T-49-15-02

LR3419 Digital ON/OFF Clock Timer Driver LSI

■ Description

The LR3419 is a CMOS LSI designed to provide clock and timer functions. The base frequency is selectable 50 Hz or 60 Hz line input or 32.768kHz crystal. It drives vacuum fluorescent display tube (VFD) directly.
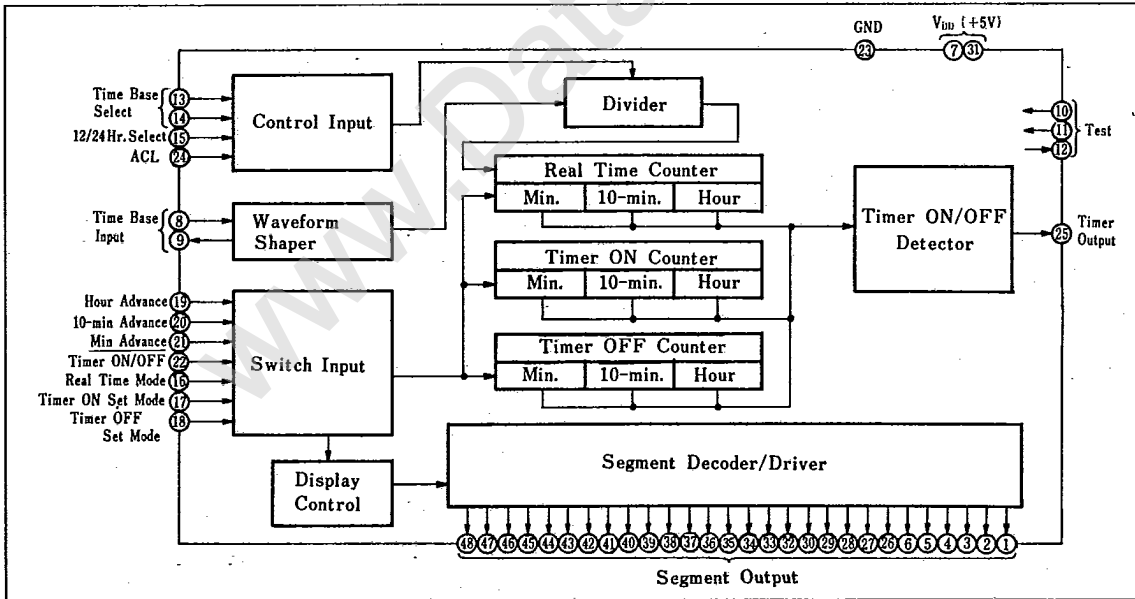
■ Features

1. "Hours-Minutes" display
2. Timer function that permits both ON/OFF times to be set
3. Power failure indication
4. Directly static-drive a VFD
5. Time base : 50/60Hz line or 32.768kHz crystal
6. Power supply voltage : +5V
7. CMOS process
8. 48-pin quad-flat package

■ Pin Connections
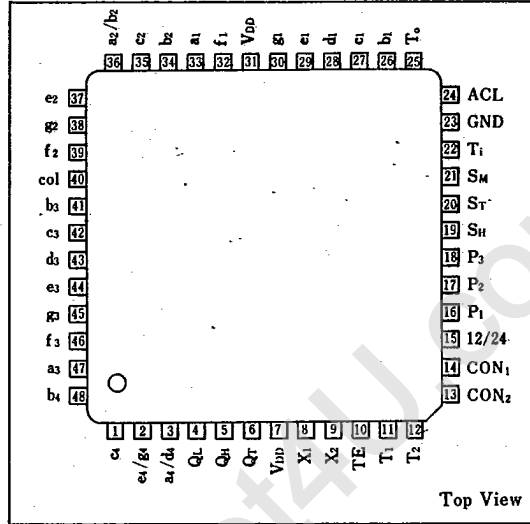
Top View

■ Block Diagram

SHARP

714

Digital ON/OFF Clock Timer Driver LSI   LR3419

T-49-15-02

■ Absolute Maximum Ratings

Parameter	Symbol	Conditions	Ratings	Unit	Note
Supply voltage	V_{DD}	Referenced to GND	−0.3 to +7.0	V	
Input voltage	V_{IN}	Referenced to GND	−0.3 to (V_{DD}+0.3)	V	
Output voltage	BV	Referenced to GND	V_{DD}+0.3 to −23	V	1
Power consumption	P_D	Ta≤+25℃	550	mW	
P_D derating ratio	ΔP_D/℃.	Ta>+25℃	5.4	mW/℃	
Pin current	I_1		±2.0	mA	1
			±1.0		2
Operating temperature	T_{opr}		−10 to +60	℃	
Storage temperature	T_{stg}		−40 to +100	℃	

Note 1: Applied to a_1-a_4, b_1-b_3, c_1-c_4, d_1-d_4, e_1-e_4, f_1-f_4, g_1-g_4, Q_L, Q_H, Q_T pins
Note 2: Applied to I/O pins except Note 1

■ Recommended Operating Conditions

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Supply voltage	V_{DD}	Referenced to GND	4.5	5.0	5.5	V
Input voltage	V_{IN}	Referenced to GND	0		V_{DD}	V
Output voltage	V_{OUT}	Referenced to GND	0	19.	21	V

■ Electrical Characteristics

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Note
Input voltage	V_{IH}	Applies to all input pins	4.0		V_{DD}	V	1~5
	V_{IL}	V_{DD}=5.0V	0		0.4		
Input current	I_{IH1}	V_{IN}=V_{DD}			1.0	μA	1
	I_{IL1}	V_{IN}=GND			−1.0		
	I_{IH2}	V_{IN}=V_{DD}		5.0	30	μA	2
	I_{IL2}	V_{IN}=GND			−1.0		
	I_{IH3}	V_{IN}=V_{DD}			1.0	μA	3
	I_{IL3}	V_{IN}=GND		−0.5	−3.0		
	I_{IH4}	V_{IN}=V_{DD}			1.0	μA	4
	I_{IL4}	V_{IN}=GND	−10	100			
	I_{IH5}	V_{IN}=V_{DD}		0.5	3.0	μA	5
	I_{IL5}	V_{IN}=GND		−0.5	−3.0		
Input amplitude	V_1	f=50 or 60Hz	4.0		V_{DD}	V_{p-p}	
Output voltage	V_{OH1}	I_{OH}=0.5mA, V_{DD}=5.0V	4.5	4.9		V	8
	V_{OL1}	Connects to −19V at R_L=100kΩ	18.0		19.0		
	V_{OH2}	I_{OH}=0.2mA, V_{DD}=5.0V	4.5	4.9		V	6
	V_{OL2}	I_{OL}=−0.2mA, V_{DD}=5.0V		0.1	0.5		
Time base	f	CON_1=GND, CON_2=GND		50		kHz	
		CON_1=V_{DD}, CON_2=GND		60			
		CON_1=GND, CON_2=V_{DD}		32.768			
Current consumption	I_{DD}	f=50Hz, V_1=$V_{DD}V_{p-p}$			50	μA	8
		f=60Hz, V_1=$V_{DD}V_{p-p}$			50		5
		With 32.768kHz crystal			50		7

Note 1: Applied to CON_1, CON_2, 12/14 pins
Note 2: Applied to P_1-P_3, S_H, S_T, S_M, T_1 pins
Note 3: Applied to ACL pin
Note 4: Applied to TE, T_1 pins
Note 5: Applied to X_1 pin
Note 6: Applied to T_{OUT} pin
Note 7: Clock display mode
Note 8: Applied to pins a_1-a_4, b_1-b_3, c_1-c_4, d_1-d_4, e_1-e_4, f_1-f_4, g_1-g_4, Q_L, Q_H, and Q_T

8

■ Specifications
(1) Basic time base

Time base	Time base select input		Time base input pin	
	CON₁	CON₂	X₁	X₂
50Hz	0	0	50Hz	OPEN
60Hz	1	0	60Hz	OPEN
32.768kHz	0	1	*	
Disable	1	1		

* Oscillator feedback circuit that consists of crystal and capacitance

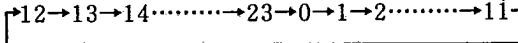### (2) Operation flow chart

(i) Function readout operation

Transits only when SW is ON. Returns automatically after it is turnd OFF
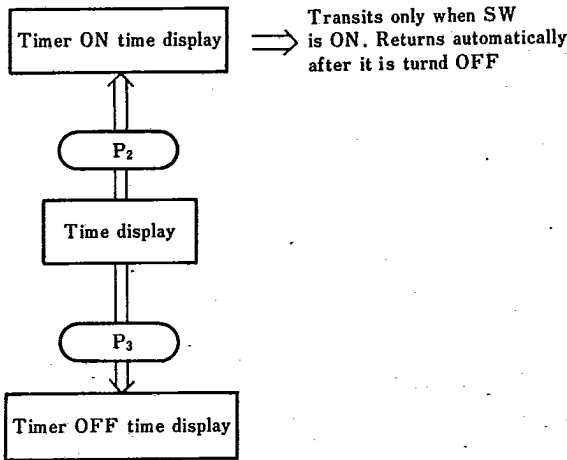
Note: Hour rapid feed (S_H) will proceed as follows.

12-hour representation
$\rightarrow$12$\rightarrow$1$\rightarrow$2$\cdots\cdots\cdots\cdots$$\rightarrow$10$\rightarrow$11
—AM/PM change—

24-hour representation
$\rightarrow$12$\rightarrow$13$\rightarrow$14$\cdots\cdots\cdots$$\rightarrow$23$\rightarrow$0$\rightarrow$1$\rightarrow$2$\cdots\cdots\cdots$$\rightarrow$11
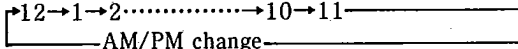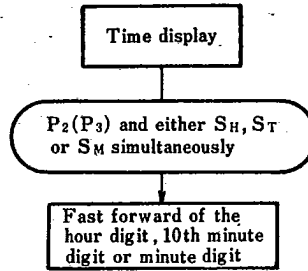
(ii) Hour display adjust operation

∘ Counter digit below second will be reset
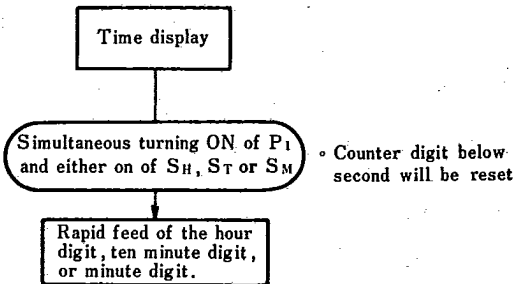
- After P is turned OFF, timing starts from 00 second.
- While being adjusted, the 10 minute digit does not increment the hour digit, nor does the minute digit increment the 10 minute digit.

(iii) Timer ON (OFF) time setting operation

- Setting will be complete when P₂(P₃) is OFF.
- While being adjusted, the 10 minute digit does not increment the hour digit, nor does the minute digit increment the 10 minute digit.
- In the timer ON (OFF) time set mode, timing will not stop.
- In the timer ON (OFF) time set mode, timer output will not be affected even if the timer ON (OFF) time coincides with the time display.

(iv) Simultaneous depression of setting switches

Normally only one of P_1, P_2, and P_3 goes ON. If more than two of these are depressed simultaneously, they enter no input and go into the time display mode.
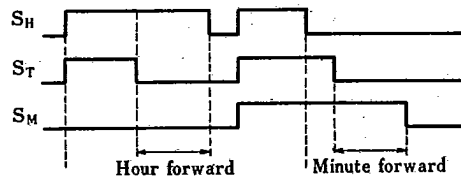
(v) Simultaneous depression of rapid feed switches

Normally only one of S_H, S_T, and S_M goes ON. If more than two of these are depressed simultaneously, the following operation will proceed.

(a) If one input goes ON followed by another input that ON
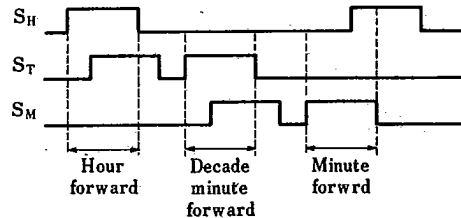
(b) More than 2 inputs go ON simultaneously

Digital ON/OFF Clock Timer Driver LSI   T-49-15-02   LR3419

(vi) **Power failure display function**

In any mode, LSI will be initialized inside on application of ACL to display :

    With 12 hour representation   PM 12 : 00

    With 24 hour representation   12 : 00

This whole display goes flashing, 0.5 second ON and 0.5 second OFF. The display stays in the initial state. To stop flashing, go into the time display mode (P_1 ON) and then timing starts with P_1 turned ON.

On application of ACL with P_1 set to ON, the display will stay in the initial state without flashing.

On the next P_1 ON, the display still in the initial state will go flashing. Then on the next P_1 ON,

flashing will stop. And on the next P_1 ON, timing starts.

(vii) **Auto clear circuit**

The internal state on power-up will be as follows.

(a) Time display
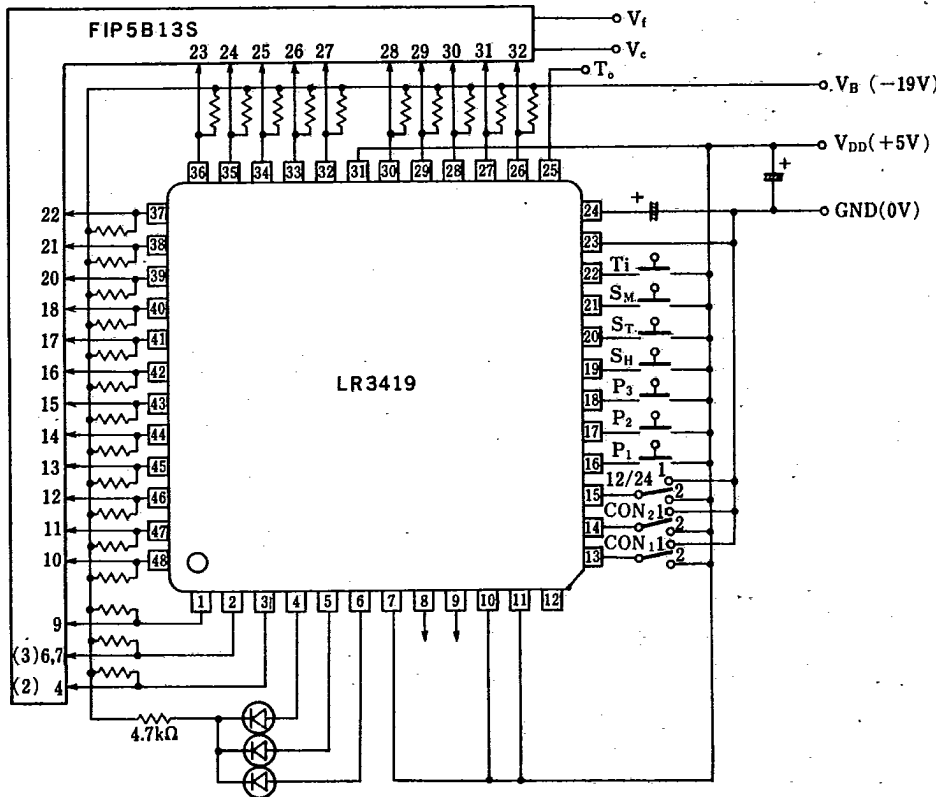
    12 hour representation   PM 12 : 00

    24 hour representation   12 : 00

And the second counter will be reset. From the time when the auto clear input ceases to exist, it will operate according to the mode input (P_1, P_2, P_3).

(b) Time ON and Timer OFF time

    With 12 hour representation   PM 12 : 00

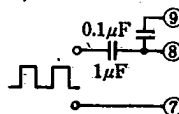   With 24 hour representation   12 : 00

■ **System Configuration Example**

Note 1: Set to side 2 under 24 hour system, and set to side 1 under 12 hour system
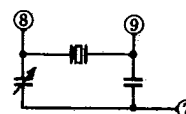
Note 2: Time base selection

	CON₁	CON₂
50Hz	side 1	side 1
60Hz	side 2	side 1
32.758kHz	side 1	side 2

Note 3: Time base input circuit
(a)At 50Hz, 60Hz   (b)At 32.768kHz

Note 4: Fluorescent display tube FIP5B13S
The number indicates the pin number.
The figure in ( ) is for 12 hour system.