PRODUCT SPECIFICATION

PART NUMBER REV#: FLD-104GML20PCCA2#00

DESCRIPTION: 10.4” TFT LCD Full View 500CD with LVDS interface, 1024x768

assemble PCap 2mm Black USB/I2C

( ) Preliminary Specification
(V) Approved Specification

Customer Name:	
Signature:	**Date:**

PREPARED BY	**REVIEWED BY**
Mia Huang	*David*

Revision History

Version	Date	Page	Description	Note
V1.0	2021/06/20		First Edition	

Table of Content

A. LCD specification

1. GENERAL DESCRIPTION

1.1 Description

10.4” is a Color Active Matrix Liquid Crystal Display Module composed of a TFT LCD panel and LED backlight system. The screen format is intended to support the XGA, 1024x768 screen and 16.2M /262K colors.

1.2 Product Summary

The following items are summary on the table under Ta=25 °C condition:

No.	Item	Specification	Unit
1	Display Size	10.4	Inch
2	Pixel Number	1024 (H) x RGB x 768 (V)	Pixels
3	Outline Dimension	240.6 (H) ×190.8 (V) ×12.35 (D)	mm
4	Active Area	210.4 (H) × 157.8 (V)	mm
5	Display Colors	16.2M/262K	- -
6	Pixel Arrangement	RGB vertical stripe	- -
7	Display Mode	Normally Black / Transmissive	- -
8	Electrical Interface	LVDS	- -
9	Surface Treatment	Anti-Glare	- -
10	Brightness	500 (Typ.)	cd/m2
11	Contrast Ratio	1000 (Typ.)	- -
12	Total Power Consumption (Typ)	TBD	W

2. ABSOLUTE MAXIMUM RATING

2.1 Electrical Absolute Rating

Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	VCC	-0.3	4	V	
Logic Input Voltage	Vin	-0.3	V_{CC}+0.3	V	
Converter Voltage	Vi	-0.3	18	V	
Enable Voltage	EN	-0.3	5.5	V	
Backlight Adjust	ADJ	-0.3	5.5	V	

Note Permanent damage to the device may occur if max. values are exceeded. Function operation should be restricted to the conditions described under normal operating conditions.

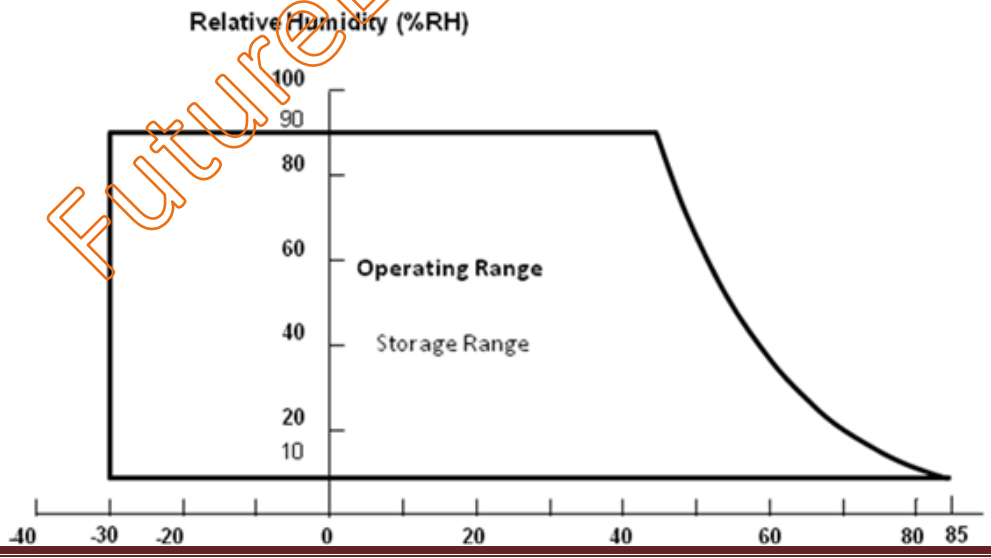
2.2 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Top	-30		85	℃	Ta=25℃
Storage Temperature	Tstg	-30		85	℃	

Note (1) Temperature and relative humidity range is shown in the figure below.

Note (2) 90%RH M)ax. (Ta<39℃)

Note (3) Wet-bulb temperature should be 39℃ Max.



3. ELECTRICAL CHARACTERISTICS

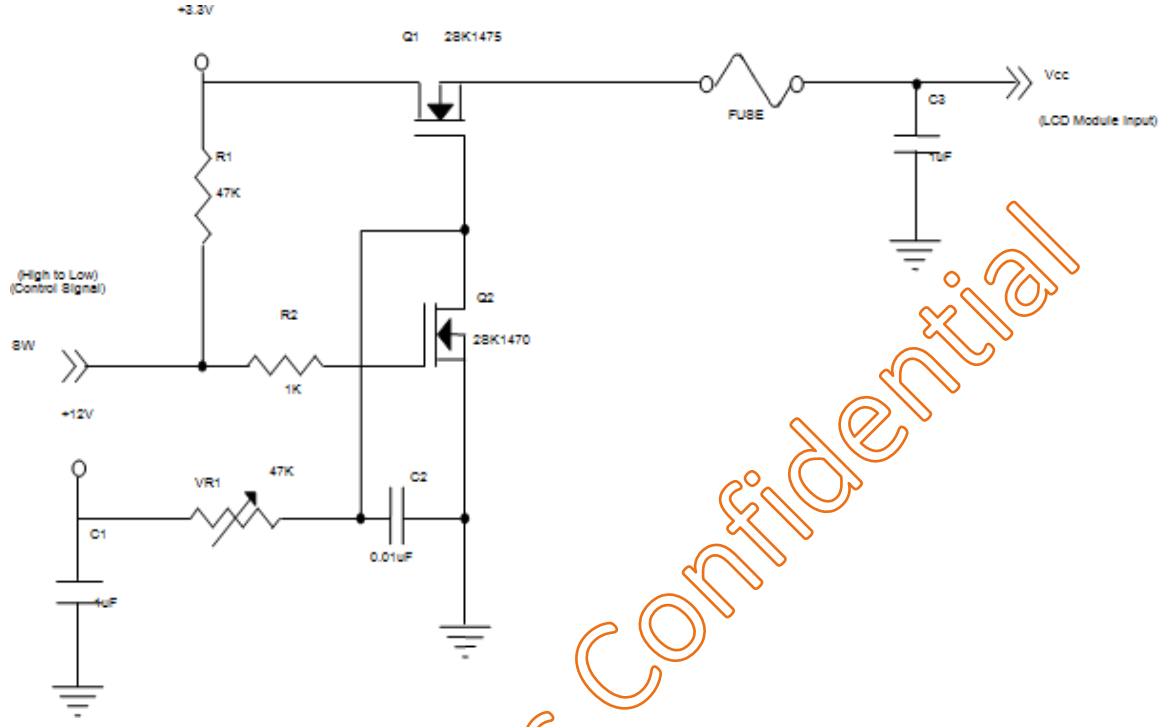
3.1 LCM

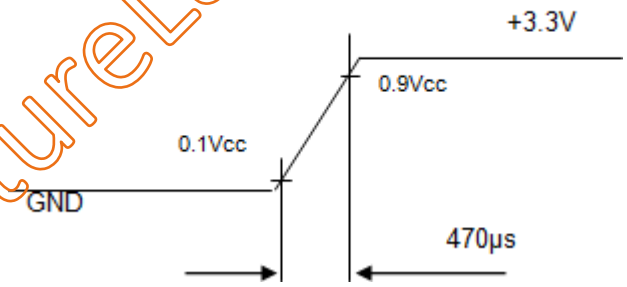
Ta = 25 ± 2 ºC

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VCC	3.0	3.3	3.6	V	(1)
Power Supply Ripple Voltage		VRP	-	-	100	mV	
Rush Current		IRUSH	-	-	4.0	A	(2)
Power Supply Current	White	ICC	-	TBD	TBD	mA	(3)
	Black		-	TBD	TBD	mA	
Power Consumption		PL	-	TBD	TBD	W	
LVDS differential input voltage		Vid	100	-	600	mV	
LVDS common input voltage		Vic	1.0	1.2	1,4	V	
Logic High Input Voltage		VIH	2.3	-	VCC	V	
Logic Low Input Voltage		VIL	0	-	0.7	V	
LVDS terminating resistor		RT	-	100	-	ohm	

Note (1) The assembly should be always operated within above ranges.

Note (2) Measurement Conditions:





Note (3) The specified power supply current is under the conditions at VDD=3.3V, Ta=25 ± 2 ºC, DC current and fv=60Hz, whereas a power dissipation check pattern below is displayed.

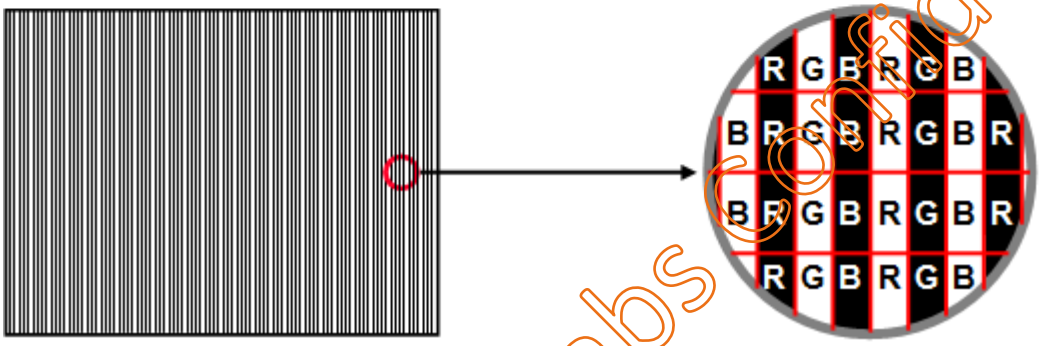
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern



Active Area

3.2 Backlight Unit

Parameter guideline for LED driving is under stable conditions at 25℃ (Room Temperature):

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Power Supply Voltage		Vi	10.8	12.0	13.2	V	(Duty 100%)
Converter Power Supply Ripple Voltage		ViRP	-	-	350	mV	
Converter Power Supply Current		Ii	-	(0.42)	(0.5)	A	@ Vi = 12V (Duty 100%)
Converter Inrush Current		IiRUSH	-	-	3.0	A	@ Vi rising time = 20ms (Vi =12V)
Backlight Power Consumption		PBL	-	(5.0)	(6.0)	W	(1),@ Vi = 12V (Duty 100%)
EN Control Level	Backlight on	BLON	2.5	3.3	5.0	V	
	Backlight off		0	---	0.3	V	
PWM Control Level	PWM High Level	E_PWM	2.5	3.3	5.0	V	
	PWM Low Level		0	-	0.15	V	
PWM Noise Range		VNoise	-	-	0.1	V	
PWM Control Frequency		fPWM	190	200	20k	Hz	(2)
PWM Control Duty Ratio		-	5		100	%	(2), Suggestion@ 190Hz≦fPWM<1kHz
			20	-	100	%	(2), @ 1kHz≦fPWM≦ 20kHz
LED Life Time		LL	50,000	-	-	Hrs	(3)

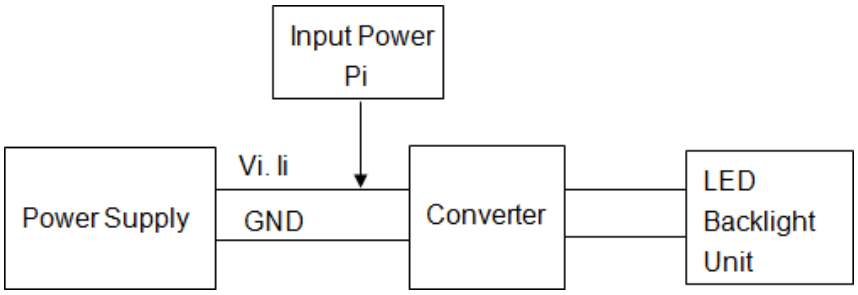
Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

Note (2) At 190 ~1kHz PWM control frequency, duty ratio range is restricted from 5% to 100%.

1K ~20kHz PWM control frequency, duty ratio range is restricted from 20% to 100%.

If PWM control frequency is applied in the range from 1KHz to 20KHZ, The “non-linear” phenomenon on the Backlight Unit may be found. So It’s a suggestion that PWM control frequency should be less than 1KHz.

Note (3) The lifetime of LED is estimated data and defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ℃ and Duty=100% until the brightness becomes ≦ 50% of its original value. Operating LED under high temperature environment will reduce lifetime and lead to color shift.



4. SIGNAL CHARACTERISTICS

4.1 Interface Timing

4.1.1 Timing Characteristics:

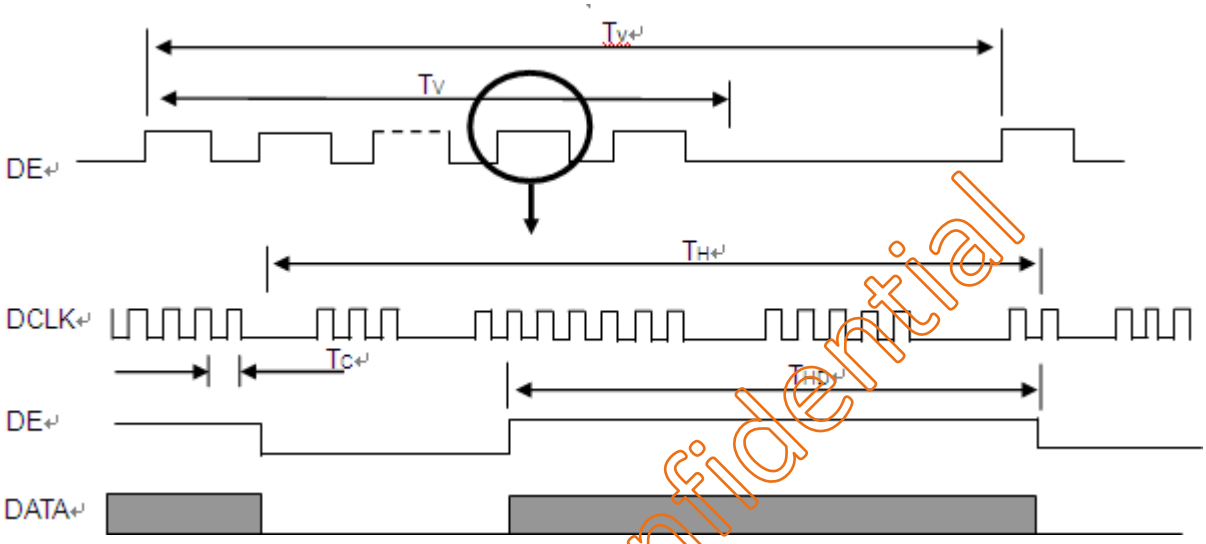
The input signal timing specifications are shown as the following table and timing diagram.

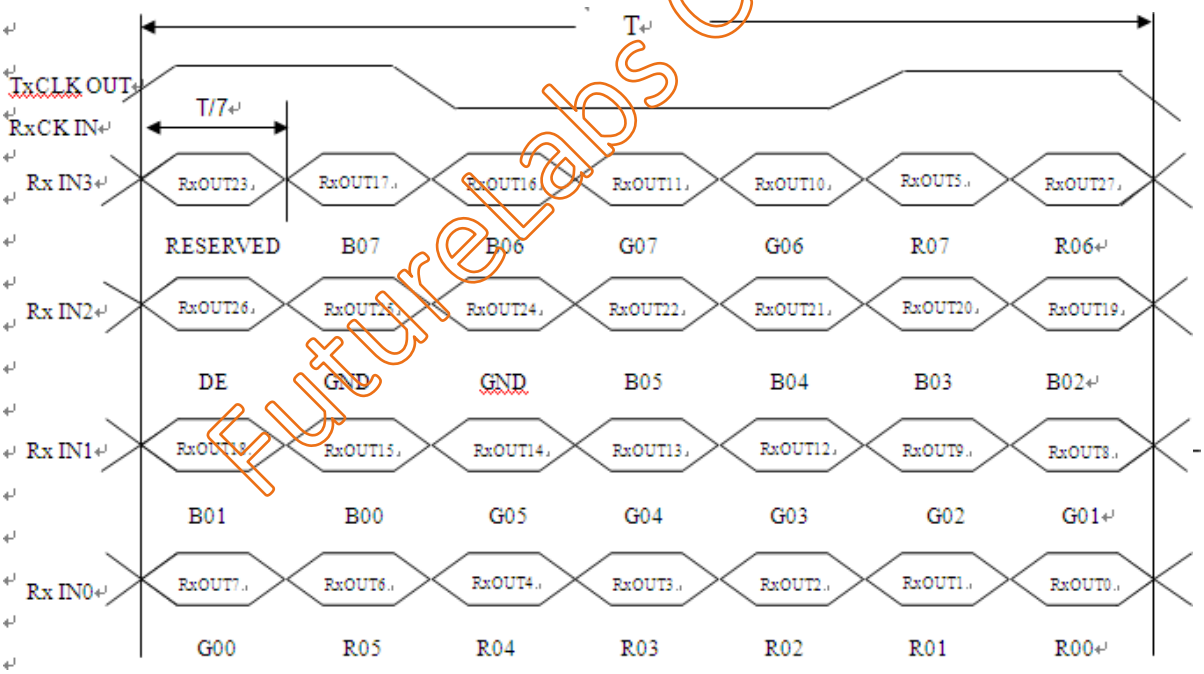
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	57.6	65	74.5	MHz	-
	Period	Tc	13.4	15.4	17.4	ns	
	Input cycle to cycle jitter	T_{rcl}	---	---	200	ns	(a)
	Input Clock to data skew	TLVCCS	-0.02*Tc	---	0.02*Tc	ps	(b)
	Spread spectrum modulation range	F_{clkin_mod}	---	---	1.02*Fc	MHz	(c)
	Spread spectrum modulation frequency	F_{SSM}	---	---	200	KHz	
	High Time	T_{ch}	---	4/7	---	T_{ch}	
	Low Time	T_{cl}	---	3/7	---	T_{ch}	
Vertical Display Term	Frame Rate	Fr	---	60	---	Hz	Tv=Tvd+Tvb
	Total	Tv	774	806	848	Th	-
	Active Display	Tvd	768	768	768	Th	-
	Blank	Tvb	6	38	80	Th	-
Horizontal Display Term	Total	Th	1240	1344	1464	Tc	Th=Thd+Thb
	Active Display	Thd	1024	1024	1024	Tc	-
	Blank	Thb	216	320	440	Tc	-

Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

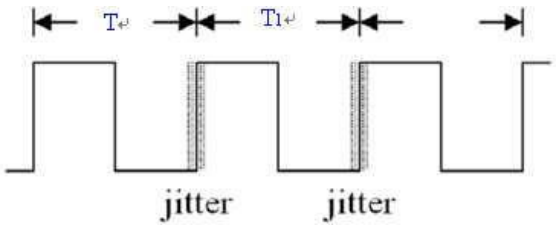
Note (2) The Tv(Tvd+Tvb) must be integer, otherwise, the module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM

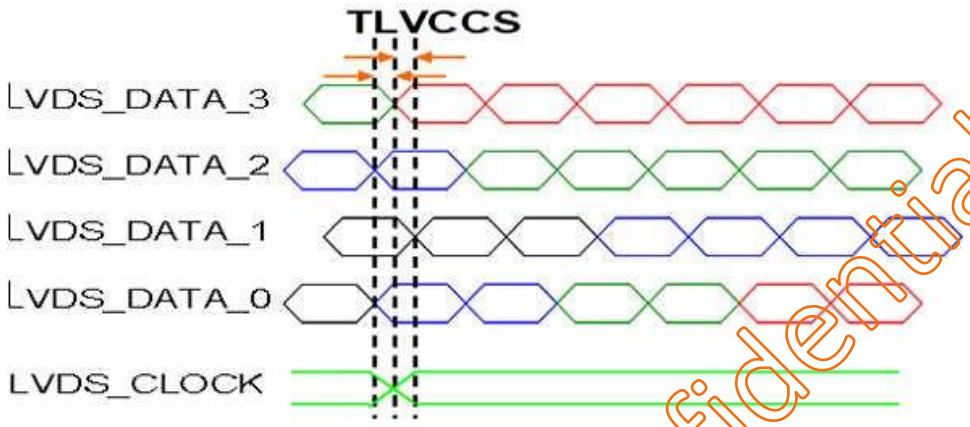


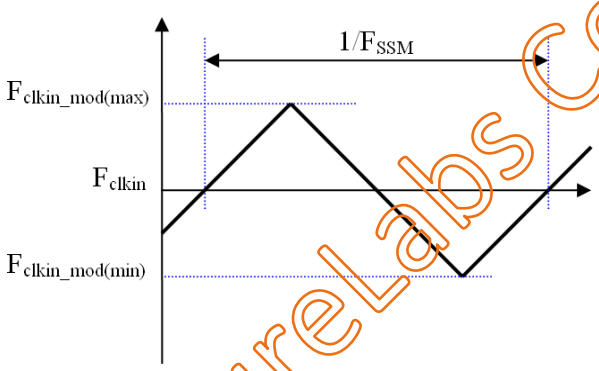


Note (a) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T_1 – TI



Note (b) Input Clock to data skew is defined as below figures.

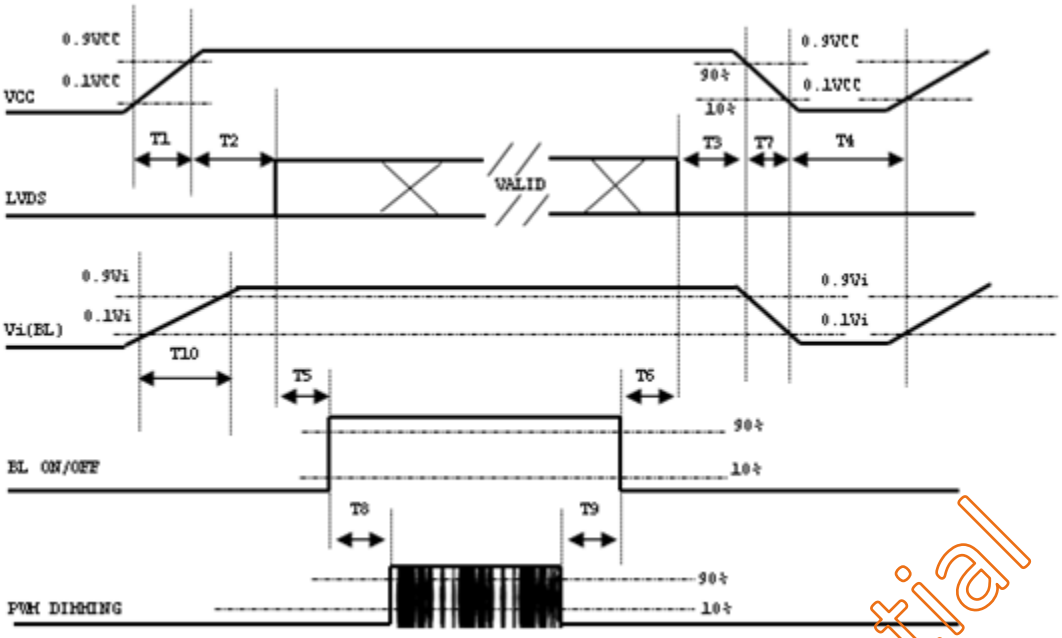




Note (c) The SSCG (Spread spectrum clock generator) is defined as below figures.

4.1.2 Power ON/OFF Sequence

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below.



Note (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

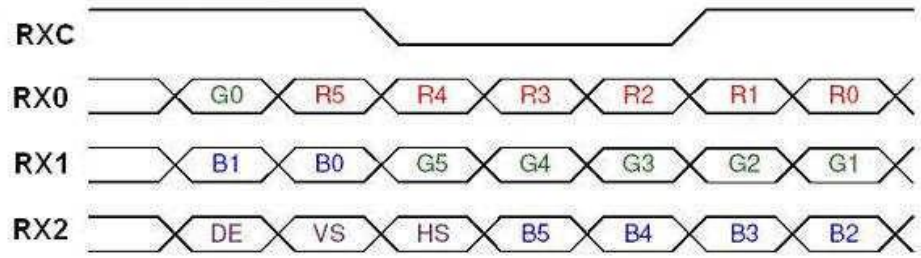
Note (6) FL won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.

Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "T7 spec".

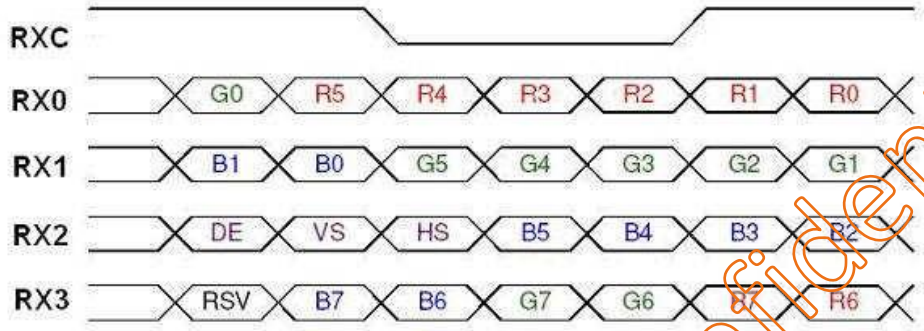
Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	---	10	ms
T2	0	---	50	ms
T3	0	---	50	ms
T4	500	---	---	ms
T5	450	---	---	ms
T6	200	---	---	ms
T7	10	---	100	ms
T8	10	---	---	ms
T9	10	---	---	ms
T10	20	---	50	ms

4.2 The Input Data Format

SEL 6/8 = "High" for 6 bits LVDS Input



SEL 6/8 = "Low" or "NC" for 8 bits LVDS Input



Note (1) R/G/B data 7: MSB, R/G/B data 0: LSB

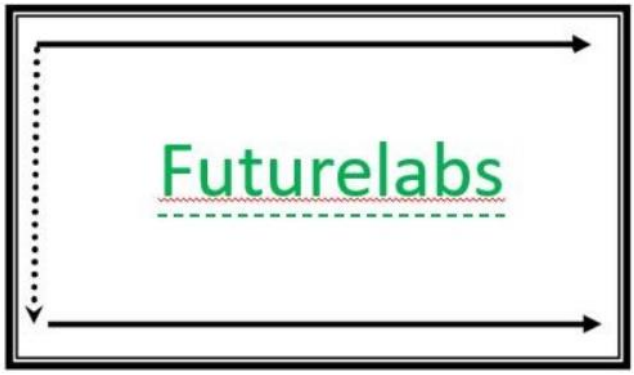
Note (2) Please follow PSWG

v

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

4.3 Scanning Direction

The following figures show the image see from the front view. The arrow indicates the direction of scan.



(PCBA on the top side)

RPFI = Low/floating; normal display (default)

(PCBA on the top side)

RPFI = high: display with 180 degree rotation

5. INTERFACE PIN DESCRIPTION

5.1 LCM Connector PIN Assignment

CN1

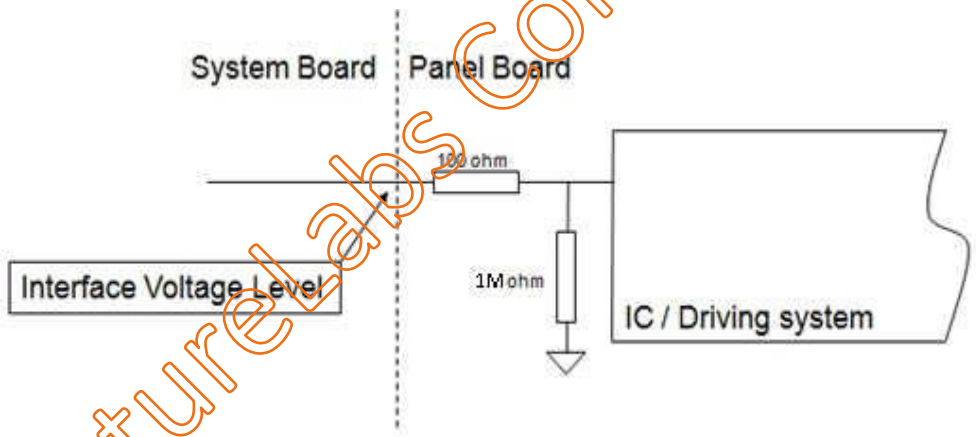
Pin No.	Symbol	Description	Note
1	VCC	Power supply: +3.3V	-
2	VCC	Power supply: +3.3V	-
3	VCC	Power supply: +3.3V	-
4	GND	Ground	-
5	GND	Ground	-
6	GND	Ground	-
7	RPFI	Reverse Panel Function (Display Rotation)	(2)
8	NC	No Connection	(2)
9	NC	No Connection	(2)
10	NC	No Connection	(2)
11	SEL6/8	LVDS 6/8 bit select function control, Low or NC =>8 bit Input Mode High => 6bit Input Mode	(2)
12	GND	Ground	-
13	NC	No Connection	(2)
14	GND	Ground	-
15	RX0-	Negative transmission data of pixel 0	-
16	RX0+	Positive transmission data of pixel 0	-
17	GND	Ground	-
18	RX1-	Negative transmission data of pixel 1	-

19	RX1+	Positive transmission data of pixel 1	-
20	GND	Ground	-
21	RX2-	Negative transmission data of pixel 2	-
22	RX2+	Positive transmission data of pixel 2	-
23	GND	Ground	-
24	RXCLK-	Negative of clock	-
25	RXCLK+	Positive of clock	-
26	GND	Ground	-
27	RX3-	Negative transmission data of pixel 3	-
28	RX3+	Positive transmission data of pixel 3	-
29	GND	Ground	-
30	NC	No Connection	(2)

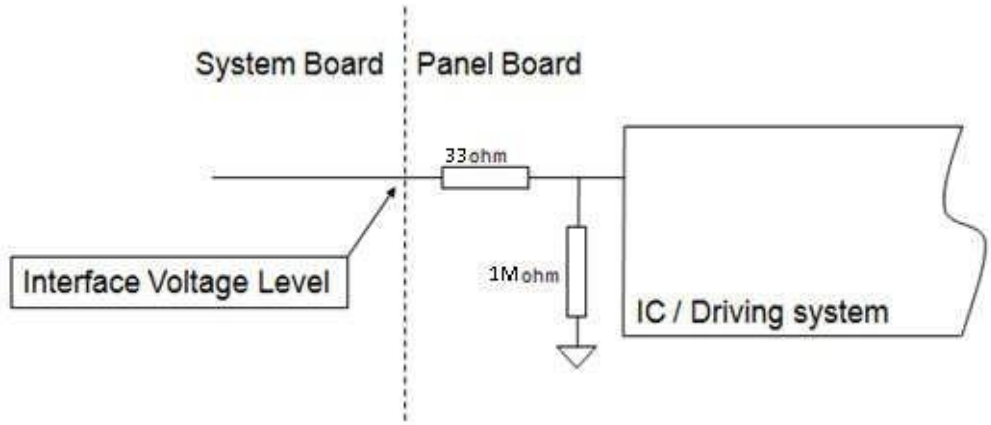
Note (1) Connector Part No.: STM, MSCK2407P30.D or compatible connector

Note (2) “Low” stands for 0V. “High” stands for 3.3V. “NC” stands for “No Connected”

RPFI pin:



SEL6/8 pin:



5.2 Backlight and LED Driver Connector PIN Assignment

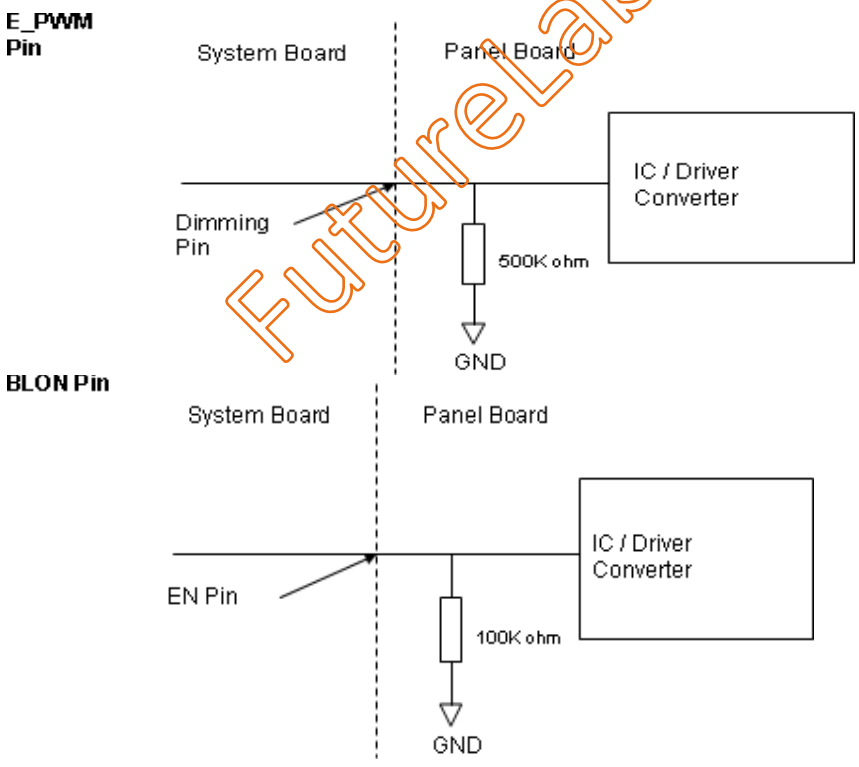
CN2

Pin	Symbol	Description	Remark
1	V_i	Converter input voltage	12V
2	V_i	Converter input voltage	12V
3	V_i	Converter input voltage	12V
4	V_i	Converter input voltage	12V
5	V_{GND}	Converter ground	Ground
6	V_{GND}	Converter ground	Ground
7	V_{GND}	Converter ground	Ground
8	V_{GND}	Converter ground	Ground
9	EN	Enable pin	3.3V, Note (3)
10	ADJ	Backlight Adjust	PWM Dimming (190-210Hz, Hi: 3.3VDC, Low: 0VDC) , Note (3)

Note (1) Connector Part No.: ACES,91208-01001-H01 or equivalent

Note (2) User's connector Part No.: ACES,91209-01011 or equivalent

Note (3) EN(BLON), ADJ(E_PWM) as shown below :



5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Basic	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Colors	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Red	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Gray	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Green	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Gray	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Blue	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

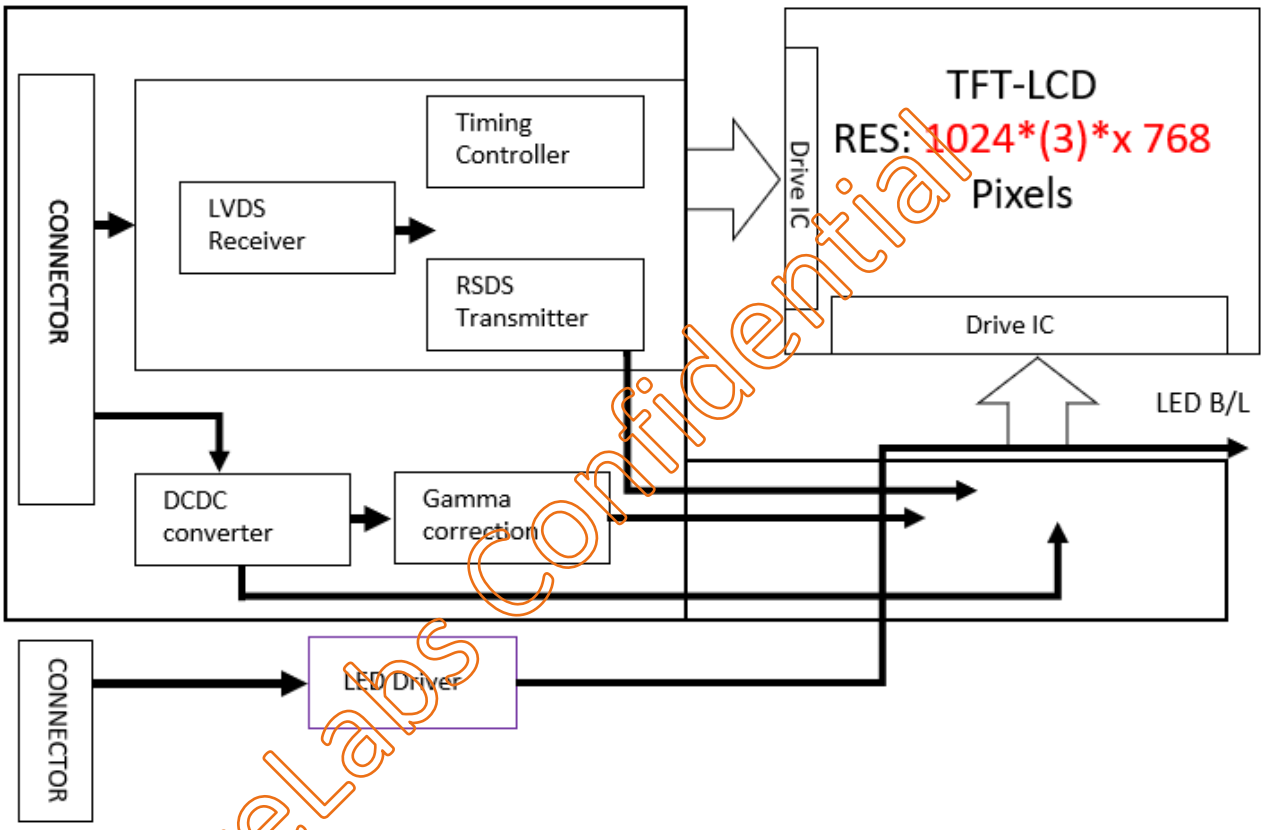
The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		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 Colors	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
	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
	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
	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
	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
	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
	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
Gray Scale Of Red	Red(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	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	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(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(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	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	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(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(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	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	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(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. BLOCK DIAGRAM

The following diagram shows the functional block of the TFT module:



7. OPTICAL CHARACTERISTIC

The optical characteristics are measured under stable conditions at room temperature.

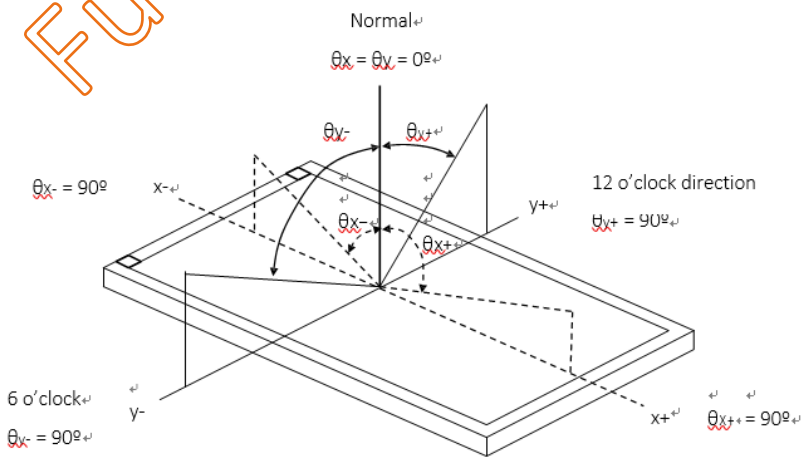
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_X=0°, θ_Y =0° Viewing angle at normal direction	700	1000		-	(2)(5)
Response Time		T_R		-	14	19	ms	(3)
		T_F		-	11	16	ms	
Center Luminance of White		L_C		400	500	-	cd/m2	(4)(5)
White Variation		δW		-	1.25	1.4	-	(5)(6)
Chromaticity	Red	Rx		Typ. -0.05	0.652	Typ. +0.05	-	(1) (5)
		Ry			0.338		-	
	Green	Gx			0.326		-	
		Gy			0.608		-	
	Blue	Bx			0.150		-	
		By			0.053		-	
	White	Wx			0.313		-	
		Wy			0.329		-	
Viewing Angle	Horizontal	θ_X+	CR≥10	80	88	-	Deg.	(1)(5)
		θ_X-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance <2 lux, and at room temperature).

The room temperature is 25°C±2°C

Note 1: Definition of Viewing Angle

Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or the vertical clock direction with respect to the optical axis which is normal to the LCD surface

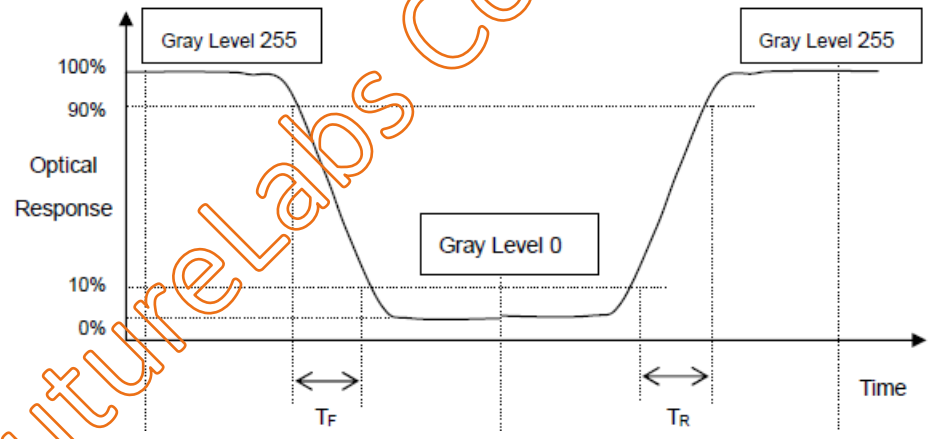


Note 2: Definition of Contrast Ratio (CR)

Measure the viewing angle of Θ= 0 and at the center of the LCD surface. Luminance with all pixels in white state divide by Luminance with all pixels in Black state

Note 3 Definition of Response Time:

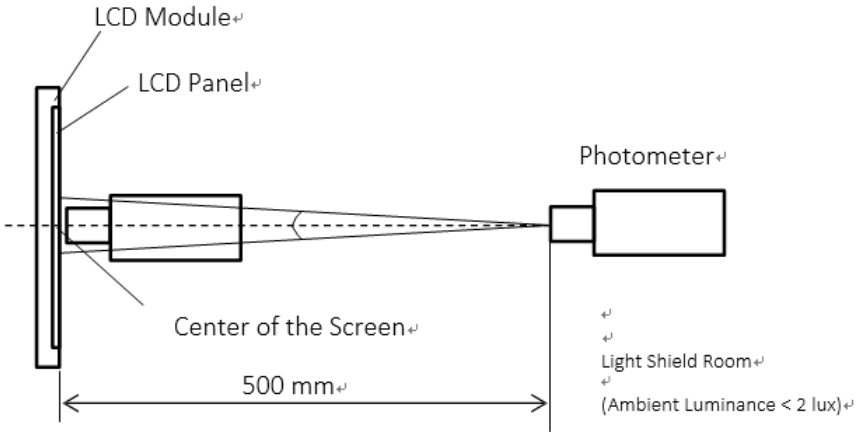
The response time is set initially by defining the "Rising Time (Tr)" and the "Falling Time (Tf)" respectively. The response time interval is between 10% and 90% of amplitudes, please refer the figure to the followings:



Note 4: Definition of Brightness (Lc)

Measure the center area of the panel and the viewing angle of the θx=θy =0°

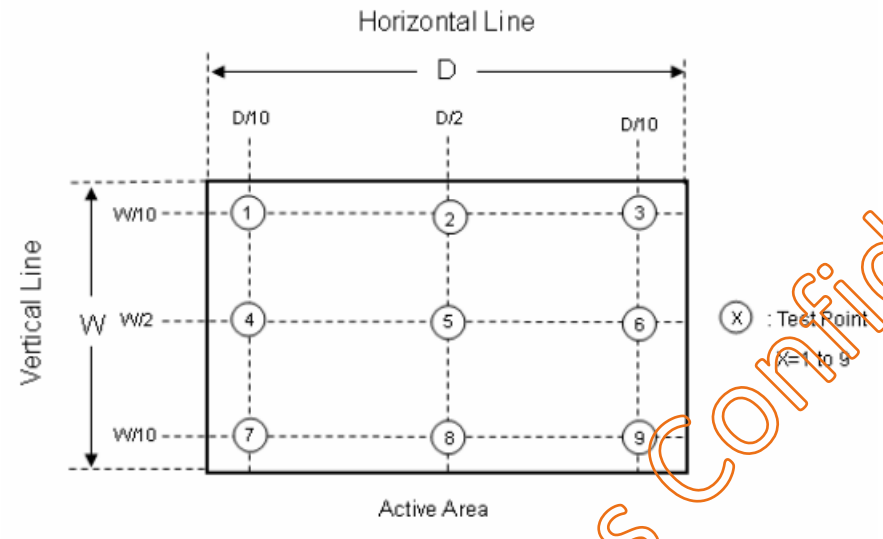
Note 5: The method of optical measurement:



Note 6: Definition of White Variation (δW):

Measure the luminance of gray level 255 at 9 points

δW = Maximum [L (1), L (2), L (3)…L (8), L (9)] / Minimum [L (1), L (2), L (3)… L (4), L (5)]



D. TFT Display RELIABILITY TEST CRITERIA

Test Item	Test Condition	Note
High Temperature Storage Test	85ºC, 240 hours	(1) (2) (4) (5)
Low Temperature Storage Test	-30ºC, 240 hours	
Thermal Shock Storage Test	-20ºC, 0.5hour←→70℃, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	85ºC, 240 hours	
Low Temperature Operation Test	-30ºC, 240 hours	
High Temperature & High Humidity Operation Test	50ºC, 80%RH, 240hours	(1) (2) (4) (6)
Shock (Non-Operating)	50G, 11ms, half sine wave, 1 time for ± X, ± Y, ± Z.	(3)(4)
Vibration (Non-Operating)	1.5G, 10 ~ 300 Hz, 10min/cycle, 3 cycles each X, Y, Z	(3)(4)

Note (1) There should be no condensation on the surface of panel during test.

Note (2) Temperature of panel display surface area should be 85 ºC Max.

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

Note (4) In the standard conditions, there is no function failure issue occurred. All the cosmetic specification is judged before reliability test.

Note (5) Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note (6) Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

B. Touch Screen specification

1. Enviromental Specification

Specification	Value	Remarks
Operating Temperature	-30ºC ~ 80ºC	
Storage Temperature	-40ºC ~ 80ºC	
Operating Humidity	20% ~ 90%RH	
Storage Humidity	10% ~ 90%RH	

2. Mechanical Specification

USB/RS22 Specification	Value
Operating Life (Finger input)	10^7 times
Light Transmittance	86% Min. (JIS K-7105) with glass
Surface hardness	Depending by the Cover Lens Material Customer choose
FPC Peeling Force	5N Max

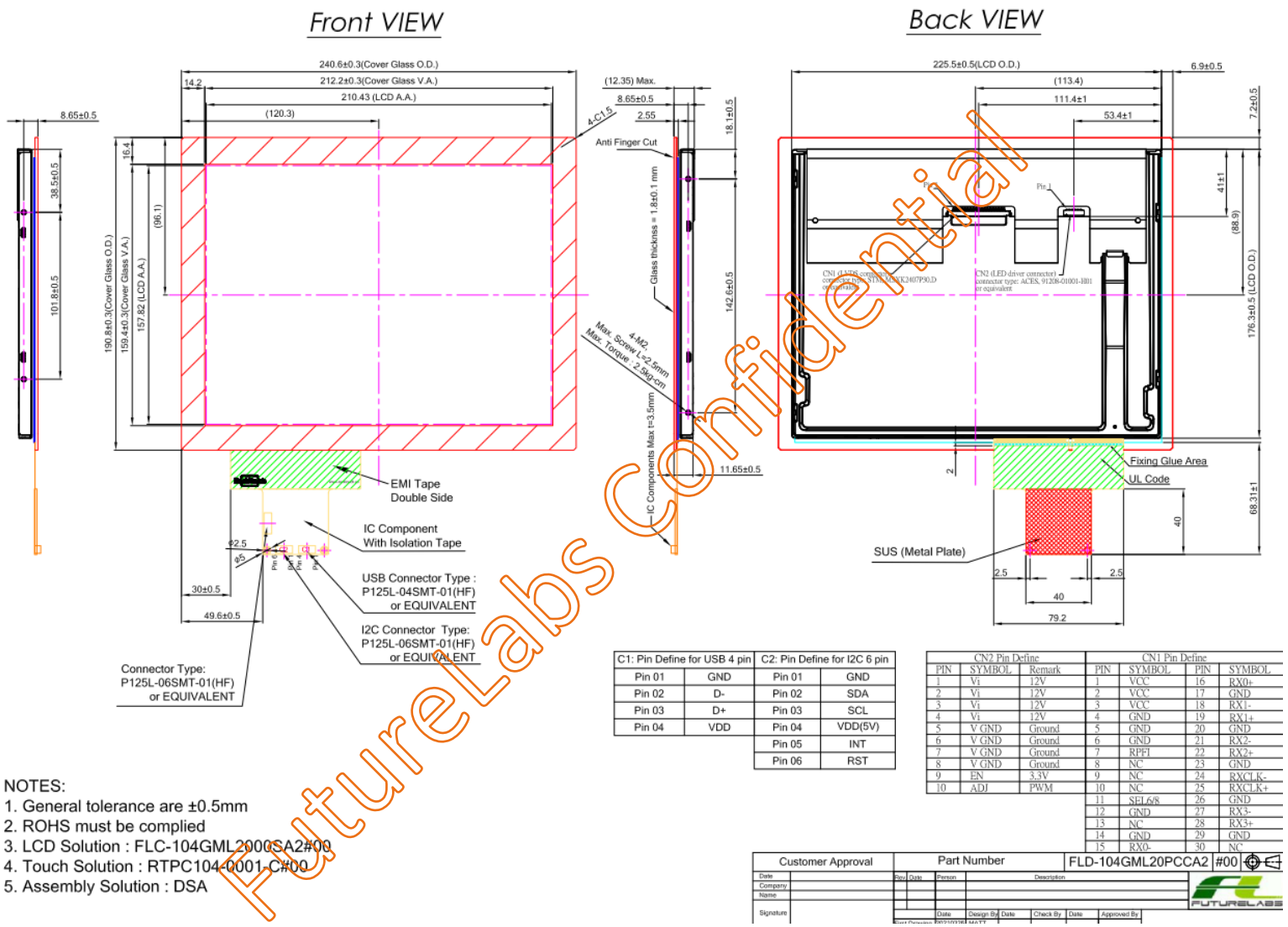
3. USB/RS232 Type Controller

Parameters	Features
Circuit Board Dimension	Refer to drawings
Channels of Panel	Based on Sensor Design
Input Voltage	5V for USB - 5V/3,3V (Min 3.2V)
Linearity(Note 1)	Single Line drawing accuracy : Up to 1pt +/- 1mm offset /10mm
	Single Touch (point) accuracy : Up to 1pt +/- 1mm
Interface	USB: 2.0(Below) Full Speed
	I2C:100K/400K Hz
Resolution	4096×4096 resolution
USB Power consumption(mA)	Active Mode: <108mA
	Idle Mode : <54mA
	Sleep Mode :< 10mA
	(Operation Mode :Active Mode only)
RS232 Power consumption(mA)	Active Mode: <106mA
	Idle Mode : <64mA
	Sleep Mode :< 12mA
	(Operation Mode :Active Mode only)
Report rate(points/sec) Note(2)	＞100 Hz
Response time	Average < 25 ms

Note (1): Depending by Sensor design and other parameters, Refer to Windows 8 Logo regulation if need to follow min spec

Note (2): Report rate will vary by channel number, cover thickness, number of fingers and other parameters

C. DIMENSION AND DRAWING



C1: Pin Define for USB 4 pin		C2: Pin Define for I2C 6 pin	
Pin 01	GND	Pin 01	GND
Pin 02	D-	Pin 02	SDA
Pin 03	D+	Pin 03	SCL
Pin 04	VDD	Pin 04	VDD(5V)
		Pin 05	INT
		Pin 06	RST

CN2 Pin Define			CN1 Pin Define			
PIN	SYMBOL	Remark	PIN	SYMBOL	PIN	SYMBOL
1	Vi	12V	1	VCC	16	RX0+
2	Vi	12V	2	VCC	17	GND
3	Vi	12V	3	VCC	18	RX1-
4	Vi	12V	4	GND	19	RX1+
5	V GND	Ground	5	GND	20	GND
6	V GND	Ground	6	GND	21	RX2-
7	V GND	Ground	7	RPFI	22	RX2+
8	V GND	Ground	8	NC	23	GND
9	EN	3.3V	9	NC	24	RXCLK-
10	ADJ	PWM	10	NC	25	RXCLK+
			11	SEL68	26	GND
			12	GND	27	RX3-
			13	NC	28	RX3+
			14	GND	29	GND
			15	RX0-	30	NC

NOTES:
1. General tolerance are ±0.5mm
2. ROHS must be complied
3. LCD Solution : FLC-104GML200SA2#00
4. Touch Solution : RTPC104-0001-C#00
5. Assembly Solution : DSA

Customer Approval	Part Number	FLD-104GML20PCCA2 #00
Date	Rev Date Person Description	
Company		
Name		
Signature	Date Design By Date Check By Date Approved By	

E. PRECAUTION AND PRODUCT HANDLING

- Do not apply the external force such as bending or twisting to the module during assembly.
- Do not insert and plug out the input connector while the LCD panel is operating.
- Do not take apart the panel or frame from module assembly or insert anything into the backlight unit.
- Do not keep the same pattern in a long period of time, it may cause image sticking on LCD panel. Can use shuffle content periodically if fixed pattern is displayed on the screen.
- Do not touch the display area with bare hands, this will stain the display area.
- Pay attention to handle lead wire of backlight, that is not tugged in connect with LED driver.
- Do not change variable resistance settings in LCD panel, it may cause not satisfy of LCD characteristics specification.
- To avoid the static electricity to damage the CMOS LSI, the operator should be grounded when in contact with the LCD panel, and also to all electrical equipment.
- Need to follow the correct power frequency when LCD panel is connecting and operating, this can avoid damage to CMOS LSI during latch-up.
- Need to store the LCD panel indoor without the exposure of sunlight where the temperature is 25°C ± 5°C and the humidity is below 60% RH.