TECHNICAL SPECIFICATION

MODEL NO : PD050QT2

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Please contact PVI or its agent for further information.

☐Customer•s Confirmation

Customer _____

Date _____

By _____

☐PVI•s Confirmation

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Confirmed By _____

Prepared By _____

◆ PRIME VIEW

Revision History

Rev.	Issued Date	Revised Contents
0.1	July 09, 2007	Preliminary
1.0	Oct 24, 2007	Add Page 13 12. Optical Characteristics data
2.0	August.11.2008	Add Page 16 13.Handling Cautions C) items of 13-1

TECHNICAL   SPECIFICATION
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PD050QT2

1. Application

This data sheet applies to a color TFT LCD module, PD050QT2. This module applies to OA product, car TV (must use Analog to Digital driving board), which requires high quality flat panel display. If you must use in severe reliability environment, please don't extend over PVI's reliability test conditions.

2. Features

. Amorphous silicon TFT LCD panel with LED back-light unit

. Pixel in stripe configuration

. Slim and compact, designed for O/A application

. TTL transmission interface

3. Mechanical Specifications

Parameter	Specifications	Unit
Screen Size	5 (diagonal)	inch
Display Format	320×(RGB)×240	dot
Active Area	102.72 (H)×75.72 (V)	mm
Pixel Pitch	0.3210(H)×0.3155 (V)	mm
Pixel Configuration	Stripe	
Display Colors	262K	
Surface Treatment	Anti-Glare +SWV	
Back-light	24-LED	
Outline Dimension	127.4 (W)×92.7 (H)×12.9 (D)(typ.)	mm
Weight	172±10	g
Display mode	Normally white	
Gray scale inversion direction	6 (ref to Note 12-1)	o'clock

PRIME VIEW

4. Mechanical Drawing of TFT-LCD Module

◆ PRIME VIEW
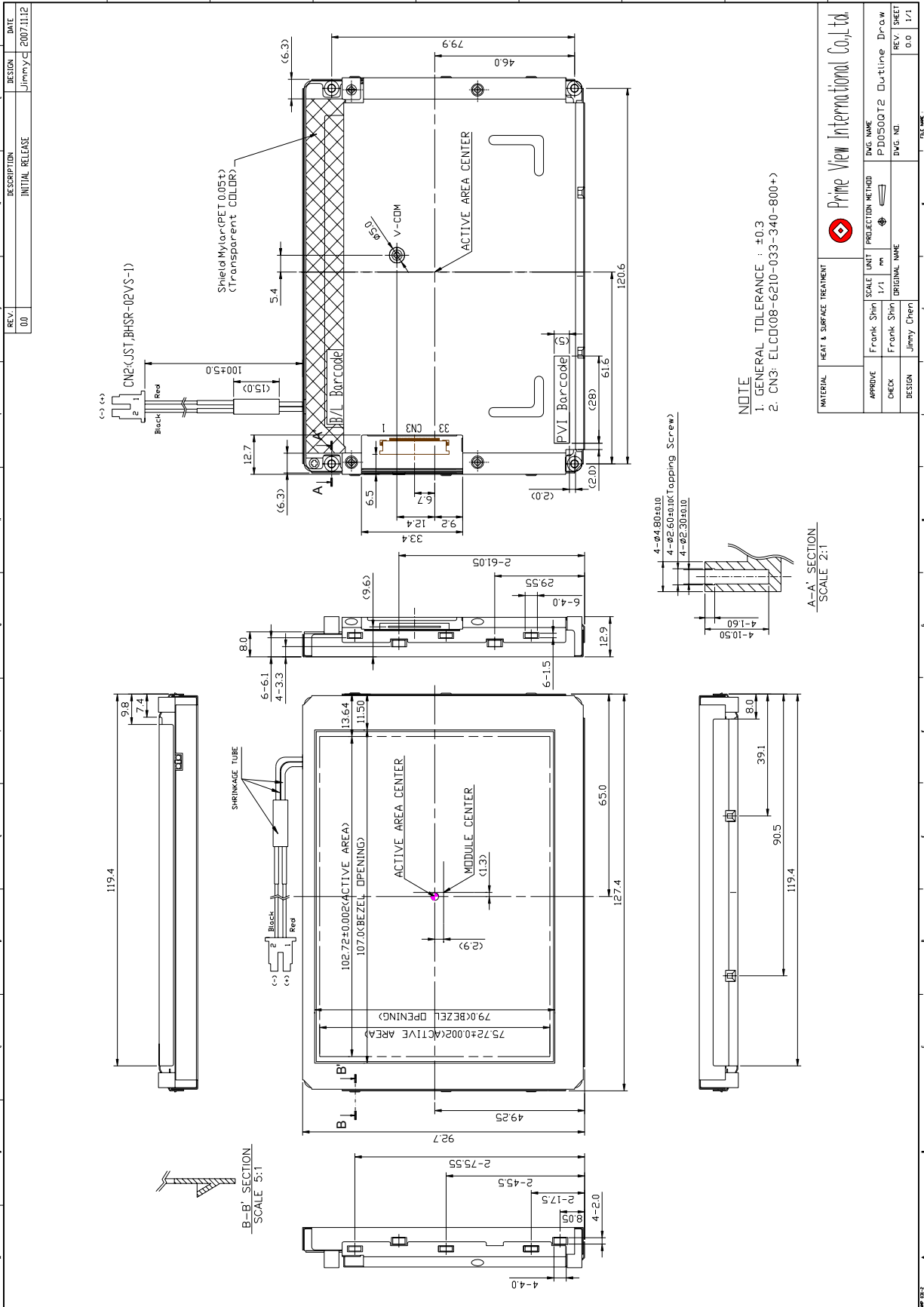
5. Input / Output Terminals

5-1) TFT-LCD Panel Driving

Connector type: ELCO 08-6210-033-340-800A+ , PIN No 33 pins, pitch=0.5mm

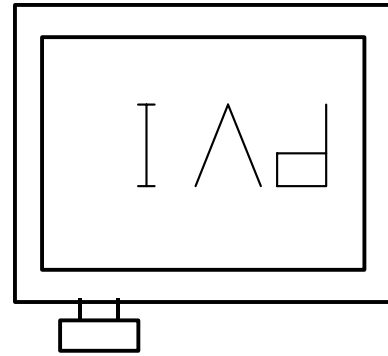| Pin No	Symbol	I/O	Description	Remark
1	GND	-	GND	
2	CK	I	Clock signal for sampling each data signal	
3	Hsync	I	Horizontal synchronous signal(negative)	
4	Vsync	I	Vertical synchronous signal(negative)	
5	GND	-	GND	
6	R0		RED data signal(LSB)	
7	R1	I	RED data signal	
8	R2	I	RED data signal	
9	R3	I	RED data signal	
10	R4	I	RED data signal	
11	R5	I	RED data signal(MSB)	
12	GND	-	GND	
13	G0	I	GREEN data signal(LSB)	
14	G1	I	GREEN data signal	
15	G2	I	GREEN data signal	
16	G3	I	GREEN data signal	
17	G4	I	GREEN data signal	
18	G5	I	GREEN data signal(MSB)	
19	GND	-	GND	
20	B0	I	Blue data signal(LSB)	
21	B1	I	Blue data signal	
22	B2	I	Blue data signal	
23	B3	I	Blue data signal	
24	B4	I	Blue data signal	
25	B5	I	Blue data signal(MSB)	
26	GND	-	GND	
27	ENAB	I	Signal to settle the horizontal display position(positive)	Note5-1
28	V_{CC}	-	+3.3V power supply	
29	V_{CC}	-	+3.3V power supply	
30	R/L	I	Horizontal display mode select signal H：Normal ,L：Left /Right reverse mode	Note5-2
31	U/D	I	Vertical display mode select signal L：Normal ,H :Up/Down reverse mode	Note5-3
32	N/C	-	NC	
33	GND	-	GND	

Note5-1：The horizontal display start timing is settled in accordance with rising of ENAB signal.
In case ENAB is fixed "Low", the horizontal start timing is determined as described in
10-2. Don't keep ENAB "High" during operation.

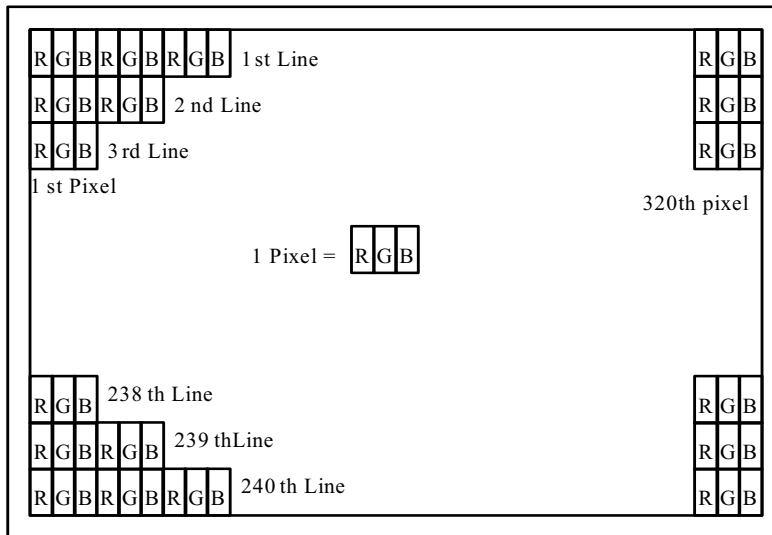Note 5-2/5-3 : The definitions of U/D & R/L
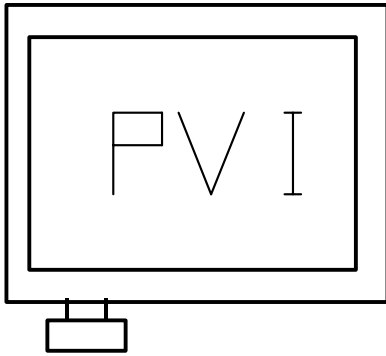
R/L(PIN 30)= Low, U/D(PIN 31)= High   R/L(PIN 30)= High , U/D(PIN 31)= Low

5-2) Backlight driving
Connector type: JST BHSR-02VS-1, PIN No 2 pin

Pin No	Symbol	Description	Remark
1	+	Input terminal (Anode)	Wire color : Red
2	-	Input terminal (Cathode)	Wire Color : Black

6. Pixel Arrangement

R G B R G B R G B 1 st Line   R G B
R G B R G B 2 nd Line   R G B
R G B 3 rd Line   R G B
1 st Pixel   320th pixel

1 Pixel = R G B

R G B 238 th Line   R G B
R G B R G B 239 thLine   R G B
R G B R G B R G B 240 th Line   R G B

7. Absolute Maximum Ratings:

GND=0V, Ta=25℃

Parameters	Symbol	Condition	MAX.	Unit	Remark
Input Voltage	V_I	Ta=25℃	-0.3~+4	V	Note7-1
+3.3V supply voltage	V_{CC}	Ta=25℃	0~+3.6	V	

Note 7-1:CK,R0~R5,G0~G5,B0~B5,Hsync,Vsync,ENAB,R/L,U/D

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8. Electrical Characteristics

8-1) Recommended Operating Conditions:

GND=0V, Ta=25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage	V_{CC}	+3.0	+3.3	+3.6	V	
Current Dissipation	I_{CC}	-	42.8	-	mA	Note 8-1
Total power consumption	P_{CC}	128.4	141.24	154.08	mW	
Permissive input ripple voltage	V_{RF}	-	-	100	mVp-p	V_{CC}=3.3V
Input voltage(Low)	V_{IL}	0	-	0.3 V_{CC}	V	
Input voltage(High)	V_{IH}	0.7 V_{CC}	-	V_{CC}	V	
V_{com} Voltage	V_{com}	-	3.55	-	V	

Note 8-1 : To test the current dissipation of V_{CC}, using the "color bars" testing pattern shown as below.

1	2	3	4	5	6	7	8
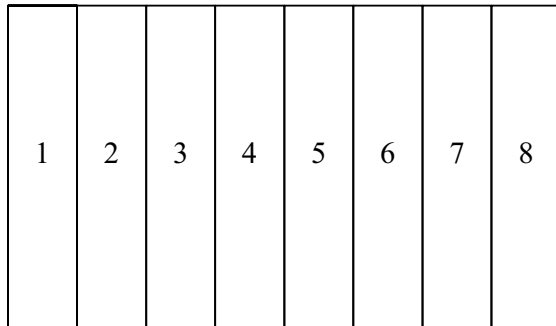
1. White
2. Yellow
3. Cyan
4. Green
5. Magenta
6. Red
7. Blue
8. Black

I_{DD} current dissipation testing pattern

8-2) Recommended Driving Condition for Back Light

GND = 0 V，Ta = 25℃

Parameter	Symbol	Min	TYP	MAX	Unit	Remark
Supply voltage of LED backlight	$V_{LED1\sim8}$	-	-	(11.0)	V	Note 8-2
Supply current of LED backlight	$I_{LED1\sim8}$	-	20	-	mA	Note 8-3
Backlight Power Consumption	P_{LED}	-	-	1.76	W	Note 8-4

Note 8-2 : $I_{LED1\sim8}$=20mA, Constant Current

Note 8-3 : The LED driving condition is defined for each LED module. (3 LED Serial)
Input current = 20mA * 8 = 160mA

Note 8-4 : $P_{LED} = V_{LED-1} * I_{LED-1} + V_{LED-2} * I_{LED-2} \ldots + V_{LED-7} * I_{LED-7} + V_{LED-8} * I_{LED-8}$

VLED-1

VLED-2

Anode

Cathode

VLED-7

VLED-8
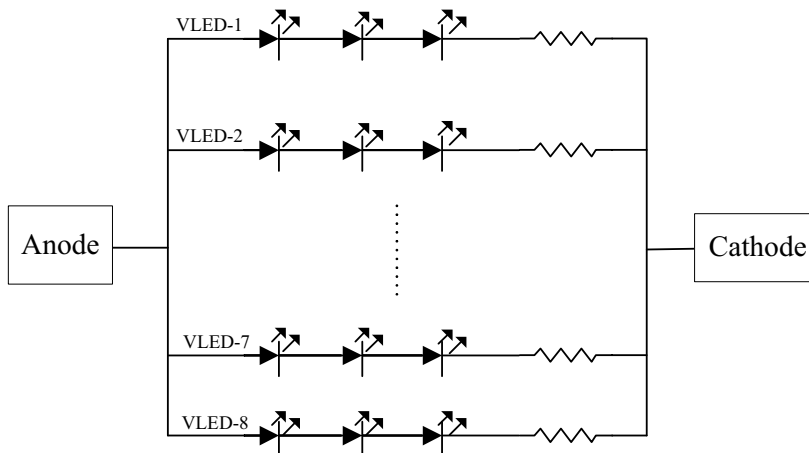
8-3) Power Consumption:

Parameters	Symbol	Max.	Unit	Remark
LCD Panel Power Consumption	-	0.16	W	Note 8-5
Backlight Power Consumption	-	1.76	W	Note 8-6
Total Power Consumption	-	1.92	W	

Note 8-5: The power consumption for backlight is not included.
Note 8-6: Back light power consumption is calculated by $I_L \times V_L$.

9. Display Color and Gray Scale Reference

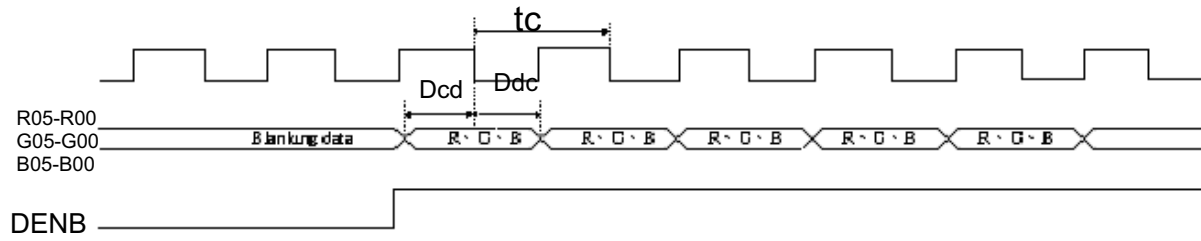| Color		Input Color Data																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue (63)	0	0	0	0	0	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	Red (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (01)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (02)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker ↓ Brighter	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Red (61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (01)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green (02)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker ↓ Brighter	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Green (61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Blue (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Darker ↓ Brighter	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Blue (61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

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10. Interface Timing

10-1) Timing Parameters

AC Electrical Characteristics (V_{CC} =+3.3V,GND=0V,Ta=25℃)

		Symbol	Min.	Typ.	Max.	Unit
Power supply		VCC	3.0	3.3	3.6	V
CLK	Frequency	1/tc	-	6.3	7.0	MHz
		tc	-	158	-	ns
HSYNC	Period	Hp	-	63.6	-	us
			-	400	-	tc
	Display period	Hdp	-	320	-	tc
	Pulse width	Hpw	5	30	-	tc
	Back-porch	Hbp	-	38	-	tc
	Front-porch	Hfp	-	12	-	tc
	Hpw+Hbp		-	68	-	tc
	Hsync-CLK	Hhc	10	-	Tc-10	ns
VSYNC	Period	Vp	-	16.8	-	ms
			-	262	288	Hp
	Display period	Vdp	-	240	-	Hp
	Pulse width	Vpw	-	3	-	Hp
	Back-porch	Vbp	-	15	-	Hp
	Front-porch	Vfp	-	6	-	Hp
	Vpw+Vbp		-	18	-	Hp
DENB	Horizontal scanning period	T1	-	400	-	tc
	Horizontal display period	T2	-	320	-	tc
	Vertical display period	T3	-	240	-	T1
	Frame cycling period	T4	-	262	288	T1
R,G,B	CLK-DATA	Dcd	10	-	-	ns
	DATA-CLK	Ddc	8	-	-	ns

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10-2) Timing Diagram

a.1 Input signal range

tc

Dcd Ddc

R05-R00
G05-G00   Blanking data   R G B   R G B   R G B   R G B   R G B
B05-B00

DENB

a.2 HSYNC timing

Hp

HSYN   Hpw

Hdp

Hbp   Hfp

R,G,B Vaild data
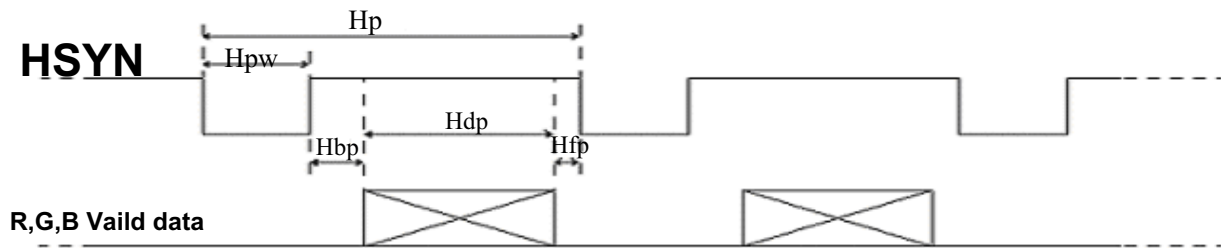
a.3 CLK,HSYNC relationship

CL

Hhc

HSYN

a.4 VSYNC timing

a.5 DENB timing

◆ PRIME VIEW

PD050QT2
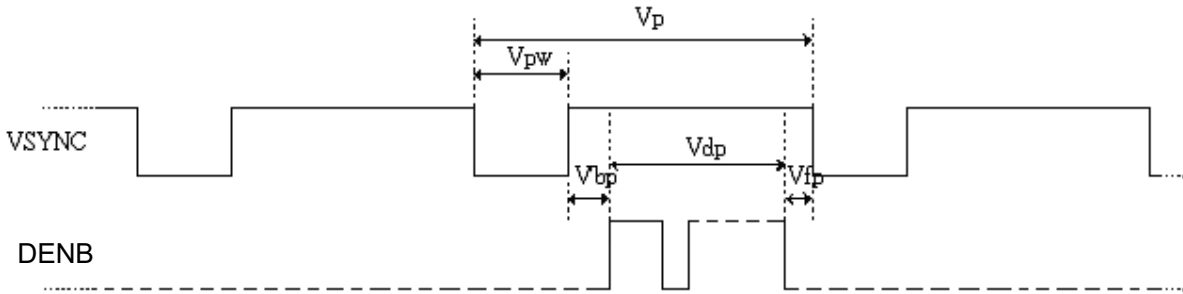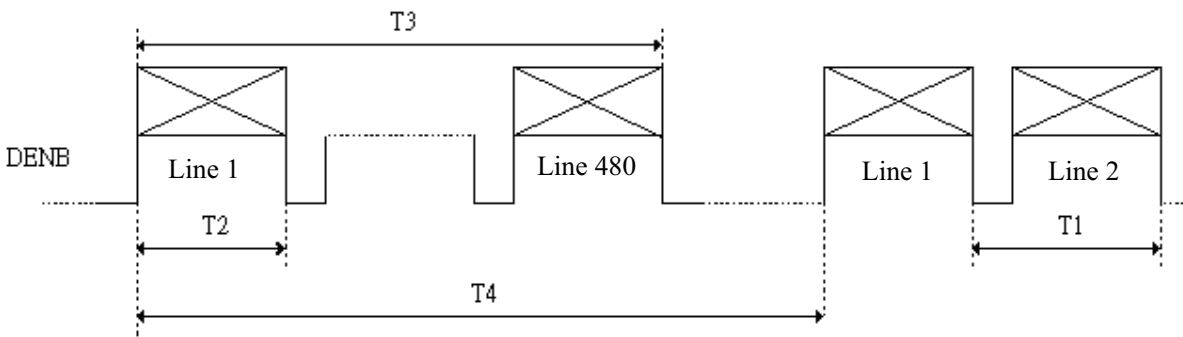
11. Power On Sequence
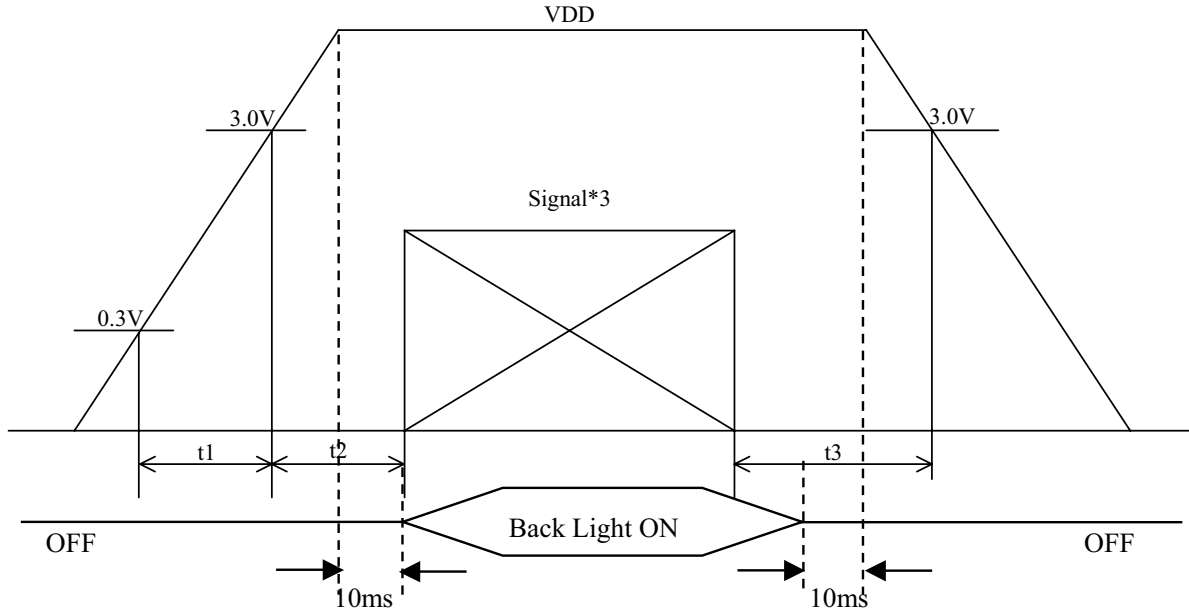
1. $0 < t1 \leqq 20ms$
2. $0 < t2 \leqq 50ms$
3. $0 < t3 \leqq 1s$

12. Optical Characteristics
12-1) Specification:

Ta = 25℃

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	$\theta 21, \theta 22$	CR≧10	55	60	--	deg	Note 12-1
	Vertical	$\theta 12$		35	40	--	deg	
		$\theta 11$		50	55	--	deg	
Contrast Ratio		CR	At optimized Viewing angle	400	600	--		Note 12-2
Luminance		L	$\theta = 0°$	500	550	--	cd/㎡	Note 12-3
White Chromaticity		x	$\theta = 0°$	0.270	0.310	0.350		
		y	$\theta = 0°$	0.300	0.340	0.380		
Response time	Rise	Tr	$\theta = 0°$	--	15	30	ms	Note 12-5
	Fall	Tf		--	25	50	ms	
Uniformity		U	-	70	80	--	%	Note 12-6
Cross Talk Ratio		CTK	-	--	--	3.5	%	Note 12-7
LED Life Time			+25℃	20000	30000	--	hrs	Note 12-4

Note 12-1: The definitions of viewing angles
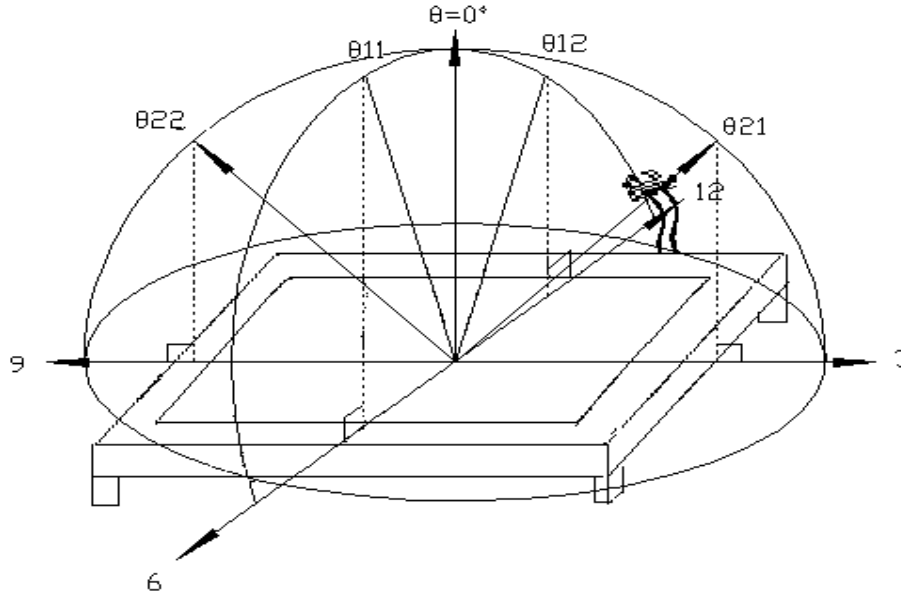
Note 12-2: $CR = \dfrac{\text{Luminance when Testing point is White}}{\text{Luminance when Testing point is Black}}$

Contrast Ratio is measured in optimum common electrode voltage.

Note 12-3: Topcon BM-7(fast) luminance meter 1° field of view is used in the testing (after 20~30 minutes operation).

Note 12-4: The "LED Life time " is defined as the module brightness decrease to 50% original Brightness that the ambient temperature is 25℃ and I_{LED} =20mA.

Note 12-5: The definition of response time :

◆ PRIME VIEW
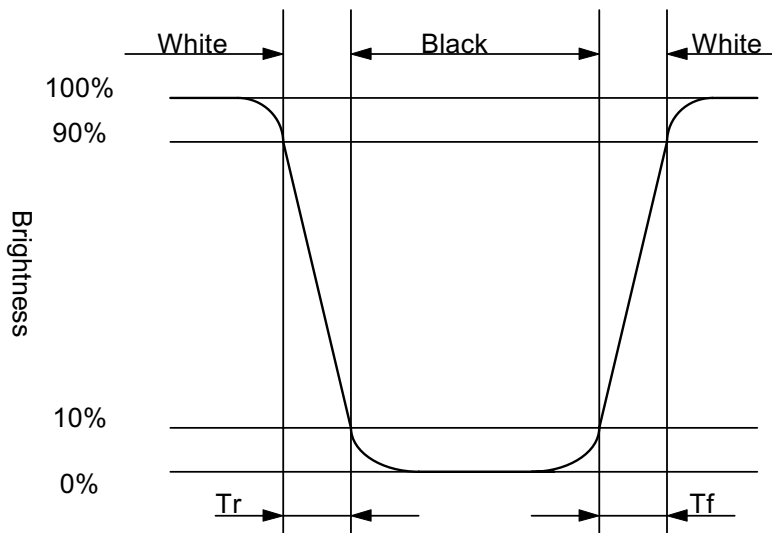
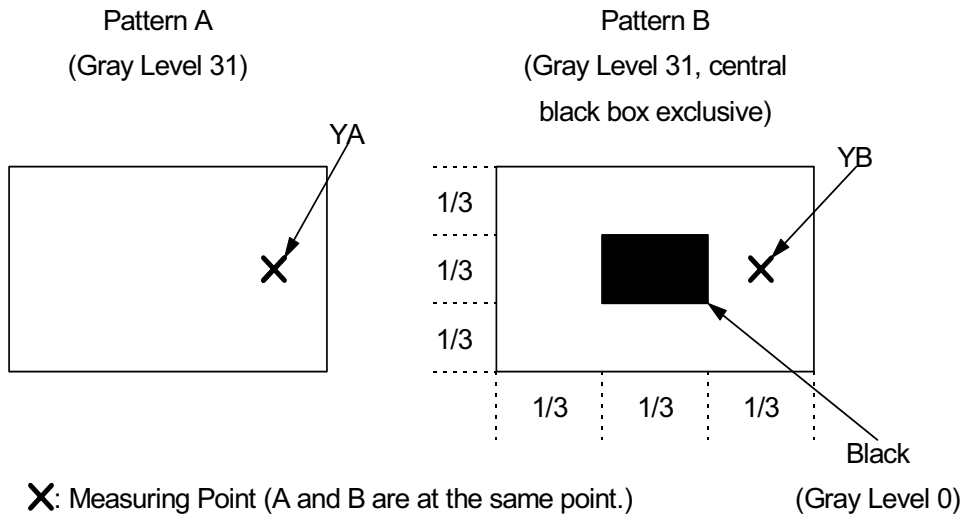Note 12-6: The uniformity of LCD is defined as

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

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 (Gray Level 63).
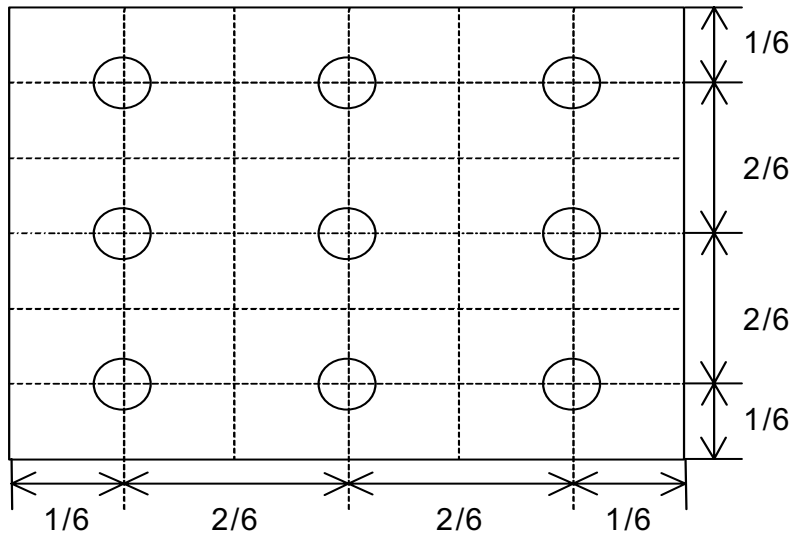
Note 12-7: Cross Talk (CTK) $= \dfrac{|YA\text{-}YB|}{YA} \times 100\%$

YA: Brightness of Pattern A
YB: Brightness of Pattern B
Luminance meter: BM 5A (TOPCON)
Measurement distance: 500 mm +/- 50 mm
Ambient illumination: < 1 Lux
Measuring direction: Perpendicular to the surface of module

Pattern A
(Gray Level 31)

Pattern B
(Gray Level 31, central
black box exclusive)

✕: Measuring Point (A and B are at the same point.)

13. Handling Cautions

13-1) Mounting of module
    A) Please power off the module when you connect the input/output connector.
    B) Polarizer which is made of soft material and susceptible to flaw must be handled carefully. Protective film (Laminator) is applied on surface to protect it against scratches and dirt.
    C) Please following the tear off direction as figure13-1 to remove the protective film as slowly as possible, so that electrostatic charge can be minimized.

13-2) Precautions in mounting
    A) When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth.
    B) Wipe off water drops or finger grease immediately. Long contact with water may cause discoloration or spots.
    C) TFT-LCD module uses glass, which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.
    D) Since CMOS LSI is used in the module. So take care of static electricity and earth yourself when handling.

13-3) Adjusting module
    A) Adjusting volumes on the rear face of the module have been set optimally before shipment.
    B) Therefore, do not change any adjusted values. If adjusted values are changed, the specifications described may not be satisfied.

13-4) Others
    A) Do not expose the module to direct sunlight or intensive ultraviolet rays for many hours.
    B) Store the module at a room temperature place.
    C) The voltage of beginning electric discharge may over the normal voltage because of leakage current from approach conductor by to draw lump read lead line around.
    D) If LCD panel breaks, it is possibly that the liquid crystal escapes from the panel. Avoid putting it into eyes or mouth. When liquid crystal sticks on hands, clothes or feet. Wash it out immediately with soap.
    E) Observe all other precautionary requirements in handling general electronic components.
    F) Please adjust the voltage of common electrode as material of attachment by 1 module.

13-5) Polarizer mark
    The polarizer mark is to describe the direction of view angle film how to mach up with the rubbing direction.
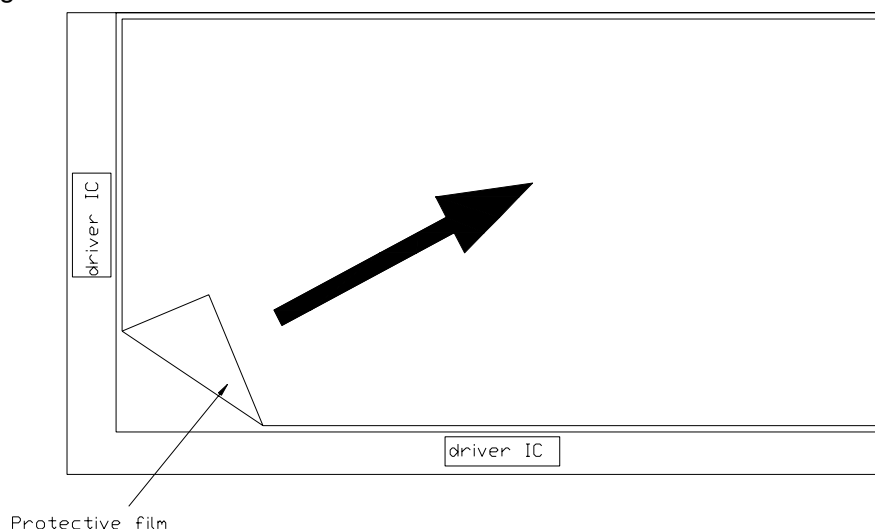
Figure 13-1 the way to peel off protective film

14. Reliability Test

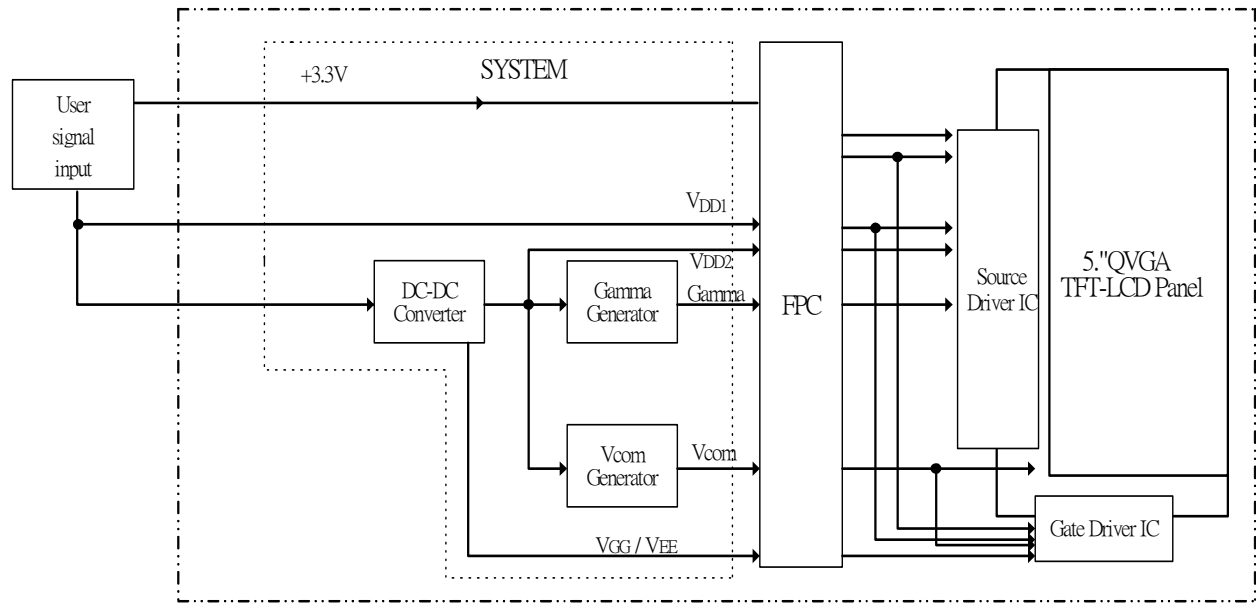| No	Test Item	Test Condition
1	High Temperature Storage Test	Ta = +80℃, 240 hrs
2	Low Temperature Storage Test	Ta = -30℃, 240 hrs
3	High Temperature Operation Test	Ta = +70℃, 240 hrs
4	Low Temperature Operation Test	Ta = -25℃, 240 hrs
5	High Temperature & High Humidity Operation Test	Ta = +60℃, 90%RH, 240 hrs
6	Thermal Cycling Test (non-operating)	-25℃→ +70℃, 200 Cycles 30 min 30 min
7	Vibration Test (non-operating)	Frequency：10 ~ 55 H$_Z$ Amplitude：1.5 mm Sweep time: 11 min Test Period: 6 Cycles for each direction of X, Y, Z
8	Shock Test (non-operating)	100G, 6ms Direction：±X, ±Y, ±Z Cycle: 3 times
9	Electrostatic Discharge Test (non-operating)	150pF, 330Ω Air: ±15KV; Contact: ±8KV 10 times/point, 5 points/panel face

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. Block Diagram

16. Packing

NOTE:
1 O'TY:10pcs panel/carton.
2.Dimension: 355*300*142mm
3.Weight: 2.6Kg

ITEM	PART NO.	DESCRIPTION	QTY	REMARK
5	50-0100011	carton 355*300*142mm	1	
4	50-0300021	FOAM 345*290*50mm	2	
3	50-0500011	防静電袋 150*180mm	10	
2		5" PANEL	10	
1	50-0300011	FOAM 345*290*20mm	2	

MTL.SPEC.	UNSPECIFIED TOL'S		REMARK		
	ANGLE			元太科技工業股份有限公司	
	ROUGHNESS			Prime View International Co.,ltd.	

			SCALE	UNIT	SHEET	DWG.TITLE		
APPROVE	Franks	07,03,06			1 OF 1	PD050QT2 Packing DWG		
CHECK	Franks	07,03,06	MTL.NO					
DESIGN	Jimmyc	07.03.06				DWG.NO.	REV. 01	A4 SIZE