

## PRODUCT SPECIFICATION

MODEL NO: SEL1487A0

< ◇ > PRELIMINARY SPECIFICATION

< ◆ > APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED

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## 1. GENERAL DESCRIPTION

SEL1487A0 is a Transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver IC, FPC and a backlight unit. The following table described the features of SEL1487A0.

## 2. FEATURES

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

## 3. MECHANICAL SPECIFICATION

Item	Specifications	Unit
Display Size	7.0	Inch
Dimensional outline	166 (W) × 106.1(H) × 7.0(D)*	mm
Resolution	800×3(R,G,B)×480	dot
Active area	152.4(W) × 91.44(H)	mm
Pixel pitch	0.1905(W) × 0.1905(H)	mm
Polarizer	AG / Clear	

\* Exclude FPC



## 5. MAXIMUM RATINGS

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

Item	Symbol	Values		Unit	Condition
		Min.	Max.		
Logic power supply voltage	VDD	-0.5	5	V	
Analog supply voltage	AVDD	8	13.5	V	
Storage Temperature	T <sub>ST</sub>	-40	95	°C	
Operating Temperature (Ambient Temperature)	T <sub>OP</sub>	-30	85	°C	
Humidity	-	-	90	%RH	Note1

Note1: T<sub>A</sub> ≤ 40°C Without dewing

## 6. ELECTRICAL CHARACTERISTICS

Item	Symbol	Values			Unit	Remark	
		Min.	Typ.	Max.			
Supply Voltage	VDD	3.0	3.3	3.6	V	Note1	
IDD	IDD	-	-	TBD	mA		
AVDD	AVDD	-	13	-	V		
IAVDD	IAVDD	-	-	TBD	mA		
VGH	VGH	-	15	-	V		
VGL	VGL	-	-9	-	V		
Frame Rate	Fr	-	60	-	Hz		
Input Voltage	H level	V <sub>IH</sub>	0.7*VDD	-	VDD	V	Note1
	L Level	V <sub>IL</sub>	GND	-	0.3VDD	V	Note1
Output t Voltage	H level	V <sub>OH</sub>	VDD-0.4	-	-	V	Note1
	L Level	V <sub>OL</sub>	GND	-	GND+0.4	V	Note1

Note1: These supply & Input & Output Voltage base on IC data Sheet.

## 7. Backlight Characteristic

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power Consumption	$P_{LED}$	-	3.36	-	W	
LED Current	$I_{AK}$	-	160	-	mA	
LED Voltage	$V_{AK}$	-	21	23.8	V	$I_{AK}=80\text{mA}/\text{chain}$ , 25°C
B/L life time	-	20,000	-	-	Hr	$I_{AK}=80\text{mA}/\text{chain}$ , 25°C Note 2
Uniformity	-	80	-	-	%	Note 4

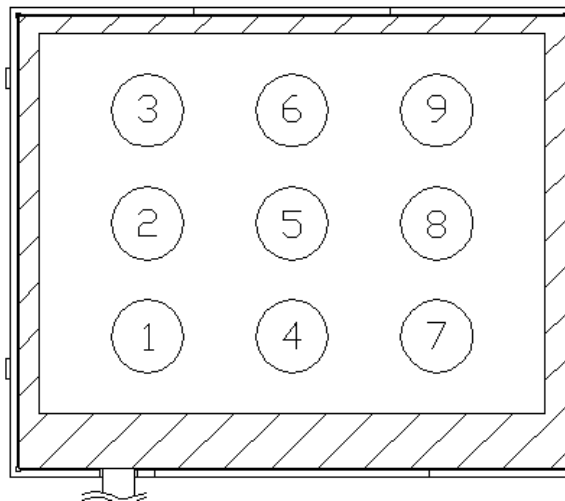
Note 1: We suggest using constant current driving this backlight unit.

Note 2: The LED chip luminance decrease to be 50% of original

Note 3: For PWM driving only .

Conditions : Pulse width  $T_w \leq 0.1\text{ms}$ , Duty ratio  $\leq 1/10$

Note 4:



- Test Instrument: BM-7 (Distance = 500mm; Field = 1°)
- Conditions:  $I_{AK} = 160\text{ mA}$ ,  $V_{AK}$  (Typ.) = 21V
- Measure Brightness: 1 ~ 9
- Uniformity = (Min. Brightness / Max. Brightness) \* 100%

## 8. MODULE FUNCTION DESCRIPTION

### 8.1.PIN Description

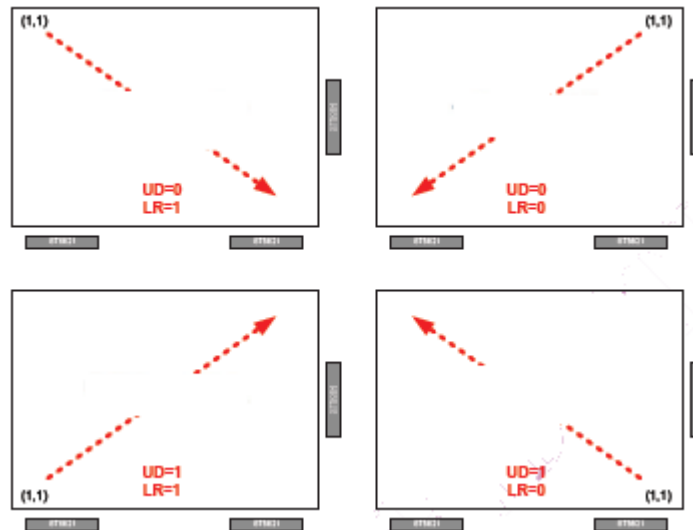
Pin	Symbol	Description	Remark
1	VCOM	Common electrode driving voltage	
2	VGL	TFT Gate Turn off voltage	
3	GND	Ground	
4	VGH	TFT Gate Turn on voltage	
5	GND	Ground	
6	AVDD	Power for source driver IC	
7	AVDD	Power for source driver IC	
8	GND	Ground	
9	V1	Gamma correction voltage (FPC internal is NC, the IC built-in digital programmable Gamma curve)	
10	V2		
11	V3		
12	V4		
13	V5		
14	V6		
15	V7		
16	V8		
17	V9		
18	V10		
19	V11		
20	V12		
21	GND	Ground	
22	TX3N	LVDS Differential Data Pair	
23	TX3P	LVDS Differential Data Pair	
24	GND	Ground	
25	TX2N	LVDS Differential Data Pair	
26	TX2P	LVDS Differential Data Pair	
27	GND	Ground	
28	TX1N	LVDS Differential Data Pair	
29	TX1P	LVDS Differential Data Pair	
30	GND	Ground	
31	TX0N	LVDS Differential Data Pair	
32	TX0P	LVDS Differential Data Pair	
33	GND	Ground	
34	TXCLKN	LVDS Differential CLK Pair	
35	TXCLKP	LVDS Differential CLK Pair	
36	GND	Ground	
37	DVDD	Power for Logic	
38	DVDD	Power for Logic	
39	GND	Ground	



## Technology

40	NC	No Use	
41	NC	No Use	
42	UD	Vertical Reverse Signal	
43	LR	Horizontal Reverse Signal	
44	NC	No Use	
45	NC	No Use	
46	NC	No Use	
47	NC	No Use	
48	RESET	RESET	
49	GND	Ground	
50	VCOM	Common electrode driving voltage	

## 8.2. Chip arrangement and scan direction control



## 8.3. TCON Mode LVDS interface data mapping

### VESA data mapping

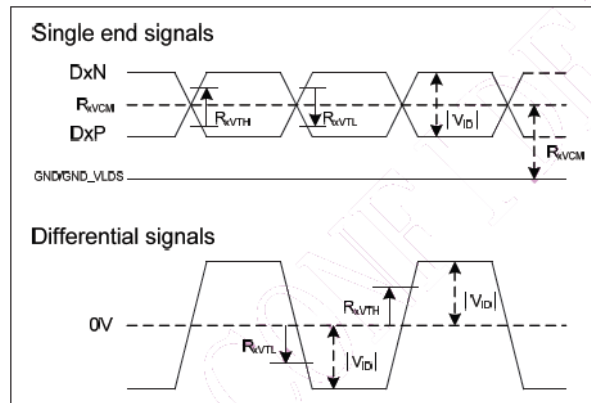


Note 1 : for 6 bit mode, MSB are R/G/B[5] and R/G/B[0] are LSB  
 Note 2 : for 8 bit mode, MSB are R/G/B[7] and R/G/B[0] are LSB

## 8.4.TCON Mode LVDS interface Timing

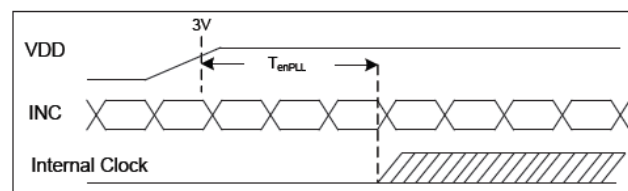
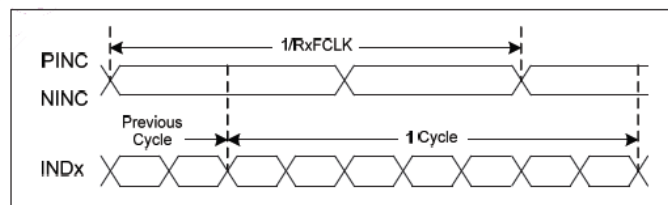
LVDS receiver characteristic (Receiver Differential Input : D0P~D3P, D0N~D3N, CLKP, CLKN), (VDD=VDD\_LVDS=3.3V, GND=GND\_LVDS=0V)

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Differential input high threshold voltage	$R_{xVTH}$			0.1	V	$R_{xVCM} = 1.2V$
Differential input low threshold voltage	$R_{xVTL}$	-0.1			V	
Input voltage range (singled-end)	$R_{xVIN}$	0		VDD-1.0	V	
Differential input common mode voltage	$R_{xVCM}$	$ V_{ID} /2$		2.4- $ V_{ID} /2$	V	
Differential input voltage	$ V_{ID} $	0.2		0.6	V	
Differential input leakage current	$R_{VxIiz}$	-10		10	$\mu A$	
LVDS Digital Operating Current	$I_{VDD\_LVDS}$	-	40	50	mA	$F_{CLK}=65\text{ MHz}$ , $VDD\_LVDS=3.3V$ Data pattern=55/H -> AA/H (loop)
LVDS Digital Stand-by Current	$I_{STBD\_LVDS}$	-	10	50	$\mu A$	Clock & all functions are stopped



LVDS AC characteristic (VDD=VDD\_LVDS=3.3V, GND=GND\_LVDS=0V)

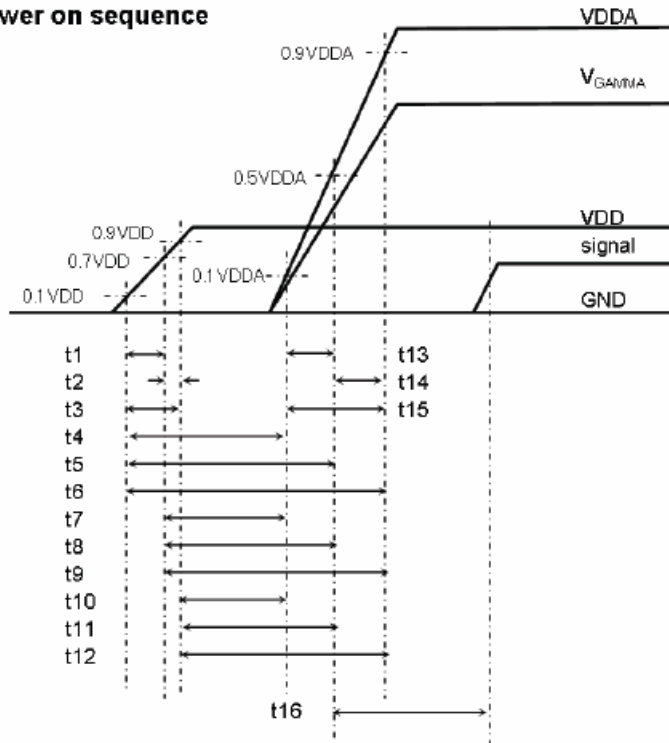
Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Clock Frequency	$R_{xFCLK}$	20		80	MHz	
Input data skew margin	$T_{RSKM}$	500			ps	$ V_{ID}  = 400mV$ , $R_{xVCM}=1.2V$ $R_{xFCLK}=80MHz$
Clock high time	$T_{LVCH}$		$4/(7 \times R_{xFCLK})$		ns	
Clock low time	$T_{LVCL}$		$3/(7 \times R_{xFCLK})$		ns	
PLL wake-up time	$T_{enPLL}$			150	us	



## 8.5. Power on/off sequence

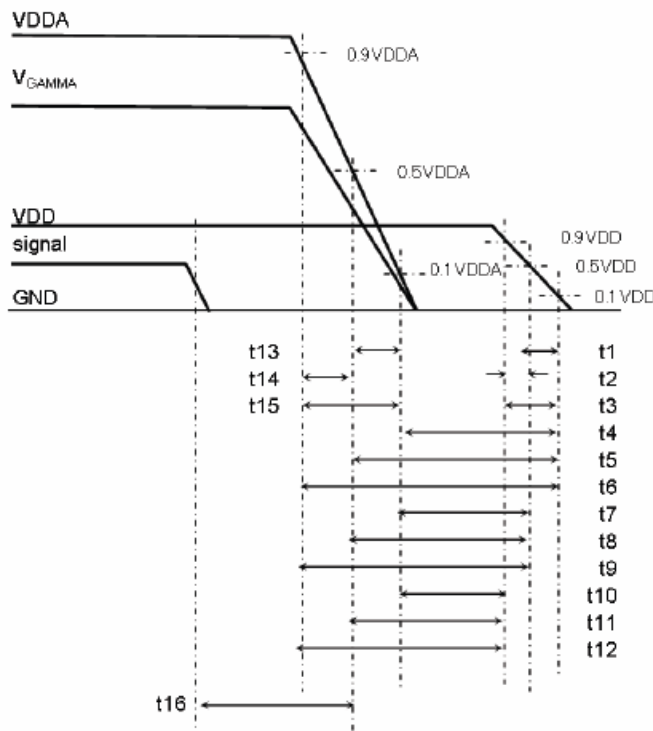
When IC use as a pure source driver or customer don't want to enable IC internal power circuit to generate all voltages, In order to prevent IC damage from abnormal power on or off sequence, please follow below timings.

### Power on sequence



sec		sec
1.5m	t1	1.5
0.5m	t2	0.5
2m	t3	0.2
3m	t4	3
3.8m	t5	3.8
4.6m	t6	4.6
1.5m	t7	1.5
2.3m	t8	2.3
3.1m	t9	3.1
1m	t10	1
1.8m	t11	1.8
2.6m	t12	2.6
0.8m	t13	0.8
0.8m	t14	0.8
1.6m	t15	1.6
30m	t16	30

### Power off sequence



sec		sec
1.5m	t1	1.5
0.5m	t2	0.5
2m	t3	0.2
3m	t4	3
3.8m	t5	3.8
4.6m	t6	4.6
1.5m	t7	1.5
2.3m	t8	2.3
3.1m	t9	3.1
1m	t10	1
1.8m	t11	1.8
2.6m	t12	2.6
0.8m	t13	0.8
0.8m	t14	0.8
1.6m	t15	1.6
30m	t16	30

Note: FPC without Component, AVDD&VGH&VGL&VCOM outside power.

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## 9. ELECTRO-OPTICAL CHARACTERISTICS

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

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	
Brightness (LCM)	-	-	650	700	-	cd/m <sup>2</sup>		
Response time	T <sub>R</sub> +T <sub>F</sub>	Θ=0, -30°C	-	-	400	ms	Note 2	
		Θ=0, 25°C	-	-	30			
		Θ=0, 70°C	-	-	20			
Contrast ratio	CR	At the center point of A.A.	500	800	-	-	Note 3	
Color Gamut	-	-	-	70	-	%		
CIE color Coordinates	White	W <sub>x</sub>	-	(0.308)	-	-	BM5; 1°	
		W <sub>y</sub>	-	(0.338)	-	-		
	RED	R <sub>x</sub>	-	(0.652)	-	-		
		R <sub>y</sub>	-	(0.336)	-	-		
	GREEN	G <sub>x</sub>	-	(0.302)	-	-		
		G <sub>y</sub>	-	(0.610)	-	-		
	BLUE	B <sub>x</sub>	-	(0.150)	-	-		
B <sub>y</sub>		-	(0.072)	-	-			
Viewing Angle	Φ <sub>H</sub>	12	CR ≥ 10	-	80	-	Degree	Note 5
	θ <sub>R</sub>	3		-	80	-		
	Φ <sub>L</sub>	6		-	80	-		
	θ <sub>L</sub>	9		-	80	-		

T<sub>a</sub>=25±2°C

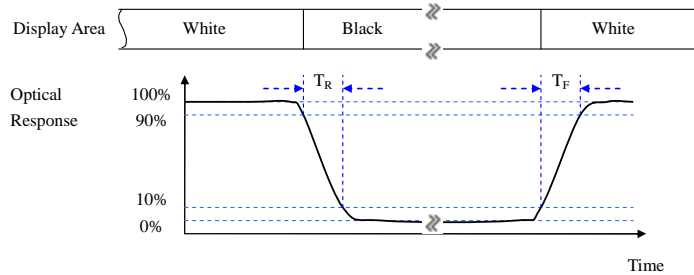
Note:

### 1. Test equipment setup

After stabilizing and leaving the panel alone at a given temperature for 30 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-5A with a viewing angle of 2° at a distance of 50cm and normal direction.

### 2. Definition of response time: T<sub>R</sub> and T<sub>F</sub>

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



### 3. Definition of contrast ratio:

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

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

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

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

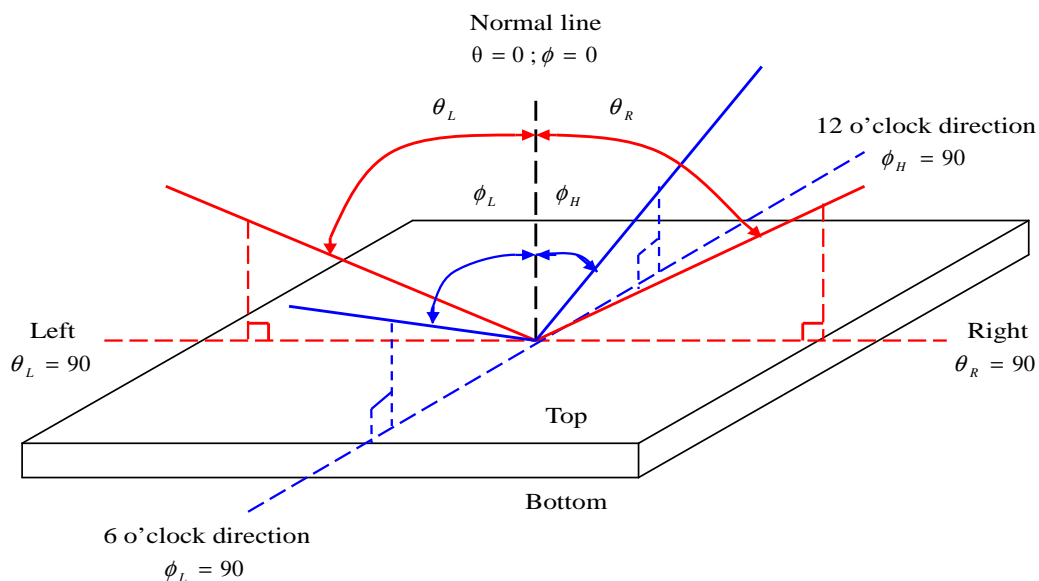
"∓" means that the analog input signal swings out of phase with VCOM signal.

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

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

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

### 5. Definition of viewing angle:



## 10.RELIABILITY

### 10.1.MTTF

The LCD module shall be designed to meet a minimum MTTF value of 50,000 hours with normal condition. (25°C in the room without sunlight; not include life time of backlight)

### 10.2.TESTS

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating	95°C , 512hrs	◦ No Defect Of Operational Function In Room Temperature Are Allowable.
2	Low Temperature Non-Operating	-40°C , 512hrs	
3	High Temperature Operating	85°C , 512 hrs	
4	Low Temperature Operating	-30°C , 512 hrs	
5	High Temperature/ Humidity Non-Operating	65°C ,90%RH 240 hrs	
6	Temperature Shock Non-Operating	-40°C ↔ 85°C (30min) (5min) (30min) trans : 5min ,500 cycle	
7	Electro-static Discharge	150pF,330ohm Contact Discharge : ±15KV	

Note 1: Test after 24 hours in room temperature.

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

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

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

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

Note 6: ESD test by customer audio-set. (Test only for customer requirement)

### 10.3.Color Performance

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

## 11.INSPECTION CRITERIA

### 11.1.Inspection Conditions

#### 11.1.1.Environmental conditions

The environmental conditions for inspection shall be as follows

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

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

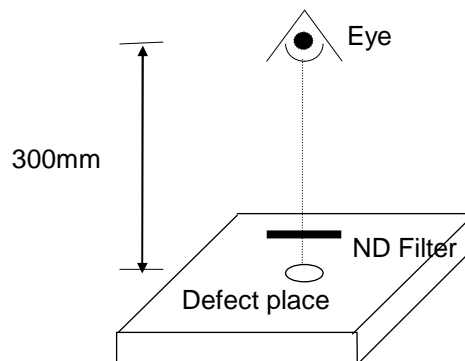
#### 11.1.2.The external visual inspection

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

### 11.2.Light Method

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

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



### 11.3.Classification Of Defects

#### 11.3.1.Major defect

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

#### 11.3.2.Minor defect

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



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

## 11.4.Sampling & Acceptable Quality Level

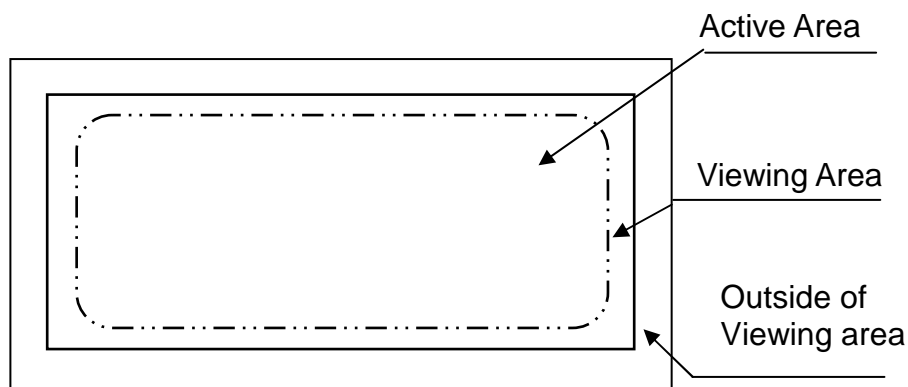
Level II, MIL-STD-105E

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

## 11.5.Definition Of Inspection Area

V.A: Viewing Area

A.A: Active Area



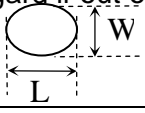
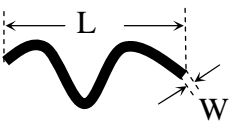
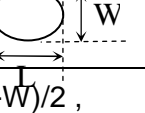
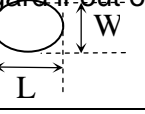
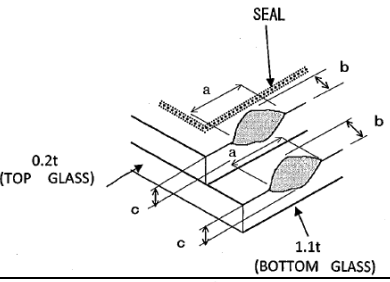
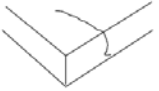
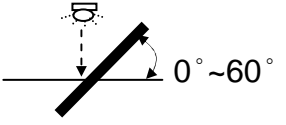
## 10.6.Inspection Item and Criteria

### 10.6.1. Cosmetic criterion

#### (1) Glass defect

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

(2) LCM appearance defect with in A.A

No	Item	Criteria		Remark
1	Round type (Minor)	Spec.	Permissible Q'ty	1. $\phi = (L+W)/2$ , L: Length, W: Width 2. Disregard if out of V.A. 
		$\phi < 0.30\text{mm}$	Disregard	
		$0.30\text{mm} \leq \phi \leq 0.60\text{mm}$	5	
		$0.60\text{mm} < \phi$	0	
2	Line type · Scratch Fiber (Minor)	Defect Spec.	Permissible Q'ty	1: L: Length, W: Width 2: Disregard if out of V.A. 
		$W \leq 0.20\text{mm}$ and $L \leq 25\text{mm}$	Disregard	
		$L \leq 25\text{mm}$ and $0.20\text{mm} < W \leq 0.30\text{mm}$	5	
		$W > 0.30\text{mm}$ or $L > 25\text{mm}$	0	
3	Polarizer Bubble (Minor)	Spec.	Permissible Q'ty	1. $\phi = (L+W)/2$ , L: Length, W: Width 2. Disregard if out of A.A. 
		$\phi < 0.30\text{mm}$	Disregard	
		$0.30\text{mm} \leq \phi \leq 0.6\text{mm}$	4	
		$0.6\text{mm} < \phi$	0	
4	Polarizer Dent / Bulge (Minor)	Spec.	Permissible Q'ty	1. $\phi = (L+W)/2$ , L: Length, W: Width 2. Disregard if out of A.A. 
		$\phi < 0.30\text{mm}$	Disregard	
		$0.30\text{mm} \leq \phi \leq 0.6\text{mm}$	4	
		$0.6\text{mm} < \phi$	0	
5	Bottom Glass (Minor)	$a \leq 5.0\text{mm}$ , $b \leq 2.0\text{mm}$ , $c \leq t$ 【Disregard】		
6	Top Glass (Minor)	$a \leq$ Not counted, $b \leq$ Boundary of Seal, $c \leq$ Not counted 【Disregard】		
7	Crack (Major)	Not allowed		
8	Newton's ring (Minor)	Defect Spec.	Permissible Q'ty	Under day light 
		$\phi \leq 15\text{mm}$	Disregard	
		$\phi > 15\text{mm}$	0	

(3) FPC

No	Defect	Criteria	Remark
1	Copper peeling (Minor)	Copper peeling <b>【Reject】</b>	

(4) Black tape

No	Defect	Criteria	Remark
1	Shift (Minor)	IC exposed <b>【Reject】</b>	
2	No black tape (Minor)	No black tape <b>【Reject】</b>	

(5) Silicon

No	Defect	Criteria	Remark
1	Amount of silicon (Minor)	ITO exposed <b>【Reject】</b>	


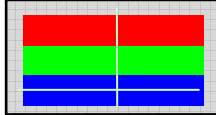
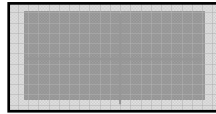
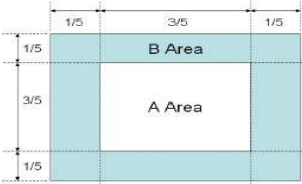
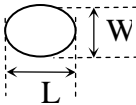
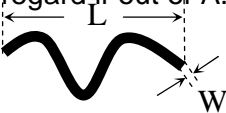
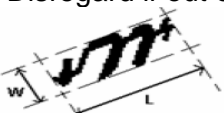
(6) Bezel

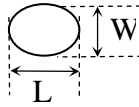
No	Defect	Criteria	Remark
1	Oxidized spot (Minor)	Oxidized spot, rust <b>【Reject】</b>	
2	Outline deformation (Minor)	By engineering diagram	
3	Greasiness (Minor)	Greasiness <b>【Reject】</b>	
4	Spots, round Type (Minor)	$H \leq$ By engineering diagram <b>【Disregard】</b>	H=Total height (thickness)
5	Plating (Minor)	Bubble, peeling <b>【Reject】</b>	

(7) Power cord

No	Defect	Criteria	Remark
1	Power cord (Minor)	Power core loose	

(1).LCM electrical criterion

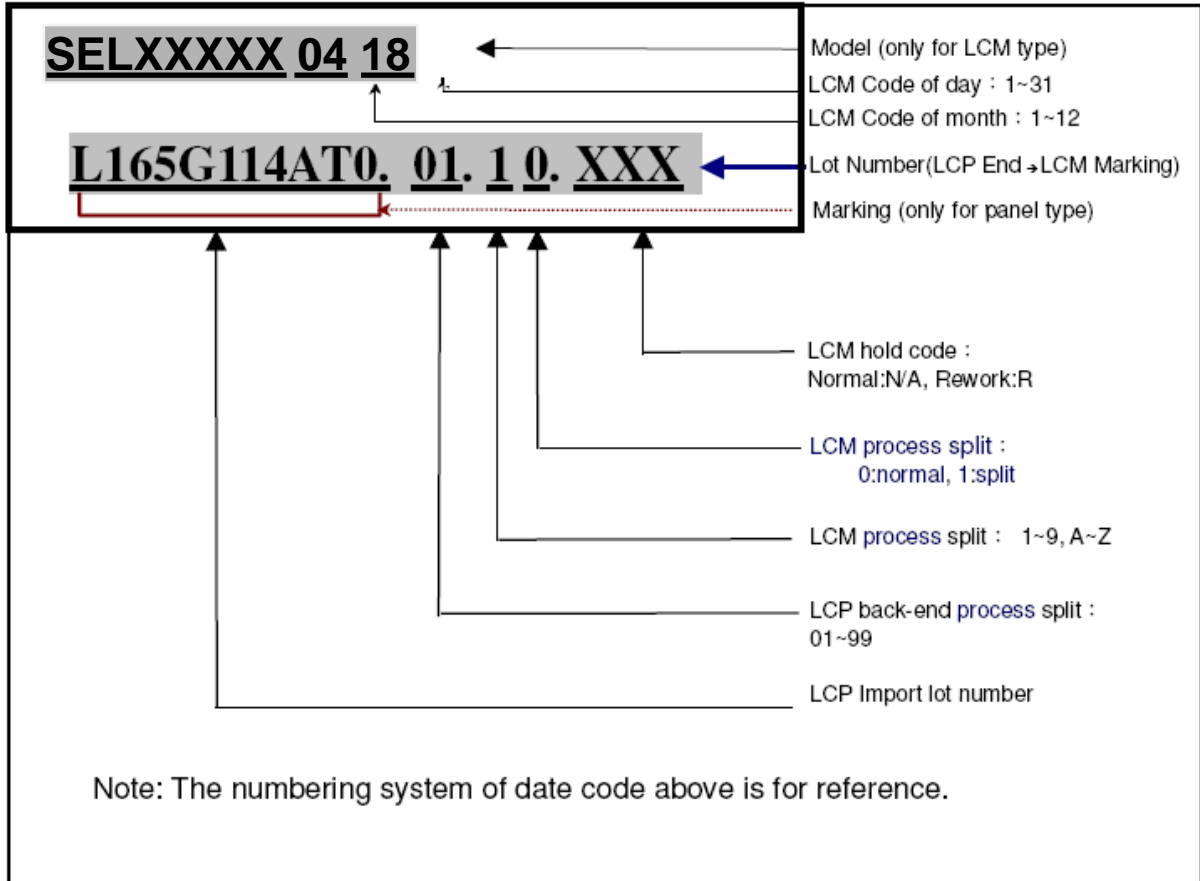
No	Defect	Criteria			Remark	
1	No display (Major)	Not allowed				
2	Missing line (Major)	Not allowed				
3	Darker or lighter line (Major)	Not allowed				
4	Bright / Dark point (Minor)		A Area	B Area	Total	1.1sub-pixel: 1R or 1G or 1B 2.Point defect area $\geq 1/2$ sub pixel. 
		Bright point	<u>1</u>	<u>2</u>	<u>3</u>	
		Dark dot point	<u>2</u>	<u>3</u>	<u>4</u>	
		Bright +Dark point	<u>3</u>	<u>4</u>	<u>5</u>	
5	Round type (Minor)	Spec.		Permissible Q'ty	1. $\phi = (L+W)/2$ , L: Length, W: Width 2. Disregard if out of A.A. 	
		$\phi < 0.30\text{mm}$		Disregard		
		$0.30\text{mm} \leq \phi \leq 0.60\text{mm}$		5		
		$0.60\text{mm} < \phi$		0		
6	Line type \cdot Scratch Fiber (Minor)	Defect Spec.		Permissible Q'ty	1.L: Length, W: Width 2. Disregard if out of A.A. 	
		$W \leq 0.20\text{mm}$ and $L \leq 25\text{mm}$		Disregard		
		$L \leq 25\text{mm}$ and $0.20\text{mm} < W \leq 0.30\text{mm}$		5		
		$W > 0.30\text{mm}$ or $L > 25\text{mm}$		0		
7	Polarizer Bubble (Minor)	Spec.		Permissible Q'ty	1.L: Length, W: Width 2. Disregard if out of A.A. 	
		$\phi < 0.30\text{mm}$		Disregard		
		$0.30\text{mm} \leq \phi \leq 0.6\text{mm}$		4		
8	Polarizer Dent / Bulge	Spec.		Permissible Q'ty	1. $\phi = (L+W)/2$ , L: Length, W: Width 2. Disregard if out of A.A.	
		$\phi < 0.30\text{mm}$		Disregard		
		$0.30\text{mm} \leq \phi \leq 0.6\text{mm}$		4		

	(Minor)	$0.6\text{mm} < \phi$	0	
9	Mura (Minor)	By 2% ND filter invisible		

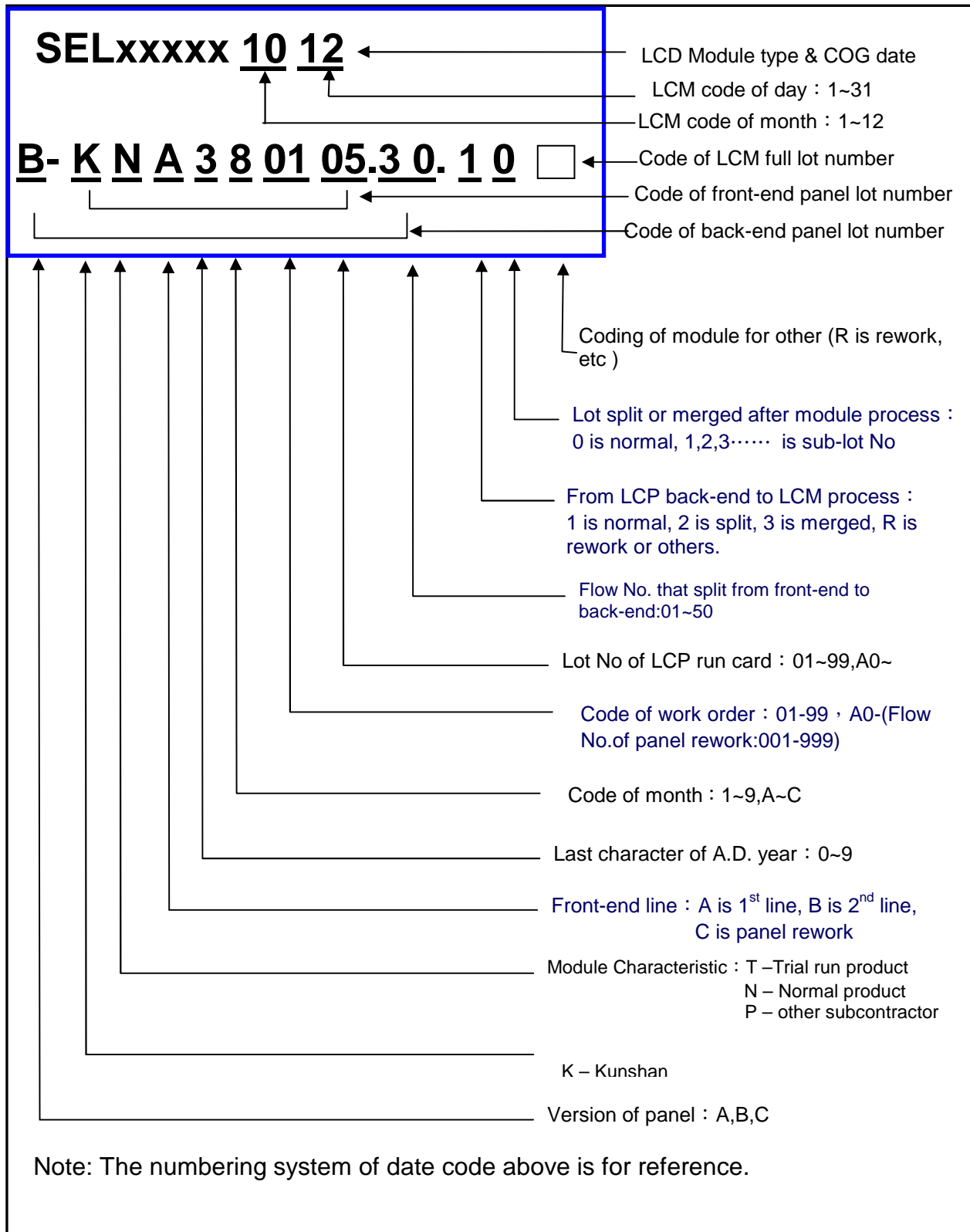
10.6.3.Others

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

## 12. ILLUSTRATION OF LCD DATE CODE



## 13.ILLUSTRATION OF LCD DATE CODE



## 14. RoHS COMPLIANT WARRANTY

RoHs Hazardous substances including:

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

## 15. PRECAUTIONS FOR USE

### 15.1. Safety

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

### 15.2. Storage Conditions

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

### 15.3. Installing LCD Module

Attend to the following items when installing the LCM.

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



## 15.4. Precautions For Operation

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

## 15.5. Handling Precautions

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

## 15.6. Warranty

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

## 16. REVISION HISTORY

Version	Revise record	Date
A	New version	2013/07/10