APPROVAL SHEET
承　　認　　書

Customer 客戶名稱	UTStarcom
Model No. 產品型號	KGM082B0
Product type 產品內容	MODE: Transflective and positive type B/W Mode FSTN LCD Dots Matrix LCD Module: 96x64+1Icons
Remarks 備註欄	

Signature by Customer:
客戶確認簽章:

Issued by	Checked by	Approved by	
		PD	QA
朱嘉意 2005.1.3	李宇智 2005.1.3	江建德 2005.1.4	許坤海 2005.1.5

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TABLE OF COTENT

1.GENERAL DESCRIPTION

The KGM082B0 is a 96x64 dots-matrix LCD module. It has a FSTN panel composed of 96 segments and 64 commons. The LCM can be easily accessed by micro-controller via serial interface.

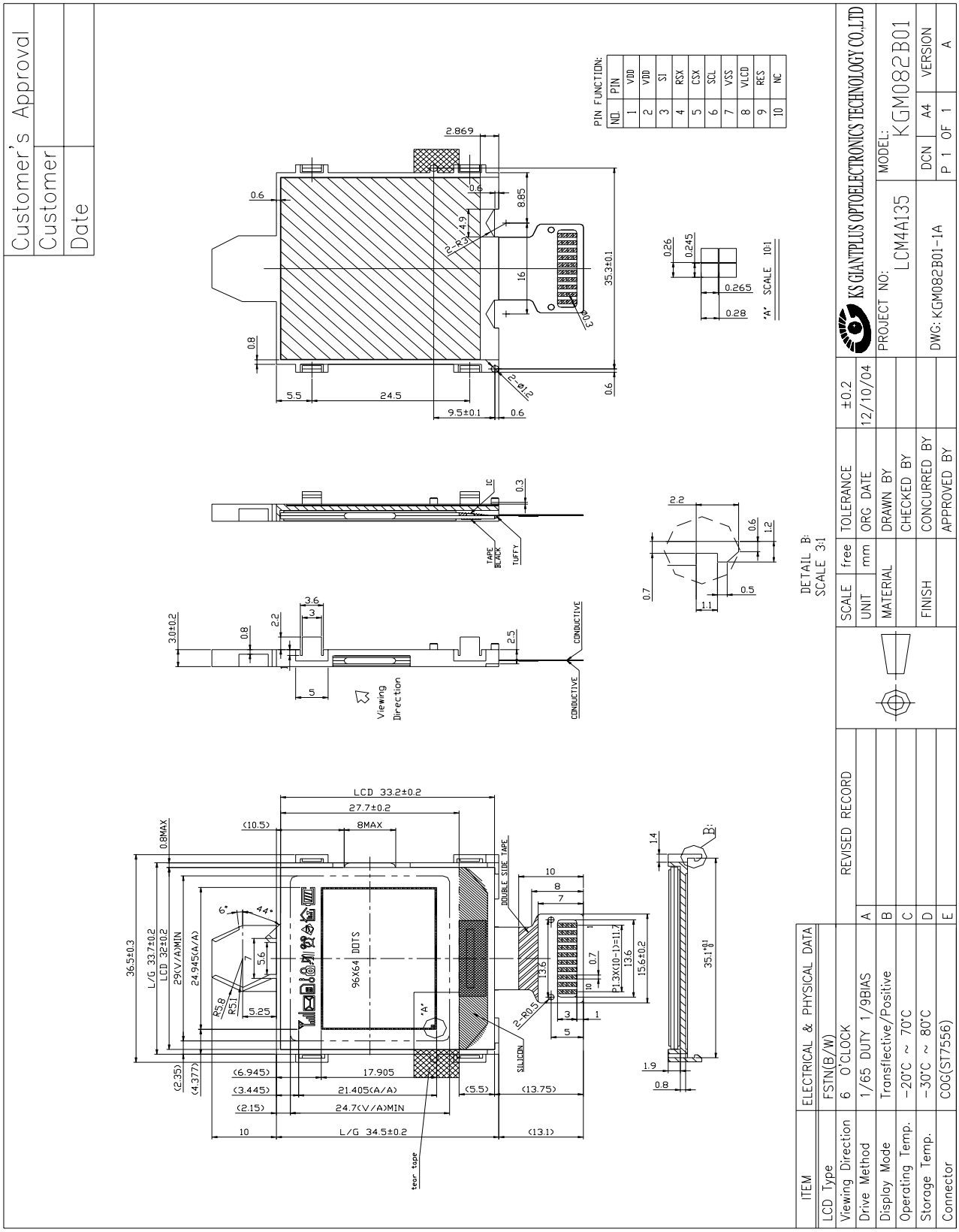
2.FEATURES

Display Mode	Transflective and positive type
	B/W Mode FSTN LCD
Display Format	Graphic 96 × 64 Dot-matrix + 1 Icons
Input Data	4-lines serial data input from MPU
Controller IC	ST7556-G
Multiplexing Ratio	1/65 Duty
Bias	1/9 Bias
Viewing Direction	6 O'clock

3.MECHANICAL SPECIFICATIONS

Item	Specifications	Unit
Dimensional outline	33.3(W)×47.6(H) ×3.0(T) (include FPC and L\G)	mm
Number of dots	96 × 64 +1 Icons	dots
active area	24.945×21.4	mm
Dots pitch	0.26*0.28 (mm)	mm
Dots size	0.245*0.265(mm)	mm

4. MECHANICAL DIMENSION



5.ABSOLUTE MAXIMUM RATING

Item	Symbol	Min	Max	Unit	Note
Supply voltage	V_{DD}	-0.5	5.0	V	
	VOP	-0.5	16	V	
Input Voltage	V_{IN}	-0.5	0.5+VDD	V	
Operating temperature	T_{OPR}	-20℃	70℃	℃	
Storage temperature	T_{STR}	-30℃	80℃	℃	
Humidity	---	---	90	%RH	

6.ECTRICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	Logic	V_{DD}	---	---	3.0	---	V
Input Voltage	H level	V_{IH}	---	0.7_{DD}	---	V_{DD}	V
	L level	V_{IL}		V_{SS}	---	$0.3V_{DD}$	
Current Consumption		I_{DD}	With internal V_{LCD} generation; V_{DD}=3.0V,V_{OP}=7.9V, T_{amb}=25℃; 3 Xcharge pump	---	---	0.72	mA
Operating Voltage		V_{OP}	Bias=1/9 V_{OP} =V0-VSS (Note 1)	7.66	7.9	8.14	V

Note:

1.V_{LCD} has ± 3 %tolerance , so it can be adjustable by setting, the internal resistor ratio is set to 10100110B.

7.MODULE FUNCTION DESCRIPTION

7.1.Pin Description

Pin No.	Symbol	Description
1	VDD	Digital voltage and analog voltage supply. Please series a capacitor to $V_{SS.}$
2	VDD	
3	SI	Serial input data.
4	A0 (RSX)	It determines whether the data bits are data or a command. A0="H": Indicates that data are display data. A0="L": Indicates that data are display command.
5	CSB (CSX)	Chip select input pin.
6	SCL	Serial input clock.
7	VSS	Digital and analog ground. Please series a capacitor to $V_{DD.}$
8	VLCD	Internal analog power supply. Please series a capacitor to $V_{SS.}$
9	RES	Reset signal input pin.
10	NC	No contact.

7.2 Timing characteristics

7.2.1. 4-lines serial interface timing

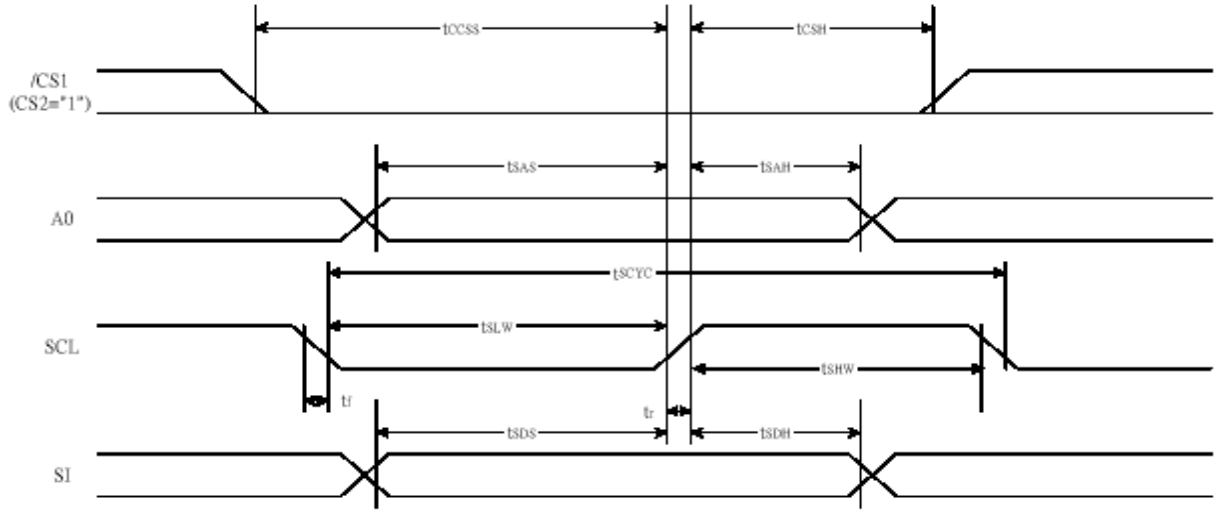


Fig 20.

(V_{DD}=3.3V, Ta=25℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC		50	—	ns
SCL "H" pulse width		tSHW		25	—	
SCL "L" pulse width		tSLW		25	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		10	—	
Data setup time	SI	tSDS		20	—	
Data hold time		tSDH		10	—	
CS-SCL time	CSB	tCSS		20	—	
CS-SCL time		tCSH		140	—	

(V_{DD}=2.7V, Ta=25℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC		100	—	ns
SCL "H" pulse width		tSHW		50	—	
SCL "L" pulse width		tSLW		50	—	
Address setup time	A0	tSAS		30	—	
Address hold time		tSAH		20	—	
Data setup time	SI	tSDS		30	—	
Data hold time		tSDH		20	—	
CS-SCL time	CSB	tCSS		30	—	
CS-SCL time		tCSH		160	—	

(V_{DD}=1.8V,Ta=25℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC		200	—	ns
SCL "H" pulse width		tSHW		80	—	
SCL "L" pulse width		tSLW		80	—	
Address setup time	A0	tSAS		60	—	
Address hold time		tSAH		30	—	
Data setup time	SI	tSDS		60	—	
Data hold time		tSDH		30	—	
CS-SCL time	CSB	tCSS		40	—	
CS-SCL time		tCSH		200	—	

*1 The input signal rise and fall time (tr, tf) are specified at 15 ns or less.

*2 All timing is specified using 20% and 80% of VDD as the standard.

7.2.2.Reset timing

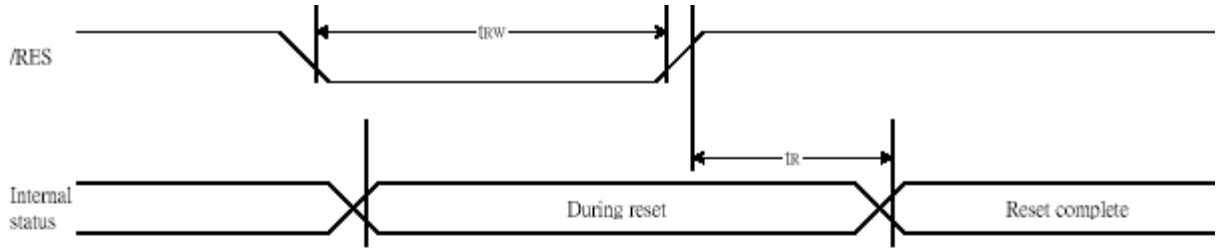


Fig 21.

(VDD = 3.3V , Ta = –40 to 85°C)

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		tR		—	—	1	us
Reset "L" pulse width	RESB	tRW		1	—	—	us

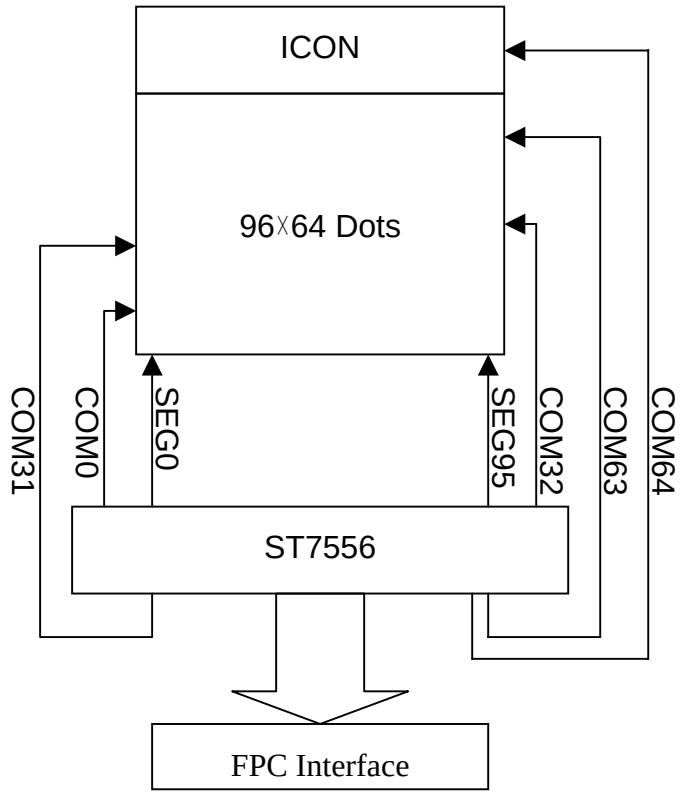
(VDD = 2.7V , Ta = –40 to 85°C)

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		tR		—	—	1.5	us
Reset "L" pulse width	RESB	tRW		1.5	—	—	us

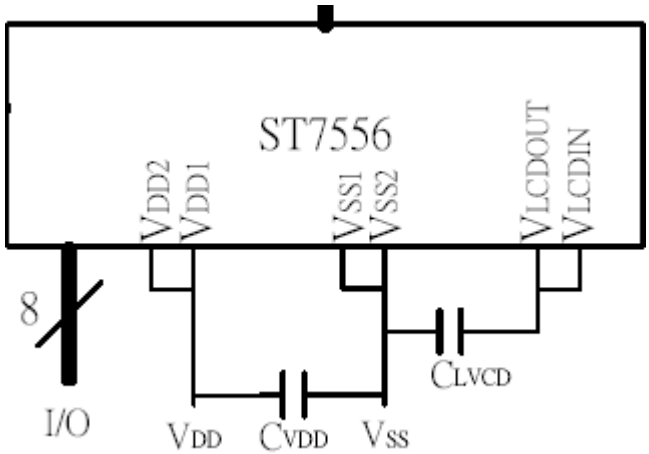
(VDD = 1.8V , Ta = –40 to 85°C)

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		tR		—	—	2.0	us
Reset "L" pulse width	RESB	tRW		2.0	—	—	us

7.3 Block diagram of LCM



7.4 APPLICATION OF LCM



The required minimum value for the external capacitors in an application with the ST7556 are:

C_{VLCD} = min. 100nF $C_{VDD1,2}$= min. 1.0 μF

Higher capacitor values are recommended for ripple reduction.

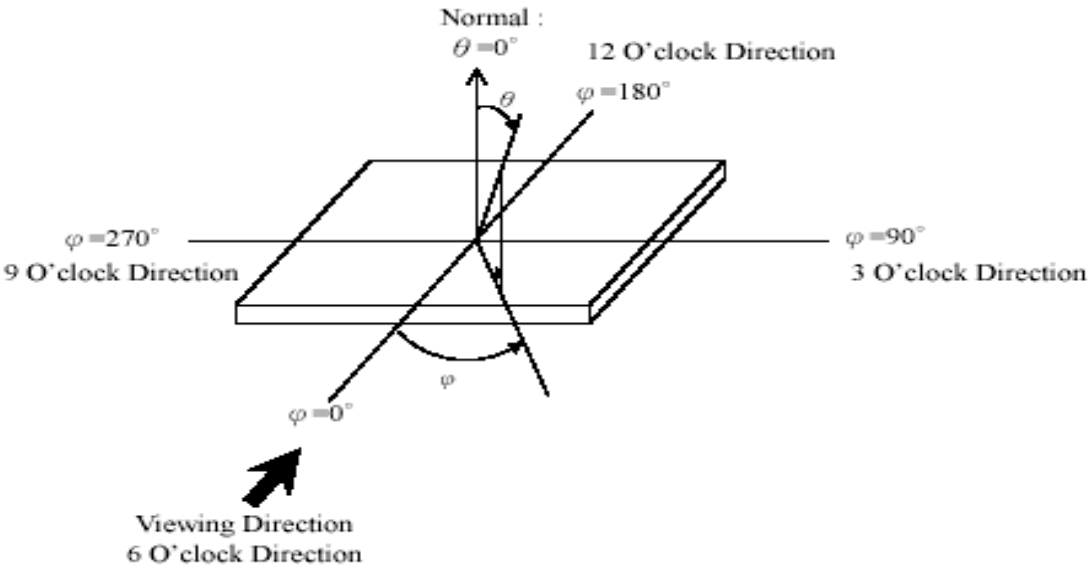
8.ELECTRO-OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Temp	Min	Typ	Max	Units	Note
Response Time	Rise Time (Tr)	θ=ψ=0	0℃	---	---	---	msec	NOTE2
	Decay Time (Td)			---	---	---		
	Rise Time (Tr)		25℃	---	165	200		
	Decay Time (Td)			---	240	300		
	Rise Time (Tr)		50℃	---	---	---		
	Decay Time (Td)			---	---	---		
Contrast Ratio	Cr	θ=ψ=0	25℃	4	10	---	---	NOTE3

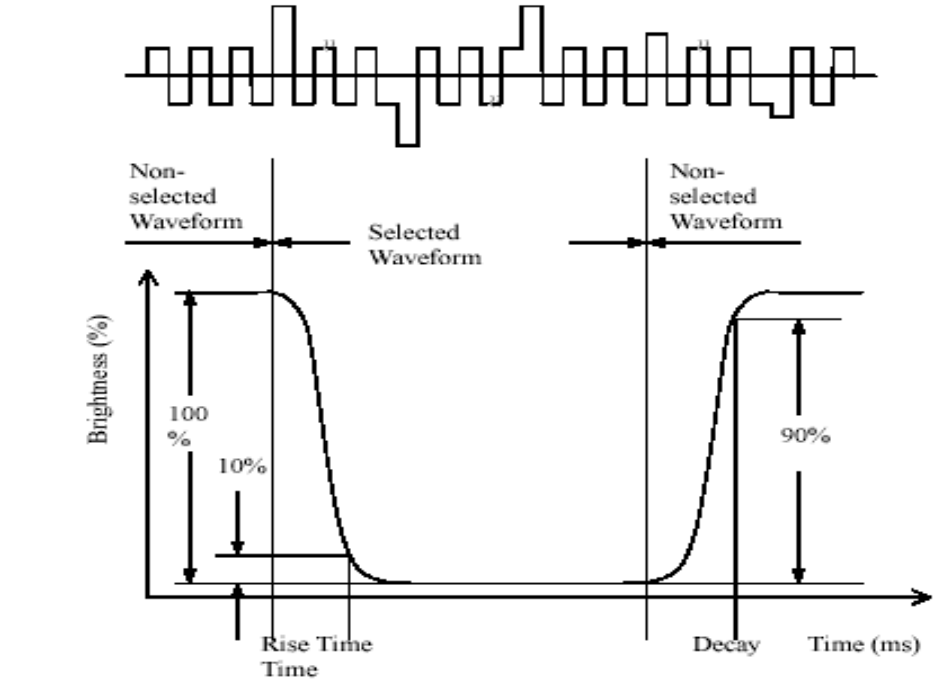
Viewing Angle Range	ψ= 0° (6”)	ψ= 90° (3”)	ψ=180° (12”)	ψ=270° (9”)	NOTE
θ (25℃) CR≥2	35	30	50	35	NOTE4

● For Panel Only

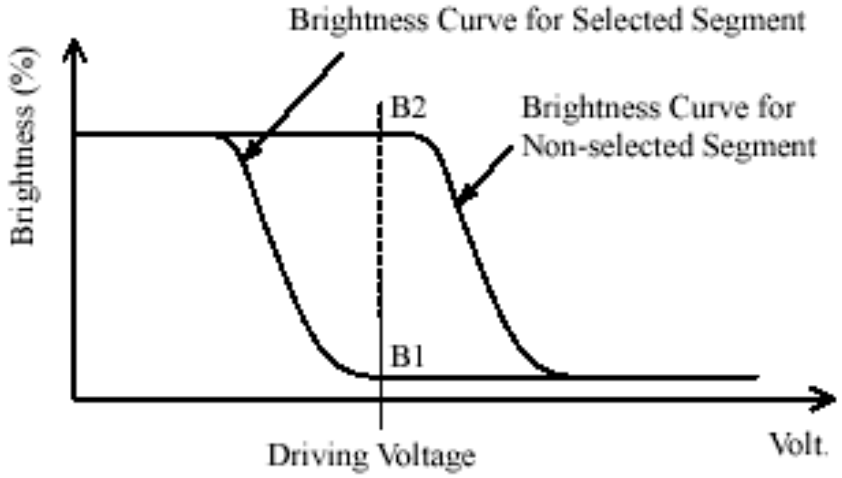
Note1:Definition of θ and φ



Note 2. Definition of response time wave form

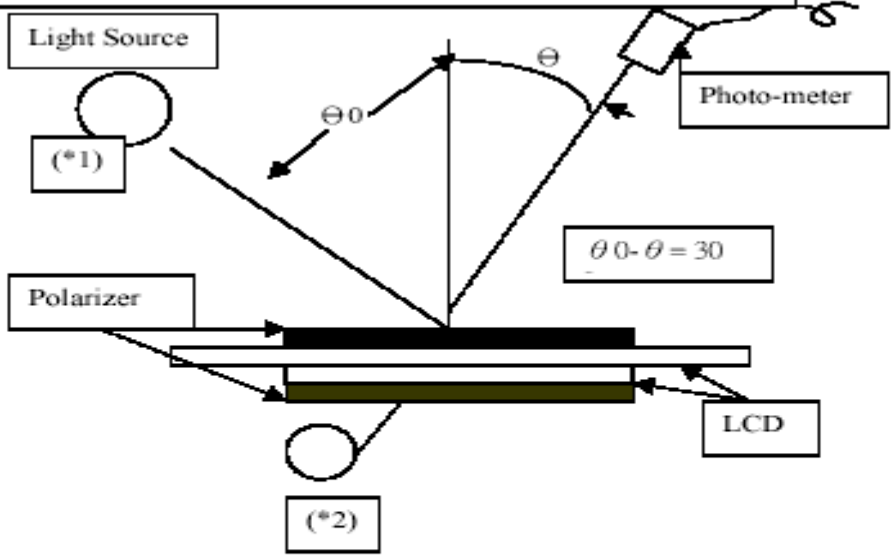


Note 3. Definition of contrast ratio (Cr)



$$Cr = \frac{\text{Brightness of Non-selected Segment (B2)}}{\text{Brightness of Selected Segment (B1)}}$$

Note4. Optical measuring system temperature regulated chamber



*1 Light Source Position For Measuring Of Reflective Type LCD

*2 Light Source Position For Measuring Of Transmissive / Transflective Type LCD

9. RELIABILITY

9.1. MTBF

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal. (25°C in the room without sunlight)

9.2. Test condition

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating Test	80℃ * 240Hrs	。No Defect Of Operational Function In Room Temperature Are Allowable. 。IDD of LCM in Pre-and Post-Test Should Follow Specification
2	Low Temperature Non-Operating Test	-30℃ * 240Hrs	
3	High Temperature/Humidity Non-Operating Test	50℃ * 90%RH * 240 Hrs	
4	High Temperature Operating Test	70℃ * 240Hrs	
5	Low Temperature Operating Test	-20℃ * 240Hrs	
6	Thermal Shock Test	-30℃(30Min)↔ 80(30Min)* 10 Cycles	

Notes:

1. Judgments should be made after exposure in room temperature for two hours.
2. The distill water is used for the high temperature / humidity test.

10. INSPECTION CRITERIA

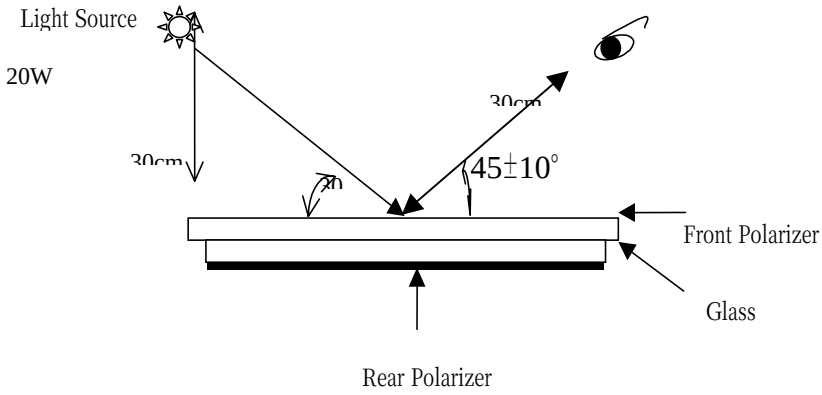
1. AQL(Acceptable Quality Level)

AQL of major and minor defect

	MAJOR DEFECT	MINOR DEFECT	MAJOR+MINOR
APPEARANCE	0.40%	0.65%	0.65%
ELECTRIC-OPTICAL	0.1%	0.65%	0.65%

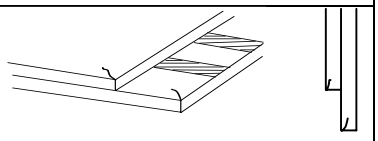
2.Basic conditions for inspection

Inspection is implemented over 30cm vertical distance and 30° incidence from LCD20W fluorescent lamps. Viewing direction for inspection is over 30cm far and 45±10°(without peeling the protective film off, except for additional requirement) against from LCD (As shown below)



3. Inspection item and criteria

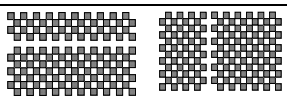
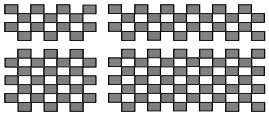
3. 1 Cosmetic inspection

No	Defect item	Criteria	Remark
1	Dimension Unconformity (Major defect)	By Engineering Drawing	
2	Cracks (Major defect)	Linear cracks on panel 【Reject】 Nonlinear crack contrast with broken specification	
3	Glass broken (Minor defect)	More than one eighths of length or width of glass 【Reject】	

No	Defect item	Criteria		Remark
4	The height, width and deviation of end seal (Minor defect)	By engineering drawing		
5	The leakage of end-seal (minor defect)	The leakage of end-seal exceeds the view area. 【Reject】		
6	Dirty dots, impurities, Polarizer prick (Major defect)	Specification	Allowable	Remark 1: ψ=(L+W)/2 ；L=length, W=width 2: Except for special requirements
		ψ≦0.1mm	Disregard	
		0.1mm<ψ≦0.2mm	3	
		0.2mm <ψ	0	
7	Fiber, scratch, polarizer folded (Major defect)	Specification	Allowable	Remark: 1: L：length, W：width
		L≦3mmandW≦0.02mm	Disregard	
		L≦3mmandW≦0.02mm	2	
		L≦1mmandW≦0.05mm	1	
		L>1mm or W>0.05mm	0	
8	Polarizer concave and convex, bubble (Minor defect)	ψ≦0.3mm	Disregard	Note: 1: ψ =(L+W)/2 ； L=length , W=width 2: If it is out of visual area, refer to customer requirements.
		0.3mm<ψ≦0.7mm	1	
		0.7mm<ψ	0	

No	Defect item	Criteria	Remark
9	Polarizer shift (Minor defect)	1.The bulge over glass side more than 0.2mm 【Reject】 2.The recess exceeds 1.2mm 【Reject】 3.Front or rear polarizer overtop the top glass area 【Reject】	Remark: 1:Measure from the side of panel 2.Abide by this criteria if no relevant engineering drawing provided
10	Protecting film peels off on polarizer. (Minor defect)	Turnup of protecting film >1/4 of the length or width of its corresponding axis. 【Reject】 Turnup of protective film>10mm 【Reject】	Except for special requirements
11	Glue covering (Major defect)	No fully covering of IC,ITO and conductive line area 【Reject】	
12	Depth of glue covering (Minor defect)	Depth of glue covering overtop front Polarizer 【Reject】	

3.2 Electrical criteria

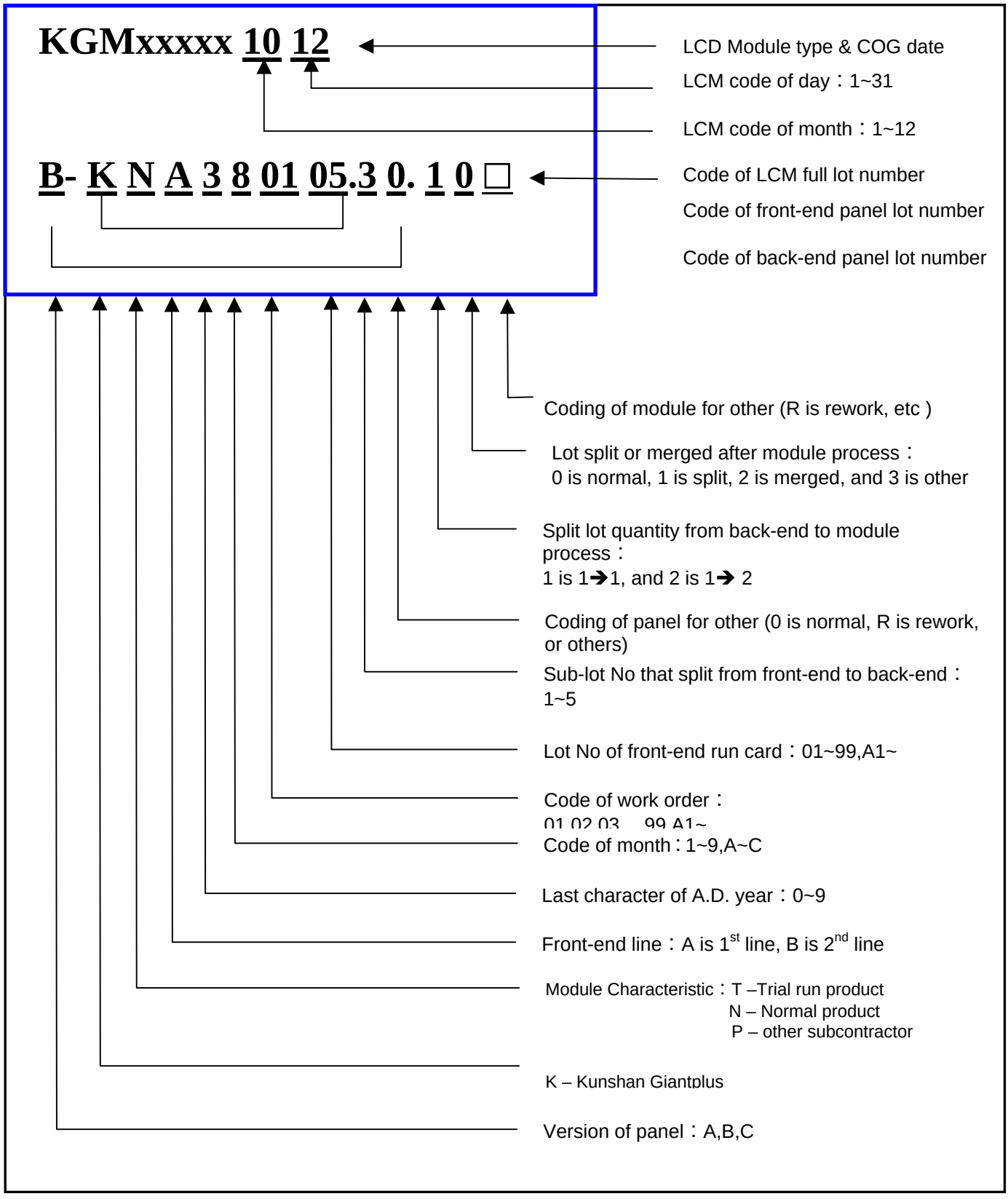
No	Items of Defect	Criteria	Remark
1	Missing line (Major defect)	Missing line 【Reject】	
2	Short cut (Major defect)	Short cut 【Reject】	
3	Pattern blur ,error code (Major defect)	Pattern blur ,error code 【Reject】	

No	Items of Defect	Criteria		Remark
4	No display in immobility (Major defect)	No display in immobility 【Reject】		
5	Flicker of Pattern (Major defect)	Flicker of Pattern 【Reject】		
6	Over current, voltage (Major defect)	By engineering specification 【Reject】		
7	Dark light, Flicker (Major defect)	Dark light, Flicker 【Reject】		
8	Black/White dots (Minor defect)	Specification	Allowable	Remark: 1: ψ=(L+W)/2 ; L=length, W=width
		ψ≦0.1mm,	Disregard	
		0.1mm<ψ≦0.2mm	3	
		0.2mm<ψ	0	
9	Fibers and scratch after light-on (Major defect)	Specification	Allowable	Remark: 1: L：Length, W：Width
		L≦3mm and W≦0.02mm	Disregard	
		L≦3mm and W≦0.02mm	2	
		L≦1mm and W≦0.05mm	1	
		L>1mm or W>0.05mm	0	

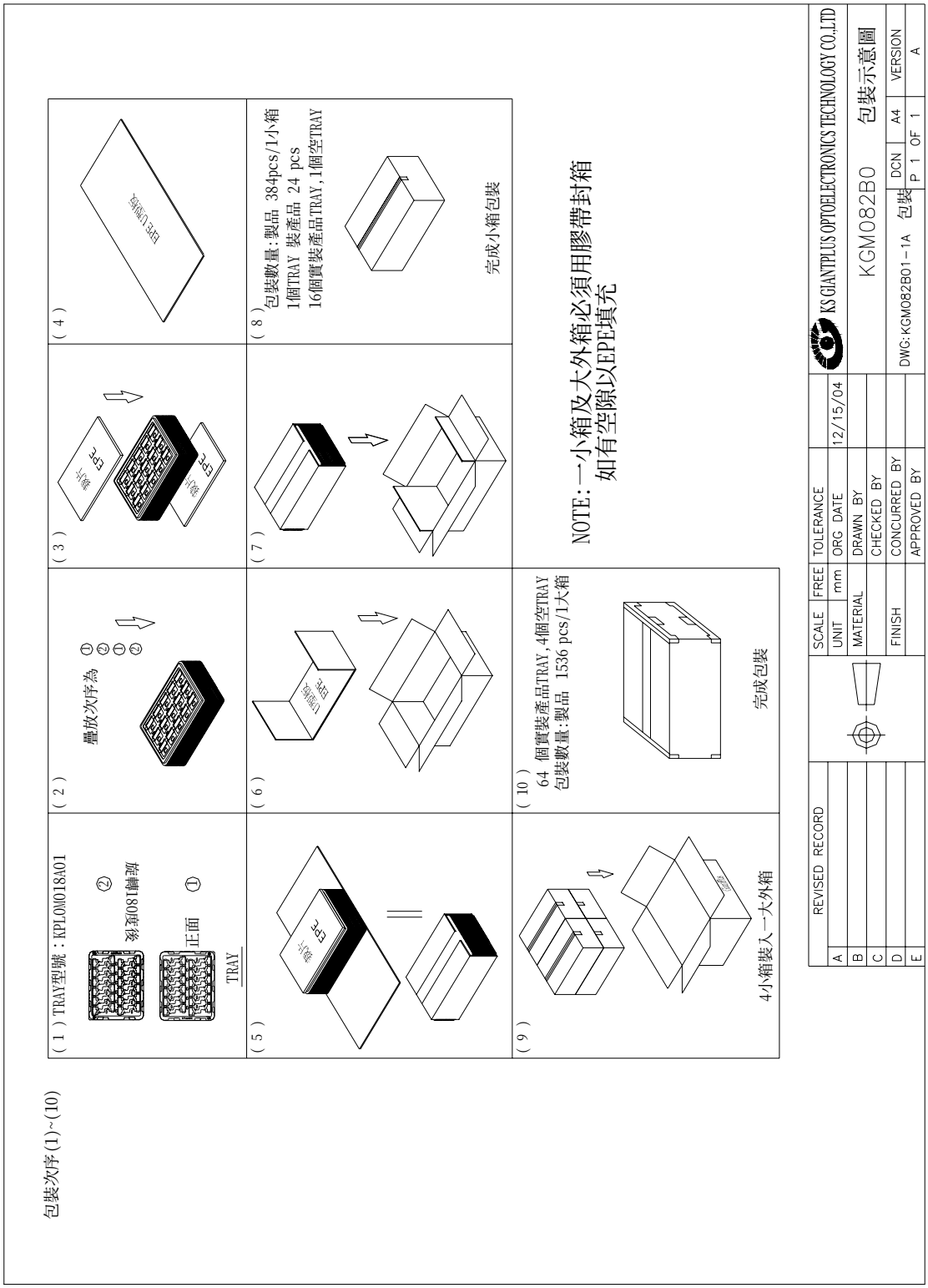
4. Mark and packaging inspection

Comply with technical files except for customer special requirement.

11. ILLUSTRATION OF LCM DATE CODE



12.PACKAGE


包裝次序(1)~(10)
(1) TRAY型號：KPL0\0180A01
正面 ①
反轉180度後 ②
TRAY
(2)
疊放次序為 ①②①②
(3)
(4)
完成小箱包裝
(5)
(6)
(7)
(8) 包裝數量:製品 384pcs/1小箱
1個TRAY 裝產品 24 pcs
16個實裝產品TRAY,1個空TRAY
(9)
4小箱裝入一大外箱
(10) 64 個實裝產品TRAY,4個空TRAY
包裝數量:製品 1536 pcs/1大箱
完成包裝
NOTE:一小箱及大外箱必須用膠帶封箱
如有空隙以EPE填充
REVISED RECORD
A
B
C
D
E
SCALE FREE
UNIT mm
MATERIAL
FINISH
TOLERANCE
ORG DATE 12/15/04
DRAWN BY
CHECKED BY
CONCURRED BY
APPROVED BY
KS GIANTPLUS OPTOELECTRONICS TECHNOLOGY CO.,LTD
KGM082B0 包裝示意圖
DWG:KGM082B01-1A 包裝
DCN A4 VERSION
P 1 OF 1 A

13.PRECAUTIONS FOR USING LCDMODULES

13.1Handling precautions

(1) The display panel is made of glass. Do not subject it to a mechanical shock or impact by dropping it.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten a cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

(6) Solvents other than those above mentioned may damage the polarizer.
Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

(7) Extra care to minimize corrosion of the electrode. Water droplets, moisture condensation or a current flow in a high-humidity environment accelerates corrosion of the electrode.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD Module, make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD Module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Be sure to ground the body when handling he LCD Module.
- Tools required for assembling, such as soldering irons, must be properly grounded.
-To reduce the amount of static electricity generated, do not conduct assembling and

other work under dry conditions.

-The LCD Module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

13.2Storage conditions

When storing, avoid the LCD module to be exposed to direct sunlight of fluorescent lamps. For stability, to keep it away from high temperature and high humidity environment (The best condition is: 23±5°C, 45±20%RH). ESD protection is necessary for long-term storage also.

13.3Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD Module have been operating for a long time showing the same display patterns the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be recovered by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD Module resulting from destruction caused by static electricity etc. exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.

14.USING LCD MODULES

14.1Liquid crystal display modules

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

(1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

(2) Do not touch, push or rub the exposed polarizers with anything harder than a HB pencil lead (glass, tweezers, etc).

(3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances, which will be damaged by chemicals such as acetone, toluene, toluene, ethanol and isopropyl alcohol.

(4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum ether. Do not scrub hard to avoid damaging the display surface.

(5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

(6) Avoid contacting oil and fats.

(7) Condensation on the surface and contact with terminals due to cold will damage, stain or polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(8) Do not put or attach anything on the display area to avoid leaving marks on.

(9) Do not touch the display with bare hands. This will stain the display area and degrade insulation between terminals (some cosmetics are determinate to the polarizers).

(10) As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

14.2Installing LCD module

Attend to the following items when installing the LCM.

(1) Cover the surface with a transparent protective plate 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 ±0.1mm.

14.3Electro-static discharge control

Since this module uses a CMOS LSI, the same careful attention should be paid for electrostatic discharge as for an ordinary CMOS IC.

(1) Make certain that you are grounded when handing LCM.
(2) Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
(3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
(4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commentator of the motor.
(5) As far as possible, make the electric potential of your work clothes and that of the workbenches to the ground potential.
(6) To reduce the generation of electro-static discharge, be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

14.4Precautions for operation

(1) Viewing angle varies with the change of liquid crystal driving voltage (Vo). Adjust Vo 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) If the display area is pushed hard during operation, the display will become abnormal. However, it will return normal if it is turned off and then on.
(5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, this product must be used and stored within the specified condition of 23±5°C, 45±20%RH.
(6) When turning the power on, input each signal after the positive/negative voltage becomes stable.

14.5 Safety

(1) It is recommended to crush damaged or unnecessary LCD into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

14.6Limted warranty

Unless agreed between KUNSHAN GIANTPLUS and customer, KUNSHAN GIANTPLUS will replace or repair any of its LCD and modules, which are found to be functionally defective when inspected in accordance with KUNSHAN GIANTPLUS LCD acceptance standards (copies available upon request) for a period of one year from date of shipments.

Cosmetic/visual defects must be returned to KUNSHAN GIANTPLUS within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of KUNSHAN GIANTPLUS is limited to repair and/or replacement on the terms set forth above. KUNSHAN GIANTPLUS will not be responsible for any subsequent or consequential events.

14.7Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are:

-Broken LCD glass.
-PCB eyelet's damaged or modified.
-PCB conductors damaged.
-Circuit modified in any way, including addition of components.
-PCB tampered with by grinding, engraving or painting varnish.
-Soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet's conductors and terminals.

15.FACTORY

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

FACTORY NAME: KUNSHAN GIANTPLUS OPTOELECTRONICS TECHNOLOGY CO., LTD.
FACTORY ADDRESS: Kunshan City, Jiangsu Province, China.
FACTORY PHONE: TEL: 86-512-57780988 FAX: 86-512-57780503

16.REVISION HISTORY

Version	Revise record	Date
A	Original version	2004/12/30

附錄: KGM082B0 BOMList

Name	Description	UOM	Quantity
LCD	模組(客製品).KGM.082.B.0	PCS	1
	COG.半成品.KGM082A0	PCS	1
IC	IC.BUMP.ST7556_G.矽創	PCS	1
LCP	液晶顯示面板.W.S.453.C.A	PCS	1
FPC	FPC.KFM018A01.C.	PCS	1
TAPE	TAPE.OM180A01.A 版	PCS	1
	TAPE.OM022102	PCS	1
偏光片	偏光片.上片.KGP001	PCS	0.0026
	偏光片.下片.LL8218STLG	PCS	0.0018
L/G	L/G.KLM018A01	PCS	1