DMT104XGHLNT0-1A

PRODUCT SPECIFICATION

Version 0.1
Mar 29, 2021

TBD

Customer's Approval	
Signature	*Date*

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Approved by *Eric Wan*

Revision History

VERSION	DATE	DESCRIPTION	AUTHOR
0.1	Mar 29, 2021	Preliminary	Joyce Huang

Legal Notice

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1. General Description

1.1 Introduction

This is a 10.4” size colour active matrix TFT LCD module that uses amorphous silicon TFT as a switching device. The display is normally black mode and featuring high contrast and excellent colour saturation. The resolution of the TFT-LCD is 1024 x 768 and can display up to 16.7M/262K colours. The display module supports 1 port LVDS, 6/8bit selectable interface.

1.2 Main Features

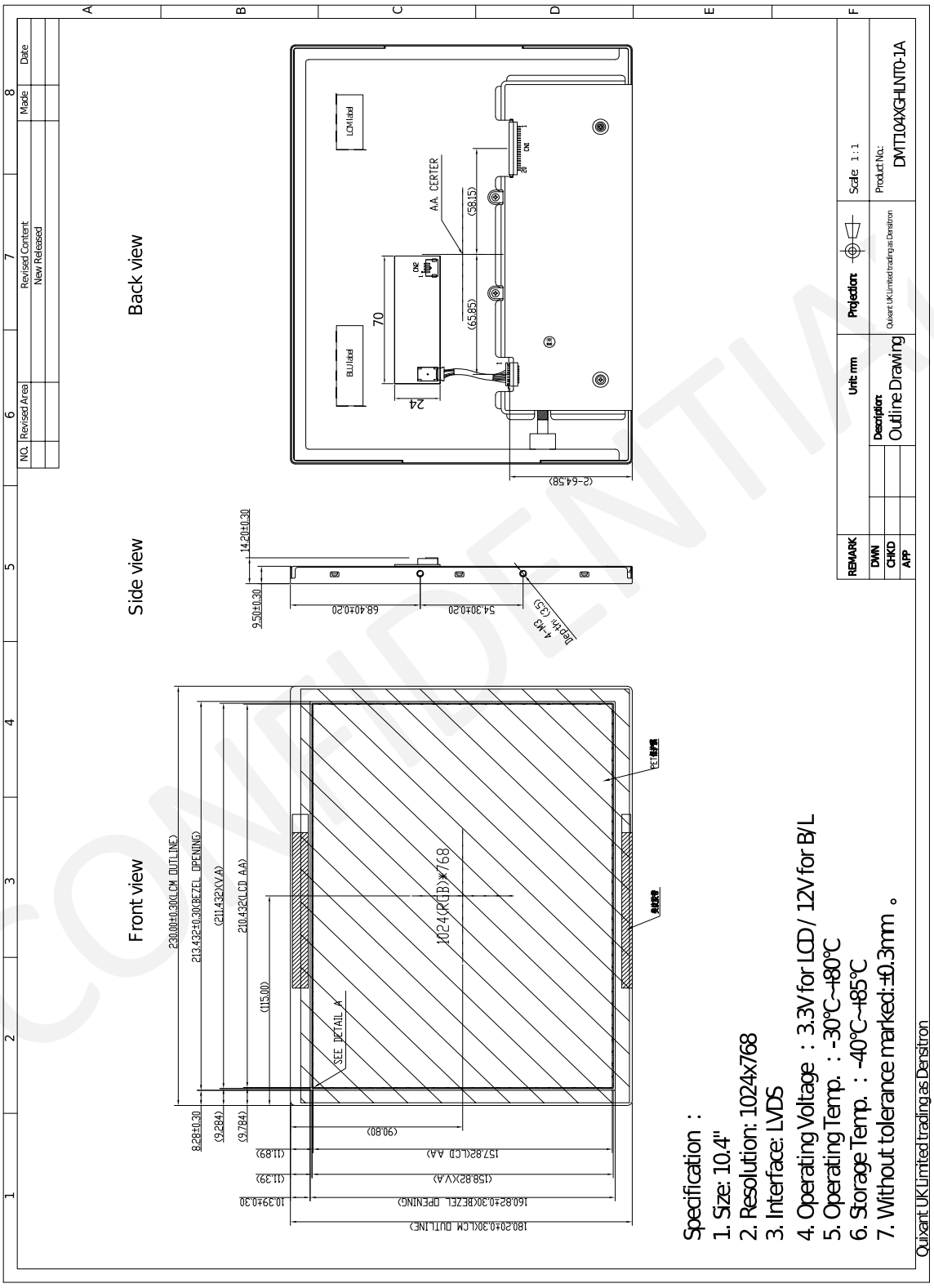
Item	Contents
Display Type	TFT LCD
Screen Size	10.4” Diagonal
Display Format	1024 x RGB x 768 Dots
No. of Colour	16.7M/262K
Overall Dimensions	230.00 (W) x 180.2 (H) x 14.5 (D) mm
Active Area	210.432 (W) x 157.824 (H) mm
Mode	SFT with Normally Black
Surface Treatment	TBD
Viewing Direction	All round
Interface	LVDS
Backlight Type	LED, White, 24 chips
Operating Temperature	-30°C ~ +80°C
Storage Temperature	-40°C ~ +85°C
ROHS	Compliant to RoHS 2.0

2. Mechanical Specification

2.1 Mechanical Characteristics

Item	Characteristic	Unit
Display Format	1024 x RGB x 768	Dots
Overall Dimensions	230.00 (W) x 180.2 (H) x 14.5 (D)	mm
Active Area	210.432 (W) x 157.824 (H)	mm
Dot Pitch	0.20625 (W) x 0.20625 (H)	mm
Weight	TBD	g

2.2 Mechanical Drawing



3. Electrical Specification

3.1 Absolute Maximum Ratings

3.1.1 Electrical Absolute Maximum Ratings

Item	Symbol	Condition	Min	Max	Unit	Note
Power Supply Voltage	VDD	-	-0.5	5.0	V	-
Backlight Supply Voltage	VLED	-	-	18	V	-
Power Voltage for CTP	-	-	-	-	V	-

Note 1: The absolute maximum rating values of this product not allowed to be Exceeded at any times. Should be module be used with any of absolute maximum ratings exceeded. The characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3.1.2 Environmental Absolute Maximum Ratings

Item	Operating		Storage		Note
	Min	Max	Min	Max	
Ambient Temperature (℃)	-30	80	-40	85	1, 2
Humidity (% RH)	10~90		10~90		3

Note 1: The response time will become lower when operated at low temperature.

Note 2: Background color changes slightly depending on ambient temperature.

Note 3: Storage Ta=40℃ & RH=90%≦96Hrs

3.2 Electrical Characteristics

3.2.1 Electrical Characteristics of LCD

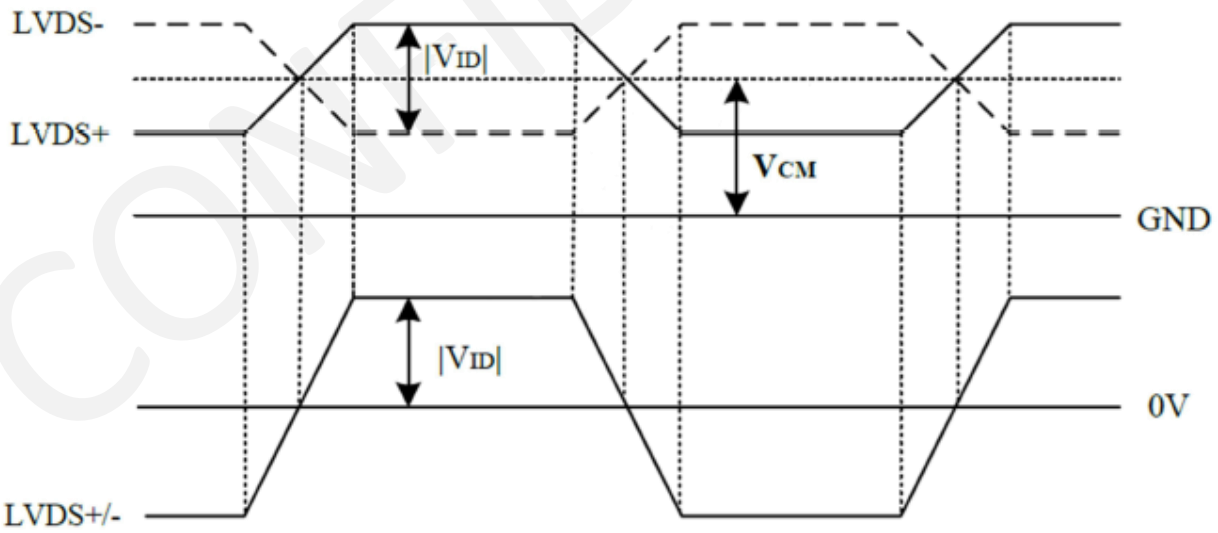
Ta=25℃

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note
Power Voltage For LCD	VDD	-	3.2	3.3	3.4	V	-
	IDD	-	300	450	675	mA	1
Differential Input Threshold	VTH	-	-	-	+100	mV	2
	VTL	-	-100	-	-	mV	
Magnitude Differential Input	$\|VID\|$	-	200	-	600	mV	-
Common Mode Voltage	VCM	-	-	-	1.6	V	-

Note 1: Test Condition: VDD=3.3V; Test Pattern: Black.

Note 2: VTH and VTL is defined in Link0+/-、Link1+/-、Link2+/-、 Link3+/-、CLKIN signal voltage level.

Voltage Definitions



3.3 Interface Pin Assignment

3.3.1 TFT LCD Panel

CN1 Connector: JAE FI-SEB20P-HFE: HB or Equivalent

Matching Connector: FI-S20S or Equivalent

No.	Symbol	Function	I/O
1	VCC	Power supply (+3.3V)	P
2	VCC	Power supply (+3.3V)	P
3	GND	Ground	P
4	GND	Ground	P
5	Link 0+	- LVDS differential data input (R0~R5, G0)	P
6	Link 0-	+ LVDS differential data input (R0~R5, G0)	P
7	GND	Ground	P
8	Link 1+	- LVDS differential data input (G1~G5, B0~B1)	I
9	Link 1-	+ LVDS differential data input (G1~G5, B0~B1)	I
10	GND	Ground	P
11	Link 2+	- LVDS differential data input (B2~B5,-,-,DE)	I
12	Link 2-	+ LVDS differential data input (B2~B5,-,-,DE)	I
13	GND	Ground	P
14	CLKIN	- LVDS differential data input	I
15	CLKIN	+ LVDS differential data input	I
16	GND	Ground	P
17	Link 3+	- LVDS differential data input (R6~R7, G6~G7, B6~B7)	I
18	Link 3-	+ LVDS differential data input (R6~R7, G6~G7, B6~B7)	I
19	Mode	L: 6bit H: 8bit	I
20	SC	Display direction selection L: Normal H: Reversed	I

Note: P: Power/GND; I: Input pin

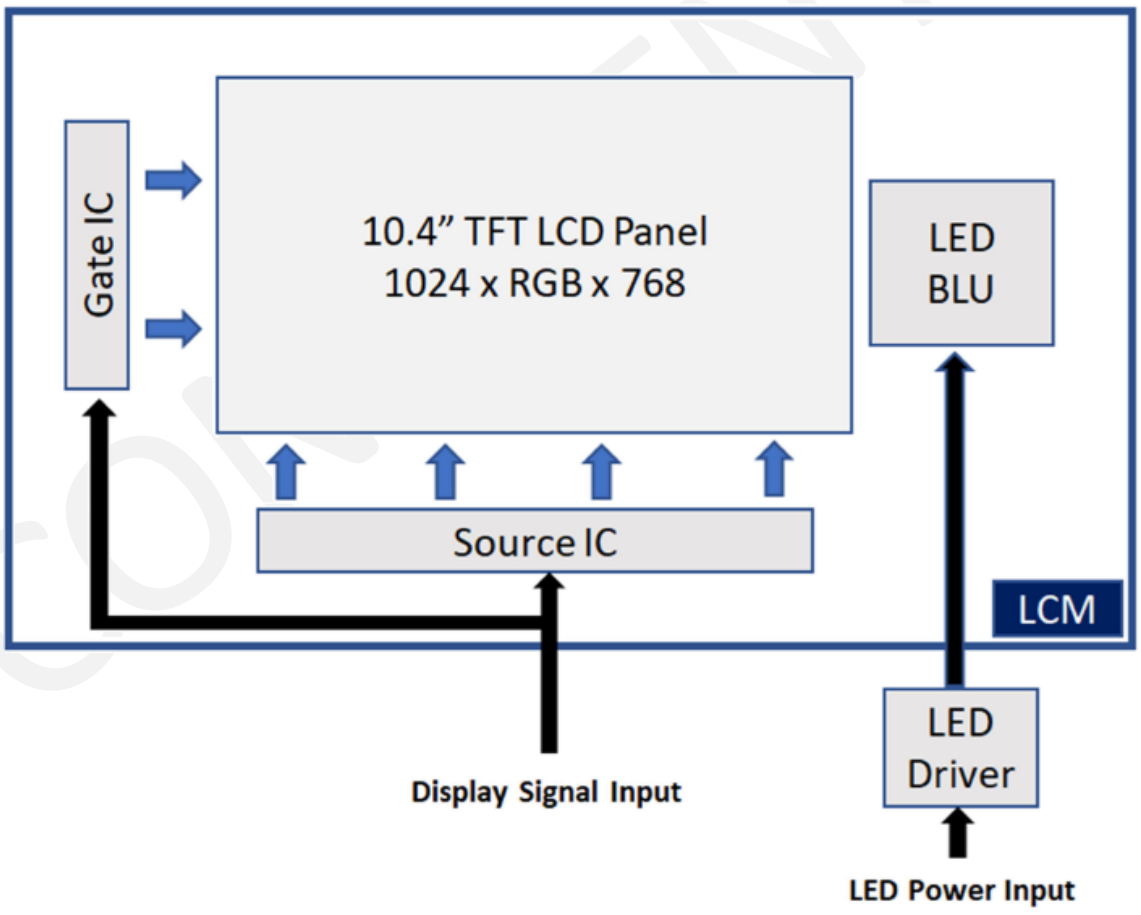
3.3.2 Backlight Pin Define

CN2 Connector：Aces, 50287-00401-001 or or equivalent

Mating Connector: Aces, 50478-004H0H0-001 or equivalent

Pin No.	Pin Define
1	VLED
2	GND
3	PWM
4	EN

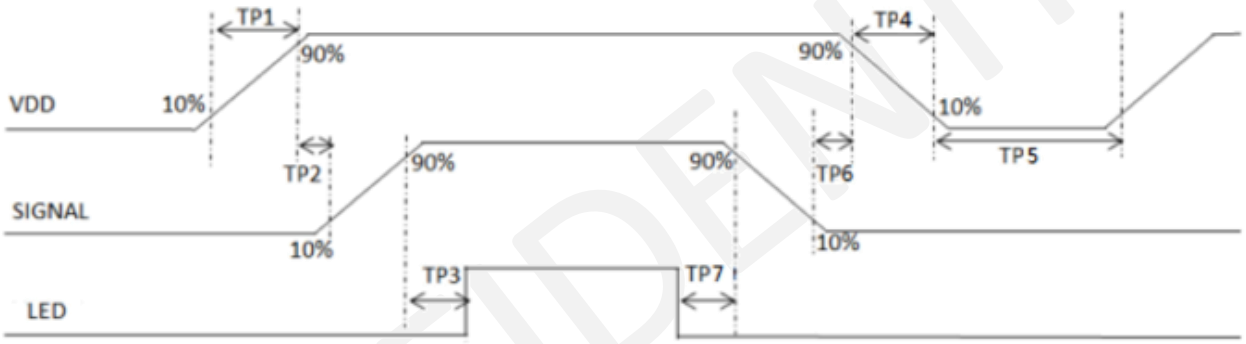
3.4 Block Diagram



3.5 Timing Characteristics

3.5.1 Power On/Off Sequence

ITEM	Symbol	Min	Typ.	Max	Unit	Note
VCC on to VCC stable	TP1	0.5	-	20	ms	-
VCC stable to signal on	TP2	1	-	-	ms	-
Signal on to LED on	TP3	200	-	-	ms	-
VDD off time	TP4	0	-	10	ms	-
VDD off to next VDD on	TP5	500	-	-	ms	-
Signal off before VDD off	TP6	1	-	-	ms	-
LED off before signal off	TP7	200	-	-	ms	-

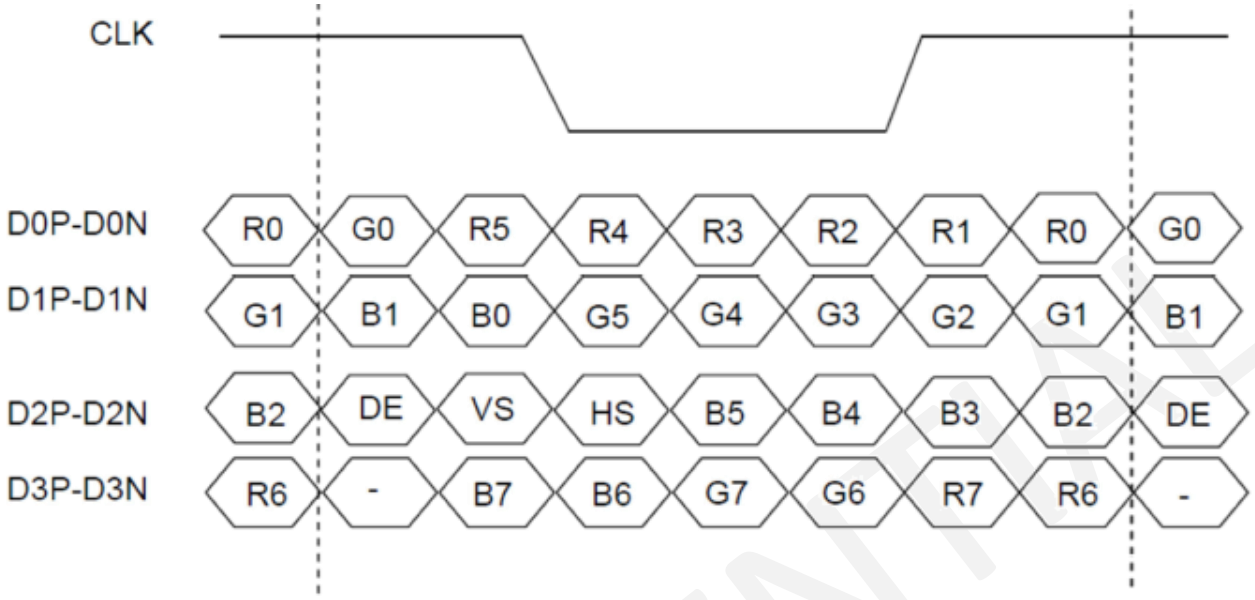


3.5.2 Timing Chart

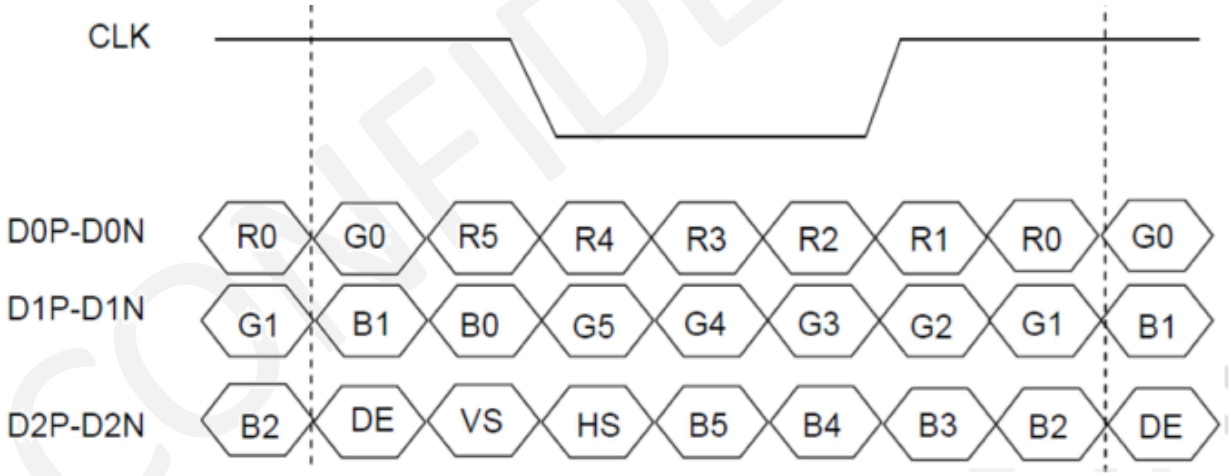
Item	Symbol	Min	Typ.	Max	Unit	Note
CLK Frequency	1/tclk	57	65	70.5	MHz	-
Horizontal Blanking Time	tHBT	176	320	376	tclk	tHBP+tHFP
Horizontal Back Porch	tHBP		160		tclk	-
Horizontal display area	tHD	-	1024	-	tclk	-
Horizontal front porch	tHFP	16	160	216	tclk	-
Horizontal period	tH	1200	1344	1400	tclk	-
Horizontal pulse width	tHPW	1	2	140	tclk	-
Vertical blanking time	tVBT	24	38	72	tH	tVBP+tVFP
Vertical back porch	tVBP		23		tH	-
Vertical display area	tVD	-	768	-	tH	-
Vertical front porch	tVFP	1	15	49	tH	-
Vertical period	tV	792	806	840	tH	-
Vertical pulse width	tVPW	1	2	20	tH	-
Frame Rate	F	-	60	-	Hz	-

3.5.3 LVDS Data Input Format

8bit mode data input



6bit mode data input

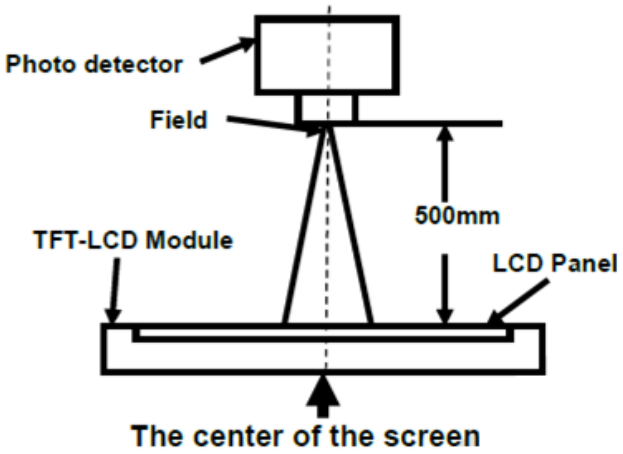
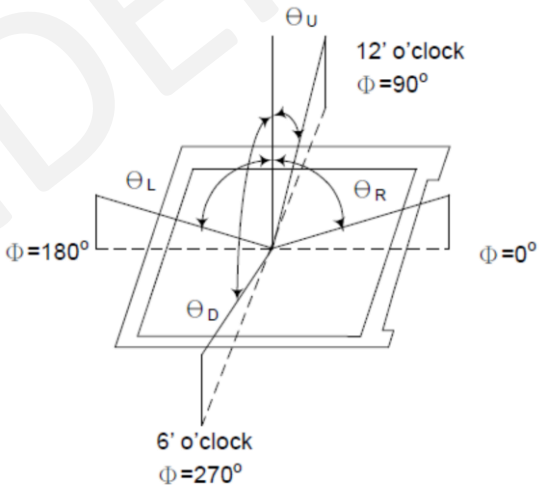


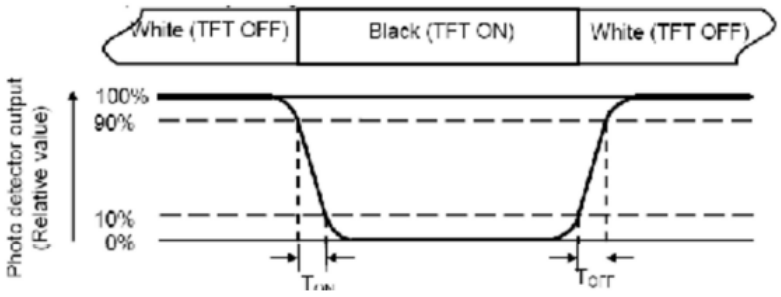
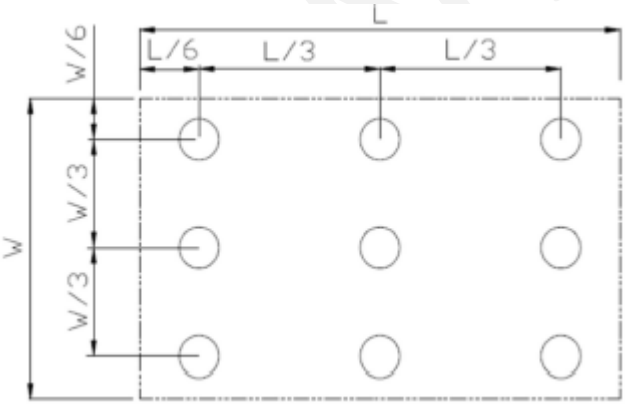
4. Optical Specification

4.1 Optical Characteristics

Ta=25℃

Characteristics		Symbol	Conditions	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR	θ = 0°	800	1000	-	-	3
Response time		TR + TF	Normal Viewing Angle	-	35	50	ms	4
Viewing Angle	Left	θ_x-	CR≧10	75	85	-	degree	2, 3
	Right	θ_x+		75	85	-		
	Up	θ_Y+		75	85	-		
	Down	θ_Y-		75	85	-		
	White	Wx		0.263	0.313	0.363	-	1, 5
		Wy		0.279	0.329	0.379		
Luminance		L	PWM=100%	1150	1300	-	cd/m^2	7
Uniformity		Yu		75	85	-	%	6

Note	Item	Test method
1	Definition of Optical Measurement System	The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel. 
2	Definition of Viewing Angle and Measurement System	Viewing angle is measured at the center point of the LCD. 
3	Definition of Contrast Ratio (CR)	measured at the center point of panel Contrast ratio (CR) = Luminance measured when LCD is at "white state" / Luminance measured when LCD is at "black state" "White state ": The state is that the LCD should drive by Vwhite. "Black state": The state is that the LCD should drive by Vblack. Vwhite: To be determined Vblack: To be determined.
4	Definition of Response Time	The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T ON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T OFF) is the

Note	Item	Test method
		time between photo detector output intensity changed from 10% to 90%. 
5	Definition of Color Chromaticity (CIE1931)	Color coordinates measured at center point of LCD.
6	Definition of Luminance Uniformity	Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area. Luminance Uniformity (U) = L m in/ L max L: Active area length, W:Active area width  Lmax: The measured Maximum luminance of all measurement position. Lmin: The measured Minimum luminance of all measurement position.
7	Definition of Luminance	Measure the luminance of white state at center point.

5. LED Backlight Specification

5.1 LED Backlight Characteristics

Ta=25℃

Item		Symbol	Min	Typ.	Max	Unit	Note
LED Driving Voltage		VLED	-	12	-	V	-
LED Driving Current		ILED	-	0.9	-	A	-
LED Life Time		-	-	100,000	-	Hrs	1
PWM Control Level	High Level	ADJ	1.5	-	-	V	-
	Low Level		0	-	0.4	V	-
Backlight ON/OFF	High Level	EN	2.5	-	6	V	-
	Low Level		0	-	0.4	V	-
ADJ Frequency		-	200	-	1000	Hz	

Note 1: The LED life time define as the estimated time to 50% degradation of initial luminous.

Note 2: Operating temperature 25℃,humidity 55%RH.

Note 3: A higher LED power supply voltage will result in better power efficiency.

6. Packaging

TBD

7. Quality Assurance Specification

7.1 Conformity

The performance, function and reliability of the shipped products conform to the Product Specification.

7.2 Environment Required

Customer's test & measurement are required to be conducted under the following conditions:

TBD

7.3 Delivery Assurance

7.3.1 Delivery Inspection Standards

Class II, Normal Inspection, MIL-STD-105E

7.3.2 Zone Definition

TBD

7.3.3 Criteria & Acceptable Quality Level

TBD

7.3.4 Criteria & Classification

TBD

7.4 Dealing with Customer Complaints

7.4.1 Non-conforming Analysis

Purchaser should supply Densitron with detailed data of non-conforming sample.

After accepting it, Densitron should complete the analysis in two weeks from receiving the sample.
If the analysis cannot be completed on time, Densitron must inform the purchaser.

7.4.2 Handling of Non-conforming Displays

If any non-conforming displays are found during customer acceptance inspection which Densitron is clearly responsible for, return them to Densitron.
Both Densitron and customer should analyse the reason and discuss the handling of non-conforming displays when the reason is not clear.
Equally, both sides should discuss and come to agreement for issues pertaining to modification of Densitron quality assurance standard.

8. Reliability Specification

8.1 Reliability Tests

Test Item	Test Condition	Note
High Temperature Operation	Ta = 85 ℃, 240 hours	1, 3
Low Temperature Operation	Ta =-40℃, 240 hours	1, 3
High Temperature Humidity Storage	60℃,90%RH, 240 hours	1, 3
High Temperature Operation	Ts= 80℃, 240 hours	2, 3
Low Temperature Operation	Ta= -30℃, 240 hours	1, 3
Temperature Cycle	-40℃~85℃ (30min) ~ (30min), 100 cycles	2, 4

In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 1：Ta is the ambient temperature of samples.

Note 2：Ts is the temperature of panel's surface.

Note 3：Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4：Star with cold temperature and end with high temperature.

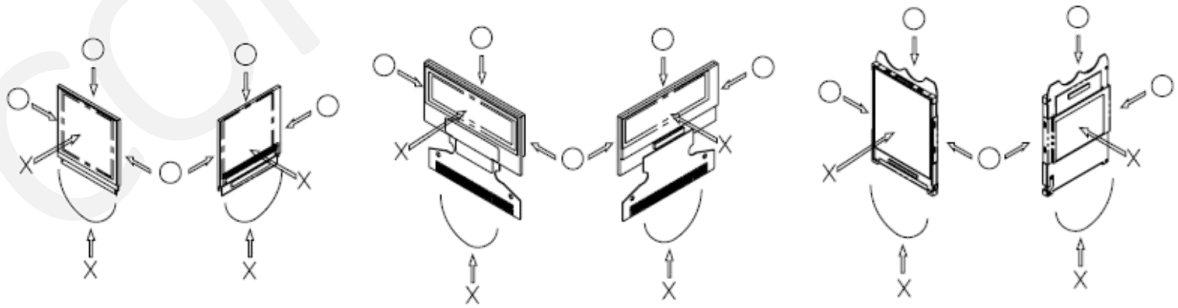
8.1.1 Inspection Check Standard

TBD

9. Handling Precautions

9.1 Handling Precautions

1) Since the display panel is being made of glass, do not apply mechanical impacts such us dropping from a high position.
2) If the display panel is broken by some accident and the internal organic substance leaks out, be careful not to inhale nor lick the organic substance.
3) If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water
4) If pressure is applied to the display surface or its neighbourhood of the display module, the cell structure may be damaged and be careful not to apply pressure to these sections.
5) The polarizer covering the surface of the display module is soft and easily scratched. Please be careful when handling the display module.
6) When the surface of the polarizer of the display module has soil, clean the surface. It takes advantage of by using following adhesion tape.
   a. Scotch Mending Tape No. 810 or an equivalent
   b. Never try to breathe upon the soiled surface nor wipe the surface using cloth containing solvent such as ethyl alcohol, since the surface of the polarizer will become cloudy.
   c. Also, pay attention that the following liquid and solvent may spoil the polarizer:
      - Water
      - Ketone
      - Aromatic Solvents
7) Hold the display module very carefully when placing it into the system housing. Do not apply excessive stress or pressure to display module. And, do not over bend the film with electrode pattern layouts. These stresses will



influence the display performance. Also, secure sufficient rigidity for the outer cases.
8) Do not apply stress to the LSI chips and the surrounding molded sections.
9) Do not disassemble nor modify the display module.
10) Do not apply input signals while the logic power is off.
11) Pay sufficient attention to the working environments when handing display modules to prevent occurrence of element breakage accidents by static electricity.

a. Be sure to make human body grounding when handling display modules.
b. Be sure to ground tools to use or assembly such as soldering irons.
c. To suppress generation of static electricity, avoid carrying out assembly work under dry environments.
d. Protective film is being applied to the surface of the display panel of the display module. Be careful since static electricity may be generated when exfoliating the protective film.

12) Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. If the display module has been stored for a long period of time, residue adhesive material of the protection film may remain on the surface of the display panel after removed of the film. In such case, remove the residue material by the method introduced in the above Section 5).
13) If electric current is applied when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful to avoid the above.

9.2 Storage Precautions

1) When storing display modules, put them in static electricity preventive bags avoiding exposure to direct sun light nor to lights of fluorescent lamps, etc. and, also, avoiding high temperature and high humidity environments or low temperature (less than 0°C) environments. (We recommend you to store these modules in the packaged state when they were shipped from Densitron) At that time, be careful not to let water drops adhere to the packages or bags nor let dewing occur with them.
2) If electric current is applied when water drops are adhering to the surface of the display module, when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful about the above.

9.3 Designing Precautions

1) The absolute maximum ratings are the ratings which cannot be exceeded for display module, and if these values are exceeded, panel damage may be happen.
2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.
3) We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VDD). (Recommend value: 0.5A)
4) Pay sufficient attention to avoid occurrence of mutual noise interference with the neighbouring devices.
5) As for EMI, take necessary measures on the equipment side basically.
6) When fastening the display module, fasten the external plastic housing section.
7) If power supply to the display module is forcibly shut down by such errors as taking out the main battery while the display panel is in operation, we cannot guarantee the quality of this display module.

9.4 Operation Precautions

1) It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life.
2) Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Give careful consideration to prevent direct current during ON/OFF timing and during operation.
3) Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged.
4) To protect display modules from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the display modules.
   a. Pins and electrodes
   b. Pattern layouts such as the FPC
5) When the driver is being exposed (COG), semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, if the driver is exposed to light, malfunctioning may occur.
   a. Design the product and installation method so that the driver may be shielded from light in actual usage.
   b. Design the product and installation method so that the driver may be shielded from light during the inspection processes.
6) Although the display module stores the operation state data by the commands and the indication data, when excessive external noise, etc. enters into the module, the internal status may be changed. It therefore is necessary to take appropriate measures to suppress noise generation or to protect from influences of noise on the system design.
7) We recommend you to construct its software to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.

9.5 Other Precautions

1) Request the qualified companies to handle industrial wastes when disposing of the display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.