



**MODEL NO. :** TM065QDHG02

**ISSUED DATE:** 2012-05-23

**VERSION :** Ver 2.5

- Preliminary Specification
- Final Product Specification

**Customer :** \_\_\_\_\_

Approved by	Notes

**SHANGHAI TIANMA Confirmed :**

Prepared by	Checked by	Approved by

This technical specification is subjected to change without notice



## Table of Contents

.....	1
Record of Revision.....	3
Updated Mechanical Drawing.....	3
Updated Timing Table.....	3
1. General Specifications.....	4
2. Input/Output Terminals.....	5
3. BLOCK DIAGRAM.....	6
4. DC ELECTRICAL CHARACTERISTICS.....	7
4.1 Absolute Maximum Ratings.....	7
5. Timing CHARACTERISTICS.....	9
6. POWER ON/OFF SEQUENCE.....	12
7. APPENDIX.....	13
8. Optical Characteristics.....	15
9. Environmental / Reliability Test.....	18
10. Mechanical Drawing.....	19
11. Packing Drawing.....	21
12. Precautions for Use of LCD Modules.....	22



## 1. General Specifications

	<b>Feature</b>	<b>Spec</b>
<b>Display Spec.</b>	Size	6.5 inch
	Resolution	640 ( RGB )× 480
	Interface	6bit LVDS
	Color Depth	262K
	Technology Type	a-Si
	Pixel Pitch (mm)	0.207x0.207
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment	AR/TMR
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
	LCM (W x H x D) (mm)	153.0 (W) * 118 (H) *11.9 (D)
<b>Mechanical Characteristics</b>	Active Area(mm)	132.480 x 99.360
	With /Without TSP	Without TSP
	Weight (g)	165g
	LED Numbers	12 LEDs
	Drive IC	NT39413B × 2+NT39207B × 1

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 TFT LCD Panel \_\_\_\_\_6bit LVDS

Mating connector DF19-20S-1C

Pi	Symbol	I/O	Description	Remark
1	VDD	P	Power Supply	
2	VDD	P	Power Supply	
3	GND	P	Ground	
4	NC	-	Not connected	
5	RXIN1-	I	LVDS Receiver Signal(-)	
6	RXIN1+	I	LVDS Receiver Signal(+)	
7	GND	P	Ground	
8	RXIN2-	I	LVDS Receiver Signal(-)	
9	RXIN2+	I	LVDS Receiver Signal(+)	
10	GND	P	Ground	
11	RXIN3-	I	LVDS Receiver Signal(-)	
12	RXIN3+	I	LVDS Receiver Signal(+)	
13	GND	P	Ground	
14	RXCLK-	I	LVDS Receiver Clock Signal(-)	
15	RXCLK+	I	LVDS Receiver Clock Signal(+)	
16	NC	-	Not connected	
17	U/D	I	Vertical reverse (L: up to down scan H: down to up scan )	Note: Don't let this pin open
18	R/L	I	Horizontal reverse (H : left to right scan L : right to left)	Note: Don't let this pin open
19	NC	-	Not connected	
20	NC	-	Not connected	

P: Power/GND; I: input pin; O: output

### 2.2 CN2 (Backlight Interface)

Matching connector: STM P24016

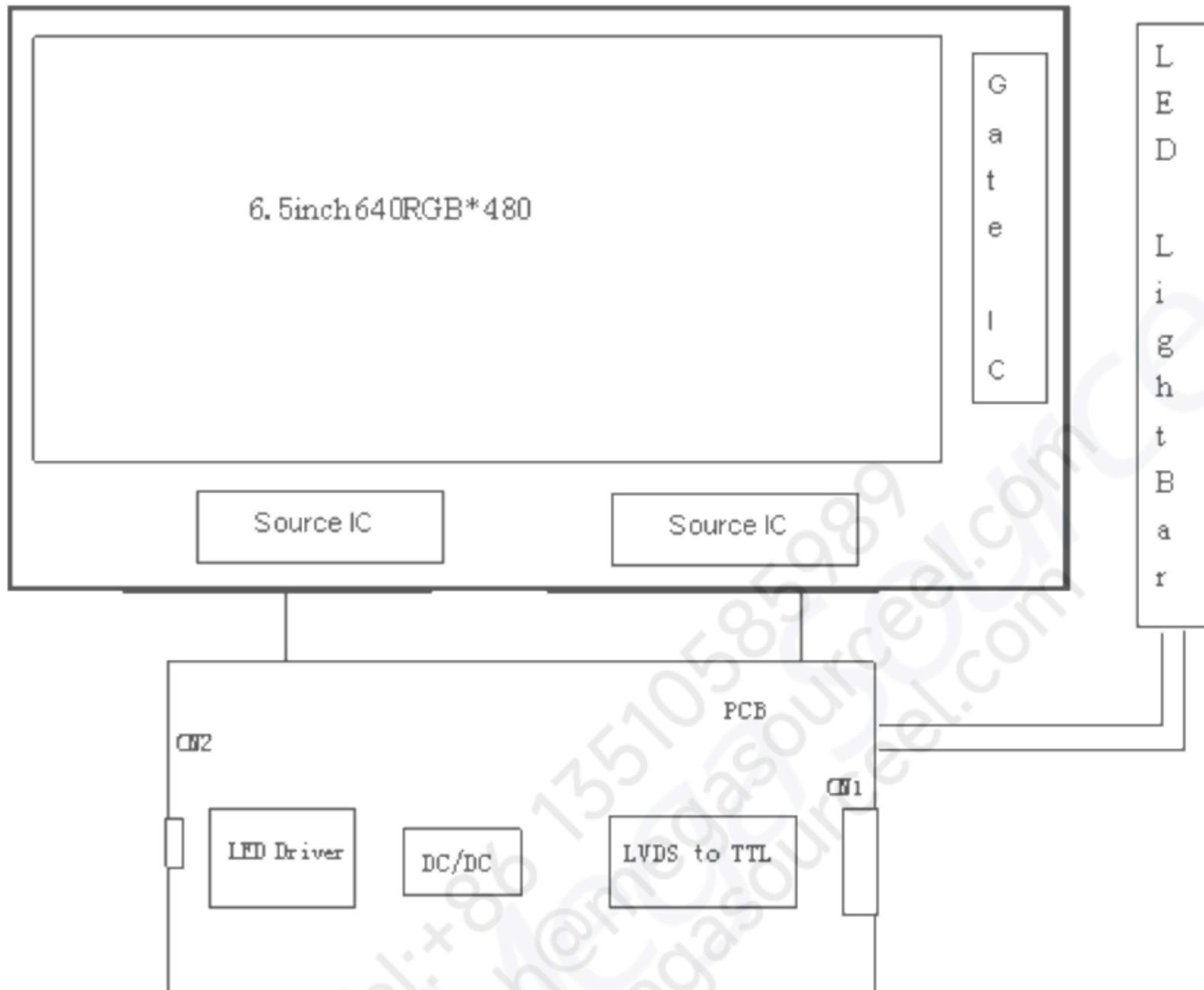
Pin	Symbol	Pin Description
1	VLED	12V Input
2	VLED	12V Input
3	GND	Ground
4	GND	Ground
5	LED On/Off	3.3V On; GND Off
6	PWM DIM	Dimming signal

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### 3. BLOCK DIAGRAM

Scanning mode





## 4. DC ELECTRICAL CHARACTERISTICS

### 4.1 Absolute Maximum Ratings

(GND=0V, Ta = 25°C)

Item	Symbol	MIN	MAX	Unit	Remark
LCD Drive Voltage	VCC	-0.50	5.00	V	Note 4-1
LED BLU Drive Voltage	VLED	0	20	V	
LED BLU Drive Dim Voltage	DIM	0	5	V	
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tst	-30	80	°C	

Note 4-1: The parameter is for driver IC (Source driver & Gate driver) only.

### 4.2 Recommended Operating Condition

#### 4.2.1 LCD DC Characteristics

(GND=0V, Ta = 25°C)

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Digital supply Voltage	VCC	3.00	3.30	3.60	V	
Current consumption	I <sub>VCC</sub>	—	210	315	mA	Note 4-2
Input Signal Voltage	Low Level	V <sub>IL</sub>	0	0.3×VCC	V	HD,VD,R0~R5, G0~G5,B0~B5, DENA,REV.
	High Level	V <sub>IH</sub>	0.7×VCC	VCC	V	

Note4-2: To test the current dissipation, use "all Black Pattern" test pattern at 3.3V of VCC.

#### 4.2.2 Backlight Unit

(GND=0V, Ta=25°C)

Item	Symbol	MIN	TYP	MAX	Unit	Remark
LED driver input voltage	VLED	9	12	15	V	100% Duty
LED driver input current	ILED	180	200	240	mA	100% Duty
Backlight Power Consumption	W <sub>BL</sub>	—	2400	—	mW	100% Duty
VLED On/Off	on	2.4	3.3	—	V	
	off	—	0	0.5	V	
PWM voltage	High	2.4	3.3	—	V	
	Low	—	0	0.6	V	
Dimming Frequency	F <sub>pwm</sub>	200	—	30K	hZ	
Dimming Duty	D <sub>pwm</sub>	5	—	100	%	



4.2.3 LED Driving Characteristics(internal use only).

(GND=0V, Ta=25°C)

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I	—	120	160	mA	
Forward Voltage	V <sub>BL</sub>	—	19.2	21.0	V	Note 4-4
Backlight Power Consumption	W <sub>BL</sub>	—	2304	—	mW	

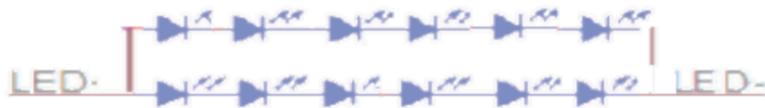
Note 4-3: The LED driving condition is defined for each LED module.

Note 4-4: The LED must be drive by constant forward current and the LED forward voltage only for reference. Optical performance should be evaluated at Ta=25°C 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.

Note 4-5: One LED: IF =60 mA, VF =3.2V.

Note 4-7: Lifetime : 50000H (typ)

LED Connection of Backlight

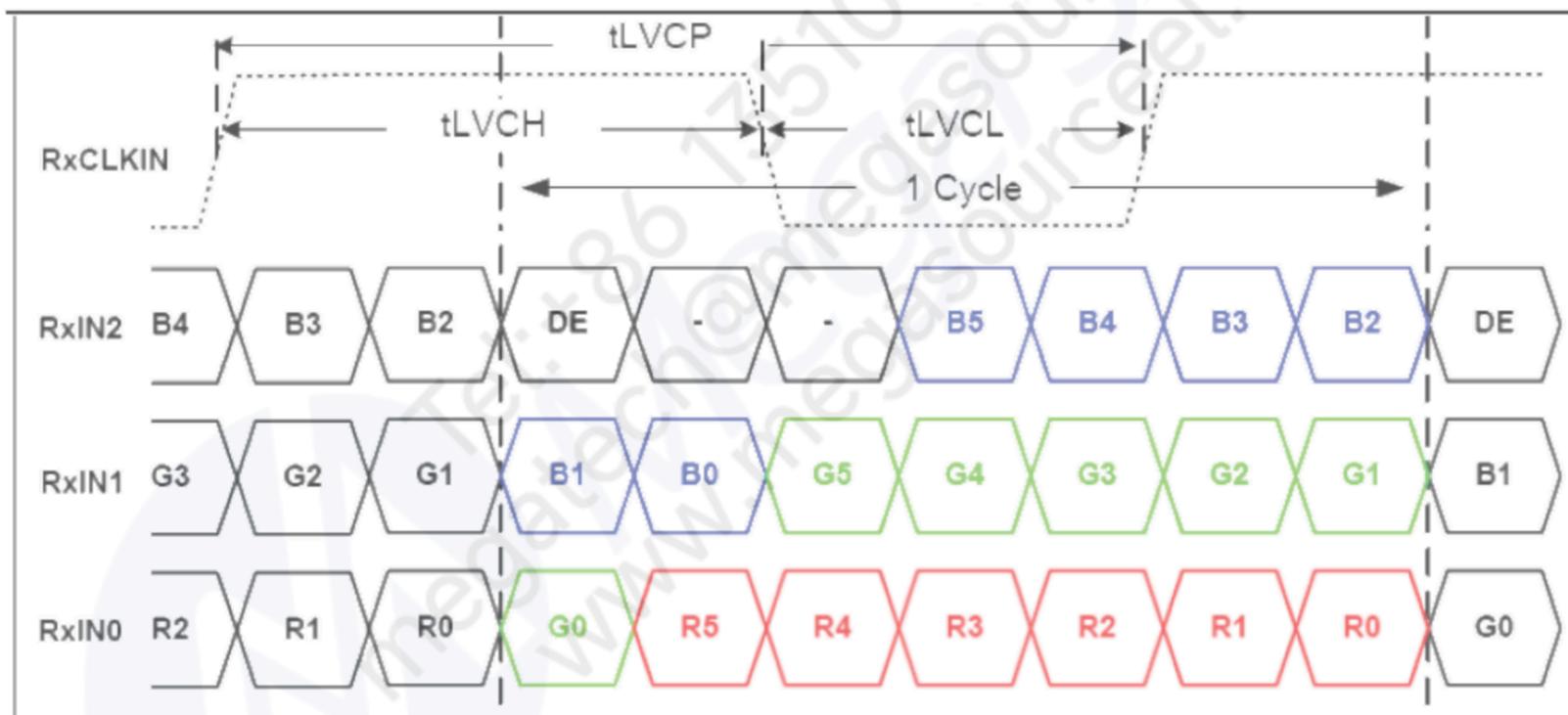


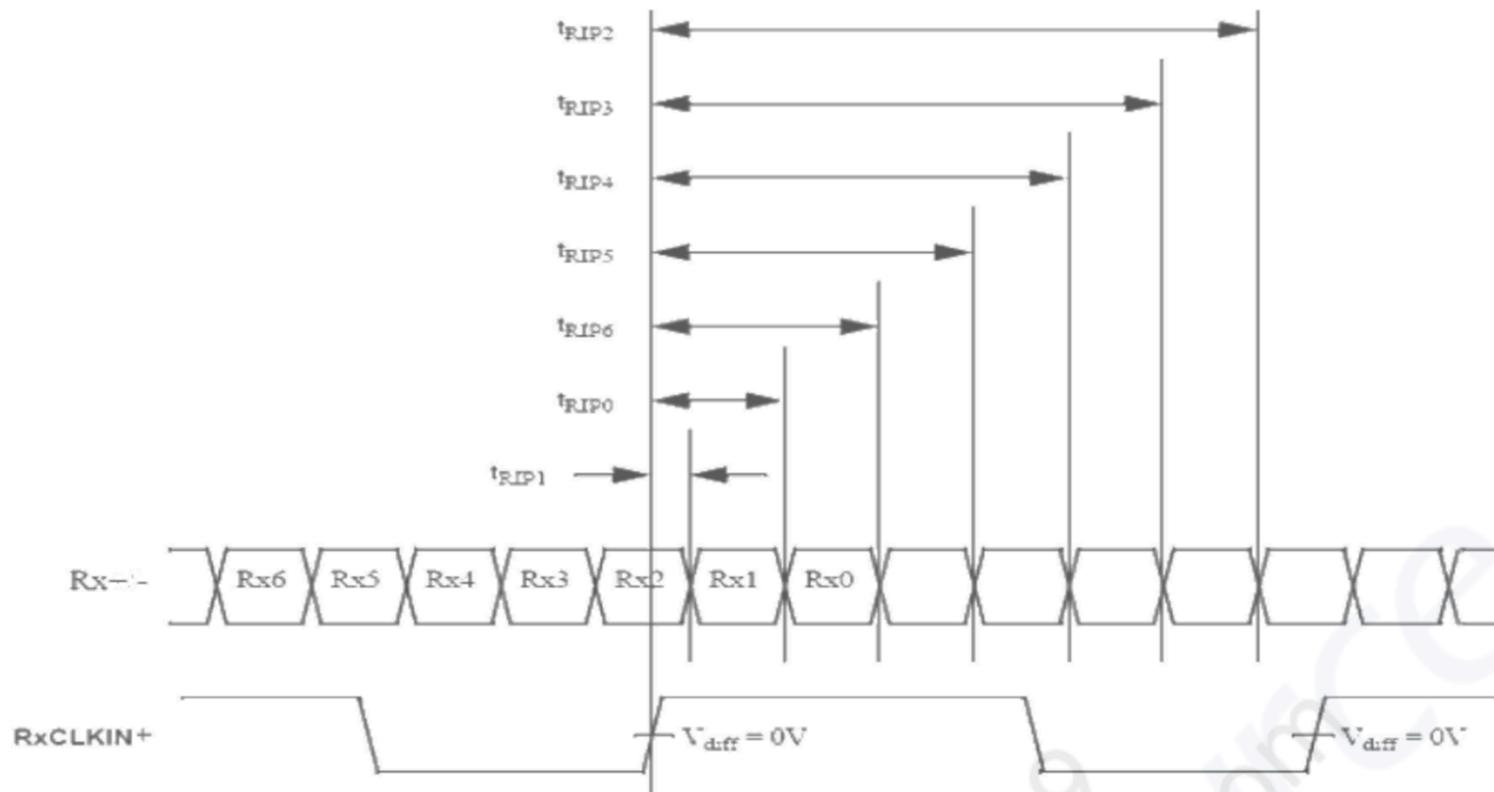


## 5. Timing CHARACTERISTICS

### 5.1 AC Electrical Characteristics

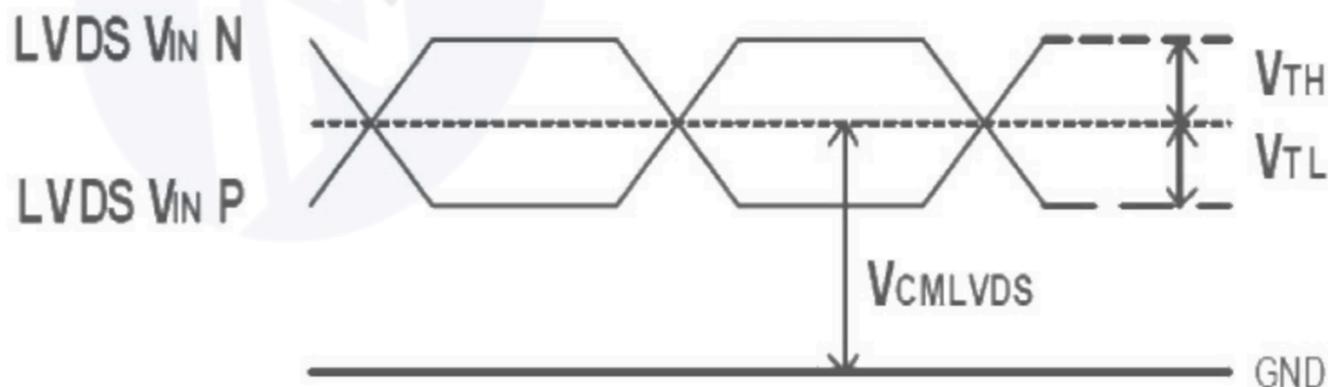
Parameter	Symbol	Min	Typ	Max	Unit	Remark
RxCLKIN frequency	flvcp	24.8	25.2	31.5	MHZ	
RxCLKIN Period	tlvcp	40.3	39.7	31.7	ns	
RxCLKIN High Time	tlvch		4T/7		ns	
RxCLKIN Low Time	tlvcl		3T/7		ns	
Input Data Position0	tRIP1	-0.4	0.0	0.4	ns	
Input Data Position1	tRIP0	T/7-0.4	T/7	T/7+0.4	ns	
Input Data Position2	tRIP6	2T/7-0.4	2T/7	2T/7+0.4	ns	
Input Data Position3	tRIP5	3T/7-0.4	3T/7	3T/7+0.4	ns	
Input Data Position4	tRIP4	4T/7-0.4	4T/7	4T/7+0.4	ns	
Input Data Position5	tRIP3	5T/7-0.4	5T/7	5T/7+0.4	ns	
Input Data Position6	tRIP2	6T/7-0.4	6T/7	6T/7+0.4	ns	





### 5.2 DC Electrical Characteristics

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Digital supply Voltage	VCC	3.00	3.30	3.60	V	
Input Signal Voltage	Low Level	VIL	0	0.3*VCC	V	Only for REV
	High Level	VIH	0.7*VCC	VCC	V	
Common Mode Voltage	VCMLVDS	-	1.25	-	V	For RxINx+/-, RxCLKIN+/-
Differential Input High Threshold	VTH	-	-	+100	mV	
Differential Input Low Threshold	VTL	-100	-	-	mV	
Input Current	IIN	-10	-	+10	uA	
Resistance	R	-	100	-	Ω	
Current of digital supply voltage	IVCC	-	205	-	mA	VCC=3.3V colorbar pattern



LVDS DC timing diagram

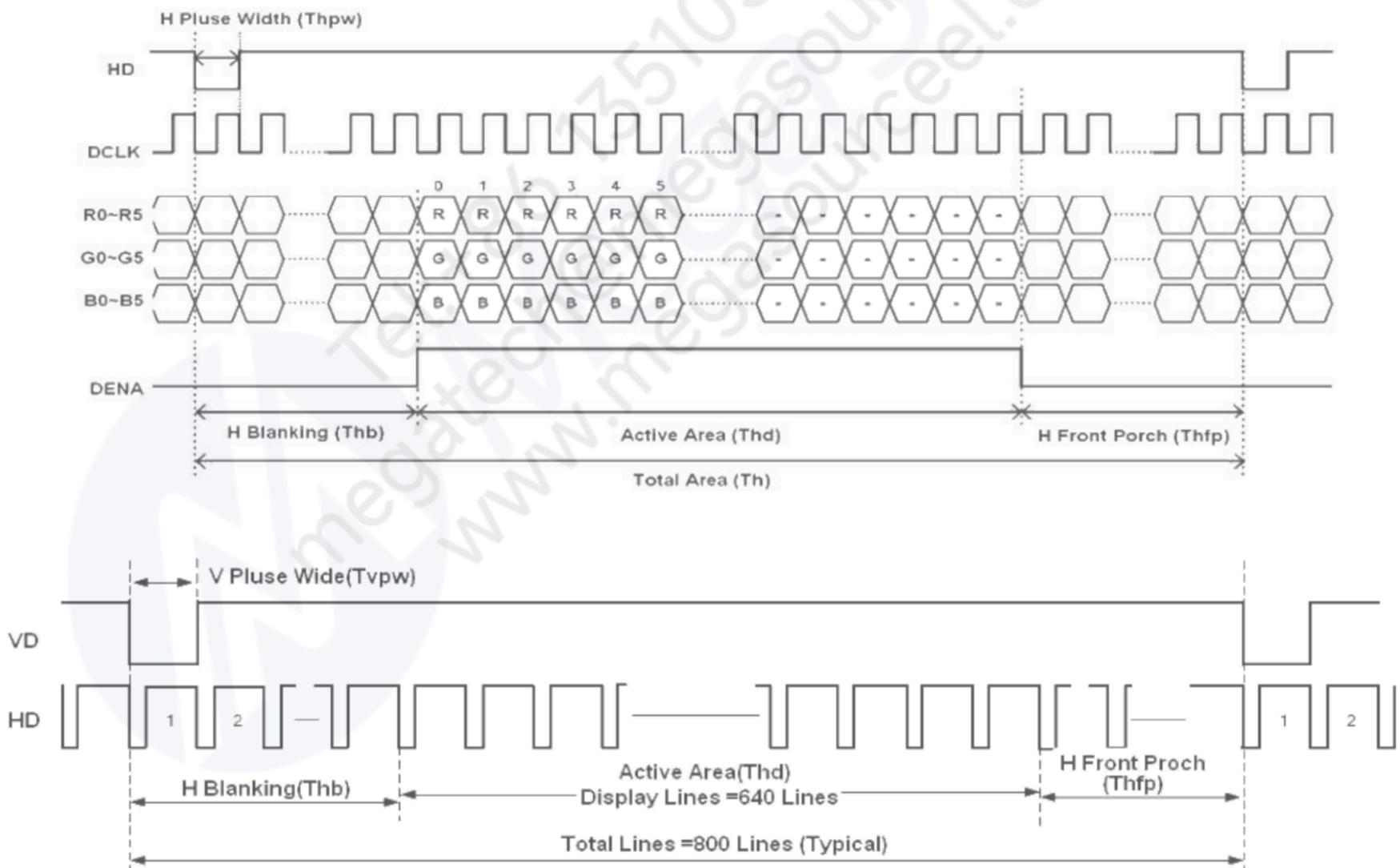


### 5.3 Timing Table

(VCC=3.3V, AVDD=10V, GND=0V, Ta=25°C)

Parameter	Symbol	Symbol	Min.	Typ.	Max.	Unit
DCLK	Dot clock frequency	Fclk	24.8	25.2	31.5	MHz
	Dot clock cycle	Tclk	31.75	39.68	40.32	ns
HD	Horizontal	Thd	640	640	640	Tclk
	1 horizontal line	Th	800	800	1000	Tclk
	Hsync pluse width	Thpw	1	—	—	Tclk
	Horizontal blank	Thb	144	144	144	Tclk
	Horizontal front porch	Thfp	16	16	216	Tclk
VD	Vertical display area	Tvd	480			Th
	Vsync period time	Tv	516	525	570	Th
	Vsync pluse width	Tvpw	1	—	—	Th
	Vsync blank	Tvb	35	35	35	Th
	Vsync front porch	Tvfp	1	10	55	Th

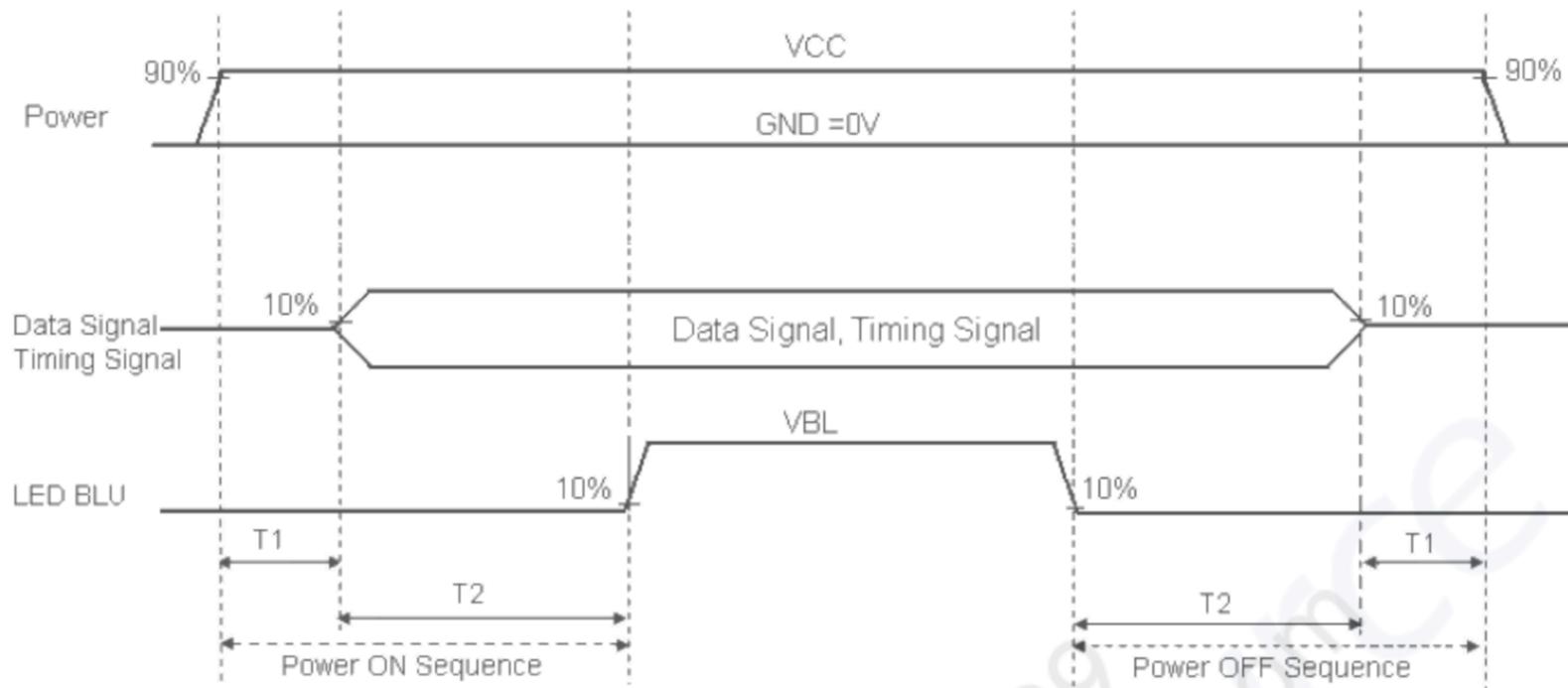
Note5-1: DEN timing refer to HD, VD input timing



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### 6. POWER ON/OFF SEQUENCE



NOTE: T1 ≥ 30ms; T2 ≥ 100ms;



## 7. APPENDIX

### 7.1 LCD DC Characteristics

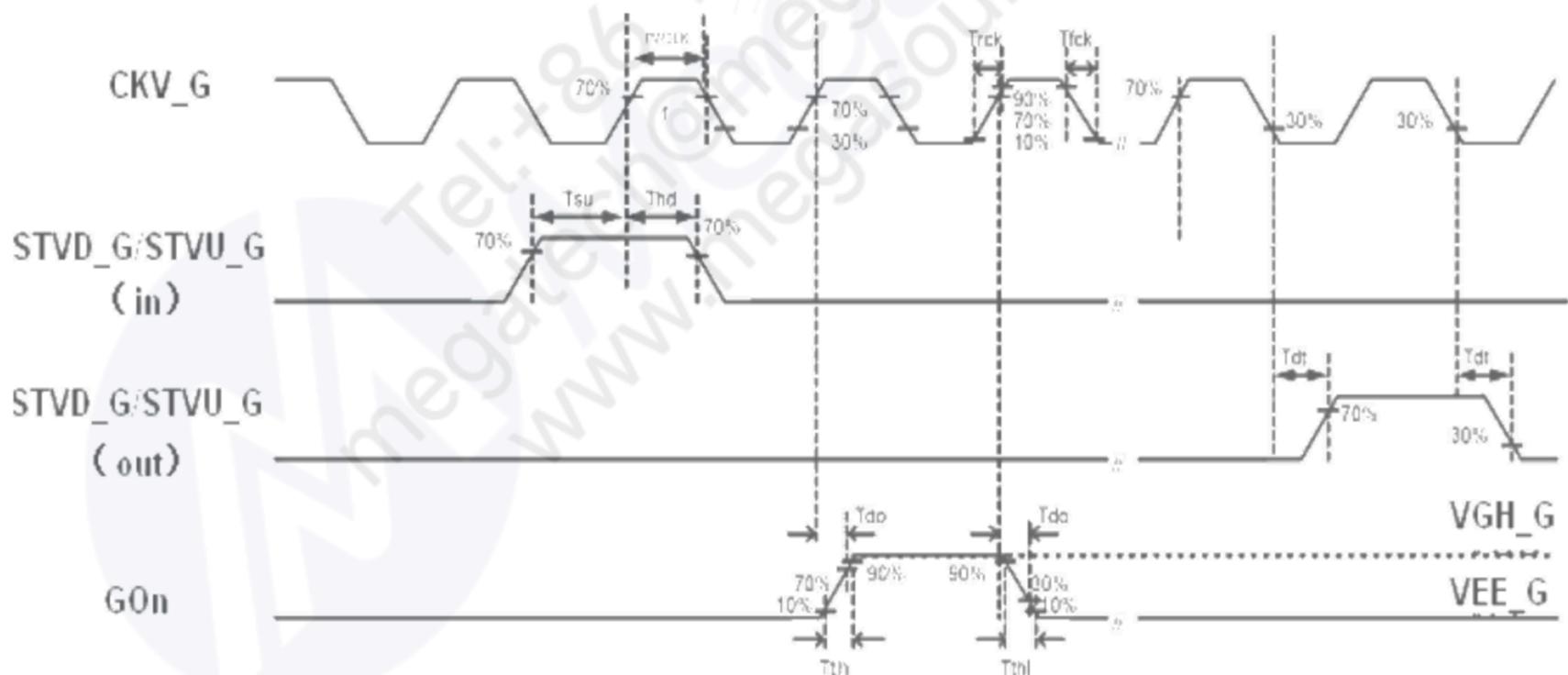
(GND=0V, Ta = 25°C)

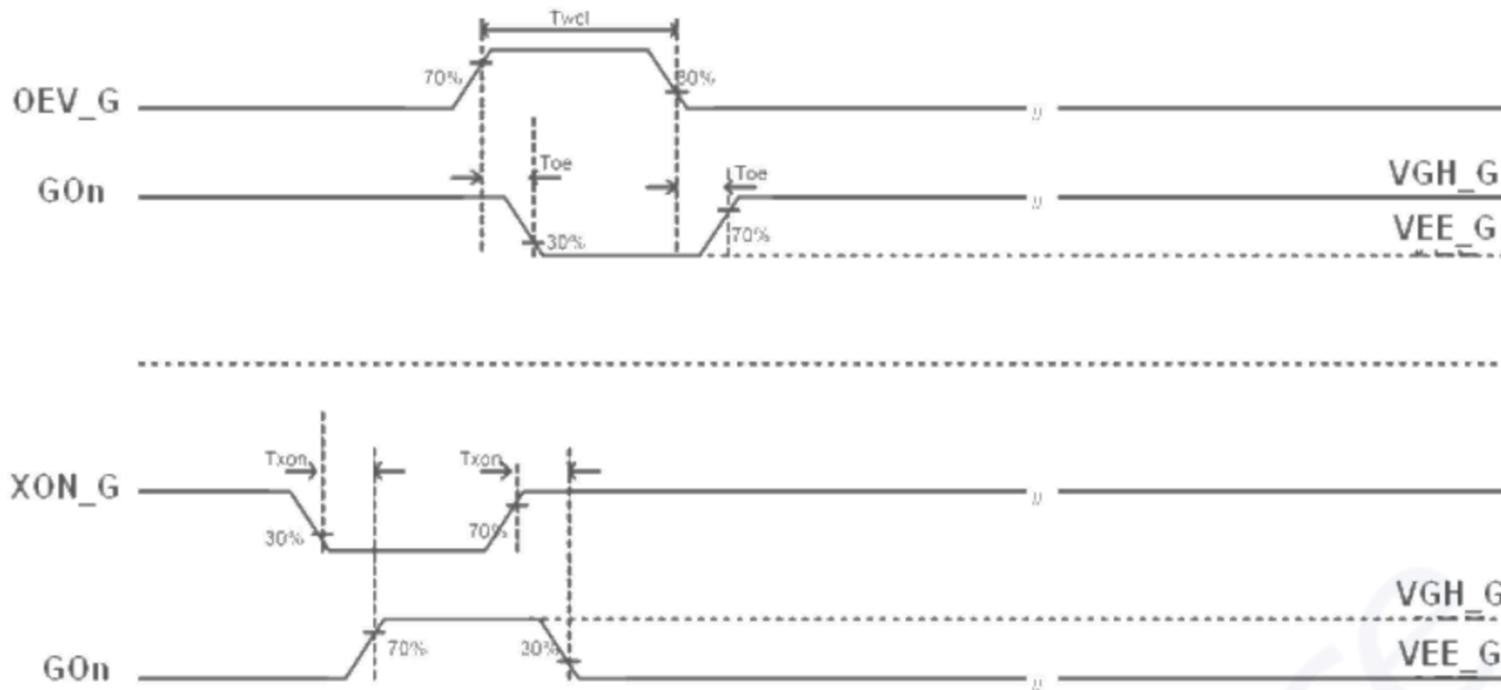
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Digital supply Voltage	VCC	3.00	3.30	3.60	V	
Analog supply Voltage	AVDD	10.37	10.95	11.34	V	
Gate on voltage	VGH G	19.00	20.00	21.00	V	
Gate off voltage	VEE G	-6.30	-6.00	-5.70	V	
Common Electrode	VCOM	—	4.73	—	V	Note7-2
Input Signal Voltage	Low Level	V <sub>IL</sub>	0	0.3×VCC	V	
	High Level	V <sub>IH</sub>	0.7×VCC	VCC	V	
Output Signal Voltage	Low Level	V <sub>OL</sub>	GND	0.2×VCC	V	
	High Level	V <sub>OH</sub>	0.8×VCC	VCC	V	
Current of VCC Power supply	I <sub>VCC</sub>	—	TBD	—	mA	Note 7-3
VCC Current				22.78	mA	
AVDD Current				36.14	mA	
VGH G Current				0.34	mA	
VEE G Current				0.36	mA	

Note7-2: For different LCM, the value may have a bit of difference.

Note7-3: To test the current dissipation, use "all Black Pattern".

### 7.2 Gate Driver Input Timing



**AC Characteristics**

(VGH\_G=20V, VEE\_G=-6V, VCC=3.3V, GND=0V, TA=25°C)

Symbol	Parameters	Min	Typ	Max	Unit	Remark
Tdt	STVD_G/STVU_G Delay Time	—	—	500	ns	
Tdo	Driver Output Delay Time	—	—	900	ns	
Tthl	Output Falling Time	—	400	800	ns	
Ttlh	Output Rise Time	—	500	1000	ns	
Toe	OEV_G to Driver Output Delay Time	—	—	900	ns	
Fclk	CKV_G Frequency	—	—	200	KHz	
Trck	CKV_G Rise Time	—	—	100	ns	
Tfck	CKV_G Falling Time	—	—	100	ns	
PWCLK	CKV_G Pluse Width (High period or Low period)	500	—	—	ns	
Tsu	STVD_G/STVU_G Setup Time	200	—	—	ns	
Thd	STVD_G/STVU_G Hold Time	300	—	—	ns	
Twcl	Output Enable pluse width	1	—	—	ns	

**8. Optical Characteristics**

Ta=25°C

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	$\theta T$	$CR \geq 10$	50	60	--	Degree	Note 2
	$\theta B$		60	70	--		
	$\theta L$		60	70	--		
	$\theta R$		60	70	--		
Contrast Ratio	CR	$\theta=0^\circ$	400	500	--		Note1 Note3
Response Time	$T_{ON}$	25°C	--	20	30	ms	Note1 Note4
	$T_{OFF}$						
Chromaticity	White	Backlight is on	x	--	$0.319 \pm 0.05$	--	Note5 Note1
			y	--	$0.355 \pm 0.05$	--	
	Red		x	--	$0.597 \pm 0.05$	--	
			y	--	$0.329 \pm 0.05$	--	
	Green		x	--	$0.354 \pm 0.05$	--	
			y	--	$0.594 \pm 0.05$	--	
	Blue		x	--	$0.157 \pm 0.05$	--	
			y	--	$0.114 \pm 0.05$	--	
Uniformity	U		75	80	--	%	Note1 Note6
NTSC			--	50	--	%	Note 5
Luminance	L		600	800	--	(without TP) cd/m <sup>2</sup>	Note1 Note7

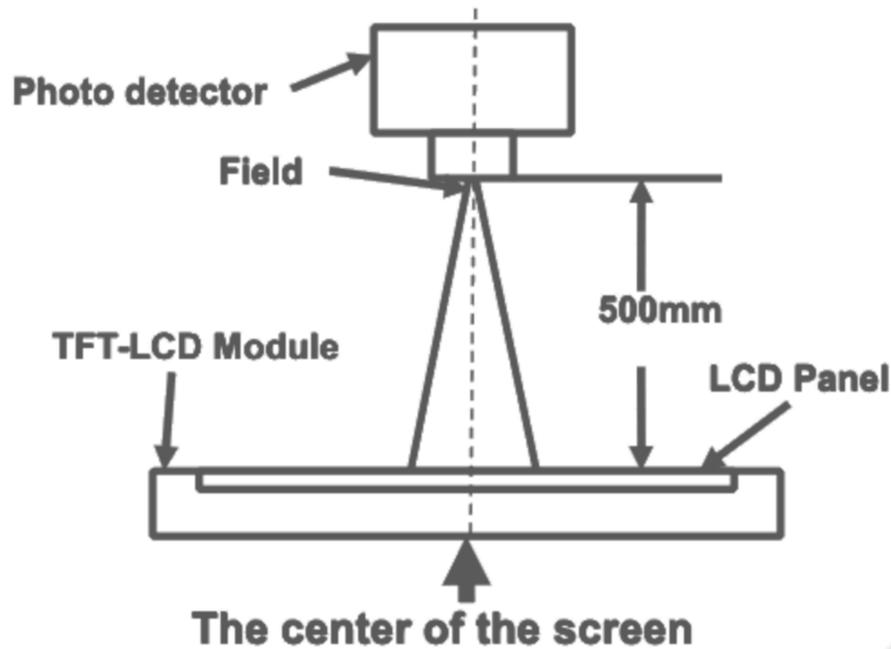
Test Conditions:

1.  $I_F=20\text{mA}$ ,  $V_F=22.4\text{V}$ , the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

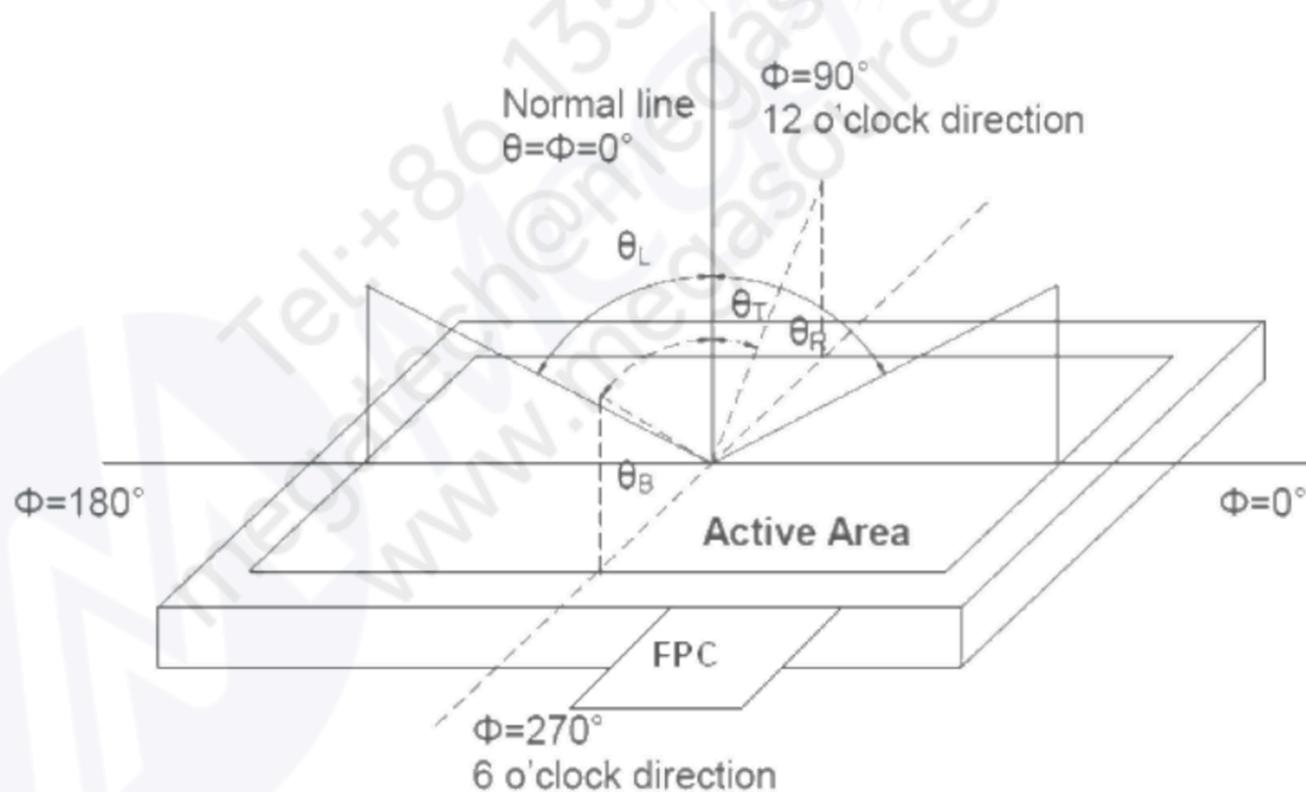
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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  $V_{white}$ .

“Black state”: The state is that the LCD should drive by  $V_{black}$ .

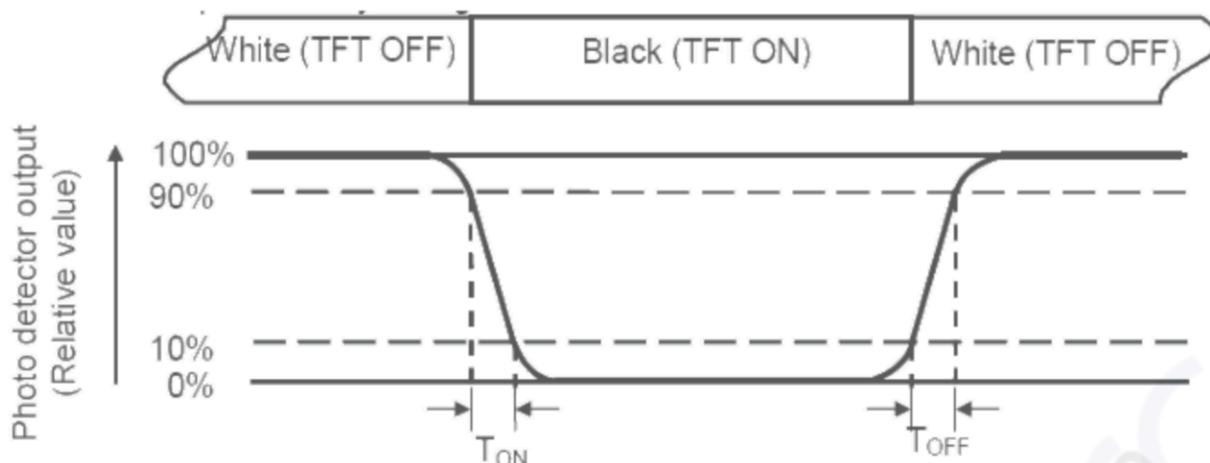
$V_{white}$ : To be determined     $V_{black}$ : To be determined.

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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)

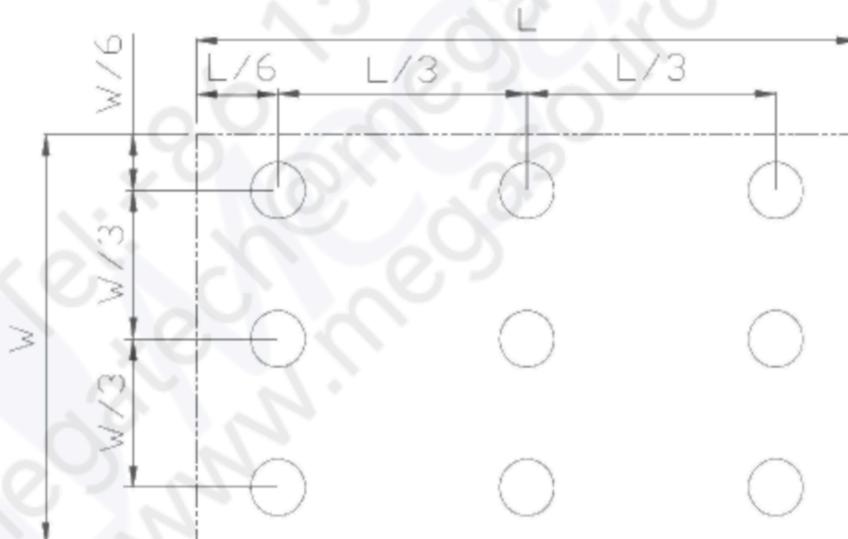
Color coordinates measured at center point of LCD.

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.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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



$L_{\max}$ : The measured Maximum luminance of all measurement position.

$L_{\min}$ : The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

**9. Environmental / Reliability Test**

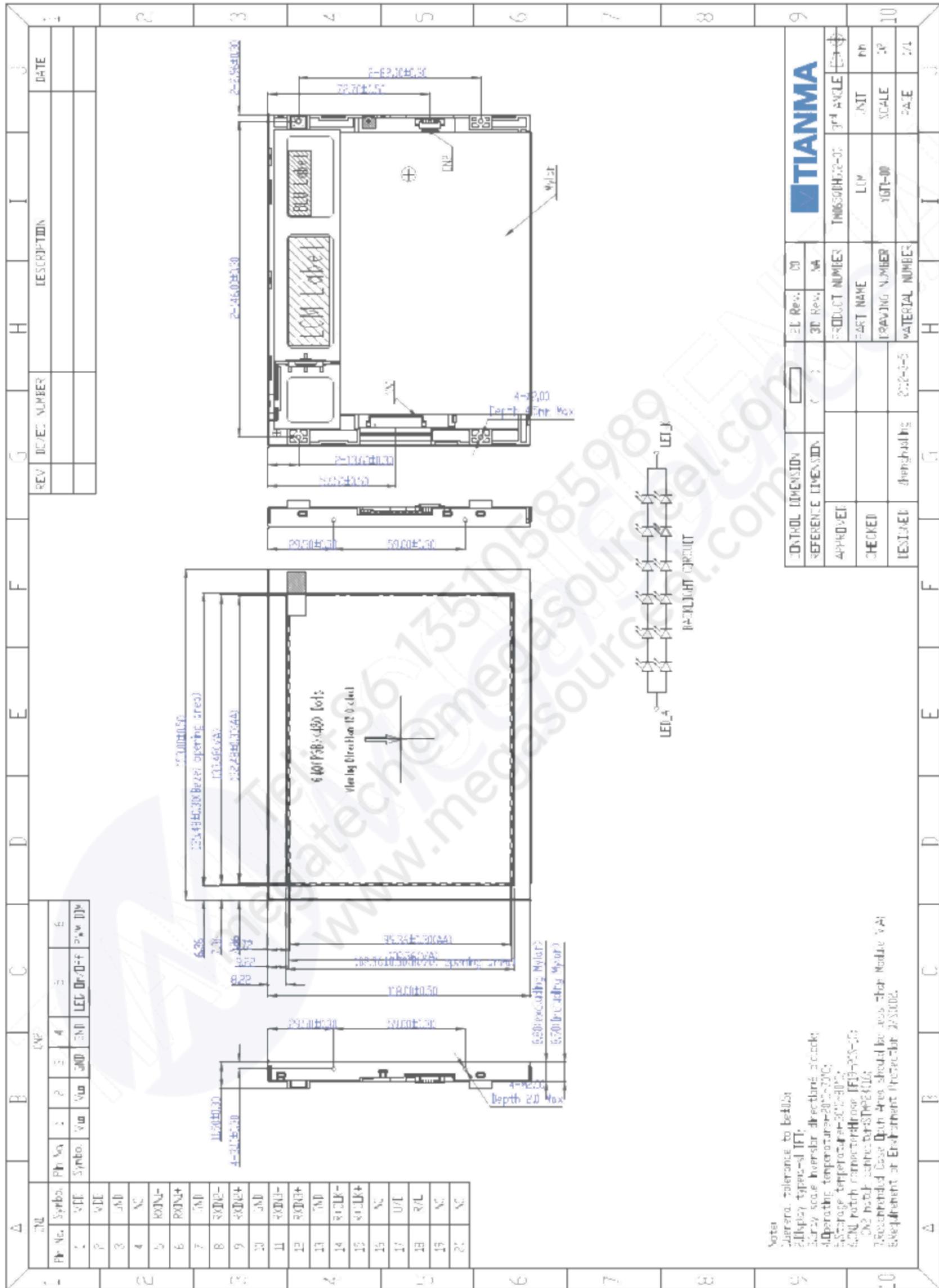
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70°C, 240 hours	IEC60068-2-2 GB2423.2
2	Low Temperature Operation	Ta = -20°C, 240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +80°C, 240hours	IEC60068-2-2 GB2423.2
4	Low Temperature Storage	Ta = -30°C, 240 hours	IEC60068-2-1 GB2423.1
5	Storage at High Temperature and Humidity	Ta = +60°C, 90% RH max,240hours	IEC60068-2-3 GB/T2423.3-
6	Thermal Shock (non-operation)	-30°C 30 min~+80°C 30 min, Change time:5min, 100 Cycle	IEC60068-2-14 GB2423.22
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15°C~35°C, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2 GB/T2423.5
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)(Package condition)	IEC60068-2-6 GB/T2423.10
9	Mechanical Shock (Non Op)	60G 6ms, ±X,±Y,±Z 3times, for each direction	IEC60068-2-27 GB/T2423.5
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8

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

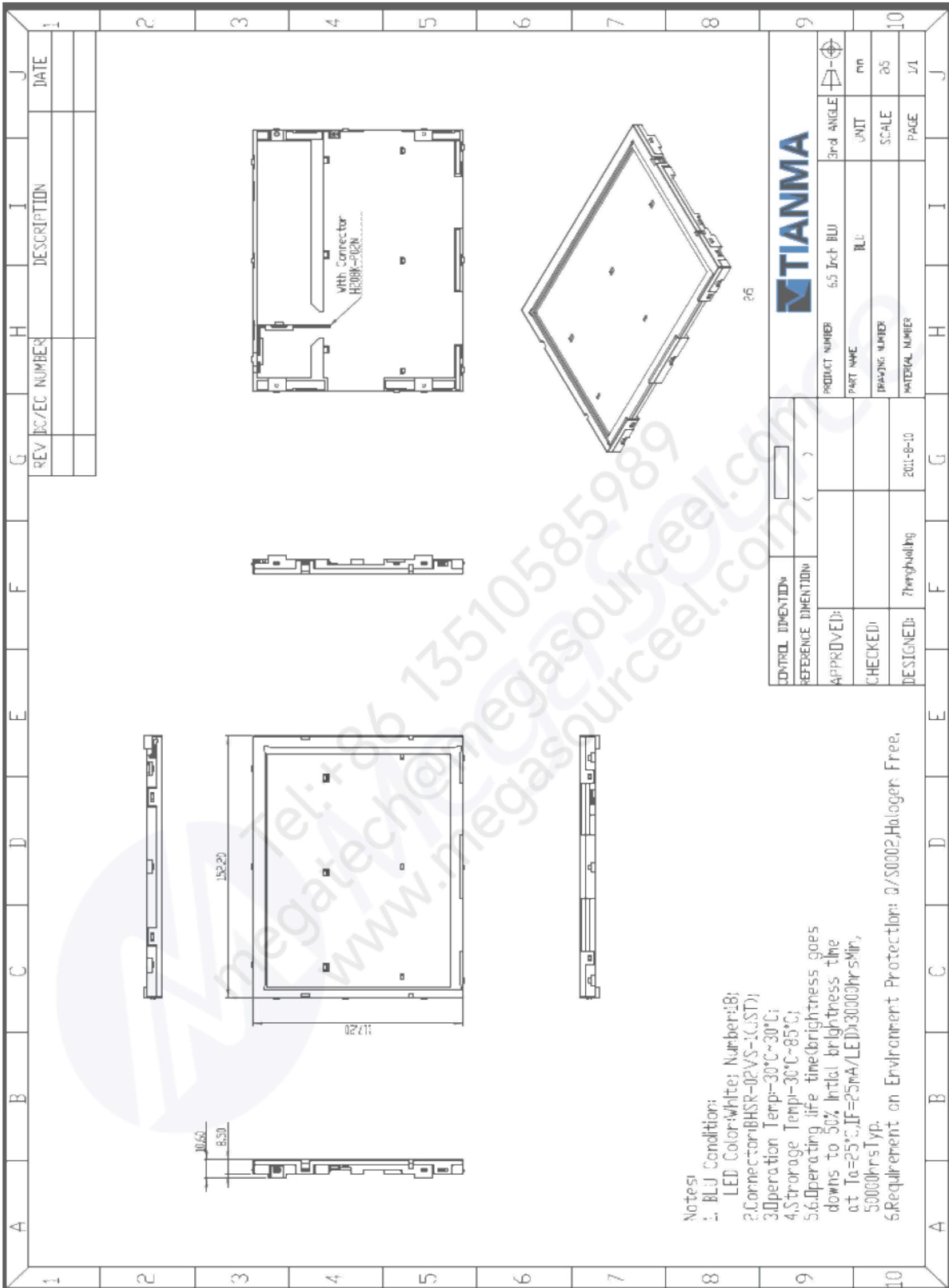
Note2: Ta is the ambient temperature of samples.



10. Mechanical Drawing



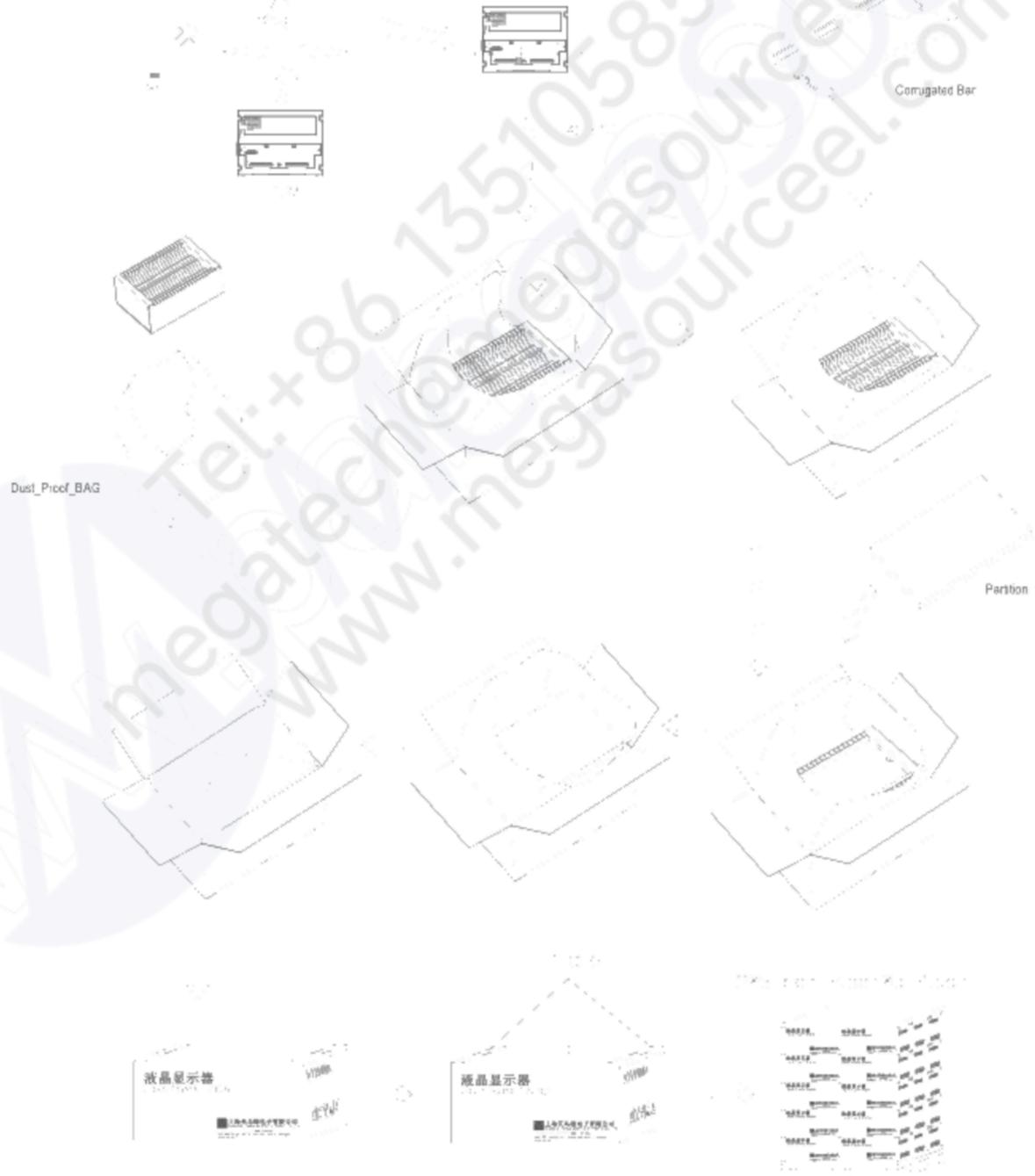
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### 11. Packing Drawing

No	Item	Model(Material)	Dimensions (mm)	Unit Weight (Kg)	Quantity	Remark
1	LCM TM065QDHG02-00		153.0 * 118 *11.9	0.165	42	
2	Partition-1	Corrugated Paper	525×345×217	1.8	1	Anti-static
3	Anti-static Bag	PE	200×185	0.0055	42	Anti-static
4	Dust-Proof Bag	PE	700×545	0.06	1	
5	Partition_2	Corrugated Paper	505×332	0.098	1	
6	Corrugated Paper	Corrugated Paper	433×317	0.1	4	
7	Carton	Corrugated Paper	544×365×250	0.76	1	
8	Total Weight (Kg)	TBD±5%				



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## 12. Precautions for Use of LCD Modules

### 12.1 Handling Precautions

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

12.1.2 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.

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

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

12.1.5 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

12.1.6 Do not attempt to disassemble the LCD Module.

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

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

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

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

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

12.1.8.4 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.

### 12.2 Storage precautions

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

12.2.2 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°C ~ 40°C      Relatively humidity: ≤80%

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

### 12.3 Transportation Precautions

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