



KYOCERA Display Corporation

DESIGN SHEET

設計規格書

Customer 客戶名稱	
Part No. 產品型號	TVL-55730D035JU-LW-G-AAN
Product type 產品內容	Mode: Transmissive and Normally white type 3.5" a-Si color TFT LCD Module
RoHS 綠色產品	<input type="checkbox"/> Non-compliance <input checked="" type="checkbox"/> Compliance
Remarks 備註欄	
<p><input checked="" type="checkbox"/> Preliminary Specification 暫行規格</p> <p><input type="checkbox"/> Final Specification 正式規格</p> <p>Signature by Customer: 客戶確認簽章:</p>	

Issued by QA	Checked by QA	Checked by PM	Approved By	
			QA	BU



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Specification of LCD Module

Product No.: TVL-55730D035JU-LW-G-AAN

Issue date: 2013/02/21

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TABLE OF CONTENTS

1. GENERAL DESCRIPTION.....	4
2. FEATURES	4
3. MECHANICAL SPECIFICATION	4
4. MECHANICAL DIMENSION	5
5. MAXIMUM RATINGS (FOR IC).....	6
6. ELECTRICAL CHARACTERISTICS	6
7. BACKLIGHT CHARACTERISTICS	7
7.1. Characteristics.....	7
7.2. Lightguide Specification.....	7
8. MODULE FUNCTION DESCRIPTION	8
8.1. PIN Description.....	8
8.2. System interface.....	10
8.3. Timing Characteristics	13
8.4. Block diagram of LCD.....	17
9. ELECTRO-OPTICAL CHARACTERISTICS.....	18
10. TOUCH PANEL CRITERIAS	20
10.1. Electronic characteristics	20
10.2. Mech. & Reliability characteristics.....	21
10.3. Reliability Test.....	22
10.4. Design guide -----important message, please read it carefully.....	22
11. RELIABILITY	25
11.1. MTF	25
11.2. Tests	25
11.3. Color performance	25
12. INSPECTION CRITERIA.....	26
12.1. Inspection Conditions.....	26
12.2. Light Method	26



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12.3.	Classification Of Defects	27
12.4.	Sampling & Acceptable Quality Level	27
12.5.	Definition Of Inspection Area	27
12.6.	Items and Criteria.....	28
13.	ROHS COMPLIANT WARRANTY	31
14.	PRECAUTIONS FOR USE.....	32
14.1.	Safety.....	32
14.2.	Storage Conditions	32
14.3.	Installing LCD Module.....	32
14.4.	Precautions For Operation.....	32
14.5.	Handling Precautions.....	33
14.6.	Precautions in use of touch panel.....	33
14.7.	Guarantee	34

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1. GENERAL DESCRIPTION

TVL-55730D035JU-LW-G-AAN is a transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver IC, and FPC, backlight and Touch Panel unit.

2. FEATURES

Display Mode	Transmissive Type
	a-Si color TFT LCD, Normally white type
Screen Size	3.5 inch
Display Format	Graphic 240*RGB*320 Stripe type
Color	262K/65K color
Interface	RGB IF(18/16 bit)
Viewing Direction	Higher Contrast ratio: 12 o'clock Less gray scale reversal: 6 o'clock

3. MECHANICAL SPECIFICATION

Item	Specifications	Unit
Dimensional outline	60.68 (W) x 82.04 (H) x 4.83 (T)	mm
Resolution	240X(R, G, B)x320	dot
Active area	53.28 (W) x71.04 (H)	mm
Pixel pitch	0.222 (W)x0.222(H)	mm

* Dimensional outline without FPC



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5. MAXIMUM RATINGS (for IC)

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

Item	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Supply for Logic	VCC	-0.3	4.6	V	
Storage Temperature	T _{ST}	-30	80	°C	
Operating Temperature (Ambient Temperature)	T _{OP}	-20	70	°C	
Humidity	-	-	90	%RH	Note1

Note1: T_A ≤ 40°C Without dewing

6. ELECTRICAL CHARACTERISTICS

A. Typical operating conditions (GND=AV_{SS}=0V)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
IC Power Voltage	VCC	3.0	3.3	3.6	V	
Input Voltage	H level V _{IH}	0.8V _{CC}		V _{CC}	V	
	L level V _{IL}	-0.3		0.2V _{CC}	V	
Consumption current of V _{DD}	I _{DD}	-	-	18	mA	

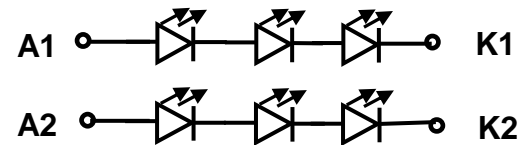
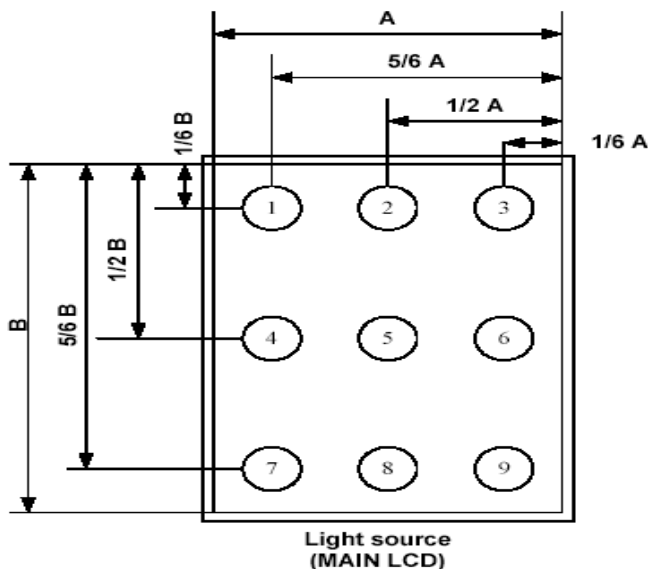
7. BACKLIGHT CHARACTERISTICS

7.1. Characteristics

Item	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_f	$I_f=40\text{mA}$	8.4	-	10.5	V
Forward current	I_f	3 series* 2 sets	40mA			mA
POWER CONSUMPTION	P_{BL}	$I_f=40\text{mA}$	336	-	420	mW
Luminous color	White					
Chip connection	3 chip series* 2 sets					

Note 1 : We suggest constant current.

7.2. Lightguide Specification



- Test Instrument: BM-7 (Distance =500mm; Field = 1°)
- Light Source: LED * 6 3S*2 sets (White)
- Conditions: $V_f(\text{MAX})=10.5\text{V}$; $I_f(\text{TYP})=40\text{mA}$
- Measure Brightness: 1 ~ 9
- Uniformity = (Min. Brightness / Max. Brightness)*100%
- Uniformity $\geq 80\%$



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8. MODULE FUNCTION DESCRIPTION

8.1. PIN Description

Pin NO.	Terminal	Functions
1	YU	Touch Panel Input PIN
2	XL	Touch Panel Input PIN
3	YD	Touch Panel Input PIN
4	XR	Touch Panel Input PIN
5	GND	GND
6	VCC	Internal logic power:
7	VCC	Internal logic power:
8	/CS	Chip select signal. Low: the is accessible High: the is not accessible Must connect to the GND or VCC level when not used. This pin has weak pull high/low resistors and can be modified to high / low by metal layer change for customer's request.
9	SCL	(A) In 80-system interface mode, a write strobe signal can be input via this pin and initializes a write operation when the signal is low. (B) In SPI mode, served as a synchronizing clock signal
10	SDI	Series Data is the input on the rising edge of the SCL signal in SPI mode. Must connect to the GND or VCC level when not in use. This pin has weak pull high/low resistors and can be modified to high / low by metal layer change for customer's request.
11	SDO	Series Data is the output on the rising edge of the SCL signal in SPI mode.
12	GND	GND
13	B0	DATA Bus Input.
14	B1	DATA Bus Input.
15	B2	DATA Bus Input.
16	B3	DATA Bus Input.
17	B4	DATA Bus Input.
18	B5	DATA Bus Input.
19	GND	GND



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Pin NO.	Terminal	Functions
20	G0	DATA Bus Input.
21	G1	DATA Bus Input.
22	G2	DATA Bus Input.
23	G3	DATA Bus Input.
24	G4	DATA Bus Input.
25	G5	DATA Bus Input.
26	GND	GND
27	R0	DATA Bus Input.
28	R1	DATA Bus Input.
29	R2	DATA Bus Input.
30	R3	DATA Bus Input.
31	R4	DATA Bus Input.
32	R5	DATA Bus Input.
33	GND	GND
34	DE	In external interface mode, polarity of DE signal is synchronized with valid graphic data input. Low: Valid data on DB17-DB0 High: Invalid data on DB17-DB0 Moreover, setting EPL bit can change the polarity of the DE signal. Must connect to the GND or VCC level when not in use. This pin has weak pull high/low resistors and can be modified to high / low by metal layer change for customer's request.
35	GND	GND
36	DOTCLK	In external interface mode, served as a dot clock signal. When DPL = "0": Input data on the rising edge of DOTCLK When DPL = "1": Input data on the falling edge of DOTCLK It is fixed to the VCC level when not in use.
37	GND	GND
38	HSYNC	In external interface mode, served as a horizontal synchronized signal input Must connect to the VCC or GND level when not used. This pin has weak pull high/low resistors and can be modified to high / low by metal layer change for customer's request.
Pin NO.	Terminal	Functions

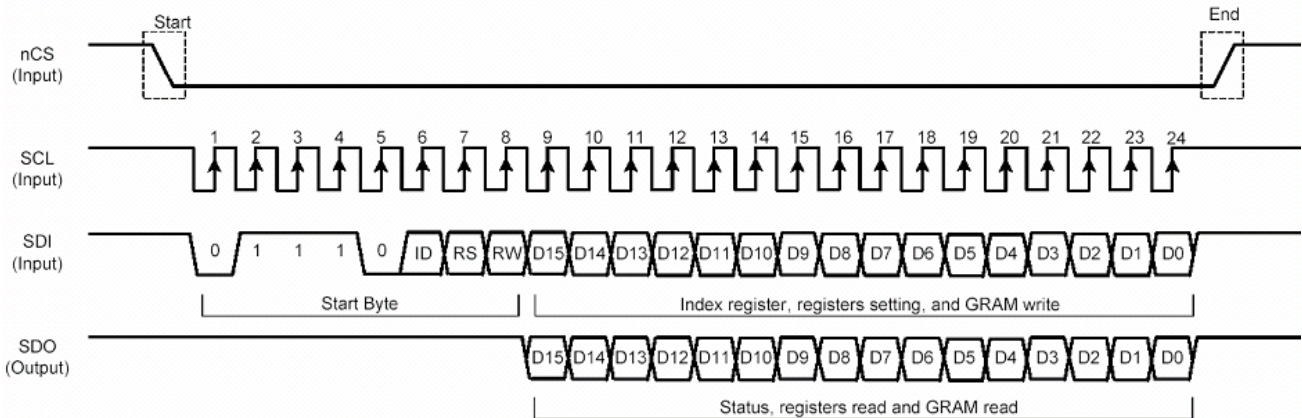


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39	VSYNC	In external interface mode, served as a vertical synchronize signal input Must connect to the VCC or GND level when not in use. This pin has weak pull high/low resistors and can be modified to high / low by metal layer change for customer's request.
40	/RESET	RESET pin. This is an active low signal.
41	GND	GND
42	A1	B/L Power input PIN anode
43	A2	B/L Power input PIN anode
44	K1	B/L Power input PIN negative
45	K2	B/L Power input PIN negative

8.2. System interface

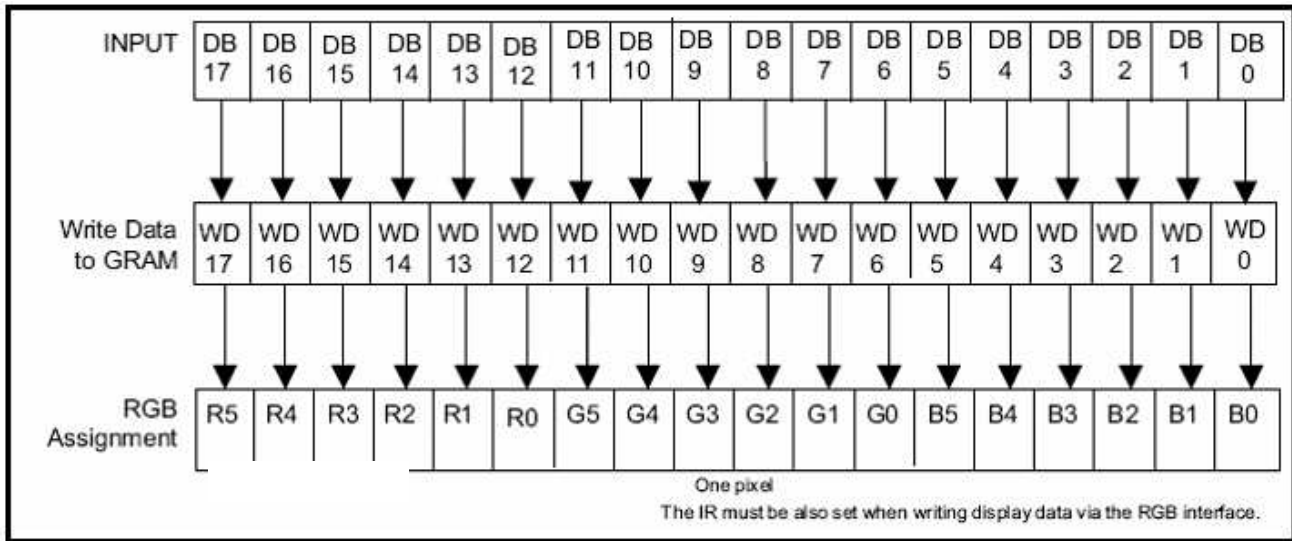
SPI



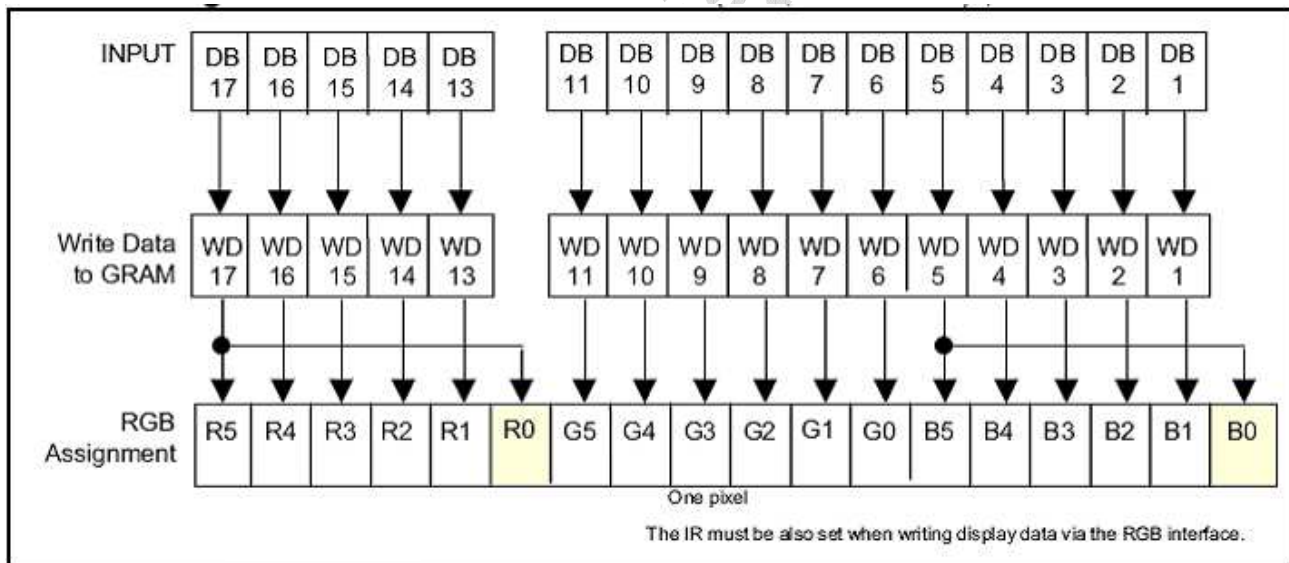


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18-bit RGB interface



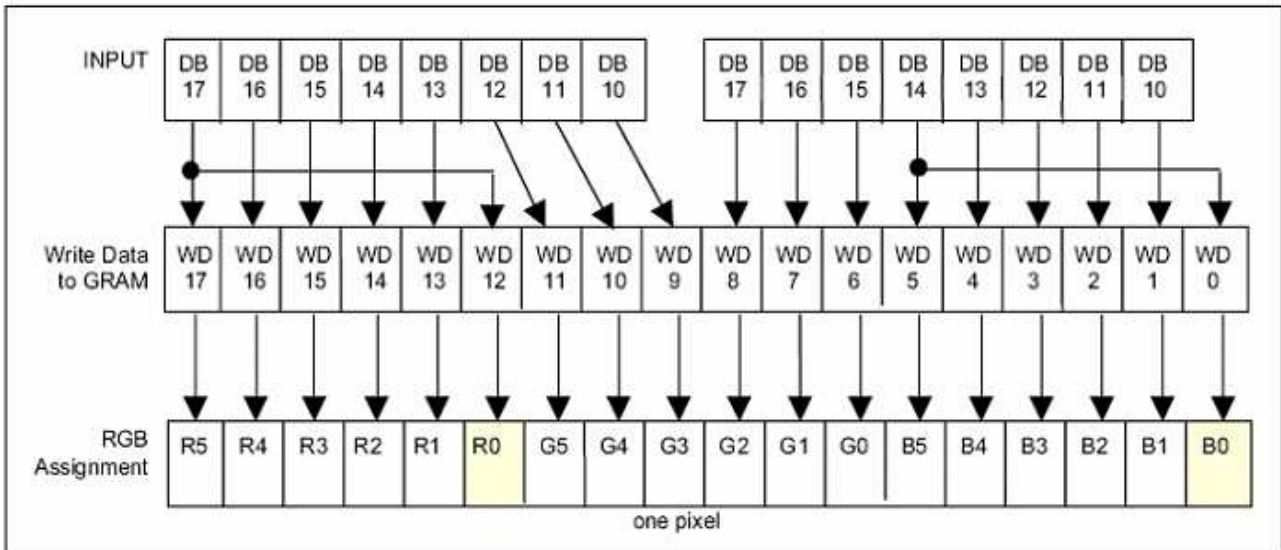
16-bit RGB interface



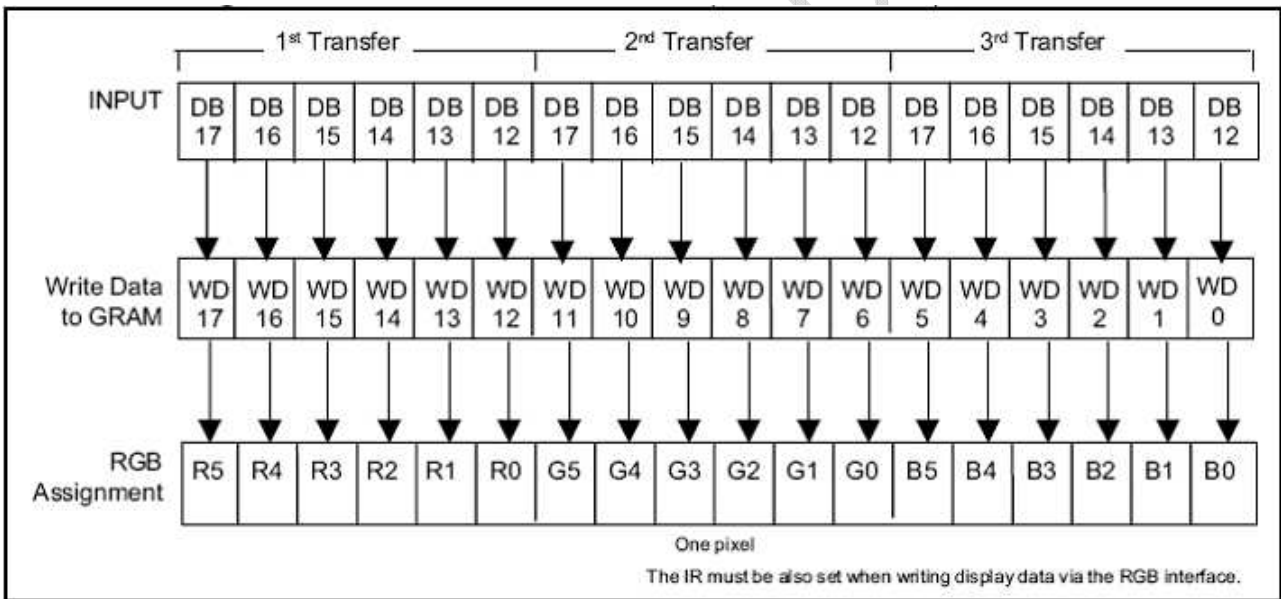
8-bit RGB interface



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6-bit RGB interface

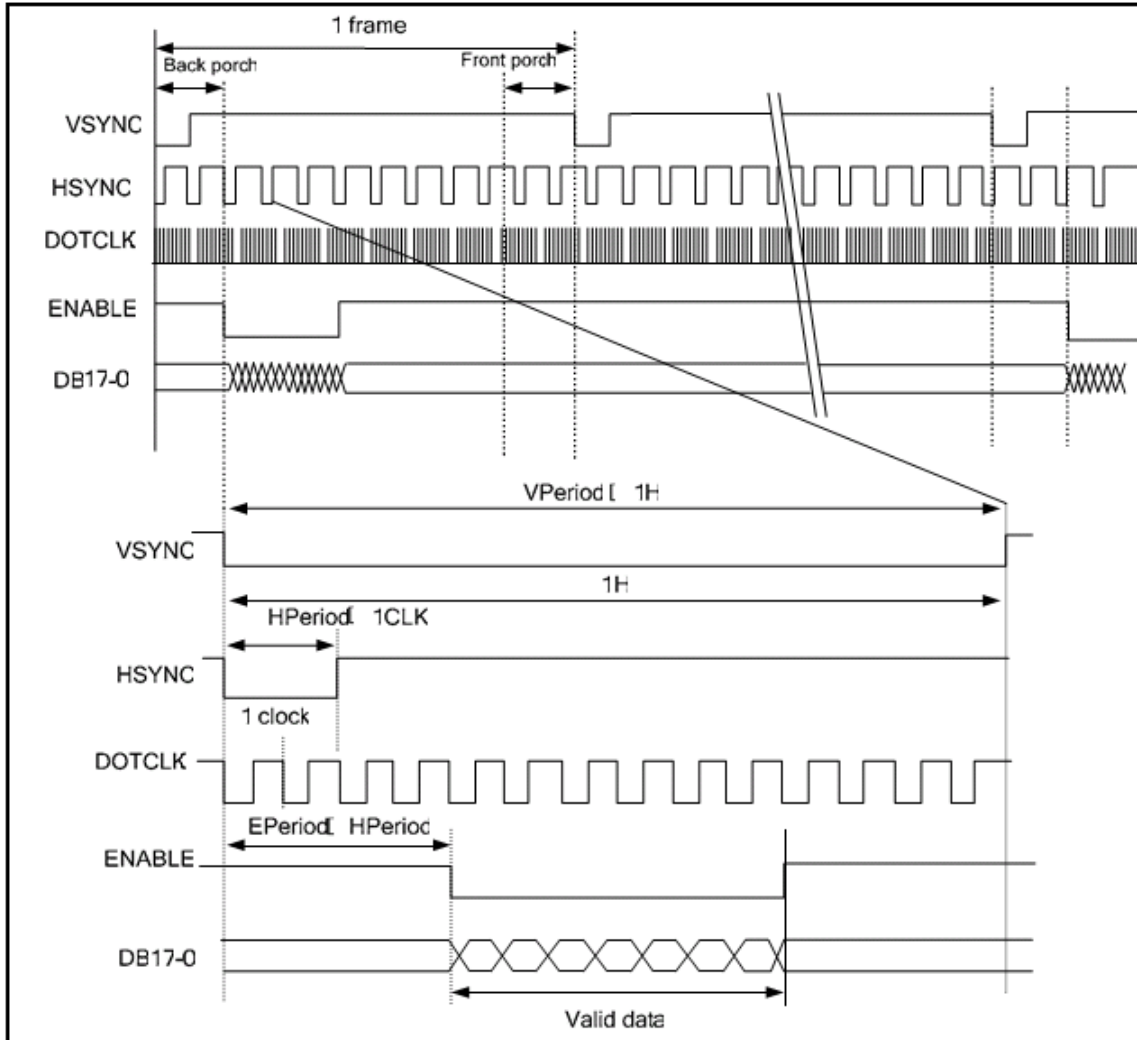




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8.3. Timing Characteristics

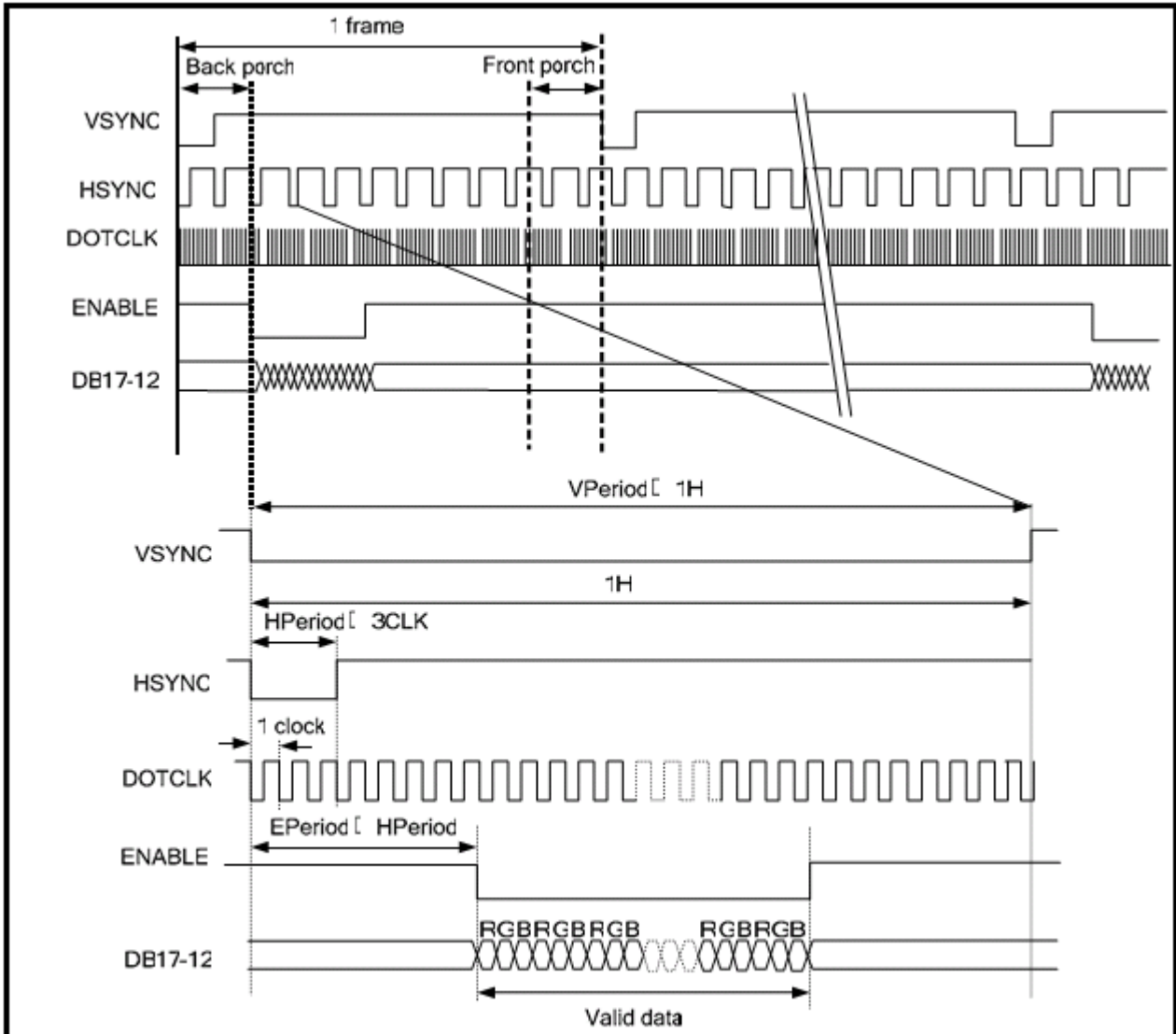
8.3.1.1 18/16-bit interface Timing





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8.3.1.2 6-bit interface Timing





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8.3.2 Clock-synchronized Serial Interface Timing Characteristics

Normal Write Function (VCC=1.65~3.30V)

Item	Symbol	Unit	Min.	Typ.	Max.	
Serial Time Clock Cycle	Write (received)	tSCYC	ns	100	-	20.000
	Read (transmitted)	tSCYC	ns	350	-	20.000
Serial Clock high-level width	Write (received)	tSCH	ns	40	-	-
	Read (transmitted)	tSCH	ns	150	-	-
Serial Clock low-level width	Write (received)	tSCL	ns	40	-	-
	Read (transmitted)	tSCL	ns	150	-	-
Serial clock rise/fall time	tSCr, tSCf	ns	-	-	20	
Chip select setup time	tCSU	ns	20	-	-	
Chip select hold time	tCH	ns	60	-	-	
Serial input data setup time	tSISU	ns	30	-	-	
Serial input data hold time	tSIH	ns	30	-	-	
Serial output data delay time	tSOD	ns	-	-	130	
Serial output data hold time	tSOH	ns	5	-	-	

8.3.3 RGB Interface Timing Characteristics

18-/ 16- bit RGB interface VCC=1.65~3.30V

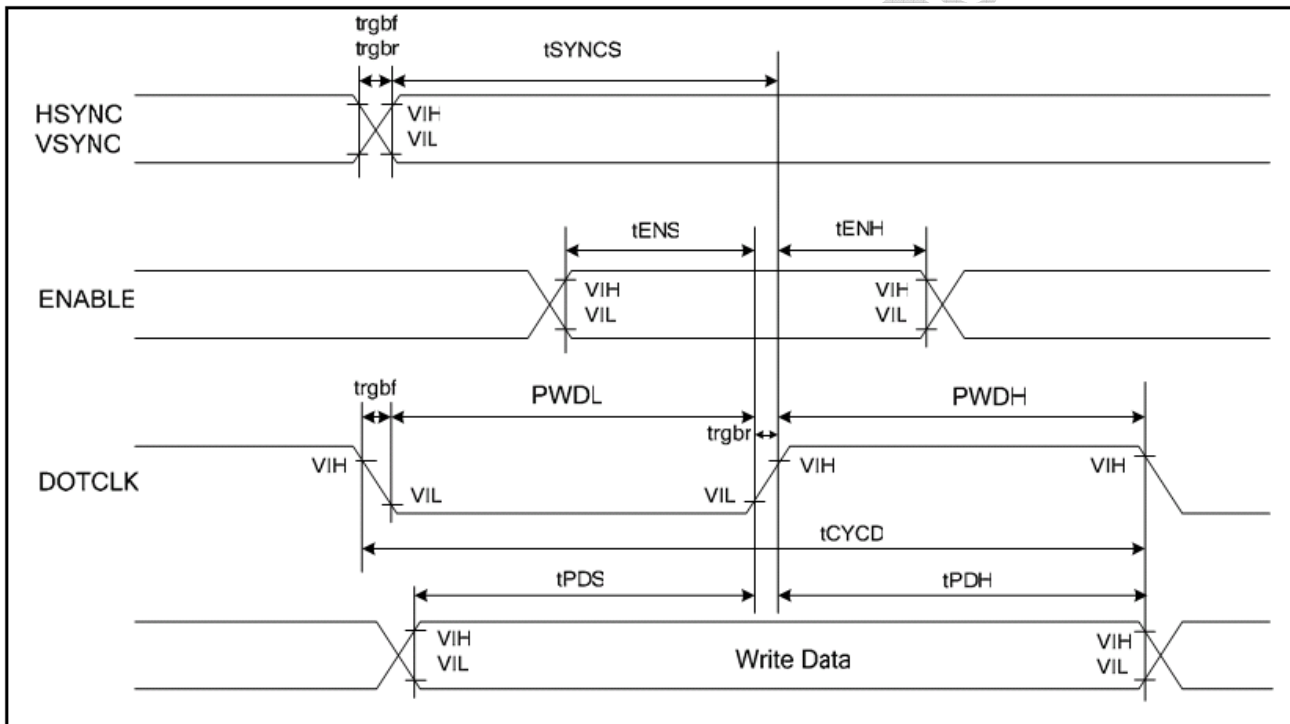
Item	Symbol	Unit	Min.	Typ.	Max.
VSYNC/HSYNC Setup time	tSYNCS	clock	0	-	1
ENABLE Setup time	tENS	ns	10	-	-
ENABLE Hold time	tENH	ns	20	-	-
DOTCLK low-level pulse width	PWDL	ns	40	-	-
DOTCLK high-level pulse width	PWDH	ns	40	-	-
DOTCLK cycle time	tCYCD	ns	100	-	-
Data setup time	tPDS	ns	10	-	-
Data hold time	tPDH	ns	40	-	-
DOTCLK, VSYNC and HSYNC rise/fall time	trgbr trgbf	ns	-	-	25

6-bit RGB interface, VCC=1.65~3.30V



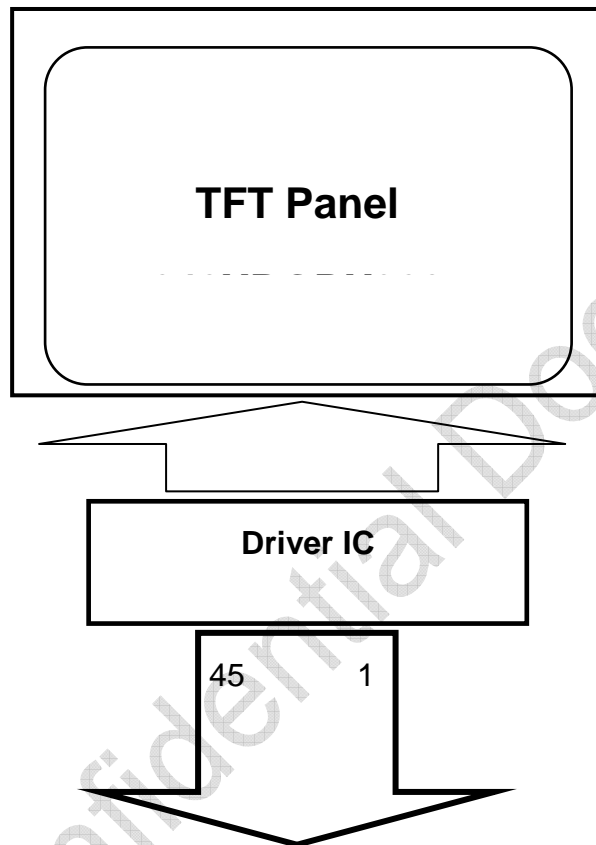
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Item	Symbol	Unit	Min.	Typ.	Max.
VSYNC/HSYNC setup time	tSYNCS	clock	0	-	1
ENABLE setup time	tENS	ns	10	-	-
ENABLE hold time	tENH	ns	25	-	-
DOTCLK low-level pulse width	PWDL	ns	25	-	-
DOTCLK high-level pulse width	PWDH	ns	25	-	-
DOTCLK cycle time	tCYCD	ns	60	-	-
Data setup-time	tPDS	ns	10	-	-
Data hold time	tPDH	ns	25	-	-
DOTCLK, VSYNC, and HSYNC rise/fall time	trgb ttrgbf	ns	-	-	25



8.4. Block diagram of LCD

8.4.1. Block diagram



9. ELECTRO-OPTICAL CHARACTERISTICS

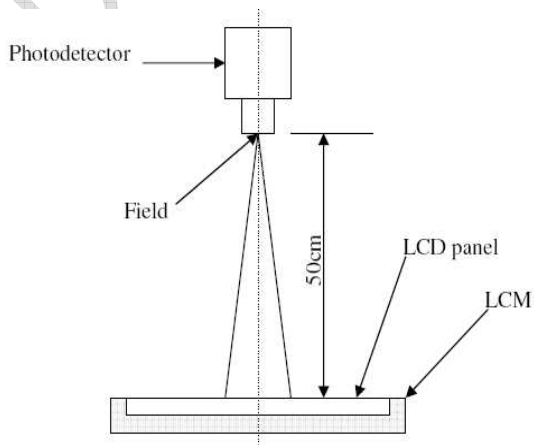
The following items are measured under stable conditions. The optical characteristics should be measured in dark room or equivalent state with the methods shown in Note 1, Note 2, Note 3.

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Response time	$T_R + T_F$	$\Theta=0$	-	30	45	ms	Note 4
Contrast ratio	CR	At optimized viewing angle	250	300	-	-	Note 5
Viewing Angle	Top	$CR \geq 10$	-	50	-	Degree	Note 6
	Bottom		-	60	-		
	Left		-	65	-		
	Right		-	65	-		
Brightness	L	$\Theta=0$	200	250	-	-	Note 3
White	X	$\Theta=0$	0.27	0.31	0.35		
	Y		0.26	0.30	0.34		
RED	X	$\Theta=0$	0.55	0.59	0.63		
	Y		0.30	0.34	0.38		
GREEN	X	$\Theta=0$	0.34	0.38	0.42		
	Y		0.53	0.57	0.61		
BLUE	X	$\Theta=0$	0.11	0.15	0.19		
	Y		0.04	0.08	0.12		

Note1: Ambient temperature = 25°C.

Note2: To be measured in the dark room.

Note3: Optical specifications are measured by Topcon BM-5A with a viewing angle of 1° at a distance of 50cm and normal direction.



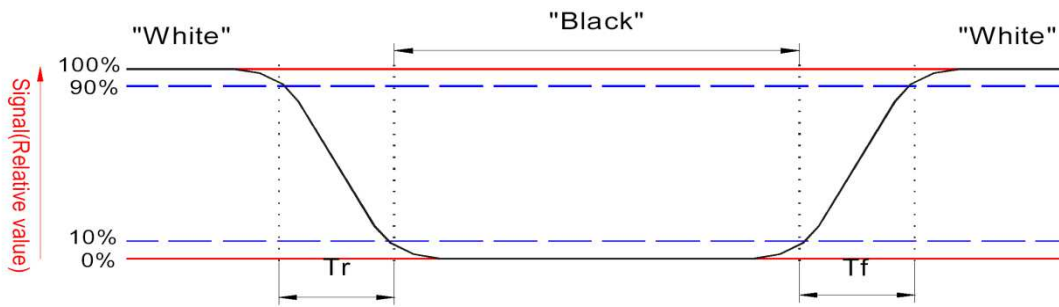


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Note4: Definition of response time:

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.



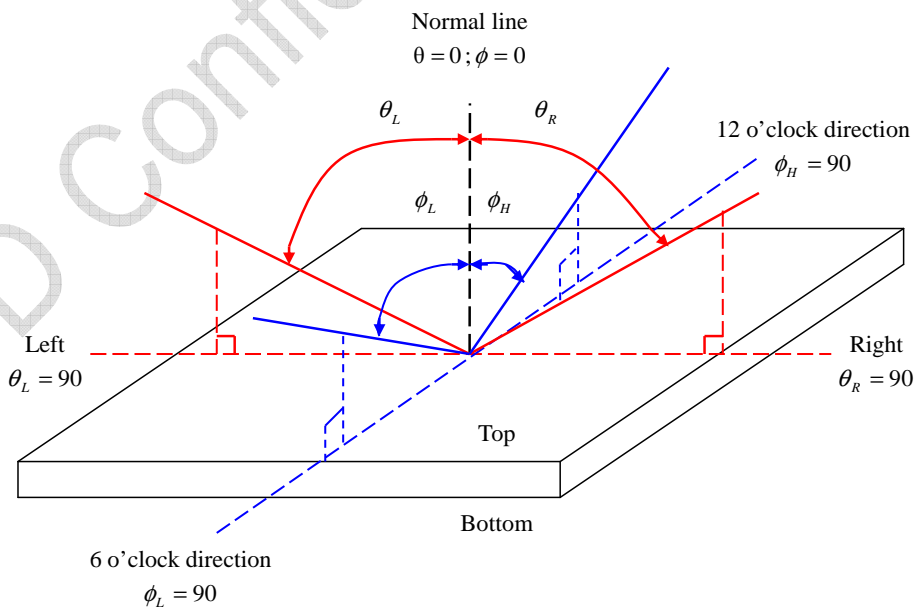
Note5: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

Note6: Definition of viewing angle:

Refer to figure as below.





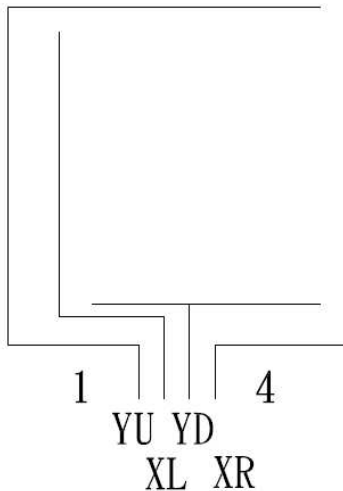
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10. TOUCH PANEL CRITERIAS

10.1. Electronic characteristics

Item	Min.	Typ.	Max.	Unit	Remark	
Operating Voltage	---	5	7	V	DC	
Resistance	X	260	---	1040	Ω	NOTE1
	Y	200	---	900		
Linearity	---	---	1.5%	---	NOTE2	
Response time	---	---	10	ms		
Insulation Resistance	20M	---	---	Ω	DC 25V/1min	

Note1.



* PIN 1 · 3(YD) on Glass

* PIN 2 · 4(XR) on Film

Note2. Linearity

$$\pm 1.5\% \text{ Measuring method, Linearity (\%)} = \frac{\Delta V}{EV-SV} \times 100$$

± 1.5%(after environmental and life test) EV-SV

ΔV: The difference between the ideal voltage and measured voltage on the each measuring line.

SV: Voltage of starting Points

EV: Voltage of Ending Points

10.2. Mech. & Reliability characteristics

Item	Specification
Input Method	Finger or Polyacetal Pen
ITO Film Surface Hardness	3H (JIS K-5400)
Pen Hitting Durability	1,000,000 times R=8mm Silicone Rubber pen
Pen Sliding Durability	100,000 times R=0.8mm Polyacetal pen
Light Transparency	>80% JIS K-7105
Linearity Force	80gf less input with stylus pen(R0.8mm) Activation force guarantee area:5.0mm inside of Active Area
Activation Force	50gf(Typical 20gf) less individual point on with stylus pen(R0.8mm). Activation force guarantee area:5.0mm inside of Active Area
Bouncing	<10ms
Impact resistance	No damage when Φ 9mm steel ball is dropped on the surface from 30cm height at 1 time.
Puffiness	0.40mm(max)
Flexible pattern heat seal peeling Strength	500gf/cm (Peeling upward by 90 deg.)
Flexible pattern bending resistance	Bending radius R=1.0mm * 10 times, the requirement in 10.1 should be satisfied
Flexible pattern Insert/Pull out resistance	>1 time, the requirement in 10.1 should be satisfied
Package Drop test	No damage to the product.(1 corner edge,2 ridges,4 surface ,drop from 50cm height)
Static loading resistance	After 4.5Kg load for 1 minute is applied to the center area of touch panel(1.0cm ²), the requirement in 10.1 should be satisfied



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10.3. Reliability Test

- 10.3.1. Hitting Durability (Test area should be at the center part of the panel.)
1,000,000 times min at the same point. The surface shall be free from damage.
The requirements in 10.1, shall be satisfied.
Test conditions
Hitting pad : Tip R 8 mm Silicone rubber & Tip R0.8mm stylus pen(Pom).
Load : 250gf
Hitting speed : 3 times / sec.
- 10.3.2. Pen Sliding Durability (Test area should be at 5.0 mm inside of transparent insulation.)
100,000 times min(slide only not in cycle). The surface shall be free from damage.
The requirements in 10.1, shall be satisfied
Test conditions
Sliding pen :Tip R0.8mm stylus pen
Load : 250gf
Sliding speed : 150mm / sec
Sliding length :25mm
Electric load :None

10.4. Design guide -----important message, please read it carefully

- 10.4.1. Electrical aspect
1. Keep the voltage under DC 7V operating the T/P.
 2. The Touch Panel cannot work correctly while touch two separate points at the same time.
 3. The contact resistance need to be stabilized before read the position figure.
 4. Please design the capacitor value of the touch panel in your sensing circuit and low-pass filters as it acts in an equivalent circuit.
- 10.4.2. Software
- It should be have the location calibration function in customer's software.
Please include "User calibration" in your software programming for long term



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using.

10.4.3. Mechanical Design

Active Area

The linearity, durability, and the operating force is guaranteed inside this area.

1. Please design your function area inside the “Active Area”, which is 1mm~1.5mm inside of the transparent insulation area.
2. Usually, the “Active Area” is equal or more than customer’s display “Active Area”.
3. Due to the construction and the material character, the durability of the input area at the edge is less than the center area; suggest not placing the key function at the edge area.

Unbearable Area

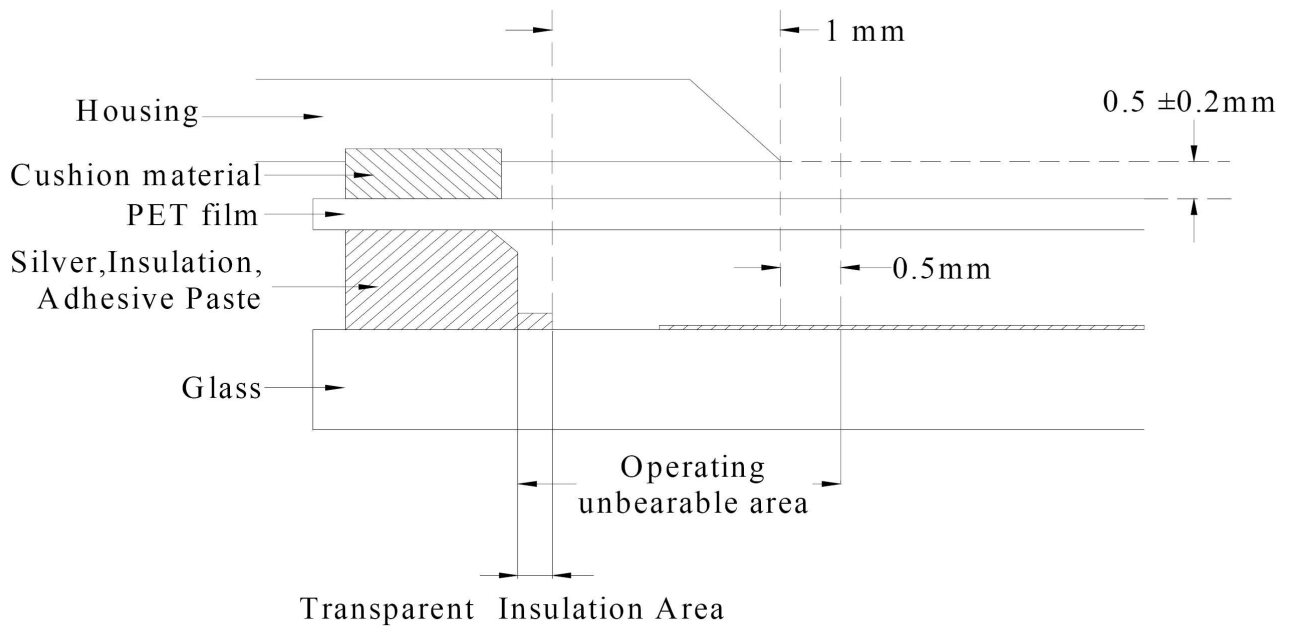
1. It still can be activated at this area, only the resistance is not stately, the linearity could not be guaranteed.
2. While in design, to prevent the potential problem is to avoid the housing of the unit to have any contact from the touch panel, or possible pressing on it while holding it. The contact causes the malfunction.
3. Normally, the durability is not guaranteed. The sliding in this area may cause the damage of the touch panel.
4. Usually the width of unbearable area is 1~1.5mm from “Active Area”, please check our specific drawing for each size, or discuss with our engineer

Transparent Insulation-area

1. The Insulation area is located outside the “Active Area” with a distance of 1~1.5mm. Please see the attached drawing of cross-section construction. It is to prevent the malfunction of the housing edge contacting the touch panel.
2. We suggest your housing design at least keep. 1.0mm outside the inner edge of Transparent Area. Please see the attached drawing of cross-section construction.



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3. Prohibited operation

To using the stylus pen or fingernail sliding at the edge of the housing is prohibited. It would cause the cracking of the ITO coating and damage the touch panel. It also request not to press this area while assembling.



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11. RELIABILITY

11.1.MTTF

The LCD module shall be designed to meet a minimum MTTF value of 50,000 hours with normal condition. (25°C in the room without sunlight; not include life time of backlight and Touch Panel).

11.2.Tests

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Operating	70°C 240 hrs	<ul style="list-style-type: none"> ◦ No defect of Operational function in room temperature are allowable(23±5°C). ◦ Leakage current should be below double of initial value.
2	Low Temperature Operating	-20°C 240 hrs	
3	High Temperature Non-Operating	80°C 240 hrs	
4	Low Temperature Non-Operating	-30°C 240 hrs	
5	High Temperature/ Humidity Non-Operating	50°C,90%RH 240 hrs	
6	Temperature Shock Non-Operating	-30°C ↔ 80°C (30min) (5min) (30min) 10 CYCLES	
7	Electro-static Discharge	HBM: ±2kv	

Note 1: Test after 24 hours in room temperature(23±5°C).

Note 2: The sampling above is individually for each reliability testing condition.

Note 3: The color fading of polarizing filter should not care.

Note 4: All of the reliability testing chamber above, is using D.I. water.(Min value:

1.0 MΩ-cm)

Note 5: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

11.3.Color performance

No.	ITEM	Criterion (initial)
1	Luminance	>50%
2	NTSC	>70%
3	Contrast Ratio	>50%

12. INSPECTION CRITERIA

12.1. Inspection Conditions

12.1.1. Environmental conditions

The environmental conditions for inspection shall be as follows

Room temperature: $23\pm 5^{\circ}\text{C}$

Humidity: $50\pm 20\%\text{RH}$

12.1.2. The external visual inspection

With a single $1000\pm 200\text{lux}$ fluorescent lamp as the light source, the inspection was in the distance of 30cm or more from the LCD to the inspector's eyes.

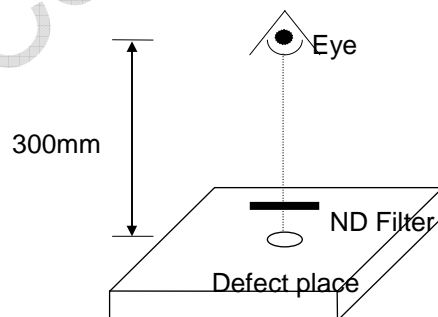
12.2. Light Method

12.2.1. Environment lamp under $1000\pm 200\text{ lux}$, Viewing direction for inspection over 30

cm

12.2.2. The distance from eye to defect around 300mm, the distance from ND Filter to

defect around 25~30mm





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12.3. Classification Of Defects

12.3.1. Major defect

A major defect refers to a defect that may substantially degrade usability for product applications.

12.3.2. Minor defect

A minor defect refers to a defect which is not considered to be able substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation.

Notes: If the LCD/LCM 's cosmetic and display performance do not specify in "inspection criterion", it should be based on these delivered samples.

12.4. Sampling & Acceptable Quality Level

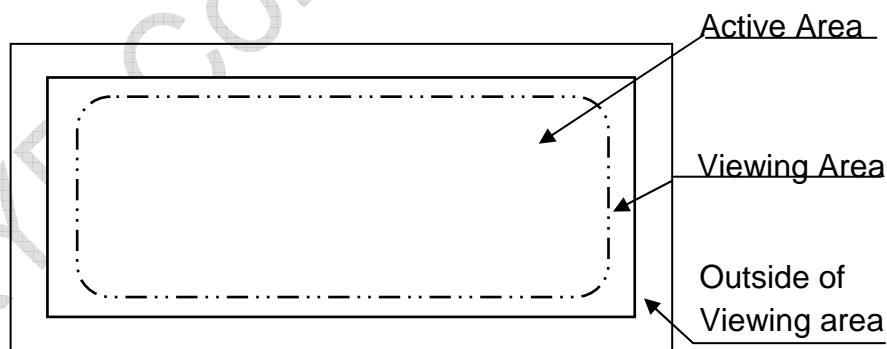
Level II, MIL-STD-105E

	Major	Minor
Cosmetic	1.0 %	1.5 %
Electrical-display	0.4%	0.65 %

12.5. Definition Of Inspection Area

V.A: Viewing Area

A.A: Active Area





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12.6.Items and Criteria

12.6.1. Visual inspection criterion in cosmetic

(1) Glass defect

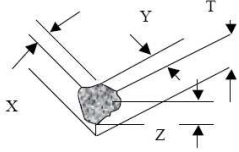
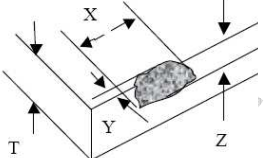
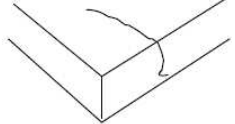
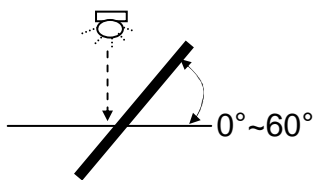
No	Defect	Criteria	Remark
1	Dimension (Minor)	By engineering diagram	
2	Cracks (Major)	Extensive crack 【Reject】	

(2) LCM appearance defect with in A.A (With Touch Panel)

No	Item	Criteria		Remark
1	Round type (Minor)	Defect Spec.	Permissible Q'ty	1: $\psi=(L+W)/2$, L: Length, W: Width 2: Disregard if out of A.A.
		$\psi \leq 0.15\text{mm}$	Disregard	
		$0.15\text{mm} < \psi \leq 0.20\text{mm}$	3	
		$0.20\text{mm} < \psi \leq 0.30\text{mm}$	1	
		$\psi > 0.30\text{mm}$	0	
2	Line type (Minor)	Defect Spec.	Permissible Q'ty	1: L: Length, W: Width 2: Disregard if out of A.A.
		$W \leq 0.03\text{mm}$	Disregard	
		$L \leq 3.0\text{mm}$ and $0.03\text{mm} < W \leq 0.05\text{mm}$	2	
		$L \leq 3.0\text{mm}$ and $0.05\text{mm} < W \leq 0.10\text{mm}$	1	
		$L > 3.0\text{mm}$ or $W > 0.10\text{mm}$	0	



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3	Corner chip (Minor)	$X \leq 3.0\text{mm}, Y \leq 3.0\text{mm}, Z \leq T$	【Disregard】	
No	Item	Criteria		Remark
4	Edge chip (Minor)	$X \leq 3.0\text{mm}, Y \leq 3.0\text{mm}, Z \leq T$	【Disregard】	
5	Crack (Major)	Not allowed		
6	Newton's ring (Minor)	Defect Spec.	Permissible Q'ty	Under day light 
		$\psi \leq 7\text{mm}$	Disregard	
		$\psi > 7\text{mm}$	0	

(3) FPC

No	Defect	Criteria	Remark
1	Copper peeling (Minor)	Copper peeling	【Reject】

(4) Black tape

No	Defect	Criteria	Remark
1	Shift (Minor)	IC exposed	【Reject】
2	No black tape (Minor)	No black tape	【Reject】

(5) Silicon

No	Defect	Criteria	Remark
1	Amount of silicon (Minor)	ITO exposed	【Reject】

(6) Power cord

No	Defect	Criteria	Remark
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1	Power cord (Minor)	Power core loose	
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12.6.2. LCM electrical criterion(With Touch Panel)

No	Defect	Criteria		Remark
1	No display (Major)	Not allowed		
2	Missing line (Major)	Not allowed		
3	Darker or lighter line (Major)	Not allowed		
4	Bright / Dark point (Minor)	Spec.	Permissible Qty	1:1sub-pixel: 1R or 1G or 1B 2:Point defect area \geq 1/2 sub pixel.
		Bright point	1	
		Dark point	2	
5	Round type (Minor)	Spec.	Permissible Qty	1. $\psi=(L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A.
		$\psi \leq 0.20\text{mm}$	Disregard	
		$0.20\text{mm} < \psi \leq 0.35\text{mm}$	3	
		$\psi > 0.35\text{mm}$	0	
6	Line type (Minor)	Spec.	Permissible Qty	1. L: Length, W: Width 2. Disregard if out of A.A.
		$W \leq 0.03\text{mm}$	Disregard	
		$L \leq 5.0\text{mm}$ and $0.03\text{mm} < W \leq 0.05\text{mm}$	4	
		$L \leq 5.0\text{mm}$ and $0.05\text{mm} < W \leq 0.15\text{mm}$	3	
		$W > 0.15\text{mm}$ or $L > 5.0\text{mm}$	0	



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8	Mura (Minor)	By 5% ND filter invisible	
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12.6.3. Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)
2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)

13. RoHS COMPLIANT WARRANTY

RoHS Hazardous substances including:

- Cd < 100 ppm
- Pb < 1000 ppm
- Hg < 1000 ppm
- Cr +6 < 1000 ppm
- PBDE < 1000 ppm
- PBB < 1000 ppm



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14. PRECAUTIONS FOR USE

14.1. Safety

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

14.2. Storage Conditions

- (1) Store the panel or module in a dark place where the temperature is $23\pm 5^{\circ}\text{C}$ and the humidity is below $50\pm 20\% \text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.
- (6) Do not exposed to direct sun light of fluorescent lamps.

14.3. Installing LCD Module

Attend to the following items when installing the LCM.

- (1) Cover the surface with a transparent protective plate or touch panel to protect the polarizer and LC cell.

14.4. Precautions For Operation

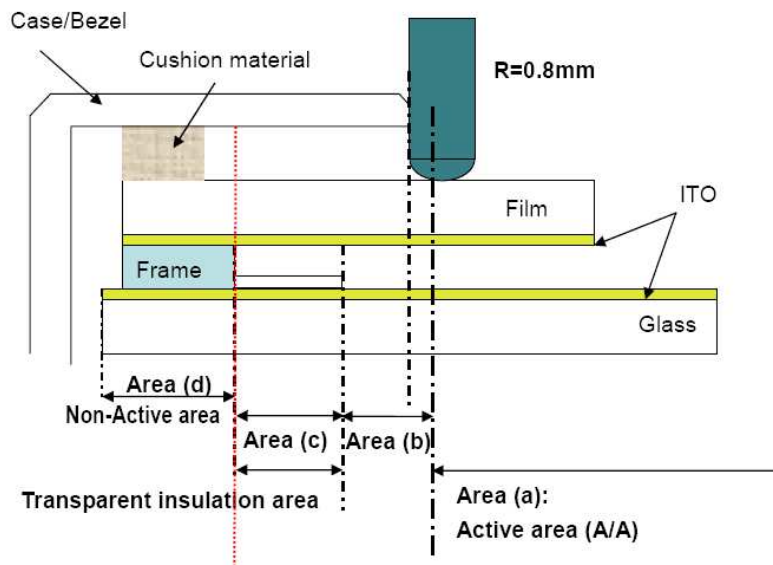
- (1) Viewing angle varies with the change of liquid crystal driving voltage (V_0). Adjust V_0 to show the best contrast.
- (2) Driving the LCD in the voltage above the limit will shorten its lifetime.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) When turning the power on, input each signal after the positive/negative voltage becomes stable.
- (5) Do not apply mater or any liquid on product, which composed of T/P.

14.5. Handling Precautions

- (1) Avoid static electricity that can damage the CMOS LSI; please wear the wrist strap when handling.
- (2) The polarizing plate of the display is very fragile. So, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface; it may cause display abnormal.
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) Do not apply mater or any liquid on product, which composed of T/P.

14.6. Precautions in use of touch panel

The structure and the performance guaranteed area of this touch panel are defined below :



- (1). The above figure is our design rule of touch panel. If it cannot meet your requirement, please contact with our engineers for further discussion. Above figure illustrates the recommended bezel and cushion design. In order to prevent unusual performance degradation and malfunction of a touch panel, please carry out the set case designing and a touch panel assembling method after surely considering the definition of each area illustrated in above figure.



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Area(a): (Active area)

The active area is guaranteed the position data detectable precision, operation force and other operations. It is strongly recommended to place the operation button or menu keys within the active area. Due to structure, the active area is less durable at the edge or close to the edge.

Area(b): (Operation non-guaranteed area)

This area does not guarantee a touch panel operation and its function. When this area is pressed, touch panel shows degradation of its performance and durability such as a pen sliding durability becomes about one-tenth compared with the active area (Area-(a) as guaranteed area) and its operation force requires about double. About 0.5 mm outside from a boundary of the active area corresponds to this area.

Area(c): (Pressing prohibition area)

The area which forbids pressing, because an excessive load is applied to a transparent electrode (ITO) and a serious damage is given to a touch panel function by pressing.

Area(d): (Non-Active area)

The area does not activate even if pressed.

14.7. Guarantee

14.7.1. The period is within 12 months since the date of shipping out under normal using and storage conditions.

14.7.2. Any defect not caused by KYOCERA DISPLAY is not guaranteed to the customer. The defect phenomenon should be agreed by both parties.



Стандарт Электрон Связь

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