

LINEAR INTEGRATED CIRCUITS



POSITIVE VOLTAGE REGULATORS WITH RECTIFYING BRIDGE

- OUTPUT VOLTAGE: 5V, 12V AND 15V
- OUTPUT CURRENT UP TO 500 mA
- SHORT CIRCUIT PROTECTION
- THERMAL OVERLOAD PROTECTION
- OVERVOLTAGE PROTECTION (60V - 10 ms)

The L194-5, L194-12 and L194-15 are fixed voltage regulators assembled in Pentawatt® package. They incorporate a rectifying diode bridge with 7A surge current capability.

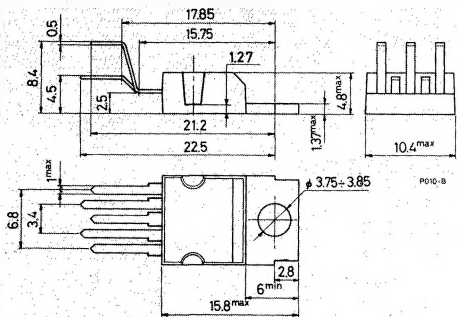
ABSOLUTE MAXIMUM RATINGS

V_i	Peak input voltage (10ms)	60	V
V_i	DC input voltage (at pin 2)	40	V
V_i	AC input voltage (rms)	28	V
V_R	Peak reverse voltage across each diode	80	V
I_D	Input diode repetitive current	2	A
I_{DS}	Input diode surge current (10 ms)	7	A
I_o	Output current	Internally limited	
P_{tot}	Power dissipation	Internally limited	
T_{stg}	Storage temperature	-65 to +150	°C
T_j	Operating junction temperature	-25 to +150	°C

ORDERING NUMBERS: L194-5V ($V_o = 5V$)
L194-12V ($V_o = 12V$)
L194-15V ($V_o = 15V$)

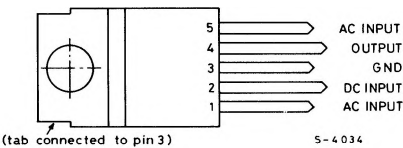
MECHANICAL DATA

Dimensions in mm

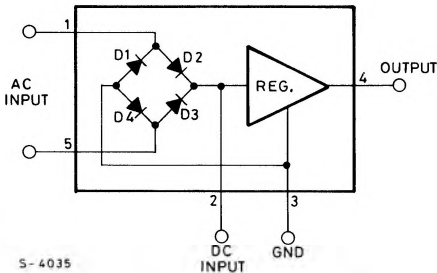




CONNECTION DIAGRAM (top view)



BLOCK DIAGRAM



THERMAL DATA

$R_{th\ j-case}$	Thermal resistance junction-case	max	4	$^{\circ}C/W$
$R_{th\ j-amb}$	Thermal resistance junction-ambient	max	50	$^{\circ}C/W$

ELECTRICAL CHARACTERISTICS ($T_j = 25^{\circ}C$)

Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_d Quiescent drain current	$I_o = 0$ V_i (pin 2) = 28V		5	14	mA
V_o Output voltage	$I_o = 100\text{ mA}$ $V_i = 15\text{V}$ (L194-5) $V_i = 22\text{V}$ (L194-12) $V_i = 25\text{V}$ (L194-15)	4.75 11.4 14.25	5 12 15	5.25 12.6 15.75	V
ΔV_o Line Regulation	$I_o = 100\text{ mA}$ $V_i = 8\text{ to }18\text{V}$ (L194-5) $V_i = 15\text{ to }25\text{V}$ (L194-12) $V_i = 18\text{ to }28\text{V}$ (L194-15)		5 10 15		mV

ELECTRICAL CHARACTERISTICS (continued)

Parameter	Test conditions	Min.	Typ.	Max.	Unit
$\frac{\Delta V_o}{V_o}$ Load Regulation	$I_o = 10$ to 250 mA $V_i = 15$ V (L194-5) $V_i = 22$ V (L194-12) $V_i = 25$ V (L194-15)		1 1 1		%
V_{i-o} Dropout voltage (pin 2-4)	$I_o = 300$ mA		2	3	V
$\frac{\Delta V_o}{\Delta T}$ Output voltage drift	$I_o = 100$ mA $V_i = 15$ V (L194-5) $V_i = 22$ V (L194-12) $V_i = 25$ V (L194-15)		0.3 0.6 0.8		mV/°C
I_o Output current	$\frac{\Delta V_o}{V_o} \leq 1\%$ L194-5/12 L194-15 (*)	500 300			mA
I_{sc} Short-circuit current	$V_i = 15$ V (L194-5) $V_i = 22$ V (L194-12) $V_i = 25$ V (L194-15)		700 500 400		mA
I_p Peak output current		0.7		1.4	A
SVR Supply voltage Rejection	$f = 100$ Hz $I_o = 200$ mA $\Delta V_i = 10$ V L194-5/12 L194-15		46 40		dB
R_o Output Resistance	$f = 1$ kHz $I_o = 100$ mA		80		mΩ
V_d Diode Forward Voltage	$I_f = 1$ A $I_f = 5$ A		1.6 4.5		V

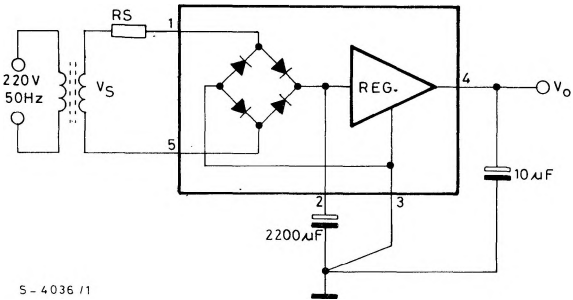
(*) See diagram of fig. 1.

APPLICATION CIRCUIT

In the design of power supplies using the L194, it must be always verified that:

$$I_{peak} = \frac{\sqrt{2} V_s}{R_s} < 7A$$

where R_s is the sum of the transformer resistance, the equivalent diode resistance and external resistors.



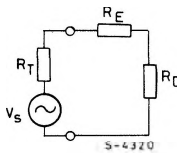
APPLICATION INFORMATION

The Absolute Maximum Ratings guarantee a max of 40V at pin 2 with max peak current of 7A in the rectifying diodes.

To avoid to damage the device, a suitable transformer secondary must be used so that even when there are network variations the limits set are always respected during operation.

For example, with a nominal voltage of 24 V_{rms} the maximum variations due to the transformer tolerance are $\pm 20\%$.

In order to limit (to the maximum value allowed) the current peak, which occurs in diodes during switch-on, an external resistance R_E, in series with the secondary of the transformer, must be introduced. Supposing that the capacitor of the filter is discharged at switch-on, the following equivalent circuit can be drawn:



V_S = Secondary voltage.

R_T = Secondary resistances of transformer.

R_D = Resistance produced by the diode pair involved in conduction.

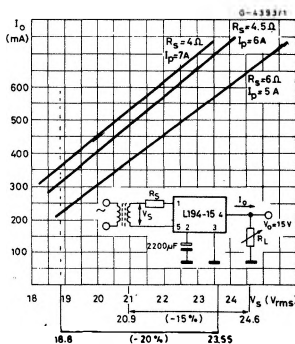
If values R_T and R_D are known R_E is calculated in such a way that the peak current at switch-on does not exceed 7A.

$$R_E \geq \frac{V_{S \text{ peak}} - 7 (R_T + R_D)}{7}$$

For the 5V, with the nominal voltage of the 10VA transformer at 12V and with a total voltage variation of $\pm 15\%$, the transformer secondary is connected directly to pins 1 and 5.

For correct use of the device at 15V the graph in fig. 1 gives the max output current.

Fig. 1 - Guaranteed output current vs. secondary voltage



Note:

V_S nom = 24.6 V_{rms} for 220V $\pm 15\%$.

V_S nom = 23.55 V_{rms} for 220V $\pm 20\%$.