

# AUTOMOTIVE DIGITAL CLOCK IC

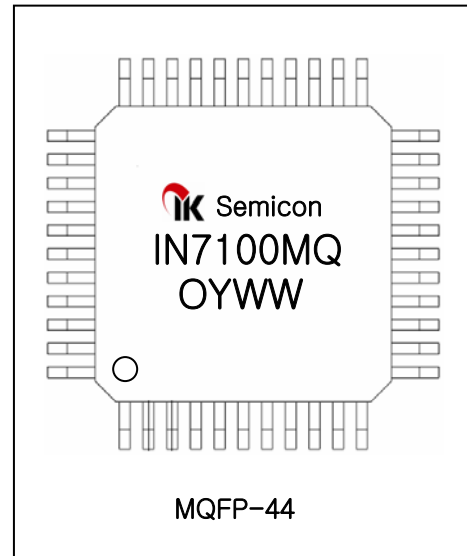
**IN7100MQ**

## 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

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

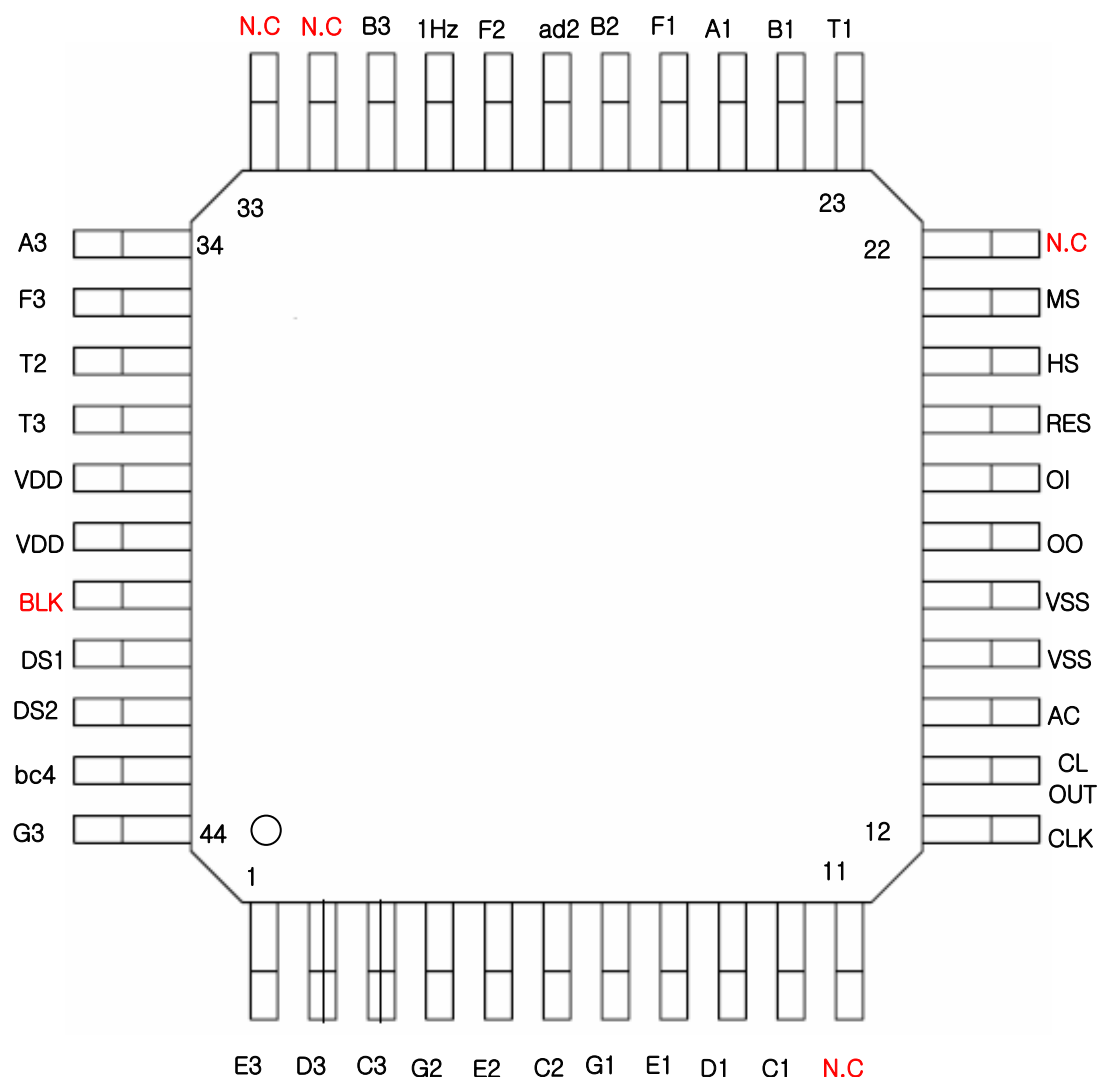
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Power Supply Voltage	$V_{DD}-V_{SS}$		3.0	—	7.0	V
Power Supply Current	$I_{DD}$	No output loads, $V_{DD}=6V$	—	0.3	0.5	mA
Leakage Current	$I_{OFF}$	$V_{DD}-V_{SS}=5.0V$			5.0	μA
High Level Output Current <sup>(1)</sup>	$I_{OH1}$	$V_{DD}-V_{SS}=3.0V, V_{DD}-V_{OUT}=0.5V$	300	—	—	μA
High Level Output Current <sup>(2)</sup>	$I_{OH2}$	$V_{DD}-V_{SS}=3.0V, V_{DD}-V_{OUT}=0.5V$	500	—	—	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

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

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	—	—	$\mu A$

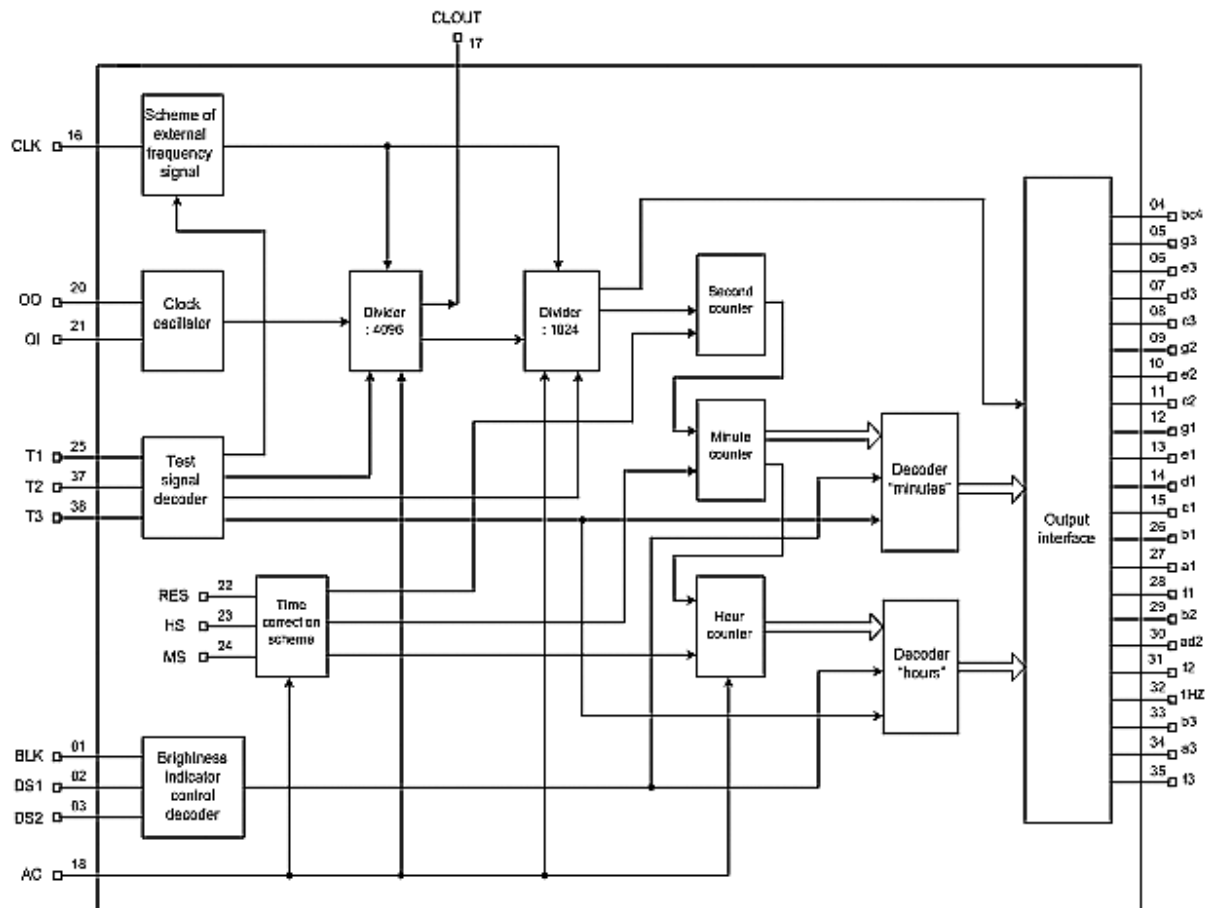
- (1) for segment other than bc4, ad2, 1Hz
- (2) for segment bc4, ad2, 1Hz and CLOUT
- (3) for CLOUT
- (4) for DS1, DS2, RES, HS, MS and BLK
- (5) for T1, T2, T3 and AC

**PIN CONFIGURATION**

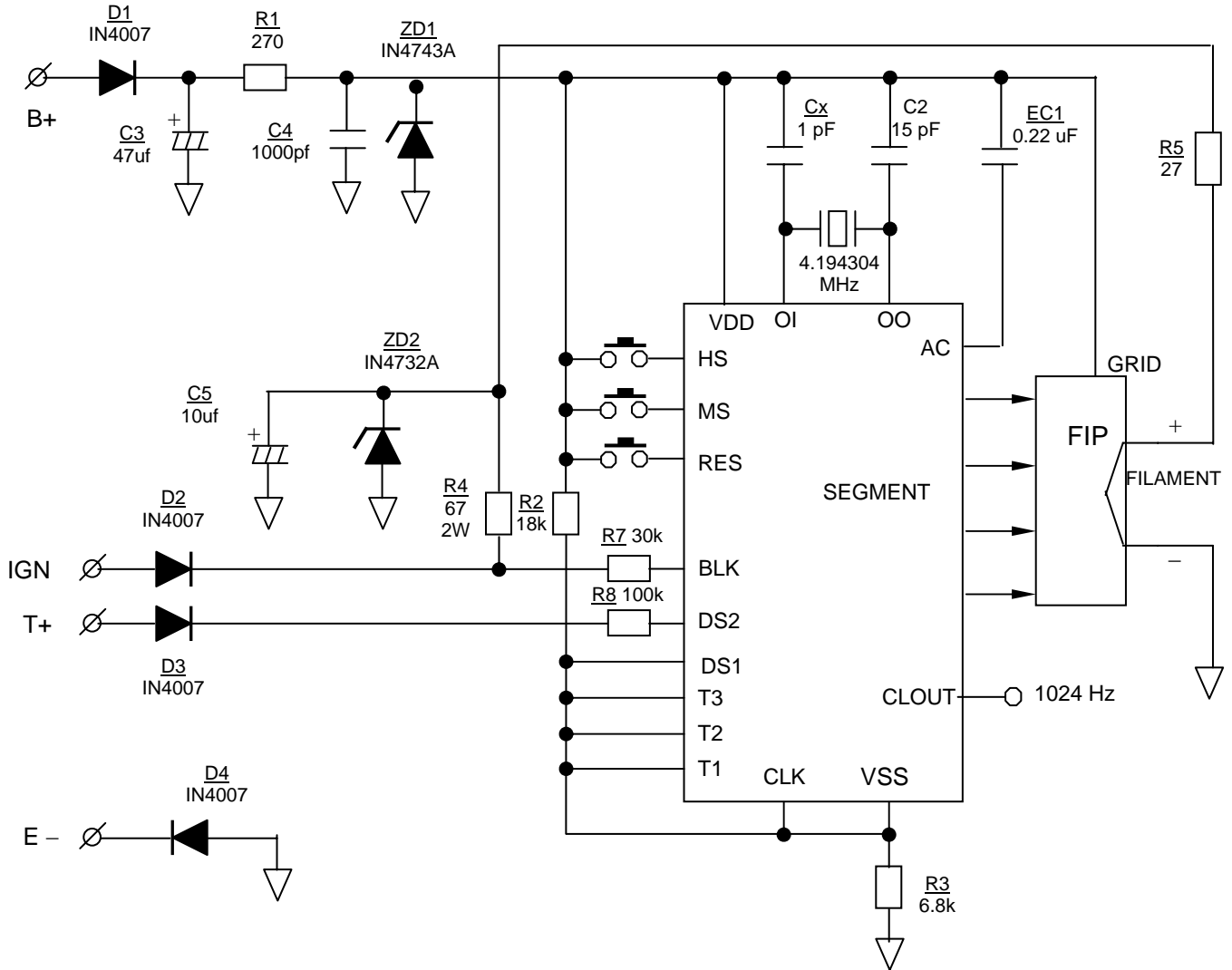


**MQFP-44**

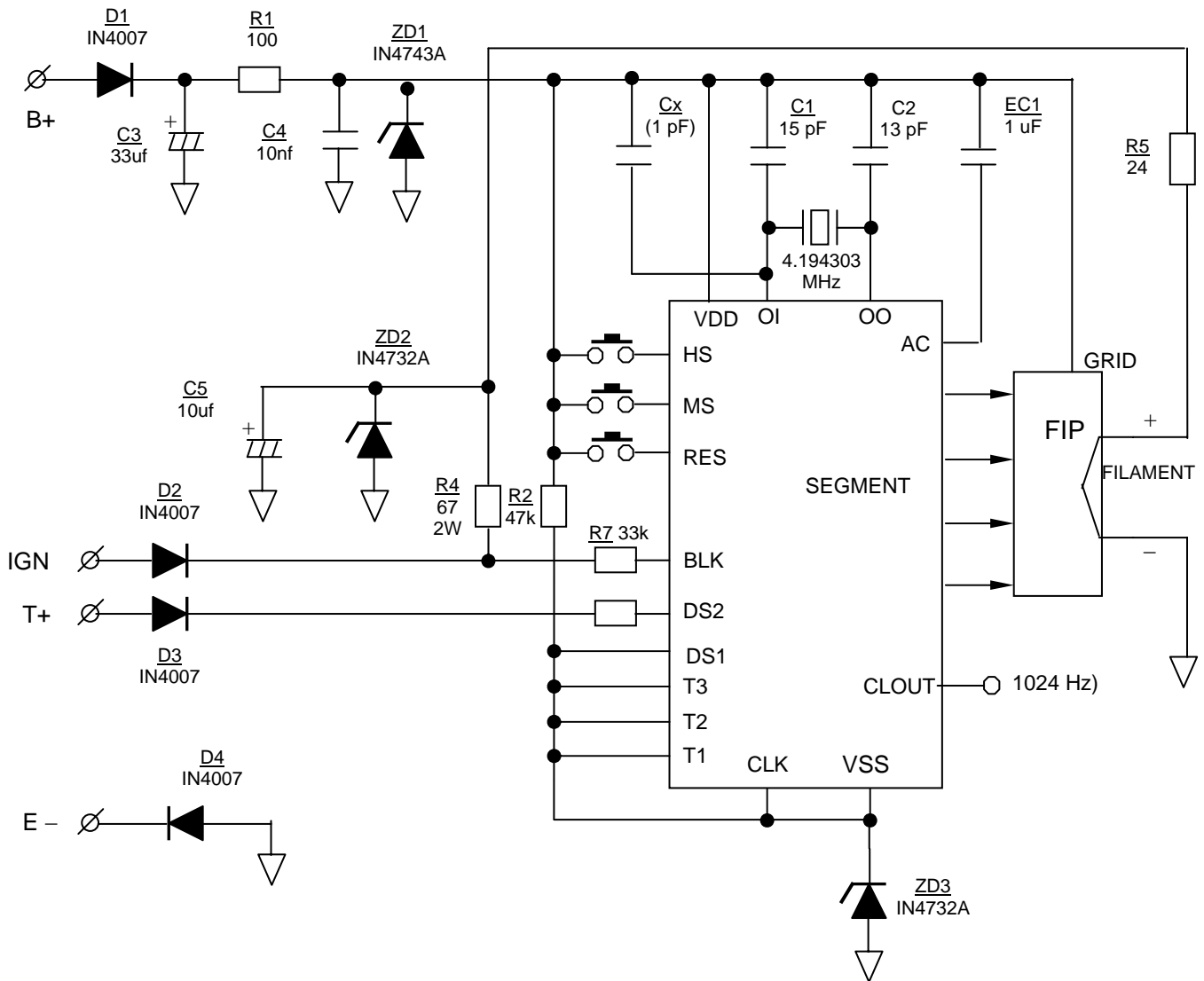
Block Diagram (for die)



APPLICATION CIRCUIT



APPLICATION CIRCUIT (for EMI enhancement)



## 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	CLOUT	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 ( $\pm 30$ 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 <sub>DD</sub>	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"> <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
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														
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

**PGK Dimension (MQFP-44)**

Dimensions in millimeters

