



SHENZHEN APTUS TECHNOLOGY CO., LIMITED

PRODUCT SPECIFICATION

7.84" COLOR TFT-LCD MODULE

MODEL NAME: DBT078VEN40M080A

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FOR CUSTOMER	
CUSTOMER APPROVED	

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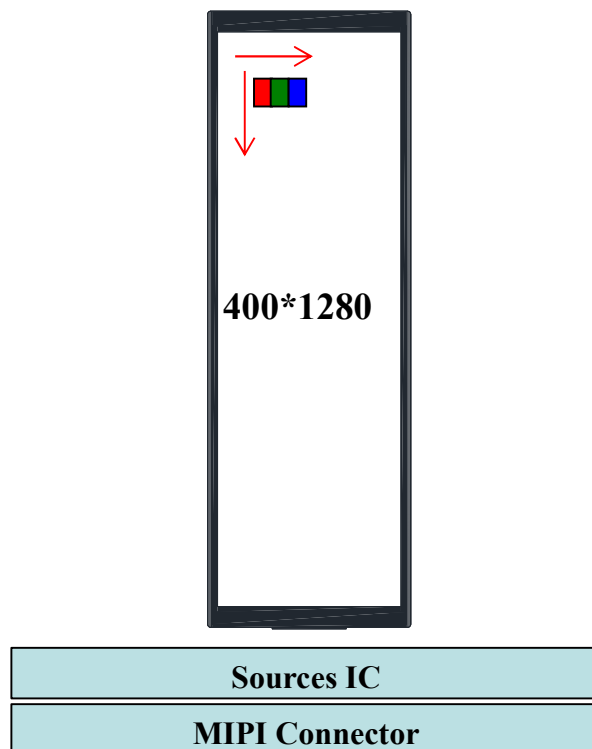
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1. GENERAL DESCRIPTION

1.1 Introduction

DBT078VEN40M080A is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This TFT LCD panel has a 7.84 inch diagonally measured active display area with WXGA- resolution (400 horizontal by 1280 vertical pixels array).



1.2 Features

- 8-bit color depth, display 16. 7M colors
- Thin and light weight
- High luminance and contrast ratio, low reflection and wide viewing angle
- RoHS Compliant
- 7*24hrs usage support with dynamic video
- Landscape and Portrait usage support

1.3 Application

- Vehicle Rearview Mirror

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Outline Dimension	67.80 (H)*205.78 (V)*7.25(B)	mm	
Active Area	59.40(H) × 190.08 (V)	mm	
Number Of Pixels	400(H)×1280 (V)	pixels	
Pixel Pitch	148.50(H) x 148.50(V)	um	
Pixel Arrangement	RGB Vertical Stripe		
Display Mode	Normally Black		
Display Colors	16.7 M	colors	
Center Luminous Intensity	800	Cd/m ²	
Viewing Angle(CR>10)	85/85/85/85 (Typ.)	deg.	
Color Gamut	60	%	
Interface	4-Lane MIPI		

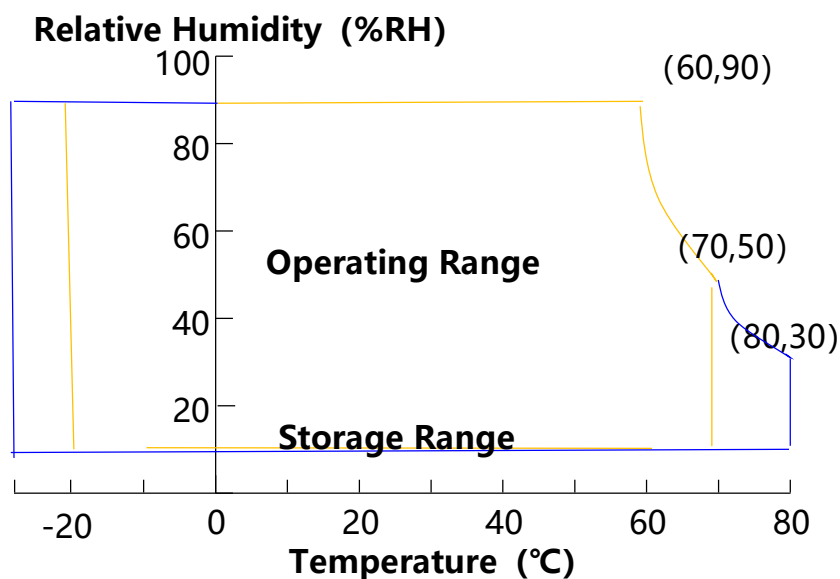
2. ABSOLUTE MAXIMUM RATINGS

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. Environment Absolute Maximum Ratings> [Ta =25±2 °C]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	3	3.6	V	Ta = 25 °C
Operating Temperature	T _{OP}	-20	+70	°C	Note 1
Storage Temperature	T _{ST}	-30	+80	°C	
Operating Ambient Humidity	H _{op}	10	90	%RH	
Storage Humidity	H _{st}	10	90	%RH	

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.



3. ELECTRICAL SPECIFICATIONS

3.1 TFT LCD Module

< Table 3. Open Cell Electrical Specifications >

[Ta =25±2 °C]

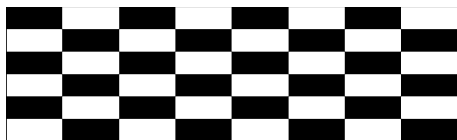
Parameter	Symbol	Values			Unit	Notes
		Min.	Typ.	Max.		
Power Supply Voltage	VDD	3.0	3.3	3.6	V	Note 1
Power Supply Ripple Voltage	VRP	-	-	100	mV	
Power Supply Current	IDD	-	40	-	mA	
Analog Operating voltage	VGH	18	19	20	V	
Analog Operating voltage	VGL	-9	-8	-7	V	
Analog Operating voltage	VCOM	3.6	4.6	5.6	V	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for VBAT=3.2V, Frame rate $f_v=60\text{Hz}$ and Clock frequency = 73MHz. Test Pattern of power supply current

a) Typ : Mosaic 6 x 8 Pattern(L0/L255)

b) Max : White

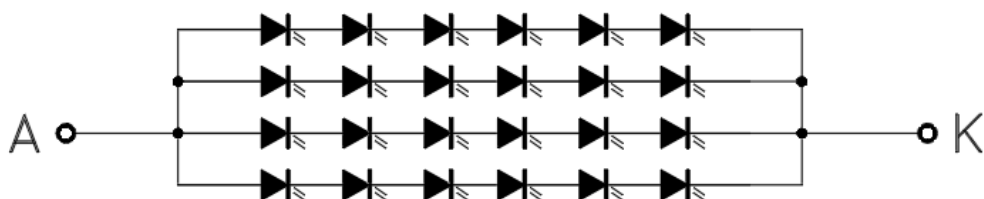


3.2 LED driver

< Table 3.2 LED Driving guideline specifications >

Ta=25+/-2°C

Parameter	Symbol	Values			Unit	Notes
		Min.	Typ.	Max.		
BLU Supply Voltage	V _{led}		18.6		V	
BLU Supply Current	I _{led}		160		mA	
Number of LED	-	24			Piece	



4. INTERFACE CONNECTION

4.1 Interface Input Signal & Power

< Table 4. Pin Assignment for Interface Connector >

Pin No	Symbol	Description	Pin No	Symbol	Description
1	GND	Ground	21	NC	No Connect
2	D0P	MIPI data input	22	NC	No Connect
3	D0N	MIPI data input	23	NC	No Connect
4	GND	Ground	24	RESET	RESET pin
5	D1P	MIPI data input	25	STBYB	Select standby mode
6	D1N	MIPI data input	26	NC	No Connect
7	GND	Ground	27	GND	Ground
8	CLKP	MIPI clock input	28	LEDK	LED Negative
9	CLKN	MIPI clock input	29	LEDK	LED Negative
10	GND	Ground	30	GND	Ground
11	D2P	MIPI data input	31	NC	No Connect
12	D2N	MIPI data input	32	GND	Ground
13	GND	Ground	33	GND	Ground
14	D3P	MIPI data input	34	NC	No Connect
15	D3N	MIPI data input	35	LEDA	LED Positive
16	GND	Ground	36	LEDA	LED Positive
17	GND	Ground	37	GND	Ground
18	IOVCC	Power supply for digital circuits +1.8V input	38	VCC	Power supply for digital circuits +3.3V input
19	IOVCC	Power supply for digital circuits +1.8V input	39	VCC	Power supply for digital circuits +3.3V input
20	NC	No Connect	40	NC	No Connect

5. Interface timing Parameter

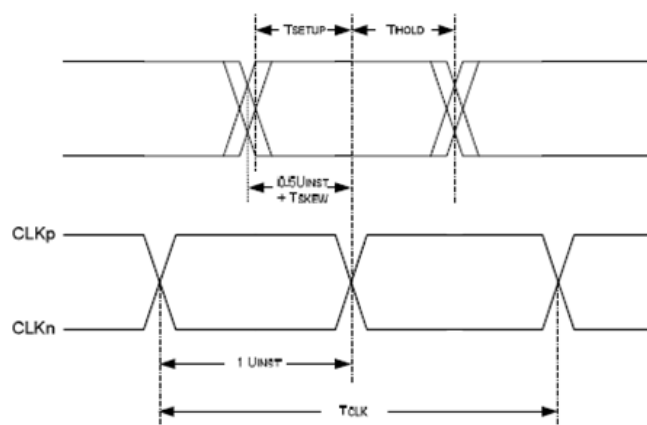
5.1 MIPI AC Characteristics

HS Receiver AC Timing Characteristics

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Bandwidth per lane	-	-	-	1000	Mbps	Bandwidth selected by register 'speedup' Speedup=0 → Max=550Mbps Speedup=1 → Max=1000Mbps
Operation frequency	-	-	-	500	MHz	
UI instantaneous	U_{INST}	1	-	12.5	ns	1
Data to Clock Skew	T_{skew}	-0.15	-	0.15	U_{INST}	
Inter-lane static skew	$T_{skew-lane}$	-	-	$U_{INST}/50$	U_{INST}	
Data to Clock Setup Time	T_{SETUP}	0.25	-	-	U_{INST}	2
Data to Clock Hold Time	T_{HOLD}	0.25	-	-	U_{INST}	
Common-mode interference beyond 450MHz	$\Delta V_{CMRX}(HF)$	-	-	100	mV	4
Common-mode interference 50MHz- 450MHz	$\Delta V_{CMRX}(LF)$	-50	-	50	mV	3,6
Common-mode termination	C_{CM}	-	-	60	pF	5

Note:

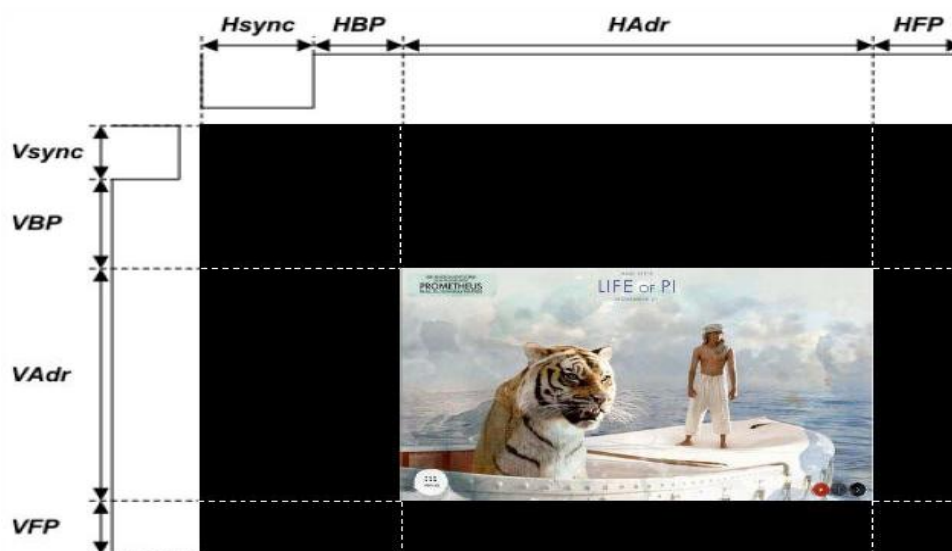
- (1) Total silicon and package delay budget of $0.3 \cdot U_{INST}$
- (2) Total setup and hold window for receiver of $0.3 \cdot U_{INST}$
- (3) Excluding 'static' ground shift of 50mV
- (4) $\Delta V_{CMRX}(HF)$ is the peak amplitude of a sine wave superimposed on the receiver input
- (5) For higher bit rates a 14pF capacitor will be needed to meet the common-mode return loss specification.
- (6) Voltage difference compared to the DC average common-mode potential.



5. Interface timing Parameter

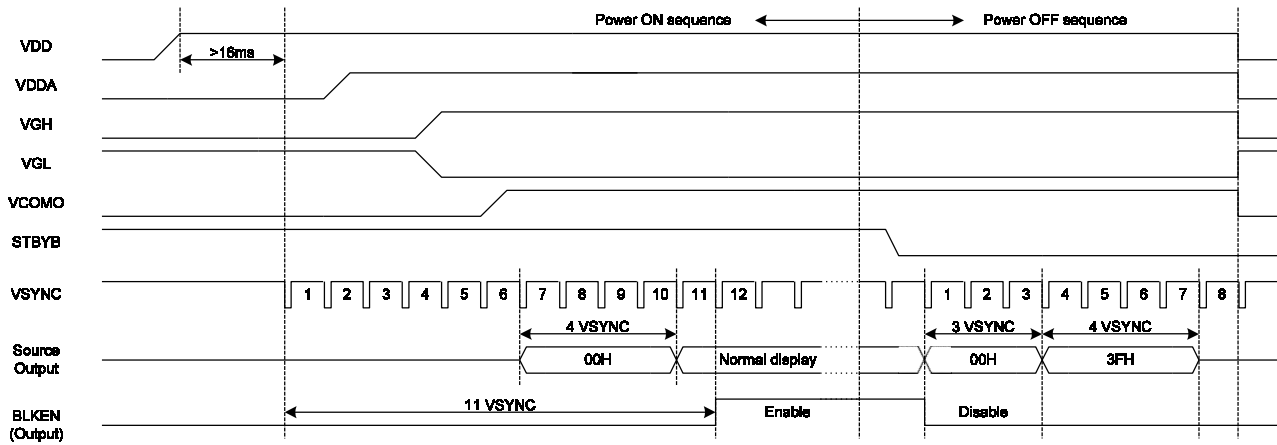
< Table 5. Timing Parameter >

Item			Symbol	min	typ	max	UNIT
LCD	Frame Rate		-	-	60	-	Hz
	Pixels Rate		-		54		MHz
Timing	Horizontal	Horizontal total time	tHP		690		t _{CLK}
		Horizontal Active time	tHadr	400			t _{CLK}
		Horizontal Pulse Width	tHsync		30		t _{CLK}
		Horizontal Back Porch	tHBP		160		t _{CLK}
		Horizontal Front Porch	tHFP		100		t _{CLK}
	Vertical	Vertical total time	tvp		1298		t _H
		Vertical Active time	tVadr	1280			t _H
		Vertical Pulse Width	tVsync		2		t _H
		Vertical Back Porch	tVBP		8		t _H
		Vertical Front Porch	tVFP		8		t _H
Lane				-	4	-	Lane



6. POWER SEQUENCE

Power-On/Off Timing Sequence:



7. OPTICAL SPECIFICATION

7.1 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 CS2000/CA310) 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 luminance, color and uniformity (etc) should be tested by CS2000/CA310. The backlight should be operating for 10 minutes prior to measurement. VDD shall be $3.3 \pm 0.3\text{V}$ at 25°C . Optimum viewing angle direction is 6 'clock

<Table 7. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Contrast Ratio		CR	$\Theta = 0^\circ$	800	900	-		
Center Luminous Intensity				700	800		Cd/m ²	
Reproduction of color		Rx	$\Theta = 0^\circ$	Typ. -0.03	0.651	Typ. +0.03	-	
		Ry			0.328		-	
		Gx			0.276		-	
		Gy			0.554		-	
		Bx			0.138		-	
		By			0.128		-	
		Wx			0.299		-	
		Wy			0.324		-	
Color Gamut			$\Theta = 0^\circ$	55	60	-	%	
Response Time		Tr	Ta= 25° C $\Theta = 0^\circ$	-	35	45	ms	
		Tf		-			ms	
		Tgray		-	-	-	ms	

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 2) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. 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.
4. The electro-optical response time measurements shall be made as FIGURE 2 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 .

7.2 Optical measurements

Figure 1: The definition of Viewing Angle

Refer to the graph below marked by θ and ϕ .

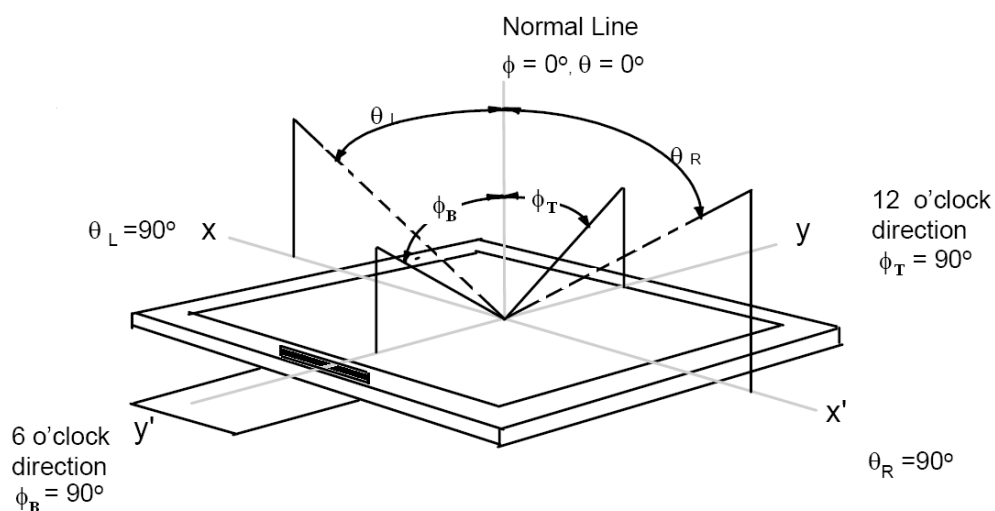
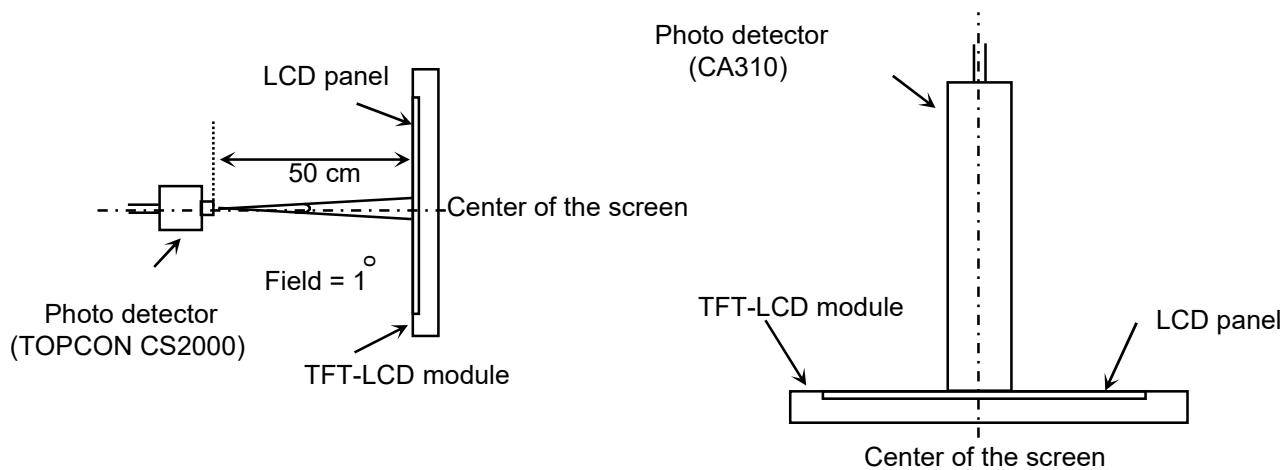


Figure 2. Measurement Set Up



View angle range, uniformity, etc. measurement setup

Flicker, measurement setup

Figure 4:

Viewing direction is normal user viewing direction which is vertical to the display surface

- The polarizer which is closer to viewer is defined as Front Polarizer
- The polarizer which is on the rear side of viewer is defined as Rear Polarizer
- The X axis is defined as parallel line to top & bottom sidelines of the Active Area
- PdF which is marked in blue arrow is polarization degree of Front polarizer
- PdR which is marked in red arrow is polarization degree of Back polarizer
- The polarization degree parameter must be indicated in range of 0deg to 180deg according to above definition

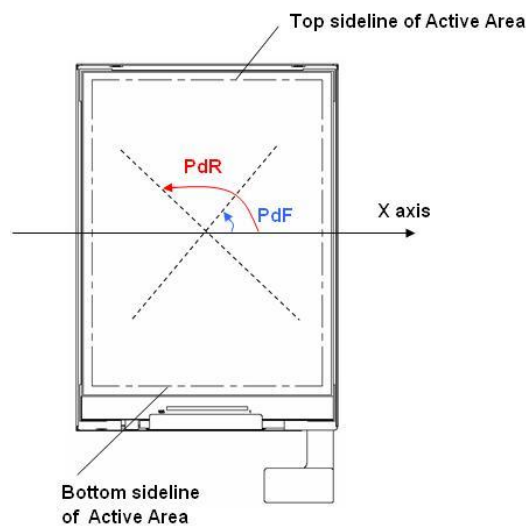
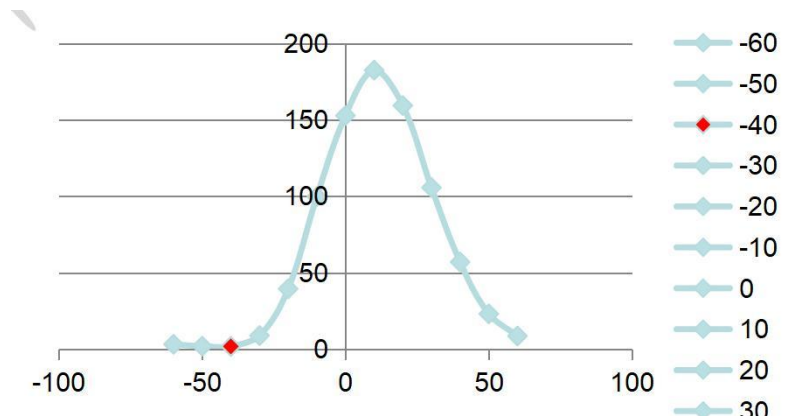


Figure.5:

Using luminance test method.

- Test pattern : 128 gray
- If the viewing direction is 12 o' clock ,then test the luminance while $\theta = -60^\circ, \theta = -50^\circ, \theta = -40^\circ, \theta = -30^\circ, \theta = -20^\circ, \theta = -10^\circ, \theta = 0^\circ, \theta = 10^\circ, \theta = 20^\circ, \theta = 30^\circ, \theta = 40^\circ, \theta = 50^\circ, \theta = 60^\circ$. The luminance test as figure below:



8. MECHANICAL CHARACTERISTICS

8.1 Dimensional Requirements

As shown in Table 8.

< Table 8. Dimensional Parameters >

Parameter	Specification	Unit
Dimensional outline	67.80 (H)*205.78 (V)*7.25(B)	mm
Active area	59.40(H) × 190.08 (V)	mm
Pixel pitch	148.50(H) x 148.50(V)	um
Number of pixels	400(H) × 1280(V)(1 pixel = R + G + B dots)	pixels

9. RELIABILITY TEST

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

<Table 9. Reliability test>

No	Test Items	Conditions
1	High temperature storage test	Ta = 80℃, 72 hrs
2	Low temperature storage test	Ta = -30 ℃, 72 hrs
3	High temperature operation test	Ta = 70℃, 72 hrs
4	Low temperature operation test	Ta = -20 ℃, 72 hrs
5	High temperature & high humidity operation test	Ta = 60 ℃, 90%RH, 72 hrs
6	Thermal shock	Ta = -30 ℃ ↔ 80℃ (0.5 hr), 50 cycle

Note : After the reliability test, the product only guarantee function normally without any fatal defect (non-display, line defect, abnormal display etc). All the cosmetic specification is judged before the reliability test.

10. Handling & Cautions

Please pay attention to the followings when you use this TFT LCD open cell (OC) .

10.1 Mounting Precautions

- Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- You must mount an OC using specified mounting holes (Details refer to the drawings).
- You should consider the mounting structure so that uneven force (ex. Twisted stress, Concentrated stress) is not applied to the OC. And the case on which an OC is mounted should have sufficient strength so that external force is not transmitted directly to the OC.
- Do not apply mechanical stress or static pressure on OC; Abnormal display cause by pressing some parts of OC during assembly process , do not belong to product failure, the press should be agreed by two sides.
- Determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Do not apply mechanical stress or static pressure on OC , and avoid impact, vibration and falling.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Protection film for polarizer on the OC should be slowly peeled off before display.
- Be careful to prevent water & chemicals contact the OC surface.
- You should adopt radiation structure to satisfy the temperature specification.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.

Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)

- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane & alcohol is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene , because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- This OC has its circuitry PCBs on the front or rear side and Driver IC, should be handled carefully in order not to be stressed.
- Avoid impose stress on PCB and Driver IC during assembly process ,Do not drawing, bending, COF package & wire.
- Do not disassemble the OC.

10.2 Operating Precautions

- Do not connect or disconnect the cable to/from the OC at the "Power On" Condition.
- When the OC is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the OC would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the OC would be damaged.
- Do not allow to adjust the adjustable resistance or switch.
- The electrochemical reaction caused by DC voltage will lead to LCD open cell degradation, so DC drive should be avoided.
- The LCD panel use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipment to protect against static electricity.
- Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the OC may be damaged.
- OC has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.

