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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
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Features

- **Phase Controlled Thyristor Ignition**
- **Triggering with Time Delay**
- **Repetition Time Delay**
- **Supply Current ≤ 2 mA**
- **Mains Supply via Resistor**

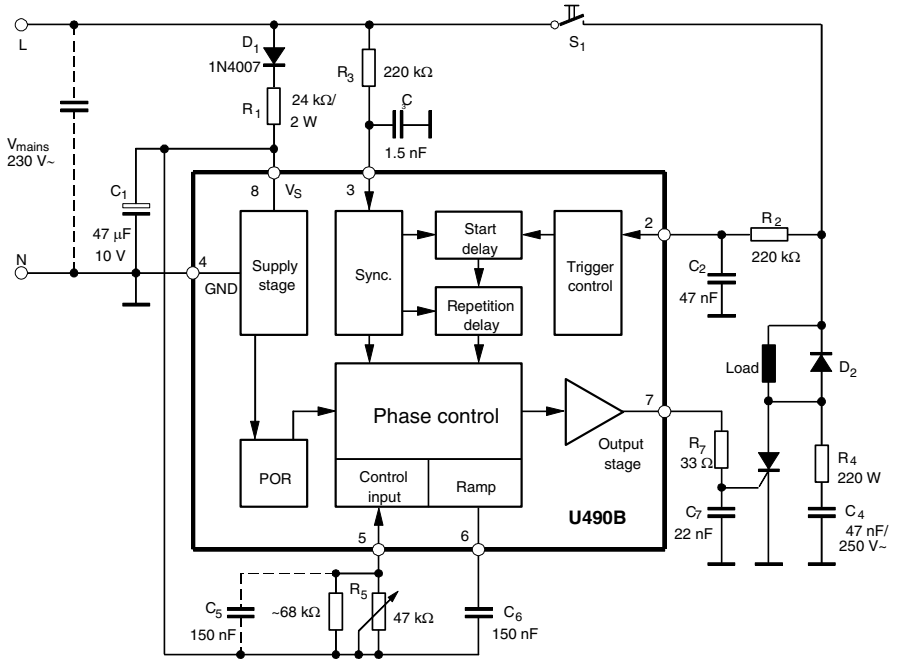
Applications

- **Electric Stapler Devices**

Description

The monolithic integrated bipolar circuit, U490B, is a one-shot power control circuit, designed to control the thyristor which is mainly used in electric stapler devices. The IC is preferred to realize a one-shot phase control, where any phase angle, thus any intensity of the load voltage is adjustable. After successful triggering and the following delay time, an ignition pulse at the output is released. Further triggering is only possible after the delay time elapses.

Figure 1. Block Diagram



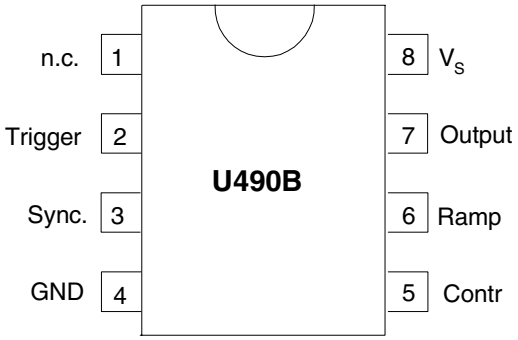
One-shot Phase Control IC

U490B

Rev. 4748A–INDCO–08/03

Pin Configuration

Figure 2. Pinning DIP8/SO8



Pin Description

Pin	Symbol	Function
1	n.c.	Not connected
2	Trigger	Triggering
3	Sync.	Synchronization
4	GND	Ground
5	Contr	Control input
6	Ramp	Ramp
7	Output	Output
8	V_S	Supply voltage

Supply, Pin 8

The internal voltage limiter enables a simple supply from the mains via series resistor R_1. The supply voltage between pin 8 (V_S) and ground (pin 4) builds up via R_1 and is smoothed by the capacitor C_1.

The series resistor R_1 can be calculated as follows:

$$R_{1max} \approx 0.85 \times \frac{V_{mains} - V_{Smax}}{2 \times I_{tot}}$$ where

V_{mains} Mains supply voltage

V_{Smax} Maximum supply voltage

I_{tot} $I_{Smax} + I_X$

I_{Smax} Maximum current consumption of the IC

I_X Current consumption of the external components

Phase Control, Pins 3, 5 and 6

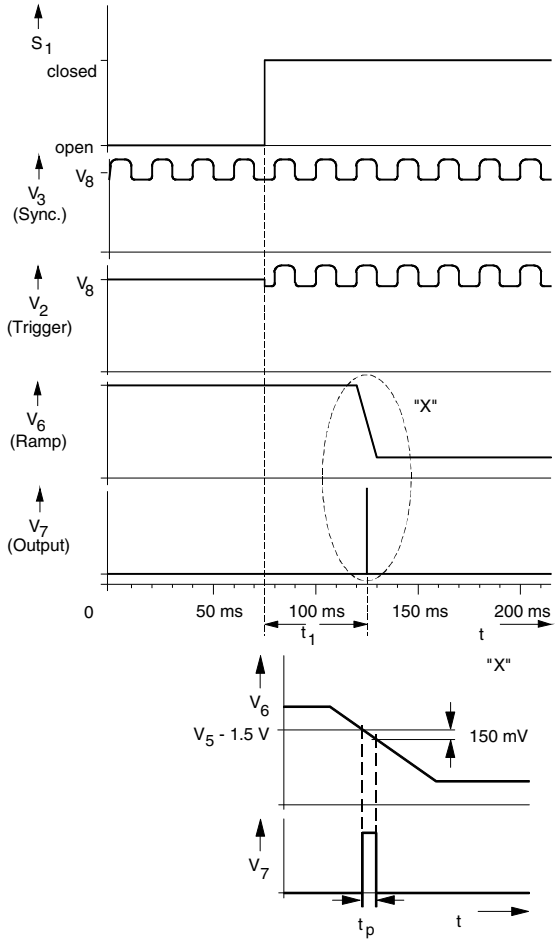
The circuit is synchronized with mains supply through pin 3. As long as the switch S_1 is open, the circuit is in wait state, i.e., the capacitor C_6 (150 nF) is discharged and is kept in this state (High level). When the switch S_1 is closed, there is a current flow in pin 2 which is evaluated by the circuit. If this current flows after the delay time elapses, the phase control is released. The capacitor C_6 is then charged with I_6 + 100 µA towards ground. At the same time, a current of ≈100 µA flows into pin 5, which results in a voltage drop across resistor R_5. The control voltage V_5 is then 1.5 V lower internally.

The output stage is released when the ramp voltage V_6 is equal to (V_5 – 1.5 V). When the voltage difference is ≈150 mV, it is again turned-off.

The result is an output pulse, whose phase shift to the zero crossing of the mains voltage is determined by the resistor R_5 at the control input pin 5 (see Figure 3). The capacitor C_6 is charged to a value of ≈1.5 V. This value is kept until the switch S_1 opens again and the repetition delay time has elapsed.

The circuit is released when four periods of the line voltage have expired after build-up of the operating voltage, before the switch S_1 is closed.

Figure 3. Signal Characteristics



Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Reference point pin 4 (GND), unless otherwise specified

Parameters	Symbol	Value	Unit
Supply current, pin 8 $t \leq 10$ µs	I_S i_s	30 150	mA mA
Output stage			
Input voltage, pin 7	V_I	-0.5 to V_S	V
Input current, pins 2 and 3 $t \leq 1$ ms	$\pm I_I$ $\pm I_I$	5 30	mA mA
Input voltage, pins 5 and 6	V_I	0 to V_8	V
Junction temperature	T_j	+125	°C
Ambient temperature	T_{amb}	-10 to +100	°C
Storage temperature range	T_{stg}	-40 to +125	°C

Thermal Resistance

Parameters		Symbol	Value	Unit
Junction ambient	DIP8	R_{thJA}	110	K/W
	SO8 on p.c.	R_{thJA}	220	K/W
	SO8 on ceramic	R_{thJA}	140	K/W

Electrical Characteristics

V_S = 7 V, T_{amb} = 25°C, reference point pin 4 (GND), unless otherwise specified

Parameters	Test Conditions/ Pins	Symbol	Min.	Typ.	Max.	Unit
Supply voltage limitation	I_S = 3 mA Pin 8 I_S = 30 mA	V_S V_S	7.2 7.4	8.2 8.4	9.2 9.4	V V
Current consumption	V_S = 7 V Pin 8	I_S			2	mA
Voltage Monitoring						
Switch-on threshold Switch-off threshold	Pin 8	V_{Son} V_{Soff}		5 3		V V
Synchronization						
Voltage limitation	I_3 = +1 mA Pin 3 – 8 I_3 = -1 mA	V_{lim} $-V_{lim}$		1.5 0.75		V V
Switch-on threshold Switch-off threshold	Pin 3	I_{Ton} I_{Toff}		120 35		µA µA
Trigger Input						
Voltage limitation	I_2 = +1 mA Pin 2 – 8 I_2 = -1 mA	V_{lim} $-V_{lim}$		1.5 0.75		V V
Switch-on threshold Switch-off threshold	Pin 2	I_{Ton} I_{Toff}		120 35		µA µA
Start delay time Repetition delay time	f_{mains} = 50 Hz Pin 2–7	t_1 t_2	40 60		60 80	ms ms

Electrical Characteristics (Continued)

V_S = 7 V, T_{amb} = 25°C, reference point pin 4 (GND), unless otherwise specified

Parameters	Test Conditions/ Pins	Symbol	Min.	Typ.	Max.	Unit
Phase Control						
Control input: Input voltage range Input current	Pin 5 2 V ≤ V_5 ≤ V_8	 V_I I_I	 2 50	 90	 V_S 130	 V µA
Ramp						
Charge current Discharge current	2 V ≤ V_6 ≤ V_8 - 0.5 V V_5 = 4 V	I_{ch} -Idis	50 2	90	130	µA mA
Phase Shift	C_6 = 150 nF, V_5 = 2 V V_5 =V_8, Pin 7–5	t_{dmax} t_{dmin}		7 600		ms µs
Output Stage, V_7 + 0 V, Pin 7						
Output reverse current Output current	Status OFF Status ON	±Io(r) -Io	 100		10	µA mA
Pulse width	C_6 = 150 nF (see Figure 3 on page 3)	t_p	100	200	300	µs

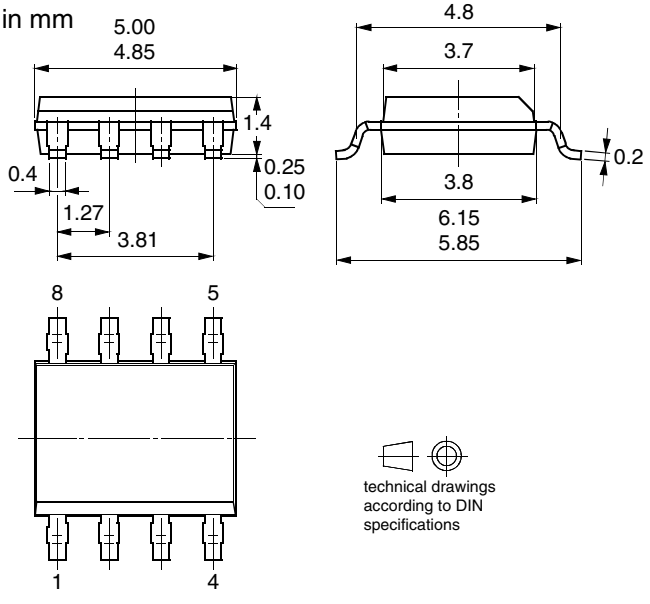
Ordering Information

Extended Type Number	Package	Remarks
U490B-x	DIP8	Tube
U490B-xFP	SO8	Tube
U490B-xFPG3	SO8	Taped and reeled

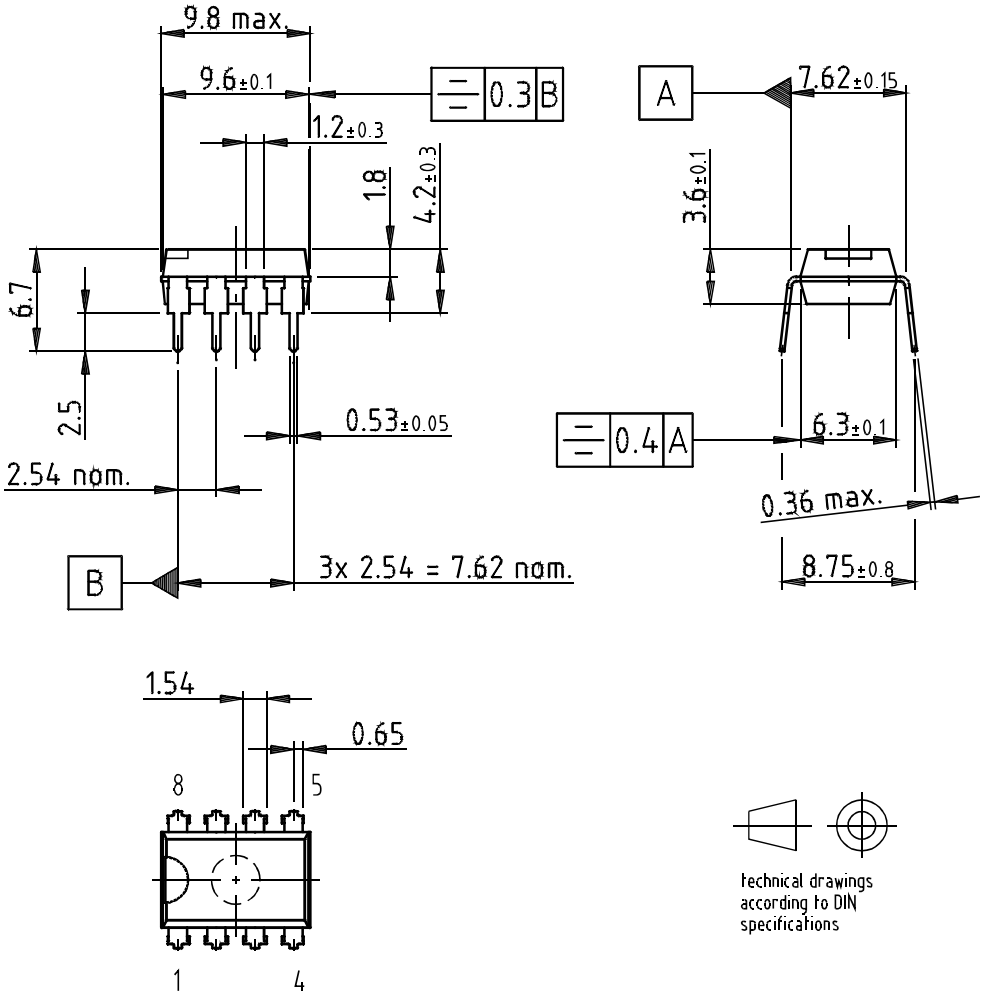
Package Information

Package SO8

Dimensions in mm



Package: DIP 8
Dimensions in mm



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Atmel Corporation

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

Regional Headquarters

Europe
Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
Tel: (41) 26-426-5555
Fax: (41) 26-426-5500

Asia
Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimshatsui
East Kowloon
Hong Kong
Tel: (852) 2721-9778
Fax: (852) 2722-1369

Japan
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Atmel Operations

Memory
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

Microcontrollers
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
Tel: (33) 2-40-18-18-18
Fax: (33) 2-40-18-19-60

ASIC/ASSP/Smart Cards
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13106 Rousset Cedex, France
Tel: (33) 4-42-53-60-00
Fax: (33) 4-42-53-60-01

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Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

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Maxwell Building
East Kilbride G75 0QR, Scotland
Tel: (44) 1355-803-000
Fax: (44) 1355-242-743

RF/Automotive
Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
Tel: (49) 71-31-67-0
Fax: (49) 71-31-67-2340

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Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

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High Speed Converters/RF Datacom
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BP 123
38521 Saint-Egreve Cedex, France
Tel: (33) 4-76-58-30-00
Fax: (33) 4-76-58-34-80

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