

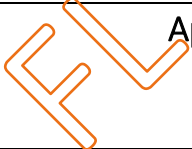
TFT Product Specification

- ◇ PRELIMINARY SPECIFICATION
- ◆ APPROVED SPECIFICATION

Part Number: FLD-116MML71PUSA1

Description: 11.6" TFT LCD IPS Type 450CD 1920x1080 LVDS interface with LED
driver assemble with Pcap 1.8mm Black USB Interface

Prepared by: Natalie

 Approved by	
Date	

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A. LCD specification

1. GENERAL DESCRIPTION

1.1 Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver ICs, a touch panel and a backlight unit.

This LCD can only be driven at Native Resolution 1920x1080 pixel, no other resolution is accepted.

1.2 Product Summary

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

No.	Item	Specification	Unit
1	Display Size	11.6W	Inch
2	Pixel Number	1920(H) x RGB x 1080 (V)	Pixels
3	Outline Dimension	267.72(H) x 164.42(V) x 6.1(T)	mm
4	Active Area	256.32 (H) x 144.18 (V)	mm
5	Display Colors	16M	--
6	Pixel Arrangement	RGB vertical stripe	--
7	Display Mode	Transmissive /Normally black	--
8	Electrical Interface	LVDS	--
9	Surface Treatment	Antiglare	--
10	Brightness	450 (Typ.)	cd/m2
11	Contrast Ratio	1000 (Typ.)	--
12	Total Power Consumption (Typ)	6.77(Max)	W

2. ABSOLUTE MAXIMUM RATING

2.1 Electrical Absolute Rating

$V_{SS}=0V$, $T_a=25^{\circ}C$

Item	Symbol	Values			Unit	Note
		Min	Typ.	Max		
Digital Supply Voltage	VDD	-0.3	-	4	V	

2.2 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Top	-20		70	$^{\circ}C$	$T_a=25^{\circ}C$
Storage Temperature	Tstg	-30		80	$^{\circ}C$	

Note 1: If T_a below $50^{\circ}C$, the maximal humidity is 90%RH, if T_a over $50^{\circ}C$, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around $-10^{\circ}C$, and the back ground will become darker at high temperature operating.



3. ELECTRICAL CHARACTERISTICS

3.1 LCM

Item		Symbol	Min.	Typ.	Max.	Unit
Supply Voltage		LCD_VDD	3	3.3	3.6	V
Current Consumption All White	Logic	I _{CC+} I _{IN}	-	233.2		mA
	Analog					

3.2 Backlight Unit

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

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	T _a =25°C, I _F =180mA		12		V
Forward Current	I _F	-		500	-	mA
Power dissipation	P _D	-		6000		mW
LED Enable Input Low Level			-	-	0.2	V
LED Enable Input High Level			2	-	-	V
PWM Duty Ratio			0		100	%
PWM Input Frequency	FPWM		8K	-	100K	Hz
LED working life(25°C)	-		-	40,000	-	Hrs
Drive method	Constant current					
LED Configuration	40 White LEDs (10 LEDs in one string and 4 groups in parallel)					

Note1: Led life time defined as follows: The final brightness is at 50% of original brightness.

The environmental conducted under ambient air flow, at T_a=25±2 °C, 60%RH±5%, Typical operating life time is estimated data, led power dissipation is evaluated by led supplier

4. SIGNAL CHARACTERISTICS

4.1 Interface Timing

4.1.1 Timing Characteristics: (Original LCD's)

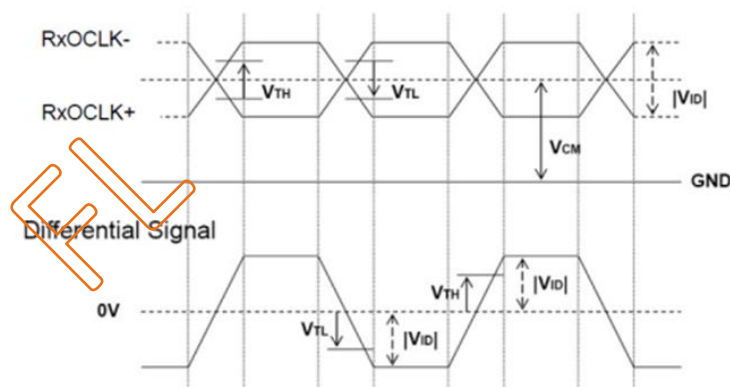
Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock	Frequency	1/Tc	-	138.5	-	MHz
Data enable signal	Horizontal period	TH	-	2080	-	clock
	Horizontal period	THd	-	1920	-	clock
	Vertical period	TV	-	1111	-	line
	Vertical period	TVd	-	16.685	-	ms
	Vertical period	TVd	-	1080	-	line

VDD=+3.0V~3.6V , Ta=-10~60°C

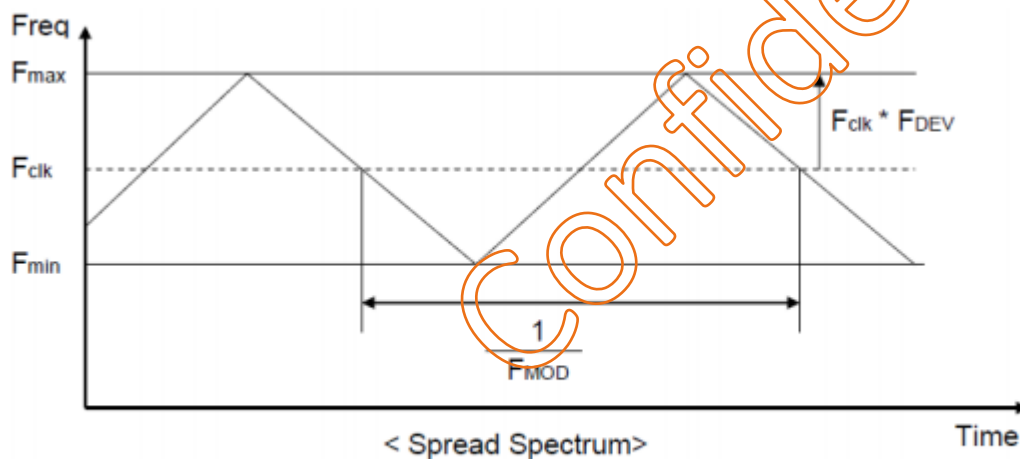
4.1.2 Signal Electrical Characteristics

Symbol	Parameter	Value			Units	Conditions
		Min.	Typ.	Max.		
V _{TH}	Differential Input High Threshold		+50	+100	mV	V _{CM} =1.2V
V _{TL}	Differential Input Low Threshold	-100	-50		mV	V _{CM} =1.2V
V _{ID}	Input Differential Voltage	100	400	600	mV	
V _{CM}	Differential Input Common Mode Voltage	+1.0	+1.2	+1.4	V	V _{TH} - V _{TL} =200mV(max)

Note: LVDS Signal Waveform
Use RxOCLK- & RxOCLK+ as example.
Single-End



Symbol	Description	Min.	Max	Unit	Remark
FDEV	Maximum deviation of input clock frequency during spread spectrum	-	+/- 3	%	
FMOD	Maximum modulation frequency of input clock during Spread Spectrum		200	KHz	

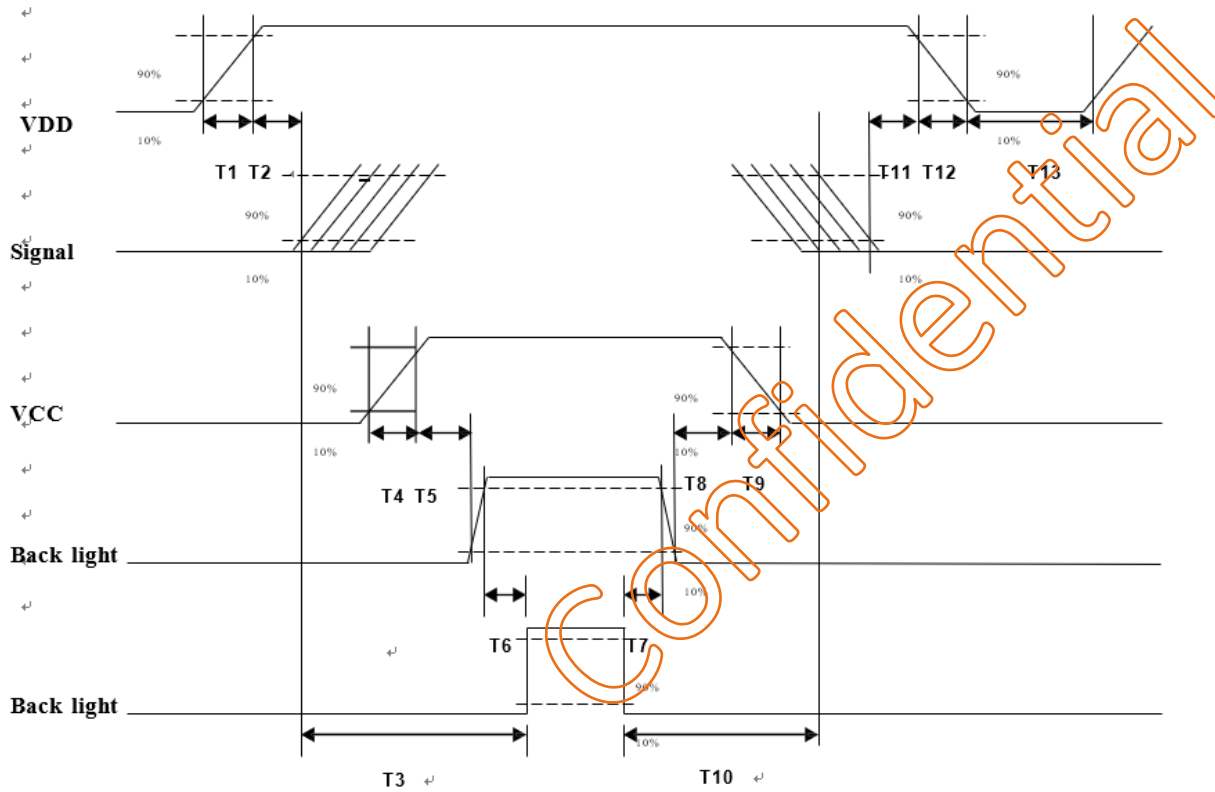


Fclk: LVDS Clock Frequency



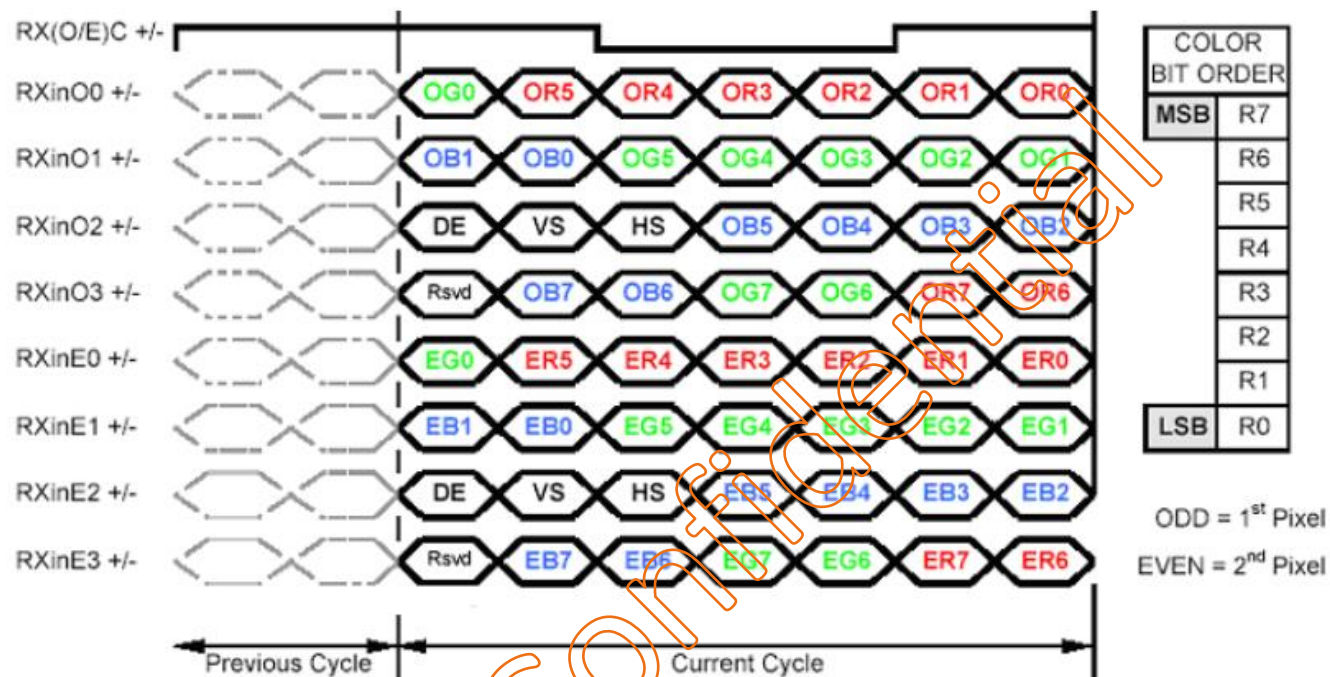
4.2 Power ON/OFF Sequence

VDD power and LED on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z stage or low level when VDD is off.



Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	40	50	ms
T3	200	-	-	ms
T4	0.5	-	10	ms
T5	10	-	-	ms
T6	10	-	-	ms
T7	0	-	-	ms
T8	10	-	-	ms
T9	-	-	10	ms
T10	110	-	-	ms
T11	0.5	16	50	ms
T12	-	-	100	ms
T13	1000	-	-	ms

4.3 The Input Data Format



5. INTERFACE PIN DESCRIPTION

5.1 LCM Connector PIN Assignment

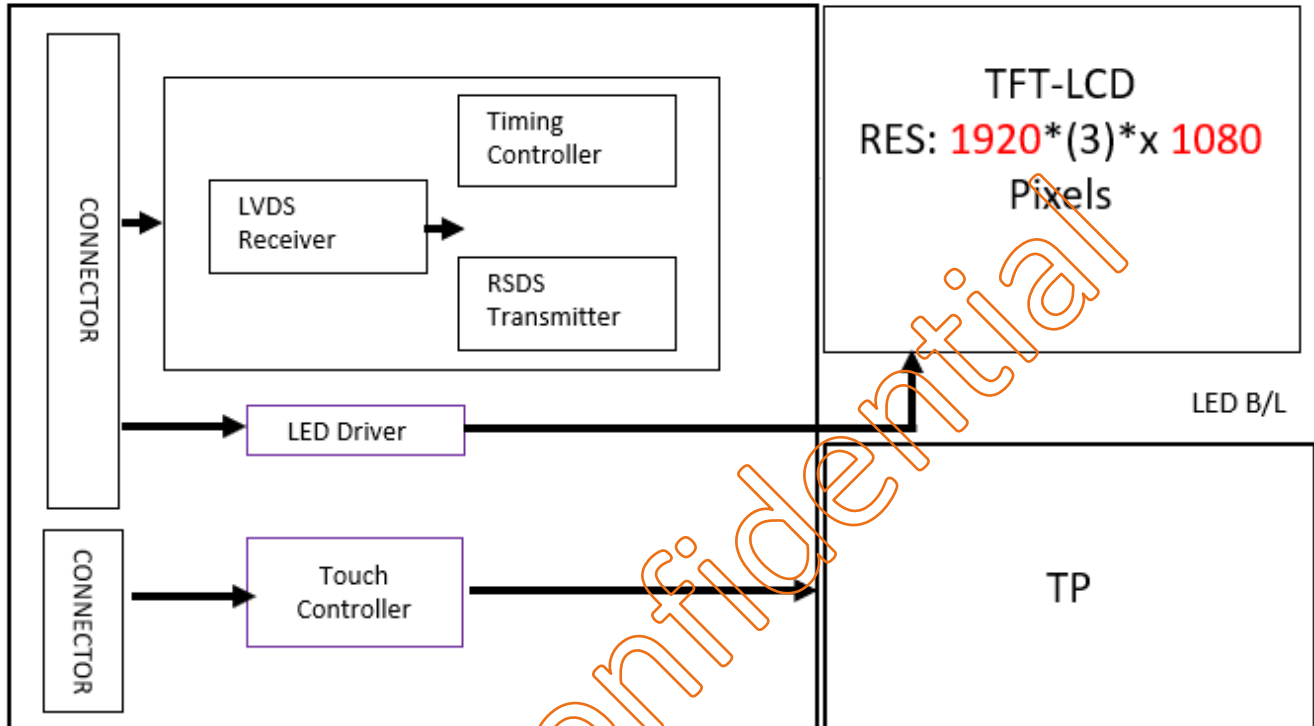
This LCD can only be driven at Native Resolution 1920x1080 pixel, no other resolution is accepted.

	Symbol	Description	Note
1	GND	Ground	
2	RX00-	LVDS Differential Data Input odd (Negative)	
3	RX00+	LVDS Differential Data Input odd (Positive)	
4	GND	Ground	
5	RX01-	LVDS Differential Data Input odd (Negative)	
6	RX01+	LVDS Differential Data Input odd (Positive)	
7	GND	Ground	
8	RX02-	LVDS Differential Data Input odd (Negative)	
9	RX02+	LVDS Differential Data Input odd (Positive)	
10	GND	Ground	
11	RX0C-	LVDS Differential Clock odd (Negative)	
12	RX0C+	LVDS Differential Clock odd (Positive)	
13	GND	Ground	
14	RX03-	LVDS Differential Data Input odd (Negative)	
15	RX03+	LVDS Differential Data Input odd (Positive)	
16	GND	Ground	
17	RXE0-	LVDS Differential Data Input even (Negative)	
18	RXE0+	LVDS Differential Data Input even (Positive)	
19	GND	Ground	
20	RXE1-	LVDS Differential Data Input even (Negative)	
21	RXE1+	LVDS Differential Data Input even (Positive)	
22	GND	Ground	
23	RXE2-	LVDS Differential Data Input even (Negative)	
24	RXE2+	LVDS Differential Data Input even (Positive)	
25	GND	Ground	
26	RXEC-	LVDS Differential Clock even (Negative)	
27	RXEC+	LVDS Differential Clock even (Positive)	
28	GND	Ground	
29	RXE3-	LVDS Differential Data Input even (Negative)	
30	RXE3+	LVDS Differential Data Input even (Positive)	
31	GND	Ground	
32	GND	Ground	
33	GND	Ground	
34	BL_ENABLE	Backlight Enable	
35	BL_PWM_DIM	Backlight Dimming	
36	BL_PWR	Backlight Power Input 12V	
37	BL_PWR	Backlight Power Input 12V	
38	VDD	3.3V Power Supply	
39	VDD	3.3V Power Supply	
40	GND	Ground	

Note: Connector Type IPex 20455-40E-12 or equivalent

6.BLOCK DIAGRAM

The following diagram shows the functional block of LCD and TP:



7. OPTICAL CHARACTERISTIC

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

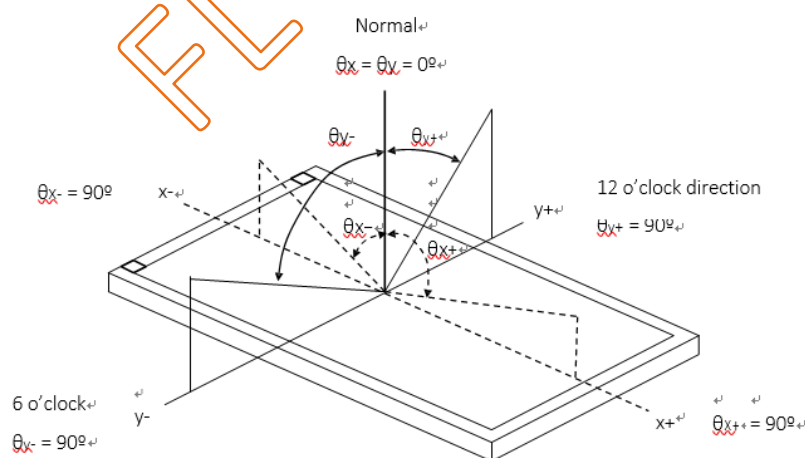
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing angle at normal direction	700	1000		-	(2)(5)
Response time		T_R+T_F		-	25		ms	(3)
Center Luminance of White		L_c		360	450	-	cd/m ²	(4)(5)
NTSC ratio				-	(72)		%	
Chromaticity	Red	R_x		Typ. -0.05	0.644	Typ. +0.05	-	(1) (5)
		R_y			0.330		-	
	Green	G_x			0.284		-	
		G_y			0.630		-	
	Blue	B_x			0.142		-	
		B_y			0.060		-	
	White	W_x			0.288		-	
		W_y			0.335		-	
Viewing Angle	Horizontal	θ_{x+}	$CR \geq 10$	80	89	-	Deg.	(1)(5)
		θ_{x-}		80	89	-		
	Vertical	θ_{y+}		80	89	-		
		θ_{y-}		80	89	-		

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 $25^\circ\text{C} \pm 2^\circ\text{C}$

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



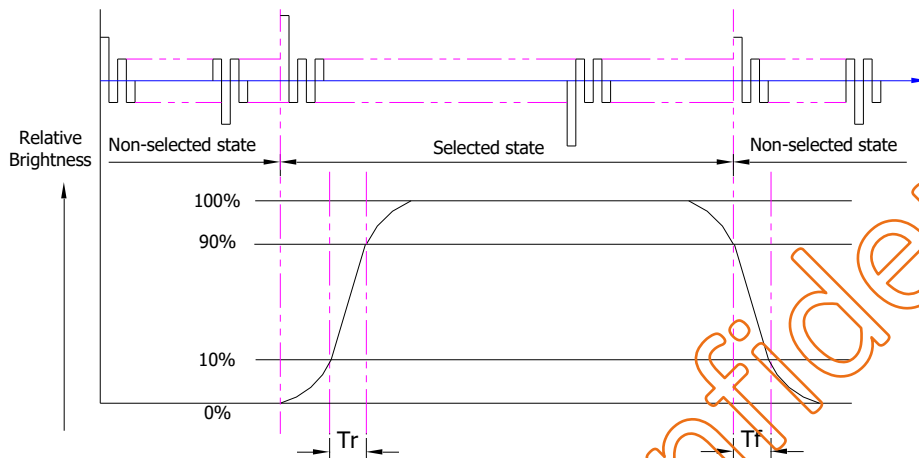
Note 2: Definition of Contrast Ratio (CR)

Contrast is measured perpendicular to display surface in reflective and transmissive mode. The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

Note 3: **Normally Black Type(Negative):**

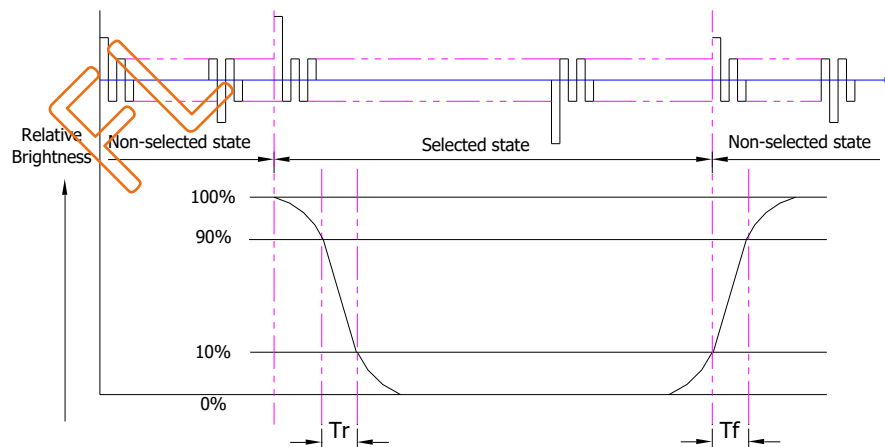


Tr is the time it takes to change from non-selected stage with relative luminance 10% to selected state with relative luminance 90%.

Tf is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note: Measuring machine: LCD-5100

Normally White Type (Positive)



Tr is the time it takes to change from non-selected stage with relative luminance 90% to

selected state with relative luminance 10%;

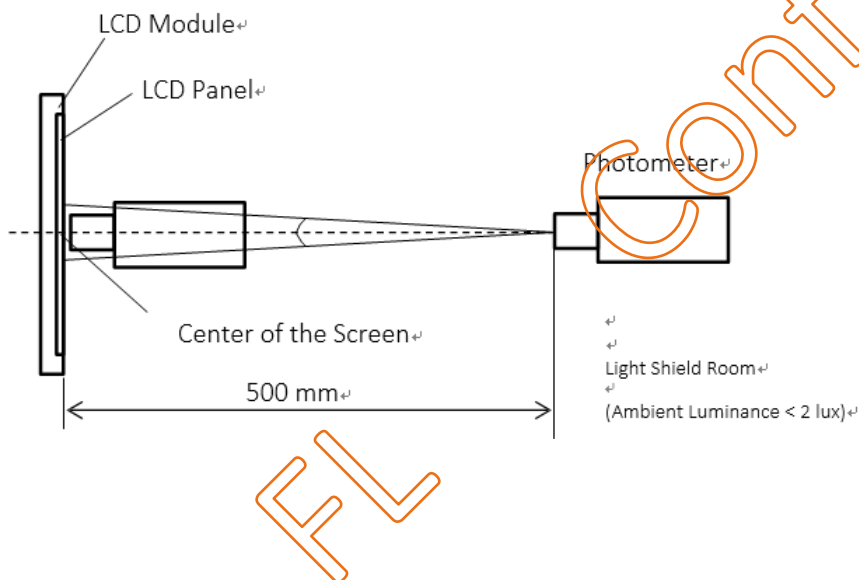
Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note: Measuring machine: LCD-5100 or EQUI

Note 4: Definition of Brightness (Lc)

Measure the center area of the panel and the viewing angle of the $\theta_x = \theta_y = 0^\circ$

Note 5: The method of optical measurement:



B. Touch Screen Specification

1. Environmental Specification

Specification	Value	Remarks
Operating Temperature	-20°C ~ 70°C	
Storage Temperature	-30°C ~ 80°C	
Operating Humidity	20% ~ 90%RH	
Storage Humidity	10% ~ 90%RH	

2. Mechanical Specification

Specification	Value
Operating Life (Finger input)	10 ⁷ times
Light Transmittance	>85% Min. (JIS K-7105) with glass
Surface hardness	6H
FPC Peeling Force	5N Max

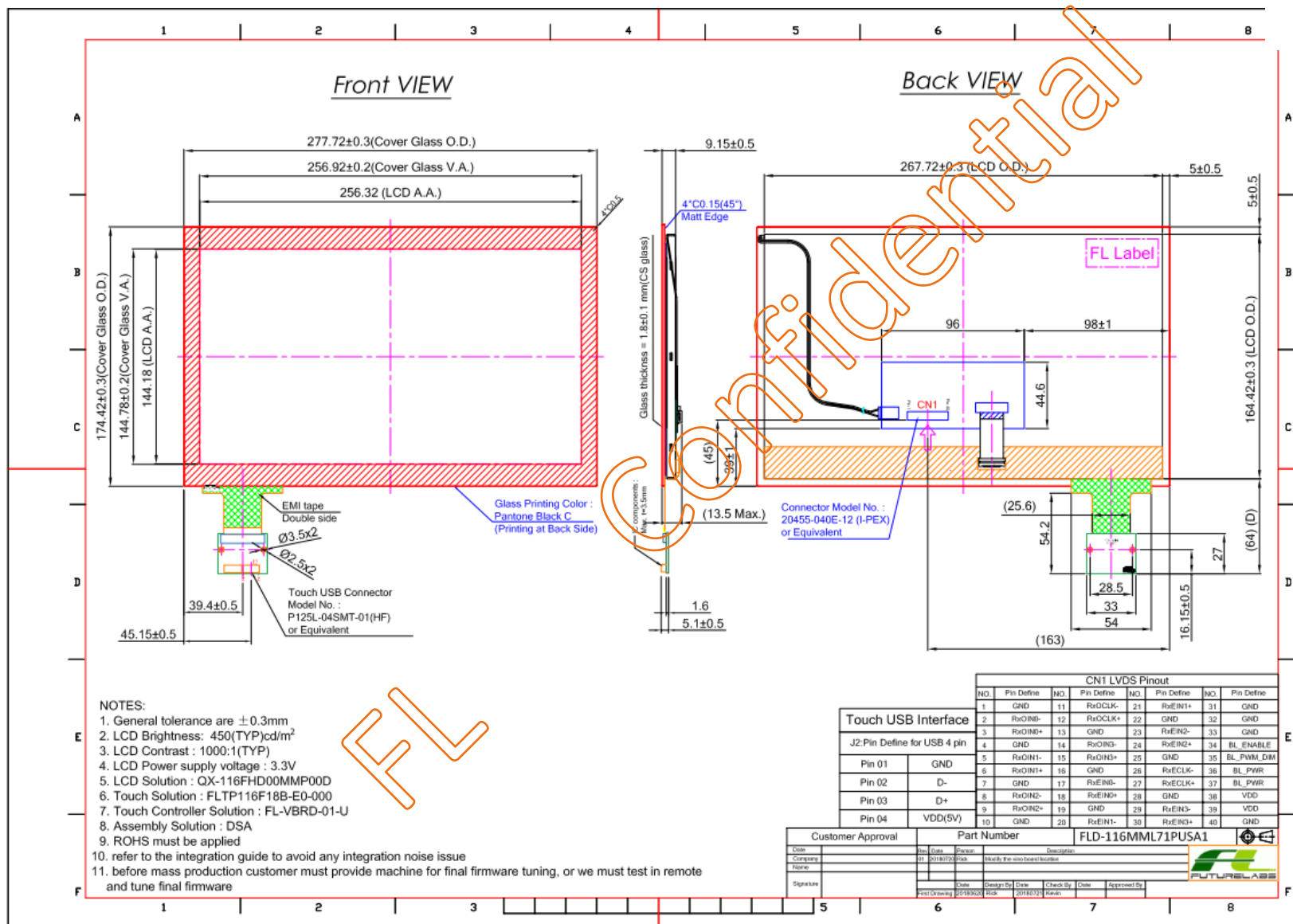
3. USB Type Controller

Parameters	Features
Circuit Board Dimension	Refer to drawings
Channels of Panel	Based on Sensor Design
Input Voltage	5V for USB
Linearity(Note 1)	Single Line drawing accuracy : Up to 1pt +/- 1mm offset /10mm
	Single Touch (point) accuracy : Up to 1pt +/- 1mm
Interface	USB: 1.1 Full Speed
Resolution	4096×4096 resolution
Power consumption(mA)	Active Mode: <50mA
	Idle Mode: <45mA
	Sleep Mode :<15mA
	(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



D. 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 $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 60% RH.



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