



Panasonic Liquid Crystal Display Co., Ltd.

Sep 4, 2012

TECHNICAL DATA

VVX10F011B00

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**RECORD OF REVISION**

Date	The upper section : Previous revision The lower section : New revision		Summary
	Sheet No.	Page	



DESCRIPTION

The following specifications are applied to the following TFT LCD module.

Product Name : VVX10F011B00

General Specifications

Effective display area	: (H) 217.44 × (V) 135.90	(mm)
Number of pixels	: (H) 1,920 × (V) 1,200	(pixels)
Pixel pitch	: (H) 0.11325 × (V) 0.11325	(mm)
Color pixel arrangement	: R+G+B vertical stripe	
Display mode	: Transmissive mode Normally black mode	
Top polarizer type	: Low Reflection + Hard Coat (w/o Retardation Film)	
Number of colors	: 16,777,216	(colors)
Input signal	: eDP 2 Lanes	
Backlight	: 60 pieces of LED	
External dimensions	: Typ. (H) 228.86 × (V) 152.5 × (t) 2.436 (PCB side 4.176)	(mm)
Weight	: Typ. 137	(g)

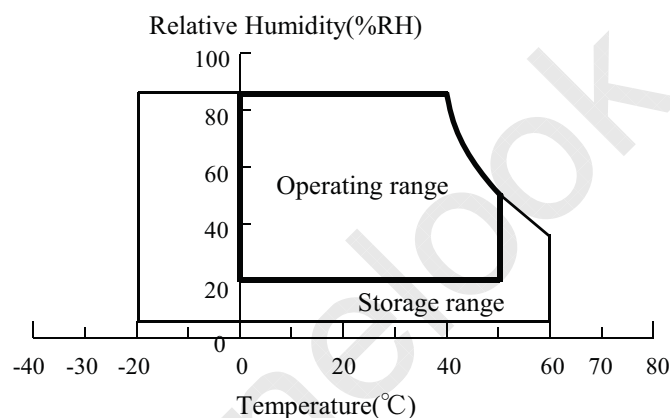
1. ABSOLUTE MAXIMUM RATINGS

1.1 Environmental Absolute Maximum Ratings

ITEM	Operating		Storage		UNIT	NOTE
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	°C	1),3)
Humidity	2)		2)		%RH	1)
Vibration	-	-	4)		m/s ²	
Shock	-	-	5)		m/s ²	
Corrosive Gas	Not Acceptable		Not Acceptable		-	
Illumination at LCD Surface	-	50,000	-	50,000	1x	

Note 1) Temperature and Humidity should be applied to the glass surface of a IPS-Pro TFT LCD module, not to the system installed with a module.

- 2) $T_a \leq 40\text{ }^{\circ}\text{C}$ ····· Relative humidity should be less than 85 %RH max. Dew is prohibited.
 $T_a > 40\text{ }^{\circ}\text{C}$ ····· Relative humidity should be lower than the moisture of the 85 %RH at 40 °C.



- 3) The temperature of LCD front surface would be 65 °C in operating, it may affect the optical characteristics however it does not damage the function of the module.
- 4) Sine vibration (Non-OP) 3.5 G Zero-to peak, 30min One sweep, 10 to 500 Hz, all 3 axes (X, Y, Z) .
- 5) Shock (Non-OP) Half sine 30.6 G, duration time 18 ms. Velocity change :3.4 m/s

1. 2 Electrical Absolute Maximum Ratings

(1)TFT-LCD module

$V_{SS} = 0\text{ V}$

ITEM	SYMBOL	Min.	Max.	UNIT	NOTE
Power Supply Voltage	VDD	0	5.0	V	
Power Supply Voltage of EEPROM	IOVDD	0	5.0	V	
Input Current of EEPROM	$I_{(IOVDD)}$	—	5	mA	
Input Voltage for logic	VI	-0.3	2.8	V	1)
LED Power Supply Voltage	VLED	-0.3	16.0	V	
Electrostatic Durability	VESD0	+ / - 6 kV		kV	2)
	VESD1	+ / - 8 kV		kV	3)

Note 1) It is applied to LEDEN, LEDPWM.

2) Non-OP, Contact discharge , 150pF/330 ohms

3) Non-OP, Air discharge , 150pF/ 330 ohms



2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted.

The optical characteristics should be measured in a dark room or equivalent state.

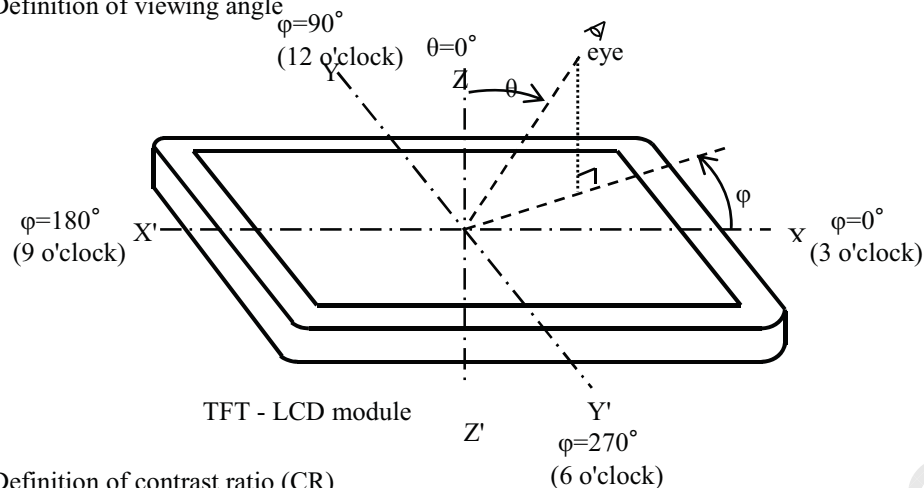
Measuring equipment : CS-1000A, or equivalent

Ambient Temperature =25 °C , AV_{DD}=3.3V , VLED= f v=60 Hz ,

If=20mA (on duty 100%)

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast ratio		CR	$\theta = 0^\circ$ 1)	600	1000	-	-	1),2)
Response time (Rise + Fall)		Tr + Tf	$\theta = 0^\circ$ 1)	-	-	35	ms	1),3)
Brightness of white		Bwh		650	-	-	cd/m ²	1)
Brightness uniformity		Buni(9points)		-	-	1.30	-	1),4)
Color chromaticity (CIE)	Red	x		0.580	0.610	0.640	-	1) 【Gray scale =255】
		y		0.310	0.340	0.370		
	Green	x		0.290	0.320	0.350		
		y		0.520	0.550	0.580		
	Blue	x		0.120	0.150	0.180		
		y		0.080	0.110	0.140		
	White	x		0.280	0.310	0.340		
		y		0.290	0.320	0.350		
Viewing Angle Contrast	Right	-	$\theta=80^\circ, \phi=0^\circ$	100	-	-	-	1)
	Left	-	$\theta=80^\circ, \phi=180^\circ$	100	-	-		
	Top	-	$\theta=80^\circ, \phi=90^\circ$	100	-	-		
	Bottom	-	$\theta=80^\circ, \phi=270^\circ$	100	-	-		
Color gamut (NTSC ratio)		-	$\theta = 0^\circ$ 1)	40	50	-	%	1)
Gamma		-	$\theta = 0^\circ$	2.2	2.5	2.8	-	1)
Cross talk		-	$\theta = 0^\circ$	-	-	5	%	1), 5)
Light leakage		-	$\theta = 60^\circ$	No Light leakage			-	

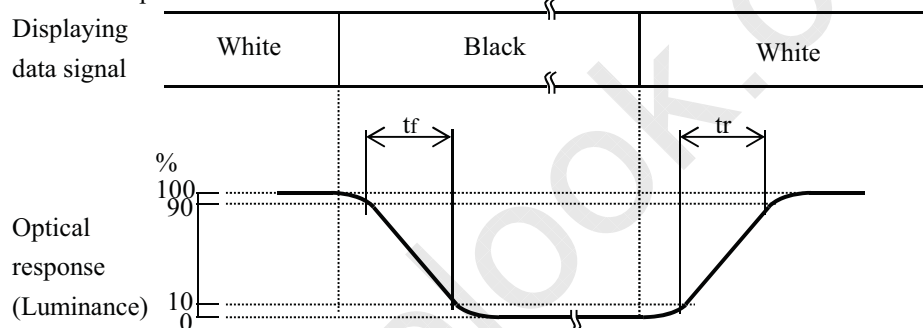
Note 1) Definition of viewing angle



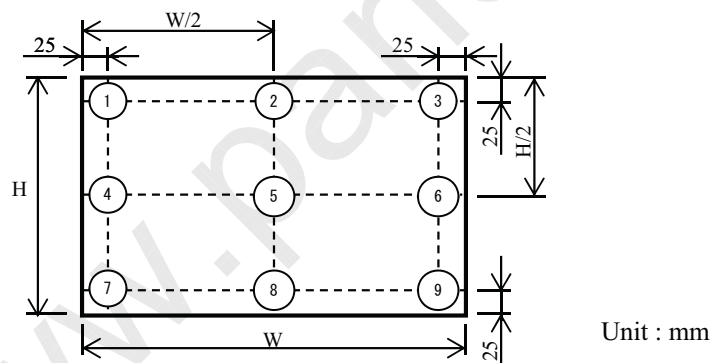
2) Definition of contrast ratio (CR)

$$CR = \frac{\text{Luminance at displaying WHITE}}{\text{Luminance at displaying BLACK}}$$

3) Definition of response time



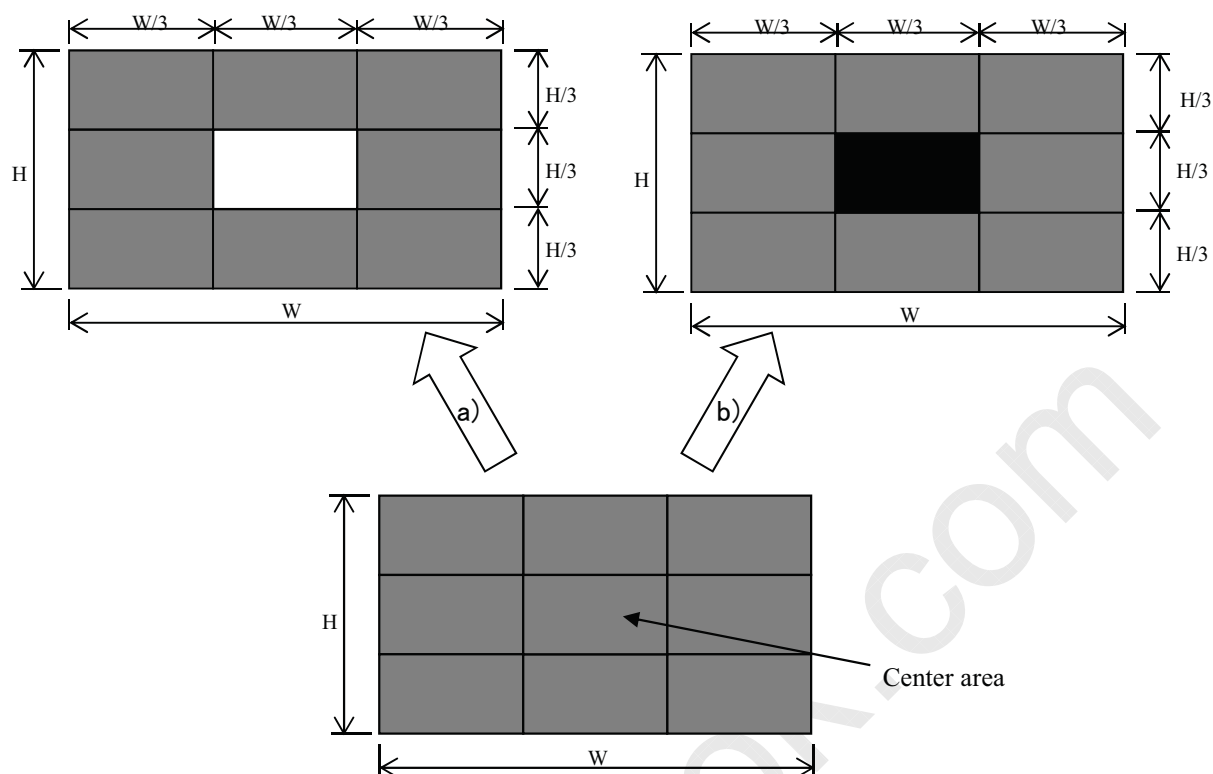
4) Definition of Uniformity



①~⑨ measuring points

$$\text{Buni (9 Points)} = \max(\text{①} \sim \text{⑨}) / \min(\text{①} \sim \text{⑨})$$

Note 5) Definition of Cross talk



a) Center area : White

$$CT = \frac{|Y_w(X_i) - Y_G(X_i)|}{Y_G(X_i)} \times 100\%$$

b) Center area : Black

$$CT = \frac{|Y_B(X_i) - Y_G(X_i)|}{Y_G(X_i)} \times 100\%$$

Note: X=U,D,L and R, i=gray level 127

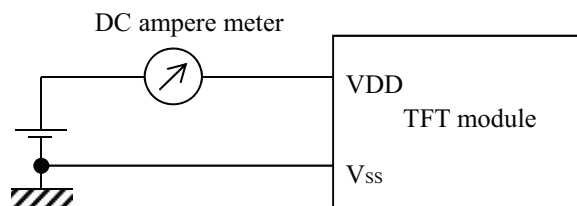
3. ELECTRICAL CHARACTERISTICS

3.1 TFT-LCD module

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

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power supply voltage		VDD	3.0	3.3	3.6	V	
LED Power supply voltage		VLED	6.0	-	8.4	V	
Power supply current		I _{DD}	-	(0.4)	(0.6)	A	1)
Ripple voltage of power supply		V _{DDR}	-	-	(100)	mV	
Logic signals input voltage	High	V _{IH}	2.0	-	-	V	LEDEN, LEDPWMI
	Low	V _{IL}	-	-	0.65	V	

Note 1)



3.2 Backlight unit

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power Consumption		P _{bl}	-	3.5	4.0	W	1), 2)
PWM	Duty	PD	1	-	100	%	
	Frequency	PF	0.1	-	20	kHz	LEDPWMI, 3)

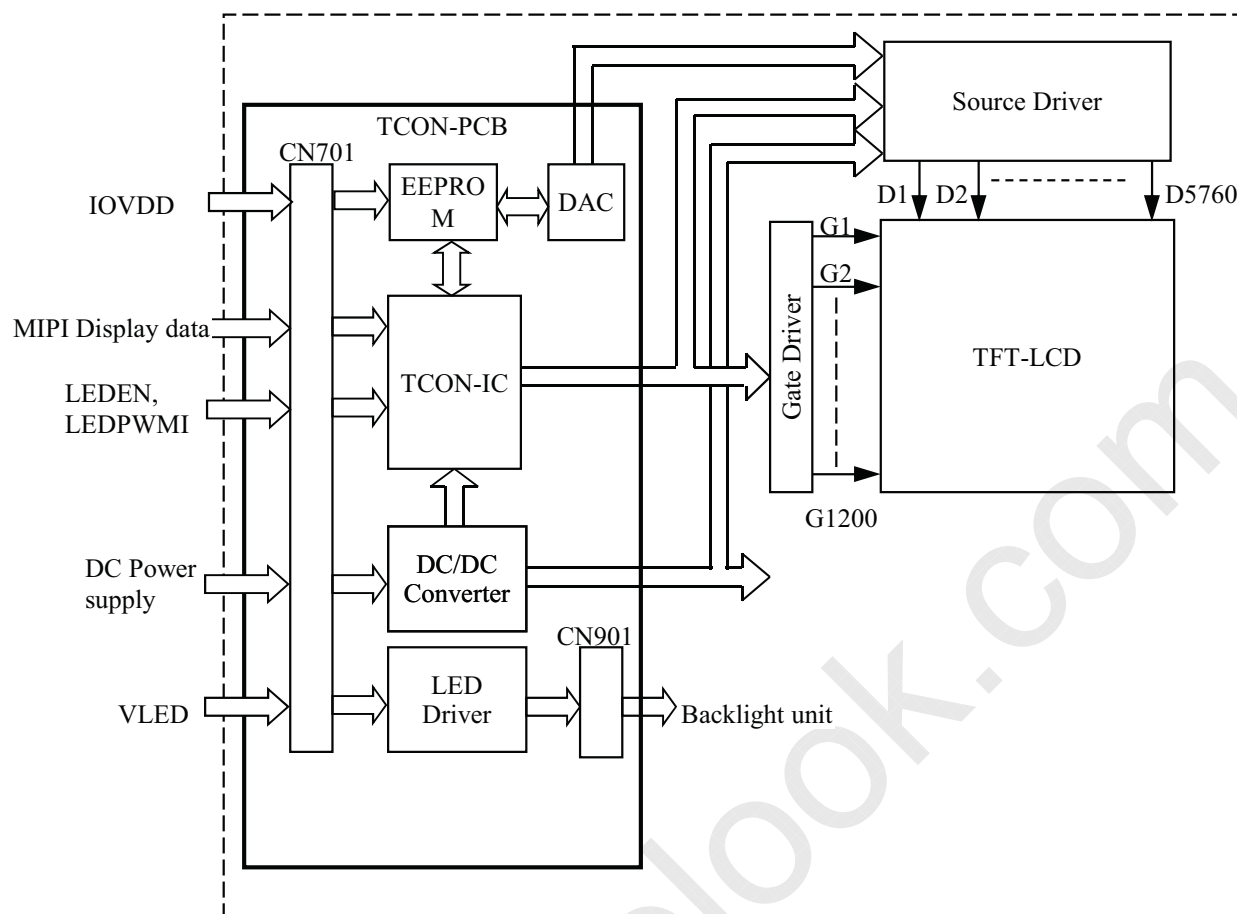
Note 1) This characteristics should be applied putting on the LED about 60 minutes later with ambient temperature.
($T_a = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$)

2) This value is not include LED driver loss.

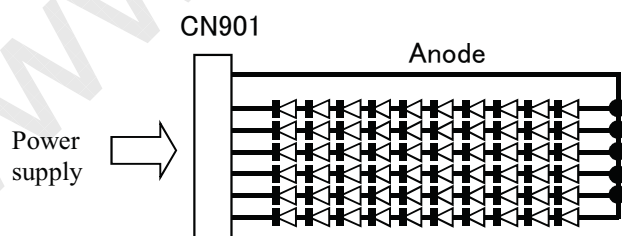
3) Duty(Min) is 1%

4. BLOCK DIAGRAM

4.1 TFT-LCD module



4.2 Backlight unit





5. INTERFACE PIN ASSIGNMENT

5.1 TFT-LCD module

CN100:JAE (HD2S030HA1)

PIN No.	SYMBOL	DESCRIPTION	Note
1	WP	EEPROM Write Protect	
2	H_GND	High Speed Ground (0V)	2)
3	Lane1_N	Complement Signal Link Lane 1	
4	Lane1_P	True Signal Link Lane 1	
5	H_GND	High Speed Ground (0V)	2)
6	Lane0_N	Complement Signal Link Lane 0	
7	Lane0_P	True Signal Link Lane 0	
8	H_GND	High Speed Ground (0V)	2)
9	AUX_CH_P	True Signal Aux Channel	
10	AUX_CH_N	Complement Signal Aux Channel	
11	H_GND	High Speed Ground (0V)	2)
12	V _{CC}	Power supply for LCD	1)
13	V _{CC}		
14	BIST	Keep open or connect to GND	
15	GND	GND(0V)	2)

PIN No.	SYMBOL	DESCRIPTION	Note
16	GND	GND(0V)	2)
17	HPD	Hot plug detection signal pin	
18	V _{LED-}	GND(0V)	2)
19	V _{LED-}		
20	V _{LED-}		
21	V _{LED-}		
22	LED_EN	LED enable	4)
23	LED_PWM	PWM signal input	
24	SDA	I2C-bus Data	
25	SCL	I2C-bus Clock	
26	V _{LED+}	Power supply for LED	3)
27	V _{LED+}		
28	V _{LED+}		
29	V _{LED+}		
30	GND	GND(0V)	2)

Notes 1) All V_{CC} pins shall be connected to +3.3V(typ).

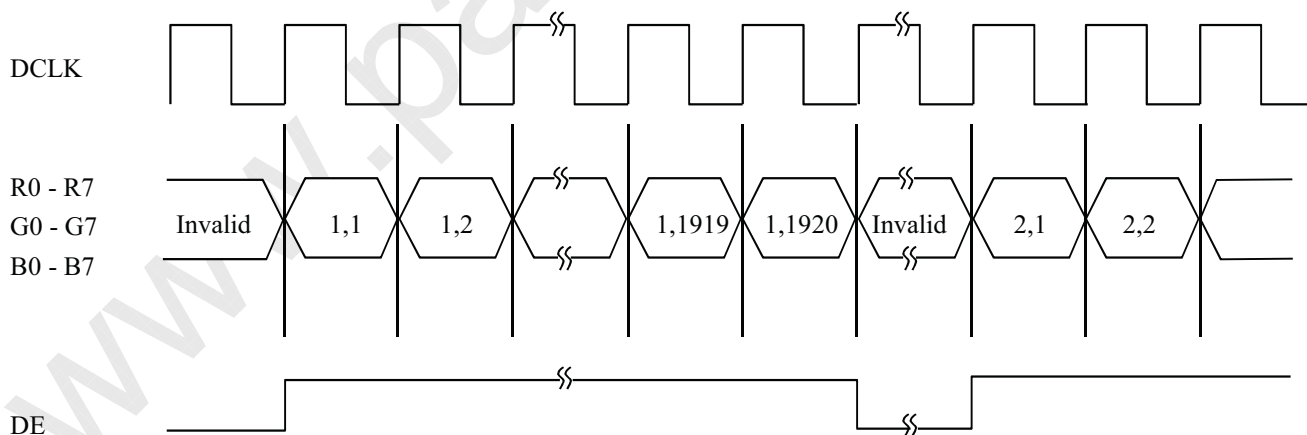
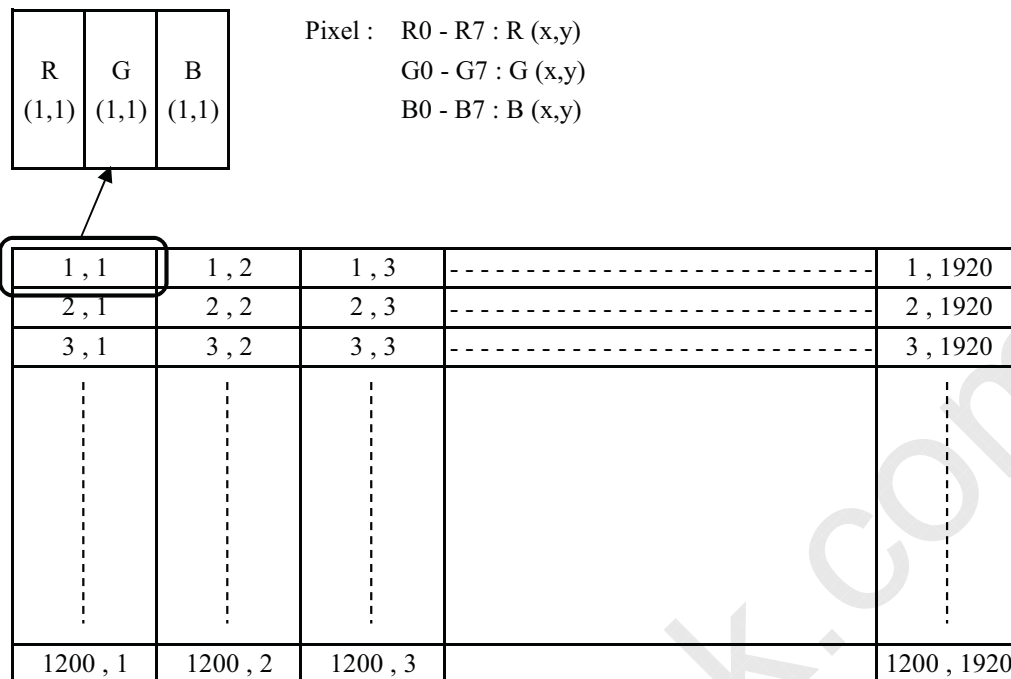
2) All GND pins shall be grounded. Metal bezel is internally connected to GND.

3) All V_{LED+} pins shall be connected to (+4.5~+11V).

4) H:LED ON L:LED OFF

5. 2 Correspondence between input data and display image

Display data of adjacent two pixel is latched during four cycle of CLK.



5.3 Relationship between display colors and input signals

Input Color		Red Data								Green Data								Blue Data													
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0						
		MSB								LSB								MSB								LSB					
Basic Color	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(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						
	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						
	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						
	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						
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						
	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(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						
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						
	Green (1)	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 (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0						
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	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						
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						
	Blue (1)	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 (2)	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 (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) Definition of gray scale :

Color(n) Number in parenthesis indicates gray scale level.

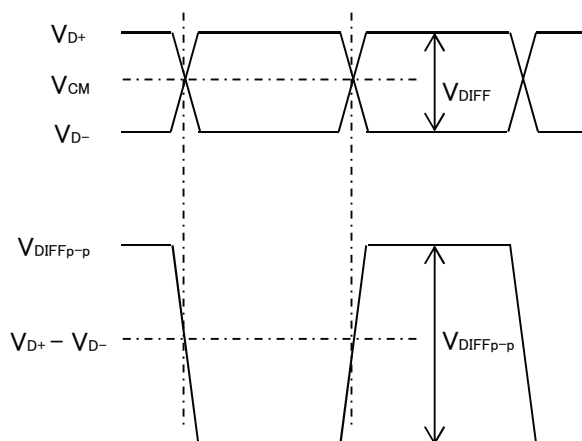
Larger n corresponds to brighter level.

2) Data : 1 : High, 0 : Low

6. INTERFACE TIMING

6.1 eDP receiver characteristics

(1) DisplayPort Main Link Receiver Characteristics



Symbol	Description	Min.	Typ.	Max.	Unit	Comments
$V_{DIFFp-p}$	Differential peak-to-peak input voltage	120		1200	mV	
V_{CM}	DC common mode voltage	0		2.0	V	
R_{TERM}	Differential termination resistance		100		Ω	
I_{SHORT}	Short circuit current limit			50	mA	
L_{SKEW}	Lane Intra-pair skew			100	ps	

(2) DisplayPort AUX Channel Characteristics

Symbol	Description	Min.	Typ.	Max.	Unit	Comments
UI	AUX Unit interval	0.4	0.5	0.6	us	
$V_{AUX_DIFFp-p}$	AUX Differential peak-to-peak input voltage	0.32		1.32	V	
V_{AUX_CM}	AUX DC common mode voltage	0		2.0	V	
R_{AUX_TERM}	AUX CH termination resistance		100		Ω	
I_{AUX_SHORT}	AUX Short circuit current limit			90	mA	
C_{AUX}	AUX AC coupling capacitor		100		nF	

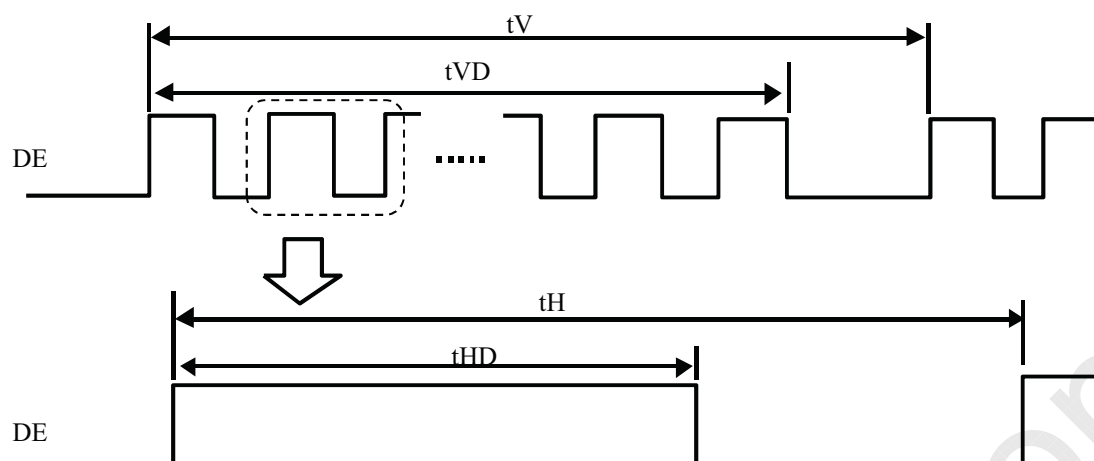
6. 2 eDP 2lane 8bit input data mapping

Lane0	Lane1
R0-7:0	R1-7:0
G0-7:0	G1-7:0
B0-7:0	B1-7:0
R2-7:0	R3-7:0
G2-7:0	G3-7:0
B2-7:0	B3-7:0
R4-7:0	R5-7:0
G4-7:0	G5-7:0
B4-7:0	B5-7:0

6. 3 HPD characteristics

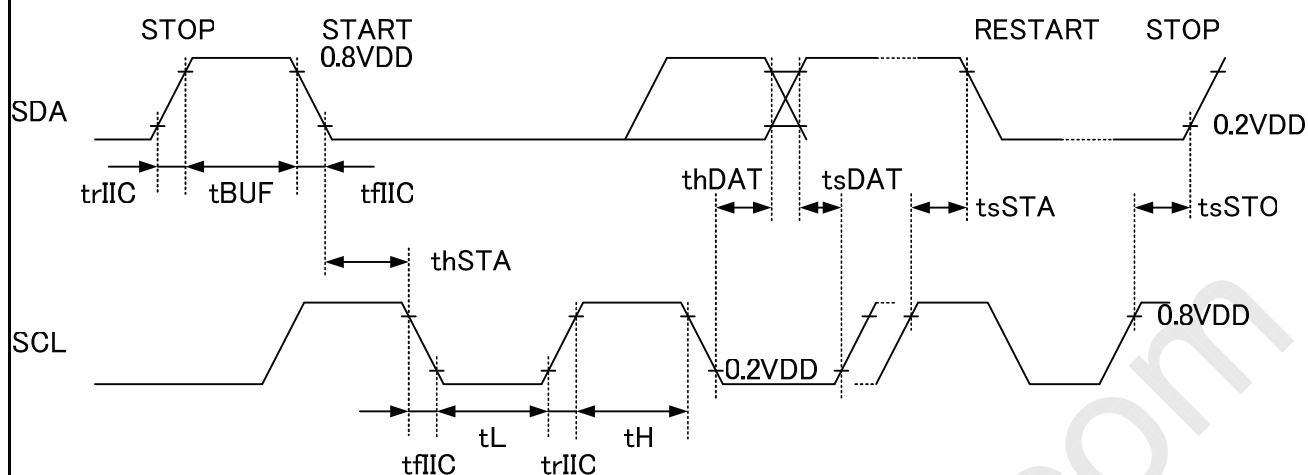
Parameter	Min.	Typ.	Max.	Unit	Comments
HPD Voltage	2.25	2.5	2.75	V	HPD signal to be driven by the Sink Device
Hot Plug Detection Threshold	2.0			V	HPD signal to be detected by the Source Device
Hot Unplug Detection Threshold			0.8	V	

6.2 SYNCHRONIZATION SIGNAL TIMING



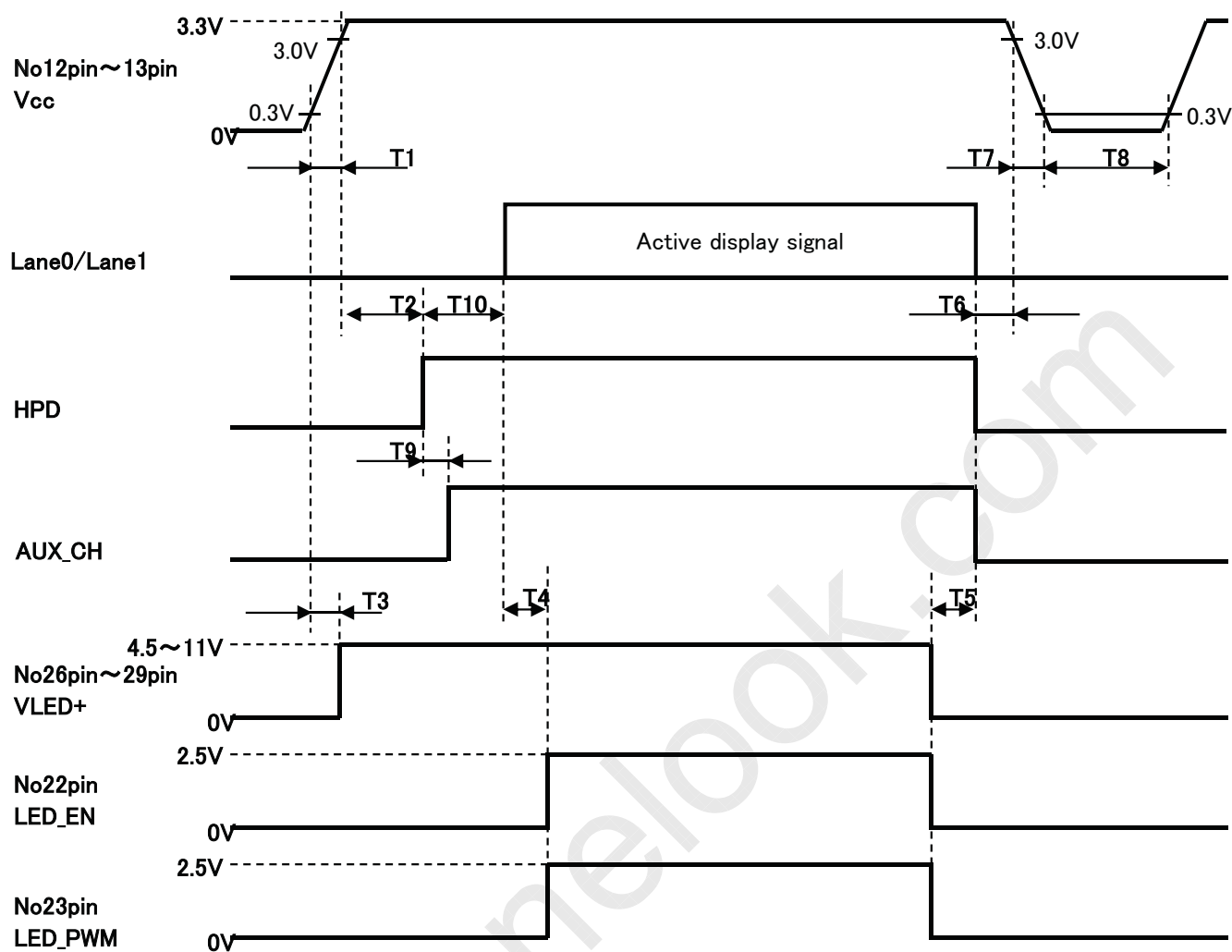
ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical Frequency	fV	58	60	62	Hz	
	Vertical Period	tV	1216	1235	1253	tH	
	Vertical Valid	tVD	1200			tH	
	Horizontal Frequency	fH	73	74	75	kHz	
	Horizontal Period	tH	2042	2080	2118	tCLK	
	Horizontal Valid	tHD	1920			tCLK	

6.3 I2C timing



Parameter	Symbol	Conditions	Rating			Unit
			MIN	TYP	MAX	
SCL Clock Frequency	fsc1		1	-	100	kHz
STOP START Interval	tBUF		4.7	-	-	μ s
START HOLD Time	thSTA		4.0	-	-	μ s
RESTART SETUP Time	tsSTA		4.7	-	-	μ s
STOP SETUP Time	tsSTO		4.7	-	-	μ s
Rize Time	trIIC	Sec. Upper Fig.	-	-	1.0	μ s
Fall Time	tFIIIC		-	-	0.3	μ s
Clock Low Time	tL		4.7	-	-	μ s
Clock High Time	tH		4.0	-	-	μ s
Data Setup Time	tsDAT		0.2	-	-	μ s
Data Hold Time	thDAT	-	0.2	-	-	μ s

6.4 Timing between interface signals and power supply



SYMBOL	Min.	Typ.	Max.	UNIT	Note
T1	0	–	TBD	ms	
T2	–	(160)		ms	
T3	0	–	–	ms	
T4	0	–	–	ms	
T5	0	–	–	ms	
T6	0	–	–	ms	
T7	–	TBD	–	ms	
T8	(500)	–	–	ms	
T9	0	–	–	ms	
T10	(160)	–	–	ms	