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LCD Module Technical Specification

Part No. : GG12864H
Customer : _____
Drawing No. : _____
Approved : _____
Date : _____

Approved: _____ Checked: _____ Prepared: _____

GEMINI Technology Co., Ltd.

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1. TABLE OF DATE-REVISION

Date	Ver.	Description	Page	Design by
2007.09.06	01	First Issue	1~21	Brandon H.Park

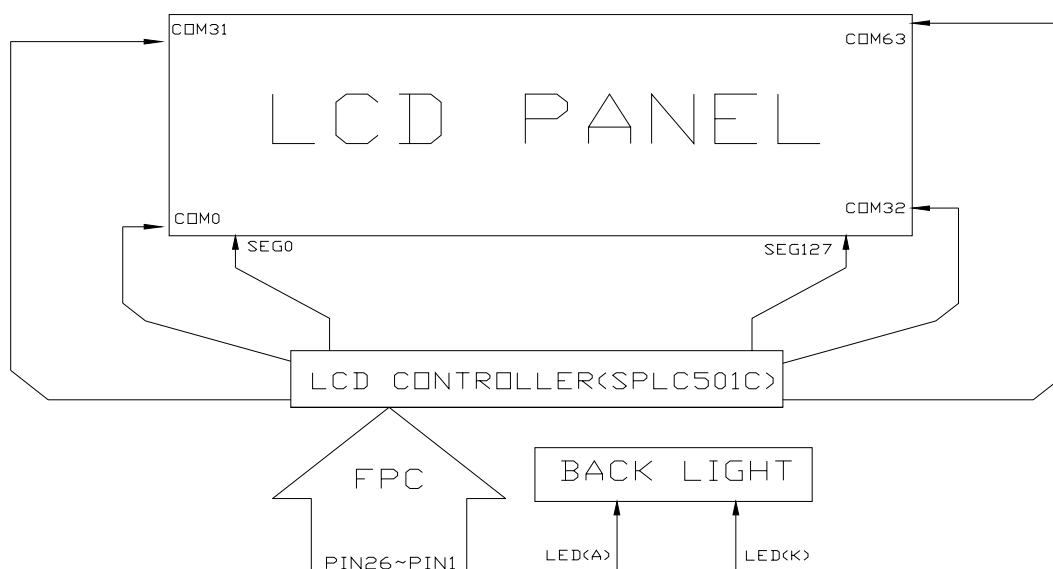
2. SCOPE

This specification is applied to the liquid crystal display modules **GG12864H** operated with 1/64 duty ,1/9bias using custom IC designed to **SPLC501C-C1** OR EQUIVALENT.
This individual specification is general specifications.

3. DISPLAY CONTENT AND MECHANICAL CHARACTERISTIC

ITEM	STANDARD VALUE	UNIT
Number of characters	128 x 64Dots	——
Module dimension	93.7(W) x 121.6(H) x 5.5(T)	mm
View display area	70.7(W) x 38.8(H)	mm
Dot size	0.50(W) x 0.50(H)	mm
Dot pitch	0.52(W) x 0.52(H)	mm
Operating temp	-20~70	℃
Storage temp	-30~80	℃
Duty	1/64	
Viewing direction	6 O'CLOCK	
Display mode	STN 、 VOP=9.8	
Display type	TRANSFLECIVE, POSITIVE.	
Driver IC	SPLC501C-C1	
DC-DC	--	
Back_light	YELLOW-GREEN 、 4.2V	

4. BLOCK DIAGRAM



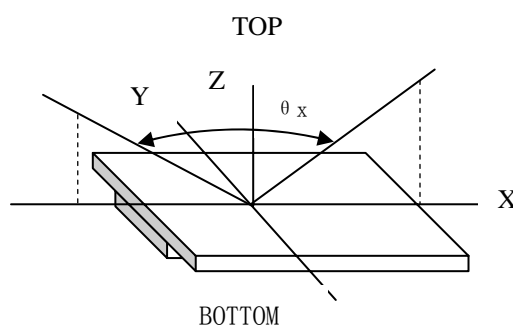
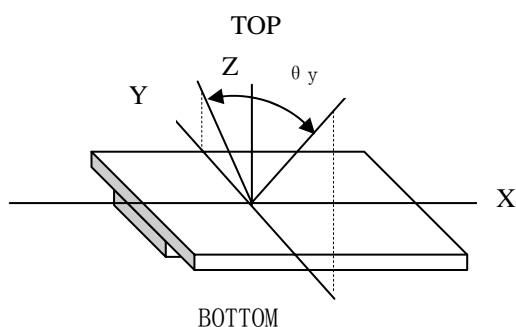
5. Electro-optical Characteristics

5.1. Electro-optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Contrast Ratio		Cr	$\theta_x = 0^\circ$ $\theta_y = 0^\circ$	3	4	—	
Response Time	Turn on	Ton	$\theta_x = 0^\circ$	—	150	300	ms
	Turn off	Toff	$\theta_y = 0^\circ$	—	200	350	
Viewing Angle	Left-Right	θ_x	$\theta_y = 0^\circ$	-30	—	30	Deg
	Top--Bottom	θ_y	$\theta_x = 0^\circ$	-15	—	30	
V_{op}			25°C	9.5	9.8	10.1	V

5.2. Definition of Electro-optical Characteristics

5.2.1. Definition of Viewing Angle



Unselected state brightness

5.2.2. Definition of Contrast Ratio =

Selected state brightness

6、 HANDLING PRECAUTION

6.1 Handling 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, ketene, 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.

6.2 STORAGE CONDITIONS

When storing, avoid the LCD module to be exposed to direct sunlight of fluorescent lamps. For stability, to keep it away form high temperature and high humidity environment (The best condition is : $23\pm5^{\circ}\text{C}$, $45\pm10\%\text{RH}$). ESD protection is necessary for long-term storage also.

6.3 Others

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 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.

7. ELECTRICAL CHARACTERISTIC

MAXIMUM ABSOLUTE LIMIT

Characteristic	Symbol	Value	Unit
Power Supply voltage	V_{DD}	-0.3 to +7	V
Power Supply voltage(2)(VDD standard) <With Triple Step-Up>	V_{SS2}	-4.0 to +0.3	V
Power Supply voltage(2)(VDD standard) <With Quad Step-Up>	V_{SS2}	-3 to +0.3	V
Input Voltage	V_{IN}	-0.3 to $V_{DD} + 0.3$	V
Power Supply voltage(VDD standard)	V_5, V_{OUT}	-12 to +0.3	V
	V_1, V_2, V_3, V_4	V_5 to +0.3	V
Operating temperature	T_{OPR}	-20 to +70	°C
Storage temperature	T_{STG}	-30 to +80	°C

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS ($V_{DD} = +3V \pm 10\%$, $V_{SS} = 0V$, $T_a = +25^\circ C$)

Item		Symbol	Condition		Rating			Units	Applicable PIN
					Min.	Typ.	Max.		
Operating Voltage (1)	Possible Operating Voltage (1A)	VDD			2.8	-	3.0	V	VDD*1
	Possible Operating Voltage (1B)				3.0	-	5.5	V	VDD*1
Operating Voltage (2)	Recommended Voltage	VSS2	(Relative to VDD)		-3.3	-	-2.7	V	VSS2
	Possible Operating Voltage	VSS2	(Relative to VDD)		-6.0	-	-1.8	V	VSS2
Operating Voltage (3)	Possible Operating Voltage (3A)	V ₅	(Relative to VDD)		-10	-	-4.5	V	V ₅ *2
	Possible Operating Voltage (3B)	V ₁ , V ₂	(Relative to VDD)		-12	-	-4.5	V	V ₅ *2
	Possible Operating Voltage		(Relative to VDD)		0.4 x V ₅	-	VDD	V	V ₁ , V ₂
	Possible Operating Voltage	V ₃ , V ₄	(Relative to VDD)		V ₅	-	0.6 x V ₅	V	V ₃ , V ₄
High-level Input Voltage		V _{IHC}			0.8 x VDD	-	VDD	V	*3
Low-level Input Voltage		V _{ILC}			VSS	-	0.2 x VDD	V	*3
High-level Input Voltage		V _{OHC}	I _{OH} = -0.5mA		0.8 x VDD	-	VDD	V	*4
Low-level Input Voltage		V _{OLC}	I _{OL} = 0.5mA		VSS	-	0.2 x VDD	V	*4
Input leakage current		I _{LI}	V _{IN} = VDD or VSS		-1.0	-	1.0	μA	*5
Output leakage current		I _{LO}			-3.0	-	3.0	μA	*6
Liquid Crystal Driver ON Resistance		R _{ON}	T _A = 25°C	V ₅ = -12V	-	2.0	3.5	KΩ	SEg _n
			(Relative To VDD)	V ₅ = -8.0V	-	3.2	5.4	KΩ	COM _n *7
Static Consumption Current		I _{SSQ}			-	0.01	5.0	μA	VSS, VSS2
Output Leakage Current		I _{SQ}	V ₅ = -12V (Relative to VDD)		-	0.01	15	μA	V ₅
Input Terminal Capacitance		C _{IN}	T _A = 25°C f = 1.0MHz		-	5.0	8.0	pF	
Oscillator Frequency	Internal Oscillator	f _{OSC}	T _A = 25°C		18	22	26	KHz	*8
	External Input	f _{CL}	SPLC501C		18	22	26	KHz	CL
Internal Power	Input Voltage	VSS2	With Triple (Relative to VDD)		-4.0	-	-2.4	V	VSS2
		VSS2	With Quad (Relative to VDD)		-3.0	-	-2.4	V	VSS2
	Supply Setup-up output voltage Circuit	V _{OUT}	(Relative to VDD)		-12	-	-	V	V _{OUT}
	Voltage regulator Circuit Operating Voltage	V _{OUT}	(Relative to VDD)		-12	-	-6.0	V	V _{OUT}
	Voltage Follower Circuit Operating Voltage	V ₅	(Relative to VDD)		-12	-5.5	-4.5	V	V ₅ *9
Base Voltage		V _{REG0}	T _A = 25°C (Relative to VDD)	-0.05%/°C	-2.28	-2.22	-2.16	V	*10

NOTES: Note: For detailed information please refer to IC data sheet: **ORISE-TECH--SPLC501C**

8. INTERFACE

No.	Symbol	Function	Note
1	/CS1	CHIP SELECT SIGNAL	
2	/RESET	RESET	
3	A0	H:D0~D7 ARE DISPLAY DATA, L: D0~D7 ARE CONTROL DATA	
4	/WR	8080:ACTIVE LOW	
5	/RD	8080:ACTIVE LOW	
6~13	DB0~DB7	PARALLEL DATA INPUT	
14	VDD	POWER SUPPLY (+3.3V)	
15	VSS	POWER SUPPLY (GND)	
16	VOUT	DC/DC VOLTAGE CONVERTER	
17	CAP3-	DC/DC VOLTAGE CONVERTER	
18	CAP1+-	DC/DC VOLTAGE CONVERTER	
19	CAP1-	DC/DC VOLTAGE CONVERTER	
20	CAP2-	DC/DC VOLTAGE CONVERTER	
21	CAP2+	DC/DC VOLTAGE CONVERTER	
22	V1	LCD OPERATING VOLTAGE	CAPACTICNCE VALUE FOR BOOSTING SHOULD BE MORE THAN 1.0uF
23	V2	LCD OPERATING VOLTAGE	
24	V3	LCD OPERATING VOLTAGE	
25	V4	LCD OPERATING VOLTAGE	
26	V5	LCD OPERATING VOLTAGE	

9. FUNCTIONAL DESCRIPTION (SPLC501C)

Command	Command Code											Function
	A0P	\overline{RD}	\overline{WR}	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	
1). Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0 1	LCD display ON/OFF 0: OFF, 1: ON
2). Display start line set	0	1	0	0	1	Display start address						Sets the display RAM display start line address
3). Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
4). Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				Set the least significant 4 bits of the display RAM column address.
5). Status read	0	0	1	Status				0	0	0	0	Reads the status data
6). Display data write	1	1	0	Write data								Writes to the display RAM
7). Display data read	1	0	1	Read data								Reads from the display RAM
8). ADC select	0	1	0	1	0	1	0	0	0	0	0 1	Sets the display RAM address SEG output correspondence 0: normal, 1:reverse
9). Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0 1	Sets the LCD display normal/ reverse 0: normal, 1:reverse
10). Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0 1	Display all points 0: normal display 1: all points ON
11). LCD bias set	0	1	0	1	0	1	0	0	0	1	0 1	Sets the LCD driver voltage bias ratio SPLC501C.....0:1/9, 1:1/7
12). Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
13). End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
14). Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
15). Common output mode select	0	1	0	1	1	0	0	0	*	*	*	Select COM output scan direction 0: normal direction, 1: reverse direction
16). Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode
17). V_s voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio (Rb/Ra) mode
18). Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set the V_s output voltage electronic volume register
Electronic volume register set	0	1	0	*	*	Electronic volume value						

Command	Command Code											Function
	A0P	RD	WR	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	
19). Static indicator ON/OFF	0	1	0	1	0	1	0	1	1	0	0	D: OFF, 1: ON
Static indicator Register set	0	1	0	*	*	*	*	*	*	Mode	1	Set the flashing mode
20). Page Blink	0	1	0	1	1	0	1	0	1	0	1	P7 - 0: 1 - blinking page 0 - no blinking, normal display
Page selection	0	1	0	P7	P6	P5	P4	P3	P2	P1	P0	
21). Driving Mode Set	0	1	0	1	1	0	1	0	0	1	0	Set the driving mode register
Mode selection	0	1	0	D1	D0	0	0	0	0	0	0	Driving capability (D1, D0): (1,1)>(0,0)>(0,1)>(1,0)
22). Power saver												Display OFF and display all points ON compound command
23). NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
24). Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command
				1	1	0	1	0	1	0	0	

NOTES: Note: For detailed information please refer to IC data sheet: **SPLC501C-C1**

10 LED Electrical/Optical Characteristics

Item	MIN	TYPE	MAX	UNIT	CONDITION
Forward Voltage	3.9	4.2	4.4	V	--
Forward Current	--	100	160	mA	4.2V
Luminance	20	25	--	CD/M2	4.2V
Operating Temp Range	-20	25	70	℃	--
Storage Temp Range	-30	25	80	℃	--

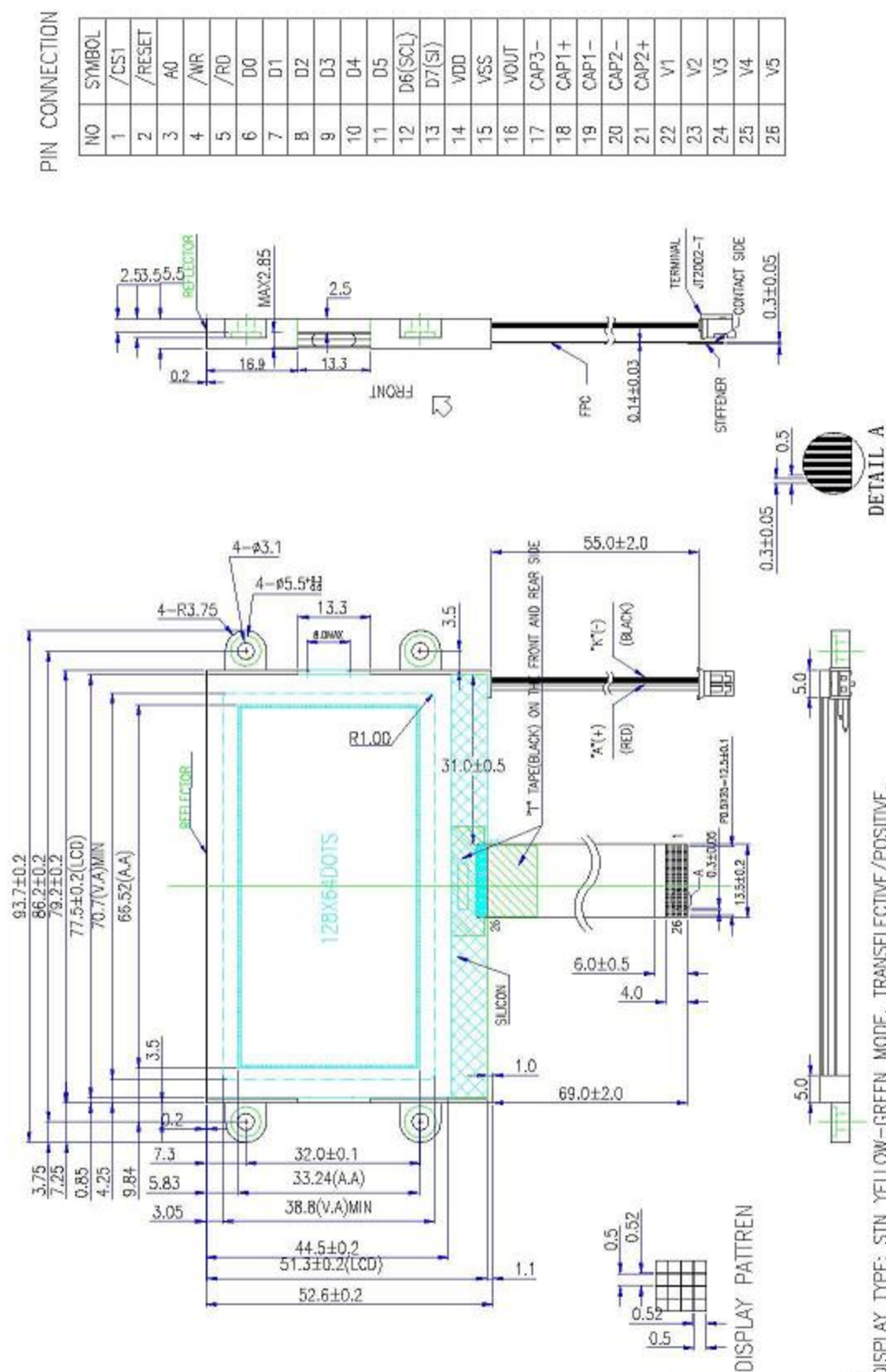
NOTE : 1) This luminous intensity is average of 3 detected points. and The Lvmax./Lvmin. is less than 1.5

Typical(max1.7) Average Luminous ≥ 70%

2)The measurement instrument is BM-7 luminance colorimeter.

3)The B/L brightness value is only own B/L luminance.


11. MODULE DRAWING



NOTES:

1. DISPLAY TYPE: STN YELLOW-GREEN MODE, TRANSPARENT/POSITIVE.
2. DRIVE METHOD: 1/65DUTY, 1/9BIAS, VOP=9.8V, VDD=3.0V
3. VIEWING DIRECTION: 6 O'CLOCK.
4. IC DRIVER: SPLC501C-C1.
5. OPERATING TEMP: -20°C ~ 70°C.
6. STORAGE TEMP: -30°C ~ 80°C.
7. LED BACKLIGHT: Y/G EDGE LEDA-LEDK=4.2V.
8. ALL UNMARKED TOLERANCES: ±0.3.
9. ENVIRONMENT REQUEST.

NO	SYMBOL
1	/CS1
2	/RESET
3	A0
4	/WR
5	/RD
6	D0
7	D1
8	D2
9	D3
10	D4
11	D5
12	D6(SCL)
13	D7(SI)
14	VDD
15	VSS
16	VOU1
17	CAP3-
18	CAP1+
19	CAP1-
20	CAP2-
21	CAP2+
22	V1
23	V2
24	V3
25	V4
26	V5

CUSTOMER APVL	CUSTOMER	DATE		
DRAWN	DRAWN	DATE	TITLE	
DTG CHK		UNIT	mm	
ENGR CHK				MODEL
APPROVAL			GG12864H	
GEMINI Technology Co., Ltd.			DWG NO	PAGE
			DWGNO	PAGE

12.QUALITY AND RELIABILITY

1)Test Condition

Test should be conducted under the following conditions:

Ambient Temperature: 25 ± 5 °C

Humidity : $60 \pm 20\%$ RH

2)Sampling Plan

Sampling procedure: General inspection levels II and single sampling plans for normal inspection of ISO2859.

3)Acceptable Quality Level

A major defect is a defect that could result in failure or materially reduce that the usability of the unit of product for its intended purpose.

A minor defect is one that does not materially reduce the usability of the unit of product for its intended purpose or is a departure from established standards having no significant bearing on the effective use or operation of the unit.

4)Appearance and Checking Standard

Appearance test is to be conducted by eyes at approximately 30cm distance from LCD module under the single fluorescent light.

(1)、 Inspection level :

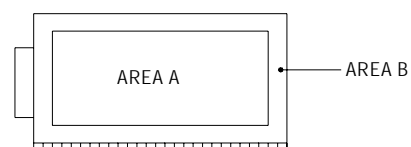
Sampling procedure: General inspection levels II and single sampling plans for normal Inspection of ISO2859.

Item	Indication	AQL
Major Nonconformity (MA)	Function	0.4
	Size	
Minor Nonconformity (MI)	Effects on LCD appearance but not on function	1.0

(2)、 The area of LCD :

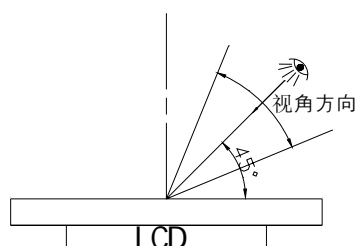
Viewing area : The uncovered area after assembling frame. (AREA A)

Non-viewing area : Covered area after assembling frame. (AREA B)

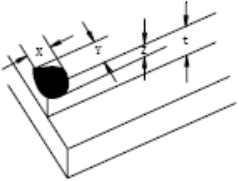
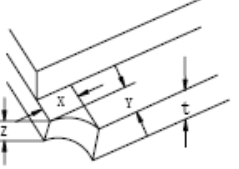
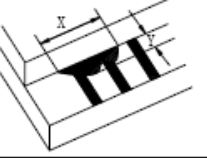
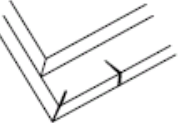


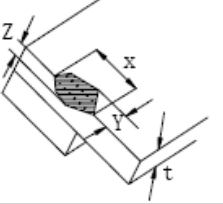
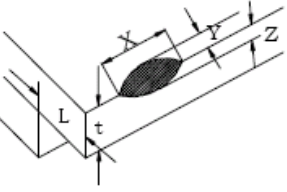
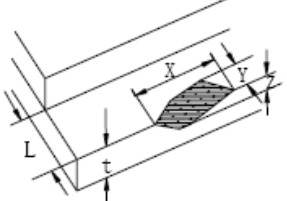
(3)、 Inspection condition :

Remark NO.	Content
1	Under 40W daylight lamp, keep the eye about 30cm away the products.
2	Choose, prepare the corresponding test equipment according to different type of LCM finished product, such as electricity test machine , test shelf ,etc..
3	According to " The LCM test standard " in the finalized designed datum of LCM products to regulate the corresponding test parameter.
4	Back-Lights or reflective boards should be adopted for inspecting transmissive LCDs.
5	The visual direction should be viewing angle range
6	This kind of situation will be judged qualificatory one that defection of product in B area won't effect customer's assembly and product quality..



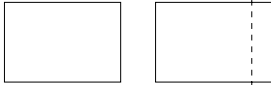
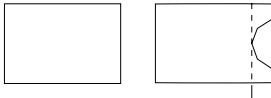
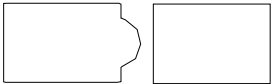

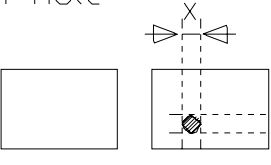
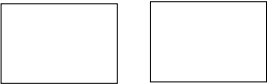
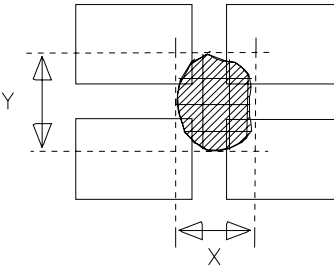
(4)、LCD Appearance Nonconformity

Item 项目		Figure	Criteria	MA/MI
Glass Nonconformity	Glass Corner Breakage		1、 $X_{max} \leq 3.0mm$ 2、Y out of seal resin 3、 $Z \leq t$	ACC MI
			1、 $X_{max} \leq 3.0mm$ 2、Y out of area A 3、 $Z \leq t$ Z don't touch seal resin $Z \leq t$	ACC
	Extra Glass Ledge		1、X ignore 2、 $Y \leq 1/3$ Length of conductor	ACC MI
Glass Nonconformity	Crack		Any crack any where	REJ MA

Glass Nonconformity 玻璃不良	Glass Side Breakage		1、 $X_{max} \leq 3.0mm$ 2、Y out of area A 3、 $Z \leq t$	ACC ACC ACC MI
			No PIN 1、 $X_{max} \leq 3.0mm$ 2、Y out of area A 3、 $Z \leq t$	ACC ACC ACC
			With PIN 1、 $X_{max} \leq 3.0mm$ 2、 $Y \leq 1/2L$ 3、 $Z \leq t$	ACC ACC ACC MI
			1、 $X_{max} \leq 3.0mm$ 2、 $Y \leq 1/4L$ (L: Length of conductor) 3、 $Z \leq t$	ACC ACC ACC MI

(6)、Display appearance inspection standard

No.	Parameter	Criteria												
1	Black and White spots,Foreign Substances	(1) Round Shape												
		Zone Dimension (mm)					Acceptable Number							
							A Area	B Area						
				D	≤	0.2	*	*						
		0.2	<	D	≤	0.3	5	6						
		0.3	<	D	≤	0.5	3	4						
		0.5	<	D			0	1						
		D=(long+Short)/2 *:Disregard												
		(2)Line shape												
		X(mm)		Y(mm)		Zone		Acceptable Number						
								A Area	B Area					
		—		W ≤ 0.03		*	*							
		L ≤ 2.0		0.03 < W ≤ 0.1		*	*							
		2.0 ≤ L ≤ 4.0				3	*							
		4.0 < L				0	2							
		—		0.1 < W		In the same way(1)								
		X:Lengh Y:Width *:Disregard												
2	Air Bubbles (between glass& polarizer)													
		Zone Dimension (mm)					Acceptable Number							
							A Area	B Area						
				D	≤	0.3	*	*						
		0.3	<	D	≤	0.4	5	*						
		0.4	<	D	≤	0.6	3	3						
		0.6	<	D			0	0						
		*:Disregard												

No.	Parameter	Criteria
3	The Shape of Dot	<p>(1)Dot Shape (with Dent)</p> <p>$0.15 \geq \Delta$</p>  <p>As per the skecth of left hand</p>  <p>(2)Dot Shape (with Projection)</p>  <p>Should not be connected to next dot</p>  <p>(3)Pin Hole</p>  <p>$(X+Y)/2 \leq 0.2\text{mm}$ (Less than 0.1mm is no counted)</p>  <p>(4)Deformation</p>  <p>$(X+Y)/2 \leq 0.2\text{mm}$</p> <p>Total acceptable number:1/dot,5/cell (Defect number of (4):1pc.)</p>
4	Polarizer Scratches	Not to be conspicuous defects
5	Polarizer Dirts	If the stains are removed easily from LCDP surface module is not defective
6	Complex Foreign Substance Defects	Black spots,line shaped foreign suvbstance or air bubbles between glass&polarizer should be 5pcs maximum in total
7	Distance between different Foreign Substance Defects	$D \leq 0.2:20\text{mm}$ or more $0.2 < D:40\text{mm}$ or more

(7)、Finished module appearance inspection standard

Remark NO.	Content
1	External dimension (whole length, width, height) of products and specification , type come up to its requirement of the finalized designed datum.
2	LCD consults " LCD inspection standard " to judge
3	FPC and LCD electrode are aligned and neat, haven't short-circuits. The misplacing amount is less than 1/3 of the electrode interval. Weld conjunction must be tight, can't have the bad phenomenon such as warp, scald, damage , bubble , blow layer.
4	Glue (hot melted glue, silica glue) must fulfill requirements, can't have leak glue and more glue, glue amount should be appropriate, can't emerge shortage or pile up too much.
5	Fabricating weld can't have batch of interstices, interstice, compression, deformation.
6	Fabricating by rush press can't have the phenomenon such as split, deformation, unparallel pressing.
7	The Size of LCM products label, attached position and content (such as type, date, lot number) must fulfill requirements and the writing is clear, can't emerge the phenomenon like the label damage , leak to attach , stick the type by mistake .
8	Highly, silica gel not exceeding glass border altitude , can not get in touch with to polarized light movie. The glue can not have the $\phi > 1.0$ mm vapor to dawdle.
9	FPC and extreme LCD electric conduction connection can not have the short circuit , the broken circuit phenomenon. Pressure FPC length $\geq 3/4$ electric conduction pole length , Slope angle of the heat seal $< 5^\circ$, electrode malposition amounts $\leq 1/3$ electrode spacing.
10	The IC shading paper firmly covers IC completely.
11	Varia phis ≤ 0.25 mm. FFC and the COB electrode are corresponding tidy , there be no the short circuit , malposition amounts within electrode spacing 1/3; Solder unhealthy tendencies such as sticking the small side door tight , having tilting , scald , damage , starting to blister, a tier.
12	After testing, cosmetic defects should not happen, no low temperature bubbles, seal loose and fall, frame rainbow, ACF bubble growing are unallowable in the appearance test.
13	After testing, cosmetic defects should not happen, no low temperature bubbles, seal loose and fall, frame rainbow, ACF bubble growing are unallowable in the appearance test.
14	Total current consumption should not be over 10% of initial value.
15	After tests being executed, Contrast must be larger than 70% of its initial value prior to the tests
16	No glass crack, chipped glass, end seal loose frame crack and so on.
17	No structure loose and fall.

(8)、Reliability

The LCD module should have no failure in the following reliability test

No.	Test Item	Description	Condition
1	High Temperature (Operation)	Durability test under long time high temperature with electrical stress (voltage, current)	70°C ± 2°C 96hrs
2	High Temperature(Storage)	Durability test under long time high temperature storage	80°C ± 2°C 96hrs
3	Low Temperature(Operation)	Durability test under long time low temperature with electrical stress (voltage, current)	-20°C ± 2°C, 96hrs
4	Low Temperature(Storage)	Durability test under long time low temperature storage	-30°C ± 2°C, 96hrs
5	Temperature cycling	Durability test under temperature and low temperature with electrical stress (voltage, current)	-20~25~70°C 10min, between, each and temp 50min, at each step temp. 5cycles
6	Humidity storage Test	Durability test under long time high temperature and high humidity	40°C ± 2°C, 80 ~ 90%RH 96hrs
7	Vibration Test	X Y Z for 30min each	10~100HZ, sweep, 4g, amp1=10mm(max)
8	Mechanical Shock	10~50HZ, 50G	X, Y, Z for 1 time, each

Note: 1: Unless otherwise specified, tests will be conducted

Note 2: Unless otherwise specified, tests will be conducted under the following condition, Temperature: : 25°C ± 2°, Humidity: 65% ± 5%

Note 3: Unless otherwise specified, tests will be not conducted under functioning state.

Note 4: No dew condensation to be observed.

Note 5: The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.

Note 6: Vibration test will be conducted to the product itself without putting it in a container.

(9)、Reliability Judgment Standard

Failure Mode	Test Item								Judgment Standard
	1	2	3	4	5	6	7	8	
Orientation	△	△	△	△	△	△			No remarkable degradation of appearance under bias/ non-bias condition
Current Value(IAC)	△	△	△	△	△	△			No remarkable increase
Contrast	△		△	△	△	△			No remarkable poor contrast
Domain	△	△		△	△	△			Less than 20% of all dots have reverse tilt of more than on third of one dot area.
Bubble (Inside Cell)	△	△	△	△	△	△			As per “ Appearance Standard” (Note. Including one which disappear after 25°C 2H)
Polarizer	△						△	△	As per “ Appearance Standard” no remarkable appearance change

- Note:
1. △ is strong linkage between Failure Mode and Test Item.
 2. Number of Test Item should be referred to former page.
 3. Judgment and Standard value should be fixed by other inspection standard and criteria samples.

13、PACKING

Packing Materials

No.	ITEM	DIMENSION(L*W*H)
1	Plastic tray	-----
2	Carton Box	——
3	Foam Broad	——

Packing Method

