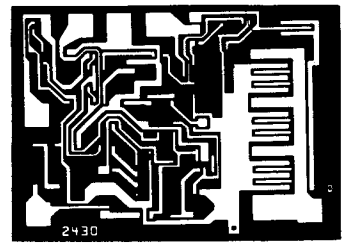
ULN-2430M TIMER

FEATURES

- Microseconds to Minutes
- Temperature Compensated
- 400 mA Output
- 8-Pin Dual In-Line Plastic Package

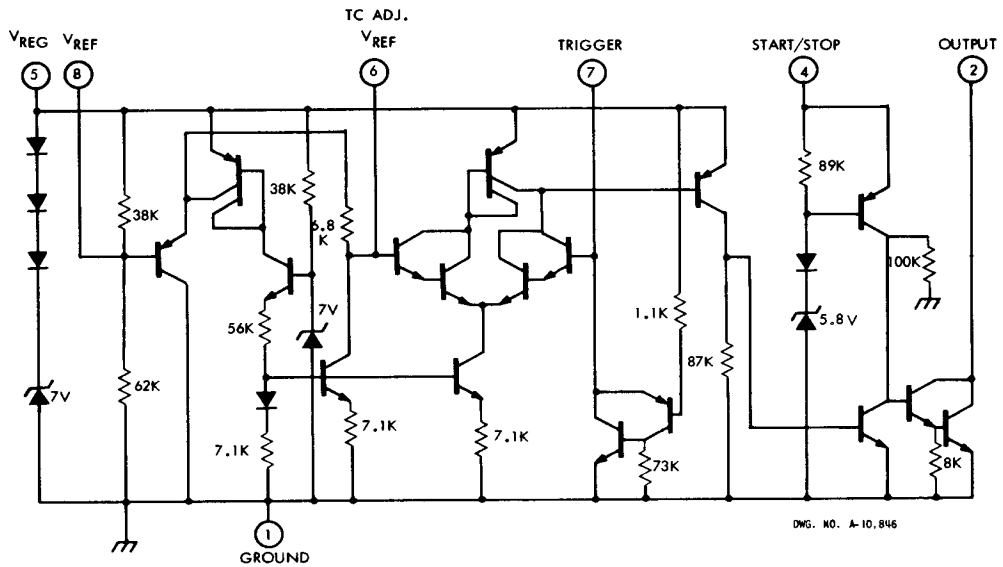


PROVIDING time delays from several microseconds to approximately 10 minutes, the ULN-2430M timer was originally designed for use as a rear window heater timer in automotive applications. In typical system designs, this device will meet all of the stringent automotive environmental and transient requirements, including "load dump". The rugged design, the high output current rating, and an internal voltage regulator and reference allow the ULN-2430M timer to be used in many industrial applications.

ABSOLUTE MAXIMUM RATINGS

Regulator Current, I_{REG}	15 mA
Latch Current, I_4	3 mA
Output Current, I_{OUT}	400 mA
Package Power Dissipation, P_D	330 mW*
Operating Temperature Range, T_A	−40°C to +85°C
Storage Temperature Range, T_S	−65°C to +150°C

*Derate at the rate of 4.2 mW/°C above T_A = +70°C.



ELECTRICAL CHARACTERISTICS at T_A = +25°C (unless otherwise noted), Fig. 1

Characteristic	Test Pin	Test Conditions	Limits			Units
			Min.	Typ.	Max.	
Operating Voltage Range			10	—	16	V
Regulator Voltage	5		8.4	9.0	10.1	V
Output Breakdown Voltage	2	I_{LEAK} = 100 μA	30	—	—	V
Output Saturation Voltage	2	I_{OUT} = 400 mA	—	—	2.5	V
		I_{OUT} = 250 mA	—	—	1.3	V
Latch Voltage	4	Over Op. Temp. Range	5.5	7.0	8.0	V
Trigger Threshold	7	V_7/V_5	0.60	0.63	0.67	
Reference	8	V_8/V_5	0.58	0.63	0.68	
Temp. Coeff. of Trigger Threshold	7		−2.0	—	−4.0	mV/°C
Trigger Input Current	7		—	20	200	nA
Capacitor Discharge Time	7	C_1 = 220 μF, ±10%	—	—	2.0	s
Supply Current	5	V_{CC} = 16 V	—	—	10	mA

CIRCUIT OPERATION

The basic system shown in Figure 1 provides power for the timer after the momentary closure of the "rear window heater switch" S_1. Momentary closure provides an input to pin 4 which turns ON the output driver, energizes the relay, and (through the relay contacts) provides power to the timer and the heater element. Waveforms are shown in Figure 2.

The output remains ON, supplying power to the heater until V_7 = 62% V_5, which occurs at time t = R_1 x C_1. The time delay can be adjusted from several microseconds to approximately 10 minutes by the choice of R_1 and C_1. When t = R_1 x C_1, the comparator changes state and the relay de-energizes, returning the circuit to the quiescent condition.

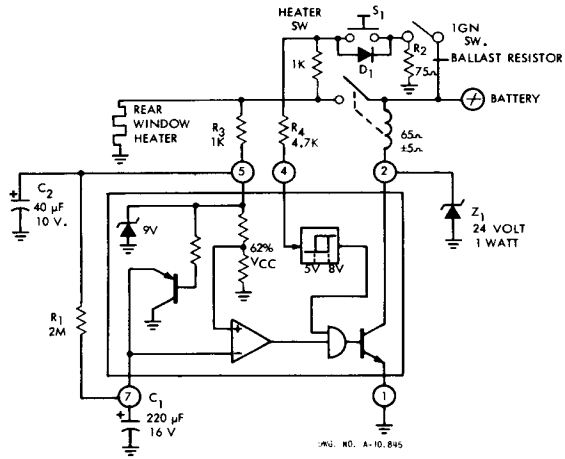
Timing accuracy is primarily a function of capacitor leakage for long time delays. Hard switching of the comparator necessitates low input bias currents on the comparator and low capacitor leakage current. The worst case comparator input is 200 nA and the charge current at V_7 = 62% V_5 is approximately 1.7 μA for R_1 = 2 MΩ. For these reasons, it is recommended that R_1 not exceed 2 MΩ and C_1 leakage be less than 500 nA.

Diode D_1 and the circuitry associated with pin 4 provide start-stop capability for the timer. When the voltage at pin 4 is larger than 8 V timing is initiated. When less than 5.5 V, timing is stopped. Transient protection against load dump and other automotive environmental hazards is provided by the integrated circuit design and discrete components Z_1, C_2, R_3, R_4, and D_1.

7

TYPICAL APPLICATION

(Figure 1)



TIMER WAVEFORMS