

## TO : LITE ON DATE : Nov. 07, 2006

# SAMSUNG TFT-LCD MODEL NO. : LTP283QV-F01

## Customer Approval

Any Modification of Spec is not allowed without SEC's permission.

Approved by : **DH.KIM** 

## AMLCD Division Mobile Display Team

## Samsung Electronics Co., LTD.



Non. 07, 2006 000 Rev.000 was issued.	Data	Rev. No.	Page		Summ	nary	
	Non. 07, 2006	000		Rev.000 was i	ssued.		
$\mathbf{P}_{\mathbf{A}} = \mathbf{N}_{\mathbf{A}} = \mathbf{I}_{\mathbf{A}} = \mathbf{P}_{\mathbf{A}} = $		2820V E	01 1 000	Day Ma	000	Daga	2 / 22

## **Contents**

General Description			(4)
1. Absolute Maximum Ratings			(5)
1.1 Absolute Ratings Of Environment			~ /
1.2 Electrical Absolute Ratings			
2. Optical Characteristics			(7)
3. Electrical Characteristics			(11)
3.1 TFT-LCD Module			
3.2 Back-Light Unit			
4. Touch Screen Panel Specifications	-		(13)
5. Block Diagram			(14)
5.1 TFT-LCD Block Diagram			
5.2 Touch Screen Panel			
5.3 Back-light Unit			
6. Input Terminal Pin Assignment			(16)
6.1 TFT-LCD Module			
6.2 Back-Light Unit			
6.3 Touch Screen Panel			
6.4 Input Signal, Basic Display Colors and Gr	ay Scale	of Each Col	lors
7. Interface Specification			(20)
7.1 Serial Peripheral interface			
7.2 Data format for 18-bit RGB interface			
7.3 Input signal timing spec			
7.4 Input Timing Characteristics			
8. Operating Sequence			(24)
8.1 Power On / Off			
8.2 Power on timing sequence of set			
8.3 Power off timing sequence of set			
9. Outline Dimensions			(25)
9.1 Module Outline Dimensions (Total Ass'y)			
10. Packing			(27)
11. Marking & Others			(28)
12. Reliability Test Result			(29)
13. General Precaution			(31)
13.1 Handling			
13.2 Storage			
13.3 Operation			
13.4 Others			
Appendix #1 LTP283QV-F01 cosmetic spec			
Appendix #2 Touch Screen Panel specificati	ons		
- Nissha & Swenc TSP			
	000	Deer	2 / 22
DUC . INO LIF283QV-FUI ACET KEV.NO	VVV	rage	5 / 55

### **General Description**

### \* Description

LTP283QV-F01 is a TMR 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 Back -light unit and a touch screen panel. The resolution of a 2.83" contains 240 x 320 pixels and can display up to 262,144 colors.

### \* Features

- TMR(Transmissive with micro reflective) type.
- 4 LED Back-light
- Using the Anti-glare Touch Screen Panel(Flim to Glass type)
- 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	43.2(H) x 57.6(V)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	262,144	colors	-
Number of pixels	240(H) x RGB x 320(V)	pixel	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.180(H) x 0.180(V)	mm	-
Display mode	Normally White	-	-
Viewing Direction	12:00	o'clock	-

### \* Mechanical Information

Item		Min.	Тур.	Max.	Unit	Note
Model	Horizontal(H)	52.7	52.9	53.1	mm	(1)
size	Vertical(V)	71.5	71.7	71.9	mm	(1)
	Depth(D)	-	5.95	6.15	mm	(1),(2)
W	eight	-	36	38	g	(1)

Note (1) Touch screen panel, FPC and Back-light unit are included.

(2) Component height is included(Component height :Max 1.2mm)

### 1. Absolute Maximum Ratings

#### 1.1 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	Tstg	-30	70	Ĉ	(1),(5)
Operating temperature (Ambient temperature)	Topr	-20	60	Ĉ	(1),(2),(5)
Vibration ( Non - operating )	Vnop	10	500	Hz	(3),(4)

Note (1) 90 % RH Max. ( 40 °C  $\geq$  Ta )

Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °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)  $(10 \Leftrightarrow 500^{\text{Hz}})^{6^{\text{CYC}}}$  10min/Cycle, 3G<sub>pk</sub>, 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.

Doc No	LTP283OV-F01 Acer	Rev No	000	Page	5 / 33
D00. 110		1001.100	000	Iugo	5755

### 1.2 Electrical Absolute Ratings

### (1) TFT-LCD Module

### (Ta = Room Temp, V<sub>ss</sub>=GND=0V)

Characteristics	Symbol	Min.	Max.	Unit	Note
Supply Voltage	$V_{\text{DD}}$	-0.3	5	V	-
Supply Voltage for Step-up	$V_{ci}$	-0.3	5	V	-

(2) Back-Light Unit

(Ta = Room Temp)

Characteristics	Symbol	Min.	Max.	Unit	Note
Current	IB	-	25	mA	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.

Functional operation should be restricted to the conditions described under normal operating conditions.

Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	6 / 33

### 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: BM-5A, BM-7, PR-650, EZ-Contrast

\*This includes optical characteristics of TSP.

(Ta = Room Temp,  $V_{ci} = 2.8$  V  $I_B = 15mA$ )

Item	ı	Symbol	Condition	Min.	Тур.	Max.	Unit	Note
Contrast ratio (Center point)		C/R1		200	300	-	-	(4) BM-5A
Luminance of white (Center point)		YL		130	170	-	cd/m2	(5) BM-5A
White uniformity		Uw	Ф=0 Ө=0	80	-	-	%	(5) BM-5A
Response	Rising:Tr	Tr∔Tf			35	50	msac	(6)
time	Falling:Tf	11 ' 11	Normal		55	50	msee	BM-7
	White	Wx1	Viewing		0.30			
		Wy1	Angle		0.34		-	
Color	Red	Wx1	B/L On	-0.05	0.55	+0.05	-	
chromaticity		Wy1			0.33			(7)
(CIE 1931)		Wx1			0.34			PR-650
	Green	Wy1			0.53			
	DI	Wx1	-		0.15			
	Blue	Wy1			0.15		-	
	TT	θL1		40	50	-		
Viewing	Hor.	θR1	C/R≥10	40	50	-	Dagraca	(8)
angle	Vor	<sub>φ</sub> H1	B/L On	40	50	-	Degrees	Ez-Contrast
	V CI .	φL1		30	40	-		

Note (1) The optical characteristics is measured with Back-light and Touch screen 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 for the Transmissive Mode (Back-light On) 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 back-light. This should be measured in the center of screen.

- Back-light Current : 15mA
- Back-Light On condition



Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	8 / 33
----------	-------------------	--------	-----	------	--------

Note (4) Definition of Contrast Ratio (C/R) : Ratio of gray max (Gmax) & gray min (Gmin) at the center point of the panel. If Back-light is on state, it is the light source and the BM-5A will be used to measure.

> \* Gmax : Luminance with all pixels white Gmax C/R=Gmin \* Gmin : Luminance with all pixels black

Note (5) 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 Back-light that generates the reflected light source on LCD in the dark room.

\* Light Source(Chip type white LED : 4EA)



Note (6) Definition of Response time : Sum of Tr ,Tf



### 3. Electrical Characteristics

### 3.1 TFT-LCD Module

(Input Voltage = 2.8V, Ta = Room Temp)

Characteristics		Symbol	MIN.	TYP.	MAX.	Unit	Note	
Logic supply voltage		Vci	2.5	2.8	3.3	V	(1),(2)	
DC/DC	c supply voltage	Vcc	2.5	2.8	3.3	V	(1),(2)	
Dissipation Current	Full	$\mathbf{I}_{\mathrm{F}}$	-	9.0	10.0	mA	(1),(2),(4)	
	White	PW	-	20.5	25.0	mW		
Power Dissipation	Blue	$PB_{lue}$		21.0	26.0	mW	(1),(2),(3),	
	Black	PB	-	23.8	28.0	mW	(4)	
	Vertical Stripe	PV	-	25.0	30.0	mW		

\* To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the Chapter 8 power on/off Sequence

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

- (2)  $V_P = Vci = Vcc.$
- (3)  $V_P = 2.8V$ , Power supply current value of motion picture is high speed write mode.
- (4) Power dissipation check pattern



(5) If you change VCC(2.8V) Typ. value, we must change our Flowchart and retest SEC Reliability Test.

Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	11 / 33
----------	-------------------	--------	-----	------	---------



#### 3.2 Back-Light Unit

The Back-light system is an edge-lighting type with 4 white LED(Light Emitting Diode)s. The characteristics of 4 white LEDs are shown in the following tables.

(Ta = Room Temp)

Characteristics	Symbol	Min.	Тур.	Max.	Unit	Note
Current	$I_{\rm B}$	-	15	25	mA	(1)
Power Consumption	$P_{\rm BL}$	-	200	440	mW	(2)

Note (1) 4 white LEDs serial type.

- (2) In Typical case,  $I_B = 15mA$ ,  $V_B = 13.2$  V,  $P_{BL} = V_B \times I_B$
- (3) In Maximum case,  $I_{\text{B}}$  = 25mA,  $V_{\text{B}}$  = 17.6 V,  $P_{\text{BL}}$  =  $V_{\text{B}}$  ×  $I_{\text{B}}$

## 4. Touch Screen Panel Specifications(Refer to Appendix #2)

Item	Min.	Тур.	Max.	Unit	Note
Linearity	-	_	1.5	%	Analog X and Y directions
Terminal	200	-	1300	Ω	X(Glass side)
resistance	200	_	900	Ω	Y(Film side)
Insulation resistance	20	-	-	MΩ	DC 25V
Voltage	-	-	7	V	DC
Chattering	-	-	10	ms	100kΩ pull-up
Transparency	80	-	-	%	-

## 4-1. Electrical Characteristics

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.	Тур.	Max.	Unit	Note
Activation force	3	-	80	g	(2)
Durability-surface scratching	-	-	Write 100,000	characters	(3)
Durability-surface pitting	-	-	1,000,000	touches	(4)
Durability-chemical	-	-	-	-	(5)
Surface hardness	3	_	-	Н	JIS K5400

Note (1) Using anti-glare TSP

(2) Pen :  $3g \sim 80g$  (R0.8mm)

Finger :  $3g \sim 80g$  (R8.0mm)

\* Activation Force is between  $3g \sim 80g$ . Touch panel is activated by the applied force less than 3g or not activated by the applied force more than 80g, such panel shall not be acceptable

(3) Measurement for Surface area

- Stylus Pen has a 20mm×20mm area

- Force : 250g

- Speed :70mm/sec
- (4) Each Touch by R0.8mm Stylus pen & 500gf load
- (5) After Dropping a drop of Toluene (or Acetone, Methanol, crude Ethanol), brushing with Fabrics for 3 min. Don't be detected uneven point.

Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	13 / 33
----------	-------------------	--------	-----	------	---------



Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	14 / 33
----------	-------------------	--------	-----	------	---------

### 5.2 Touch Screen Panel



Top View

 ${\tt X}$  : Upper electrode

Y : Lower electrode

### 5.3 Back-light Unit



Pin No.	Symbol	I/O		
1	LED_ANODE	Anode		
2	LED_CATHODE	Cathode		

Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	15 / 33
----------	-------------------	--------	-----	------	---------

## 6. Input Terminal Pin Assignment

	Symbol	Desc	cription	Ren	nark
1	DE	Data	enable	Low	enable
2	MCLK	Maii	n clock	Rising	g edge
3	RST	IC	Reset	Low width	enable = min1ms
4	X1	TSP >	K1 Signal		
5	GND	Gı	round		
6	N.C.	No co	onnection		
7	N.C.	No co	onnection		
8	GND	Gı	round		
9	N.C.	No co	onnection		
10	N.C.	No co	onnection		
11	N.C.	No co	onnection		
12	N.C.	No co	onnection		
13	GND	Gı	round		
14	Y1	TSP Y	71 Signal		
15	N.C.	No co	onnection		
16	N.C.	No co	onnection		
17	N.C.	No co	onnection		
18	N.C.	No co	onnection		
19	GND	GR	OUND		
20	VCC	Logic	e Power		
21	VCC	Logic	e Power		
22	N.C.	No co	onnection		
23	N.C.	No co	onnection		
24	X2	TSP X	K2 Signal		
25	GND	Gı	round		
26	N.C.	No co	onnection		
27	Y2	TSP Y	72 Signal		
28	VCC	Logic Power			
29	PD17	Red data(R5)		(1	1)
30	PD16	Red data(R4)			
31	PD15	Red data(R3)			
32	PD14	Red	data(R2)		
33 PD13		Red	data(R1)		
34	PD12	Red	data(R0)		l)
			1		

6.1	<b>TFT-LCD</b>	Module	(Mating	Connector	: 61PIN	(Part	Name:FH23-61S-0.3SHW,	HIROSE))
-----	----------------	--------	---------	-----------	---------	-------	-----------------------	----------

Pin No	Symbol	Description	Remark
35	PD11	Green data(G5)	(1)
36	PD10	Green data(G4)	
37	PD9	Green data(G3)	
38	PD8	Green data(G2)	
39	PD7	Green data(G1)	
40	PD6	Green data(G0)	(1)
41	PD5	Blue data(B5)	(1)
42	PD4	Blue data(B4)	
43	PD3	Blue data(B3)	
44	PD2	Blue data(B2)	
45	PD1	Blue data(B1)	
46	PD0	Blue data(B0)	(1)
47	N.C.	No connection	
48	CS	Chip select	Low enable
49	SCL	SPI / Write clock	Rising edge
50	SDI	SPI / Data input	(2)
51	SDO	SPI / Data output	
52	HSYNC	Horizontal sync signal	Low enable
53	GND	Ground	
54	N.C.	No connection	
55	N.C.	No connection	
56	VSYNC	Vertical sync signal	Low enable
57	LED+	LED ANODE	
58	LED+	LED ANODE	
59	LED-	LED CATHODE	
60	LED-	LED CATHODE	
61	N.C.	No connection	

Remark (1) LSB : B0, G0, R0

MSB : B5, G5, R5

(2) We need a "SPI" for initial power setting of driver IC including the power block(3) X1 : Right, Y1 : Down, X2 : Left, Y2 : Top

6.2 Back-Light Unit (Connector : 2 pin FPC Solder type)

Pin No.	Symbol	Function
1	LED+	LED Anode
2	LED-	LED Cathode

Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	17 / 33
----------	-------------------	--------	-----	------	---------

Pin No.	Symbol	I/O	Function
1	X1	Right	Right electrode - differential analog
2	Y1	Bottom	Bottom electrode - differential analog
3	X2	Left	Left electrode - differential analog
4	Y2	Тор	Top electrode - differential analog

### 6.3 Touch Screen Panel (Connector : 4Pin FPC Solder type)

Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	18 / 33
----------	-------------------	--------	-----	------	---------

|              |  |   |   |   |  |  |  
   | DA  | TA S  
  | SIGN   | IAL   
  |  |   |   
  |   |   |  
   |   | GRAY  |
|--------------|--|---|---|---|--|--
--
--|---
--
--|--|--|--
---
--|---
---|--|---|---|
| DISPLAY      |  |   | RE  | ED  |  |  |  
   |   | GRI   
  | EEN  |   
  |  |   |   
  | BL  | UE  |  
   |   | SCALE   |
|              | R0   | R1  | R2  | R3  | R4   | R5   | G0   
   | G1  | G2  
  | G3   | G4  
  | G5   | B0  | B1  
  | B2  | B3  | B4   
   | B5  | LEVEL   |
| 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   | -   |
|              | 0  | 0   | 0   | 0   | 0  | 0  | 1  
   | 1   | 1   
  | 1  | 1   
  | 1  | 1   | 1   
  | 1   | 1   | 1  
   | 1   | -   |
|              | 1  | 1   | 1   | 1   | 1  | 1  | 0  
   | 0   | 0   
  | 0  | 0   
  | 0  | 1   | 1   
  | 1   | 1   | 1  
   | 1   | -   |
| YFLLOW       | 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   | _   |
| 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  |
| I            | •••  | •••   | •   | •••   | •••  | •••  | •••  
   | •••   | •••   
  | •••  | •••   
  | •••  | •   | •••   
  | •••   | •••   | •••  
   | •••   | R3~R60  |
| I            | :  | :   | :   | :   | :  | :  | :  
   | :   | :   
  | :  | :   
  | :  | :   | :   
  | :   | :   | :  
   | :   | 1.0 1.00  |
| ↓<br>LICUT   | 1  | 0   | 1   | 1   | 1  | 1  | 0  
   | 0   | 0   
  | 0  | 0   
  | 0  | 0   | 0   
  | 0   | 0   | 0  
   | 0   | R61   |
|              | 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   |
| BLACK        | 0  | 0   | 0   | 0   | 0  | 0  | 0  
   | 0   | 0   
  | 0  | 0   
  | 0  | 0   | 0   
  | 0   | 0   | 0  
   | 0   | GU  |
| DARK         | 0  | 0   | 0   | 0   | 0  | 0  | 0  
   | 1   | 0   
  | 0  | 0   
  | 0  | 0   | 0   
  | 0   | 0   | 0  
   | 0   |   |
| ↑            | •  | •   | •   | •   | •  | •  | •  
   | •   | •   
  | •  | •   
  | •  | •   | •   
  | •   | •   | •  
   | •   | 02  |
|              | •  | •   | •   | •   | •  | •  | •  
   | •   | •   
  | •  | •   
  | •  | •   | •   
  | •   | •   | •  
   | •   | G3~G60  |
| $\downarrow$ | 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   |
| 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  |
| $\uparrow$   | 0  | 0   | 0   | 0   | 0  | 0  | 0  
   | 0   | 0   
  | 0  | 0   
  | 0  | 0   | 1   
  | 0   | 0   | 0  
   | 0   | B2  |
|              | :  | :   | :   | :   | :  | :  | :  
   | :   | :   
  | :  | :   
  | :  | :   | :   
  | :   | :   | :  
   | :   | B3~B60  |
| Ļ            | :  | :   | :   | :   | :  | :  | :  
   | :   | :   
  | :  | :   
  | :  | :   | :   
  | :   | :   | :  
   | :   | 5.0.1   |
| LIGHT        | 0  | 0   | 0   | 0   | 0  | 0  | 0  
   | 0   | 0   
  | 0  | 0   
  | 0  | 1   | 0   
  | 1   | 1   | 1  
   | 1   | B61   |
|              | 0  | 0   | 0   | 0   | 0  | 0  | 0  
   | U   | U   
  | U  | U   
  | U  | U   |   
  |   |   |  
   | 1   | B02   |
|              | GREEN<br>CYAN<br>RED<br>AGENTA<br>YELLOW<br>WHITE<br>BLACK<br>DARK<br>↑<br>LIGHT<br>GREEN<br>BLACK<br>DARK<br>↑<br>LIGHT<br>GREEN<br>BLACK<br>DARK<br>↑<br>LIGHT | GREEN       0         CYAN       0         RED       1         MAGENTA       1         YELLOW       1         WHITE       1         BLACK       0         DARK       1         ↓       1         LIGHT       0         GREEN       0         ↓       1         LIGHT       0         GREEN       0         LIGHT       0         BLACK       0         ↓       0         LIGHT       0         BLACK       0         ↓       0         LIGHT       0         DARK       0         ↓       0         LIGHT       0         LIGHT       0         ↓       0         ↓       0         ↓       0         ↓       0         ↓       0         ↓       0         ↓       0         ↓       0         ↓       0         ↓       0         ↓       0         ↓       0 | $\begin{array}{c cccc} GREEN & 0 & 0 \\ CYAN & 0 & 0 \\ RED & 1 & 1 \\ \\ MAGENTA & 1 & 1 \\ \\ MAGENTA & 1 & 1 \\ \\ YELLOW & 1 & 1 \\ \\ WHITE & 1 & 1 \\ \\ WHITE & 1 & 1 \\ \\ \\ WHITE & 1 & 1 \\ \\ \\ HICH & 0 & 0 \\ \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$ | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | GREEN       0       0       0       0         CYAN       0       0       0       0         RED       1       1       1       1         MAGENTA       1       1       1       1         YELLOW       1       1       1       1         WHITE       1       1       1       1         BLACK       0       0       0       0         DARK       1       0       0       0         ↓       1       0       1       1         LIGHT       0       1       1       1         BLACK       0       0       0       0         ↓       1       0       1       1         LIGHT       0       1       1       1         BLACK       0       0       0       0         ↓       0       0       0       0         ↓       0       0       0       0         ↓       0       0       0       0         ↓       0       0       0       0         ↓       0       0       0       0 | GREEN       0       0       0       0       0       0         CYAN       0       0       0       0       0       0         RED       1       1       1       1       1       1         MAGENTA       1       1       1       1       1       1         YELLOW       1       1       1       1       1       1         WHITE       1       1       1       1       1       1       1         BLACK       0       0       0       0       0       0       0         DARK       1       0       0       0       0       0       0         ↓       1       0       1       1       1       1       1         LIGHT       0       1       1       1       1       1         BLACK       0       0       0       0       0       0         ↓       1       1       1       1       1       1         BLACK       0       0       0       0       0       0         ↓       1       1       1       1       1       1 | GREEN         0         1 <td>GREEN       0       0       0       0       0       0       0       1         CYAN       0       0       0       0       0       0       1       1         RED       1       1       1       1       1       1       1       1       0         AAGENTA       1       1       1       1       1       1       1       1       1       1         WHITE       1       1       1       1       1       1       1       1       1         BLACK       0       0       0       0       0       0       0       0         DARK       1       0       0       0       0       0       0       0         I       0       1       0       0       0       0       0       0       0         I       0       1       1       1       1       1       1       0</td> <td>GREEN       0       0       0       0       0       0       0       1       1         CYAN       0       0       0       0       0       0       0       0       0       1       1         RED       1       1       1       1       1       1       1       1       0       0         MAGENTA       1<td>GREEN         0         0         0         0         0         0         1         1         1           CYAN         0         0         0         0         0         0         1</td><td>GREEN         0         0         0         0         0         0         0         1         1         1         1           CYAN         0         0         0         0         0         0         0         1</td><td>GREEN         0         0         0         0         0         0         1         1         1         1         1           CYAN         0         0         0         0         0         0         1</td><td>GREEN       0       0       0       0       0       1       1       1       1       1       1         CYAN       0       0       0       0       0       0       0       1 
     1       1       1       1       1       <th< td=""><td>GREEN       0       0       0       0       0       0       1<td>GREEN       0       0       0       0       0       1<td>GREEN         0         0         0         0         1</td><td>GREEN         0         0         0         0         0         0         1<td>GREEN         0         0         0         0         0         1</td></td></td></td></th<><td>GREEN       0       0       0       0       1</td></td></td> | GREEN       0       0       0       0       0       0       0       1         CYAN       0       0       0       0       0       0       1       1         RED       1       1       1       1       1       1       1       1       0         AAGENTA       1       1       1       1       1       1       1       1       1       1         WHITE       1       1       1       1       1       1       1       1       1         BLACK       0       0       0       0       0       0       0       0         DARK       1       0       0       0       0       0       0       0         I       0       1       0       0       0       0       0       0       0         I       0       1       1       1       1       1       1       0 | GREEN       0       0       0       0       0       0       0       1       1         CYAN       0       0       0       0       0       0       0       0       0       1       1         RED       1       1       1       1       1       1       1       1       0       0         MAGENTA       1 <td>GREEN         0         0         0         0         0         0         1         1         1           CYAN         0         0         0         0         0         0         1</td> <td>GREEN         0         0         0         0         0         0         0         1         1         1         1           CYAN         0         0         0         0         0         0         0         1       
 1         1         1         1         1         1         1         1         1         1         1         1         1         1         1</td> <td>GREEN         0         0         0         0         0         0         1         1         1         1         1           CYAN         0         0         0         0         0         0         1</td> <td>GREEN       0       0       0       0       0       1       1       1       1       1       1         CYAN       0       0       0       0       0       0       0       1       <th< td=""><td>GREEN       0       0       0       0       0       0       1<td>GREEN       0       0       0       0       0       1<td>GREEN         0         0         0         0         1</td><td>GREEN         0         0         0         0         0         0         1<td>GREEN         0         0         0         0         0         1</td></td></td></td></th<><td>GREEN       0       0       0       0       1</td></td> | GREEN         0         0         0         0         0         0         1         1         1           CYAN         0         0         0         0         0         0         1 | GREEN         0         0         0         0         0         0         0         1         1         1         1           CYAN         0         0         0         0         0         0         0         1        
1         1 | GREEN         0         0         0         0         0         0         1         1         1         1         1           CYAN         0         0         0         0         0         0         1 | GREEN       0       0       0       0       0       1       1       1       1       1       1         CYAN       0       0       0       0       0       0       0       1 <th< td=""><td>GREEN       0       0       0       0       0       0       1<td>GREEN       0       0       0       0       0       1<td>GREEN         0         0         0         0         1</td><td>GREEN         0         0         0         0         0         0         1<td>GREEN         0         0         0         0         0         1</td></td></td></td></th<> <td>GREEN       0       0       0       0       1</td> | GREEN       0       0       0       0       0       0       1 <td>GREEN       0       0       0       0       0       1   
   1       1<td>GREEN         0         0         0         0         1</td><td>GREEN         0         0         0         0         0         0         1<td>GREEN         0         0         0         0         0         1</td></td></td> | GREEN       0       0       0       0       0       1 <td>GREEN         0         0         0         0         1</td> <td>GREEN         0         0         0         0         0         0         1<td>GREEN         0         0         0         0         0         1</td></td> | GREEN         0         0         0         0         1 | GREEN         0         0         0         0         0         0         1 <td>GREEN         0    
    0         0         0         0         1</td> | GREEN         0         0         0         0         0         1 | GREEN       0       0       0       0       1 |

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

### 7. Interface Specifications.





### 7.2 Data Format for 18bit RGB Interface





Doc . No	LTP283QV-F01 Acer	Rev.No	000	Page	21 / 33
----------	-------------------	--------	-----	------	---------

Г

### 7.4 Input Timing Characteristics

			(T <sub>A</sub>	= -40 to $+85$ <sub>o</sub> C)
Characteristic	Symbol	Min.	Max.	Unit
DOTCLK cycle time	tDCYC	150	-	
DOTCLK rise / fall time	tR, tF	-	25	
DOTCLK Pulse width high	tDCHW	60	-	
DOTCLK Pulse width low	tDCLW	60	-	
ENABLE setup time	tENS	45	-	
ENABLE hold time	tENH	45	-	
Vertical Sync Setup Time	tVSYS	45	-	ns
Vertical Sync Hold Time	tVSYH	45	-	
Horizontal Sync Setup Time	tHSYS	45	-	
Horizontal Sync Hold Time	tHSYH	45	-	
PD data setup time	tPDS	45	-	
PD data hold time	tPDH	30	-	
Phase difference of sync signal falling edge	THV	0	240	tmck



		1	(T.	$_{A} = -40$ to $+85$ <sub>o</sub> C)
Characteristic	Symbol	Min.	Max.	Unit
Serial clock cycle time	tscyc	600	-	
Serial clock rise / fall time	tR, tF	-	25	
Pulse width high for write	tSCHW	40	-	
Pulse width high for read	tSCHR	230	-	-
Pulse width low for write	tSCLW	60	-	
Pulse width low for read	tSCLR	230	-	
Chip Select setup time	tCSS	20	-	ns
Chip Select hold time	tCSH	60	-	
Serial input data setup time	tSIDS	30	-	
Serial input data hold time	tSIDH	30	-	
Serial output data delay time	tSODD	-	200	
Serial output data hold time	tSODH	5	-	





#### 8.2 Power on sequence

Vci & Vcc(2.8V) on  $\rightarrow$  RST on  $\rightarrow$  MCLK on  $\rightarrow$  SPI on  $\rightarrow$  SYNC & DE& DATA on

\* If disobey descriptions timing rule above, abnormal display can occur

### 8.3 Power off sequence

SPI on  $\rightarrow$  MCLK off  $\rightarrow$  SYNC & DE& DATA off  $\rightarrow$  Vci & Vcc(2.8V) off

\* If disobey descriptions timing rule above, abnormal display can occur

Doc . No LTP283QV-F01_	Acer Rev.No	000	Page	25 / 33

### 9. Outline Dimensions

- 9.1 Module Outline Dimensions (Total Assa'y)
  - Refer to the Next Page.

Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	26 / 33
----------	-------------------	--------	-----	------	---------



ER. 001	< E		Ι			NO.	CODE	I
EET 1/1	HS N	ENS I O	DIM	LINE	OUT	SHEET	PART/ NA	. 0.3. 2.3 EC. NO
1	0	QV-I	883	LTP:		NAME	MODEL	P'D BY
Y'D BY	CH -			NOS	REAS	s ledue	NI SSIIC	5111(5)
<u><u></u></u>		S	48	PD14	32	N.C	- 16	
		N.C	47	PD15	31	N. C	15	Chassis
NC	01	PDO	46	PD16	30	TSP2	14	
MAIN_LEU-	60	PU2	д 4 л 4	VUU DN 1 7	28 28	N.C	12	٩
MAIN_LED-	59	PD3	43	TSP4	27	N.C	11	
MA IN_LED+	58	PD4	42	N.C	26	N.C	10	
MA IN_LED+	57	PD5	41	SSA	25	N. C	9	
VSYNC	56	PD6	40	TSP3	24	VSS W. C	∞ `	I
	л 54 Л	PU8	. <u>3</u> 9		2.3		7 0	
SSA	53	PD9	37	VDD	21	SSA	о <i>С</i> т	
HSYNC	52	PD10	36	VDD	20	TSP1	4	
SUU	510	P011	5, C 57 4	N.C	10	RST		
SCL	лл 70	PD13	33	2 <u>7</u> 0	18	DE	o −	
Name	No	Name	No	Name	No	Name	No	
		MENT	( SIGN	I A IN AS		ре		
		2 - C		N 11 L	+ ) ].	n		
		0.3±0.07		(2) 2-R0.		0.	$\sim$	
	<	-						
		55 -			ÌHUU	6-R0.;	<	
			0.4					
			+0.04 -0.03					×
	18	10	>				17	18
	.6±0.0	8 ±0.03	<				. 4 ±0.0	. 6 ±0. 11
	05		(0.	+0.04			)3	05 . 3 ±0
			-1)			_		0.5
		(C	0.6			<u>0.6</u> (0.0		
		0.2)	5 ±0.02			±0.02 )5)	\ >	
	>		r I N I					
		). 3 ±0.07	(1)		<u> </u>	1 ±0.1	\ 0.3±0.02	
	ben	iyer O	er/c	GOV	5±0	1.5±0.	I	
								83QV-F01
REMARK	-	SPEC NO	T Y	Q		N	ICATIO	SPECIF
	-							



### 11. Marking & Others

(1) Packing case attach



Doc . No	LTP283QV-F01_Acer	Rev.No	000	Page	29 / 33
----------	-------------------	--------	-----	------	---------

### 12. Reliability Test Result

### 12. 1 Condition

ITEM	CONDITION	REMARK
High Temperature Operating Life-test	60℃, 240HR	Pass
Low Temperature Operating Life-test	-20°C, 240HR	Pass
Temperature Humidity Bias test	50℃ 90%RH, 240HR	Pass
Temperature Cycle ON/OFF test	$-30^{\circ}C \Leftrightarrow 70^{\circ}C \text{ ON/OFF, 5CY}$	Pass
High Temperature Storage test	70℃, 240HR	Pass
Low Temperature Storage test	-30°C, 240HR	Pass
Wet High Temperature Storage test	60℃ 90%RH, 240HR	Pass
Thermal Shock test	-30℃ ⇔ 70℃, 100CY	Pass
Electro-Static Discharge test	CONTACT: ±4 <sup>kV</sup> , 20times A I R: ±8 <sup>kV</sup> , 20times	Pass
Box Vibration test	RANDOM 0.74Grms, 1HR/Y axis(SMALL BOX)	Pass
Box Drop test	1 Corner 3 Edges 6 faces, 66cm(MEDIUM BOX)	Pass

Note(1) ON Time over 10 seconds, OFF Time under 10 seconds







Note(3) Main-LCD, 5 times to every 4 corners of active area

Note(4) Basic transportation by common carrier environmental,

OVERAL	BREAK POINT					
L RMS LEVEL	FRQUENC Y	PSD VALUE	FRQUENC Y	PSD VALUE	FRQUENC Y	PSD VALUE
	10Hz	0.00650	121Hz	0.00300	340Hz	0.00003
0.74G	20Hz	0.00650	200Hz	0.00300	500Hz	0.00015
	120 <sup>Hz</sup>	0.00020	240 <sup>Hz</sup>	0.00150	-	-

514.4 MIL-STD-810E

#### 12.2 Judgement

- > Main LCD should work under the normal condition.
- > After the temperature and humidity test,

the luminance and CR(Contrast Ratio) should not be changed over 50% compared with those before the test.

Doc . No	LTP283QV-F01 Acer	Rev.No	000	Page	31 / 33
				U	

### 13. General Precautions

### 13.1 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 Integrated Gate Circuit.
- (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.
- (1) Pins of I/F connector shall not be touched directly with bare hands.

### 13.2 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.

### 13.3 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 8.1 "Power on/off sequence"

### 13.4 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.

## Cosmetic Standards for Outgoing Inspection (2.83"QVGA 240x320 TFT-LCD : LTP283QV-F01)

Document Control				
Document NO : COS_283QV_060303				
Customer ( ACER ) Supplier ( SAMSUNG Electro			SAMSUNG Electronics )	
Approved by	Signature Here	Prepared by	ch?	
		Checked by	Coc do Jun	
		Approved by	ZFF	

REVISION RECORD				
REV	REVISION ITEM	DATE		
0	Engineering release	February 14th , 2006		
1	Dot spec change from(1,2,3) to (1,1,1)	March 3 <sup>rd</sup> , 2006		

All materials in this document are highly confidential and proprietary to Samsung electronics.

Any part of this document can not be coped or reproduced, in whole or in part, without the written permission of Samsung electronics.

Address : San 24 Nongseo-Ri, Giheung-Eup, Yongin-City, Gyeonggi-Do, Korea 449-711 Tel. 82-31-209-6134 Fax. 82-31-209-7607



1

Cosmetic Standard for Outgoing Inspection Rev. 00 (06-02-14)

### Samsung Confidential

1. Inspection Conditions:				
✓ Viewing distance	30± 5cm			
<ul> <li>✓ Ambient illumination         <ul> <li>Operating Inspection</li> <li>Appearance Inspection</li> </ul> </li> </ul>	50 ~ 150 Lux 1000 ~ 1500 Lux			
✓ Viewing angle	Within 30 degrees left, right, up and down as the right picture shown .			
✓ Ambient temperature	23 ± 2 'C			
✓ Display pattern	2.83" QVGA 240x320 - R, G, B, Black, White			
✓ Inspection area	Active area which is operating with pixels.			
<ul> <li>2. Inspection Criteria:</li> <li>2-1. Inspection Zone</li> <li>; Below judged criteria are applie</li> <li>; The center zone is "dot defendence</li> </ul>	ied to the whole active area <b>except the center zone.</b>			
- <u>*</u> - <u>*</u> - <u>3</u>	-3> A: Vertical length of active area			
	$\frac{B}{3}$ B : Horizontal length of active area			
B Center Zone	B 3 			
- * -   A	<u>¥                               </u>			
Cosmetic Standard for Outgoing Inspecti	on Rev. 00 (06-02-14)			

### 2-2. Visual Inspection

### 2-2-1 Definition of Visual defects

✓Spot

Black/White spot appeared on the display which remain unchanged size.

✓ Line

Dark/Bright lines appeared on the display which remain unchanged in size.

✓ Polarizer Scratch

When the unit lights, visible scar or streak appear on the surface of polarizer.

- Polarizer Dent/Bubble
   When the unit lights, visible carved mark or bubble on the surface of polarizer
- ✓ Fish eye
   When the unit lights, visible mark or bubble with border on TSP film.
- Newton's Ring
   When the unit lights, visible "rainbow" (by optical interference)


# 2-1-2 Visual Defect Criteria

Below judgment criteria includes glasses, TSP, back light and polarizer defect.

Defect Mode	Acceptable Judgment Criteria			
	Size D (mm)	Quantity (ea)		
Spot particles	D ≤ 0.1	Disregard		
(Black or White)	$0.1 < D \le 0.3$	3		
	0.3 < D	0		
Line particles	Width W(mm), Length $L(mm)$	Quantity (ea)		
(Black or White)	$0.03 < W \le 0.1$			
	$1.0 < L \le 3.0$	3		
Scratch	Width W(mm), Length L(mm)	Quantity (ea)		
(Polarizer)	0.03 <w≦0.1, l≦5<="" td=""><td>2</td></w≦0.1,>	2		
Scratch	Width W(mm), Length L(mm)	Quantity (ea)		
(TSP)	$0.03 < W \le 0.1$			
	$1.0 \le L \le 3.0$	2		
Newton Ring	Size D (mm)	Quantity (ea)		
1	$D \le 7.0$	Disregard		
	7.0 < D	0		
Bubble/Dent	Size D (mm)	Quantity (ea)		
(Polarizer)	$D \le 0.1$	Disregard		
	$0.1 < D \le 0.3$	3		
Bubble/Dent/Fish eye	Size D (mm)	Quantity (ea)		
(TSP)	$0.1 < D \le 0.2$	4		
	$0.2 < D \le 0.3$	3		
	$0.3 < D \le 0.4$	2		
Maximum allowable defect ty	wpe	6		

*Remarks (How to measure?)* 

- Use inspection tools like a loupe or microscope if unsure of pass/fail criteria.

- Translucent edge is ignored in measuring the diameter of spot.



Cosmetic Standard for Outgoing Inspection Rev. 00 (06-02-14)

4

SAMSUNG

## Samsung Confidential

## 2-2-1 Definition of Pixel defects

✓ Pixel

3 sub-pixels (R+G+B)

✓ DOT

1 sub-pixel (R or G or B / or or )

✓ Bright/Dark Dot

A sub-pixel (R,G,B dot) stuck off/on (electrical)

Bright dots (black dots) shall be counted on a black pattern (a pure R,G,B and white pattern).

✓ Adjacent Dot

2 or 3 dots situated close to a neighboring dot. ( R,G or G,B or B,R or R,G,B )

# 2-2-2 Dot Defect Criteria

Defect Mode	Acceptable Judgment Criteria			
Defect Mode	Dot Type	Quantity (ea)		
Bright Dot	Random ( Red or Blue or Green )	1		
	2 or more adjacent dot defects	0		
Dark Dot	Dark dot	1		
	2 or more adjacent dot defects	0		
Maximum allowable number of dot defect		1		

- In case of adjacent dots, vertical direction is not permitted.

- The center zone is the dot defect free area.



Cosmetic Standard for Outgoing Inspection Rev. 00 (06-02-14)

# **2-3. The other Inspections**

# 2-3-1 Functional Defects

# Below items are considered to be failure.

## ✓ Line Defect

One or more permanent horizontal or vertical lines on a white/black pattern.

## ✓ No Display

No pixels is active when power and valid data are applied to the display.

## No Back Light

No or weak light from the LED/CCFL when the backlight is activated. (*Measure brightness or uniformity if unsure of pass/fail criteria.*)

## ✓ Gray Defect

Abnormal display of gray colored level on a specified R,G,B pattern. (*Measuring chromaticity if unsure of pass/fail criteria.*)

✓ Noise

Wave on display due to electrical ripple or noise.

## Abnormal Display

Abnormal display excluding items mentioned above.

- If not issued from the customer site or not described above, SEC follows internal guide line.



Cosmetic Standard for Outgoing Inspection Rev. 00 (06-02-14)

#### **1. RANGE OF APPLICATION**

These specifications apply to the 'Fine Touch "<sup>7IM</sup> (Nissha Product code No. SS-A19D) supplied to Messrs. SEC.

#### 2. SHAPE

Shape, structure and dimension as per drawing.

#### **3. RATING**

3.1. Maximum voltage

DC7V

3.2. Operating temperature range

From -30°C to 60°C (Before assembling Touch Panel, Humidity from 20% to 90%. No dew condensation shall be acceptable)

3.3. Storage temperature range

From -40°C to 60°C (Humidity from 20% to 90%.No dew condensation shall be acceptable) From 61°C to 85°C (Humidity from 20% to 60%.No dew condensation shall be acceptable)

#### 4. ELECTRICAL PERFORMANCE

4.1. Resistance between terminals

Direction "X" (Glass side):  $450 \sim 1,300 \Omega$  (TYP.600  $\Omega$  ) Direction "Y" (Film side):  $200 \sim 650 \Omega$  (TYP.430  $\Omega$  )

#### 4.2. Linearity

Direction''X'':1.5% or less Direction''Y'':1.5% or less \* Measurement as per attached Appendix.1

#### 4.3. Insulation resistance

 $DC25V \,and \, 20M \,\Omega\,$  or more

4.4. Chattering

10msec or less

\* Measurement as per attached Appendix. 2

#### 5. MECHANICAL PERFORMANCE

5.1. Input

Through a special stylus or finger

5.2. Activation force

Input with finger: 0.03N~0.6N

Input with stylus : 0.03N~0.6N

\*Activation force is between 0.03N and 0.6N.In the case that touch panel is activated by the applied force less than 0.03N or touch panel is not activated by the applied force more than 0.6N, such panels shall not be acceptable.

\* Measurement as per attached Appendix. 3

#### 5.3. Surface hardness

Hardness of pencil 3H or more according to JIS-K5600 Note : The load is 500gf.

#### 6. OPTICAL PERFORMANCE

6.1.Optical clarity

Total Transmission 80% or more (TYP.83%) According to JIS-K7105 Nissha grade: TYPE18L-VII Surface : Anti Glare type Haze: 3~10 % (TYP.7%)

#### 7. RELIABILITY

7.1. Exposure to high temperature

Put it in a vessel at the condition of  $85^{\circ}$ C for 240 hours. Moreover, let it alone for 24 hours or more in a room temperature and measure it. The measurement must satisfy the under-mentioned items.

- Resistance between terminals : According to Section 4.1.
- Linearity : According to Section 4.2.
- Insulation resistance : According to Section 4.3.

#### 7.2. Exposure to low temperature

Put it in a vessel at the condition of  $-40^{\circ}$ C for 240 hours. Moreover, let it alone for 24 hours or more in a room temperature and measure it. The measurement must satisfy the under-mentioned items.

- Resistance between terminals : According to Section 4.1.
- Linearity: According to Section 4.2.
- Insulation resistance : According to Section 4.3.
- 7.3. Exposure to high temperature and high humidity

Put it in a vessel at the condition of 60°C and 90%RH for 240 hours. Moreover, let it alone for 24 hours or more in a room temperature and measure it. The measurement must satisfy the under-mentioned items.

- Resistance between terminals : According to Section 4.1.
- Linearity: According to Section 4.2.
- Insulation resistance : According to Section 4.3.

7.4.Heat shock

 $-40^{\circ}$ C(30min.)—Room temperature (3 min.)  $\rightarrow$ 85°C(30min.) —Room temperature (3 min.) total 30 cycles Moreover, let it alone for 24 hours or more in a room temperature and measure it. The measurement must satisfy the under-mentioned items.

- Resistance between terminals : According to Section 4.1.
- Linearity : According to Section 4.2.
- Insulation resistance : According to Section 4.3.

#### 8. DURABILITY

8.1 Point activation life

Hit it one million times with a silicon rubber of R8 Hs60° and measure it. The measurement must satisfy the under-mentioned items. Then, hitting force shall be 2.45N and hitting speed 3 times per second.

- Resistance between terminals : According to Section 4.1.
- Linearity: According to Section 4.2.
- Insulation resistance : According to Section 4.3.

#### 8.2. Hand writing friction resistance

Write one hundred thousand capital and small alphabetical characters with a special-stylus in an area 20mm × 20mm and measure it. The measurement must satisfy the under-mentioned items. Then, writing force shall be 2.45N and writing speed 5,000 characters per hour.

- Resistance between terminals : According to Section 4.1.
- Linearity: According to Section 4.2.
- Insulation resistance : According to Section 4.3
- 8.3. Writing friction resistance

After 300,000 times (150,000 round trips) of drag over 40mm path with a 2.45N load with a speed of 3 round trips per sec. The measurement must satisfy the under-mentioned items.

- Resistance between terminals : According to Section 4.1.
- Linearity: According to Section 4.2.
- Insulation resistance : According to Section 4.3
- 8.4. FPC peeling strength

400gf/cm or more (3.92N/cm)



9.1. Resistance between terminals

Criterion: According to section 4.1.

Number of products to be inspected: All products upon initial operation. Sampling of inspection shall be adopted taking into consideration processing capacity.

9.2. Linearity

Criterion: According to section 4.2.

Number of products to be inspected: All products upon initial operation. Sampling of inspection shall be adopted taking into consideration processing capacity.

#### 9.3. Insulation resistance

Criterion: According to section 4.3.

Number of products to be inspected: All products upon initial operation. Sampling of inspection shall be adopted taking into consideration processing capacity.

#### 9.4. Appearance

Criterion: According to section 10.2.

Number of products to be inspected: All products upon initial operation Sampling of inspection shall be adopted taking into consideration processing capacity.

#### **10. VISUAL CRITERION**

#### 10.1. How to inspect

A man or woman, who has good health and has 20/20 vision with or without glasses, shall inspect 30cm away from it. Twin fluorescent lamps of 14W and three-wave type shall be used. The visual inspection shall be executed under the conditions shown below and both background and desktop shall be black:

Lighting conditions: 2000LUX or less on the blight room



Transmitted light

Reflected light

#### 10.2. Criterion

The under-mentioned items (1)-(5) shall apply in a visible area. Any invisible area shall be acceptable unless any scratch or irregularity, which affects electrical performance, is observed. Criterion of visual inspection shall be according to a limit sample.

With regards to (1) to (5), the touch panel having less than four defects shall be acceptable.

(1) Scratch
-------------

Width Length		Criterion	
W≦0.03mm		Acceptable	
0.03mm <w≦0.1mm< td=""><td>1.0mm≦L≦2.0mm</td><td>Acceptable if such scratches are two or less</td></w≦0.1mm<>	1.0mm≦L≦2.0mm	Acceptable if such scratches are two or less	
0.1mm <w< td=""><td></td><td>Unacceptable</td></w<>		Unacceptable	

(2) Granular foreign object (Black or White) ("D" is an average diameter)

Diameter	Criterion
D≦0.10mm	Acceptable
0.10mm <d≦0.20mm< td=""><td>Acceptable if such foreign objects are two or less</td></d≦0.20mm<>	Acceptable if such foreign objects are two or less
0.20mm <d≦0.30mm< td=""><td>Acceptable if such foreign objects are one or less</td></d≦0.30mm<>	Acceptable if such foreign objects are one or less
0.30mm <d< td=""><td>Unacceptable</td></d<>	Unacceptable

(3)Linear foreign object (Black or White)

( <u>-)</u>			
Width Length		Criterion	
W≦0.03mm		Acceptable	
0.03mm <w≦0.10mm< td=""><td>1.0mm<l≦2.0mm< td=""><td>Acceptable if such foreign objects are two or less</td></l≦2.0mm<></td></w≦0.10mm<>	1.0mm <l≦2.0mm< td=""><td>Acceptable if such foreign objects are two or less</td></l≦2.0mm<>	Acceptable if such foreign objects are two or less	
0.1mm <w< td=""><td></td><td>According to Granular foreign object</td></w<>		According to Granular foreign object	

#### (4)Bubble/Dent (Including Fish eye) on film

Diameter	Criterion
D≦0.1mm	Acceptable
0.1mm <d≦0.2mm< td=""><td>Acceptable if such foreign objects are four or less</td></d≦0.2mm<>	Acceptable if such foreign objects are four or less
0.2mm <d≦0.3mm< td=""><td>Acceptable if such foreign objects are three or less</td></d≦0.3mm<>	Acceptable if such foreign objects are three or less
0.3mm <d≦0.4mm< td=""><td>Acceptable if such foreign objects are two or less</td></d≦0.4mm<>	Acceptable if such foreign objects are two or less
0.4mm <d< td=""><td>Unacceptable</td></d<>	Unacceptable

"D" is an average diameter of the under-mentioned part;





According to limited sample of depth of color.(Add to above-mentioned criterion)

- (5) Newton's ring/Surface sheet warping According to limited sample of depth of color.
- (6) Breakage on film surface Not acceptable
- (7)Stain

According to limited sample.

(8) Blistering (Puffiness)

Check through any 0.4mm gauge whether a panel surface film does not contact a measuring face.



(9) Breal	kage on glass						
		Breakage on corner			Breakage on any area other than corner		
	Judgment Criterion		X Y Z				
		Х	Y	Ζ	Х	Y	Ζ
		OK≦2	OK≦2	OK≦t	OK≦3	OK≦3	OK≦t

If any value of "X","Y" and "Z" is out of allowable range, it shall be regarded as defective.

#### 11. PACKING

Product shall be packed according to the under-mentioned drawing. Package:160pcs=16pcs(Inner Palette)  $\times$  10

Material of Package: Polypropylene (PP)



Package

#### **12. PRECAUTIONS**

- 12.1. Input must be performed through a special stylus or finger. Do not pile up the products nor put any heavy thing on it.
- 12.2. Do not give any shock nor vibration to the product and not drop it.
- 12.3. Do not apply water, organic solvent nor chemicals such as acid and alkali to the product. Do not put the product in such atmosphere.
- 12.4. Upon carrying the products be sure to hold the glass edge. Do not touch an operating surface or it may be stained or damaged. Never pull the cable nor give any considerable force to the peripheral circuit, or cable may be broken.
- 12.5. When any dust or stain is observed on a film surface, C lean it using a commercial cleaner for lenses of glass or something like that.
- 12.6.Don't write near the film-side electrode(within1.5mm from boundary of double-side adhesive tape), or it may damage to an electric film raised fall of linearity.

#### **13. NOTES ON ASSEMBLING**

- 13.1. Do not pull any cable forcibly, give any excessive force to it nor bend it Otherwise, it may broken.
- 13.2. Upon assembling "Fine Touch, take care not to apply considerable load to it. It is advisable to fix it with double-sided adhesive tape.
- 13.3. Do not give any pressures on the top layer via the cabinet and so on. If you are obliged to press on the top layer, you must press in the area of double-sided adhesive tape through the cushioned rubber in order to press it uniformly.

#### **14. QUALITY GUARANTEED**

#### 14.1.The terms of guarantee

This product is guaranteed for one year after shipping. (Condition of storage temperature 40°C70%RH or less)

#### 14.2. The scope of guarantee

When Nissha agrees that products became out of order or broken due to sole liability of Nissha, such products shall be replaced during the term of guarantee, on condition and in accordance with the followings terms.

- (1) In case the problem or breakage is due to miss-handling including but not limited to the abnormal shock or fall of the products in your process.
- (2) In case the problem or breakage is due to natural calamities or disaster
- (3) In case products were repaired, modified, tried to repair, or tried to modify without our explicit prior permission.
- (4) In case the products are handled not conforming to the handling advice, described in this specification.
- (5) The following procedures must be taken in order to receive replacement products, and failure to do so shall be deemed to have waived the right of replacement products.
- 5-1) Any defect or alleged defect must be informed to Nissha within thirty (30) days after relevant shipment date from Japan, and shall be treated following the instruction by Nissha.
- 5-2) In accordance with Nissha's instruction, all or part of defective or alleged defective products must be shipped back to Nissha not later than 14 days after Nissha's instruction, together with detailed explanation including without limitation relevant invoice numbers.
- 5-3) Unless otherwise expressly and separately agreed by Nissha, no debit note shall be issued and no deduction from payment shall be made
- 14.3.Sampling test

Electrical performance: ANSI/ASQC Z1.4 S-2 Standard Sampling time 1 AQL=0.4 Appearance performance: ANSI/ASQC Z1.4 Level II Standard Sampling time 1 AQL=1.0

#### [Appendix 1: How to measure the linearity]

Definition of linearity

In Fig. 1, when the DC5V is impressed between the "X" directional electrode and "Y" directional electrode of table alternately, the voltage between the depressed point and the reference surface shall be the output voltage (Eox and Eoy). As shown in Fig. 2, measure the point on 10mm grid enclosed by the positions "A" and "B", which are located at the inside of visible area the specified distance away from the edge, has been depressed.



When the output voltage corresponding to every measurement position is plotted as shown in Fig.3, the difference between the voltage enclosed by the positions "A" and "B" and the output voltage at the same position shall be " $\Delta$ Ex" (or " $\Delta$ Ey") and the electric potential difference "EABx" (or "EABy") between "A" and "B" shall be defined as the linearity.

Linearity of Touch panel (X)= $(\Delta Ex/EABx) \times 100\%$ Linearity of Touch panel (Y)= $(\Delta Ey/EABy) \times 100\%$ 



## Measurement of linearity

A measured value shall be a maximum value in absolute value tolerance when every nodal point on a grid shown in Fig.5 has been pressed under wiring conditions described in Fig.4.

<Hitting conditions>

Load : 0.8N Measuring jig : 0.8R resin pen Measuring area :6 × 5

<Measuring circuit>







Fig.4



Fig.5

#### [Appendix2: How to measure chattering]

Deasuring machine : Hioki 8802 MEMORY Hi CORDER

 $\Box$  Measuring conditions : Measuring voltage 5V

Testing resistor  $100 \text{k} \Omega$ 

Switching Hold a R8 silicon rod and speed as usual finger input.

Measurement of rise time / fall time

- Rise time When the switch has been turned on, the voltage at both ends of transparent tablet in the under-mentioned measuring circuit draws the under-mentioned chart. Measure the changing time from 10% and 90% of stable measuring voltage.
- Fall time When the switch has been turned off, the voltage at both ends of transparent tablet in the under-mentioned measuring circuit draws the under-mentioned chart. Measure the changing time from 90% and 10% of stable measuring voltage.







## [Appendix 3: Measurement of operating force]

When DC 5V is impressed to the "X" side, force is loaded by a silicone head of R8 and Hs  $60^{\circ}$  and a voltage value is stable, such force shall be the operation force. Upon pen operation, a polyacetal stylus of R0.8 shall be used.



<Measurement of Pen Input>

# Specifications of "FineTouch" $^{TM}$

Product No.:LJ97-00892A (Nissha Product No.: SS-A19D)

> Rev.1 April 24, 2006 April 4, 2006 Industrial materials and Electronics Precision Devices Business Unit Nissha Printing Co., LTD.

Sumsung Electronics CO., LTD. Approved by:

Nissha Printing Co., LTD.

# **REVISION PAGE**

<b>Revision</b> No.	Date of revision	Details of revision		
	April 4,2006	1St edition		
Day 1	Amil 24 2006	5.2 Surface hardware		
Kev.1	Apiii 24,2000	S.S. Sufface flateness		
		Note · The load is 500 of		
		6 1 Optical clarity		
		Haze: $3 \sim 10^{-96}$ (TVP 7%)		
		101 How to inspect		
		Lighting conditions: 2000LUX or less on the blight room		
		10.2 (9) Breakage on glass		
		Breakage on corner $X \leq 2, Y \leq 2, Z \leq t$		
		Breakage on any area other than corner $X \leq 3, Y \leq 3, Z \leq t$		

# **Resistive Touch Panel Specification**

# MODEL NO. 900291002

Doc. No	
New	2006/02/14
2	2006/3/23

Customer acceptance signature

APPROVED by CHECKED by		PREPARED by
M. H. Yeh	James Yan	Daniel Y. Chen

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	1 / 22

Resume of specification							
Version	Date	Contents	Writer				
1	2006/02/14	New	Daniel Y. Chen				
2	2006/03/23	Add the average of the terminal resistance of X-axis and Y-axis(only reference)	James Yan				

<u>Contents</u>	PAGE
1. Product scope ······	03
2. Product guarantee	03
3. Product structure characteristics	03
4. Temperature and humidity range of storage and operation -	04
5. Optical characteristics	04
6. Electrical characteristics	05
7. Mechanical characteristics	···· 07
8. Reliability characteristics	08
9. Durability characteristics	10
10. Appearance Inspection	12
11. Packaging procedure ······	15
12. Precautions in use of touch panel······	17
13. Others ······	21

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	3 / 22

# 1. Scope

The Specification is applicable for SWENC model No. **900291002**, 4-wire resistive type touch panel.

# 2. Guarantee

12 months guarantee after shipment under storage, shipment conditions as described in this spec.

# 3. Structure

3.1 Type : Film on Glass, high quality 4-wire analog type touch panel.

3.2 Input mode : Stylus or finger.

```
3.3 Structure :
```

3.3.1 Upper layer

substrate :ITO film thickness:180 ± 5µm

3.3.2 Lower layer

substrate : ITO Glass thickness : 0.7 ±0.1 mm

3.3.3 FPC.

substrate : Polyimide film circuit material : copper foil

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	4 / 22

# 4. Temperature and humidity range of storage and operation

- 4.1 Storage temperature range : -30°C ~ 70°C. humidity range : 20%RH ~ 90%RH (out of dew point).
- 4.2 Operation temperature range : -20°C ~ 60°C. humidity range : 20%RH ~ 90%RH (out of dew point).

# 5. Optical characteristics

Item		Spec.		Description	
Optical	5.1 Transmittance	total spectrum (400nm~700nm)	T%≧82%	JIS-K7105 The measurement equips: (Haze-gard plus: BYK-Gardner)	
characteristics	5.2 Glare	total spectrum (400nm~700nm)	Haze:6±3%	JIS-K7105 The measurement equips: (Haze-gard plus: BYK-Gardner)	

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	5 / 22

	Item	Item		Description
Op	perating Voltag	ge	DC 5V(standard)	7V (Maximum)
6.1 Working	Contact current		≦ 1mA	Measurement of contact current $a_1$ $a_3$ $x$ $x$ $a_{rea}$ $x$ $a_{rea}$ $a_4$ $y$ $a_4$ $a_4$ $a_1$ $a_2$ $a_4$ $a_1$ $a_2$ $a_4$ $a_1$ $a_2$ $a_4$ $a_1$ $a_2$ $a_3$ $a_4$ $a_1$ $a_2$ $a_3$ $a_4$ $a_1$ $a_2$ $a_3$ $a_4$ $a_1$ $a_2$ $a_3$ $a_3$ $a_4$ $a_1$ $a_2$ $a_3$ $a_3$ $a_4$ $a_1$ $a_2$ $a_3$ $a_3$ $a_3$ $a_4$ $a_1$ $a_2$ $a_3$ $a_3$ $a_3$ $a_3$ $a_3$ $a_4$ $a_1$ $a_2$ $a_3$ $a_$
current	Operating	FILM	= ≤ 20mA	Measurement of 5Vdc operation current + ITO Film
	current	GLASS		Scope 10Ω 1.Solid line: ITO Glass measurement path. 2.Dash line: ITO Film measurement path.
X-axis			<1.5%	Actual measurement value Actual measurement value Actual measurement value
Linearity errors	Y-axis		= 1.570	$\frac{1}{Max. derivation \Delta v}$ Measurement distance A1~A2 $\frac{1}{Max. derivation \Delta v}$ Measurement distance A1~A2 $\frac{1}{Max. derivation \Delta v}$

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	6 / 22



Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	7 / 22

7. N	7. Mechanical characteristics								
	Item			Spec.	説明 (Description)				
	Outline dimen	sion.	52.2±0.3(W	)×69.9±0.3(H)	Measurement method of Outline dim.				
	View area dim (mm)		45.5(W) × 5	9.9(H) Min.					
	Active area dir (mm)	n.	44.2(W) × 5	8.6(H) Min.					
	Total thickness (mm)	8	0.95±0.15 (	T)					
	Connector		FPC , 4-pin Pitch=1.2	(21.6±0.5×5.0±0.2),					
Mech	7.1 Input mode	e	With stylus	or finger					
lar	<b>7.2 Surface hardness</b> ≥3H pencil hardness (45° /4.9Nt)				Judgment ref. JIS -K5600				
iical spec	7.3 Pulling test of FPC	Vertical (90°)	strength:≧ pull rate:5	≧500g/cm 0mm/min	FPC Strength test method Strength≥500g/cm Pull rate : 50mm/min Vertical 90°				
	<ol> <li>FPC holder e</li> <li>FPC center line</li> <li>to avoid shea</li> </ol>	edge sho ine shou ar force.	ould be in allia	nce with FPC edge. ce with FPC holder center,	FPC Strength test Holder fixed-way of the explation FPC Center line Graphite Center point paste				
	7.4 Operating force		with stylus	≦80g	Measurement of operating force With pen 5Vdc Minimum pressure for conductance M.8.8mm M.8.8mm				
			with finger	≦80g	Measurement of operating 5Vdc force With Finger Minimum pressure for conductance M				

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	8 / 22

# 8. Reliability test

### 8.1 High temperature test

Put under environment of 80°C,testing for 240 hrs then put into room temperature for 24 hrs, goods must fulfil :

Linearity error : According to 6.2 spec. • Terminal resistance : According to 6.3 spec. • Insulation resistance : According to 6.4 spec. •

8.2 Low temperature test

Put under environment of -40°C, testing for 240 hrs then put into room temperature for 24 hrs, goods must fulfil :

Linearity error : According to 6.2 spec. • Terminal resistance : According to 6.3 spec. • Insulation resistance : According to 6.4 spec. •

8.3 High temperature & high humidity test

Under the environment of 60°C humidity 90% RH , testing after 240 hrs then put into room temperature for 24 hrs, goods must fulfil :

Linearity error : According to 6.2 spec. • Terminal resistance : According to 6.3 spec. • Insulation resistance : According to 6.4 spec. •

## 8.4 Thermal shock

Put into environmental chamber, first test under low temperature -40°C for continuous testing 30 min then raise temperature to high temperature 80°C for continuous testing 30 min. within 5 min., the cycle is 10 cycles, then put into room temperature for 24 hours, goods must fulfil :

Linearity error : According to 6.2 spec. • Terminal resistance : According to 6.3 spec. • Insulation resistance : According to 6.4 spec. •

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	9 / 22



Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	10 / 22

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	11 / 22

## 9.3 Still ball drop test

Using F 9mm steel ball from the height of 30cm and falling on touch panel surface, the result must pass the conditions as below :

Appearance : The same before test and without change, including panel broken.





## 9.4 Durability of edge friction

The durability of edge friction we guarantee more than 5000 times only within following conditions.

(a) Inward from active area 0.5mm for X-axis and Y-axis.

(b) F3.0mm/R0.8mm/POM stylus pen tip with 2.45N (250g) loading.

After test, the result should be passed as below condition :

Linearity error : According to 6.2 spec. • Terminal resistance : According to 6.3 spec. • Insulation resistance : According to 6.4 spec. •

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	12 / 22

# 10. Appearance inspection

purpose:

To establish appearance standard and maintain product quality.

scope :

View area within touch panel

10.1 Rule:

- 10.1.1 Inspection condition.
- (A) Environmental luminance : 2000 Lux.
- (B) Distance between human eyes and panel : 30 cm .

(panel must be tested under light transparent)

- (C) Visual angel: >60°.
- (D) Light source : 3-waves fluorescent light.

# 10.1.2 Judge criterion

Judgment under above mentioned criterion (panel must be tested under light transparent), testing goods defect can be visible within 10 seconds, which will be judged as major defects.

# 10.1.3 Sampling standard

The sampling standard will be confirmed by both of SWENC and Customer.

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	13 / 22

Inspection items	Sepc.	Judge criterion	Operation guideline
	W≦0.03mm & L≦1mm	Acceptable	
Scratch	0.03 <w≦0.1mm &amp; 1<l≦2mm< td=""><td>Max. 2 EA</td><td>Visual inspection-Transmitted Light</td></l≦2mm<></w≦0.1mm 	Max. 2 EA	Visual inspection-Transmitted Light
	0.03 < W ≦ 0.1mm & L > 2mm W > 0.1mm	. Not allowed	Approx.300mm Eyes
	D≦0.1mm	Acceptable	
Granular	0.1mm <d≦0.2mm< td=""><td>Max. 2 EA</td><td>2000Lux</td></d≦0.2mm<>	Max. 2 EA	2000Lux
foreign object	0.2mm <d≦0.3mm< td=""><td>Max. 1 EA</td><td>Visual inspection- Reflecting Light</td></d≦0.3mm<>	Max. 1 EA	Visual inspection- Reflecting Light
	D>0.30mm	Not allowed	Black back ground
	W≦0.03mm & L≦1mm	Acceptable	Panel Fluorescent lamps
Linear	0.03 <w≦0.1mm &amp; 1<l≦2mm< td=""><td>Max. 3 EA</td><td>Approx.300mm Eyes</td></l≦2mm<></w≦0.1mm 	Max. 3 EA	Approx.300mm Eyes
foreign object	0.03 < W ≦ 0.1mm & L>2mm	Not allowed	60° 2000Lux
	W>0.1mm		
	D≦0.1mm	Acceptable	
PET Bubbles/	0.1 <d≦0.2mm< td=""><td>Max. 4 EA</td><td></td></d≦0.2mm<>	Max. 4 EA	
Dent/	0.2 <d≦0.3mm< td=""><td>Max. 3 EA</td><td></td></d≦0.3mm<>	Max. 3 EA	
Fisheye	0.3 <d≦0.4mm< td=""><td>Max. 2 EA</td><td></td></d≦0.4mm<>	Max. 2 EA	
	D>0.4mm	Not allowed	
Puffiness(Baggy)	H≦0.4mm	Acceptable	Puffiness

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	14 / 22

		X≦3 、Y≦3mm、Z≦t (t = thickness)	Acceptable	
Chip on glass	Edge	X>3mm or Y>3mm	Not allowed	Chip of glass
	Corner	X≦2 or Y≦2mm or Z≦t (t = thickness)	Acceptable	Z X X X X X X X X X X X X X X X X X X X
		X>2mm or Y>2mm	Not allowed	
Flaw o	n glass		Not allowed	Flaw on glass
Dirt /	Stain		Without any defect	
Newton ring		D≦7.0mm	Max. 1 EA	
		D>7.0mm	Not allowed	$(\bigcirc)$

## Remarks :

- 1. If the particles which can be clarified clearly by visual inspection, it will be judged by the spec. as above.
- 2. If the particles which can not be clarified by visual inspection, it will not be counted as defects.
- 3. The summary of defect types are maximum four types allowed.

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	15 / 22

ltem	Sp	ec.	Remarks
			Front view of package drop test
11.1 Packa	By using the material of PET 60cm, go through the produc faces drop test : Linearity error : Accordin	and EPE, the height of test is ct test by 1 corner/3 edges/6 ng to 6.2 spec. •	Subject
ıge drop test	Insulation resistance · A Insulation resistance · A ※ Follow JIS Z 0202 falling te	ccording to 6.3 spec. • ccording to 6.4 spec. • est Level-3 standard.	Subject
11.2 P			
acka	1. Put the panels in tray piece by piece.	2. Trays are laminated and covered by plastic bag.	3. Move the socket into carton.
ging procedure			
	4. Put buffers into the carton.	5. Seal the carton.	6. Complete packaging.

# 11.3 Packaging Storage

- 1. Goods must be kept in original package for long term storage.
- 2. For storage conditions please follow specification section item 4-1.
- 3. Don't expose goods to sunshine directly.
  - 4. Please store the carton according to the UP/DOWN mark for the proper direction.

Taking off package

- 1. To remove touch panel from package, it is not allowed to pull by FPC.
  - 2. When unpack the package, please open the carton according to the UP/DOWN mark for correct procedure.
- 11.4 Delivery

Prevent from high humidity and high temperature environment during the journey. Extremely high or low temperature may cause the goods damage.

Document No	Specification of 900291002			Reported by	Daniel Y. Chen
Issuing date	2006/03/23	Ver.	2	Page	17 / 22

# 12. Precautions in use of touch panel

# 1. Purpose :

In order to prevent accidental use and performance deterioration, please keep the following precautions and inhibited points.

# 2. Item and illustration :

(1)Structure, area definition

The structure and the performance guaranteed area of this to uch panel are defined below :



Above figure illustrates the recommended bezel and cushion design. In order to prevent unusual performance degradation and malfunction of a touch panel, please carry out the set case designing and a touch panel assembling method after surely considering the definition of each area illustrated in above figure.

# Area(a): Active area

The active area is guaranteed the position data detectable precision, operation force and other operations. It is strongly recommended to place the operation button or menu keys within the active area. Due to structure, the active area is less durable at the edge or close to the edge.
#### Area(b): Operation non-guaranteed area

This area does not guarantee a touch panel operation and its function. When this area is pressed, touch panel shows degradation of its performance and durability such as a pen sliding durability becomes about one-tenth compared with the active area (Area-(a) as guaranteed area) and its operation force requires about double. About 0.5 mm outside from a boundary of the active area corresponds to this area.

#### Area(c): Pressing prohibition area

The area which forbids pressing, because an excessive load is applied to a transparent electrode (ITO) and a serious damage is given to a touch panel function by pressing.

Area(d): Non-Active area The area does not activate even if pressed.

- (2) Cautions for storage
  - (i) 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.
    Do not store the touch panel in a high temperature and humidity for a long period of time and avoid storage in the environment where condensation could arise.
  - (ii) If the touch panel is stored with the protecting film attached for a long period of time, the pressure sensitive adhesive of protecting film may stick to the touch panel as stains. Lightly wipe out the stains with a soft moistened cloth in ethanol.

## (3) Cautions for unpacking

Check the vertical direction before unpacking.

- (4) Cautions for handling
  - (i) Transparency is an important factor for the product. So, please wear clean finger sacks, gloves and mask to protect the products from fingerprint or stain attach, and also hold the portion outside the view area when handling the panel.
  - (ii) Do not handle the product by holding the flexible pattern portion in order to assure the reliability.
  - (iii) Do not put one product on the other. Otherwise, it may cause the product to be scratched and/or change on cosmetic occur (e.g. Newton ring).
  - (iv) Do not put a heavy, hard or sharp object on the product.

(5) Cautions for installing and assembling

(i)Do not give excessive strain to the product.

- (ii) Flexible pattern cable is connected to the body by the rmal pressure method. So, do not apply excessive forces to the flexible pattern. Do not add an excessive force to a FPC (Flex tail) that makes peeling off of the FPC from the product. Do not fix, adhere or mount any additional goods on the FPC such as additional film/plate on the FPC, because such additional goods will apply a stress at the FPC bonding area. It may affect the conductivity of FPC with touch panel.
- (iii) In order not to apply load on the display, provide a clearance of at least 0.3mm between the product and display.
- (iv) We recommend the design of a case or bezel should covers the boundary of the active area inside in order to prevent an operation at outside of the active area which can not guarantee the function or durability (refer to item 2.(1). Structure, area definition). Bezel's edge part may guide the pen sliding on the same position repeatedly. If the bezel is placed outside of the active area, it may cause the damage of the ITO film.
- (v) Pressing inside of boundary of the frame(part (A) as shown in below) may causes fault operation, so please design to avoid pressing of touch panel at part (A) such as having gasket/cushion at part (C). Particularly the area (B) shall be free from burr. The gasket/cushion material at the part (C) should not be exceeded to inside of the boundary of the frame.



- (vi)To prevent giving distortion to the film of the product and peeling off of the film from the product, do not fix the film and a set case or a shock absorbing material adhered to a set case by adhesion.
- (vii) Wipe off the stain on the product 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. Do not use any organic solvent or detergent other than ethanol.
- (viii) The corners of the product are not chamfered and are sharp. When positioning and fixing the product 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.
- (ix)Do not press the film of the product when this product is built into a set.
- (x) When attaching a protection sheet on this product at customer side, please confirm its characteristic in advance whether any damage is given to this product. Some changes may arise in the function of this product by the protection sheet attachment such as operation, cosmetic, etc., however those changes are out of our guarantee.
- (xi) Even when attaching a protection sheet with adhesion material by our side based on the request from customer, some changes may arise in the function of this product by the protection sheet attachment such as operability, cosmetic, etc., however those changes are out of our guarantee.
- (xii) When this product is attached on LCD or other target by using a double-sided tape etc., put an enough pressure onto the non-active area (Frame) of a touch panel. As attachment, please apply pressure equally onto the corner part and four sides of a touch panel. There is a case to take a time being for conducting an original adhesion, therefore, do not apply any strong stress to the product for a few hours after attachment.

## (6)Cautions for operation

- (i) Operate it with a polyacetal pen (tip R0.8 or over) or a belly of a finger without applying excessive load. Never use any mechanical pencils, ball point pens and hard fingertips whose tip is hard for input, otherwise malfunctions may result.
- (ii) The 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.
- (iii) Operation at the out of Active Area is out of our guarantee. It causes a serious damage of a transparent electrode. Do not operate at the out of Active Area.

(iv) In case of cleaning the part of the case boundary of accomplished set, use a soft cloth with a finger berry or a cotton bud. Do not clean with a thing other than the finger such as hard or sharp edges like a finger nail etc. on the cloth, because it cause transparent conductive film cracks. Please advise this inhibition to your last customers.

# 13. Others

- 1. Any issue or dispute on the specification, must be subjected to change after negotiation.
- 2. Revision of the spec. must follow up with written documentation first then is valid.
- 3. If Spec. sheet is different to individual spec., please follow up individual spec.
- 4. SWENC has no liability for any random spec. modification by buyers without both parties agreement.
- 5. SWENC will provide one year product guarantee under operation condition described in this specification.