Display the World

Date: 2014/11/07

Specifications for Approval

Customer : Mc ' Tronic

Model name : GY1206P6FSW6G07 REV: A

Description : LCM (Y1206P6FSW6G07– DD682 – E1103A)

LCD Specification: LCD (SDD682 – 73 – 8223 – 110409 – 1)

ENG	CHECK	QA	APPROVAL
WuChao	Nanli	Wallace	Michael

Customer Approval	☐ Accept ☐ Reject Comment: Approved by: _____

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REVISION RECORD (MODEL NO.: GY1206P6FSW6G07)

Revision	Revision Date	Page	Contents
A	2014/11/07		Initial Release and Issue Full Specification.

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2. REVISION RECORD

1. FEATURES

The features of LCD are as follows

* Display mode : FSTN, Positive, Transflective
* Color : Display dot : Black
  Background: White
* Display Format : 128Dots × 64Dots graphic
* IC : Sitronix ST7565R-G
* Interface Input Data : 8-Bit Parallel 6800 / 4-Line SPI MPU Interface
* Driving Method : 1/65 Duty, 1/9 Bias
* Viewing Direction : 6 O'clock
* Backlight : LED (White)
* LCM technological conditions: **RoHS**

2. MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module Size	67.15(W) X 64.15(H) X 5.3(T)	mm
Viewing Area	61.0(W) X 31.4(H)	mm
Effective Display Area	57.57(W) X 28.77(H)	mm
Number of Dots	128 X 64 Dots	-
Dot Size	0.42(W) X 0.42(H)	mm
Dot Pitch	0.45(W) X 0.45(H)	mm

3. ELECTRICAL SPECIFICATIONS

3-1. Absolute Maximum Ratings (Vss=0V)

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	V_{DD}	0.3	-	5.0	V
Supply Voltage For LCD Drive	V_0,V_{OUT}	0.3	-	18.0	V
Operating Temp.	T_{OP}	-20	-	+70	°C
Storage Temp.	T_{ST}	-30	-	+80	°C
Static Electricity	Be sue that you are ground when handing LCM				

3. ELECTRICAL SPECIFICATIONS (Continued)

3-2-1.Electrical Characteristics

Item		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic		V_{DD} - V_{SS}	-	1.8	3.3	3.3	V
Supply Voltage For LCD		V0-V_{SS}	-	8.0	8.3	8.6	V
Input Voltage	"H" Level	V_{IH}	-	0.8V_{DD}	-	V_{DD}	V
	"L" Level	V_{IL}		V_{SS}	-	0.2V_{DD}	V
Output Voltage	"H" Level	V_{OH}	I_{OUT}= -0.5mA	0.8V_{DD}	-	V_{DD}	V
	"L" Level	V_{OL}	I_{OUT}= 0.5mA	V_{SS}	-	0.2V_{DD}	V
Current Consumption		I_{DD}	V_{IN} = V_{DD}	-	1.50	3.0	mA
			Dots All off	25	50	-	cd/m^2

NOTE: 1) Duty ratio=1/65, Bias=1/9

2) Measured in Dots ON-state

3-3.BACKLIGHT

3-3-1. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Typ.	Max	Unit
Forward Current	IF	Ta= 25℃	-	-	100	mA
Reverse Voltage	VR		-	-	10	V
Power Dissipation	PD	Ta= 25℃	-	-	420	mW

3-3-2. Opto-electronic Characteristics

Item	Symbol	Condition	Min.	Typ.	Max	Unit
Forward Voltage	VF	IF= 60mA	3.8	4.0	4.2	V
Reverse current	IR	VR=10V	-	-	60	uA
Luminous intensity	LV	IF=60mA	450	600	-	cd/m²
Avg.X of 1931 C.I.E	X	IF=60mA	0.25	0.28	0.31	-
Avg.Y of 1931 C.I.E	Y		0.25	0.28	0.31	

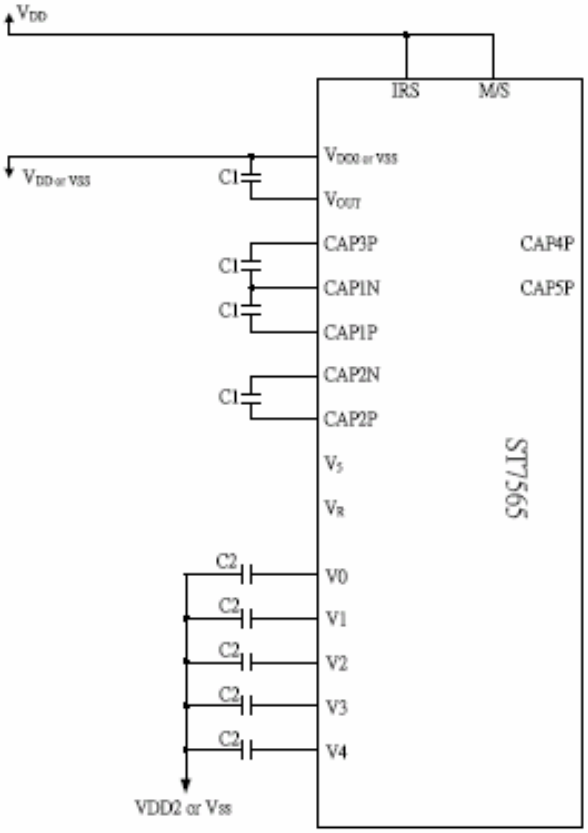
* The brightness is measured without LCD panel

4. POWER SUPPLY and BLOCK DIAGRMA

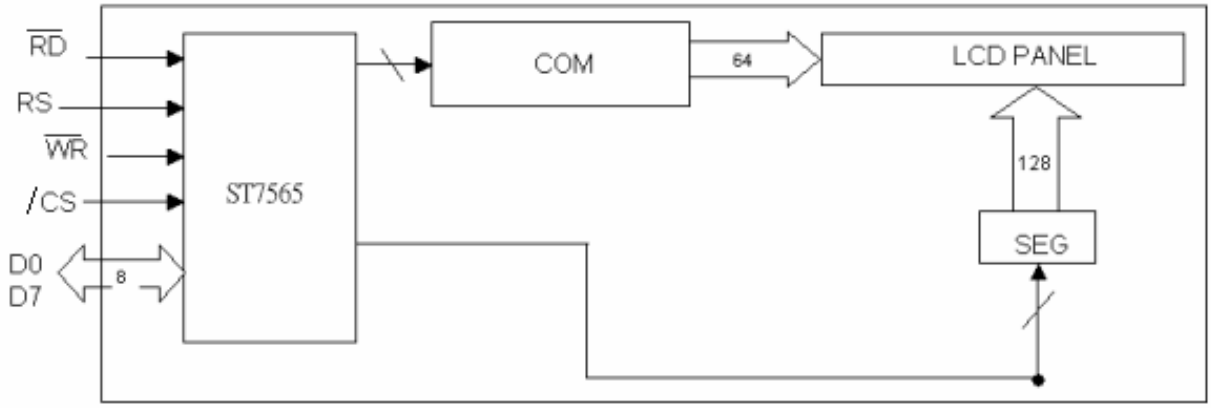
4-1 Power supply

(1) When the voltage regulator internal resistor is used.

(Example where VDD2 = VDD, with 4x step-up)



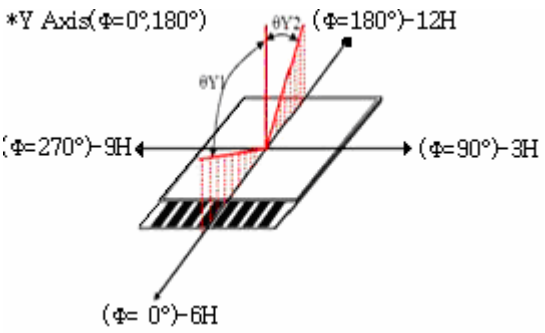
4-2 Block diagram



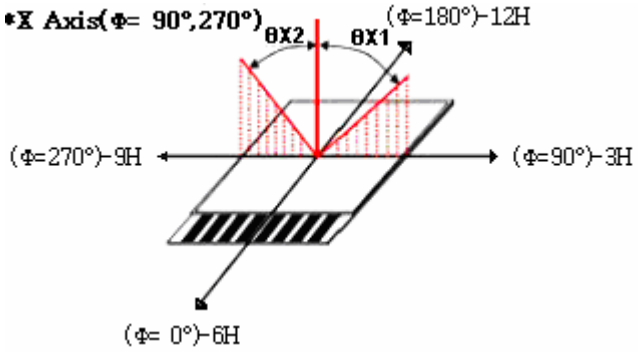
5. ELECTRO – OPTICAL CHARACTERISTICS

Item		Symbol	Temp.	Min.	Typ.	Max.	Unit	Conditions	Note
Viewing Angle Cr≥2	Φ=0°	Θ1	25℃	--	33	--	Deg.	-	1,2
	Φ=180°	Θ2		--	35	--			
	Φ=90°	Θ3		--	28	--			
	Φ=270°	Θ4		--	32	--			
Viewing Direction			6 O'clock						
Contrast Ratio		Cr	25℃	2.0	5.08	5.18	-	Θ= 0° Φ= 0°	3
Response Time(rise)		Tr	25℃	-	96	300	ms	Θ= 0° Φ= 0°	4
			0℃	-	1250	1650			
Response Time(fall)		Tf	25℃	-	218	300	ms	Θ= 0° Φ= 0°	4
			0℃	-	1250	1650			

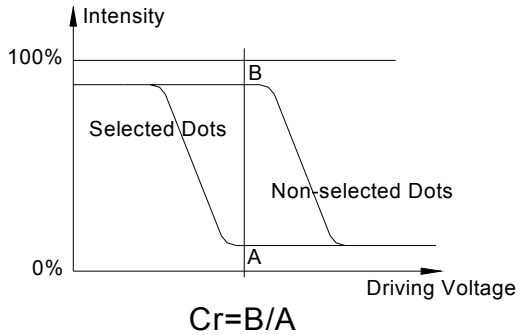
Note1. Definition of Angle ΘY1&ΘY2



Note2. Definition of Viewing Angle ΘX1&ΘX2

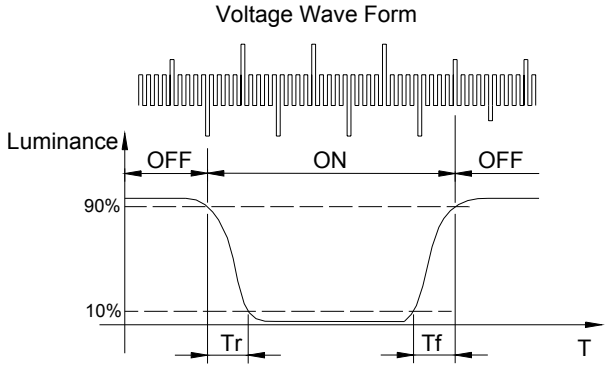


Note3. Definition of Contrast Cr



Cr=B/A

Note4. Definition of Optical Response



6. INTERFACE PIN FUNCTION

Pin NO.	Symbol	I / O	Functions
1	/CS	I	This is the chip select signal.
2	/RES	I	When RES is set to “L”, the setting are initialized.
3	A0	I	This is connect to the least significant bit of the Norman MPU address bus, and it determines whether the data bits are data or a command.
4	WR(/WR)	I	The data bus are latched at the rising edge of the WR signal
5	RD(/RD)	I	The data bus is in output status when this signal is “L”
6~13	D0~ D7	I/O	This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus.
14	V_{DD}	Power supply	Power supply
15	V_{SS}	Power supply	Ground
16	V_{OUT}	O	DC/DC voltage converter. Connect a capacitor between this terminal and v_{ss} or VDD
17	NC	/	No connect
18	CAP3+	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
19	CAP1-	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1P terminal.
20	CAP1+	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
21	CAP2+	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2N terminal.
22	CAP2-	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2P terminal.
23~27	V4~ V0	Power supply	This is a multi-level power supply for the liquid crystal drive.
28	P/S	I	This pin configures the interface to parallel mode or serial mode. P/S=”H”:Parallel data input/output. P/S=”L”:Serial data input.

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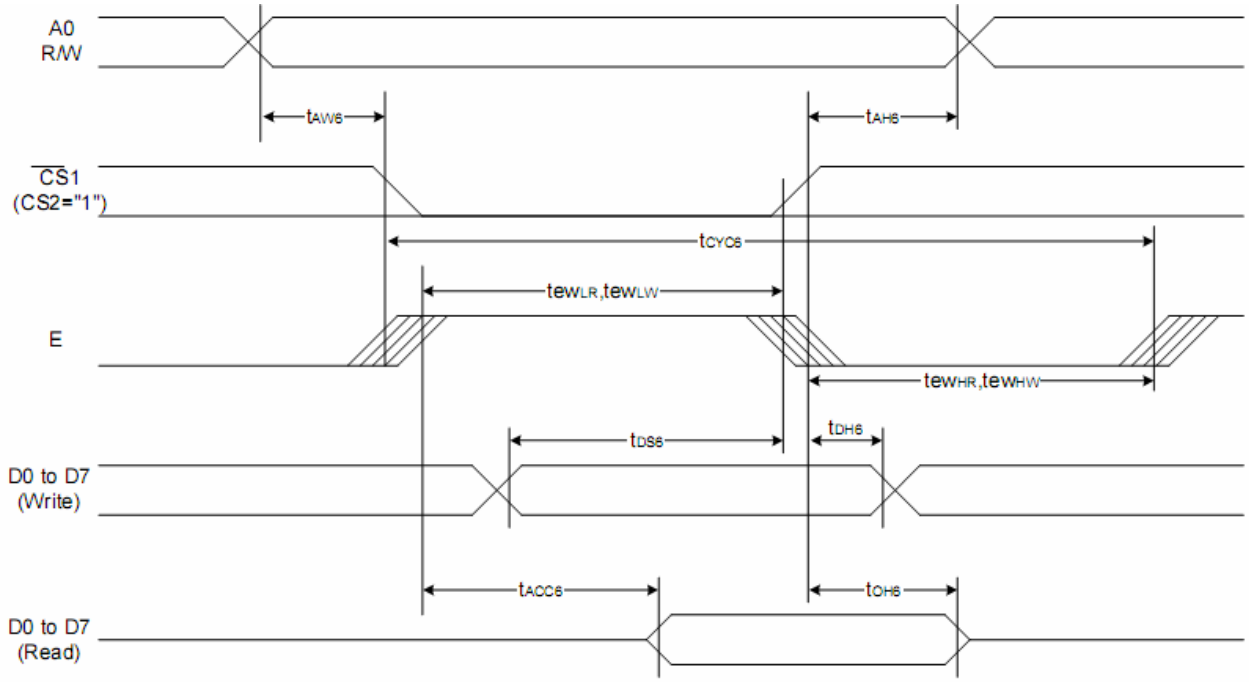
7. COMMAND LIST

Command	Command Code										Function
	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1	D0	
(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 Column address set lower bit	0 0	1 1	0 0	0 0	0 0	0 0	1 0	Most significant column address Least significant column address				Sets the most significant 4 bits of the display RAM column address. Sets 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 drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565P)
(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 1	*	*	*	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) Vo 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 Electronic volume register set	0	1	0	1 0	0 0	0 Electronic volume value	0	0	0	0	1	Set the Vo output voltage electronic volume register
(19) Static indicator ON/OFF Static indicator register set	0	1	0	1 0	0 0	1 0	0 0	1 0	1 0	0 0	0 1 Mode	0: OFF, 1: ON Set the flashing mode
(20) Booster ratio set	0	1	0	1 0	1 0	1 0	1 0	1 0	0 0	0 step-up value	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
(21) Power saver												Display OFF and display all points ON compound command
(22) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

8.TIMING CHARACTERISTICS

8-1. 6800 Series MPU

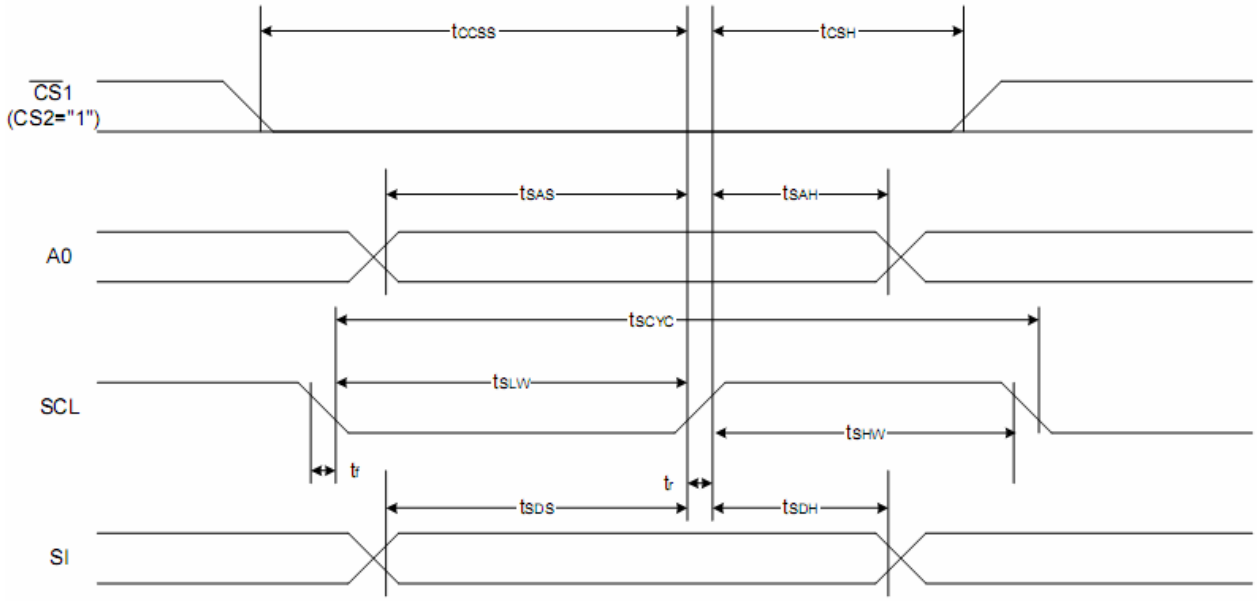


(V_{DD} = 3.3V, Ta = –30 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	t_{AH6}		0	—	ns
Address setup time		t_{AW6}		0	—	
System cycle time		t_{CYC6}		240	—	
Enable L pulse width (WRITE)	WR	t_{EWLW}		80	—	
Enable H pulse width (WRITE)		t_{EWHW}		80	—	
Enable L pulse width (READ)	RD	t_{EWLR}		80	—	
Enable H pulse width (READ)		t_{EWHR}		140		
WRITE Data setup time	D0 to D7	t_{DS6}		40	—	
WRITE Address hold time		t_{DH6}		0	—	
READ access time		t_{ACC6}	C_L = 100 pF	—	70	
READ Output disable time		t_{OH6}	C_L = 100 pF	5	50	

8.TIMING CHARACTERISTICS

8-2. 4-Line SPI Interface



(VDD = 3.3V,Ta = –30 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
4-line SPI 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	CS	Tcss		20	—	
CS-SCL time		Tcsh		40	—	

9. RELIABILITY

NO.	Item	Condition	Criterion
1	High Temperature Operating	70℃, 96Hrs	No defect in cosmetic and operational function allowable. Total current Consumption should be below double of initial value.
2	Low Temperature Operating	-20℃, 96Hrs	
3	High Humidity	60℃, 90%RH, 96Hrs	
4	High Temperature Storage	80℃, 96Hrs	
5	Low Temperature Storage	-30℃, 96Hrs	
6	Vibration	Random wave 10 ~ 100Hz Acceleration: 2G 60 Minute	
7	Thermal Shock	-10℃ to 25℃ to 60℃ (60Min) (15Min) (60Min) 10Cycles	
8	ESD Testing	Contract Discharge Voltage: +1 ~ 5kV and –1 ~ –5kV	There will be discharged ten times at every discharging voltage cycle. The voltage gap is 1kV.
		Air Discharge Voltage: +1 ~ 8kV and –1 ~ -8kV	

Note: 1) Above conditions are suitable for GOLDENTEK standard products.
2) For restrict products, the test conditions listed as above must be revised.

10. HANDLING PRECAUTION

(1) Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizers which easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling the LCD Modules.

(2) Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotrifloroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Ketone
- Aromatics

(3) Caution against static charge

The LCD Module use C-MOS LSI drivers, so we recommend that you connect any unused input terminal to V_{DD} or V_{SS}, do not input any signals before power is turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

(4) Packaging

- Modules use LCD elements, and must be treated as such. Avoid intense shock and falls from a height.
- To prevent modules from degradation. Do not operate or store them exposed directly to sunshine or high temperature/humidity.

(5) Caution for operation

- It is indispensable to drive LCD's within the specified voltage limit since the higher voltage than the limit shorten LCD life. An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.

10. HANDLING PRECAUTION (Continued)

- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them.

However those phenomena do not mean malfunction or out of order with LCD's. Which will come back in the specified operating temperature range.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 40°C, 80%RH or less is required.

(6) Storage

In the case of storing for a long period of time (for instance ,for years) for the purpose or replacement use, The following ways are recommended.

- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping temperature in the specified storage temperature range.
- Storing with no touch on polarizer surface by the anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery)

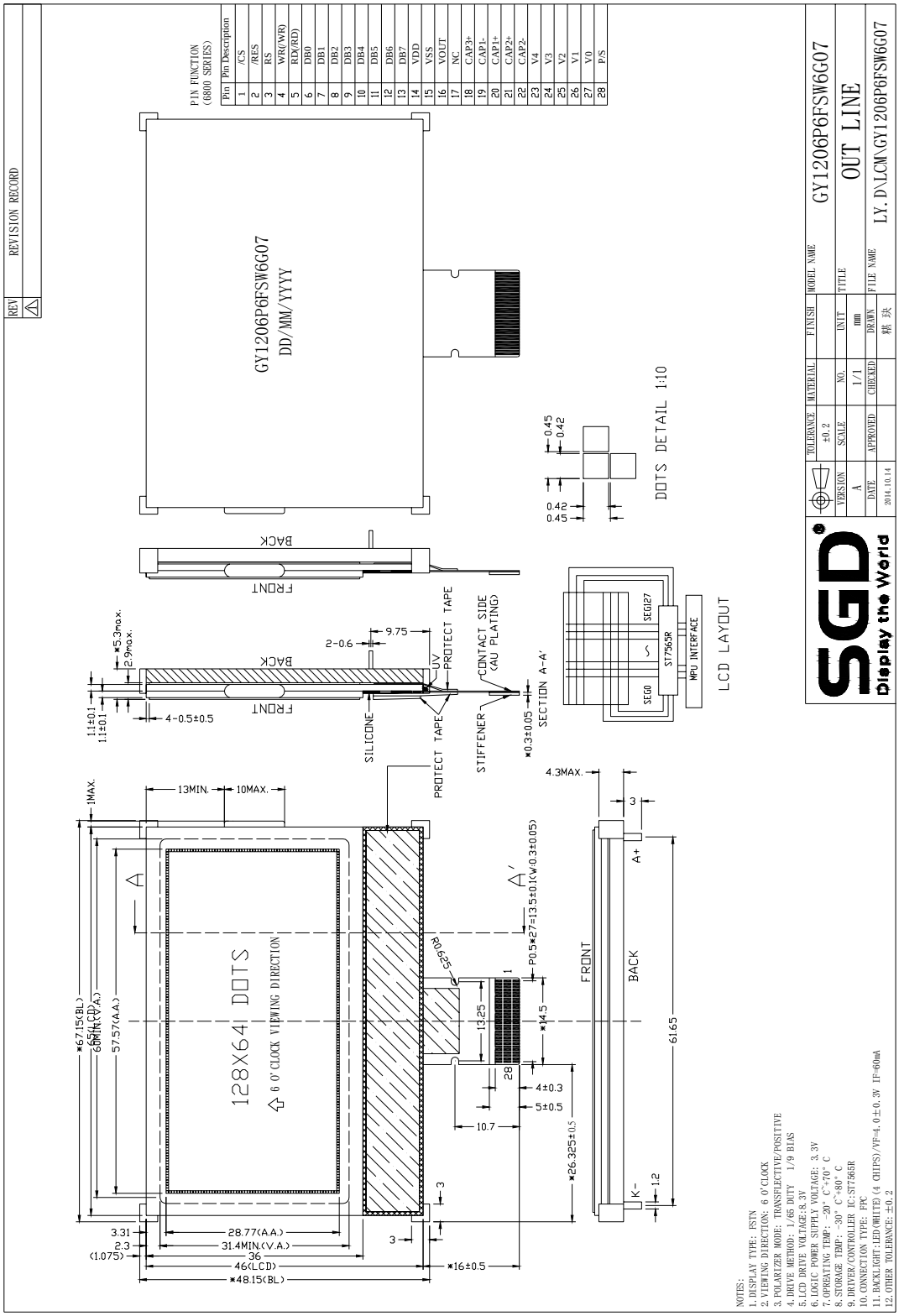
(7) Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol.

Which should be burned up later.

- When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

11. OUTLINE DIMENTION



SAMPLE OUTGOING INSPECTION REPORT (LCM)

Data: 2014/11/07 NO. : QAE11009

Customer	Product NO.	Driving Voltage	Testing Condition	Quantity
Mc'Tronic	GY1206P6FSW6G07	VOP: 5.0V	25℃	5Pcs

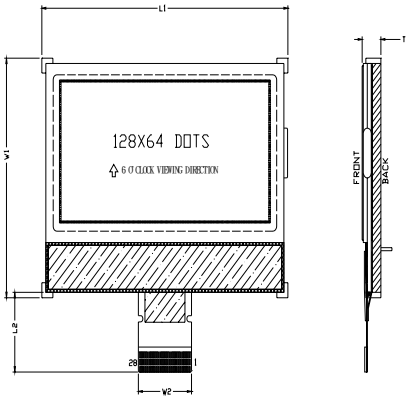
Inspection Result

Items	Specification
Display Mode	● W / B Mode ○ B / W Mode ○ Yellow Mode ○Blue Mode ○ Gray Mode
Polarizer Type	○ Reflective ● Transflective ○ Transmissive
Viewing direction	○ 3 O'clock ● 6 O'clock ○ 9 O'clock ○ 12 O'clock

Electrical / Appearance

Item	Inspection Method	Specification	Inspection Result	
Appearance	Spot Gauge Caliper	Final Inspection Criteria	● OK	○ NG
Electrical	LCM Tester	Product Specification	● OK	○ NG
Pattern	LCM Tester	Drawing	● OK	○ NG

Dimension / Supply Current

Item	Spec.(mm)	NO.1	NO.2	NO.3	NO.4	NO.5	Result		Fig.
L1	67.15±0.2	67.19	67.19	67.16	67.18	67.17	● OK	○ NG	
L2	16±0.5	16.30	16.12	16.00	16.15	16.23	● OK	○ NG	
W1	48.15±0.2	48.18	48.18	48.16	48.19	48.20	● OK	○ NG	
W2	14.5±0.2	14.43	14.44	14.45	14.48	14.50	● OK	○ NG	
T	5.3 Max	4.90	4.89	4.91	4.92	4.90	● OK	○ NG	
IDD	2.0mA Max	0.20	0.20	0.20	0.20	0.20	● OK	○ NG	

Designed	ELIN	Checked	/	Approved	Wallace

Doc. NO.: F10018A .

Subject: LCM OQC inspection criteria (A spec.)	Doc. No.：WQ181	Version：A
	Pages：01/09	This page version：0

* * * * * *Catalog * * * * * *

Items	Contents	Pages
	Catalog	01/09
	Amendment course	02/09
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2	Sampling plan, acceptance / reject criteria	03/09
3	Judgment criteria	04/09~08/09
4	Regulation	09/09
5	Reference details	09/09

Issued by	Auditing	Approval

Subject: LCM OQC inspection criteria (A spec.)	Doc. No.: WQ181	Version: A
	Pages: 02/09	This page version: 1

＊＊＊＊＊＊ Amendment course ＊＊＊＊＊＊

Document version amendment record：

Version	ECN No.	Effective date	Main changing
A	EC-Q080422968	2008.04.25	Re amendment.

Pages amendment status：

Page	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Version		1		1			1	1							
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Version															
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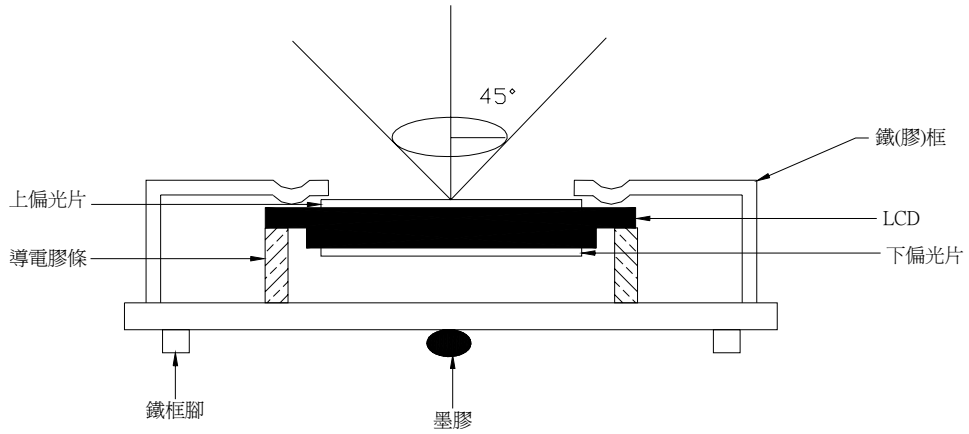
Version															

Pages	Version	ECN No.	Main changing
4/7/8 頁	1	EC-Q091203823	Amendment inspection criteria.

Subject: LCM OQC inspection criteria (A spec.)	Doc. No.: WQ181	Version: A
	Pages: 03/09	This page version: 0

1. Module appearance and electric function inspection conditions (example as assembly module):

1 - 1 Under normal line lighting, vision and module distance 30 cm.



1 - 2 Viewing angle inspection: normal line front and rear about in 45 degrees.

2. Sampling plan and acceptance/reject criteria: According to《Module out going inspection criteria》pages 6.)

2 - 1 Sampling plan:

According to MIL-STD-105E (II) normal sampling plan list.

2 - 2 Acceptance/reject criteria:

Major defection: AQL = 0.25%

Minor defection: AQL = 0.65%

3. Judgment criteria:

3-1 LCD inspection: refer to《LCD OQC inspection criteria》specification A.

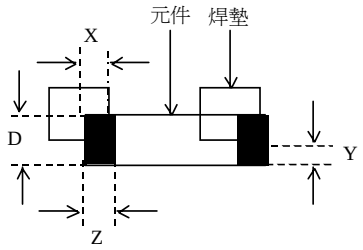
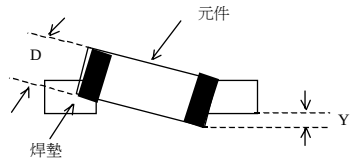
3 - 2 COB inspection:

defection	Inspection items	Criteria
1 major	PCB copper pad strip off.	within active area S > 1.0mm$^{2.}$. reject
2 major	Sealing glue high	Out of engineering drawing remark dimension. reject
3 major	PCB hairy thorn	Out of engineering drawing remark dimension. reject
4 major	Revelation aluminum line at sealing glue area.	reject
5 major	Sealing glue bubble, broken.	Non reveal conduction pad and aluminum line. acceptance
6 minor	Sealing glue width.	At out side of white circle 2.0mm (non cover character), acceptance In side 0.8mm (must cover conduction pad)
7 minor	PCB scratch(conduction pad area)	Single line L＜5mm、W＜0.5mm, acceptance Border double or multi lines, reject Neglected non active area.
8 minor	PCB scratch(non conduction area)	W＜0.3mm 、L＜8mm acceptance 4 lines 0.3≦W＜0.5mm L＜5mm acceptance 1 line.

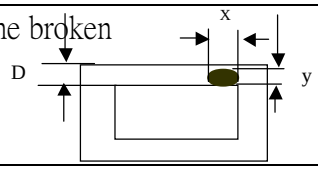
3-3 SMT inspection:

defection	Inspection items	criteria
1 major	Parts poor soldering	Reject
2 major	Parts inverse soldering	Reject
3 major	Parts miss soldering, multi soldering, and wrong soldering.	Reject
4 minor	Parts extrusion.	Eachof side extrude level 0.5mm reject
5 minor	Solder point extrude	Extrusion over parts high 0.5mm, reject
6 major	Joining soldering	Caused electric short, reject
7 major	Solder ball, solder residue Φ =(L+W)/2	According to parts side solder ball, solder residue Φ >0.4mm, reject. Spreading on PCB, covering soldering cushion, conduction pins, conduction pad Φ>0.2mm
8 major	Parts broken	reject

Subject: LCM OQC inspection criteria (A spec.)	Doc. No.: WQ181	Version: A
	pages: 05/09	This page version: 0

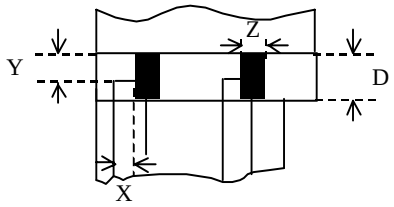
defection	Inspection items	criteria
9 minor	Solder point	>0.8mm, reject
10 minor	Parts characters.	Character readable. acceptance
11minor	Parts bias 	X＜3/4Z reject Y＞1/3D reject
12 minor	parts tilted 	Y＞1/3D reject
13 major	Solder residue on PCB, sundries	LED soldering hole, ribbon wire jams, reject. At bonding area, heat seal line and assembly pad, reject.

3 - 4 Metal, plastic frames, screw inspection:

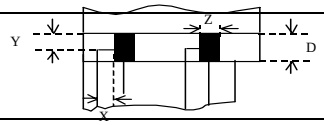
defection	Inspection items	Criteria
1 major	Plastic frame crack	Anyplace reject
2 major	Plastic frame broken 	X＞1/ 10 at side of length Y＞1/3D reject
3 major	Leg of metal frame inverse	reject
4 major	Leg distortion	30-50 degrees (no touch line pad) acceptance
5 major	Without twisted leg	Afterassemblymissingtwisted,orwithouttwistedlegs. reject
6 major	Suspending twisted leg	AfterassemblybetweenPCBandmetalframehasgap. reject
7 major	Inverted assembly	LCD inverted assembly reject
8 major	Plastic convex	reject
9 major	Color of metal, plastic	Comparison with limit approval samples.
10 major	Notchy at fringe of plastic frame	Out of engineering drawing remark dimension, reject
11 major	Metal frame rush	reject

defection	Inspection items	Criteria
12 major	Missing screw	reject
13 major	Screw looseness	Between plastic hole and PCB has gap. reject
14 major	Screw rust	Comply with limit approval sample. acceptance
15 major	Screw head swirl	Comply with limit approval sample. acceptance
16 major	Orientation pole broken	reject
17 major	Metal frame coating pull off	Based material revealed at outside. Reject Acceptance after repairing.
18 minor	Metal and plastic frame scratch.	W＜0.3mm L any length Ignore 0.03≦W＜0.05mm L≦5.0mm acceptance 2 lines 0.05≦W＜0.1mm L≦3.0mm acceptance 1 line
19 minor	Metal, plastic frame stab, sundries, concave covex dots. $\Phi = \frac{(L+W)}{2}$	Φ≦1.0mm acceptance 2 pcs 1.0＜Φ≦1.5mm acceptance 1 pcs Φ＞1.5mm reject Considerable between two dots distance＞5mm， Ignore of cavity and others. reject

3 - 5 Ribbon wire, connector, and pin inspection.

defection	Inspection items	Criteria
1 minor	Ribbon wire tilted soldering	Within±3 degrees acceptance
2 minor	Head of solder set uneven	Solder head and basement height discrepancy ＞0.5mm rejec
3 minor	Ribbon wire crispation	＞1.5mm reject
4 minor	Ribbon wire scar $\Phi = \frac{(L+W)}{2}$ (broken)	Both of conduction wire revealed reject Damage of conduction wire Φ＞1.0mm reject
5 minor	Ribbon wire bias 	X＞1/3Z reject Y＞1/2D reject
6 minor	TCP, FFC, FPC insufficiency soldering	Solder bundle pin width >2/3 acceptance

3-6 Heat seal, TCP, FPC inspection.

defection	Inspection items	Criteria
1 major	Heat seal press crunch (broken)	Φ=(L+W)/2, damaged conduction wire, reject. Undamaged Φ＞0.5 mm. reject.
2 major	Conduction pad oxidization, contamination.	TCP, FFC, FPC conduction pad oxidization, Contamination reject (after cleaning can be accepted)
3 major	Scratch, stab	TCP, FFC, FPC scratch, stab cause revealed of conduction wire. reject
4 major	In reverse pressing	Heat seal, FPC etc area in reverse pressing. reject
5 major	Conduction wire concave, convex (D conduction wire width)	Concave width d<1/3 D acceptance Convex width d<1/3D acceptance
6 major	Conduction wire folded	Smooth fold, obtuse angle. acceptance 
7 major	Conduction wire distortion	Smooth but not distortion twisted. acceptance.
8 major	rupture，broken off	TCP,FFCFPCconductionwireandpadrupturebrokenoff. reject
9 minor	bias 	X＞1/2Z reject Y＞2/3D reject

3-7 LED Back light protection film and other inspection.

defection	Inspection items	Criteria
1 major	UV glue	UV glue no rigidity, fall off, glue leakage, rupture. Reject. UV glue no rigidity criteria: no has a hand in glue OK. is
2 major	UV glue bubble Φ =(L+W)/2	Φ>0.2mm reject
3 major	SILICONE glue	According to engineering drawing marking sealing area 1.ITO exposure reject 2.Silicon contamination, bubble, fall off. reject 3.Silicon has sponge impression. reject 4.Non Silicon area has residue glue, contamination. reject
4 minor	LED Back light./EL contamination	Φ＜0.10mm ignore 0.10≦Φ＜0.15mm acceptance 1 pcs Φ≧0.15mm reject
5 minor	LED Back light /EL uneven	Bottom light <70% reject Side light<65% reject

defection	Inspection items	Criteria
6	Back light high electric current	Out of specification value. reject
7	Most portion of backlight dim and brightness	Seeable with vision. reject
8	LED back light/El lamp dead, no light.	reject
9	LED Back light stab, and scratch.	a. W＜0.02mm Ignore b. 0.02≦W＜0.03mm L＜5.0mm Accept 2 pcs c. 0.03≦W＜0.05mm L＜3.0mm Accept 1 pcs
10	Double side adhesive tape.	LED Back light double side adhesive tape, Gasket glue etcetera come into active area. reject.
11	Protection film	Missing adhibit protection film. reject Protection film uncompleted cover LCD. reject No pull off Back light, LCD protection film. reject
12	Inside of protection film contamination, sundries.	Same as《LCD OQC inspection criteria》A specification criteria judgment.

3 - 8 Electric function inspection.

defection	Inspection items	Criteria
1	Short	reject
2	Missing segment, inadequate display	reject
3	Multi segment, multi display	reject
4	No display	reject
5	Out of power consumption specification.	reject
6	Double vision	reject
7	Crosstalk	reject
8	Display in disorder	reject
9	Display unsteady	reject
10	Display dim	Complied with limit approval sample. acceptance
11	Display tinge	Complied with limit approval sample. acceptance
12	Display illegibility	Complied with limit approval sample. acceptance
13	Slow response	reject

4. Regulations:

4-1 To set up customer production specification must be complied with above contents judgment.

4-2 If any special require from customer must be complied with customer requirement judgment.

5. Reference details.

5-1 《LCD OQC inspection criteria》

LIQUID CRYSTAL DISPLAY

OQC INSPECTION SPECIFICATION

DOC NO. : WQ156

REV : A

SPEC. :

DATE : 2003.11.01

TRANSLATED BY	CHECKED BY	APPROVED BY
MARTIN MA	WILLIAM CHEN	KEN CHOU

Subject: LCD OQC INSPECTION SPECIFICATION	Doc. No.: WQ156	Doc. Rev: A
	Page No.: 01/13	Page Rev: 0

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	Revision Records	02/13
1	General Inspection	03/13~13/13

TRANSLATED BY	CHECKED BY	APPROVED BY
MARTIN MA	WILLIAM CHEN	KEN CHOU

Subject:	Doc. No.: WQ156	Doc. Rev: A
LCD OQC INSPECTION SPECIFICATION	Page No.: 02/13	Page Rev: 0

＊＊＊＊＊＊ Revision Records ＊＊＊＊＊＊

Doc. revision records：

Rev	ECN No.	Effective Date	Major contents of change
A	EC-Q031101362	NOV 01, 2003	Reissue

Page revision records：

Page	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Rev															
Page	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Rev															
Page	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Rev															
Page	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Rev															

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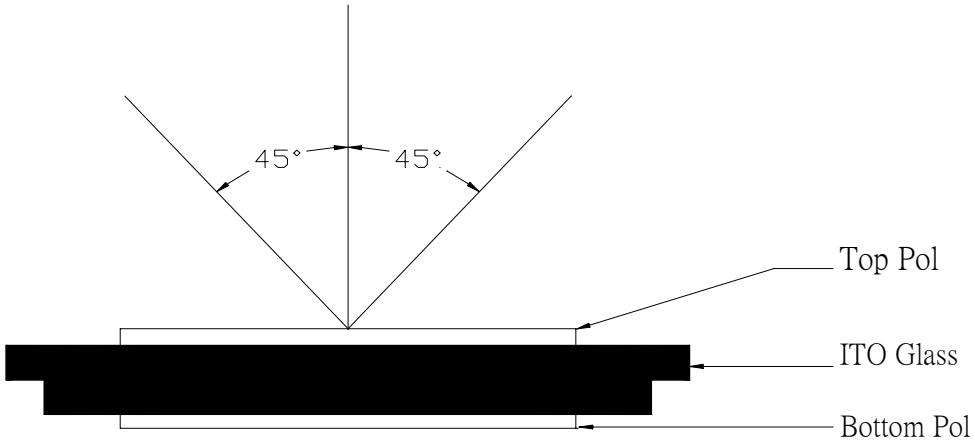
一: General Inspection

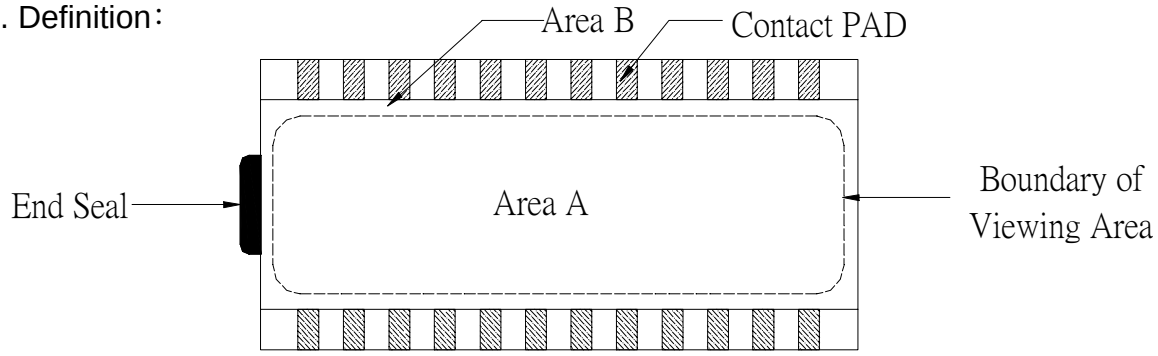
1. Visual & Electrical Inspection

1 - 1. Eyeballs 30 cm away from LCD under 30W illumination.



1 - 2 View Angle: with 45^0 around the normal line.

2. Definition:



Area A: Viewing area

Area B: Non-Viewing area

3. Sampling Plan and AQL (Implementation according to《LCD Final Inspection Specification》)

3–1 Sampling Plan:

MIL - STD - 105E Level Ⅱ S1

3–2 AQL:

MA: AQL = 0.25%

MI : AQL = 0.65%

4. Provision:

4 - 1 The number of Visual defects is no more than 3.

4 - 2 The number of Visual and Electrical defects is no more than 6.

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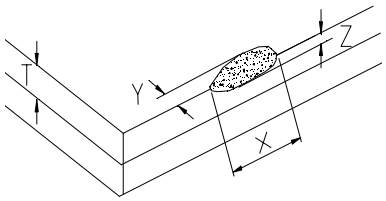
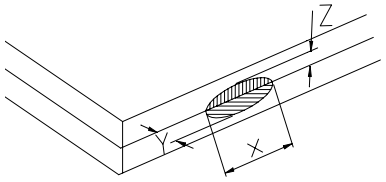
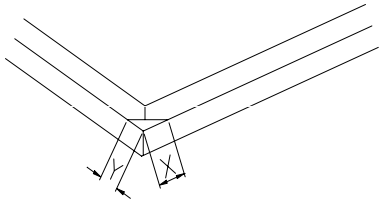
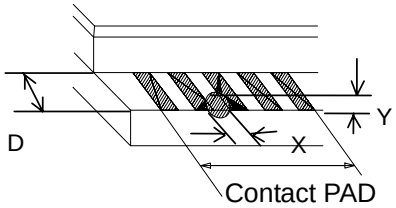
LCD OQC INSPECTION SPECIFICATION	Page No.: 04/13	Page Rev: 0

5. Inspection Standard:(unit: mm)

<table>
<tr><th>Defect</th><th>Definition</th><th>FIG</th><th>Criteria</th></tr>
<tr>
<td>1
Chipping
(MI)</td>
<td>Chipping somewhere on the LCD glass</td>
<td>1.Not at the PAD
(1) At the corner (Z<T, Z is the length between the surface and the seam):
 

(2) At the seam (Z is the chipping about the seam):
 

2. On the PAD
(1) On the contact PAD:
 
</td>
<td>
<table>
<tr><td>Y</td><td>Not touch the periphery seal</td><td>Cover periphery seal but not enter into viewing area</td><td>Enter into viewing area</td></tr>
<tr><td>X</td><td></td><td>X≤1/8 length</td><td></td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td><td>REJ</td></tr>
</table>
<table>
<tr><td>Y</td><td>Any chip but not touch the periphery or common point</td><td>Any chip expose periphery or common point which reduce its original width less than 2/3</td><td>Any chip expose periphery or common point more than 1/3</td></tr>
<tr><td>X</td><td></td><td>X≤1/8 length</td><td></td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td><td>REJ</td></tr>
</table>
<table>
<tr><td>Y</td><td>Y≤1/5D</td><td>1/5D<Y≤1/4D</td><td>Y>1/4D</td></tr>
<tr><td>X</td><td></td><td>X≤1/8 length</td><td></td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td><td>REJ</td></tr>
</table>
Only for COG products:
<table>
<tr><td>Y</td><td>Y≤0.5</td><td>0.5<Y≤1.0</td><td>Y>1.0</td></tr>
<tr><td>X</td><td></td><td>X≤1/8 length</td><td></td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td><td>REJ</td></tr>
<tr><td colspan="4">Note: Not touch the PAD in Y direction.</td></tr>
</table>
</td>
</tr>
</table>

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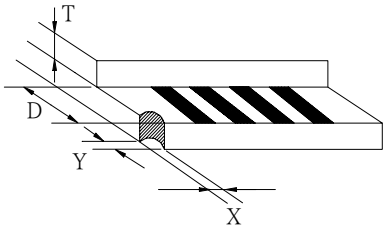
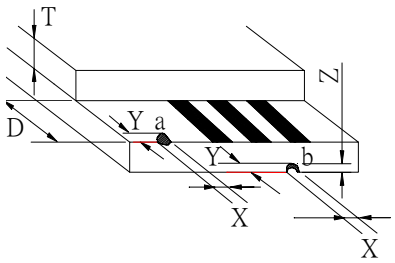
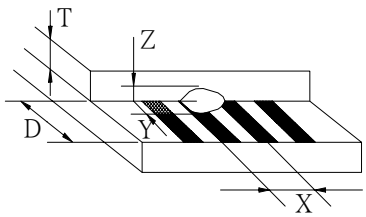
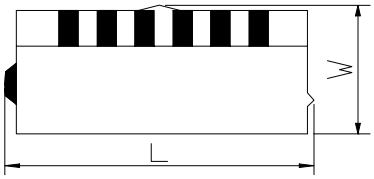
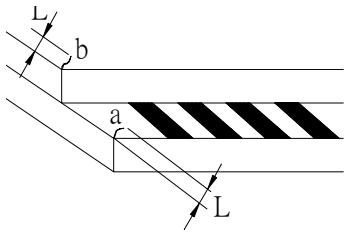
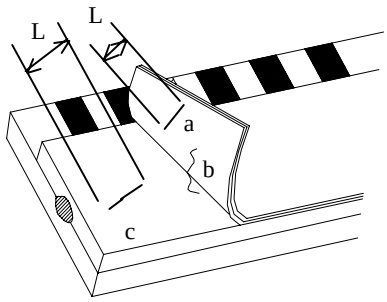
<table>
<tr><th>Defect</th><th>Definition</th><th>FIG</th><th>Criteria</th></tr>
<tr><td></td><td></td><td>(2) At the corner:
 

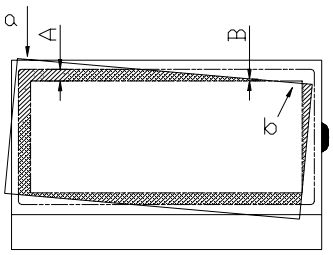
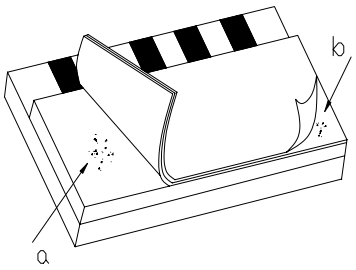
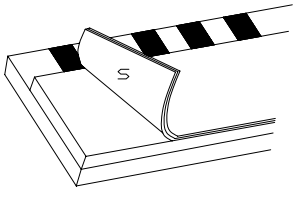
(3) Other parts:
 
</td><td>
<table>
<tr><td>Y</td><td>Y≦1/4D
(Y≦0.5)</td><td>1/4D＜Y≦3/4D</td><td>Y＞3/4D</td></tr>
<tr><td>X</td><td></td><td>X≦2.0</td><td>X＞2.0</td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td><td>REJ</td></tr>
</table>
Only for COG products:
<table>
<tr><td>Y</td><td>Y≦1/5D</td><td>1/5D＜Y≦2/5D</td><td>Y＞2/5D</td></tr>
<tr><td>X</td><td></td><td>X≦3.0</td><td>X＞3.0</td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td><td>REJ</td></tr>
</table>
Note: Not touch the PAD in X direction.
<table>
<tr><td>Y</td><td>Y≦1/4D</td><td>1/4D＜Y≦3/4D</td><td>Y＞3/4D</td></tr>
<tr><td>X</td><td></td><td>X≦2.0</td><td></td></tr>
<tr><td>z</td><td colspan="3">a point: Ignored.
b point: Ignored when Z≦1/2T; Judge as (1) on the contact PAD when Z>1/2T</td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td><td>REJ</td></tr>
</table>
Only for COG products:
<table>
<tr><td>Y</td><td>Y≦1/5D</td><td>1/5D＜Y≦2/5D</td><td>Y＞2/5D</td></tr>
<tr><td>X</td><td></td><td>X≦3.0</td><td></td></tr>
<tr><td>z</td><td colspan="3">a point: Ignored.
b point: Ignored when Z≦1/2T; Judge as (1) on the contact PAD when Z>1/2T</td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td><td>REJ</td></tr>
</table>
Note: Any chipping should not touch PAD.
</td></tr>
<tr><td>2
Cutting
Breaking
(MA)</td><td>No-cutting glass on the LCD glass</td><td>1. At the ITO PAD
 

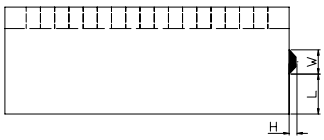
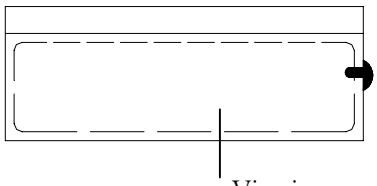
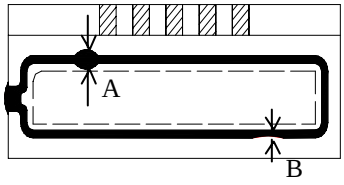
2. At the LCD boundary
 
</td><td>
<table>
<tr><td>z</td><td>Z≦1/2T</td><td>Z＞1/2T</td></tr>
<tr><td>Y</td><td>Y≦1/6D</td><td>Y≦0.2</td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td></tr>
</table>
<table>
<tr><td>L & W exceed the drawing spec.</td><td>REJ</td></tr>
</table>
</td></tr>
</table>

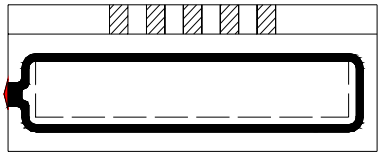
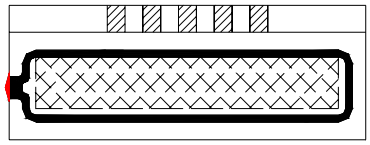
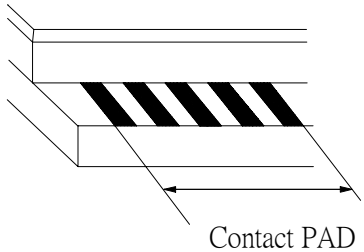
<table>
<tr><th>Defect</th><th>Definition</th><th>FIG</th><th>Criteria</th></tr>
<tr><td>3
Cracking
(MA)</td><td>Crack of LCD glass may lead to rip</td><td> 
</td><td>Any cracking REJ</td></tr>
<tr><td>4
Glass Scratch
(MI)</td><td>Liner scratch on LCD glass (as fig c)</td><td rowspan="3"> 
</td><td rowspan="3">S＜10000mm²
<table><tr><td>W</td><td>W≦0.03</td><td>W>0.03 or L>3</td></tr><tr><td>L</td><td>L≦3</td></tr><tr><td>Judge</td><td>1EA</td><td>REJ</td></tr></table>
S≧10000 mm²
<table><tr><td>W</td><td>W≦0.03</td><td>0.03＜W≦0.05</td><td>W＞0.05 or L>3</td></tr><tr><td>L</td><td>L≦3</td><td>L≦3</td></tr><tr><td>Judge</td><td>2EA</td><td>1EA</td><td>REJ</td></tr></table>
Note: judge after pol bonded (semitransparent and transparent product should be inspected on back light)</td></tr>
<tr><td>5
POL Scratch
(MI)</td><td>Liner scratch on POL (as fig a)
Scratch of semitransparent glass on pol back</td></tr>
<tr><td>6
Fiber & Liner material
(MI)</td><td>Liner material between glass and glass or glass and Pol(as fig b)</td></tr>
<tr><td>7
Black or White Spot
(Un-operation status)
(MI)</td><td>Foreign material between glass and glass or glass and pol, and can be found after pol bonded</td><td rowspan="2">$\Phi = \frac{L+W}{2}$
(L: length of spot or prick)
(W: width of spot or prick)</td><td>S＜10000mm²
<table><tr><td>Φ</td><td>Φ≦0.10</td><td>0.10＜Φ≦0.15</td><td>Φ＞0.15</td></tr><tr><td>ACC NO.</td><td></td><td>1EA</td><td>0EA</td></tr></table>
S≧10000 mm²
<table><tr><td>Φ</td><td>Φ≦0.10</td><td>0.10＜Φ≦0.15</td><td>Φ＞0.15</td></tr><tr><td>ACC NO.</td><td></td><td>2EA</td><td>0EA</td></tr><tr><td colspan="4">Note: Distance between 2 defects must be more than 10mm, and ignored when in non-viewing area.</td></tr></table></td></tr>
<tr><td>8
POL Prick
(MI)</td><td>Pol protuberance or hole for external strength</td></tr>
</table>

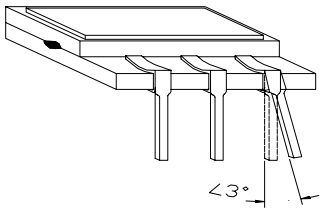
<table>
<tr><th>Defect</th><th>Definition</th><th>FIG</th><th>Criteria</th></tr>
<tr><td>9
Pol bubble, Concave or Convex point

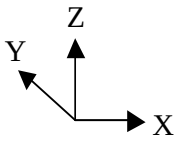
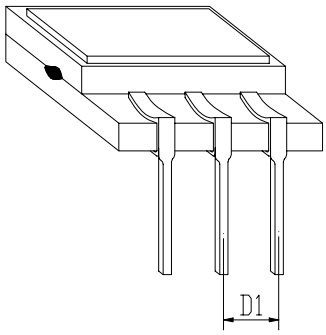
(MI)</td><td>Void between pol and glass lead to concave or convex point</td><td>Φ= (L +W) / 2

L: Length of bubble, concave or convex point)
W: Width of bubble, concave or convex point)</td><td>S＜10000mm^2
<table><tr><td>Φ</td><td>Φ≦0.2</td><td>0.2＜Φ≦0.3</td><td>Φ＞0.3</td></tr><tr><td>ACC No.</td><td></td><td>1EA</td><td>0EA</td></tr></table>(Ignored when in non-viewing area)
S≧10000 mm^2
<table><tr><td>Φ</td><td>Φ≦0.2</td><td>0.2＜Φ≦0.3</td><td>Φ＞0.3</td></tr><tr><td>ACC No.</td><td></td><td>2EA</td><td>0EA</td></tr></table>(Distance between 2 defects must be more than 10mm, and ignored when in non-viewing area)</td></tr>
<tr><td>10
Misalignment pol bonded
(MI)</td><td>Pol and angle side unparallel or not in the middle</td><td>  </td><td>A: Exceed LCD edge REJ
B: Not cover the periphery REJ</td></tr>
<tr><td>11
Contaminated Pol (after remove Protective layer)
(MI)</td><td>Foreign material on pol after remove of protective layer (Such as place b)</td><td rowspan="2">  </td><td rowspan="2">Visual by eye away from 30cm REJ</td></tr>
<tr><td>12
Contaminated Glass surface (MI)</td><td>Foreign material on on glass (Such as place a)</td></tr>
<tr><td>13
Peel up of protective layer
(MI)</td><td>Protective layer and pol disaffiliate or part disaffiliate</td><td> 
“S” is the disaffiliate area</td><td>S>200 mm^2 or exceed 1/3 glass area REJ</td></tr>
</table>

Defect	Definition	FIG	Criteria
14 Background Color (MI)	LCD background color different approval sample		According to approval sample for inspection
15 Discoloration (MI)	The same LCD has more than two different color in different place		According to approval sample for inspection
16 Excessive height or width of end seal glue (MI)	End seal is different with the demand relative to the LCD place and the height of opposite side and width of the sealant		W, L & H according to drawing spec for insp.
17 Permeating Resin Defect (MI)	End seal permeate too deep or shallow		End seal enter into viewing area REJ Length of end sealant $\leq$ 0.2mm REJ
18 Leaky End Seal (MA)	LC over-flowing		Any leaky end seal REJ
19 Leaky Periphery Seal (MI)	LC over-flowing		Any leaky periphery seal REJ
20 Periphery Seal not Proportion (MI)	Periphery seal is too broad or shallow relative to normal periphery seal		a: A > 3/2 of average width REJ b: B < 1/2 of average width REJ c: Periphery seal enter into viewing area REJ

Defect	Definition	FIG	Criteria
21 Misalignment Periphery Seal (MI)	Periphery seal not in the right position		Periphery seal enter into viewing area REJ
22 Bubble on Periphery Seal (MI)	Hole in the periphery seal		W > 2/3 A REJ W: Width of bubble A: Length of periphery seal (By reliability test when necessary)
23 Discolored Periphery Seal (MI)	Color of periphery seal different with normal color		According to reliability test for inspection
24 Misalignment Polymide Coating (MI)	PI layer deflect the right place		Not whole cover viewing area REJ
25 contaminant on ITO PAD (MI)	PI or foreign material on the contact PAD		Visual by eye REJ
	Foreign material not in the contact PAD		Visual by eye away from 30cm REJ

<table>
<tr><th>Defect</th><th>Definition</th><th>FIG</th><th>Criteria</th></tr>
<tr><td>26
PIN Body Defect
(MI)</td><td>PIN body is not met the spec requirement</td><td></td><td>A: PIN type is not met spec REJ
B: Length of PIN is not met the spec REJ</td></tr>
<tr><td rowspan="2">27
PIN Defect
(MI)</td><td rowspan="2">The comparative position of PIN and LCD</td><td>1. PIN Tilt
 

 
</td><td>A: Exceed ±3° in X axis REJ
B: Exceed ±3° in Y axis REJ</td></tr>
<tr><td>2. PIN Shift
D is the standard alternate distance
△D = | D − D1 |
 

<table><tr><td>△D</td><td>△D≦1/6D</td><td>1/6D＜△D≦1/4D</td><td>△D＞1/4D</td></tr><tr><td>Judge</td><td></td><td>ACC IEA</td><td>REJ</td></tr></table></td><td></td></tr>
</table>

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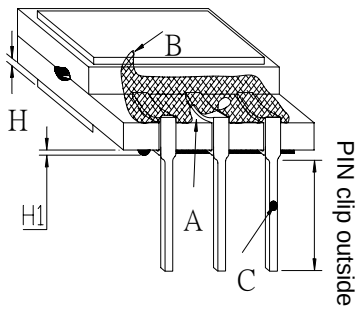
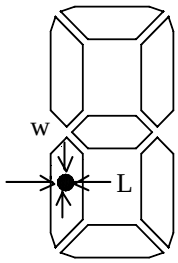
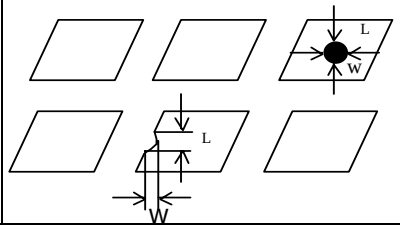
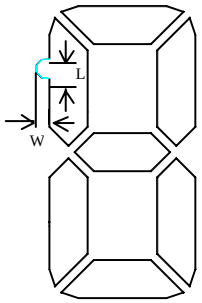
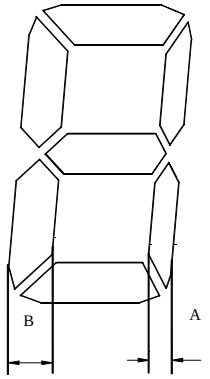
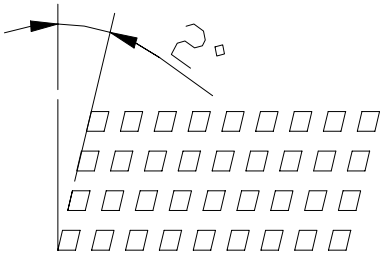
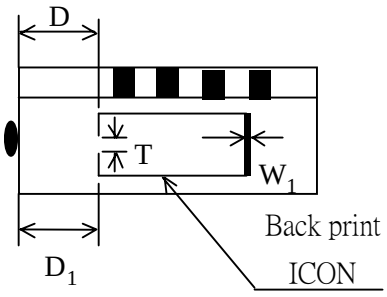
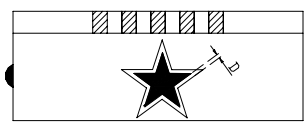
<table>
<tr><th>Defect</th><th>Definition</th><th>FIG</th><th>Criteria</th></tr>
<tr><td>28
Drop glue Defect
(MI)</td><td>The position, glue amount and glue atmosphere of UV glue given arise to defect</td><td> 
</td><td>A: No glue about the PIN clip (place A) REJ
B: Glue exceed the height of top pol REJ
C: Glue exceed the bottom pol 1.0mm(H1-H>1.0) REJ
D: Glue on the PIN clip outside(place C) REJ
E: PIN glue is not cured(nail mark when press) REJ</td></tr>
<tr><td>29
Short or High Current
(MA)</td><td>Current exceed the setting value when input normal voltage</td><td></td><td>＞ 2uA / cm^2 REJ
(According to product spec when additional requirement)</td></tr>
<tr><td>30
Open
(MA)</td><td>Segment un-display when input current</td><td></td><td>Any open REJ</td></tr>
<tr><td>31
Segment Defect
(MI)</td><td>No showing on one unit</td><td>1.Characteristic
 

$\Phi = \frac{W + L}{2}$
2. Dot Matrix
 
</td><td>S＜10000mm^2
<table><tr><td>Φ</td><td>Φ≦0.1</td><td>0.1＜Φ≦0.2</td><td>0.2＜Φ≦0.25</td><td>Φ＞0.25</td></tr><tr><td>Acc No.</td><td>3/100 mm^2</td><td>2EA</td><td>1EA</td><td>0EA</td></tr></table>S≧10000mm^2
<table><tr><td>Φ</td><td>Φ≦0.1</td><td>0.1＜Φ≦0.2</td><td>0.2＜Φ≦0.25</td><td>Φ＞0.25</td></tr><tr><td>Acc No.</td><td>3/100 mm^2</td><td>4EA</td><td>2EA</td><td>0EA</td></tr></table>Note: Reject when W > 1/2 width of segment (dot), and distance between two defects must be more than 10mm.</td></tr>
</table>

<table>
<tr><th>Defect</th><th>Definition</th><th>FIG</th><th>Criteria</th></tr>
<tr><td>32
Protuberant Segment
(MI)</td><td>Redundant showing on the segment</td><td> 

$\Phi = \frac{W + L}{2}$</td><td>$S < 10000mm^2$
<table>
<tr><td>Φ</td><td>Φ≦0.1</td><td>0.1＜Φ≦0.2</td><td>0.2＜Φ≦0.25</td><td>Φ＞0.25</td></tr>
<tr><td>W</td><td></td><td>W≦1/2 seg or W≦0.20</td><td>W≦1/2 seg or W≦0.20</td><td></td></tr>
<tr><td>Acc No.</td><td>3/100 mm²</td><td>2EA</td><td>1EA</td><td>0EA</td></tr>
</table>
$S \geqq 10000mm^2$
<table>
<tr><td>Φ</td><td>Φ≦0.1</td><td>0.1＜Φ≦0.2</td><td>0.2＜Φ≦0.25</td><td>Φ＞0.25</td></tr>
<tr><td>W</td><td></td><td>W≦1/2 seg or W≦0.20</td><td>W≦1/2 seg or W≦0.20</td><td></td></tr>
<tr><td>Acc No.</td><td>3/100 mm²</td><td>4EA</td><td>2EA</td><td>0EA</td></tr>
</table></td></tr>
<tr><td>33
Misalignment Assembly
(MI)</td><td>Deformation of showing segment</td><td>1. Characteristic
 

2. Dot Matrix
 
</td><td>
<table>
<tr><td>B</td><td>B＜0.4</td><td>0.4≦B≦1.0</td><td>B＞1.0</td></tr>
<tr><td>B-A</td><td>B-A＜1/2B</td><td>B-A≦0.20</td><td>B-A≦0.25</td></tr>
<tr><td>Judge</td><td>ACC</td><td>ACC</td><td>ACC</td></tr>
</table>
<table>
<tr><td>Deformation ＞2°</td><td>REJ</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Defect</th><th>Definition</th><th>FIG</th><th>Criteria</th></tr>
<tr><td rowspan="2">34
Cross-Talk, Dim
(MA)</td><td>Segment show display when input Voff</td><td rowspan="2"></td><td rowspan="2">According to approval sample for inspection.
TN、HTN: (D: Duty)
<table>
<tr><td>Type</td><td>1/1D</td><td>1/2D</td><td>1/3D</td><td>1/4D</td><td>>1/4D</td></tr>
<tr><td>Voff</td><td>±0.05</td><td>±0.04</td><td>±0.03</td><td>±0.03</td><td>±0.02</td></tr>
<tr><td>Judge</td><td>OK</td><td>OK</td><td>OK</td><td>OK</td><td>OK</td></tr>
</table>
STN:
<table>
<tr><td>Type</td><td>≤1/16D</td><td>>1/16D</td></tr>
<tr><td>Voff</td><td>±0.03</td><td>±0.02</td></tr>
<tr><td>Judge</td><td>OK</td><td>OK</td></tr>
</table>
DMS test when necessary</td></tr>
<tr><td>Segment show weak contrast when input Von</td></tr>
<tr><td>35
Slow Response
(MA)</td><td>The response time that from input normal voltage to normal showing of LCD</td><td></td><td>＞300ms (Room Temp) REJ
(DMS test when necessary)</td></tr>
<tr><td>36
View direction & angle defect
(MA)</td><td>Normal observation direction & angle range</td><td></td><td>A: Direction is met the spec REJ
B: Small view angle (by DMS test) REJ</td></tr>
<tr><td>37
Backside Printing Defect
(MI)</td><td>The position and width of the printing icon defect on the LCD glass or pol</td><td> 
</td><td>A: Position shift (D is the spec size)
｜D-D1｜ ≥ 0.20mm REJ
B: Broken characteristics or icon line
Broken clearance ≥ 0.25mm REJ
C: Width of icon line (W is the spec width)
2/3W ≤ W1 ≤ 4/3W ACC
D: Burr & print fuzziness according to approval Sample for inspection</td></tr>
<tr><td>38
Bubble on Backside Print</td><td>The bubble when pol is bonded caused the printing icon on the glass</td><td> 
(D is the width of bubble along the icon)</td><td>D≦0.3 ACC</td></tr>
</table>