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Product Specifications

31.5” WXGA Color TFT-LCD Module
Model Name: T315XW01 VH
(QD32HL05 Rev.01)

( ) Preliminary Specifications
(*) Final Specifications

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Contact and consult with an AUO sales representative for any questions about this device.

Revision History			
Ver.	**Date**	**ECN NO.**	**Change Content**
01	**Dec. 13,2005**	**NA**	**Preliminary Specification Initiate**
02	**Jan.11,2006**	**NA**	**1.Updated haze, connector (Page: 5, 6, 8) 2.Updated electrical characteristics (Page: 10, 11). 3.Updated optical characteristics (Page: 17). 4.Updated module Reliability test item ESD: C&R (Page: 20). 5,Updated modue label, packing label (Page: 20).**
03	**Jan.13,2006**	**NA**	**1.Updated Vcc-dip conditions: 4V ≦ V_{cc} ＜4.5 V (Page: 11) 2.Update 7-1. Timing characteristics (Page: 15).**
03	**Jan.14,2006**	**NA**	**9. Optical characteristic (page18) Add Note 4 12.Reliability test items (page 21) Change item name to "High temperature storage test 2" Add item 16 (Page 31 and 32)**
04	**Mar.04, 2006**	**NA**	**1.Updated input voltage for control 5.5V (Page 10) 2.Updated rush current spec.: 3.0A (max.) (Page 11). 3.Updated backlight driving characteristics and lamp life time (typ.) to 60000hrs (Page 12). 4.Updated timing characteristics F_{CLK} (max.): 82MHz changed to 85MHz (Page 15). 5.Added remark V_{BRTC}=3.3V at luminance of white (Page 18). 6.Changed reliability test item and criteria (item10) name to "High temperature operation test2", proceeded in operation mode (Page:21, 31). 7.Correct reliability test ESD C&R condition, 150PF/330Ω (Page: 21, 30). 8.Updated Lot No. label and packing label description (Page:22, 23) 9.Updated module back view drawing with FFC protect Mylar modification (Page 25).**
05	**Nov.02, 2006**	**CECN-31T01-0610-01**	**1. Update Produce spec document format to AUO standard. 2. Update AUO model name QD32HL05 Rev01 à T315XW01 VH 3. Update Serial label & carton label format. (page 23)**

Content List

1. Application

This specification applies to a color TFT-LCD module, QD32HL05

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 +5V 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) **High aperture panel; high brightness**
2) **Brilliant and high contrast image**
3) **High speed response**
4) **WXGA resolution, 16:9**
5) **LVDS interface**
6) **QSV technology**
7) **Wide viewing angle**

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)×48(D)	mm
Thickness	48 max.	mm
Weight	7000 max.	g
Surface treatment	Anti-glare (Haze 13 %) and hard-coating 3H	
Lamp Quantity	16 straight lamps	pcs

4. Input Terminals

4-1. TFT-LCD pin assignment of panel

CN1: FI-X30SSL-HF (JAE) or equivalent

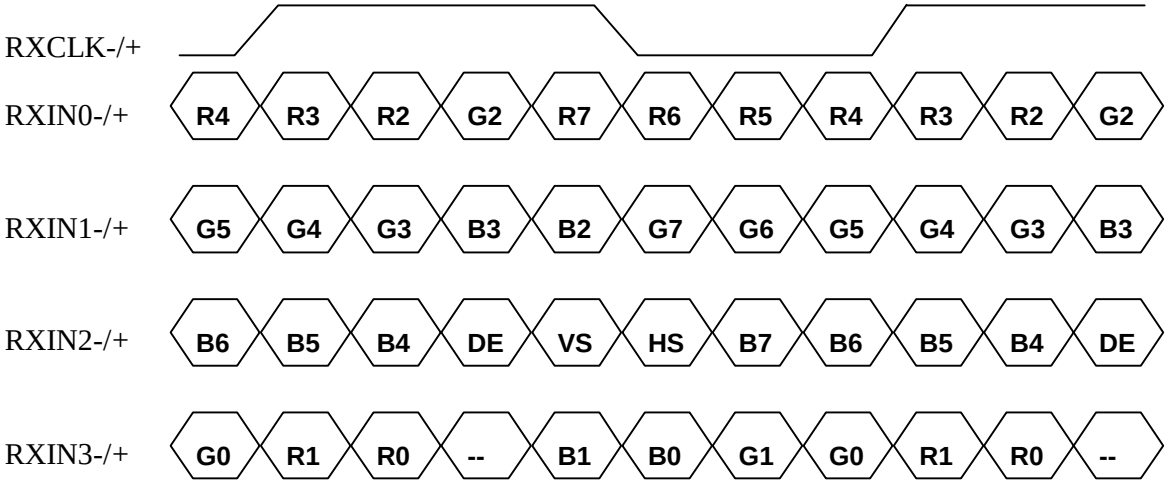
Pin NO.	Symbol	Function	Remark
1	V_{CC}	+5V input	
2	V_{CC}	+5V input	
3	V_{CC}	+5V input	
4	V_{CC}	+5V input	
5	GND	Power Ground	
6	GND	Power Ground	
7	GND	Power Ground	
8	GND	Power Ground	
9	LVDS SELECT	LVDS data mapping Low/Open for Normal (NS), High for JEIDA	Low: 0-0.8 V; High: 2.7-3.3 V; Default NS type.
10	RESERVED	N.C.	
11	GND	Ground	
12	RXIN0-	LVDS data input	
13	RXIN0+	LVDS data input	
14	GND	Ground	
15	RXIN1-	LVDS data input	
16	RXIN1+	LVDS data input	
17	GND	Ground	
18	RXIN2-	LVDS data input	
19	RXIN2+	LVDS data input	
20	GND	Ground	
21	RXCLK-	LVDS clock input	
22	RXCLK+	LVDS clock input	
23	GND	Ground	
24	RXIN3-	LVDS data input	
25	RXIN3+	LVDS data input	
26	GND	Ground	
27	RESERVED	N.C.	
28	NTSC or _PAL_SELECTION	OD table selection	Low/Open for PAL(50Hz) High for NTSC(60Hz)
29	GND	Ground	
30	GND	Ground	

【Note 1】 All GND(ground) pins should be connected together and to V_{CC} which should also be connected to the LCDs metal frame.

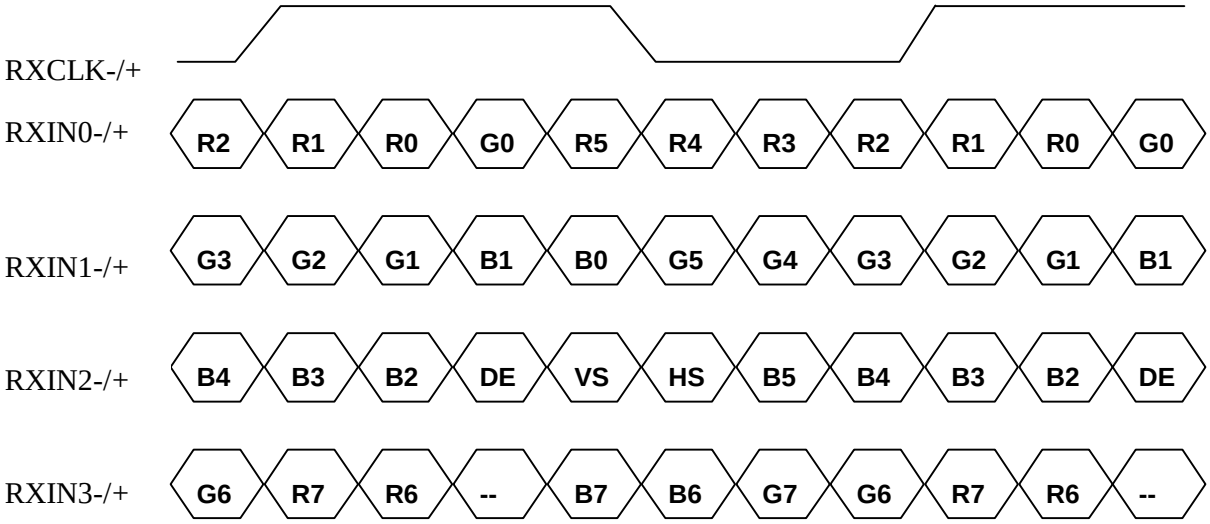
【Note 2】 Relation between LVDS signals and actual data shows below section (7-1).

【Note 3】All V_{CC} (power supply) pins should be connected together.

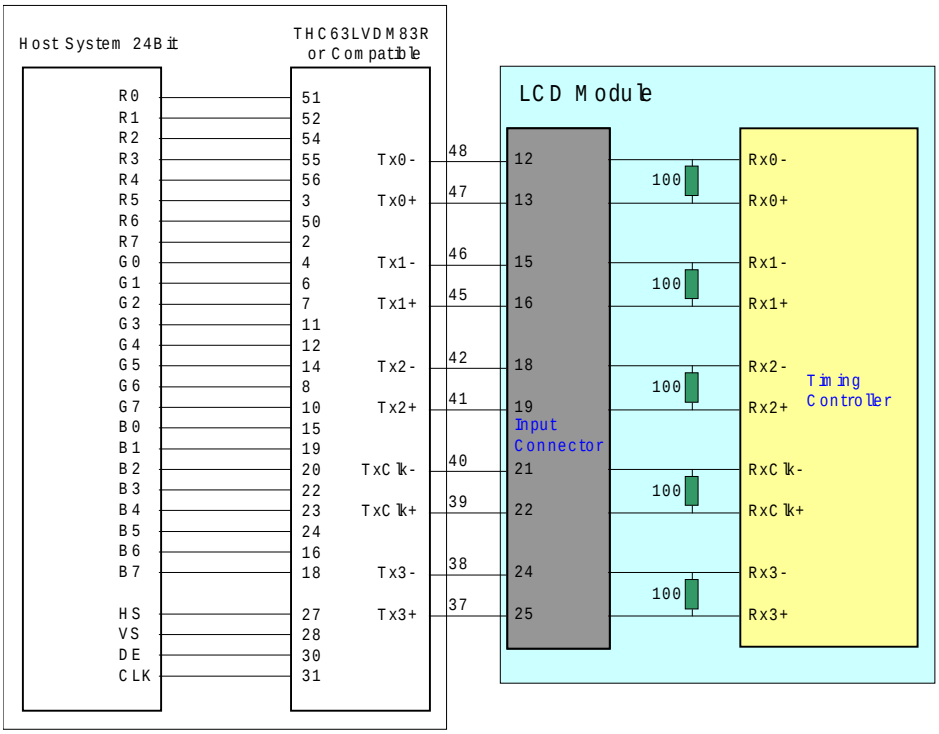
LVDS OPTION=High(3.3 V)



LVDS OPTION=LOW (GND)/ NC



4-2 Interface block diagram



4-3. Backlight driving

4-3-1. Inverter conector

Connector	Type
CN1	S14 B-PH-SM3 TB (JST) or Equivalent
CN2~CN9	SM02(12B)-BHS-1-TB (JST) or Equivalent
CN10	S2B-ZR-SM3A-TF (JST) or Equivalent

4-3-2 Pin assignment of inverter (CN1)

Pin No.	Symbol	Description	Remark
1	V_{DD}	+24V DC	
2	V_{DD}	+24V DC	
3	V_{DD}	+24V DC	
4	V_{DD}	+24V DC	
5	V_{DD}	+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 controlled by voltage method	Note.1
14	SGND	Signal Ground	

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

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

5. Absolute Maximum Ratings

LCD module

Parameter	Symbol	Condition	Ratings	Unit	Remark
Input Voltage (for control)	VI	Ta=25℃	-0.3 ~ +5.5	V_{DC}	【Note1】
5 V Supply Voltage (for Pannel)	V_{CC}	Ta=25℃	0 ~ ＋6.0	V_{DC}	
Input Voltage (for inverter)	V_{brt}	Ta=25℃	0 ~ ＋6.0	V_{DC}	【Note2】
24V supply voltage (for Inverter)	V_{INV}	Ta=25℃	0 ~ 27.5	V_{DC}	
Storage temperature	Tstg	－	-20 ~ ＋60	℃	【Note3】
Operating temperature (Ambient)	Topa	－	0 ~ ＋50	℃	

【Note1】LVDS SELECT, NTSC or PAL SELECTION

【Note2】BRTC,BRTI

【Note3】Humidity：90%RH Max. at Ta≦40℃.

Maximum wet-bulb temperature at 39℃ or less at Ta>40℃.

No condensation.

6. Electrical Characteristics

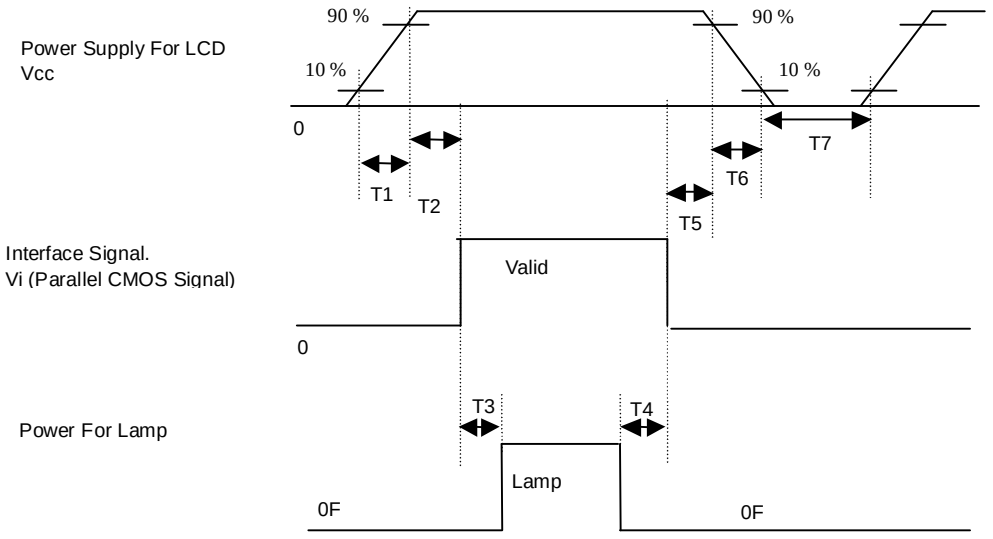
6-1TFT-LCD panel driving

Ta=25 C

Parameter			Symbol	Min.	Typ.	Max.	Unit	Remark
Vcc	Supply input voltage		Vcc	+4.5	+5	+5.5	V	【Note2】
	Supply input current		ICQ	—	960	1400	mA	【Note3】
	Power description		PD	—	4.8	7.7	W	
	Rush current		Iccs			3.0	A	
	Permissive Input Ripple Voltage		Vrp			120	mV	
Differential input Threshold voltage		High	V_{TH}	—	—	+100	mV	V_{CM}=+1.2V 【Note1】
		Low	V_{TL}	–100	—	—	mV	
LVDS select (High)			V_{IH}	2.7		3.3	V	
LVDS select (Low)			V_{IL}	0		0.8	V	
Input current (High)			I_{OH}	—	—	+/-10	μA	V_I=3.3V
Input current (Low)			I_{OL}	—	—	+/-10	μA	V_I=0V
Terminal resistor			R_T	—	100	—	Ω	Differential input

【Note1】V_{CM} : Common mode voltage of LVDS driver.

【Note2】On-off conditions for supply voltage

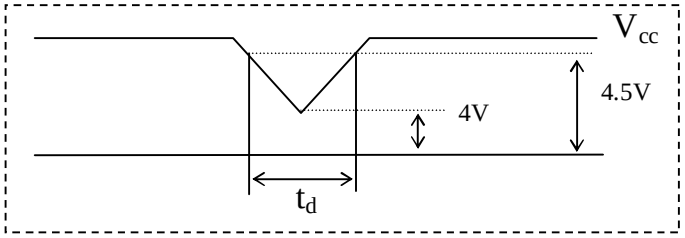


0＜T1≦10ms; 0.5ms＜T2≦50ms; 200ms≦T3; 200ms≦T4; 0.5ms＜T5≦50ms; 0＜T6≦10ms; 400ms＜T7

V_{cc}-dip conditions

1) 4V ≦ V_{cc} ＜4.5V
t_d ≦10 ms

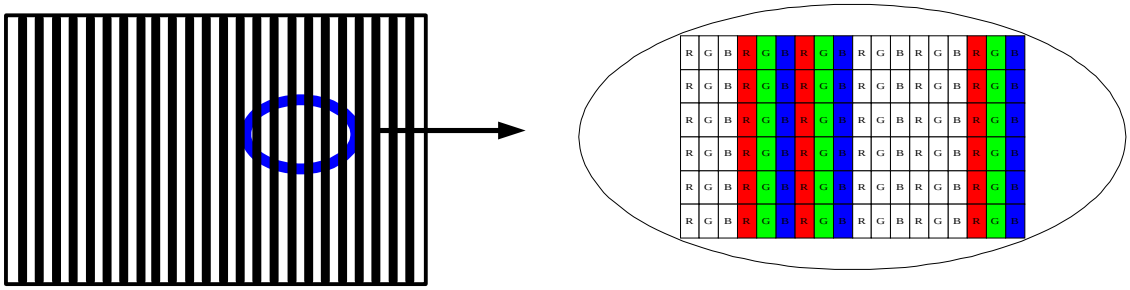
2) V_{cc}＜4 V



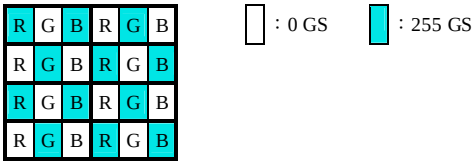
V_{cc}-dip conditions should also follow the On-off conditions for supply voltage

【Note3】

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



6-2. Backlight driving

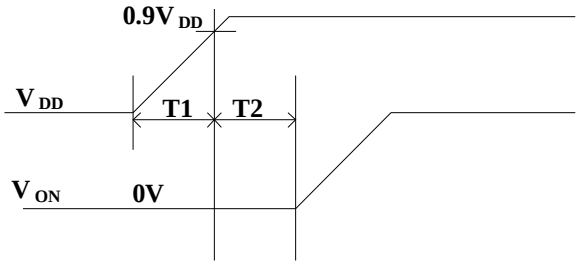
The backlight system is a direct-lighting type with 16 CCFT (Cold Cathode Fluorescent Tube).

The characteristics of the lamp are shown in the following table.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply Input Voltage	V_{DD}	21.6	24.0	26.4	V	【Note1】
Power Supply Input Current	I_{DD}	4.1	4.6	5.0	A	
Power Consumption	P_{DD}	-	110.4	132	W	【Note3】
Lamp current	IL	4.5	5.0	5.5	mA	【Note2】
Lamp voltage	V L	1215	1350	1485	Vrms	±10%
Lamp power consumption by per lamp	PL	-	6.75	8.17	W	
Ripple Voltage	Vrf	-	-	800	mV	
Diming Voltage	VBrt	0	-	3.3	V	Input Impedance:58K
BRTC(ON / OFF Voltage)	V_{ON}	2.0	3.3	5.0	V	High
	V_{OFF}	0	-	0.8	V	Low
Lamp frequency	FL	56	58	60	kHz	【Note4】
Established starting voltage	Vs	-	-	1700	Vrms	Ta=25℃ 【Note5】
				1900	Vrms	Ta=0℃
Lamp life time	LL	50000	60000		Hours	I_L<=6.0mA【Note6】

【Note1】

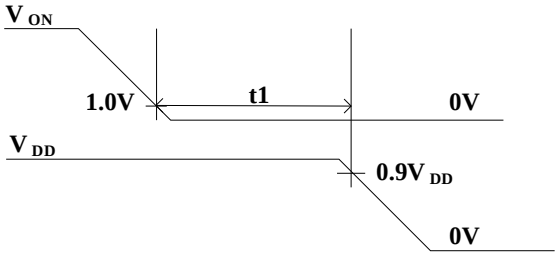
1. Power ON sequence:



4mS ＜ T1 ≦ 20mS

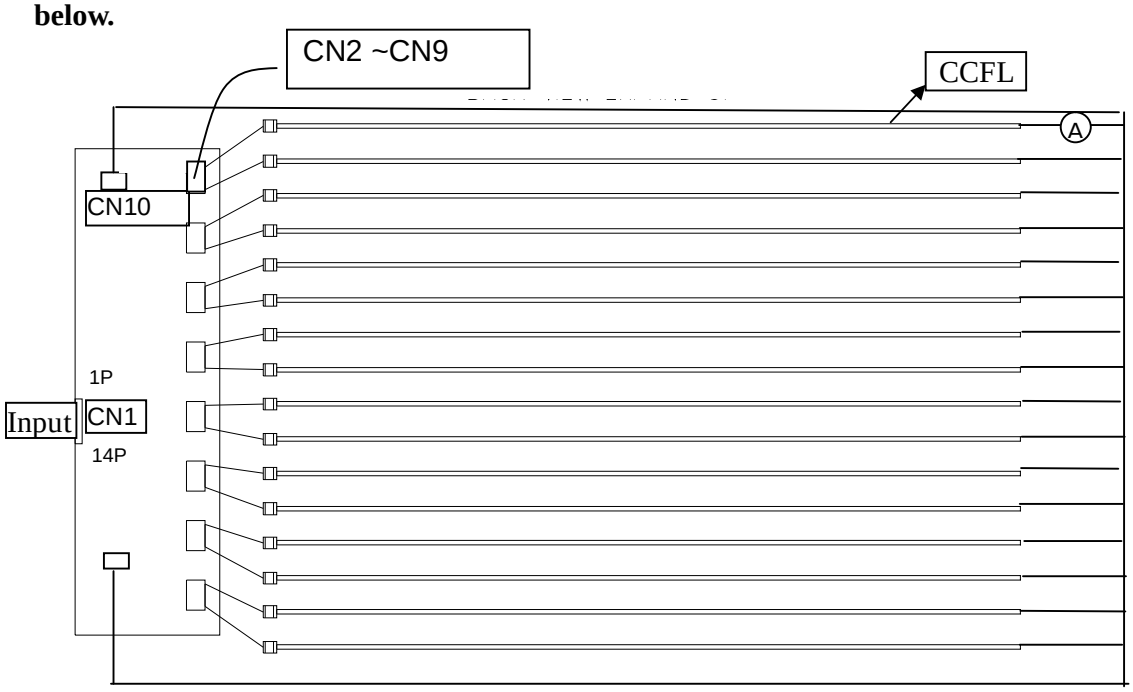
2mS ≦ T2

2. Power OFF sequence:



2mS ≦ t1

【Note2】 Lamp current is measured with current meter at low voltage end as shown below.



【Note3】 Calculated Value for reference ($I_{DD} \times V_{DD}$)

【Note4】 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.

【Note5】 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.

【Note6】 Lamp life time is defined as the time when either ① or ② occurs in the continuous operation under the condition of Ta = 25℃ and $I_L \leqq$ 6.0mArms.

① Brightness becomes 50 % of the original value under standard condition.

② Kick-off voltage at Ta = 0℃ exceeds maximum value.

7. Timing characteristics of LCD module input signals

7-1. Timing characteristics

ITIME	Symbol		Min	Typ	Max	Unit	Notes
DCLK	Frequency	F_{CLK}	55	80	85	MHz	
	Period	t_{CLK}	18.18	12.5	-	ns	
Hsync	Period	t_{HA}	1512	1648	1780	t_{CLK}	(A)
	Width-Active	t_{HC}	8	16	-		(C)
	Frequency	f_H	36.38	48.6	52	kHz	
Vsync	Period	t_{VA}	774	810	-	t_{HA}	(A)
	Width-Active	t_{VC}	2	6	-		(C)
	Frequency	fv	47	60	63	Hz	
Data Enable	Horizontal back porch	t_{HD}	8	80	-	t_{CLK}	(D)
	Horizontal front porch	t_{HF}	130	186	-	t_{CLK}	(F)
	Horizontal active	t_{HE}	1366	1366	1366	t_{CLK}	(E)
	Horizontal blanking	t_{HB}	146	282		t_{CLK}	(B)
	Vertical back porch	t_{VD}	2	20	-	t_{HA}	(D)
	Vertical front porch	t_{VF}	2	16	-	t_{HA}	(F)
	Vertical active	t_{VE}	768	768	768	t_{HA}	(E)
	Vertical blanking	t_{VB}	6	42		t_{HA}	(B)

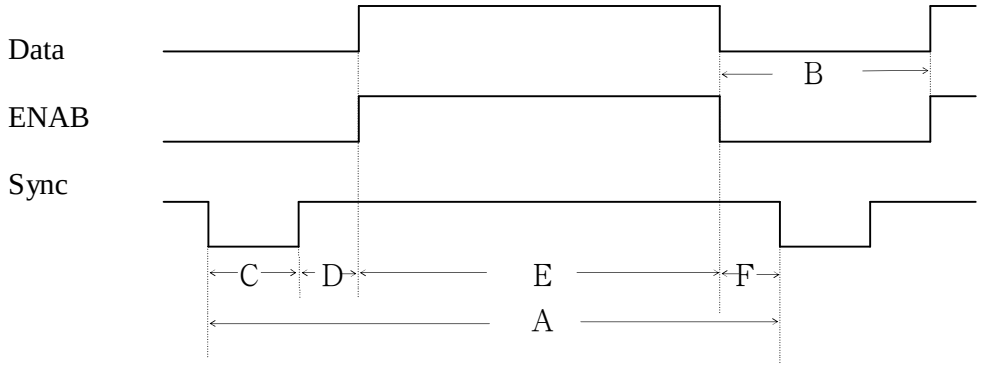
Notes:

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

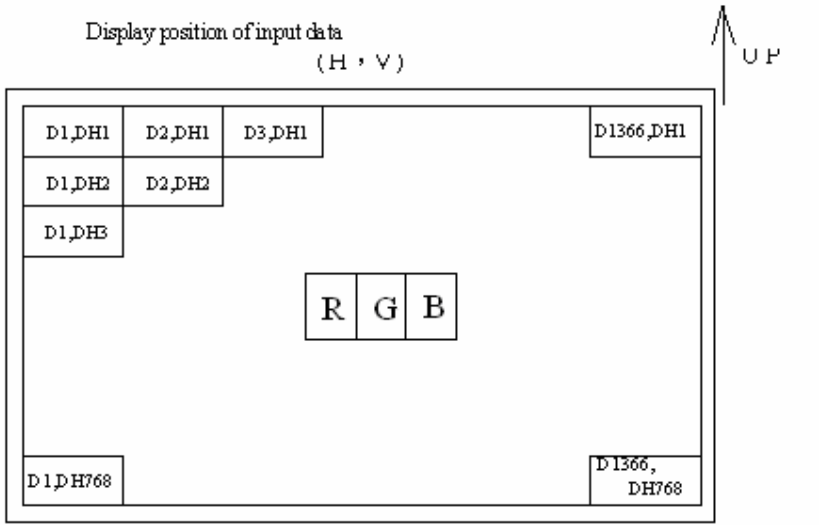
2. This module is drived by the data enable signal.

The data enable signal should follow Vsync and Hsync of above table.

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
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
	ñ	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
	ñ	â					â								â								â			
	ò	â					â								â								â			
	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
	ò	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
	ñ	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
	ñ	â																								
	ò	â																								
	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
	ò	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
	ñ	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
	ñ	â																								
	ò	â																								
	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
	ò	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℃, V_{cc}=+5V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	L/R	θ 21, θ 22	CR>10	80	88		Deg.	【Note1,4】
	U	θ 11		80	88		Deg.	
	D	θ 12		80	88		Deg.	
Contrast ratio		CRn	θ =0°	900	1200	—		【Note2,4】
Response time		τ		—	TBD	TBD	ms	【Note3,4】
Rise time	τ r				TBD	TBD	ms	
Fall time	τ d				TBD	TBD	ms	
Gray to gary reponse time					8	TBD	ms	
Chromaticity of White (CIE 1931)		Wx		0.247	0.277	0.307		【Note4】
		Wy		0.257	0.287	0.317		
Chromaticity of Red (CIE 1931)		Rx		0.611	0.641	0.671		NTSC 72%
		Ry		0.310	0.340	0.370		
Chromaticity of Green (CIE 1931)		Gx		0.254	0.284	0.314		
		Gy		0.582	0.612	0.642		
Chromaticity of Blue (CIE 1931)		Bx		0.116	0.146	0.176		
		By		0.047	0.077	0.107		
Luminance of white		YL		400	500		Cd/m^2	V_{BRTC}=3.3V 【Note4】
White Uniformity		δ W (5P)		—	-	1.25		【Note5】
Color Temperatore		CT			10500		˚K	

※ The measurement shall be executed 30 minutes after lighting at rating.(Typical I_L =6.0 m Arms)

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

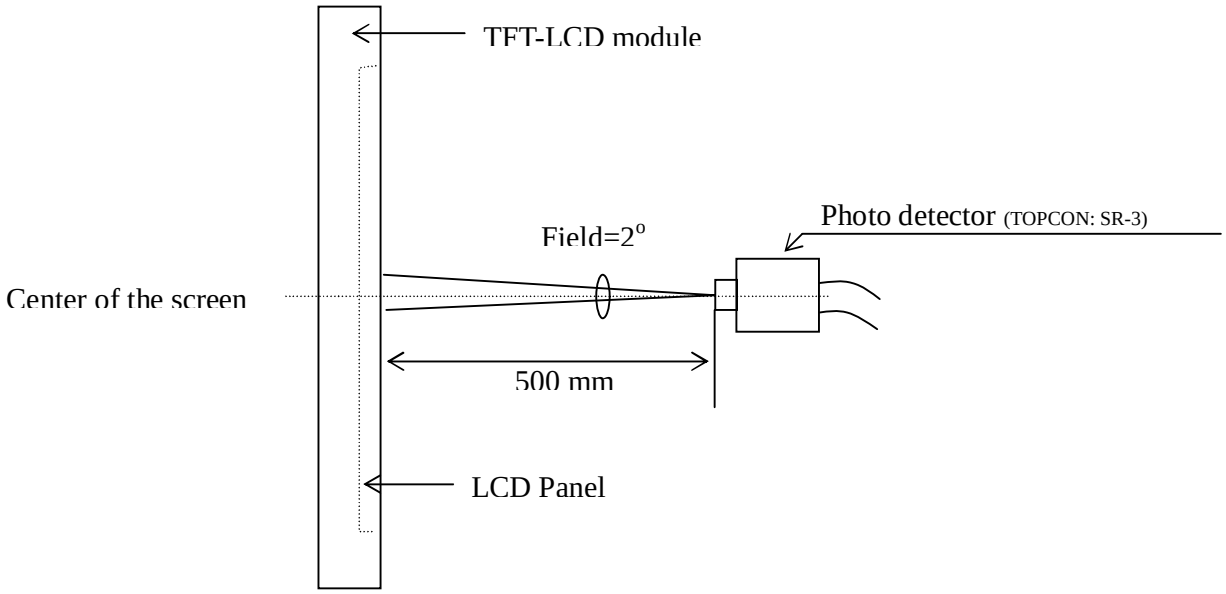
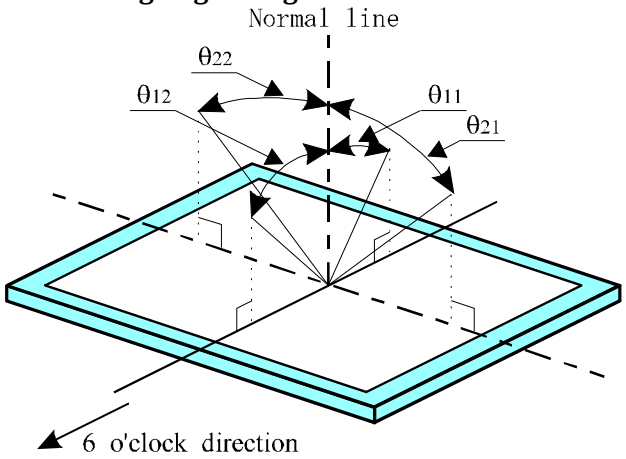


Fig 1. Optical characteristics measurement method

【Note1】Definitions of viewing angle range:



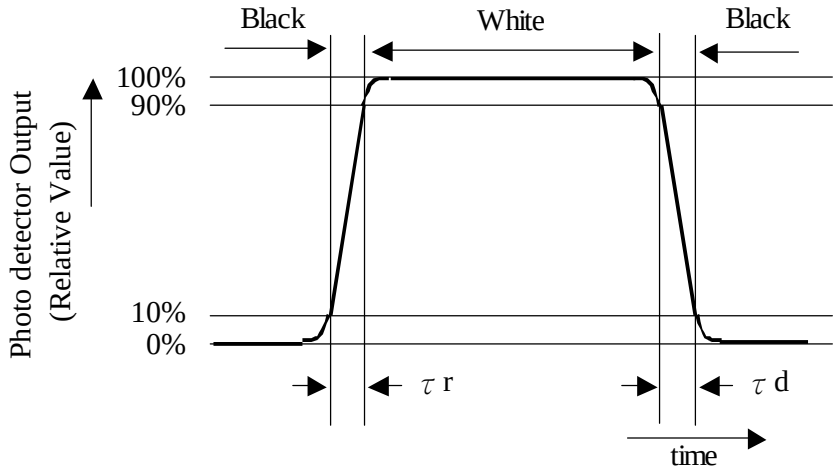
【Note2】Definition of contrast ratio:

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" .

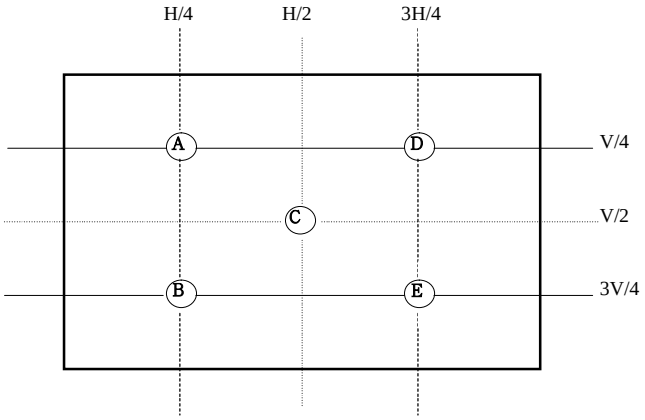


【Note4】This shall be measured at center of the screen.

Share of module quantity of luminance over 460cd/m^2; ≧ 90%

【Note5】Definition of white uniformity:

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



$$\delta_W = \frac{\text{Maximum Luminance (of 5 points measurement)}}{\text{Minnum Luminance (of 5 points measurement)}}$$

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 discolora -tion 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.

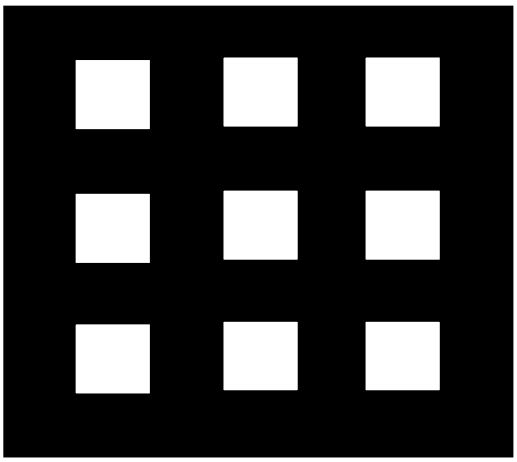
i) This module has its circuitry PCBs on the rear side and should be handled carefully in order not to be stressed.

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

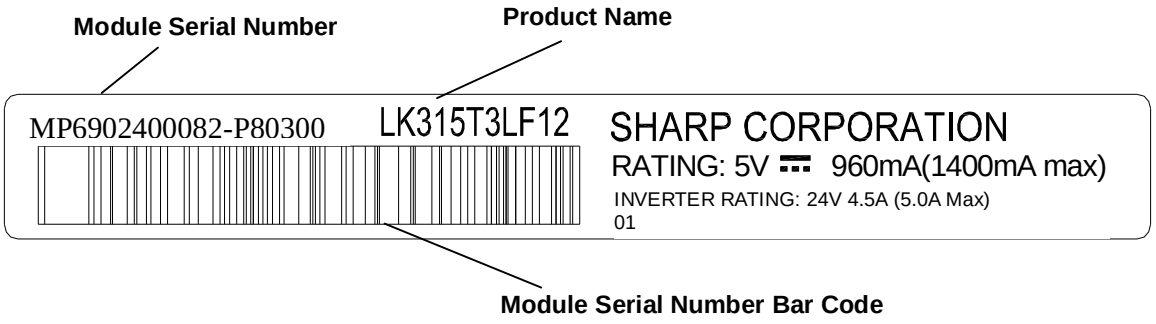
No.	Test item	Conditions
1	High temperature storage test	Ta = 60℃, 500h
2	Low temperature storage test	Ta = -25℃, 500h
3	High temperature & High humidity operation test	Ta = 40℃, 95 %RH, 500h
4	High temperature operation test	Ta = 50℃, 500h
5	Low temperature operation test	Ta = 0℃, 500h
6	Vibration test (non-operating)	Frequency: 10～500Hz, 1.0G, 1Hr/each axis
7	Shock test (Non- operating)	Gravity: 100G Pulse width: 2ms, 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) C: 150PF R: 330Ω
9	Thermal cycle	Ta = -20, 1h ~ 60℃, 1h, 100 cycles
10	High temperature operation test 2	Ta =60℃, 200h 【Note1】

【Note1】Image sticking pattern (black pattern with white block matrix inside, white block size equals to one-seventh active area) shown as following:

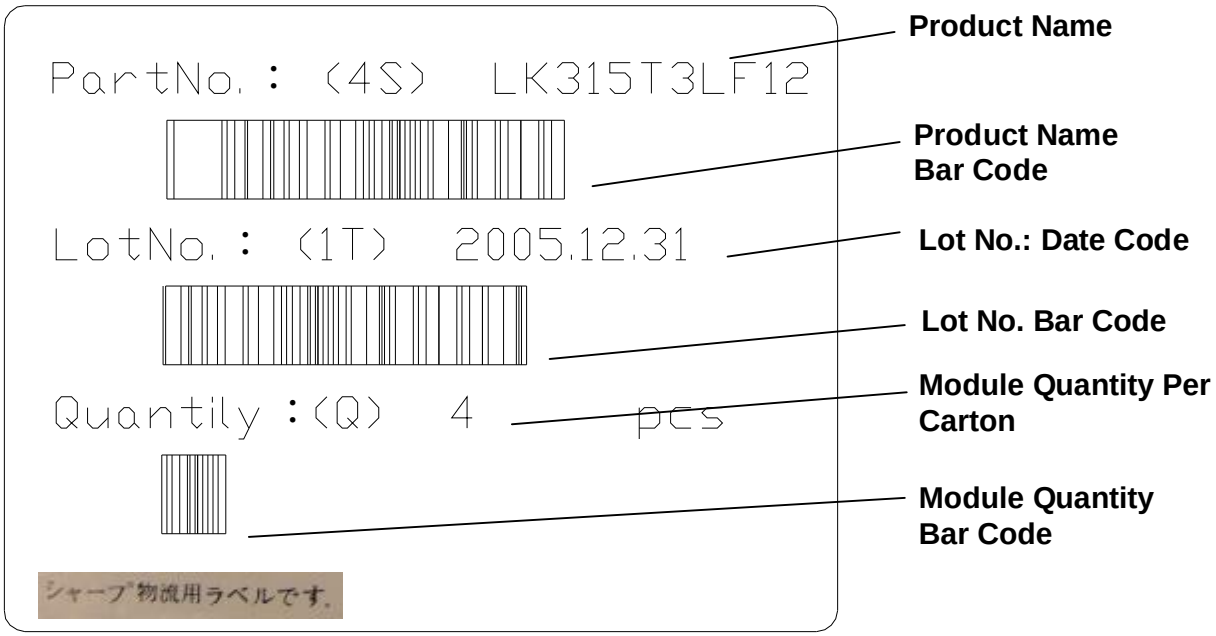


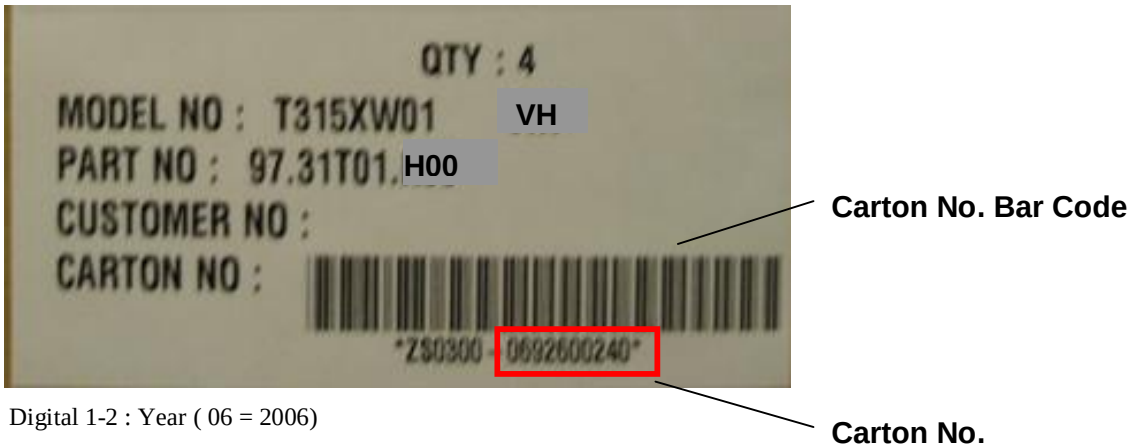
13 · Others

1) Lot No. Label:



2) Packing Label: 2 packing labels was attached on Carton shown as following.





Digital 1-2 : Year (06 = 2006)

Digital 3 : Month (1,2,3,4,5,6,7,8,9,A,B,C)

Digital 4-5: Day.

Digital 6-10 : Carton Sequential Number.

3) Pallet

By air transportation, there are 2-layer of cartons stacking on one pallet;

By ocean transportation, there are 3-layer of cartons stacking on one pallet.

For both air- and ocean- transportation, each layer has 6 cartons.

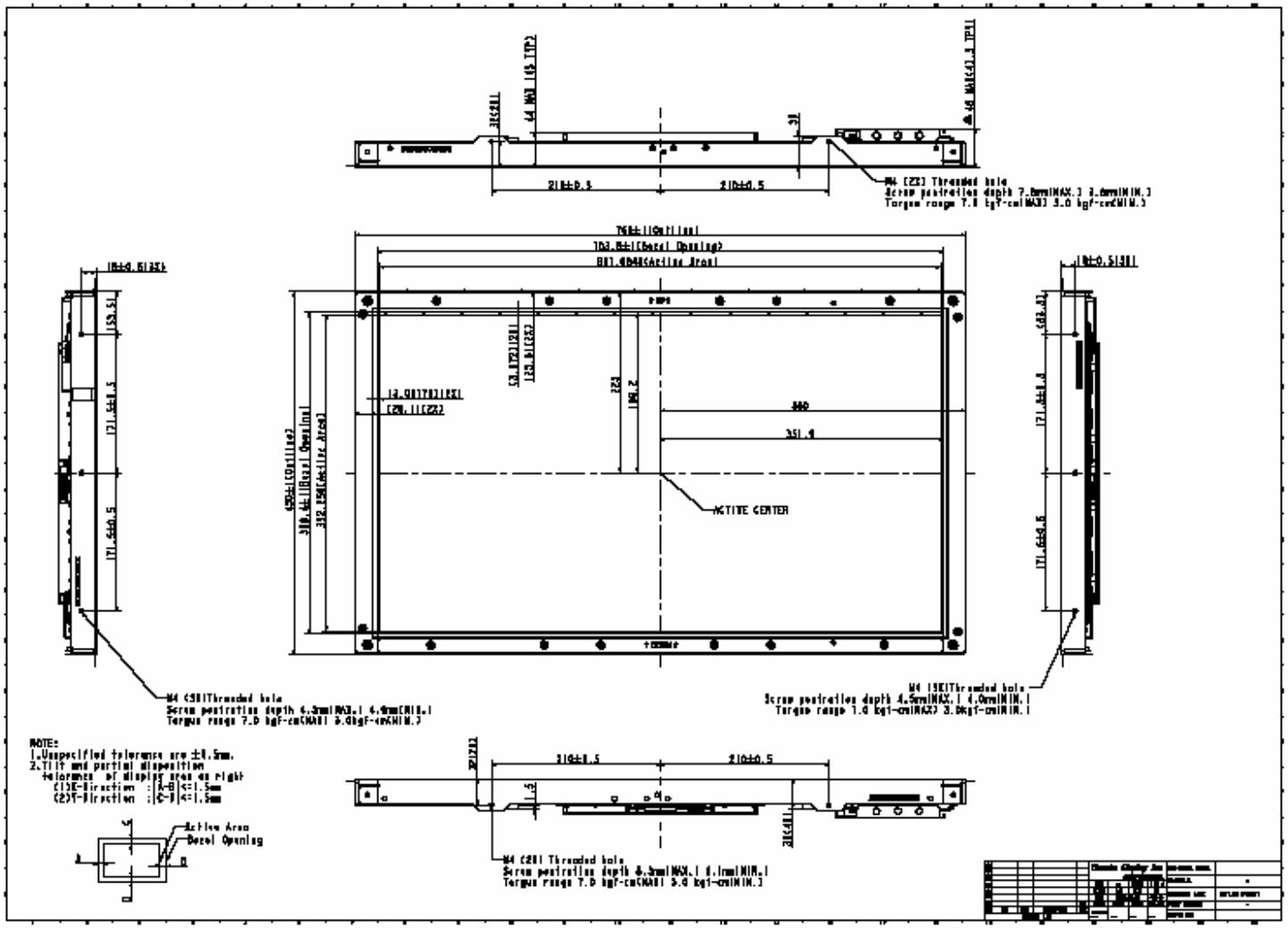
4) Maximum layer of carton 3-layer.

Notes:

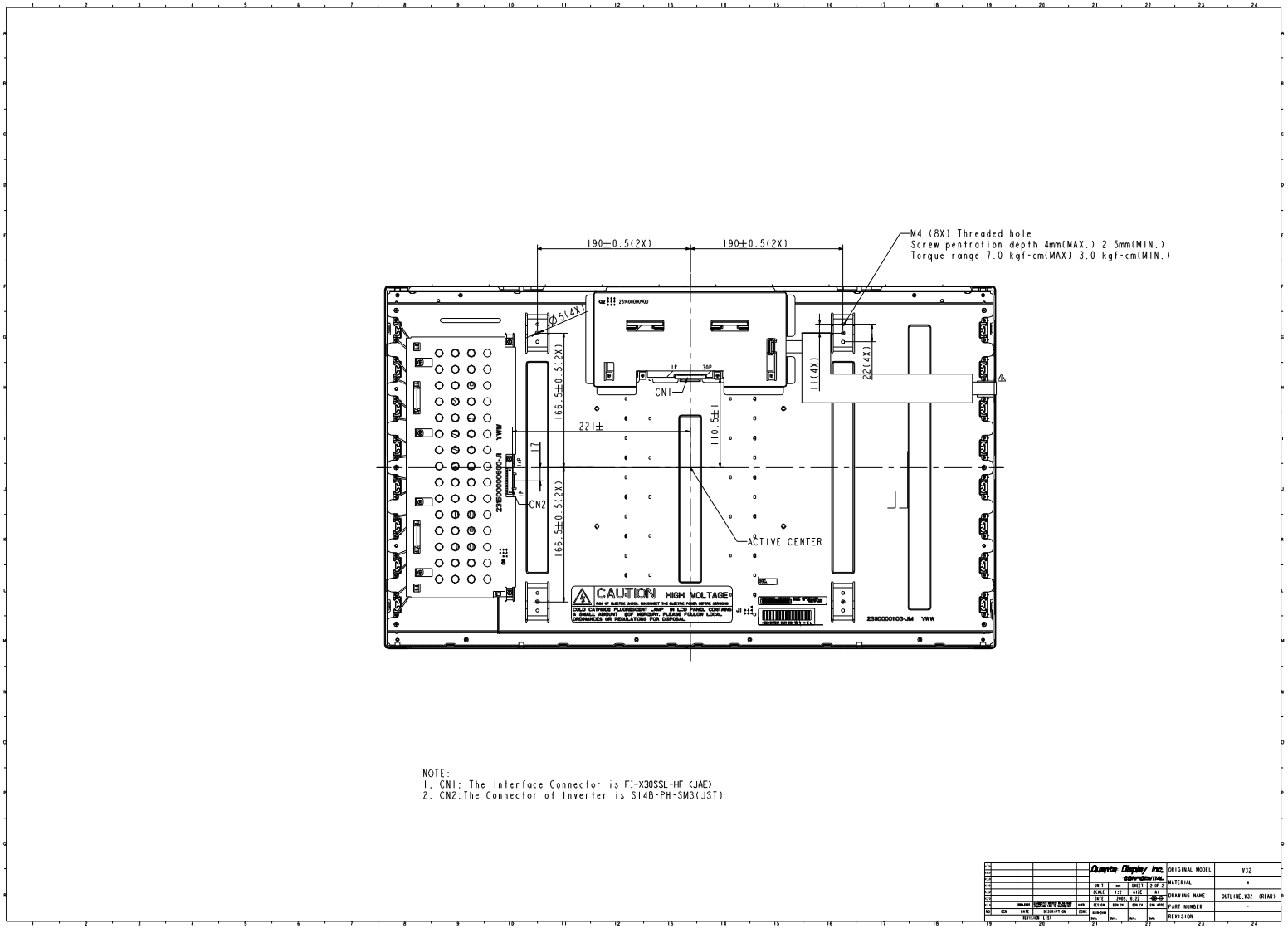
1) Adjusting volume has been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.
2) Disassembling the module can cause permanent damage and should be strictly avoided.
3) Please be careful since image retention may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

14. Drawing

Front View

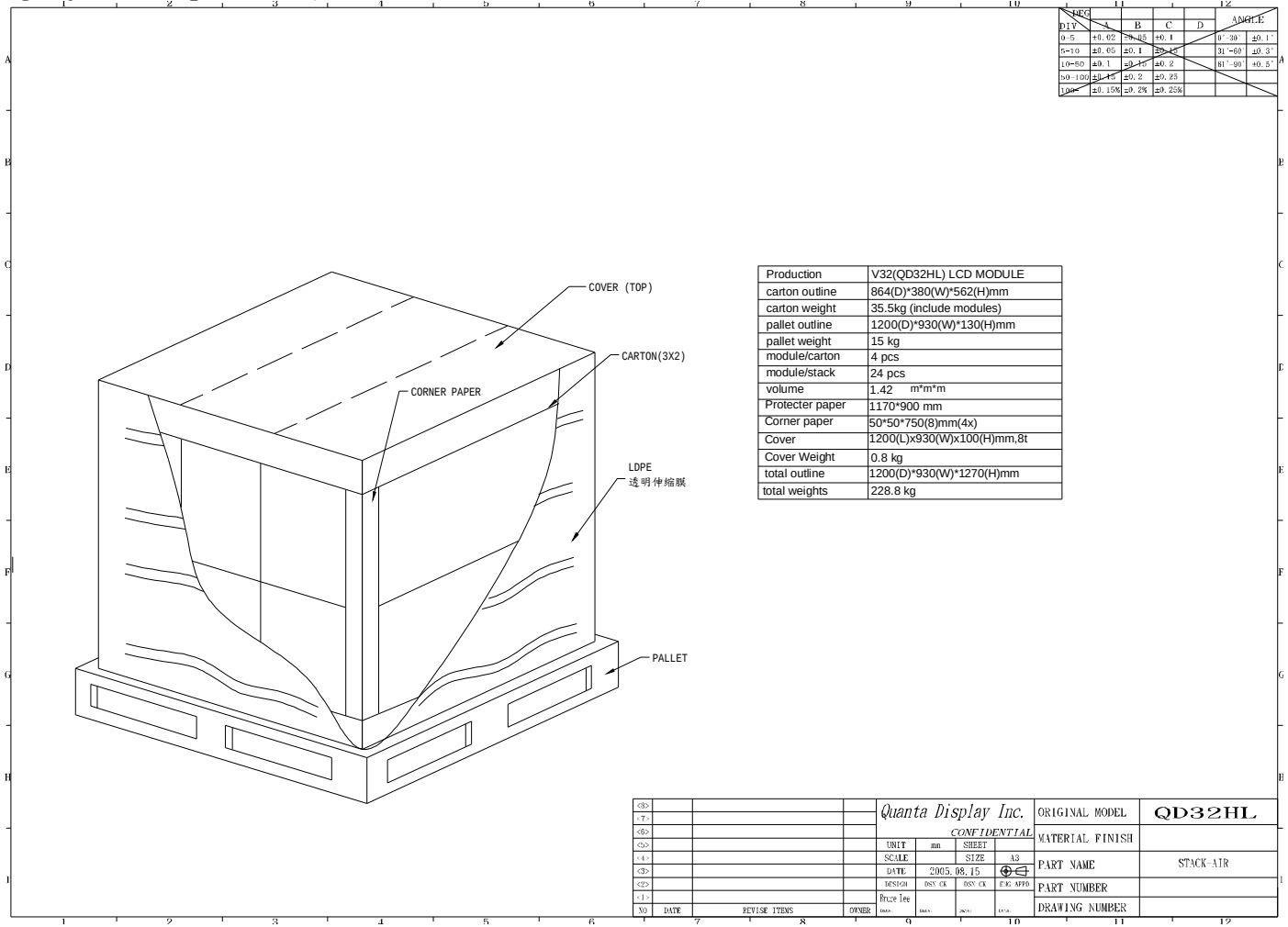


Back View



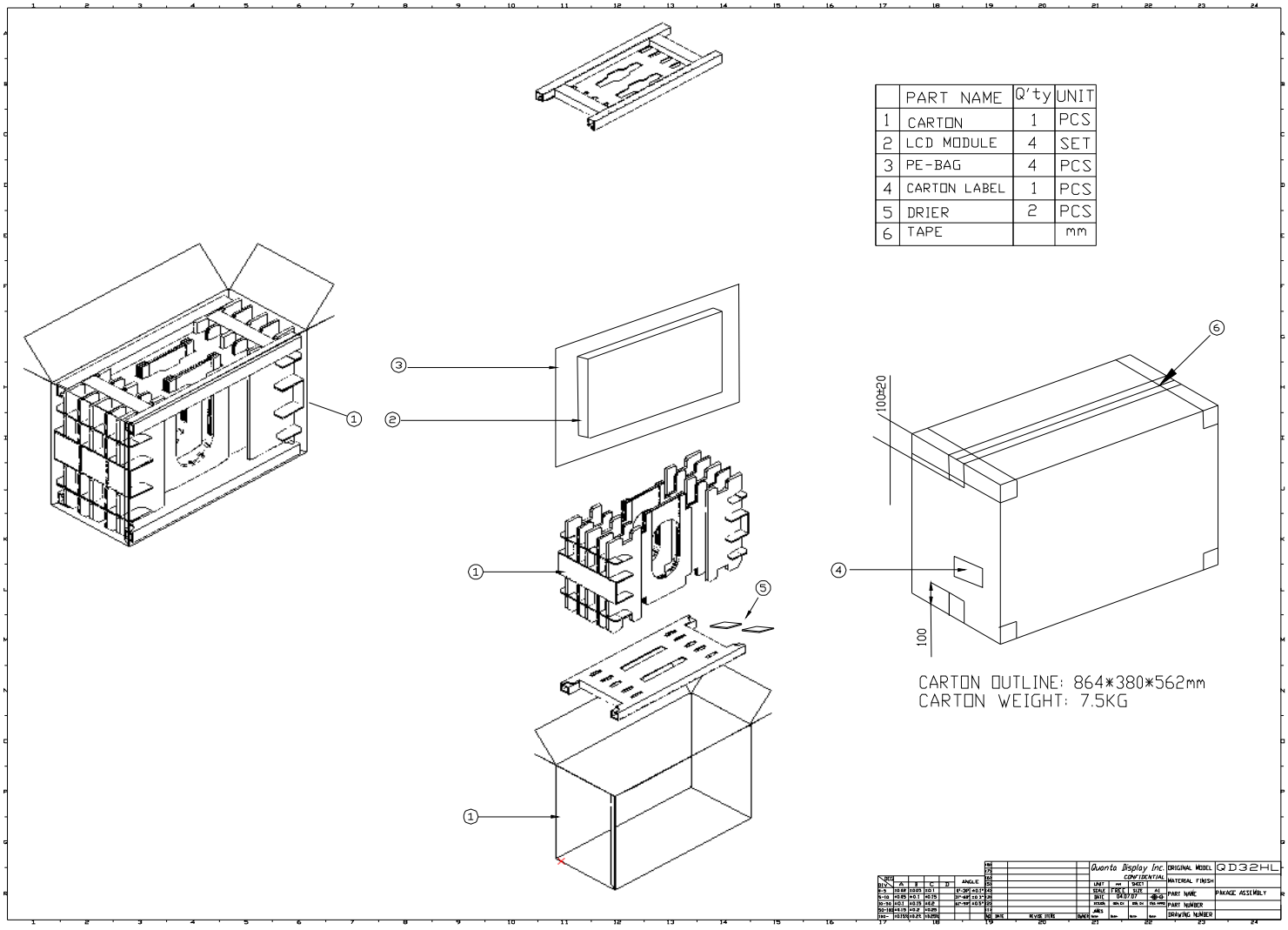
15) Packing

15-1 Packing: By air transportation (1 of 2)

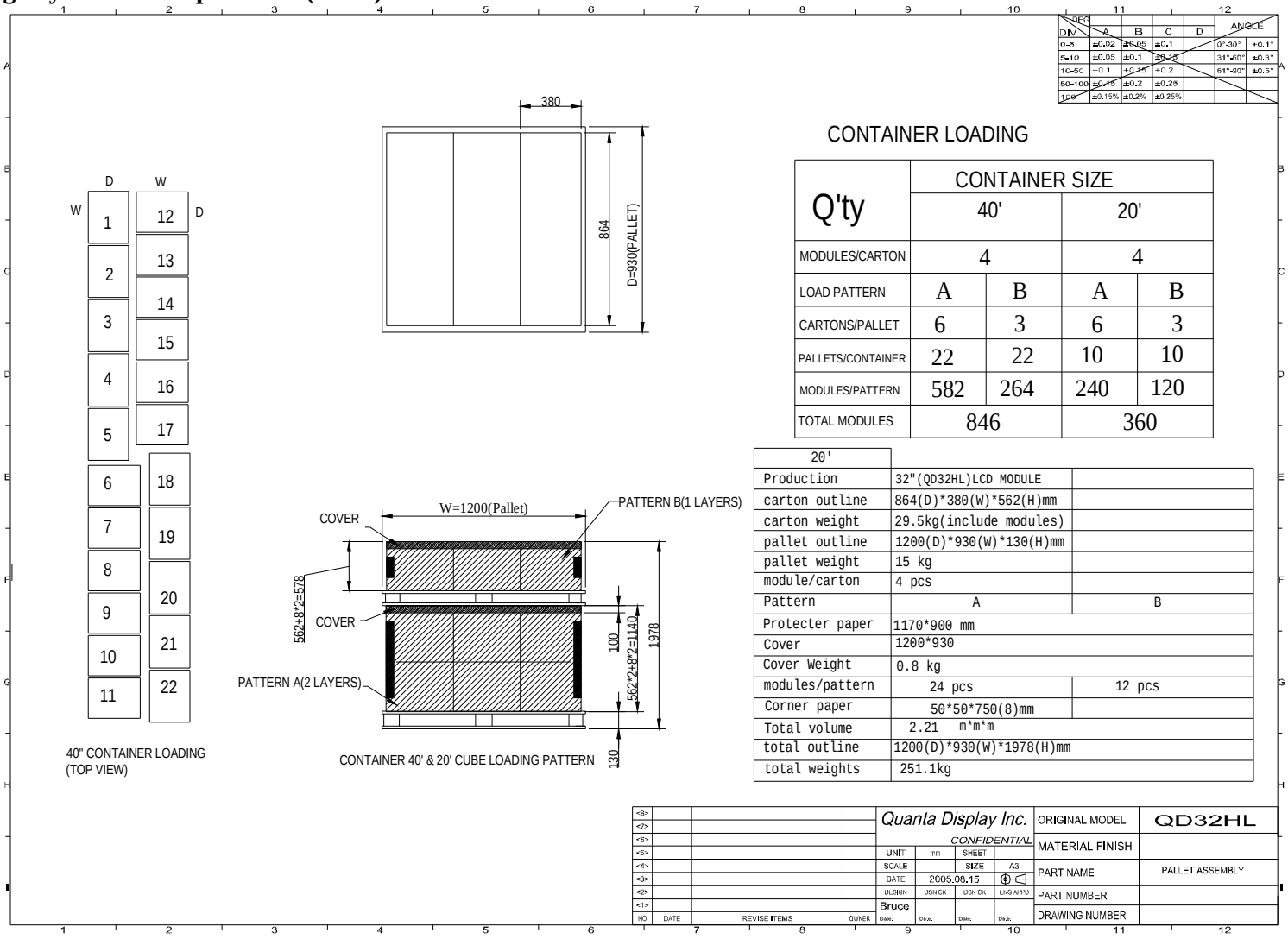


Production	V32(QD32HL) LCD MODULE
carton outline	864(D)*380(W)*562(H)mm
carton weight	35.5kg (include modules)
pallet outline	1200(D)*930(W)*130(H)mm
pallet weight	15 kg
module/carton	4 pcs
module/stack	24 pcs
volume	1.42 m*m*m
Protecter paper	1170*900 mm
Corner paper	50*50*750(8)mm(4x)
Cover	1200(L)x930(W)x100(H)mm,8t
Cover Weight	0.8 kg
total outline	1200(D)*930(W)*1270(H)mm
total weights	228.8 kg

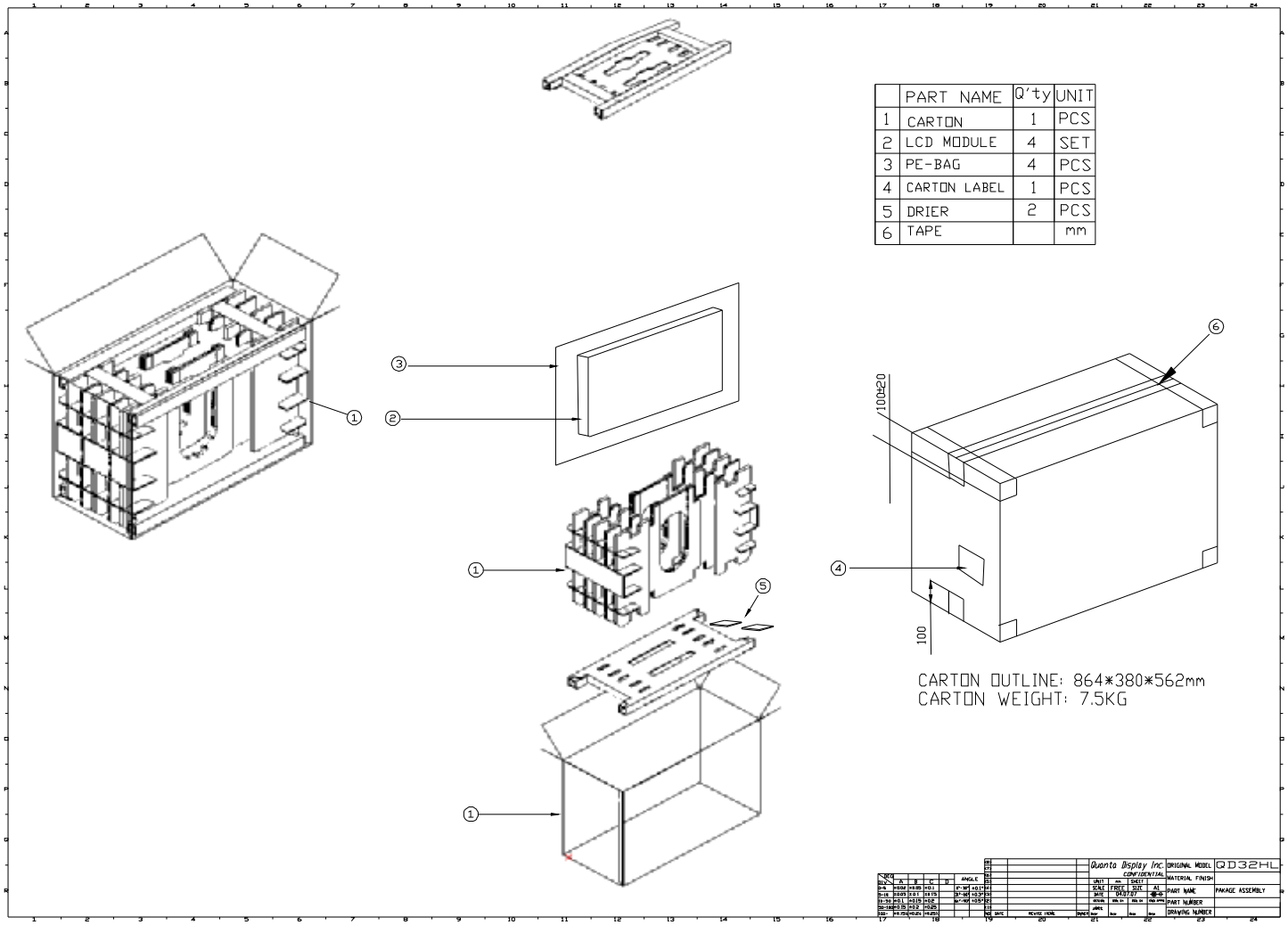
Packing: By air transportation (2 of 2)



15-2 Packing: By ocean transportation (1 of 2)



Packing: By ocean transportation (2 of 2)



16. Reliability test criteria

No.	Test item	Conditions	Judge Criteria
1	High temperature storage test	Ta = 60℃, 500h	There is no faital defect for the performance of the LCD module inspected by the inspection method specified in Doc.NO. QD32HL05-01-IIS
2	Low temperature storage test	Ta = -25℃, 500h	There is no faital defect for the performance of the LCD module inspected by the inspection method specified in Doc.NO. QD32HL05-01-IIS
3	High temperature & High humidity operation test	Ta = 40℃, 95 %RH, 500h	There is no faital defect for the performance of the LCD module inspected by the inspection method specified in Doc.NO. QD32HL05-01-IIS
4	High temperature operation test	Ta = 50℃, 500h	There is no faital defect for the performance of the LCD module inspected by the inspection method specified in Doc.NO. QD32HL05-01-IIS
5	Low temperature operation test	Ta = 0℃, 500h	There is no faital defect for the performance of the LCD module inspected by the inspection method specified in Doc.NO. QD32HL05-01-IIS
6	Vibration test (non-operating)	Frequency: 10～500Hz, 1.0G, 1Hr/each axis	There is no faital defect for the performance of the LCD module inspected by the inspection method specified in Doc.NO. QD32HL05-01-IIS Active area must be inside of the bezel opening.
7	Shock test (Non- operating)	Gravity: 100G Pulse width: 2ms, half sine wave Direction : ±X,±Y,±Z Once for each direction.	There is no faital defect for the performance of the LCD module inspected by the inspection method specified in Doc.NO. QD32HL05-01-IIS Active area must be inside of the bezel opening.
8	ESD	Contact-op: ±8kv, Contact-nop: ±10kv, Air-op: ±15kv, Air-nop: ±20kv, (Contact area is limited on metal bezel) C: 150PF, R: 330Ω	There is no faital defect for the performance of the LCD module inspected by the inspection method specified in Doc.NO. QD32HL05-01-IIS

9	**Thermal cycle**	**Ta = -20, 1h ~ 60℃, 1h, 100 cycles**	**There is no faital defect for the performance of the LCD module inspected by the inspection method specified in Doc.NO. QD32HL05-01-IIS**
10	**High temperature operation test 2**	**Ta =60℃, 200h 【Note1】** **To check linear simi that occur boundary between white and black pattern.**	**Cannot see any simi through the 10% ND filter at any gray scale at 60 degC.** **Tentative criteria until the end of Feb:** **Cannot see any simi through the 5% ND filter at 60 degC and through the 10% ND filter at 25 degC at any gray scale.**

【Note1】 Image sticking pattern shown as following: