

Product Specification

SPECIFICATION FOR APPROVAL

- () Preliminary Specification
- (●) Final Specification

Title	1.9" qCIF+ TFT-LCD
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BUYER	SII
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LH190J01
SUFFIX	TH02

*When you obtain standard approval,
please use the above model name without suffix

SIGNATURE	DATE
_____ / _____	_____
_____ / _____	_____
_____ / _____	_____

Please return 1 copy for your confirmation with your signature and comments.

APPROVED BY	DATE
C. S. Kyeong / Team Leader	<i>[Signature]</i>
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Application Panel Design Team
LG.Philips LCD Co., Ltd.

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Product Specification**RECORDS OF REVISIONS**

Revision No	Revision No.	Page	DESCRIPTION
Ver1.0 Ver2.0	FEB. 03, 2006 1	14	Ver1.0 was Released. Package quantity in one box : 648 pcs. → 540 pcs.

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1. General Description

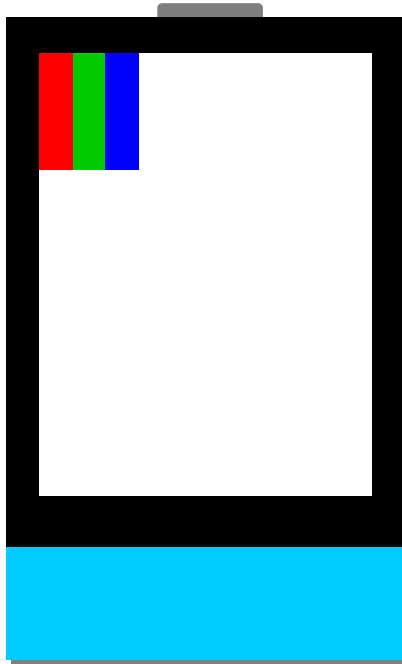
The **LH190J01-TH02** model is a Thin Film Transistor- Liquid Crystal Display without polarizer. The matrix compose a-Si Thin Film Transistor as a active element.

It is a transmissive type display operating in the normally white mode. This TFT-LCD has **1.9 inch** diagonally measured active display area with qCIF+ resolution(176×RGB×220 pixels)

Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes.

The LH190J01-TH02 has been designed to apply the interface method that enables low power.

The LH190J01-TH02 is intended to support applications where thin thickness, low power are critical factors and graphic display are important. In combination with the vertical arrangement of the sub-pixels, the LH190J01-TH02 characteristics provide an high quality display for mobile phone application.



General Features

Active Screen Size	1.9 inch diagonal
Outline Dimension	33.7(H) x 45.0(V) x 0.7(D) mm(Typ.) , Only panel without polarizer
Dot Pitch	0.057 mm x 0.171mm
Pixel Format	176× RGB×220 Pixels (RGB Stripes Arrangement)
Color Gamut	50%(Typ.) , Only CF
Transmittance (without POL)	14 % (Typ.)
Weight (without POL)	2.6(Typ.)± 0.26g
Rubbing Direction	12 O'clock (COG PAD at 6 O'clock)
D-IC	R61503B
Display Operating Mode	Transmissive Mode, Normally White

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2. Absolute Maximum Ratings

The following are maximum values which, if exceeded, may cause operation or damage to the unit.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value		Unit	Notes
		Min.	Max.		
LC Operating Voltage *1)	V _{OP}	3.3 (Typ.)		V	@ 25±5 °C
Operating Temperature	T _{OP}	-20	70	°C	
Storage Temperature	T _{ST}	-30	80	°C	
Operating Ambient Humidity *2)	H _{OP}	10	*3)	%RH	
Storage Humidity *2)	H _{ST}	10	*4)	%RH	

Notes:

- *1) Liquid Crystal driving voltage.
Due to the characteristics of LC Material, this voltage vary with environmental temperature.
- *2) Non-condensation.
- *3) Temp. ≤ 60 °C , 90% RH MAX.
- *4) Temp. > 60 °C , Absolute humidity shall be less than 90% RH at 60 °C.

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3. Electrical Specifications

Table 2. Recommend Parameters for Electrical Characteristics

@ 25 ± 5°C

Parameter	Symbol	Value			Unit	Notes
		Min.	Typ.	Max.		
TFT Gate ON Voltage	VGH *1)	12	14	16	V	*3)
TFT Gate OFF Voltage	VGL *2)	-10	-8	-6	V	
TFT Common Electrode Voltage	VcomH	2.5	-	4	V	
	VcomL	-1.5	-	0	V	
TFT Kick-Back Voltage Max.	ΔV_p Max	0.2	-	1.0	V	
TFT Kick-Back Voltage Min.	ΔV_p Min					

Notes:

*1) VGH is TFT Gate Operating Voltage.

*2) VGL is TFT Gate Operating Voltage
The low voltage level of VGL signal must be fluctuated with same phase as Vcom, in case of Cadd (Storage on Gate) structure.
The storage capacitance structure of LH190J01-TH02 is Cst (Storage on Common)

*3) Vcom must be adjusted to optimize display quality: Cross-talk, Contrast Ratio and etc.

We just kindly recommend the setting-voltage as the reference value.

In order to get the optimized display quality, the setting-voltage should be changed as based on customer's developing condition.

(The display quality could be changed by customer's setting-voltage.)

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4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 50cm from the TFT-LCD surface at a viewing angle of Φ and θ equal to 0 °.

Measurement condition: Refer to next pages (C-light source, Halogen Lamp)

- *1): with Polarizer
- *2): without Polarizer
- *3): only Color Filter glass

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
*1) Threshold Voltage	Vsat	2.0	2.1	2.2	V	Fig.2
	Vth	1.0	1.1	1.2	V	
*2) Transmittance	T(%)	-	14	-	%	Fig.1
*1) Contrast Ratio	C/R	300	350	-		
*1) Response Time	Tr+Tf	-	25	40	msec.	Fig.3
*3) CIE Color Coordinate	Rx	0.579	0.599	0.619		
	Ry	0.300	0.320	0.340		
	Gx	0.290	0.310	0.330		
	Gy	0.543	0.563	0.583		
	Bx	0.118	0.138	0.158		
	By	0.140	0.160	0.180		
	Wx	0.288	0.308	0.328		
	Wy	0.324	0.344	0.364		
*1) Viewing Angle	Θ_l	45	-	-	Degree	C/R>10 Fig.4
	Θ_r	45	-	-		
	Θ_u	35	-	-		
	Θ_d	15	-	-		

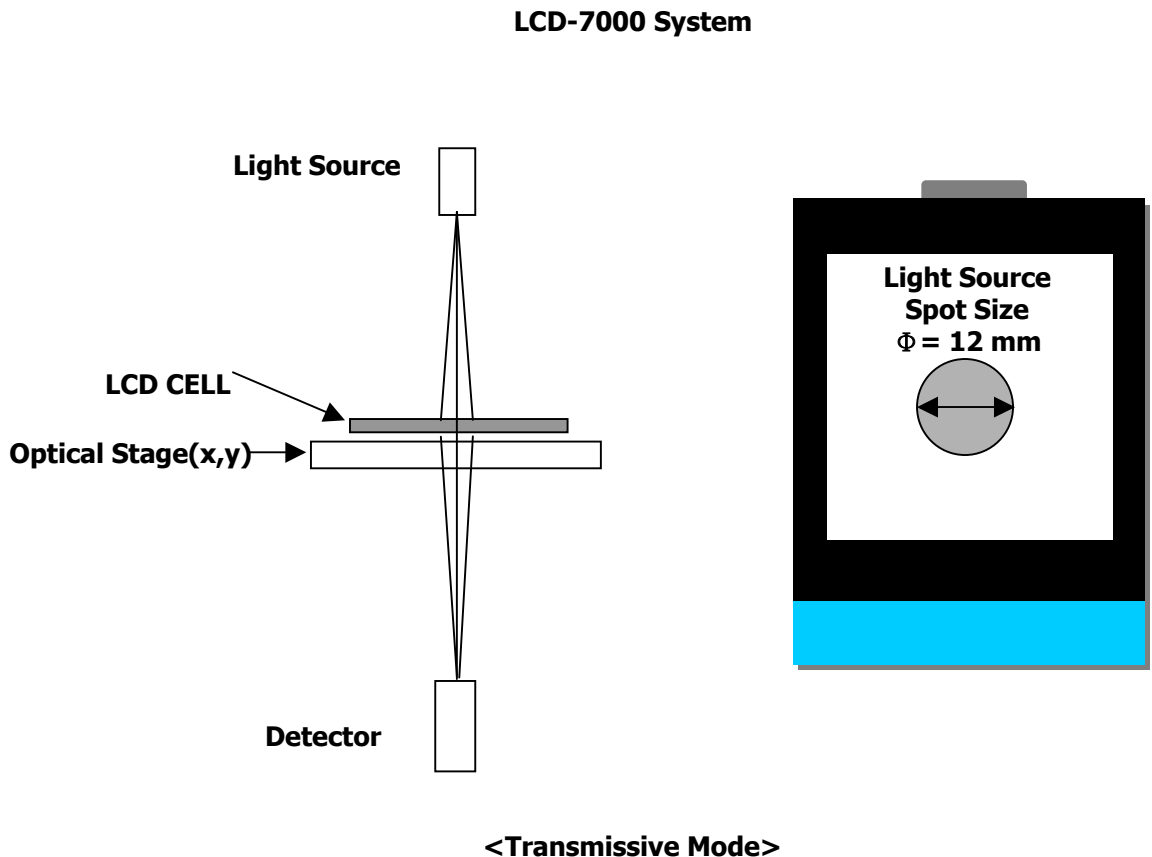
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Notes : 1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the TFT-LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.
3. Response time is the time required for the display to transition from white to black(Rise Time, Tr) and from black to white(Falling Time, Tf). For additional information see FIG 3.
4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the TFT-LCD surface. For more information see FIG 4.
5. Optimum contrast is obtained by adjusting the TFT-LCD Threshold voltage(Vth & Vsat)

FIG. 1 Optical Characteristic Measurement Equipment and Method



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FIG. 2 The definition of V_{th} and V_{sat}

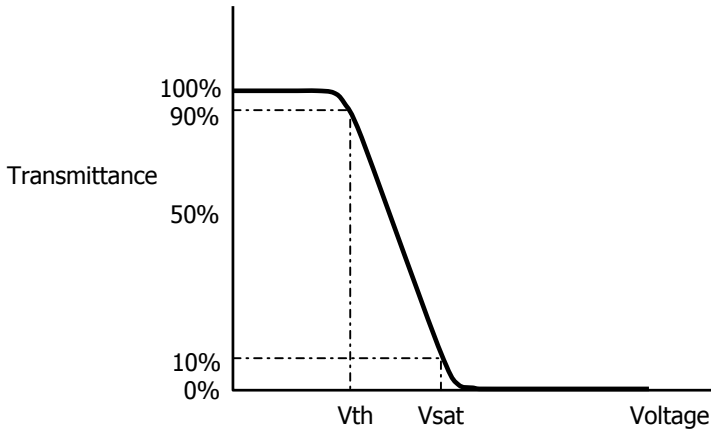
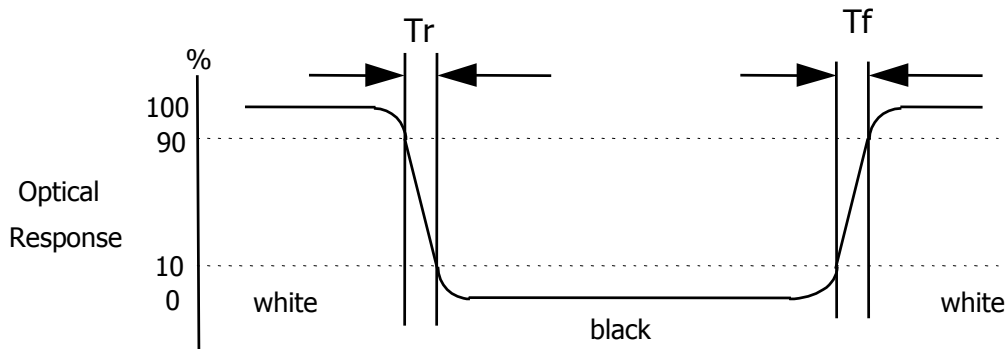


FIG. 3 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

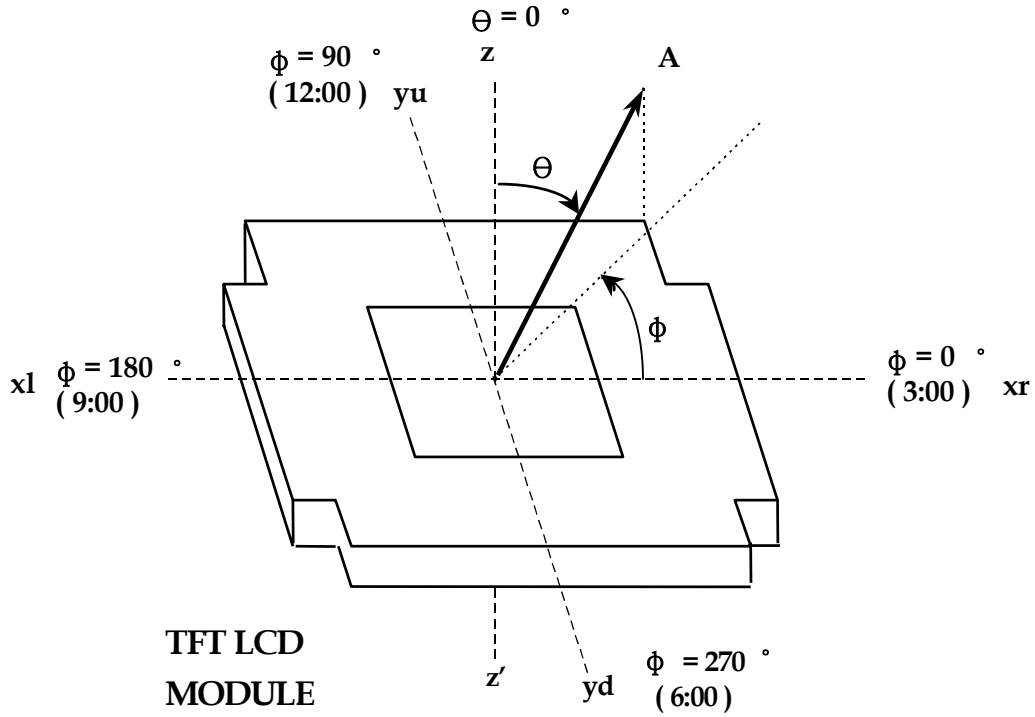


* Voltage conditions for Response time
 V_{gate} : 19V DC
 V_{data} : 0V~3.3V DC
 V_{com} : 0V (Ground)

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FIG. 4 The definition of viewing angle

<dimension of viewing angle range>



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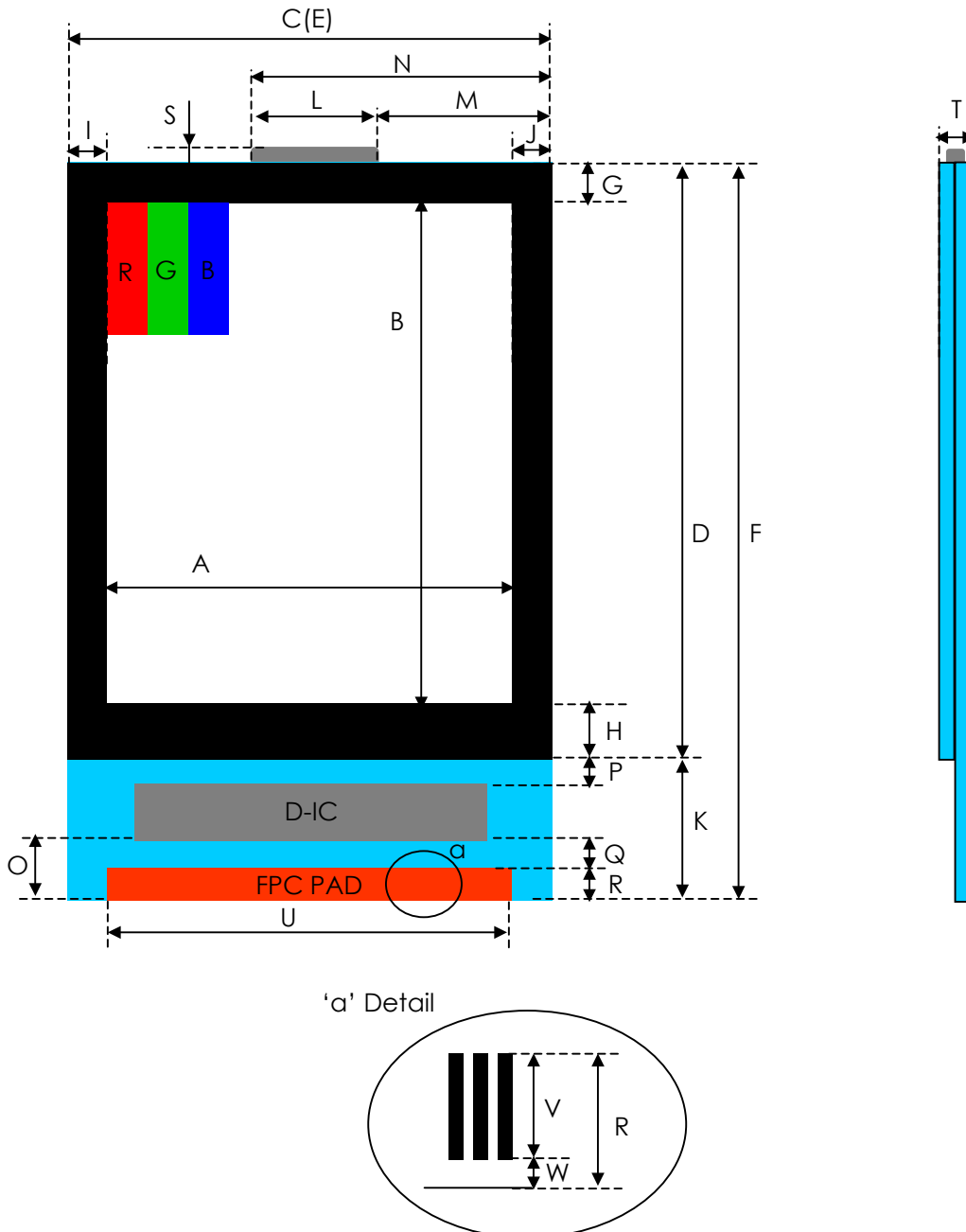
5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model **LH190J01-TH02**. In addition the figures in the following page are detailed mechanical drawing of the TFT-LCD.

Parameter	Symbol	Specification	Unit	Notes
Active Area	A	30.096	mm	
	B	37.620	mm	
Upper Glass Size	C	33.70±0.2	mm	
	D	41.42±0.2	mm	
Bottom Glass Size	E	33.70±0.2	mm	
	F	45.00±0.2	mm	
Panel thickness	T	0.7±0.05	mm	
Cell Margin	G	2.00±0.1	mm	
	H	1.80±0.1	mm	
	I	1.802±0.1	mm	
	J	1.802±0.1	mm	
COG PAD Area	K	3.58±0.2	mm	
End Seal Size	L	10.0	mm	Max.
Glass Edge to End Seal	M	11.85	mm	Min.
Glass Edge to End Seal Edge	N	21.85	mm	Max.
Upper Glass Edge to D-IC	P	0.6±0.1	mm	
Bottom Glass Edge to D-IC	O	1.55±0.1	mm	
D-IC to FPC	Q	0.35	mm	
FPC to Glass Edge	R	1.2± 0.1	mm	
End Seal Height	S	0.6	mm	Max.
FPC Length	U	20.70	mm	
FPC Pad Length(Metal)	V	0.9	mm	
FPC Pad(metal area) to Glass Edge	W	0.3± 0.1	mm	
Weight		2.6± 0.26	g	

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FIG. 5 Outline Dimension of TFT-LCD Cell



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6. Reliability Test

Absolute Maximum Conditions

No.	Parameter	Condition
1	Operating Temperature	-20 ~ 70℃
2	Storage Temperature	-30 ~ 80℃

Reliability test conditions (Polarizer characteristics null)

No.	Test Items	Test Condition	
1	High Temperature Storage	T = 80℃ for 500hr	Module (Without Contamination)
2	Low Temperature Storage	T = -30℃ for 500hr	
3	High Temperature Operating	T = 70℃ for 500hr	
4	Low Temperature Operating	T = -20℃ for 500hr (But no condensation of dew)	
5	High Temp. and High Humidity Operating	T = 60℃ /90% for 500hr (But no condensation dew)	
6	Thermal Shock	-30 ~ 80℃, 100cycle	Packing
7	Packing Shock	1coner, 3edge, 6face / 76cmDrop	
8	Packing Vibration	Random 1.06Grms XYZ 30min for each direction	

※ 1) No.1~ No.6 : No guarantee for panel, only for module with the above test conditions.

2) No.7~ No.8 : Refer to 7-1) Packing Ass'y on page 14.

Result Evaluation Criteria

TFT- LCD Panel should be at room temperature for 2 hours when the display quality test is over. There should be no particular change which might affect the practical display function and the display quality test should be conducted under normal operating condition.

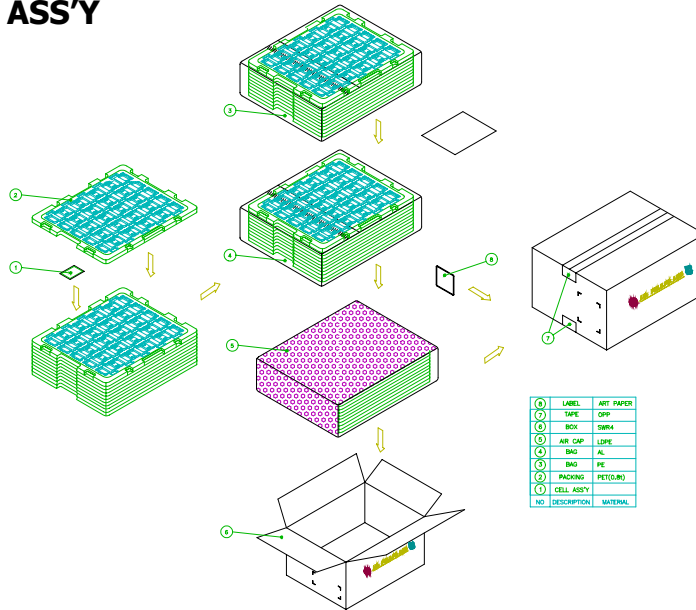
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7. Packing Form

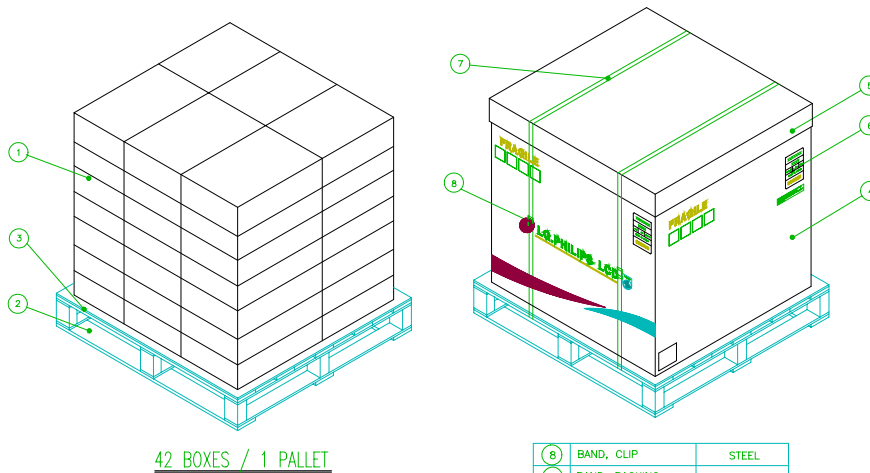
a) Package quantity in one box : 540 pcs

b) Box Size : 393mm X 339mm X 135mm

7-1. PACKING ASS'Y



7-2. PALLET ASS'Y



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8. PRECAUTIONS

Please pay attention to the following when you use this TFT-LCD panel.

8-1. MOUNTING PRECAUTIONS

- 1) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials.
- 2) Since a TFT-LCD Panel is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc .
- 3) Do not leave at the high temperature and high humidity in long time.
- 4) Do not leave the TFT-LCD panel from direct sunlight.
- 5) Do not contact with water to avoid Metal corrosion.
- 6) The TFT-LCD Panel shall be installed flat, without twisting or bending

8-2. OPERATING PRECAUTIONS

- 1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
 $V = \pm 200\text{mV}$ (Over and under shoot voltage)
- 2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- 3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
- 4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- 5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- 6) The TFT-LCD shall be operated within the temperature limits specified. when you operate the TFT-LCD panel at below (beyond) the limit specified, It may cause damage or image degradation.
This phenomenon may not recover.

8-3. ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge.
Make certain that treatment persons are connected to ground through wrist band etc.
And don't touch interface pin directly.

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8-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of color filter. It may not recover.

8-5. STORAGE

When storing TFT-LCD panel as spares for a long time, the following precautions are necessary.

- 1) Store them in a dark place. Do not expose to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- 2) The TFT-LCD glass surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.
- 3) As TFT-LCD panels are packed in a vacuum with PE bag and Al bag in Nitrogen gas environment ,

Customer is required to keep the product under a good condition(25 degree, 50%) to prevent any of unwanted damage from the moisture, and chemicals, etc. And recommended to use it in a short-time period, after it's unpacked.

8-6. HANDLING PRECAUTIONS FOR TFT-LCD Glass

Be careful when TFT-LCD panel is broken.(TFT-LCD is made of glass)