IIDWay Technology Co. Ltd

PRODUCT SPECIFICATIONS

For Customer: _____ ☐ : APPROVAL FOR SPECIFICATION

Customer Model No. _____ ☐ : APPROVAL FOR SAMPLE

Module No.: *GZ70100-DIT037TH* *Date : 2024.3.21*

Table of Contents

For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	APPROVER
YZJ		

2. Revision Record

Date	Rev.No.	Page	Revision Items	Prepared
2024.3.21	V0		The first release	YZJ

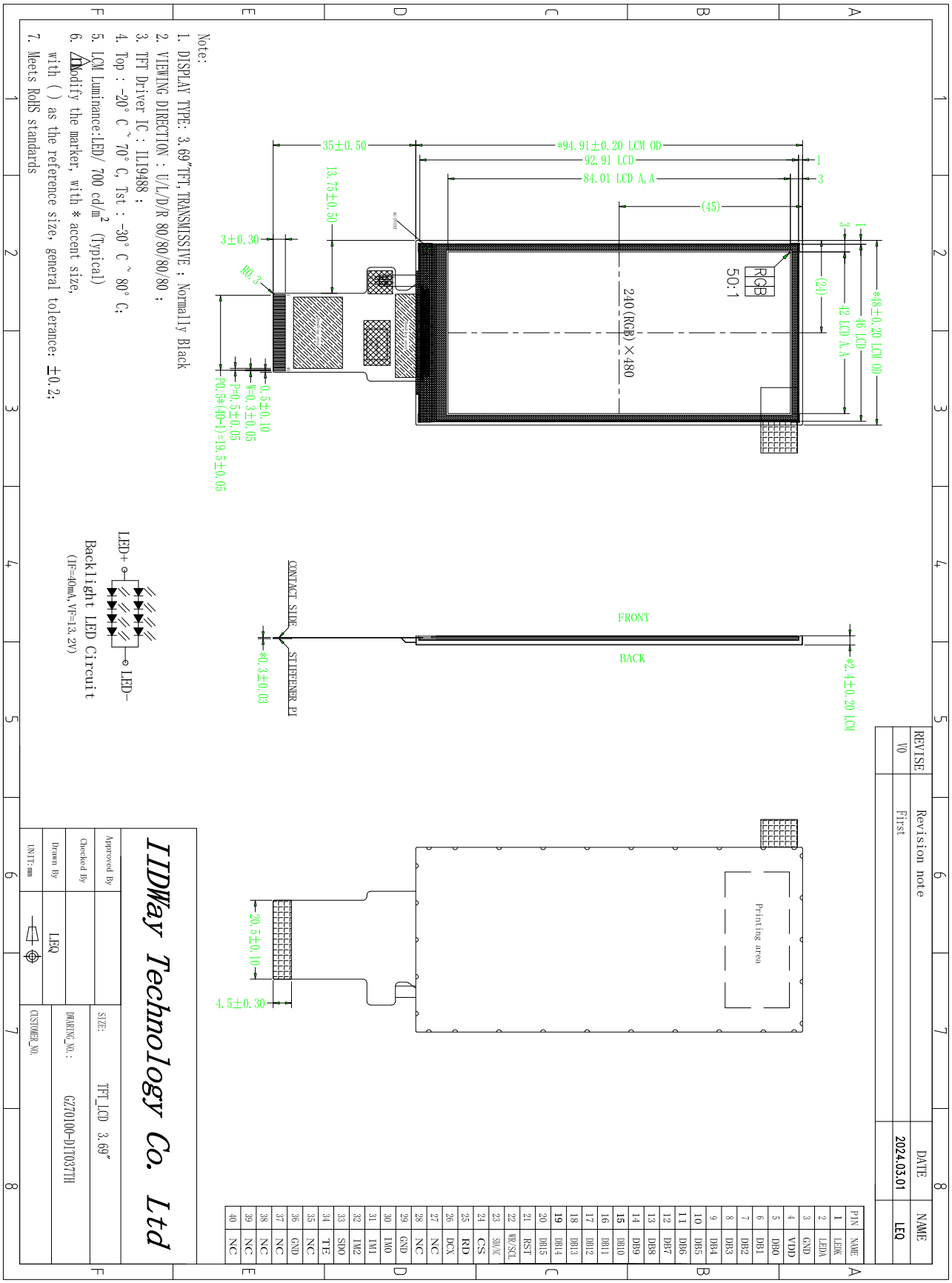
3. General Specifications

GZ70100-DIT037TH is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC,a back light unit. The 3.69″ display area contains 240x480 pixels and can display up to 16.7M colors. This product accords with RoHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	16.7M	1	
Viewing Direction	ALL	O'Clock	
Operating temperature	-20~+70	℃	
Storage temperature	-30~+80	℃	
Module size	Refer to outline drawing	mm	
Active Area(W×H)	42X84.01	mm	
Number of Dots	*240x480*	dots	
Driver IC	ILI9488	-	
Power Supply Voltage	3.3	V	
Backlight	4S2P-LEDs (white)	pcs	
Interface	MCU/SPI	-	

Note1：Color tune is slightly changed by temperature and driving voltage.

4.Outline.Drawing



PIN	NAME
1	LEDK
2	LEDA
3	GND
4	VDD
5	DB0
6	DB1
7	DB2
8	DB3
9	DB4
10	DB5
11	DB6
12	DB7
13	DB8
14	DB9
15	DB10
16	DB11
17	DB12
18	DB13
19	DB14
20	DB15
21	RST
22	WR/SCL
23	SDA/NC
24	CS
25	RD
26	DCX
27	NC
28	NC
29	GND
30	IM0
31	IM1
32	IM2
33	SDO
34	TE
35	NC
36	GND
37	NC
38	NC
39	NC
40	NC

5. Absolute Maximum Ratings(Ta=25℃)

5.1 Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25℃)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	-0.3	3.3	V	1，2

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.

2. V_{DD} >V_{SS} must be maintained.

3. Please be sure users are grounded when handing LCD Module.

5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-30℃	80℃	-20℃	70℃
Humidity	-	-	-	-

1. The response time will become lower when operated at low temperature.

2. Background color changes slightly depending on ambient temperature.

The phenomenon is reversible.

3. Ta<=40 ℃:85%RH MAX.

Ta>=40 ℃:Absolute humidity must be lower than the humidity of 85%RH at 40 ℃.

6. Electrical Specifications and Instruction Code

6.1 Electrical characteristics(Vss=0V ,Ta=25℃)

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		VDD	Ta=25℃	2.5	2.8	3.3	V	
Input voltage	'H'	V_{IH}	V_{DD}=3.3V	0.7V_{DD}	-	V_{DD}	V	
	'L'	V_{IL}	V_{DD}=3.3V	0	-	0.3V_{DD}	V	

Note: If one of the above items is exceeded its maximum limitation momentarily, the quality of the product may be degraded. Absolute maximum limitation, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the recommend range.

6.2 LED backlight specification(VSS=0V ,Ta=25℃)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage VLED	V_f	If=40mA		13.2		V	
Uniformity	∆Bp	If=40mA	80	-	-	%	
LED Life Time	-	-	30K	-	-	hr	1

Note 1: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25℃

6.3 Interface signals

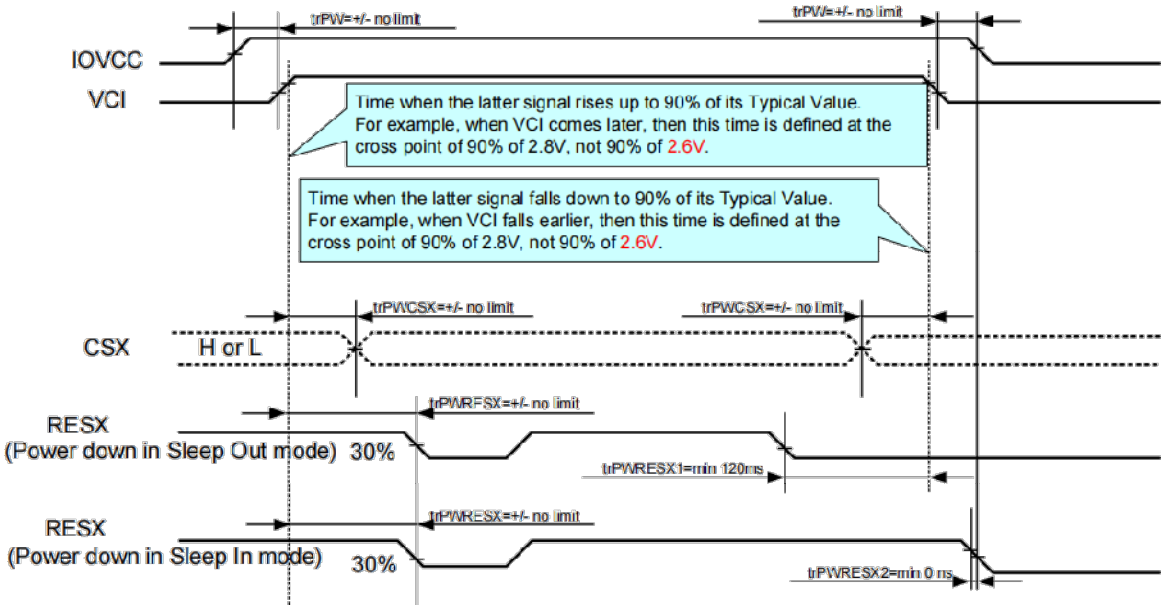
6.3.1 LCM PIN

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>I/O</th><th>Function</th></tr>
<tr><td>1</td><td>LEDK</td><td>P</td><td>LED back light(Cathode)</td></tr>
<tr><td>2</td><td>LEDA</td><td>P</td><td>LED back light(Anode)</td></tr>
<tr><td>3</td><td>GND</td><td>P</td><td>Ground</td></tr>
<tr><td>4</td><td>VDD</td><td>P</td><td>Analog or digital supply voltage</td></tr>
<tr><td>5-20</td><td>DB0-DB15</td><td>I</td><td>Data Bus</td></tr>
<tr><td>21</td><td>RST</td><td>I</td><td>Global reset signal input pin</td></tr>
<tr><td>22</td><td>WR/SCL</td><td>I</td><td>Write signal</td></tr>
<tr><td>23</td><td>SDA/NC</td><td>I</td><td>Serial in/out signal pin</td></tr>
<tr><td>24</td><td>CS</td><td>I</td><td>Chip select input pin</td></tr>
<tr><td>25</td><td>RD</td><td>I</td><td>Read signal</td></tr>
<tr><td>26</td><td>DCX</td><td>I</td><td>Serves as the selector of command or data</td></tr>
<tr><td>27-28</td><td>NC</td><td></td><td>No connection</td></tr>
<tr><td>29</td><td>GND</td><td>P</td><td>Ground</td></tr>
<tr><td>30-32</td><td>IM0-IM2</td><td>I</td><td>
<table>
<tr><th>IM2</th><th>IM1</th><th>IM0</th><th>Interface</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>MIPI-DBI Type B 24-bit bus (DB_EN = 1)</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>MIPI-DBI Type B 18-bit bus (DB_EN = 0)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>MIPI-DBI Type B 9-bit bus</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>MIPI-DBI Type B 16-bit bus</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>MIPI-DBI Type B 8-bit bus</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>MIPI-DBI Type C Option 1 (3-line SPI)</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>MIPI DSI</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>MIPI-DBI Type C Option 3 (4-line SPI)</td></tr>
</table>
</td></tr>
<tr><td>33</td><td>SDO</td><td>I</td><td>Serial out signal pin</td></tr>
<tr><td>34</td><td>TE</td><td>I</td><td>Serves TE(Tearing Effect) pin</td></tr>
<tr><td>35</td><td>NC</td><td></td><td>No connection</td></tr>
<tr><td>36</td><td>GND</td><td>P</td><td>Ground</td></tr>
<tr><td>37-40</td><td>NC</td><td></td><td>No connection</td></tr>
</table>

6.4 Power Sequence

Case 1 – RESX Line is Held High or Unstable by Host at Power ON

If the RESX line is held High or unstable by the host during Power On, then Hardware Reset must be applied after both VCI and IOVCC have been applied. Otherwise, the correct functionality is not guaranteed. There is no timing restriction upon this hardware reset.



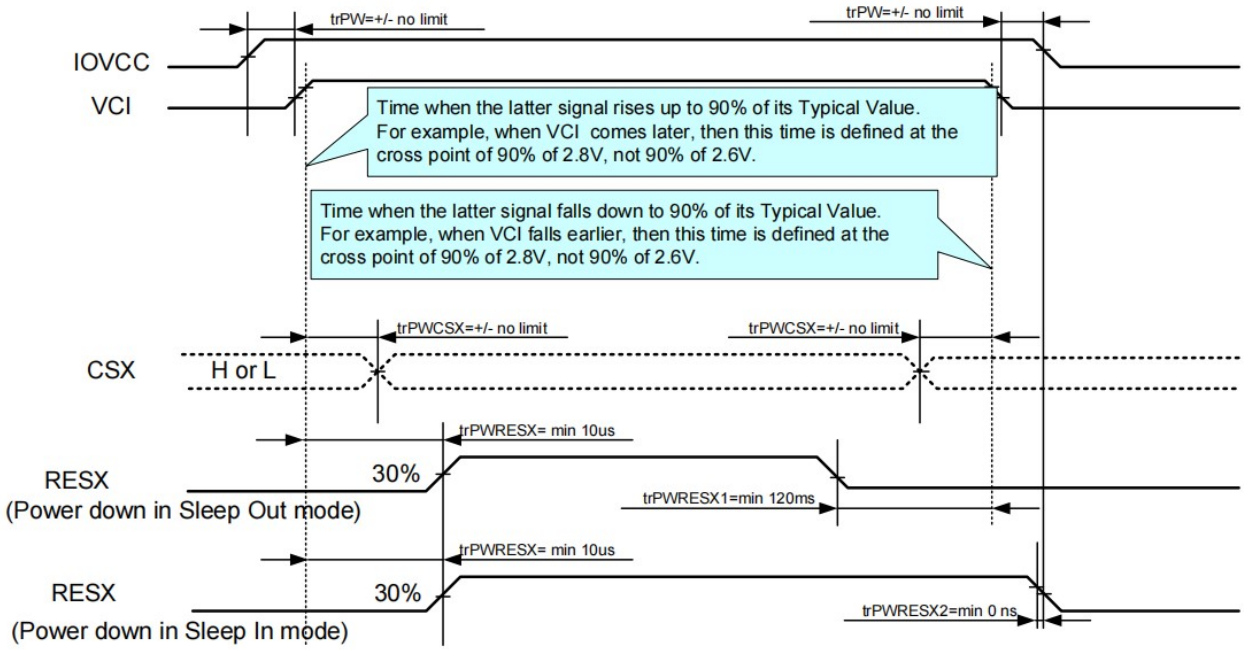
trPWRESX1 is applied to RESX falling in the Sleep Out Mode

trPWRESX2 is applied to RESX falling in the Sleep In Mode

Note: Unless otherwise specified, timings herein show the cross point at 50% of the signal power level.

Case 2 – RESX Line is Held Low by Host at Power ON

If the RESX line is held Low (and stable) by the host during Power On, then the RESX must be held low for a minimum of 10µsec after both VCI and IOVCC have been applied.



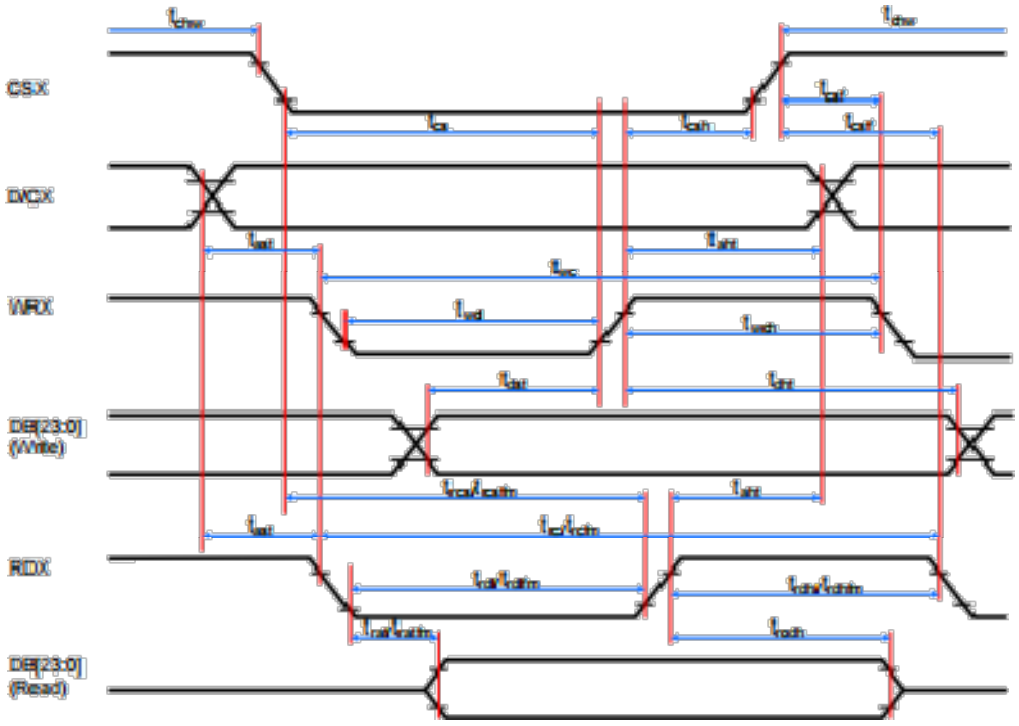
trPWRESX1 is applied to RESX falling in the Sleep Out Mode
trPWRESX2 is applied to RESX falling in the Sleep In Mode

Note: Unless otherwise specified, timings herein show the cross point at 50% of the signal power level.

6.5 Timing Characteristics

6.5.1

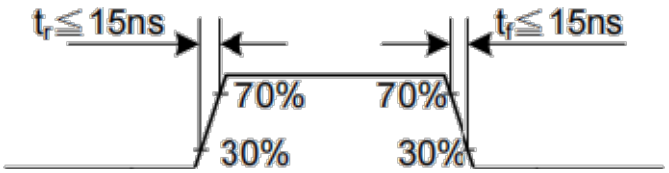
DBI Type B Timing Characteristics



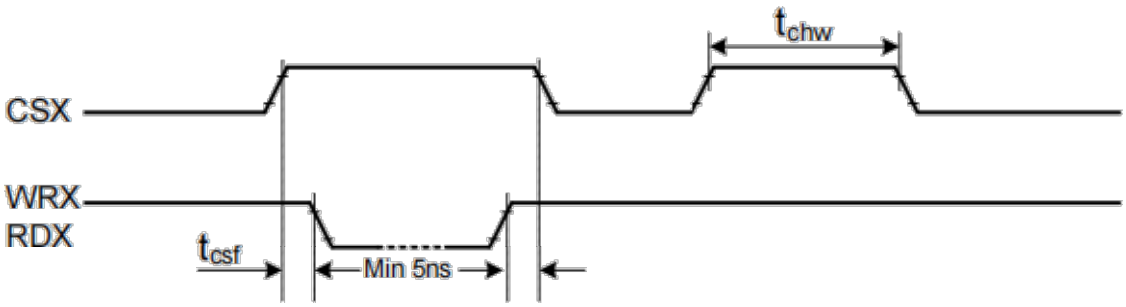
Signal	Symbol	Parameter	min	max	Unit	Description
D/CX	tast	Address setup time	0	-	ns	-
	taht	Address hold time (Write/Read)	0	-	ns	-
CSX	tchw	CSX "H" pulse width	0	-	ns	-
	tcs	Chip Select setup time (Write)	15	-	ns	-
	trcs	Chip Select setup time (Read ID)	45	-	ns	-
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	-
	tcsf	Chip Select Wait time (Write/Read)	0	-	ns	-
WRX	twc	Write cycle	40	-	ns	-
	twrh	Write Control pulse H duration	15	-	ns	-
	twrl	Write Control pulse L duration	15	-	ns	-
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	When read from Frame Memory
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	When read ID data
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
DB [23:0], DB [17:0], DB [15:0], DB [8:0], DB [7:0]	tdst	Write data setup time	10	-	ns	For maximum, CL=30pF For minimum, CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

Notes:

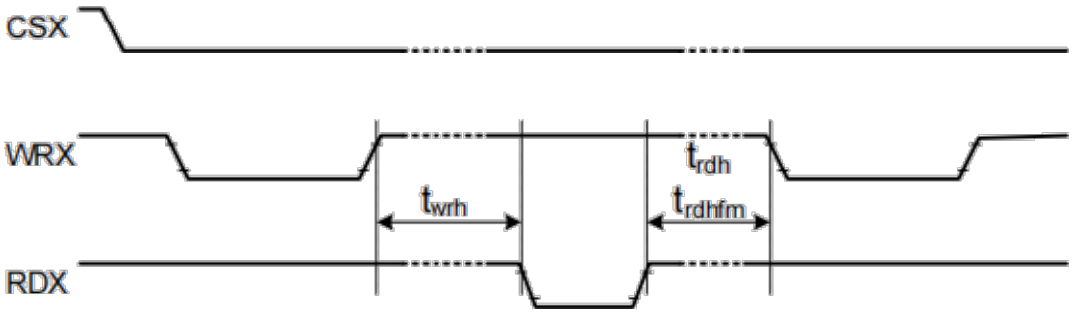
1. Ta = -40 to 85 °C, IOVCC = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = DGND = 0V
2. Logic high and low levels are specified as 30% and 70% of IOVCC for input signals.
3. Input signal rising time and falling time:



7. The CSX timing:

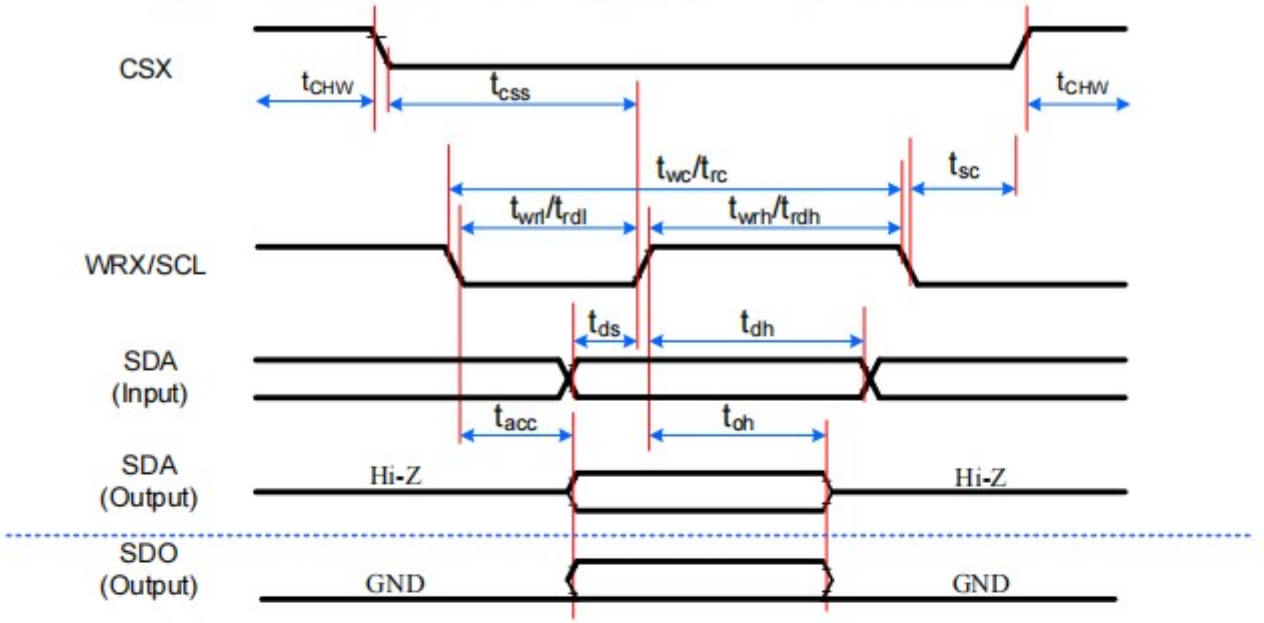


8. The Write to Read or the Read to Write timing:



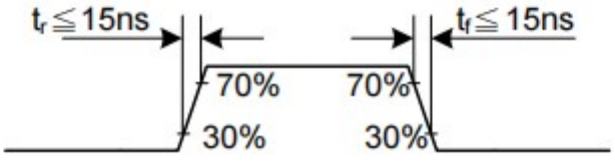
6.5.2

DBI Type C Option 1 (3-Line SPI System) Timing Characteristics



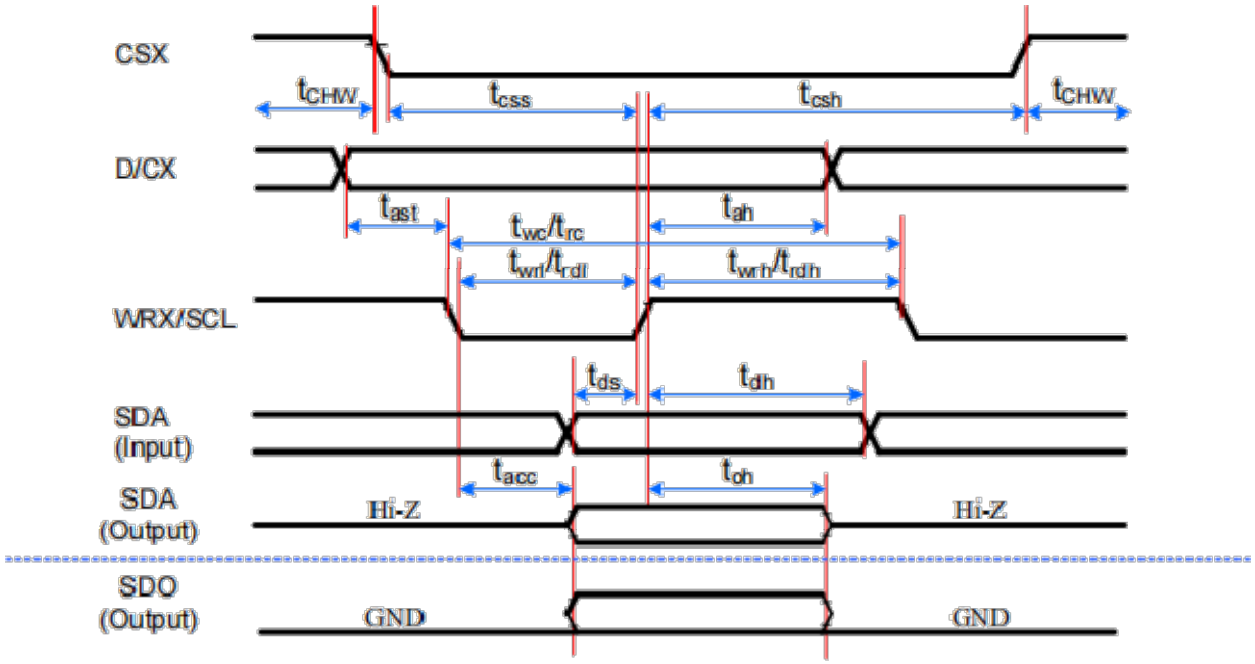
Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tsc	SCL-CSX	15	-	ns	
	tchw	CSX H Pulse Width	40	-	ns	
	tcss	Chip select time (Write)	60	-	ns	
	tcsh	Chip select hold time (Read)	65	-	ns	
SCL	twc	Serial Clock Cycle (Write)	66	-	ns	
	twrh	SCL H Pulse Width (Write)	15	-	ns	
	twrl	SCL L Pulse Width (Write)	15	-	ns	
	trc	Serial Clock Cycle (Read)	150	-	ns	
	trdh	SCL H Pulse Width (Read)	60	-	ns	
	trdl	SCL L Pulse Width (Read)	60	-	ns	
SDA (Input)	tds	Data setup time (Write)	10	-	ns	
	tdh	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	tacc	Access time (Read)	10	50	ns	For maximum CL=30pF
	toh	Output disable time (Read)	15	50	ns	For minimum CL=8pF

Note: Ta = -40 to 85 °C, IOVCC = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = DGND = 0V, T = 10+/-0.5ns



6.5.3

DBI Type C Option 3 (4-Line SPI System) Timing Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tcss	Chip select time (Write)	15	-	ns	
	tcsh	Chip select hold time (Read)	15	-	ns	
	tCHW	CS H pulse width	40	-	ns	
SCL	twc	Serial clock cycle (Write)	50	-	ns	
	twrh	SCL H pulse width (Write)	10	-	ns	
	twrl	SCL L pulse width (Write)	10	-	ns	
	trc	Serial clock cycle (Read)	150	-	ns	
	trdh	SCL H pulse width (Read)	60	-	ns	
	trdl	SCL L pulse width (Read)	60	-	ns	
D/CX	tas	D/CX setup time	10	-	ns	
	tah	D/CX hold time (Write/Read)	10	-	ns	
SDA (Input)	tds	Data setup time (Write)	10	-	ns	
	tdh	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	tacc	Access time (Read)	10	50	ns	For maximum CL=30pF For minimum CL=8pF
	tod	Output disable time (Read)	15	50	ns	

Notes:

3. Ta = -40 to 85 °C, IOVCC = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = DGND = 0V, T = 10+/-0.5ns.

2. Does not include signal rising and falling times.

7. Optical Characteristics

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		θ=0° Φ=0°	-	700	-	Cd/m²	1
Uniformity	⊿Bp			80	-	-	%	1,2
Viewing Angle	3:00		Cr≥10	-	80	-	Deg	3
	6:00			-	80	-		
	9:00			-	80	-		
	12:00			-	80	-		
Contrast Ratio	Cr		θ=0° Φ=0°	1000	-	-	-	4
Response Time	T_r+T_f			-	35	40	ms	5
Color of CIE Coordinate	W	x	θ=0° Φ=0°	Typ-0.05	TBD	Typ+0.05	-	1,6
		y					-	
	R	x					-	
		y					-	
	G	x					-	
		y					-	
	B	x					-	
		y					-	
NTSC Ratio	S			-	67	-	%	

Note：The parameter is slightly changed by temperature, driving voltage and materiel

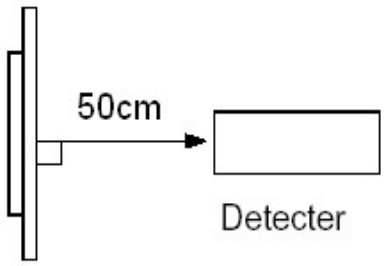
*Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipm*ent BM-7 (Φ5mm)

Measuring condition:

- *Measuring surroundings: Dark room.*
- *Measuring temperature: Ta=25℃.*
- *Adjust operating voltage to get optimum contrast at the center of the display.*

Measured value at the center point of LCD panel after more than 5 minutes while backlight

turning on.

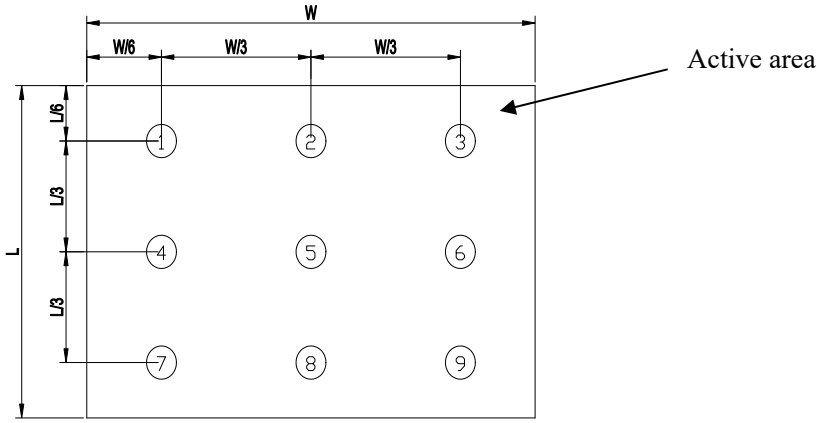


Note 2: The luminance uniformity is calculated by using following formula.

⊿Bp = Bp (Min.) / Bp (Max.)×100 (%)

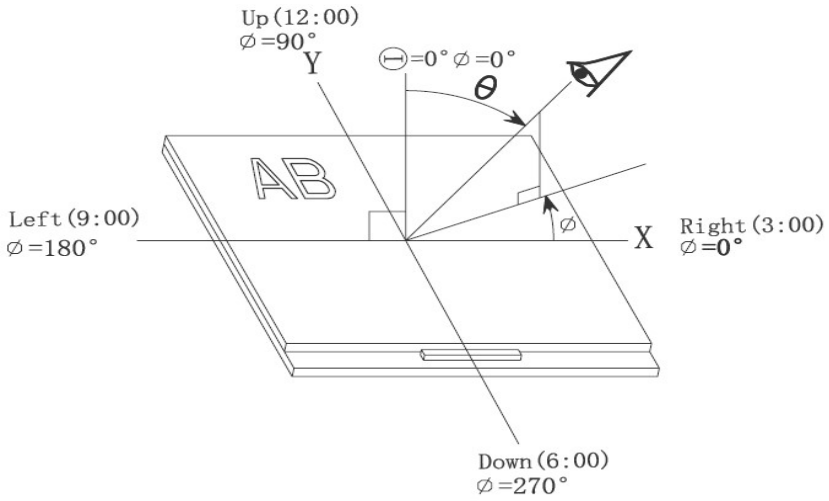
Bp (Max.) = Maximum brightness in 9 measured spots

Bp (Min.) = Minimum brightness in 9 measured spots.

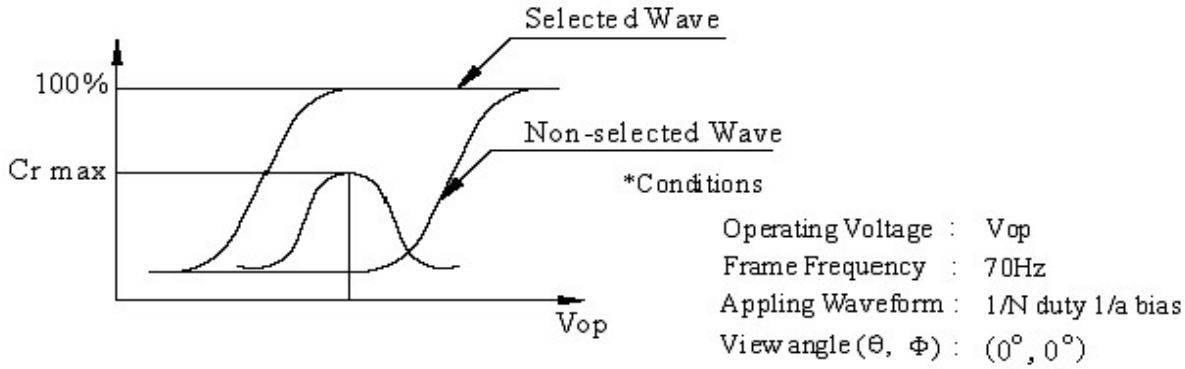


Note 3: The definition of viewing angle:

Refer to the graph below marked by ϑ and Φ



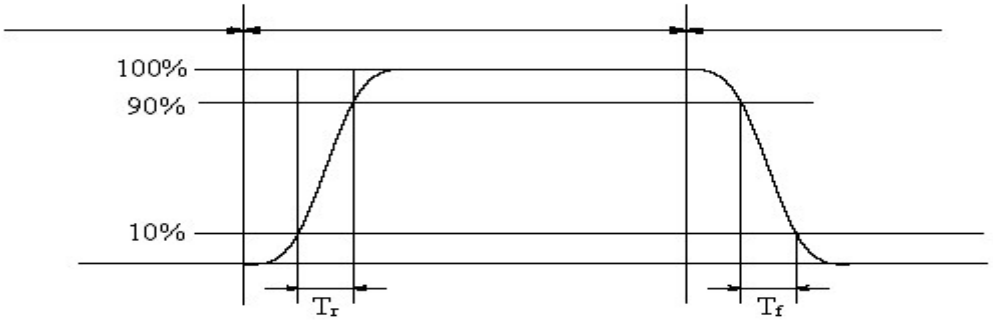
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



$$Contrast\ ratio(Cr) = \frac{Brightness\ of\ selected\ dots}{Brightness\ of\ non-selected\ dots}$$

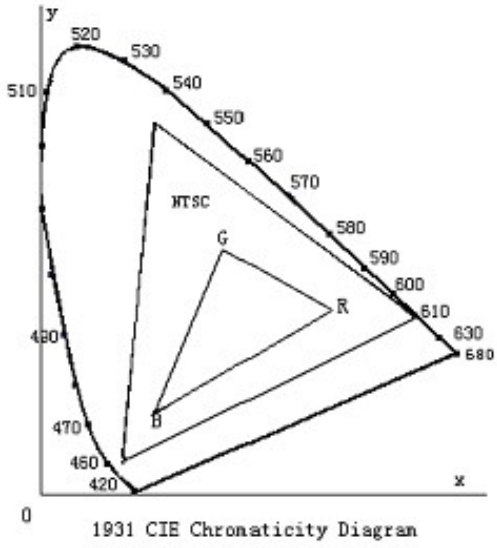
Note 5: Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes.Refer to figure as below.



The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

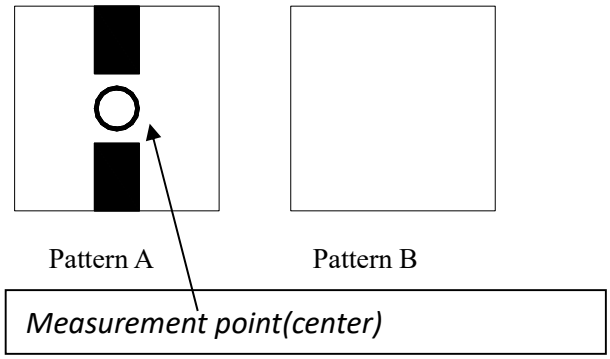


Color gamut:

$$\mathbf{S = \frac{area\ of\ RGB\ triangle}{area\ of\ NTSC\ triangle} \times 100\%}$$

Note 7: Definition of cross talk.

*Cross talk ratio(%)=|pattern A Brightness-pattern B Brightness|/pattern A Brightness*100*



Electric volume value=3F+/-3Hex

8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80℃±2℃ 96H Restore 2H at 25℃ Power off	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value.
2	Low Temperature Storage	-30℃±2℃ 96H Restore 2H at 25℃ Power off	
3	High Temperature Operation	70℃±2℃ 96H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-20℃±2℃ 96H Restore 4H at 25℃ Power on	
5	High Temperature/Humidity Operation	60℃±2℃ 90%RH 96H Power on	
6	Temperature Cycle	-30℃←——→80℃ 30min 5min 30min after 5 cycle, Restore 2H at 25℃ Power off	

Note: Operation: Supply 3.3V for logic system.

The inspection terms after reliability test, as below

ITEM	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0,05

9. Precautions for Use of LCD Modules

9.1 Handling Precautions

9.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

9.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

9.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

9.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

9.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

— Isopropyl alcohol — Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

— Water — Ketone — Aromatic solvents

9.1.6 Do not attempt to disassemble the LCD Module.

9.1.7 If the logic circuit power is off, do not apply the input signals.

9.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

a. Be sure to ground the body when handling the LCD Modules.

b. Tools required for assembly, such as soldering irons, must be properly ground.

c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

9.2 Storage precautions

9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃

Relatively humidity: ≤80%

9.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

9.3 ***The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.***

END