

T-49-15-02

LR3419 Digital ON/OFF Clock Timer Driver LSI

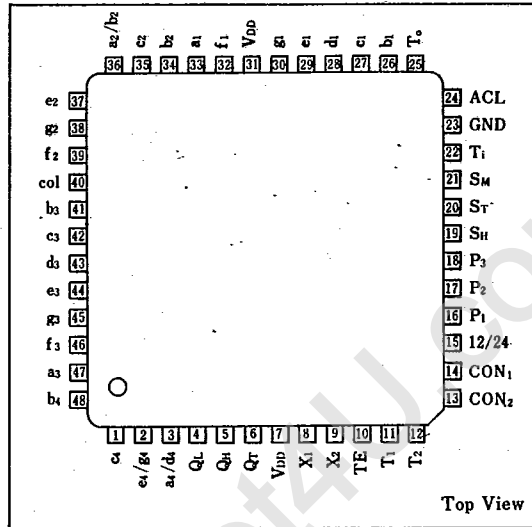
Description

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.

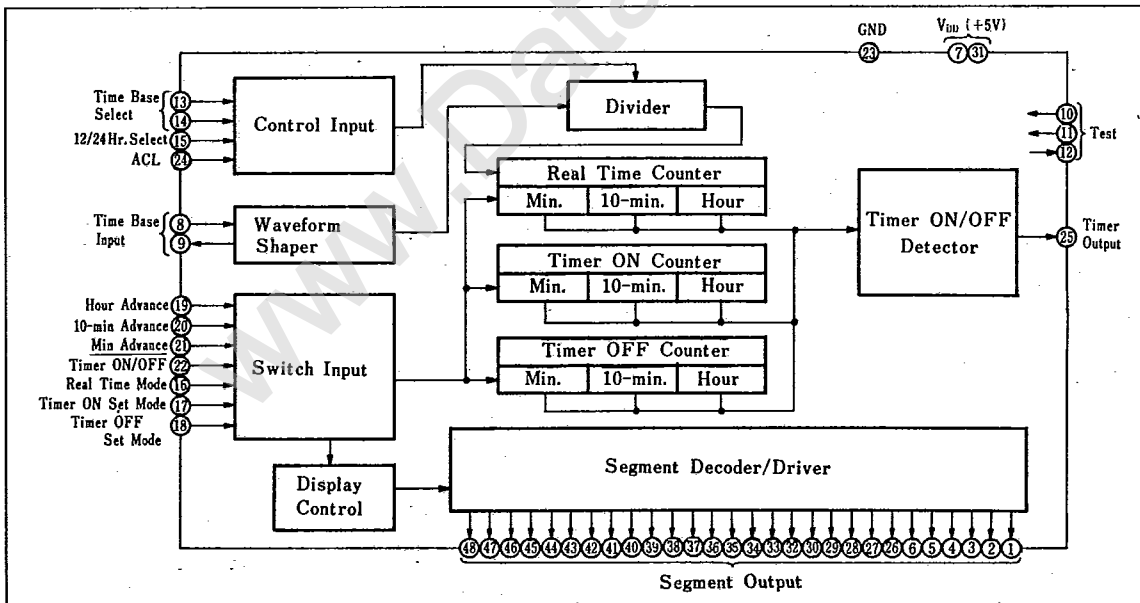
Features

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



Block Diagram



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	$T_a \leq +25^\circ\text{C}$	550	mW	
P_D derating ratio	$\Delta P_D/^\circ\text{C}$	$T_a > +25^\circ\text{C}$	5.4	mW/ $^\circ\text{C}$	
Pin current	I_1		± 2.0	mA	1
			± 1.0		2
Operating temperature	T_{OP}		-10 to +60	$^\circ\text{C}$	
Storage temperature	T_{STG}		-40 to +100	$^\circ\text{C}$	

Note 1: Applied to a₁-a₄, b₁-b₃, c₁-c₄, d₁-d₄, e₁-e₄, f₁-f₄, g₁-g₄, 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}	$V_{DD}=5.0\text{V}$	0		0.4		
Input current	I_{IH1}	$V_{IN}=V_{DD}$			1.0	μA	1
	I_{IL1}	$V_{IN}=\text{GND}$			-1.0		
	I_{IH2}	$V_{IN}=V_{DD}$		5.0	30	μA	2
	I_{IL2}	$V_{IN}=\text{GND}$			-1.0		
	I_{IH3}	$V_{IN}=V_{DD}$			1.0	μA	3
	I_{IL3}	$V_{IN}=\text{GND}$		-0.5	-3.0		
	I_{IH4}	$V_{IN}=V_{DD}$			1.0	μA	4
	I_{IL4}	$V_{IN}=\text{GND}$	-10	100			
	I_{IH5}	$V_{IN}=V_{DD}$			0.5	μA	5
	I_{IL5}	$V_{IN}=\text{GND}$		-0.5	-3.0		
Input amplitude	V_1	f=50 or 60Hz	4.0		V_{DD}	V_{p-p}	
Output voltage	V_{OH1}	$I_{OH}=0.5\text{mA}$, $V_{DD}=5.0\text{V}$	4.5	4.9		V	8
	V_{OL1}	Connects to -19V at $R_L=100\text{k}\Omega$	18.0		19.0		
	V_{OH2}	$I_{OH}=0.2\text{mA}$, $V_{DD}=5.0\text{V}$	4.5	4.9		V	6
	V_{OL2}	$I_{OL}=-0.2\text{mA}$, $V_{DD}=5.0\text{V}$		0.1	0.5		
Time base	f	$\text{CON}_1=\text{GND}$, $\text{CON}_2=\text{GND}$		50		kHz	
		$\text{CON}_1=V_{DD}$, $\text{CON}_2=\text{GND}$		60			
		$\text{CON}_1=\text{GND}$, $\text{CON}_2=V_{DD}$		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 CON₁, CON₂, 12/14 pinsNote 2: Applied to P₁-P₃, S_H, S_T, S_M, T₁ pins

Note 3: Applied to ACL pin

Note 4: Applied to TE, T₁ pinsNote 5: Applied to X₁ pin

Note 6: Applied to Tour pin

Note 7: Clock display mode

Note 8: Applied to pins a₁-a₄, b₁-b₃, c₁-c₄, d₁-d₄, e₁-e₄, f₁-f₄, g₁-g₄, Q_L, Q_H, and Q_T

Specifications

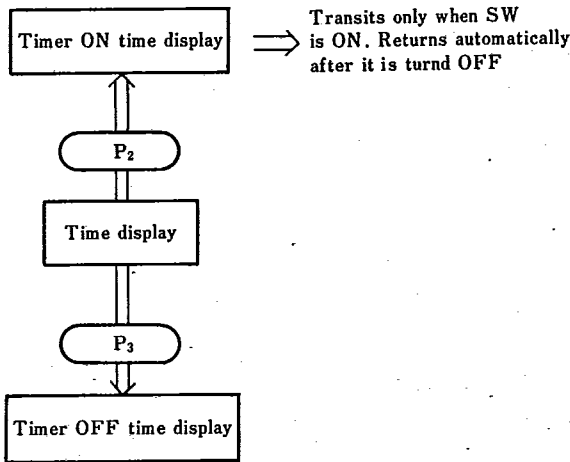
(1) Basic time base

Time base	Time base select input		Time base input pin	
	CON ₁	CON ₂	X ₁	X ₂
50Hz	0	0	50Hz	OPEN
60Hz	1	0	60Hz	OPEN
32.768kHz	0	1	*	
Disable	1	1		

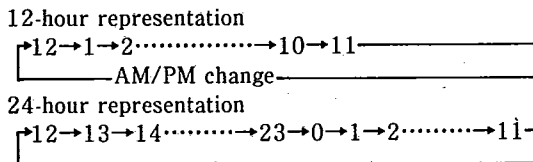
* Oscillator feedback circuit that consists of crystal and capacitance

(2) Operation flow chart

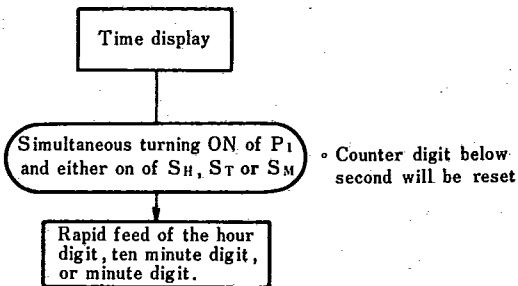
(i) Function readout operation



Note: Hour rapid feed (S_H) will proceed as follows.

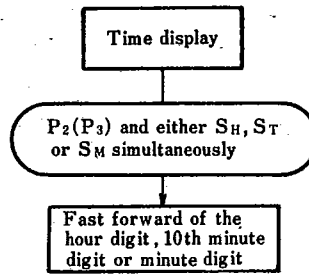


(ii) Hour display adjust operation



- 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.

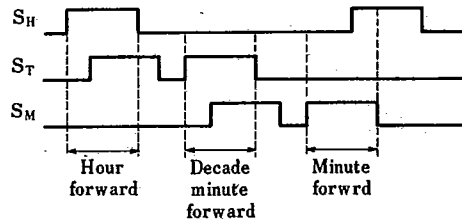
(iv) Simultaneous depression of setting switches

Normally only one of P₁, P₂, and P₃ goes ON. If more than two of these are depressed simultaneously, they enter no input and go into the time display mode.

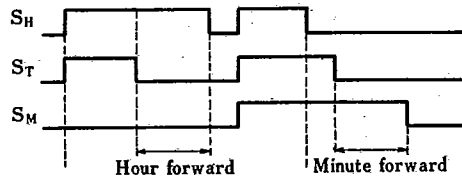
(v) Simultaneous depression of rapid feed switches

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



(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 (P₁ ON) and then timing starts with P₁ turned ON.

On application of ACL with P₁ set to ON, the display will stay in the initial state without flashing.

On the next P₁ ON, the display still in the initial state will go flashing. Then on the next P₁ ON,

flashing will stop. And on the next P₁ ON, timing starts.

(vii) Auto clear circuit

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

(a) Time display

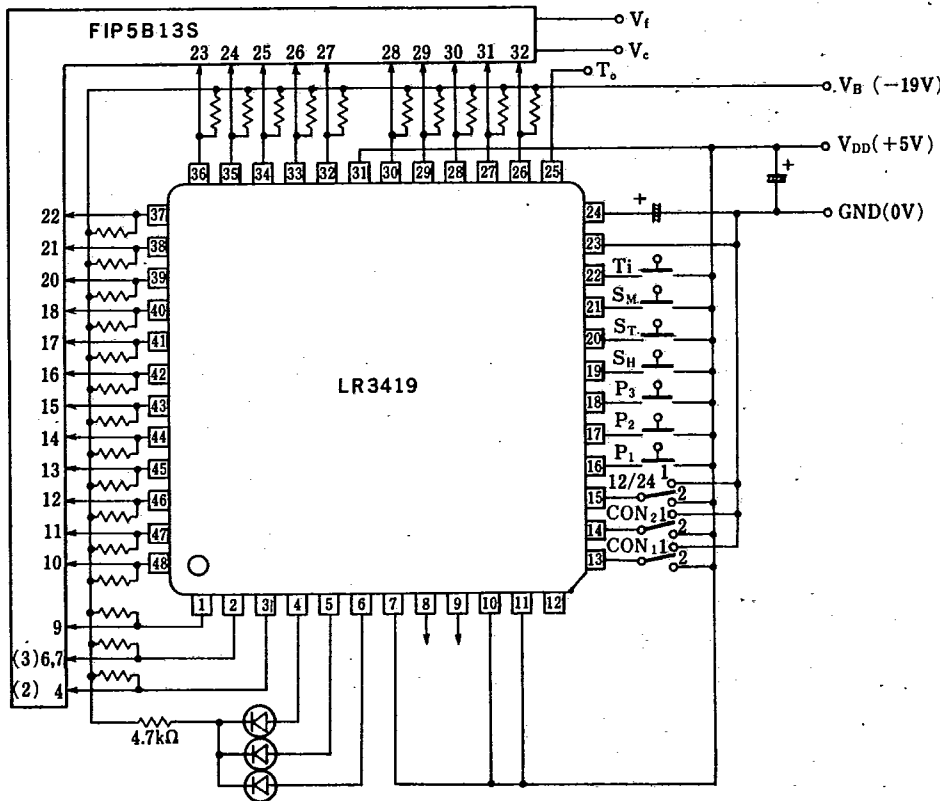
- 12 hour representation PM 12 : 00
- 24 hour representation 12 : 00

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 (P₁, P₂, P₃).

(b) Time ON and Timer OFF time

- With 12 hour representation PM 12 : 00
- With 24 hour representation 12 : 00

System Configuration Example



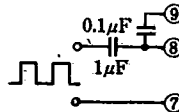
Note 1: Set to side 2 under 24 hour system, and set to side 1 under 12 hour system

Note 2: Time base selection

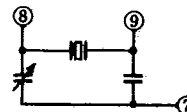
	CON ₁	CON ₂
50Hz	side 1	side 1
60Hz	side 2	side 1
32.758kHz	side 1	side 2

Note 3: Time base input circuit

(a) At 50Hz, 60Hz



(b) At 32.768kHz



Note 4: Fluorescent display tube FIP5B135
The number indicates the pin number.
The figure in () is for 12 hour system.

