

TECHNICAL SPECIFICATION**MODEL NO : PM060WY2**

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☐ Customer's Confirmation

Customer _____

Date _____

By _____

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Dep	PM	FAE	Panel Design	Electronic Design	Mechanical Design	Product Verification	Prepared by
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Revision History

Rev.	Issued Date	Revised Content
0.1	May 31,2011	Preliminary

TECHNICAL SPECIFICATION

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1. Application

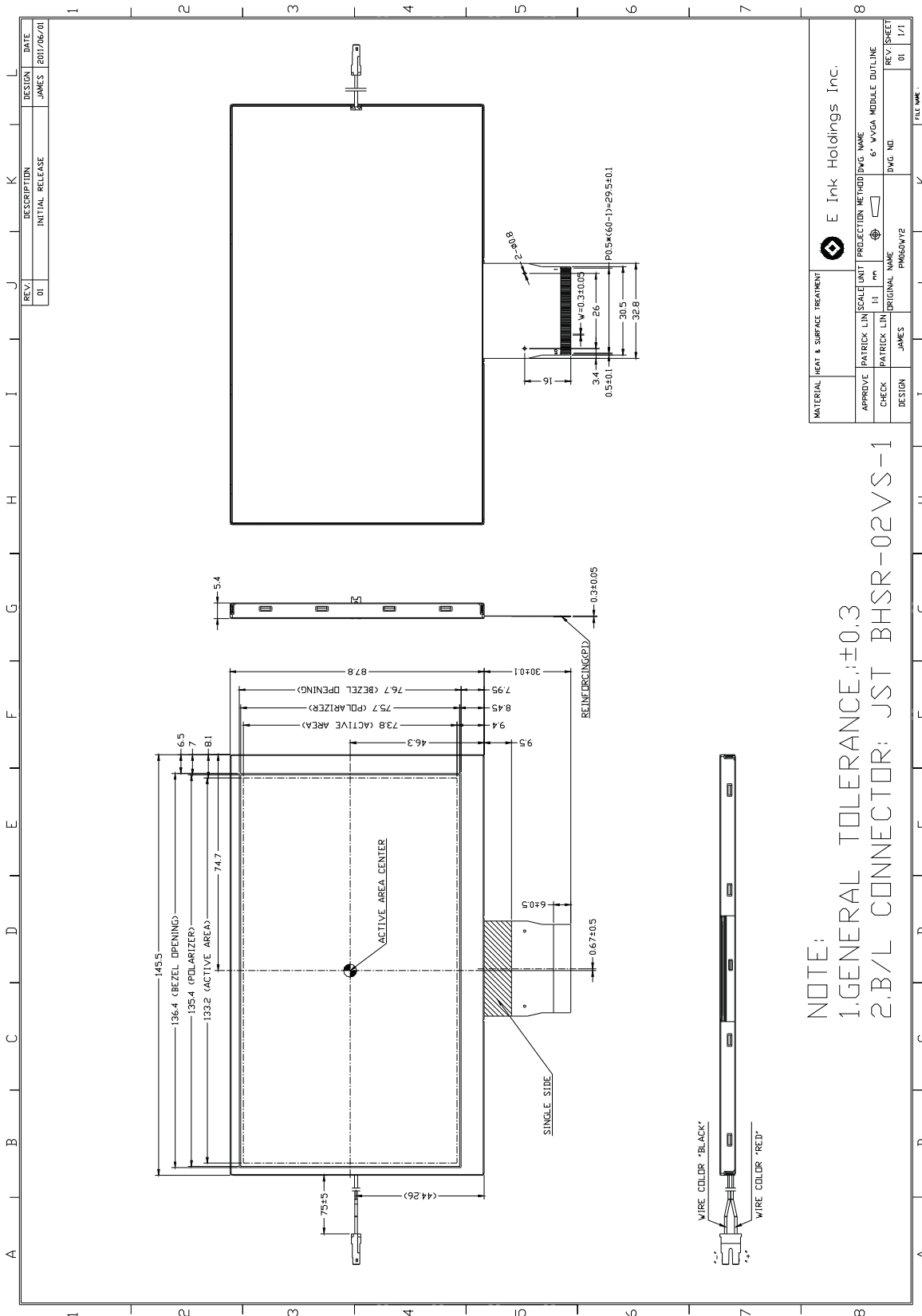
This data sheet applies to a color TFT LCD module, PM060WY2. The module applies to OA product, which require high quality flat panel display. If you must use in high reliability environment, Please don't over reliability test condition.

2. Features

- . Amorphous silicon TFT LCD panel
- . Pixel in RGB Vertical stripe configuration
- . TTL transmission interface

3. Mechanical Specifications

Parameter	Specifications	Unit
Screen Size	6.0 (diagonal)	inch
Display Format	800(R,G,B)×480	dot
Interface	TTL RGB 24bits	
Active Area	133.20(H)×73.80 (V)	mm
Pixel Pitch	0.1665(H)×0.1538(V)	mm
Pixel Arrangement	RGB Stripe	
Outline Dimension	145.50(W) × 87.80 (H) ×5.40(D) (typ.)	mm
Weight	TBD	g
Surface treatment	Anti-Glare+EWV Film	
Display mode	Normally white	
Gray scale inversion direction	6 o'clock [ref to Note 13-1]	

4. Mechanical Drawing of TFT-LCD Module


5. Input / Output Terminals

5-1) CN1 of TFT-LCD Panel

FPC Connect 60 Pins.

Pin No.	Symbol	I/O	Function	Remark
1	AGND	P	Ground	
2	AVDD	P	Analog Power	
3	VCC	P	Digital Power Supply	
4	R0	I	Red data	
5	R1	I	Red data	
6	R2	I	Red data	
7	R3	I	Red data	
8	R4	I	Red data	
9	R5	I	Red data	
10	R6	I	Red data	
11	R7	I	Red data	
12	G0	I	Green data	
13	G1	I	Green data	
14	G2	I	Green data	
15	G3	I	Green data	
16	G4	I	Green data	
17	G5	I	Green data	
18	G6	I	Green data	
19	G7	I	Green data	
20	B0	I	Blue data	
21	B1	I	Blue data	
22	B2	I	Blue data	
23	B3	I	Blue data	
24	B4	I	Blue data	
25	B5	I	Blue data	
26	B6	I	Blue data	
27	B7	I	Blue data	
28	DCLK	I	Clock Input	
29	DE	I	Data Enable Signal	
30	HSD	I	Horizontal Sync Input. Negative Polarity	
31	VSD	I	Vertical Sync Input. Negative Polarity	
32	MODE	I	DE/SYNC Mode Select. H:DE mode, L:SYNC mode	
33	PSTB	I	Global Reset Pin	
34	STBYB	I	Standby Mode Select H: normal operation , L: standby mode	
35	SHLR	I	Source Right or Left Sequence Control	
36	VCC	P	Digital Power	
37	UPDN	I	Gate Up or Down Scan Control	
38	GND	P	Ground	
39	AGND	P	Ground	
40	AVDD	P	Analog Power	
41	VCOM	I	Common Voltage Input	
42	DITH	I	Dithering Setting. H:6bit Resolution , L: H:8bit Resolution	
43	NC	N	NO Connection	
44	NC	N	NO Connection	

45	V10	I	Gamma Voltage 10	
46	V9	I	Gamma Voltage 9	
47	V8	I	Gamma Voltage 8	
48	V7	I	Gamma Voltage 7	
49	V6	I	Gamma Voltage 6	
50	V5	I	Gamma Voltage 5	
51	V4	I	Gamma Voltage 4	
52	V3	I	Gamma Voltage 3	
53	V2	I	Gamma Voltage 2	
54	V1	I	Gamma Voltage 1	
55	NC	N	NO Connection	
56	VGH	P	Positive Power for TFT	
57	VCC	P	Digital Power	
58	VGL	P	Negative Power for TFT	
59	GND	P	Ground	
60	NC	N	NO Connection	

Note: I/O definition

I----Input O----Output P----Power/Ground N----No Connection

5-2) CN2 of LED BL Connector

Pin	Symbol	I/O	Description	Remark
1	LED+	P	LED Anode	Red Cable
2	LED-	P	LED Cathode	White Cable

5-3) U/D R/L Function Description

Scan Control Input		Scanning Direction
UPDN	SHLR	
GND	VCC	Up to Down, Left to Right
VCC	GND	Down to Up, Right to Left
GND	GND	Up to Down, Right to Left
VCC	VCC	Down to Up, Left to Right

6. Absolute Maximum Ratings:

AGND= GND=0V, Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VCC	-0.50	5.00	V	
	AVDD	-0.50	13.50	V	
	VGH	-0.30	40.00	V	
	VGL	-20.00	0.30	V	
	VGH-VGL	-0.30	40.00	V	
Operating Temperature	TOPR	-20.0	70.0	°C	
Storage Temperature	TST	-30.0	80.0	°C	

7. Electrical Characteristics

7-1) Recommended Operating Condition

AGND=0V, Ta=25°C

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Digital Supply Voltage		VCC	3.0	3.3	3.6	V	
Analog Supply Voltage		AVDD	9.34	9.84	10.33	V	
Gate on Voltage		VGH	17.10	19.00	22	V	
Gate off Voltage		VGL	-7.70	-7.00	-6.30	V	
Common Electrode Driving Signal		VCOM	3.60	3.86	4.00	V	(Flick must better)
Input Signal Voltage	Low Level	V _{IL}	0	-	0.3×VCC	V	R0~R7, G0~G7, B0~B7 , DE, DCLK, HSD, VSD , MODE, RSTB, STBYB , SHLR, UPDN, VCOM , DITH
	High Level	V _{IH}	0.7×VCC	-	VCC	V	
Output Signal Voltage	Low Level	V _{OL}	-	-	0.2×VCC	V	
	High Level	V _{OH}	0.8×VCC	-	VCC	V	

Note: The value is for design stage only.

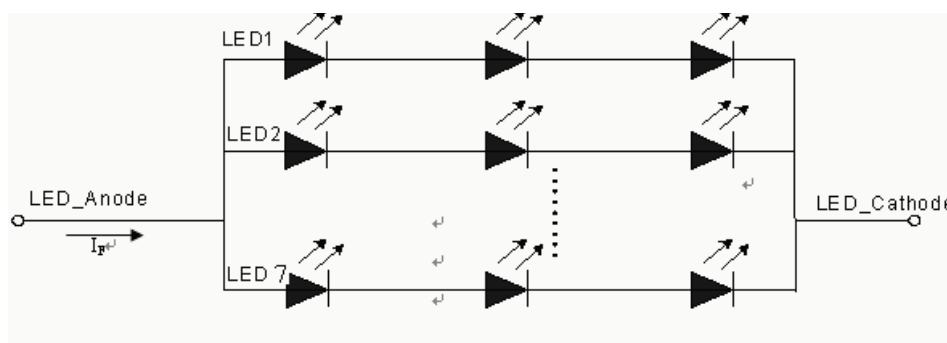
7-2) Recommended Driving Condition for Back Light
 $T_a = 25^{\circ}\text{C}$

Parameter	Symbol	Min	TYP	MAX	Unit	Remark
Supply voltage of LED backlight	$V_{\text{LED1} \sim 7}$	-	TBD	-	V	Note 7-1
Supply current of LED backlight	$I_{\text{LED1} \sim 7}$	-	TBD	TBD	mA	Note 7-2
Backlight Power Consumption	P_{LED}	-	TBD	TBD	W	Note 7-1 /Note 7-3

Note 7-1 : $I_{\text{LED}} = 20\text{mA}$, Constant Current.

Note 7-2: The LED driving condition is defined for each LED module. (3LED Serial)
Input current = 140mA

Note 7-3: $P_{\text{LED}} = V_{\text{LED1}} * I_{\text{LED1}} + V_{\text{LED2}} * I_{\text{LED2}} + \dots + V_{\text{LED7}} * I_{\text{LED7}}$

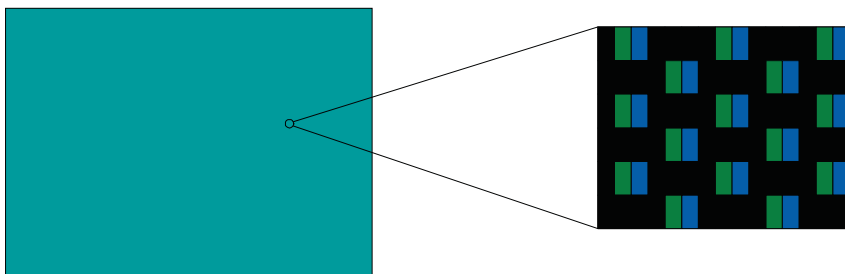

7-3) Power consumption

Parameter	Symbol	Condition	Typ.	Max.	Unit	Remark
Supply Current for Gate Driver (Hi level)	I_{GG}	$V_{\text{GG}} = -7\text{V}$	TBD	TBD	mA	Note 7-6
Supply Current for Gate Driver (Low level)	I_{EE}	$V_{\text{EE}} = 19\text{V}$	TBD	TBD	mA	Note 7-6
Supply Current for Source Driver (Digital)	I_{DD1}	$V_{\text{DD1}} = 3.3\text{V}$	TBD	TBD	mA	Note 7-6
Supply Current for Source Driver (Analog)	I_{DD2}	$V_{\text{DD2}} = 9.84\text{V}$	TBD	TBD	mA	Note 7-6
Supply Current for Gate Driver (Digital)	I_{CC}	$V_{\text{CC}} = 3.3\text{V}$	TBD	TBD	mA	Note 7-6
LCD Panel Power Consumption			TBD	TBD	mW	Note 7-4
Back Light Lamp Power Consumption			TBD	TBD	W	Note 7-5

Note 7-4: The power consumption for back light is not included.

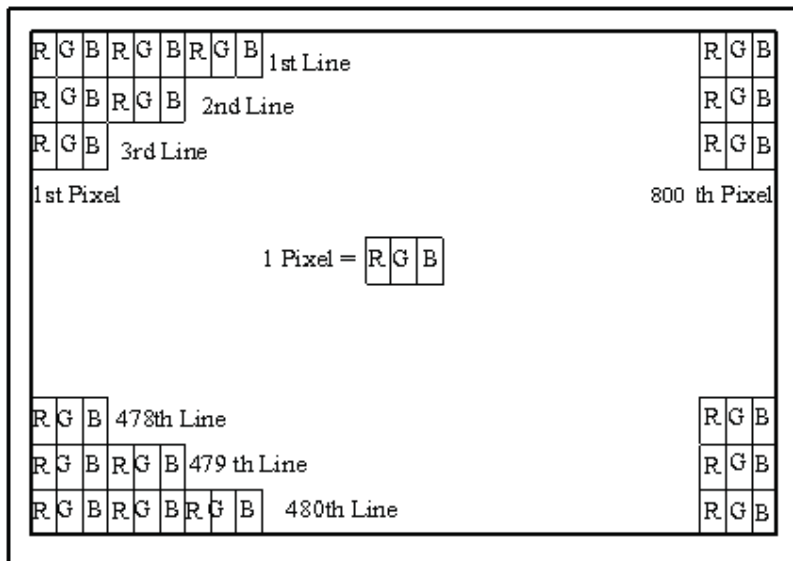
Note 7-5: Back light lamp power consumption is calculated by $I_L \times V_L$.

Note 7-6 : Test Pattern for dissipative current.



8. Pixel Arrangement

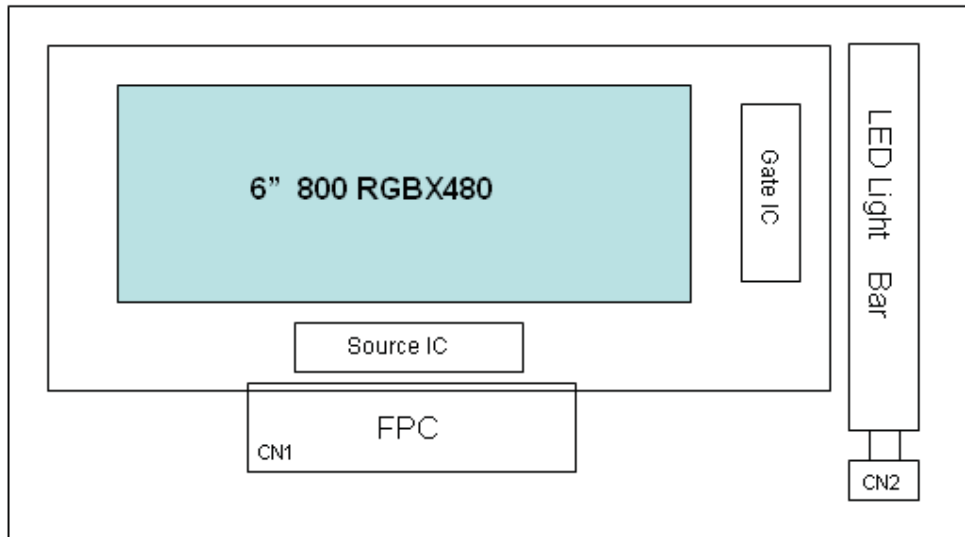
The LCD module pixel arrangement is the stripe.



9. Display Color and Gray Scale Reference

Color		Input Color Data															
		Red								Green							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0
		B7	B6	B5	B4	B3	B2	B1	B0								
Basic Colors	Black	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
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	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
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (01)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Red (02)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Darker																
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																
	Red	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	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
Green	Green	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	0	0	0	0	0	1	0
	Green	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Darker																
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Blue	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker																
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																
	Blue	0	0	0	0	0	0	0	0	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
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

10. Block Diagram



11-1)TFT-LCD Input Timing

VCC=3.3V, AVDD=9.84V, AGND=GND=0V, Ta=25°C.

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
DCLK Frequency	F_{clk}	-	33.3	50.0	MHz	
DCLK Pulse Width	T_{cw}	40%	50%	60%	T_{cph}	
VSD Setup Time	T_{vst}	8			ns	
VSD Hold Time	T_{vhd}	8	-	-	ns	
HSD Setup Time	T_{hst}	8			ns	
HSD Hold Time	T_{hhd}	8	-	-	ns	
Data Setup Time	T_{dsu}	8			ns	Data to DCLK
Data Hold Time	T_{dhd}	8	-	-	ns	Data to DCLK
DE Hold Time	T_{ehd}	8	-	ns		
DE Setup Time	T_{esu}	8	-	-	ns	
RSTB Pulse Width	T_{rst}	50	-	-	us	

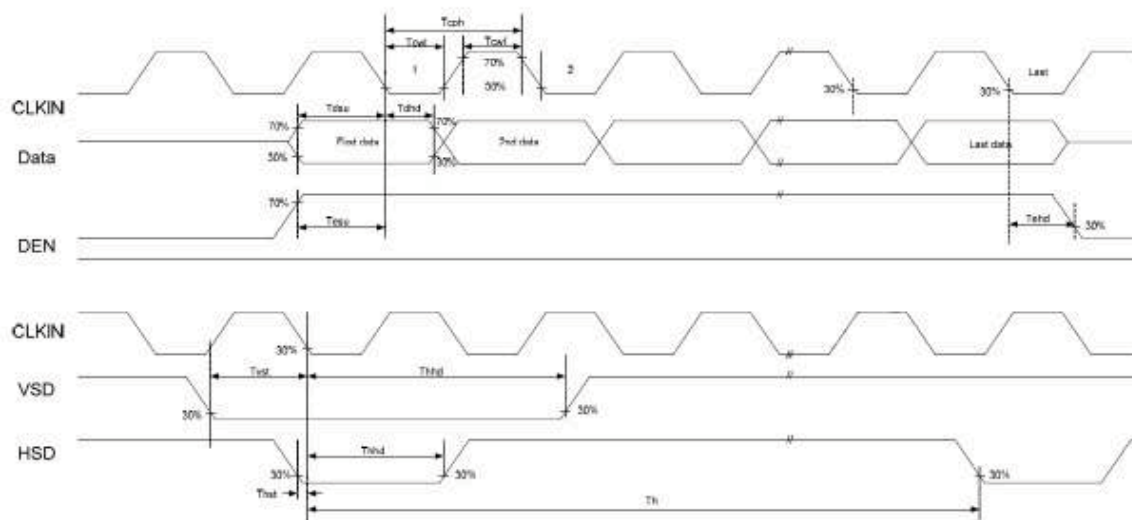


Figure 11-1 Input clock and data timing waveform

11-2)Timing Characteristic

Horizontal input timing

Parameter	Symbol	Value			Unit	Note
Horizontal display area	thd	800			DCLK	
DCLK frequency	fclk	Min.	Typ.	Max.	--	
		-	33.3	50	MHz	
1 Horizontal Line	th	908	928	1010	DCLK	thb+thpw=88 DCLK is fixed.
HSD pulse width	thpw	4	48	64		
HSD Back Porch (Blanking)	thb	20	40	84		
HSD Front Porch	thfp	20	40	122		

Vertical input timing

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Vertical display area	tvd	480			H	
VSD period time	tv	515	525	-	H	
VSD pulse width	tpw	1	3	31	H	tpw+tvb=32H Is fixed
VSD Back Porch (Blanking)	tvb	1	29	31	H	
VSD Front Porch	tvfp	3	13	-	H	

A.2: DE Mode

Parameter	Symbol	Spec			Unit
		Min.	Typ.	Max.	
CLK frequency	fclk	-	33.3	50	MHz
DE H period	thpw+thb+thd+thfp = th	920	1000	1010	DCLK
DE H-Display Area	thd	800			DCLK
DE H-Blanking	th-thd	120	200	210	DCLK
DE V period	tpw+tvb+tvd+tvfp	500	512	-	DCLK
DE V-Display Area	tvd	480			th
DE V-Blanking	tv-tvd	20	32	-	th

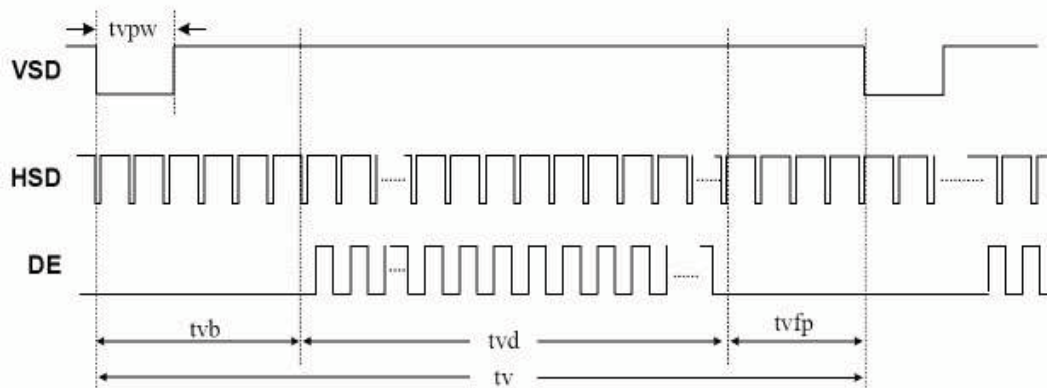


Figure 5.1 TCON Vertical Input Timing Diagram HV

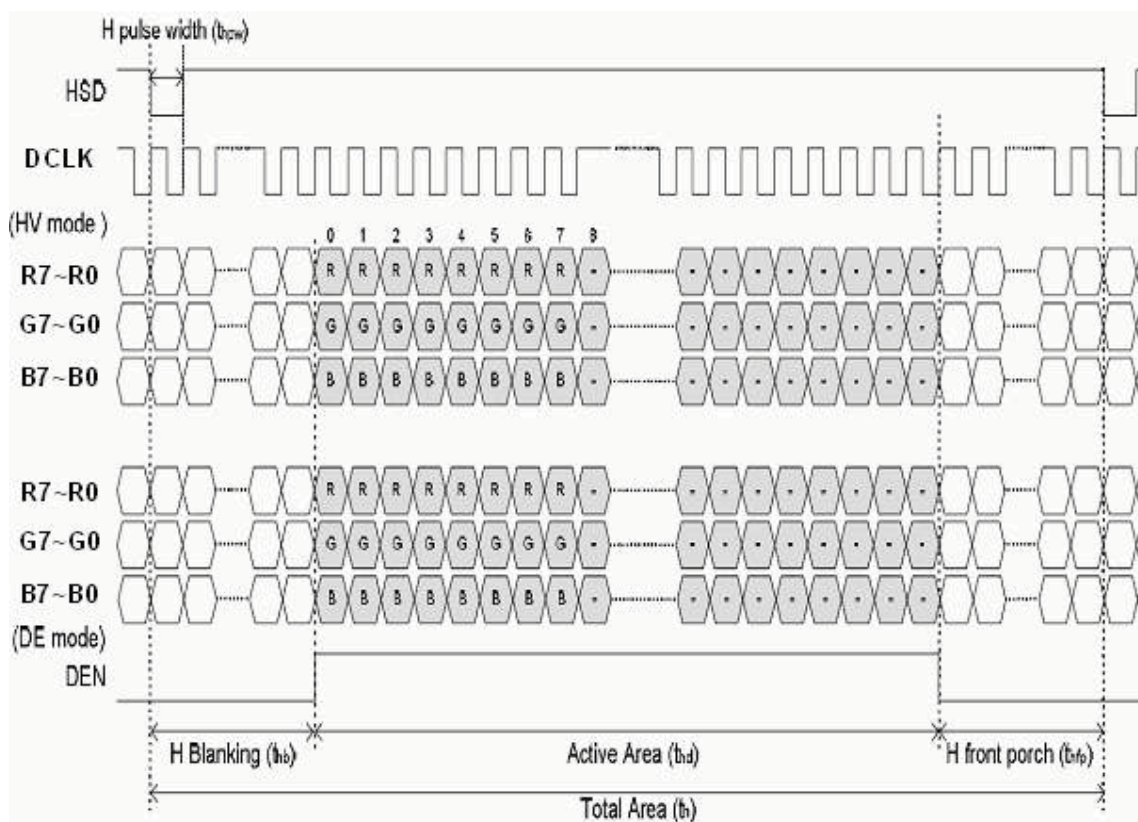


Figure 5.2 TCON Horizontal input timing Diagram

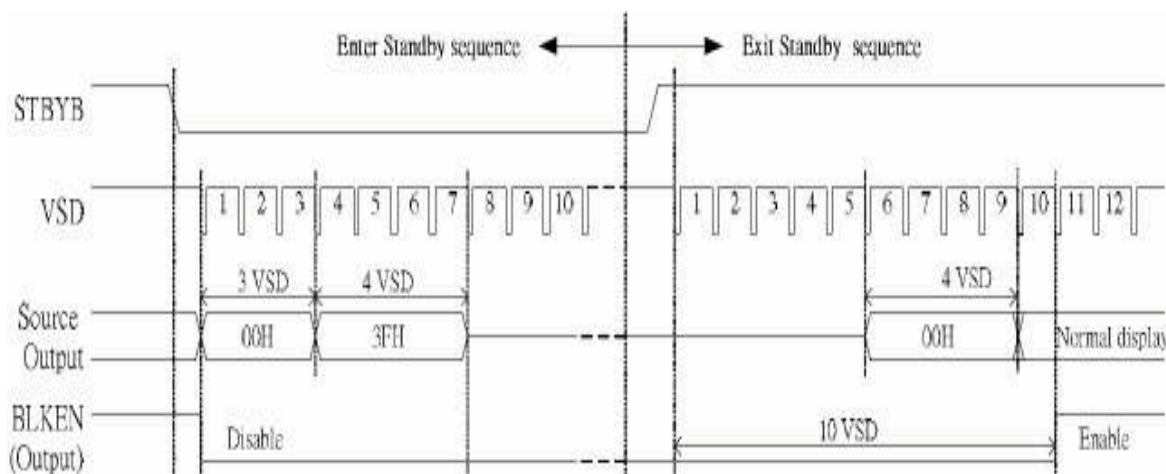
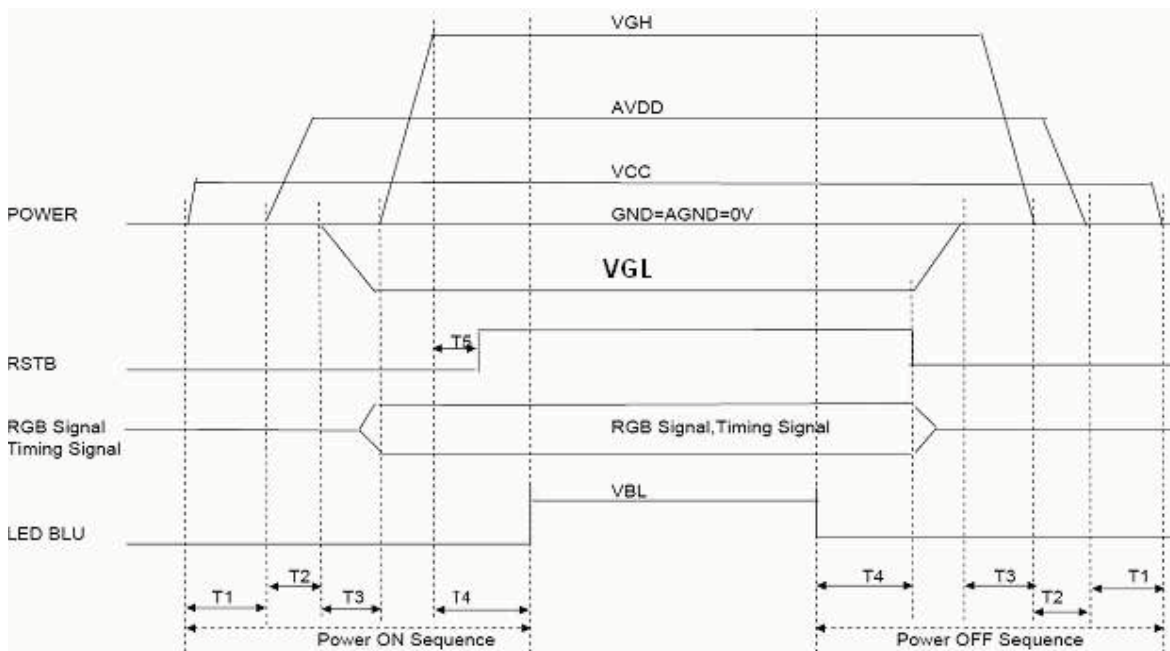


Figure 5.3 Enter and Exit Standby Mode Sequence

12. Power On Sequence



Note: T1≥20ms, T2≥20ms, T3≥5ms, T4≥100ms, T5≥5ms.

13. Optical Characteristics

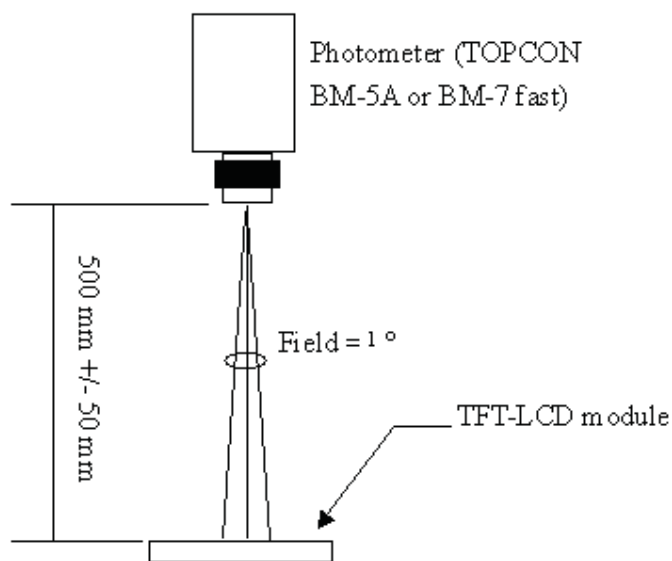
13-1) Specification:

Ta=25°C

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ	CR≥10	65	75	-	deg	Note 13-1
	Vertical	θ (to 12 o'clock)		50	60	-	deg	
		θ (to 6o'clock)		60	70	-	deg	
Contrast Ratio		CR	At optimized Viewing angle	(400)	(500)	-	-	Note 13-2
Response time	Rise	Tr	$\theta=0^{\circ}$	-	20	30	ms	Note 13-3
	Fall	Tf						
Brightness		L	$\theta=0^{\circ}/\psi=0$	(350)	(400)	-	Cd/m ²	Note 13-4
Luminance Uniformity		U		(70)	(80)	-	%	Note 13-5
LED life Time				TBD	TBD	-	hrs	Note 13-6
White Chromaticity		x		TBD	TBD	TBD	-	
		y		TBD	TBD	TBD	-	
Cross Talk			$\theta=0^{\circ}$	-	-	3.5	%	Note 13-7

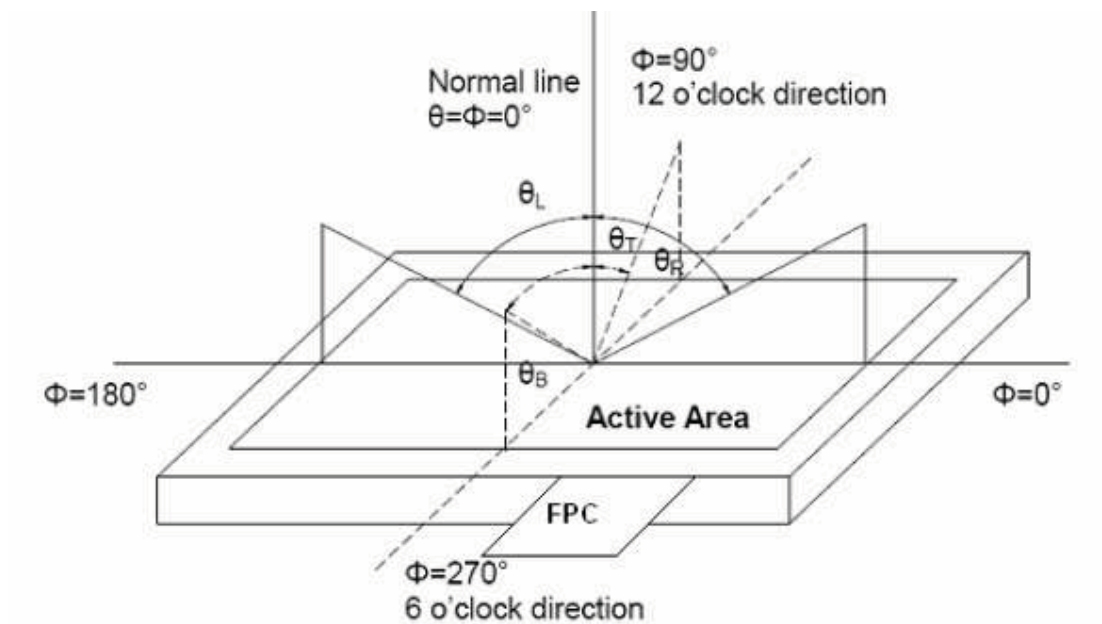
All the optical measurement shall be executed 30 minutes after backlight being turn-on.

The optical characteristics shall be measured in dark room (ambient illumination on panel surface less than 1 Lux). The measuring configuration shows as following figure.



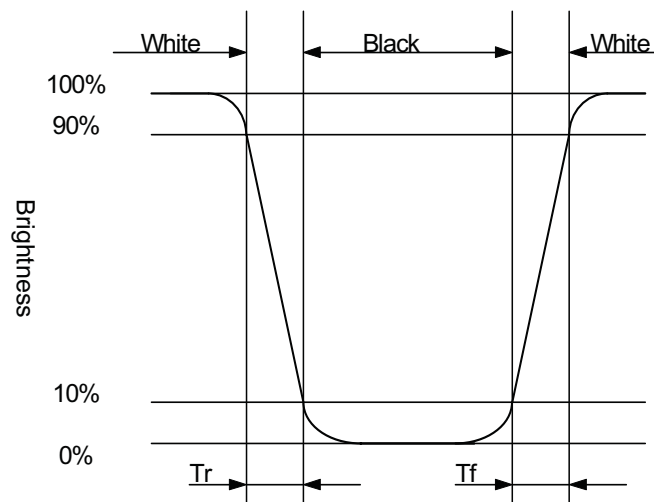
Optical characteristics measuring configuration

Note 13-1: The definitions of viewing angles are as follow



Note 13-2 : The definition of contrast ratio $CR = \frac{\text{Luminance at White Pattern}}{\text{Luminance at Black Pattern}}$

Note 13-3: Definition of Response Time T_r and T_f :



Note 13-4 :Topcon BM-5A or BM-7 fast luminance meter 1°field of view is used in the testing (after 30minutes' operation).The typical luminance value is measured at LED current 140 mA

Note 13-5 : The uniformity of LCD is defined as

$$U = \frac{\text{The Minimum Brightness of the 9 testing Points}}{\text{The Maximum Brightness of the 9 testing Points}}$$

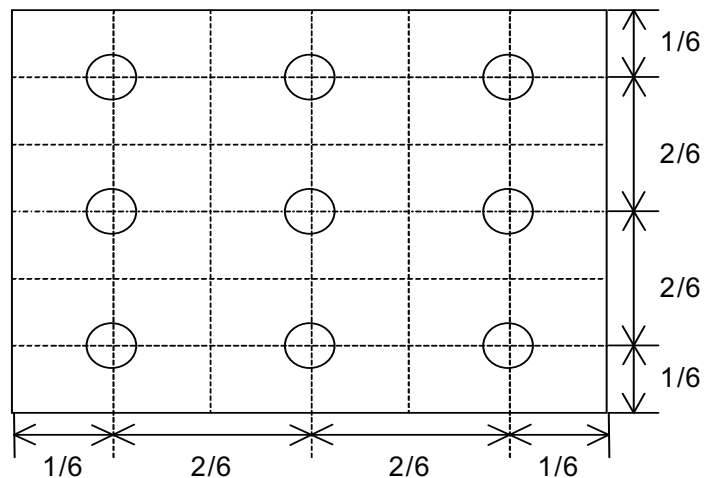
Luminance meter : BM-5A or BM-7 fast (TOPCON)

Measurement distance : 500 mm +/- 50 mm

Ambient illumination : < 1 Lux

Measuring direction : Perpendicular to the surface of module

The test pattern is white.



Note 13-6: The “LED Life time” is defined as the module brightness decrease to 50% original Brightness that the ambient temperature is 25°C and $I_{LED}=140\text{mA}$

Note 13-7: Cross Talk (CTK) =
$$\frac{|Y_A - Y_B|}{Y_A} \times 100\%$$

Y_A: Brightness of Pattern A

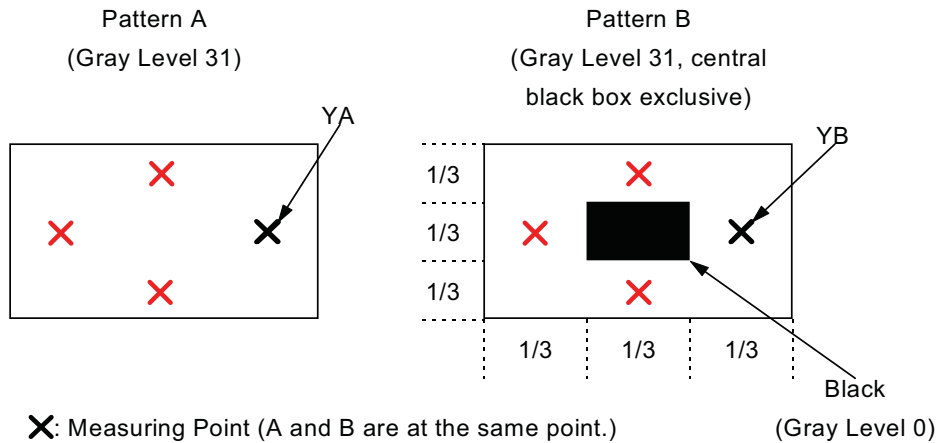
Y_B: Brightness of Pattern B

Luminance meter : BM 5A or BM-7 fast (TOPCON)

Measurement distance : 500 mm +/- 50 mm

Ambient illumination : < 1 Lux

Measuring direction : Perpendicular to the surface of module



14. Reliability Test

No	Test Item	Test Condition
1	High Temperature Storage Test	Ta = +80°C, 240 hrs
2	Low Temperature Storage Test	Ta = -30°C, 240 hrs
3	High Temperature Operation Test	Ta = +70°C, 240 hrs
4	Low Temperature Operation Test	Ta = -20°C, 240 hrs
5	High Temperature & High Humidity Test	TBD
6	Thermal Cycling Test (non-operating)	TBD
7	Electrostatic Discharge Test(non-operating)	C=200pF,0Ω,±200V 1time/each terminal
8	Vibration Test	Frequency rango:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z (6 hours for total)
9	Mechanical shock (Non Op)	Half Sine Wave 100G, 6ms,±X±Y±Z 3 times for each direction
10	Package Drop Test	Height:60cm 1 corner,3edges,6surfaces

Ta: ambient temperature

Note: The protective film must be removed before temperature test

[Criteria]

In the standard conditions, there is not display function NG issue occurred. (including : line defect ,no image).All the cosmetic specification is judged before the reliability stress.

15.Packing

TBD