PLESSEY
Semiconductors

ADVANCE INFORMATION

SL441C

ZERO VOLTAGE SWITCH

The SL441C is a symmetrical burst control integrated circuit in an 8 pin DIL package. When used with a triac, AC power may be regulated by varying the number of mains cycles applied to the load in a fixed timing period. The device is especially suited to room temperature control applications including panel heaters, fan heaters etc. Zero Voltage Switching has the advantage of minimising radio frequency interference.

SPECIAL FEATURES

1. Balanced zero voltage point crossing detector, spike filter and pulse generator for reliable triggering of the triac.
2. A period pulse generator and bistable which are arranged to provide symmetrical burst control and eliminate $\frac{1}{2}$ wave firing. (EN50.006, BS5406, 1976)
3. A ramp generator whose output is used to modify an internal reference voltage which is then compared with the voltage appearing on the thermistor to form a proportional control system. The period of the ramp generator is defined externally and may be chosen to limit 'lamp flicker' in accordance with EN50.006/ BS5406, 1976.
4. The comparison amplifier has inbuilt hysteresis to eliminate switching jitter and a spike filter/sampling circuit to provide high immunity to both spikes and coherent 50Hz/60Hz.
5. Thermistor malfunction may be sensed and power automatically removed.
6. A supply voltage sensing circuit which inhibits firing pulses when the supply is inadequate to guarantee proper circuit operation. This eliminates stressing of the triac at switch-on.

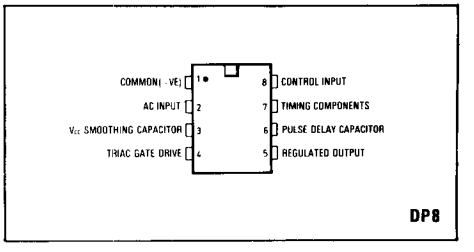


Fig. 1 Pin connections

ABSOLUTE MAXIMUM RATINGS

Voltages

Voltage on pin 8 V_{8-1} Max. 12V
Voltage on pin 4 V_{4-1} Max. 10V

Currents

Supply current (pin 2) Peak value $\pm I_{2M}$ 50mA.
Non-repetitive peak current (tp $\leqslant$250μs) $\pm I_{2SM}$ 200mA.
Output current (pin 5) Max. 5mA Short circuit protected.
Output current (pin 4) average value $I_{4(AV)}$ Max 5mA Short circuit protected.

Temperature

Operating ambient temperature T_{AMB} −10°C to +75°C
Storage temperature T_{STG} −30°C to +125°C

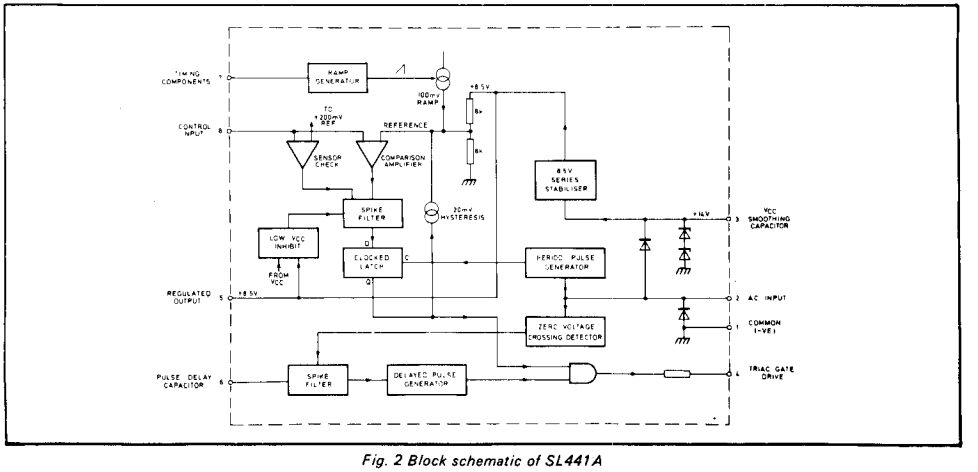


Fig. 2 Block schematic of SL441A

ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated):
T_{AMB} = 25°C
All voltages measured with respect to common (pin 1)

Characteristics	Value			Units
	Min.	Typ.	Max.	
Shunt regulating voltage pin 3 @ 16mA		14.7		V
Shunt regulating voltage pin 3 @ 16mA @ 75°C			16	V
Supply voltage trip level pin 3		12.2		V
Supply current (less I_4AV, I_5) (see Note 1)			7.5	mA
Regulated voltage pin 5	8.0	8.5	9.0	V
Regulated voltage temperature coefficient pin 5	−1		+1	mV/°C
Triac gate drive pin 4 (See Note 2)				
Open circuit ON voltage		8.5		V
Open circuit OFF voltage			0.1	V
Output current into 2V drain	100	130		mA
Output current into 4V drain	65	80		mA
Output current into short circuit			200	mA
Internal drain resistance		800		Ω
Control input pin 8				
Bias current			1	µA
Hysteresis		20		mV
Sensor malfunction circuit operates at	150	200	250	mV
Input working voltage range	0		12	V
Internal reference voltage (Ramp start) (See Note 3)	4.0	4.25	4.5	V
Internal reference voltage (Ramp finish) (See Note 3)		4.35		V
Peak-to-peak amplitude of ramp	70	100	130	mV
Pin 6 output impedance (R6) (See Note 2)	21.5	27	32.5	kΩ
Maximum ripple voltage pin 3			1	V_{P-P}

NOTES
1. The supply current is 0.45 × (RMS current fed into pin 2). I_5 is the current drained from pin 5 externally. I_{4AV} is the average triac gate current supplied each mains cycle.
2. Triac firing pulse. t_p Pulse width = 0.69 $R6C_D$µs typical
   t_f Pulse finish = 1.09 $R6C_D$ µs minimum after zero voltage point R6 in kΩ, C_D in nF See Application circuit
   t_p Nominal (C_D = 2.7nF) = 50µs
   t_f Minimum (C_D = 2.7nF) = 63µs
3. Ramp period = 0.85 ±0.15 × R_TC_T sec. See Application circuit. The actual value of R_t must lie between 500kΩ and 3MΩ.

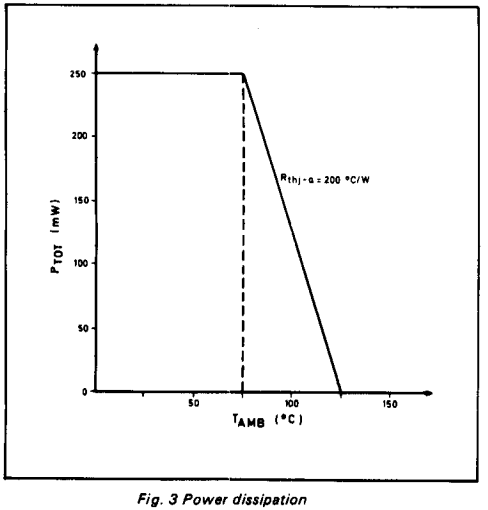


Fig. 3 Power dissipation

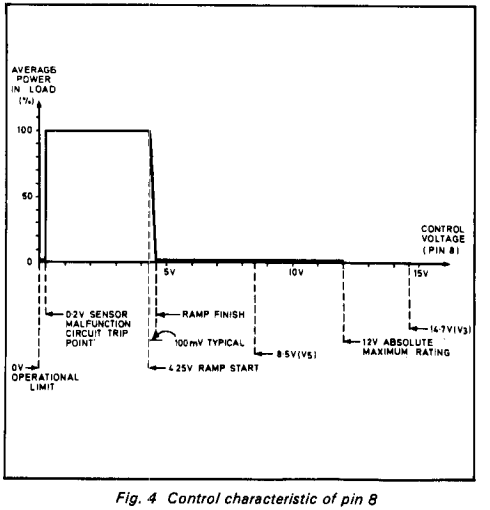


Fig. 4 Control characteristic of pin 8

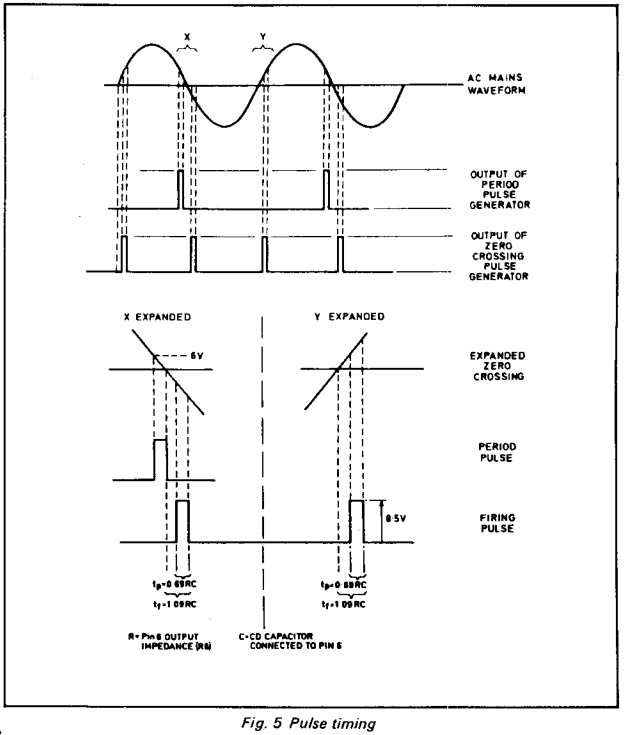
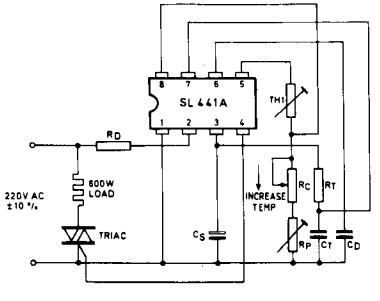


Fig. 5 Pulse timing

APPLICATIONS

Electronic thermostat for room heater

The circuit in Fig. 6 has a sensitivity of nominally 100mV/°C. The width of the proportional control band is nominally 1.0°C and offers a good compromise between temperature stability and regulation performance. For potentiometer control characteristics see Figs. 7 and 8.



SUGGESTED VALUES

R_D	8.2kΩ 5% 6W (less in air stream)	
R_F	22kΩ linear control potentiometer	
R_t	2.7MΩ	} Ramp period = 11 secs.*
C_t	4.7µF 10V TANT	
C_f	47nF (filter if required)	
C_S	150µF 16V	
C_D	2.2nF ±10%	
Triac	TAG 225–400	

TAG 250-400

TH1 NTC thermistor. R_{25} = 10kΩ
B = 4200. e.g. ITT KΩ103

R_X 6.2k ±5% fixed resistor or 10kΩ preset.
See control characteristics Figs. 7 and 8

*If on-off control is required, omit R_T and C_T and link pin 7 to pin 1.

*Fig. 6 Application circuit for proportional temperature control system.**

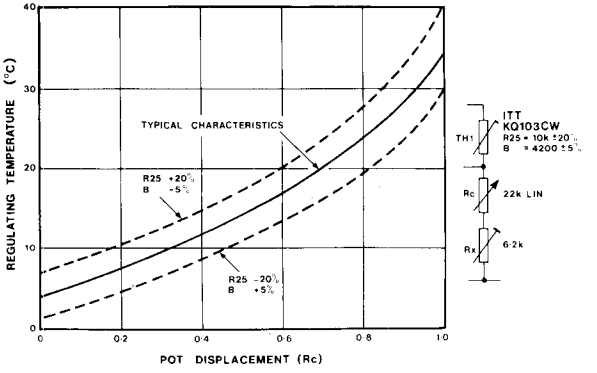


Fig. 7 Control characteristics of electronic room thermostat (mechanical calibration)

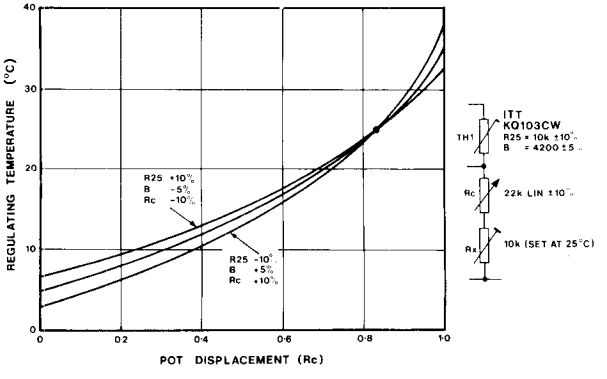


Fig. 8 Control characteristics of electronic room thermostat (electrical calibration)