

**Preliminary**



**Quanta Display Inc.  
SPECIFICATION**

**Doc No. QD32HL0101**

**Doc. REV.: 03**

**Issue Date:02/24/2005**

**With RoHS compliant**

**Specification for TFT LCD Module**

Model No.  
QD32HL01 Rev.:01

□ **Approved By**

<b>Customer</b>	<b>Quanta Display Inc.</b>



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<b>Revision History</b>			
<b>REV.</b>	<b>Date</b>	<b>ECN NO.</b>	<b>Change Content</b>
1	01/07/2005	N/A	Preliminary specification Initiate
2	02/21/2005	N/A	1. Modify the LVDS pin assignment (p.6) 2. Update LVDS data mapping (p.7) 3. Modify the electrical characteristics (p.9,10) 4. Update the measurement test condition (p.15)
3	02/24/2005	N/A	1. Modify the mechanical drawing (p19,20)



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## 1. Application

This specification applies to a color TFT-LCD module, 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 1366 × 3 × 768 dots panel with 16.7 million colors by using the LVDS (Low Voltage Differential Signaling) interface, 8-bit driving method and supplying +12V DC supply voltage for TFT-LCD panel driving.

The TFT-LCD panel used for this module has fast response time. A low-reflection and higher-color-saturation type color filter is also used for this panel. Therefore, high-brightness and high-contrast image, which is suitable for multimedia use, can be obtained by using this module.

### [Features]

- 1) Brilliant and high contrast image.
- 2) Wide viewing angle.
- 3) Fast response time
- 4) WXGA resolution.
- 5) LVDS interface.
- 6) High color saturation

## 3. General Specifications

Parameter	Specifications	Unit
Display size	80.04 (31.51") Diagonal	cm
Active area	697.685 (H) × 392.256 (V)	mm
Pixel format	1366 (H) × 768 (V)	Pixel
	(1 pixel = R+G+B dots)	
Pixel pitch	0.5107(H) × 0.5107 (V)	mm
Pixel configuration	R,G,B vertical stripe	
Display mode	Normally Black	
Unit outline dimensions	760 (W) × 450 (H)	mm
Thickness	48 max.	mm
Weight	TBD	g
Surface treatment	Anti-glare and hard-coating 3H	
Lamp Quantity	Direct 16 lamps	pcs



#### 4. Input Terminals

##### 4-1. TFT-LCD pin assignment of panel

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	RXClk-	Low Voltage Differential Signal Input Clock (-)	LVDS
15	RXClk+	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 VDD which should also be connected to the LCDs metal frame.

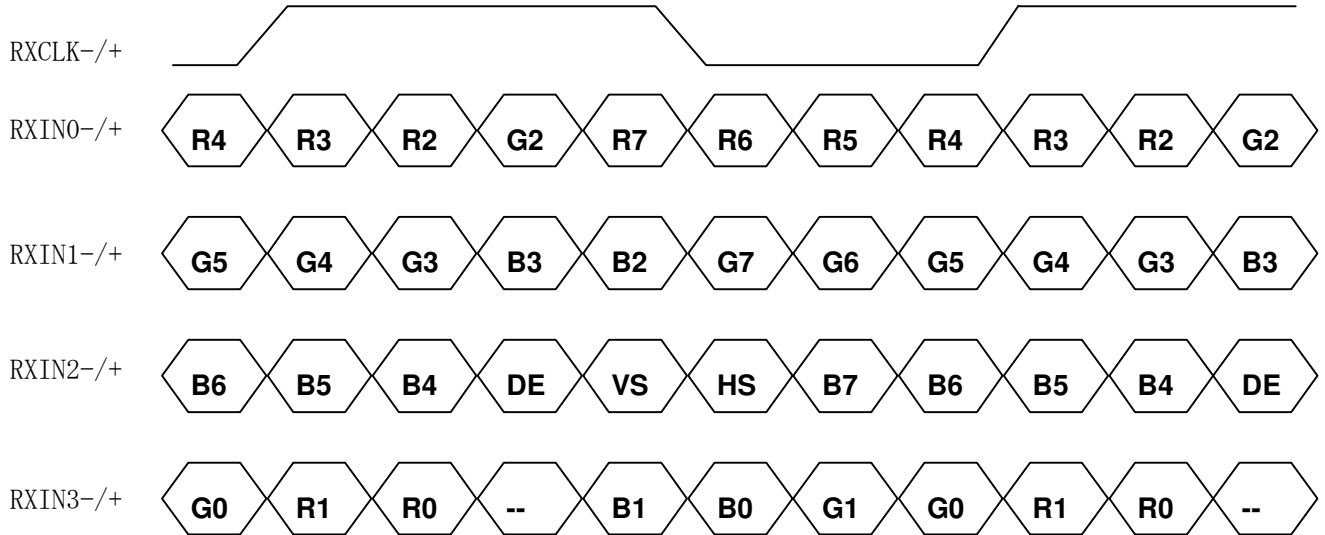
**[Note 2]** Relation between LVDS signals and actual data shows below section (7-1).

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

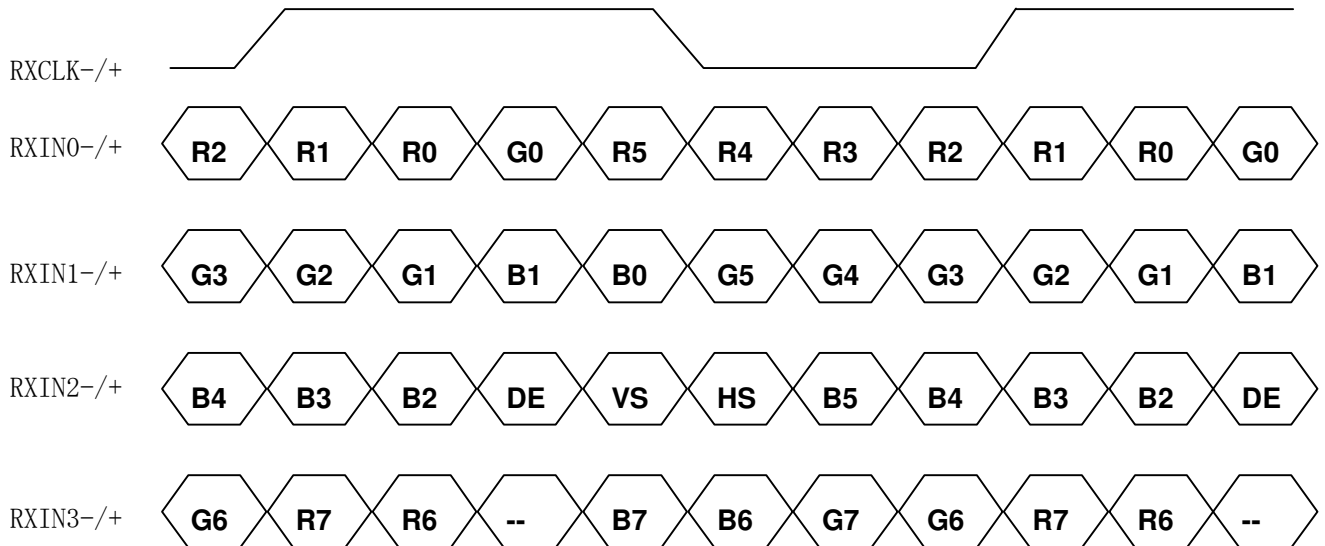


### 4-2 LVDS data mapping

#### LVDS OPTION=LOW(GND)



#### LVDS OPTION=High (3.3V)/NC





### 4-3. Backlight driving

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

Mating connector of 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. Absolute Maximum Ratings

LCD module

Parameter	Symbol	Condition	Ratings	Unit	Remark
+3.3V Input Voltage	V <sub>CC</sub>	T <sub>a</sub> =25°C	- 0.3 ~ +14.0	V <sub>DC</sub>	
Storage temperature	T <sub>stg</sub>	-	-20 ~ +60	°C	【Note1】
Operating temperature (Ambient)	T <sub>opa</sub>	-	0 ~ +50	°C	

【Note1】 Humidity : 90%RH Max. at T<sub>a</sub> ≤ 40°C.

Maximum wet-bulb temperature at 39°C or less at T<sub>a</sub> > 40°C.

No condensation.





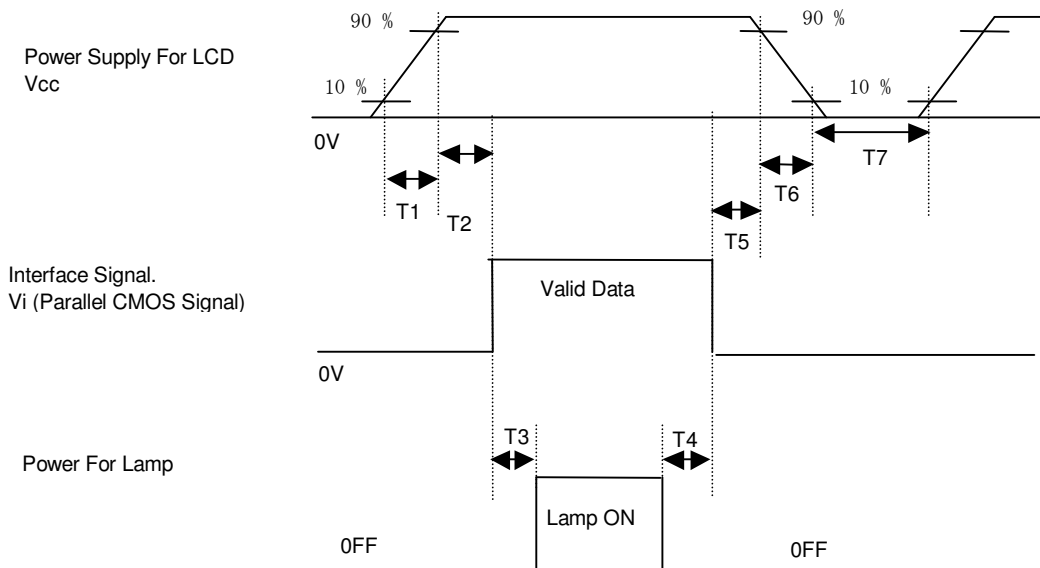
### 6. Electrical Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Vcc	Supply voltage	Vcc	+4.5	+5	+5.5	V	【Note2】
	Current dissipation	Icc	—	1.4	1.9	A	【Note3】
	Rush current	Iccs			4.0	A	
	Permissive Input Ripple Voltage	Vrp			120	mV	
Differential input threshold voltage	High	V <sub>TH</sub>	—	—	+100	mV	V <sub>CM</sub> =+1.2V 【Note1】
	Low	V <sub>TL</sub>	-100	—	—	mV	
Input current (High)		I <sub>OH</sub>	—	—	+/-10	μ A	V <sub>I</sub> =2.4V Vcc=3.6V
Input current (Low)		I <sub>OL</sub>	—	—	+/-10	μ A	V <sub>I</sub> =0V Vcc=3.6V
Terminal resistor		R <sub>T</sub>	—	100	—	Ω	Differential input

【Note1】 V<sub>CM</sub> : Common mode voltage of LVDS driver.

【Note2】

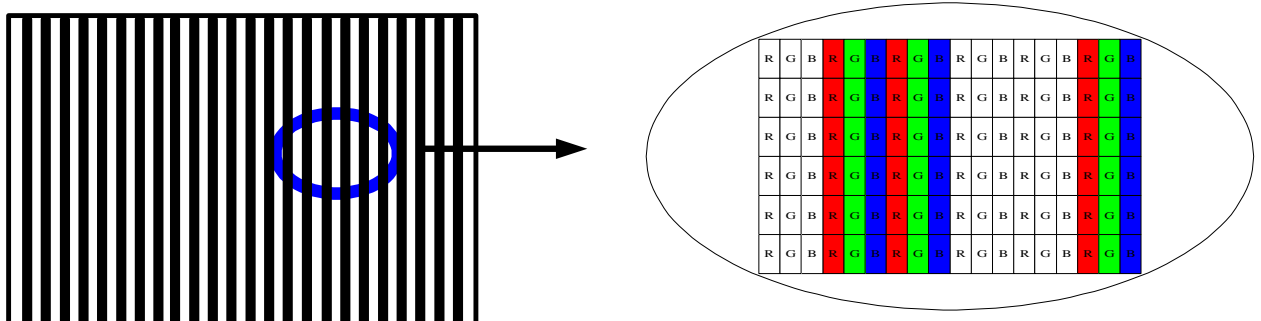
On-off conditions for supply voltage



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

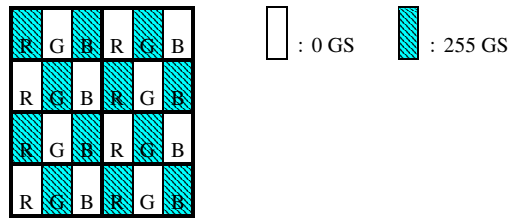
【Note3】

Typical current condition: 2-line vertical stripe pattern (0,255GS). V<sub>CC</sub>=+5V





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



### 6-2. 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.

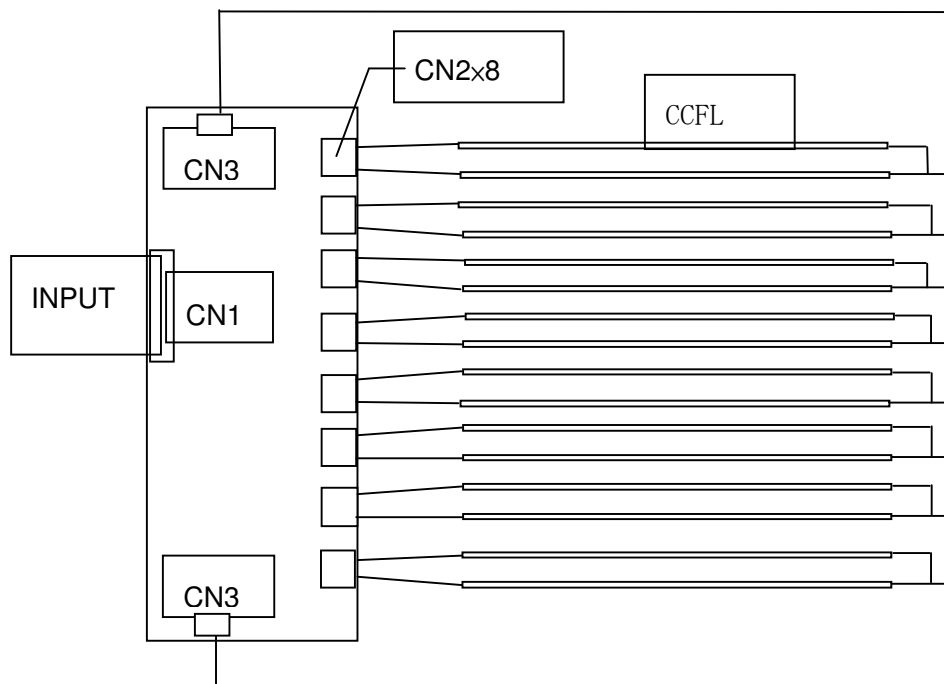
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
<b>Inverter</b>						
Power Supply Input Voltage	$V_{DDB}$	22.8	24.0	25.2	Vdc	
Power Supply Input Current	$I_{DDB}$		(4.6)		A	
Power Consumption	$P_B$		(110.4)		W	
<b>LAMP</b>						
Lamp current	$I_L$		5.0		mA	
Lamp voltage	$V_L$	(1089)	(1210)	(1331)	Vrms	
Lamp power consumption	$P_L$		(6.05)		W	【Note2】 $I_L=5mA$
Lamp frequency	$F_L$		(52)		kHz	【Note3】
Established starting voltage	$V_s$		(1360)	(1630)	Vrms	$T_a=25^{\circ}C$
			(1700)	(2040)	Vrms	$T_a=0^{\circ}C$
Lamp life time	$L_L$	50000			hour	【Note5】

# the value with

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
Input Voltage for Control System Signals	BRTI Signal	VBI	0		3.8	V	
	BRTC Signal	Low	VBCL	0		0.8	V
		High	VCBH	2.0	3.5	5.0	V



**【Note1】** Lamp current is measured with current meter for high frequency as shown below.



**【Note2】** Calculated Value for reference ( $I_L \times V_L$ )

**【Note3】** 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.

**【Note4】** 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.

**【Note5】** 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  $25 \pm 2^\circ\text{C}$ .

**【Note6】** 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.

**【Note7】** Protection function : if one lamp cannot light on well, the inverter will shut down all lamps.

**【Note8】** The value with “()” is the temporary spec that will be defined at the final spec



**7. Timing characteristics of LCD module input signals**

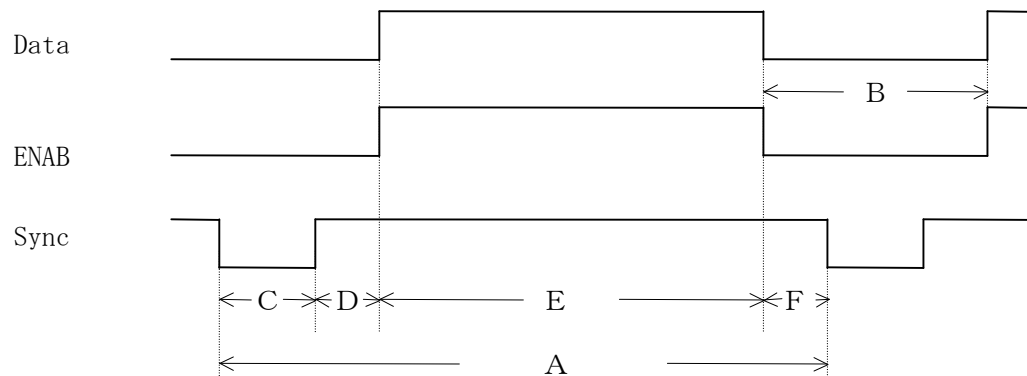
**7-1. Timing characteristics**

ITIME	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		$t_{HA}$	

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

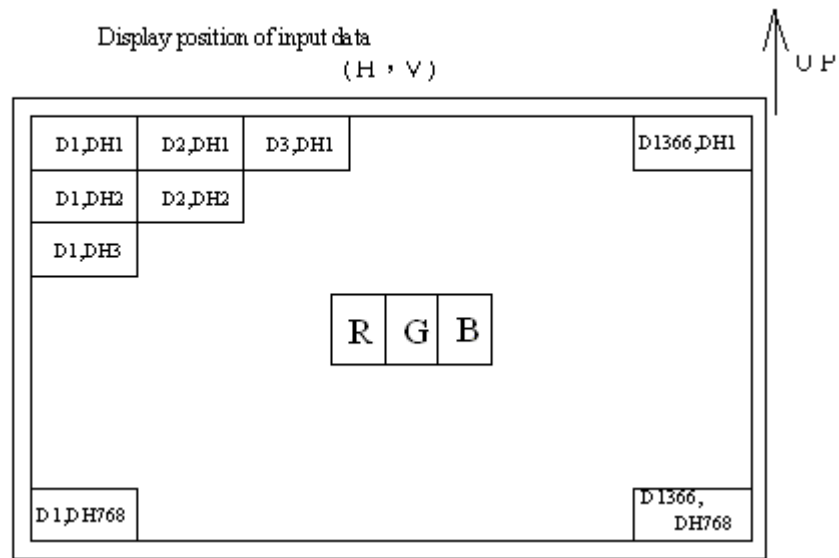
**2.Hsync period shall be a double number of character (8).**

**7-2 Signal Timing Waveform**





### 7-3. Input Data Signals and Display Position on the screen





**8. Input Signals, Basic Display Colors and Gray Scale of Each Color**

Colors & Gray scale	Data signal																									
	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	
<b>Basic Color</b>	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
<b>Gray Scale of Red</b>	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
	↑	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
	Darker	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
<b>Gray Scale of Green</b>	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
	↑	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
	Darker	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
<b>Gray Scale of Blue</b>	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
	↑	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
	Darker	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.

9. Optical Characteristics

Ta=25°C, VDD=+5V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	L/R	$\theta 21, \theta 22$	CR>10	80	85		Deg.	【Note1,4】
	U	$\theta 11$		80	85		Deg.	
	D	$\theta 12$		80	85		Deg.	
Contrast ratio		C R n	$\theta =0^\circ$		800	—		【Note2,4】
Response time		$\tau$		—	21		ms	【Note3,4】
Rise time	$\tau r$				TBD		ms	
Fall time	$\tau d$				TBD		ms	
Chromaticity of White (CIE 1931)		Wx		0.246	0.276	0.306		【Note4】
		Wy		0.266	0.296	0.326		
Chromaticity of Red (CIE 1931)		Rx			TBD			
		Ry			TBD			
Chromaticity of Green (CIE 1931)		Gx			TBD			
		Gy			TBD			
Chromaticity of Blue (CIE 1931)		Bx			TBD			
		By			TBD			
Luminance of white 【Note4】		$Y_L$			500		Cd/m <sup>2</sup>	
White Uniformity		$\delta_{W(SP)}$		—	-	1.3		【Note5】

※ The measurement shall be executed 30 minutes after lighting at rating. (typical condition :  $I_L = 5$  mArms)

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.3 below.

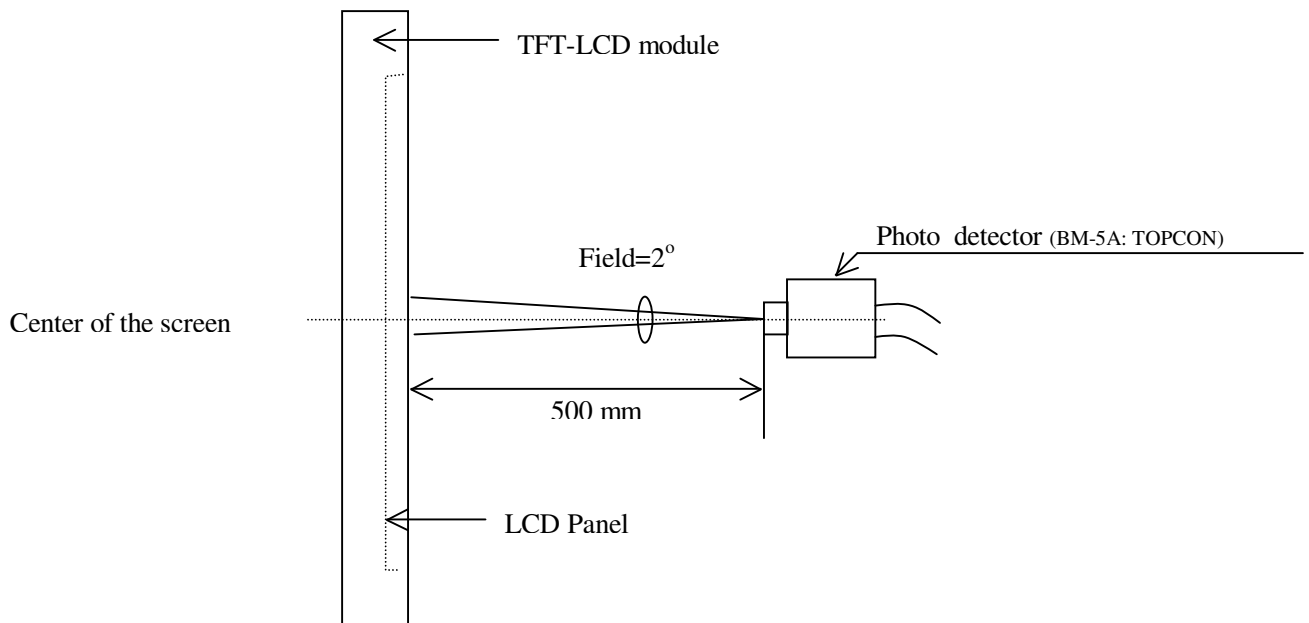
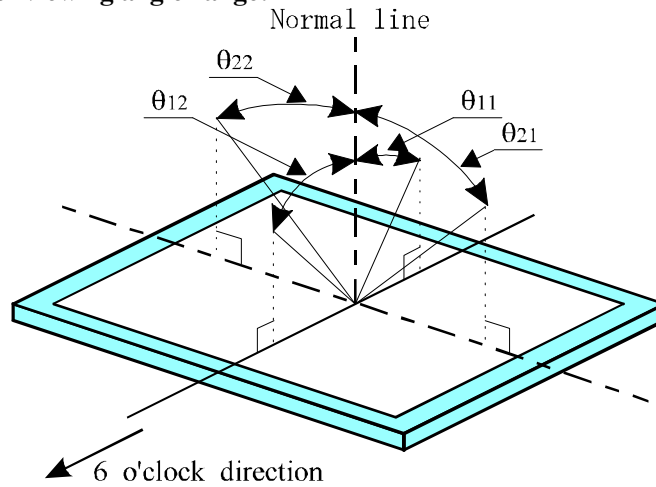


Fig 1. Optical characteristics measurement method



**[Note1] Definitions of viewing angle range:**



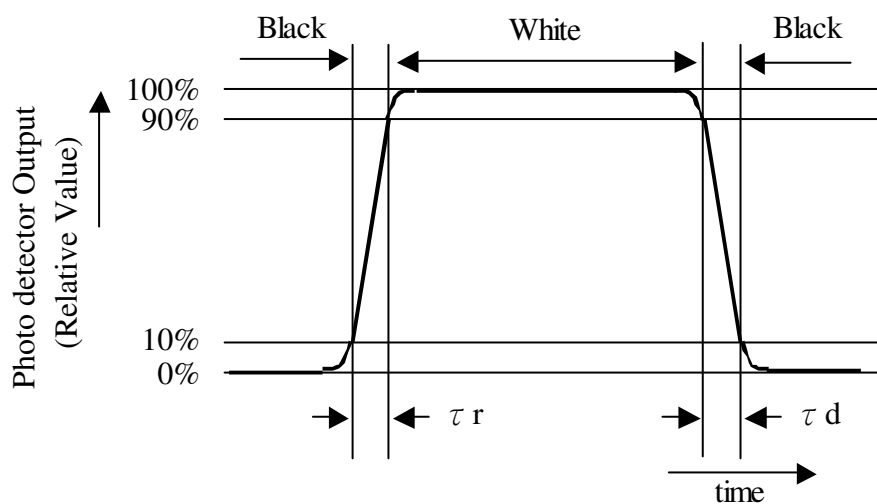
**[Note2] Definition of contrast ratio:**

The contrast ratio is defined as the following.

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

**[Note3] 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" .

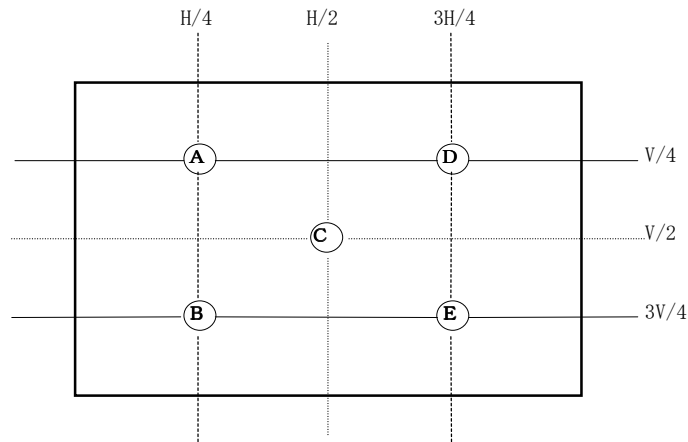


**[Note4] This shall be measured at center of the screen.**



**【Note5】 Definition of white uniformity:**

White uniformity is defined as the following the number of measurement points within active area, formula are  $\delta_w(5)(A \sim E)$ . HxV : active area



$$\delta_w = \frac{\text{Maximum Luminance (of 5 points measurement)}}{\text{Minimum Luminance (of 5 points measurement)}}$$

**10. Display Quality**

The display quality of the color TFT-LCD module shall be in compliance with the Incoming Inspection Standard.

**11. Handling Precautions**

- a) Be sure to turn off the power supply when inserting or disconnecting the cable.
- b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.
- c) Since the front polarizer is easily damaged, pay attention not to scratch it.
- d) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.  
Handle with care.
- g) Since CMOS LSI is used in this module, take care of static electricity and injure the human earth when handling.
- h) Observe all other precautionary requirements in handling components.
- i) This module has its circuitry PCBs on the rear side and should be handled carefully in order not to be stressed.
- j) Laminated film is attached to the module surface to prevent it from being scratched. Peel the film off slowly just before the use with strict attention to electrostatic charges. Ionized air shall be blown over during the action. Blow off the 'dust' on the polarizer by using an ionized nitrogen gun, etc..

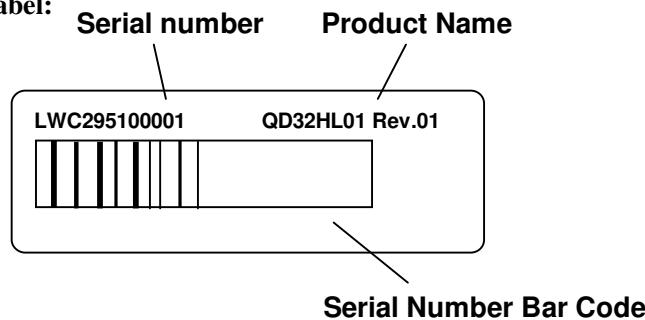


**12. Reliability test items**

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 = 40°C ; 95%RH 240h (No condensation)
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 , 1Hr/each axis
7	Shock test (non- operating)	Gravity : 50G Pulse width : 11 ms, half sine wave Direction : ±X, ±Y, ±Z Once for each direction.
8	ESD	Contact-op: +-8kv, Contact-nop: +-10kv, Air-op: +-15kv, Air-nop: +-20kv, (contact area is limited on metal bezel)

**13. Others**

1) Lot No. Label:



LWC295100001 Digital code 4, 5 is Date code.

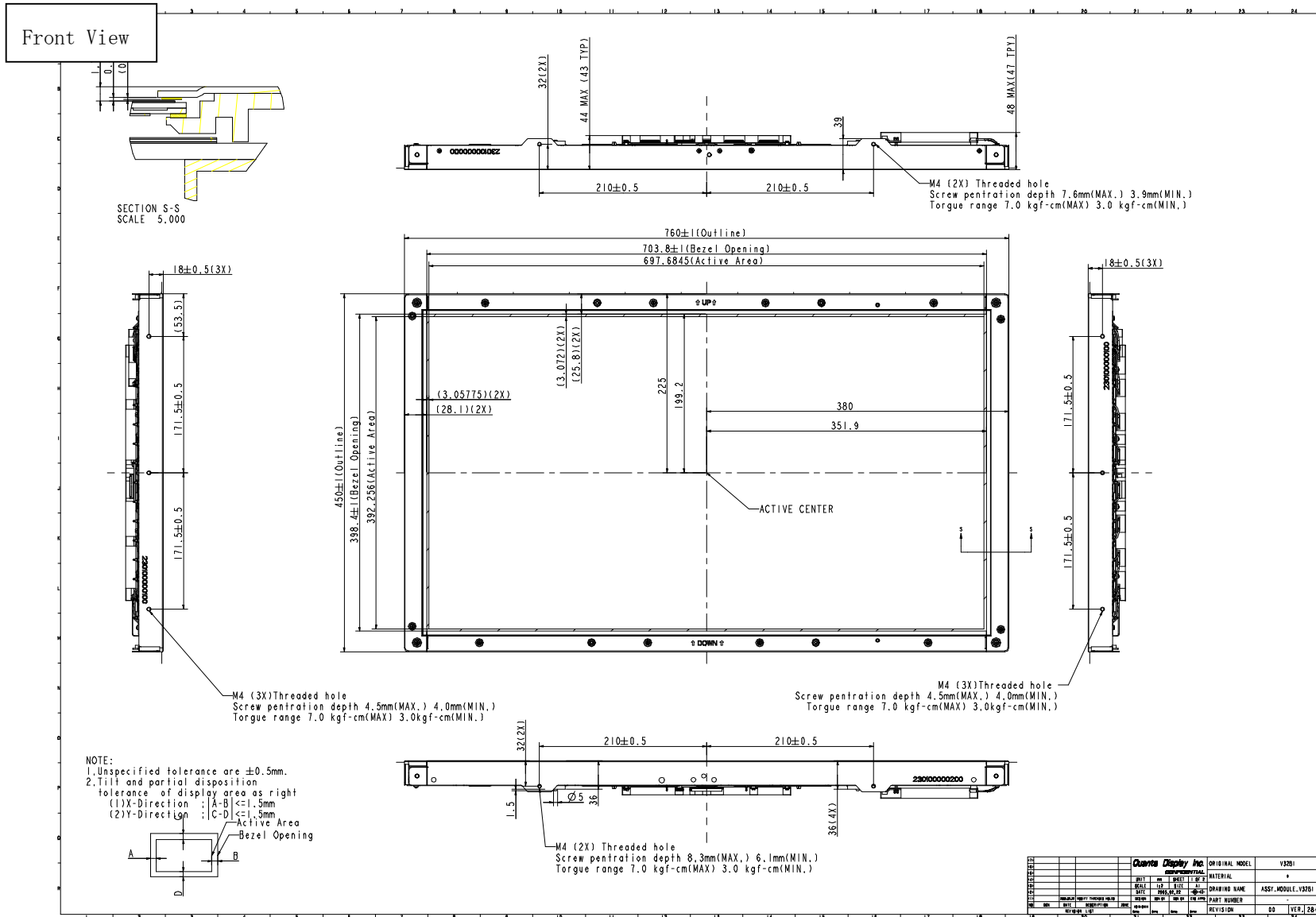
Digital 4 (Year) 1: 2001, 2: 2002, 3:2003,....

Digital 5 (Month) 1: Jan, 2: Feb,... , A:Oct, B:Nov., C: Dec.

- 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.

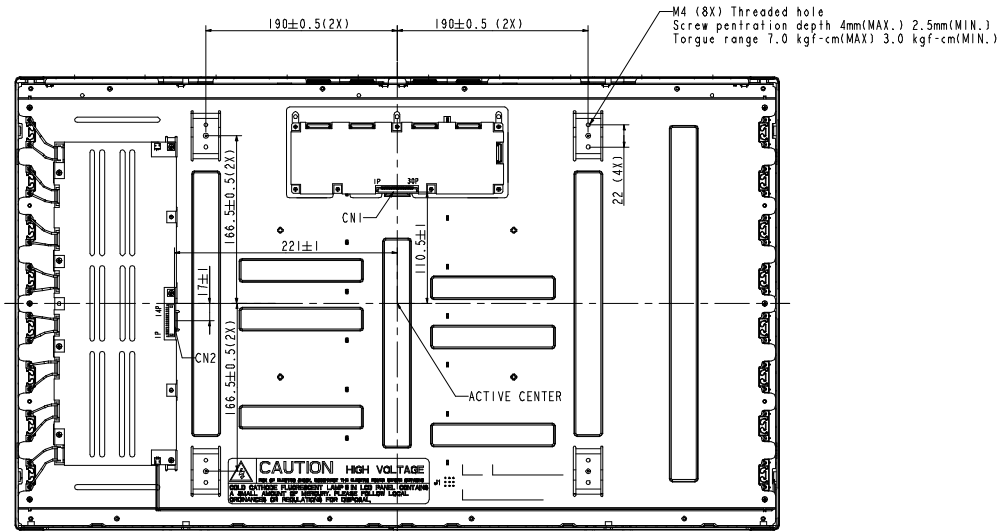


### 14. Drawing





Back View



- NOTE:  
 1. CN1: The Interface Connector is F1-E30S (JAE)  
 2. CN2: The Connector of Inverter is SI4B-PH-SM3(JST)

Quantum Display Inc.		ORIGINAL MODEL	V32B1
www.quantumdisplay.com		MATERIAL	*
SCALE	1:1	DRAWING NAME	ASSY.MODULE.V32B1
DATE	2014.05.27	PART NUMBER	-
REV	01	REVISION	00
REV	01	VER.	1.28