

TITLE : HV101HD1 - 1E1**Preliminary Product Specification****HYDIS Technologies**

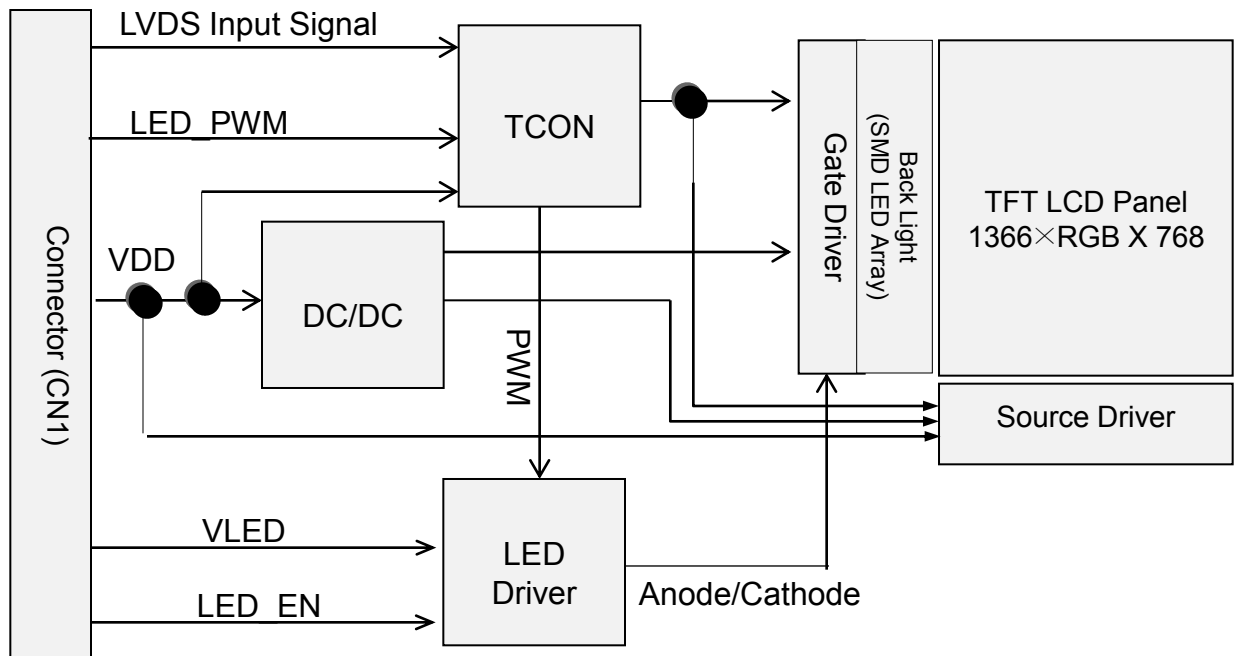
Contents

No	Item	Page
1.0	General Description	4
2.0	Absolute Maximum Ratings	6
3.0	Electrical Specifications	7
4.0	Optical Specifications	11
5.0	Interface Connections	16
6.0	Signal Timing Specifications	19
7.0	Signal Timing Waveforms	19
8.0	Input Signals, Basic Display Colors & Gray Scale of Colors	20
9.0	Power Sequence	21
10.0	Mechanical Characteristics	22
11.0	Mechanical Drawing	23
12.0	Reliability Test	25
13.0	Handling & Cautions	26
14.0	Labels	27
15.0	Packing Information	29

1.0 GENERAL DESCRIPTION

1.1 Introduction

HV101HD1-1E1 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 10.1 inch diagonally measured active area with HD resolutions (1366 horizontal by 768 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical Stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is a low reflection and higher color type.



1.2 Features

- FAB Site : CPT
- 3.3 V Logic Power
- LVDS Interface (1channel)
- 16.7M Colors (8bit)
- Data Enable Signal Mode
- SMD LED (36EA) Bottom alignment
- Green Product (RoHS) & Halogen free

1.3 Application

- industrial tablet

1.4 General Specifications

< Table 1. General Specifications >

Parameter	Specification	Unit	Remark
Active area	223.341(H) × 125.568(V)	mm	
Number of pixels	1366(H) × RGB X 768(V)	pixels	
Pixel pitch	0.1635 × 0.1635	mm	
Pixel arrangement	RGB Vertical Stripe		
Display colors	16.7M (8bit)	colors	
Display mode	Normally Black		
Outline dimension	234.53±0.3(H) × 138.97±0.3(V) × 2.4±0.2(D)	mm	
Weight	115 (Max.)	g	
Back-light	Bottom alignment, 36-LEDs type		

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

< Table 2. Absolute Maximum Ratings >

Ta=25+/-2°C

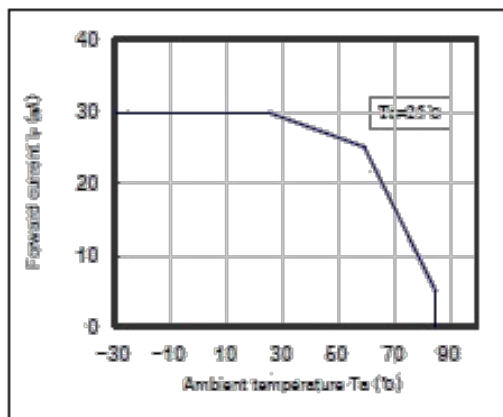
Parameter	Symbol	Min.	Max.	Unit	Remarks
Logic Power Supply Voltage	V _{DD}	-0.3	4.0	V	
Logic Power Supply Voltage	V _{CC}	-0.3	2.0	V	
Back-light Power Supply Voltage	HV _{DD}	-0.3	40	V	
Back-light LED Current	I _{LED}		30.0	mA	Note 1
Back-light LED Reverse Voltage	V _R	-	TBD	V	
Operating Temperature	T _{OP}	-0	+50	°C	Note 1, Note 2
Storage Temperature	T _{SP}	-20	+60	°C	

Note 1. Ambient temperature vs allowable forward current are shown in the figure below.

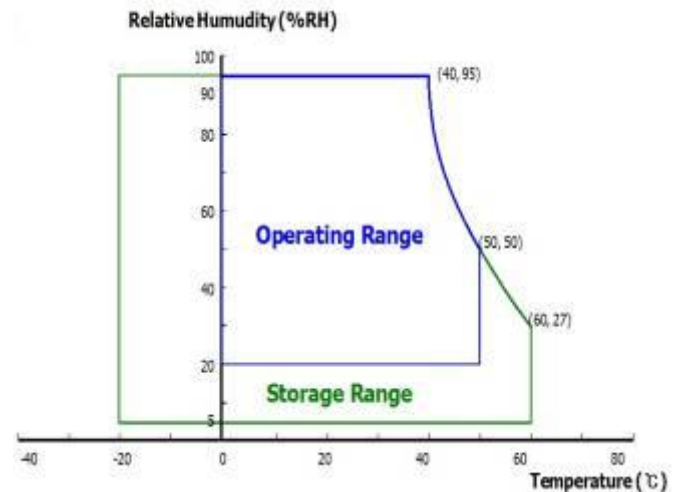
Note 2. Temperature and relative humidity range are shown in the figure below.

90% RH Max. (40°C ≥ Ta)

Maximum wet - bulb temperature at 39°C or less. (> 40°C) No condensation.



Forward Current Dissipation Curve



3.0 ELECTRICAL SPECIFICATIONS

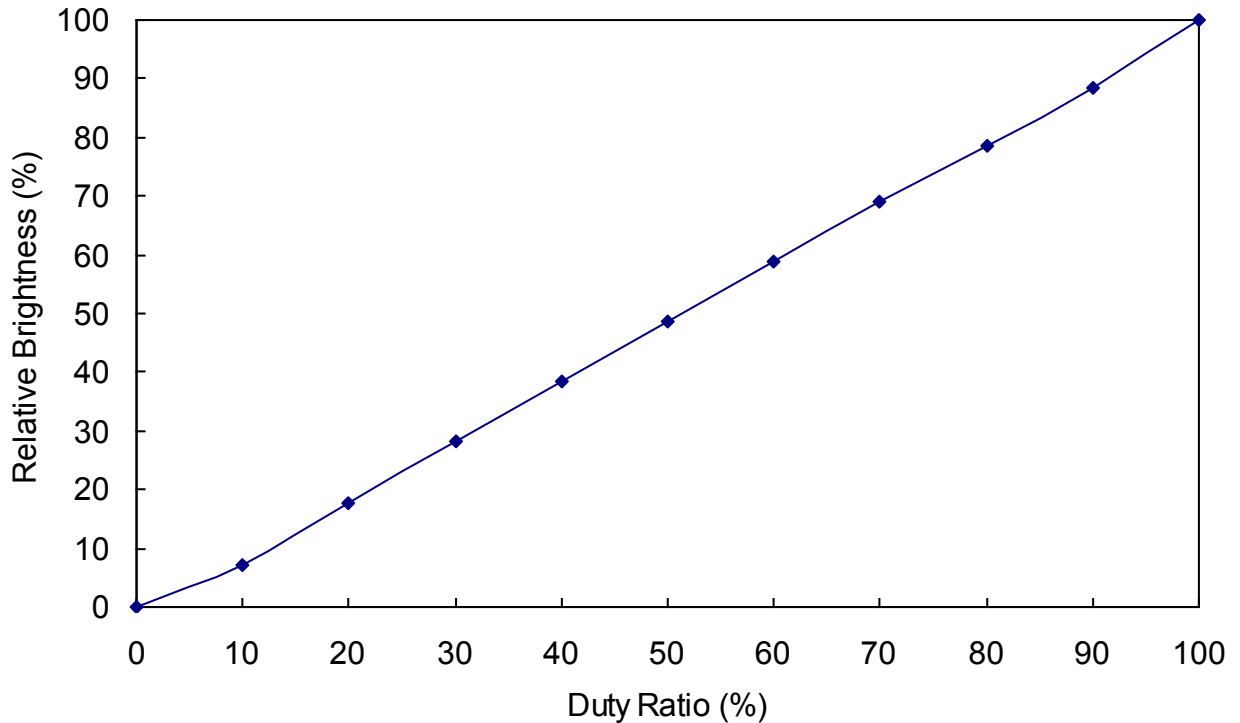
3.1 Electrical Specifications

< Table 3. Electrical Specifications >

Parameter		Min.	Typ.	Max.	Unit	Remarks
Logic Power Supply Voltage	V_{DD}	-	3.3	-	V	
Logic Power Supply Current	I_{DD}	-	TBD	-	mA	Vdd=3.3V, 25°C Note 1
Back-light LED Voltage / Back-light LED Total Voltage	V_{LED} / V_{BL}	2.8/ 16.8	2.9/ 17.4	3.0/ 18.0	V	
Back-light LED Current / Back-light LED Total Current	I_{LED} / I_{BL}	-	17/ 102	-	mA	
Power Consumption	P_{DD}	-	TBD	-	W	Note 2
	P_{CC}	-	TBD	-	W	
	P_{BL}	2.02	2.10	2.16	W	

- Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
(Test Pattern : White)
2. Calculated value for reference ($V_{LED} \times I_{LED} \times \#$ of LEDs (36EA)).
This value is with LED driver efficiency (85%)

3.2 PWM Duty Ratio vs Brightness



Notes :

In case of duty ratio 0%, LED can't illuminate itself so this state is LED off.

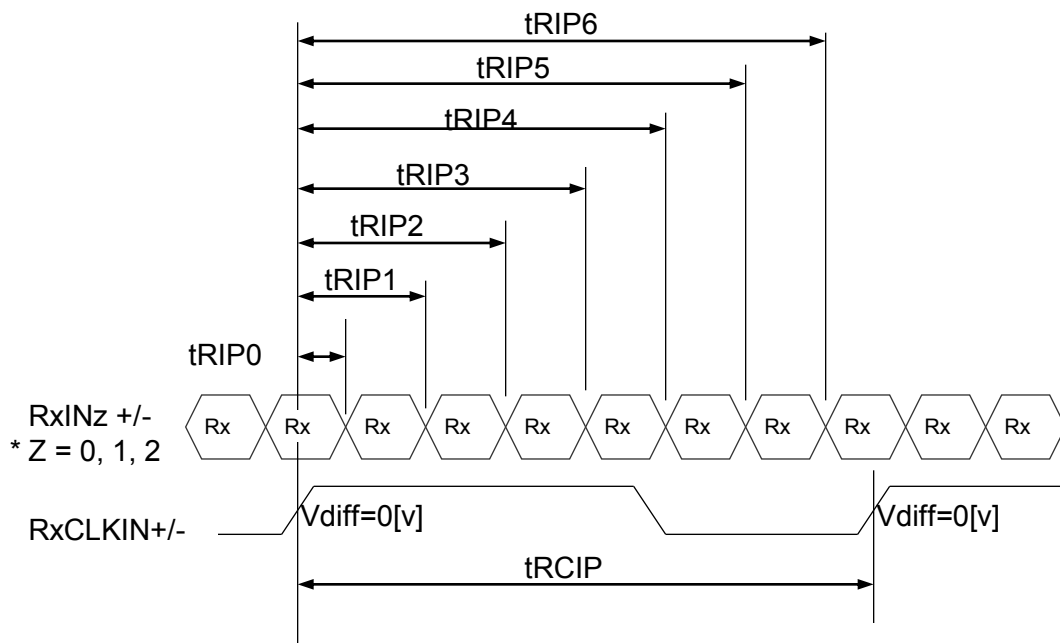
In case of duty ratio 100%, the brightness of LED is maximum and the state is LED on.

3.3 LVDS Interface

The specification of the LVDS Rx interface timing parameter

< Table 9, LVDS Rx Interface Timing Specification >

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
CLKIN Period	tRCIP	-	12.43	-	nsec	
Input Data 0	tRIP0	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP1	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP2	2 × tRCIP/7-0.4	2 × tRCIP/7	2 × tRCIP/7+0.4	nsec	
Input Data 3	tRIP3	3 × tRCIP/7-0.4	3 × tRCIP/7	3 × tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4 × tRCIP/7-0.4	4 × tRCIP/7	4 × tRCIP/7+0.4	nsec	
Input Data 5	tRIP5	5 × tRCIP/7-0.4	5 × tRCIP/7	5 × tRCIP/7+0.4	nsec	
Input Data 6	tRIP6	6 × tRCIP/7-0.4	6 × tRCIP/7	6 × tRCIP/7+0.4	nsec	



4.0 OPTICAL SPECIFICATIONS

4.1 Overview

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 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 $\theta_{\Phi=0}$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta_{\Phi=90}$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta_{\Phi=180}$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta_{\Phi=270}$ ($=\theta_6$) 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 backlight should be operating for 30 minutes prior to measurement. V_{DD} shall be $3.3 \pm 0.3\text{V}$ at 25°C .

4.2 Optical Specifications

<Table 6. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Viewing Angle range	Horizontal	θ_3	CR > 10	80	89	-	Deg.	Note 1
		θ_9		80	89	-	Deg.	
	Vertical	θ_{12}		80	89	-	Deg.	
		θ_6		80	89	-	Deg.	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$	500	800	-		Note 2
Luminance of White	1 Points	Y_w	$\Theta = 0^\circ$	350	400	-	cd/m ²	Note 4
White Luminance uniformity	9 Points	ΔY_9		75	-	-	%	Note 4
White Chromaticity		W_x	$\Theta = 0^\circ$		TBD		-	Note 3
		W_y			TBD		-	
Reproduction of color	Red	R_x	$\Theta = 0^\circ$		-		-	Note 3
		R_y			-		-	
	Green	G_x			-		-	
		G_y			-		-	
	Blue	B_x			-		-	
		B_y			-		-	
NTSC					50		%	
Response Time		Total ($T_r + T_d$)	Ta = 25°C $\Theta = 0^\circ$	-	-	30	ms	Note 5
Cross Talk		CT	$\Theta = 0^\circ$	-	-	2.0	%	Note 6

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 Figure1).

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 Figure1). Luminance Contrast Ratio (CR) is defined mathematically as $CR = \text{Luminance when displaying a white raster} / \text{Luminance when displaying a black raster}$.

3. Reference only / Standard Front Surface Treatment Measured with green cover glass. The color chromaticity coordinates specified in Table 4 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.

4.3 Optical Measurements

Figure 1. Measurement Set Up

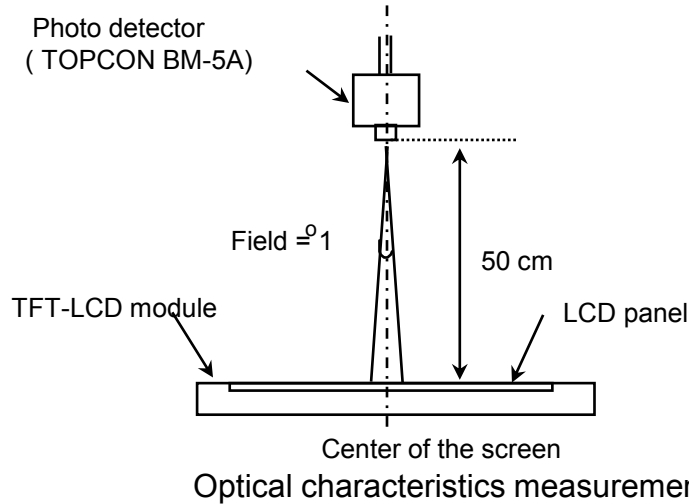
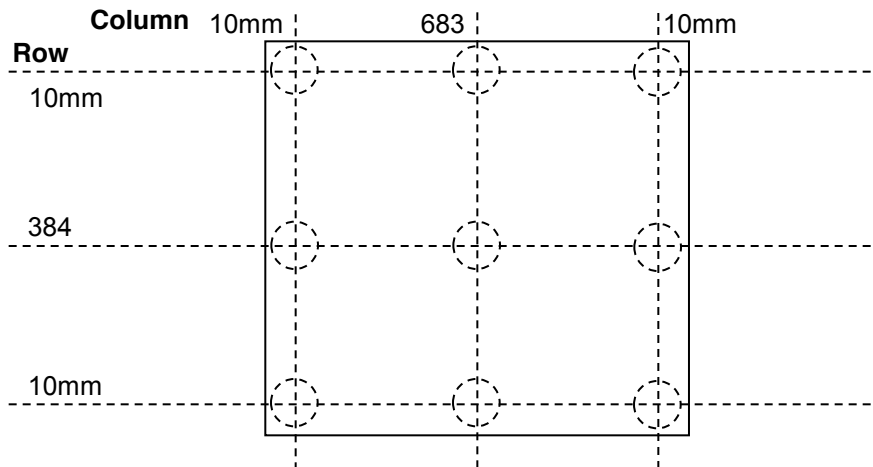


Figure 2. White Luminance and Uniformity Measurement Locations (9 points)



Note 4.

Luminance of white is defined as luminance values of 9 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.

* $Y_W = (\text{Sum of 9 Points Luminance} / 9)$

* LED Condition = (Duty Ratio 100%, LED current 17 mA)

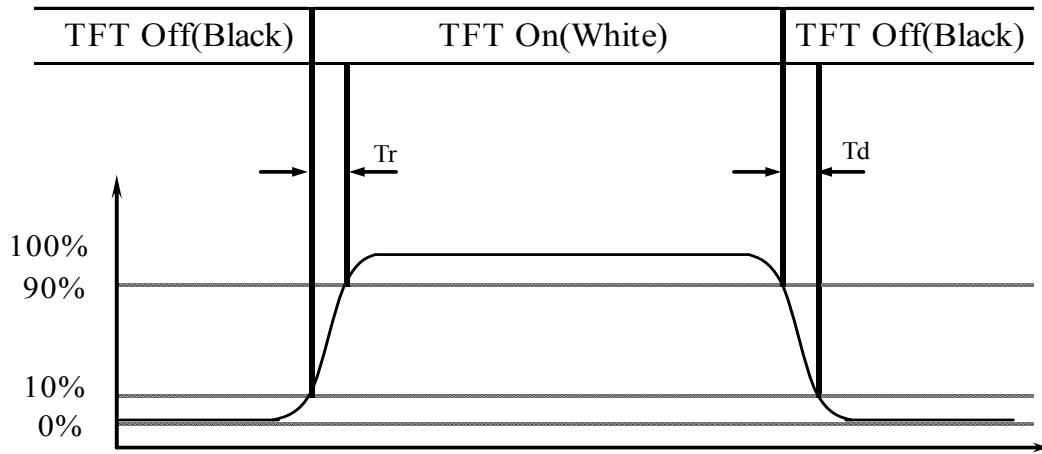
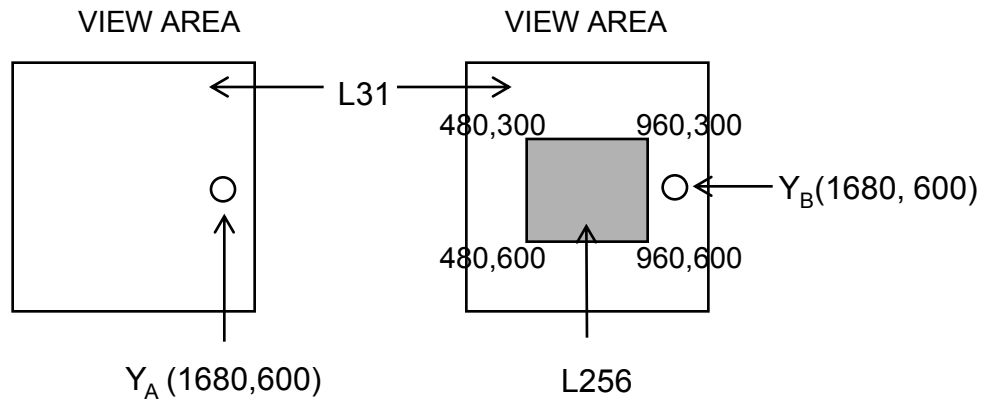
Figure 3. Response Time Testing


Figure 4. Cross Modulation Test Description


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

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

Note 5.

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 .

Note 6.

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).

5.0 INTERFACE CONNECTIONS

5.1 Electrical Interface Connection

CN1	HYDIS side connector	I-PEX : 20455-040E-12
-----	----------------------	-----------------------

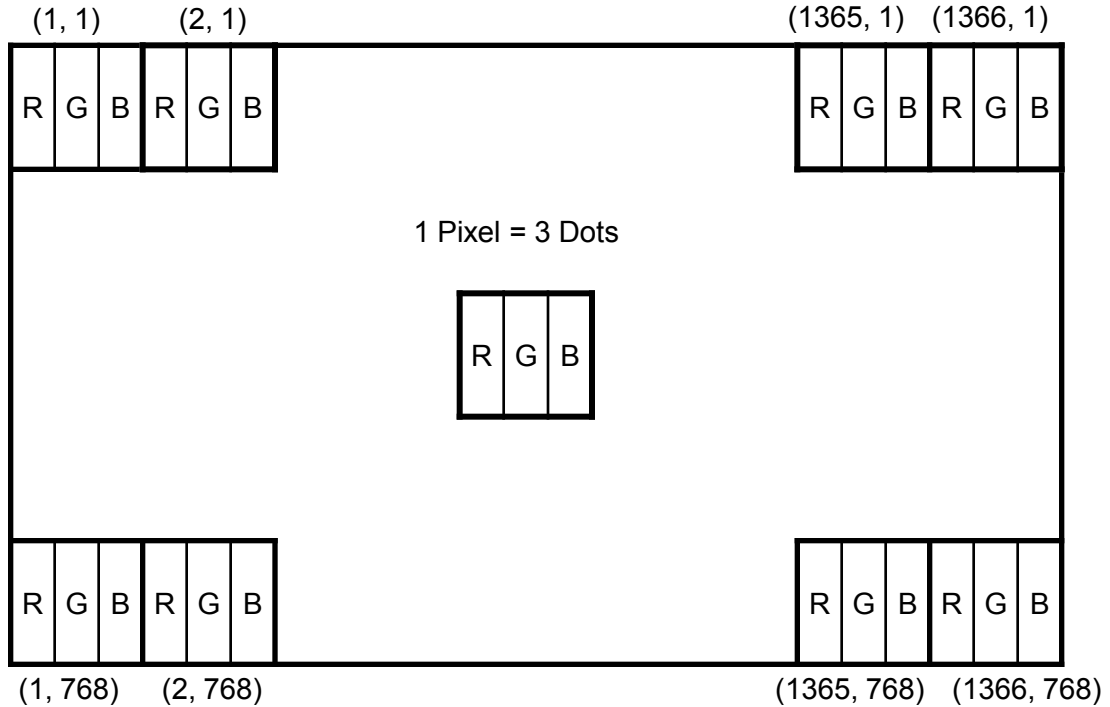
< Table 7, Electrical Interface Connection >

Pin No	Symbol	Function
1	NC	NC (Please let it floating for test only)
2	VCC	+3.3V Power
3	VCC	+3.3V Power
4	V_EDID	EDID 3.3V Power
5	NC	NC (Please let it floating for test only)
6	CLK_EDID	EDID Clock
7	DATA_EDID	EDID Data
8	RXIN0-	LVDS Signal(-)—channel 0
9	RXIN0+	LVDS Signal(+)—channel 0
10	GND	Ground
11	RXIN1-	LVDS Signal(-)—channel 1
12	RXIN1+	LVDS Signal(+)—channel 1
13	GND	Ground
14	RXIN2-	LVDS Signal(-)—channel 2
15	RXIN2+	LVDS Signal(+)—channel 2
16	GND	Ground
17	RXCLKIN-	LVDS Clock Signal(-)
18	RXCLKIN+	LVDS Clock Signal(+)
19	GND	Ground
20	RXIN3-	LVDS Signal(-)—channel 3
21	RXIN3+	LVDS Signal(+)—channel 3

< Table 7, Electrical Interface Connection >

Pin No	Symbol	Function
22	GND	Ground
23	NC	NC (Please let it floating for test only)
24	NC	NC (Please let it floating for test only)
25	GND	Ground
26	NC	NC (Please let it floating for test only)
27	NC	NC (Please let it floating for test only)
28	GND	Ground
29	NC	NC (Please let it floating for test only)
30	NC	NC (Please let it floating for test only)
31	VSSLED	Ground – LED
32	VSSLED	Ground – LED
33	VSSLED	Ground – LED
34	NC	NC (Please let it floating for test only)
35	PWM	System PWM Signal Input (+3.3V Swing)
36	LED_EN	LED enable pin (+3.3V Input)
37	NC	NC (Please let it floating for test only)
38	VLED	Power Supply for LED(VLED =4.5V ~ 21V)
39	VLED	Power Supply for LED(VLED =4.5V ~ 21V)
40	VLED	Power Supply for LED(VLED =4.5V ~ 21V)

5.2 Data Input Format



6.0. SIGNAL TIMING SPECIFICATIONS

6.1 The LCM is operated by the only DE (Data enable) mode

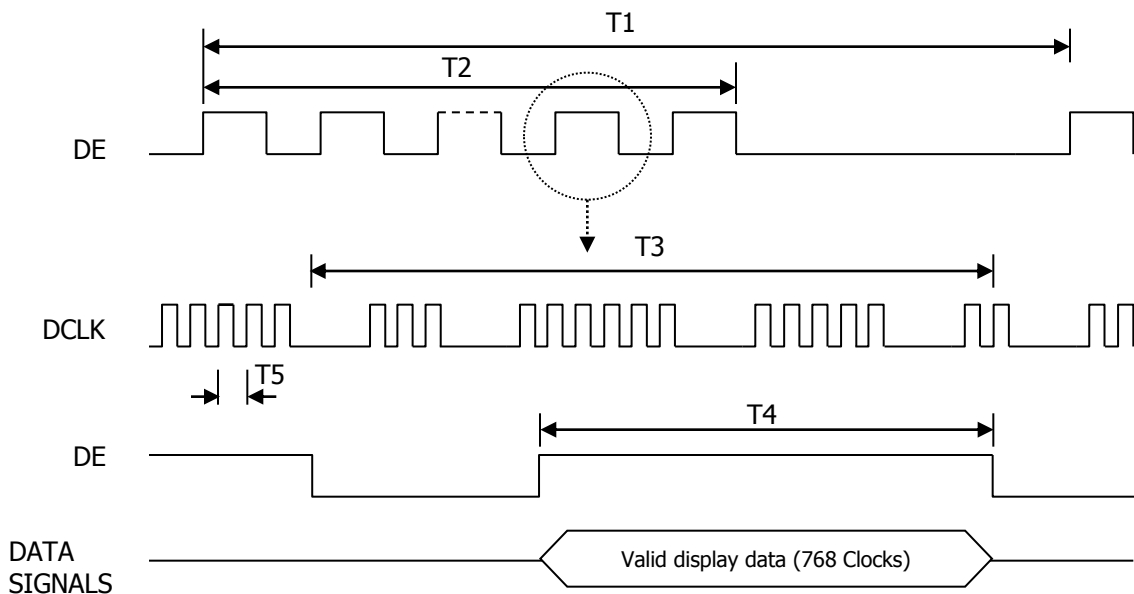
< Table 8. Signal Timing >

Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	-		60		Hz
Frame Period	T1		838		Lines
Vertical Display Time	T2		768		Lines
Vertical Blanking Time	T3		70		Lines
1 Line Scanning Time	T4		1600		Clocks
Horizontal Display Time	T5		1366		Clocks
Horizontal Blanking Time	T6		243		Clocks
Clock Rate	1/T7		80.44		MHz

Note 1. This value only guarantee for the circuit-operation

7.0 SIGNAL TIMING WAVEFORMS

7.1 Timing Waveforms of Interface Signal



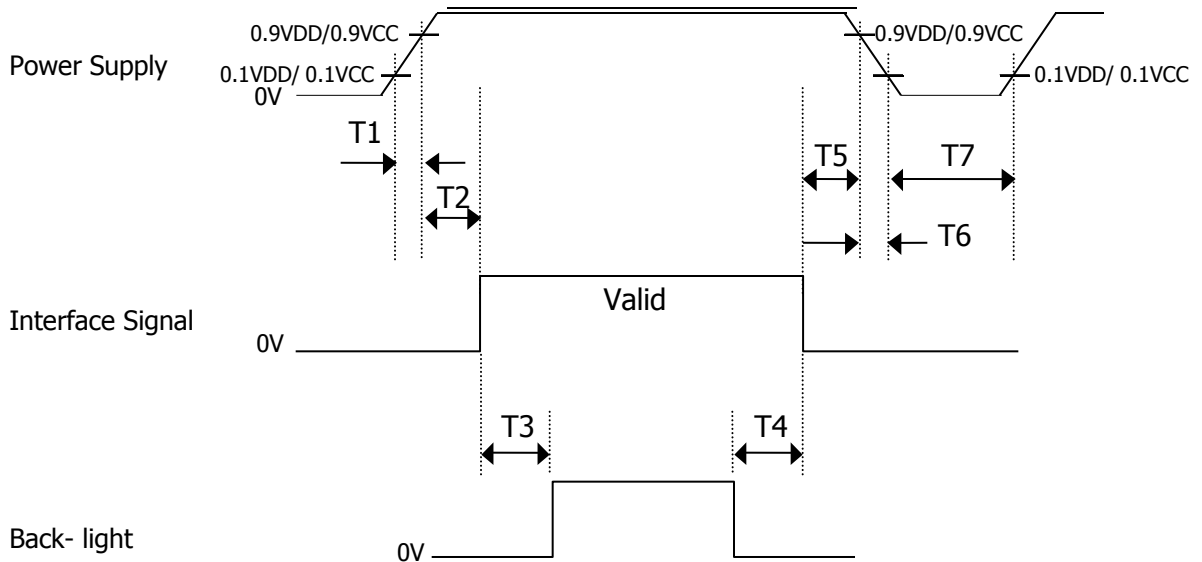
8.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

Each color is displayed in sixty-four gray scales from a 8 bit data signal input.

Colors & Gray Scale		Red Data						Green Data						Blue Data					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
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	1	0	0	0	0	0	0	0	0	0	0	0	
	Darker	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	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	1	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	
	▽	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	
	Green	0	0	0	0	0	0	1	1	1	1	1	1	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	1	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	
	▽	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	
Gray Scale Of White & Black	Black	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	1	0	0	0	0	0	1	
	Darker	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	
	▽	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

9.0 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



- $T1 \leq 10 \text{ ms}$
- $0 \leq T2 \leq 50 \text{ ms}$
- $70 \text{ ms} \leq T3$
- $200 \text{ ms} \leq T4$
- $0 \leq T5 \leq 50 \text{ ms}$
- $0 \leq T6 \leq 10 \text{ ms}$
- $150 \text{ ms} \leq T7$

Notes : 1. When the power supply VDD/ VCC 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.

3. Back Light must be turn on after power for logic and interface signal are valid.

10.0 MECHANICAL CHARACTERISTICS

10.1 Dimensional Requirements

Figure 5 & 6 shows mechanical outlines for the model

< Table 9, Mechanical Characters >

Parameter	Specification	Unit
Active Area	223.341(H) × 125.568(V)	mm
Number of pixels	1366(H) X 768(V) (1 pixel = R + G + B dots)	
Pixel pitch	0.1635(H) X 0.1635(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display colors	262K (6bits)	
Display mode	Normally Black	
Outline dimension	234.53(H) × 138.97(V) × 2.4(D) (Typ.)	mm
Weight	115(Max.)	g
Back-light	Bottom alignment 36-LEDs type	

10.2 LR and Polarizer Hardness.

The surface of the LCD has an Clear and a coating to reduce scratching.

10.3 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 150lux. The manufacture shall furnish limit samples of the panel showing the light leakage acceptable.

11.0 Mechanical Drawing

Figure 5. TFT-LCD Module Outline Dimension (Front View)

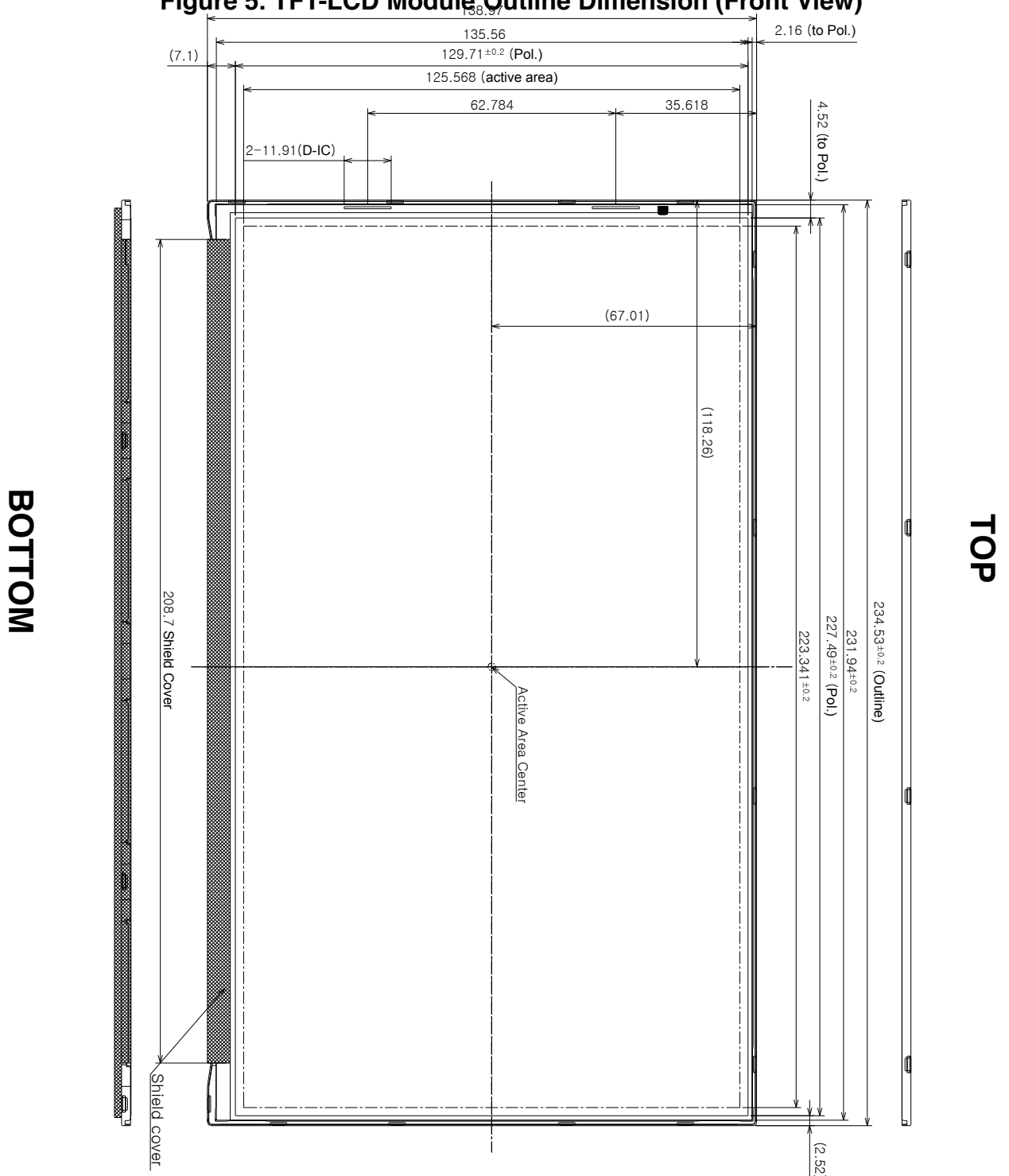
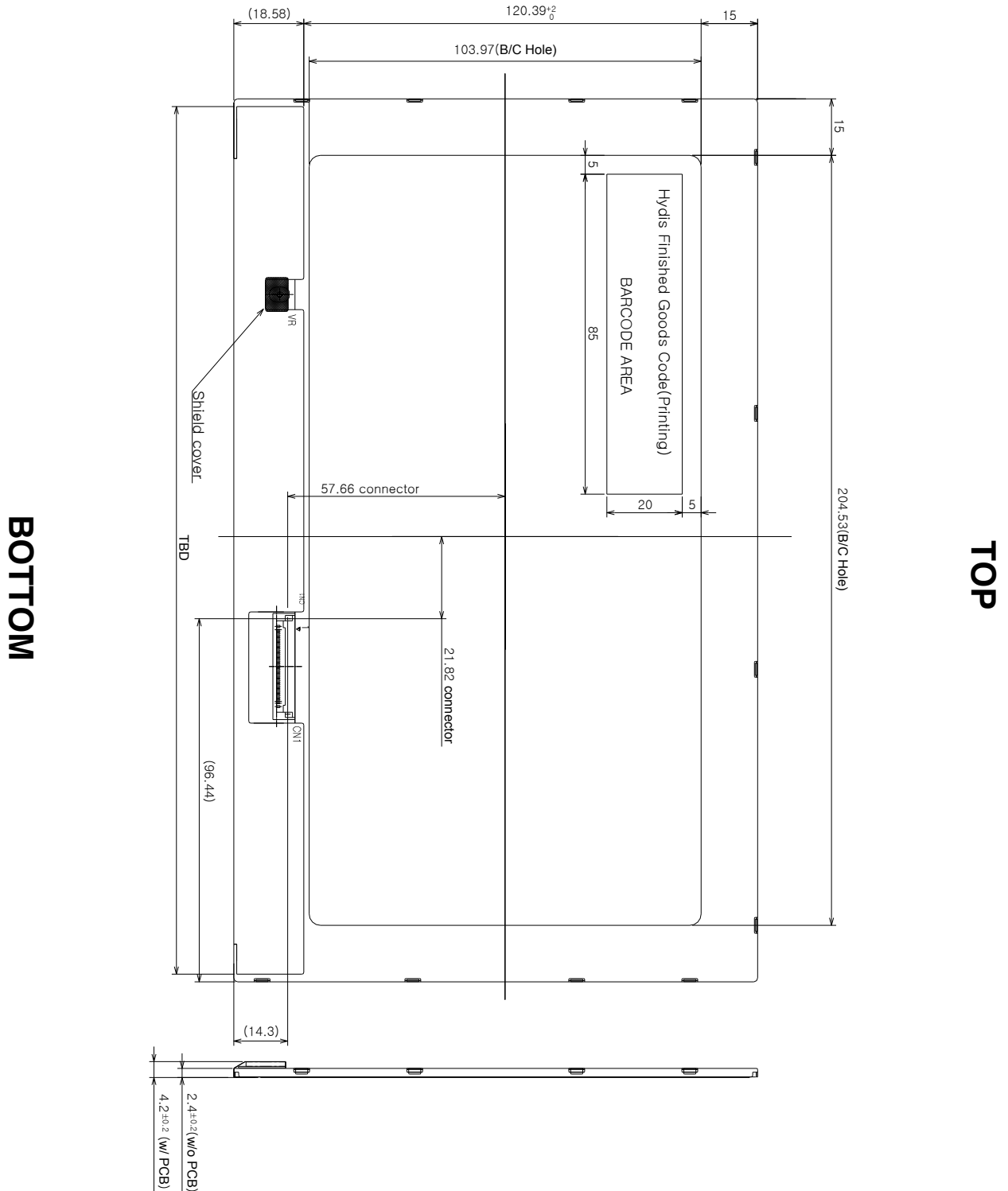


Figure 6. TFT-LCD Module Outline Dimensions (Rear view)


12.0 RELIABILITY TEST

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

< Table10, Reliability Test >

No	Test Item	Test Condition	Operating
1	High temperature storage test	Ta = 60 °C, 240 hrs	No
2	Low temperature storage test	Ta = -20 °C, 240 hrs	No
3	High temperature & high humidity operation test	Ta = 50 °C, 80%RH, 240hrs	Yes
4	High temperature operation test	Ta = 50 °C, 240 hrs	Yes
5	Low temperature operation test	Ta = 0 °C, 240 hrs	Yes
6	Thermal shock	Ta = -20 °C ↔ 60 °C (30 min), 100 cycle	No
7	Vibration test (non-operating)	Frequency : 10~500Hz Gravity/AMP : 1.5G Period : X,Y,Z 30min	NO
8	Shock test (non-operating)	Gravity : 220G Pulse width : 2ms, half sine wave ±X, ±Y, ±Z Once for each direction	No
9	Electro-static discharge test (non-operating)	C=150pF, R=330Ω, 5cycle/ Air 15KV, Contact 8kV	No Note 1

Note 1 :

1. ESD test condition is standard of customer system.

13.0 HANDLING & CAUTIONS

13.1 Cautions when taking out the module

- Pick the pouch only, when taking out module from a shipping package.

13.2 Cautions for handling the module

- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and back - light element are made from fragile glass (epoxy) material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

13.3 Cautions for the operation

- When the module is operating, do not lose MCLK, DE signals. If any one of these signals were lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

13.4 Cautions for the atmosphere

- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

13.5 Cautions for the module characteristics

- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

13.6 Cautions for the digitizer assembly

- When assembling FPC connector, do not flip connector past 90° due to possible damage to connector.
- When positioning digitizer underneath driver IC, do not lift driver IC past 90° due to possible damage to drive IC pattern.
- Please be warned that during assembly of digitizer, the opening or closing of FPC will result in possible electrostatic discharge damage to the LED

13.7 Other cautions

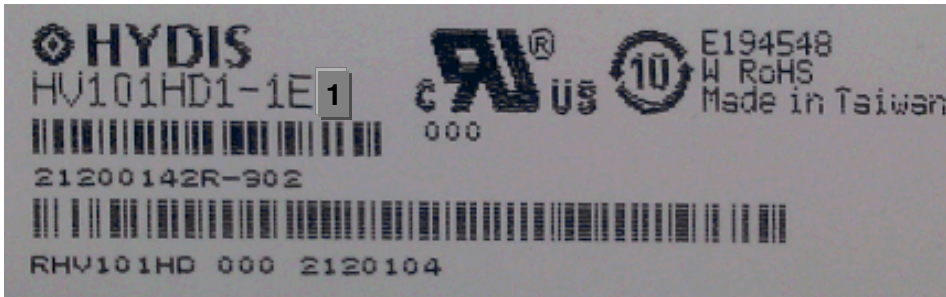
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

14.0 LABELS

14.1 Product Label

Printing at Reflection sheet (LCM back side)

Model : HV101HD1-1E1



R	H	V	1	0	1	H	D
---	---	---	---	---	---	---	---

0	0	0
---	---	---

2	1	2	0	1	0	4
---	---	---	---	---	---	---

**Output
Factory**

R : T2

U : WJ LCM1

V : WJ LCM2

Hydis model name

BOM number

Week

Serial number

Year

2012 : 2

2013 : 3

14.2 Packing Label

15.0 PACKING INFORMATION**15.1 Packing order****TBD**

Notes : 1. Box Dimension: TBD
2. Package Quantity in one Box : TBD

15.2 Pallet**TBD***** Note**

- Pallet Dimension : TBD
- Package Quantity in one Box : TBD
- Box Quantity in one Pallet : TBD