

IIDWay Technology Co. Ltd

PRODUCT SPECIFICATIONS

For Customer: _____

: APPROVAL FOR SPECIFICATION

Customer Model No. _____

: APPROVAL FOR SAMPLE

Module No.: GZ70122-DIT040TH

Date : 2020.10.14

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For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT
RCR			

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3. General Specifications

GZ70122-DIT040TH is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light and LENS unit . The 3.95" display area contains 480 x (RGB) x 480 pixels and can display up to 262K colors. This product accords with ROHS environmental criterion.

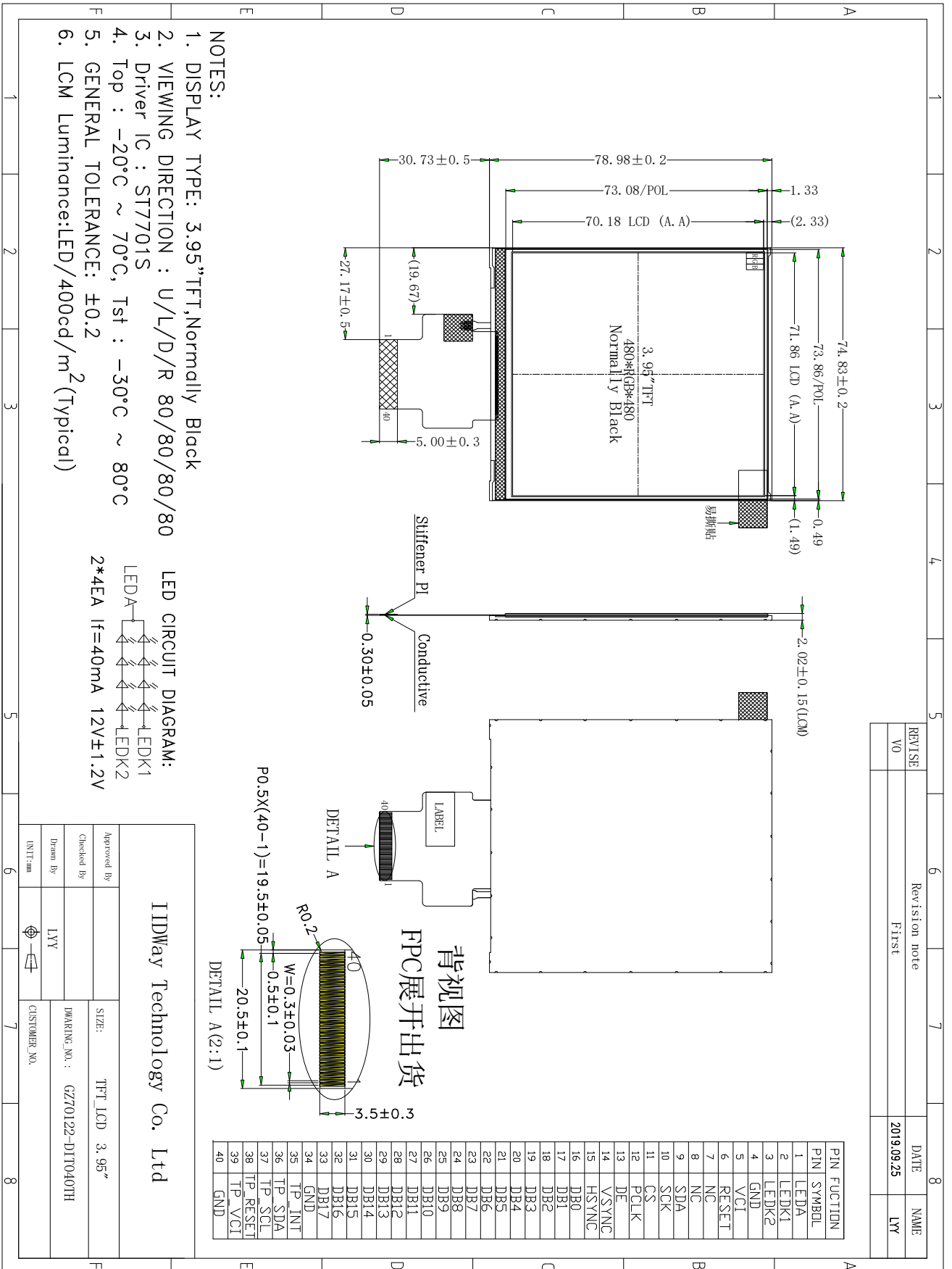
Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	262K		1
Viewing Direction	ALL	O'Clock	
Operating temperature	-20~+70	°C	
Storage temperature	-30~+80	°C	
Module size	152.40 X 101.60 X 4.22	mm	2
Active Area(W×H)	70.176 X 71.856	mm	
Number of Dots	480 X 480	dots	
TFT Controller	ST7701S	-	
Power Supply Voltage	2.8	V	
Backlight	4S2P-LEDs (white)	pcs	
Weight	---	g	
Interface	SPI+RGB-18bit	-	

Note 1: Color tune is slightly changed by temperature and driving voltage.

Note 2: Without FPC and Solder .with LENS.

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4 Outline Drawing



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5. Absolute Maximum Ratings(Ta=25°C)

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

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VCI	-0.3	3.6	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. $V_{CI} > V_{SS}$ must be maintained.
3. Please be sure users are grounded when handing LCD Module

5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30°C	80°C	-20°C	70°C	1,2
Humidity	-	-	-	-	3

Notes:

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

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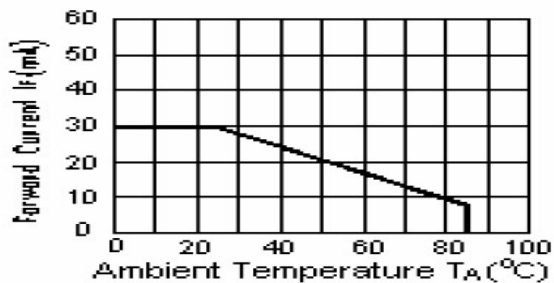
6. Electrical Specifications

6.1 Electrical characteristics(V_{SS}=0V ,T_a=25°C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note	
Power supply	V _{CI}	T _a =25°C	2.5	2.8	3.6	V		
Input voltage	'H'	V _{IH}	T _a =25°C	0.7*V _{CI}	-	V _{CI}	V	
	'L'	V _{IL}	T _a =25°C	0	-	0.3*V _{CI}	V	

6.2 LED backlight specification(V_{SS}=0V ,T_a=25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V _f	I _f =40mA	10.8	12.0	13.2	V	
Uniformity	Δ B _p	I _f =40mA	75	80	-	%	
Life Time	time	I _f =40mA	20K	-	-	hours	1



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

6.3 Interface signals

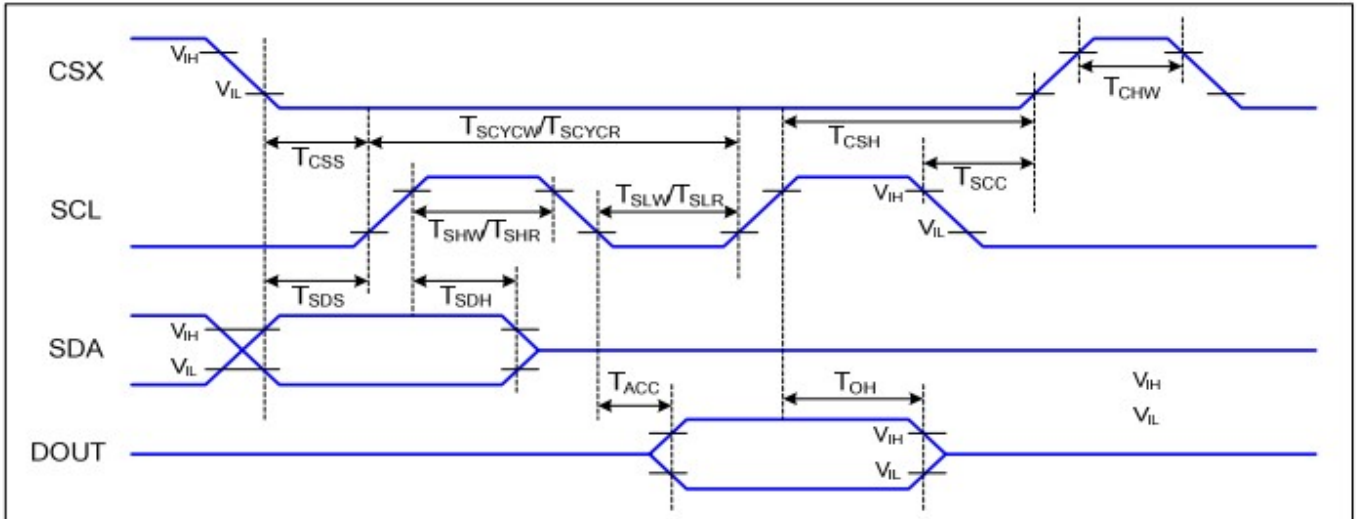
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Pin No.	Symbol	I/O	Function
1	LEDA	P	LED back light(Anode)
2	LEDK1	P	LED back light(Cathode)
3	LEDK2	P	LED back light(Cathode)
4	GND	P	Ground
5	VCI	P	Power supply for digital circuits
6	RESET	I	Chip reset pin,Normal active"L"
7-8	NC	-	No Connection
9	SDA	I	Serial input data for SPI Interface.
10	SCK	I	Serial clock Input for SPI Interface.
11	CS	I	chip select signal
12	PCLK	I	Dot clock signal for RGB interface operation
13	DE	I	Data Input Enable.Normally pull low.
14	VSYNC	I	Vertical sync input signal, Normally pull high
15	HSYNC	I	Horizontal sync input signal, Normally pull high
16-33	DB0-17	I	18-bit parallel data bus for RGB Interface.
34	GND	P	Ground
35-39	NC	-	No Connection
40	GND	P	Ground

6.4 AC Characteristics

6.4.1 Serial Interface Characteristics

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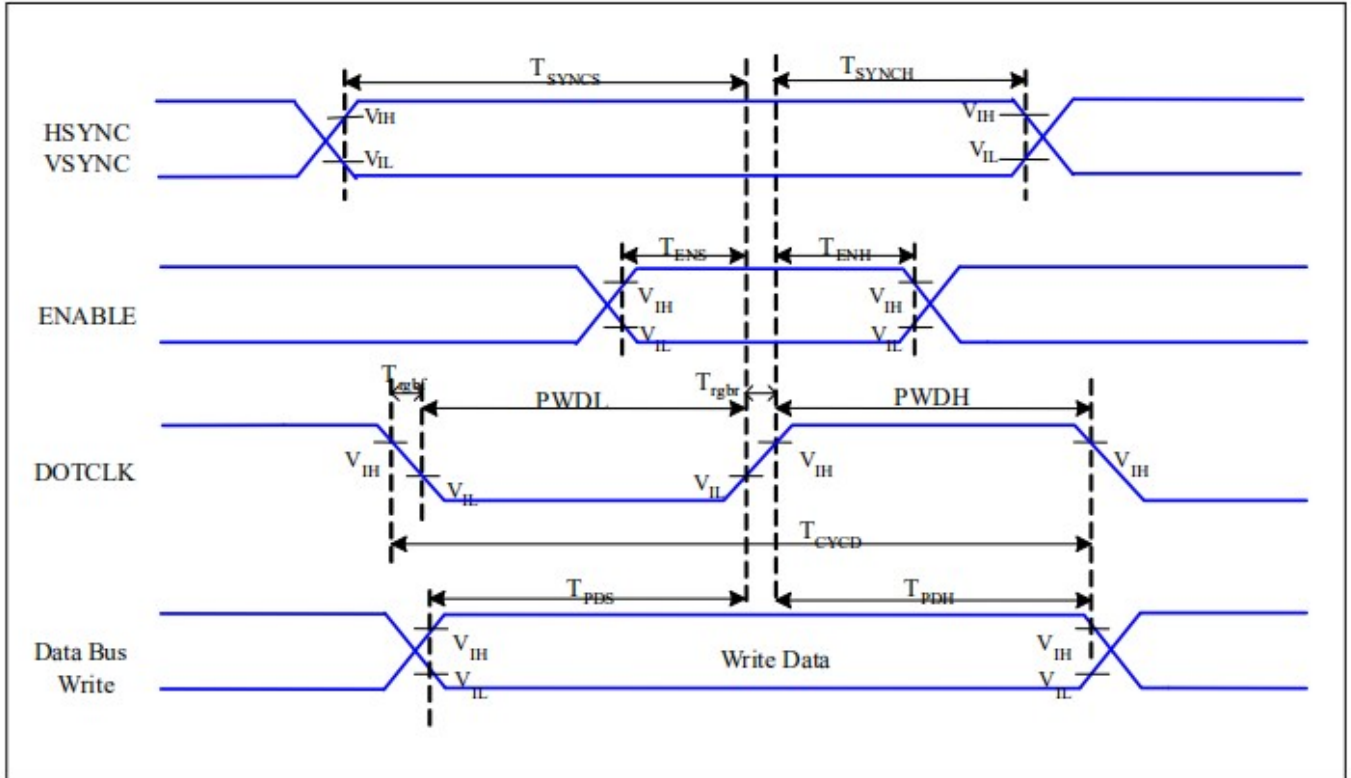


VDDI=1.8, VDD=2.8, AGND=DGND=0V, Ta=25°C

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	60		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	

6.4.2 RGB Interface Characteristics

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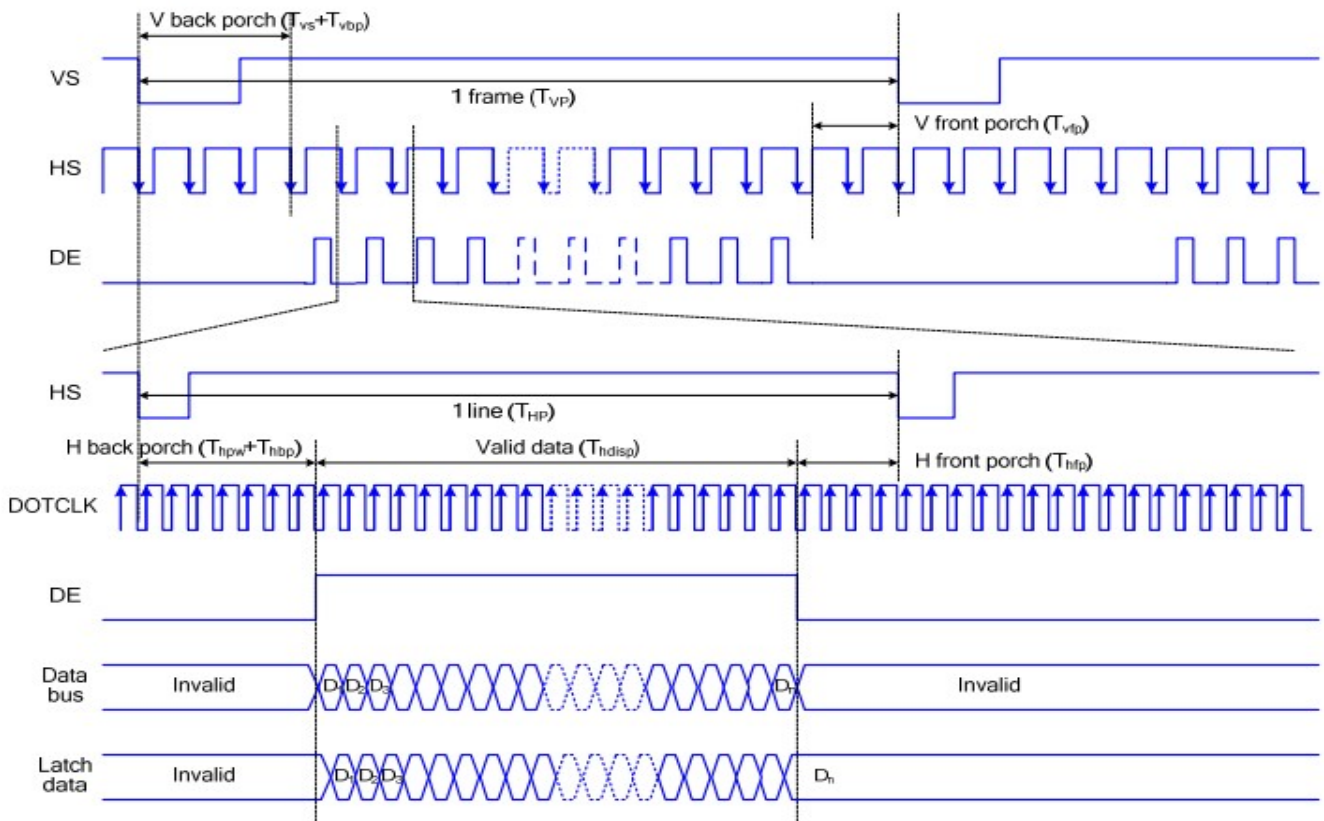


VDDI=1.8, VDD=2.8, AGND=DGND=0V, Ta=25 °C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYNC, HSYNC Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	

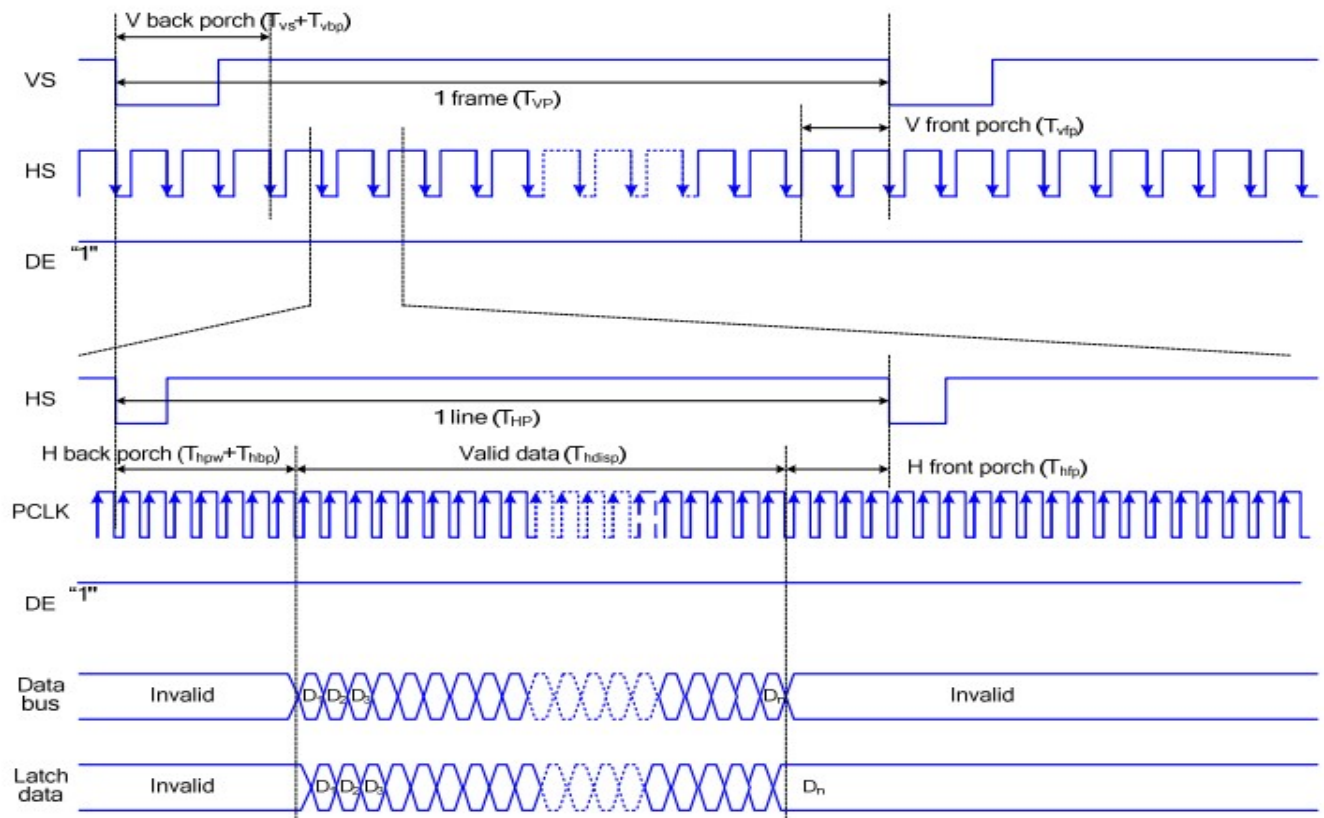
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The timing chart of RGB interface DE mode is shown as follows.



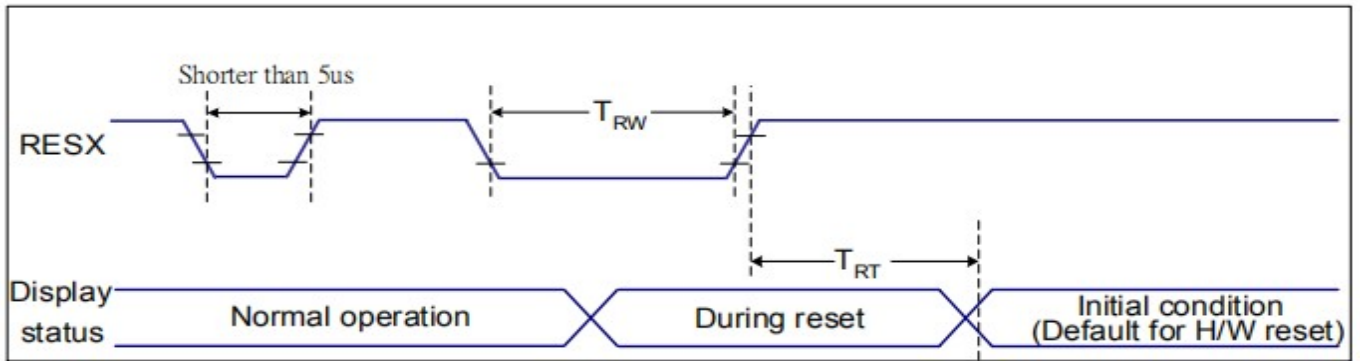
Note: The setting of front porch and back porch in host must match that in IC as this mode.

The timing chart of RGB interface HV mode is shown as follows.



6.4.3 Reset Timing

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

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
-			120 (Note 1, 6, 7)	ms	

Notes:

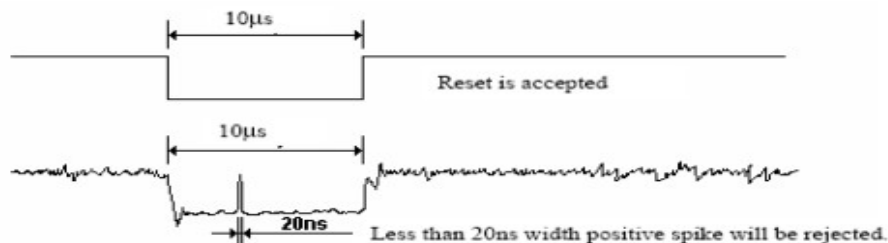
1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (t_{RT}) within 5 ms after a rising edge of RESX.

2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode.) and then return to Default condition for Hardware Reset.

4. Spike Rejection also applies during a valid reset pulse as shown below:



5. When Reset applied during Sleep In Mode.

6. When Reset applied during Sleep Out Mode.

7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

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7. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Brightness	Bp	$\theta=0^\circ$ $\Phi=0^\circ$	-	350	-	Cd/m ²	1	
Uniformity	\triangle Bp		75	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	$\theta=0^\circ$ $\Phi=0^\circ$	640	800	-	-	4	
Response Time	T _r +T _f		-	25	35	ms	5	
Color of CIE Coordinate	W	x	$\theta=0^\circ$ $\Phi=0^\circ$	Typ -0.05	0.27	Typ +0.05	-	1,6
		y			0.30		-	
	R	x			TBD		-	
		y			TBD		-	
	G	x			TBD		-	
		y			TBD		-	
	B	x			TBD		-	
		y			TBD		-	
NTSC Ratio	S	55	60	-	%			

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.

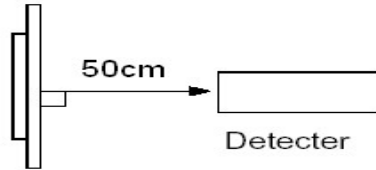
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The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: $T_a=25^{\circ}\text{C}$.
- 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 turning on.

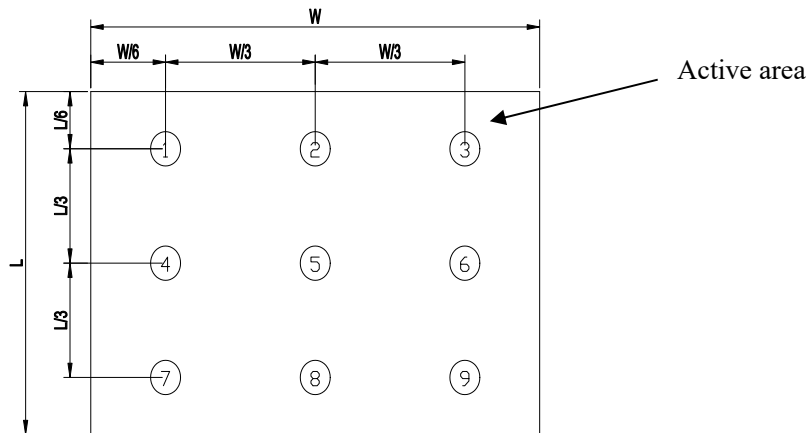


Note 2: The luminance uniformity is calculated by using following formula.

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

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

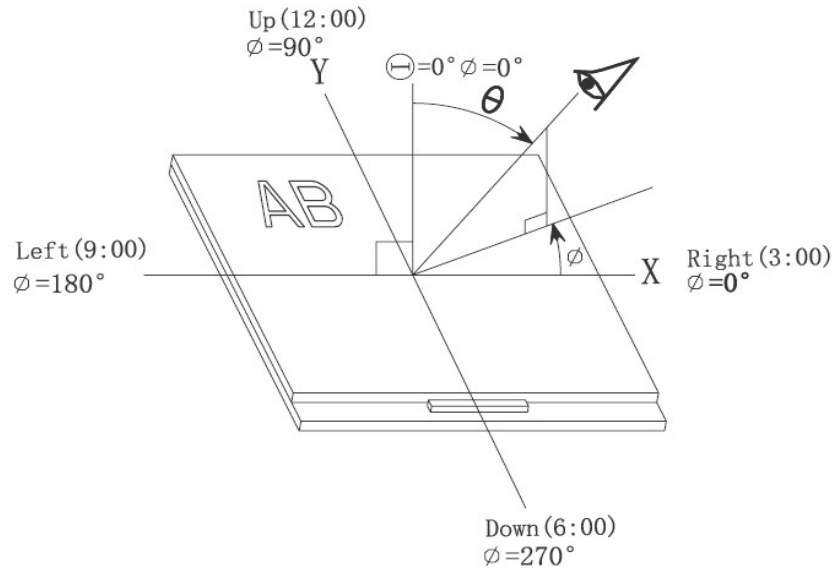
$B_p (\text{Min.})$ = Minimum brightness in 9 measured spots.



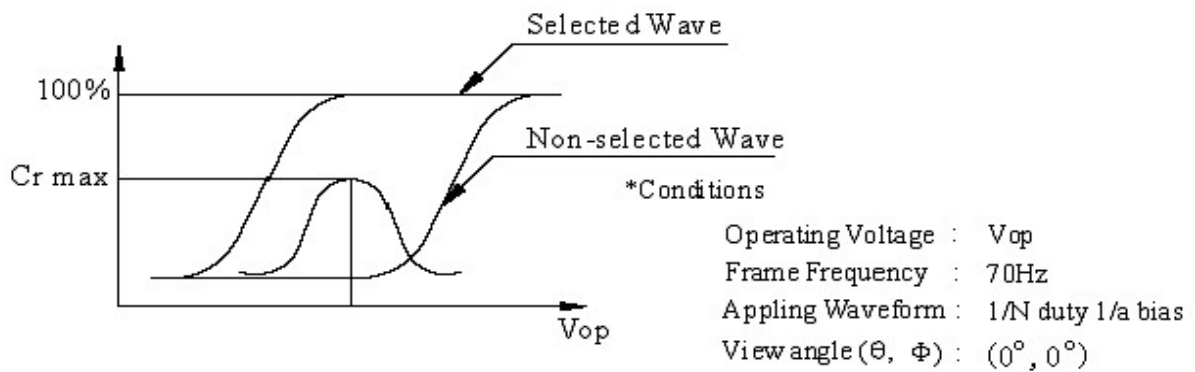
Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and Φ

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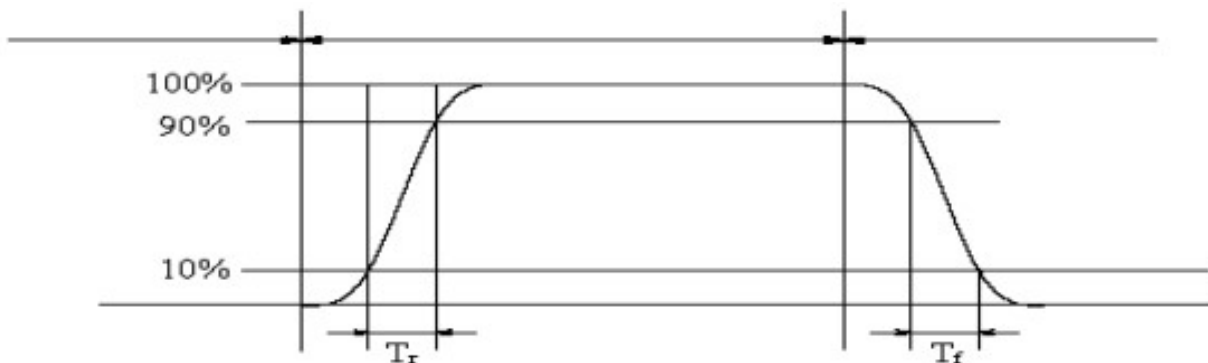
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



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

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

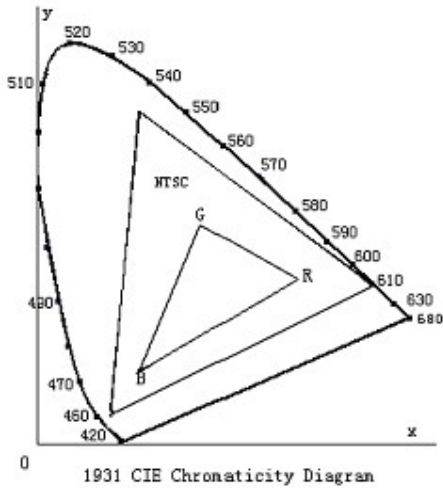
The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



The definition of response time

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

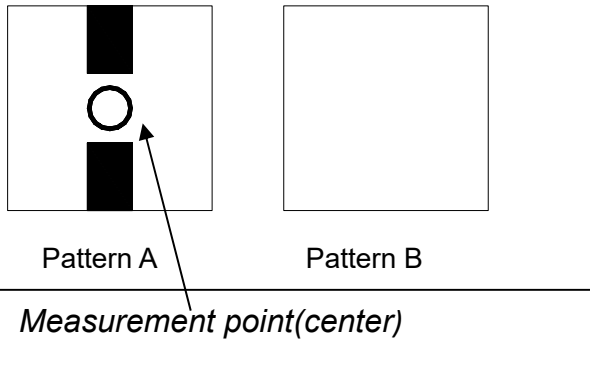


Color gamut:

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

Note 7: Definition of cross talk.

Cross talk ratio(%) = $\frac{|\text{pattern A Brightness} - \text{pattern B Brightness}|}{\text{pattern A Brightness}} \times 100$



Electric volume value = $3F \pm 3Hex$

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8. Reliability Test Items and Criteria

Test Item	Test condition	Remark
High Temperature Storage	Ta = 80°C 96hrs	Note1,Note3, 4
Low Temperature Storage	Ta = -30°C 96hrs	Note1,Note3, 4
High Temperature Operation	Ta = 70°C 96hrs	Note2,Note3, 4
Low Temperature Operation	Ta = -20°C 96hrs	Note1,Note3, 4
Operation at High Temperature/Humidity	+60°C, 90%RH 96hrs	Note3, 4
Thermal Shock	-30°C/30 min ~ +80°C/30 min for a total 10 cycles, Start with cold temperature and end with high temperature.	Note3, 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:60cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	±2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: 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 don't guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time,at least 2 hours at room temperature

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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
