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NEXT VISION DISPLAY

SPECIFICATION

CUSTOMER : _____

MODULE NO.: NT070-N001ME

Version	0.1
Engineer	
Date	2022/01/21

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Customer:
Approved by

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Record of Revision

Version	Revise Date	Page	Content
V01	2022/ 1/ 21		Initial release.

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1. General Specifications

No.	Item	Specification	Remark
1	LCD size	7.0 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800X3(RGB)X480	
4	Display mode	Normally Black	
5	Dot pitch	0.0635(W)X0.1905(H) mm	
6	Active area	152.4 (W)X91.44 (H) mm	
7	Module size	165(W)X104.09(H)X5.3 (D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Interface	Digital (TTL)	
11	Backlight power consumption	1.5W (Typ.)	Note 2
12	Panel power consumption	0.66 W (Typ.)	Note 3
13	Weight	T.B.D.	

Note 1: Refer to Mechanical Drawing.
Note 2: Including LED Driver power consumption.
Note 3: Including T-con power consumption.

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2. Pin Assignment

Pin No.	Symbol	Description	Remark
1	GND	Power Ground	
2	GND	Power Ground	
3	NC	Not Connect	
4	Vcc	Power Supply for Digital Circuit	
5	Vcc	Power Supply for Digital Circuit	
6	Vcc	Power Supply for Digital Circuit	
7	Vcc	Power Supply for Digital Circuit	
8	NC	Not Connect	
9	DE	Data Enable	
10	GND	Power Ground	
11	GND	Power Ground	
12	GND	Power Ground	
13	B5	Blue Data 5 (MSB)	
14	B4	Blue Data 4	
15	B3	Blue Data 3	
16	GND	Power Ground	
17	B2	Blue Data 2	
18	B1	Blue Data 1	
19	B0	Blue Data 0 (LSB)	
20	GND	Power Ground	
21	G5	Green Data 5 (MSB)	
22	G4	Green Data 4	
23	G3	Green Data 3	
24	GND	Power Ground	
25	G2	Green Data 2	
26	G1	Green Data 1	
27	G0	Green Data 0 (LSB)	
28	GND	Power Ground	
29	R5	Red Data 5 (MSB)	
30	R4	Red Data 4	
31	R3	Red Data 3	
32	GND	Power Ground	
33	R2	Red Data 2	
34	R1	Red Data 1	
35	R0	Red Data 0 (LSB)	
36	GND	Power Ground	
37	GND	Power Ground	
38	DCLK	Clock Signals ; Latch Data at the Falling Edge	
39	GND	Power Ground	
40	GND	Power Ground	

Note: User's connector part number is **MT-FP430N-2FR** manufactured by UJU or equivalent.

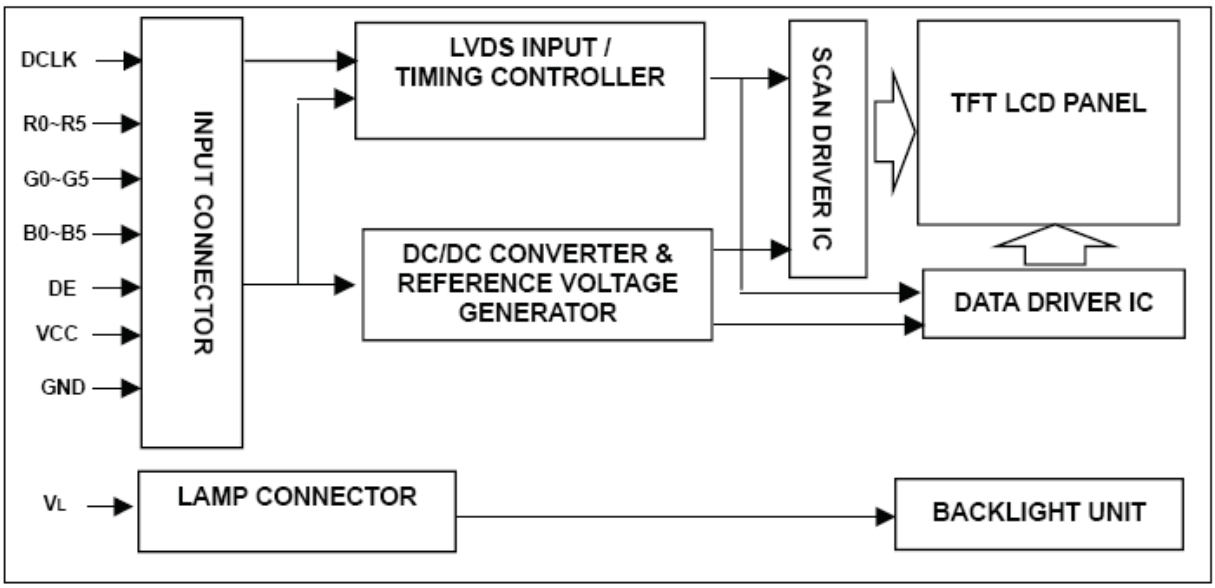
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Backlight Driving Part

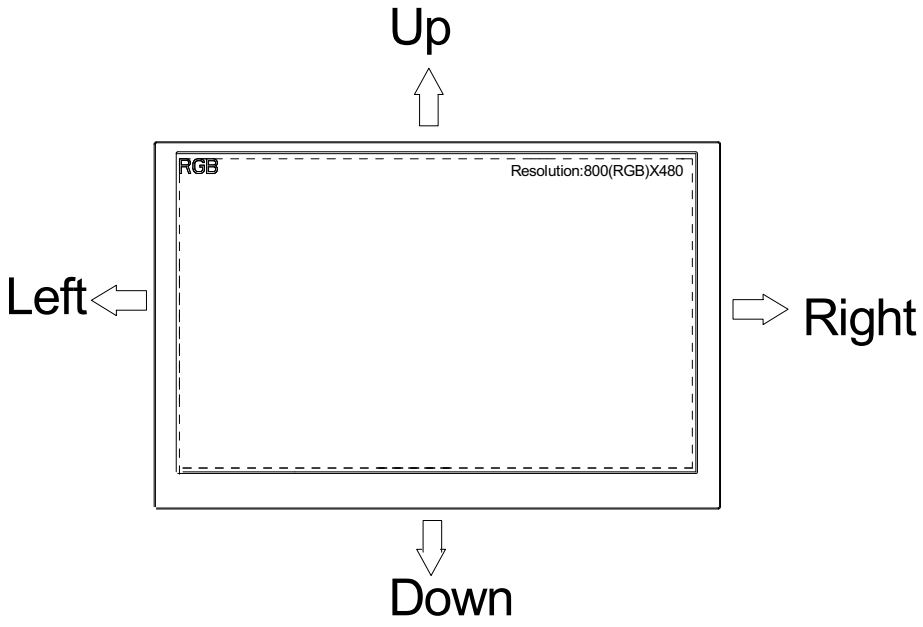
Pin No.	Symbol	Description
1	VLED+	Red, LED_ Anode
2	VLED-	White, LED_ Cathode

Note: The backlight interface connector is a model **SM02B-BHSS-1-TB** manufactured by JST or equivalent. The matching connector part number is **BHSR-20VS-1** manufactured by JST or equivalent.

BLOCK DIAGRAM



Scanning direction refer to the figure below.



3. Operation Specifications

3.1. Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	V_{CC}	-0.3	6.0	V	
Input signal voltage	V_I	-0.3	6.3	V	
Operation Temperature	T_{OP}	-20	70	℃	
Storage Temperature	T_{ST}	-30	80	℃	

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed.

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3.2. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V_{CC}	3.1	3.3	3.5	V	Note 1
Current consumption	Icc	-	200	260	mA	
	I_F	-	160	-	mA	Note 2
Input logic high voltage	V_{IH}	$0.7V_{CC}$	-	V	V	Note 3
Input logic low voltage	V_{IL}	0	-	0.3V	V	
LED life time						Note 4

Note1: V_{CC} setting should match the signals output voltage (refer to Note 4) of customer's system board.

Note 2: LED driving current.

Note 3 : DCLK,DE, HS, VS, R0~ R5,,G0~ G5,B0~ B5.

Note 4: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25 and I_{LED}= 160 mA. The LED lifetime could be decreased if operating I_{LED} is larger than 160 mA.

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3.3. Power Sequence

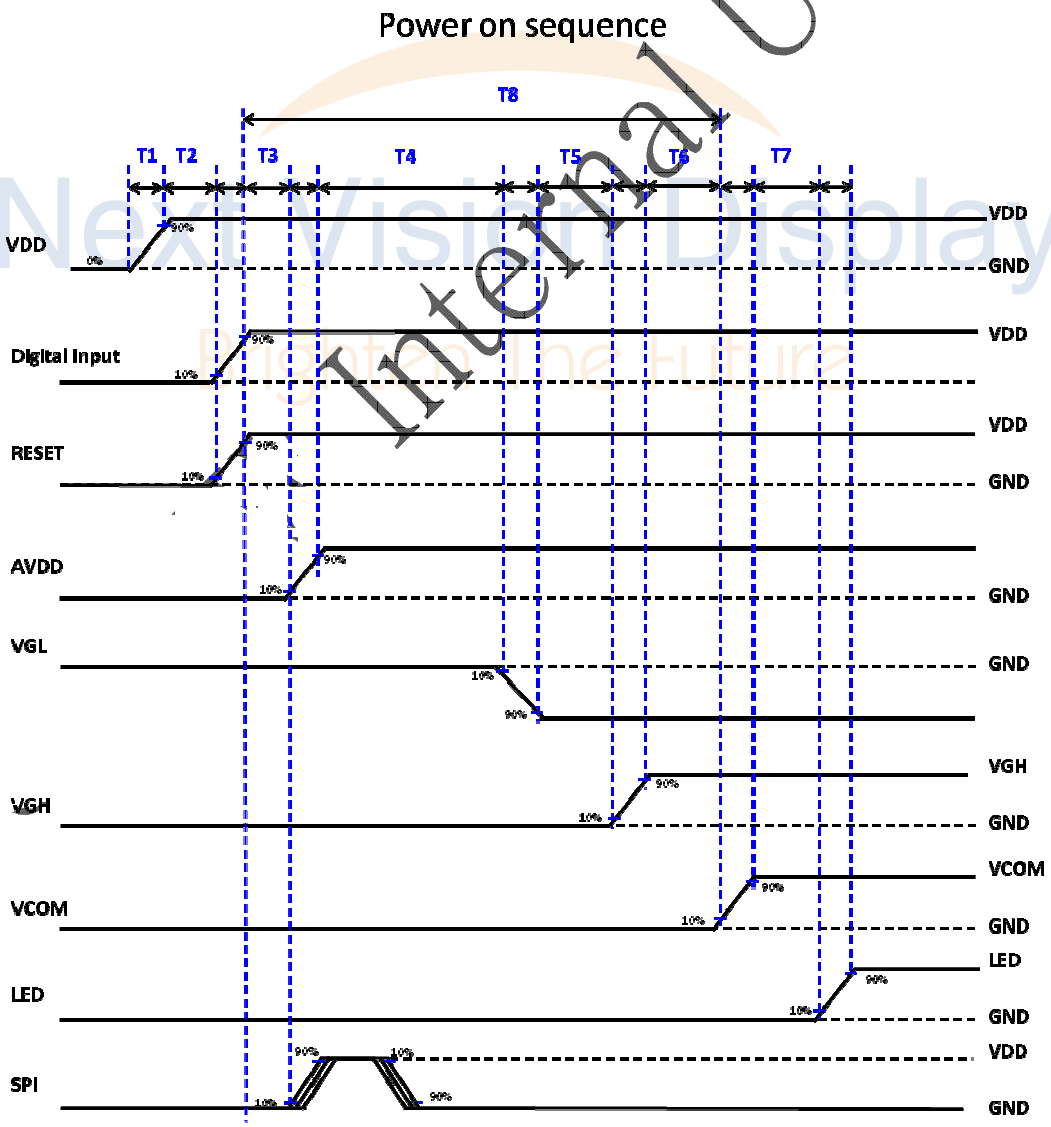
Power on/off sequence

The LCD adopts high voltage driver IC, so it could be permanently damaged under a wrong power on/off sequence. The suggested LCD power sequence is below:

Panel Power on sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	--	--	20	ms
T2	1	--	--	ms
T3	20	--	--	ms
T4	1	--	--	ms
T5	1	--	--	ms
T6	1	--	--	ms
T7	1	--	--	ms
T8	--	--	80	ms

VDD → Digital Input &RESET→ AVDD&SPI → VGL → VGH →VCOM →LED



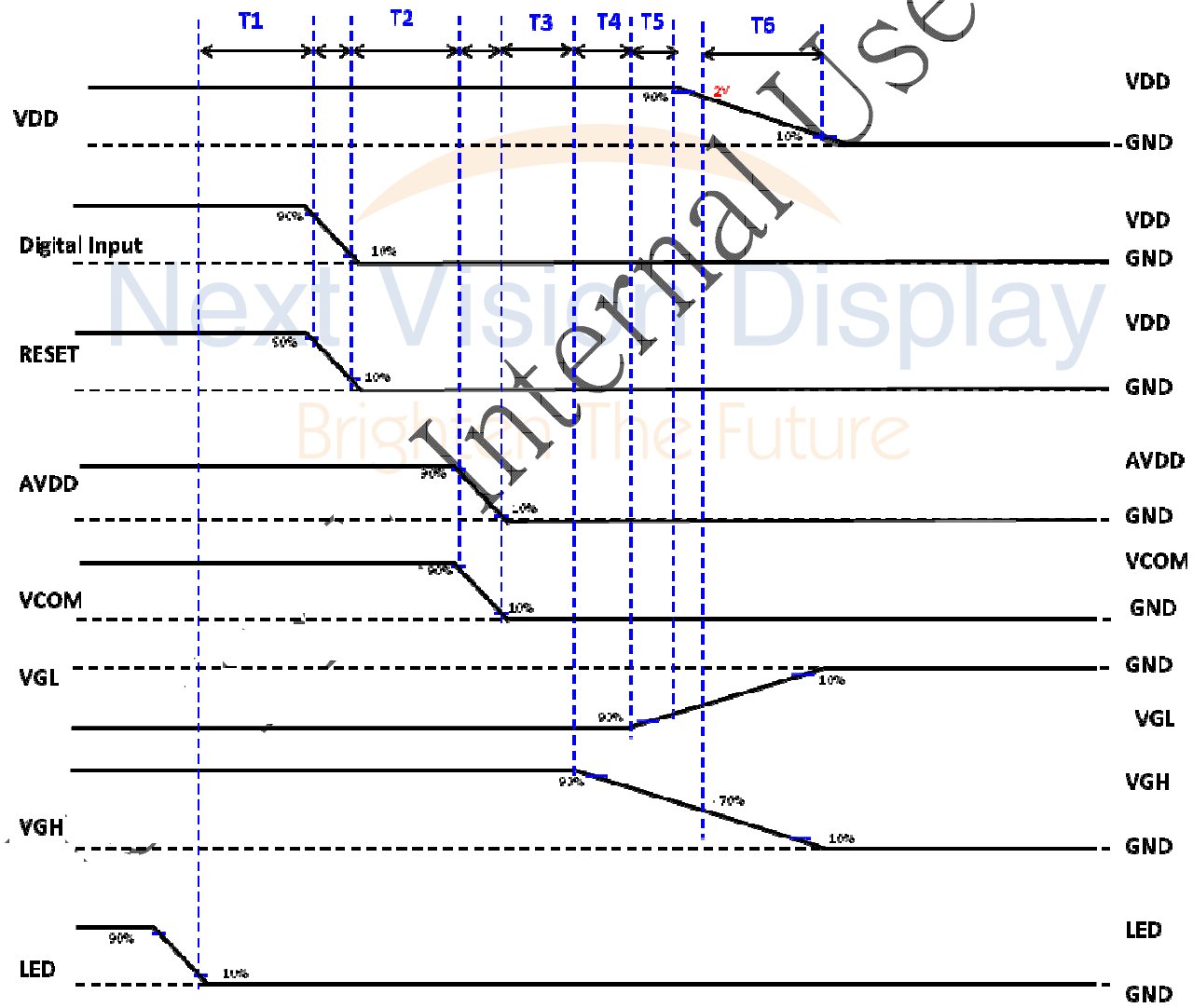
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Panel Power off sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0	--	-	ms
T2	0	--	16	ms
T3	0	--	16	ms
T4	0	--	1	ms
T5	0	--	1	ms
T6	40	--	--	ms

LED → Digital input&RESET→AVDD&VCOM→VGH→VGL→VDD

Power off sequence



Note：VDD=2V,VGH > 70%
All signal must be discharge to zero voltage when power off.

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3.4. Timing Characteristics

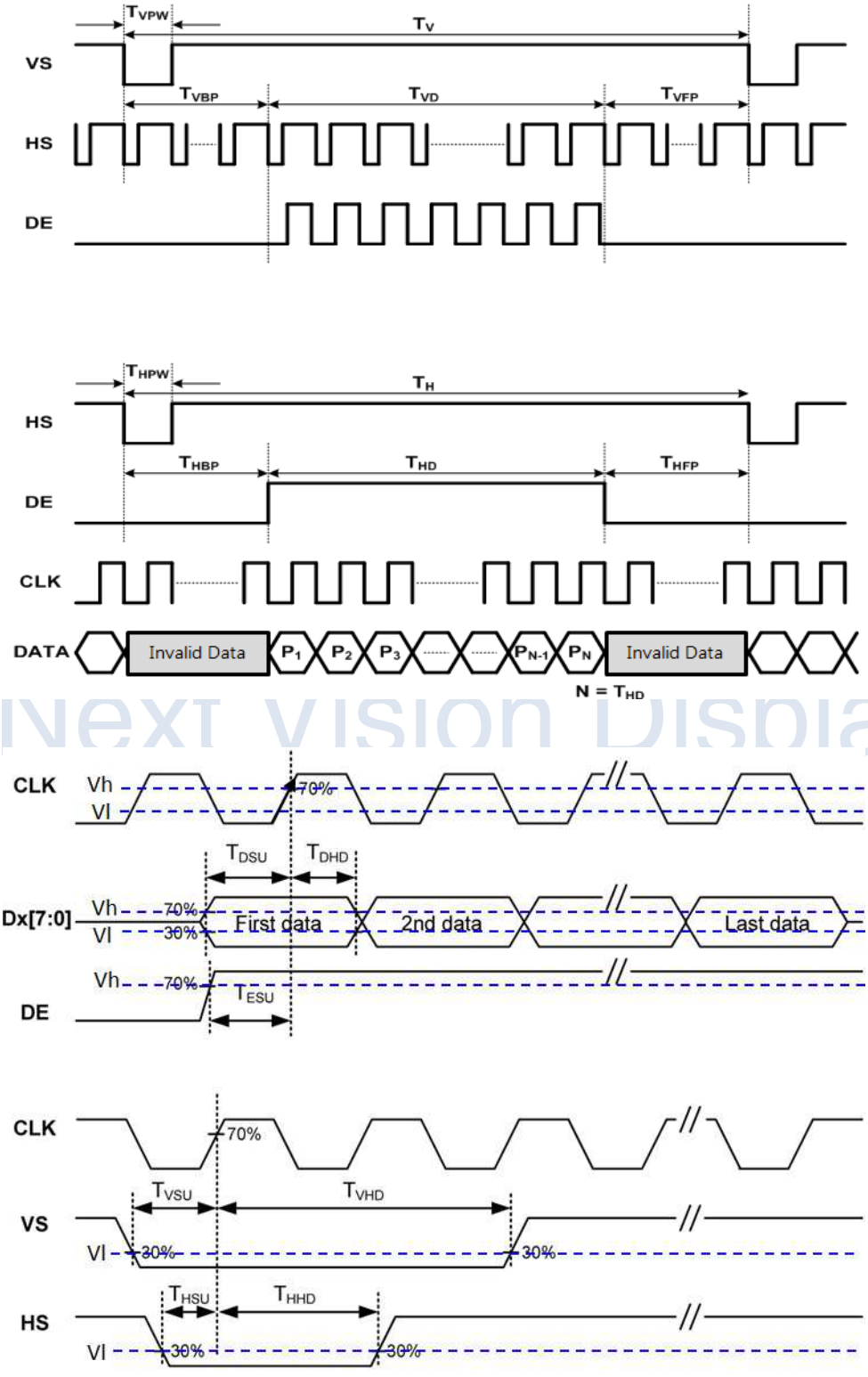
3.4.1. Timing Conditions

Item	Symbol	Min	Typ	Max	Unit	Remark
Clock frequency	F_{CLK}	27.027	29.988	40.0	MHz	
Vertical display area	T_{VD}		480		H	
Vertical period area	T_V	525	525	530	H	
Vertical blanking area	T_{VB}	45	45	50	H	Note1
Vertical pulse width	T_{VPW}		3		H	
Vertical back porch	T_{VBP}		20		H	
Vertical front porch	T_{VFP}	25	25	30	H	
Horizontal display area	T_{HD}		800		dclk	
Horizontal period area	T_H	858	952	1258	dclk	
Horizontal blanking area	T_{HB}	58	152	458	dclk	Note2
Horizontal pulse width	T_{HPW}		3		dclk	
Horizontal back porch	T_{HBP}		48		dclk	
Horizontal front porch	T_{HFP}	10	104	410	dclk	
HS setup time	T_{HSU}	6	-	-	ns	
HS hold time	T_{HHD}	6	-	-	ns	
VS setup time	T_{VSU}	6	-	-	ns	
VS hold time	T_{VHD}	6	-	-	ns	
Data setup time	T_{DSU}	6	-	-	ns	
Data hold time	T_{DHU}	6	-	-	ns	
DE setup time	T_{ESU}	6	-	-	ns	

Note1: $T_{VB} = T_V - T_{VD}$
Note2: $T_{HB} = T_H - T_{HD}$

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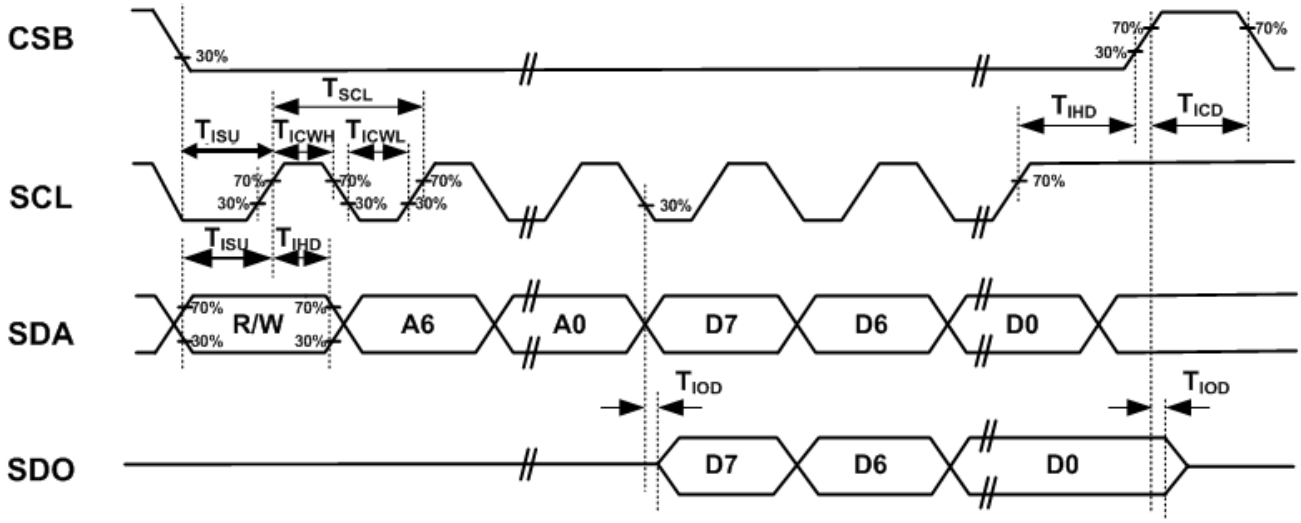
3.4.2. Timing Diagram



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Note : Latch data at CLK Rising Edge.

d. Serial control interface AC characteristic

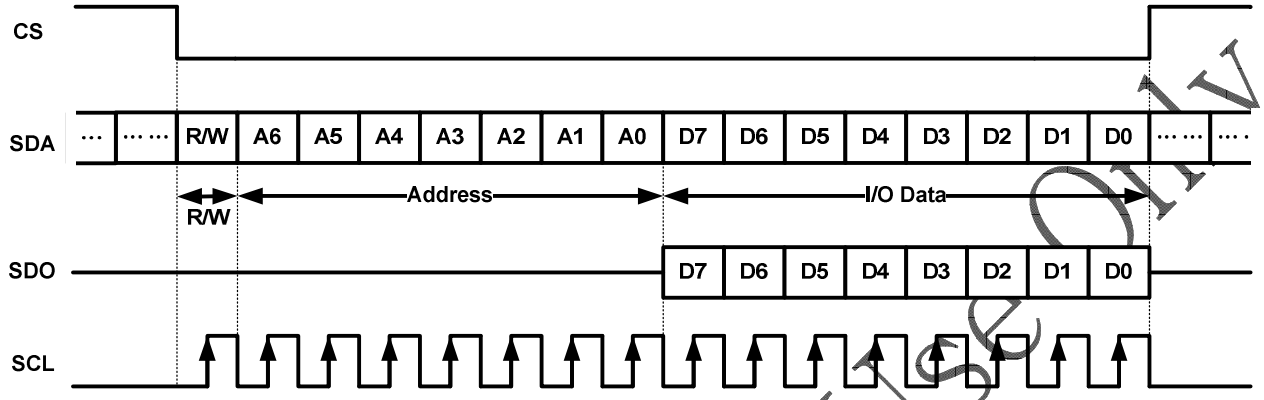


Item	Symbol	Min	Typical	Max	Unit
Serial clock	T_{SCL}	330	-	-	ns
SCL HIGH period	T_{ICWH}	150	-	-	ns
SCL LOW period	T_{ICWL}	150	-	-	ns
Serial data setup time	T_{ISU}	120	-	-	ns
Serial data hold time	T_{IHD}	120	-	-	ns
Serial output delay time	T_{IOD}	-	-	30	ns
Chip select distinguish	T_{ICD}	1	-	-	us

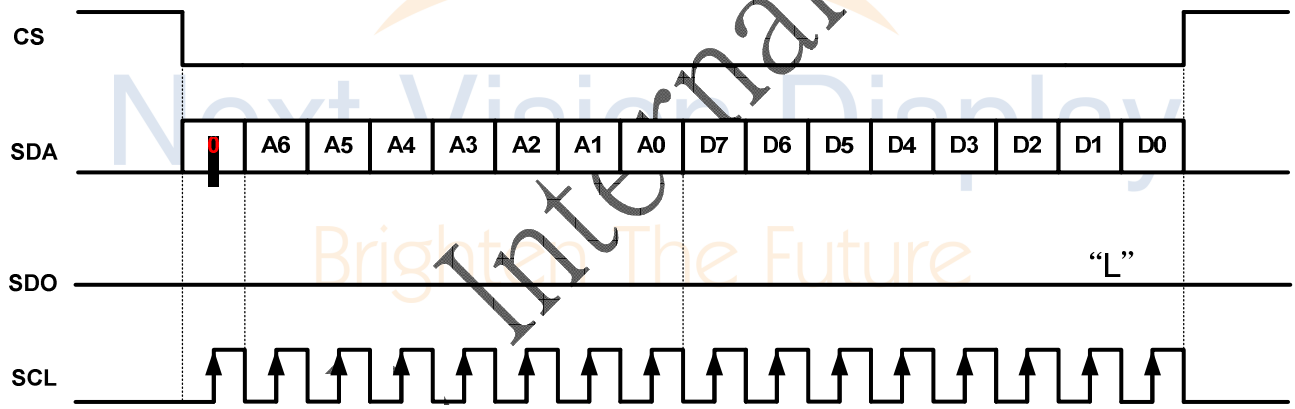
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e. **Timing chart**

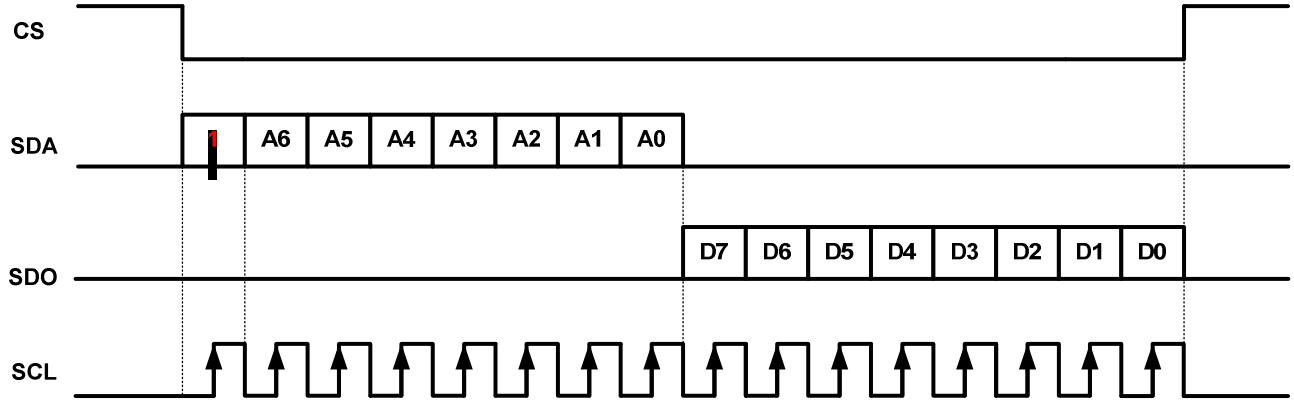
MSB															LSB
R/W	**A6**	**A5**	**A4**	**A3**	**A2**	**A1**	**A0**	**D7**	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**
R/W	Address							I/O Data							



Write Mode:



Read Mode:



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4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	70	80	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	70	80	-		
	θ_T	Φ=90°(12 o'clock)	70	80	-		
	θ_B	Φ=270°(6 o'clock)	70	80	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	11	-	msec	Note 3
	T_{OFF}		-	9	-	msec	Note 3
Contrast ratio	CR		800	1000	-	-	Note 4
Color chromaticity	W_X		0.270	0.0290	0.350		Note 2 Note 5 Note 6
	W_Y		0.280	0.0300	0.360		
Luminance	L		-	350	-	cd/m^2	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

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Note 1: Definition of viewing angle range

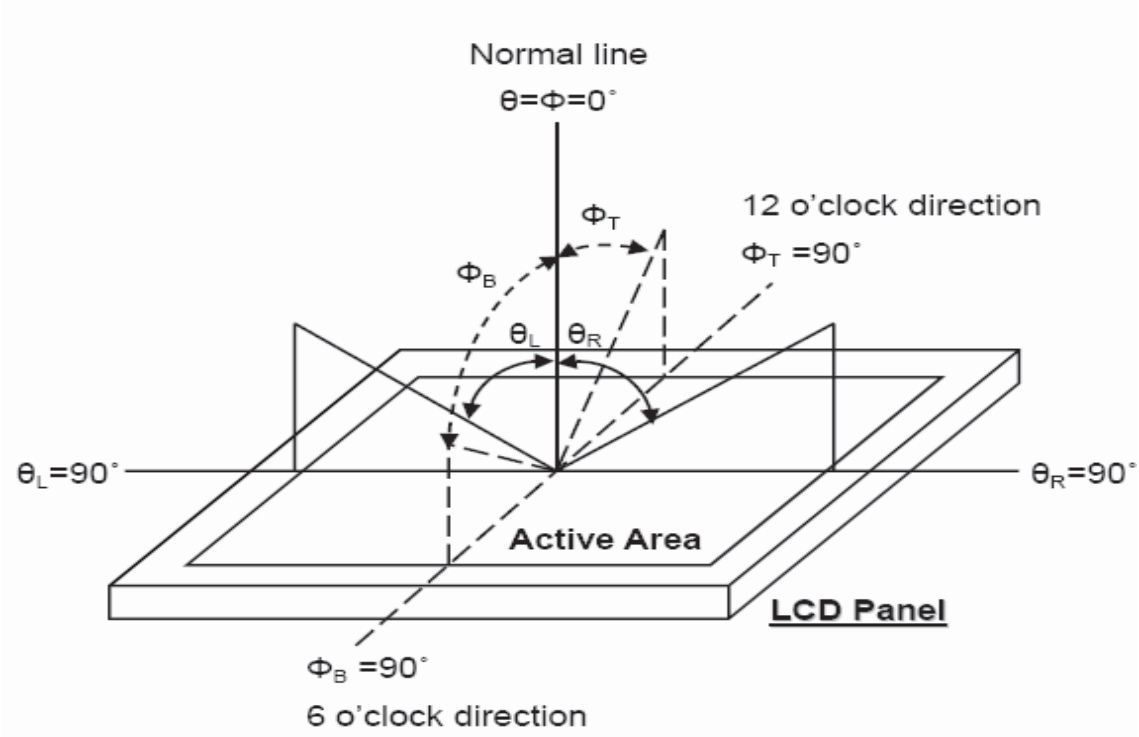


Fig. 7-1 Definition of viewing angle

Note 2: Test equipment setup:
After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0°field of view at a distance of 50cm and normal direction.

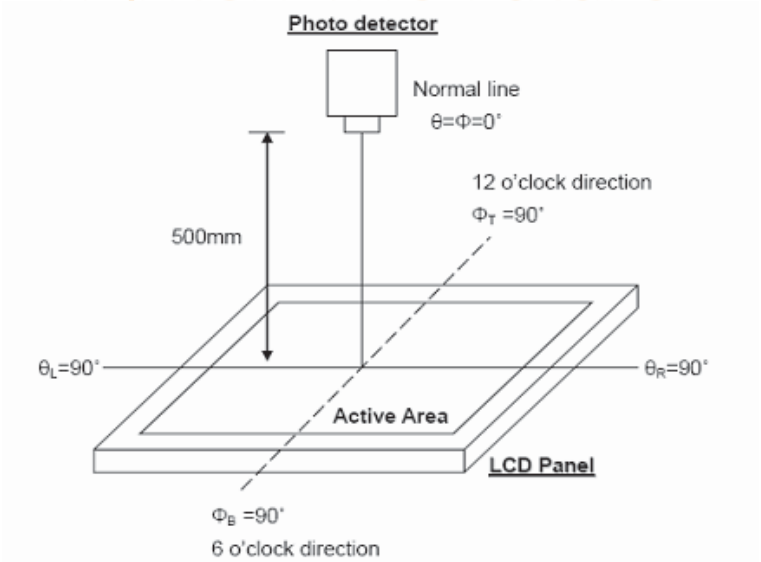


Fig.7-2 Optical measurement system setup

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Note 3: Definition of Response time:
The response time is defined as the LCD optical switching time interval between “White state and “Black” state. Rise time, Tr, is the time between photo detector output intensity changed from 90% to 10% . And fall time, Tf, is the time between photo detector output Intensity changed from10% to 90% .

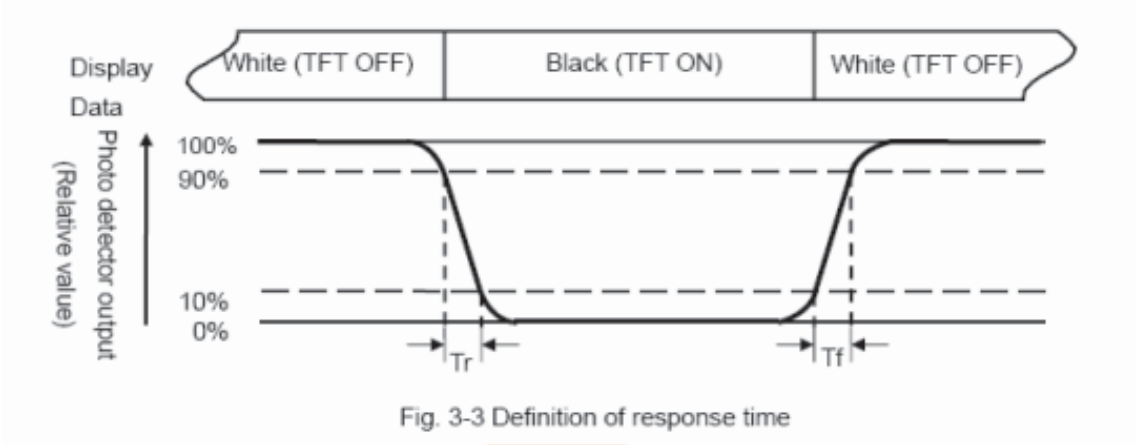


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the “White” state}}{\text{Luminance measured when LCD on the “Black” state}}$$

Note 5: White Vi = V_{i50} ± 1.5V
Black Vi = V_{i50} ± 2.0V
“±” means that the analog input signal swings in phase with VCOM signal.
“±” means that the analog input signal swings out of phase with VCOM signal.
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

$$\text{Note 8 : Uniformity (U)} = \frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$$

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5. Reliability Test Items

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80℃ 240 hrs	Note 1
Low Temperature Storage	Ta = -30℃ 240hrs	Note 1
High Temperature Operation	Ts = 70℃ 240hrs	Note 2
Low Temperature Operation	Ta =-20℃ 240hrs	Note 1,Note 4
Operate at High Temperature and Humidity	+40℃, 90%RH max. 240 hrs	Note 4
Thermal Shock	-30℃/30 min ~ +80℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

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Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.
Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

6. General Precautions

6.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

6.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

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6.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

6.4. Storage

1. Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

6.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

7. Mechanical Drawing

