SAMSUNG ELECTRONICS

Product Information

ISSUE DATE : 02-04-08
MODEL : LTS350Q1-PD1

Note : This product information is subjet to change after 3 months of issue date.

PREPARED BY : AMLCD Technical Customer Service Team

Samsung Electronics Co . , LTD.

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Revision History

Data	Rev. No.	Page	Summary
Jun.30. 2001	000		Rev.000 was issued.
Jan.03. 2002	001		Rev.001 was issued.
Jan.25. 2002	002		Rev.002 was issued.
Apr.08. 2002	003		Rev.003 was issued.

General Description

*** Description**

LTS350Q1-PD1 is a reflective type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching devices. This model is composed of a TFT-LCD module(TFT-LCD panel, driver ICs and FPC), a front-light unit and a touch panel. The resolution of a 3.5" contains 240 x 320 pixels and can display up to 260K colors.

*** Features**

- Reflective type.
- Front light with CCFL and touch panel included.
- MTN(Mixed Twisted Nematic) mode.
- Line inversion mode.
- Low Power consumption.

*** Applications**

- Display terminals for PDA application products.
- Smart phone / Game machine / Camcoder.

*** General Information**

Items	Specification	Unit	Note
Display area	53.64(H) x 71.52(V)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	262,144	colors	-
Number of pixels	240(H) x 320(V)	pixel	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.2235(H) x 0.2235(V)	mm	-
Display mode	Normally White	-	-
Viewing Direction	6:00	o'clock	-
Surface treatment	Anti-Glare (Haze 12%), Anti-Reflection	-	-

*** Mechanical Information**

Item		Min.	Typ.	Max.	Unit	Note
Model size	Horizontal(H)	69.75	70.0	70.25	mm	(1)
	Vertical(V)	90.45	90.7	90.95	mm	(1),(2)
	Depth(D)	4.65	4.90	5.15	mm	(1)
Weight		-	50	55	g	(1)

Note (1) Touch panel and front light unit are included.

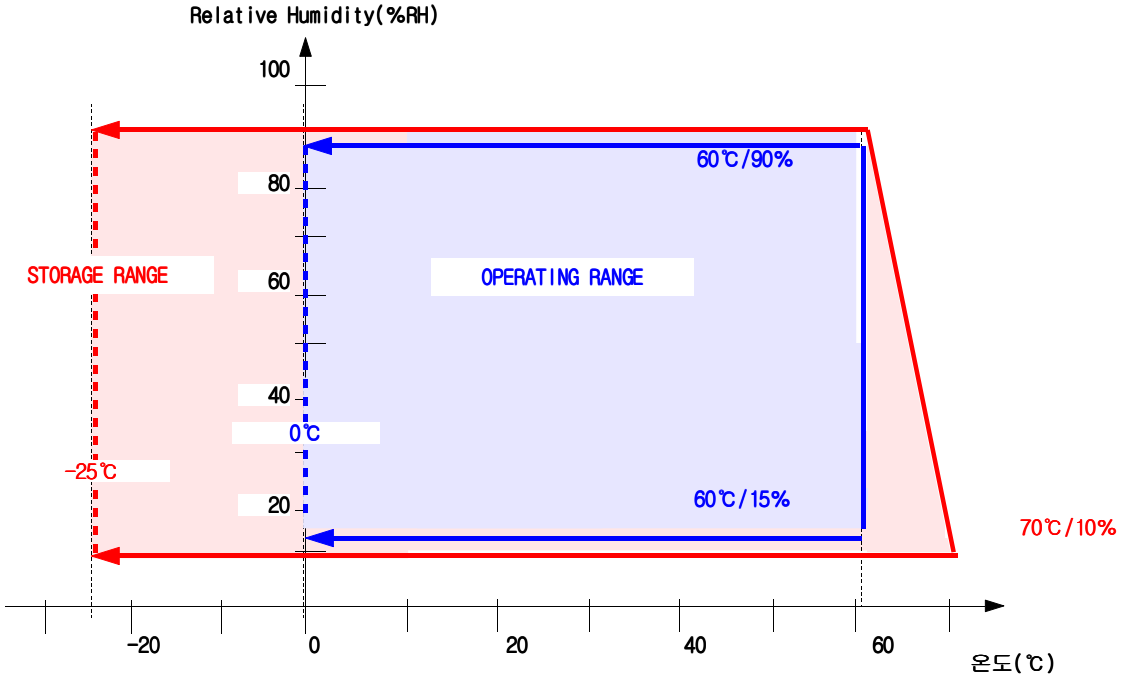
(2) FPC is not included. (Refer to the Outline Dimension in the page 26 for further information.)

1. Absolute Maximum Ratings

1.1 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-25	70	℃	(1),(5)
Operating temperature (Ambient temperature)	T_{OPR}	0	60	℃	(1),(2),(5)
Vibration (Non - operating)	Vnop	10	500	Hz	(3),(4)

Note (1) 90 % RH Max. (60 °C ≥ Ta)
Maximum wet-bulb temperature at 59 °C or less. (Ta > 60 °C) No condensation.



(2) In case of below 0° , the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one.
Level of retardation depends on temperature, because of LC's characteristics.

(3) (10 ⇔ 500Hz)^{6CYC} 10min/Cycle, $3G_{pk}$,, for each X, Y, Z axis.

(4) At testing vibration, the fixture in holding the module to be tested have to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

(5) If product is exposed to high temperatures for extended time, there is a possibility of the polarizer film damage which could degrade the optical characteristics.

1.2 Electrical Absolute Ratings

(1) TFT-LCD Module

(Ta = 25 ± 2°C, V_{gg}=GND=0V)

Characteristics	Symbol	Min.	Max.	Unit	Note
Power supply(analog, digital)	V_{DD}	-0.3	6.5	V	-
Power supply(gate on)	V_{ON}	-0.3	44	V	-
Power supply(gate off)	V_{OFF}	V_{ON}-44	0.3	V	-
Common Voltage	V_{COM}	-1.5	5.5	V	AC
Input voltage	V_I	-0.3	V_{DD}+0.3	V	-

(2) Front-Light Unit

(Ta = 25 ± 2°C)

Item	Symbol	Min.	Max.	Unit.	Note
Lamp current	I_L	1.0	4.0	mArms	(1)
Lamp frequency	F_L	50	80	kHz	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

2. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (3).
Measuring equipment: LCD-7000, BM-5A

(Ta = 25 ± 2°C)

Item			Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Reflectance	Ver.		Rf		8	12	-	%	(4) LCD-7000
Contrast ratio	F/L Off		C/R		10	15	-		(5) LCD-7000
	F/L On				4	5	-		(5) BM-5A
Luminance of white	F/L On		YL		25	30	-	cd/m2	(6) BM-5A
Response time	Rising:Tr		Tr+Tf		-	40	45	msec	(8) BM-5A
	Falling:Tf								
Color chromaticity (CIE 1931)	White F/L Off		Wx1		0.30	0.32	0.34		(9) LCD-7000
			Wy1		0.35	0.37	0.39		
	White F/L On		Wx2		0.31	0.33	0.35		(10) BM-5A
			Wy2		0.30	0.32	0.34		
Viewing angle	F/L Off	Hor.	θL + θR	CR≥2	80	100	-	Degrees	(11) LCD-7000
		Ver.	ϕH + ϕL		80	100	-		
	F/L On	Hor.	θL + θR		70	80	-		(11) BM-5A
		Ver.	ϕH + ϕL		70	80	-		
Crosstalk	F/L On				-	5	-	%	(12) BM-5A
Uniformity	F/L On				-	50	-	%	(7) BM-5A

* Optical Characteristics can be changed without special notice

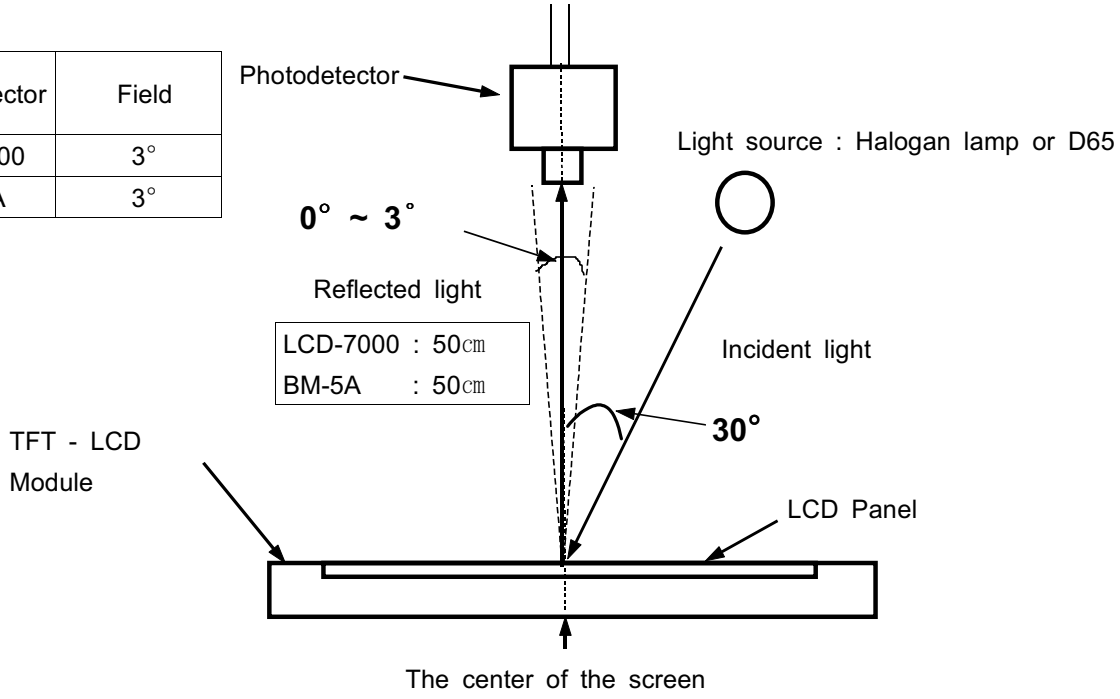
Note (1) The optical characteristics is measured with front-light and touch panel.

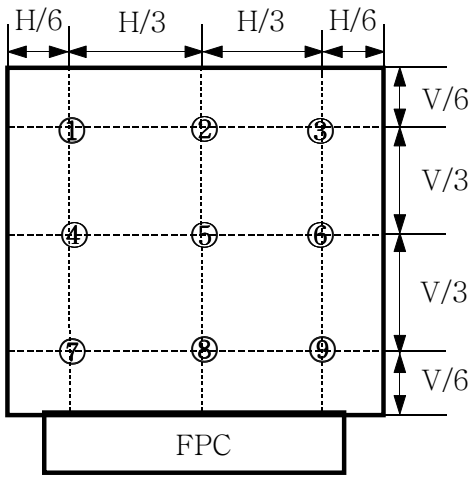
(2) If product is exposed to high temperatures for extended time, there is a possibility of the polarizer film damage which could degrade the optical characteristics.

Note (3) Test Equipment Setup

After stabilizing and leaving the panel alone at a given temperature for 30 min, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the Front-light or reference light source. The reflected light intensity should be measured in the center of screen. The incident angle of the light source is 30° to the normal direction where the photodetector is positioned.
Environment condition : Ta = 25 ± 2 °C

Photodetector	Field
LCD-7000	3°
BM-5A	3°





The spot locations for luminance measurement

Note (4) Definition of Reflectance : The reflectance is relative quantity to the standard white $BaSO_4$ or MgO plate that the reflectance of the standard white plate is the 100%.

$$\text{Reflectance} = \frac{\dfrac{\text{Intensity of the reflected light on LCD}}{\text{Intensity of the incident light on BaSO4 plate}}}{\dfrac{\text{Intensity of the reflected light on BaSO4 plate}}{\text{Intensity of the incident light on BaSO4 plate}}} \text{ X } 100\%$$

Note (5) Definition of Contrast Ratio (C/R) : Ratio of gray max (Gmax) & gray min (Gmin) at the center point of the panel. If frontlight is on state, it is the light source and the BM-5A will be used to measure.

$$C/R = \frac{Gmax}{Gmin}$$

* Gmax : Luminance with all pixels white

* Gmin : Luminance with all pixels black

Note (6) Definition of Luminance of White : Luminance of white at center point. In this case, the incident light is not from the light source but from the front-light that generates the reflected light source on LCD in the dark room.

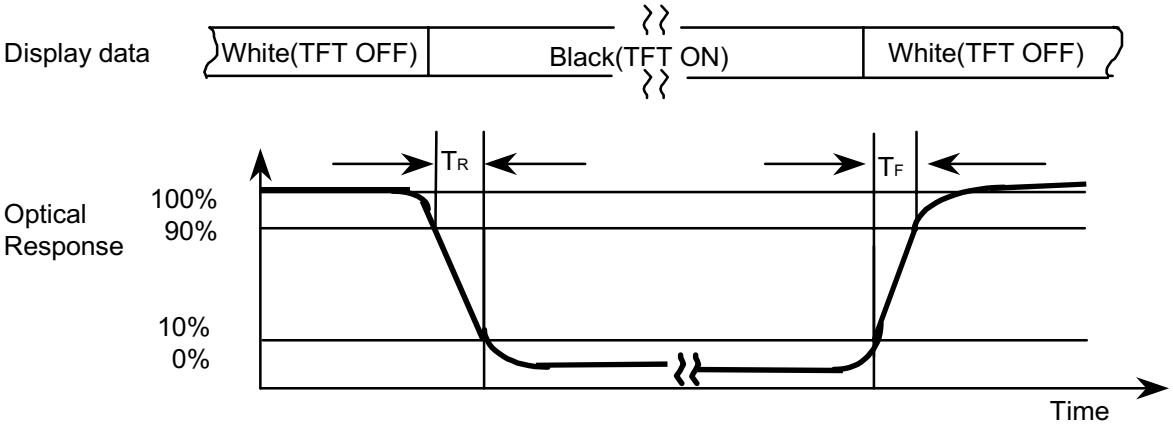
Note (7) Definition of Uniformity :

$$Buni = 100 * \frac{B\min}{B\max}$$

Bmax : Maximum brightness

Bmin : Minimum brightness

Note (8) Definition of Response time : Sum of Tr ,Tf



Note (9) Definition of Color Chromaticity (CIE 1931), (Front light:Off)

Color coordinate of white at center point.

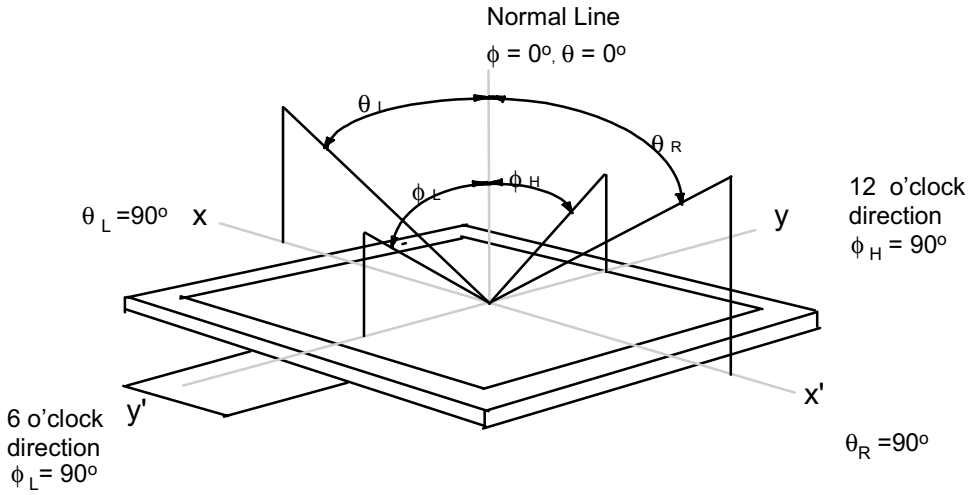
It should be measured at vertical direction on front light off state

* Light Source : D65. (Front light:Off.)

Note (10) Definition of Color Chromaticity (CIE 1931), (Front light:On)

Color coordinate of white at center point.

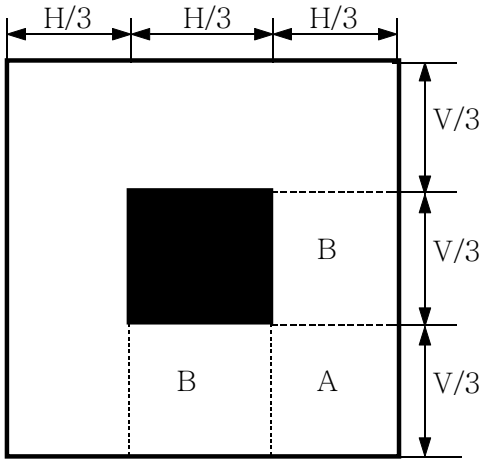
Note (11) Definition of Viewing Angle : Viewing angle range (CR≥ 2)



Note (12) Definition of Cross-talk level

$$C/T = \frac{|Y_A - Y_B|}{Y_A} \times 100\%$$

* Y_A : Luminance of A area (Cd/m²)
* Y_B : Luminance of B area (Cd/m²)



When this panel displays a black window pattern, the luminance of B area is effected from black window. The Luminance of B area is different from the Luminance of A area. This pattern for measurement has a black window on the background of middle-gray.

3. Electrical Characteristics

3.1 TFT-LCD Module

Ta = 25 ± 2°C

Characteristics		Symbol	MIN.	TYP.	MAX.	Unit	Note
Digital supply voltage		DV_{DD}	3.0	3.3	3.6	V	
Analog supply voltage		AV_{DD}	4.5	4.7	5.0	V	
Gate On voltage		V_{ON}	16	18	20	V	
Gate Off voltage		V_{OFF}	-13	-10	-8	V	
Common voltage		$V_{COMH(Vpp)}$	-	4.5	-	V	
Digital supply current		I_{DVDD}	-	0.3	1.3	mA	
Analog supply current		I_{AVDD}	-	5.0	8.5	mA	
Gate supply current		$I_{VON/VOFF}$	-	-	0.6	mA	
Input voltage	Source driver (High)	V_{IHS}	$0.8DV_{DD}$	-	DV_{DD}	V	
	Source driver (Low)	V_{ILS}	GND	-	$0.2DV_{DD}$	V	
	Gate driver (High)	V_{IHG}	0.8 x 1.65	-	DV_{DD}	V	
	Gate driver (Low)	V_{ILG}	GND	-	0.2 x 1.65	V	
Power Dissipation	White	P_W	-	(15)	25	mW	(1),(2)
	Black	P_B	-	(20)	30	mW	
	Vertical	P_V	-	(20)	30	mW	

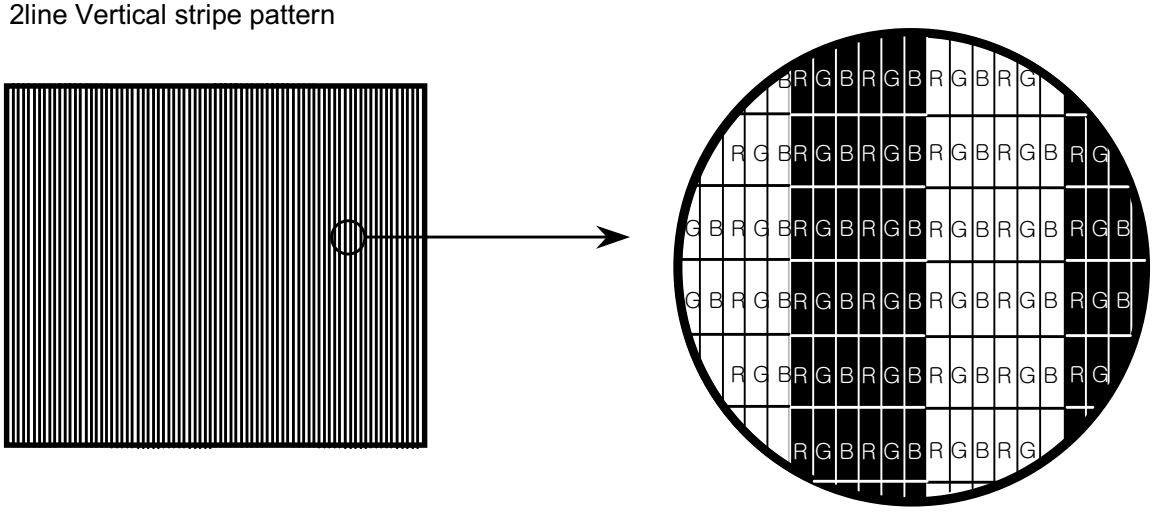
* To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as below.

- Power On : DV_{DD} → AV_{DD} → V_{OFF} → V_{ON} → Data
- Power Off : Data → V_{ON} → V_{OFF} → AV_{DD} → DV_{DD}

Note (1) Condition : TFT-LCD module only with typ. electrical characteristics

(2) Power dissipation check pattern

▶ 2line Vertical stripe pattern



3.2 Front-Light Unit

The back-light system is an edge-lighting type with a single CCFL(Cold Cathode Fluorescent Lamp). The characteristics of a single lamp are shown in the following tables.

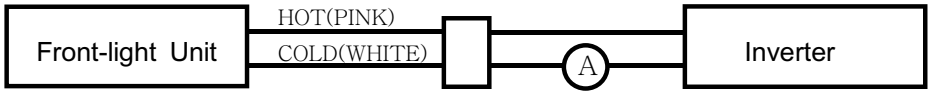
(Ta=25 ± 2°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp current	I_L	1.0	1.5	4.0	mArms	(1)
Lamp voltage	V_L	-	330	-	Vrms	(1)
Lamp frequency	f_L	50	-	80	kHz	(2)
Operating life time	Hr	10,000	-	-	Hour	(3)
Power Consumption	P_L	316	495	984	mW	(4)
Start up voltage	Vs	-	-	0℃:600 25℃:450	Vrms	(5)

Note) The waveform of the inverter output voltage must be area symmetric and the design of the inverter must have specifications for the modularized lamp.

The performance of the front-light, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter. When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the front-light and the inverter never occur. When you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Note (1) Lamp current is measured with high frequency current meter as shown below.



(2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

(3) Life time (Hr) of a lamp is defined as the time in which it continues to operate under the condition of Ta=25±2°C and I_L=3.0mArms for a lamp until the brightness becomes 50% or lower than it's original value.

(4) Refer to I_L x V_L to calculate.

(5) If an inverter has shutdown function, it should keep its output for more than 1 second even if the lamp connector open. Otherwise the lamp may not to be turned on.

4. Touch Panel Specifications

4-1. Electrical Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Terminal resistance	150	340	630	Ω	X(Glass side)
	180	360	720	Ω	Y(Film side)
Insulation resistance	20	-	-	MΩ	DC 25V
Voltage	-	5	7	V	DC
Bouncing	-	-	10	ms	10ms or less at On/Off
Transparency	-	83	-	%	No anti-glare

Caution (1) : Do not operate it with a thing except a polyacetal pen(tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

4-2. Mechanical & Reliability Characteristics

Item	Min.	Typ.	Max.	Unit	Note
ITO glass	-	-	0.7	mm	Glass substrate material option
ITO film	-	-	180	μ m	No anti-glare
Activation force	-	-	0.8	N	(1)
Durability-surface scratching	Write 300,000	-	-	times	(2)
Durability-surface hitting	1,000,000	-	-	touches	(3)
Surface hardness	3	-	-	H	JIS K5400

Note (1) 0.8N or less (Tip R0.8mm polyacetal pen or Tip R3.75mm, hardness 10° to 20°, silicone rubber operation)

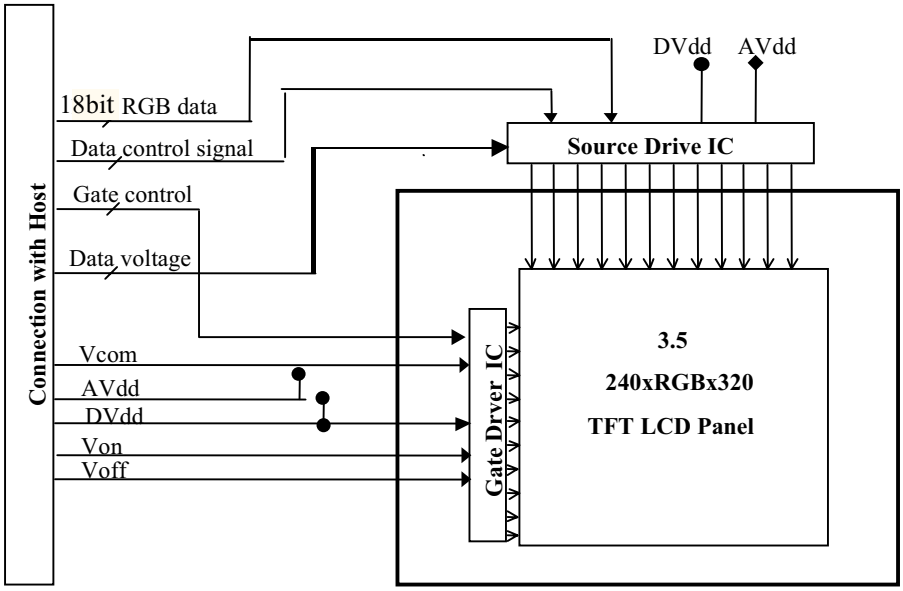
(2) Test Conditions
- Sliding Pen : Tip R0.8mm, Polyacetal pen
- Load : 2.45 N
- Sliding speed : 60 mm/s

(3) Test Conditions :
- Hitting pad : Tip R3.75mm, Hardness 10° to 20°, Silicone rubber
- Load : 2.45 N
- Hitting speed : Twice/s

Refer to the Appendix 1: Touch Panel Specifications.

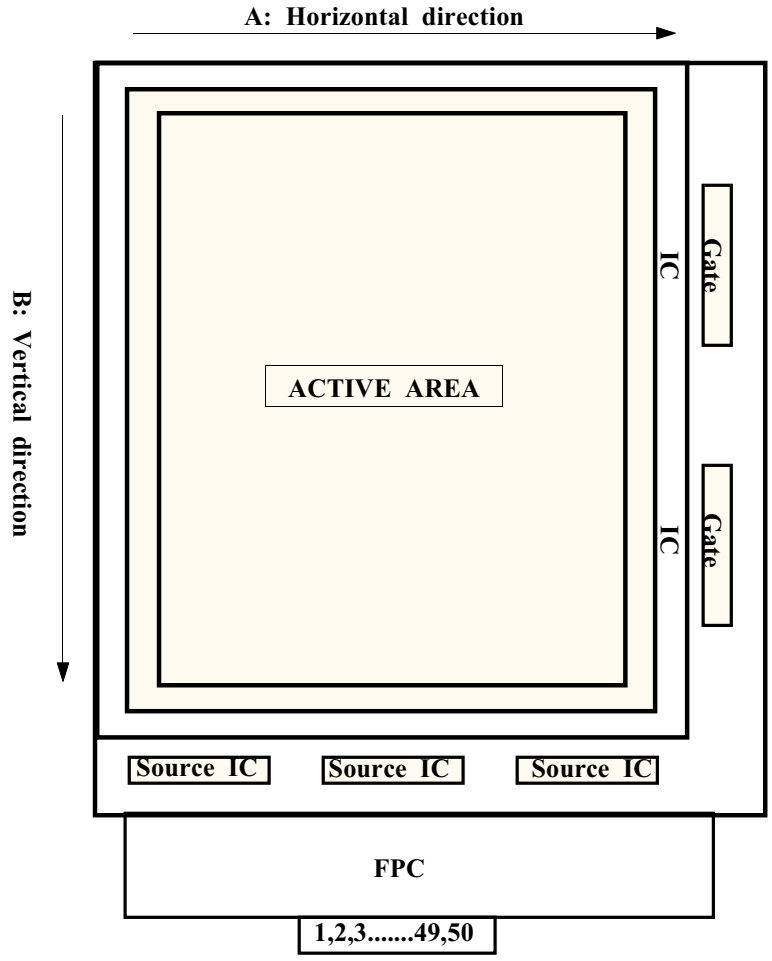
5. Block Diagram

5.1 TFT-LCD Module

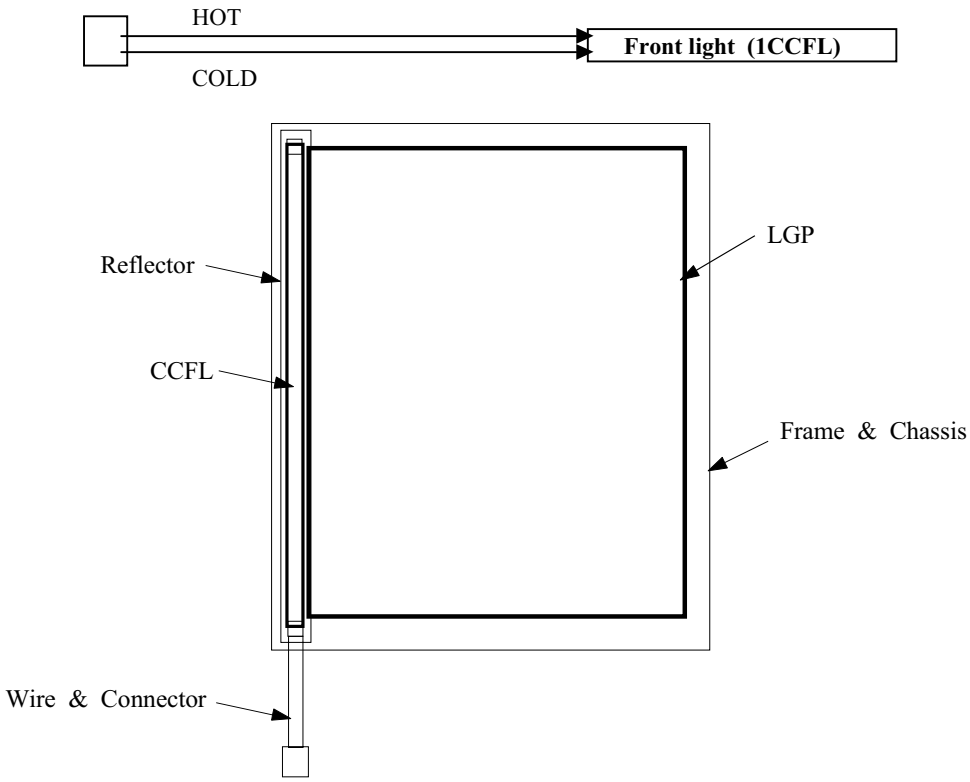


The scanning direction for the horizontal period and the vertical period are A and B respectively as shown below.

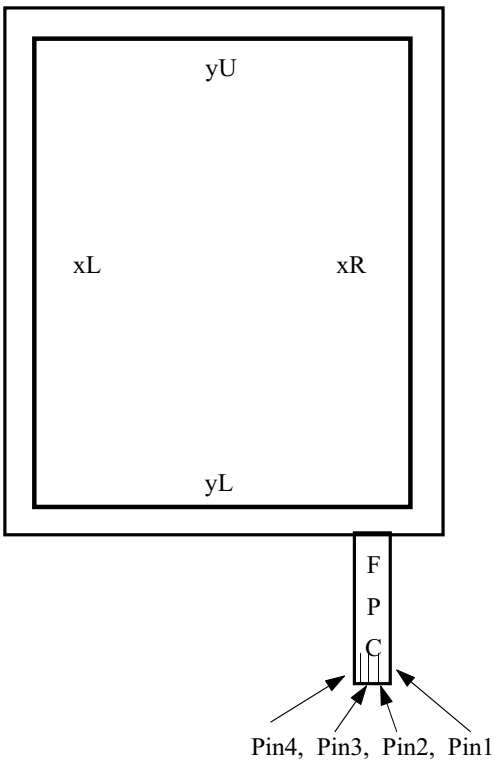
The scanning directions are from a front view.



5.2 Front Light Unit



5.3 Touch Panel



Pin No.	Symbol	I/O
1	xR	X_Right
2	xL	X_Left
3	yL	Y_Bottom
4	yU	Y_Up

6. Input Terminal Pin Assignment

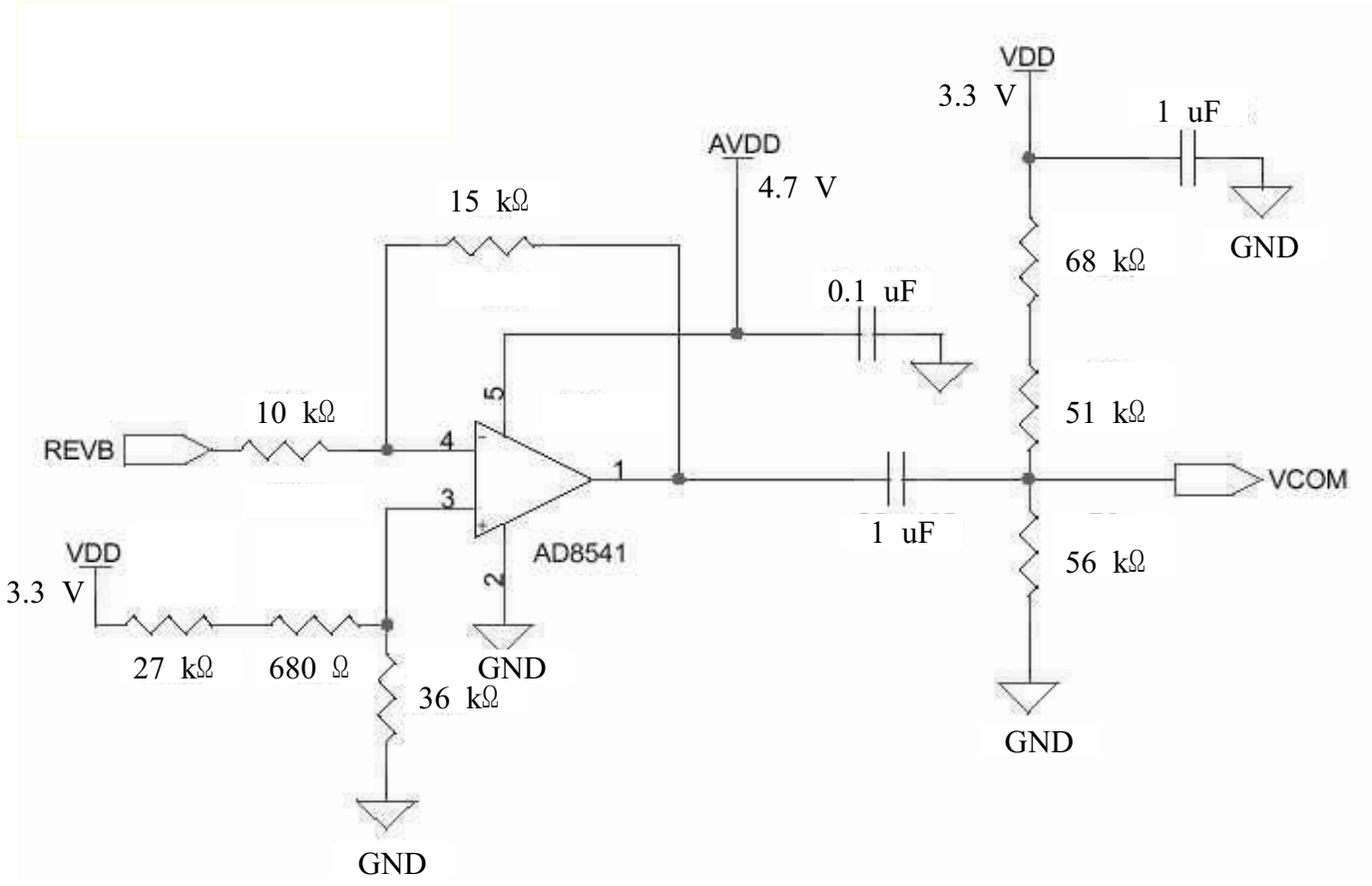
6.1 TFT-LCD Module (Connector : 50Pin FPC type ↔ Hirose FH12-50S-0.5SH)

Pin No	Symbol	Description	Remark
1	AV_{DD}	Power Supply	-
2	AV_{DD}	Power Supply	-
3	STH	Horizontal Start Pulse	-
4	R0	Red Pixel Data (LSB)	-
5	R1	Red Pixel Data	-
6	R2	Red Pixel Data	-
7	R3	Red Pixel Data	-
8	R4	Red Pixel Data	-
9	R5	Red Pixel Data (MSB)	-
10	G0	Green Pixel Data (LSB)	-
11	G1	Green Pixel Data	-
12	G2	Green Pixel Data	-
13	G3	Green Pixel Data	-
14	G4	Green Pixel Data	-
15	G5	Green Pixel Data (MSB)	-
16	V_{REF0}	Gray Scale Voltage0	(2)
17	V_{REF1}	Gray Scale Voltage1	
18	V_{REF2}	Gray Scale Voltage2	
19	V_{REF3}	Gray Scale Voltage3	
20	V_{REF4}	Gray Scale Voltage4	
21	V_{REF5}	Gray Scale Voltage5	
22	V_{REF6}	Gray Scale Voltage6	
23	V_{REF7}	Gray Scale Voltage7	
24	V_{REF8}	Gray Scale Voltage8	
25	V_{REF9}	Gray Scale Voltage9	
26	V_{REF10}	Gray Scale Voltage10	
27	DV_{DD}	Power Supply	-
28	TP	Source Driver Data Load Pulse	-
29	V_{SS}	Ground	-
30	INV	Digital Data Inversion	(2)
31	HCLK	Horizontal Sampling Clock	-
32	B0	Blue Pixel Data (LSB)	-
33	B1	Blue Pixel Data	-
34	B2	Blue Pixel Data	-

Pin No	Symbol	Description	Remark
35	B3	Blue Pixel Data	-
36	B4	Blue Pixel Data	-
37	B5	Blue Pixel Data (MSB)	-
38	V_{SS}	Ground	-
39	V_{SS}	Ground	-
40	V_{COM}	Common Voltage	(1)
41	V_{COM}	Common Voltage	
42	V_{ON}	Power Supply (Gate ON)	-
43	V_{OFF}	Power Supply (Gate OFF)	-
44	V_{SS}	Ground	-
45	V_{SS}	Ground	-
46	CPV	Vertical Shift Clock	-
47	DV_{DD}	Power Supply	-
48	V_{OFF}	Power Supply (Gate OFF)	-
49	V_{ON}	Power Supply (Gate ON)	-
50	STV	Vertical Start Pulse	-

Note (1) Recommended Vcom generator circuit

REV, REVB : Timing control IC output signal

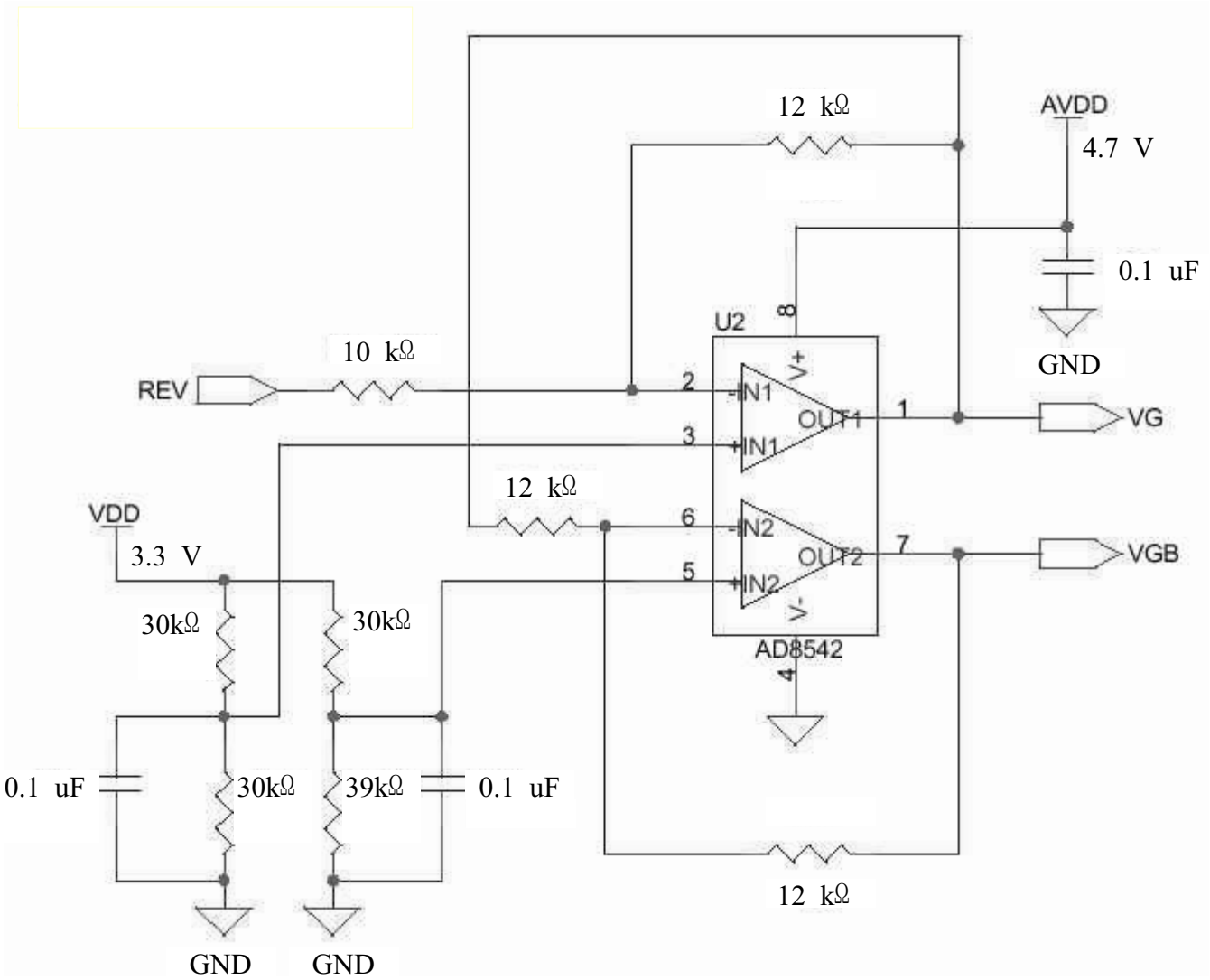


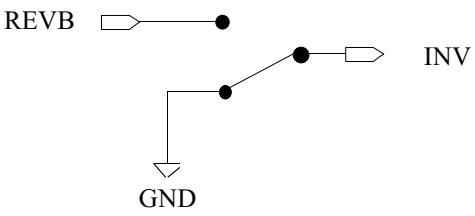
Note (2) Recommended INV signal& gray scale voltage generator circuits

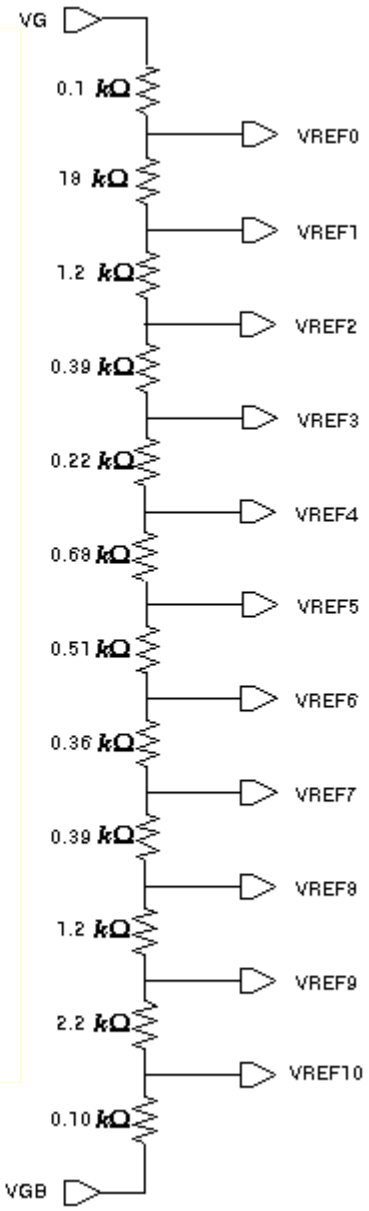
Recommended circuits could not be optimal circuits and could be modified by user.

* Recommended Circuit

- Gamma Voltage Generator Circiut.
- REV, REVB : Timing control IC output signal




REVB
INV
GND


VG
0.1 kΩ
VREF0
18 kΩ
VREF1
1.2 kΩ
VREF2
0.39 kΩ
VREF3
0.22 kΩ
VREF4
0.68 kΩ
VREF5
0.51 kΩ
VREF6
0.36 kΩ
VREF7
0.39 kΩ
VREF8
1.2 kΩ
VREF9
2.2 kΩ
VREF10
0.10 kΩ
VGB

6.2 Front-Light Unit (Connector : BHSR-02VS-1 ↔ JST SM02B-BHSS-1-TB)

Pin No.	Symbol	Color	Function
1	HOT	PINK	High voltage
2	COLD	WHITE	Low voltage

6.3 Touch Panel (Connector : 4Pin FPC type ↔ Hirose FH12-10(4)SA-1SH)

Pin No.	Symbol	I/O	Function
1	xR	X_Right	X axis position - differential analog
2	xL	X_Left	X axis position - differential analog
3	yL	Y_Bottom	Y axis position - differential analog
4	yU	Y_Up	Y axis position - differential analog

6.4 Input Signal, Basic Display Colors and Gray Scale of Each Colors

COLOR	DISPLAY	DATA SIGNAL																		GRAY SCALE LEVEL
		RED						GREEN						BLUE						
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
	↑	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R60
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R61
	LIGHT	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R62
	RED	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R63
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	G1
	↑	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G60
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	G61
	LIGHT	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	G62
	GREEN	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	G63
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	B1
	↑	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B60
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	B61
	LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	B62
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	B63

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

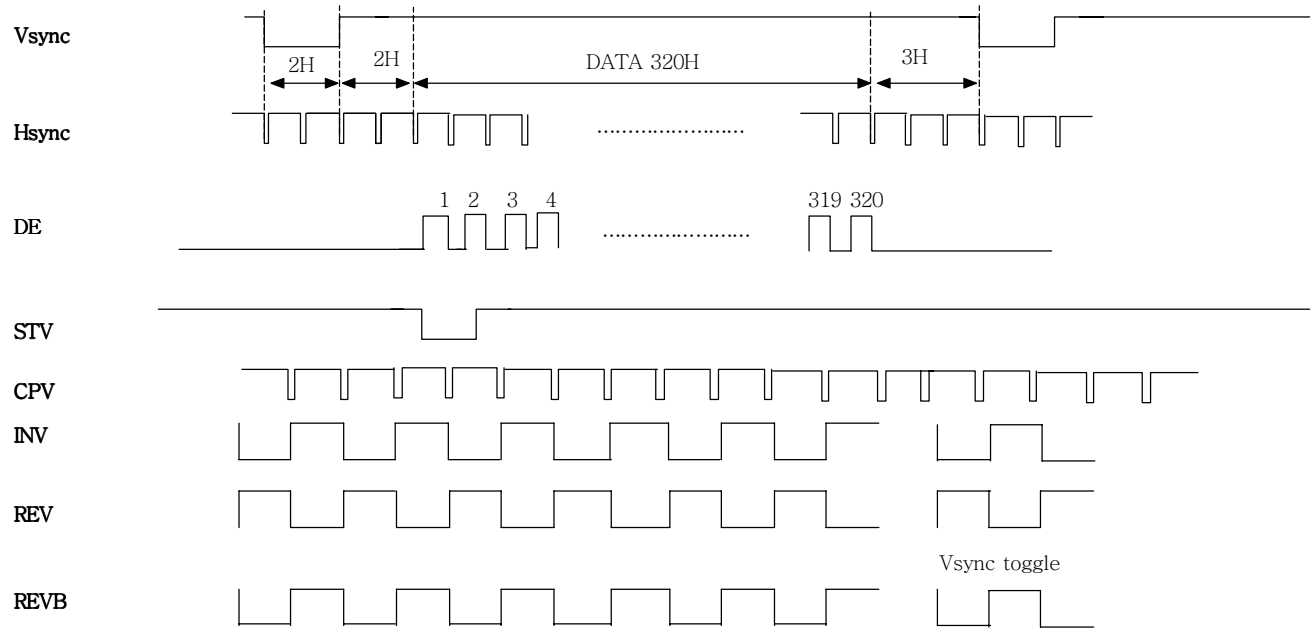
※R5,G5,B5:MSB R0,G0,B0:LSB

7. Interface Timing

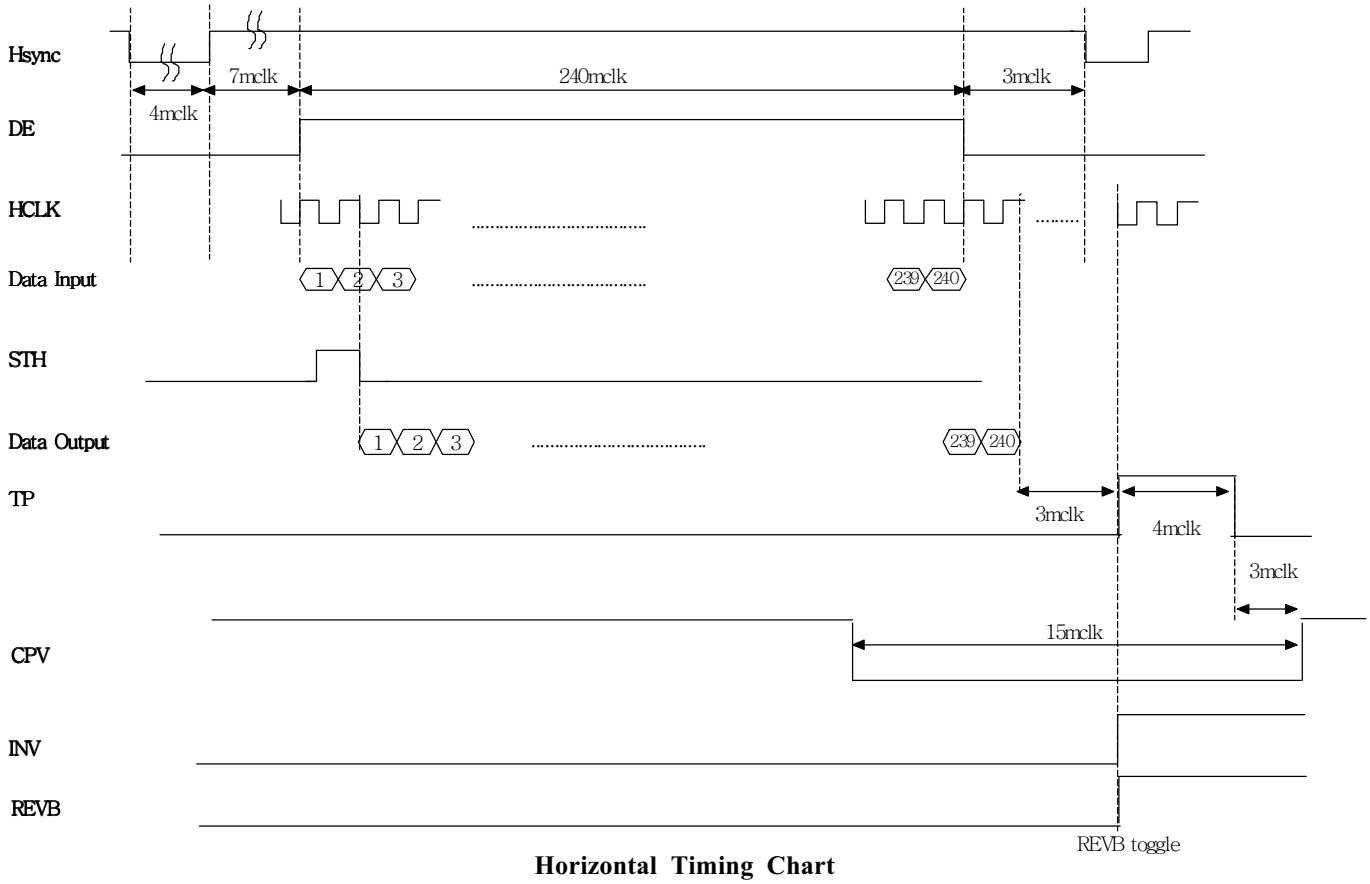
7.1 Timing Parameters of TFT-LCD Module Input Signals

ITEM	Symbol	MIN.	TYP.	MAX.	Unit
HCLK frequency	$1/t_{HCLK}$	-	5.0	-	MHz
HCLK pulse low width	t_{WL1}	$0.5t_{HCLK}$	-	-	-
HCLK pulse high width	t_{WH1}	$0.5t_{HCLK}$	-	-	-
STH setup time	t_{ST1}	15	-	-	ns
STH hold time	t_{HD1}	15	-	-	ns
TP setup time	t_{ST2}	15	-	-	ns
TP hold time	t_{HD2}	15	-	-	ns
INV setup time	t_{ST3}	15	-	-	ns
INV hold time	t_{HD3}	15	-	-	ns
STV setup time	t_{ST4}	100	-	-	ns
STV hold time	t_{HD4}	300	-	-	ns
CPV cycle	t_{CPV}	2	-	-	μs
CPV pulse low width	t_{WL2}	500	-	-	ns
CPV pulse high width	t_{WL2}	500	-	-	ns

7.2 Timing Diagrams of Interface Signal



Vertical Timing Chart



Horizontal Timing Chart

Note (1) Vsync, Hsync, DE, Data Input : Timing control IC input signals
REV, REVB : Timing control IC output signals
INV : TFT-LCD module input signal
Others : Timing control IC output and TFT-LCD module input signals
(2) To operate our panel correctly, CPV_SEL should be Low(Ground)

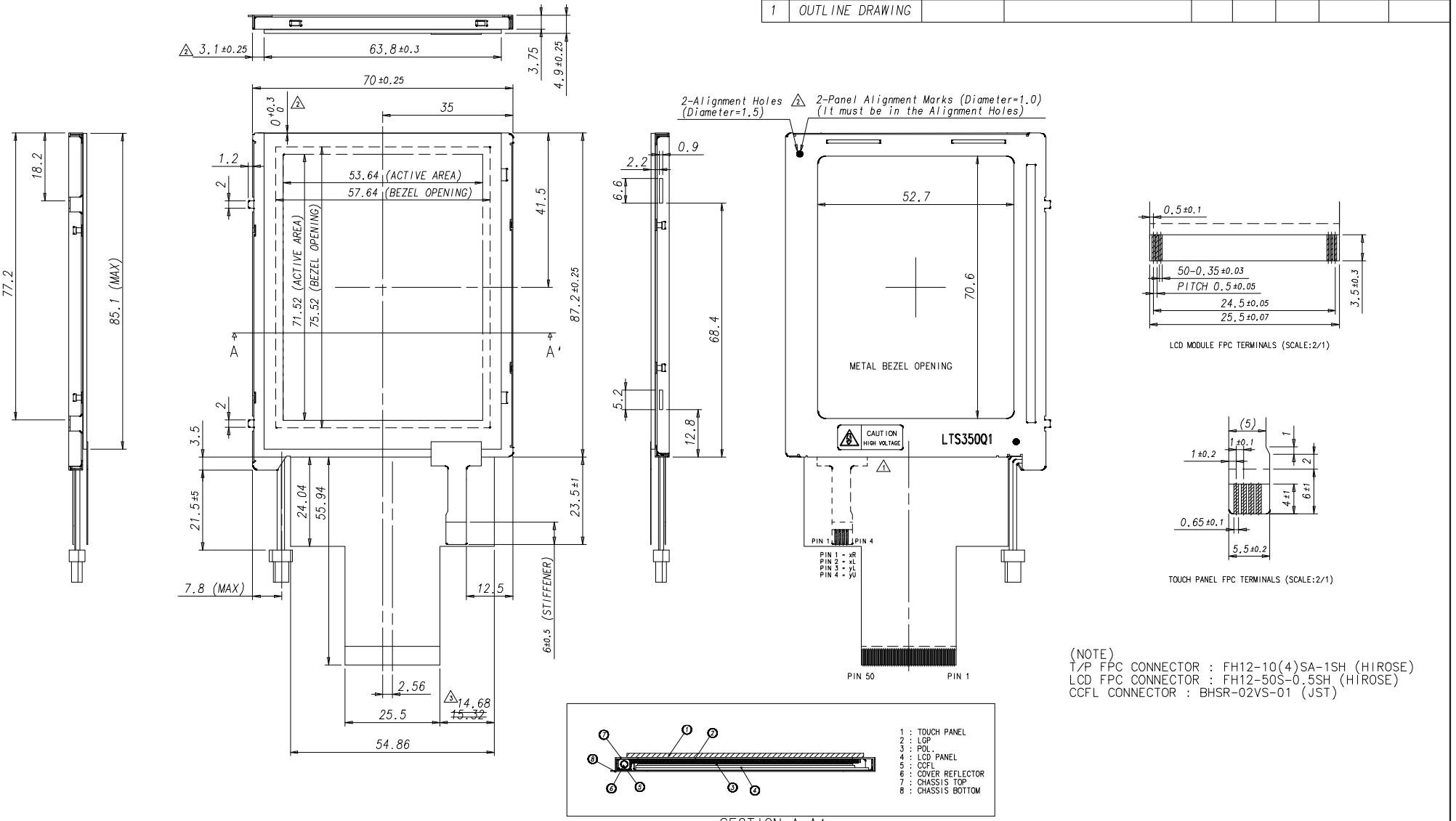
8. Outline Dimensions

8-1. Module Outline Dimensions (Total Assa'y)

- Refer to the Next Page.

FILE NO.

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	WEIGHT		UNFOLDED DIM. OF. MATERIAL	REMARK
					FINISH	MATERIAL		
1	OUTLINE DRAWING							



SECTION A-A'

(NOTE)
T/P FPC CONNECTOR : FH12-10(4)SA-1SH (HIROSE)
LCD FPC CONNECTOR : FH12-50S-0.5SH (HIROSE)
CCFL CONNECTOR : BHSR-02VS-01 (JST)

REVISION

REV	DATE	DESCRIPTION OF REVISION	CHK'D BY
2	02.01.09	⚠3 Changed Panel FPC Dimension	J.B.KIM

GENERAL TOLERANCE

STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X ≤ 4	±0.05	±0.1	±0.2
4 < X ≤ 16	±0.08	±0.15	±0.3
16 < X ≤ 64	±0.12	±0.25	±0.5
64 < X ≤ 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION	REASON	CHK'D BY
1	01.08.28	⚠1 Added Caution Mark, ⚠2 Added Alignment Spec.	-	J.B.KIM

UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY
SCALE	1/1	J.B.KIM		K.H.KHO	I.S.LEE
TOLERANCE		2001.07.12		2001.07.12	2001.07.12

SAMSUNG ELECTRONICS

SPEC. NO: SDS05224-002

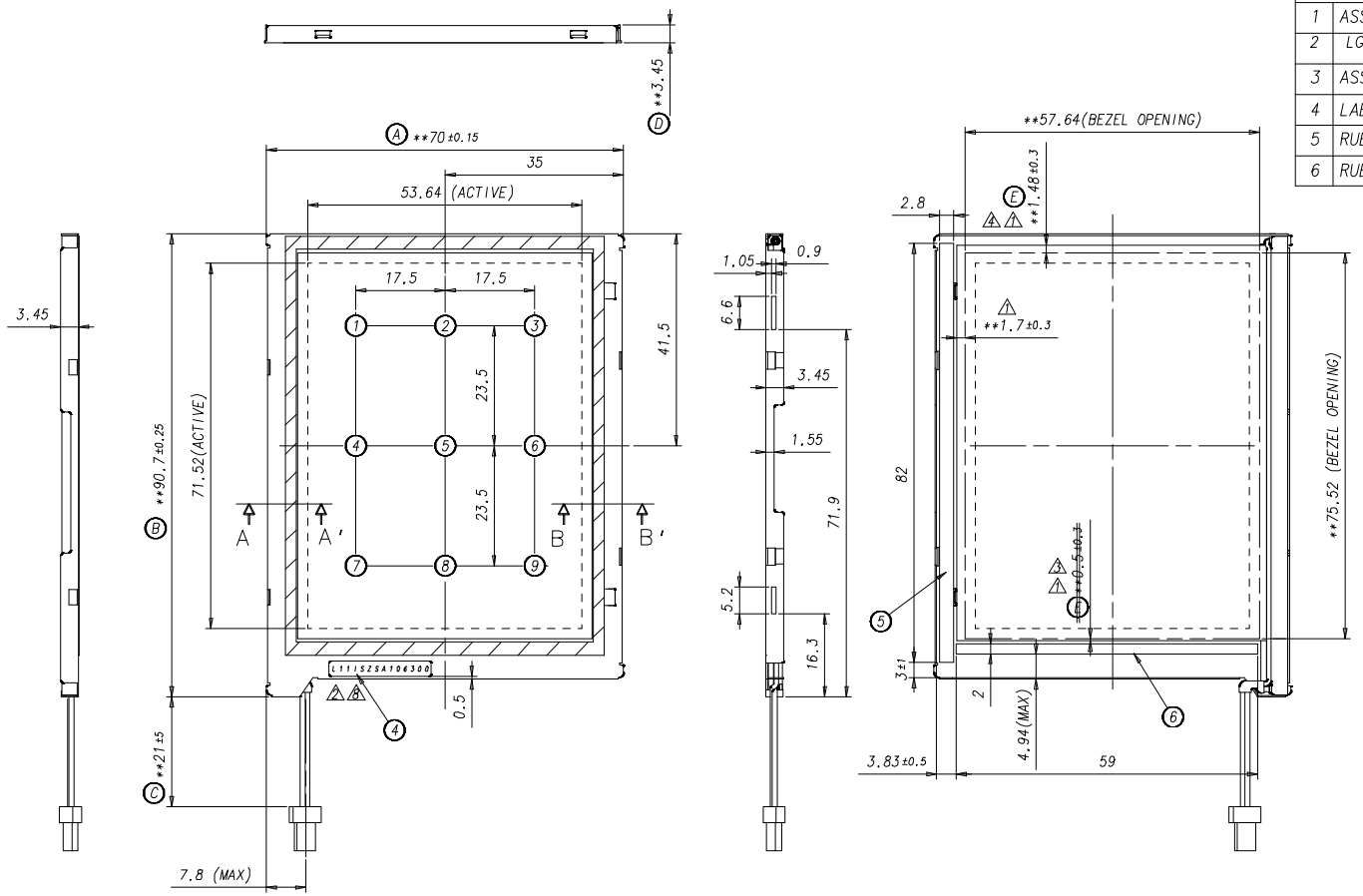
MODEL NAME	LTS350Q1-PD1		
PART/SHEET NAME	OUTLINE DRAWING	SHEET	1/1
CODE NO.	-	VER.	002

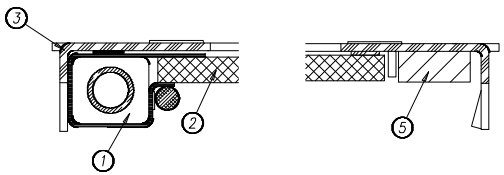
8-2. FLU Outline Dimensions

- Refer to the Next Page.

FILE NO.

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	REMARK
	ASSY-F/L	LJ96-00496A	D1.8,L86.0,2PIN,LTS350Q1	1	SDS07567
1	ASSY-LAMP	LJ91-00352A	D1.8,L86.0,2PIN,LTS350Q1	1	SDS05214
2	LGP △	LJ61-00580A LJ61-00712A	ZEONOR,AR COAT,LTS350Q1 ZEONOR,AR COAT,LTS350Q1	1	SDS05220 SDS07700
3	ASSY-CHASSIS,TOP	LJ97-00134A	SUS301,0.3T,LTS350Q1	1	SDS05222
4	LABEL-CODE(F/L)	LJ68-00058A	PET,WHT,LTS350Q1	1	SDS05228
5	RUBBER	-	BLK,L82,W2.8,D1.2	1	-
6	RUBBER	-	BLK,L59,W2.0,D1.2	1	-





SECTION A-A' (S=5:1)

SECTION B-B' (S=5:1)

1. LABEL-CODE(F/L) SPEC.

L X X X X X S A X X X X X X L111SZSA106300
1 2 3 4 5 6 7 8 9

1. F/L MAKER CODE — Ⓐ~Ⓔ : ELITECOM
2. CCFL MAKER CODE — 1 : KUMHO, 2 : WEST
3. CCFL LOT NO. △
4. LGP MAKER CODE — S : SAMSUNG TECHWIN, N : NANOLCD
5. LGP CAVITY — CAVITY 1 : A △, CAVITY 2 : B
6. YEAR CODE
7. MONTHLY CODE
8. DATE CODE
9. REVISION NO. △

2. INSPECTION POINTS : Ⓐ ~ Ⓔ
3. BRIGHTNESS MEASURE POINTS : ① ~ ⑨
4. ** IS VERY IMPORTANT DIMENSION.
5. F/L UNIT SPECIFICATION

SPEC. ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Brightness	Br	25	30	-	cd/m^2	CENTER POINT
Coordinates of Chromaticity	Wx	-	0.310	-		±0.02
	Wy	-	0.340	-		
Lamp Voltage	V_L	-	(300)	-	Vrms	Frequency :60 kHz (TYP.)
Lamp Current	IL	-	1.5	4	mArms	
Power Consumption	PL	-	450	-	mW	-
Uniformity	Fu	60	-	-	%	(Min./Max.)x100

<NOTE> Brightness measurement must be done on the reference reflective LCD panel
- BM7 Field : 1°, 25 ±2℃

△6. F/L UNIT WEIGHT : 13±2g

7. HIGH VOLTAGE TEST SPEC.
-VOLTAGE : AC 1.0KV(RMS)
-CUTOFF CURRENT : 0.4mA
-DURATION TIME : 1 sec

REVISION

REV	DATE	DESCRIPTION OF REVISION	CHK'D BY
5	01.12.26	△5 Changed Label (Changed F/L Maker Code)	J.B.KIM
4	01.11.28	△4 Added Part(LGP for common use)	J.B.KIM
3	01.11.16	△6 Changed Label (Added Revision No.)	J.B.KIM
3	01.11.16	△5 Added Spec (Weight Spec & High Voltage Test Spec)	J.B.KIM
3	01.11.16	△3 Delete Dimension, △4 Changed Inspection Point	J.B.KIM
2	01.11.02	△2 Changed Label (Added CCFL Lot No. & LGP Cavity)	J.B.KIM

GENERAL TOLERANCE

STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X ≤ 4	±0.05	±0.1	±0.2
4 < X ≤ 16	±0.08	±0.15	±0.3
16 < X ≤ 64	±0.12	±0.25	±0.5
64 < X ≤ 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY
1	01.09.18	△1 Changed Tolerances (3 Points)	J.B.KIM		K.H.KHO	I.S.LEE

UNIT mm | SCALE 1/1 | TOLERANCE LEVEL 2 | 2001.09.11 | 2001.09.12 | 2001.09.12

SAMSUNG ELECTRONICS

SPEC. NO SDS07567-005

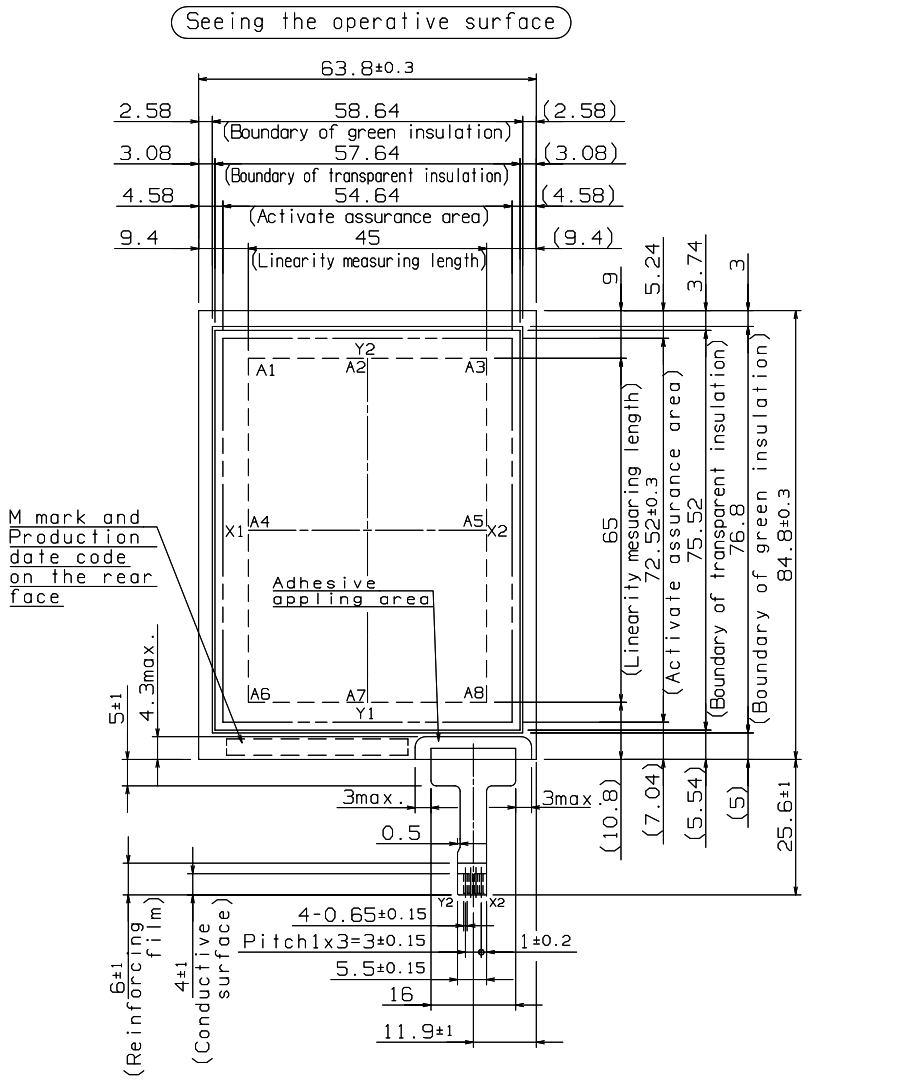
Realization of Dimensions J.B.KIM
REASON CHK'D BY

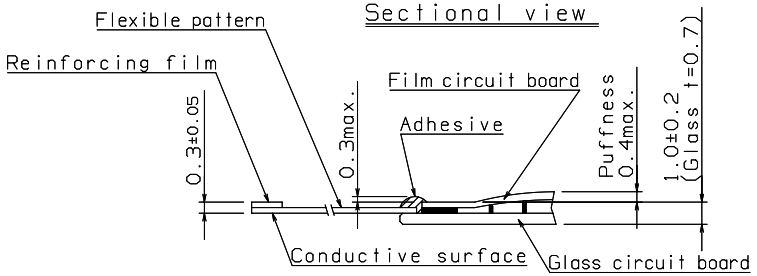
MODEL NAME	LTS350Q1-PD1		
PART/SHEET NAME	ASSY-F/L	SHEET	1/1
CODE NO.	LJ96-00496A	VER.	005

8-3. Touch Panel Outline Dimensions

- Refer to the Next Page.

Commercial Tolerance	Sym.	Date	Revision	Signed	Checked
±0.5	△				
	△				
	△				
	△				





Note: Our transparent touch panel forms all of wiring patterns except for FPC part on the side of the glass.

M mark

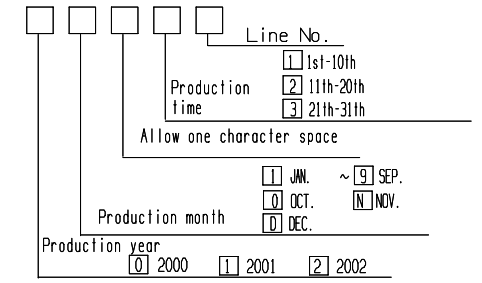
Specification

Subject to Specification 151-EMU601A2SA00 for EMU60 type individual except for the following items.

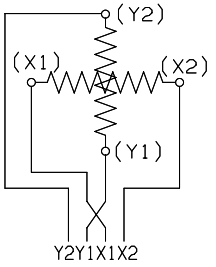
Packing specification:The standerd quantity per packing case shall be 200 pcs.

Items		Specification	Remarks
9 Electric characteristics	9-1 Terminal resistance	X: 150Ω~ 630Ω (typical:340Ω) Y: 180Ω~ 720Ω (typical:360Ω)	X:Glass Y:Film
	9-2 Linearity	X: ± 1.5 %max. Y: ± 1.5 %max.	(Measuring method) Linearity(%)= $\frac{\Delta V}{EV - SV}$ X 100 ΔV: the difference between the ideal voltage and measured voltage on the each measuring line. SV:Voltage of Starting Points (X axis:A1,A4,A6 , Y axis:A1,A2,A3) EV:Voltage of Ending Points (X axis:A3,A5,A8 , Y axis:A6,A7,A8) Measuring line X axis:A1-A3,A4-A5,A6-A8 Y axis:A1-A6,A2-A7,A3-A8
	Effective potential ratio	X: 55 % min. Y: 60 % min.	Percentage divided the value of the electric potential at the both ends in the Linearity measuring length by the value of the apply voltage. (The points at the both ends to be measured) X:A1A3,A4A5,A6A8 Y:A1A6,A2A7,A3A8
10 Optical characteristics	10-1 Total light transparency	83%(typical)	Visible Radiation Haze 2%(typ.)
Product weight		11 g± 3g	

Production Date Code indicating method



Circuit diagram



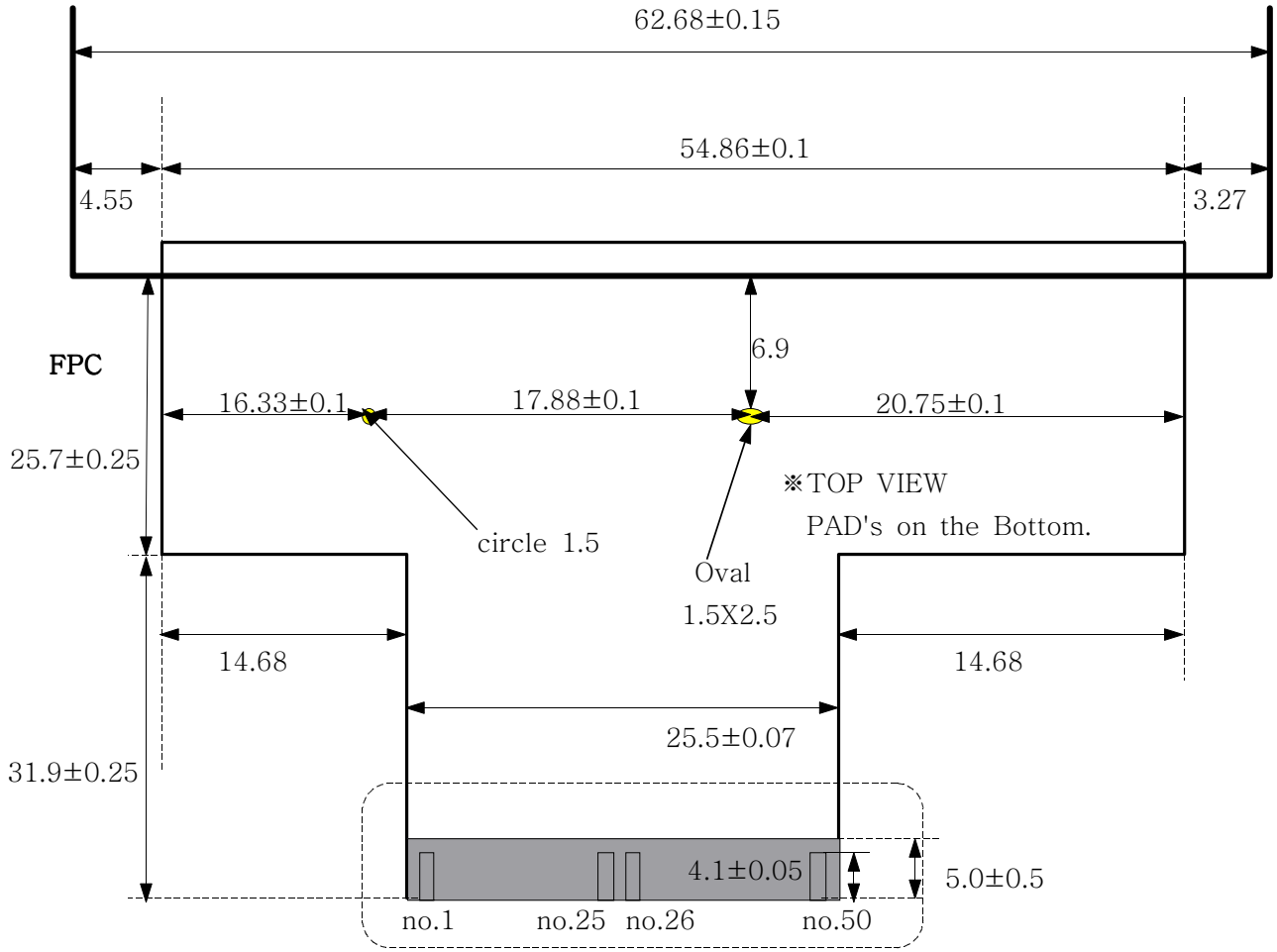
Sym.	Item or Code No.	Material & Size	qt.	Process	Remarks
4	Flexible pattern	Polyester film 25μ	—	Cu-Sn/Pb type	Printing layer
3	Adhesive	———	—	———	———
2	Glass circuit board	Glass t=0.7	—	———	———
1	Film circuit board	Polyester film t=0.18	—	Clear type	———

Esta.Date	Oct.26.2001		Promul
Enfo.Date	Oct.26.2001		

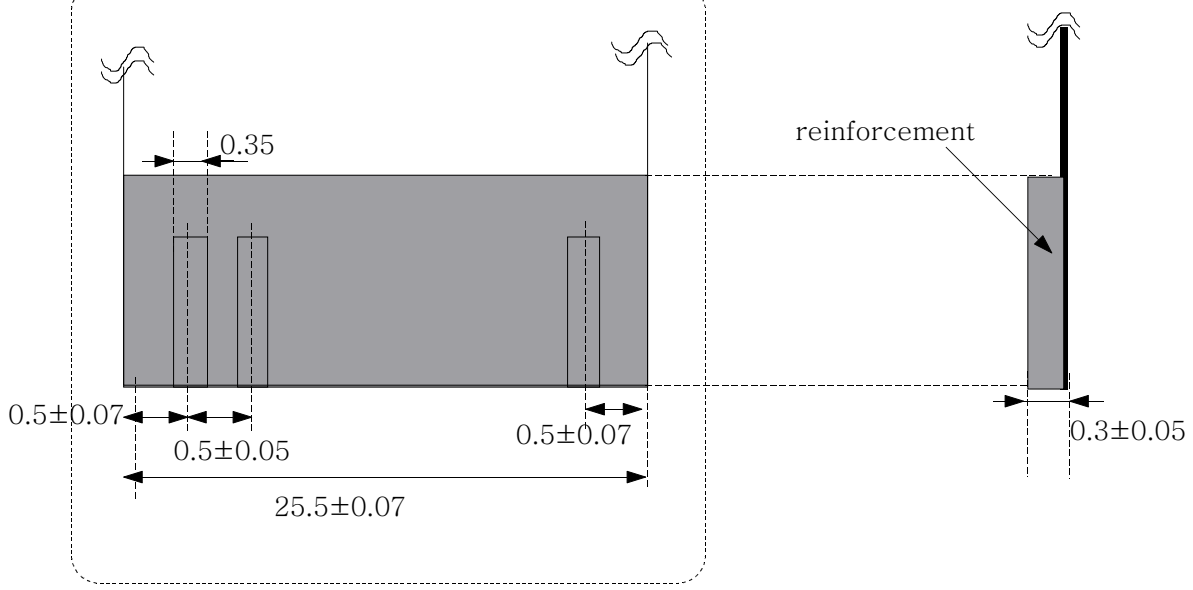
Scale	Designed	Drawn	Traced	Checked	Enacted
1/1	K.okamoto Oct.26.2001	K.okamoto Oct.26.2001	K.Wate Oct.26.2001		

Specification	Customer	SAMSUNG
Name	Transparent touch panel	
Part No.	EMU601A2SA00	
Drawing No.	151-EMU-601A2SA00 (R)	

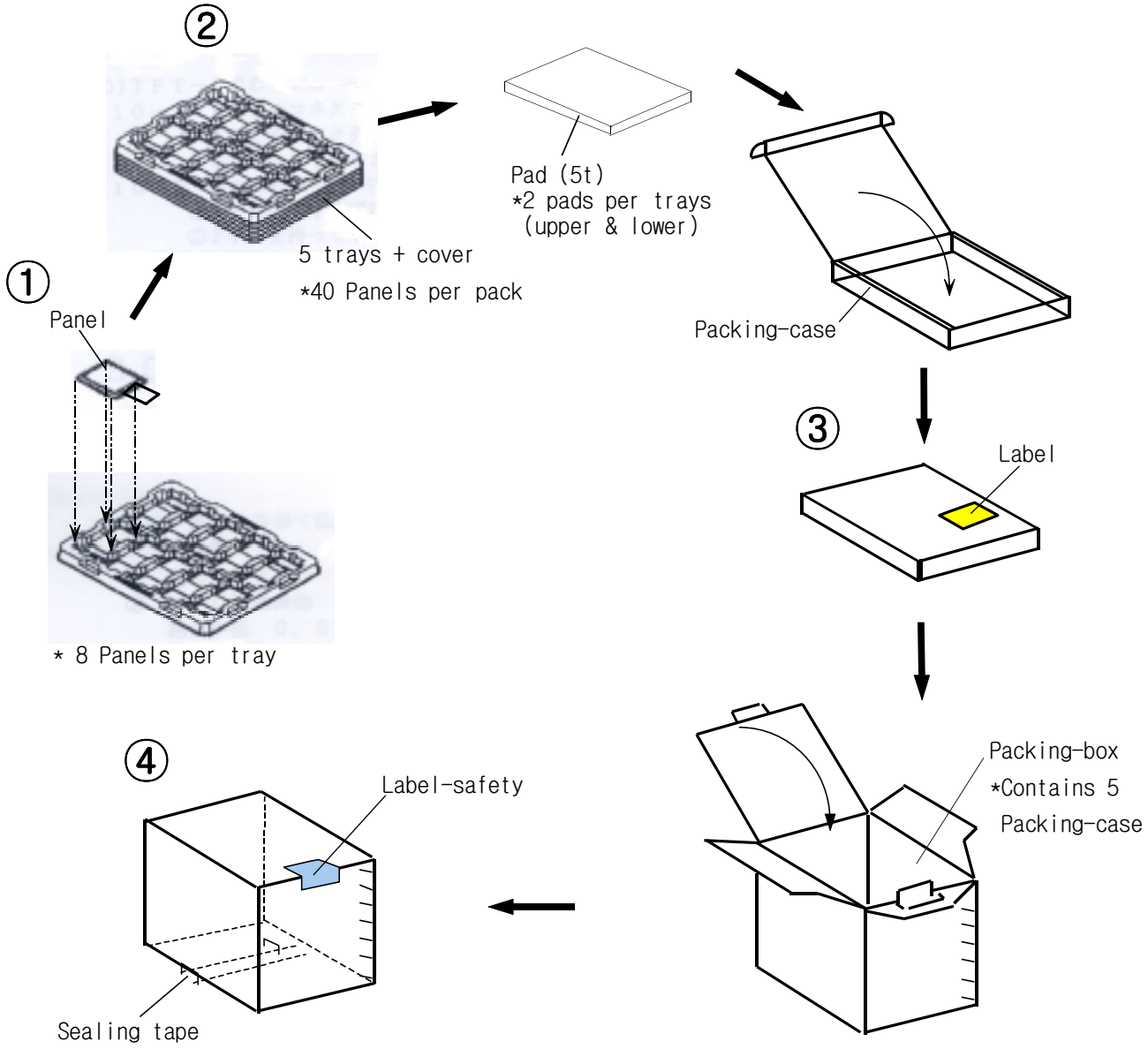
9. FPC Outline Dimension



Cross-sectional view



10. PACKING :



Note (1) Total : Case: Approx. 3.5Kg
Box: Approx. 18Kg

(2) Size : Case: 490(W) x 342(D) x 58(H)
Box: 505(W) x 355(D) x 300(H)

(3) Place the panels in the tray facing the direction shown in the figure.

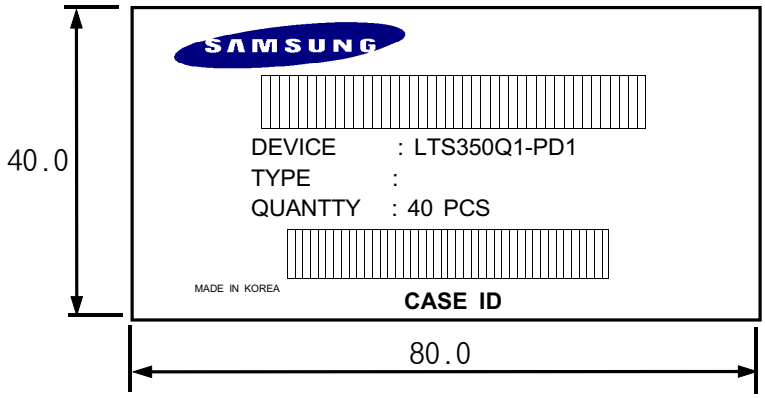
(4) Place 5 tray and cover(empty tray) and pads inside the packing-case.

(5) Place 5 packing-case inside the packing-box.(Affix the label)

(6) Seal the packing-box. Affix the label-safety.

11. MARKING & OTHERS :

(1) Packing case attach



CASE ID : V 00 00 00001

- Serial No.(00001-99999)
- Week
- Year
- Device

12. General Precautions

12.1 Handling

(a) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bend the module.

(b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

(e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(f) The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(h) Protect the module from static , it may cause damage to the CMOS Gate Array IC.

(i) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(j) Do not disassemble the module.

(k) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(l) Pins of I/F connector shall not be touched directly with bare hands.

12.2 Storage

(a) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35° C and relative humidity of less than 70%.

(b) Do not store the TFT-LCD module in direct sunlight.

(c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

12.3 Operation

(a) Do not connect, disconnect the module in the "Power On" condition.

(b) Power supply should always be turned on/off by the item 3.1 "Power on/off sequence"

12.4 Others

(a) The liquid-crystal is deteriorated by ultraviolet rays. Do not leave it in direct sunlight and strong ultraviolet rays for many hours.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the panel may be damaged.

(d) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image "Sticks" to the screen.

(e) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

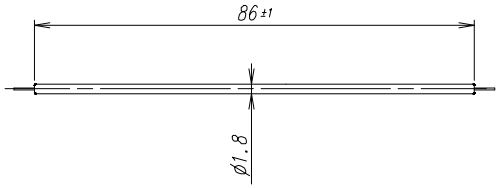
Appendix 1

CCFL Specifications

- Refer to the Next Page

FILE NO.

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	WEIGHT		UNFOLDED DIM. OF. MATERIAL	REMARK
					FINISH	MATERIAL		
1	LAMP-CCFL	LJ47-00139A	D1.8,L86.0,LTS350Q1	1				



<LAMP SPECIFICATION>

1. Initial Characteristics

NO	Items	Code	Unit		Requirement MIN	TYP	MAX	REMARKS
1	Lamp Current	I_L	mArms		1.0	2.0	4.0	
2	Lamp Voltage	V_L	Vrms		350 ± 25 Vrms(at : 1mA) 325 ± 23 Vrms(at : 2mA) 310 ± 22 Vrms(at : 3mA) 300 ± 21 Vrms(at : 4mA)			
3	Start up Voltage	Es	Vrms	25°C	-	-	595	
				0°C	-	-	715	
4	Luminance	B	cd/m²		7000 ± 910cd/m² (at : 1mA) 18000 ± 2350 cd/m² (at : 2mA) 30500 ± 3965 cd/m² (at : 3mA) 39500 ± 5135 cd/m² (at : 4mA)			
5	Effective Emission Length	Le	mm		72	-	-	
6	Chromaticity	X			0.305 ±0.01			WEST
		Y			0.304 ±0.01			
7	Chromaticity Uniformity	Δx,Δy			-	-	0.015	
8	Lighting Frenquency	fr	kHz		(50)	-	(80)	
9	Light Spectrum		nm	Red		(610)		
				Green		(545)		
				Blue		(440)		

NO	Items	Code	Unit		Requirement MIN	TYP	MAX	REMARKS
10	Luminance Stabilization Time	Ts		min	-	-	3	
11	Life Time		Hr	25°C	10000	-	-	at 4.0 mA
				0°C	500	-	-	
12	Surface Temperature	T_B	deg		Center(°C)	Hot(°C)	Cold(°C)	
				at;1mA	45	50	50	
				at;2mA	50	65	65	
				at;3mA	57	80	80	
				at;4mA	65	95	95	
13	Phosphor Separation		Ⓐ: No permission B : Up to 1EA C : Up to 6EA D : Don't care					
14	Hg Amount (mg) Min / Typ / Max: 0.4 / 0.9 / 1.5		Gas Pressure (Pa): (11970)		Electrode Type: W		Electrode Length: (Max4.0mm)	Ne : Ar Partial Pressure Ratio: 95:5

Notice1) To reference drawing Specification for Initial characteristics.
All measured characteristics are refered to WEST measuring standards.

REVISION

GENERAL TOLERANCE			
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X ≤ 4	±0.05	±0.1	±0.2
4 < X ≤ 16	±0.08	±0.15	±0.3
16 < X ≤ 64	±0.12	±0.25	±0.5
64 < X ≤ 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION	REASON	CHK'D BY

UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY
SCALE	1/1	J.B.KIM		K.H.KHO	I.S.LEE
TOLERANCE LEVEL 2		2001.09.14		2001.09.18	2001.09.18

SAMSUNG ELECTRONICS

SPEC. NO: SDS07663-000

MODEL NAME	LTS350Q1-PD1		
PART/SHEET NAME	LAMP-CCFL	SHEET	1/1
CODE NO.	LJ47-00139A	VER.	000

Appendix 2

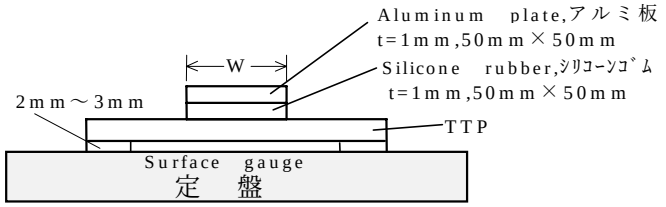
Touch Panel Specifications

- Refer to the Next Page

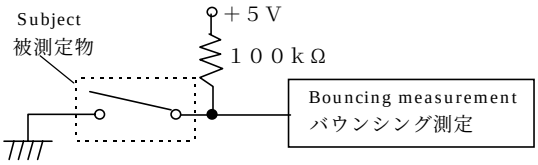
Classification 標準書名	Product specification for information 納　入　仕　様　書	Standard No. (R) 記号番号 151-EMU-601A2SA00 9-1
Item　項目	Specification　仕様	Remarks　備考
1.Product name Code No 製品名、品番	Transparent touch panel　EMU601A2SA□□ 透明タッチパネル	
2.Scope 適用範囲	This specification applies to EMU601A2 analog type pen or finger input transparent touch panels.(Those mentioned in the individual specification shall be given priority.) この仕様書は、EMU601A2 型ペン又は指入力 透明タッチパネルに適用する。（但し、個別仕様書に記載してあるものは、これを優先して適用する）	
3.Application 用途	The products are film / glass type transparent touch panels used as the input devices for general electric appliances and OA equipment. この製品は、一般電気製品及び OA 機器の入力装置として使用するフィルム／ガラス透明タッチパネルである。	
4.Manufacturer 製造元	Administration, Sales and Engineering: Electromechanical Components Division. Matsushita Electronic Components Co., Ltd. Address:1006, Oaza Kadoma, Kadoma City, Osaka Pref. Manufacturing: Electromechanical Components Division. Matsushita Electronic Components Co., Ltd.or Qingdao Matsushita Electronic Components （Free Trade Zone）Co., Ltd. Address:1006, Oaza Kadoma, Kadoma City, Osaka Pref.or 中国山東省青島市青島保税区二期用地 18 号地 1 号 管理部門：松下電子部品（株） 所 在 地：大阪府門真市大字門真 1006 番地 製造部署：松下電子部品（株）又は 青島松下電子部品（保税区）有限会社 所 在 地：大阪府門真市大字門真 1006 番地又は 中国山東省青島市青島保税区二期用地 18 号地 1 号	
5-1 Operating Temperature and humidity 使用温湿度範囲	-10℃～60℃ 20%RH～ 90%RH 但、40℃～60℃は絶対湿度が 40℃90%RH 相当以下 Except for dew gathering. 但し結露は除く。	
5-2 Storage Temperature and humidity 保存温湿度範囲	-20℃～70℃ 20%RH～ 90%RH 但、40℃～70℃は絶対湿度が 40℃90%RH 相当以下 60℃～70℃は 240h 以下 Except for dew gathering. 但し結露は除く。	
6.Shape and dimensions 形状、寸法	As specified in individual drawings 個別図面による。	
7.Rating 定格	DC７Vmax. （５Vtyp.）	
8.Mechanical characteristics 機械的特性		
8-1 Operation force 操作力	0.8N or less (Tip R0.8mm polyacetal pen or Tip R3.75mm,hardness 10 ° to 20 °, silicone rubber operation.) 0.8N 以下（先端 R0.8mm ポリアセタールペンまたは、先端 R3.75mm、硬度 10 °～20 °、シリコーンゴム操作）	
8-2 Impact resistance 耐衝撃性	No damage when φ9mm steel ball is dropped on the surface from 0.3m height at 1 time. φ9 の鋼球を 0.3m の高さから一回落下させて破損なきこと。	
Remarks/Revision　備考／改訂		

Date issued　制定 Oct,26,2001	Electromechanical Components Business Unit 機構部品 ビジネスユニット	Approval 制定権者	Check　管理責任者	Check　検印	Signature　担当者
Date enforced　実施 Oct,26,2001		T.Yagasaki	T.Yagasaki	H,Komiya	K,Okamoto

Custom Components Company　Matsushita Electronic Components Co., Ltd
松下電子部品株式会社　カスタムコンポーネンツカンパニー

Classification 標準書名	Product specification for information 納　入　仕　様　書	Standard No. (R) 記号番号 151-EMU-601A2SA00 9-2
Item　項目	Specification　仕様	Remarks　備考
8-3 Static load resistance 耐静荷重強度	After 45N load is applied to the center area (2500mm^2) of the transparent touch panel, the requirements in 8-1 and 9 shall be satisfied. 透明タッチパネルの中央部 2500mm^{2}を 45N の荷重で 30s 加えた後、8-1 項、第 9 項を満足すること。 	
8-4 Surface hardness 表面硬度	3H or over. (JIS K5400, Pressure 1N,45°.) 3H 以上。(JISK5400 準拠, 押圧 1N,45°)	
8-5 Flexible pattern heat seal peeling strength ﾌﾚｷｼﾌﾞﾙﾊﾟﾀｰﾝﾋｰﾄｼｰﾙﾋﾟｰﾙ強度	0.15N/mm(peeling upward by 90°.) 0.15N/mm (上方向 90°剥離)	
8-6 Flexible pattern bending resistance ﾌﾚｷｼﾌﾞﾙﾊﾟﾀｰﾝ耐屈曲性	Bending 3 times or more by bending radius R1 mm. The requirements in 9-1 shall be satisfied. 屈曲半径 R1mm で屈曲回数 3 回以上。 第 9-1 項を満足すること。	
8-7 Flexible pattern insert/pull out resistance ﾌﾚｷｼﾌﾞﾙﾊﾟﾀｰﾝ耐挿抜性	20 times at least. The requirements in 9-1 shall be satisfied. Type of connector : Japan Molex 5597-□□CPB(1.25mm pitch) 52030-□□10(1.0mm pitch) (Insert/pull-out conditions) One test cycle: Connector unlock⇒Flexible pattern insert⇒Connector lock⇒Connector unlock⇒Flexible pattern pull-out⇒ Connector lock 20 回以上。第 9-1 項を満足すること。 コネクタ種類: 日本モレックス 5597-□□CPB(1.25mm pitch) 52030-□□10(1.0mm pitch) (挿抜条件) ｺﾈｸﾀﾛｯｸ解除⇒ﾌﾚｷｼﾌﾞﾙﾊﾟﾀｰﾝ挿入⇒ｺﾈｸﾀﾛｯｸ⇒ｺﾈｸﾀﾛｯｸ解除⇒ﾌﾚｷｼﾌﾞﾙﾊﾟﾀｰﾝ抜去⇒ｺﾈｸﾀﾛｯｸを 1 回とする。	□□ depend on the number of keys. □□は極数による。
8-8 Vibration resistance(product) 耐振動性(製品)	In operation : No faulty operation when sweep vibration of 2m/s^2,10Hz～55Hz (1min) is given for 30min each in the directions of X, Y, Z. Not in operation : The requirements in 8-1 and 9 shall be satisfied after sweep vibration of 20m/s^2,10Hz～55Hz(1min) is given for 30min each in the directions of X, Y, Z. 動作時：2m/s^2、10Hz～55Hz 周期 1min の掃引振動を X,Y,Z の各方向に 30min 与えても、誤動作しないこと。 非動作時：20m/s^2、10Hz～55Hz 周期 1min の掃引振動を、X,Y,Z の各方向に 30min 与えた後、第 8-1 項、第 9 項を満足すること。	
8-9 Package drop 包装落下	No damage to the product. (1 corner edge, 2 ridges, 4 surfaces, drop from 0.5m height: 0.65m for the bottom) 製品に破損なきこと。 (1 角、2 陵、4 面、0.5m 落下、但し底面は 0.65m 落下)	
Remarks/Revision　備考／改訂		

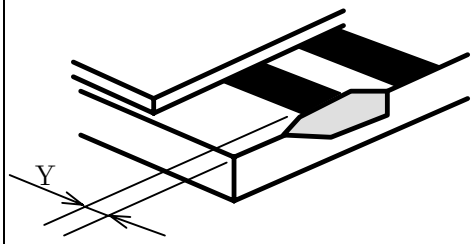
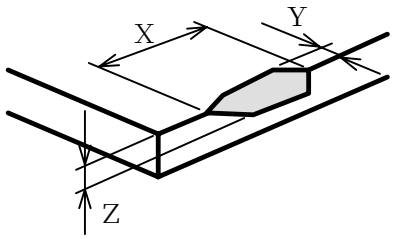
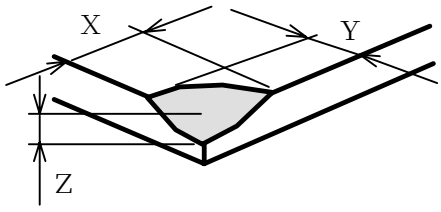
Date issued　制定 Oct,26,2001	Electromechanical Components Business Unit 機構部品 ビジネスユニット	Approval 制定権者	Check 管理責任者	Check 検印	Signature 担当者
Date enforced　実施 Oct,26,2001		T.Yagasaki	T.Yagasaki	H,Komiya	K,Okamoto

Item　項目	Specification　仕様	Remarks　備考
9.Electric characteristics 電気的特性		
9-1 Terminal resistance 端子間抵抗	As specified in individual drawings. 個別図面による。	
9-2 Linearity 直線性	As specified in individual drawings. 個別図面による。	
9-3 Bouncing バウンシング	10ms or less at ON; 10ms or less at OFF. Tip R3.75mm, hardness 10°～20°,silicone rubber 4.5N operation : 400mm/s. ON 時 10ms 以下、OFF 時 10ms 以下。 先端 R3.75mm 硬度 10°～20° シリコーンゴム 4.5N 操作:打鍵速度 400mm/ｓ 	
9-4 Insulation resistance 絶縁抵抗	20 MΩor over (DC25V) 20 MΩ以上　(DC25V)	
10.Optical characteristics 光学的特性		
10-1Light transparency 光線透過率	As specified in individual drawings. 個別図面による。	
10-2 Newton's ring ﾆｭｰﾄﾝﾘﾝｸﾞ	No remarkable Newton's ring in practical use. Visual inspection shall be done at a distance of 0.3m . between eyes and a product at an angles of 60° to the surface of the product under a ceiling fluorescent light (40W,natural color). 実用上問題のあるニュートンリングのなきこと。 天井蛍光灯（40W、自然色）を使用し、目と製品の距離を 0.3m あけ、製品面に対して 60° の角度で目視検査。	
11.Reliability 信頼性		
11-1 Humidity resistance 耐湿性	The requirements in 8-1, 9 and 10 shall be satisfied after exposing at 60℃, 90%RH for 240h (after dehumidifying in the chamber (60℃ and 50%RH max.)) and at normal temperature and humidity for 24h. 60℃、90%RH の槽内に 240h 放置後、60℃、50%RH 以下の湿度で槽内除湿してから、常温常湿に取り出して 24h 放置し、第 8-1 項、第 9 項、第 10 項を満足すること。	Except for dew gathering 出槽時結露注意
11-2 Heat resistance 耐熱性	The requirements in 8-1, 9 and 10 shall be satisfied after exposing at 70℃ for 240h and at normal temperature and humidity for 24 h. 70℃、240h 放置後、常温常湿に 24h 放置し　、第 8-1 項、第 9 項、第 10 項を満足すること。	
11-3 Cold resistance 耐寒性	The requirements in 8-1, 9 and 10 shall be satisfied after exposing at -40℃ for 240h and at normal temperature and humidity for 24h. -40℃、240h 放置後、常温常湿に 24h 放置し 、第 8-1 項、第 9 項、第 10 項を満足すること。	Except for dew gathering 出槽時結露注意
Remarks/Revision　備考／改訂		

Date issued　制定 Oct,26,2001	Electromechanical Components Business Unit 機構部品 ビジネスユニット	Approval 制定権者	Check　管理責任者	Check　検印	Signature　担当者
Date enforced　実施 Oct,26,2001		T.Yagasaki	T.Yagasaki	H,Komiya	K,Okamoto

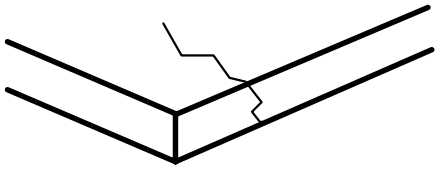
Item　項目	Specification　仕様	Remarks　備考
11-4 Thermal shock 熱衝撃	The requirements in 8-1, 9 and 10 shall be satisfied after exposing under the conditions of -10℃(1h)⇔60℃(1h) by 20 cycles (taking out at 60℃) and at normal temperature and humidity for 24h. -10℃（1h）⇔60℃（1h）を 1 サイクルとした条件中に 20 サイクル放置後、常温常湿に 24h 放置し、第 8-1 項、第 9 項、 第 10 項を満足すること。	Except for dew gathering 出槽時結露注意
11-5 Hitting durability 打鍵耐久性	One million times minimum. The requirements in 9 shall be satisfied. The surface shall be free from damage. (Test conditions) Hitting pad : Tip R3.75mm Hardness 10 ° to 20 °. Silicone rubber. Load : 2.45N Hitting speed : Twice/s. Electric load : None 100 万回以上。第 9 項を満足すること。 キズがつかないこと。 （試験条件） 打鍵パッド:先端 R3.75mm 硬度 10 ° ～20 ° シリコーンゴム 荷　重:2.45N 打鍵速度 :2 回/s 電気負荷 :なし	
11-6 Pen sliding durability ペン摺動耐久性	300,000 times minimum. The requirements in 9 shall be satisfied. The surface shall be free from damage. (Test conditions) Sliding pen :Tip R0.8mm Polyacetal pen Load :2.45N Sliding speed:60mm/s Electric load :None 30 万回以上。第 9 項を満足すること。 キズがつかないこと。 （試験条件）摺動ペン:先端 R0.8mm ポリアセタールペン 荷　重:2.45N 摺動速度:60mm/s 電気負荷:なし	
12.Appearance limit standard 外観限度基準		
12-1 Scope 適用範囲	This standard applies to the view area(inside of transparent insulation). For the area outside the view area, it shall be regarded acceptable provided that there is no possibility of causing influences to the performance. However, the Item 12-4 Chip and Crack applies to the whole part of the product. この基準は、ビューエリア内(透明レジスト境界の内側)に適用する。 ビューエリア外については、性能に大きく影響を及ぼす可能性のない限り良品とする。但し、12-4 欠け については製品全体に適用する。	

Remarks/Revision　備考／改訂

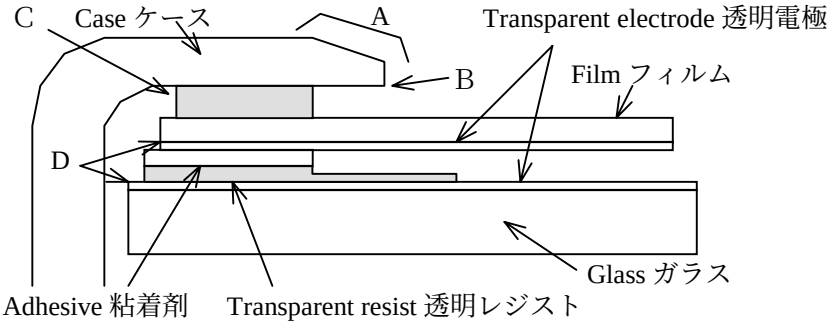
Item　項目	Specification　仕様	Judgment　判定内容
12-2 Dot-like foreign matter 点状異物	A:d≦0.1 B:0.1＜d≦0.2 C: 0.2＜d≦0.3 D:d＞0.3　d(mm): average diameter =(Long dia. + short dia.)/2 A:d≦0.1 B:0.1＜d≦0.2 C: 0.2＜d≦0.3 D:d＞0.3　d(mm):平均直径=(長径＋短径)/2	A: Ignored B: 2　or less C: 1　or less D: Zero A:無視 B:2 個以下 C:1 個以下 D:0 個
12-3 Linear foreign matter 線状異物	A:L＜２.0　and　W＜0.0２ B: 2.0≦L　or　0.02≦W L(mm) : overall length, W(mm): width A:L＜2.0 かつ W＜0.02 B:2.0≦L 又は　0.02≦W L(mm):全長、W(mm):幅	A: Ignored B: Zero A:無視 B:0 個
12-4 Chip and crack 欠けとヒビ	(1)Chip reaching bottom glass pattern 下ガラスパターンにかかる欠け。  	Y≦1mm Y≦1mm とする。
	(2)General chip X: width direction to ridge line. Y: length direction to ridge line. Z: thickness direction to ridge line. t: bottom glass thickness. 一般欠け X はリョウ線に対し巾方向 Y はリョウ線に対し奥方向 Z はリョウ線に対し板厚方向 t は下ガラス厚  	X(mm) / Y(mm) / Z ≦3.0 / ≦3.0 / ≦2/3t
	(3)Corner chip t: bottom glass thickness コーナー部欠け t は下ガラス厚  	X(mm) / Y(mm) / Z ≦3.0 / ≦3.0 / ≦2/3t

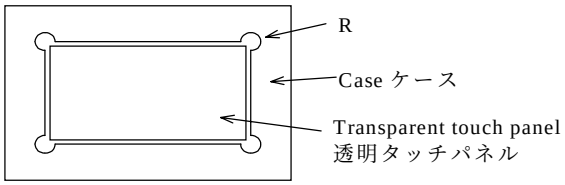
Remarks/Revision　備考／改訂

Date issued　制定 Oct,26,2001	Electromechanical Components Business Unit 機構部品 ビジネスユニット	Approval 制定権者	Check 管理責任者	Check 検印	Signature 担当者
Date enforced　実施 Oct,26,2001		T.Yagasaki	T.Yagasaki	H,Komiya	K,Okamoto

Item　項目	Specification　仕様	Judgment　判定内容
12-4 Chip and crack 欠けとヒビ	(4)Bad crack (possibly expanding) 進行性のあるヒビ。 	All shall be rejected. 全て不良とする。
12-5 Scratch キズ	A:L<3and W＜0.05 B: 3≦L or 0.05≦W L(mm): overall length　W(mm): width A:L<3 かつ W＜0.05 B: 3≦L 又は 0.05≦W L(mm):全長 W(mm):幅	A: Ignored B: Zero A:無視 B:0 個
12-6 Fish eye 打痕、気泡	A:D≦0.2 B:0.2＜D≦0.4 C:D＞0.4　D(mm): average diameter =(Long dia. + short dia.)/2 A:D≦0.2 B:0.2＜D≦0.4 C:D＞0.4　D(mm):平均直径=(長径＋短径)/2	A: Ignored B: 2 or less C: Zero A:無視 B:2 個以下 C:0 個
12-7 Stain Upper electrode slack Film break 汚れ、上部電極ﾀﾙﾐ ﾌｨﾙﾑ折れ	Not excessive 目立たぬこと	
12-8 Others その他	This specification is considered as basic on transparent touch panels, but details are subject to discussion upon individual customer requirement. 本仕様での運用を基本とするが、疑義を生じた場合は別途協議する。	
13.Precautions for use 使用上の注意事項	In order to prevent accidental use and performance deterioration, please keep the following precautions and inhibited points. ご使用に際しては、不安全事故や性能劣化等の未然防止のため、以下に記します注意事項についてのご配慮と禁止事項の厳守をお願い致します。	
13-1 Cautions for storage 保存に関する注意事項	Store the products at the temperature and humidity mentioned in the specification in a state of package with care not to expose the products to the direct sunlight or stresses. 保存は仕様書に決められた温湿度内で、製品に直射日光、応力を加えないよう梱包状態のまま行って下さい。	
13-2 Cautions for unpacking 開梱に関する注意事項	Check the vertical direction before unpacking. 上下方向を確認して開梱して下さい。	
13-3 Cautions for handling 取り扱いに関する注意事項	①Transparency is an important factor for the transparent touch panel. So, please wear clean finger sacks, gloves and mask to protect the products from fingerprint or stain, and also hold the portion outside the view area when handling the panel. 透明タッチパネルは透明性が重要な機能となっていますので、製品に指紋、汚れが付着しないよう、清浄な指サック、手袋やマスク等を着用し、ビューエリア外をもってお取り扱い下さい。 ②The glass edges are not chamfered. So, use finger sacks or gloves to avoid injuries by sharp edges when handling the panel. ガラス面は面取りされておりません。鋭利な部分がありますので指サックや手袋を必ず使用の上、取り扱いには充分ご注意下さい。	
Remarks/Revision　備考／改訂		

Date issued　制定 Oct,26,2001	Electromechanical Components Business Unit 機構部品 ビジネスユニット	Approval 制定権者	Check　管理責任者	Check　検印	Signature　担当者
Date enforced　実施 Oct,26,2001		T.Yagasaki	T.Yagasaki	H,Komiya	K,Okamoto

Item　項目	Specification　仕様
	【Inhibition】 ・Do not handle the transparent touch panel by holding the flexible pattern portion in order to assure the reliability. ・Do not put one product on the other. It may otherwise cause the product to be scratched. ・Do not put a heavy, hard or sharp object on the transparent touch panel. 【禁止事項】 ・信頼性確保のため透明パッチパネルのフレキシブルパターン部を持って取り扱わないで下さい。 ・製品にキズをつける恐れがあるため、重ね置きはしないで下さい。 ・透明タッチパネルの上に重量物や硬い物、鋭利な物を置かないで下さい。
13-4 Cautions for installing and assembling 実装、組立上の注意事項	① Do not give excessive strain to the transparent touch panel. 透明タッチパネルに無理な歪みを与えないようにして下さい。 ②Flexible pattern cable is connected to the body by heat-seal (thermal pressure) method. So, do not apply excessive forces to the flexible pattern. 透明タッチパネルのフレキシブルパターンは熱圧着により結線されていますので、フレキシブルパターン根元に無理な力が加わらないようにして下さい。 ③ In order not to apply load on the display, provide a clearance of at least 0.3mm between touch panel and display. 透明タッチパネルとディスプレイの間はうねりや透明タッチパネル操作時のたわみを考慮し、スキマ（目安 0.3mm～0.7mm）を設けるようにしてディスプレイに負荷等かからない様に取り付けることが好ましいです。 ④Pressing the boundary area (around A of the sketch shown below) of adhesive and transparent resist may cause faulty operation. So, design its structure impossible to press the area around A by using a case, etc. Particularly the area B shall be free from burr, etc. It is recommended to provide a buffer material at clearance C. 粘着剤や透明レジストの境界部分（下図 A 付近、ビューエリア内）を押さえると誤動作する恐れがありますので、スキマ C 部に緩衝材を設ける等をして A 部付近（ビューエリア、動作エリア間）を押さえることの出来ない構造にして下さい。 特に B 部にはバリ等のないようにして下さい。 又、ケース先端が動作エリアまで入らないように設計下さい。  Respective transparent electrodes for film and glass do not perform pattern etching. Therefore, design the construction not to touch conductive material on the end part D. フィルム及びガラスの透明電極はパターンエッチングされていませんので、端部 D 部に導電性材料がタッチしないよう設計して下さい。 【Inhibition】 To avoid giving strain to Film, do not bond the upper Film board to the case or the buffer. 【禁止事項】 フィルムへの歪みを避けるためフィルム基板とケース又はケースに接着された緩衝材等の接着固定しないで下さい。
Remarks/Revision　備考／改訂	

Item　項目	Specification　仕様
	⑤ In case of the transparent touch panel is provided with an air groove, please design the surrounding structure not to store any liquid nor any fine particles. 透明タッチパネルに空気溝を設けてある場合は、この付近に液状物や微粉体が貯まらないケース構造として下さい。 ⑥ Wipe off the stain on the transparent touch panel by using soft cloth moistened with ethanol. Take care not to allow ethanol to soak into the joint of upper Film and bottom glass. It may otherwise cause peeling or defective operation. 透明タッチパネルの表面の汚れは、エタノールを少し含ませた柔らかい布等で拭き取って下さい。但し、エタノールがフィルムーガラス貼り合せ部分にしみこみますと剥がれ、動作不良の原因となりますのでご注意下さい。 【Inhibition】 Do not use any organic solvent or detergent other than ethanol. 【禁止事項】 エタノール以外の有機溶剤や洗剤は使用しないで下さい。 ⑦ The corners of the transparent touch panel are not chamfered and are sharp-edged. When positioning and fixing the transparent touch panel on the case, provide a R part on the corner of the case so as not to apply load on the corner of the transparent touch panel. 透明タッチパネルのコーナー部は面取りされておらず鋭利な部分がありますので、透明タッチパネルをケースで位置決め、固定される場合は下図のようにケースのコーナーにR部を設ける等をして透明タッチパネルのコーナー部に負荷がかからないようにして下さい。 
13-5 Cautions for operation 操作上の注意事項	①Operate it with a polyacetal pen (tip R0.8mm or over) or a finger without applying excessive load. 操作は先端 R0.8mm 以上のポリアセタールペン、又は指で行い、無理な荷重をかけないで下さい。 【Inhibition】 Do not operate it with a thing except a poyacetal pen (tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil. 【禁止事項】 上記先端 R0.8mm 未満のポリアセタールペン、又は指以外の物、特にボールペン、ｼｬｰﾌﾟﾍﾟﾝｼﾙの先等の先端の硬い物や先端の鋭利なもので操作しないで下さい。 ②The input position may be fluctuated a little through long-time use. It is desirable to provide a zero-adjustment function by using a circuit and software. 長時間ご使用されると、入力位置がずれることがあります。回路及びソフトウェアーでの入力位置補正機能を設けていただくようにお願いいたします。 ③Use ethanol to remove stain from the touch panel surface. If ethanol soaks into the joint of upper film and bottom glass, it may cause peeling and defective operation. 透明タッチパネル表面の汚れ等の除去については、エタノール系で拭き取って下さい。但し、エタノールがフィルムーガラス貼り合せ部分にしみこみますと剥がれ、動作不良の原因となりますのでご注意下さい。 【Inhibition】 Do not use alkaline detergents including glass cleaner, manicure remover (toluene), benzine or other organic solvents. 【禁止事項】 エタノール以外の有機溶剤は使用しないで下さい。 （ガラスクリーナー等のアルカリ洗剤、マニキュア除去液（ﾄﾙｴﾝ）、ﾍﾞﾝｼﾞﾝ等）
Remarks/Revision　備考／改訂	

Date issued　制定 Oct,26,2001	Electromechanical Components Business Unit 機構部品 ビジネスユニット	Approval 制定権者	Check 管理責任者	Check 検印	Signature 担当者
Date enforced　実施 Oct,26,2001		T.Yagasaki	T.Yagasaki	H,Komiya	K,Okamoto

Item　項目	Specification　仕様
13-6 Application notes for circuit condition 回路条件に関する注意事項	①Use for set Although full care is taken to ensure product quality, failure modes such as degradation, short circuits, or open circuits might be caused. Therefore, to design a product set, study the affects of any single failure of the panel in advance and consider fail-safe design to secure the safety of the system. セットへのご使用にあたって。 当製品の品質には万全をつくしておりますが、破壊、寿命などの故障モードとして性能劣化、ショート、オープン等が発生する恐れがあります。 したがってセットの設計に際しては、部品の単一故障に対しセットとしてどうなるか?を事前にご検討いただき、システムとして安全を図るためフェール・セーフ設計の配慮を十分に行い、安全性の確保をお願いします。
13-7 Other cautions その他の注意事項	①Please note that dew gathering in the panel due to abrupt temperature or humidity change, etc. may cause deterioration of the performance. 急激な温湿度変化等によるパネル内部の結露発生は性能劣化の原因となりますで充分ご注意下さい。 ②The glass of transparent touch panels may break due to a set's drop or overload on the panels. (It is difficult to avoid the break by nature.) Besides, the broken glass may cause injuries. Therefore, take care not to break the glass of transparent touch panels when handling the set, and add the following notes to the product operation manual and the product itself to avoid injuries by the broken glass. 1)When handling the product, take care not to break the transparent touch panel. 2)In case the transparent touch panel is broken, do not touch the panel bare-handed to prevent injuries, and contact a service center immediately. セットの落下、透明タッチパネルへの過荷重等により透明タッチパネルのガラス割れが発生する恐れがあります。（これを本質的に防ぐことは困難です。） また、この割れたガラスによって怪我を招く恐れがあります。 従って、透明タッチパネルのガラスが割れないように取扱いに注意していただくとともに、割れたガラスにより怪我をしないように貴社製品の取扱い説明書と製品本体に下記内容の警告表示をお願いします。 1）透明タッチパネルが割れないように取扱ってください。 2）透明タッチパネルが割れた場合、怪我をする恐れがあるため、製品に素手で直接触らず、貴社サービスセンターへ連絡して下さい。
14. Handling of product specification for information 納入仕様書の取り扱い	① This specification shall guarantee the quality of the panel alone. For actual use, be sure to check and evaluate the product set with the panel installed in your equipment. 本納入仕様書は、単体での品質を保証するものです。ご使用に際しては、御社製品に取り付けされた状態で必ず確認、評価をして下さい。 ② After evaluation, please put your approval stamp on our submitted specification and return us two copies of the specification. In case the copies are not returned to us even 3 months after the issued date described in the specification, we will regard that you have approved the contents of the specification. ご確認後、本納入仕様書に御社受領印を捺印の上、2 部を弊社へご返却下さい。 納入仕様書表紙に記載の発行日より 3 ヶ月を経過してもご返却頂けない場合は、本納入仕様書の内容を御了承いただけたものとさせて頂きますので、宜しく御了解願います。 ③Any change of the specification is subject to discussion prior to the actual changes. 本納入仕様書の内容の変更については、御社と事前協議の上実施させて頂きます。
Remarks/Revision　備考／改訂	

Date issued　制定 Oct,26,2001	Electromechanical Components Business Unit 機構部品 ビジネスユニット	Approval 制定権者	Check　管理責任者	Check　検印	Signature　担当者
Date enforced　実施 Oct,26,2001		T.Yagasaki	T.Yagasaki	H,Komiya	K,Okamoto

Appendix 3

Timing Control IC Specifications

- Refer to the Next Page

(Preliminary)

(Rev. 1)

3.5” Reflective Type a-si TFT LCD

Timing Controller Spec.

(240 x 320 , Portrait Type)

(for ASIC by SEC)

ISSUE DATE : Dec. 11. 2001

MODEL :

Produced by : Ho-suk Maeng
Approved by : Hyong-gon Lee

Samsung Electronics Co . , LTD.

1. General Description

Timing control IC for QVGA(240x320) portrait LCD Panel.

2. Feature

- Resolution : 240(horizontal) x RGB x 320(vertical)
- Voltage : 3.3V
- 6bit x RGB DATA
- DE mode / Sync mode
- CPV pulse low width selection

3. Pin Description

PIN	DIRECTION	PIN #	FUNCTION AND APPLICATION
MCLK	I	1	Main Clock
GND1		2	Ground
DE	I	3	DE signal input
VSYNC	I	4	Vertical sync
HSYNC	I	5	Horizontal sync
R0_I	I	6	Red 0 bit data input (LSB)
R1_I	I	7	Red 1 bit data input
R2_I	I	8	Red 2 bit data input
R3_I	I	9	Red 3 bit data input
R4_I	I	10	Red 4 bit data input
R5_I	I	11	Red 5 bit data input (MSB)
VDD1		12	Power(3.3V)
G0_I	I	13	Green 0 bit data input (LSB)
G1_I	I	14	Green 1 bit data input
G2_I	I	15	Green 2 bit data input
GND2		16	Ground
G3_I	I	17	Green 3 bit data input
G4_I	I	18	Green 4 bit data input
G5_I	I	19	Green 5 bit data input (MSB)
GND3		20	Ground
B0_I	I	21	Blue 0 bit data input (LSB)
B1_I	I	22	Blue 1 bit data input
B2_I	I	23	Blue 2 bit data input
B3_I	I	24	Blue 3 bit data input
B4_I	I	25	Blue 4 bit data input
B5_I	I	26	Blue 5 bit data input (MSB)
GND4		27	Ground
OE	O	28	Gate Output Enable
CPV	O	29	Clock Pulse(vertical)
VDD2		30	Power(3.3V)
STV	O	31	Start Pulse (vertical)
STH	O	32	Start Pulse (horizontal)

PIN	DIRECTION	PIN #	FUNCTION AND APPLICATION
REV	O	33	Polarity Signal
REVB	O	34	Polarity Signal
TP	O	35	Data Load Signal
GND5		36	Ground
R5	O	37	Red 5 bit data output (MSB)
R4	O	38	Red 4 bit data output
R3	O	39	Red 3 bit data output
R2	O	40	Red 2 bit data output
R1	O	41	Red 1 bit data output
R0	O	42	Red 0 bit data output (LSB)
VDD3		43	Power(3.3V)
G5	O	44	Green 5 bit data output (MSB)
G4	O	45	Green 4 bit data output
G3	O	46	Green 3 bit data output
G2	O	47	Green 2 bit data output
GND6		48	Ground
G1	O	49	Green 1 bit data output
G0	O	50	Green 0 bit data output (LSB)
GND7		51	Ground
B5	O	52	Blue 5 bit data output (MSB)
B4	O	53	Blue4 bit data output
B3	O	54	Blue 3 bit data output
B2	O	55	Blue 2 bit data output
B1	O	56	Blue 1 bit data output
B0	O	57	Blue 0 bit data output (LSB)
VDD4		58	Power(3.3V)
HCLK	O	59	Clock Pulse (horizontal)
CPV_SEL	I	60	CPV_SEL Should be low.(ground)
MODE_SEL	I	61	DE/Sync mode select “1” DE mode “0” Sync mode
RE_SEL	I	62	Resolution select “1” 240X320 “0” 320X240
RST	I	63	Reset
TEST	I	64	TEST

4. Absolute Maximum Rating

Characteristics	Symbol	Ratings	Unit
DC Supply Voltage	V_{DD}	-0.3 to +4.6	V
DC Input Voltage	V_{IN}	-0.3 to V_{DD}+0.3	V
DC Input Current	I_{IN}	±10	mA
Storage Temperature	T_{STG}	-40 to 125	°C

5. Recommended Operating Conditions

Characterisitics	Symbol	Ratings	Unit
DC Supply Voltage	V_{DD}	2.7 to 3.6	V
Operating Temperature	T_A	0 to 70	°C

6. Electrical Characteristics

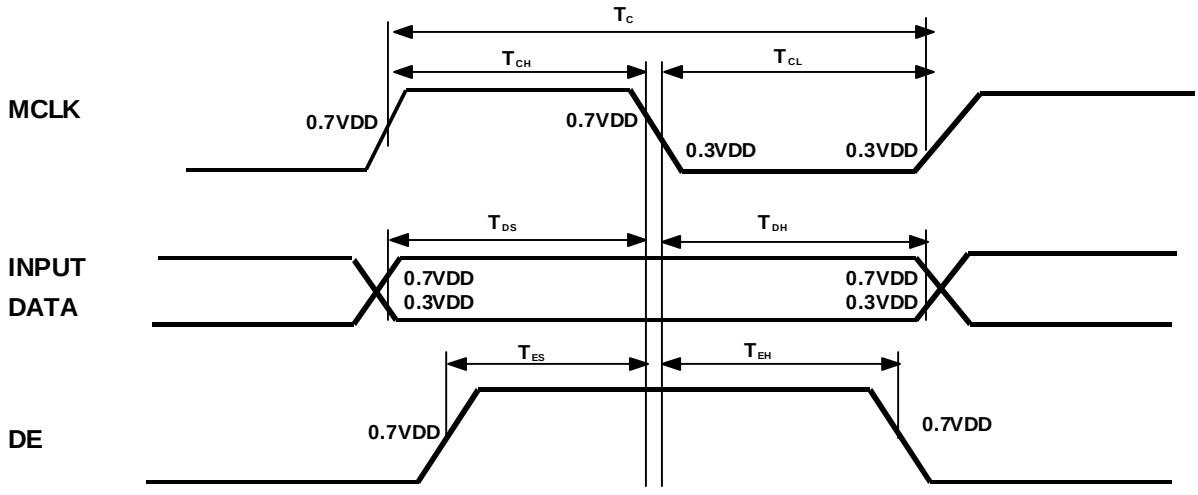
1) DC ELECTRICAL CHARATERISTICS (V_{DD}=3.3±10%(V), T_A=0 to 70°C)

Characteristics	Symbol	Test Condition		Min	Typ	Max	Unit
Input High Current	I_{IH}	$V_{IN}=V_{DD}$	Normal	-10		10	uA
Input with pull-down				10		200	
Input Low Current	I_{IL}	$V_{IN}=V_{SS}$	Normal	-10		10	uA
Input with pull-up				-200		-10	
Input High Voltage	V_{IH1}	CMOS		$0.7V_{DD}$			V
Input Low Voltage	V_{IL1}	CMOS				$0.3\ V_{DD}$	V
Output High Voltage	V_{OH}	1mA buffer, I_{OH}=-1mA 2mA buffer, I_{OH}=-2mA		2.4 2.4	- -	- -	V
Output Low Voltage	V_{OL}	1mA buffer, I_{OL}= 1mA 2mA buffer, I_{OL}= 2mA		- -	- -	0.4 0.4	v

- HCLK : 2mA buffer , Others : 1mA buffer
- Output Load : HCLK : 45pF, Others : 35pF

2) AC ELECTRICAL CHARACTERISTICS

Signal	Item	Condition	Symbol	Min.	Typ.	Max.	Unit
MCLK	Frequency	Dual scan In	$1/T_C$	-	5.0	15	Mhz
	High level width	-	T_{CH}	3	-	-	ns
	Low level width	-	T_{CL}	3	-	-	ns
INPUT DATA	Setup time	-	T_{DS}	3	-	-	ns
	Hold time	-	T_{DH}	3	-	-	ns
DEI	Setup time	-	T_{ES}	3	-	-	ns
	Hold time	-	T_{EH}	3	-	-	ns



3) INPUT TIMING SPEC

	Item	Description	Condition	Min.	Typ.	Max.	Unit
FRAME	T_{V_TOTAL}	V total line number	-		327		H
	T_{V_SYNC+} T_{V_BP}	From sync to data	Sync mode	-	4	-	H
	T_{V_DATA}	Data duration	-	-	320	-	H
LINE	T_{H_TOTAL}	H total pixel number	-		254		mclk
	T_{H_SYNC+} T_{H_BP}	From sync to data	Sync mode	-	11	-	mclk
	T_{H_DATA}	Data duration	-	-	240	-	mclk

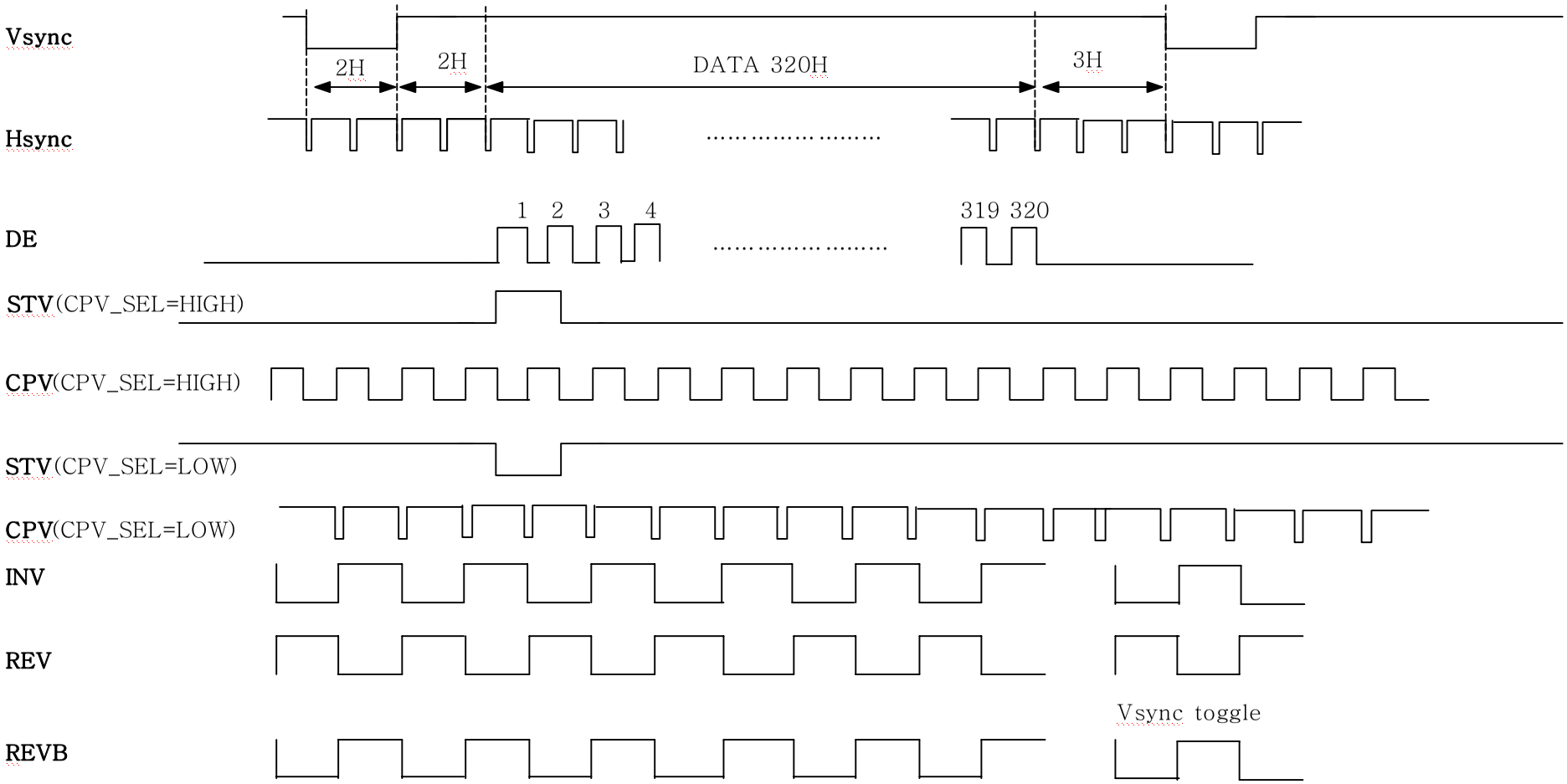


Fig.1 VERTICAL TIMING CHART (RE_SEL = HIGH)

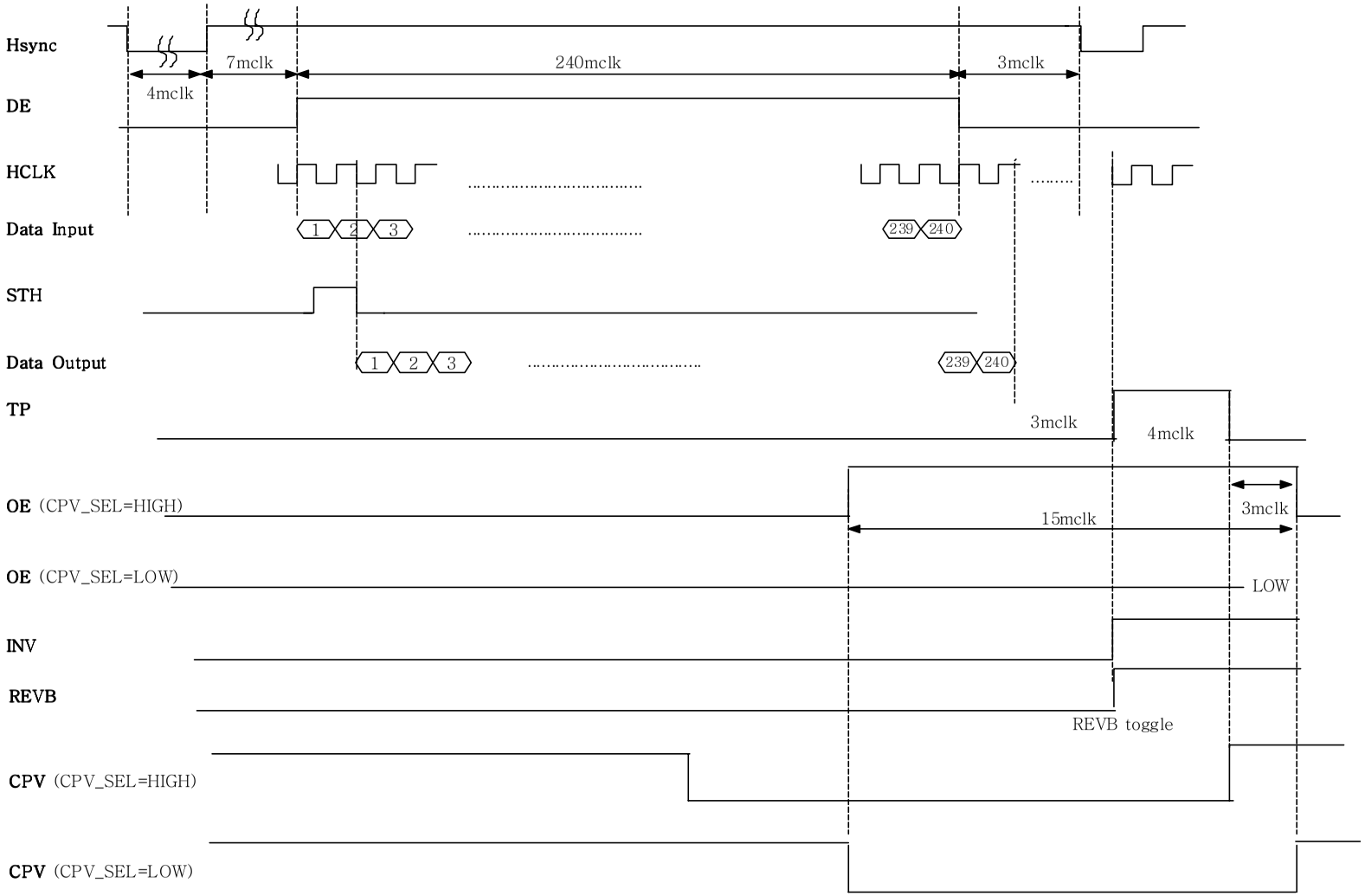


Fig.2 HORIZONTAL TIMING CHART (RE_SEL = HIGH)

7.Package

64LQFP 1010

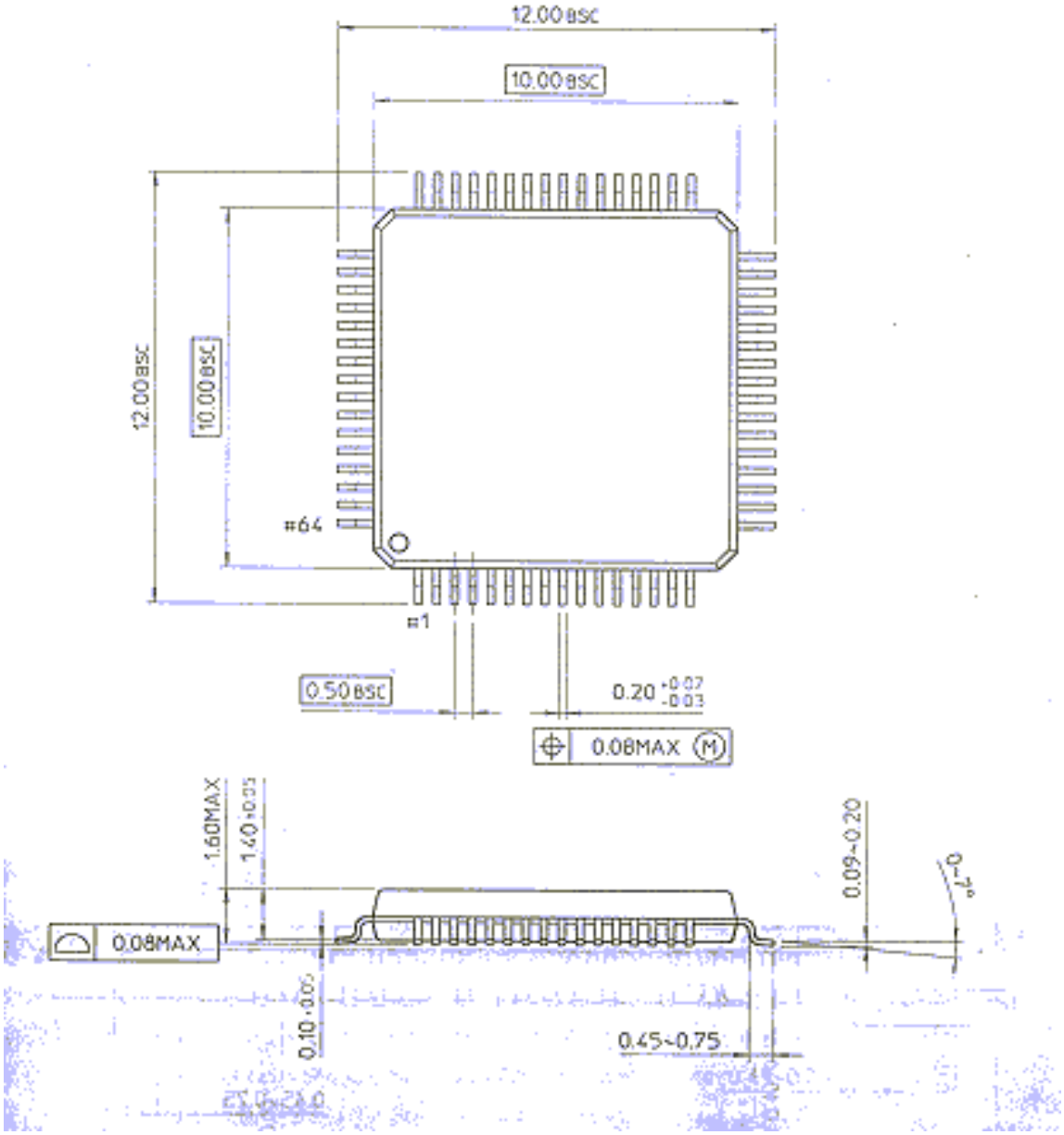


Fig.3 Dimension

Revision ITEM

ITEM	Rev.1	Rev.0	Page
OE_SEL => CPV_SEL	CPV_SEL Should be low. OE should be low. (Ground)	OE pulse width selection	Page 2,3
Gate Clock name	CPV	CKV	Page 2
Output buffer size	HCLK : 2mA buffer Others : 1mA buffer	HCLK : 4mA buffer Others : 2mA buffer	Page 4
Output Load	HCLK : 45pF Others : 35pF	75 pF	Page 4
MCLK	Typ. = 5.0 Mhz	Typ. = 6.3 Mhz	Page 4
V total line	327	350	Page 5
From Vsync to data	4	23	Page 5
H total pixel	254	300	Page 5
From Hsync to data	11	54	Page 5
Vertical timing chart	Fig.1	Fig.1	Page 6
Horizontal Timing chart	Fig.2	Fig.2	Page 7