1/300 Timer

Features

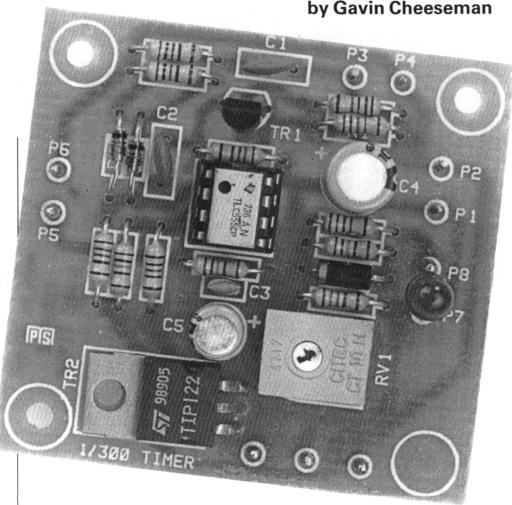
- * Adjustable Operating Period
- **★ Wide Supply Voltage Range**
- **★ Low Current Consumption**
- ★ Switches up to 500mA
- **★ LED Output State Indicator**

Introduction

Many applications call for a short duration timer to provide a 'time out' (auto switch off) function for devices such as lights and sounders after a set period. The 1/300 timer provides a switched output with an adjustable period of between approximately 1 second and 5 minutes. Current up to a maximum of 500mA may be switched using the timer module making it ideal for driving relays, sirens, etc. A light emitting diode is included in the design to provide an indication of the output state.

Circuit Description

Referring to Figure 1, it may be seen that the circuit is based around the TLC555 timer IC; this device is a low power CMOS version of the NE555 timer and has the additional advantage that it typically draws around 1/50 of the current of the standard device. Additional features have been implemented to make the 1/300 Timer more versatile than a



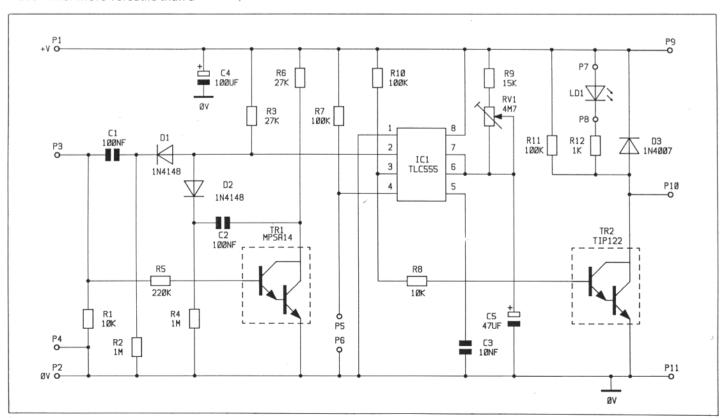


Figure 1. Circuit Diagram

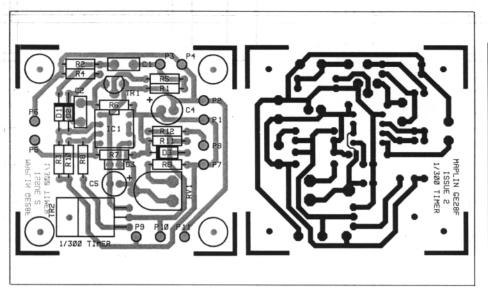


Figure 2. Track and Legend

circuit based around the IC alone.

As standard, the TLC555 is triggered by a negative going pulse on the trigger pin; although this is usually quite acceptable, there are applications in which it is necessary to trigger the device on both negative and positive going pulses. To allow for this possibility, an inverter circuit is included in the design to invert positive pulses to negative pulses suitable to trigger the timer. Capacitors, C1 and C2 isolate the input from DC whilst allowing a pulse to pass unhindered. If DC is applied between P3 and P4, the capacitor charges rapidly, producing a suitable pulse to trigger the IC. Diodes D1 and D2 allow only negative going pulses to reach the trigger input of IC1. Resistors R1 and R2 provide a discharge path for C1 so that the circuit may be quickly re-triggered and R3 pulls up the trigger input of IC1 allowing it to be pulsed low.

The operating period of the timer is determined by the value of R9, RV1 and C5. Preset resistor RV1 is included in the circuit to allow period adjustment providing a minimum/maximum ratio of approximately 1/300. With the values included in the kit, on-times of between around 1 second and 5 minutes are possible.

Resistor R10 acts as a load for IC1 and the output from the device is fed to the base of transistor TR2 via current limiting resistor R8. A darlington transistor is used for TR2 as this exhibits a higher input impedance and a superior switching characteristic to most single bipolar transistors. Diode D3 protects TR2 from damage due to any high voltage spikes that may develop when driving inductive loads such as relay coils. An indication of the output state is provided by light emitting diode LD1, which lights when TR2 is switched on; the current through the LED is limited by R12. So that the module may be used to drive additional high impedance circuitry, R11 is included to provide a load for the transistor when no other load is

connected. The value of R11 can be changed to suit different drive requirements.

Construction

Insert and solder the components onto the PCB referring to the legend (Figure 2). It is a good idea to start with the resistors as these are relatively small and may be more awkward to fit once the other components are in place. Take care when soldering RV1 as it can be easily damaged if overheated. Next fit the IC socket, ensuring that the notch at one end corresponds with the polarity marking on the PCB legend. Do not insert the IC until all of the other components have been soldered in place. When fitting the capacitors make sure that the lead marked by a negative (-) symbol on the polarised (electrolytic) capacitors is positioned away from the positive (+) symbol marked on the printed circuit board. Diodes D1 - D3, as with all semiconductors require some caution during installation; in particular, make sure that you do not overheat these during soldering and that you observe the polarity markings on the legend. The end of the diode marked by a band should line up with that on the PCB outline. Similar considerations apply to transistor TR1, where the case of the transistor should be positioned so that it corresponds with the outline on the legend. Transistor TR2 has a different package style and is fitted so that its heatsink mounting tab is in contact with the surface of the PCB as shown

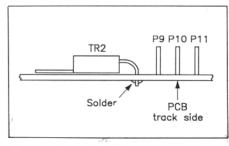


Figure 3. Mounting TR2

in Figure 3. Finally, insert PCB pins P1 -P11 into the PCB and press them into position using a hot soldering iron. When the pins are heated in this way, very little pressure should be required to push them into place. Once correctly positioned the pins can then be soldered. Finally, insert IC1 into the socket so that the polarity notch is at the same end as that on the PCB outline. LED indicator LD1 may either be wired to the PCB pins directly or via a short length of cable: the cathode of the LED is indicated by the short lead and the flat side of the case. For further information on soldering and construction techniques please refer to the constructors' guide included in the kit

Testing

Before applying power to the completed 1/300 timer module, it is a good idea to double check your work to make sure that all of the components are fitted correctly and also to ensure that there are no dry joints or short circuits caused by 'blobs' of solder across adjacent tracks. If a multimeter is available it is a good idea to measure the resistance between the power supply pins (P1 and P2) to make sure that there are no short circuits. The resistance may start off at a relatively low value but this should increase rapidly as the capacitors in the circuit start to charge; the final value after a few seconds of connecting the meter should be in excess of 1000 ohms.

The module requires a 3V – 15V supply that is capable of delivering at least 20mA. If the same power supply is also used to drive the output load (as is usually the case), then the load current must also be added to the current drain of the module. As can be seen from Figure 4, the power supply is connected to P1(+V) and P2(0V). For reliable operation, it is recommended that power supply ripple is kept to a minimum and if possible a regulated supply should be used.

Apply power to the unit and set preset resistor RV1 to the fully clockwise position. If P3 is connected to the positive supply rail (+V), this will trigger the timer and LD1 should then light for a short time (typically around 1 second but the time niay vary slightly depending on the operating conditions). If P3 is connected to +V until LD1 is extinguished and then disconnected the timer will then be triggered by the negative going pulse produced as the potential on P3 returns from the supply voltage to 0V; LD1 should then light for a further period and then return to the off state. If RV1 is then turned to the fully anti-clockwise position and the above test is repeated, the operation of the module will remain the same but the switch on period should then be in the region of 5 minutes.

If a multimeter is available you can measure the voltage between P9 and P10 when the output is both in the on and the off states to check that TR2 is switching properly. In the off state there should be very little potential between the two pins but in the on state the voltage should be only a fraction of a volt less than the supply voltage.

Using the 1/300 Timer

The 1/300 timer can be used in many varied applications requiring a short duration timer. For example, the module could be used to switch off a light automatically if it was left on unnecessarily for an extended period or to switch off an alarm siren after a set period. The maximum operating period is achieved by setting RV1 to the fully anti-clockwise position. It should be remembered that the 1/300 timer is not intended for use in precision applications and the operating times stated may vary considerably due to component tolerances.

In some applications it may be necessary to switch higher voltages or currents than are possible directly. In this case the module can be used to switch a relay which is suitable for higher power switching. The open collector output makes the circuit ideal for operating relays. It is important to make sure that the relay coil is suitable for use at the power supply voltage vou have chosen for the 1/300 Timer and also that the contact rating is correct for the voltage and current level that you are switching. Typical examples of suitable relays for general purpose use are stock codes JM18U for 12V operation and JM17T for 6V operation. Relay coil connections are made to P9 and P10.

PCB pins P5 (reset) and P6 (0V) provide access to the reset line of IC1 to allow the user to inhibit the output of the module independently of the input state. When P5 is not connected the reset line is automatically pulled high, allowing the timer to function normally. Access to the reset input can be useful when it is necessary to return the output to the off state before the timing cycle is complete (to switch off a light manually for example). The timer remains reset as long as P5 is in the low state. If P5 is held low when power is applied to the module, the output will remain in the off condition even if trigger pulses are applied to the input; the timer will only respond to input signals when P5 is allowed to return to the high state.

The 1/300 Timer is ideal for use with the Audio Controlled Switch kit (Stock code LP29G) as it is triggered by both positive and negative going pulses. Figure 5 shows how the two circuits can be interfaced together.

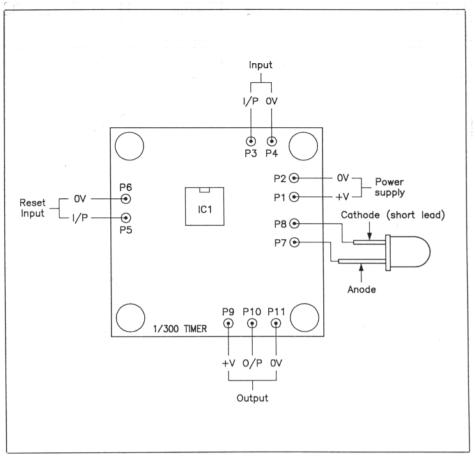


Figure 4. Wiring Diagram

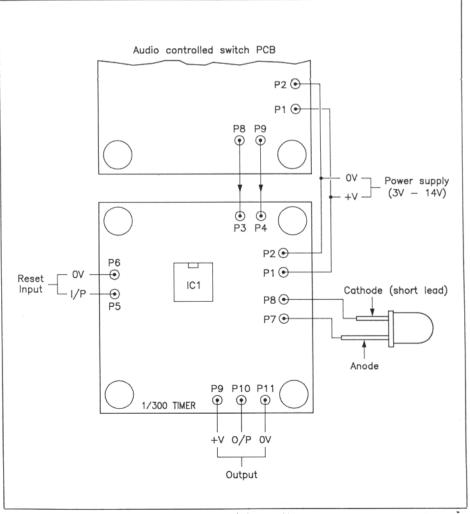


Figure 5. Connection to the Audio Controlled Switch

Specification of prototype

Power Supply Voltage

Power Supply Current
Maximum Load current

Switch-on Period Input Trigger PCB Dimensions With no external load

3V - 15V

12mA Maximum at 12V

500mA

Adjustable Positive & Negative Edge

57mm x 54mm

1s – 310s Approx.

 \pm Supply Voltage

Table 1. Specification of Prototype

When used in this way the timer provides an automatic shut-off facility, switching off the current supply to the load after a preset period. If the two projects are used together it is not necessary to fit R13 or LD1 on the audio control switch module as the timer module has a separate LED indicator.

Finally, Table 1 shows the specification of the prototype 1/300 timer module.

1/300 TIMER PARTS LIST					Semiconductors			
	A II 40/ 0 014/			TR1	MPSA14	1	(QH60Q)	
Resistors: All 1% 0.6W metal film.			TR2	TIP122	1	(WQ73Q)		
				IC1	TLC555CP	1	(RA76H)	
				LD1	LED Red	1	(WL27E)	
R1,8	10k	2	(M10K)	D1,2	1N4148	2	(QL80B)	
R2,4	1M	2	(M1M)	D3	1N4007	1	(QL79L)	
R3,6	27k	2	(M27K)				(42/02/	
R5	220k	1	(M220K)	Miscellan	eous			
R7,10,11	100k	3	(M100K)	P1-11	Pins 2145	1 Pkt	(FL24B)	
R9	15k	1	(M15K)		DIL Socket 8-Pin	1	(BL17T)	
R12	1k	1	(M1K)		PC Board	1	(GE28F)	
RV1	4M7 Hor. Encl. Preset	1	(UH11M)		Constructors Guide	1	(XH79L)	
Capacitors					A complete kit of parts is	a available:		
C1,2	100nF Minidisc	2	(YR75S)	The following item in the kit is also available separately, but is not shown in the 1990 catalogue:				
C3	10nF Ceramic	1	(WX77J)					
C4	100μF 16V Minelect	1	(RA55K)					
C5	47μF 16V Minelect	1	(YY37S)					
00	47 10 10 10 10 10 10 10 10 10 10 10 10 10		(11070)	Adj Time Sw PCB Order As GE28F				



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