SPECIFICATION

FOR

TFT LCD MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HG MODEL : HG133FH025

☐ **Preliminary Specification**

■ **Final Specification**

Customer Confirmation column: Approved by :_____Dept. :_____Data :_____ Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

Designed by	Checked by	Approved by

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1.0 GENERAL DESCRIPTION

1.0.1 Introduction

HG133FH025 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 13.3 inch diagonally measured active area with Full-HD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7 M colors.

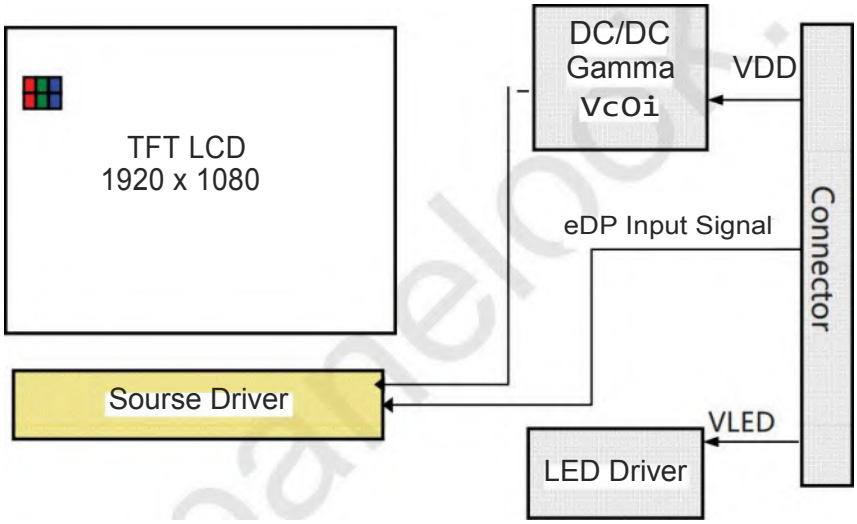

Figure 1. Drive Architecture

1.0.2 Features

O 2 lane eDP interface with 2.7Gbps link rates
O Thin and light weight
O 16.7M color depth, color gamut 83%»

1.0.3 Application

6 Video Phone/IP Phone/Smart Key/ e-cigarettes etc.

1.0.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	293.76 (H) x 165.24 (V)	mm	
Number of pixels	1920 (H) 1080 (V)	Pixels	
Pixel pitch	0.153 (H) X 0.153 (V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M	Colors	8Bit
Display mode	Normally Black		
Dimensional outline /	300.2 (H) x 178.3(V) x 2.8(D) typ.		
Weight	TBD	g	
Surface treatment	FineAG		

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Environment Absolute Maximum Ratings> [Ta =2512 ”C]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Back-light Power Supply Voltage	HV_DDOUT			V	Ta = 25 °C Note 1&2
Back-light LED Current	'HVDD	-	-	A	
Back-light LED Reverse Voltage	V_R			V	
Operating Temperature	T	-20	70	C	Environment Temperature
Storage Temperature	T_{ST}	-30	80	”C	
Operating Ambient Humidity	Hop	-	90	9oRH	
Storage Humidity	Hst		90	°oRH	
Heat Release Requirement	Tds	15		℃	Note3 仅适用于Q/Single/FOG出货项

Note:
1. These range above is maximum value not the actual operating temperature . Actual Operating temperature is no more than 50”C and temperature refers to the LCM surface temperature ;
2.HG is not responsible for product problems beyond the use conditions.
3.When the ambient temperature is T ”C, the surface temperature of Panel can not exceed (T+15)”C.

3.0 ELECTRICAL SPECIFICATIONS

3.1 TFT LCD Module

< Table3. LCD Module Electrical Specifications > [Ta =2512 ”C]

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	V_{DD}	3.0	3.3	3.6	V	Note 1
Power Supply Current	I_{DD}	-	200	300	mA	
LED Driver Power Supply Voltage	H_{VDD}	2.7		24	V	
LED Driver Power Supply Current	I_{HVDD}	-	20	-	mA	
LED Power Consumption	P_{LED}	-	TBD	-	W	
Positive-going Input Threshold Voltage	$V_{,+}$	-		+100	mV	
Negative-going Input Threshold Voltage	$V_{,T}$	-100		-	mV	
Differential input common mode voltage			TBD		V	V_{com}

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.3V at 25 ”C
Max value at Black Pattern

2. Calculated value for reference I_{LED} * V_{LED} 0.85 = P_{LED}

3.2 Back-light Unit

< Table 4. LED Driving guideline specifications > Ta=25+/-2°C

Parameter			Min.	Typ.	Max.	Unit	Remarks
Power supply voltage for Back light		V_{LED}	5	-	37	V	
Power supply Current for Back light		I_{LED}	6	-	25	mA	
Power supply for Back light		P_{LED}	0.18		5.55	W	Note 1
EN Control Level	Backlight on	V_{ENH}	1.2			v	EN logic high voltage
	Backlight off	V_{ENL}			0.6	V	EN logic low voltage
PWM Control Level	PWM High Level	V_{PML}	1.2		5.0	V	
	PWM Low Level	V_{PML}	0		0.6	V	
PWM Control Duty Ratio	Frequency	F_{PWM}	100		2000	Hz	
			1		100	%	

Notes : 1. Calculator Value for reference I_{LED} * V_{LED} " P_{LED}

2. The LED Life-time define as the estimated time to 50% degradation of initial luminous under the condition of the ambient temperature of 25”C .

4.0 INTERFACE CONNECTION.

4.0.1 Electrical Interface Connection

The electronics interface connector is IS050-L30B-C10.
The LED connector is MSK24022P10D
The connector interface pin assignments are listed in Table 5 and 6.

<Table 5. Pin Assignments for the Interface Connector>

PIN #	Symbol	Description Remark	PIN #	Symbol	Description Remark
1	CABC-EN	CABC-EN	16	GND	Power Ground
2	GND	Power Ground	17	HPD	Hot plug detect output
3	LANE1-N	eDP RX channel 1 negative	18	BL-GND	Power Ground
4	LANE1-P	eDP RX channel 1 positive	19	BL-GND	Power Ground
5	GND	Power Ground	20	BL-GND	Power Ground
6	LANE0-N	eDP RX channel 0 negative	21	BL-GND	Power Ground
7	LANE0-P	eDP RX channel 0 positive	22	BL-ENABLE	BL-ENABLE
8	GND	Power Ground	23	BL-PWM	Reset low active
9	AUX-CH-P	eDP AUX CH positive	24	MSCL	FOR DEBUG
10	AUX-CH-N	eDP AUX CH negative	25	MSDA	FOR DEBUG
11	GND	Power Ground	26	BL-POWER	BL-POWER
12	LDC-VCC	3.3V	27	BL-POWER	BL-POWER
13	LCD-VCC	3.3V	28	BL-POWER	BL-POWER
14	LCD-TEST	Panel self test enable	29	BL-POWER	BL-POWER
15	GND	Power Ground	30	NC	NC

PIN	Symbo	Description Remark	PIN #	Symbol	Description Remark
1	LEDI	LED—	6	LED6	LED—
3	LED3	LED—	8		
4	LED4	LED—	9	VLEDOUT	VLEDO UT
5	LED5	LED—	10		

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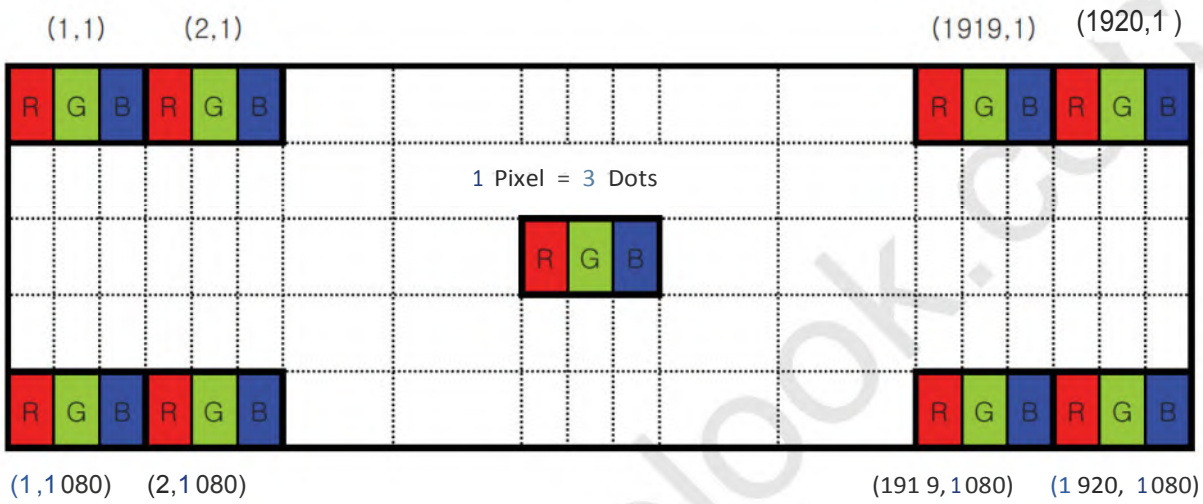
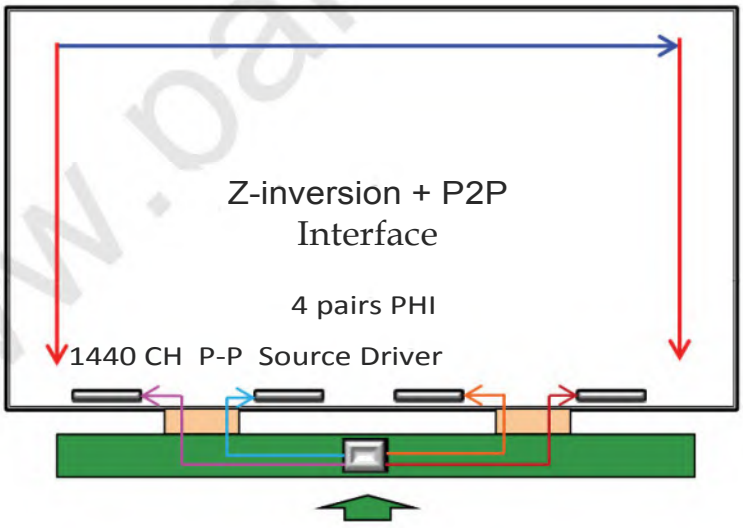
4.2 DataInput Format

Figure 2. Pixel Format



Display Position of Input Data (V-H)

Figure 3. Scan direction



eDP 1.2 2.7Gbps
Input

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5.0 SIGNAL TIMING SPECIFICATION

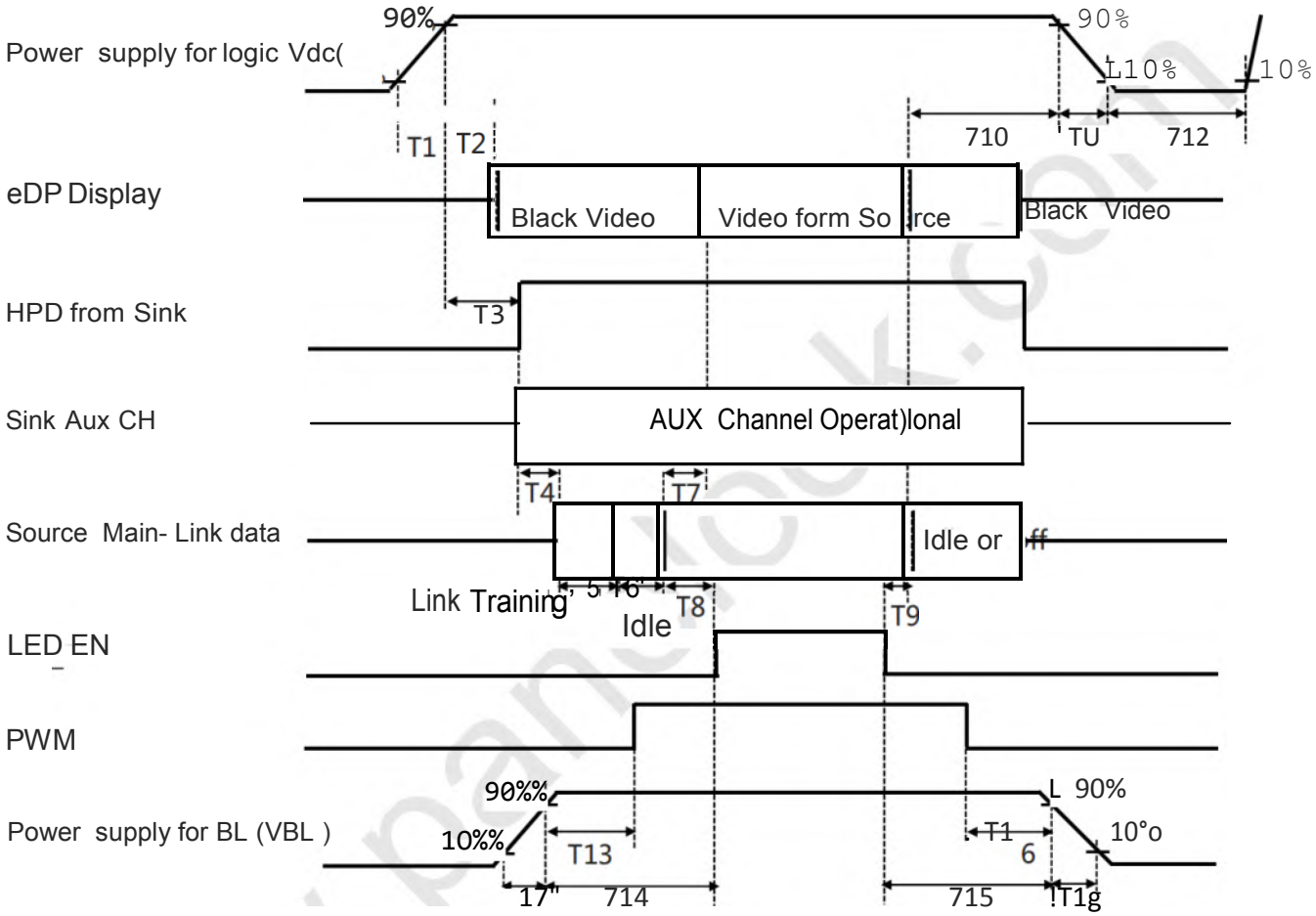
5.0.1 HG133FH025 is operated by the DE only.

Item		Symbols	Min	Typ	Max	Unit
CIOCk	Frequency	1/Tc	100	147.8	160	MHz
	High Time	Tch		4/7Tc		Tc
	Low Time	Tel		4/7Tc		Tc
Frame Period		Tv	1112	1125	1238	lines
			40	60	66	Hz
			25	16.67	15.15	ITIS
VerticalDisplay Period		Tvd		1080		lines
One line Scanning Period		Th	2080	2200	2400	clocks
Horizontal Display Period		Thd		1920		clocks

Note: The DCLK range at last line of V-blanking should be set in 0-H-active/2.

6.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



- 0.5ms 71 10 ins
- Oms < 72 < 200 ms
- Oms 73 200 ins
- Oms < 713
- Oms 714
- Oms 717
- 80ms 78

- Oms < 77 < 5Oms
- Oms < 710 < SOOms
- O.5ms < 711 < 10 ms
- 5OOms < 712
- Oms < 715
- Oms < 716
- Oms < 718

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

7.0 OPTICAL SPECIFICATION

7.0.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance :L 1lux and temperature = 2512”C) with the equipment of Luminance meter system (Goniometer system and TOPCON CS2000/CA310) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of 0 and 6 equal to 0°. We refer to 00=0 (=03) as the 3 o’clock direction (the “right"), 0 0=90 (= 012) as the 12 o’clock direction (“upward"), 0 0=180 (= 09) as the 9 o’clock direction (“left") and 0 0=270(= 06) as the 6 o’clock direction (“bottom"). While scanning 0 and/or 0, the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity (etc) should be tested by CS2000/CA310. The backlight should be operating for 10 minutes prior to measurement. VDD shall be 3.3 1 0.3V at 25°C. Optimum viewing angle direction is 6 ’clock

<Table 7. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ21 θ22	CR＞10	80	85	-	Deg.	
	Vertical	θ11		80	85	-	Deg.	
		θ12		80	85		Deg.	
Contrast ratio		CR		600	800	-	-	
Transmittance		Tr		3.85	4.2		%	
Response time		T_r+T_d		-	25	35	ms	
Chromaticity of white		x		0.283	0.313	0.343	-	
		y		0.299	0.329	0.359	-	
Chromaticity of red		x		0.6303	0.6603	0.6903	-	
		y		0.2786	0.3086	0.3386	-	
Chromaticity of green		x		0.2606	0.2906	0.3206	-	
		y		0.6327	0.6527	0.6827	-	
Chromaticity of blue		x		0.1079	0.1379	0.1679	-	
		y		0.0419	0.0719	0.109	-	
NTSC ratio		%		80	83	-	%	
Luminance of white		Y_{LI}		450	500	-	cd/m^2	
TC:				-	6500	7000	k	

Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2 Contrast measurements shall be made at viewing angle of @= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

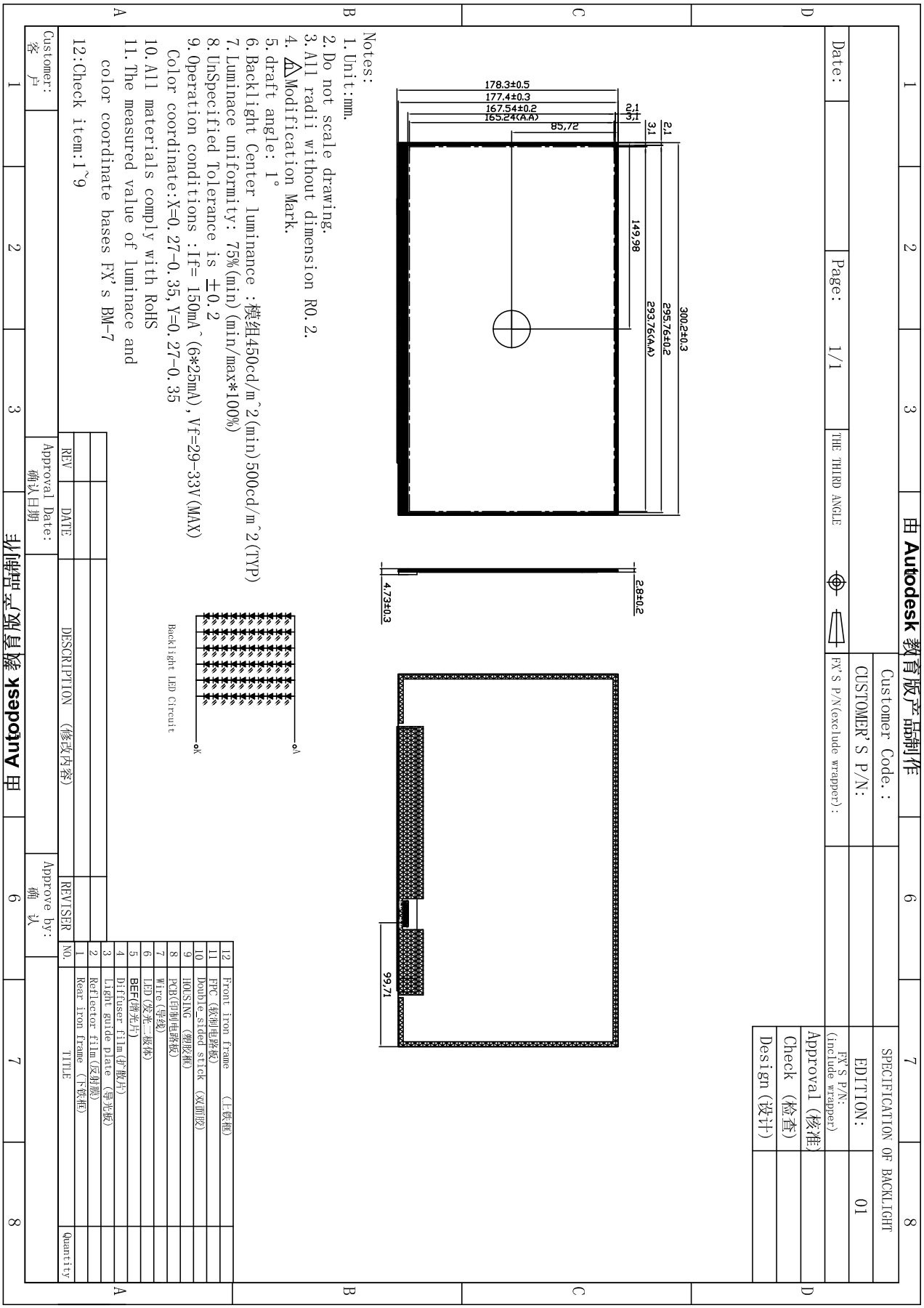
$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Luminance of white is defined as luminance values of center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display. The luminance is measured by CS2000/CA310 when the LED current is set at 60mA.

4. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

5. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

8.0 MECHANICAL OUTLINE DIMENSION



9.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

<Table 8. Reliability test>

No	Test Items	Conditions	Remark
1	High temperature storage test	Ta = 80‘ C , 60% RH, 240 hrs	
2	Low temperature storage test	Ta = -30‘ C , 240 hrs	
3	High temperature & high humidity operation test	Ta = 60‘ C , 80% RH, 240 hrs	
4	High temperature operation test	Ta = 70‘ C , 60% RH, 240 hrs	
5	Low temperature operation test	Ta = -20‘ C , 240 hrs	
6	Thermal shock	Ta = -20 C - 60 "C (0.5 hr), 60% I 3%RH, 100 cycle	
7	Vibration test (non-operating)	Ta = 25‘ C , 60% RH, 1.5G, 10=500Hz, Sine X,Y,Z / Sweep rate : 1 hour	Note 1
8	Shock test (non-operating)	Ta = 25‘ C , 60%«RH, 220G, Half Sine Wave 2msecI X,I Y,I Z Once for each direction	Note 1
9	Electro-static discharge test (operating)	Air : 150 pF, 330fI, 1 15 KV Contact : 150 pF, 330fI, 18 KV Ta = 25‘ C , 60% RH,	Note 2

Notes :

1. The fixture must be hard enough , so that the module would not be twisted or bent.
2. Self- recovery and restart recovery is allowed. No hardware failures.

10.0 Precautions

Please pay attention to the followings when you use this TFT LCD Panel.

- 11,1 Mounting Precautions
- (1) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (2) You must mount a module using specified mounting holes (Details refer to the drawings).
- (3) Please make sure to avoid external forces applied to the Source PCB or FPC and D-IC during the process of handling or assembling. If not, It causes panel damage or malfunction.
- (4) Note that polarizers are very fragile and could be easily damaged. 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.
- (5) Do not pull or fold the source D-IC which connect the source PCB or FPC and the panel.
- Do not pull or fold the LED wire.
- (6) Aher removing the protective film, when the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with alcohol or purified water.
- Do not strong polar solvent because they cause chemical damage to the polarizes.
- (7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (8) Protection film for polarizer on the module shall be slowly peeled offjust before use so that the electrostatic charge can beminimized.
- (9) Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.
- (10) Do not disassemble the module.
- (11) To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- (12) If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.
- (13)Do not drop water or any chemicals onto the LCD’s surface.

10.1 Operating Precautions

• (l) 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.

• (2)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 minimized the interference.

• (3) The electrochemical reaction caused by DC voltage will lead to LCD degradation, so DC drive should be avoided.

• (4) The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.

• (5) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.

• (6) Design the length of cable to connect between the connector for back-light and the converter as short as possible and the shorter cable shall be connected directly.
The longer cable between that of back-light and that of converter may cause the luminance of LED to lower and need a higher startup voltage(Vs).

• (7) Connectors are precise devices for connecting PCB and transmitting electrical signals. Operators should insert and unplug MDL in parallel when assembling MDL.

• (8) Do not connect or disconnect the cable to/ from the module at the "Power On" condition.

• (9) When the module is operating, do not lose CLK, ENAB signals. If any one these signals is lost, the LCD panel would be damaged.

• (10) Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

• (l l) Do not re-adjust variable resistor or switch etc.

10.2 Electrostatic Discharge Control

• (l) 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. Keep products as far away from static electricity as possible.

• (2) Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

10.3 Precautions for Strong Light Exposure

It is not allowed to store or Operate directly in strong light or in high temperature and humidity for a long time; Strong light exposure causes degradation of polarizer and color filter.

10.4 Storage Precautions

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

•(1) Control of ventilation and temperature is necessary.

•(2) Please make sure to protect the product from strong light exposure, water or moisture. Be careful for condensation.

•(3) Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.

•(4)Do not store the LCD near organic solvents or corrosive gasses.

•(5) Please keep the FOB at a circumstance shown below Fig.

10.5 Precautions for Protection Film

• (1) Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50% RH to reduce the risk of static charge.

• (2) In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

10.6 **Appropriate Condition for Display**

•(1) Normal operating condition

- Temperature: 0 40 C
- Operating Ambient Humidity: 10 90 %»
- Display pattern: dynamic pattern (Real display)
- Long-term lighting products recommended regular shutdown

•(2) Special operating condition

If the product will be used in extreme conditions such as high temperature, humidity, display patterns or 7*24hrs operation time etc.., It is strongly recommended to contact HG for Application engineeri ng advice. Otherwise, its reliability and function may not be guaranteed.

•(3)B1ack image or moving image is strongly recommended as a screen save.

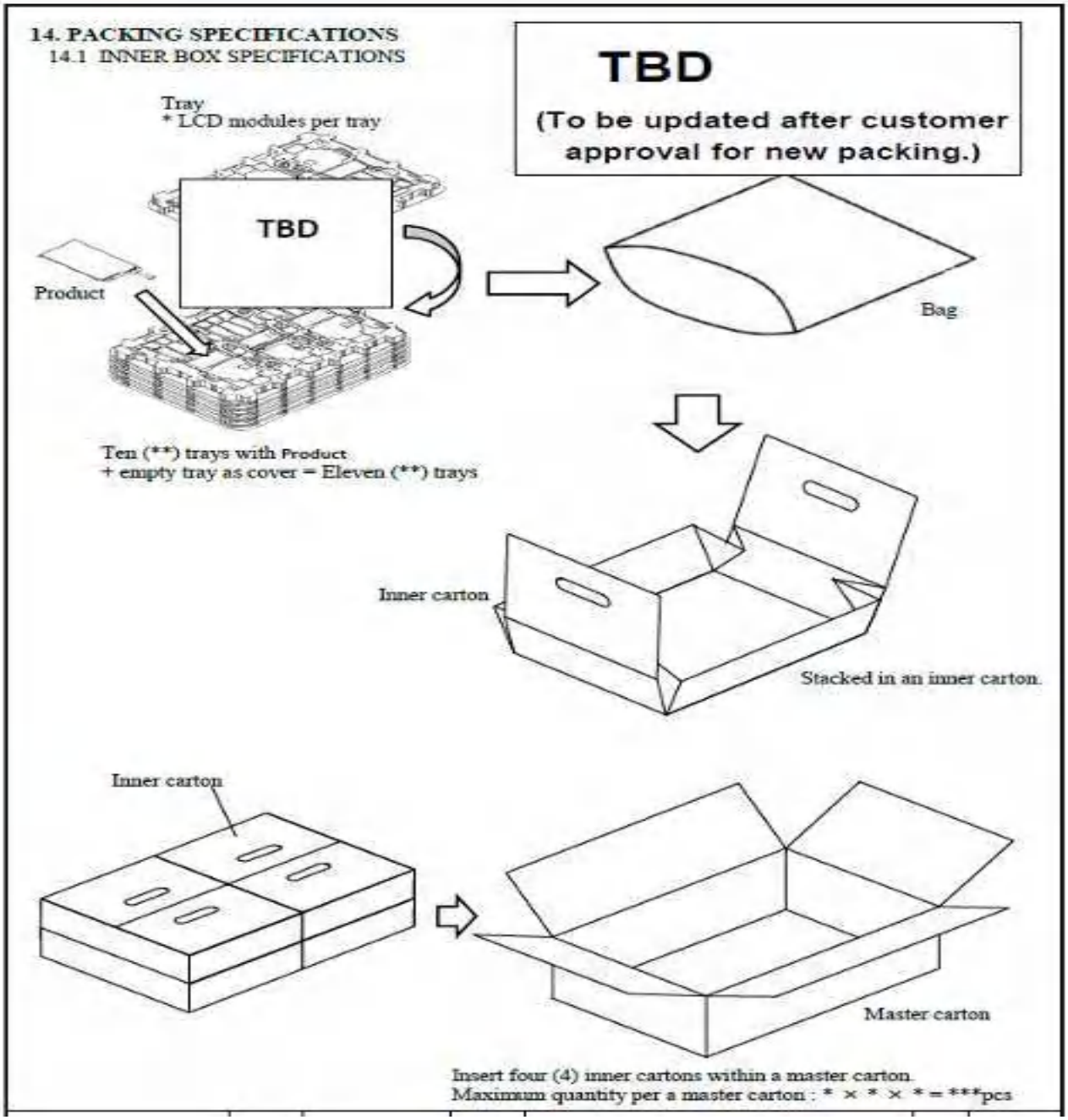
- (4) Lifetime in this spec. is guaranteed only when commercial display is used according to operating usages.
- (5) Please contract HG in advance when you want to switch between portrait and landscape screen
- (6) Please contact HG in advance for outdoor o peration.
- (7) Please contact HG in advance when you display the same pattern for a long time.
- (8) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen. To avoid image sticking, it is recommended to use a screen saver.
- (9) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (10) Dew drop atmosphere should be avoided.
- (11) The storage room should be equipped with a good ventilation facility and avoid to expose to corrosive gas , which has a temperature controlling system.
- (12) When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- (13) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation

10.7 Others

A, LC Leak

- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.

B, Rework

- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

11.0 PACKING INFORMATION