



## Sample Approval Sheet

Product Description: <b>2.00" 176X220 TFT-LCD Transmissive Cell Product</b>			
----- Specification version 0.2			
AU Model Name: H200HN05 V1			
Customer :			
Customer Signature	Date	AUO	2008/1/11
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# Product Specification

## 2.00" QCIF+ TFT-LCD Cell Product

MODEL NAME: H200HN05 V1

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

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## A. General Specification

The specification shall be applicable to the TFT-LCD product, which is designed for cellular phones, without polarizer, driver IC, FPC, and backlight unit attached. (Except remarked with special description)

### 1. Physical specifications

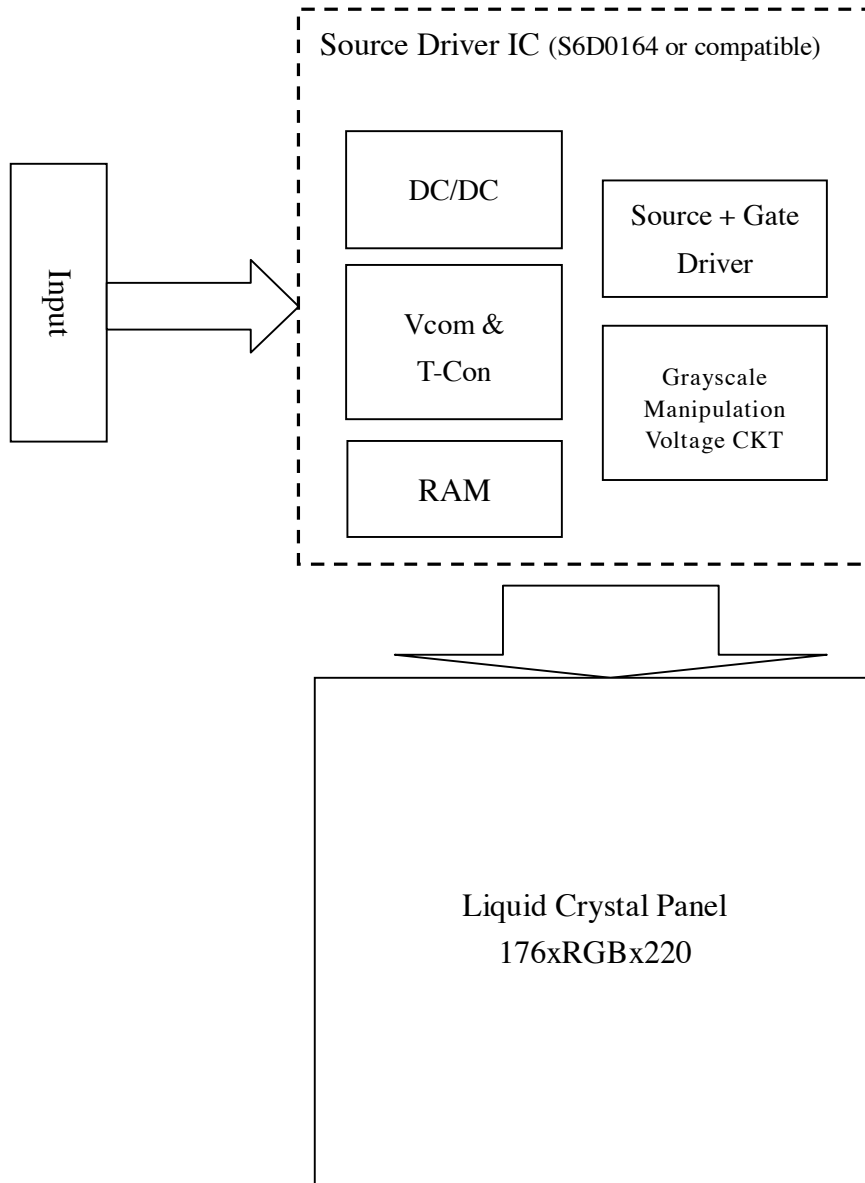
Item	Description	Single LCM	Remark
1	Screen Size (inch)	2.00"	
2	Driving Method	TFT	a-Si
3	Display Mode	Transmissive	
4	Display Resolution (dot)	176xRGBx220	
5	Active Area (mm)	31.68(W) x 39.60(H)	
6	Pixel Pitch (um)	180	
7	Pixel Configuration	R.G.B. Vertical Strip	
8	Display Color	262K	
9	Driver IC	S6D0164 or NT39115	Samsung, Novatek
10	Interface	CPU&SPI I/F	
11	Gray Scale Inversion (GSI)	12 o'clock	
12	Glass Dimension (mm)	35.08(W) × 47.10(H) × 1.0(D)	HxVxD: exclude PF
13	Weight (g)	3.5+/-0.3	

Driver IC PAD Compatible: Samsung S6D0164, NOVATEK NT39115

Basis of the application with different driver IC, FPC design and wiring could not be compatible. For the correct design, please according to the driver IC data sheet.

**Remark:** All the completed panels were inspected by full function testing after production process were completed. As the electronic/production procedure/testing restrictions, *“there will never be aging process included within the production process”*

## 2. Block diagram



The TFT-LCD module should be completed by preparing polarizer, driver IC, FPC and backlight unit attached.

## B. Electrical specifications

### 1. FPC pin assignment (please refer to the IC specification – Samsung S6D0164 or NT39115)

NO	S6D0164	NT39115	NO	S6D0164	NT39115
1	DUMMY	DUMMY	35	FLM	TE
2	NULL	NULL	36	M	DBS
3	VCOM	VCOM	37	SDO	SDO
4	VCOM	VCOM	38	IM<0>	IM<0>
5	VCOM	VCOM	39	IM<1>	IM<1>
6	FPC R_OUT	FPC R_OUT	40	IM<2>	IM<2>
7	FPC R_IN	FPC R_IN	41	IM<3>	IM<3>
8	TG	TG	42	DB<0>	DB<0>
9	VCOM	VCOM	43	DB<1>	DB<1>
10	VCOM	VCOM	44	DB<2>	DB<2>
11	VCOM	VCOM	45	DB<3>	DB<3>
12	CONTACT2	CONTACT2	46	DB<4>	DB<4>
13	CONTACT1	CONTACT1	47	DB<5>	DB<5>
14	VCOMR	VCOMR	48	DB<6>	DB<6>
15	VCOML	VCOML	49	DB<7>	DB<7>
16	VCOMH	VCOMH	50	DB<8>	DB<8>
17	GVDDO	GVDD	51	DB<9>	DB<9>
18	GVDDO	GVDD	52	DB<10>	DB<10>
19	VREF	DUMMY	53	DB<11>	DB<11>
20	VDD3	VDDI	54	DB<12>	DB<12>
21	VDD3	VDDI	55	DB<13>	DB<13>
22	VDD3	VDDI	56	DB<14>	DB<14>
23	VDD	VCC	57	DB<15>	DB<15>
24	VDD	VCC	58	DB<16>	DB<16>
25	VDD	VCC	59	DB<17>	DB<17>
26	RVDD	VCC	60	RW_WRB	RW_WRB
27	RVDD	VCC	61	E_RDB	E_RDB
28	RVDD	VCC	62	SDI	SDI
29	VGS	AGND	63	RESETB	RESETB
30	VSS	DGND	64	ENABLE	ENABLE
31	VSS	DGND	65	DOTCLK	DOTCLK
32	AVSS	AGND	66	HSYNC	HSYNC
33	AVSS	AGND	67	VSYNC	VSYNC
34	CL1	EXTC	68	CSB	CSB

NO	S6D0164	NT39115	NO	S6D0164	NT39115
69	RS	RS	103	C22M	C22N
70	VCL	VCL	104	C22P	C22P
71	VCL	VCL	105	C22P	C22P
72	VCI	VDD	106	VGL	VGL
73	VCI	VDD	107	VGL	VGL
74	VCI	VDD	108	VGL	VGL
75	AVDD	AVDD	109	VGH	VGH
76	AVDD	AVDD	110	VGH	VGH
77	AVDD	AVDD	111	VGH	VGH
78	C31M	C23N	112	VCOM	VCOM
79	C31M	C23N	113	VCOM	VCOM
80	C31P	C23P	114	VCOM	VCOM
81	C31P	C23P	115	TG	TG
82	C12M	DUMMY	116	FPC R_OUT	FPC R_OUT
83	C12M	DUMMY	117	FPC R_IN	FPC R_IN
84	C12P	OTP	118	VCOM	VCOM
85	C12P	OTP	119	VCOM	VCOM
86	C11M	C11N	120	VCOM	VCOM
87	C11M	C11N	121	NULL	NULL
88	C11M	C11N	122	DUMMY	DUMMY
89	C11P	C11P			
90	C11P	C11P			
91	C11P	C11P			
92	VCI1	VCI1			
93	VCI1	VCI1			
94	VCI1	VCI1			
95	VSSC	AGND			
96	VSSC	AGND			
97	VSSC	AGND			
98	C21M	C21N			
99	C21M	C21N			
100	C21P	C21P			
101	C21P	C21P			
102	C22M	C22N			



## 2. Absolute maximum ratings ( $V_{SS}=0V$ ) (Note 1)

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Logic supply voltage	VDD		-0.3	3.3	V	
Supply voltage for step-up circuit	VCI		-0.3	5.0	V	
LCD supply voltage range	VGH-VGL		-0.3	33	V	
Operating temperature	Topr		-20	+60	°C	
Storage temperature	Tstg		-55	+110	°C	
Storage humidity	Hstg		10	90	%	

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. It is not allowed for any of these ratings to be exceeded. Make sure all the design characteristics are adequate before the panel is initialed.

Note 2: All the measurements should be operated with driver IC and experimental FPC mounted.

## 3. Electrical characteristics

### a. Typical operating conditions

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Input power supply	VDD	1.65	1.8	3.3	V	Note 1
	VCI	2.5	2.8	3.3	V	
Input Signal Voltage	H Level	$V_{IH}$	$0.7 \times VDD$	-	VDD	V
	L Level	$V_{IL}$	0	-	$0.3 \times VDD$	V
Output signal voltage	H Level	$V_{OH}$	$0.8 \times VDD$	-	VDD	V
	L Level	$V_{OL}$	0	-	$0.2 \times VDD$	V

Note1 : The operation is guaranteed under the recommended operating conditions only. The operation is not guaranteed if a quick voltage change occurs during the operation. To prevent the noise, a bypass capacitor must be inserted into the line closed to the power pin.

Note 2: All the measurements should be operated with driver IC and experimental FPC mounted.

**b. Power consumption** (Note 1)

Mode	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Normal	P <sub>N</sub>	V <sub>CI</sub> =2.8V	-	8.5	9	mW	Note 2
		V <sub>DD</sub> =1.8V	-	72	100	uW	
Stand-by	P <sub>S</sub>	V <sub>CI</sub> =2.8V	-	0.5	1	uW	Note 3
		V <sub>DD</sub> =1.8V	-	3	10	uW	

Note 1: Measure condition: 60Hz frame rate, line inversion, 25°C ,driver IC S6D0164.

Note 2: No backlight is driven, Typ. pattern: chessboard; MAX. Pattern: all pixel black.

Note 3: Display off mode.

**C. Optical specification** (Note 1, Note 2, Note 3)

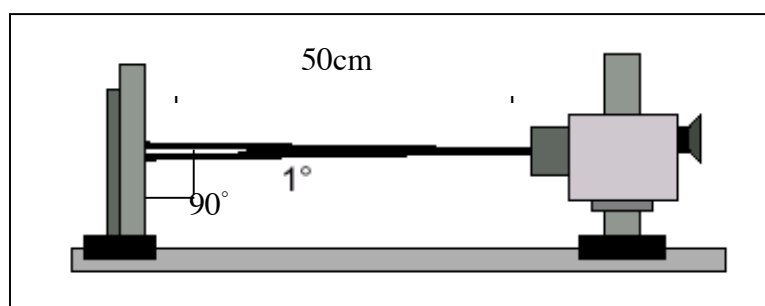
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time (with polarizer)	Rise	Tr	$\theta = 0^\circ$	-	10	20	ms	Note 4, 5
	Fall	Tf		-	20	30	ms	
Contrast ratio (with polarizer)		CR	At optimized Viewing angle	150	200	-		Note 5, 6
Viewing angle (with polarizer)	Top		$CR \geq 10$	40	60	-	degree	Note 5, 7
	Bottom			10	15	-		
	Left			35	40	-		
	Right			35	40	-		
Transmittance (with polarizer)				6.2%	6.7%			
Color filter coordination		Rx	$\theta = 0^\circ$	-	0.58	-		simulated by LED light source, which is provided by customer
		Ry		-	0.34	-		
		Gx		-	0.32	-		
		Gy		-	0.58	-		
		Bx		-	0.15	-		
		By		-	0.11	-		
		Wx		-	0.30	-		
		Wy		-	0.32	-		
White Balance ( Typ )					7000+/-1000K			$\Delta u'v' < 0.03$
Gray Linearity ( Max )						$\Delta u'v' < 0.05$		
Cross Talk ( Max )						2%		50% H

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

Note 2: To be measured in the dark room with backlight unit.

Note 3: To be measured at the center area of panel with a viewing cone of  $1^\circ$  by Topcon luminance

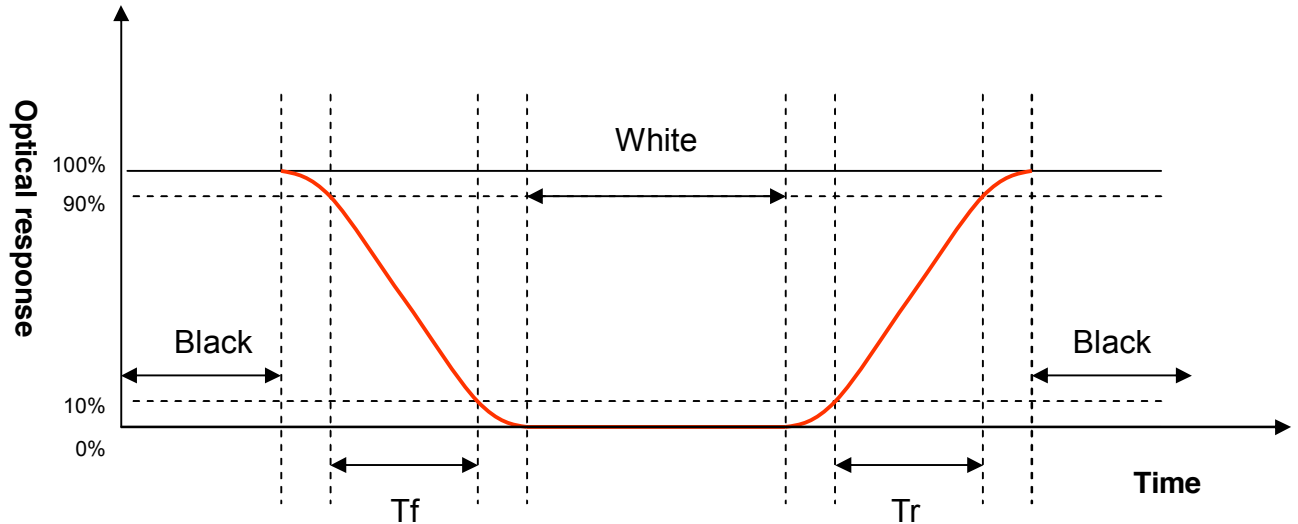
meter BM-7, after 10 minutes operation (module).



Note 4: Definition of response time:

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

Refer to figure as below.



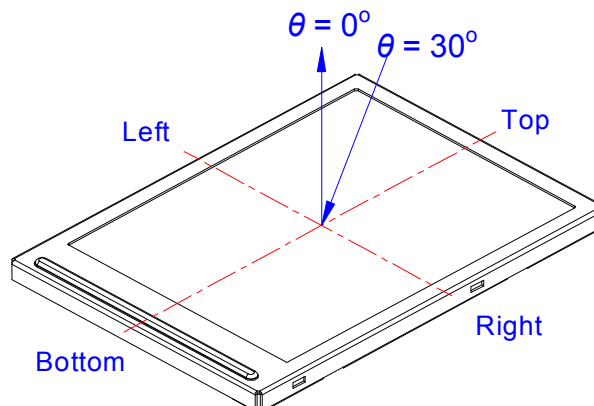
Note 5. Definition of contrast ratio:

Contrast ratio is calculated with the following formula:

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

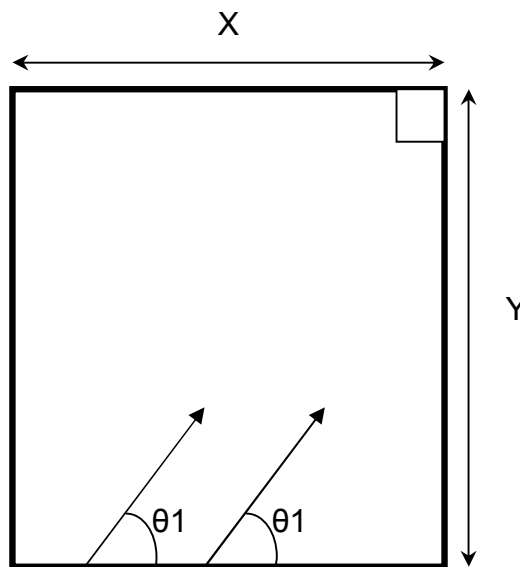
Note 6. White Vi=5.5V / Black Vj=0.9V

Note 7. Definition of viewing angle



### D. Absorption angle of display

Absorption axis  $\theta$  is the angle of the light absorption direction when see it from the **protect film** side of the polarizer



Polarizer Model	Dimension (mm)		Absorption Angle ( $\theta_1$ )
	X	Y	
By customer design features	By customer LCM design features		45 degree

**E. Reliability test items (note1)**

The panel performance shall meet the judgment criteria after the testing items have been performed. However, only a single item of these tests shall be executed on a single panel. No more one test item shall be executed on a single panel.

**1. Test items and conditions (Note 1)**

No.	Test items	Conditions	Remark
1	High temperature storage	Ta= 80°C                      240H	
2	Low temperature storage	Ta= -30°C                      240H	
3	High temperature operation	Ta= 70°C                      240H	Operation
4	Low temperature operation	Ta= -20°C                      240H	Operation
5	High temperature and high humidity	Ta= 60°C . 90% RH              240H	Operation
6	Thermal shock Test	Cycle display from -30°C to +80 °C with 5-minute transfer time. 15 minute dwell, 15 cycles	Non-operation
7	Vibration Test (Package state)	Amplitude: 20mm 5Hz, 1G/45 min for each X,Y,Z	Non-operation Package
8	Drop Test (Package state)	Height: 60cm 1 corner, 3 edges, 6 surfaces	Each direction 1 time

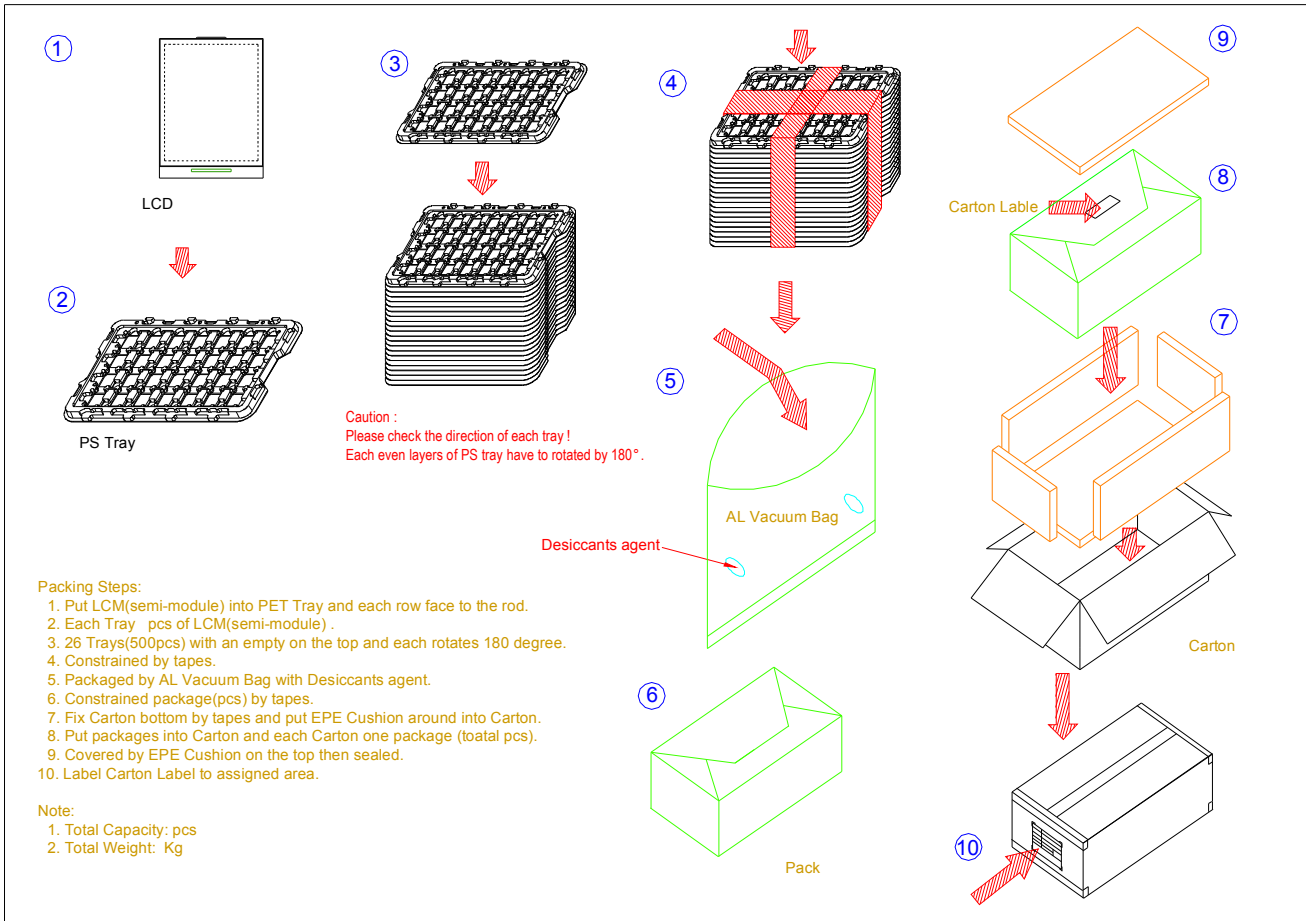
Ta: Ambient temperature.

Note 1: All the tests are performed by whole set of TFT-LCD module with completed driver IC, FPC, and backlight module.

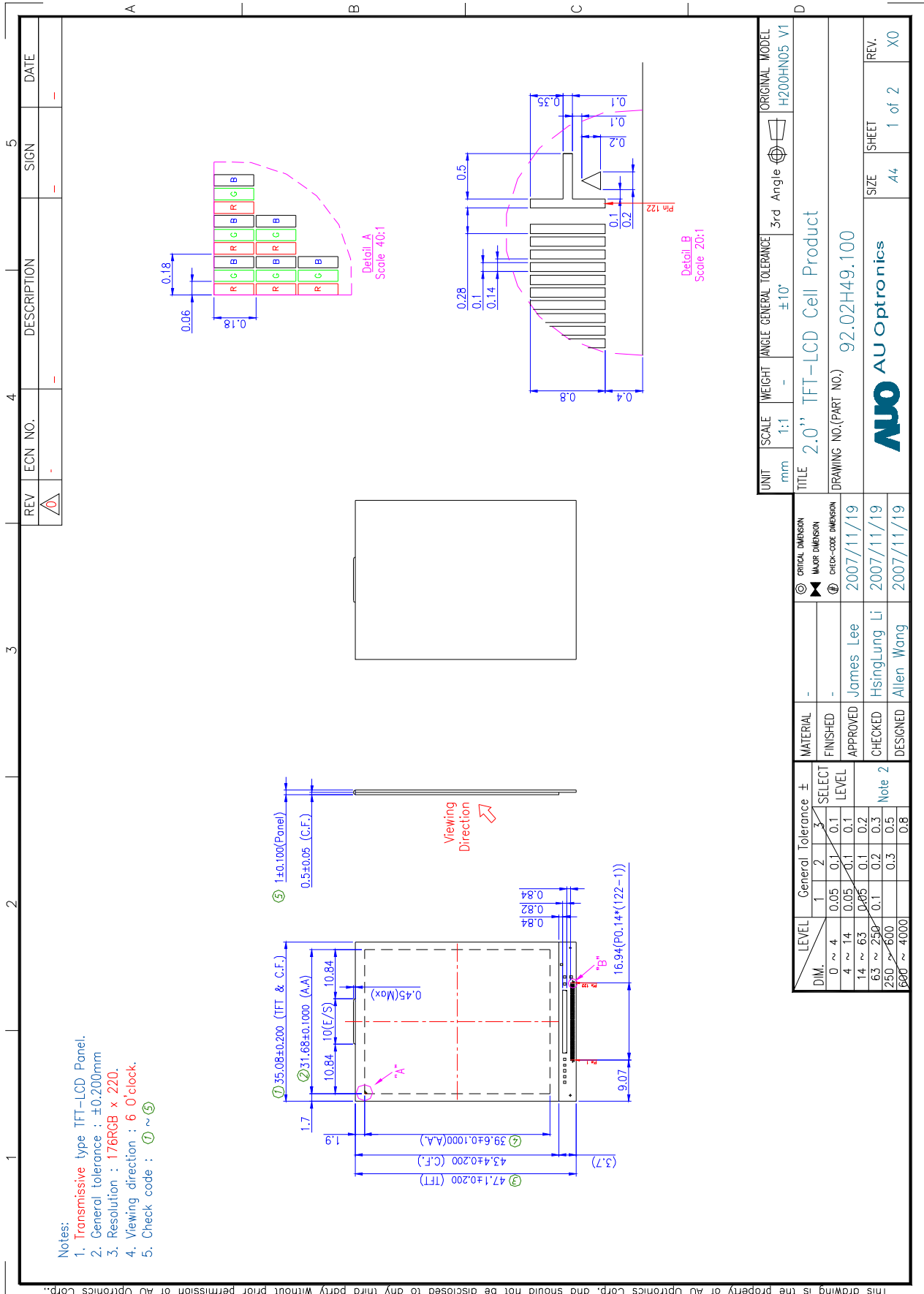
**2. Failure Judgment Criteria**

- a. After the test, the panel should be left at room temperature and room humidity (15°C~35°C, 45%~65% RH). Then the panel could be inspected for normal operation.
- b. Neither abnormality nor significant visible deterioration should be found on display performance.
- b. There should be no functions abnormalities on display quality.

## F. Product packing process

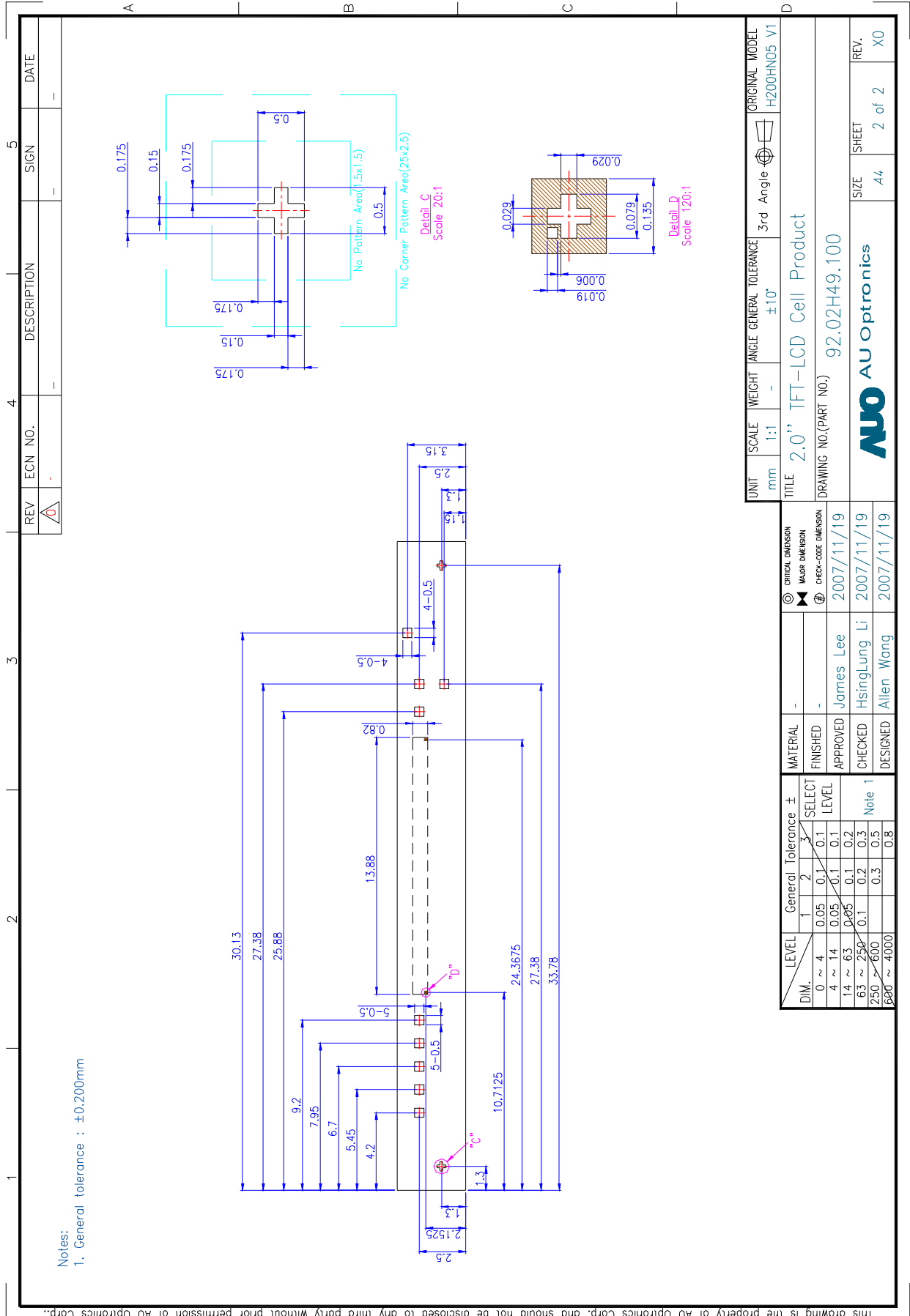


Appendix: TFT-LCD outline dimension mechanical drawing (Fig.1)





Appendix: COG bonding alignment mark drawing (Fig.2)



Notes:  
1. General tolerance : ±0.200mm

REV	ECN NO.	DESCRIPTION	SIGN	DATE
△	-	-	-	-

UNIT	SCALE	WEIGHT	ANGLE	GENERAL TOLERANCE	3rd	Angle	ORIGINAL MODEL
mm	1:1	-	-	±10'			H200HN05 V1
TITLE 2.0" TFT-LCD Cell Product							
DRAWING NO.(PART NO.) 92.02H49.100							
AUO Optonics				SIZE	SHEET	REV.	
				A4	2 of 2	X0	

DIM.	LEVEL	General Tolerance ±			MATERIAL	APPROVED	CHECKED	DESIGNED	DATE	CHECK-CODE	DIMENSION
		1	2	3							
0 ~ 4	0.05	0.1	0.1	0.1	FINISHED						
4 ~ 14	0.05	0.1	0.1	0.1	APPROVED	James Lee	2007/11/19				
14 ~ 63	0.05	0.1	0.1	0.2	CHECKED	HsingLung Li	2007/11/19				
63 ~ 250	0.1	0.2	0.3	Note 1	DESIGNED	Allen Wang	2007/11/19				
250 ~ 600	0.3	0.5	0.5								
600 ~ 4000	0.8	0.8	0.8								

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