

Specification

Module No. : GEA-070E01-DC9509-G020

Version No. : A1

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Issue History

Version	History	Date	Remarks
A1	First Issue	2020/01/13	

CONTENTS

1. Purpose	4
2. Feature	5
2.1 Type of Module	5
2.2 Storage, Operating and Application Environment	5
2.3 Module Structure	5
2.4 Dimension of Module	5
2.5 Mechanical Drawing	6
3. Characteristics	7
3.1 Optical Characteristics	7
3.2 Electrical Characteristics	7
3.2.1 Touch Panel	7
3.2.2 Display	7
4. Appearance Inspection	8
4.1 Terms Definition	8
4.2 Inspection conditions	9
4.3 Printing Area Appearance Inspection Criteria	10
4.4 View Area Appearance Inspection Criteria	11
4.4.1 Liner-like Defects	11
4.4.2 Dot-like Defects	11
4.4.3 Stain and Dirty Mark	12
4.4.4 Surface Fisheye	12
4.4.5 Defects of back side, locates outside the View Area	12
4.5 Glass Breakage	13
4.5.1 Cover Glass Breakage	13
4.5.2 Sensor Glass Breakage	13
5. Reliability Test	14
5.1 Environment Test	14
5.2 Mechanical Characteristics Test	15
6. Packing and Label	16
7. Quality Guarantee	17
7.1 Sampling Plan	17
7.2 Statement	17
8. Miscellaneous	18
8.1 General requirements	18
8.2 Nonconforming Analysis & Deal With Manners	18
8.2.1 Nonconforming analysis:	18
8.2.2 Disposition of nonconforming:	18
9. Display Specification	19

1. Purpose

This specification document is issued for the Capacitive-Type Touch Panel with BOE Display delivered by General Electrical Touch Co., Limited. This document defined the general provisions (including structure, performance, characteristics and quality guarantee) for the specific module listed at the front page of this document. In the event of conflict between this document and other documents, this document including the attachments and drawing, is highest-level specification for this products.

Here we confirm that all components into our Touch Modules are ROHS and REACH Conform.

2. Feature

2.1 Type of Module

Projected Capacitive Touch Panel with BOE Display

2.2 Storage, Operating and Application Environment

Items	Specification	Remarks
Storage Environment	Temperature:-30 °C~80°C Humidity : 20%~90%	Acid free/ Non dew condensation
Operating Environment	Temperature:-20°C~70°C Humidity : 20%~90%	Acid free/ Non dew condensation

2.3 Module Structure

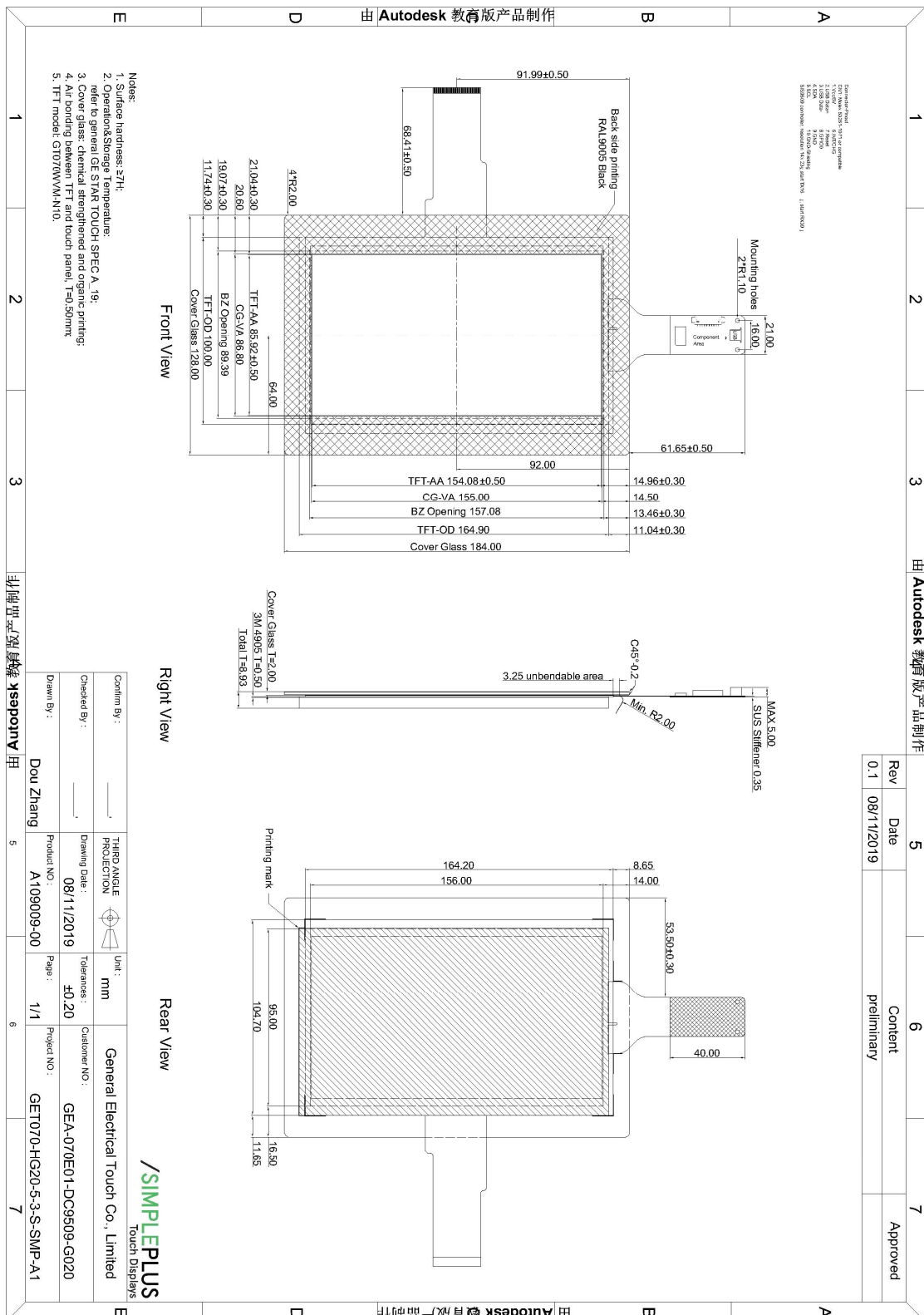
Main Component	Materials	Remarks
Cover Glass	Chemical Toughened Glass	Black Organic Printing
Adhesive	OCA	Thickness: 0.175 mm
Touch Sensor	DITO Glass/Silver/Insulation	ITO Square Resistance: 100±20Ω/□
FPC	Copper Foil/PI	COF
Touch Controller	SIS 9509	
Tape	Double Side Tape 3M4905	
Display	BOE GT070WVM-N10	

2.4 Dimension of Module

ITEMS	Dimension	Tolerance
Total Thickness	8.93 mm	±0.50mm
Outline	184.00 x 128.00 mm	±0.20mm
Visible Area	155.00 x 86.80 mm	±0.20mm

*Remark: Detailed Dimension please refer to Mechanical Drawing.

2.5 Mechanical Drawing



3. Characteristics

*Remark: This depends on the performance of the IC characteristics.

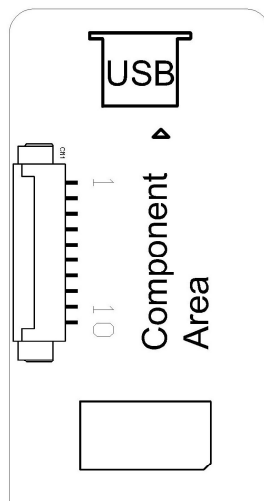
3.1 Optical Characteristics

Items	Value	Remarks
Total Light Transmittance	$> 80\%$	JIS K7105
Haze	$\leq 11\%$	
Surface hardness	$\geq 7H$	

3.2 Electrical Characteristics

3.2.1 Touch Panel

Electronic components on tail (COF). Tail Type: FPC By Gold Plated.



Connector-Pinout

CN1: Molex 53261-1071 or compatible

1.Vcc/5V	6.INT/CHG
2.USB Data+	7.Reset
3.USB Data-	8.GPIO0
4.SDA	9.GND
5.SCL	10.GND-Shielding

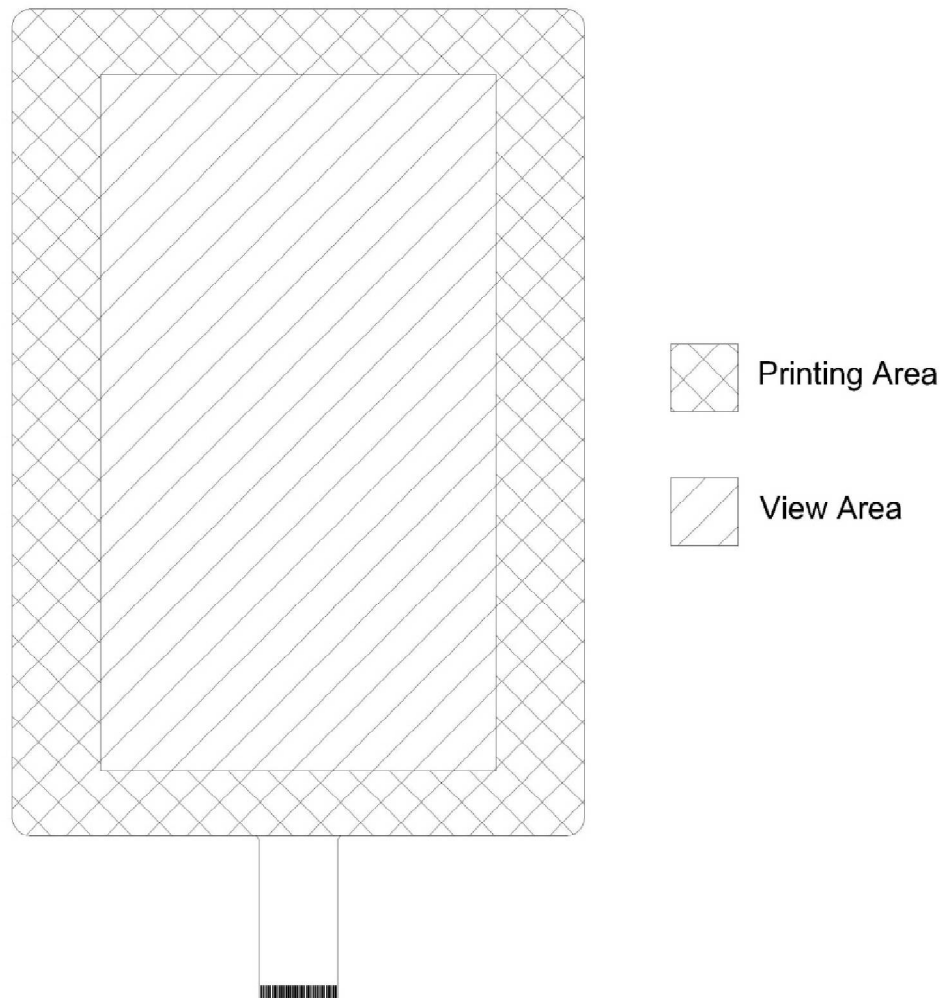
SIS9509 controller, resolution 14x 23y,
start TX16↓, start RX39↓

3.2.2 Display

All display details please refer to the display spec GT070WVM-N10 in chapter 9.

4. Appearance Inspection

4.1 Terms Definition



4.2 Inspection conditions

Items	Conditions	Remarks
Inspection Lamp	Florescent Cool White Lamp, 1000~1200Lux	
Inspection with Reflect Light (RL)	<ul style="list-style-type: none"> *Normal eyes level 1.0 (with Glasses accepted); *Distance between Lamp and product:40-50cm; *Distance between Eyes and Product:25-35cm; *Angle of view: 45°; *Black background; *Inspection time no more than 10s. 	<p>The diagram illustrates the Reflect Light (RL) inspection setup. A lamp is positioned to the left of a product, with a distance of 400-500mm indicated. The observer's eyes are positioned to the right of the product, with a distance of 250-350mm indicated. The angle of view from the eyes to the product is 45 degrees. The product is shown as a rectangular block on a surface.</p>
Inspection with Through Light (TL)	<ul style="list-style-type: none"> *Normal eyes level 1.0 (with Glasses accepted); *Distance between Lamp and Product: 40-50cm; *Distance between Eyes and Product: 25-35cm; *Angle of view: 45°; *Black background; *Inspection time no more than 10s. 	<p>The diagram illustrates the Through Light (TL) inspection setup. A lamp is positioned to the left of a product, with a distance of 400-500mm indicated. The observer's eyes are positioned to the right of the product, with a distance of 250-350mm indicated. The product is shown as a rectangular block with a cross-hatched pattern, indicating light transmission. The angle of view from the eyes to the product is 45 degrees.</p>

4.3 Printing Area Appearance Inspection Criteria

Items	Conditions	Inspection Criteria	Method
Light Transparent Hole/Light Leakage	TL	Not Allowed (Repaired with black marker pen at the back side can be accepted.)	Eye view
Ink Off	TL	Not Allowed	Eye view
Stain and Dirty Mark	RL	*Stain and dirty mark refer to visible sheet contamination; the non-cleanable stain should be inspected as "Dot-like Defects". *Contamination cannot be cleaned by soft cloth and alcohol, Not Allowed; *Contamination can be cleaned by soft cloth and alcohol, Accept; but if the ratio of such contamination defected products is more than 10% of all the inspected products, Not Allowed;	Eye view
Liner-like Defects	RL	Refer to 4.4.1 Liner-like Defects.	Eye view, dot/wire gauge
Dot-like Defects	RL	Refer to 4.4.2 Dot-like Defects.	Eye view, dot/wire gauge
Logo/ Letter	RL	*Logo Break; Not Allowed *within a shaping printing < 120 mm: ± 0.10 ≥ 120 mm < 400 mm: ± 0.15 ≥ 400 mm: ± 0.25 *between shaping printing(offset to 2nd, 3rd, etc. color) < 400 mm: ± 0.30 ≥ 400 mm: ± 0.50	Eye view, dot/wire gauge

4.4 View Area Appearance Inspection Criteria

4.4.1 Liner-like Defects

(W=Width, L=Length)



Condition	Width(mm)	Length(mm)	Criteria
RL	$W \leq 0.03$	Not limited	*Accept QTY: not limited.
	$0.03 < W \leq 0.05$	$L \leq 10$	*Accept QTY: not more than 4; *Not allowed if the distance between 2 objects is less than 20 mm.
	$0.05 < W \leq 0.08$	$L \leq 10$	*Accept QTY: not more than 2; *Not allowed if the distance between 2 objects is less than 20 mm.
	$W > 0.08$	$L > 10$	*Not allowed.
	Liner-like Defects including: Liner Foreign Object/Scratch.		

4.4.2 Dot-like Defects

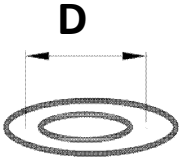
(D=Diameter)

Condition	Average Diameter(mm)	Criteria
RL	$D \leq 0.15$	*Not limited.
	$0.15 < D \leq 0.20$	*Accept Qty: not more than 8; *Not allowed if the distance between 2 defects is less than 20mm.
	$0.20 < D \leq 0.30$	*Accept Qty: not more than 3; *Not allowed if the distance between 2 defects is less than 20mm.
	$D > 0.30$	*Not allowed.
	Dot-like Defects including: Foreign Objects/Stab.	

4.4.3 Stain and Dirty Mark

Condition	Criteria
RL	<p>* Stain and Dirty Mark refer to the visible contamination in mass, Dot-like contamination should be inspect as "Dot-like Defects";</p> <p>*Contamination cannot be clean by soft cloth and alcohol, Not Allowed;</p> <p>*Contamination can be clean by soft cloth and alcohol, Accept; but if the ratio of such defected products are more than 10% of all the inspected products, Not Allowed.</p>

4.4.4 Surface Fisheye

Condition	Average Diameter(mm)	Criteria	Remarks
RL	$D \leq 0.15$	<p>*Accept QTY: not more than 3;</p> <p>* Not allowed if the distance between 2 objects is less than 50 mm.</p>	
	$0.15 < D \leq 0.30$	<p>*Accept Qty: not more than 2;</p> <p>* Not allowed if the distance between 2 objects is less than 50 mm.</p>	
	$0.30 < D \leq 0.50$	*Accept Qty: not more than 1.	
	$D > 0.50$	*Not allowed.	

4.4.5 Defects of back side, locates outside the View Area

The Appearance defects, such as Scratch, Foreign Object, Stain and Dirty-mark, on the backside of Module not lead to the performance failure, Accept;

FPC and sensor pin bonding migration not more than pin width 1/2, Accept;

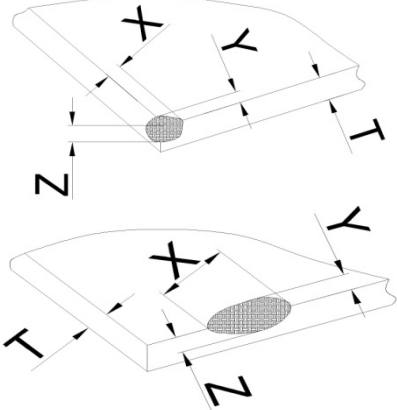
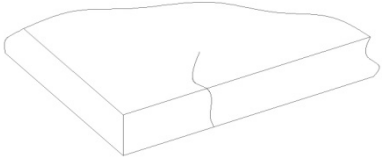
Scratches on bonding area on PS, Not Allowed;

Mechanical damages on FPC(dent/kink), Not Allowed;

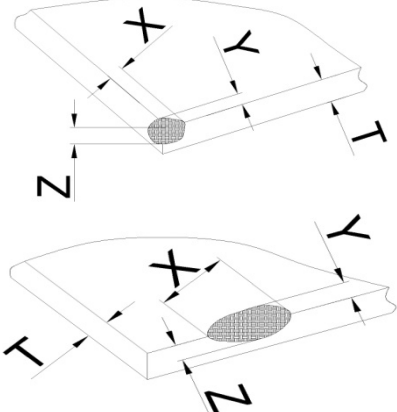
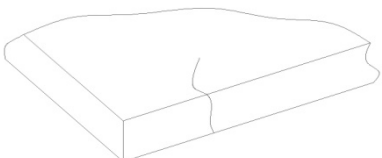
Glue residue, broken and oxidation on gold finger, Not Allowed.

4.5 Glass Breakage

4.5.1 Cover Glass Breakage

Items	Criteria	Remarks
Corner/ Edge Breakage	$*(X+Y)/2 < 0.3 \text{ mm}$, $Z < 1/3T \text{ mm}$; distance between 2 defects more than 5 mm; *Accept QTY: not more than 3.	
Crack	Not Allowed.	

4.5.2 Sensor Glass Breakage

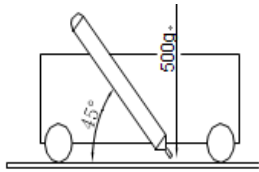
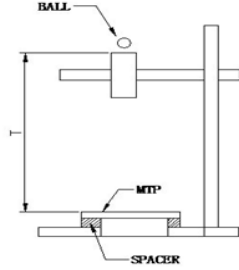
Items	Criteria	Remarks
Corner/ Edge Breakage	$*(X+Y)/2 < 1.5 \text{ mm}$, $Z < T \text{ mm}$; distance between 2 defects more than 5 mm; *Accept QTY: not more than 3.	
Crack	Not Allowed.	

5. Reliability Test

5.1 Environment Test

Items	Condition and Criteria	Remarks
Low Temperature	1) Temp: -30°C, 240Hrs; 2) Room Temp, 24Hrs; 3) Inspection Item: Appearance: No Air Bubble, No Separation; Function: No functional abnormalities.	Non-operation
High Temperature and High Humidity	1) Temp: 80°C, RH: 85%, 240Hrs; 2) Room Temp, 24Hrs; 3) Inspection Item: Appearance: No Air Bubble, No Separation; Function: No functional abnormalities.	Non-operation
Temperature Shock	1) -30°C(60min)→80°C(60min), 10 Cycles; 2) RH≤90%; 3) Room Temp, 24Hrs; 4) Inspection Item: Appearance: No Air Bubble, No Separation; Function: No functional abnormalities.	Non-operation

5.2 Mechanical Characteristics Test

Items	Condition and Criteria	Remarks
Surface Hardness	<ul style="list-style-type: none"> * JIS K5600; * Slide the pencil (beeline length about 30-40mm) and 45°angle, force vertically approx. 500gf; * Pencil's Hardness: H 2H 3H 4H 5H 6H 7H; * After sliding, wipe off the pencil trace with clean soft cloth moistened with ethanol, and then check whether or not existing the scratch on the sliding place; * Judgment: If scratch no found, then the surface hardness up to the hardness of the testing pencil. 	
Impact Resistance	<ul style="list-style-type: none"> * Test the dropping height according to different glass thickness; * 64g steel ball is dropped vertically on the center of product surface from 60cm height; * One cushion with 3mm thickness lay beneath the product; * Judgment: No Glass Breakage, Accept. 	
Static Load Resistance	<ul style="list-style-type: none"> * One hole wooden cushion lay beneath the product(cushion: outline 60*60mm, inner dimension 40*40mm, thickness: 10mm); * Pressing vertically on the center of product with 8~10kgf by Φ10mm test pen of the manometer with 30s continuance; * Judgment: No Break or Crack, Accept. 	
Vibration Resistance	<ul style="list-style-type: none"> * During operation: inspect Linearity refer to 3.1"Electric" within 30min of vibration from X,Y,Z direction with 2m/s², 10~55Hz condition; * NON OPERATION:INSPECT linearity refer to 3.1"Electric"after 30min of vibration from X,Y,Z direction with 20m/s², 10~55Hz; * Judgment: No functional abnormalities, Accept. 	
Package Drop	<ul style="list-style-type: none"> * Drop from height of 90cm 7 times for each package (1 corner, 2 edges and 4 surface); * Judgment: No Break or Crack, Accept. 	

6. Packing and Label

TBD

7. Quality Guarantee

7.1 Sampling Plan

- Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E LEVEL II;
Lot size: Quantity per shipment as one lot (different model as different lot).
- Sampling type: Normal inspection, single sampling.
- Sampling level: Level II.
- AQL: Acceptable Quality Level.
- The defects classify of AQL as following:
Major defect (function defects): AQL=0.65 ;
Minor defect (Appearance defects): AQL=1.5.

7.2 Statement

24months guarantee after shipment in storage, shipment conditions described in this document.

In case General Electrical Touch is responsible for the failure or problem, General Electrical Touch should repair the failed product or exchange with a good product.

General Electrical Touch should not be held responsible for failures as below:

- I. Improper installation.
- II. Goods are changed, repaired, or improved by third party.
- III. Causes of pressure or damage from outside of the product.
- IV. Incident, misuse, careless, fire, flooding, or other natural disaster.
- V. In case of Over guarantee period (2 Years).
- VI. In case of Over Product Storage Standard (2 Years).

8. Miscellaneous

8.1 General requirements

- i. General procedure for un-described flaws
Permitted deviations should be agreed upon between customer and manufacturer. The overall impression must correspond to the permitted flaws.
- ii. Gloss level deviation: according to agreement.

8.2 Nonconforming Analysis & Deal With Manners

8.2.1 Nonconforming analysis:

- i. Purchaser should supply the detail data of non -conforming sample and the non - suitable state.
- ii. After accepting the detail data from purchaser, the analysis of nonconforming should be finished in two weeks.
- iii. If supplier cannot finish analysis on time, must announce purchaser before two weeks.

8.2.2 Disposition of nonconforming:

- i. If find any product defect of supplier during assembly time, supplier must change the good product for every defect after recognition.
- ii. Both supplier and customer should analyze the reason and discuss the disposition of nonconforming when the reason of nonconforming is not sure.

9. Display Specification

The BOE GT070WVM-N10 display specification is added on the next 27 pages.

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SPEC. NUMBER

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PRODUCT GROUP

TFT- LCD

REV.

P0

ISSUE DATE

2019.06.11

PAGE

1 OF 27

B3 GT070WVM-N10 Specification Rev.P0

SUPPLIER

• HEFEI BOE Optoelectronics Technology CO., LTD

FG-Code

GT070WVM-N10-DGP0

ITEM BUYER SIGNATURE DATE

ITEM SUPPLIER SIGNATURE DATE

Prepared _____

Reviewed _____

Approved _____

PAGE
2 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

Contents

No.	Items	Page
1.0	General Description	4
2.0	Absolute Maximum ratings	6
3.0	Electrical specifications.	7
4.0	Interface Connection	9
5.0	Signal Timing Specifications	11
6.0	Power Sequence	12
7.0	Optical specifications.	13
8.0	Mechanical Characteristics	17
9.0	Reliability Test	18
10.0	Precautions	19
11.0	Label	23
12.0	Packing information	25
13.0	Mechanical Outline Dimension	26

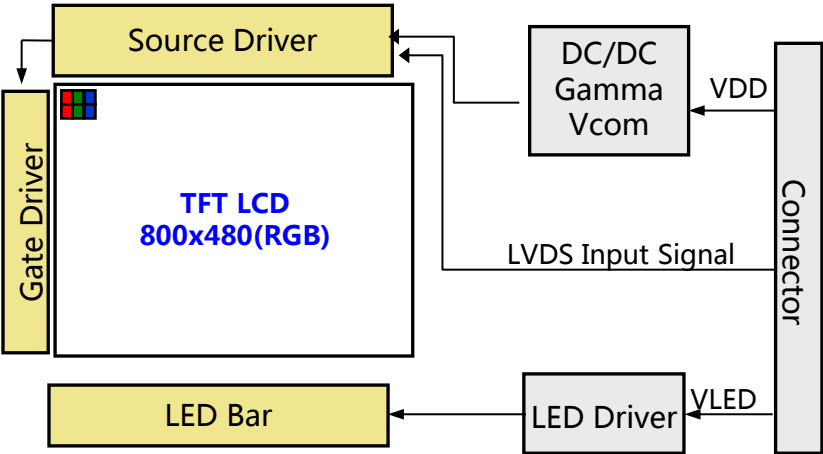
SPEC. NUMBER S801-5126	SPEC TITLE GT070WVM-N10 Product Specification	PAGE 3 OF 27
---------------------------	--	-----------------

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

1.0 GENERAL DESCRIPTION

1.0.1 Introduction

GT070WVM-N10 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 7diagonally measured active area with XGA resolutions (800 horizontal by 480 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7 M colors.



1.0.2 Features （根据产品特性填写关键描述）

- LED back-light
- RGB interface
- RoHS Compliant

1.0.3 Application

- （根据客户使用场景填写）

SPEC. NUMBER	SPEC TITLE	PAGE
S801-5126	GT070WVM-N10 Product Specification	4 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

1.0.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	154.08(H)*85.92(V)	mm	
Number of pixels	800(H) X480 (V)	Pixels	
Pixel pitch	0.1926(H)*0.179(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M	Colors	8bit
Display mode	Normally White		
Dimensional outline	164.9(H) × 100(V) × 5.7(D) typ.	mm	
Weight	160	g	
Surface treatment	Haze 25%, 3H		
Back-light	Edge side, 1-LED Lighting Bar Type		18*LED

SPEC. NUMBER S801-5126	SPEC TITLE GT070WVM-N10 Product Specification	PAGE 5 OF 27
---------------------------	--	-----------------

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Environment Absolute Maximum Ratings> [Ta =25±2 ℃]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Back-light Power Supply Voltage	HV _{DDOUT}	-0.3	24	V	Ta = 25 ℃ Note 1&2
Back-light LED Current	I _{HVDD}	-	-	mA	
Back-light LED Reverse Voltage	V _R	-	40	V	
Operating Temperature	T _{OP}	-20	70	℃	Panel担当 确认更新 是否标注温 湿曲线图
Storage Temperature	T _{ST}	-30	80	℃	
Operating Ambient Humidity	Hop	10	90	%RH	
Storage Humidity	Hst	10	90	%RH	

Note:

- These range above is maximum value not the actual operating temperature . Actual Operating temperature is no more than 40℃ and temperature refers to the LCM surface temperature ;
- BOE is not responsible for product problems beyond the use conditions.

SPEC. NUMBER S801-5126	SPEC TITLE GT070WVM-N10 Product Specification	PAGE 6 OF 27
---------------------------	--	-----------------

3.0 ELECTRICAL SPECIFICATIONS

3.0.1 TFT LCD Module

< Table 3. LCD Module Electrical Specifications >

[Ta =25±2 °C]

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	V _{DD}	3.0	3.3	3.6	V	Note 1
Power Supply Current	I _{DD}	-	520	700	mA	
Positive-going Input Threshold Voltage	V _{IT+}	-		+100	mV	V _{com} = 1.2V typ.
Negative-going Input Threshold Voltage	V _{IT-}	-100		-	mV	
Differential input common mode voltage	V _{com}		1.2		V	V _{IH} =100mV, V _{IL} =-100mV

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.3V at 25 °C
Max value at Black Pattern

3.2 Back-light Unit

< Table 4. LED Driving guideline specifications >

Ta=25+/-2°C

Parameter			Min.	Typ.	Max.	Unit	Remarks
Power supply voltage for Back light		V _{LED}	8.1	9.3	9.9	V	
Power supply Current for Back light		I _{LED}	-	160	-	mA	
Power supply for Back light		P _{LED}	1.296	1.488	1.584	W	Note 1
EN Control Level	Backlight on	V _{ENH}	2	-	-	V	EN logic high voltage
	Backlight off	V _{ENL}	-	-	0.6	V	EN logic low voltage
PWM Control Level	PWM High Level	V _{PML}	2	-	-	V	
	PWM Low Level	V _{PML}	-	-	0.6	V	
PWM Control Frequency		F _{PWM}	0.12	-	1	KHz	
Duty Ratio		-	5	-	100	%	

Notes : 1. Calculator Value for reference $I_{LED} \times V_{LED} = P_{LED}$

2. The LED Life-time define as the estimated time to 50% degradation of initial luminous under the condition of the ambient temperature of 25°C.

4.0 INTERFACE CONNECTION.
4.0.1 Electrical Interface Connection

根据IC规格填写
The electronics interface connector is FH34S_20P-0.5mm.

<Table 6. Pin Assignments for the Interface Connector>

Terminals	Symbol	Functions	Terminal	Symbol	Functions
Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	LEDA	Led anode	26	G1	Green data
2	LEDA	Led anode	27	G0	Green data
3	LEDK	Led cathode	28	R7	Red data
4	LEDK	Led cathode	29	R6	Red data
5	GND	Ground	30	R5	Red data
6	VCOM	Common voltage input	31	R4	Red data
7	VDD	Power Supply	32	R3	Red data
8	MODE	DE / SYNC mode select	33	R2	Red data
9	DE	Data Input Enable	34	R1	Red data
10	VS	Vertical Sync input.	35	R0	Red data
11	HS	Horizontal Sync input	36	GND	Ground
12	B7	Blue data	37	DCLK	Data clock
13	B6	Blue data	38	GND	Ground
14	B5	Blue data	39	L/R	Source Right or Left sequence control
15	B4	Blue data	40	U/D	Gate Up or Down scan control
16	B3	Blue data	41	VGH	Positive power of TFT
17	B2	Blue data	42	VGL	Negative power of TFT
18	B1	Blue data	43	AVDD	Analog power supply
19	B0	Blue data	44	RESET	Global reset pin.
20	G7	Green data	45	DUMMY	No Connection
21	G6	Green data	46	VCOM	Common voltage input
22	G5	Green data	47	DITHB	Disable internal dithering function.
23	G4	Green data	48	GND	Ground
24	G3	Green data	49	DUMMY	No Connection
25	G2	Green data	50	DUMMY	No Connection

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

4.2 Data Input Format

Figure 5. Pixel Format

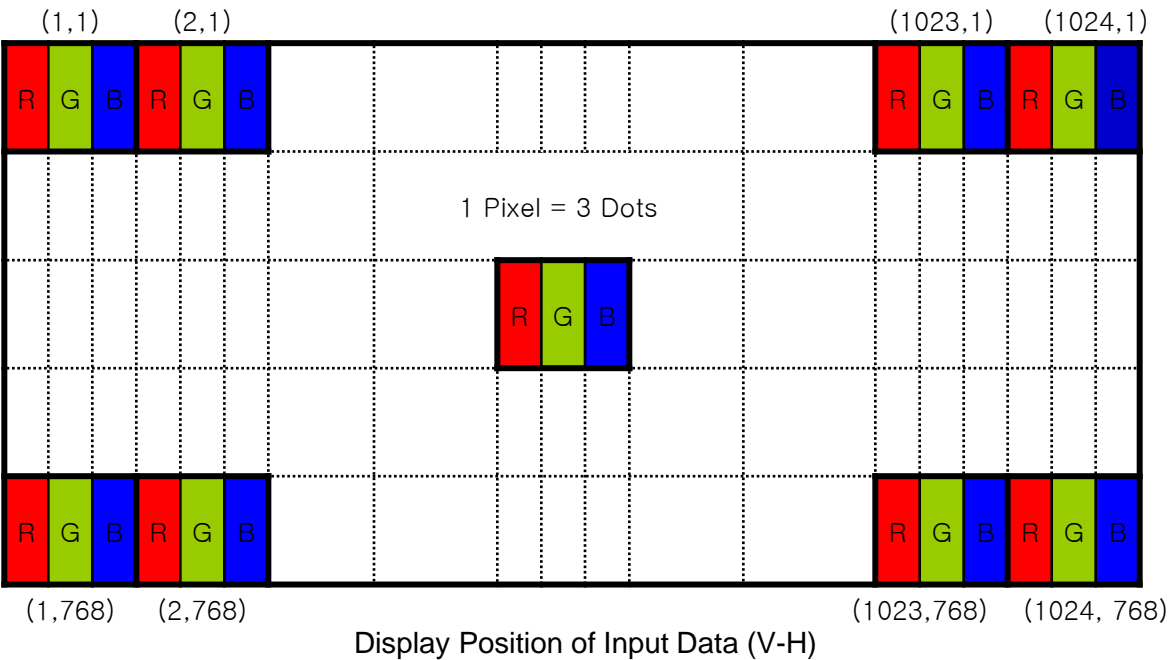
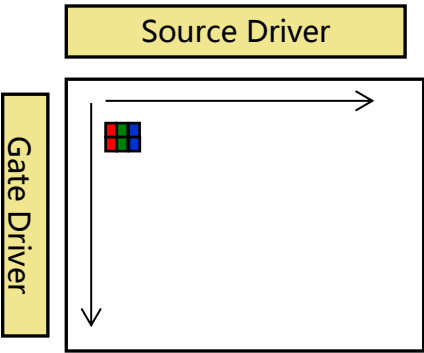


Figure 6. Scan direction



SPEC. NUMBER	SPEC TITLE	PAGE
S801-5126	GT070WVM-N10 Product Specification	10 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

5.0 SIGNAL TIMING SPECIFICATION

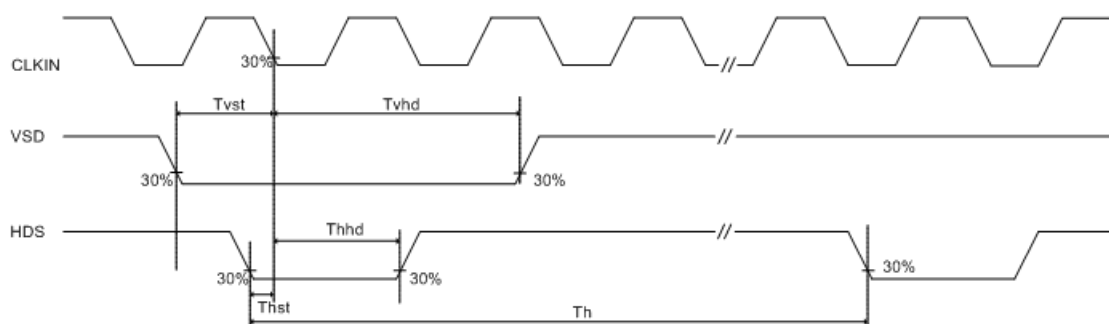
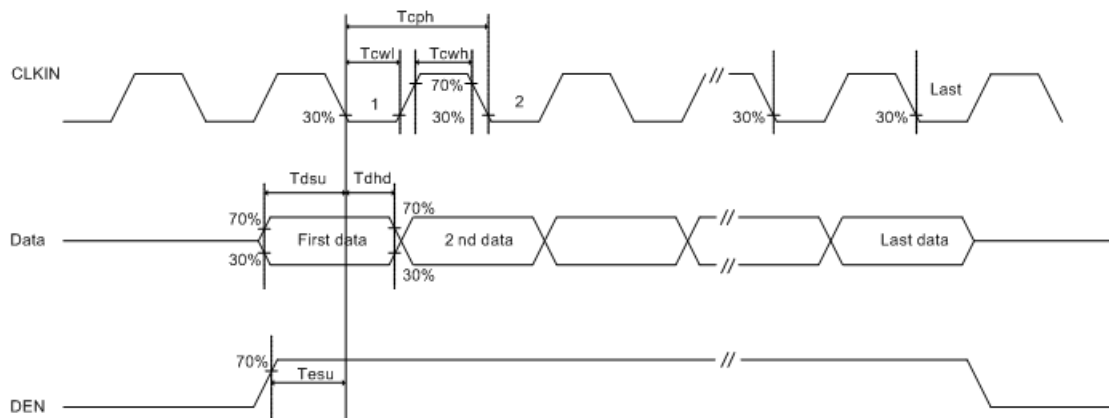
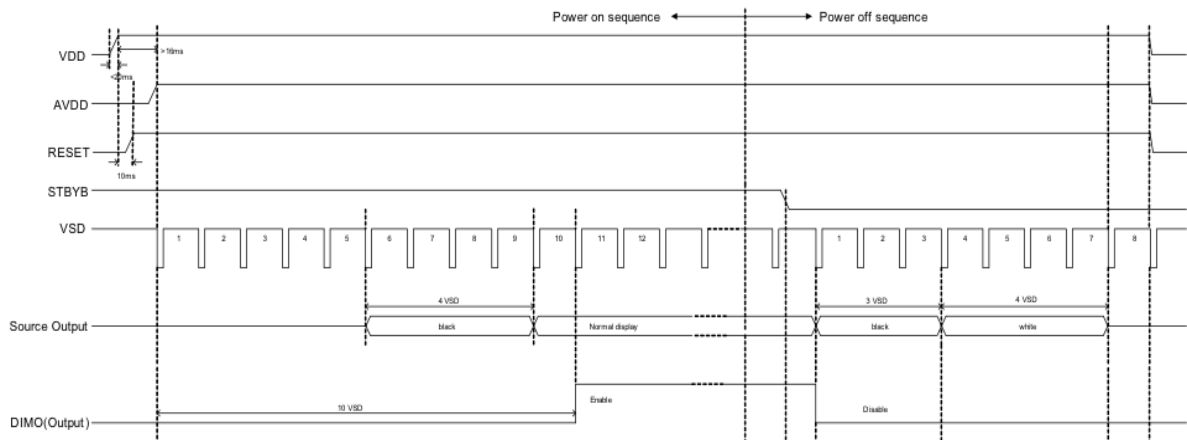
5.0.1 The GT070WVM-N10 is operated by the DE only.

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	28.2	29.2	40	MHz
Horizontal display area	thd	800			pixel
HSYNC period time	th	908	928	1088	pixel
HSYNC blanking	thb+ thfp	88	88	88	pixel
Vertical display area	Tvd	480			H
Frequency	fV	-	60	-	Hz
VSYNC period time	Tv	517	525	613	H
VSYNC blanking	Tvb+ Tvfp	-	32	-	H

SPEC. NUMBER S801-5126	SPEC TITLE GT070WVM-N10 Product Specification	PAGE 11 OF 27
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6.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off



7.0 OPTICAL SPECIFICATION

7.0.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance $\leq 1\text{lux}$ and temperature = $25\pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCON CS2000/CA310) 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° . We refer to $\theta\varnothing=0$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta\varnothing=90$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta\varnothing=180$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta\varnothing=270$ ($=\theta_6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or \varnothing , the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity (etc) should be tested by CS2000/CA310. The backlight should be operating for 10 minutes prior to measurement. VDD shall be $3.3 \pm 0.3\text{V}$ at 25°C . Optimum viewing angle direction is 6 'clock

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	-	70	-	Deg.	Note 1
		Θ_9		-	70	-	Deg.	
	Vertical	Θ_{12}		-	70	-	Deg.	
		Θ_6		-	70	-	Deg.	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$	400	600	-		Note 2
Luminance of White	Center	Y_w	$\Theta = 0^\circ$	400	500	-	cd/m ²	Note 3
White Luminance uniformity	9 Points	ΔY_9		70	75	-	%	Note 4
Color Gamut	NTSC	CIE1931	$\Theta = 0^\circ$	45	50	-	%	Note 5
Reproduction of color	White	W_x	$\Theta = 0^\circ$	Typ -0.05	0.313	Typ +0.05		
		W_y			0.329			
Response Time		Tr+Td	Ta= 25° C $\Theta = 0^\circ$	-	25	30	ms	Note 6

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles 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 (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ 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 . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. Luminance of white is defined as luminance values of center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display. The luminance is measured by CS2000/CA310 when the LED current is set at 160mA.

4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \frac{\text{Minimum Luminance of 9 Points points}}{\text{Maximum Luminance of 9 Points points}}$ (See FIGURE 2).

5. The color chromaticity coordinates specified in Table 5. 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 panel.

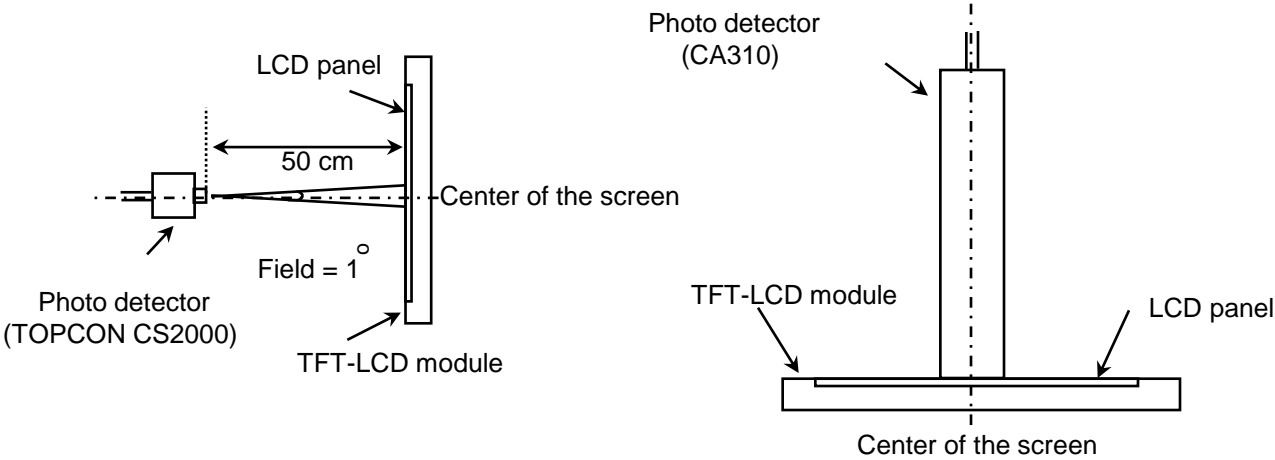
6. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_d .

SPEC. NUMBER	SPEC TITLE	PAGE
S801-5126	GT070WVM-N10 Product Specification	14 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

7.0.2 Optical measurements

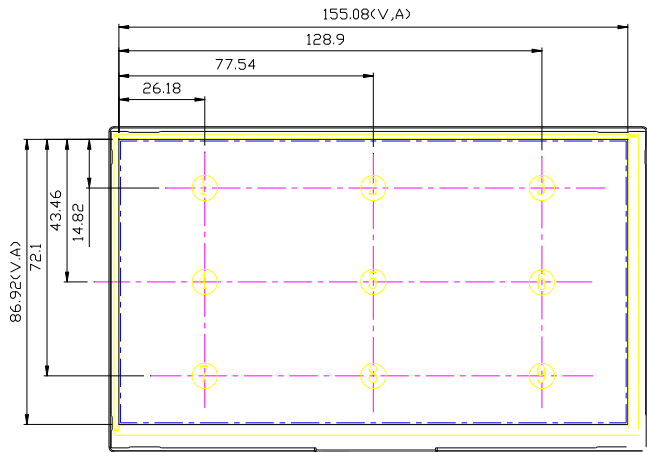
Figure 1. Measurement Set Up



View angel range, uniformity, etc. measurement setup Flicker, measurement setup

Figure 2. White Luminance and Uniformity Measurement Locations (9 points)

根据客户需求 填写
9points位置，更新示意图



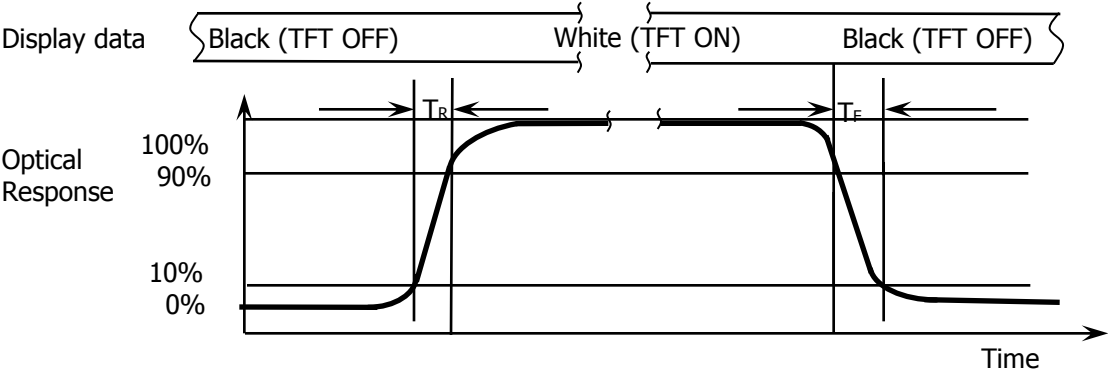
Luminance of white is defined as luminance values of center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

The White luminance uniformity on LCD surface is then expressed as : $\Delta Y9 = \text{Minimum Luminance of 9 points} / \text{Maximum Luminance of 9points}$ (see FIGURE 2).

SPEC. NUMBER	SPEC TITLE	PAGE
S801-5126	GT070WVM-N10 Product Specification	15 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

Figure 3. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 3 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r and 90% to 10% is T_d .

SPEC. NUMBER	SPEC TITLE	PAGE
S801-5126	GT070WVM-N10 Product Specification	16 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

8.0 MECHANICAL CHARACTERISTICS FOG产品去除此项

8.0.1 Dimensional Requirements

7inch产品 规格参考, 不同产品存在差异
<Table 8. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	154.08(H)*85.92(V)	mm
Number of pixels	800(H) X480 (V)	
Pixel pitch	0.1926(H)*0.179(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display colors	16.7M (8bit)	colors
Display mode	Normally White	
Dimensional outline	164.9(H) × 100(V) × 5.7(D) typ.	
Weight	160	gram
Back-light	Edge side, 1-LED Lighting Bar Type	

SPEC. NUMBER S801-5126	SPEC TITLE GT070WVM-N10 Product Specification	PAGE 17 OF 27
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9.0 RELIABILITY TEST （以客户规格为主，若客户无具体规格，以厂内标准为准）

The Reliability test items and its conditions are shown in below.

<Table 9. Reliability test>

No	Test Items	Conditions	Remark
1	High temperature storage test	Ta = 80℃, 240 hrs	根据客户规格更新
2	Low temperature storage test	Ta = -30℃, 240 hrs	
3	High temperature operation test	Ta = 70℃, 240 hrs	
4	Low temperature operation test	Ta = -20℃, 240 hrs	
5	High temperature & high humidity operation test	Ta = 60℃, 90%RH, 240 hrs	
6	Thermal shock	Ta = -30℃ ↔ 80℃ (0.5 hr), 100 cycle	Non-operation
7	Image Sticking	5*5 Pattern, 2hrs 25℃ ± 2℃ check pattern Gray 127, after 5 mins, the mura must be disappeared completely	根据客户规格更新
8	ESD test	Air Voltage: ± 8KV & ± 15KV Contact Voltage: ± 8KV R: 330Ω C: 150pF 5 time	
9	Vibration Test	Random: 0.015G ² /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ 8H	

Note : After the reliability test, the product only guarantee function normally without any fatal defect (non-display, line defect, abnormal display etc). All the cosmetic specification is judged before the reliability test.

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

10.0 General Precautions

10.1 Handing

- (1) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (2) You must mount a module using specified mounting holes (Details refer to the drawings).
- (3) Please make sure to avoid external forces applied to the **Source PCB or FPC** and D-IC during the process of handling or assembling. If not, It causes panel damage or malfunction.
- (4) Note that **polarizers** are very fragile and could be easily damaged. Do not touch, push or rub the exposed **polarizers** with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
- (5) Do not pull or fold the source D-IC which connect the **source PCB or FPC** and the panel. Do not pull or fold the LED wire.
- (6) After removing the protective film, when the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with alcohol or purified water. Do not strong polar solvent because they cause chemical damage to the **polarizer**.
- (7) Wipe off saliva or water drops as soon as possible. Their long time contact with **polarizer** causes deformations and color fading.
- (8) Protection film for **polarizer** on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (9) Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.
- (10) Do not disassemble the **module**.
- (11) To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- (12) If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.
- (13) Do not drop water or any chemicals onto the LCD's surface.
- (14) The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.

注：① (4)(6)(7)(8) 涉及到**Pol**相关条目适用于**OC/MDL**出货产品，针对**Q/Single**建议将**pol**改为**LCD surface**，同时删除第8条
 ②第(14)条适用于**Q/Single**出货产品（**MDL/OC**可去除此条）

SPEC. NUMBER	SPEC TITLE	PAGE
S801-5126	GT070WVM-N10 Product Specification	19 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

10.2 Operating Precautions

- (1) 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.
- (2) 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 minimized the interference.
- (3) The electrochemical reaction caused by DC voltage will lead to LCD degradation, so DC drive should be avoided.
- (4) The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- (5) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (6) Design the length of cable to connect between the [connector](#) for back-light and the converter as short as possible and the shorter cable shall be connected directly.
The longer cable between that of back-light and that of converter may cause the luminance of LED to lower and need a higher startup voltage(Vs).
- (7) [Connectors](#) are precise devices for connecting [PCB](#) and transmitting electrical signals. Operators should insert and unplug MDL in parallel when assembling MDL.
- (8) Do not connect or disconnect the cable to/ from the module at the "Power On" condition.
- (9) When the module is operating, do not [lose CLK, ENAB signals](#). If any one these signals is lost, the LCD panel would be damaged.
- (10) Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- (11) Do not re-adjust variable resistor or switch etc.

注：①(1)涉及到Pol相关条目适用于OC/MDL出货产品，
②(6)(7)涉及到connector相关适用于OC/MDL出货产品

10.3 Electrostatic Discharge Control

- (1) 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. Keep products as far away from static electricity as possible.
- (2) Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

SPEC. NUMBER	SPEC TITLE	PAGE
S801-5126	GT070WVM-N10 Product Specification	20 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

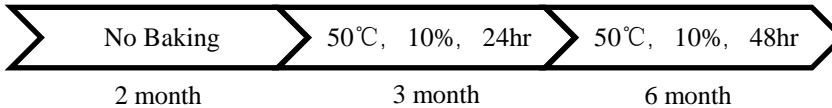
10.4 Precautions for Strong Light Exposure

Strong light exposure causes degradation of **polarizer** and color filter. It is not allowed to store or run directly in strong light or in high temperature and humidity for a long time

10.5 Storage Precautions

When storing modules as spares for a long time, the following precautions are necessary.

- (1) The **polarizer** 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.
Temperature : 5 ~ 40 °C
- (2) Humidity : 35 ~ 75 %RH
- (3) Period : 6 months (参考常规 , 建议半年)
- (4) Control of ventilation and temperature is necessary.
- (5) Please make sure to protect the product from strong light exposure, water or moisture.
Be careful for condensation.
- (6) Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
- (7) Do not store the LCD near organic solvents or corrosive gasses.
- (8) Please keep the **Modules/OC/FOG** at a circumstance shown below Fig.



10.6 Handling Precautions for Protection Film (适用通用产品 , 含Q/Single Production)

- (1) Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- (2) In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

10.7 Operation Condition Guide

- (1) Normal operating condition
 - Temperature: 0 ~ 40°C
 - Operating Ambient Humidity : 10 ~ 90 %
 - Display pattern: dynamic pattern (Real display)
 - Suitable operating time: under 8 hours a day. (结合具体项目制定相应建议时间)
- (2) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc., It is strongly recommended to contact BOE for Application engineering advice. Otherwise, its reliability and function may not be guaranteed.
- (3) Black image or moving image is strongly recommended as a screen save.

SPEC. NUMBER	SPEC TITLE	PAGE
S801-5126	GT070WVM-N10 Product Specification	21 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

- (4) Lifetime in this spec. is guaranteed only when Commercial Display is used according to operating usages.
- (5) Please contract BOE in advance when you want to switch between portrait and landscape screen (横竖屏兼容设计可删除此项)
- (6) Please contact BOE in advance for outdoor operation. (产品规定室内使用保留此项)
- (7) Please contact BOE in advance when you display the same pattern for a long time.
- (8) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen. To avoid image sticking, it is recommended to use a screen saver.
- (9) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (10) Dew drop atmosphere should be avoided.
- (11) The storage room should be equipped with a good ventilation facility, which has a temperature controlling system.
- (12) When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- (13) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.

10.8 Others

- (1)When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.
- (2) In order to prevent potential problems, flicker should be adjusted by optimizing the Vcom value in customer LCM Line (适用于Q/Single/OC出货产品)
- (3) 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.
- (4) For the crash damaged or unnecessary LCD, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.
- (5) If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
- (6) If the liquid crystal should get in your eyes, flush your eyes with running water for at least fifteen minutes.

SPEC. NUMBER	SPEC TITLE	PAGE
S801-5126	GT070WVM-N10 Product Specification	22 OF 27

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

11.0 LABEL

(1) Product label



1	2	3	4	5	6	7
X	X	X	X	X	X	X

Type designation	No 5. Month (1, 2, 3, ..., 9, X, Y, Z)
No 1. Control Number	No 6. Product Identification (FG)
No 2. Rank / Grade	No 7. Serial Number
No 3. Line classification (BOE OT:A/BC)	
No 4. Year (10 : 2010, 11: 2011, ...)	

(2) High voltage caution label

	HIGH VOLTAGE CAUTION	COLD CATHODE FLUORESCENT LAMP IN LCD PANEL CONTAINS A SMALL AMOUNT OF MERCURY. PLEASE FOLLOW LOCAL OR- DINANCES OR REGULATIONS FOR DISPOSAL.
	RISK OF ELECTRIC SHOCK. DISCONNECT THE ELECTRIC POWER BEFORE SERVICING	

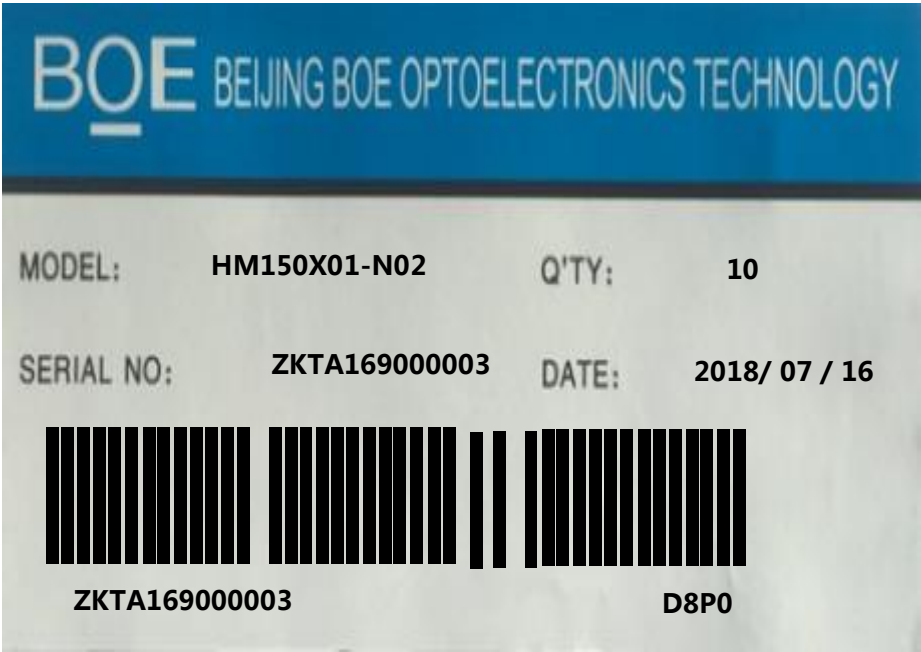
SPEC. NUMBER S801-5126	SPEC TITLE GT070WVM-N10 Product Specification	PAGE 23 OF 27
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BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

(3) Box label

Label Size: 110 mm (L) × 56 mm (W)

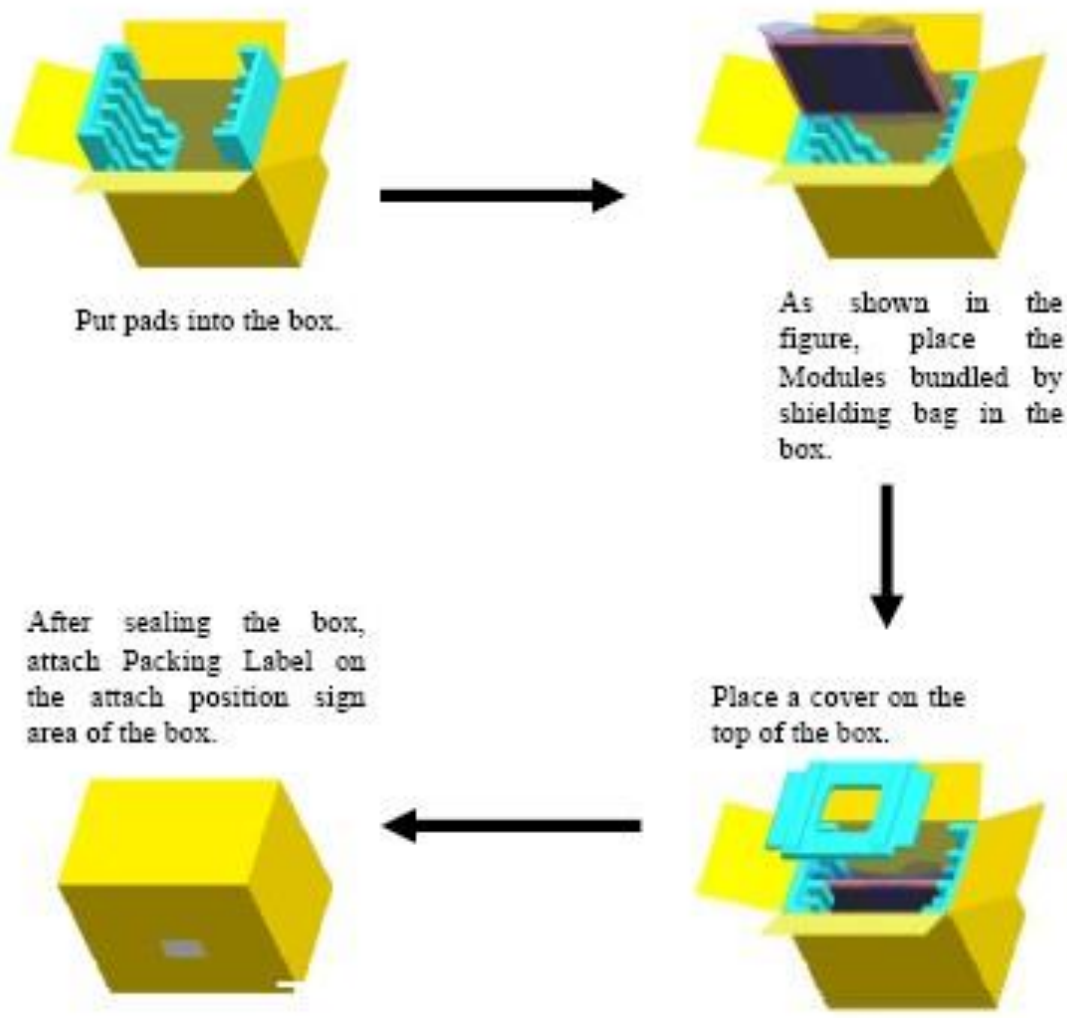
Contents
Model: **HM150X01-N02**
Q`ty: Module Q`ty in one box
Date: Packing Date
Internal use of Product



SPEC. NUMBER S801-5126	SPEC TITLE GT070WVM-N10 Product Specification	PAGE 24 OF 27
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BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

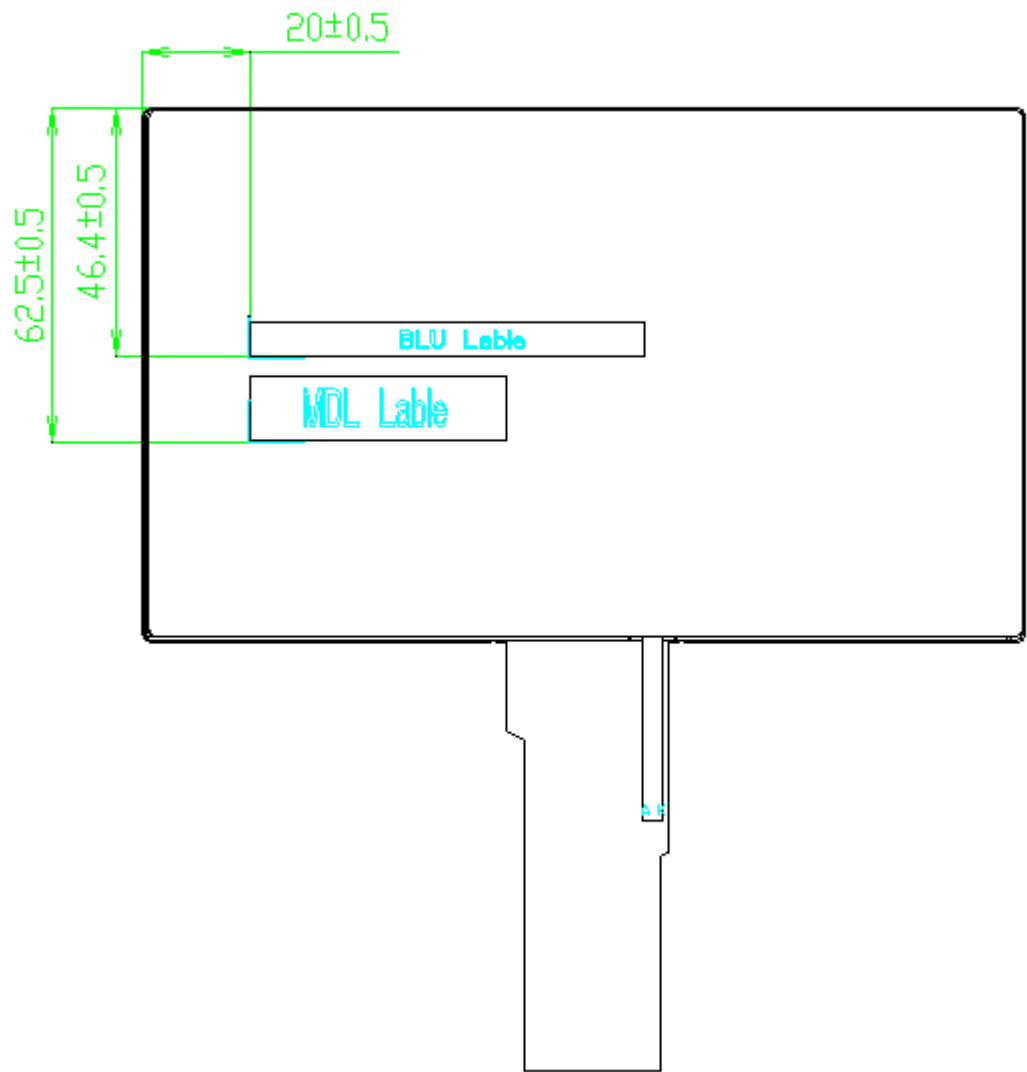
12.0 PACKING INFORMATION



SPEC. NUMBER S801-5126	SPEC TITLE GT070WVM-N10 Product Specification	PAGE 25 OF 27
---------------------------	--	------------------

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	P0	2019.06.11

Figure 6. TFT-LCD Module Outline Dimensions (Rear view)



SPEC. NUMBER S801-5126	SPEC TITLE GT070WVM-N10 Product Specification	PAGE 27 OF 27
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