MODEL NO. : TM190MFS02

ISSUED DATE: 2012/05/10

VERSION : 1.0

□Preliminary Specification

■Final Product Specification

Customer :

Approved by	Notes

SHANGHAI AVIC Confirmed :

Prepared by	Approved by
Pean Wu	Hyman Chen

This technical specification is subjected to change without notice

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RECORD OF REVISION

Rev	Issued Date	Description	Editor
1.0	2012-05-10	First issued	Pean Wu

1. OUTLINE

1.1 STRUCTURE AND PRINCIPLE

TM190MFS02 open cell is composed of the amorphous silicon thin film transistor liquid crystal display (a-Si TFT LCD) panel structure with driver LSIs for driving the TFT (Thin Film Transistor) array. The a-Si TFT LCD panel structure is injected liquid crystal material into a narrow gap between the TFT array glass substrate and a color-filter glass substrate.

Color (Red, Green, Blue) data signals from a host system (e.g. PC, signal generator, etc.) are modulated into best form for active matrix system by a signal processing board, and sent to the driver LSIs which drive the individual TFT arrays. The TFT array as an electro-optical switch regulates the amount of transmitted light from the backlight assembly, when it is controlled by data signals. Color images are created by regulating the amount of transmitted light through the TFT array of red, green and blue dots.

1.2 APPLICATIONS

• Monitor

1.3 FEATURES

• a-Si TFT active matrix
• LVDS interface
• R.G.B input 8bit, 16.7 millions colors (6bit+Hi-FRC)
• Resolution WXGA+ (1,440× 900 pixels)
• High contrast ratio 600 :1
• Fast response time (Ton+ Toff= 5 ms）

2. GENERAL SPECIFICATIONS

Display area	408.24 (H) × 255.15 (V) mm (typ.)
Diagonal size of display	480 mm (19.0 inches)
Drive system	a-Si TFT active matrix
Display color	16.7 M colors (6bit+ Hi-FRC)
Pixel	1,440 (H) × 900(V) pixels
Pixel arrangement	RGB vertical stripe
Pixel pitch	0.2835 (H) × 0.2835 (V) mm
Signal system	LVDS 2port
Power supply voltage	LCD panel signal processing board: 5.0V
Transmissive Mode	Normally White
Response time	5 ms (typ.)
Contrast ratio	600 :1 (typ.)
Surface Treatment	Anti Glare

3. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit	Remarks
Power supply voltage	VDD	-0.3 ~ +3.6	V	Ta = 25°C
Input voltage for signals	Vi	-0.3 ~ +3.6	V	Ta = 25°C
Storage temperature	Tst	-20 ~ +60	°C	Note 3
Operating temperature	Top	0 ~ +50	°C	Note 3, 4
Absolute humidity	AH	≤ 70	g/m^3	Ta > 50°C
Operating altitude	-	≤ 4,850	m	0°C≤ Ta≤ 50°C
Storage altitude	-	≤ 13,600	m	-20°C≤ Ta≤ 60°C

Note1: Display signals are DA0+/-, DA1+/-, DA2+/-, DA3+/-, CKA+/-, DB0+/-, DB1+/-, DB2+/-, DB3+/-, and CKB+/-.

Note2: Function signal is MSL.

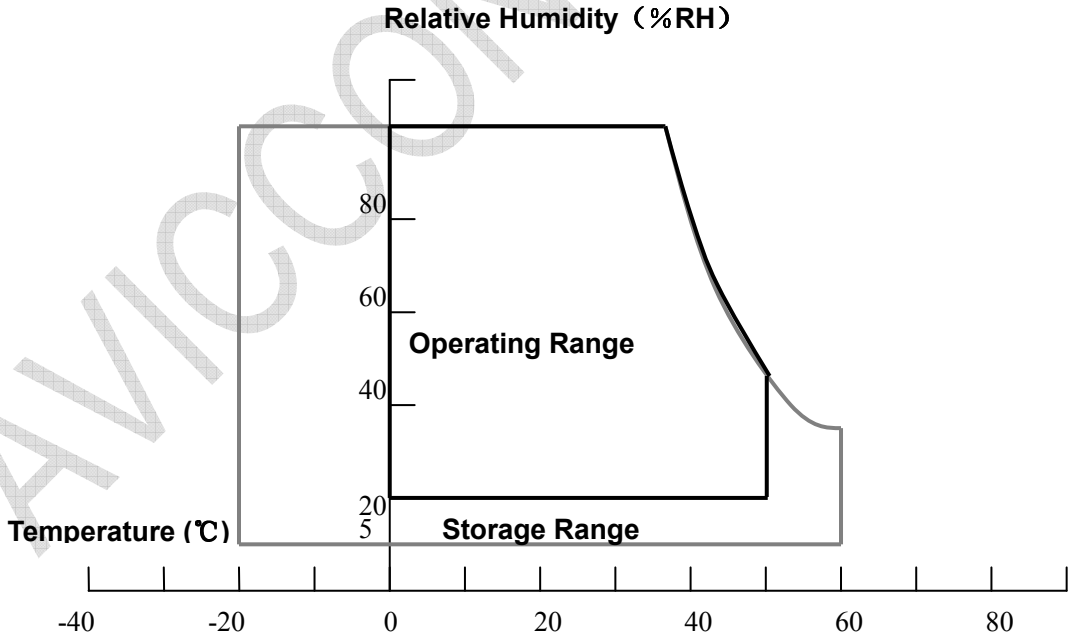
Note3: Temperature and relative humidity range is shown in the figure below.

(a) 90%RH Max. (Ta≤ 40°C)

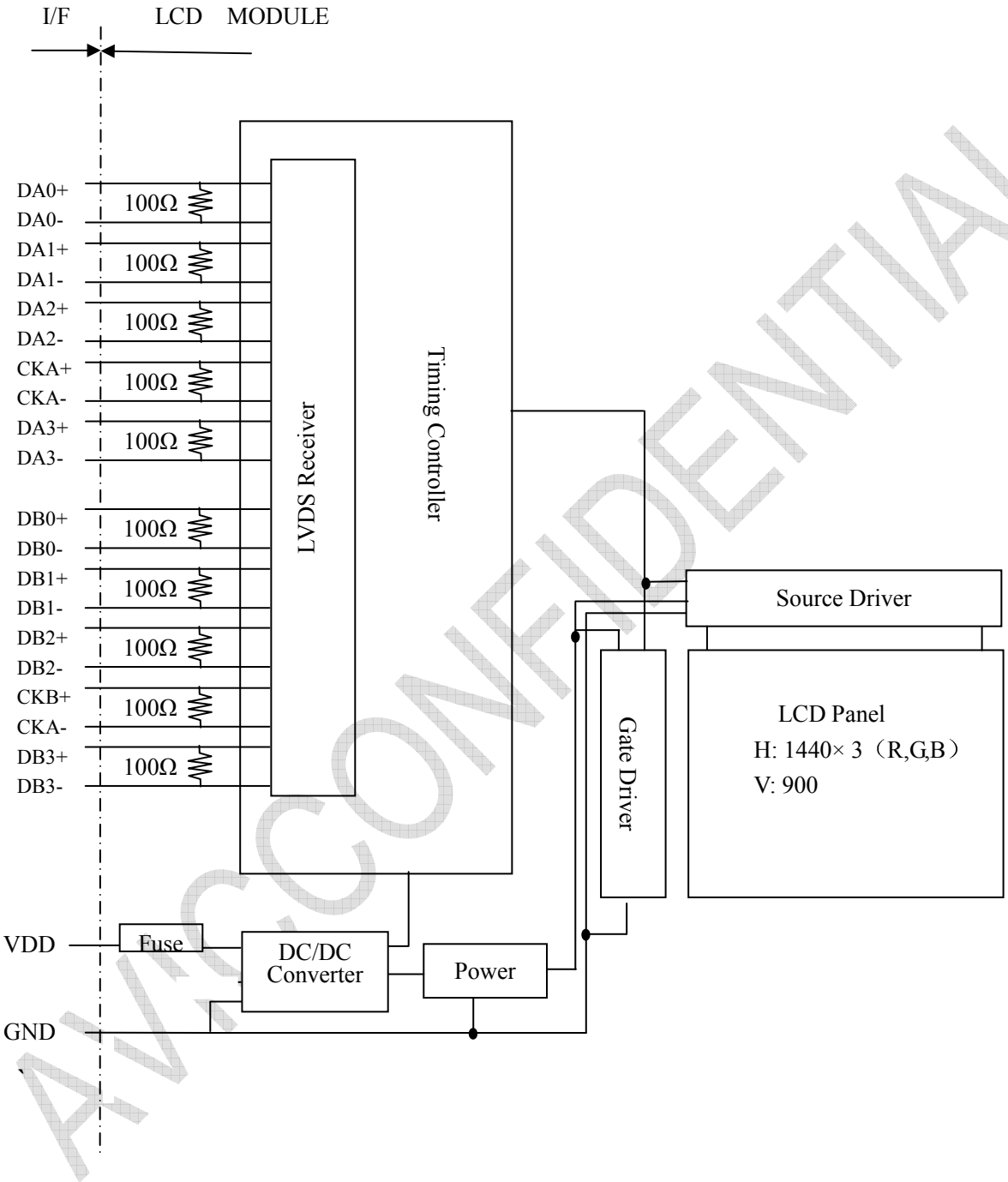
(b) Wet-bulb temperature should be39°C Max. (Ta> 40°C)

(c) No condensation.

Note4: The temperature of panel display surface area should be 0°C Min and 60°C Max.



4. BLOCK DIAGRAM



Note: System ground (GND), FG (Frame ground) in the product should be connected together in customer equipment.

5. MECHANICAL SPECIFICATIONS

Parameter	Specification	Unit
Display area	408.24(H) × 255.15(V) mm (typ.), [48.0 cm (19.0 inches)]	mm
Display dot number	1440×3(H) ×900(V)	-
Pixel pitch	0.2835(H)×0.2835(V)	mm
Dot pitch	0.0945(H) ×0.2835(V)	mm

6. ELECTRICAL CHARACTERISTICS

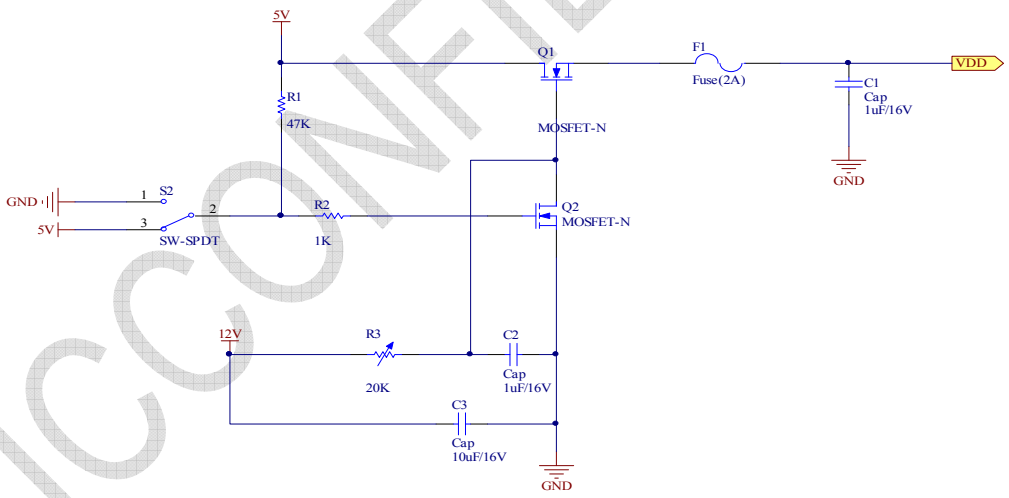
Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage		VDD	4.5	5.0	5.5	V	-
Power supply current		IDD	-	700 Note1	1000 Note 2	mA	at VDD = 5.0V
Permissible ripple voltage		VRP	-	-	200	mV	VDD
Differential input voltage		| Vid |	200		600	mV	
Differential input threshold voltage for LVDS receiver	Low	VTL	-100	-	-	mV	at VCM = 1.2V
	High	VTH	-	-	100	mV	Note3
Input voltage width for LVDS receiver		Vi	0	-	3.3	V	-
Terminating resistor		RT	-	100	-	Ω	-
Rush current		I_{rush}	-	-	3.0	A	Note4

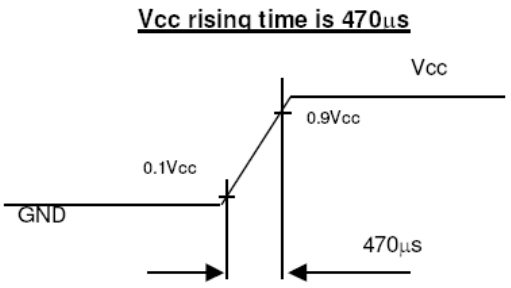
Note 1: Black pattern

Note 2: 1H1V dot inverse pattern

Note 3: Common mode voltage for LVDS receiver

Note4: Measurement Conditions:





7. CONNECTIONS AND FUNCTIONS FOR INTERFACE PINS

7.1 LVDS

CN1: FI-XB30SSRLA-HF16 (Produced by JAE) or equivalent.

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	GND	Ground
26	NC	Not connection.
27	GND	Ground
28	VDD	+5.0V power supply
29	VDD	+5.0V power supply
30	VDD	+5.0V power supply

7.2 CONNECTION BETWEEN RECEIVER AND TRANSMITTER FOR LVDS

Input DATA			Transmitter pin	Transmitter DS90CF383,C385 or equivalent			CN1 pin	CN1 Symbol
Odd pixel data and control signals	RA0	→	51	TXIN0				
	RA1	→	52	TXIN1		TA1-	→ 1	DA0-
	RA2	→	54	TXIN2		TA1+	→ 2	DA0+
	RA3	→	55	TXIN3				
	RA4	→	56	TXIN4		TB1-	→ 3	DA1-
	RA5	→	3	TXIN6		TB1+	→ 4	DA1+
	GA0	→	4	TXIN7				
	GA1	→	6	TXIN8		TC1-	→ 5	DA2-
	GA2	→	7	TXIN9		TC1+	→ 6	DA2+
	GA3	→	11	TXIN12			7	GND
	GA4	→	12	TXIN13		TCLK1-	→ 8	CKA-
	GA5	→	14	TXIN14		TCLK1+	→ 9	CKA+
	BA0	→	15	TXIN15				
	BA1	→	19	TXIN18		TD1-	→ 10	DA3-
	BA2	→	20	TXIN19	1'ST	TD1+	→ 11	DA3+
	BA3	→	22	TXIN20				
	BA4	→	23	TXIN21				
	BA5	→	24	TXIN22				
	RSVD	→	27	TXIN24				
	RSVD	→	28	TXIN25				
	DE	→	30	TXIN26				
	RA6	→	50	TXIN27				
	RA7	→	2	TXIN5				
	GA6	→	8	TXIN10				
	GA7	→	10	TXIN11				
	BA6	→	16	TXIN16				
	BA7	→	18	TXIN17				
	RSVD	→	25	TXIN23				
	CLK	→	31	CLKIN				
Even pixel data	RB0	→	51	TXIN0				
	RB1	→	52	TXIN1		TA2-	→ 12	DB0-
	RB2	→	54	TXIN2		TA2+	→ 13	DB0+
	RB3	→	55	TXIN3			14	GND
	RB4	→	56	TXIN4		TB2-	→ 15	DB1-
	RB5	→	3	TXIN6		TB2+	→ 16	DB1+
	GB0	→	4	TXIN7			17	GND
	GB1	→	6	TXIN8		TC2-	→ 18	DB2-
	GB2	→	7	TXIN9		TC2+	→ 19	DB2+
	GB3	→	11	TXIN12				
	GB4	→	12	TXIN13		TCLK2-	→ 20	CKB-
	GB5	→	14	TXIN14		TCLK2+	→ 21	CKB+
	BB0	→	15	TXIN15				
	BB1	→	19	TXIN18		TD2-	→ 22	DB3-
	BB2	→	20	TXIN19	2'nd	TD2+	→ 23	DB3+
	BB3	→	22	TXIN20			24	GND
	BB4	→	23	TXIN21			25	GND
	BB5	→	24	TXIN22			26	NC
	RSVD	→	27	TXIN24			27	GND
	RSVD	→	28	TXIN25			28	VDD
	RSVD	→	30	TXIN26			29	VDD
	RB6	→	50	TXIN27			30	VDD
	RB7	→	2	TXIN5				
	GB6	→	8	TXIN10				
	GB7	→	10	TXIN11				
	BB6	→	16	TXIN16				
	BB7	→	18	TXIN17				
	RSVD	→	25	TXIN23				
	CLK	→	31	CLKIN				

Note1: The lowest bit (RA0, GA0, BA0, RB0, GB0, BB0), the most upper bit (RA7, GA7, BA7, RB7, GB7, BB7)

Note2:Connecting cable between LCD panel's connector and transmitter should use 100Ω twisted line.

Note3: If only Hsync and Vsync, the product don't work. Make sure DE signal has been input.

8. DISPLAY COLORS AND INPUT DATA SIGNALS

This product can display in equivalent to 16,777,216 colors in 256 scales. Also the relation between display colors and input data signals is as the following table.

Display colors		Data signal （0:Low level，1:High Level）																							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
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
	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
	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
	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
	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 grayscale	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	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dark ↑	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:				:									:								:			
	↓				:									:								:			
	Bright	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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	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 grayscale	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	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Dark ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:				:									:								:			
	↓				:									:								:			
	Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
		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	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 grayscale	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Dark ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:				:									:								:			
	↓				:									:								:			
	Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
		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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

9. INTERFACE TIMING

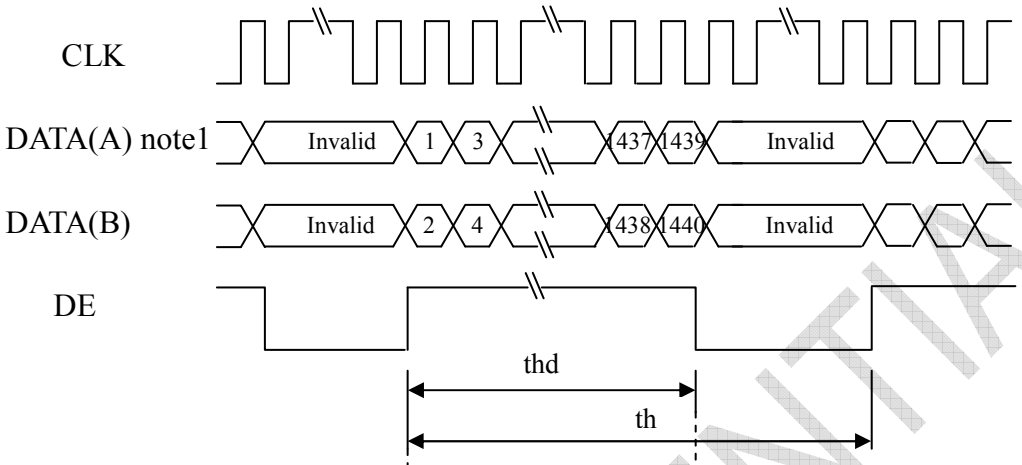
9.1 TIMING CHARACTERISTICS

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Clock	Frequency	1/tc	37.04	44.45	55.56	MHz	LVDS transmitter input
		tc	27.0	22.50	18.0	ns	
	Rise time, Fall time	-	Refer to the timing characteristics of LVDS transmitter			ns	Note 1
	Duty	-				-	
Horizontal signals	Cycle	th	14.8	18.0	26.5	µs	55.5kHz(typ.)
			754	800	900	CLK	
	Display period	thd	720			CLK	-
Vertical signals	Cycle	tv	13.3	16.67	20	ms	60.0Hz(typ.)
			912	926	1100	H	
	Display period	tvd	900			H	-
DE/Data	Setup time	-	Refer to the timing characteristics of LVDS transmitter			ns	Note 1
	Hold time	-				ns	
	Rise time, Fall time	-				ns	

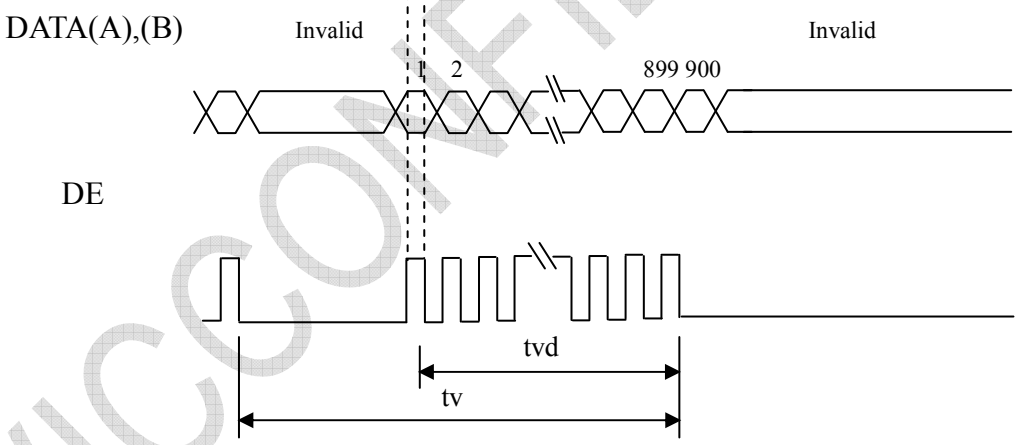
Note1: See the data sheet of LVDS transmitter.

9.2 INPUT SIGNAL TIMING CHART

Horizontal timing



Vertical timing



Note 1:
DATA(A)=RA0-RA7,GA0-GA7,BA0-BA7
DATA(B)=RB0-RB7,GB0-GB7,BB0-BB7

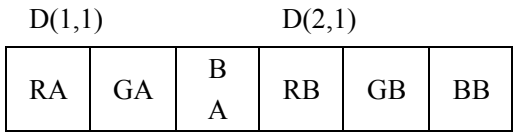
9.3 PIXEL DATA ALIGNMENT OF DISPLAY IMAGE

The following chart is the coordinates of per pixel

Odd Pixel: RA= R DATA Even Pixel : RB=R DATA

GA= G DATA GB=G DATA

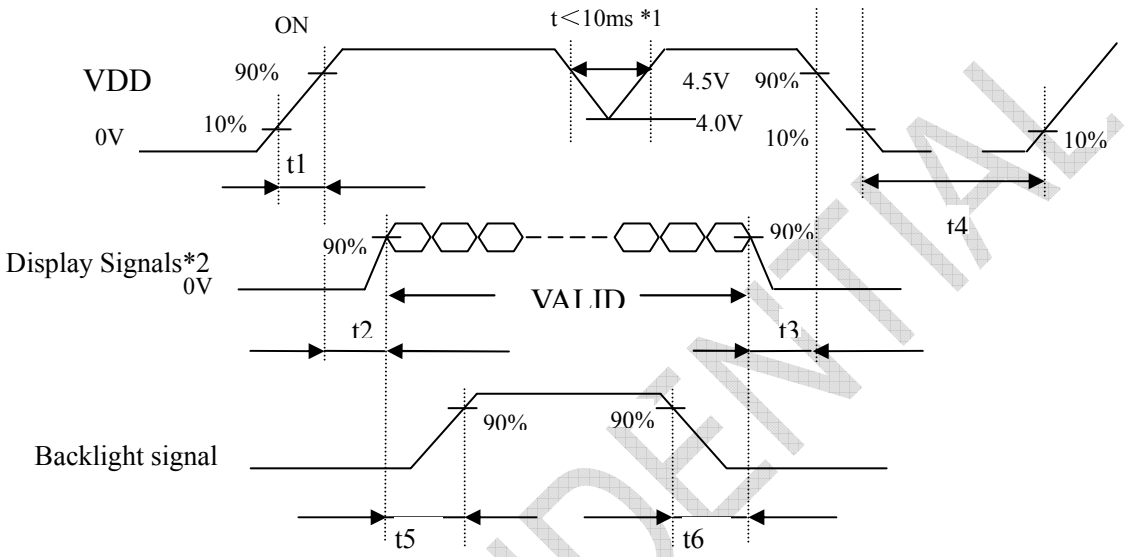
BA= B DATA BB=B DATA



D(1,1)	D(2,1)	D(3,1)	•••	D(1440,1)
D(1,2)	D(2,2)	D(3,2)	•••	D(1440,2)
D(1,3)	D(2,3)	D(3,3)	•••	D(1440,3)
•	•	•	•••	•
•	•	•	•••	•
•	•	•	•••	•
D(1,900)	D(2,900)	D(2,900)	•••	D(1440,900)

9.4. POWER SUPPLY VOLTAGE SEQUENCE

9.4.1 The sequence of backlight and power



Timing Specifications:

t1 0.47ms<t1 <10ms

t2 0.5 ms<t2 <50ms

t3 0ms<t3 <50ms

t4 >1000ms

t5 >200ms

t6 >200ms

*1. When VDD is on, but the value is lower than 4.5V, a protection circuit may work, then the module may not display.

*2 The signal line is not connected with the module, at the end of cable the terminal resistor of 100Ω should be added.

Note1: Display signals (D0+/-, D1+/-, D2+/-, D3+/- and CK+/-) must be "0" voltage, exclude the VALID period (See above sequence diagram). If these signals are higher than 0.3 V, the internal circuit is damaged.

If some of display signals of this product are cut while this product is working, even if the signal input to it once again, it might not work normally. If customer stops the display signals, they should cut VDD.

Note2: When VDD is on, it should be set above 4.0V.

Note3: The backlight power supply voltage should be inputted within the valid period of display and function signals, in order to avoid unstable data display.

9.4.2 Power supply voltage ripple

When the power supply is designed, the next form can give the reference. If the voltage ripple is over the value in next form, the noise should be seen in display area.

Ripple (Measured at input terminal of power supply)

	VDD (5V to drive the panel)
Ripple voltage	≤150mVP-P（Including spike noise）

9.4.3 Fuse

Parameter	Fuse		Rating	Fusing current	Remarks
	Type	Supplier			
VDD	F0603FA2000V032T	AEM	2A 32V	4A	Note1

Note1: There are different power supply systems from the power input terminal. The power supply capacity should be less than the fusing current. If the power supply capacity is above the fusing current, the fuse may blow in a short time, and then nasty smell, smoking and so on may occur.

10. OPTICS

10.1 Optical characteristics

Base on TFT-LCD module TM190MDS01

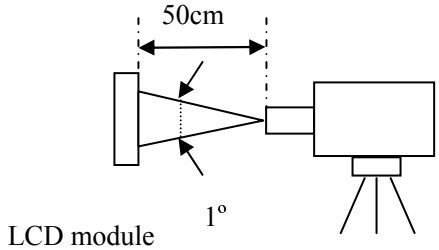
Note1 ,Note2

Parameter Note1		Condition	Symbol	min.	typ.	max.	Unit	Remarks
Luminance		White at center θR=0°, θL=0°, θU=0°, θD=0°	L	160	200	-	cd/ m^2	-
Contrast ratio		White/Black at center θR=0°, θL=0°, θU=0°, θD=0°	CR	(420)	600	-	-	Note3
Luminance uniformity		White θR=0°, θL=0°, θU=0°, θD=0	LU	-	1.25	(1.33)	-	Note4
Chromaticity	White	X coordinate	Wx	0.283	0.313	0.343	-	Chromaticity
		Y coordinate	Wy	0.299	0.329	0.359	-	
	Red	X coordinate	Rx	0.617	0.647	0.677	-	
		Y coordinate	Ry	0.310	0.340	0.370	-	
	Green	X coordinate	Gx	0.253	0.283	0.313	-	
		Y coordinate	Gy	0.574	0.604	0.634	-	
	Blue	X coordinate	Bx	0.113	0.143	0.173	-	
		Y coordinate	By	0.037	0.067	0.097	-	
Color gamut		θR=0°, θL=0°, θU=0°, θD=0 At center,against NTSC	C	-	72	-	%	
Response time		White to black	Ton	-	1.3	(2.6)	ms	Note6 Note7
		Black to white	Toff	-	3.7	(7.4)	ms	
		Ton+ Toff	-	-	5	(10)	ms	
Viewing angle	Right	θU=0°, θD=0°, CR≥10	θR	-	45	-	°	Viewing angle
	Left	θU=0°, θD=0°, CR≥10	θL	-	45	-	°	
	Up	θR=0°, θL=0°, CR≥10	θU	-	25	-	°	
	Down	θR=0°, θL=0°, CR≥10	θD	-	45	-	°	

Note1: The values in upper table are only initial characteristics, and measured with AVIC backlight unit

Note2: Measurement conditions are as follows.

Ta= 25°C, VDD= 5.0V, IBL= 6.5mArms/lamp, Display mode: WXGA+,
Horizontal cycle=55.56KHz, Vertical cycle=60.0Hz
Optical characteristics are measured at luminance saturation after 30minutes from working the product in the dark room. Also measurement method for luminance is as follows.



Luminance Meter (TOPCON BM-5A)
Spectroradiometer(TOPCON SR-3)

Note 3: See**"10.2 Definition of contrast ratio".**
Note 4: See**"10.3 Definition of luminance uniformity".**
Note 5: CIE 1931 Chromaticity Diagram Standard.
Note 6: Product surface temperature: TopF = 33.0 °C
Note 7: See **"10.4 Definition of response time".**
Note 8: See **"10.5 Definition of viewing angle".**

10.2 Definition of contrast ratio

The contrast ratio is calculated by using the following formula.

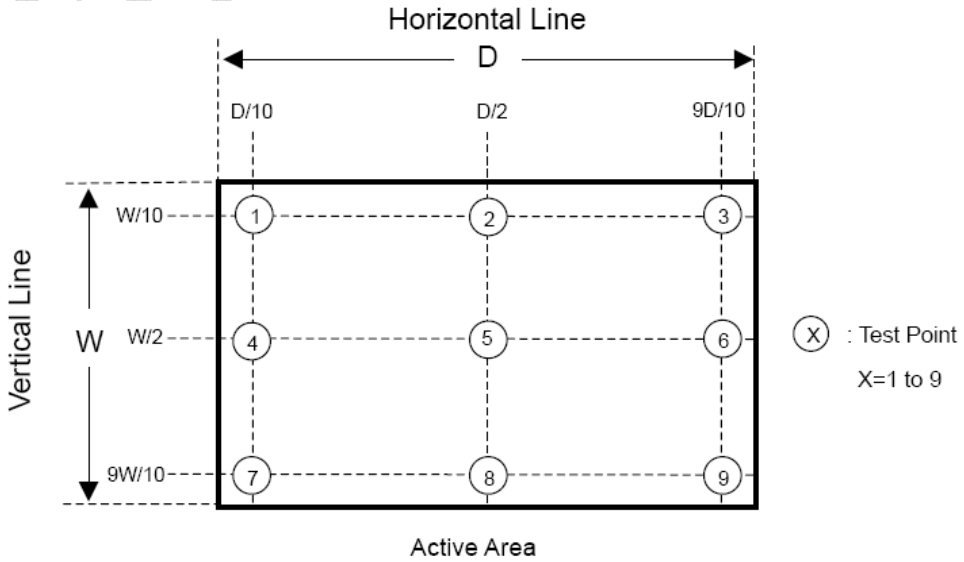
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance of white screen}}{\text{Luminance of black screen}}$$

10.3 Definition of luminance uniformity

The luminance uniformity is calculated by using the following formula.

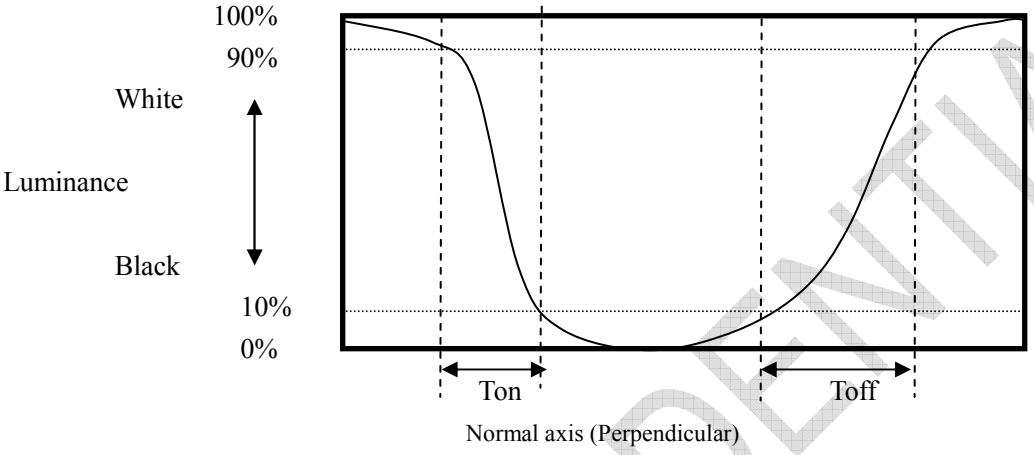
$$\text{Luminance uniformity (LU)} = \frac{\text{Maximum luminance from ① to ⑨}}{\text{Minimum luminance from ① to ⑨}}$$

The luminance is measured at near the 9 points shown below.

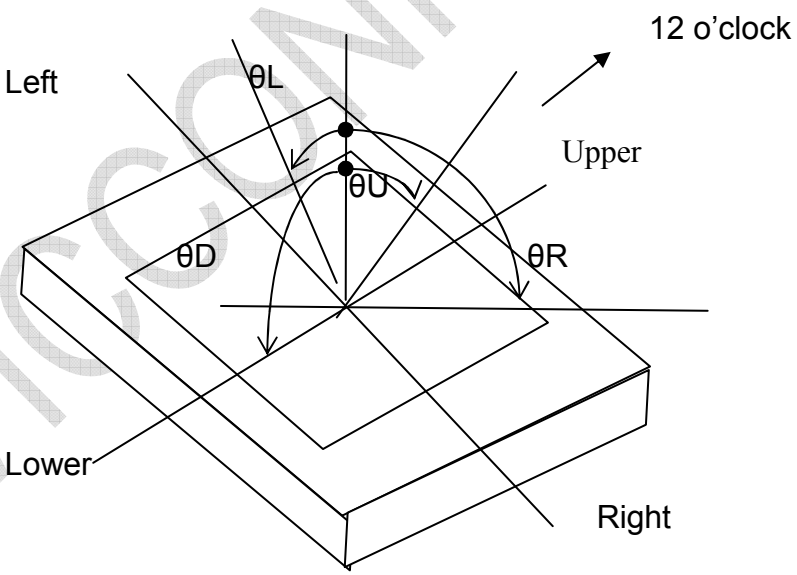


10.4 Definition of response times

Response time is measured, the luminance changes from "white" to "black", or "black" to "white" on the same screen point, by photo-detector. Ton is the time it takes the luminance change from 90% down to 10%. Also Toff is the time it takes the luminance change from 10% up to 90%. (See the following diagram.)



10.5 Definition of viewing angles



11. MARKINGS

AVIC will pack products to deliver to customer in accordance with AVIC packing specifications, and will deliver products to customer in such a state that products will not suffer from damage during transportation .The delivery conditions are as follows.

11.1 PRODUCT LABEL

Product label

Open cell barcode：

•Example: 9WX0818C23916121011H6H109505003

190M01	18C239161210	116H109505003
Open cell Number Code	**Cell ID**	**Lot number**

Cell ID: 18C239161210

Jan. to Sep.: Number of month
October: A
November: B
December: C

1	8	C	23	9161210
S1 Line	Manufacturing year (e.g:A.D2008 is 08.)	Manufacturing month 1 letter	Manufacturing day	Panel Location Internal use

Lot number: 11H6H109505003

Jan. to Sep.: Number of month
October: A
November: B
December: C

116H1	09	5	05	003
Internal use	Manufacturing year 2 figures of the A.D. end numbers (e.g: A.D2009 is 09.)	Manufacturing month 1 letter	Manufacturing day	Production number Multi-letter (figure)

11.2 PACKING

(1) Packing box

5 products are packed up with the maximum in a packing box(See "**11.6 OUTLINE FIGURE FOR PACKING** ").

Products are put into a plastic bag for prevention of moisture.

The type name and quality are shown on outside of the packing box, either labeling or printing.

(2)Pallet Packing (See"**11.6 OUTLINE FIGURE FOR PACKING** ")

① Packing boxes are tired on a cardboard pallet.

②Cardboard sleeve and top cap are attached to the packing boxes, and then they are fixed by a band.

11.3 INSPECTION RECORD SHEET

Inspection record sheets are included in the packing box with delivery products to customer. It is summarized to a number of products for pass/fail assessment.

11.4 TRANSPORTATION

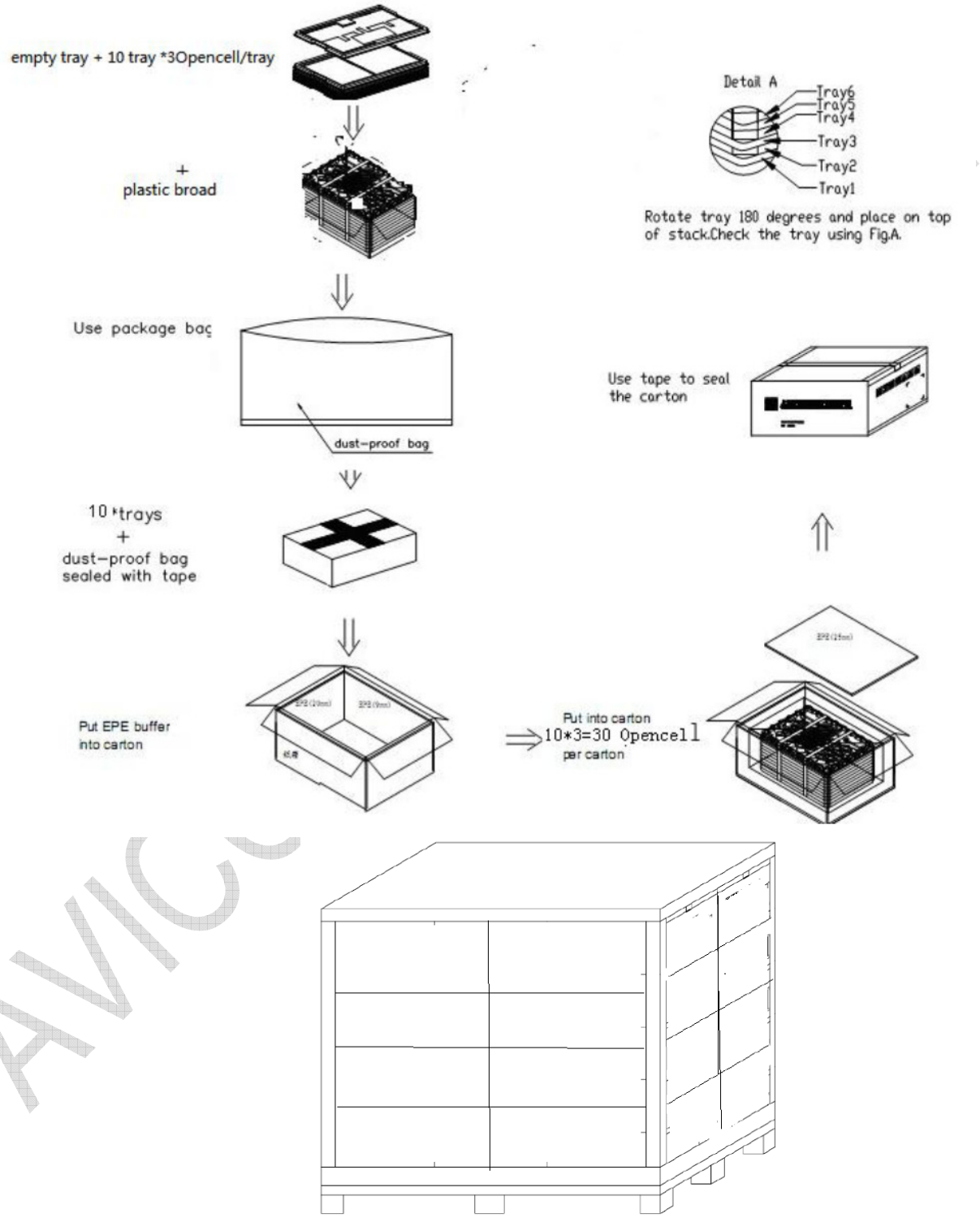
The product is transported by vehicle, aircraft or shipment in the state of pallet packing.

11.5 SIZE AND WEIGHT FOR PACKING BOX

Parameter	Packing box	Unit
Size	571×459×274(typ.)	mm
Weight	0.46(typ.)	kg
Total weight	19.1 （typ., with 30 PCS panel）	kg

11.6 OUTLINE FIGURE FOR PACKING (For reference)

Packing box and pallet packing



Note: The ways for Packing and Shipping vary from different shipment volume, dependent on specific situations.

12. PRECAUTIONS

12.1 ASSEMBLY AND HANDLING PRECAUTIONS

1) Take the measures of electrostatic discharge such as earth band, ionic shower and so on, when customer deals with the product, because products may be damaged by electrostatic.
2) Do not operate or store in high temperature, high humidity, dewdrop atmosphere or corrosive gases. Keep the product in antistatic pouch in room temperature, because of avoidance for dusts and sunlight, if customer stores the product.
3) In order to prevent dew condensation occurring by temperature difference, the product packing box must be opened after leave under the environment of an unpacking room temperature enough. Because a situation of dew condensation occurring is changed by the environment temperature and humidity, evaluate the leaving time sufficiently. (Recommendation leaving time: 6 hour or more with packing state)
4) This product is not designed as radiation hardened.
5) To assemble backlight or install module into user's system, it should be in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
6) 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, skin or clothes, it has to be washed away thoroughly with soap.
7) It is dangerous that moisture come into or contacted the product, because moisture may damage the product when it is operating.
8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage condition.
9) When ambient temperature is lower than 10℃ may reduce the display quality. For example, the response time will become slowly.
10) Do not apply rough force such as bending or twisting to the product during assembly.
11) It's not permitted to have pressure or impulse on the module because the LCD panel will be damaged.
12) Do not pull the I/F connector in or out while the module is operating.
13) After the product's end of life, it is not harmful in case of normal operation and storage.

12.2 OTHER

All GND and VCC terminals should be used without a non-connected line.

The following items are neither defects nor failures.

1) Response time, luminance and color may be changed by ambient temperature.
2) The LCD may be seemed luminance non-uniformity, flicker, vertical seam or small spot by display patterns.
3) The interference noise of input signal frequency for this product and luminance control frequency of customer's backlight inverter may appear on a display. Set up luminance control frequency of backlight inverter so that the interference noise does not appear.

13. OUTDRAWING