SPECIFICATION
FOR
LCD Module
PV07039T0240Q-CO

MODULE:	PV07039T0240Q-CO
CUSTOMER:	

KT	INITIAL	DATE
PREPARED BY	杨荣武	2022.9.27
CHECKED BY	陈志文	2022.9.27
APPROVED BY	罗教平	2022.9.27

CUSTOMER	INITIAL	DATE
APPROVED BY		

REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2022.9.27	-	First Issued.	YANG

TABLE OF CONTENTS

1. General Description

*** DESCRIPTION**

PV07039T0240Q-CO is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 7.0" TFT-LCD contains 1200 x 1920 pixels, and can display up to 16.7M colors.

*** Features**

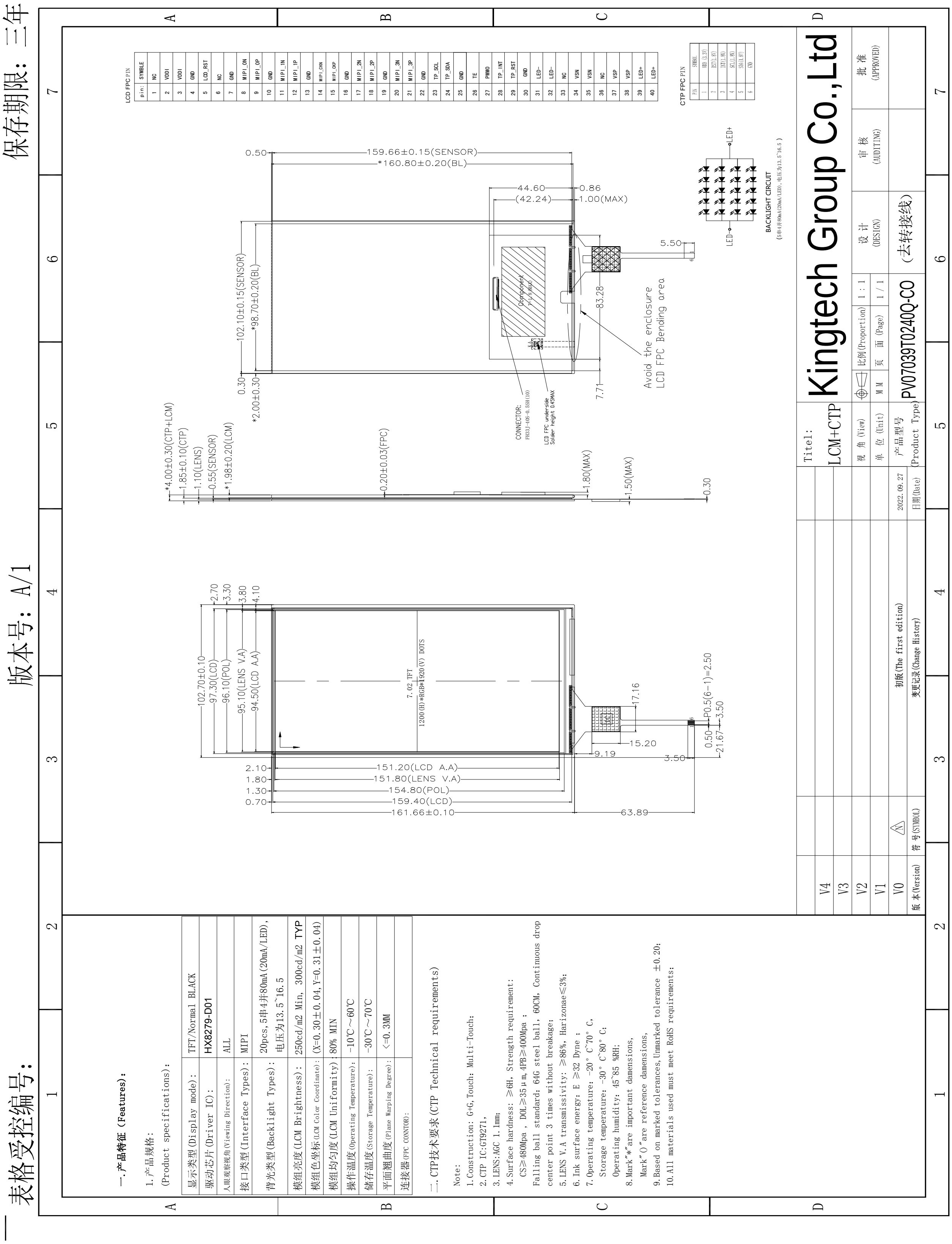
-Low Input Voltage: IOVCC: 1.65~3.3V;VCC: 2.5~3.3V
-Display Colors of TFT LCD: 16.7M colors
- Interface: MIPI-4 Lanes
-Internal Power Supply Circuit.

General Information Items	Specification Main Panel	Unit	Note
Display area(AA)	94.5(H) *151.2(V) (7inch)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	1200(RGB) *1920	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	78.75(H) x 78.75(V)	um	-
Viewing angle	All	o'clock	-
Drive IC	HX8279	-	-
Display mode	Normally black	-	-
Operating temperature	-10～+60	℃	-
Storage temperature	-30～+70	℃	-

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	102.70	-	mm	±0. 1
	Vertical(V)	-	161.66	-	mm	±0. 1
	Depth(D)	-	4.01	-	mm	±0. 3
Weight		-	TBD	-	g	-

2. Mechanical Specification



3. Pin Description

LCM PIN

Pin NO.	Pin name	Description	Pin NO.	Pin name	Description
1	NC	No connection	21	MIPI_3P	MIPI Positive data signal (+)
2	IOVCC	Power supply for system ,IOVCC=1.8V	22	GND	Ground
3	IOVCC		23	NC	No connection
4	GND	Ground	24	NC	No connection
5	RST	Device reset signal	25	GND	Ground
6	NC	No connection	26	NC/TE	Tearing effect output signal for NVM(OTP),Let it open when not in use
7	GND	Ground	27	PWMO	PWM control signal for LED driver
8	MIPI_0N	MIPI Negative data signal (-)	28	NC/BIST	Enables the Test Image Generation function, if not used, connect to ground
9	MIPI_0P	MIPI Positive data signal (+)	29	NC	No connection
10	GND	Ground	30	GND	Ground
11	MIPI_1N	MIPI Negative data signal (-)	31	LED-	LED cathode
12	MIPI_1P	MIPI Positive data signal (+)	32	LED-	
13	GND	Ground	33	NC	No connection
14	MIPI_CKN	MIPI Negative clock signal (-)	34	VSN	Analog supply negative voltage
15	MIPI_CKP	MIPI Positive clock signal (+)	35	VSN	
16	GND	Ground	36	NC	No connection
17	MIPI_2N	MIPI Negative data signal (-)	37	VSP	Analog supply positive voltage
18	MIPI_2P	MIPI Positive data signal (+)	38	VSP	
19	GND	Ground	39	LED+	LED anode
20	MIPI_3N	MIPI Negative data signal (-)	40	LED+	

CTP

Pin NO.	Symbol	Remark
1	VDD3.3V	Power supply
2	RST1.8V	Reset pin
3	INT1.8V	Interrupt pin
4	SCL1.8V	Serial clock input
5	SDA1.8V	Serial data input pin
6	GND	Power Ground

4. Electrical Characteristics

4.1 Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Supply Voltage for Logic circuit	IOVCC	1.7	1.9	V	
Supply Voltage for analog circuit	VCC	3.0	3.6	V	

4.2 DC Electrical Characteristics

4.2.1 Operating Conditions

Typical Operating Conditions (Ta=25℃)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Power Supply	Vcc	3.0	3.3	3.6	V	
Power Supply	IOVCC	1.7	1.8	1.9	V	
Normal mode Current consumption	Icc	-	-	150	mA	VCC=3.3V
TFT Gate ON Voltage	VGH	-	-	-	V	
TFT Gate OFF Voltage	VGL	-	-	-	V	

4.2.2 Backlight Unit (GND=0V)

Item		Symbol	Values			Unit	Remark
			Min	Typ	Max.		
Power Supply		LED-VCCS	10	12	14	V	
Forward supply Current		I_f	-	170	-	mA	
ON/OFF Control	High	LED-EN	1.5	-	5.5	V	
	Low		0	-	0.4	V	
LCM+CTP Luminance		L_V	250	300	–	cd/m2	I_B=80mA
Uniformity		/	75			%	-
LED life time			20000			H	

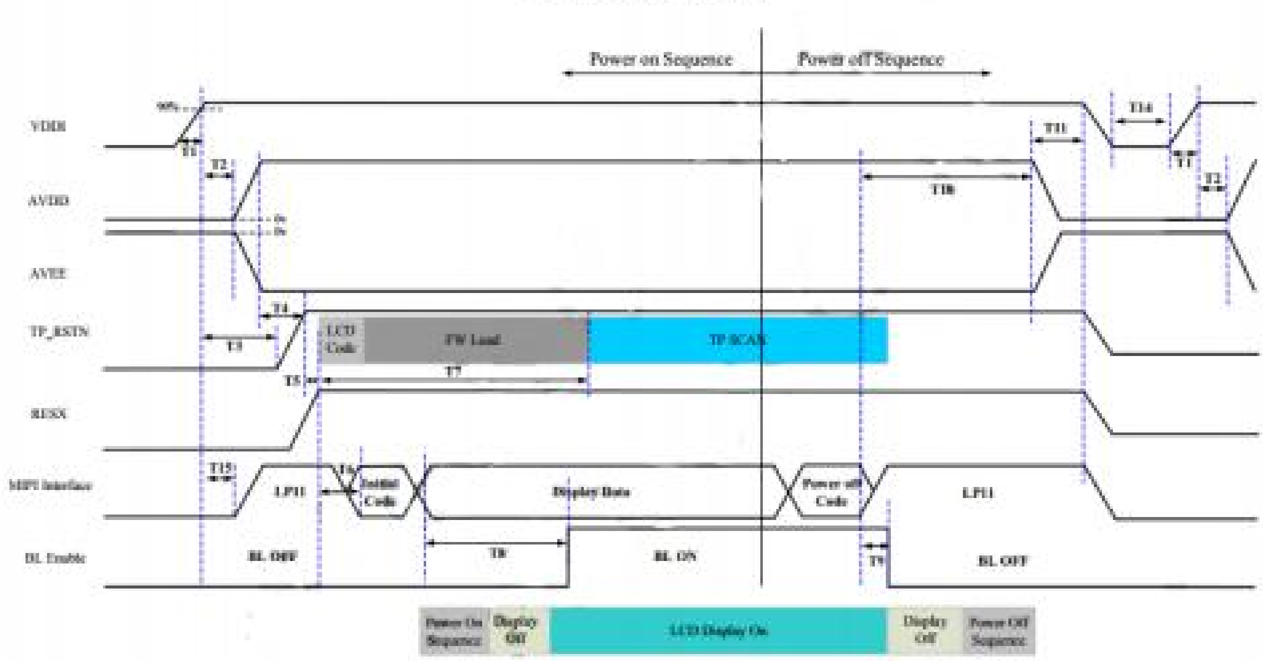
Typical Operating Conditions (Ta=25℃)

4.3 MIPI Interface Characteristics

2.4 Power ON/OFF Sequence

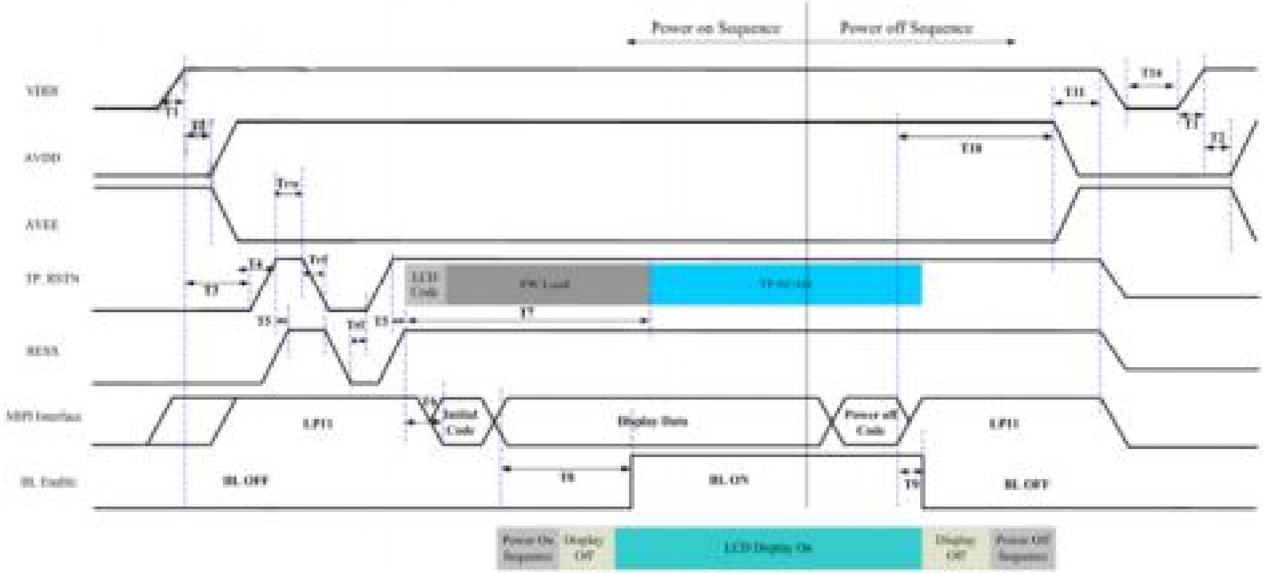
The power supply ON/OFF setting sequences is illustrated in figure below.

Power On/Off Sequence



If system cannot ensure the MIPI interface power up after VDDI, 2nd reset is suggested to used as below diagram.

Power On/Off Sequence with 2nd Reset



Power On/Off Sequence Timing				
Parameter	**Description**	**Min.**	**Max.**	**Unit**
T1	Rise time from 0.1VDDI to0.9VDDI	0	5	mS
T2	AVDD/AVEE rise after VDDI power on	1		mS
T3	TP reset time after VDDI power on	5		mS
T4	TP reset release time after AVDD power on	100		uS
T5	TP reset release to LCD Reset release	0		mS
T6	FLASH download LCD code after LCD Reset	120		mS
T7	LCD Reset release to TP SCAN Start	150		mS
T8	LED On after Initial Code	150		mS
T9	LED OFF after power off Code	50		mS
T10	AVDD/AVEE power down after power off code	150		mS
T11	VDDI power down after AVDD/AVEE power down	5		mS
T12	TP reset time before LCD reset	5		mS
T13	RESX reset falling to TP reset release	5	120	mS
T14	VDDI rise again after prebvious VDDI powered down	50		mS
T15	MIPI signals start(Hi-Z/GND to LP11)after VDDI power on	3		mS

3.0 SIGNAL TIMING SPECIFICATION

3.1 MIPI Interface Timing

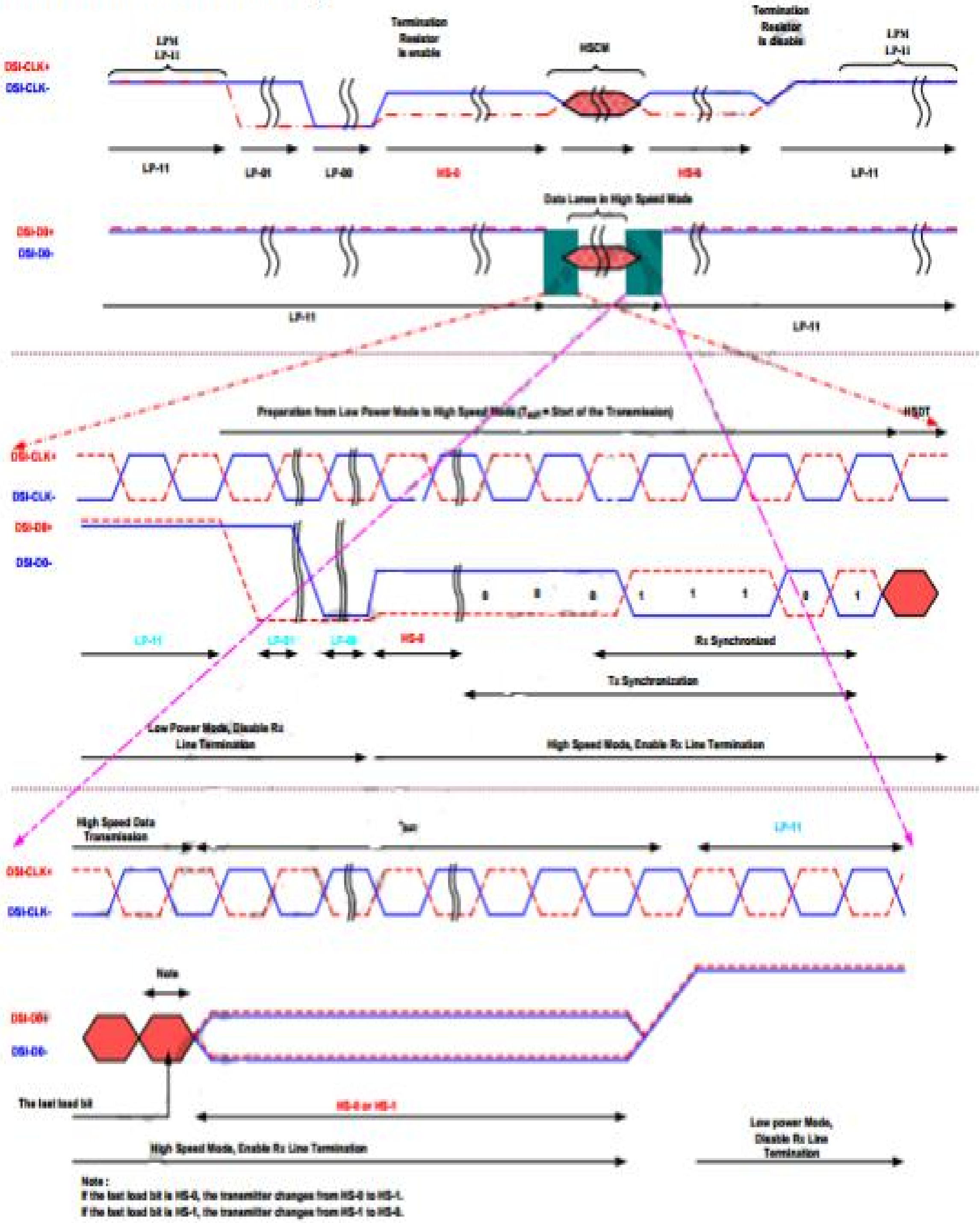
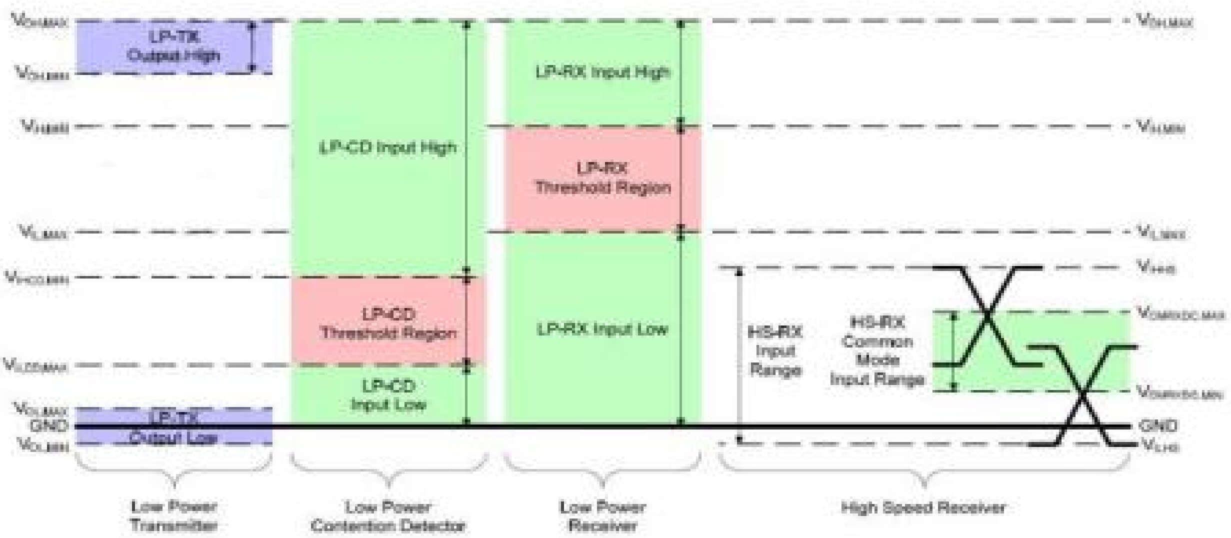


Figure: High speed clock burst

3.2 MIPI Interface DC Characteristics

Parameter	Symbol	Condition	Specification			Unit
			MIN	TYP	MAX	
Power supply voltage for MIPI interface						
Power supply voltage for MIPI interface	VDDAM	-	1.65	1.8	3.6	V
	LVDSVDD	-	1.125	1.3	1.5	V
LPDT Input Characteristics						
Pad signal voltage range	VI	-	-50	-	1350	mV
Ground Shift	VGNDSH	-	-50	-	50	mV
Logic 0 input threshold	VIL	-	0	-	550	mV
Logic 1 input threshold	VIH	-	880	-	LVDSVDD	mV
Input hysteresis	VHYST	-	25	-	-	mV
LPDT Output Characteristics						
Out low level	VOL	-	-50	-	50	mV
Out high level	VOH	-	1.1	1.2	1.3	V
Logic 1 contention threshold	VIHCD,MIN	-	450	-	LVDSVDD	mV
Logic 0 contention threshold	VIHCD,MAX	-	0	-	200	mV
Output impedence of LPDT	ZOLP	-	80	100	125	ohm
Hi-speed Input/Output Characteristics						
Single-end input low voltage	VILHS	-	-40	-	-	mV
Single-end input high voltage	VIHHS	-	-	-	460	mV
Single-end threshold for HS termination enable	VTERM-EN	-	-	-	450	mV
Differential input low threshold	VIDTL	-	-70	-	-	mV
Differential input high threshold	VIDTH	-	-	-	70	mV
Common mode voltage	VCMRXDC	-	70	-	330	mV
Differential input impedence	ZID	-	80	100	125	ohm



5. OPTICAL CHARACTERISTICS

(LCD MONOMER PARAMETERS)

4.0 OPTICAL SPECIFICATIONS

4.1 Overview

The test of Optical specifications shall be measured in a dark room(ambient luminance≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Topcon SR-UL1R and Westar TRD-100A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°.The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

4.2 Optical Specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle	Horizontal	Θ3	CR>10	70	80		°	Note 1
		Θ9		70	80		°	
	Vertical	Θ12		70	80		°	
		Θ6		70	80		°	
Contrast Ratio		CR	Θ= 0°	1000	1200			Note 2
NTSC		%	Θ= 0°	75	80			C Light
Reproduction Of color	Red	Rx	Θ= 0°		0.670			Note 3 *C Light+ CF
		Ry			0.318			
	Green	Gx			0.219			
		Gy			0.621			
	Blue	Bx			0.137			
		By			0.098			
White		Wx	Θ= 0°		0.282			
		Wy			0.303			
Response Time		Tr+Tf	Θ= 0°		25		ms	Note 4
Trans.			-	2.97	3.5	-	%	W/O APF

Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.

2. Contrast measurements shall be made at viewing angle of Θ= 0° and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. Luminance Contrast Ratio (CR) is defined mathematically.

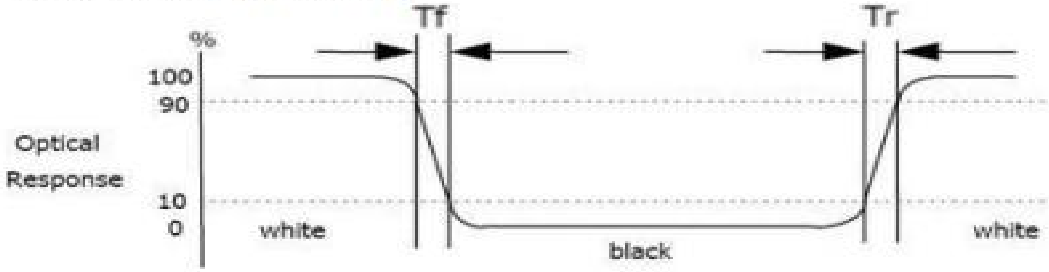
$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. The color chromaticity coordinates specified in Table4.2 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at

the center of the Module.

4. The electro-optical response time measurements shall be made as FIG.1 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr and 90% to 10% is Tf.

Figure 1. Response Time Testing



6. QUALITY SPECIFICATIONS

1. Inspection condition

1.1:Cosmetic inspection: viewing distance is about 30cm with bare eyes, and under an environment of 20~40W light intensity（800~1200LUX）, all directions for inspecting the sample should be within 45° against perpendicular line.

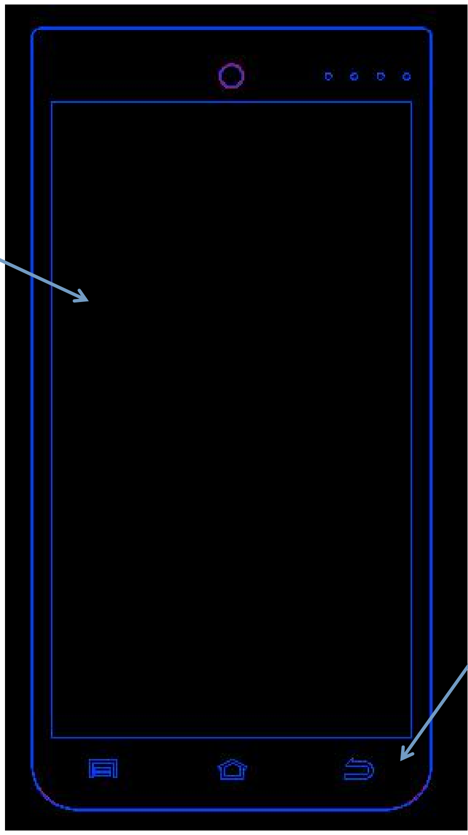
6.1.2:Function inspection: viewing distance is about 30cm with bare eyes, and under an environment of 300LUX light intensity, all directions for inspecting the sample should be within 45° against perpendicular line.

2. Definition of Inspection Item.

2.1 Definition of Inspection zone in I-touch module.

AA zone/Display area

VA area： Front surface (Include AA area and BM area)

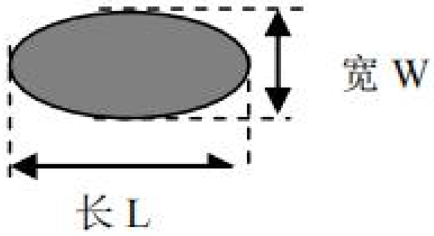


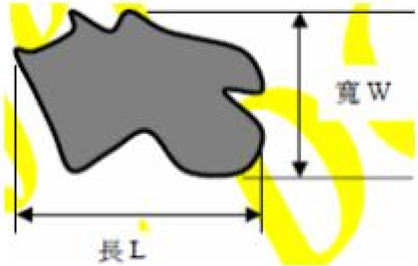
BM area/Printing area

AA zone: Character/Display area
BM zone: Printing area
VA zone: Viewing area（AA area + BM area = viewing area ）

3. Defect definition

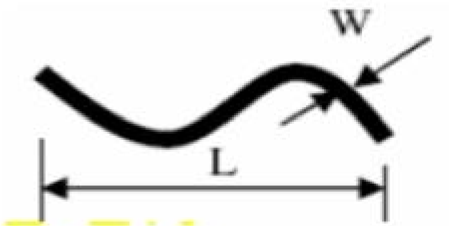
3.1 Circular defect



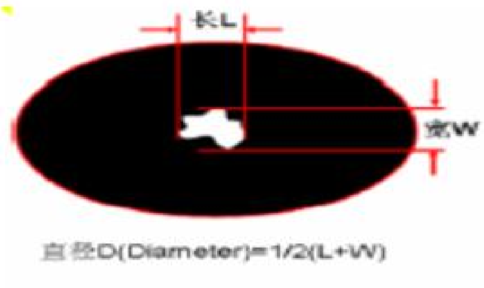


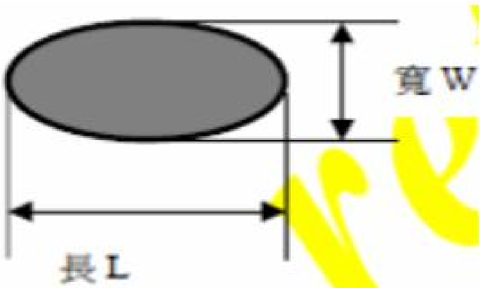
Diameter Φ=1/2(L+W) Diameter Φ=1/2(L+W)

3.2 Linear defect

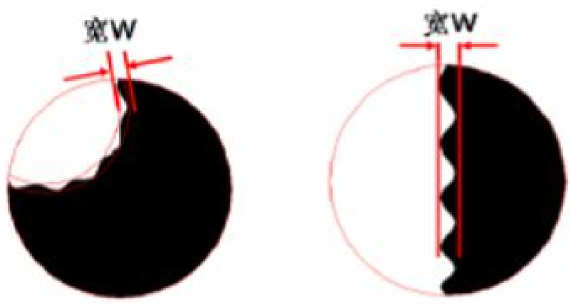


3.3 Pin hole



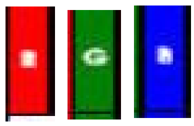
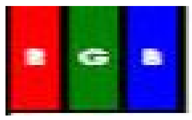


3.4 Zigzag



4. Inspection standards

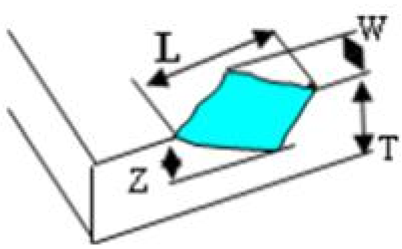
4.1 Major defect

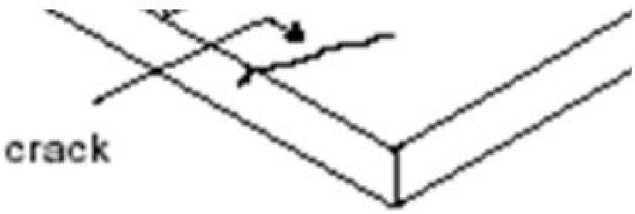
-Item -No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical, horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting. 6) Touch panel abnormal.	Major
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4.1.4	LCD Mura	LCD Mura according to ND 5% keep out to determine, if keep out distance at 30cm be seen by eyes is NG, otherwise will be ok if invisible.	
4.1.5	Sub Pixel classification	● Sub Pixel: Number of sub pixel doesn't exceed two dot.  Sub Pixel (Dot) a> Dark dot ----two Allowed b> Bright dot ---- two Allowed ● Pixel : Three dots link together doesn't exceed twos  Pixel	N≦2

4.2 Cosmetic defect

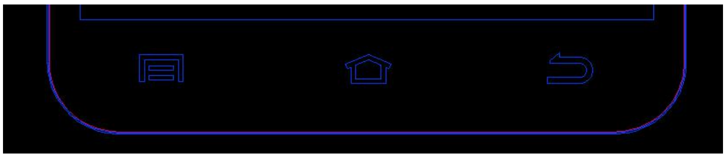
<table>
<tr><th>Item No</th><th>Items to be inspected</th><th colspan="2">Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td rowspan="7">4.2.1</td><td rowspan="7">Dot defect</td><td rowspan="2">Zone
Size(mm)</td><td>VA area</td><td rowspan="7">Minor</td></tr>
<tr><td>Acceptable Qty</td></tr>
<tr><td>Φ≤0.1</td><td>Ignore</td></tr>
<tr><td>0.10<Φ≤0.25</td><td>3</td></tr>
<tr><td>0.25<Φ≤0.30</td><td>2</td></tr>
<tr><td>0.30<Φ</td><td>0</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="6">4.2.2</td><td rowspan="6">Dim Spots:
Circle
shaped
and dim
edged
defects</td><td rowspan="2">Zone
Size(mm)</td><td>VA area</td><td rowspan="6">Minor</td></tr>
<tr><td>Acceptable Qty</td></tr>
<tr><td>Φ≤0.20</td><td>Ignore</td></tr>
<tr><td>0.20<Φ≤0.40</td><td>3</td></tr>
<tr><td>0.40<Φ≤0.60</td><td>2</td></tr>
<tr><td>0.60<Φ</td><td>0</td></tr>
<tr><th>Item No</th><th>Items to be inspected</th><th colspan="2">Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td rowspan="6">4.2.3</td><td rowspan="6">Dent Spot
Fish eye</td><td rowspan="2">Zone
Size(mm)</td><td>VA area</td><td rowspan="6">Minor</td></tr>
<tr><td>Acceptable Qty</td></tr>
<tr><td>Φ≤0.10</td><td>Ignore</td></tr>
<tr><td>0.10<Φ≤0.20</td><td>3</td></tr>
<tr><td>0.20<Φ≤0.30</td><td>2</td></tr>
<tr><td>0.30<Φ</td><td>0</td></tr>
</table>

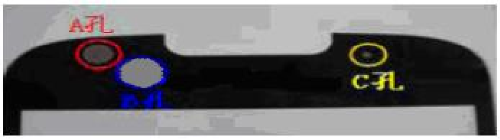
<table>
<tr>
<td>4.2.4</td>
<td>Line defect</td>
<td>
<table>
<tr><td colspan="2">Zone / Size(mm)</td><td>VA area</td></tr>
<tr><td>L
(Length)</td><td>W
(Width)</td><td>Acceptable Qty</td></tr>
<tr><td>Ignore</td><td>W≤0.03</td><td>Ignore</td></tr>
<tr><td>L≤5.0</td><td>0.03<W≤0.05</td><td>3</td></tr>
<tr><td>L≤3.0</td><td>0.05<W≤0.07</td><td>1</td></tr>
<tr><td>/</td><td>0.07<W</td><td>Define as spot defect</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
<tr>
<td>4.2.5</td>
<td>Scratch</td>
<td>
If the scratch can be seen after mobile phone cover assembling or in the operating condition, judged as the line defect of 4.2.4.
If the scratch can be seen only in non-operating condition or some special angle, judged as the following table.
<table>
<tr><td colspan="2">Size (mm)</td><td>VA area</td></tr>
<tr><td>L
(Length)</td><td>Acceptable Qty</td><td>Acceptable Qty</td></tr>
<tr><td>Ignore</td><td>W≤0.03</td><td>Ignore</td></tr>
<tr><td>5.0<L≤10.0</td><td>0.03<W≤0.05</td><td>2</td></tr>
<tr><td>L≤5.0</td><td>0.05<W≤0.08</td><td>1</td></tr>
<tr><td>/</td><td>W>0.08</td><td>0</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
</table>

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defect</th></tr>
<tr><td>4.2.6</td><td>Bubble</td><td>
<table>
<tr><td>Zone / Size(mm)</td><td>VA area
Acceptable Qty</td></tr>
<tr><td>Φ≤0.15</td><td>Ignore</td></tr>
<tr><td>0.15<Φ≤0.25</td><td>2</td></tr>
<tr><td>0.25<Φ</td><td>0</td></tr>
</table>
</td><td rowspan="3">Minor</td></tr>
<tr><td rowspan="2">4.2.7</td><td rowspan="2">Glass defect</td><td>
4.2.7a Chip on corner or surface


<table>
<tr><td>L(length)</td><td>W(width)</td><td>Z(thickness)</td></tr>
<tr><td>L≤0.30</td><td>W≤0.20</td><td>T/2</td></tr>
</table>
Notes: T=Lens thickness， Φ≤0.10 ignore
Acceptable Qty： Single edge N≤2， Total N≤4
</td></tr>
<tr><td>
4.2.7b Cracks
Cracks tend to break are not allowed.


</td></tr>
</table>

Item No	Items to be inspected	Inspection Standard	Classification of defect
4.2.8	Parts alignment	1) Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. 2) Not allow chip or solder component is off center more than 50% of the pad outline.	Minor
4.2.9 view area/ printing area of front surface and view area of rear surface	LOGO Pattern	 **Dot: according to Dot spec.** **Thickness odds:** $\frac{\lvert \text{Spec pattern width} - \text{Print pattern width} \rvert \times 100\%}{\text{Spec pattern width}} \leqslant 30\%$ **Drawing slant:** Print pattern length≤10mm, slant angle ≤3°; 10mm < Print pattern length ≤ 20mm, slant angle ≤ 1.5°  **Pattern serration:** H≤0.05 mm **Pattern leak print/ error/overprint:** not allowed **Pattern break line:** width ≤0.10 mm **Logo pattern color windage / color thin:** Follow the limit samples.	Minor

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.2.10 view area/printing area of front surface and view area of rear surface	IR hole(A)/ Light sensor hole(B)/ LED hole(C)	 1. A.B.C hole must be according the transmittancy 2. Light leakage on A.B.C hole or follow the limited sample. 3. A.B.C hole (LED) hole only judge by black background， no need to check in the lamb condition.	Minor
	Surface dirty	1. Dirty can not be cleaned follow the dot spec. 2. Accept while the dirty can be cleaned. 3. The quality guarantee period of protective film is 3months, during the period, the spot or contamination is not allowed.3. 保护膜的质量保证期为三个月，在保证期内因保护膜问题引起的脏污判定为不良。	
	Printing area Light leakage	Follow the dot defect spec， MAX， Severity －see light leakage limit sample	
	Ink overflow	Visual inspection 30cm not allowed	
	Color discordant	Obvious color difference in the BM area is not allowed	
	Icon scratch of printing logo area	Icon printing logo area is not allow penetrability scratch	

7.RELIABILITY

Test Item	Test Condition	Inspection after test
High Temperature Operation	60℃ for 96 hours	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 试验结束后，已测试的 LCD 样品必须在室内正常温湿度 环境下放置2~4个小时以上才能进行功能和外观检查，样品不允许有以下缺陷： 1.无功能不良，例：缺划,，显异，严重爆灯等 2.外观无偏光片气泡，OCA 气泡等不良： 2. The test samples should be applied to only one test item.每个被测试的模块只能用于其中的一个测试项目。
Low Temperature Operation	-10℃ for 96 hours	
High Temperature Storage	70℃ for 96 hours	
Low Temperature Storage	-30℃ for 96 hours	
High Temperature Operation Humidity Operation	60℃, 90%RH for 72 hours	
Thermal Shock	-10℃(30min) ~+25℃(5min)~ +60℃(30min) for 10 cycles	
Vibration Test (No Operation)	Frequency: 10~55Hz Amplitude:1.0mm Sweep Time: 11min Test Period: 6 Cycles for each direction of X, Y, Z	
Static electricity test	Touch ±4KV,air touch ±8KV	

8. Handling Precaution

8.1 Safety

(1) Do not swallow any liquid crystal, even if there is no proof that liquid stal is poisonous.
(2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
(3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

8.2 Storage Conditions

(1) Store the panel or module in a dark place where the temperature is 23±5℃ and thehumidity is below 50±20%RH.
(2) Store in anti-static electricity container.
(3) Store in clean environment, free from dust, active gas, and solvent.
(4) Do not place the module near organics solvents or corrosive gases.
(5) Do not crush, shake, or jolt the module.

8.3 Handling Precautions

(1) Avoid static electricity which can damage the CMOS LSI.
(2) The polarizing plate of the display is very fragile. So, please handle it very carefully.
(3) Do not give external shock.
(4) Do not apply excessive force on the surface.
(5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
(6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with acleaning naphtha solvent.
(7) Do not operate it above the absolute maximum rating.
(8) Do not remove the panel or frame from the module.

8.4 Warranty

1) Under normal use and storage conditions, it is within 12 months from the date of delivery. 在正常使用和储存条件下，自交货之日起12个月内。
2) According to Kingtech TFT LCD quality standrad,Kingtech will rework or exchange for functional defect goods sine within one year。依据Kingtech TFT LCD质量标准，Kingtech将在一年内保修或置换功能缺陷产品。
3) strictly prohibit the display in the whole machine for a long time point a fixed screen (display by the LCD residual shadow determination criteria); suggest that the entire machine more than 2 minutes without the use of LCM automatically into hibernation, more than 30 minutes without the use of the system to force LCM into hibernation. 严禁显示屏在整机长期点一个固定画面（显示屏依LCD残影判定标准）;建议整机超过2分钟不使用LCM自动进入休眠，超过30分钟不使用系统强制LCM进入休眠状态。

4) Display is strictly prohibited to work continuously for more than 8 hours on the whole machine. 严禁显示屏在整机连续工作8小时以上。
5) Please take the module under static protection.请在有静电防护情况下，拿取模组。
6) LCM in special scenarios (such as high concentration of chemicals, strong magnetic field, extreme cold, and other use scenarios) use in advance to contact us to confirm.LCM在特殊场景（比如高浓度化学品，强磁场，极寒等使用场景）使用时提前联系我们确认。

9. Package Drawing

TBD