MODEL NO : TM090DDSG01

MODEL VERSION: 00

SPEC VERSION : Ver 1.3

ISSUED DATE: 2016-10-23

■Preliminary Specification
□Final Product Specification

Customer :

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Tiantian Zhao	Junyan Zhang	

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2015-07-23	Release for reference	Guangliang Qin
1.1	2015-08-06	1.Update Mechanical Drawing	Guangliang Qin
1.2	2015-11-23		Guangliang Qin
1.3	2016-10-23		Tiantian Zhao

1 General Specifications

Feature		Spec
Display Spec.	Size	9.0 inch
	Resolution	1024(RGB) x 600
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.192 (H) x 0.19025(V)
	Display Mode	TM,NW
	Surface Treatment	Anti Glare
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	211.1 x 126.5 x 5.7
	Active Area(mm)	196.608 x 114.15
	With /Without TSP	Without TSP
	Matching Connection Type	TBD
	LED Numbers	30 LEDS
	Weight (g)	TBD
Electrical Characteristics	Interface	LVDS
	Color Depth	16.7M

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: Q/S0002

Note 3: LCM weight tolerance: ± 5%

2 Input/Output Terminals

2.1 Pins definition of FPC

PIN	Symbol	I/O	Description	Remark
1	VCOM	P	Common voltage input	
2	DVDD	P	Digital power supply	
3	DVDD	P	Digital power supply	
4	NC	NC	No connect	
5	RESET	I	reset pin When RESET =”0” effective	
6	U/D	I	Vertical inversion When U/D=”0”, set top to bottom scan direction. When U/D=”1”, set bottom to top scan direction.	
7	L/R	I	Horizontal inversion When L/R=”0”, set right to left scan direction. When L/R=”1”, set left to right scan direction.	
8	STBYB	I	Standby mode, Normally pulled high STBYB = “1”, normal operation STBYB = “0”, timing controller, source driver will turn off, all output are High-Z	
9	GND	P	Ground	
10	NINC	I	- LVDS differential clock input	
11	PINC	I	+ LVDS differential clock input	
12	GND	P	Ground	
13	NIND0	I	- LVDS differential data input	
14	PIND0	I	+ LVDS differential data input	
15	GND	P	Ground	
16	NIND1	I	- LVDS differential data input	
17	PIND1	I	+ LVDS differential data input	
18	GND	P	Ground	
19	NIND2	I	- LVDS differential data input	
20	PIND2	I	+ LVDS differential data input	
21	GND	P	Ground	
22	NIND3	I	- LVDS differential data input	
23	PIND3	I	+ LVDS differential data input	
24	GND	P	Ground	
25	SELB	I	6bit/8bit mode select If LVDS input data is 6 bits ,SELB must be set to High; If LVDS input data is 8 bits ,SELB must be set to Low.	
26	GND	P	Ground	
27	AVDD	P	Power for Analog Circuit	
28	GND	P	Ground	
29	VGH	P	Gate ON Voltage	
30	NC	NC	No connect	
31	NC	NC	No connect	
32	VGL	P	Gate OFF Voltage	
33	GND	P	Ground	
34	NC	NC	No connect	

35	NC	NC	No connect	
36	NC	NC	No connect	
37	NC	NC	No connect	
38	NC	NC	No connect	
39	NC	NC	No connect	
40	NC	NC	No connect	

I---Input, O---Output, P--- Power/Ground VCC=VDD

Table 2.1 terminal pin assignments

Note1：Please add the FPC connector type and matched one if necessary .

2.2 CN2 of LED BLU Connector

Matching Connector of BHSR-02VS-1

No	Symbol	I/O	Description	Comment
1	LED+	P	LED Anode	Red Cable
2	LED-	P	LED Cathode	White Cable

3 Absolute Maximum Ratings

GND=0V Ta = 25℃

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VDD	-0.5	5.0	V	Base on IC Spec
	AVDD	-0.5	15.0	V	Base on IC Spec
	VGH	7	VGL+40	V	Base on IC Spec
	VGL	-20	-5	V	Base on IC Spec
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃＜Ta≤50℃
		--	≤55	%	50℃＜Ta≤60℃
		--	≤36	%	60℃＜Ta≤70℃
		--	≤24	%	70℃＜Ta≤80℃
Absolute Humidity	AH	--	≤70	g/m³	Ta＞70℃

Table 3 Absolute Maximum Ratings

Note1: Input voltage include R0~R5, G0~G5, B0~B5, Dotclk, Hsync, Vsync, Enable, R/L, U/D.(For your reference)

Note2: Ta means the ambient temperature.
It is necessary to limit the relative humidity to the specified temperature range.
Condensation on the module is not allowed.

4 Electrical Characteristics

4.1 LCD module electric

VDD=3.3V，GND=0V，Ta = 25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Digital supply Voltage		VDD	3.0	3.3	3.6	V	
Analog supply Voltage		AVDD	10.5	10.6	10.7	V	
Gate on voltage		VGH	22.7	23	23.3	V	
Gate off voltage		VGL	-7.3	-7	-6.7	V	
Common Electrode Driving Signal		VCOM	-	4.03	-	V	Note1
Input Signal Voltage	Low Level	VIL	0	-	0.3*VDD	V	-
	High Level	VIH	0.7*VDD	-	VDD	V	
Output low voltage	Low Level	VOL	-	-	GND+0.4	V	-
Output high voltage	High Level	VOH	VDD-0.4	-	-	V	-
Power Consumption		Black Mode (71Hz)	-	TBD	-	mW	Not include Backlight

Table 4.1 LCD module electrical characteristics

Note 1: There is tolerance in optimum VCOM voltage during production ,Minimum and maximum VCOM voltages indicate the range of optimum VCOM voltage shift due to production tolerance. Typ .VCOM is only a reference value, it must be optimized ,according to each LCM .Be sure to use VR.

4.2 Backlight Unit Driving Condition

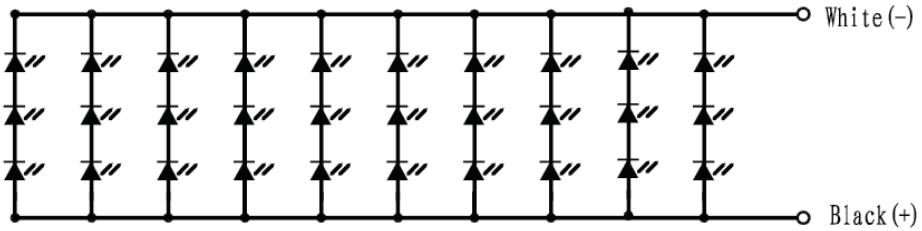
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	-	300	-	mA	30 LEDs (3 LED Serial, 10 LED Parallel)
Forward Current Voltage	VF	-	9.6	-	V	
Backlight Power Consumption	WBL	-	2880	-	mW	
Operating Life Time	--	10000	--	--	hrs	Note 2, Note 3

Table 4.2 Backlight driving condition

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 10 LED Parallel).

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: 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% initial brightness. Typical operating life time is estimated data .At the same time the luminance of Backlight would decrease under the high temperature.
Note4: The LED driving condition is defined for each LED module.



LED=30Pcs (If=30*10=300mA, Vf=9.6 TYP)

4.3 BLOCK DIAGRAM

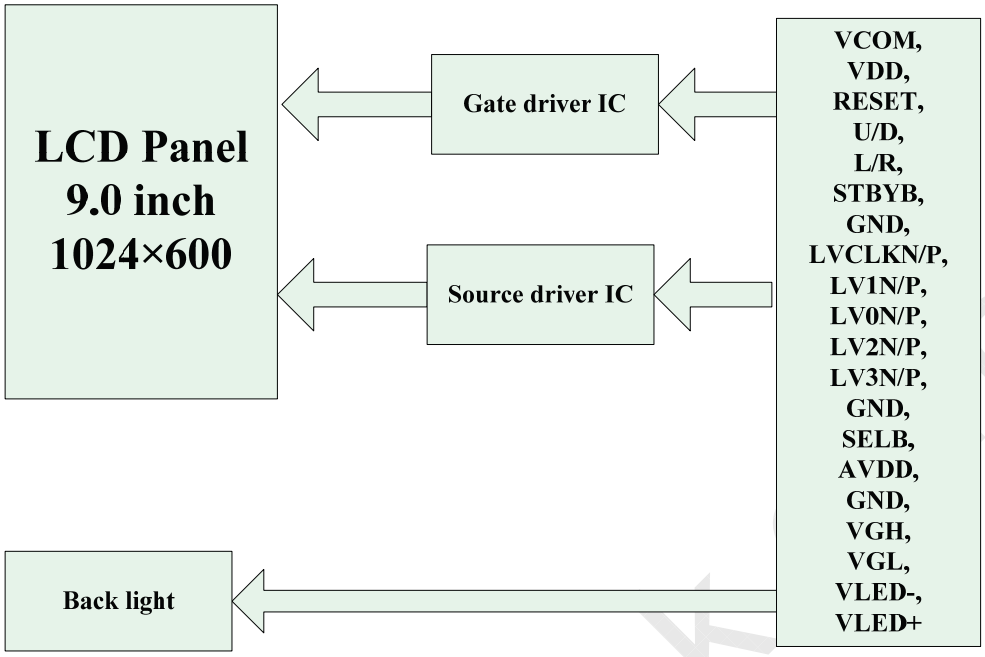


Figure 4.2 Function block

5 Timing Chart

5.1 LVDS mode AC electrical characteristics

VDD=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	R_{XFclk}	20	-	71	ms	
Input data skew margin	T_{RSKM}	500	-	-	us	$\|V_{ID}\|$=400V Rxvcm=1.2V R_{XCLK}=71MHz
Clock high time	T_{lvch}	-	4/(7*RXFCLK)	-	ns	
Clock low time	T_{lvcl}	-	3/(7*RXFCLK)	-	ns	
PLL wake-up time	T_{empll}	-	-	150	us	

Table 5.1 LVDS mode AC electrical characteristics

5.2 LVDS mode DC electrical characteristics

DVDD=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Differential input high Threshold voltage	R_{XVTH}	-	-	+0.1	V	Rxvcm=1.2V
Differential input low threshold voltage	R_{XVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{XVIN}	0	-	VDD-1.2+ $\|V_{ID}\|$/2	V	-
Differential input common Mode voltage	R_{XVCM}	$\|V_{ID}\|$/2	-	VDD-1.2	V	-
Differential input voltage	$\|V_{ID}\|$	0.2	-	0.6	V	-
Differential input leakage Current	Rv_{Xliz}	-10	-	+10	μA	-
LVDS Digital Operating Current	Iddlvds	-	15	30	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	Istlvds	-	10	50	μA	

Figure 5.2 LVDS mode DC electrical characteristics

5.3 Recommended Parallel RGB input timing table

5.3.1 DE mode

DVDD =3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	F_{clk}	40.8	51.2	67.2	MHZ	
Horizontal Display Area	thd		1024		tclk	
HSD Period	th	1114	1344	1400	tclk	
HSD Blanking	thb+thfp	90	320	376	tclk	
Vertical Display Area	tvd		600		th	
VSD Period	tvbp	610	635	800	th	
VSD Blanking	tvbp+tvfp	10	35	200	th	

Table 5.2 DE mode(1024x600)

6 Optical Characteristics

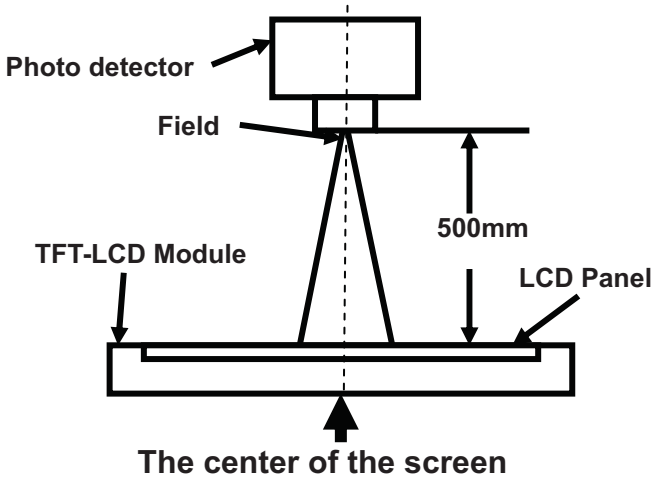
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	40	50	-	Degree	Note2,3
		θB		60	70	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	640	800	-		Note 3
Response Time		T_{ON}	25℃	-	25	40	ms	Note 4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.229	0.304	0.329	-	Note 1,5
		y		0.258	0.335	0.358		
	Red	x		0.528	0.580	0.628	-	Note 1,5
		y		0.293	0.337	0.393		
	Green	x		0.281	0.329	0.381	-	Note 1,5
		y		0.566	0.617	0.666		
	Blue	x		0.106	0.154	0.206	-	Note 1,5
		y		0.051	0.104	0.151		
Uniformity		U	-	70	80	-	%	Note 6
NTSC			-	45	50	-	%	Note 5
Luminance		L	-	400	500	-	cd/m^2	Note 7

Test Conditions:

1. I_F= **300** mA, VF=9.6 V and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

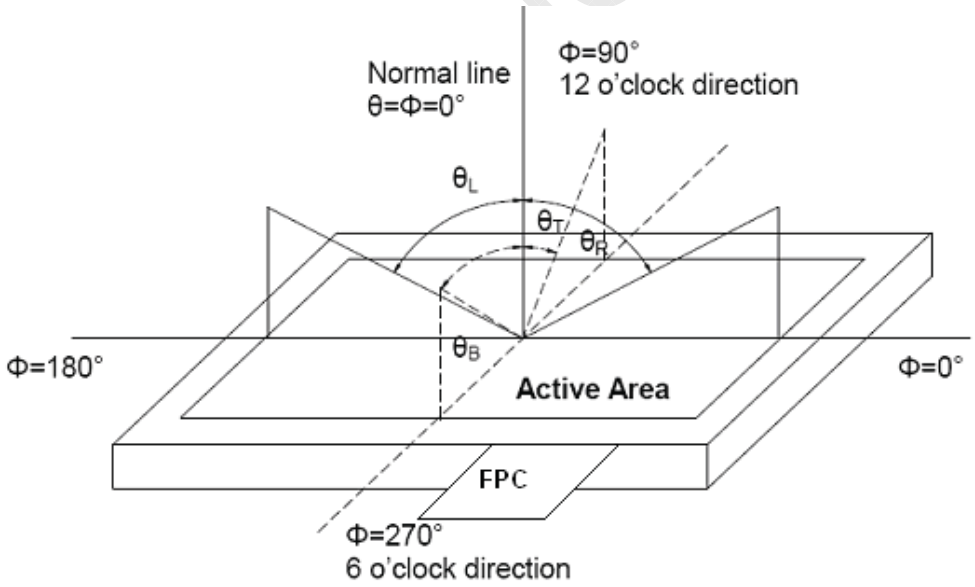
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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

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

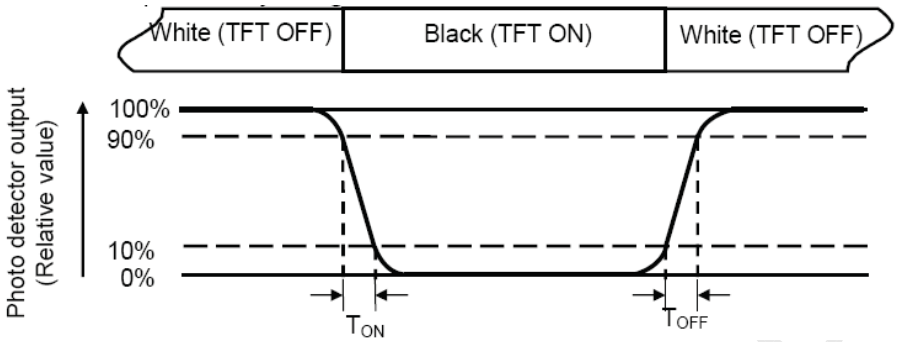
"White state ": The state is that the LCD should drive by Vwhite.

"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)

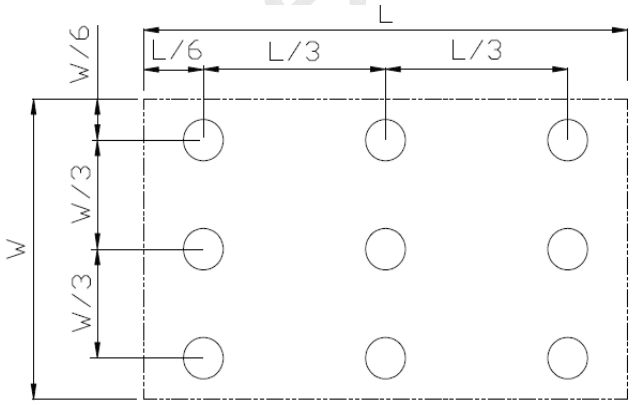
Color coordinates measured at center point of LCD.

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.

7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours	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 = +60℃, 90% RH max,240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 100 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	Half Sine Wave 100G 4ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:60cm, 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

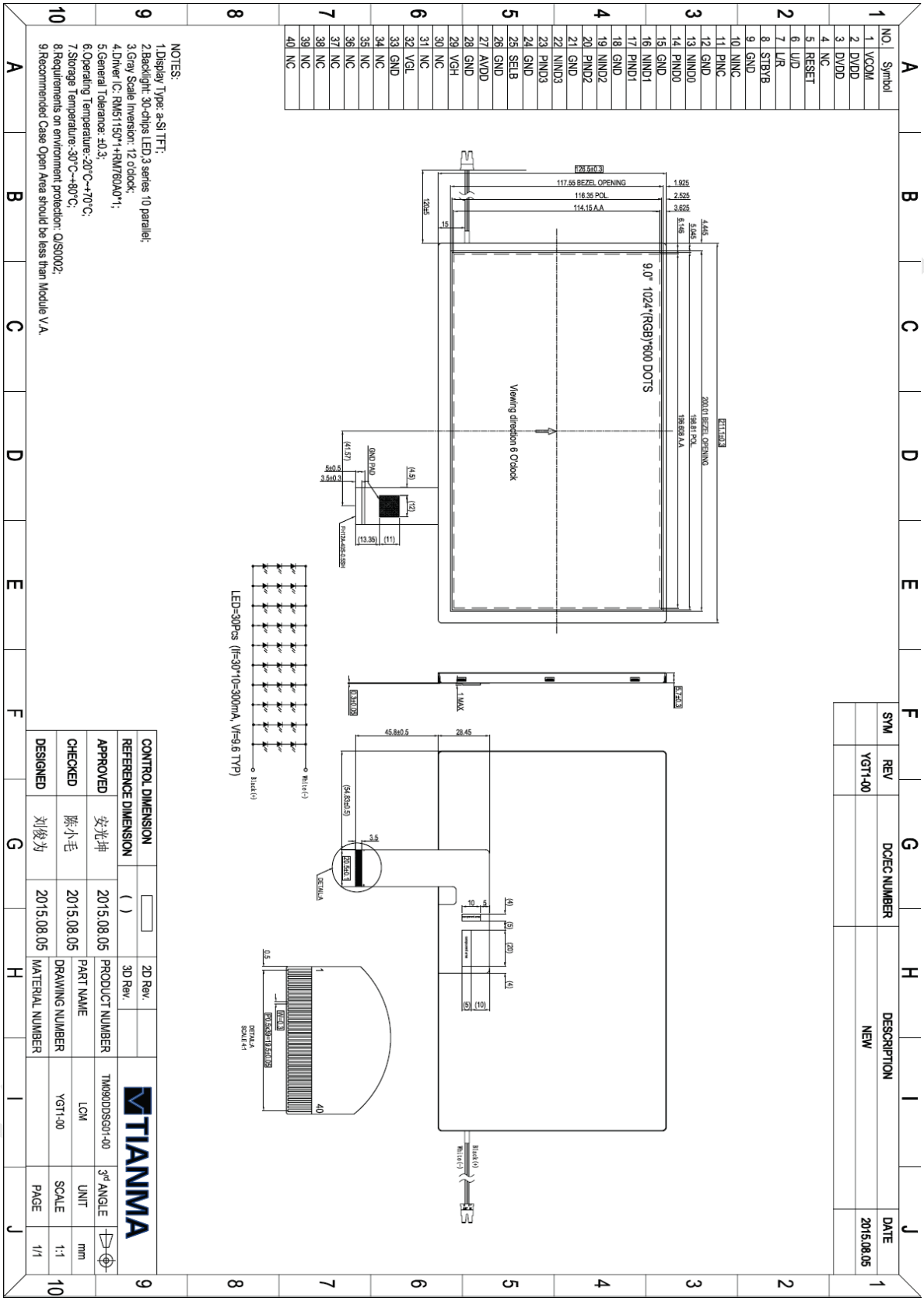
Note1: Ts is the temperature of panel's surface.

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.

8 Mechanical Drawing



9 Packing Drawing

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM090DDSG01-00	211.1X126.5X5.7	TBD	50	
2	Partition_1	Corrugated paper	513×333×251	1.178	1	
3	Anti-static Bag	PE	253*161*0.05	0.001	50	Anti-static
4	Dust-Proof Bag	PE	700×545×0.05	0.06	1	
5	Partition_2	Corrugated Paper	505×332×4.0	0.098	2	
6	Corrugated Bar	Corrugated paper	513×173×3	0.041	4	
7	Carton	Corrugated paper	530×350×288	1.12	1	
8	Crepe Paper Tape		30×10	0.000039	50	
9	Desiccant		45X35mm(2g)	0.01	12	
10	Carton Label		100×60	0.001	1	
	Total weight	TBD Kg±10%				

10 Precautions for Use of LCD Modules

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5 If the display surface is contaMinated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

10.3.1 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.