



**SPECIFICATION
FOR
LCD Module
TS8156FH007-T**

MODULE:	TS8156FH007-T
CUSTOMER:	

TZD	INITIAL	DATE
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CUSTOMER	INITIAL	DATE
APPROVED BY		



RECORDS OF REVISION

DATE	NO	REVISED No.	PAGE	SUMMARY	NOTE
2022-12-21		Rev01	19	-	
2023.6.16			19	增加 CTP	

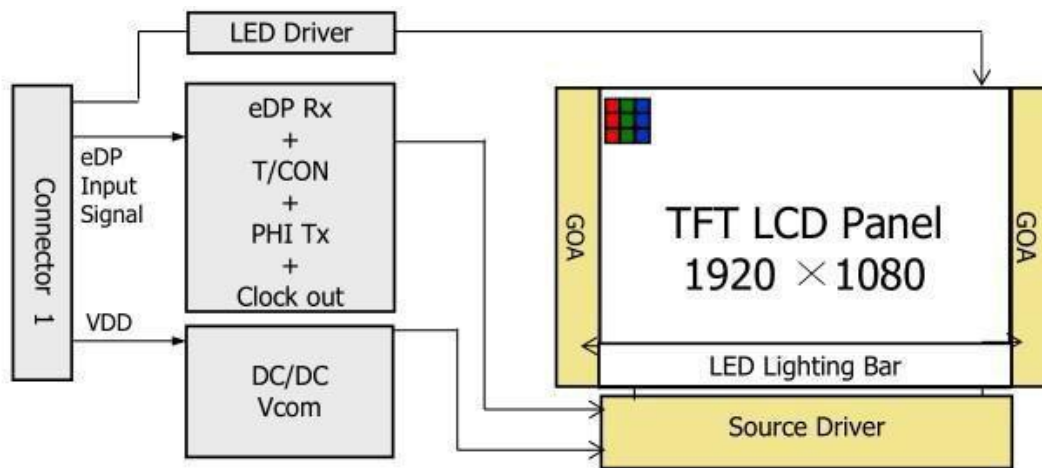


1. Application

This specification applies to a color TFT-LCM Module,

2. Overview

This TFT-LCM Module is a color active matrix TFT LCD using amorphous silicon TFT's (Thin Film Transistors) as active switching devices. This LCM has a 15.6 inch diagonally measured active area with FHD 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 LCM can display 16.7M colors. The TFT-LCD panel used for this LCM is a low reflection and higher color type. All input signals are DP1.2 interface compatible.



- 2 lane eDP Interface with 2.7Gbps Link Rates
- Thin and lightweight
- 8-bit color depth, display 16.7M colors
- Single LED Lighting Bar. (Down side/Horizontal Direction)
- Green Product (RoHS & Halogen free product)
- Low driving voltage and low power consumption



3. Mechanical specifications.

Parameter	Specification	Unit	Note
Display size	15.6"(Diagonal)	inch	
Active area	344.16(H)×193.59(V)	mm	
Pixel Format	1920(H)×1080(V) (1pixel =R+ G+Bdot)	pixel	
Pixel pitch	0.17925(H)×0.17925(V)	mm	
Pixel configuration	R,G,Bvertical stripe		
Display mode	Normally black		
Display colors	16.7M	colors	
Color Gamut	72%NTSC		
Surface treatment of front panel polarizer	Anti-glare coating:(3H)		

Outlined dimensions

Parameter		Min	Typ	Max	Unit	Remark
Unit outlined dimensions	Width	389.10	389.40	389.70	mm	
	Height	239.60	239.90	240.20	mm	
	Depth	5.85	6.35	6.85	mm	
Mass		-	-	-	g	



4. InputTerminals

4.1. DrivinginterfaceofPWB

TheelectronicsinterfaceconnectorisUJUIS050-L30B-C10orCompatible.TheconnectorinterfacepinassignmentsarelistedinTable6.

<Table6.PinAssignmentsfortheInterfaceConnector>

PinNo.	Symbol	I/O	Function	Remark
1	NC	I	NC	
2	H_GND	P	HighSpeedround	
3	Lane1_N	I	ComplementSignalLinkLane1	
4	Lane1_P	I	TrueSignalLink Lane1	
5	H_GND	P	HighSpeedround	
6	Lane0_N	I	ComplementSignalLinkLane0	
7	Lane0_P	I	TrueSignalLink Lane0	
8	H_GND	P	HighSpeedround	
9	AUX_CH_P	I	True SignalAuxiliaryChannel	
10	AUX_CH_N	I	ComplementSignalAuxiliaryChannel	
11	H_GND	P	HighSpeedround	
12	LCD_VDD	P	LCD logic anddriverpower(3.3V)	
13	LCD_VDD	P	LCD logic anddriverpower(3.3V)	
14	NC	I	NC	
15	LCD_GND	P	LCDlogic anddriverground	
16	LCD_GND	P	LCDlogic anddriverground	
17	HPD	O	HPD signalpin	
18	LED-1	P	Backlightground	
19	LED-2	P	Backlightground	
20	LED-3	P	Backlightground	
21	LED-4	P	Backlightground	
22	BL_ENABLE	I	Backlighton/off	
23	BL_PWM_DIM	I	SystemPWM	
24	NC	-	Reservedfor LCD manufacturer'suse	
25	NC	-	Reservedfor LCD manufacturer'suse	
26	BL_PWR	P	LEDPowerSupply5V-21V; Ifnotuse, NC	
27	BL_PWR	P	LEDPowerSupply5V-21V; Ifnotuse, NC	
28	BL_PWR	P	LEDPowerSupply5V-21V; Ifnotuse, NC	
29	BL_PWR	P	LEDPowerSupply5V-21V; Ifnotuse, NC	
30	NC		ColorEnginFunctionReserved	

*1 P: POWER I:Input

O:Output



The electronics interface connector is UJUIS050-L30B-C10 or Compatible. Mating housing/Part Number: I-PEX20454-030 or Compatible. The connector interface pin assignments are listed in Table

CN1 pin 1 position



4.2. eDP interface

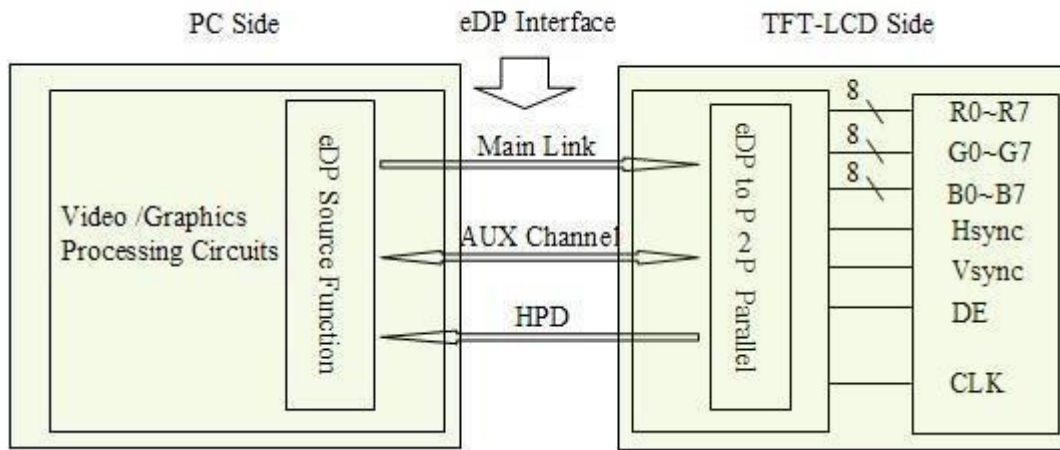


Fig.4-2-4eDP2lane6bitinputdatamapping

Lane0	Lane1
R0-7:0	R1-7:0
G0-7:0	G1-7:0
B0-7:0	B1-7:0
R2-7:0	R3-7:0
G2-7:0	G3-7:0
B2-7:0	B3-7:0
R4-7:0	R5-7:0
G4-7:0	G5-7:0
B4-7:0	B5-7:0



5. Electrical Characteristics

5.1. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings		Unit	Remark
			MIN	MAX		
+3.3V supply voltage	VDD	Ta=25°C	-0.3	+4.0	V	
Backlight supply voltage	V _{BL}	Ta=25°C	-0.3	+25.6	V	
Input voltage (eDP)	V _I	Ta=25°C	-0.3	+1.5	V	[Note5-1]
Input voltage (BL)	V _{BL_I}	Ta=25°C	-0.3	VDD+0.3	V	[Note5-2]
Storage temperature	T _{stg}		-20	+60	°C	[Note5-3]
Operation temperature	T _{opa}		0	+50	°C	

(*) "Absolute Maximum Ratings" is regulation that do not exceed it even momentarily.

(*) Stress beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

[Note5-1] eDP signals

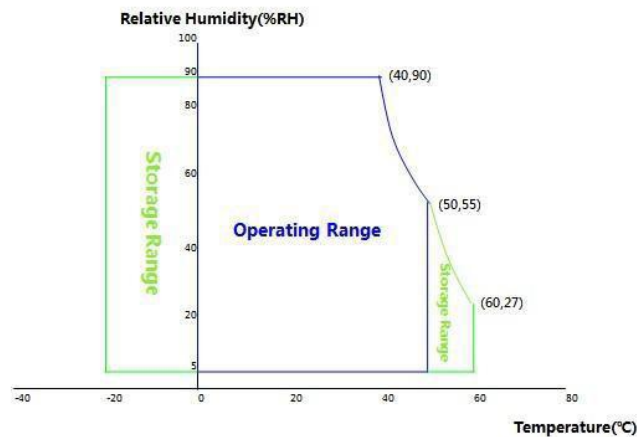
[Note5-

2] Backlight control signals (BL_ENABLE, BL_PWM_DIM) [Note5

-3] Humidity: 90% RH

Max. at Ta ≤ +40°C.

Maximum wet-bulb temperature at +39°C or less at Ta > +40°C, No condensation.





5.2. Electrical Specifications

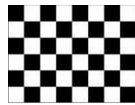
<Electrical specifications>

Ta=25+/-2°C Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	3.0	3.3	3.6	V	Note1
Permissible Input Ripple Voltage	V _{RF}	-	-	100	mV	@V _{DD} =3.3V
BIST Control Level	High Level	2	-	3.6	V	-
	Low Level	0	-	0.8	V	-
Power Supply Current	I _{DD}	-	212	303	mA	Note1
Power Supply Inrush Current	Inrush	-	-	2.0	A	Note3
Power Consumption	P _D	-	0.7	1.0	W	Note1
	P _{BL}	-	4.5	4.8	W	Note2
	P _{total}	-	5.2	5.8	W	Note1

Notes:

- 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.
 - Typ: Mosaic pattern 8*8
 - Max: R/G/B patterns



(a)



(b)

Figure 3. Power Measure Patterns

2. Calculated value for reference (V_{LED} × I_{LED}) 3. M

Measure condition (Figure 4)

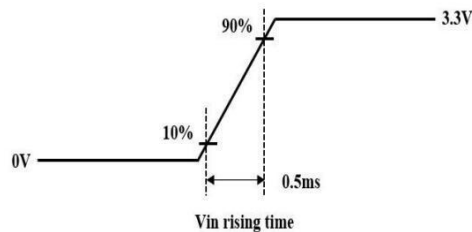


Figure 4. Inrush Measure Condition

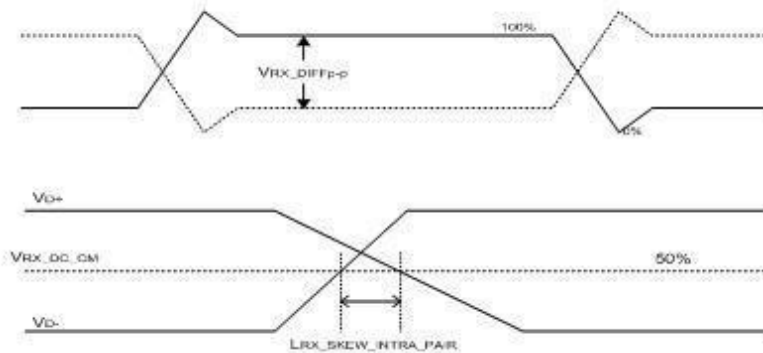


5.3. DC Characteristics

TFT-LCD panel driving. This specification of the DPRx interface timing parameter is shown in Table 8.

<eDPRx Interface Timing Specification>

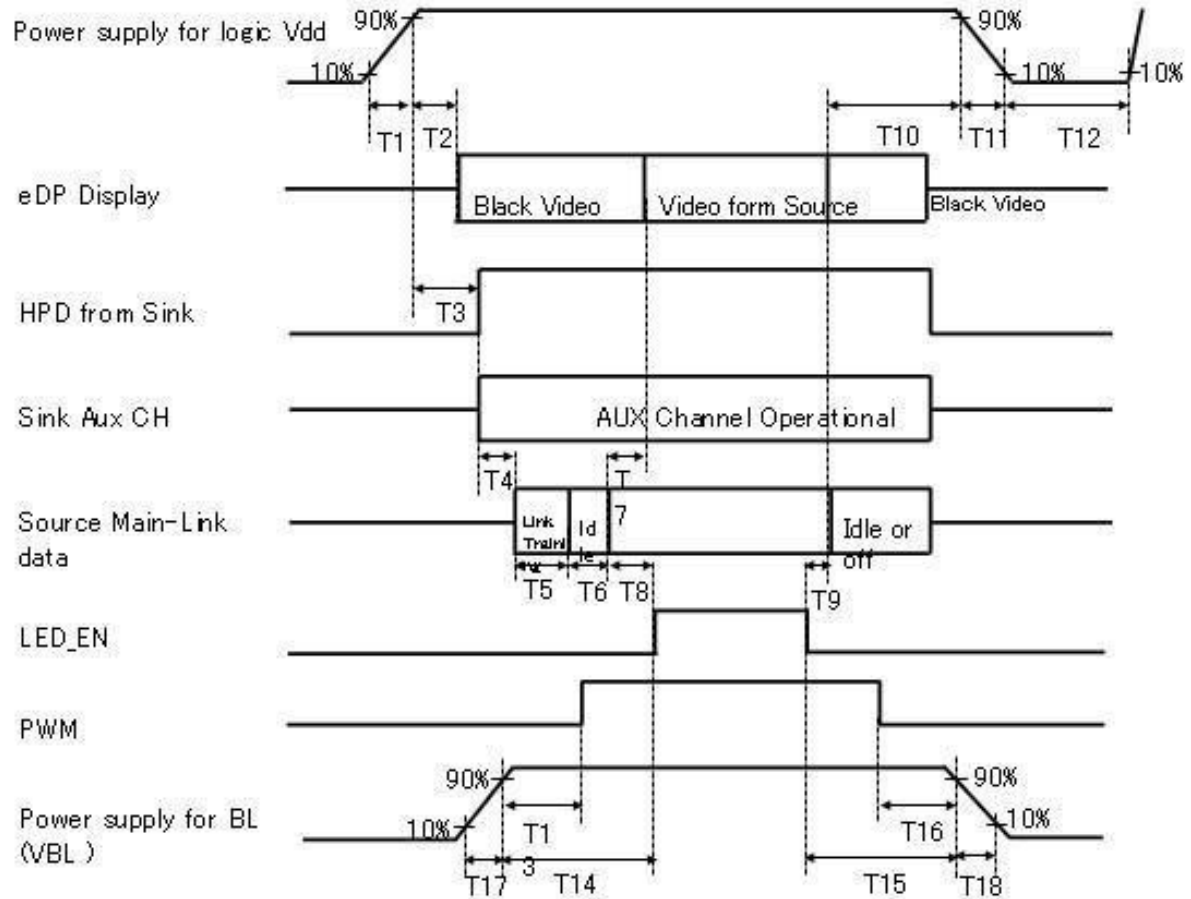
Item	Symbol	Min	Typ	Max	Unit	Remark
Spread spectrum clock	SSC		0.5		%	
Differential peak-to-peak input voltage at package pins	VRX-DIFFp-p	120	0	1200	mV	
Rx input DC common mode voltage	VRX_DC_CM	-	GND	-	V	
Differential termination resistance	RRX-DIFF	80	100	120	Ω	
Single-ended termination resistance	RRX-SE	45	50	60	Ω	
Rx short circuit current limit	IRX_SHORT	-	-	50	mA	
Intra-pair skew at Rx package pins (HBR) RX intra-pair skew tolerance at HBR	LRX_SKEW_INTRA_PAIR	-	-	60	ps	





5.4. POWERSEQUENCE

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



- 0.5ms ≤ T1 ≤ 10 ms
- 0ms ≤ T2 ≤ 200 ms
- 0ms ≤ T3 ≤ 200 ms
- 0ms ≤ T13
- 0ms ≤ T14
- 0ms ≤ T17
- T3+T4+T5+T6+T8 > T2(max)=200ms
- 0ms ≤ T7 ≤ 50ms
- 0ms ≤ T10 ≤ 500 ms
- 0 ms ≤ T11 ≤ 10 ms
- 150ms ≤ T12
- 0ms ≤ T15
- 0ms ≤ T16
- 0ms ≤ T18

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Backlight sequence is reference.



6. Backlightdriving

Thebacklightsystemisanedge-lightingtypewithwhite-LED.

(Itisusuallyrequiredtomeasureunderthefollowingcondition:Ta=25°C±2°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supplyvoltage	V_{BL}	6.0	12.0	21.0	V	
Currentdissipation	I_{BL}	-	376	-	mA	$V_{BL}=12V$ Duty Ratio=100%
ENControl Level	Backligh ton	1.6	-	5	V	[Note6-3-3]
	Backligh toff	0	-	1	V	
PWMControl Level	V_{PWMH}	1.3	-	5	V	
	V_{PWML}	0	-	0.15	V	
BrightnessControl DutyRatio	Duty	1	-	100	%	[Note6-3-1]
BrightnessControl frequency	f_{PWM}	100	-	20,00	Hz	
LEDlifetime	-	-	30,000	-	h	LED

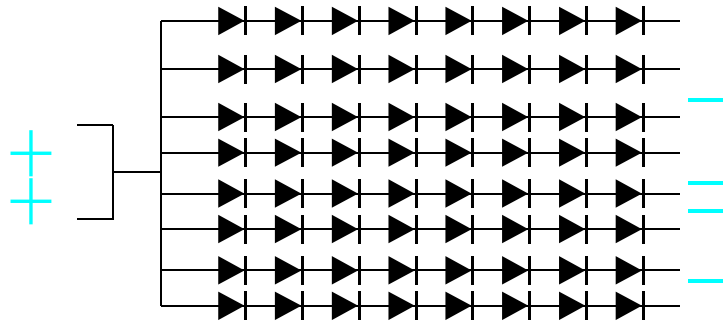
Notes:1.Powersupplyvoltage12VforLEDDriver

Calculator Valueforreference $I_F \times V_F \times 40$ /efficiency=PLED

2.TheLEDLife-timedefineasthe

estimatedtimeto50%degradationofinitialluminous.3.1%dutycycleisachievablewithadimmingfrequencylessthan1KHz.

LEDstructure



LED: $8 \times 8 = 64$ PCS

BacklightLED8串8并64颗 Circuit



7. Timing characteristicsofinputsignals

7.1. TimingCharacteristics

TheTFT-LCMModuleisoperatedbytheDEonly.

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	136.65	147.84	155	MHz
	HighTime	Tch	-	4/7	-	Tc
	LowTime	Tcl	-	3/7	-	Tc
FramePeriod		Tv	1095	1120	1130	lines
			-	60	-	Hz
			-	16.7	-	ms
VerticalDisplayPeriod		Tvd	-	1080	-	lines
OnelineScanningPeriod		Th	2080	2200	2248	clocks
HorizontalDisplayPeriod		Thd	-	1920	-	clocks

7.2. Inputdatasignalsanddisplaypositiononthescreen



Displaypositionofinputdata(V·H)



7.3. Inputsigal,basicdisplaycolorsandgrayscaleof eachcolor

Colors & Gray Scale	Gray Scale	Data signal																													
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7						
		LSB								MSB								LSB								MSB					
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	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	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	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	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	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	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	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	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	0	0	0	0	
	↑	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	
	↑	↓	↓								↓								↓												
	↓	↓	↓								↓								↓												
	Brighter	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	↓	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	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	0	0	0	0	
	↑	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	
	↑	↓	↓								↓								↓												
	↓	↓	↓								↓								↓												
	Brighter	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
	↓	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	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	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	0	0	0		
	↑	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	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	0	0	0		
	↑	↓	↓								↓								↓												
	↓	↓	↓								↓								↓												
	Brighter	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1		
	↓	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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	1	1	1		

0: Low level voltage, 1: High level voltage.

Each basic color can be displayed in 256 grayscales from 8 bit data signals.
According to the combination of 24 bit data signals, the 16.7M color display can be achieved on the screen.

8. EDID Specifications(TBD)



9. OPTICAL SPECIFICATION

9.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25 \pm 2 $^{\circ}$ C) with the equipment of Luminance meters system and test unit shall be located at an approximated distance

50cm from the LCD surface at a viewing angle of θ and Φ equal to 0 $^{\circ}$. We refer to $\theta\theta=0(=\theta3)$ as the 3 o'clock direction (the "right"), $\theta\theta=90(=\theta12)$ as the 12 o'clock direction ("upward"), $\theta\theta=180(=\theta9)$ as the 9 o'clock direction ("left") and $\theta\theta=270(=\theta6)$ as the 6 o'clock direction ("bottom"). While scanning θ and/or Φ , the center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. VDD shall be 3.3 \pm 0.3V at 25 $^{\circ}$ C. Optimum viewing angle direction is 6 o'clock.

9.2 Optical characteristics

Parameter	Conditions	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	-	85	-	degree
		θR	-	85	-	
	Vertical	θT	-	85	-	
		θB	-	85	-	
Contrast Ratio	Center	1000	1200	-	-	
Response Time	Tr+Td	-	30	35	ms	
CF Color Chromaticity (CI E1931)	Redx	Typ.-0.03	TBD	Typ.+0.03	-	[Note 9-2, 9-6] Normal operation (PWM Duty=100%)
	Redy		TBD		-	
	Greenx		TBD		-	
	Greeny		TBD		-	
	Bluex		TBD		-	
	Bluey		TBD		-	
	Whitex		0.316		-	
Whitey	0.326	-				
NTSC ratio	%		72		-	
Center Luminance of white	Y_{Li}	250	280		cd/m	
Cross Talk	CT			2.0	%	

Notes:

- 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).
- Contrast measurements shall be made at viewing angle of $\theta=0$ 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. Center Luminance of white is defined as luminance values of 5 point average across 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.
4. The White luminance uniformity on LCD surface is then expressed as: $\Delta Y = \text{Minimum Luminance of 5 (or 13) points} / \text{Maximum Luminance of 5 (or 13) points}$. (see FIGURE 2 and FIGURE 3).
5. 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.
6. The electro-optical response time measurements shall be made as FIGURE 4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_d .
7. Cross-talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when an adjacent area is driven dark

9.3 Optical measurements

Measurement Setup

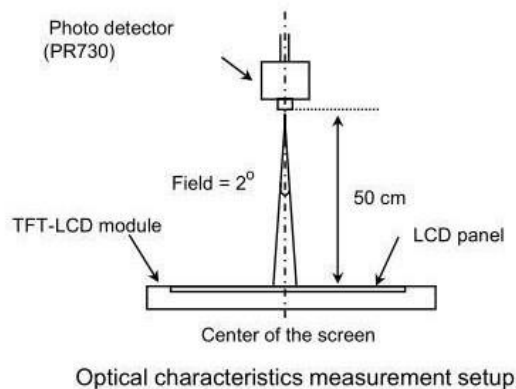
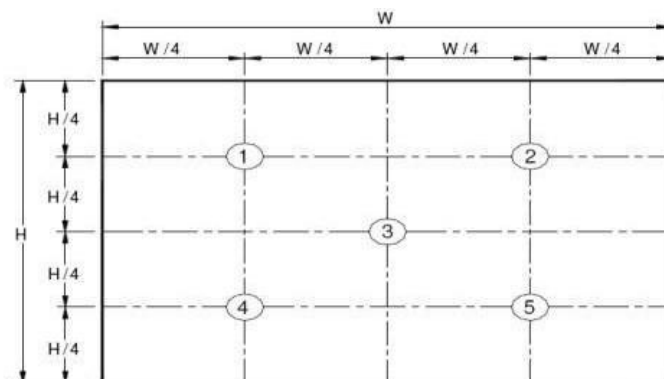


Figure 2. White Luminance and Uniformity Measurement Locations (5 points)

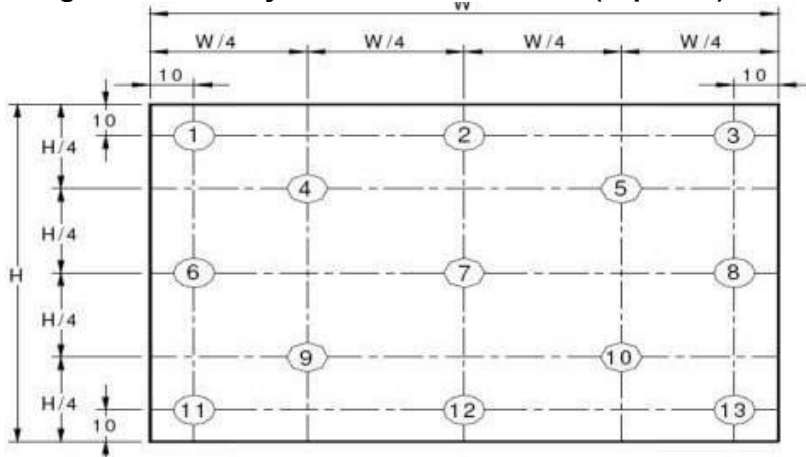


Center Luminance of white is defined as luminance values of center 5 points across the LCD surface.



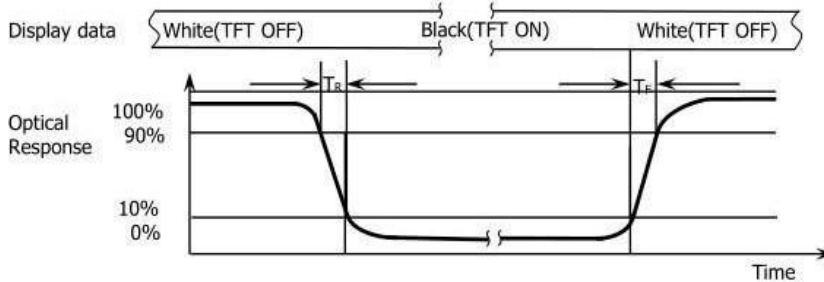
Luminances shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 3. Uniformity Measurement Locations (13 points)



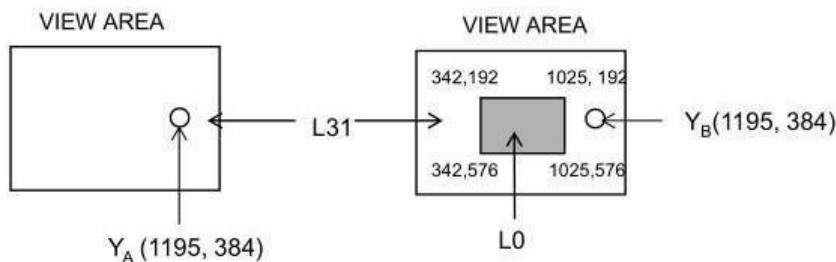
The White luminance uniformity on LCD surface is then expressed as: $\Delta Y_5 = \text{Minimum Luminance of five points} / \text{Maximum Luminance of five points}$ (see FIGURE 2), $\Delta Y_{13} = \text{Minimum Luminance of 13 points} / \text{Maximum Luminance of 13 points}$ (see FIGURE 3).

Figure 4. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 4 by switching the “data” in p ut signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_d and 90% to 10% is T_r .

Figure 5. Cross Modulation Test Description



$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where:

Y_A = Initial luminance of measured area (cd/m²)

Y_B = Subsequent luminance of measured area (cd/m²)

2) The location measured will be exactly the same in both patterns



Cross-

Take of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area where any adjacent area is driven dark (Refer to FIGURE 5).

10. Display Quality

The display quality of the color TFT-LCD modules 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.
Please insert for too much stress not to join a connector in the case of insertion of a connector.
- b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warpage 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 LSIs are used in this module, take care of static electricity and injure the human earth when handling. Observe all other precautionary requirements in handling components.
- h) This module has its circuitry PCBs on the side and should be handled carefully in order not to be stressed.
- i) Laminated film is attached to the module surface to prevent it from being scratched. Peel the laminated 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. Working under the following environments is desirable.
 - All workers wear conductive shoes, conductive clothes, conductive finger stalls and grounding belts without tail.
 - Use ionized blower for electrostatic removal, and peel off the laminated film with a constant speed. (Peeling off takes over 2 seconds)
- j) The polarizer surface on the panel is treated with Anti-Glare. In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.
- k) Do not expose the LCD module to direct sunlight, for a long period of time to protect the module from the ultraviolet ray.
- l) When handling LCD modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidation or deoxidation gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gases, may cause corrosion and discoloration of the LCD modules.
- m) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets inside your eye or mouth by mistake.
- n) Disassembling the module can cause permanent damage and should be strictly avoided. Please don't remove the fixed tape, insulating tape etc. that was pasted on the original module. (Except for protection film of the panel.)
- o) Be careful when using it for long time with fixed pattern display as it may cause after image. (Please use as screen saver etc., in order to avoid an after image.)
- p) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and



inhalation hole if you intend to install a fan.

- q) Epoxy resin (amine series curing agent), silicone adhesive material (decalcoholization series and oxime series), tray forming agent (azo compound) etc. in the cabinet or the packing materials may induce abnormal display with polarizer film deterioration regardless of contact or non-contact polarizer film. Be sure to confirm the component of them.
- r) Do not use polychloroprene. If you use it, there is some possibility of generating Cl₂ gas that influences the reliability of the connection between LCD panel and driver IC.
- s) Do not put a laminate film on LCD module, after peeling off the original one. If you put on it, it may cause discoloration or spots because of the occurrence of air gaps between the polarizer and the film.
- t) Ground module bezel to stabilize against EMI and external noise.

12. Packaging Condition (TBD)

Piling number of cartons	
Package quantity in one carton	
Carton size	
Total mass of one carton filled with full modules	
Packing form	

13. Label (TBD)

- 1) Module Barcode label: T
BD
- 2) Packing barcode label: T
BD

14. RoHS Directive

This LCD open-cell is compliant with RoHS Directive.

15. Reliability Test Items

No.	Test Item	Conditions
1	High temperature storage test	Ta=60°C 72h
2	Low temperature storage test	Ta=-20°C 72h
3	High temperature & high humidity operation test	Ta=50°C 80%RH 72h (No condensation)
4	High temperature operation test	Ta=50°C 72h
5	Low temperature operation test	Ta=0°C 72h

[Result Evaluation Criteria] Under the display quality test condition with normal operation state.

Do not change these conditions as such changes may affect practical display function. [Normal operation state] temperature : +15~+35°C , Humidity : 45~75% , Atmospheric

pressure : 86~106kPa



16. Mechanical drawing

保存期限: 三年

版本号: A/1

表格受控编号:

1	2	3	4	5	6	7																																																														
<p>1. LCM产品特征 (LCM Features):</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>显示类型 (Display mode):</td><td>TFT/Normal BLACK</td></tr> <tr><td>驱动芯片 (Driver IC):</td><td>/</td></tr> <tr><td>人眼观察角 (Viewing Direction):</td><td>ALL</td></tr> <tr><td>接口类型 (Interface Types):</td><td>BDP</td></tr> <tr><td>背光类型 (Backlight Types):</td><td>64pcs, 8并8并, 160mA (20mA/LED), 电压为22.4V~25.6V</td></tr> <tr><td>LCM/CTP亮度 (LCM/CTP Brightness):</td><td>200 cd/m² Min, 220 cd/m² TYP</td></tr> <tr><td>模颜色坐标 (Color coordinate):</td><td>(X:0.31±0.04, Y:0.32±0.04)</td></tr> <tr><td>模粗细均匀度 (LCM Uniformity):</td><td>75% MIN</td></tr> <tr><td>操作温度 (Operating Temperature):</td><td>-10°C~50°C</td></tr> <tr><td>储存温度 (Storage Temperature):</td><td>-20°C~60°C</td></tr> <tr><td>平面翘曲度 (Plane Warpage Max):</td><td>≤0.3MM</td></tr> <tr><td>连接器 (PC Connector):</td><td></td></tr> </table>							显示类型 (Display mode):	TFT/Normal BLACK	驱动芯片 (Driver IC):	/	人眼观察角 (Viewing Direction):	ALL	接口类型 (Interface Types):	BDP	背光类型 (Backlight Types):	64pcs, 8并8并, 160mA (20mA/LED), 电压为22.4V~25.6V	LCM/CTP亮度 (LCM/CTP Brightness):	200 cd/m ² Min, 220 cd/m ² TYP	模颜色坐标 (Color coordinate):	(X:0.31±0.04, Y:0.32±0.04)	模粗细均匀度 (LCM Uniformity):	75% MIN	操作温度 (Operating Temperature):	-10°C~50°C	储存温度 (Storage Temperature):	-20°C~60°C	平面翘曲度 (Plane Warpage Max):	≤0.3MM	连接器 (PC Connector):																																							
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<p>Technical parameters:</p> <ol style="list-style-type: none"> TP Structure: G+G; TP Type: COP, IC controller: ILI 2511; RX:1*TX:23 Working voltage: USB (5V); Light transmittance: ≥85%; Surface hardness: more than 7H; Working environment: -20°C~70°C, ≤85 WRH; Storage environment: -30°C~80°C, ≤85 WRH; Tolerance of those parts without any notes: + / - 0.3 mm; Products comply with RoHS standard. Points need special quality control. 																																																																				
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<p>深圳市天正达电子股份有限公司 SHENZHEN TECHSTAR ELECTRONICS CO., LTD.</p>																																																																				

