深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO.,LTD.

MODEL NO. : LMT150DNGFWD-1

ISSUED DATE : 2017-06-07

VERSION : V2.0

■ **Preliminary Specification**

□ **Final Product Specification**

Customer :

Approved by	Notes

TOPWAY Confirmed :

Prepared by	Checked by	Approved by
Liu Tihou		

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2016-05-04	Preliminary Product Specification Released.	Chen Ji
2.0	2017-06-07	Update Section 2.2	Liu Tihou

1 General Specifications

Feature		Spec
Display Spec.	Size	15 inch
	Resolution	1024xRGBx768
	Technology Type	a-Si
	Pixel Configuration	RGB vertical stripe
	Pixel pitch(mm)	0.297(H) × 0.297(V)
	Display Mode	TM with Normally White
	Surface Treatment	Anti Glare
	Viewing Direction	12:00
	Gray Scale Inversion Direction	6:00
Mechanical Characteristics	LCM (W x H x D) (mm)	326.5(H)×253.5 (V) ×11.8 (D) (typ.)
	Active Area(mm)	304.128(W) x 228.096 (V) (typ.)
	With /Without TSP	Without TSP
	Connection Type	Socket
	Weight (g)	TBD
	Backlight	LED backlight type Replaceable lamp holder for backlight
Electrical Characteristics	Interface	LVDS 1 port
	Color Depth	16.2M/262K

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: RoHS

Note 3: LCM weight tolerance: ± 5%

2 Input/Output Terminals

2.1 LCD PINS

CN1 socket(Module side): 185083-20121 (P-TWO ELECTRIC TECHNOLOGY CO., LTD.)

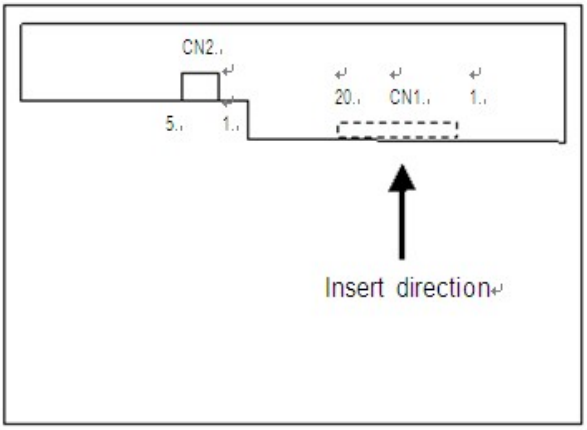
Pin No.	Symbol	Signal	Input data signal: 8bit	Input data signal:6bit	Remarks
1	VCC	Power supply	Power supply		
2	VCC				
3	GND	Ground	Ground		
4	REV	Selection of scan direction	High: Reverse scan Low or Open: Normal scan		
5	D0-	Pixel data	R0-R5,G0		
6	D0+				
7	GND	Ground	Ground		
8	D1-	Pixel data	G1-G5,B0-B1		
9	D1+				
10	GND	Ground	Ground		
11	D2-	Pixel data	B2-B5,DE		
12	D2+				
13	GND	Ground	Ground		
14	CLK-	Pixel clock	Pixel clock		
15	CLK+				
16	GND	Ground	Ground		
17	D3-	Pixel data	R6-R7, G6-G7, B6-B7	Ground	
18	D3+				
19	NC	Non connection	-		
20	SEL6/8	Selection of the number of colors	Low	High or Open	

2.2 BACKLIGHT PINS

CN2: MSB24038P5 (Produced by STM) or equivalent.

Pin	Symbol	Description
5	VDD	12V
4	GND	Ground
3	BRTC	Back light ON/OFF control: 5V-On / 0V-Off
2	PWM	PWM Luminance control(Active high) PWM= Hi,100% Drive PWM= Lo,0% Drive
1	NC	NC

2.3 POSITIONS OF PLUG AND SOCKET



3 Absolute Maximum Ratings

AGND=GND=0V, Ta = 25℃

Parameter	Symbol	Rating	Unit	Remarks
Power Supply Voltage	VCC	-0.3~+3.96	V	Ta = 25°C
Input voltage for signals	Vi	-0.5~+3.96	V	Ta = 25°C
Storage temperature	Tst	-30 ~ +80	°C	Note 1
Operating temperature	Top	-20 ~ +70	°C	Note 1, 2
Absolute humidity	AH	≤ 70	g/m^3	Ta > 50°C

Note1: Temperature and relative humidity range is shown in the figure below.
(a) 90%RH Max. (Ta≤ 40°C)
(b) Wet-bulb temperature should be39°C Max. (Ta> 40°C)
(c) No condensation.
Note2: The temperature of panel display surface area should be -20°C Min and 70°C Max.

4 Electrical Characteristics

4.1 Driving For LCD

AGND=GND=0V, Ta = 25℃

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage		VCC	3.0	3.3	3.6	V	-
Power supply ripple		Vp-p			200	mV	Including spike noise
Power supply current		ICC	-	550	-	mA	Note 1
Permissible ripple voltage		VRP	-	-	100	mV	
Differential input voltage		| Vid |	250		450	mV	
Differential input threshold voltage for LVDS receiver	High	VTH	-	-	100	mV	VCM = 1.25V Note2
	Low	VTL	-100	-		mV	
Input voltage width for LVDS receiver		Vi	0	-	1.90	V	-
Terminating resistor		RT	-	100	-	Ω	-
Rush current		I_{rush}	-	-	1.5	A	Note3
Input voltage for MSL signals	High	VFH	0.7VCC		VCC	V	
	Low	VFL	0		0.3VCC	V	

Note 1: Black mode, 65MHz, at VCC = 3.3V.
Note 2: Common mode voltage for LVDS receiver.
Note 3: Measurement Conditions:

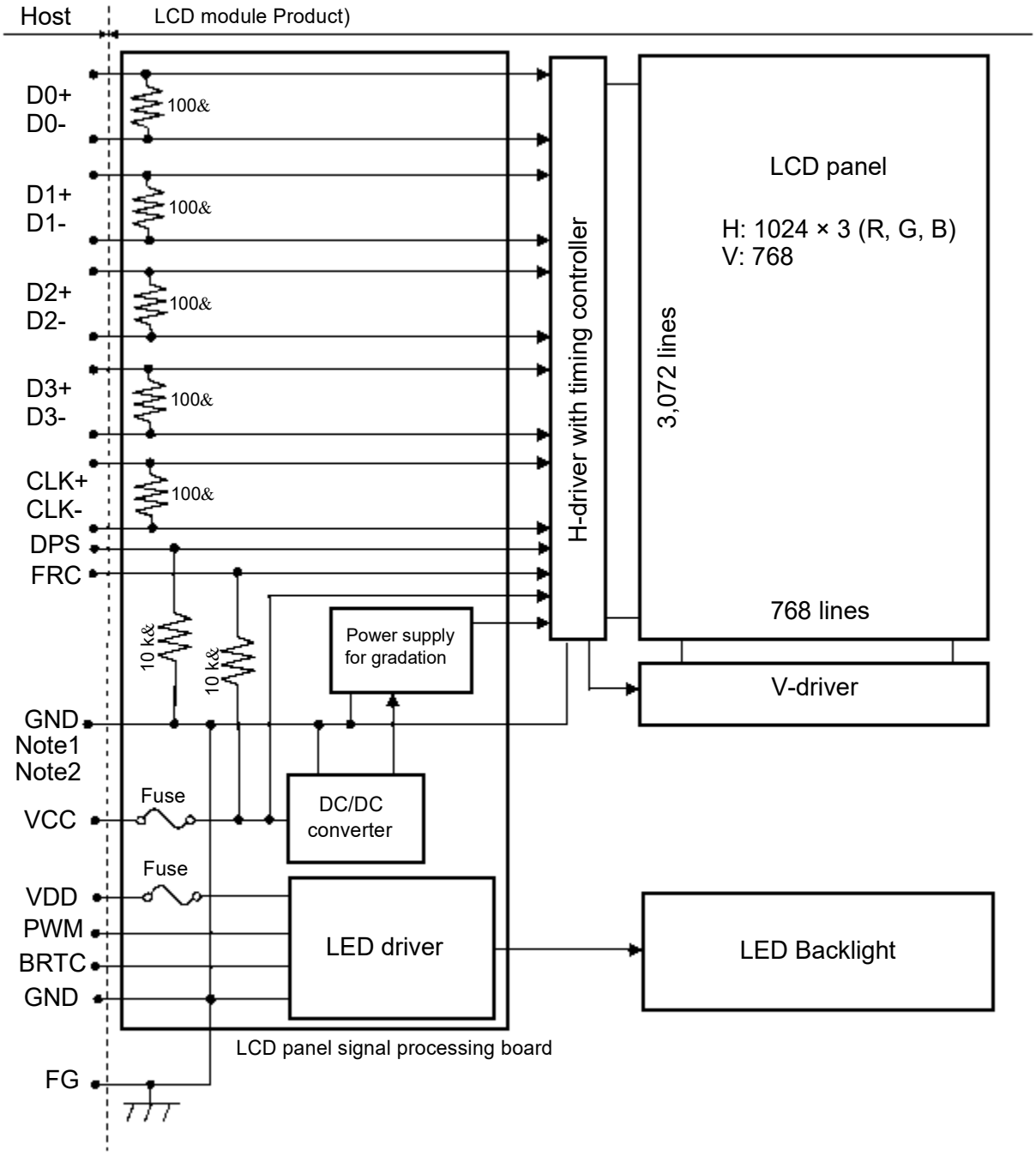
4.2 Driving For Backlight

(Ta=25°C) Note1

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage		VDD	10.8	12.0	12.6	V	
Power supply current		IDD	-	TBD	-	mA	
Light bar life time		Hr	30000	50000	-	Hour	Note1
Input voltage for PWM signal	High	VDFH1	2.0		5.0	V	
	Low	VDFL1	0		0.4	V	
Input voltage for BRTC signal	High	VDFH2	2.0		5.0	V	
	Low	VDFL2	0		0.4	V	
PWM frequency		fpwm	200		(20K)	Hz	
PWM pulse width		tPWH	10			us	

Note1: Optical performance should be evaluated at Ta=25℃.Only If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is an estimated data.

4.3 Block Diagram



Note1: Relations between GND (Signal ground and LED driver ground) and FG (Frame ground) in the LCD module are as follows:

GND - FG	Connected

Note2: GND and FG must be connected to customer equipment's ground, and it is recommended that these grounds be connected together in customer equipment.

5 DISPLAY COLORS AND INPUT DATA INFORMATION

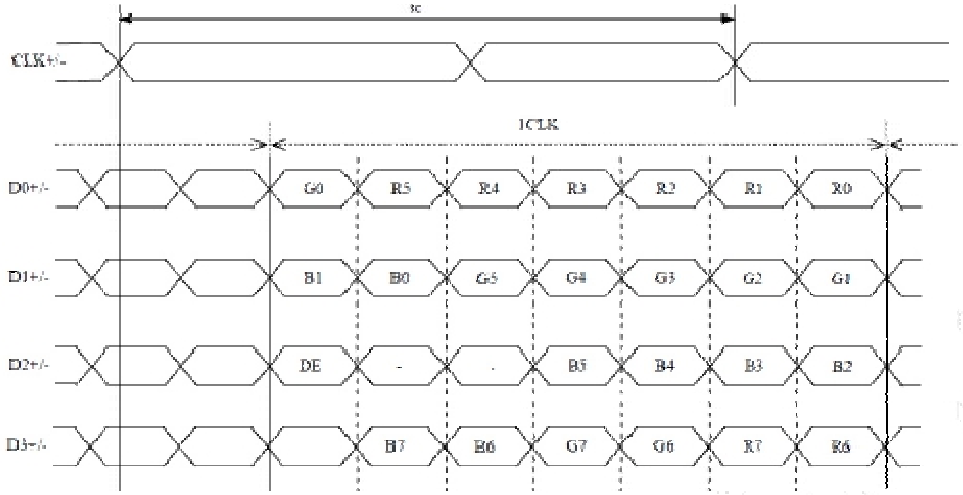
5.1 DISPLAY COLORS AND DATA SIGNAL

This product can display in equivalent to 16,194,277 colors in 253 scales. Also the relation between display colors and input data signals is as the following table. And it can display in equivalent to 262,144 colors in 64 scales, without data signals R7, R6, G7, G6, B7, B6 in the following table.

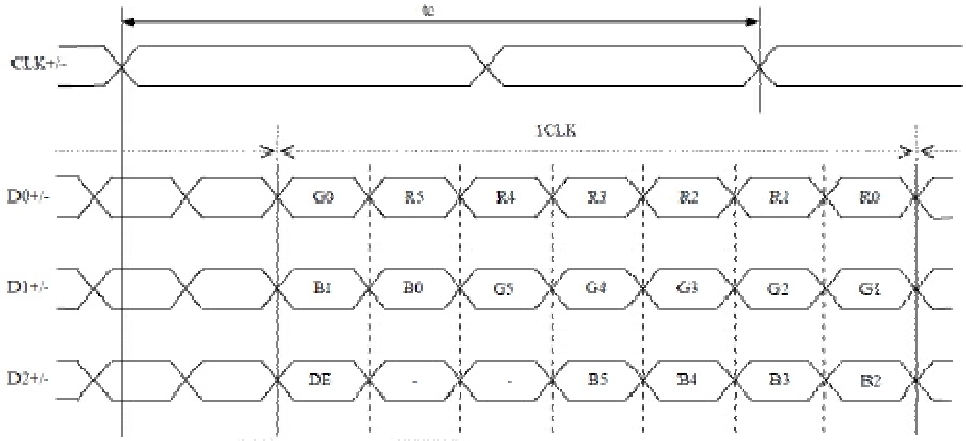
Display colors		Data signal （0:Low level，1:High Level）		
		R7 R6 R5 R4 R3 R2 R1 R0	G7 G6 G5 G4 G3 G2 G1 G0	B7 B6 B5 B4 B3 B2 B1 B0
Basic Color	Black	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
	Blue	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1
	Red	1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
	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
	Green	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1	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	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 grayscale	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
	Dark	0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
		0 0 0 0 0 0 1 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
		:	:	:
	Bright	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	1 1 1 1 1 1 1 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	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
Green grayscale	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
	Dark	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0
		0 0 0 0 0 0 0 0	0 0 0 0 0 0 1 0	0 0 0 0 0 0 0 0
		:	:	:
	Bright	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	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 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	0 0 0 0 0 0 0 0
Blue grayscale	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
	Dark	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 1
		0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 1 0
		:	:	:
	Bright	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	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 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

5.2 DATA MAP

(1) LVDS Input data signal: 8bit



(2) LVDS Input data signal: 6bit

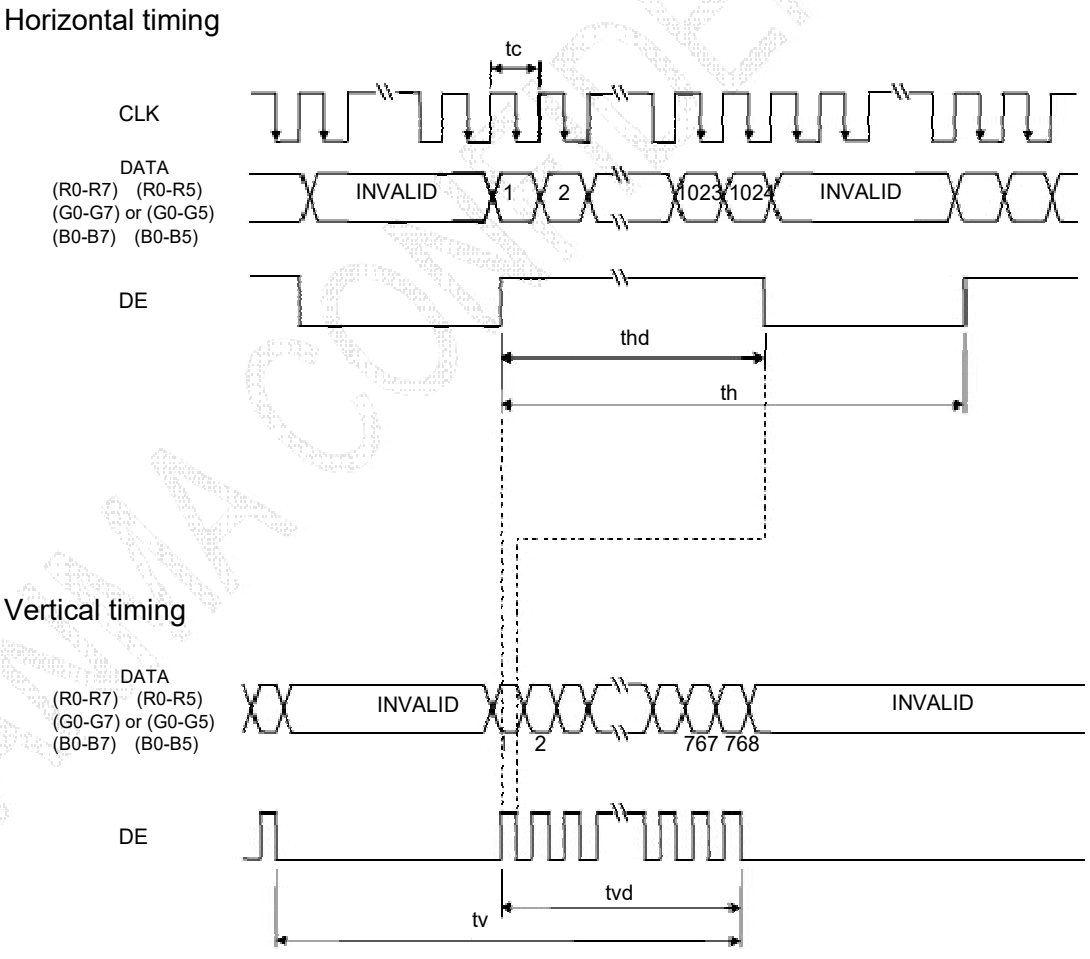


6 Timing Chart

6.1 TIMING CHARACTERISTICS

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Clock	Frequency	1/tc	52	56.88	71	MHz	17.58ns (typ.)
		tc	19.23	17.58	14.08	ns	
Horizontal signals	Cycle	th	1114	1200	1400	CLK	
	Display period	thd		1024			-
Vertical signals	Cycle	tv	778	790	845	H	60.0Hz(typ.)
	Display period	tvd		768			-

6.2 INPUT SIGNAL TIMING CHART



6.3 PIXEL DATA ALIGNMENT OF DISPLAY IMAGE

The following chart is the coordinates of per pixel

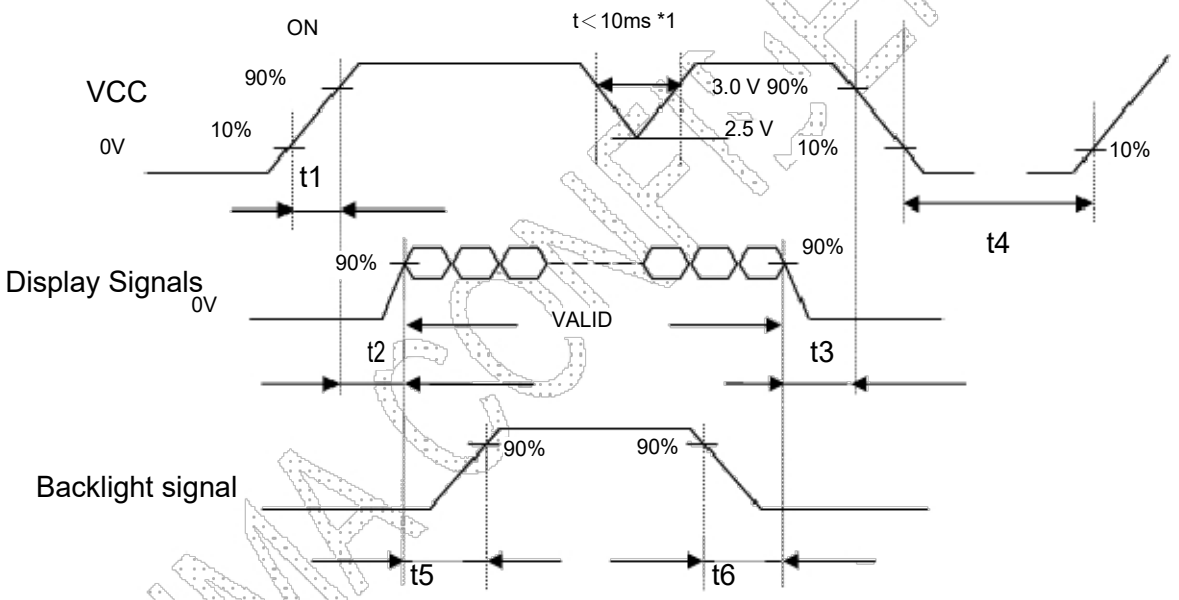
D(1,1)

B	G	R

D(1,1)	D(2,1)	D(3,1)	…	D(1024,1)
D(1,2)	D(2,2)	D(3,2)	…	D(1024,2)
D(1,3)	D(2,3)	D(3,3)	…	D(1024,3)
. . .	. . .	. . .	… … …	. . .
D(1,768)	D(2,768)	D(3,768)	…	D(1024,768)

6.4 POWER SUPPLY VOLTAGE SEQUENCE

6.4.1 The sequence of backlight and power



Timing Specifications:

t1 :0.5ms<t1 <10ms;

t2 :0.5 ms<t2 <50ms;

t3 :0ms<t3 <50ms;

t4 :t4 >1000ms;

t5 :t5 >200ms;

t6 :t6 >200ms;

7 Optical Characteristics

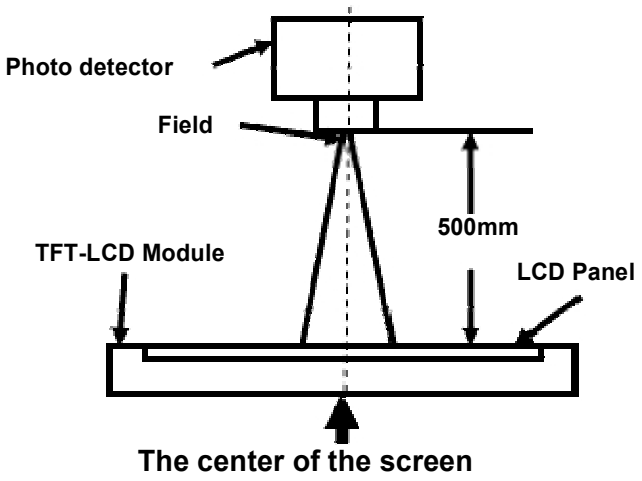
Item		Symbol	Condition	Min	Typ.	Max	Unit	Remark
View Angles		θ_T	CR≧10	70	80	-	Degree	Note 2
		θ_B		70	80	-		
		θ_L		70	80	-		
		θ_R		70	80	-		
Contrast Ratio		CR	θ=0°	600	800	-	-	Note1 Note3
Luminance uniformity		U		-	1.25	1.33	-	Note6
Response Time		T_{ON}	25℃	-	8	12	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.263	0.313	0.363	-	Note5 Note1
		y		0.279	0.329	0.379		
	Red	x		0.582	0.632	0.682		
		y		0.305	0.355	0.405		
	Green	x		0.294	0.344	0.394		
		y		0.558	0.608	0.658		
	Blue	x		0.107	0.157	0.207		
		y		0.037	0.087	0.137		
NTSC				50	60	-	%	Note5
Luminance		L		400	450	-	cd/㎡	Note7

Test Conditions:

1. The ambient temperature is 25℃. VDD= 3.3V, VCC=12V, 100% brightness,
2. The test systems refer to Note 1 and Note2.

Note 1: Definition of optical measurement system.

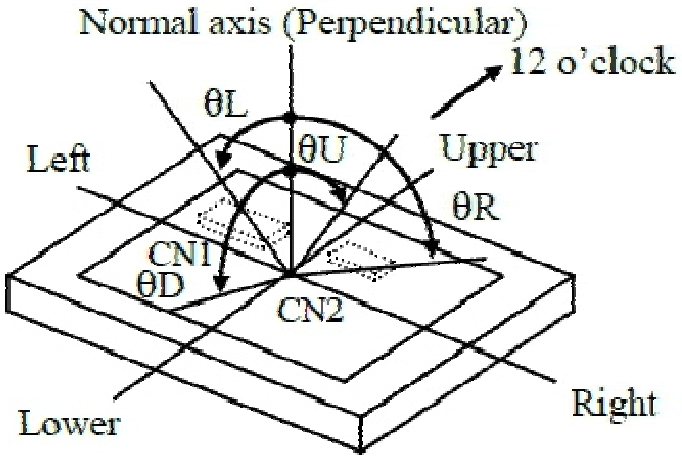
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

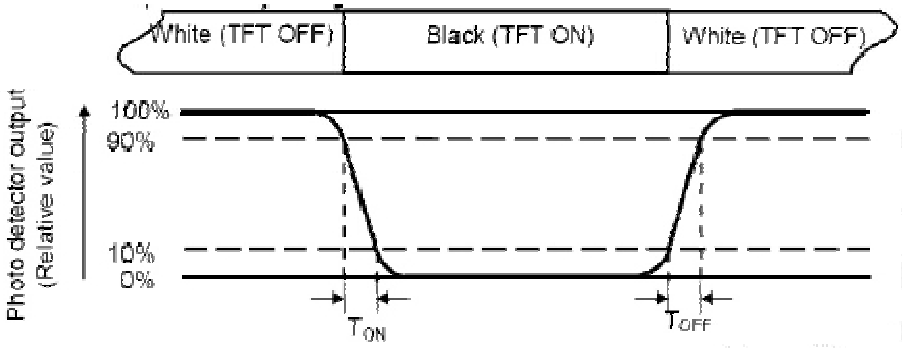
“White state “: The state is that the LCD should drive by Vwhite.

“Black state”: The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

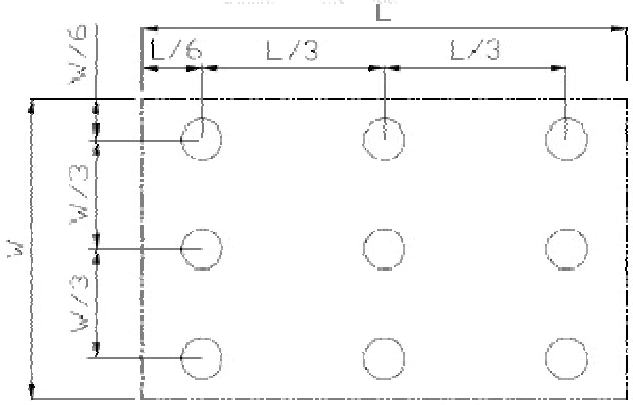
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

L-------Active area length W----- Active area width



Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

8 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours (Note1)	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours (Note1)	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	Ta = +50℃, 80% RH max, 240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-20℃ 30 min ~ +60℃ 30 min, Change time:5min, 20 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984, GB2423.22-2002
7	ESD(Operation)	C=150pF. R=330Ω.5point/panel Air: ±15Kv, 9points,25times/point; Contact: ±8Kv, 9points,25times/point (Environment: 15℃~35℃, 30%~60%. 86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Package Drop Test	Height: 60cm, 1corner, 3edges, 6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995
9	Vibration (Non-operation)	Frequency range:5~100Hz,11.76m/s^2 1minute/cycle X,Y,Z directions 50times each directions	IEC600682-6:1982 GB2423.10-1995
10	Shock (Non-operation)	30G,11ms,±X,Y,Z directions,3times For each direction	IEC60068-2-27:1987 GB/T2423.5—1995

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

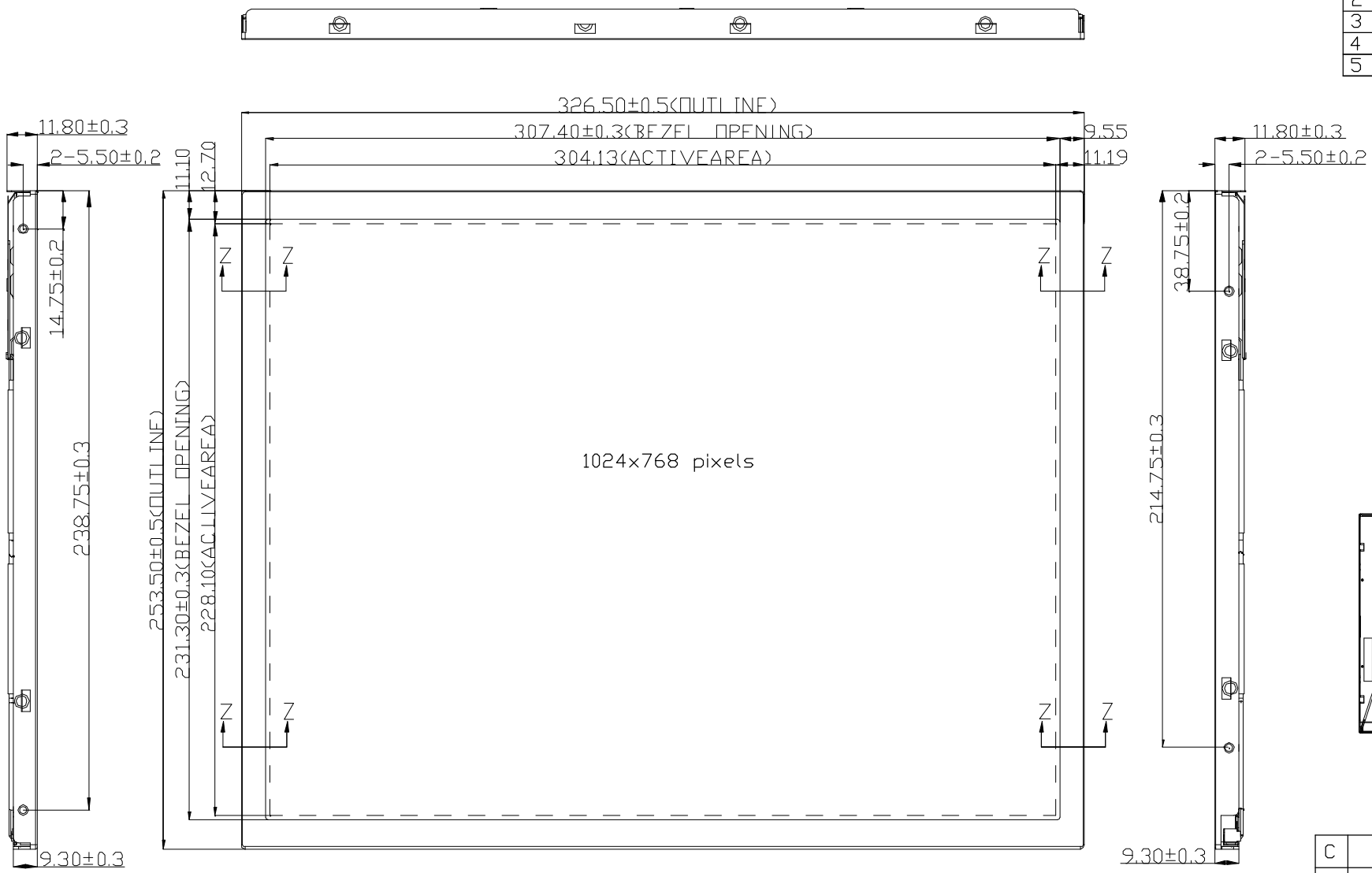
Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

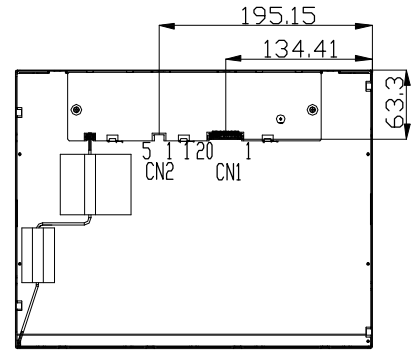
9 Precautions for Use of LCD Modules

Please refer to "LCD-Module-Design-Handling-Precaution.pdf".

CN2 Terminal	
No	Pin Name
1	NC
2	PWM
3	BRTC
4	GND
5	VDD

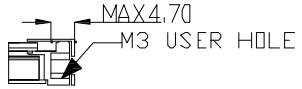
CN1 Terminal	
No	Pin Name
1	VCC
2	VCC
3	GND
4	REV
5	D0-
6	D0+
7	GND
8	D1-
9	D1+
10	GND
11	D2-
12	D2+
13	GND
14	CLK-
15	CLK+
16	GND
17	D3-
18	D3+
19	NC
20	SEL6/8





Back side view
Scale=free

Note:
*1. LED Display Type: TFT,Transmissive
*2. Pixel Arrangment: RGB VERTICAL STRIPE
*3. Color Depth : 16.2M/262K colors
*4. Operating Voltage : 3.3V
*5. Backlight Supply : 12.0V
*6. Backlight : White LED
*7. Interface : 24bit(VESA)/18bit LVDS
*8. CN1: SOCKET 185083-20121(P-TWO ELECTRIC TECHNOLOGYCO,LTD.)
*9. CN2: MSB24038P5 (PRODUCED BY STM) or equivalent
*10. Operating Temperature : -20°C~70°C
*11. Storage Temperature : -30°C~80°C



SECTION Z-Z
4 PLACES

C		
B		
A		
Rev	Note	Date

Dwg Title: LMT150DNGFWD-1 Outline Dwg

Dwg No.: MK-005565-1-1 | Date: 2016-05-04

Scale: 3/5 | Tol.: ±0.5 | Unit: mm | Paper Size: A3

Approved | Checked | Drawn: Chen Ji

TOPWAY