Product Specification

(√) Preliminary Specification
( ) Approval Specification

The information described in this SPEC is preliminary and can be changed without prior notice.

DATE OF ISSUE	.

MODEL NO.	LR1012K01
EXTENSION CODE	-T

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REVISION HISTORY

Date.	Rev.No.	Page	Revision Description
13-09-06	P00	All	Initial Release

1. GENERAL DESCRIPTION

DESCRIPTION

LR1012K01 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as switching devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight unit. The resolution of a 10.1" contains 2560 x 1600 and can display up to 16,194,277 colors. 6 O'clock direction is the optimum viewing angle.

FEATURES

High contrast ratio, Ultra wide viewing angle
WQ (2560 x 1600) resolution
Low power consumption
LED Back Light with internal LED Driver
eDP(V1.1) Input Interface

APPLICATIONS

Tablet PC
If the intent to use this product is for other purpose, please contact our.

GENERAL INFORMATION

Item	Specification	Unit	Note
Display area	216.576(H) X 135.36(V) (10.05”diagonal)	mm	
Driver element	a-Si TFT active matrix		
Display colors	16,194,277		6bit+FRC
Resolution	2560 * 1600		16:10
Pixel arrangement	RGBW vertical stripe		
Pixel pitch	0.0423 (H) x 0.0846 (V) (TYP.)	mm	
Display Mode	Normally black (PLS mode)		
Surface treatment	2H		Glare

MECHANICAL INFORMATION

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	232.02	232.22	232.42	mm	
	Vertical (V)	156.72	156.92	157.12	mm	
	Depth (D) Body	-	2.84	3.04	mm	(1) Active Area
	Depth (D) Max	-	4.90	5.20	mm	(1) PCB Area
Weight				160	g	

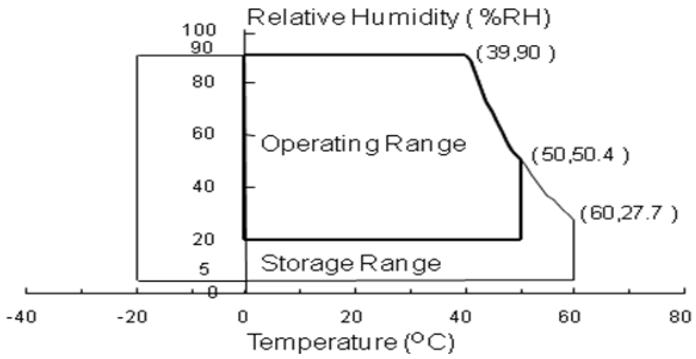
NOTE (1) Thickness Measuring Method
. Equipment : height gauge

2. ABSOLUTE MAXIMUM RATINGS

2.1 ENVIRONMENTAL ABSOLTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	TSTG	-20	60	°C	(1)
Operating temperature (Temperature of glass surface)	TOPR	0	50	°C	(1)
Shock (non-operating)	Snop	-	240	G	(2), (4)
Vibration (non-operating)	Vnop	-	2.41	G	(3), (4)

Note (1) The range of temperature and relative humidity is shown in the graph below 90% RH Max. .
(39℃ ≥ Ta) If the temperature is higher than 40 ℃, the maximum temperature of wet–bulb shall be less than 39℃. No condensation



(2) Vibrate ±X, ±Y, and ± Z axis in the shape of the half sine wave one time for 2ms.
(3) Vibrate the X, Y, and Z randomly within a 5 - 500 Hz range for 30min.
(4) When testing a vibration and a shock, the fixture, which holds the module to be tested, shall be hard and rigid in order for the module not to be twisted or bent by the fixture.

2.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

V_{LCD_VCC}=3.3V, V_{SS} = GND = 0V

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VLCD_VCC	VSS - 0.3	VLCD_VCC + 0.3	V	(1),(2),(3)
EDP Differential Input Voltage	[VIDM]	100mV	1320mV		

Note (1) Within Ta (25 ± 2 °C)

(2) Permanent damage to the device may occur if exceed maximum values.

(3) Functional operation should be restricted to the conditions described under normal operating conditions.

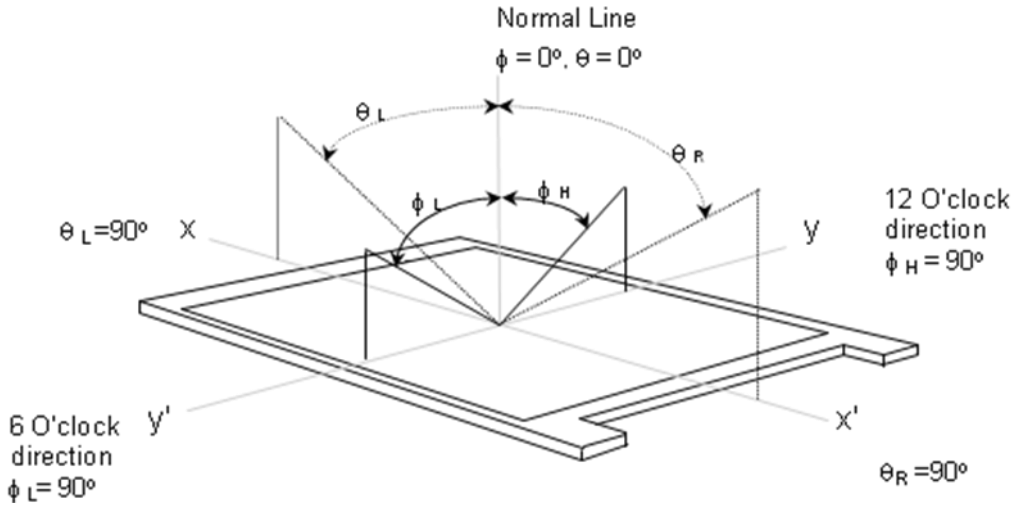
3. OPTICAL CHARACTERISTICS

The following items are measured under the stable conditions.* The optical characteristics should be measured in the dark room or the equivalent environment by the methods shown in the Note (5).
Measuring equipment: TOPCON SR-3

Ta = 25 ± 2 °C, V_{LCD_VCC}=3.3V, f_V = 60Hz, f_{DCLK} = 268.6MHz

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (5 points)		CR	Normal Viewing Angle $\phi = 0$ $\theta = 0$	600	800	-	-	(1),(2), (5),(6)
Response time (Rising + Falling)		T_{RT}		-	16	25	msec	(1),(3)
Average Luminance of White (5 Points)		$Y_{L,AVE}$		310	370	-	cd/m^2	IF=100% Duty (1),(4)
Gamma		G		1.9	2.2	2.5	-	(7)
Gamma (Full White@DBLC On)		G		-	2.2	-		
Color Chromaticity (CIE)	Red	R_X		-0.03	0.637	+0.03	(1),(5),(8) SR-3	(1),(5) SR-3
		R_Y			0.338			
	Green	G_X			0.295			
		G_Y			0.602			
	Blue	B_X			0.149			
		B_Y			0.071			
	White	W_X			0.311			
		W_Y			0.320			
Viewing Angle	Hor.	θ_L	CR ≥ 10 At center	80	89	-	(1),(5),(8)	(1),(5)
		θ_H		80	89	-		
	Ver.	ϕ_H		80	89	-		
		ϕ_L		80	89	-		
Color Gamut		CG		65	72	-	%	
White variation (13P)		δ_L		-	-	1.7		(6)

Note (1) The definition of viewing angle: The range of viewing angle (10 ≤ C/R)

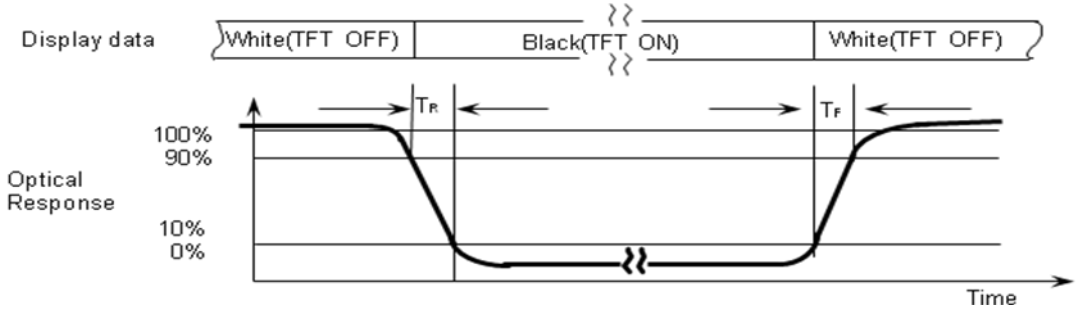


Note (2) The definition of contrast ratio (CR): The ratio of max. gray and min gray at 5 points (4, 5, 7, 9, and 10)

$$CR = \frac{CR(4) + CR(5) + CR(7) + CR(9) + CR(10)}{5}$$

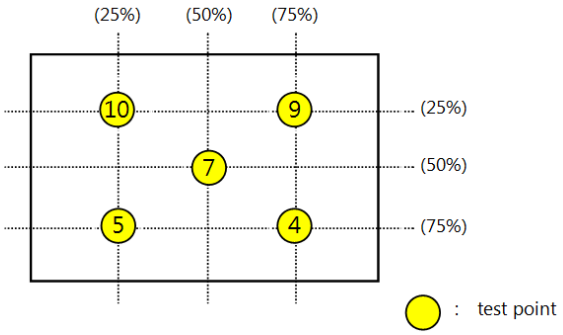
Points = ④ , ⑤ , ⑦ , ⑨ , ⑩ at the figure of Note(6).

Note (3) The definition of Response time: Subtotal of the time, during which the transmission changes from 10% to 90% when the TFT turns on and off.

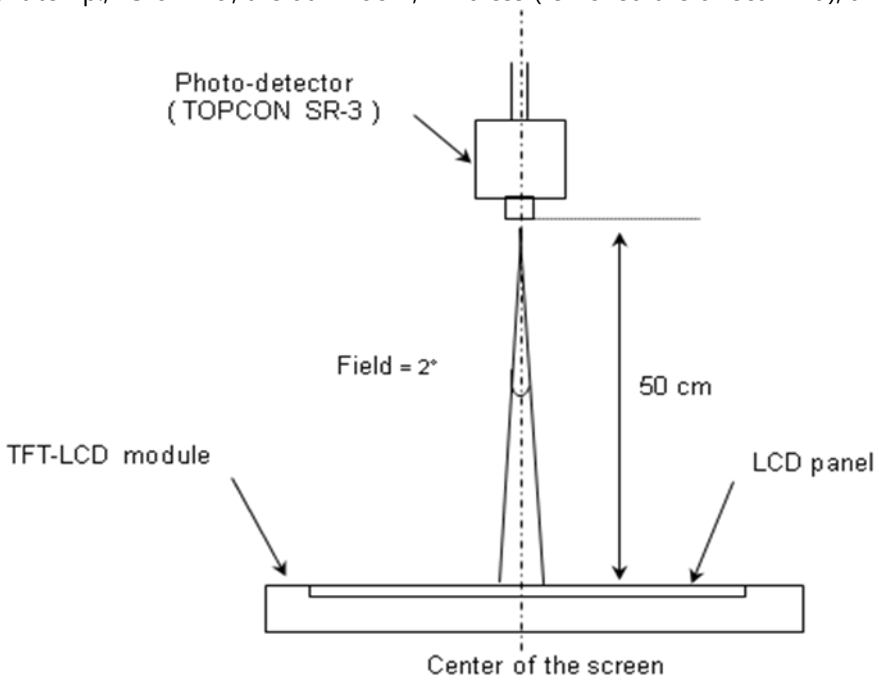


Note (4) The definition of average luminance of white: Measure the luminance of white at 5 points.

$$Y_{L.AVE} = \frac{Y_{L4} + Y_{L5} + Y_{L7} + Y_{L9} + Y_{L10}}{5}$$



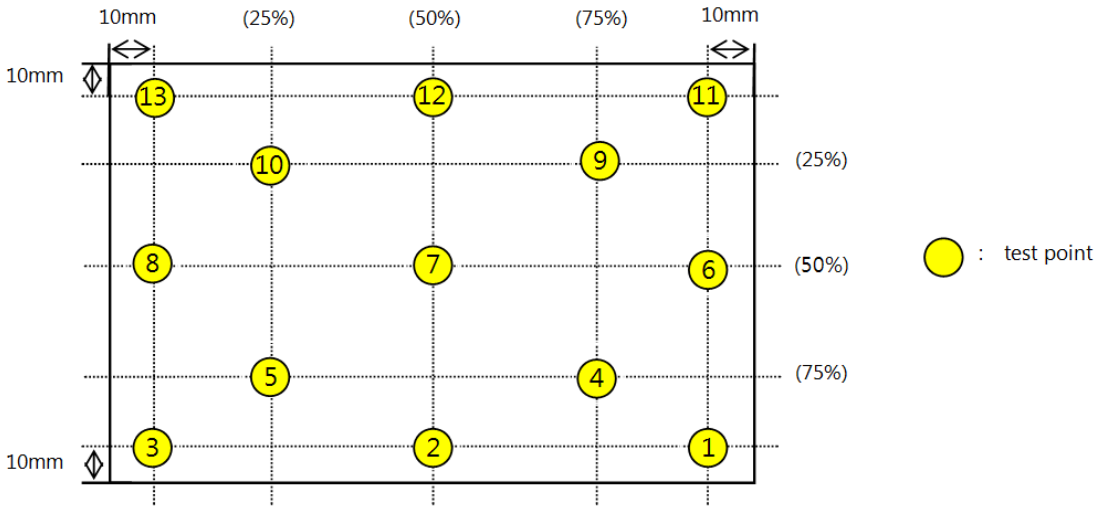
Note (5) Measure the panel, which is left for 30 min. at the normal temp. after leaving it for 30 min with turning the back light on at the rating. The measurement should be executed under the condition including the ambient temp., 25℃±2℃, the dark room, windless (removed the direct wind), and no vibration.



[Optical characteristics measurement setup]

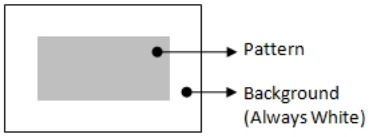
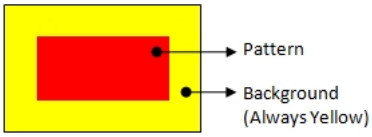
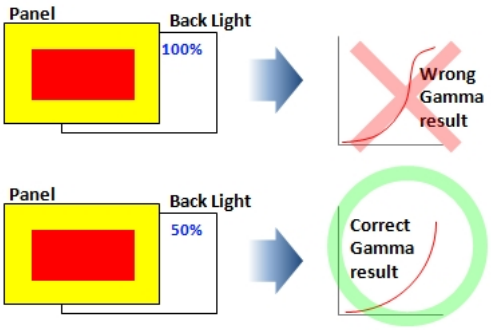
Note (6) The definition of white variation at 13 points (δ L)

$$\delta L = \frac{\text{Maximum luminance of 13 points}}{\text{Minimum luminance of 13 points}}$$



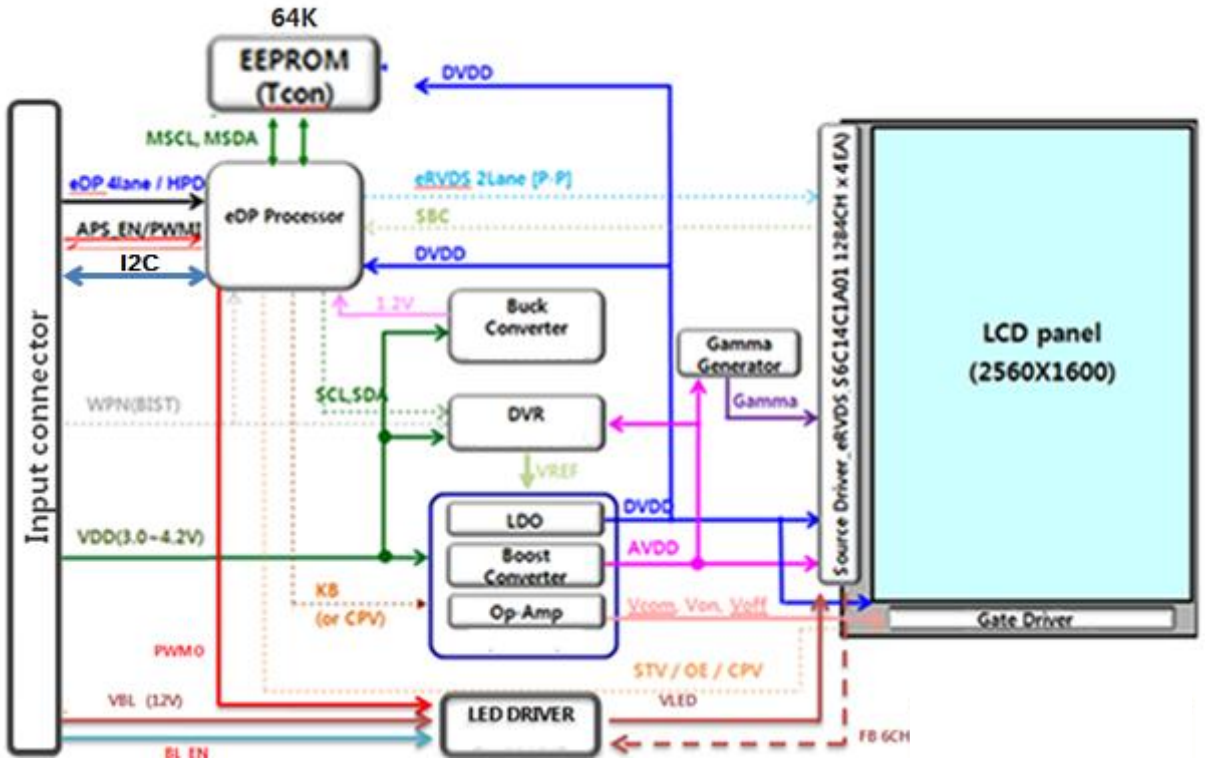
Note (7) Measure the panel, which is left for 30 min. at the normal temp. after measuring Gamma

▪ **Gamma measurement @ Green display**

	White gamma measurement	RGB gamma measurement
Pattern	To hold Scale value and Back light brightness, → White background (10%~15% of total area) → Gamma measurement pattern center 	To hold Scale value and Back light brightness, → Yellow background (10%~15% of total area) → Gamma measurement pattern center 
PWM_IN	-	. PWM_IN should be 50% for RGB gamma measurement @ green display 

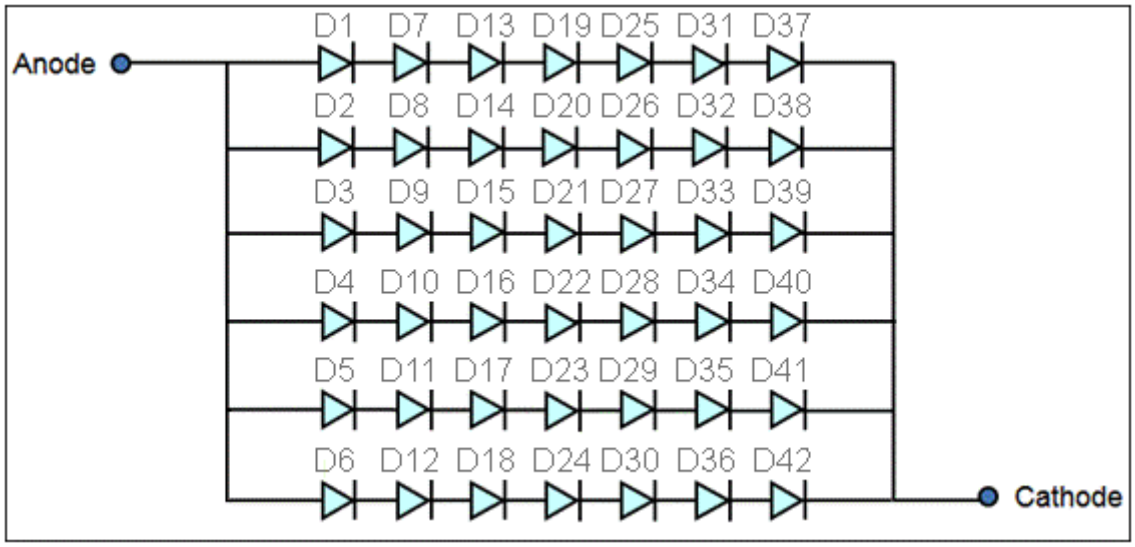
4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 THE STRUCTURE OF LED PLACEMENT

(6 channel x 7ea = 42ea)



5. ELECTRICAL CHARACTERISTICS

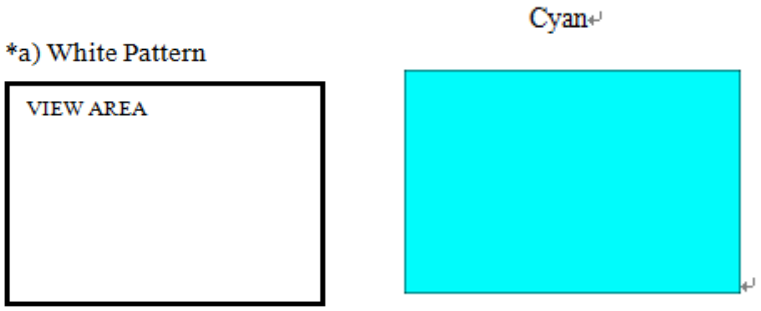
5.1 TFT LCD MODULE

* Ta = 25 ± 2 °C

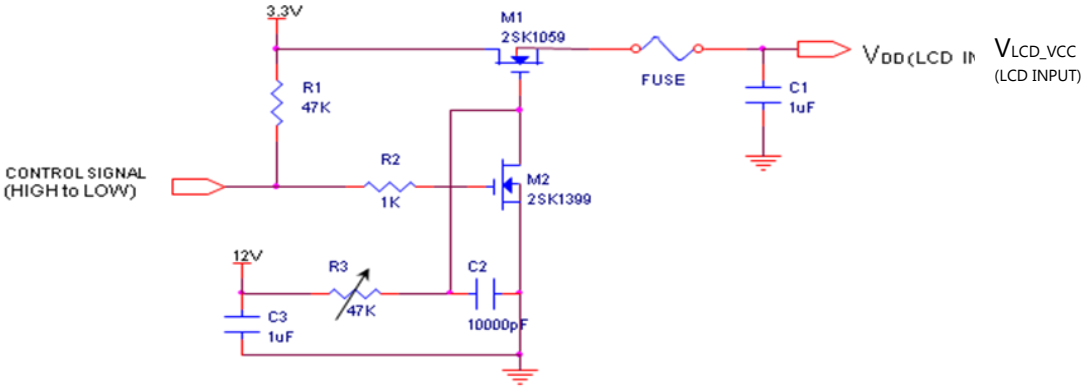
Item			Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage			VLCD_VCC	3.0	3.3	3.6	V	
General I/O Pin DC Characteristics	LVCMOS Input	High	V_{IH}	0.7VDD	-	-	V	(1) , (2)
		Low	V_{IL}	-	-	0.25VDD	V	(1) , (2)
	Output	High	V_{OH}	0.8VDD				I_{OL}=4mA I_{OH}=-4mA (2)
		Low	V_{OL}			0.15VDD		
Differential Input Voltage for eDP Receiver Threshold		High	V_{IH}	-	-	+60	mV	
		Low	V_{IL}	-60	-	-	mV	
I2C Threshold		High	-	2.8	-	-	V	-
		Low	-	-	-	0.375	V	-
Vsync Frequency		60 Hz	fv	-	60	-	Hz	-
Main Frequency		60 Hz	f_{DCLK}		268.6		MHz	-
Rush Current			I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply		White	I_{DD}	-	303	333	mA	(3) @ White
Power Consumption		Panel	PCC	-	1.0	1.1	W	(3) @ White
		Total	-	-	2.88	3.1	W	
		Panel	PCC	-	1.55	1.8	W	(3) @ Cyan
		Total	-	-	4.80	5.55	W	

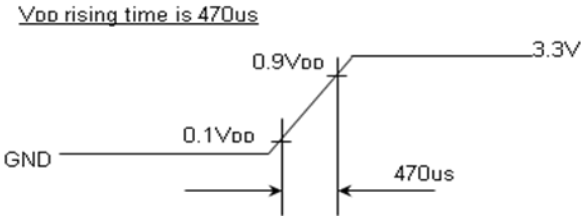
Note (1) The data pins for display and signal pins for timing should be connected.(GND= 0V)
(2) VDD = 2.8V

Note (3) The dissipation pattern for power



Note (4) The condition for measurement for rush current





5.2 BACK LIGHT UNIT

Ta = 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	-	12.2	-	mA	
LED Forward Voltage	VF	2.7	2.8	2.9	V	IF = 20mA
LED Array Voltage	VP	-	19.6	-	V	
LED Power Consumption	P	-	1.88	2.0	W	@White
	P	-	3.25	3.75	W	@Cyan
LED Life time	Hr	12,000	-	-	Hours	(1)
LED Counts	Q	-	42	-	EA	

Note (1) The life time (Hr) of LEDs can be defined as the time during which it continues to operate under the condition, which the Ta is 25 ± 2 °C and IF= 12.2 mArms until the one of the following events occurs when the brightness becomes 50% or lower than the original.

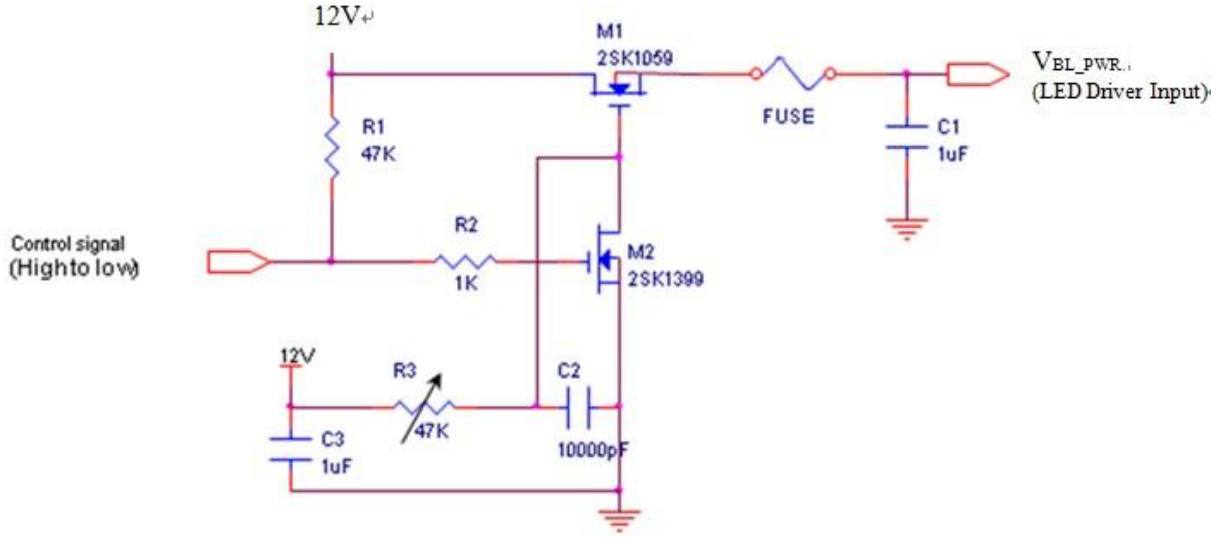
5.3 LED DRIVER

The manufacturer of LED driver: Richtek RT8561C

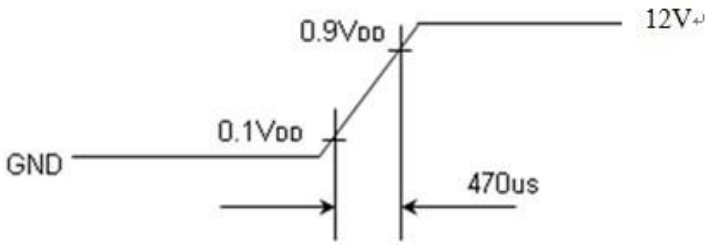
Ta= 25 ± 2 °C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage		V_{BL_PWR}	6	12	16	V	
Input Current		I_{BL_PWR}	-	155	-	mA	Vin=12V Duty 100%
External PWM duty Ratio		-	0.8	-	100	%	PWM : 1KHz
External PWM Frequency		-	0.2	1	20	kHz	System → T-con
Internal PWM Frequency		-	0.1	1	30	kHz	T-con → LED Driver
In-Rush Current		$I_{RUSH\_BL\_PWR}$			1.5	A	(1)
EN Control Level	High	V_{BL_ENABLE}	1.6		5	V	(2)
	Low		-		0.5	V	(3)
PWM Control Level	High	$V_{BL\_PWM\_DIM}$	1.3		5	V	
	Low		-		0.65	V	
V_{BL_PWR} @ LED Driver On		V_{BL_PWR}	6		16	V	
V_{BL_PWR} @ LED Driver Off		V_{BL_PWR}	0		2	V	
Operating frequency		FO	0.8	1	1.2	MHz	
Efficiency		η		80		%	

Note (1) Rush current measurement condition
(2) Range (0.51~1.59V) is can not guarantee.



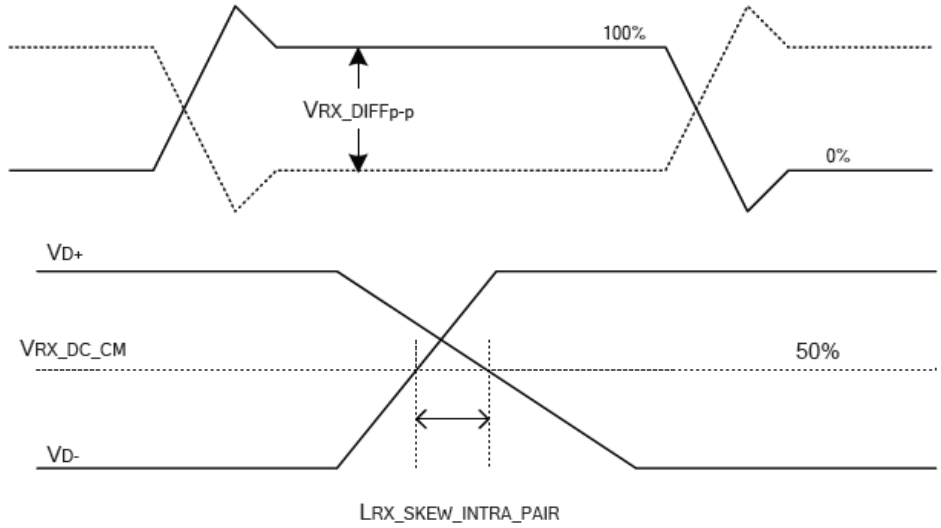
The V_{BL_PWR} rising time is 470us.



5.4 Interface Receiver/Transmitter Characteristics

5.4.1 eDP Receiver Main Link Characteristics (DP Ver1.1)

Parameter	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Differential peak-to-peak input voltage	$V_{RX-DIFFp-p}$	100		1320	mV	
RX. Input DC common mode voltage	VRX-DC-CM	-	GND	-	V	
Single-ended termination resistance	RRX_SE	40	50	60	ohm	
Differential termination resistance	RRX_DIFF	80	100	120	ohm	
Rx intra-pair skew tolerance at HBR	LRX_SKEW_INTARA_PAIR			150	ps	
Rx intra-pair skew tolerance at RBR	LRX_SKEW_INTARA_PAIR			300	ps	

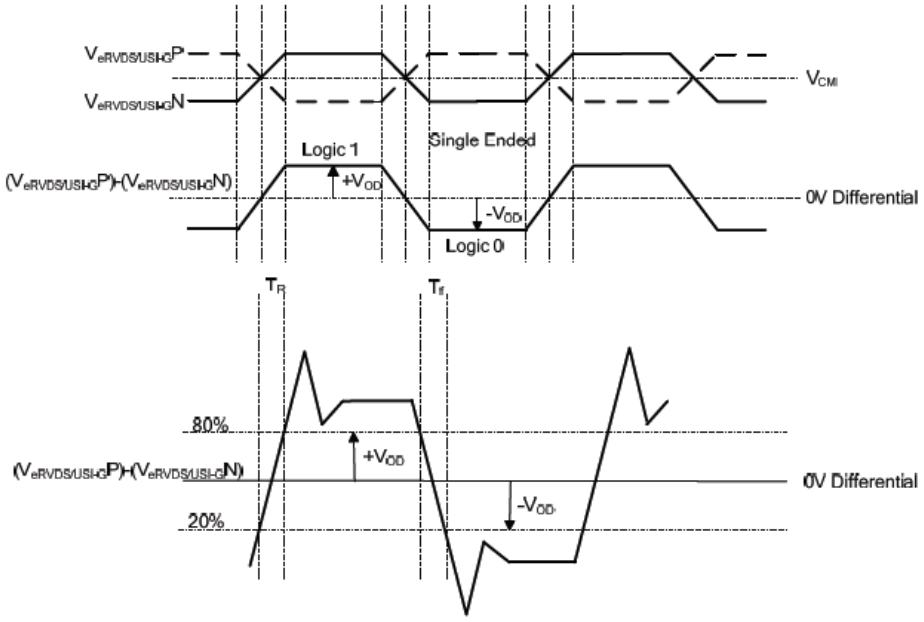


5.4.2 eDP Receiver AUX Characteristic

Parameter	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Unit Interval for AUX channel	**UI**	0.4	0.5	0.6	us	
AUX differential peak-to-peak Voltage swing at receiving device	**VAUX-DIFF-PP**	500	-	1000	mV	
AUX DC common mode voltage when receiving	**VAUX-DC-CM-RX**		GND		V	
AUX DC common mode voltage when transmitting	**VAUX-DC-CM-TX**		0.15		V	
AUX short circuit current limit	**IAUX-SHORT**	-	-	20	mA	
AUX AC coupling capacitor	**CAUX**	75	-	200	nF	

5.4.3 eRVDS Transmitter Characteristic

Parameter	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**	**NOTE**
Differential output voltage at default setting	VOD	320	400	480	mV	Rterm=100ohm
Output common mode voltage	Vcm	500	600	700	mV	Rterm=100ohm
Variation in between VOD 0 and 1	∆ VOD	-	-	30	mV	Rterm=100ohm
Variation in between Vcm 0 and 1	∆ Vcm	-	-	30	mV	Rterm=100ohm
Rise and Fall Transition Time (20% ～80 %)	TR/TF	-	430	-	ps	Vcm = 600mV VOD = 400mV
Transmitter Differential Output Impedance	RTX			100	ohm	

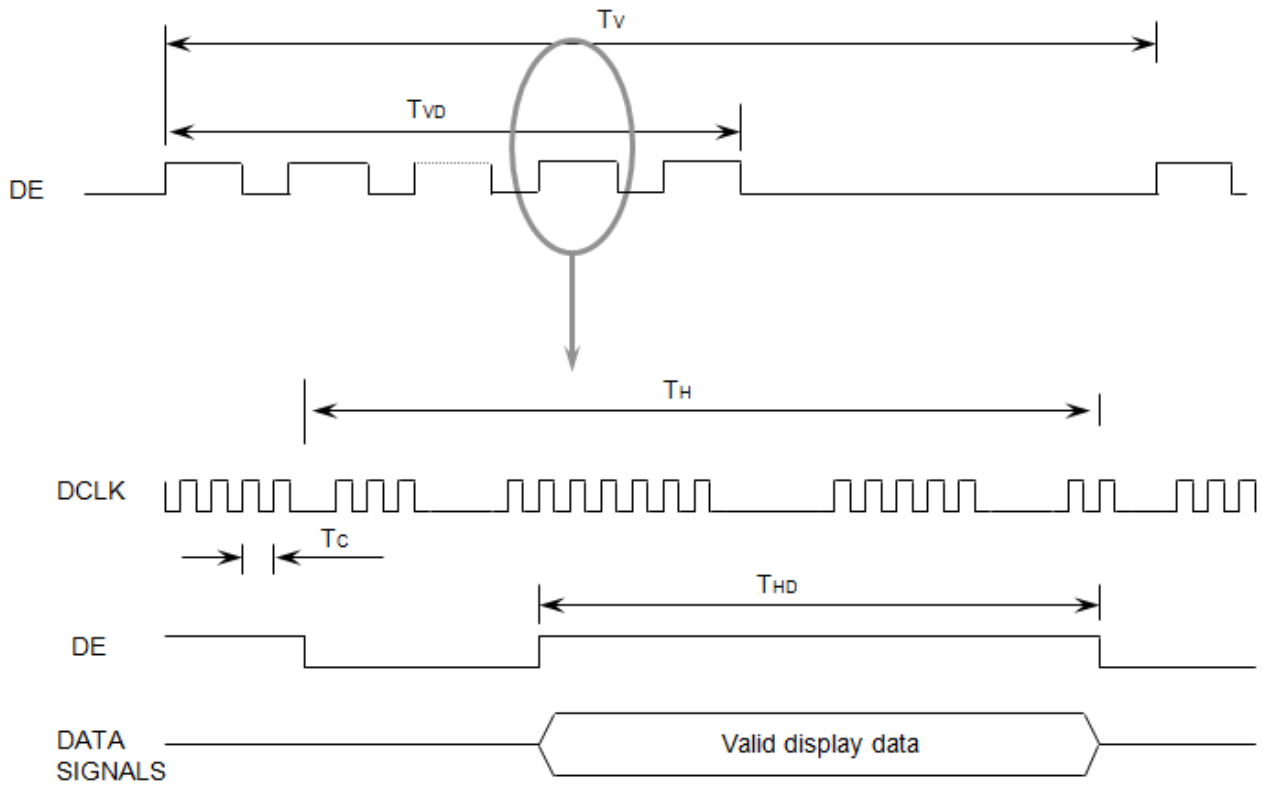


5.5 INTERFACE TIMING

5.5.1 TIMING PARAMETERS

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	T_V	1606	1646		Lines	
Vertical active in the display term	Display Period	T_{VD}	-	1600	-	Lines	
Scanning time in one line	Cycle	T_H	2688	2720		Clocks	
Horizontal active in the display term	Display Period	T_{HD}	-	2560	-	Clocks	

5.5.2 TIMING DIAGRAMS OF INTERFACE SIGNAL



5.6 INPUT COLOR DATA MAPPING

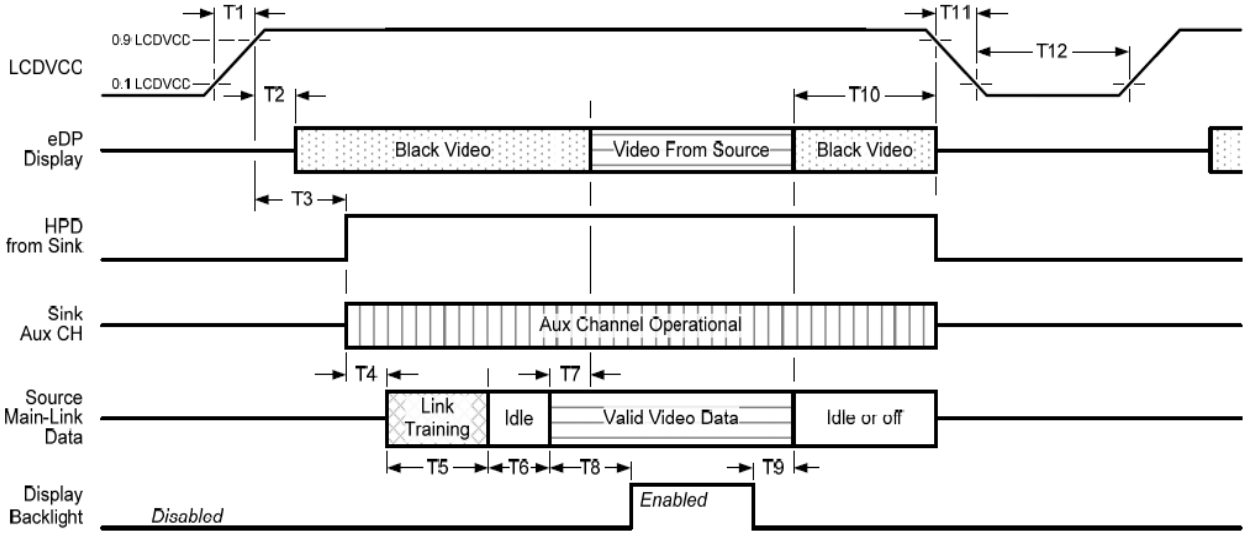
Color	Display	Data Signal																								Gray Scale Level
		Red								Green								Blue								
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	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	-
	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	-
	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	-
	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	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	R0
	Dark	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
	↑	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R252
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
	Light	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	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	R255
Gray Scale Of Green	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	G0
	Dark	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
	↑	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G252
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
	Light	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	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	G255
Gray Scale Of Blue	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	B0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
	↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B252
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
	Light	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	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	B255

Note (1) Definition of gray : Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)

Note (2) Input signal: 0 =Low level voltage, 1=High level voltage

5.7 POWER ON/OFF SEQUENCE

To prevent the product from being latched up or the DC in the LCD module from starting an operation, the order to turn the power on and off should be changed to the order as shown in the diagram below.



Timing Parameter	Specification	Notes
T1	0.5ms ≤ T1 ≤ 10ms	
T2	0ms ≤ T2 ≤ 200ms	Prevent display noise until valid video data is received from the Source(See note 1 below)
T3	240ms ≤ T3 ≤ 290ms	Sink AUX Channel must be optional upon HPD high
T4	-	Allow for Source to read Link capability and initialize
T5	-	Dependant on Source link training protocol
T6	-	Min accounts for required BS-Idle pattern. Max allows for Source frame synchronization
T7	0ms ≤ T7 ≤ 50ms	Max allows Sink validate video data and timing
T8	-	Source must assure display video is stable
T9	-	Source must assure backlight is no longer illuminated(See note 1 below)
T10	0ms ≤ T10 ≤ 500ms	
T11	T11 ≤ 10ms	
T12	T12 ≥ 500ms	

NOTE(1) The Sink must include the ability to generate black video autonomously. The Sink must automatically Enable black video under the following condition.
- Upon LCDVCC power-on(within T2 max)
- When the "NO VideoStream_Flag"(VB-ID Bit 3) is received from the Source(at the end of T9)
- When no Main Link data, or invalid video data, is received from the Source. Black video must be Displayed within 50ms(max) from the start of either condition. Video data can be deemed invalid Based on MSA and timing information, for example.
- PWM which is sent from SET should be come after the 0.9LEDVCC (0.9LED VCC is the 90% of LEDVCC which is received from SET)
- Also, BL_EN must be follow after PWM signal. And its difference between PWM and BL_EN Signal is minimum 0msec
- 0.9LEDVCC should go after the Invalid Signal at least over 10msec

NOTE(2) The Sink may implement the ability to disable the black video function, as described in Notes 1, above, for system development and debugging purposes.

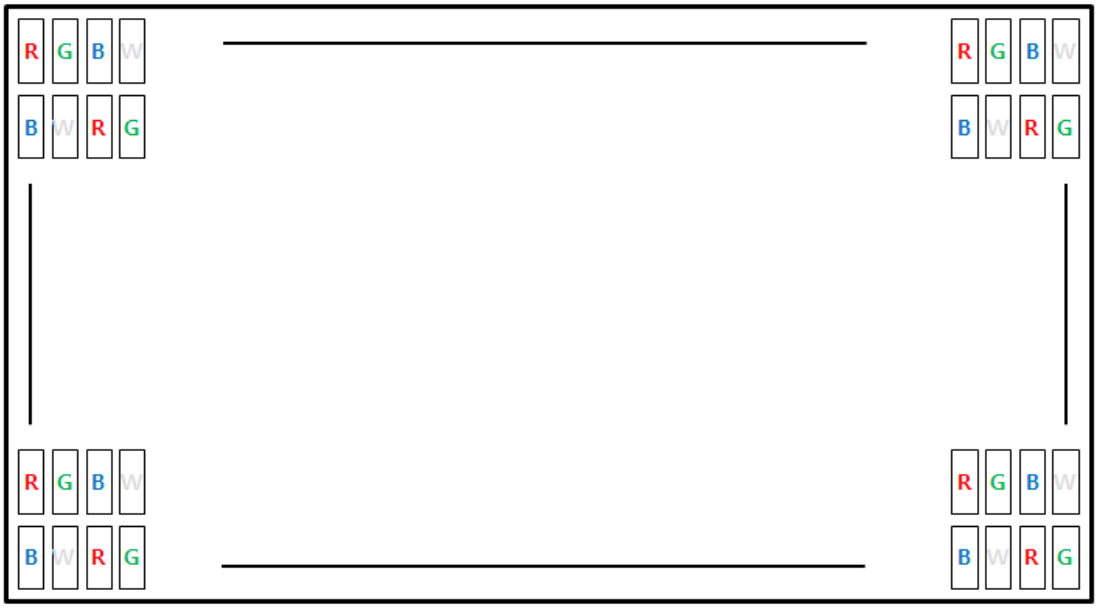
NOTE(3) The Sink must support AUX Channel polling by the Source immediately following LCDVCC power-on Without causing damage to the Sink device (the Source can re-try if the Sink is not ready). The Sink must Be able to respond to an AUX Channel transaction with the time specified within T3 max.

5.8 INPUT TERMINAL PIN ASSIGNMENT

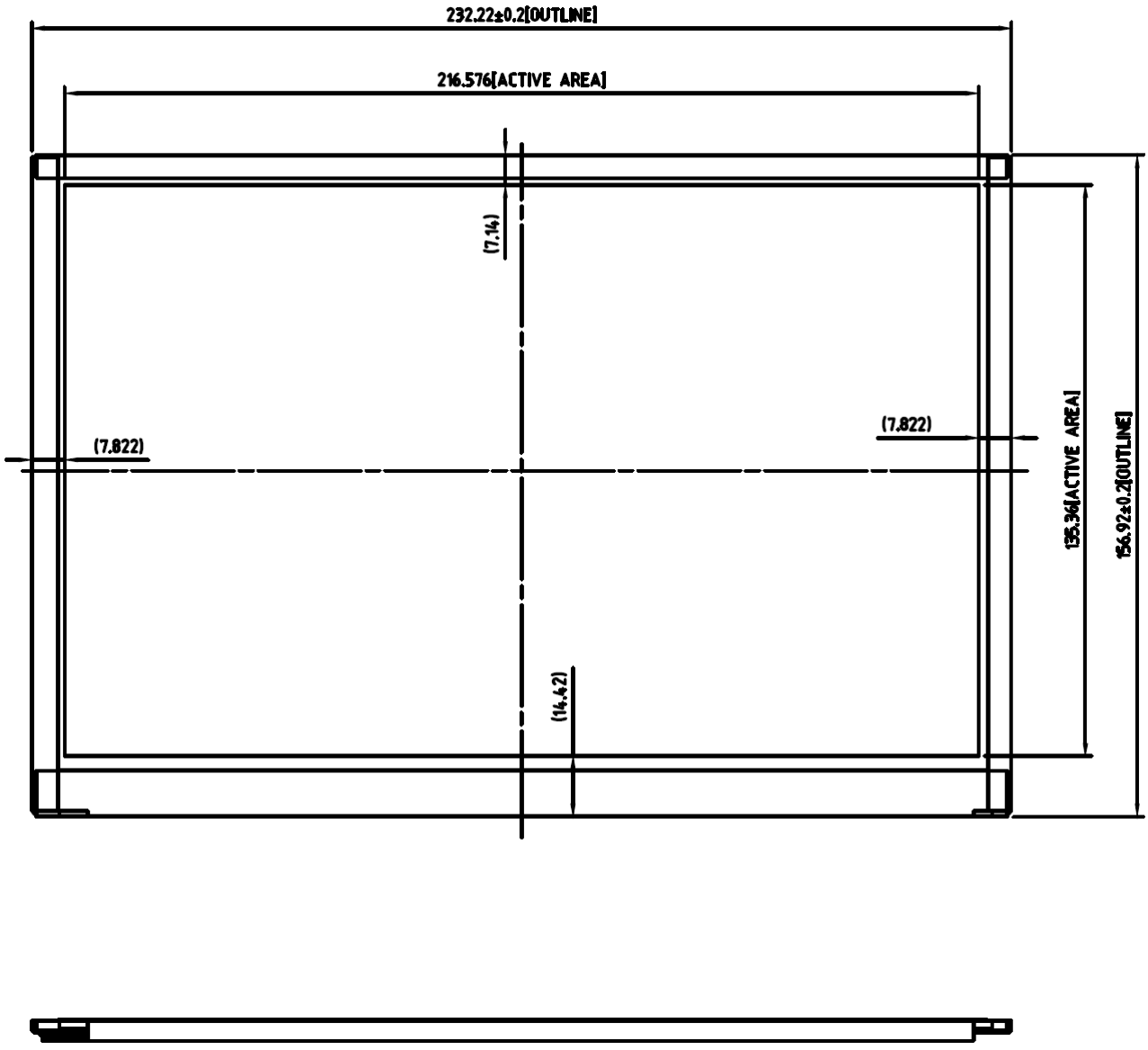
5.8.1 INPUT SIGNAL & POWER (DP, Connector : DDK 45P or the equipment with the equivalent capability)

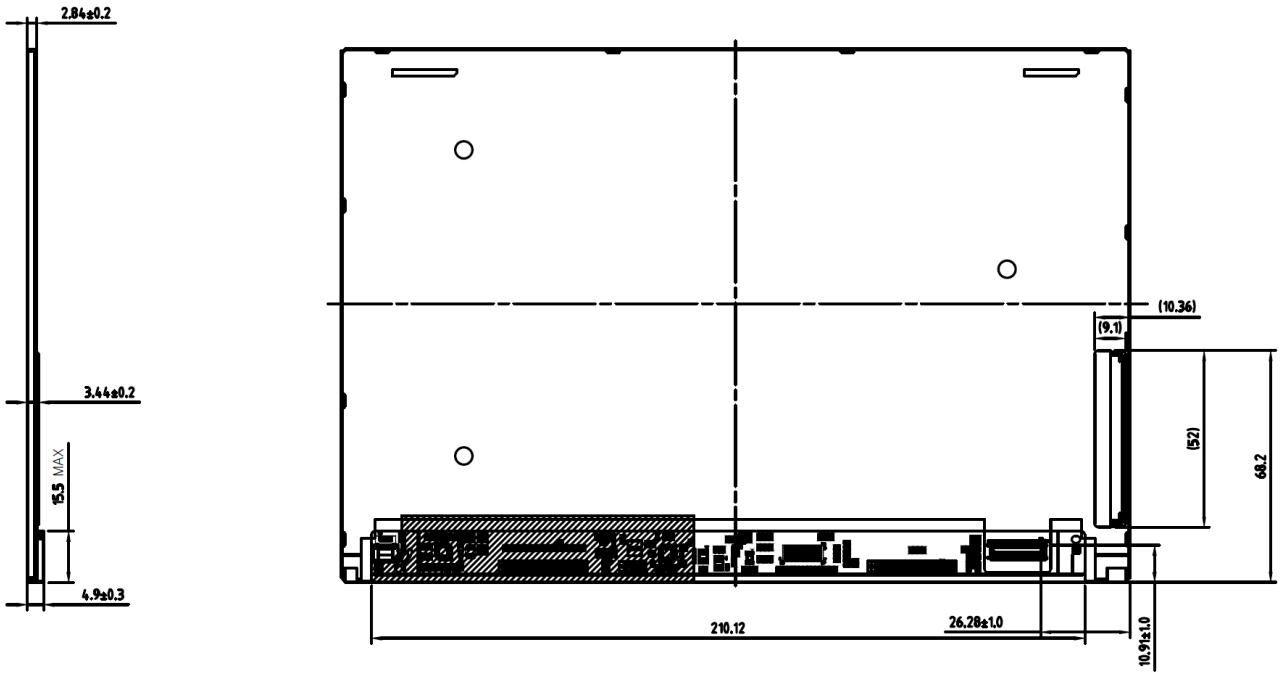
Pin	Symbol	Function
1	GND	Analog ground
2	GND	Analog ground
3	NC	No connection
4	HPD	Hot Plug Detection
5	VCC	Module Input Voltage
6	VCC	Module Input Voltage
7	VCC	Module Input Voltage
8	VCC	Module Input Voltage
9	VCC	Module Input Voltage
10	NC(WPN)	Write Protection Pin
11	NC	No connection
12	GND	Signal Ground
13	DAUXP	DP Aux channel [Positive]
14	DAUXN	DP Aux channel [Negative]
15	GND	Signal Ground
16	DRX0N	Negative eDP Differential Data Input – 1st Channel
17	DRX0P	Positive eDP Differential Data Input – 1st Channel
18	GND	Signal Ground
19	DRX1N	Negative eDP Differential Data Input – 2nd Channel
20	DRX1P	Positive eDP Differential Data Input – 2nd Channel
21	GND	Signal Ground
22	DRX2N	Negative eDP Differential Data Input – 3rd Channel
23	DRX2P	Positive eDP Differential Data Input – 3rd Channel
24	GND	Signal Ground
25	DRX3N	Negative eDP Differential Data Input – 4th Channel
26	DRX3P	Positive eDP Differential Data Input – 4thChannel
27	GND	Signal Ground
28	NC	No connection
29	NC	No connection
30	NC	No connection
31	NC	No connection
32	NC	No connection
33	NC	No connection
34	GND	Analog ground
35	NC	No connection
36	VLED	LED DRIVER Input Voltage
37	VLED	LED DRIVER Input Voltage
38	VLED	LED DRIVER Input Voltage
39	VLED	LED DRIVER Input Voltage
40	NC	No connection
41	PWM_IN	PWM_IN
42	BL_EN	BL_EN
43	SCL_P	EEPROM SCL Signal
44	SDA_P	EEPROM SDA Signal
45	GND	Analog ground

6. PIXEL FORMAT



7. OUTLINE DIMENSION



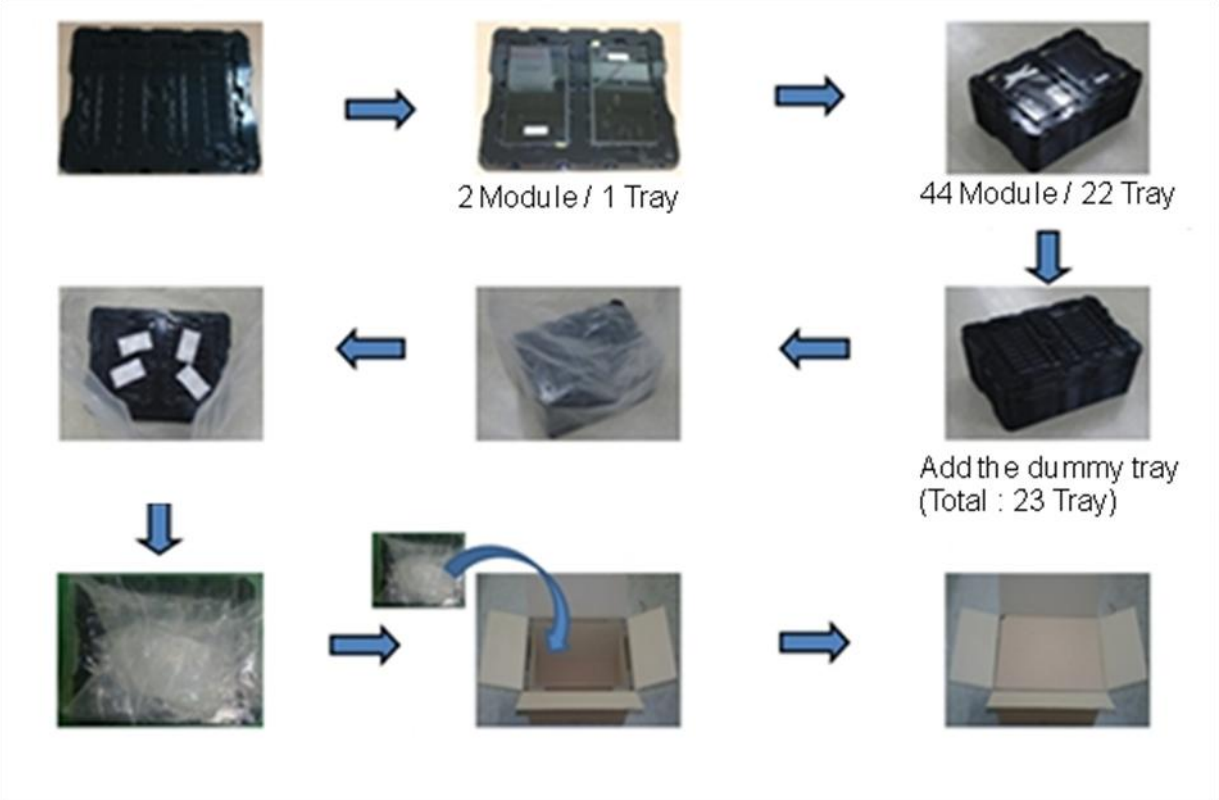

2.84±0.2
3.44±0.2
15.5 MAX
4.9±0.3
(10.36)
(9.1)
(52)
68.2
210.12
26.28±1.0
10.9±1.0

8. PACKING

8.1 CARTON

(1) Packing Form
Corrugated cardboard box and ABS tray

(2) Packing Method



Note 1)Total Weight: Approximately 11 kg
2) Acceptance number of piling: 44 sets
3) Carton size : 385(W) × 506(D) × 339(H)

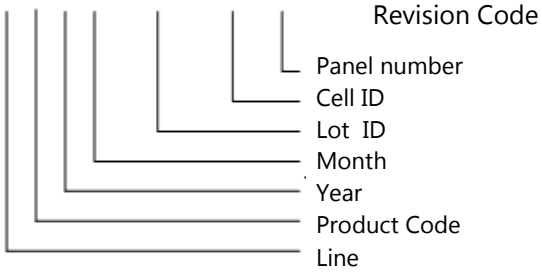
(3) Packing Method

No	Part name	Quantity
1	Packing case (Inner box) included shock absorber	1 set
2	Cushion Tray	23 pcs
3	Static electric protective sack	1 pcs
4	Carton	1 set

8.2 MARKING

A nameplate is affixed to the specified location on each product.

(1)Parts number LR1012K01
(2)Revision code : 3 letters
(3)Lot number : X X X X XXX XX X T01



(4) Packing small box attach

9. GENERAL PRECAUTIONS

9.1 HANDLING

(a) When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.

(b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT back-light.

(c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

(e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(f) The desirable cleaners are water, IPA (Isoprophyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth .In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(h) Protect the module from static , it may cause damage to the C-MOS Gate Array IC.

(i) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(j) Do not disassemble the module.

(k) Do not pull or fold the LED FPC.

(l) Do not touch any component which is located on the back side (consult the figure on page 39).

(m) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(n) Pins of I/F connector shall not be touched directly with bare hands.

9.2 STORAGE

We highly recommend to comply with the criteria in the table below.

ITEM	Unit	Min.	Max.
Storage Temperature	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage Life	12 months		
Storage Condition	- The storage room should be equipped with a good ventilation facility, which has a temperature controlling system. - Products should be placed on the pallet, which is away from the wall not on the floor. - Prevent products from being exposed to the direct sunlight, moisture, and water.; Be cautious not to pile the products up. - Avoid storing products in the environment, which other hazardous material is placed. - If products are delivered or kept in the storage facility more than 3 months,we recommend you to leave products under the condition including a 20℃ temperature and a humidity of 50% for 24 hours. - If you store semi-manufactured products for more than 3 months, bake the products under the condition including the 50℃ temp. and the 10% humidity for 24hrs after being used.		

9.3 OPERATION

(a) Do not connect, disconnect the module in the " Power On" condition.

(b) Power supply should always be turned on/off by following item 6.3 " Power on/off sequence ".

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The FPC cable between the LED chips and its converter power supply shall be a minimized length and be connected directly .The longer cable between the back-light and the converter may cause lower luminance of light source (LED).

(e) The standard limited warranty is only applicable when the module is used for general notebook applications. If used for purposes other than as specified, SEC is not to be held reliable for the defective operations. It is strongly recommended to contact SEC to find out fitness for a particular purpose.

9.4 OTHERS

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, Variation in part contents and environmental temperature, so on) Otherwise the module may be damaged.

(d) If the module displays the same pattern continuously for a long period of time, it can be the situation when The image “sticks” to the screen.

(e) This module has its circuitry PCB’s on the rear side and should be handled carefully in order not to be stressed.