SPECIFICATION
FOR
AMOLED Module

MODULE No:	KD142QHOEN001-C001A
CUSTOMER:	

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Revision History

Date	Rev. No.	Page	Summary
2024.10.16	V1.0	ALL	FIRST ISSUE
2024.10.16	V1.1	P7	Add picture
2026.01.21	V1.2	P16，P18，P19，P20	Update AC Characteristic

Contents

* Description

This is a color active matrix AMOLED module using Low Temperature Poly-silicon Thin Film Transistors as a ctive switching devices. This module has a 14.2 inch diagonally measured active area with 2650 horizonta l by 1392 vertical pixel arrays. Each pixel is divided into RED and GREEN dots, or BLUE and GREEN dot s, and two pixels share RED or BLUE dots which are arranged in vertical stripe and this module can displa y 8bit/10bit colors Depth.

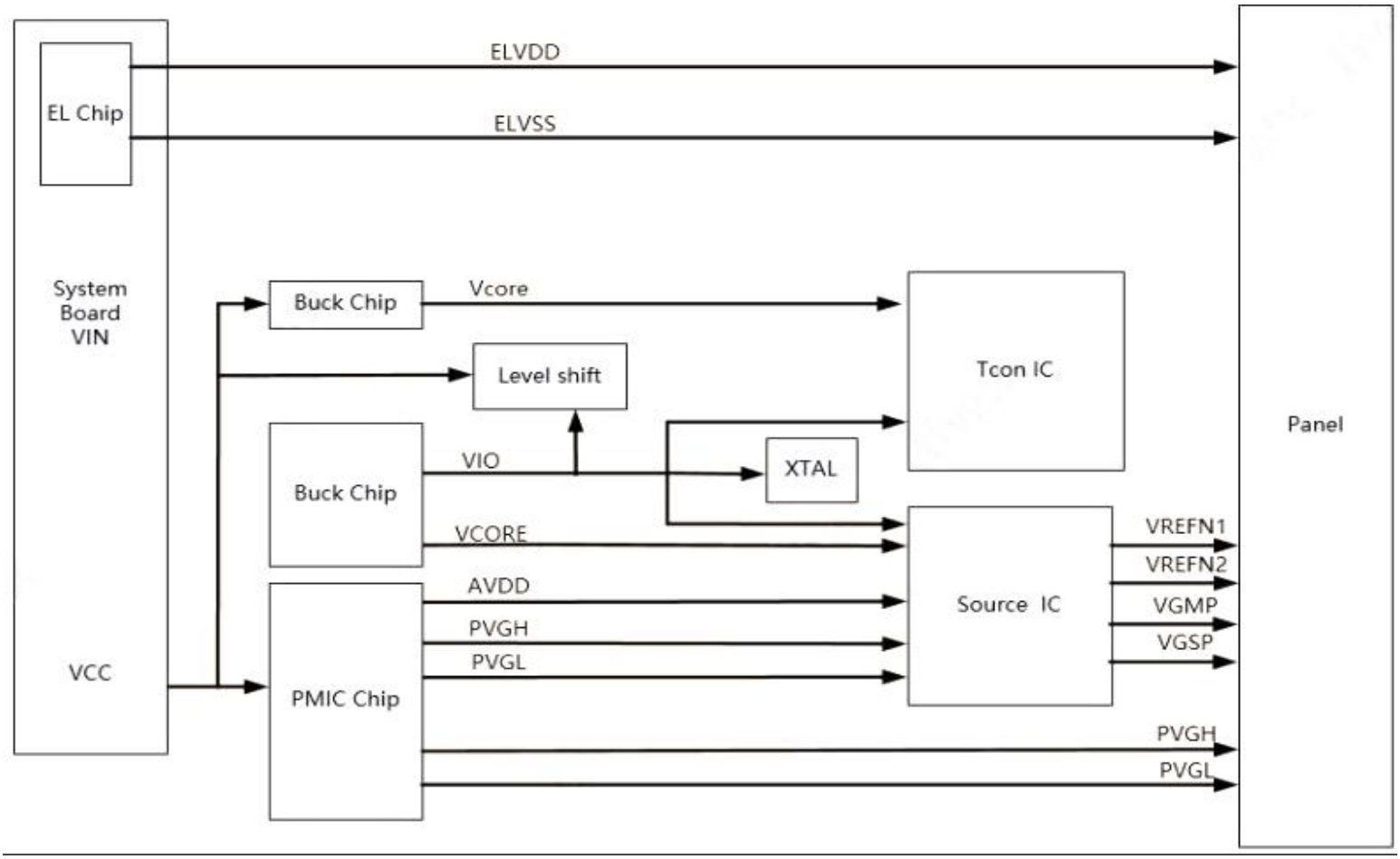
* Features

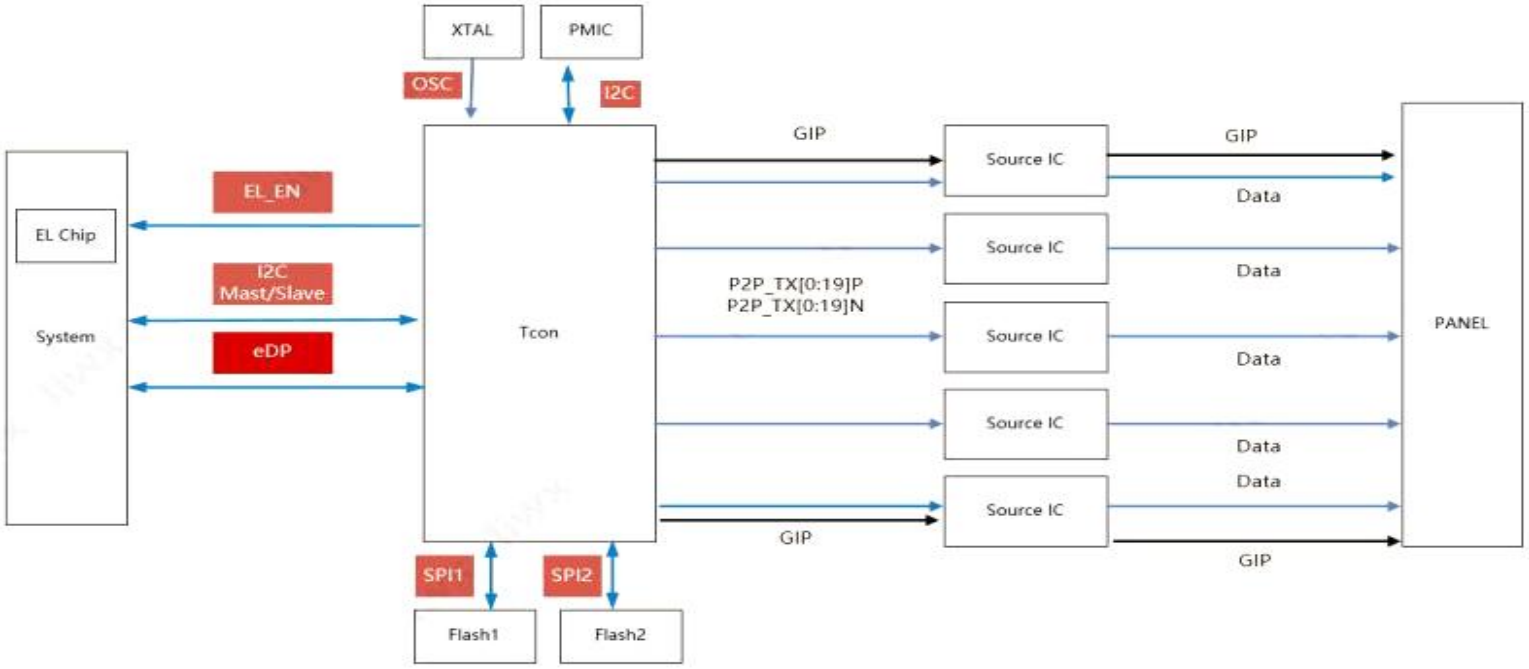
General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	319.325(H)*167.736(V) (14.2 inch)	mm	
Driver element	TFT active matrix	-	
Color Depth	8bit/10bit		
Number of pixels	2650(RGB)*1392	dots	
Pixel pitch	120.5 (Real RGB)	um	
Controller IC	TBD	-	
Touch Controller IC	TBD	-	
LCM Interface	EDP V1.4b	-	
Display mode	AMOLED	-	
Operating temperature	-40～+85	℃	
Storage temperature	-40～+90	℃	

* Mechanical Information

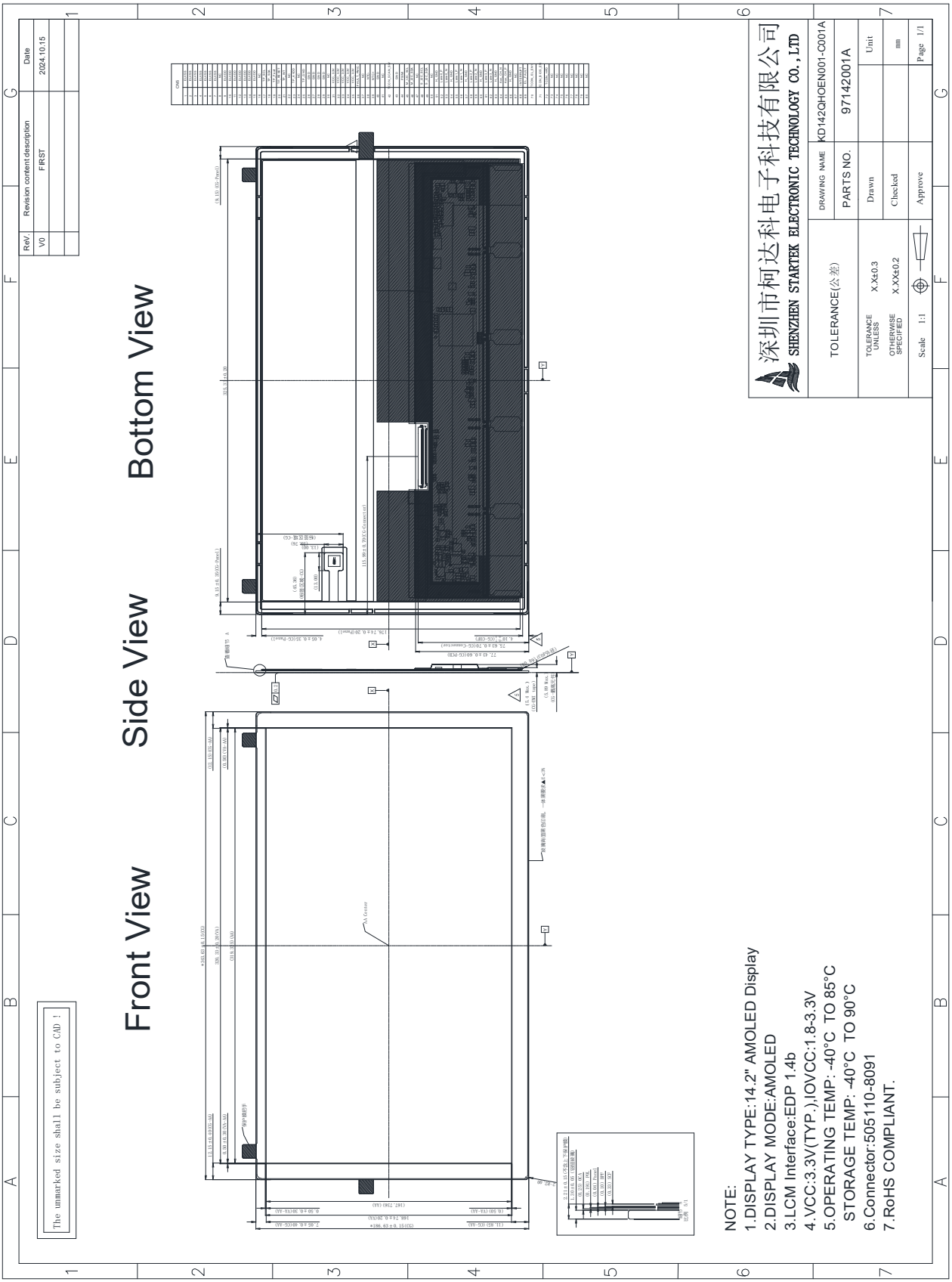
Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		343.63		mm	-
	Vertical(V)		186.63		mm	-
	Depth(D)			6.44	mm	-
Weight			370		g	-

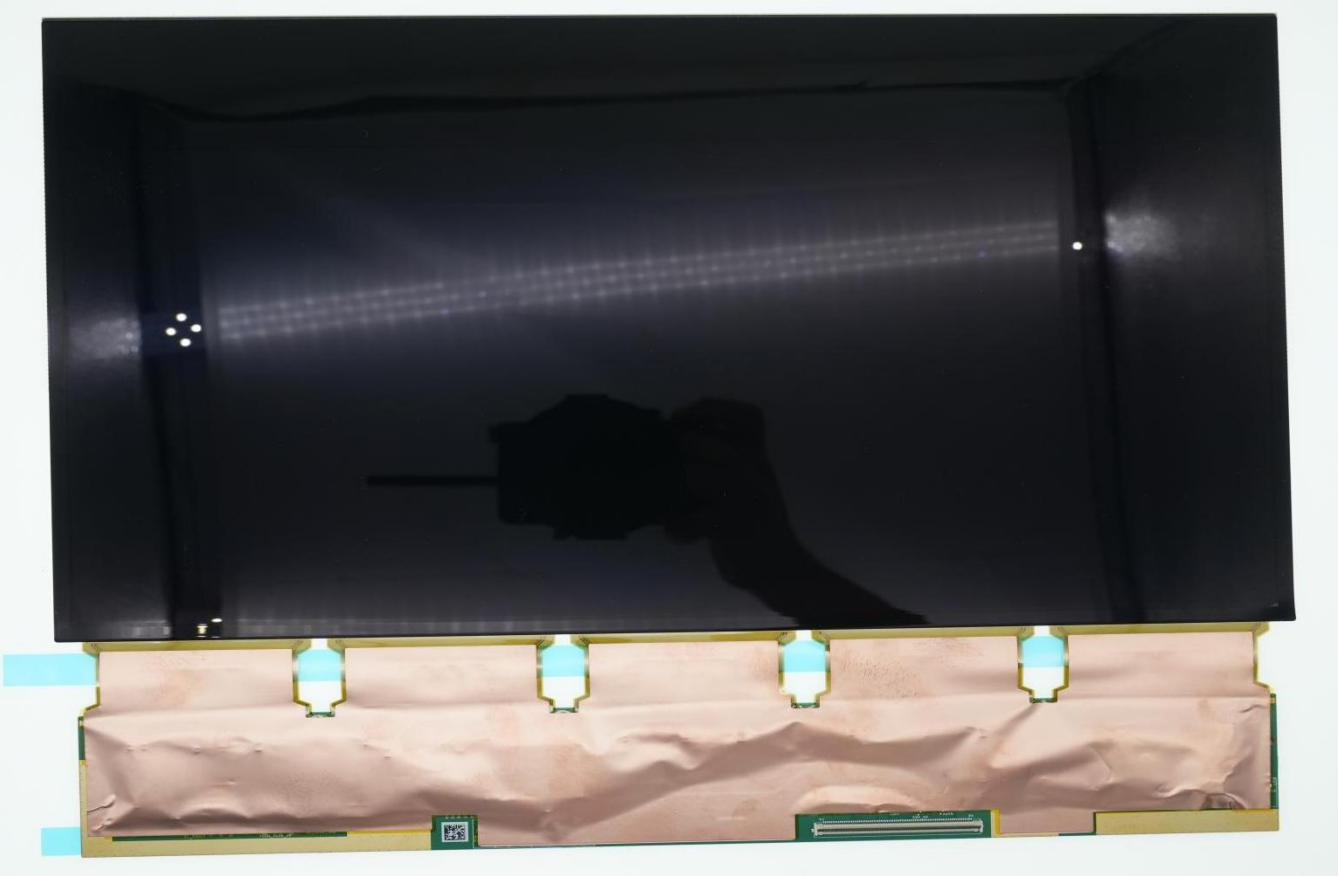
1. Block Diagram

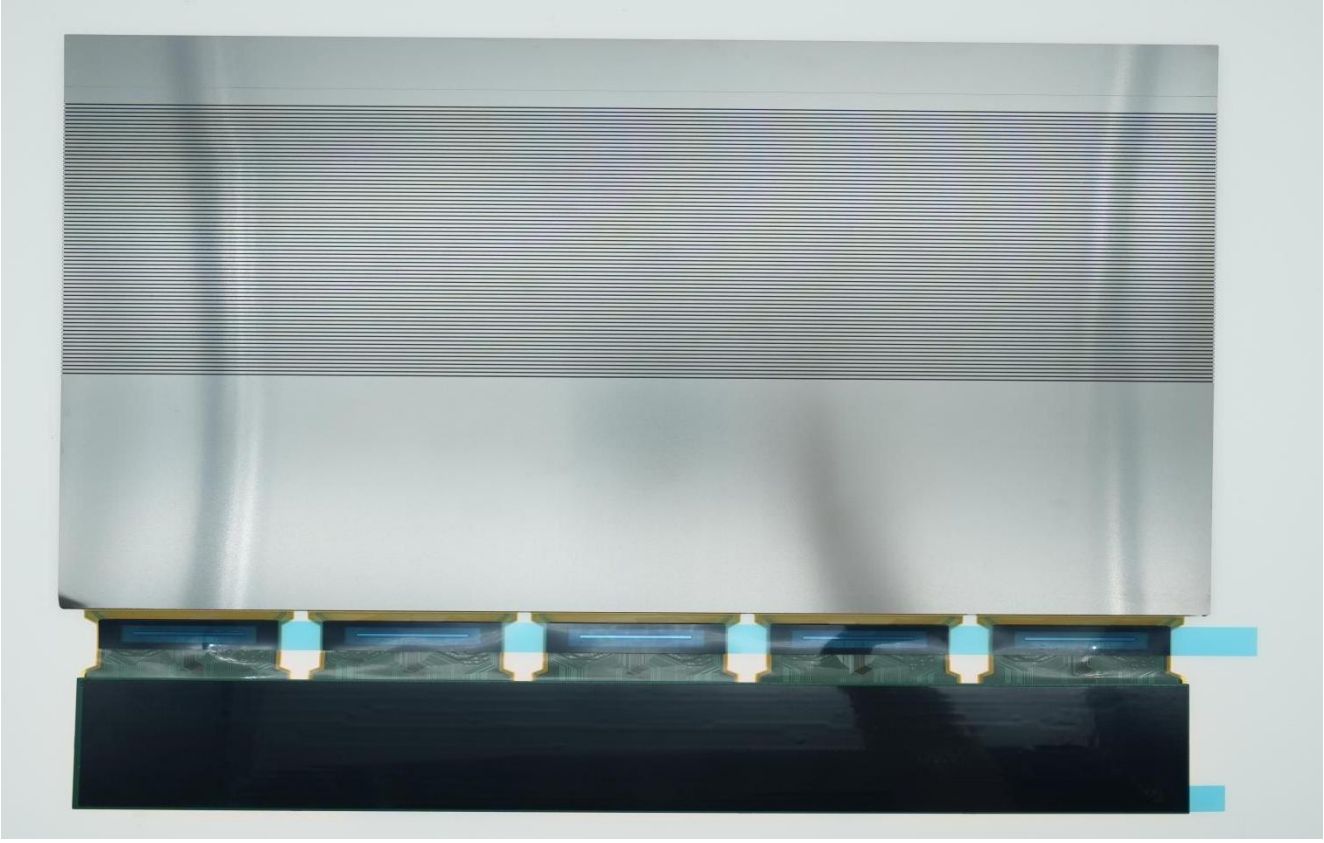




2. Outline dimension







3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	ELVSS	OLED negative power voltage	P
2	ELVSS	OLED negative power voltage	O
3	ELVSS	OLED negative power voltage	O
4	ELVSS	OLED negative power voltage	P
5	ELVSS	OLED negative power voltage	O
6	ELVSS	OLED negative power voltage	O
7	ELVSS	OLED negative power voltage	P
8	NC	No Connection	O
9	ELVDD	OLED positive power voltage	O
10	ELVDD	OLED positive power voltage	P
11	ELVDD	OLED positive power voltage	O
12	ELVDD	OLED positive power voltage	O
13	ELVDD	OLED positive power voltage	P
14	ELVDD	OLED positive power voltage	O
15	ELVDD	OLED positive power voltage	O
16	NC	No Connection	P
17	TP_SCL	I2C Clk for touch panel	I
18	TP_SDA	I2C Data for touch panel	I
19	TP_Fault	TP Self-diagnostic Pin	I
20	TP_RESET	Reest signal for touch panel	I
21	TP_INT	Interrupt signal from touch panel	P
22	NC	No Connection	P
23	TP_AVDD	Analog power for touch panel	P
24	NC	No Connection	O
25	TP_GND	Touch Ground	O
26	GND	Ground	O

27	GND	Ground	I
28	GND	Ground	P
29	GND	Ground	P
30	NC	No Connection	P
31	VCC_3.3V	Logic and driver power	
32	VCC_3.3V	Logic and driver power	
33	VCC_3.3V	Logic and driver power	P
34	VCC_3.3V	Logic and driver power	P
35	VCC_3.3V	Logic and driver power	
36	FAULT_PMIC	Power ic RTQ6751 FAULT pin	
37	NC	No Connection	I
38	NTC-	Connect to NTC	P
39	NTC+	Connect to NTC	O
40	GND	Ground	
41	NC	No Connection	
42	TCON_SCAN_SW	Display scan direction change signal	
43	GND	Ground	
44	PWMI	OLED bringhtness control singal	
45	M_I2C_SCL	I2C master	
46	M_I2C_SDA	I2C master	
47	NC	No Connection	
48	S_I2C_SCL	I2C Slave	
49	S_I2C_SDA	I2C Slave	
50	NC	No Connection	
51	H_GND	High Speed Ground	
52	Lane0_P	EDP_RX0P，True Signal Link Lane0	
53	Lane0_N	EDP_RX0N，Complement Signal Link Lane0	
54	H_GND	High Speed Ground	

55	Lane1_P	EDP_RX1P，True Signal Link Lane1	
56	Lane1_N	EDP_RX1N，Complement Signal Link Lane1	
57	H_GND	High Speed Ground	
58	Lane2_P	EDP_RX2P，True Signal Link Lane2	
59	Lane2_N	EDP_RX2N，Complement Signal Link Lane2	
60	H_GND	High Speed Ground	
61	Lane3_P	EDP_RX3P，True Signal Link Lane3	
62	Lane3_N	EDP_RX3N，Complement Signal Link Lane3	
63	H_GND	High Speed Ground	
64	Aux_CH_N	EDP_AUXN，Complement signal Aux channel	
65	Aux_CH_P	EDP_AUXP，True signal Aux channel	
66	H_GND	High Speed Ground	
67	NC	No Connection	
68	INTERRUPT	Interrupt signal to Tcon	
69	EL_FAULT	EL IC FAULT pin	
70	TCON_EL_EN1	EL_EN signal to display , TCON EL_EN	
71	TCON_BIOS_EN	BIOS_EN signal from display, TP BIOS_EN	
72	TCON_HPD	TCON HPD signal, eDP RX Hot Plug detect	
73	NC	No Connection	
74	NC	No Connection	
75	NC	No Connection	
76	NC	No Connection	
77	NC	No Connection	
78	NC	No Connection	
79	NC	No Connection	
80	NC	No Connection	

4. AMOLED Optical Characteristics

4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	Θ=0 Normal	10000	--	--		(1)(2)
LCM Luminance		LV	White Mode		650		cd/m2	
Color gamut		S(%)	vs. NTSC	90	100	--	%	(1)
Color Filter Chromacicity	White	W_X		-0.04	0.310	+0.04		(1)(4)
		W_Y			0.330			
	Red	R_X			0.680			
		R_Y			0.315			
	Green	G_X			0.250			
		G_Y			0.710			
	Blue	B_X			0.140			
		B_Y			0.050			
OLED Life Time				--	TBD	--	Hrs	
Option View								

*The data comes from the LCD specification.

Measuring Condition

Measuring surrounding : dark room

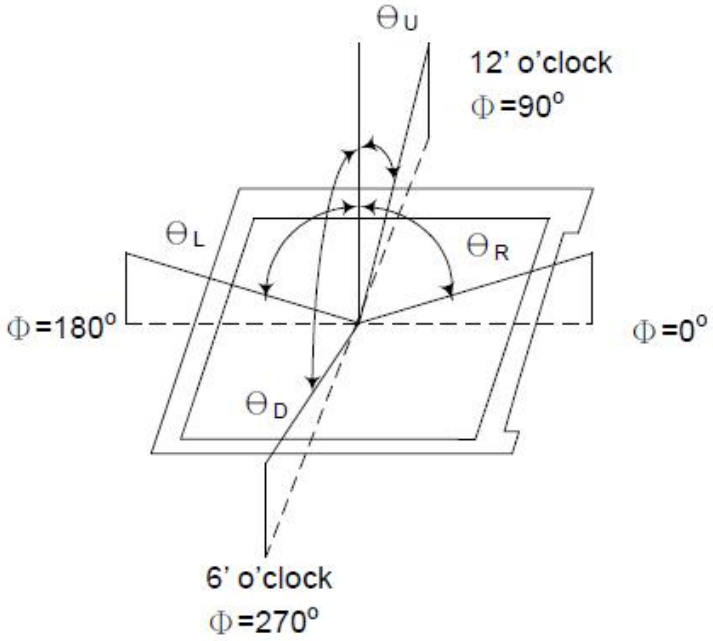
Ambient temperature : 25±2oC

15min. warm-up time.

Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

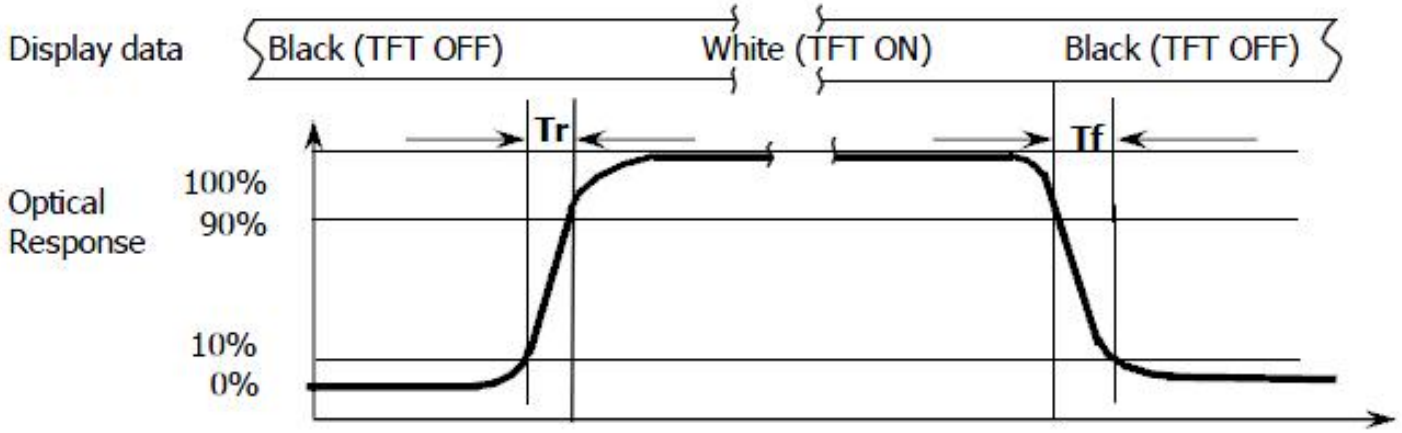
Note (1): Definition of Viewing Angle :



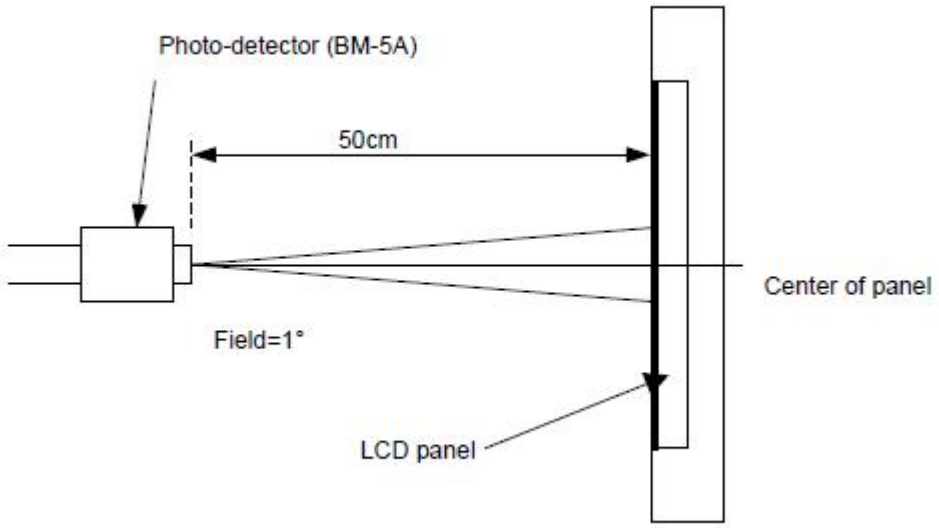
Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3): Response Time



Note (4): Definition of optical measurement setup



5. AMOLD Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Max.	Unit
VIN Power supply	VCC	0	6.0	V
Positive power for OLED	ELVDD	+2.8	+8.0	V
Negative power for OLED	ELVSS	-18.0	-4.0	V

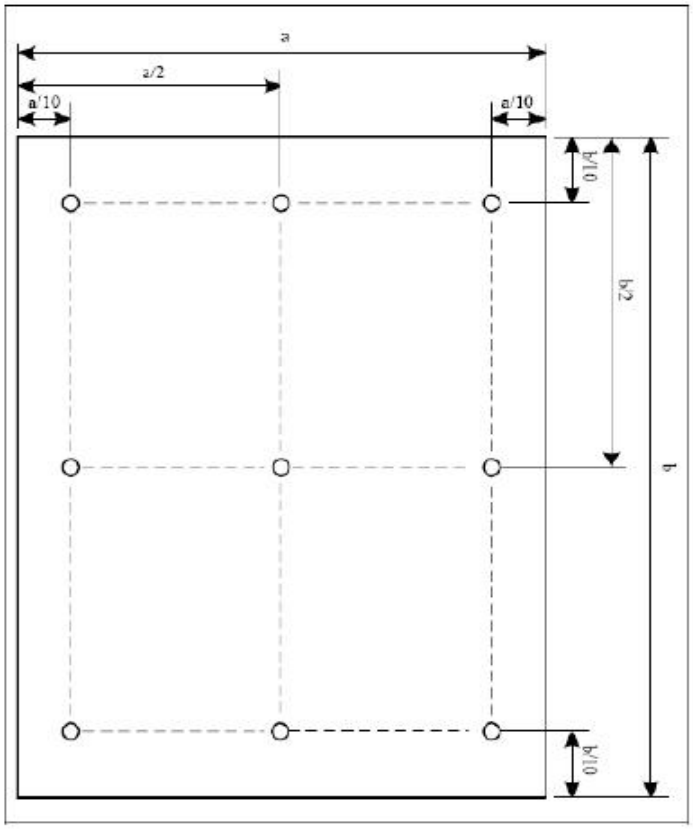
NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
VIN Power supply	VCC	2.96	3.3	3.6	V	--
Positive Output voltage total variation	ELVDD	-	4.60	-	V	--
		-1.0	-	+1.0	V	--
Default Negative Output voltage	ELVSS	-	4.0	-	V	--
		-1.0	-	+1.0	V	--
Level input voltage	V_{IH}	0.65*VCC	-	3.63	V	--
	V_{IL}	0	-	0.35*VCC	V	--
Level output voltage	V_{OH}	0.45*VCC	-	VCC	V	--
	V_{OL}	0	-	0.45	V	--
Normal （720nit White 255）	I_{ELVDD} /I_{ELVSS}	-	1250	-	mA	
	I_{Vcc}	-	450	-	mA	
Power consumption（White 255）	P	-	10750	-	mW	

Note: The current and power consumption were tested under White pattern，25℃

NOTE 3：Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

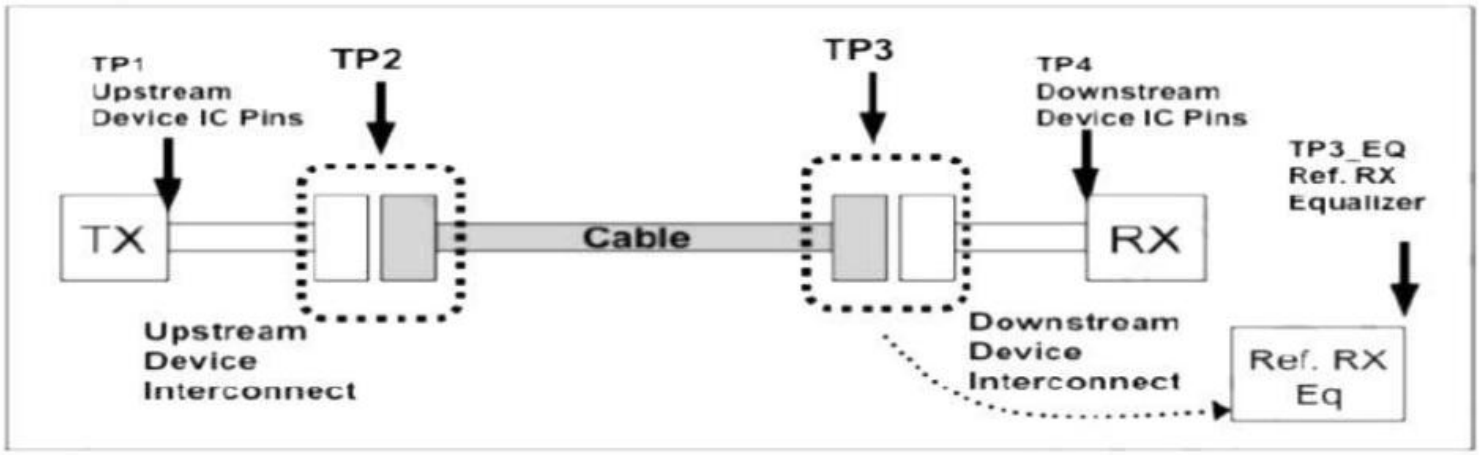
6. AC Characteristic

6.1 eDP Interface Characteristics

eDP RX Main-Link

Specification	Description	Min	Typical	Max	Unit	Condition
Datarate	Data Transfer Rate	1.62	-	8.1	Gbps	Supports 1.62/2.16/2.43/2.7/3.24/4.32/5.4/8.1Gbps
Rterm_Differential	Differential Input Termination Impedance	-	85	-	Ω	-
Common Mode Voltage	Input Common Mode Voltage	0	-	1.8	V	-
Differential Vin_p2p	Differential Input Voltage Peak-to-Peak	75	-	1320	mV	Measured at TP4 point
Down Spread Amplitude	Link Clock Down-Spread Range	0	-	0.005	-	Maximum SSC 0.5% down-spread @30KHz~33KHz
Intra-pair Skew Tolerance	Skew Between PADP & PADN in the Same Lane	-	-	3	ps	Measured at TP4 point
Different-pair Skew Tolerance	Skew Between PADP & PADN Across Different Lanes	-	-	25	ps	Measured at TP4 point
AC couple Capacitor	AC Coupling Capacitor	75	-	265	nF	At least one AC coupling capacitor on TX/RX side
I_short	Short-Circuit Current	-	-	50	mA	2.0V over 40Ω

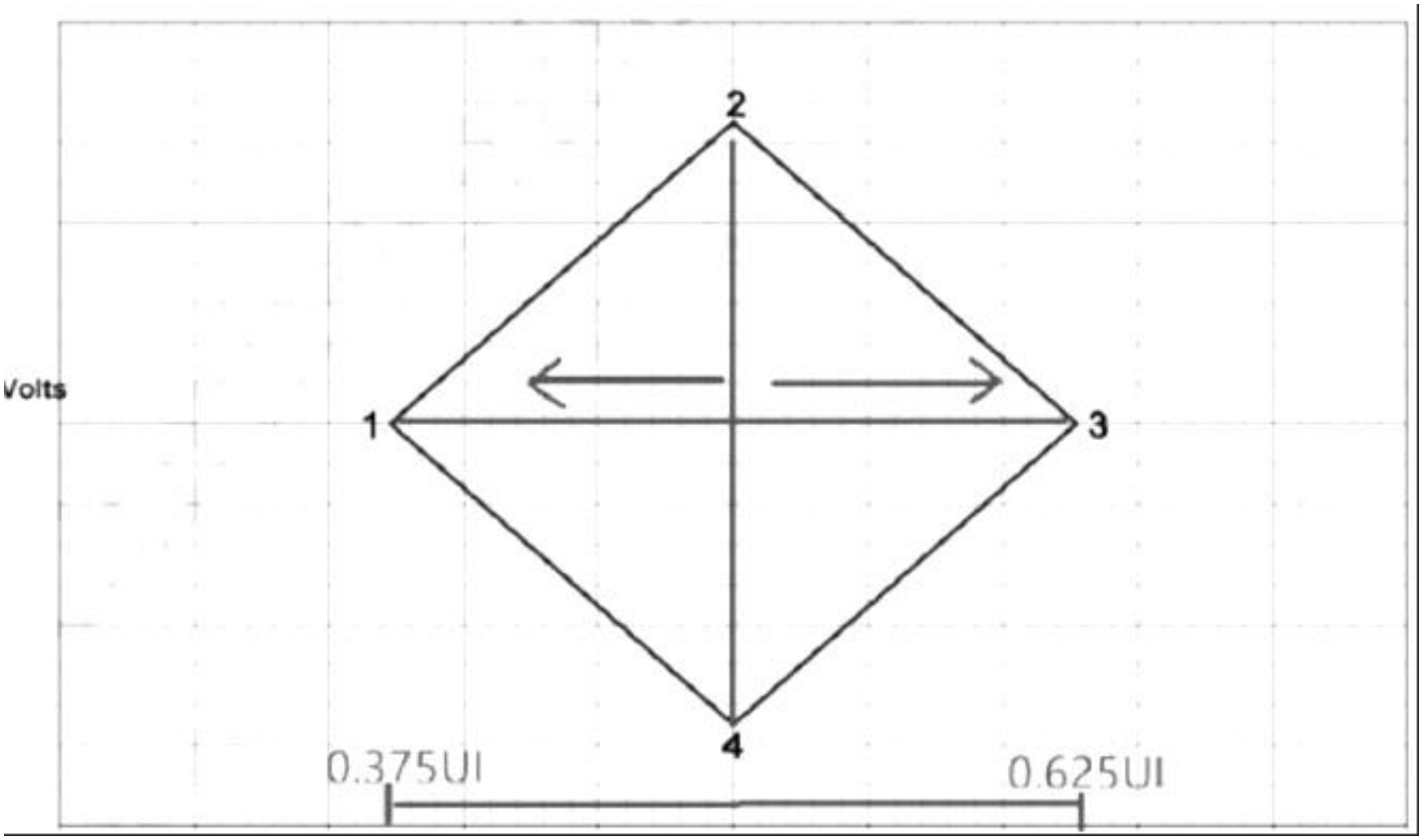
TP1~TP4 Port Description



- TP1-eDPTX packagepins;
- TP2-Source device eDP Cable Connector;
- TP3-Sink device (panel) eDP Cable Connector;
- TP3_EQ-After Reference RX Equalizer;
- TP4-eDPRX package pins。

eDP RX Main-link

The eDPRX observes the eye at TP3_EQ after the transmitted data passes through the reference equalization (ref.RX EQ), to evaluate whether the transmitter data and channel meet the requirements.Below are the eye diagram template requirements at eDPRX TP3_EQ.



1	Any UI location (x), where the EYE width is open from x to x + 0.5UI	0.0000
2	Any Passing UI location between 0.375 and 0.625UI	0.0375
3	Point 1 + 0.5UI	0.0000
4	Same as Point 2	-0.0375

eDP RX AUX

Symbol	Parameter Description	Min	Typical	Max	Unit	Notes
UI_MAN	Unit Interval of Initial Symbol Code	0.4	-	0.6	us	Includes coding overhead; bit rate in Mbps
Pre-charge Pulses	Number of Pre-charge Pulses	10	-	16	-	Each pulse contains the initial symbol code "0"
TAUX-BUS-PARK	AUX CH Bus Park Time	10	-	-	ns	Bus park time after AUX CH STOP
Tcycle-to-cycle jitter	Maximum Allowed UI Variation for Single Bit Cycle at Transmitter Connector Pins	-	-	0.08	UI	Max 48ns; Transmitter is upstream device (request) or downstream device (response)
	Maximum Allowed UI Variation Between Adjacent Bits at Transmitter Connector Pins	-	-	0.04	UI	Max 24ns; Transmitter is upstream device (request) or downstream device (response)
	Maximum Allowed UI Variation for Single Bit Cycle at Receiver Connector Pins	-	-	0.1	UI	Max 60ns; Transmitter is upstream device (request) or downstream device (response)

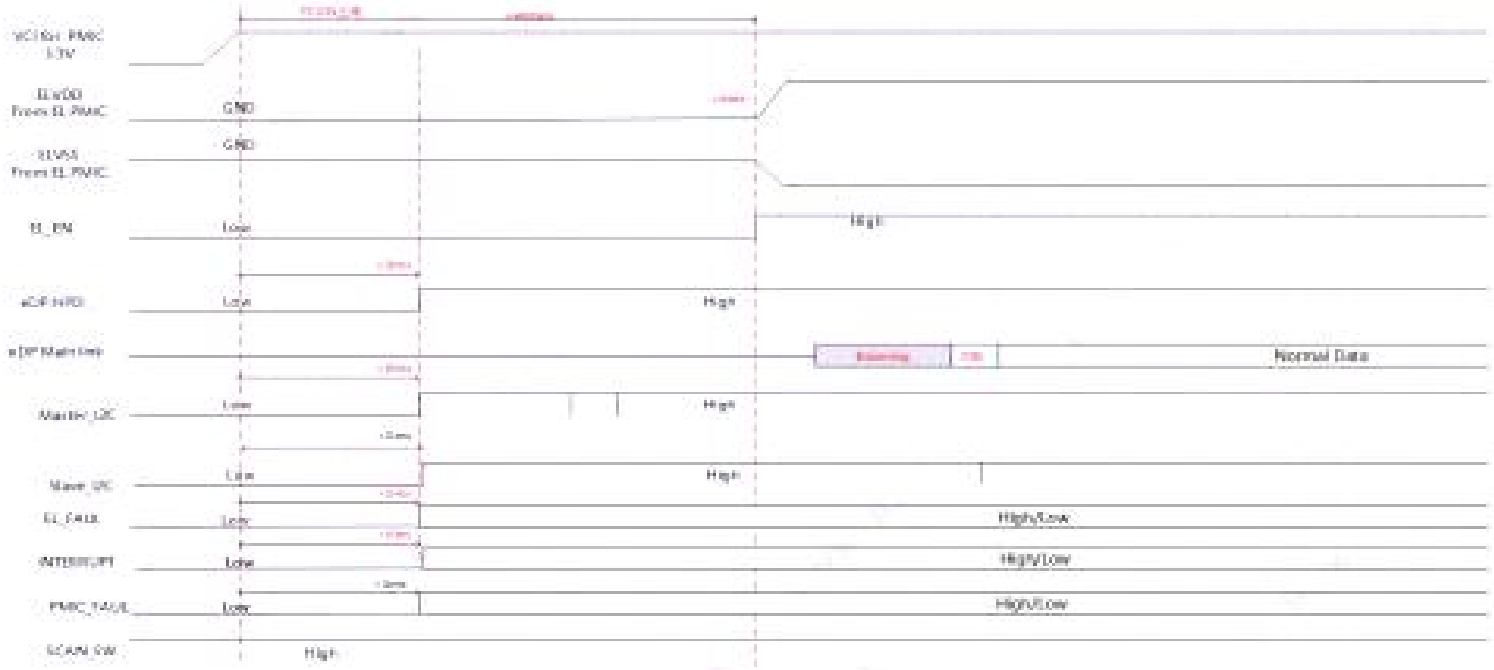
	Maximum Allowed UI Variation Between Adjacent Bits for Single Bit Cycle at Receiver Connector Pins	-	-	0.05	UI	Max 30ns; Transmitter is the upstream device for requests and downstream device for responses
V_AUX-DIFFp-p	AUX Peak-to-Peak Voltage at TP1	0.18	0.2	1.38	V	V_AUX-DIFFp-p = 2 * |VAUXP-VAUXN|
	AUX Peak-to-Peak Voltage at TP3	0.14	-	1.36	V	
V_AUX_TERM_R	AUX CH Port DC Resistance	-	100	-	Ω	-
V_AUX-DC-CM	AUX DC Common Mode Voltage	0	-	2	V	Common mode voltage equals Vbias_TX (or Vbias_RX)
V_AUX-TURN-CM	Adjustable Common Mode Voltage Range of AUX	-	-	0.3	V	Offset of steady-state common mode voltage between transmitter and receiver
I_AUX_SHORT	AUX Short-Circuit Current Limit	-	-	90	mA	Total device current when short-circuited to ground

CAUX	AUX AC Coupling Capacitor	75	-	200	nF	AUX coupling capacitor placed between DP upstream and downstream devices
SRAUX_20-80	AUX Slew Rate (20%-80%)	-	-	375	mV/ ns	Measured between 20%-80% of the rising/falling edge

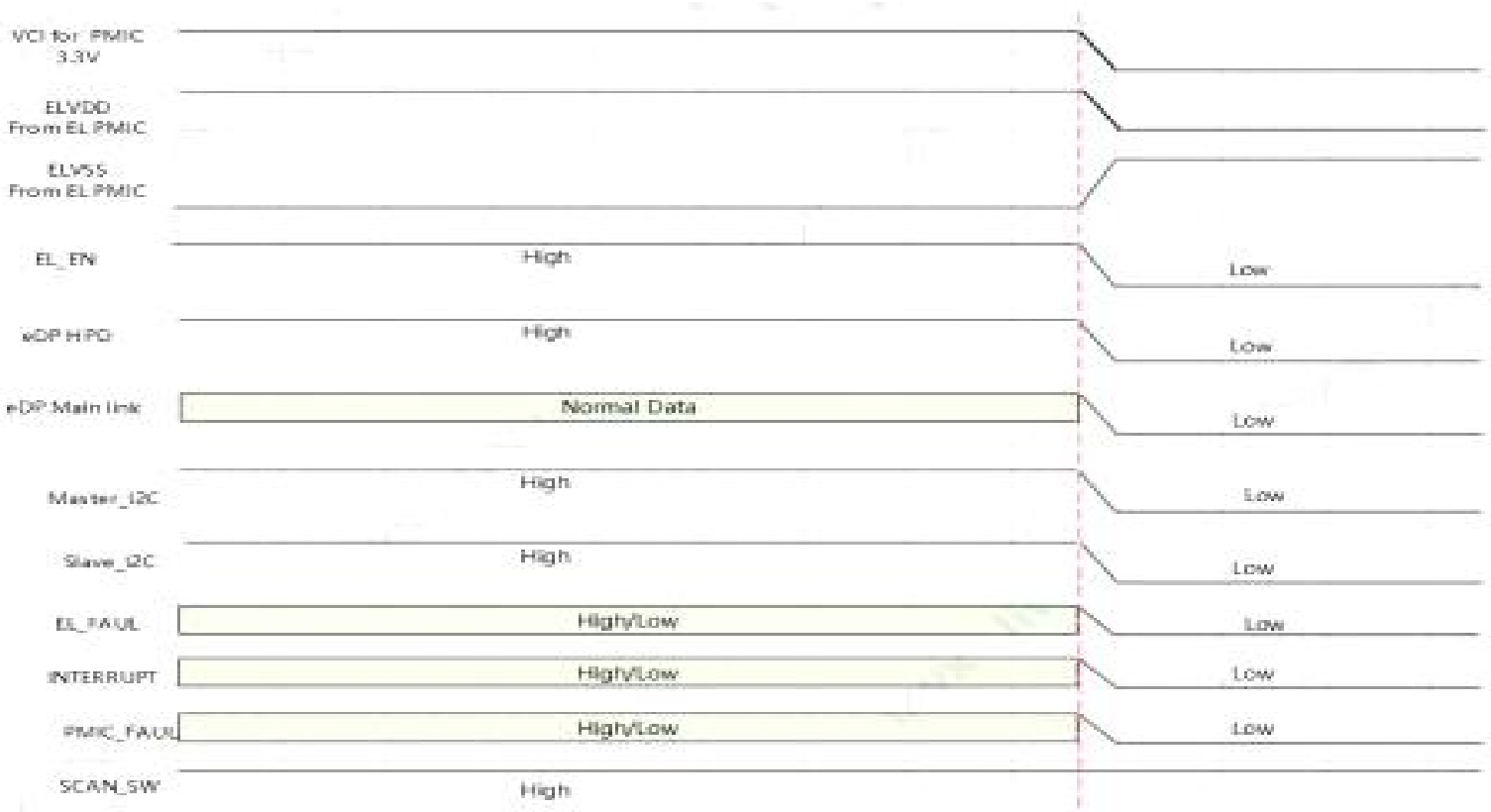
6.2 I2C Timming Chart

Parameter	Symbol	Standard Mode		Fast Mode		Unit
		Min	Max	Min	Max	
SCL Clock Frequency	f_{SCL}	0	100	0	400	kHz
Start Hold Time	$t_{HD:STA}$	4	-	0.6	-	μs
SCL Low Period	t_{LOW}	4.7	-	1.3	-	μs
SCL High Period	t_{HIGH}	4	-	0.6	-	μs
Start Setup Time	$t_{SU:STA}$	4.7	-	0.6	-	μs
Data Hold Time	$t_{HD:DAT}$	0	3.45	0	0.9	μs
Data Setup Time	$t_{SU:DAT}$	250	-	100	-	ns
SDA, SCL Rise Time	t_r	-	1000	$20+0.1C_b$	300	ns
SDA, SCL Fall Time	tp	-	300	$20+0.1C_b$	300	ns
Stop Setup Time	$t_{SU:STO}$	4	-	0.6	-	μs
Bus Free Time Between Start and Stop	t_{BUF}	4.7	-	1.3	-	μs
Bus Load	C_β	-	400	-	400	pF
Low Level Noise Margin	V_{NL}	$0.1V_{DD}$	-	$0.1V_{DD}$	-	V
High Level Noise Margin	V_{NH}	$0.2V_{DD}$	-	$0.2V_{DD}$	-	V

6.3 Power On Sequence



6.4 Power Off Sequence



6.5 Input timing

Items		Min	Typ	Max	Unit
DCLK	Clock Frequency	253.9	254.6	255.3	MHz
	Clock Period	3.94	3.92	3.91	ns
HS	Horizontal Valid Area		2650		CLK
	Hsync pulse Width	36	36	36	CLK
	Hsync Back-Porch	28	28	28	CLK
	Hsync Front-Porch	130	138	146	CLK
	1 horizontal line	2844	2852	2860	CLK
VS	Vetical Valid Area		1392		H
	Vsync pulse width	16	16	16	H
	Vertical Back-Porch	44	44	44	H
	Verticak Front-Porch	36	36	36	H
	1 vertical field	1488	1488	1488	H
FR	Frame rate		60		Hz

7. Touch Specification

7.1 Electrical Characteristics

7.1.1 Absolute Maximum Rating

Item	Symbol	Min.	Max.	Unit	Note
TP power supply Input	TSP_AVDD	-0.3	3.9	V	
TP power supply for logic circuits	TSP_DVDD	-0.3	3.9	V	
Operating temperature	T_{OP}	-40	+85	℃	
Storage temperature	T_{ST}	-40	+90	℃	

7.1.2 DC Electrical Characteristics (Ta=25℃)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
TP power supply Input	TSP_AVDD	2.8	3.3	3.4	V	
TP power supply for logic circuits	TSP_DVDD	2.8	3.3	3.4	V	

8. Quality Level

8.1 AMOLED Module of Characteristic Inspection

The environmental condition and visual inspection shall be conducted as below:

(1) Ambient temperature: 23± 3℃

(2) Humidity: 55 ± 10%RH

(3) Ambient light intensity of visual inspection: 800 ~1300 lux

(4) Ambient light intensity of electrical inspection: <200lux

(5) Viewing Distance: 30~35cm

(6) Viewing angle: ±45°

8.2 Sampling Procedures for each item acceptance table

Defect type	Sampling Procedures	AQL
Major defect	GB/T2828.1-2012 Inspection levelⅡ normal inspection single sample inspection	0.4
Minor defect	GB/T2828.1-2012 Inspection levelⅡ normal inspection single sample inspection	0.65

Major defect:

Any defect may result in functional failure, or reduce the usability of product for its purpose. For example, no display, abnormal display, bright lines, dark lines, dimensional mismatch, etc.

Minor defect:

A defect does not reduce the usability of product for its intended purpose, such as bright and dark dot, foreign body, scratch, bubble, un-uniformity display, etc.

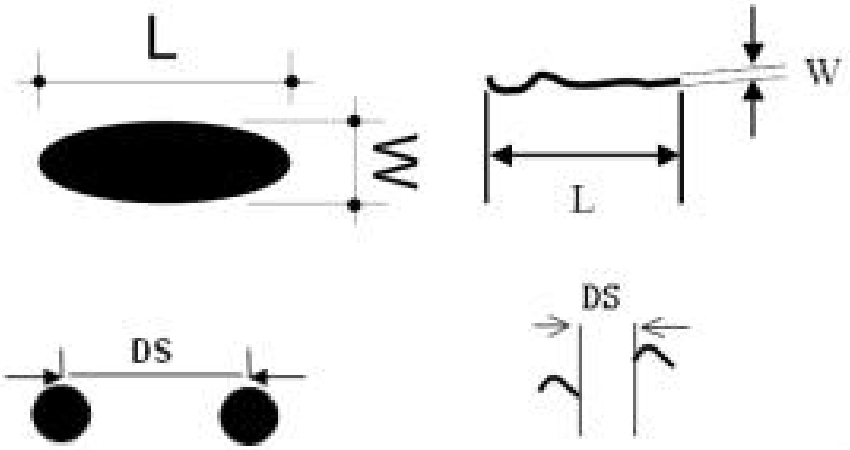
The criteria on major and/or minor judgment will be according with the degree of impact on the quality of product.

8.3 Appearance Inspection Item

No	Item	Level Surface	Criterion of Inspection				Defect Type
1	Dot defect-Bright point	Level 0	NG;				Minor
2	Dot defect-Dark point	Level 0	D (mm)	DS (mm)	acceptance		
			D≤0.15	-	ignore		Minor
			0.15 < D≤0.2	DS≥10	N≤5		
			0.2 < D	/	0		
3	Black-and-White Point, concave point, Emboss point, bubble		D (mm)	DS (mm)	acceptance		Minor
		Level 0/1	D≤0.15	-	ignore		
		Level 0/1	0.15 < D≤0.3	DS≥10	N≤4		
			0.3 < D	/	0		
4	Line defect(visible in appearance and invisible in light mode, such as fine scratch, filament, etc.)		W (mm)	L (mm)	DS (mm)	acceptance	Minor
		Level 0/1	W≤0.05	-	-	ignore	
		Level 0/1	0.05 < W≤0.10	L≤5	DS≥10	N≤4	
5	Mura	Level 0	Sensory cannot exist Or Follow limited sample				Minor
6	Full Sky Star	Level 0	Not allowed				Minor
7	Flaw&chipping	Level 0/1	Z≤t,X≤0.5mm,Y≤4mm Flaw Not allowed, Sealant damage Not allowed (t=0.4mm) 				Minor
8	Smear	Level 0	If wipe disappear in 3 seconds, judge OK If wipe existence, follow point or line defect rule				Minor
9	FPC/ Snap	Level 2	Not Allow :indenture, pinhole Snap NG:Fracture or fall off				Minor
10	Marking/ QR code	Level 2	Can be recognized				Minor
11	Display function	Level 0	NG: Black screen, Splash screen, blurred screen, shadow				Minor
12	Mylar	Level 2	NG: worn, Scratches follow Scratches rule				Minor
13	Bright line of Mylar	Level 2	W (mm)	L (mm)	DS (mm)	acceptance	Minor

8.4 The term definition of defect

V/A: View Area, L: Length, W: width , Z: thickness , D: Diameter, DS :Distance



Level 0: Important areas such as information or taking photo on the display screen. For example, AA display area

Level 1: The main surface exposed can be seen directly during normal use, such as the front side except level 0. For example, non-display area outside AA area, CG ink area.

Level 2: The reverse side of screen except camera hole, ICON, and IR hole area, such as FPC.

9. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	85℃,96H	IEC60068-2-2,GB2423.2
Low Temperature Operating	-40℃, 96HR	IEC60068-2-1 GB2423.1
High Temperature Storage	90℃, 96HR	IEC60068-2-2 GB2423.2
Low Temperature Storage	-40℃, 96HR	IEC60068-2-1 GB2423.1
High Temperature & High	+65℃, 93% RH ,96 hours.	IEC60068-2-78 GB/T2423.3
Thermal Shock (Non-operation)	-40℃,30 min ↔ 80℃,30 min, Change time:5min 20CYC.	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22

Note： Product reliability items in the form of GK are used as reference items. The test results shall refer to the results of the reliability test of Visionox standards.

10. Cautions and Handling Precautions

10.1 Handling Precautions:

(1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from height..
(2) Do not press down the screen or the adjoining areas too hard because the color tone may be shifted.
(3) The polarizer covering the display surface of the AMOLED module is soft and easily scratched. Handle this polarizer carefully.
(4) If the display surface is contaminated, blow on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear, moisten the cloth with ethyl alcohol.
(5) Solvents may damage the polarizer. Do not use water, ketone or aromatic solvents except ethyl alcohol.
Do not attempt to disassemble the AMOLED Module.
(6) If the logic circuit power is off, do not apply the input signals.
(7) To prevent destruction from static electricity, be careful to maintain an optimum working environment.
(8) Be sure to make yourself in contact with the ground when handling with the AMOLED Modules.
(9) Tools required for assembly, such as soldering irons, must be properly ground.
(10) To reduce the generation of static electricity, do not conduct assembly or other work under dry conditions.
(11) To protect the display surface, the AMOLED Module is coated with a film. Be careful when peeling off this protective film, because static electricity may generate.

10.2 Storage Precautions.

(1) When storing the AMOLED modules, be sure that they are not directly exposed to the
sunlight or the light of fluorescent lamps.
(2) The AMOLED modules should be stored under the storage temperature range. If the AMOLED modules will be stored for a long time, the recommended condition is: Temperature: 0℃~40℃ Relatively humidity: ≤80%
(3) The AMOLED modules should be stored in the room without acid, alkali or harmful gas.

10.3 Transportation Precautions:

(1) The AMOLED modules should not be suffered from falling and violent shocking during transportation. Besides, excessive press, water, damp and sunshine, should be avoided.

11. Packing

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