General Electrical Touch Co., Limited
香港通用电子触控有限公司

/SIMPLEPLUS
Touch Displays

Specification

Module No. : GEA-101C01-DC9509-G020

Version No. : A2

Client Confirmation	Approved by	Prepared by
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Issue History

Version	History	Date	Remarks
A1	First Issue	2021/04/03	
A2	Updated 3.Electrical Specifications Added 4.Optical Specifications Removed 5.General Precaution Updated 5.Reliability Test Added 6.1 Label&6.3 Firmware Version	2023/07/14	

CONTENTS

1. Overview

This specification document is issued for the 10.1” 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	2mm chemical strengthened glass	black printed boarder
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 G101EAN02.1

2.2 General Specifications

Item	Specifications	Remark
Display Active Area	216.96(H) × 135.60(V) mm	
Display Resolution	1280(H) × 800(V)	
Pixel Pitch	0.1695 × 0.1695 mm	
Pixel Arrangement	R.G.B. Vertical Stripe	
Display Colors	16.7M colors (RGB 6-bit + Hi-FRC)	
Display Brightness	400 cd/m^2	Typ.
Display Mode	AHVA, Normally Black	
Display Surface Treatment	HC	
Electrical Interface	Display: LVDS 1Port 8bit	
	Touch: USB and I^2C	
Touch Activation	Multi-finger touch	
Touch Resolution	20X, 32Y	
Touch Controller	SIS9509	
Bonding Method	CG to touch sensor: optical bonding TP module to display: tape bonding	
Outline Dimension	248.20(H) × 170.00(V) × 8.03(Max) mm	

3. Electrical Specifications

3.1 Display Electrical Specifications

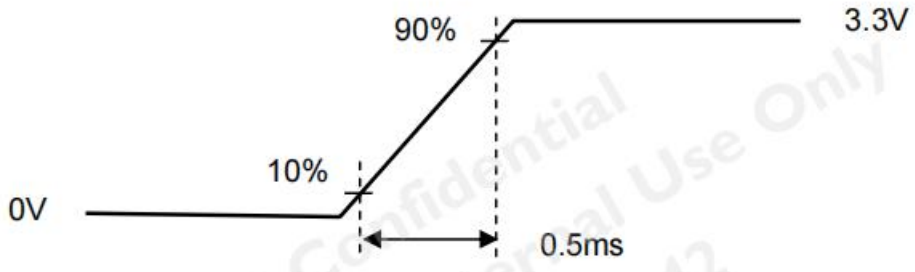
3.1.1 Power Specification

The power specification are measured under 25℃ and frame frequency under 60Hz.

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
IDD	VDD Current	-	278.7	303	[mA]	All White Pattern (VDD=3.3V, at 59.9Hz)
Irush	LCD Inrush Current	-	-	1500	[mA]	Note 1
PDD	VDD Power	-	0.92	1	[Watt]	All White Pattern (VDD=3.3V, at 59.9Hz)
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	All White Pattern (VDD=3.3V, at 59.9Hz)

Note 1:Maximum Measurement Condition: White Pattern at 3.3V driving voltage. (P_{max}= $V_{3.3}$ x I_{white})

Note 2: Measure Condition



VDD rising time

3.1.2 Backlight Unit

Parameter guideline for LED

Following characteristics are measured under a stable condition using an inverter at 25℃ (Room Temperature):

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
VLED	Input Voltage	10.8	12	13.2	[Volt]	
I_{VLED}	Input Current	---	188.75	204.19	[mA]	100% Brightness (VLED = 12V)
P_{VLED}	Power Consumption	---	2.265	2.45	[Watt]	100% Brightness (VLED = 12V)
I_F	LED Forward Current	---	22	---	[mA]	Ta = 25°C
VEN	LED Enable Input High Level	2.3	-	5.5	[Volt]	
	LED Enable Input Low Level	-	-	0.3	[Volt]	
VPWM	PWM Logic Input High Level	2.3	-	5.5	[Volt]	
	PWM Logic Input Low Level	-	-	0.3	[Volt]	
PWM Input Frequency	FPWM	200	-	20K	Hz	
PWM Duty Ratio	Duty	10		100	%	
Operation Life	---	20,000	30,000	---	Hrs	(Ta=25℃), Note 2 IF=22mA

Note 1: Ta means ambient temperature of TFT-LCD module.
Note 2: V_{LED}, I_{VLED}, P_{VLED} are defined for LED backlight.(100% duty of PWM dimming)
Note 3: If display module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.
Note 4: Operating life means brightness goes down to 50% initial brightness. Minimum operating life time is estimated data.

3.1.3 Electrical Interface Connection

The LVDS connector interface pin assignments are listed in below table. Connector model number: IPEX 20765-040E-11A or compatible. Manufacturer: STM or compatible.

PIN NO	Symbol	Function
1	GND	Ground
2	VDD	LCD Power Supply +3.3V
3	VDD	LCD Power Supply +3.3V
4	VDD	LCD Power Supply +3.3V
5	NC	AUO Self Test Pin
6	NC	AUO Self Test Pin
7	NC	AUO Self Test Pin
8	Rxin0-	-LVDS differential data input
9	Rxin0+	+LVDS differential data input
10	GND	Ground
11	Rxin1-	-LVDS differential data input
12	Rxin1+	+LVDS differential data input
13	GND	Ground
14	Rxin2-	-LVDS differential data input
15	Rxin2+	+LVDS differential data input
16	GND	Ground
17	ClkIN-	-LVDS differential clock input
18	ClkIN+	+LVDS differential clock input
19	GND	Ground
20	Rxin3-	-LVDS differential data input
21	Rxin3+	+LVDS differential data input
22	GND	Ground
23	NC	No connect
24	NC	No connect
25	GND	Ground
26	NC	No connect
27	NC	No connect
28	GND	Ground
29	NC	No connect
30	NC	No connect
31	BL_GND	Ground for backlight
32	BL_GND	Ground for backlight
33	BL_GND	Ground for backlight
34	NC	No connect
35	LED_PWM	PWM Dimming
36	LED_EN	LED ON/OFF
37	NC	No connect
38	VLED	LED Power Supply +12V
39	VLED	LED Power Supply +12V
40	VLED	LED Power Supply +12V

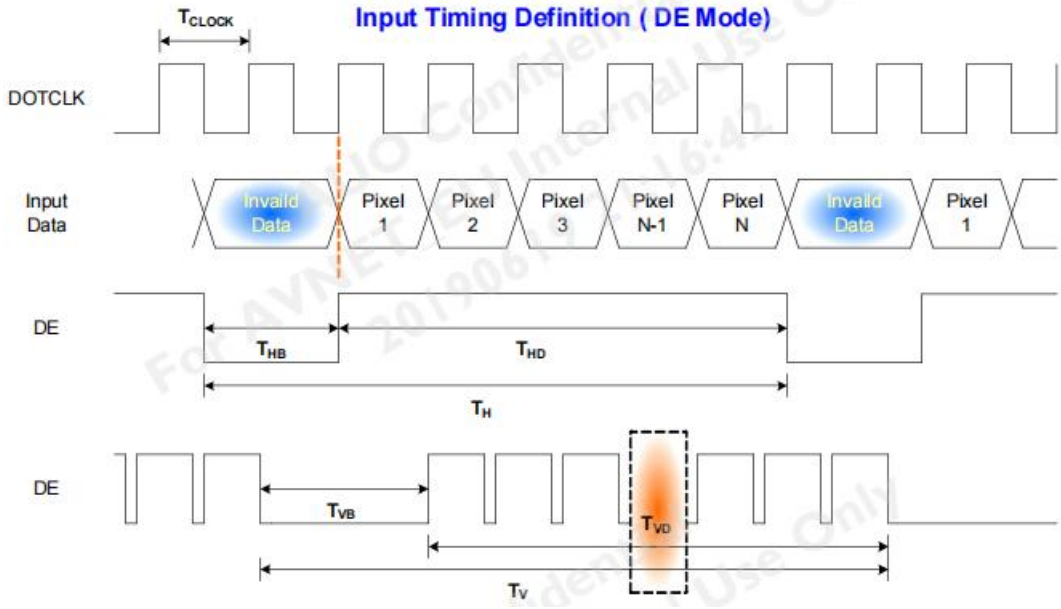
3.1.4 Display Timing Specifications

Timing Characteristics

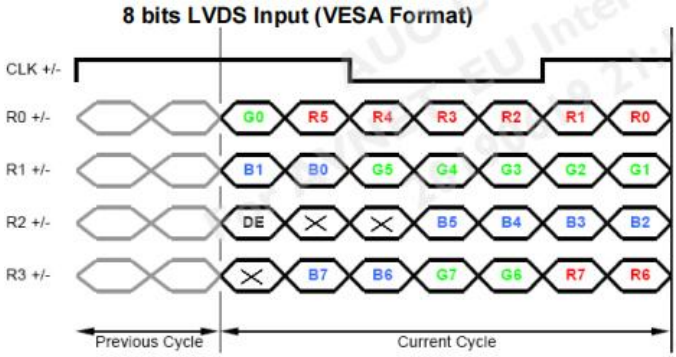
Signal		Symbol	Min.	Typ.	Max.	Unit
Clock Frequency		1/ TClock	68.9	71.1	80	MHz
Vertical Section	Period	TV	815	823	860	TLine
	Active	TVD	800			
	Blanking	TVB	15	23	60	
Horizontal Section	Period	TH	1410	1440	1550	TClock
	Active	THD	1280			
	Blanking	THB	130	160	270	
Frame Rate		F	---	59.99	---	Hz

Note: DE mode

Input Timing Diagram



The Input Data Format

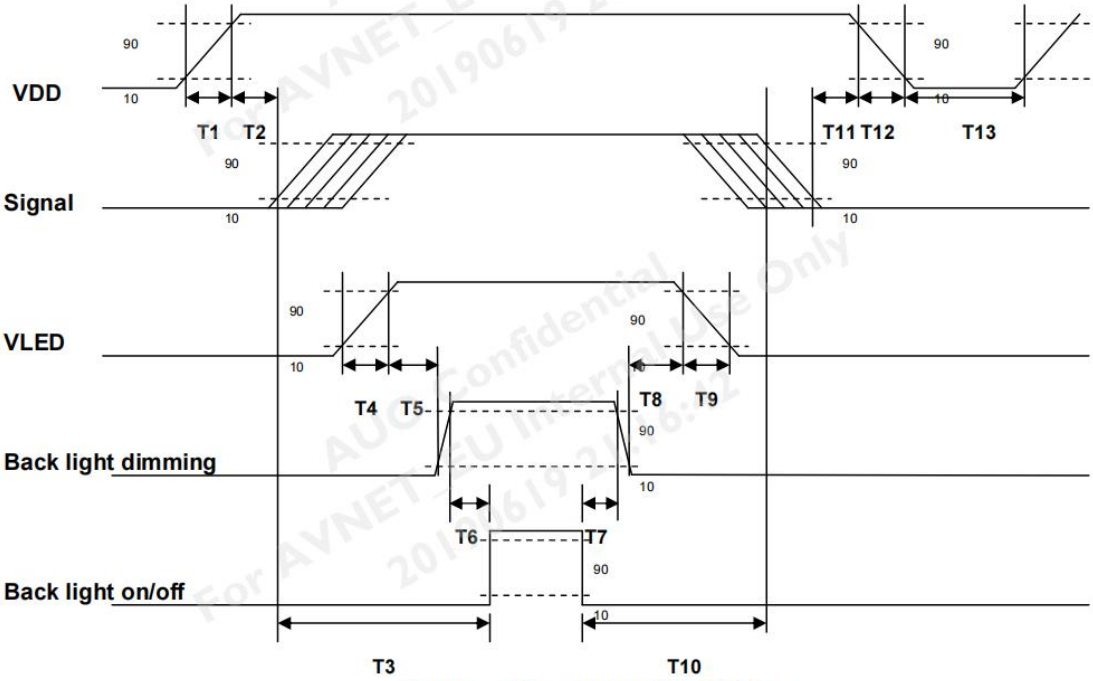


Signal Name	Description	
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data For 8Bits LVDS input MSB: R7 ; LSB: R0
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 (MSB) Green Data 6 Green Data 5 Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB)	Green-pixel Data For 8Bits LVDS input MSB: R7 ; LSB: R0
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data For 8Bits LVDS input MSB: R7 ; LSB: R0
RxCLKIN	Data Clock	The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of RxCLKIN. When the signal is high, the pixel data shall be valid to be displayed.

Note: Output signals from any system shall be low or High-impedance state when VDD is off.

3.1.5 Power ON/OFF Sequence

VDD power and backlight 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.



Power Sequence Timing

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	200	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	-	-	200	[ms]
T10	110	-	-	[ms]
T11	0	16	50	[ms]
T12	-	-	200	[ms]
T13	1000	-	-	[ms]

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 Electrical Specifications

3.2.1 Interface Connection

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

3.2.2 Connector Pins Definition

<Molex 53261-1071 Pins Definition>

Pin	Definition	Description
1	Vcc	5V
2	USB Data+	
3	USB Data-	
4	SDA	I^2C serial data
5	SCL	I^2C serial clock
6	INT	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 I^2C Interface

Slaver address	0x5c(7-bits addressing, programmable)
Clock rate	@400 kHz(fast mode)
Interrupt mode	Default active low, level trigger
_CID	PNP0C50
_DSM	3CDFF6F7-4267-4555-AD05-B30A3D8938DE
HID Descriptor address	0x0000

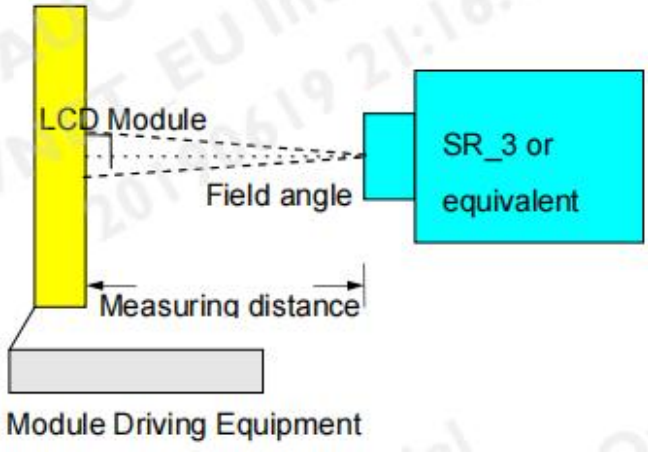
4. Optical Specifications

4.1 Display Optical Specifications

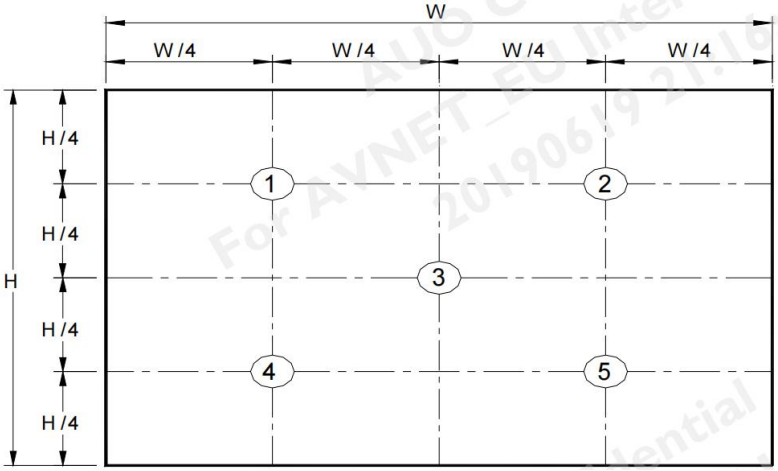
The optical characteristics are measured under stable conditions at 25℃ (Room Temperature):

Item	Unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	[cd/m2]	I_{LED}= 22mA (center)	320	400	---	
Uniformity	%	5 points	70%		---	
Contrast Ratio			600	800	---	
Response Time	[msec]	Rising + Falling	---	29	38	
Viewing Angle	[degree]	Horizontal (Right) CR = 10	80	89	---	
	[degree]	(Left)	80	89	---	
	[degree]	Vertical (Upper) CR = 10	80	89	---	
	[degree]	(Lower)	80	89	---	
Color / Chromaticity Coordinates (CIE 1931)		Red x	0.532	0.582	0.632	
		Red y	0.295	0.345	0.395	
		Green x	0.29	0.34	0.39	
		Green y	0.522	0.572	0.622	
		Blue x	0.112	0.162	0.212	
		Blue y	0.077	0.127	0.177	
		White x	0.263	0.313	0.363	
		White y	0.279	0.329	0.379	
Color Gamut	%		---	50	---	

Note 1: Measurement method
Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)
Aperture Field angle 2° with 50cm measuring distance
Test Point Center
Environment <1 lux



Note 2: Definition of 5 points position



Note 3: The luminance uniformity of 5 points is defined by dividing the minimum luminance values by the maximum test point luminance

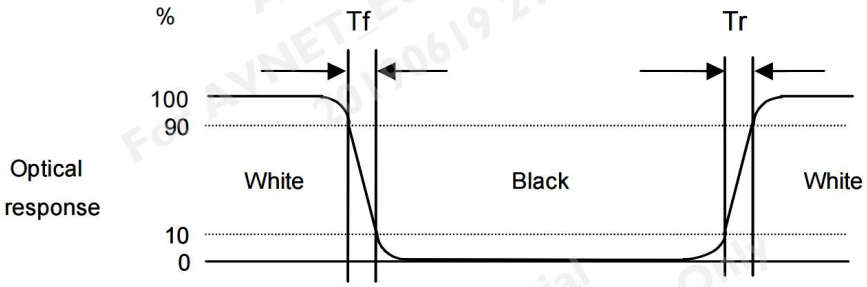
$$\delta_{W5} = \frac{\text{Minimum Brightness of five points}}{\text{Maximum Brightness of five points}}$$

Note 4: Definition of contrast ratio (CR):

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

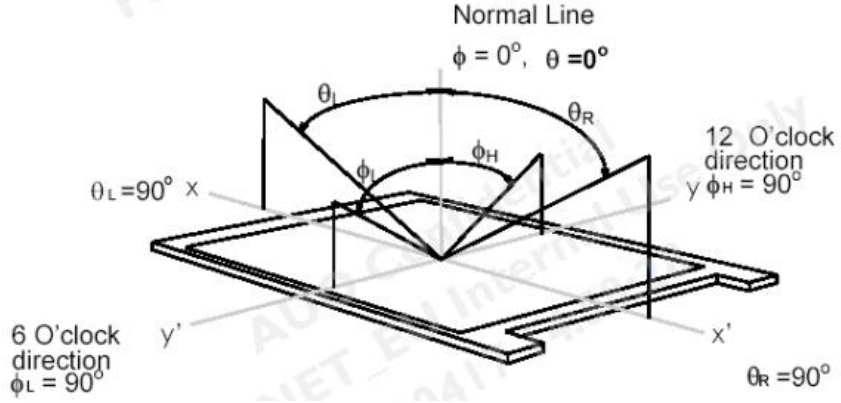
Note 5: Definition of response time:

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.



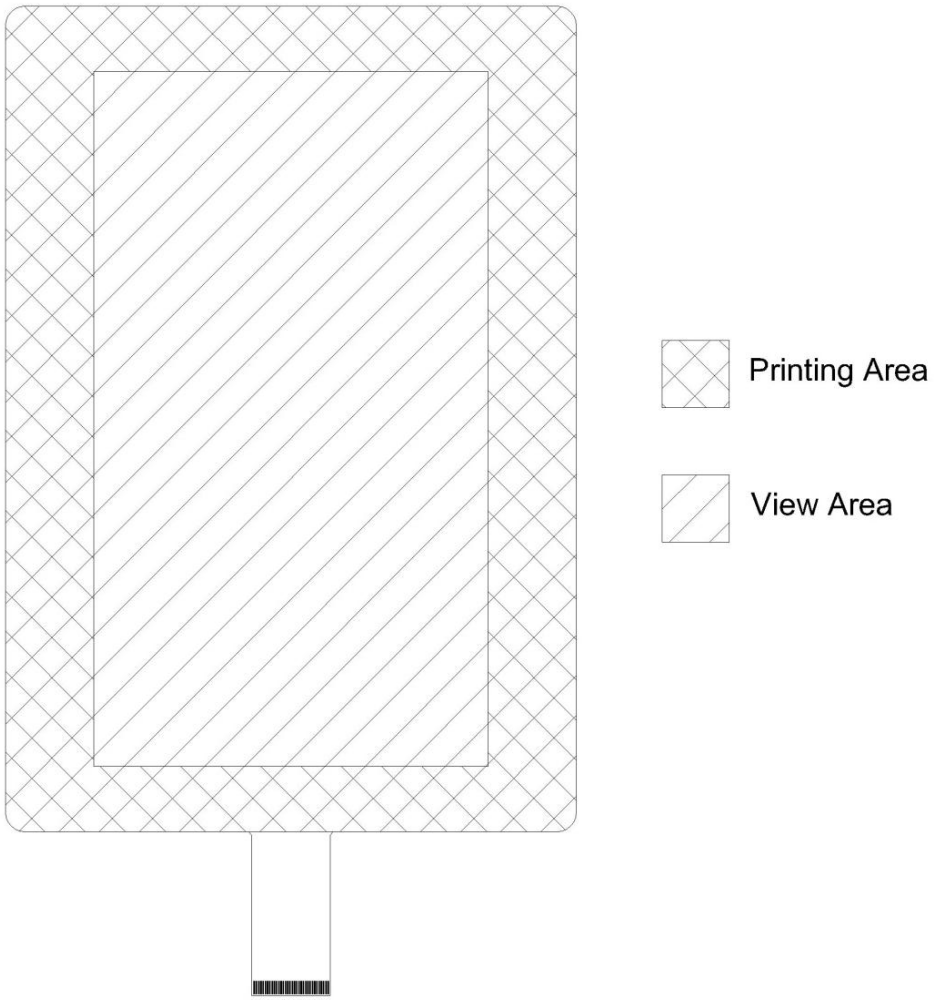
Note 6: Definition of viewing angle

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.

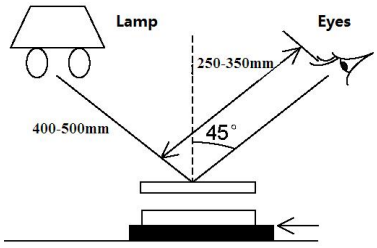
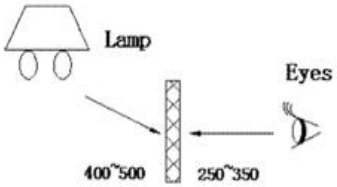


4.2 Appearance Specifications

4.2.1 Terms Definition



4.2.2 Inspection Conditions

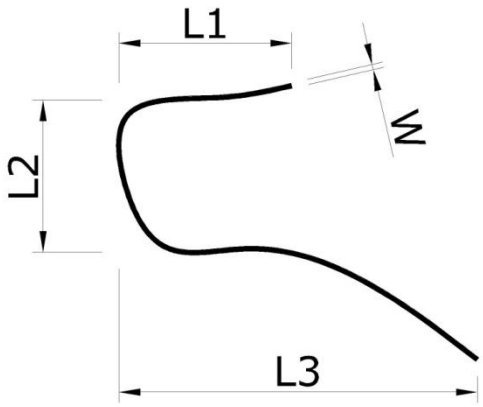
Items	Conditions	Remarks
Inspection Lamp	Florescent Cool White Lamp, 1000~1200Lux	
Inspection with Reflect Light (RL)	*Normal eyes level 1.0 (with Glasses accepted); *Distance between Lamp and product:40-50cm; *Distance between Eyes and Product:25-35cm; *Angle of view: 45°; *Black background; *Inspection 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)



L=L1+L2+L3

<Liner-like Defects>

Condition	Width(mm)	Length(mm)	Criteria
RL	W≤0.03	Not limited	*Accept QTY: not limited.
	0.03<W≤0.06	L≤10	*Accept QTY: not more than 6; *Not allowed if the distance between 2 objects is less than 20 mm.
	0.06<W≤0.10	L≤10	*Accept QTY: not more than 4; *Not allowed if the distance between 2 objects is less than 20 mm.
	W>0.10	L>10	*Not allowed.
	Liner-like Defects including: Liner Foreign Object/Scratch.		

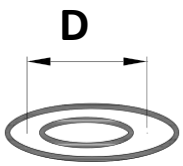
< Dot-like Defects> (D=Diameter)

Condition	Average Diameter(mm)	Criteria
RL	D≤0.20	*Not limited.
	0.20<D≤0.30	*Accept Qty: not more than 10; *Not allowed if the distance between 2 defects is less than 20mm.
	0.30<D≤0.40	*Accept Qty: not more than 5; *Not allowed if the distance between 2 defects is less than 20mm.
	D>0.40	*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.

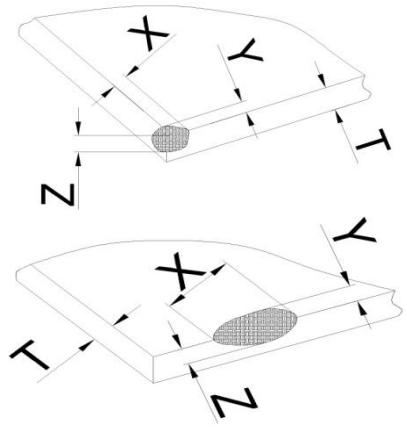
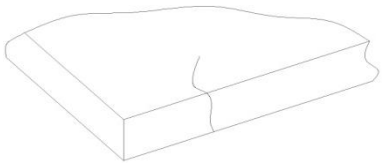
< Surface Fisheye>

Condition	Average Diameter(mm)	Criteria	Remarks
RL	D≤0.15	*Accept QTY: not more than 3; * Not allowed if the distance between 2 objects is less than 50 mm.	
	0.15<D≤0.30	*Accept Qty: not more than 2; * Not allowed if the distance between 2 objects is less than 50 mm.	
	0.30<D≤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 mm, Z< 1/3T 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 =60℃, 300 hrs
2	Low temperature storage test	Ta =-20℃, 300 hrs
3	High temperature & high humidity operation test	Ta =40℃, 90%RH, 300hrs
4	High temperature operation test	Ta =60℃, 300hrs
5	Low temperature operation test	Ta =-20℃, 300hrs
6	Thermal shock	Ta = -20℃↔60℃(0.5hr), 100 cycle
7	Shock test	50G, 20ms, Half-sine wave, (± X, ± Y, ± Z), non-operation
8	ESD test	Air Voltage: ±15KV Contact Voltage: ±8KV (Note 1)
9	Vibration test	1.5G, (10~200Hz, random), 30 mins / axis (X, Y, Z), non-operation
10	Impact Resistance	Steel ball: 64 g Height: 30 cm

Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost Self-recoverable. No hardware failures.
Note2:

- 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 24hours at least in advance.

6. Label, Package and Firmware Version

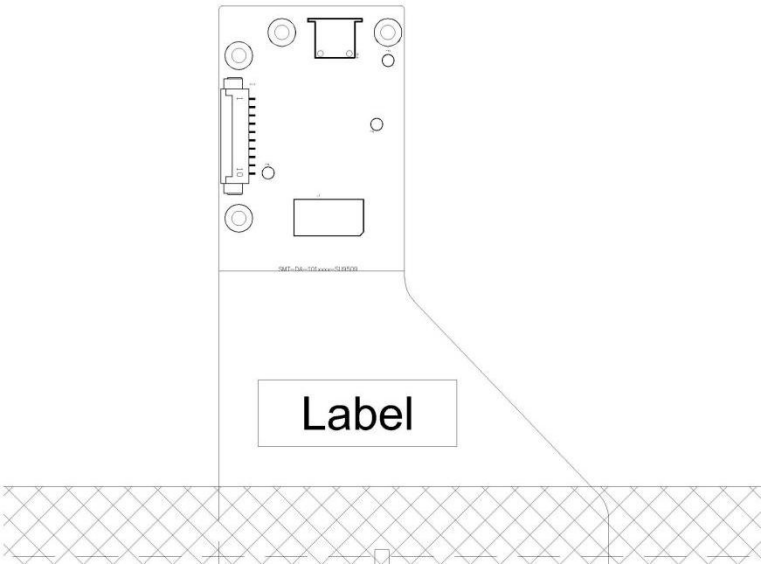
6.1 Label

6.1.1 Product Label Information

GEA-101C01-DC9509-G020
Product code.
SMT-DA-101N000-SU9509-8-5
Touch sensor type for test.
10123280001CDC2
101: product active area size 2328: 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

10_1_USB_HERMAN.bin

10_1_USB_HERMAN.bin

7. Mechanical Drawing