LCD MODULE SPECIFICATION

Customer: _____

Module No.: _____

Date: <u>2023-12-08</u>_____

Version: <u>3.0</u>_____

For Customer's Acceptance:

Approved by	Comment

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Record of Revision

Rev.	Date	Description	Editor
1.0	2021-12-15	First release.	
2.0	2023-02-03	Change the brightness.	
3.0	2023-12-08	Update brightness and color coordinate parameters	

1   General Specifications

No.	Item	Specification	Remark
1	LCD Size	4.3 inch (Diagonal)	
2	Driver Element	a-Si TFT active matrix	
3	Resolution	800 (RGB) ×480	
4	Display Mode	Normally Black, Transmissive	
5	Pixel Pitch	0.1188 (H) × 0.1122(V)	
6	Display Colors	16.7M	
7	Surface Treatment	--	
8	Color Arrangement	RGB-Stripe	
9	Interface	24 bit-RGB	
10	Viewing Direction	All	
11	Gray Scale Inversion Direction	/	Note 1
12	Outline Dimension (mm)	105.5(W) × 67.2 (H) × 3.87(T)	
13	Active Area (mm)	95.04(W) × 53.86 (H)	
14	Touch Screen	With CTP	
15	Display Driver IC	ST7262E43	
16	Touch Driver IC	FT6336U	

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

Note 2: RoHS compliant.

2 Pin Assignment

2.1 LCD Pin assignment

Match connector: XF2M-3015-1A by OMRON or equivalent.

PIN	Symbol	I/O	Description	Remark
1	LED-K	I	LED Cathode	
2	LED-A	I	LED Anode	
3	VSS	P	Power Ground	
4	VDD	P	Power Source for 3.3V	
5~12	R00~R07	I	RED Data Buss	
13~20	G00~G07	I	GREEN Data Buss	
21~28	B00~B07	I	BLUE Data Signal	
29	VSS	P	Power Ground	
30	DLCK	I	Clock Signal to Sample each data	
31	DISP	I	Display ON/OFF Signal	
32	HSYNC	I	Horizontal Synchronizing Signal	
33	VSYNC	I	Vertical Synchronizing Signal	
34	DE	I	Input Data enable control	
35	NC	-	Set Open	
36	VSS	P	Power Ground	
37	XR	NC	Touch Panel PIN(NC)	
38	YD	NC	Touch Panel PIN(NC)	
39	XL	NC	Touch Panel PIN(NC)	
40	YU	NC	Touch Panel PIN(NC)	

I---Input, O---Output, P--- Power/Ground

2.2 Touch panel pin assignment

Match connector: XF2M-1015-1A by OMRON or equivalent

No.	Symbol	Description
1	GND	Ground
2	TP-VDD	TP 3.3V Power
3	SCL	I2C _SCL(2.8~3.3V), 4.7K~10K pull up resistor needed
4	NC	No connection
5	SDA	I2C_SDA (2.8~3.3V),4.7K~10K pull up resistor needed
6	NC	No connection
7	/RST	External reset(2.8~3.3V)
8	NC	No connection
9	INT	External interrupt (2.8~3.3V)
10	GND	Ground

3   Absolute Maximum Ratings

Ta = 25°C

Item	Symbol	Min.	Max.	Unit	Remark
Power Voltage	VDD	-0.30	+4.0	V	
	TP-VDD	-0.30	+3.6	V	
Backlight Forward Current(LED)	IF	0	60	mA	
Operating Temperature	Top	-20.0	70.0	$^{\circ}$C	
Storage Temperature	T_{st}	-30.0	80.0	$^{\circ}$C	
Operating and Storage Humidity	H_{stg}	10%	90%	%(RH)	

4. Electrical Characteristics

4.1 Recommended Operating Condition

VDD=3.3V，GND=0V，Ta = 25℃

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply Voltage		VDD	3.1	3.3	3.6	V	
TP Power		TP-VDD	2.8	3.0	3.3	V	
Input Signal Voltage	Low Level	V_{IL}	0	-	0.3 x VDD	V	
	High Level	V_{IH}	0.7 x VDD	-	VDD	V	
Power supply Current		I_{VDD}	-	-	50	mA	VDD=3.3V, color bar pattern

4.2 Backlight Unit Driving Condition

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Current	I_F	-	40	50	mA	10 LEDs (5 LED Serial, 2 LED Parallel)
Forward Current Voltage	V_F	-	16	17	V	
Backlight Power Consumption	W_{BL}	-	640	867	mW	
Operating Life Time	--	30000	--	--	hrs	Note 2, Note 3

Note1: The LED driving condition is defined for each module (5LED Serial, 2 LED Parallel).

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

Note3: Optical performance should be evaluated at Ta=25℃ When LED is driven at 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.
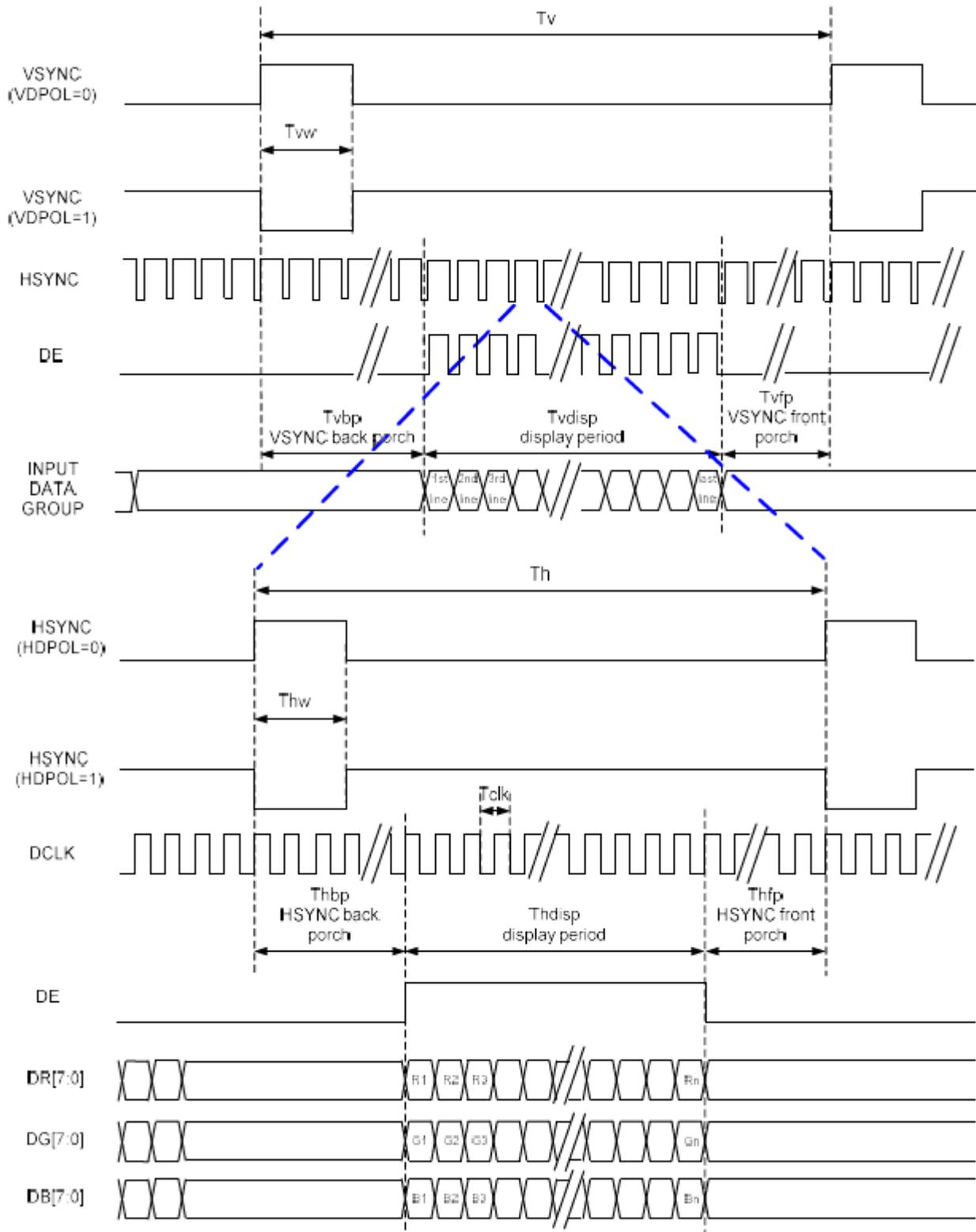
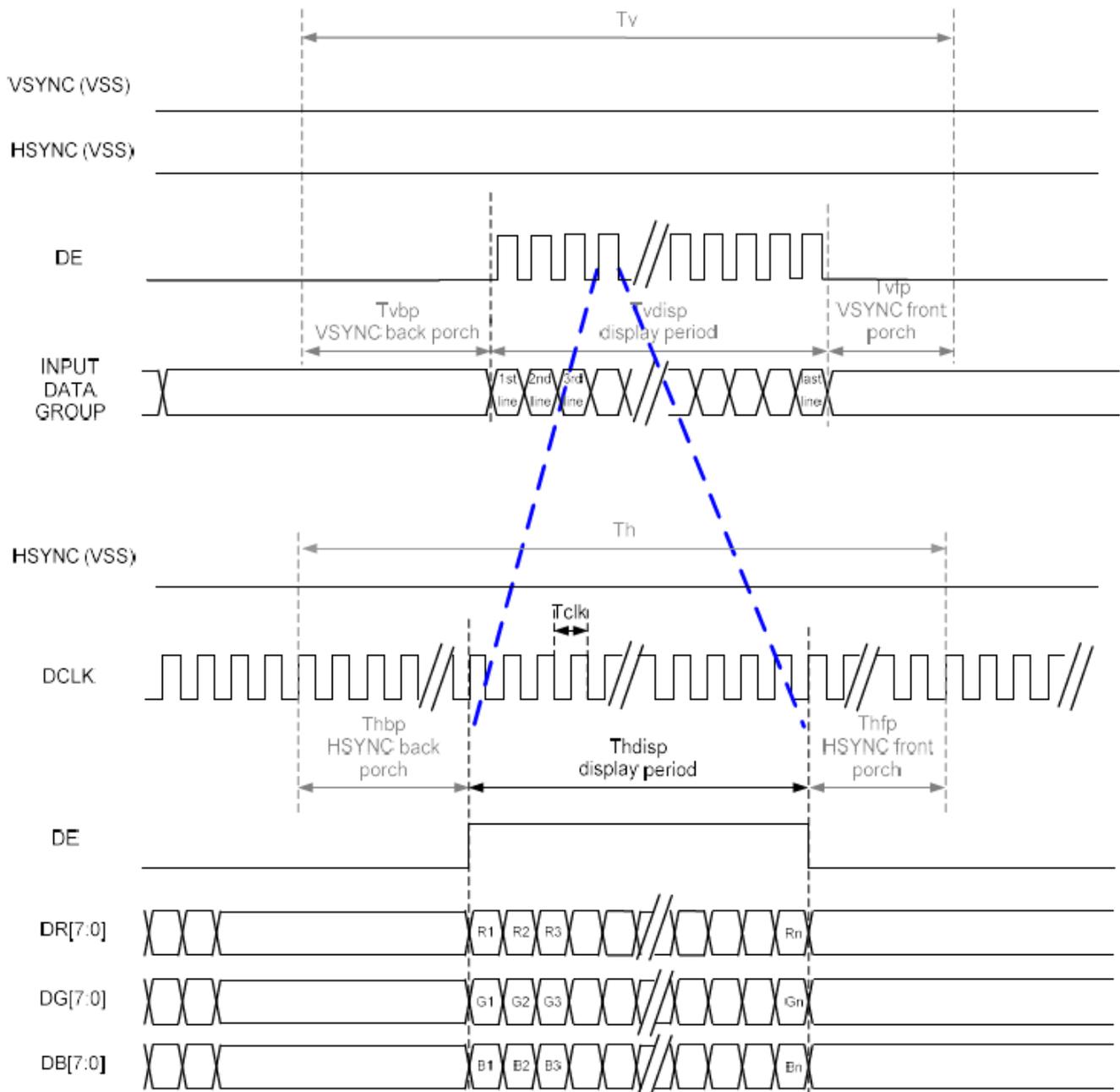Note4: The LED driving condition is defined for each LED module.
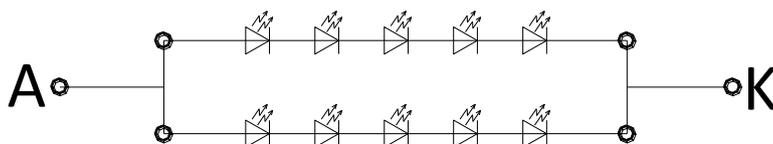
5   Timing Chart

5.1   RGB Interface

5.1.1SYNC Mode

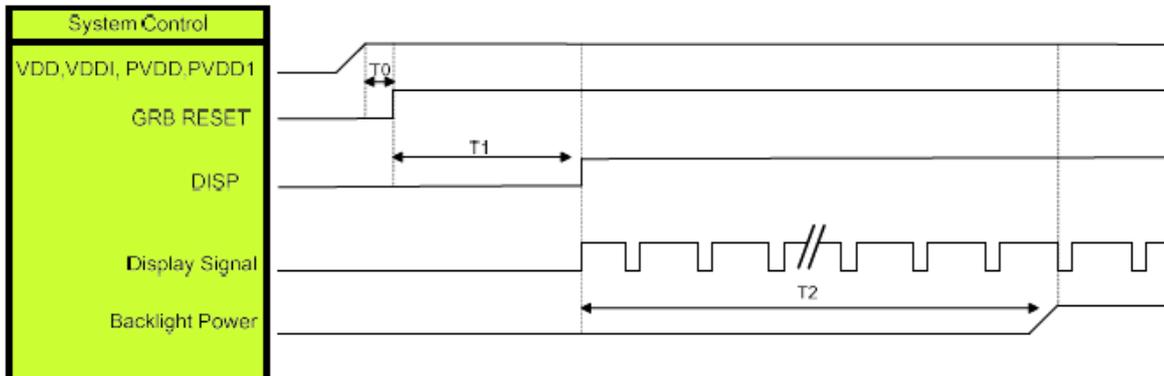## 5.1.2   DE Mode

5.2 Recommended Timing Setting of TCON

TCON (Embedded in Source IC) Input Timing (DCLK, HS, VS, DE)

VDD-3V3=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK	Fclk	-	27	-	MHz	
	tclk	-	37.04	-	ns	
HSD	thd	-	800	-	tclk	
	thpw	-	6	-	tclk	
	thb	-	30	-	tclk	
	thfp	-	50	-	tclk	
VSD	tvd	-	480	-	th	
	tvpw	-	2	-	th	
	tvb	-	10	-	th	
	tvfp	-	16	-	th	

5.3 Power on/off Sequence

Power On Timing

Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note :

1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.

2. RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

3: LVDS interface Display signal: DCLK P/N; RX[3:0] P/N

Power Off Timing
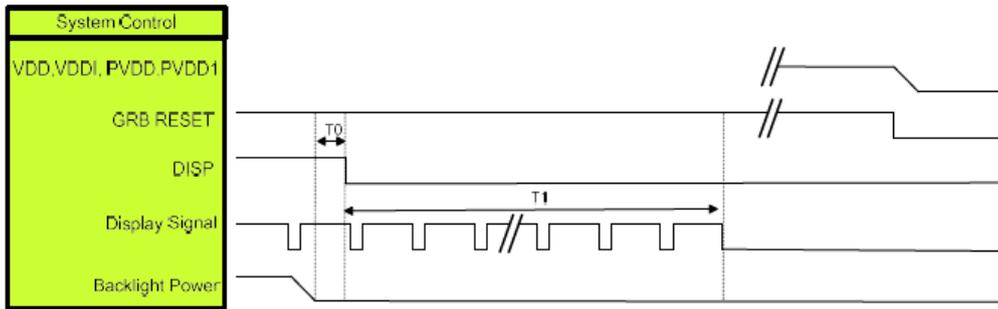
Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	100	ms

Note :

1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures. Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.

2. RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

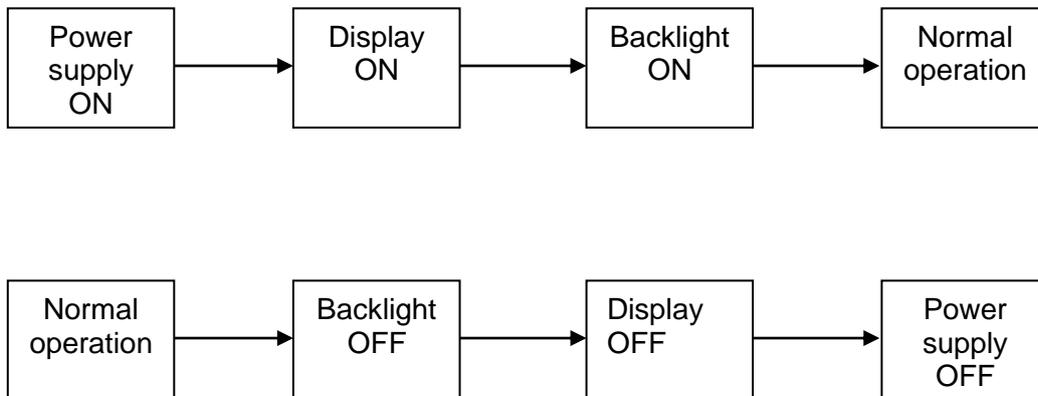3. LVDS interface Display signal: DCLK P/N; RX[3:0] P/N

6 Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
View Angles		θT	CR≧10	-	80	-	Degree	Note 2
		θB		-	80	-		
		θL		-	80	-		
		θR		-	80	-		
Contrast Ratio		CR	θ=0°	-	1200	-		Note1 Note3
Response Time		T_{ON}	25℃	-	30	-	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.258	0.288	0.318		Note1 Note5
		y		0.254	0.284	0.314		
	Red	x		0.576	0.606	0.636		
		y		0.322	0.352	0.382		
	Green	x		0.309	0.339	0.369		
		y		0.532	0.562	0.592		
	Blue	x		0.120	0.150	0.180		
		y		0.068	0.098	0.128		
Uniformity		U		75	80	-	%	Note1 Note6
NTSC				-	70	-	%	Note 5
Luminance		L		-	300	-	cd/m^2	Note1 Note7

Test Conditions:

1. I_F= 40 mA, V_F=16.0V and the ambient temperature is 25±2℃.humidity is 65±7%

2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

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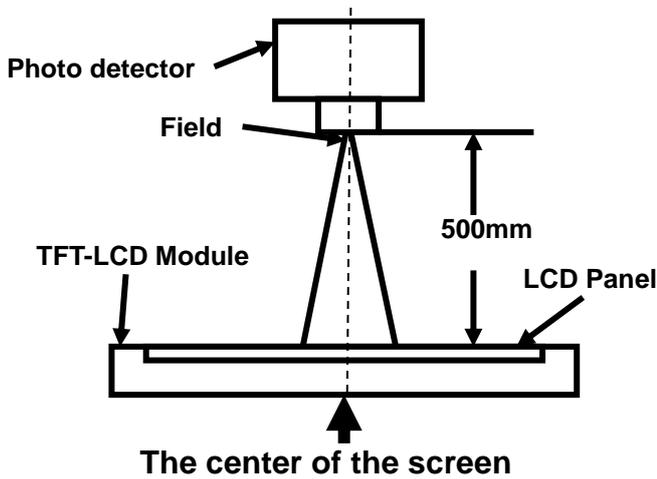
Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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)。
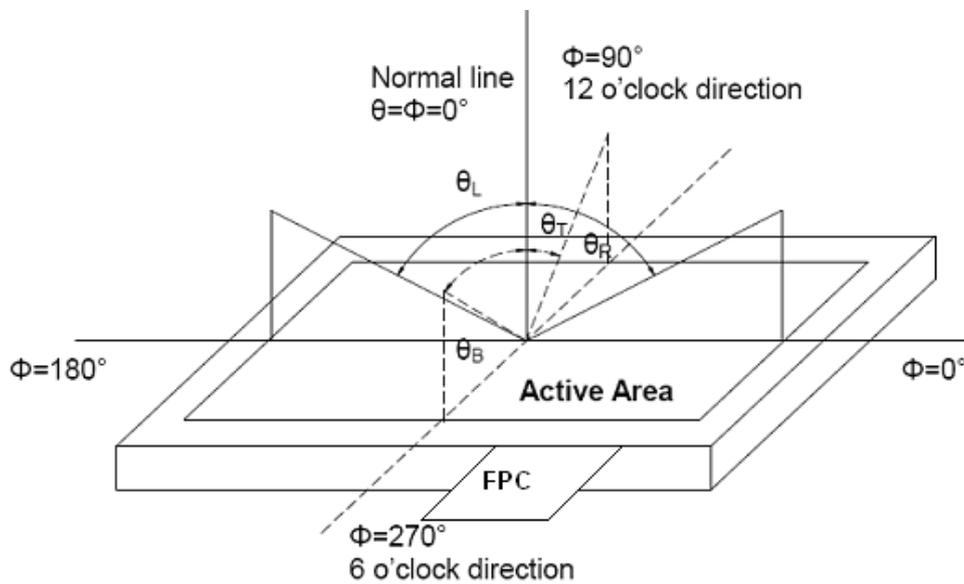
Note 3: Definition of contrast ratio

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

"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.

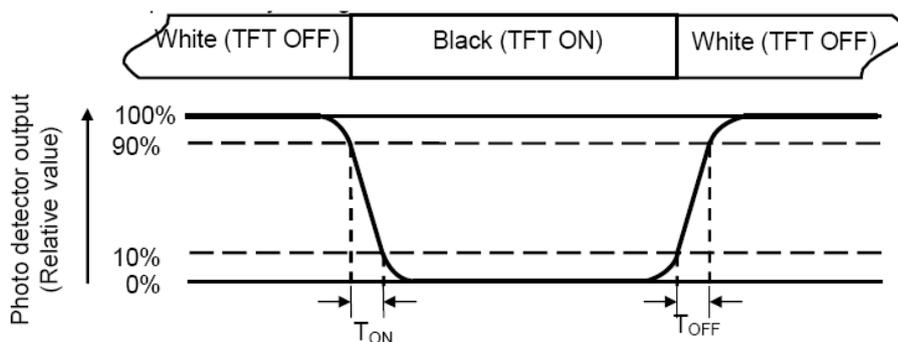## Note 4: Definition of response time

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
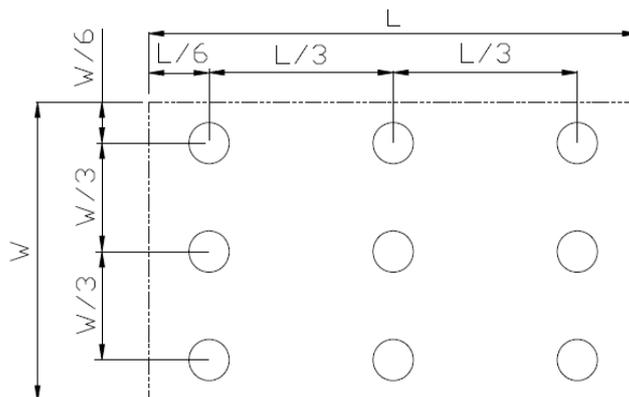
Lmax: The measured Maximum luminance of all measurement position.

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℃, 120 hours	No abnormalities in functions
2	Low Temperature Operation	Ta = -20℃, 120 hours	No abnormalities in functions
3	High Temperature Storage	Ta = +80℃, 120 hours	No abnormalities in functions
4	Low Temperature Storage	Ta = -30℃, 120 hours	No abnormalities in functions
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max,120hours	No abnormalities in functions
6	Thermal Shock (non-operating)	-30℃ 30 min~ +70℃ 30 min, Change time: 0.5 hour ← 5 min → 0.5 hour.10 Cycle	Start with cold temperature, End with high temperature,
7	ESD	C=150pF, R=330Ω,5point/panel Air: ±8Kv, 5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	No abnormalities in functions

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

Note2: Ta is the ambient temperature of samples.

8 Mechanical Drawing

Angle(视角): Unit(单位): mm

Date(日期):

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Notes:
1. Unit:mm.
2. Modification rev. number.
3. All radii without dimension R0.3mm.
4. Unspecified Tolerances is :±0.20mm.
5. Driver IC:ST7262E43
6. **LCD Driver Voltage:2.8~3.3V**
7. **Color:White**
8. Display Type:IPS
9. Operating Temperature : -20° --- +70°C
10. Storage Temperature : -30° --- +80°C
11. Requirements on Environmental Protection: RoHS HSF

Technical Parameter:
1. Composition: G+F
   Touch IC: FT6336U
2. Degree of tempering:110g Steel Ball,30 cm in height, unbreakable.
   Surface hardness, testing:≥6H(Pencil hardness test)
3. Transmittance: ≥85%
4. Surface hardness: 6H
5. Operating Temperature: -20℃~70℃, Humidity:20%~90%
6. Storage Temperature: -30℃~+80℃, Humidity:20%~90%
7. Undimensioned Tolerance:±0.2mm

TFT:4.3"
DOTS:800*RGB*480
VIEWING DIRECTION
ALL
AG

*105.5±0.20 LCM OUTLINE
105.2±0.10 TP OD
98.04±0.15 LCD OD
98.04±0.10 BEZEL OPEN
95.84 TP VA
95.04 LCD AA

*67.2±0.20 LCM OUTLINE
66.75±0.10 TP OD
61.66±0.15 LCD OD
56.86±0.10 BEZEL OPEN
54.66 TP VA
53.86 LCD AA
1.98
3.43
3.78
4.83
5.23
3.43

18.55±0.30
45.62±0.30
3.5±0.30
P=39*0.5=19.5
0.35
0.15
0.5
20.5±0.10

2-0.5±0.1
W:0.35±0.05
P:0.5±0.05
5.5±0.1

Electronic component
High temperature adhesivetape

3.87±0.20 LCM+TP
0.95±0.10 TP
2.75±0.10 LCM
0.3±0.03
0.3±0.03

STRETCH THE SHIPMENT
Bend Out

CURRENT VF=16.0V,IF=40mA(TYP)
5C*2B=10 LEDS
Backlit circuit diagram

39.84±0.5
18.12
10.53
PI
T=0.3±0.03

Reinforcement steel sheet T=0.200MM
grounding of reinforcement steel sheet T=0.200MM

3M Tape T=0.1MM
104.76±0.2 (SENSOR OD)
66.31±0.2 (SENSOR OD)
4.5±0.30

NO.	PIN NAME
1	LED-K
2	LED-A
3	VSS
4	VDD
5	R00(LSB)
6	R01
7	R02
8	R03
9	R04
10	R05
11	R06
12	R07(MSB)
13	G00(LSB)
14	G01
15	G02
16	G03
17	G04
18	G05
19	G06
20	G07(MSB)
21	B00(LSB)
22	B01
23	B02
24	B03
25	B04
26	B05
27	B06
28	B07(MSB)
29	VSS
30	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	VSS
37	XR
38	YD
39	XL
40	YU

TP PIN DESCRIPTION

PIN NO.	SYMBOL
1	GND
2	TP-VDD
3	SCL
4	SDA
5	NC
6	NC
7	/RST
8	NC
9	INT
10	GND

9   Precautions for Use of LCD Modules

Handling Precautions

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

9.1.2 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.

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

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

9.1.5 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

9.1.6 Do not attempt to disassemble the LCD Module.

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

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

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

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

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

9.1.8.4 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.

Storage Precautions

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

9.2.2 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 : $0℃ \sim 40℃$ Relatively humidity: ≤80%

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

Transportation Precautions

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