



DATA SHEET

規 格 書

Customer 客戶名稱	
Car Project Name (車用型號)	
Part No. 產品型號	9.46inch
Product type 產品內容	TFT module : Transmissive Type, Normally black mode RGB vertical stripe 1280x3(R,G,B)x240
Remarks 備註欄	
<input checked="" type="checkbox"/> Preliminary Specification 暫行規格 <input type="checkbox"/> Final Specification 正式規格 Signature by Customer: 客戶確認簽章:	

Issued by QA	Checked by QA	Checked by MD	Checked by PM	Approved By	
				PD	CS

Specification of LCD Module

Product No.:9.46inch

Issue date: 2017/10/30

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1. GENERAL DESCRIPTION

9.46inch is a Transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT **LCD Panel**, **Driver IC**, **FPC** and a **Backlight unit**.

2. FEATURES

Display Mode	Transmissive Type
	a-Si TFT , Normally Black
Display Format	RGB Strip type
Color	16.7M color
Interface	LVDS data bus,24 bit
Viewing Direction	Free
Backlight type / color	LED / White

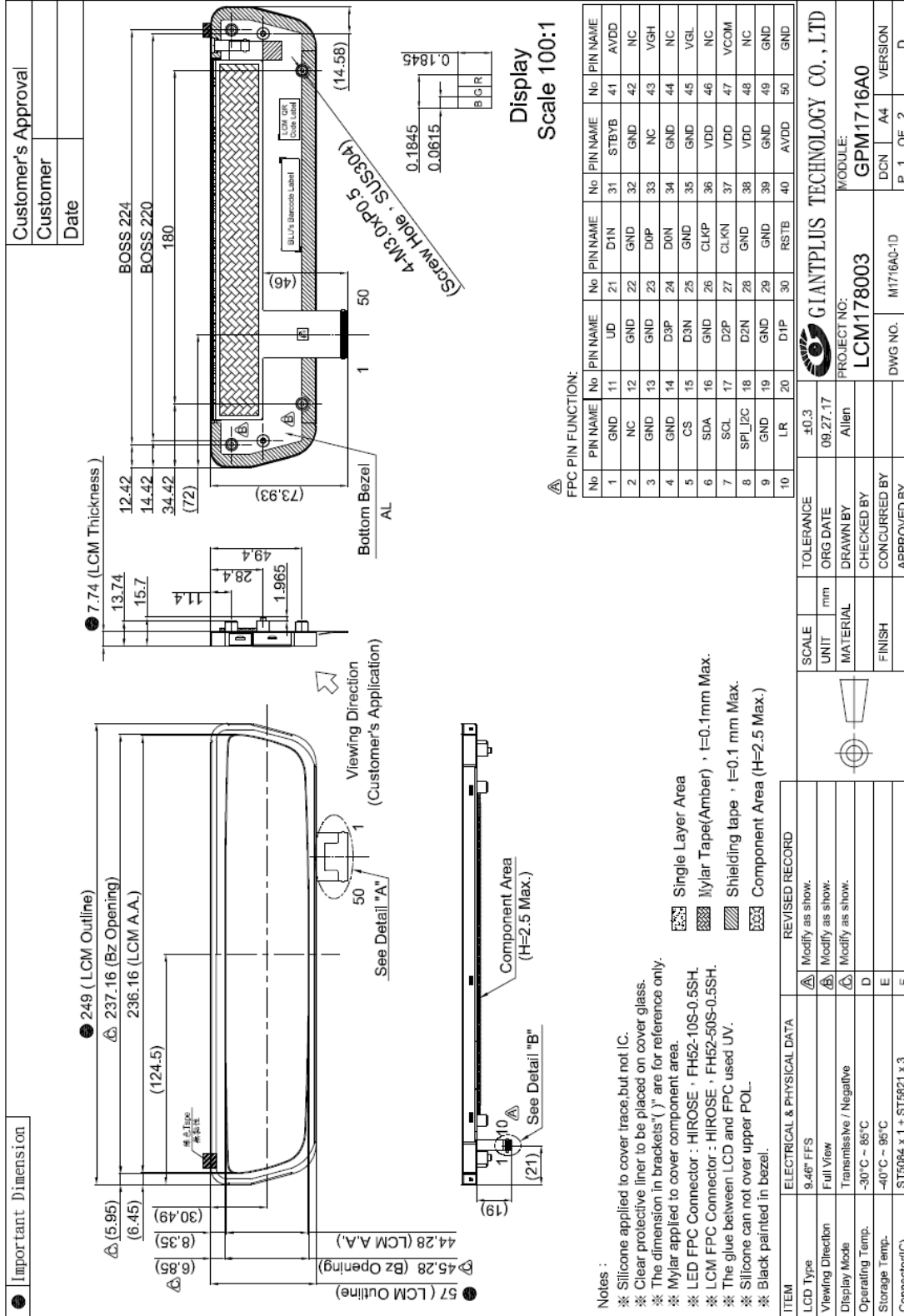
3. MECHANICAL SPECIFICATION

Item	Specifications	Unit
Display Size	9.46	Inch
Dimensional outline	249 (W) × 57(H) × 7.74(D)*	mm
Resolution	1280×3(R,G,B)×240	dot
Active area	236.16(W) × 44.28(H)	mm
Pixel pitch	0.1845(W) × 0.1845(H)	mm
POL	<u>Top: AG / Bottom: Clear*</u>	

* Exclude FPC

* Clean type means no AG surface treatment.

4. MECHANICAL SPECIFICATION



5. MAXIMUM RATINGS

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

Item	Symbol	Values		Unit	Condition
		Min.	Max.		
Logic supply voltage	VDD	-0.5	+5V	V	
Analog supply voltage	AVDD	-0.5	14.85	V	
Storage Temperature	T _{ST}	-40	95	°C	
Operating Temperature (Ambient Temperature)	T _{OP}	-30	85	°C	
Humidity	-	-	90	%RH	Note1

Note1: T_A ≅ 40°C Without dewing

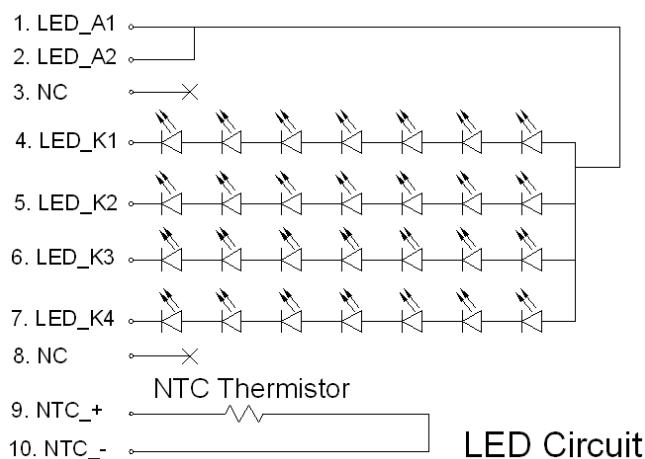
6. ELECTRICAL CHARACTERISTICS

Item	Symbol	Values			Unit	Remark	
		Min.	Typ.	Max.			
Supply Voltage	VCC	3.2	3.3	3.4	V		
Power supply for Gate on output.	VGH	17.5	18	18.5	V	TBD	
Power supply for Gate off output.	VGL	-6.5	-6	-5.5	V	TBD	
Source driver analog power supply	AVDD	12.7	13	13.3	V	TBD	
Common Voltage	VCOM	4.3	5.3	6.3	V	TBD	
IDD	IDD	-	-	200	mA	TBD	
Power Consumption (Without Backlight)	PFOG	0.64	0.66	0.68	W	TBD	
Power Consumption (With Backlight)	PMDL	11.42	12.52	13.22	W	TBD	
I/O Input Voltage	H level	V _{IH}	0.7*VCC	-	VCC	V	
	L Level	V _{IL}	GND	-	0.3VCC	V	

7. BACKLIGHT CHARACTERISTIC

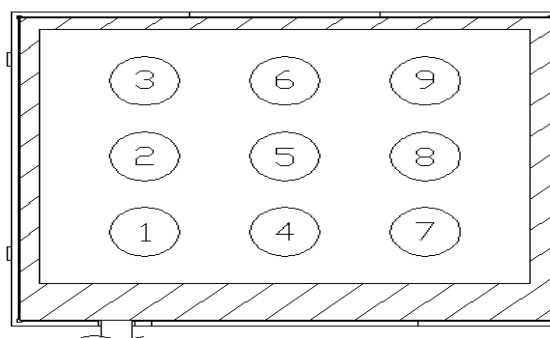
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power Consumption	P_{LED}	10.78	11.86	12.54	W	
LED Current	I_{AK}	280			mA	Total 4 string/ Led= 70 mA per piece
LED Voltage	V_{AK}	38.5	42.35	44.8	V	LED6.05v/1ea
LED life time (L50%)	-	20000			Hr	Ta=60°C RH=60% IF=50mA Tj=90°C
Uniformity	-	75	80	-	%	Note 2

Backlight LED Circuit:



Note 1: GP suggest using constant current driving this backlight unit.

Note 2:



8. MODULE FUNCTION DESCRIPTION

8.1.Pin Description

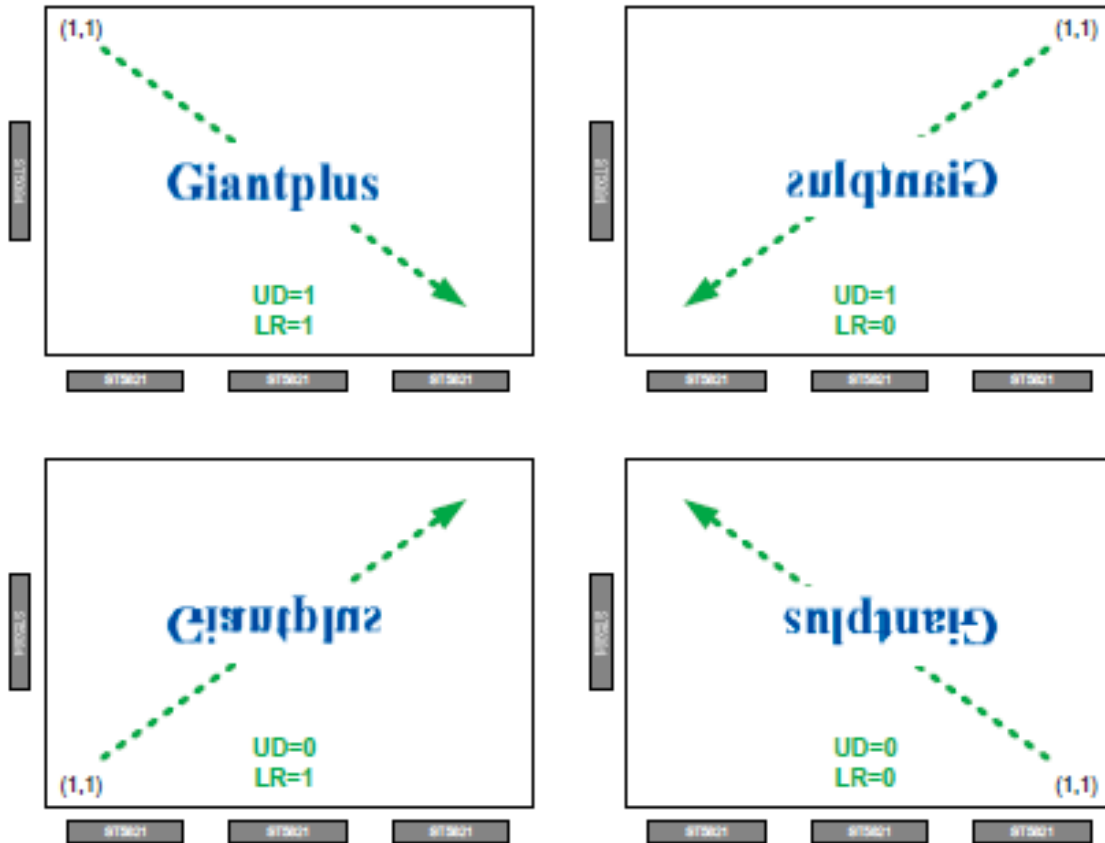
Pin No.	Define	I/O	Description	GP Use
Pin1	GND	P	System Ground	
Pin2	NC	P	No connect	VDD_MTP
Pin3	GND	P	System Ground	
Pin4	GND	P	System Ground	ROM_RLB
Pin5	CS	I	Chip select signal H : chip not selected (inaccessible) L : chip selected (accessible)	
Pin6	SDA	I/O	Serial data input of SPI, I2C or EEPROM	
Pin7	SCL	I/O	Clock signal for SPI, I2C or EEPROM	
Pin8	SPI_I2C	I	Serial interface selection. H : SPI L : I2C	
Pin9	GND	P	System Ground	
Pin10	LR	I	SD horizontal shift direction selection H : SO[1] SO[2] ... SO[1284] L : SO[1284] SO[1283] ... SO[1]	
Pin11	UD	I	GD vertical shift direction selection, actual shift direction depends on GD location (Left or right side on panel)	
Pin12	GND	P	System Ground	BIST
Pin13	GND	P	System Ground	
Pin14	D3P	I	LVDS Differential Data Pair	
Pin15	D3N	I	LVDS Differential Data Pair	
Pin16	GND	P	System Ground	
Pin17	D2P	I	LVDS Differential Data Pair	
Pin18	D2N	I	LVDS Differential Data Pair	
Pin19	GND	P	System Ground	



Pin20	DIP	I	LVDS Differential Data Pair
Pin21	DIN	I	LVDS Differential Data Pair
Pin22	GND	P	System Ground
Pin23	DOP	I	LVDS Differential Data Pair
Pin24	DON	I	LVDS Differential Data Pair
Pin25	GND	P	System Ground
Pin26	CLKP	I	LVDS Differential Data Pair
Pin27	CLKN	I	LVDS Differential Data Pair
Pin28	GND	P	System Ground
Pin29	GND	P	System Ground
Pin30	RSTB	I	Reset pin H : normal operation L : reset state, suggest to connecting with an RC circuit for stability
Pin31	STBYB	I	Standby mode H: normal operation L: TCON, SD, power circuit and temp sensor will turn off
Pin32	GND	P	System Ground
Pin33	NC		No connect
Pin34	GND	P	System Ground
Pin35	GND	P	System Ground
Pin36	VDD	P	System Power
Pin37	VDD	P	System Power
Pin38	VDD	P	System Power
Pin39	GND	P	System Ground
Pin40	AVDD	P	Source driver analog power supply
Pin41	AVDD	P	Source driver analog power supply
Pin42	NC		No connect
Pin43	VGH	P	Power supplu for Gate on output.
Pin44	NC		No connect
Pin45	VGL	P	Power supplu for Gate nff output.
Pin46	NC		No connect
Pin47	VCOM	P	Common electrode driving voltage.

Pin48	NC		No connect	
Pin49	GND	P	System Ground	
Pin50	GND	P	System Ground	

8.2.Pin Chip arrangement and scan direction control



8.3.LVDS mode AC Electrical Characteristic

Timing Chart only for 1280X240 Sync mode Timing

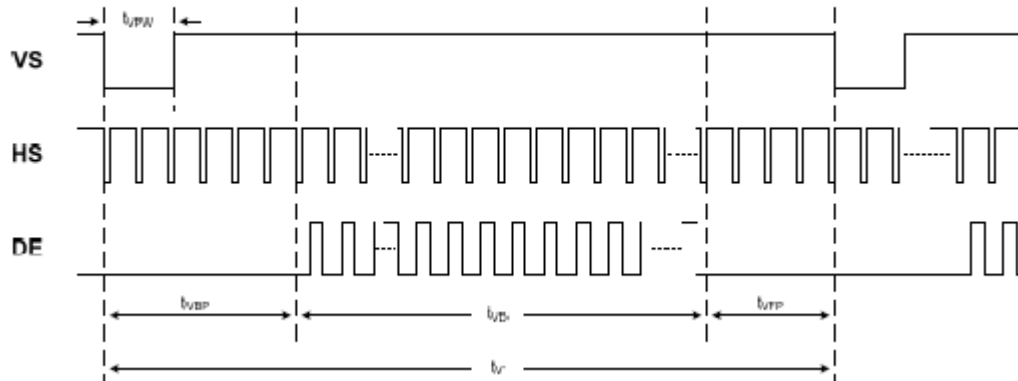
Parameter	Symbol	Value			Unit
		Min.	Recommend	Max.	
CLK frequency	t_{CLK}	25.4	27.7	36.7	Mhz
Horizontal back porch	t_{HBP}		10		t_{CLK}
Horizontal display area	t_{HD}	1280	1280	1280	t_{CLK}
Horizontal front porch	t_{HFP}	15	74	159	t_{CLK}
Horizontal period	t_H	1305	1364	1439	t_{CLK}
Horizontal pulse width	t_{HPW}		2		t_{CLK}
Vertical back porch	t_{VBP}		82		t_H
Vertical display area	t_{VD}	240	240	240	t_H
Vertical front porch	t_{VFP}	3	16	100	t_H
Vertical period	t_V	325	338	422	t_H
Vertical pulse width	t_{VPW}		2		t_H

Notes: In Sync mode(HSYNC+VSYNC+CLK), it could support 1280X240 resolutions as full screen.

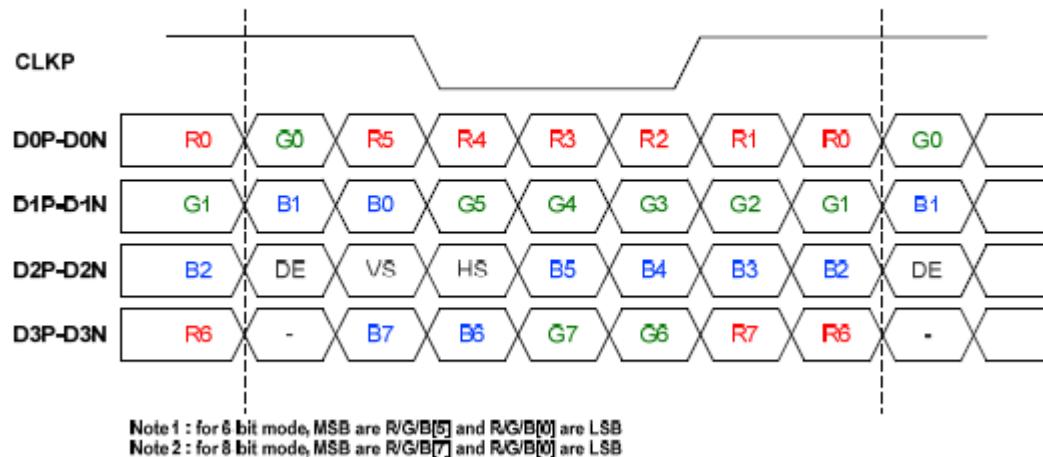


8.4.Data input format

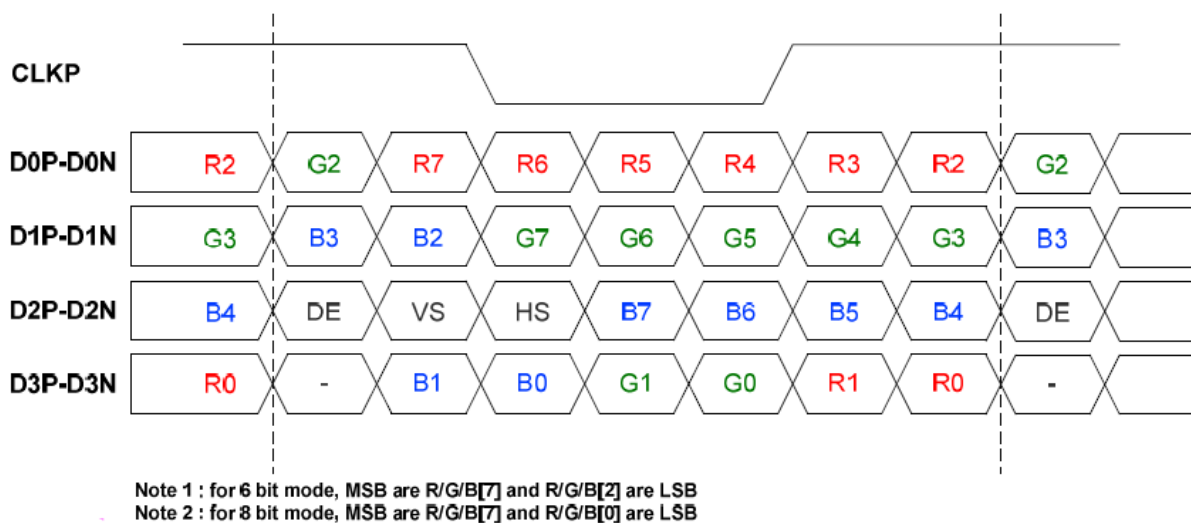
Vertical input timing



VESA data mapping



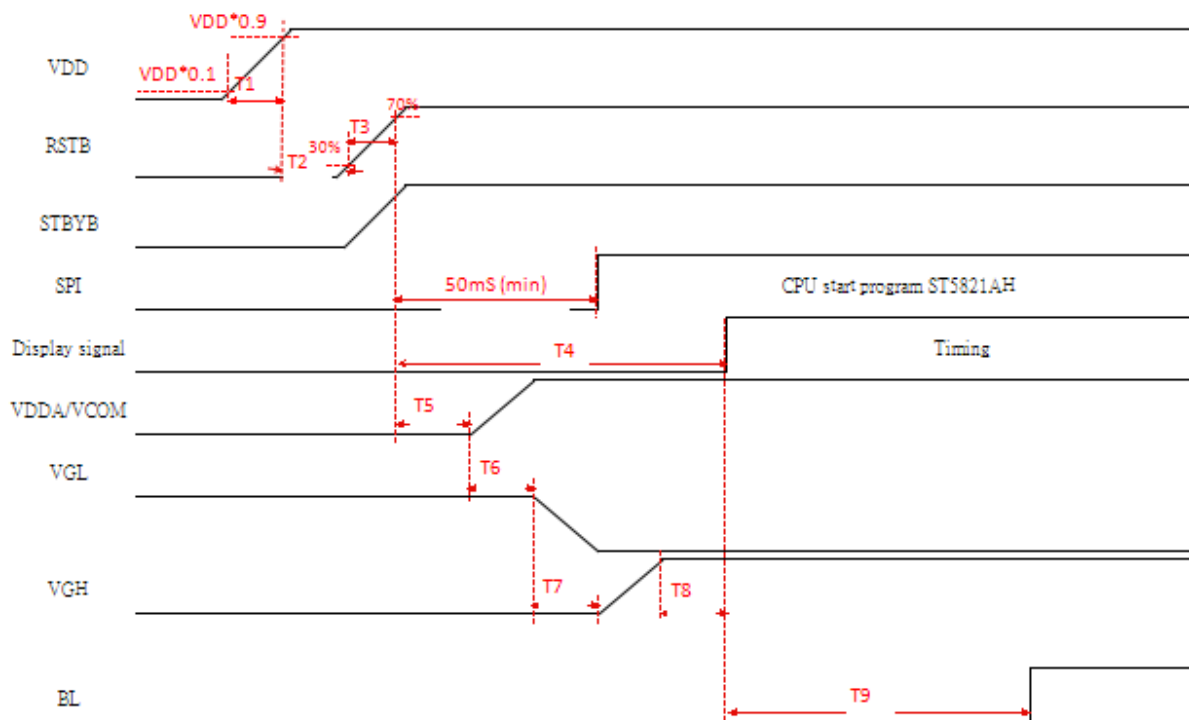
JEIDA data mapping



8.5. Power on /off sequence

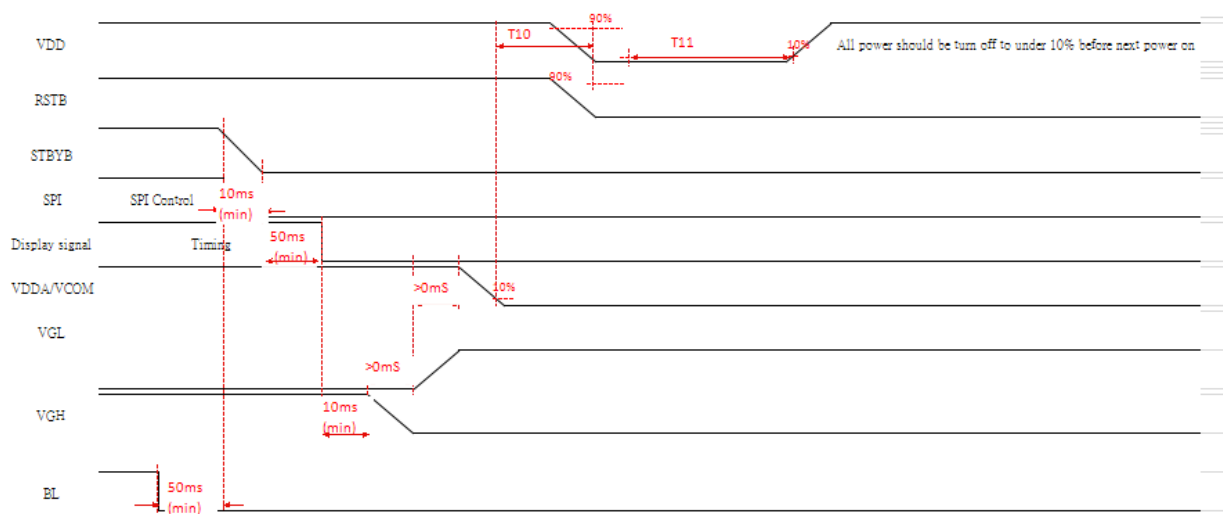
Power On

Power on sequence



Power Off

Power off sequence

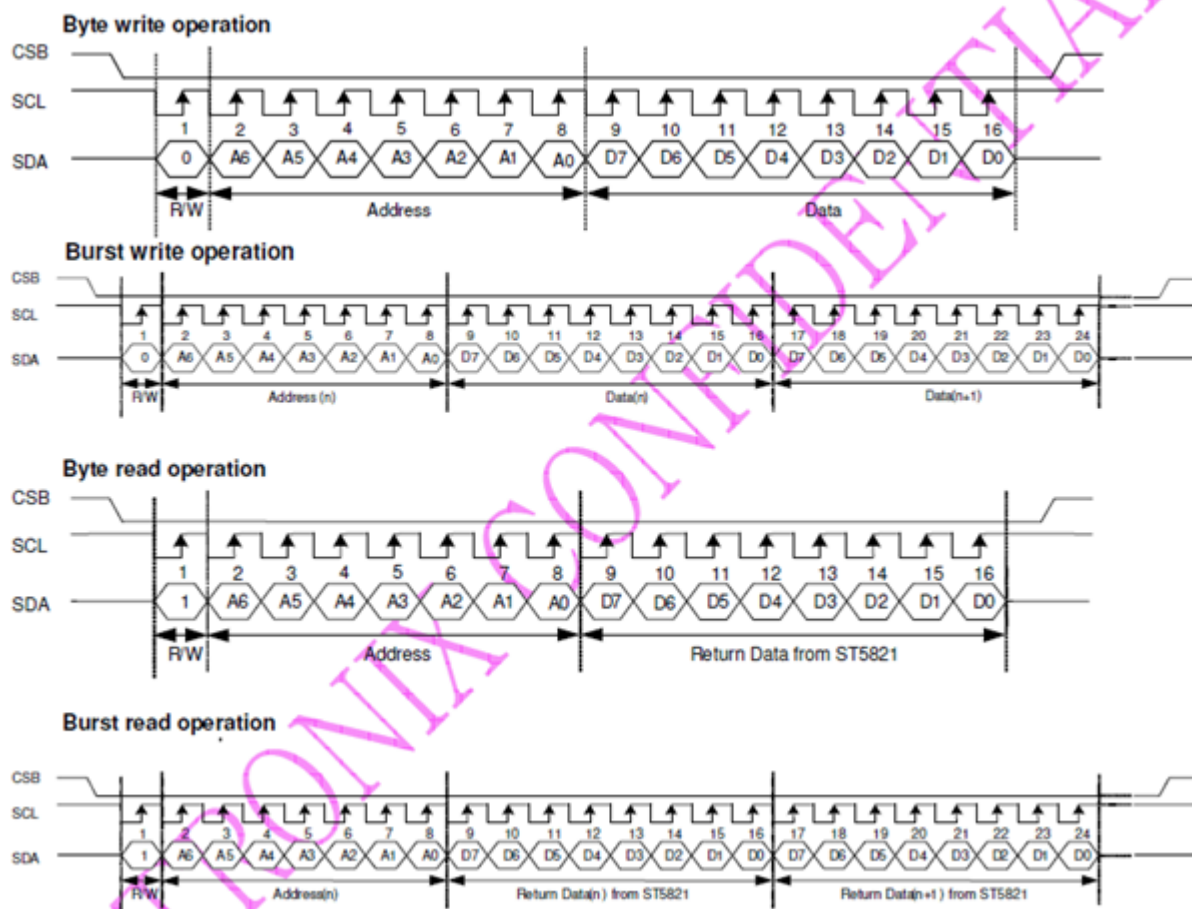




	min	typ	max	Unit	Note
T1	1.5	-	5	ms	
T2	1	-	20	ms	
T3	-	-	<1	us	MCU
T4	T5+T6+T7+T8	200	300	ms	
T5	1	20	30	ms	
T6	>0	-	20	ms	
T7	>0	-	20	ms	
T8	5	-	-	ms	
T9	400	500	-	ms	
T10	1	10	20	ms	
T11	1	3	-	s	



9. SPI Serial Interface



10.ELECTRO-OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in dark room or equivalent state with the methods shown in Note 1.

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	
Brightness	-	-	4000	4200	-	cd/m ²	CA210	
Response time	T _R +T _F	Θ=0, -30°C	-	400	550	Ms	Note 1	
		Θ=0, 25°C	-	25	50			
Contrast ratio	CR	At the center point of A.A.	600	1000	-	-	Note 2	
Color Gamut	-	-	-	59	-	%		
CIE color Coordinates	White	Wx	0.28	0.31	0.33	-	CA210	
		Wy	0.30	0.33	0.36	-		
	RED	Rx	0.61	0.64	0.67	-		
		Ry	0.29	0.32	0.35	-		
	GREEN	Gx	0.27	0.30	0.33	-		
		Gy	0.54	0.57	0.60	-		
	BLUE	Bx	0.13	0.16	0.19	-		
		By	0.10	0.13	0.16	-		
Viewing Angle	Φ _H	12	CR ≥ 10	-	89	-	Degree	Note 3
	θ _R	3		-	89	-		
	Φ _L	6		-	89	-		
	θ _L	9		-	89	-		

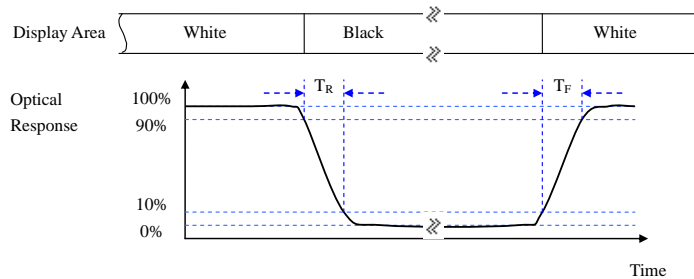
Note:

1. Test equipment setup

After stabilizing and leaving the panel alone at a given temperature for 30 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-5A at a distance of 50cm and normal direction.

2. Definition of response time: T_R and T_F

The figure below is the output signal of the photo detector.



3. Definition of contrast ratio:

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

White $V_i = V_{i50\%} \pm 1.5V$

Black $V_i = V_{i50\%} \mp 2.0V$

" \pm " means that the analog input signal swings in phase with VCOM signal.

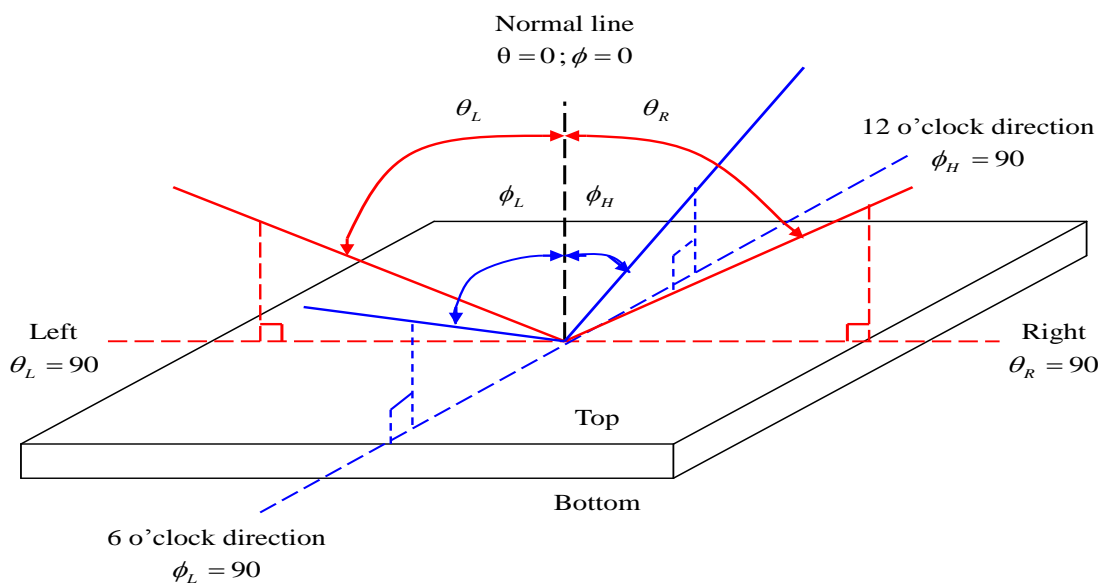
" \mp " means that the analog input signal swings out of phase with VCOM signal.

$V_{i50\%}$: The analog input voltage when transmission is 50%.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

4. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

5. Definition of viewing angle:



11.RELIABILITY

11.1.TESTS

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating	90°C , 500hrs	No Defect Of Operational Function In Room Temperature Are Allowable.
2	Low Temperature Non-Operating	-40°C , 500hrs	
3	High Temperature Operating	85°C , 500hrs	
4	Low Temperature Operating	-30°C , 500hrs	
5	High Temperature/ Humidity Operating	60°C ,90%RH 500hrs	
6	Temperature Shock Non-Operating	-40°C ↔ 85°C (30min)(5min)(30min) trans: 5min, 200cycle	
7	Electro-static Discharge (LCM only) (Note 6)	150pF,330ohm Contact Discharge: ±2KV Air Discharge: ±8KV	
8	Mechanical Shock Non-Operating	50G,11ms,±X, ±Y, ±Z Three times for each direction	

Note 1: Test after 24 hours in room temperature.

Note 2: The sampling above is individually for each reliability testing condition.

Note 3: The color fading of polarizing filter should not care.

Note 4: All of the reliability testing chamber above, is using D.I. water.(Min value:1.0 MΩ -cm)

Note 5: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

Note 6: ESD Test on Car Mirror System.

11.2.Color Performance

No.	ITEM	Criterion (initial)
1	Luminance	>50%
2	NTSC	>70%
3	Contrast Ratio	>50%

12.INSPECTION CRITERIA

12.1.Inspection Condition

12.1.1.Environmental conditions

The environmental conditions for inspection shall be as follows

Room temperature: $23\pm 5^{\circ}\text{C}$

Humidity: $50\pm 20\%\text{RH}$

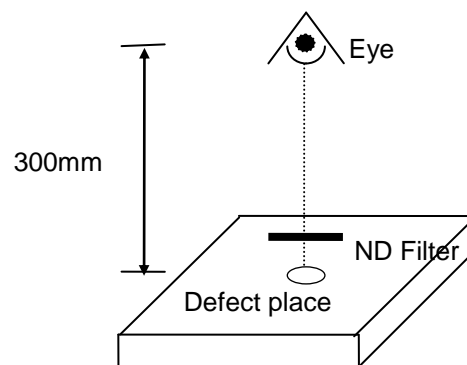
12.1.2.The external visual inspection

With a single $1000\pm 200\text{lux}$ fluorescent lamp as the light source, the inspection was in the distance of 30cm or more from the LCD to the inspector's eyes

12.2.Light Method

12.2.1.Environment lamp under $1000\pm 200\text{ lux}$, Viewing direction for inspection over 300 mm

12.2.2.The distance from eye to defect around 300mm, the distance from ND Filter to defect around 25~30mm



12.3.Classification Of Defects

12.3.1.Major defect

A major defect refers to a defect that may substantially degrade usability for product applications.

12.3.2.Minor defect

Inspection Item	Major defect	Minor defect
Cosmetic	1.0%	1.5%
Electrical test	0.4%	0.65%

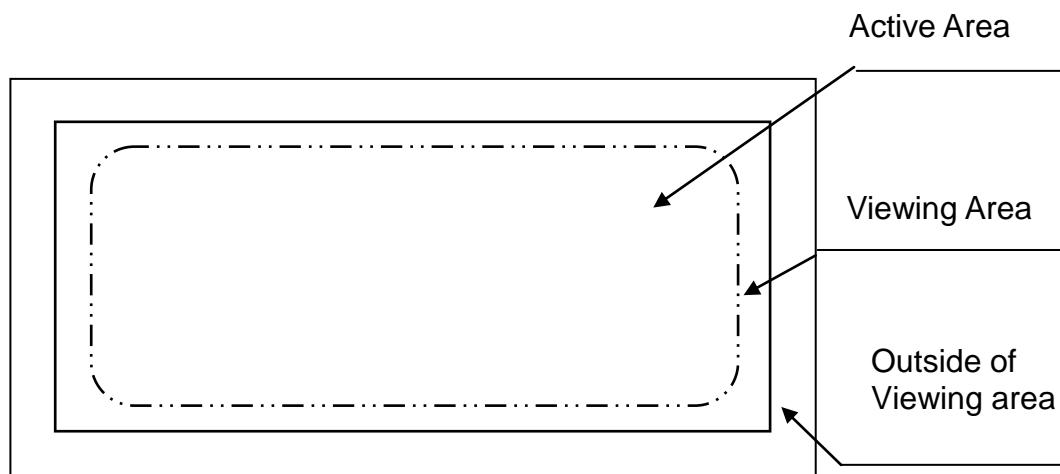
A minor defect refers to a defect which is not considered to be able substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation.

Notes: If the LCD/LCM's cosmetic and display performance do not specify in "inspection criterion",it should be based on these delivered samples.

12.4.Definition Of Inspection Area

V.A: Viewing Area

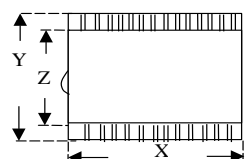
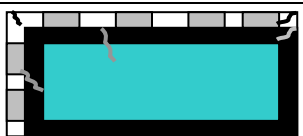
A.A: Active Area



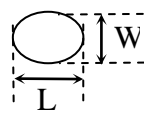
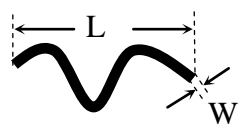

12.5. Inspection Item and Criteria

12.5.1. Cosmetic criterion

(1) Glass defect

No	Defect	Criteria	Remark
1	Dimension (Minor)	By engineering diagram	
2	Cracks (Major)	Extensive crack 【Reject】	

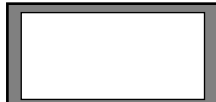
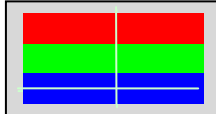

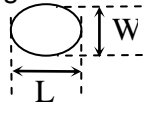
(2) LCM appearance defect with in A.A

No	Defect	Criteria		Remark
1	Round type (Minor)	Spec.	Permissible Q'ty	1. $\phi = (L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A. 
		$\psi \leq 0.3 \text{ mm}$	Disregard	
		$0.3\text{mm} < \psi \leq 0.6\text{mm}$	4	
		$0.6\text{mm} < \phi$	0	
2	Line type、Scratch (Minor)	Spec.	Permissible Q'ty	1. L: Length, W: Width 2. Disregard if out of A.A. 
		$W \leq 0.05\text{mm}$ and $L \leq 15\text{mm}$	Disregard	
		$0.05\text{mm} < W \leq 0.15\text{mm}$ and $L \leq 15\text{mm}$	5	
		$W > 0.15\text{mm}$ or $L > 15\text{mm}$	0	
3	Fiber (Minor)	Spec.	Permissible Q'ty	L: Length, W: Width 2. Disregard if out of A.A. 
		$W \leq 2.0\text{mm}$ and $L \leq 2.0\text{mm}$	5	
		$W > 2.0\text{mm}$ or $L > 2.5\text{mm}$	0	

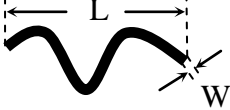



4	Polarizer bubble (Minor)	Spec.	Permissible Q'ty	1. $\phi = (L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A 
		$\phi < 0.35\text{mm}$	Disregard	
		$0.35\text{mm} \leq \phi \leq 0.6\text{mm}$	4	
		$0.6\text{mm} < \phi$	0	
5	Polarizer Dent (Minor)	Spec.	Permissible Q'ty	1. $\phi = (L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A 
		$\phi < 0.35\text{mm}$	Disregard	
		$0.35\text{mm} \leq \phi \leq 0.6\text{mm}$	5	
		$0.6\text{mm} < \phi$	0	

12.5.2.LCM electrical criterion

(1).LCM electrical criterion

No	Defect	Criteria		Remark
1	No display (Major)	Not allowed		
2	Missing line (Major)	Not allowed		
3	Darker or lighter line (Major)	Not allowed		
4	Bright / Dark point (Minor)		Total	1.1 sub-pixel: 1R or 1G or 1B 2. Point defect area \geq 1/2 sub pixel.
		Bright point	0	
		Dark dot point	5	
5	Round type (Minor)	Spec.	Permissible Q'ty	1. $\phi = (L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A 
		$\phi < 0.30\text{mm}$	Disregard	
		$0.30\text{mm} \leq \phi \leq 0.6\text{mm}$	4	
		$0.6\text{mm} < \phi$	0	

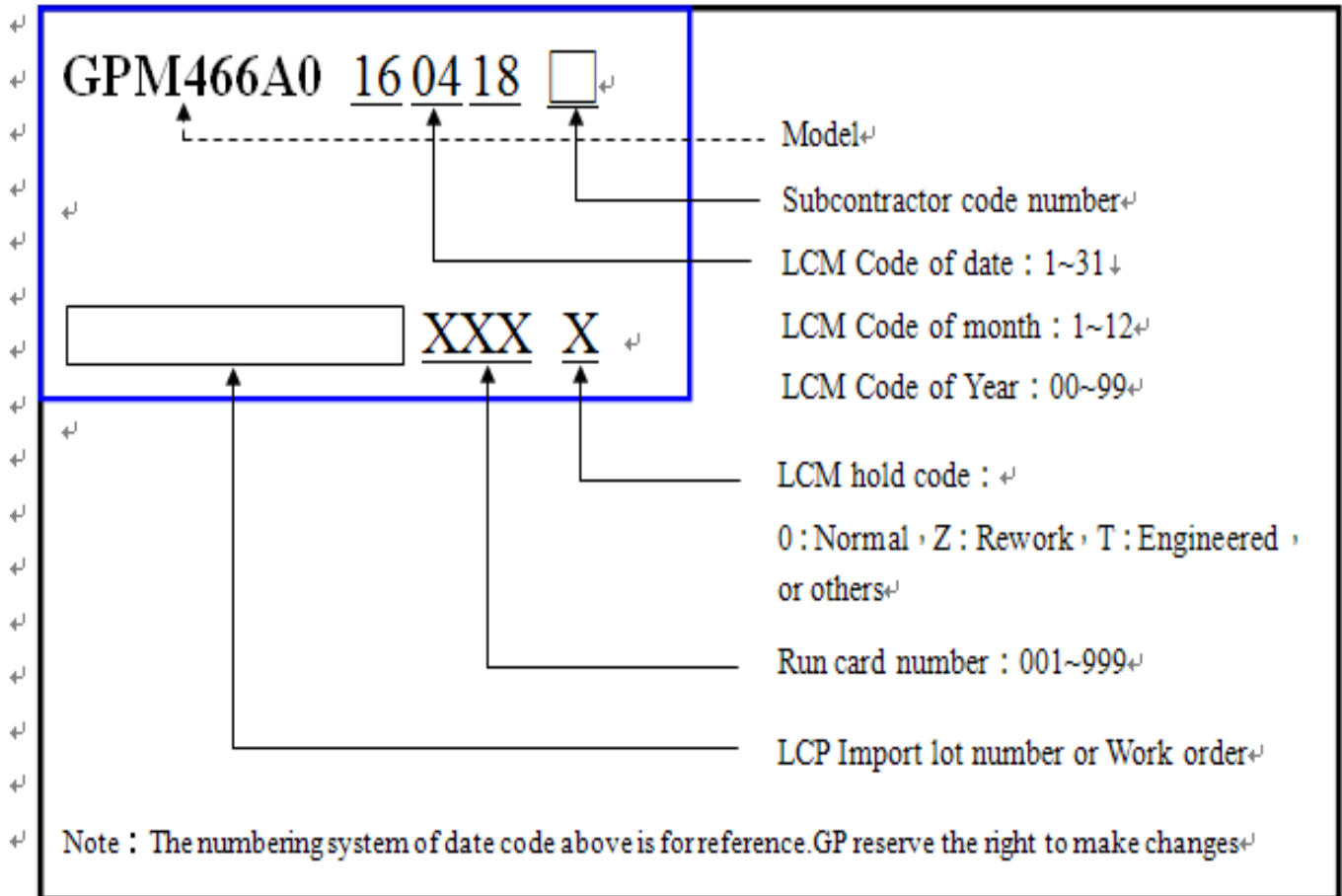


6	Line type · Scratch (Minor)	Spec.	Permissible Q'ty	L: Length, W: Width 2. Disregard if out of A.A. 
		$W \leq 0.05\text{mm}$ and $L \leq 15\text{mm}$	Disregard	
		$0.05\text{mm} < W \leq 0.15\text{mm}$ and $L \leq 15\text{mm}$	5	
		$W > 0.15\text{mm}$ or $L > 15\text{mm}$	0	
7	Fiber (Minor)	Spec.	Permissible Q'ty	L: Length, W: Width 2. Disregard if out of A.A. 
		$W \leq 2.0\text{mm}$ and $L \leq 2.5\text{mm}$	5	
		$W > 2.0\text{mm}$ or $L > 2.5\text{mm}$	0	
8	Polarizer Bubble (Minor)	Spec.	Permissible Q'ty	$\phi = (L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A. 
		$\phi < 0.30\text{mm}$	Disregard	
		$0.30\text{mm} \leq \phi \leq 0.6\text{mm}$	4	
		$0.6\text{mm} < \phi$	0	
9	Polarizer Dent (Minor)	Spec.	Permissible Q'ty	$\phi = (L+W)/2$, L: Length, W: Width 2. Disregard if out of A.A. 
		$\phi < 0.30\text{mm}$	Disregard	
		$0.30\text{mm} \leq \phi \leq 0.6\text{mm}$	5	
		$0.6\text{mm} < \phi$	0	
10	Mura (Minor)	By 2% ND filter invisible		

12.5.3.Other

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)
2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)

13.ILLUSTRATION OF LCD DATE CODE



14.ROHS COMPLIANT WARRANTY

RoHs Hazardous substances including:

- Pb : Solder<500 ppm, Other<300ppm
- Hg<200ppm
- Cr6+<200ppm
- Cd<50ppm
- PBB<200ppm
- PBDE<200ppm
- Deca-BDE<200ppm
- HBCD<200ppm
- Asbestos<1000ppm

15. PRECAUTIONS FOR USE

15.1. Safety

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

15.2. Storage Conditions

- (1) Store the panel or module in a dark place where the temperature is $23\pm 5^{\circ}\text{C}$ and the humidity is below $50\pm 20\% \text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.
- (6) Do not exposed to direct sun light of fluorescent lamps.

15.3. Installing LCD Module

Attend to the following items when installing the LCM.

- (1) Cover the surface with a transparent protective plate or touch panel to protect the polarizer and LC cell.
- (2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be $\pm 0.1 \text{mm}$.

15.4. Precautions For Operation

- (1) Viewing angle varies with the change of liquid crystal driving voltage (V_0). Adjust V_0 to show the best contrast.
- (2) Driving the LCD in the voltage above the limit will shorten its lifetime.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) When turning the power on, input each signal after the positive/negative voltage becomes stable.

- (5) Do not apply water or any liquid on product which composed of T/P.

15.5.Warranty

- (1) The period is within 12 months since the date of shipping out under normal using and storage conditions.
- (2) The warranty will be avoided in case of defect induced by customer.

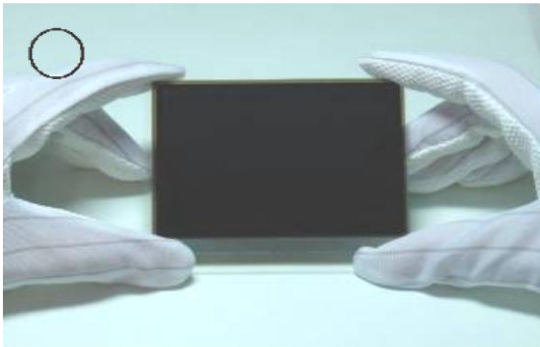
15.6.Handling Precautions

- (1) Avoid static electricity which can damage the CMOS LSI; please wear the wrist strap when handling.
- (2) The polarizing plate of the display is very fragile. so, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface; it may cause display abnormal .
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) Do not apply water or any liquid on product, which composed of T/P.

15.6.1. Handling precaution for LCD

LCD is easy to be damaged.
Please note below and be careful for handling!

Correct handling:



As above photo, please handle with anti-static gloves around LCD edges.

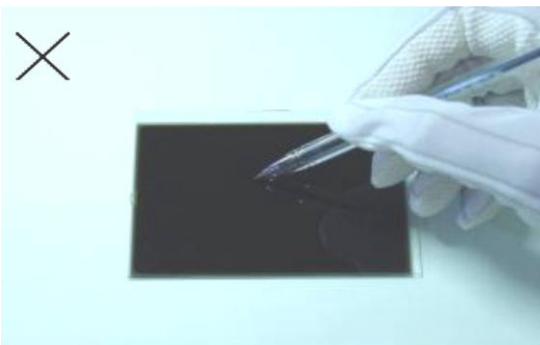
Incorrect handling:



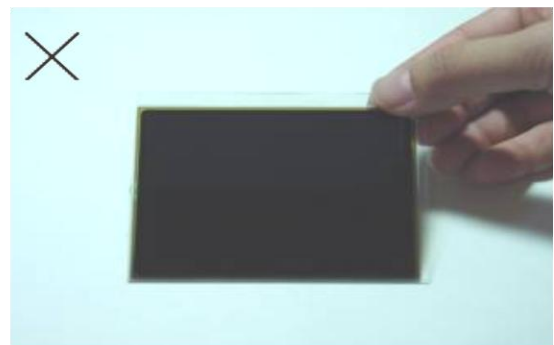
Please don't stack the LCDS.



Please don't hold the surface of LCD.



Please don't operate with sharp stick such as pens.

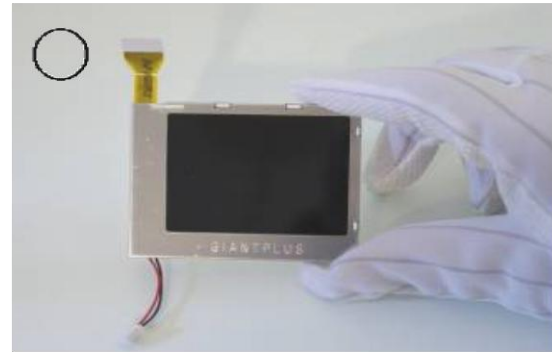


Please don't touch ITO glass without anti-static gloves.

15.6.2.Handling precaution for LCM

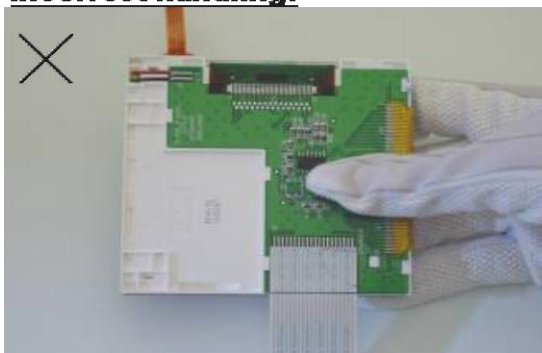
LCM is easy to be damaged.
Please note below and be careful for handling!

Correct handling:

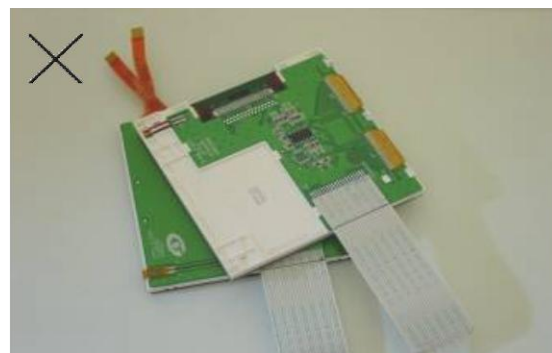


As above picture, please handle with anti-static gloves around LCM edges.

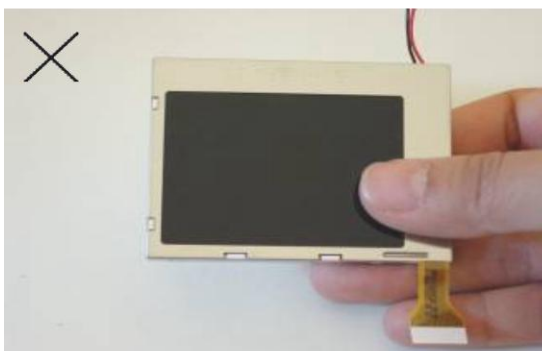
Incorrect handling:



Please don't touch IC directly.



Please don't stack LCM.



Please don't hold the surface of panel.



Please don't stretch interface of output, such as FPC cable.

16.FACTORY

For the consideration of mass production convenience, this model will be manufactured in the factories listed below.

FACTORY NAME: GIANTPLUS TECHNOLOGY CO., LTD

FACTORY ADDRESS: No.15 Industrial Rd., Lu-Chu Li, Toufen Town
351 Miao-Li County, Taiwan, R.O.C..

FACTORY PHONE: TEL: 886-37-611-611 FAX: 886-37-613-166

FACTORY ADDRESS: No.1127,Heping Rd.,Bade City,Taoyuan,334, Taiwan, R.O.C..

FACTORY PHONE: TEL: 886-3-3679978 FAX: 886-3-3670661

FACTORY NAME: KUNSHAN GIANTPLUS OPTOELECTRONICS
TECHNOLOGY CO., LTD.

FACTORY ADDRESS: No.88,HuanQing Rd., Hitech Industrial Park, Cheng-Bei Town,
KunShan City, JiangShu Province, China.

FACTORY PHONE: TEL:86-512-57780-988 FAX : 86-512-57780-503

FACTORY NAME: SHENZHEN GIANTPLUS OPTOELEC. DISPLAY CO., LTD.

FACTORY ADDRESS: Building A, Distict A ,MinZhu99 Industrial City,
ShaJing Industrial Park, BaoAn District, ShenZhen, China

FACTORY PHONE: TEL: 86-755-29720-088 FAX : 86-755-29720-828

17.REVISION HISTORY

Version	Revise record	Date
A	New version	2017/5/16
B	Drawing – version D	2017/10/30