

TFT LCD Specification

Model Name: TD070TTEA1

Customer Signature
Date

This technical specification is subjected to change without notice.

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Record of Revision

Rev	Issued Date	Description
0.00	March. 21,2007	New Create
0.01	July. 12. 2007	Update: 1. Weight; 2. BL power consumption; 3. Timing chart; 4. Add Flicker spec item
1.0	SEP. 06. 2007	Modify: 3.1 TFT LCD Pin assignment 5.2 Driving touch panel (Analog resistance type) 6.1 Timing Chart 7.1 Optical Specification 10. MECHANICAL DRAWING 11. PACKING DRAWING
1.1	OCT. 15. 2007	Update: 3.1 TFT LCD Pin assignment
1.2	OCT. 25. 2007	Update: 6.2 Power ON/OFF Sequence 8. REILIABILITY 10. MECHANICAL DRAWING
1.3	Nov.06.2007	Update: 3.1 TFT LCD Pin assignment 5.2 Driving touch panel (Analog resistance type)
1.4	Nov.30.2007	Update: 1. General Specifications, Weight. 7.1 Optical Specification, NTSC, R/G/B Chromaticity.
1.5	Dec.12.2007	Update: 8. RELIABILITY, to cancel Deflection Force, FPC Bending Test, Noise item 10. MECHANICAL DRAWING v1.1 11. PACKING DRAWING
1.6	Dec.31.2007	Update: 6.1 TIMING CHART, modify DENB signal setup/hold time 10 MECHANICAL DRAWING 11. PACKING DRAWING
1.7	Jan.09.2008	Update: 8. REILIABILITY, modify High Temperature & High Humidity Storage, HHS and Thermal Shock, TS
1.8	Mar.3.2008	Modify: 6.2 Power ON/OFF Sequence

1. FEATURES

The 7.0"(17.77 cm) LCD module is an active matrix color TFT LCD module. LTPS (Low Temperature Poly Silicon) TFT technology is used. Horizontal drivers are built on the panel. Horizontal scan can be from left to right or from right to left and Vertical scan can be from up to down or from down to up. The product is designed for the requirement of the green product, and the specification complies with TPO's "Green Product Chemical Substance Specification Standard Hand Book".

2. GENERAL SPECIFICATIONS

Item	Description	Unit
Display Size (Diagonal)	7.0(17.77)	Inch (cm)
Display Type	Transmissive	
Active Area (HxV)	152.4 x 91.44	mm
Number of Dots (HxV)	800 X RGB X 480	dot
Dot Pitch (HxV)	0.0635x0.1905	mm
Color Arrangement	RGB Stripe	
Color Numbers	262K	
Color Saturation	50 (NTSC)	%
Outline Dimension (HxVxT) *	165(typ)x104(typ)x6.2(max)	mm
Weight	160(max)	g

* Exclude protrusions

3. INPUT/OUTPUT TERMINALS

3.1 TFT LCD Pin assignment

CN1, HRS : FH19SC-30S-0.5SH(05)

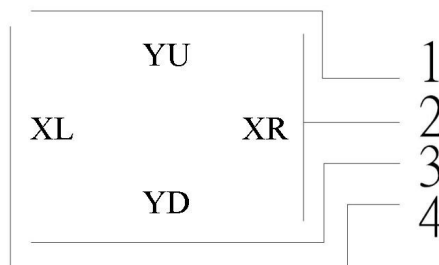
PIN No.	P/I/O	Symbol	Signal level	Descriptions
1	I	U/D		Up or Down display control (no function)
2	I	DMS		Selection DE or SYNC (no function) (fix DE mode)
3	I	Hsync		Horizontal synchronous for Display DATA (no used)
4	P	VLED		B/L LED Anode
5	P	VLED		B/L LED Anode
6	P	VLED		B/L LED Anode
7	P	VDD		Power supply for digital logic
8	I	Vsync		Vertical synchronous for Display DATA (no used)
9	I	DE		Data enable
10	P	GND	GND	Ground
11	O	ID		301k ohm pull-down
12	I	ADJ		Adjust for LED brightness
13	I	B5		BLUE signal 5 (MSB)
14	I	B4		BLUE signal 4
15	I	B3		BLUE signal 3
16	P	GND	GND	Ground
17	I	B2		BLUE signal 2
18	I	B1		BLUE signal 1
19	I	B0		BLUE signal 0
20	P	GND	GND	Ground
21	I	G5		GREEN signal 5 (MSB)
22	I	G4		GREEN signal 4
23	I	G3		GREEN signal 3
24	P	GND	GND	Ground
25	I	G2		GREEN signal 2
26	I	G1		GREEN signal 1
27	I	G0		GREEN signal 0
28	P	GND	GND	Ground
29	I	R5		RED signal 5 (MSB)

30	I	R4		RED signal 4
31	I	R3		RED signal 3
32	P	GND	GND	Ground
33	I	R2		RED signal 2
34	I	R1		RED signal 1
35	I	R0		RED signal 0
36	P	GND	GND	Ground
37	P	GND	GND	Ground
38	P	DCLK		Clock signals; Latch data at the falling edge
39	P	GND	GND	Ground
40	I	L/R		Left or Right Display control (no function)

3.2 Touch panel Pin assignment

CN2, HRS : FH19SC-4S-0.5SH(05)

Touch Panel Pin	Symbol	Description	Remark
1	YU	Touch Panel Upper Side	
2	XR	Touch Panel Right Side	
3	YD	Touch Panel Lower Side	
4	XL	Touch Panel Left Side	



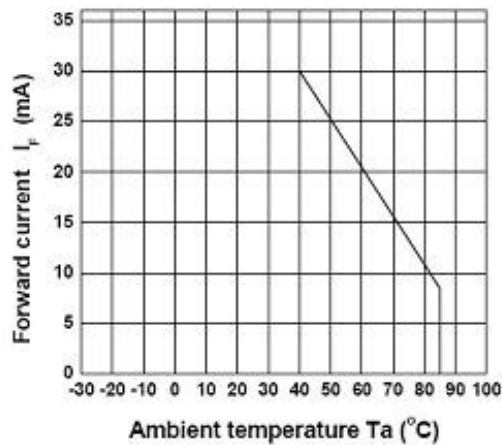
3.3 Light Source

Light Source Type: LED Backlight

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	MAX	Unit
Power Supply for Driver	VDD	3.0	3.6	V
Back Light Forward Current	I_f	--	30	mA
Operating Temperature	Topr	-20	+60	°C
Storage Temperature	Tstg	-30	+70	°C

Note 4.1 : Relation between maximum LED forward current and ambient temperature is showed as Below



5. ELECTRICAL CHARACTERISTICS

5.1 TFT LCD Module

VSS=0V, Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply for Driver	VDD	3.0	3.3	3.6	V	
Power Supply for LED Driver	VLED	4.5	5		V	
Logic Input Voltage	VIH	VDD*0.8		VDD	V	
	VIL	0		VDD*0.2	V	
ADJ Input Voltage	VIH	3.0		3.3	V	Freq:10KHz
	VIL	GND		0.3	V	
Power Consumption	Wp	--	(0.77)		W	
Backlight Power Consumption (With LED driver)	W _{BL}		(2)		W	

5.2 Driving touch panel (Analog resistance type)

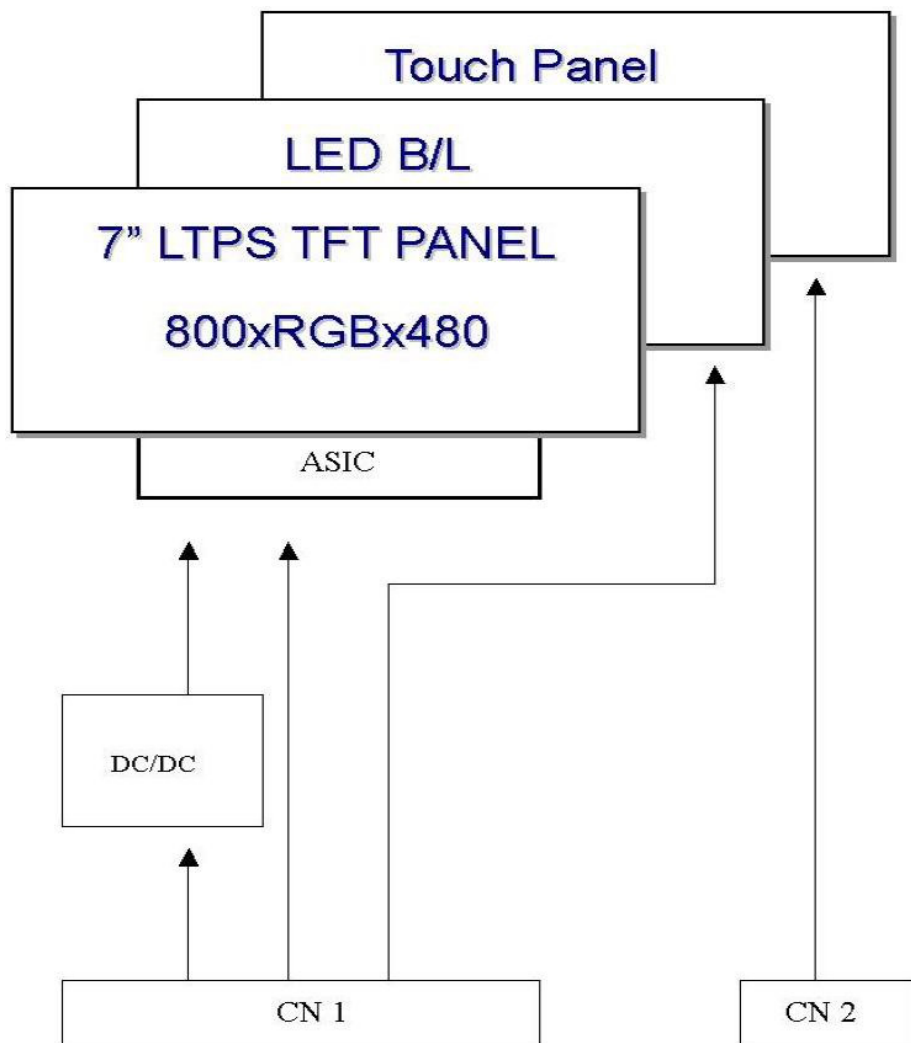
Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Resistor between terminals (XR-XL)	R _x	390	NIL	1350	Ω	
Resistor between terminals (YU-YL)	R _y	100	NIL	800	Ω	
Operation Voltage	V _{Touch}	NIL	5.0	7.0	V	DC
Line Linearity (X direction)	-	-1.5	NIL	+1.5	%	Note
Line Linearity (Y direction)	-	-1.5	NIL	+1.5	%	
Surface Hardness	-	3	NIL	NIL	H	JIS K 5600
Minimum tension for detecting	-	NIL	NIL	80	gf	(TP AA inside 2mm)
Insulation Resistance	R _i	20	NIL	NIL	MΩ	DC 25V

Note. The minimum test force is 80 g.

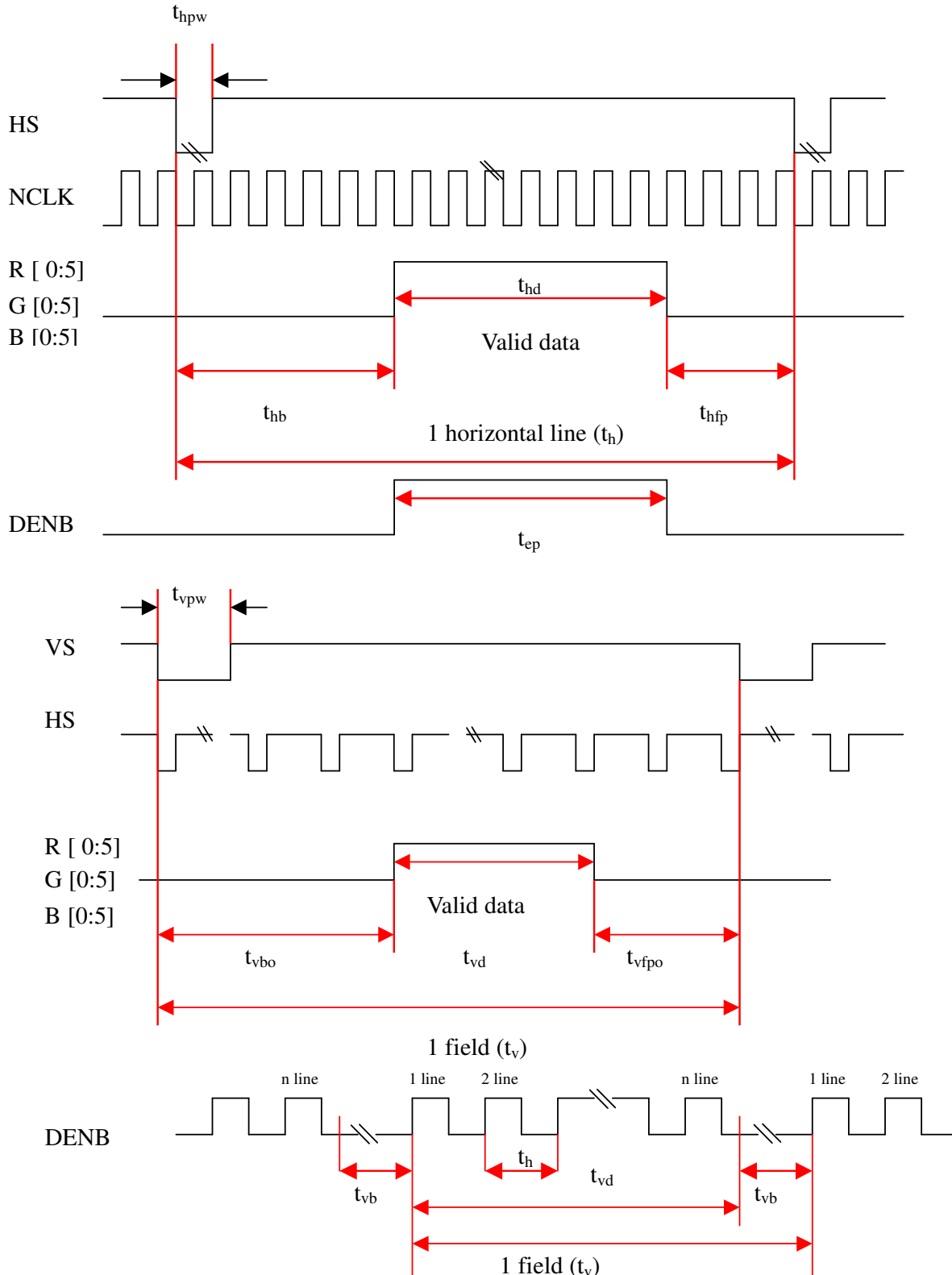
TP vendor is Fujitsu.

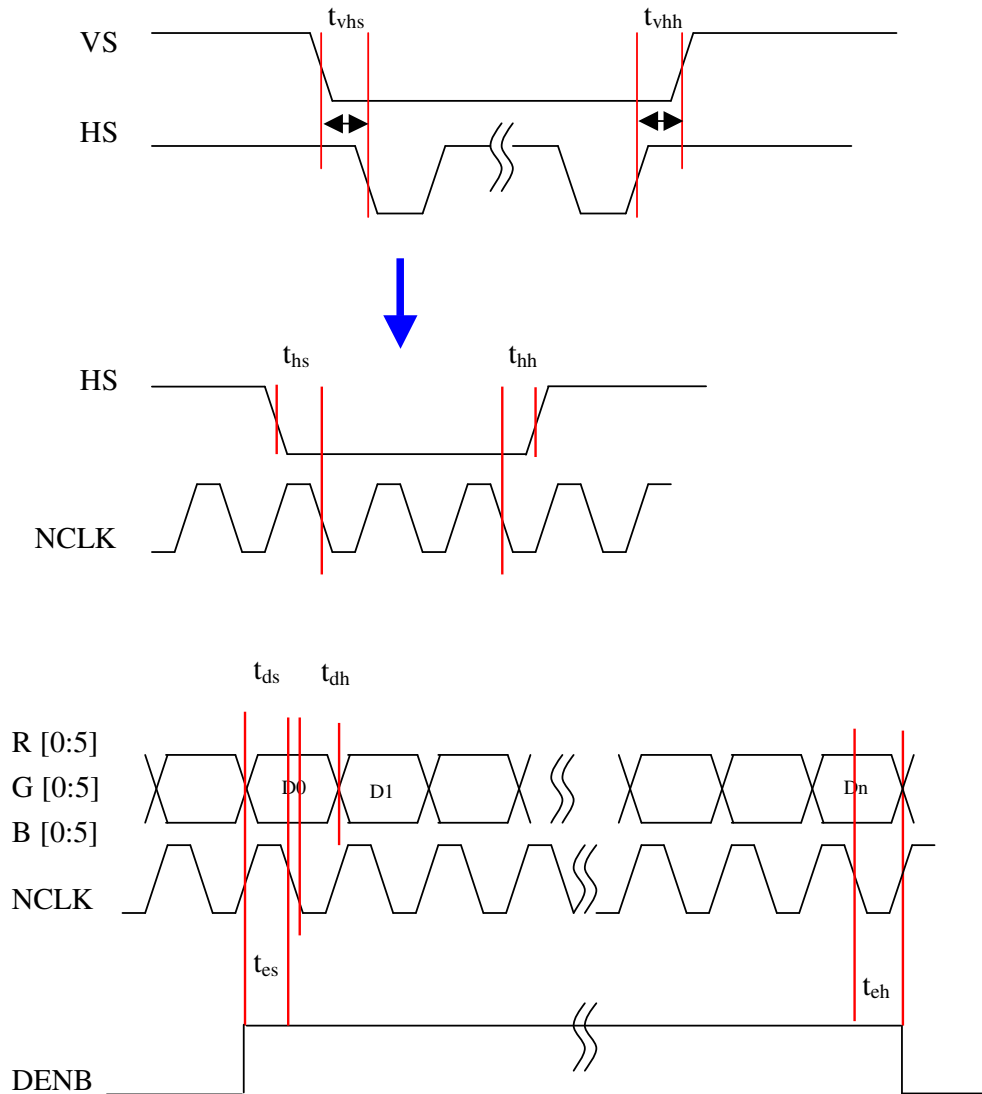
5.2TFT LCD Block Diagram



6. TIMING CHART

6.1 Timing Chart





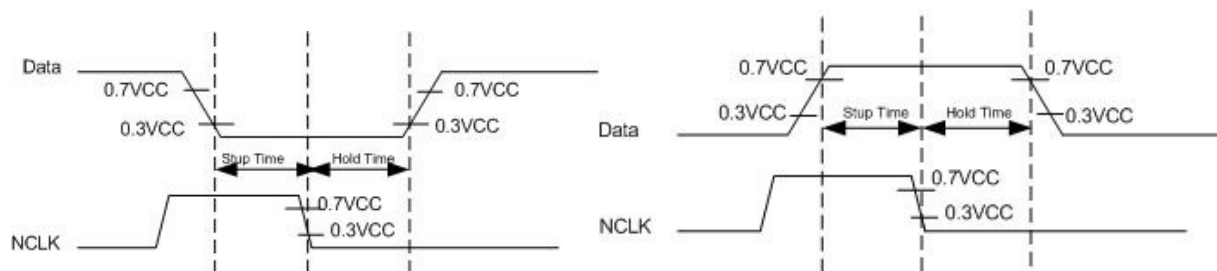
Timing Characteristics

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks
Clock(NCLK)	Frequency	1/Tc		33.2		MHz	Tc=nclk In 60 Hz
1 Horizontal Line		t _h	1056			nclk	
Hsync pulse width		t _{hd}	1	-	-	nclk	
Hsync blanking		t _{hb}	216			nclk	
Hsync front proch		t _{hfp}	40			nclk	
Horizontal valid data		t _{hd}		800		nclk	
DENB Enable Time		t _{ep}		800		nclk	
Vertical display area		t _{vd}		480		line	
Vertical period time		t _v		525		line	
Vsync pulse width		t _{vpw}	1	-	-	line	
Vertical blanking		t _{vbo}		35		line	
Vertical front porch		t _{vfpo}		10		line	
Vertical blanking of DENB		t _{vb}		20		line	
Nclk duty rate		duty	40		60	%	
Data setup time		t _{ds}	4			ns	Note 6-1
Data hold time		t _{dh}	5			ns	Note 6-1
Vsync. Signal setup time		t _{vhs}	12			ns	
Vsync. Signal hold time		t _{vhh}	12			ns	
Hsync. Signal setup time		t _{hs}	12			ns	
Hsync. Signal hold time		t _{hh}	12			ns	
DENB Signal setup time		t _{es}	12			ns	
DENB Signal hold time		t _{eh}	8			ns	

Note 6-1

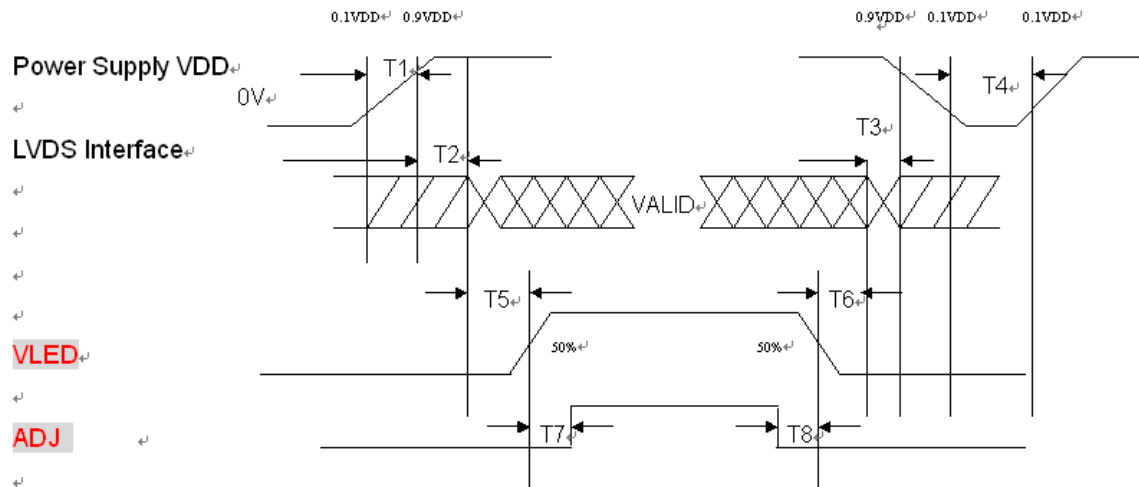
Data = 0

Data = 1



6.2 Power ON/OFF Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



$$T1 \leq 10\text{ms} \quad 50\text{ms} \leq T2 \leq 80\text{ms} \quad 30\text{ms} \leq T3 \leq 50\text{ms} \quad T4 \geq 1 \text{ sec} \quad T5 \geq 200\text{ms} \quad T6 \geq 200\text{ms} \\ 1\text{ms} \leq T7 \quad 1\text{ms} \leq T8$$

T1:VDD rising time from 0.1VDD to 0.9VDD.

T2:The time from 0.9VDD to valid data at power ON.

T3:The time from 0.9VDD to valid data at power OFF.

T4:VDD off time for window restarts.

T5:The time from valid data to B/L enable at POWER ON.

T6 The time from valid data to B/L enable at POWER OFF

T7: The time from VLED ON to ADJ ON.

T8: The time from ADJ OFF to VLED OFF.

7. OPTICAL CHARACTERISTICS

7.1 Optical Specification

Ta=25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Remarks
Viewing Angle		Θ11	CR ≥ 10	60	65	--	Degree	Note 7-1
		Θ12		60	65	--		
		Θ21		40	50	--		
		Θ22		50	60	--		
Contrast Ratio		CR	Θ=0°	320	400	--		Note 7-2
Response Time	Rising	Tr			4.5	6.0	ms	Note 7-3
	Falling	Tf			7.5	9.0		
Luminance (If=20mA)		L		240	300	--	cd/m ²	Note 7-4
Uniformity (If=20mA)		u		70	80	--	%	
NTSC ratio		NTSC		40	50	--	%	Note 7-6
Chromaticity	White	x _w		0.27	0.31	0.35		
		y _w		0.29	0.33	0.37		
	Red	R _x		0.565	0.615	0.665		
		R _y		0.318	0.368	0.418		
	Green	G _x		0.299	0.349	0.399		
		G _y		0.500	0.550	0.600		
	Blue	B _x		0.089	0.139	0.189		
		B _y		0.035	0.085	0.135		
Flicker		-	1 dot inversion test pattern (Center)	--	-20	--	dB	

7.2 Basic Measure Conditions

7.2.1 Driving voltage

VDD= 3.3V

7.2.2 Ambient Temperature: Ta=25°C

7.2.3 Testing Point: Measure in the display center point and the test angle $\Theta=0^\circ$

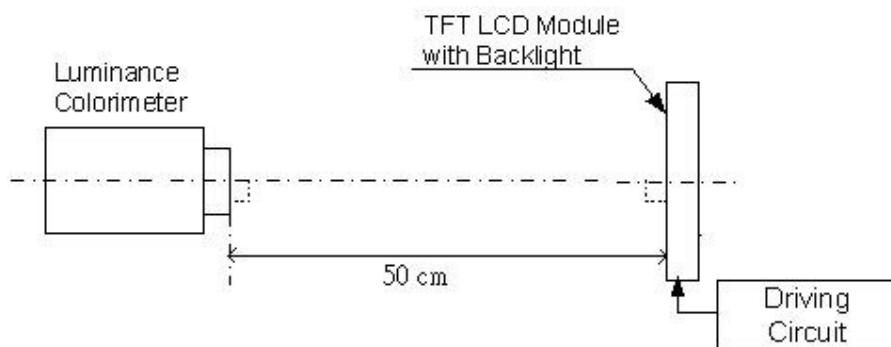
7.2.4 LED Current: $I_F=20mA$.

7.2.5 Measurement System

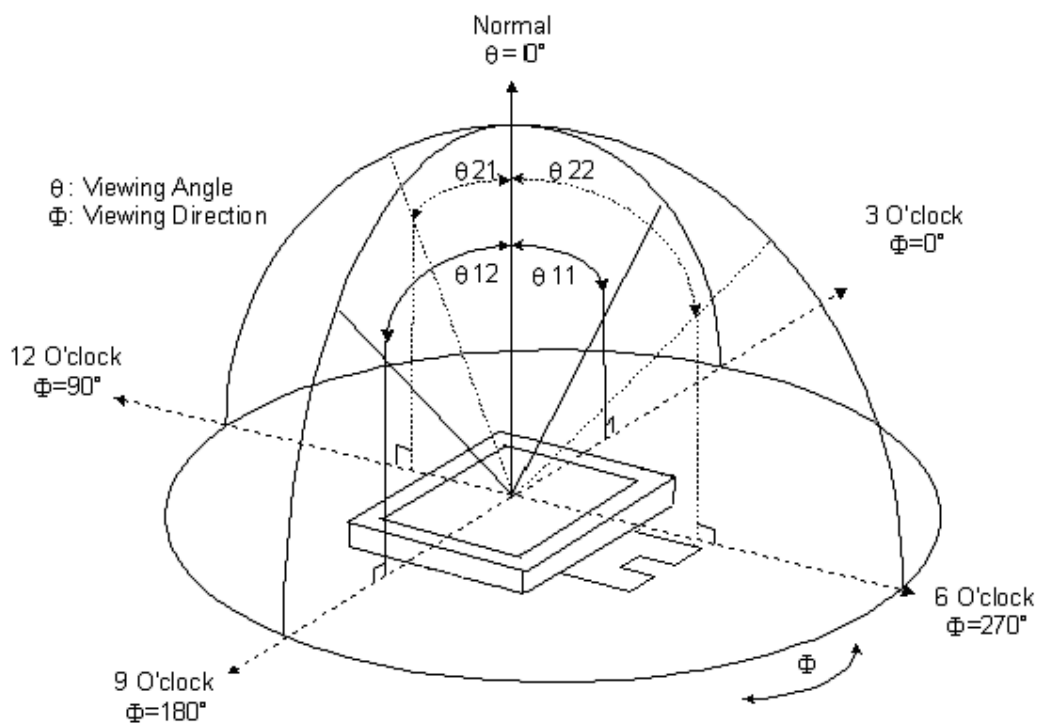
A. Environmental illumination: ≤ 1 Lux

B. Using the TOPCON BM-5A luminance meter

C. Using the DMS dpecutrm meter



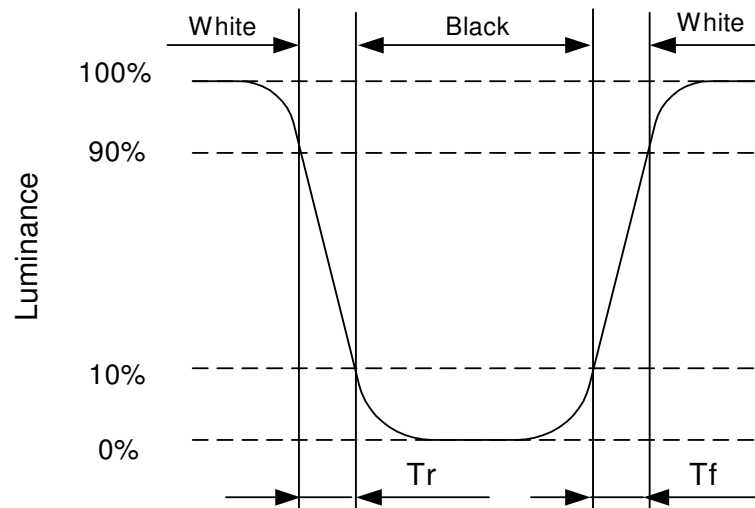
Note 7-1: Viewing angle diagrams:



Note 7-2: Contrast ratio is measured in optimum common electrode voltage.

$$CR = \frac{\text{Luminance with white image}}{\text{Luminance with black image}}$$

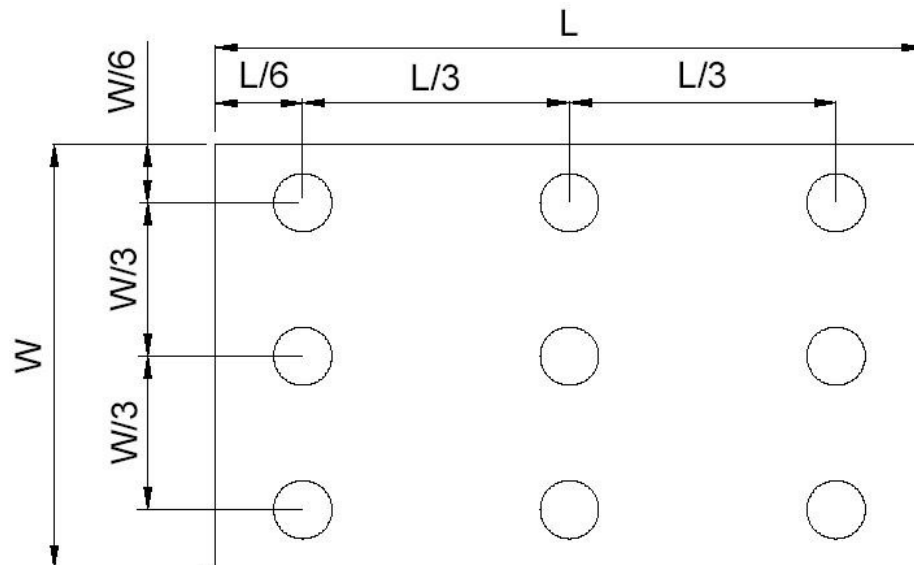
Note 7-3: Definition of response time:



Note 7-4: Luminance:

L = White luminance at the center of the panel

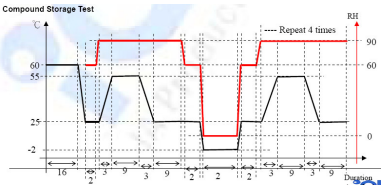
Note 7-5: Uniformity:



$$u = \frac{\text{Minimum Luminance of 9 point}}{\text{Maximum Luminance of 9 point}}$$

Note 7-6: Chromaticity: The same test condition as Note 7-4. But change the detector to spectrum meter.

8 REILIABILITY

No	Test Item	Condition
1	High Temperature Operation,HTO	Ta=60°C , 240Hrs , No malfunction or abnormal should be found.
2	High Temperature Storage,HTS	Ta=70°C , 240Hrs.No malfunction or abnormal should be found.
3	Low Temperature Operation,LTO	Ta=-20°C , 240Hrs. No malfunction or abnormal should be found.
4	Low Temperature Storage,LTS	Ta=-30°C , 240Hrs. No malfunction or abnormal should be found.
5	High Temperature & High Humidity Operation,HHO	Ta=40°C , RH=95%, 240Hrs. No malfunction or abnormal should be found.
6	High Temperature & High Humidity Storage,HHS	Ta=40°C , RH=95%, 240Hrs. No malfunction or abnormal should be found.
7	Thermal Shock,TS	-30°C (30 mins)↔60°C (30 mins), 50Cycles. No malfunction or abnormal should be found.
8	Low Pressure test - Non Operation	Non-Operation, 40,000ft(0.186atm) /48hours. No malfunction or abnormal should be found.
9	Compound Storage Test	<p>1. 60°C (16Hrs) 2.25°C , 60%RH, 2Hrs 3.90%RH, 25°C→55°C within 3 Hrs, stay 9Hrs at 55°C, 55°C→25°C within 3Hrs ,stay 9Hrs at 25°C 4.25°C , 60%RH, 2Hrs 5.-20°C , 24Hrs 6.25°C , 60%RH, 2Hrs 7.90%RH, 25°C→55°C within 3 Hrs,stay 9Hrs at 55°C, 55°C→25°C within 3Hrs ,stay 9Hrs at 25°C . repeat 4 times</p> <p>+ T/P ACP Bonding Test</p>  <p>The graph, titled 'Compound Storage Test', plots Temperature (°C) on the left Y-axis and Relative Humidity (RH) on the right Y-axis against Time (Hours) on the X-axis. The temperature cycle (black line) starts at 60°C for 16 hours, drops to 25°C, stays for 9 hours, drops to -20°C, stays for 24 hours, and then returns to 25°C. The humidity cycle (red line) starts at 90% RH for 2 hours, drops to 25% RH, stays for 2 hours, and then returns to 90% RH. The entire sequence is repeated 4 times.</p>
10	Shock Test- Non Operation	Acceleration: 400G; Time: 2.0ms;Directions: ±X, ±Y, ±Z; Cycles: one
11	Sine Vibration Test - Non Operation	Sine: 10-500-10Hz, 6G, 3 sweeps per axis (1cycle:10~500~10Hz,15min/cycle,2cycle)
12	Random Vibration Test - Non Operation	Random:10-500Hz (6 Grms (0.074 G2/Hz)), 500-2000Hz (-3db/octave), 60min, X, Y, Z
13	Dust Test	By Chamber (依詢 HTC 新店廠測試方法→ IEC60529 IP5X)
14	Writing Durability (Random Drawing)	Horizontal & Vertical linearity should be under 1.5% after 200k lines of random drawing with R0.6 polyacetal stylus.

15	Touch Panel Writing Friction Resistance Test	After 100,000 cycles (forward – back two way defined as 1 cycle) with a stylus of R0.6 polyacetal (load: 250g) in center of active area and measure it.
16	T/P Writing Durability (TSP AA Boundary Drawing)	Horizontal & Vertical linearity should be under 1.5% after 10k cycles of TSP AA boundary drawing with R0.6 polyacetal stylus. Weight Load: 250 g Speed 105 mm/sec Test Cycles: 10k for criteria and then up to 20k
17	Touch Panel Pin Activation Test	Hit it 1,000,000 times with a silicon rubber of R8 Hs40 and measure it. The hitting force shall be 250g and hitting speed 3 times per second.
18	ESD	IEC 61000-4-2 contact +-8kV, Air +- 15kV

Tp: Panel Temperature

Ta: Ambient Temperature

9 HANDLING CAUTIONS

9.1 ESD (Electrical Static Discharge) Strategy

ESD will cause serious damage of the panel, ESD strategy is very important in handling.

Following items are the recommended ESD strategy

- 9.1.1 In handling LCD panel, please wear non-charged material gloves. Connect the wrist conduction ring to the earth and the conducting shoes to the earth are necessary.
- 9.1.2 The machine and working table for the panel should have ESD protection strategy.
- 9.1.3 In handling the panel, using ionized air to decrease the charge in the environment is necessary.
- 9.1.4 In the process of assembly the module, shield case should connect to the ground.

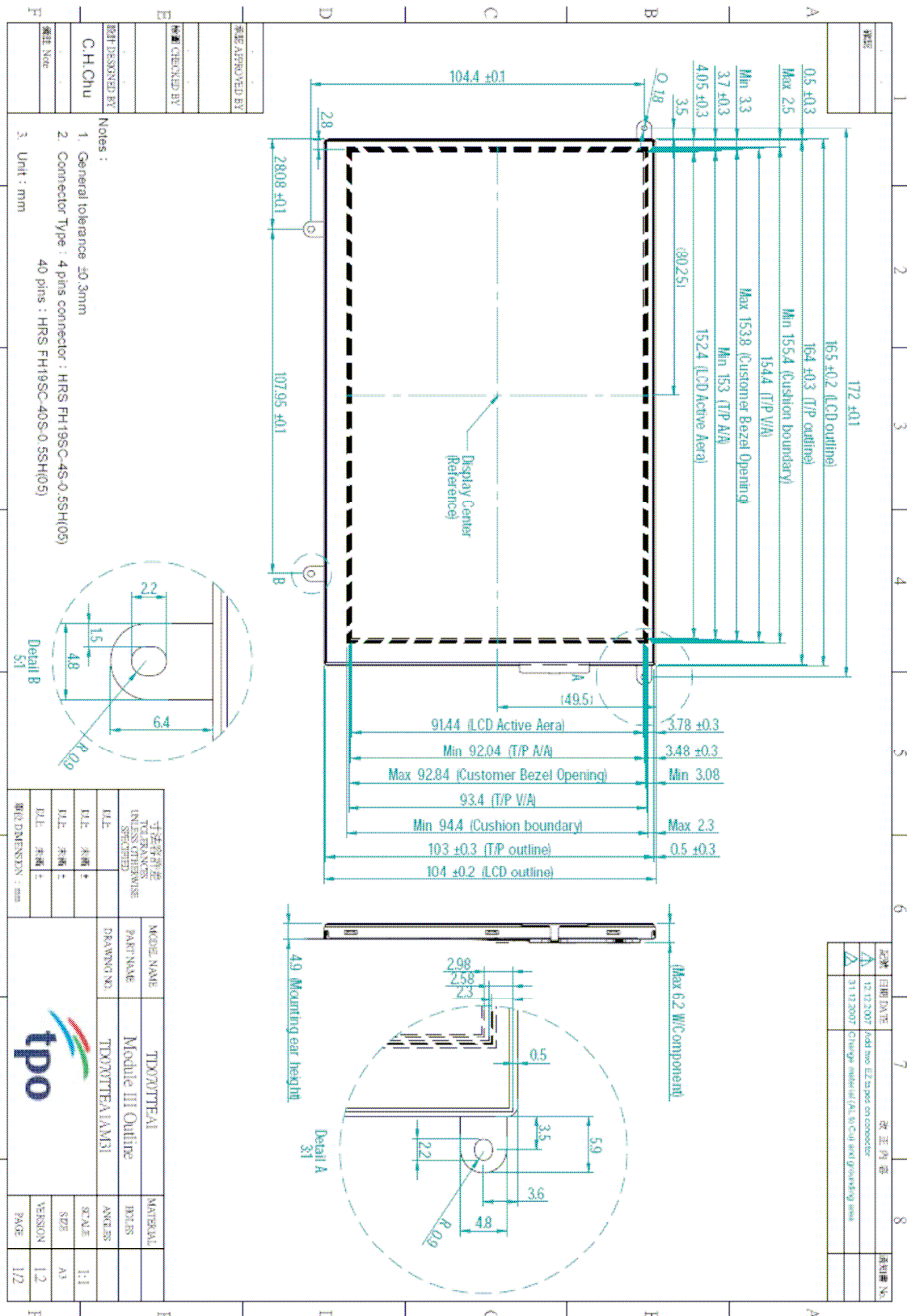
9.2 Environment

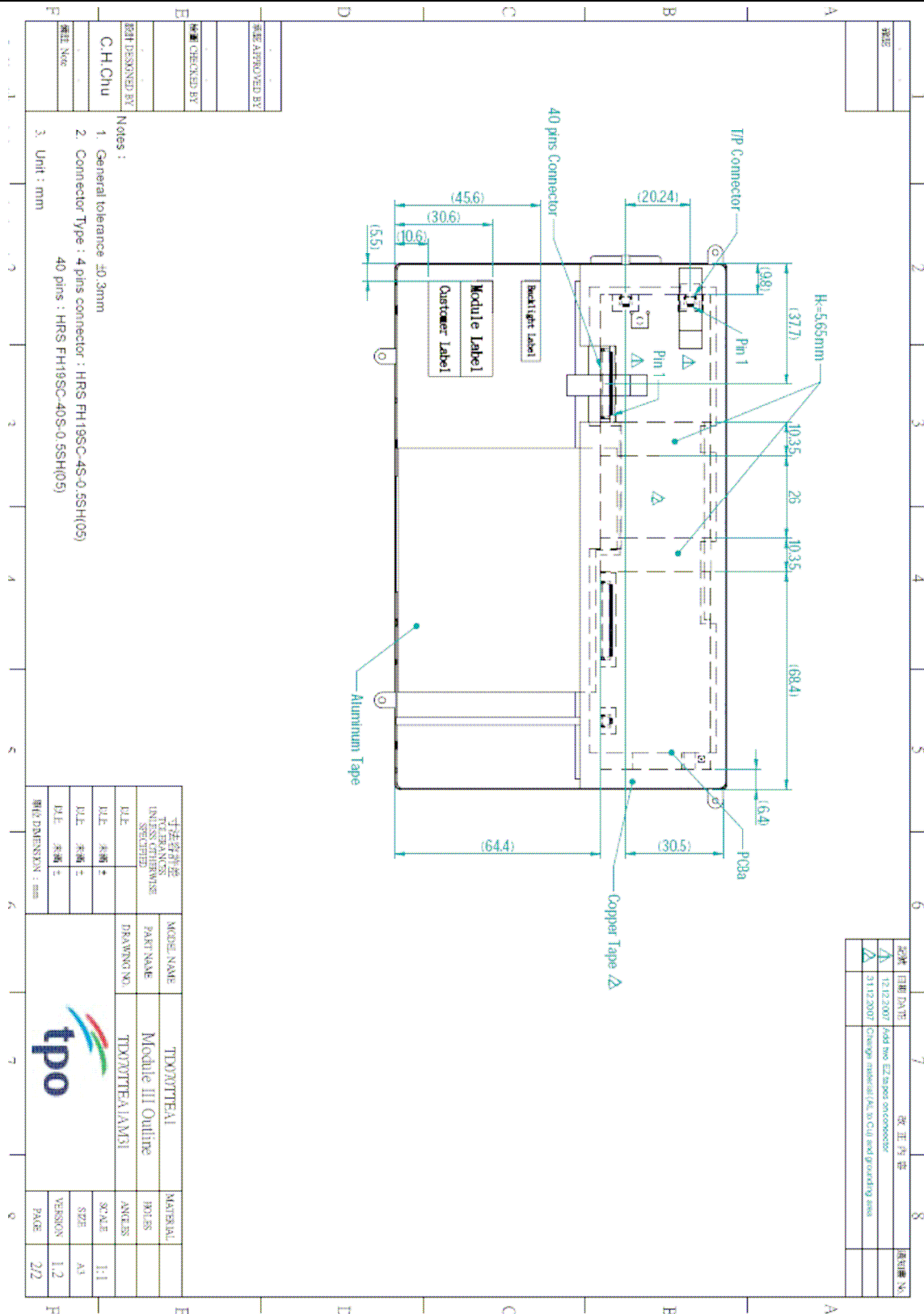
- 9.2.1 Working environment of the panel should be in the clean room.
- 9.2.2 The front polarizer is easy to be damaged. Handle it carefully and do not scratch it by sharp material.
- 9.2.3 Panel has polarizer protective film in the surface. Please remove the protection film of polarizer slowly with ionized air to prevent the electrostatic discharge.

9.3 Others

- 9.3.1 Turn off the power supply before connecting and disconnecting signal input cable.
- 9.3.2 The connection area of FPC and panel is very weak, do not handle panel only by FPC or bend FPC.
- 9.3.3 Water drop on the surface or condensation as panel power on will corrode panel electrode.
- 9.3.4 As the packing bag open, watch out the environment of the panel storage. High temperature and high humidity environment is prohibited.
- 9.3.5 When the TFT LCD module is broken, please watch out whether liquid crystal leaks out or not. If your hand touches liquid crystal, wash your hand cleanly by water and soap as soon as possible.

10 MECHANICAL DRAWING





11 PACKING DRAWING

7" Module delivery packing method

- (1). Module packed into tray cavity (with Module display face down).
- (2). Tray stacking with 12 layers and with 1 empty tray above the stacking tray unit.
2pcs desiccant put above the empty tray
- (3). Stacking tray unit put into the LDPE bag and fix by adhesive tape.
- (4). Put 1pc cardboard inside the carton bottom, and then pack the package unit into the carton.
Put 1pc cardboard above the package unit.
- (5). Carton tapping with adhesive tape.

