Preliminary



Doc No. QD26HL02-01

Doc. REV.: 04

Issue Date:Sep. 27,'05

With RoHS compliant

Specification for TFT LCD Module

Model No. QD26HL02 Rev.:01

☐ Customer's Approval	
Date	
	Approved
by	Ву

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			Revision History
REV.	Date	ECN NO.	Change Content
1	May 23,'05	N/A	Preliminary specification Initiate
2	May 30,'05	N/A	Page7, update pin9 from "High/open-NS, Low-JEIDA" to "Low/open-NS,High-JEIDA", page12, update LCD current, page 18 update gray to gray response time as 8ms typ. 16ms max.
3	Aug 16,'05	N/A	Page 18, update optical spec. page 5, update thickness, page 24,25, update bar code label position
4.	Sep. 27,'05	N/A	Page 5, update weight, page 24, update bar code label position



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1. Application

This specification applies to a color TFT-LCD module, QD26HL02

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 $1366 \times 3 \times 768$ 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 very high aperture ratio. 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 the LCD TV,HDTV and 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	66.05 (26") Diagonal	cm
Active area	575.769 (H)×323.712 (V)	mm
Pixel format	1366 (H)×768 (V)	Pixel
	(1 pixel = R+G+B dots)	
Pixel pitch	0.4215 (H) × 0.4215 (V)	mm
Pixel configuration	R,G,B vertical stripe	
Display mode	Normally Black	
Unit outline dimensions	626 x 373	mm
Thickness	Тур 40.9	mm
Weight	Max. 4500	g
Surface treatment	Anti-glare(13%) and hard-coating	
	3Н	
Lamp Quantity	8 U shape	pcs

4. Input Terminals

4-1. TFT-LCD panel driving

CN1 (LVDS signals and +12V DC power supply)

Connector on Panel: FI-X30SSL-HF(Manufactured by JAE) or Equivalent
Mating connector: FI-30C2L (Manufactured by JAE) or Equivalent

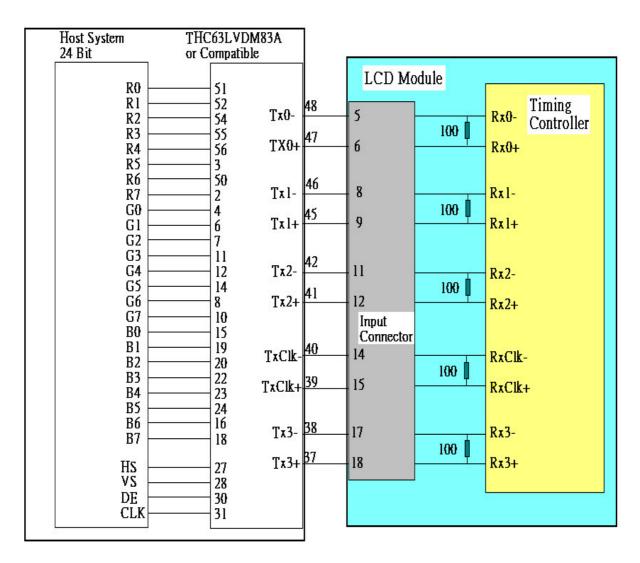
Quanta Display Inc.

		na Display inc.	
Pin No	Symbol	Description	Default
1	VCC	+12V, DC, Regulated	
2	VCC	+12V, DC, Regulated	
3	VCC	+12V, DC, Regulated	
4	VCC	+12V, DC, Regulated	
5	GND	Ground and Signal Return	
6	GND	Ground and Signal Return	
7	GND	Ground and Signal Return	
8	GND	Ground and Signal Return	
9	LVDS Option	Low/Open for Normal (NS), High for JEIDA	Default NS type
10	Reserved	N.C.	
11	GND	Ground and Signal Return for LVDS	
12	RXIN0-	LVDS Channel 0 negative	
13	RXIN0+	LVDS Channel 0 positive	
14	GND	Ground and Signal Return for LVDS	
15	RXIN1-	LVDS Channel 1 negative	
16	RXIN1+	LVDS Channel 1 positive	
17	GND	Ground and Signal Return for LVDS	
18	RXIN2-	LVDS Channel 2 negative	
19	RXIN2+	LVDS Channel 2 positive	
20	GND	Ground and Signal Return for LVDS	
21	RXCLKIN-	LVDS Clock negative	
22	RXCLKIN+	LVDS Clock Positive	
23	GND	Ground and Signal Return for LVDS	
24	RXIN3-	LVDS Channel 3 negative	
25	RXIN3+	LVDS Channel 3 positive	
26	GND	Ground and Signal Return for LVDS	
27	Reserved	N.C.	
28	Reserved	N.C.	
29	GND	Ground and Signal Return	
30	GND	Ground and Signal Return	

- [Note 1] All GND(ground) pins should be connected together.
- [Note 2] All $V_{DD}\mbox{ (power supply)}$ pins should be connected together.



4-2 Interface block diagram



4-3. Backlight driving

4-3-1. Inverter Connector

Connector on Inverter: S14B-PH-SM3(Manufactured by JST) or Equivalent

Mating connector: PHR-14 (Manufactured by JST) or Equivalent

Pin No	Symbol	Description	Default			
1	VIN	Operating Voltage Supply, +24V DC regulated	24V			
2	VIN	Operating Voltage Supply, +24V DC regulated	24V			
3	VIN	Operating Voltage Supply, +24V DC regulated	24V			
4	VIN	Operating Voltage Supply, +24V DC regulated	24V			
5	VIN	Operating Voltage Supply, +24V DC regulated	24V			
6	BLGND	Ground and Current Return	GND			
7	BLGND	Ground and Current Return	GND			
8	BLGND	Ground and Current Return	GND			
9	BLGND	Ground and Current Return	GND			
10	BLGND	Ground and Current Return	GND			
11	ADIM ⁽¹⁾	GND (0V) 80% Lum / Open (1.6V) 100% Lum / High (3.3V) 120% Lum				
12	ON/OFF	BL On-Off: Open/High (3.3V) for BL On as default	On			
13	PDIM ⁽²⁾	PWM Dimming: Open/High (3.3V) for 100% Lum				
14	PWM Selection ⁽³⁾	GND: Duty Signal to 13pin, Open/High(3.3V): Analog				

[Note]

- (1) ADIM is control signal for Inverter's output Power to Back Light Lamp Bulb. Input Signal should be able to control Amplitude of Inverter Output voltage. From 0V to 3.3V, Inverter Output Voltage should be able to vary to control Brightness of Lamp from 80% to 120% Luminescence variation.
- (2) PDIM is PWM control input; i.e. for the given ADIM, this PDIM input should be able to control Width of Voltage Burst of inverter output for Lamp Driving. This input can have two type of input; Ordinary default setting will be DC level signal using Saw Tooth Wave control for PWM duty control. The other setting is Duty Signal Input with 3.3V TTL specification. These two method should be decided by 14th Pin input setting.
- (3) (3) 14 Pin is selection pin for PWM control method; if this pin is connected to GND, PDIM input of 13th Pin should have Logic Level Duty Signal for PWM control. If this is set to High or





Open, 13th Pin should have DC level signal therefore the Inverter should have Saw Tooth Wave Generator to generate internal PWM signal. Default setting is "Analog", means when it is "Not Connected", 13th pin of PWM control should be have DC Level signal for PWM.

4-3-2. Lamp connector

Back Light Lamp Connectors and Pin Assignment are as follows.

Connectors attached to Lamp Lead: BHR-04VS-1(JST)

Mating connectors for Inverter output: SM02(12.0)B-BHS-1-TB(JST) or

4002P0220T(LANDWIN

Pin No	Symbol	Description	Default
1	CFL HOT	High Voltage AC Signal	
2	N.C.	Spacing for High Voltage Clearance	
3	CFL HOT	Return for High Voltage AC Signal	

5. Absolute Maximum Ratings

LCD module

Parameter	Symbol	Condition	Ratings	Unit	Remark
+12V supply voltage	V_{DD}	Ta=25℃	-0.3 ~ +14.0	v	
Storage temperature	Tstg	_	$-20 \sim +60$	ဇ	[Note1]
Operating temperature (Ambient)	Тора	_	0 ~ +50	က	

[Note1] Humidity: 90%RH Max. at Ta≤40°C.

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

No condensation.

6. Electrical Characteristics

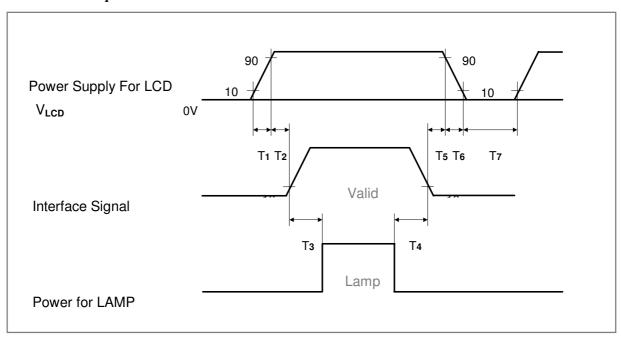
6-1.TFT-LCD panel driving

Ta=25℃

	Parameter		Symbol	Min.	Тур.	Max.	Unit	Remark
V_{DD}	Supply voltage		V_{DD}	11.4	+12.0	12.6	V	[Note2]
	Current dissipation		I_{DD}	I	340	650	m A	[Note3]
Per	Permissive input ripple voltage		V_{RP}	ı	_	120	mV p-p	$V_{DD}=+12V$
Differ	ential input	High	V_{TH}	ı	_	100	mV	V_{CM} =+1.2 V
thr	threshold voltage Low		V_{TL}	-100	_	_	mV	[Note1]
Rush current		I _{RUSH}			3.0	A	Rise time	
								470uS

[Note1] V_{CM} : Common mode voltage of LVDS driver.

[Note2] Power On-off sequence



 $50 \,\mu\,\text{s} < \text{T1,T6} \le 10 \,\text{ms}$ $0.5 \,\text{ms} < \text{T2,T5} \le 50 \,\text{ms}$ $200 \,\text{ms} < \text{T3,T4}$ $\text{T7} > 1 \,\text{s}$

[Note3] Maximum current condition; Change to 1x1 dot checker board pattern. V_{DD} =+12V

R G B R G B	: 0 GS	: 255 GS
R G B R G B		
R G B R G B		

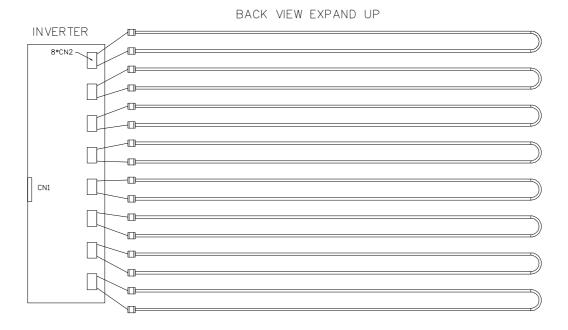
6-2. Backlight driving

The backlight system is a direct-lighting type with $8~\mathrm{U}$ shape CCFT (Cold Cathode Fluorescent Tube).

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

Parameter	Symbol	Min.	Тур.	Max.	Unit	Remark
Lamp current range	$I_{\rm L}$	5.5	6	6.5	mArm	[Note1]
					S	
Lamp voltage	$\mathbf{V}_{\mathbf{L}}$		1000		Vrms	
Lamp power consumption	$\mathbf{P}_{\mathbf{L}}$		6		W	[Note2] IL=mA
Lamp frequency	$\mathbf{F}_{\mathbf{L}}$	42	45	48	kHz	[Note3]
Established starting voltage	Vs		1100	1500	Vrms	Ta=25℃
			1200	1500	Vrms	Ta=0°C [Note4]
Lamp life time	$L_{\rm L}$	50000			hour	[Note5]

[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 startup. Otherwise the lamp may not be turned on.
- [Note5] 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 IL = 6mArms.
 - ① Brightness becomes 50 % of the original value under standard condition.
 - ② Kick-off voltage at $Ta = 0^{\circ}C$ exceeds maximum value.



- [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] The lamp wire length is TBD mm(from AL back cover surface to connector, not including connector length)

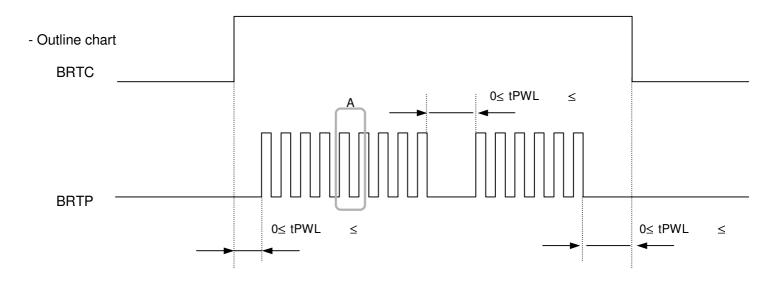
6-3 Backlight inverter

6-3-1. Inverter Electrical Characteristics

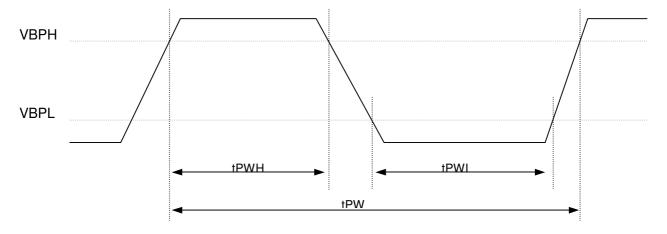
Parameter	Symbol	Min.	Тур.	Max.	Unit	Notes
Power Supply	Vddb	22.8	24	25.2	Vdc	
Input Voltage						
Power Supply	IDDB		3000	3400	mA	
Input Current						
Power	PB		72		W	
Consumption						

6.4 Luminance Controls

Method	Adjustment and Lun	ninanc	e Ratio		PWM Selection	Rema	ırk	
Voltage control	Adjustment – Contin Luminance by adjust		· ·	High/Open for max.				
	ADIM PDIM Lum ratio	0V	1.6V/open	3.3V				
	3.3V	80%	100%	120%				
	0V	\times	20%					
PWM control	Adjustment- The lu	ıminaı	nce is com	trolled k	Эy	GND	See	PWM
	duty ratio of BR	RTP	signal wh	en PWI	M		timin	g
	Selection is GND an	d PW	'M signal i	s inputte	ed			
	into BRTP termial.							
	Duty Ratio	Lumi	nance Rati	0				
	0.2	20%	(minimum)					
	1.0	100%	(maximur	n)				



- Detail of A part



6-5-2. Each parameter

Parameter	Symbol	Min.	Тур.	Мах.	Unit	Notes
Luminance control fequency	FL	150	255	350	Hz	1, 2
Duty Ratio	DL	0.2	-	1.0	-	1, 3
Non signal Period	tPWL	0	-	50	Ms	4

Notes: 1. Definition of parameters is as follows

$$FL = \frac{1}{tPW}$$
 , $DL = \frac{tPWH}{tPW}$

2. See the following formula for luminance control frequency.

Luminance control frequency = tvv X (n+0.25)[or(n+0.72)]

n=1,2,3,....

tvv : See "7.1 Signal timing specification"



7. Timing characteristics of LCD module input signals

7-1. Timing characteristics

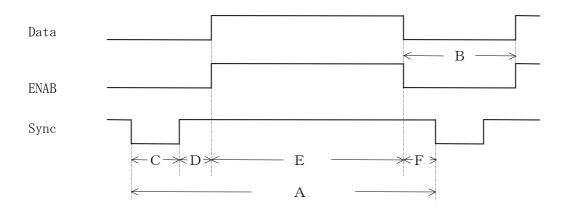
(This is specified at digital outputs of LVDS driver.)

	Symbol		Min	Тур	Max	Unit	Notes
ITIME		_					
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	fH	44	48.54	52	kHz	
Vsync	Frequency	fv	47	60	63	Hz	
	Period	t _{VA}	774	810	-	t _{HA}	
	Width-Active	t_{VC}	2	6	-		
Data	Horizontal back porch	t _{HD}	8	80	-	t _{CLK}	
Enable	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 rate.

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

7-2 Signal Timing Waveform(The time "B" is the on horizontal timing and tye on vertical timing)





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

0. 11	8. Input Signals, Basic Display Colors and Gray Scale of Each Color Data Signal																								
	Colors &											Dа	ta S	oign	aı		1								
	Gray scale	R0	R1	R2	R3	R4	R5	R6	R7	G	G1	G2	G	G	G5	G6	G7	В	В	B	В	B	B	В	В
										0			3	4				0	1	2	3	4	5	6	7
	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
B	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
asic	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
Basic Color	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
ř	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
	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
Gra	Û	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Red	Darker	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cale	Û				,	^							,	١							1	\			
of I	Û				•	ل ا							•	<u>ا</u>							1	<u> </u>			
Red	Bright	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Û	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	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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
G G	仓	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray :	Darker	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sca	仓				/	^							/	^							1	\			
le o	Û				•	ل ا							•	<u>ا</u>							1	/			
Scale of Green	Bright	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
een	D	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	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	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
Gray Scale of Blue	Û	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
/ Sc	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
ale	仓				/	^							/	^							1	\			
of B	Û				•	<u>ا</u>							•	ل ا							1	<u> </u>			
lue	Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	Û	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

9. Optical Characteristics

Ta=25°C, $V_{DD}=+12V$

	1		Г	1	1	1	14-23 C	, v _{DD} =+12 v
Parameter		Symbol	Condition	Min.	Тур.	Max.	Unit	Remark
Viewing	L/R	θ 21, θ 22	CR>10	80	85		Deg.	[Note1,4]
angle	U	θ 11		80	85		Deg.	
range	D	θ 12		80	85		Deg.	
Contrast ratio		CRn	θ =0°	500	600	_		[Note2,4]
Respo	nse time	τ		_	25	_	ms	[Note3,4]
Rise time	e τr				21	_	ms	
Fall time	τ d				4	_	ms	
Gray to g	ary reponse				8	16	ms	
ti	me							
Chromaticity of		Wx		0.245	0.275	0.305		[Note4]
White (CIE 1931)		$\mathbf{W}\mathbf{y}$		0.268	0.298	0.328		
Chromatic	city of	Rx		0.608	0.638	0.668		NTSC 72%
Red (CIE	1931)	Ry		0.305	0.335	0.365		
Chromati	city of	Gx		0.241	0.271	0.301		
Green (CI	E 1931)	Gy		0.567	0.597	0.627		
Chromatic	city of	Bx		0.115	0.145	0.175		
Blue (CIE	1931)	Ву		0.035	0.065	0.095		
Luminan	ce of white	YL		400	500		Cd/m ²	
[N	ote4]							
White U	niformity	δ w		_	-	1.3		[Note5]
Black U	niformity	δв				1.3		[Note5]

[%] The measurement shall be executed 30 minutes after lighting at rating. (typical condition : $I_L = 6mArms$)

The optical characteristics shall be measured in a dark room or equivalent state with the method

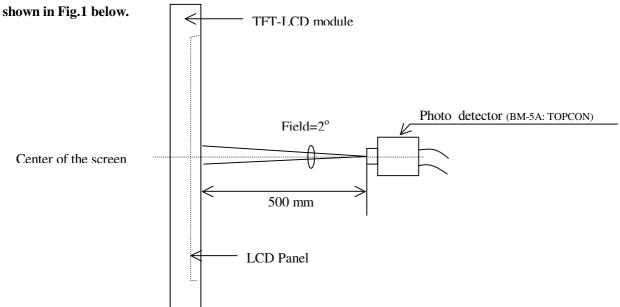
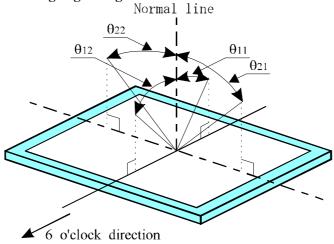


Fig 1. Optical characteristics measurement method

[Note1] Definitions of viewing angle range:



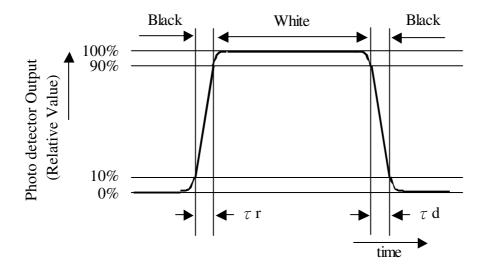
[Note2] Definition of contrast ratio:

The contrast ratio is defined as the following.

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

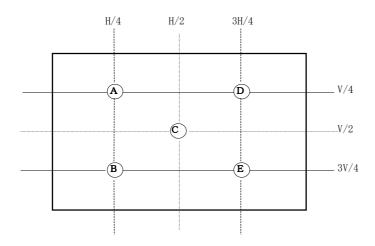
[Note3] Definition of response time:

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 with five measurements



 $\delta_{\mathrm{W,\,B}}$ = Luminance of Center

Luminance (of every point other than center point)

10. Display Quality

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

11. Handling Precautions

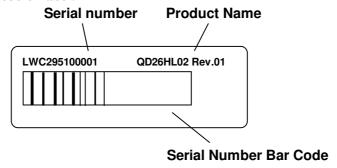
- a) Be sure to turn off the power supply when inserting or disconnecting the cable.
- b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.
- c) Since the front polarizer is easily damaged, pay attention not to scratch it.
- d) Wipe off 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	$Ta = 60^{\circ}C$ 240h
2	Low temperature storage test	Ta =-20℃ 240h
3	High temperature	$Ta = 50^{\circ}C$; 80 %RH 240h
	& high humidity operation test	
4	High temperature operation test	$Ta = 60^{\circ}C$ 240h
5	Low temperature operation test	$Ta = 0^{\circ}C \qquad 240h$
6	Vibration test (non- operating)	Frequency: 10~500Hz, 1.0G, 20 min/each axis
7	Shock test	Gravity : 100G
	(non- operating)	Pulse width: 2ms, half sine wave
		Direction: $\pm X, \pm Y, \pm Z$
		Once for each direction.

13. Others

1) LCD Module 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.

Front View

14. Drawing

