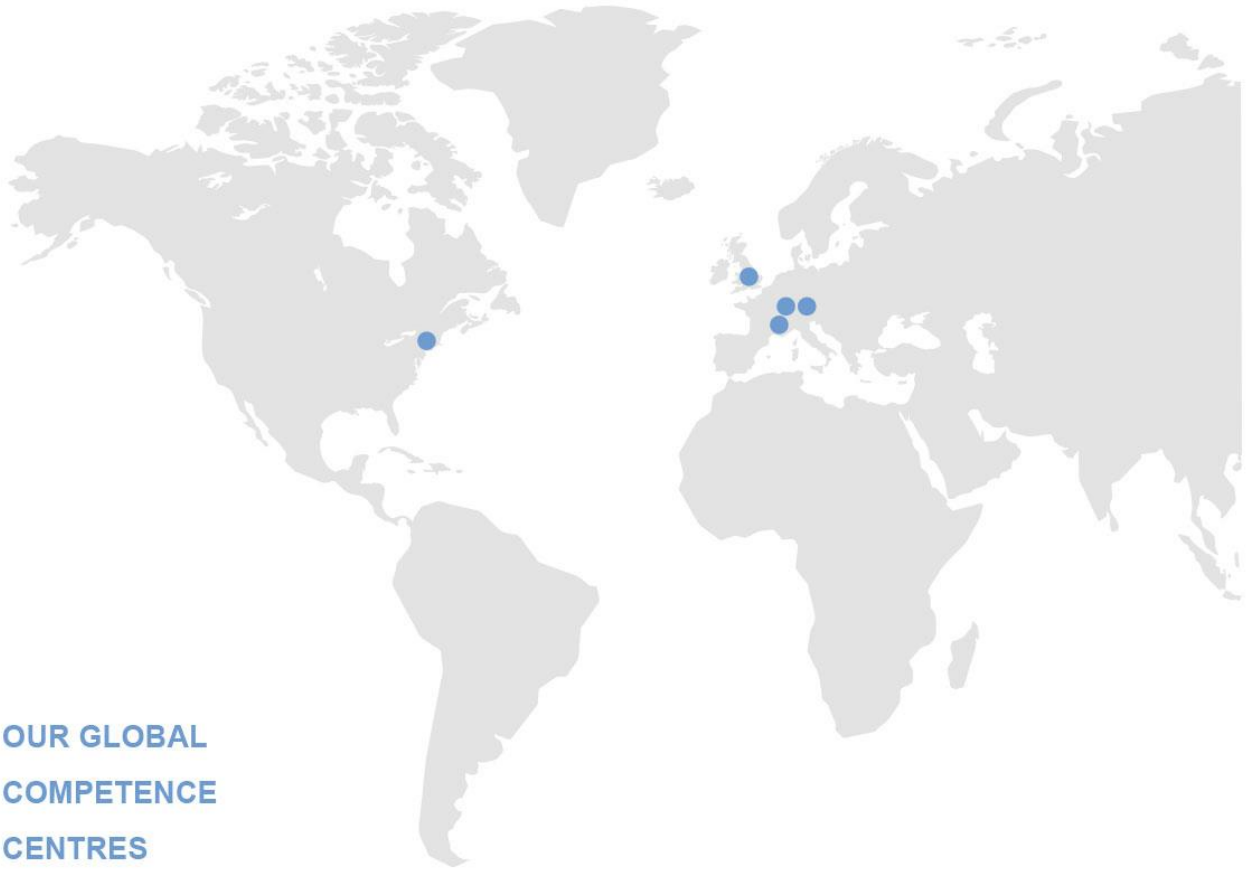
FORTEC
ELEKTRONIK AG



OUR GLOBAL COMPETENCE CENTRES

APOLLO DISPLAY TECHNOLOGIES

DISTEC

DISPLAY TECHNOLOGY

FORTEC
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Datasheet

Panasonic

VVX10F087J00

PS-01-001

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Panasonic Liquid Crystal Display Co., Ltd.

For Messrs. Distec GmbH

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

VVX10F087J00

CONTENTS

Please return 1 copy with your signature on this page for approval.

Accepted by Date:

Panasonic Liquid Crystal Display Co., Ltd.
Approved by Nobuhiko Hosotani
Reviewed by Tatsuo Kamei
Proposed by Masakatsu Yamashita Sep. 26. '17

RECORD OF REVISION

Date	The upper section : Previous revision The lower section : New revision Sheet No.	Page	Summary
Jul./5/2017		All	1st Edition

DESCRIPTION

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

Product Name : VVX10F087J00

Production factory: Panasonic Liquid Crystal Display Co., Ltd.

Country of origin: Japan

General Specifications

Display size	: 10	(inch)
Effective display area	: (H) 220.32 × (V) 123.93	(mm)
Number of pixels	: (H) 1,920 × (V) 1,080	(pixels)
Pixel pitch	: (H) 0.11475 × (V) 0.11475	(mm)
Pixel density	: 221	(ppi)
Color pixel arrangement	: B+G+R vertical stripe	
Display mode	: Transmissive mode Normally black mode	
Top polarizer type	: Anti-Glare Hardness 3H (Pencil hardness (0.5kg))	
Number of colors	: 16,777,216	(colors)
Input signal	: eDP (Ver 1.2) 2Lane	
Backlight	: 28 pieces of LED (LED : Light-emitting diode)	
External dimensions	: Typ. (H) 232.7 × (V) 138.05 × (T) 5.7 (PCB area)	(mm)
Weight	: Typ. 170 Max. 178	(g) (g)

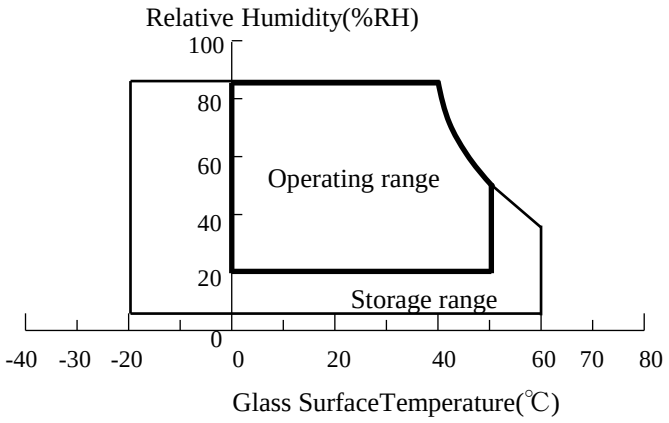
1. ABSOLUTE MAXIMUM RATINGS

1. 1 Environmental Absolute Maximum Ratings

ITEM	Operating		Storage		UNIT	NOTE
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	℃	1),3),5),6)
Humidity	2)		2)		%RH	1),4)
Vibration	-	-	7)		Grms	-
Shock	-	-	8)		m/s^2	-
Corrosive Gas	Not Acceptable		Not Acceptable		-	-
Illumination at LCD Surface	-	50,000	-	50,000	lx	-

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

2) Ta≦40 ℃ · · · · · · Relative humidity should be less than 85 %RH max. Dew is prohibited.
Ta＞40 ℃ · · · · · · Relative humidity should be lower than the moisture of the 85 %RH at 40 ℃.



3) The temperature of LCD front surface would be 65℃ in operating, it may affect the optical characteristics however it does not damage the function of the module.

4) The humidity of LCD front surface would be less than 20％RH in storage, it may affect the optical characteristics, however it does not damage the function of the module.

5) Long term operation (more than 1000 hours) with 60℃ or above may cause optical performance issue. However it does not damage the function of the module.

6) Long term storage (more than 1000 hours) with -25℃ or below may cause optical performance issue.

7) Vibration(Non-OP) : Frequency Random 5-500Hz, Acceleration 2.3Grms, 30min each axis(X, Y, Z).

8) Shock(Non-OP) : Acceleration 120G 2ms, 1 time each direction(±X, ±Y, ±Z).

1. 2 Electrical Absolute Maximum Ratings

(1)TFT-LCD module

V_{SS} = 0 V

ITEM	SYMBOL	Min.	Max.	UNIT	NOTE
Power Supply Voltage	V_{DD}	-0.3	4.5	V	
Input Voltage for LED driver	V_{LED}	-0.3	16	V	
Input Voltage for logic 1	VI_1	-0.3	1.4	V	1)
Input Voltage for logic 2	VI_2	-0.3	11.4	V	2)

Note

1) eDP signal (Lane0_P/N, Lane1_P/N, AUX_CH_P/N)

2) LED_PWM, LED_EN

2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 10 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.

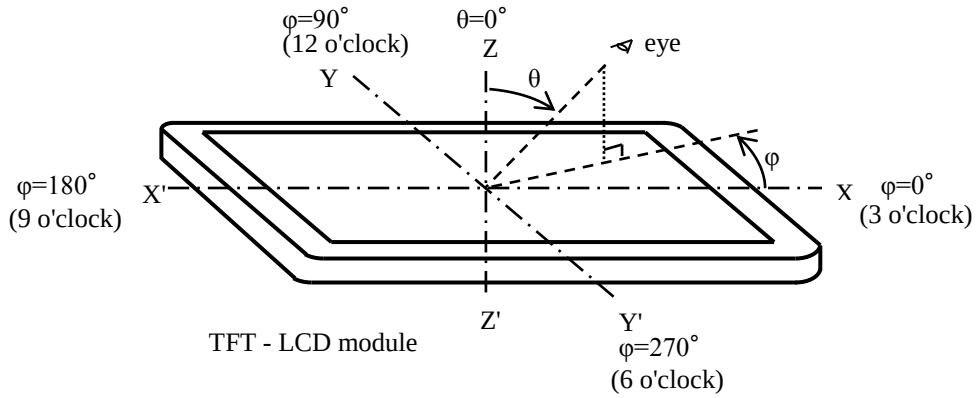
Measuring equipment : CS-2000, or equivalent

Ambient Temperature =25 ℃, V_{DD}=3.3 V, V_{LED}=13V, fV=60 Hz ,

LED current = 25.5mA/string (On-duty=100%)

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast ratio		CR	θ= 0 ° 1)	600	1000	-	-	2)
Response time		Tr + Tf		-	26	35	ms	3)
Brightness of white		Bwh		230	300	-	cd/m^2	4)
Brightness uniformity		Buni		62.5	-	-	%	4)
Color chromaticity (CIE)	Red	x		0.610	0.640	0.670	-	【Gray scale =255】
		y		0.295	0.325	0.355		
	Green	x		0.270	0.300	0.330		
		y		0.582	0.612	0.642		
	Blue	x		0.120	0.150	0.180		
		y		0.030	0.060	0.090		
	White	x		0.269	0.299	0.329		
		y		0.285	0.315	0.345		
Contrast ratio at 85 °		CR85	φ=0°, 90° ,180°,270° 5)	10	-	-	-	Estimated value
NTSC		-	θ=0°	-	72	-	%	-
Gamma		-	θ=0°	-	2.2	-	-	-
Image sticking		-	Checker pattern	Not recognized			-	6)
Cross talk		-	θ=0°	Not recognized			-	7)

Note 1) Definition of viewing angle



Note 2) Definition of contrast ratio (CR)

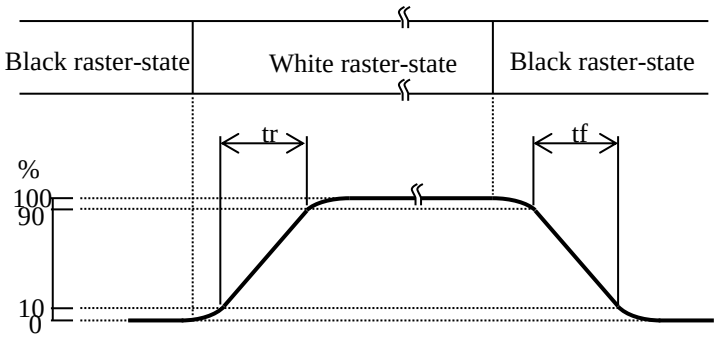
$$CR = \frac{B_{WH}}{B_{BL}}$$

B_{WH} : Brightness at white raster-state

B_{BL} : Brightness at black raster-state

3) Definition of response time

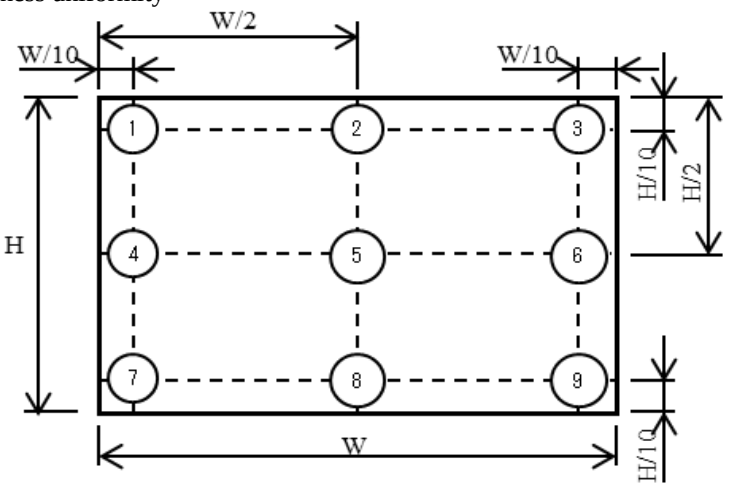
Displaying data signal



tr = Start-up time

tf = Falling time

4) Definition of brightness uniformity



Active area

①-⑨ : Measurement points

Brightness : point⑤

Buni (9 points) : Min(①-⑨) / Max(①-⑨)×100%

5) Contrast ratio at 85 °

The conditions are on horizontal & vertical axis

6) Aging :

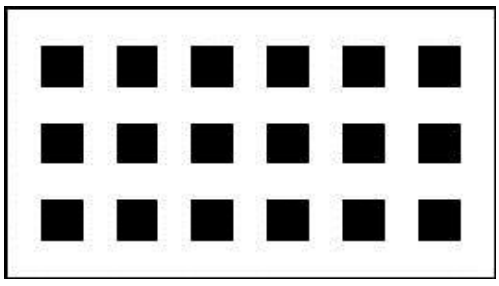
4hours aging with checker pattern at room temperature.

Check :

After aging, turn on gray raster (127/255 level) pattern

It must not recognize within 5 seconds when hold

6% ND filter to the display side.



Display pattern for image sticking

7) It must not recognize within 5 seconds when hold 6% ND filter to the display side.

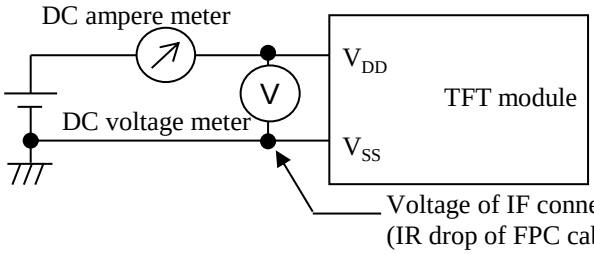
3. ELECTRICAL CHARACTERISTICS

3. 1 TFT-LCD module

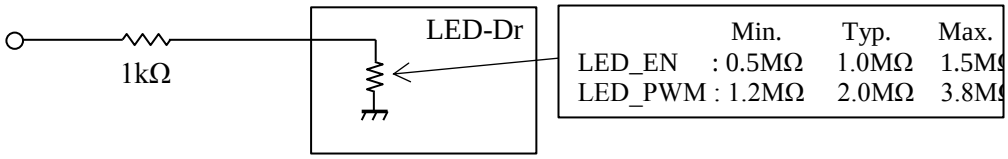
Ta = 25℃, V_{SS} = 0 V

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power supply voltage		V_{DD}	3.0	3.3	3.6	V	
Power supply current		I_{DD}	-	174	460	mA	1)
Ripple voltage of power supply		V_{DDR}	-	-	150	mV	
Input voltage for LED driver		V_{LED}	11.4	-	13.65	V	
Logic signals input voltage	High	VIH	2.35	-	-	V	LED_EN LED_PWM 2)
	Low	VIL	-	-	0.75		
Logic signals output voltage1	High	VOH	2.90	-	-	V	LED_FAIL IOH : 10uA IOL : 0.1mA
	Low	VOL	-	-	0.25		
Logic signals output voltage2	High	VOH	2.30	-	-	V	HPD
	Low	VOL	-	-	0.60		

Note 1) Typ : fV=60.0Hz, V_{DD}=3.3V, and display pattern is white raster.
Max : fV=60.0Hz, V_{DD}=3.0V, display pattern is pixel checker(white and black).



2) Input circuit



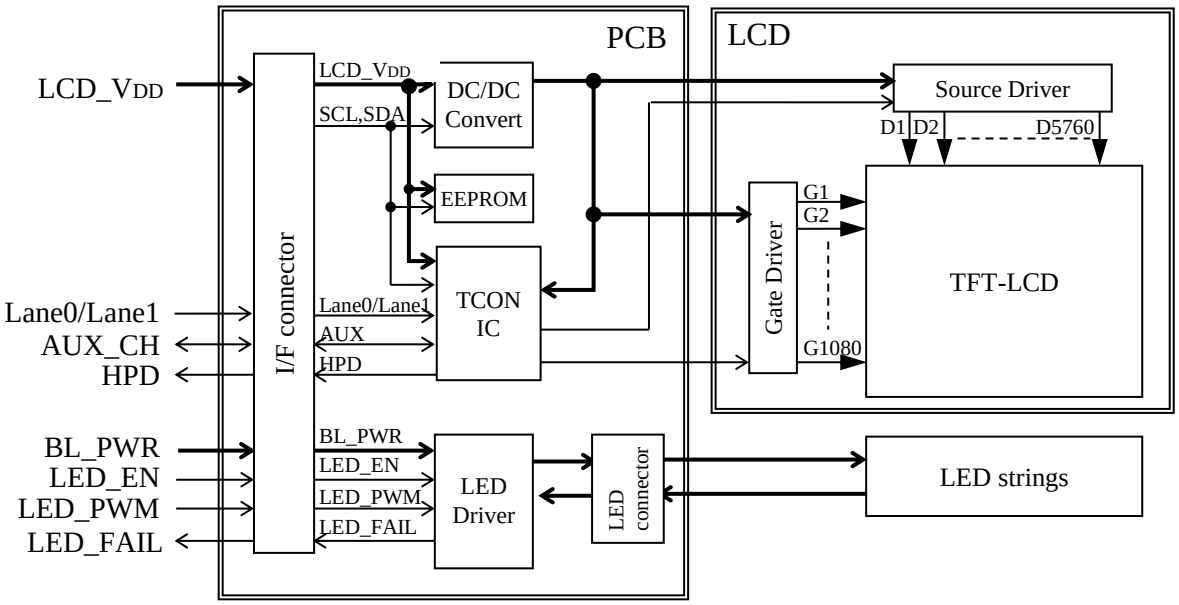
3. 2 Backlight unit

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power Consumption		Pbl	-	2.45	3.02	W	1)
PWM	Duty	PD	1	-	100	%	
	Frequency	PF	100	-	360	Hz	
LED Life time		-	-	30,000	-	h	2), 3)

One Backlight Unit : 1 LED Array
One LED Array : 4 LED String
One LED String : 7 LED package

Note 1) PWM on-duty=100%
2) Life time of LED is defined as follows. The life is estimated as the time at which brightness of the LED is 50% compared to that of initial value at that typical forward current on condition of continuous operating at 25 ± 2℃
3) LED current value is If = 25.5mA

4. BLOCK DIAGRAM



5. INTERFACE PIN ASSIGNMENT

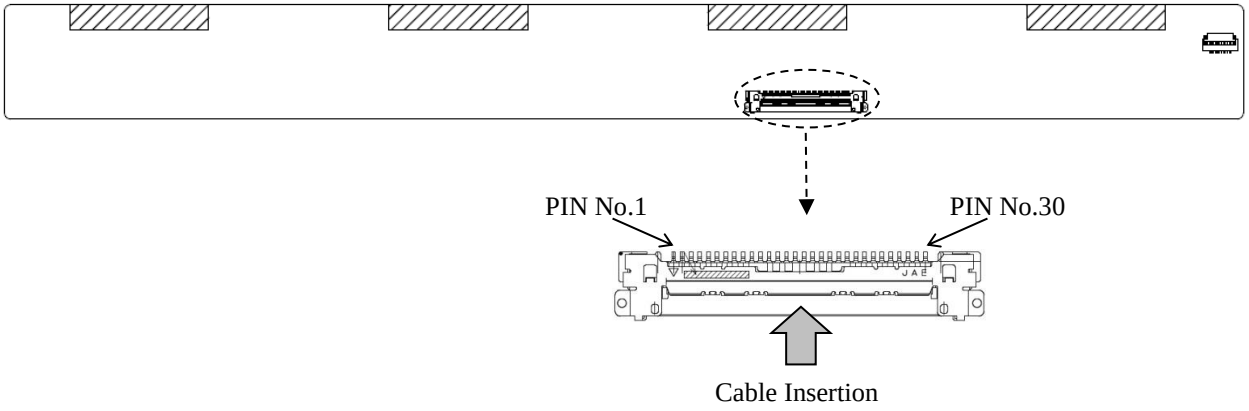
5. 1 Pin assingment

Connector's Part Number : HD2S030HA1 (Maker : JAE)

PIN No.	SYMBOL	I/O	DESCRIPTION	Note
1	LED_FAIL	O	Abnormal detection of Backlight	6)
2	H_GND	-	High Speed Ground (0V)	2)
3	Lane1_N	I	Complement Signal Link Lane 1	
4	Lane1_P	I	True Signal Link Lane 1	
5	H_GND	-	High Speed Ground (0V)	2)
6	Lane0_N	I	Complement Signal Link Lane 0	
7	Lane0_P	I	True Signal Link Lane 0	
8	H_GND	-	High Speed Ground (0V)	2)
9	AUX_CH_P	IO	True Signal Aux Channel	
10	AUX_CH_N	IO	Complement Signal Aux Channel	
11	H_GND	-	High Speed Ground (0V)	2)
12	LCD_V_{DD}	P	Power supply for LCD	1)
13	LCD_V_{DD}			
14	BIST	I	Keep open or connect to GND	
15	LCD_GND	-	GND (0V)	2)

PIN No.	SYMBOL	I/O	DESCRIPTION	Note
16	LCD_GND	-	GND (0V)	2)
17	HPD	O	Hot plug detection	
18	BL_GND	-	GND (0V)	2)
19	BL_GND			
20	BL_GND			
21	BL_GND			
22	LED_EN	I	Enable signal for Backlight	4)
23	LED_PWM	I	Brightness control of Backlight	4)
24	SDA	IO	I2C-bus Data	5)
25	SCL	I	I2C-bus Clock	5)
26	BL_PWR	P	Power supply for Backlight	3)
27	BL_PWR			
28	BL_PWR			
29	BL_PWR			
30	GND	-	GND (0V)	2)

Note 1) All pins should be connected to the power supply for LCD on the customer's product.
2) All pins should be connected to GND(0V) on the customer's product.
3) All pins should be connected to the power supply for Backlight on the customer's product.
4) H=on (active), L=off (inactive)
5) Keep open. (It is no problem because this pin has an internal pull-up.)
6) H=Normal state, L=Abnormal state



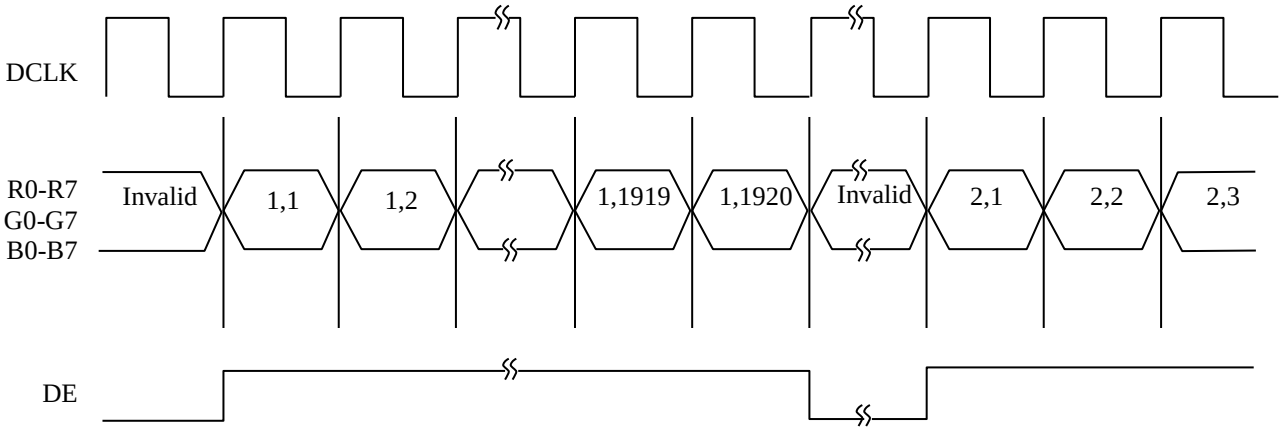
5. 2 Correspondence between input data and display image

Display data of adjacent two pixel is latched during four cycle of DCLK(Dot clock).

B (1,1)	G (1,1)	R (1,1)

Pixel : B0 - B7 : B (x,y)
G0 - G7 : G (x,y)
R0 - R7 : R (x,y)

1 , 1	1 , 2	1 , 3	- -	1 , 1920
2 , 1	2 , 2	2 , 3	- -	2 , 1920
3 , 1	3 , 2	3 , 3	- -	3 , 1920
1080 , 1	1080 , 2	1080 , 3		1080 , 1920



5. 3 Relationship between display colors and input signals

Color \ Input		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	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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	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(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	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 (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.

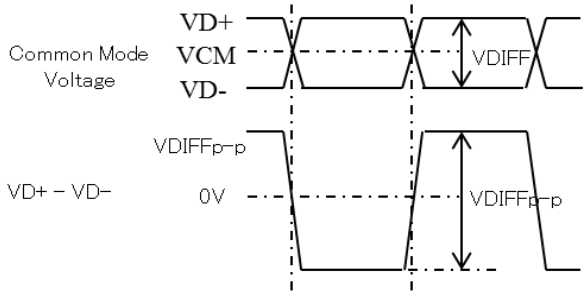
Larger n corresponds to brighter level.

2) Data : 1 : High, 0 : Low

6. INTERFACE TIMING

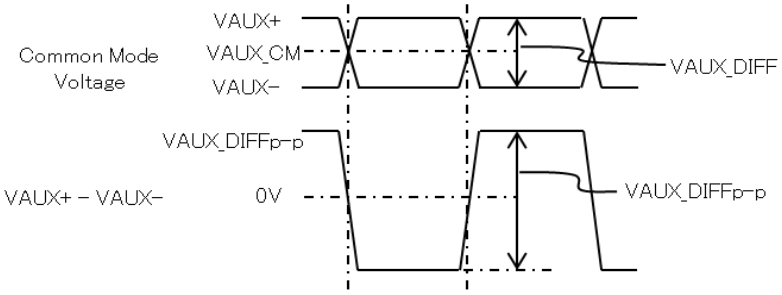
6. 1 eDP receiver characteristics

(1) DisplayPort Main Link Receiver Characteristics



Symbol	Description	Min.	Typ.	Max.	Unit	Comments
VDIFFp-p	Differential peak-to-peak input voltage	120	-	1200	mV	For HBR.
VCM	DC common mode voltage	0.7	-	2.0	V	
RTERM	Differential termination resistance	-	100	-	Ω	
ISHORT	Short circuit current limit	-	-	50	mA	
LSKEW	Lane Intra-pair skew	-	-	100	ps	For HBR.

(2) DisplayPort AUX Channel Characteristics



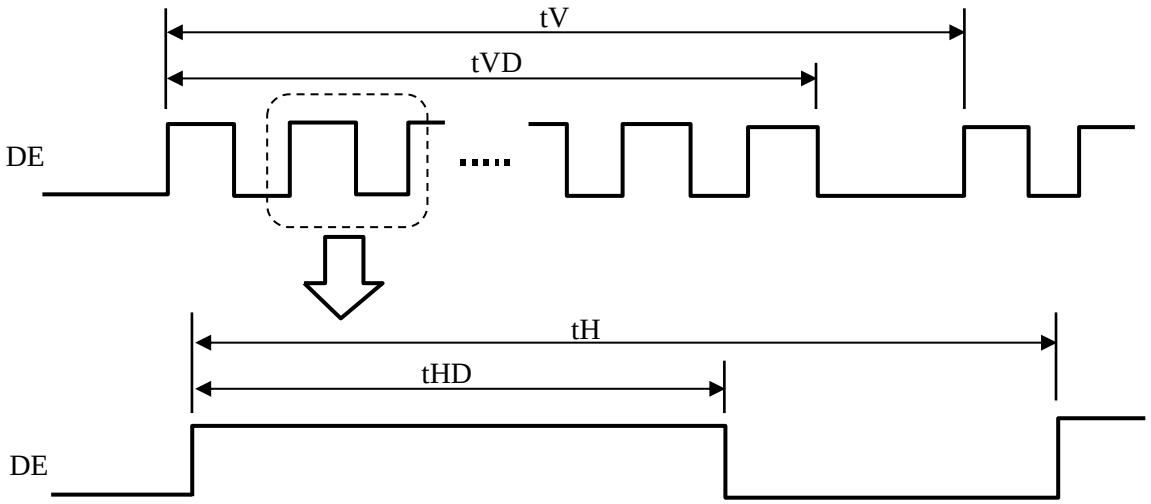
Symbol	Description	Min.	Typ.	Max.	Unit	Comments
UI	AUX Unit interval	0.4	0.5	0.6	us	
VAUX_DIFFp-p	AUX Differential peak-to-peak input voltage	0.32	-	1.32	V	
VAUX_CM	AUX DC common mode voltage	0	-	2.0	V	
RAUX_TERM	AUX CH termination resistance	-	100	-	Ω	
IAUX_SHORT	AUX Short circuit current limit	-	-	90	mA	
CAUX	AUX AC coupling capacitor	-	100	-	nF	1)

Note 1) Coupling capacitor is not mounted on our PCB.

6. 2 eDP 2lane 8bit input data mapping

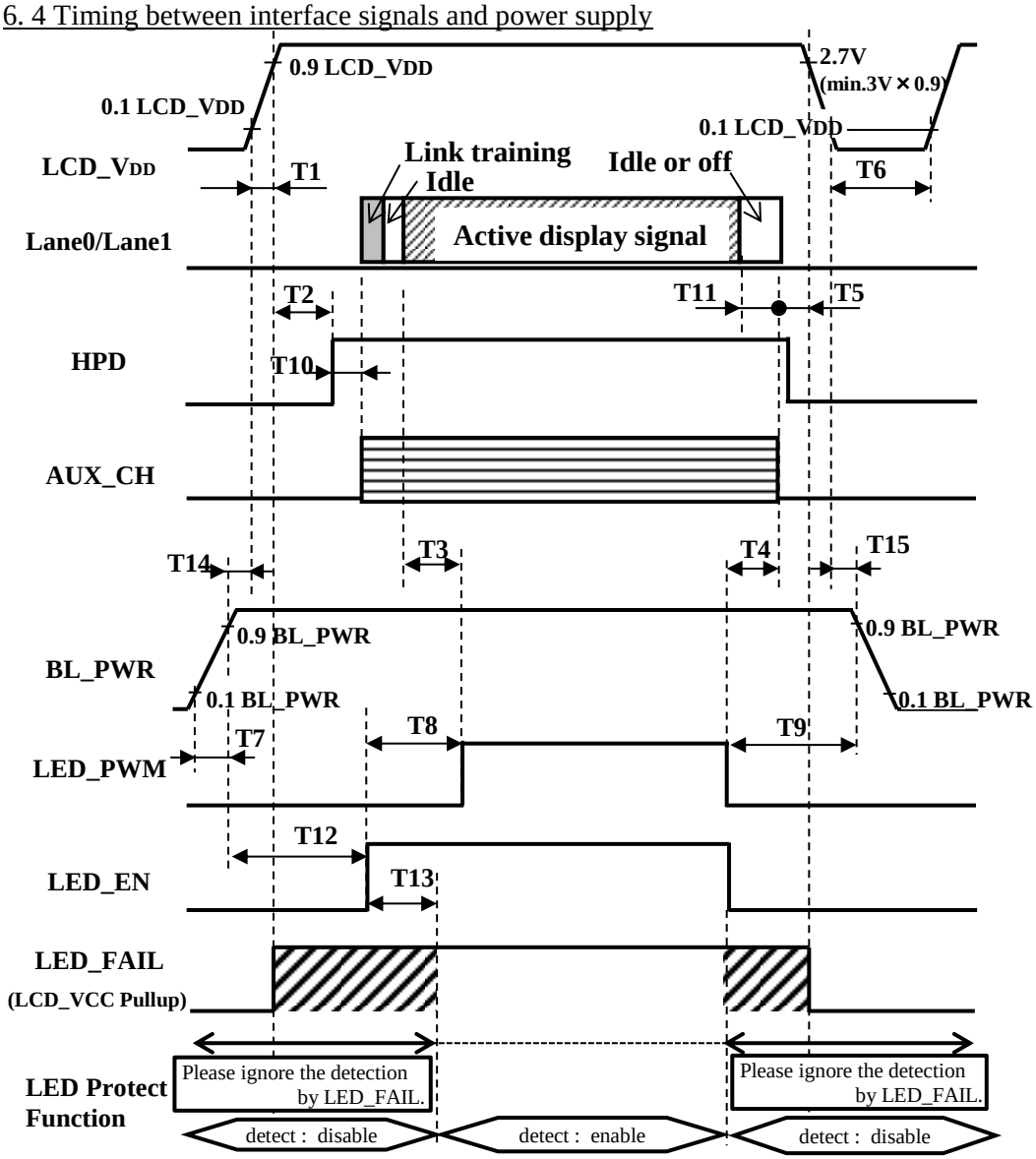
Lane0	Lane1
R1-7:0	R2-7:0
G1-7:0	G2-7:0
B1-7:0	B2-7:0
R3-7:0	R4-7:0
G3-7:0	G4-7:0
B3-7:0	B4-7:0
R5-7:0	R6-7:0
G5-7:0	G6-7:0
B5-7:0	B6-7:0

6. 3 Syncronization signal timing



ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical frequency	fV	59	60	61	Hz	
	Vertical Period	tV	1107	1125	1144	tH	
	Vertical Valid	tVD	1080			tH	
	Horizontal Period	tH	2200			tCLK	
	Horizontal Valid	tHD	1920			tCLK	

6. 4 Timing between interface signals and power supply



SYMBOL	Min.	Typ.	Max.	UNIT	Note
T1	0.5	1	10	ms	
T2	-	-	200	ms	
T3	33.3	-	-	ms	
T4	0	-	-	ms	
T5	0	-	-	ms	
T6	500	-	-	ms	1)
T7	0.5	-	10	ms	
T8	0	-	-	ms	
T9	0	-	-	ms	
T10	0	-	-	ms	
T11	0	-	-	ms	
T12	0	-	-	ms	
T13	-	30	-	ms	
T14	0	-	-	ms	
T15	0	-	-	ms	

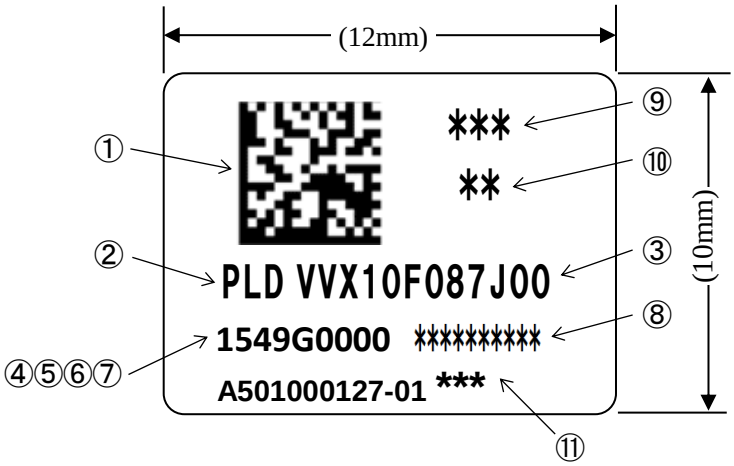
Note 1) Please discharge LCD_V_{DD} below 50mV (duration is over 1ms) before re-power on.

7. LABEL FORMAT

7.1 Label

The label is on the Backlight Frame as shown in 11. Dimensional outline.

The style of character and/or contents will be changed without notice.



① Contents of ②～⑧ are indicated by bar codes.【Express by the data matrix】

② PLD

③ VVX10F087J00

④ Please refer Note 1)

⑤ Please refer Note 2)

⑦ 4 digits for serial number (0001 - ZZZZ) without I and O and U and V.

⑩ Please refer Note 3)

⑥,⑧,⑨ A cord for production of PLD inside management.

⑪PLD's own ID

Note 1)

Mark	Year
17	2017
18	2018
19	2019

Note 2)

01 , The 1st week of year
02 , The 2nd week of year
03 , The 3rd week of year
04 , The 4th week of year
05 , The 5th week of year
06 , The 6th week of year
・・・・・
52 , The 52th week of year

Note 3)

WS : WS
WS2 : W2
ES : ES
CS : CS
MP : 01 - ZZ

8. COSMETIC SPECIFICATIONS

8.1 Condition for cosmetic inspection

(1) Viewing zone

a) The Fig.8.1 shows the viewing angle and distance from human eyes (of inspector) to a surface of the LCD cell.
θ≦10°
L=300 ~ 400mm

b) Inspection should be carried out only at front surface and only in display active area + 1mm (A-zone).
Cosmetic at both B-zone and C-zone are ignored.
Tarnish of Fixed tape which may not affect electrical performance are ignore.
(refer to Fig. 8.2 Definition of zone)

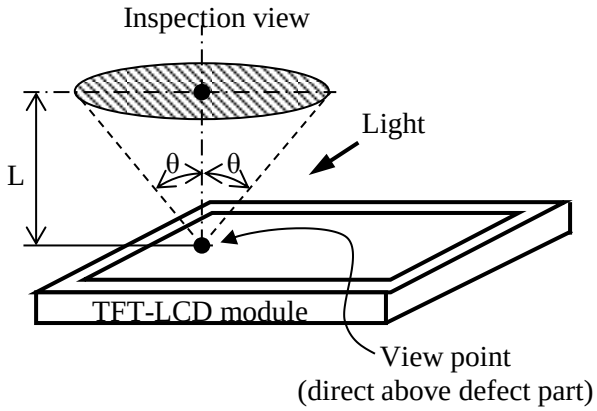


Fig.8.1 Inspection view

(2) Environmental

a) Temperature : 25±5 ℃

b) Ambient light : 300 ～ 500 lx and non-directive when operating inspection.
300 ～ 800 lx and non-directive when non-operating inspection.

c) Backlight : when non-operating inspection, backlight should be off.

8.2 Definition of zone

・A-zone : Display area (pixel area)
・B-zone : Area between A-zone and C-zone
・C-zone : Fixed tape area

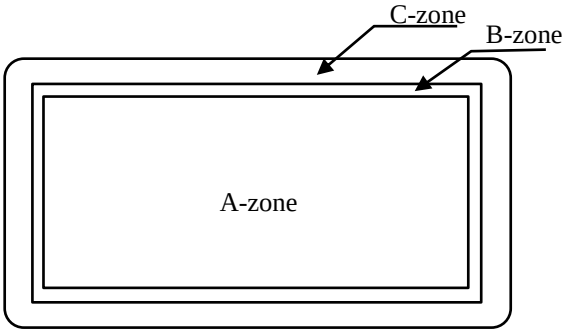


Fig. 8.2 Definition of zone

8.3 Cosmetic specifications

When displaying conditions are not stable (ex. at turn on or off), the following specifications are not applied.

Inspection condition	Zone	No	ITEM			Max. acceptable number	Unit	Note
Operating inspection	A	1	Dot defect	Bright dot	Random	2	pcs	1),,3)
					2-dots	0	Units	1),4),9)
					3-dots	0		
					Density	1	pcs/φ10mm	1),5)
					Total	2	pcs	
				Dark dot	Random	5	pcs	2),3)
					2-dots	2	Units	2),4),9)
					3-dots	0		
					Density	1	pcs/φ10mm	2),5)
					Total	7	pcs	
		2	Stain inclusion Dot shape (D : ave. dia (mm))	D≦0.2		Ignore	pcs	6),7),8)
				0.2<D≦0.4		4		
				D>0.4		0		
		3	Stain inclusion Line shape (W: Width (mm) L: Length (mm))	W≦0.05		Ignore	pcs	6),7),8)
				0.05<W≦0.1	L≦0.5	Ignore		
					0.5<L≦2.0	4		
					L>2.0	0		
				W>0.1		See Dot shape		
		4	Mura			Can not be seen through ND filter	-	11)
		5	Defect on polarizer (D : ave. dia (mm))	Dent Air bubble Peeling	D≦0.2	Ignore	pcs	6)
					0.2<D≦0.4	4		
					D>0.4	0		
					Total	4	pcs	
	B,C	6	Light leakage			Ignore	-	-
Non operating inspection	A	7	Polarizer scratches (W: Width (mm) L: Length (mm))	W≦0.05		Ignore	pcs	6)
				0.05<W≦0.1	L≦0.5	Ignore		
					0.5<L≦10.0	4		
					L>10.0	0		
				W>0.1		See Dot shape		
		8	Wrinkles on polarizer			Serious one is not allowed	-	-
	B	9	Polarizer scratches			Serious one is not allowed	-	-
		10	Lack of polarizer adhesive (W: Width (mm) L: Length (mm))	W≦0.5	L≦9	Ignore	pcs	-
				W＞0.5	L＞9	0		
		11	Fixed tape overlap with polarizer			Not Allowed	-	-
	C	12	Peeling of fixed tape edge			Ignore	-	-
		13	Floating of fixed tape			Ignore	-	-
		14	Wrinkles on fixed tape			Serious one is not allowed	-	-
	All	15	Warpage H:Height(mm)	H≦1.5		Ignore	-	12)
				H>1.5		Not allowed		

Note 1) Bright dot : Count the dot that it is brighter than the judgment pattern of bright dot.
(Judgement gray level is Red : 200, Green : 200, Blue : 200)
Bright dot is ignore, if the bright dot is less than which gray level is Red : 200, Green : 200, Blue : 200.

2) Dark dot : Count the dot that it is brightness less than 70% at white. (visible to eye)

3) 1 dot : Defect dot is isolated, not attached to other defect dot.

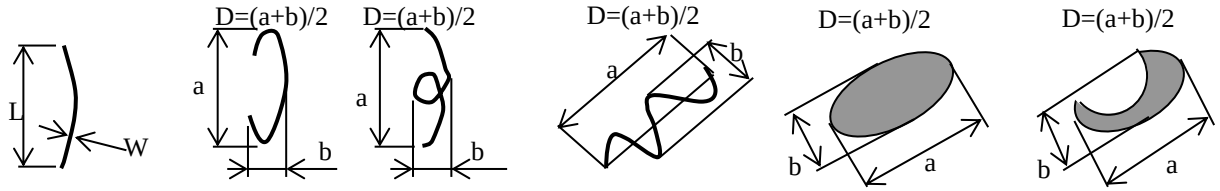
4) N-dots : N-dots defect is a consecutive dot defect. Where N is 2 or greater number of defect dots,
N-dots defect excludes stain, scratch, bubble, etc.

5) Density : Number of defect dots inside φ10mm

6) Those stain inclusion which can be wiped out easily are acceptable.

7) The defect which due to the stain inclusion shall be seen from the front side of the display.
The defect which due to the air bubble is judged at the place where it is seen the maximum brightness
by seeing from many angles.

8) Diameter of stain inclusion is the maximum diameter.
Dimensional definition of scratch and stain inclusion is as follows.



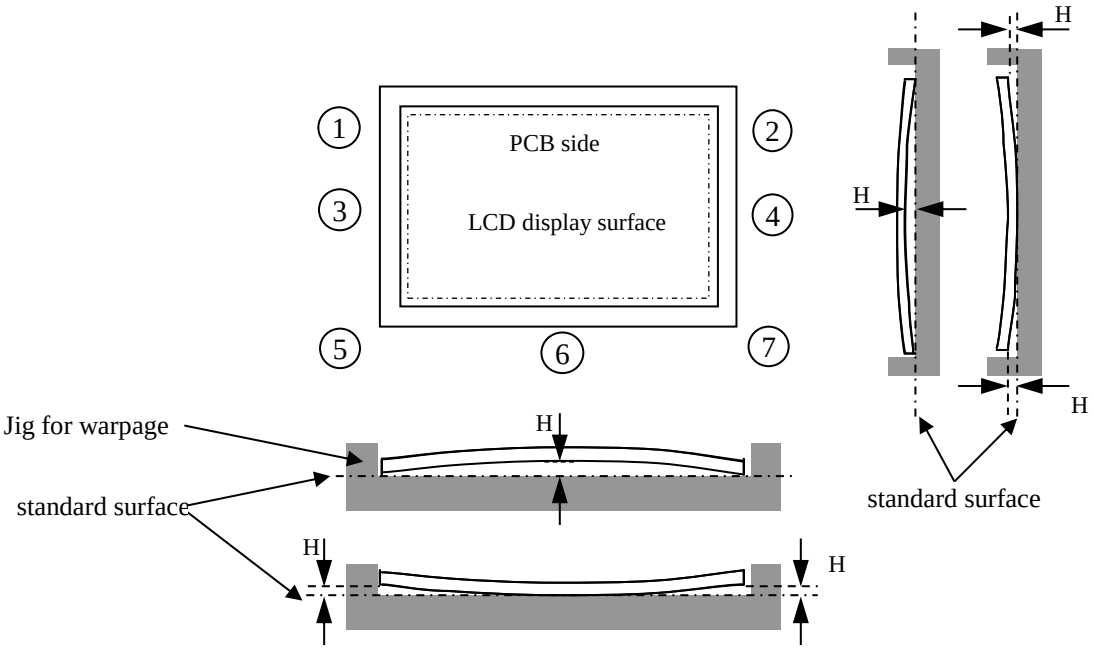
9) Definition of the linked dot defect : 2-dot defect is counted as "2-dot defect: 1 set" when 1 out of 6 dots except for the vertical direction against nearby dot defect is a dot defect.
Dot defects in the vertical direction against nearby dot defect are not allowed.
※ If there is a defect in any of the location of the "△" against "×" in the right figure below, it is defined as the linked dot defect.

B	R △	G △	B △	R	G	B	R	G
B	R △	G ×	B △	R	G	B	R	G
B	R △	G △	B △	R	G	B	R	G

10) Sample for judgment of defect visibility (Limit Sample) shall be agreed if necessary.
The other defect items shall be added if necessary.

Note 11) Visible through 5% ND filter. It must be No-count if not visible by 5%ND filter.

12) Dimensional warpage of LCD module is as follows.
LCD module is measured the warpage setting on the jig for warpage measurement.
It is measured warpage 7 points of between the surface of LCD and the standard surface of jig.
Jig for warpage should be the mutually agreed one.



13) In order to protect the surface of the top polarizer,
the protection film is stuck on the polarizer while shipment.
Definition of zone refer to Fig.8.2.
A-zone : Any stain and bent and dent are ignored unless anything affects polarizer.
B-zone : Any stain, bent, dent, bubble and peeling are ignored.

9. PRECAUTION

Please pay attention to the followings when a TFT module with a backlight unit is used, handled and mounted.

9.1 Precaution to handling and mounting

(1) Applying strong force to a part of the module may cause partial deformation of frame or mold, and cause damage to the display.

(2) The module should gently and firmly be held by both hands. Never hold by just one hand in order to avoid any internal damage. Never drop or hit the module.

(3) Uneven force such as twisted stress should not be applied to a module when a module is mounted on the cover case. The cover case must have sufficient strength so that external force can not be transmitted directly to a module.

(4) It is recommended to leave a space between a module and a holding board of a module so that partial force is not applied to a module.

(5) A transparent protective plate should be added on the display area of a module in order to protect a polarizer and TFT cell. The transparent protective plate should have sufficient strength so that the plate can not touch a module by external force.

(6) Materials included acetic acid and choline should not be used for a cover case as well as other parts and boards near a module. Acetic acid attacks a polarizer. Choline attacks electric circuits due to electro-chemical reaction.

(7) The polarizer on a TFT cell should carefully be handled due to its softness, and should not be touched, pushed or rubbed with glass, tweezers or anything harder than HB pencil lead. The surface of a polarizer should not be touched and rubbed with bare hand, greasy clothes or dusty clothes.

(8) The surface of a polarizer should be gently wiped with absorbent cotton, chamois or other soft materials slightly contained petroleum benzene when the surface becomes dirty. Normal-hexane or Isopropyl alcohol as cleaning chemicals is recommended in order to clean adhesives which fix front/rear polarizers on a TFT cell. Other cleaning chemicals such as acetone, toluene and alcohol should not be used to clean adhesives because they cause chemical damage to a polarizer.

(9) Saliva or water drops should be immediately wiped off. Otherwise, the portion of a polarizer may be deformed and its color may be faded.

(10) The module should not be opened or modified. It may cause not to operate properly.

(11) A module should not be handled with bare hand or dirty gloves. Otherwise, color of a module fixed sheet and metal frame may become dirty during its storage. It is recommended to use clean soft gloves and clean finger stalls when a module is handled at incoming inspection process and production (assembly) process.

(12) Printed circuits board part should not be held and touched. It may cause not to operate properly.

9.2 Precaution to operation

(1) The ambient temperature near the operated module should be satisfied with the absolute maximum ratings. Unless it meets the specifications, sufficient cooling system should be adopted to system.

(2) The spike noise causes the mis-operation of a module. The level of spike noise should be as follows:

$$-100\text{mV} \leqq \text{over- and under- shoot of } V_{DD} \leqq +100\text{mV}$$

V_{DD} including over- and under- shoot should be satisfied with the absolute maximum ratings.

(3) Optical response time, luminance and chromaticity depend on the temperature of a TFT module.

(4) Sudden temperature change may cause dew on and/or in the a module. Dew makes damage to a polarizer and/or electrical contacting portion. Dew causes fading of displayed quality.

(5) Fixed patterns displayed on a module for a long time may cause after-image. It will be recovered soon.

(6) A module has high frequency circuits. Sufficient suppression to electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be effective to minimize the interference.

(7) Noise may be heard when a backlight is operated. If necessary, sufficient suppression should be done by system manufacturers.

(8) The module should not be connected or removed while a main system works.
(9) Inserting or pulling I/F connectors causes any trouble when power supply and signal data are on-state. I/F connectors should be inserted and pulled after power supply and signal data are turned off.
(10)Do not keep the LCD panel with its operation in the condition while the backlight is turned off because there is a possibility that the panel is charged up and may cause MURA.

9.3 Electrostatic discharge control

(1) Since a module consists of a TFT cell and electronic circuits with CMOS-ICs, which are very weak to electrostatic discharge, persons who are handling a module should be grounded through adequate methods such as a list band. I/F connector pins should not be touched directly with bare hands.
(2) Protection film for a polarizer on a module should be slowly peeled off so that the electrostatic charge can be minimized.

9.4 Precaution to strong light exposure

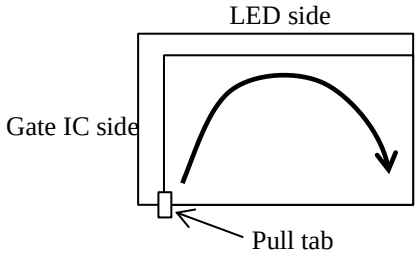
(1) A module should not be exposed under strong light. Otherwise, characteristics of a polarizer and color filter in a module may be degraded.

9.5 Precaution to storage

When modules for replacement are stored for a long time, following precautions should be taken care of:
(1) Modules should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during storage. Modules should be stored at 0 to 35℃ at normal humidity (60%RH or less).
(2) The surface of polarizers should not come in contact with any other object. It is recommended that modules should be stored in the Panasonic Liquid Crystal Display's shipping box.

9.6 Precaution to handling protection film

(1) The protection film for polarizers should be peeled off slowly and carefully by persons who are electrically grounded with adequate methods such as a list band. Besides, ionized air should be blown over during peeling action. Dusts on a polarizer should be blown off by an ionized nitrogen gun and so on.
(2) The protection film should be peeling off without rubbing it to the polarizer. Because, if the film is rubbed together with the polarizer, since the film is attached to the polarizer with a small amount of adhesive, the adhesive may remain on a polarizer.
(3) The module with protection film should be stored on the conditions explained in 10.5 (1). However, in case that the storage time is too long, adhesive may remain on a polarizer even after a protection film is peeled off. Besides, in case that a module is stored at higher temperature and/or higher humidity, adhesive may remain on a polarizer. The remained adhesive may cause non-uniformity of display image.
(4) The adhesive can be removed easily with Normal-Hexane or Isopropyl alcohol. The remained adhesive or its vestige on the polarizer should be wiped off with absorbent cotton or other soft materials such as chamois slightly contained Normal-Hexane or Isopropyl alcohol.
(5) The procedure of peeling protection film on polarizer is recommended as follows.
Peel off protection film from upper polarizer film with tape.
Please peel off the protection film like the below figure.



9.7 Safety

(1) Since a TFT cell is made of glass, handling to the broken module should be taken care sufficiently in order not to be injured. Hands touched liquid crystal from a broken cell should be washed sufficiently.

(2) The module should not be taken apart during operation so that backlight drives by high voltage.

9.8 Environmental protection

Flexible printed circuits and printed circuits board used in a module contain small amount of lead. Please follow local ordinance or regulations for its disposal.

9.9 Use restrictions and limitations

(1) This product is not authorized for use in life support devices or systems, military applications or other applications which pose a significant risk of personal injury.

(2) In no event shall Panasonic Liquid Crystal Display Co., Ltd., be liable for any incidental, indirect or consequential damages in connection with the installation or use of this product, even if informed of the possibility thereof in advance. These limitations apply to all causes of action in the aggregate, including without limitation breach of contact, breach of warranty, negligence, strict liability, misrepresentation and other torts.

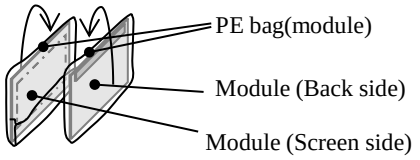
9.10 Others

Electrical components which may not affect electrical performance are subjective to change without notice because of their availability.

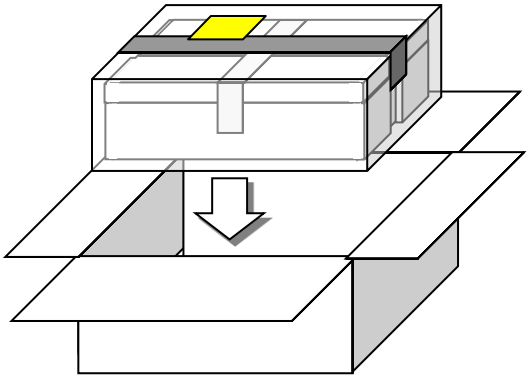
10. PACKING

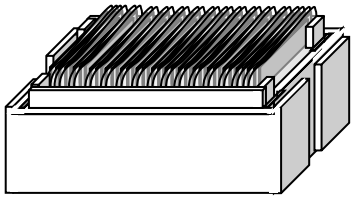
10.1 Precaution to handling and mounting

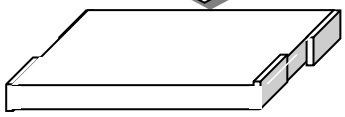
1) Standard packing specification.

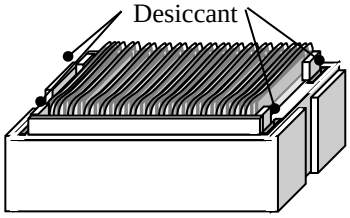


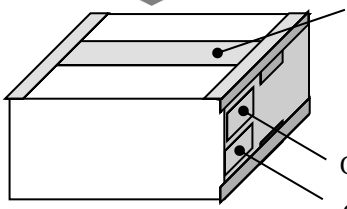
※1 Put the 2 modules in 1 groove
※2 Screen on the inside

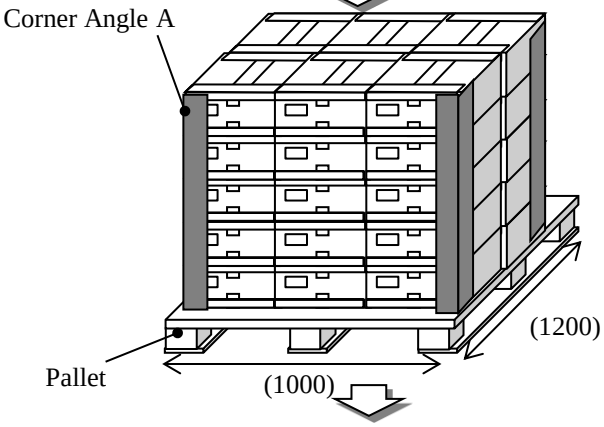


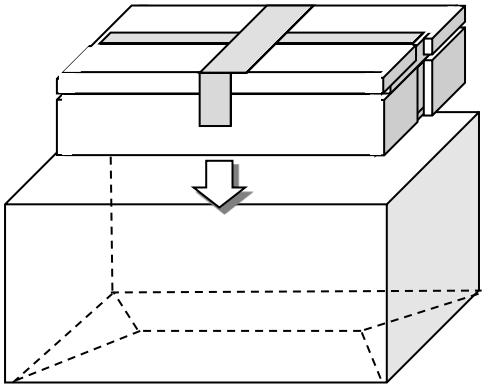


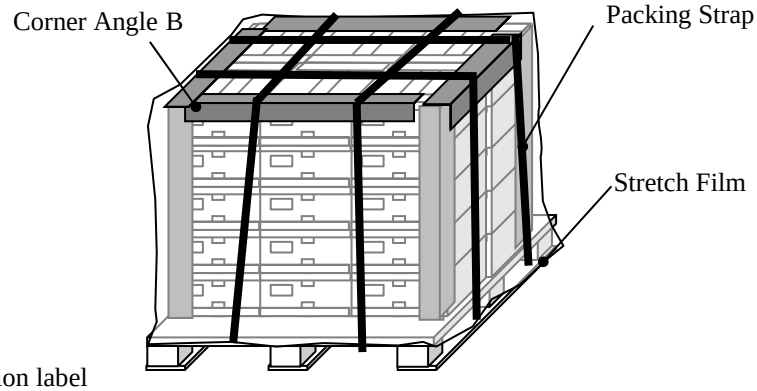


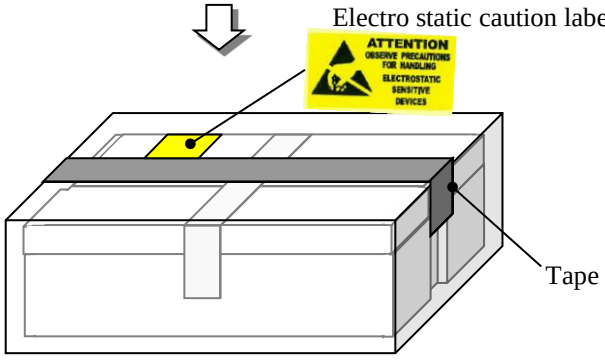










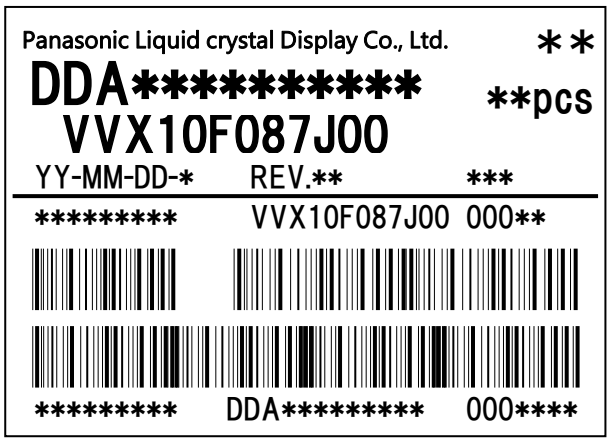


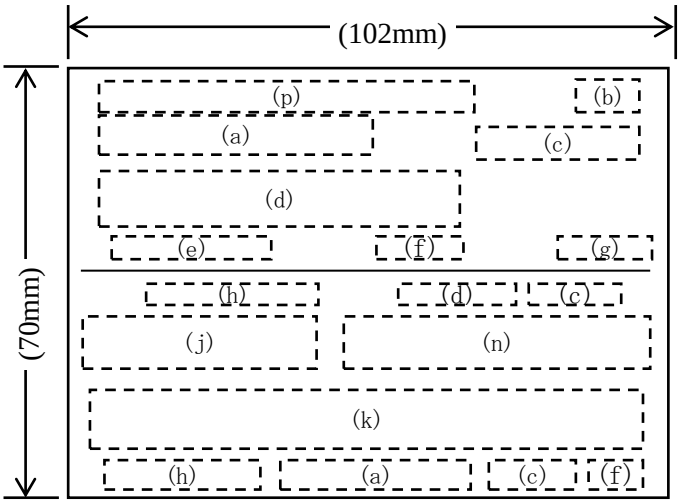
Package information

ITEMS	Box	Pallet
Size [mm]	508 × 312 × 215 (inner size)	1200 × 1000 × 1200
Product quantity [Pieces]	30	900
Packing weight [kg] (*)	-	180

10.2 Label-1 on packing box

production ship (ex.)





Code	Contents of Printing
(a)	PLD internal code.
(b)	The place of issuing label.
(c)	Quantity of the product (pcs)
(d)	This shows product name.
(e)	Lot of registration
(f)	Revision (Rev.)
(g)	PLD's own ID
(h)	Serial No. of identification tag Serial No. is defined as follows. 6 7 11 B 0001 Serial No. (0001～9999 and A000~Z999) must be continuous. Do not reset. Date (Refer to the table 1.) The production base refers to Note (1) Base Code mentioned above. Month (Refer to the table 2.) Year (Last 1digit of AD)
(j)	Bar code corresponds to (h).
(k)	Bar codes correspond to (h), (a),(c) and (f).
(n)	Bar codes correspond to (d), (c).
(p)	Panasonic Liquid Crystal Display Co., Ltd.

Table 1 Date ※Do not use I.O.

Date	1	2	3	4	5	6	7	8	9	10	11	12
Code	1	2	3	4	5	6	7	8	9	A	B	C
Date	13	14	15	16	17	18	19	20	21	22	23	24
Code	D	E	F	G	H	J	K	L	M	N	P	Q
Date	25	26	27	28	29	30	31					
Code	R	S	T	U	V	W	X					

Table 2 Month ※Do not use I.O.

Month	1	2	3	4	5	6	7	8	9	10	11	12
Code	A	B	C	D	E	F	G	H	J	K	L	M

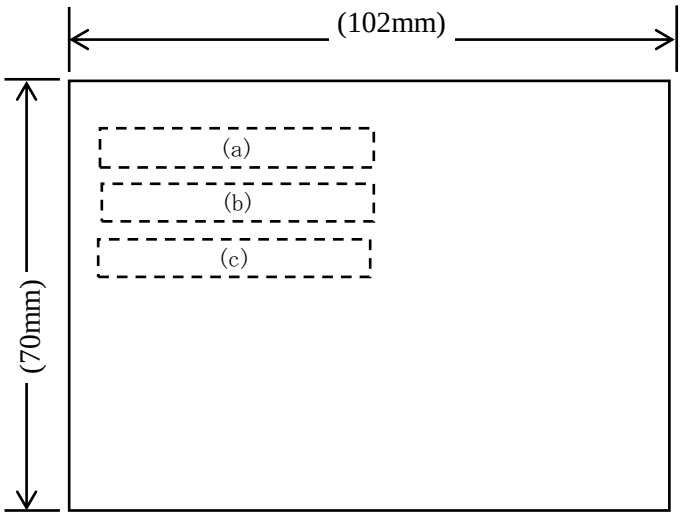
10.3 Label-2 on packing box

This label shows PLD's own ID.

The style of character and/or contents will be changed without notice.

production ship (ex.)

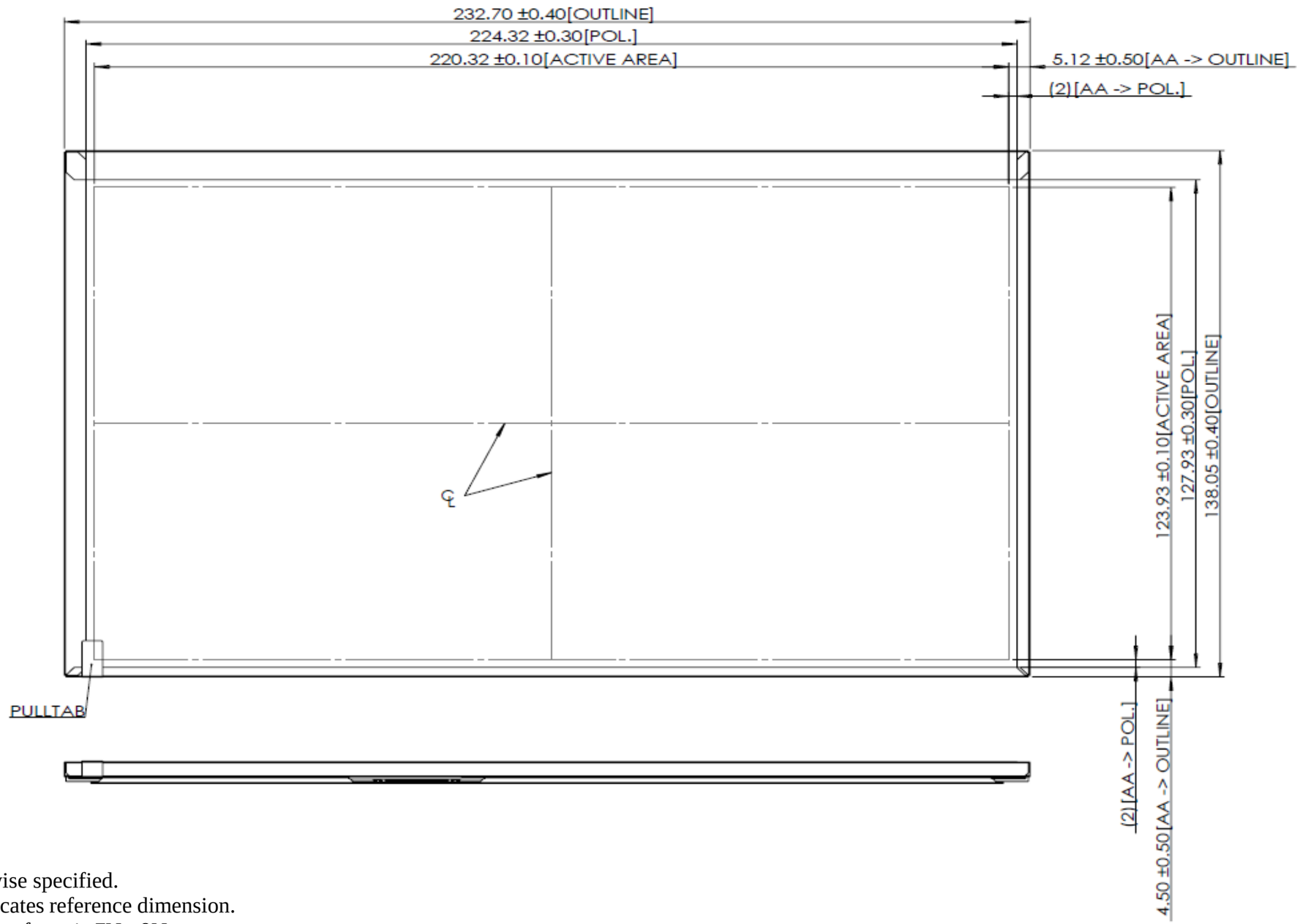
-A501000127
-A501000127-01 A
-L5EDDYY00918



Code	Contents of Printing
(a)	ID-A
(b)	ID-B
(c)	ID-C

9. Dimensional outline

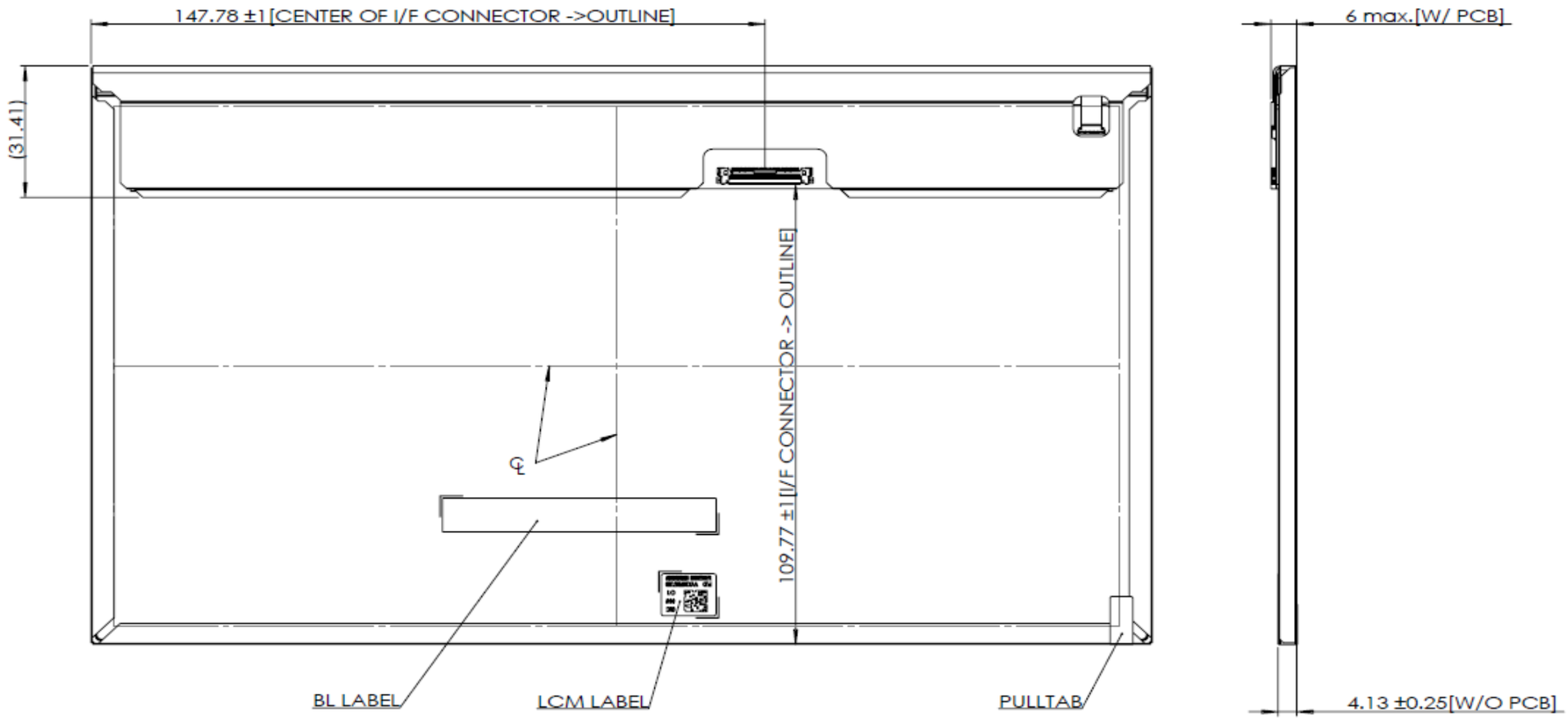
< Front view>



Notes : Unless otherwise specified.
1) Round bracket indicates reference dimension.
2) Thickness measuring force is 7N - 9N.

Panasonic Liquid Crystal Display Co., Ltd.	Date	Jul./5/2017	Sheet No.	IPS4 PS 2614 VVX10F087J00-1	Page	14-1/2

< Back view>



Notes : Unless otherwise specified.
1) A number in round bracket indicates a reference dimension.
2) Thickness measuring force is 7N - 9N.

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