Version : 1.0

TECHNICAL SPECIFICATION

MODEL NO : PD050QT1

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Please contact PVI or its agent for further information.

☐Customer's Confirmation

Customer _____

Date _____

By _____

☐PVI's Confirmation

Confirmed By Tommy Chang

Prepared By 黃秀晶

Revision History

Rev.	Eng.	Issued Date	Revised Contents
1.0	黃秀晶	May 10, 2007	New

TECHNICAL SPECIFICATION

CONTENTS

1. Application

This data sheet applies to a color TFT LCD module, PD050QT1.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 back-light unit

. Pixel in stripe configuration

. Slim and compact, designed for O/A application

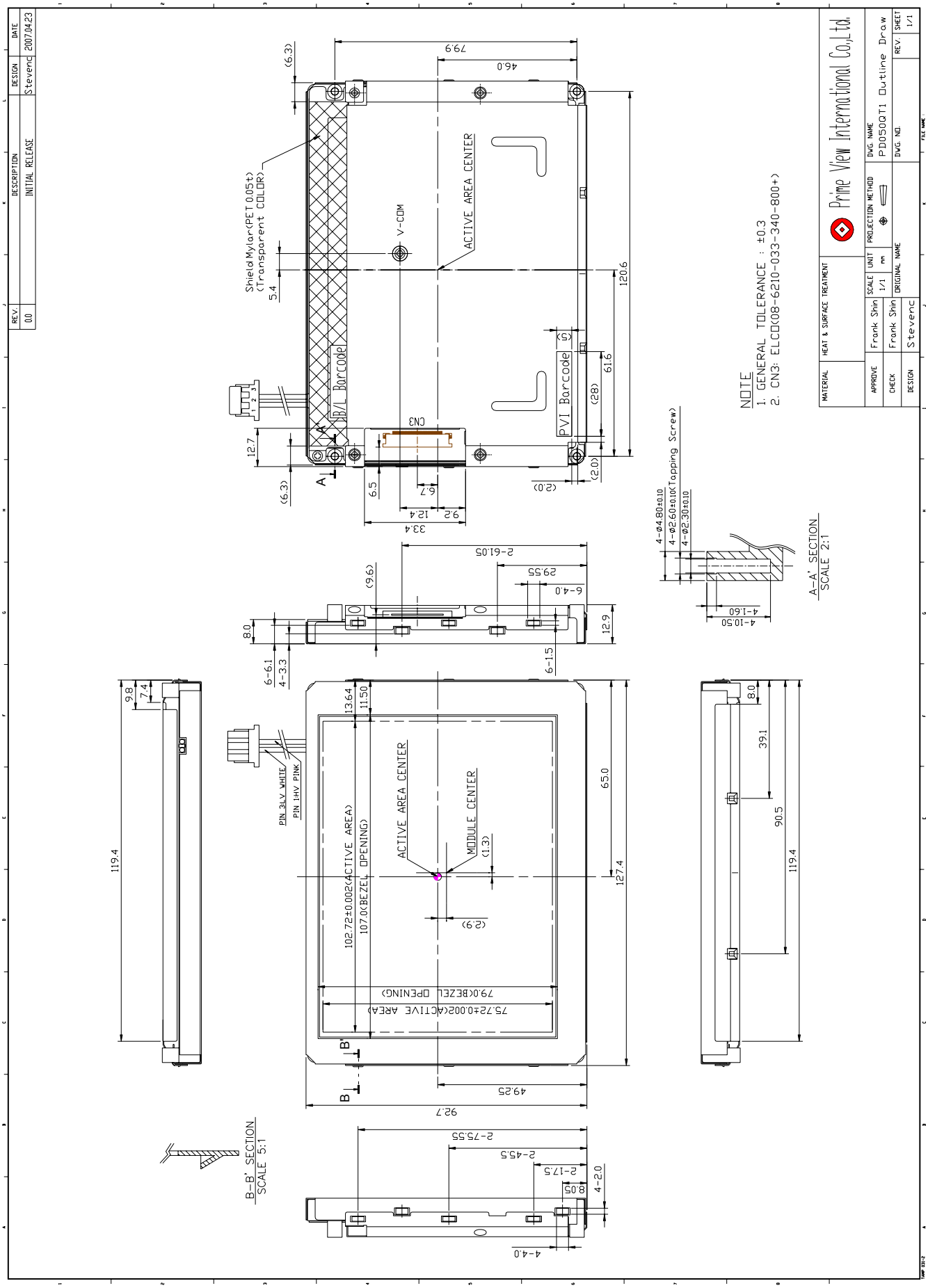
. Backlight driving DC/AC inverter not included in this module

. 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	CCFL, 1 tubes	
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 Page 13 viewing angle)	o'clock

4. Mechanical Drawing of TFT-LCD Module



5. Input / Output Terminals

5-1) TFT-LCD Panel Driving

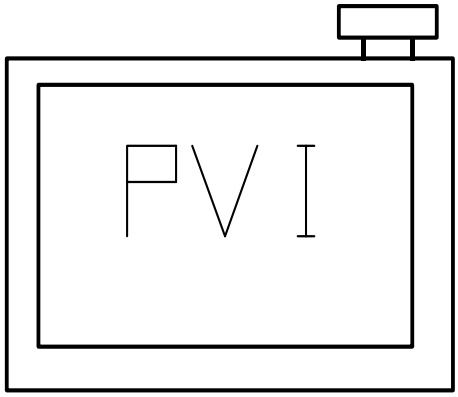
Connector type: ELCO 08-6210-033-340-800A+ , PIN No 33 pins, pitch=0.5mm

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 L：Normal ,H：Left /Right reverse mode	Note5-2
31	U/D	I	Vertical display mode select signal H：Normal ,L :Up/Down reverse mode	Note5-3
32	V/Q	I	VGA / QVGA mode select signal	Note10-2
33	GND	-	GND	

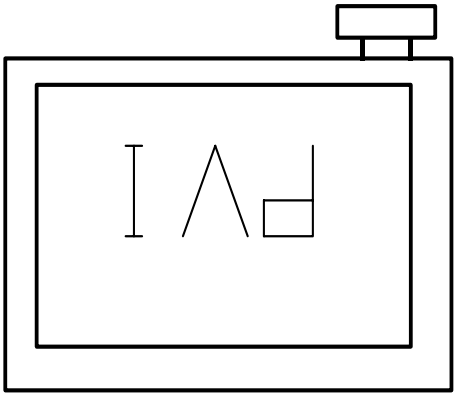
Note5-1：The horizontal display start timing is settled in accordance with rising of ENAB signal. In case ENAB is fixed ”Low”, the horizontal start timing is determined as described in 10-2. Don`t keep ENAB ”High” during operation.

Note 5-2 , 5-3 : The definitions of U/D & R/L

U/D(PIN 31)=Low R/L(PIN 30)=High



U/D(PIN 31)=High R/L(PIN 30)=Low



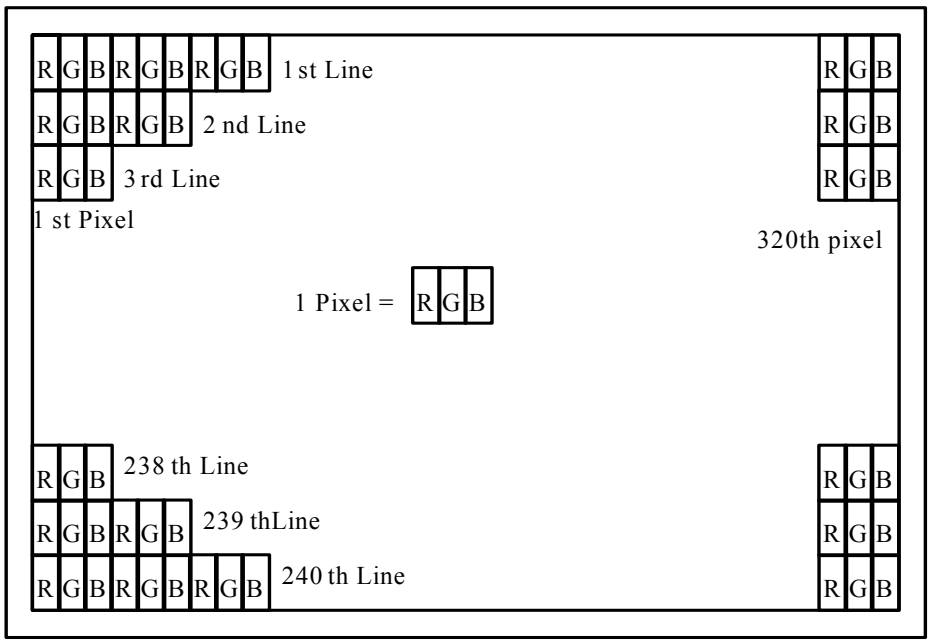
5-2) Backlight driving

Connector type: JST BHR-03VS-1, PIN No 3 pins, pitch=3.5mm

Pin No	Symbol	Description	Remark
1	V_{High}	Power supply for lamp (High voltage side)	Pink
2	NC	This is electrically opened	-
3	V_{Low}	Power supply for lamp (Low voltage side)	White, Note 5-4

Note 5-4: Low voltage side of backlight inverter connects with ground of inverter circuits.

6. Pixel Arrangement



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	

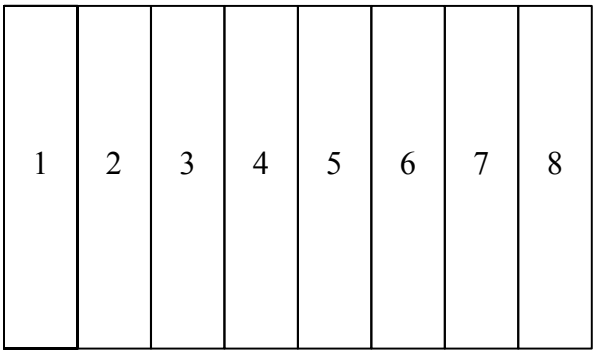
Note 7-1:CK,R0~R5,G0~G5,B0~B5,Hsync,Vsync,ENAB,R/L,U/D,V/Q

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}	-	65.8	-	mA	Note 8-1
Total power consumption	P_{CC}	197.4	217.14	236.88	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}	-	3.68	-	V	

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



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 Ta=25℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V_L	423	448	494	Vrms	
Lamp current	I_L	3.0	6.0	8.0	mA	Note 8-2
Lamp frequency	F_L	40	55	80	KHz	Note 8-3
Starting Voltage (25℃) (Reference Value)	Vs	-	-	600	Vrms	Note 8-4
Starting Voltage (0℃) (Reference Value)	Vs	-	-	760	Vrms	Note 8-4

Note 8-2：In order to have proper operation of the B/L, no matter what kind of inverters, the output lamp current must be between Min. and Max. values to avoid the abnormal display image caused by B/L.

Note 8-3：The waveform of lamp driving voltage should be as closed to a perfect sine wave as possible.

Note 8-4：The “Starting Voltage” means the minimum voltage of inverter to turn on the lamp. And it should be applied to the lamp for more than 1 second to start up. Otherwise the lamp may not be turned on. PVI strongly recommend that the minimum voltage of inverter could be designed for 0℃ condition.

8-3) Power Consumption

Parameters	Symbol	Typ.	Max.	Unit	Remark
LCD Panel Power Consumption	-	0.22	0.24	W	Note 8-5
Backlight Power Consumption	-	2.7	3.95	W	Note 8-6
Total Power Consumption	-	2.92	4.16	W	

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

9. Display Color and Gray Scale Reference

Color		Input Color Data																							
		Red								Green								Blue							
		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	0	0	0	0	0	0	0	0
	Red (255)	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 (255)	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 (255)	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	Red (00)	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 (01)	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 (02)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker																								
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																								
	Red (253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (254)	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 (255)	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	Green (00)	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 (01)	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 (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Darker																								
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																								
	Green (253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green (254)	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 (255)	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	Blue (00)	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 (01)	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 (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Darker																								
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	Brighter																								
	Blue (253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue (254)	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 (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

10. Interface Timing

10-1) Timing Parameters

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

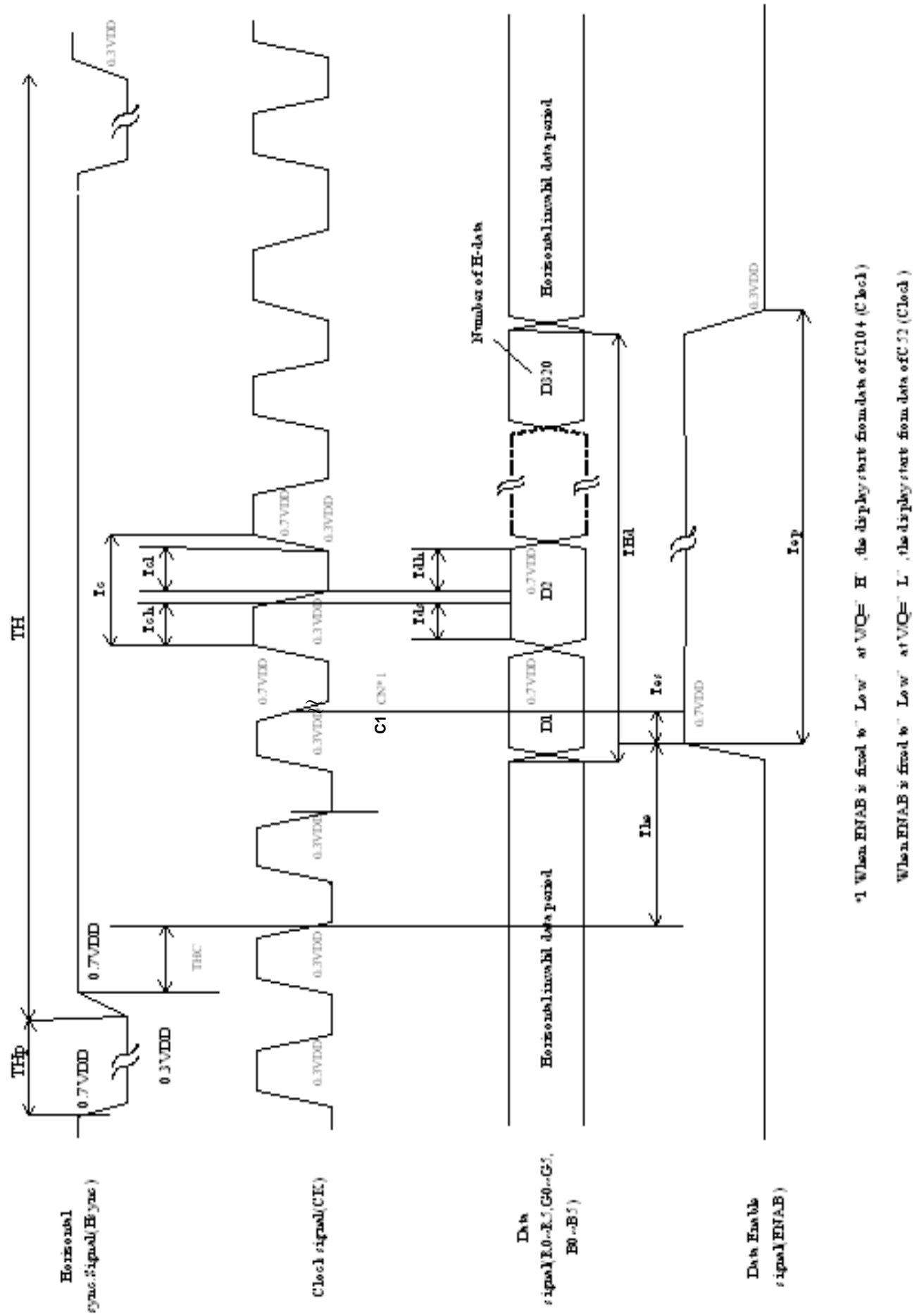
Characteristics		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	-	25.18	28.33	MHz	V/Q=H
			-	6.3	7.0	MHz	V/Q=L
	Duty ratio	Tch/Tc	40	50	60	%	V/Q=L
Data	Set up time	Tds	5	-	-	ns	
	Hold time	Tdh	10	-	-		
Horizontal sync. signal	Cycle	TH	30.0	31.8	-	us	V/Q=H
			700	800	900	clock	
		TH	50.0	63.6	-	us	V/Q=L
			360	400	450	clock	
	Pulse width	THp	2	96	200	clock	
Vertical sync. signal	Cycle	TV	515	525	560	line	V/Q=H
		TV	251	262	280		V/Q=L
	Pulse width	TVp	2	-	34	line	
Horizontal display period		THd	320			Clock	
Hsync.-Clock phase difference		THc	10	-	Tc-10	ns	
Hsync.-Vsync. phase difference		TVh	0	-	TH-THp	ns	
Vertical sync. signal start position		TVs	34			line	V/Q=H
			7				V/Q=L

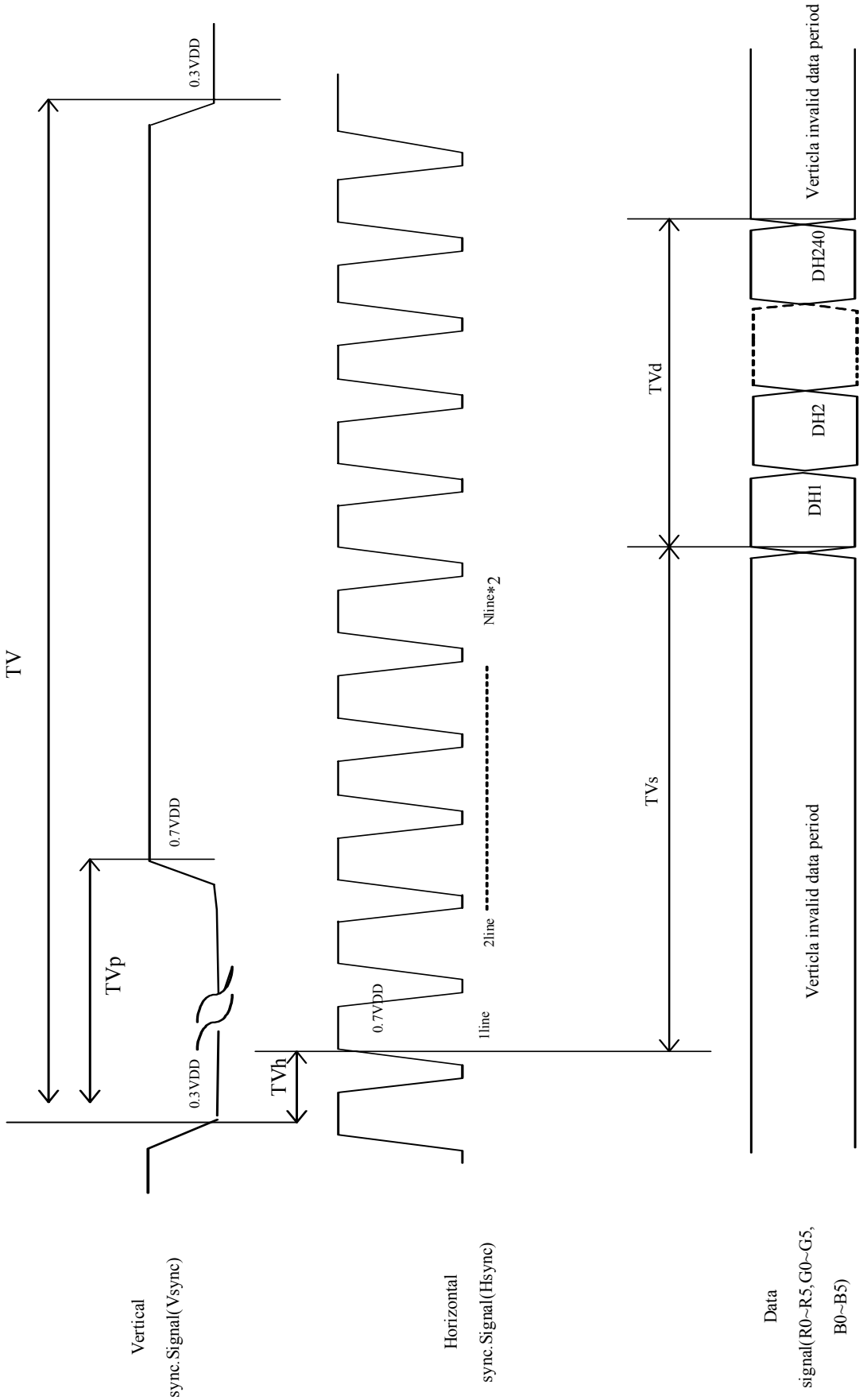
Note10-1：In case of lower frequency, the deterioration of the display quality, flicker etc., may occur.

Parameter		symbol	Min.	Typ	Max	Unit	Remark
Enable signal	Set up time	Tes	5	-	Tc-10	ns	
	Pulse width	Tep	2	320	TH-10	clock	
Hsync-Enable signal phase difference		The	44	-	TH-664	clock	V/Q=H
			2	-	TH-340		V/Q=L

Note10-2：
When ENAB is fixed at “V/Q=Low”, the display starts from the data of C52 (clock).
When ENAB is fixed at “V/Q=High”, the display starts from the data of C104 (clock).

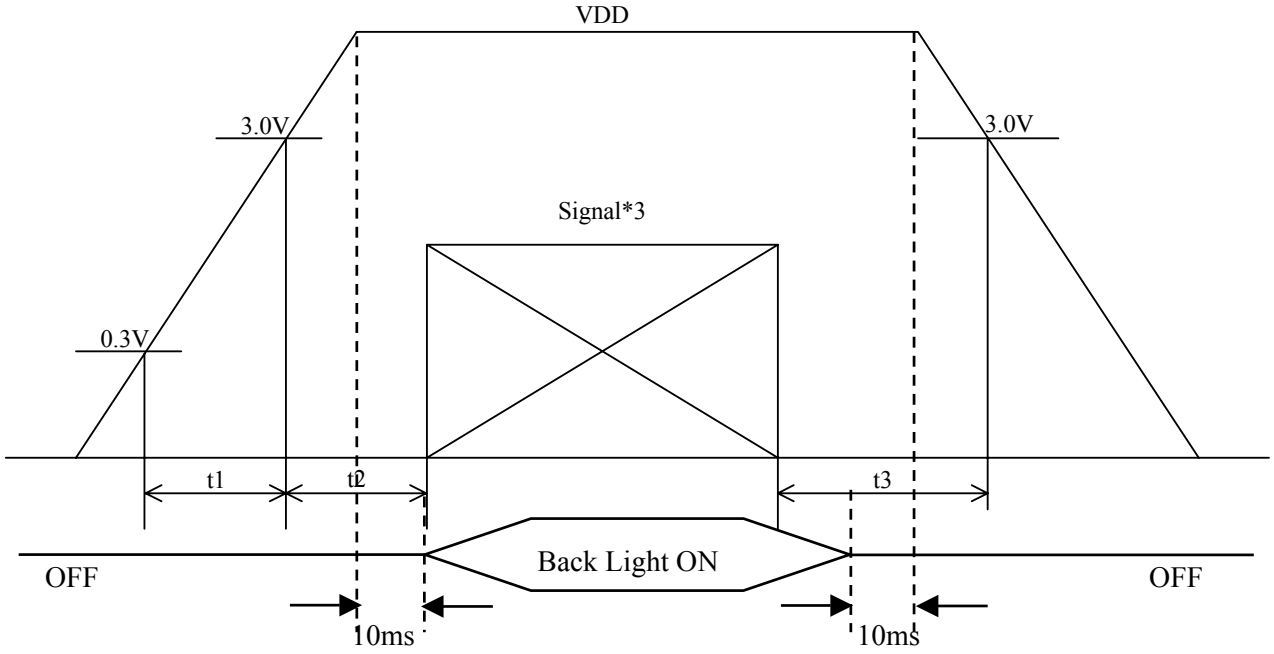
10-2) Timing Diagram





*2 The vertical display position (TVs) is fixed at 34th line (V/Q=H) and 7th line (V/Q=L).

11. Power On Sequence



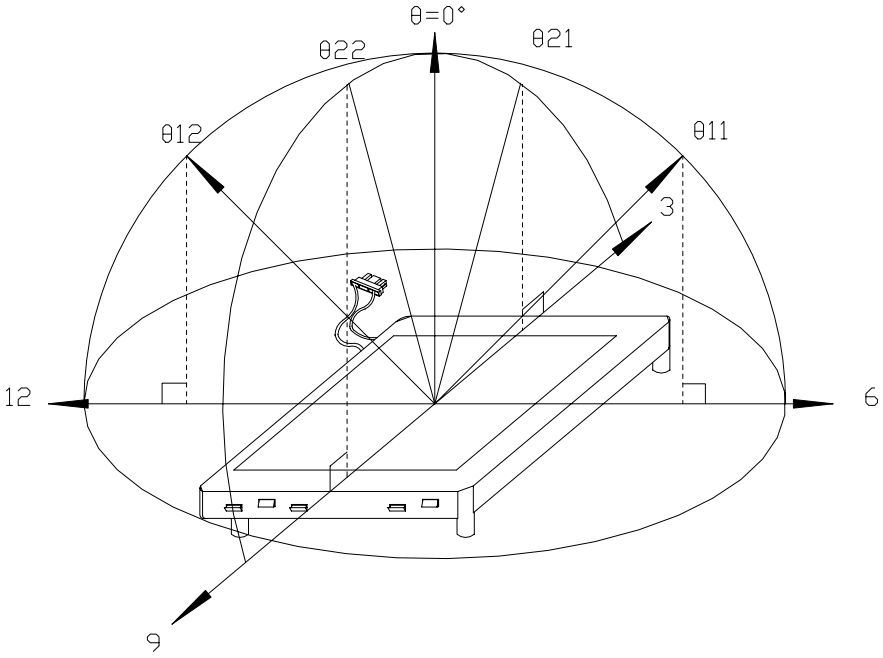
1. $0 < t1 \leqq 20ms$
2. $0 < t2 \leqq 50ms$
3. $0 < t3 \leqq 1s$

12. Optical Characteristics

12-1) Specification: Ta = 25℃

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ 21, θ 22	CR≧10	55	60	---	deg	Note 12-1
	Vertical	θ 12		35	40	---	deg	
		θ 11		50	55	---	deg	
Contrast Ratio		CR	At optimized Viewing angle	200	350	---		Note 12-2
Luminance		L	θ =0°	350	400	---	cd/㎡	Note 12-3
White Chromaticity		x	θ =0°	0.270	0.300	0.330		
		y	θ =0°	0.310	0.340	0.370		
Response time	Rise	Tr	θ =0°	---	15	30	ms	Note 12-4
	Fall	Tf		---	25	50	ms	
Uniformity		U	-	70	80	---	%	Note 12-5
Cross Talk Ratio		CTK	-	---	---	3.5	%	Note 12-6
Lamp Life Time			+25℃	30,000	---	---	hrs	

Note 12-1 : The definitions of viewing angles

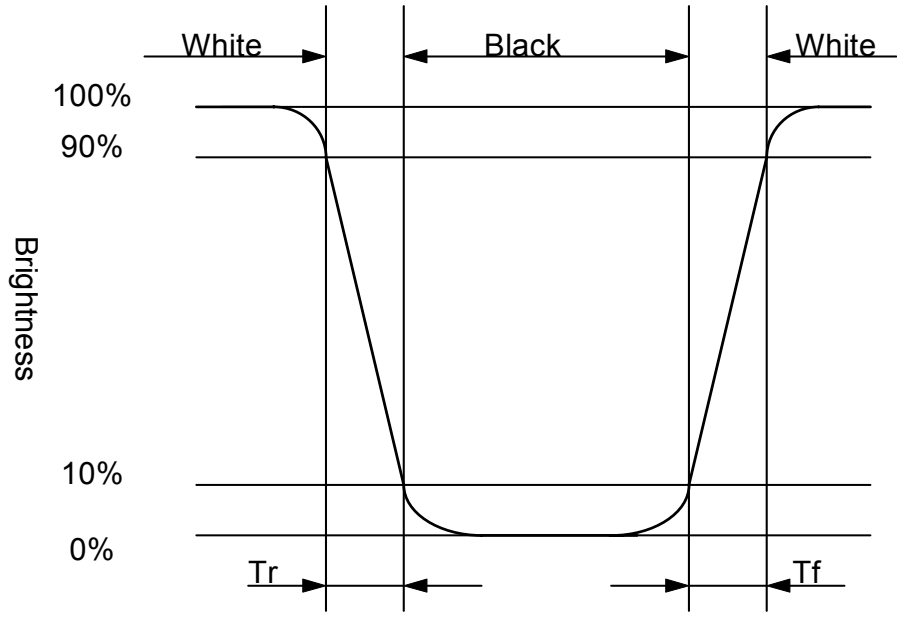


Note 12-2 : CR = $\frac{\text{Luminance when Testing point is White}}{\text{Luminance when Testing point is Black}}$

Contrast Ratio is measured in optimum common electrode voltage.

Note 12-3 : 1.Topcon BM-7(fast) luminance meter 1° field of view is used in the testing (after 20~30 minutes operation).
2.Lamp current : 6 mA
3.Inverter model : TDK-347.

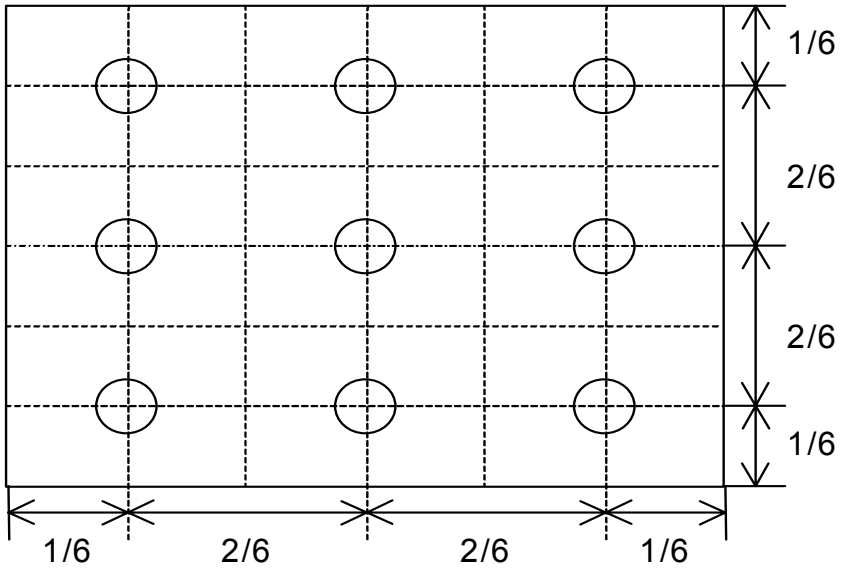
Note 12-4 : The definition of response time :



Note 12-5: The uniformity of LCD is defined as

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

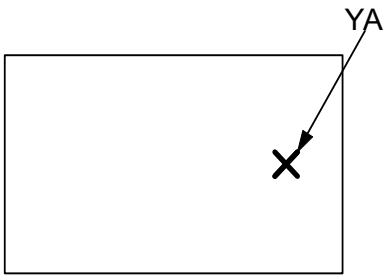
Luminance meter : BM-5A or BM-7 fast(TOPCON)
Measurement distance : 500 mm +/- 50 mm
Ambient illumination : < 1 Lux
Measuring direction : Perpendicular to the surface of module
The test pattern is white (Gray Level 63).



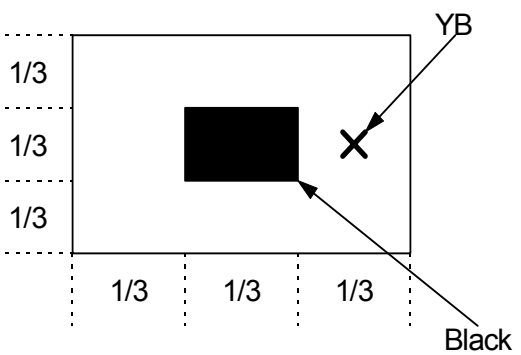
Note 12-6: Cross Talk (CTK) = $\frac{|YA-YB|}{YA} \times 100\%$

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.)

(Gray Level 0)

13. Handling Cautions

13-1) Mounting of module

A) Please power off the module when you connect the input/output connector.

B) Please connect the ground pattern of the inverter circuit surely. If the connection is not perfect, some following problems may happen possibly.
1. The noise from the backlight unit will increase.
2. The output from inverter circuit will be unstable.
3. In some cases a part of module will heat.

C) Polarizer which is made of soft material and susceptible to flaw must be handled carefully.

D) Protective film (Laminator) is applied on surface to protect it against scratches and dirts. It is recommended to peel off the laminator before use and taking care of static electricity.

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.

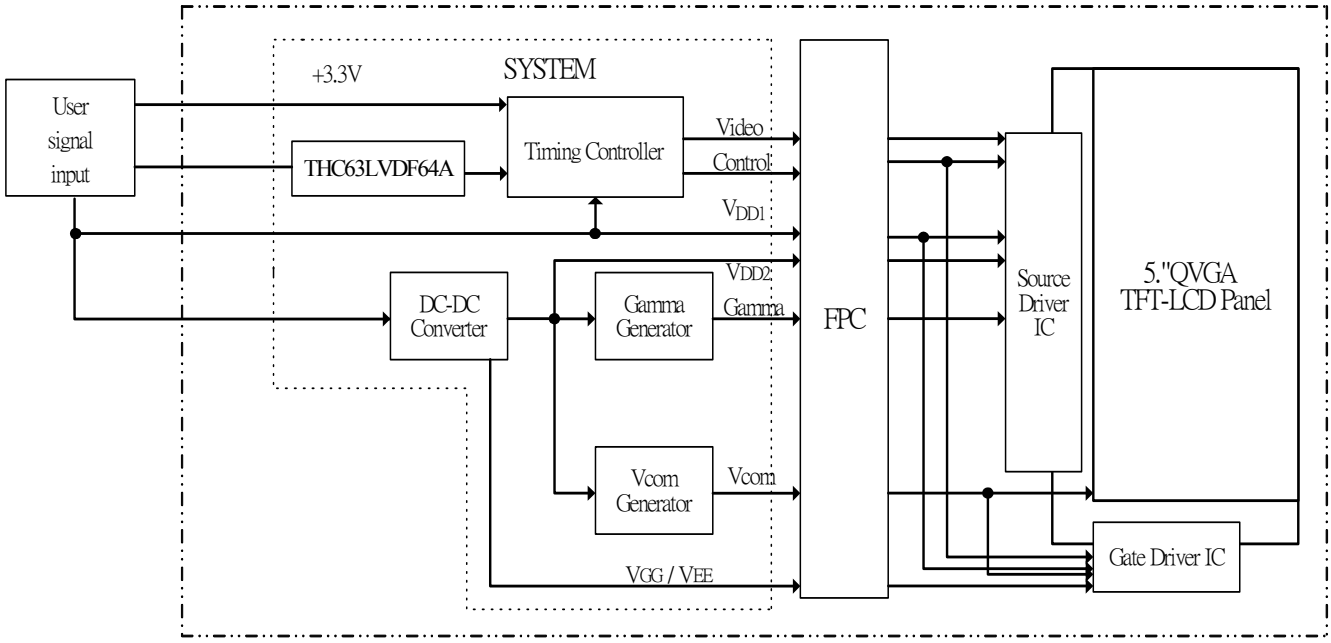
14. Reliability Test

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 mins 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

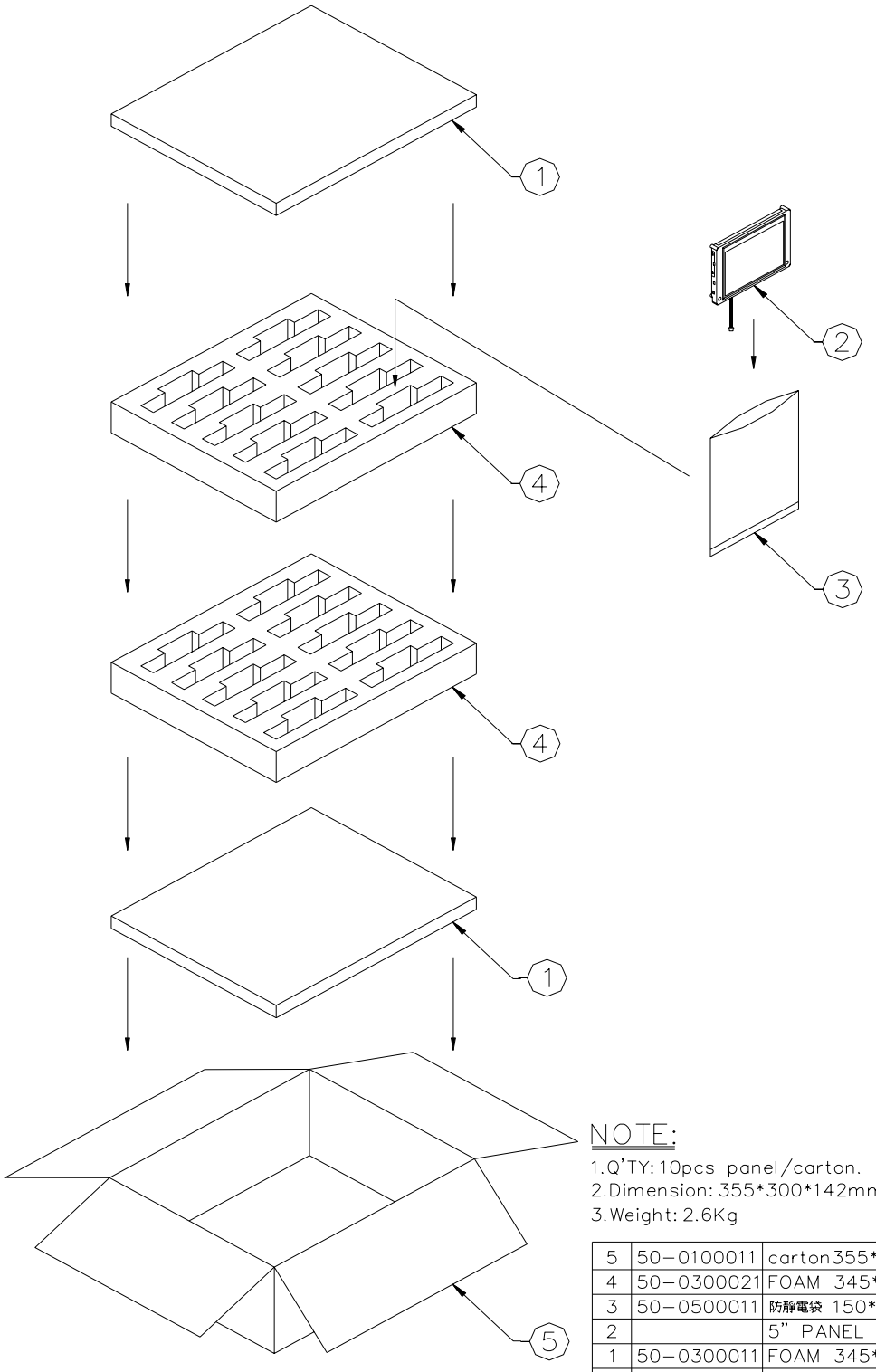
Ta: ambient temperature
Note : The protective film must be removed before temperature test.

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

ITEM	PART NO.	DESCRIPTION	QTY	REMARK
5	50-0100011	carton355*300*142mm	1	
4	50-0300021	FOAM 345*290*50mm	2	
3	50-0500011	防靜電袋 150*180mm	10	
2		5" PANEL	10	
1	50-0300011	FOAM 345*290*20mm	2	

MTL.SPEC.	UNSPECIFIED TOL'S ANGLE ROUGHNESS	REMARK	元太科技工業股份有限公司 Prime View International Co.,ltd.			
APPROVE Franks 07.03.06	SCALE	UNIT	SHEET 1 OF 1	DWG.TITLE PD050QT1 Packing DWG		
CHECK Franks 07.03.06						
DESIGN Jimmyc 07.03.06	MTL.NO.		DWG.NO.		REV. 01	A4 SIZE