

Specification of LCD Module

Customer 客戶名稱	
Part No. 產品型號	GPG3224013QS1
Product type 產品內容	5.7" TFT module: Transmissive Type, Positive mode , RGB vertical stripe
RoHS 綠色產品	<input type="checkbox"/> Non-compliance <input checked="" type="checkbox"/> Compliance
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:	

Approved by	Checked by	Organized by
Tony Hu	Mark Lin	Frank Fan

Specification of LCD Module

Product No.: GPG3224013QS1

Issue date: 2008/10/14

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1. GENERAL DESCRIPTION

GPG3224013QS1 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 ICs, FPC, and a backlight unit. The following table described the features of GPG3224013QS1

2. FEATURES

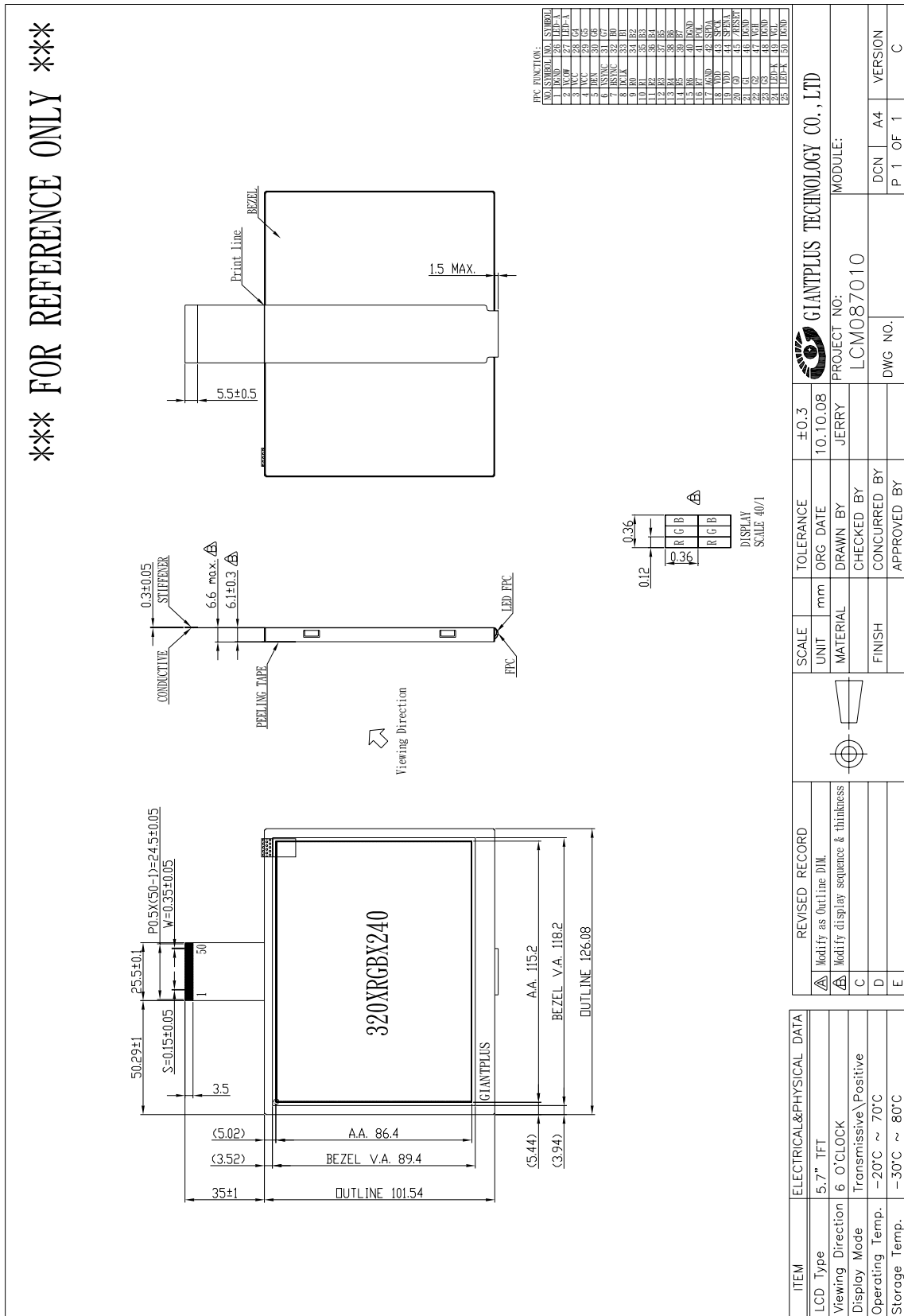
Display Mode	Transmissive Type
	TFT LCD, Normally white
Display Format	RGB Strip type
Color	16.7M color
Interface	RGB data bus, 24 bit parallel data
Viewing Direction	6 O'clock
Backlight type / color	LED / White

3. MECHANICAL SPECIFICATION

Item	Specifications	Unit
Dimensional outline	126.08 (W) × 101.54 (H) × 6.1 (D)*	mm
Resolution	320×3(R,G,B)×240	dot
Active area	115.2 (W) × 86.4 (H)	mm
Dot pitch	0.12 (W) × 0.36 (H)	mm
Pixel pitch	0.36 (W) × 0.36 (H)	mm

*Exclude FPC

4. MECHANICAL DIMENSION



5. MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT
Digital supply voltage	V _{cc}	-0.3	+5.5	V
Input voltage	V _{in}	-0.3	V _{cc} +0.3	V
Operation Temperature	T _{op}	-20	70	°C
Storage Temperature	T _{st}	-30	80	°C
Forward current	I _F	-	60	mA
Humidity	*C	-	90	%RH

Note:

- a. All of voltage listed above are with respect to GND=VSS=0V.
- b. Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.
- c. T_A ≤ 40°C Without dewing.

6. ELECTRICAL CHARACTERISTICS

6.1. TFT LCD Characetristic

Typical operating conditions

(GND=AVSS=0V)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply	V _{cc}	3.0	3.3	3.6	V	
	V _{dd}	3.8	5.0	5.5		
Current	I _{cc}	-	TBD	-	mA	
	I _{dd}	-	TBD	-	mA	
Driver Input signal voltage	H	V _{IH}	0.7* V _{cc}	-	V _{cc}	V
	L	V _{IL}	0	-	0.3* V _{cc}	V

6.2. Backlight Characteristic

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LED Current	I _L	-	60	-	mA	
LED Voltage	V _L	12	-	14.4	V	

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

7. MODULE FUNCTION DESCRIPTION

7.1.FPC PIN Description

Pin	Symbol	Description	Remark
1	DGND	Digital Power ground	
2	VCOM	TFT common electrode voltage VcomH=2.5~5.5V , VcomL = -2.0~0V	
3	VCC	Digital power. 3.3V is recommended.	
4	VCC	Digital power. 3.3V is recommended.	
5	DEN	Data enable	
6	Vsync	Vertical synchronous singal	
7	Hsync	Horizontal synchronous singal	
8	DCLK	Clock signal	
9	R0	Red data (LSB)	
10	R1	Red data	
11	R2	Red data	
12	R3	Red data	
13	R4	Red data	
14	R5	Red data	
15	R6	Red data	
16	R7	Red data (MSB)	
17	AGND	Analog Power ground	
18	VDD	Analog power. 5V is recommended.	
19	VDD	Analog power. 5V is recommended.	
20	G0	Green data (LSB)	
21	G1	Green data	
22	G2	Green data	
23	G3	Green data	
24	LEDK	LED Cathode	
25	LEDK	LED Cathode	
26	LEDA	LED Anode	
27	LEDA	LED Anode	
28	G4	Green data	

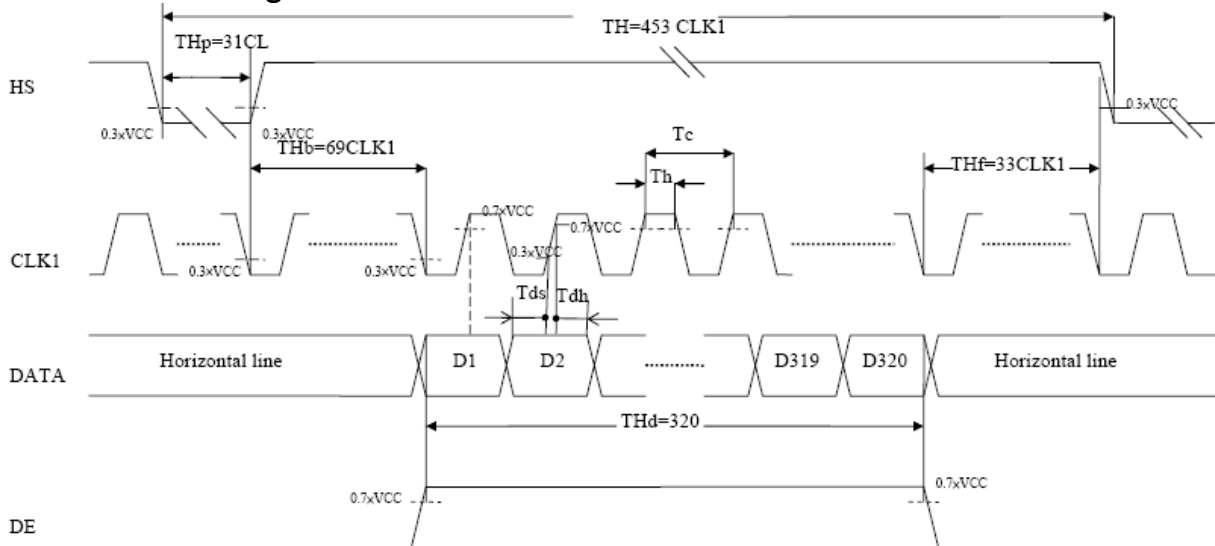


29	G5	Green data	
30	G6	Green data	
31	G7	Green data (MSB)	
32	B0	Blue data (LSB)	
33	B1	Blue data	
34	B2	Blue data	
35	B3	Blue data	
36	B4	Blue data	
37	B5	Blue data	
38	B6	Blue data	
39	B7	Blue data (MSB)	
40	DGND	Digital Power ground	
41	POL	Polarity select for the line inversion control signal. When POL=L, output voltage is negative polarity. When POL=H, output voltage is positive polarity.	
42	SPDA	Serial port Data input/output	
43	SPCK	Serial port Clock. Normally pull high	
44	SPENA	Serial port Data Enable Signal. Normally pull high	
45	/RESET	Reset signal.	
46	DGND	Digital Power ground	
47	VGH	Power supply for LCM drive output high. 18V is recommended.	
48	DGND	Digital Power ground	
49	VGL	Power supply for LCM drive output low. -6V is recommended.	
50	DGND	Digital Power ground	

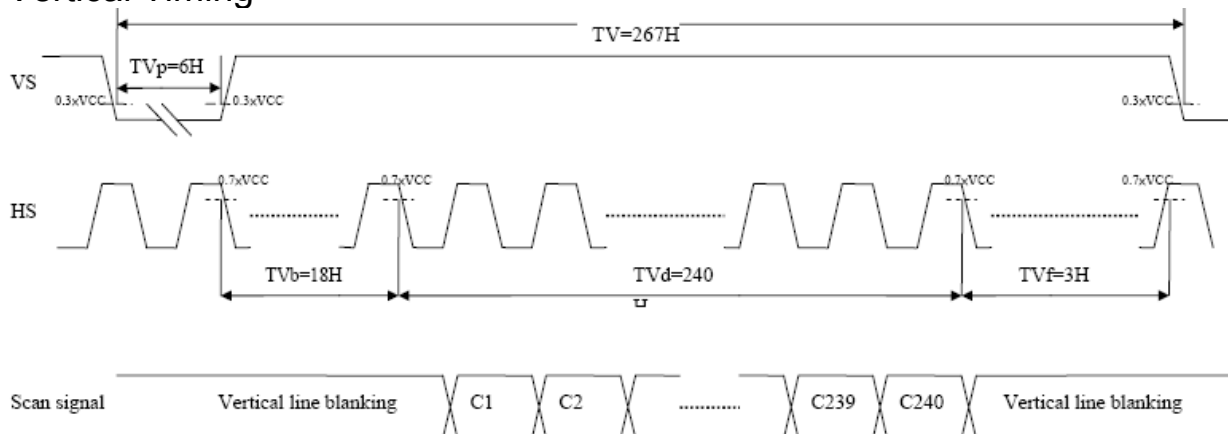
7.2. Timing characteristics

7.2.1. Timing Chart.

Horizontal Timing



Vertical Timing



7.2.2. Timing Specification

Item		Symbol	Min.	Typ.	Max.	Unit
CLK	Frequency	1/Tc		(6.3)		MHZ
	Duty ratio	Th/Tc	40	50	60	%
DATA	Setup time	Tds	12			ns
	Hold time	Tdh	12			ns
Horizontal synchronizing	Period	TH	-	(453)	-	Clock
	Pulse width	THp	-	(31)	-	Clock
	Horizontal period	THd	-	(320)	-	Clock
	Blank porch	THb	-	(69)	-	Clock
	Front porch	THf	-	(33)	-	Clock
Vertical synchronizing	Period	TV	-	(267)	-	Line
	Pulse width	TVp	-	(6)	-	Line
	Vertical period	TVd	-	(240)	-	Line
	Blank porch	TVb	-	(18)	-	Line
	Front porch	TVf	-	(3)	-	Line

7.2.3. Color data Assignment

COLOR	INPUT DATA	R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	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
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	BLUE (2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
	BLUE (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

[NOTE] :

- 1) Definition of Gray level : Color(n) : n to show the Gray level , n is the more high and the light more bright.
- 2) Data:1-High, 0-Low.

8. 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				-	(350)	-	cd/m ²	
Response time		T _R +T _F	Θ=0	-	30	-	ms	Note 2
Contrast ratio		CR	At the center point of A.A.	-	(450)	-		Note 3
Chromaticity (Note.1)	White	x	θ=φ= 0°		(0.313)			
		y		(0.339)				
		Y		(31.1)				
	Red	x	θ=φ= 0°		(0.640)			
		y		(0.364)				
		Y		(22.2)				
	Green	x	θ=φ= 0°		(0.302)			
		y		(0.572)				
		Y		(57.6)				
	Blue	x	θ=φ= 0°		(0.135)			
		y		(0.125)				
		Y		(14.0)				
Viewing Angle	Horizontal	θ	CR ≥ 10	-	(140)	-	Degree	Note 4
	Vertical	φ		-	(120)	-		

Ta=25±2°C

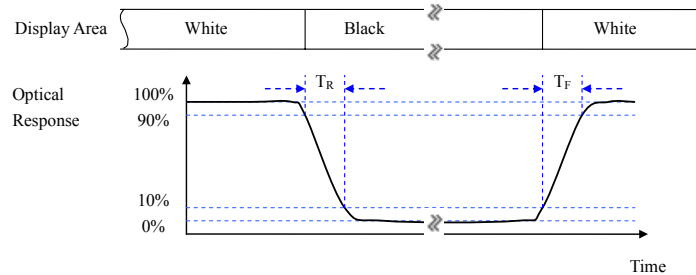
Note:

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 with a viewing angle of 2° 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 $V_i = V_{i50\%} \mu 2.0V$

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

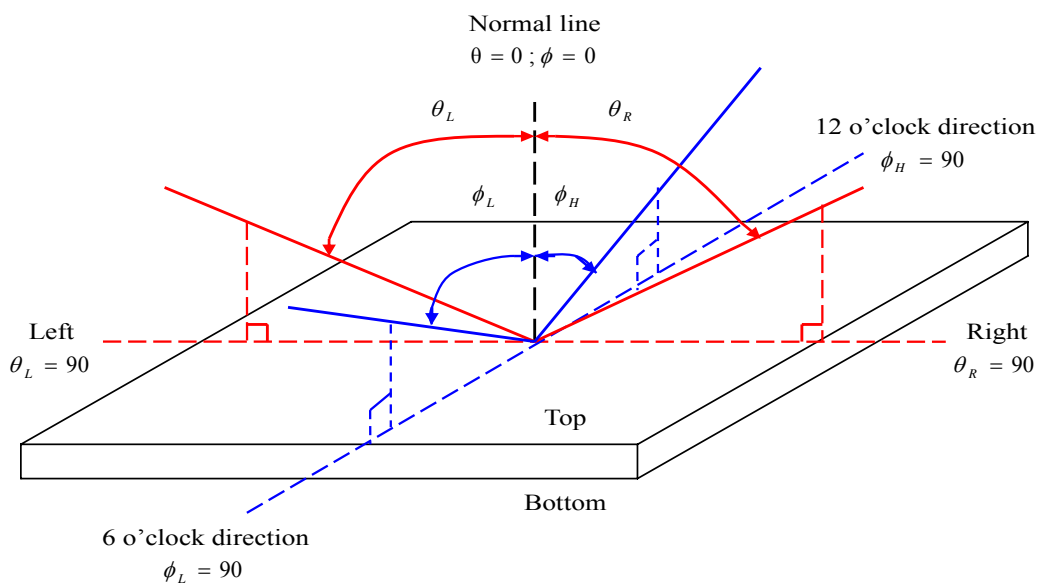
" μ " means that the analog input signal swings out of phase with VCOM signal.

$V_{i50\%}$: 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.

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

4. Definition of viewing angle:



9. RELIABILITY

9.1. TESTS

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Operating	70°C 240 hrs	◦ No Defect Of Operational Function In Room Temperature Are Allowable.
2	Low Temperature Operating	-20°C 240 hrs	
3	High Temperature/ Humidity Non-Operating	60°C ,90%RH ,240 hrs (No condensation)	
4	High Temperature Non-Operating	80°C 240 hrs	
5	Low Temperature Non-Operating	-30°C 240 hrs	
6	Temperature Shock Non-Operating	-30°C ← (30min) ↔ (5min) → 80°C (30min) 100 CYCLES	
7	Electro-static Discharge	HBM : ±2kv	

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.

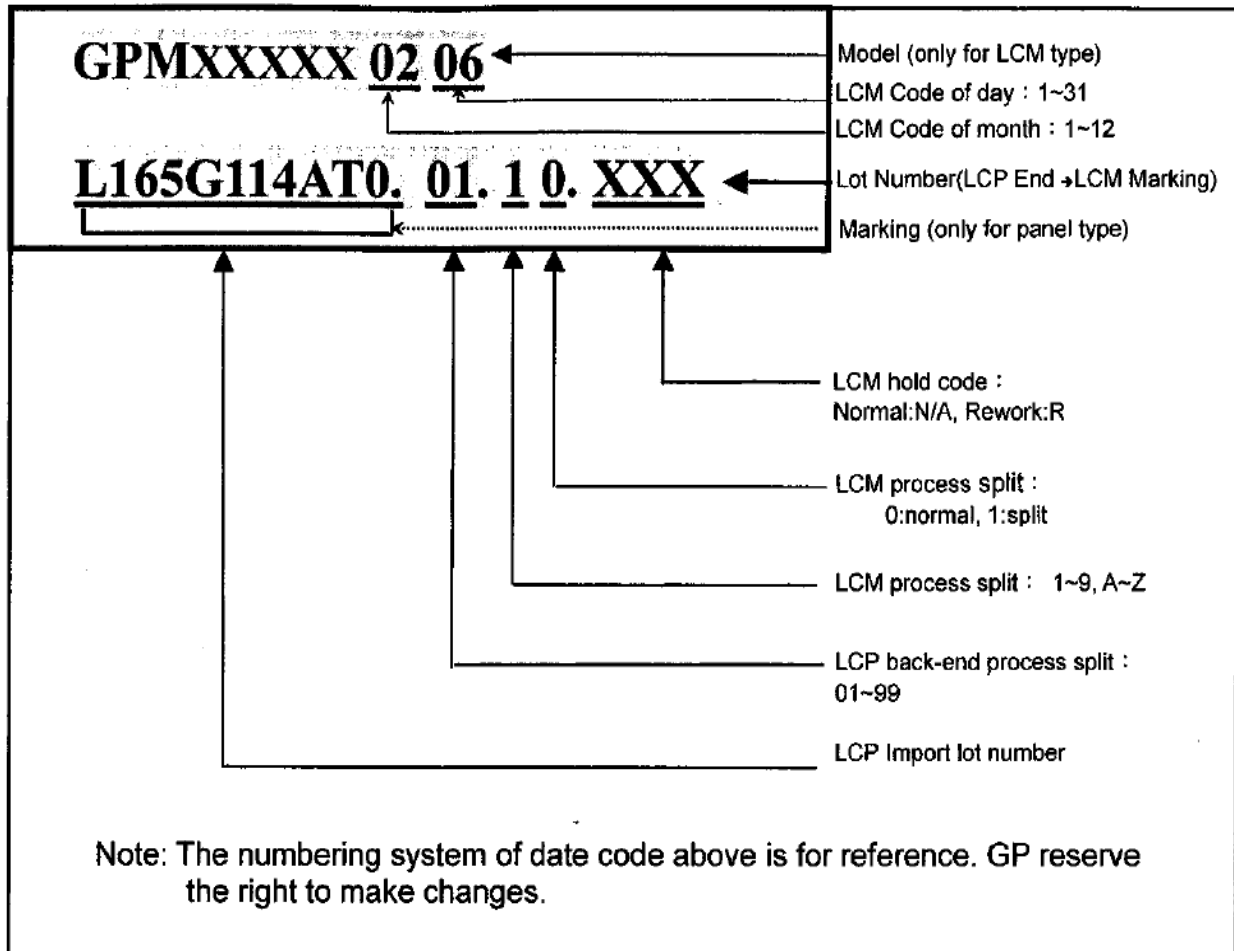
Note 4: All of the reliability testing chamber above, is using D.I. water.(Min value:1.0 MΩ-cm)

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.

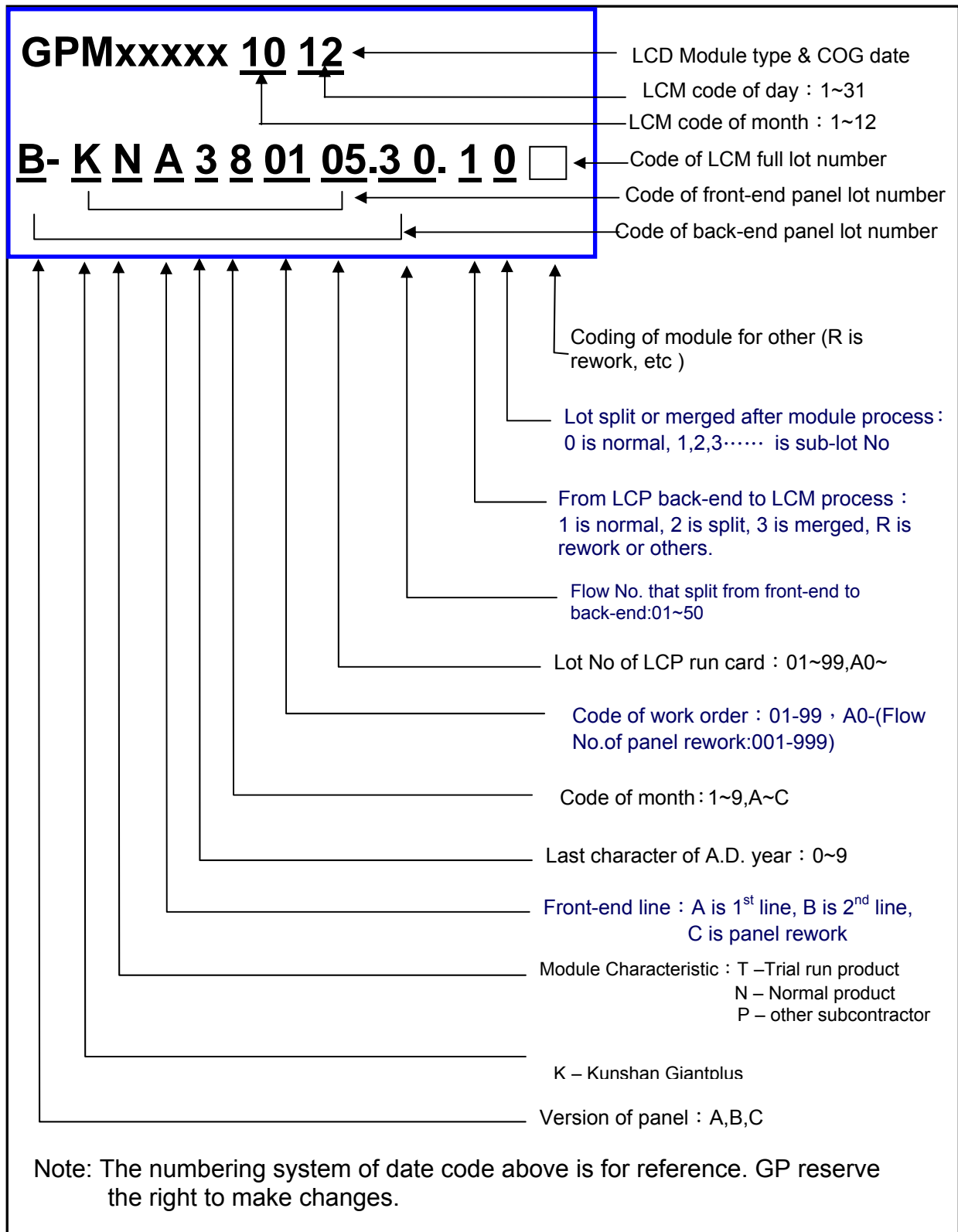
9.2. Color Performance

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

10. ILLUSTRATION OF LCD DATE CODE (GP)



11. ILLUSTRATION OF LCD DATE CODE (KGP)



12. RoHS COMPLIANT WARRANTY

RoHS Hazardous substances including:

- Cd < 100 ppm
- Pb < 1000 ppm
- Hg < 1000 ppm
- Cr +6 < 1000 ppm
- PBDE < 1000 ppm
- PBB < 1000 ppm

13. PRECAUTIONS FOR USE

13.1. 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.

13.2. 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.

13.3. 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 $\pm 0.1\text{mm}$.

13.4. 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.

13.5. 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.

13.6. 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.

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

15.REVISION HISTORY

Version	Revise record	Date
A	New version	2008/8/13
B	P.16 Brightness	2008/9/30
C	Modify display sequence & thinkness	2008/10/14