

TFT-LCD MOD SPECIFICATION

Module No.: BI097XN02

() Preliminary Specification

(●) Final Specification

Customer	
Prepared by	
Approved by	

CTC	
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A. General Specifications**(1) Overview**

BI097XN02 is a 9.7" (9.676" diagonal) TFT Liquid Crystal Display module with LED Backlight unit and 30 pins LVDS interface. This module supports 1024 x 768 XGA mode and can display 262,144 colors.

(2) Application

LCD Monitor on tablet or other consumer product.

(3) General Specifications

No.	Item	Specification	Remark
1	Screen size	9.676" diagonal	
2	Active Area	196.608(H)x147.456(V)	
3	Resolution	1024x768	
4	Aspect Ratio	4:3	
5	Pixel Pitch	0.192 (V) x 0.192 (H) mm	
6	Display Mode	transmission type, Normally Black, IPS	
7	Color configuration	R G B vertical stripe	
8	Panel outline	205.808(H)x158.06(V)	
9	Input signal	LVDS	
10	Panel power consumption	Total 3.576 W @ cell 1.2 W (Typ) LED BL 2.376W (Max)	Note1
11	Weight	223 g (MAX)	
12	Total thickness	5.65 mm (MAX)	

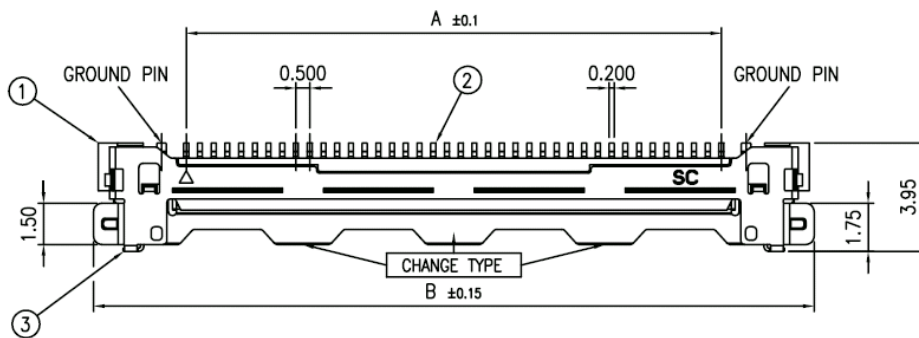
Note1: The specified power consumption (without converter efficiency) is under the conditions at VCC =3.3 V, $f_v = 60 \text{ Hz}$, $I_{LED} = 22\text{mA}$ and $T_a = 25 \pm 2 \text{ }^\circ\text{C}$, whereas white pattern is displayed.

B. Mechanical Specifications

Item		Min.	Typ.	Max.	Unit	Note	
Module Size	Horizontal (H)	209.71	210.21	210.71	mm		
	Vertical (V)	163.75	164.25	164.75	mm		
	Thickness (T)	W/O PCBA	--	2.92	3.25	mm	
		PCBA Side	--	--	5.65	mm	
Active Area	Horizontal	--	196.608	--	mm		
	Vertical	--	147.456	--	mm		
Weight		--	--	223	g		

Note1: Please refer to the attached drawings for more information of front and back outline dimensions.

CONNECTOR TYPE



Connector Part No.: 300E30-0010RA-G3

User's connector Part : 111B30-1210TA-G3.

C. Absolute maximum ratings.**(1) ABSOLUTE RATINGS OF ENVIRONMENT**

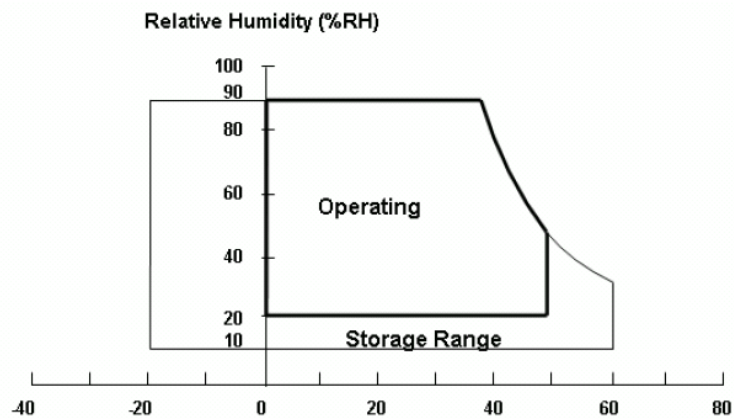
Item	Symbol	Value		Unit	Remark
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	Note 1
Operating Ambient Temperature	T _{OP}	0	+50	°C	Note1 Note2

Note 1: (a) 90 %RH Max. (Ta ≤ 40 °C).

(b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

(c) No condensation.

Note 2 The temperature of panel surface should be 0 °C min. and 50 °C max.



Note 3: Stress beyond those listed in above “ELECTRICAL ABSOLUTE RATINGS” may cause permanent damage to the device. Normal operation should be restricted to the conditions described in “ELECTRICAL CHARACTERISTICS”.

(2) ELECTRICAL ABSOLUTE RATINGS

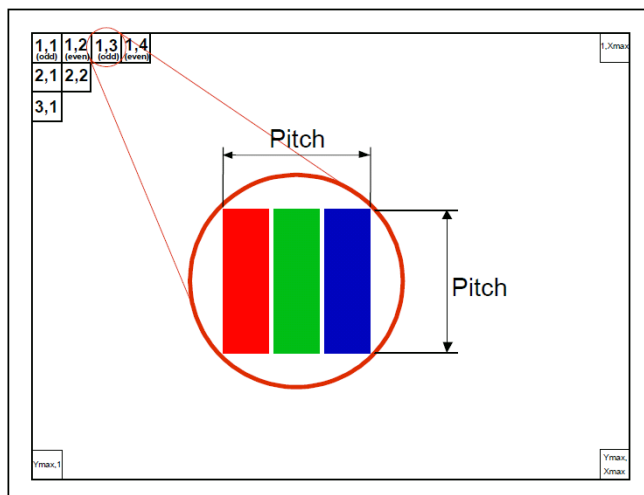
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V _{CC}	-0.3	+4.0	V	(1)
Logic Input Voltage	V _{IN}	-0.3	V _{CC} +0.3	V	

Note1: Stress beyond those listed in above “ELECTRICAL ABSOLUTE RATINGS” may cause permanent damage to the device. Normal operation should be restricted to the conditions described in “ELECTRICAL CHARACTERISTICS”.

D. Pin Assignment

Pin	Symbol	Description
1	GND	Ground
2	Vcc	Power Supply (+3.3V Typ.)
3	Vcc	Power Supply (+3.3V Typ.)
4	V EDID	DDC Power+3.3V
5	NC	NC (Reserve)
6	CLK EDID	DDC Clock
7	DATA EDID	DDC Data
8	Rin0-	LVDS Differential Data Input
9	Rin0+	LVDS Differential Data Input
10	GND	Ground
11	Rin1-	LVDS Differential Data Input
12	Rin1+	LVDS Differential Data Input
13	GND	Ground
14	Rin2-	LVDS Differential Data Input
15	Rin2+	LVDS Differential Data Input
16	GND	Ground
17	CLK in-	LVDS Differential Clock Input
18	CLK in+	LVDS Differential Clock Input
19	GND	Ground
20	NC	NC
21	Vdc	LED Anode (Positive)
22	Vdc	LED Anode (Positive)
23	NC	NC
24	Vdc1	LED Cathode (Negative)
25	Vdc2	LED Cathode (Negative)
26	Vdc3	LED Cathode (Negative)
27	Vdc4	LED Cathode (Negative)
28	Vdc5	LED Cathode (Negative)
29	Vdc6	LED Cathode (Negative)
30	NC	NC

Note 1: The first pixel is odd as shown in the following figure.



E. Optical specifications

Ambient temperature = 25°C

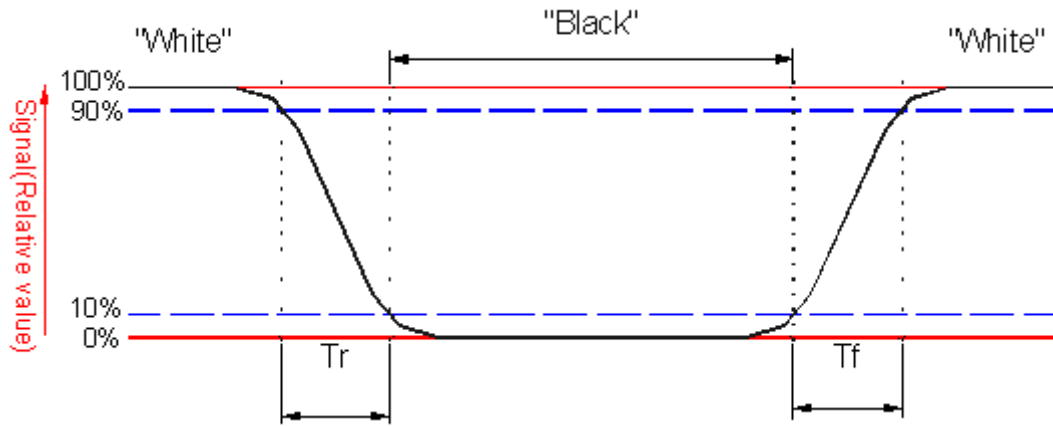
Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
Response time	Tr+Tf	$\theta = 0^\circ$	--	25	30	ms	Note 1,2
Contrast ratio	CR	$\theta = 0^\circ$	600	800	--		Note 1,3
Luminance	Y	ILED=22mA	300	350(Center)	--	cd/m2	Note 1,
Viewing angle	Top	$CR \geq 10$	85	89	--	deg	Note 1,4
	Bottom	$CR \geq 10$	85	89	--		
	Left	$CR \geq 10$	85	89	--		
	Right	$CR \geq 10$	85	89	--		
Color chromaticity (CIE)	W_x	$\theta = 0^\circ$	-0.035	0.302	+0.035		Note 1
	W_y			0.319			
	R_x			0.605			
	R_y			0.345			
	G_x			0.330			
	G_y			0.572			
	B_x			0.150			
	B_y			0.109			
Color Gamut	NTSC	CIE1931	42.5	50	--	%	Note 1
Uniformity	$\bar{\delta}_{W(5)}$		65	80	--	%	Note 1,5
	$\bar{\delta}_{W(13)}$		65	80	--	%	
Cross talk	Ct		--	--	2%		Note 1,6

Note1: Measuring Conditions

The optical characteristics are determined after the unit has been 'ON' and stable at the maximum brightness, in a dark environment at an ambient temperature at $25^\circ\text{C} \pm 2^\circ\text{C}$. The electrical conditions include $V_{cc} = 3.3\text{ V}$, $f_v = 60\text{ Hz}$, $f_{CLK} = 100\text{ MHz}$, $I_{LED} = 22.0\text{ mA}$. Recommended measuring equipments for luminance and color is BM5A Colorimeter with a viewing cone of 2° or similar. The measuring distance should be about 30-50 cm from the LCD surface at normal unless otherwise specified. The (virtual) measuring spot should be 5mm in diameter. The CIE 1931 Standards shall be used. Measurements should be done on the 13 grid points as shown in the following figures. Viewing angle measurements should be done by an CS2000 EZ Color system or similar.

保管單位 Storage	PM
保存年限 Retention Period	3年

Note2: Definition of response time:

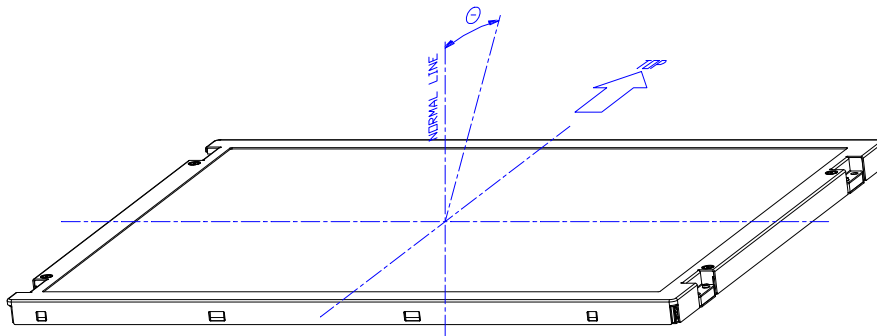


Note3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula:

$$\text{Contrast ratio} = \frac{L_{\text{white (center point)}}}{L_{\text{Black (center point)}}$$

Note4: Definition of viewing angle



Note5: Definition white uniformity

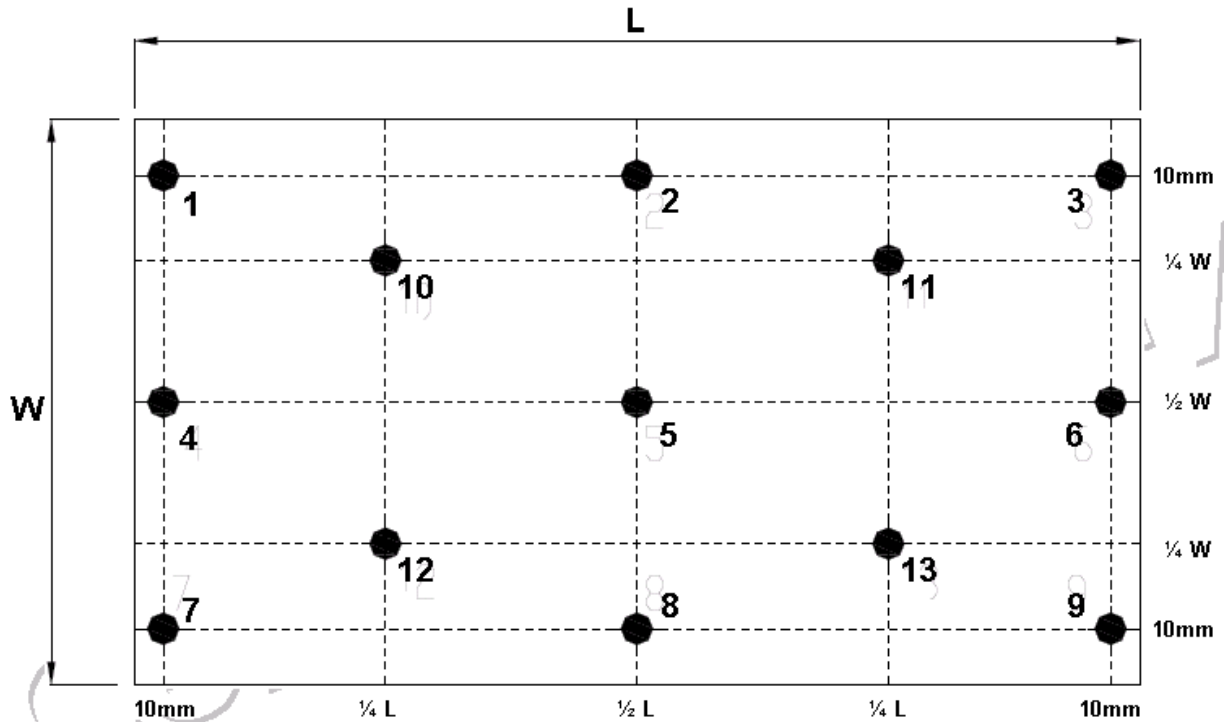
Luminance is measured at the following thirteen points (1~13):

$$\delta_{W(13)} = \frac{\text{Minimum brightness of thirteen points}}{\text{Maximum brightness of thirteen points}}$$

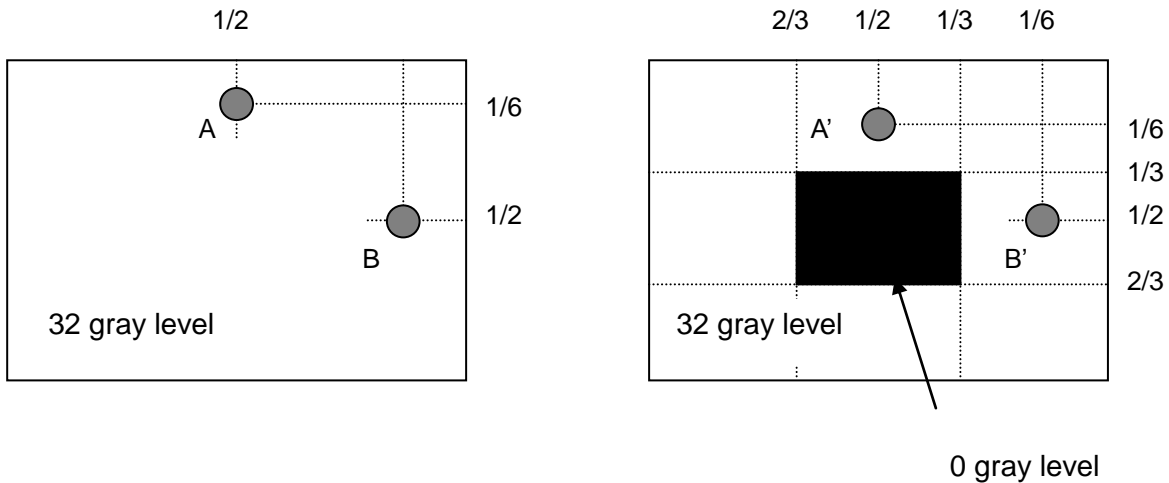
$$\delta_{W(5)} = \frac{\text{Minimum brightness of five points}}{\text{Maximum brightness of five points}}$$

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13 point measuring locations refer to the point 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13.
 5 point measuring locations refer to the point 5, 10, 11, 12 and 13.



Note6:



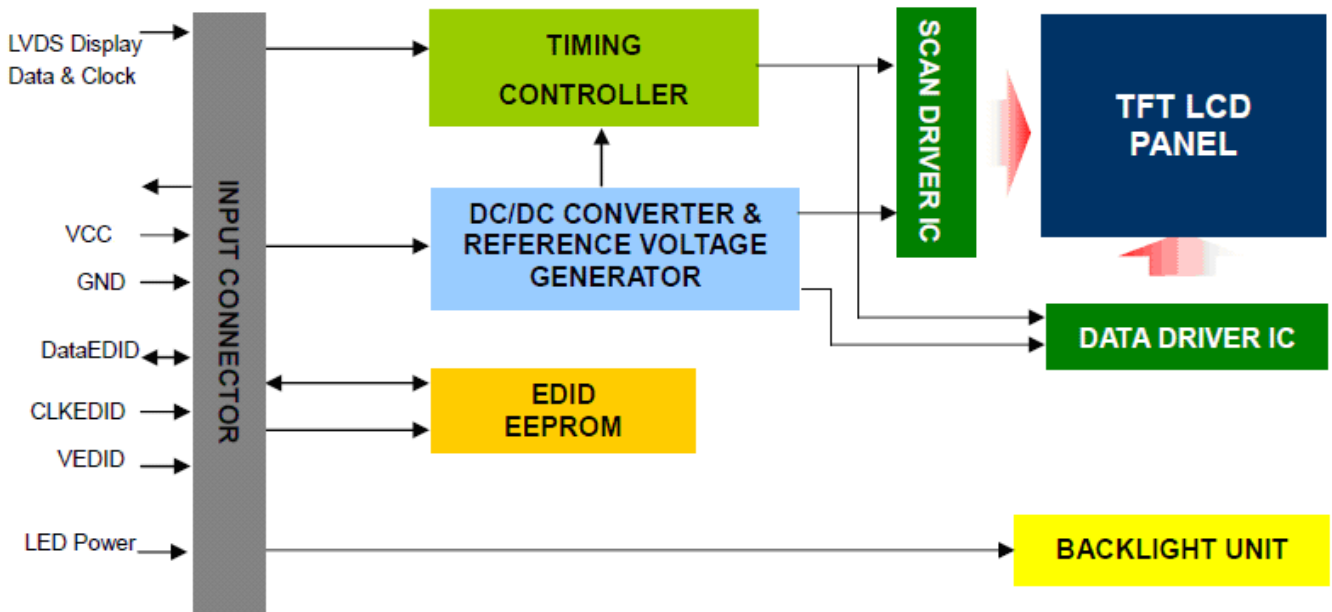
Unit: percentage of dimension of display area

$|L_A - L_{A'}| / L_A \times 100\% = 2\% \text{ max.}$, 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'

F. ELECTRICAL SPECIFICATION

(1) FUNCTION BLOCK DIAGRAM



(2) ELECTRICAL CHARACTERISTICS

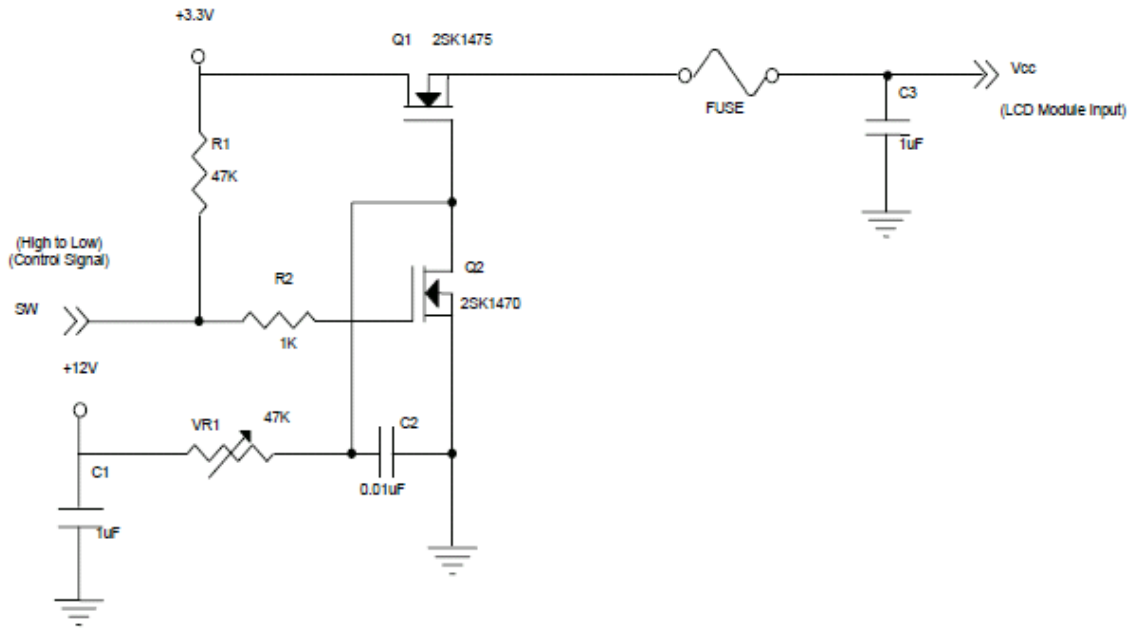
Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Logic/LCD Drive Voltage	VCC	3.0	3.3	3.6	V	Note1
Inrush Current	IRUSH			1.5	A	Note1,2
Ripple Voltage	Vcc Ripple			100	mV	Note1
Power Supply Current	Mosaic		270	398	mA	Note3
	White		325	480	mA	Note3

Note1: The ambient temperature is $T_a = 25 \pm 2 \text{ }^\circ\text{C}$.

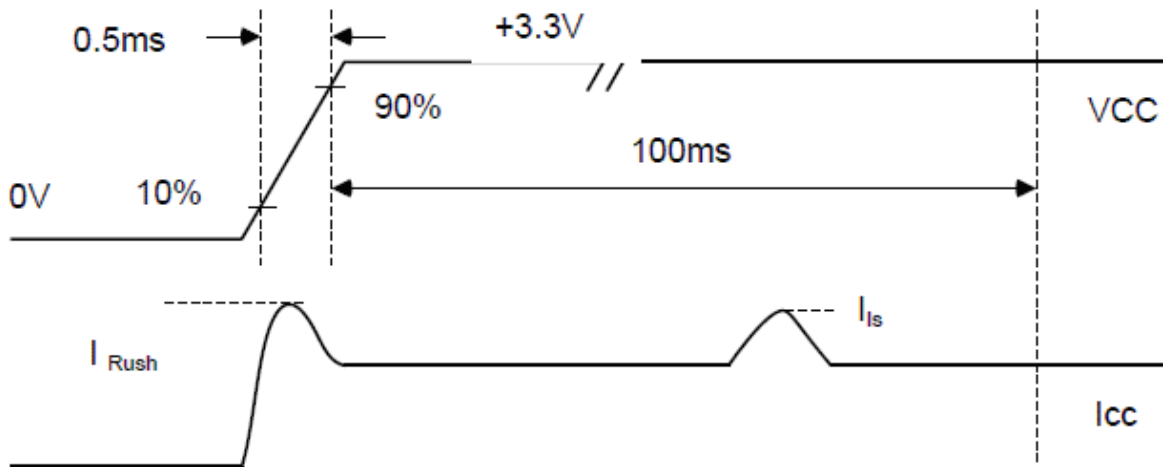
Note2: IRUSH: the maximum current when VCC is rising

Measurement Conditions: Shown as the following figure. Test pattern: white.

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保存年限 Retention Period	3年



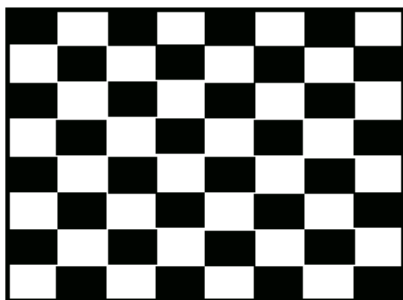
VCC rising time is 0.5ms



Note:3 The specified power supply current is under the conditions at VCC = 3.3 V, Ta = 25 ± 2 °C,

DC Current and fv = 60 Hz (fCLK = 100MHz), whereas a power dissipation check pattern below is displayed.

a. Mosaic Pattern



Active Area

b. White Pattern



Active Area

(3) BACKLIGHT UNIT (6 Strings, 6 LED per string)

Ta = 25 ± 2 °C

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Number of LEDs	NLED	--	36	--	pc	
Forward Voltage	V _F	2.6	2.9	3.0	V	I _F = 22mA
Forward Current	I _F	--	22	--	mA	Note1
Power Consumption	P _L	2.059	2.296	2.376	W	Note2
LED Life Time	L _{BL}	10,000			Hrs	Note3

Note (1) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

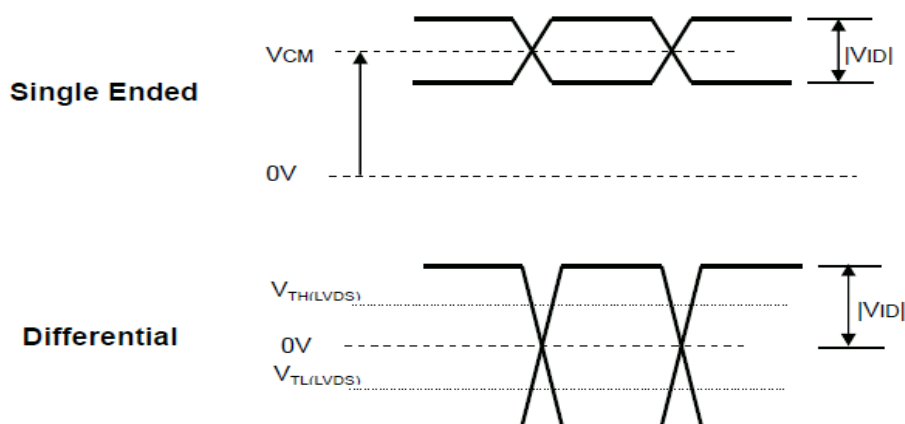
Note (2) $P_L = V_F \times I_F \times N_{LED}$ (Without LED converter transfer efficiency)

Note (3) The life time of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ± 2 °C and I_L = 22 mA (Per EA) until the brightness becomes 50% of ≦ its original value

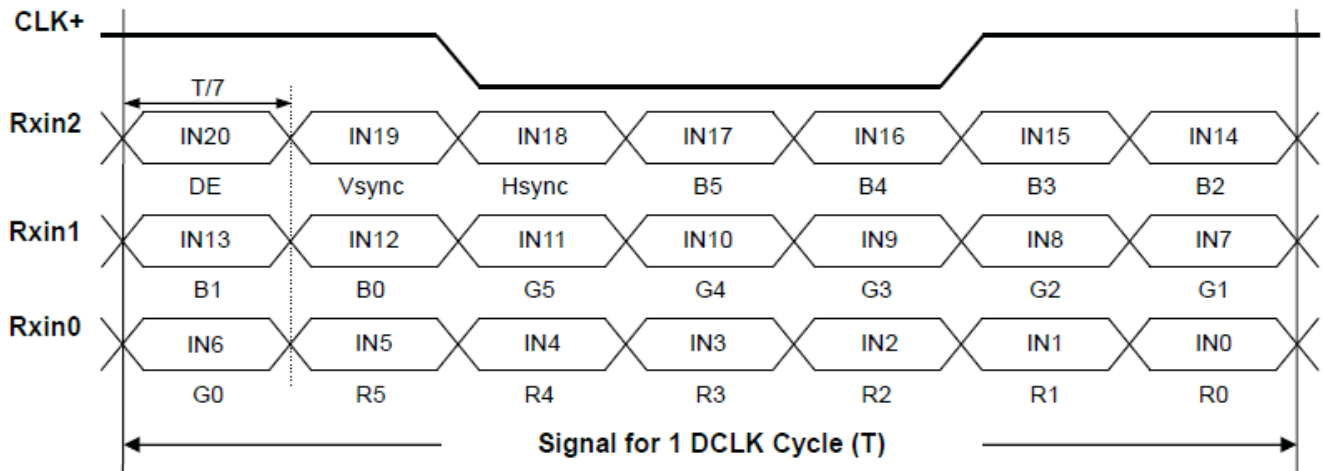
(4) LVDS Receiver Input Characteristic

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LVDS Differential Input High Threshold	V _{TH(LVDS)}			+100	mV	Note1, V _{CM} =1.2V
LVDS Differential Input Low Threshold	V _{TL(LVDS)}	-100			mV	Note1 V _{CM} =1.2V
LVDS Common Mode Voltage	V _{CM}	1.125	1.200	1.375	V	Note1
LVDS Differential Input Voltage	V _{ID}	100		600	mV	Note1
LVDS Terminating Resistor	R _T	90	100	110	Ohm	

Note1: The parameters of LVDS signals are defined as the following figures.



(5) LVDS Data Format



(6) Color Data Input Assignment.

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input is the brighter the color will be. The table below provides the assignment of color versus data input. 6 bits data input:

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Scale Of Blue	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

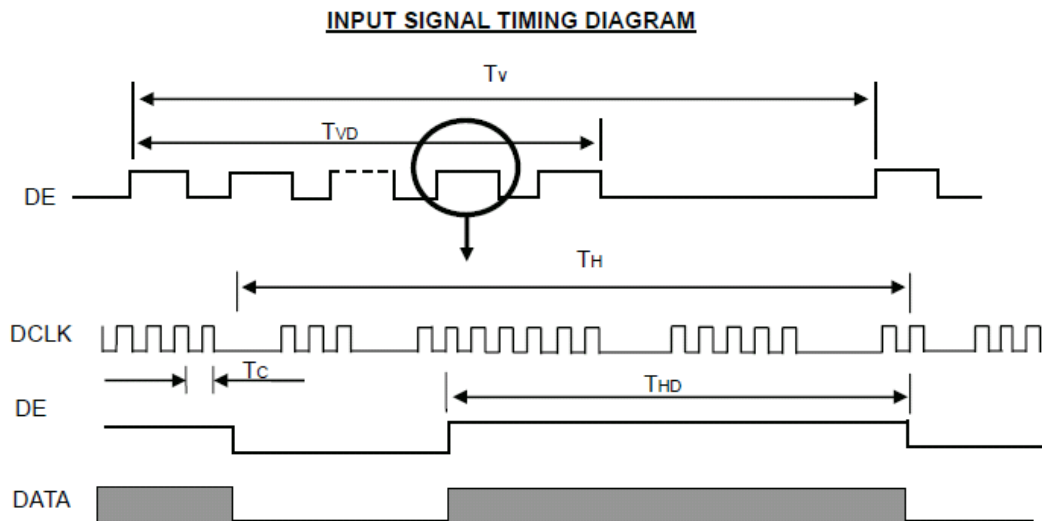
Note (1) 0: Low Level Voltage, 1: High Level Voltage

(7) Display Timing Specification.

The input signal timing specifications are shown as the following table and timing diagram.

Item	Symbol	Min.	Typ.	Max.	Unit
Frequency	1/Tc	--	100	--	MHz
Vertical Total Time	Tv	--	800	--	TH
Vertical Active Display Period	TvD	--	768	--	TH
Vertical Blanking Period	TVB	--	32	--	TH
Horizontal Total Time	TH	--	2084	--	Tc
Horizontal Active Display Period	THD	--	1024	--	Tc
Horizontal Blanking Period	THB TH	--	1060	--	Tc

Note1: Because this module is operated by DE only mode, Hsync and Vsync are ignored.

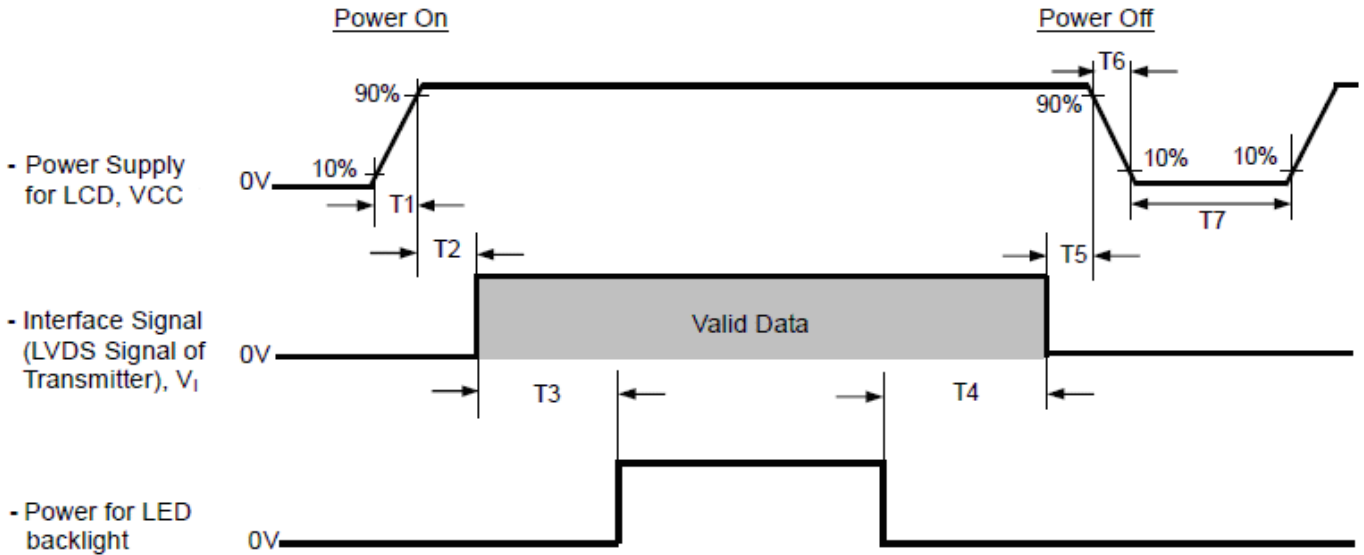


(8) POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.

Symbol	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	--	10	ms
T2	0	--	50	ms
T3	70	250	--	ms

T4	200	250	--	ms
T5	0.5	20	50	ms
T6	0	--	20	ms
T7	200	--	--	ms



Note:1 Please don't plug or unplug the interface cable when system is turned on.

Note:2 Please avoid floating state of the interface signal during signal invalid period.

Note:3 It is recommended that the backlight power must be turned on after the power supply for LCD and the interface signal is valid.

G. Safety

(1) Sharp Edge Requirements

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

(2) Materials

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

H. Display quality

The display quality of the color TFT-LCD module should be in compliance with the CTC's Incoming inspection standard.

I. Handling precaution

The Handling of the TFT-LCD should be in compliance with the CTC's handling principle standard.

J. Reliability test item

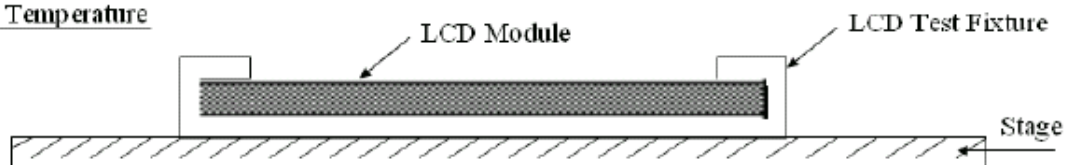
Test	Test Condition	Remark
High Temperature Storage Test	60°C, 240 hours	Note1 Note2
Low Temperature Storage Test	-20°C, 240 hours	
Thermal Shock Storage Test	-20°C, 0.5hour ←→60°C, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	50°C, 240 hours	
Low Temperature Operation Test	0°C, 240 hours	
High Temperature & High Humidity Operation Test	50°C, 80%RH, 240hours	
ESD Test (Operation)	150pF, 330Ω, 1sec/cycle Condition 1 : Contact Discharge, ±4KV Condition 2 : Air Discharge, ±8KV	Note1
Shock (Non-Operating)	200G, 2ms, half sine wave, 1 time for each direction of ±X, ±Y, ±Z	Note1 Note3
Vibration (Non-Operating)	Random, 1.48Grms, 10~500Hz, XYZ, 30min/each direction	Note1 Note3

Note:1 Criteria: Normal display image with no function defect and no line defect.

Note:2 Evaluation should be tested after storage at room temperature for more than two hours.

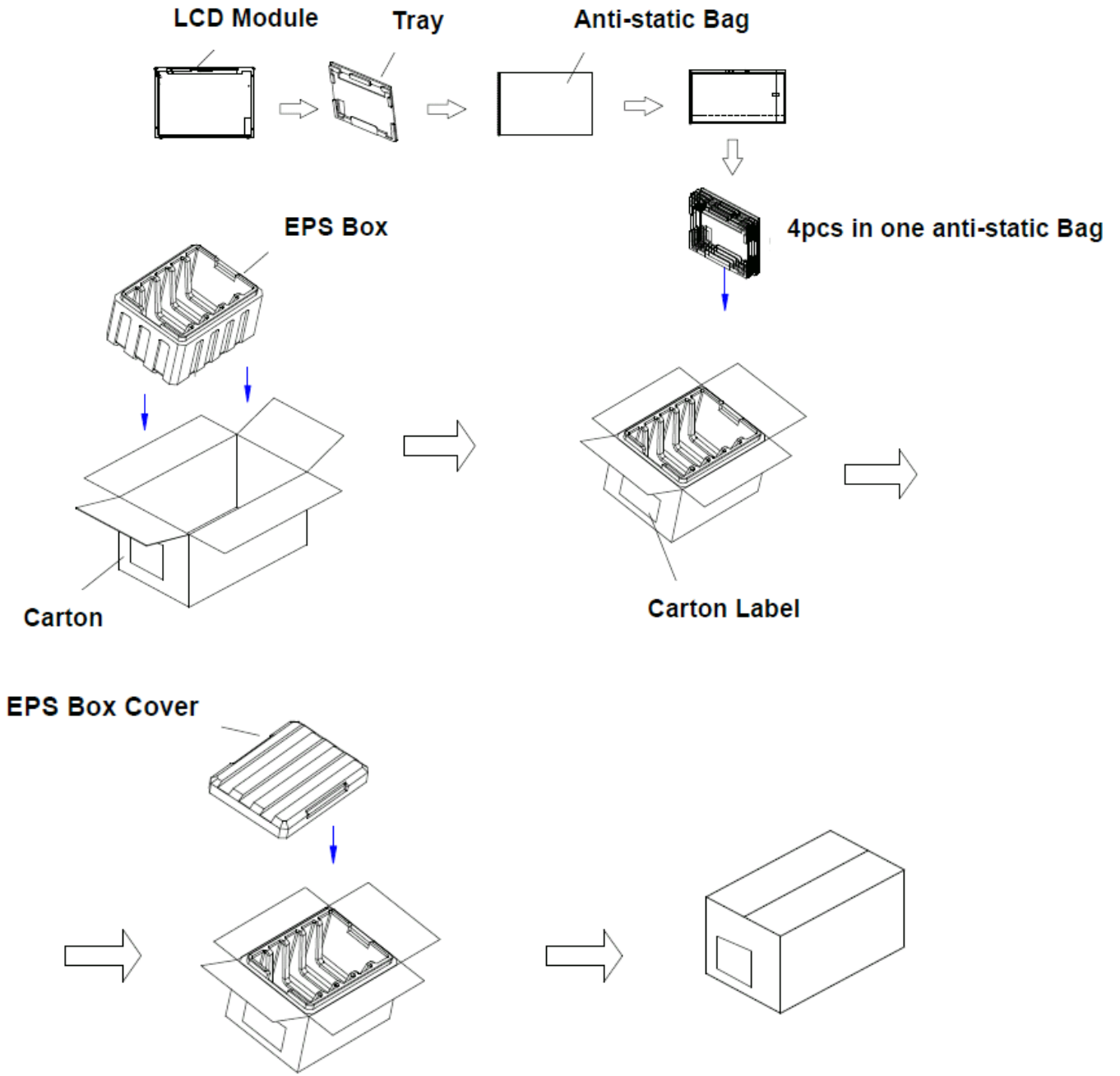
Note:3 At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture

At Room Temperature



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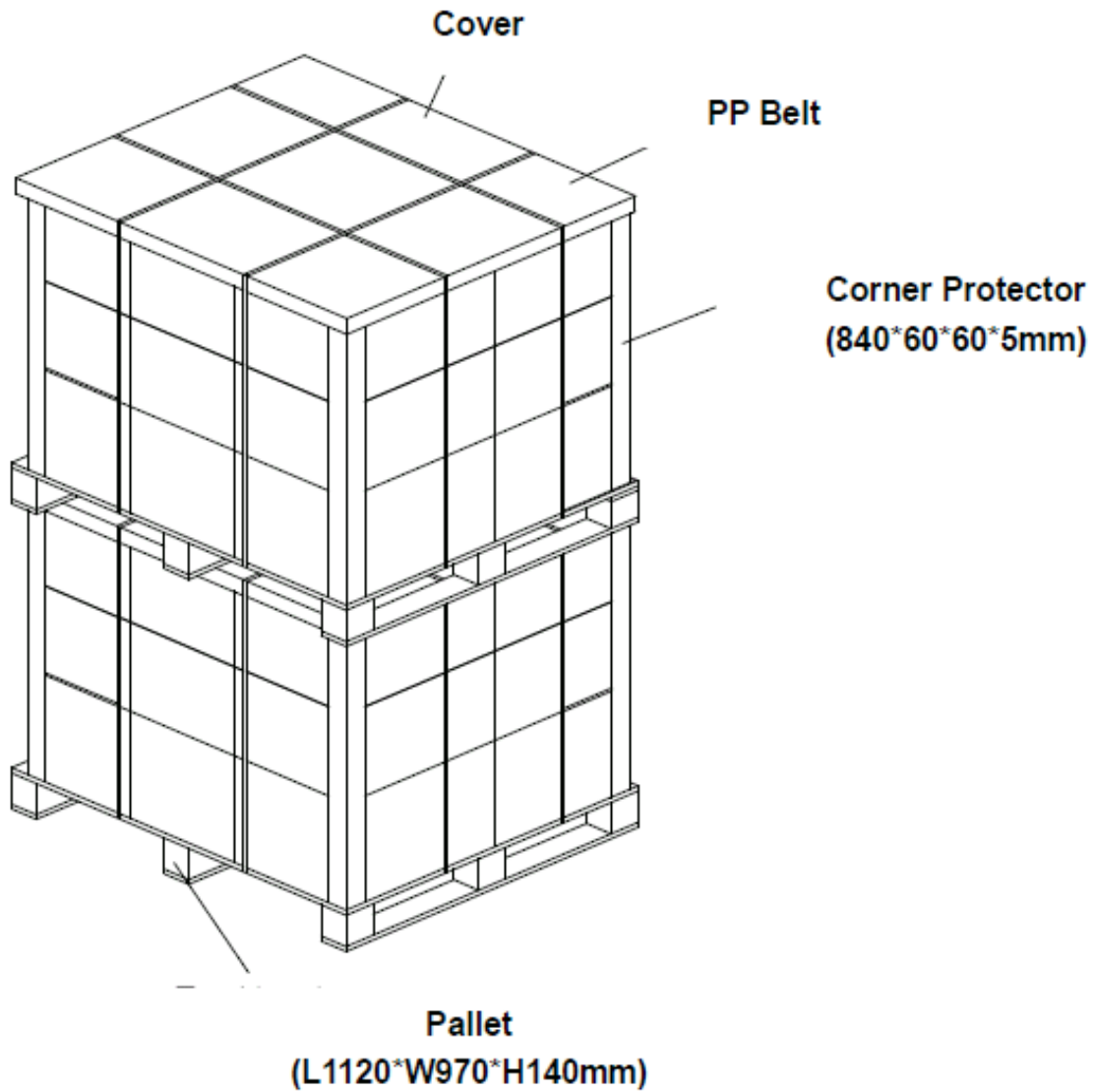
K. Packing Form



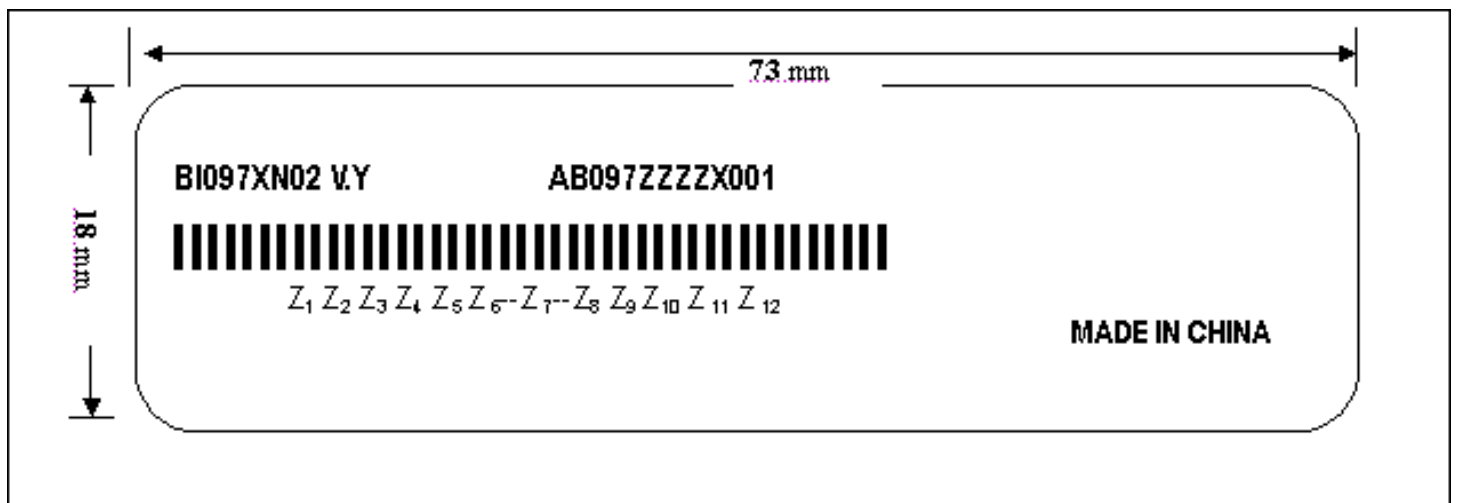
Box Dimensions: L 470*W 365 *H 340mm
Weight: Approx. 7Kg (20 module. Per 1 box)

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PALLET



Module Label Format



保管單位 Storage	PM
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Note:

- 1: BI097XN02 V.Y : Module Name
- 2: AB097ZZZX001 : 成品料號
- 3: Z₁Z₂Z₃Z₄-Z₅Z₆Z₇-Z₈Z₉Z₁₀Z₁₁Z₁₂:Serial Numeber
 Z1:Module plant 組裝廠別,使用:H
 Z2:年,例 2003,取最後一位 3
 Z3:月,如下表

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	A	B	C

Z4:日,如下表

Z ₄ 日: 32 进位制 (32 进制中 I, O, Q, U 易与 0, 1 模糊, 故禁用)。																
Data	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Code	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
Data	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Code	G	H	J	K	L	M	N	P	R	S	T	V	W	X	Y	Z

- Z5: Inner control code
- Z6: Inner control code
- Z7:等級碼:1,3,5,E
- Z8~Z12:Module Sequential number 組裝流水號 (32 進位制)

Carton Label Format



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Note :

1: BOX ID : Z₁ Z₂ Z₃ Z₄ Z₅ Z₆ Z₇ Z₈ Z₉

Z1: 包裝廠別,使用:H

Z2: 包裝年份的最後一碼, 如 2009 年則 Z2=9

Z3: 包裝月份的編碼 (12 進制), 如 Nov 月則 Z3=B

Z4: 包裝日期的編碼 (32 進制), 如 15 日則 Z4=F

Z5: 等級碼(1,3,5,E)

Z6~Z9: 4 位包裝流水碼(32 進制)

2: Part No : 客戶料號 (有客戶需求時為客戶料號, 客戶無需求時可以廠內成品料號代替) .

3: Model No : CTC Module Name & 成品料號.

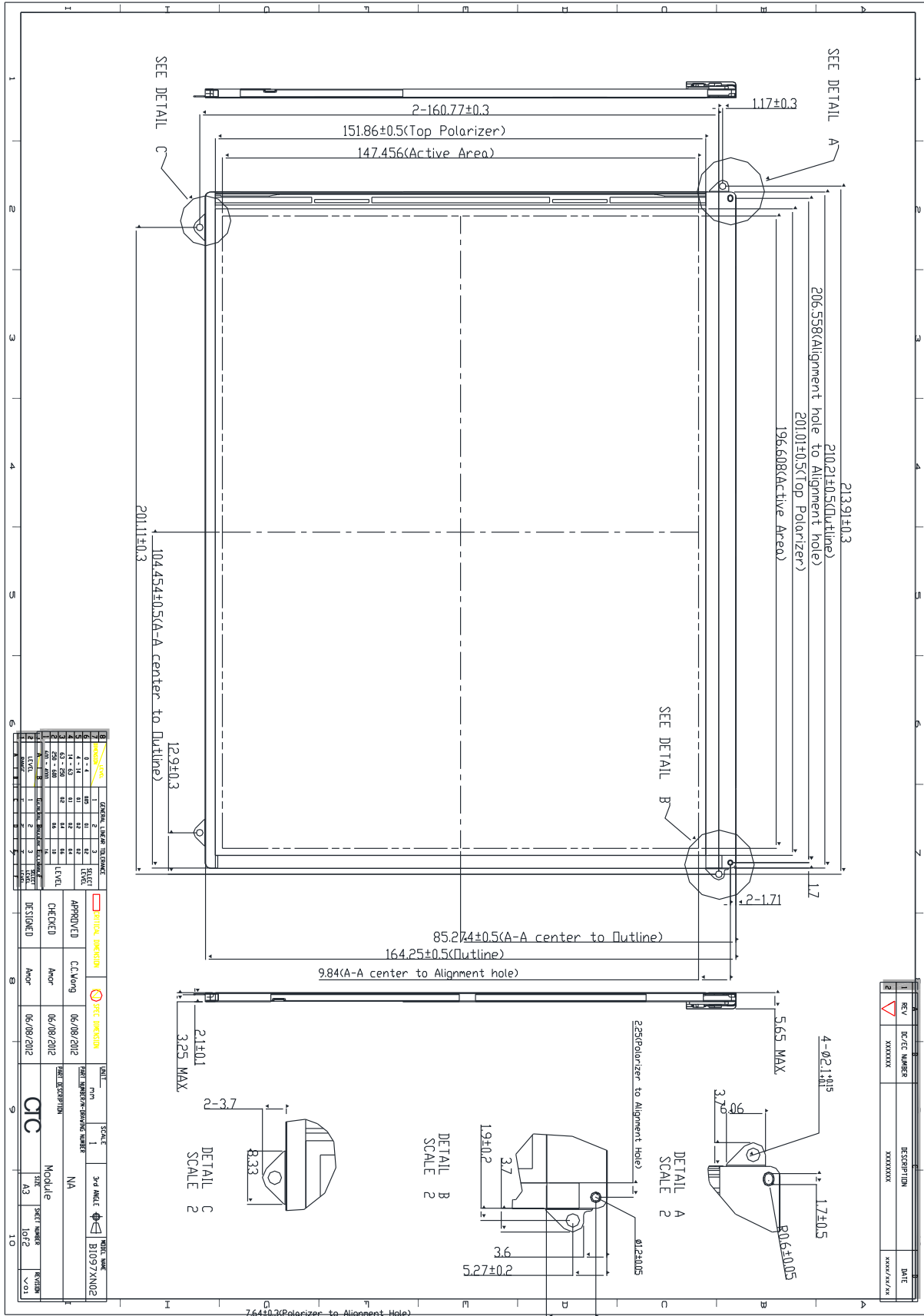
4: Quantity : 表示此箱成品數量.

5: MFG Data: 工廠裝箱時間.

6: MADE IN CHINA: 製造國

保管單位 Storage	PM
保存年限 Retention Period	3年

L. Mechanical Drawings



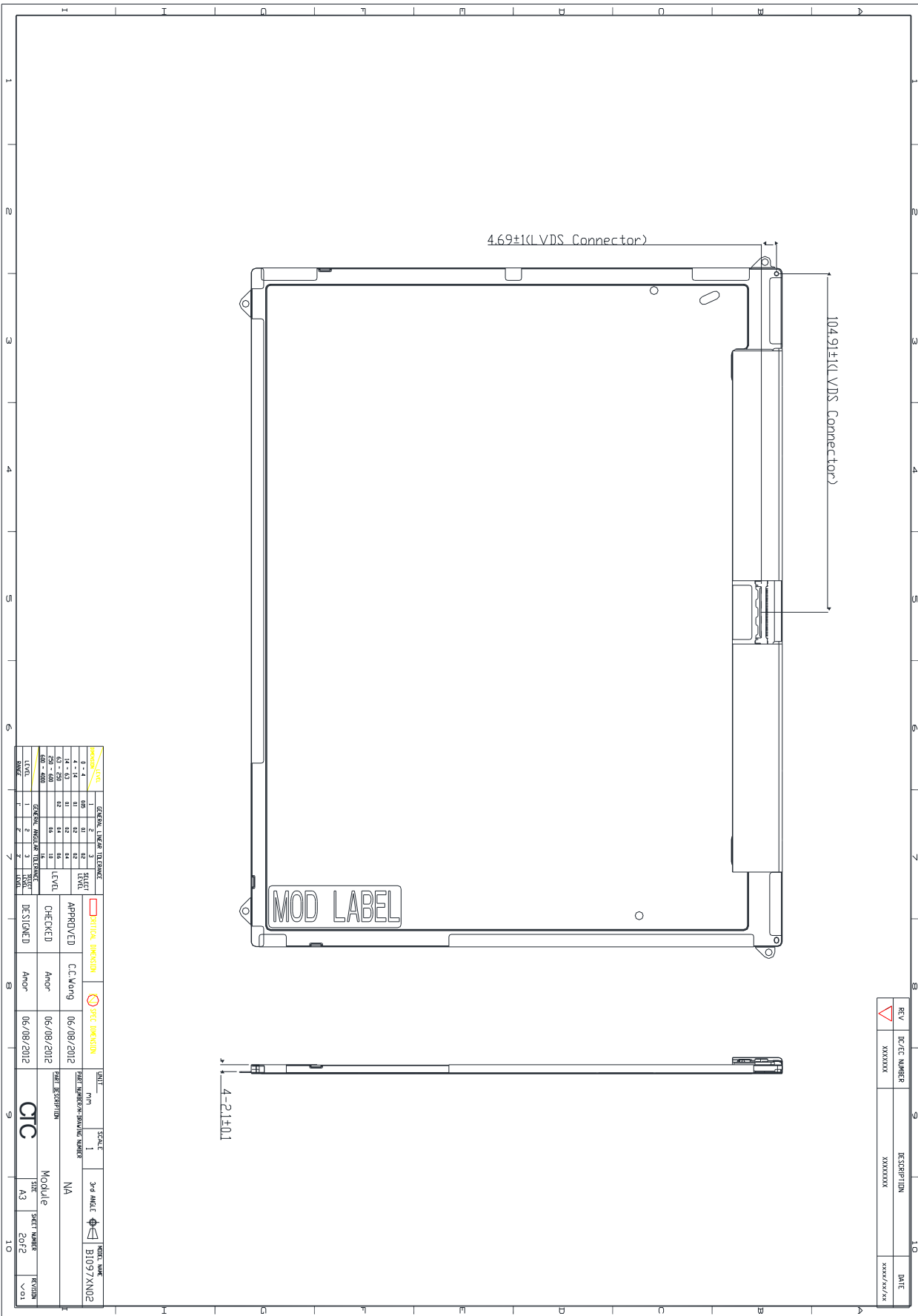
REV	DATE	DESCRIPTION	BY	CHK	APP
1	XXXXXX	XXXXXX			
2	XXXXXX	XXXXXX			

DATE	SCALE	UNIT	DESIGNER/ENGINEER NUMBER	SCALE	3rd AMLT	REVISION
06/08/2012	1	mm	C.C.Moeng	1		B1097XN02
06/08/2012			Checked			
06/08/2012			Appr			
06/08/2012			Appr			

REVISION	DATE	DESCRIPTION
1		
2		

DATE	SCALE	UNIT	DESIGNER/ENGINEER NUMBER	SCALE	3rd AMLT	REVISION
06/08/2012	1	mm	C.C.Moeng	1		B1097XN02
06/08/2012			Checked			
06/08/2012			Appr			
06/08/2012			Appr			

DATE	SCALE	UNIT	DESIGNER/ENGINEER NUMBER	SCALE	3rd AMLT	REVISION
06/08/2012	1	mm	C.C.Moeng	1		B1097XN02
06/08/2012			Checked			
06/08/2012			Appr			
06/08/2012			Appr			



REV	DC/EC NUMBER	DESCRIPTION	DATE
✓	XXXXXX	XXXXXXXX	XXXXXXXXXX

APPROVAL		GENERAL LINE/REVISION			SPEC. DIMENSION		UNIT	SCALE	3rd ANGLE	MARKING
LEVEL	DATE	1	2	3	APPROVED	CC	MM	1	☐	B1097XN02
4	14	01	01	01	APPROVED	Amor	06/08/2012	1	☐	NA
5	14	01	01	01	CHECKED	Amor	06/08/2012	1	☐	Module
6	14	01	01	01	DESIGNED	Amor	06/08/2012	1	☐	Module
7	14	01	01	01				1	☐	Module
8	14	01	01	01				1	☐	Module
9	14	01	01	01				1	☐	Module
10	14	01	01	01				1	☐	Module

1 2 3 4 5 6 7 8 9 10