48 OUTPUT LED DRIVER / 9 BIT PWM CONTROLLER

SL70D0948

System Logic Semiconductor

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INTRODUCTION

The SL70D0948 is LED driver / controller IC for LED display panel. This is consisted of 48 channel LED driver , 9Bit PWM controller and 48 bit shift register. Also it is very convenient to application because all display data can transfer by serial method.

FEATURES

Driver Output Circuits

- 48 LED Driver Outputs : N-ch Open Drain MOS Transistor Output
- LED Driving Voltage : Max. 16V (When Transistor Off)
- LED Driving Current : Max. 90mA
- LED Driving Current Control
- Outputs are 9bit PWM controlled

Data Interface

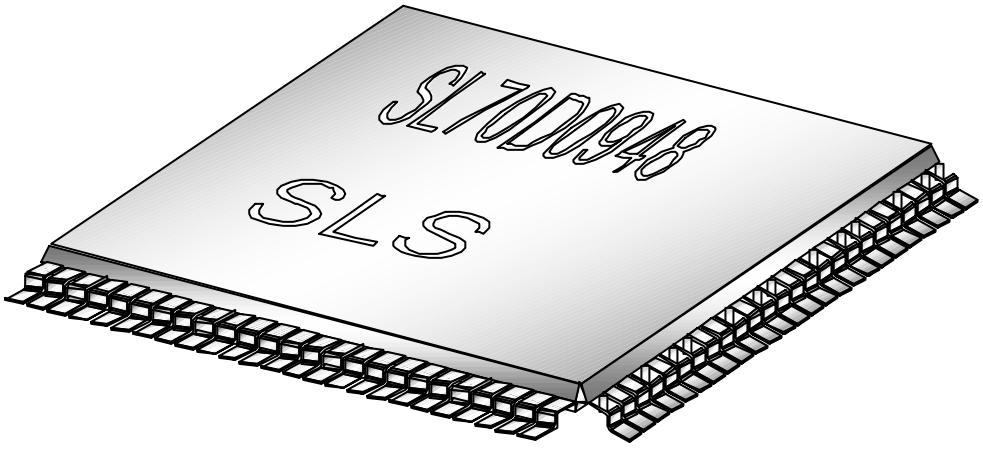
- 48bit Shift Register for 9bit data input
- 9bit parallel data format selectable

PWM controller

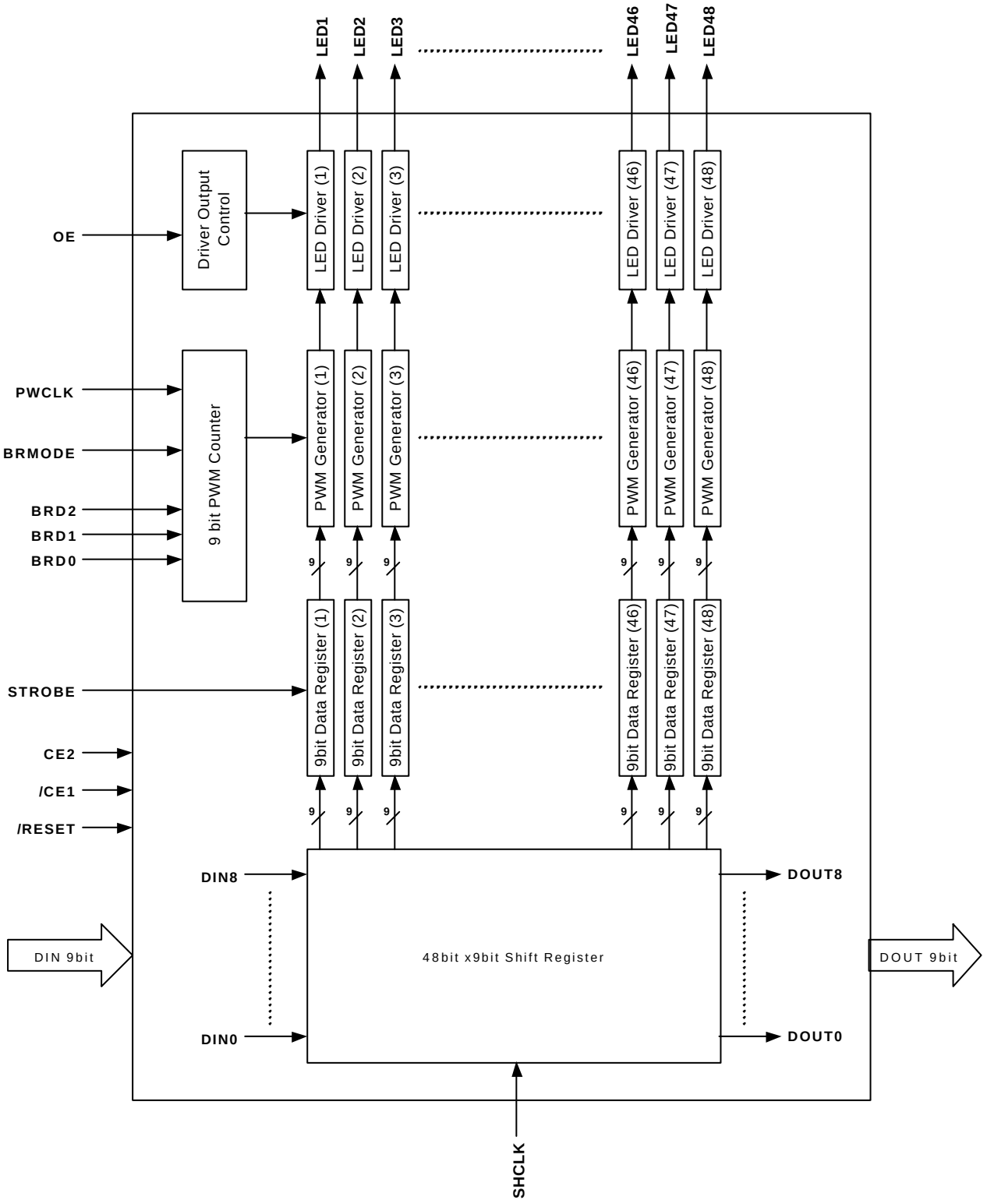
- 9bit PWM control (512 Gray scale)
- 3bit Brightness / 4bit Brightness input selectable

Package Type

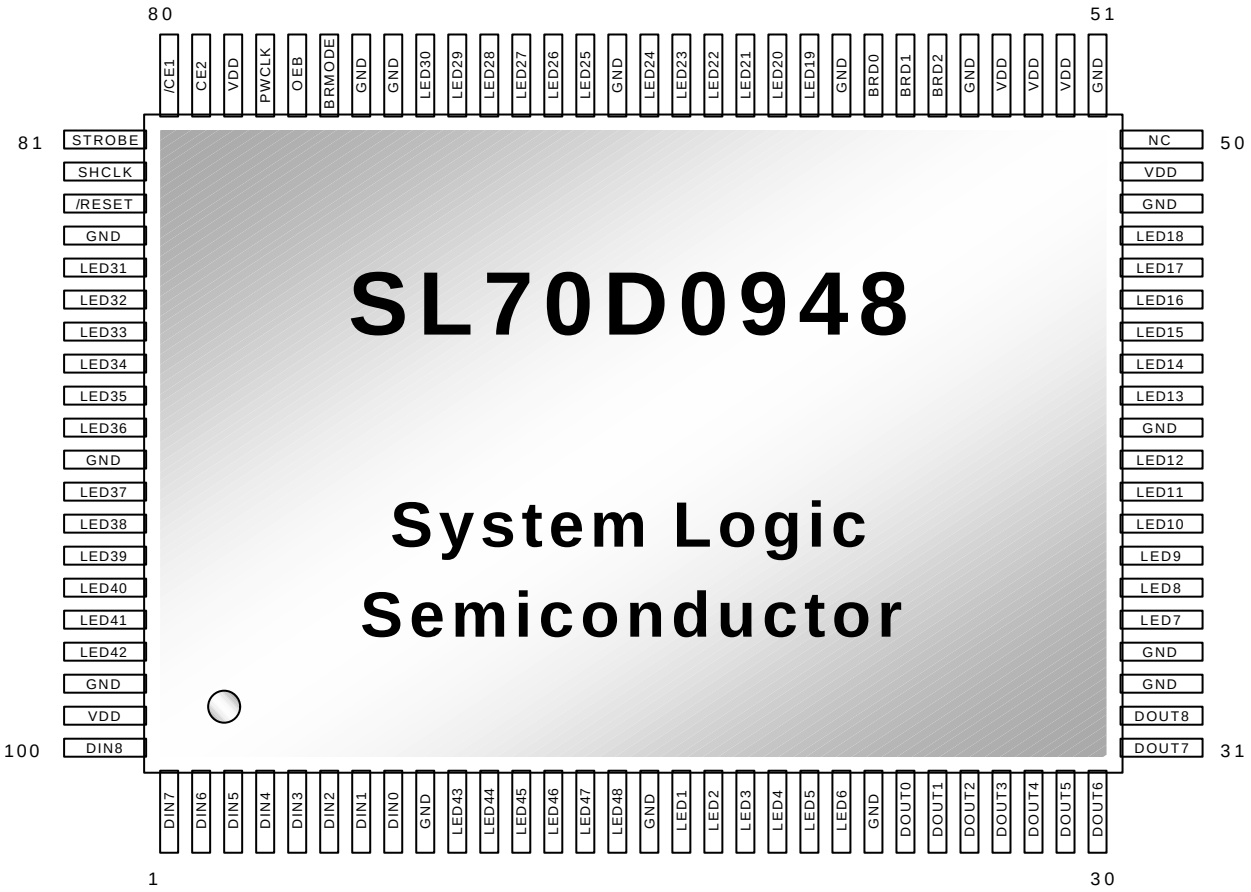
- 100 pin MQFP



BLOCK DIAGRAM



PIN ASSIGNMENT(MQFP)



PIN DESCRIPTION

PIN No. (MQFP)	PIN NAME	FUNCTION
49,52,53,54,78,99	VDD	5V Power supply terminal.
9, 16, 23, 33, 34, 41, 48, 59, 65, 72,74 84, 91, 98	GND	GND terminals for LED Drivers and control logic. All GND terminals must be connected to GND level. Do not left any GND terminal to NC.
83	/RESET	Reset input terminal (Low active).
100, 1, 2, 3, 4, 5, 6, 7, 8	DIN8 ~ DIN0	Data input terminals for 9bit R, G, B data. Shift register accepts R, G, B data from these terminals. (at rising edge of SHCLK)
32, 31, 30, 29, 28, 27, 26, 25, 24	DOUT8 ~ DOUT0	Output terminals of shift register output data for next DIN8 ~ DIN0 terminals.
82	SHCLK	Shift register clock input terminal.
81	STROBE	Strobe signal input terminal. At rising edge of strobe signal, 48 channels of 9 bit data registers copy R, G, B data from shift register.
80	/CE1	Chip enable signal input terminal (Low active).
79	CE2	Chip enable signal input terminal (High active). The device accepts SHCLK and STROBE when /CE1 = “L” and CE2 = “H”.
76	OEB	Output enable signal input terminal. The device outputs data when OEB = “L”. When OEB = “H” all R, G, B output terminals hold high-impedance state.
77	PWCLK	PWM generator reference clock input terminal.
75	BRMODE	Brightness control mode input terminal.
56, 57, 58	BRD2 ~ BRD0	Brightness control data input terminal.

PIN DESCRIPTION (continued)

PIN No. (MQFP)	PIN NAME	FUNCTION
51,55	GND	Reserved Pin. Must be tied to GND.
50	NC	No Connection
17, 18, 19, 20, 21, 22,35 , 36, 37, 38, 39, 40, 42, 43, 44, 45 46, 47, 60, 61 62, 63, 64, 65 67, 68, 69, 70, 71, 72, 85, 86 87, 88, 89, 90 92, 93, 94, 95 96, 97, 10, 11 12, 13, 14, 15	LED1 ~ 48	LED driver output terminals.

FUNCTION DESCRIPTION

SYSTEM INTERFACE

Chip Enable Input

The chip enable pins are /CE1 and CE2. The SL70D0948 can enable chip by /CE1=0, and CE2=1.

If the SL70D0948 is enable then it can receive signal that DIN,SHCLK and STROBE.

Output Enable Input

The SL70D0948 has output enable pin (OEB). If the OEB = 1, all output are off and if OEB = 0 then all output pins are PWM output.

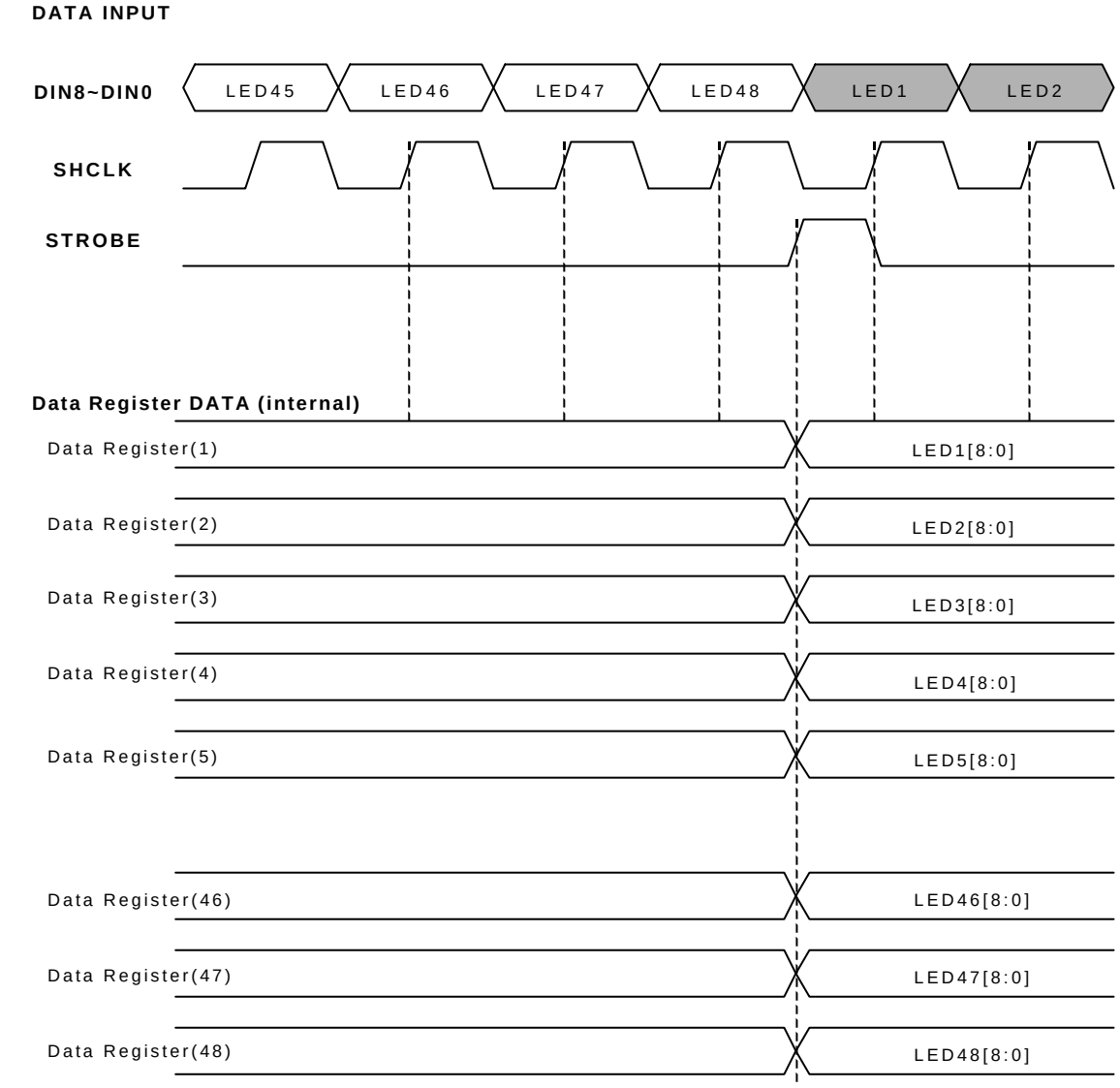
Data Input / Output

The SL70D0948 has 9bit data input pins (DIN[8:0]) and 9bit data output pins (DOUT[8:0]).

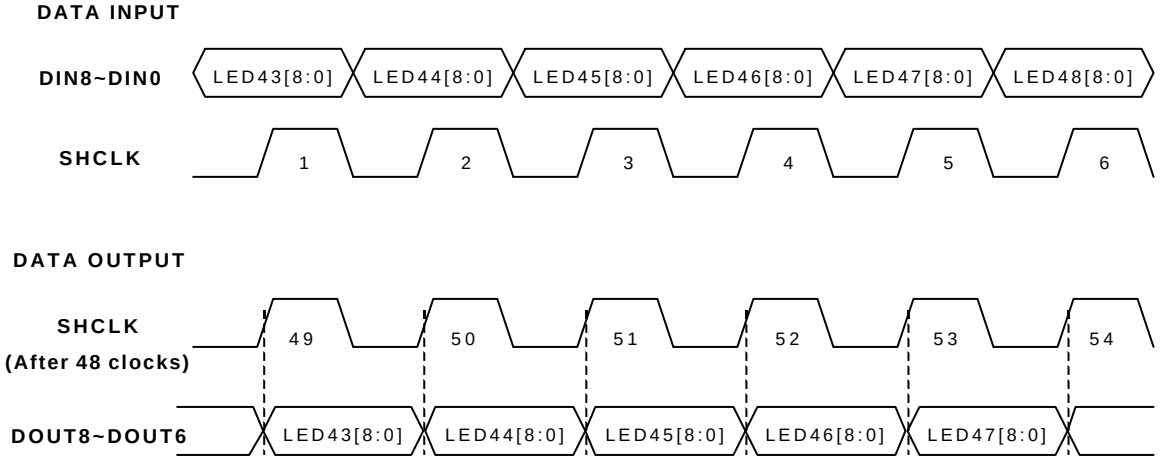
The output data is out after 48 times SHCLK from input data. If DOUT[8:0] pins are connected to next device DIN[8:0] pins, the first device 48bit input data can shift the next device 48bit input data by SHCLK. It can transfer display data to serial method so it makes device to connect directly.

The 9bit LED input data are MSB first inputted. The 9bit input data are inputted 9bit LED1 and next 9bit LED2 and next 9bit LED3 ... LED48 input data by SHCLK.

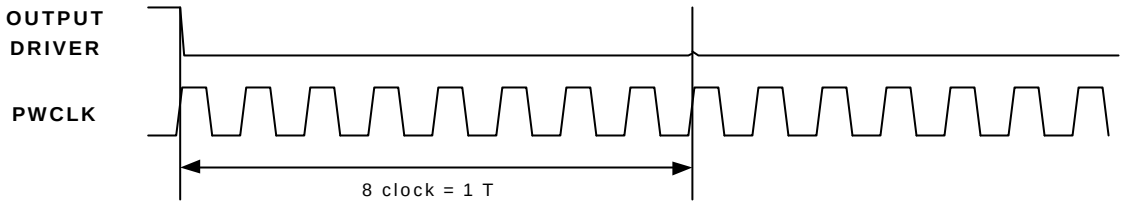
INPUT TIMING DIAGRAM



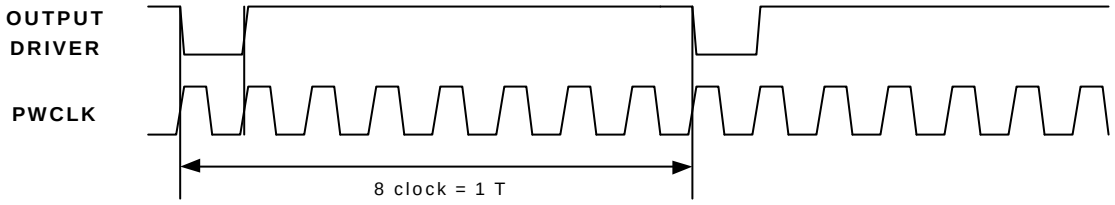
DOUT TIMING DIAGRAM



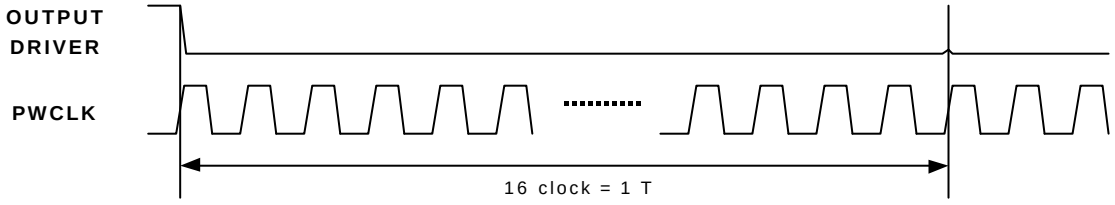
PWM OUTPUT WAVEFORM



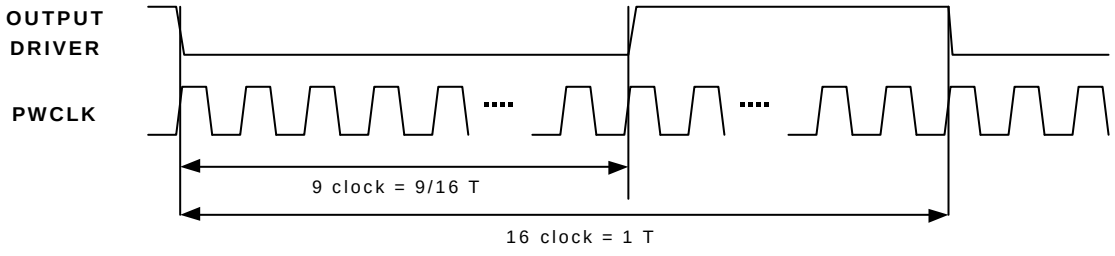
BRMODE = 0, BRD[2:0] = (1 1 1)$_2$



BRMODE = 0, BRD[2:0] = (0 0 0) $_2$

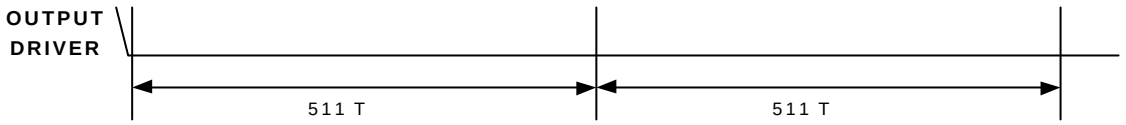


BRMODE = 1, BRD[2:0] = (111) $_2$

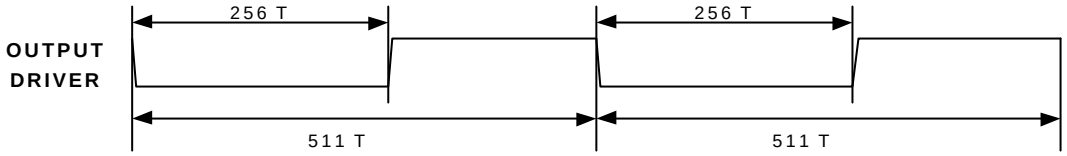


BRMODE = 1, BRD[2:0] = (0 0 0) $_2$

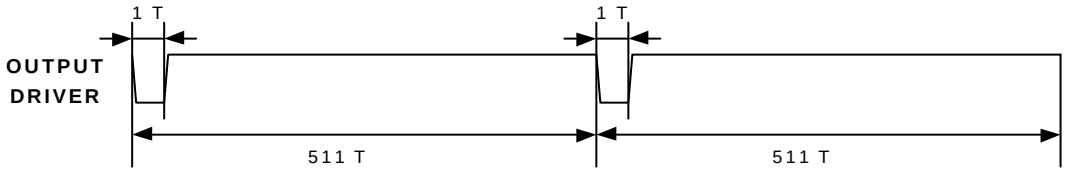
PWM OUTPUT TIMING DIAGRAM



DATA = (1FF)$_{16}$



DATA = (100)$_{16}$



DATA = (001)$_{16}$

SPECIFICATIONS

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{DD}	0 ~ 7.0	V
Output Voltage (LED1 ~ LED48)		V_{OUT}	-0.5 ~ 17	V
Output Current (LED1 ~ LED48)		I_{OUT}	90	mA
Input Voltage		V_{IN}	-0.4 ~ V_{DD} + 0.4	V
GND terminal Current		I_{GND}	1440	mA
Clock Frequency	SHCLK	F_{SR}	15	MHz
	PWCLK	F_{PWM}	20	MHz
Power Dissipation		P_D	1.78	W
Operating Temperature		T_{OPR}	-40 ~85	°C
Storage Temperature		T_{STG}	-55 ~ 150	°C

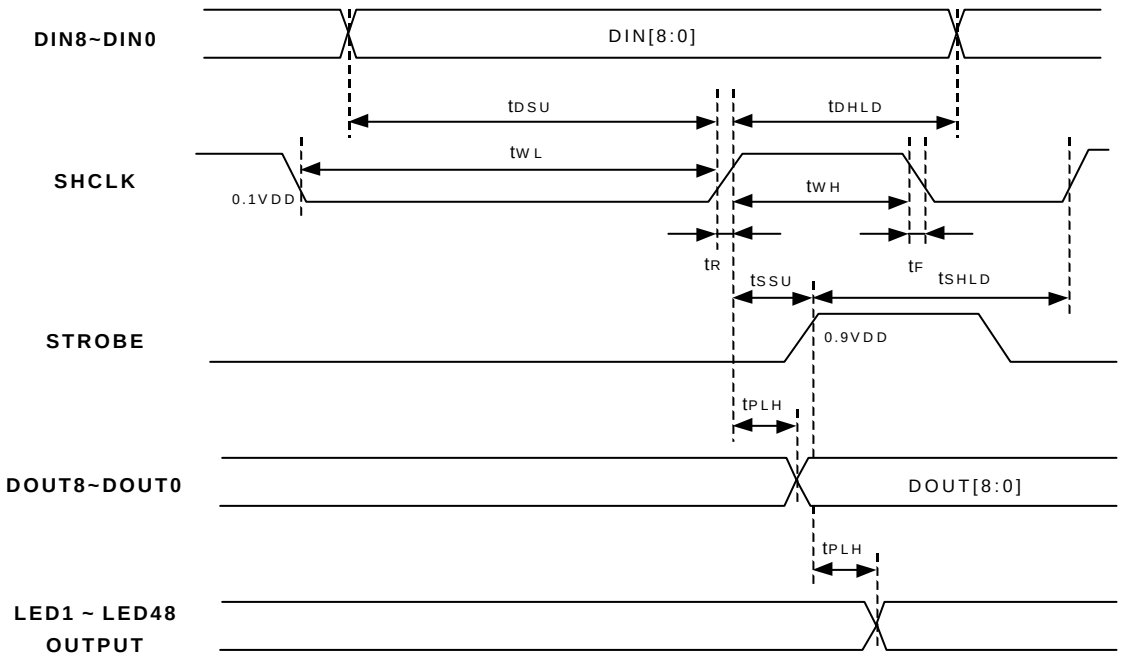
RECOMMANDED OPERATING CONDITION (Ta = 25°C)

CHARACTERISTIC		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage		V_{DD}	-	4.5	5.0	5.5	V
Output Voltage (LED1~48)		V_{OUT}	-	-	-	15.0	V
Output Current	LED1~ 48	I_{OUT}	-	-	-	88	mA
	SHCLK	I_{OH}	-	-	-	-1.0	
		I_{OL}	-	-	-	1.0	
Input Voltage		V_{IN}	-	0	-	V_{DD}	V
DIN Data Setup Time		t_{DSU}	-	50	-	-	ns
DIN Data Hold Time		t_{DHLD}	-	20	-	-	ns
STROBE Setup Time		t_{SSU}	-	50	-	-	ns
STROBE Hold Time		t_{SHLD}	-	20	-	-	ns
Pulse Width SHCLK, PWCLK, STROBE		t_{WH}	-	30	-	-	ns
		t_{WL}	-	30	-	-	ns
Clock Frequency	SHCLK	F_{SR}	-	-	-	10	MHz
	PWCLK	F_{PWM}	-	-	-	15	MHz
Power Dissipation		P_D	-	-	-	1.78	W

SWITCHING CHARACTERISTICS (Ta = 25°C)

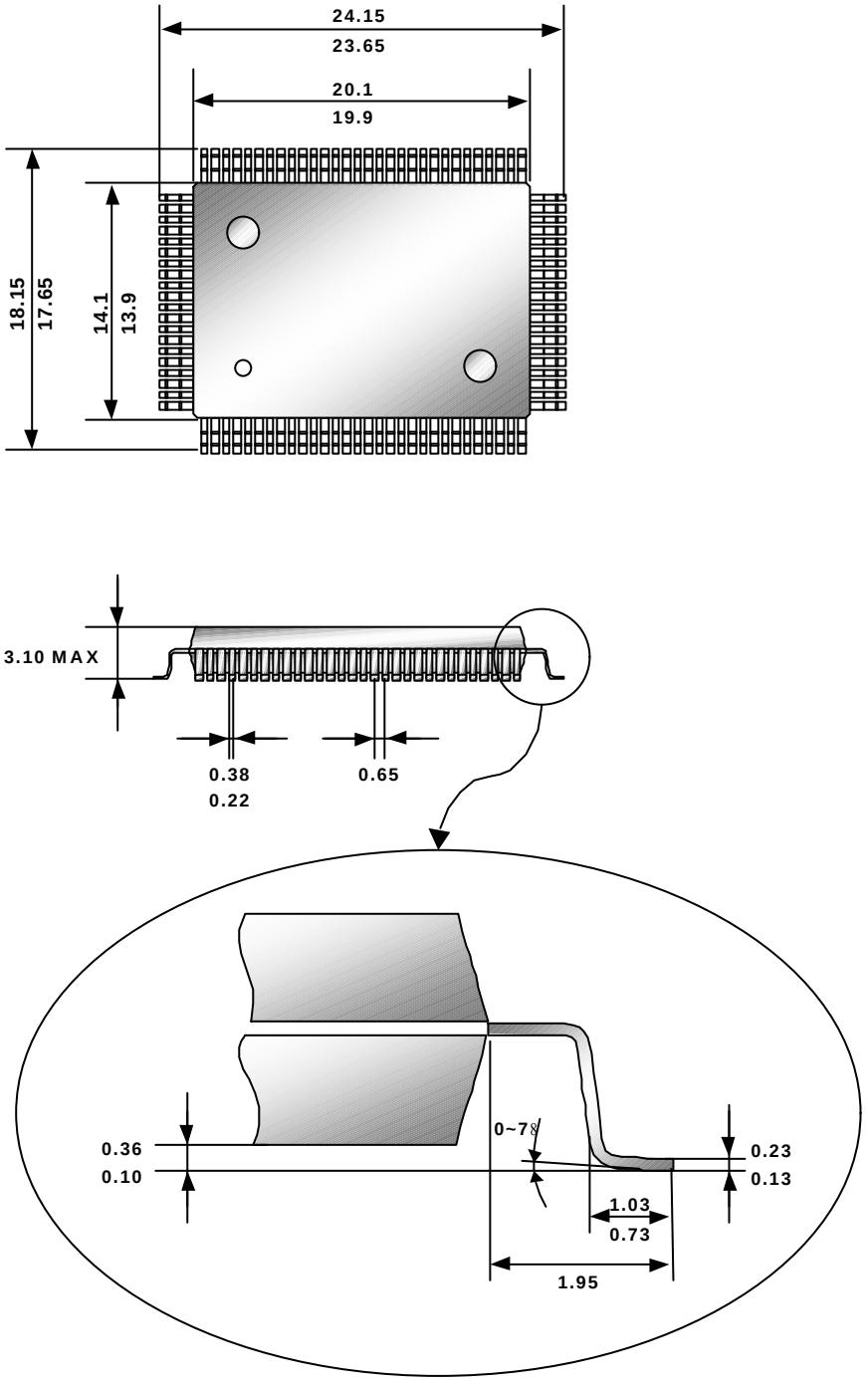
CHARACTERISTIC		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time ("L" to "H")	SHCLK-DOUT	t_{PLH}	V_{DD} = 5.0V V_{OUT} = 0.4V V_{CON} = V_{DD} V_{IH} = V_{DD} V_{IL} = GND F_{PWM} = 10MHz I_{OUT} = 40mA	-	20	50	ns
	STROBE			-	50	100	
	OE			-	50	100	
Maximum Clock Frequency	SHCLK	F_{SRMAX}		10	15	20	MHz
	PWCLK	F_{PWMAX}		15	20	30	
	STROBE	F_{STMAX}		10	15	20	
Minimum Pulse Width	SHCLK	t_{WH} t_{WL}		-	10	20	ns
	PWCLK			-	10	20	
	STROBE			-	10	20	
Data Set Up Time		t_{DSU}		-	15	30	ns
Data Hold Time		t_{DHLD}		-	10	15	
Maximum Clock Rise Time		t_R		-	-	10	us
Maximum Clock Fall Time		t_F		-	-	10	
Maximum Output Rise Time		t_{OR}		-	50	100	ns
Maximum Output Fall Time		t_{OF}		-	100	200	

TIMING WAVE FORM



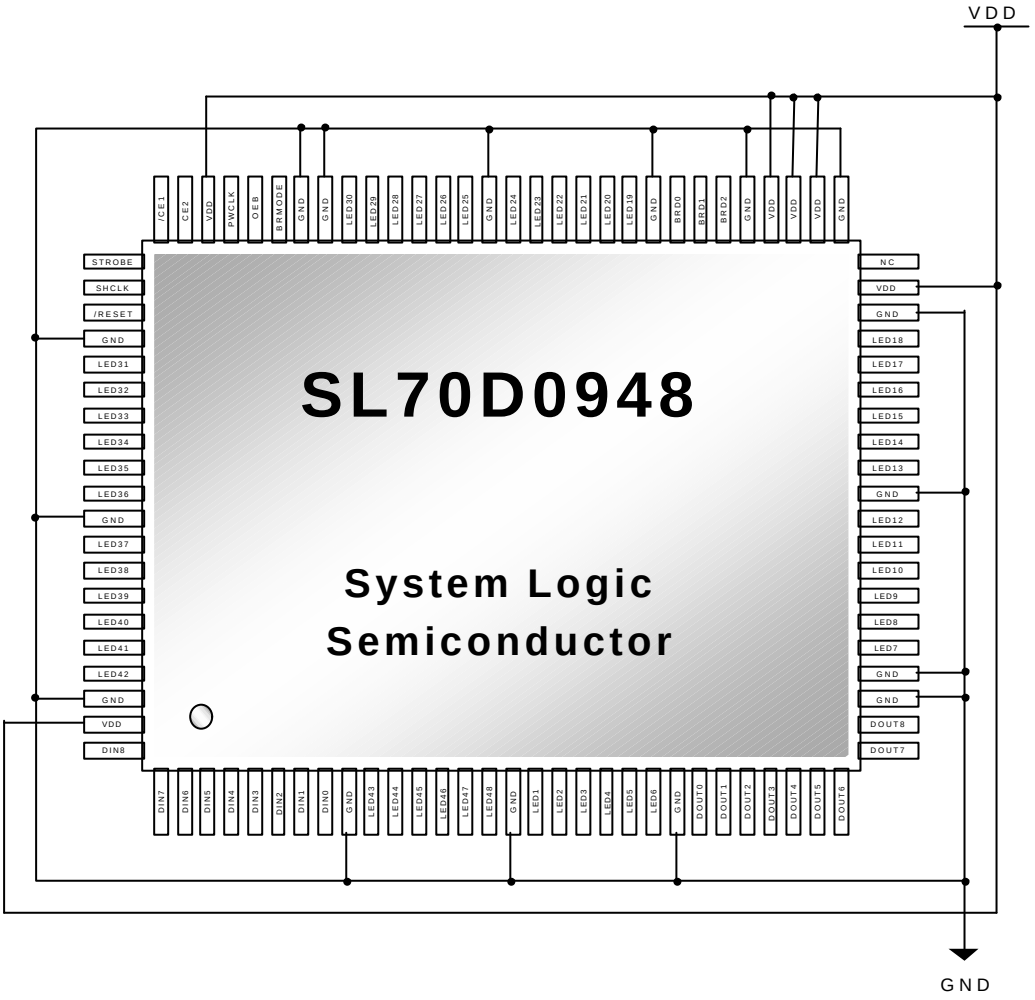
PACKAGE INFORMATION

100 PIN MQFP (14 x 20 Body)



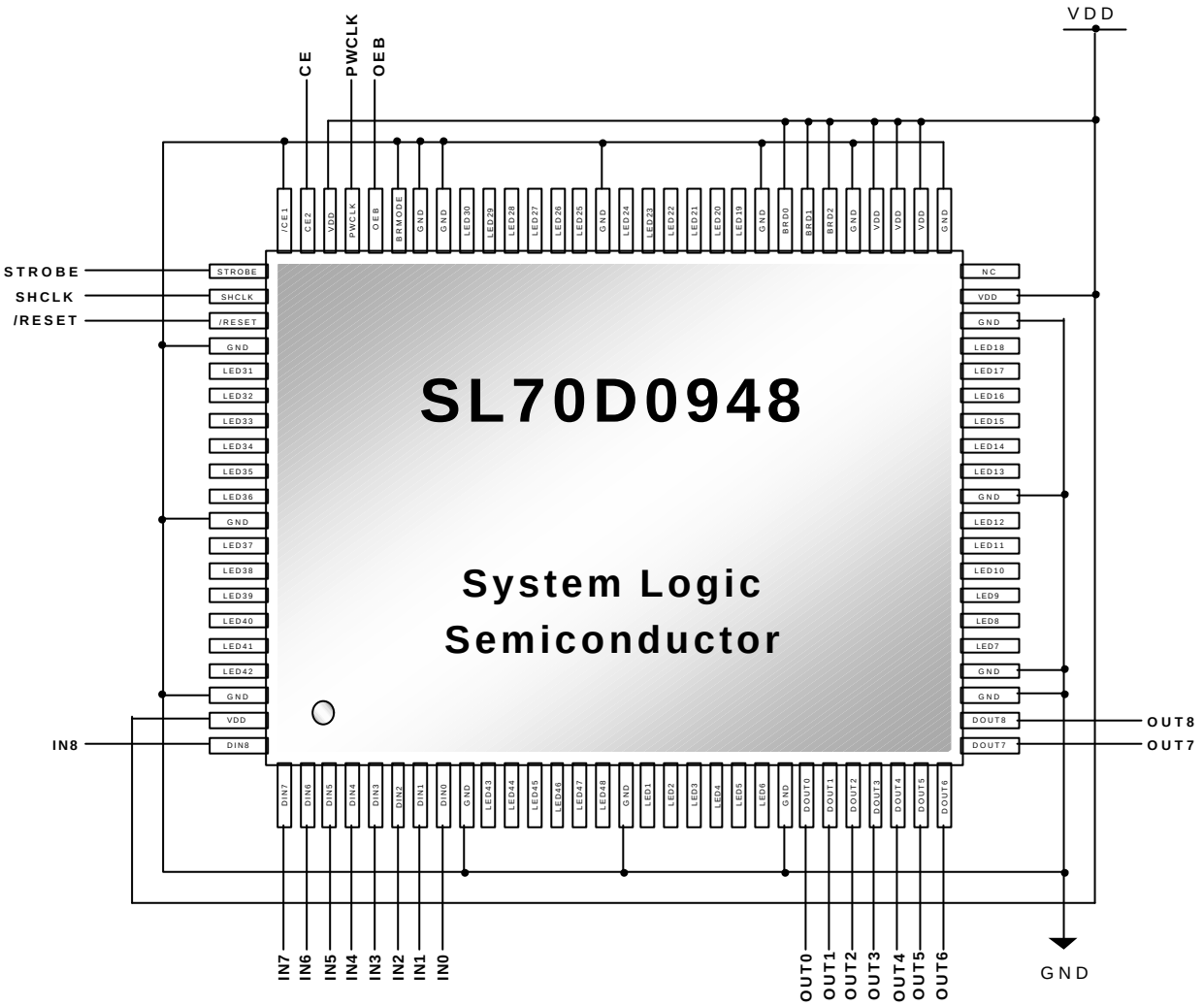
REFERENCE APPLICATIONS

Power Line Connection



REFERENCE APPLICATIONS (continued)

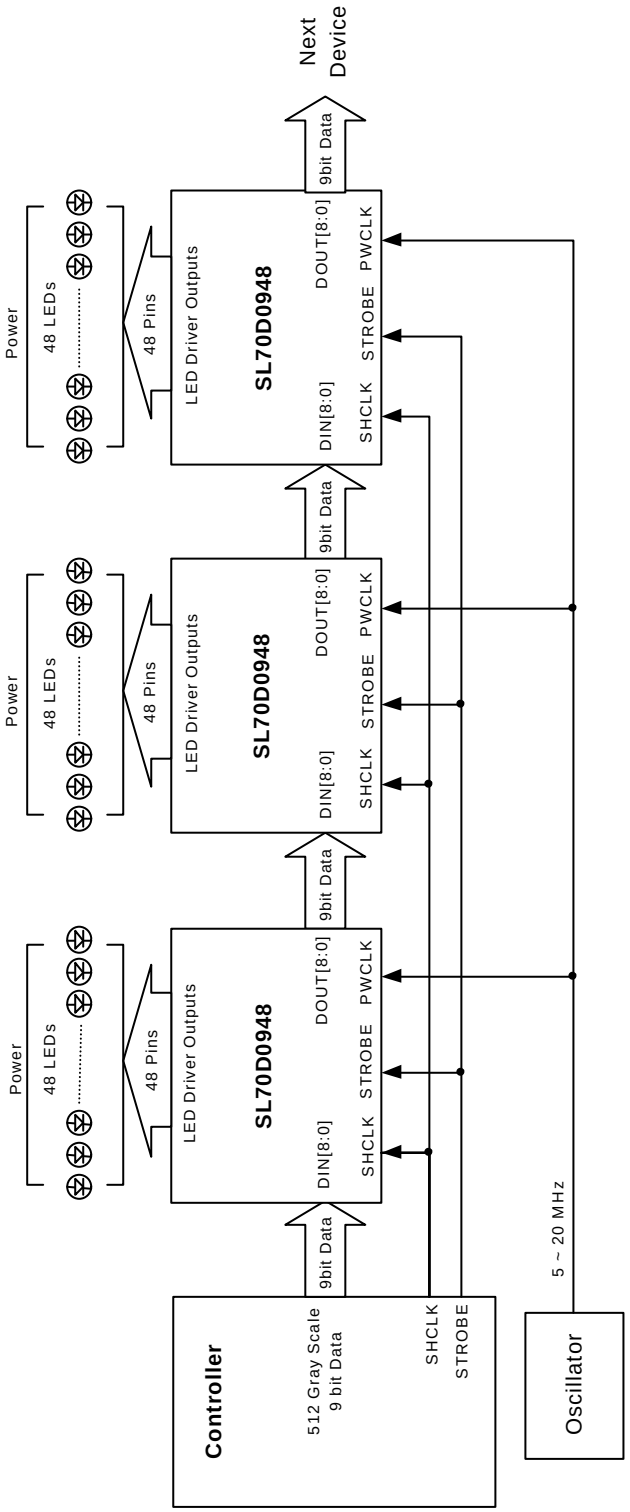
Data & Control Signal Connection



Application Ex 1.

BRMODE = 0 : The brightness is controlled by 8 steps such as 8/8 ~ 1/8.

REFERENCE APPLICATIONS (continued)



Data & Control Signal Connection