SPECIFICATION

Customer: _____

Model Name: TI133FI315

SPEC NO.: _____

Date: 2024.11.04

Version: V02

■ Preliminary Specification

□ Final Specification

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by

Record of Revision

Version	Revise Date	Page	Content
V02	2024.11.04	4	更正背光电压

Contents

1. General Specifications

No.	Item	Specification	Unit
1	LCD size	13.3	inch
2	Sub Pixel pitch	51 (H) x 153 (V)	um
3	Active area	293.76(H) x 165.24(V)	mm
4	Module size(FOG)	305.2(H)X178.1(V)X2.6(T)	mm
5	Number of pixel	1920 RGB(H)X 1080 (V)	pixels
6	Number of colors	16.7M	colors
7	Interface	eDP	
8	Display mode	Normally Black	
9	Pixel arrangement	RGB Vertical stripe	
10	Surface Treatment	AG	
11	NTSC	54.9	%
12	Brightness	350(type)	cd/m2
13	Backlight power consumption	N/A	W
14	Panel power consumption	TBD	W
15	Module Weight	TBD	g

Note 1: Refer to Mechanical Drawing.

2.INTERFACE CONNECTIONS

2.1 Input CONN Pin Assignment

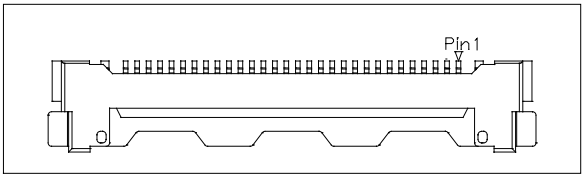
Input Connector (I-pex 20455-030E-76) is used for the module electronics interface, the recommended

CONN of user is 20453-030T-03 manufactured by I-pex.

Date: 2024/11/04

Pin No.	Symbol	Description	Remark
1	NC	No Connection (Reserved for LCD test)	
2	H_GND	High Speed Ground	
3	ML1-	Complement Signal-Lane 1	
4	ML1+	True Speed Ground	
5	H_GND	High Speed Ground	
6	ML0-	Complement Signal-Lane 0	
7	ML0+	True Speed Ground	
8	H_GND	High Speed Ground	
9	AUX+	True Signal-Auxiliary Channel	
10	AUX-	Complement Signal-Auxiliary Channel	
11	H_GND	High Speed Ground	
12	VCCS	Power Supply +3.3V(typical)	
13	VCCS	Power Supply +3.3V(typical)	
14	NC	No Connection (Reserved for LCD test)	
15	GND	Ground	
16	GND	Ground	
17	HPD	Hot Plug Detect	
18	BL_GND	BL Ground	
19	BL_GND	BL Ground	
20	BL_GND	BL Ground	
21	BL_GND	BL Ground	
22	LED_EN	BL_Enable Signal of LED Converter	
23	LED_PWM	PWM Dimming Control Signal of LED Converter	
24	NC	No Connection (Reserved for LCD test)	
25	NC	No Connection (Reserved for LCD test)	
26	LED_VCCS	BL Power	
27	LED_VCCS	BL Power	
28	LED_VCCS	BL Power	Note1
29	LED_VCCS	BL Power	
30	NC	No Connection (Reserved for LCD test)	

2.3 CONN Pin1 location

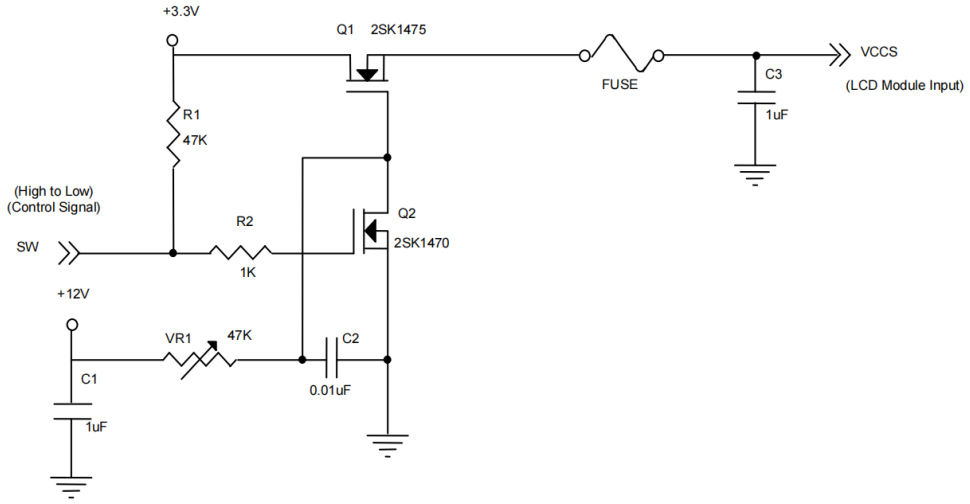


3. Operation Specifications

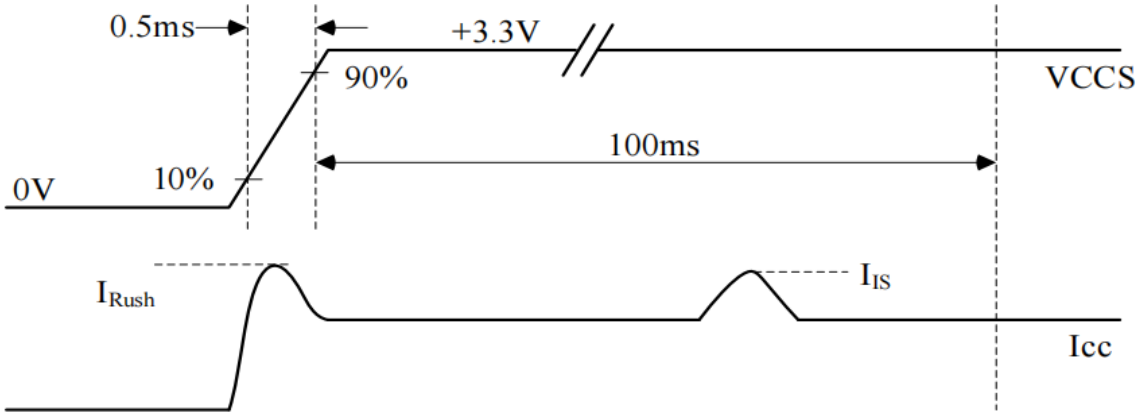
3.1.1.LCD ELETRONICS SPECIFICATION

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VCC	3.0	3.3	3.6	V	
	VLED	5	12	20	V	
Current Consumption	I_{VCC}	-	TBD	-	mA	
	I_{VLED}	118	120	122	mA	
Power Consumption	P_{LCD}	-	TBD	-	W	
	P_{LED}	-	TBD	-	W	
EN Control Level	On	3.0	-	3.6	V	
	Off	0	-	0.7	V	
PWM Control Level	H	3.0	-	3.6	V	
	L	0	-	0.7	V	
PWM Control Frequency	f	100	-	30K	Hz	

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.
Note (2) I_{RUSH}: the maximum current when VCCS is rising
I_{IS}: the maximum current of the first 100ms after power-on
Measurement Conditions: Shown as the following figure. Test pattern: black.

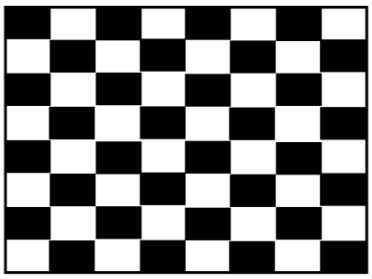


VCCS rising time is 0.5ms



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

Mosaic Pattern



Active Area

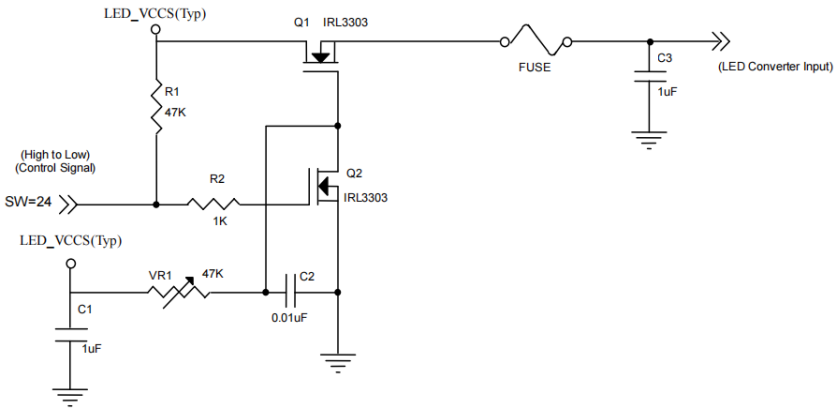
Note (4) The specified signals have pull down resistor to ground in the LCD module respectively. Customers should keep the input signal level requirement with the load of LCD module. Please refer to Note (4) of 4.3.2 LED CONVERTER SPECIFICATION to obtain more information.

Note (5) When a source detects a low-going HPD pulse, it must be regarded as a HPD event. Thus, the source must read the link / sink status field or receiver capability field of the DPCD and take corrective action.

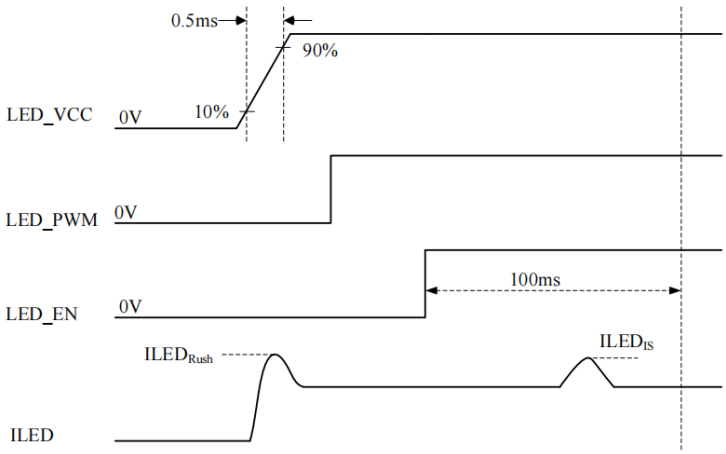
3.1.2. LED CONVERTER SPECIFICATION

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Input Power Supply Voltage		LED_VCCS	5	12	21	V	
Converter Inrush Current		$I_{LED\_VCCS_{RUSH}}$	0	-	1.5	A	(1)
LED_EN Control Level	Backlight On	VH_{LED_EN}	2.2	-	5.0	V	(4)
	Backlight Off	VL_{LED_EN}	0	-	0.6	V	(4)
LED_EN Pull-Low Resistance		R_{LED_EN}	30K	-	100K	ohm	(4)
PWM Control Level	PWM High Level	VH_{PWM}	2.2	-	5.0	V	(4)
	PWM Low Level	VL_{PWM}	0	-	0.6	V	(4)
PWM Pull-Low Resistance		R_{PWM}	30K	-	100K	ohm	(4)
PWM Control Duty Ratio			1	-	100	%	(5)
PWM Control Permissive Ripple Voltage		V_{PWM_pp}	0	-	100	mV	
PWM Control Frequency		f_{PWM}	190	-	2K	Hz	(2)

Note (1) $I_{LED_{RUSH}}$: the maximum current when LED_VCCS is rising,
$I_{LED_{IS}}$: the maximum current of the first 100ms after power-on,
Measurement Conditions: Shown as the following figure. LED_VCCS = Typ, Ta = 25 ± 2 ºC, f_{PWM} = 200 Hz, Duty=100%



VLED rising time is 0.5ms



Note (2) If PWM control frequency is applied in the range less than 1KHz, the “waterfall” phenomenon on the screen may be found. To avoid the issue, it’s a suggestion that PWM control frequency should follow the criterion as below.

PWM control frequency f_{PWM} should be in the range

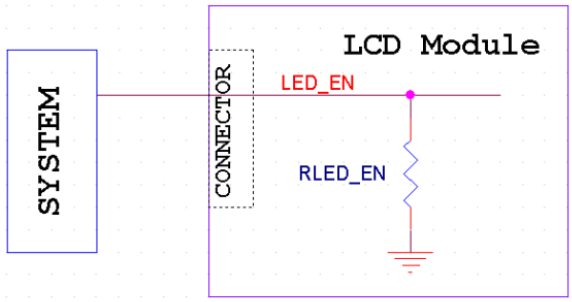
$$(N+0.33)*f \leq f_{PWM} \leq (N+0.66)*f$$

N : Integer $(N \geq 3)$

f : Frame rate

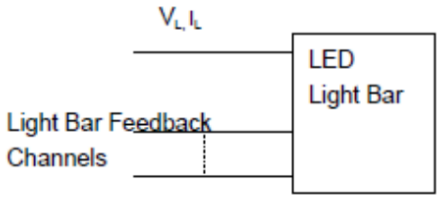
Note (3) The specified LED power supply current is under the conditions at “LED_VCCS = Typ.”, Ta = 25± 2 ºC, fPWM = 200 Hz, Duty=100%.

Note (4) The specified signals have pull down resistor to ground in the LCD module respectively. Customers should keep the input signal level requirement with the load of LCD module. For example, the figure below describes the equivalent pull down resistance of LED_EN (If it exists). The rest pull down resistance of other signals (eg. HPD, PWM …) are in the same concept.



Note (5) If the cycle-to-cycle difference of PWM duty exceeds 0.1%, especially when the PWM duty is low,slight brightness change might be observed.

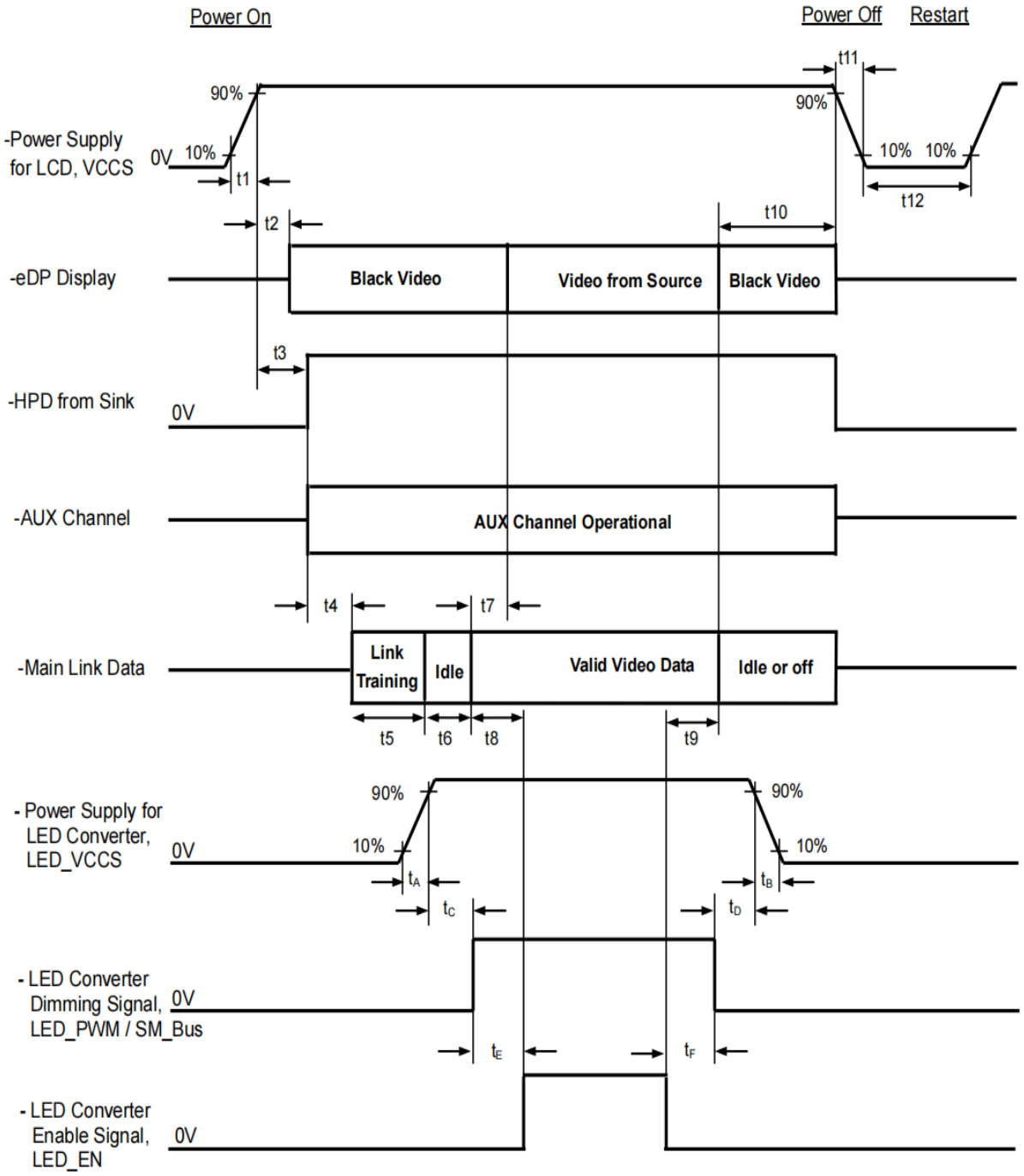
Note (6) LED Light Bar Power Supply Current is measured by utilizing a high frequency current meter as shown below :



Note (7) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

Note (8) VLOVP=35V.

3.2. Power On/Off Sequence

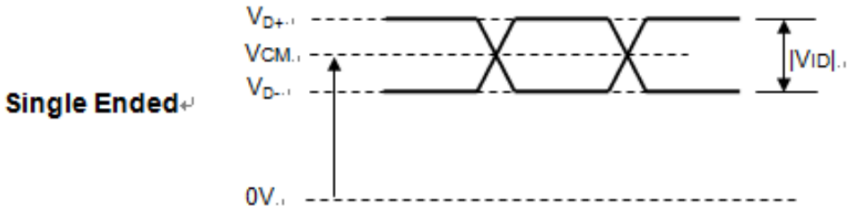


3.3 Timing Characteristics

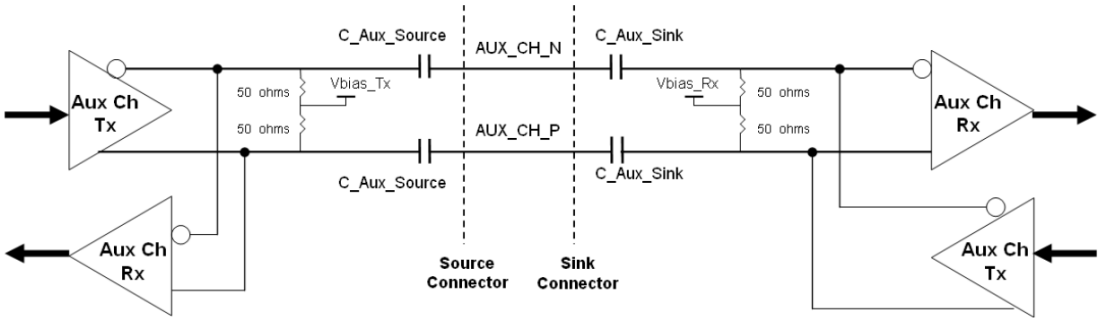
3.3.1. DISPLAY PORT INTERFACE

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Differential Signal Common Mode Voltage(MainLink and AUX)	VCM	0		2	V	(1)(4)
AUX AC Coupling Capacitor	C_AUX_Source	75		200	nF	(2)
Main Link AC Coupling Capacitor	C_ML_source	75		200	nF	(3)

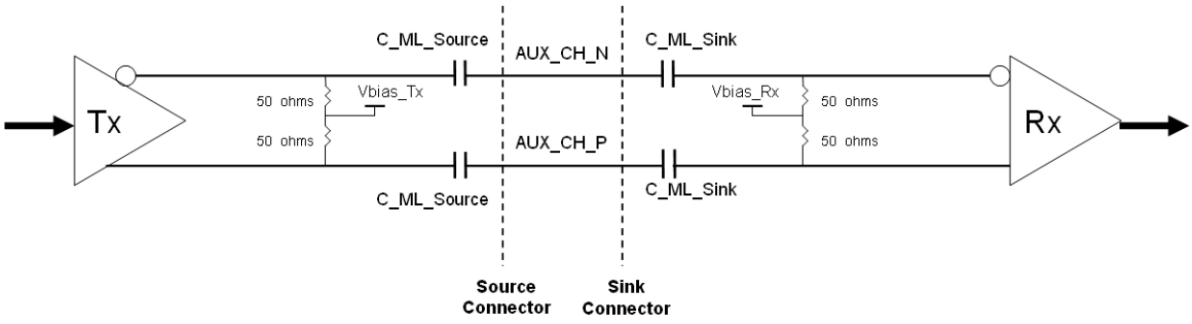
Note (1) Display port interface related AC coupled signals should follow VESA DisplayPort Standard Version1. Revision 1a and VESA Embedded DisplayPort™ Standard Version 1.2. There are many optional items described in eDP1.2. If some optional item is requested, please contact us.



(2) Recommended eDP AUX Channel topology is as below and the AUX AC Coupling Capacitor (C_Aux_Source) should be placed on the source device..



(3) Recommended Main Link Channel topology is as below and the Main Link AC Coupling Capacitor (C_ML_Source) should be placed on the source device.



(4) The source device should pass the test criteria described in DisplayPort Compliance Test Specification(CTS) 1.1

3.3.2 COLOR DATA INPUT ASSIGNMENT

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
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	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
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	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
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	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

3.4 DISPLAY TIMING SPECIFICATIONS

TBD

4.Optical specifications

Item	Symbol	Condition	Values	Unit	Remark

			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180° (9 o'clock)	-	80	-	degree	Note 1
	θ_R	Φ=0° (3 o'clock)	-	80	-		
	θ_T	Φ=90° (12 o'clock)	-	80	-		
	θ_B	Φ=270° (6 o'clock)	-	80	-		
Response time Rise+Fall	T_{RT}	Normal θ=Φ=0°	-	-	35	msec	Note 3
Contrast ratio	CR		1000	1500	-	-	Note 4
Color chromaticity	W_X		0.299	0.319	0.339	-	Note 2
	W_Y		0.308	0.328	0.348	-	Note 5
NTSC	Ratio		49.9	54.9	-	%	Note 6
Luminance	L		280	350	-	cd/㎡	Note 6
Luminance uniformity	Y_U	9 AVG	75	80	-	%	Note 6-7

Note 1: Definition of viewing angle range

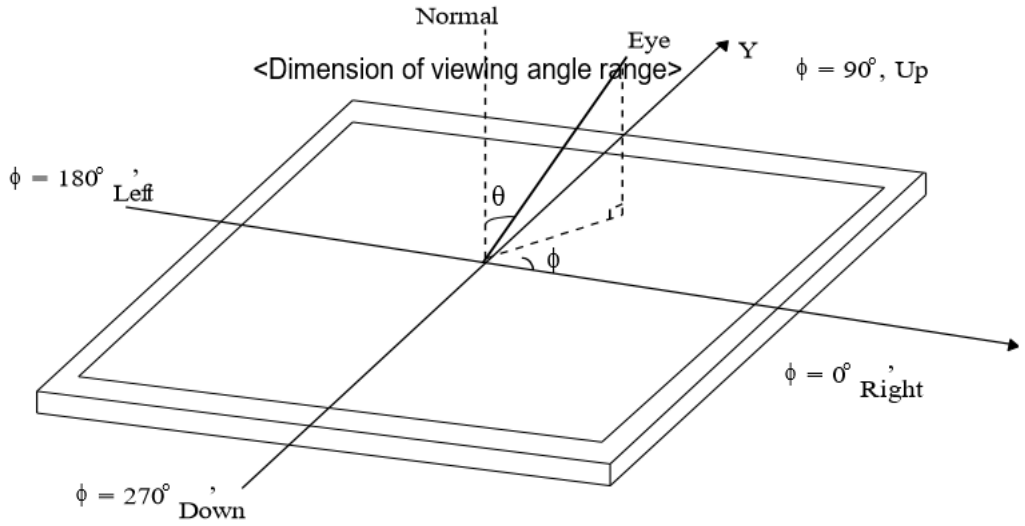


Fig. 4-1 Definition of viewing angle

Note 2: 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. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm ,Response time is measured by Photo detector TOPCON BM-5A, other items are measured by BM-7A/Field of view: 1° /Height: 500mm.)

Normal line
θ=Φ=0°

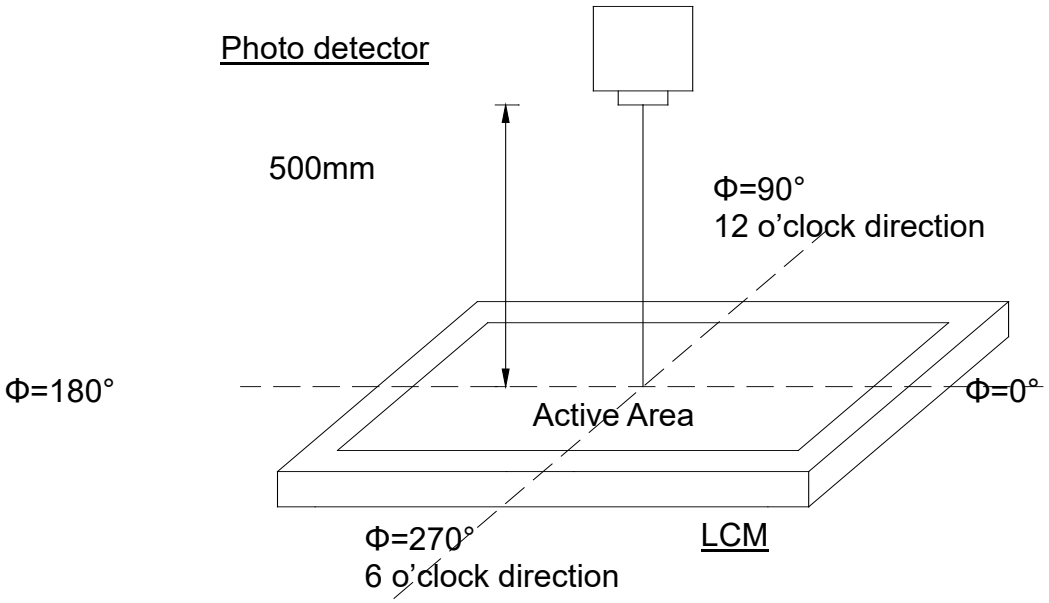


Fig. 4-2 Optical measurement system setup

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%.

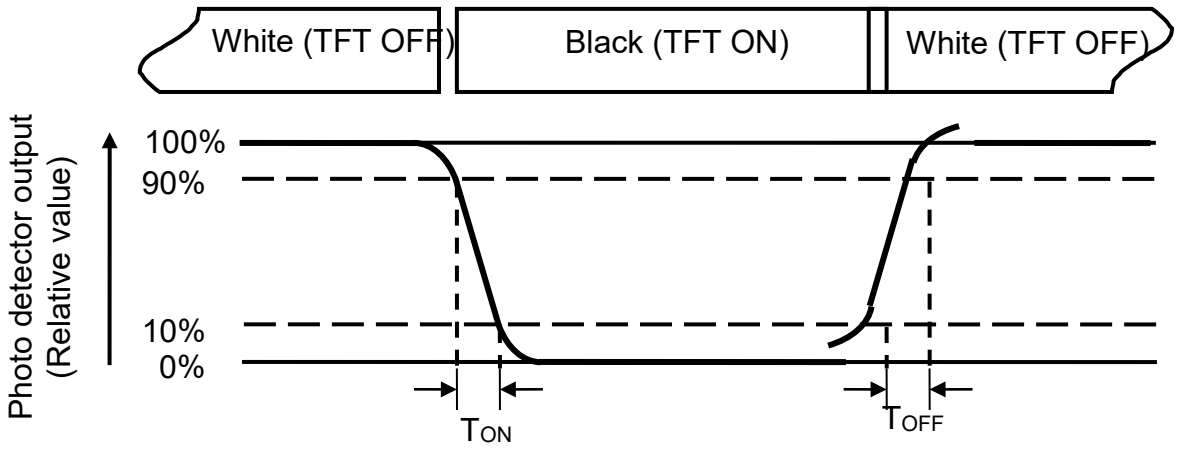


Fig. 4-3 Definition of response time

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 coordinates measured at center point of LCD.

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

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

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

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

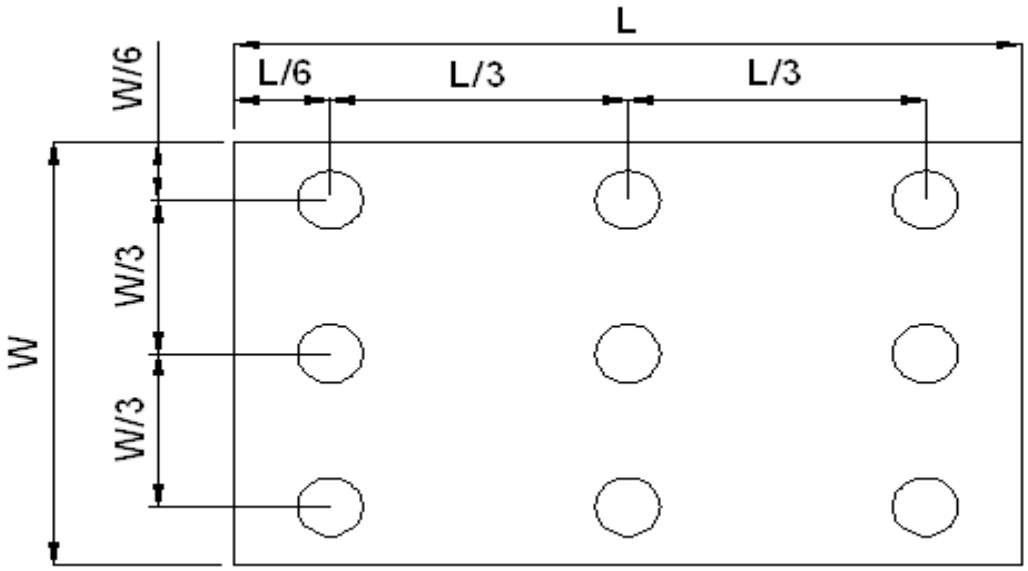


Fig. 4-4 Definition of measuring points

B_{max}: The measured maximum luminance of all measurement position.
B_{min}: The measured minimum luminance of all measurement position.

5. Reliability Test Items

Item	Test Conditions	Remark
High Temperature Storage	Ta =60℃ 240hrs	
Low Temperature Storage	Ta = -20℃ 240hrs	
High Temperature Operation	Ts = 50℃ 240hrs	
Low Temperature Operation	Ta = 0℃ 240hrs	
Operate at High Temperature and Humidity	50℃, 80%RH max. 240hrs	Operation
Thermal Shock	-20℃~+60℃ 10cycles 0.5Hrs/cycle	Non-operation
Electrostatic Discharge	Contact=±4KV, class B Air=±8KV, class B	

Note1: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.
Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

6.General Precautions

6.1. Safety

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

6.2. 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.

6.3. Static Electricity

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

6.4. 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.

6.5. Cleaning

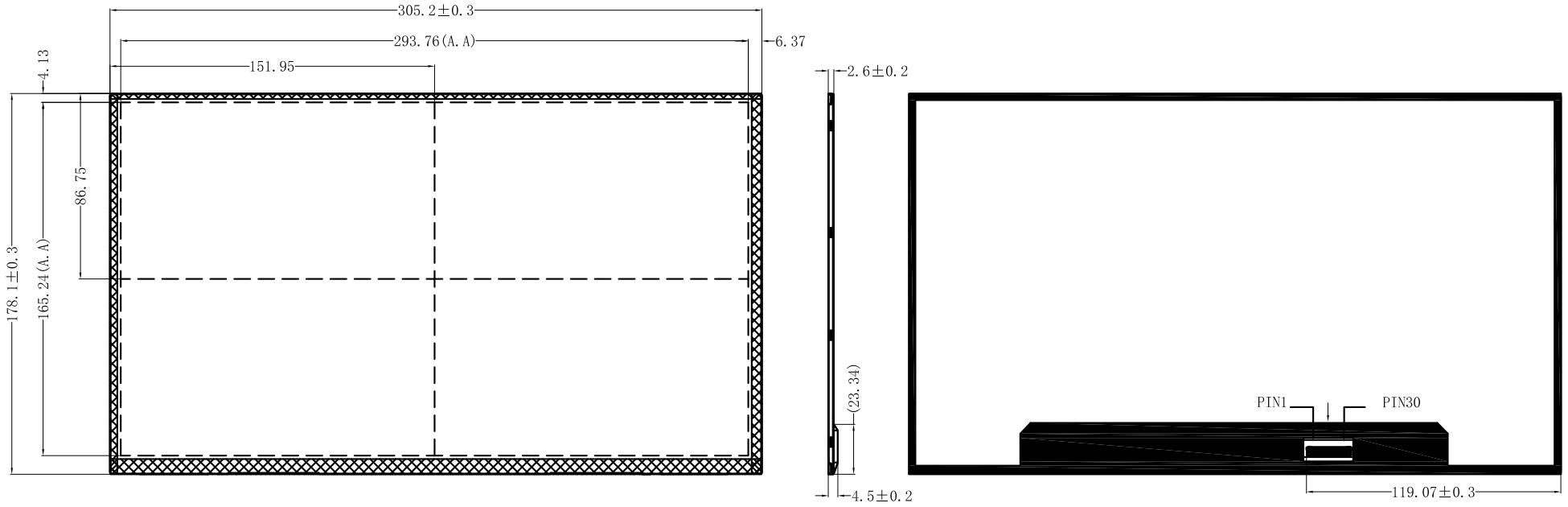
1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

7.Mechanical Drawing

Version	Mark	Modification	Date	Made by
V1.0				

MECHANICAL OUTLINE, UNIT:mm

(Unspecified Tolerances is: ±0.3 mm)



DESIGN		MODEL	T133FI315	CLASS	RATIO
		MATERIAL		FIRST PERSON	1:1
REVIEW		NO.		PAGE:1	TOTAL:1
APPROVAL		SURFACE		厦门炬垚森科技有限公司	

8. Package

TBD