



# DATA IMAGE CORPORATION

## TFT Module Specification PRELIMINARY

ITEM NO.: SCF1001102GGU15

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Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
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	1	12/MAY/14'		26

**2. RECORD OF REVISION**

Rev	Date	Item	Page	Comment
1	12/MAY/14'			Initial PRELIMINARY

### 3. GENERAL SPECIFICATIONS

Composition: 10.1 inch WSVGA resolution display with a projected Capacitive Touch Panel (CTP).

Interface : LVDS Interface for panel and USB for the CTP.

No.	Item	Specification	Unit
1	LCD size	10.1 (Diagonal)	inch
2	Outline Dimension	240.4(W) x 143.1(H) x 7.45(D)	mm
3	LCD Active Area	222.72(W) x 125.28(H)	mm
4	Sensor Active Area	223.72(W) x 126.28(H)	mm
5	Number of Pixel	1024(H) × (RGB) × 600 (V)	pixels
6	Dot pitch	0.22(H) × 0.21(V)	mm
7	Display mode	Normally white	
8	Surface treatment	Glare	
9	Weight	TBD	g
11	View direction	6 o'clock	
12	LCM part number	FG100131DNSWAG01	
13	Operating temperature	0 ~ 50	°C
14	Storage temperature	-20 ~ 60	

#### 3.1 Functional Block Diagram

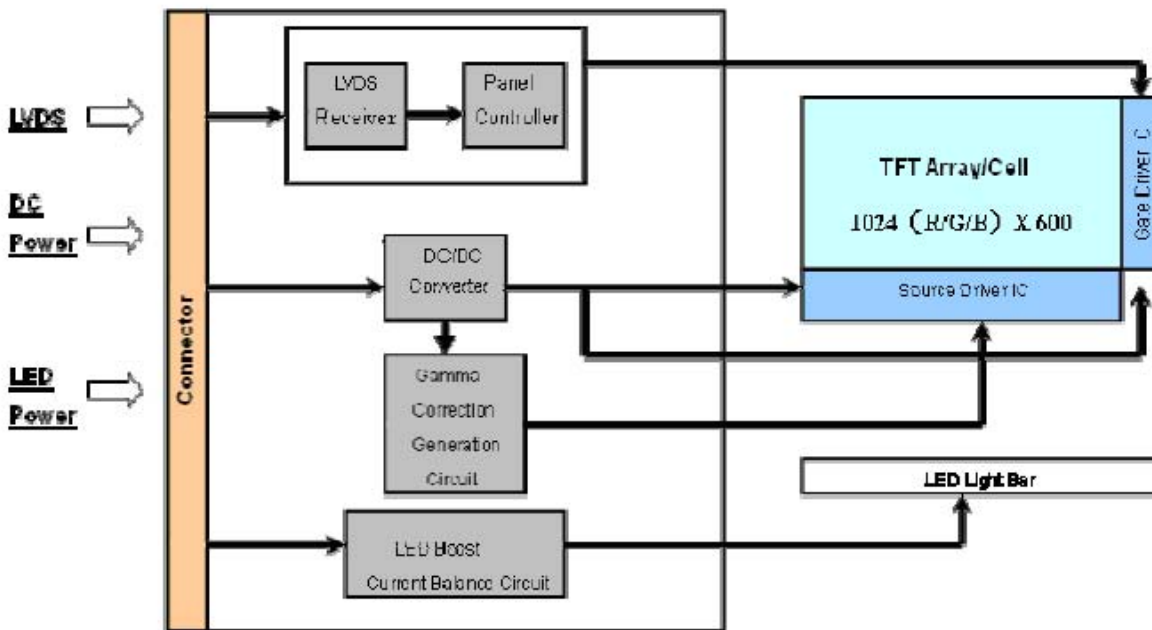


Figure 1 shows the functional block diagram of the LCD module.

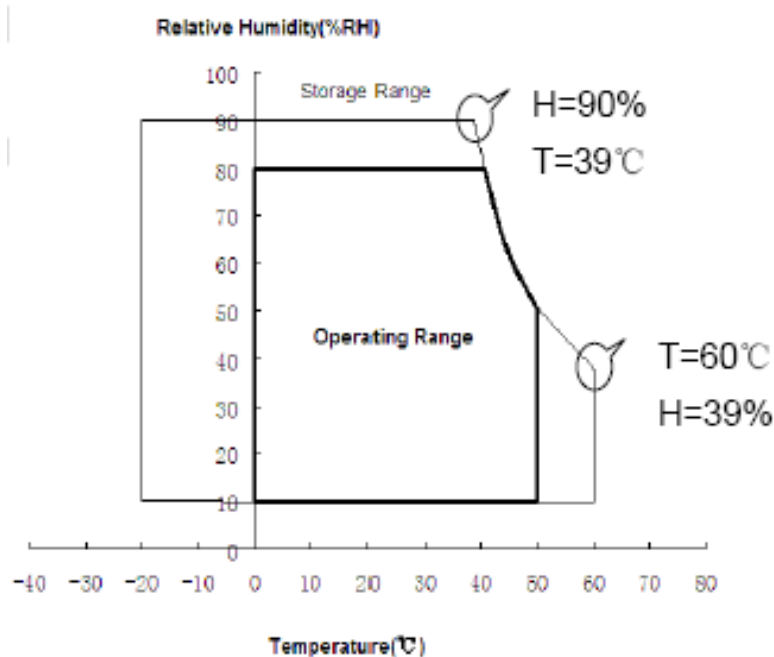
#### 4. LCD ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Max	Unit	Conditions
Supply Voltage	VDD	-0.3	4.0	V	Typ.=3.3V
Input Signal		-0.3	2.7	V	LVDS signals
Operating Temperature	TOP	0	50	°C	(Note 3 )
Operating Humidity	HOP	10	80	% RH	(Note 3 )
Storage Temperature	TST	-20	60	°C	(Note 3 )
Storage Humidity	HST	10	90	% RH	(Note 3 )
Vibration			1.5G	G	30min for X, Y, Z axis
			10~500Hz	Hz	
Shock			220	G	Half sign wave
			2	mS	
LED Current	I-LED		(20)	mA	per LED

Table 1

Note:

- (1) Maximum Wet-Bulb should be 39°C. No condensation.
- (2) When you apply the LCD module for OA system. Please make sure to keep the temperature of LCD module is less than 60°C.
- (3) Storage /Operating temperature





## 6. OPTICAL CHARACTERISTICS

The optical characteristics are measured under stable conditions as following notes

Item	Conditions		Specification			
			Min	Typ.	Max	Note
Viewing Angle [degrees] K=Contrast Ratio>10	Horizontal	Left	35	45	-	A, B
		Right	35	45	-	
	Vertical	Up	5	15	-	
		Down	25	35	-	
Contrast ratio	Center		350	450	-	A, C
Response Time [ms]	Rising + Falling		-	16	-	A, D
Color Chromaticity (CIE1931)	Red	x	Typ. -0.03	0.579	Typ. +0.03	A,
	Red	y		0.346		A,
	Green	x		0.336		A,
	Green	y		0.560		A,
	Blue	x		0.156		A,
	Blue	y		0.123		A,
	White	x	0.263	0.313	0.365	A,
	White	y	0.279	0.329	0.379	A,
White Luminance [cd/m <sup>2</sup> ]	I-LED=20mA		120	160	-	5 point A, E
Luminance Uniformity [%]	I-LED=20mA , 13points		62.5	-	-	A, F
	I-LED=20mA , 5points		80.0	-	-	

Table 2 Optical Characteristics

Note: A. Measurement Setup:

The LCD module should be stabilized at given temperature for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.

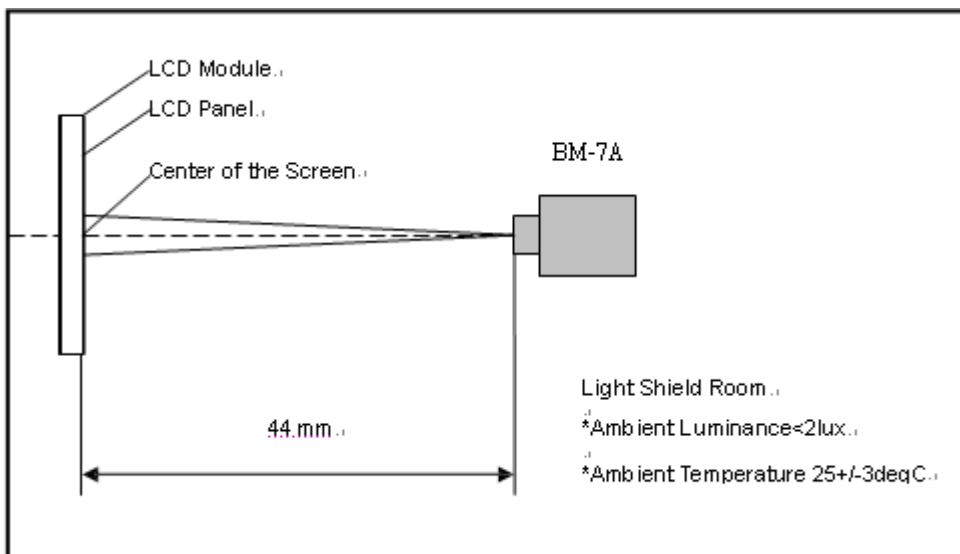


Figure 3 Measurement Setup

B. Definition of Viewing Angle

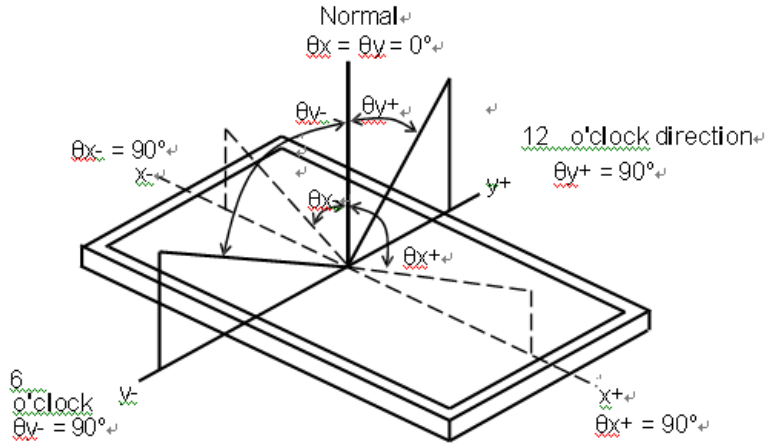


Figure 4 Definition of Viewing Angle

C. Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L63 / L0$$

L63: Luminance of gray level 63, L0: Luminance of gray level 0

D. Definition of Response Time (TR, TF)

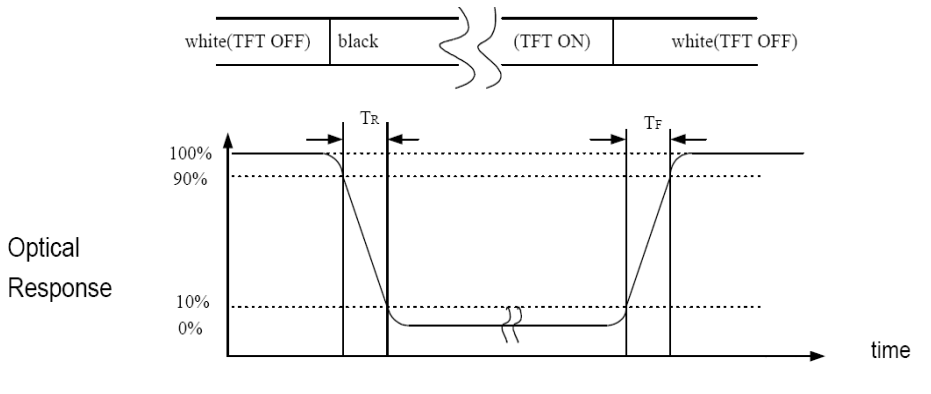


Figure 5 Definition of Response Time

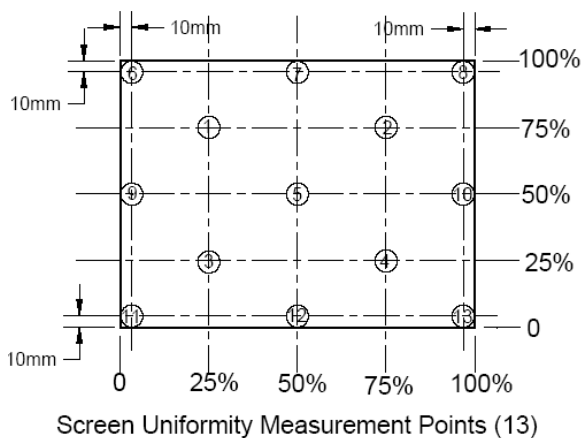


Figure 6 Measurement Locations of 13 Points

## E. Definition of Luminance White

Measure the luminance of gray level 63 at center point and 5 points.

Center of Luminance = Y1

$$\text{Average Luminance of 5 points} = \frac{Y1+Y2+Y3+Y4+Y5}{5}$$

## F. Definition of Luminance Uniformity (Variation)

Measure the luminance of gray level 63 at 13 points.

$$\text{Uniformity of 13 points} = \frac{\text{Min Luminance of Y1~Y13}}{\text{Max Luminance of Y1~Y13}} \times 100\%$$

$$\text{Uniformity of 5 points} = \frac{\text{Min Luminance of Y1~Y5}}{\text{Max Luminance of Y1~Y5}} \times 100\%$$



## 7. BACKLIGHT CHARACTERISTICS

### 7.1 Parameter Guideline of LED Backlight

Symbol	Parameter	Min.	Typ.	Max.	Units	Condition	
V_LED	LED input	5	12	21	[V]	Ta=25[deg C]	
LT	LED Life Time	10,000	-	-	Hours	Ta=25[deg C] Note C	
VPWM_EN	PWM Signal Voltage	High	2.0	3.3	3.6	V	-
		Low	0	-	0.5	V	
FPWM	Output PWM frequency	-	200	1K	Hz	-	
VLED_EN	LED enable Voltage	High	2.0	3.3	3.6	V	-
		Low	0	-	0.5		
PWM	PWM Duty ratio	5	--	100	%	-	

Table 3 Parameter Guideline for LED Backlight

 Note A:  $I_{LED}=20$  mA (Per LED)

Note B: Calculator value for LED chip specification.

Note C: The LED life time define as the estimated time to 50% degradation of initial luminous.

## 8. LCD ELECTRICAL CHARACTERISTICS

### 8.1 Interface Connector

Manufacturer	UJU (or equivalent)
Type / Part Number	IS050-L40B-C10

Table 4 Connector Name / Designation

Table 5 Signal Pin Assignment

Pin #	Signal Name	Description	Remarks
1	NC	Not connected	
2	VDD	Power supply 3.3V(Typ.)	
3	VDD	Power supply 3.3V(Typ.)	
4	VEDID	EDID +3.3V Power	
5	BIST	Bist Mode	Reserve for Aging
6	CLK_EDID	EDID Clock Input	
7	DAT_EDID	EDID Data Input	
8	Rin0-	-LVDS differential data input(R0-R5,G0)	
9	Rin0+	+LVDS differential data input(R0-R5,G0)	
10	GND	Ground	
11	Rin1-	-LVDS differential data input(G1-G5,B0-B1)	
12	Rin1+	+LVDS differential data input(G1-G5,B0-B1)	
13	GND	Ground	
14	Rin2-	-LVDS differential data input(B2-B5,HS,VS,DE)	
15	Rin2+	+LVDS differential data input(B2-B5,HS,VS,DE)	
16	GND	Ground	
17	CLKN-	-LVDS differential clock input	
18	CLKN+	+ LVDS differential clock input	
19	NC	Not connected(Reserve)	
20	NC	Not connected(Reserve)	
21	NC	Not connected(Reserve)	
22	GND	Ground-Shield	
23	NC	Not connected(Reserve)	
24	NC	Not connected(Reserve)	
25	GND	Ground-Shield	
26	NC	Not connected(Reserve)	
27	NC	Not connected(Reserve)	
28	GND	Ground-Shield	
29	NC	Not connected(Reserve)	
30	NC	Not connected(Reserve)	
31	VLED_GND	LED Ground	
32	VLED_GND	LED Ground	
33	VLED_GND	LED Ground	
34	NC	Not connected(Reserve)	
35	VPWM_EN	System PWM Logic Input Level	
36	VLED_EN	LED enable Input Level(+3.3V)	
37	NC	Not connected(Reserve)	
38	VLED	LED Power Supply 5--21V	
39	VLED	LED Power Supply 5--21V	
40	VLED	LED Power Supply 5--21V	

All input signals shall be low or Hi-Z state when VDD is off

## 8.2 LVDS Receiver

### 8.2.1 Signal Electrical Characteristics for LVDS Receiver

The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644 ) standard.

Parameter	Symbol	Min	Typ.	Max	Unit	Conditions
Differential Input High Threshold	V <sub>th</sub>	-	-	+100	mV	V <sub>cm</sub> =+1.2V
Differential Input Low Threshold	V <sub>tl</sub>	-100	-	-	mV	V <sub>cm</sub> =+1.2V
Magnitude Differential Input Voltage	V <sub>id</sub>	100	-	600	mV	
Common Mode Voltage	V <sub>cm</sub>	0.9	1.2	1.5	V	
Common Mode Voltage Offset	ΔV <sub>cm</sub>	-	-	50	mV	V <sub>cm</sub> =+1.2V

Table 6 LVDS Receiver Electrical Characteristics

Note:

- Input signals shall be low or Hi-Z state when VDD is off.
- All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

Parameter	Symbol	Min	Typ.	Max	Unit	Conditions	Note
Clock Frequency	F <sub>c</sub>	44.4	50.4	65.2	MHz		

Table 7 Timing Requirements

Note: All values are at VDD=3.3V, T<sub>a</sub>=25 °C

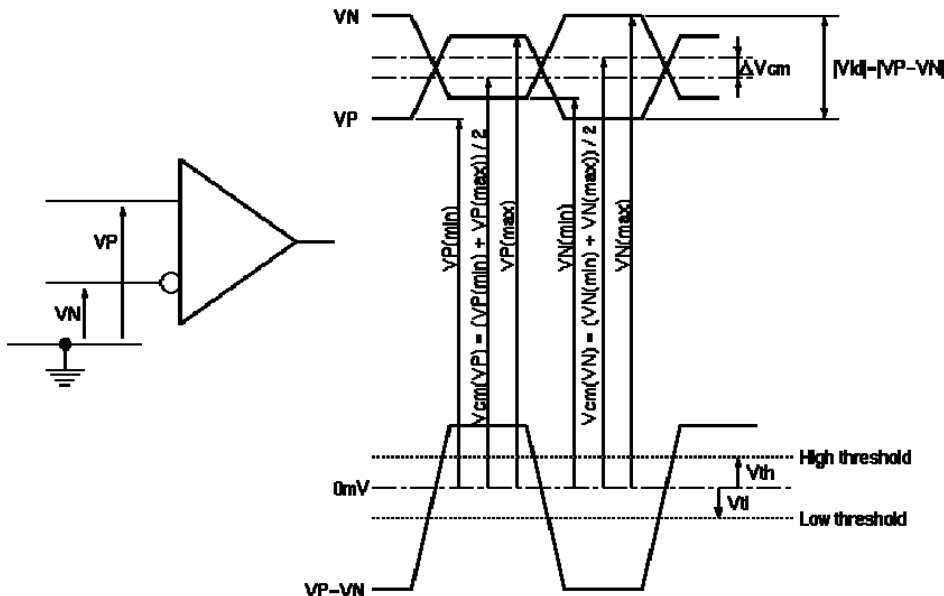


Figure 7 Voltage Definitions

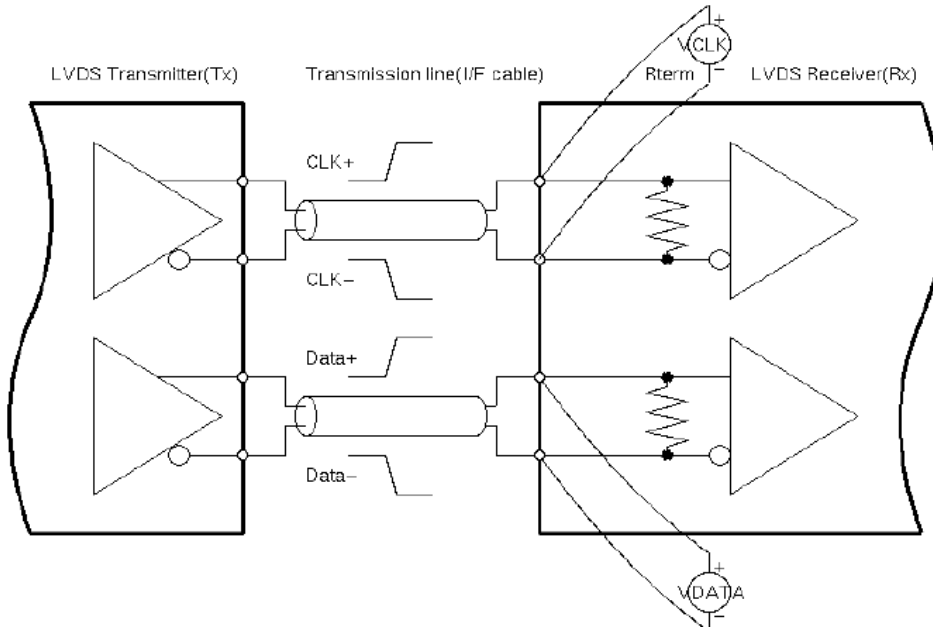
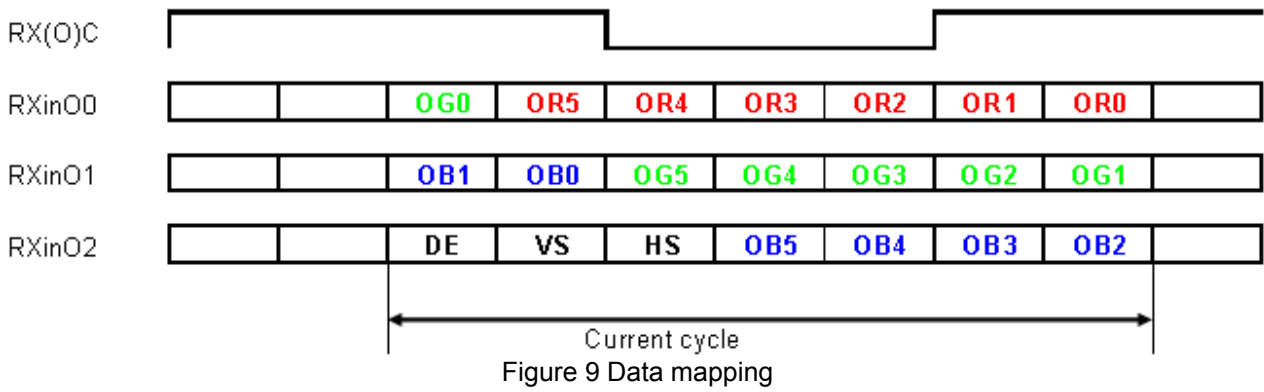


Figure 8 Measurement System



Detail A

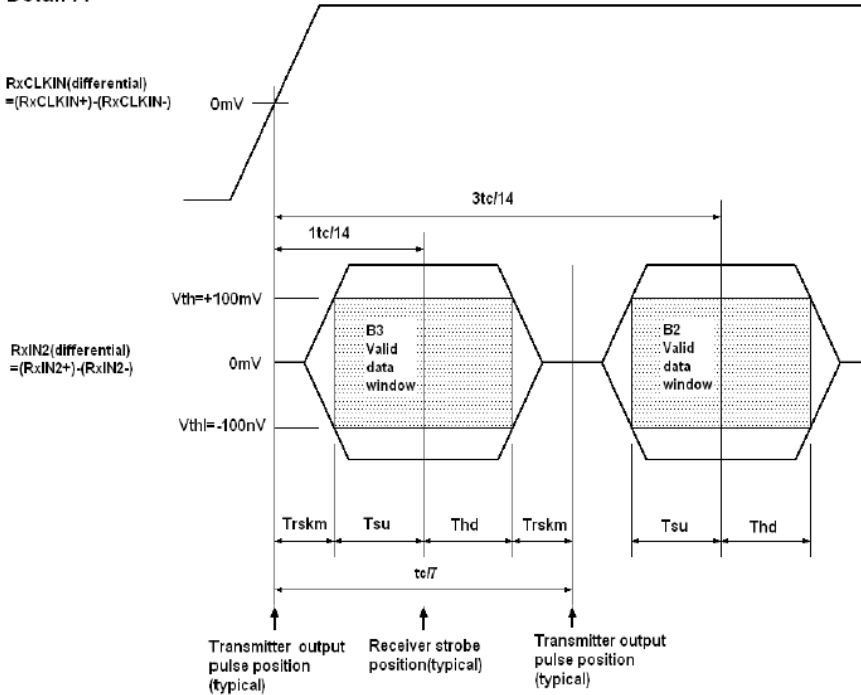


Figure 10 Timing Definition

Note:  $Tsu$  and  $Thd$  is internal data sampling window of receiver.  $Trskm$  is the system skew margin; i.e., the sum of cable skew, source clock jitter, and other inter-symbol interference, shall be less than  $Trskm$ .

8.2.2 LVDS Receiver Internal Circuit

Figure 11 LVDS Receiver Internal Circuit shows the internal block diagram of the LVDS receiver. This LCD module equips termination resistors for LVDS link.

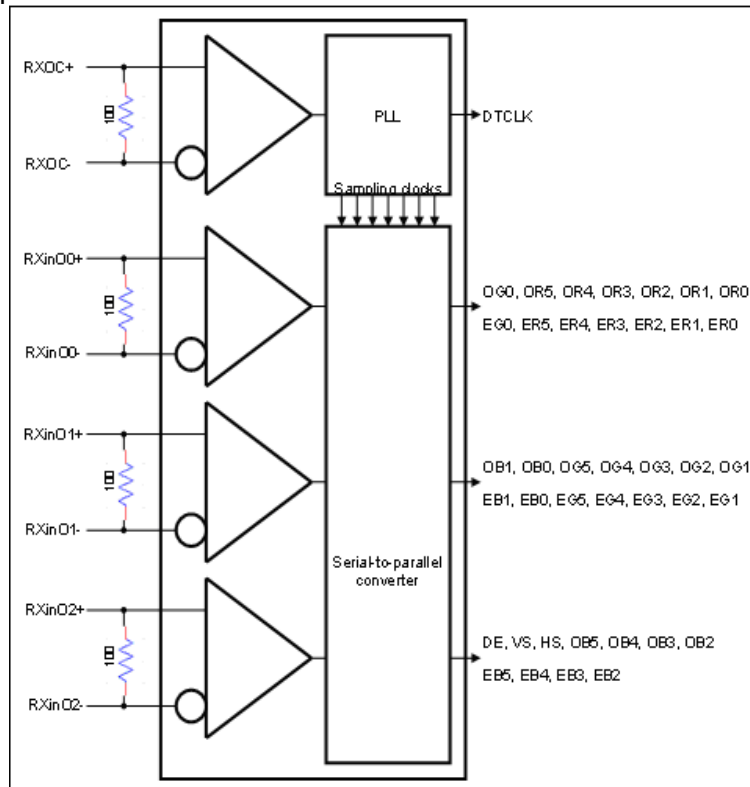


Figure 11 LVDS Receiver Internal Circuit

## 9. LCD INTERFACE TIMINGS

### 9.1 Timing Characteristics

Parameter	Symbol	Unit	min	Typ.	Max
LVDS Clock Frequency(single)	Fdck	MHz	44.4	50.4	65.2
H Total Time	Htotal	clocks	1320	1344	1362
H Active Time	Hac	clocks	1024	1024	1024
V Total Time	Vtotal	lines	612	625	638
V Active Time	Vac	lines	600	600	600
Frame Rate	Vsync	Hz	55	60	65

Table 8 Interface Timings

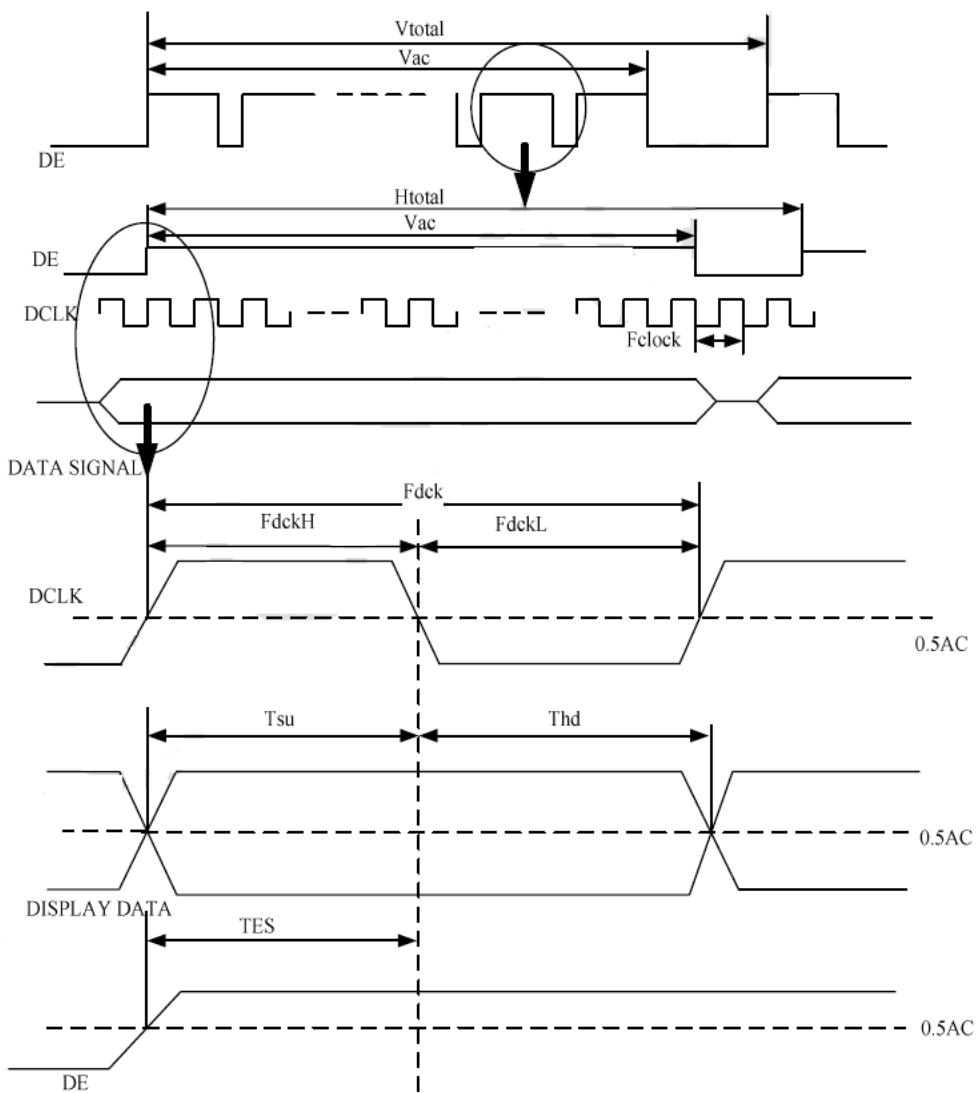


Figure 12 Timing Characteristics

Note: TES is data enable signal setup time.

## 10. LCD POWER CONSUMPTION

Input power specifications are as follows.

Symbol	Parameter	Min	Typ.	Max	Units	Condition
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[V]	
IDD	VDD Current	--	160	--	[A]	All black pattern, 60Hz
PDD	VDD Power	--	--	0.53	[W]	Max pattern, 60Hz
Irush	Rush Current	--	--	2	[A]	
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	--	--	300	[mVp-p]	

Table 9 Power Consumption

## 11. LCD POWER ON/OFF SEQUENCE

VDD power, interface signals, and lamp on/off sequence are shown in Figure 13. Signals shall be Hi-Z state or low level when VDD is off.

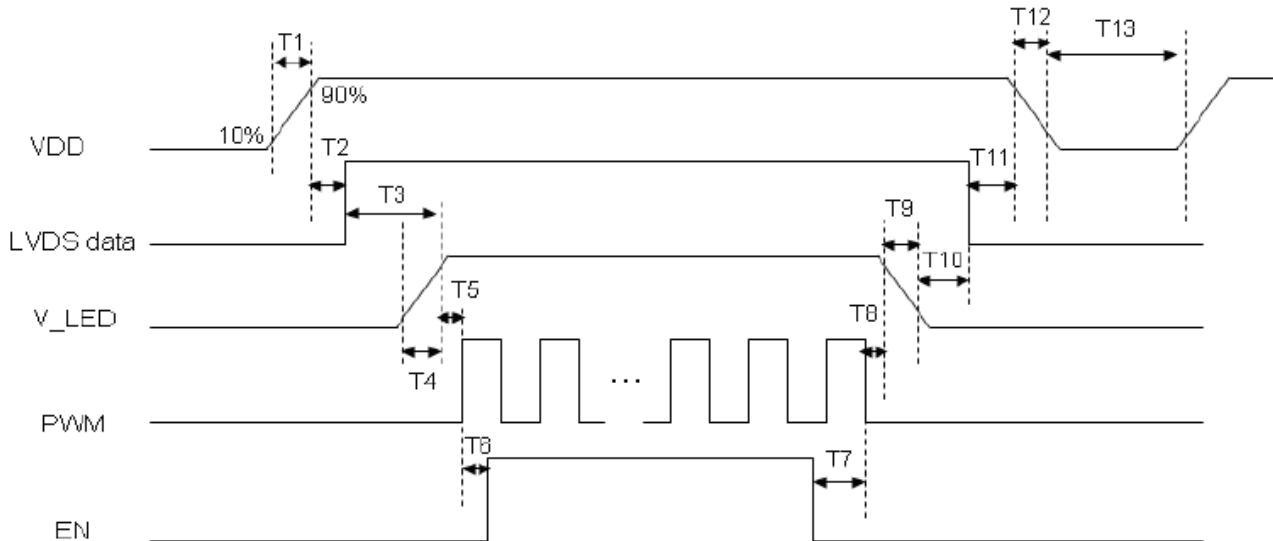


Figure 13 Power Sequence

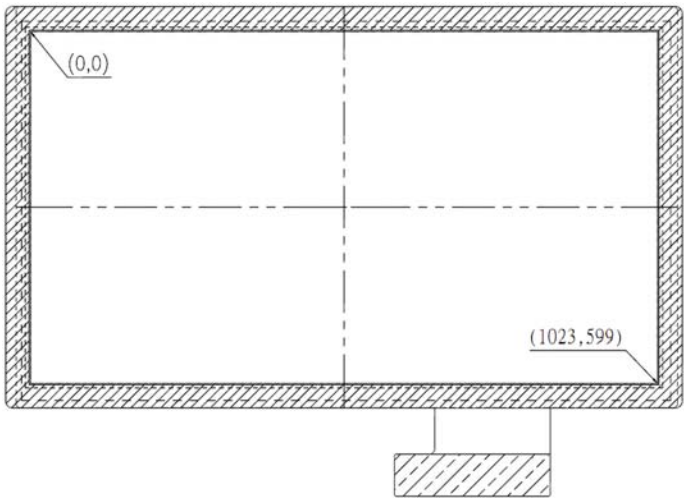
Parameter	Symbol	min	Typ.	max	Unit
VDD Rise Time	T1	0.5	--	10	ms
VDD Good to Signal Valid	T2	30	--	90	ms
Signal Valid to Backlight On	T3	200	--	--	ms
Backlight Power on Time	T4	0.5	--	--	ms
Backlight VDD Good to System PWM on	T5	10	--	--	ms
System PWM on to Backlight Enable on	T6	10	--	--	ms
Backlight Enable off to System PWM off	T7	0	--	--	ms
System PWM off to B/L Power Disable	T8	10	--	--	ms
Backlight Power off Time	T9	--	10	30	
Backlight Off to Signal Disable	T10	200	--	--	ms
Signal Disable to Power Down	T11	0	--	50	ms
VDD Fall Time	T12	--	10	30	ms
Power Off	T13	500	--	--	ms

Table 10 Power Sequencing Requirements



## 12. CTP GENERAL SPECIFICATIONS

### 12.1 CTP main feature

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Multi touch	5	Point
(X,Y) Position		

### 12.2 ABSOLUTE MAXIMUM RATINGS

Symbol	Description	Min	Typ.	Max	Unit	Notes
VCC1	Supply voltage	-0.3	-	6.5	V	
Vio	DC input voltage	-0.3	-	VCC1+0.3	V	

### 12.3 CTP electrical characteristic

Symbol	Description	Min	Typ.	Max	Unit	Notes
VCC1	Supply voltage	--	5.0	--	V	
GND	Supply voltage	-	0	-	V	
I	Supply current		70		mA	At VCC1=5.0

### 12.4 CTP pin functions

Pin	Symbol	Type	Description
1	VCC1	Power	Power; VCC1 =5.0V(typ.)
2	D-	Signal	USB Signal
3	D+	Signal	USB Signal
4	GND	Power	Ground

Note: Interface protocol please refer to Universal Serial Bus Specification Revision 1.1

## 13. APPEARANCE SPECIFICATION

### 13.1 Inspection condition

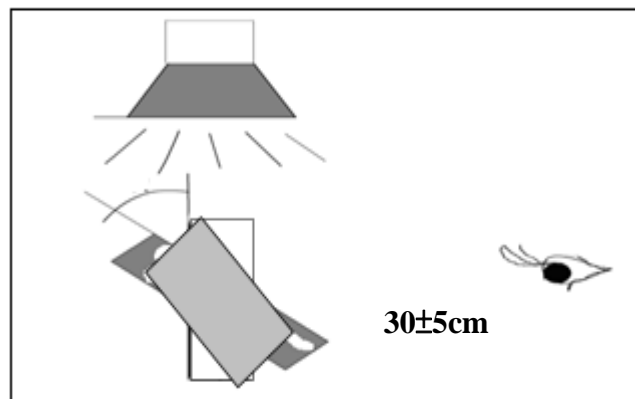
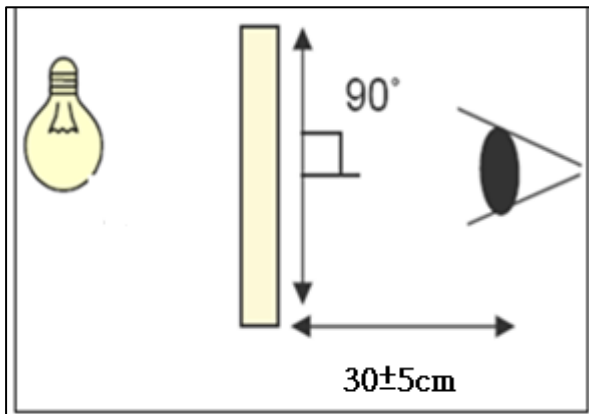
#### 13.1.1 Inspection conditions

13.1.1.1 Inspection Distance :  $30 \pm 5$  cm

13.1.1.2 View Angle :

(1) Inspection that light pervious to the product:  $90 \pm 15^\circ$

(2) Inspection that light reflects on the product:  $90 \pm 15^\circ$

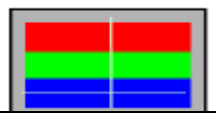
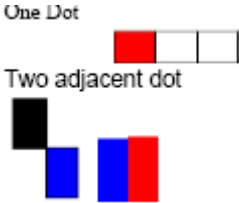
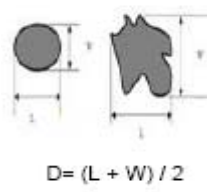
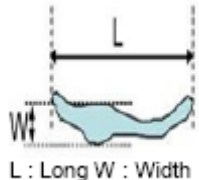


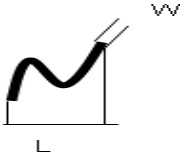
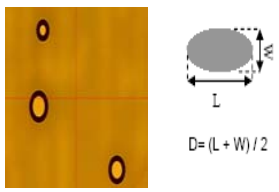
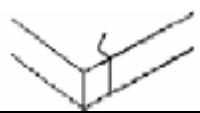
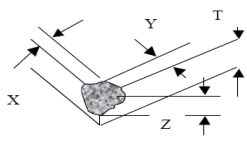
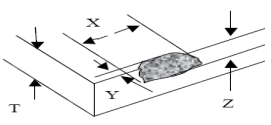
#### 13.1.2 Environment conditions :

Ambient Temperature :	$25 \pm 5^\circ\text{C}$
Ambient Humidity :	30~75%RH
Ambient Illumination	600~800 lux

### 13.2 Inspection Parameters

Appearance inspection standard (D: diameter, L: length; W: width, Z: height, T: glass thickness)

Inspection item	Inspection standard		Description	
No image	Prohibited			
Image abnormal	Prohibited			
Bright line	Prohibited			
Thin line	It is acceptable that the defect can not be seen with 5% ND filter.			
Mura	It is acceptable that the defect can not be seen with 5% ND filter.			
Dot	Item	Acceptable		
		Visible area		Total
	Bright dot	3		6
	Dark dot	5		
	Bright adjacent dots	1		1
	Dark adjacent dots	2		2
Adjacent dots with a bright dot and a dark dot	2	2		
Foreign material in dot shape	SPEC (unit: mm)		Acceptable	
	$D \leq 0.5$		Ignored	
	$0.5 < D \leq 0.8, \text{distance} > 5$		$n \leq 5$	
	$D > 0.8$		0	
 <p><math>D = (L + W) / 2</math></p>				
Foreign material in line shape	SPEC		Acceptable	
	$W \leq 0.05 \text{ and } L \leq 10$		Ignored	
	$0.05 < W \leq 0.1, L \leq 10, \text{distance} > 5$		$n \leq 5$	
	$W > 0.1 \text{ or } L > 10$		0	
 <p>L : Long W : Width</p>				
Contamination	It is acceptable if the dirt can be wiped.			

Scratch	SPEC	Acceptable	
	$W \leq 0.05$ and $L \leq 10$	Ignored	
	$0.05 < W \leq 0.08$ , $L \leq 10$ , distance $> 5$	$n \leq 5$	
	$0.08 < W \leq 0.1$ , $L \leq 10$ , distance $> 5$	$n \leq 3$	
	$W > 0.1$ or $L > 10$	0	
Bubble	SPEC (unit: mm)	Acceptable	
	$D \leq 0.3$	Ignored	
	Non visible area	Ignored	
	$0.3 < D \leq 0.5$ , distance $> 5$	$n \leq 5$	
	$D > 0.5$	0	
Polarizer flaw or leak out resin	Defect is defined as the active area.		
Cover & Sensor Crack	Prohibited		
Cover angle missing	SPEC (unit: mm)	Acceptable	
	Side/Bottom	Ignored	
	It is prohibited if the defect appears on the front.	0	
Cover edge break	SPEC (unit: mm)	Acceptable	
	$X \leq 3.0$ , $Y \leq 3.0$ , $Z \leq T$	Ignored	
	$X > 3.0$ , $Y > 3.0$ , $Z > T$	0	
Ink	SPEC (unit: mm)	Acceptable	
	word unclear, inverted, mistake, break line	0	
Bubble under protection film	SPEC (unit: mm)	Acceptable	
	NA		
Function	Prohibited		

### 13.3 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

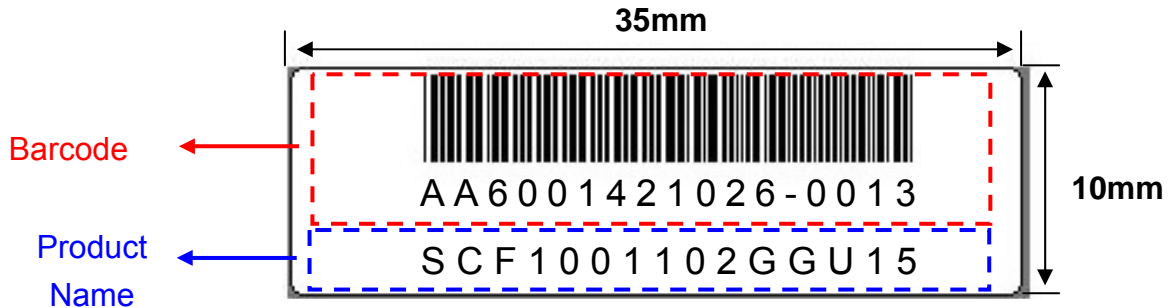
Sampling table: MIL-STD-105E

Inspection level: Level II

Class of defects	Definition		
	<b>Major</b>	AQL 0.65%	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
<b>Minor</b>	AQL 1.5%	It is a defect that will not result in functioning problem with deviation classified.	

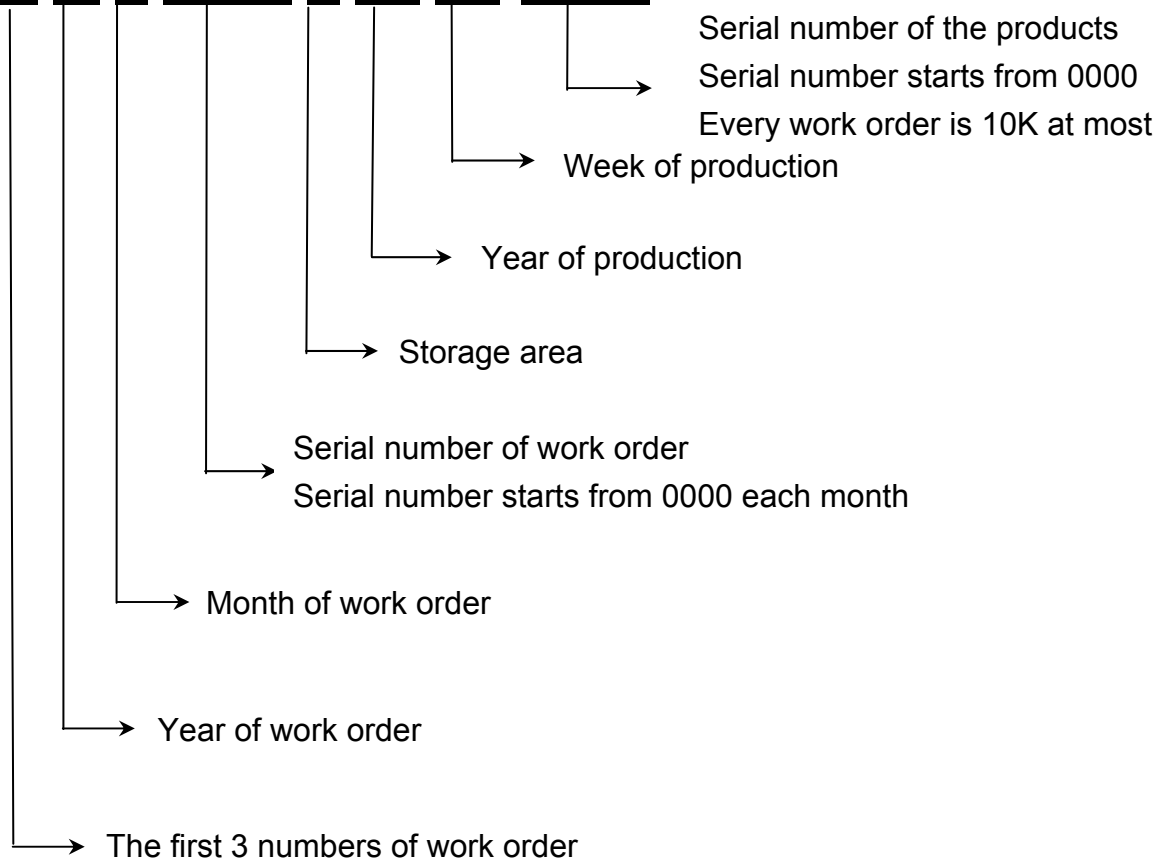
## 14. CTP LCM PRODUCT LABEL DEFINE

CTP LCM Product Label style:

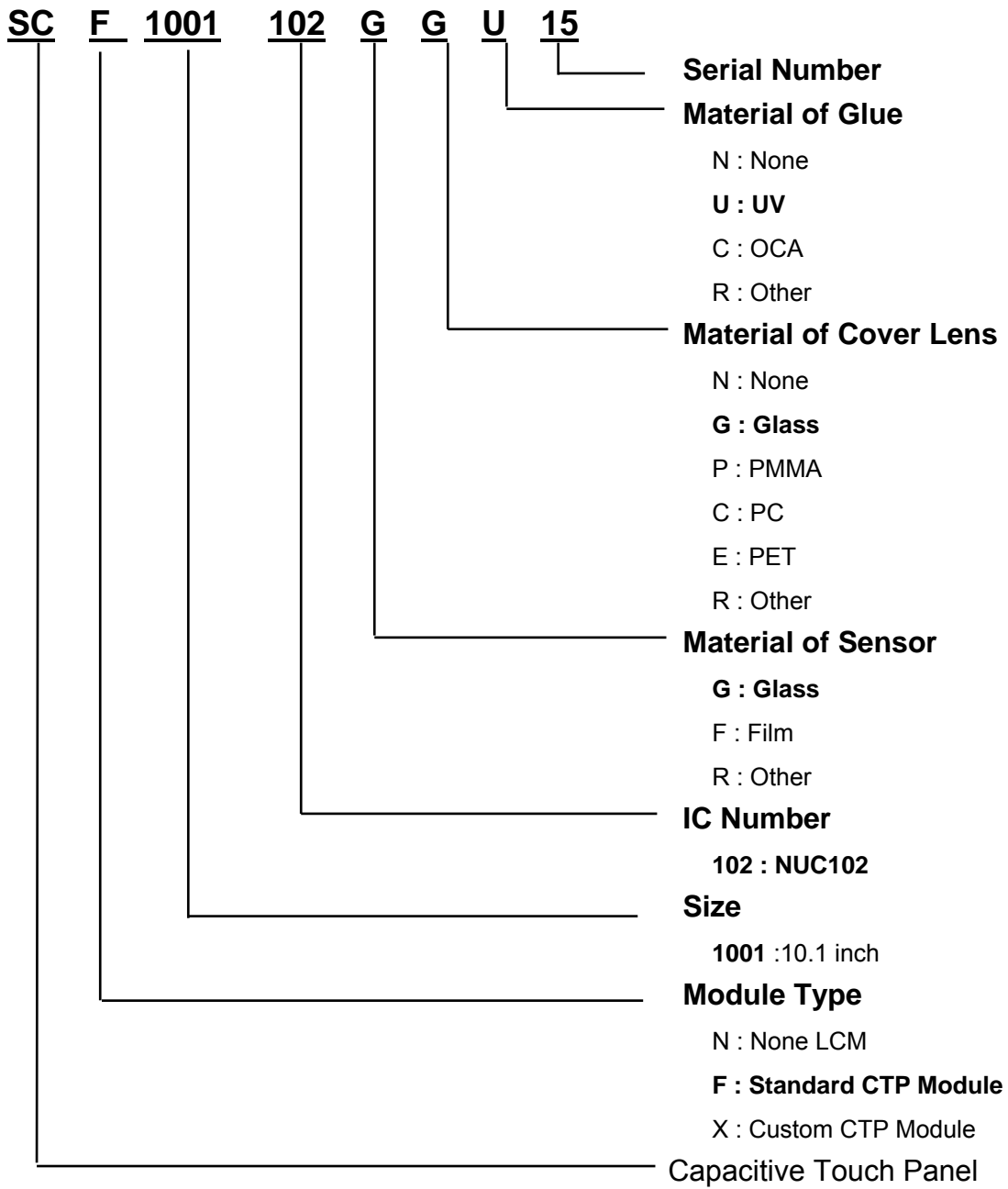


Barcode Define:

**AA6001421026-0013**



**Product Name Define:**



## 15. PRECAUTIONS IN USE LCM

### 1. ASSEMBLY PRECAUTIONS

- (1) Since Touch Panel is consist of glass,please be careful your hands to be injured during handing. You must wear gloves during handing.
- (2) Do not touch, push or rub the exposed touch panel, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
- (3) Do not stack the touch panels together.Do not put heavy objects on touch panel.
- (4) Please do not take a CTP to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
- (5) Please excessive force or strain to the panel or tail is prohibited, Do not lift touch panel by cable(FPC).
- (6) Use clean sacks or glove to prevent fingerprints and/or stains left on the panel. Extra attention and carefulness should be taken while handling the glass edge.
- (7) Please pay attention for the matters stated below at mounting design of touch panel enclosure.

Enclosure support to fix touch panel must be out of active area.(do not design enclosure presses the active area to protect from miss put)

### 2 .OPERATING PRECAUTIONS

- (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
- (2) Please do not change variable resistance settings in CTP. They are adjusted to the most suitable value. If they are changed, it might happen CTP does not satisfy the characteristics specification
- (3) Be careful for condensation at sudden temperature change. Condensation makes damage to snesor or electrical contacted parts.
- (4) CTP has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (5) Touch the panel with your finger or stylus only to assure normal operation. Any sharp edged or hard objects are prohibited.
- (6) Operate the panel in a steady environment. Abrupt variation on temperature and humidity may cause malfunction of the panel.

### 3. ELECTROSTATIC DISCHARGE CONTROL

- (1) The operator should be grounded whenever he/she comes into contact with the CTP. Never touch any of the conductive parts such the copper leads on the FPC and the interface terminals with any parts of the human body.

- (2) The CTP should be kept in antistatic bags or other containers resistant to static for storage.
- (3) Only properly grounded soldering irons should be used.
- (4) If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.
- (5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
- (6) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

### 4. STORAGE PRECAUTIONS

- (1) When you store touch panel for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
- (2) Please do not leave touch panel in the environment of high humidity and high temperature such as 60°C 90%RH
- (3) Please do not leave touch panel in the environment of low temperature; below -20°C.

### 5. OTHERS

For the packaging box, please pay attention to the followings:

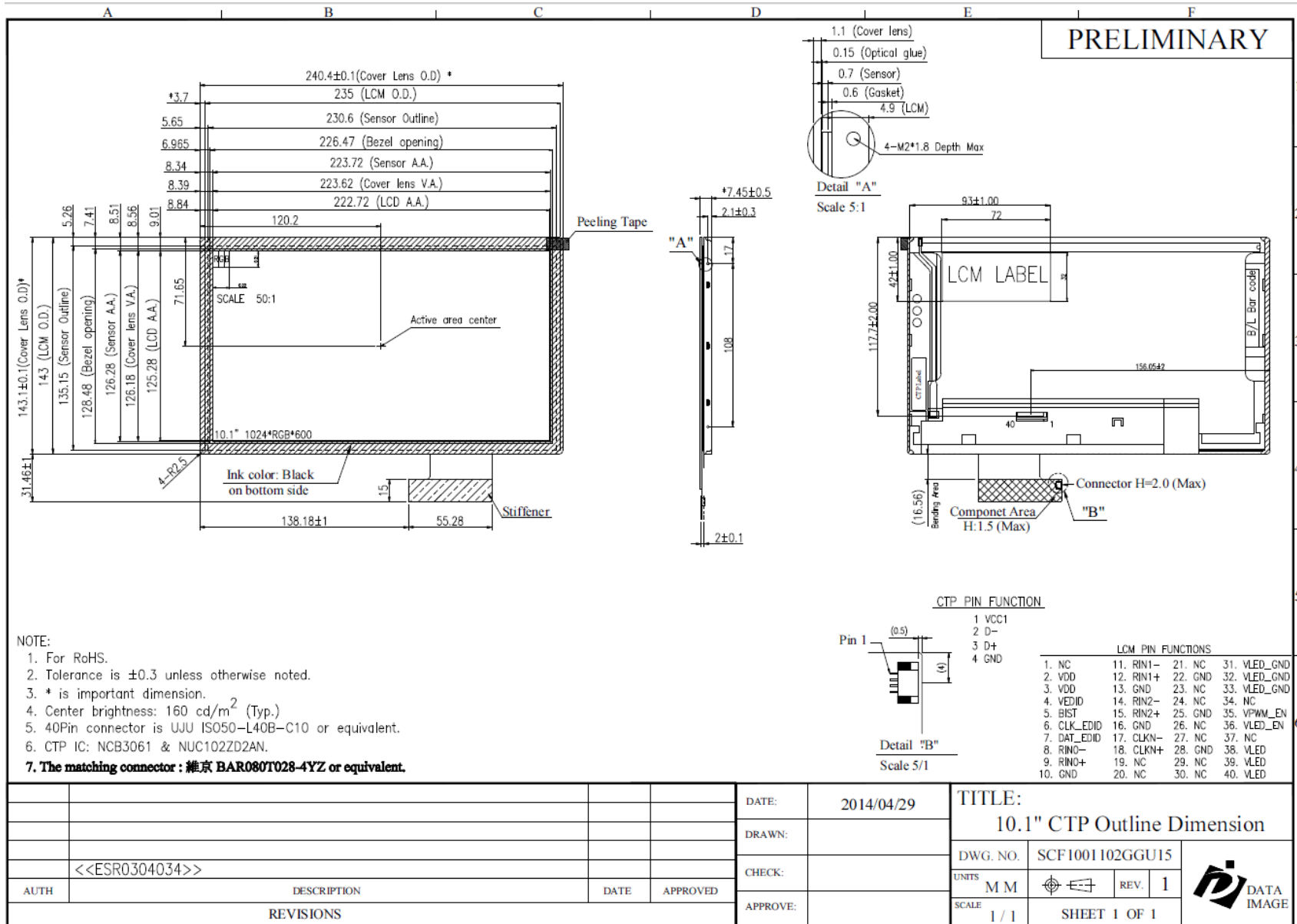
- (4) Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
- (5) Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
- (6) Packing box and inner case for CTP are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)

### 6. LIMITED WARRANTY

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its CTP which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not responsible for any subsequent or consequential events.



# 16. OUTLINE DRAWING





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## 17. PACKAGE INFORMATION

TBD