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# Product Specification

## 1.8" COLOR TFT-LCD

MODEL NAME: A018HN01 V1

Note: The content of this specification is subject to change.

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Record of Revision

Version	Revise Date	Page	Content
0.0	2006/02/15		First draft
0.1	2007/3/9	11	Update packing figure.

## Index

A. General Specification .....	3
1. Physical specifications .....	3
2. Block diagram.....	4
B. Electrical Specifications .....	5
1. FPC pin assignment of FPC .....	5
2. Absolute maximum ratings ( $V_{SS}=0V$ ) .....	5
3. Electrical Characteristics.....	6
3.1 Typical operating conditions.....	6
3.2 Power consumption (Note 1) .....	6
4. AC Characteristics (CPU i80 system) .....	7
C. Optical Specification.....	8
D. Reliability Test Items.....	10
E. Packing form .....	11
F: Outline dimensions of TFT LCD drawing.....	12

## A. General Specification

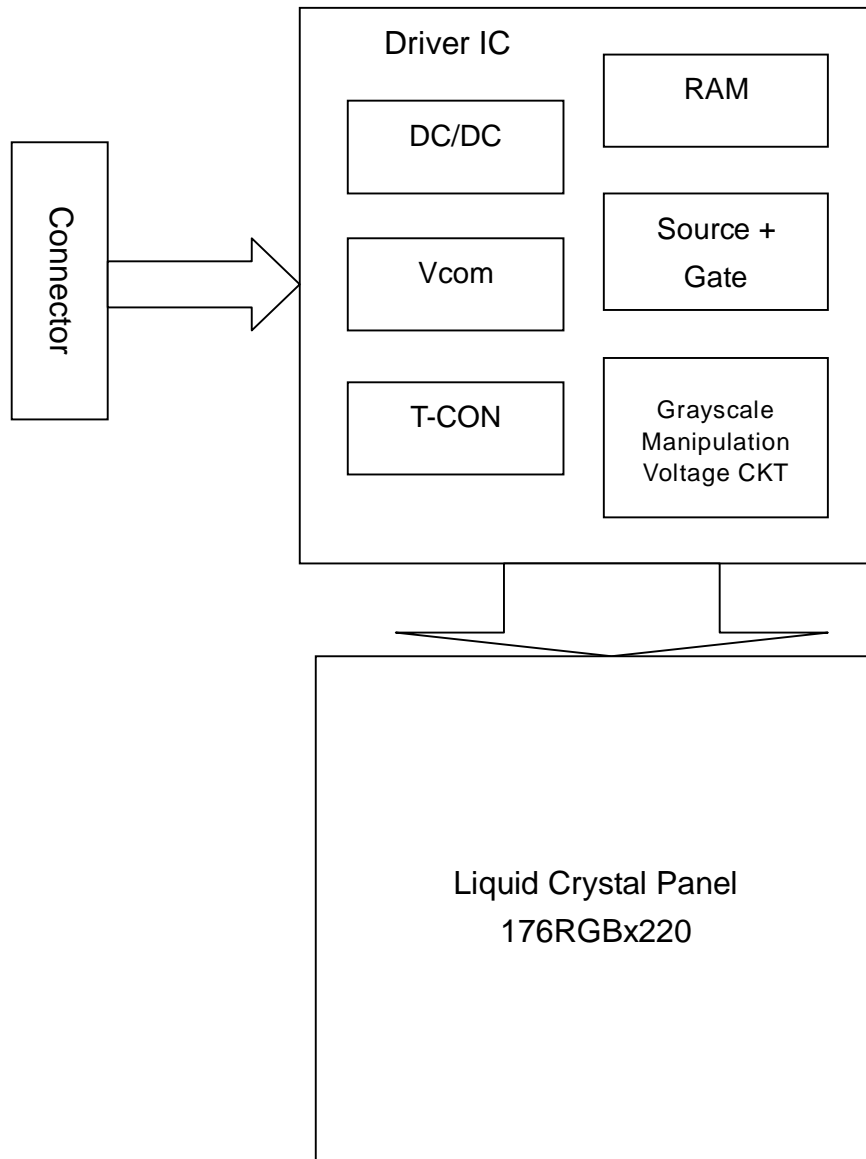
### 1. Physical specifications

NO.	Item	Specification	Remark
1	Display method	Active matrix TFT	
2	Display mode	Transmissive	
3	Display resolution (dot)	176 X RGB (H) X 220(V)	
4	Active area (mm)	27.984 (H) × 34.980 (V)	
5	Screen size (inch)	1.76 (Diagonal)	
6	Pixel pitch (mm)	0.159(H) X 0.159(V)	
7	Color configuration	R. G. B. stripe	
8	Display color	65k	
9	Surface treatment of Upper Polarizer	Hard Coating	
10	Transmittance	5.0%	
11	Overall dimension (mm)	34(H)x 44.83(V)x 2.7(T)	
12	View Direction	12 o'clock (gray scale inversion)	
13	Weight (g)	7.5 g	

### Key Features

- Allows direct RAM data display (RAM is included in the source driver):  
A single pixel consists of three dots (RGB), and a single dot consists of 6-bit data (64 gray-scale).  
Built-in RAM capacity is  $176 \times 3 \times 240 \times 6 = 760,320$  bits
- Able to display moving pictures up to 30 FPS, and support area scrolling and partial display
- Able to support 8/16 bit parallel i80 series CPU interface
- Low power consumption and single chip driver solution

## 2. Block diagram



## B. Electrical Specifications

### 1. FPC pin assignment of FPC

Pin No.	Pin name	Description	Pin No.	Pin name	Description
1	Anode	Anode	17	PD8	Data bit 7
2	Cathode 1	Cathode 1	18	PD9	GND
3	Cathode 2	Cathode 2	19	PD10	Data bit 8
4	Cathode 3	Cathode 3	20	PD11	Data bit 9
5	CS/	Chip selection	21	PD12	Data bit 10
6	RS	Register selection	22	PD13	Data bit 11
7	WR/SCL	Write	23	PD14	Data bit 12
8	RD/	Read	24	PD15	Data bit 13
9	PD0	GND	25	PD16	Data bit 14
10	PD1	Data bit 0	26	PD17	Data bit 15
11	PD2	Data bit 1	27	RESET/	Reset
12	PD3	Data bit 2	28	Dummy	GND
13	PD4	Data bit 3	29	VCI	Analog power
14	PD5	Data bit 4	30	IOVCC	I/O Power
15	PD6	Data bit 5	31	GND	GND
16	PD7	Data bit 6			

### 2. Absolute maximum ratings ( $V_{SS}=0V$ )

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Input power supply	IOVCC		-0.3	4.6	V	
Analog power supply	VCI		-0.3	4.6	V	
Logic input voltage	VCC		-0.3	IOVCC+0.3	V	Note 2
Operating temperature (Ambient)	$T_{OPA}$		0	60	°C	
Storage temperature (Ambient)	$T_{STG}$		-25	80	°C	

Note 1: If the module exceeds the absolute maximum ratings, it may be damaged permanently. Also, if the module operated with the absolute maximum ratings for a long time, its reliability may drop.

Note 2: D0 ~D15,  $\overline{CS}$ ,  $\overline{RS}$ ,  $\overline{WR}$ ,  $\overline{RD}$ ,  $\overline{RESET}$

### 3. Electrical Characteristics

#### 3.1 Typical operating conditions

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
IOVCC (Interface Power)		IOVCC		1.8	-	3.3	V	Note 1
VCI (DC/DC)		VCI		2.8	-	3.3	V	
Input Signal Voltage	H Level	$V_{IH}$	IOVCC =1.8~3.7V	0.8*IOVCC	-	IOVCC	V	Note 2
	L Level	$V_{IL}$	IOVCC=1.8~3.7V	-0.3	-	0.2*IOVCC	V	
Output signal voltage	H Level	$V_{OH}$		0.8*IOVCC	-	-	V	Note 3
	L Level	$V_{OL}$	IOVCC=1.8~3.3V	-	-	0.2*IOVCC	V	

Note 1: The operations are guaranteed under the recommended operating conditions only. These operations are not guaranteed if a quick voltage change occurs during operation. To prevent noise, a bypass capacitor must be inserted into the line close to power pin.

Note 2:  $\overline{CS}$ ,  $\overline{RS}$ , DN (N=0 ~15),  $\overline{WR}$ ,  $\overline{RD}$ ,  $\overline{RESET}$ ,

Note 3: DN (N=0 ~15)

#### 3.2 Power consumption (Note 1)

Mode	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Stand-by	$P_s$	$V_{CC} = 2.8V$	-		0.01	mW	Note 2
Still (65k colors)	$P_g$		-	-	11	mW	Note 3

Note 1: No backlight is driven

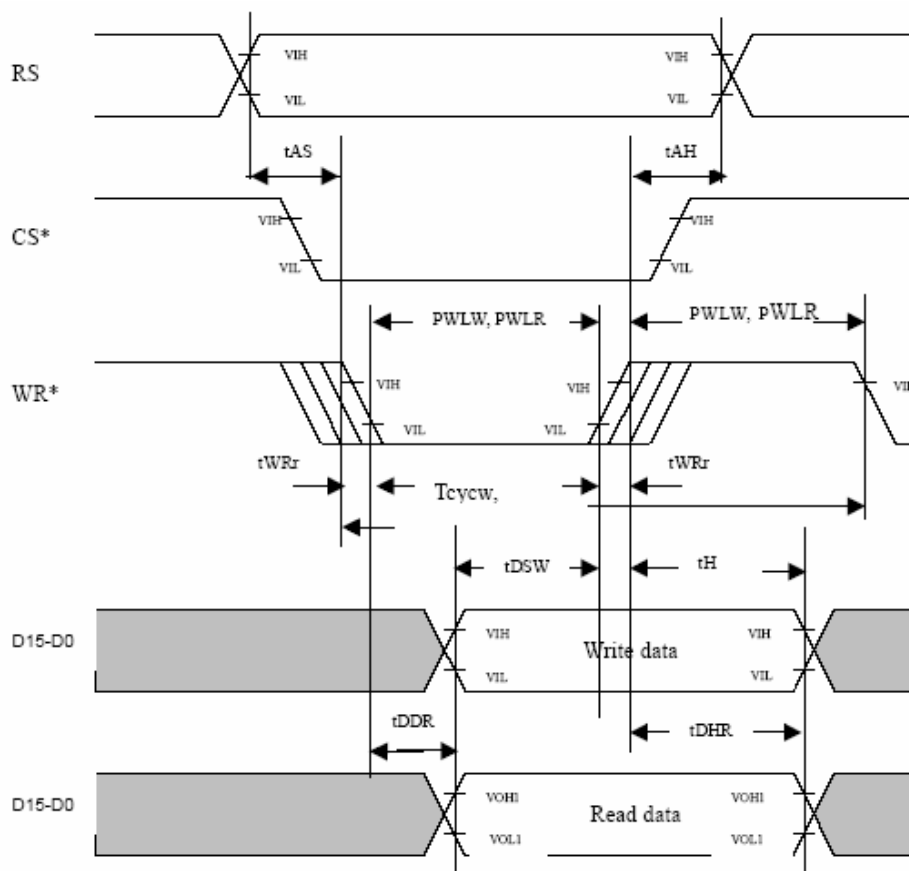
Note 2: Display off, black pattern

Note 3: Full screen with 65K colors (Line inversion)

## 4. AC Characteristics (CPU i80 system)

Normal Write Mode (HWM/LHWM=0) ( $V_{cc}=RV_{cc}=2.40\sim 3.60V$ ,  $IOVCC=1.65\sim 3.6V$ )

Item		Symbol	Unit	Timing diagram	Min	Typ.	Max
Bus Cycle time	Write	Tcycw	ns	Figure1	120	-	-
	Read	Tcycr	ns	Figure1	400	-	-
Write low level pulse width	Write	PWLw	ns	Figure1	40	-	-
Read low level pulse width	Read	PWLr	ns	Figure1	200	-	-
Write low level pulse width	Write	PWhw	ns	Figure1	50	-	-
Read low level pulse width	Read	PWhr	ns	Figure1	200	-	-
Write/Read rise/fall time		Twrr, twrf	ns	Figure1	-	-	25
Setup time	Write (RS~CS*, WR*)	Tas	ns	Figure1	0	-	-
	Read (RS~CS*, RD*)		ns	Figure1	10	-	-
Address hold time		Tah	ns	Figure1	2	-	-
Write data setup time		Tdsw	ns	Figure1	25	-	-
Write data hold time		Th	ns	Figure1	5	-	-
Read data delay time		Tddr	ns	Figure1	-	-	100
Read data hold time		Tdhr	ns	Figure1	5	-	-





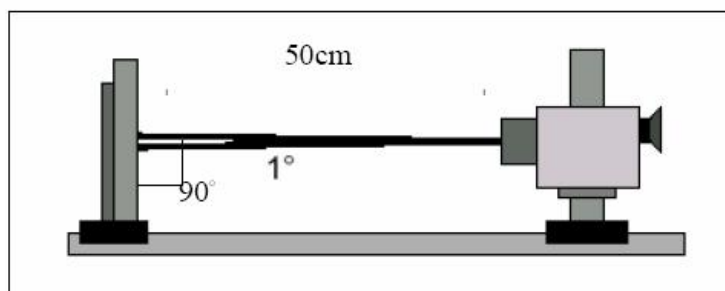
## C. Optical Specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	Tr	$\theta = 0^\circ$	-	15	-	ms	Note 4
	Fall	Tf		-	20	-	ms	
Central Brightness		-	$\theta = 0^\circ$	200	300	-	nit	-
Contrast Ratio		CR	At optimize viewing angle	200	300		-	Note 5
Viewing Angle	Top	-	$CR \geq 10$	45	55	-	deg.	Note 6
	Bottom			40	50	-		
	Left			55	65	-		
	Right			55	65	-		
Color Tone	White	Wx	$\theta = 0^\circ$	0.27	0.32	0.37	-	-
		Wy		0.29	0.34	0.39		

Note 1:  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ .

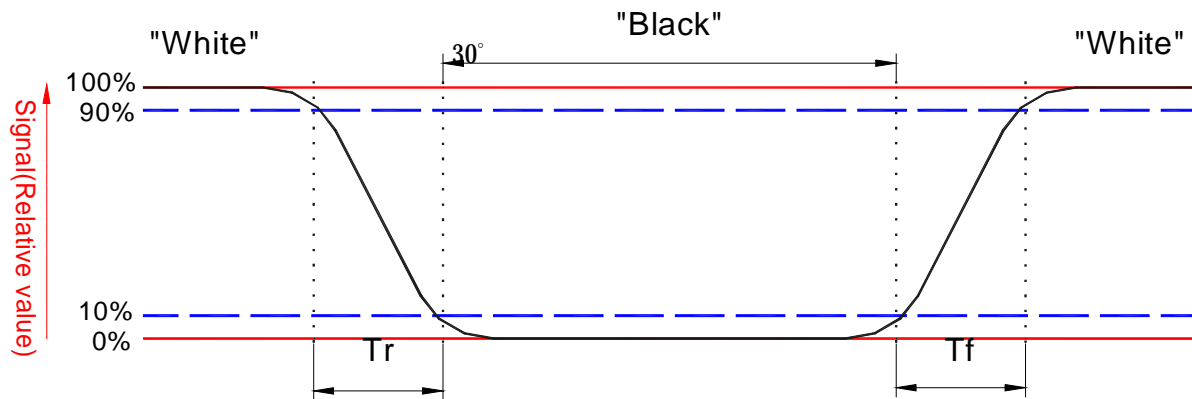
Note 2: To be measured in the dark room.

Note 3: To be measured at the center area of panel with a aperture of  $1^\circ$  by Topcon luminance meter BM-5A , after 10 minutes module operation.



Note 4: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white” (falling time) and from “white” to “black” (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below:



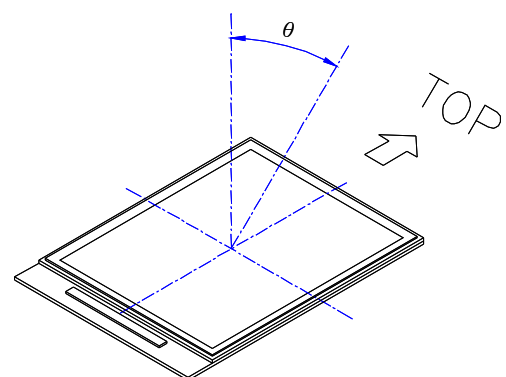
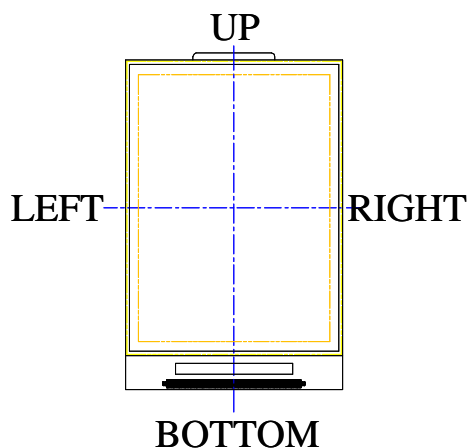
Note 5. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 6. Definition of viewing angle:

Refer to the figure as below.



## D. Reliability Test Items

No.	Test items	Condition		Remark
1	High temperature storage	Ta= 80℃	240H	
2	Low temperature storage	Ta= -30℃	240H	
3	High temperature operation	Ta=70℃	240H	
4	Low temperature operation	Ta= -10℃	240H	
5	High temperature and high humidity	Ta= 60℃ . 90% RH	240H	Operation
6	Heat shock	-30℃~70℃/10 cycles 4H/cycle		Non-operation
7	Electrostatic discharge	±200V, 200pF(0Ω), once for each terminal		Non-operation
8	Drop (with carton)	Height: 80cm 1 corner, 3 edges, 6 surfaces		

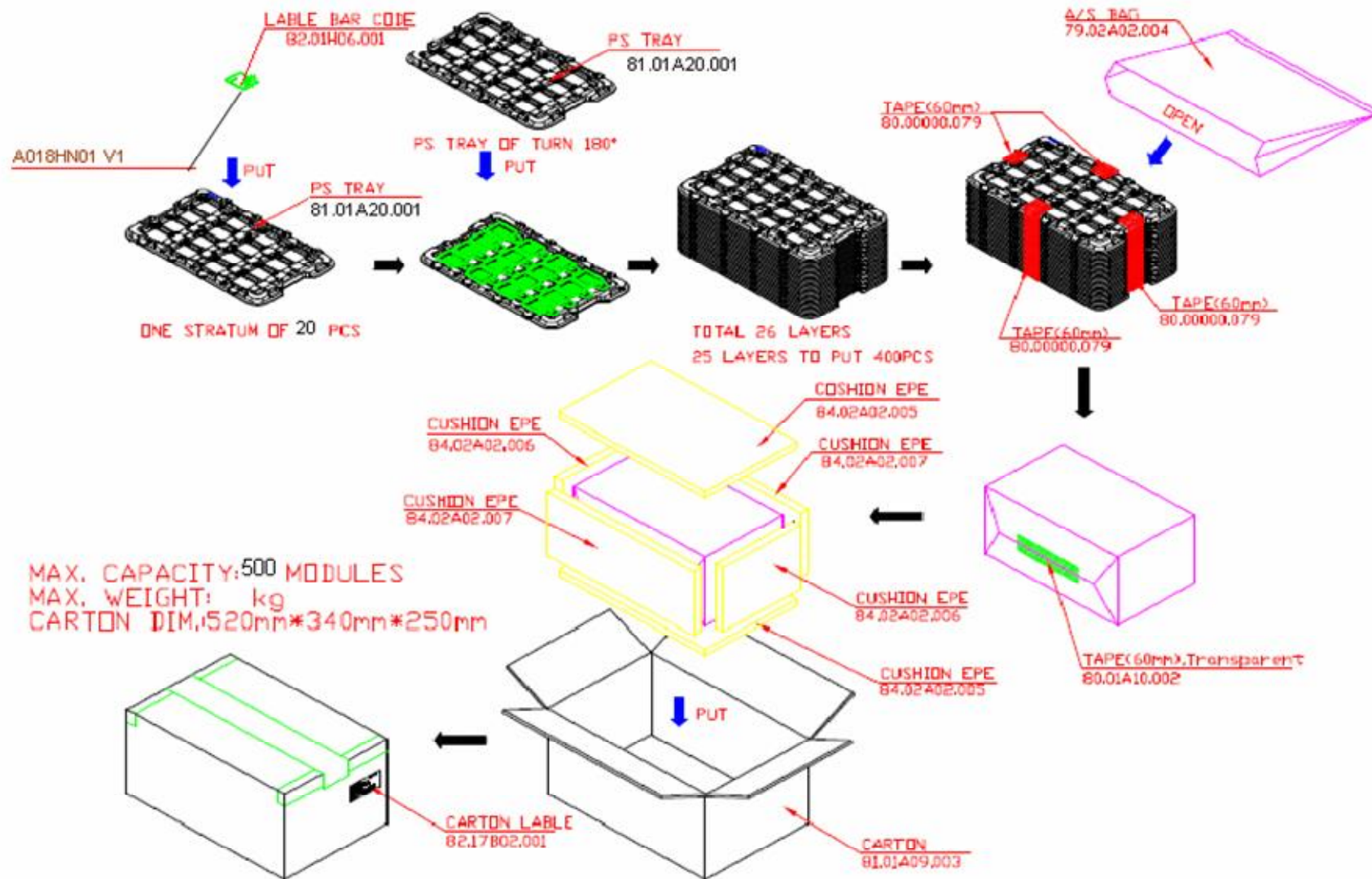
Note 1: Ta: Ambient Temperature.

Note 2: After finishing the test, leave the samples under room temperature and normal humidity for 2 hours, and then this module should work normally.

Note 3: Failure Judgment Criterion:

- Squarely inspect all LCD function before and after reliability test.
- In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

## E. Packing form



## F: Outline dimensions of TFT LCD drawing

**Notes:**

1. General tolerance is  $\pm 0.3$
2. The bending radius of FPC should be large than 0.6
3. Unit: mm

