Model Name: ZXGL156009

LCD Screen model : GV156FHB-N10

Issue Date : 2023/07/17

( )Preliminary Specifications
(*)Final Specifications

Customer Signature:	
ZXGL Part No.:	
Approved By:	Approval By PM Director
Note:	Reviewed By RD Director
	Reviewed By Project Leader
	Prepared By PM

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REVISION HISTORY

Version	Date	Page	Description
1.0	2023/07/17	All	First release

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1. GENERAL DESCRIPTION

1.1 OVERVIEW

This specification applies to the 15.6 inch Color TFT-LCD Module ZXGL156009. This LCD module has a TFT active matrix type liquid crystal panel 1920x1080 pixels, and diagonal size of 15.6 inch. This module supports 1920x1080 mode. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot. The ZXGL156009 has been designed to apply the 8-bit 2 channel LVDS interface method. It is intended to support displays where high brightness, wide viewing angle, high color saturation, and high color depth are very important.

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	15.6	Inch	-
Driver Element	a-Si TFT active matrix	-	-
Pixel Number	1920 x 1080	Pixel	
Pixel pitch	0.17925 (H) x 0.17925 (W)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Colors	8B / 16.7 millions	Color	
Transmissive Mode	Normally Black	-	
Surface Treatment	Anti-Glare	-	
Luminance, White	2000 (typical)	cd/m2	
Color Gamut	72% of NTSC(Typ.)	-	
Power Consumption	Total 21W @ cell 3.5W , BL 17.48W		(1)

Note(1) The specified power consumption: Total=cell(reference 4.3.1)+BL(reference 4.3.3)

2. MECHANICAL SPECIFICATIONS

Item		Min	Typ.	Max	Unit	Note
Module Size	Horizontal(H)		363.8		mm	(1)
	Vertical (V)		215.9		mm	
	Thickness (T)		10.86	16	mm	
Bezel Area	Horizontal		344.16		mm	
	Vertical		193.59		mm	
Active Area	Horizontal	-	344.16	-	mm	
	Vertical	-	193.59	-	mm	
Weight		-	TBD		Kg	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

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3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-30	+85	ºC	(1)
Operating Ambient Temperature	TOP	-20	+80	ºC	(1),(2)

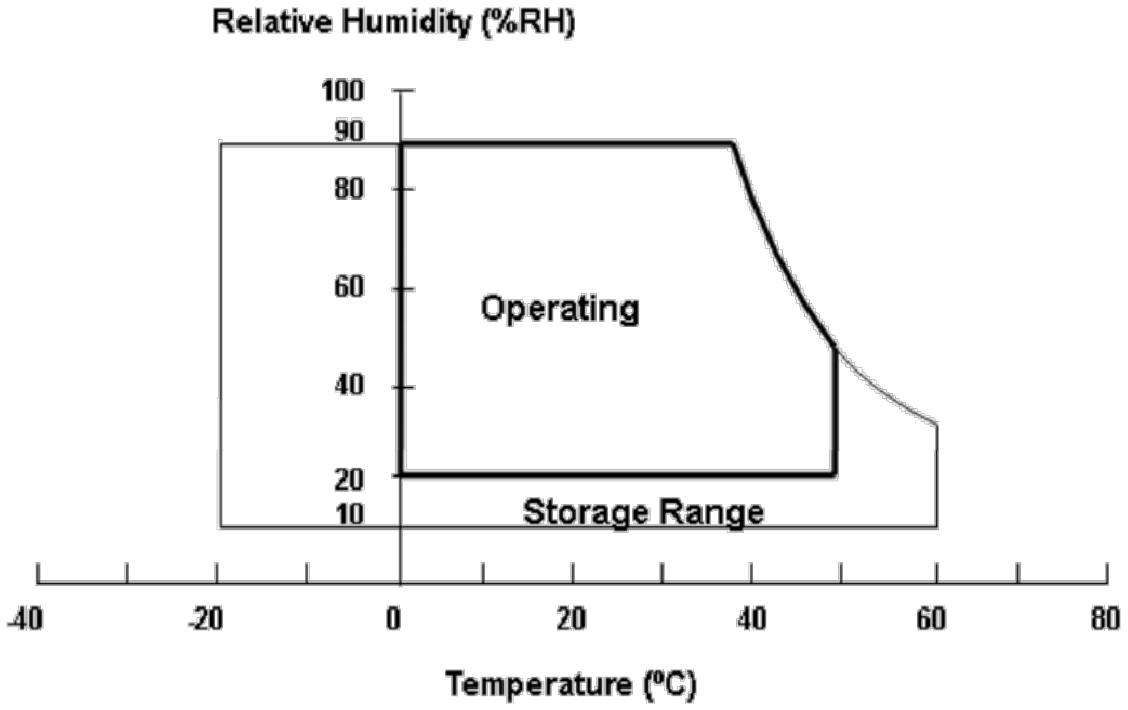
Note (1)

(a) 90 %RH Max. (Ta <= 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel surface should be 0 ºC min. and 60 ºC max.



3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 BACKLIGHT UNIT

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Forward Current	I_F	-	460	480	mA	(1),(2) Duty=100%
LED voltage	VF	-	38	39	V	(1),(2) Pulse Width≦ 10msec. and Duty= 30%

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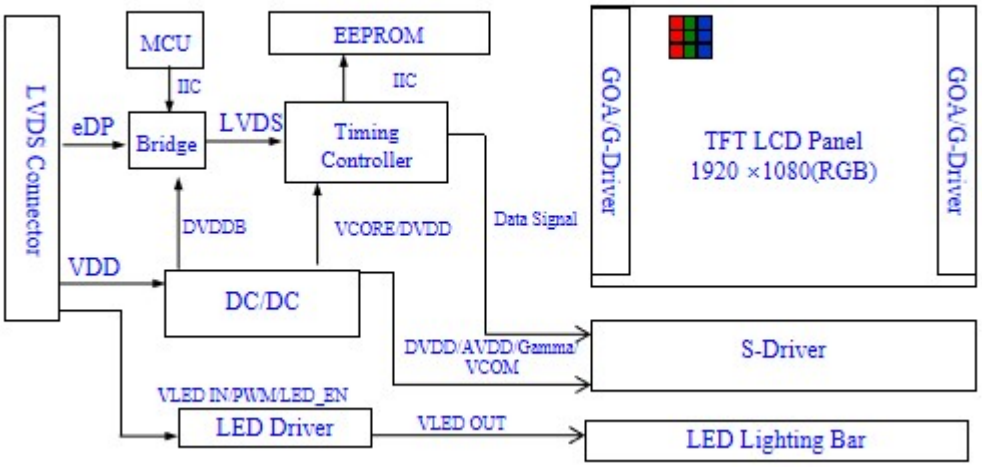
Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for input pin of LED light bar at Ta=25±2 °C

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM



4.2 INTERFACE CONNECTIONS

PIN ASSIGNMENT

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	LED_VCC	LED Power Supply,12V(typical)
2	LED_VCC	LED Power Supply,12V(typical)
3	LED_VCC	LED Power Supply,12V(typical)
4	LED_VCC	LED Power Supply,12V(typical)
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	LED_EN	LED Enable
10	LED_PWM	LED PWM Control
11	LCD_VCC	LCD Power Supply,3.3V(typical)
12	LCD_VCC	LCD Power Supply,3.3V(typical)
13	LCD_VCC	LCD Power Supply,3.3V(typical)
14	NC	No Connection
15	NC	No Connection
16	NC	No Connection
17	GND	Ground
18	RXO0-	-LVDS differential data input
19	RXO0+	+LVDS differential data input
20	RXO1-	-LVDS differential data input

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Terminal	Symbol	Functions
Pin No.	Symbol	Description
21	RXO1+	+LVDS differential data input
22	RXO2-	-LVDS differential data input
23	RXO2+	+LVDS differential data input
24	GND	Ground
25	RXOC-	-LVDS differential clock input
26	RXOC+	+LVDS differential clock input
27	GND	Ground
28	RXO3-	-LVDS differential data input
29	RXO3+	+LVDS differential data input
30	RXE0-	-LVDS differential data input
31	RXE0+	+LVDS differential data input
32	RXE1-	-LVDS differential data input
33	RXE1+	+LVDS differential data input
34	GND	Ground
35	RXE2-	-LVDS differential data input
36	RXE2+	+LVDS differential data input
37	RXEC-	-LVDS differential clock input
38	RXEC+	+LVDS differential clock input
39	RXE3-	-LVDS differential data input
40	RXE3+	+LVDS differential data input

Module Panel Connector Information

Item	Description
Manufacturer	/
Type part number	/
Mating housing part number	20455-040E

4.3 ELECTRICAL CHRARCTERISTICS

4.3.1 LCD ELETRONICS SPECIFICATION

The ambient temperature is Ta = 25 ± 2 °C.

Parameter			Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage		V_{DD}	3.0	3.3	3.46	V	Note 1
Power Supply Inrush Current		I_{nrush}	-	-	3	A	Note3
Power Supply Current	Mosaic	I_{DD}	TBD	TBD	TBD	mA	Note 1
	RGB		TBD	TBD	TBD	mA	
Power Consumption	Mosaic	P_M	-	-	TBD	W	
	RGB	P_{RGB}	-	-	TBD	W	
	BLU	P_{BL}	-	-	TBD	W	Note 2
	Total	P_{Total}	-	-	TBD	W	@Mosaic

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Notes :

1. The supply voltage is measured and specified at the interface connector of LCM.
   The current draw and power consumption specified is for 3.3V at 25 °C.
   a) Mosaic pattern 8*8
   b) R/G/B patterns

(a) (b)

Figure 3. Power Measure Patterns

2. Calculated value for reference (VLED × ILED)
3. Measure condition (Figure 4)

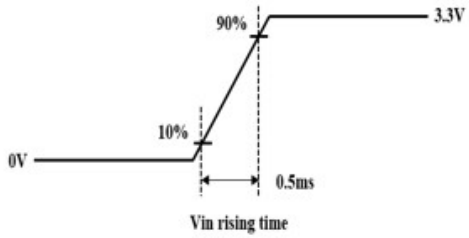

Figure 4. Inrush Measure Condition

4.3.2 BACKLIGHT UNIT

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Input Voltage Per Input Pin	VPIN		38	39	V	(1), Duty=100%, IPIN=95mA
LED Light Bar Current Per Input Pin	IPIN		460	480	mA	(1), (2) Duty=100%
LED Life Time	LLED	40000			Hrs	(3)
Power Consumption	PBL	---	17.48	18.72	W	(1) Duty=100%I PIN=460mA

Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:

Note (2) PBL (Typ) = IPIN(Typ) × VPIN(Typ) × (2) PBL(Max) = IPIN(Typ) x VPIN(Max)x(2) input pins ,

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Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at Ta = 25 ±2 ℃ and I= (460)mA (per chip) until the brightness becomes Š 50% of its original value.

Note (4) The module must be operated with constant driving current.

Connector Information

Pin number	Description
1	negative polarity
2	Input voltage Power Supply

Note (1) User's Mating Connector Part No.:

Connector (wire type): PH2.0-2Pin 2 groups

4.4 LVDS INPUT SIGNAL SPECIFICATIONS

4.4.1 The GV156FHB-N10 is operated by the DE only.

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	141.8	143.8	145.7	MHz
Frame Period		Tv	1118	1128	1138	lines
			-	60	-	Hz
			-	16.67	-	ms
Vertical Display Period		Tvd	-	1080	-	lines
One line Scanning Period		Th	2114	2124	2134	clocks
Horizontal Display Period		Thd	-	1920	-	clocks

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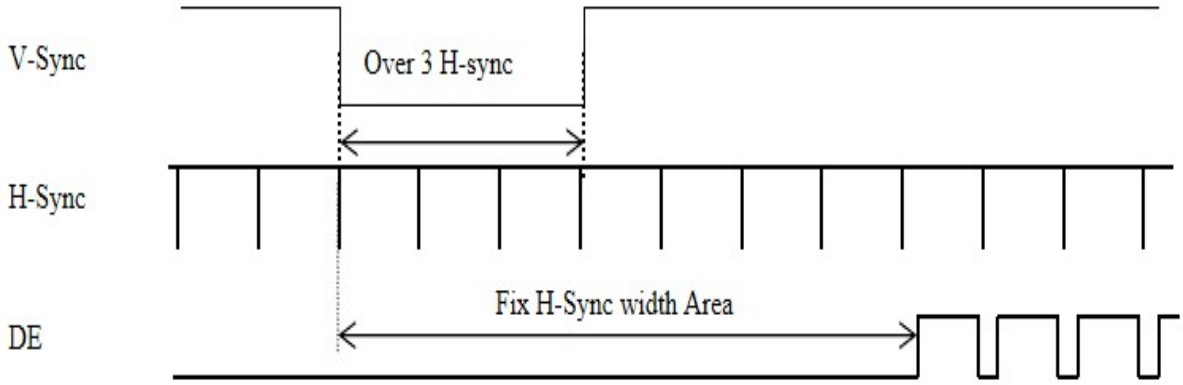
4.4.2 The specification of the LVDS Rx interface timing parameter is shown in

<LVDS Rx Interface Timing Specification>

Symbol	Symbol	Min	Typ	Max	Unit
Rate	LVDS data rate per pair	400	-	1000	Mbps
Fclk	LVDS input clock frequency	57	-	143	MHz
Vth	Differential input high threshold	-	-	0.1	V
Vtl	Differential input low threshold	-0.1	-	-	V
Vcm	LVDS common mode voltage	0.9	-	1.4	V

4.4.3 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

Sync Timing Waveforms



1) Need over 3 H-sync during V-Sync Low

2) Fix H-Sync width from V-Sync falling edge to first rising edge

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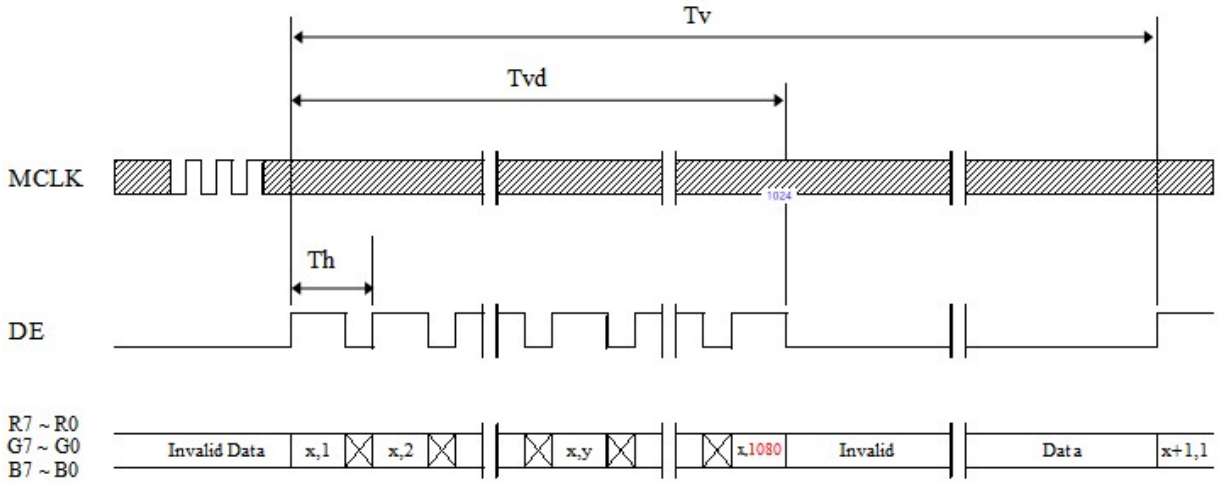
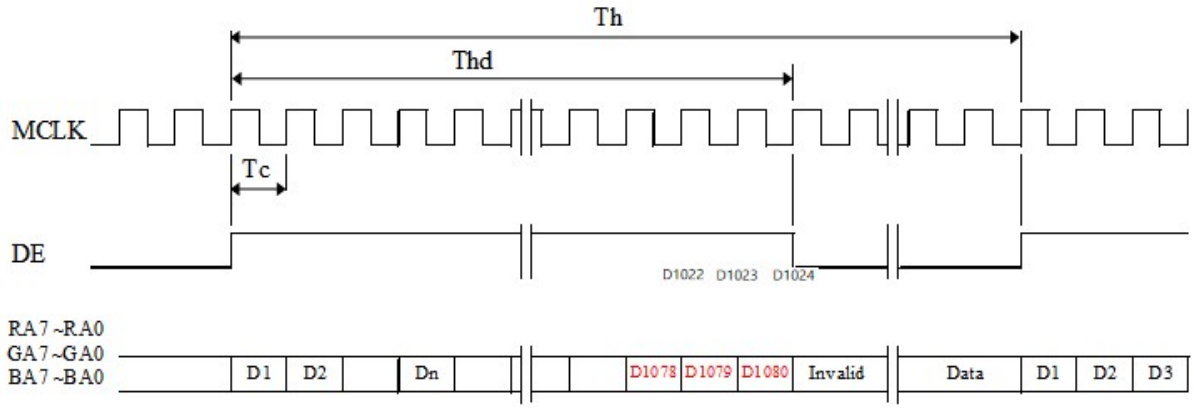
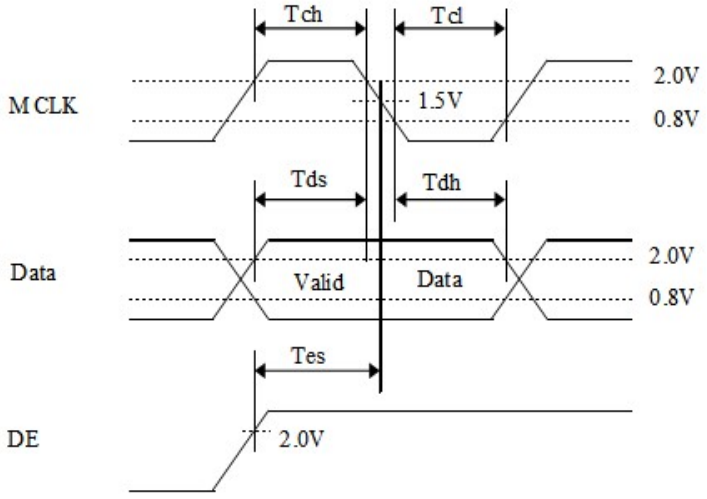
Vertical Timing Waveforms



Horizontal Timing Waveforms





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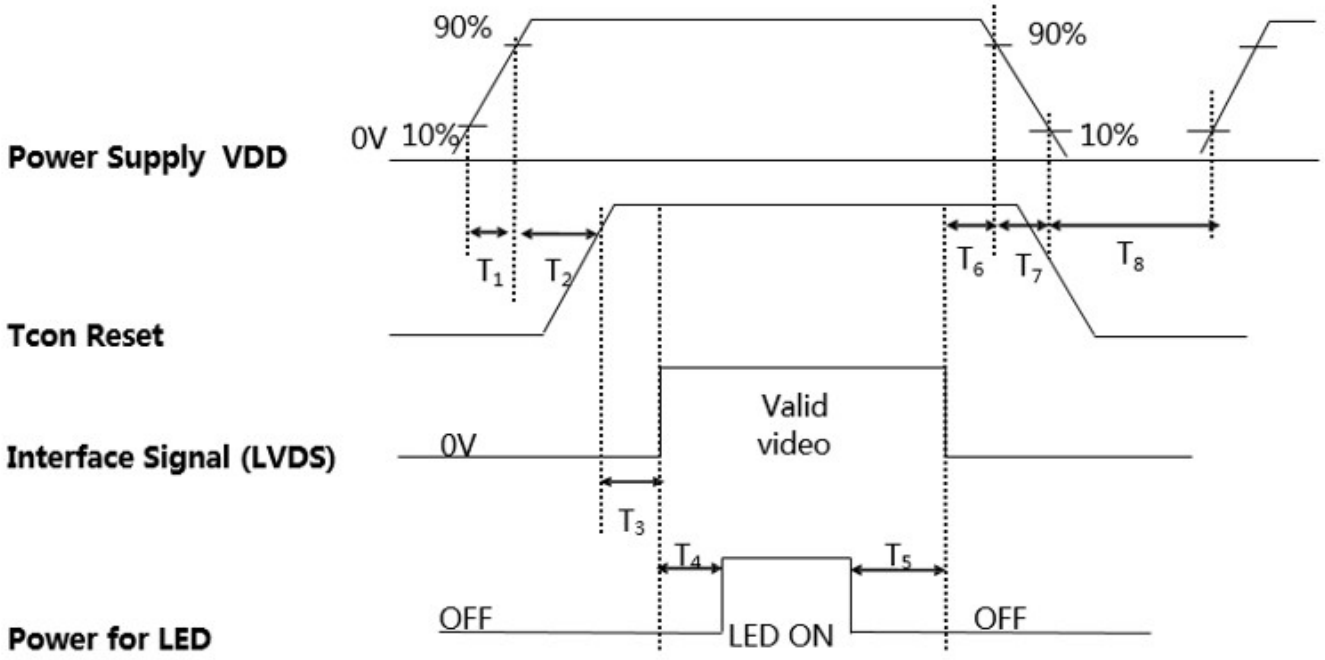
POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.1	-	8	(ms)
T2	-	8	-	(ms)
T3	0	-	-	(ms)
T4	300	-	-	(ms)
T5	300	-	-	(ms)
T6	0	-	50	(ms)
T7	0	-	10	(ms)
T8	500	-	-	(ms)

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5. OPTICAL CHARACTERISTICS

5.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance 1lux and temperature = 25 2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON CS2000/CA310) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0 . We refer to θ Ø=0 (= θ 3) as the 3 o’ clock direction (the “right”), θ Ø=90 (= θ 12) as the 12 o’ clock direction (“upward”), θ Ø=180 (= θ 9) as the 9 o’ clock direction (“left”) and θ Ø=270(= θ 6) as the 6 o’ clock direction (“bottom”). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity (etc) should be tested by CS2000/CA310. The backlight should be operating for 10 minutes prior to measurement. VDD shall be 3.3 ± 0.3V at 25 C. Optimum viewing angle direction is 6 ’ clock

< Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	85	89	-	Deg.	Note 1
		Θ_9		85	89	-	Deg.	
	Vertical	Θ_{12}		85	89	-	Deg.	
		Θ_6		85	89	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	1000	1200	-		Note 2
Color Gamut	sRGB	CIE1931	Θ = 0°	76	81	-	%	Only CF@C Light
Reproduction of color	White	Wx	Θ = 0°	Typ -0.03	0.320	Typ +0.03		
		Wy			0.327			
Response Time		Tr+Td	Ta= 25° C Θ = 0°	-	30	35	ms	Note 6

Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o’ clock direction and the vertical or 6, 12 o’ clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of Θ = 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

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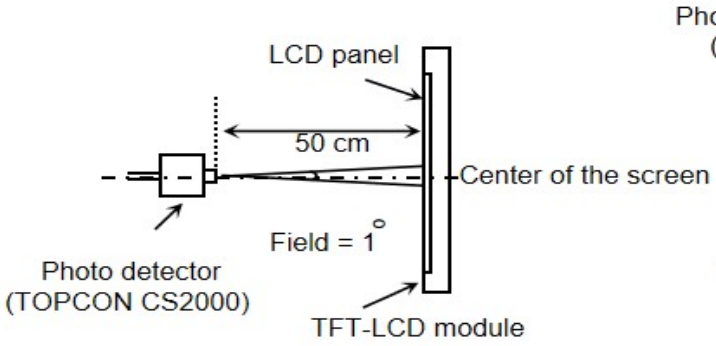
$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

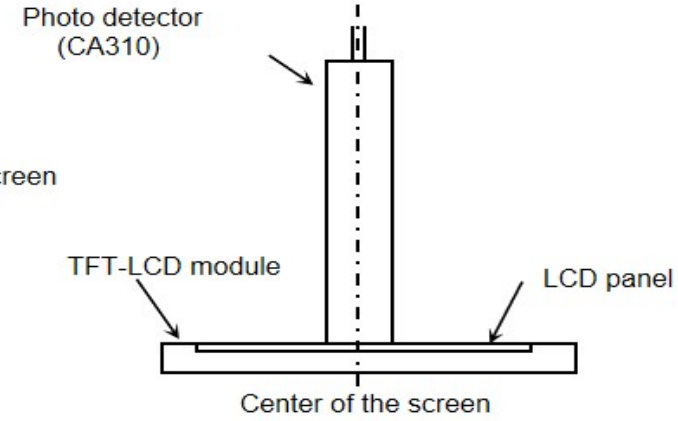
4. The electro-optical response time measurements shall be made as FIGURE 2 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

5.2 Optical measurements

Figure 1. Measurement Set Up

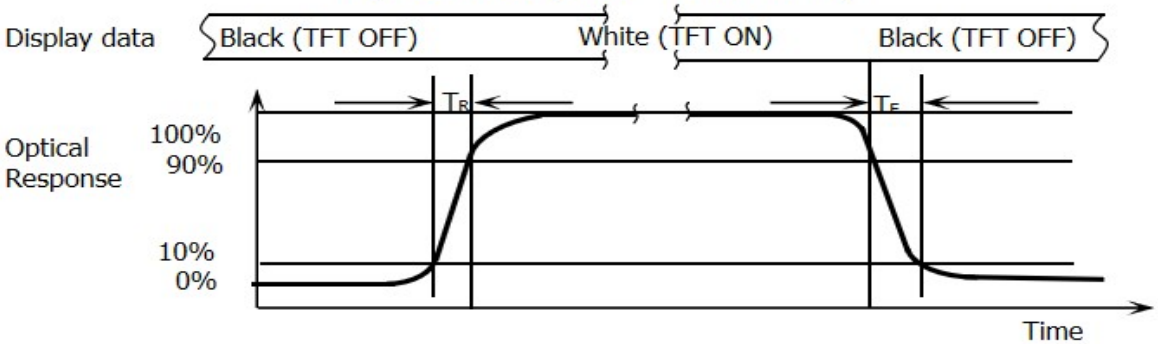


View angel range, uniformity, etc. measurement setup



Flicker, measurement setup

Figure 2. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIG URE 3 by switching the "data" input signal ON and OFF. The times needed for th e luminance to change from 10% to 90% is Tr and 90% to 10% is Td.

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6. RELIABILITY TEST ITEM

The Reliability test items and its conditions are shown in below.

<Reliability test>

No	Test Items	Conditions	Remark
1	High temperature storage test	Ta = 85℃, 240 hrs	根据客户规格更新
2	Low temperature storage test	Ta = -30 ℃, 240 hrs	
3	High temperature operation test	Ta = 80℃, 240 hrs	
4	Low temperature operation test	Ta = -20 ℃, 240 hrs	
5	High temperature & high humidity operation test	Ta = 60 ℃, 90%RH, 240 hrs	
6	Thermal shock	Ta = -30 ℃ ↔ 80℃ (0.5 hr), 100 cycle	Non-operation
7	Image Sticking	5*5 Pattern, 2hrs 25℃±2℃, check Pattern Gray 127, after 5 mins, the mura must be disappeared completely	根据客户规格更新

Note：After the reliability test, the product only guarantee function normally without any fatal defect (non-display, line defect, abormal display etc). All the cosmetic specification is judged before the reliablity test.

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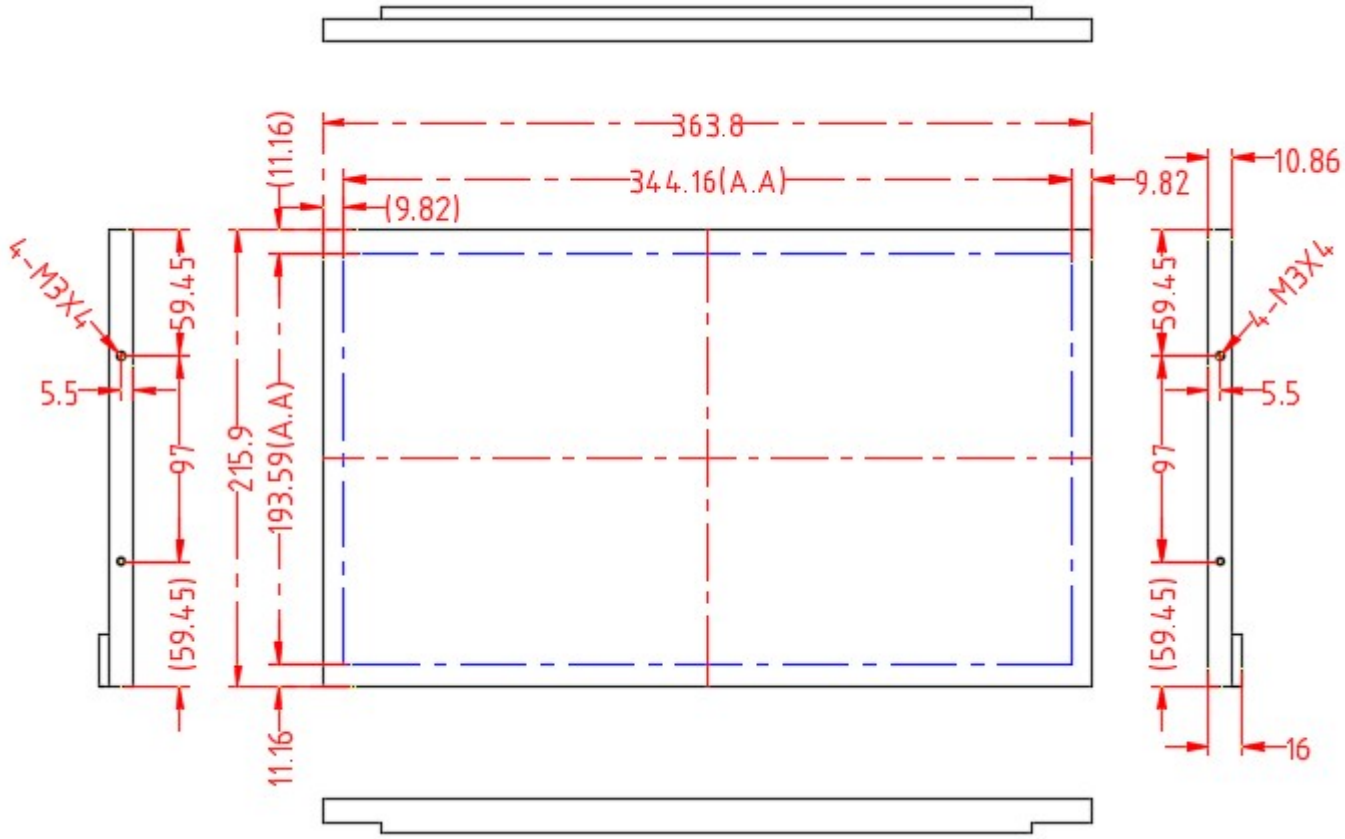
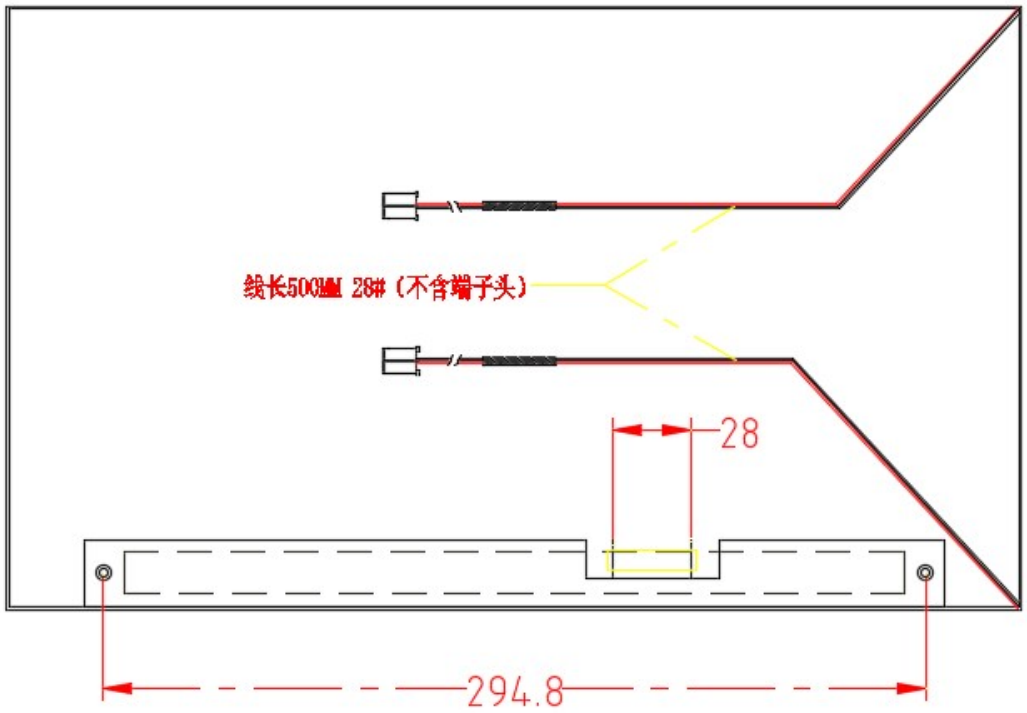
7. MECHANICAL OUTLINE DIMENSION





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