

## Quartz Controlled Pulse Generator

### Description

The monolithic integrated bipolar circuit, U2391B, is designed as a quartz controlled pulse generator. The tristate input enables the selection of different pulse period durations. The internal switch-on monitoring

achieves the start up of the IC when the power-on occurs. The output pulse can supply a drive signal upto 150 mA, which is short circuit protected.

### Features

- Standard quartz  $f_{osc} = 32.768 \text{ kHz}$
- Minimum operating voltage  $4.5 \text{ V}/1.5 \text{ mA}$
- Pulse width,  $t_p = 31.25 \text{ ms}$
- Power stage with current limitation: typical  $150 \text{ mA}$
- Tristate period selection:  $1/36/60 \text{ s}$
- Reset and disable possibility
- Operation with  $C \cong 33 \text{ pF}$ , as operational time counter possible
- Minimum dimensions due to SO-case

### Application

Operational time counter

Case: SO8

### Block Diagram

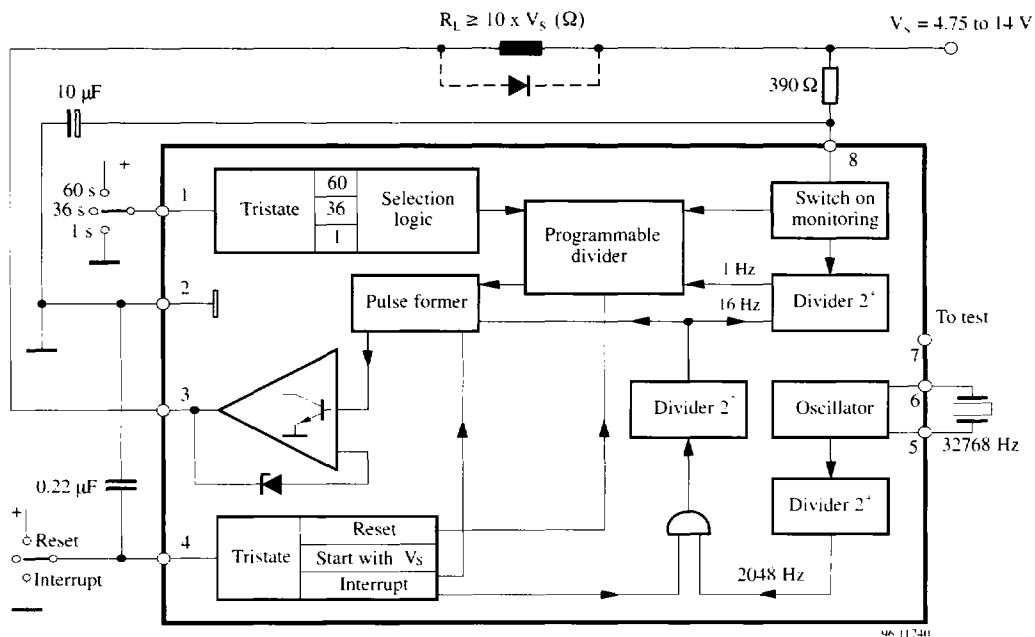


Figure 1. Block diagram with external circuit

## Pin Description

Pin	Symbol	Function
1	Period	Period selection input
2	GND	Ground
3	Output	Output control pulse
4	Contr.	Control input
5, 6	Osc.	Quartz-oscillator input
7	Test	Test logic input/output
8	V <sub>S</sub>	Supply voltage

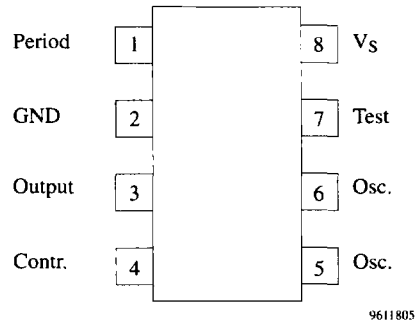


Figure 2. Pinning

## Description

### Pin 1, Period Selection Logic

Period selection at Pin 1 is as follows:

Pin 1 = open,  $\tau = 36 \text{ s}$

Pin 1 = ground  $\tau = 1 \text{ s}$

Pin 1 = V<sub>S</sub> (Pin 8),  $\tau = 60 \text{ s}$

### Pin 2, Ground

### Pin 3, Output Stage

Output stage, being short circuit protected is limited to a current value of typical 150 mA. Apart from it, there is a voltage limitation which controls the power stage at the rate of  $V_3 \geq 28.8$  to 32 V and serves as an active Z-diode. Output pulse width is 31.25 ms when quartz frequency is 32.768 kHz. It is independent of the selected period.

### Pin 4, Control Logic

- Counting delay is typ 1.5 s (maximum 8 s) when Pin 4 is open and V<sub>S</sub> is switched on.
- Programmable residual divider  $\tau \geq 1 \text{ s}$  is resealed if Pin 4 is connected to Pin 8. This results in an absolute tolerance, at the start across "Reset/End" to be  $\leq 1 \text{ s}$ .
- Clock input to the 2<sup>7</sup> divider is inhibited, if Pin 4 is connected to the ground (Pin 2). Absolute tolerance for every interruption is  $\leq 0.488 \text{ ms}$ .

- An interruption is ignored (Pin 4 =  $\perp$ ) during the output pulse time.
- When Pin 4 is switched to V<sub>S</sub> during the output pulse time — this output pulse will be resealed.

### Pin 5, 6 Quartz-Oscillator Input

The propagated period time selection is based on circuit with a low cost clock quartz of 32.768 kHz.

### Pin 7, Test Logic, Figure 2, 3

To test the circuit in a reasonable time, it is possible to control the divider ( $f_0 = 16 \text{ Hz}$ ) at Pin 7 as well as to feed in a higher frequency to the programmed residual counter ( $f_1 \leq 2 \text{ kHz}$ ).

### Pin 8, Supply Voltage

An operating voltage of 4.5 V is necessary for the functioning of the circuit, although an internal switch-on monitoring allows it to operate with a voltage of 3.6 V. This means that there is sufficient reliability for the performance of the circuit.

The circuit is designed for  $12 \text{ V} \pm 10\%$  with internal supply voltage limitation of typical 15 V. In case of higher voltages there is a need of a series resistance and buffer capacitance as shown in figure 1.

## Absolute Maximum Ratings

Reference point Pin 2, unless otherwise specified

Parameters	Symbol	Value	Unit
Supply current $t \leq 10 \mu\text{s}$	Pin 8 $I_S$ $i_s$	30 150	mA
Supply voltage without series resistance	Pin 8 $V_S$	13.2	V
<b>Voltages</b>			
Selection logic	Pin 1 $V_1$	0 to $V_S$	V
Control logic	Pin 4 $V_4$	0 to $V_S$	V
Output stage, without protection circuit	Pin 3 $V_3$	28.8	V
<b>Currents</b>			
Test logic	Pin 7 $I_7$	$\pm 100$	$\mu\text{A}$
Oscillator	Pin 5, 6 $I_{osc}$	$\pm 100$	$\mu\text{A}$
Output stage $t \leq 1 \text{ ms}$	Pin 3 $I_3$	300	mA
<b>Power dissipation</b>			
$T_{amb} = 45^\circ\text{C}$	$P_{tot}$	270	mW
$T_{amb} = 85^\circ\text{C}$		135	
Storage temperature range	$T_{stg}$	-40 to +125	$^\circ\text{C}$
Ambient temperature range	$T_{amb}$	-20 to +100	$^\circ\text{C}$
Junction temperature	$T_j$	125	$^\circ\text{C}$

## Electrical Characteristics

$V_S = 5 \text{ V}$ ,  $T_{amb} = 25^\circ\text{C}$ , figure 1, reference point Pin 2, unless otherwise specified

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
DC supply currents	$V_8 = 5 \text{ V}$ Pin 8 $V_8 = 12 \text{ V}$	$I_S$		1.2	1.5 2	mA
Minimum supply voltage	Pin 8	$V_S$	4.5			V
Supply voltage limitation	$I_8 = 3 \text{ mA}$ Pin 8 $I_8 = 30 \text{ mA}$	$V_S$	13.2	15	16.3 17.2	V
<b>Voltage monitoring</b> Pin 8						
Turn-on threshold		$V_{TON}$		3.6		V
Turn-off threshold		$V_{TOFF}$		2.4		V
Temperature coefficient		-TC		0.33		%/K
Selection logic	Pin 1 = $\perp$ (1 s) Pin 1 = + (60 s)	$I_1$ $-I_1$		6 6		$\mu\text{A}$
Control logic	Pin 4 = 0 V (Interrupt) Pin 4 = 5 V (Reset) Reset current	$I_4$ $-I_4$ $-I_4$	65	45 135	1500	$\mu\text{A}$
<b>Oscillator</b> $f_{osc} = 32768 \text{ Hz}$ , $C_{osc} \geq 33 \text{ pF}$						
Operating current	Pin 5, 6	$-I_{osc}$		20		$\mu\text{A}$
Build-up time		$t_{on}$		1.5	8	s

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
<b>Output stage</b>						
Pin 3						
Saturation voltages	$-I_O = 100 \text{ mA}$ , $V_S = 12 \text{ V}$ $-I_O = 75 \text{ mA}$ , $V_S = 12 \text{ V}$	$V_O$			0.5 0.5	V
Current limitation	$V_3 = 2 \text{ V}$	$-I_O$	100		220	mA
Output pulse width	$f_{osc} = 32768 \text{ Hz}$	$t_p$		31.25		ms
Voltage limitation	$-I_O = 1 \text{ mA}$	$V_{limit}$	28.8		33	V
Reserve current	$V_3 = 12 \text{ V}$	$I_{O(R)}$			10	$\mu\text{A}$
Drive current ( $\Delta I_8$ during $t_p$ )	$V_8 = 5 \text{ V}$ Pin 8 $V_8 = 12 \text{ V}$	$\Delta I_8$		4 10		mA

## Test Circuit

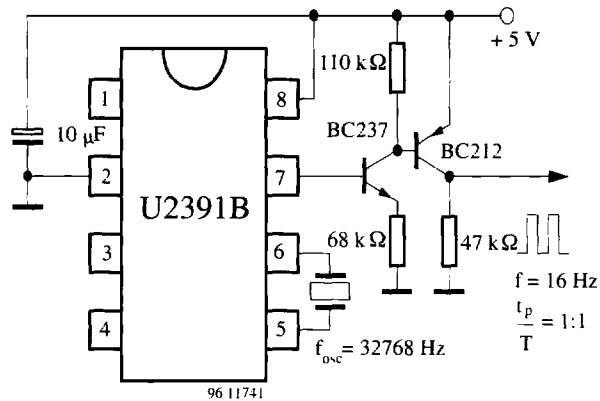


Figure 3. 16 Hz Test

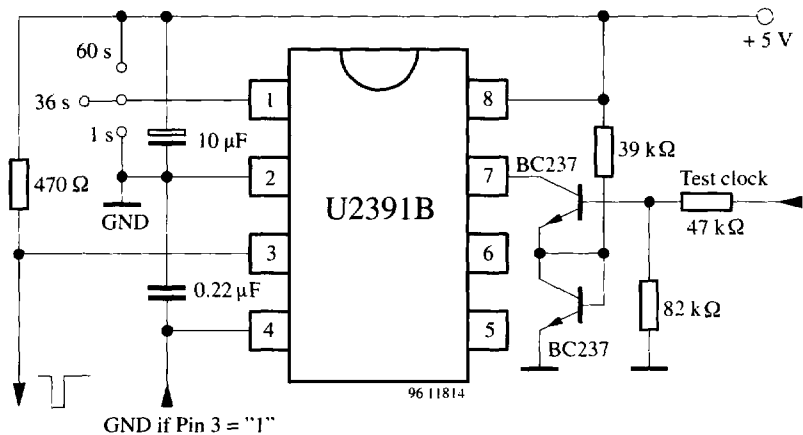


Figure 4. Programmed residual counter  $f_i = 2 \text{ kHz}$  (Test clock)

**Applications**

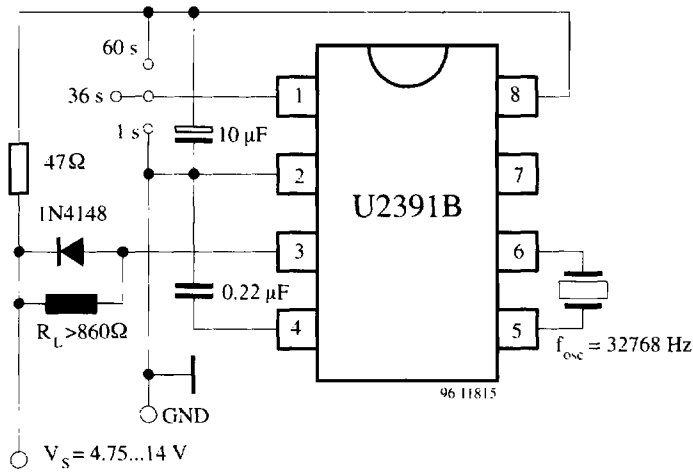


Figure 5. Standard circuit for  $V_S = 4.75$  to  $14$  V, without reset and interruption  
Cycle duration selected by Pin 1

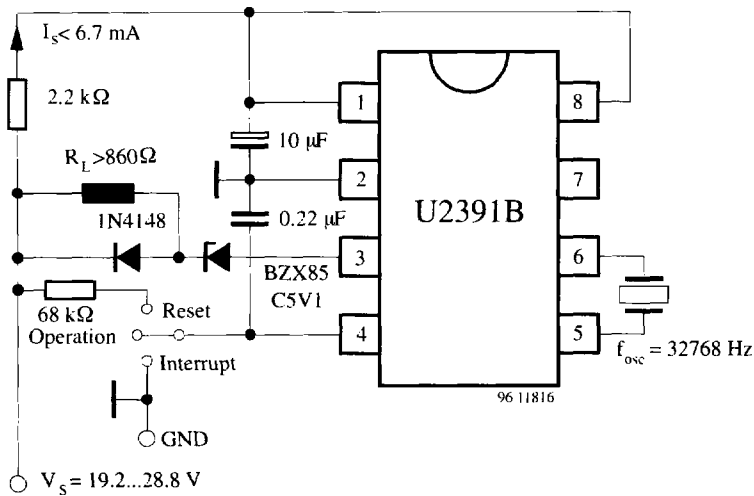


Figure 6.  $V_S = 24$  V  $\pm$  20% with reset and interrupt switch.  
Cycle time  $\tau = 60$  sec.

## Dimensions in mm

Package: SO8

