



INNOLUX DISPLAY CORPORATION

BT133HG01 LCD MODULE SPECIFICATION

() Preliminary Specification

(●) Final Specification

Customer	Checked & Approved by

Checked by		
QRA	PD	MKT

Date: 2008/06/05

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Version: 1

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Record of Revision

Version	Revise Date	Page	Content
0	2007-11-28	All	First edition to all
1	2008-02-25	3	Update Contents
		5	Update Pin assignment
		6	Add title " Rear view of LCM"
		7	Update Absolute maximum ratings
		8	Update Typical operating conditions
		9~10	Update Note 3, Note 4
		11	Update Display color vs. input data signals
		12	Update Input signal timing
		14	Add Module function block
		15	Update Color gamut, add the contrast ratio 350 Min.
		16~17	Update Note 6, Note 9
		18	Update Reliability test items
		20	Update Module lable
		23	Update Packing form
		24~25	Update Mechanical drawings

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A. General specifications

NO.	Item	Specification	Remark
1	Display resolution (pixel)	1280(H) X 800(V), WXGA resolution	
2	Active area (mm)	286.08(H) X 178.80(V)	
3	Screen size (inch)	13.3 inches diagonal	
4	Pixel pitch (mm)	0.2235(H) X 0.2235(V)	
5	Color configuration	R, G, B vertical stripe	
6	Overall dimension (mm)	299.0(W) X 195.0(H) X 5.5(D) (max)	
7	Weight (g)	355 Max.	
8	Surface treatment	Hard coating 2H	
9	Input color signal	6 bit LVDS	
10	Display colors	262K (6 bit)	
11	Optimum viewing direction	6 o'clock	
12	Backlight	1 CCFL	
13	RoHS	RoHS compliance	

B. Electrical specifications

1. Pin assignment

a. Panel connector

Connector Part No.: DF19KR-20P-1H (HIROSE) or equivalent

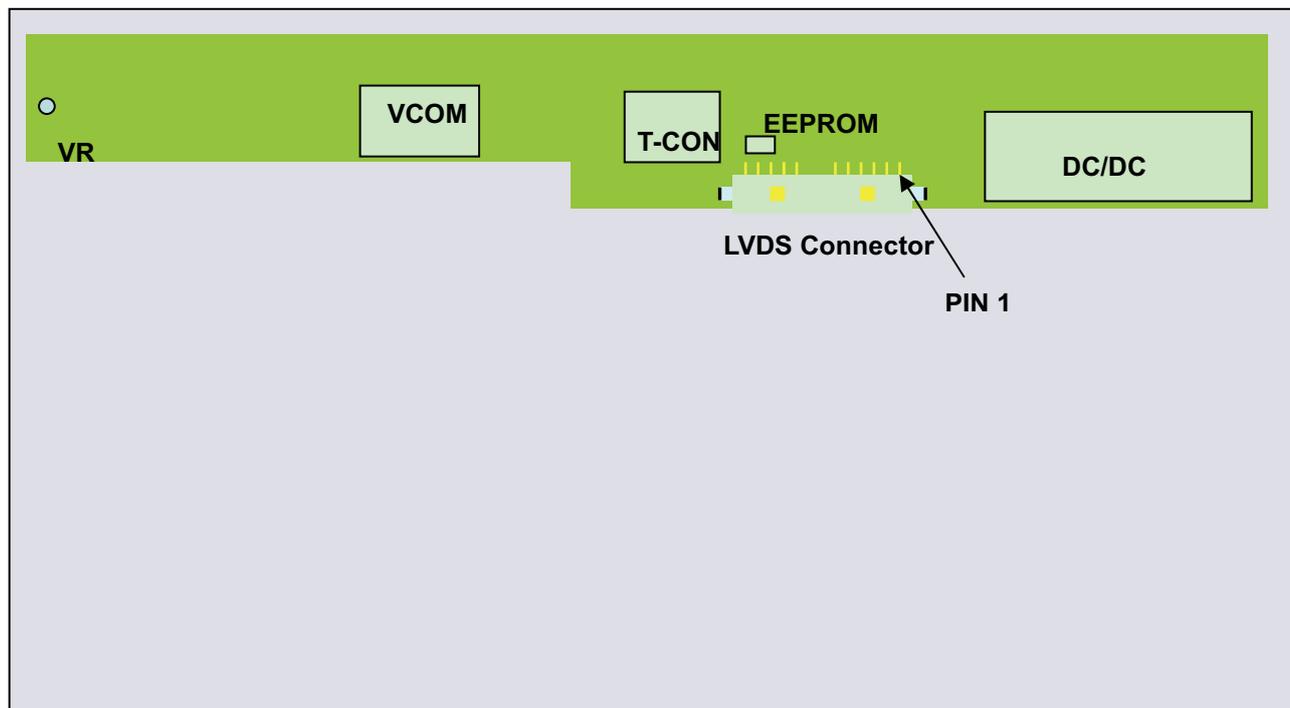
User's connector Part No: DF-19G-20S-1SD or equivalent

Pin No	Symbol	Description	Remark
1	GND	Ground	
2	V _{CC}	Power Supply (+3.3V)	
3	V _{CC}	Power Supply (+3.3V)	
4	V _{EDID}	DDC Power +3.3V	
5	NC	No Connection	
6	Clk _{EDID}	DDC Clock	
7	DATA _{EDID}	DDC Data	
8	Rxin0-	Differential Data Input	R0~R5,G0
9	Rxin0+	Differential Data Input	
10	GND	Ground	
11	Rxin1-	Differential Data Input	G1~G5,B0,B1
12	Rxin1+	Differential Data Input	
13	GND	Ground	
14	Rxin2-	Differential Data Input	B2~B5,DE,Hsync,Vsync
15	Rxin2+	Differential Data Input	
16	GND	Ground	
17	CLK-	Differential Clock Input	
18	CLK+	Differential Clock Input	
19	GND	Ground	
20	GND	Ground	

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Rear view of LCM



b. Backlight connector

Connector Part No.: JST BHSR-02VS-1 or equivalent

Pin no.	Symbol	Description	Remark
1	V_{IH}	Lamp high voltage input	Cable color: Pink
2	V_{IL}	Lamp low voltage input	Cable color: White

2. Absolute maximum ratings

Parameter	Symbol	Values		Unit	Remark
		Min.	Max.		
Power input voltage	V_{CC}	- 0.3	4.0	V	At 25°C
Input signal voltage	V_{IN}	- 0.3	4.0	V	At 25°C
Operating temperature	T_{OP}	0	50	°C	Note 1
Storage temperature	T_{ST}	- 20	60	°C	Note 2
Lamp current	I_L	2	7	mA_{rms}	
Lamp voltage	V_L	-	2.5	KV	
Re-screw		-	5	Times	
Assured torque at side mount		-	2	kgf.cm	

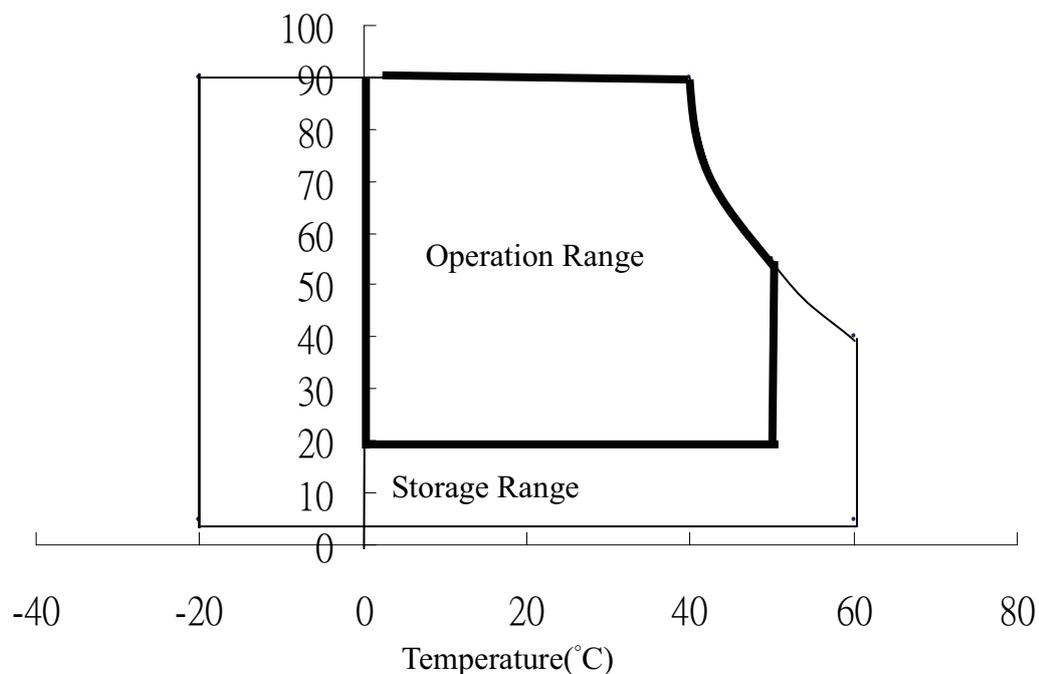
Note 1:

The relative humidity must not exceed 90% non-condensing at temperatures of 40°C or less. At temperatures greater than 40°C, the wet bulb temperature must not exceed 39°C.

Note 2:

The unit should not be exposed to corrosive chemicals.

Relative Humidity (%RH)



3. Electrical characteristics

a. Typical operating conditions

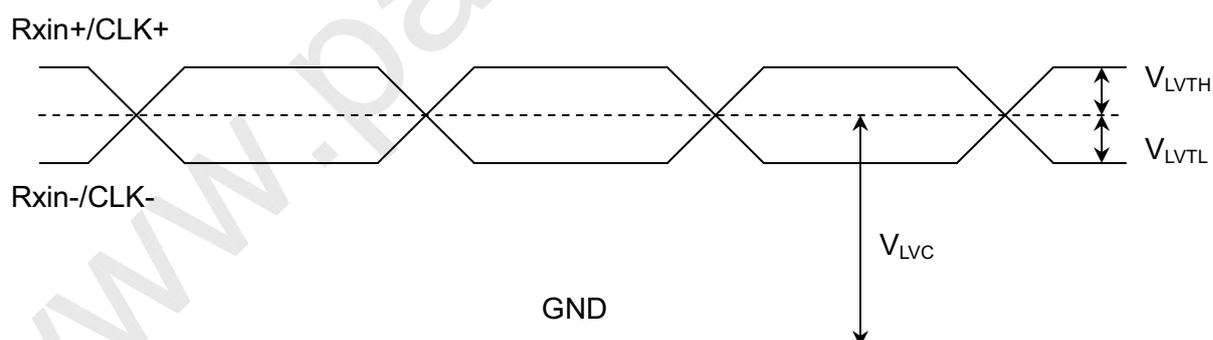
Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
Power input voltage	V_{CC}	3	3.3	3.6	V		
Permissible power input ripple	V_{RF}	-	-	0.1	V		
Power input current	I_{CC}	-	230	260	mA	Note 1	
Power consumption	P_C	-	0.76	0.86	Watts	Note 1	
LVDS Interface	Differential input high threshold voltage	V_{LVTH}	-	-	+100	mV	$V_{LVC}=1.2V$, Note 2
	Differential input low threshold voltage	V_{LVTL}	-100	-	-	mV	$V_{LVC}=1.2V$, Note 2
	Common input voltage	V_{LVC}	1.125	1.25	1.375	V	Note 2
	Terminating resistor	R_T	90	100	110	ohm	
Rush current	I_{Rush}	-	-	1.5	A	Note 3	

Note 1:

The specified input current and power consumption are under the $V_{CC}=3.3V$, $25^{\circ}C$, $f_v=60Hz$ (frame frequency) condition whereas black pattern is displayed.

Note 2:

LVDS waveform diagram



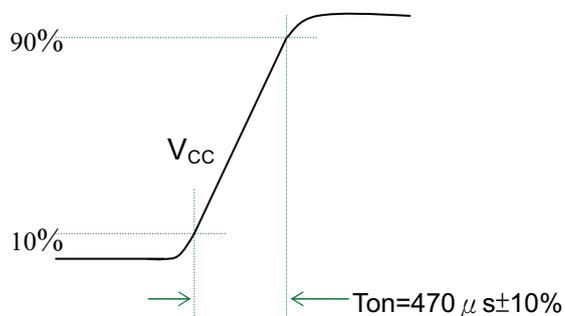
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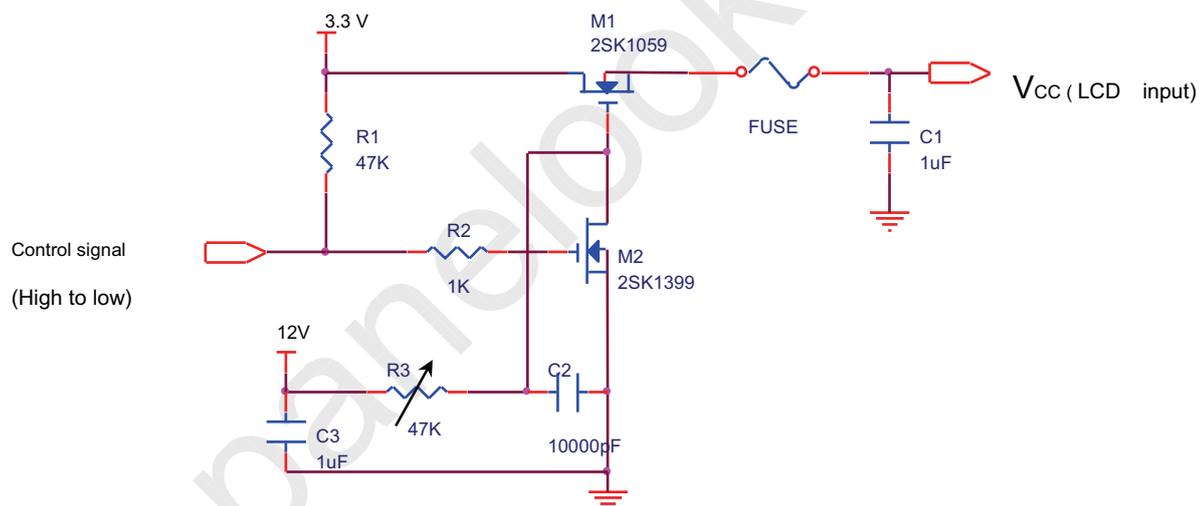
Note 3:

Test condition

(1) Pattern: Black pattern

(2) $V_{CC} = 3.3\text{ V}$, V_{CC} rising time = $470\ \mu\text{s} \pm 10\%$ 

(3) Test circuit

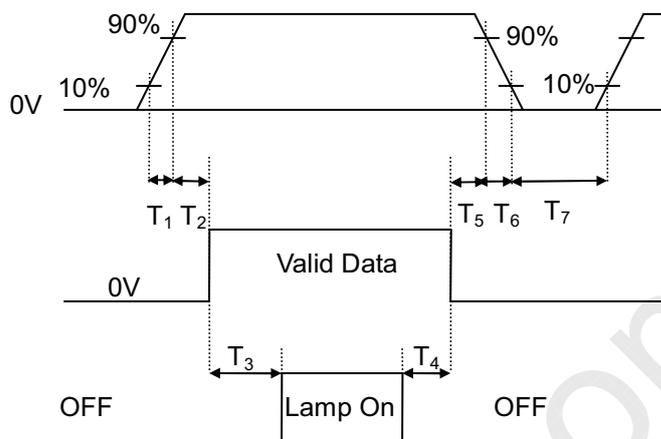


Note 4: Power sequence

Power supply for LCD,
 V_{CC}

Interface data signal, V_i
(LVDS signal of transmitter)

Backlight on/off

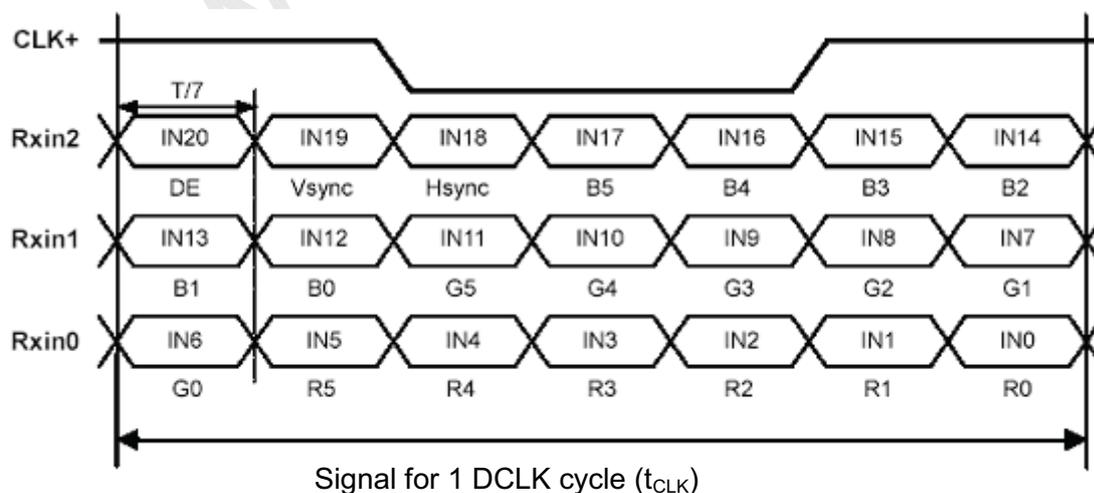


Power sequence timing table

Parameter	Value			Units
	Min.	Typ.	Max.	
T_1	0.5	-	10	ms
T_2	0	-	50	ms
T_3	200	-	-	ms
T_4	200	-	-	ms
T_5	0	-	50	ms
T_6	0	-	10	ms
T_7	200	-	-	ms

b. Display color vs. input data signals

Signal Name	Description	Remark
R5	Red Data 5 (MSB)	Red-pixel data. Each red pixel's brightness data consists of these 6 bits pixel data.
R4	Red Data 4	
R3	Red Data 3	
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0 (LSB)	
	Red-pixel Data	
G5	Green Data 5 (MSB)	Green-pixel data. Each green pixel's brightness data consists of these 6 bits pixel data.
G4	Green Data 4	
G3	Green Data 3	
G2	Green Data 2	
G1	Green Data 1	
G0	Green Data 0 (LSB)	
	Green-pixel Data	
B5	Blue Data 5 (MSB)	Blue-pixel data. Each blue pixel's brightness data consists of these 6 bits pixel data.
B4	Blue Data 4	
B3	Blue Data 3	
B2	Blue Data 2	
B1	Blue Data 1	
B0	Blue Data 0 (LSB)	
	Blue-pixel Data	



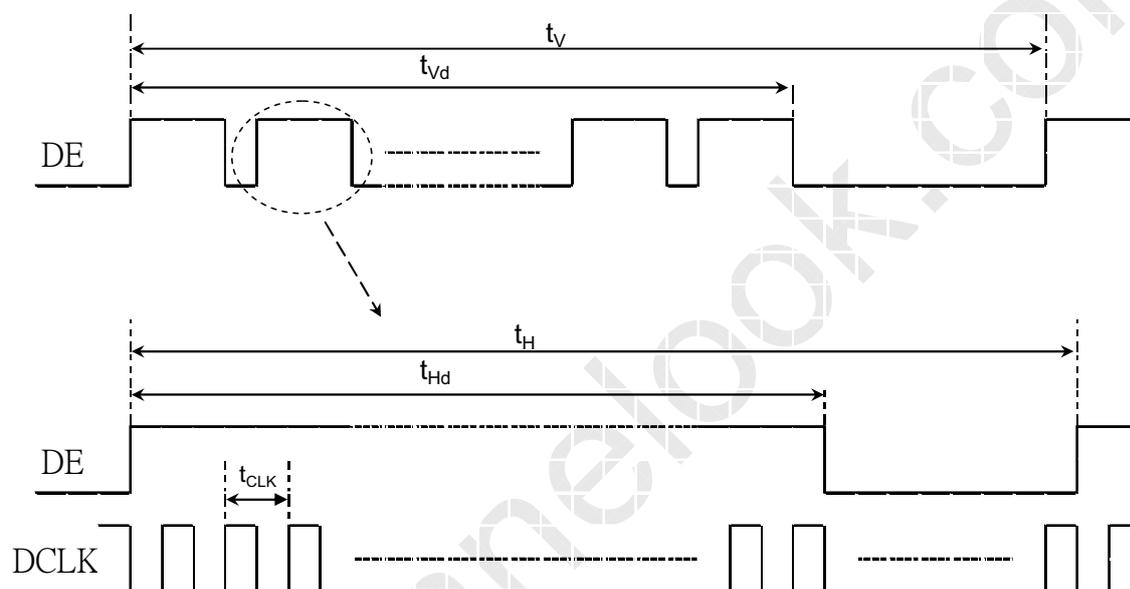
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c. Input signal timing

Timing table

Description	Symbol	Min	Typ	Max	Unit
Cycle time	t_{CLK}	12.5	14.06	20	ns
Line cycle time	t_H	1360	1440	1800	t_{CLK}
Line width-active	t_{Hd}	1280	1280	1280	t_{CLK}
Frame cycle time	t_V	810	823	950	t_H
V width-Active	t_{Vd}	800	800	800	t_H



d. Display Position

D(1, 1)	D(2, 1)	.....	D(640, 1)	.....	D(1279, 1)	D(1280, 1)
D(1, 2)	D(2, 2)	.....	D(640, 2)	.....	D(1279, 2)	D(1280, 2)
⋮		⋮	⋮	⋮
D(1, 400)	D(2, 400)	.....	D(640, 400)	.....	D(1279, 400)	D(1280, 400)
⋮		⋮	⋮	⋮
D(1, 799)	D(2, 799)	.....	D(640, 799)	.....	D(1279, 799)	D(1280, 799)
D(1, 800)	D(2, 800)	.....	D(640, 800)	.....	D(1279, 800)	D(1280, 800)

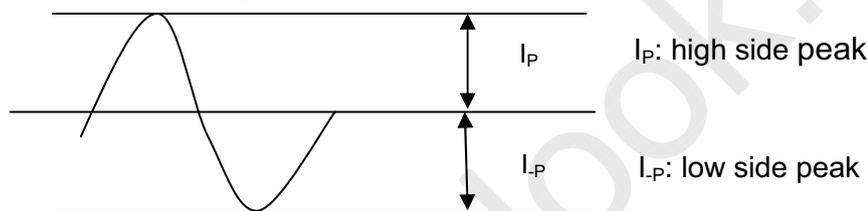
e. Backlight driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V_L	590	640	825	V_{rms}	
Lamp operation	I_L	2	6	7	mA_{rms}	Note 1
Power consumption	P_L	1.65-	3.84	4.13	W	Note 2,3,4
Lamp starting voltage	V_{LS}			1300	V_{rms}	$T = 25^{\circ}C$, Note 2,3,4
				1450	V_{rms}	$T = 0^{\circ}C$, Note 2,3,4
Frequency	F_L	50	55	60	KHz	Note 4
Lamp life time		15,000			Hr	Note 5

Note 1:

The degrees of unbalance: less than 10%. (Please do not use the inverter, which has unsymmetrical voltage and unsymmetrical current and spike wave.)

The ratio of wave height: less than $\sqrt{2} \pm 10\%$



The degrees of unbalance = $\frac{|I_P - I_{\bar{P}}|}{I_{RMS}} * 100(\%)$

The ratio of wave height = $I_P(\text{or } I_{\bar{P}}) / I_{RMS}$

Lamp should be completely turned on.

Note 2:

The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise, the lamp may not be turned on normally.

Note 3:

Inverter should provide more than max. value, and then lamp could be completely turned on.

Note 4:

Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note 5:

Lamp life definition:

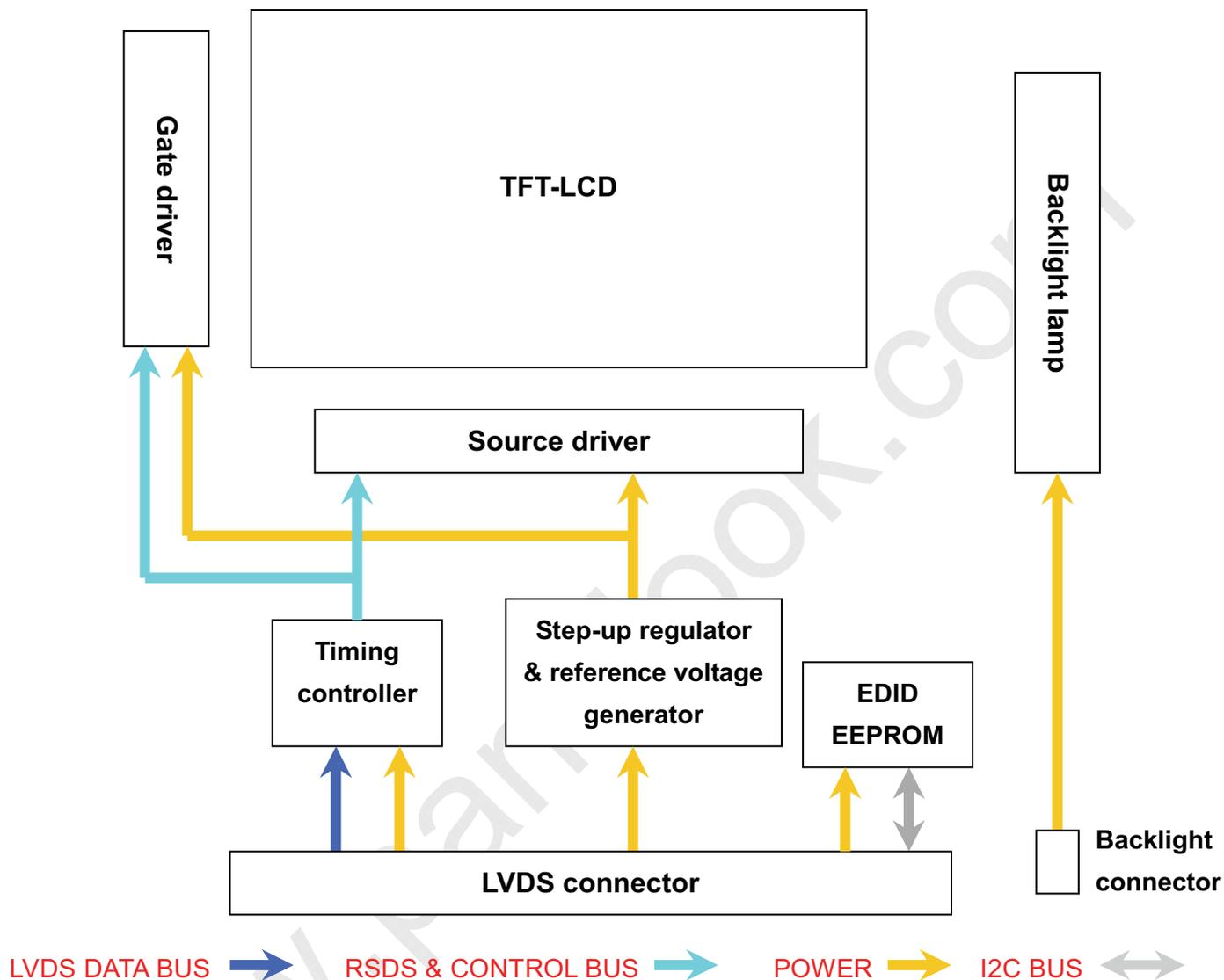
(A) Lamp current $I_L = 6 mA_{rms}$

(B) The brightness of lamp becomes 50% of the initial brightness or not normal lighting.

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f. Module function block



C. Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
Response time	Tr+Tf	$\theta = 0^\circ$		25		ms	Note 4
Contrast ratio	CR	$\theta = 0^\circ$	350				Note 3,5
Viewing angle	Top	$CR \geq 10$		20		deg	Note 3,5,7
	Bottom	$CR \geq 10$		30			
	Left	$CR \geq 10$		45			
	Right	$CR \geq 10$		45			
Brightness (5 points average)	Y_L		200	220		nit	Note 3,6
Color chromaticity (CIE)	W_x	$\theta = 0^\circ$	-0.03	0.313	+0.03		Note 3
	W_y			0.329			
	R_x			0.595			
	R_y			0.345			
	G_x			0.320			
	G_y			0.555			
	B_x			0.155			
	B_y			0.145			
Color Gamut	NTSC	CIE1931	40	45		%	-
White uniformity (13)	δ_w		0.65	0.70			Note 3,8
Cross talk	Ct				2%		Note 9

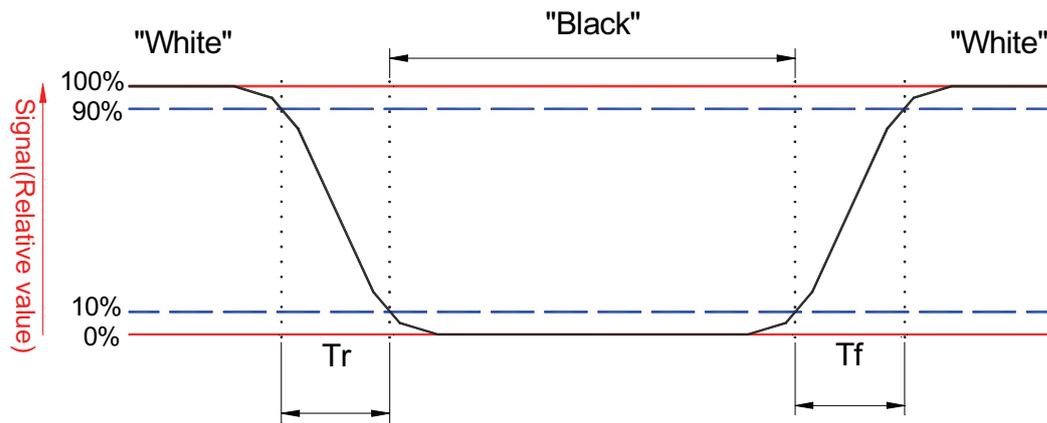
Note 1: Ambient temperature = 25°C.

Note 2: To be measured in dark room after backlight warm up 30 minutes.

Note 3: To be measured with a viewing cone of 2° by Topcon luminance meter BM-5A.

Note 4: Definition of response time:

The output signals of BM-7 are measured when the input signals are changed from "Black" to "White" (falling time) and from "White" to "Black" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Refer to figure as below.



Note 5: Definition of contrast ratio:

Contrast ratio is calculated with the following formula:

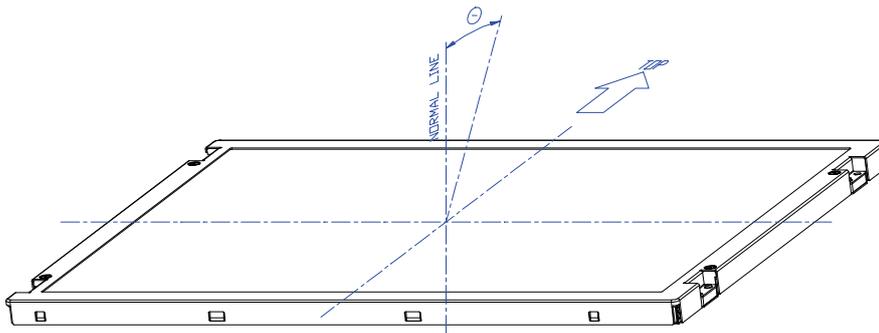
$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Note 6: Driving conditions for CCFL: $I_L = 6.0 \text{ mA}_{\text{rms}}$, 55 KHz Frequency.

Luminance are measured at the following thirteen points (1~13):

$$Y_L = (Y_5 + Y_{10} + Y_{11} + Y_{12} + Y_{13}) / 5$$

Note 7: Definition of viewing angle



Note 8: Definition white uniformity:

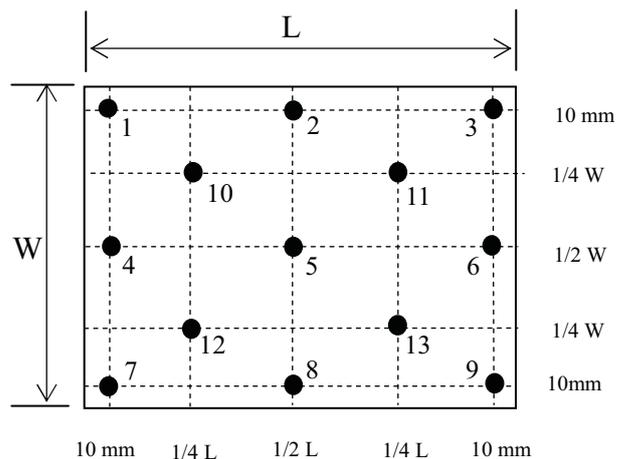
Luminance are measured at the following thirteen points (1~13):

$$\delta_w = \frac{\text{Minimum Brightness of thirteen points}}{\text{Maximum Brightness of thirteen points}}$$

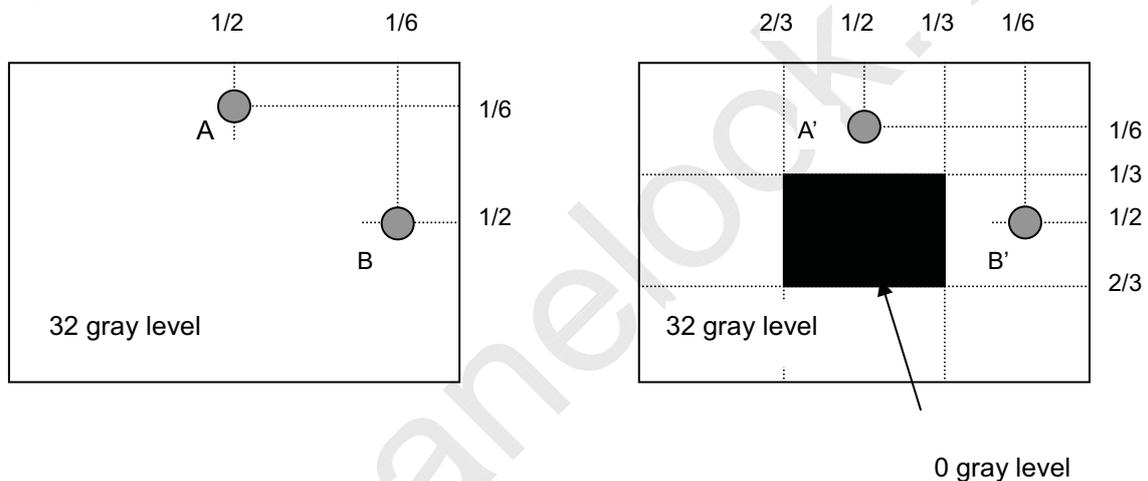


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Note 9:



Unit: percentage of dimension of display area

 $|L_A - L_{A'}| / L_A \times 100\% = 2\% \text{ max.}$, L_A and $L_{A'}$ are brightness at location A and A' $|L_B - L_{B'}| / L_B \times 100\% = 2\% \text{ max.}$, L_B and $L_{B'}$ are brightness at location B and B'

D. Reliability test items

Test Item	Test Condition	Judgment	Remark
High temperature storage	60°C, 240 hours	Note 1	Note 2
Low temperature storage	-20°C, 240 hours	Note 1	Note 2
High temperature & high humidity operation	40°C, 90%RH, 240 hours (No condensation)	Note 1	Note 2
High temperature operation	50°C, 240 hours	Note 1	Note 2
Low temperature operation	0°C, 240 hours	Note 1	Note 2
Thermal Shock (Non-operation)	-25°C/30 mins ~ 65°C/30 mins 100 cycles	Note 1	Note 2
Electrostatic discharge (ESD)	150 pF,330Ω, Contact: ±8kV,Air: ±15kV	Note 1	
Vibration (Sine wave, non-operation)	Sinusoidal vibration, 3G zero-to-peak, 5 to 150 Hz, 0.37 octave/minute; 0.5hr in each perpendicular axes.	Note 1	Note 2
Mechanical shock (Non-operation)	200G/2ms, Half sine wave, ±X, ±Y, ±Z one time for each direction	Note 1	Note 2

Note 1:

Pass: Normal display image with no obvious non-uniformity and no line defect.

Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

Note 2:

Evaluation should be tested after storage at room temperature for one hour.

E. Safety

1. Sharp edge requirements

There will be no sharp edges or corners on the display assembly that could cause injury.

2. Materials

a. Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible InnoLux Toxicologist.

b. Flammability

All components including electrical components that do not meet the flammability grade UL94-V0 in the module will complete the flammability rating exception approval process. The printed circuit board will be made from material rated 94-V0 or better. The actual UL flammability rating will be printed on the printed circuit board.

c. Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

F. Display quality

The display quality of the color TFT-LCD module should be in compliance with the InnoLux incoming inspection standard.

G. Handling precaution

The handling of the TFT-LCD should be in compliance with the InnoLux handling principle standard.

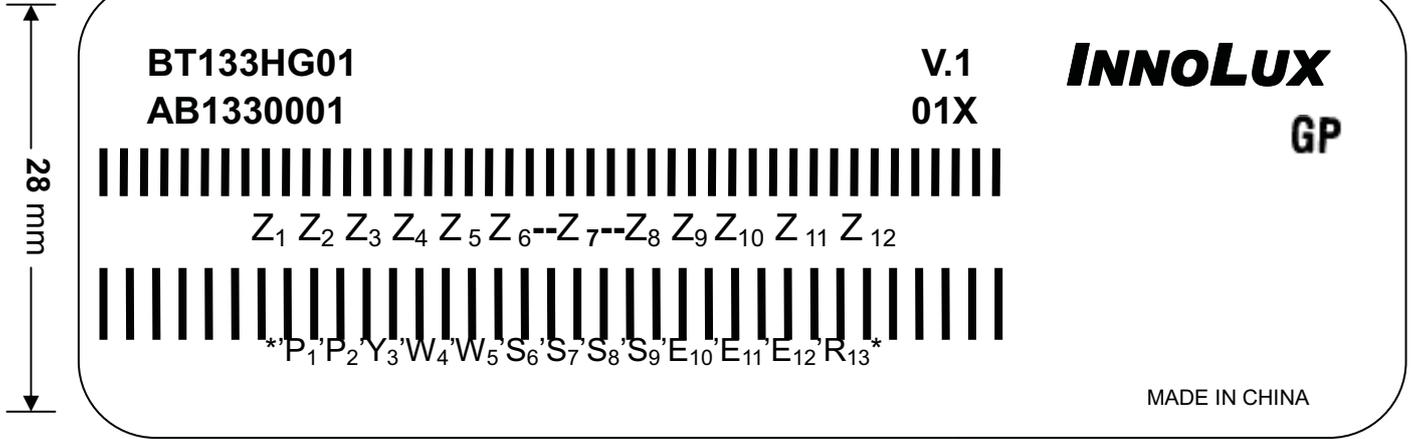


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H. Label**1. Module label**

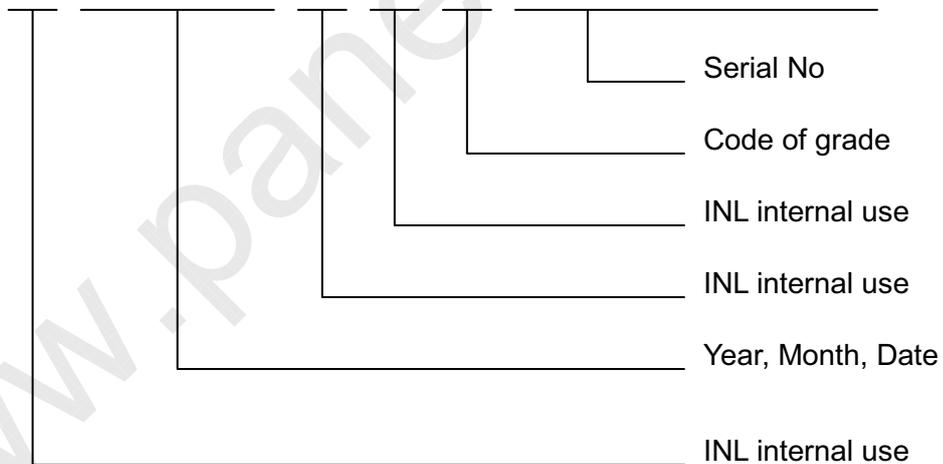
83 mm



a. Model name : BT133HG01

b. Version : V.1

c. Product Number : AB133000101X (INL internal use)

d. Serial ID : Z₁ Z₂ Z₃ Z₄ Z₅ Z₆ Z₇ Z₈ Z₉ Z₁₀ Z₁₁ Z₁₂

Serial ID includes the information as below:

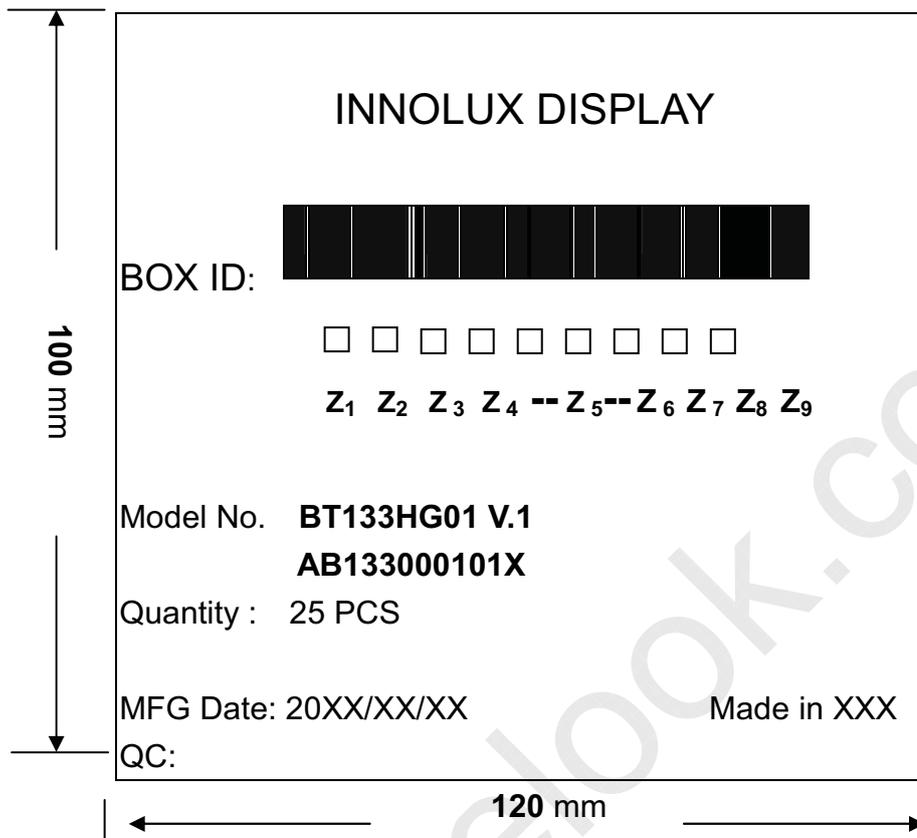
- (1) Manufactured Date: Year: 0~9, for 2000~2009
- (2) Month: 1~9 & A~C for Jan. ~ Dec.
- (3) Date: 1~9 & A~Z (exclude I, O, Q, U) for 1th~31th
- (4) Code of grade: 1, 3, 5, 7
- (5) Serial No: Module manufacture sequential no



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2. Carton label



a. Model name : BT133HG01

b. Version : V.1

c. Packing quantity : 25 pcs

d. Serial ID : Z₁ Z₂ Z₃ Z₄ Z₅ Z₆ Z₇ Z₈ Z₉

Serial No

Code of grade

Year, Month, Date

INL internal use

Serial ID includes the information as below:

(1) Manufactured Date: Year: 0~9, for 2000~2009

Month: 1~9 & A~C for Jan. ~Dec.

Date: 1~9 & A~Z (exclude I, O, Q, U) for 1th~31th

(2) Code of grade: 1, 3, 5, 7, E

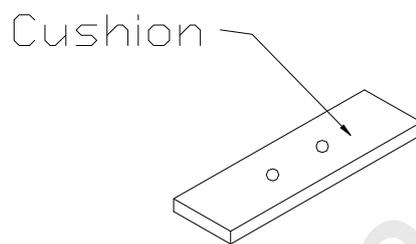
(3) Serial No: Module packing sequential no



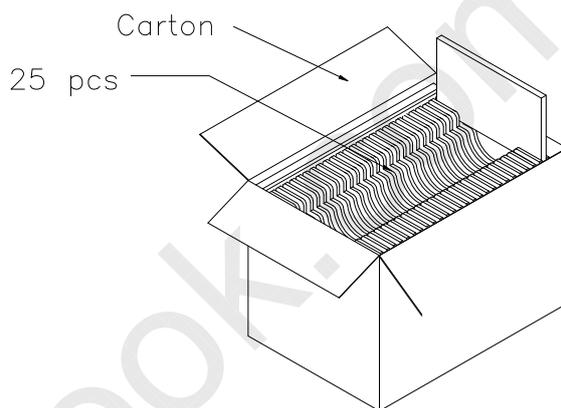
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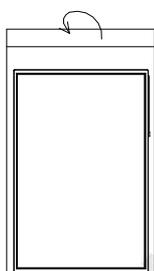
I. Packing form



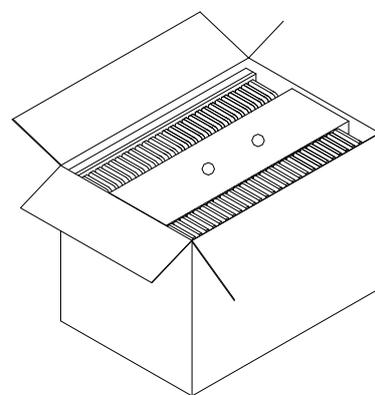
↓ Step A
Put LCM into A/S bag



↓ Step B
Turn back A/S bag



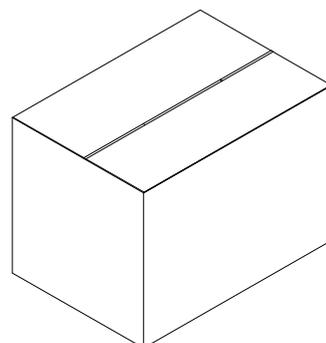
↓ Step E



↓ Step C



↓ Step F



Step D

Put LCM with A/S bag into carton

