DMT084W2NLNT0-1A

PRODUCT SPECIFICATION

Version 0.1
Jun 16, 2023

TBD

Customer's Approval	
Signature	*Date*

Prepared by *Yvette Hsieh*
Approved by *Evan Huang*

Revision History

VERSION	DATE	DESCRIPTION	AUTHOR
0.1	Jun 16, 2023	Initial Release	Yvette Hsieh

Legal Notice

Table of Contents

1. General Description

1.1 Introduction

This is an 8.4” size color active matrix TFT LCD module that uses amorphous silicon TFT as a switching device. The display is normally white mode, transmissive, and featuring high contrast and excellent color saturation. The resolution of the TFT-LCD is 800 x 600 and can display up to 16.2M colors. The display module supports LVDS 8 bit interface.

1.2 Main Features

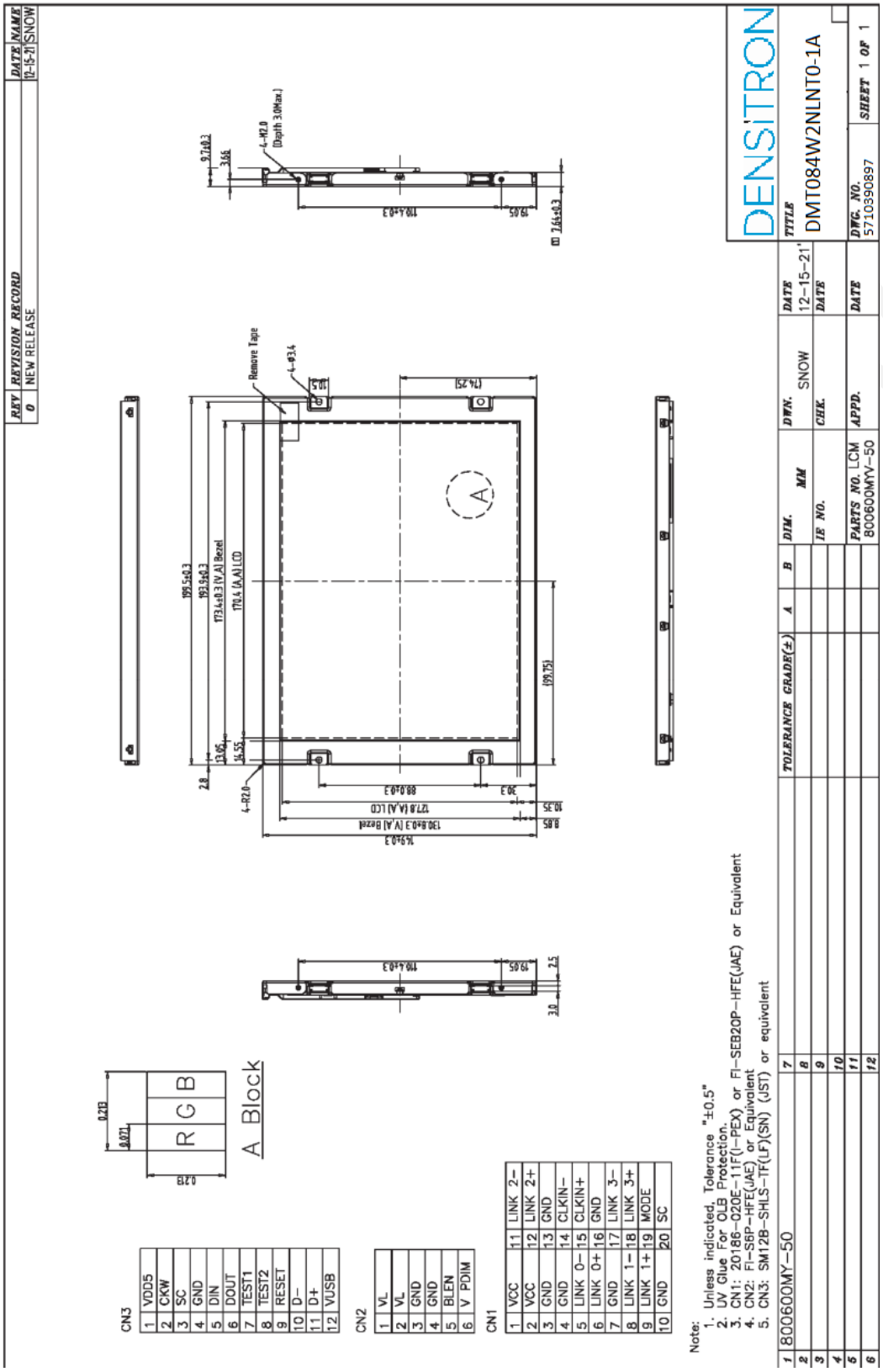
Item	Contents
Display Type	TFT LCD
Screen Size	8.4” Diagonal
Display Format	800 x RGB x 600 dots
No. of Colour	16.2M
Overall Dimensions	199.5 (W) x 149 (H) x 9.7 (D) mm
Active Area	170.4 (W) x 127.8 (H) mm
Mode	Normally white / Transmissive
Surface Treatment	Anti-Glare
Viewing Direction	All round
Interface	LVDS 8 bit
Driver IC	source IC: HX8282-A01DPD300-C Gate IC: HX8696-A00DPD300-E
Backlight Type	LED, White, TBDchips
Operating Temperature	-20°C ~ +70°C
Storage Temperature	-30°C ~ +80°C
ROHS	Compliant to RoHS 2.0

2. Mechanical Specification

2.1 Mechanical Characteristics

Item	Characteristic	Unit
Display Format	800 x RGB x 600	Dots
Overall Dimensions	199.5 (W) x 149 (H) x 9.7 (D)	mm
Active Area	170.4 (W) x 127.8 (H)	mm
Dot Pitch	0.213 (W) x 0.213 (H)	mm
Weight	TBD	g
IC Controller/Driver	source IC: HX8282-A01DPD300-C Gate IC: HX8696-A00DPD300-E	

2.2 Mechanical Drawing



3. Electrical Specification

3.1 Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Note
Supply voltage range	V_{CC}	-0.3	4	V	1
Voltage range at any terminal	V_I	-0.3	V_{CC} + 0.3	V	-
Operating Temperature	T_{op}	-20	70	˚C	-
Storage Temperature	T_{stg}	-30	80	˚C	-

Note 1: All voltage values are with respect to the GND terminals unless otherwise noted.

Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. For normal operations, it is desirable to use this module under the conditions according to Section 3.2 “Electrical Characteristics”, to avoid malfunctioning.

Note 3: Background colour changes slightly depending on ambient temperature. This phenomenon is reversible.

Note 4: Please refer to item of RELIABILITY.

3.2 Electrical Characteristics

3.2.1 Power Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Logic/LCD Drive Voltage	V_{CC}	3.0	3.3	3.6	V	-
VCC Current	I_{CC}	-	120	-	mA	1

Note 1: fV =60Hz , Ta=25℃ , Display pattern : All Black

3.2.2 LVDS electrical Specification

CMOS/TTL DC Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Note
High Level Input Voltage	V_{IH}	2.0	-	V_{cc}	V	-
Low Level Input Voltage	V_{IL}	GND	-	0.8	V	-
High Level Output Voltage	V_{OH}	2.4	-	-	V	I_{OH}=4mA
Low Level Output Voltage	V_{OL}	-	-	0.4	V	I_{OL}=4mA
Input current	I_{IN}	-	-	±10	uA	0V≤V_{IN}≤VCC
Pull Down Current	I_{PD}	-	-	100	uA	R/F pin, V_{IH}=Vcc

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Output Short Circuit Current	I_{OS}	-	-	-50	mA	V_{OUT}=0V

LVDS DRIVER DC Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Differential Output Voltage	V_{OD}	250	350	450	mV	RL=100Ω
Change in VOD between Complimentary Output States	$\triangle V_{OD}$	-	-	35	mV	
Common Mode Voltage	V_{OC}	1.125	1.25	1.375	V	
Change in VOC between Complimentary Output States	$\triangle V_{OC}$	-	-	35	mV	
Output Short Circuit Current	I_{OS}	-	-	-24	mA	V_{OUT}=0V, RL=100Ω
Output TRI-STATE Current	I_{OZ}	-	-	±10	uA	/PDWN=0V, V_{OUT}=0V to V_{CC}

LVDS Receiver DC Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Differential Input High Threshold	VTH	-	-	+100	mV	V_{OC}=+1.2V
Differential Input Low Threshold	VTL	-100	-	-	mV	
Input Current	IIN	-	-	±10	uA	V_{IN}=+2.4V/0V, V_{DD}=3.6V

3.3 Interface Pin Assignment

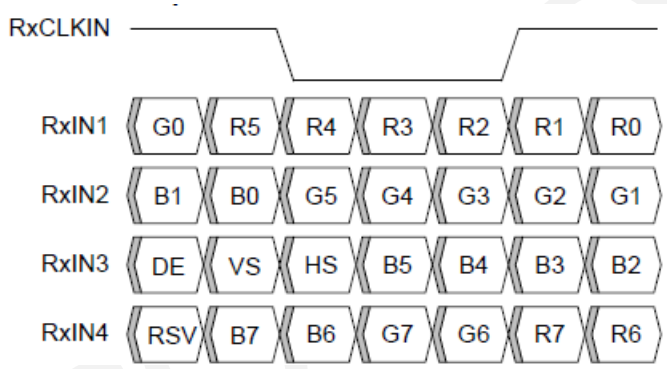
3.3.1 CN 1(Interface Signal)

Used connector 20186-020E-11F (I-PEX) or FI-SEB20P-HFE (JAE) Corresponding connector 20197-20U-F (I-PEX) or FI-S20S [for discrete Wire FI-SE20ME (for FPC] (JAE)

NO.	Symbol	I/O	Function
1	VCC	-	power supply: 3.3V
2	VCC	-	power supply: 3.3V
3	GND	-	Power Ground
4	GND	-	Power Ground
5	Link0-	-	Transmission Data of Pixels 1
6	Link0+	-	Transmission Data of Pixels 1

NO.	Symbol	I/O	Function
7	GND	-	Power Ground
8	Link1-	-	Transmission Data of Pixels 2
9	Link1+	-	Transmission Data of Pixels 2
10	GND	-	Power Ground
11	Link2-	-	Transmission Data of Pixels 3
12	Link2+	-	Transmission Data of Pixels 3
13	GND	-	Power Ground
14	CLKKIN-	-	Sampling Clock
15	CLKKIN+	-	Sampling Clock
16	GND	-	Power Ground
17	Link3-	-	Transmission Data of Pixels 4
18	Link3+	-	Transmission Data of Pixels 4
19	MODE	-	Not connect
20	SC	-	Scan direction control (Low=normal, High=Reverse)

8 bits LVDS input



Note: R/G/B data 7: MSB, R/G/B data 0: LSB

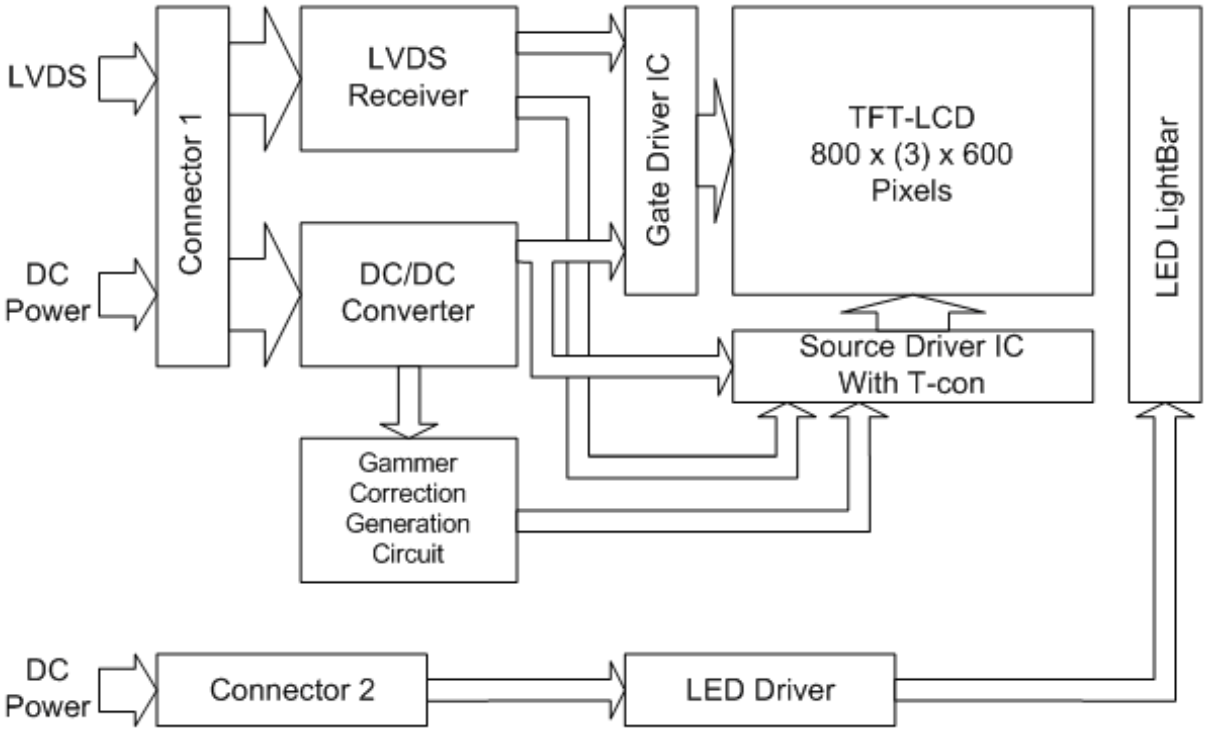
Item	Description	Note
R7	Red Data 7 (MSB)	
R6	Red Data 6	
R5	Red Data 5	
R4	Red Data 4	Red-pixel Data
R3	Red Data 3	Each red pixel's brightness data consists of these 8 bits pixel data.
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0 (LSB)	
G7	Green Date 7 (MSB)	Green-pixel Data

G6 G5 G4 G3 G2 G1 G0	Green Date 6 Green Date 5 Green Date 4 Green Date 3 Green Date 2 Green Date 1 Green Date 0 (LSB)	Each green pixel's brightness data consists of these 8 bits pixel data.
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 8 bits pixel data.
RxCLKIN+ RxCLKIN-	LVDS Clock Input	-
DE	Display Enable	-
VS	Vertical Sync	-
HS	Horizontal Sync	-

3.3.2 CN2: LED Driver Connector

NO.	Symbol	I/O	Function	Note
1	VL	-	LED Driver input voltage	12V
2	VL	-	LED Driver input voltage	12V
3	GND	P	LED Driver ground	Ground
4	GND	P	LED Driver ground	Ground
5	BLEN	P	LED Driver Enable pin. High : LED Back-light ON Low : LED Back-light Low	-
6	V_{PDIM}	P	PWM input for Back-light brightness adjust	1

3.4 Block Diagram



3.5 Timing Characteristics

3.5.1 DE Mode

Item	Symbol	Min	Typ.	Max.	Unit	Note
DCLK Frequency	fclk	32.6	39.6	62.4	MHz	-
Horizontal Display Area	thd		800		DCLK	-
HSD Period	th	890	1000	1300	DCLK	-
HSD Blanking	thb+thfp	90	200	500	DCLK	-
Vertical Display area	tvd		600		T_H	-
VSD Period	tv	610	660	800	T_H	-
VSD blanking	tvbp+tvfp	10	60	200	T_H	-

3.5.2 HV Mode

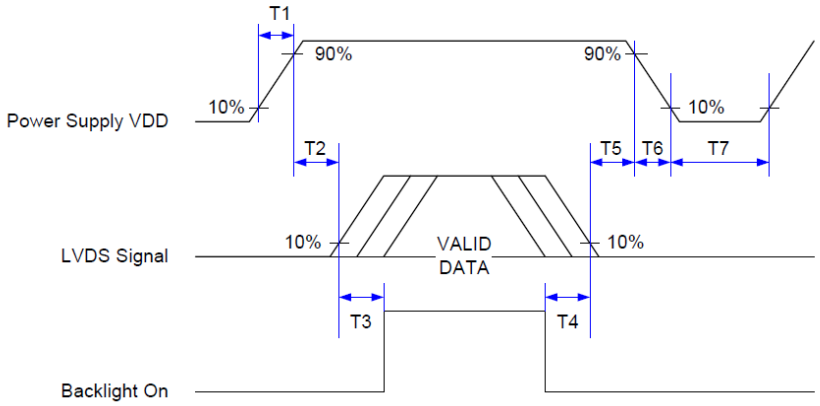
Horizontal timing

Item	Symbol	Min	Typ.	Max.	Unit	Note
DCLK Frequency	fclk	34.5	39.6	50.4	MHz	-
Horizontal Display Area	thd		800		DCLK	-
HSD Period	th	900	1000	1200	DCLK	-
HSD Pulse Width	thpw	1	-	40	DCLK	-
HSD Back Porch	thbp		88		DCLK	-
HSD Front Porch	thfp	12	112	312	DCLK	-

Vertical timing

Item	Symbol	Min	Typ.	Max.	Unit	Note
Vertical Display Area	tvd		600		T_H	-
VSD Period	tv	640	660	700	T_H	-
VSD Pulse Width	tvpw	1	-	20	T_H	-
VSD Back Porch	tvbp		39		T_H	-
VSD Front Porch	tvfp	1	21	61	T_H	-

3.5.3 Power ON/OFF Sequence



Symbol	Min	Typ.	Max.	Unit	Note
T1	0.5	-	20	ms	-
T2	0	40	50	ms	-
T3	200	-	-	ms	-
T4	200	-	-	ms	-
T5	0	40	50	ms	-
T6	0	-	20	ms	-
T7	1000	-	-	ms	-

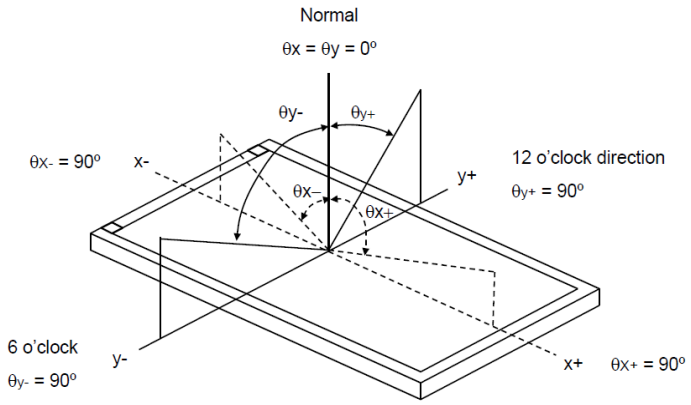
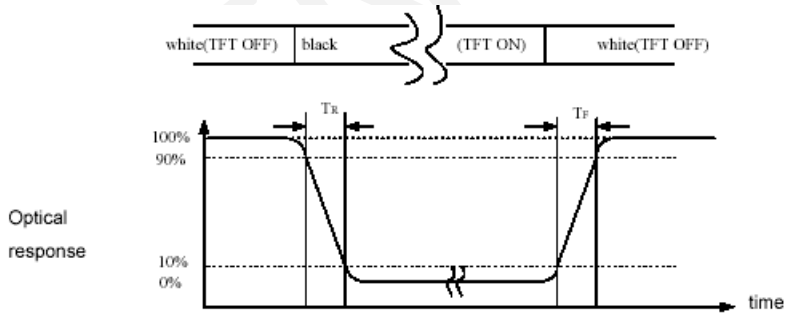
4. Optical Specification

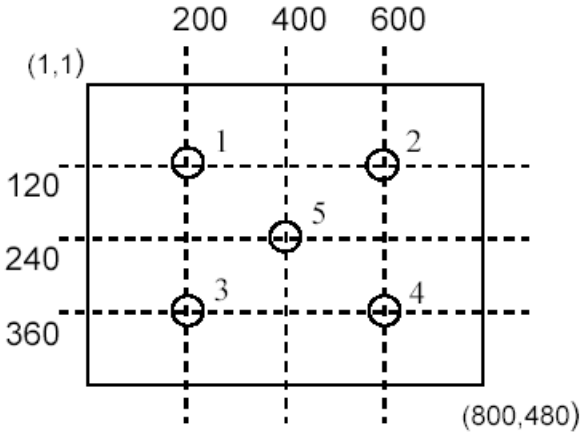
4.1 Optical Characteristics

Characteristics		Symbol	Conditions	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR	θ = 0° Normal viewing angle	480	600	-	ms	
Response Time	Rising	Tr + Tf		-	16	25	ms	3
	Falling							
Viewing Angle	Left	θ_x-	CR≥10	-	85	-	Degree	2, 5
	Right	θ_x+		-	85	-		
	Up	θ_Y+		-	85	-		
	Down	θ_Y-		-	85	-		
Colour Chromaticity	Red	Rx	θ = 0° Normal viewing angle	-	-	-	-	
		Ry		-	-	-		
	Green	Gx		-	-	-		
		Gy		-	-	-		
	Blue	Bx		-	-	-		
		By		-	-	-		
	White	Wx		TBD	TBD	TBD		
		Wy		TBD	TBD	TBD		
Luminance (Center)		L	θ = 0°, Ta=25°C	452	565	-	cd/m^2	4, 5
Uniformity		ΔL	-θ = 0° Normal viewing angle	-	70	-	%	4, 5

Measuring Condition: in dark room, at ambient temperature = 25±2°C, 15 min. warm-up time

These items are measured by BM-5A (TOPCON) or CA-1000(MINOLTA) in the dark room (no ambient light).

Note	Item	Test method
1	Definition of Viewing Angle	Viewing angle is measured at the center point of the LCD 
2	Definition of Contrast Ratio (CR)	Measure contrast ratio on the below 5 points (refer to figurel, #1~#5point) and take the average value, Contrast ratio is calculated with the following formula: Contrast Ratio (CR) = (White) Luminance of ON ÷ (Black) Luminance of OFF
3	Definition of Response Time	
4	Definition of Luminance Uniformity	Measured Maximum luminance [L (MAX)] and Minimum luminance [L (MIN)] on the 5 points. Luminance Uniformity is calculated with the following formula: ΔL = [L (MIN) / L (MAX)] X 100%
5	Definition of Luminance	Measure white luminance on the center point (point 5) and take the value.

Note	Item	Test method
		 Fig.1 Measuring point

5. LED Backlight Specification

5.1 LED Backlight Characteristics

Item	Symbol	Min	Typ.	Max	Unit	Condition
Input Voltage	VL	10.8	12.0	13.2	V	-
Input Current	ILED	-	TBD	-	mA	100% PWM duty, VL=12V
BLEN Logic High	VIH	2.5	-	VL	V	-
BLEN logic low	VIL	0	-	0.4	V	-
V_{PDIM} Logic High	VIH	2.5	-	5.5	V	-
V_{PDIM} Logic Low	VIL	0	-	0.4	V	-
V_{PDIM} PWM Duty Range	DR	5	-	100	%	-
LED Life Time	LT	80000	100000	-	-	-

Note 1: Ta means ambient temperature of TFT-LCD module.

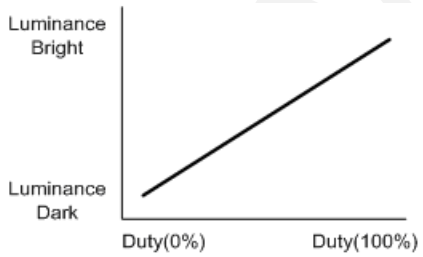
Note 2: VL, ILED are defined for LED B/L. (100% duty of PWM dimming)

Note 3: FPDIM are defined for LED Driver.

Note 4: If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note5: Operating life means brightness goes down to 50% minimum brightness. LED life time is estimated data.

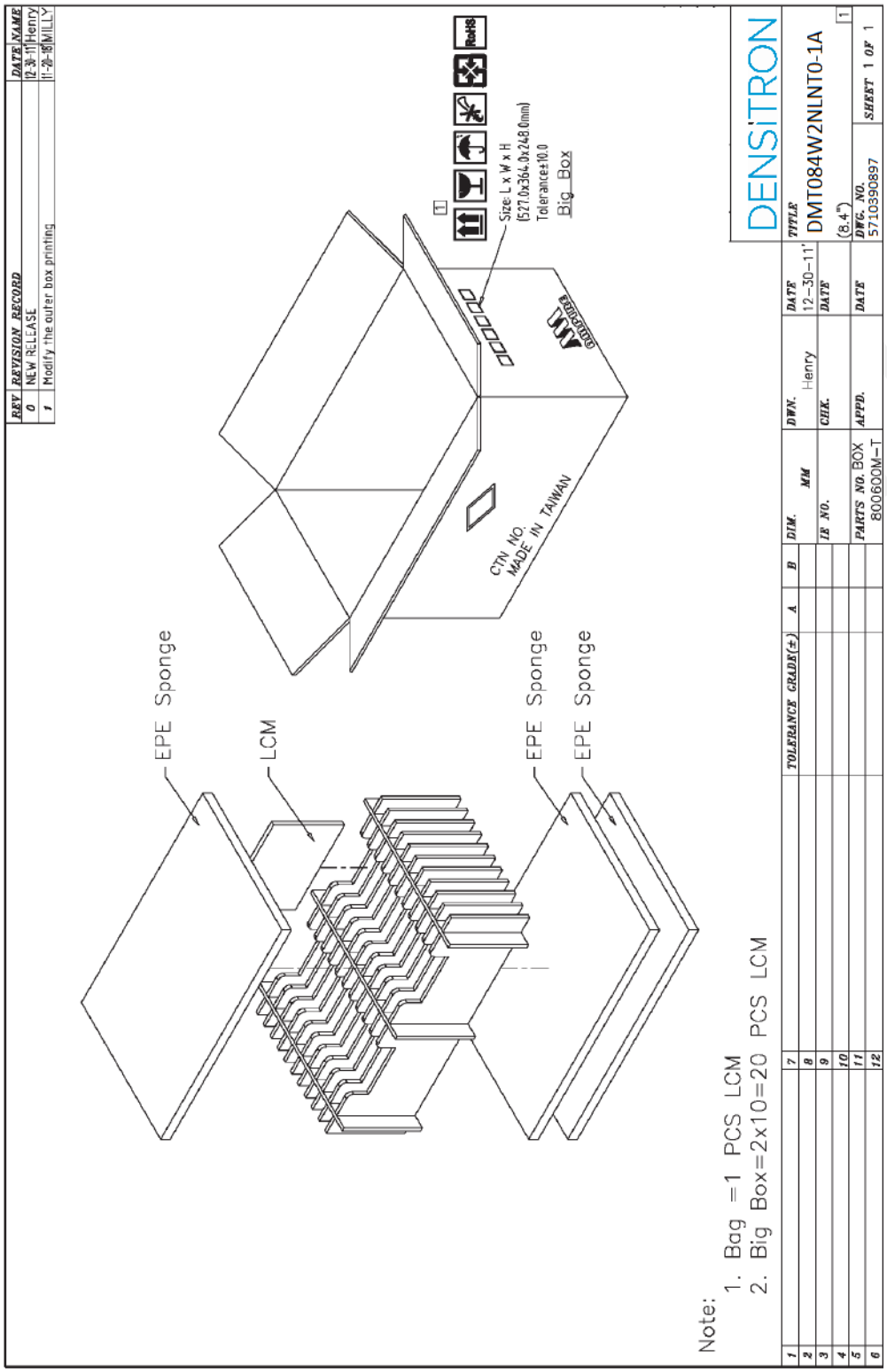
Note 6: the structure of LED B/L shows as below.



5.2 Internal Circuit Diagram

TBD

6. Packaging



7. Quality Assurance Specification

7.1 Conformity

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

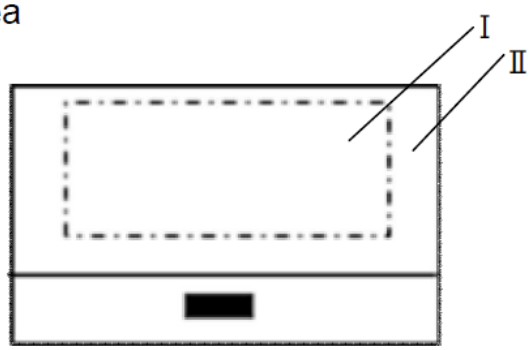
7.2 Delivery Assurance

7.2.1 Delivery Inspection Standards

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

7.2.2 Zone Definition

Ⅰ area: viewing area
Ⅱ area: outside viewing area



7.3 Dealing with Customer Complaints

7.3.1 Non-conforming Analysis

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

After accepting it, Densitron should complete the analysis in reasonable time and update the status to the purchaser.

7.3.2 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	70±3°C , t=240 hrs	-
Low Temperature Operation	-20±3°C , t=240 hrs	-
High Temperature Storage	80±3°C , t=240 hrs	1, 2
Low Temperature Storage	-30±3°C , t=240 hrs	1, 2
Storage at High Temperature and Humidity	60°C, 90% RH , 240 hrs	1, 2
Thermal Shock Test	-20°C (30min) ~ 70°C (30min), 100 cycles	1, 2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1: Condensation of water is not permitted on the module.

Note 2: The module should be inspected after 1 hour storage in normal conditions (15-35°C, 45-65%RH).

Definitions of life end point:

Current drain should be smaller than the specific value.

Function of the module should be maintained.

Appearance and display quality should not have degraded noticeably.

Contrast ratio should be greater than 50% of the initial value.

Note 3: The module shouldn't be tested more than one condition, and all the test conditions are independent.

Note 4: All the reliability tests should be done without protective film on the module.

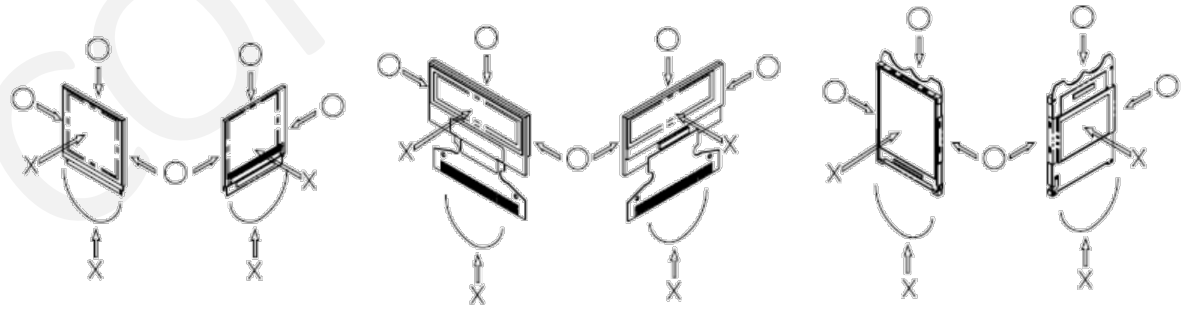
8.1.1 Inspection Check Standard

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.