

To : _____**REV
A**

Product Specification
(Preliminary version)
(RoHS Compliant)

Customer :

Model No. : **HD-1280G800-101CPT**

Designed by	Checked by	Production DEPT.	Approved by

Final Approval by Customer

☐ **OK**☐ **NG, Problem survey:**

Approved By _____

Hyundai LCD (HK) Co., Ltd.**MODEL****HD-1280G800-101CPT****1****Product Specifications**

* Records of Revision *

Version	Contents	Date	Note
A.0	New specification was released	2013.08.27	

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1. GENERAL DESCRIPTION

1.1 DESCRIPTION

HD-1280G800-101CPT is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, driver ICs, FPC, a backlight unit and a capacity touch panel.

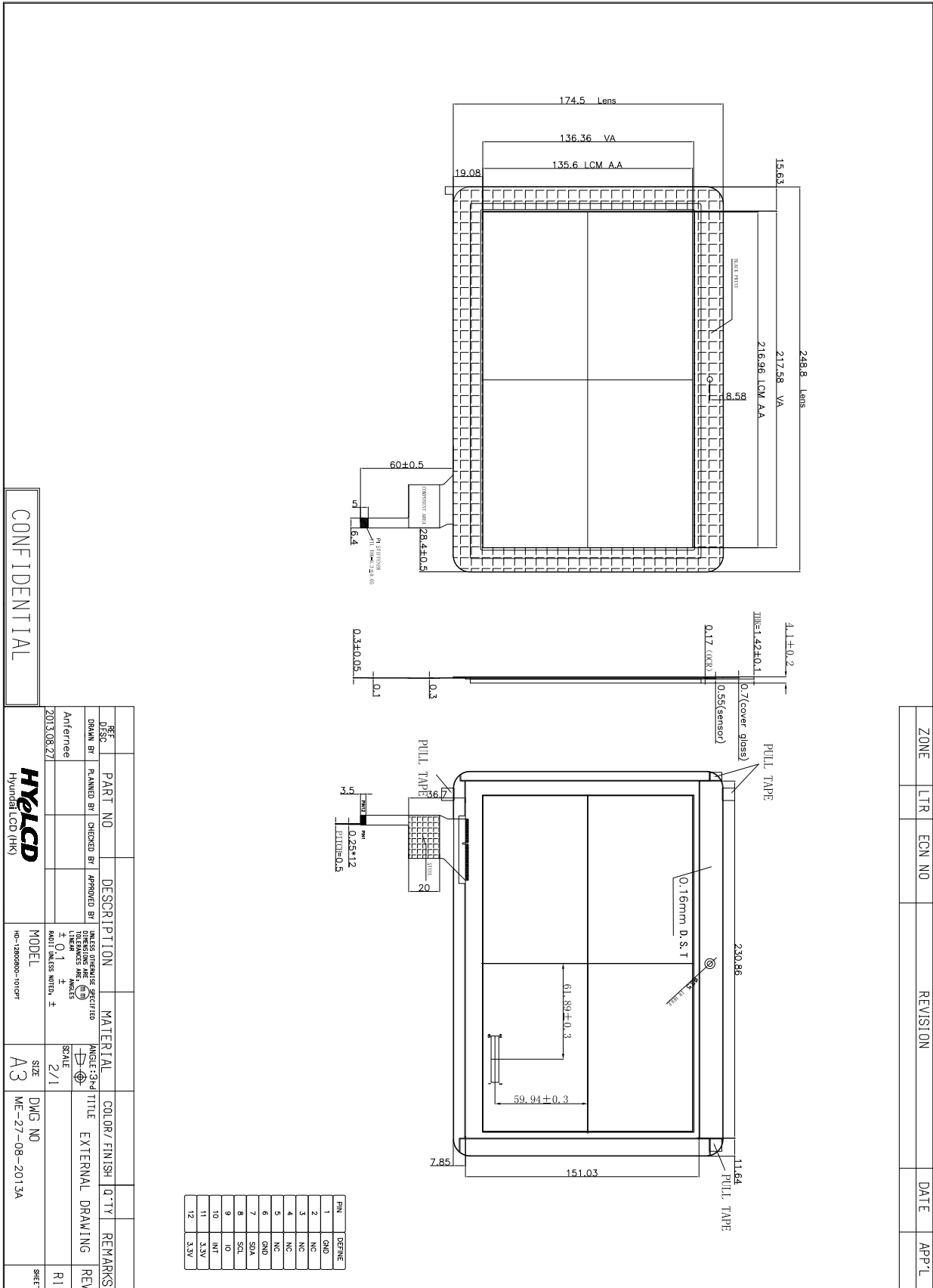
1.2 FEATURES:

Parameter	Specification	Unit	Remarks
Active area	216.96(H) x 139.6(V)	mm	
Number of pixels	1280(H) × 800(V)	pixels	
Pixel pitch	0.1695 (H) X0.1695 (V) × RGB	mm	
Pixel arrangement	Pixels RGB stripe arrangement		
Display colors	16777216(8bits)	colors	
Display mode	Transmission mode, Normally Black		
Outline Dimension	229.46(H) × 149.20(V) × 2.5(D) typ.	mm	
Weight	-----		
Surface Treatment	Hard Coating, 3H, Low Reflection (Front Polarizer)		

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2. MECHANICAL SPECIFICATION

Genral tolerance: ± 0.2



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3. PIN DESCRIPTION

3.1 Electrical Interface Connection

The electronics interface connector is FF12-31A-R11B.

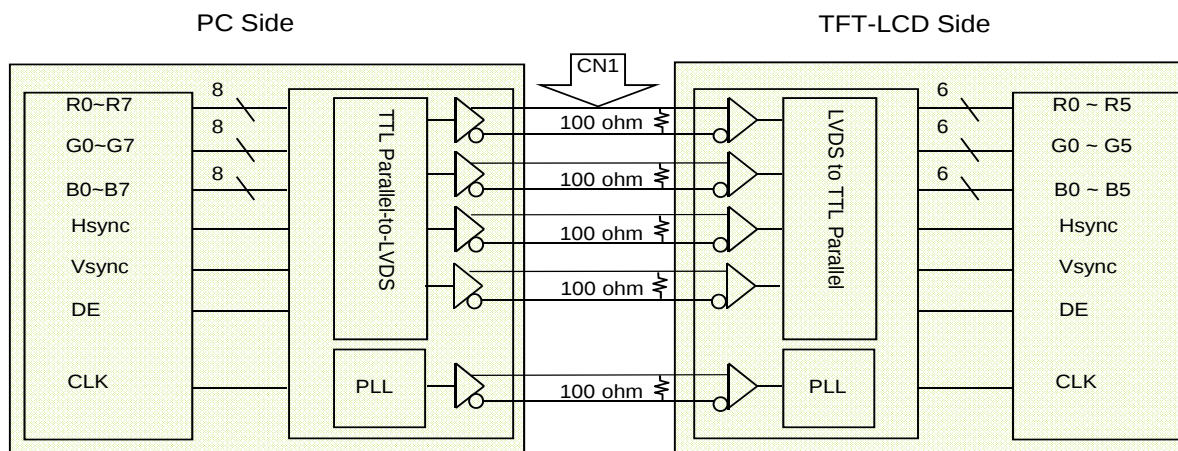
The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

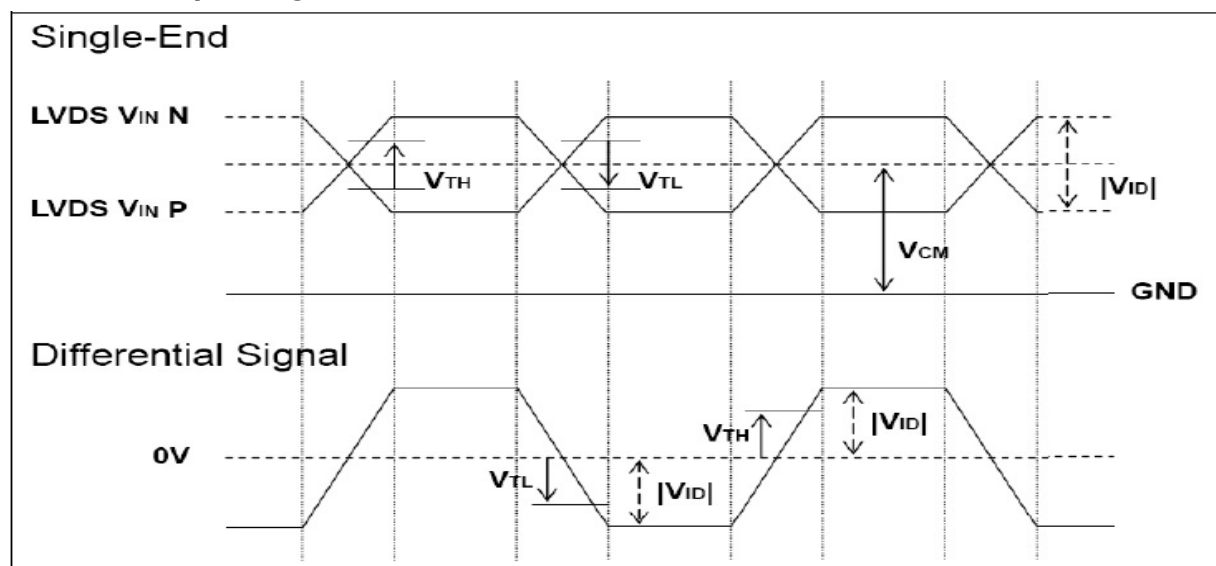
Pin	Symbol	Functions	Pin	Symbol	Functions
1	GND1	Ground	24	RXin1N	-LVDS differential data (G1-G5, B0-B1)
2	GND2	Ground	25	RXin1P	+LVDS differential data (G1-G5, B0-B1)
3	NC1	No connection	26	GND9	Ground
4	3.3V	Logic power 3.3V	27	RXin0N	-LVDS differential data (R0-R5, G0)
5	3.3V	Logic power 3.3V	28	RXin0P	+LVDS differential data (R0-R5, G0)
6	3.3V	Logic power 3.3V	29	GND10	Ground
7	3.3V	Logic power 3.3V	30	GND11	Ground
8	3.3V	Logic power 3.3V	31	NC2	No connection
9	WPN	No connection	32	FB1	LED FB1
10	SCL	No connection	33	FB2	LED FB2
11	SDA	No connection	34	FB3	LED FB3
12	GND3	Ground	35	FB4	LED FB4
13	GND4	Ground	36	FB5	No connection
14	GND5	Ground	37	FB6	No connection
15	RXin3N	-LVDS differential data (R6,R7,G6,G6,B6,B7)	38	NC3	No connection
16	RXin3P	+LVDS differential data (R6,R7,G6,G6,B6,B7)	39	VLED1	LED Power supply Voltage
17	GND6	Ground	40	VLED2	LED Power supply Voltage
18	LVDS_RX_N	- LVDS differential clock input	41	VLED3	LED Power supply Voltage
19	LVDS_RX_P	+ LVDS differential clock input	42	VLED4	LED Power supply Voltage
20	GND7	Ground	43	VLED5	LED Power supply Voltage
21	RXin2N	-LVDS differential data (B2-B5, HS, VS, DE)	44	NC4	No connection
22	RXin2P	+LVDS differential data (B2-B5, HS, VS, DE)	45	GND12	Ground
23	GND8	Ground			

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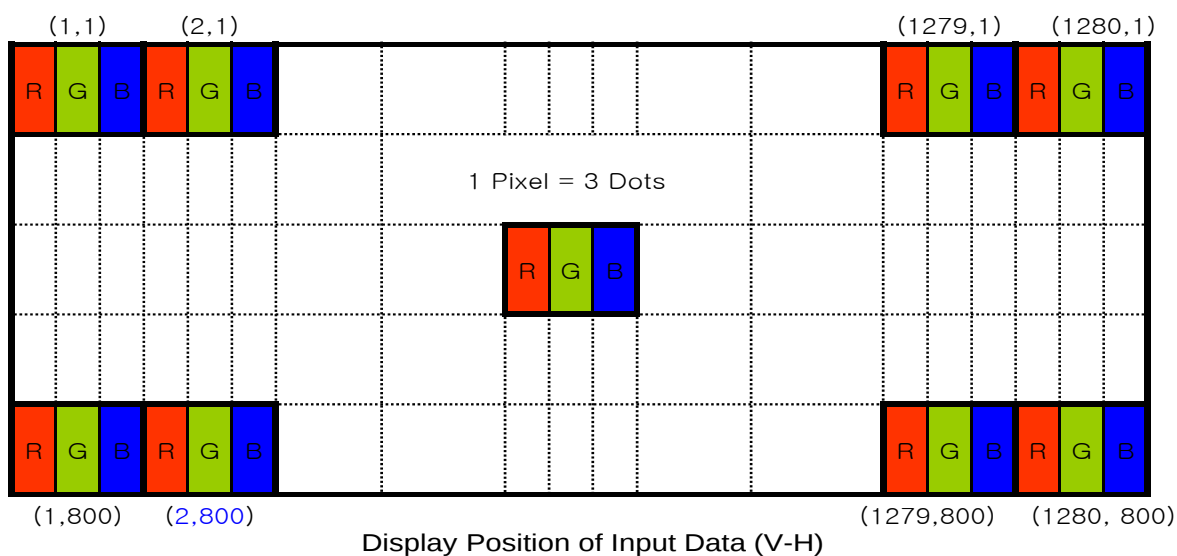
3.2 LVDS Interface



3.3 LVDS Input signal



3.4 Data Input Format



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4. ELECTRICAL CHARACTERISTICS

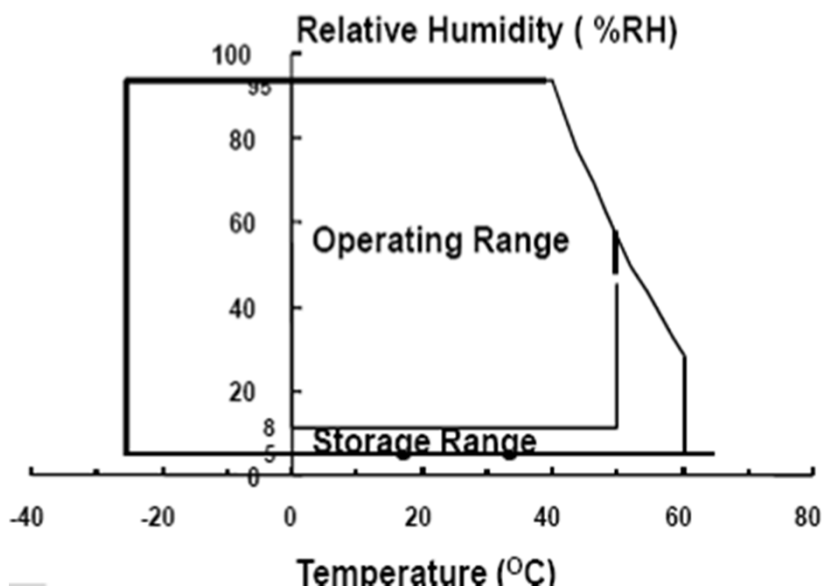
4.1 ABSOLUTE MAXIMUM RATINGS

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. LCD Module Electrical Specifications > [Ta = 25 ± 2 °C]

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage (LCD Module)	V _{DD}	3	3.3	3.6	V	
Back-light Power Supply Voltage	HV _{DD}	-	-	31	V	
Back-light LED Current	I _{LED}	-		80	mA	
Back-light LED Reverse Voltage	V _R	-		3.1	V	
Operating Temperature	T _{OP}	-20		+65	°C	
Storage Temperature	T _{ST}	-40		+85	°C	

Note : 1) Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 °C max. and no condensation of water.



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4.2 TFT LCD MODULE

4.2.1 Operating Conditions

< Table 3. LCD Module Electrical Specifications >

[Ta =25 ± 2 °C]

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	V _{DD}	3.0	3.3	3.6	V	-
Power Supply Current	I _{DD}	-	-	260	mA	-
Back-light Power Supply Voltage	H _{VDD}			17	V	-
Back-light Power Supply Current	I _{HVDD}		72		mA	-
Positive-going Input Threshold Voltage	V _{IT+}	-	-	+100	mV	Vcom = 1.2V typ.
Negative-going Input Threshold Voltage	V _{IT-}	-100	-	-	mV	
Differential input common mode voltage	V _{com}	-	1.2	-	V	V _{IH} =100mV, V _{IL} =-100mV
Power Consumption	P _D	-	-	0.85	W	Note 1
	P _{BL}	-	-	2.2	W	Note 2
	P _{Total}		-	3.05	W	

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.

b) Typ. : Color Bar Pattern

a) Max. : White(L255) Pattern

2. Calculated value for reference (V_{LED} × I_{LED}) w/o LED Driver's efficiency

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4.3 BACKLIGHT UNIT

< Table 4. LED Driving guideline specifications >

Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage	V _F	18	18.6	19.2	V	-
LED Forward Current	I _F	108	120	138	mA	-
LED Power Consumption	P	1944	2232	2649.6	mW	Note 1
LED Life-Time	N/A	15,000			Hour	IF = 20mA Note 2

Notes : 1. Calculator Value for reference $I_{LED} \times V_{LED} = P_{LED}$

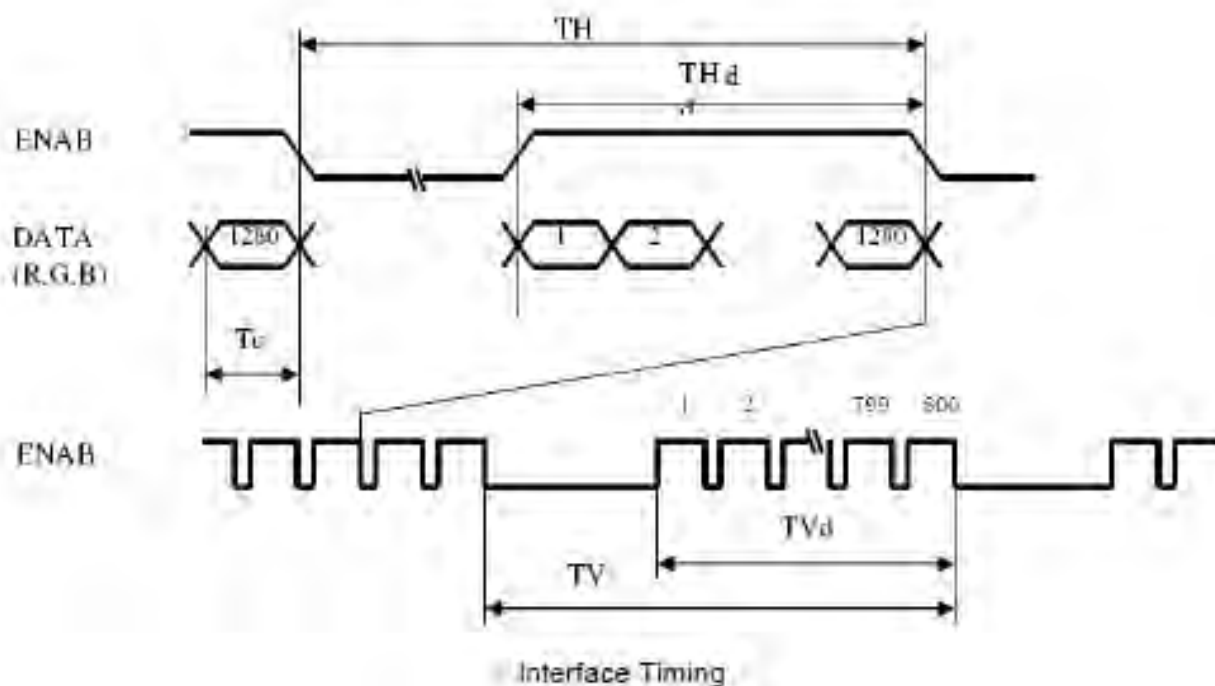
2. The LED Life-time define as the estimated time to 50% degradation of initial luminous.

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5. INPUT SIGNAL TIMING

5.1 The 101CPT is operated by the DE mode.

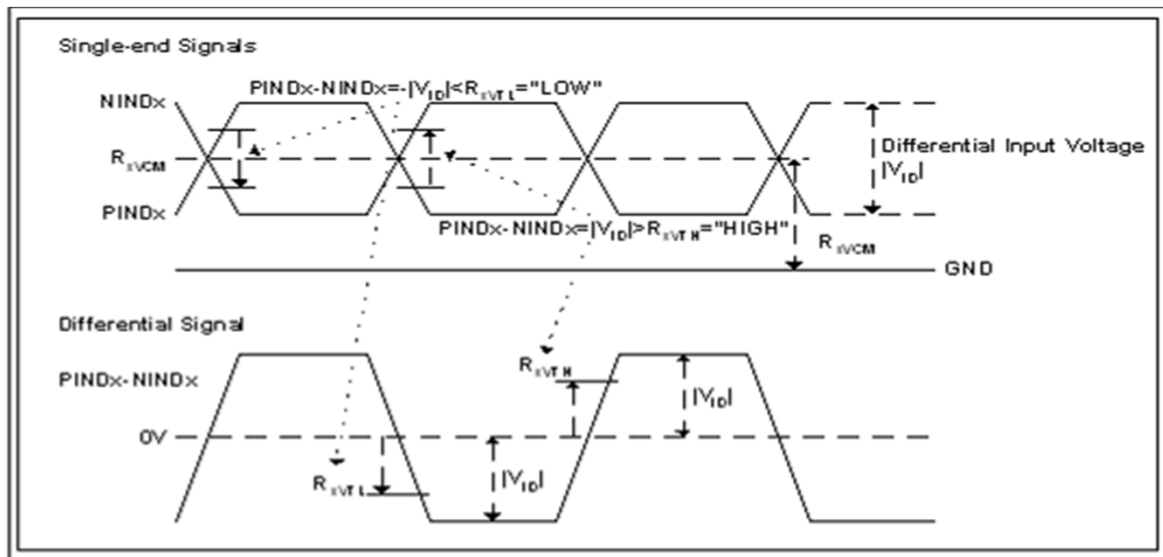
Signal	Item	Symbol	Min	Type	Max	Unit
DCLK	Frequency	1/TC	60	65	70	MHz
	Cycle	Tc	16.66	15.38	14.3	ns
DE	Horizontal Period	THd	1280	1280	1280	Tc
	Horizontal Cycle	TH	1310	1330	1560	Tc
		TH_time	19.5	20.46	21.83	ns
	Vertical Period	TVd	800	800	800	Tc
	Vertical Cycle	TV	-	812	-	Tc



5.2 LVDS Rx Interface Timing Parameter

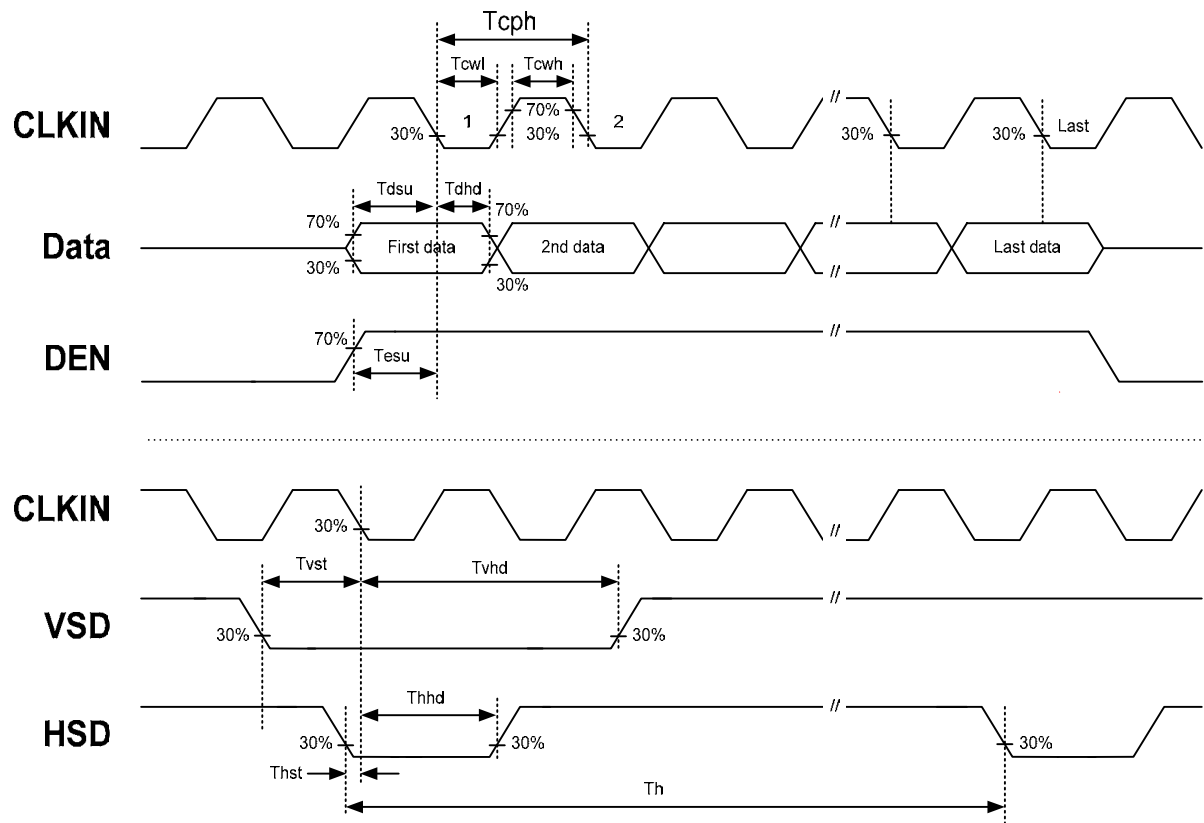
The specification of the LVDS Rx interface timing parameter is shown in Table 8.

<Table 8. LVDS Rx Interface Timing Specification>



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5.3 Input Clock and Data Timing Diagram



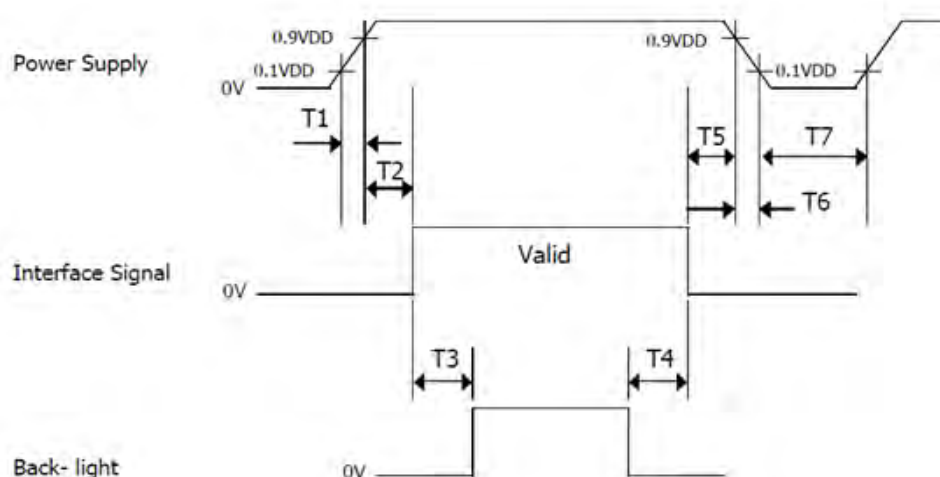
5.4 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

Color & Gray Scale		Input Data Signal																							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	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
	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
	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
	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
	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
	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
	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
	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
Gray Scale of Red	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	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	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	0	0	0	0	0
	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
Gray Scale of Green	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	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Darker	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	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	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
	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
Gray Scale of Blue	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	0	0	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	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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
Gray Scale of White	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	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	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

5.5 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

Power-On/Off Timing Sequence:



Parameter	Values			Units
	Min	Typ	Max	
T1	0	-	10	ms
T2	0	-	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0.5	-	50	ms
T6	0	-	10	ms
T7	500	-	-	ms

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.

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6. OPTICAL CHARACTERISTICS

6.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance $\leq 1\text{lux}$ and temperature = $25\pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . We refer to $\theta=0$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta=90$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta=180$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta=270$ ($=\theta_6$) 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 luminance, color and uniformity should be tested by CA210. The backlight should be operating for 30 minutes prior to measurement. VDD shall be $3.7 \pm 0.5\text{V}$ at 25°C . Optimum viewing angle direction is 6 o'clock.

6.2 Optical Specifications <Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	80	80	-	Deg.	Note 1
		Θ_9		80	80	-	Deg.	
	Vertical	Θ_{12}		80	80	-	Deg.	
		Θ_6		80	80	-	Deg.	
Color Gamut				-	50	-	%	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$	600	800			Note 2
Luminance of White	9 Points	Yw	$\Theta = 0^\circ$	300	400		cd/m2	Note 3
White Luminance uniformity	9 Points	ΔY_5		80%	90%	-		Note 4
	13 Points	ΔY_{13}		65%	-			
Reproduction of color	White	W_x	$\Theta = 0^\circ$	Typ. -0.03	T.B.D.	Typ. +0.03		
		W_y			T.B.D.			
	Red	R_x			T.B.D.			
		R_y			T.B.D.			
	Green	G_x			T.B.D.			
		G_y			T.B.D.			
	Blue	B_x			T.B.D.			
		B_y			T.B.D.			
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C $\Theta = 0^\circ$	-	30	-	ms	Note 6
Cross Talk		CT	$\Theta = 0^\circ$	-	-	2.0	%	Note 7

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 $\theta = 0$ 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)
- 1) Luminance Contrast Ratio (CR) is defined mathematically.

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

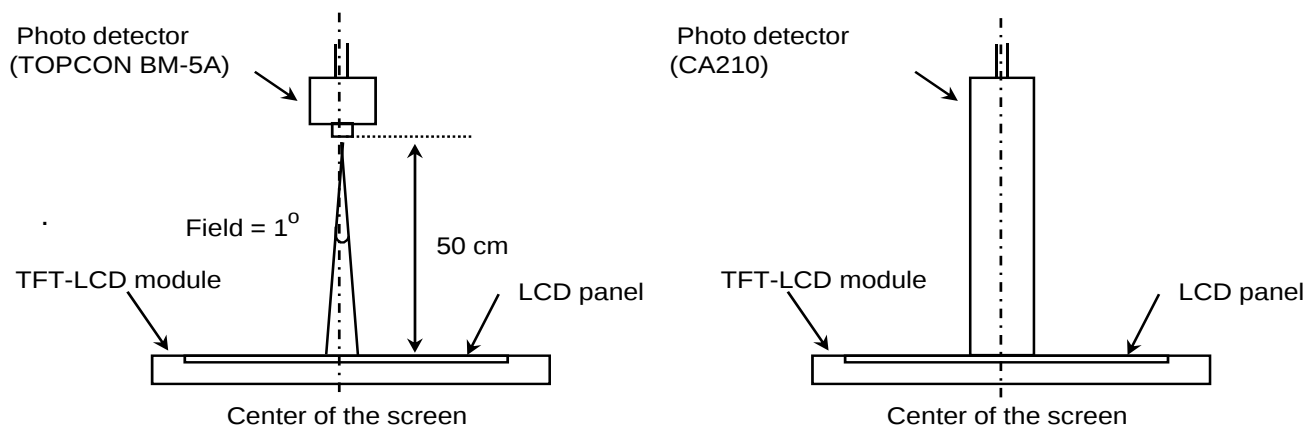
3. Center Luminance of white is defined as luminance values of 5point average across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display. The luminance is measured by CA210 when the LED current is set at 18.8mA.

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4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \text{Minimum Luminance of 5 points} / \text{Maximum Luminance of 5 points}$ (see FIGURE 2).
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 3 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 any adjacent area is driven dark. (See FIGURE 4).

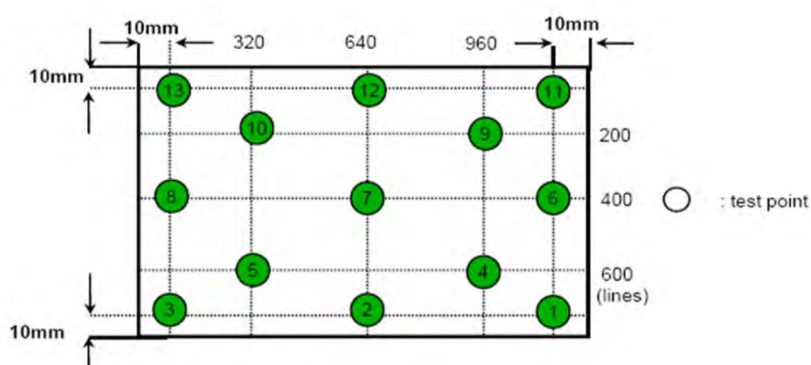
6.3 Optical measurements

Figure 1. Measurement Set Up



View angle range measurement setup Luminance , uniformity and color measurement setup

Figure 2. White Luminance and Uniformity Measurement Locations (13 points)

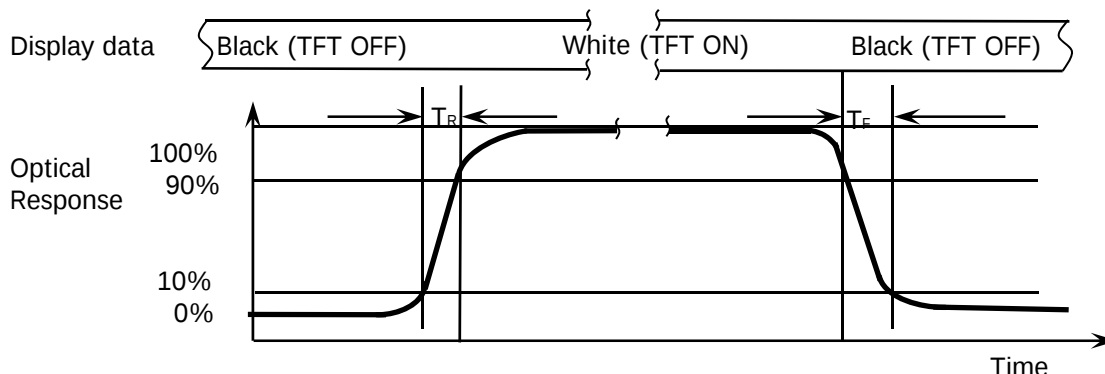


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Center Luminance of white is defined as luminance values of center 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

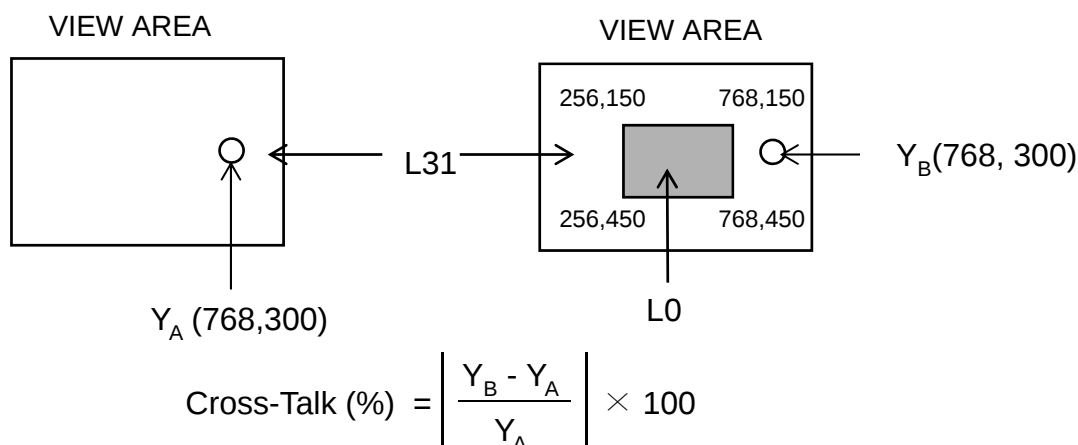
The White luminance uniformity on LCD surface is then expressed as : $\Delta Y5 = \text{Minimum Luminance of 5 points} / \text{Maximum Luminance of 5 points}$ (see FIGURE 2).

Figure 3. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 3 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 .

Figure 4. Cross Modulation Test Description



Where:

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

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

The location measured will be exactly the same in both patterns

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 any adjacent area is driven dark (Refer to FIGURE 4).

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7. Touch Panel Specifications

7.1 Scope

This specification applies to consumer electronics the capacitive touch screen (such as MID, multipoint vehicle DVD, etc.)

7.1.1 Features and General Specifications

General Specifications (L=Length ; W=Width ; T=Thickness)

Items	Specifications
structure	G/G
Outline Dimensional	248.8(W) X 174.5(H) X 1.42(T) mm
View Area	217.58(W) X 136.36(H) mm

7.1.2 Environment Conditions

Items	Value
Operating Temperature & Humidity	-20~70℃, ≤90%RH
Storage Temperature & Humidity	-30~80℃, ≤90%RH

7.1.3 Mechanical characteristics

Items	Value
Finger contact area	$\Phi \geq 5\text{mm}$
Optical Characteristics	Transmittance: $\geq 82\%$
Surface Hardness	6H

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7.2 Electric Characteristics

Items	Value
Driver Type	COF
Driver IC	FT5406
Working voltage	DC2.8-3.3V
Insulation Resistance	> 20M DC25V
Working current	12mA~14.5mA
Response time	≤16ms

7.3 Interface

Pin NO	Describe
1	GND
2-5	NC
6	GND
7	SDA
8	SCL
9	IO
10	INT
11	3.3V
12	3.3V

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8. QUALITY ASSURANCE SYSTEM

8.1 TEMPERATURE AND HUMIDITY

Test Item	Test Condition
High Temperature Storage	Ta=70℃ ; 240hrs
Low Temperature Storage	Ta=-20℃ ; 240hrs
High Temperature Operation	Ta=60℃ , 240Hrs
Low Temperature Operation	Ta=-10℃ ; 240hrs
High Temperature High Humidity Operation	Ta=40℃ , 90%RH , 240Hrs(no condensation)
Thermal Shock	-10℃ (0.5h) ~ 60℃ (0.5h) / 1Hrs/cycles

8.2 VIBRATION & Drop

Test item	Conditions
Drop (with carton)	Height:60cm 1corner, 3edges, 6 surfaces
Vibration (with carton)	Radom vibration: 0.015G ² /Hz from 5 ~ 200Hz -6dB/octave from 200~500Hz

8.3 ESD

Test item	Conditions
Electro Static Discharge Test (non-operation)	±200v, 200pF, 0Ω

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9. PRECAUTION RELATING PRODUCT HANDLING

9.1 SAFETY

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

9.2 HANDLING

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

9.3 STATIC ELECTRICITY

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

9.4 STORAGE

1. Store the module in a dark room where must keep at $25\pm10^{\circ}\text{C}$ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

9.5 CLEANING

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

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