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Product Specifications

31.5" WXGA Color TFT-LCD Module

Model Name: T315XW01 VC

(QD32HL01)

() Preliminary Specifications

(*) Final Specifications

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Do not use the device for equipment that requires an extreme level of reliability, such as aerospace applications, telecommunication equipment (trunk lines), nuclear power control equipment and medical or other equipment for life support.

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1. Application

This specification applies to a color TFT-LCD module T315XW01VC (QD32HL01).

2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel; driver ICs, control circuit and power supply circuit and a backlight unit. Graphics and texts can be displayed on a 1366x3x768 dots, Wide XGA mode, with 16,777,216 colors by using 8-bit 1 channel LVDS (Low Voltage Differential Signaling) to interface and +5V DC supply voltage for TFT-LCD panel driving.

The TFT-LCD panel used for this module has wide view angles and fast response time. Display mode is normally black. Each pixel is divided into Red, Green and Blue sub-pixels, which are arranged in vertical strips. A low-reflection surface treatment and high-color-saturation type color filter are also used for this panel. Therefore, this module is suitable for the multimedia use. Especially TV can be obtained by using this module.

[Features]

- 1) High contrast image. (800:1)
- 2) High brilliant image. (500 nits)
- 3) Wide viewing angle. (88/88/88/88)
- 4) Fast response time. (On/Off 16ms)
- 5) High color saturation. (NTSC 72%)
- 6) WXGA resolution. (1366x768)
- 7) LVDS interface. (8-bit 1 channel)

3. General Specification

Parameter	Specifications	Unit
Display size	80.04 (31.5") Diagonal	mm
Active area	697.685 (H) × 392.256 (V)	mm
Pixel format	1366 (H)×768 (V) ; (1 pixel = R+G+B dots)	Pixel
Pixel size	0.5107 (H) × 0.5107 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Color depth	16.7M colors	
Luminance (Center point typ.)	500	Cd/m ²
Contrast Ratio	1000:1	
View angle	88/88/88/88	
Display mode	Normally Black	
Unit outline dimensions (typ.)*1	760.0×450.0×48.0	mm
Weight (Max.)	6000	g
Surface treatment	Anti-glare and hard-coating 3H	
Lamp Quantity	Direct 16 Lamps	pcs

*1.Note : excluding backlight cables.

4. Absolute Maximum Ratings

LCD module

Parameter	Symbol	Condition	Ratings	Unit	Remark
Panel Input Voltage	V _{CC}	Ta=25°C	-0.3 ~ +5.5	V _{DC}	
Storage temperature	T _{stg}	—	-20 ~ +60	°C	【Note1】
Operating temperature (Ambient)	Topa	—	0 ~ +50	°C	

Note 1. Humidity : 90%RH Max. at Ta ≤ 40°C . Maximum wet-bulb temperature at 39°C or less at Ta > 40°C .

No condensation.

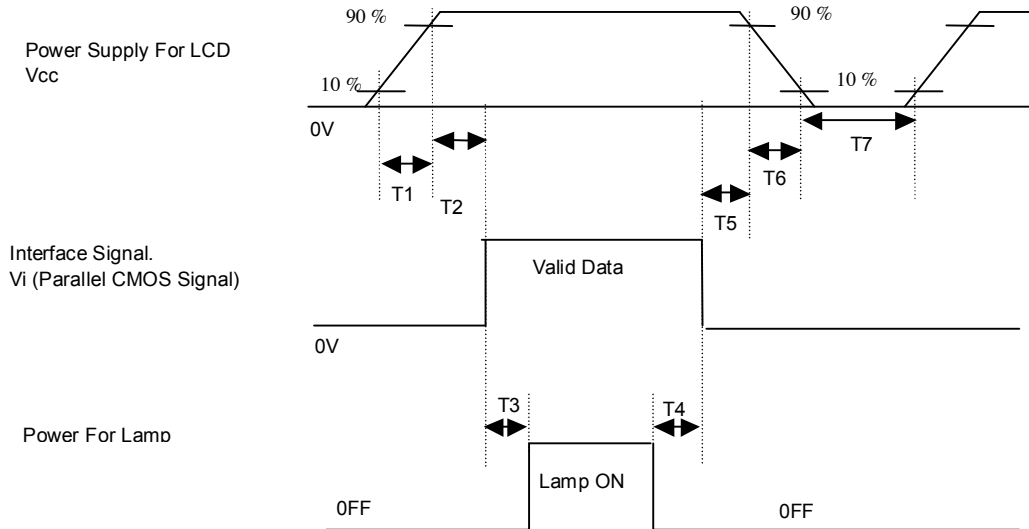
5. Electrical Specifications

5-1. TFT-LCD Module Driving

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
V _{CC}	Supply voltage	V _{CC}	+4.5	+5	+5.5	V	Note 2.
	Current dissipation	I _{CC}	---	1.4	1.9	A	Note 3.
	Rush current	I _{CCS}	---	---	4.0	A	
	Permissive Input Ripple Voltage	V _{IP}	---	---	120	mV	
Differential input Threshold voltage	High	V _{TH}	---	---	+100	mV	V _{CM} =+1.2V
	Low	V _{TL}	-100	---	---	mV	Note 1.
Input current (High)		I _{OH}	---	---	+/- 10	μA	V _I =2.4V V _{CC} =3.6V
Input current (Low)		I _{OL}	---	---	+/- 10	μA	V _I =0V V _{CC} =3.6V
Terminal resistor		R _T	---	100	---	Ω	Differential input

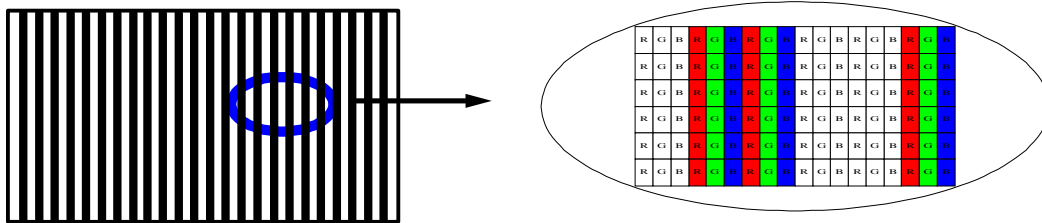
Note 1. V_{CM} : Common mode voltage of LVDS driver.

Note 2. On-off conditions for supply voltage

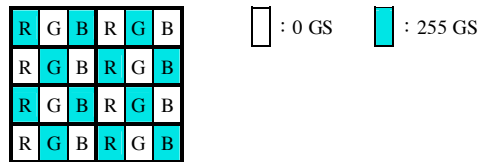


$0.1 \leq t1 \leq 10 \text{ ms}$; $0 < t2 \leq 50 \text{ ms}$; $200 \text{ ms} \leq t3$; $200 \text{ ms} \leq t4$; $0 < t5 \leq 50 \text{ ms}$; $0 < t6 \leq 10 \text{ ms}$; $400 \text{ ms} < t7$

Note 3. Typical current condition: 2-line vertical stripe pattern (0,255GS). $V_{CC}=+5V$



Max current condition: 1x1dot Checker Board Pattern (0, 255GS). $V_{CC}=+5V$



5-2. TFT-LCD Pin Assignment

CN1 (LVDS signals and +5V DC power supply)

Using connector: FI-E30S (JAE)

Pin No.	Symbol	Function	Remark
1	NC	NC	
2	NC	NC	
3	NC	NC	
4	GND	Ground	
5	RX0-	Low Voltage Differential Signal Input Data (-)	LVDS
6	RX0+	Low Voltage Differential Signal Input Data (+)	LVDS
7	GND	Ground	
8	RX1-	Low Voltage Differential Signal Input Data (-)	LVDS
9	RX1+	Low Voltage Differential Signal Input Data (+)	LVDS
10	GND	Ground	
11	RX2-	Low Voltage Differential Signal Input Data (-)	LVDS
12	RX2+	Low Voltage Differential Signal Input Data (+)	LVDS
13	GND	Ground	
14	RXC1k-	Low Voltage Differential Signal Input Clock (-)	LVDS
15	RXC1k+	Low Voltage Differential Signal Input Clock (+)	LVDS
16	GND	Ground	
17	RX3-	Low Voltage Differential Signal Input Data (-)	LVDS
18	RX3+	Low Voltage Differential Signal Input Data (+)	LVDS
19	GND	Ground	
20	Reserved	Reserved	
21	LVDS option	NC or H(3.3V) for NS, Low(GND) for JEIDA	
22	GND	GND	
23	GND	GND	
24	GND	GND	
25	GND	GND	
26	VDD	+5V DC Voltage Input	
27	VDD	+5V DC Voltage Input	
28	VDD	+5V DC Voltage Input	
29	VDD	+5V DC Voltage Input	
30	VDD	+5V DC Voltage Input	

Note 1. All GND(ground) pins should be connected together and to Vss which should also be connected to the LCDs metal frame.

Note 2. Relation between LVDS signals and actual data shows below section (7-1).

Note 3. All VDD (power supply) pins should be connected together.

5-3. Backlight driving

The backlight system is a direct-lighting type with 16 CCFT (Cold Cathode Fluorescent Tube). The characteristics of the lamp are shown in the following table.

Parameter	Symbol	Values			Unit	Notes		
		Min	Typ	Max				
Inverter								
Power Supply Input Voltage	VDDDB	22.8	24.0	25.2	Vdc			
Power Supply Input Current	IDDB	4.2	4.6	5.0	A			
Power Consumption	PB	-	110	126	W			
Input Voltage for Control System Signals	BRTI Signal	VBI	0	---	3.8	V		
	BRTC	Low	VBCL	0	---	0.8	V	
		High	VCBH	2.0	3.5	5.0	V	
Lamp current	IL	---	5.0	---	mA			
Lamp voltage	V _L	(1215)	(1350)	(1485)	V _{rms}	25°C		
Lamp power consumption	PL	---	(6.53)	---	W	Note 2. IL=5mA		
Lamp frequency	F ₀	---	(58)	---	kHz	Note 3		
Established starting voltage	V _s			(1700)	V _{rms}	Ta = 25°C	Note 4	
				(1900)	V _{rms}	Ta = 0°C		
Lamp life time	LL	50000	---	---	hour	Note 5.		

Note 1. Lamp current is measured with current meter for high frequency.

Note 2. Calculated Value for reference (IL × V_L)

Note 3. Lamp frequency may produce interference with horizontal synchronous frequency, and this may cause beat on the display. Therefore lamp frequency shall be detached as much as possible from the horizontal synchronous frequency and from the harmonics of horizontal synchronous to avoid interference.

Note 4. The voltage above this value should be applied to the lamp for more than 1 second to start-up. Otherwise the lamp may not be turned on.

Note 5. The life is determined as the time at which luminance of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25 ± 2°C.

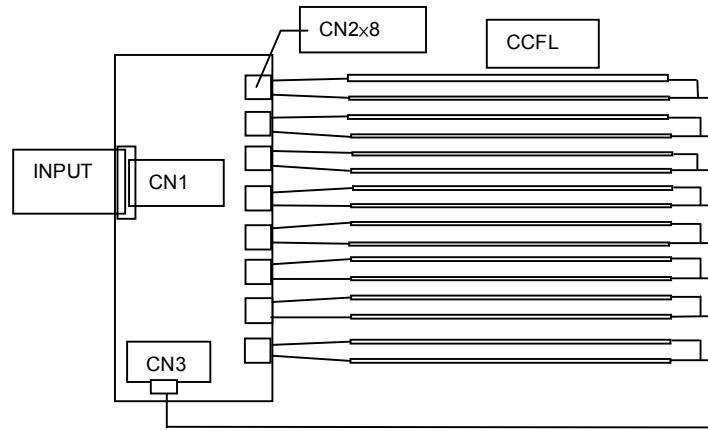
Note 6. The performance of the backlight, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter (miss-lighting, flicker, etc.) never occur. When you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Note 7. Protection function : if one lamp cannot light on well, the inverter will shut down all lamps.

5-4. Backlight Inverter Connection

5-4-1. Inverter Connector:

Connector	Type	Manufactured
CN1	S14 B-PH-SM3 TB	JST
CN2	SM02(12B)-BHS-1-TB	JST
CN3	S2B-ZR-SM3A-TF	JST



5-4-2. Inverter Connector Pin Assignment :

CN1: PHR-14(JST) or Equivalent

Pin No.	Symbol	Description	Remark
1	VDDB	+24V DC	
2	VDDB	+24V DC	
3	VDDB	+24V DC	
4	VDDB	+24V DC	
5	VDDB	+24V DC	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	GND	Ground	
10	GND	Ground	
11	NC	Non Connection	
12	BRTC	Backlight On/OFF signal	On : High, Off : Low
13	BRTI	Luminance by voltage method	Note.1
14	SGND	Signal Ground	

Note.1 Luminance ratio is linearly controllable in the range of the following table.

BTRI Voltage (VBI)	Luminance ratio
0V	20% (Minimum)
3.3V	100% (Maximum)

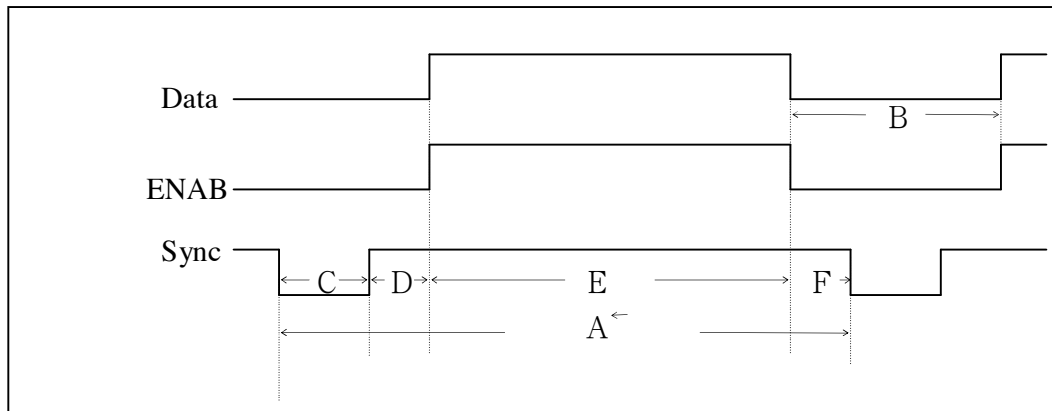
5-5. Signal Timing Spec.

Item	Symbol	Min	Typ	Max	Unit	Notes	
DCLK	Frequency	F_{CLK}	---	80	82	MHz	
	Period	t_{CLK}	12.2	12.5	---	ns	
Hsync	Period	t_{HA}	1512	1648	1780	t_{CLK}	
	Width-Active	t_{HC}	8	16	---		
	Frequency	f_H	44	48.54	52	kHz	
Vsync	Frequency	f_V	47	60	63	Hz	
	Period	t_{VA}	774	810	--	t_{HA}	
	Width-Active	t_{VC}	2	6	---		
Data Enable	Horizontal back porch	t_{HD}	8	80	---	t_{CLK}	
	Horizontal front porch	t_{HF}	16	186	---	t_{CLK}	
	Horizontal active	t_{HE}	1366	1366	1366	t_{CLK}	
	Horizontal blanking	t_{HB}	146	282	---	t_{CLK}	
	Vertical back porch	t_{VD}	2	20	---	t_{HA}	
	Vertical front porch	t_{VF}	2	16	---	t_{HA}	
	Vertical active	t_{VE}	768	768	768	t_{HA}	
	Vertical blanking	t_{VB}	6	42	---	t_{HA}	

Note 1. The performance of electro-optical characteristics may be influenced by variance of the vertical refresh rates.

Note 2. Hsync period shall be a double number of character (8).

Note 3. Signal Timing Waveform as below.



5-6. Reference of Data Signal and Color.

	Colors &		Data signal																							
	Gray scale	Gray Scale	R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Basic Color	Black	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	—	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	—	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	—	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	—	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	—	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	—	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brighter	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brighter	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
		GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Brighter	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
		GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0 : Low level voltage, 1 : High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. According to the combination of total 24 bit data signals, the 16,777,216-color display can be achieved on the screen.

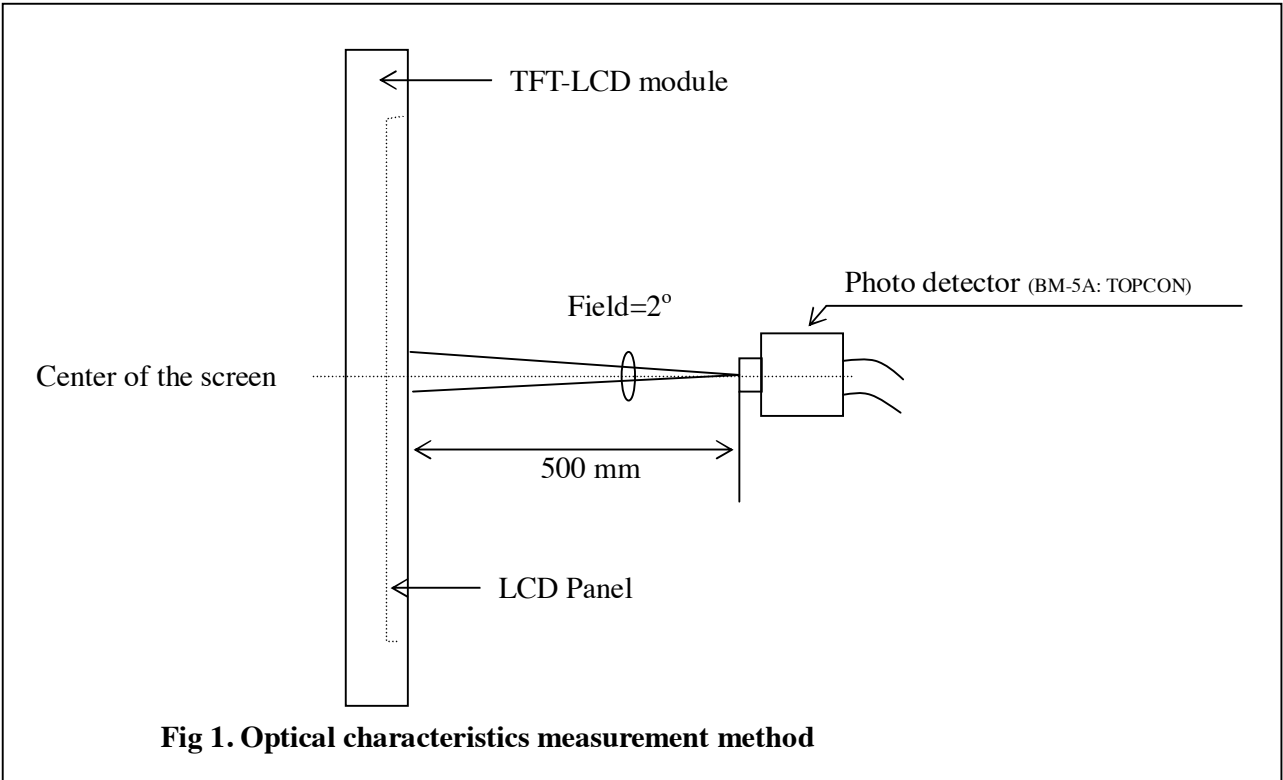
6. Optical Specifications

Ta=25°C, Vcc=+5V

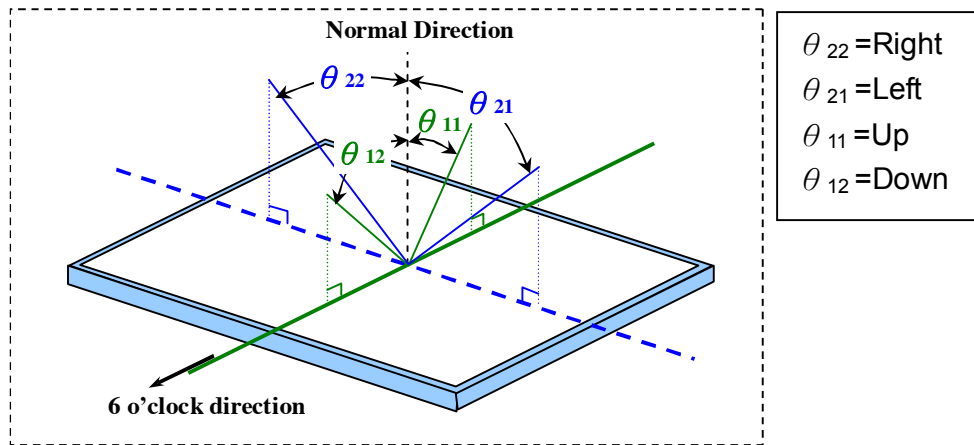
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	L/R	$\theta 21, \theta 22$	CR>10	85	88	—	Deg.	Note 1,4
	U	$\theta 11$		85	88	—	Deg.	
	D	$\theta 12$		85	88	—	Deg.	
Contrast ratio		C R n	$\theta =0^\circ$	600	1000	—		Note 2,4
Response Time (G-G)		τ		—	—	—		Note 3,4
Response time		τ		—	21	—	ms	
Rise time	τr			—	16	—	ms	
Fall time	τd			—	5	—	ms	
Chromaticity of White (CIE 1931)		Wx		0.246	0.276	0.306		Note 4 Color Temperature 10,000K NTSC 72 %
		Wy		0.266	0.296	0.326		
Chromaticity of Red (CIE 1931)		Rx		0.611	0.641	0.671		
		Ry		0.308	0.338	0.368		
Chromaticity of Green (CIE 1931)		Gx		0.255	0.285	0.315		
		Gy		0.580	0.610	0.640		
Chromaticity of Blue (CIE 1931)		Bx		0.115	0.145	0.175		
		By		0.045	0.075	0.105		
Luminance of white		Y L		—	500		Cd/m ²	Note 4
White Uniformity		$\delta W (5P)$		—	—	1.3		Note 5
Cross Talk		HDsha%				1		Note 6
		VDsha%				1		

※ The measurement shall be operated 30 minutes after lighting at rating. (typical condition : IL = TBD mArms)

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.1 below.



Note 1. Definitions of viewing angle range:



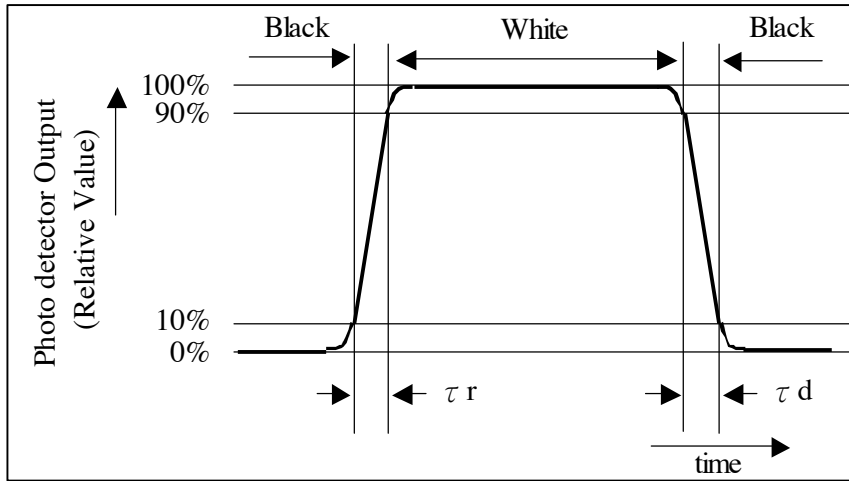
Note 2. Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

Note 3. Definition of response time:

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

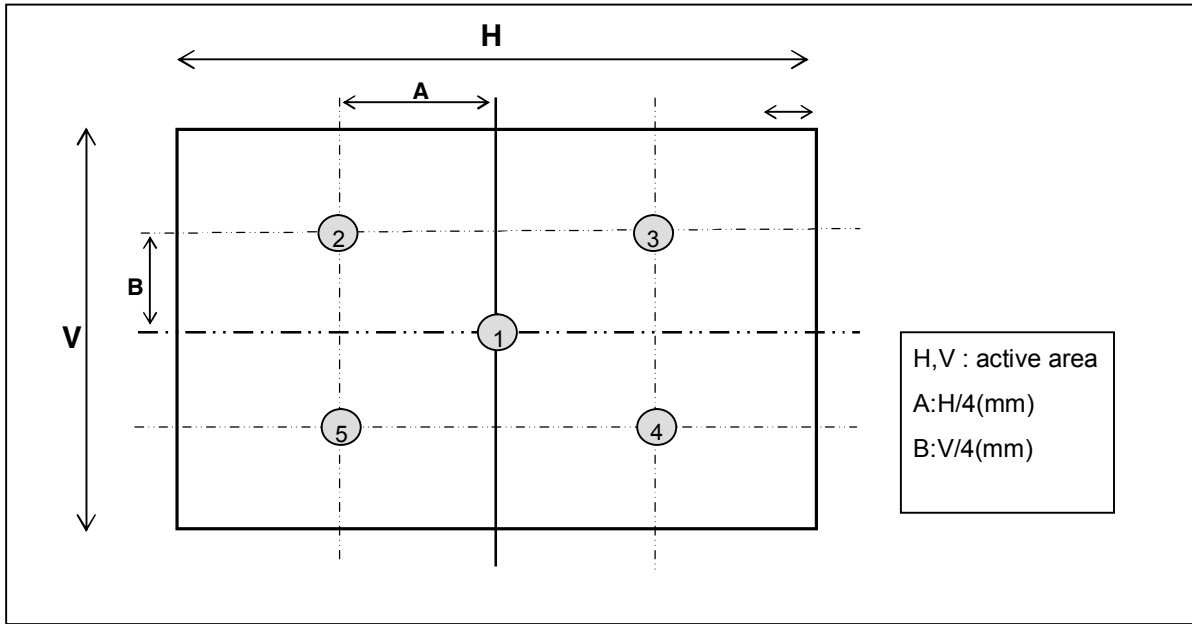


Note 4. This shall be measured at center of the screen.

Note 5. Definition of white uniformity:

White uniformity is defined as the following the number of measurement points within active area. formula are $\delta w(5)$ and $\delta w(13)$.

$$\delta w(5P) = \frac{\text{Maximum Luminance of 5 points}}{\text{Minimum Luminance of 5 points}}$$



Note 6. Definition of Shadow:

Horizontal Shadow:

Y_{wh} is the brightness of point P1 when module display B pattern

Y_{crs} is the brightness of point P1 when module display A pattern

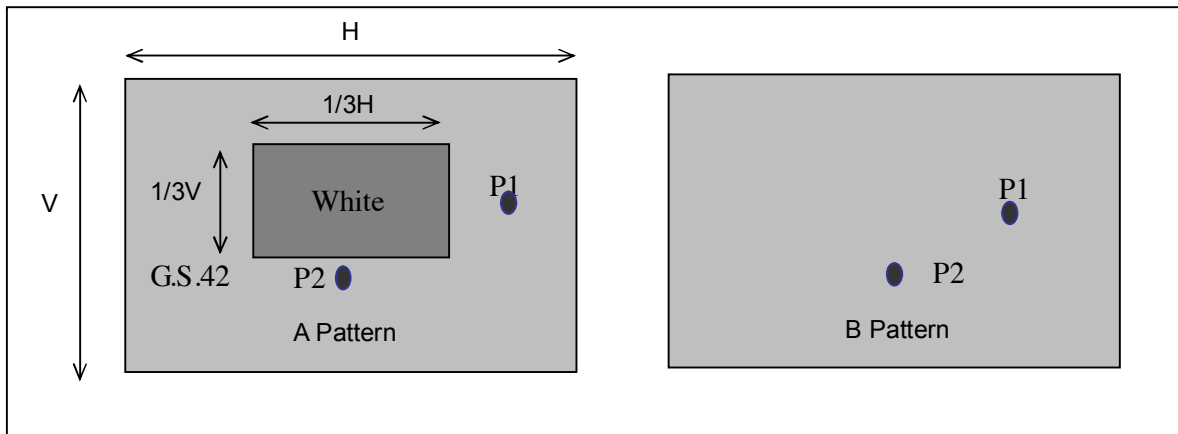
$$\text{H-Shadow (Dsha\%)} = (| Y_{wh} - Y_{crs} | / Y_{wh}) \times 100$$

Vertical Shadow:

Y_{wh} is the brightness of point P2 when module display B pattern

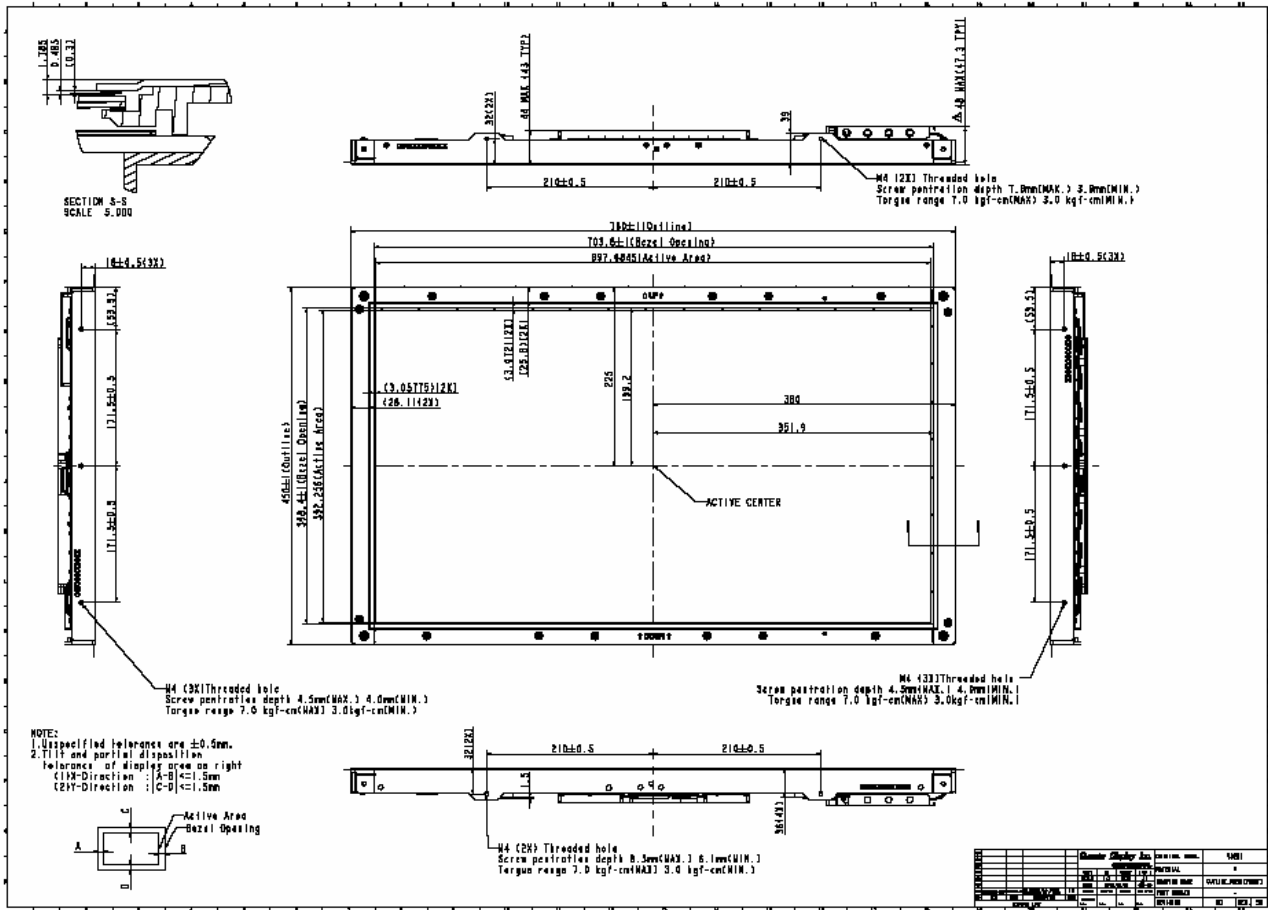
Y_{crs} is the brightness of point P2 when module display A pattern

$$\text{V-Shadow (Dsha\%)} = (| Y_{wh} - Y_{crs} | / Y_{wh}) \times 100$$

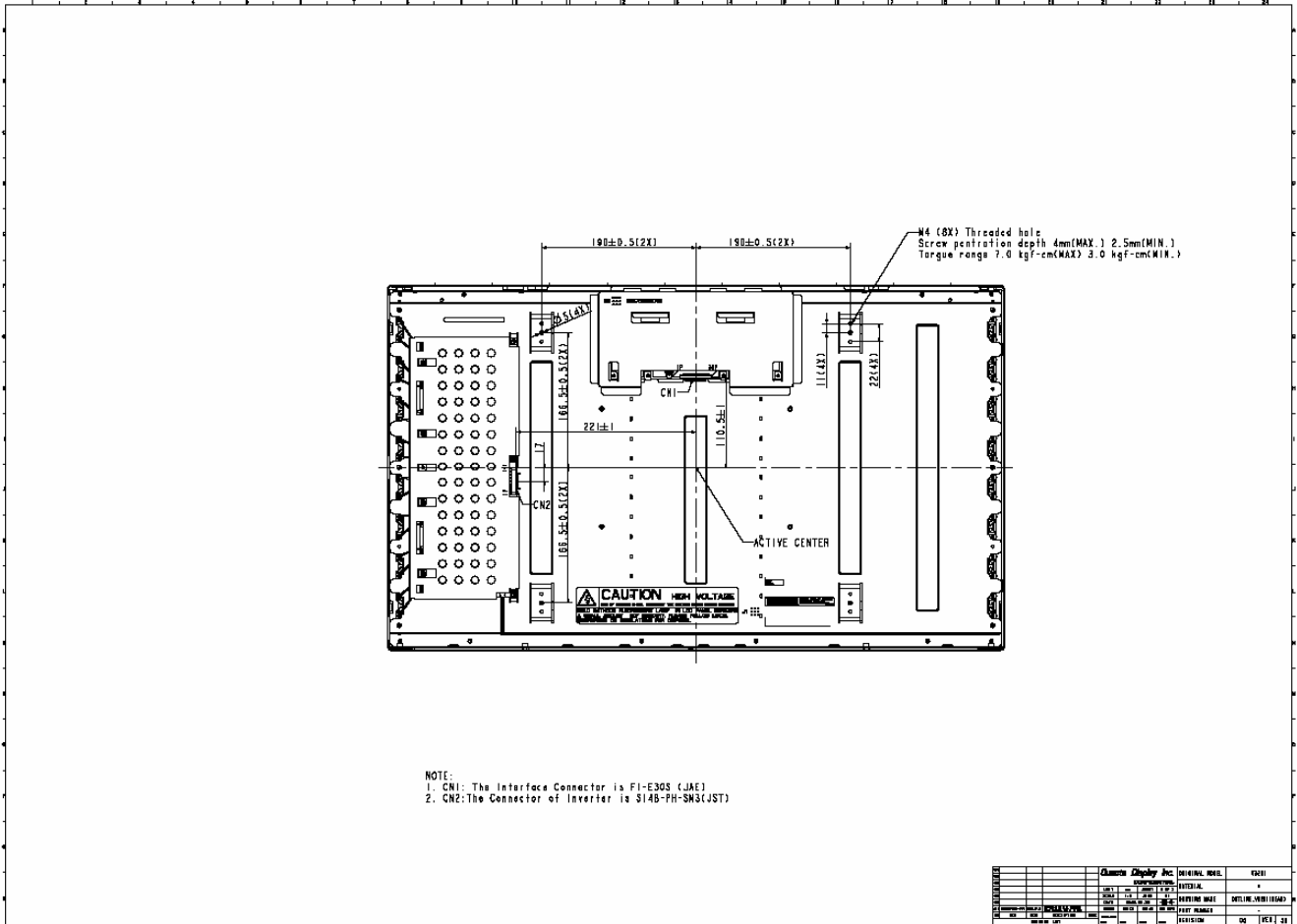


7. Mechanical Specifications

1. Front View



2. Back View



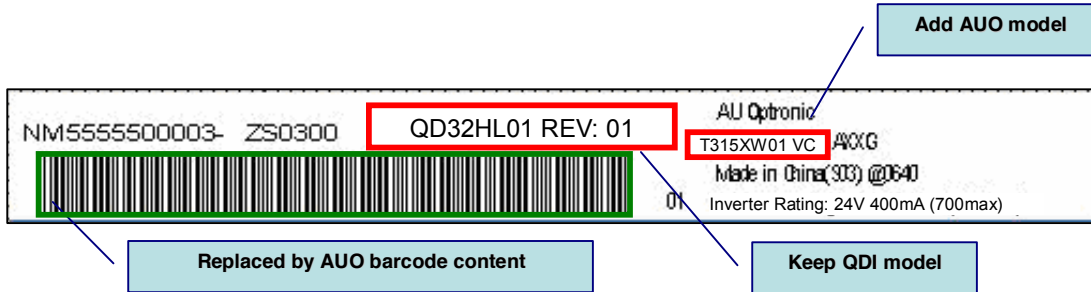
8. Reliability Test

8-1. Reliability Items

No.	Test item	Conditions
1	High temperature storage test	Ta = 60°C 240h
2	Low temperature storage test	Ta = -20°C 240h
3	High temperature & high humidity operation test	Ta = 50°C ; 80 %RH 240h
4	High temperature operation test	Ta = 50°C 240h
5	Low temperature operation test	Ta = 0°C 240h
6	Vibration test (non-operating)	Frequency: 10~500Hz, 1.0G , 20 min/each axis
7	Shock test (non- operating)	Gravity : 50G Pulse width : 11ms, half sine wave Direction : ±X,±Y,±Z Once for each direction.
8	ESD	Contact: Operating/Non-Operating ±8KV/±10KV Air: Operating/Non-Operating ±15KV/±20KV

9. Others

1. LCD Module Label:



2. Adjusting volume has been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.
3. Disassembling the module can cause permanent damage and should be strictly avoided.
4. Please be careful since image retention may occur when a fixed pattern is displayed for a long time.
5. If any problem occurs in relation to the description of this specification, it shall be resolved through discussion with spirit of cooperation.