



TFT LCD Module

Product Specification

DT035BTFT-PTS1

**3.5" (320(RGB) x 240 DOTS) TFT Module
with Capacitive Touch Screen**

October 28, 2016

Remark:

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Revision Record

REV	CHANGES	DATE
0.0 (Ref. 1.0 20160930)	First release	Oct 28, 2016

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1. Scope

This data sheet is to introduce the specification of DT035BTFT-PTS1, active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC, capacitive touch panel and a backlight unit. The 3.5" display area contains 320 (RGB) x 240 pixels.

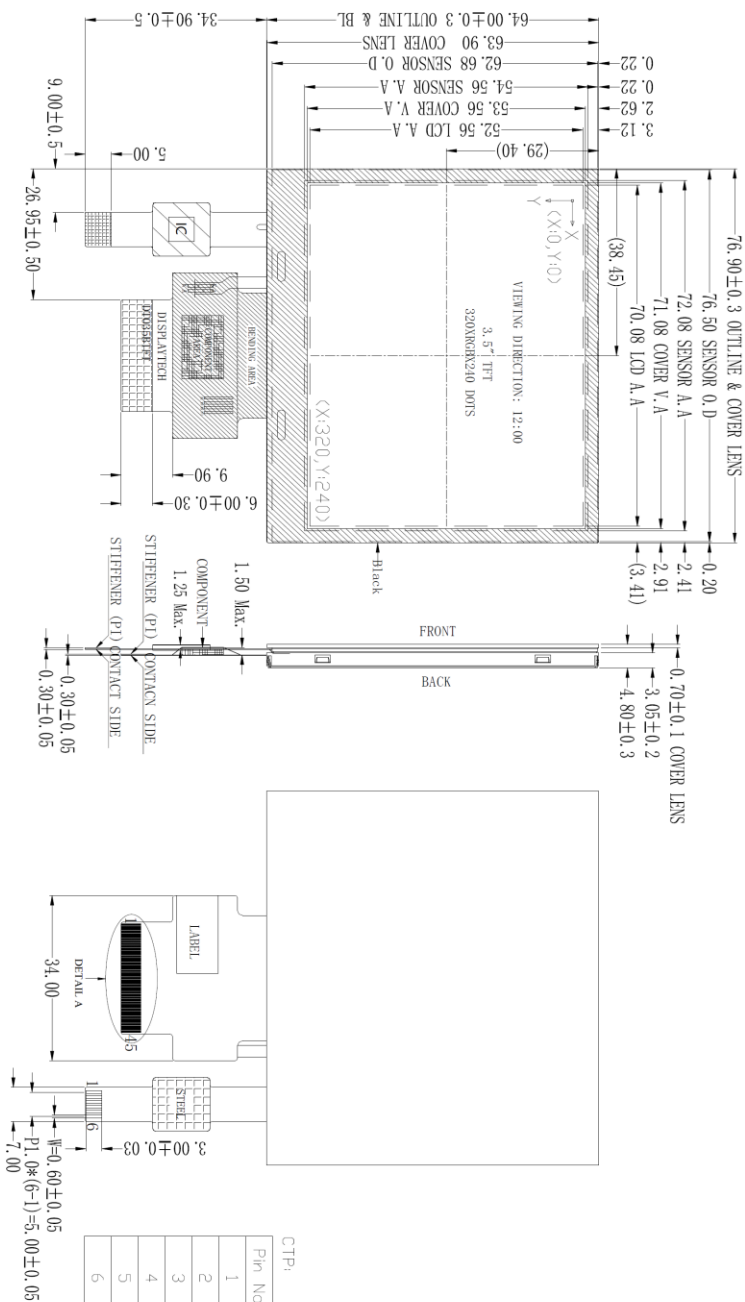
2. Application

Digital equipment which need color display, mobile phone, mobile navigator/video systems.

3. General Information

Item	Contents	Unit
Size	3.5	inch
Resolution	320(RGB) x 240	/
Interface	RGB	/
Technology Type	a-Si TFT	/
Pixel Configuration	R.G.B. Vertical Stripe	/
Pixel Pitch	0.219 x 0.219	mm
Outline Dimension (W x H x D)	76.90 x 64.00 x 4.8	mm
Active Area	70.08 x 52.56	mm
Display Mode	Transmissive, Normally White	/
Backlight Type	LED	/
Driver IC for PCAP	FT5346	
Weight	TBD	g

4. Outline Drawing

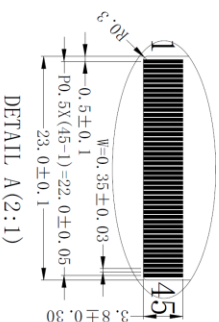


Pin No.	Assignment
1	SCL(1.8V)
2	SDA(1.8V)
3	VDD(2.8V)
4	RST(1.8V)
5	INT(1.8V)
6	GND

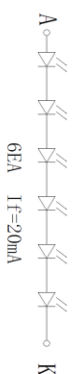
45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	PIN	FUNCTIO	SWMBOL																																																																																																																																																																																																																																																																																																																																																		
NC	LEOK	LEDA	NC	GND	D1A10	D1A11	D1A12	D1A13	D1A14	D1A15	D1A16	D1A17	D1A18	D1A19	D1A20	D1A21	D1A22	D1A23	D1A24	D1A25	D1A26	D1A27	D1A28	D1A29	D1A30	D1A31	D1A32	D1A33	D1A34	D1A35	D1A36	D1A37	D1A38	D1A39	D1A40	D1A41	D1A42	D1A43	D1A44	D1A45	D1A46	D1A47	D1A48	D1A49	D1A50	D1A51	D1A52	D1A53	D1A54	D1A55	D1A56	D1A57	D1A58	D1A59	D1A60	D1A61	D1A62	D1A63	D1A64	D1A65	D1A66	D1A67	D1A68	D1A69	D1A70	D1A71	D1A72	D1A73	D1A74	D1A75	D1A76	D1A77	D1A78	D1A79	D1A80	D1A81	D1A82	D1A83	D1A84	D1A85	D1A86	D1A87	D1A88	D1A89	D1A90	D1A91	D1A92	D1A93	D1A94	D1A95	D1A96	D1A97	D1A98	D1A99	D1A100	D1A101	D1A102	D1A103	D1A104	D1A105	D1A106	D1A107	D1A108	D1A109	D1A110	D1A111	D1A112	D1A113	D1A114	D1A115	D1A116	D1A117	D1A118	D1A119	D1A120	D1A121	D1A122	D1A123	D1A124	D1A125	D1A126	D1A127	D1A128	D1A129	D1A130	D1A131	D1A132	D1A133	D1A134	D1A135	D1A136	D1A137	D1A138	D1A139	D1A140	D1A141	D1A142	D1A143	D1A144	D1A145	D1A146	D1A147	D1A148	D1A149	D1A150	D1A151	D1A152	D1A153	D1A154	D1A155	D1A156	D1A157	D1A158	D1A159	D1A160	D1A161	D1A162	D1A163	D1A164	D1A165	D1A166	D1A167	D1A168	D1A169	D1A170	D1A171	D1A172	D1A173	D1A174	D1A175	D1A176	D1A177	D1A178	D1A179	D1A180	D1A181	D1A182	D1A183	D1A184	D1A185	D1A186	D1A187	D1A188	D1A189	D1A190	D1A191	D1A192	D1A193	D1A194	D1A195	D1A196	D1A197	D1A198	D1A199	D1A200	D1A201	D1A202	D1A203	D1A204	D1A205	D1A206	D1A207	D1A208	D1A209	D1A210	D1A211	D1A212	D1A213	D1A214	D1A215	D1A216	D1A217	D1A218	D1A219	D1A220	D1A221	D1A222	D1A223	D1A224	D1A225	D1A226	D1A227	D1A228	D1A229	D1A230	D1A231	D1A232	D1A233	D1A234	D1A235	D1A236	D1A237	D1A238	D1A239	D1A240	D1A241	D1A242	D1A243	D1A244	D1A245	D1A246	D1A247	D1A248	D1A249	D1A250	D1A251	D1A252	D1A253	D1A254	D1A255	D1A256	D1A257	D1A258	D1A259	D1A260	D1A261	D1A262	D1A263	D1A264	D1A265	D1A266	D1A267	D1A268	D1A269	D1A270	D1A271	D1A272	D1A273	D1A274	D1A275	D1A276	D1A277	D1A278	D1A279	D1A280	D1A281	D1A282	D1A283	D1A284	D1A285	D1A286	D1A287	D1A288	D1A289	D1A290	D1A291	D1A292	D1A293	D1A294	D1A295	D1A296	D1A297	D1A298	D1A299	D1A300	D1A301	D1A302	D1A303	D1A304	D1A305	D1A306	D1A307	D1A308	D1A309	D1A310	D1A311	D1A312	D1A313	D1A314	D1A315	D1A316	D1A317	D1A318	D1A319	D1A320	D1A321	D1A322	D1A323	D1A324	D1A325	D1A326	D1A327	D1A328	D1A329	D1A330	D1A331	D1A332	D1A333	D1A334	D1A335	D1A336	D1A337	D1A338	D1A339	D1A340	D1A341	D1A342	D1A343	D1A344	D1A345	D1A346	D1A347	D1A348	D1A349	D1A350	D1A351	D1A352	D1A353	D1A354	D1A355	D1A356	D1A357	D1A358	D1A359	D1A360	D1A361	D1A362	D1A363	D1A364	D1A365	D1A366	D1A367	D1A368	D1A369	D1A370	D1A371	D1A372	D1A373	D1A374	D1A375	D1A376	D1A377	D1A378	D1A379	D1A380	D1A381	D1A382	D1A383	D1A384	D1A385	D1A386	D1A387	D1A388	D1A389	D1A390

NOTES:

1. DISPLAY TYPE: 3.5TFT, TRANSMISSIVE
2. VIEWING DIRECTION : U/L/D/R 65/65/55/65
3. TFT Driver IC : NV3035
3. CTP Driver IC : FT5346
4. Top : -20° C ~ 70° C, Tst : -30° C ~ 80° C
5. GENERAL TOLERANCE: ±0.2
6. LCM Luminance: LED/500cd/m² (Typical)




LED CIRCUIT DIAGRAM:



6EA If=20mA

Displaytech

DRAWN BY:				<div>  </div>			
CHECKED BY:							
APPROVED BY:							
CONFIRMED BY:							
TITLE: DT035BTFT-PTS1				SCALE:			
DWG NO:				UNITS: mm			
DWG NAME:				SHEET NO. OF			

5. Interface Signals

No	Symbol	Description	Remark
1 ~ 5	NC	No connection	
6	VDD	Power supply	
7	VDD	Power supply	
8	RESET	Global reset pin	
9	SPDA	SPI Serial data input/output	
10	SPCK	SPI interface clock	
11	SPENA	Serial port data enable signal	
12	ENABLE	Data enable input	
13	HSYNC	Horizontal sync input	
14	VSYNC	Vertical sync input	
15	DCLK	Data clock	
16 ~ 39	DATA23 ~ DATA0	Data bit	
40	GND	Power ground	
41	GND	Power ground	
42	NC	No connection	
43	LEDA	LED backlight (Anode)	
44	LEDK	LED backlight (Cathode)	
45	NC	No connection	

CTP signal interface

No.	Symbol	Function
1	SCL	Clock for the data input
2	SDA	Data input
3	VDD	Power supply
4	RESET	Reset
5	INT	Interrupt output pin
6	GND	Ground

6. Absolute Maximum Ratings

6.1 Electrical absolute maximum ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power supply voltage	VDD	-0.3	5.0	V	

6.2 Environment conditions

Parameter	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	+70	°C	
Storage Temperature	TSTG	-30	+80	°C	

7. Electrical Specifications

7.1 Electrical characteristics

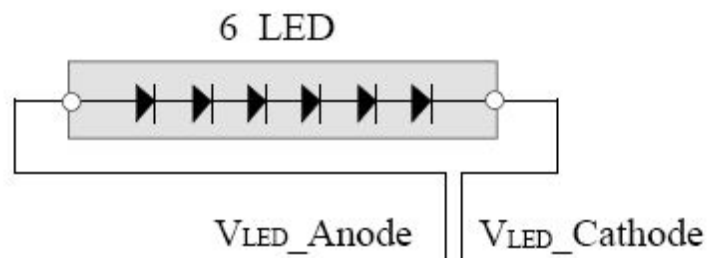
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Supply voltage	VDD	3	3.3	3.6	V	
Input signal voltage	Low level	VIL	GND	-	0.1xVDD	V
	High level	VIH	0.8xVDD	-	VDD	V
TFT Common electrode	VcomH	2.5	-	4.5	V	
Voltage	VcomL	-3	-	0	V	
TFT Gata ON voltage	VcomH			15	V	
TFT Gata OFF voltage	VcomL	-10			V	

7.2 LED backlight

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward current	IF	-	20	25	mA	
Forward voltage	VF	16.8	19.2	21.6	V	
LED life time	-	-	25,000	-	Hr	

The figure below shows the connection of LED



8. Command / AC Timing

8.1 AC Electrical Characteristics

Test Condition: (VDD=VDDP=3.3V, VDDA=5.0V, GND=GNDA=GNDP=0V, TA= 25°C)

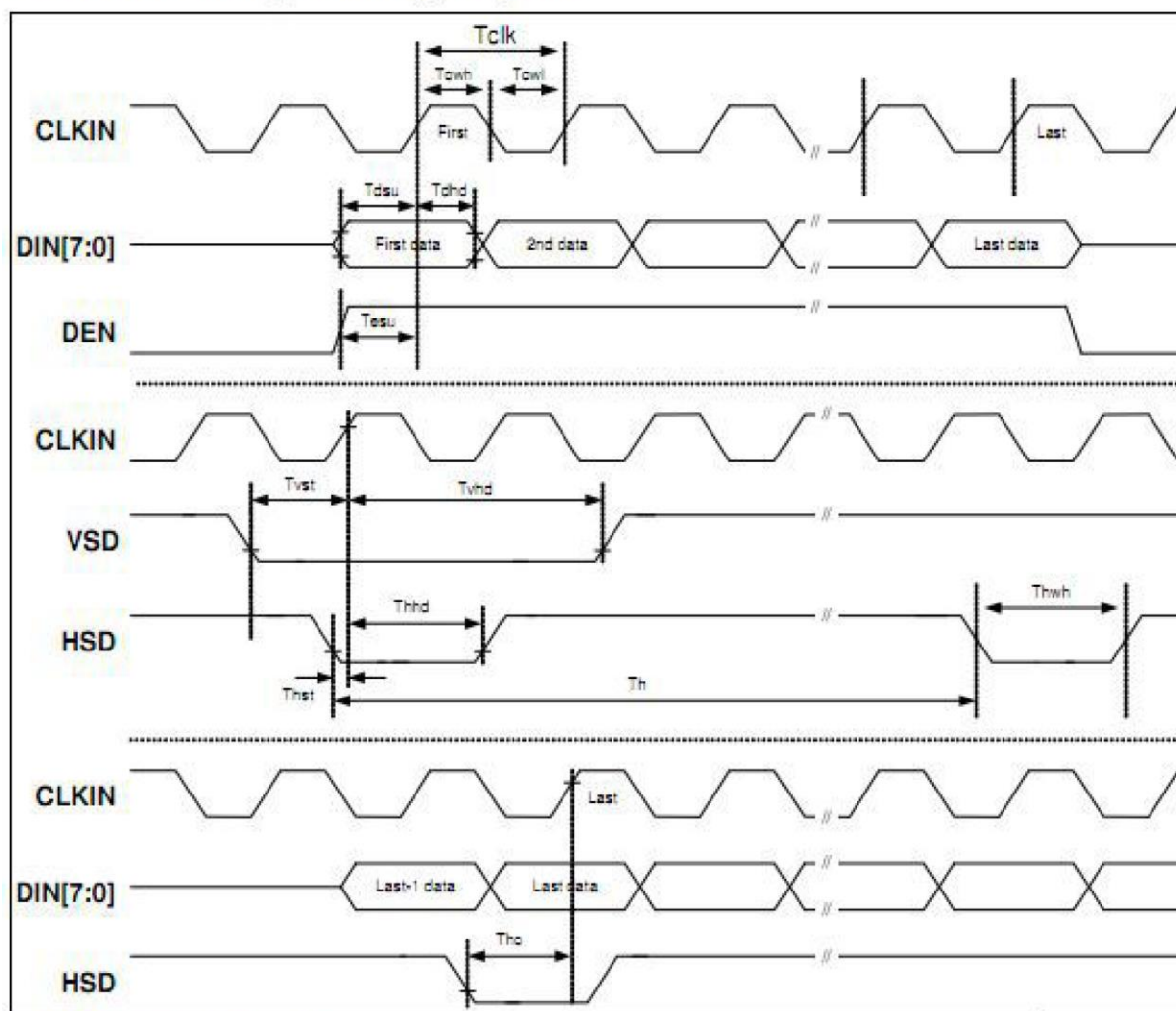
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
System Operation Timing						
VDD power source slew time	T _{POR}			1000	us	From 0V to 90% VDD
RSTB active pulse width	T _{RSTB}	40			us	VDD = 3.3V
Input Output Timing						
CLKIN clock time	T _{clk}	33.3/125	-	-	ns	Please refer to timing table(p.32)
HSD to CLKIN	T _{hc}	-	-	1	CLKIN	
HSD width	T _{hwh}	1	-	-	CLKIN	
VSD width	T _{vwh}	1	-	-	Th	
HSD period time	T _h	60	63.56	67	us	
VSD setup time	T _{vst}	8	-	-	ns	
VSD hold time	T _{vhd}	10	-	-	ns	
HSD setup time	T _{hst}	8	-	-	ns	
HSD hold time	T _{hhd}	10	-	-	ns	
Data set-up time	T _{dsu}	8	-	-	ns	DIN[23:0] to CLKIN
Data hold time	T _{dhd}	10	-	-	ns	DIN[23:0] to CLKIN
DEN setup time	T _{esd}	12	-	-	ns	DEN to CLKIN
Time that VSD to 1 st line data input	T _{vs}	2	13	127	Th	@CCIR601 / 8bit RGB HV mode Control by HDLY[6:0] setting T _{vs} = HDLY[6:0]
Time that CCIR_V to 1 st line data input	T _{vs}	12	20	28	Th	@CCIR656 NTSC mode Control by HDLY[6:0] setting T _{vs} = HDLY[6:0]
Time that CCIR_V to 1 st line data input	T _{vs} 17 25 33 Th					@CCIR656 PAL mode Control by HDLY[6:0] setting T _{vs} = HDLY[6:0]
Time that VSD to 1 st line data input	T _{vs}	2	13	127	Th	@24bit RGB HV mode Control by HDLY[6:0] setting T _{vs} = HDLY[6:0]
Source output stable time 1	T _{st}	-	25	30	us	96% final, CL=30pF, RL=2K
Gate output stable time	T _{gst}	-	500	1000	ns	96% final, CL=40pF
VCOMOUT output stable time	T _{cst}	-	4	8	us	96% final, CL=33nF, RL=100ohm
3-wire serial communication AC timing						
Serial clock	T _{spck}	320	-	-	ns	
SPCK pulse duty		40	50	60	%	T _{ckh} / T _{spck}
Serial data setup time	T _{isu}	120	-	-	ns	
Serial data hold time	T _{ihd}	120	-	-	ns	
Serial clock high/low	T _{ckh/l}	120	-	-	ns	
Chip select distinguish	T _{cd}	1	-	-	us	
SPENB to VSD	T _{cv}	1	-	-	us	
SPENB input setup time	T _{eck}	150	-	-	ns	
SPENB input hold time	T _{cke}	150	-	-	ns	

8.2 24 Bit RGB Mode (@ SEL[3:0] = 1100 or 1101)

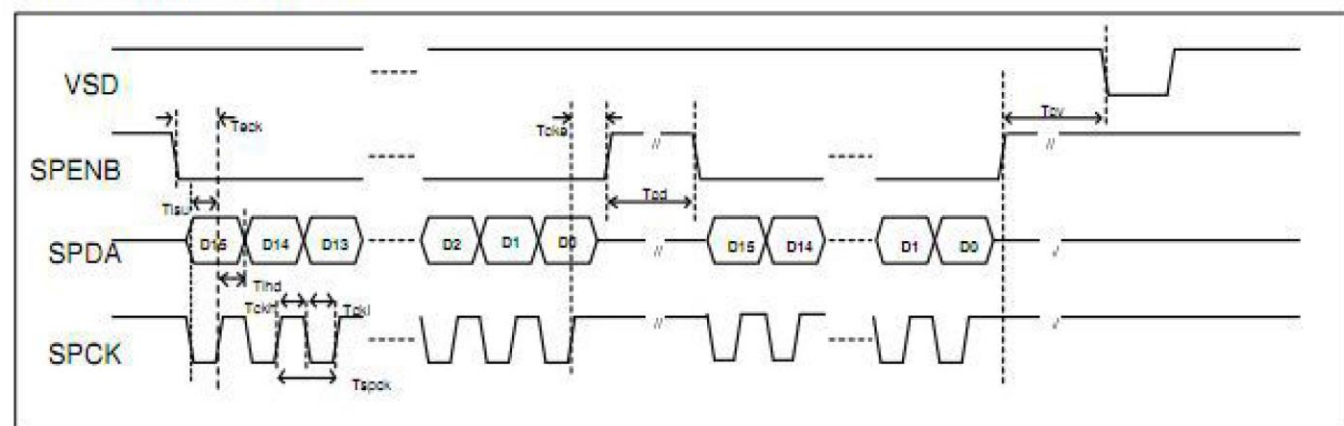
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLKIN frequency	F _{clk}	6.1	6.4	8.0	MHz	VDD = 3.0 ~3.6V
CLKIN cycle time	T _{clk}	125	156	164	ns	
CLKIN pulse duty	T _{cwh}	40	50	60	%	T _{clk}
Time that HSD to 1 st data input(NTSC)	T _{hs}	40	70	255	CLKIN	DDLY =70, Offset = 0 (fixed)

8.3 Timing Diagram

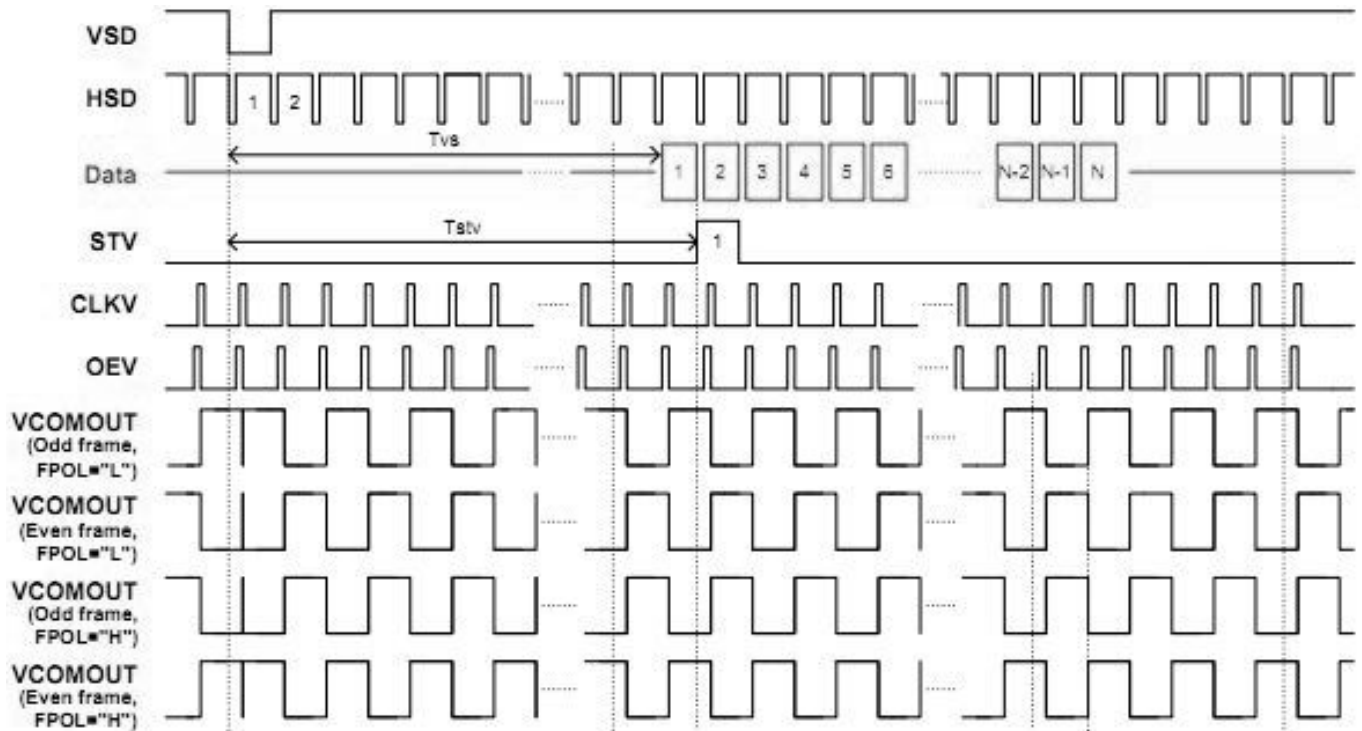
Clock and Data Input Timing Diagram



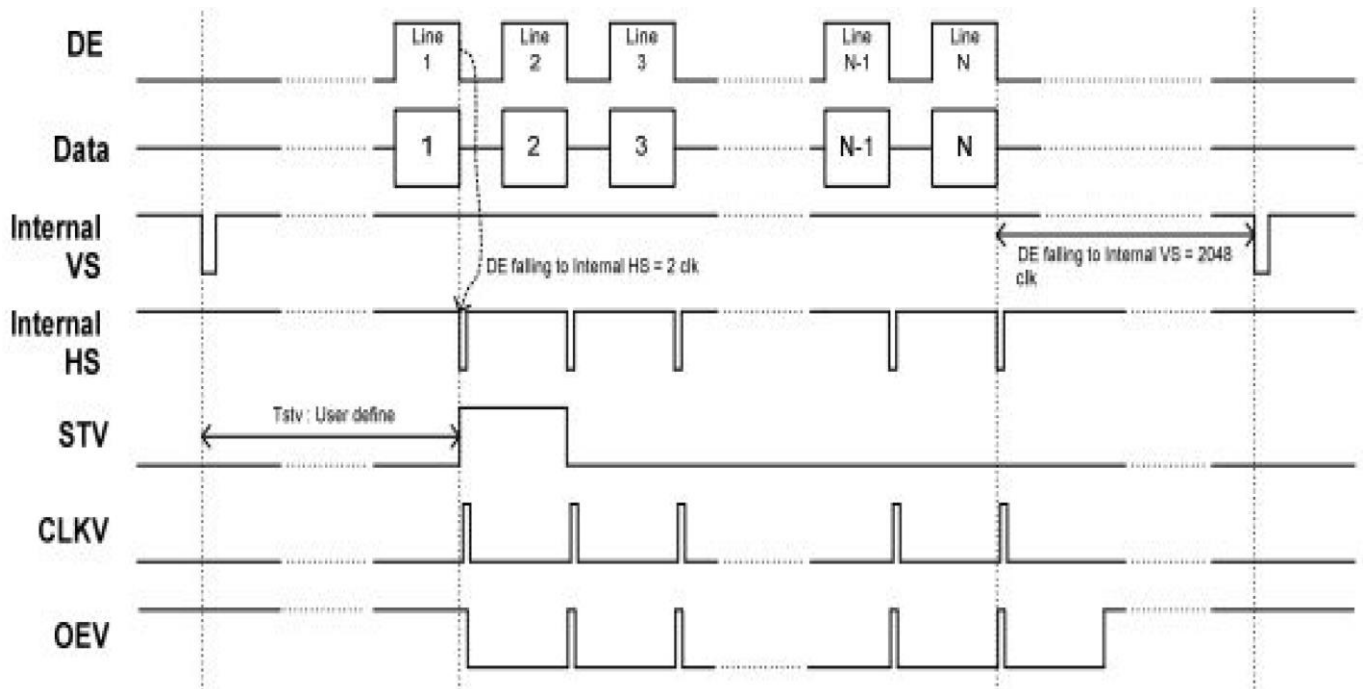
3-Wire Timing Diagram



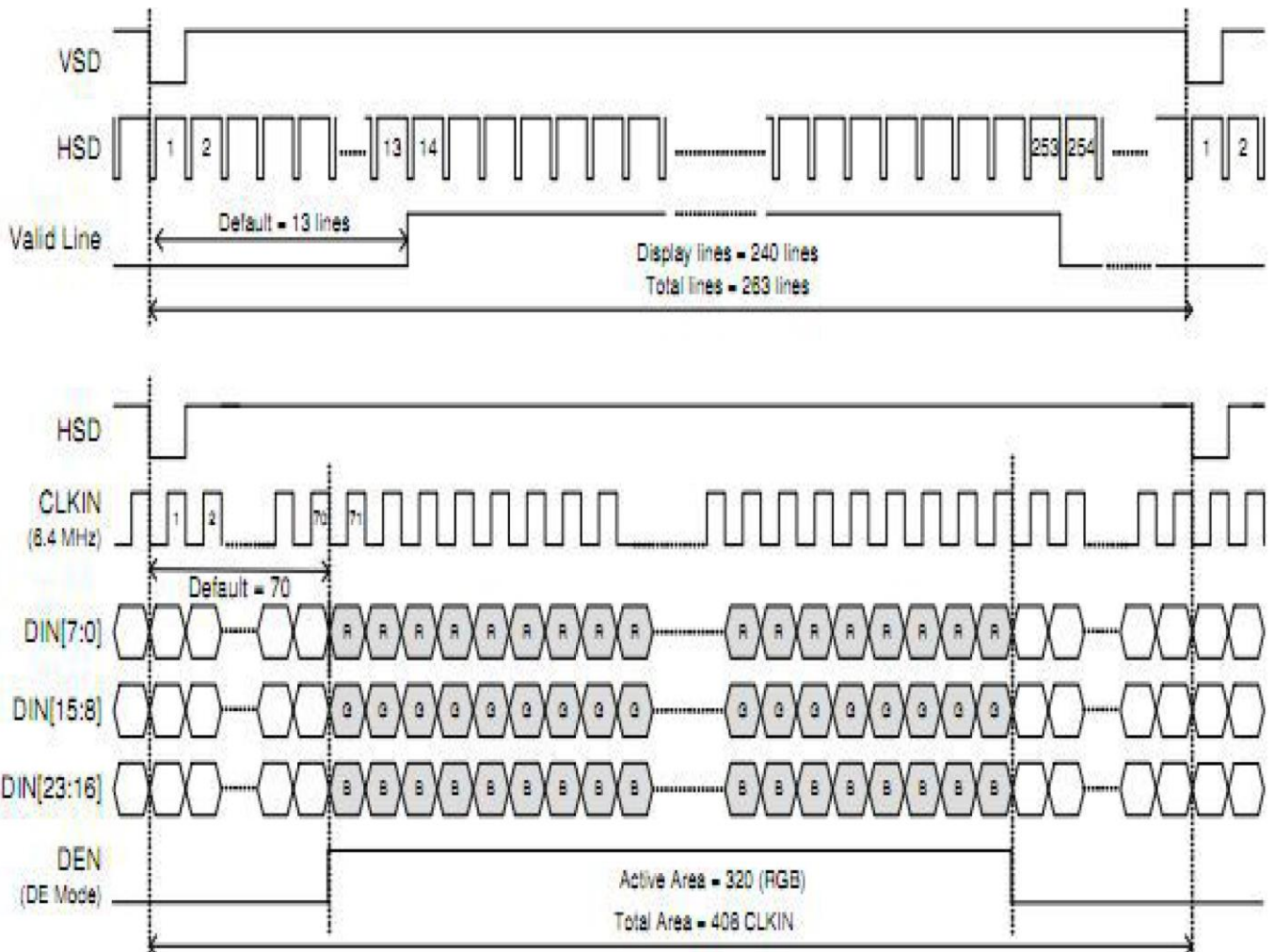
8.4 Vertical Timing Diagram (HV Mode)



8.5 Vertical Timing Diagram (DE Mode)



8.6 Input Data Timing (24 bit RGB mode for 960 x 240 @ SEL[3:0] = 1100b)



9. Optical Specification

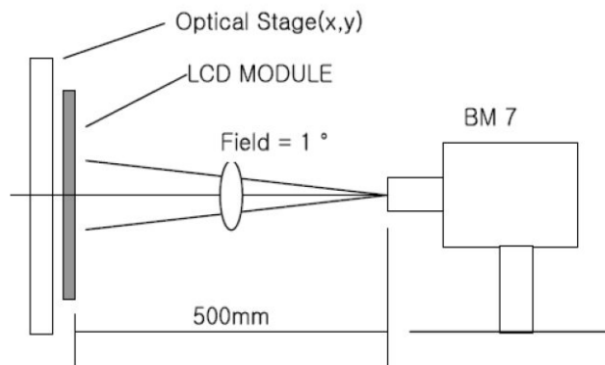
Ta=25°C

Item	Symbol	Condition	MIN	TYP	MAX	Unit	Remark
Contrast ratio	CR	$\theta=0^\circ$	350	500	-		Note 1, 2
Response time	Tr / Tf	25°C	-	10	-	ms	Note 1, 3
View angles	θT	$CR \geq 10$	-	65	-	Degree	Note 4
	θB		-	55	-		
	θL		-	65	-		
	θR		-	65	-		
Chromaticity	Red	x	-	0.51	-		Note 1, 5
		y	-	0.34	-		
	Green	x	-	0.31	-		
		y	-	0.56	-		
	Blue	x	-	0.15	-		
		y	-	0.14	-		
	White	x	-	0.28	-		
		y	-	0.33	-		
NTSC			50	60		%	Note 5
Luminance	L		-	480	-	cd/m ²	Note 1, 6
Uniformity	U		75	80	-	%	Note 1, 7

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

LED back-light: ON, Environment brightness < 150 lx

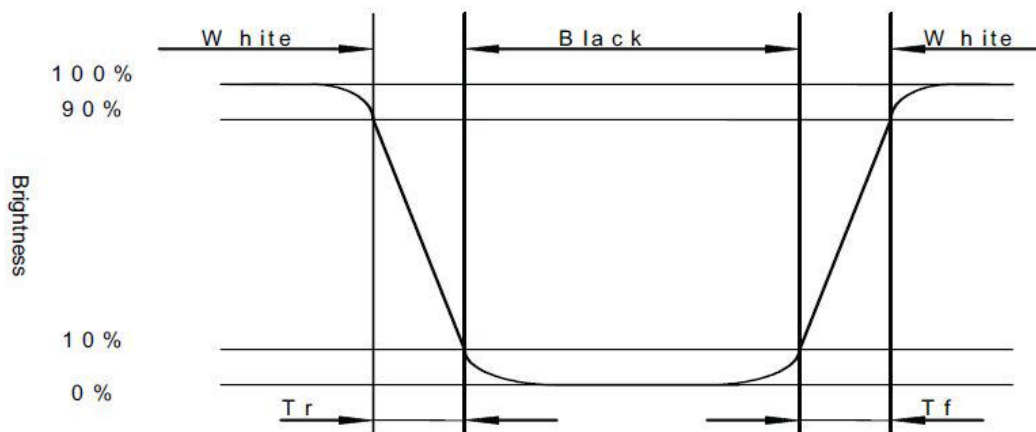


Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

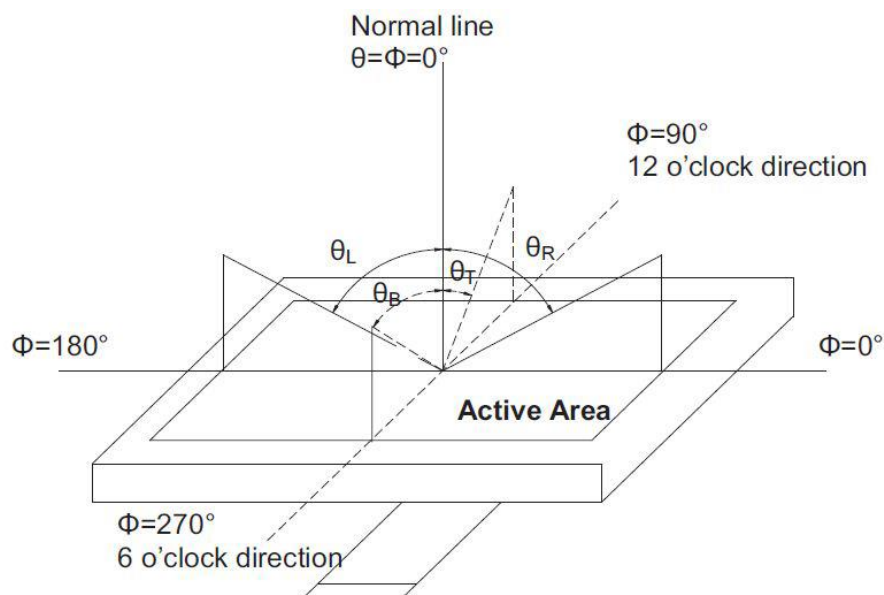
Note 3: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise time, T_r) and from white to black (Decay Time, T_f).



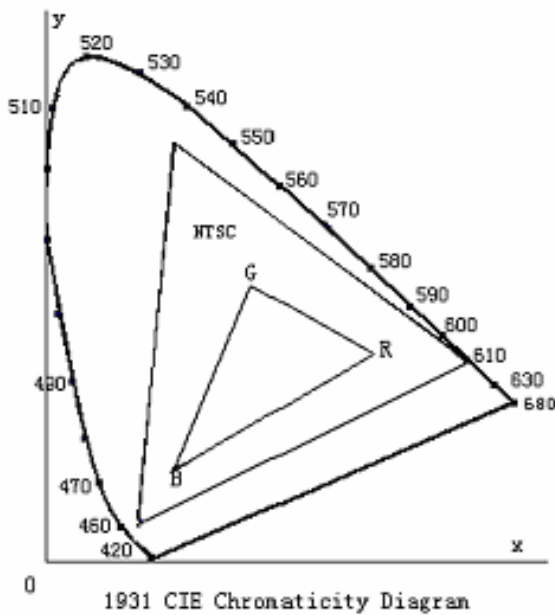
Note 4: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 5: Color chromaticity is defined as follow (CIE1931)

Color coordinates measured at center point of LCD.



$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 6: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels "White" at the center of display area on optimum contrast.

Note 7: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig.2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity (U)} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

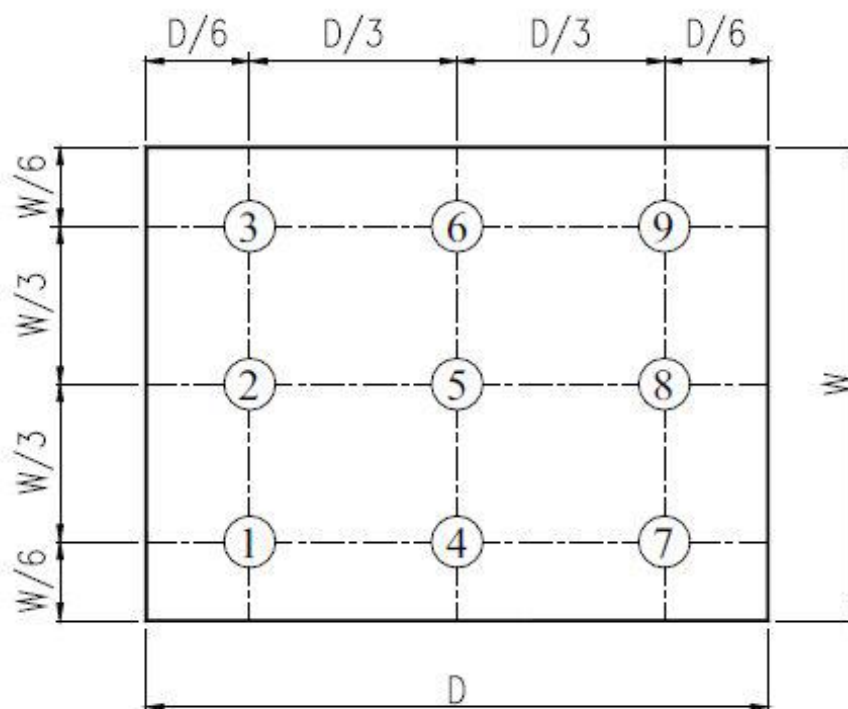


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment Criteria
1	High Temp Operation	Ta=+70°C, 120hrs	Per table below
2	Low Temp Operation	Ta=-20°C, 120hrs	Per table below
3	High Temp Storage	Ta=+80°C, 120hrs	Per table below
4	Low Temp Storage	Ta=-30°C, 120hrs	Per table below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH, 120hrs	Per table below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min ~ +80°C 30 min, Change time: 5 min, 10 cycles	Per table below
7	ESD (Operation)	C=150pF, R=330Ω, 5points/panel Air:±8KV, 5 times; Contact:±4KV, 5 times	Per table below
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.	Per table below
9	Shock (Non-operation)	60G 6ms, ±X, ±Y, ±Z, 3 times, for each direction	Per table below
10	Package Drop Test	Height: 80cm, 1 corner, 3 edges, 6 surfaces	Per table below

Inspection	Criterion (after test)
Appearance	No crack on the FPC, on the LCD panel
Alignment of LCD panel	No bubbles in the LCD panel No other defects of alignment in active area
Electrical current	Within device specifications
Function / Display	No broken circuit, no short circuit or no black line No other defects of display

11. Precautions for Use of LCD Modules

11.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

11.2 Handling

- The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- Do not handle the product by holding the flexible pattern portion in order to assure the reliability.
- Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.
- Provide a space so that the panel does not come into contact with other components.
- To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.
- Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.

- g. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.
- h. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

11.3 Static electricity

- a. Ground soldering iron tips, tools and testers when they are in operation.
- b. Ground your body when handling the products.
- c. Power on the LCD module before applying the voltage to the input terminals.
- d. Do not apply voltage which exceeds the absolute maximum rating.
- e. Store the products in an anti-electrostatic bag or container.

11.4 Storage

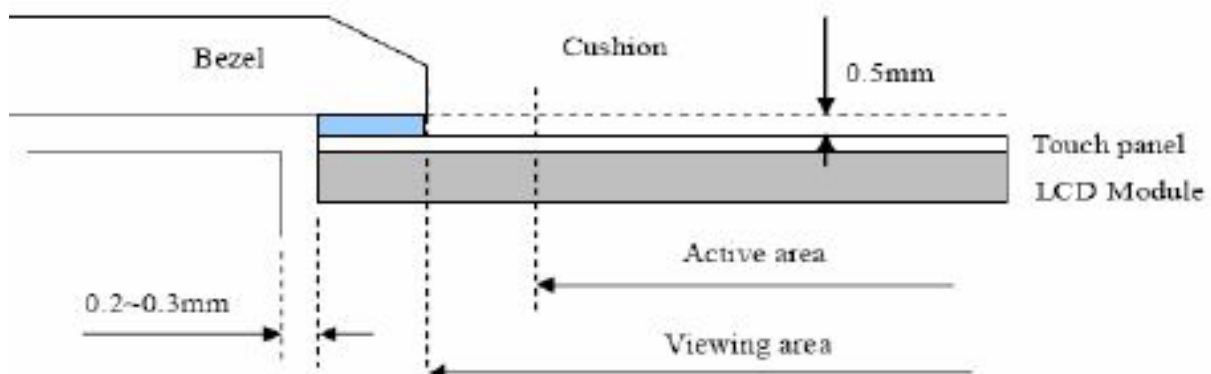
- a. Store the products in a dark place at $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.
- b. Storage in a clean environment, free from dust, active gas, and solvent.

11.5 Cleaning

- a. Do not wipe the touch panel with dry cloth, as it may cause scratch.
- b. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

11.6 Cautions for installing and assembling

Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.



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