

TEA1620P

STARplug™

Rev. 01 — 17 March 2004

Product data sheet

1. General description

The TEA1620P is a Switched Mode Power Supply (SMPS) controller IC that operates directly from the rectified universal mains. It is implemented in the high voltage EZ-HV™ SOI process, combined with a low voltage BICMOS process.

The device includes a high voltage power switch and a circuit for start-up directly from the rectified mains voltage. A dedicated circuit for valley switching is built in, which makes a very efficient slim-line electronic power-plug concept possible.

In its most basic version of application, the TEA1620P acts as a voltage source. Here, no additional secondary electronics are required. A combined voltage and current source can be realized with minimum costs for external components. Implementation of the TEA1620P renders an efficient and low cost power supply system.

2. Features

- Designed for general purpose supplies
- Integrated power switch: 48 Ω and 650 V
- Operates from universal AC mains supplies: 80 V to 276 V
- Adjustable frequency for flexible design
- RC oscillator for load insensitive regulation loop constant
- Valley switching for minimum switch-on loss
- Frequency reduction at low power output for low standby power: <100 mW
- Adjustable overcurrent protection
- Undervoltage protection
- Temperature protection
- Short winding protection
- Safe restart mode for system fault conditions
- Simple application with both primary and secondary (opto) feedback
- Available in 8-pin DIP package.

3. Applications

- Chargers
- Adapters
- TV and monitor standby supplies
- PC peripherals.

PHILIPS

4. Quick reference data

Table 1: Quick reference data

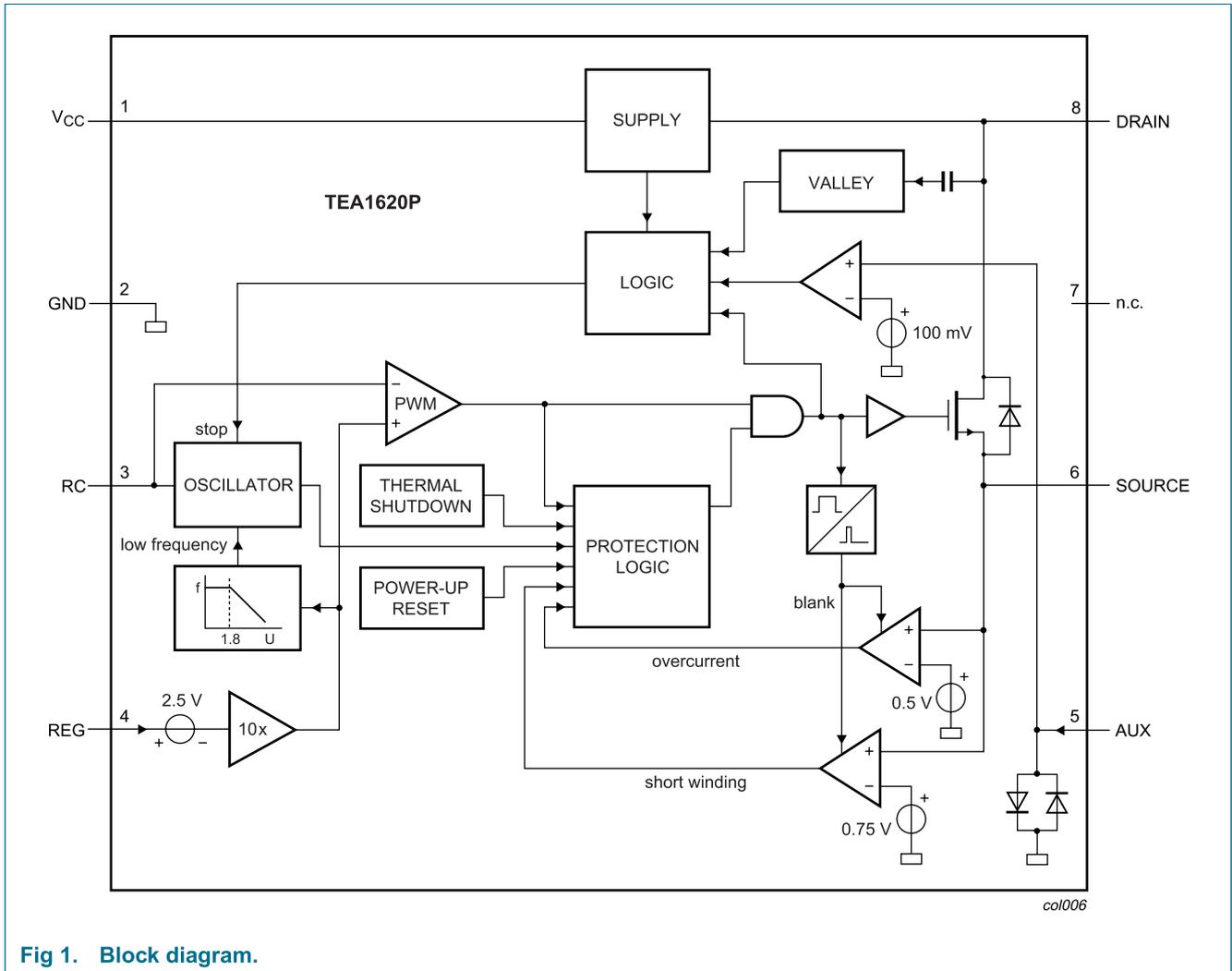
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC(max)}$	maximum supply voltage		-	-	40	V
$V_{DRAIN(max)}$	maximum voltage at pin DRAIN	$T_j > 0\text{ °C}$	-	-	650	V
I_{DRAIN}	supply current drawn from pin DRAIN	no auxiliary supply	-	0.5	-	mA
R_{DSon}	drain-source on-state resistance	$I_{SOURCE} = -0.06\text{ A}$				
		$T_j = 25\text{ °C}$	-	48	55.2	Ω
		$T_j = 100\text{ °C}$	-	68	78.2	Ω
f_{osc}	oscillator frequency range		10	-	200	kHz
T_{amb}	ambient temperature		-20	-	+85	$^{\circ}\text{C}$

5. Ordering information

Table 2: Ordering information

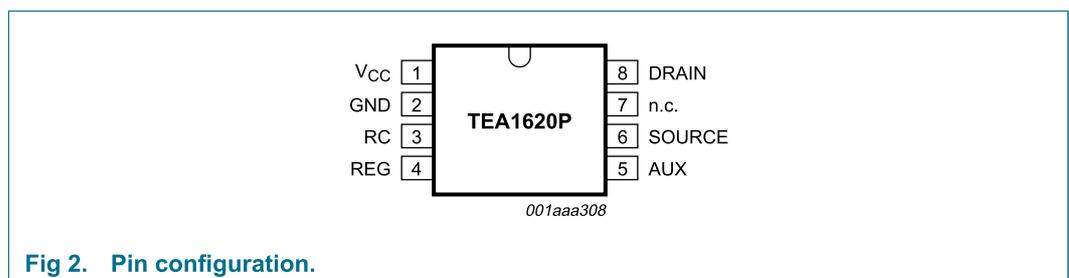
Type number	Package		
	Name	Description	Version
TEA1620P	DIP8	plastic dual in-line package; 8 leads (300 mil)	SOT97-1

6. Block diagram



7. Pinning information

7.1 Pinning



7.2 Pin description

Table 3: Pin description

Symbol	Pin	Description
V_{CC}	1	supply voltage
GND	2	ground
RC	3	frequency setting
REG	4	regulation input
AUX	5	input for voltage from auxiliary winding for timing (demagnetization)
SOURCE	6	source of internal MOS switch
n.c.	7	not connected
DRAIN	8	drain of internal MOS switch; input for start-up current and valley sensing

8. Functional description

The TEA1620P is the heart of a compact flyback converter, with the IC placed at the primary side. The auxiliary winding of the transformer can be used for indirect feedback to control the isolated output. This additional winding also powers the IC. A more accurate control of the output voltage and/or current can be implemented with an additional secondary sensing circuit and optocoupler feedback.

The TEA1620P uses voltage mode control. The frequency is determined by the maximum transformer demagnetizing time and the time of the oscillator. In the first case, the converter operates in the Self Oscillating Power Supply (SOPS) mode. In the latter case, it operates at a constant frequency, which can be adjusted with external components R_{RC} and C_{RC} . This mode is called Pulse Width Modulation (PWM). Furthermore, a primary stroke is started only in a valley of the secondary ringing. This valley switching principle minimizes capacitive switch-on losses.

8.1 Start-up and undervoltage lock-out

Initially, the IC is self supplying from the rectified mains voltage. The IC starts switching as soon as the voltage on pin V_{CC} passes the $V_{CC(start)}$ level. The supply is taken over by the auxiliary winding of the transformer as soon as V_{CC} is high enough and the supply from the line is stopped for high efficiency operation.

As soon as the voltage on pin V_{CC} drops below the $V_{CC(stop)}$ level, the IC stops switching and restarts from the rectified mains voltage.

8.2 Oscillator

The frequency of the oscillator is set by the external resistor and capacitor on pin RC. The external capacitor is charged rapidly to the $V_{RC(max)}$ level and, starting from a new primary stroke, it discharges to the $V_{RC(min)}$ level. Because the discharge is exponential, the relative sensitivity of the duty factor to the regulation voltage at low duty factor is almost equal to the sensitivity at high duty factors. This results in a more constant gain over the duty factor range compared to PWM systems with a linear sawtooth oscillator. Stable operation at low duty factors is easily realized. For high efficiency, the frequency is reduced as soon as the duty factor drops below a certain value. This is accomplished by increasing the oscillator charge time.