



SL443A

ZERO VOLTAGE SWITCH

The SL443A is a symmetrical burst control integrated circuit in an 8-pin DIL plastic package and is mainly intended for manual heat control applications, for example cooker hot plates and powerful hair dryers.

SPECIAL FEATURES

1. Well defined load power/potentiometer displacement characteristics
2. High immunity against spurious triac firing under noisy mains environment (automatic spike filtration)
3. Enables compliance with Cenelec EN50,006/BS5406-1976

- (A) Switching rate controlled
- (B) symmetrical burst control

4. Very low external component count
5. Triac firing pulses inhibited whilst the IC's power supply is being established.

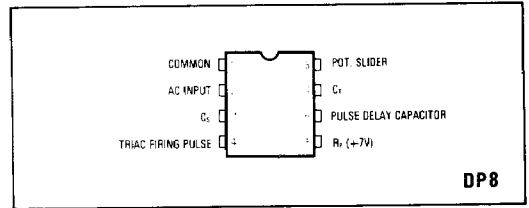


Fig. 1 Pin connections - top view

APPLICATIONS

- Cooker hotplates
- Powerful hairdryers

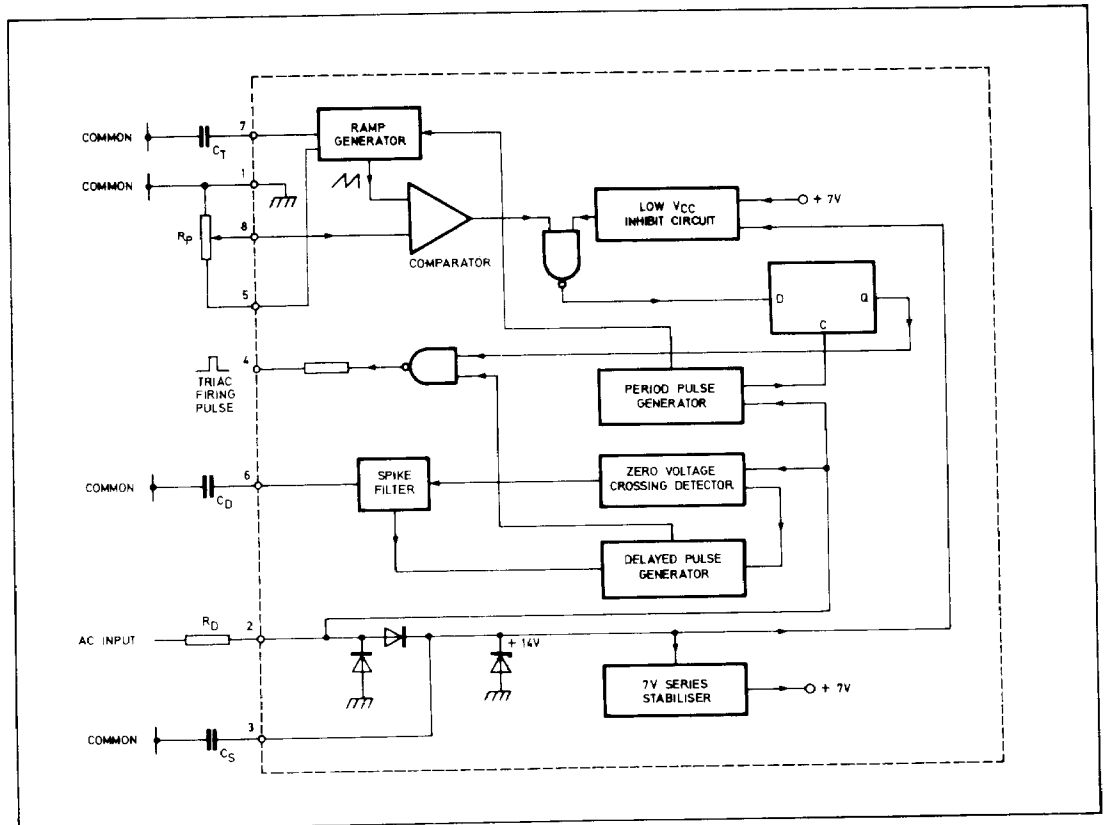


Fig. 2 SL443A block diagram

ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated):

 $T_{amb} = 25^{\circ}\text{C}$,

All voltages measured with respect to common (pin 1)

| Characteristic | Value | | | Units | Conditions |
|--|-------------|-------------|-------------|---------------|---|
| | Min. | Typ. | Max. | | |
| Shunt regulating voltage pin 3 | | 14.7 | | V | $I_3 = 16\text{mA}$ $I_3 = 16\text{mA}$, $T_{amb} = +75^{\circ}\text{C}$ |
| Shunt regulating voltage pin 3 | | | 16 | V | |
| Supply voltage trip level pin 3 | | 12.2 | | V | |
| • Supply current (less I_4 AV, $2 \times I_5$) See Note 1 | | | 7.2 | mA | |
| Potentiometer supply pin 5, V_5 | 6.8 | 7.0 | 7.6 | V | |
| Potentiometer resistance range | 18 | | 140 | k Ω | |
| Triac gate drive pin 4 | | | | | |
| Open circuit ON voltage | | 8.5 | | V | |
| Open circuit OFF voltage | | | 0.1 | V | |
| Output current into 2V drain | 80 | 100 | | mA | |
| Output current into 4V drain | 50 | 70 | | mA | |
| Output current into short circuit | | | 200 | mA | |
| Internal drain resistance | | 800 | | Ω | |
| Control input pin 8 | | | | | |
| Bias current | | | 1 | μA | |
| Internal reference – ramp start | 0.3 | 0.5 | 0.7 | | |
| – ramp finish | $V_5 - 0.5$ | $V_5 - 0.3$ | $V_5 - 0.1$ | | |
| ★ Period of ramp generator – T | 27 | 30 | 33 | s | $(R_P = 100\text{K}, C_t = 0.68\mu)$ (RMS mains voltage=220v) |
| Pin 6 output impedance R6 | 21.5 | 27 | 32.5 | k Ω | |

• The supply current is $0.45 \times$ (RMS current fed into Pin 2)

★ Period of ramp = $T = 2 \times C_t \times R_P \times$ (RMS mains voltage) seconds

ABSOLUTE MAXIMUM RATINGS

Voltages

| | | | |
|-------------------|-----------|-----|-----|
| Voltage on pin 8, | V_{8-1} | Max | 10v |
| Voltage on pin 4, | V_{4-1} | Max | 10v |

Currents

| | | |
|---|-------------------------|-------|
| Supply current, pin 2 peak value $\pm I_{2M}$ | Max | 50mA |
| Non-repetitive peak current ($t_P \geq 250\mu\text{S}$) $\pm I_{2SM}$ | Max | 200mA |
| Output current, pin 5 I_5 | Short circuit protected | |
| Output current, pin 4, average value I_4 (AV) | Max | 10mA |
| | Short circuit protected | |

Temperatures

| | | |
|-------------------------------|-----------|---------------------------------|
| Operating ambient temperature | T_{amb} | -10 to 75°C |
| Storage temperature | T_{STG} | -55 to $+125^{\circ}\text{C}$ |
| Power Dissipation | See Fig.3 | |

CIRCUIT DESCRIPTION

The externally current limited AC supply is applied to the device, and rectification followed by shunt regulation provides a 14V DC supply. This is externally smoothed before application to the 7.0V series stabiliser which feeds the resistance bridge. The stabiliser must be within regulation, or operation of the 'Low Vcc Inhibit' circuit will result. This circuit overrides all other circuitry and prevents unsuitable firing pulses from being supplied to the triac at 'switch-on'. The current limited AC supply also drives the Period Pulse Generator (PPG) and zero voltage crossing circuits.

The PPG produces a single short duration pulse for each completed mains cycle and serves two purposes. Firstly it is used to clock logic information such that the circuit behaves in a symmetrical manner and only complete mains cycles are applied to the load. Secondly the pulse is used to switch timing components in the ramp generator and this enables long time constants to be achieved without having to resort to the use of

electrolytic capacitors.

The zero voltage crossing detector controls a pulse generator that has a delayed output. The delay is necessary since, with loads that are slightly inductive or low power resistive, the triac load current may not reach its required holding level at zero voltage point.

Both delay and pulse duration are defined by an external capacitor and this further serves the purpose of filtering out spikes which occur in the zero crossing region. Automatic rejection takes place of spikes having a duration of up to 50 per cent of the normal width of the triac firing pulse.

The comparator amplifier has differential inputs and these are used to compare the potential appearing on the slider of the control potentiometer with that of the ramp waveform. The output of this amplifier controls the logic circuitry and the potentiometer setting defines the fraction of the ramp period for which the triac is in conduction so controlling the power in the load.

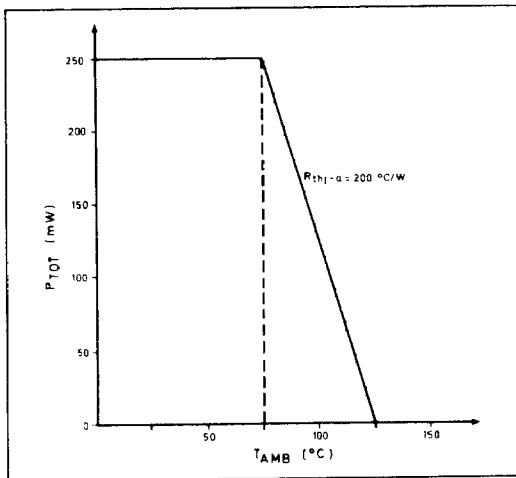


Fig. 3 Power dissipation

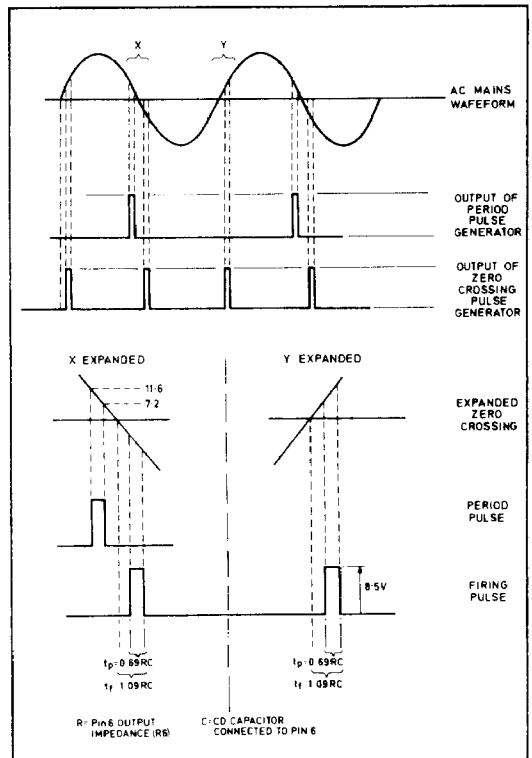


Fig. 4 Pulse timing

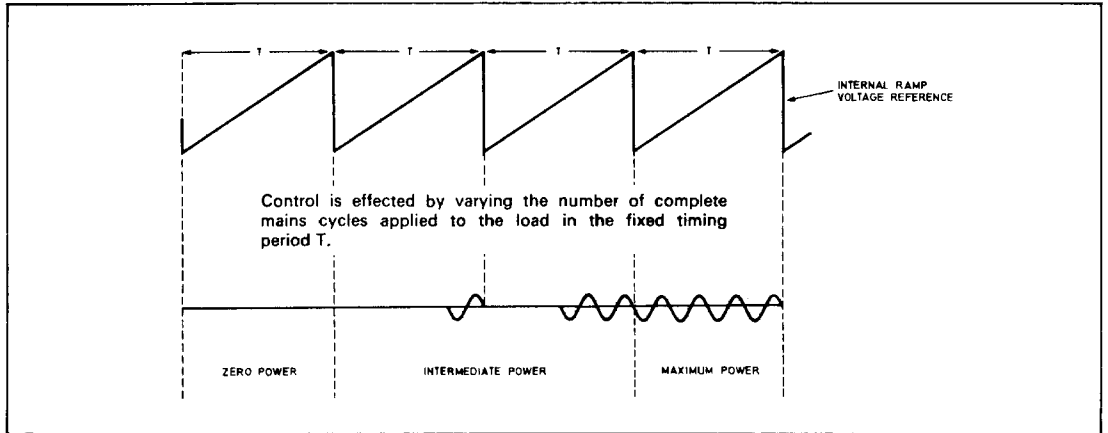


Fig. 5 Method of control