TFT-LCD MONITOR

SPECIFICATION DATA SHEET

(Temporary)

MODEL NO. : T070W1D4

Date : *2008.06.05* ***Revision 0.1***

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This product specification is subject to change without any notice.

Records of Revision

Date	Rev. No.	Summary	Page
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1.0 Handling Precaution

1.) Handle with care. Pay attention not to press or scratch the surface of the monitor, especially the polarizer. Do not twist or bend the monitor. It may cause un-recoverable damage.

2.) Do not drop or bump the monitor since this monitor contains fragile glass components. Breakage of this monitor might cause leakage of the liquid crystal sealed inside the glasses. Do not touch the liquid crystal liquid in case of leakage. **Flush with massive water immediately in case of contact with your skin by liquid crystal fluid and call for doctor for immediate medical treatment.**

3.) Be sure to turn off power supply while plug or un-plug the power input connector.

4.) Clean up the polarizer only with soft solvent if necessary. The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, toluene, Ethyl acid or Methyl chloride. It will permanently damage the polarizer due to chemical reaction. 5.) Wipe off fluid drop immediately to prevent from possible discoloration or spots on the polarizer.

6.) Do not twist nor bend the monitor structure, even momentarily. Bending or twisting torque may likely damage the internal components of the monitor.

7.) The cold cathode fluorescent lamp in LCD contains small amount of mercury (Hg). Please refer to the design specification for application and the local regulations and environmental laws for disposal purpose.

8.) Protect the monitor from static environment to prevent from damage to the CMOS gate array IC.

2.0 General Description

T070W1D4 is a 7 inch (16:9 aspect ratio) color active matrix TFT LCD monitor with slim outlook and excellent display performance driven by a pure **DIGITAL** CMOS interface. This monitor supports 480(H) x RGB x 234(V), stripe color pixel format, and 262,144 colors (RGB 6 bits data) with outstanding color image and **ALL-IN-ONE** functionality, including a built-in DC-DC inverter for LED Backlight with extremely wide dimming range and DC-DC circuitry for TFT array. Its outstanding performances with wide operation temperature range, **-30 ~ 85ºC**, high brightness of **420 nits(typ.) under -30ºC low temperature environment,** and wide viewing angle(120°/100°) make this monitor very suitable for applications under server environments or outdoor use. It provides customers with high design flexibilities, especially for industrial and medical applications.

2.1 General Applications

- Display terminal for applications of Car Navigation, Car PC, Industrial, Medical, Gaming, Amusement or more

2.2 Main Features

- 16:9 Display Aspect Ratio
- Wide Viewing Angle
- Wide Temperature Range
- High Brightness
- High Contrast Ratio
- Pure Digital CMOS Interface
- Thin and Light Weight
- LED Backlight with Wide Dimming Range and Superior Brightness Performance under Low Temperature Environment.
- Built-in LED Driver
- Built-in DC-DC

2.3 General Information

2.3.1 Display Characteristics

Item	Specification	Unit	Note
Display Area (HxV)	154.08 x 86.58 (7” Diagonal)	mm	-
Driver Element	a-Si TFT Active Matrix	-	-
Number of Pixels (HxV)	480 x 234	pixel	Wide 16:9
Pixel Arrangement	R.G.B Vertical Stripe	-	-
Dot Pitch (HxV)	0.107 x 0.370	mm	Dot

Display Mode	Normally White	-	-
Viewing Angle (H/V)	120/100	degree	6 o'clock
Signal Interface	Digital RGB 18 bits		262K colors

2.3.2 Mechanical Dimensions

Item		Min.	Typ.	Max.	Unit	Note
Dimension	Horizontal		164.9		mm	±0.3 mm
	Vertical		100.0			±0.3 mm
	Depth		14			±1 mm
Weight			200		g	±10 g

3.0 Absolute Maximum Ratings

3.1 Absolute Ratings of Environment Requirement

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	Tstg	-40	95	ºC	
Operation Temperature (Ambient Temperature)	Topr	-30	85	ºC	

3.2 Electrical Absolute Ratings

3.2.1 TFT-LCD Module

(Ta=25±2ºC), Vgg=GND=0V)

Item	SYMBOL	Min.	Max.	UNIT	NOTE
Power Supply Voltage	V_{DD}	-0.3	6.0	V	(1),(2)
Input Voltage	V_{i1}	-0.3	5.5	V	(1),(2),(3)

3.2.2 Backlight Inverter Module

Item	SYMBOL	MIN	MAX	UNIT	NOTE
Power Supply Voltage	V_{BL}	-0.3	15	V	(1),(2)
Input Voltage	V_{i2}	-0.3	5.5	V	(1),(2),(4)

Note (1) Within operating temperature

Note (2) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (3) For all pins except power and ground pins

Note (4) For pins "DIM" and "ENA"

4.0 Optical Characteristics

The following items are measured under stable conditions in a dark room or equivalent state.

* Measuring Equipment: BM-5A, PR-650

(V_{DD}=5V, f_V=60Hz, f_H=15.734KHz, Ta=25±2ºC)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	At optimized Viewing Angle	200	300	-		(4)
Response Time at 25ºC	Rising	T_R	θ=0º	-	12	50	ms	(3)
	Falling	T_F		-	18	60		
Luminance		T_L	25ºC	-	420		cd/m^2	
Color Chromaticity (CIE 1931)	White	W_X	θ =0º		-			(6)
		W_Y	θ =0º		-			
Viewing Angle	Hor.	θ_L	CR≥10 at center point	50	60	-	Degree	(5)
		θ_R		50	60	-		
	Ver.	θ_H		30	40	-		
		θ_L		50	60	-		
Viewing Angle	Hor.	θ_L	CR≥5 at center point	60	70	-	Degree	(5)
		θ_R		60	70	-		
	Ver.	θ_H		30	50	-		
		θ_L		60	70	-		

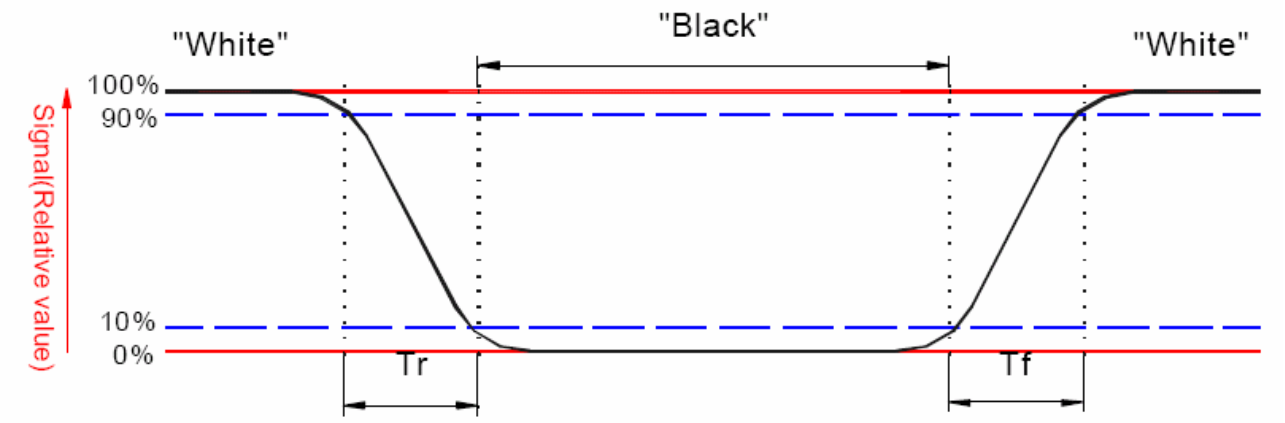
Note (1) : Ambient temperature =25℃, and , using the Mode 2 of LED control scheme and V_{DIM} =0V to get the maximum brightness. To be measured in the dark room.

Note (2) : To be measured on the center area of panel with a viewing cone of 1°by Topcon luminance meter BM-5, after 10 minutes operation.

Note (3) : Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.

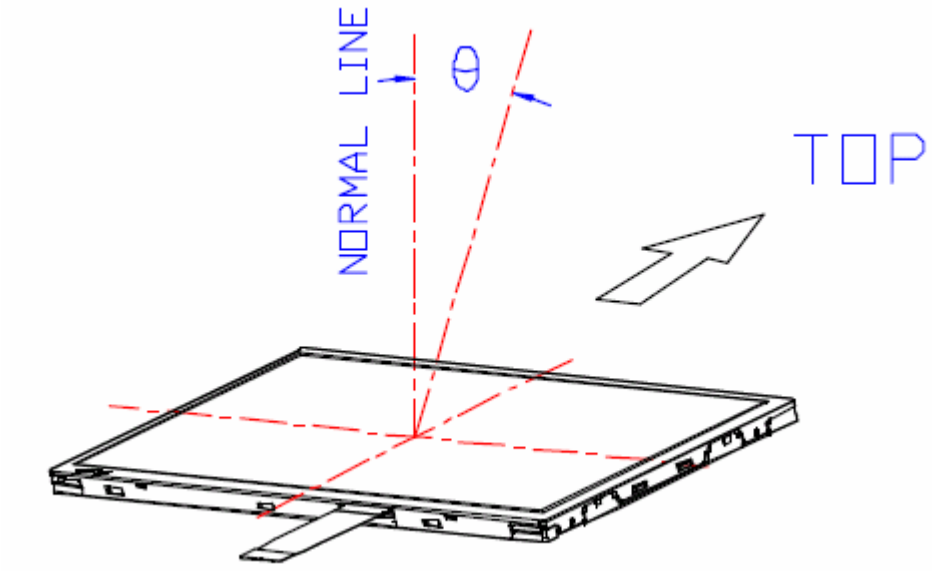


Note (4) : Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note (5) : Definition of viewing angle, Refer to figure as below.



Note (6) : Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

5.0 Electrical Characteristics

5.1 AC Timing Characteristics

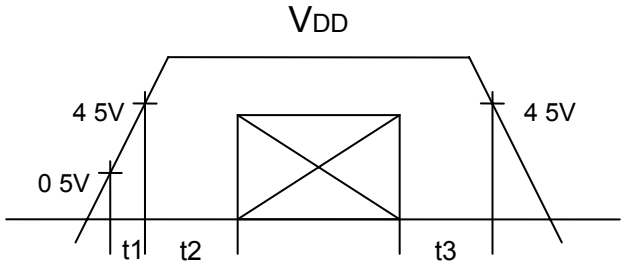
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Clock Frequency	F_{ck}	8.0	8.33	9.4	MHz	
Clock Duty Ratio	$T_{ch}/(T_{ch}+T_{cl})$	40	50	60	%	
Hsync Period	T_h	545	572	600	clk	
	τ_h	60	63.5	67	μs	$\tau_h=F_{ck}xT_h$
Hsync Pulse Width	T_{hw}	2	44	64	clk	
Vsync Period	T_v	258	262	280	T_h	
	τ_v	16.1	16.6	17.1	ms	$\tau_v=\tau_h$ x T_v
Vsync Pulse Width	T_{vw}	2	4	16	T_h	
Hsync/Vsync Phase Shift	T_{vpd}	2	-	-	clk	
Horizontal Display Start	T_{he}	60	80	100	clk	
Vertical Display Start	T_{ve}	15	18	21	T_h	
Hsync Clock Shift	T_{hc}	10	-	$(T_{ch}+T_{cl})$-10	ns	
Data Setup Time	T_{ds}	5	-	-	ns	
Data Hold Time	T_{ch}	10	-	-	ns	

5.2 DC Characteristics

5.2.1 TFT-LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{DD}	4.75	5.0	5.25	V	(1)
	I_{DD}	-	200	260	mA	(2)
Permissive Input Ripple Voltage	V_{RF}	-	-	100	mV_{P-P}	V_{DD}=+5V
Input Voltage (Low)	V_{IL}	0	-	0.8	V	(3)
Input Voltage (High)	V_{IH}	2.0	-	5.5	V	(3)
Input Current (Low)	I_{IL}	-	-	10	μA	(3)
Input Current (High)	I_{IH}	-	-	10	μA	(3)

Note (1) VDD Power-On condition :



0 < t1 ≤ 20 ms
0 < t2 ≤ 50 ms
t3 ≤ 1 s

Note (2) Conditions for current consumption :
8 Gray Scale Pattern, V_{CC}=5.0V, f_H=15.3K, f_V=58.4Hz, f_{CLK}=6.0MHz

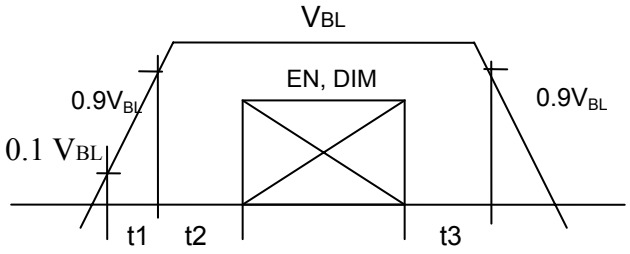
Note (3) CLK, Hsync, Vsync, DE, R0~R5, G0~G5, B0~B5

5.2.2 LED Backlight Driving Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{BL}	9.0	12.0	13.2	V	
	I_B	-	260	295	mA	V_{DIM}=0V V_{ENA}=5V
Dimming Voltage	V_{Dim}	0	-	5	V	
Enable Control Voltage	V_{ENA-L}	0	-	0.4	V	
	V_{ENA-H}	3.0	-	5.0	V	
Operation Life Time	Hr		50,000		Hours	(2)

Note (1) V_{BL} Power-On Condition for LED driver :

Please make sure the control signals must arrive after the power supply of LED driver, V_{BL}.



0 < t1 ≤ 10 ms
0 < t2 ≤ 50 ms
t3 ≤ 50 ms

Note (2) Life time (Hr) of a lamp is defined as the time in which it continues to operate under the condition of Ta = 25±2°C and V_DIM = 0V to get the maximum brightness for a lamp until the brightness becomes 50% or lower than its original value.

5.3 Input Terminal Pin Assignment

5.3.1 Signal Input Interface

Connector : 31 pin Board to Board Type : DF9-31P-1V20

Matching Connector : DF9-31S-1V20

Pin No	Symbol	Description	Remark
1	GND	Ground	-
2	CLK	Data Clock	-
3	Hsync	Horizontal Sync.	-
4	Vsync	Vertical Sync.	-
5	GND	Ground	-
6	R0	Red Data (LSB)	-
7	R1	Red Data	-
8	R2	Red Data	-
9	R3	Red Data	-
10	R4	Red Data	-
11	R5	Red Data (MSB)	-
12	GND	Ground	-
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 (MSB)	-
19	GND	Ground	-
20	B0	Blue Data (LSB)	-
21	B1	Blue Data	-
22	B2	Blue Data	-
23	B3	Blue Data	-
24	B4	Blue Data	-
25	B5	Blue Data (MSB)	-
26	GND	Ground	-
27	NC	No Connection	-
28	VDD	Power Supply (+5V)	-
29	VDD	Power Supply (+5V)	-
30	NC	No Connection	-
31	NC	No Connection	

5.3.2 DC-AC Power Input Interface

Connector : 11 pins Board-to-Board Type : DF9-11P-1V20

CN4 Matching Connector : DF9-11S-1V20

Pin No.	Symbol	Description	Remark
1	GND	Ground	-
2	GND	Ground	-
3	GND	Ground	-
4	DIM	Dimming Control	-
5	ENA	On/Off Control (GND/Off; 5V/On)	-
6	V_{BL}	Power Supply (+12V)	-
7	V_{BL}	Power Supply (+12V)	-
8	V_{BL}	Power Supply (+12V)	-
9	NC	No Connection	-
10	NC	No Connection	-
11	NC	No Connection	-

Connector : 5 pins 1.25 mm pitch Board-to-Wire Type P/N: DF13-5P-1.25DSA20

CN5 Matching Connector : DF13-5S-1.25C Maker : Hirose

Pin No.	Symbol	Description	Remark
1	Vin	Power Supply (+12V)	-
2	ENA	On/Off Control (GND/Off, 5V/On)	-
3	DIM	Dimming Control	-
4	GND	Ground	-
5	GND	Ground	-

5.3.3 Color Data Reference

The below table is about nput signal, Basic display colors and gray scale of each color.

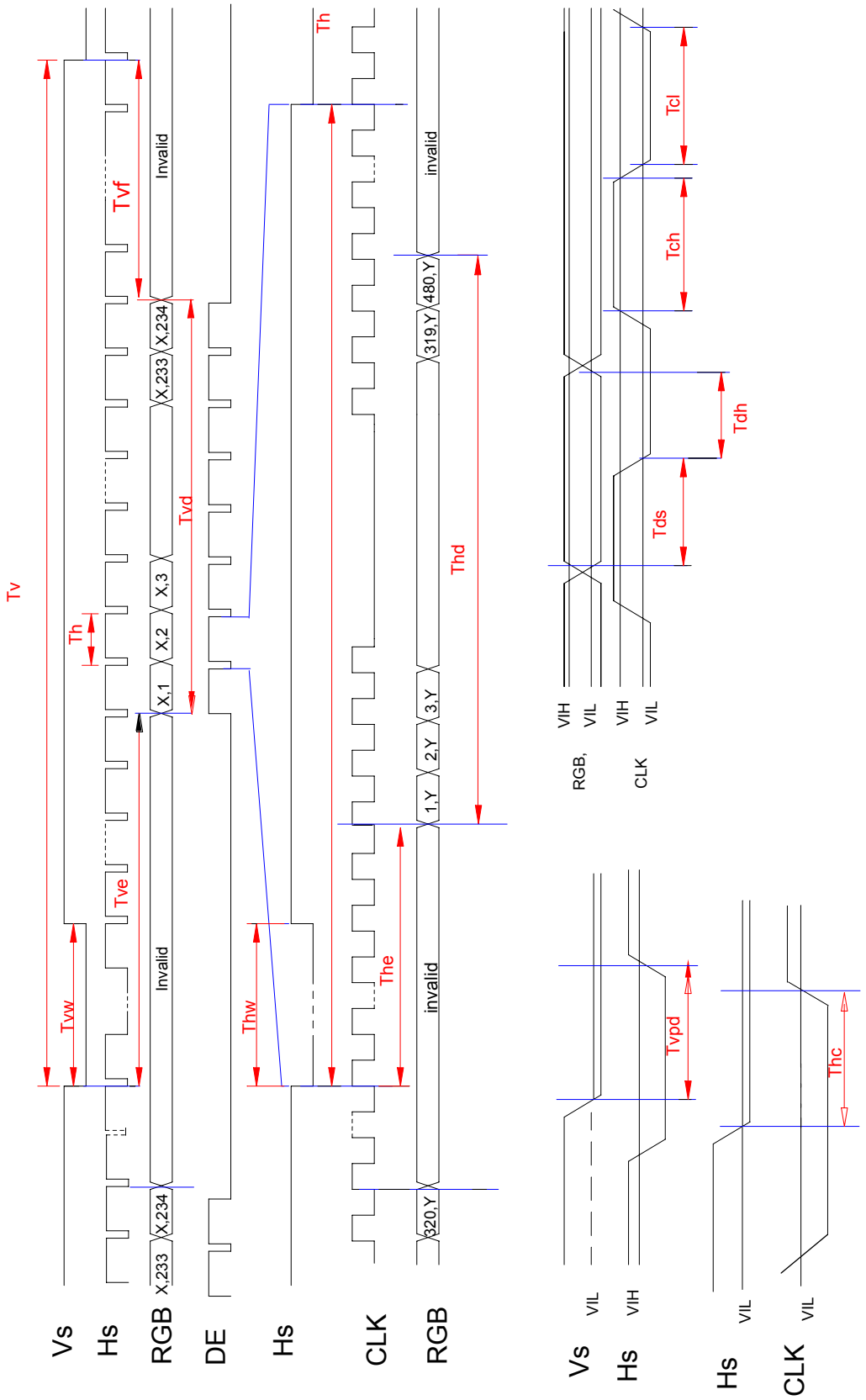
0 : Low Level Voltage 1 : High Level Voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. With the combination of total 18 bit data signals, the 262,144 color display can be achieved on the screen.

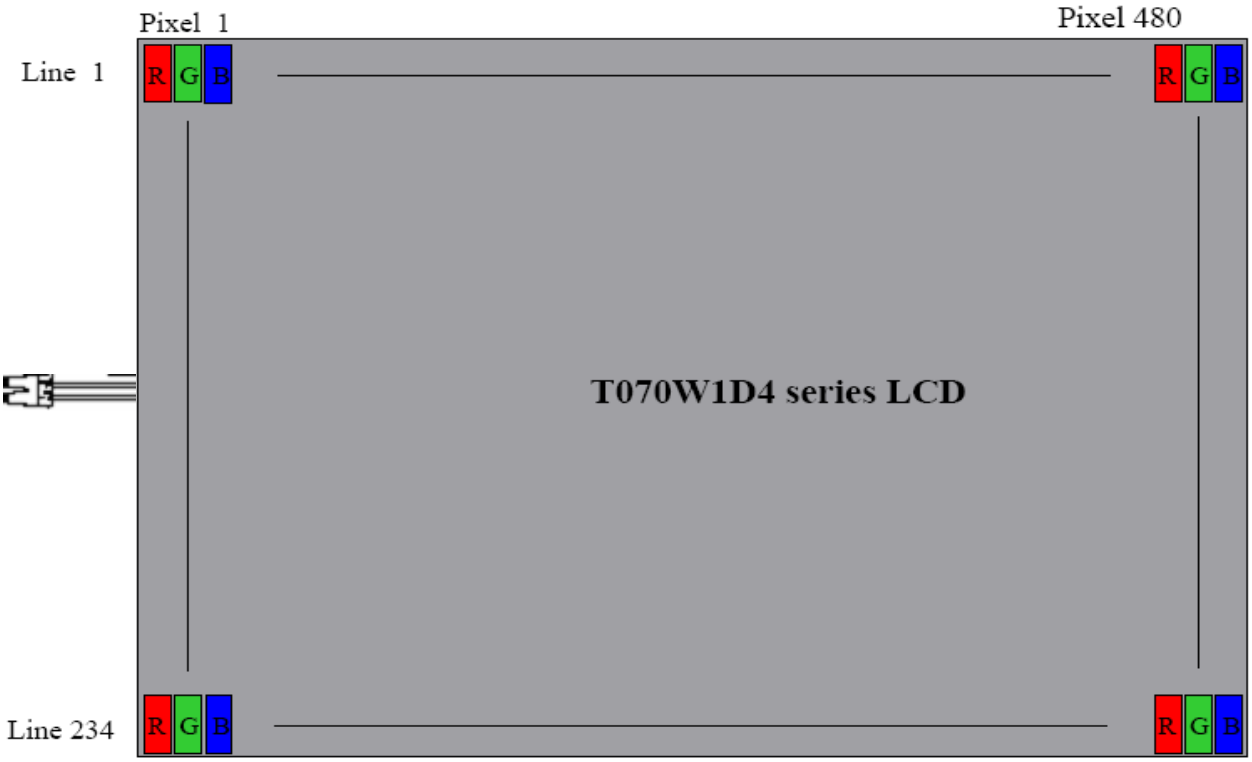
- Please refer to the next page

	Colors & Gray Scale	Data Signal																	
		Gray Scale	R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic Color	Black	-	0	0	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	1	1	1	1	1	1
	Green	-	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	-	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	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
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓				↓						↓						↓		
	⇩	↓										↓						↓		
	Brighter	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	⇧	↓				↓														
	⇩	↓				↓														
	Brighter	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	⇩	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	⇧	↓																		
	⇩	↓																		
	Brighter	GS61	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	⇩	GS62	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

5.4 Input Timing Chart



6.0 Pixel Format Image

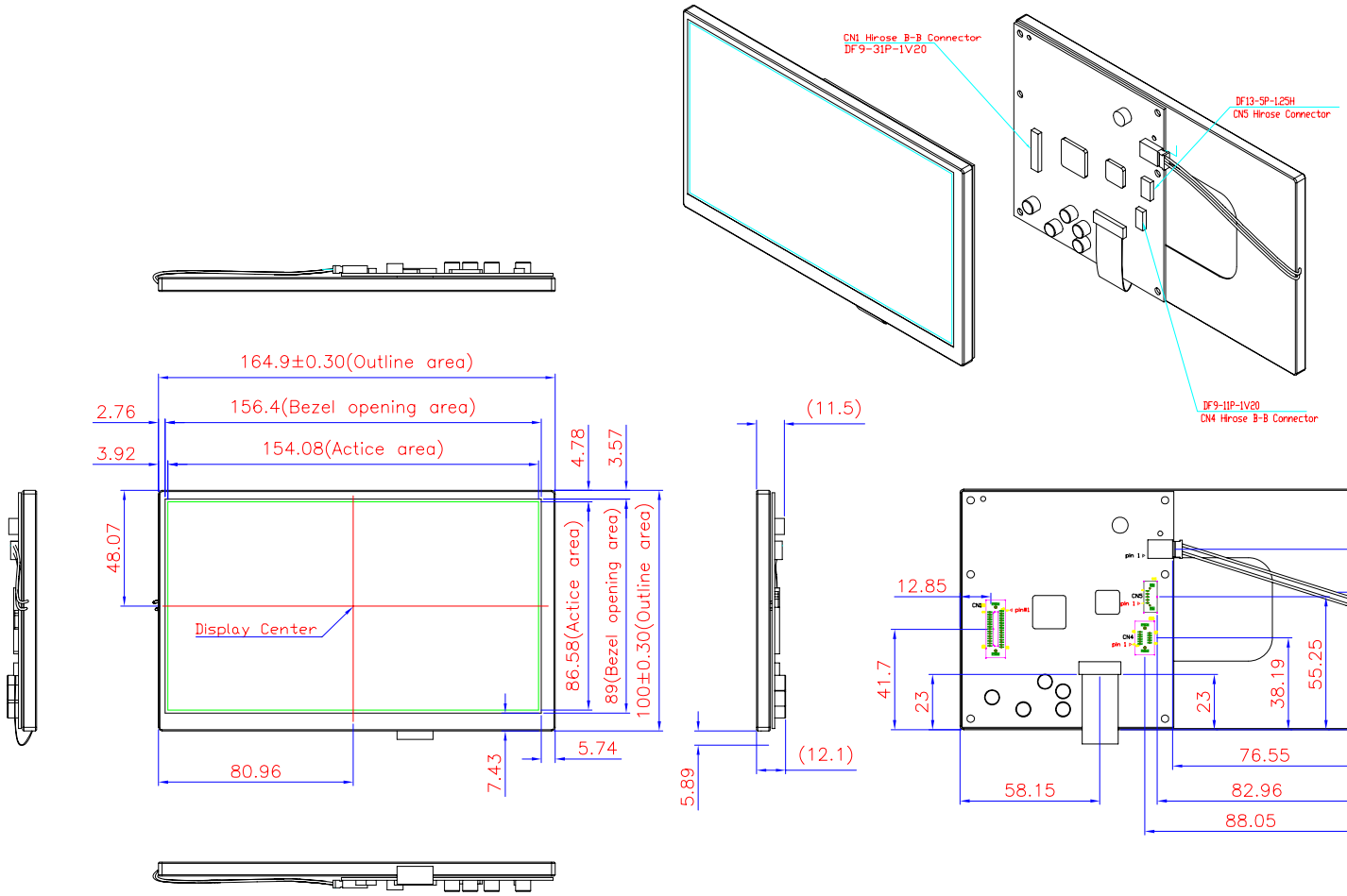


7.0 Display Outline Dimensions

7.1 Monitor Outline Dimensions

- Please refer to the next page

REV	EC NUMBER	DESCRIPTION	DATE
▽	XXXXXXX	XXXXXXXX	

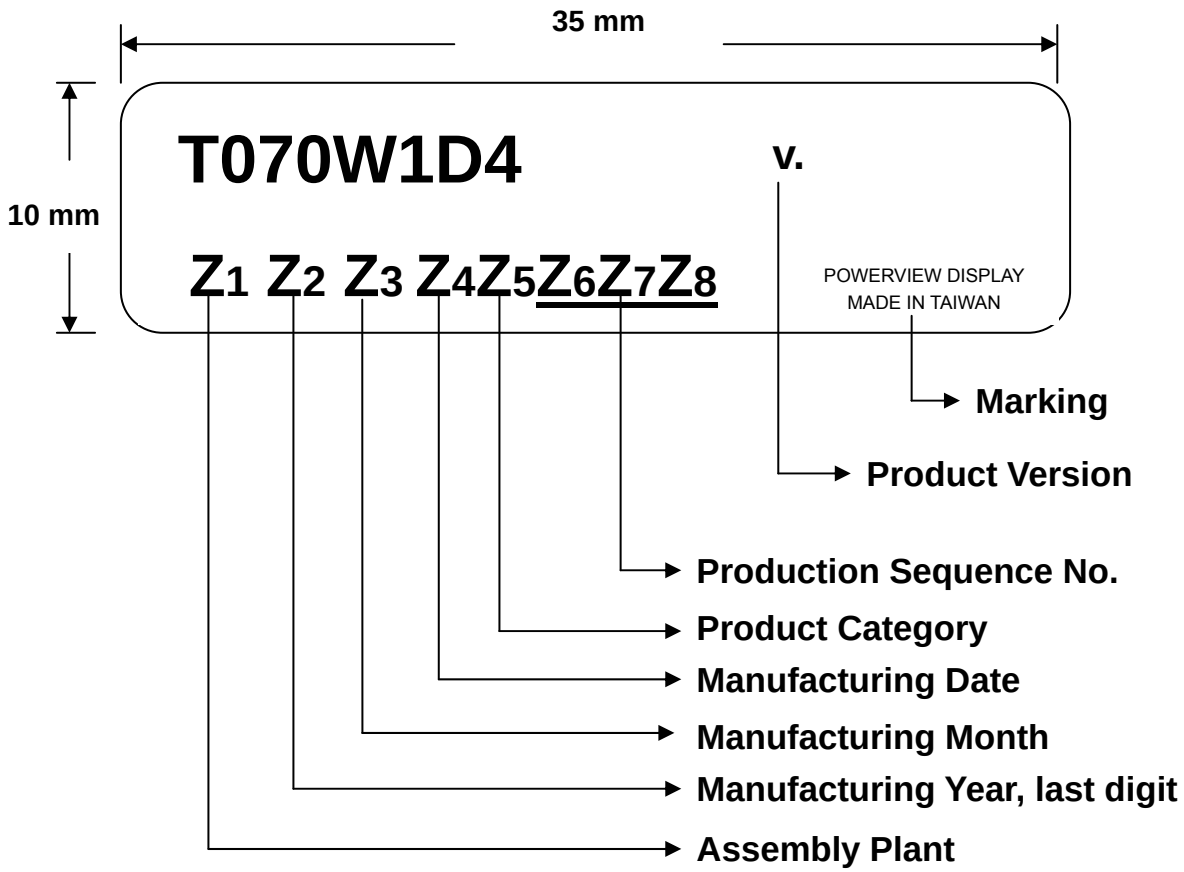


LEVEL / DIMENSION	GENERAL TOLERANCE RANGE 1	2	3	SELECT LEVEL
0 ~ 4	0.1	0.2	0.2	
4 ~ 14	0.1	0.2	0.2	
14 ~ 63	0.1	0.2	0.4	
63 ~ 250	0.2	0.4	0.6	2
250 ~ 600		0.6	1.0	
600 ~ 4000			1.6	

MATERIAL	See notes	CRITICAL DIMENSION / SPEC DIMENSION	UNIT: mm; SCALE: 1:1; WEIGHT; 3rd ANGLE; MODEL NAME: T070W1D4
FINISH	finish		PART NUMBER: T070W1D4
APPROVED			PART DESCRIPTION: 7" 480x234 WQVGA TFT LCD w/ TTL I/F & LED B/L
CHECKED			SIZE: A4; SHEET NUMBER: 1-1; REV: A
DESIGNED	RF Wang	2008/06/02	

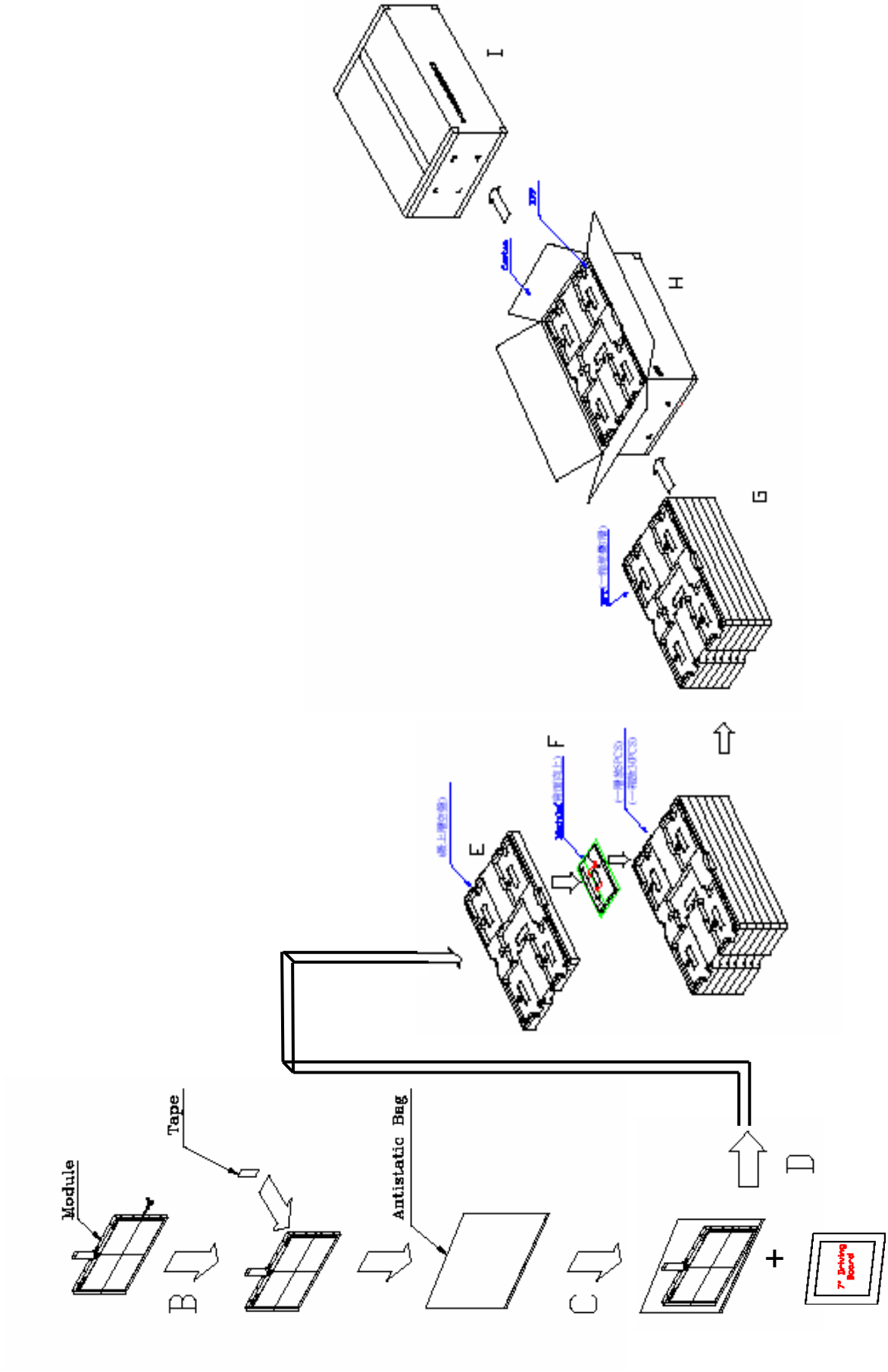
8.0 Labeling, Packaging & Others

*** Labeling**



*** Packaging**

- Please refer to the next page



9.0 General Notice

9.1 Reliability Test Items (Note 2)

No.	Test items	Conditions	Remark
1	High temperature storage	Ta= 95℃ 240Hrs	
2	Low temperature storage	Ta= -40℃ 240Hrs	
3	High temperature operation	Ta= 85℃ 240Hrs	
4	Low temperature operation	Ta= -30℃ 240Hrs	
5	High temperature and high humidity	Ta= 60℃, 90% RH 240Hrs	Operation
6	Heat shock	-30℃~85℃/200 cycles 1Hrs/cycle	Non-operation
7	Electrostatic discharge	±200V,200pF(0Ω), once for each terminal	Non-operation
8	Vibration	Frequency range : 8~33.3Hz Stoke : 1.3mm Sweep : 2.9G, 33.3 ~ 400Hz Cycle : 15 minutes 2 hours for each direction of X,Z 4 hours for Y direction	JIS C7021, A-10 Condition A
9	Mechanical shock	100G, 6ms, ±X,±Y,±Z 3 times for each direction	JIS C7021, A-7 Condition C
10	Vibration (with carton)	Random vibration: $0.015G^2$/Hz from 5~200Hz –6dB/octave from 200~500Hz	IEC 68-34
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

Note1: Ta: Ambient temperature.

Note 2: In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

9.2 Storage, Operation & Others

(a) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C and relative humidity of less than 70%.

(b) Do not store the TFT-LCD module in direct sunlight.

(c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

(d) Do not connect, disconnect the module in the "Power On" condition.

(e) Power supply should always be turned on/off by the item 3.2 "Electrical Absolute Ratings"

(f) The liquid-crystal is deteriorated by ultraviolet rays. Do not leave it in direct sunlight and strong ultraviolet rays for many hours.

(g) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(h) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the panel may be damaged.

(i) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image "Sticks" to the screen.

(j) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.