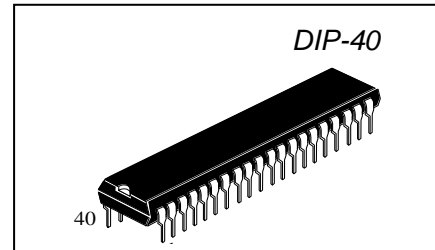


# AUTOMOTIVE DIGITAL CLOCK IC

**IN7100**

## DESCRIPTION

IN7100 is a automotive digital clock, CMOS LSI. It drives fluorescent indicator panel directly. It can be driven by a 4.194304 MHz crystal oscillator or an external clock signal (1024 Hz). It has 4-ways display brightness control function and its display format is 12 hours.



## FEATURES

- 4.194304 MHz crystal oscillator
- 4-ways display brightness control (Segment signal duty: 1, 1/4, 1/8, 1/16)
- Hours and Minutes Setting
- ± 30 seconds auto correction
- 1024 Hz external clock drive
- 1024 Hz SIGNAL output
- Segment Output: P-channel open drain
- 40 DIP package MS-011AC

## ABSOLUTE MAXIMUM RATINGS (Ta = 25 °C)

Parameter	Symbol	Specification	Unit
Power Supply Voltage	$V_{DD} - V_{SS}$	- 0.5 ~ + 8.0	V
Input Voltage	$V_{IN}$	$V_{SS} - 0.3 \sim V_{DD} + 0.3$	V
Output Voltage	$V_{OUT}$	$V_{DD} - 30 \sim V_{DD} + 0.3$	V
Operating Temperature	$T_a$	- 40 ~ + 85	°C
Storage Temperature	$T_{STG}$	- 55 ~ + 125	°C

\* Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## DC CHARACTERISTICS (Ta=25°C, RH≤70%, CD=CG=15pF, Xtal=4.194304MHz)

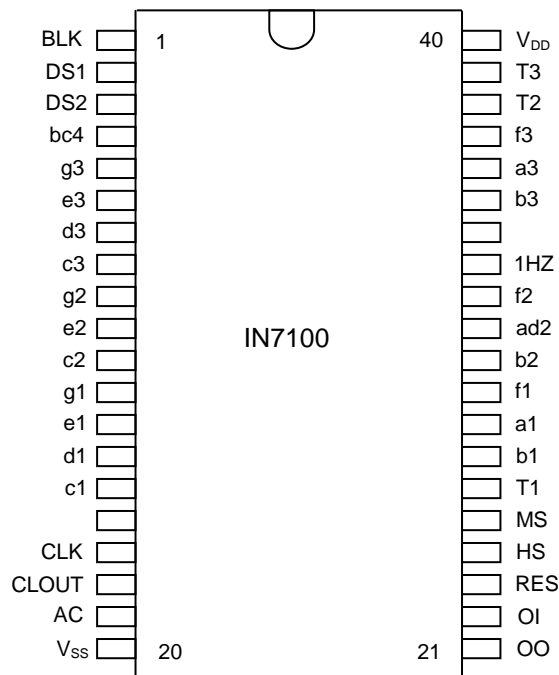
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Power Supply Voltage	$V_{DD}-V_{SS}$		3.0	—	7.0	V
Power Supply Current	$I_{DD}$	No output loads, $V_{DD}=6V$	—	0.3	0.5	mA
Leakage Current	$I_{OFF}$	$V_{DD}-V_{SS}=5.0V$			5.0	μA
High Level Output Current <sup>(1)</sup>	$I_{OH1}$	$V_{DD}-V_{SS}=3.0V, V_{DD}-V_{OUT}=0.5V$	300	—	1500	μA
High Level Output Current <sup>(2)</sup>	$I_{OH2}$	$V_{DD}-V_{SS}=3.0V, V_{DD}-V_{OUT}=0.5V$	500	—	1800	μA
Low Level Output Current <sup>(3)</sup>	$I_{OL}$	$V_{DD}-V_{SS}=3.0V, V_{OUT}-V_{SS}=0.5V$	500	—	—	μA
High Level Input Current <sup>(4)</sup>	$I_{IH1}$	$V_{IN}=V_{DD}=6V$	—	15	30	μA
High Level Input Current <sup>(5)</sup>	$I_{IH2}$	$V_{IN}=V_{DD}=6V$	—	120	600	μA
External Clock Duty	$C_{LD}$		40	50	60	%
OSC. Feedback Resistance	$R_F$	$V_{DD}=6V$		3		MΩ

( $V_{DD}-V_{SS}=3.0\sim 7.0V$ ,  $T_a = -40 \sim +85^{\circ}C$ ,  $RH\leq 70\%$ ,  $CD=CG=15pF$ ,  $Xtal=4.194304MHz$ )

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Power Supply Current	$I_{DD}$	No output loads	—	—	0.5	mA
High Level Output Current <sup>(1)</sup>	$I_{OH1}$	$V_{DD}-V_{SS}=3.0V$ , $V_{DD}-V_{OUT}=0.5V$	250	—	—	$\mu A$
High Level Output Current <sup>(2)</sup>	$I_{OH2}$	$V_{DD}-V_{SS}=3.0V$ , $V_{DD}-V_{OUT}=0.5V$	400	—	—	$\mu A$

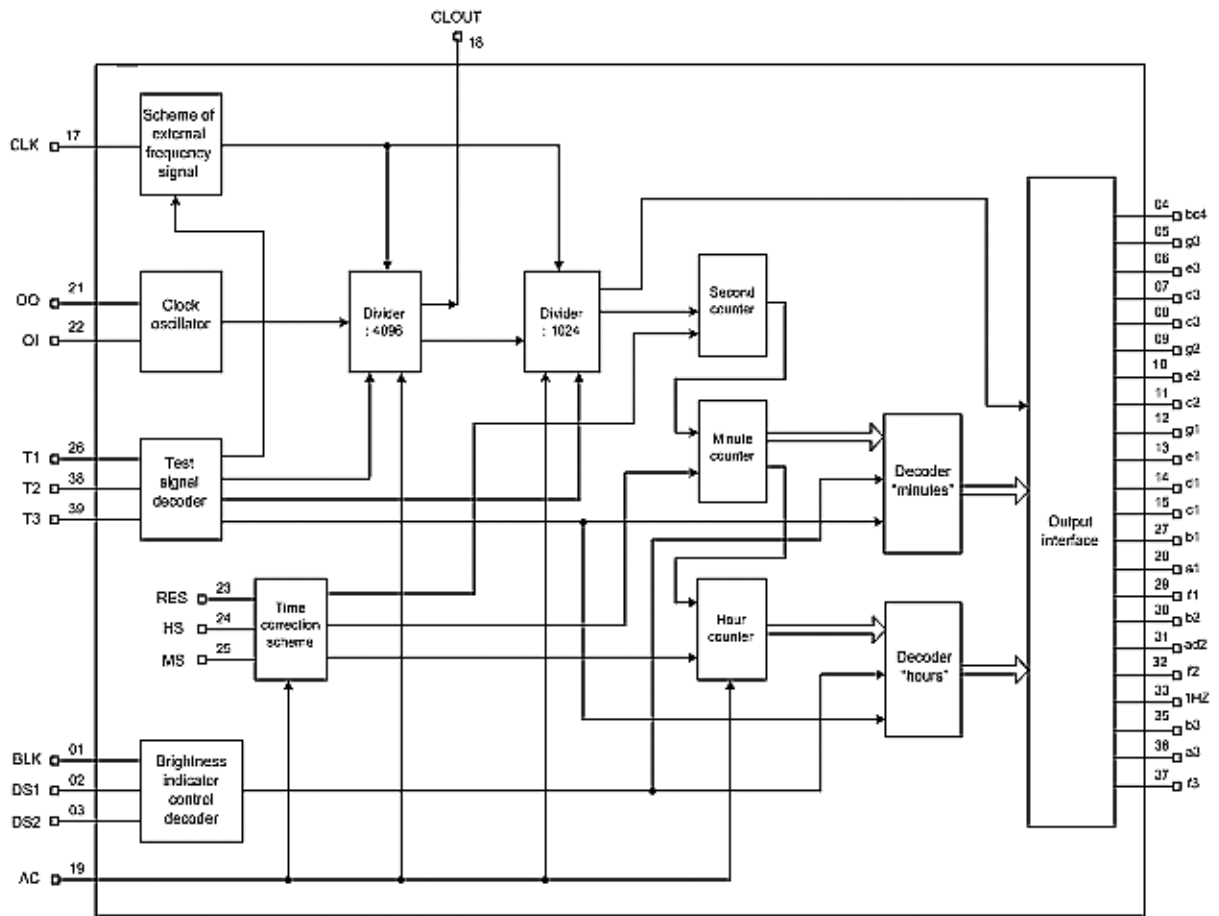
- (1) for segment other than bc4, ad2, 1Hz
- (2) for segment bc4, ad2, 1Hz and CLOUT
- (3) for CLOUT
- (4) for DS1, DS2, RES, HS, MS and BLK
- (5) for T1, T2, T3 and AC

**PIN CONFIGURATION**

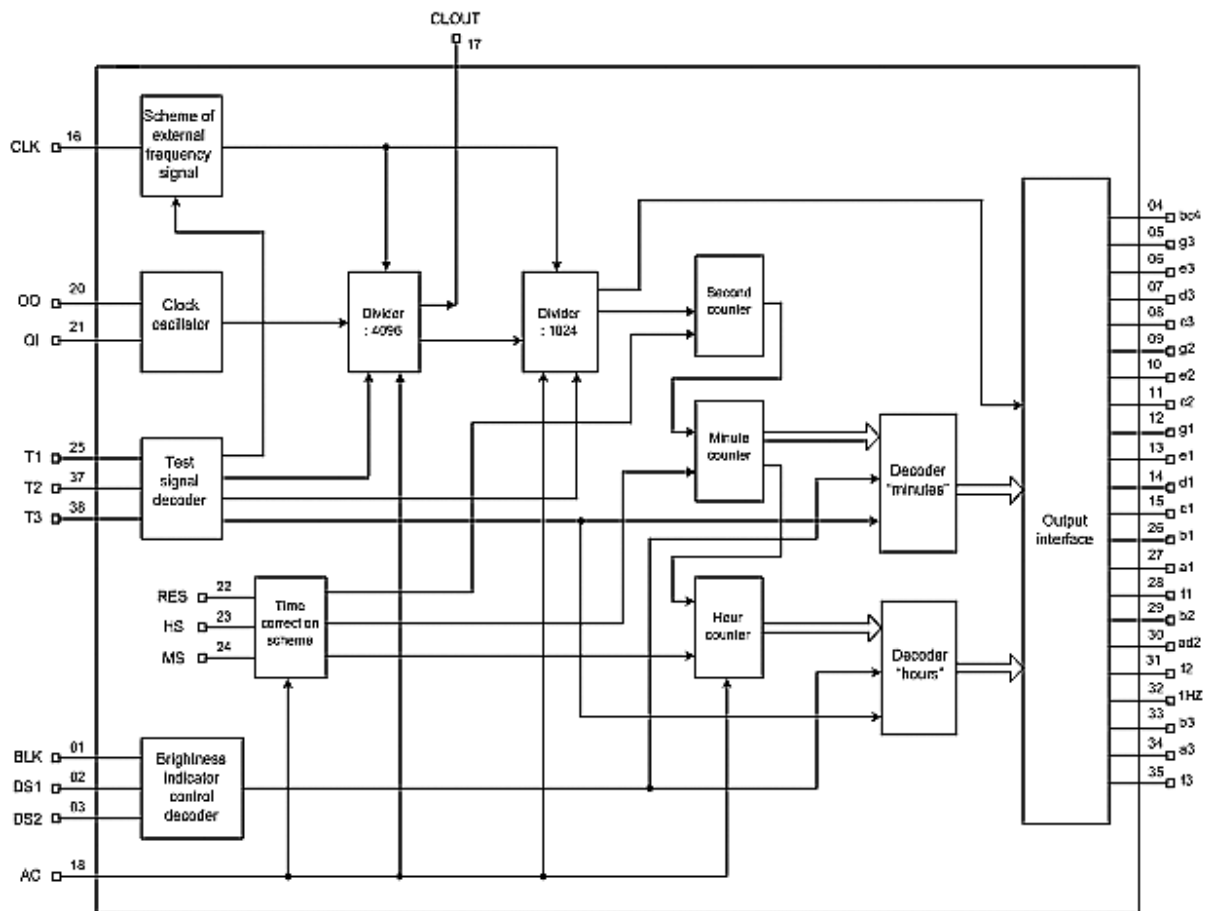


40-DIP MS-011AC

Block Diagram

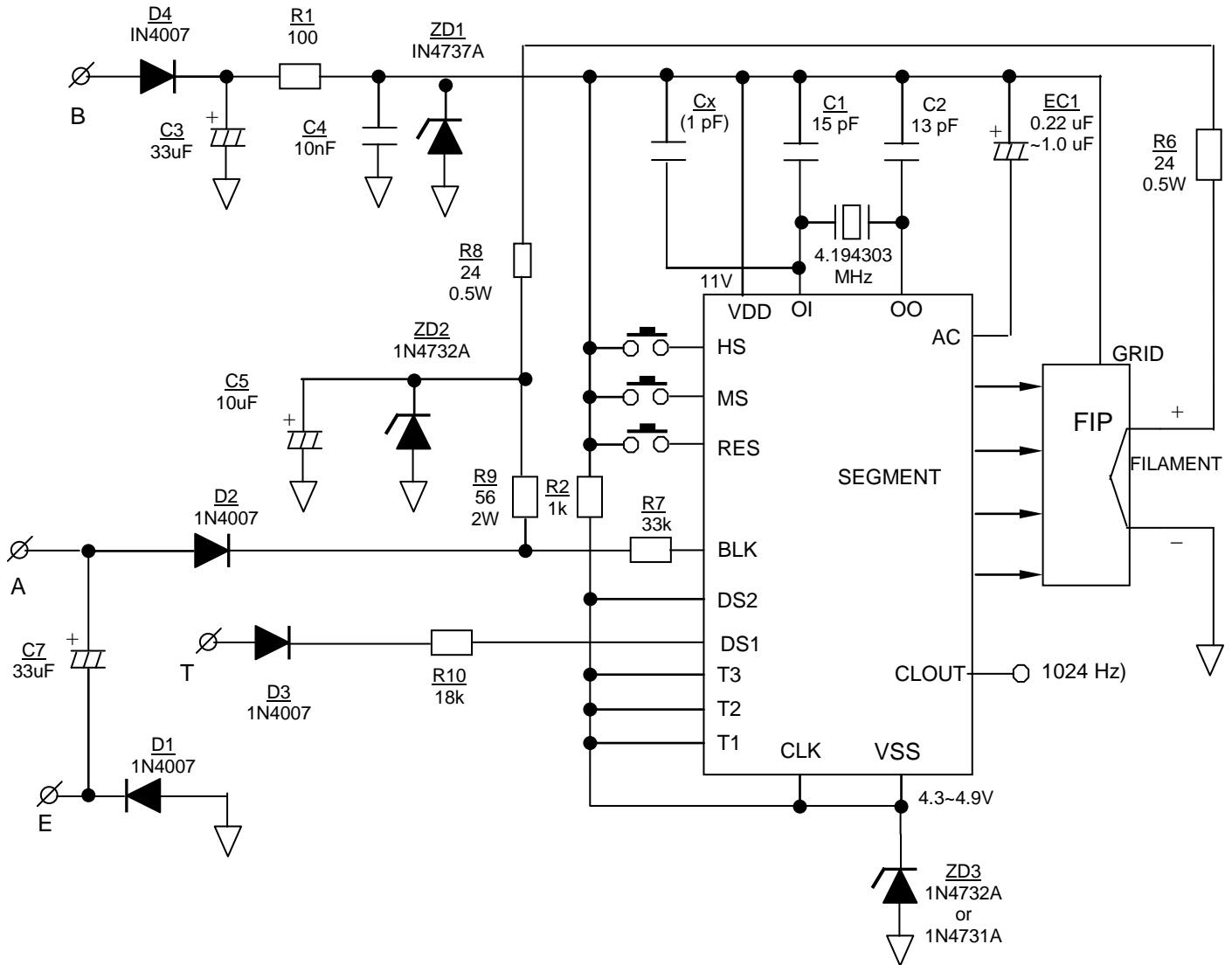


Block Diagram (for die)

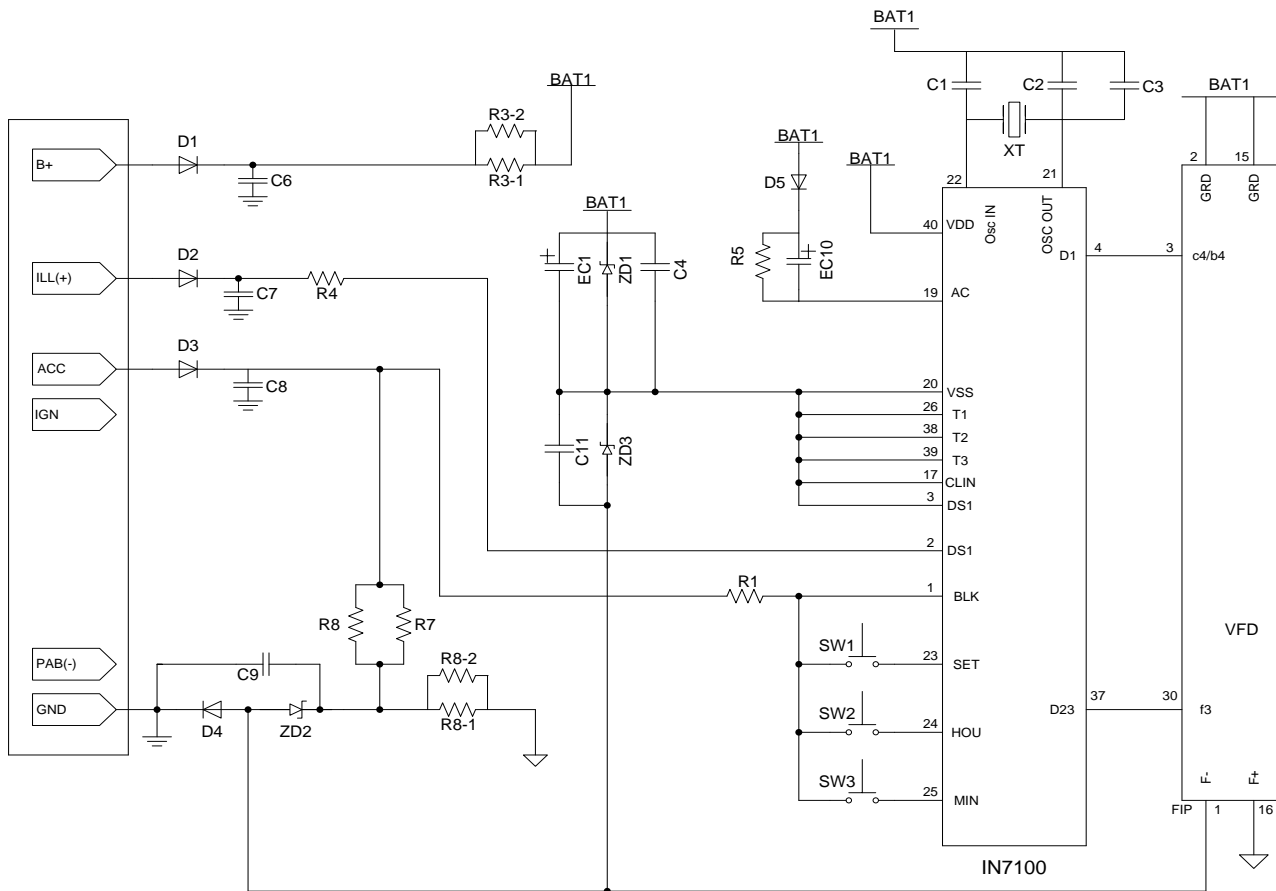


APPLICATION CIRCUITS

Typical Application



“Keeping Time” Application



Part List

S/No	PART	Q'NTY
IC1	IN7100	1
VFD	SVC-01MS01	1
XT	4194304hz	1
C1	10pF	1
C2	15pF	1
C3	1~12pF ADJ	1
EC1	470uF, 25V	1
EC10	22uF, 10V	1
C4	104	1
C11	104	1
C6~9	104	4
R1	68k, 1/4w	1
R2	-	-

S/No	PART	Q'NTY
R3-1~2	560, 1/4W	2
R4	100k, 1/8W	1
R5	560k, 1/8W	1
R6	130, 2W	1
R7	130, 2W	1
R8-1~2	56, 1/4W	2
ZD1	1N4735A	1
ZD2	1N4732A	1
ZD3	1N4729A	1
SW1~3	Switch(THH-10910)	3
D1~4	1N4007	4
D5	1N4148	1
CON1	Connector(5566-05A)	1

## PIN DESCRIPTION

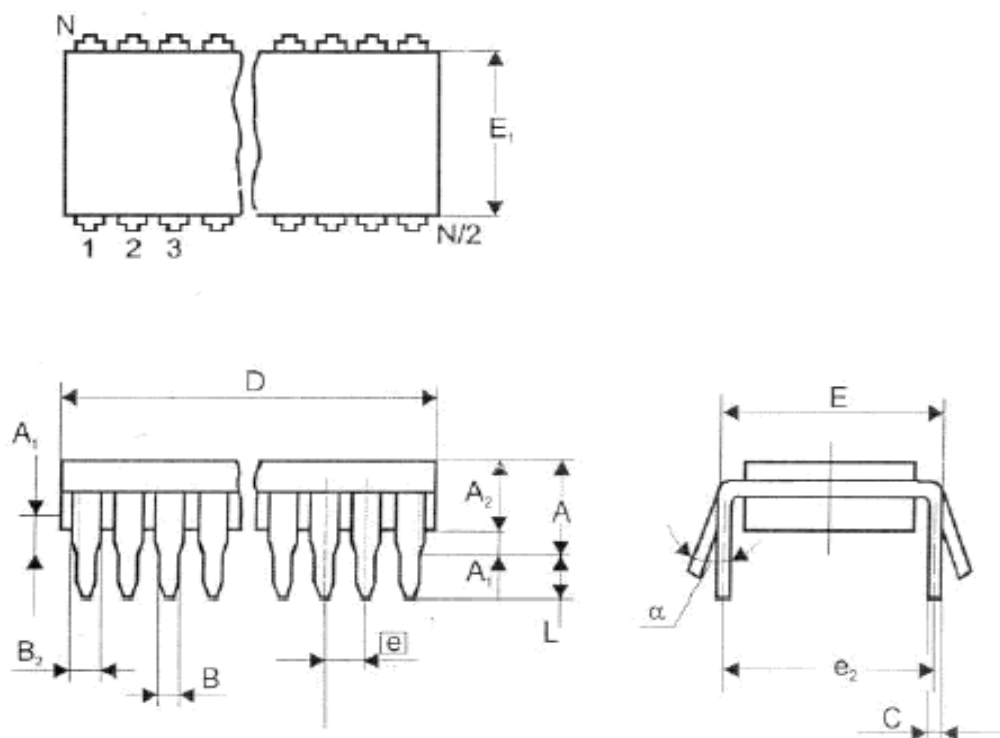
PIN #	NAME H	I/O	DESCRIPTION															
1	BLK	I	BLANCKING INPUT; When this pin is low state, FIP is off and the operation of HS, MS, RES, switch is blocking, or vice versa															
2	DS1	I	DIMMER INPUT1, DIMMER INPUT2; This PIN control the brightness of FIP. Duty of segment output is determined depend on the level of DS1, DS2															
3	DS2	I																
			<table border="1"> <tr> <td>DS1</td> <td>V<sub>DD</sub></td> <td>V<sub>SS</sub></td> <td>V<sub>DD</sub></td> <td>V<sub>SS</sub></td> </tr> <tr> <td>DS2</td> <td>V<sub>DD</sub></td> <td>V<sub>DD</sub></td> <td>V<sub>SS</sub></td> <td>V<sub>SS</sub></td> </tr> <tr> <td>DUTY</td> <td>1/16</td> <td>1/8</td> <td>1/4</td> <td>1</td> </tr> </table>	DS1	V <sub>DD</sub>	V <sub>SS</sub>	V <sub>DD</sub>	V <sub>SS</sub>	DS2	V <sub>DD</sub>	V <sub>DD</sub>	V <sub>SS</sub>	V <sub>SS</sub>	DUTY	1/16	1/8	1/4	1
DS1	V <sub>DD</sub>	V <sub>SS</sub>	V <sub>DD</sub>	V <sub>SS</sub>														
DS2	V <sub>DD</sub>	V <sub>DD</sub>	V <sub>SS</sub>	V <sub>SS</sub>														
DUTY	1/16	1/8	1/4	1														
4	bc4	O	SEGMENT OUTPUT															
5	g3	O	SEGMENT OUTPUT															
6	e3	O	SEGMENT OUTPUT															
7	d3	O	SEGMENT OUTPUT															
8	c3	O	SEGMENT OUTPUT															
9	g2	O	SEGMENT OUTPUT															
10	e2	O	SEGMENT OUTPUT															
11	c2	O	SEGMENT OUTPUT															
12	g1	O	SEGMENT OUTPUT															
13	e1	O	SEGMENT OUTPUT															
14	d1	O	SEGMENT OUTPUT															
15	c1	O	SEGMENT OUTPUT															
16	--	--	NO CONNECTION															
17	CLK	I	EXTERNAL CLOCK INPUT; External clock of 1024 Hz frequency can drive the IC operation															
18	CLOUT	O	CLOCK OUTPUT; Clock of 1024 Hz frequency is generated when using 4.194304 MHz crystal															
19	AC	I	CLEAR INPUT (power on reset input pin)															
20	VSS	I	GROUND															
21	OO	O	OSCILLATOR OUTPUT (4.194304 MHz crystal output)															
22	OI	I	OSCILLATOR INPUT (4.194304 MHz crystal input)															
23	RES	I	RES INPUT ( $\pm 30$ minutes auto correction Input)															
24	HS	I	HOUR ADJUST INPUT															
25	MS	I	MINUTE ADJUST INPUT															
26	T1	I	TEST PIN1															
27	b1	O	SEGMENT OUTPUT															
28	a1	O	SEGMENT OUTPUT															
29	f1	O	SEGMENT OUTPUT															
30	b2	O	SEGMENT OUTPUT															
31	ad2	O	SEGMENT OUTPUT															
32	f2	O	SEGMENT OUTPUT															
33	1HZ	O	SEGMENT OUTPUT (colon)															
34	--	--	NO CONNECTION															
35	b3	O	SEGMENT OUTPUT															
36	a3	O	SEGMENT OUTPUT															
37	f3	O	SEGMENT OUTPUT															
38	T2	I	TEST PIN2															
39	T3	I	TEST PIN3															
40	V <sub>DD</sub>	I	POWER SUPPLY															

## INTERNAL STATE

pull down: BLK, DS1, DS2, AC, RES, HS, MS, TE1, TE2, TE3

P-ch OPEN DRAIN: bc4, g3, e3, d3, c3, g2, e2, c2, g1, e1, d1, c1, b1, a1, f1, b2, ad2, f2, 1Hz, b3, a3, f3

## 40-Pin Plastic Dual-in-Line



<i>Dimension, mm</i>		
A	max	6.35
A <sub>1</sub>	min	0.38
A <sub>2</sub>	min	3.18
	max	4.95
B	min	0.36
	max	0.56
B <sub>2</sub>	min	0.77
	max	1.78
C	min	0.20
	max	0.38
D	min	50.30
	max	53.20
E	min	15.24
	max	15.87
E <sub>1</sub>	min	12.32
	max	14.73
e	nom	2.54
e <sub>2</sub>	nom	15.24
L	min	2.92
	max	5.08
α	min	0°
	max	10°