SHENZHEN APTUS TECHNOLOGY CO., LIMITED

PRODUCT SPECIFICATION

7" TFT-LCD MODULE WIHT RTP

MODEL NAME: DBT070AVR40R035A

DOC VERSION: 1.2

TOTAL PAGES: 23

DATE: 2024.03.22

FOR CUSTOMER	
CUSTOMER APPROVED	

NOTE: THE CONTENT OF THIS SPECIFICATION IS SUBJECT TO CHANGE WITHOUT NOTICE.

Record of Revision

Version	Revise Date	Page	Content
V1.0	2024/ 01/ 16		Initial release.
V1.1	2024/ 03/ 16		Timing data rivised
V1.2	2024/ 03/ 22		Add package data

Contents

1. General Specifications

No.	Item	Specification	Remark
1	LCD size	7.0 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800X3(RGB)X480	
4	Display mode	Normally Black	
5	Dot pitch	0.0635(W)X0.1905(H) mm	
6	Active area	152.4 (W)X91.44 (H) mm	
7	LCD size	165(W)X104.09(H)X5.3 (D) mm	Note 1
8	Module with RTP size	165(W)*104.09(H)*6.85(D)mm	Note 1
9	Color arrangement	RGB-stripe	
10	Interface	Digital (TTL)	
11	Backlight power consumption	1.5W (Typ.)	Note 2
12	Panel power consumption	0.66 W (Typ.)	Note 3
13	Weight	T.B.D.	

Note 1: Refer to Mechanical Drawing.
Note 2: Including LED Driver power consumption.
Note 3: Including T-con power consumption.

2. Pin Assignment

Pin No.	Symbol	Description	Remark
1	GND	Power Ground	
2	GND	Power Ground	
3	NC	Not Connect	
4	Vcc	Power Supply for Digital Circuit	
5	Vcc	Power Supply for Digital Circuit	
6	Vcc	Power Supply for Digital Circuit	
7	Vcc	Power Supply for Digital Circuit	
8	NC	Not Connect	
9	DE	Data Enable	
10	GND	Power Ground	
11	GND	Power Ground	
12	GND	Power Ground	
13	B5	Blue Data 5 (MSB)	
14	B4	Blue Data 4	
15	B3	Blue Data 3	
16	GND	Power Ground	
17	B2	Blue Data 2	
18	B1	Blue Data 1	
19	B0	Blue Data 0 (LSB)	
20	GND	Power Ground	
21	G5	Green Data 5 (MSB)	
22	G4	Green Data 4	
23	G3	Green Data 3	
24	GND	Power Ground	
25	G2	Green Data 2	
26	G1	Green Data 1	
27	G0	Green Data 0 (LSB)	
28	GND	Power Ground	
29	R5	Red Data 5 (MSB)	
30	R4	Red Data 4	
31	R3	Red Data 3	
32	GND	Power Ground	
33	R2	Red Data 2	
34	R1	Red Data 1	
35	R0	Red Data 0 (LSB)	
36	GND	Power Ground	
37	GND	Power Ground	
38	DCLK	Clock Signals ; Latch Data at the Falling Edge	
39	GND	Power Ground	
40	GND	Power Ground	

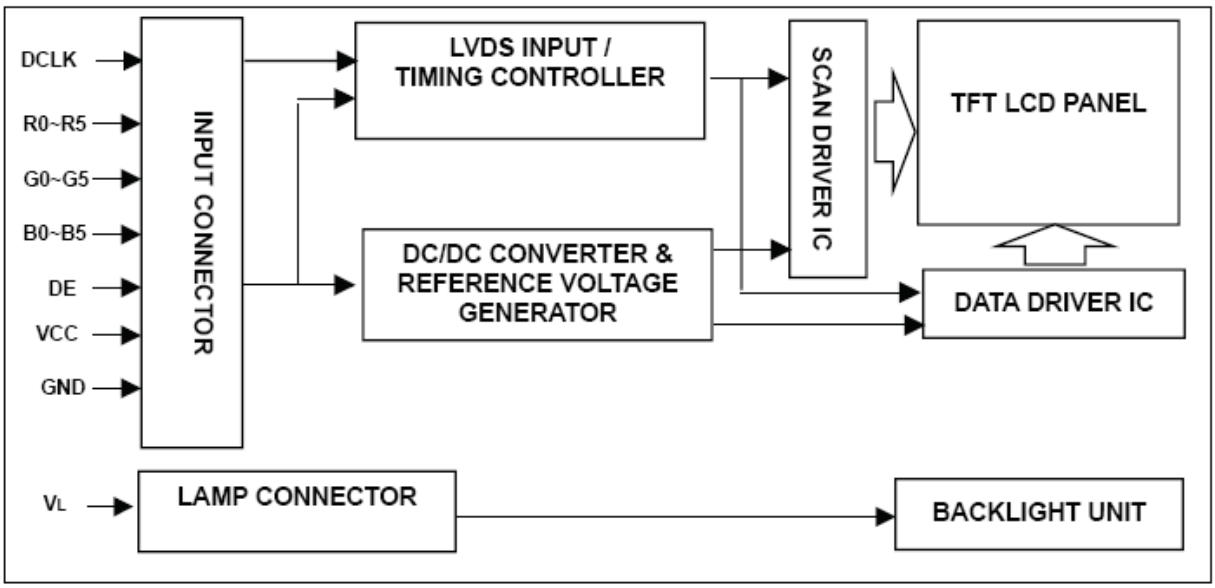
Note: User's connector part number is **MT-FP430N-2FR** manufactured by UJU or equivalent.

Backlight Driving Part

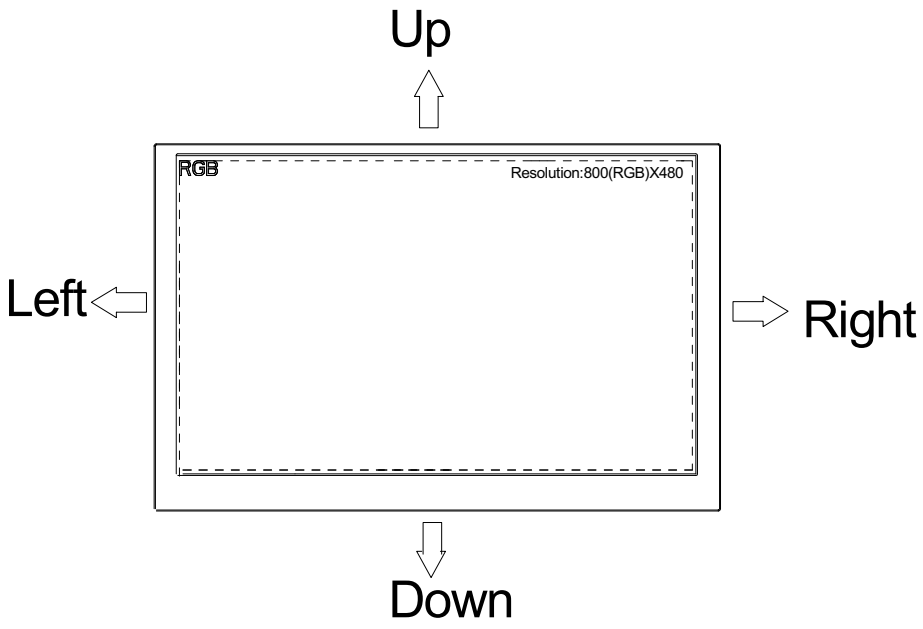
Pin No.	Symbol	Description
1	VLED+	Red, LED_ Anode
2	VLED-	White, LED_ Cathode

Note: The backlight interface connector is a model **SM02B-BHSS-1-TB** manufactured by JST or equivalent. The matching connector part number is **BHSR-20VS-1** manufactured by JST or equivalent.

BLOCK DIAGRAM



Scanning direction refer to the figure below.



3. Operation Specifications

3.1. Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	V_{CC}	-0.3	6.0	V	
Input signal voltage	V_I	-0.3	6.3	V	
Operation Temperature	T_{OP}	-20	70	℃	
Storage Temperature	T_{ST}	-30	80	℃	

3.2. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V_{CC}	3.1	3.3	3.5	V	Note 1
Current consumption	Icc	-	200	260	mA	
	I_F	-	160	-	mA	Note 2
Input logic high voltage	V_{IH}	$0.7V_{CC}$	-	V	V	Note 3
Input logic low voltage	V_{IL}	0	-	0.3V	V	
LED life time	-	20,000	-	-	Hr	Note 4

Note1: V_{CC} setting should match the signals output voltage (refer to Note 4) of customer's system board.

Note 2: LED driving current.

Note 3 : DCLK,DE, HS, VS, R0~ R5,,G0~ G5,B0~ B5.

Note 4: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25 and I_{LED}= 160 mA. The LED lifetime could be decreased if operating I_{LED} is larger than 160 mA.

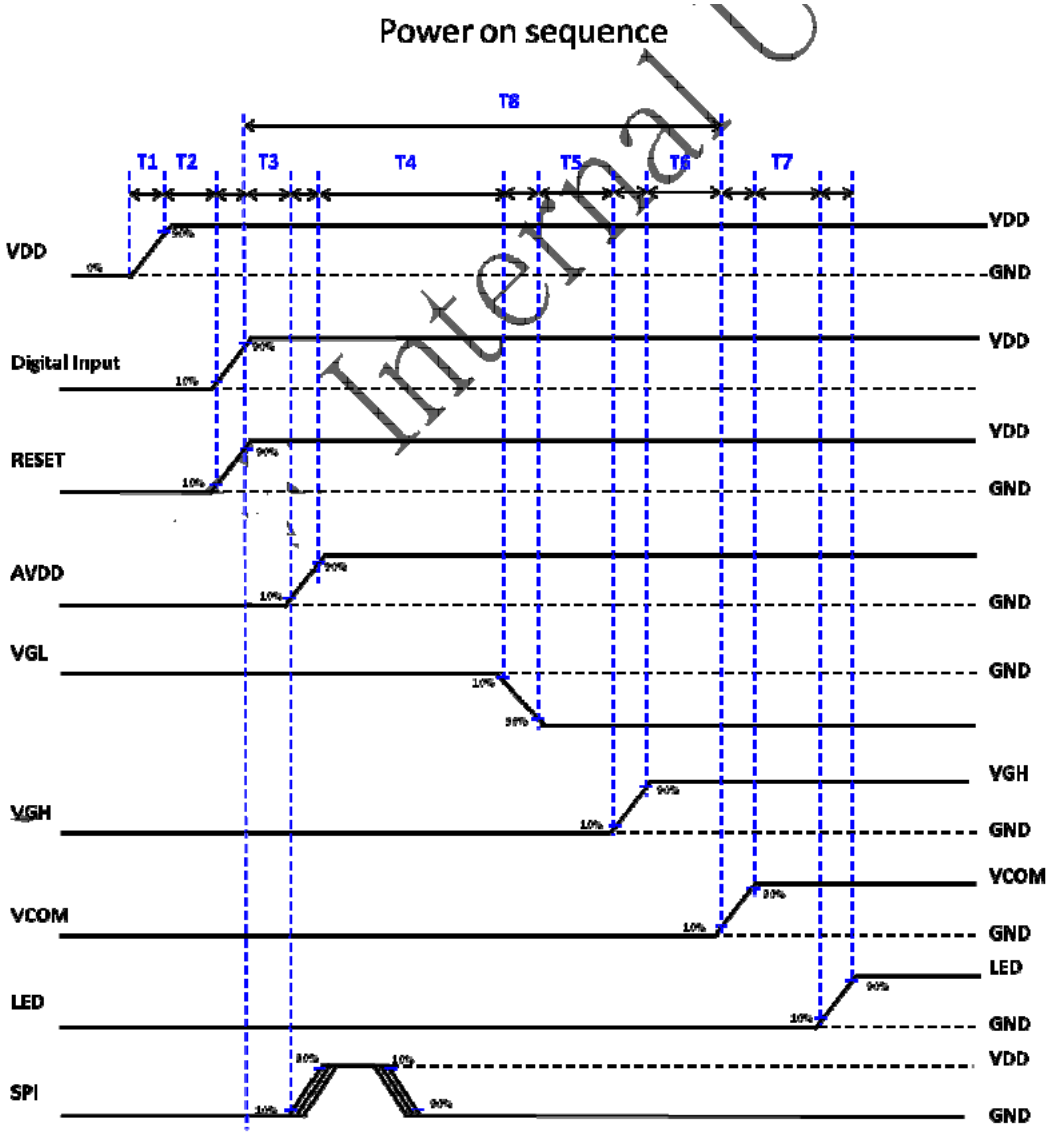
3.3. Power Sequence

The LCD adopts high voltage driver IC, so it could be permanently damaged under a wrong power on/off sequence. The suggested LCD power sequence is below:

Panel Power on sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	--	--	20	ms
T2	1	--	--	ms
T3	20	--	--	ms
T4	1	--	--	ms
T5	1	--	--	ms
T6	1	--	--	ms
T7	1	--	--	ms
T8	--	--	80	ms

VDD → Di ital Input &RESET→ AVDD&SPI → VGL → VGH →VCOM →LED

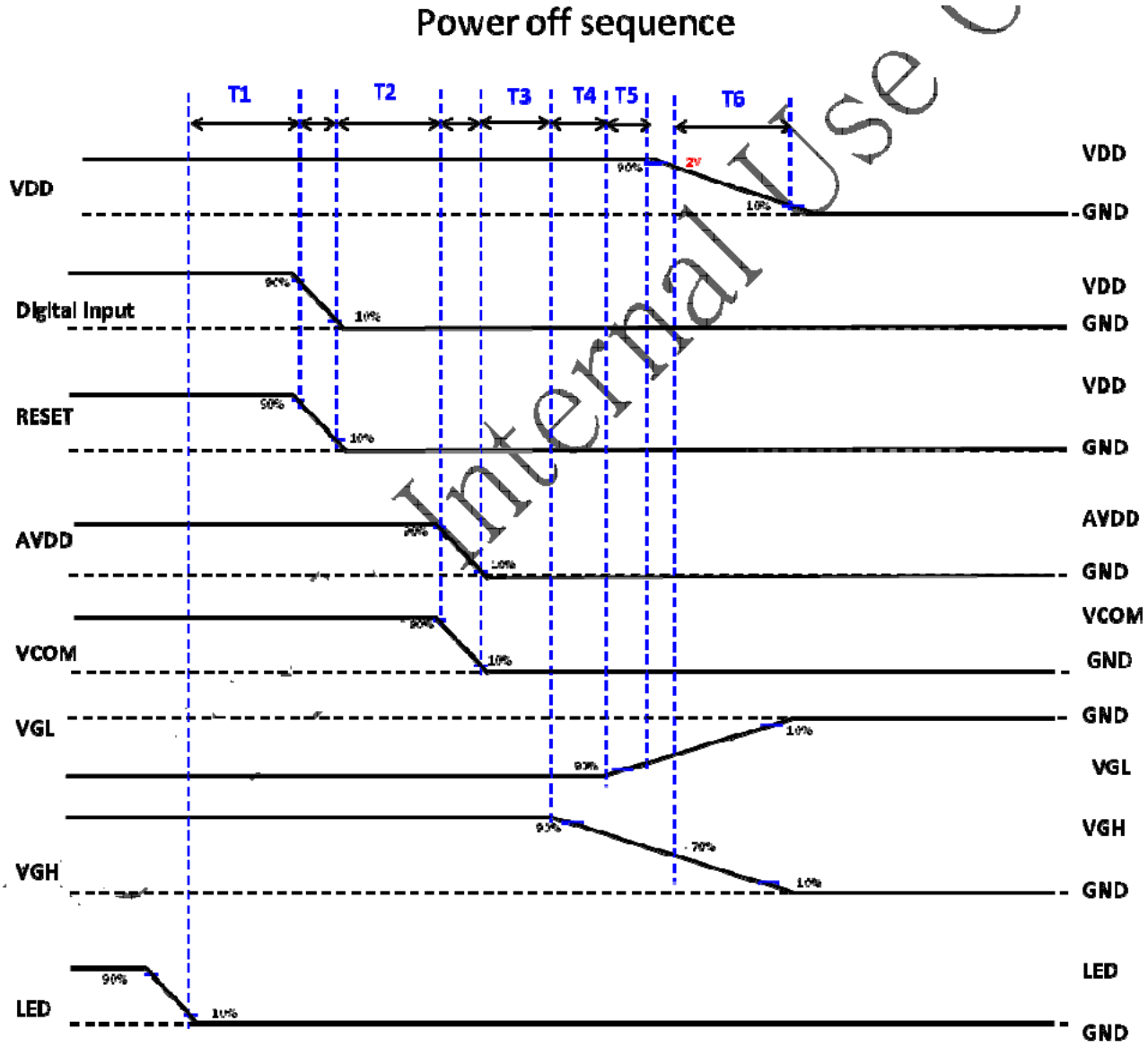


Note: Reset signal must rising after VDD signal

Panel Power off sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0	--	-	ms
T2	0	--	16	ms
T3	0	--	16	ms
T4	0	--	1	ms
T5	0	--	1	ms
T6	40	--	--	ms

LED → Di ital in ut&RESET→AVDD&VCOM→VGH→VGL→VDD



Note: VDD=2V,VGH > 70%
All signal must be discharge to zero voltage when power off.

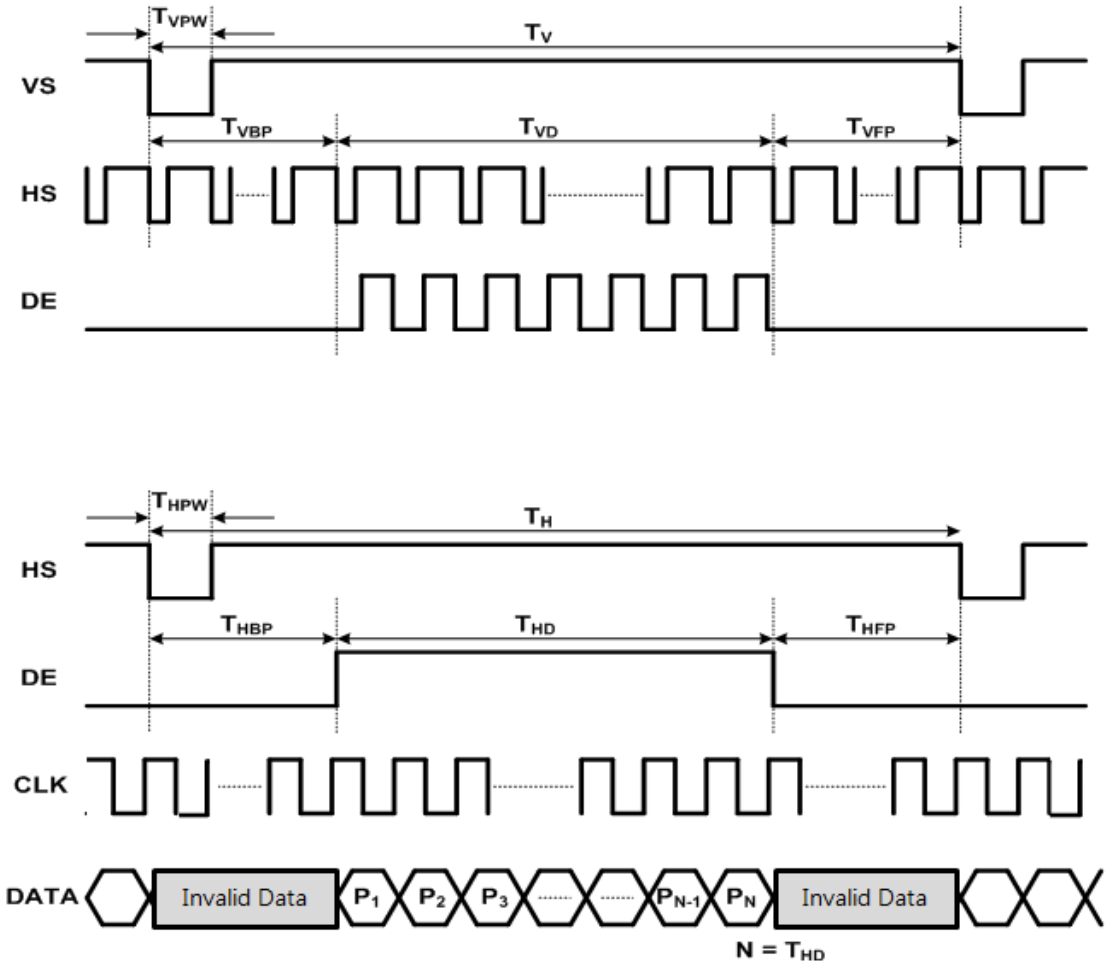
3.4. Timing Characteristics

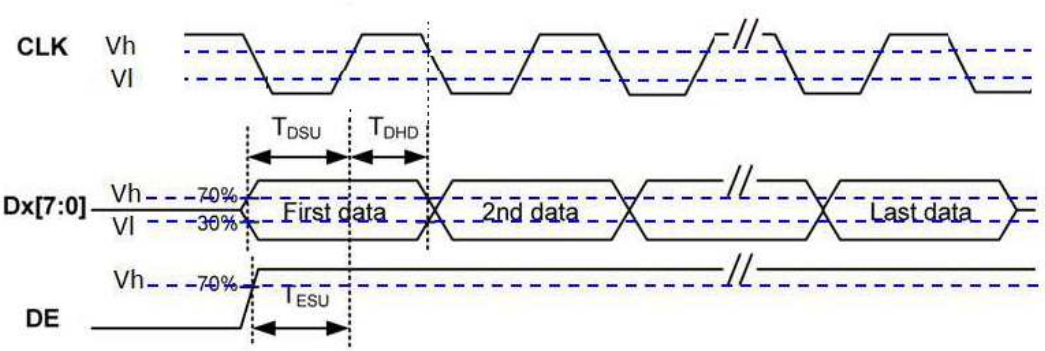
3.4.1. Timing Conditions

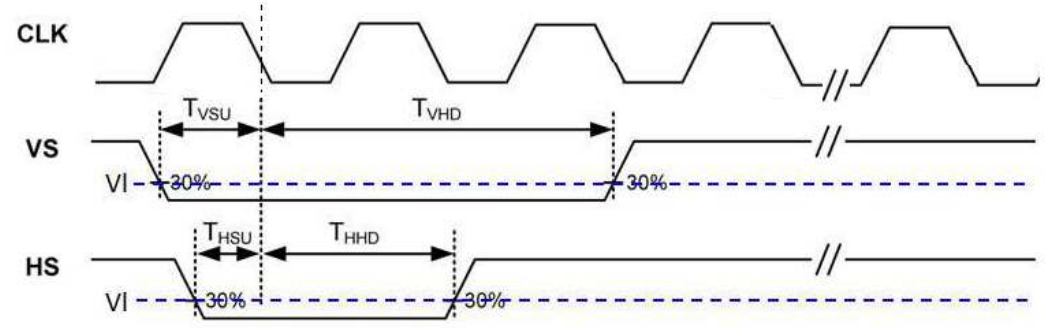
Item	Symbol	Min	Typ	Max	Unit	Remark
Clock frequency	F_{CLK}	27.027	29.988	40.0	MHz	
Vertical display area	T_{VD}		480		H	
Vertical period area	T_V	525	525	530	H	
Vertical blanking area	T_{VB}	45	45	50	H	Note1
Vertical pulse width	T_{VPW}		3		H	
Vertical back porch	T_{VBP}		20		H	
Vertical front porch	T_{VFP}	25	25	30	H	
Horizontal display area	T_{HD}		800		dclk	
Horizontal period area	T_H	858	952	1258	dclk	
Horizontal blanking area	T_{HB}	58	152	458	dclk	Note2
Horizontal pulse width	T_{HPW}		3		dclk	
Horizontal back porch	T_{HBP}		48		dclk	
Horizontal front porch	T_{HFP}	10	104	410	dclk	
HS setup time	T_{HSU}	6	-	-	ns	
HS hold time	T_{HHD}	6	-	-	ns	
VS setup time	T_{VSU}	6	-	-	ns	
VS hold time	T_{VHD}	6	-	-	ns	
Data setup time	T_{DSU}	6	-	-	ns	
Data hold time	T_{DHU}	6	-	-	ns	
DE setup time	T_{ESU}	6	-	-	ns	

Note1: $T_{VB} = T_V - T_{VD}$
Note2: $T_{HB} = T_H - T_{HD}$

3.4.2. Timing Diagram







Note : Latch data at CLK Falling Edge.

4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	70	80	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	70	80	-		
	θ_T	Φ=90°(12 o'clock)	70	80	-		
	θ_B	Φ=270°(6 o'clock)	70	80	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	11	-	msec	Note 3
	T_{OFF}		-	9	-	msec	Note 3
Contrast ratio	CR		800	1000	-	-	Note 4
Color chromaticity	W_X		0.270	0.0290	0.350		Note 2 Note 5 Note 6
	W_Y		0.280	0.0300	0.360		
Luminance	L		220	270	-	cd/m^2	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Note 1: Definition of viewing angle range

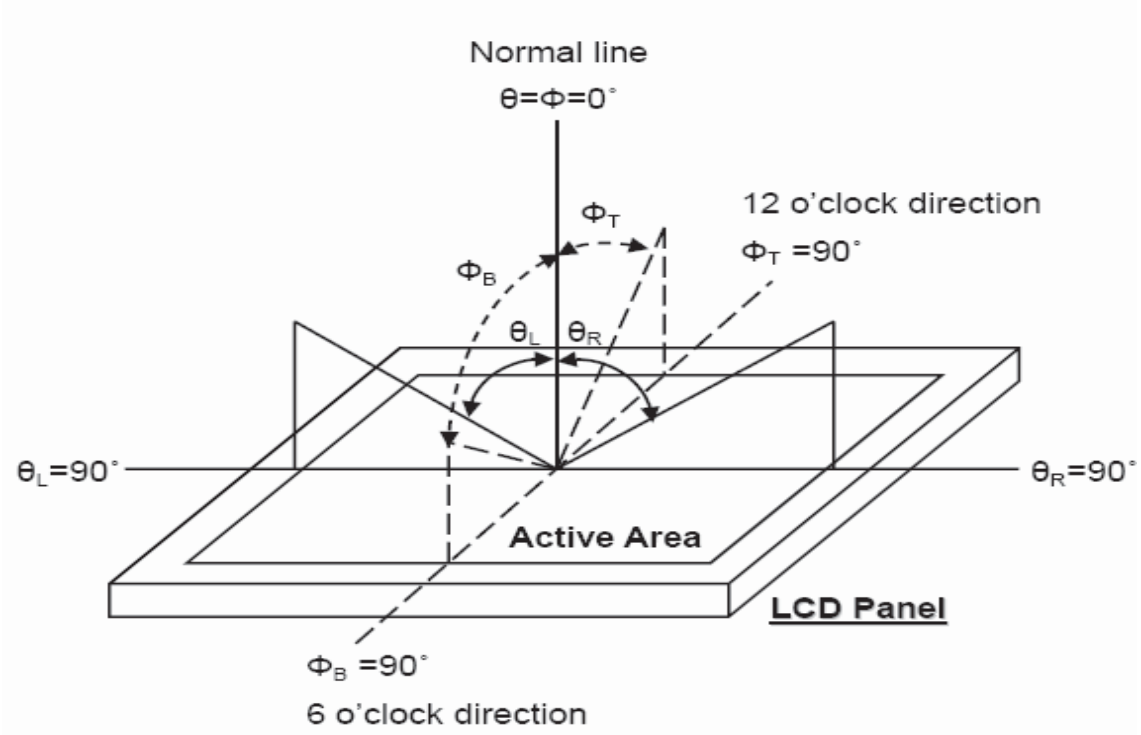


Fig. 7-1 Definition of viewing angle

Note 2: Test equipment setup:
After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0°field of view at a distance of 50cm and normal direction.

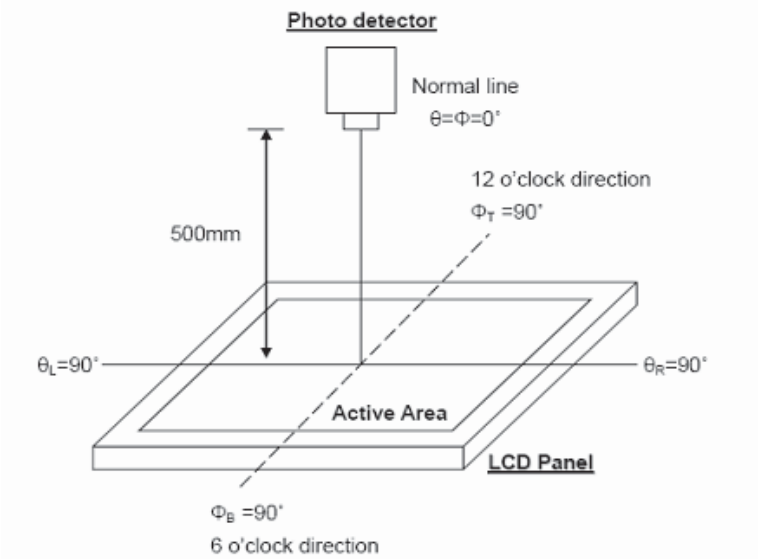


Fig.7-2 Optical measurement system setup

Note 3: Definition of Response time:
The response time is defined as the LCD optical switching time interval between “White state and “Black” state. Rise time, Tr, is the time between photo detector output intensity changed from 90% to 10% . And fall time, Tf, is the time between photo detector output Intensity changed from10% to 90% .

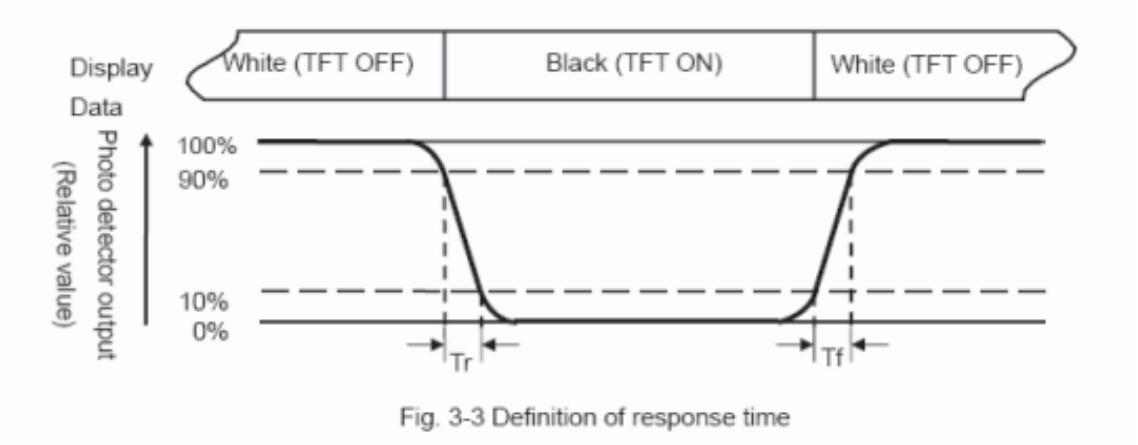


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the “White” state}}{\text{Luminance measured when LCD on the “Black” state}}$$

Note 5: White Vi = V_{i50} ± 1.5V
Black Vi = V_{i50} ± 2.0V
“±” means that the analog input signal swings in phase with VCOM signal.
“±” means that the analog input signal swings out of phase with VCOM signal.
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

$$\text{Note 8 : Uniformity (U)} = \frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$$

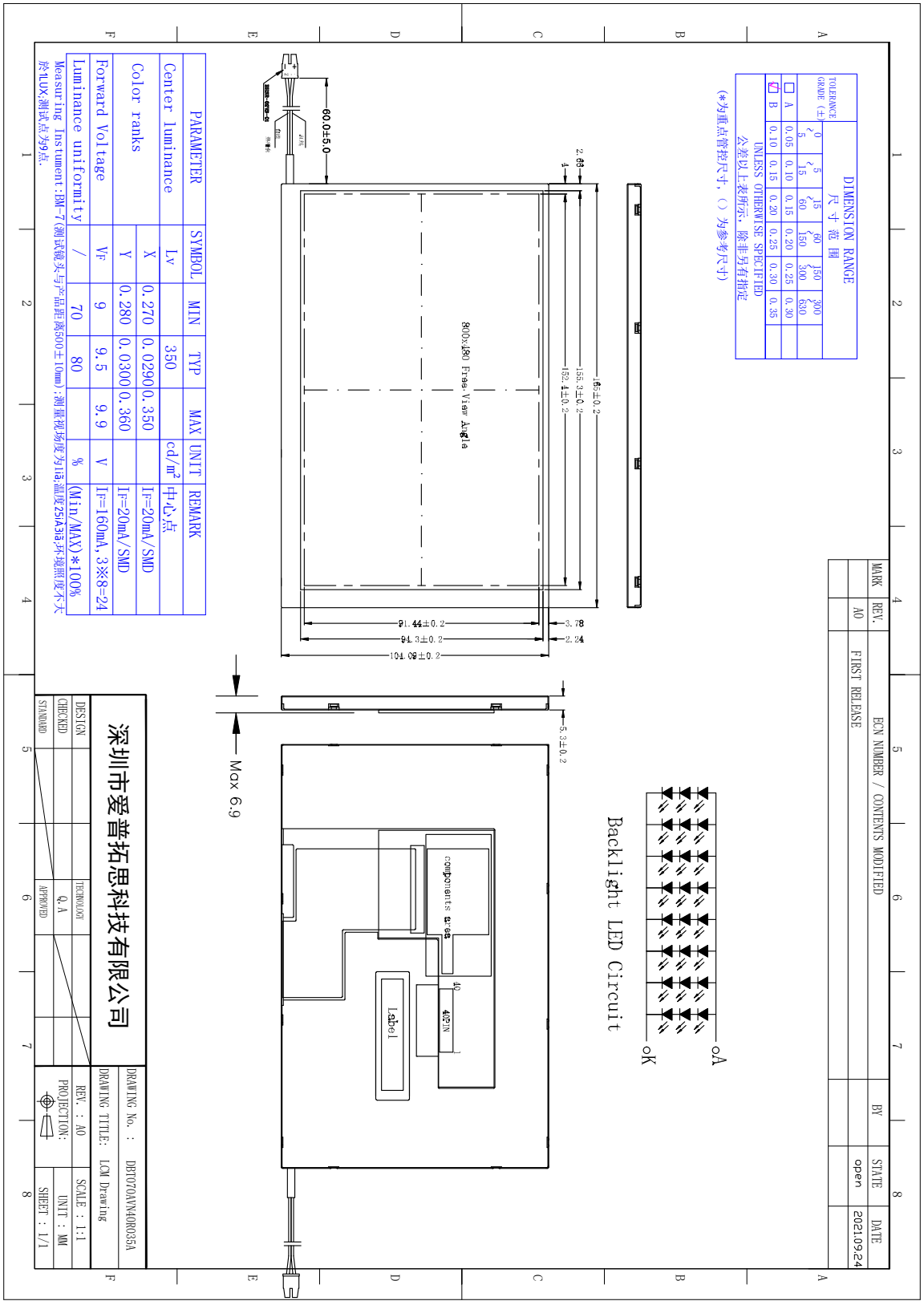
5. Reliability Test Items

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80℃ 240 hrs	Note 1
Low Temperature Storage	Ta = -30℃ 240hrs	Note 1
High Temperature Operation	Ts = 70℃ 240hrs	Note 2
Low Temperature Operation	Ta =-20℃ 240hrs	Note 1,Note 4
Operate at High Temperature and Humidity	+40℃, 90%RH max. 240 hrs	Note 4
Thermal Shock	-30℃/30 min ~ +80℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
: 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 doesn't guarantee all the cosmetic specification.
Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

6. Mechanical Drawing

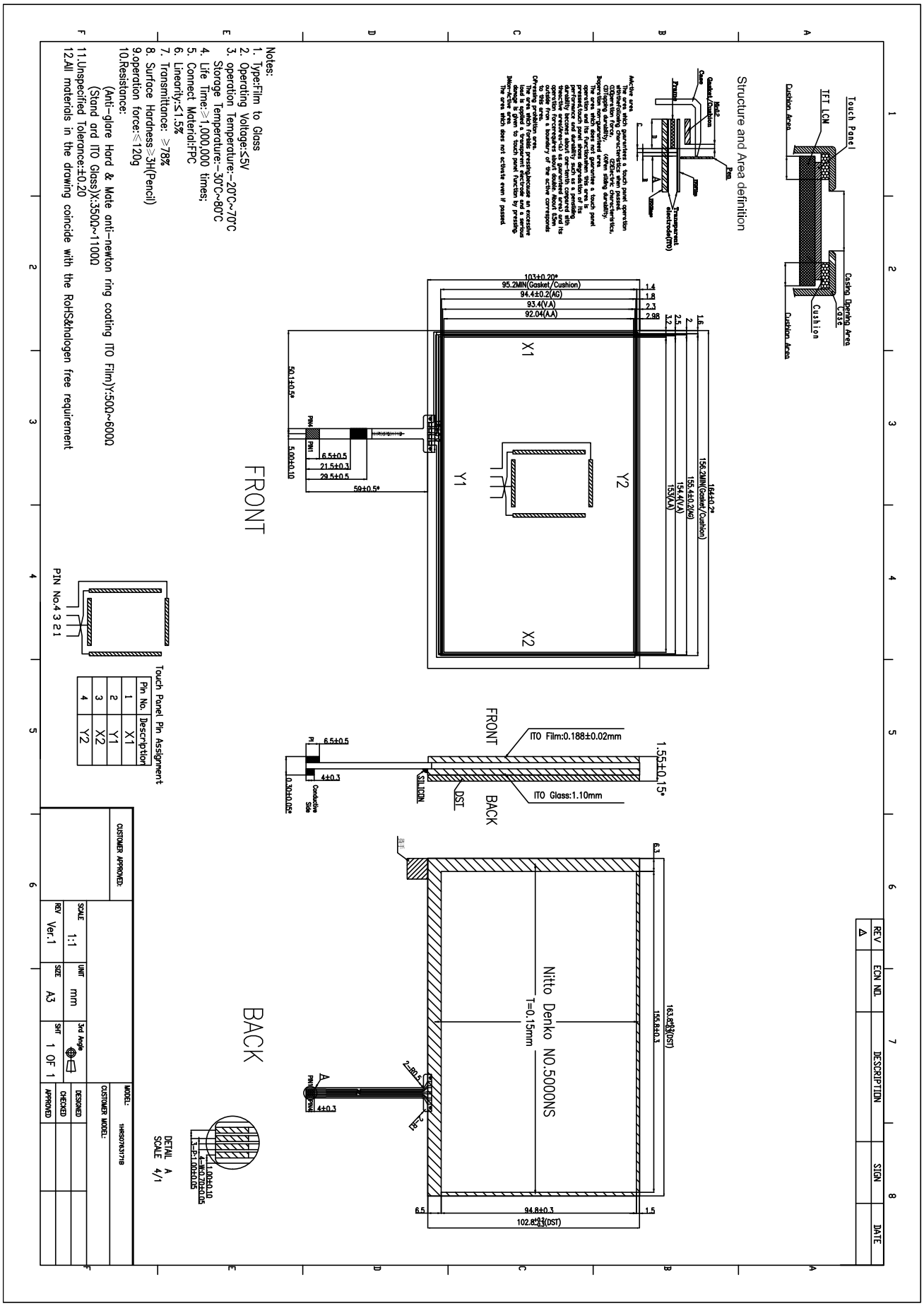
6.1 LCD Mechanical Drawing



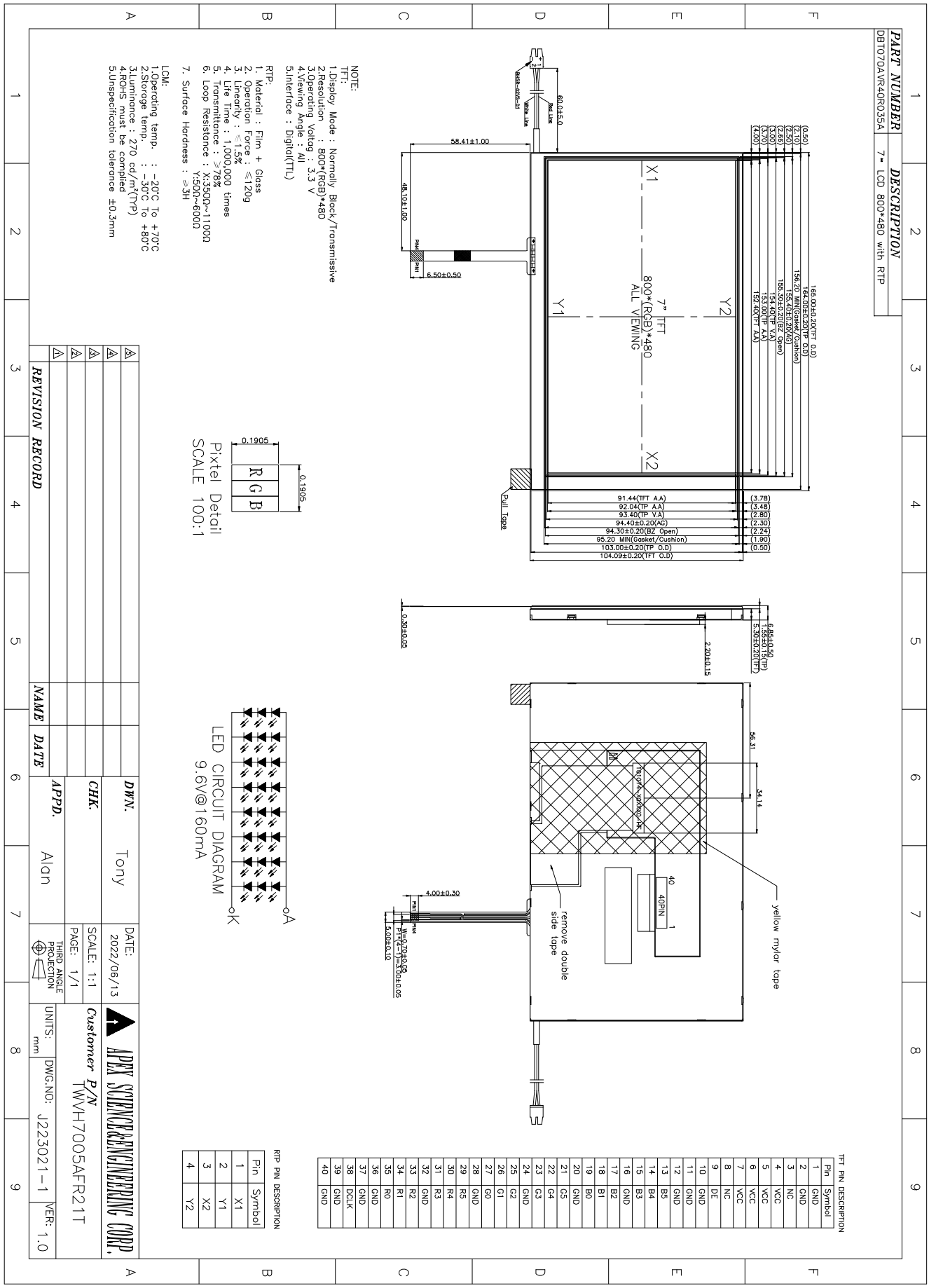
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	REMARK
Center luminance	Lv	350			cd/m²	中心点
Color ranks	X	0.270	0.290	0.350		IF=20mA/SMD
	Y	0.280	0.300	0.360		
Forward Voltage	VF	9	9.5	9.9	V	IF=160mA, 3※8=24
Luminance uniformity	/	70	80		%	(Min/MAX)*100%

Measuring Instument:BM-7(测试镜头与产品距离500±10mm);测量视场度为1a温度25/A3a;环境照度不大於1LUX,测试点为9点.

6.2 RTP Mechanical Drawing

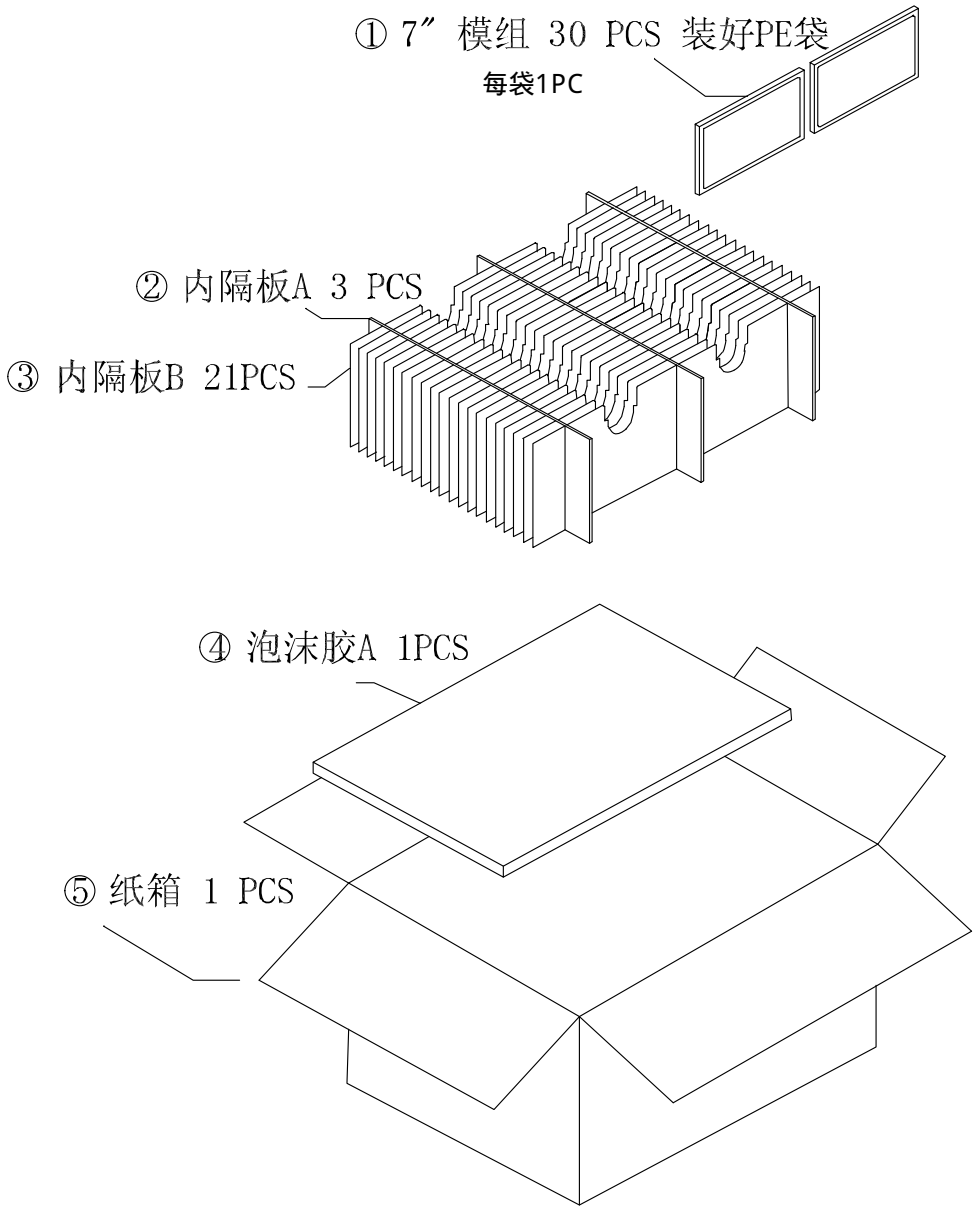


6.3 Module with RTP Mechanical Drawing



7. Package Drawing

7″模组纸箱外形成套包材包装示意

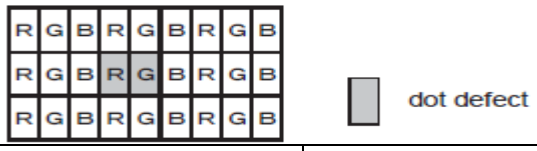
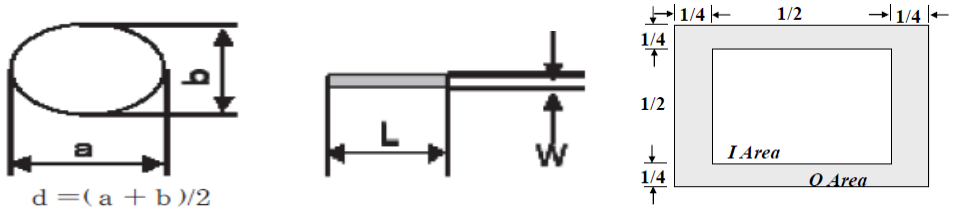


备注:
1. 必须正确填写<外箱标签>中的内容
2. 必须认真检查是否有少装、多装、错装等现象
3. 必须认真检查有无漏贴标签
4. 每箱装30PCS。

序号	日 期	修 改 内 容	修订者
包装方式示意图			

模组号		版本	01	核准	
客户代码		日期		检查	
				设计	

8 .Visuals Specification: 1)Note

<table>
<tr><td>General</td><td colspan="3">1. Customer identified anomalies not defined within this inspection standard shall be reviewed by Duobond, and an additional standard shall be determined by mutual consent.
2. This inspection standard about the image quality shall be applied to any defect within the effective viewing area and shall not be applicable to outside of the area.
3. Inspection conditions
Luminance : 500 Lux min.
Inspection distance : 300 mm.
Temperature : 25±5°C
Direction : Directly above</td></tr>
<tr><td rowspan="6">Definition of inspection item</td><td rowspan="3">Dot defect</td><td>Bright dot defect</td><td>The dot is constantly “on” when power applied to the LCD, even when all “Black” data sent to the screen. Inspection tool: 5% Transparency neutral density filter.Count dot: If the dot is visible through the filter. Don’t count dot: If the dot is not visible through the filter.
 
</td></tr>
<tr><td>Black dot defect</td><td>The dot is constantly “off” when power applied to the LCD, even when all “White” data sent to the screen.</td></tr>
<tr><td>Adjacent dot</td><td>Adjacent dot defect is defined as two or more bright dot defects or black dot defects.
 
</td></tr>
<tr><td>External inspection</td><td>Bubble ,scratch(foreign Particle polarizer, Cell, Backlight)</td><td>Visible operating (all pixels “Black” or “White”) and non operating.</td></tr>
<tr><td></td><td>Appearance inspection</td><td>Does not satisfy the value at the spec.</td></tr>
<tr><td>Others</td><td>LED wires</td><td>Damaged to the LED wires, connector, pin, functional failure or appearance failure.</td></tr>
<tr><td>Definition of Size</td><td colspan="2">Definition of circle : definition of linear size definition Area I/O
 
</td></tr>
</table>

2) Standard

Classification		Inspection item		Judgment Standard	
Defect (in LCD glass)	Dot defect	Area		I	O
		Bright dots(Note: Visible under:ND5%) 1:D≤0.15mm:No count); D>0.15mm acceptable: 2		N≤0	N≤2
		Dark dots (0.15mm<D≤0.3mm), D>0.3mm Not allowable		N≤3	
		Bright dot-2Adjacent		N≤0	
		Dark dot-2Adjacent		N≤0	
		Dark or bright dots-3 and more adjacent(note6)		N≤0	
		Total bright and dark dots		N≤5	
		Minimum distance between bright dots		5mm	
		Minimum distance between dark dots		5mm	
		Minimum distance between bright and bright dots		5mm	
Visual defect		Foreign partial	Circular foreign material: dark/bright sport	Visible under:ND5% 1:D≤0.15mm:No count 2:0.15mm<D≤0.3mm,N≤4 3:D>0.3mm:Not allowable	
			Linear foreign material: bright or dark line	Invisible under ND5% 0.1mm<W≤0.3mm, 0.3mm<L≤1.5mm,N≤4	
		Polarizer	Linear scratch	1:BM:No Count 2:Pixel area 0.15mm≤D≤0.3mm,N≤4	
		Mura & leak		ND5%	

9.0 GENERAL PRECAUTION

9.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life threatening or otherwise catastrophic.

9.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. AUO does not warrant the module, if customers disassemble or modify the module.

9.3 Breakage of LCD Panel

9.3.1.If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

9.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

9.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

9.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

9.4 Electric Shock

9.4.1. Disconnect power supply before handling LCD module.

9.4.2. Do not pull or fold the LED cable.

9.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

9.5 Absolute Maximum Ratings and Power Protection Circuit

9.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged. 9.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time. 11.5.3. It's recommended to employ protection circuit for power supply.

9.6 Operation

9.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

9.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

9.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
9.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
9.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

9.7 Mechanism

Please mount LCD module by using mouting holes arranged in four corners tightly.

9.8 Static Electricity

9.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
9.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

9.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

9.10 Disposal

When disposing LCD module, obey the local environmental regulations.