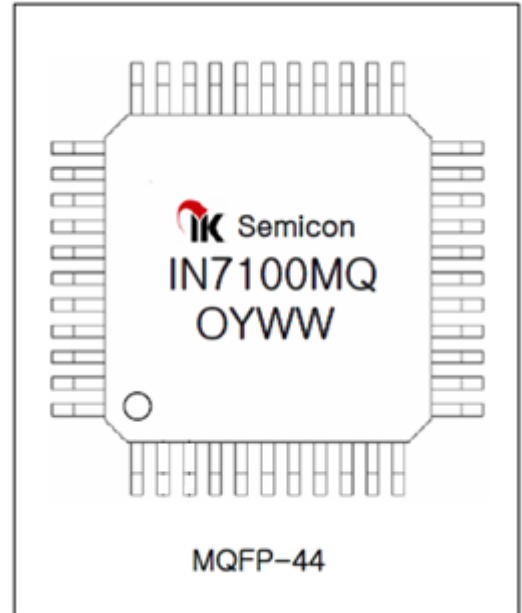


AUTOMOTIVE DIGITAL CLOCK IC

IN7100MQ

DESCRIPTION

IN7100 is 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
- 44 MQFP package

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

DC CHARACTERISTICS ($T_a=25^\circ\text{C}$, $\text{RH}\leq 70\%$, $C_D=C_G=15\text{pF}$, $X_{\text{tal}}=4.194304\text{MHz}$)

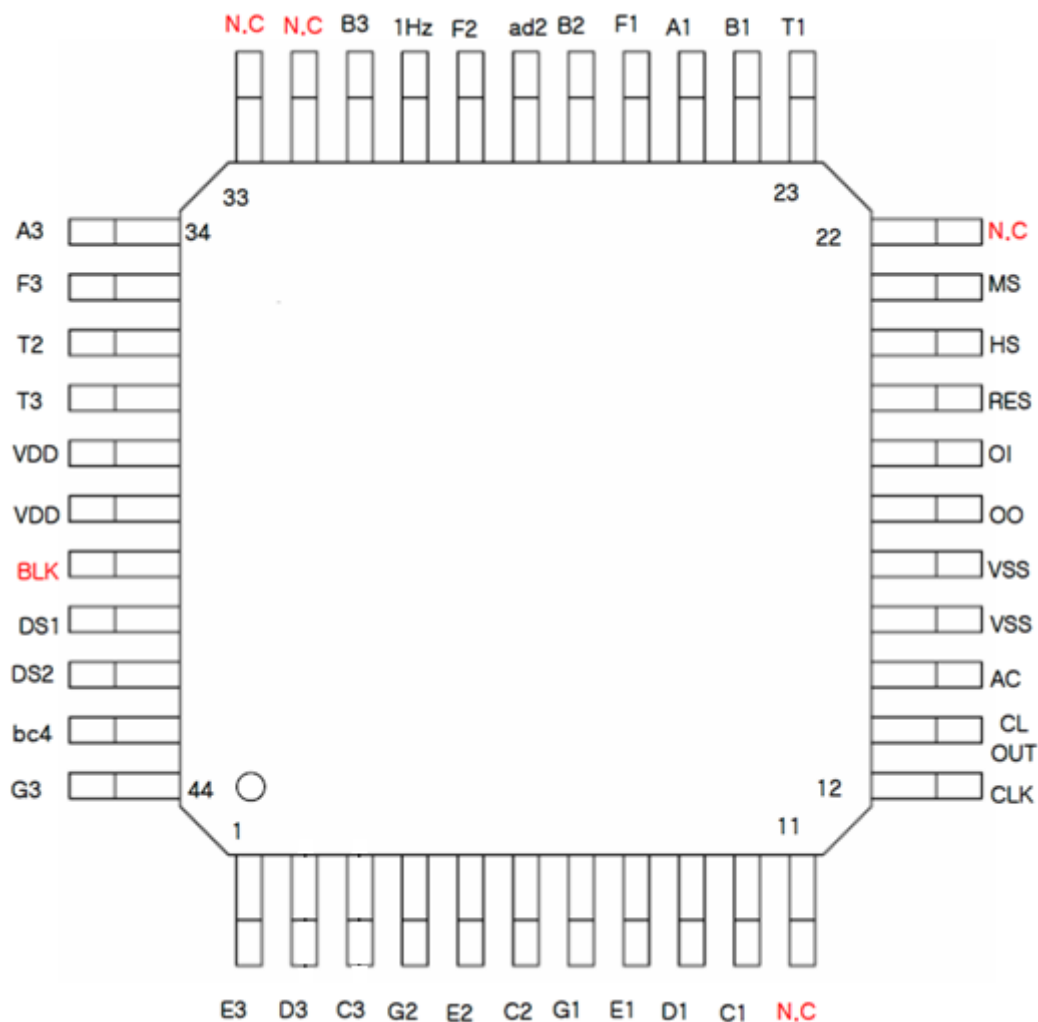
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Power Supply Voltage	$V_{DD}-V_{SS}$		3.0	—	7.0	V
Power Supply Current	I_{DD}	No output loads, $V_{DD}=6\text{V}$	—	0.3	0.5	mA
Leakage Current	I_{OFF}	$V_{DD}-V_{SS}=5.0\text{V}$			5.0	μA
High Level Output Current ⁽¹⁾	I_{OH1}	$V_{DD}-V_{SS}=3.0\text{V}$,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

($V_{DD}-V_{SS}=3.0\sim 7.0\text{V}$, $T_a = -40 \sim +85^\circ\text{C}$, $\text{RH}\leq 70\%$, $C_D=C_G=15\text{pF}$, $X_{\text{tal}}=4.194304\text{MHz}$)

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

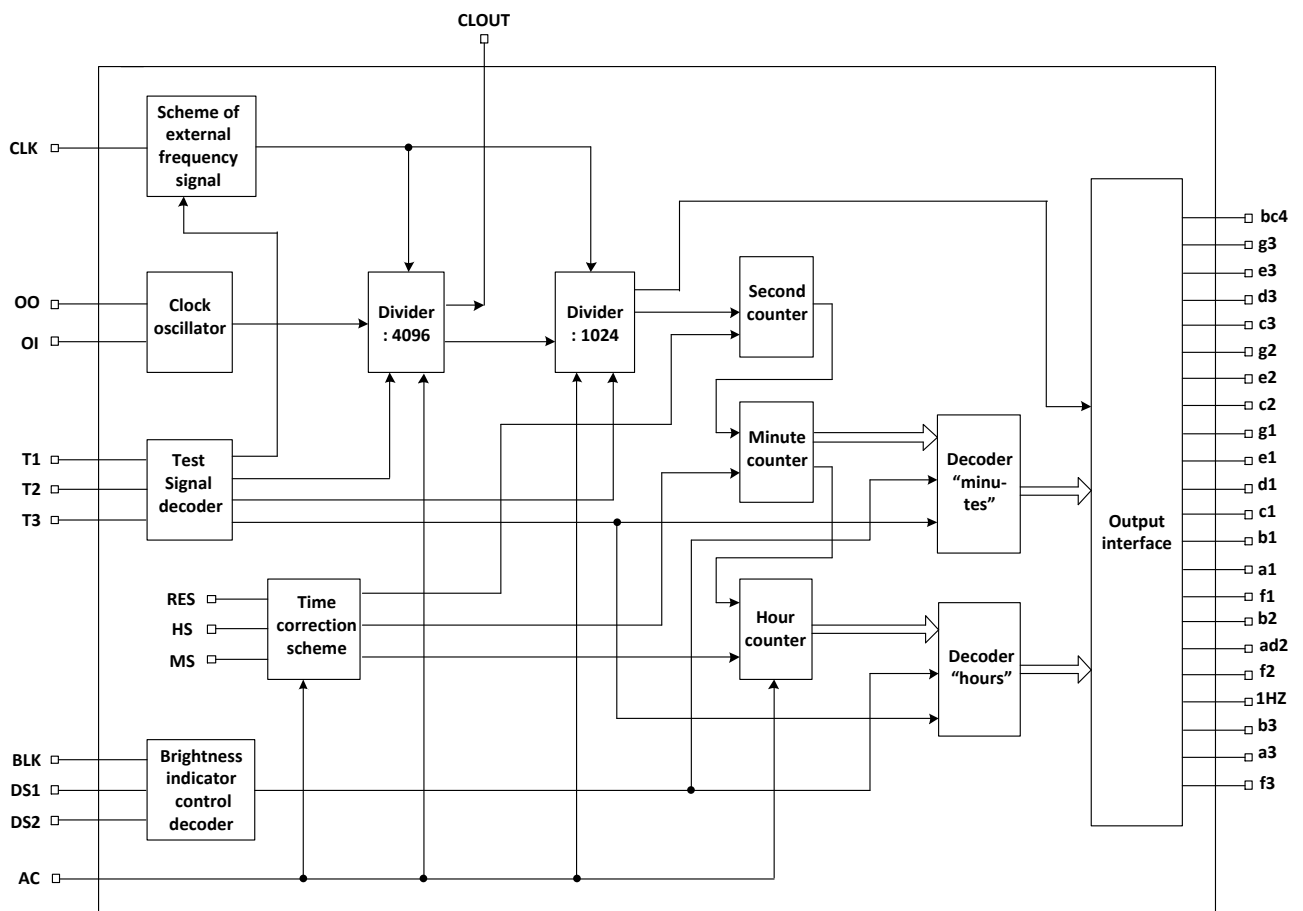
- (1) for segment other than bc4, ad2, 1Hz
 (2) for segment bc4, ad2, 1Hz and CLOUT
 (3) for CLOUT
 (4) for DS1, DS2, RES, HS, MS and BLK
 (5) for T1, T2, T3 and AC

PIN CONFIGURATION

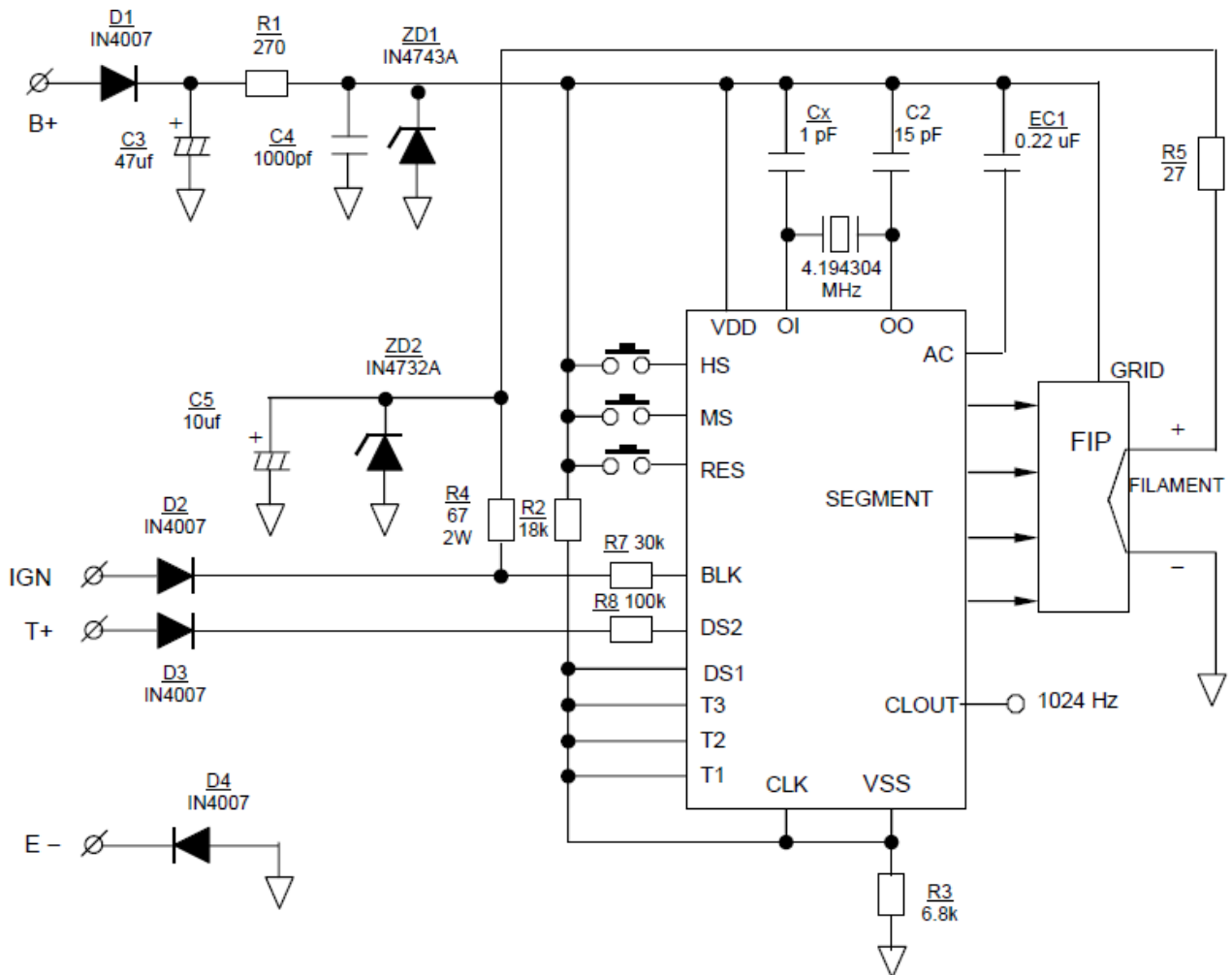


MQFP-44

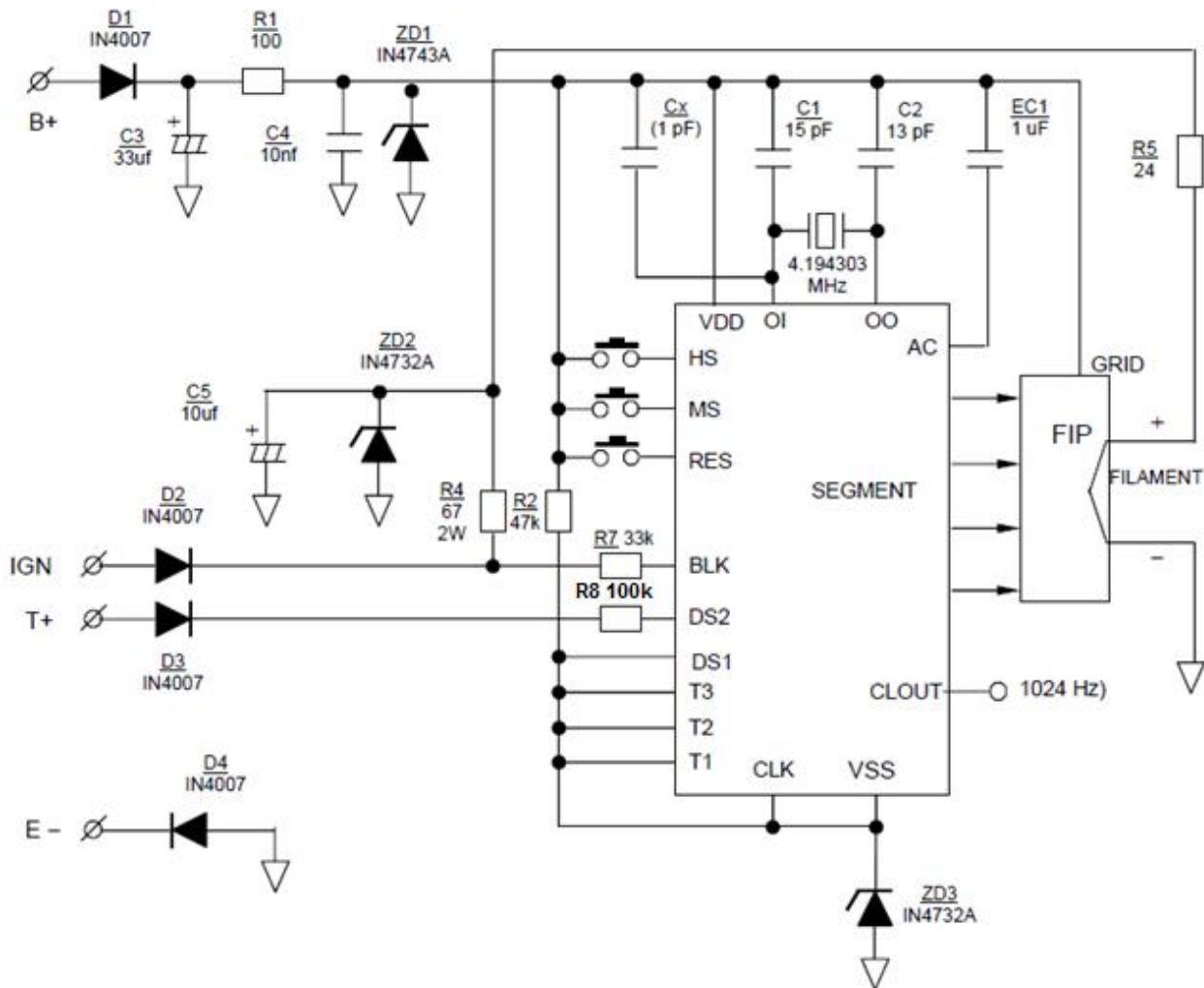
BLOCK DIAGRAM



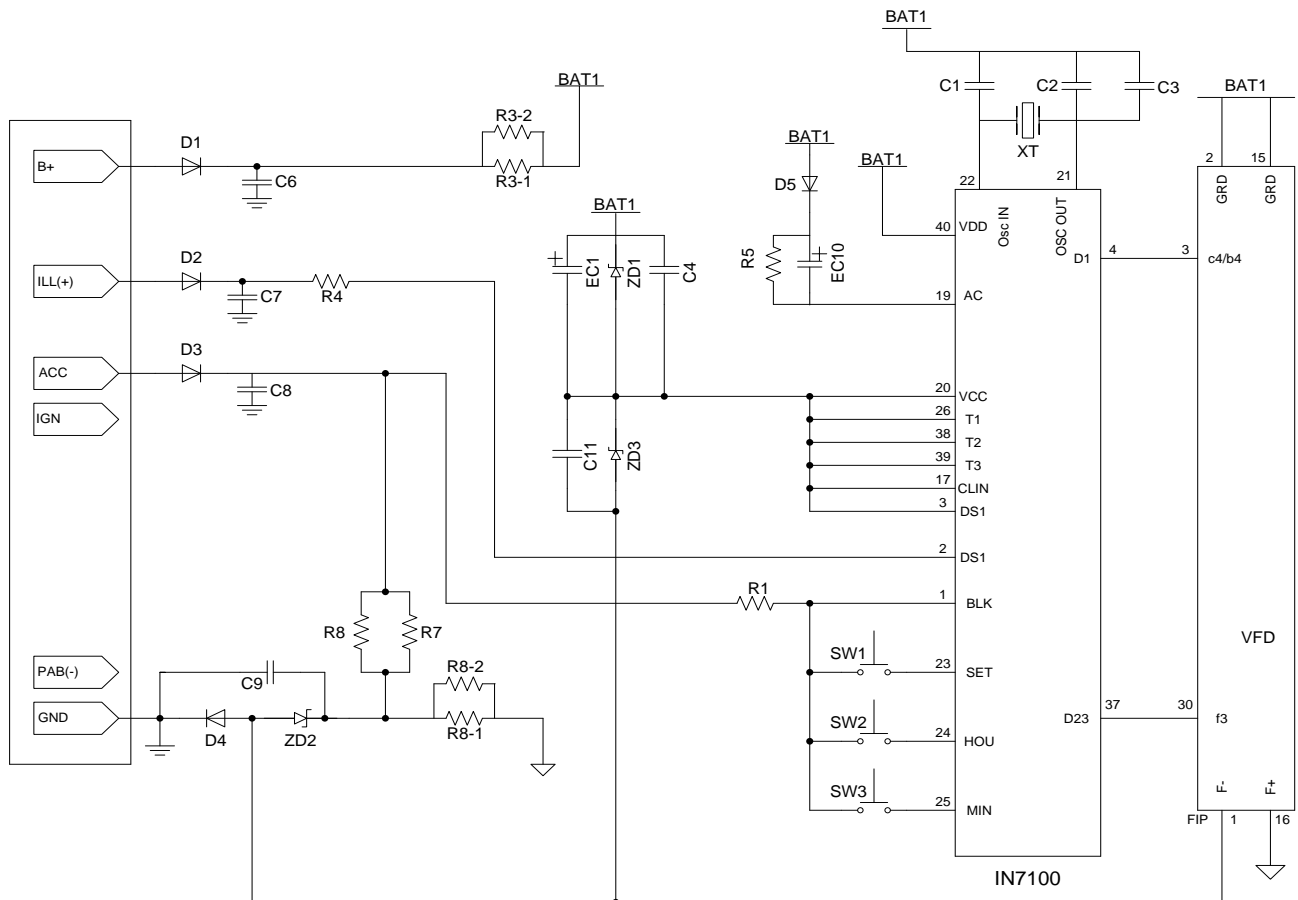
APPLICATION CIRCUIT



APPLICATION CIRCUIT (for EMI enhancement)



“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
EC10	22uF, 10V	1
C4	104	1
C11	104	1
C6~9	104	4
R1	68k, 1/4w	1
R2	-	-
R3-1~2	560, 1/4W	2
R4	100k, 1/8W	1
R5	800k, 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	1N4007	1
CON1	Connector(5566-05A)	1

PIN DESCRIPTION

QFP-44	NAME	I/O	DESCRIPTION															
1	E3	O	SEGMENT OUTPUT															
2	D3	O	SEGMENT OUTPUT															
3	C3	O	SEGMENT OUTPUT															
4	G2	O	SEGMENT OUTPUT															
5	E2	O	SEGMENT OUTPUT															
6	C2	O	SEGMENT OUTPUT															
7	G1	O	SEGMENT OUTPUT															
8	E1	O	SEGMENT OUTPUT															
9	D1	O	SEGMENT OUTPUT															
10	C1	O	SEGMENT OUTPUT															
11	--	--	NO CONNECTION															
12	CLK	I	EXTERNAL CLOCK INPUT; External clock of 1024 Hz frequency can drive the IC operation															
13	CLOCK	O	CLOCK OUTPUT; Clock of 1024 Hz frequency is generated when using 4.194304 MHz crystal															
14	AC	I	CLEAR INPUT (power on reset input pin)															
15, 16	VSS	I	GROUND															
17	OO	O	OSCILLATOR OUTPUT (4.194304 MHz crystal output)															
18	OI	O	OSCILLATOR INPUT (4.194304 MHz crystal input)															
19	RES	I	RES INPUT (± 30 minutes auto correction Input)															
20	HS	I	HOUR ADJUST INPUT															
21	MS	I	MINUTE ADJUST INPUT															
22	--	--	NO CONNECTION															
23	T1	I	TEST PIN1															
24	B1	O	SEGMENT OUTPUT															
25	A1	O	SEGMENT OUTPUT															
26	F1	O	SEGMENT OUTPUT															
27	B2	O	SEGMENT OUTPUT															
28	ad2	O	SEGMENT OUTPUT															
29	F2	O	SEGMENT OUTPUT															
30	1HZ	O	SEGMENT OUTPUT (colon)															
	--	--	NO CONNECTION															
31	B3	O	SEGMENT OUTPUT															
32	--	--	NO CONNECTION															
33	--	--	NO CONNECTION															
34	A3	O	SEGMENT OUTPUT															
35	F3	O	SEGMENT OUTPUT															
36	T2	I	TEST PIN2															
37	T3	I	TEST PIN3															
38, 39	V _{DD}	I	POWER SUPPLY															
40	BLK	I	BLANKING INPUT; When this pin is low state, FIP is off and the operation of HS, MS, RES, switch is blocking, or vice versa															
41	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															
42	DS2	I		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>DS1</td> <td>V_{DD}</td> <td>V_{SS}</td> <td>V_{DD}</td> <td>V_{SS}</td> </tr> <tr> <td>DS2</td> <td>V_{DD}</td> <td>V_{DD}</td> <td>V_{SS}</td> <td>V_{SS}</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 _{DD}	V _{SS}	V _{DD}	V _{SS}	DS2	V _{DD}	V _{DD}	V _{SS}	V _{SS}	DUTY	1/16	1/8	1/4
DS1	V _{DD}	V _{SS}	V _{DD}	V _{SS}														
DS2	V _{DD}	V _{DD}	V _{SS}	V _{SS}														
DUTY	1/16	1/8	1/4	1														
43	bc4	O	SEGMENT OUTPUT															
44	G3	O	SEGMENT OUTPUT															

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

Package Dimension

MQFP-44

Dimensions In millimeters

