LINEAR INTEGRATED CIRCUITS

L194-5
L194-12
L194-15

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.

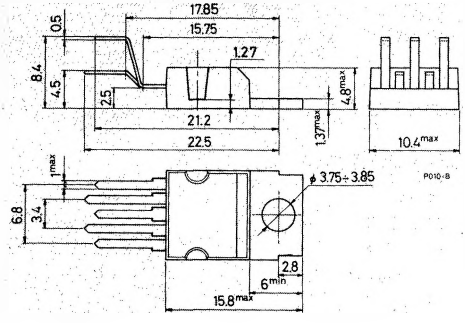
ABSOLUTE MAXIMUM RATINGS

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)

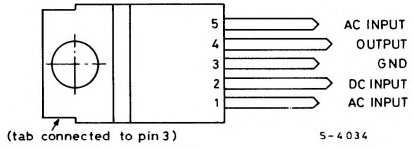
MECHANICAL DATA

Dimensions in mm

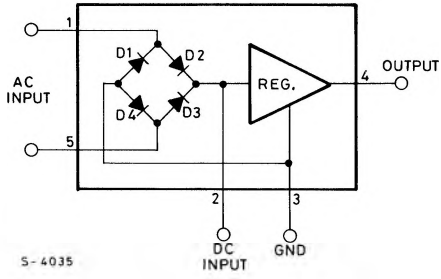


L194-5
L194-12
L194-15

CONNECTION DIAGRAM
(top view)



BLOCK DIAGRAM



THERMAL DATA

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

ELECTRICAL CHARACTERISTICS (T_j = 25°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 mA	V_i = 15V (L194-5) V_i = 22V (L194-12) V_i = 25V (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 mA	V_i = 8 to 18V (L194-5) V_i = 15 to 25V (L194-12) V_i = 18 to 28V (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 = 15V (L194-5) V_i = 22V (L194-12) V_i = 25V (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 = 15V (L194-5) V_i = 22V (L194-12) V_i = 25V (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 = 15V (L194-5) V_i = 22V (L194-12) V_i = 25V (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 ΔV_i = 10V	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 = 1A I_f = 5A			1.6 4.5		V

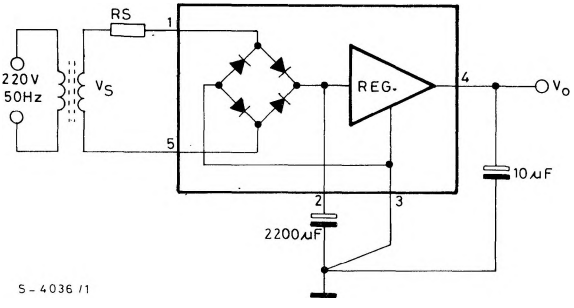
(*) See diagram of fig. 1.

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.



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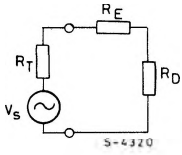
APPLICATION INFORMATION

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 ± 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:



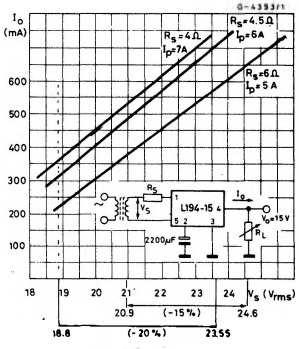
V_S = Secondary voltage.
R_T = Secondary resistances of transformer.
R_D = Resistance produced by the diode pair involved in conduction.

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.

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

For the 5V, with the nominal voltage of the 10VA transformer at 12V and with a total voltage variation of ±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 ± 15%.
V_s nom = 23.55 V_{rms} for 220V ± 20%.