

Specification

Module No. : GEA-070C01-DC9509-G020

Version No. : A2

Client Confirmation	Approved by	Prepared by
	Carl Chen	Dou Zhang

Issue History

Version	History	Date	Remarks
A1	First Issue	2021/03/20	
A2	Updated 3.Electrical Specifications Added 4.Optical Specifications Removed 5.General Precaution Added 6.1 Label&6.3 Firmware Version	2023/04/12	

CONTENTS

1. Overview	4
2. Feature	5
2.1 Module Structure	5
2.2 General Specifications	5
3. Electrical Specifications	6
3.1 Display Electrical Specifications	6
3.1.1 Power Specification	6
3.1.2 Backlight Unit	7
3.1.3 Electrical Interface Connection	8
3.1.4 Display Timing Specifications	10
3.1.5 Power ON/OFF Sequence	10
3.2 Touch Panel Interface Connection	12
3.2.1 Interface Connection	12
3.2.2 Connector Pins Definition	12
3.2.3 I ² C Interface	12
4. Optical Specifications	13
4.1 Display Optical Characteristics	13
4.2 Module Appearance Specifications	16
4.2.1 Terms Definition	16
4.2.2 Inspection Conditions	17
4.2.3 Printing Area Appearance Inspection Criteria	18
4.2.4 View Area Appearance Inspection Criteria	19
4.2.5 Glass Breakage	21
5. Reliability Test	22
6. Label, Package and Firmware Version	23
6.1 Label	23
6.1.1 Product Label Information	23
6.1.2 Product Label Size and Position	23
6.2 Package	24
6.2.1 Packaging Steps	24
6.2.2 Carton Information:	24
6.3 Firmware Version	24
7. Mechanical Drawing	25

1. Overview

This specification document is issued for the 7" TFT Liquid Crystal Display bonded with Capacitive-Type Touch Panel delivered by General Electrical Touch Co., Limited. This document defined the general provisions 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.

2. Feature

2.1 Module Structure

Main Component	Materials	Remarks
Cover Glass	1.1mm chemical strengthened glass	black printed board
Adhesive	OCA	0.175 mm
Touch Sensor	0.55mm DITO glass + COF FPC	SIS9509 Controller
Air Bonding Tape	3M 4905	0.50 mm
Display	TFT LCD	AUO G070VAN01.0

2.2 General Specifications

Item	Specifications	Remark
Display Active Area	152.40(H) × 91.44(V) mm	
Display Resolution	800(H) × 480 RGB(V)	
Pixel Pitch	0.1905(H) × 0.0635×RGB(V) mm	
Pixel Arrangement	R.G.B. Horizontal Stripe	
Display Colors	16.7M Colors	
Display Brightness	480 cd/m ²	Typ.
Display Mode	Normally Black	
Display Surface Treatment	Anti-Glare	
Electrical Interface	Display: LVDS	
	Touch: USB and I ² C	
Touch Activation	Multi-finger touch	
Touch Resolution	14X, 23Y	
Touch Controller	SIS9509	
Bonding Method	CG to touch sensor: optical bonding TP module to display: tape bonding	
Outline Dimension	185.00(H) × 116.80(V) × 12.33(Max) mm	

3. Electrical Specifications

3.1 Display Electrical Specifications

3.1.1 Power Specification

Input power specifications are shown as follows:

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	Note1
IVDD	Panel Current	-	140	200	[mA]	Note1,2,3
IVDD Inrush	Inrush Current	-	-	550	[mA]	Note 2
Digital input	Leakage current	-	-	50	[uA]	Note 2
Differential input		-	-	100	[uA]	Note 2
IVDD		-	-	300	[uA]	Note 2

All conditions should be set typical value.

The panel can operate normally in the recommended operating condition.

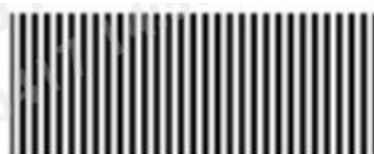
Note1: Test pattern is the following picture & typ. by VDD=3.3V & max by VDD=3.6V.

Note2: Operating temperature from -20°C to 70°C.

Note3: Panel loading of color bar pattern is close to typ spec, VBW pattern is close to max spec.



Color bar pattern



VBW pattern

3.1.2 Backlight Unit

Following characteristics are measured under a stable condition using an inverter at 25°C (Room Temperature).

Backlight driving conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
I_L	LED Supply Current	-	92		[mA]	Ta = 25°C, Note 2
V_L	LED Supply Voltage	-	22.4	25.2	[Volt]	Ta = 25°C Note 2/3
P_{LED}	LED Power Consumption		2.06		[Watt]	Ta = 25°C Note 3/4/5
L_L	LED Life Time	50000	70000		Hrs	Ta = 25°C, Note 6, Note 7

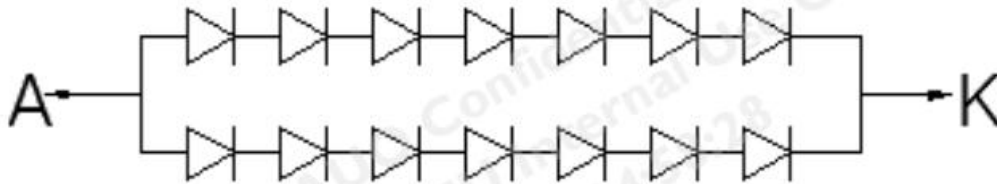
Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: I_L , V_L are defined for 2strings of LED.

Note 3: LED backlight is 14 LEDs (2strings, 7pcs for each string).

Note 4: The LED supply power is for 2strings of LED.

Note 5: The voltage capacity of LED driver IC must be over max. of LED Voltage.



Note 6: Definition of life time: Brightness becomes to 50% of its original value.

Note 7: If the display module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

3.1.3 Electrical Interface Connection

Connector model number: 093G30-00001A-M4

Manufacturer: CHIEF LAND Electronic CO., Ltd.

The LVDS connector interface pin assignments are listed in below table.

Pin no	Symbol	Function	Remark
1	NC	NOT CONNECT	Note 1
2	LED+	LED ANODE	
3	LED+	LED ANODE	
4	NC	NOT CONNECT	
5	NC	NOT CONNECT	
6	NC	NOT CONNECT	
7	LED-	LED KATHODE	
8	LED-	LED KATHODE	
9	VDD	Power supply +3.3V	
10	VDD	Power supply +3.3V	
11	GND	Ground	
12	GND	Ground	
13	RXIN0N	Negative LVDS differential input	
14	RXIN0P	Positive LVDS differential input	
15	GND	Ground	
16	RXIN1N	Negative LVDS differential input	
17	RXIN1P	Positive LVDS differential input	
18	GND	Ground	
19	RXIN2N	Negative LVDS differential input	
20	RXIN2P	Positive LVDS differential input	
21	GND	Ground	
22	RXCLKN	Negative LVDS differential clock input	
23	RXCLKP	Positive LVDS differential clock input	
24	GND	Ground	
25	RXIN3N	Negative LVDS differential input	
26	RXIN3P	Positive LVDS differential input	
27	GND	Ground	
28	SEL 6/8	Low or NC → 6bit input mode High → 8bit input mode	
29	NC	NOT CONNECT	Note 1
30	NC	NOT CONNECT	Note 1

Note 1: AUO internal engineering use



30pin start from left side of connector.

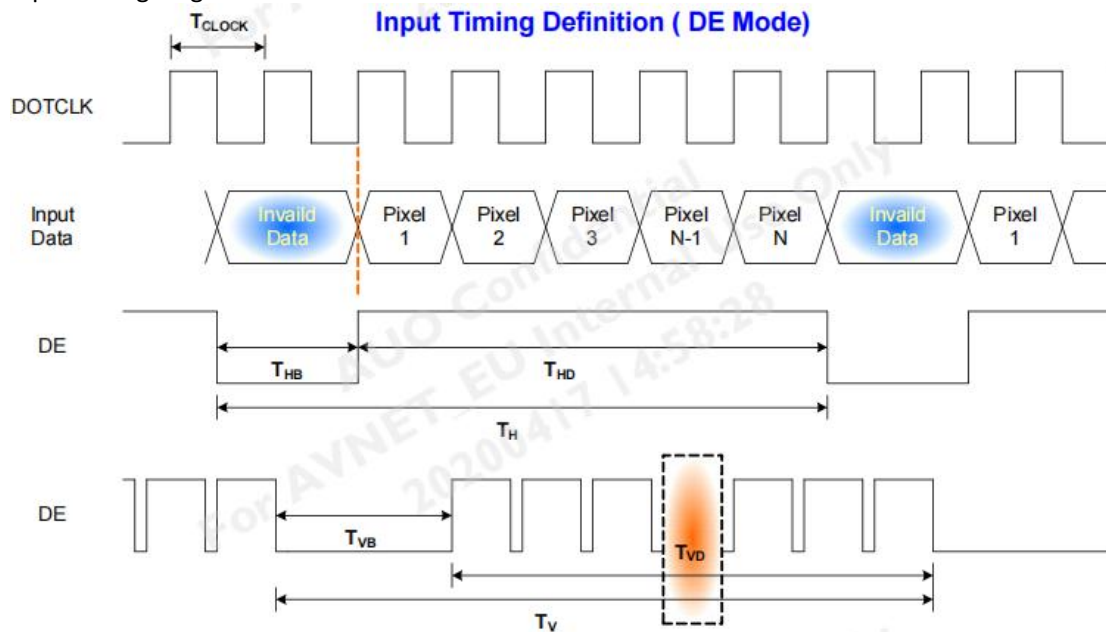
Note 2: Input signals shall be low or High-impedance state when VDD is off.

3.1.4 Display Timing Specifications

Signal		Symbol	Min.	Typ.	Max.	Unit
Clock Frequency		1/T _{Clock}	33.2	37	45	MHz
Vertical Section	Period	T _V	525	525	580	T _{Line}
	Active	T _{VD}	480			
	Blanking	T _{VB}	45	45	100	
Horizontal Section	Period	T _H	1054	1175	1395	T _{Clock}
	Active	T _{HD}	800			
	Blanking	T _{HB}	254	375	595	
Frame Rate		F	60			Hz

Note: DE mode.

Input timing diagram:

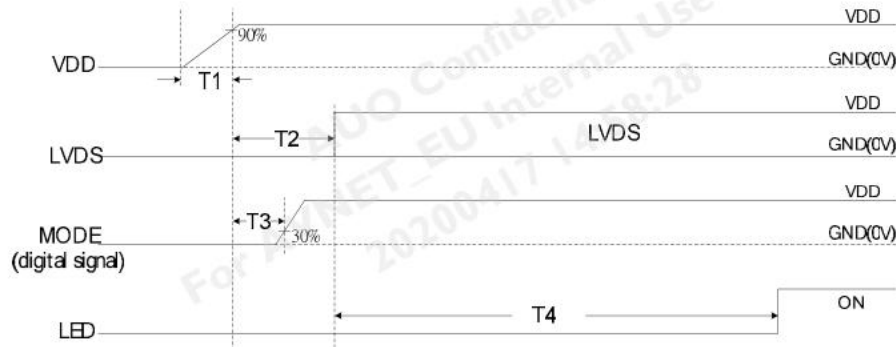


3.1.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.

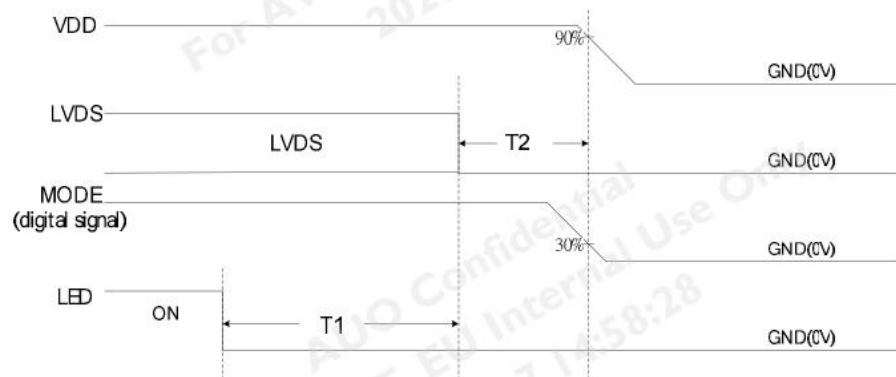
Panel Power on sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	1	-	-	ms
T2	7	-	-	ms
T3	0	-	-	ms
T4	300	-	-	ms



Panel Power off sequence:

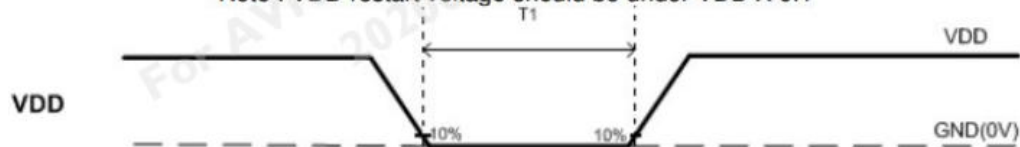
Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	350	-	-	ms
T2	0	-	-	ms



VDD ON/OFF:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	700	--	-	ms

Note : VDD restart voltage should be under VDD X 0.1



The above on/off sequence should be applied to avoid abnormal function in the display.
Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

3.2 Touch Panel Interface Connection

3.2.1 Interface Connection

Item	Specification	Remarks
FPC type	COF	
Connector	USB-MINI-B	
	Molex 53261-1071	or compatible
Communication	USB and I ² C	

3.2.2 Connector Pins Definition

<Molex 53261-1071 Pins Definition>

Pin	Definition	Description
1	V _{CC}	5V
2	USB Data+	
3	USB Data-	
4	SDA	I ² C serial data
5	SCL	I ² C serial clock
6	INT/CHG	Interrupt pin sending request to HOST
7	Reset	Low active power on reset signal
8	GPIO0	General purpose input/output port
9	GND	
10	GND-Shielding	

3.2.3 I²C Interface

Slaver address	0x5c(7-bits addressing, programmable)
Clock rate	@400 kHz(fast mode)
Interrupt mode	Default active low, level trigger
_CID	PNP0C50
_DSM	3CDF6F7-4267-4555-AD05-B30A3D8938DE
HID Descriptor address	0x0000

4. Optical Specifications

4.1 Display Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C (Room Temperature):

Item	Unit	Conditions		Min.	Typ.	Max.	Note
White Luminance	cd/m ²	I _{LED} =92mA(center point)		380	480		1
Uniformity	%	9 points			80		2,3
Contrast Ratio	—			1000	1300		4
Response Time	msec	Rising				11	5
		Falling				19	
		Rising + Falling				20	
Viewing Angle	degree	Horizontal CR >= 10	(Right)	70	89		6
			(Left)	70	89		
		Vertical CR >= 10	(Upper)	70	89		
			(Lower)	70	89		
Color / Chromaticity Coordinates (CIE 1931)	—	Red x		0.593	0.643	0.693	
		Red y		0.283	0.333	0.383	
		Green x		0.255	0.305	0.355	
		Green y		0.563	0.613	0.663	
		Blue x		0.105	0.155	0.205	
		Blue y		0.001	0.051	0.101	
		White x		0.257	0.307	0.357	
		White y		0.271	0.321	0.371	
Color Gamut	%				70		

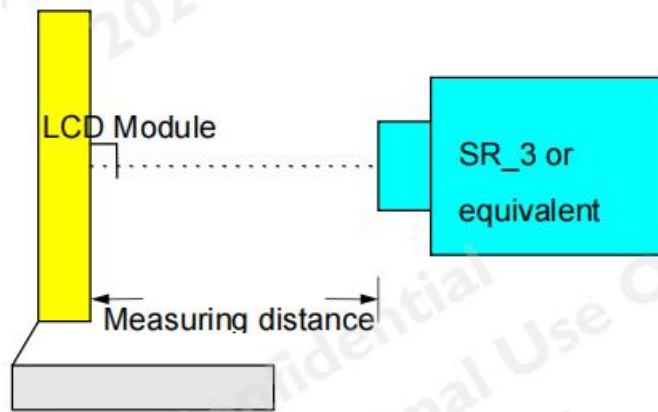
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

Aperture 1° with 50cm viewing distance

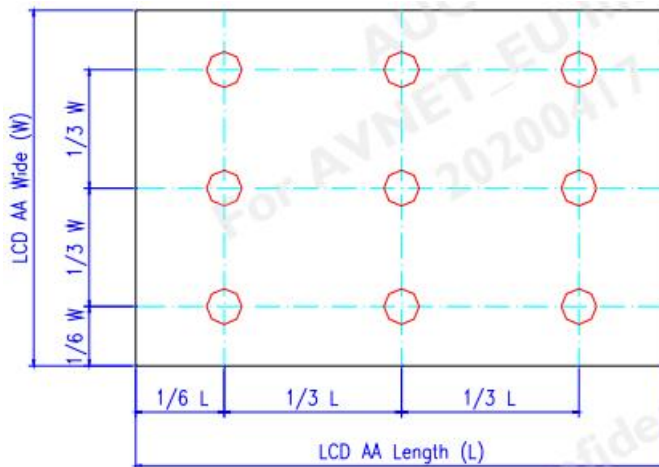
Test Point Center

Environment <1 lux



Module Driving Equipment

Note 2: Definition of 9 points position



Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance

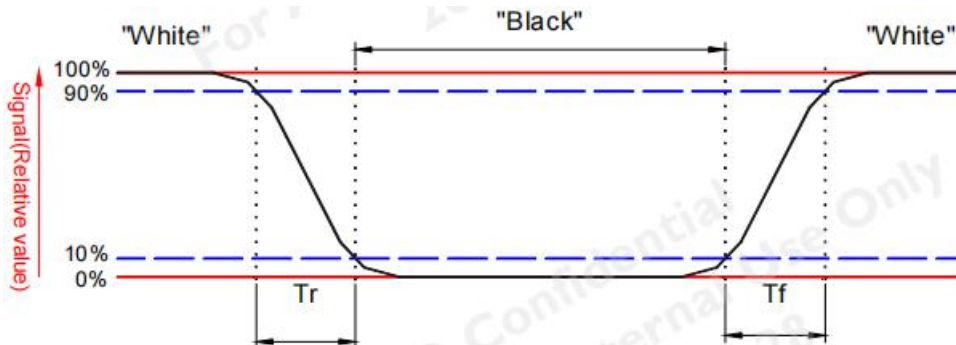
$$\delta_{w9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

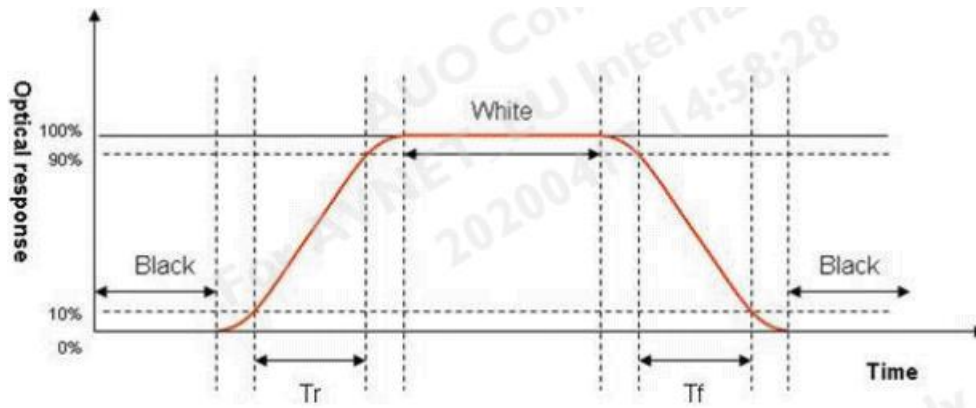
Note 4: Definition of contrast ratio (CR):

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

Note 5: Definition of response time:

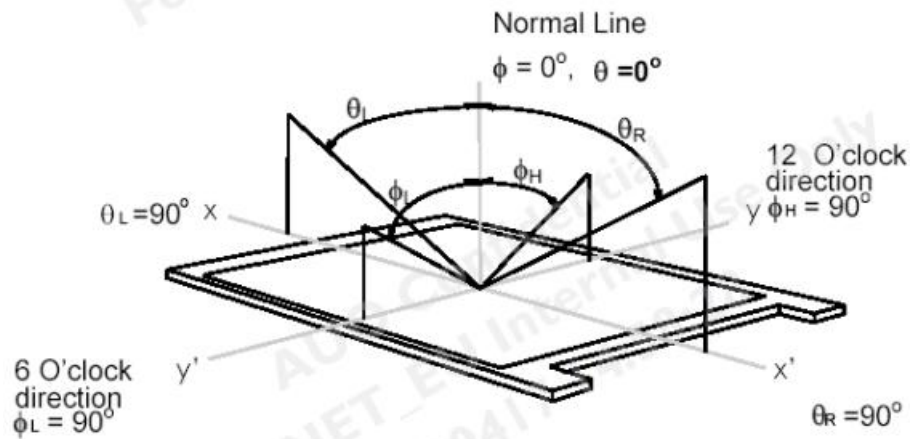
The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.





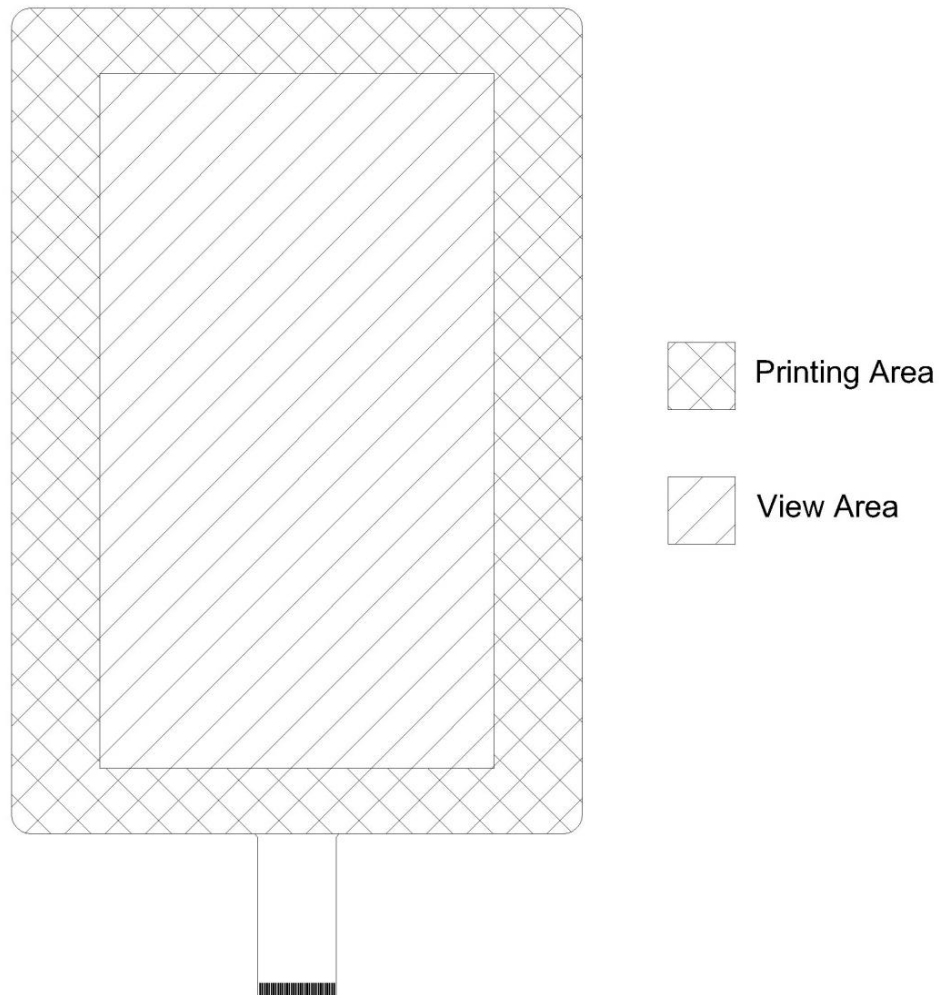
Note 6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (ϕ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.

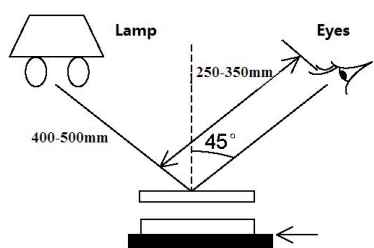
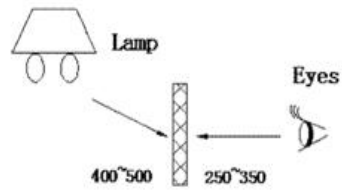


4.2 Module Appearance Specifications

4.2.1 Terms Definition



4.2.2 Inspection Conditions

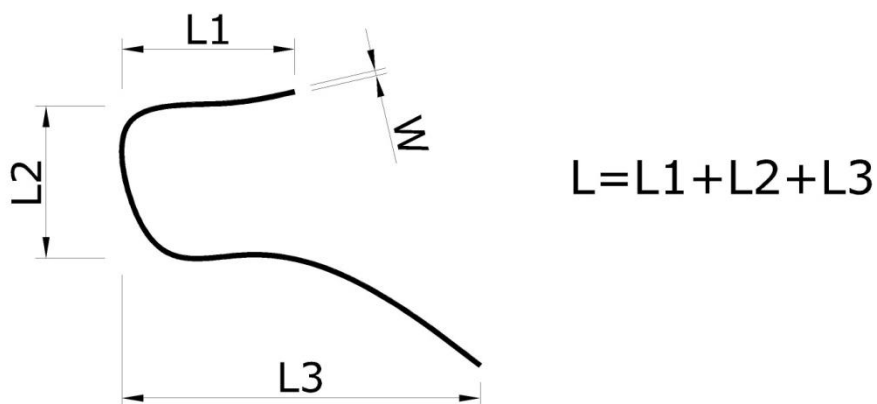
Items	Conditions	Remarks
Inspection Lamp	Florescent Cool White Lamp, 1000~1200Lux	
Inspection with Reflect Light (RL)	*Normal eyes level 1.0 (with Glasses accepted); *Distance between Lamp and product:40-50cm; *Distance between Eyes and Product:25-35cm; *Angle of view: 45°; *Black background; *Inspection time no more than 10s.	
Inspection with Through Light (TL)	*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.	

4.2.3 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 4.2.4 Liner-like Defects.	Eye view, dot/wire gauge
Dot-like Defects	RL	Refer to 4.2.4 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

4.2.4 View Area Appearance Inspection Criteria

(W=Width, L=Length)



<Liner-like Defects>

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.		

< Dot-like Defects>

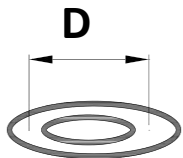
(D=Diameter)

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.	

< Stain and Dirty Mark>

Condition	Criteria
RL	* Stain and Dirty Mark refer to the visible contamination in mass, Dot-like contamination should be inspect as "Dot-like Defects"; *Contamination cannot be clean by soft cloth and alcohol, Not Allowed; *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.

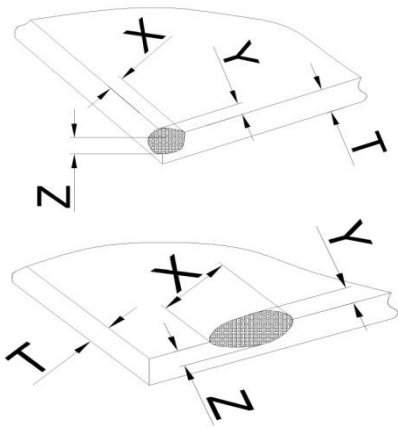
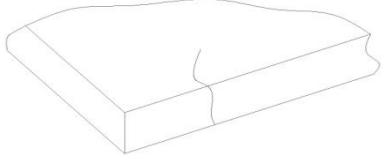
< Surface Fisheye>

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

<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 silver	Not Allowed
Mechanical damages on FPC(dent/kink)	Not Allowed
Glue residue, broken and oxidation on gold fingers	Not Allowed

4.2.5 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.	

5. Reliability Test

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

No	Test Items	Conditions
1	High temperature storage test	Ta =80℃, 240 hrs
2	Low temperature storage test	Ta =-30℃, 240 hrs
3	High temperature & high humidity operation test	Ta =60℃, 90%RH, 240hrs
4	High temperature operation test	Ta =70℃, 240hrs
5	Low temperature operation test	Ta =-20℃, 240hrs
6	Thermal shock	Ta = -30℃↔80℃ (0.5hr), 100 cycle
7	Vibration test	Frequency: 10~50 Hz Stoke: 1.5mm Sweep: 10~55~10 Hz
8	ESD test	Air Voltage: ±15KV Contact Voltage: ±8KV
9	Shock test (Non-Operating)	50G, 20ms, Half-sine wave, (±X, ±Y, ±Z)
10	Impact Resistance	Steel ball: 64 g Height: 30 cm

Note 1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost. Self-recoverable. No hardware failures.

Note 2:

- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD module capability.
- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.

6. Label, Package and Firmware Version

6.1 Label

6.1.1 Product Label Information



GEA-070C01-DC9509-G020

Product code.

SMT-DA-070N000-SU9509-5-3

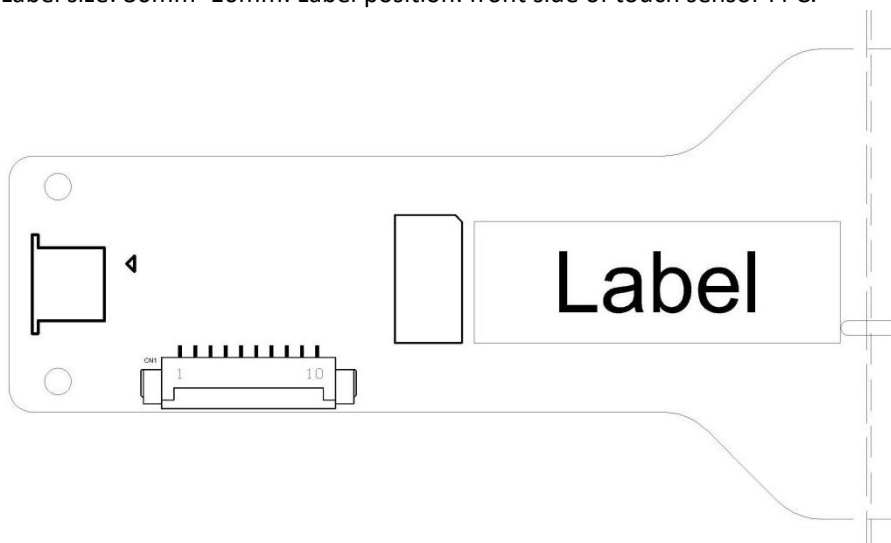
Touch sensor type for test.

07023110001CDC2

070: product active area size 2311: YYWW 0001: series number CDC2: internal code

6.1.2 Product Label Size and Position

Label size: 30mm*10mm. Label position: front side of touch sensor FPC.



6.2 Package

6.2.1 Packaging Steps

TBC

6.2.2 Carton Information:

Size	55*40*25 (L*W*H)	cm
Product QTY of full box	TBC	PCS
Total weight	TBC	kg
Single product weight	TBC	kg

6.3 Firmware Version

Fw_7_dual.bin



Fw_7_dual.bin

7. Mechanical Drawing

