



Doc. version :	0.1
Total pages :	16
Date :	2014/06/11

Product Specification

4.45" COLOR TFT-LCD MODULE

MODEL NAME: H445VAN01.0

< ◆ > Preliminary Specification
< > Final Specification

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

© 2014 AU Optronics
All Rights Reserved,
Do Not Copy.



Contents

A. General Information	3
Physical Specifications	3
B. Electrical Specifications	5
1. Interface Specification	5
2. Absolute Maximum Ratings	5
3. Typical Operation Condition	5
4. Scan direction	6
5. Pin Discription.....	7
6. Initial Timing Sequence	9
C. Optical Specification	11
D. Absorption angle of display	13
E. Reliability test items	14
F. Packing	15
G. Outline Dimension	16

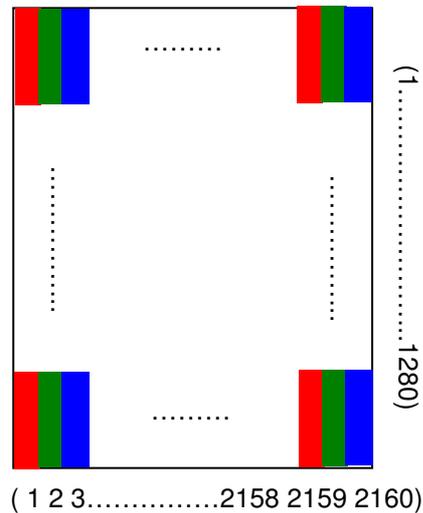
A. General Information

The specification shall be applicable to the TFT-LCD product, which is designed for cellular phones, with Polarizer and IC attached. (Except remarked with special description)

Physical Specifications

NO.	Item	Specification	Remark
1	Screen Size (inch)	4.45	
2	Driving Method	a-Si TFT	
3	Display Mode	AHVA type	
4	Display Resolution (dot)	480RGB(H)×854(V)	
5	Active Area (mm)	55.44 (H)×98.637(V)	
6	Pixel Pitch (mm)	0.0385(H)×0.1155 (V)	
7	Color Configuration	R. G. B. Vertical Stripe	Note 1
8	Color Depth	16.7M Colors	
9	Drive IC	NT35510S/NT35512S/OTM8012A/ OTM8018B/HX8379-A/RM68172 ILI9806H (Compatible IC list)	AUO test by NT35510S
10	Interface	MIPI	
11	Outline Dimension (mm)	58.04 (H) × 105.257 (V) × 0.4(T)	
12	Weight (g)	TBD	

Note 1: Below figure shows dot stripe arrangement.



Block Diagram

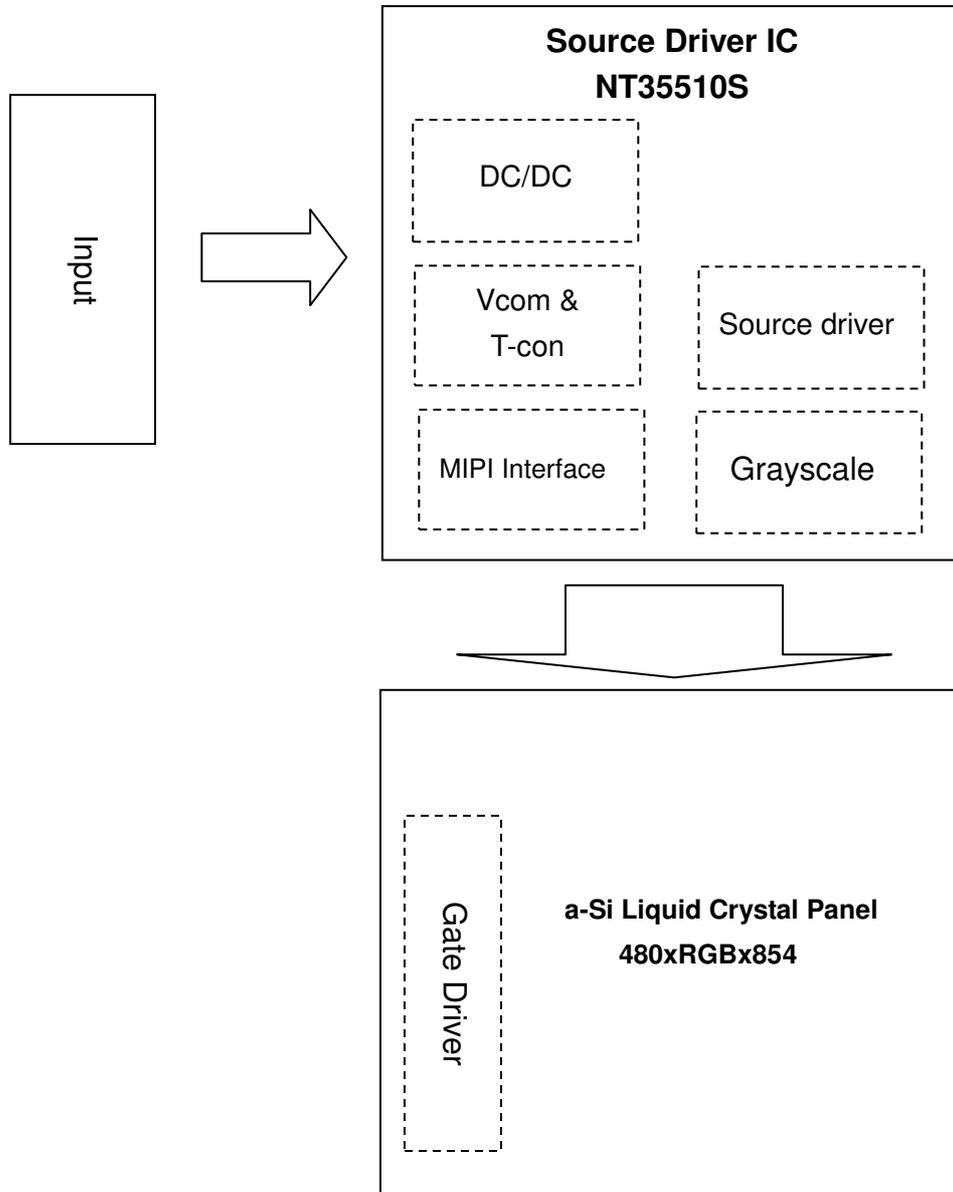


Fig. 1 Block diagram

B. Electrical Specifications

1. Interface Specification: MIPI Display Serial Interface (DSI V1.01 r11 and D-PHY V1.0, 1 clock and 1 or 2 data lane pairs)

2. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Supply voltage (Analog)	VDDA, VDDB, VDDR, VDDAM	-0.3	+5	V	
Supply voltage (Logic)	VDDI	-0.3	+3.6	V	
Supply voltage (Digital)	VDD	-0.3	+2.0	V	
Supply voltage (MV)	AVDD-VSS AVEE-VSS	-0.3 +0.3	+6.6 -6.6	V	
Supply voltage (HV)	VGH-VSS VGLX-VSS VGH-VGLX (VGHO-VGLO)	-0.3 +0.3 -0.3	+19.5 -19.5 +33	V	
Logic input voltage range	VIN	-0.3	VDDI+0.3	V	
Logic output voltage range	VO	-0.3	VDDI+0.3	V	
Differentiial input voltage	HSSI_CLK_P/N, HSSI_DATA0_P/N, HSSI_DATA1_1P/N	-0.3 -0.3 -0.3	+1.8 +1.8 +1.8	V	
Operating temperature range	TOPR	-40	+85	°C	
Storage temperature range	TSTG	-55	+125	°C	

NOTE 1. VSS means VSSA, VSSR, VSSB, AVSS and VSSAM.

NOTE 2. If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute

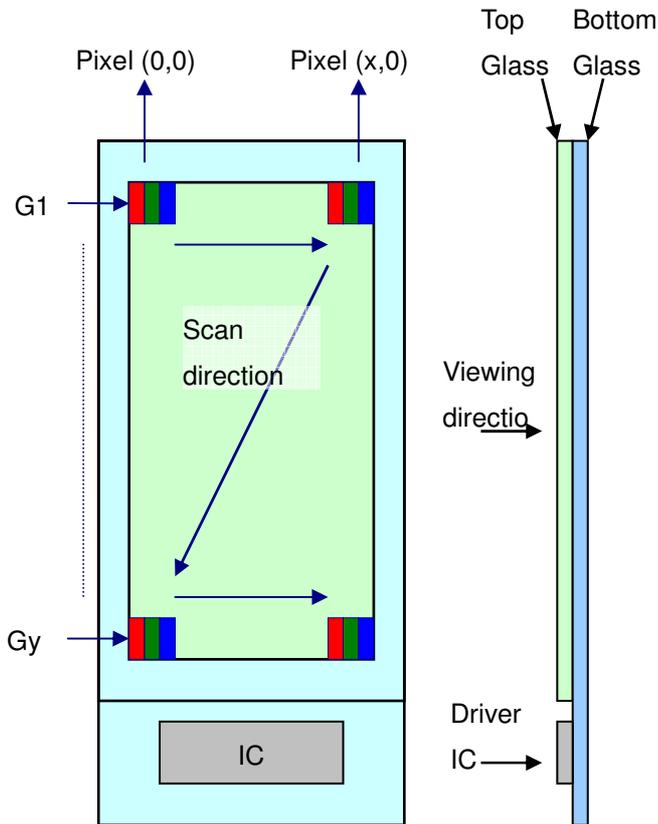
3. Typical Operation Condition (Base on NT35510S, 2-Power mode)

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage (Analog)	VDD	2.7	2.8	2.9	V	
Power supply voltage Logic)	VDDI	1.7	1.8	1.9	V	
Supply voltage	VGH	14	15	17	V	
	VGL	-10	-12	-8	V	
	VCOM	-0.7	-1	-1.6	V	
	AVDD	4.8	5	5.2	V	
	AVEE	-4.8	-5	-5.2	V	

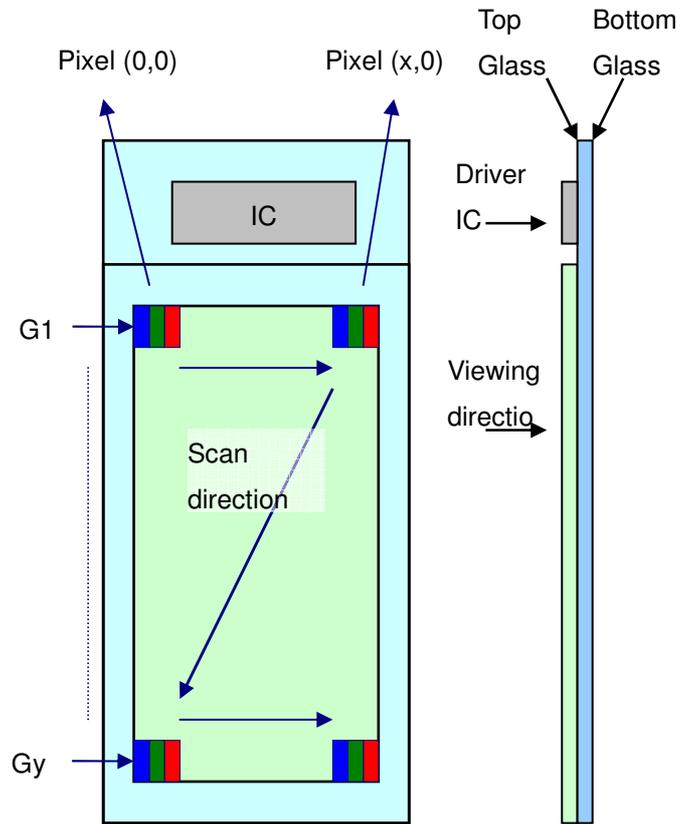
Note : Vcom must be adjusted to optimize display quality:cross-talk, contrast ratio and etc.

4. Scan direction

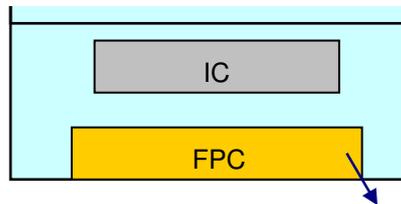
Normal mode
Default scan direction



Inverted mode
Reverse scan direction



5. Pin Discription



Pin 1

For NT35510S

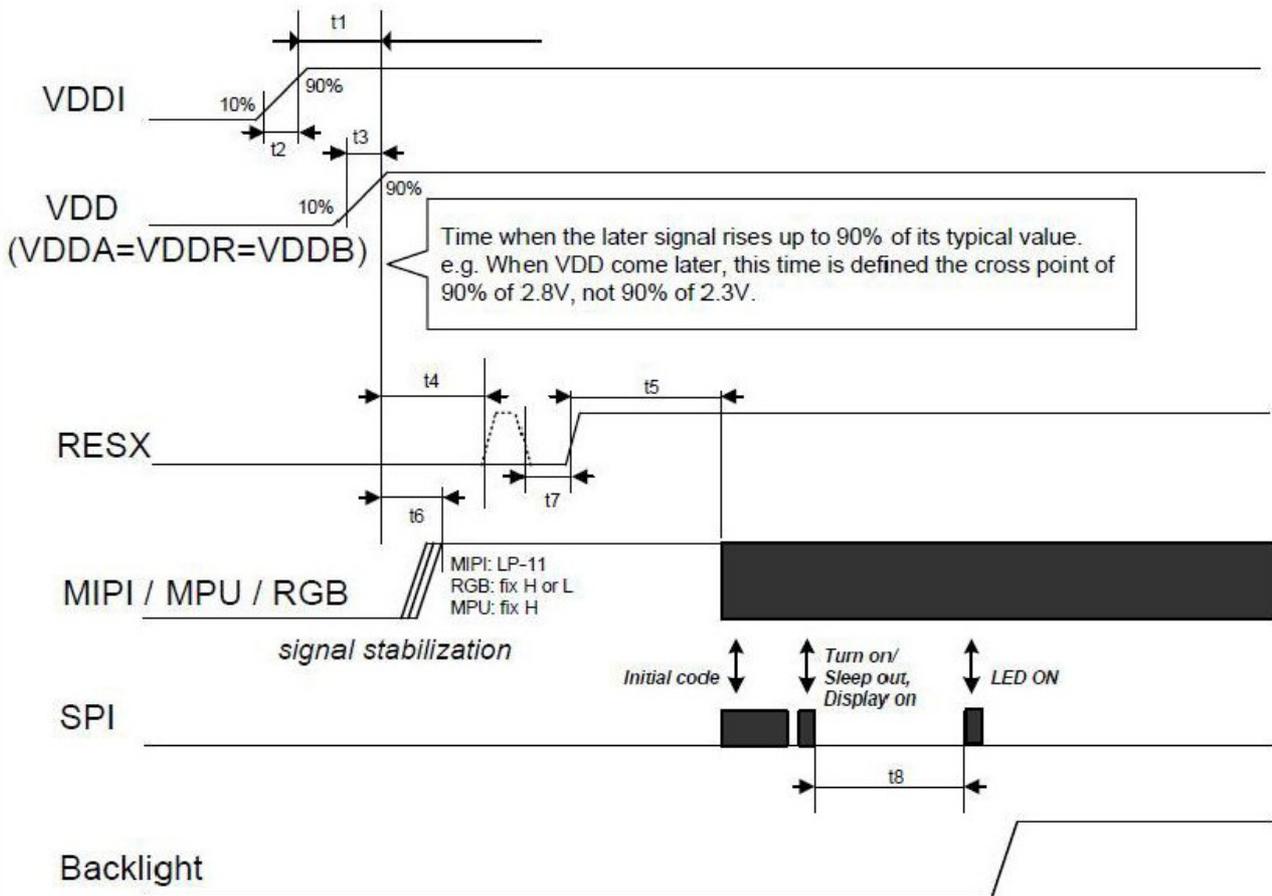
1	DUMMY	61	VSSD	121	HS_LDOL	181	VSSD_P
2	VSS	62	VDD1	122	HS_LDOL	182	VSSD_P
3	VSS	63	D23	123	HS_LDO	183	VSSD_P
4	VCOM_CF	64	D22	124	HS_LDO	184	C31P
5	VCOM_CF	65	D21	125	HS_VCC	185	C31P
6	VCOM_CF	66	D20	126	HS_VCC	186	C31N
7	VCOM_CF	67	D19	127	VDD3	187	C31N
8	VCOM_CF	68	D18	128	TE_R	188	C32P
9	VCOM_CF	69	D17	129	VSSA	189	C32P
10	VCOM_CF	70	D16	130	VTESTOUTP	190	C32N
11	VCOM_CF	71	D15	131	VCSW2	191	C32N
12	VCOM_CF	72	D14	132	CSP	192	VDDD
13	VCOM_CF	73	D13	133	VCSW1	193	VSSD
14	OTP_PWR	74	D12	134	CSN	194	C41P
15	OTP_PWR	75	D11	135	VDD3_P	195	C41P
16	VGL	76	D10	136	VDD3_P	196	C41N
17	VGLO_L	77	D9	137	VSSD_P	197	C41N
18	VGL_REG	78	D8	138	VSSD_P	198	VGH
19	VCL	79	D7	139	C11P	199	VGH
20	VCL	80	D6	140	C11P	200	C51P
21	VREF	81	D5	141	C11N	201	C51P
22	VSSAC	82	D4	142	C11N	202	C51N
23	VDD2	83	D3	143	C12P	203	C51N
24	VDD3	84	D2	144	C12P	204	VGL_REG
25	VSSA	85	D1	145	C12N	205	VGL_REG
26	VDD3	86	D0	146	C12N	206	VGLO_R
27	Dummy_DIOPWR	87	DE	147	C13P	207	VGLO_R
28	VGSN	88	PCLK	148	C13P	208	VGL
29	VGSP	89	HS	149	C13N	209	VGL
30	VSNR	90	VS	150	C13N	210	VCOM_out
31	VSPR	91	CABC_PWM_OUT	151	C14P	211	VCOM_out
32	VSSD	92	CABC_LED_EN	152	C14P	212	VCOM_TFT



33	VDDD	93	DUMMY_KBBC	153	C14N	213	VCOM_TFT
34	VDD3	94	ERR	154	C14N	214	VCOM_TFT
35	VDD3	95	VDD1	155	VSP	215	VCOM_TFT
36	VCL	96	VSSD	156	VSP	216	VCOM_CF
37	VSSA	97	VSP	157	VSSD_P	217	VCOM_CF
38	LANSEL	98	VSP	158	VSSD_P	218	VCOM_CF
39	DSWAP	99	VSSA	159	VSN	219	VCOM_CF
40	PSWAP	100	VSN	160	VSN	220	CONTACT2A
41	DUMMY_DSTB_SEL	101	VSN	161	C21P	221	CONTACT2B
42	DUMMY_RGBBP	102	VDD3	162	C21P	222	DUMMY
43	I2C_SA0	103	VSSD	163	C21N		
44	IM3	104	VDDD	164	C21N		
45	IM2	105	HS_VSS	165	C22P		
46	IM1	106	HSSI_D1_P	166	C22P		
47	IM0	107	HSSI_D1_P	167	C22N		
48	GPO2	108	HSSI_D1_N	168	C22N		
49	GPO1	109	HSSI_D1_N	169	C23P		
50	GPO0	110	HS_VSS	170	C23P		
51	IDLE_ON	111	HSSI_CLK_P	171	C23N		
52	TE_L	112	HSSI_CLK_P	172	C23N		
53	LED_BOOST	113	HSSI_CLK_N	173	C24P		
54	SDO	114	HSSI_CLK_N	174	C24P		
55	SDI_I2C_SDA	115	HS_VSS	175	C24N		
56	DCX	116	HSSI_D0_P	176	C24N		
57	SCL_I2C_SCL	117	HSSI_D0_P	177	VDD3_P		
58	DUMMY_RDX	118	HSSI_D0_N	178	VDD3_P		
59	CSX	119	HSSI_D0_N	179	VCL		
60	RESX	120	HS_VSS	180	VCL		

6. Initial Timing Sequence

6.1 Power On Sequence



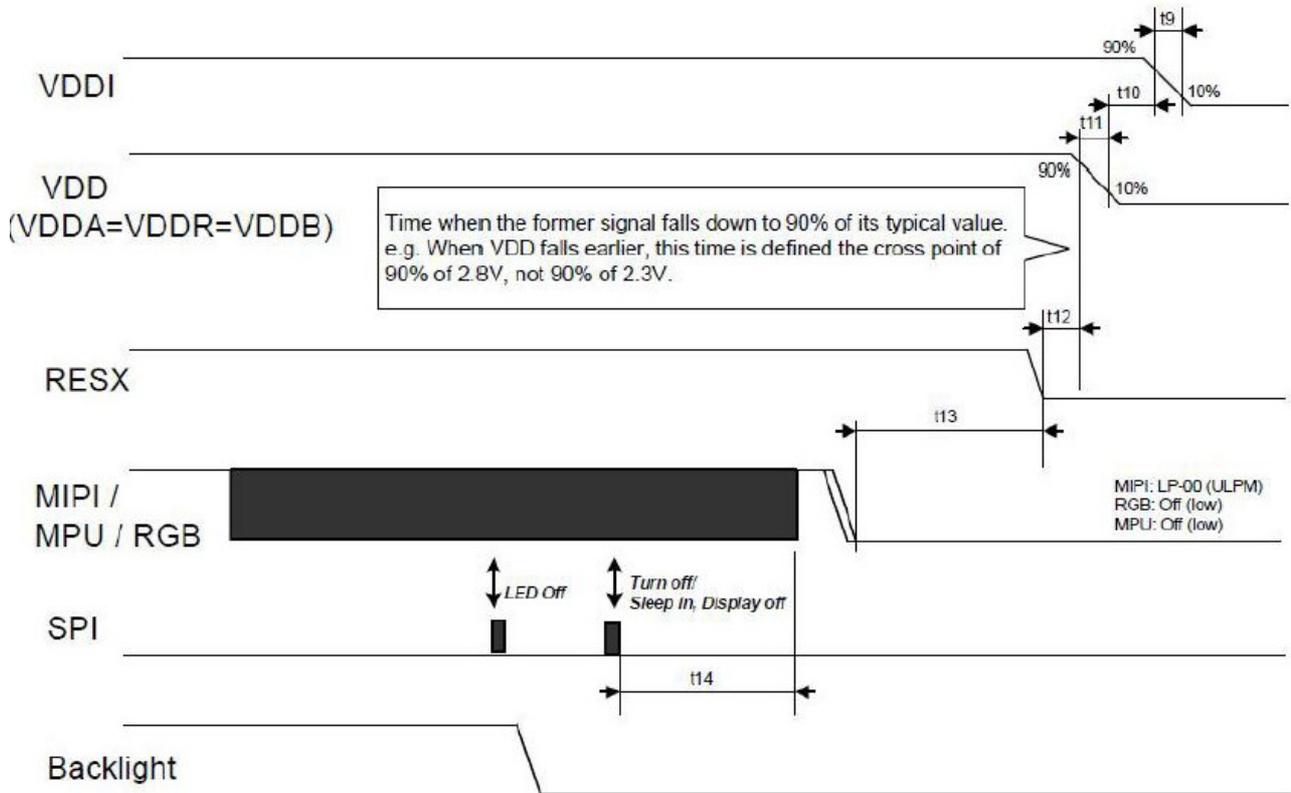
Note 1: Unless otherwise specified, timings herein show cross point at 50% of signal/power level.

Note 2: This power-on sequence is based on adding schottky diode on VGLX pin to ground.

Note 3: Reset signal H to L to H is better than only L to H.

Symbol	Value			Unit	Note
	Min.	Typ.	Max.		
t1		No limit		ms	Schottky diode should added on VGLX
t2			150	us	
t3			150	us	
t4	2			ms	
t5	20			ms	
t6	0		<t4	ms	
t7	10			us	
t8	7			VS	Keep data more than 7 frame (VS)

6.2 Power Off Sequence



Note 1: Unless otherwise specified, timings herein show cross point at 50% of signal/power level.

Symbol	Value			Unit	Note
	Min.	Typ.	Max.		
t9	150			us	
t10		No limit		ms	
t11	150			us	
t12	0			ms	
t13	0			ms	
t14	4			VS	Keep data more than 4 frame (VS)~ Can be optional
t15	0			ms	

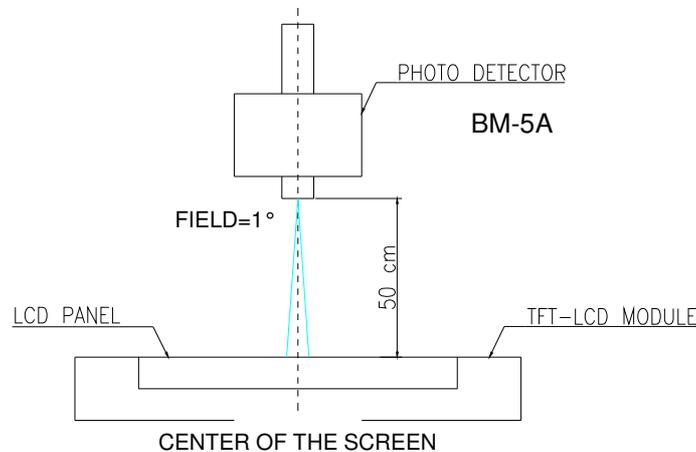
C. Optical Specification

All optical specification is measured under typical condition (Note 1, 2)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time	Rise+Fall	Tr+Tf	$\theta=0^\circ$	--	35	40	ms	Note 3
Contrast ratio		CR	At optimized viewing angle	700	900		--	Note 4
NTSC		%	$\theta=0^\circ$	65	70	--		
Viewing Angle	Top		$CR \geq 10$	70	80	--	deg.	Note 5
	Bottom			70	80	--		
	Left			70	80	--		
	Right			70	80	--		
Transmittance		%			(3.97)	--		w/o APCF
Crosstalk		%	25°C			3		
Chromaticity	White	X	$\theta=0^\circ$		(0.297)		Measured by C Light source	
		Y	$\theta=0^\circ$		(0.328)			
	Red	X	$\theta=0^\circ$		(0.643)			
		Y	$\theta=0^\circ$		(0.334)			
	Green	X	$\theta=0^\circ$		(0.296)			
		Y	$\theta=0^\circ$		(0.595)			
	Blue	X	$\theta=0^\circ$		(0.140)			
		Y	$\theta=0^\circ$		(0.072)			

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

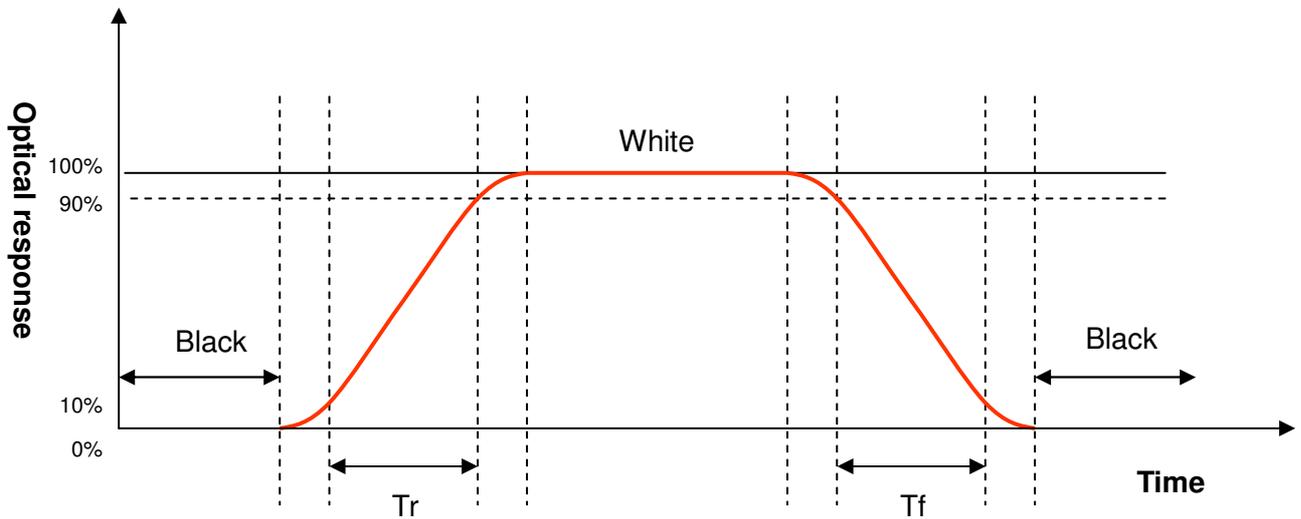
Note 2: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-5A, after 15 minutes operation.



Note 3: 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.

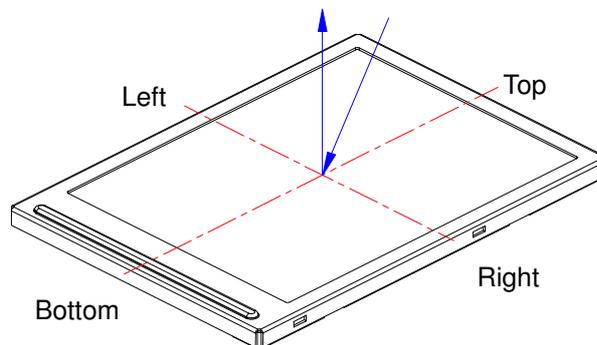


Note 4. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

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

Note 5. Definition of viewing angle, θ , Refer to figure as below.

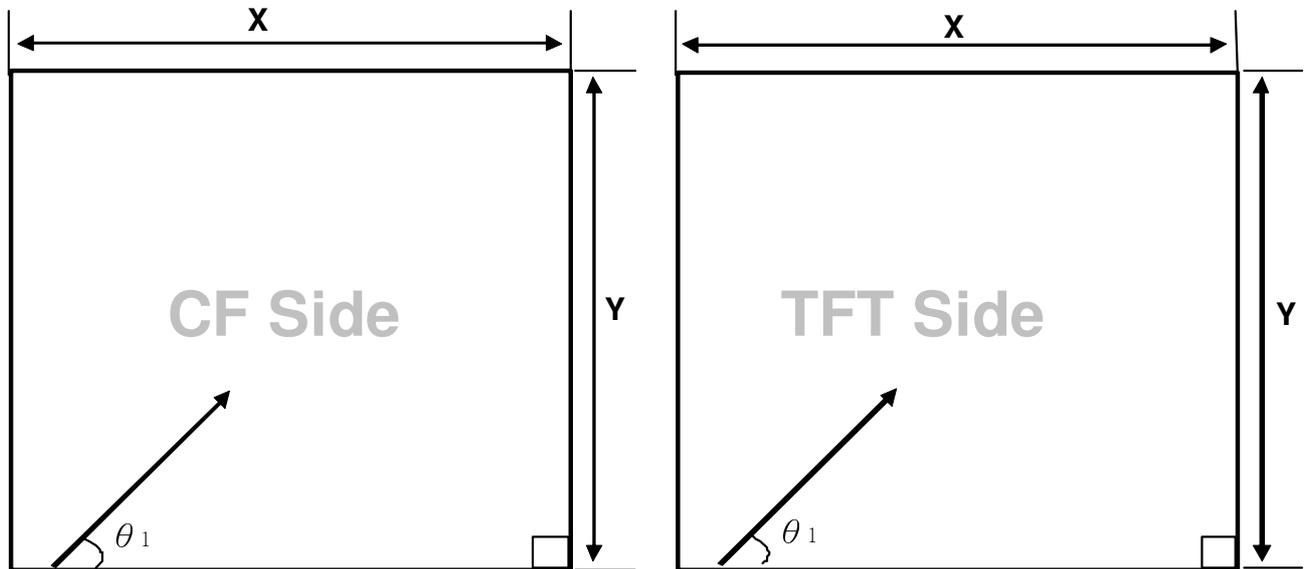


Note 6: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 7: Gamma value will be based on initial code.

D. Absorption angle of display

Absorption axis θ is the angle of the light absorption direction, which is defined at the protection film side of the polarizer.



Top view front the protective film

Polarizer Model (Recommended)	※Dimension (mm)		Absorption Angle
	X	Y	θ_1 (°)
CF Size	57.44	101.137	83
TFT Size	57.44	101.137	7

Water contact Angle < 70°

Note1: All fields denoted with ‘※’ are recommended only.

E. Reliability test items

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= -40°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. 60 minute dwell, 15 cycles	Non-operation

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.

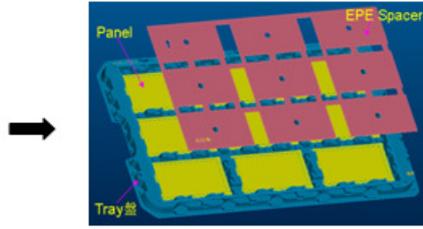
2. Failure Judgment Criteria

- 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.
- c. There should be no functions abnormalities on display quality.

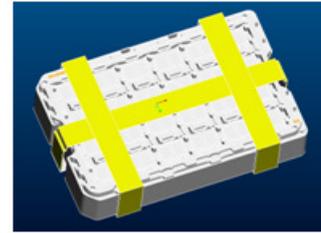
F. Packing



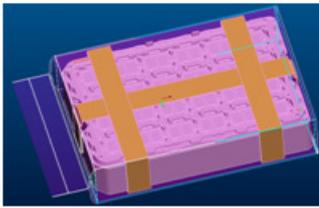
12pcs Panel/Tray



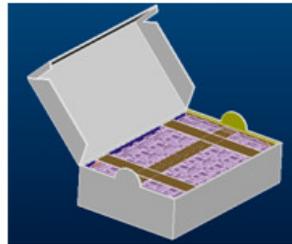
Cover 1pcs EPE Spacer on Panels/Tray



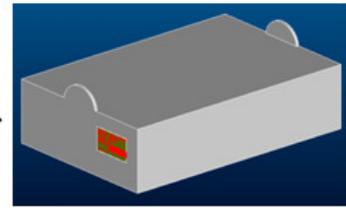
18 Layers Tray/Stack and Stick Tape on Stack



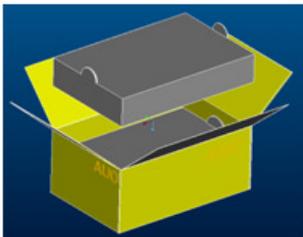
204pcs Panels/Bag



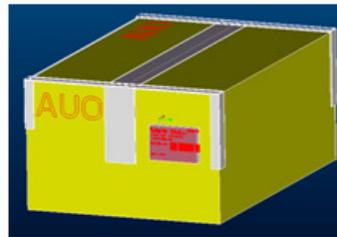
1Bag/little Box



Stick 1pcs carton Label/Box



2 little Boxes



Total 408pcs Panels

Tray Design

