

HITACHI

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FOR MESSRS : _____

DATE : May.13,2008

CUSTOMER'S ACCEPTANCE SPECIFICATIONS TX07D09VM1CAB CONTENTS

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*When product will be discontinued, customer will be informed by HITACHI with twelve months prior to discontinuation.

ACCEPTED BY: _____

PROPOSED BY: Dan Cheng

KAOHSIUNG HITACHI ELECTRONICS CO.,LTD.	Sh. No.	7B64PS 2701-TX07D09VM1CAB-3	PAGE	1-1/1
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RECORD OF REVISION

DATE	SHEET No.	SUMMARY																												
Feb.13,'07	7B64PS 2704 - TX07D09VM1CAB - 2 Page 4 - 2/2	<p>4.3 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS Revised</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">ITEM</th> <th colspan="2">OPERATING</th> <th colspan="2">STORAGE</th> </tr> <tr> <th>Min.</th> <th>Max.</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Ambient Temperature</td> <td>-20°C</td> <td>60°C</td> <td>-30°C</td> <td>70°C</td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">ITEM</th> <th colspan="2">OPERATING</th> <th colspan="2">STORAGE</th> </tr> <tr> <th>Min.</th> <th>Max.</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Ambient Temperature</td> <td>-20°C</td> <td>70°C</td> <td>-30°C</td> <td>80°C</td> </tr> </tbody> </table> <p>Note 2: For storage condition Ta at -30°C < 48h , at 70°C < 100h.</p> <p style="text-align: center;">↓</p> <p>Note 2: For storage condition Ta at -30°C < 48h , at 80°C < 100h.</p>	ITEM	OPERATING		STORAGE		Min.	Max.	Min.	Max.	Ambient Temperature	-20°C	60°C	-30°C	70°C	ITEM	OPERATING		STORAGE		Min.	Max.	Min.	Max.	Ambient Temperature	-20°C	70°C	-30°C	80°C
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7B64PS 2711 - TX07D09VM1CAB - 2 Page 11 - 3/3	<p>11.5 STORAGE Revised</p> <p>(2) Keep the temperature between -30°C and 70°C at normal humidity.</p> <p style="text-align: center;">↓</p> <p>(2) Keep the temperature between -30°C and 80°C at normal humidity.</p>																													
7B64PS 2714 - TX07D09VM1CAB - 2 Page 14 - 1/1	<p>14. RELIABILITY TEST Revised</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>TEST ITEM</th> <th>CONDITION</th> </tr> </thead> <tbody> <tr> <td>Heat Cycle (Operation)</td> <td>● -20±3°C...1hour , 60±3°C...1 hour ● 30 cycles, 8 hours / cycle</td> </tr> <tr> <td>Thermal Shock (Storage)</td> <td>● -30±3°C...30 minutes , 70±3°C...30 minutes ● 100 cycles , 1 hour / cycle ● Temperature transition time is within 4 minutes</td> </tr> <tr> <td>High Temperature (Storage)</td> <td>● 70±3°C...100 hours</td> </tr> <tr> <td>High Temperature (Operation)</td> <td>● 60±3°C...48 hours</td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>TEST ITEM</th> <th>CONDITION</th> </tr> </thead> <tbody> <tr> <td>Heat Cycle (Operation)</td> <td>● -20±3°C...1hour , 70±3°C...1 hour ● 30 cycles, 8 hours / cycle</td> </tr> <tr> <td>Thermal Shock (Storage)</td> <td>● -30±3°C...30 minutes , 80±3°C...30 minutes ● 100 cycles , 1 hour / cycle ● Temperature transition time is within 4 minutes</td> </tr> <tr> <td>High Temperature (Storage)</td> <td>● 80±3°C...100 hours</td> </tr> <tr> <td>High Temperature (Operation)</td> <td>● 70±3°C...48 hours</td> </tr> </tbody> </table>	TEST ITEM	CONDITION	Heat Cycle (Operation)	● -20±3°C...1hour , 60±3°C...1 hour ● 30 cycles, 8 hours / cycle	Thermal Shock (Storage)	● -30±3°C...30 minutes , 70±3°C...30 minutes ● 100 cycles , 1 hour / cycle ● Temperature transition time is within 4 minutes	High Temperature (Storage)	● 70±3°C...100 hours	High Temperature (Operation)	● 60±3°C...48 hours	TEST ITEM	CONDITION	Heat Cycle (Operation)	● -20±3°C...1hour , 70±3°C...1 hour ● 30 cycles, 8 hours / cycle	Thermal Shock (Storage)	● -30±3°C...30 minutes , 80±3°C...30 minutes ● 100 cycles , 1 hour / cycle ● Temperature transition time is within 4 minutes	High Temperature (Storage)	● 80±3°C...100 hours	High Temperature (Operation)	● 70±3°C...48 hours									
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RECORD OF REVISION

DATE	SHEET No.	SUMMARY
May.13,'08	7B64PS 2712 - TX07D09VM1CAB - 3 Page 12 - 1/1	12.2 Location of lot mark Lot mark change: Print on FPC → Barcode label on frame

3.GENERAL DATA

The specifications are applied to the following TFT-LCD (Transmissive Amorphas silicon TFT) module with Back-light unit. LCD driving circuit and LED driving circuit do not obtain in this module.

(1) Part Name	TX07D09VM1CAB
(2) Module Dimensions	50.54(W)mm x 68.62(H)mm x 3.63(D)mm typ. Except FPC Area
(3) Effective Display Area	41.04(W)mm x 54.72(H)mm
(4) Dot Pitch	0.057mm x 3(R,G,B)(W) x 0.171(H)mm
(5) Resolution	240 x 3(R,G,B)(W) x 320 (H) dots
(6) Color Pixel Arrangement	R,G,B Vertical Stripe
(7) LCD Type	Transmissive Color TFT LCD (Normally White)
(8) Display Type	Active Matrix
(9) Number of Colors	262 ^K Colors (R,G,B 6 Bit Digital each)
(10) Backlight	Light Emitting Diode (LED) x 5
(11) Weight	(24)g
(12) Interface	45 pin C-MOS
(13) Viewing Direction	6 O'clock (The direction it's hard to be discolored)
(14) Touch Panel	Resistance type. The surface is anti-glare

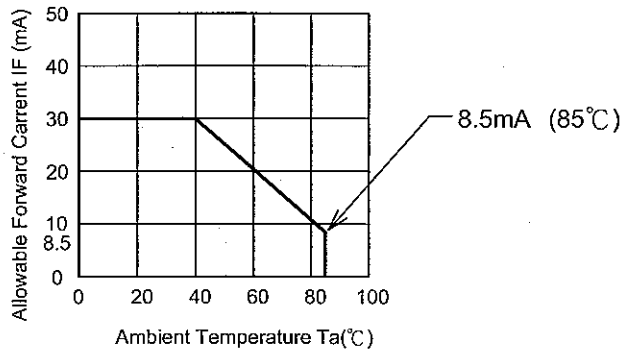
4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS OF LCD

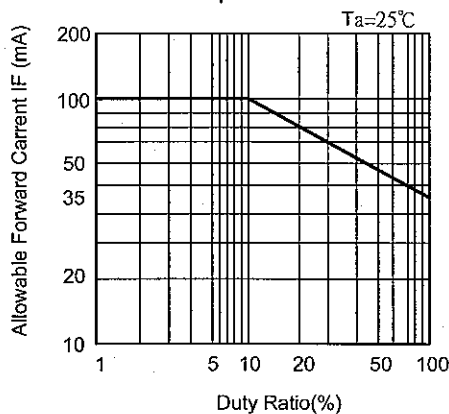
ITEM			SYMBOL	MIN.	MAX.	UNIT	REMARKS
Power Supply for Logic			VCC	-0.3	3.6	V	
Power Supply Voltage for Source Driver and Vcom			VDH	-0.3	6.0	V	
Input Voltage			V _i	0	VCC	V	(1)
Gate	Power Supply for Gate	High	V _{GH}	-0.3	V _{GL} +20	V	
		Low	V _{GL}	-6	0.3	V	
LED	Forward Current		I _F	-	30	mA	(2)
	Pulse Forward Current		I _{FP}	-	80	mA	(3)
	Reverse Voltage		V _R	-	5	V	
Static Electricity			-	-	(±15)	kV	(4) (5)

Note (1) Hsync, Vsync, DCLK, R0~R5, G0~G5, B0~B5

(2)



(3) I_{FP} Conditions : pulse width ≤ 10ms and Duty ≤ 1/10



(4) Make certain you are grounded when handling LCM.

(5) Testing condition : 200pF - 0 Ω, 25° C - 70%RH.

4.2 ELECTRICAL ABSOLUTE MAXIMUM RATINGS OF TOUCH PANEL

ITEM	SPECIFICATION	UNIT	CONDITION	REMARKS
Supply Voltage	7.0	V	DC	
Endurance Voltage	25	V	DC	(Note 1)

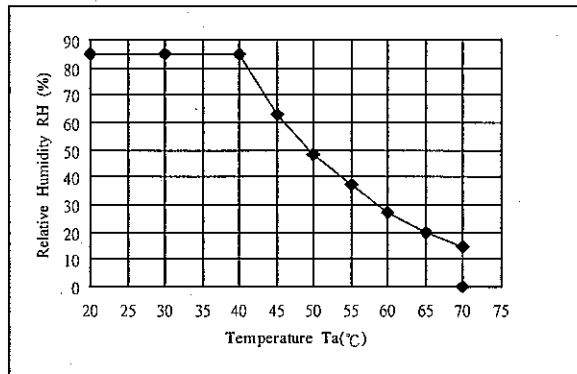
Note 1 : Waiting 1 minute.

4.3 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		REMARKS
	Min.	Max.	Min.	Max.	
Ambient Temperature	-20°C	70°C	-30°C	80°C	(Note 2,3,6,7,9,10)
Humidity	(Note 1)		(Note 1)		Without condensation
Vibration	-	-	-	(11.76)m/s ² (1.2G)	(Note 4,5)
Shock	-	-	-	(490)m/s ² (50G)	(Note 5,8)
Corrosive Gas	Not Acceptable		Not Acceptable		

Note 1 : $T_a \leq 40^\circ\text{C}$: 85%RH max.

$T_a > 40^\circ\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at 40°C .
as follow diagram.



Note 2 : For storage condition T_a at $-30^\circ\text{C} < 48\text{h}$, at $80^\circ\text{C} < 100\text{h}$.

For operating condition T_a at $-20^\circ\text{C} < 100\text{h}$

Note 3 : Background color changes slightly depending on ambient temperature.

This phenomenon is reversible.

Note 4 : 5Hz~100Hz(Except resonance frequency)

Note 5 : This LCM will resume normal operation after finishing the test.

Note 6 : The response time will be slower as low temperature.

Note 7 : Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at 25°C .

Note 8 : Pulse Width : 10ms

Note 9 : This is panel surface temperature, not ambient temperature.

Note 10 : If LED is driven by high current, the life time of LED will be reduced, also high temperature and high humidity.

5. ELECTRICAL CHARACTERISTICS

5.1 ELECTRICAL CHARACTERISTICS OF LCD

Ta=25°C, VSS=0V

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Power Supply Voltage for logic	VCC	-	2.5	3.0	3.3	V
Power Supply Voltage for Source Driver and Vcom	VDH	-	4.5	5.0	6.0	
Input voltage for logic (note 1)	Vi	"H" level	0.8VCC	-	VCC	V
		"L" level	VSS	-	0.2VCC	
Power Supply for LCD	VGH	-	14.0	15.0	16.0	V
	VGL		-16.0	-15.0	-14.0	
	VCOM	VCOM-VSS	-	2.2	-	
Power Supply Current (note 2)	ICC	VCC-VSS=3.0V	-	0.6	-	mA
	IDH	VDH-VSS=5.0V	-	2.5	-	
	IGH	VGH-VSS=15.0V	-	0.06	-	
	IGL	VGL-VSS=-15.0V	-	0.22	-	
Vsync Frequency	fV	-	54	60	68	Hz
Hsync Frequency	fH	-	18.57	20.77	22.73	kHz
DCLK Frequency	fCLK	-	5.0	5.6	6.5	MHz

Note 1 : DCLK, RD0~RD5, GD0~GD5, BD0~BD5.

Note 2 : fV=60Hz, Ta=25°C, Pattern used as display pattern : All black.

Note 3 : Need to made sure of flickering and rippling of display when setting the frame frequency in your set.

5.2 ELECTRICAL CHARACTERISTICS OF BACK LIGHT

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARKS
LED Input Voltage	VF	IF=20mA	-	(3.2)	3.5	V	LED / Part
LED Forward Current	IF	-	-	20	25	mA	LED / Part
LED Reverse Current	IR	VR=5V	-	-	50	μA	LED / Part

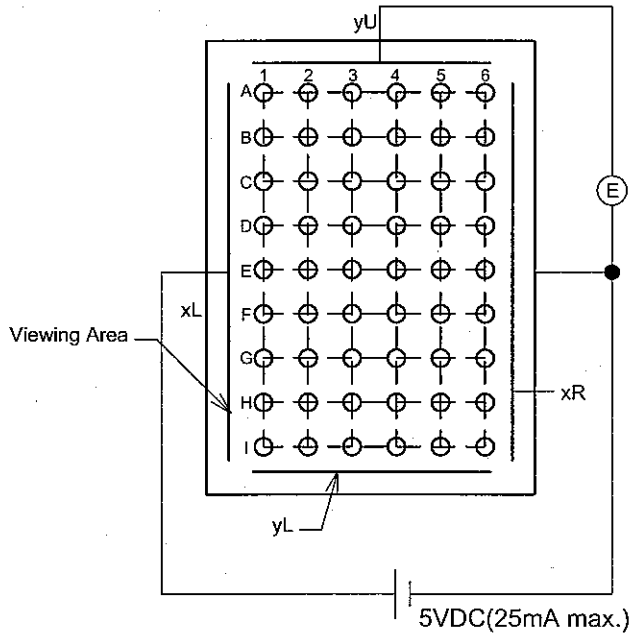
5.3 ELECTRICAL CHARACTERISTICS OF TOUCH PANEL

ITEM		SPECIFICATION	UNIT
Resistance between Terminal	xR - xL	190~540	ohm
	yU - yL	140~540	ohm
Insulance Resistance (Note 1)	x - y	10M min.	ohm
Linearity (Note 2,3)	x	1.5 max.	%
	y	1.5 max.	%
Chattering		10 max.	ms

Note 1 : Operating Voltage 25V DC.

Note 2 : Test Condition.

(a) Y axis linearity testing method (with tip radius 0.8, polaycetal pen). $V_{xL-xR}=5V$, $V_{OUT}=V_{yU}$.

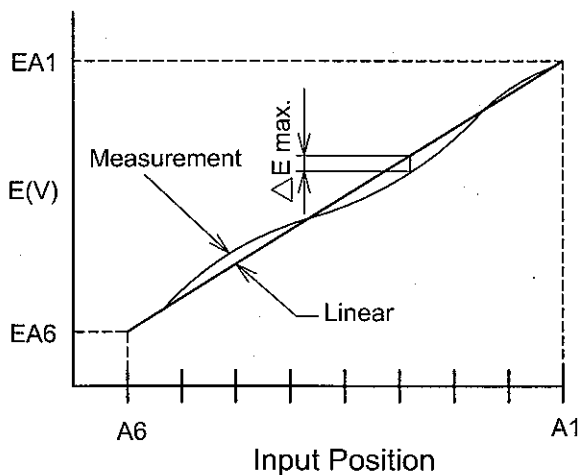


(b) X axis linearity method $V_{yU-yL}=5V$, $V_{OUT}=V_{xL}$.

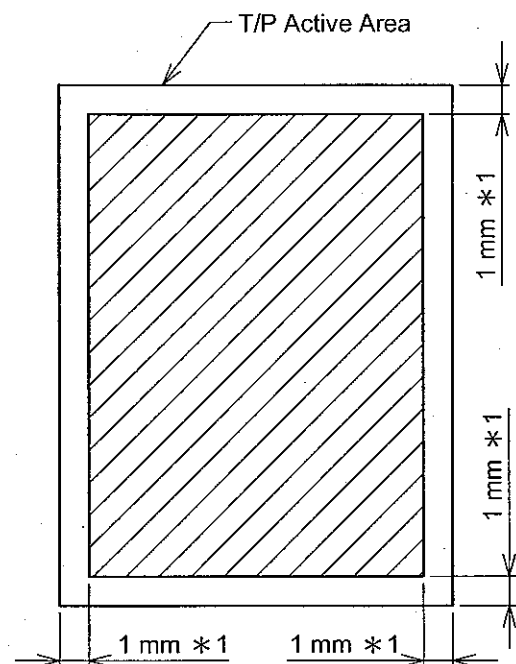
Note 3 : Calculation

(a) Y axis linearity

$$\text{Linearity} = \frac{\Delta E \text{ max.}}{EA1 - EA6} \times 100(\%)$$



Note (4) Pen Force Area



5.4 MECHANICAL CHARACTERISTICS OF TOUCH PANEL

ITEM	SPECIFICATION	UNIT	REMARKS
Pen Input Pressure	0.1 - 1.3	N	R0.8mm Polyacetal pen Note(4)
Surface Hardness	3H min.	-	JIS K 5400

6. OPTICAL CHARACTERISTICS

6.1 OPTICAL CHARACTERISTICS OF LCD (BACK LIGHT ON)

Ta=25°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE	
Brightness(center)	B	$\phi=0^\circ \theta=0^\circ$	290	340	-	cd/m ²	(1)	
Uniformity	-	$\phi=0^\circ \theta=0^\circ$	70	-	-	%	(2),(3),(4)	
Viewing Angle	θx	$\phi=0^\circ, K \geq 5.0$	-	60	-	deg	(5),(6)	
	$\theta x'$	$\phi=180^\circ, K \geq 5.0$	-	80	-			
	θy	$\phi=90^\circ, K \geq 5.0$	-	70	-			
	$\theta y'$	$\phi=270^\circ, K \geq 5.0$	-	70	-			
Contrast Ratio	K	$\phi=0^\circ \theta=0^\circ$	200	300	-	-	(4)	
Response Time (rise-fall)	tr+tf	$\phi=0^\circ \theta=0^\circ$	-	(30)	-	ms	(8)	
Color Tone (Primary Color)	Red	x	$\phi=0^\circ \theta=0^\circ$	(0.55)	(0.60)	(0.65)	-	(4)
		y		(0.29)	(0.34)	(0.39)	-	
	Green	x		(0.31)	(0.36)	(0.41)	-	
		y		(0.50)	(0.55)	(0.60)	-	
	Blue	x		(0.10)	(0.15)	(0.20)	-	
		y		(0.09)	(0.14)	(0.19)	-	
	White	x		(0.29)	(0.34)	(0.39)	-	
		y		(0.30)	(0.35)	(0.40)	-	

(Measurement condition : HITACHI standard)

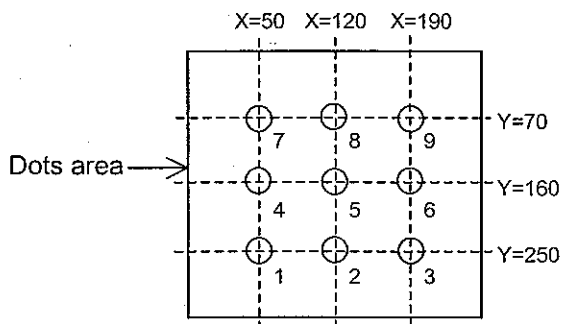
Note 1 : Active area center
LED Current : 20mA / Part

Note (4)~(7) : See page 6-2/2

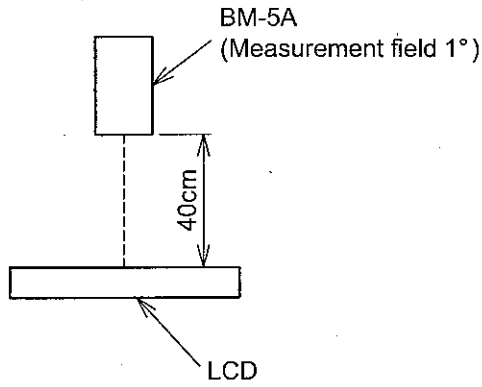
Note 2 : Driving Condition
Display Pattern : White Raster
LED Current : 20mA / Part
Measurement of the following
9 places on the display.

Note 3 : Definition of the brightness uniformity

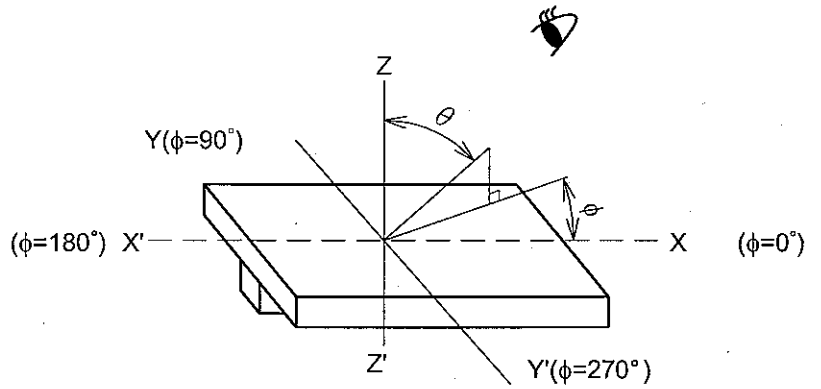
$$\left(\frac{\text{Min. brightness}}{\text{Max. brightness}} \right) \times 100$$



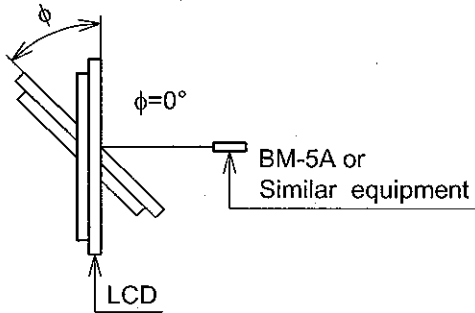
Note 4 : Measurement Condition



Note 5 : Definition of θ and ϕ
(Normal)
Viewing direction



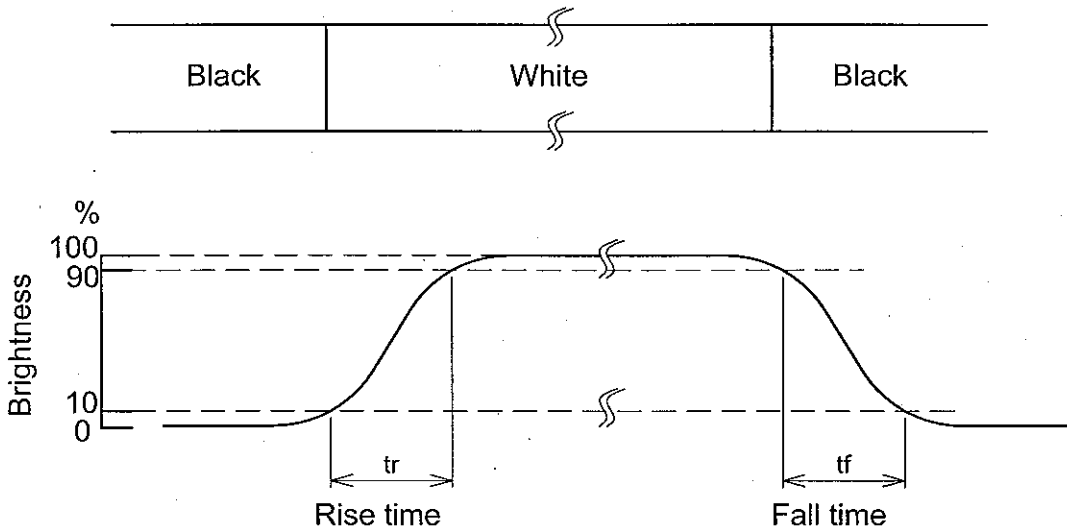
Note 6 : Definition of Viewing angle



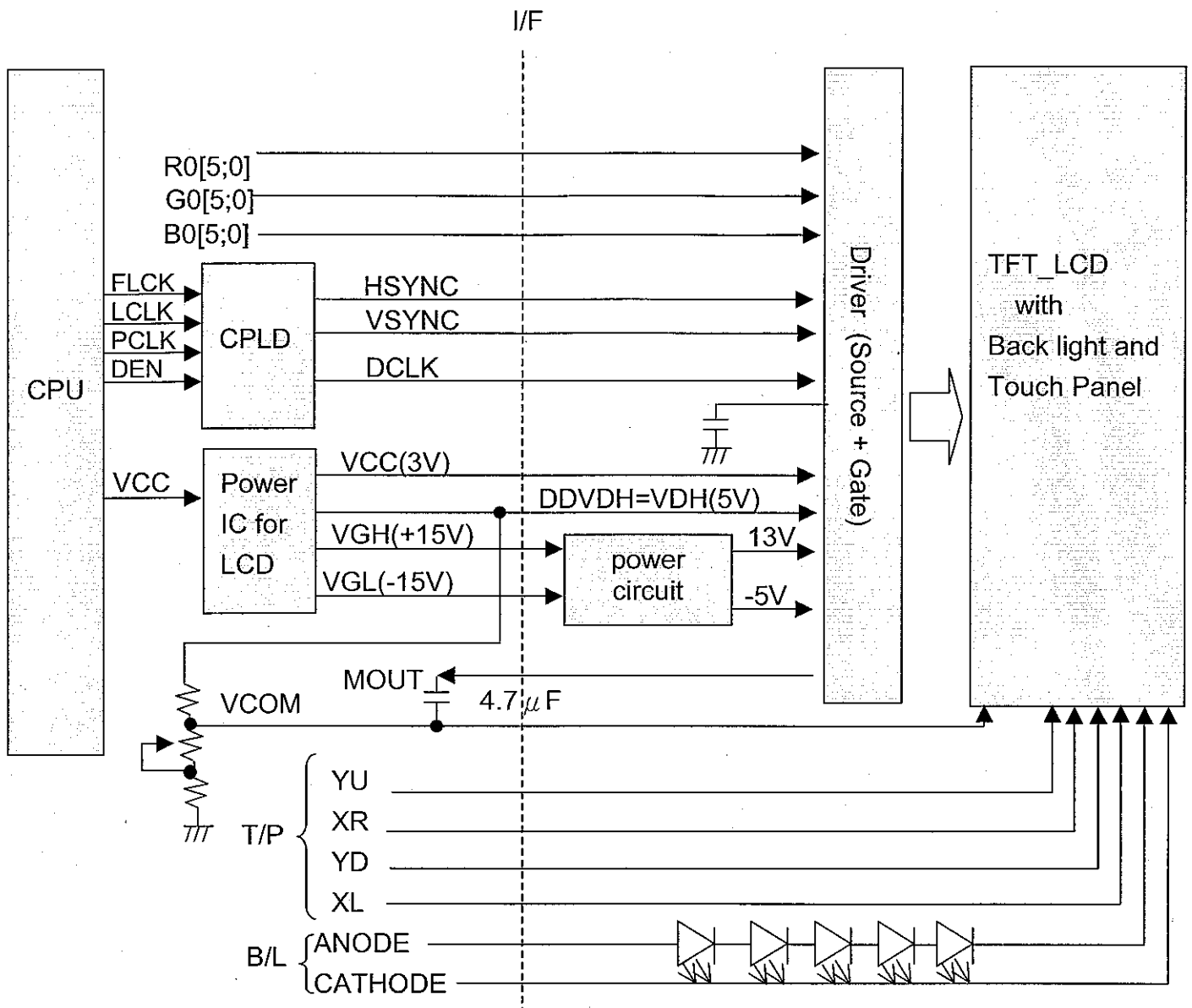
Note 7 : Definition of contrast "K"

$$K = \frac{\text{White Brightness}}{\text{Black Brightness}}$$

Note 8 : Definition optical response time



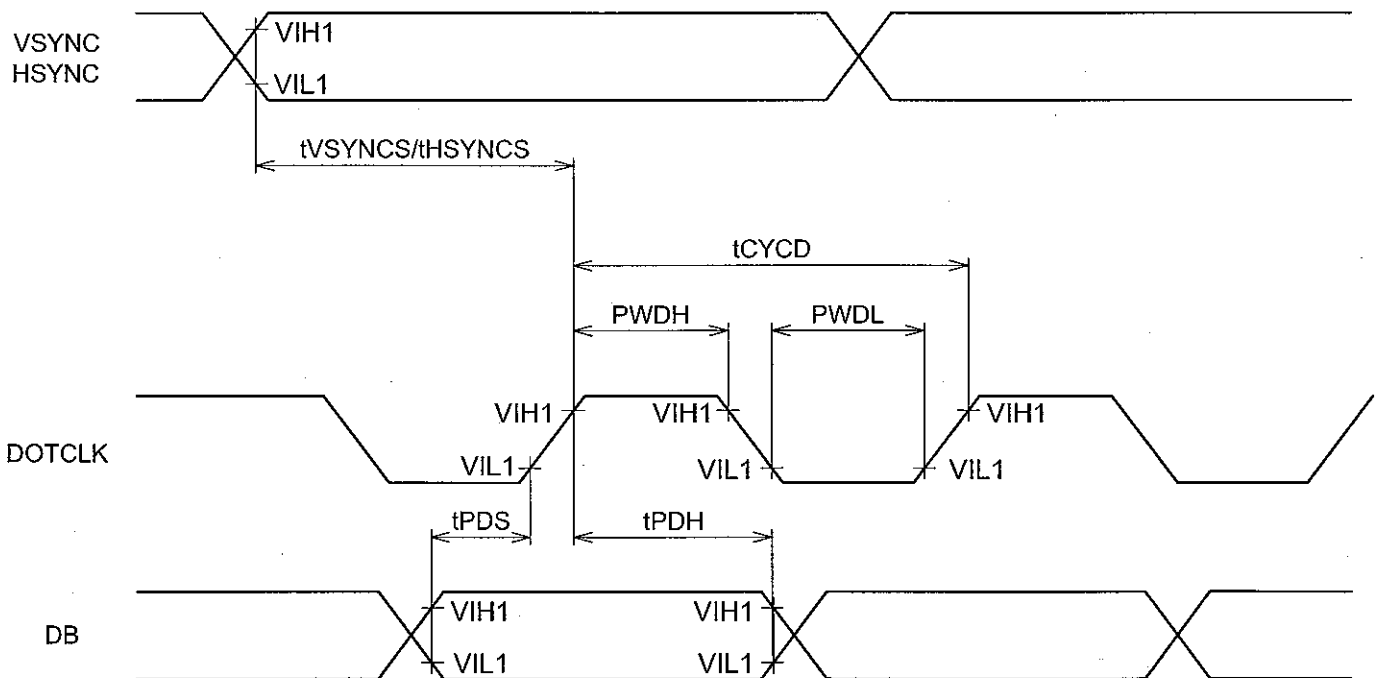
7. BLOCK DIAGRAM



8. INTERFACE TIMING

8.1 INTERFACE TIMING

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
DOTCLK Cycle Time	tCYCD	83	-	-	ns	1 trans
		60	-	-		3 trans
DOTCLK Low Level Pulse Width	PWDL	25	-	-	ns	-
DOTCLK High Level Pulse Width	PWDL	25	-	-	ns	-
VSYNC Setup Time	tVSYNCS	0	-	1	clock	-
HSYNC Setup Time	tHSYNCS	0	-	1	clock	-
RGB Data Setup Time	TPDS	10	-	-	ns	-
RGB Data Hold Time	TPDH	20	-	-	ns	-
DOTCLK/VSYNC/HSYNC Rising Edge , Falling Edge Time	trgbr / trgbf	-	-	20	ns	-

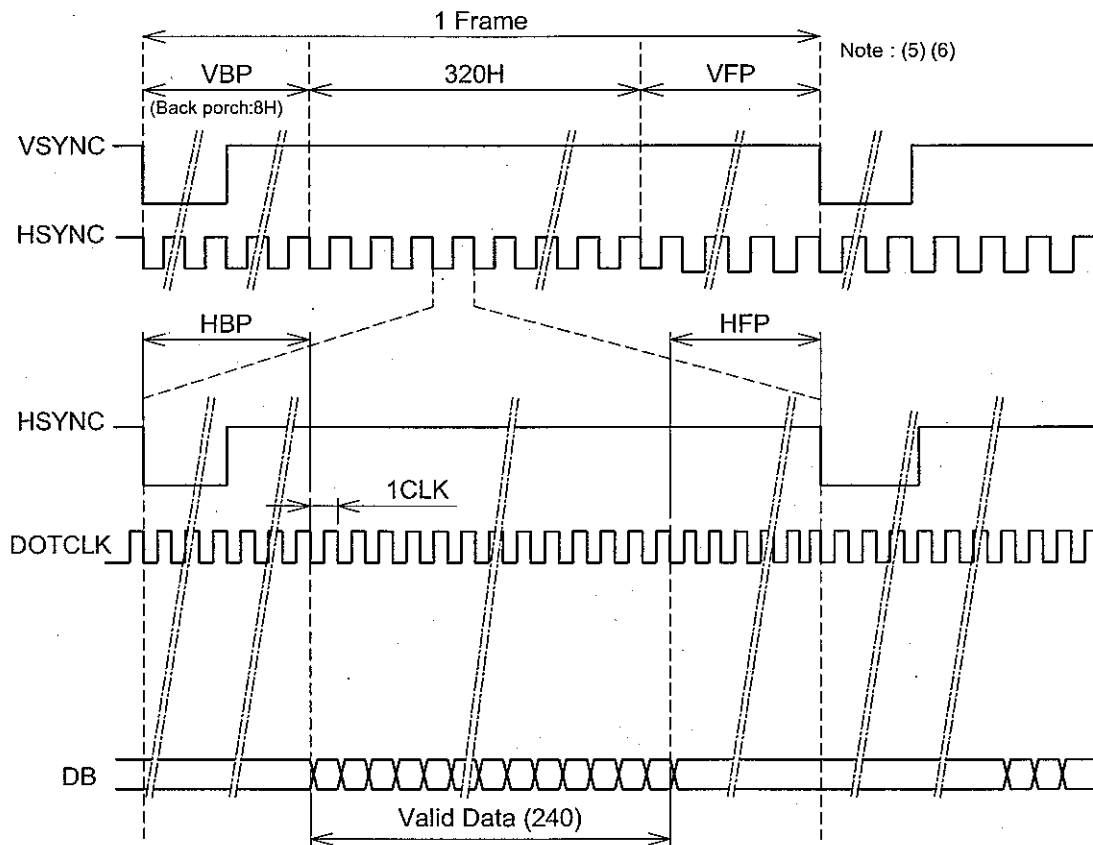


8.2 TIMING CHART

	SYMBOL	MIN.	TYP.	MAX.	UNIT
Back porch for Horizontal	HBP	-	12	-	Clock
Front porch for Horizontal	HFP	15	18 Note(1)	21	Clock
Back porch for Vertical	VBP	-	8 Note(3)	-	HSYNC
Front porch for Vertical	VFP	17	(20) Note(2)	22	HSYNC

Note(1) : (DOTCLK total) - ((Valid data period for Horizontal) + (HBP))

(2) : (HSYNC total) - ((Active Area period) + VBP)



(3) Note about VSYNC timing setting

Check the timing chart of VSYNC and HSYNC , If timing setting is not set as fig1, it must be set as fig2 .

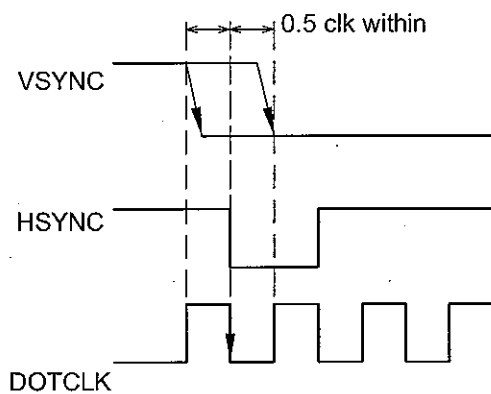


fig1. VSYNC timing

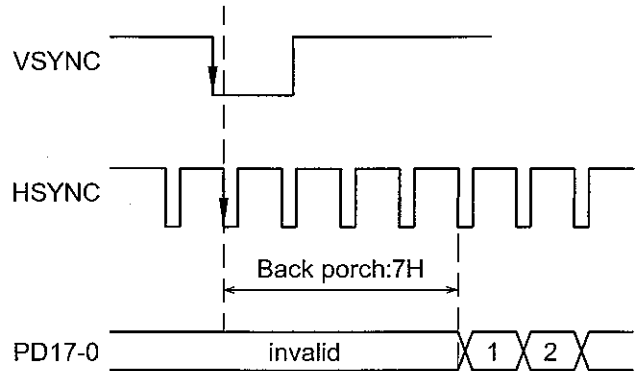
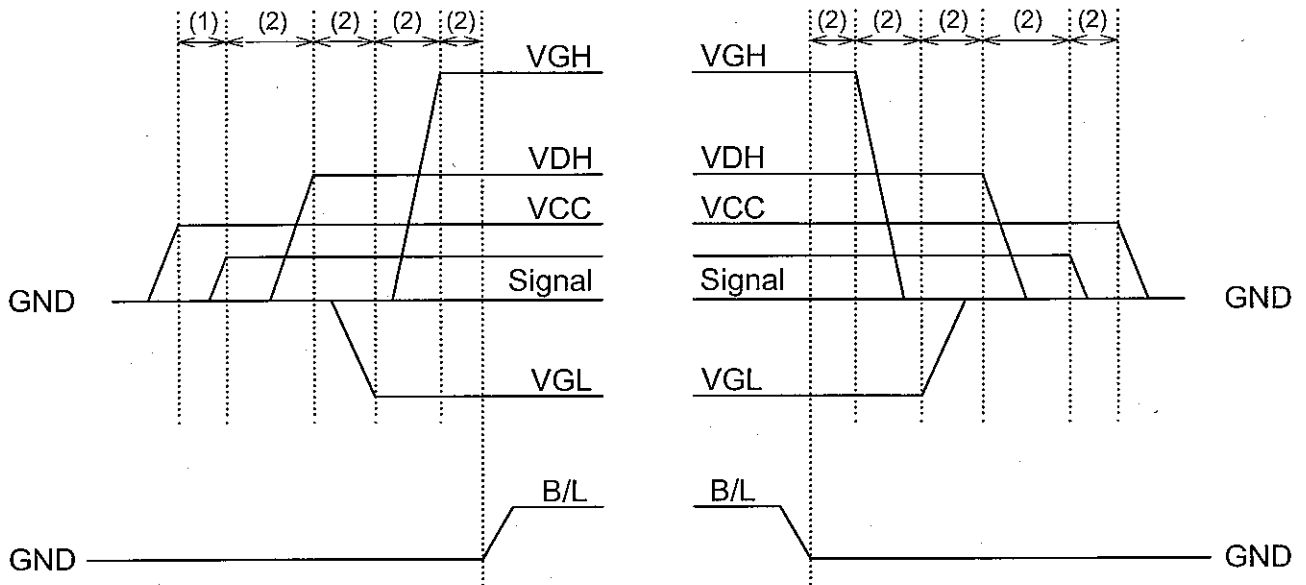


fig2. Vertical back porch regulation

- (4) The DOTCLK signal must be supplied consecutively.
- (5) Front and back porch (VBP , VFP) must be set before and after the display operation period.
- (6) The front porch period continues until the next input of VSYNC signal.

8.3 POWER ON/OFF SEQUENCE



- (1) : VCC must be in stable situation ($VCC \geq 2.7v$), then Signal can be input.
 The period for (1) is $t > 0ms$ min.
- (2) : $t > 0ms$.

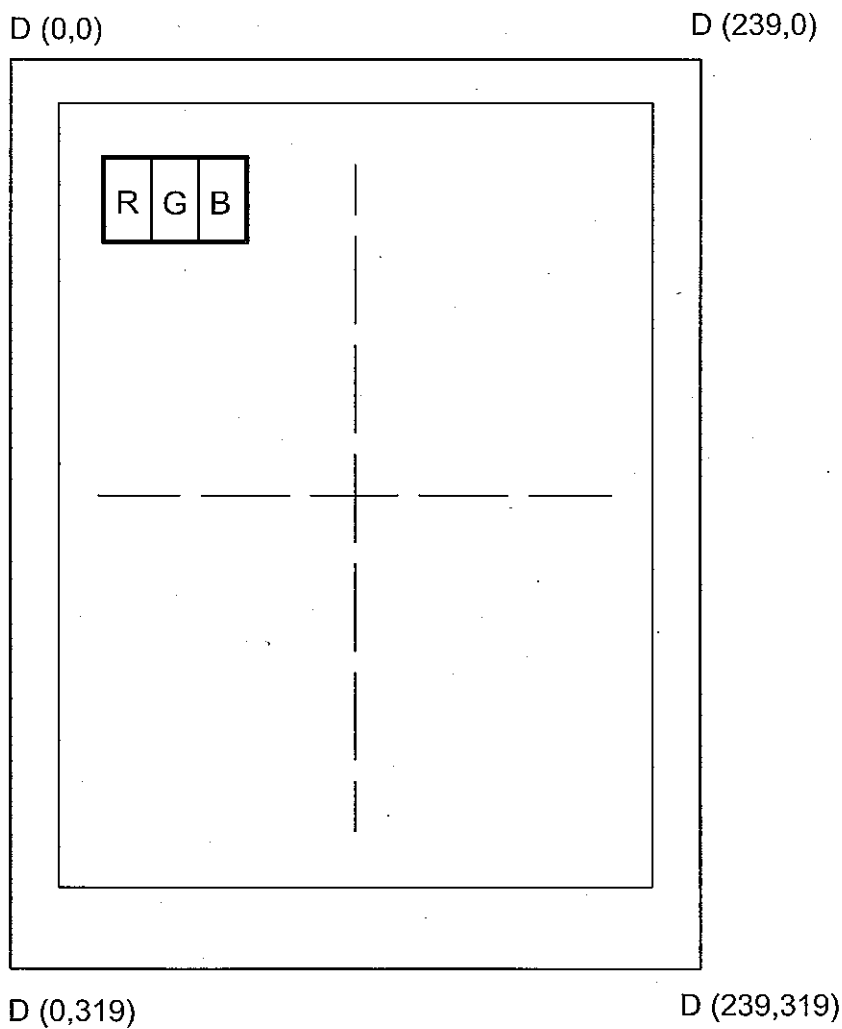
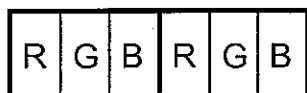
8.4 RELATIONSHIP BETWEEN DISPLAYED COLOR AND INPUT DATA

8.4.1 Display Colors

Input color		Red Data						Green Data						Blue Data					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB			LSB			MSB			LSB			MSB			LSB		
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(61)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(2)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(61)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(2)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

8.4.2 Data address

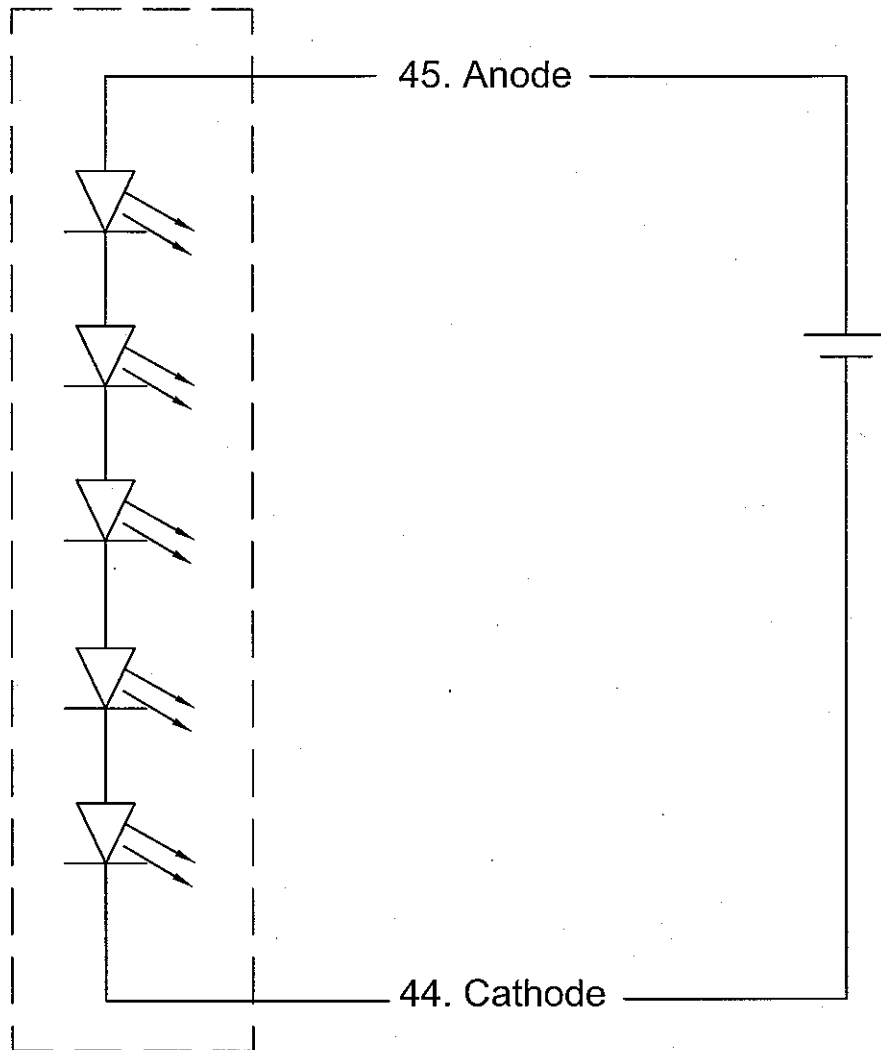
D (0,0) D (1,0)



Top View

8.5 POWER SUPPLY CIRCUIT FOR LED BL

LED B/L

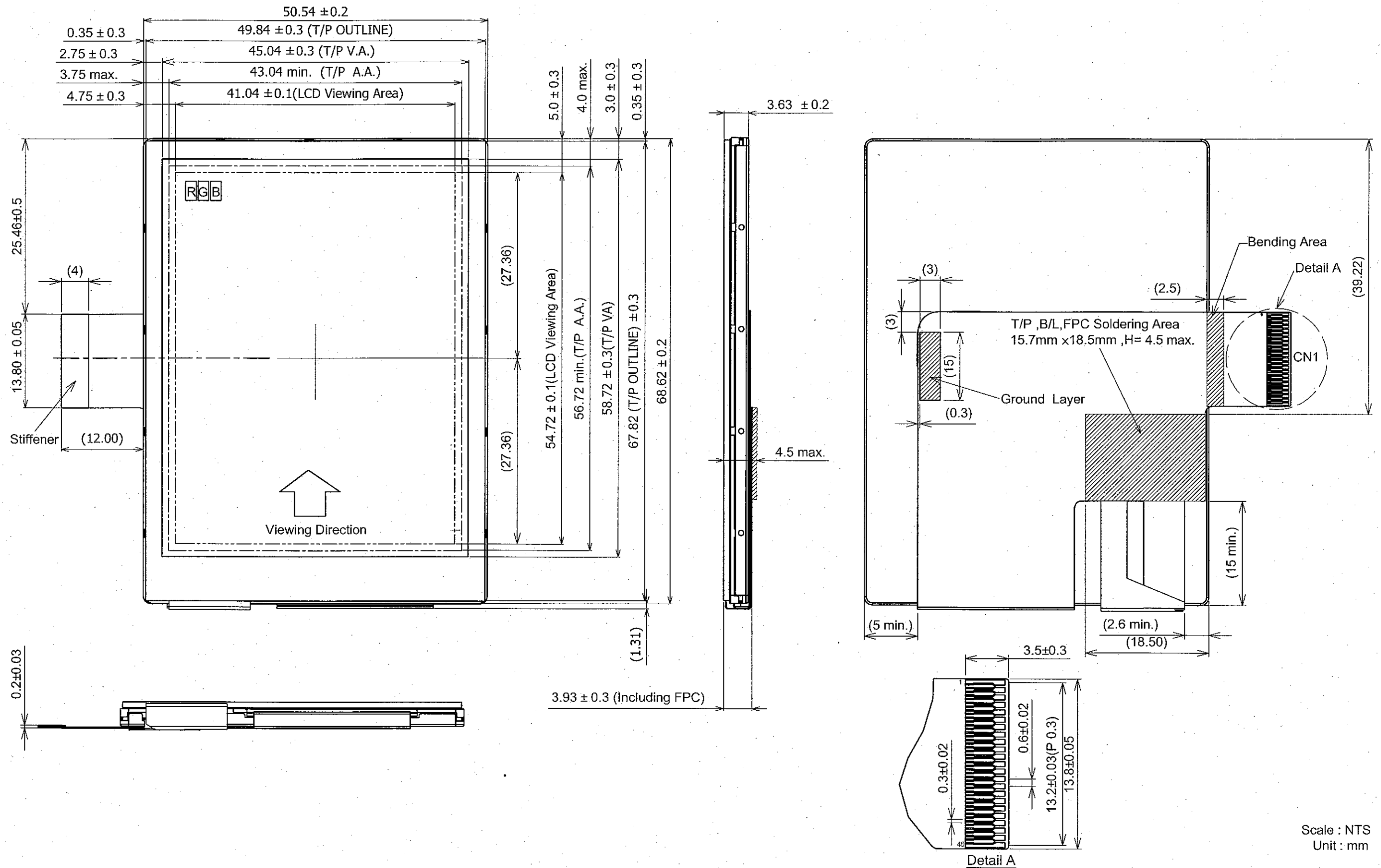


8.5 INTERNAL PIN CONNECTION

CN1 (FPC) : Adaptable socket : FH23-45S-0.3SHW(Hirose Electric Co.,Ltd)

PIN No.	SIGNAL	FUNCTION
1	VSS	Ground
2	VCOM	Common electrode
3	VSS	Ground
4	MOUT	Alternating signal for Vcom output
5	VSS	Ground
6	NC	No connection
7	NC	No connection
8	NC	No connection
9	VCC	Power Supply Voltage for logic
10	DCLK	Dot clock signal
11	NC	No connection
12	VSS	Ground
13	D20	(LSB)
14	D21	Red Data
15	D22	
16	D23	
17	D24	
18	D25	
19	D10	(LSB)
20	D11	Green Data
21	D12	
22	D13	
23	D14	
24	D15	
25	D00	(LSB)
26	D01	Blue Data
27	D02	
28	D03	
29	D04	
30	D05	
31	VSS	Ground
32	VDH	Power Supply Voltage for source Dr. and Vcom
33	HSYNC	Horizontal Sync Signal
34	VGL	Power Supply for Gate Driver (Low)
35	NC	No Connection
36	VGH	Power Supply for Gate Driver (High)
37	VSYNC	Vertical Sync Signal
38	VSS	Ground
39	YU	Touch Panel Upper Side
40	XR	Touch Panel right Side
41	YD	Touch Panel Lower Side
42	XL	Touch Panel Left Side
43	VSS	Ground
44	CATHODE	Supply voltage for LED
45	ANODE	Supply voltage for LED

9. DIMENSIONAL OUTLINE



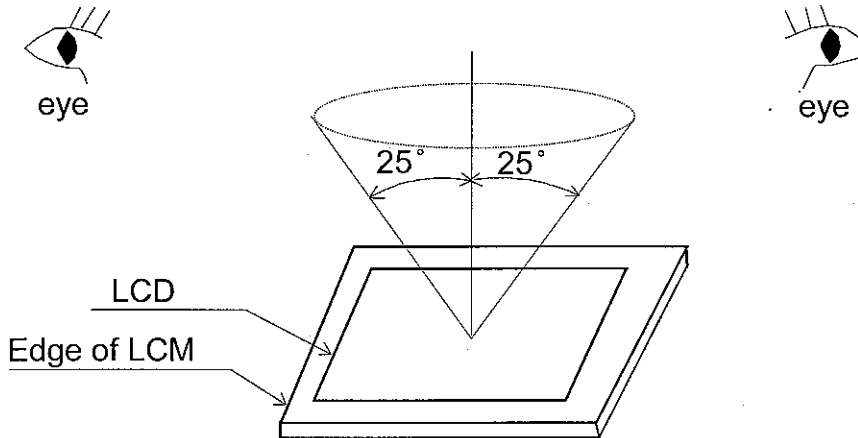
Scale : NTS
Unit : mm

10. APPEARANCE STANDARD

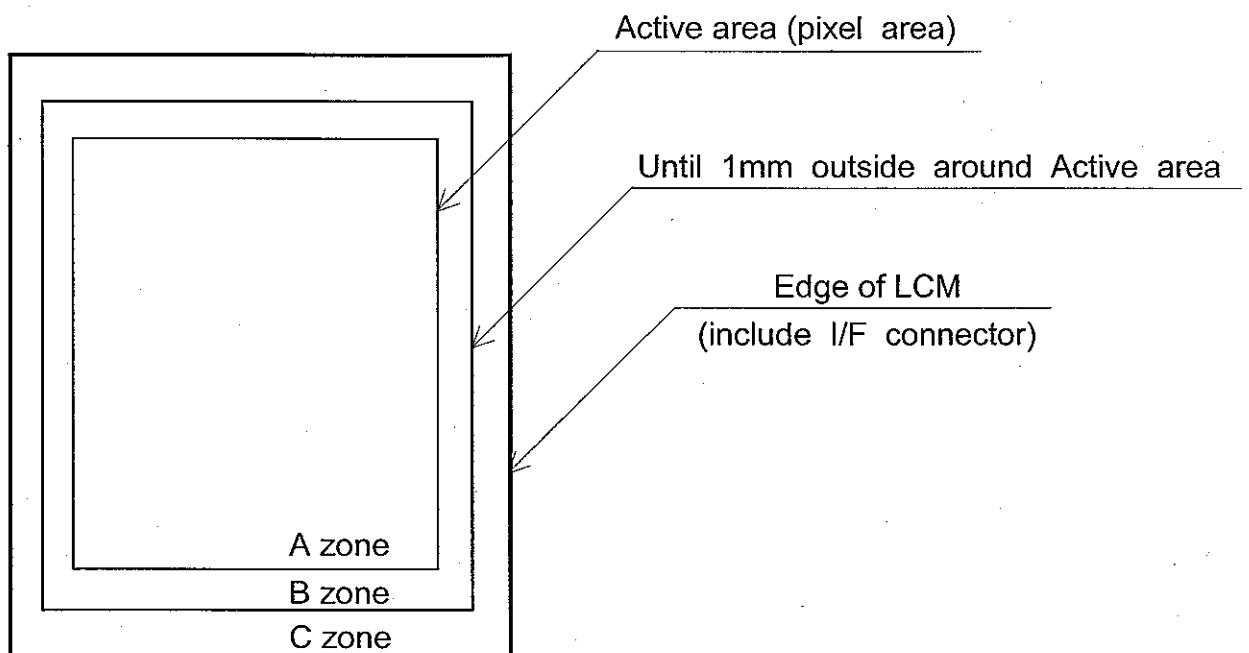
10.1 APPEARANCE INSPECTION CONDITION

Visual inspection should be done under the following condition.

- (1) The inspection should be done in a dark room.(More than 1000lx) and non-directive)
- (2) The distance between eyes of an inspector and the LCD module is 30cm.
- (3) The viewing zone is shown the figure.
Viewing angle $\leq 25^\circ$



10.2 DEFINITION OF ZONE



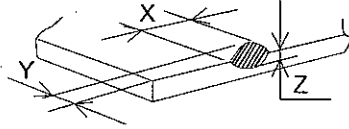
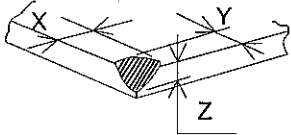
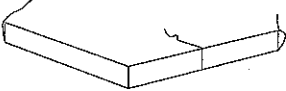
10.3 APPEARANCE SPECIFICATION

(1) LCM Appearance

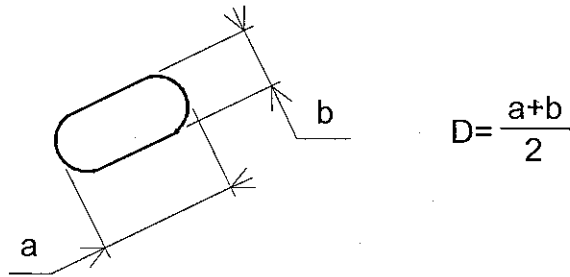
*) If the problem related to this section occurs about this item, the responsible persons of both party (Customer and HITACHI) will discuss the matter in detail.

No.	ITEM	CRITERIA			APPLIED ZONE
L C M	Scratches	Length L(mm)	Width W(mm)	Maximum number acceptable	A,B
		$L < 2.0$	$W \leq 0.03$	ignored	
	Dent	Distinguished one is acceptable (To be judged by limit sample (Note4))			A
	Wrinkles in Polarize	Same as above			A
	Stains Foreign Materials Bubbles Dark spot	Filamentous (Line shape)			A,B
		Length L(mm)	Width W(mm)	Maximum number acceptable	
		$L \leq 0.5$	$W \leq 0.1$	ignored	
		$0.5 \leq L \leq 2.5$	$W \leq 0.1$	3	
		$2.5 < L$	$W > 0.1$	none	
		Round(Dot shape)			
		Average diameter D(mm)	Maximum number acceptable		
		$D \leq 0.2$	ignored		
	$0.2 < D \leq 0.4$	3			
	$0.4 < D$	none			
		Those wiped out easily are acceptable			
	Color Tone	To be judged by limit sample (Note4)			A
Color Uniformity	Same as above			A	
Newton Ring (Touch Panel)	To be judged by limit sample (Note4)			A,B	
Touch Panel Uncleanness	No conspicuous dirt			A	
Rubbing Scratch	To be judged by limit sample (Note4)			-	
L C D	Line Defect	Not allowed			A
	Bright Dots	Red + Green + Blue	-	≤ 4 dots	
		Red + Green + Blue	Linked 2 dots	≤ 2 set	
			Linked 3 or more dots	0 set	
	Dark Dots	Black	-	≤ 4 dots	
			Linked 2 dots	≤ 2 set	
			Linked 3 or more dots	0 set	
Total	Bright dots + Dark dots		≤ 6 dots		

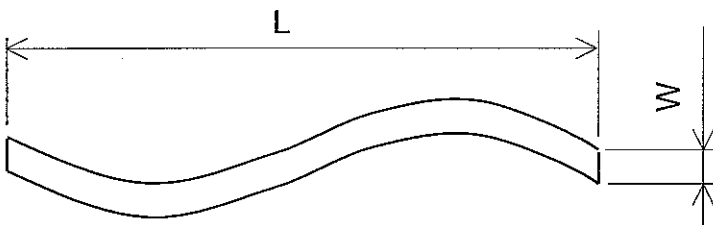
(2) Glass indentation

ITEM	SPECIFICATIONS						
Common Indentation	 <table border="1" data-bbox="1094 282 1390 383"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>≤ 5.0</td> <td>≤ 1.0</td> <td>$\leq t$</td> </tr> </table>	X	Y	Z	≤ 5.0	≤ 1.0	$\leq t$
X	Y	Z					
≤ 5.0	≤ 1.0	$\leq t$					
Corner Broken	 <table border="1" data-bbox="1094 481 1390 582"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>≤ 2.0</td> <td>≤ 2.0</td> <td>$\leq t$</td> </tr> </table>	X	Y	Z	≤ 2.0	≤ 2.0	$\leq t$
X	Y	Z					
≤ 2.0	≤ 2.0	$\leq t$					
Proceeding Crack	 <p data-bbox="1043 734 1123 768">None</p>						

Note 1 : Definition of average diameter (D)



Note 2 : Definition of length (L) and width (W)



Note 3 : Definition of dot defect

- (a) Regardless of bright or intermittent bright , 1/3 or more defects of a dot area is counted as the defect dot.
- (b) Bright dots are measured while the display is black.
- (c) Dark dots are measured while the display is illuminated with red , green and blue.
- (d) The pattern of linked 2 dots is as follows.

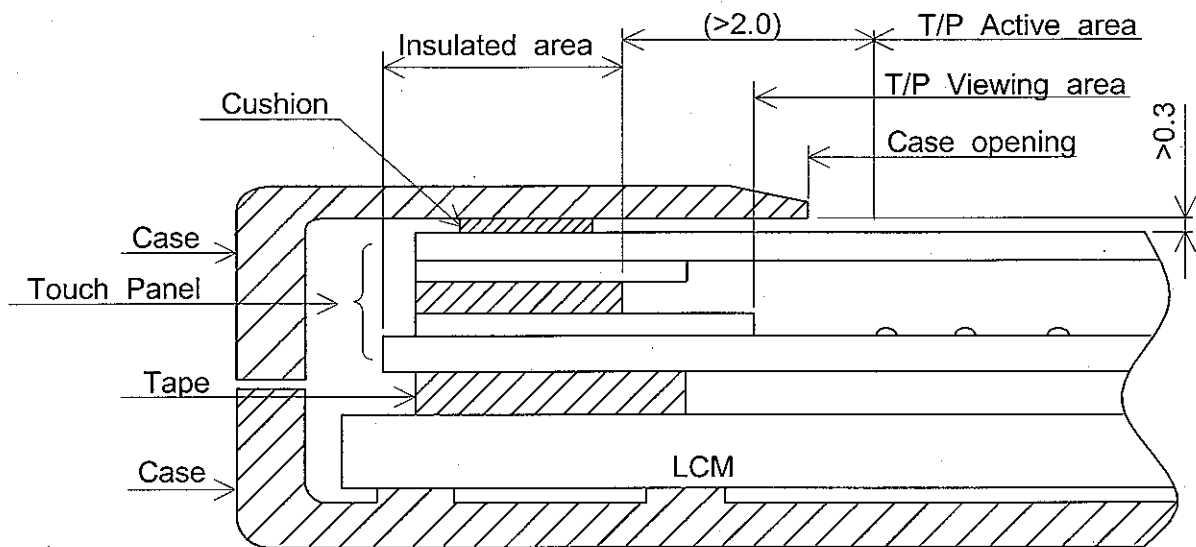
: Bright dot	: Dark dot		
The pattern of linked 2 dots			

Note 4 : When problem occurred, it judged the basis of both company deliberation after limit sample creation.

11. PRECAUTION IN DESIGN

11.1 MOUNTING PRECAUTION

(1) When assembling the Touch Panel and you case, please refer to the figure below.



- (2) The clearance between the Touch Panel and case shall be designed so that the case edge never presses the input screen when it is deformed by heat or other causes.
- (3) The case shall be designed not to touch the tail portion (FPC for Touch Panel).
- (4) The boundary space between the effective area and the insulated area is unstable. Touching this area may effect the operation of the Touch Panel. The case must be designed so that it does not touch the boundary space.

11.2 PRECAUTIONS AGAINST ELECTROSTATIC DISCHARGE

As this module contains C-MOS LSIs, it is not strong against electrostatic discharge. Make certain that the operator's body is connected to the ground through a list band, etc. And don't touch I/F pins directly.

11.3 HANDLING PRECAUTIONS

- (1) Since the Touch Panel on the top, and the frame on the bottom tend to be easily damaged, they should be with full care so as not to get them touched, pushed or rubbed by a piece on glass, tweezers and anything else which are harder a pencil lead 3H.

- (2) As the adhesives used for adhering upper/lower polarizer's and frame are made of organic substances which will be deteriorated by a chemical reaction with such chemicals as acetone, toluene, ethanol and isopropyl alcohol. The following are recommended for use :
normal hexane

Please contact with us when it is necessary for you to use chemicals other than the above.

- (3) Lightly wipe to clean the dirty surface with absorbent cotton or other soft material like chamois, soaked in the recommended chemicals without scrubbing it hardly.

Always wipe the surface horizontally or vertically. Never give a wipe in a circle. To prevent the display surface from damage and keep the appearance in good state, it is sufficient, in general, to wipe it with absorbent cotton.

- (4) Immediately wipe off saliva or water drop attached on the display area because it may cause deformation or faded color.

- (5) Foggy dew deposited on the surface may cause a damage, stain or dirt to the polarizer.

When you need to take out the LCD module from some place at low temperature for test, etc.

It is required to be warmed them up to temperature higher than room temperature before taking them out.

- (6) Touching the display area or I/F pins with bare hands or contaminating them are prohibited, because the stain on the display area and poor insulation between terminals are often caused by being touched with bare hands.

(Some cosmetics are detrimental to polarizer's.)

- (7) In general, the glass is fragile so that, especially on its periphery, tends to be cracked or chipped in handling. Please not give the LCD module sharp shocks by falling , etc.

- (8) Maximum pressure to the surface must be less than 1.96×10^4 Pa.

And if the pressure area is less than 1cm^2 , maximum pressure must be less than 1.96N.

- (9) Top sheets shall be cleaned gently using a soft cloth such as those used for glasses.

Hard wiping accumulated dust will leave scars on the surface even using a cloth.

11.4 OPERATION PRECAUTION

- (1) Using a LCM module beyond its maximum ratings may result in its permanent destruction.

LCM module's should usually be used under recommended operating conditions shown in chapter 4 and chapter 5. Exceeding any of these conditions may adversely affect its reliability.

- (2) Response time will be extremely delayed at lower temperature than the specified operating temperature range and on the other hand LCD's shows dark blue at higher temperature.
However those phenomena do not main defects of the LCD module. Those phenomena will disappear in the specified operating temperature range.
- (3) If the display area is pushed hard during operation, some display patterns will be abnormally display.
- (4) A slight dew depositing on terminals may cause electrochemical reaction which leads to terminal open circuit. Please operate the LCD module under the relative condition of 40°C 85%RH.
- (5) Resistance range : Your controller shall be set up to allow the resistance range of Touch Panel specified in our CAS.
- (6) Pointed position of Touch Panel may shift owing to a change in resistance of Touch Panel depending on the operation condition . To compensate this shift, the set shall be given a calibration function.
- (7) Input shall be made with a stylus pen (polyacetal , R0.8). Chances are very high that use of a metal piece including a ball point pen or sharp edge will impair accuracy.
- (8) The Touch Panel is an auxiliary input device. The system shall be designed to have other input device.

11.5 STORAGE

In case of storing LCD module for a long period of time (for instance, for years) for the purpose of replacement use, the following precautions necessary.

- (1) Store the LCD modules in a dark place; do not expose them to sunlight or ultraviolet rays.
- (2) Keep the temperature between -30°C and 80°C at normal humidity.
- (3) Store the LCD modules in the container which is used for shipping from us.
- (4) No articles shall be left on the surface over an extended period of time.

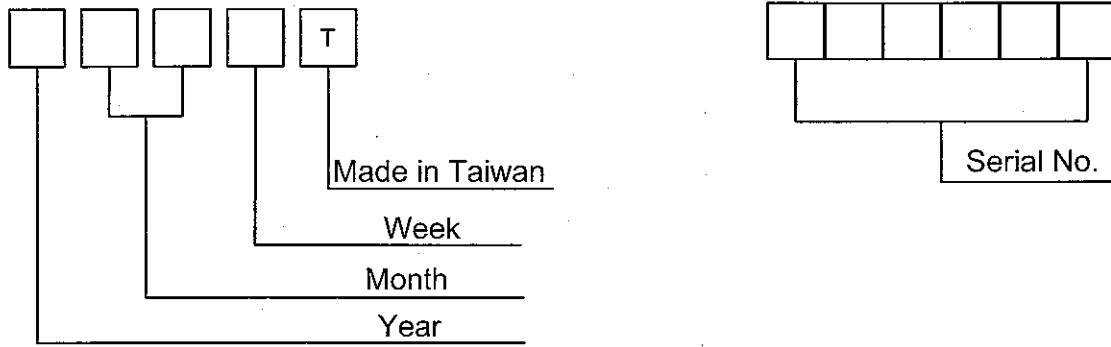
11.6 SAFETY

Wear finger cots or gloves whenever handling or assembling a Touch Panel, its glass edges are sharp.

12. DESIGNATION OF LOT MARK

12.1 LOT MARK

Lot mark is consisted of 4 digits for production lot and 6 digits for production control..

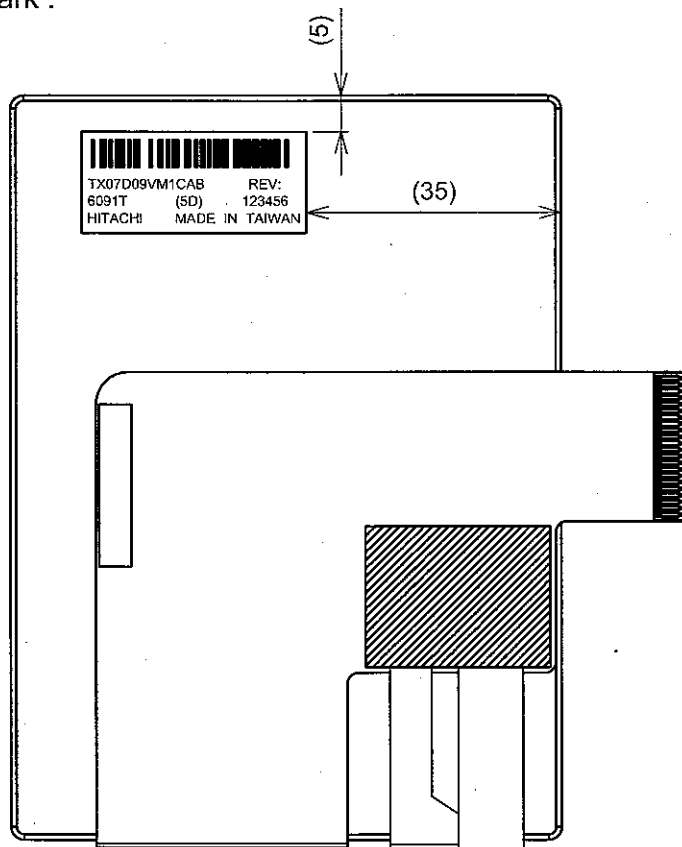


Year	Mark
2007	7
2008	8
2009	9
2010	0
2011	1

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.
Mark	01	02	03	04	05	06
Month	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	07	08	09	10	11	12

Week (Day In Calendar)	Figure In Lot Mark
01~07	1
08~14	2
15~21	3
22~28	4
29~31	5

12.2 Location of lot mark :



13. PRECAUTION FOR USE

(1) A limit sample should be provided by the both parties on an occasion when the both parties agree to its necessity.

Judgement by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

(2) On the following occasions, the handling of the problem should be decided through discussion and agreement between responsible persons of the both parties.

1) When a question is arisen in the specifications.

2) When a new problem is arisen which is not specified in this specifications.

3) When an inspection specifications change or operating condition change by customer is reported to HITACHI, and some problem is arisen in the specification due to the change.

4) When a new problem is arisen at the customer's operating set for sample evaluation.

(3) Regarding the treatment for maintenance and repairing, both parties will discuss it in six months later after latest delivery of this product.

The precaution that should be observed when handling LCM have been explained above.

If any points are unclear or if you have any requests, please contact with HITACHI.

14. RELIABILITY TEST

TEST ITEM	CONDITION	JUDGEMENT NOTE
High Temperature and Humidity (Operation)	● 40±2°C, RH=85%, 250 hours	No display malfunctions
Heat Cycle (Operation)	● -20±3°C...1hour, 70±3°C...1 hour ● 30 cycles, 8 hours / cycle	
Thermal Shock (Storage)	● -30±3°C...30 minutes, 80±3°C...30 minutes ● 100 cycles, 1 hour / cycle ● Temperature transition time is within 4 minutes	
High Temperature (Storage)	● 80±3°C...100 hours	
Low Temperature (Storage)	● -30±3°C...48 hours	
High Temperature (Operation)	● 70±3°C...48 hours	
Low Temperature (Operation)	● -20±3°C...100 hours	
ESD (Storage)	● 200pF, 0Ω, (±15)kV, 70%RH ● 9 places on a panel surface ● 3 times each places at 1 sec interval	
Vibration (Storage)	● 5 to 100Hz, (11.76)m/s ² ● X, Y, Z direction ● 1 times each directions	No display malfunctions No physical damages
Shock (Storage)	● (490) m/s ² , 10ms ● ±X, ±Y, ±Z direction ● 1 times each directions	

Note1 : Condensation of water is not permitted on the module.

Note2 : The module should be inspected after 1 hour storage in room conditions.