SAMSUNG ELECTRONICS

Product Information

ISSUE DATE : 2003-06-20
MODEL : LTM190E1-A01

Note : This Product information is subject to change after 3 months of issuing date

Prepared by AMLCD Technical Customer Service Team

Samsung Electronics Co . , LTD.

Contents

1. General Description

LTM190E1-A01 is a new concept of System-On-Panel (SOP) display device. It provides total and high quality TFT-LCD display solutions for customer system design. Customer can use the high quality display unit just like an integrated circuit (IC).
As ICs are used as building blocks of many complicated electronic systems, this new display solution can be used just same.
This device includes the high quality PVA(Plus Viewing Angle) TFT-LCD panel and the high brightness 4-lamp backlight unit with the optimized inverter. Integrated signal processing unit, named LSP (LCD Signal Processor™), includes all electronic function for user application. It includes analog-to-digital conversion, Scaling, OSD, EDID (DDC 2 compliance) and LCD Timing controller. More functions are available, also.
World-top notebook LCD design technology of Samsung realize the most compact solution. Customer can enjoy wide system design flexibility.
EMI is the additional point of this device. All of the units are shielded by metal case finally.

* Features

-. PVA(Plus Viewing Angle): High contrast ratio, Wide-viewing angle and High-speed response time.
-. High brightness with the 4-CCFL backlight lamps using optimized inverter.
-. On Screen Display(OSD): Samsung generic bitmap OSD is supported,
but the customized OSD is also available using system development tool.
-. Digital Image Processor is embedded with intelligent microprocessor.
-. Wide Input Voltage Range : +12VDC±10%
-. DDC Ver. 2 Compliance by system integrator
-. VESA DPMS compliance
-. Low Power Consumption
-. Easier EMI troubleshooting and solution supported.
-. Easy Lamp replacement

* Information

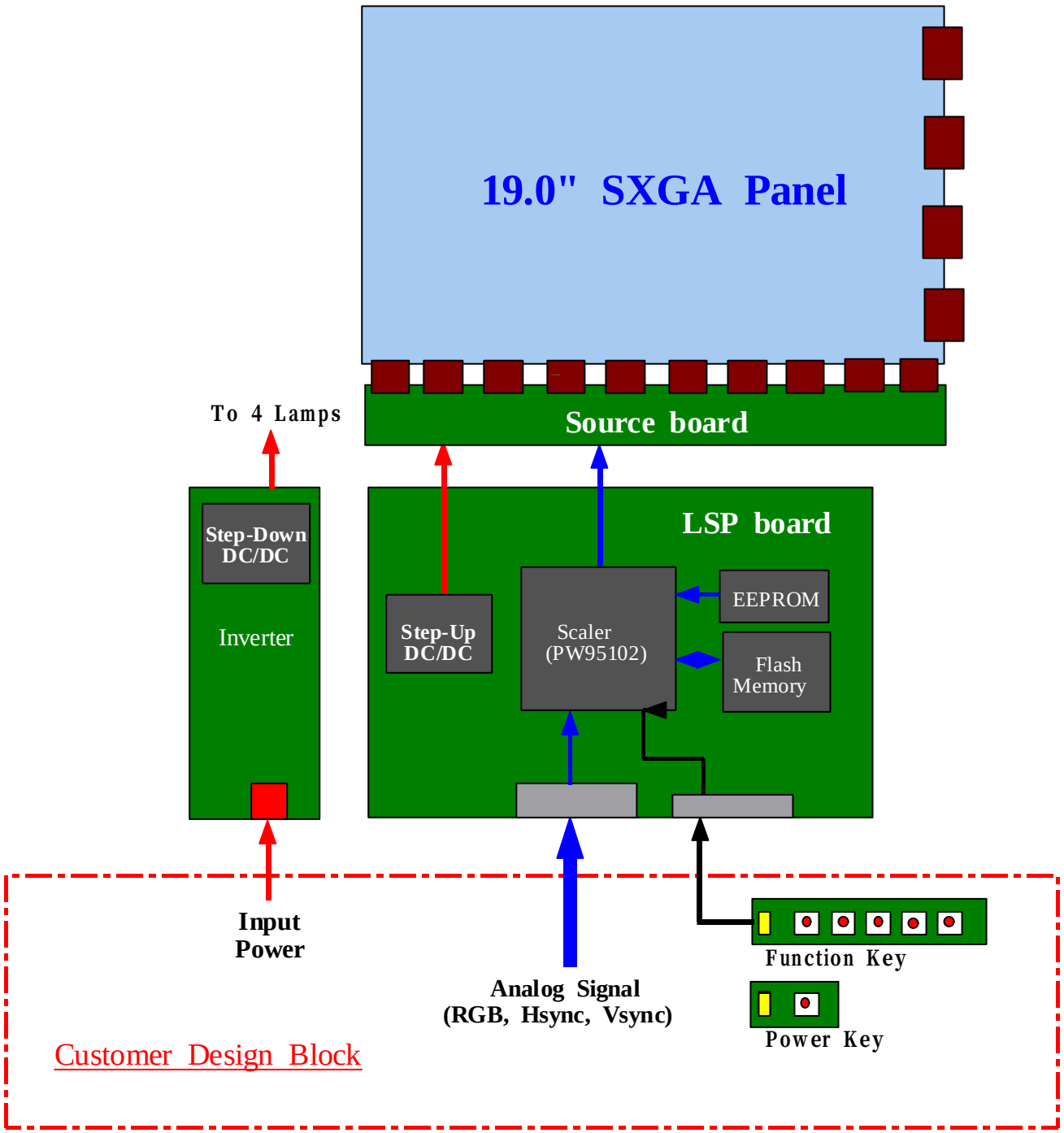
Items	Specification	Unit	Note
Display area	376.32(W) x 301.056(H)	mm	19.0 inch diagonal
Driver element	a-Si TFT active matrix		
Display colors	16.2M (true)	colors	6-bit FRC
Number of pixels	1280x1024	pixel	
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.294(W) x 0.294(H)	mm	
Display mode	Normally Black(PVA)		
Surface treatment	Haze 44% , Hard-coating (3H)		
Backlight	4 Lamps		

*** Explanation for Product code**

L T M 1 9 0 E 1 - A01 -□ □ □

Base code	Interface -A: Analog only	Derivative Mode	Customer code	S/W revision	H/W revision

*** System Block Diagram**



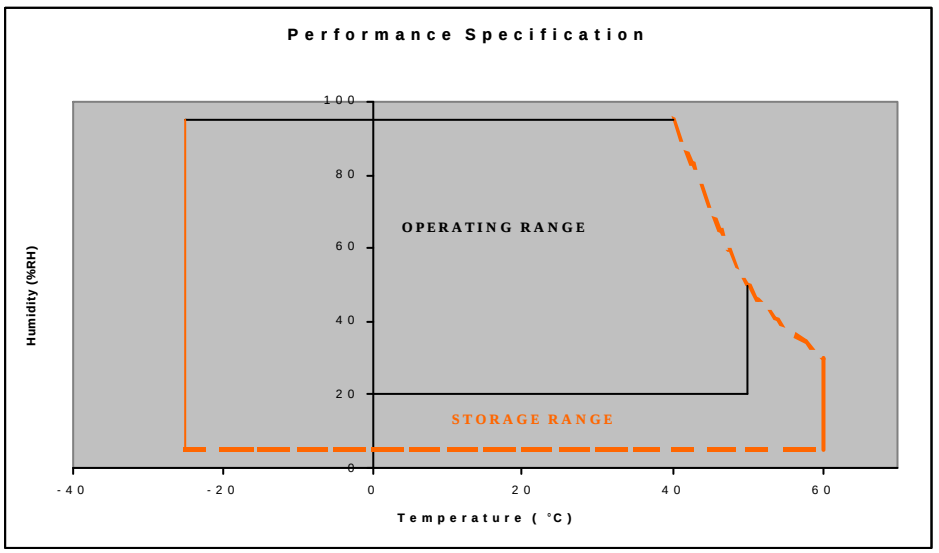
*** Mechanical information**

Item		Min.	Typ.	Max.	Note
Module size	Horizontal(H)	403.7	404.2	404.7	mm
	Vertical(V)	329.5	330	330.5	mm
	Depth(D)	-	-	23	mm
Weight		-	-	2900	g

2. Environmental Specification

Items	Min.	Max.	Units	Note
Storage Temperature	-25	+60	℃	
Operating Temperature	0	+50	℃	
Shock (Non-operating)	-	50	G	11ms, 1 time for ±X, ±Y, ±Z
Vibration (Non-operating)	-	1.5	G	10-300Hz, Sweep rate:10min, 30min for X, Y, Z axis

■ Note: If this product is used for extended time excessively or exposed to high temperatures for extended time, there is a possibility of wide viewing angle film damage which could affect visual characteristics.



3. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured

in a dark room or equivalent state with the methods shown in Note (1).

※Measuring equipment : TOPCON BM-5A: Contrast Ratio, Luminance of White, Viewing Angle
TOPCON BM-7: Response time
Photo Research PR650: Color Chromaticity

※Ta = 25±2℃ , VIN = +12V, fv= 60Hz

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Contrast Ratio		CR	Φ=0, θ=0 Normal Viewing Angle	400	600	-		(1),(2),(4)
Response Time at Ta	Rising	T_R		-	15	-	msec	(1),(3)
	Falling	T_F		-	10	-		
Luminance of White (Center of Screen)		Y_L		200	250	-	cd/m^2	(1),(4)
Color Chromaticity (CIE 1931)	Red	R_X		T.B.D	0.634	T.B.D		(1), (4)
		R_Y			0.354			
	Green	G_X			0.304			
		G_Y			0.581			
	Blue	B_X			0.143			
		B_Y			0.102			
	White	W_X			0.310			
		W_Y			0.330			
Viewing Angle	Hor.	θ_L	CR≥10	70	85	-	Degrees	
		θ_R		70	85	-		
	Ver.	Φ_H		70	85	-		
		Φ_L		70	85	-		
Color Gamut				-	65	-	%	
Brightness Uniformity (9 points)		B_{UNI}		-	-	25	%	(5)
Cross Modulation		C_T		-	-	5	%	(6)

■ Measuring Condition: Maximum value of Brightness and Contrast in OSD menu.

4. Electrical Specification

4.1 Input video and sync signal

* Signal Connector : S13B-PH-SM3-TB (JST) ☞ Mating Connector : PHR-13

Item		Description	Notes
Video	Input	·Type: Analog RGB ·level : 0.7Vp-p ±5% ·Polarity: Positive Bright ·Impedance: 75Ω±5% (Terminated)	VESA Compliance
	Resolution	·Optimum: 1280×1024@60Hz ·Maximum: 1280×1024@75Hz	
	Horizontal Frequency	·30~80KHz	
	Vertical Frequency	. 55~75Hz	
	Applicable Bandwidth	·Typical: 108MHz (1280x1024@60Hz) ·Max: 135MHz (1280x1024@75Hz)	
Sync	Input	. Type : separate H/V sync, . Level : TTL level (V high ≥ 2.0V, V low ≤ 0.8V) . Polarity : Positive or negative.	

4.2 Input Signal Pin Assignment and Description

* Signal Connector : S13B-PH-SM3-TB (JST) ☞ Mating Connector : PHR-13

Group	Pin No.	Pin Name	Description	Note
Analog RGB	Pin 01	DB_DET	Cable Detect Pin	Internally Pull-Up (Connect this pin with DSUB #5 pin)
	Pin 02	DB_SDA	Serial Data for DDC	
	Pin 03	DB_SCL	Serial Clock for DDC	
	Pin 04	RGND	Red Ground	
	Pin 05	DB_RED	Red Data Input	
	Pin 06	GGND	Green Ground	
	Pin 07	DB_GRN	Green Data Input	
	Pin 08	BGND	Blue Ground	
	Pin 09	DB_BLU	Blue Data Input	
	Pin 10	NC	Not used	
	Pin 11	DB_VSY	Vsync Input	
	Pin 12	SGND	Sync Ground	
	Pin 13	DB_HSY	Hsync Input	

4.3 Function Key Pin Assignment and Description

* Connector type: 53261-1490 (MOLEX) ☞Mating Connector: 51021-1490

Group	Pin No.	Pin Name	Description
Keypad	Pin 01	KVDD	Keypad Unit Power
	Pin 02	KGND 1	Keypad Unit Ground
	Pin 03	KEY8	Key Input #8
	Pin 04	KEY7	Key Input #7
	Pin 05	KEY6	Key Input #6
	Pin 06	KEY5	Key Input #5
	Pin 07	KEY4	Key Input #4
	Pin 08	KEY3	Key Input #3
	Pin 09	KEY2	Key Input #2
	Pin 10	KGND 2	Keypad Unit Ground
	Pin 11	KEY1	Key Input #1
	Pin 12	KGND 3	Keypad Unit Ground
	Pin 13	LED1	Status Indicator
	Pin 14	LED2	Status Indicator

4.4 Power Supply

4.4.1 Pin Assignment and description

*Connector type: 40006WR-02 (YeonHo Electronics)

Pin No.	Pin Name	Description	Note
1	Vin	Input Power, +12VDC (typ.)	
2	GND	Ground	

4.4.2 Input voltage & Rush current

Items	Symbol	Min.	Typ.	Max.	Unit
Input Volage	Vin	+10.8	+12	+13.2	V
Rush Current	Irush	-	-	+12	A

4.4.3 DPMS: VESA DPMS compliance

4.5 Power Consumption

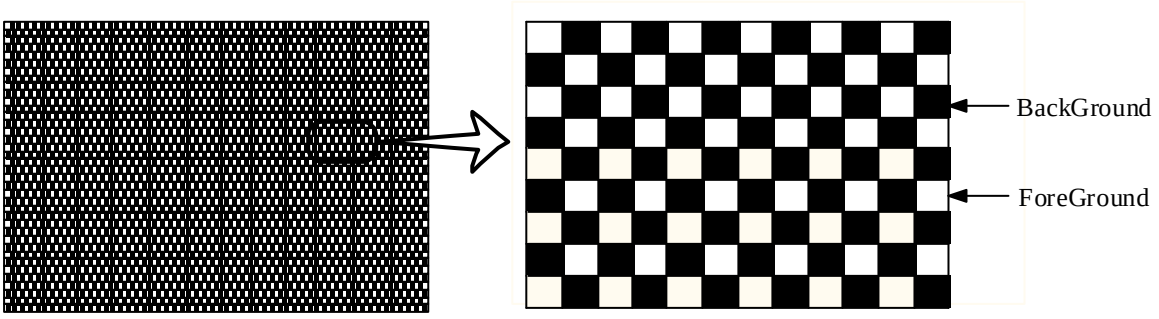
4.5.1 Measurement of power consumption

Voltage	Current				Resolution
	Min.	Typ.	Max.	Unit	
12V	-	2.5	3.1	A	1280*1024@60Hz

☞ Power saving(Stand-by, Suspend, Off mode): less than 3 watts. Monitor has to be recovered to normal operation mode within 4 seconds when normal signal is applied from signal source.

☞ Maximum condition

- OSD condition : Brightness 100, Contrast 100
- test pattern : One pixel on/off (1dot) pattern



4.5.2 Power management mode: VESA DPMS protocol applied.

Mode	Horizontal sync	Vertical sync	LED1	LED2	Power consumption
On	Active	Active	Off	On	32 watts(Typ.)
Stand-by	Inactive	Active	On/Off (Blinking)	On	< 3 watts
Suspend	Active	Inactive			
Off	Inactive	Inactive			

5. User Interface

5.1 OSD Key Matrix

※This table is based on OSD S/W presented by SAMSUNG.

If our customer wants their customized OSD, Key matrix will be changed.

Input Connector		Keypad
Pin No.	Pin Name	Function
Pin 01	KVDD	+3.3V / 100mA
Pin 02	KGND1	
Pin 03	KEY8	AUTO
Pin 04	KEY7	EXIT
Pin 05	KEY6	LEFT
Pin 06	KEY5	
Pin 07	KEY4	
Pin 08	KEY3	RIGHT
Pin 09	KEY2	MENU
Pin 10	KGND2	
Pin 11	KEY1	POWER
Pin 12	KGND3	
Pin 13	LED1	LED1
Pin 14	LED2	LED2

* Firmware(including OSD) presented by SAMSUNG is edited by SmartSDK 1.0
* ( ) : Hot Key

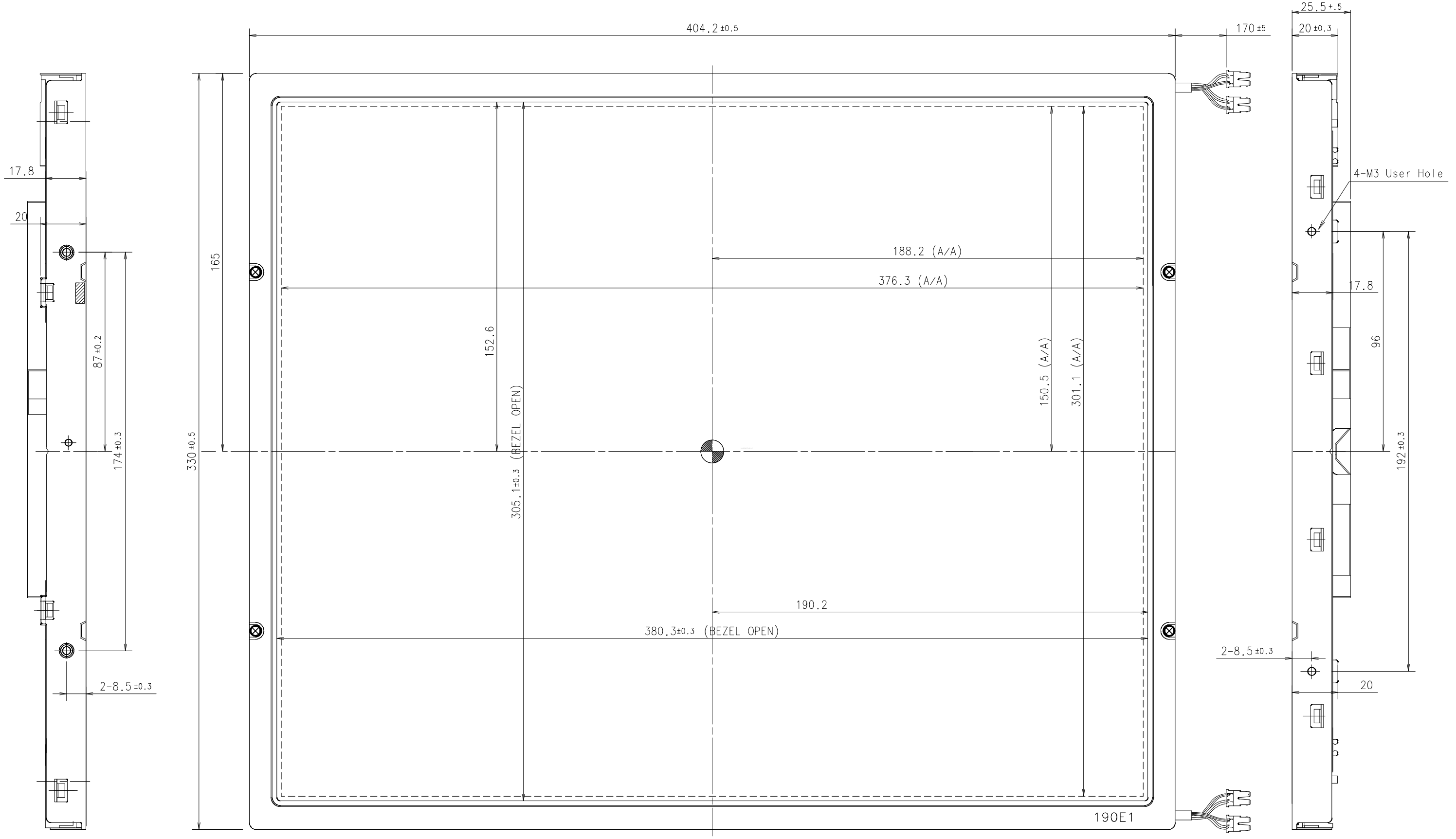
5.2 User Controls

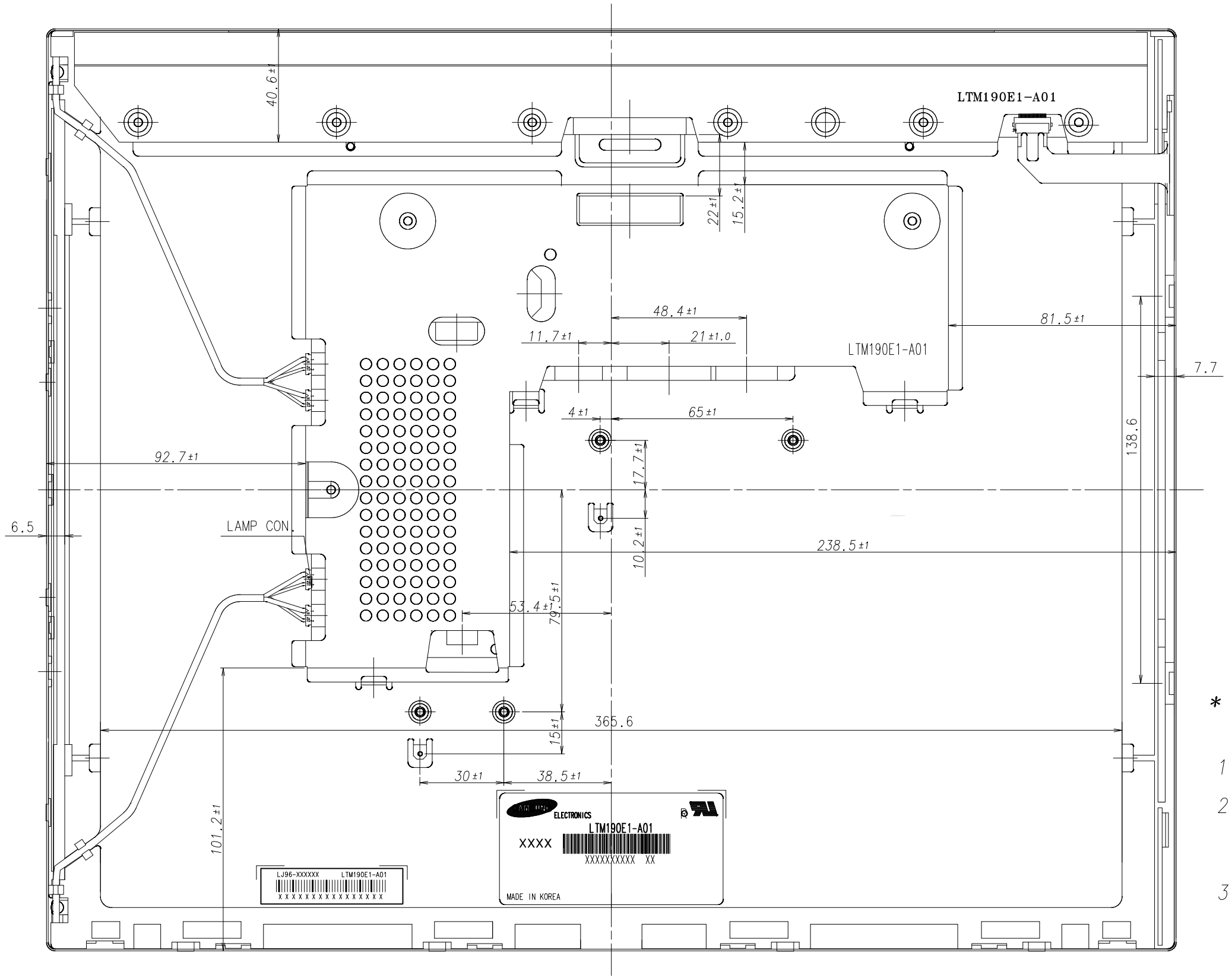
* POWER: Turn on and off the monitor power.
* MENU: Calls OSD menu and select the function to be adjusted.
* EXIT
  - ☞ Exit from the OSD function or Back to previous menu.
* AUTO
  - ☞ Auto adjust by press directly without OSD menu.
* "LEFT"
  - ☞ Moves the selector left on the OSD menu.
  - ☞ Decrease the value of selected adjustment or Select proper setting.
  - ☞ Brightness control by press directly without OSD menu.
* "RIGHT"
  - ☞ Moves the selector right on the OSD menu.
  - ☞ Increase the value of selected adjustment or Select proper setting.
  - ☞ Brightness control by press directly without OSD menu.
* LED: Indicates the status of monitor operation.
  - ☞ LED2: Normal
  - ☞ Black: Power OFF
  - ☞ LED1: Power saving mode or Disconnection of signal cable.
* Service key
  - ☞ Software Information -> Press "EXIT" & "-" during 2 secs
    Backlight Hours -> Press "-" & "+" during 2 secs

6. Mechanical Specification

6.1 Outline dimension

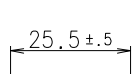
☞ **Nest page**


404.2 ±0.5
170 ±5
25.5 ±.5
20 ±0.3
4-M3 User Hole
17.8
20
165
188.2 (A/A)
376.3 (A/A)
152.6
150.5 (A/A)
301.1 (A/A)
87 ±0.2
174 ±0.3
330 ±0.5
305.1±0.3 (BEZEL OPEN)
96
192 ±0.3
190.2
380.3±0.3 (BEZEL OPEN)
2-8.5 ±0.3
2-8.5 ±0.3
20
190E1



* NOTES

1. BACKLIGHT : 4 COLD CATHODE FLUORESCENT LAMPS.
2. I/F CONNECTOR SPECIFICATION.
   - MAKER : JAE
   - PART NO : FI-X30S-HF
3. LAMP CONNECTOR/WIRE SPECIFICATION.
   - MAKER : JST
   - PART NO : BHSR-02VS-1(2 PIN x 170mm)

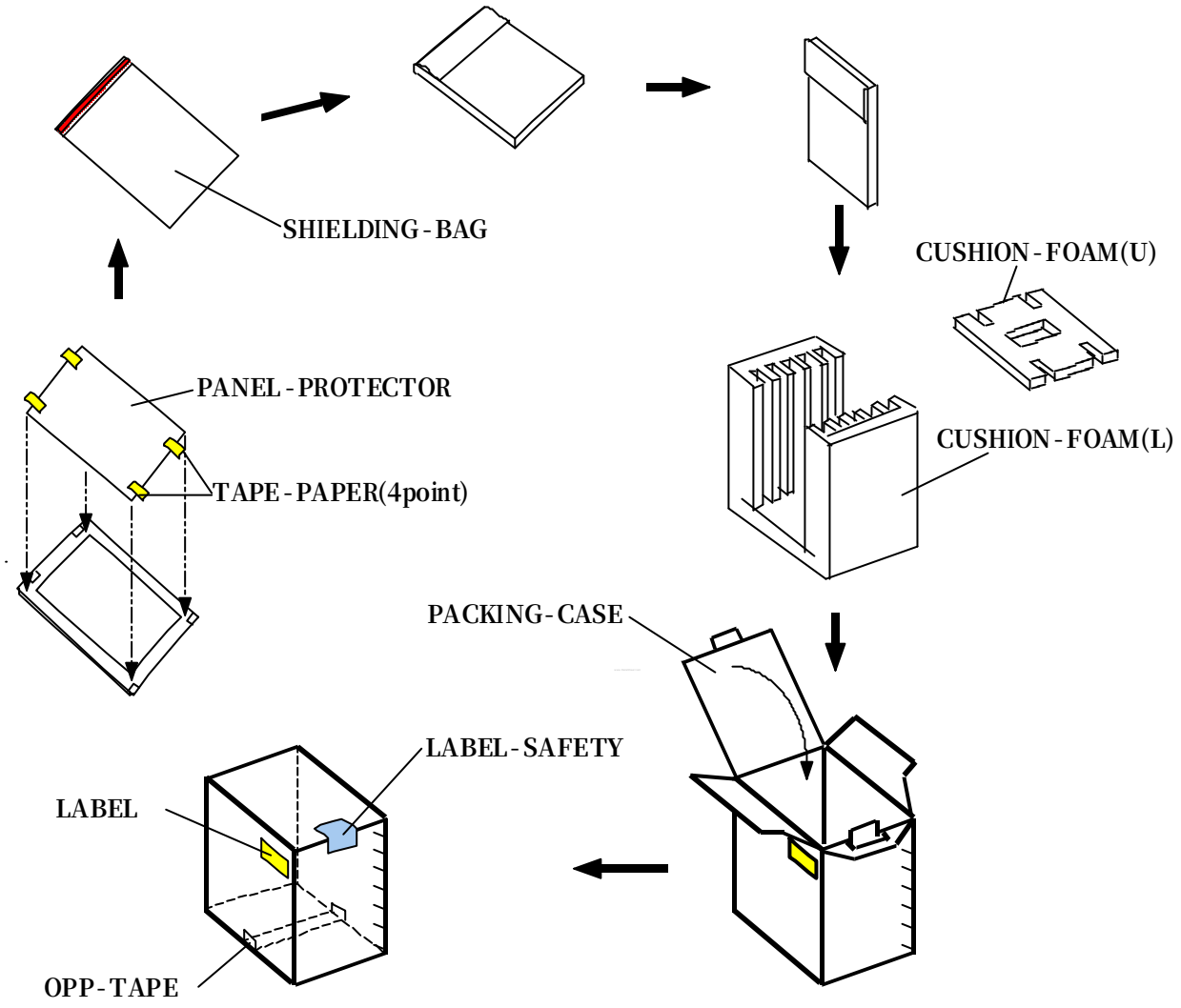


6.2 Packing Information

6.2.1 Carton (Internal Package)

6.2.1.1 Packing Form: Corrugated fiberboard box and corrugated cardboard as shock absorber.

6.2.1.2 Packing Method



NOTE 1) Acceptance number of piling : 5sets

2) MAX accumulation quantity : 5 cartons

6.2.1.3 Packing Material

No	Part name	Quality
1	Static electric protective sack	5
2	Packing case(Inner box) included shock absorber	1 set
3	Pictorial marking	2 pcs
4	Carton	1 set

7. GENERAL PRECAUTION

7.1 Handling

- ☞ When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.
- ☞ Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT back-light.
- ☞ Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.
- ☞ Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.
- ☞ If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- ☞ The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- ☞ If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
- ☞ Protect the module from static , it may cause damage to the CMOS IC.
- ☞ Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- ☞ Do not disassemble the module.
- ☞ Do not pull or fold the lamp wire.
- ☞ Do not adjust the variable resistor which is located on the back side.
- ☞ Pins of I/F connector shall not be touched directly with bare hands.

7.2 Storage

- ☞ Do not leave the module in high temperature, and high humidity for a long time.
- ☞ It is highly recommended to store the module with temperature from $0^{o}C$ to $35^{o}C$ and relative humidity of less than 70%.

☞ Do not store the TFT-LCD module in direct sunlight.
☞ The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

7.3 Operation

☞ Do not connect,disconnect the module in the Power On condition.
☞ Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

7.4 Others

☞ Ultra-violet ray filter is necessary for outdoor operation.
☞ Avoid condensation of water. It may result in improper operation or disconnection of electrode.
☞ Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, so on) Otherwise the module may be damaged.
☞ If the module displays the same pattern continuously for a long period of time, it can be the situation when the image sticks to the screen.
☞ This module has its circuitry PCB on the rear side and should be handled carefully in order not to be stressed.