晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS   FOR
LCD   MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	**AM-800480I2TZQW-T00H**
APPROVED BY	
DATE	

☐ **Preliminary Specification**
☐ **Formal Specification**

Approved by	Checked by	Organized by
Patrick	Simon	Mantle

This Specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2021/01/13	--	New Release	Mantle
2021/06/04	8	Correct Screen Scan Direction	Mantle
2021/06/22	5,6,15	IF 150->250mA ,VF 21->20V	Mantle
2021/07/29	9	Update Display Position and Scan Direction	Simon

1. General Specifications

7 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module.

This module is composed of a 7" TFT-LCD panel, TFT driving PCBA, and backlight unit.

1.1 Features

(1) Construction: 7" a-Si TFT active matrix, White LED Backlight.

(2) Resolution (pixel): 800(R.G.B) X480

(3) Number of the Colors : 16.7M colors (R , G , B 8 bit digital each)

(4) LCD type : Transmissive, normally Black

(5) Interface: LVDS

(6) Projective: Capacitive Touch :

    a. Touch controller: ILI2132 (ILITEK),

    b. Interface : USB(default) , UART

1.2 Product Summary

NO	Item	Specification	Remark
1	LCD Size	7.0 inch (Diagonal)	
2	Resolution	800 x 3 (RGB) x 480	
4	Pixel pitch	0.1905 (W) x 0.1905(H) mm	
5	Active area	152.4(W) x 91.44(H) mm	
7	Color arrangement	RGB-stripe	
8	Luminance	850 cd/m2	cd/m^2

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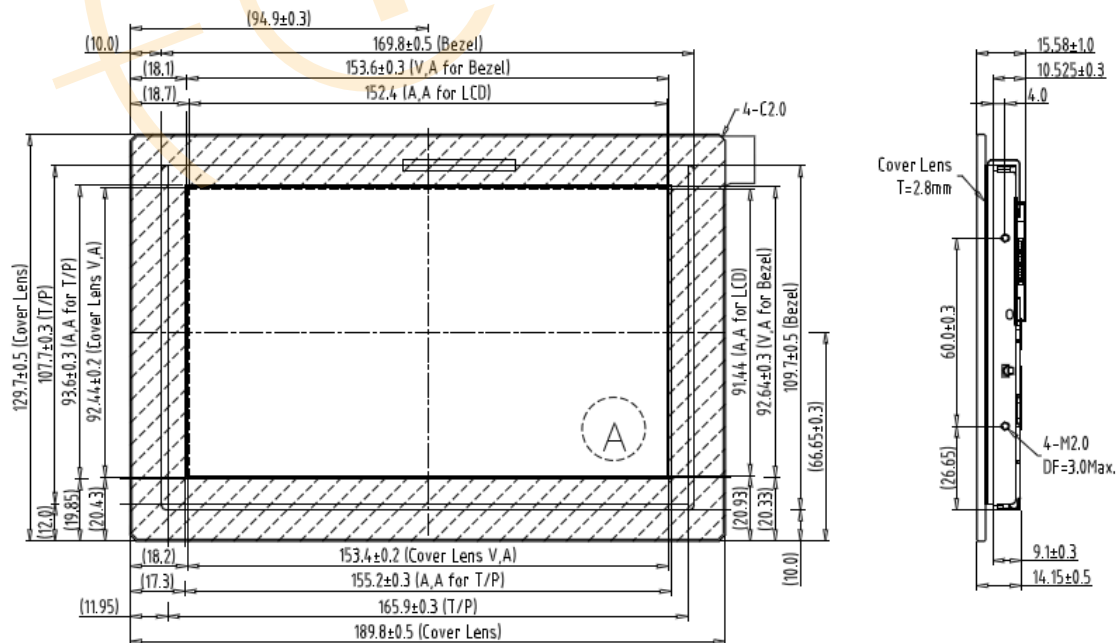
2. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remakes
Supply Voltage	V_{DD}	-0.3	3.6	V	-
	V_{LED}	-0.3	15	V	
Input Voltage of Logic	V_I	-0.3	$V_{DD+0.3}$	V	Note 1
DIM frequency Input Voltage	V_{PDIM}	-0.3	7	V	
Operating Temperature	T_{OP}	-30	70	℃	Note 2
Storage Temperature	T_{ST}	-30	80	℃	Note 2

Note 1: The rating is defined for the signal voltages of the interface such as CLK and pixel data pairs.

Note2: The maximum rating is defined as above based on the chamber temperature, which might be different from ambient temperature after assembling the panel into the application. Moreover, some temperature-related phenomenon as below needed to be noticed:

- Background color, contrast and response time would be different in temperatures other than 25℃.

-Operating under high temperature will shorten LED lifetime.

3. Electrical Characteristics

3.1 Recommended Operating Condition

| Item		Symbol	Min.	Typ.	Max.	Unit	Note
LCD Supply Voltage		V_{DD}	3.0	3.3	3.6	V	-
LCD Supply Current		I_{DD}	-	180	-		(1)
Power Supply Voltage For LED Driver		VL	10.8	12.0	13.2	V	(1) 100%duty
Power Supply Current For LED Driver		I_{LED}	-	(520)	--	mA	VLED=12V 100%duty
DIM frequency		f_{PWM}	100	500	1000	Hz	Note2
Backlight ON-OFF	HIGH	BLEN	2.5	--	VL	V	
	LOW		0	--	0.4	V	
DIM frequency Input Voltage	HIGH	V_{PDIM}	2.5	--	5.5	V	
	LOW		0	--	0.3	V	
LVDS RECEIVER DC SPECIFICATIONS							
Differential Input High Threshold		VTH	-	-	+100	mV	VOC=+1.2V
Differential Input Low Threshold		VTL	-100	-	-	mV	

Note1: Ta=25℃, Display pattern: All White

Note2: Dimming function can be obtained by PWM signal from the display CN2. The recommended PWM signal is 100Hz~1000Hz.
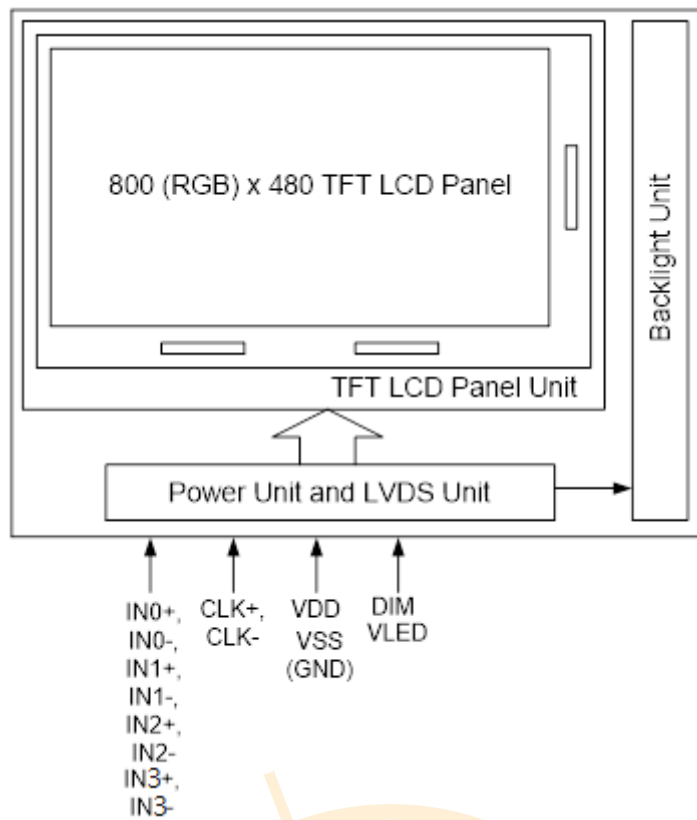

3.2 Recommended Driving Condition for Backlight

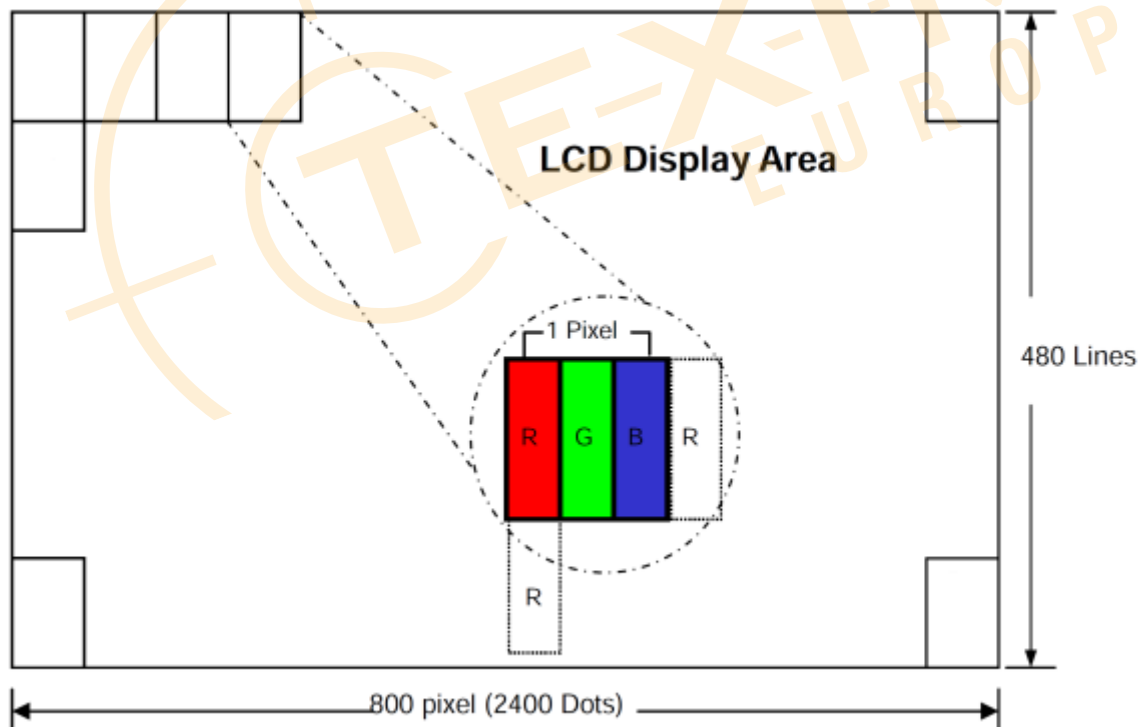| Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	--	250	--	mA	Ta=25℃
LED Forward Voltage	VF	--	20	--	V	IF=250mA, Ta=25℃
LED life time			100000	-	Hr	IF=250mA, Ta=25℃

■ The constant current source is needed for white LED back-light driving.

■ When LCM is operated over 40℃ ambient temperature, the IF should be follow :
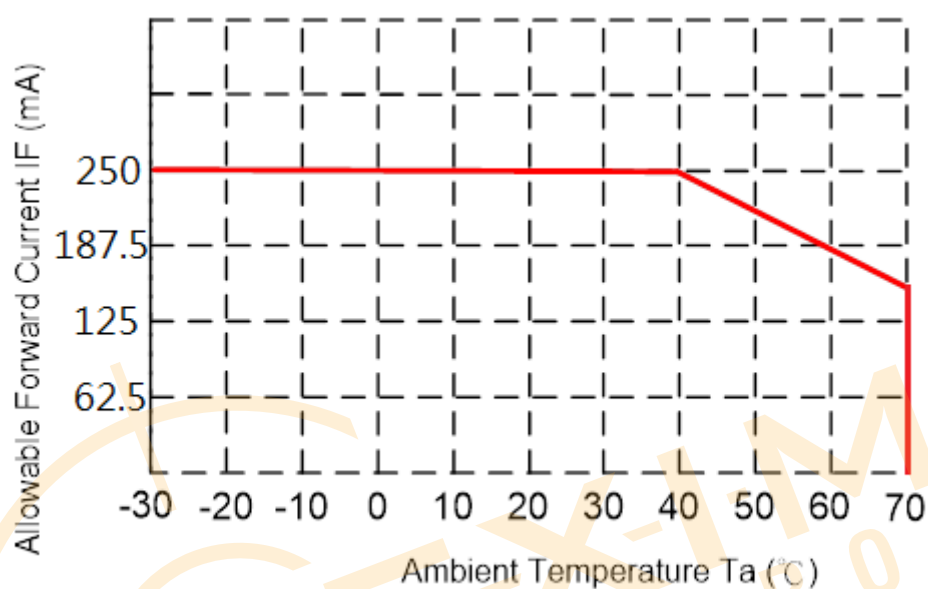
3.3 Block Diagram

3.4 Pixel format

4. Input/Output Terminals

LVDS: CN1

Item	Description
Manufacturer / Type	20186-020E-11F(I-PEX0) or FI-SEB20P-HFE(JAE)
Mating Receptacle / Type (Reference)	20197-*20U-F(I-PEX) or FI-S20S[for discrete Wire]，FI-SE20ME[for FPC](JAE)

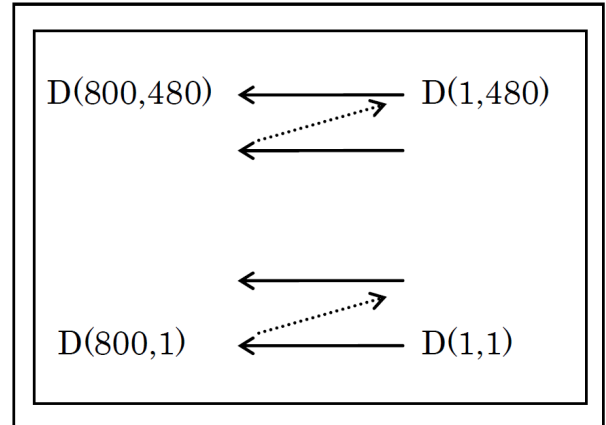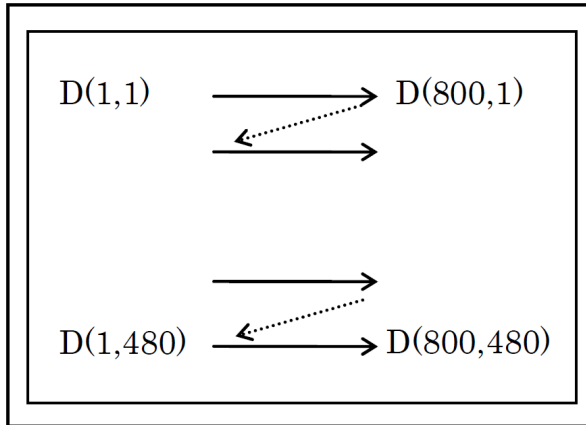| Pin No.	Symbol	Function
1	VDD	POWER SUPPLY:3.3V
2	VDD	POWER SUPPLY:3.3V
3	VSS(GND)	Power Ground
4	VSS(GND)	Power Ground
5	IN0-	Transmission Data of Pixels
6	IN0+	Transmission Data of Pixels
7	VSS(GND)	Power Ground
8	IN1-	Transmission Data of Pixels 1
9	IN1+	Transmission Data of Pixels 1
10	VSS(GND)	Power Ground
11	IN2-	Transmission Data of Pixels 2
12	IN2+	Transmission Data of Pixels 2
13	VSS(GND)	Power Ground
14	CLK-	Sampling Clock
15	CLK+	Sampling Clock
16	VSS(GND)	Power Ground
17	IN3-	Transmission Data of Pixels 3
18	IN3+	Transmission Data of Pixels 3
19	NC	No connection
20	SC	Horizontal/Vertical display mode select signal

Display Position and Scan Direction

D(X，Y) show the data number of input signal.

SC: Low   SC: High

Backlight driving:

CN4:

Item	Description
Manufacturer / Type	**FI-S6P-HFE(JAE)**
Mating Receptacle / Type (Reference)	**FI-S6S(JAE)**

| Pin No.	Symbol	Function
1	VL	Power supply of LED driving circuit
2	VL	Power supply of LED driving circuit
3	GNDL	Power Ground
4	GNDL	Power Ground
5	BLEN	LED Enable Pin (High: enable, Low: disable)
6	VPDIM	Adjust the LED brightness by PWM

5. Timing Chart

5.1 TFT-LCD Input Timing

HV mode for 800x480

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK frequency	F_{CLK}	25.2	25.4	35.7	MHz
Horizontal display area	T_{HD}		800		CLK
HS period time	T_H	860	864	974	CLK
HS pulse width	T_{HPW}	1	2	40	CLK
HS back porch	T_{HBP}		32		CLK
HS front porch	T_{HFP}	28	32	142	CLK
Vertical display area	T_{VD}		480		H
VS period time	T_V	488	490	611	H
VS pulse width	T_{VPW}	1	2	20	H
VS back porch	T_{VBP}		5		H
VS front porch	T_{VFP}	3	5	126	H

DE mode for 800x480

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK frequency	F_{CLK}	25.2	25.4	35.7	MHz
Horizontal display area	T_{HD}		800		CLK
HS period time	T_H	860	864	974	CLK
HS blanking	$T_{HFP} + T_{HBP}$	60	64	174	CLK
Vertical display area	T_{VD}		480		H
VS period time	T_V	488	490	611	H
VS blanking	$T_{VBP} + T_{VFP}$	8	10	131	H

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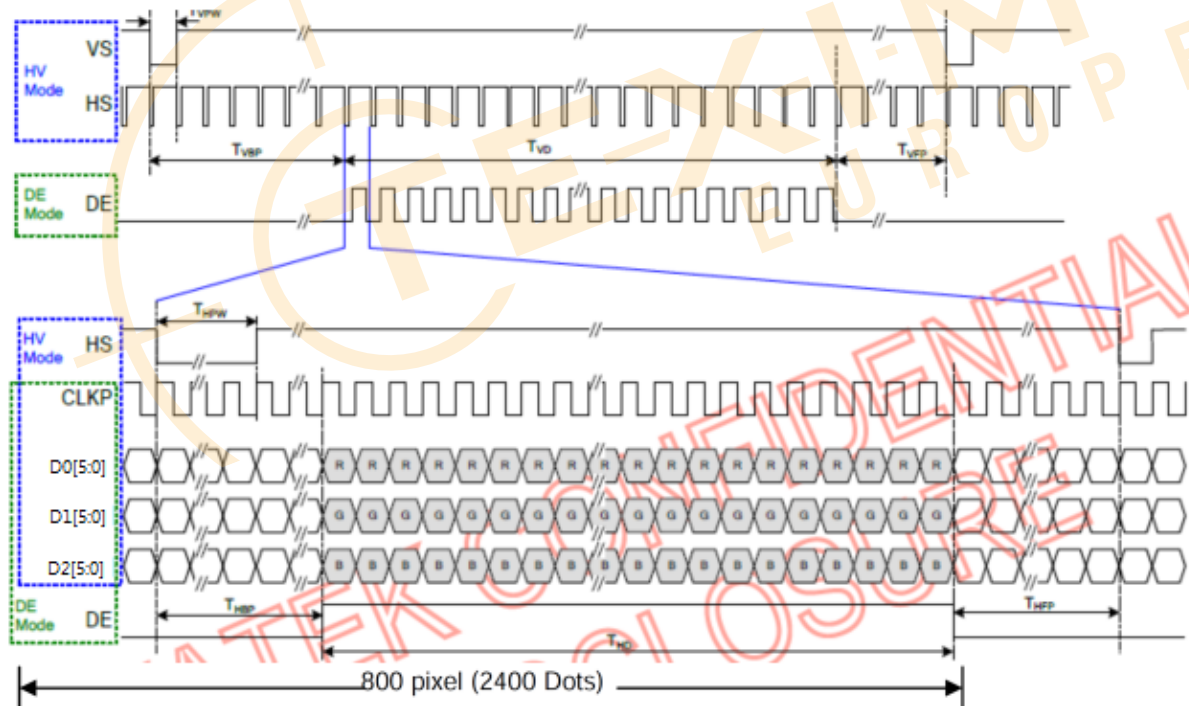
5-2 LVDS Signal

switching characteristics over recommended operating conditions (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
t_{su}	Setup time, D0–D20 to CLKOUT↓	C_L = 8 pF, See Figure 5	5			ns
t_h	Data hold time, CLKOUT↓ to D0–D20		5			ns
$t_{(RSKM)}$	Receiver input skew margin§ (see Figure 7)	t_c = 15.38 ns (±0.2%), |Input clock jitter| < 50 ps¶,	550	700		ps
t_d	Delay time, CLKIN↑ to CLKOUT↓ (see Figure 7)	V_{CC} = 3.3 V, t_c = 15.38 ns (±0.2%), T_A = 25°C	3	5	7	ns
t_{en}	Enable time, $\overline{SHTDN}$ to phase lock	See Figure 7		1		ms
t_{dis}	Disable time, $\overline{SHTDN}$ to off state	See Figure 8		400		ns
t_t	Transition time, output (10% to 90% t_r or t_f) (data only)	C_L = 8 pF		3		ns
t_t	Transition time, output (10% to 90% t_r or t_f) (clock only)	C_L = 8 pF		1.5		ns
t_w	Pulse duration, output clock			0.50 t_c		ns

† All typical values are at V_{CC} = 3.3 V, T_A = 25°C.
§ The parameter $t_{(RSKM)}$ is the timing margin available to allocate to the transmitter and interconnection skews and clock jitter. The value of this parameter at clock periods other than 15.38 ns can be calculated from t_{RSKM} = tc/14 – 550 ps.
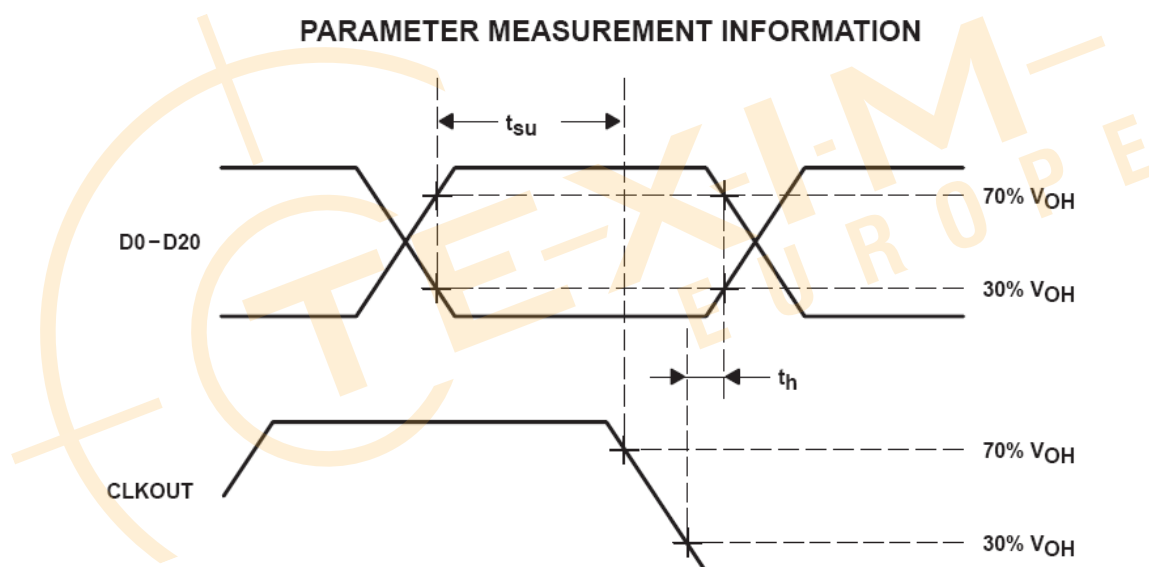¶ |Input clock jitter| is the magnitude of the change in input clock period.

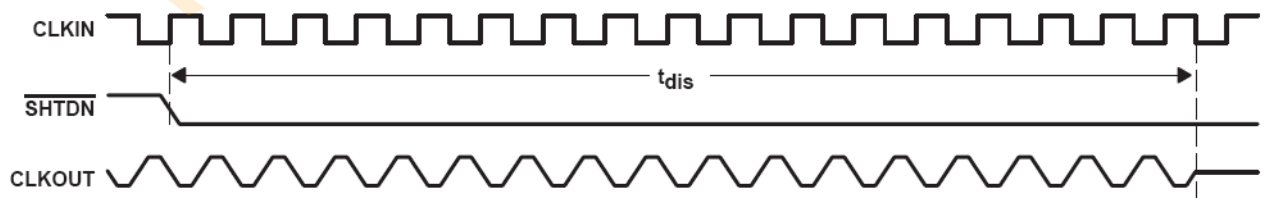## PARAMETER MEASUREMENT INFORMATION

Figure 5. Setup and Hold Time Waveforms

t_c

t_{su1}

t_{h1}

An

and An

CLKIN

t_d

t_W

CLKOUT

t_r

CLKIN
or An

90%   ≈300 mV

0 V

10%   ≈−300 mV

t_W

t_d

V_{OH}

1.4 V

V_{OL}

CLKOUT

t_{en}

$\overline{SHTDN}$

Dn   Invalid   Valid

Figure 7. Enable Time Waveforms

CLKIN

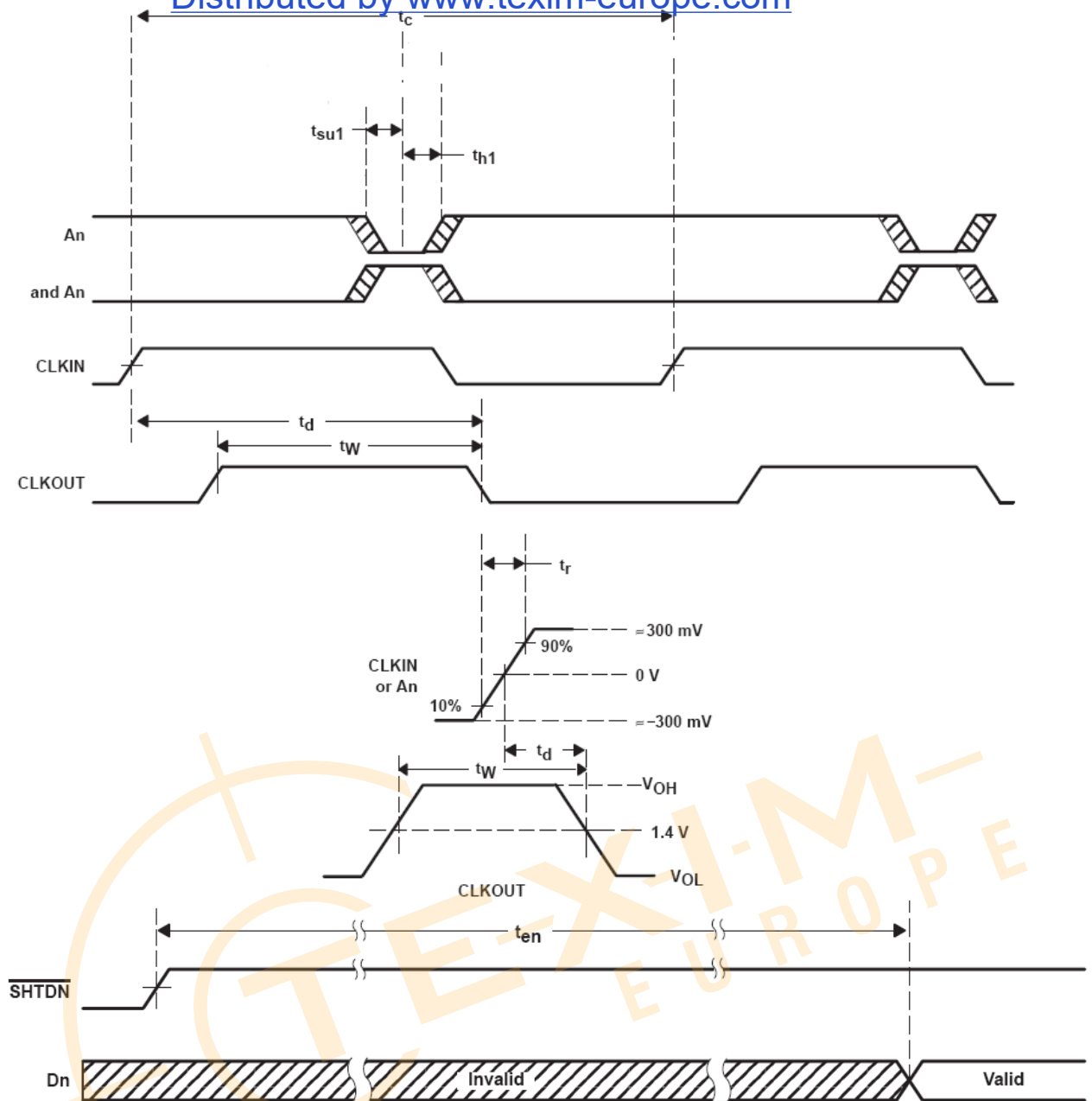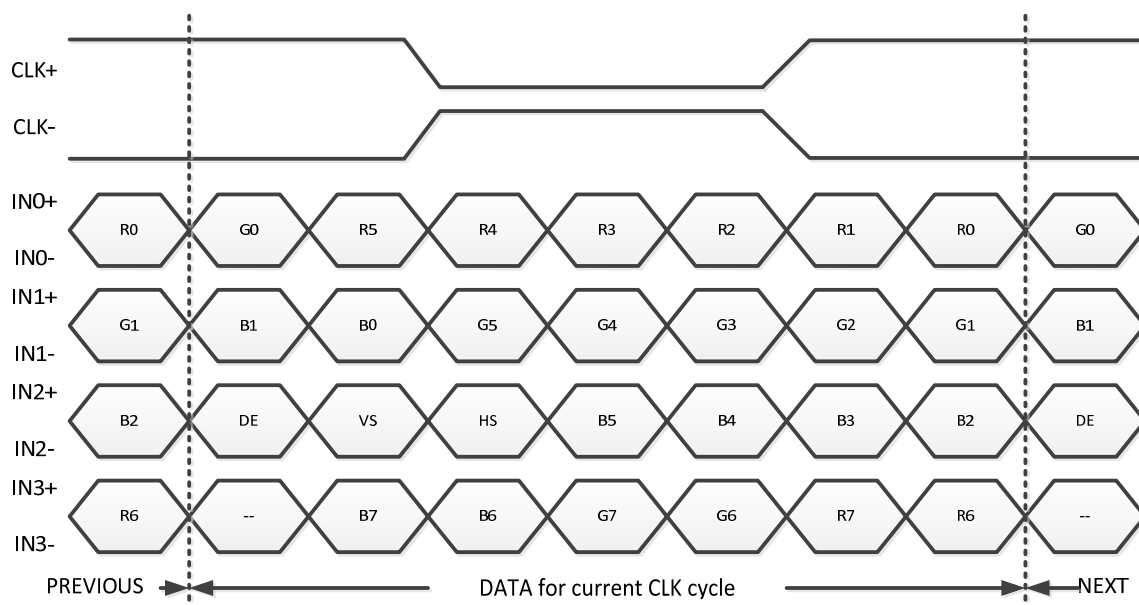$\overline{SHTDN}$

t_{dis}

CLKOUT

Figure 8. Disable Time Waveforms

8-BITS LVDS Input Data Format

Note: R/G/B data 7: MSB, R/G/B data 0: LSB

Signal Name	Description	Remark
R7	Red Data 7 (MSB)	
R6	Red Data 6	
R5	Red Data 5	
R4	Red Data 4	Red-pixel Data
R3	Red Data 3	Each red pixel's brightness data consists of
R2	Red Data 2	these 8 bits pixel data.
R1	Red Data 1	
R0	Red Data 0 (LSB)	
G7	Green Date 7 (MSB)	
G6	Green Date 6	
G5	Green Date 5	
G4	Green Date 4	Green-pixel Data
G3	Green Date 3	Each green pixel's brightness data consists of
G2	Green Date 2	these 8 bits pixel data.
G1	Green Date 1	
G0	Green Date 0 (LSB)	
B7	Blue Data 7 (MSB)	
B6	Blue Data 6	
B5	Blue Data 5	
B4	Blue Data 4	Blue-pixel Data
B3	Blue Data 3	Each blue pixel's brightness data consists of
B2	Blue Data 2	these 8 bits pixel data.
B1	Blue Data 1	
B0	Blue Data 0 (LSB)	
CLK+ CLK-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync Signal	
HS	Horizontal Sync Signal	

5.3 POWER ON/OFF SEQUENCE
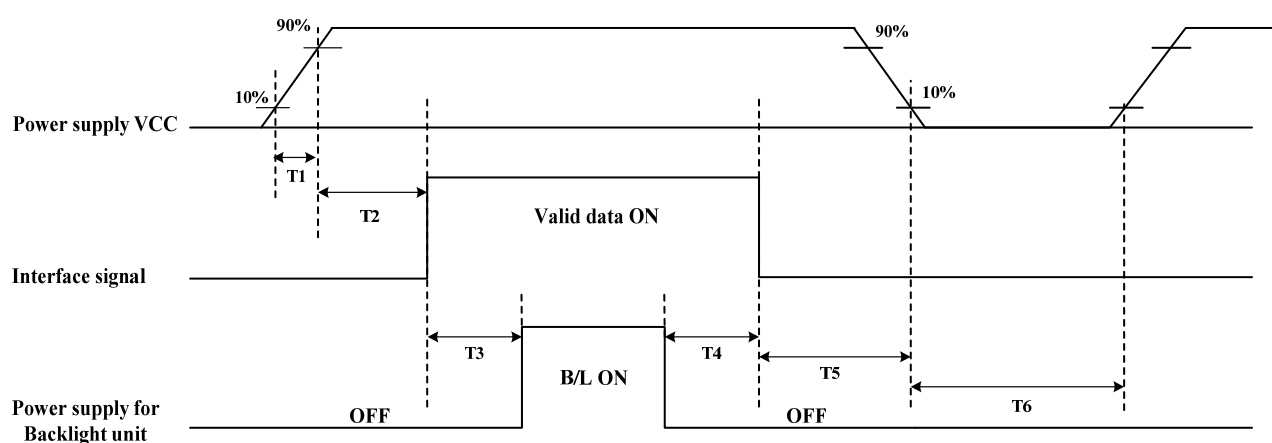
Parameter	SPEC.			Unit
	Min.	Typ.	Max.	
T1	1	-	2	[ms]
T2	0	60	100	[ms]
T3	200	-	-	[ms]
T4	200	-	-	[ms]
T5	1	-	-	[ms]
T6	1000	-	-	[ms]

6. Optical Characteristics

| Item		Symbol	Conditio	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	70	85	-	Degree	Note 2
		θB		70	85	-		
		θL		70	85	-		
		θR		70	85	-		
Contrast Ratio		CR	θ=0°	800	1000	-		Left/right 0° Top/bottom 5°
Response Time		$T_{ON}+T_{OFF}$	25℃	-	25	35	ms	Note1 Note4
Chromaticity	White	x		Typ-0.05	0.328	Typ+0.05		Note5 Note1
		y			0.347			
	Red	x			0.615			
		y			0.321			
	Green	x			0.310			
		y			0.563			
	Blue	x			0.136			
		y			0.098			
Uniformity		U		70	--	-	%	Note1、Note6
Luminance		L		680	850	-	cd/m²	Note7

Test Conditions:

1. I_F= 250mA, the ambient temperature is 25℃.

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 10 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.

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Note 1 : Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view : 1° / Height : 500mm.)
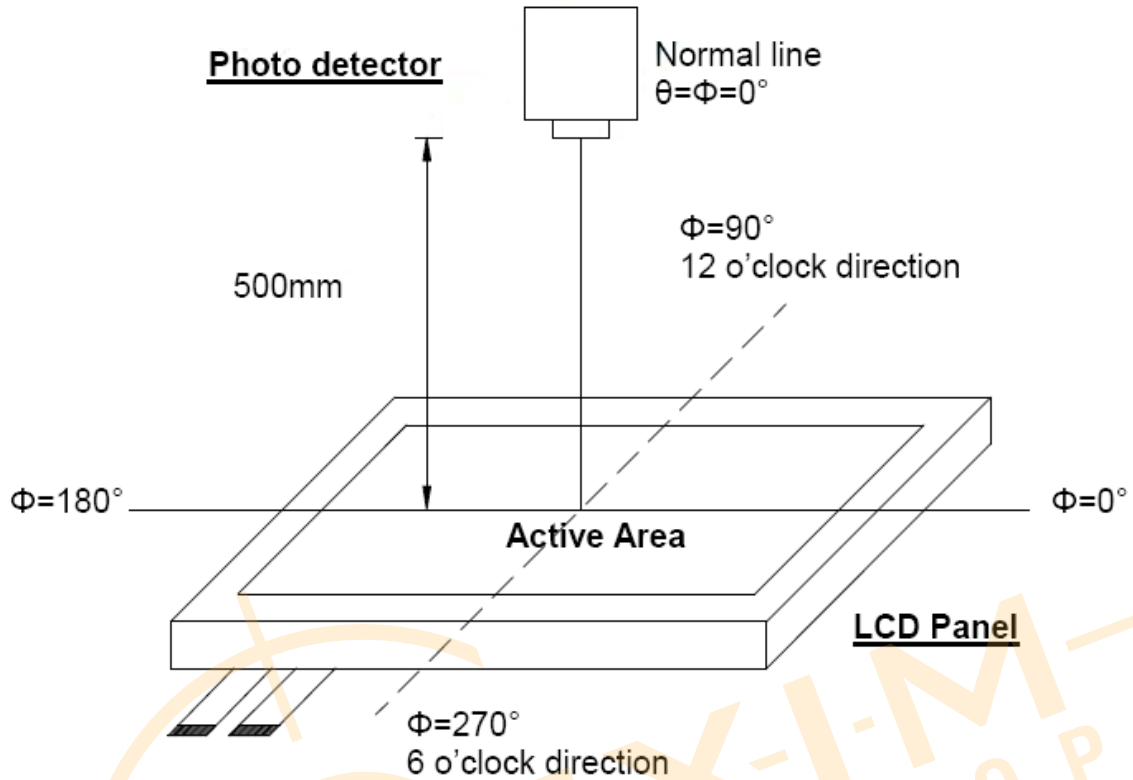

Note 2 : Definition of viewing angle range
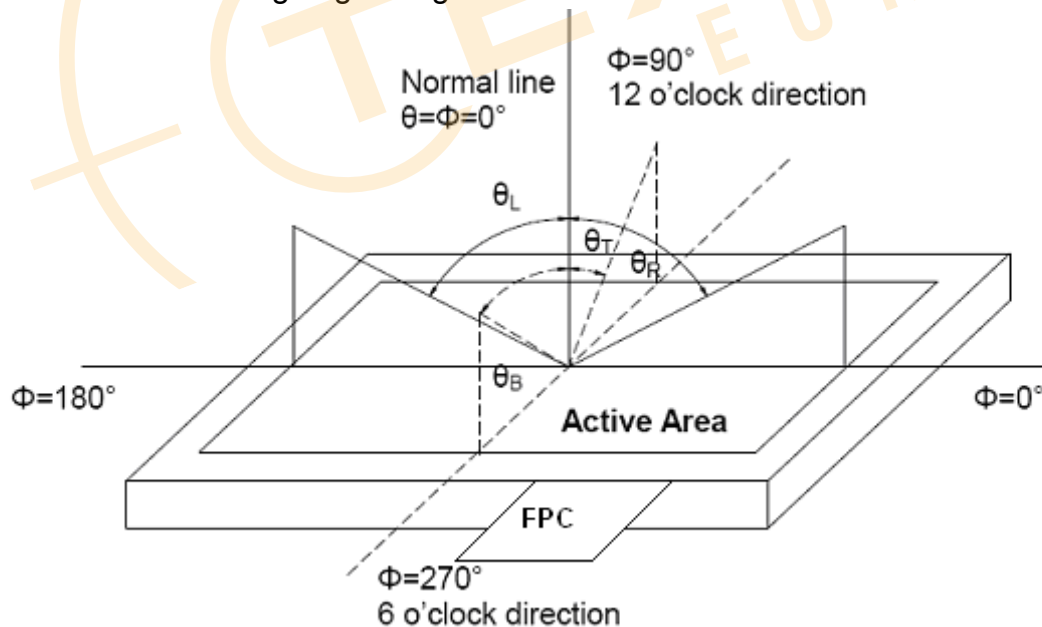
Note 3 : Definition of Response time

    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%.
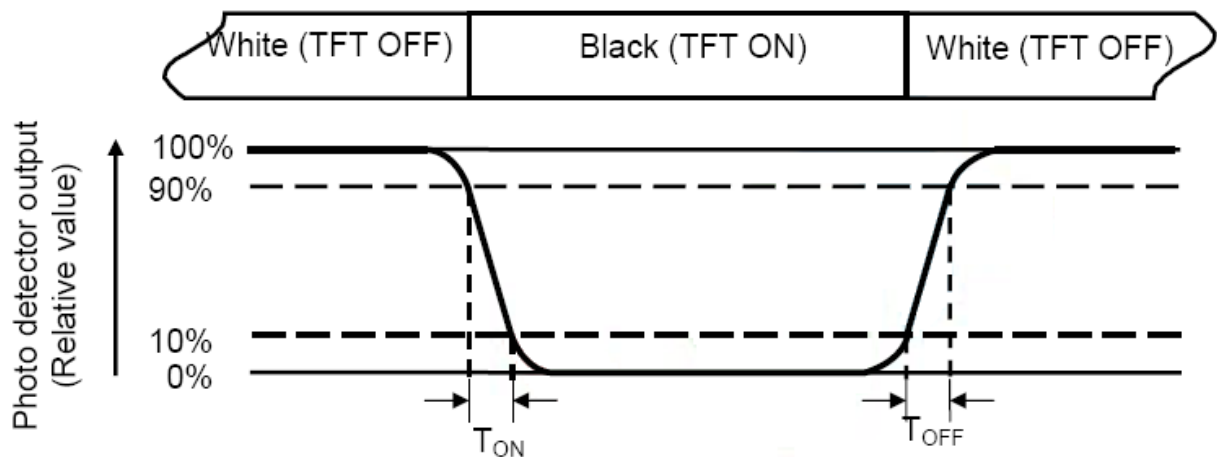
Note 4 : Definition of contrast ratio

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

Note 5 : Definition of color chromaticity (CIE1931)

    Color coordinated measured at center point of LCD.

Note 6 : All input terminals LCD panel must be ground when measuring the center area of the panel.

Note 7 : Definition of Luminance Uniformity

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

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

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

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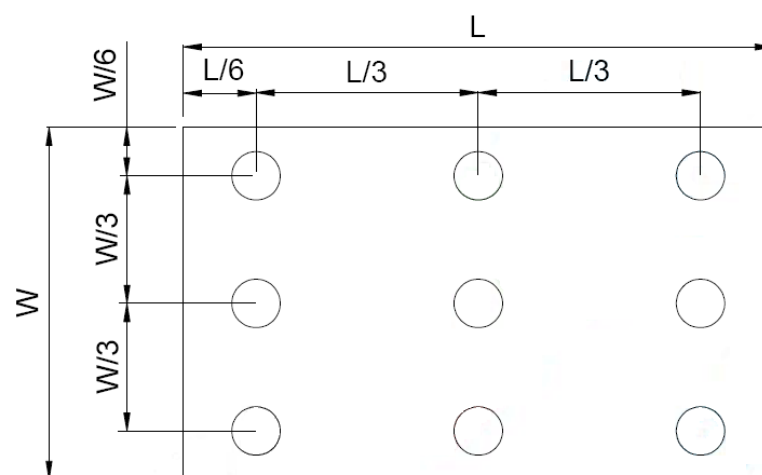
Bmax : The measured maximum luminance of all measurement position.

Bmin : The measured minimum luminance of all measurement position.

7. Projective Capacitive Touch Panel:

7.1 Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	Max 10-fingers or Single-finger
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Control IC	ILITEK ILI2132
Interface	USB

7.2 Electrical Absolute Max Rating

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Power Supply voltage	VDD	-0.3	5.5	V	GND =0V

7.3 Electrical Characteristics

Specify the normal operating condition

(GND=0V)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	VDD	--	5.0	--	V	
Power Consumption	I_{VDD}		50	(200)	mA	1

Note 1   Reference only .

7.4 Interface

CN3

Item	Description
Manufacturer / Type	**SM12B-SHLS-TF(LF)(SN)(JST)**
Mating Receptacle / Type (Reference)	**SHLP-12V-S-B(JST)**

Pin No.	Symbol	Function
1	VDD5	No connection
2	CKW	No connection
3	SC	No connection
4	GND	GND
5	DIN	No connection
6	DOUT	No connection
7	TEST1	No connection
8	TEST2	No connection
9	RESET	No connection
10	D-	USB Data-
11	D+	USB Data+
12	VUSB	Power supply 5.0V

8. Reliability Test Items

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C ,　t=240 hrs	
Low Temperature Operation	-30±3°C ,　t=240 hrs	
High Temperature Storage	80±3°C ,　t=240 hrs	1,2
Low Temperature Storage	-30±3°C ,　t=240 hrs	1,2
Storage at High Temperature and Humidity	40°C, 85% RH , 240 hrs	1,2
Thermal Shock Test	-30°C (30min) ~ 85°C (30min) 50 cycles	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Note 3 : The module shouldn't be tested more than one condition, and all the test conditions are independent.

Note 4 : All the reliability tests should be done without protective film on the module.

Definitions of life end point :
- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

9. General Precautions

9-1 Safety

Liquid crystal is poisonous. Do not put it your month. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

9-2 Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

9-3 Static Electricity

1. Be sure to ground module before turning on power or operation module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

9-4 Storage

1. Store the module in a dark room where must keep at +25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

9-5 Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

9-6 Others

1.Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.
2. AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.
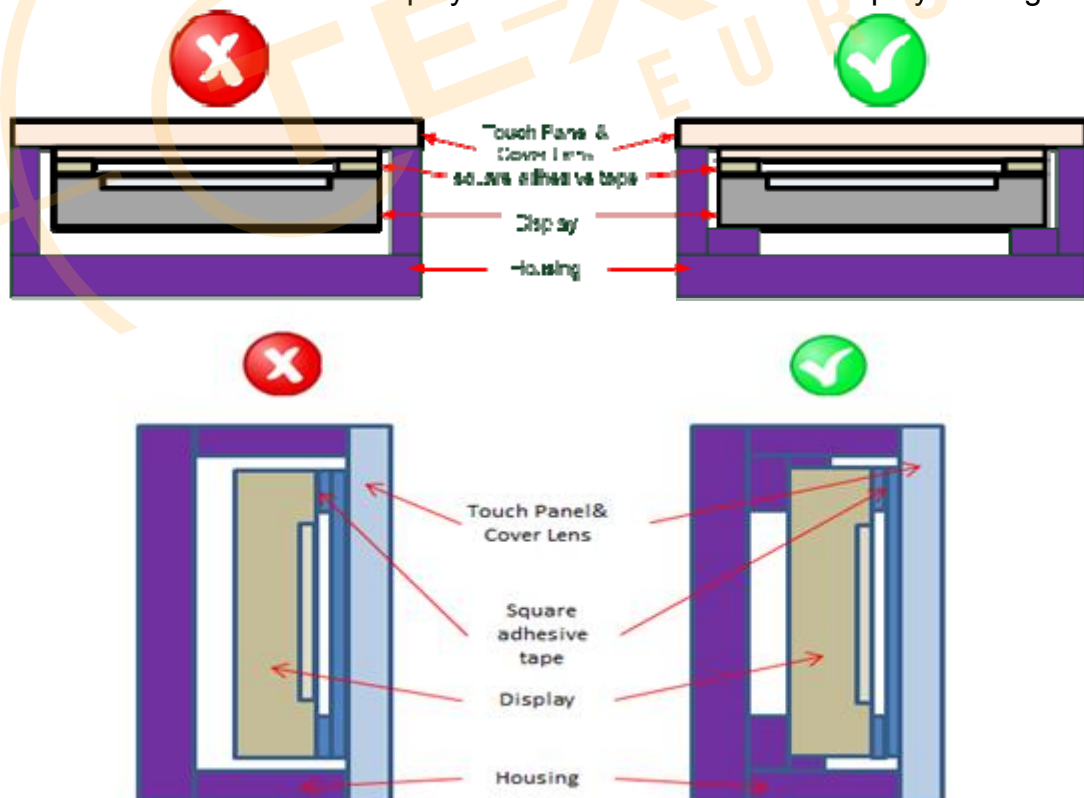
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3. TP needs to work in environment with stable stray capacitance. In order to minimize the variation in stray capacitance, all conductive mechanical parts must not be floating. Intermittent floating any conductive part around the touch sensor may cause significant stray capacitance change and abnormal touch function. It is recommended to keep all conductive parts having same electrical potential as the GND of the touch controller module.
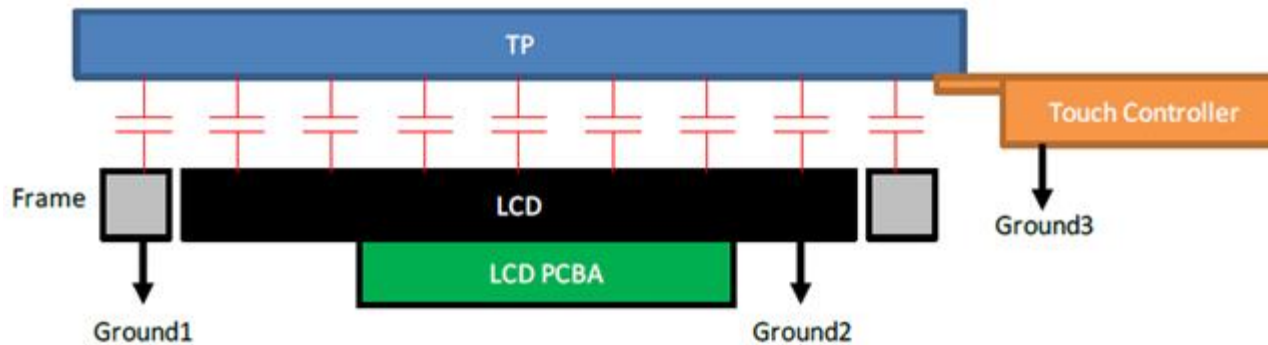
GND1, GND2 and GND3 should be connected together to have the same ground

9-7 Mechanism

1. The square adhesive tape which is between the touch panel and display can't provide well supporting in the long term and high ambient temperature condition. Whether upright or horizontal position the support holder which is in the back side of the display is needed. Do not let the display floating.
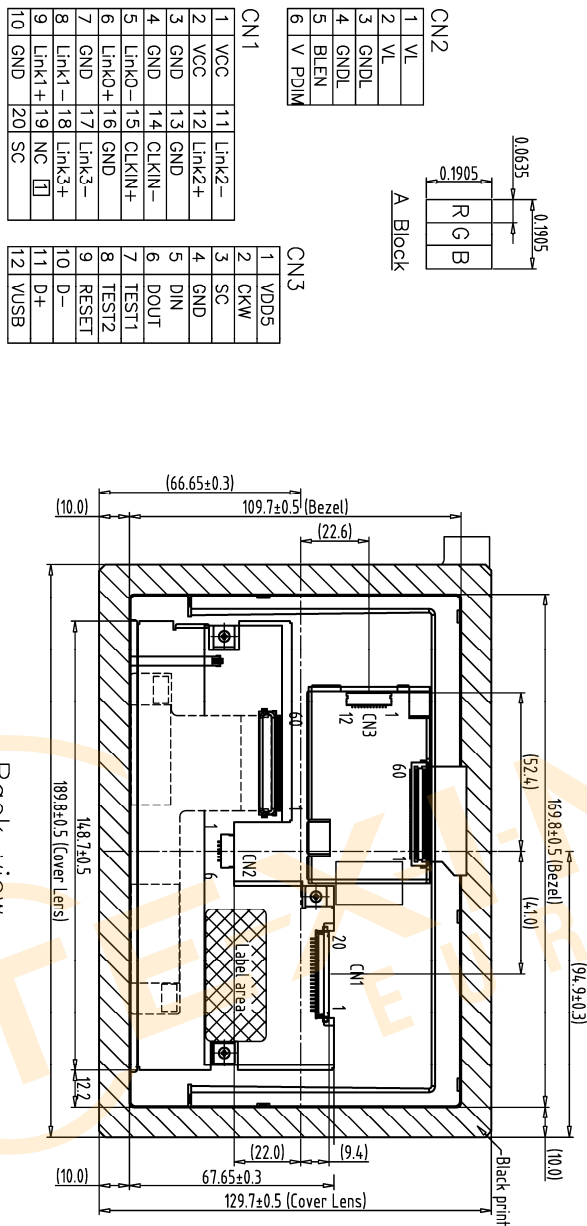
10. OUTLINE DIMENSION

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN1:P1.25 20Pin/FI-SEB20P-HFE or Equivalent
4. CN2:P1.25 6Pin/FI-S6P-HFE or Equivalent
5. CN3:P1.0 12Pin/SM12B-SHLS-TF(LF)(SN) or Equivalent
6. LCD 800x3(R.G.B)x480=> 7.0" IPS TFT LCD

CN2

1	VL
2	VL
3	GNDL
4	GNDL
5	BLEN
6	V PDIM

CN1

1	VCC	11	Link2−
2	VCC	12	Link2+
3	GND	13	GND
4	GND	14	GND
5	Link0−	15	CLKIN+
6	Link0+	16	GND
7	GND	17	GND
8	Link1−	18	Link3−
9	Link1+	19	NC
10	GND	20	SC

CN3

1	VDD5		
2	CKW	7	TEST1
3	SC	8	TEST2
4	GND	9	RESET
5	DIN	10	D−
6	DOUT	11	D+
		12	VUSB

A Block

R
G
B

0.0635
0.1905
0.1905

Back view

(10.0)
(66.65±0.3)
109.7±0.5 (Bezel)
(22.6)
60 CN3 12
60
14.8±0.5
189.8±0.5 (Cover Lens)
169.8±0.5 (Bezel)
(52.4)
CN2
(4.0)
20 CN1 1
(94.9±0.3)
Label area
12.2
(22.0)
(9.4)
(10.0)
67.65±0.3
129.7±0.5 (Cover Lens)
(10.0)
Black print

6					12
5					11
3					9
2		TOLERANCE GRADE(±)	A	B	8
1	TFT-800480-414B-1				7

DIM.	MM			
IE NO.				
PARTS NO. LCM-1 80048012−T				

DWN.	CHK.	APPD.		
EMILY				
DATE 08-17-20'	DATE	DATE		

TITLE 80048012−T
(7.0") IPS

DWG. NO. *20864MA **SHEET** 1 OF 1

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REVISION RECORD

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	08-17-20'	EMILY
1	Modify P19 interface(MODE to NC)	09-18-20'	MILLY
2	TFT-800480-414B-1 Rename to 80048012−T	09-24-20'	EMILY

Date : 2021/07/29   AMPIRE CO., LTD.   25

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All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts.

Please contact us if you have any questions about the contents of the datasheet.

This may not be the latest version of the datasheet. Please check with us if a later version is available.

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