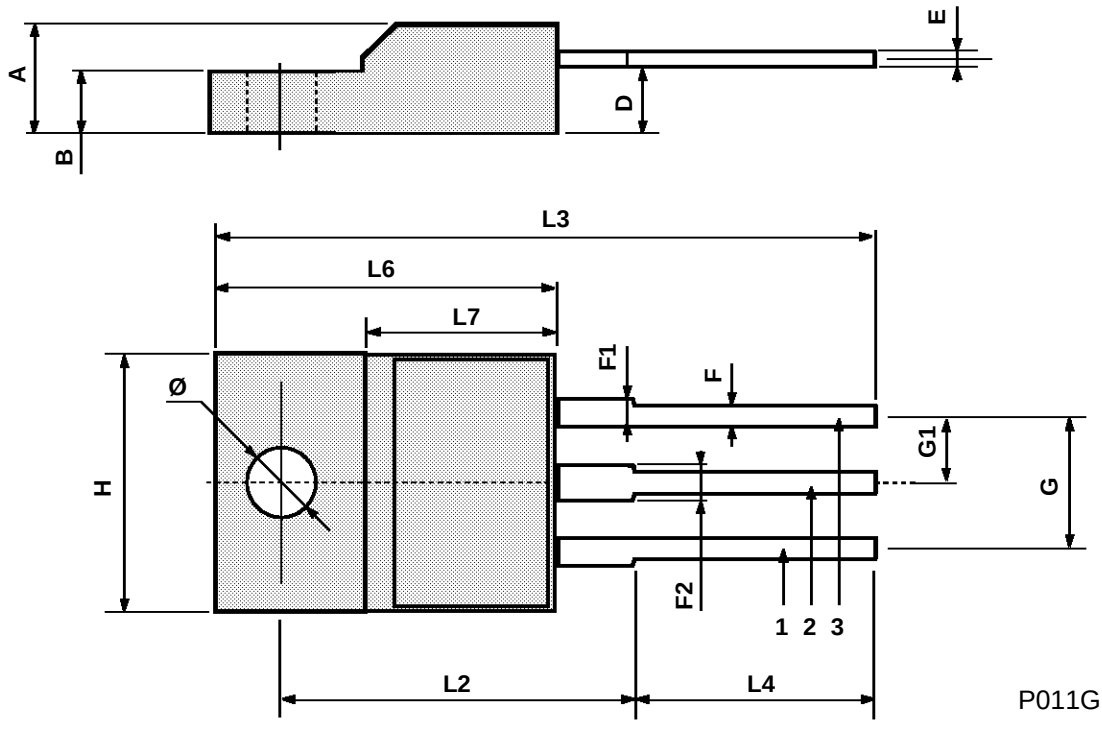
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			4.8			0.189
C			1.37			0.054
D	2.4		2.8	0.094		0.110
D1	1.2		1.35	0.047		0.053
E	0.35		0.55	0.014		0.022
F	0.8		1.05	0.031		0.041
F2	1.15		1.4	0.045		0.055
G	4.95	5.08	5.21	0.195	0.200	0.205
H2			10.4			0.409
H3	10.05		10.4	0.396		0.409
L2		16.2			0.638	
L3	26.3	26.7	27.1	1.035	1.051	1.067
L5	2.6		3	0.102		0.118
L6	15.1		15.8	0.594		0.622
L7	6		6.6	0.236		0.260
Dia.	3.65		3.85	0.144		0.152



P011D

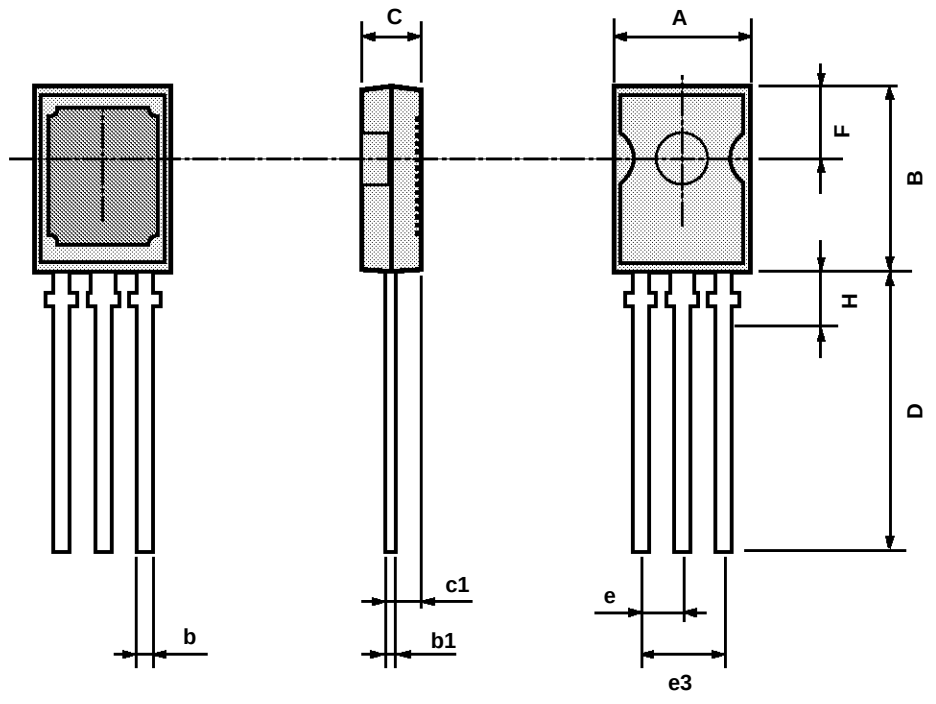
ISOWATT220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.4		0.7	0.015		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



SOT-82 MECHANICAL DATA

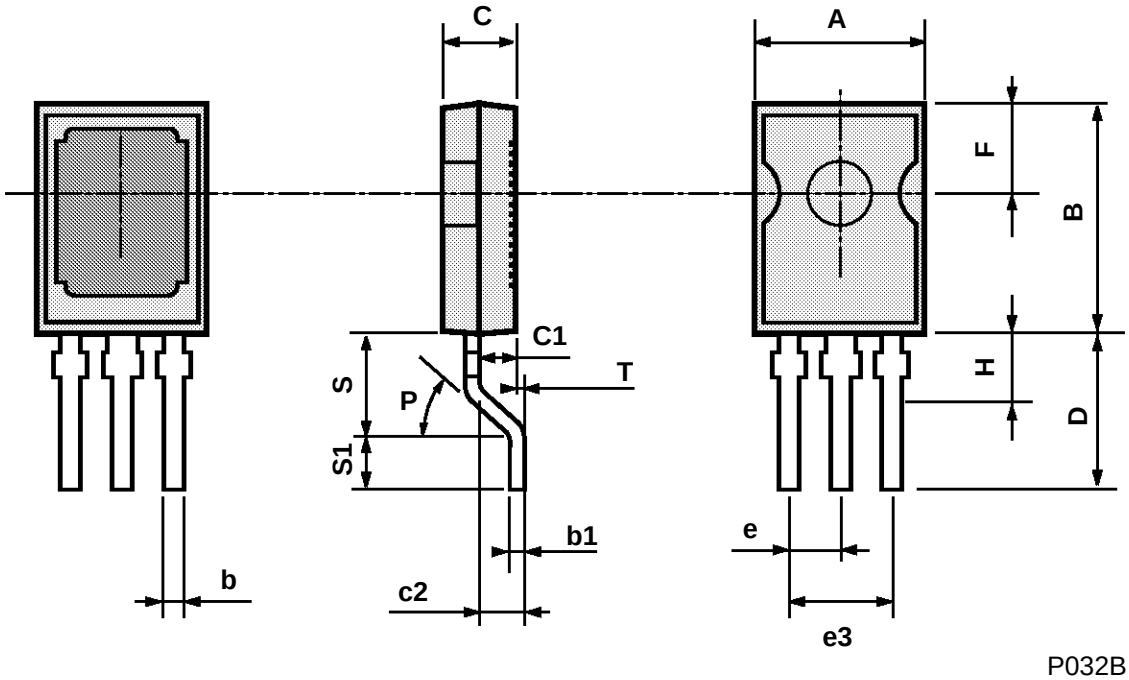
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	7.4		7.8	0.291		0.307
B	10.5		11.3	0.413		0.445
b	0.7		0.9	0.028		0.035
b1	0.49		0.75	0.019		0.030
C	2.4		2.7	0.04		0.106
c1		1.2			0.047	
D		15.7			0.618	
e		2.2			0.087	
e3		4.4			0.173	
F		3.8			0.150	
H			2.54		0.100	



P032A

SOT-194 MECHANICAL DATA

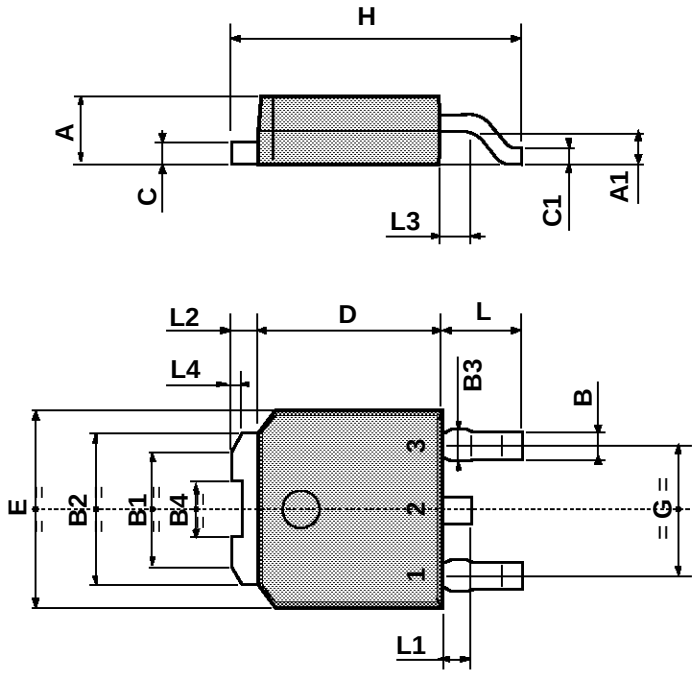
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	7.4		7.8	0.291		0.307
B	10.5		11.3	0.413		0.445
b	0.7		0.9	0.028		0.035
b1	0.49		0.75	0.019		0.030
C	2.4		2.7	0.094		0.106
c1		1.2			0.047	
c2		1.3			0.051	
D		6			0.236	
e		2.2			0.087	
e3		4.4			0.173	
F		3.8			0.150	
H			2.54			0.100
P	45° (typ.)					
S		4			0.157	
S1		2			0.079	
T		0.1			0.004	



P032B

TO-252 (DPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
B	0.64		0.8	0.025		0.031
B1	3.4		3.6	0.133		0.141
B2	5.2		5.4	0.204		0.212
B3			0.9			0.035
B4	1.9		2.1	0.074		0.082
C	0.48		0.6	0.018		0.023
C1	0.45		0.6	0.017		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	2.55		3.05	0.100		0.120
L1	0.6		1	0.023		0.039
L2		0.8			0.031	
L3	0.8		1.2	0.031		0.047
L4	0.3		0.45	0.012		0.017



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsability for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may results from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and r eplaces all information previously supplied.
SGS-THOMSON Microelectronics products are not authorized for use as critical components in life s upport devices or systems without express written approval of SGS-THOMSON Microelectonics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

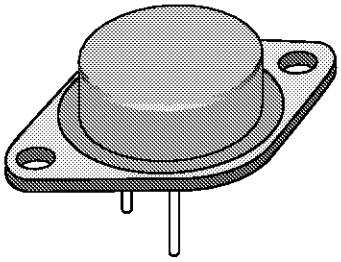
SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A

SGS-THOMSON MICROELECTRONICS

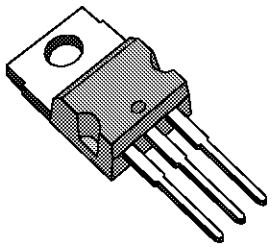
L78S00 SERIES

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 TRANSISTOR SOA PROTECTION



TO-3

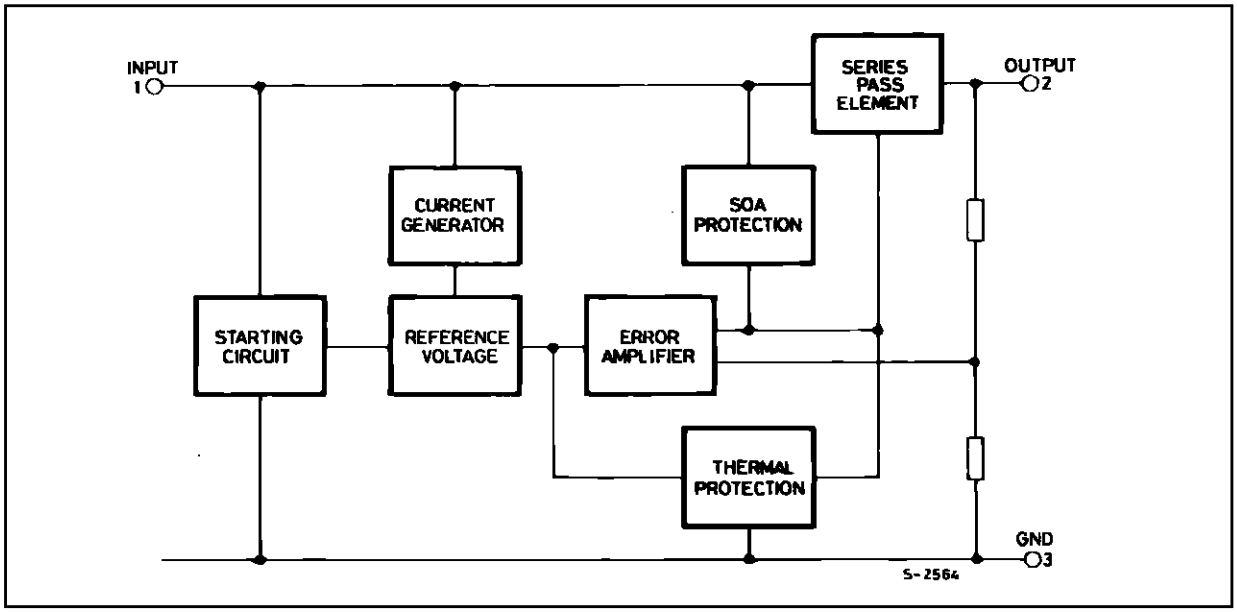


TO-220

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.

BLOCK DIAGRAM



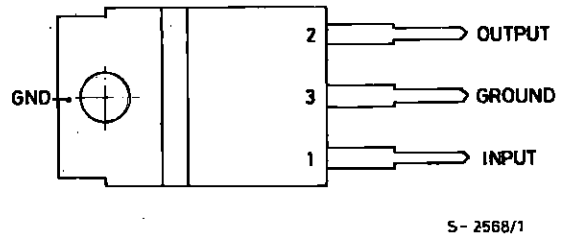
ABSOLUTE MAXIMUM RATINGS

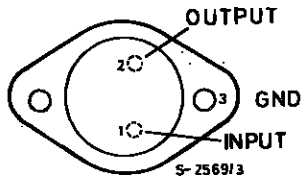
Symbol	Parameter	Value	Unit
V_i	DC Input Voltage (for V_o = 5 to 18V) (for V_o = 24V)	35 40	V V
I_o	Output Current	Internally limited	
P_{tot}	Power Dissipation	Internally limited	
T_{stg}	Storage Temperature	– 65 to + 150	°C
T_{op}	Operating Junction Temperature (for **L78S00**) (for **L78S00C**)	– 55 to + 150 0 to + 150	°C °C

THERMAL DATA

			TO-220	TO-3	
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case	Max	3	4	°C/W
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	50	35	°C/W

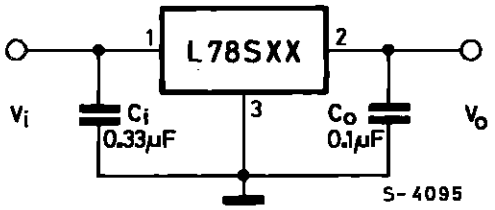
CONNECTION DIAGRAMS AND ORDERING NUMBERS (top views)



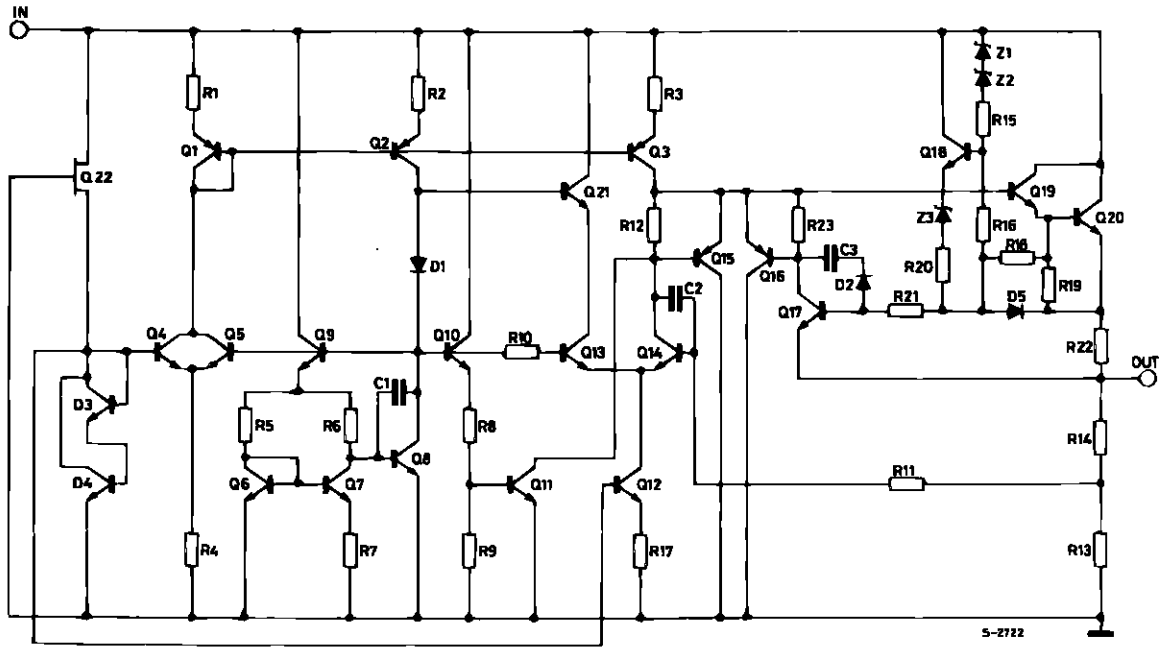


Type	TO-220	TO-3	Output Voltage
L78S05		L78S05T	5V
L78S05C	L78S05CV	L78S05CT	5V
L78S75		L78S75T	7.5V
L78S75C	L78S75CV	L78S75CT	7.5V
L78S09		L78S09T	9V
L78S09C	L78S09CV	L78S09CT	9V
L78S10		L78S10T	10V
L78S10C	L78S10CV	L78S10CT	10V
L78S12		L78S12T	12V
L78S12C	L78S12CV	L78S12CT	12V
L78S15		L78S15T	15V
L78S15C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

APPLICATION CIRCUIT



SCHEMATIC DIAGRAM



TEST CIRCUITS

Figure 1 : DC Parameters.

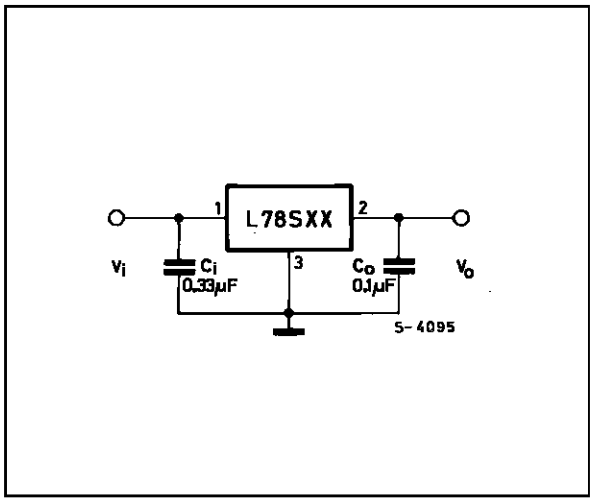


Figure 2 : Load Regulation.

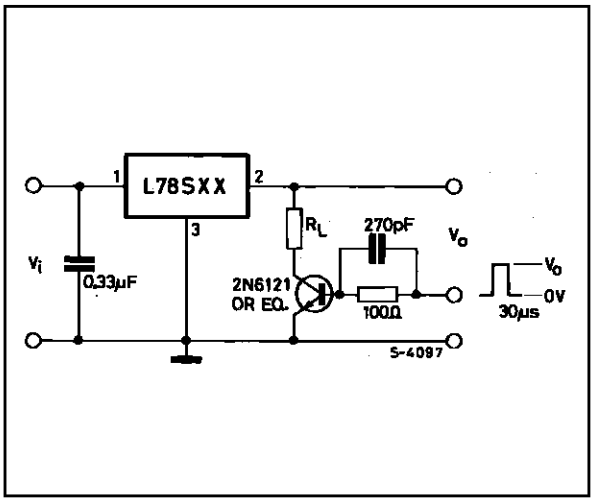
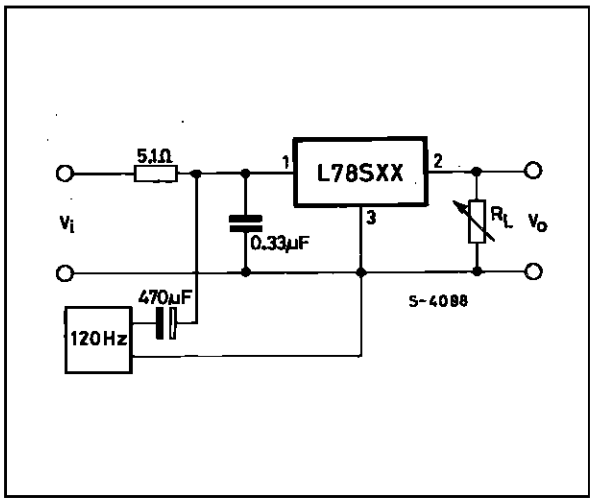


Figure 3 : Ripple Rejection.



ELECTRICAL CHARACTERISTICS FOR L78S05 (refer to the test circuits, T_j = 25 °C, V_i = 10V, 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 = 1 A V_i = 7 V	4.75	5	5.25	V
ΔV_o	Line Regulation	V_i = 7 to 25 V V_i = 8 to 25 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			100	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 7 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-1.1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		40		µV
SVR	Supply Voltage Rejection	f = 120 Hz	60			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	8			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S75 (refer to the test circuits, T_j = 25 °C, V_i = 12.5V, 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 = 1 A V_i = 9.5 V	7.1	7.5	7.95	V
ΔV_o	Line Regulation	V_i = 9.5 to 25 V V_i = 10.5 to 20 V			120 60	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			120	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 9.5 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 °C		-0.8		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		52		µV
SVR	Supply Voltage Rejection	f = 120 Hz	54			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	10.5			V
R_o	Output Resistance	f = 1KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S09 (refer to the test circuits, T_j = 25 ^oC, V_i = 14V, 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 = 1 A V_i = 11 V	8.6	9	9.4	V
ΔV_o	Line Regulation	V_i = 11 to 25 V V_i = 11 to 20 V			130 65	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			130	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 11 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 ^oC		-1		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		60		µV
SVR	Supply Voltage Rejection	f = 120 Hz	53			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	12			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S10 (refer to the test circuits, T_j = 25 ^oC, V_i = 15V, 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 = 1 A V_i = 12.5 V	9.4	10	10.6	V
ΔV_o	Line Regulation	V_i = 12.5 to 30 V V_i = 14 to 22 V			200 100	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			150	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 12.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 ^oC		-1		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		65		µV
SVR	Supply Voltage Rejection	f = 120 Hz	53			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	13			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S12 (refer to the test circuits, T_j = 25 ^oC, V_i = 19V, 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 = 1 A V_i = 14.5 V	11.4	12	12.6	V
ΔV_o	Line Regulation	V_i = 14.5 to 30 V V_i = 16 to 22 V			240 120	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			160	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 14.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 ^oC		-1		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		75		µV
SVR	Supply Voltage Rejection	f = 120 Hz	53			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	15			V
R_o	Output Resistance	f = 1KHz		18		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S15 (refer to the test circuits, T_j = 25 ^oC, V_i = 23V, 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 = 1 A V_i = 17.5 V	14.25	15	15.75	V
ΔV_o	Line Regulation	V_i = 17.5 to 30 V V_i = 20 to 26 V			300 150	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			180	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 17.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 ^oC		-1		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		90		µV
SVR	Supply Voltage Rejection	f = 120 Hz	52			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	18			V
R_o	Output Resistance	f = 1KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S18 (refer to the test circuits, T_j = 25 ^oC, V_i = 26V, 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 = 1 A V_i = 20.5 V	17	18	19	V
ΔV_o	Line Regulation	V_i = 20.5 to 30 V V_i = 22 to 28 V			360 180	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			200	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 22 to 33 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 ^oC		-1		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		110		µV
SVR	Supply Voltage Rejection	f = 120 Hz	49			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	21			V
R_o	Output Resistance	f = 1KHz		22		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S24 (refer to the test circuits, T_j = 25 ^oC, V_i = 33V, 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 = 1 A V_i = 27 V	22.8	24	25.2	V
ΔV_o	Line Regulation	V_i = 27 to 38 V V_i = 30 to 36 V			480 240	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 2 A			250	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 8 to 25 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = -55 to 150 ^oC		-1.5		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		170		µV
SVR	Supply Voltage Rejection	f = 120 Hz	48			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	27			V
R_o	Output Resistance	f = 1KHz		23		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S05C (refer to the test circuits, T_j = 25 °C, V_i = 10V, 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 = 1 A V_i = 7 V	4.75	5	5.25	V
ΔV_o	Line Regulation	V_i = 7 to 25 V V_i = 8 to 12 V			100 50	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 80	100	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 7 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1.1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		40		µV
SVR	Supply Voltage Rejection	f = 120 Hz	54			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	8			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S75C (refer to the test circuits, T_j = 25 °C, V_i = 12.5V, 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 = 1 A V_i = 9.5 V	7.1	7.5	7.95	V
ΔV_o	Line Regulation	V_i = 9.5 to 25 V V_i = 10.5 to 20 V			120 60	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 100	140	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 9.5 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-0.8		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		52		µV
SVR	Supply Voltage Rejection	f = 120 Hz	48			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	10.5			V
R_o	Output Resistance	f = 1KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S09C (refer to the test circuits, T_j = 25 ^oC, V_i = 14V, 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 = 1 A V_i = 11 V	8.6	9	9.4	V
ΔV_o	Line Regulation	V_i = 11 to 25 V V_i = 11 to 20 V			130 65	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 100	170	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 11 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 ^oC		-1		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		60		µV
SVR	Supply Voltage Rejection	f = 120 Hz	47			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	12			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S10C (refer to the test circuits, T_j = 25 ^oC, V_i = 15V, 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 = 1 A V_i = 12.5 V	9.4	10	10.6	V
ΔV_o	Line Regulation	V_i = 12.5 to 30 V V_i = 14 to 22 V			200 100	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 150	240	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 12.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 ^oC		-1		mV/^oC
e_N	Output Noise Voltage	B = 10Hz to 100KHz		65		µV
SVR	Supply Voltage Rejection	f = 120 Hz	47			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	13			V
R_o	Output Resistance	f = 1KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S12C (refer to the test circuits, T_j = 25 °C, V_i = 19V, 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 = 1 A V_i = 14.5 V	11.4	12	12.6	V
ΔV_o	Line Regulation	V_i = 14.5 to 30 V V_i = 16 to 22 V			240 120	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 150	240	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 14.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		75		µV
SVR	Supply Voltage Rejection	f = 120 Hz	47			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	15			V
R_o	Output Resistance	f = 1KHz		18		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S15C (refer to the test circuits, T_j = 25 °C, V_i = 23V, 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 = 1 A V_i = 17.5 V	14.25	15	15.75	V
ΔV_o	Line Regulation	V_i = 17.5 to 30 V V_i = 20 to 26 V			300 150	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 150	300	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 17.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		90		µV
SVR	Supply Voltage Rejection	f = 120 Hz	46			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	18			V
R_o	Output Resistance	f = 1KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S18C (refer to the test circuits, T_j = 25 °C, V_i = 26V, 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 = 1 A V_i = 20.5 V	17	18	19	V
ΔV_o	Line Regulation	V_i = 20.5 to 30 V V_i = 22 to 28 V			360 180	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 200	360	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 20.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		110		µV
SVR	Supply Voltage Rejection	f = 120 Hz	43			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	21			V
R_o	Output Resistance	f = 1KHz		22		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

ELECTRICAL CHARACTERISTICS FOR L78S24C (refer to the test circuits, T_j = 25 °C, V_i = 33V, 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 = 1 A V_i = 27 V	22.8	24	25.2	V
ΔV_o	Line Regulation	V_i = 27 to 38 V V_i = 30 to 36 V			480 240	mV mV
ΔV_o	Load Regulation	I_o = 20 mA to 1.5 A I_o = 2 A		 300	480	mV
I_d	Quiescent Current				8	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA to 1A			0.5	mA
ΔI_d	Quiescent Current Change	I_o = 20 mA V_i = 27 to 38 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA T_j = 0 to 70 °C		-1.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz		170		µV
SVR	Supply Voltage Rejection	f = 120 Hz	42			dB
V_i	Operating Input Voltage	$I_o \leq$ 1.5 A	27			V
R_o	Output Resistance	f = 1KHz		28		mΩ
I_{sc}	Short Circuit Current	V_i = 27 V		500		mA
I_{scp}	Short Circuit Peack Current			3		A

Figure 4 : Dropout Voltage vs. Junction Temperature.

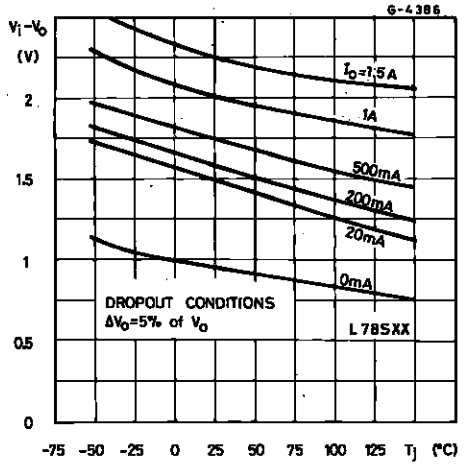


Figure 5 : Peak Output Current vs. Input/Output Differential Voltage.

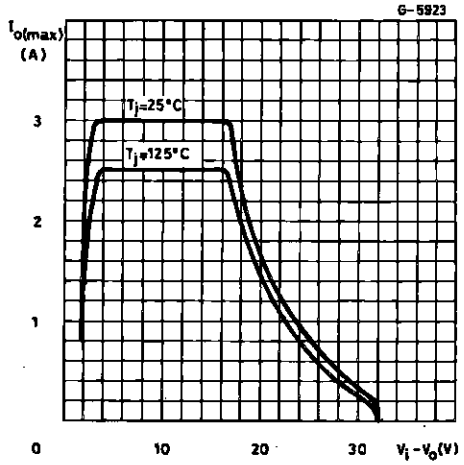


Figure 6 : Supply Voltage Rejection vs. Frequency.

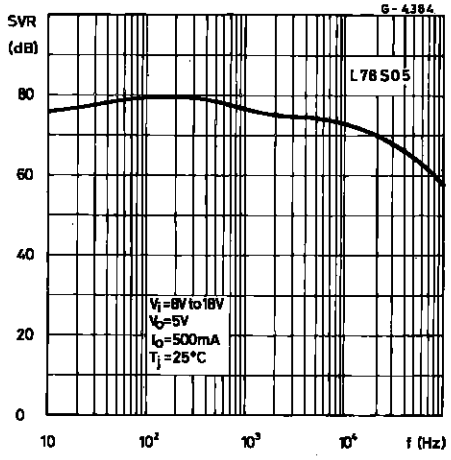


Figure 7 : Output Voltage vs. Junction Temperature.

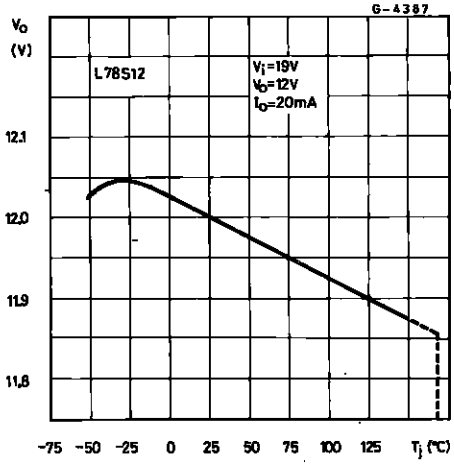


Figure 8 : Output Impedance vs. Frequency.

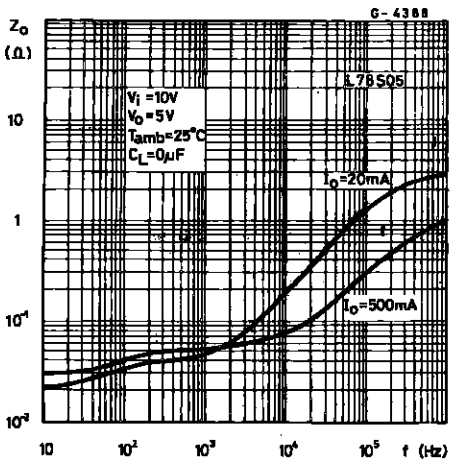


Figure 9 : Quiescent Current vs. Junction Temperature.

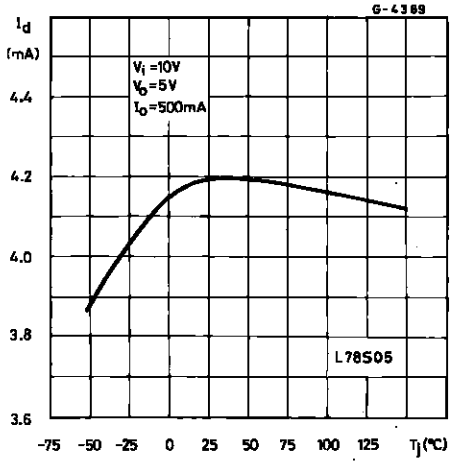


Figure 10 : Load Transient Response.

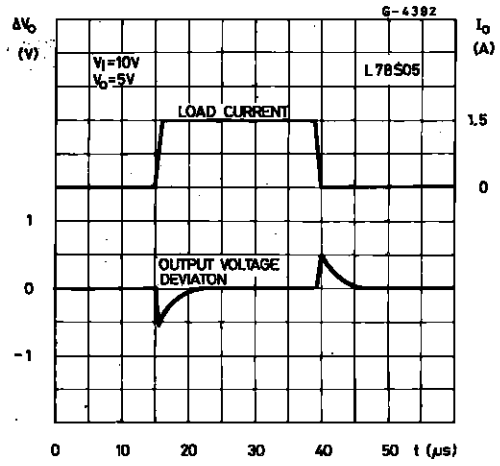


Figure 11 : Line Transient Response.

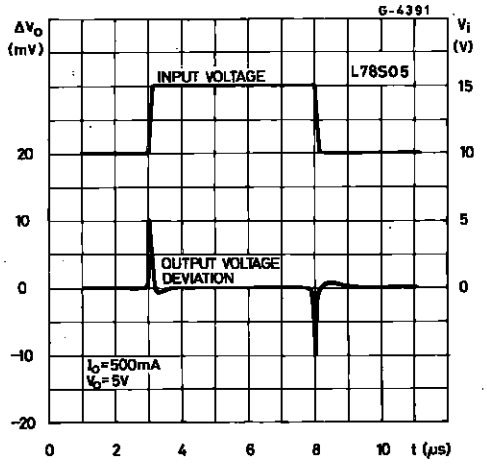


Figure 12 : Quiescent Current vs. Input Voltage.

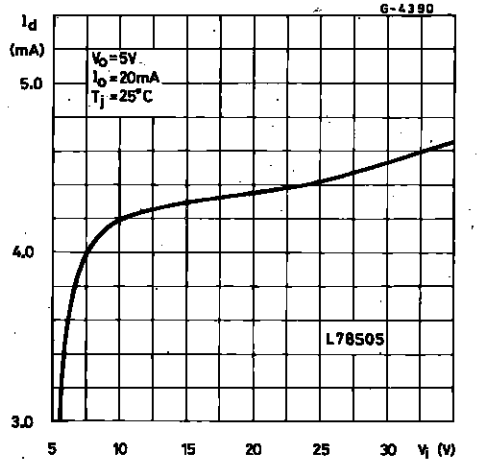
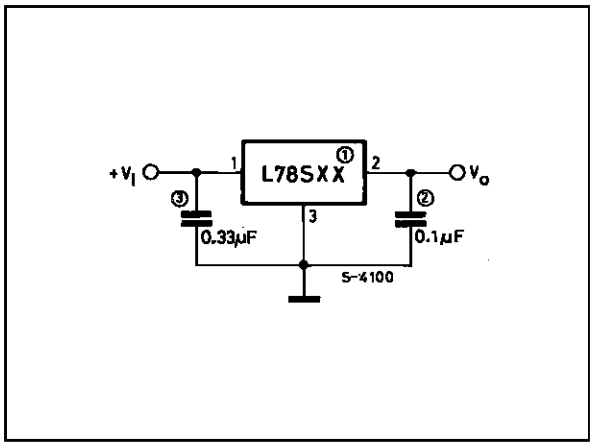


Figure 13 : Fixed Output Regulator.



Notes : 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 dis-tance from power supply filter.

Figure 14 : Constant Current Regulator.

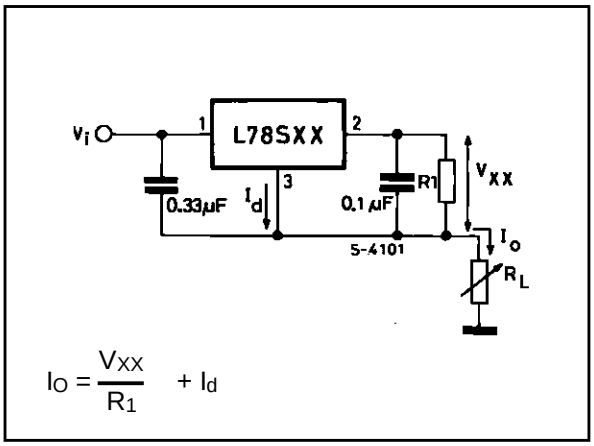
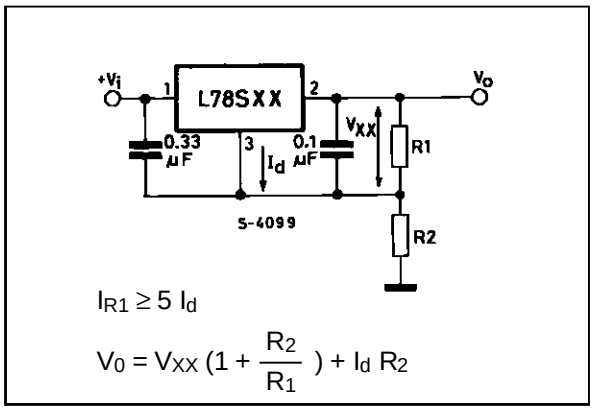


Figure 15 : Circuit for Increasing Output Voltage.



$I_{R1} \geq 5\ I_d$

$$V_0 = V_{XX}\left(1 + \frac{R_2}{R_1}\right) + I_d R_2$$

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

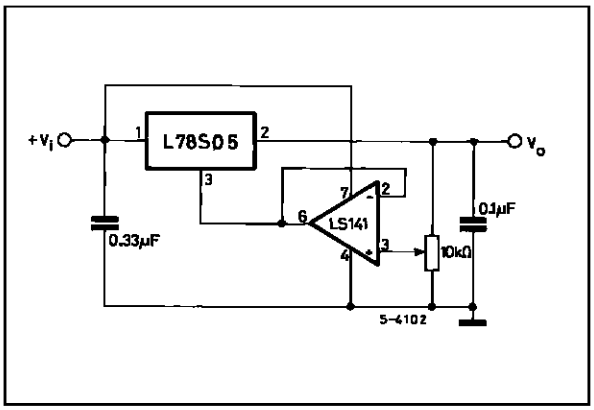
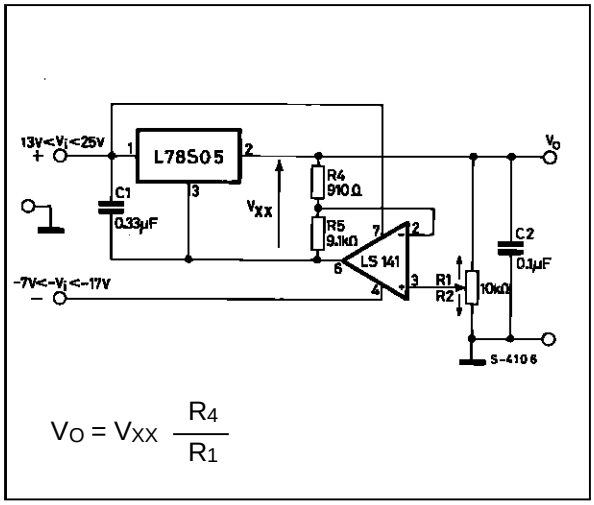
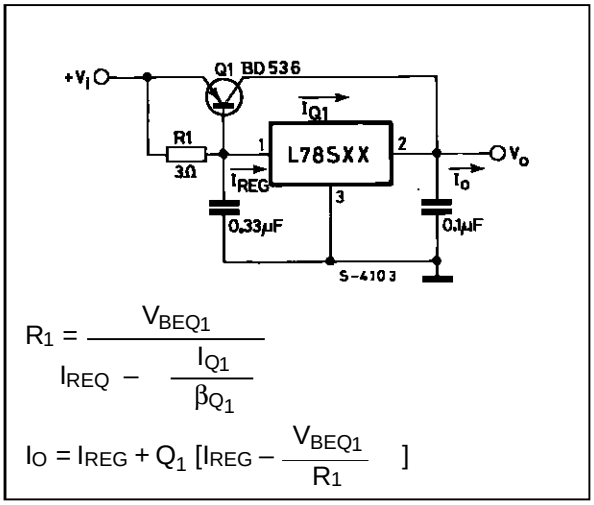


Figure 17 : 0.5 to 10V Regulator.



$$V_O = V_{XX}\ \frac{R_4}{R_1}$$

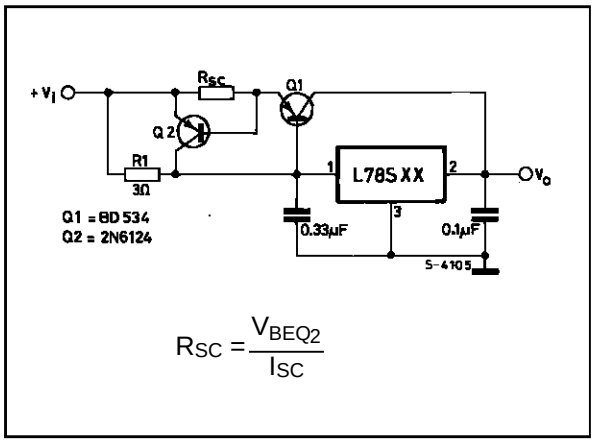
Figure 18 : High Current Voltage Regulator.



$$R_1 = \frac{V_{BEQ1}}{I_{REQ} - \frac{I_{Q1}}{\beta_{Q_1}}}$$

$$I_O = I_{REG} + Q_1\left[I_{REG} - \frac{V_{BEQ1}}{R_1}\right]$$

Figure 19 : High Output Current with Short Circuit Protection.



$$R_{SC} = \frac{V_{BEQ2}}{I_{SC}}$$

Figure 20 : Tracking Voltage Regulator.

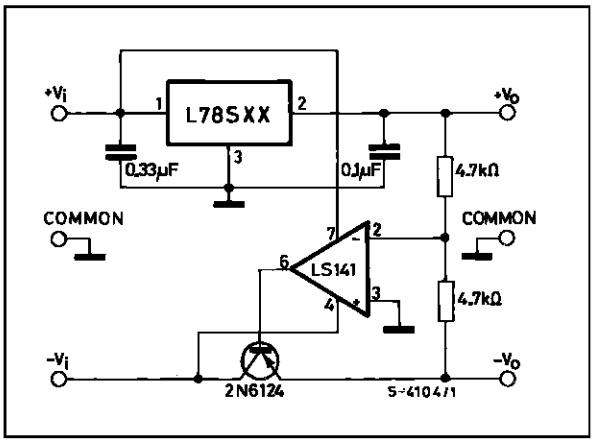
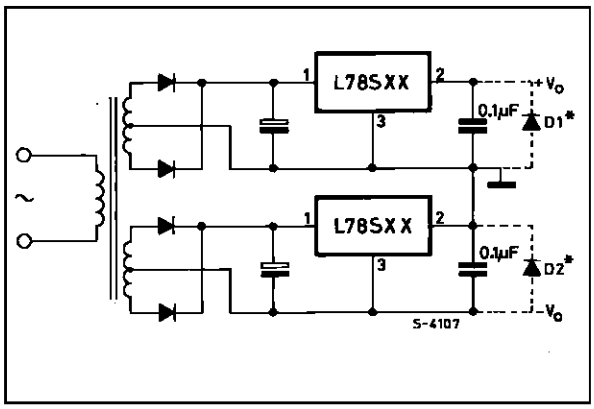


Figure 21 : Positive and Negative Regulator.



(*) D_1 and D_2 are necessary if the load is connected between + V_0 and – V_0.

Figure 22 : Negative Output Voltage Circuit.

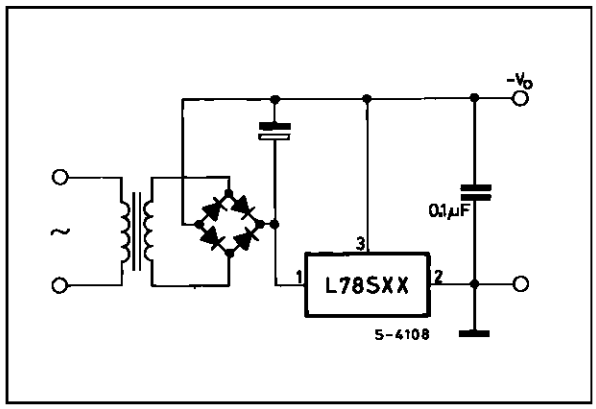


Figure 23 : Switching Regulator.

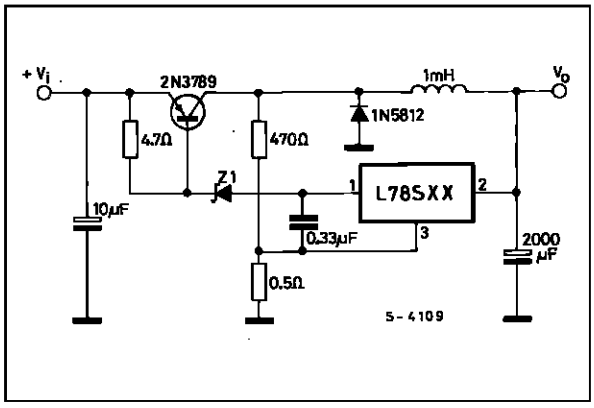
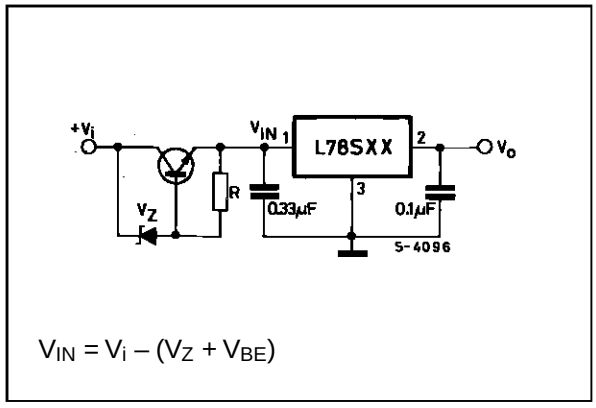
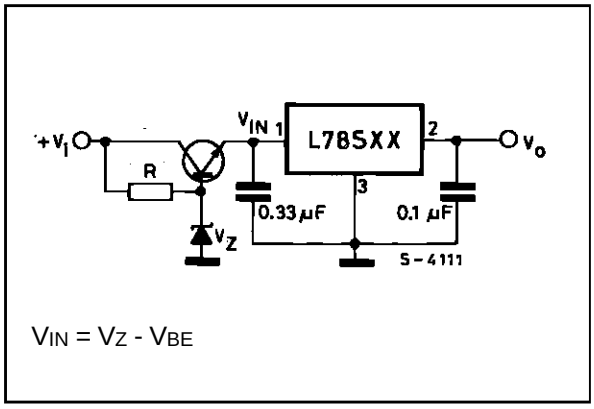


Figure 24 : High Input Voltage Circuit.



$V_{IN} = V_i - (V_Z + V_{BE})$

Figure 25 : High Input Voltage Circuit.



$V_{IN} = V_Z - V_{BE}$

Figure 26 : High Output VoltageRegulator.

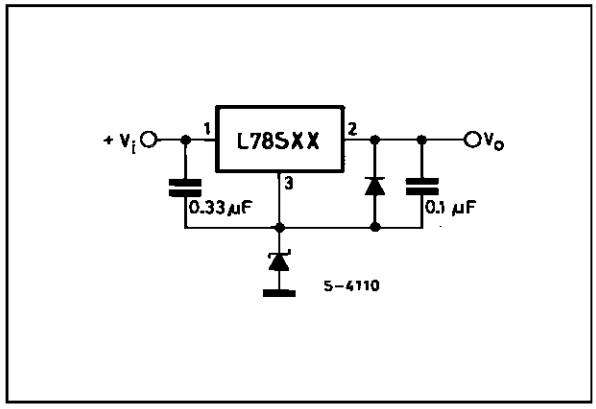
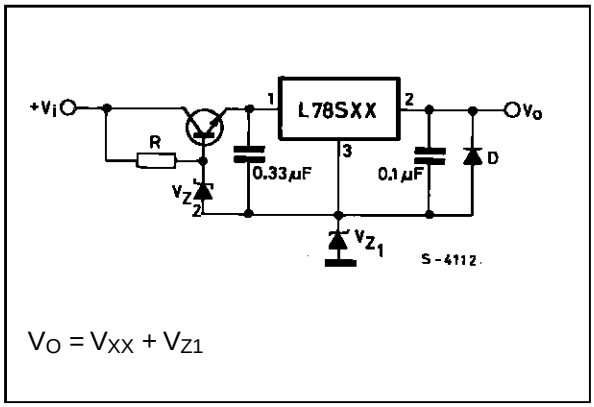
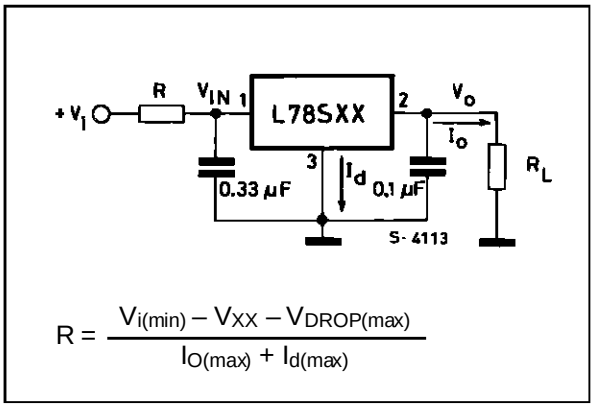


Figure 27 : High Input and Output Voltage.



$V_O = V_{XX} + V_{Z1}$

Figure 28 : Reducing Power Dissipation with Dropping Resistor.



$$R = \frac{V_{i(min)} - V_{XX} - V_{DROP(max)}}{I_{O(max)} + I_{d(max)}}$$

Figure 29 : Remote Shuntdown.

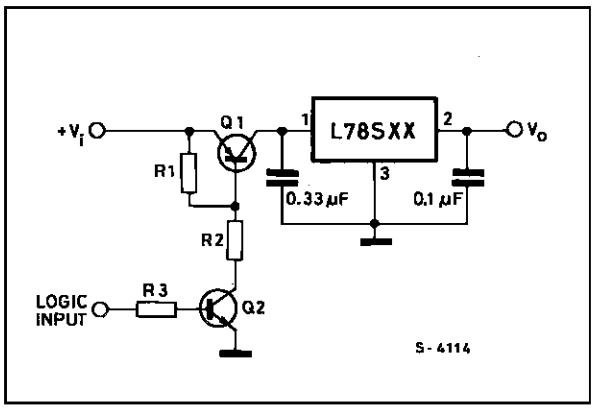
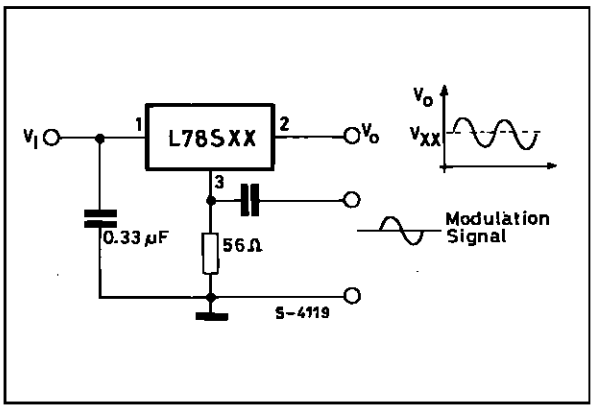
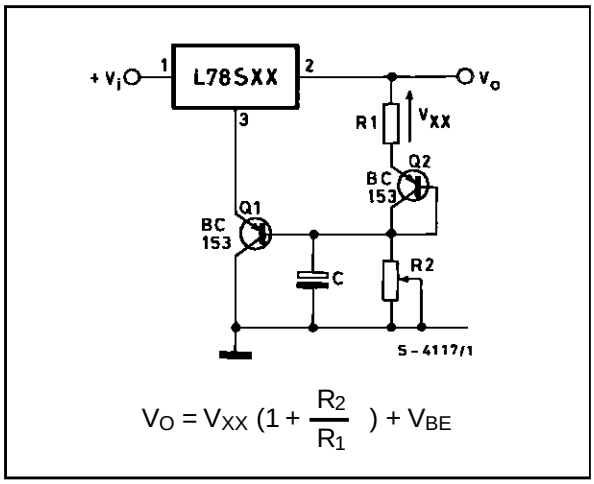


Figure 30 : Power AM Modulator (unity voltage gain, Io ≤ 1A).



Note : The circuit performs well up to 100KHz.

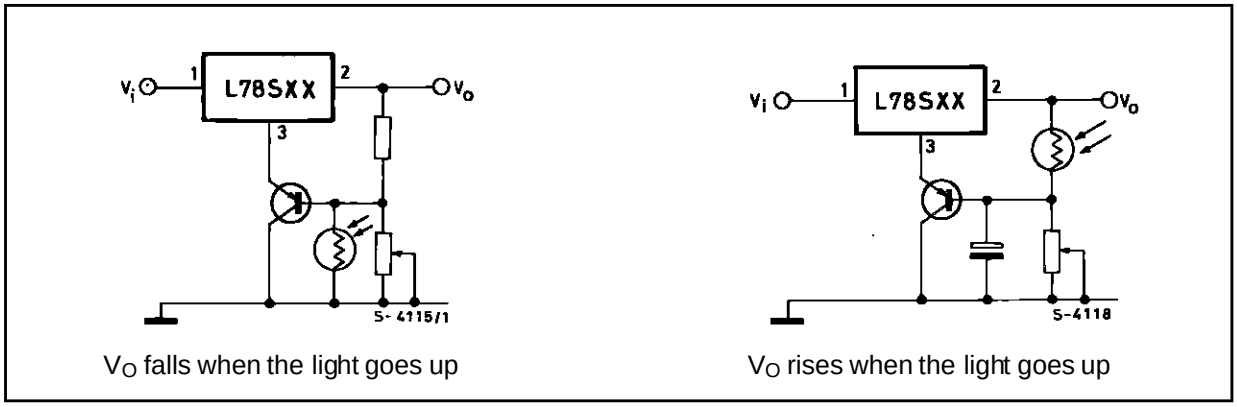
Figure 31 : Adjustable Output Voltage with Temperature Compensation.



$$V_O = V_{XX}\left(1 + \frac{R_2}{R_1}\right) + V_{BE}$$

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

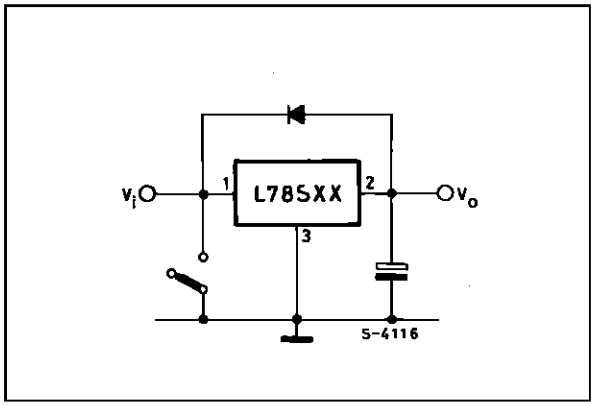
Figure 32 : Light Controllers ($V_{o\,min} = V_{xx} + V_{BE}$).



V_O falls when the light goes up

V_O rises when the light goes up

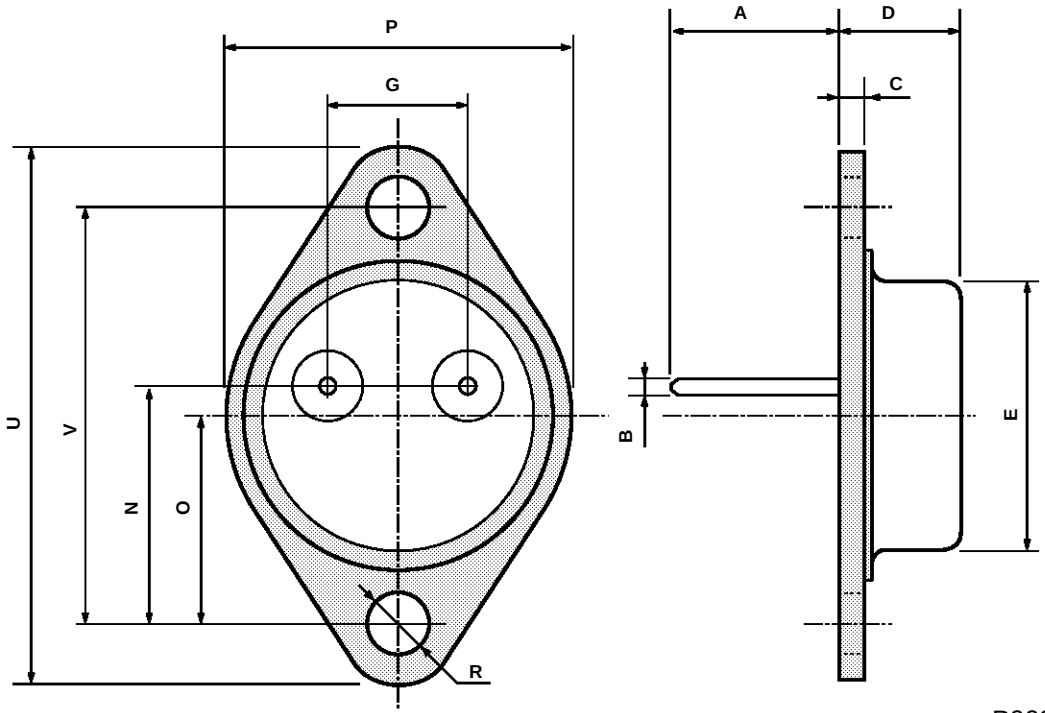
Figure 33 : Protection against Input Short-circuit with High Capacitance Loads.



Applications 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 decreases showly. 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 bypasses the current from the IC to ground.

TO-3 MECHANICAL DATA

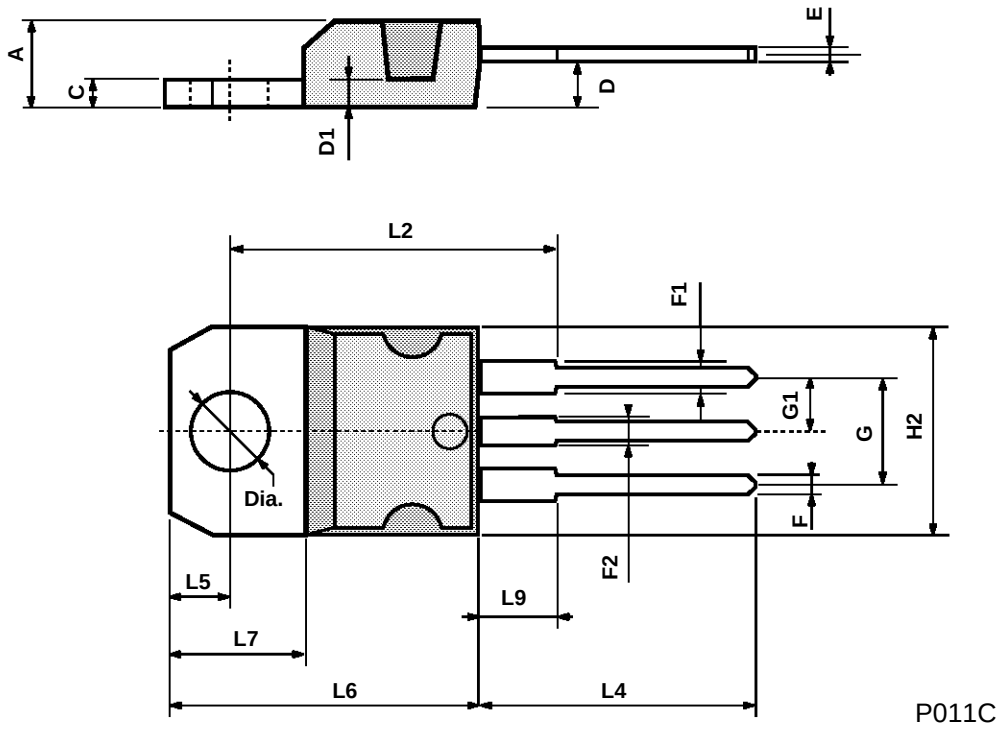
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.00		13.10	0.433		0.516
B	0.97		1.15	0.038		0.045
C	1.50		1.65	0.059		0.065
D	8.32		8.92	0.327		0.351
E	19.00		20.00	0.748		0.787
G	10.70		11.10	0.421		0.437
N	16.50		17.20	0.649		0.677
P	25.00		26.00	0.984		1.023
R	4.00		4.09	0.157		0.161
U	38.50		39.30	1.515		1.547
V	30.00		30.30	1.187		1.193



P003F

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	15.2		15.9	0.598		0.625
L7	6.2		6.6	0.244		0.260
L9	3.5		4.2	0.137		0.165
DIA.	3.75		3.85	0.147		0.151



P011C

Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsability for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may results from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied.
SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectonics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

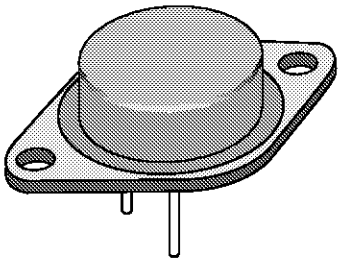
SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A

SGS-THOMSON MICROELECTRONICS

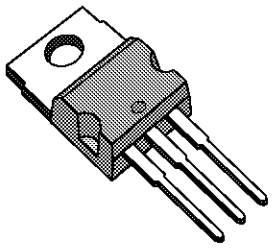
L7900 SERIES

NEGATIVE VOLTAGE REGULATORS

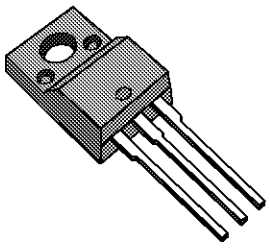
- OUTPUT CURRENT UP TO 1.5A
- OUTPUT VOLTAGES OF – 5; – 5.2; -6; – 8; – 12 ; – 15; –18; – 20; – 22; – 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION



TO-3



TO-220



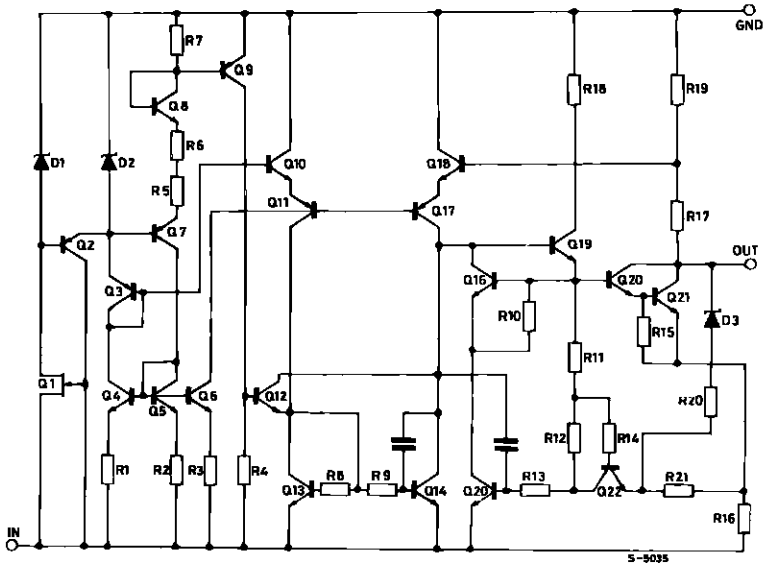
ISOWATT220

DESCRIPTION

The L7900 series of three-terminal negative regulators is available in TO-220 and TO-3 packages and with several output voltages. They can provide local on-card regulation, eliminating the distribution problems associated with single point regulation; furthermore, having the same voltage options as the L7800 positive standard series, they are particularly suited for split power supplies. In addition, the –5.2V is also available for ECL system.

If adeguate heatsinking is provided, the L7900 series can deliver an output current in excess of 1.5A. Although designed primarly as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

SCHEMATIC DIAGRAM



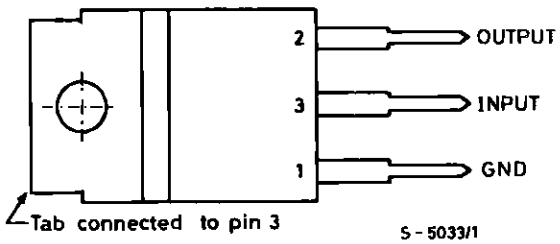
ABSOLUTE MAXIMUM RATINGS

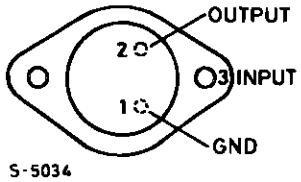
Symbol	Parameter	Value	Unit
V_i	DC Input Voltage (for V_o = – 5 to – 18V) (for V_o = – 20, – 24V)	– 35 – 40	V V
I_o	Output Current	Internally limited	
P_{tot}	Total Power Dissipation	Internally limited	
T_{op}	Operating Junction Temperature	0 to + 150	°C
T_{stg}	Storage Temperature	– 65 to + 150	°C

THERMAL DATA

			TO-3	TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-Case	Max	4	3	4	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-Ambient	Max	35	50	60	°C/W

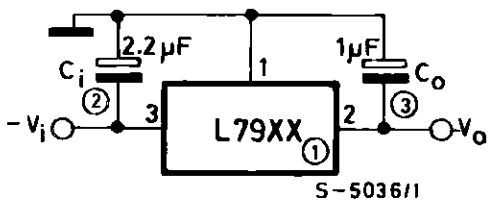
CONNECTION DIAGRAM AND ORDERING NUMBERS (top views)





TYPE	TO-3	TO-220	ISOWATT220	OUTPUT VOLTAGE
L7905C	L7905CT	L7905CV	L7905CP	-5 V
L7952C	L7952CT	L7952CV		-5.2 V
L7906C	L7906CT	L7906CV	L7906CP	-6 V
L7908C	L7908CT	L7908CV	L7908CP	-8 V
L7912C	L7912CT	L7912CV	L7912CP	-12 V
L7915C	L7915CT	L7915CV	L7915CP	-15 V
L7918C	L7918CT	L7918CV	L7918CP	-18 V
L7920C	L7920CT	L7920CV	L7920CP	-20 V
L7922C	L7922CT	L7922CV		-22 V
L7924C	L7924CT	L7924CV	L7924CP	-24 V

APPLICATION CIRCUIT



ELECTRICAL CHARACTERISTICS FOR L7905C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -10V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-4.8	-5	-5.2	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = 8 to 20 V	-4.75	-5	-5.25	V
ΔV_o*	Line Regulation	V_i = -7 to -25 V T_j = 25 °C V_i = -8 to -12 V T_j = 25 °C			100 50	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 50	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -8 to -25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.4		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		100		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.4		V
I_{sc}	Short Circuit Current			2.1		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.5		A

ELECTRICAL CHARACTERISTICS FOR L7952C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -10V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-5.0	-5.2	-5.4	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = -9 to -21 V	-4.95	-5.2	-5.45	V
ΔV_o*	Line Regulation	V_i = -8 to -25 V T_j = 25 °C V_i = -9 to -12 V T_j = 25 °C			105 52	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			105 52	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -9 to -25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.5		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		125		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.4		V
I_{sc}	Short Circuit Current			2		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.5		A

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

ELECTRICAL CHARACTERISTICS FOR L7906C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -11V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-5.75	-6	-6.25	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = -9.5 to -21.5 V	-5.7	-6	-6.3	V
ΔV_o*	Line Regulation	V_i = -8.5 to -25 V T_j = 25 °C V_i = -9 to -15 V T_j = 25 °C			120 60	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			120 60	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -9.5 to -25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.6		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		144		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.4		V
I_{sc}	Short Circuit Current			2		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.5		A

ELECTRICAL CHARACTERISTICS FOR L7908C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -14V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-7.7	-8	-8.3	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = -11.5 to -23 V	-7.6	-8	-8.4	V
ΔV_o*	Line Regulation	V_i = -10.5 to -25 V T_j = 25 °C V_i = -11 to -17 V T_j = 25 °C			160 80	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			160 80	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -11.5 to -25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.6		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		175		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.5		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.5		A

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

ELECTRICAL CHARACTERISTICS FOR L7912C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -19V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-11.5	-12	-12.5	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = -15.5 to -27 V	-11.4	-12	-12.6	V
ΔV_o*	Line Regulation	V_i = -14.5 to -30 V T_j = 25 °C V_i = -16 to -22 V T_j = 25 °C			240 120	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			240 120	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -15 to -30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.8		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		200		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.5		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.5		A

ELECTRICAL CHARACTERISTICS FOR L7915C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -23V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-14.4	-15	-15.6	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = -18.5 to -30 V	-14.3	-15	-15.7	V
ΔV_o*	Line Regulation	V_i = -17.5 to -30 V T_j = 25 °C V_i = -20 to -26 V T_j = 25 °C			300 150	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			300 150	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -18.5 to -30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.9		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		250		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.3		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.3		A

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

ELECTRICAL CHARACTERISTICS FOR L7918C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -27V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-17.3	-18	-18.7	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = -22 to -33 V	-17.1	-18	-18.9	V
ΔV_o*	Line Regulation	V_i = -21 to -33 V T_j = 25 °C V_i = -24 to -30 V T_j = 25 °C			360 180	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			360 180	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -22 to -33 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		300		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.1		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7920C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -29V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-19.2	-20	-20.8	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = -24 to -35 V	-19	-20	-21	V
ΔV_o*	Line Regulation	V_i = -23 to -35 V T_j = 25 °C V_i = -26 to -32 V T_j = 25 °C			400 200	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			400 200	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -24 to -35 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		350		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			0.9		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.5		A

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

ELECTRICAL CHARACTERISTICS FOR L7922C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -31V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-21.1	-22	-22.9	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = -26 to -37 V	-20.9	-22	-23.1	V
ΔV_o*	Line Regulation	V_i = -25 to -37 V T_j = 25 °C V_i = -28 to -34 V T_j = 25 °C			440 220	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			440 220	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -26 to -37 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		375		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.1		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

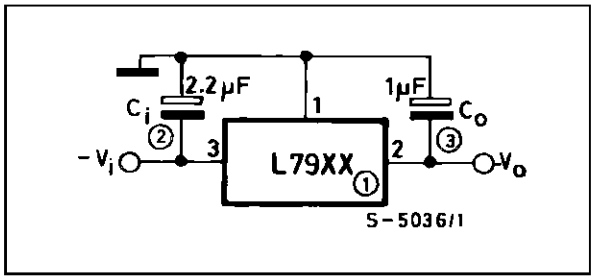
ELECTRICAL CHARACTERISTICS FOR L7924C (refer to the test circuits, T_j = 0 to 150 °C, V_i = -33V, I_o = 500 mA, C_i = 2.2 µF, C_o = 1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-23	-24	-25	V
V_o	Output Voltage	I_o = -5 mA to -1 A $P_o \leq$ 15 W V_i = -27 to -38 V	-22.8	-24	-25.2	V
ΔV_o*	Line Regulation	V_i = -27 to -38 V T_j = 25 °C V_i = -30 to -36 V T_j = 25 °C			480 240	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			480 240	mV mV
I_d	Quiescent Current	T_j = 25 °C			3	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = -27 to -38 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
e_N	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		400		µV
SVR	Supply Voltage Rejection	ΔV_i = 10 V f = 120 Hz	54	60		dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C ΔV_O = 100 mV		1.1		V
I_{sc}	Short Circuit Current			1.1		A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

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

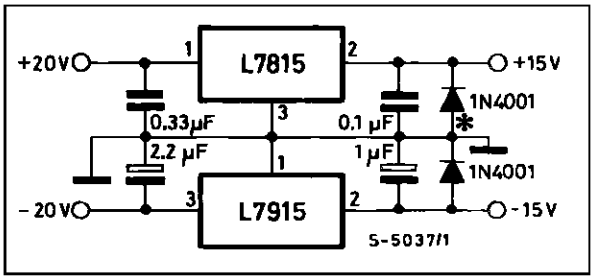
APPLICATION INFORMATION

Figure 1 : Fixed Output Regulator.



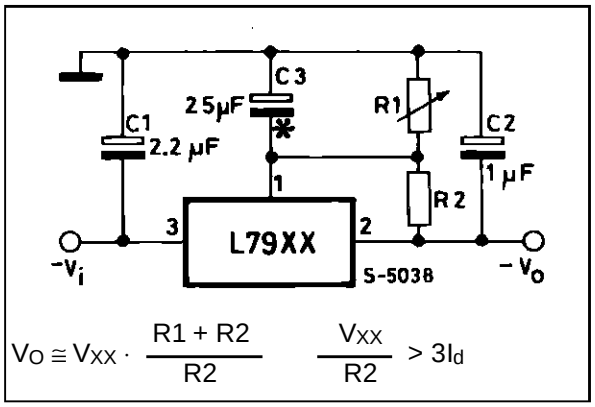
Notes : 1. To specify an output voltage, substitute voltage value for "XX".
2. Required for stability. For value given, capacitor must be solid tantalum. If aluminium electrolitics are used, at least ten times value should be selected. C_1 is required if regulator is located an appreciable distance from power supply filter.
3. To improve transient response. If large capacitors are used, a high current diode from input to output (1N4001 or similar) should be introduced to protect the device from momentary input short circuit.

Figure 2 : Split Power Supply (± 15V/1A).



* Against potential latch-up problems.

Figure 3 : Circuit for Increasing Output Voltage.



* C3 Optional for improved transient response and ripple rejection.

Figure 4 : High Current Negative Regulator (– 5V/4A with 5A current limiting).

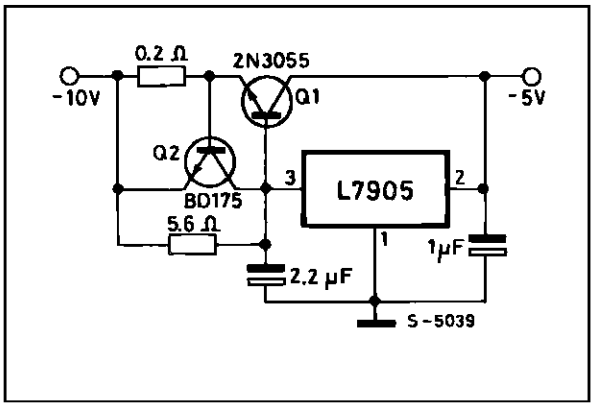
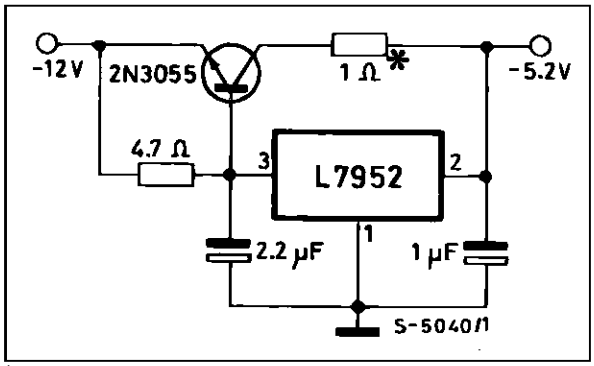


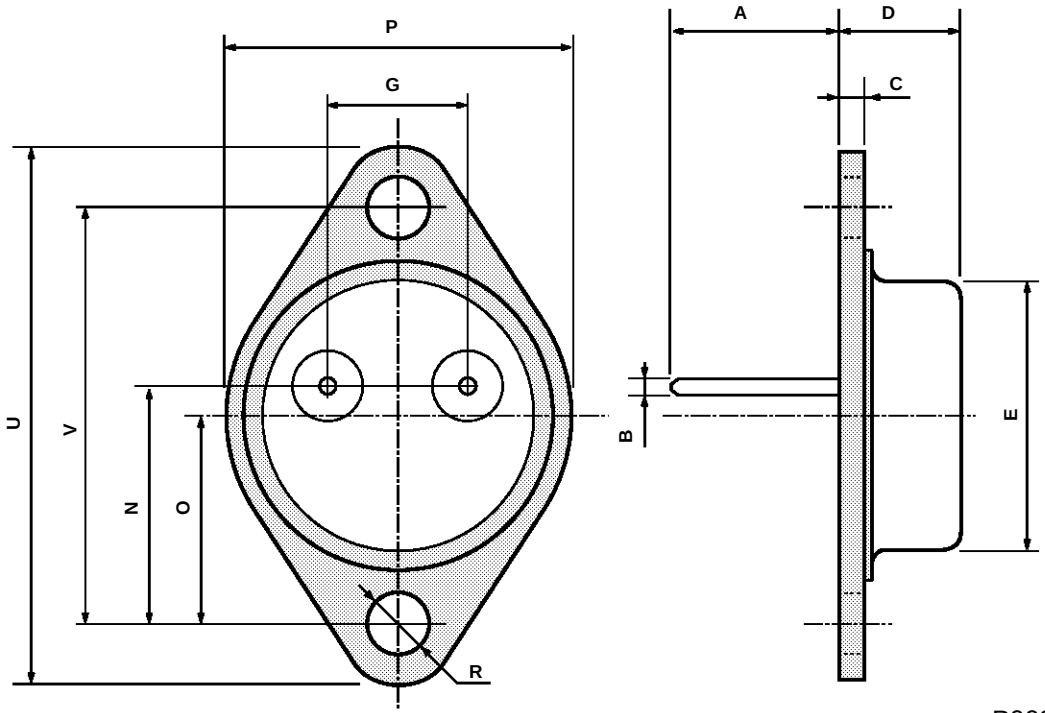
Figure 5 : Typical ECL System Power Supply (– 5.2V/4A).



* Optional dropping resistor to reduce the power dissipated in the boost transistor.

TO-3 MECHANICAL DATA

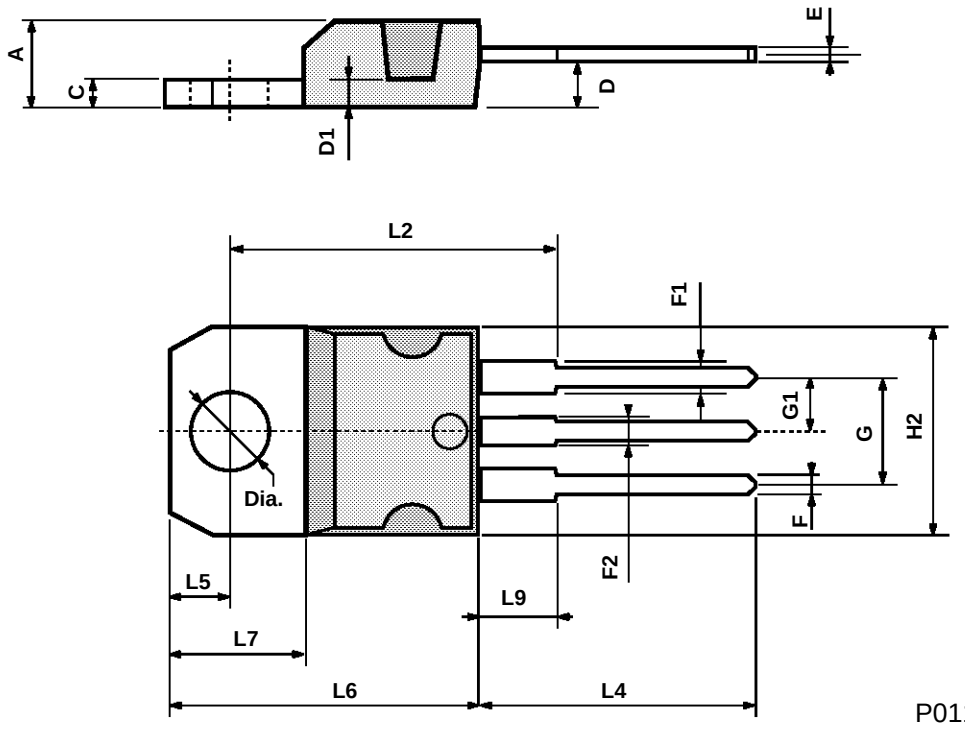
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.00		13.10	0.433		0.516
B	0.97		1.15	0.038		0.045
C	1.50		1.65	0.059		0.065
D	8.32		8.92	0.327		0.351
E	19.00		20.00	0.748		0.787
G	10.70		11.10	0.421		0.437
N	16.50		17.20	0.649		0.677
P	25.00		26.00	0.984		1.023
R	4.00		4.09	0.157		0.161
U	38.50		39.30	1.515		1.547
V	30.00		30.30	1.187		1.193



P003F

TO-220 MECHANICAL DATA

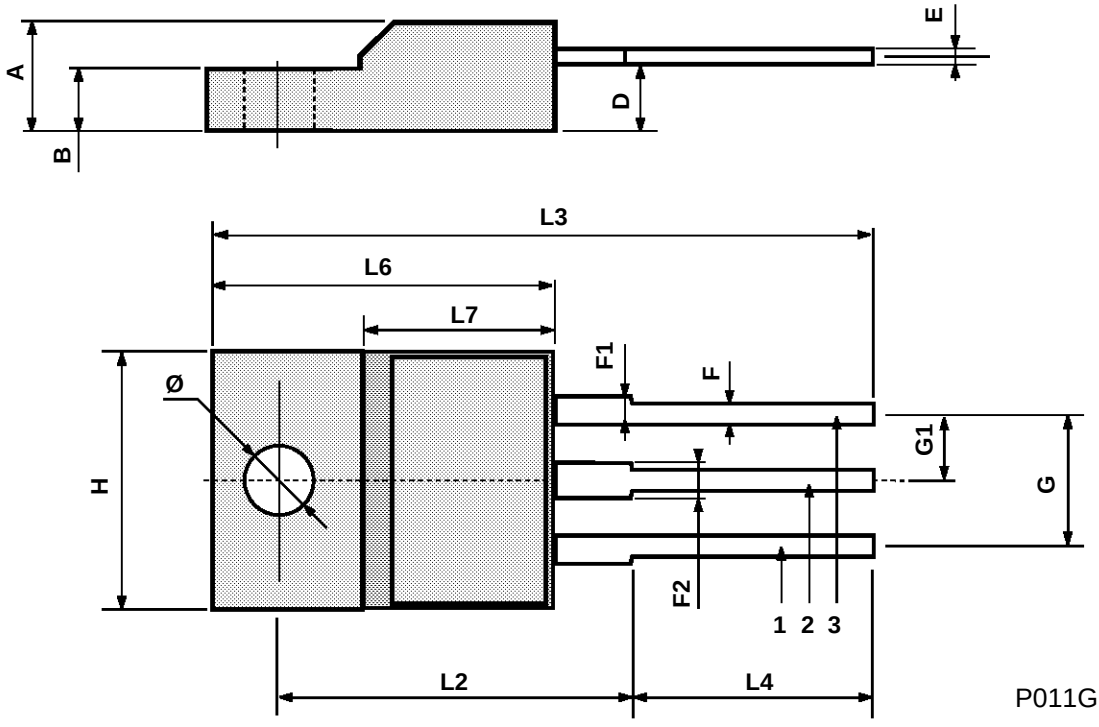
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
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	15.2		15.9	0.598		0.625
L7	6.2		6.6	0.244		0.260
L9	3.5		4.2	0.137		0.165
DIA.	3.75		3.85	0.147		0.151



P011C

ISOWATT220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.4		0.7	0.015		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		3.66
Ø	3		3.2	0.118		0.126



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsability for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may results from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied.
SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectonics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

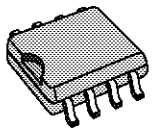
SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A

SGS-THOMSON MICROELECTRONICS

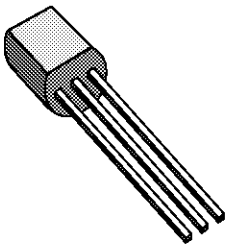
L79L00 SERIES

NEGATIVE VOLTAGE REGULATORS

- OUTPUT CURRENT UP TO 100 mA
- OUTPUT VOLTAGES OF -5; -6; -8; -9; -12; -15V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- NO EXTERNAL COMPONENTS ARE REQUIRED
- AVAILABLE IN EITHER ± 5% (AC) OR ± 10% (C) SELECTION



SO-8



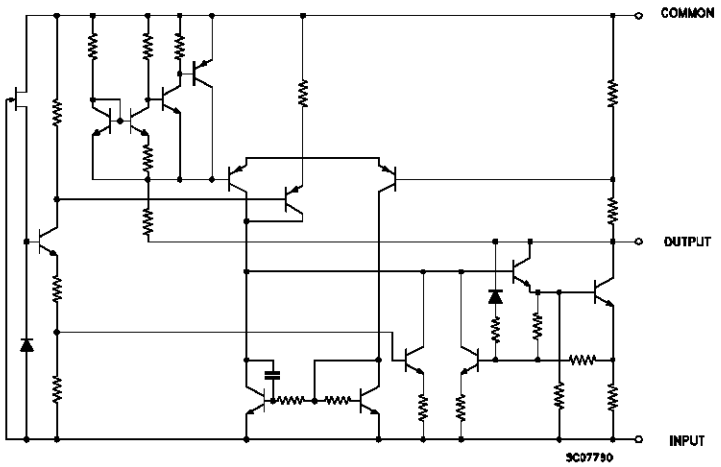
TO-92

DESCRIPTION

The L79L00 series of three-terminal negative regulators employ internal current limiting and thermal shutdown, making them essentially indestructible. If adequate heatsink is provided, they can deliver up to 100 mA output current. They are intended as fixed voltage regulators in a wide range of applications including local or on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power pass elements to make high-current voltage regulators.

The L79L00 series used as Zener diode/resistor combination replacement, offers an effective output impedance improvement of typically two orders of magnetude, along with lower quiescent current and lower noise.

SCHEMATIC DIAGRAM

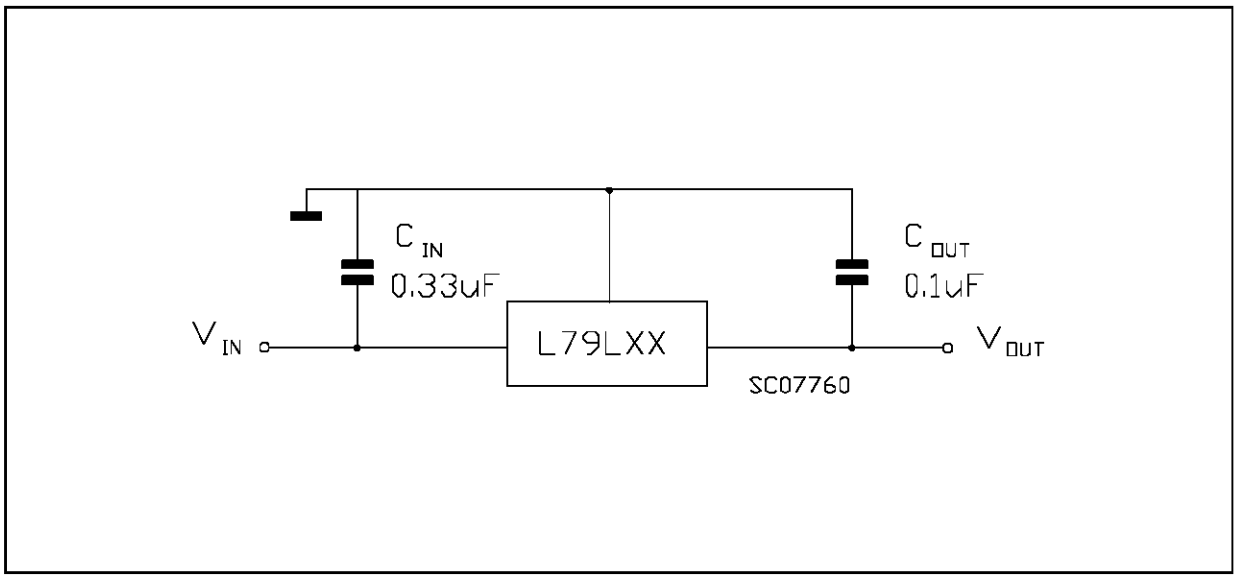


ABSOLUTE MAXIMUM RATINGS

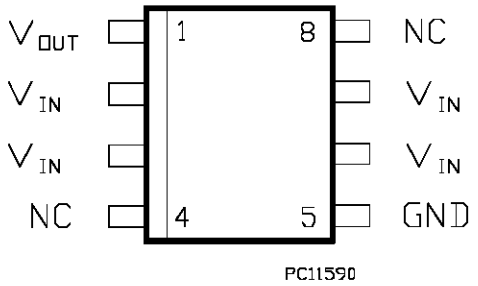
Symbol	Parameter		Value	Unit
V_i	DC Input Voltage	V_o = -5 V to -9 V	-30	V
		V_o = -12 V to -15 V	-35	V
I_o	Output Current		100	mA
P_{tot}	Power Dissipation		Internally limited (*)	
T_{stg}	Storage Temperature Range		- 40 to 150	^oC
T_{op}	Operating Junction Temperature Range	For L79L00C, L79L00AC For L79L00AB	0 to 125 - 40 to 125	^oC ^oC

(*) Our SO-8 package used for Voltage Regulators is modified internally to have pins 2, 3, 6 and 7 electrically commoned to the die attach flag. This particular frame decreases the total thermal resistance of the package and increases its ability to dissipate power when an appropriate area of copper on the printed circuit board is available for heatsinking. The external dimensions are the same as for the standard SO-8

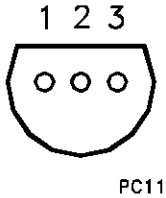
TEST CIRCUITS



CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



SO-8



pin 1 = GND
pin 2 = IN
pin 3 = OUT

TO-92

ORDERING NUMBERS

Type	SO-8	TO-92	Output Voltage
L79L05C	L79L05CD	L79L05CZ	-5 V
L79L05AC	L79L05ACD	L79L05ACZ	-5 V
L79L05AB	L79L05ABD	L79L05ABZ	-5 V
L79L06C	L79L06CD	L79L06CZ	-6 V
L79L06AC	L79L06ACD	L79L06ACZ	-6 V
L79L06AB	L79L06ABD	L79L06ABZ	-6 V
L79L08C	L79L08CD	L79L08CZ	-8 V
L79L08AC	L79L08ACD	L79L08ACZ	-8 V
L79L08AB	L79L08ABD	L79L08ABZ	-8 V
L79L09C	L79L09CD	L79L09CZ	-9 V
L79L09AC	L79L09ACD	L79L09ACZ	-9 V
L79L09AB	L79L09ABD	L79L09ABZ	-9 V
L79L12C	L79L12CD	L79L12CZ	-12 V
L79L12AC	L79L12ACD	L79L12ACZ	-12 V
L79L12AB	L79L12ABD	L79L12ABZ	-12 V
L79L15C	L79L15CD	L79L15CZ	-15 V
L79L15AC	L79L15ACD	L79L15ACZ	-15 V
L79L15AB	L79L15ABD	L79L15ABZ	-15 V

ELECTRICAL CHARACTERISTICS FOR L79L05 (refer to the test circuits, T_j = 0 to 125 °C, V_i = -10V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-4.6	-5	-5.4	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -7 to -20 V I_o = 1 to 70 mA V_i = -10 V	-4.5 -4.5		-5.5 -5.5	V V
ΔV_o	Line Regulation	V_i = -7 to -20 V T_j = 25 °C V_i = -8 to -20 V T_j = 25 °C			200 150	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			60 30	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = -8 to -20 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		40		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -8 to -18 V	40	49		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L06 (refer to the test circuits, T_j = 0 to 125 °C, V_i = -12V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-5.52	-6	-6.48	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -8.5 to -20 V I_o = 1 to 70 mA V_i = -12 V	-5.4 -5.4		-6.6 -6.6	V V
ΔV_o	Line Regulation	V_i = -8.5 to -20 V T_j = 25 °C V_i = -9 to -20 V T_j = 25 °C			200 150	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			60 30	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = -8 to -20 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		50		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -9 to -20 V	38	46		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L08 (refer to the test circuits, T_j = 0 to 125 °C, V_i = -14V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-7.36	-8	-8.64	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -10.5 to -23 V I_o = 1 to 70 mA V_i = -14 V	-7.2 -7.2		-8.8 -8.8	V V
ΔV_o	Line Regulation	V_i = -10.5 to -23 V T_j = 25 °C V_i = -11 to -23 V T_j = 25 °C			200 150	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			80 40	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = -11 to -23 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		60		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -12 to -23 V	36	45		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L09 (refer to the test circuits, T_j = 0 to 125 °C, V_i = -15V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-8.28	-9	-9.72	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -11.5 to -23 V I_o = 1 to 70 mA V_i = -15 V	-8.1 -8.1		-9.9 -9.9	V V
ΔV_o	Line Regulation	V_i = -11.5 to -23 V T_j = 25 °C V_i = -12 to -23 V T_j = 25 °C			250 200	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			80 40	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = -12 to -23 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		70		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -12 to -23 V	36	44		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L12 (refer to the test circuits, T_j = 0 to 125 °C, V_i = -19V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-11.1	-12	-12.9	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -14.5 to -27 V I_o = 1 to 70 mA V_i = -19 V	-10.8 -10.8		-13.2 -13.2	V V
ΔV_o	Line Regulation	V_i = -14.5 to -27 V T_j = 25 °C V_i = -16 to -27 V T_j = 25 °C			250 200	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			100 50	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = -16 to -27 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		80		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -15 to -25 V	36	42		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L15 (refer to the test circuits, T_j = 0 to 125 °C, V_i = -23V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-13.8	-15	-16.2	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -17.5 to -30 V I_o = 1 to 70 mA V_i = -23 V	-13.5 -13.5		-16.5 -16.5	V V
ΔV_o	Line Regulation	V_i = -17.5 to -30 V T_j = 25 °C V_i = -20 to -30 V T_j = 25 °C			300 250	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			150 75	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.2	mA
ΔI_d	Quiescent Current Change	V_i = -20 to -30 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		90		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -18.5 to -28.5 V	33	39		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L05AB AND L79L05AC

(refer to the test circuits, V_i = -10V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L05AC, T_j = -40 to 125 °C for L78L05AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-4.8	-5	-5.2	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -7 to -20 V I_o = 1 to 70 mA V_i = -10 V	-4.75 -4.75		-5.25 -5.25	V V
ΔV_o	Line Regulation	V_i = -7 to -20 V T_j = 25 °C V_i = -8 to -20 V T_j = 25 °C			150 100	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			60 30	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = -8 to -20 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		40		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -8 to -18 V	41	49		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L06AB AND L79L06AC

(refer to the test circuits, V_i = -12V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L06AC, T_j = -40 to 125 °C for L78L06AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-5.76	-6	-6.24	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -8.5 to -20 V I_o = 1 to 70 mA V_i = -12 V	-5.7 -5.7		-6.3 -6.3	V V
ΔV_o	Line Regulation	V_i = -8.5 to -20 V T_j = 25 °C V_i = -9 to -20 V T_j = 25 °C			150 100	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			60 30	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = -9 to -20 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		50		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -9 to -20 V	39	46		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L08AB AND L79L08AC

(refer to the test circuits, V_i = -14V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L08AC, T_j = -40 to 125 °C for L78L08AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-7.68	-8	-8.32	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -10.5 to -23 V I_o = 1 to 70 mA V_i = -14 V	-7.6 -7.6		-8.4 -8.4	V V
ΔV_o	Line Regulation	V_i = -10.5 to -23 V T_j = 25 °C V_i = -11 to -23 V T_j = 25 °C			175 125	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			80 40	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = -11 to -23 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		60		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -12 to -23 V	37	45		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L09AB AND L79L09AC

(refer to the test circuits, V_i = -15V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L09AC, T_j = -40 to 125 °C for L78L09AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-8.64	-9	-9.36	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -11.5 to -23 V I_o = 1 to 70 mA V_i = -15 V	-8.55 -8.55		-9.45 -9.45	V V
ΔV_o	Line Regulation	V_i = -11.5 to -23 V T_j = 25 °C V_i = -12 to -23 V T_j = 25 °C			225 150	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			80 40	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6 5.5	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = -12 to -23 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		70		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -12 to -23 V	37	44		dB
V_d	Dropout Voltage			1.7		V

ELECTRICAL CHARACTERISTICS FOR L79L12AB AND L79L12AC

(refer to the test circuits, V_i = -19V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L12AC, T_j = -40 to 125 °C for L78L12AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-11.5	-12	-12.5	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -14.5 to -27 V I_o = 1 to 70 mA V_i = -19 V	-11.4 -11.4		-12.6 -12.6	V V
ΔV_o	Line Regulation	V_i = -14.5 to -27 V T_j = 25 °C V_i = -16 to -27 V T_j = 25 °C			250 200	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			100 50	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = -16 to -27 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		80		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -15 to -25 V	37	42		dB
V_d	Dropout Voltage			1.7		V

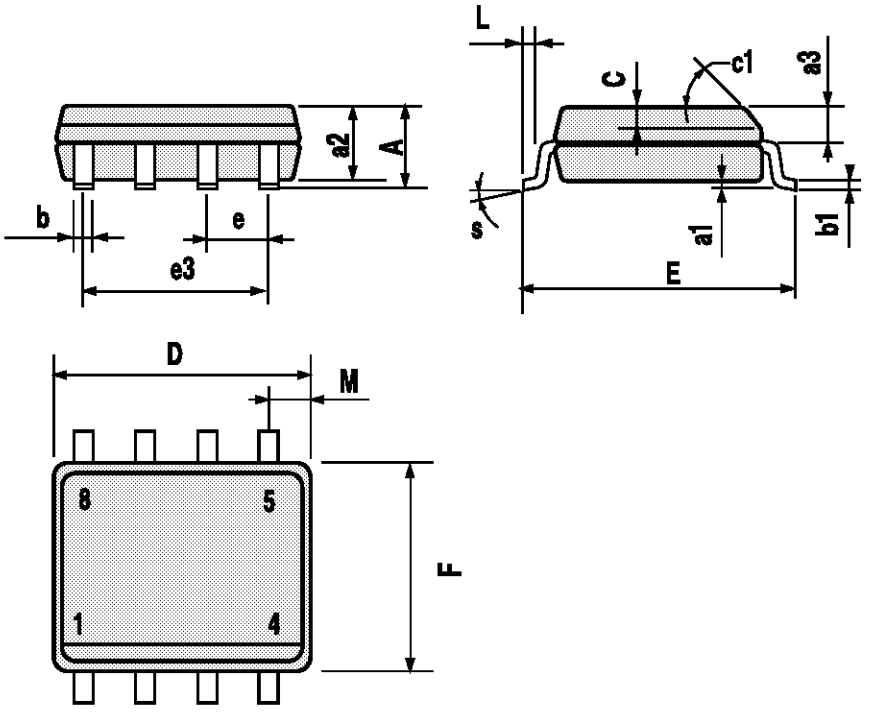
ELECTRICAL CHARACTERISTICS FOR L79L15AB AND L79L15AC

(refer to the test circuits, V_i = -23V, I_o = 40 mA, C_i = 0.33 µF, C_o = 0.1 µF, T_j = 0 to 125 °C for L78L15AC, T_j = -40 to 125 °C for L78L15AB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	-14.4	-15	-15.6	V
V_o	Output Voltage	I_o = 1 to 40 mA V_i = -17.5 to -30 V I_o = 1 to 70 mA V_i = -23 V	-14.25 -14.25		-15.75 -15.75	V V
ΔV_o	Line Regulation	V_i = -17.5 to -30 V T_j = 25 °C V_i = -20 to -30 V T_j = 25 °C			300 250	mV mV
ΔV_o	Load Regulation	I_o = 1 to 100 mA T_j = 25 °C I_o = 1 to 40 mA T_j = 25 °C			150 75	mV mV
I_d	Quiescent Current	T_j = 25 °C T_j = 125 °C			6.5 6	mA mA
ΔI_d	Quiescent Current Change	I_o = 1 to 40 mA			0.1	mA
ΔI_d	Quiescent Current Change	V_i = -20 to -30 V			1.5	mA
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		90		µV
SVR	Supply Voltage Rejection	I_o = 40 mA f = 120 Hz T_j = 25 °C V_i = -18.5 to -28.5 V	34	39		dB
V_d	Dropout Voltage			1.7		V

SO8 MECHANICAL DATA

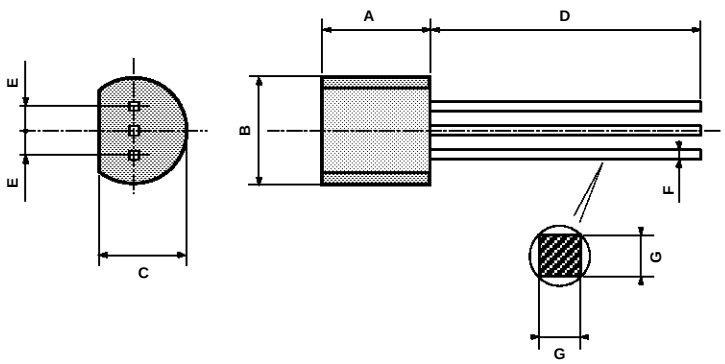
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45° (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8° (max.)					



P013M

TO-92 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.58		5.33	0.180		0.210
B	4.45		5.2	0.175		0.204
C	3.2		4.2	0.126		0.165
D	12.7			0.500		
E		1.27			0.050	
F	0.4		0.51	0.016		0.020
G	0.35			0.14		



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsability for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may results from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied.
SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectonics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A