

**Product Specification**

# SPECIFICATION FOR APPROVAL

- ( ) Preliminary Specification  
 (●) Final Specification

<b>Title</b>	<b>2.2" (320XRGBX320) TFT LCD</b>
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BUYER	
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LH220Q32
SUFFIX	FD01

\*When you obtain standard approval,  
 please use the above model name without suffix.

SIGNATURE	DATE
/	_____
/	_____
/	_____

Please return 1 copy for your confirmation with your signature and comments.

APPROVED BY	DATE
C.K. Shin /Manager	_____
<b>REVIEWED BY</b>	
H.S. Ha /Engineer	_____
<b>PREPARED BY</b>	
S.H. Cho /Engineer	_____

**Product Engineering Dept.  
 LG Display Co., Ltd**

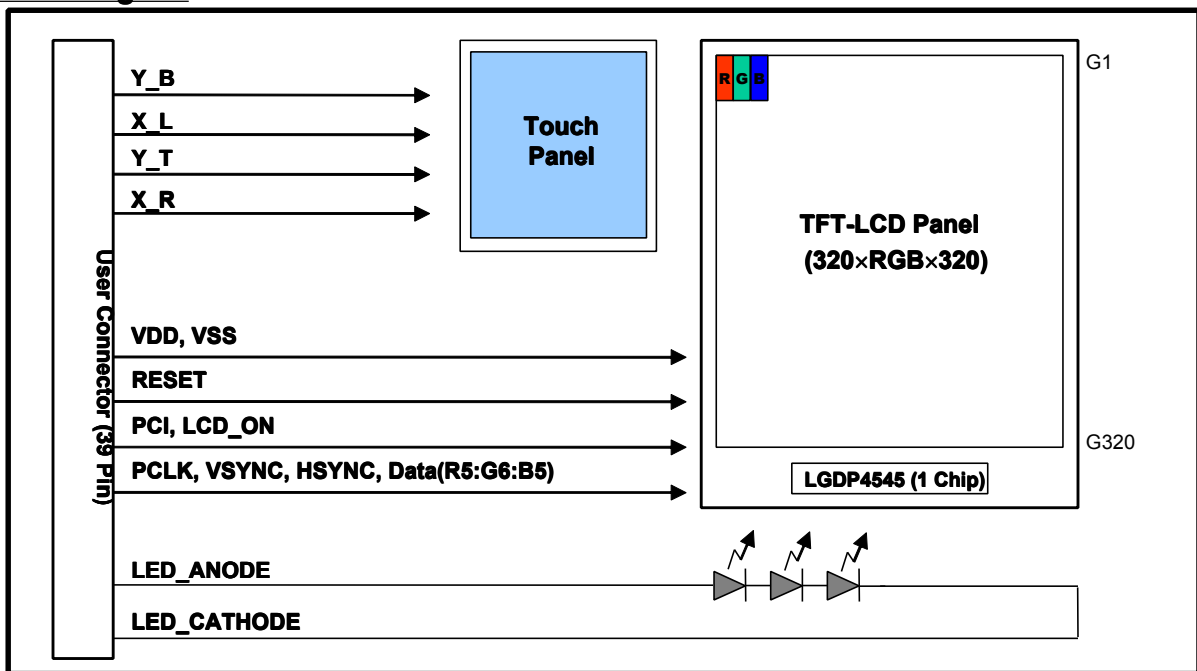




**Product Specification**
**1. GENERAL DESCRIPTION**

The LH220Q33 is a Color Active Matrix Liquid Crystal Display with Light Emission Diode(LED) backlight system. The matrix employs a-Si Thin Film Transistor as the active element.

It is transfective type display operating in the normally white mode. This TFT-LCD has 2.2 inch diagonally measured active display area with (320\*RGB\*320) resolution. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes.

**Block Diagram**


Mating User Connector: Hirose FH23-39S-0.3SHW(05)

**Fig 1.1 Block Diagram of TFT-LCD Module with LED Backlight Unit**

**General Features**

Active screen size	2.2" diagonal
Outline Dimension	47.4 (H) X 51.85 (V) X 3.5 (T) MM (TYP.)
Pixel Pitch	0.123 (H) X 0.123 (V) mm
Pixel format	320(H) X 320 (V) (RGB Stripe)
Color depth	16-bits (R5, G6, B5)
Interface	16-bit RGB I/F
Power Consumption	161mW (typ. BL on), 36mW (typ. BL off)
Luminance	160nit(typ.) @13mA
Viewing Direction	6~7 0'clock
Weight	18 g(typ.)
Surface hardness	3H
LCD Driver	COG 1Chip

**Product Specification**
**2. ABSOLUTE MAXIMUM RATINGS**

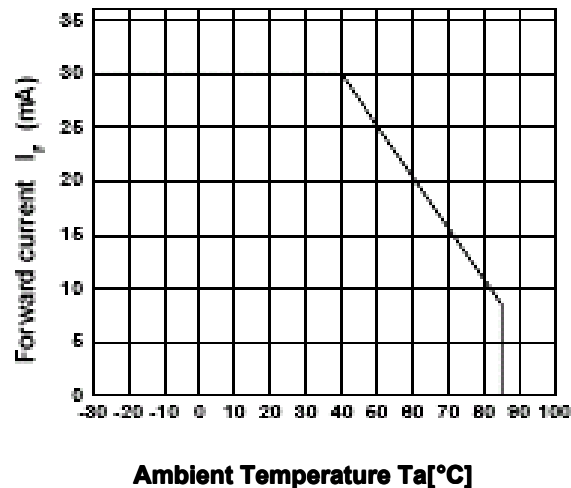
The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

**Table 2.1 Absolute Maximum Ratings**

Parameter	Symbol	Values		Units	Notes
		Min.	Max		
Power Supply Input	$V_{DD}$	-0.3	4.2	V	1
LED Power Consumption	$P_{LED}$	-	120	mW	2
LED Current	$I_{LED}$	-	30	mA	2, 3

Notes:

1. Applies to VDD, RESET, PCLK, HSYNC, VSYNC, LCD\_ON, PCI, Data.
2. Applies to each LED individually.
3. Allowable forward current is refer to Fig 2.1


**Fig 2.1 Ambient Temperature vs. Allowable Forward Current**

**Product Specification**
**3. ELECTRICAL SPECIFICATIONS**
**3-1. ELECTRICAL CHARACTERISTICS**
**Table 3.1 Electrical Characteristics Of TFT-LCD Module**

Parameter	Symbol	Values			Units	Notes
		Min	Typ.	Max		
LCD Power Supply Voltage	$V_{DD}$	2.9	3.0	3.1	V	
"H"Level Input Voltage	$V_{IH}$	$0.8 V_{DD}$	-	$V_{DD}$	V	2
"L"Level Input Voltage	$V_{IL}$	0	-	$0.2V_{DD}$	V	2
Current Consumption, Panel	Ivdd		12	19.5	mA	1

Notes:

- The specified current consumption are under the conditions at  $V_{DD} = 3.0V$ ,  $T_a = 25^{\circ}C$ , and  $f_v = 54$  Hz, 16 gray steps is displayed and  $f_v$  is the frame frequency.
- Input mode of Data, PCLK, HSYNC, VSYNC, LCD\_ON, PCI, RESET.

**3-2. BACK LIGHT UNIT**

The edge-lighting type of back light unit consists of 3 LEDs which is connected in serial.

**Table 3.2 Electrical Characteristics Of Back Light Unit**

Parameter	Symbol	Values			Units	Notes
		Min	Typ.	Max		
LED Current	$I_{LED}$	-	13	30	mA	
LED Forward Voltage	$V_{LED}$	-	9.6	10.5	V	
LED Power Consumption	$P_{LED}$	-	125	137	mW	

**3-3. TOUCH PANEL**
**Table 3.3 Touch Panel Electrical and Optical Specifications (GND=0V,  $T_a = 25^{\circ}C$ )**

Parameter	Min.	Typ.	Max.	Unit	Remarks
Linearity	-1.5	-	1.5	%	
Terminal Resistance	100	-	1100	$\Omega$	X-axis
	100	-	1100	$\Omega$	Y-axis
Insulation Resistance	20	-	-	$M\Omega$	DC 25V
Voltage	-	5	7	V	DC
Chattering	-	-	20	ms	DC 5V, 100k $\Omega$
Transparency	78	80	-	%	

**Product Specification**
**3-4. INTERFACE CONNECTIONS**

The pin connections are provided in Table 3.3 The mating connector for the flex tail is Hirose FH23-39S-0.3SHW(05) Or equivalent.

**Table 3.4 Module Connector Pin Configuration**

<b>Pin</b>	<b>SYMBOL</b>	<b>I/O, Power, Analog</b>	<b>Comment</b>
1	Y_Bottom	Analog	Touch Panel Y-Bottom
2	X_Left	Analog	Touch Panel X-Left
3	Y_Top	Analog	Touch Panel Y-Top
4	X_Right	Analog	Touch Panel X-Right
5	RESET	I	LCD Reset
6	PCI	I	Power Control In
7	Vss	Power	Ground reference (0V)
8	PCLK	I	Pixel Clock
9	Vss	Power	Ground reference (0V)
10	HSYNC	I	Horizontal Sync Signal
11	VSYNC	I	Vertical Sync Signal
12	Vss	Power	Ground reference (0V)
13	R5	I	Red Data
14	R4	I	Red Data
15	R3	I	Red Data
16	R2	I	Red Data
17	R1/ID1	I/O	Red Data / ID Bit 1
18	Vss	Power	Ground reference (0V)
19	G5	I	Green Data
20	G4	I	Green Data
21	G3	I	Green Data
22	G2	I	Green Data
23	G1	I	Green Data
24	G0	I	Green Data
25	Vss	Power	Ground reference (0V)
26	B5	I	Blue Data
27	B4	I	Blue Data
28	B3	I	Blue Data
29	B2	I	Blue Data
30	B1/ID2	I/O	Blue Data / ID Bit 2
31	LCD_ON	I	Switches LCD on (active low)
32	LED_Anode	I	LED Anode
33	LED_Cathode	I	LED Cathode
34	Vss	Power	Ground reference (0V)
35	VDD	Power	Digital Power Supply (3.0V)
36	Vss	Power	Ground reference (0V)
37	Vss	Power	Ground reference (0V)
38	Vss	Power	Ground reference (0V)
39	Vss	Power	Ground reference (0V)

**Product Specification**
**3-5. SIGNAL TIMING SPECIFICATIONS**
**Table 3.5 Timing Parameters**

Item	Symbol	Minimum	Typical	Maximum	Unit	Note
Input clock voltage	V <sub>IL</sub>	-0.3	0	0.2*VDD	V	
	V <sub>IH</sub>	0.8*VDD	-	VDD	V	
Vertical frequency	f <sub>v</sub>	50.5	54.1	57.8	Hz	
Horizontal frequency	f <sub>h</sub>	17.0	18.1	19.2	KHz	
PCLK frequency	f <sub>tch</sub>	6.25	6.5	6.75	MHz	
PCLK pulse width	t <sub>clk</sub>	148	154	160	ns	
PCLK Low/High pulse width	PW <sub>DL</sub> , PW <sub>DH</sub>	32	0.5t <sub>clk</sub>	-	ns	
PCLK cycle time	t <sub>CYCD</sub>	80	-	-	ns	
Hsync low pulse width	t <sub>hsw</sub>	4	5	8	dots	
Vsync low pulse width	t <sub>hsw</sub>	1	1	4	line	
Hsync setup time	t <sub>SYNCS</sub>	20	-	-	ns	
Hsync hold time	t <sub>SYNCH</sub>	20	-	-	ns	
Data setup time	t <sub>PDS</sub>	20	-	-	ns	
Data hold time	t <sub>PDH</sub>	20	-	-	ns	
Number of Horizontal		352	360	368	dots	
Horizontal blanking period	t <sub>hblk</sub>	32	40	48	clk	
Hsync falling edge → 1 <sup>st</sup> data start	t <sub>hbp</sub>	-	24.5	-	dots	
Hsync front porch	t <sub>hfp</sub>	7.5	15.5	23.5	dots	
Number of vertical		332	334	336	line	
Vertical blanking period	t <sub>vblk</sub>	12	14	16	line	
Vsync falling edge → 1 <sup>st</sup> data start	t <sub>vbp</sub>	-	8	-	line	
Vsync front porch	t <sub>vfp</sub>	4	6	8	line	
Vsync falling edge → Hsync falling edge	t <sub>vhde</sub>	-5	-4	100	clk	
Fast clock rise time	t <sub>rgbr</sub>	-	-	25	ns	1
Fast clock fall time	t <sub>rgbf</sub>	-	-	25	ns	1
Slow clock rise time	t <sub>rsclk</sub>	-	-	100	ns	2
Slow clock fall time	t <sub>fsclk</sub>	-	-	100	ns	2

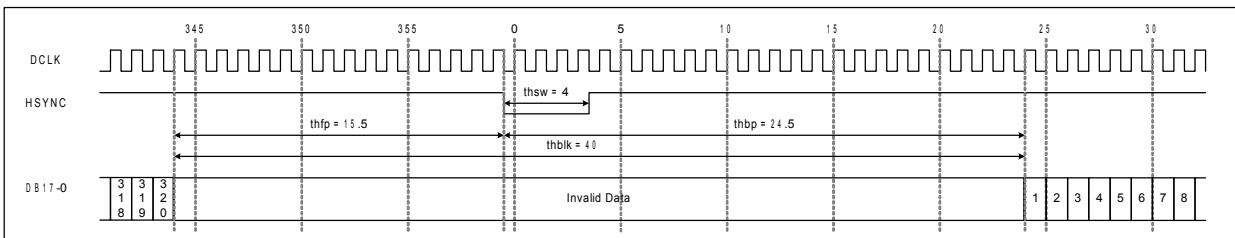
Notes: 1. PCLK, VSYNC, HSYNC  
2. LCD\_ON, PCI



**Product Specification**

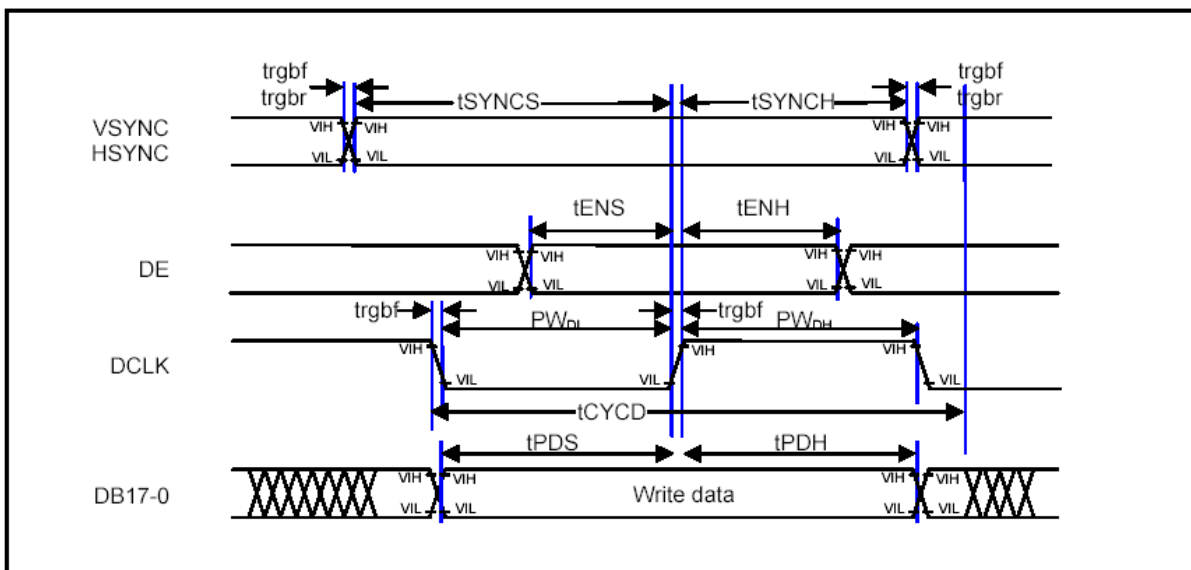
3-6. SIGNAL TIMING WAVEFORMS

**Fig 3.1 Horizontal Timing chart**



**Fig 3.2 Vertical Timing chart**

**Fig 3.3 Timing Characteristics**



**Product Specification**
**3-7. COLOR INPUT DATA REFERENCE**

Display Colors		Data Signal															
		R 5	R 4	R 3	R 2	R 1	G 5	G 4	G 3	G 2	G 1	G 0	B 5	B 4	B 3	B 2	B 1
Basic Color	Black	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	1	1	1	1	1
	Green	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0
	Cyan	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red Gray Scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker ↑ ↓	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Brighter ↓	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
		1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Green Gray Scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker ↑ ↓	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Brighter ↓	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0
		0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
Green	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	
Blue Gray Scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker ↑ ↓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Brighter ↓	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1
		0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0
Blue	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	

**Product Specification**
**4. OPTICAL CHARACTERISTICS**
**4-1. Optical Characteristics – Backlight Off**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Viewing angle range	ΘUP	CR ≥ 2	60	75	-	°(degree)	Note 3
	ΘDOWN					°(degree)	Note 3
	ΘLEFT		50	65	-	°(degree)	Note 3
	ΘRIGHT					°(degree)	Note 3
Contrast ratio	CR	Optimal	3	5	-		Note 2 (Spot light)
Reflectivity	R	Optimal	2.5	3.5	-	%	Note 1 (Diffuse light)
Response time	$\tau_f + \tau_r$	Θ = 0 ° Ta = 25 °C	-	40	60	ms	Note 4
White Chromaticity	Wx		0.290	0.325	0.360	CIE	Note 1 (Diffuse light)
	Wy		0.318	0.353	0.388	CIE	

1. Optical Test Equipment & method refer to Note1,2,3,4.

**Product Specification**
**4-2. Optical Characteristics – Backlight On**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Viewing angle range	ΘUP	CR ≥ 5	25	40		°(degree)	Note 3
	ΘDOWN		35	50		°(degree)	Note 3
	ΘLEFT		60	90		°(degree)	Note 3
	ΘRIGHT					°(degree)	Note 3
Contrast ratio	CR	Optimal	100	120		--	Note 2
Brightness	Y	I <sub>LED</sub> =13mA	110	160		cd/m <sup>2</sup>	Note 1 [PR880]
Brightness Uniformity	Y	I <sub>LED</sub> =13mA	80			%	Note 5 [PR880]
Backlight Power Consumption	P <sub>LED</sub>	I <sub>LED</sub> =13mA		125		mW	
Response time	τ <sub>f</sub> + τ <sub>r</sub>	Θ = 0 ° Ta = 25 °C		35	50	ms	Note 4
White Chromaticity	Wx	Θ = 0 ° Ta = 25 °C	0.240	0.290	0.340		Note 1 [PR650]
	Wy		0.263	0.313	0.363		
Red Chromaticity	Rx		0.528	0.578	0.628		
	Ry		0.289	0.339	0.389		
Green Chromaticity	Gx		0.254	0.304	0.354		
	Gy		0.494	0.544	0.594		
Blue Chromaticity	Bx		0.099	0.149	0.199		
	By		0.068	0.118	0.168		
Color Gamut	NTSC		45			%	

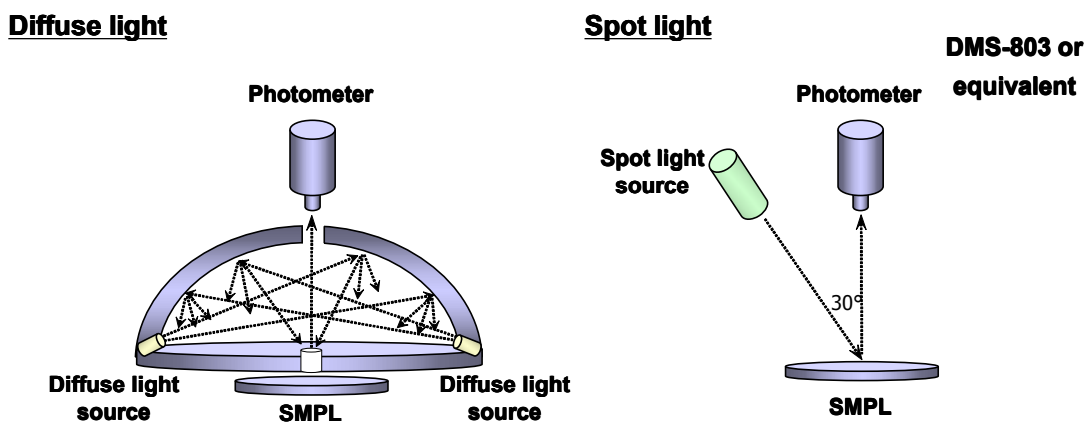
1. Optical Test Equipment & method refer to Note1,2,3,4.

**Product Specification**

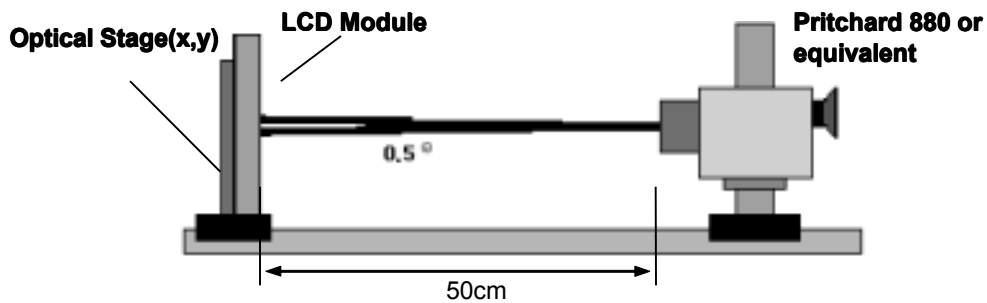
[Note 1] Optical Test Equipment Setup

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface. In case of backlight on, measured on the center area of the panel by PHOTO RESEARCH photometer PR-880&PR650 or Equivalent.

In case of backlight off, measured on the center area of the panel by DMS-803



**Fig 4.1 Backlight Off (Optical Characteristic Measurement Equipment and Method)**



**Fig 4.2 Backlight On (Optical Characteristic Measurement Equipment and Method)**

**Product Specification**

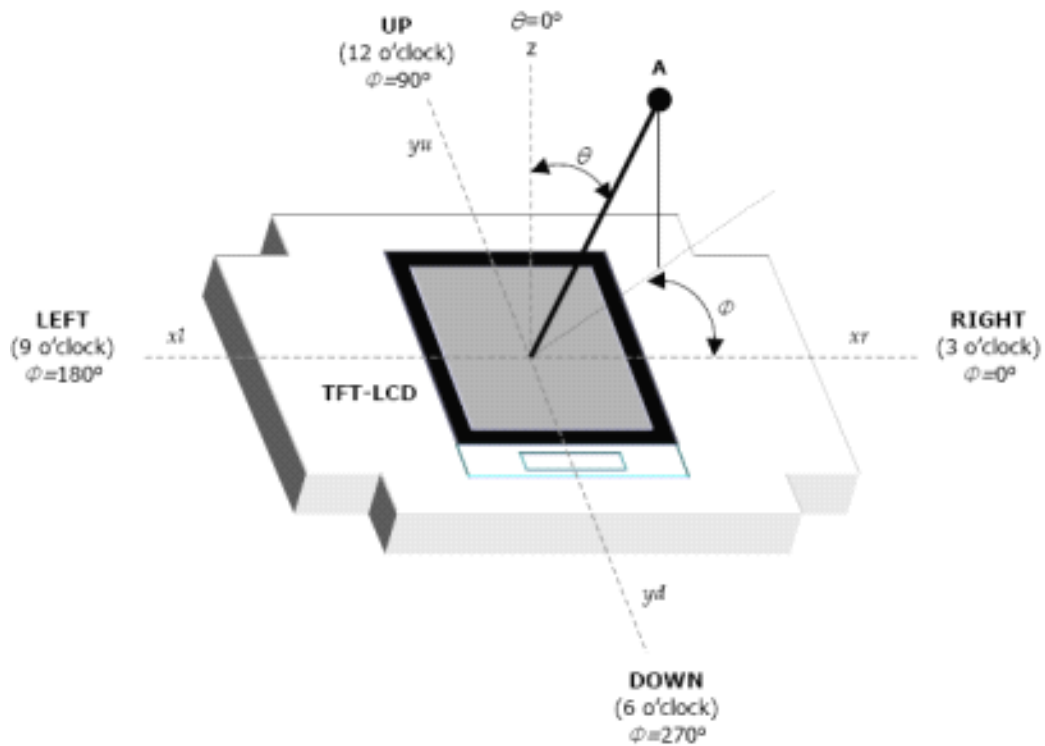
[Note 2]

Contrast ratio is defined as follows ;

$$\text{Contrast Ratio(CR)} = \frac{\text{Photo detector output with LCD being "white"}}{\text{Photo detector output with LCD being "black"}}$$

[Note 3]

Viewing angle range is defined as follows;

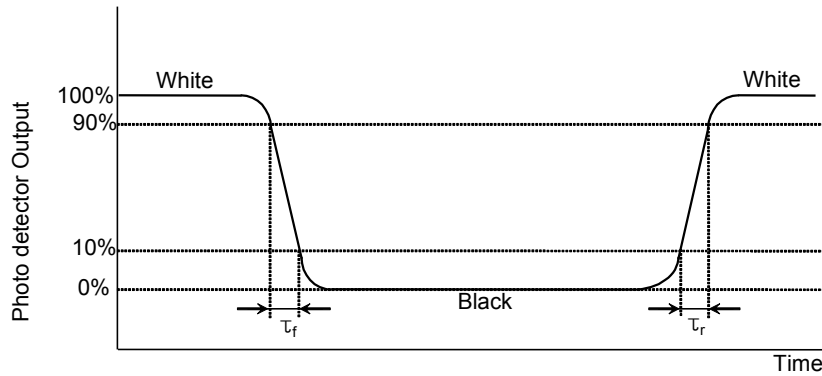


**Fig 4.3 Viewing Angle Definitions**

**Product Specification**

[Note 4]

Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area “black” to and from “white”.

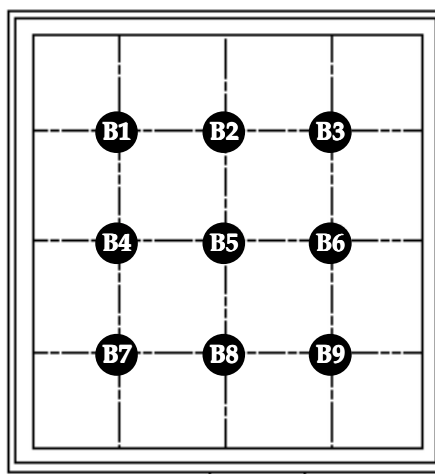


**Fig 4.4 Response Time Definition**

[Note 5]

The brightness measurement is taken at point B5.

$$\text{Brightness Uniformity} = \frac{\text{Minimum Photo detector output for B1-B9 with all pixels white}}{\text{Maximum Photo detector output for B1-B9 with all pixels white}} \times 100$$



**Fig 4.5 Brightness measurement points**

**Product Specification****5. MECHANICAL CHARACTERISTICS**

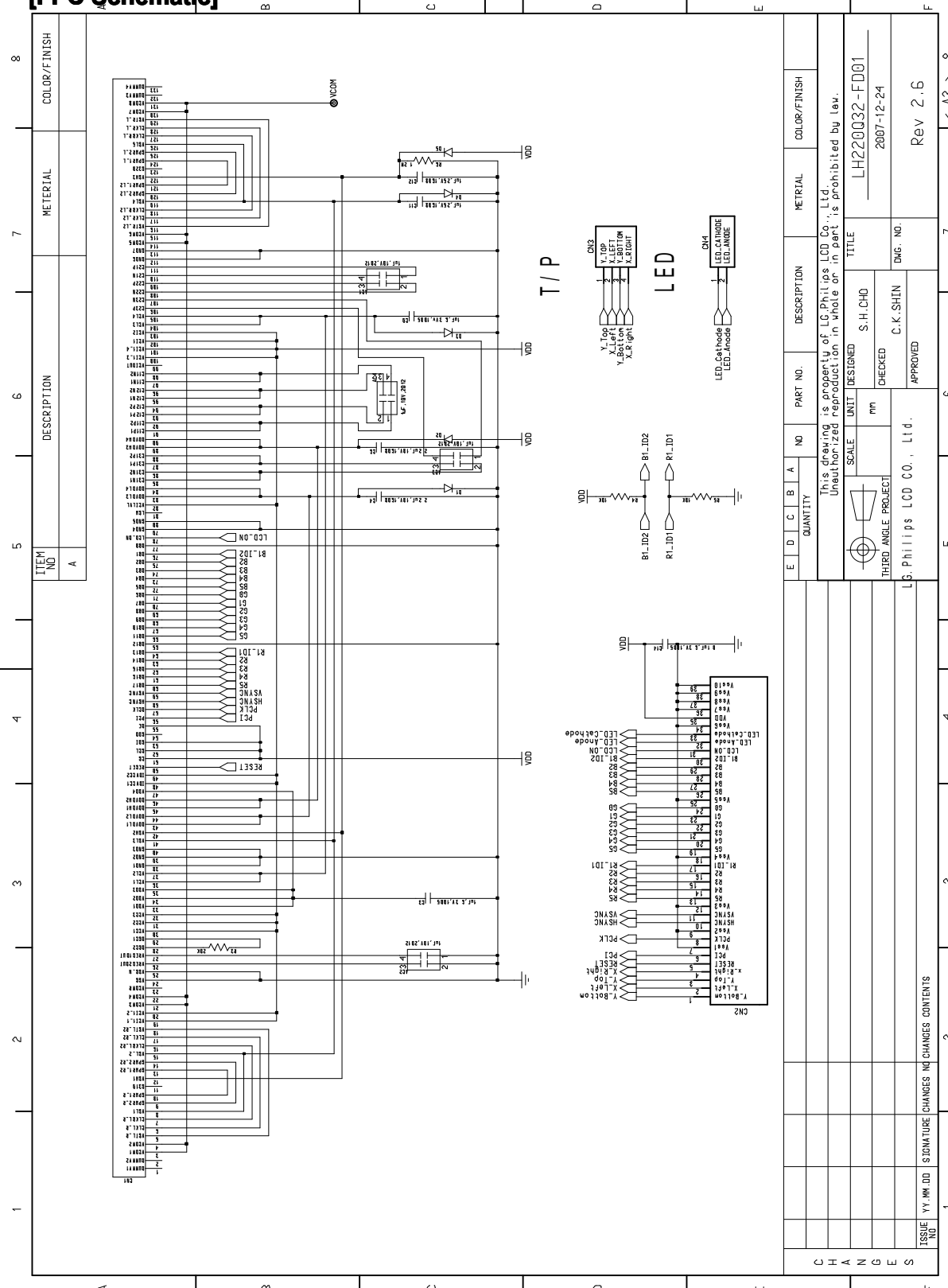
The contents provide general mechanical characteristics for the model LH220Q33.  
In addition the figures in the next page are detailed mechanical drawing of the LCD.

<b>DIMENSION</b>	<b>MIN</b>	<b>TYP</b>	<b>MAX</b>	<b>UNIT</b>
HORIZONTAL (H)	47.2	47.4	47.6	MM
VERTICAL (V)	51.65	51.85	52.05	MM
THICKNESS (T)	-	3.5	3.8	MM





# [FPC Schematic]



ITEM NO	DESCRIPTION	MATERIAL	COLOR/FINISH
A			

QTY	UNIT	SCALE	DESIGNED	CHECKED	APPROVED	DATE	REV
1	mm		S.H.CHO	C.K.SHIN		2007-12-24	2.6

This drawing is property of LG Philips LCD Co., Ltd. Unauthorized reproduction in whole or in part is prohibited by law.

LG Philips LCD CO., Ltd.  
 THIRD ANGLE PROJECT  
 TITLE: LH22032-FD01  
 DWG. NO.: 2007-12-24  
 Rev 2.6

ISSUE NO: YY-MM-DD SIGNATURE CHANGES NO CHANGES CONTENTS

**6. POWER SUPPLY & Display SEQUENCE**

**[ Power-up Sequence ]**

**Fig 6.1 Power-up Sequence**

**[ Power-down Sequence ]**

**Fig 6.2 Power-down Sequence**

**Product Specification**
**[ Power-up/down Sequence Timing Condition]**

<b>Symbol</b>	<b>Minimum</b>	<b>Typical</b>	<b>Maximum</b>	<b>Unit</b>	<b>Remarks</b>
TS0	4	-	200	ms	
TR1	2	-	5	frame	2-5 frames
TR2	2	-	5	frame	2-5 frames
TR3	2.5	-	5	frame	2.5-5 frames
TR4	2	-	5	frame	2-5 frames
TS4	17.2	-	59.4	ms	
TS5	100	-	-	ms	

**Table 6.1 Power-up/down Sequence Timing Conditions**

**Product Specification**
**7. RELIABILITY TEST**
**7-1. RELIABILITY TEST**

No.	Test Items	Test Condition	Remark
1	Low Temperature Storage	Ta=-30℃ 240hrs	
2	High Temperature Storage	Ta=70℃ 240hrs	
3	Low Temperature Operation	Ta=-10℃ 240hrs	
4	High Temperature Operation	Ta=60℃ 240hrs	
5	High Temperature and High Humidity Operation	Ta=40℃ 95%RH 240hrs	
6	High temperature and Humidity Storage	Ta=60℃ 90%RH 240hrs	
7	Low Pressure Non-operating	303hpa(40,000ft), RT, 48hrs	
8	Heat Shock	-30C to +70C, 10 cycles, 1.5h	
9	Shock Test	Half sine wave, 180G, 2ms, 1 time shock of X, Y, Z axis	
10	Vibration Test	- X, Y, Z : 1hr(axis, sweep) - Acceleration : 10mm/4.4G/2.5G the amplitude is 10mm - Sweep range: 5~15Hz/10mm P-P/ 16~30Hz/4.4G, 30~300Hz/2.5G	

{ Result Evaluation Criteria }

TFT-LCD Panel should be at room temperature for 2 hours after the reliability test is over.

There should be no particular change which might affect the practical display function and the display quality should be conducted under normal operating condition.

**Product Specification**
**7-2. TOUCH PANEL RELIABILITY TEST**

PARAMETER	MIN.	TYP.	MAX.	UNIT	REMARK
Activation force	-	15	80	g	R0.8mm polyacetal Pen or Finger
Durability (Surface scratching)	200,000 cycles			-	Note 1
Durability (Surface pitting)	1,000,000			Touches	Note 2
Surface hardness	3	-	-	H	Judgment ref.JIS-K5400

[Note 1] Measurement for Surface area

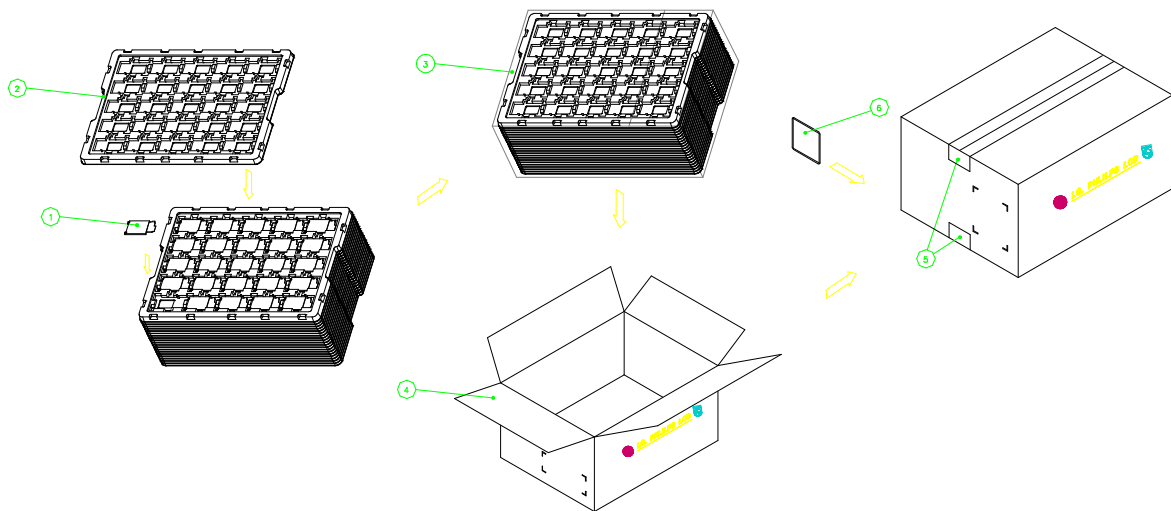
- Force : 250gf
- Speed : 60mm/sec
- Stylus : R0.8 poly- acetal resin
- Judgment  
Terminal Resistance : According to section 3-3  
Linearity : According to section 3-3

[Note 2] Pit 1,000,000 times on the Film with a R0.8 Poly- acetal resin

- Force : 250gf
- Frequency : 60 cycles/min.
- Judgment  
Terminal Resistance : According to section 3-3  
Linearity : According to section 3-3

**Product Specification**
**8. PACKING**

- a) Package quantity in one box : 320 pcs
- b) Box Size : 475mm X 348mm X 210mm
- c) 1Box = 20(Full tray) + 1 (dummy / top tray) = 21 tray



NO.	Description	Material
1	Module	
2	Packing, tray	PET(0.8t)
3	Bag	PE 560x830
4	Box	SWR4
5	Tape	OPP 70MMx300m
6	Label	Art Paper 100x70

**Product Specification****9. PRECAUTIONS**

Please pay attention to the following when you use this TFT LCD module.

**9-1. ASSEMBLY PRECAUTIONS**

- (1) Please attach a transparent protective plate to the surface in order to protect the polarizer.  
Transparent protective plate should have sufficient strength in order to resist external force.
- (2) You should adopt radiation structure to satisfy the temperature specification.
- (3) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- (4) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.  
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics deteriorate the polarizer.)
- (5) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
- (6) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (7) Do not open the case because inside circuits do not have sufficient strength.
- (8) The metal case of a module should be contacted to electrical ground of your system.

**9-2. OPERATING PRECAUTIONS**

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :  
 $V = \pm 200\text{mV}$  (Over and under shoot voltage)
- (2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- (3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)  
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
- (4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.



**Product Specification****9-3. ELECTROSTATIC DISCHARGE CONTROL**

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

**9-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE**

Strong light exposure causes degradation of polarizer and color filter.

**9-5. STORAGE**

When storing modules as spares for a long time, the following precautions are necessary.

- (1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- (2) The polarizer surface should not come in contact with any other object.  
It is recommended that they be stored in the container in which they were shipped.

**9-6. HANDLING PRECAUTIONS FOR PROTECTION FILM**

- (1) When the protection film is peeled off, static electricity is generated between the film and polarizer.  
This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- (2) The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer.  
Please carefully peel off the protection film without rubbing it against the polarizer.
- (3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- (4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

**Product Specification****10. International Standards****10-1. Safety**

- a) UL 60950-1:2003, First Edition, Underwriters Laboratories, Inc., Standard for Safety of Information Technology Equipment.

**10-2. EMC**

- a) ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHz to 40GHz." American National Standards Institute(ANSI), 1992
- b) CISPR22 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." International Special Committee on Radio Interference.
- c) EN 55022 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." European Committee for Electrotechnical Standardization.(CENELEC), 1998 ( Including A1: 2000 )