

Specification

Module No. : GEA-215E01-DC9521-G020
Client Name : _____
Client Ref. : _____
Version No. : A2

Client Confirmation	Approved by	Prepared by
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Issue History

Version	History	Date	Remarks
A1	First Issue	2020/05/29	
A2	Removed 6.General Precaution Added 6.1 Label&6.3 Firmware Version	2023/07/15	

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1. Purpose

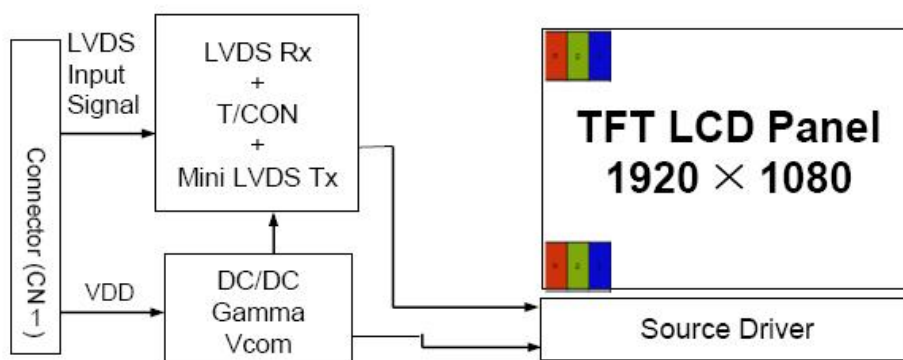
This specification document is issued for the 21.5" TFT Liquid Crystal Display bonded with Capacitive-Type Touch Panel delivered by General Electrical Touch Co., Limited. This document defined the general provisions (including structure, performance, characteristics and quality guarantee) for the specific 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.

2. Feature

2.1 Overview

The touch part is a 21.5 inch DITO glass Capacitive-Type Touch Panel. It uses a SIS9521 touch controller and with USB & I²C communication.

The display part BOE HR215WU1-120 which 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 21.5 inch diagonally measured active area with FHD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.



2.2 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.

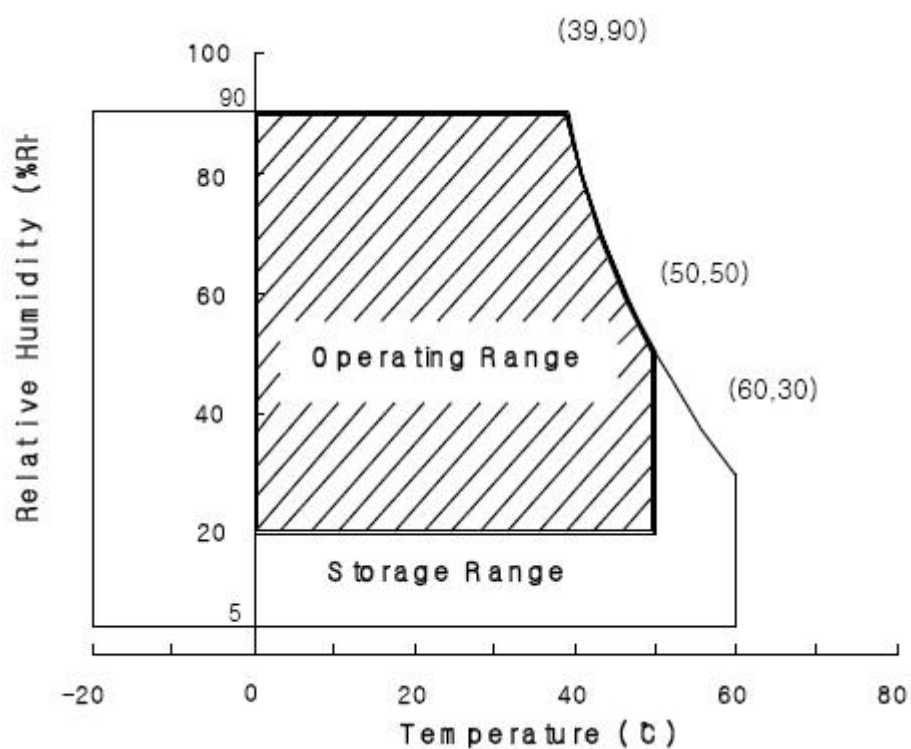
<Absolute Maximum Ratings>

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	-0.3	5.5	V	Ta = 25 °C
Logic Supply Voltage	V _{IN}	VSS-0.3	V _{DD} +0.3	V	
Operating Temperature	T _{OP}	0	+50	°C	1)
Storage Temperature	T _{ST}	-20	+60	°C	1)

Notes:

1. Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be 39 °C max. and no condensation of water.



2.3 Module Structure

Main Component	Materials	Remarks
Cover Glass	2mm chemical strengthened glass	black printed boarder
Adhesive	SCA	Thickness: 0.25 mm
Touch Sensor	DITO glass	0.70mm, 60~90Ω/□
Air Bonding Tape	3M 4905	Thickness: 0.5 mm
Display	TFT LCD	BOE HR215WU1-120

2.4 Physical Specifications

Item	Specifications	Remark
TFT Active Area	476.064(H)*267.786(V) mm	
Touch Visible Area	478.00(H)*269.70(V) mm	
Number Of Pixels	1920(H)×1080(V)	
Pixel Pitch	0.24795 (H)×0.24795(V) mm	
Pixel Arrangement	RGB Vertical stripe	
Display Colors	16.7M	
Display Mode	Normally Black	
TFT Surface Treatment	Anti-glare, 3H	
Touch Surface	-	
Touch Activation	Multi-finger touch	
Touch Resolution	41X, 72Y	
Touch Controller	SIS9521	
Bonding Method	CG to touch sensor: optical bonding TP module to display: tape bonding	
Outline Dimension	518.00(H)*309.70(V)*14.15(Typ) mm	
Weight	3.25 KG	

3. Electrical Specifications

3.1 Display Electrical Specifications

3.1.1 TFT LCD Module

<LCD Module Electrical Specifications>

[Ta=25 ± 2°C]

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	4.5	5.0	5.5	V	Note1
Power Supply Current	I _{DD}	-	500	1200	mA	
In-Rush Current	I _{RUSH}	-	2.0	3	A	Note 2
Permissible Input Ripple Voltage	V _{RF}	-	-	300	mV	V _{DD} = 5.0V
High Level Differential Input Threshold Voltage	V _{IH}	-	-	+100	mV	
Low Level Differential Input Threshold Voltage	V _{IL}	-100	-	-	mV	
Differential input voltage	V _{ID}	200	-	600	mV	
Differential input common mode voltage	V _{cm}	1.0	1.2	1.5		V _{IH} =100mV, V _{IL} =-100mV
LED Voltage	V _L	2.9	3.1	3.2	V	
LED Channel Voltage	V _L	-	49.6	51.2	V	
LED Channel Current	I _L	38	40	42	mA	
LED Lifetime		30,000	-	-	Hrs	I _L =40 mA
Power Consumption	P _D	-	2.5	6	W	
	P _{BL}	-	7.9	8.2	W	I _L =40mA, Note 3
	P _{total}	-	10.4	14.2	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=5.0V, Frame rate=75Hz. Test Pattern of power supply current

a) Typ: Color Bar pattern

b) Max: Gray level 255 pattern

2. Duration of rush current is about 2 ms and rising time of VDD is 520 μs ± 20%.

3. Calculated value for reference (V_L × I_L) × 4(channel) excluding driver loss. (LED Light bar: 16S4P)

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Light Bar Input Voltage Per Input Pin	VPIN	-	49.6	51.2	V	Duty 100%
LED Light Bar Input Current Per Input Pin	IPIN	38	40	42	mA	Note1,2,
LED Power Consumption	PBL	-	7.9	8.2	W	Note 3
LED Life-Time	-	30,000	-		Hrs	Note 4

LED bar consists of 64 LED packages, 4 strings(parallel)*16packages(serial).

Note1: There are one light bar, and the specified current is input LED chip 100% duty current.

Note2: The sense current of each input pin is 40mA.

Note3: $P_{BL} = 4 \text{ Input pins} \times V_{PIN} \times I_{PIN}$.

Note4: The lifetime is determined as the time at which luminance of LED become 50% of the initial.

brightness or not normal lighting at $I_{PIN}=40\text{mA}$ on condition of continuous operating at $25 \pm 2^\circ\text{C}$.

3.1.2 Electrical Interface Connection

- CN11 Module Side Connector : UJU IS100-L30R-C23or Equivalent

User Side Connector : JAE FI-X30H or Equivalent

Pin No	Symbol	Function	Remark
1	RXO0-	Negative Transmission data of Pixel 0 (ODD)	
2	RXO0+	Positive Transmission data of Pixel 0 (ODD)	
3	RXO1-	Negative Transmission data of Pixel 1 (ODD)	
4	RXO1+	Positive Transmission data of Pixel 1 (ODD)	
5	RXO2-	Negative Transmission data of Pixel 2 (ODD)	
6	RXO2+	Positive Transmission data of Pixel 2 (ODD)	
7	BIST	Bist function	Note1
8	RXOC-	Negative Transmission Clock (ODD)	
9	RXOC+	Positive Transmission Clock (ODD)	
10	RXO3-	Negative Transmission data of Pixel 3 (ODD)	
11	RXO3+	Positive Transmission data of Pixel 3 (ODD)	
12	RXE0-	Negative Transmission data of Pixel 0 (EVEN)	
13	RXE0+	Positive Transmission data of Pixel 0 (EVEN)	
14	GND	Power Ground	
15	RXE1-	Negative Transmission data of Pixel 1 (EVEN)	
16	RXE1+	Positive Transmission data of Pixel 1 (EVEN)	
17	GND	Power Ground	
18	RXE2-	Negative Transmission data of Pixel 2 (EVEN)	
19	RXE2+	Positive Transmission data of Pixel 2 (EVEN)	
20	RXEC-	Negative Transmission Clock (EVEN)	
21	RXEC+	Positive Transmission Clock (EVEN)	
22	RXE3-	Negative Transmission data of Pixel 3 (EVEN)	
23	RXE3+	Positive Transmission data of Pixel 3 (EVEN)	
24	GND	Power Ground	Note 2
25	CTL	*Reserved for LCD manufacturer's(CTL_DVR)	
26	CE	*Reserved for LCD manufacturer's(CE_DVR)	
27	NC		
28	VDD	Power Supply: +5V	
29	VDD		
30	VDD		

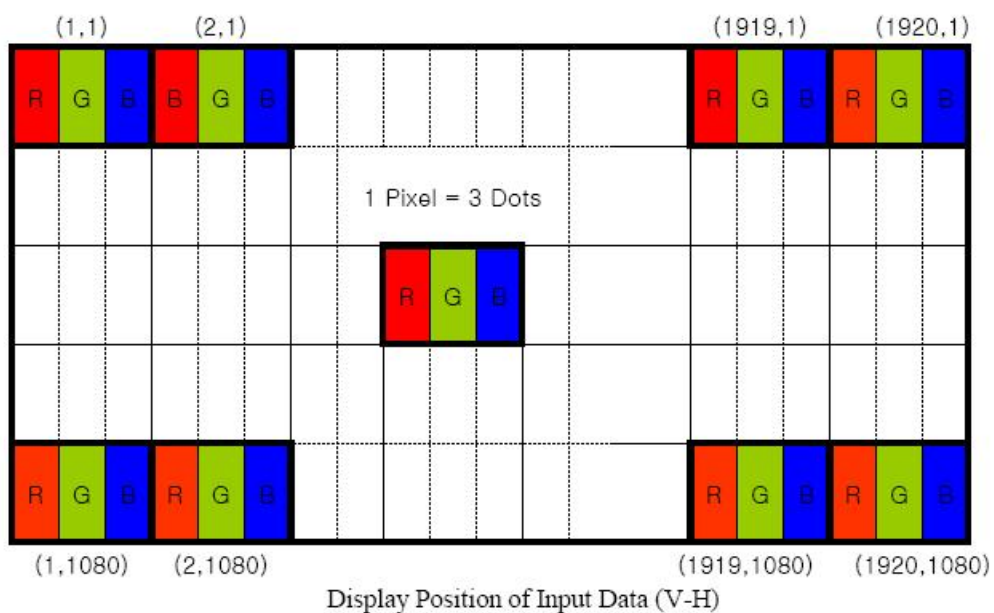
Note 1 : H: White-Black-Red-Green-Blue Pattern Aging, L:Black pattern , when no LVDS signal

Note2: This pin should be connected with GND.

3.1.3 LVDS Interface

	Input Signal	Transmitter		Interface		MV215FHB-N30 (CN11)	Remark
		Pin No.	Pin No.	System (Tx)	TFT-LCD (Rx)	Pin No.	
L V D S	OR0	51	48 47	OUT0- OUT0+	RXO0- RXO0+	1 2	
	OR1	52					
	OR2	54					
	OR3	55					
	OR4	56					
	OR5	3					
	OG0	4	46 45	OUT1- OUT1+	RXO1- RXO1+	3 4	
	OG1	6					
	OG2	7					
	OG3	11					
	OG4	12					
	OG5	14					
	OB0	15	42 41	OUT2- OUT2+	RXO2- RXO2+	5 6	
	OB1	19					
	OB2	20					
	OB3	22					
	OB4	23					
	OB5	24					
	Hsync	27	40 39	OUT- CLK	CLK- RXO	8 9	
	Vsync	28					
	DE	30					
	MCLK	31					
	OR6	50	38 37	OUT3- OUT3+	RXO3- RXO3+	10 11	
	OR7	2					
	OG6	8					
	OG7	10					
	OB6	16					
	OB7	18					
	RSVD	25					

Data Input Format



LED connector: 3707K-Q06N-08X manufactured by Entry

<LED Light Bar>

Pin No	Symbol	Description
1	IRLED1	LED current sense for string1
2	IRLED2	LED current sense for string2
3	VLED	LED power supply
4	VLED	LED power supply
5	IRLED3	LED current sense for string3
6	IRLED4	LED current sense for string4

3.1.4 Signal Timing Specification

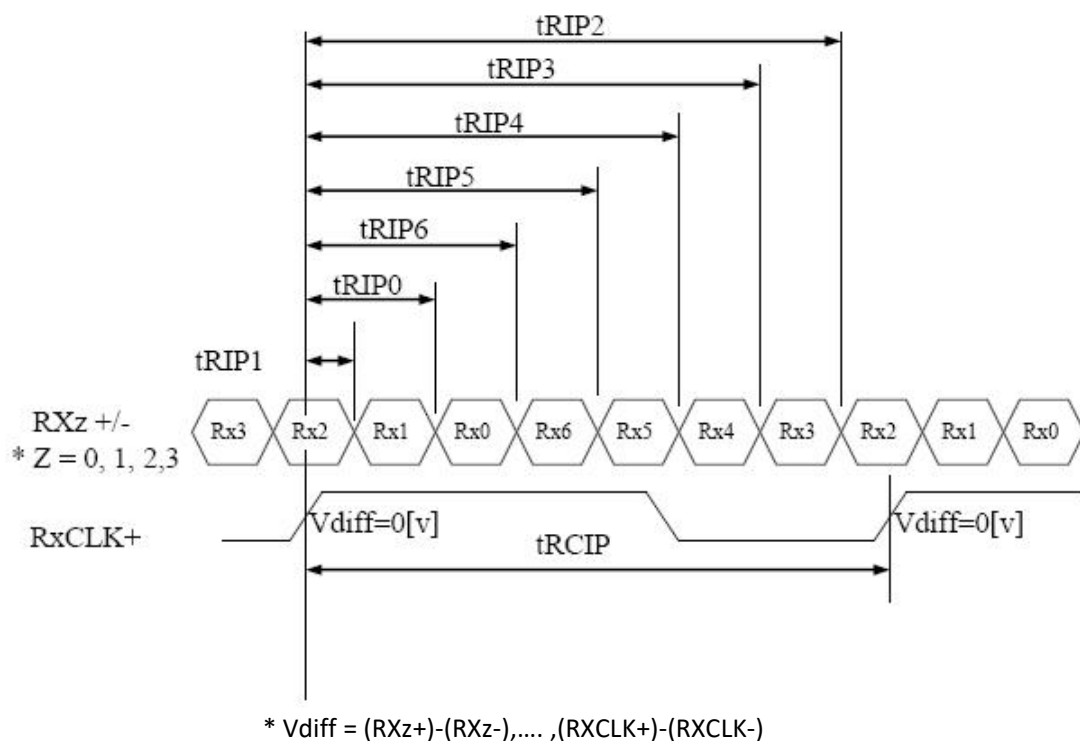
The HR215WU1-120 is operated by the DE only.

Item	Symbols		Min	Typ	Max	Unit
DCLK	Period	tCLK	11.1	13.47	16.7	ns
	Frequency	-	60	74	90	MHz
Horizontal Display Term	Period	tHP	1050	1100	1120	tCLK
	Horizontal Valid	tHV	960	960	960	tCLK
	Horizontal Blank	tHB	90	140	160	tCLK
	Frequency	fH	64	67	83	KHz
Vertical Display Term	Period	tVP	1110	1125	1251	tHP
	Vertical Valid	tVV	1080	1080	1080	tHP
	Vertical Blank	tVB	30	45	171	tHP
	Frequency	fV	50	60	75	Hz
LVDS Receiver clock	Input spread spectrum ratio	SSr	-3	-	+3	%

Note 1 : This DCLK range at last line of V-blanking should be set in 0~987.

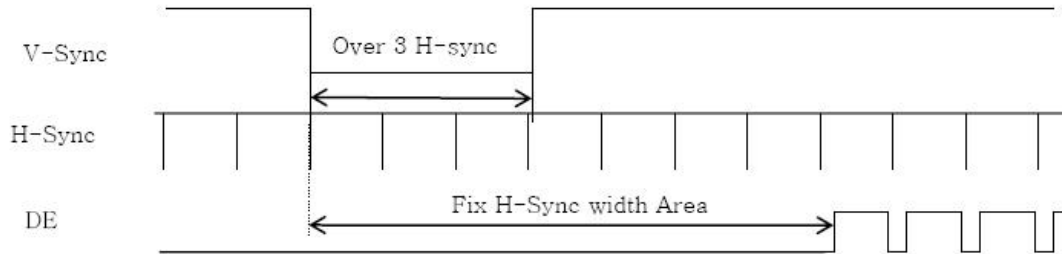
< LVDS Rx Interface Timing Specification >

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	15.4	19.3	23.1	nsec	
Input Data 0	tRIP1	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP0	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP6	$2 \times tRCIP/7-0.4$	$2 \times tRCIP/7$	$2 \times tRCIP/7+0.4$	nsec	
Input Data 3	tRIP5	$3 \times tRCIP/7-0.4$	$3 \times tRCIP/7$	$3 \times tRCIP/7+0.4$	nsec	
Input Data 4	tRIP4	$4 \times tRCIP/7-0.4$	$4 \times tRCIP/7$	$4 \times tRCIP/7+0.4$	nsec	
Input Data 5	tRIP3	$5 \times tRCIP/7-0.4$	$5 \times tRCIP/7$	$5 \times tRCIP/7+0.4$	nsec	
Input Data 6	tRIP2	$6 \times tRCIP/7-0.4$	$6 \times tRCIP/7$	$6 \times tRCIP/7+0.4$	nsec	



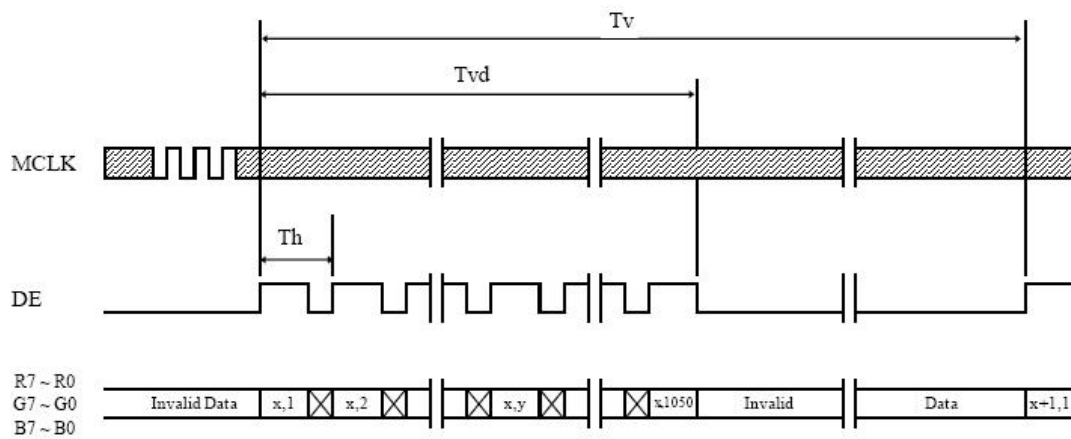
3.1.5 Signal Timing Waveforms of Interface Signal

1. Sync Timing Waveforms

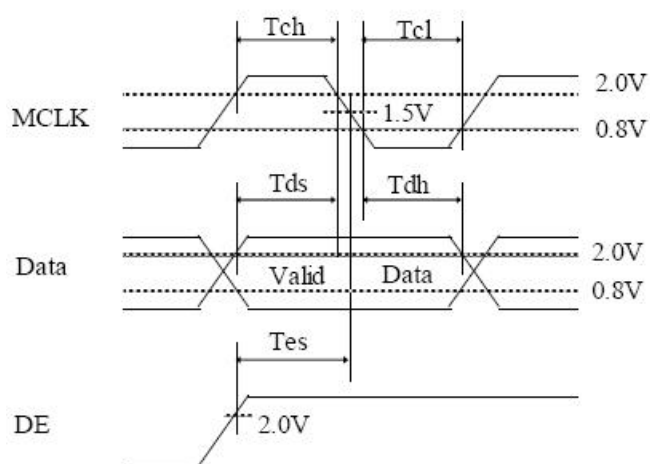
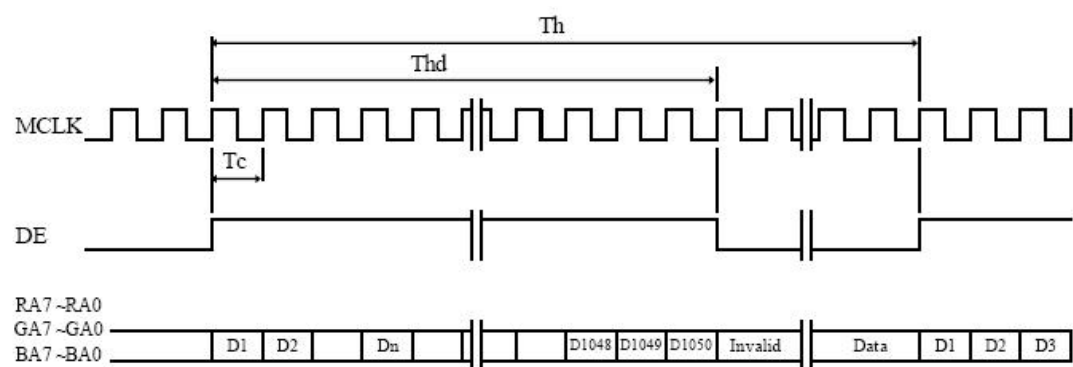


- 1) Need over 3 H-sync during V-Sync Low
- 2) Fix H-Sync width from V-Sync falling edge to first rising edge

2. Vertical Timing Waveforms



3. Horizontal Timing Waveforms

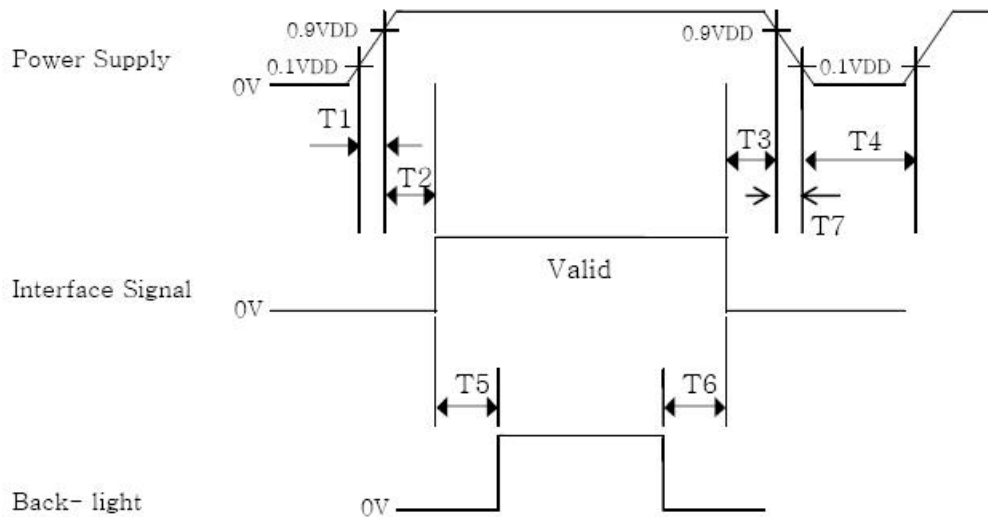


3.1.6 Input Signals, Basic Display & Gray Scale of Colors

Color & Gray Scale		RED DATA								GREEN DATA								BLUE DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of RED	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△																								
	▽																								
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of GREEN	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	△																								
	▽																								
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of BLUE	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	△																								
	▽																								
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of WHITE	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	△																								
	▽																								
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

3.1.7 Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



- $0.5\text{ ms} \leq T1 \leq 10\text{ ms}$
- $0 \leq T2 \leq 50\text{ ms}$
- $0 \leq T3 \leq 50\text{ ms}$
- $1\text{ sec} \leq T4$
- $200\text{ ms} \leq T5$
- $200\text{ ms} \leq T6$

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on.
3. Back Light must be turn on after power for logic and interface signal are valid.
4. T7 decreases smoothly, there is none re-bouncing voltage.
5. During changing the resolution or mode changing, the logic power/ back-light/interface signal should be turned off as shown above; after the changing, power on as shown above.

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 ² C	

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 ² C serial data
5	SCL	I ² C serial clock
6	INT	Interrupt pin sending request to HOST
7	Reset	Low active power on reset signal
8	GPIO0	
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 Specifications

4.1.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature $= 25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCONE PR730) 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 $\theta\Phi=0$ ($=\theta 3$) as the 3 o'clock direction (the "right"), $\theta\Phi=90$ ($=\theta 12$) as the 12 o'clock direction ("upward"), $\theta\Phi=180$ ($=\theta 9$) as the 9 o'clock direction ("left") and $\theta\Phi=270$ ($=\theta 6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or Φ , the center of the measuring spot on the Display surface shall stay fixed. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 5.0V $\pm 10\%$ at 25°C . Optimum viewing angle direction is 6 o'clock.

4.1.2 Optical Specifications

[VDD = 5.0V, Frame rate = 60Hz, Clock = 78MHz, $I_{BL} = 240\text{mA}$, $T_a = 25 \pm 2^\circ\text{C}$]

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	85	89	-	Deg.	Note 1
		Θ_9		85	89	-	Deg.	
	Vertical	Θ_{12}		85	89	-	Deg.	
		Θ_6		85	89	-	Deg.	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$ (Center) Normal Viewing Angle	700	1000			Note 2
Luminance of White		Y_w		200	250	-	cd/m ²	Note 3
White luminance uniformity		ΔY		75	-	-	%	Note 4
Reproduction of color	White	W_x		0.283	0.313	0.343	-	Note 5
		W_y		0.299	0.329	0.359	-	
	Red	R_x		0.608	0.638	0.668	-	
		R_y		0.327	0.357	0.387	-	
	Green	G_x		0.284	0.314	0.344	-	
		G_y		0.608	0.638	0.668	-	
	Blue	B_x		0.122	0.152	0.182	-	
		B_y		0.038	0.068	0.098	-	
Response Time	GTG	T_g			14	20	ms	Note 6
Cross Talk		CT			-	-	2.0	%

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 $\Theta = 0^\circ$ 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 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. Center Luminance of white is defined as 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.

4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = (\text{Minimum Luminance of 9points} / \text{Maximum Luminance of 9points}) * 100$ (See FIGURE 2 shown in Appendix).

5. The color chromaticity coordinates specified in the table above. 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. Response time T_g is the average time required for display transition by switching the input signal as below table and is based on Frame rate $f_V = 60\text{Hz}$ to optimize. Each time in below table is defined as Figure 3 and shall be measured by switching the input signal for "any level of gray(bright)" and "any level of gray(dark)". (See FIGURE 3 shown in Appendix).

7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark. (See FIGURE 4

shown in Appendix).

Figure 1. Measurement Set Up

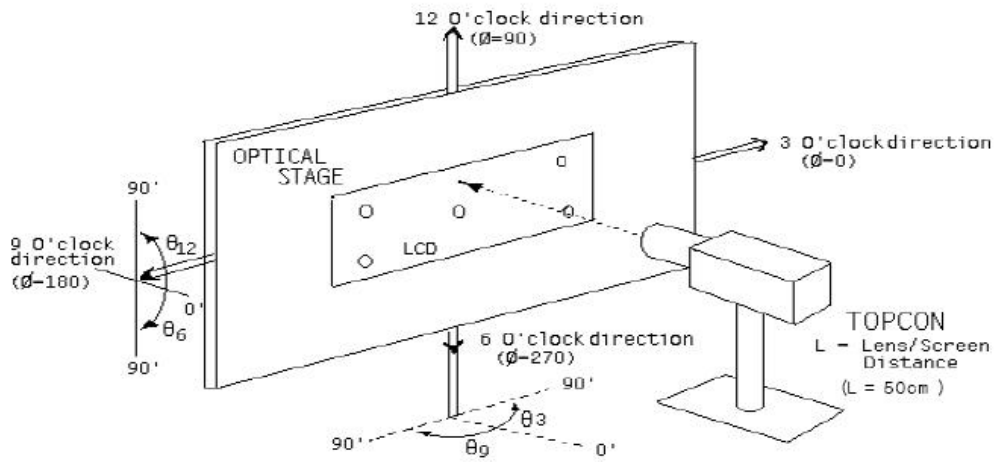


Figure 2. White Luminance and Uniformity Measurement Locations (9 points)

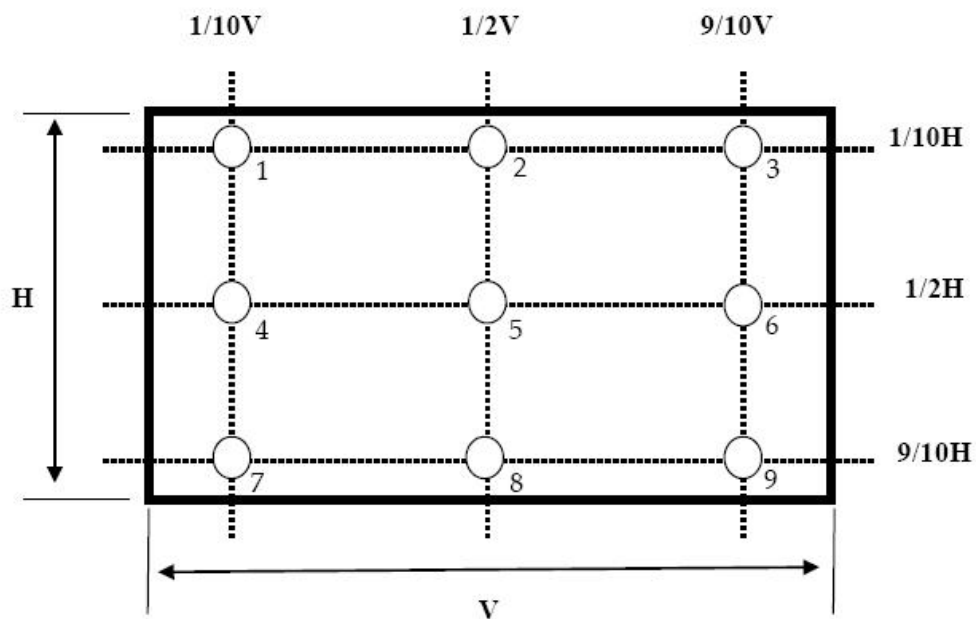
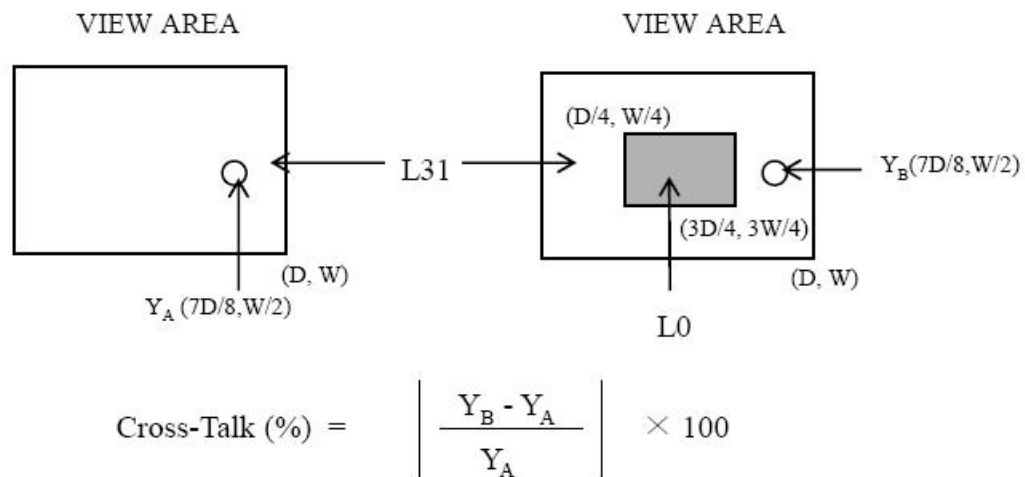


Figure 3. Response Time Testing



Figure 4. Cross Modulation Test Description



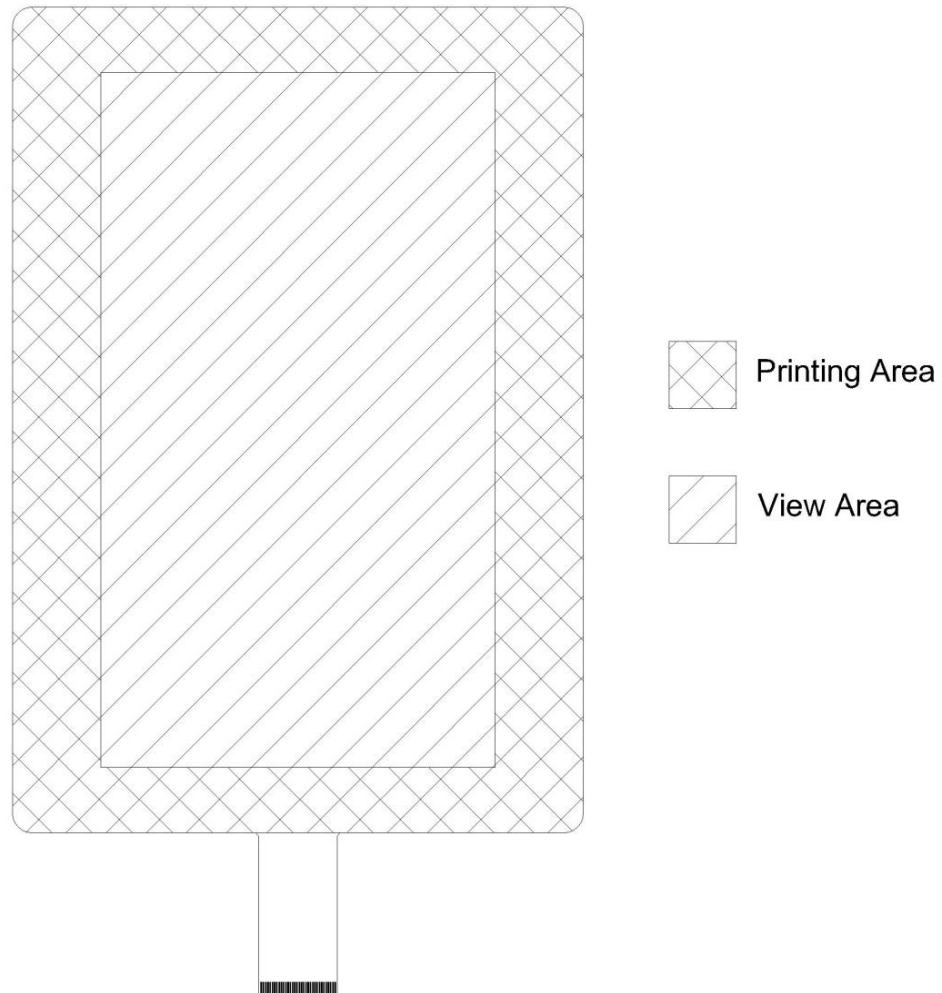
Where: Y_A = Initial luminance of measured area (cd/m^2)

Y_B = Subsequent luminance of measured area (cd/m^2)

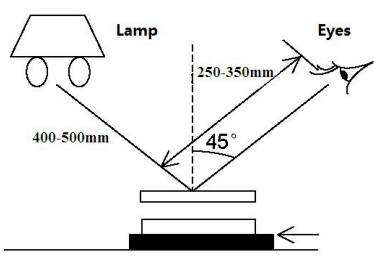
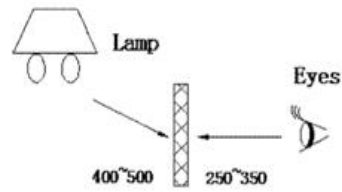
The location measured will be exactly the same in both patterns.

4.2 Appearance Specifications

4.2.1 Terms Definition



4.2.2 Inspection Conditions

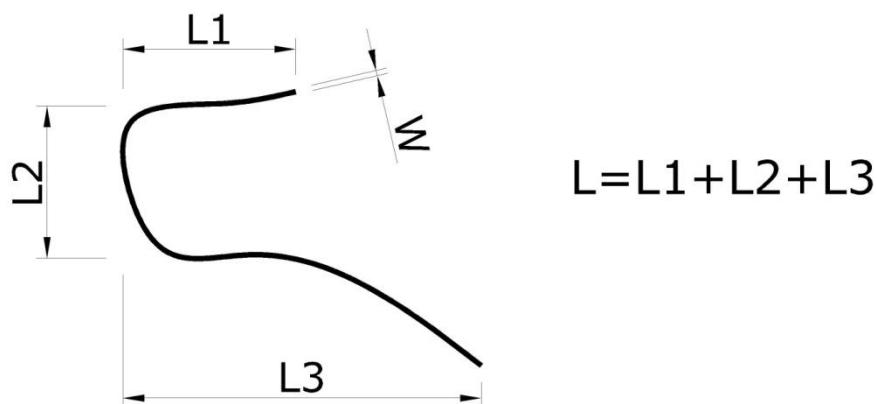
Items	Conditions	Remarks
Inspection Lamp	Florescent Cool White Lamp, 1000~1200Lux	
Inspection with Reflect Light (RL)	*Normal eyes level 1.0 (with Glasses accepted); *Distance between Lamp and product:40-50cm; *Distance between Eyes and Product:25-35cm; *Angle of view: 45°; *Black background; *Inspection 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 $< 120 \text{ mm}: \pm 0.10$ $\geq 120 \text{ mm} < 400 \text{ mm}: \pm 0.15$ $\geq 400 \text{ mm}: \pm 0.25$ *between shaping printing(offset to 2nd, 3rd, etc. color) $< 400 \text{ mm}: \pm 0.30$ $\geq 400 \text{ mm}: \pm 0.50$	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	$W \leq 0.05$	Not limited	*Accept QTY: not limited.
	$0.05 < W \leq 0.08$	$L \leq 10$	*Accept QTY: not more than 6; *Not allowed if the distance between 2 objects is less than 30 mm.
	$0.08 < W \leq 0.15$	$L \leq 10$	*Accept QTY: not more than 4; *Not allowed if the distance between 2 objects is less than 30 mm.
	$W > 0.15$	$L > 10$	*Not allowed.
	Liner-like Defects including: Liner Foreign Object/Scratch.		

< Dot-like Defects>

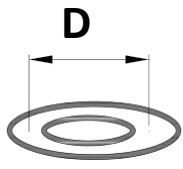
(D=Diameter)

Condition	Average Diameter(mm)	Criteria
RL	$D \leq 0.25$	*Not limited.
	$0.25 < D \leq 0.35$	*Accept Qty: not more than 10; *Not allowed if the distance between 2 defects is less than 30mm.
	$0.35 < D \leq 0.50$	*Accept Qty: not more than 5; *Not allowed if the distance between 2 defects is less than 30mm.
	$D > 0.50$	*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;

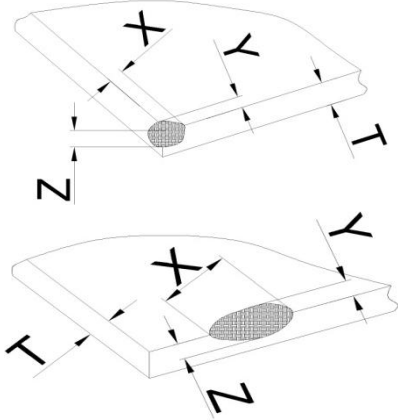
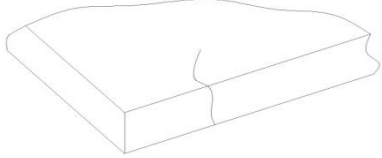
FPC and sensor pin bonding migration not more than pin width 1/2, Accept;

Scratches on bonding area on PS, Not Allowed;

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

Glue residue, broken and oxidation on gold finger, 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

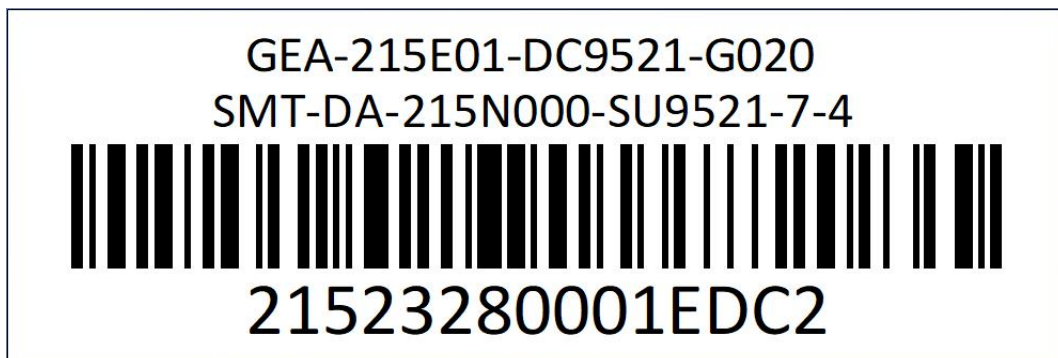
The Reliability test items and its conditions are shown in below.

No	Test Items	Conditions	
1	High temperature storage test	Ta = 60℃, 240 hrs	
2	Low temperature storage test	Ta = -20℃, 240 hrs	
3	High temperature & high humidity operation test	Ta = 50℃, 80%RH, 240hrs	
4	High temperature operation test	Ta = 50℃, 240hrs	
5	Low temperature operation test	Ta = 0℃, 240hrs	
6	Thermal shock	Ta = -20℃ ↔ 60℃ (0.5hr), 100 cycle	
7	Vibration test (non-operating)	Frequency Random, 10 ~ 300 Hz, 30 min/Axis Gravity / AMP 1.5 Grms Period X, Y, Z: 30 min	
8	Shock test (non-operating)	Gravity	50G
		Pulse width	11msec, sine wave
		Direction	±X, ±Y, ±Z Once for each
9	Electro-static discharge test (non-operating)	Air: 150 pF, 330Ω, 15KV Contact: 150 pF, 330Ω, 8KV	
10	Altitude test	Non Operating: 40000 ft, -10℃ / 24 Hr, 25℃ / 24 Hr, -10℃ / 24 Hr	
		Operating: 15000 ft, 0℃ / 24 Hr, 25℃ / 24 Hr, 50℃ / 24 Hr	
11	Impact Resistance	Steel ball: 64 g Height: 30 cm	

6. Label, Package and Firmware Version

6.1 Label

6.1.1 Product Label Information



GEA-215E01-DC9521-G020

Product code.

SMT-DA-215N000-SU9521-7-4

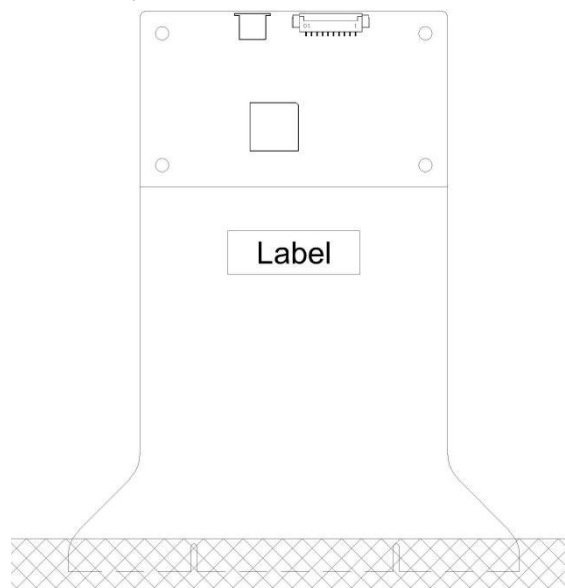
Touch sensor type for test.

21523280001EDC2

215: product active area size 2328: YYWW 0001: series number EDC2: 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	xx*xx*xx (L*W*H)	cm
Product QTY of full box	TBC	PCS
Total weight	TBC	kg
Single product weight	TBC	kg

6.3 Firmware Version

21_5_USB_COF_DITO.bin



21_5_USB_COF_DITO.bin

1 2 3 4 5 6 7

Rev 01 Date 23/04/2020 Content preliminary Approved

1. Cover glass chemical strengthened
2. Touch sensor recommend connector Molex 53261-1071 + Mini USB;
3. Touch panel light transmission >83%;
4. Air bonding with 3M 4905 tape between IFT and touch panel;
5. All display details please refer to spec BDE HR215WUI-120;
6. Operation & Storage Temperature refer to general GE STAR TOUCH SPEC A_22.

Notes:

Connector Pinout: 1. Vcc (5V) 2. GND 3. Data+ 4. Data- 5. GND 6. IFTCHG 7. Reset 8. IFTCHG 9. IFTCHG 10. IFTCHG 11. IFTCHG 12. IFTCHG 13. IFTCHG 14. IFTCHG 15. IFTCHG 16. IFTCHG 17. IFTCHG 18. IFTCHG 19. IFTCHG 20. IFTCHG 21. IFTCHG 22. IFTCHG 23. IFTCHG 24. IFTCHG 25. IFTCHG 26. IFTCHG 27. IFTCHG 28. IFTCHG 29. IFTCHG 30. IFTCHG 31. IFTCHG 32. IFTCHG 33. IFTCHG 34. IFTCHG 35. IFTCHG 36. IFTCHG 37. IFTCHG 38. IFTCHG 39. IFTCHG 40. IFTCHG 41. IFTCHG 42. IFTCHG 43. IFTCHG 44. IFTCHG 45. IFTCHG 46. IFTCHG 47. IFTCHG 48. IFTCHG 49. IFTCHG 50. IFTCHG 51. IFTCHG 52. IFTCHG 53. IFTCHG 54. IFTCHG 55. IFTCHG 56. IFTCHG 57. IFTCHG 58. IFTCHG 59. IFTCHG 60. IFTCHG 61. IFTCHG 62. IFTCHG 63. IFTCHG 64. IFTCHG 65. IFTCHG 66. IFTCHG 67. IFTCHG 68. IFTCHG 69. IFTCHG 70. IFTCHG 71. IFTCHG 72. IFTCHG 73. IFTCHG 74. IFTCHG 75. IFTCHG 76. IFTCHG 77. IFTCHG 78. IFTCHG 79. IFTCHG 80. IFTCHG 81. IFTCHG 82. IFTCHG 83. IFTCHG 84. IFTCHG 85. IFTCHG 86. IFTCHG 87. IFTCHG 88. IFTCHG 89. IFTCHG 90. IFTCHG 91. 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