Electromechanical Timer Replacement

PIC12C508 Based Timer

Author: *Ravi Pailoor*
Chip Technologies
Bangalore, India

DESCRIPTION

1. CONFIGURATION OF THE PIC12C508.

a) Pin 2 - input for configuration.

b) Pin 3 - output for software PWM generation.

c) Pin 4 - input for start/stop switch.

d) Pin 5 - input for 50 Hz time-base.

e) Pin 6 - output for relay driving.

f) Pin 7 - input for comparator input.

2. POWER SUPPLY.

   Transformer T1, Diodes D1, D2, and D3 with C1, C2, C3, and U3 form the power supply giving 5 volts to the relay and the I.C.s. A transformerless power supply can be used if isolation is required.

3. TIME-BASE

   To generate a time-base for the timer, the second opamp, U2B, is used to generate a square wave of 50 Hz. Alternatively, a resistor and a zener diode can be used for generating a near square wave. Even the internal clocking can be used for the time-base.

4. CONFIGURATION

   Jumper J3 is used to select the range of the time-base. If J3 is open, 0 to 100 second range is selected and if closed 0 to 100 minutes range is selected.

5. START/STOP

   Switch S1 will start the timing and also stop the timer is required.

6. COMPARISON

   The PIC12C508 will generate PWM which is filtered to generate an analog signal. Double filtering can be used for a smoother waveform. This signal is fed to the inverting I/P of the opamp (LM358 used as the comparator). It is then compared to the signal at the non-inverting input. The signal (0 - 5V via potentiometer R5 and resistor R4) to the non-inverting input is proportional to the timing required.

7. OUTPUT

   The SPDT relay is driven by the PIC12C508 on time-out.

OPERATION

On power up the timer goes to standby mode. The time is selected by R5. The range depends on the selection of J3 as explained previously. Once the time is set, the START/STOP button is pressed to start the timing. The PIC12C508 will generate a PWM signal at a ratio of 1:258 (8-bits) and poll pin 7 for a change of state. On detecting the change, the timing is scaled as follows:

256 bits = 100 seconds or minutes

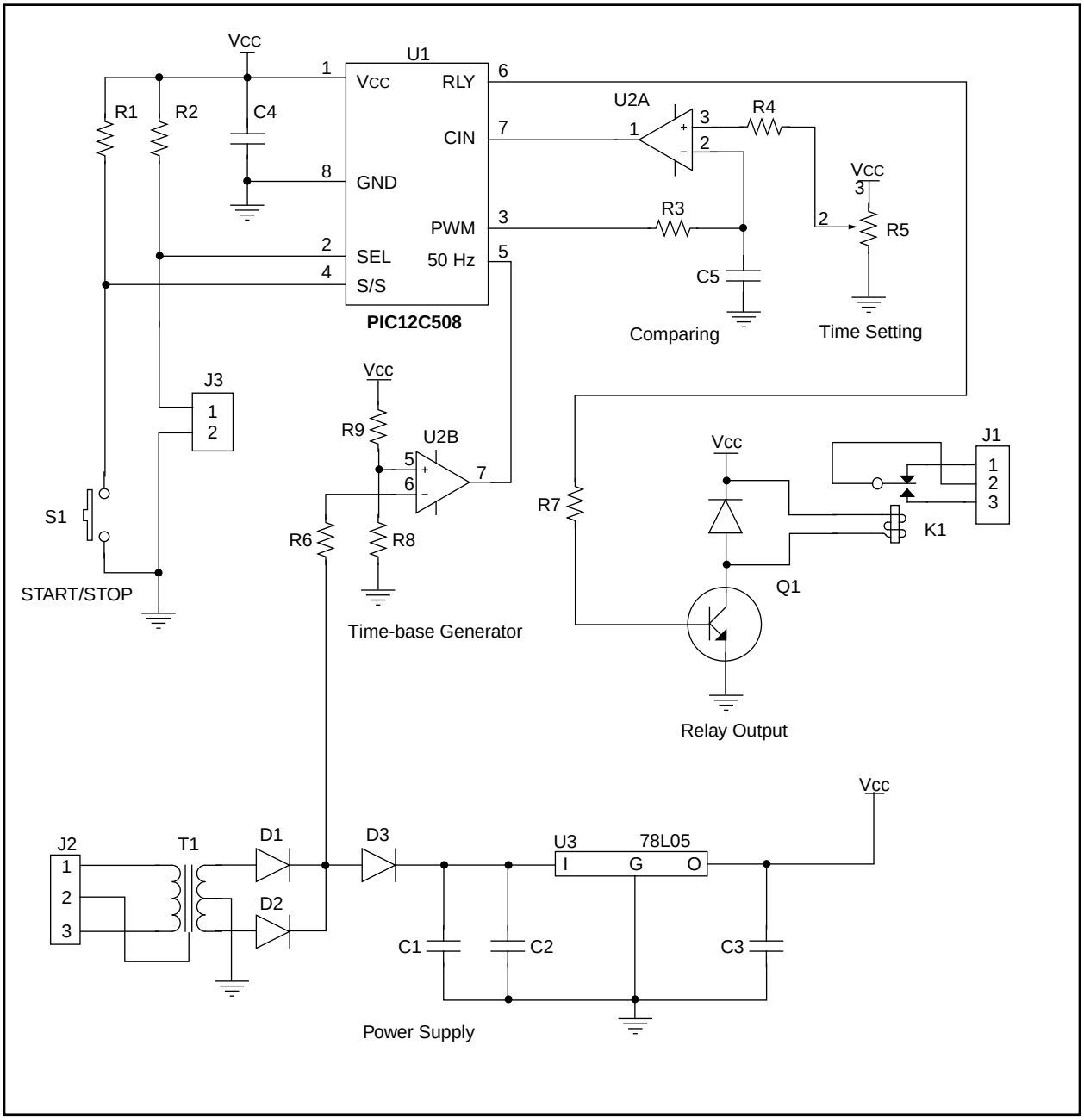
n bits = (n x 100)/256 seconds or minutes

After calculation the relay will be switched on and the timer will start timing out. The 50 Hz input is taken as the time-base and the timer will de-energize the relay on time-out and go to standby mode. At any given time, pressing switch S1 will stop the timer.

Notes:

1. Software generation of PWM and converting to analog will not give 5 volts due to attenuation. Hence the POT setting has to be limited to the generated voltage or the analog voltage will have to be amplified to 5 volts. This voltage will have to be proportional from 0 to 256 bits.
2. Internal or mains based timing is as accurate as crystal based timing.
3. Transformer based power supply is not cost effective but used mainly for isolation.
4. U2B for 50 Hz squaring is used because LM358 has dual opamp and only one is required for comparing.

FIGURE 1: SCHEMATIC



NOTES:

WORLDWIDE SALES & SERVICE

AMERICAS

Corporate Office
Microchip Technology Inc.
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 602-786-7200 Fax: 602-786-7277
Technical Support: 602 786-7627
Web: http://www.microchip.com

Atlanta
Microchip Technology Inc.
500 Sugar Mill Road, Suite 200B
Atlanta, GA 30350
Tel: 770-640-0034 Fax: 770-640-0307

Boston
Microchip Technology Inc.
5 Mount Royal Avenue
Marlborough, MA 01752
Tel: 508-480-9990 Fax: 508-480-8575

Chicago
Microchip Technology Inc.
333 Pierce Road, Suite 180
Itasca, IL 60143
Tel: 630-285-0071 Fax: 630-285-0075

Dallas
Microchip Technology Inc.
14651 Dallas Parkway, Suite 816
Dallas, TX 75240-8809
Tel: 972-991-7177 Fax: 972-991-8588

Dayton
Microchip Technology Inc.
Two Prestige Place, Suite 150
Miamisburg, OH 45342
Tel: 937-291-1654 Fax: 937-291-9175

Los Angeles
Microchip Technology Inc.
18201 Von Karman, Suite 1090
Irvine, CA 92612
Tel: 714-263-1888 Fax: 714-263-1338

New York
Microchip Technology Inc.
150 Motor Parkway, Suite 416
Hauppauge, NY 11788
Tel: 516-273-5305 Fax: 516-273-5335

San Jose
Microchip Technology Inc.
2107 North First Street, Suite 590
San Jose, CA 95131
Tel: 408-436-7950 Fax: 408-436-7955

Toronto
Microchip Technology Inc.
5925 Airport Road, Suite 200
Mississauga, Ontario L4V 1W1, Canada
Tel: 905-405-6279 Fax: 905-405-6253

ASIA/PACIFIC

Hong Kong
Microchip Asia Pacific
RM 3801B, Tower Two
Metroplaza
223 Hing Fong Road
Kwai Fong, N.T., Hong Kong
Tel: 852-2-401-1200 Fax: 852-2-401-3431

India
Microchip Technology Inc.
India Liaison Office
No. 6, Legacy, Convent Road
Bangalore 560 025, India
Tel: 91-80-229-4036 Fax: 91-80-559-9840

Korea
Microchip Technology Korea
168-1, Youngbo Bldg. 3 Floor
Samsung-Dong, Kangnam-Ku
Seoul, Korea
Tel: 82-2-554-7200 Fax: 82-2-558-5934

Shanghai
Microchip Technology
RM 406 Shanghai Golden Bridge Bldg.
2077 Yan'an Road West, Hong Qiao District
Shanghai, PRC 200335
Tel: 86-21-6275-5700
Fax: 86 21-6275-5060

Singapore
Microchip Technology Taiwan
Singapore Branch
200 Middle Road
#10-03 Prime Centre
Singapore 188980
Tel: 65-334-8870 Fax: 65-334-8850

Taiwan, R.O.C
Microchip Technology Taiwan
10F-1C 207
Tung Hua North Road
Taipei, Taiwan, ROC
Tel: 886 2-717-7175 Fax: 886-2-545-0139

EUROPE

United Kingdom
Arizona Microchip Technology Ltd.
Unit 6, The Courtyard
Meadow Bank, Furlong Road
Bourne End, Buckinghamshire SL8 5AJ
Tel: 44-1628-851077 Fax: 44-1628-850259

France
Arizona Microchip Technology SARL
Zone Industrielle de la Bonde
2 Rue du Buisson aux Fraises
91300 Massy, France
Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79

Germany
Arizona Microchip Technology GmbH
Gustav-Heinemann-Ring 125
D-81739 Müchen, Germany
Tel: 49-89-627-144 0 Fax: 49-89-627-144-44

Italy
Arizona Microchip Technology SRL
Centro Direzionale Colleoni
Palazzo Taurus 1 V. Le Colleoni 1
20041 Agrate Brianza
Milan, Italy
Tel: 39-39-6899939 Fax: 39-39-6899883

JAPAN

Microchip Technology Intl. Inc.
Benex S-1 6F
3-18-20, Shinyokohama
Kohoku-Ku, Yokohama-shi
Kanagawa 222 Japan
Tel: 81-45-471- 6166 Fax: 81-45-471-6122

7/29/97