Control No.：	TR-S-085
Version No.：	1

SPECIFICATIONS

PRODUCT ：LCD MODULE

MODEL NO.： G128064-96

CUSTOMER			SHING YIH TECH.		
APPROVED	CHECKED	CHECKED	APPROVED	CHECKED	PREPARED
			Kevin Mao		Y. U. Tsai

興益科技股份有限公司

SHING YIH TECHNOLOGY CO., LTD.

RECORDS OF REVISION

STANDARD DOC.	PRODUCT SPEC.	MODEL NO.	G128064-96		
DATE	**REVISED NO.**	**REVISED DESCRIPTIONS**	**PREPARED**	**CHECKED**	**APPROVED**
2001.11.22	1	NEW ISSUE	Y. U. Tsai		Kevin Mao

CONTENTS

1. GENERAL SPECIFICATIONS：

1-1 SCOPE:

This specification covers the delivery requirements for the liquid crystal display delivered by SHING-YIH Technology to Customer。

1-2 PRODUCTS:

Liquid Crystal Display Module (LCM)

1-3 MODULE NAME:

G128064-96

2. FEATURES：

2-1 Display type: FSTN, Black& White, Transflective, 6O'clock, Positive
2-2 Driving Method: 1/65 Duty，1/9 Bias
2-3 Built-in controller: TL0313_v00-5.5V

3. MACHANICAL SPECIFICATIONS：

ITEMS	SPECIFICATIONS	UNIT
OUTLINE DIMEMSIONS	72.0(W) x 76.0(H) x 5.1(T)	mm
ACTIVE AREA	61.41(W) x 30.69(H)	mm
VIEWING AREA	66.0(W) x 32.7(H)	mm
DISP. CONSTRUCTION	128 x 64 dots	—
NUMBER OF DOTS	128 x 64	Dots
DOT SIZE	0.45(W) x 0.45(H)	mm
DOT PITCH	0.48(W) x 0.48(H)	mm
ASSY. TYPE	COG	—
BACKLIGHT	Light Guide + LED Light Bar	—
WEIGHT	About 25.0	g

4. ABSOLUTE MAXIMUM RATING

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY FOR LOGIC	$V_{DD}-V_{SS}$	Ta=25℃	-0.3	—	+7.0	V
POWER SUPPLY FOR LCD DRIVING	V_{LCD}	Ta=25℃	-0.3	—	+17.0	V
INPUT VOLTAGE	V_{IN}	Ta=25℃	-0.3	—	V_{DD}+0.3	V
OPERATION TEMPERATURE	T_{OPR}	—	-20	—	+70	℃
STORAGE TEMPERATURE	T_{STG}	—	-30	—	+80	℃

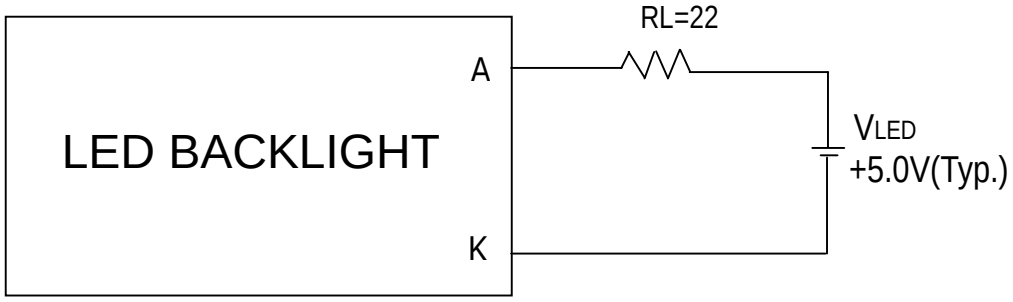
NOTE : LCM SHOULD BE GROUNDED DURING HANDLING LCM

5. ELECTRICAL CHARACTERISTICS (Ta=25℃)

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY VOLTAGE	$V_{DD}-V_{SS}$	2x booster circuit	—	5.0	5.5	V
		3x booster circuit	—	4.5	5.0	
		4x booster circuit	2.4	3.0	3.3	
POWER SUPPLY FOR LCD DRIVING	V_{LCD}	Ta=25℃	9.5	9.8	10.1V	V
INPUT VOLTAGE “H” LEVEL	V_{IH}	—	0.8V_{DD}	—	V_{DD}	V
INPUT VOLTAGE “L” LEVEL	V_{IL}	—	0	—	0.2V_{DD}	V
OUTPUT VOLTAGE “H” LEVEL	V_{OH}	I_{OH}=-0.5mA	0.8V_{DD}	—	V_{DD}	V
OUTPUT VOLTAGE “L” LEVEL	V_{OL}	I_{OL}=0.5mA	0	—	0.2V_{DD}	V
POWER SUPPLY CURRENT	I_{DD}	—	—	0.5	1.5	mA
	I_{EE}	—	—	—	—	mA

6. LED BACKLIGHT

6-1 POWER SUPPLY FOR LED BACKLIGHT



6-2 ABSOLUTE MAXIMUN RATING

PARAMETER	SYMBOL	YELLOW GREEN			UNIT
		MIN	TYP	MAX	
POWER DISSIPATION	PAD	—	65	—	mW
FORWARD CURRENT	IAF	—	25	—	mA
REVERSE VOLTAGE	VR	—	5	—	V
OPERATION TEMPERATURE	TOPR	-30	—	+85	℃
STORAGE TEMPERATURE	TSTG	-40	—	+85	℃

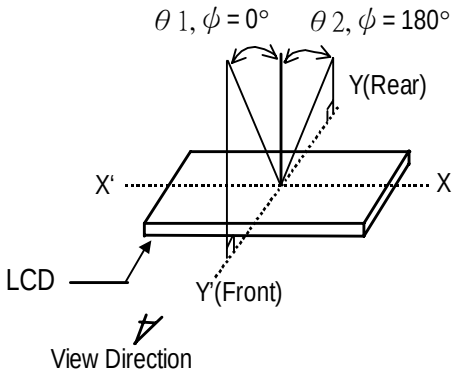
6-3 ELECTRICAL CHARACTERISTICS

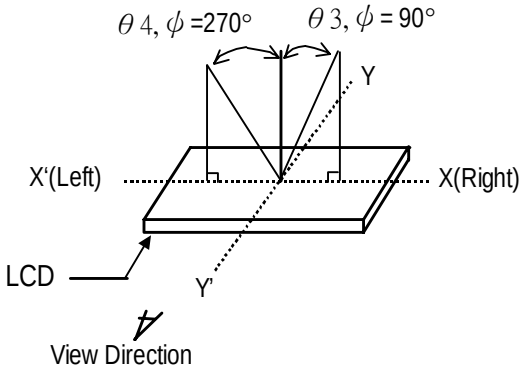
PARAMETER	SYMBOL	LIGHT SOURCE	CONDITION	STANDARD VALUE			UNIT
				MIN	TYP	MAX	
FORWARD VOLTAGE	Vf	YELLOW GREEN	If=20mA	—	2.2	2.6	V
LUMINOUS INTENSITY	Iv	YELLOW GREEN	If=80mA	—	13	—	cd/m²
PEAK EMISSION WAVELENGTH	λp	YELLOW GREEN		—	570	—	nm
SPECTRUM RADIATION BANDWIDTH	△λ	YELLOW GREEN		—	30	—	nm
REVERSE CURRENT	IR	YELLOW GREEN	Vr=8V	—	—	0.2	mA

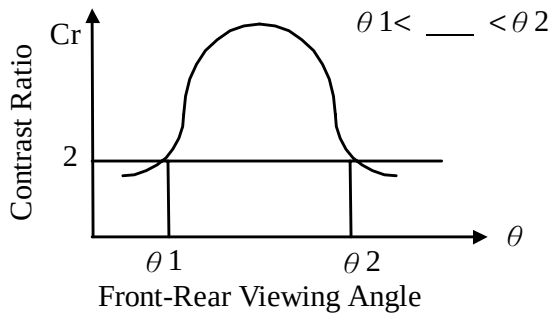
7. OPTICAL CHARACTERISTICS

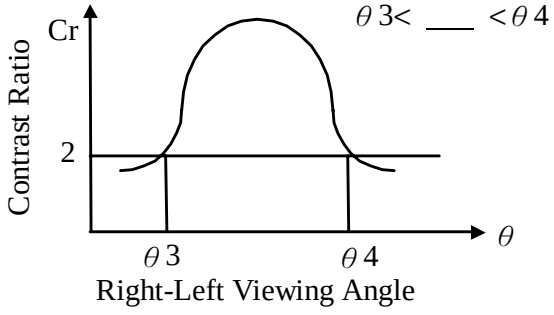
ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE
VIEWING ANGLE	$\theta 1$	Cr ≧ 2.0 Vop=9.8V	—	35	—	Deg	(1)
	$\theta 2, \theta 3, \theta 4$		—	30	—		
CONTRAST RATIO	Cr	Vop=9.8V	5	8	—	—	(2)
RESPONSE TIME (rise)	Tr	$\theta 1= 0^\circ \theta 2= 0^\circ$	—	120	210	ms	(3)
RESPONSE TIME (fall)	Tf	$\theta 1= 0^\circ \theta 2= 0^\circ$	—	200	360	ms	(3)

(1) DEFINITION OF VIEWING ANGLE



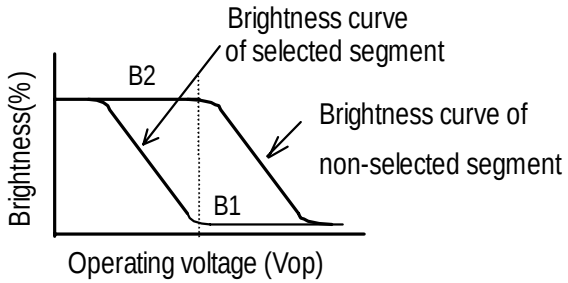




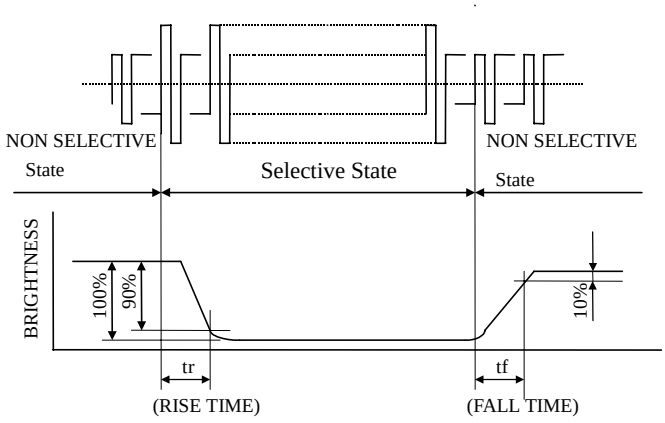


(2) DEFINITION OF CONTRAST RATIO

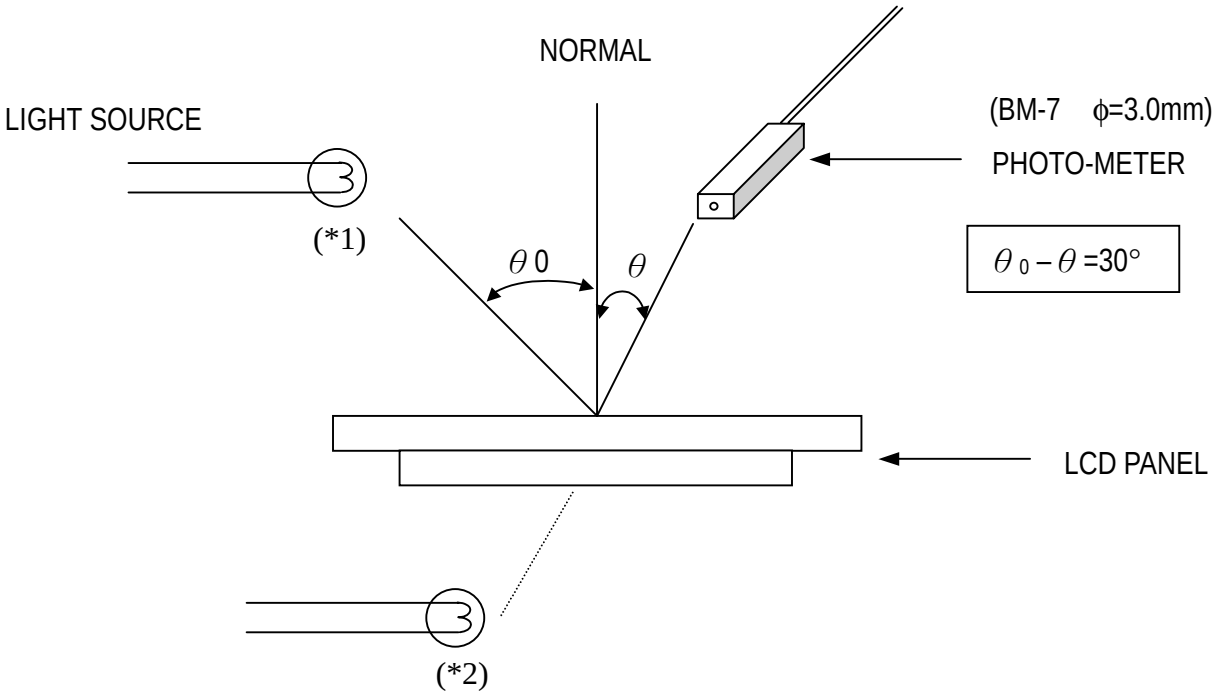
$$C.R = \frac{\text{Brightness of non-selected segment (B2)}}{\text{Brightness of selected segment (B1)}}$$



(3) DEFINITION OF RESPONSE TIME



(4)Measuring Instruments For Electro-optical Characteristics



*1.Light source position for measuring the reflective type of LCD panel

*2.Light source position for measuring the transflective / transmissive types of LCD panel

8. TIMING CHARACTERISTICS

8-1 Parallel TIMING CHARACTERISTICS

(V_{DD}=2.7V~3.6V, Ta=-40 to +85℃)

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT
ADDRESS SETUP TIME		t_{AS68}	13	—	—	ns
ADDRESS HOLD TIME		t_{AH68}	17	—	—	ns
SYSTEM CYCLE TIME		t_{CY68}	400	—	—	ns
DATA SETUP TIME		t_{DS68}	35	—	—	ns
DATA HOLD TIME		t_{DH68}	13	—	—	ns
ACCESS TIME		t_{ACC68}	—	—	125	ns
OOUTPUT DISABLE TIME		t_{OD68}	10	—	90	ns
ENABLE PULSE	READ	$t_{PW68(W)}$	125	—	—	ns
WIDTH	WRITE	$t_{PW68(R)}$	55	—	—	ns

(V_{DD}=3.6V~5.5V, Ta=-40 to +85℃)

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT
ADDRESS SETUP TIME		t_{AS68}	10	—	—	ns
ADDRESS HOLD TIME		t_{AH68}	10	—	—	ns
SYSTEM CYCLE TIME		t_{CY68}	150	—	—	ns
DATA SETUP TIME		t_{DS68}	18	—	—	ns
DATA HOLD TIME		t_{DH68}	10	—	—	ns
ACCESS TIME		t_{ACC68}	—	—	65	ns
OOUTPUT DISABLE TIME		t_{OD68}	10	—	45	ns
ENABLE PULSE	READ	$t_{PW68(W)}$	—	—	—	ns
WIDTH	WRITE	$t_{PW68(R)}$	—	—	—	ns

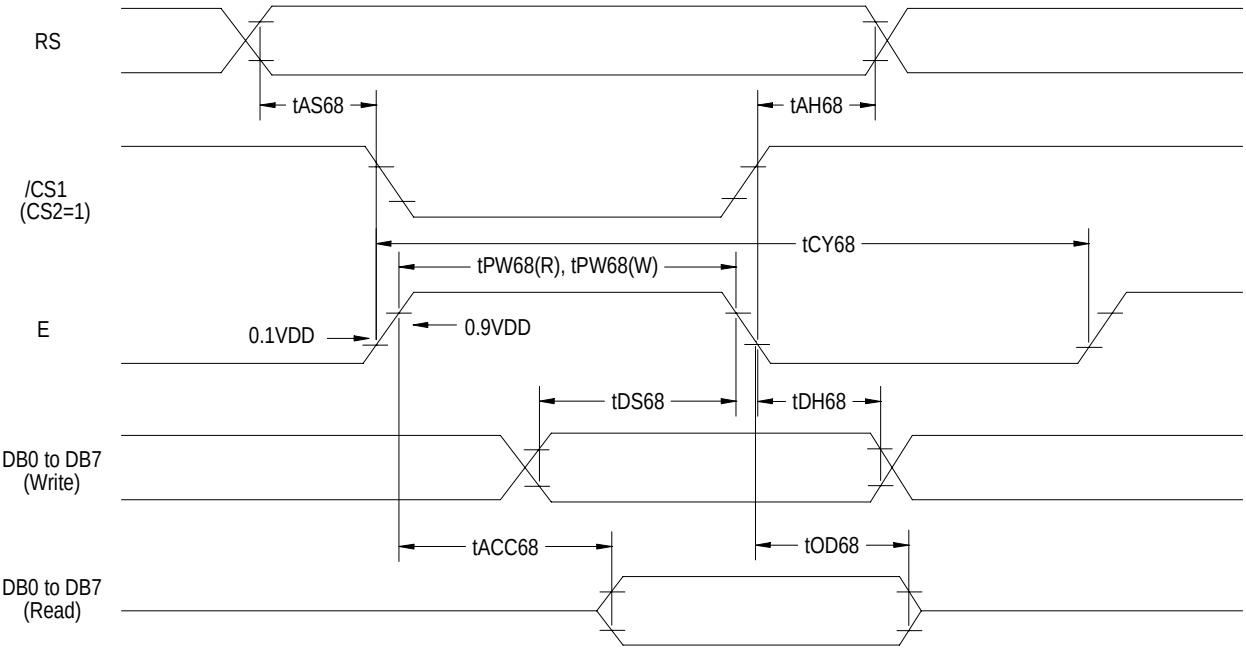


Figure 1. Parallel 6800-series interface Timing Characteristics

8-2 Parallel TIMING CHARACTERISTICS

(V_{DD}=2.4V~3.6V, Ta=-40 to +85℃)

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
ADDRESS SETUP TIME	t_{AS80}	13	—	—	ns
ADDRESS HOLD TIME	t_{AH80}	17	—	—	ns
SYSTEM CYCLE TIME	t_{CY80}	400	—	—	ns
PULSE WIDTH (WR)	$t_{PW80(W)}$	55	—	—	ns
PULSE WIDTH (RD)	$t_{PW80(R)}$	125	—	—	ns
DATA SETUP TIME	t_{DS80}	35	—	—	ns
DATA HOLD TIME	t_{DH80}	13	—	—	ns
READ ACCESS TIME	t_{ACC80}	—	—	125	ns
OUTPUT DISABLE TIME	t_{OD80}	10	—	90	ns

(V_{DD}=3.6V~5.5V, Ta=-40 to +85℃)

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
ADDRESS SETUP TIME	t_{AS80}	10	—	—	ns
ADDRESS HOLD TIME	t_{AH80}	10	—	—	ns
SYSTEM CYCLE TIME	t_{CY80}	150	—	—	ns
PULSE WIDTH (WR)	$t_{PW80(W)}$	65	—	—	ns
PULSE WIDTH (RD)	$t_{PW80(R)}$	25	—	—	ns
DATA SETUP TIME	t_{DS80}	18	—	—	ns
DATA HOLD TIME	t_{DH80}	10	—	—	ns
READ ACCESS TIME	t_{ACC80}	—	—	65	ns
OUTPUT DISABLE TIME	t_{OD80}	10	—	45	ns

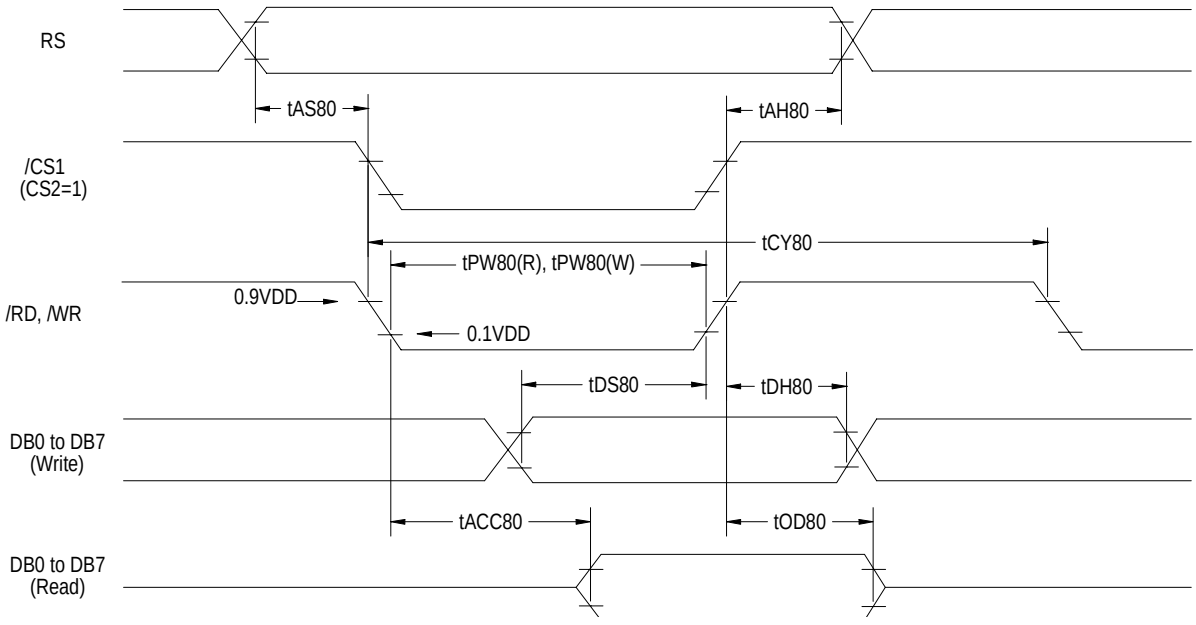


Figure 2. Parallel 8080-series interface Timing Characteristics

8-3. SERIAL -TIMING CHARACTERISTICS

(V_{DD}=2.7V~3.6V, Ta=-40 to +85℃)

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
SERIAL CLOCK CYCLE	t_{CYS}	450	—	—	ns
SCLK HIGH PULSE WIDTH	t_{WHS}	180	—	—	ns
SCLK LOW PULSE WIDTH	t_{WLS}	135	—	—	ns
ADDRESS SETUP TIME	t_{ASS}	90	—	—	ns
ADDRESS HOLD TIME	t_{AHS}	360	—	—	ns
DATA SET-UP TIME	t_{DSS}	90	—	—	ns
DATA HOLD TIME	t_{DHS}	90	—	—	ns
/CS1 SETUP TIME	t_{CSS}	55	—	—	ns
/CS1 HOLD TIME	t_{CHS}	180	—	—	ns

(V_{DD}=3.6V~5.5V, Ta=-40 to +85℃)

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
SERIAL CLOCK CYCLE	t_{CYS}	225	—	—	ns
SCLK HIGH PULSE WIDTH	t_{WHS}	90	—	—	ns
SCLK LOW PULSE WIDTH	t_{WLS}	70	—	—	ns
ADDRESS SETUP TIME	t_{ASS}	45	—	—	ns
ADDRESS HOLD TIME	t_{AHS}	180	—	—	ns
DATA SET-UP TIME	t_{DSS}	45	—	—	ns
DATA HOLD TIME	t_{DHS}	45	—	—	ns
/CS1 SETUP TIME	t_{CSS}	25	—	—	ns
/CS1 HOLD TIME	t_{CHS}	90	—	—	ns

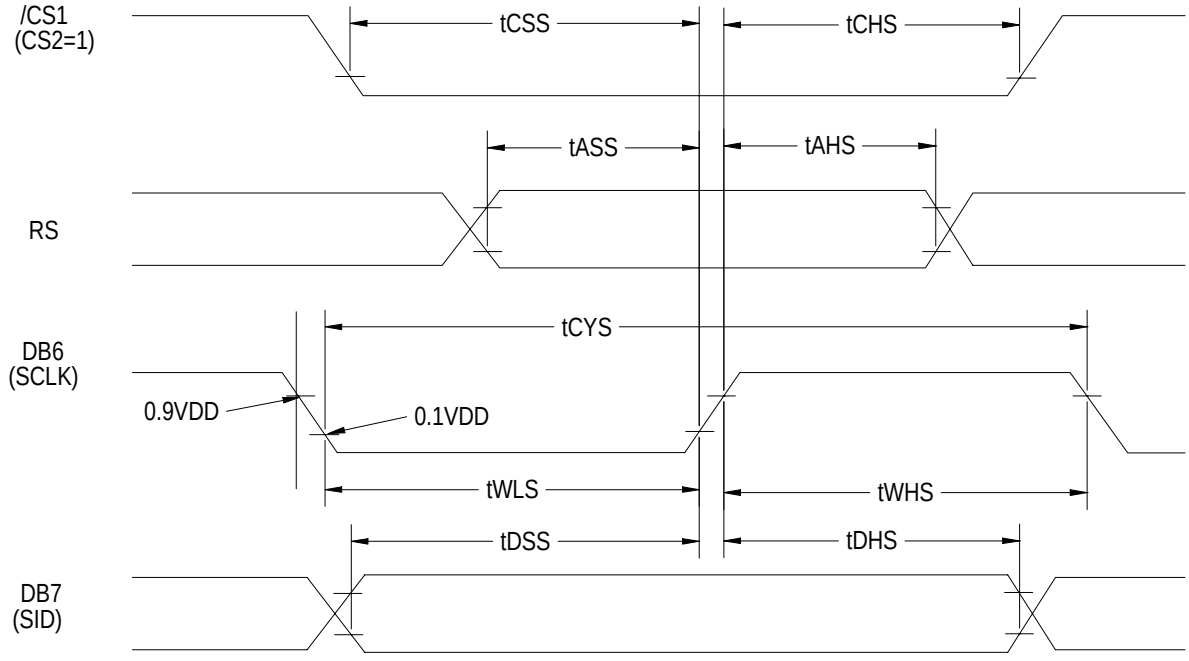
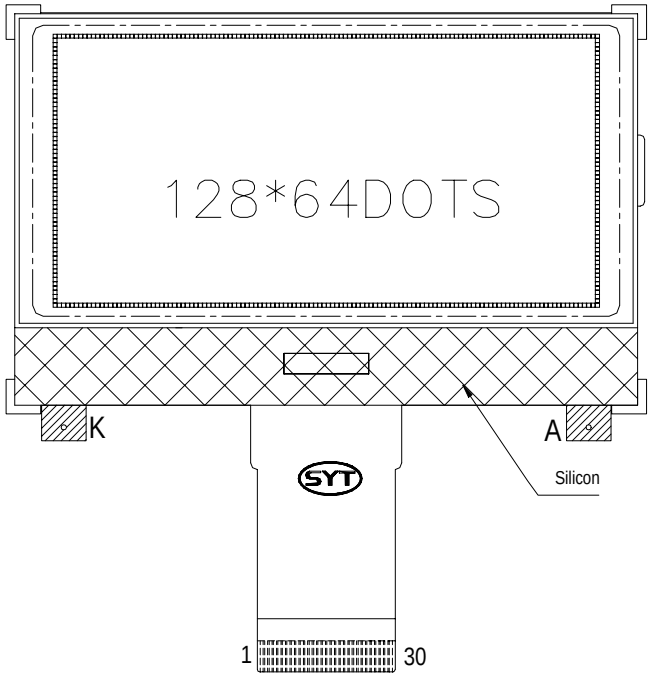


Figure 3.Serial interface Timing Characteristics

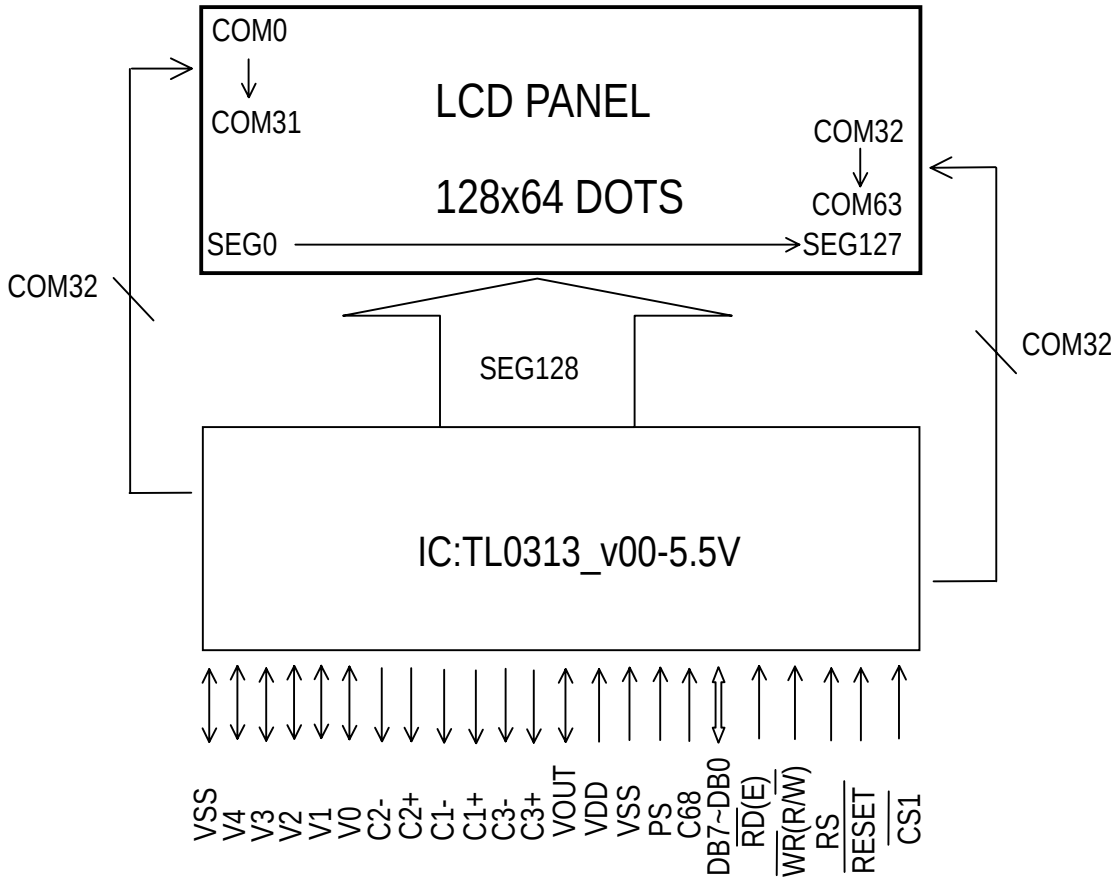
9. PIN ASSIGNMENT

PIN NO.	FUNCTION	SYMBOL
1	Ground	V_{SS}
2	LCD driver supply voltage	V4
3	LCD driver supply voltage	V3
4	LCD driver supply voltage	V2
5	LCD driver supply voltage	V1
6	LCD driver supply voltage	V0
7	Capacitor2- connect for internal voltage converter	C2-
8	Capacitor2+ connect for internal voltage converter	C2+
9	Capacitor1- connect for internal voltage converter	C1-
10	Capacitor1+ connect for internal voltage converter	C1+
11	Capacitor3- connect for internal voltage converter	C3-
12	Capacitor3+ connect for internal voltage converter	C3+
13	Voltage converter output	V_{OUT}
14	Power Supply for Logic	V_{DD}
15	Ground	V_{SS}
16	Parallel/Serial data input select input, H: Parallel type L: Serial type	PS
17	Microprocessor interface selects input pin, H: 6800 type L: 8080 type	C68
18	Data bus or Serial input data	DB_7 (SID)
19	Data bus or Serial input clock	DB_6 (SCLK)
20	Data bus	DB_5
21	Data bus	DB_4
22	Data bus	DB_3
23	Data bus	DB_2
24	Data bus	DB_1
25	Data bus	DB_0
26	8080 type: Read signal 6800 type: Enable signal	E($\overline{RD}$)
27	8080 type: Write signal 6800 type: Read/Write execution control pin	R/$\overline{W}$($\overline{WR}$)
28	Register Select input, H: display data L: control data	RS
29	Hardware reset input	/RESET
30	Chip Select inputs	/CS1

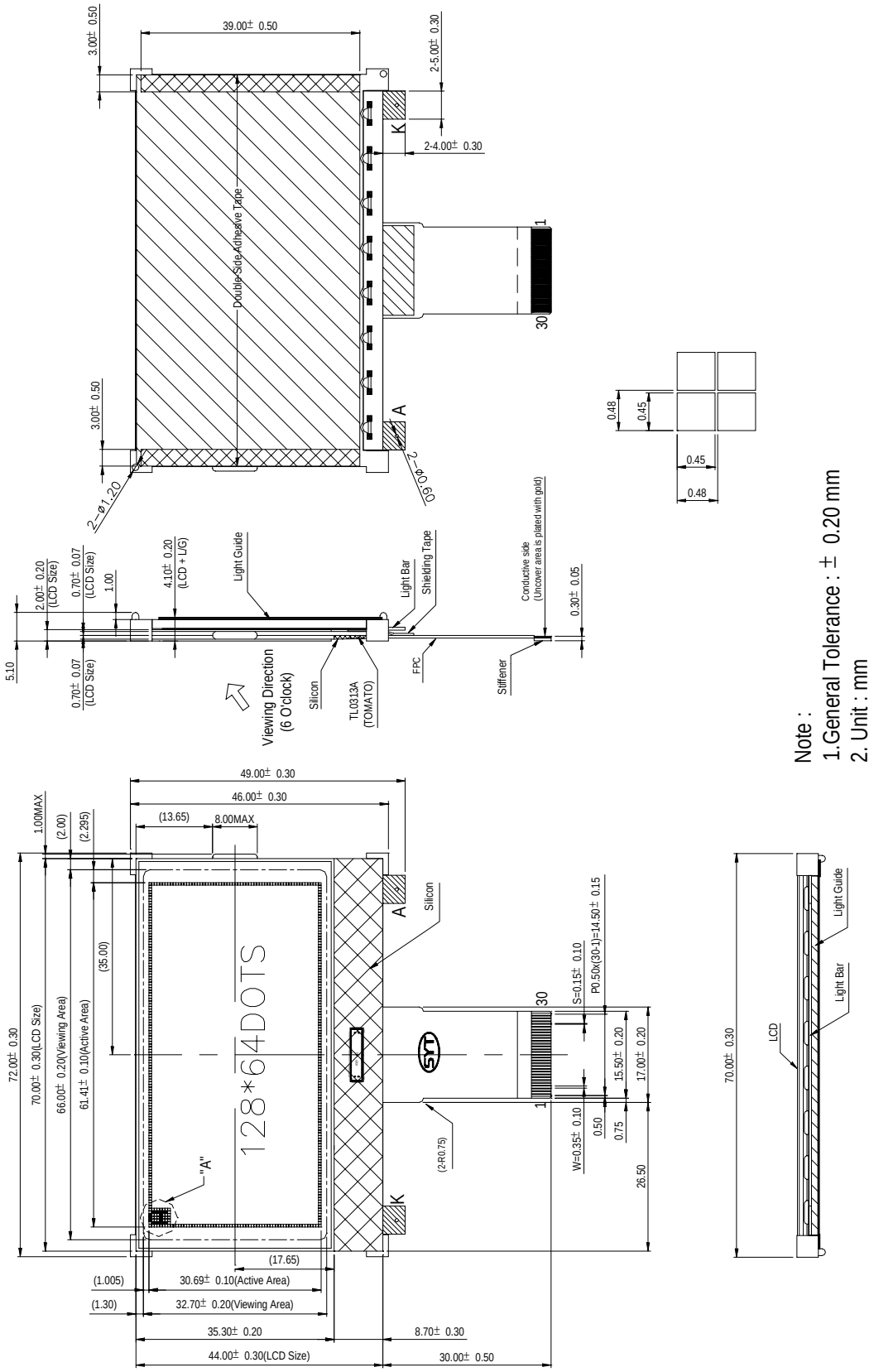
10. PIN NO



11. BLOCK DIAGRAM

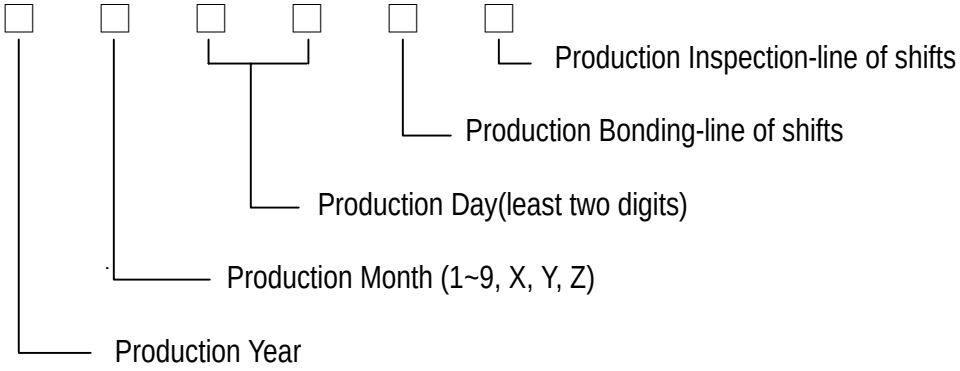


12.OUTLINE DIMENSION



13. Code System of Production Lot

The production lot of module is specified on the back of PWB as follows;



14. Precaution for Use

The following precautions should be followed, since this module contains precise parts.

(1) Do not store module for an extended periods of time under the conditions of high temperature and high humidity.
(2) Avoid using or storing the module in areas that expose it to direct sunlight or ultraviolet rays.
(3) Use protective finger covers when handling the module to avoid scratching or staining the module.
(4) Care should be taken not to expose the module to static electricity, because the module contains C-MOS LSI's.
(5) The LSI is sensitive to light.
The user's product should be designed so that LSI is not exposed to any light during operation.
(6) During installation, cover the display area with acrylic protection plates to protect the polarizer plate and LCD cells.
(7) Do not apply any excessive shocks to the module because the module contains sensitive LCD cells.
Do not use a module which has experienced strong mechanical shock.
(8) Care should be taken when the power supply turns on as following.
(a) Do not apply any input signals before the supplying voltage is applied.
(b) Do not turn off the power supply while any input signals are applied.

Caution

(1) Dangerous. Do not shock glass because glass can break.
(2) If module breaks, do not touch it directly.
(Glass could stick or cut skin.)
(3) Do not swallow Liquid Crystal.
(In case of broken LCD panel, do not swallow liquid crystal even if there is no proof that liquid crystal is poisonous.)
(4) If liquid crystal is exposed to skin, wash the area thoroughly with alcohol or soap.
(5) When disposing of the product, please observe industrial waste disposal laws in each country and district.
(6) In case of injury, give immediate treatment and consult with a doctor.
(7) This product is constructed precisely. Don't disassemble or modify.

※ Neglecting this mark can cause injury to humans and damage to materials.