

IIDWay Technology Co. Ltd

PRODUCT SPECIFICATIONS

For Customer: _____

: APPROVAL FOR SPECIFICATION

Customer Model No. _____

: APPROVAL FOR SAMPLE

Module No.: GZ70112-DIT023TH

Date : 2023.9.20

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For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	APPROVER
YZJ		

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2. Revision Record

Date	Rev.No.	Page	Revision Items	Prepared
2023.9.20	V0		The first release	YZJ

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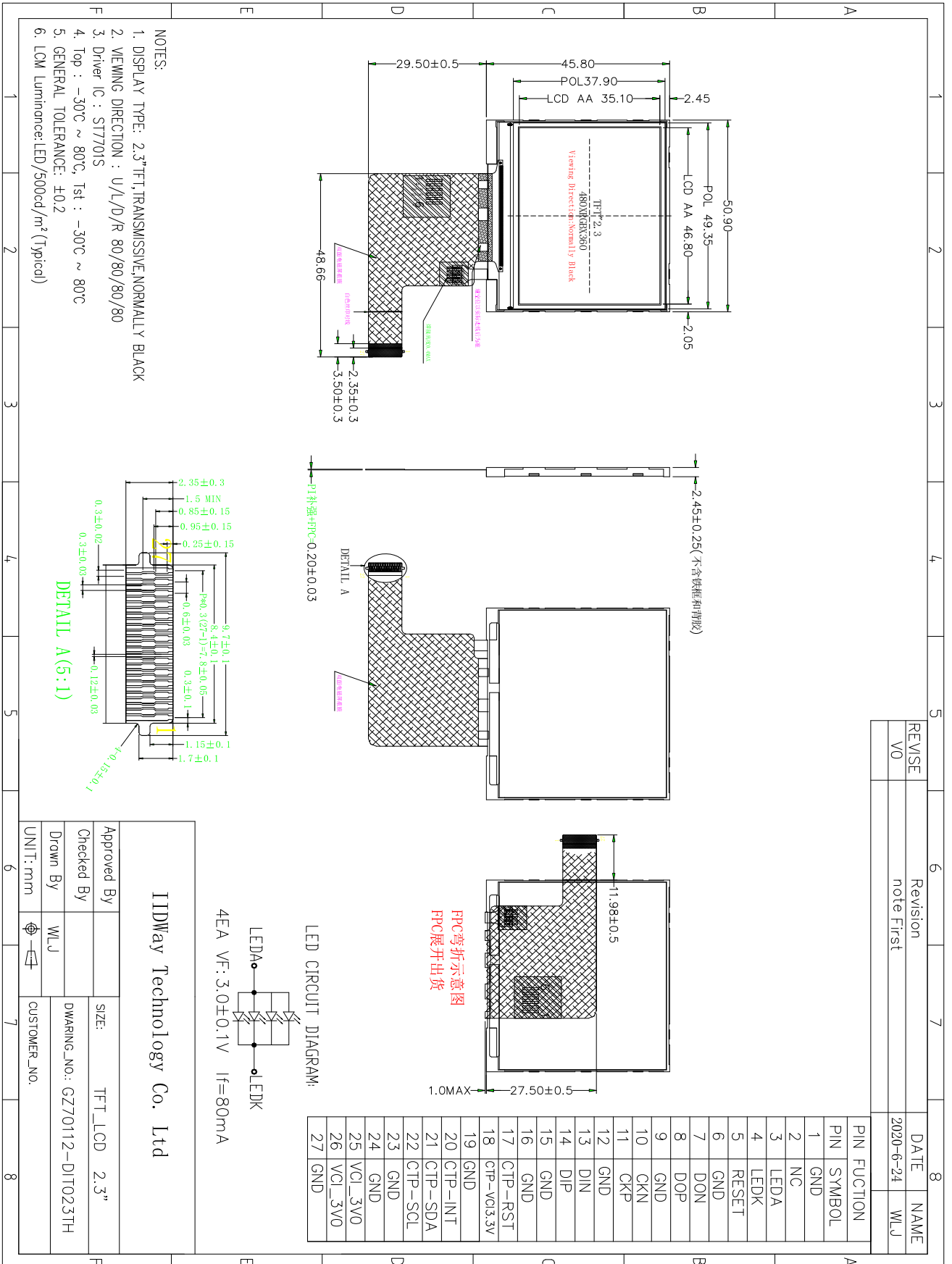
3. General Specifications

GZ70112-DIT023TH is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light unit. The 2.3" display area contains 480x360 pixels and can display up to 262K colors. This product accords with RoHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	262K		
Viewing Direction	ALL	O'Clock	
Operating temperature	-30~+80	°C	
Storage temperature	-30~+80	°C	
Module size	Refer to outline drawing	mm	
Active Area(W×H)	46.80X35.10	mm	
Number of Dots	480x360	dots	
Driver IC	ST7701	-	
Power Supply Voltage	2.8	V	
Outline Dimensions	Refer to outline drawing	-	
Backlight	4P-LEDs (white)	pcs	
Interface	MIPI	-	

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4.Outline.Drawing



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5. Absolute Maximum Ratings($T_a=25\text{ }^\circ\text{C}$)

5.1 Electrical Absolute Maximum Ratings.($V_{SS}=0V, T_a=25\text{ }^\circ\text{C}$)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	-0.3	4.6	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	$-30\text{ }^\circ\text{C}$	$80\text{ }^\circ\text{C}$	$-30\text{ }^\circ\text{C}$	$80\text{ }^\circ\text{C}$
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. $T_a \leq 40\text{ }^\circ\text{C}$: 85%RH MAX.

$T_a \geq 40\text{ }^\circ\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at $40\text{ }^\circ\text{C}$.

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6. Electrical Specifications and Instruction Code

6.1 Electrical characteristics($V_{SS}=0V, T_a=25^\circ C$)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply	VDD	$T_a=25^\circ C$	2.5	2.8	3.6	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($V_{SS}=0V, T_a=25^\circ C$)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage VLED	V_f	$I_f=80mA$	2.9	3.0	3.1	V	
Uniformity	ΔB_p	$I_f=80mA$	80	-	-	%	
LED Life Time	-	-	20000	-	-	hr	1

Note 1: Brightness to be decreased to 50% of the initial value at ambient temperature $T_A=25^\circ C$

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6.3 Interface signals

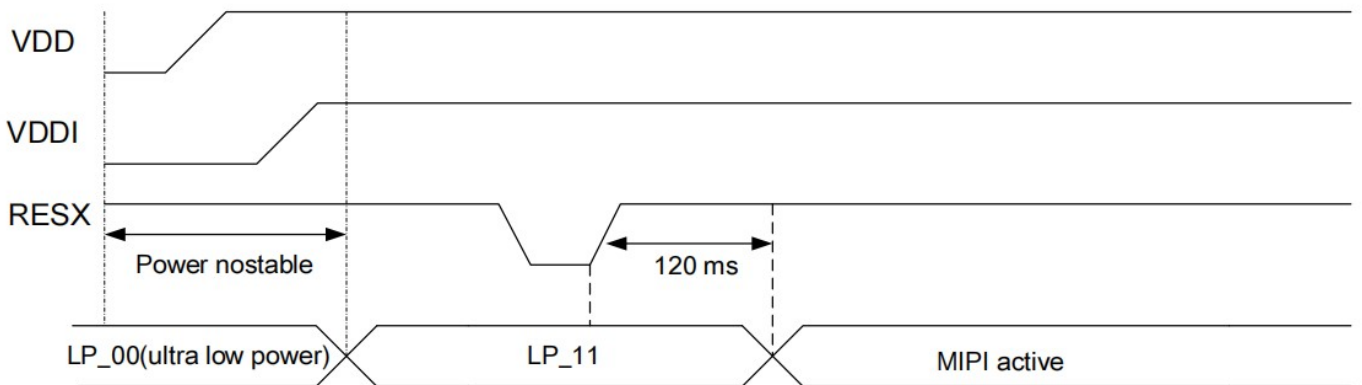
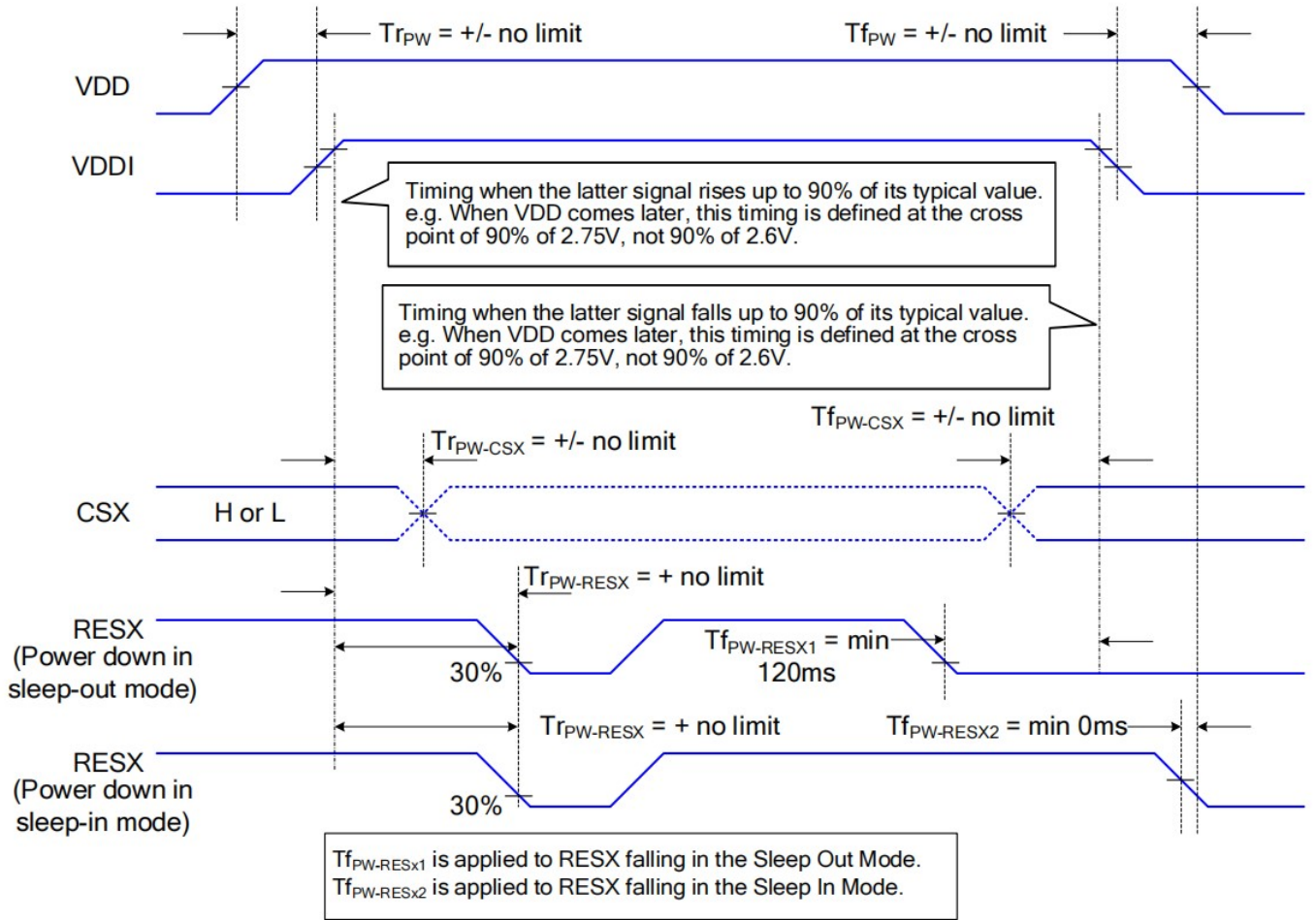
6.3.1 LCM PIN

Pin No.	Symbol	I/O	Function
1	GND	P	Ground
2	NC		No connection
3	LEDA	P	LED back light(Anode)
4	LEDK	P	ED back light(Cathode)
5	RESET	I	Global reset signal input pin
6	GND	P	Ground
7	D0N	I	MIPI-DSI data Lane negative-end input pin
8	D0P	I	MIPI-DSI data Lane positive-end input pin
9	GND	P	Ground
10	CKN	I	MIPI-DSI data Lane negative-end input pin
11	CKP	I	MIPI-DSI data Lane positive-end input pin
12	GND	P	Ground
13	D1N	I	MIPI-DSI data Lane negative-end input pin
14	D1P	I	MIPI-DSI data Lane positive-end input pin
15-16	GND	P	Ground
17	CTP-RST	I	CTP reset pin
18	CTP-VCI3.3V	P	CTP Analog or digital supply voltage
19	GND	P	Ground
20	CTP-INT	I	External Interrupt to the IC of CTP
21	CTP-SDA	I	CTP Serial in/out signal pin
22	CTP-SCL	I	CTP Serial interface clock pin
23-24	GND	P	Ground
25-26	VCI_3V0	P	Power supply
27	GND	P	Ground

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6.4 Power Sequence

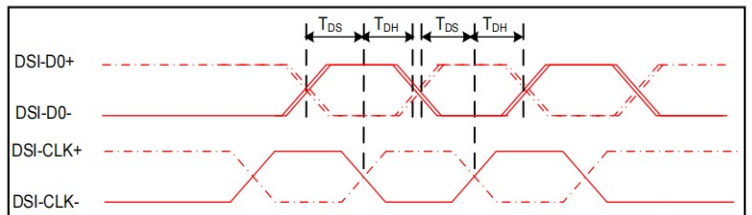
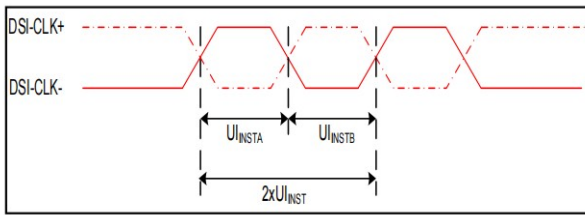
The power on/off sequence is illustrated below



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6.5 MIPI Interface Characteristics

6.5.1 High Speed Mode

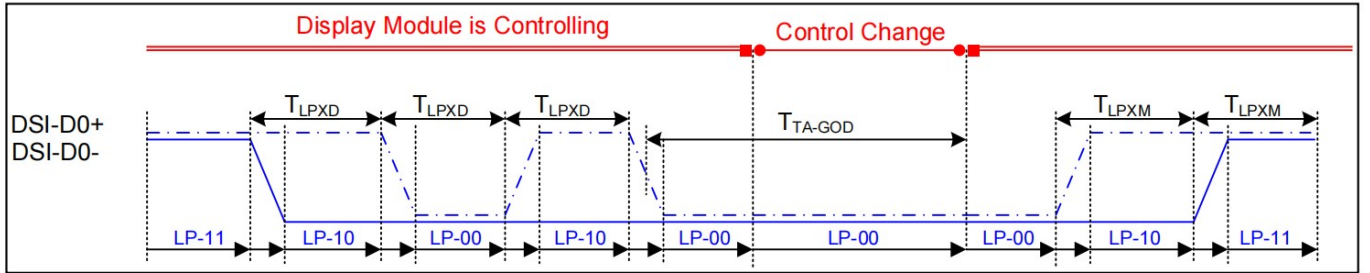
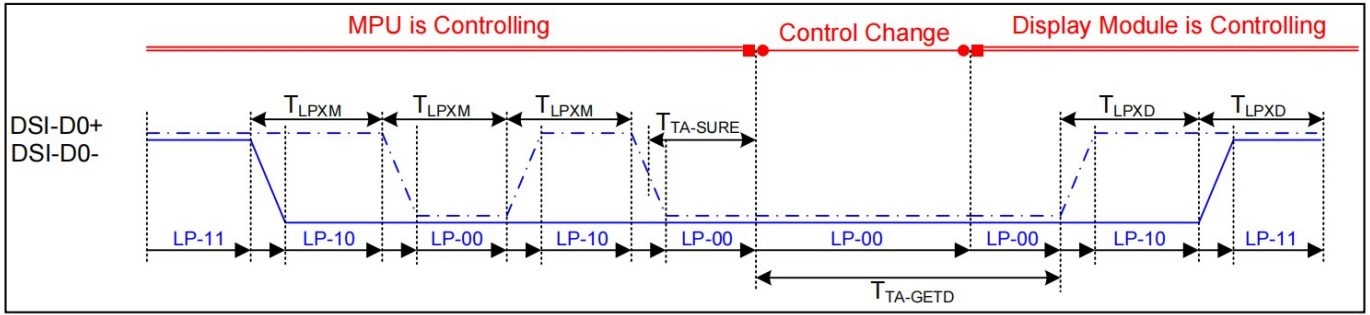


VDDI=1.8, VDD=2.8, AGND=DGND=0V, Ta=25 °C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-CLK+/-	$2xUI_{INSTA}$	Double UI instantaneous	2.5	25	ns	
DSI-CLK+/-	UI_{INSTA} UI_{INSTB}	UI instantaneous halves	1.25	12.5	ns	$UI = UI_{INSTA} = UI_{INSTB}$
DSI-Dn+/-	t _{DS}	Data to clock setup time	0.15	-	UI	
DSI-Dn+/-	t _{DH}	Data to clock hold time	0.15	-	UI	

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6.5.2 Low Power Mode

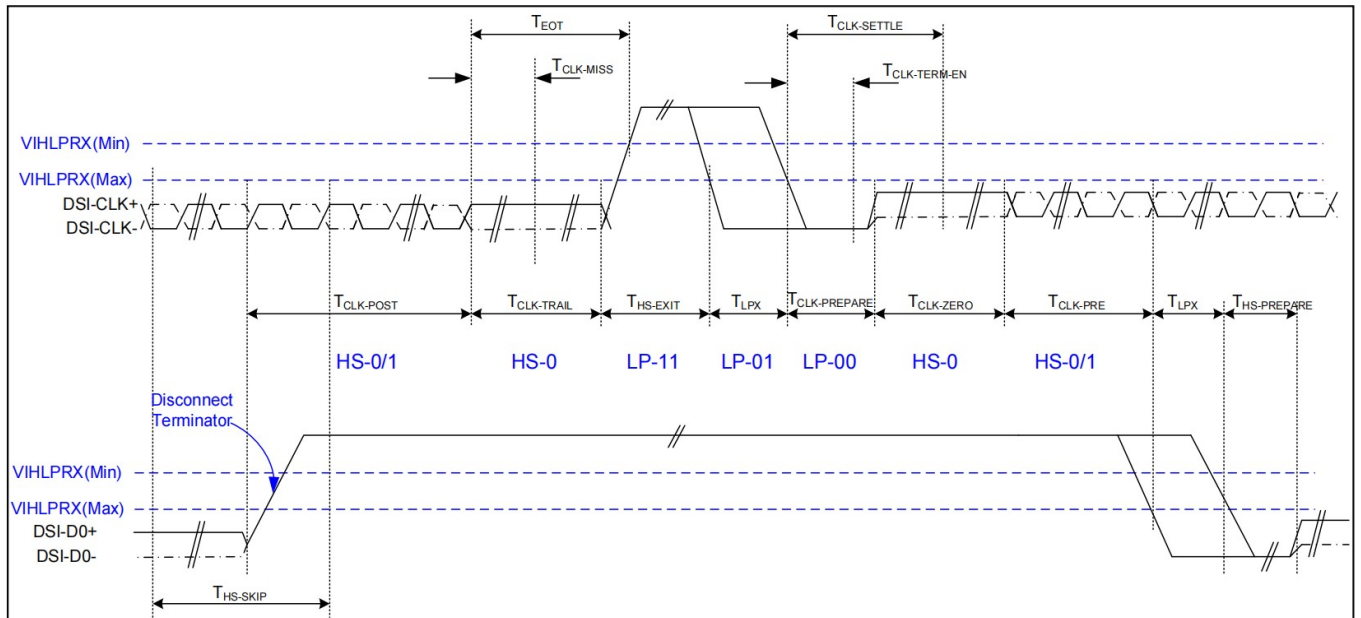
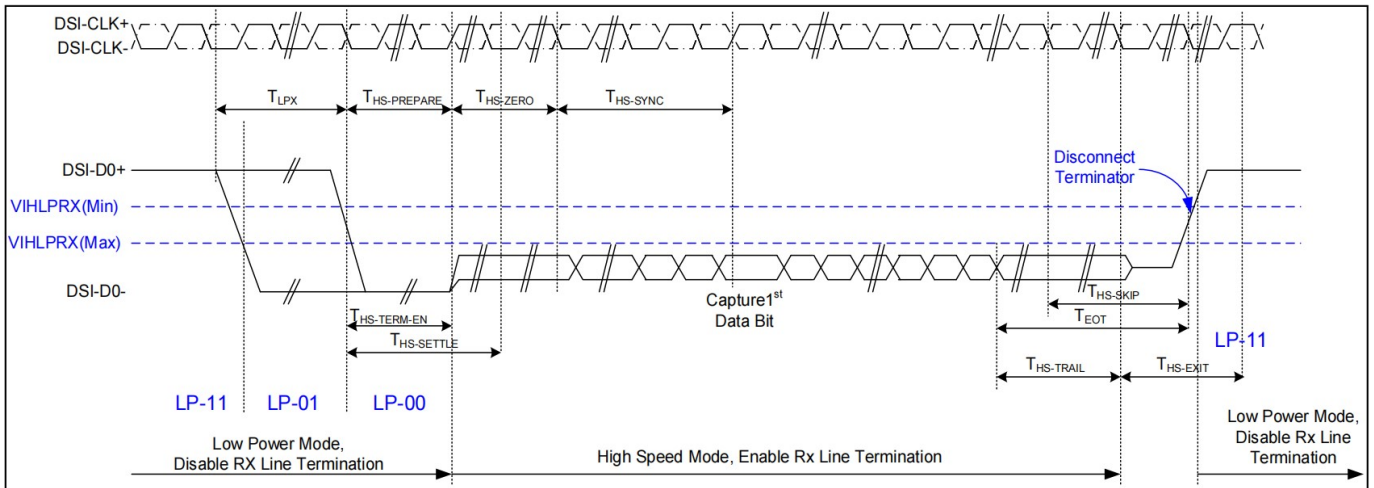


$V_{DDI}=1.8, V_{DD}=2.8, A_{GND}=D_{GND}=0V, T_a=25\text{ }^{\circ}\text{C}$

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-D0+/-	T_{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Input
DSI-D0+/-	T_{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Output
DSI-D0+/-	$T_{TA-SURED}$	Time-out before the MPU start driving	T_{LPXD}	$2 \times T_{LPXD}$	ns	Output
DSI-D0+/-	$T_{TA-GETD}$	Time to drive LP-00 by display module	$5 \times T_{LPXD}$		ns	Input
DSI-D0+/-	T_{TA-GOD}	Time to drive LP-00 after turnaround request-MPU	$4 \times T_{LPXD}$		ns	Output

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6.5.3 DSI Bursts Mode



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VDDI=1.8, VDD=2.8, AGND=DGND=0V, Ta=25 °C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
Low Power Mode to High Speed Mode Timing						
DSI-Dn+/-	TLPX	Length of any low power state period	50	-	ns	Input
DSI-Dn+/-	THS-PREPARE	Time to drive LP-00 to prepare for HS transmission	40+4 UI	85+6 UI	ns	Input
DSI-Dn+/-	THS-TERM-EN	Time to enable data receiver line termination measured from when Dn crosses VILMAX	-	35+4 UI	ns	Input
DSI-Dn+/-	THS-PREPARE + THS-ZERO	THS-PREPARE + time to drive HS-0 before the sync sequence	140+ 10UI	-	ns	Input
High Speed Mode to Low Power Mode Timing						
DSI-Dn+/-	THS-SKIP	Time-out at display module to ignore transition period of EoT	40	55+4 UI	ns	Input
DSI-Dn+/-	THS-EXIT	Time to drive LP-11 after HS burst	100	-	ns	Input
DSI-Dn+/-	THS-TRAIL	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60+4 UI	-	ns	Input
High Speed Mode to/from Low Power Mode Timing						
DSI-CLK+/-	TCLK-POS	Time that the MPU shall continue sending HS clock after the last associated data lane has transition to LP mode	60+5 2UI	-	ns	Input
DSI-CLK+/-	TCLK-TRAIL	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	ns	Input
DSI-CLK+/-	THS-EXIT	Time to drive LP-11 after HS burst	100	-	ns	Input
DSI-CLK+/-	TCLK-PREPARE	Time to drive LP-00 to prepare for HS transmission	38	95	ns	Input
DSI-CLK+/-	TCLK-TERM-EN	Time-out at clock lan display module to enable HS transmission	--	38	ns	Input
DSI-CLK+/-	TCLK-PREPARE + TCLK-ZERO	Minimum lead HS-0 drive period before starting clock	300	-	ns	Input
DSI-CLK+/-	TCLK-PRE	Time that the HS clock shall be driven prior to any associated data lane beginning the transition from LP to HS mode	8UI	-	ns	Input
DSI-CLK+/-	TEOT	Time form start of TCLK-TRAIL period to start of LP-11 state	-	105n s+12 UI	ns	Input

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7. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Brightness	Bp	$\theta=0^\circ$	-	500	-	Cd/m ²	1	
Uniformity	ΔBp	$\Phi=0^\circ$	80	-	-	%	1,2	
Viewing Angle	3:00	Cr \geq 10	-	80	-	Deg	3	
	6:00		-	80	-			
	9:00		-	80	-			
	12:00		-	80	-			
Contrast Ratio	Cr	$\theta=0^\circ$	800	1000	-	-	4	
Response Time	T _r +T _f	$\Phi=0^\circ$	-	30	35	ms	5	
Color of CIE Coordinate	W	x	$\theta=0^\circ$	Typ-0 .05	TBD	Typ+0. 05	-	1,6
		y					-	
	R	x					-	
		y					-	
	G	x					-	
		y					-	
	B	x					-	
		y					-	
NTSC Ratio	S		63	68	-	%		

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 equipment BM-7 (Φ 5mm)

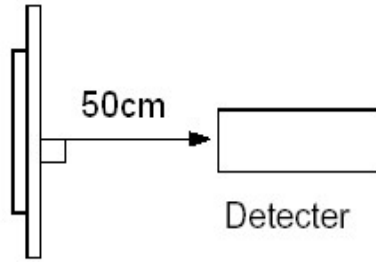
Measuring condition:

- *Measuring surroundings: Dark room.*
- *Measuring temperature: Ta=25 °C.*
- *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

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turning on.

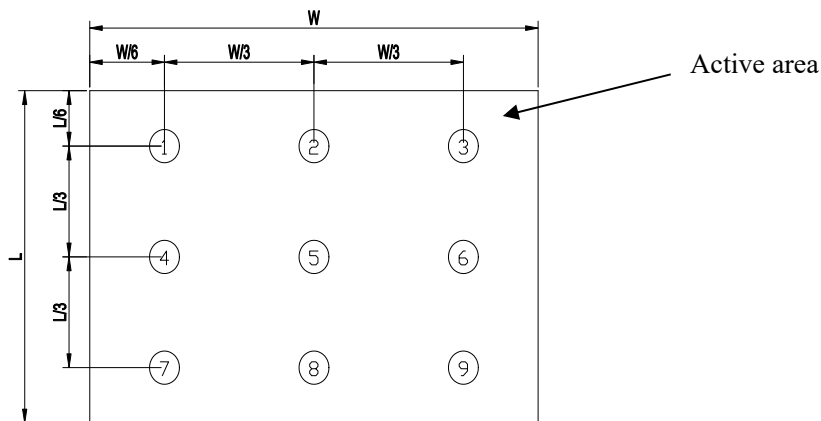


Note 2: The luminance uniformity is calculated by using following formula.

$$\Delta Bp = Bp (\text{Min.}) / Bp (\text{Max.}) \times 100 (\%)$$

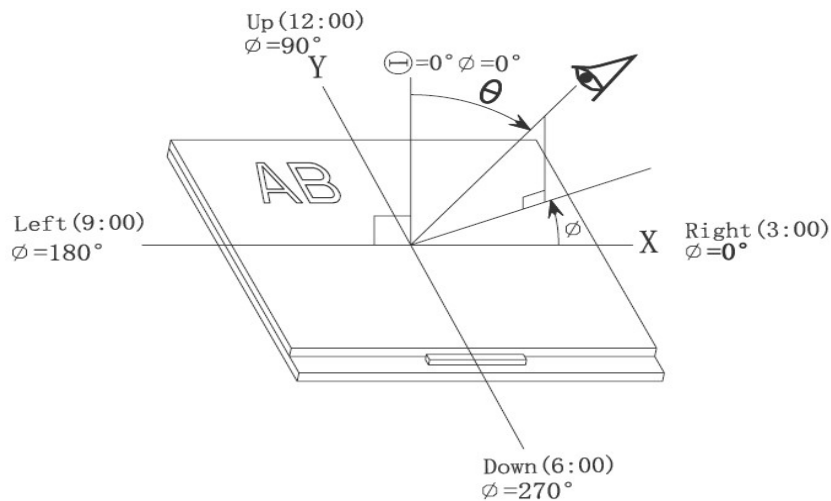
$Bp (\text{Max.})$ = Maximum brightness in 9 measured spots

$Bp (\text{Min.})$ = Minimum brightness in 9 measured spots.



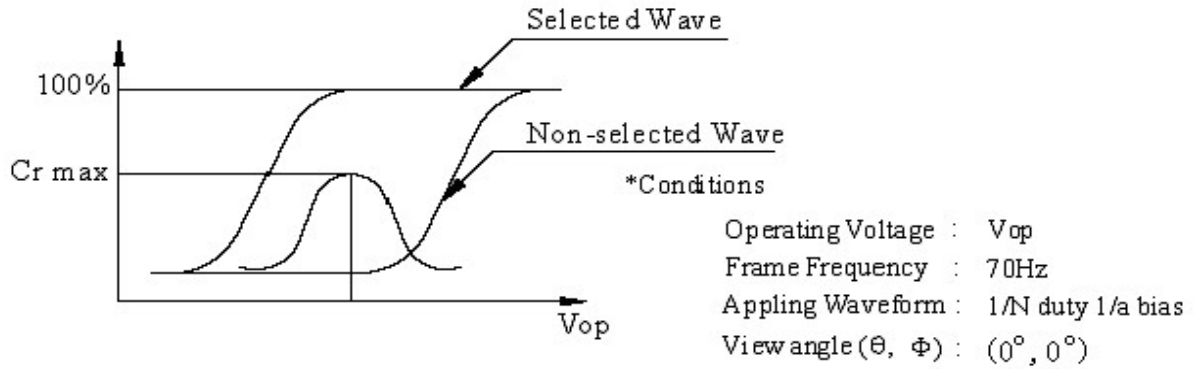
Note 3: The definition of viewing angle:

Refer to the graph below marked by ϑ and Φ



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

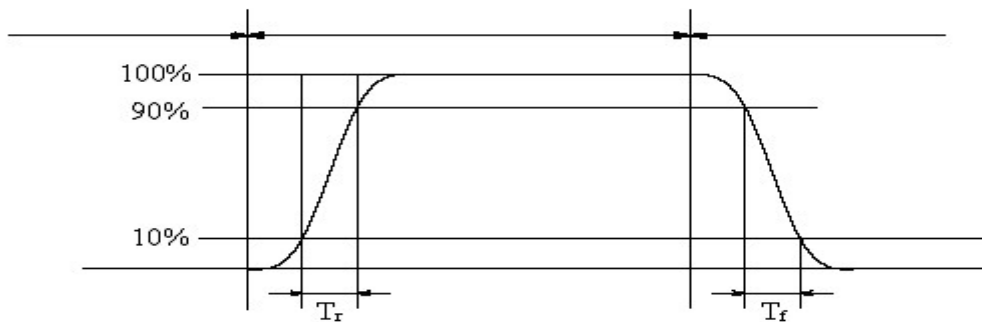
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$$\text{Contrast ratio}(Cr) = \frac{\text{Brightness of selected dots}}{\text{Brightness of non-selected dots}}$$

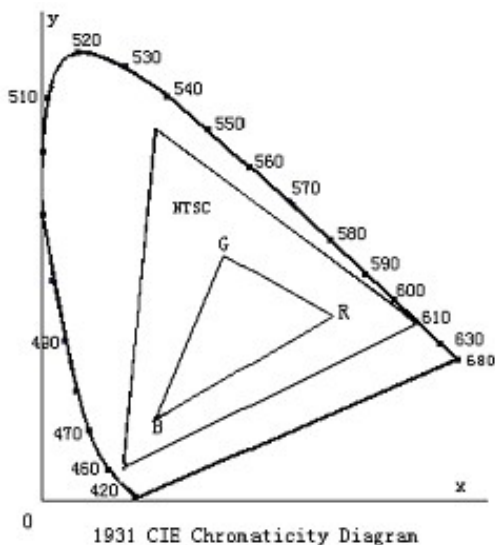
Note 5: Definition of Response time. (Test LCD using DMS501):

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.



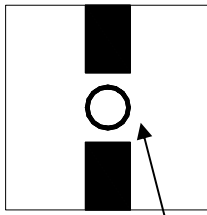
Color gamut:

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

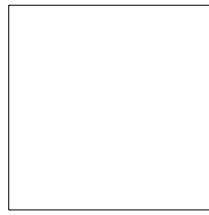
Note 7: Definition of cross talk.

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



Pattern A



Pattern B

Measurement point(center)

Electric volume value=3F+/-3Hex

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8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80°C±2°C 96H Restore 2H at 25°C 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°C±2°C 96H Restore 2H at 25°C Power off	
3	High Temperature Operation	80°C±2°C 96H Restore 2H at 25°C Power on	
4	Low Temperature Operation	-30°C±2°C 96H Restore 4H at 25°C Power on	
5	High Temperature/Humidity Operation	60°C±2°C 90%RH 96H Power on	
6	Temperature Cycle	-30°C → 80°C 30min 5min 30min after 5 cycle, Restore 2H at 25°C 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

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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.

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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°C ~ 40°C

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
