Display Future Ltd
www.displayfuture.com

LCD MODULE SPECIFICATION

Model: DF-SSC0587---M1

This module uses ROHS materials

For customer acceptance

Customer		date
Approved		
Comments		

The standard product specification may change without prior notice in order to improve performance or quality. Please contact Display Future Ltd for updated specification and product status before design for the standard product or release of the order.	Revision	1.2
	Engineering	
	Date	2018/01/4
	Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2018-01-04	Initial Release	

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3. APPLICATION

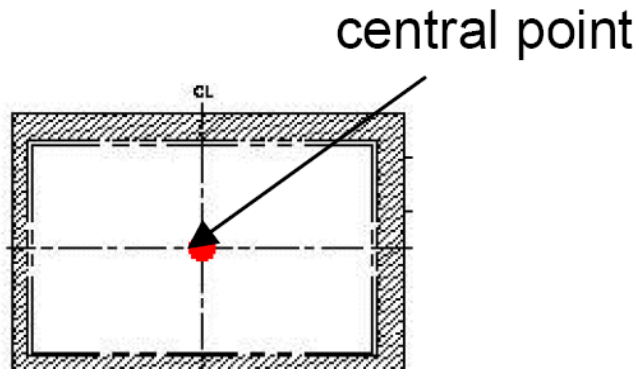
DVD player, UMPC, POS, MID

4. GENERAL SPECIFICATIONS

Composition: 5.7inch Capacitive Touch Panel (CTP).
Interface: I^2C for the CTP.

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Finger	10	
Sensor Active Area	118.76(W)(typ.) x89.95(H)(typ.)	mm
Transparency	≧85%	%
Haze	≦2.0%	%
Origin Point	The upper left corner	
Hardness	7H (typ.) [by JIS K5400]	Pencil hardness
Report rate	Max：122	Points/sec
Response time	15	ms
Point hitting life time	1,000,000 times min.	Note 1

Note 1: Use 8 mm diameter silicon rubber/force 3N to knock on the same point twice per second (no-operating), after test function check pass.



5. ABSOLUTE MAXIMUM RATINGS

Symbol	Description	Min	Typ.	Max	Unit	Notes
VCC1	Supply voltage	2.66	-	3.47	V	
VIO	DC input voltage	0	-	VCC1+0.3	V	

6. ELECTRICAL CHARACTERISTICS

Symbol	Description	Min	Typ	Max	Unit	Notes
VCC1	Supply voltage	2.8	-	3.3	V	
GND	Supply voltage	-	0	-	V	
I	Active mode	-	13	15	mA	
VIH	Input H voltage	1.35	1.8	2.1	V	
VIL	Input L voltage	-0.3	0	0.45	V	

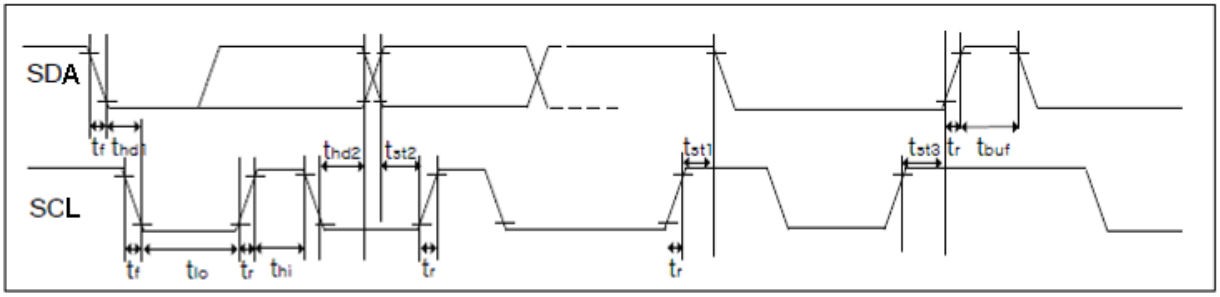
7. TIMING SPECIFICATIONS

7.1 CTP Interface and Data Format [Slave address is 0x5D(7 bit addressing)]

Communication protocol: I^2C

Clock frequency : 100Khz （400Khz Fast mode）

Below is timing of I2C hardware circuit:

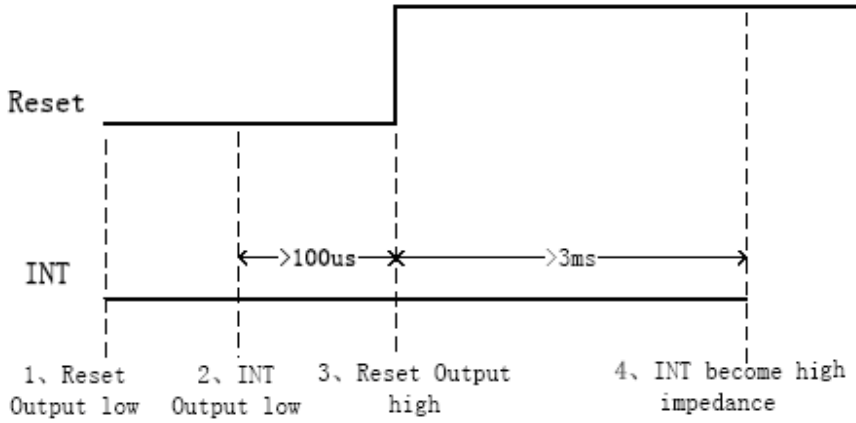


Test condition 1: 3.3V communication interface, 400Kbps, pull up resistor is 2K ohm

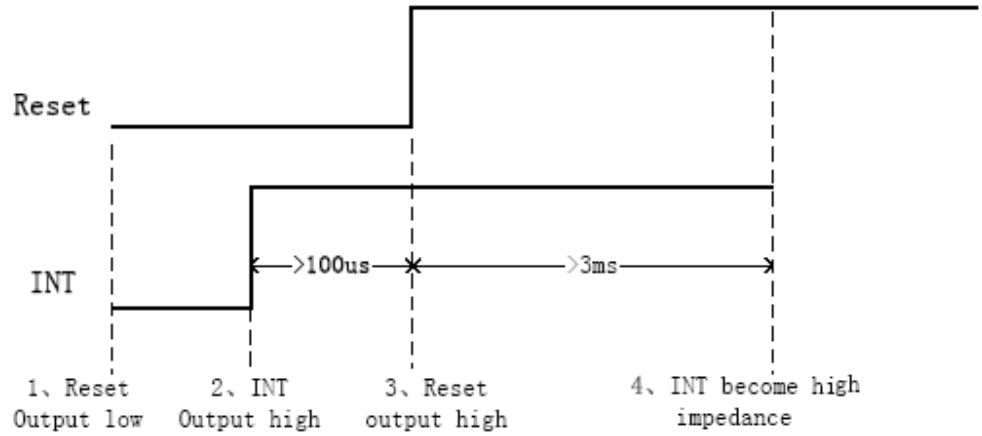
Parameter	Symbol	Min	Max	Unit
SCL low period	t_{lo}	0.9	0.9	us
SCL high period	t_{hi}	0.8	0.8	us
SCL setup time for START condition	t_{st1}	0.4	0.4	us
SCL setup time for STOP condition	t_{st3}	0.4	0.4	us
SCL hold time for START condition	t_{st1}	0.3	0.3	us
SDA setup time	t_{st2}	0.4	0.4	us
SDA hold time	t_{st2}	0.4	0.4	us

GT927 has 2 sets of slave address 0xBA/0xBB or 0x28/0x29. Master can control Reset & INT pin to configure the slave address the slave address in power on initial state like following

7.1.1 Timing of setting slave address to 0xBA/0XBB:



7.1.2 Timing of setting slave address to 0x28/0X29:



a) Data Transmission (ex: slave address is 0xBA/0xBB)

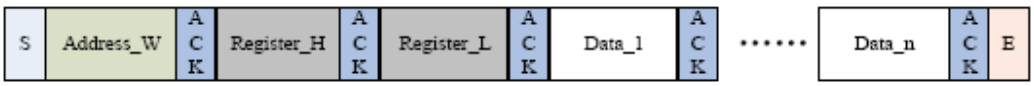
Communication is always initiated by master, A high-to-low transition of SDA with SCL high is a start condition.

All addresses words are serially transmitted to and from on bus in 8-bit words. GT927 sends a “0” to acknowledge when the address word is 0xBA/BB. This happens during the ninth clock cycle. If the slave address is not matched, GT927 will stay in idle state.

The data words are serially transmitted to and from in 9-bit words: 8-bit data + 1-bit ACK or NACK sent by GT927. Data changes during SCL high periods.

A low-to-high transition of SDA with SCL high is a stop condition.

b) Write Operations to GT927 (ex: slave address is 0xBA/0xBB)



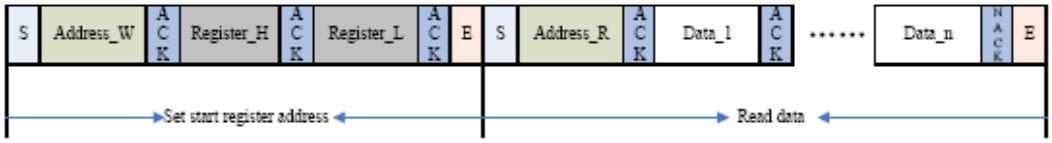
Write Operations

Please check above figure, master start the communication first, and then sends address words 0XBA for a write operation.

After receiving ACK from GT927, master sends out register address word in 16-bit, and then the data word in 8-bit, which is going to be wrote into GT927.

GT927's address pointer will be automatically added 1 after write operation, so master can sequential write in one operation. When operation finished, master stop the communication.

c) Read Operations to GT927 (ex: slave address is 0xBA/0xBB)



Read operation

Please check above figure, master start the communication first, and then sends address words 0xBA for a write operation.

After receiving ACK from GT927, master sends out register address word in 16-bit, to set GT927's address pointer. After receiving ACK, master sends out a start signal once again, start the read operation with command: 0xBB, and read data word from GT927 in 8-bit.

GT927 also supports sequential read operation, and the default setting is sequential read mode. Master shall send out ACK when receiving successfully in every data word, master sends NACK after getting all the data required, then sends stop signal to finish the communication.

7.1.3 Register Information of GT927

a) Real Time Order (Write Only)

Addr	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x8040	Command	0: read status of coordinate 1:D-value 2: software reset 3: benchmark update 4: benchmark calibration 5: screen off							
0x8041	LED_Control	Control word under control of touch key LED light							
0x8042	Proximity_En	Proximity switch							

b) Configuration Information (R/W)

Addr	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x8047	Config_Version	Version number of configuration document							
0x8048	X Output Max_L	Max value of X axis							
0x8049	X Output Max_H								
0x804A	Y Output Max_L	Max value of Y axis							
0x804B	Y Output Max_H								
0x804C	Touch Number	Reserved				Touch number: 1~5			
0x804D	Module_Switch1	Reserved	Stretch_rank			X2Y	Sito	INT trigger method	
0x804E	Module_Switch2	Reserved						Touch_Key	
0x804F	Shake_Count	Reserved				Finger shake count			
0x8050	Filter	First_Filter	Normal_Filter(filtering value of original coordinate window, coefficiency is 1)						
0x8051	Large_Touch	Number of touch in large area							
0x8052	Noise_Reduction	Reserved				Value of noise elimination(coefficient is 1)			
0x8053	S_Touch_Level	Threshold of touch grow out of nothing							
0x8054	S_Leave_Level	Threshold of touch grow out of nothing							
0x8055	Low_Power_Control	Reserved				Time to low power consumption(0~15s)			
0x8056	Refresh_Rate	Reserved				Coordinate report rate(Cycle: 5+N ms)			
0x8057	x_threshold	Reserved							
0x8058	y_threshold								
0x8059	X_Speed_Limit	Parameter of speed limit							
0x805A	Y_Speed_Limit								
0x805B	Space	Blank area of boarder-top				Blank area of boarder-bottom			
0x805C		Blank area of boarder-left				Blank area of boarder-right			
0x805D	NC	Reserved							
0x805E	NC	Reserved							
0x805F	NC	Reserved							
0x8060	NC	Reserved							
0x8061	NC	Reserved							
0x8062	Drv_GroupA_Num	All_Driving	Reserved			Driver_Group_A_number			
0x8063	Drv_GroupB_Num	Reserved		D_Freq		Driver_Group_B_number			
0x8064	Sensor_Num	Sensor_Group_B_Number				Sensor_Group_A_Number			
0x8065	FreqA_factor	Driver frequency double frequency coefficient of Driver group A GroupA_Frequence =Multiplier factor *baseband							
0x8066	FreqB_factor	Driver frequency double frequency coefficient of Driver group B GroupB_Frequence =Multiplier factor *baseband							
0x8067	Pannel_BitFreqL	Baseband of Driver group A\B(1526Hz<baseband<14600Hz)							
0x8068	Pannel_BitFreqH								
0x8069	Pannel_Sensor_TimeL	Time interval of the neibouring two driving signal(Unit: us)							
0x806A	Pannel_Sensor_TimeH								

0x806B	Pannel_Tx_Gain	Reserved	Pannel_Drv_output_R, 4 gears	Pannel_DAC_Gain	
0x806C	Pannel_Rx_Gain	Pannel_PGA_C	Pannel_PGA_R	Pannel_Rx_Vcmi	Pannel_PGA_Gain
0x806D	Pannel_Dump_Shift	Reserved	Magnification coefficient of original value(The Nth power of 2)		
0x806E	Drv_Frame_Control	Reserved	SubFrame_Drv Num	Repeat_Num	
0x806F	NC	Reserved			
0x8070	NC	Reserved			
0x8071	NC	Reserved			
0x8072	Stylus_Tx_Gain	Undefined(invalid when stylus_priority=0)			
0x8073	Stylus_Rx_Gain	Undefined(invalid when stylus_priority=0)			
0x8074	Stylus_Dump_Shift	Undefined(invalid when stylus_priority=0)			
0x8075	Stylus_Touch_Level	Undefined(invalid when stylus_priority=0)			
0x8076	Stylus_Leave_Level	Undefined(invalid when stylus_priority=0)			
0x8077	Stylus_Control	Pen mode escape time out period(Unit: Sec)			
0x8078	NC	Reserved			
0x8079	NC	Reserved			
0x807A	Freq_Hopping_Start	Frequency hopping start frequency(Unit: 2KHz,50means 100KHz)			
0x807B	Freq_Hopping_End	Frequency hopping stop frequency(Unit: 2KHz,150means 300KHz)			
0x807C	Noise_Detect_Tims	Detect_Stay_Times	Detect_Confirm_Times		
0x807D	Hopping_Flag	Hop_En	Reserved	Detect_ Time_Out	
0x807E	Hopping_Threshold	Large_Noise_Threshold	Large_Hit_Threshold		
0x807F	Noise_Threshold	Threshold of noise level			
0x8080	NC	Reserved			
0x8081	NC	Reserved			
0x8082	Hopping_seg1_BitFreqL	Frequency hopping segment band 1 central frequency(for driver A/B)			
0x8083	Hopping_seg1_BitFreqH				
0x8084	Hopping_seg1_Factor	Frequency hopping segment 1 central frequency coefficient			
0x8085	Hopping_seg2_BitFreqL	Frequency hopping segment band 2 central frequency(for driver A/B)			
0x8086	Hopping_seg2_BitFreqH				
0x8087	Hopping_seg2_Factor	Frequency hopping segment 2 central frequency coefficient			
0x8088	Hopping_seg3_BitFreqL	Frequency hopping segment band 3 central frequency(for driver A/B)			
0x8089	Hopping_seg3_BitFreqH				
0x808A	Hopping_seg3_Factor	Frequency hopping segment 3 central frequency coefficient			
0x808B	Hopping_seg4_BitFreqL	Frequency hopping segment band 4 central frequency(for driver A/B)			
0x808C	Hopping_seg4_BitFreqH				
0x808D	Hopping_seg4_Factor	Frequency hopping segment 4 central frequency coefficient			
0x808E	Hopping_seg5_BitFreqL	Frequency hopping segment band 5 central frequency(for driver A/B)			
0x808F	Hopping_seg5_BitFreqH				
0x8090	Hopping_seg5_Factor	Frequency hopping segment 5 central frequency coefficient			
0x8091	NC	Reserved			
0x8092	NC	Reserved			
0x8093	Key1	Key 1 Position: 0~255 valid(0 means no touch, it means independent touch key when 4 of the keys are 8 multiples)			
0x8094	Key2	Key 2 position			
0x8095	Key3	Key 3 position			
0x8096	Key4	Key 4 position			
0x8097	Key_Area	Time limit for long press(1~16s)	Touch valid interval setting: 0~15 valid		
0x8098	Key_Touch_Level	Key threshold of touch key			

0x8099	Key_Leave_Level	Key threshold of touch key	
0x809A	Key_Sens	KeySens_1(sensitivity coefficient of key 1,same below)	KeySens_2
0x809B	Key_Sens	KeySens_3	KeySens_4
0x809C	Key_Restrain	Reserved	Reserved
0x809D	NC	Reserved	
0x809E	NC	Reserved	
0x809F	NC	Reserved	
0x80A0	NC	Reserved	
0x80A1	NC	Reserved	
0x80A2	Proximity_Drv_Select	Drv_Start_Ch(start channel of driving direction)	Drv_End_Ch(End channel)
0x80A3	Proximity_Sens_Select	Sens_Start_Ch(start channel of sensing direction)	Sens_End_Ch(End channel)
0x80A4	Proximity_Touch_Level	Proximity effective threshold value	
0x80A5	Proximity_Leave_Level	Proximity ineffective threshold value	
0x80A6	Proximity_Freq_Factor	Frequency mollification of proximity sensing channel	
0x80A7	Proximity_BitFreqL	Base frequency of proximity sensing channel	
0x80A8	Proximity_BitFreqH		
0x80A9	Proximity_Sensor_TimeL	Time interval between proximity adjacent driving signal	
0x80AA	Proximity_Sensor_TimeH		
0x80AB	Proximity_Tx_Gain	Driving gain of proximity	
0x80AC	Proximity_Rx_Gain	Driving gain of proximity	
0x80AD	Proximity_Dump_Shift	Reserved	Magnification coefficient of proximity original value(The Nth power of 2)
0x80AE	NC	Reserved	
0x80AF	NC	Reserved	
0x80B0	NC	Reserved	
0x80B1	NC	Reserved	
0x80B2	NC	Reserved	
0x80B3	NC	Reserved	
0x80B4	NC	Reserved	
0x80B5	NC	Reserved	
0x80B6	NC	Reserved	
0x80B7~ 0x80C4	Sensor_CH0~ Sensor_CH13	Corresponding channel no. of ITO Sensor	
0x80C5~ 0x80D4	NC	Reserved	
0x80D5~ 0x80EA	Driver_CH1~ Driver_CH21	Corresponding channel no. of ITO Driver0	
0x80EB~ 0x80FE	NC	Reserved	
0x80FF	Config_Chksum	Check of configuration information	
0x8100	Config_Fresh	Updated configuration(by master control)	

c) Coordinates Information

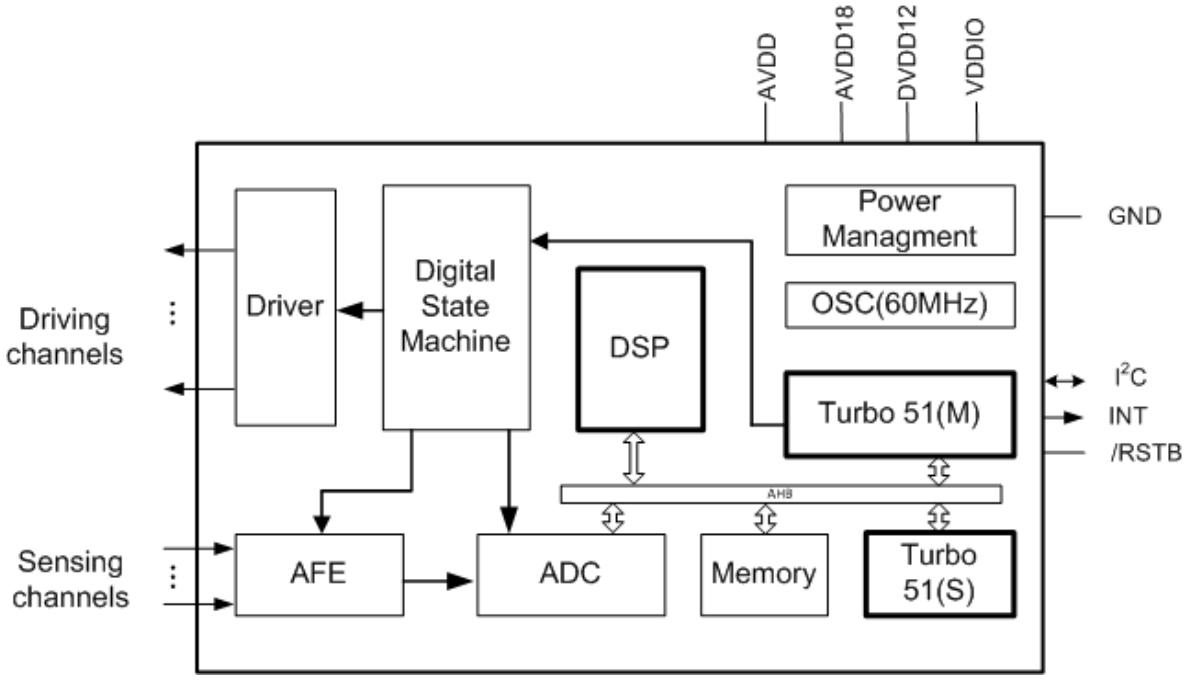
Addr	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0x8140	Product ID(Lowest Byte, ASCII code 6)							
0x8141	Product ID(Third Byte, ASCII code 0)							
0x8142	Product ID(Second Byte, ASCII code 0)							
0x8143	Product ID(Highest Byte, ASCII code 9)							
0x8144	Firmware version(byte1)(Low Byte)							
0x8145	Firmware version(byte2)(High Byte)							
0x8146	x coordinate resolution(low byte)(current output resolution)							
0x8147	x coordinate resolution(high byte)							
0x8148	y coordinate resolution(low byte)							
0x8149	y coordinate resolution(high byte)							
0x814A	Vendor_id(current module choice information)							
0x814B	Reserved							
0x814C	gesture type(Reserved)							
0x814D	gesture value(Reserved)							
0x814E	buffer status	Large detect	Proximity Valid		HaveKey		number of touch points	
0x814F	track id							
0x8150	point 1 x coordinate(low byte)							
0x8151	point 1 x coordinate(high byte)							
0x8152	point 1 y coordinate(low byte)							
0x8153	point 1 y coordinate(high byte)							
0x8154	point 1 size(low byte)							
0x8155	point 1 size(high byte)							
0x8156	Reserved							
0x8157	track id							
0x8158	point 2 x coordinate(low byte)							
0x8159	point 2 x coordinate(high byte)							
0x815A	point 2 y coordinate(low byte)							
0x815B	point 2 y coordinate(high byte)							
0x815C	point 2 size(low byte)							
0x815D	point 2 size(high byte)							
0x815E	Reserved							
0x815F	track id							
0x8160	point 3 x coordinate(low byte)							
0x8161	point 3 x coordinate(high byte)							
0x8162	point 3 y coordinate(low byte)							
0x8163	point 3 y coordinate(high byte)							
0x8164	point 3 size(low byte)							
0x8165	point 3 size(high byte)							
0x8166	Reserved							
0x8167	track id							
0x8168	point 4 x coordinate(low byte)							
0x8169	point 4 x coordinate(high byte)							
0x816A	point 4 y coordinate(low byte)							
0x816B	point 4 y coordinate(high byte)							
0x816C	point 4 size(low byte)							
0x816D	point 4 size(high byte)							
0x816E	Reserved							
0x816F	track id							
0x8170	point 5 x coordinate(low byte)							
0x8171	point 5 x coordinate(high byte)							
0x8172	point 5 y coordinate(low byte)							

0x8173	point 5 y coordinate(high byte)
0x8174	point 5 size(low byte)
0x8175	point 5 size(high byte)
0x8176	Reserved
0x8177	track id
0x8178	point 6 x coordinate(low byte)
0x8179	point 6 x coordinate(high byte)
0x817A	point 6 y coordinate(low byte)
0x817B	point 6 y coordinate(high byte)
0x817C	point 6 size(low byte)
0x817D	point 6 size(high byte)
0x817E	Reserved
0x817F	track id
0x8180	point 7 x coordinate(low byte)
0x8181	point 7 x coordinate(high byte)
0x8182	point 7 y coordinate(low byte)
0x8183	point 7 y coordinate(high byte)
0x8184	point 7 size(low byte)
0x8185	point 7 size(high byte)
0x8186	Reserved
0x8187	track id
0x8188	point 8 x coordinate(low byte)
0x8189	point 8 x coordinate(high byte)
0x818A	point 8 y coordinate(low byte)
0x818B	point 8 y coordinate(high byte)
0x818C	point 8 size(low byte)
0x818D	point 8 size(high byte)
0x818E	Reserved
0x818F	track id
0x8190	point 9 x coordinate(low byte)
0x8191	point 9 x coordinate(high byte)
0x8192	point 9 y coordinate(low byte)
0x8193	point 9 y coordinate(high byte)
0x8194	point 9 size(low byte)
0x8195	point 9 size(high byte)
0x8196	Reserved
0x8197	track id
0x8198	point 10 x coordinate(low byte)
0x8199	point 10 x coordinate(high byte)
0x819A	point 10 y coordinate(low byte)
0x819B	point 10 y coordinate(high byte)
0x819C	point 10 size(low byte)
0x819D	point 10 size(high byte)
0x819E	Reserved
0x819F	Keyvaule

8. Pin Connections

No.	Name	I/O	Description
1	NC	-	No connection
2	SCL	I	I^2C Clock
3	SDA	I/O	I^2C Data
4	NC	-	No connection
5	INT	O	Interrupt output
6	GND	P	Ground
7	VCC1	P	Power supply Voltage
8	/RESET	I	Reset active low
9	NC	-	No connection

9. BLOCK DIAGRAM



10. Appearance Specification

10.1 Process/Content:

10.1.1Inspection equipment： fluorescent lamp，functional test jig，magnifying glass, Vernier caliper, ESD wrist strap.

10.1.2 Environment demand

1.2.1 Temperature：25±5℃

1.2.2 Humidity：30-75%RH

1.2.3 Luminance：Fluorescent light（appearance：800-1200UXL function：100-500UXL）

10.1.3 Inspection process

1.3.1 Inspect distribution operation

1.3.2 Shift team leader is in charge of distributing work when work order goes to OQC inspection of finished products

1.3.3 Products of great emergency or especially asked by customer should be finished in advance.

1.3.4 All the items should be fully inspected before shipment.

1.3.5 The inspection standard & specification should be carried out according to customer's demand. If customer has no other standard & specification, just stick to this one.

10.1.4 Sampling plan

1.4.1 Do tests regularly according to MIL-STD-105E. Single sampling plan is arrived out according to Level.

1.4.2 Defect definition

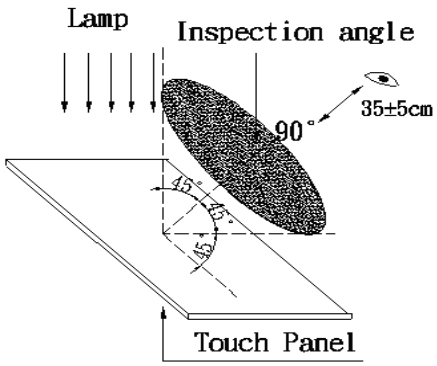
1.4.2.1 Major defect is inspected according to AQL 0.40%.

1.4.2.2 Minor defect is inspected according to AQL 0.40%.

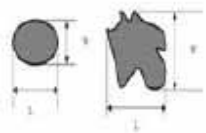
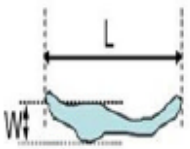
10.1.5 Appearance inspection

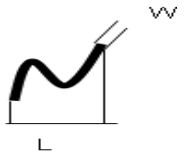
1.5.1 Appearance inspection method

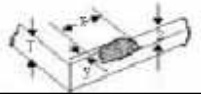
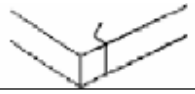
Inspection angle spacing：30-40cm



1.5.2 Appearance inspection standard

<table>
<tr><th>Item</th><th>Spec</th><th>Statement</th></tr>
<tr><td>Foreign material
Punctiform</td><td>
<table>
<tr><th>Spec</th><th>Q’ty allowed</th></tr>
<tr><td>D＞0.5mm</td><td>0</td></tr>
<tr><td>0.3mm≦D≦0.5mm</td><td>5</td></tr>
<tr><td>D＜0.3mm</td><td>Disregarded</td></tr>
</table>
</td><td> 
D= (L + W) / 2</td></tr>
<tr><td>Foreign material
Linear</td><td>
<table>
<tr><th>Spec</th><th>Q’ty allowed</th></tr>
<tr><td>W＞0.1mm L＞5mm</td><td>0</td></tr>
<tr><td>0.05mm≦W≦0.1mm
L≦5mm</td><td>5</td></tr>
<tr><td>W＜0.05mm</td><td>Disregarded</td></tr>
</table>
</td><td> 
L : Long W : Width</td></tr>
<tr><td>Image uniformity</td><td>Gray color can be seen on RGB through ND5%</td><td></td></tr>
</table>

<table>
<tr><td>TP scratch</td><td>
<table>
<tr><th>Spec</th><th>Q’ty allowed</th></tr>
<tr><td>W＞0.07mm L＞7mm</td><td>0</td></tr>
<tr><td>W≦0.07mm L≦7mm</td><td>5</td></tr>
</table>
</td><td>  </td></tr>
<tr><td>TP dented spot</td><td>
<table>
<tr><th>Spec</th><th>Q’ty allowed</th></tr>
<tr><td>D＞0.5mm</td><td>0</td></tr>
<tr><td>0.3mm≦D≦0.5mm</td><td>5</td></tr>
</table>
</td><td> 
D= (L + W) / 2</td></tr>
<tr><td>TP overflows or lacks of glue</td><td>±0.45mm</td><td></td></tr>
</table>

Surface broken	X<2mm Y<2mm Z<glass	
Edge broken	X<2mm Y<2mm Z<glass	
Rift	Not allowed	
Bubble appears in protection film	D>10mm N=0 5≦D≦10mm N=2 D<5 disregarded	
TP deviation	According to the specifications of customer's drawing	
Bubble	D≦0.2mm disregarded 0.2mm＜D≦0.3mm N≦2 0.3mm＜D not allowed No influence on appearance and function in invisible area OK	
Printing ink	No light leak Silk-screen saw tooth：S≦0.1 disregarded 0.1mm≦S≦0.15mm N=5 S＞0.15 ng LOGO break line NG Script dim，printed backwards，no printing in wrong place	
Finger print	Not allowed	
Stain	Stain on surface can be removed OK Bonding surface has no influence on appearance and function OK Can't be removed & not allowed	
Protection film	Bent isn't allowed No lift up Bent is allowed L＜10MM N≦5	

11. QUALITY ASSURANCE

11.1 Test Condition

11.1.1 Temperature and Humidity (Ambient Temperature)

Temperature: 25 ± 5°C

Humidity: 65 ± 5%

11.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

11.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

11.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

11.1.5 Test Method

Reliability Test Item & Level		Test Level
No.	Test Item	
1.	High Temperature Storage Test	T= 80℃ 120hrs after 1 hrs at room temperature and test.
2.	Low Temperature Storage Test	T= -30℃ 120hrs after 1 hrs at room temperature and test.
3.	High Temperature and High Humidity Storage Test	T= 40℃, 90%RH,120hrs after 24 hrs at room temperature and test.
4.	Thermal Cycling Test (No operation)	-30 ℃ 30min ~ 80 ℃ 30 min , 100 Cycles after 24 hrs at room temperature and test.
5.	Vibration Test (No operation)	Frequency :10 ~ 55 HZ Amplitude :1.5 mm Sweep time : 11 mins Test Period: 6 Cycles for each direction of X, Y, Z
6.	ESD TEST	Air Discharge : ±15KV Indirect Contact Discharge : ±8KV

12. PRECAUTIONS IN USE CTP

1. ASSEMBLY PRECAUTIONS
   (1) Since Touch Panel is consist of glass, please be careful your hands to be injured during handing. You must wear gloves during handing.
   (2) Do not touch, push or rub the exposed touch panel, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
   (3) Do not stack the touch panels together. Do not put heavy objects on touch panel.
   (4) Please do not take a CTP to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
   (5) Please excessive force or strain to the panel or tail is prohibited, Do not lift touch panel by cable(FPC).
   (6) Use clean sacks or glove to prevent fingerprints and/or stains left on the panel. Extra attention and carefulness should be taken while handling the glass edge.
   (7) Please pay attention for the matters stated below at mounting design of touch panel enclosure.
   Enclosure support to fix touch panel must be out of active area.(do not design enclosure presses the active area to protect from miss put)
2. OPERATING PRECAUTIONS
   (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
   (2) Please do not change variable resistance settings in CTP. They are adjusted to the most suitable value. If they are changed, it might happen CTP does not satisfy the characteristics specification
   (3) Be careful for condensation at sudden temperature change. Condensation makes damage to sensor or electrical contacted parts.
   (4) CTP has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
   (5) Touch the panel with your finger or stylus only to assure normal operation. Any sharp edged or hard objects are prohibited.
   (6) Operate the panel in a steady environment. Abrupt variation on temperature and humidity may cause malfunction of the panel.
3. ELECTROSTATIC DISCHARGE CONTROL
   (1) The operator should be grounded whenever he/she comes into contact with the CTP. Never touch any of the conductive parts such the copper leads on the FPC and the interface terminals with any parts of the human body.
   (2) The CTP should be kept in antistatic bags or other containers resistant to static for storage.
   (3) Only properly grounded soldering irons should be used.
   (4) If an electric screwdriver is used, it should be well grounded and shielded from commentator sparks.
   (5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
   (6) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.
5. STORAGE PRECAUTIONS
   (1) When you store touch panel for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
   (2) Please do not leave touch panel in the environment of high humidity and high temperature such as 60°C 90%RH
   (3) Please do not leave touch panel in the environment of low temperature; below -20°C.
6. OTHERS
   For the packaging box, please pay attention to the followings:
   a. Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
   b. Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
   c. Packing box and inner case for CTP are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)
7. LIMITED WARRANTY
   Unless otherwise agreed between Display Future and customer, Display Future will replace or repair any of its CTP which is found to be defective electrically and visually when inspected in accordance with Display Future acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of Display Future is limited to repair and/or replacement on the terms set forth above. Display Future will not responsible for any subsequent or consequential events.

13. OUTLINE DRAWING