HITACHI

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FOR MESSRS : _____ DATE : Nov.23,2007

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

TX11D01VM2APA

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

ACCEPTED BY: _____ PROPOSED BY: Dan Cheng

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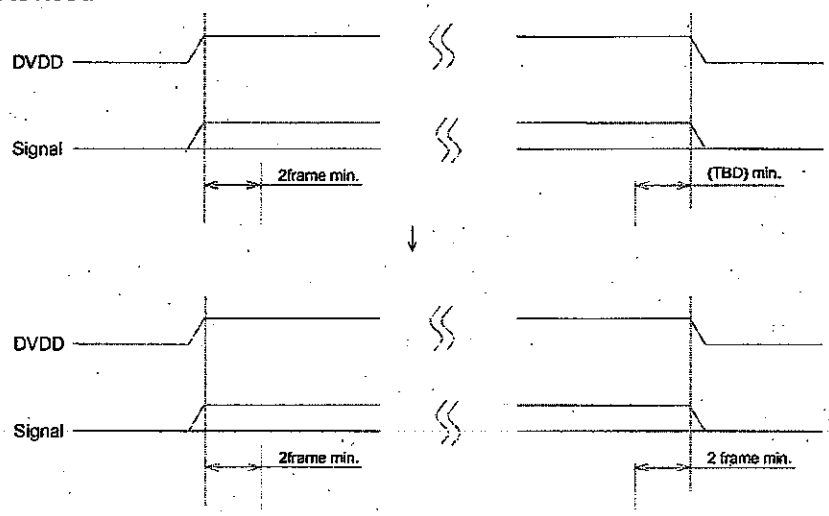
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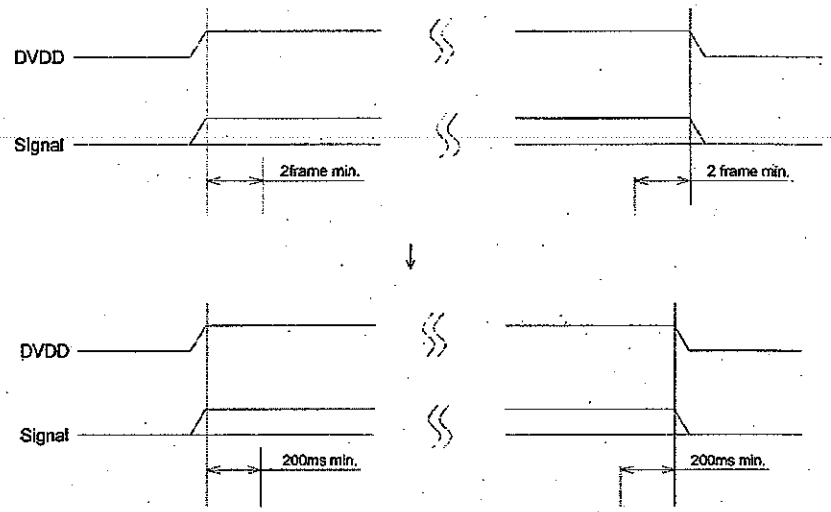
Nov.23,'07	7B64PS 2708 – TX11D01VM2APA-3 PAGE 8-4/8	8.3 POWER ON/OFF SEQUENCE Revised 
	7B64PS 2709 – TX11D01VM2APA-3 PAGE 9-1/1	9. DIMENSIONAL OULINE Modify Label potion from left side to right side.
	7B64PS 2712 – TX11D01VM2APA-3 PAGE 12-1/1	12. DESIGNATION OF LOT MARK Revised REV.A to REV.B for change frame metal of BL.

3.GENERAL DATA

The specifications are applied to the following 4.3"TFT-LCD (Transmissive Amorphas Silicon TFT) module with Back-light unit.

(1)	Part Name	TX11D01VM2APA
(2)	Module Dimensions	105.5(W)mm x 67.2(H)mm x 3.9(D)mm typ. (Except FPC Area)
(3)	Effective Display Area	95.04(W)mm x 53.856(H)mm (Diagonal:11cm)
(4)	Dot Pitch	0.066mm x 3(R,G,B)(W) x 0.198(H)mm
(5)	Resolution	480 x 3(R,G,B)(W) x 272 (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	16.7^{M} Colors (R,G,B 8 Bit Digital each)
(10)	Backlight	Light Emitting Diode (LED) x 10
(11)	Weight	(56)g
(12)	Interface	45 pin C-MOS
(13)	Viewing Direction	12 O'clock (The direction it's hard to be discolored)
(14)	Touch Panel	Resistance type. The surface is anti-glare.

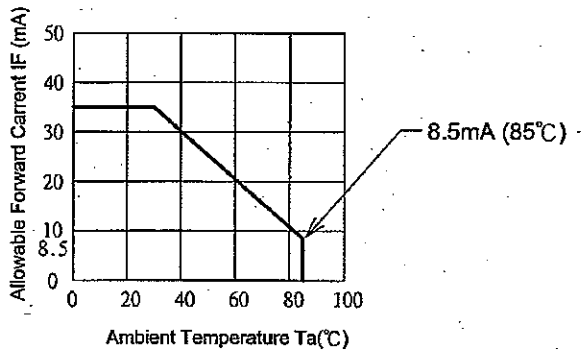
4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS OF LCD

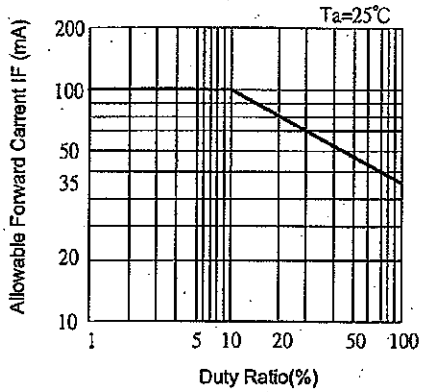
ITEM		SYMBOL	MIN.	MAX.	UNIT	REMARKS
Power Supply for Logic		DVDD	-0.3	6.0	V	
Input Voltage		V_i	0	DVDD	V	(1)
LED	Forward Current	IF	-	35	mA	(2)
	Pulse Forward Current	I_{FP}	-	100	mA	(3)
	Reverse Voltage	V_R	-	5	V	
Static Electricity		-	-	±15	kV	(4) (5)

Note (1) Hsync, Vsync, CLK , R0~R7 , G0~G7 , B0~B7

(2)



(3) IFP Conditions : pulse width≦10ms and Duty≦1/10



(4) Make certains 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

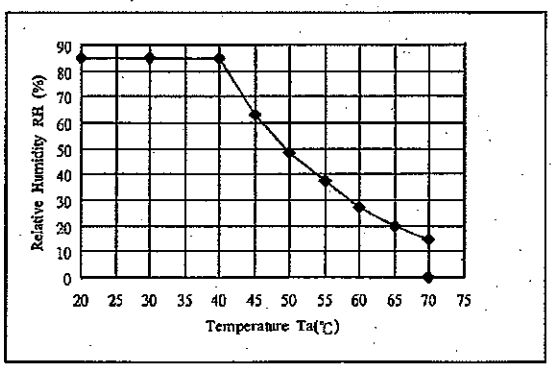
ITEM	SPECIFICATION	UNIT	CONDITION	REMARKS
Supply Voltage	7.0	V	DC	
Endurance Voltage	25	V	DC	(Note 1)

Note 1 : Waiting 1 minute.

4.3 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		REMARKS
	Min.	Max.	Min.	Max.	
Ambient Temperature	-20℃	70℃	-30℃	80℃	(Note 2,3,6,7,9,10)
Humidity	(Note 1)		(Note 1)		Without condensation
Vibration	-	$(2.45)m/s^2$ (0.25G)	-	$(11.76)m/s^2$ (1.2G)	(Note 4,5)
Shock	-	$(29.4)m/s^2$ (3G)	-	$(490)m/s^2$ (50G)	(Note 5,8)
Corrosive Gas	Not Acceptable		Not Acceptable		

Note 1 : Ta≦40℃ : 85%RH max.
Ta>40℃ : Absolute humidity must be lower than the humidity of 85%RH at 40℃, as follow diagram.



Note 2 : For storage condition Ta at -30℃ < 48h , at 80℃ < 100h.
For operating condition Ta at -20℃ <100h
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 guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25℃.
Note 8 : Pulse Width : 10ms
Note 9 : This is panel surface temperature , not ambient temperature.
Note 10 : If LED is drove 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℃, VSS=0V

I T E M	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Power Supply Voltage for logic	DVDD	-	2.7	3.0	3.3	V
Input voltage for logic (note 1)	Vi	"H" level	0.7DVDD	-	DVDD	V
		"L" level	VSS	-	0.3DVDD	
Power Supply Current (note 2)	IDD	DVDD-VSS=(3.0)V	-	38	48	mA
Vsync Frequency	fV	-	56.2	60	79.2	Hz
Hsync Frequency	fH	-	16.2	17.14	22.8	kHz
DCLK Frequency	fCLK	-	8.5	9.0	12	MHz

Note 1 : CLK, R0~R7, G0~G7, B0~B7.
Note 2 : fV=60Hz, Ta=25℃, Pattern used as display pattern : All black.

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

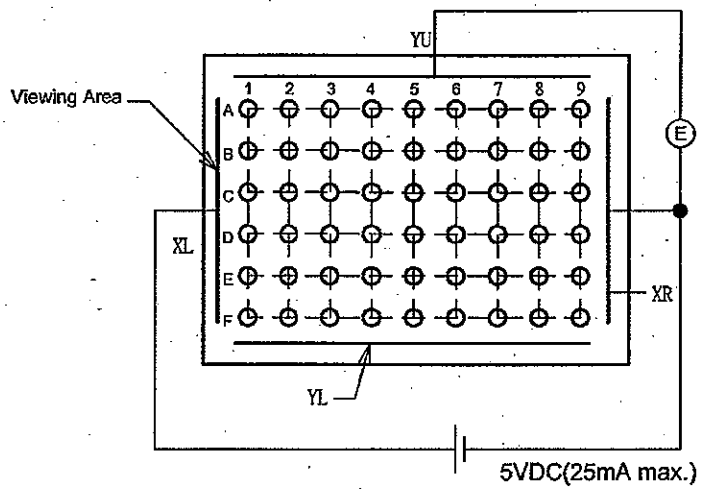
ITEM		SPECIFICATION	UNIT
Resistance between Terminal	XR - XL	430~1310	ohm
	YU - YL	160~600	ohm
Insulance Resistance (Note 1)	X - Y	10M min.	ohm
Linearity (Note 2,3)	X	1.5 max.	%
	Y	1.5 max.	%
Chattering		10 max.	ms

Note 1 : Operating Voltage 25V DC.

Note 2 : Test Condition.

(a) Y axis linearity testing method (with tip radius 0.8, polaycetal pen). VXL-XR=5V , VOUT=VYU.

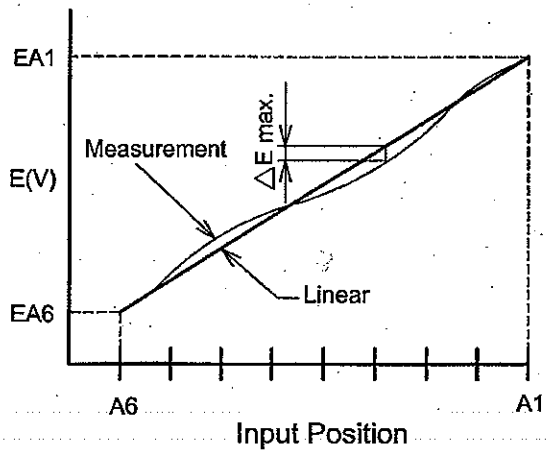
(b) X axis linearity method VYU-YL=5V , VOUT=VXL.



Note 3 : Calculation

(a) Y axis linearity

$$\text{Linearity} = \frac{\triangle E \text{ max.}}{EA1 - EA9} \times 100(\%)$$



5.4 MECHANICAL CHARACTERISTICS OF TOUCH PANEL

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

6. OPTICAL CHARACTERISTICS

6.1 OPTICAL CHARACTERISTICS OF LCD (BACK LIGHT ON)

Ta=25℃

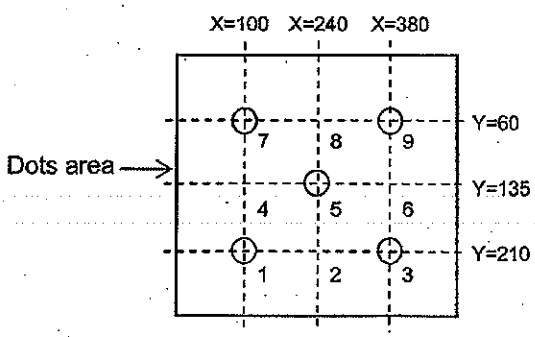
ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Brightness		B	ϕ=0° θ=0°	300	340	-	cd/m^2	(1)
Uniformity		-	ϕ=0° θ=0°	70	-	-	%	(2),(3),(4)
Viewing Angle		θx	ϕ=0°,K≧5.0	-	70	-	deg	(5),(6)
		θx'	ϕ=180°,K≧5.0	-	70	-		
		θy	ϕ=90°,K≧5.0	-	60	-		
		θy'	ϕ=270°,K≧5.0	-	80	-		
Contrast Ratio		K	ϕ=0° θ=0°	-	300	-	-	(4)
Response Time (rise-fall)		tr+tf	ϕ=0° θ=0°	-	(30)	-	ms	(8)
Color Tone (Primary Color)	Red	x	ϕ=0° θ=0°	0.55	0.60	0.65	-	(4)
		y		0.31	0.36	0.41	-	
	Green	x		0.33	0.38	0.43	-	
		y		0.50	0.55	0.60	-	
	Blue	x		0.10	0.15	0.20	-	
		y		0.04	0.09	0.14	-	
	White	x		0.28	0.33	0.38	-	
		y		0.28	0.33	0.38	-	

(Measurement condition : HITACHI standard)

Note 1 : Active area center

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

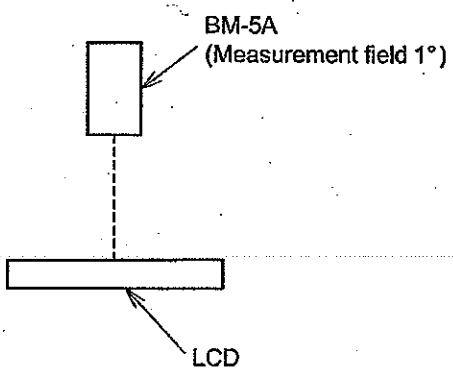
Note 2 : Driving Condition
Display Pattern : White Raster
LED Current : 20mA / Part
Measurement of the following
5 places on the display.



Note 3 : Definition of the brightness uniformity

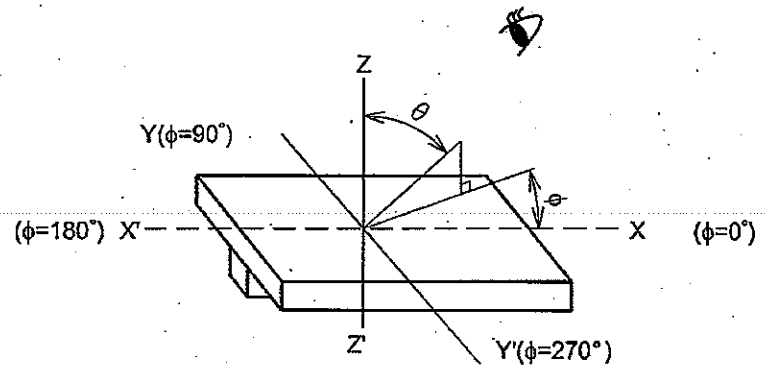
$$\left(\frac{\text{Min. brightness}}{\text{Max. brightness}}\right) \times 100$$

Note 4 : Measurement Condition

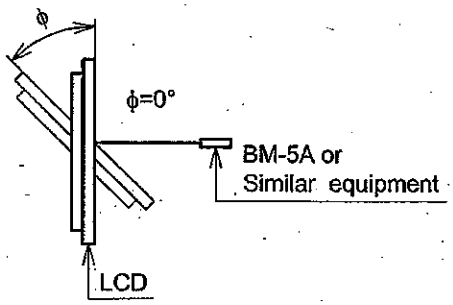


Note 5 : Definition of θ and ϕ

(Normal)
Viewing direction



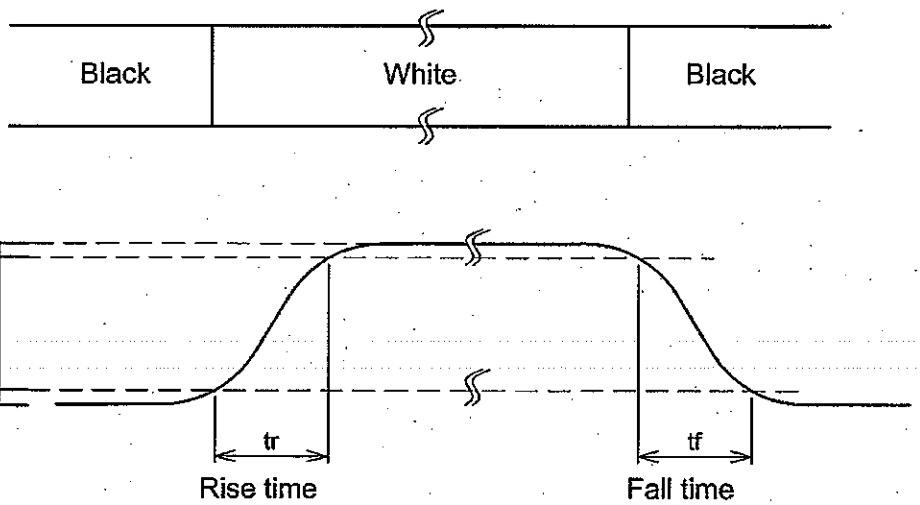
Note 6 : Definition of Viewing angle



Note 7 : Definition of contrast "K"

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

Note 8 : Definition optical response time



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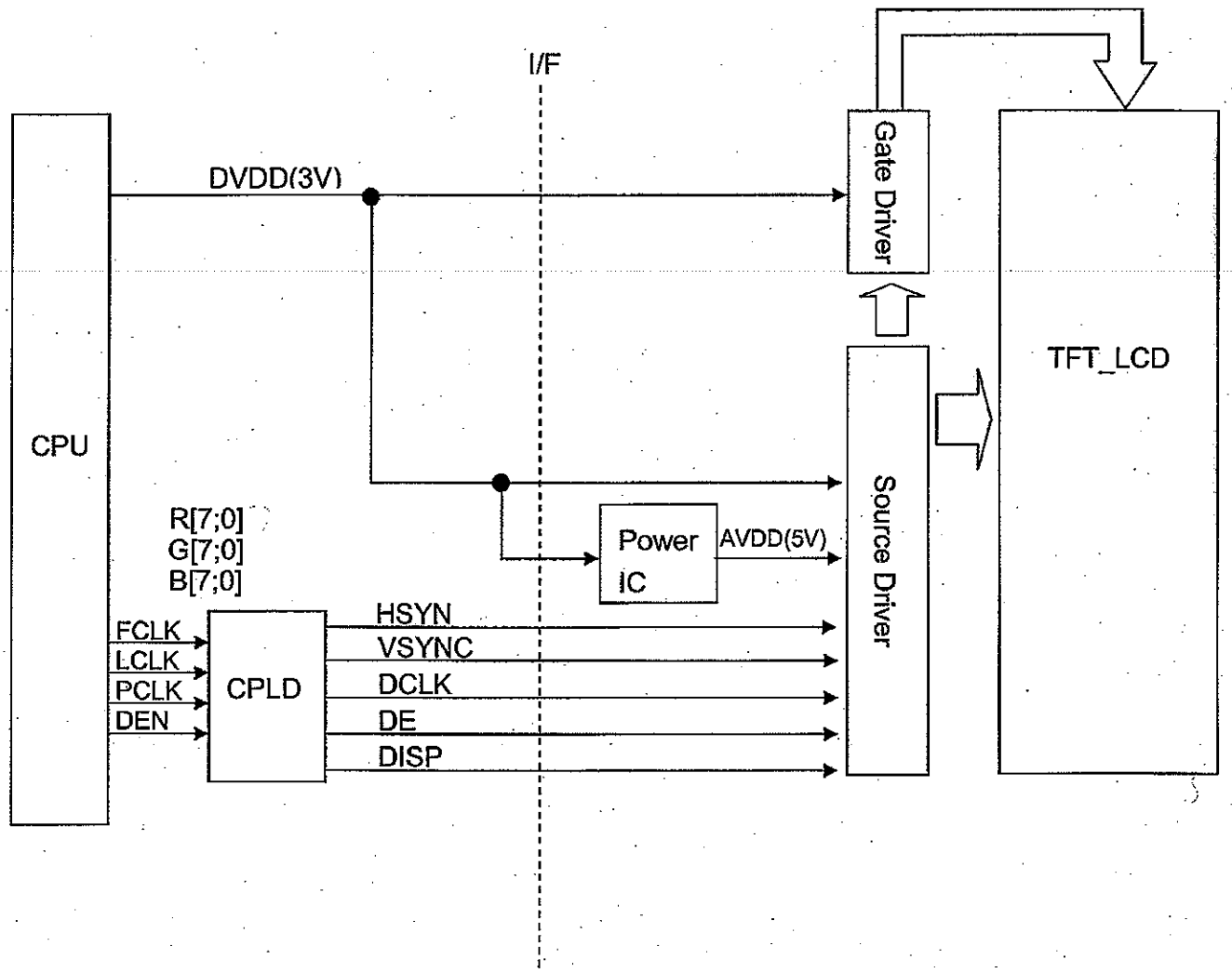
7. BLOCK DIAGRAM (FOR REFEREUCE ONLY)



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8. INTERFACE TIMING

8.1 TIMING REQUIREMENT 1

(Ta=25°C, DVDD=2.7 to 33V, DVSS=0V, tr(1)=tf(1)=2ns)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
DISP setup time	t_{diss}	(10)	-	-	ns
DISP hold time	t_{dish}	(10)	-	-	ns
Clock period	$PW_{CLK(1)}$	(66.7)	-	-	ns
Clock pulse high period	$PWH_{(1)}$	(26.7)	-	-	ns
Clock pulse low period	$PWL_{(1)}$	(26.7)	-	-	ns
Hsync setup time	t_{hs}	(10)	-	-	ns
Hsync hold time	t_{hh}	(10)	-	-	ns
Data setup time	t_{ds}	(10)	-	-	ns
Data hold time	t_{dh}	(10)	-	-	ns
DE setup time	t_{des}	(10)	-	-	ns
DE hold time	t_{deh}	(10)	-	-	ns
Vsync setup time	t_{vhs}	(10)	-	-	ns
Vsync hold time	t_{vhh}	(10)	-	-	ns

Note(1) : tr, tf is defined 10% to 90% of signal amplitude.

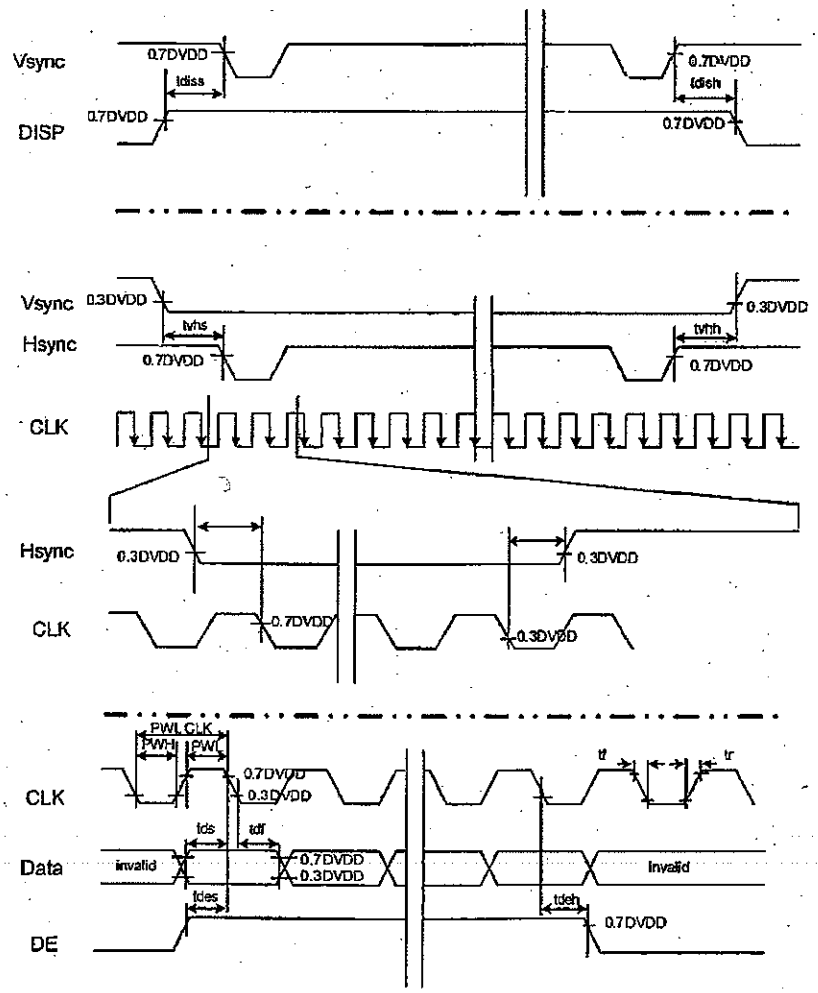


Figure 8.1 Input setup timing

8.2 TIMING REQUIREMENT 2

(480RGBx272, Ta=25°C, DVDD=2.7 to 33V, VSS=0V)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock cycle	$f_{CLK(1)}$	8.5	9	12	MHz
Hsync cycle	1/th	16.2	17.14	22.8	KHz
Vsync cycle	1/tv	56.2	60	79.2	Hz
Horizontal Signal					
Horizontal cycle	th(1)	-	525	-	CLK
Horizontal display period	thd	-	480	-	CLK
Horizontal front porch	thf	2	-	-	CLK
Horizontal pulse width	thp	2	41	-	CLK
Horizontal back porch	thb	2	2	-	CLK
Vertical Signal					
Vertical cycle	tv	-	286	-	H
Vertical display period	tvd	-	272	-	H
Vertical front porch	tvf	1	2	-	H
Vertical pulse width	tvp	1	10	-	H
Vertical back porch	tvb	1	2	-	H

Note(1) : thd=480CLK, thf=2CLK, thp=41CLK, thb=2CLK, thf + thp + thb > 44CLK, (CLK=1/f_{CLK}, H=th)

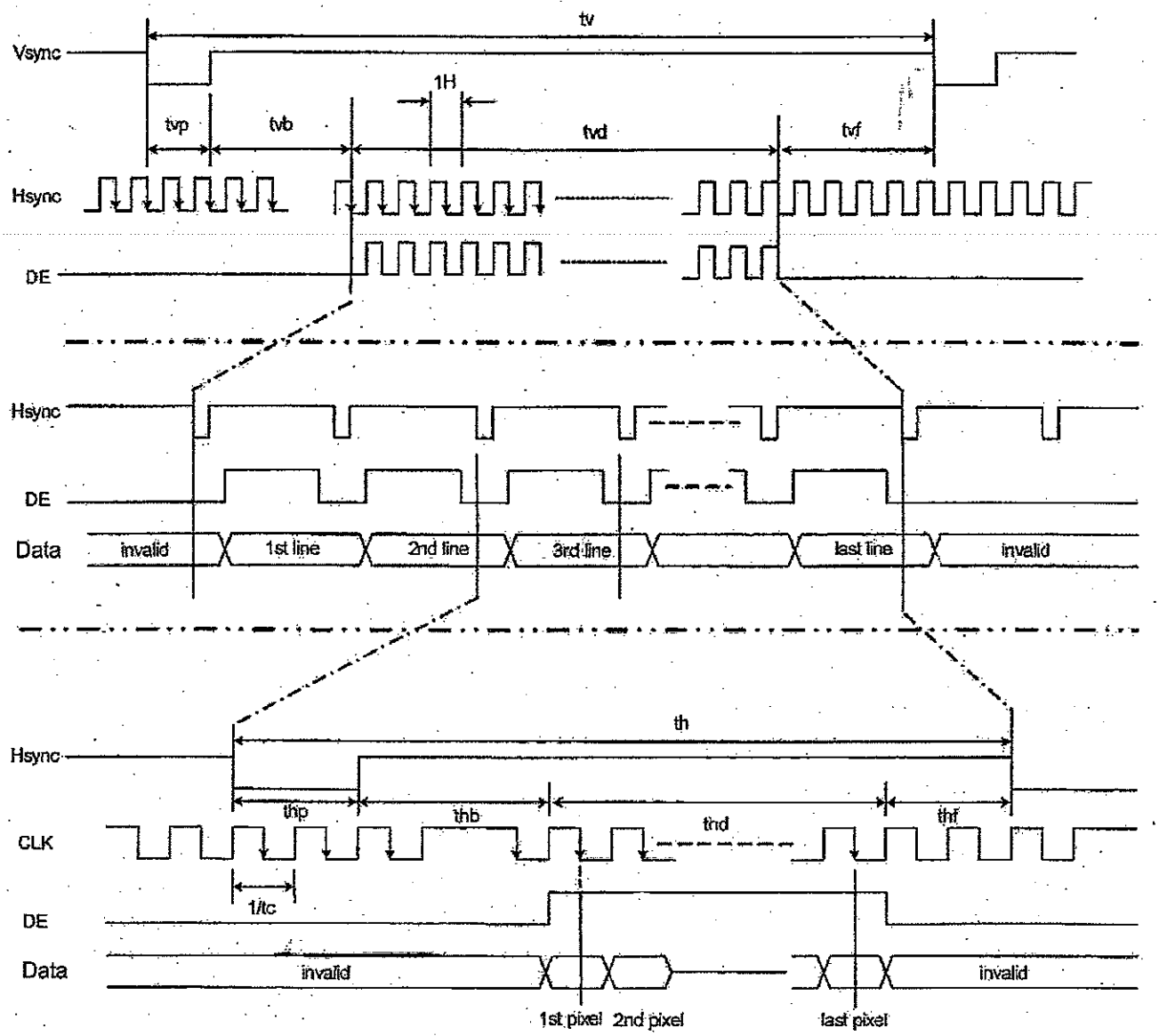
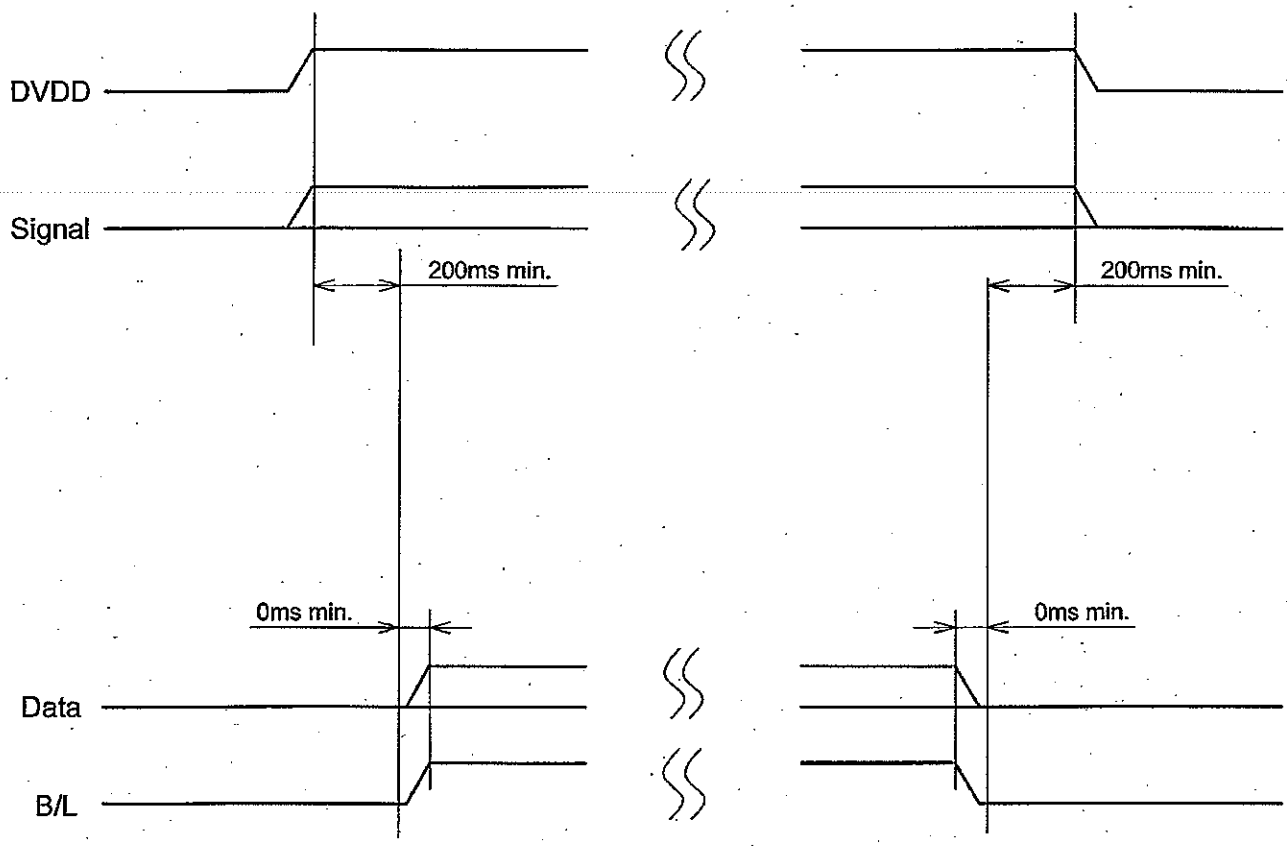


Figure 8.2 Input timing

8.3 POWER ON/OFF SEQUENCE

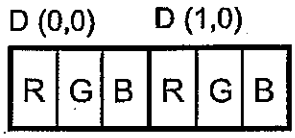


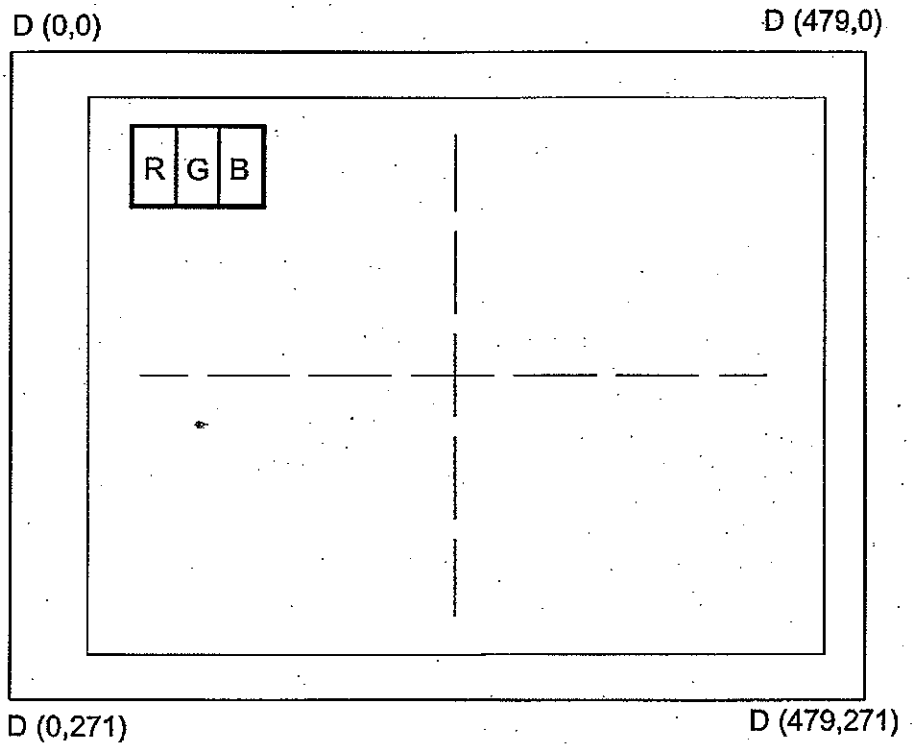
8.4.RELATIONSHIP BETWEEN DISPLAYED COLOR AND INPUT DATA

8.4.1 Display Colors

Input color		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	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	0	0	0	0	0	0
	Red(0)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	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	0	0	0	0	0	0
	Red(62)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(61)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(2)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	1	1	1	1	1	1	1	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	1	1	0	0	0	0	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	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(61)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(2)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	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	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	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	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

8.4.2 Data address

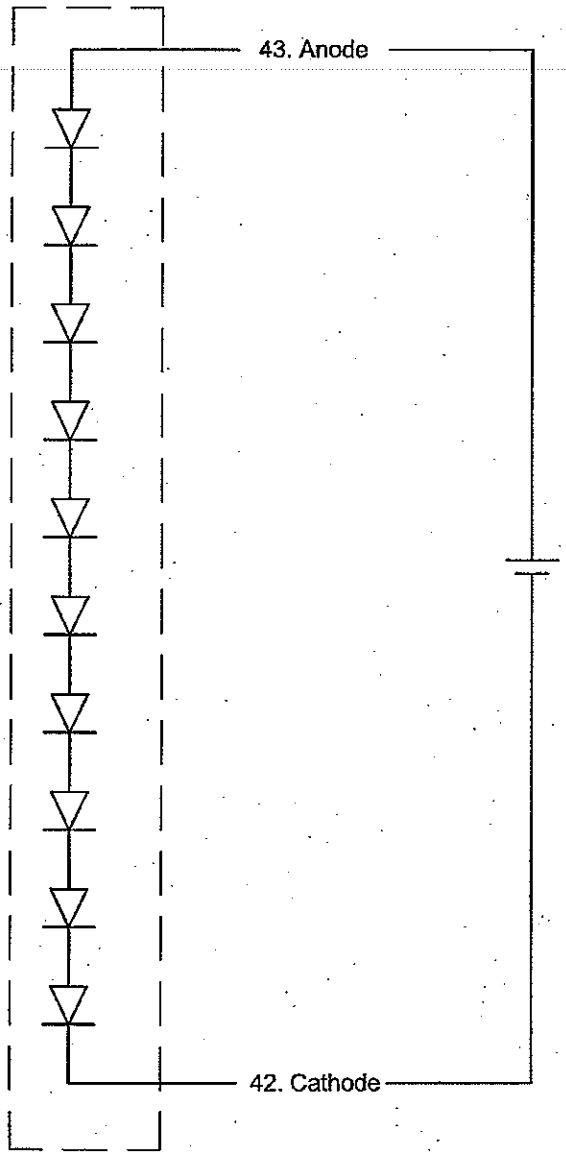




Top View

8.5 POWER SUPPLY CIRCUIT FOR LED BL (REFERENCE ONLY)

Example 1.
LED B/L



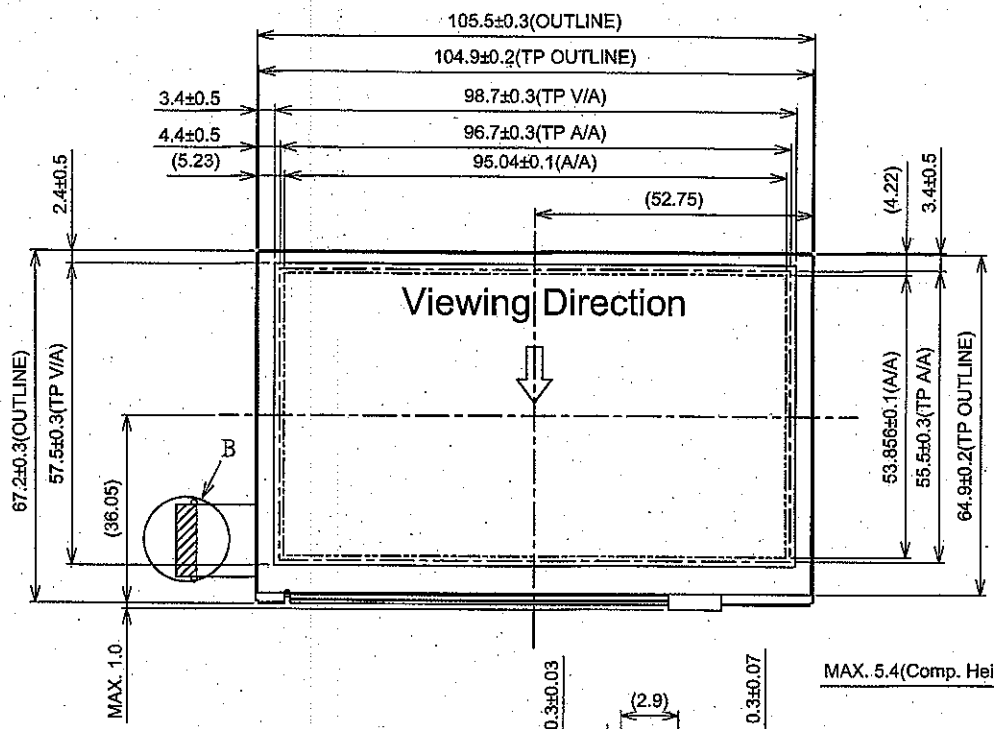
8.7 INTERNAL PIN CONNECTION

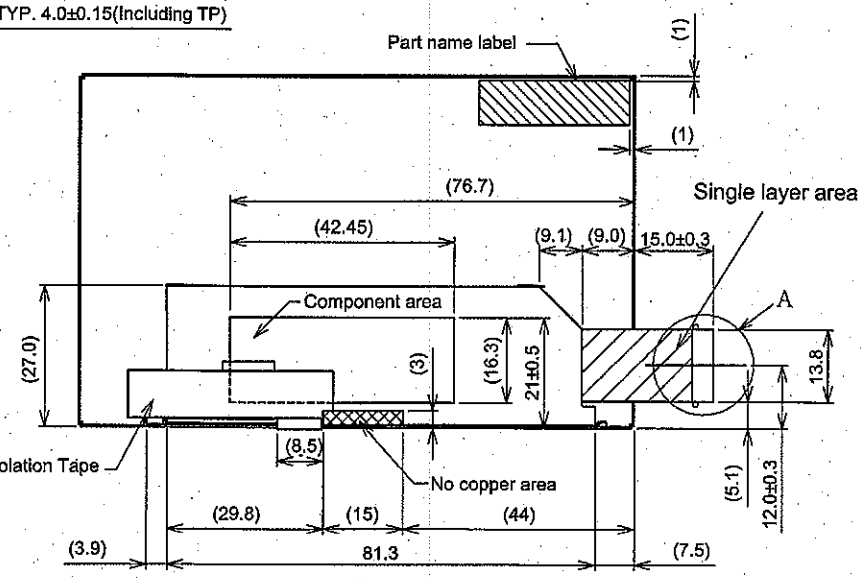
Suitable connector : FH23-45S-0.3SHW

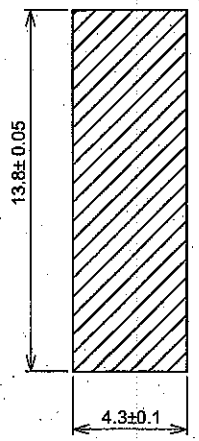
No	SYMBOL	FUNCTION
1	VSS	Ground
2	VSS	Ground
3	DVDD	Power Supply for Logic
4	DVDD	Power Supply for Logic
5	R0	Red Data (LSB)
6	R1	Red Data
7	R2	Red Data
8	R3	Red Data
9	R4	Red Data
10	R5	Red Data
11	R6	Red Data
12	R7	Red Data (MSB)
13	G0	Green Data (LSB)
14	G1	Green Data
15	G2	Green Data
16	G3	Green Data
17	G4	Green Data
18	G5	Green Data
19	G6	Green Data
20	G7	Green Data (MSB)
21	B0	Blue Data (LSB)
22	B1	Blue Data
23	B2	Blue Data

No	SYMBOL	FUNCTION
24	B3	Blue Data
25	B4	Blue Data
26	B5	Blue Data
27	B6	Blue Data
28	B7	Blue Data (MSB)
29	VSS	Ground
30	DCLK	Dot Clock
31	DISP	Display On/Off
32	HSYNC	Horizontal Sync Signal
33	VSYNC	Vertical Sync Signal
34	DE	Data Enable
35	NC	No Connection
36	VSS	Ground
37	YU	Touch Panel Upper Side
38	XL	Touch Panel Left Side
39	YB	Touch Panel Bottom Side
40	XR	Touch Panel Right Side
41	VSS	Ground
42	Cathode	LED Power Supply (-)
43	Anode	LED Power Supply (+)
44	U/D	Shift Direction Control Pin (U/D) H: Top -> Bottom(Default) L: Bottom -> Top
45	L/R	Shift Direction Control Pin (L/R) H: Left-> Right(Default) L: Right -> Left

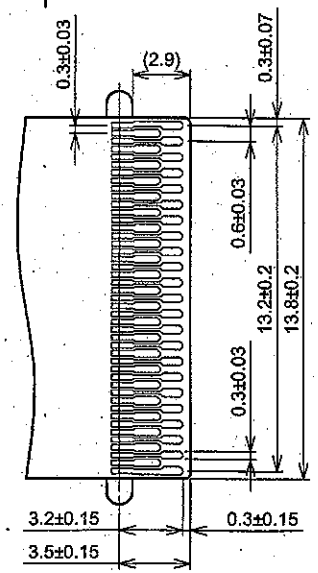
9. DIMENSIONAL OUTLINE



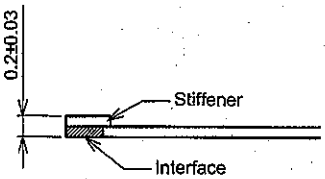




Stiffener
Detail B



Interface
Detail A



Thickness of Interface

Scale : NTS
Unit : mm

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