LSI/CSI

LS7217

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PHOTO CONTROLLED OUTDOOR LIGHTING WITH PROGRAMMABLE TIMER

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FEATURES:

- Input interface to a LDR or a photo transistor
- Programmable Duration Selection
- Shunt regulator
- 50Hz / 60Hz time base selection
- Relay Driver output
- 6.0V ± 0.75V operating voltage range (V_{DD} – V_{SS})
- LS7217 (DIP), LS7217-S (SOIC) – See Figure 1

APPLICATIONS

Lighting control for outdoor area lighting, street lighting, parking lot lighting, billboards lighting

DESCRIPTION

The 7217 is a programmable Timer IC designed to turn on a relay at night and turn off the relay at dawn or after a selectable number of hours. Figure 2 shows a typical application schematic.

PIN DESCRIPTION:

The following describes the operation of the inputs and outputs of the IC.

V_{DD} (Pin 2)

V_{DD} is the supply voltage positive terminal. It is regulated internally in the IC. The internal voltage regulator produces 6.0V ± 0.75V.

V_{SS} (Pin 6)

V_{SS} is the supply voltage negative terminal.

50Hz / 60Hz SELECT Input (Pin 8)

A high at this input selects the correct timing for 50Hz operation. Floating this input selects the correct timing for 60Hz operation. A low at this input places the LS7217 into Test Mode where the timeouts are accelerated by a factor of 60.

50Hz / 60Hz Input (Pin 7)

This input is the clock source for all timing functions. This input has a Schmitt trigger to ensure a clean internal clock waveform.

TIME SELECT Inputs TS1, TS2 (Pins 4, 5)

The two Select inputs determine the time duration that the Relay output stays on after the photo input goes low. Both inputs have internal pull-down transistors so that float is logic zero and connection to V_{DD} is logic 1.

PIN ASSIGNMENT

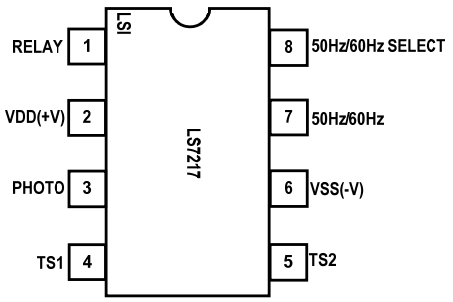

FIGURE 1

The Time Select Table is as follows:

TS1	TS2	Time Duration
0	0	4 Hours
0	1	6 Hours
1	0	8 Hours
1	1	Dusk-to-Dawn

Dusk-to-Dawn duration is determined solely by the photo-cell; i.e., the Relay output is on whenever the photocell recognizes an ambient dark condition.

PHOTO Input (Pin 3)

The photo input has hysteresis for a positive trip point. The input will work with a Light Dependent Resistor (LDR) or a photo-transistor connected between the input and V_{DD}. The photo device has low impedance in the presence of ambient light and high impedance in the presence of ambient darkness.

The IC is configured so that the detection of a light condition must remain for 6.0 seconds (± 0.5 seconds) continuously in order to be recognized as a valid light condition. A dark condition must remain for 1.0 second (± 0.25 seconds) continuously in order to be recognized as a valid dark condition.

RELAY Output (Pin 1)

This output is configured to drive the base of an external NPN transistor (see Figure 2). A valid dark condition at the PHOTO input causes the RELAY output to switch high and a valid light condition at the PHOTO input causes the output to switch low.

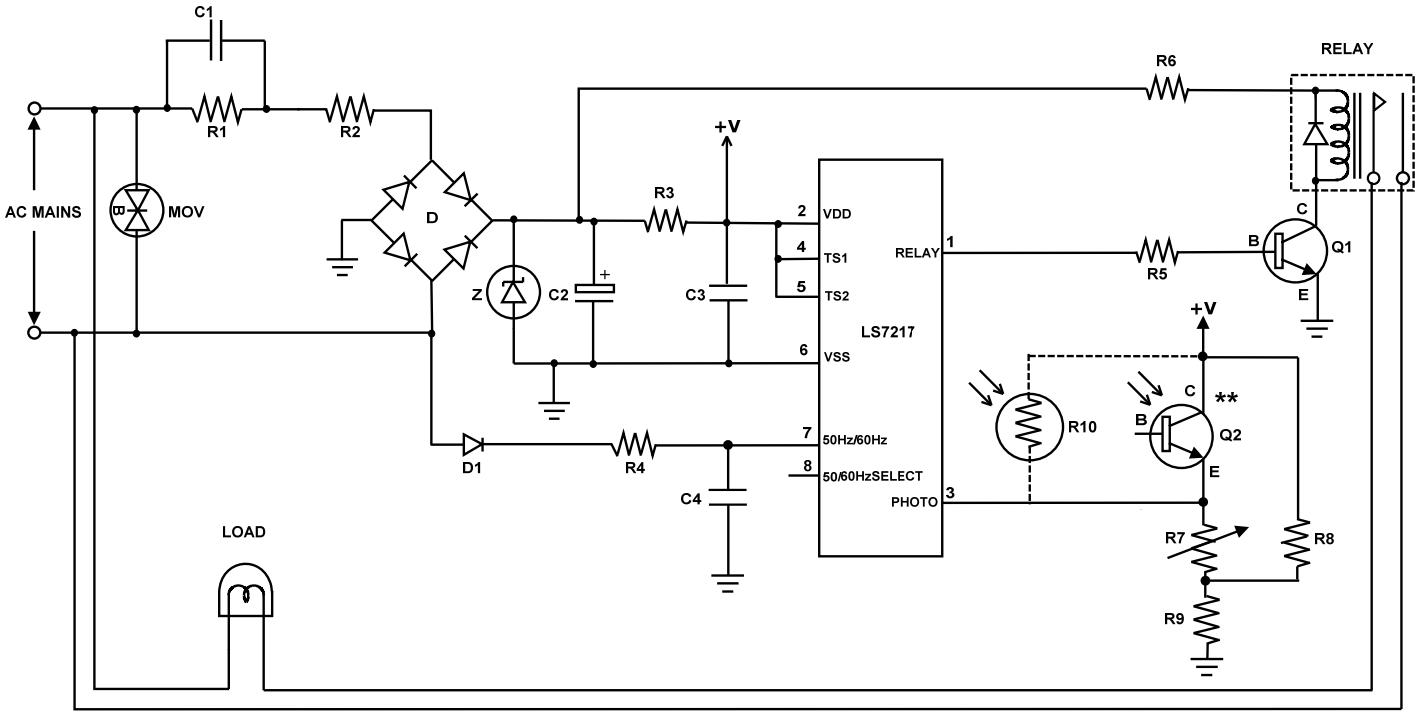

FIGURE 2. DUSK TO DAWN AUTO ON/OFF OUTDOOR LIGHTING APPLICATION

R1=68kΩ, 1/2W, @120VAC
R1=240kΩ, 1/2W, @240VAC
R2=6.8kΩ, 2W, @120VAC
R2=27kΩ, 2W, @240VAC
R3=4.7kΩ, 2W, @120VAC
R4=680kΩ, 2W, @240VAC
R4=1MΩ, 2W, @120VAC
R5, R6=As needed for driving relay
R7=100kΩ, 1/4W Potentiometer
R8=18kΩ, 1/4W
R9=4.3kΩ, 1/4W

C1=0.33uF, 200VAC, @120VAC
C1=0.2uF, 400VAC, @240VAC
C2=470uF, 25V
C3=0.1uF
C4=470pF
Z=15V Zener, 1W
D=DF04
D1=1N4148
Q1=2N5845
LOAD=Incandescent, LED, fluorescent or HID lamp

****For the photo-sensitive device use either LDR, R10=Silonex NSL-19M51 or use Photo-transistor, Q2=Vishay TEPT 4400.**

NOTE1: This application circuit can be used for lighting control of public spaces such as Parking Lots, Billboards, street lamps etc.

NOTE2: Indicated connections of pins 4 and 5 keep the lamp on from dusk to dawn. See page 1 for configuring pins 4 and 5 connections to select 4, 6 or 8 hours on-time.

ABSOLUTE MAXIMUM RATINGS: (All voltages referenced to V_{SS})

	SYMBOL	VALUE	UNIT
DC Supply Voltage	V_{DD}	+8	V
Voltage (Any Pin)	V_{IN}	V_{SS} - 0.3 to V_{DD} + 0.3	V
Operating Temperature	T_A	-20 to +85	°C
Storage Temperature	T_{STG}	-40 to +150	°C

DC ELECTRICAL CHARACERISTICS:
(T_A = 25°C, V_{DD} = 6.0V unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
TS1, TS2 Low	T_{LO}	-	-	1.4	V
TS1, TS2 High	T_{HI}	3.0	-	-	V
50/60 Hz Low	V_{HZL}	-	-	2.9	V
50/60 Hz High	V_{HZH}	4.4	-	-	V
Photo					
Light Threshold	V_{IT}	**3.5**	-	-	V
Dark Threshold	V_{ET}	-		2.9	V
Input Current					
(All inputs high)					
50Hz/60Hz Select]	I_{IH}	-	24	-	mA
TS1, TS2]					
RELAY Output Current					
Sourcing, V_O = 0.7V	I_{OH}	4.0	-	-	mA
Sinking, V_O = 0.4V	I_{OL}	-50	-	-	uA

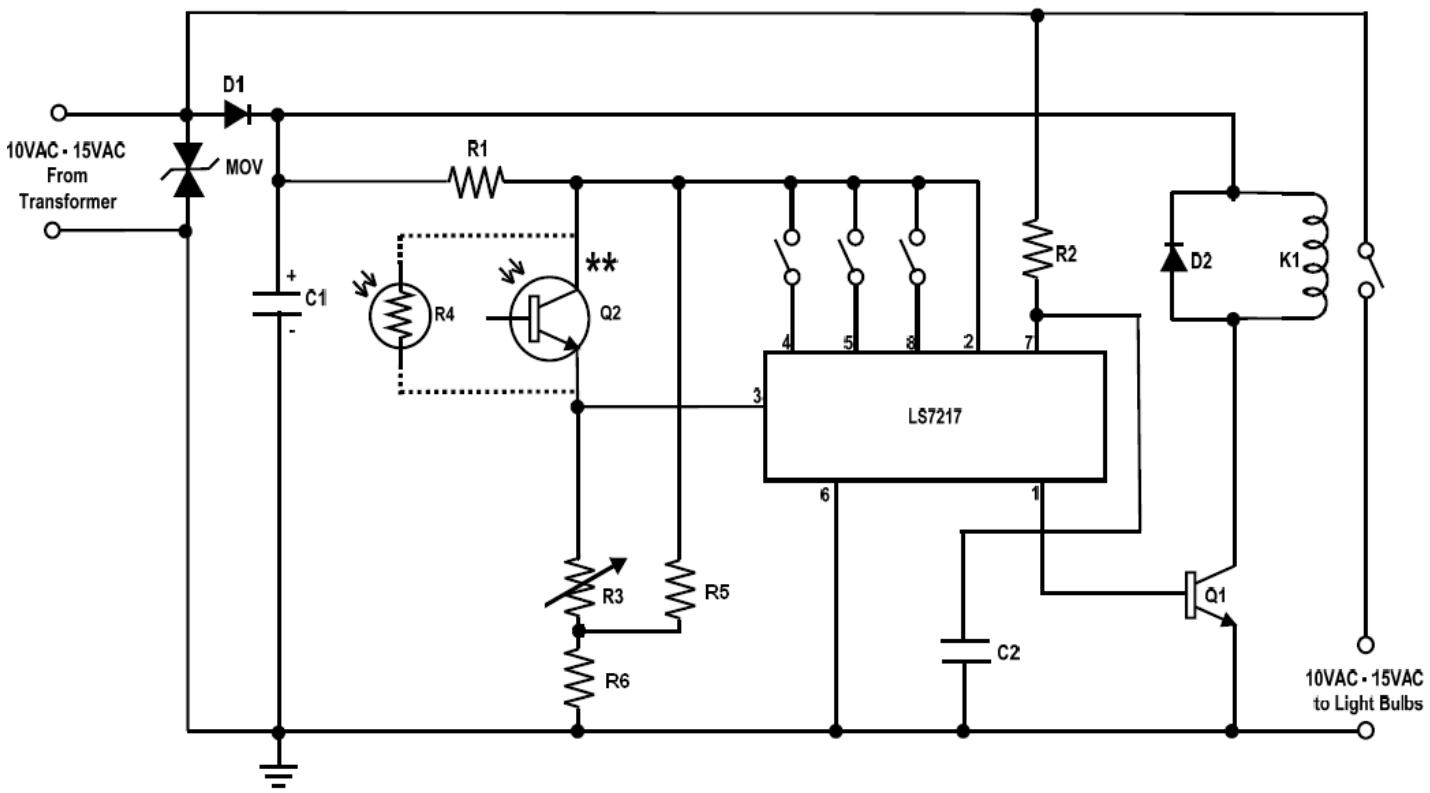

FIGURE 3. TYPICAL LANDSCAPE LIGHTING APPLICATION SCHEMATIC

R1=1kΩ, 1/4W
R2=220kΩ, 1/4W
R3=100kΩ, 1/4W Potentiometer
R5=18kΩ, 1/4W
R6=4.3kΩ, 1/4W
D1=1N4004
D2=1N4004
C1=220uF, 25V
C2=470pF, 10V
Q1=2N3904 (Typical)

****For the photo-sensitive device use either**
LDR, R4=Silonex NSL-19M51 or use
Photo-transistor, Q2=Vishay TEPT 4400

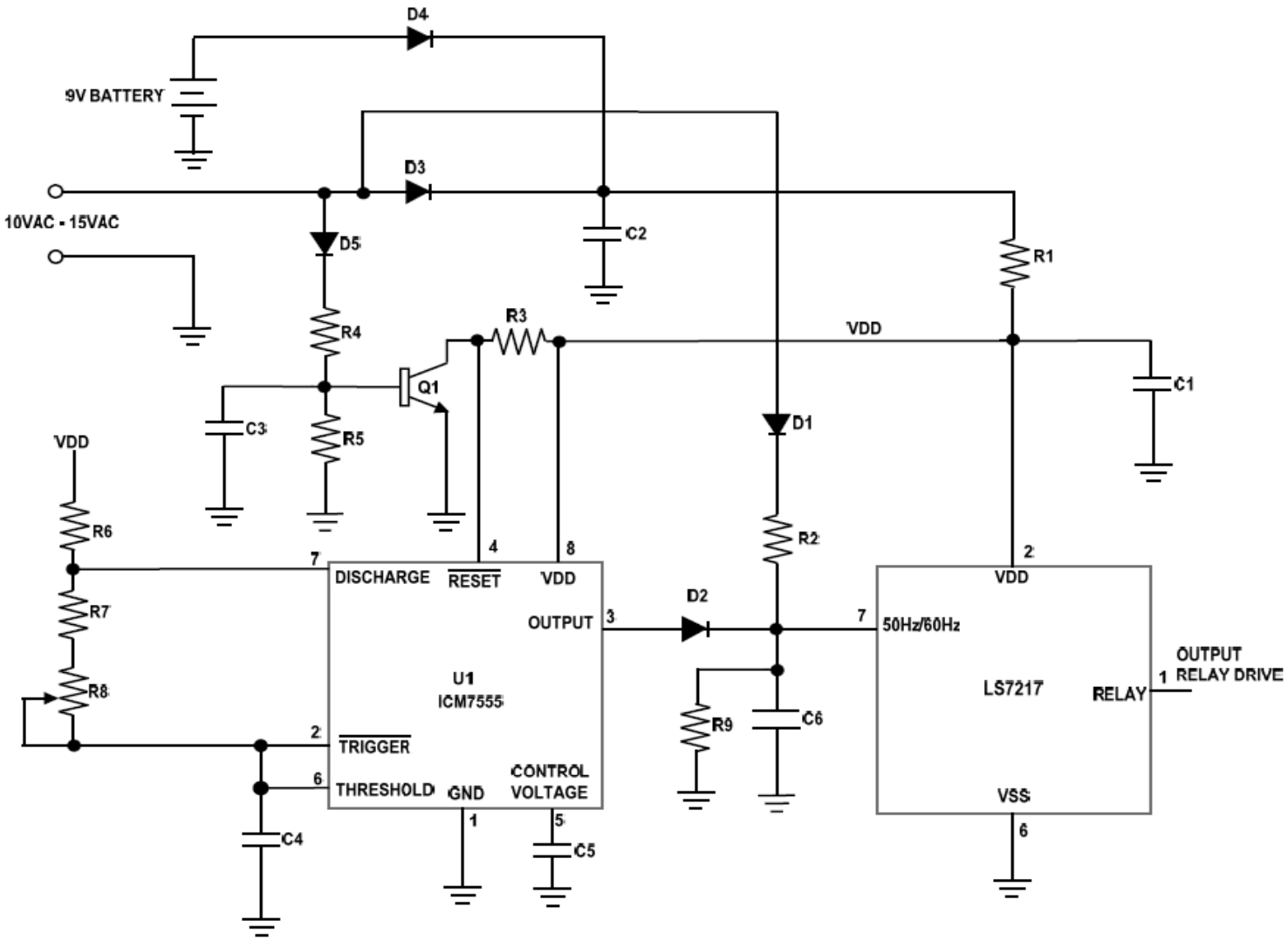

FIGURE 4. BATTERY BACK-UP FOR AC POWER FAILURE

R1=1kΩ
R2=270kΩ
R3=100kΩ
R4=100kΩ
R5=1MΩ

R6=10kΩ
R7=10kΩ
R8=50kΩ
R9=1MΩ

C1=220uF
C2=470uF
C3=0.1uF
C4=0.1uF
C5=0.1uF
C6=470pF

D1=1N4004
D2=1N4004
D3=1N4004
D4=1N4004
D5=1N4004

Q1=2N2222
U1=ICM7555

Figure 4 shows how to connect a back-up battery circuit to the LS7217 timer in case of power failure. Upon ac power failure, U1 generates either a 50Hz or 60Hz clock (set by R8) so that the LS7217 timeout remains uninterrupted. When power returns timeout continues as if no ac interruption occurred.

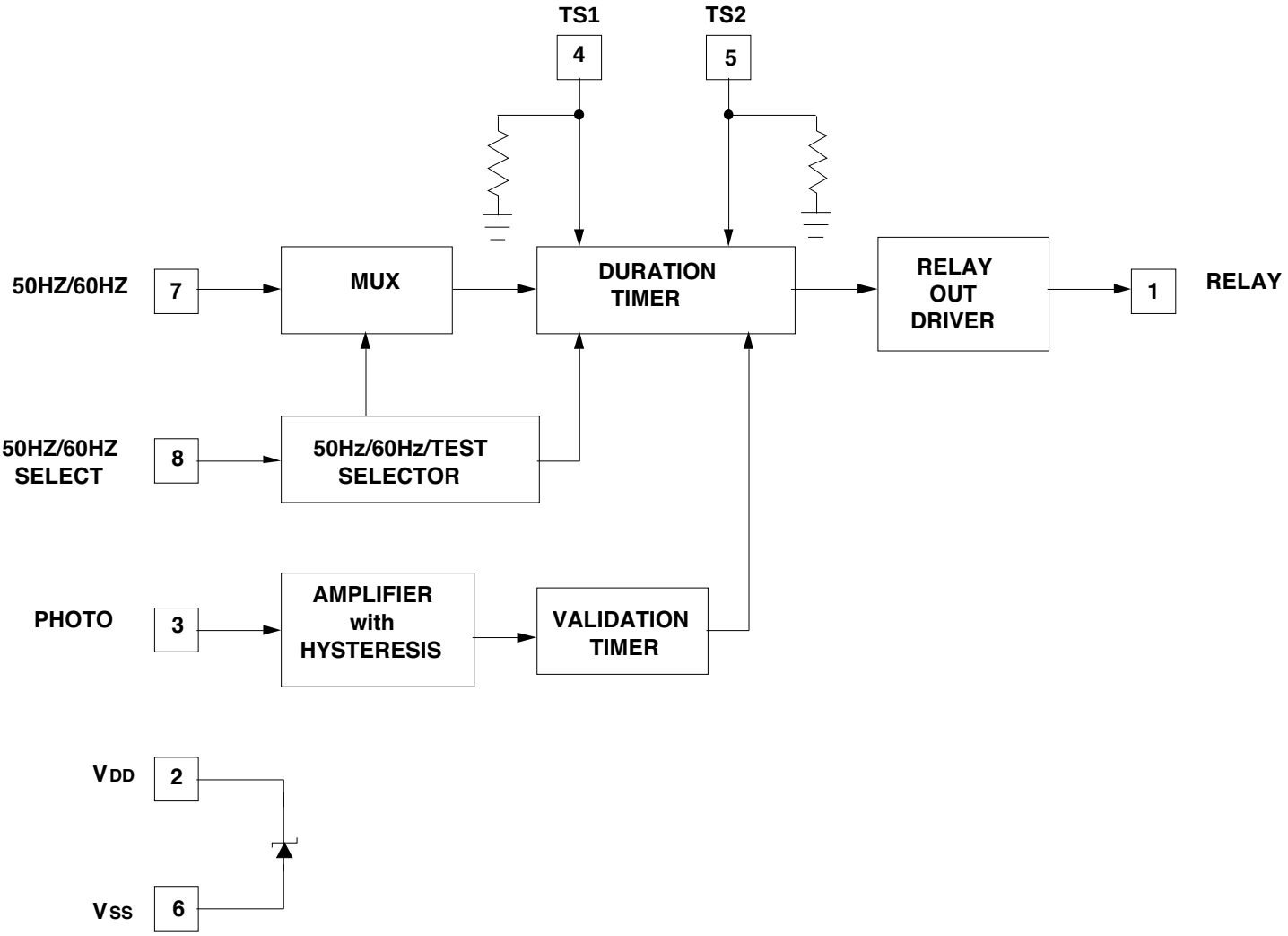

FIGURE 5. LS7217 BLOCK DIAGRAM