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	LARGE LIQUID CRYSTAL DISPLAY BUSSINESS GROUP SHARP CORPORATION SPECIFICATION	LIQUID CRYSTAL DISPLAY DIVISION

DEVICE SPECIFICATION FOR

TFT-LCD Module

Model No. LK695D3LA88

CUSTOMER'S APPROVAL

DATE

PRESENTED

BY _____

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SHARP CORPORATION

RECORDS OF REVISION

MODEL No. : LK695D3LA88

SPEC No. : LD-K24103B

SPEC No.	DATE	REVISED No.	PAGE	SUMMARY	NOTE
LD-K24103	2012.1.20	-	-	-	1st ISSUE
	2012.2.21	A	8-10	Added as "Installation and Display direction"	2nd ISSUE
	2012.3.9	B	2,3	Revised Mating connector	3rd ISSUE
			6,7	Revised Ref.No. of Backlight CN	
			7	Added Voltage value of [Note 2]	
			16	Specified Luminance uniformity	
			19	Revised Packing Label	
			21	Updated MODULE OUTLINE DIMENSIONS and added LED-Driving-PWB Cover	

1. Application

This technical literature applies to the color 69.5" TFT-LCD module LK695D3LA88.

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2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit, LED driver circuit, and edge-light LED system etc. Graphics and texts can be displayed on a 1920×RGB×1080 dots panel with one billion colors (RGB 10bits) by using LVDS (Low Voltage Differential Signaling) to interface, +12V of DC supply voltages.

And in order to improve the response time of LCD, this module applies the Over Shoot driving (O/S driving) technology for the control circuit. In the O/S driving technology, signals are being applied to the Liquid Crystal according to a pre-fixed process as an image signal of the present frame when a difference is found between image signal of the previous frame and that of the current frame after comparing them.

This LCD module also adopts Double Frame Rate driving method.

With combination of these technologies, motion blur can be reduced and clearer display performance can be realized.

3. Mechanical Specifications

Parameter	Specifications	Unit
Display size	176.563 (Diagonal)	cm
	69.513 (Diagonal)	inch
Active area	1538.880 (H) x 865.620 (V)	mm
Pixel Format	1920(H) x 1080(V) (1pixel = R + G + B dot)	pixel
Pixel pitch	0.802(H) x 0.802 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Display mode	Normally black	
Outline Dimensions (*1)	1566(W) x 901.8(H) x 29.6(D)	mm
Mass	26.0 ±1.5	kg
Surface treatment	Low-Haze Anti Glare Hard coating: 2H and more	

(*1) Outline is shown in fig. of "OUTLINE DIMENSIONS"

4. Input Terminals

4.1. TFT panel driving

CN1 (Interface signals and +12V DC power supply)

Using connector : 91213-0510Y (ACES)

Mating connector : 91214-05130 (ACES), FI-RE51HL/FI-RE51CL (JAE) ▲B

Mating LVDS transmitter : THC63LVD1023 or equivalent device

Pin No.	Symbol	Function	Remark
1	GND		
2	Reserved	It is required to set non-connection(OPEN)	Pull up 3.3V
3	Reserved	It is required to set non-connection(OPEN)	Pull up 3.3V
4	Reserved	It is required to set non-connection(OPEN)	Pull up 3.3V
5	FRAME	Frame frequency setting 1:120Hz 0:100Hz [Note 1]	Pull down: (GND)
6	O/S set	O/S operation setting H:O/S_ON, L:O/S_OFF [Note 3]	Pull up 3.3V
7	SELLVDS	Select LVDS data order [Note 2]	Pull down: (GND)
8	Reserved	It is required to set non-connection(OPEN)	Pull down: (GND)
9	Reserved	It is required to set non-connection(OPEN)	Pull down: GND
10	Reserved	It is required to set non-connection(OPEN)	Pull down: GND
11	GND		
12	AIN0-	Aport (-)LVDS CH0 differential data input	
13	AIN0+	Aport (+)LVDS CH0 differential data input	
14	AIN1-	Aport (-)LVDS CH1 differential data input	
15	AIN1+	Aport (+)LVDS CH1 differential data input	
16	AIN2-	Aport (-)LVDS CH2 differential data input	
17	AIN2+	Aport (+)LVDS CH2 differential data input	
18	GND		
19	ACK-	Aport LVDS Clock signal(-)	
20	ACK+	Aport LVDS Clock signal(+)	
21	GND		
22	AIN3-	Aport (-)LVDS CH3 differential data input	
23	AIN3+	Aport (+)LVDS CH3 differential data input	
24	AIN4-	Aport (-)LVDS CH4 differential data input	
25	AIN4+	Aport (+)LVDS CH4 differential data input	
26	GND		
27	GND		
28	BIN0-	Bport (-)LVDS CH0 differential data input	
29	BIN0+	Bport (+)LVDS CH0 differential data input	
30	BIN1-	Bport (-)LVDS CH1 differential data input	
31	BIN1+	Bport (+)LVDS CH1 differential data input	
32	BIN2-	Bport (-)LVDS CH2 differential data input	
33	BIN2+	Bport (+)LVDS CH2 differential data input	
34	GND		
35	BCK-	Bport LVDS Clock signal(-)	
36	BCK+	Bport LVDS Clock signal(+)	
37	GND		
38	BIN3-	Bport (-)LVDS CH3 differential data input	
39	BIN3+	Bport (+)LVDS CH3 differential data input	
40	BIN4-	Bport (-)LVDS CH4 differential data input	
41	BIN4+	Bport (+)LVDS CH4 differential data input	
42	GND		
43	GND		
44	GND		
45	GND		
46	GND		
47	VCC	+12V Power Supply	

48	VCC	+12V Power Supply	
49	VCC	+12V Power Supply	
50	VCC	+12V Power Supply	
51	VCC	+12V Power Supply	

CN2 (Interface signals)

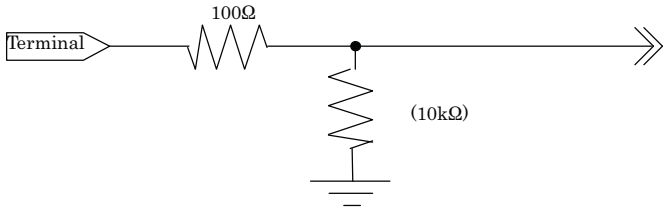
Using connector : 91213-0410Y (ACES)

Mating connector : 91214-04130 (ACES) , FI-RE41HL/FI-RE41CL (JAE) ▲B

Pin No.	Symbol	Function	Remark
1	Reserved (VCC)	(+12V Power Supply)	
2	Reserved (VCC)	(+12V Power Supply)	
3	Reserved (VCC)	(+12V Power Supply)	
4	Reserved (VCC)	(+12V Power Supply)	
5	Reserved		
6	Reserved		
7	Reserved		
8	Reserved		
9	GND		
10	CIN0-	Cport (-)LVDS CH0 differential data input	
11	CIN0+	Cport (+)LVDS CH0 differential data input	
12	CIN1-	Cport (-)LVDS CH1 differential data input	
13	CIN1+	Cport (+)LVDS CH1 differential data input	
14	CIN2-	Cport (-)LVDS CH2 differential data input	
15	CIN2+	Cport (+)LVDS CH2 differential data input	
16	GND		
17	CCK-	Cport LVDS Clock signal(-)	
18	CCK+	Cport LVDS Clock signal(+)	
19	GND		
20	CIN3-	Cport (-)LVDS CH3 differential data input	
21	CIN3+	Cport (+)LVDS CH3 differential data input	
22	CIN4-	Cport (-)LVDS CH4 differential data input	
23	CIN4+	Cport (+)LVDS CH4 differential data input	
24	GND		
25	GND		
26	DIN0-	Dport (-)LVDS CH0 differential data input	
27	DIN0+	Dport (+)LVDS CH0 differential data input	
28	DIN1-	Dport (-)LVDS CH1 differential data input	
29	DIN1+	Dport (+)LVDS CH1 differential data input	
30	DIN2-	Dport (-)LVDS CH2 differential data input	
31	DIN2+	Dport (+)LVDS CH2 differential data input	
32	GND		
33	DCK-	Dport LVDS Clock signal(-)	
34	DCK+	Dport LVDS Clock signal(+)	
35	GND		
36	DIN3-	Dport (-)LVDS CH3 differential data input	
37	DIN3+	Dport (+)LVDS CH3 differential data input	
38	DIN4-	Dport (-)LVDS CH4 differential data input	
39	DIN4+	Dport (+)LVDS CH4 differential data input	
40	GND		
41	GND		

[Note] The GND on Control-PWB should be connected with a module chassis.

[Note 1]The equivalent circuit figure of the terminal



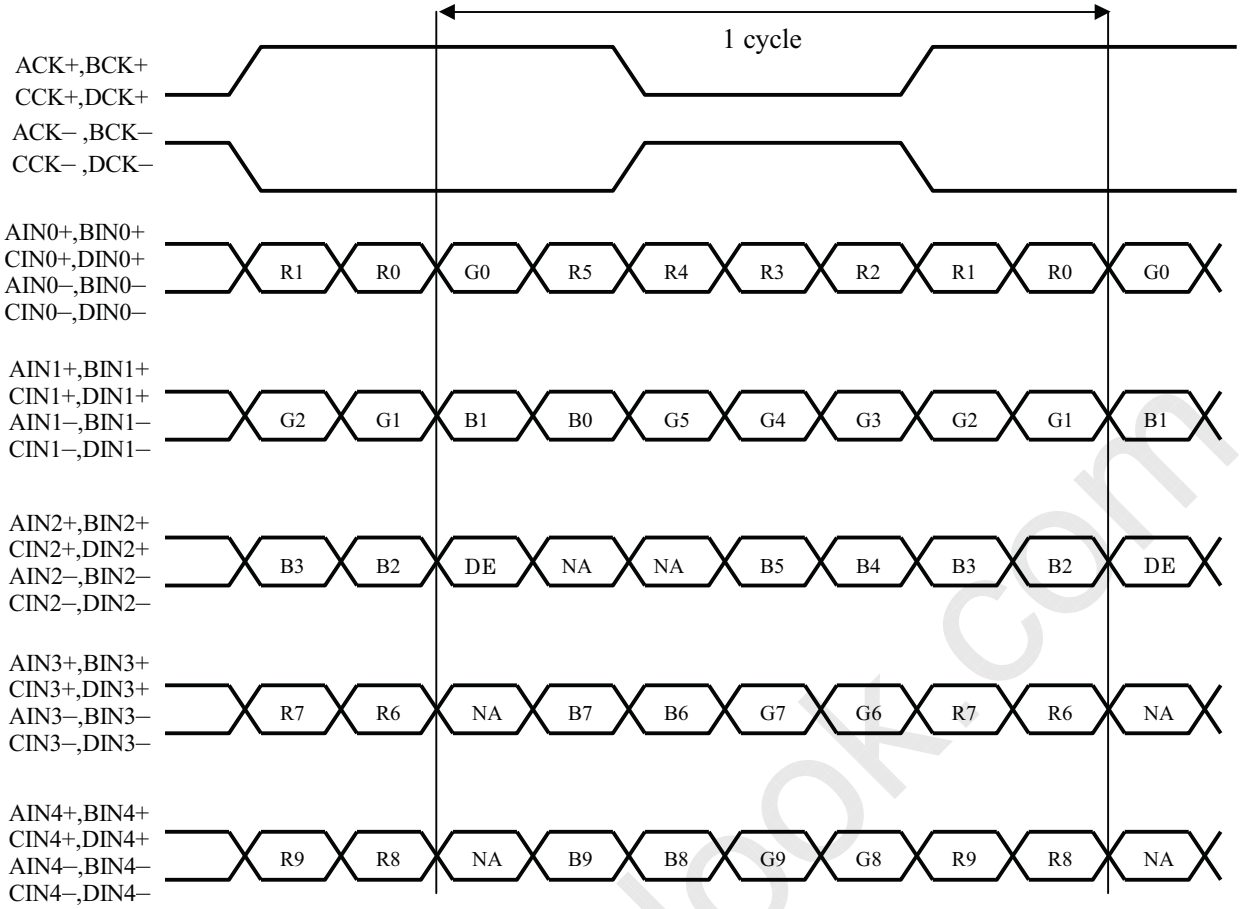
[Note 2] LVDS Data order

SELLVDS		
Data	L(GND) or Open [VESA]	H(3.3V) [JEIDA]
TA0	R0(LSB)	R4
TA1	R1	R5
TA2	R2	R6
TA3	R3	R7
TA4	R4	R8
TA5	R5	R9(MSB)
TA6	G0(LSB)	G4
TB0	G1	G5
TB1	G2	G6
TB2	G3	G7
TB3	G4	G8
TB4	G5	G9(MSB)
TB5	B0(LSB)	B4
TB6	B1	B5
TC0	B2	B6
TC1	B3	B7
TC2	B4	B8
TC3	B5	B9(MSB)
TC4	NA	NA
TC5	NA	NA
TC6	DE(*)	DE(*)
TD0	R6	R2
TD1	R7	R3
TD2	G6	G2
TD3	G7	G3
TD4	B6	B2
TD5	B7	B3
TD6	N/A	N/A
TE0	R8	R0(LSB)
TE1	R9(MSB)	R1
TE2	G8	G0(LSB)
TE3	G9(MSB)	G1
TE4	B8	B0(LSB)
TE5	B9(MSB)	B1
TE6	N/A	N/A

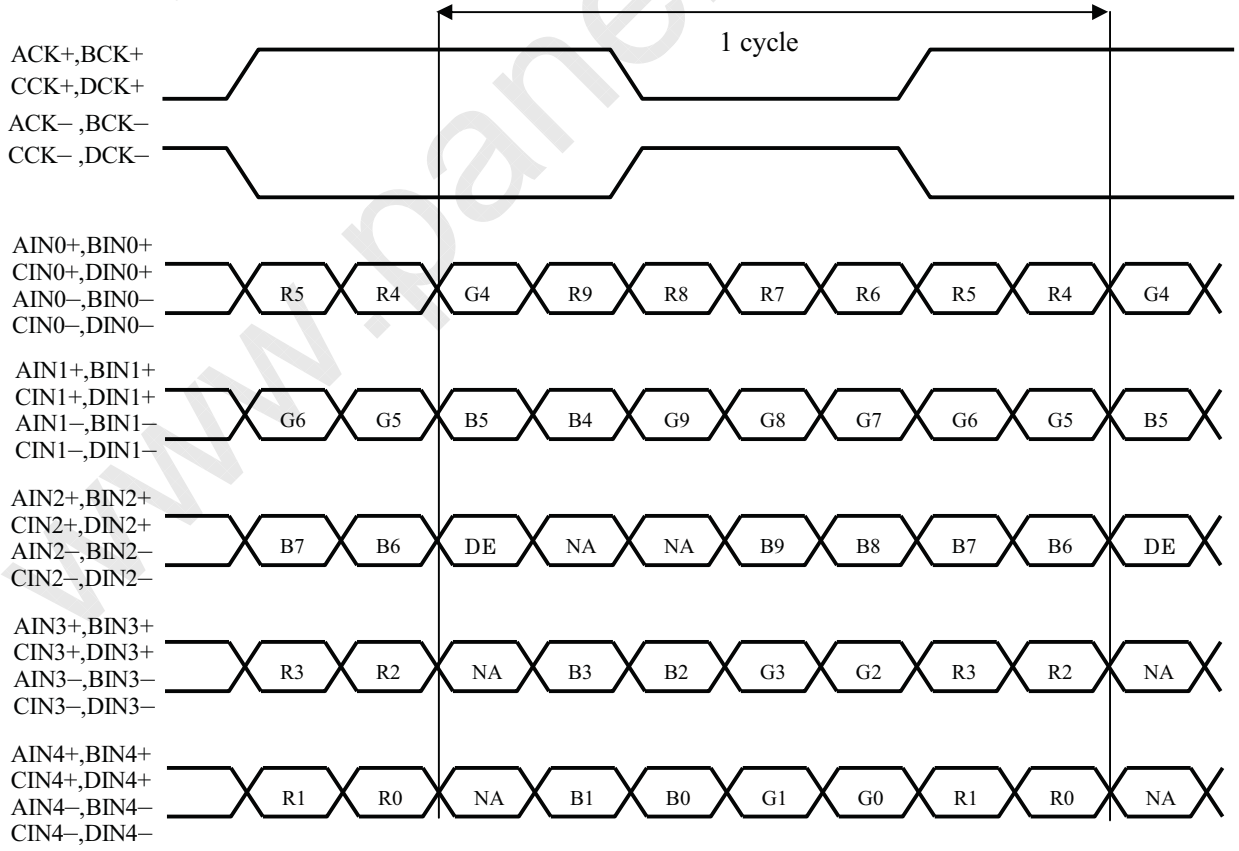
NA: Not Available

(*)Since the display position is prescribed by the rise of DE(Display Enable)signal, please do not fix DE signal at ”High” during operation.

SELLVDS= Low (GND) or OPEN

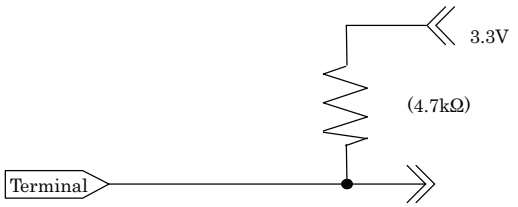


SELLVDS= High (3.3V)

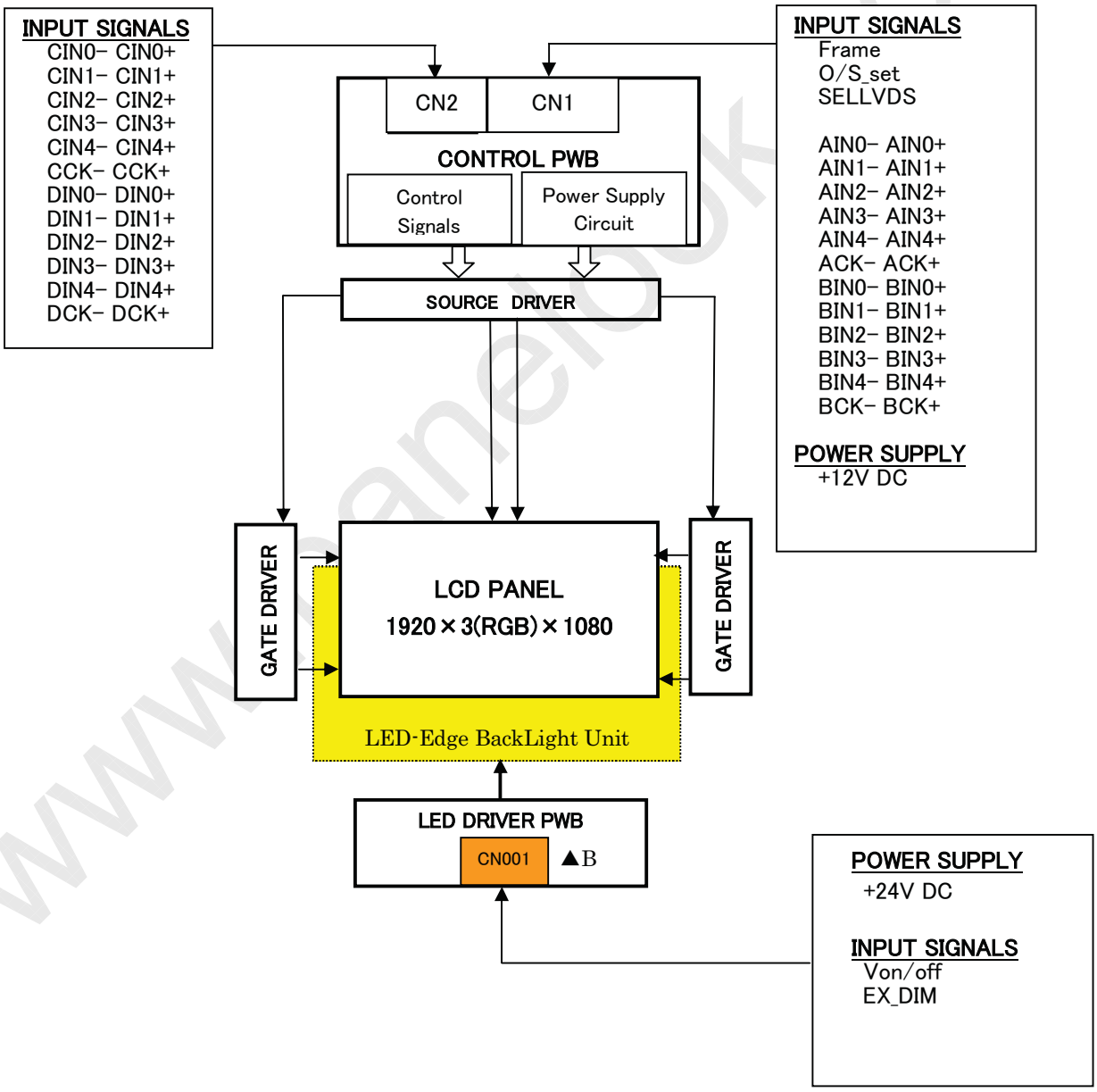


DE: Display Enable, NA: Not Available (Fixed Low)

[Note 3] The equivalent circuit figure of the terminal:



4.2. Interface block diagram



4.3. Backlight driving

CN001 (+24V DC power supply and inverter control) ▲B

Using connector: 20022WR-14B1(YEONHO)

Mating connector: 20022HS-14L (YEONHO) or equivalent connector.

Pin No.	Symbol	I/O	Function	Default(OPEN)	Input Impedance (min)	Remark
1	VLED	In	+24V	-		
2	VLED	In	+24V	-		
3	VLED	In	+24V	-		
4	VLED	In	+24V	-		
5	VLED	In	+24V	-		
6	GND	In	GND	-		
7	GND	In	GND	-		
8	GND	In	GND	-		
9	GND	In	GND	-		
10	GND	In	GND	-		
11	Error_out	Out	Error Detection	Open Collector		[Note 1]
12	Von/off	In	LED driver On/Off	LED driver Off	10k-ohm pull-down to GND	[Note 2]
13	NC	-	-	-		
14	EX_DIM	In	Brightness Control (PWM 1～100%)	3.3V : pull up Brightness 100%	10k-ohm pull-up to 3.3V	[Note 3] Pulse Dimming

[Note 1] Error Detection

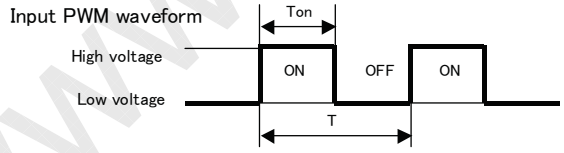
	MIN	TYP	MAX
Normal	-	-	1.0V
Abnormal	Open Collector		

[Note 2] LED driver ON/OFF ▲B

Input voltage	Symbol	Voltage	Function
High voltage	V_{ON}	2.4～3.6V	LED driver : On
Low voltage	V_{OFF}	-0.3～0.8V	LED driver : Off

[Note 3] Pulse Dimming

Pin No.14 'EX_DIM' is used for the pulse dimming control by the PWM duty with input pulse from 90Hz to 360Hz.



High voltage: 2.4～3.6V

Low voltage: -0.3～0.8V

		MIN	TYP	MAX	Remark
Pulse signal	[Hz]	90	-	360	
DUTY(Ton/T)	[%]	1	-	100	Ta=25°C
Dimming level (luminance ratio)	[%]	-	-	100	Ta=25°C

• 4.4. LED lifetime

LED light system is side-edge type. The characteristics of the LED are shown in the following table. The value mentioned below is at the case of one LED.

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Life time	T_{LED}	-	60,000	-	Hour	[Note]

[Note]

LED life time is defined as the time when brightness becomes 50% of the original value in the continuous operation under the condition of Ta = 25℃

[Operation condition]

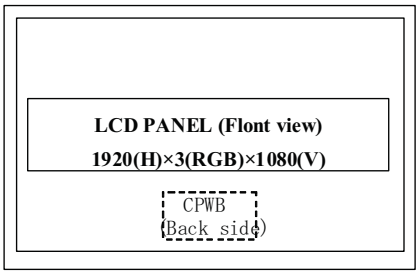
- ambient temperature Ta=25℃

5. Installation and Display direction

This module can be installed by both installation direction “landscape” and “portrait” as follows.

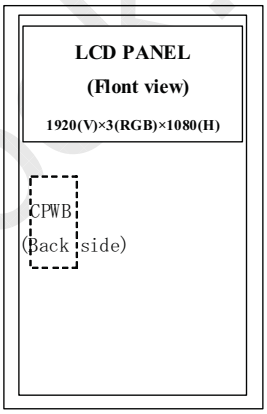
[Landscape direction]

In front view, CPWB is located BOTTOM



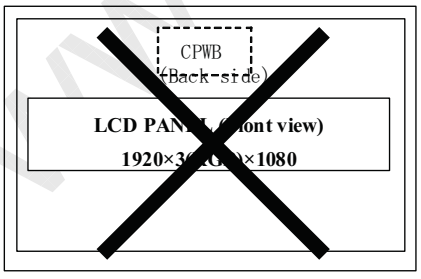
[Portrait direction]

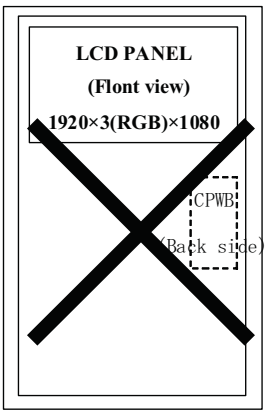
In front view, CPWB is located Left-side



[Note] Other installation direction

Since in case of the other installation direction the characteristic and reliability cannot be guaranteed, **NOT recommended.**

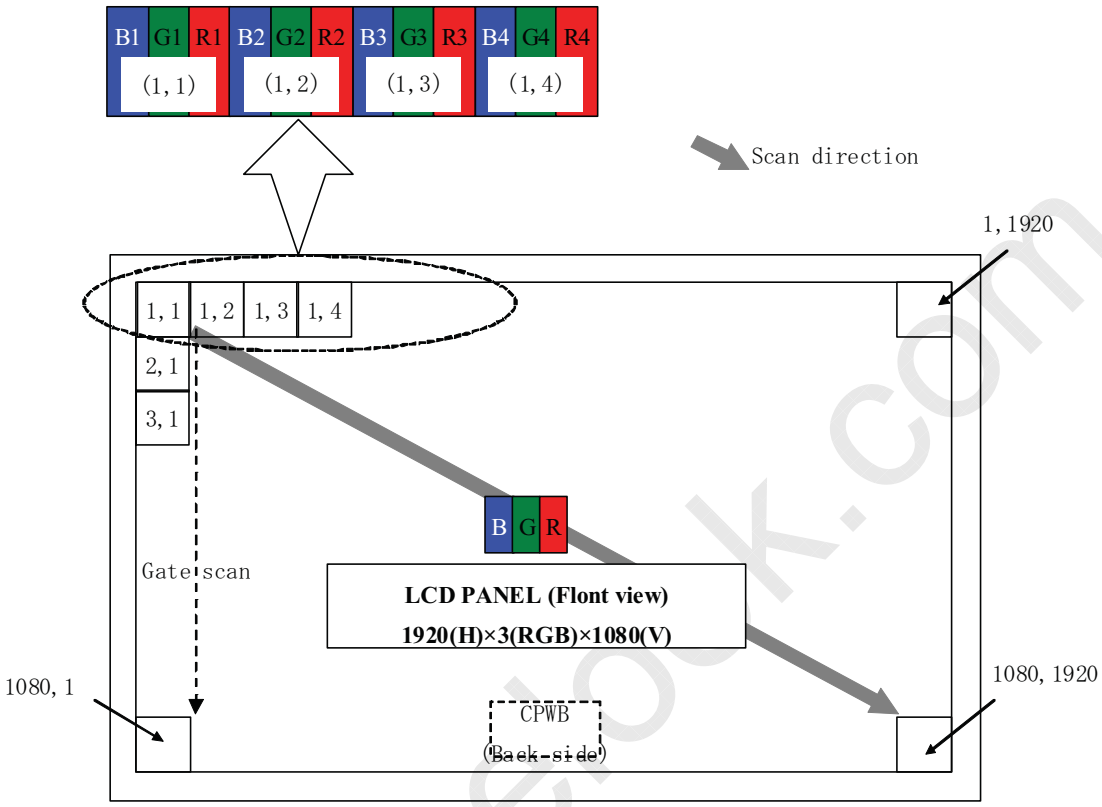




5.2 Display direction

Each subpixel R, G, B is aligned as follows.

[Landscape direction]

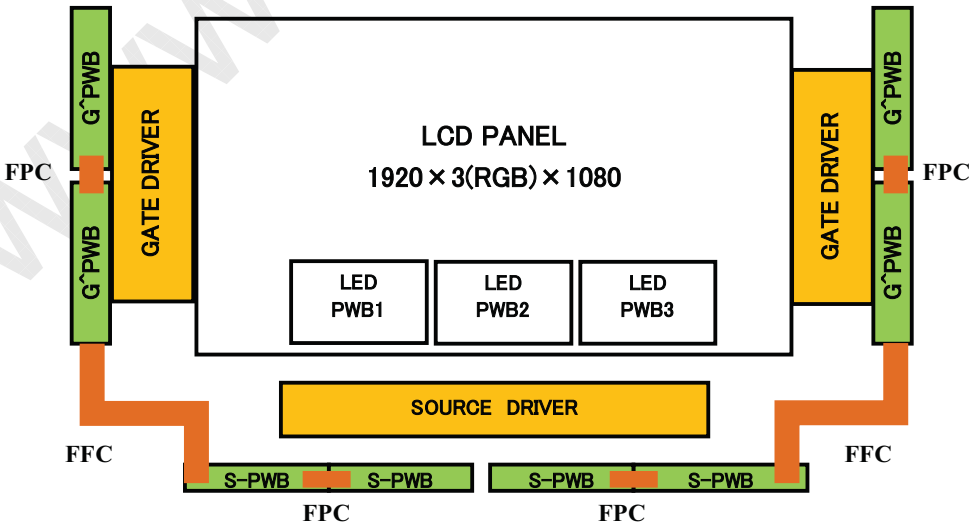


LCD subpixel alignment in Landscape installaion

[Note] PWB layout

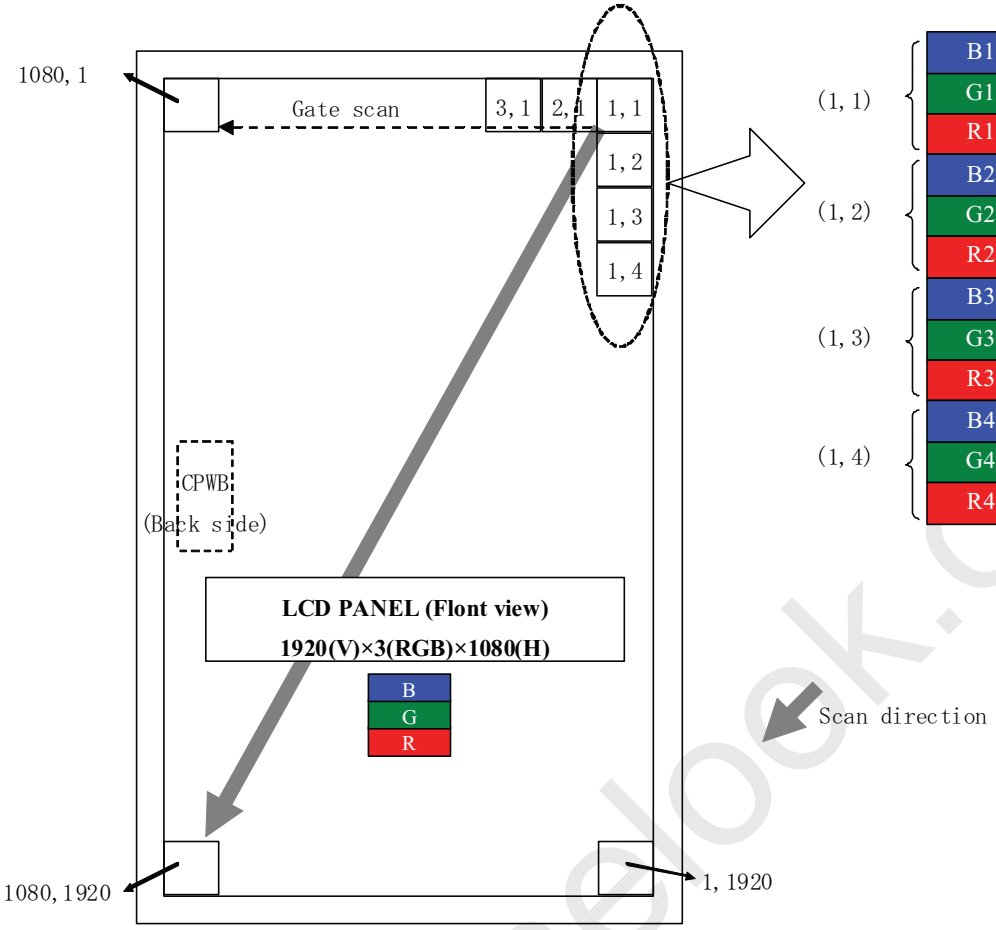
In Landscape installation,

Four S-PWBs and three LED-PWBs are layout at the bottom side of the screen.



Layout of LED-PWB, S-PWB & G-PWB (Front View)

[Portrait direction]



LCD subpixel alignment in Portrait installaion

6. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
12V supply voltage (for Control PWB)	VCC	Ta=25 °C	0 ~ + 14	V	
24V supply voltage (for LED Driver)	V_{LED}	Ta=25 °C	0 ~ +29.0	V	
Input voltage (for LED Driver)	V_{on} /V_{off} V_{DIMH} /V_{DIML}	Ta=25 °C	-0.3 ~ +3.9	V	[Note 1]
Storage temperature	Tstg	-	-25 ~ +60	°C	[Note 2]
Operation temperature (Ambient)	Topa	-	0 ~ +50	°C	

[Note 1] Von/off, EX_DIM in CN101.

[Note 2] Humidity 95%RH Max. (Ta≦40°C)

Maximum wet-bulb temperature at 39 °C or less.(Ta>40°C). No condensation.

7. Electrical Characteristics

7.1. Control circuit driving

Ta=25 °C

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
+12V supply voltage	Supply voltage	Vcc	11.4	12	12.6	V	[Note 1]
	Current dissipation	Icc	-	0.75	2.0	A	[Note 2]
	Inrush current	$I_{RUSH}1$	-	4.4	-	A	t1=500us [Note3]
		$I_{RUSH}2$	-	2.4	-	A	t1>5ms
Permissible input ripple voltage		V_{RP}	-	-	100	mV_{P-P}	Vcc = +12.0V
Differential input threshold voltage	High	V_{TH}	-	-	100	mV	V_{CM} = +1.2V
	Low	V_{TL}	-100	-	-	mV	[Note 4]
Terminal resistor		R_T	-	100	-	Ω	Differential input

[Note]V_{CM}: Common mode voltage of LVDS driver.

[Note 1]

Input voltage sequences

50us < t1 ≦ 20ms

20ms < t2 ≦ 5s

1s < t3 ≦ 5s

0 < t4 ≦ 1s

0 < t5 ≦ 1s

1s ≦ t6

0 ≧ t7

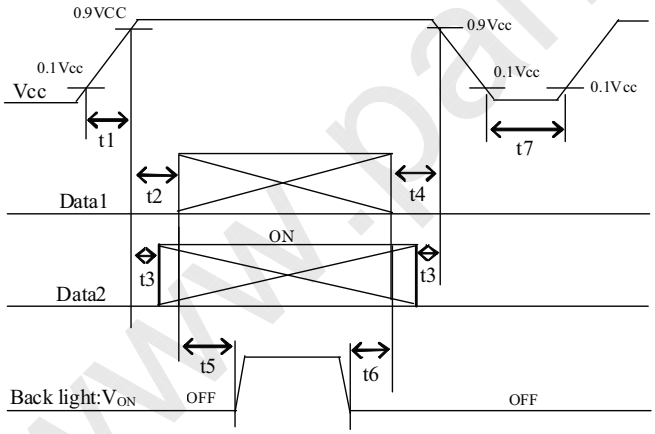
Dip conditions for supply voltage

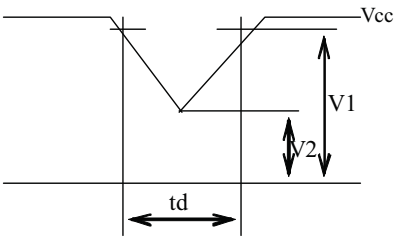
a) 9.1V ≦ Vcc < 10.8V

td ≦ 10ms

b) Vcc < 9.1V

Dip conditions for supply voltage is based on input voltage sequence.





V1:10.8V
V2:9.1V

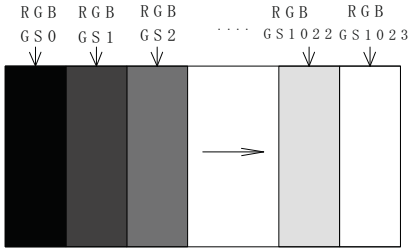
※ Data1: ACK±, AIN0±, AIN1±, AIN2±, AIN3±, AIN4±,BCK±, BIN0±, BIN1±, BIN2±, BIN3±, BIN4±

*V_{CM} voltage pursues the sequence mentioned above

※ Data2: SELLVDS, FRAME, O/S_SET

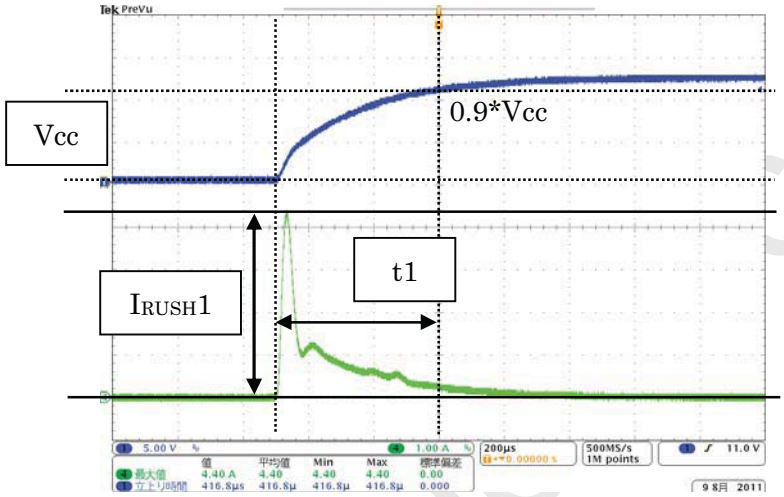
[Note]About the relation between data input and back light lighting, please base on the above-mentioned input sequence. When back light is switched on before panel operation or after a panel operation stop, it may not display normally. But this phenomenon is not based on change of an incoming signal, and does not give damage to a liquid crystal display.

[Note 2] Typical current situation: 1024 gray-bar patterns. (Vcc = +12.0V)
The explanation of RGB gray scale is seen in section 9.



Vcc＝+12.0V
CK＝74.25MHz
Th＝7.41μs

[Note 3] Vcc 12V inrush current waveform ($I_{RUSH}1$)



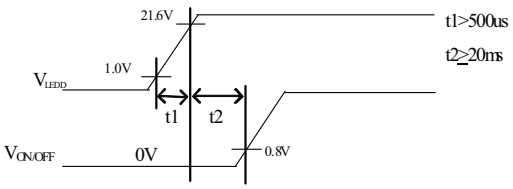
[Note 4] O/S_SET
[Note 5] FRAME, SELLVDS
[Note 6] ACK±, AIN0±, AIN1±, AIN2±, AIN3±, AIN4±, BCK±, BIN0±, BIN1±, BIN2±, BIN3±, BIN4±

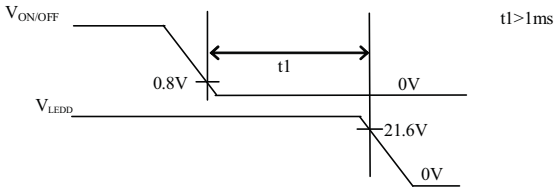
7 .2. LED driving for Back Light

Ta=25 °C

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
+24V supply voltage	Current dissipation	I_{LEDD}	-	7.8	8.6	A	V_{LED} = 24V, Ta=25°C DUTY =100% [Note 1]
	Irush current	I_{RUSH}	-	22.0	-	A	
	Supply voltage	V_{LED}	21.6	24.0	26.4	V	24V±10%
Permissible input ripple voltage		V_{RP}	-	-	1	V_{P-P}	V_{LEDD}=＋24.0V
Input voltage (On)		V_{ON}	2.4	3.0	3.6	V	$V_{ON/OFF}$, EX_DIM
Input voltage (Off)		V_{OFF}	-0.3	0	0.8	V	

[Note 1] 1) V_{LED}-turn-on condition 2) V_{LED}-turn-off condition





8 Timing characteristics of input signals

8.1. Timing characteristics

Timing diagrams of input signal are shown in Fig.1.

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	69	74.25	80	MHz	
Data enable Signal	Horizontal period	TH	525	550	650	Clock	
			7.1	7.41	8.0	μs	
	Horizontal period (High)	THd	480	480	480	Clock	
	Vertical period	TV	1120	1125	1400	Line	
			94	120	120.64	Hz	
	Vertical period (High)	TVd	1080	1080	1080	line	

[Note]-When vertical period is very long, flicker and etc. may occur.

-Please turn off the module after it shows the black screen.

-Please make sure that length of vertical period should become of an integral multiple of horizontal length of period. Otherwise, the screen may not display properly.

-As for your final setting of driving timing, we will conduct operation check test at our side, please inform your final setting.

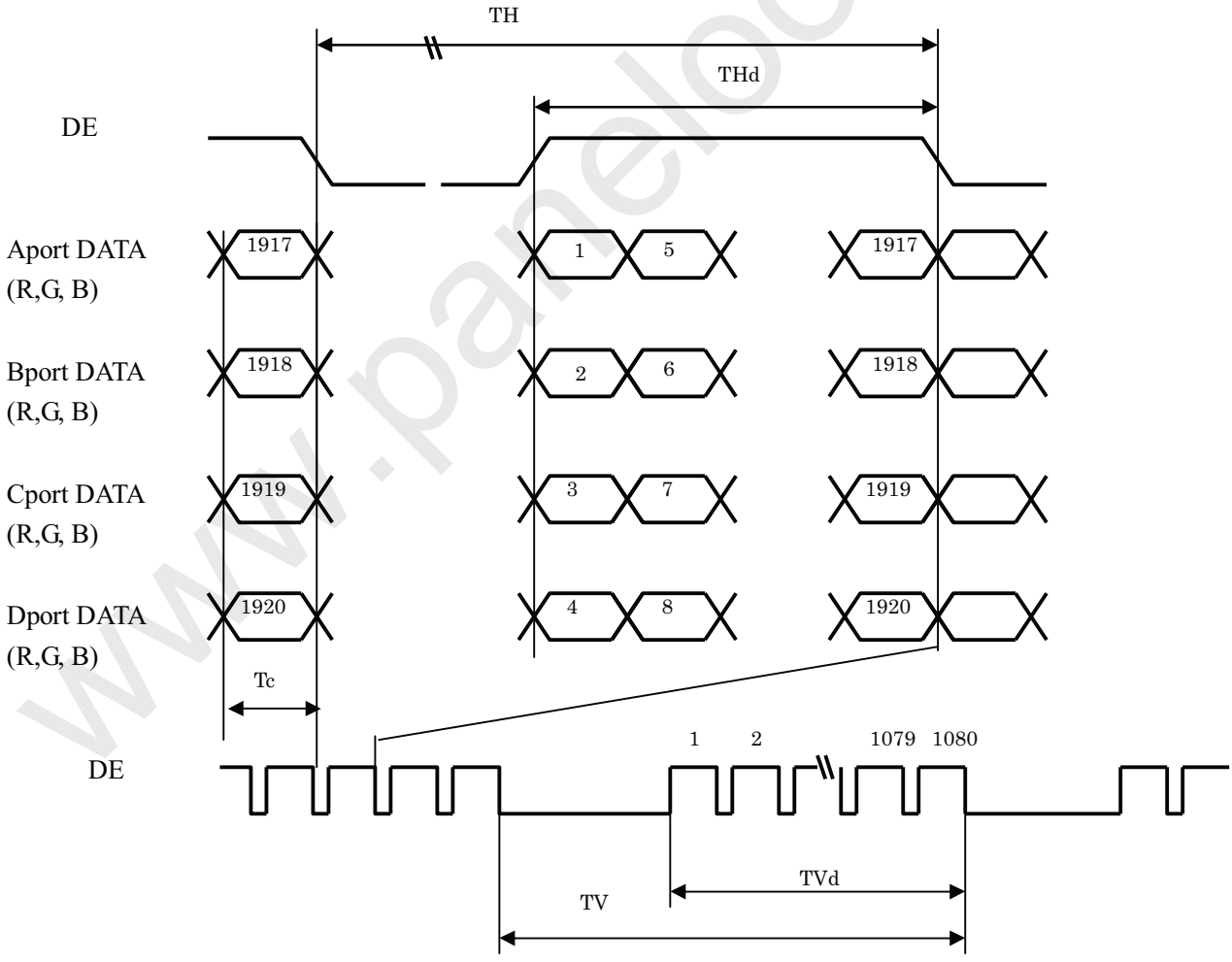
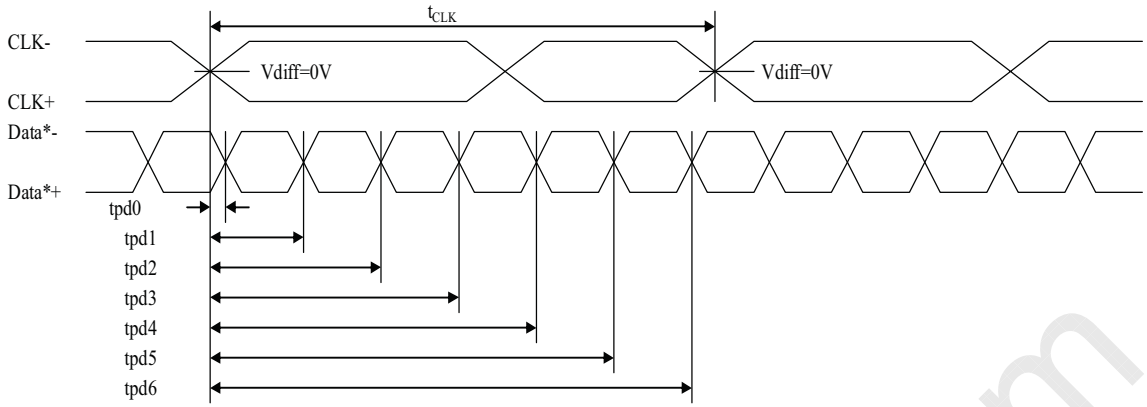


Fig.1 Timing characteristics of input signals

8.2. LVDS signal characteristics



Item		Symbol	Min.	Typ.	Max.	Unit
Data position	Delay time, CLK rising edge to serial bit position 0	tpd0	-0.25	0	0.25	ns
	Delay time, CLK rising edge to serial bit position 1	tpd1	$1*t_{CLK}/7-0.25$	$1*t_{CLK}/7$	$1*t_{CLK}/7+0.25$	
	Delay time, CLK rising edge to serial bit position 2	tpd2	$2*t_{CLK}/7-0.25$	$2*t_{CLK}/7$	$2*t_{CLK}/7+0.25$	
	Delay time, CLK rising edge to serial bit position 3	tpd3	$3*t_{CLK}/7-0.25$	$3*t_{CLK}/7$	$3*t_{CLK}/7+0.25$	
	Delay time, CLK rising edge to serial bit position 4	tpd4	$4*t_{CLK}/7-0.25$	$4*t_{CLK}/7$	$4*t_{CLK}/7+0.25$	
	Delay time, CLK rising edge to serial bit position 5	tpd5	$5*t_{CLK}/7-0.25$	$5*t_{CLK}/7$	$5*t_{CLK}/7+0.25$	
	Delay time, CLK rising edge to serial bit position 6	tpd6	$6*t_{CLK}/7-0.25$	$6*t_{CLK}/7$	$6*t_{CLK}/7+0.25$	

9 Input Signal, Basic Display Colors and Gray Scale of Each Color

	Colors & Gray scale	Gray Scale	Data signal																													
			R0	R1	R2	R3	R4	R5	R6	R7	R8	R9	G0	G1	G2	G3	G4	G5	G6	G7	G8	G9	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9
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	0	0	0	0	0	0
	Blue	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Green	–	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Cyan	–	0	0	0	0	0	0	0	0	0	0	1	1	1	1	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	1	1	0	0	0	0	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	1	1	0	0	0	0	0	0	0	0	0	0	1	1	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	1	1	1	1	0	0	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	1	1	1	1	1	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓										↓										↓					
	⇩	↓					↓										↓										↓					
	Brighter	GS1021	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS1022	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS1023	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓										↓										↓					
	⇩	↓					↓										↓										↓					
	Brighter	GS1021	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	⇩	GS1022	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Green	GS1023	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	⇩	↓					↓										↓										↓					
	⇩	↓					↓										↓										↓					
	Brighter	GS1021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1
	⇩	GS1022	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
	Blue	GS1023	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1

0: Low level voltage, 1: High level voltage.

Each basic color can be displayed in 1024 gray scales from 10 bits data signals. According to the combination of total 30 bits data signals, one billion-color display can be achieved on the screen.

10 Optical characteristics

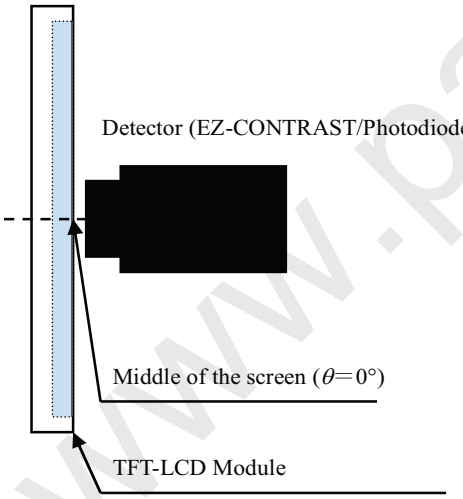
Ta=25°C, Vcc=12.0V, V_{LED}=24.0V

Frame rate:120Hz (typical)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ21 θ22	CR≧10	70	88	-	Deg.	[Note1,4]
	Vertical	θ11 θ12		70	88	-	Deg.	
Contrast ratio		CRn	θ=0 deg.	3000	4000	-		[Note2,4]
Response time		τ_{DRV}		-	4	-		Ta=35℃[Note3,4,5]
				-	6	-	ms	Ta=25℃[Note3,4,5]
Chromaticity	White	x		0.284	0.314	0.344	-	[Note4]
		y		0.294	0.324	0.354	-	
	Red	x		0.617	0.647	0.677	-	
		y		0.317	0.347	0.377	-	
	Green	x		0.288	0.318	0.348	-	
		y		0.616	0.646	0.676	-	
	Blue	x		0.127	0.157	0.187	-	
		y		0.030	0.060	0.090	-	
Luminance	White	Y_L		280	350	-	cd/m^2	
Luminance uniformity ▲B	White	δw		-	1.33	1.43		[Note 6]

- Measurement condition: Set the value of backlight control voltage to maximum luminance of white.
- The measurement shall be executed 60 minutes after lighting at rating.

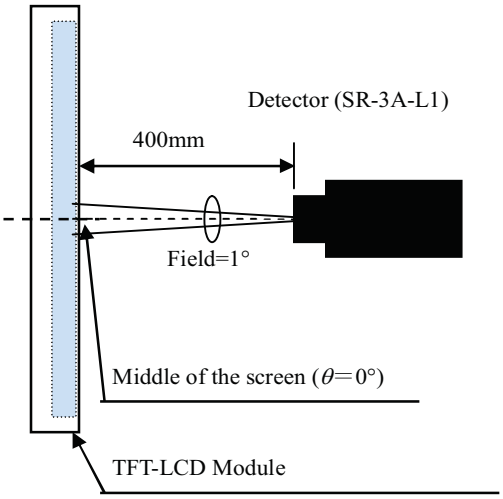
[Note]The optical characteristics are measured by following equipment:



*Measurement of viewing angle range and Response time.

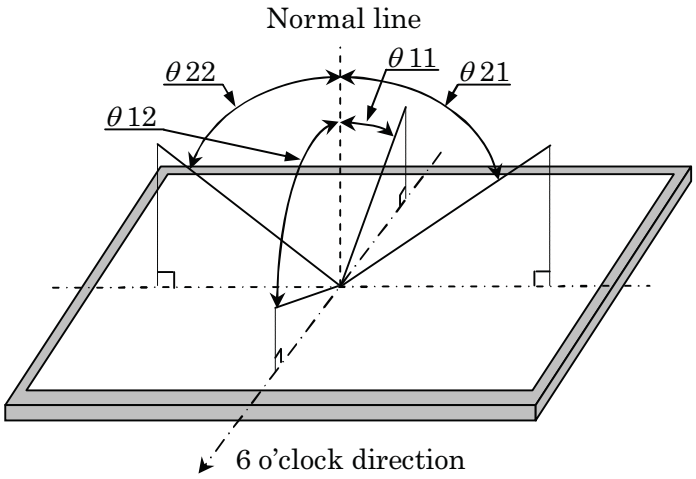
-Viewing angle range: EZ-CONTRAST

- Response time: Photodiode



*Measurement of Contrast, Luminance, Chromaticity.

[Note 1]Definitions of viewing angle range:



[Note 2]Definition of contrast ratio :

The contrast ratio is defined as the following.

$$\text{Contrast Ratio} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

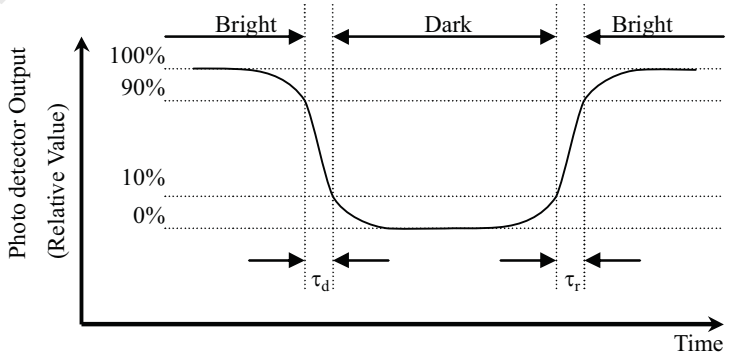
[Note 3]Definition of response time

The response time (τ) is defined as the following figure and shall be measured by switching the input signal for "any level of gray (0%, 25%, 50%, 75% and 100%)" and "any level of gray (0%, 25%, 50%, 75% and 100%)".

	0%	25%	50%	75%	100%
0%		tr:0%-25%	tr:0%-50%	tr:0%-75%	tr:0%-100%
25%	td: 25%-0%		tr: 25%-50%	tr25%-75%	tr: 25%-100%
50%	td: 50%-0%	td: 50%-25%		tr: 50%-75%	tr: 50%-100%
75%	td: 75%-0%	td: 75%-25%	td: 75%-50%		tr: 75%-100%
100%	td: 100%-0%	td: 100%-25%	td: 100%-50%	td:100%-75%	

t*:x-y...response time from level of gray(x) to level of gray(y)

$$\tau = \{\sum(\text{tr}: x - y) + \sum(\text{td}: x - y)\}/20$$



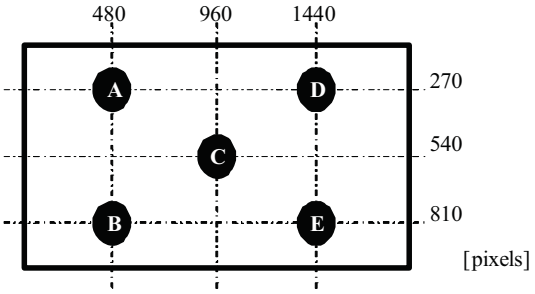
[Note 4]This shall be measured at center of the screen.

[Note 5] This value is valid when O/S driving is used at typical input time value.

[Note 6]Definition of white uniformity;

White uniformity is defined as the following with five measurements. (A~E)

$$\delta W = \frac{\text{Maximum luminance of five points (brightness)}}{\text{Minimum luminance of five points (brightness)}}$$



11 Packing form

a) Piling number of cartons : 2 Maximum

b) Packing quantity in one carton : 10pcs

c) Carton size : 1772(W) ×1110(D) ×1153(H)

d) Total mass of one carton filled with full modules : 350kg

12 Carton storage condition

Temperature	0°C to 40°C
Humidity	95% RH or less
Reference condition	20°C to 35°C, 85% RH or less (summer) 5°C to 15°C, 85% RH or less (winter) the total storage time (40°C, 95% RH) : 240h or less
Sunlight	Be sure to shelter a production from the direct sunlight.
Atmosphere	Harmful gas, such as acid and alkali which bites electronic components and/or wires must not be detected.
Notes	Be sure to put cartons on palette or base, don't put it on floor, and store them with keeping off a wall. Please take care of ventilation in storehouse and around cartons, and control temperature within the natural environment.
Storage life	1 year.

13 Reliability test item

No.	Test item	Condition
1	High temperature storage test	Ta=60°C 240h
2	Low temperature storage test	Ta=-25°C 240h
3	High temperature and high humidity operation test	Ta=40°C ; 95%RH 240h (No condensation)
4	High temperature operation test	Ta=50°C 240h
5	Low temperature operation test	Ta=0°C 240h
6	Vibration test (non-operation)	Frequency: 10~57Hz/Vibration width (one side): 0.075mm : 58~500Hz/Acceleration: 9.8 m/s² Sweep time: 11 minutes Test period: 3 hours (1h for each direction of X, Y, Z)
7	ESD	At the following conditions, it is a thing without incorrect operation and destruction. (1)Non-operation: Contact electric discharge ±10kV Non-contact electric discharge ±20kV (2)Operation Contact electric discharge ±8kV Non-contact electric discharge ±15kV Conditions: 150pF, 330ohm

[Result evaluation criteria]

Under the display quality test condition with normal operation state, there shall be no change, which may affect practical display function.

14 Others

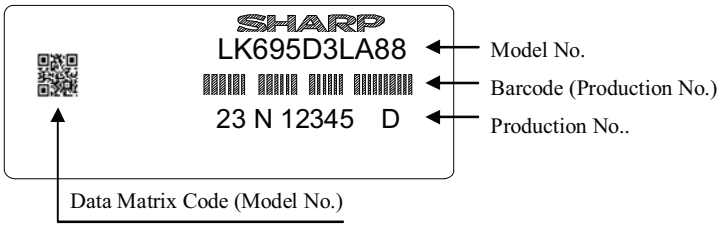
14.1. Serial label

The label that displays SHARP, product model (LK695D3LA88), a product number is stuck on the back of the module.

a) Overview

This label is stuck on the backlight chassis.

ex) LK695D3LA88X or D [NSEC production]



How to express Production No.

O O O OOOOO O

- Suffix code
- Serial No. [Note1]
- Production place code [Note2]
- Production month (1~9,X,Y,Z)
- Production year (the last figures of the Christian Era)

[Note1] Serial No.

- 1st ~ 99,999th/month :00001~99999
- 100,000th ~ 109,999th/month :A0000~A9999
- 110,000th ~ 119,999th/month :B0000~B9999

--------- (without "I","O")

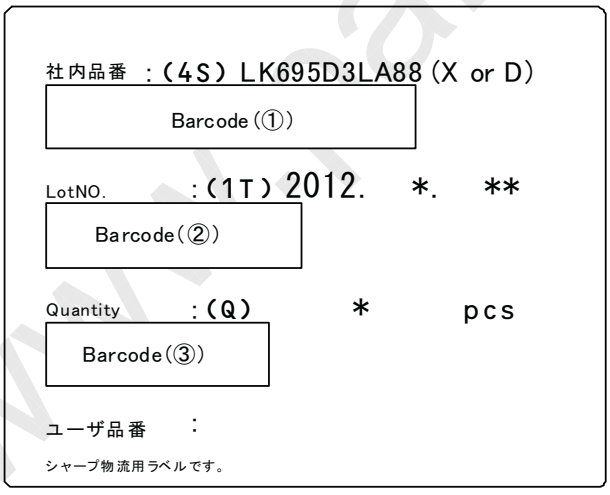
[Note2] Production place code

Code	Place	Model No. & Suffix Code
N	NSEC	LK695D3LA88X or D

14.2. Packing Label

This label is stuck on each packing box.

ex) LK695D3LA88 (X or D) ▲B

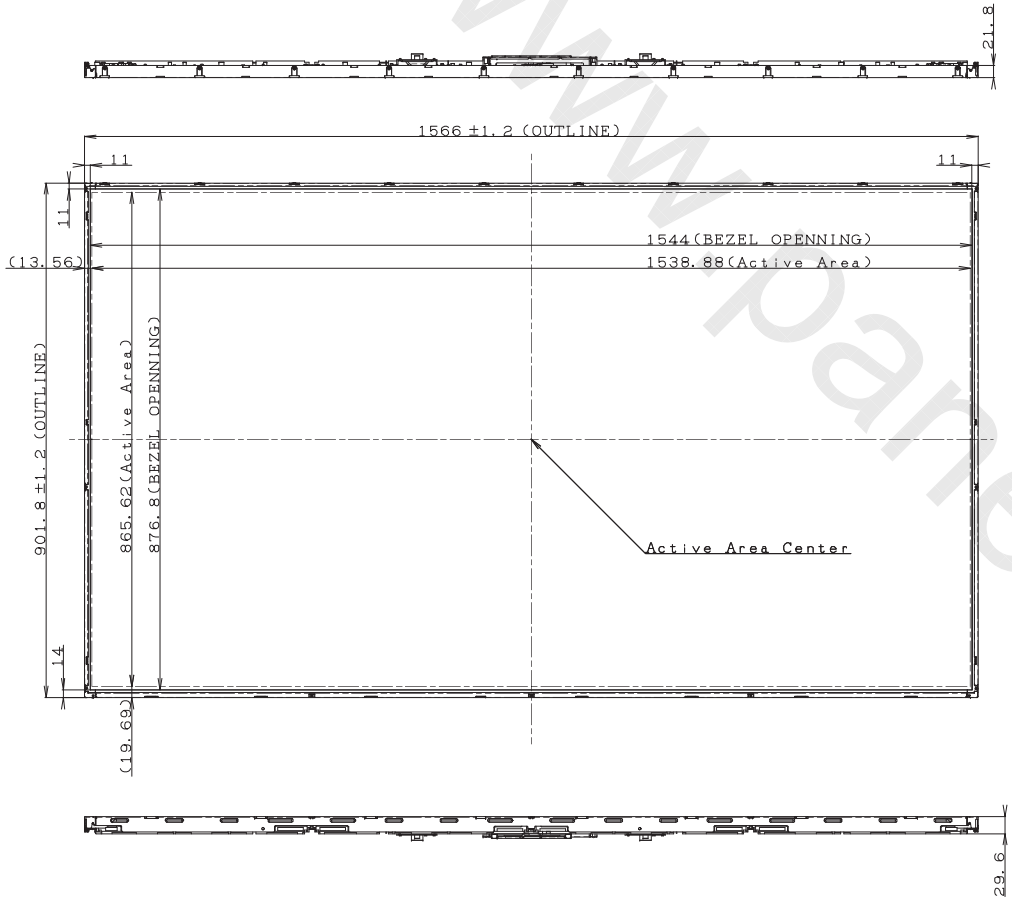


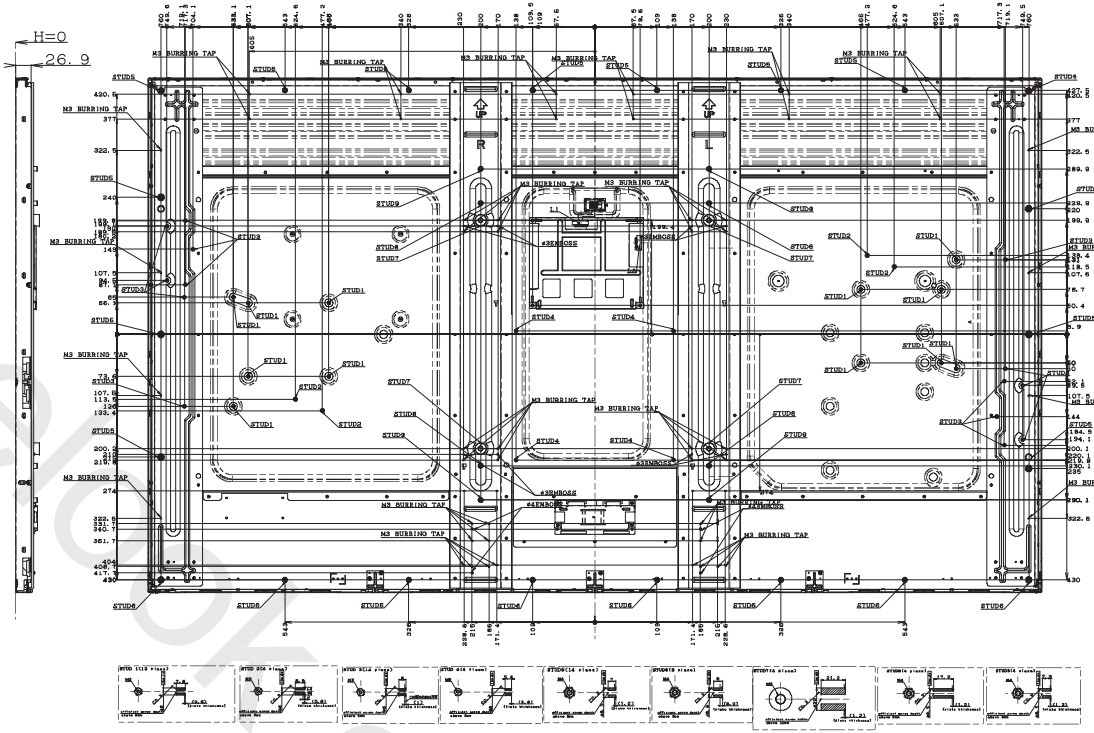
① Model No.& Suffix Code
② Lot No.
③ Quantity

15 Precautions

a) Be sure to turn off the power supply when inserting or disconnecting the cable.
b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.
c) Since the front polarizer is easily damaged, pay attention not to scratch it.
d) Since long contact with water may cause discoloration or spots, wipe off water drop immediately.
e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.
g) Since CMOS LSI is used in this module, take care of static electricity and take the human earth into consideration when handling.
h) The module has some printed circuit boards (PCBs) on the back side, take care to keep them form any stress or pressure when handling or installing the module; otherwise some of electronic parts on the PCBs may be damaged.
i) Observe all other precautionary requirements in handling components.
j) When some pressure is added onto the module from rear side constantly, it causes display non-uniformity issue, functional defect, etc. So, please avoid such design.
k) When giving a touch to the panel at power on supply, it may cause some kinds of degradation. In that case, once turn off the power supply, and turn on after several seconds again, and that is disappear.
l) When handling LCD module and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the LCD modules.
m) This LCD module is designed to prevent dust from entering into it. However, there would be a possibility to have a bad effect on display performance in case of having dust inside of LCD module. Therefore, please ensure to design your TV set to keep dust away around LCD module.
n) This LCD module passes over the rust.
o) Adjusting Vcom has been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.
p) Disassembling the module can cause permanent damage and should be strictly avoided.
q) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.
r) The chemical compound, which causes the destruction of ozone layer, is not being used.
s) In any case, please do not resolve this LCD module.
t) This module is corresponded to RoHS.
u) When any question or issue occurs, it shall be solved by mutual discussion.

2012.03.09

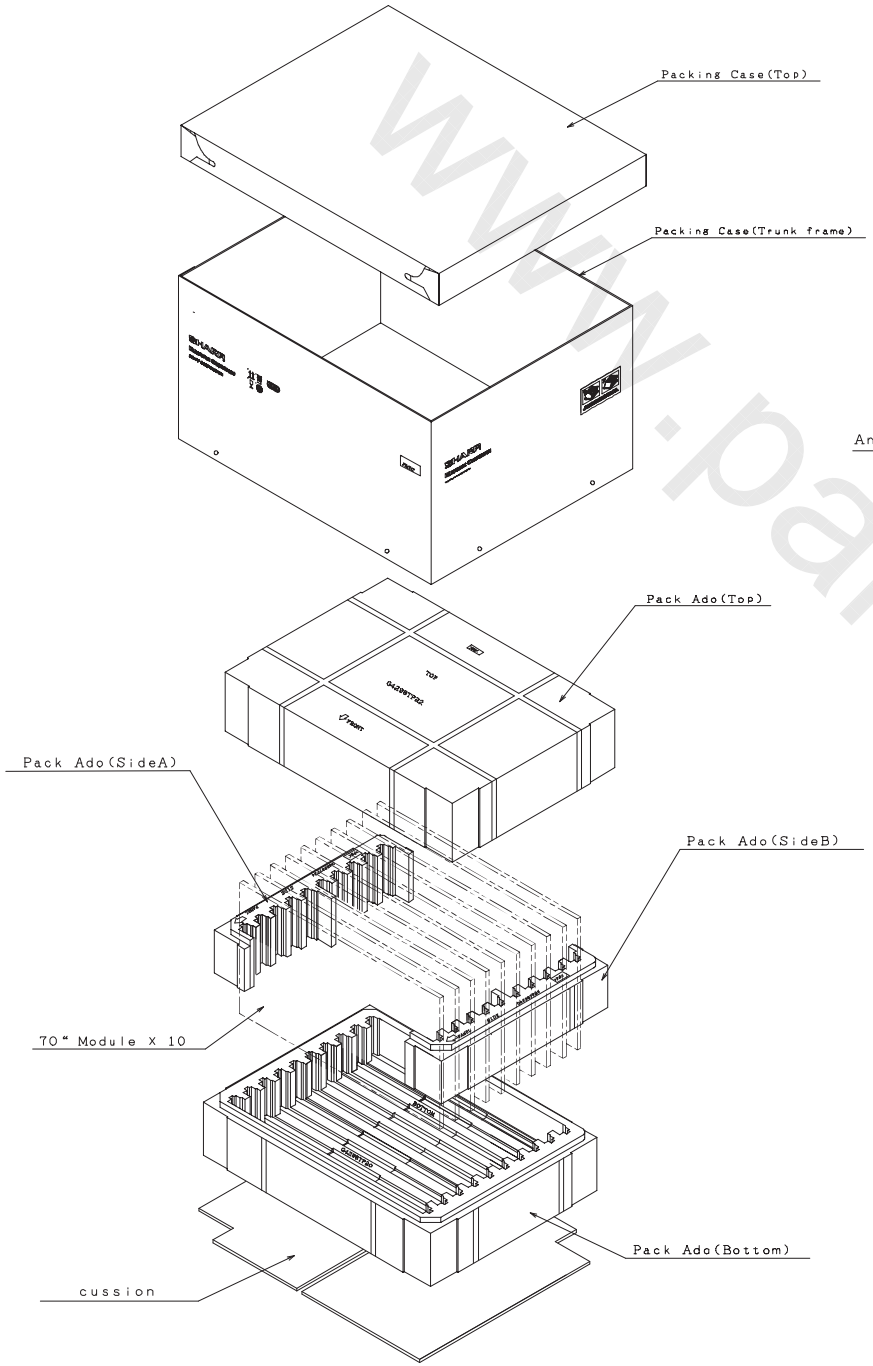


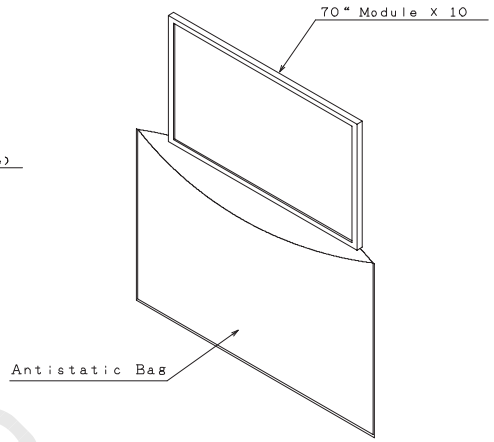


NOTE)

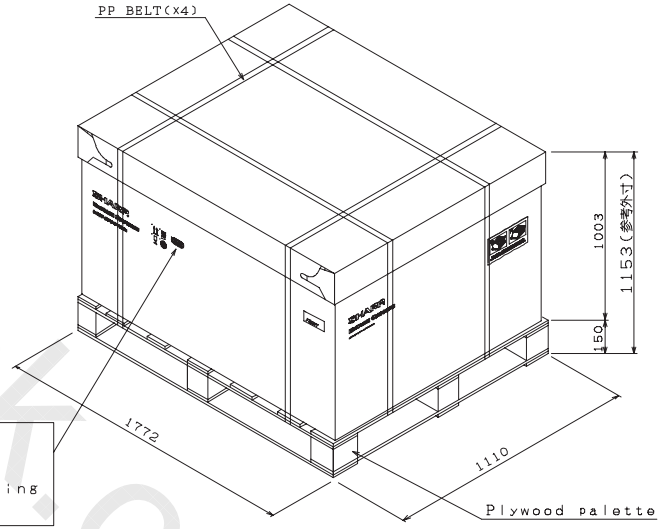
1. UNSPECIFIED TOLERANCE TO BE ±2.0
2. TOLERANCE OF ALL BOSS POSITION TO BE ±1.2
3. RECOMMENDED TIGHTENING SCREW TORQUE
   M3 TAPPING : TORQUE 0.77N·m
   M4 TAPPING : TORQUE 1.07N·m
   M8 TAPPING : TORQUE ABOVE 10N·m

LK695D3LA88 MODULE OUTLINE DIMENSIONS ▲B





Parts Name	Material
Packing Case(Top)	Cardboard
Pack Ado(Bottom)	PS
Pack Ado(Top)	PS
Pack Ado(SideA)	PS
Pack Ado(SideB)	PS
cussion	PS
Packing Case(Trunk frame)	Cardboard
Plywood Palette	Plywoods
Antistatic Bag	PE(t=20μ)



R.C.
There is R.C. marking on the this side.

Packing style of LK695D3LA88