# *Crystalfontz America, Inc.*

| CUSTOMER | | |
|---|---|---|
| MODEL | CFAX12864C-WGH-TS | |
| APPROVAL | BY: | DATA: |

| SALES BY | APPROVED BY | CHECKED BY | PREPARED BY |
|---|---|---|---|
| | | | |

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# Contents

# 1.Module Classification Information

**CFA X 1 2 8 6 4 C - W G H - TS**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

| | | | |
|---|---|---|---|
| ① | Brand: CRYSTALFONTZ AMERICA, INCORPORATED | | |
| ② | Display Type: H→Character Type, G→Graphic Type, **X→TAB** | | |
| ③ | Display's logical dimensions: **128** pixels by **64** pixels | | |
| ④ | Model serials no. | | |
| ⑤ | Backlight Type: | N→Without backlight<br>B→EL, Blue green<br>D→EL, Green<br>**W→EL, White**<br>F→CCFL, White<br>Y→LED, Yellow Green | <br>A→LED, Amber<br>R→LED, Red<br>O→LED, Orange<br>G→LED, Green |
| ⑥ | LCD Mode: | B→TN Positive, Gray<br>N→TN Negative,<br>**G→STN Positive, Gray**<br>Y→STN Positive, Yellow Green<br>M→STN Negative, Blue<br>F→FSTN Positive | T→FSTN Negative |
| ⑦ | LCD Polarizer Type/ Temperature range/ View direction | A→Reflective, N.T, 6:00<br>D→Reflective, N.T, 12:00<br>G→Reflective, W. T, 6:00<br>J→Reflective, W. T, 12:00<br>B→Transflective, N.T,6:00<br>E→Transflective, N.T.12:00 | **H→Transflective, W.T,6:00**<br>K→Transflective, W.T,12:00<br>C→Transmissive, N.T,6:00<br>F→Transmissive, N.T,12:00<br>I→Transmissive, W. T, 6:00<br>L→Transmissive, W.T,12:00 |
| ⑧ | Special Code: | **TS→Matrix touch screen** | |

# 2.Precautions in use of LCD Modules

(1) Avoid applying excessive shocks to the module or making any alterations or modifications to it.

(2) Don’t make extra holes on the printed circuit board, modify its shape or change the components of LCD module.

(3) Don’t disassemble the LCM.

(4) Don’t operate it above the absolute maximum rating.

(5) Don’t drop, bend or twist LCM.

(6) Soldering: only to the I/O terminals.

(7) Storage: please storage in anti-static electricity container and clean environment.

# 3.General Specification

| Item | Dimension | Unit |
|---|---|---|
| Number of Characters | 128 characters x 64 Lines | - |
| Module dimension | 56.0 x 42.5 x 2.4(MAX) | mm |
| View area | 52.0x 33.5 | mm |
| Active area | 47.76x 30.29 | mm |
| Dot size | 0.37 x 0.42 | mm |
| Dot pitch | 0.35 x 0.4 | mm |
| LCD type | STN, Positive, Transflective, Gray | |
| Duty | 1/64 | |
| View direction | 6 o’clock | |
| Backlight Type | EL, White | |

# 4.Absolute Maximum Ratings

| Item | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Operating Temperature | $T_{OP}$ | -20 | - | +70 | ℃ |
| Storage Temperature | $T_{ST}$ | -30 | - | +80 | ℃ |
| Input Voltage | $V_I$ | $V_{SS}$ | - | $V_{DD}$ | V |
| Supply Voltage For Logic | $V_{DD}$-$V_{SS}$ | 2.4 | - | 5.5 | V |
| Supply Voltage For LCD | $V_O$-$V_{SS}$ | 4.0 | - | 15.0 | |

# 5.Electrical Characteristics

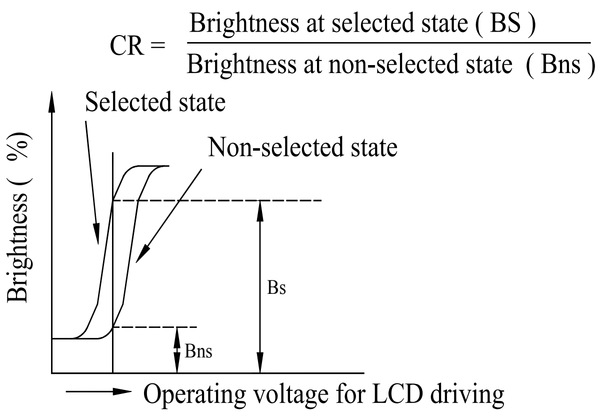
| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage For Logic | $V_{DD}$-$V_{SS}$ | - | 2.4 | - | 5.5 | V |
| Supply Voltage For LCD | $V_{DD}$-$V_0$ | Ta=-20℃ | - | - | 9.2 | V |
| | | Ta=25℃ | - | 8.2 | -. | V |
| | | Ta=+70℃ | 7.2 | - | - | V |
| Input High Volt. | $V_{IH}$ | - | 0.8 $V_{DD}$ | - | $V_{DD}$ | V |
| Input Low Volt. | $V_{IL}$ | - | - | - | 0.2 $V_{DD}$ | V |
| Output High Volt. | $V_{OH}$ | - | $V_{DD}$ -0.4 | - | - | V |
| Output Low Volt. | $V_{OL}$ | - | - | - | 0.4 | V |
| Supply Current | $I_{DD}$ | $V_{DD}$=5V | - | 1.5 | - | mA |

# 6.Optical Characteristics

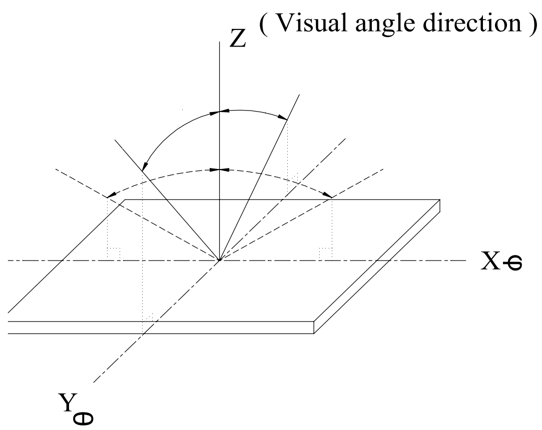
| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| View Angle | (V)θ | CR≧2 | 10 | - | 40 | deg |
| | (H)φ | CR≧2 | -30 | - | 30 | deg |
| Contrast Ratio | CR | - | - | 5 | - | - |
| Response Time | T rise | - | - | 110 | 220 | ms |
| | T fall | - | - | 260 | 520 | ms |

## 6.1 Definitions

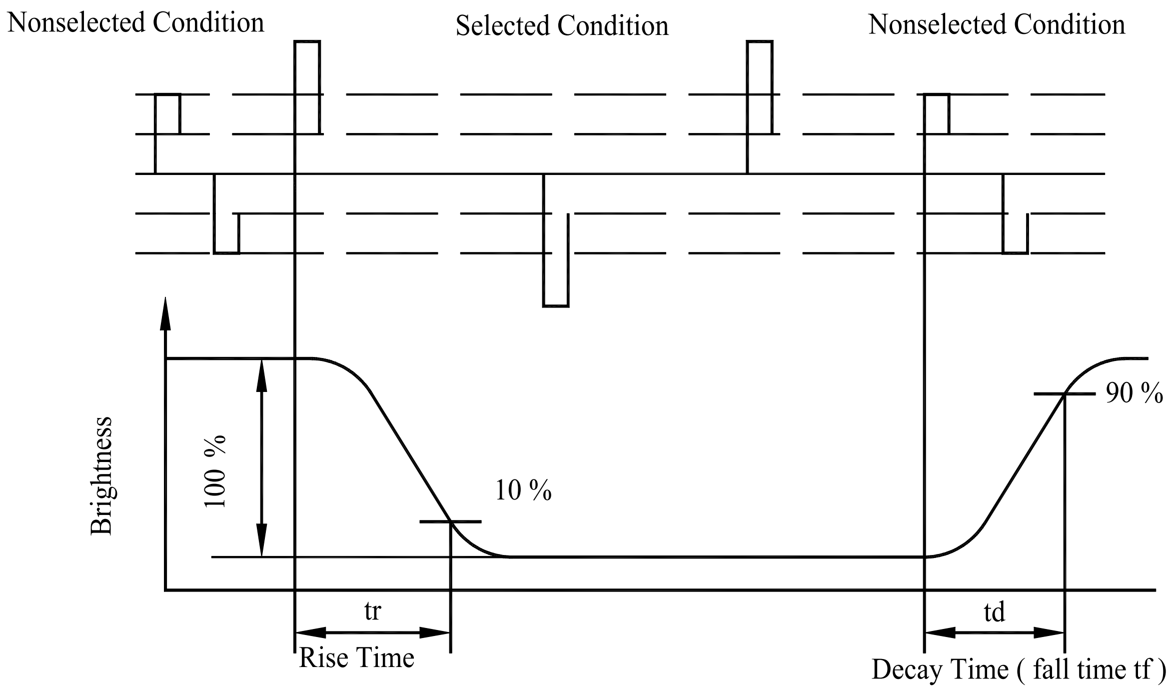
■**View Angles**




■**Contrast Ratio**



■ **Response Time**



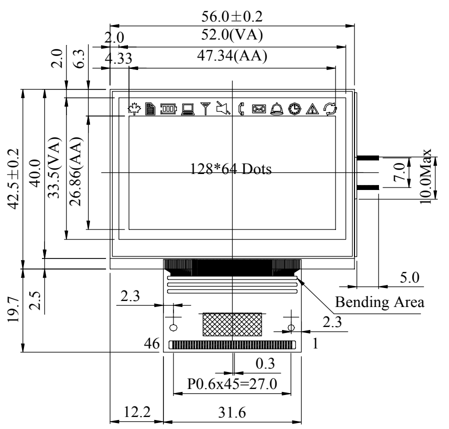
# 7.Interface Description

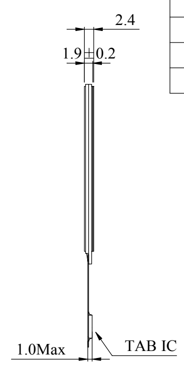
| Pin No. | Symbol | I/O | Description |
|---|---|---|---|
| 1 | NC | - | No connection |
| 2 | TEMPS | I | Selects temperature coefficient of the reference voltage<br><br>TEMPS="L": -0.05%℃, TEMPS="H": -0.2%℃ |
| 3 | INTRS | I | Internal resistors select pin<br>This pin selects the resistors for adjusting V0 voltage level.<br>INTRS="H": use the internal resistor.<br>INTRS="L": use the external resistor.<br>V0 voltage is controlled with VR pin and external resistive divider. |
| 4 | HPM | I | Power control pin of the power supply circuit for LCD driver.<br>HPM="H": high power mode<br>HPM="L": normal power mode<br>This pin is valid in master operation. |
| 5 | DCDC5B | I | 5times boosting circuit enable input pin.<br>When this pin is low in 4 times boosting circuit, the 5-time boosting voltage appears at VOUT. |
| 6 | BSTS | I | Select input voltage of the built-in voltage converter.<br>Voltage converter input<br>BSTS="H": 4V (VDD>4V)<br>BSTS="L": VDD (2.4V≦VDD≦5.5V)<br>When BSTS pin is "L", VDD must be higher than 4V in our 4-time boosting. |
| 7~11 | V0~V4 | I/O | LCD driver supply voltages.<br>The voltage determined by LCD pixel is impedance-converted by an operational amplifier for application.<br>Voltages should have the following relational;<br>V0≧V1≧V2≧V3≧V4≧VSS |
| 12 | VR | I | V0 voltage adjustment pin.<br>It is valid only when on-chip resistors are not used(INTRS="L") |
| 13 | C2- | O | Capacitor 2 negative connection pin for voltage converter. |
| 14 | C2+ | O | Capacitor 2 positive connection pin for voltage converter. |

| Pin No. | Symbol | I/O | Description |
|---|---|---|---|
| 15 | C1- | O | Capacitor 1 negative connection pin for voltage converter. |
| 16 | C1+ | O | Capacitor 1 positive connection pin for voltage converter. |
| 17 | C3- | O | Capacitor 1 negative connection pin for voltage converter. |
| 18 | C3+ | O | Capacitor 1 positive connection pin for voltage converter. |
| 19 | VOUT | I/O | Voltage converter input/output pin. |
| 20 | VDD | - | Power supply pin for logic. |
| 21 | VSS | - | Ground pin, connected to 0V |
| 22 | PS | I | Parallel/Serial data input select pin.<br><br>Interface Data Read/Write Serial clock<br>PS="H": Parallel DB0~DB7 E_RD,RW_WR -<br>PS="L": Serial SID(DB7) Write only SCLK(DB6)<br>In serial mode, it is impossible to read data from the on-chip RAM. And DB0 to DB5 are high impedance and E_RD and RW_WR must be fixed to either "H" or "L". |
| 23 | MI | I | Microprocessor interface selects pin.<br>MI="H": 6800-series MPU interface<br>MI="L": 8080-series MPU interface |
| 24 | CLS | I | Built-in oscillator circuit enable/disable select pin.<br>CLS="H": enable<br>CLS="L": disable(external display clock input from CL pin) |
| 25 | MS | I | Master or Slave mode operation select pin.<br>MS="H" : master operation<br>MS="L" : slave operation |
| 26<br>27 | DUTY1<br>DUTY0 | I | The LCD driver duty ratio depends on the following table<br>DUTY1 DUTY0 Duty ratio<br>L L 1/33<br>L H 1/49<br>H L 1/65 |
| 28~35 | DB7~DB0 | I/O | 8-bit bi-directional data bus that is connected to the standard 8-bit microprocessor data bus.<br>When the serial interface selected(PS="L")<br>DB0~DB5: high impedance<br>DB6: serial input clock (SCLK)<br>DB7: serial input data (SID)<br>When chip select is not active, DB0~DB7 may be high impedance. |

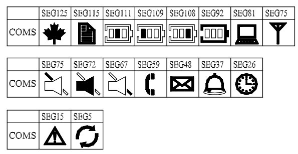
| Pin No. | Symbol | I/O | Description |
|---|---|---|---|
| 36 | E_RD | I | When connected to 80-family MPU:<br>Read enable clock input pin. When /RD is “L”, DB0~DB7 are in an output status<br>When connected to 68-family MPU:<br>RW = ”H”: When E is “H”, DB0~DB7 are in an output status<br>RW = “L”: The data on DB0~DB7 are latched at the falling edge of the E signal |
| 37 | RW_WR | I | When connected to 80-family MPU:<br>Write enable clock input pin. The data ON DB0~DB7 are latched at the rising edge of the /WR signal.<br>When connected to 68-family MPU:<br>RW = ”H”: read<br>RW = “L”: write |
| 38 | RS | I | Register select pin<br>RS=”H”: DB0~DB7 are display data<br>RS=”L”: DB0~DB7 are control data |
| 39 | RESETB | I | Reset input pin<br>When RESETB is “L”, initialization is executed. |
| 40<br>41 | CS2<br>CS1B | I | Chip select input pins<br>Data/instruction I/O enable only when CS1B is “L” and CS2 is “H”.<br>When chip select is non-active, DB0~DB7 may be high impedance. |
| 42 | DISP | I/O | LCD display blanking control input /output<br>When KS0713 is used in master/slave mode (multi-chip), the DISP pins must be connected each other.<br>MS=”H”: output<br>MS=”L”: input |
| 43 | CL | I/O | Display clock input/output pin<br>When the KS0713 is used in master/slave mode (multi-chip), the CL pins must be connected each other. |
| 44 | M | I/O | LCD AC signal input /output pin<br>When KS0713 is used in master/slave mode (multi-chip), the M pins must be connected each other.<br>MS=”H”: output<br>MS=”L”: input |
| 45 | FRS | O | Static driver segment output pin<br>This pin is used together with the M pin. |
| 46 | NC | - | No connection. |

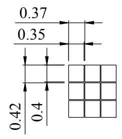
# 8.Contour Drawing & Block Diagram




| PIN NO. | SYMBOL | PIN NO. | SYMBOL | PIN NO. | SYMBOL |
|---|---|---|---|---|---|
| 42 | DISP | 21 | Vss | 1 | NC |
| 43 | CL | 22 | PS | 2 | TEMPS |
| 44 | M | 23 | MI | 3 | INTRS |
| 45 | FRS | 24 | CLS | 4 | HPM |
| 46 | NC | 25 | MS | 5 | DCDC5B |
| | | 26 | DUTY1 | 6 | BSTS |
| | | 27 | DUTY0 | 7 | V4 |
| | | 28 | DB7 | 8 | V3 |
| | | 29 | DB6 | 9 | V2 |
| | | 30 | DB5 | 10 | V1 |
| | | 31 | DB4 | 11 | V0 |
| | | 32 | DB3 | 12 | VR |
| | | 33 | DB2 | 13 | C2- |
| | | 34 | DB1 | 14 | C2+ |
| | | 35 | DB0 | 15 | C1- |
| | | 36 | E_RD | 16 | C1+ |
| | | 37 | RW_WR | 17 | C3- |
| | | 38 | RS | 18 | C3+ |
| | | 39 | RESETB | 19 | Vout |
| | | 40 | CS2 | 20 | Vdd |
| | | 41 | CS1B | | |

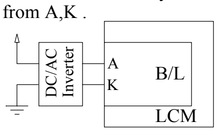




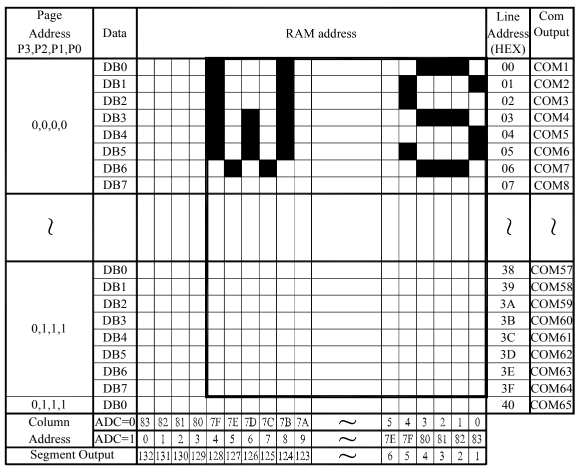

DOT SIZE
SCALE 10/1

The non-specified tolerance of dimension is ¡ Ó0.15 mm .

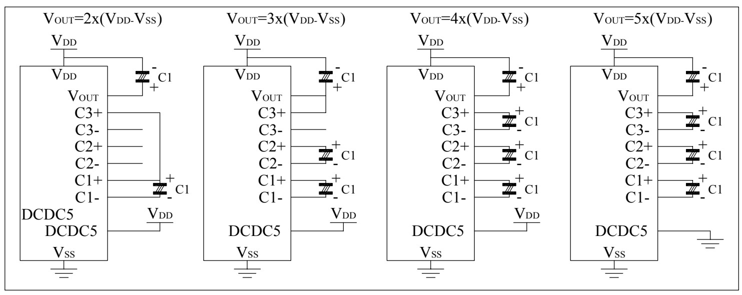
EL B/L drive directly
from A,K .

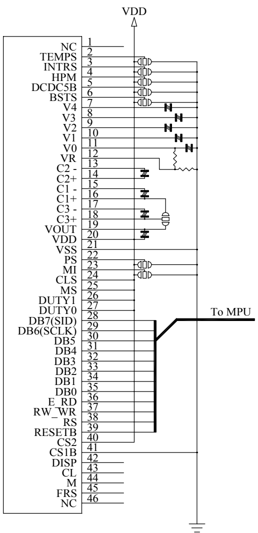



Display Data RAM



Boosting Circuit





Application Circuit

# 9.Backlight Information

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT | TEST CONDITION |
|---|---|---|---|---|---|---|
| Drive Voltage | Vmax | 78 | — | 85 | Vrms | 25°C |
| Drive Wave | Fmax | 400 | — | 1000 | Hz | 25°C |
| Brightness | | 65 | - | - | $cd/m^2$ | 78~85Vrms/400~1000Hz |
| Power Consumption | | - | 43.55 | - | mW | 78~85Vrms/400~1000Hz |
| Chromatism | X | - | 0.330 | - | - | 78~85Vrms/400~1000Hz |
| | Y | - | 0.365 | - | - | 78~85Vrms/400~1000Hz |
| Life time | | 5000 | | | hour | 78~85Vrms/400~1000Hz |
| Color | | White | | | - | - |

# 10.Touch Screen

## 1. General

1.1 This document includes the specification of PN4-025F-01N touch screen.
1.2 This touch screen is 4 wires analog resistive type.
1.3 It is based on one ITO glass sheet with one layer of ITO PET on top.
1.4 The PET is coated with ITO and is separated with printed spacers.
1. It is designed to be activated by pressure of finger or stylus.
2.

## 2. Environment

2.1 Storing Environment
Temperature Range: -20 deg C ~ 70 deg C
Humidity Range: 10% RH ~ 90% RH

2.2 Operating Environment
Temperature Range: 0 deg C ~ 50 deg C
Humidity Range: 20% RH ~ 80% RH

2. The above envionment is under normal pressure of the atmosphere.

## 3. Mechanical Specification

3.1 Touch panel style

| | |
|---|---|
| style: | Analog resistance |

3.2 Dimension Specifications:

| | |
|---|---|
| Dimension Outline | 63.5mm ±0.3mm x 41.5mm ±0.3mm |
| Viewable area | 56.70mm x 35.00mm |
| Active area | 54.40mm x 32.40mm |
| PET thickness | max. 200μm |
| Glass thickness | 1.1mm |

3.3 Dot Spacer Specifications：

| | |
|---|---|
| (1) Diameter: | 0.05 mm ±0.01 mm |
| (2) Height: | 5 um ~ 10 um |
| (3) Pitch: | 3 mm |
| (4) Pattern: | rhombus |
| (5) Operative Force: | <= 40g |

3.4 Surface Hardness PET: >= 3H
3.5 Transparency

Non-Glare Panel: >= 70 % , Wave length at 450~700nm

## 4. Electrical Specification

Film resistance between leads: 150Ω ~ 1300Ω
Glass resistance between leads: 150Ω ~ 1300Ω
Operative resistance: <= 2KΩ
Linearity deviation: <= 2.0%
Insulation resistance: >= 20MΩ/25V.

( The ON Resistance is measured when the panel is pressed by R8 , HS60 silicon rubber at 80 g force ).

## 5. Quality Standard

5.1 Resistance against chemicals

The panel could be cleaned with cloth containing ethanol or neutral cleaner. It is no effects to the characteristics.

5.2 Dirt and Flaws on Panel Surface

The flaws and Impurities are allowed outside viewing area except those affecting electrical functions.
Inside the viewing area , it meets the following :

5.3 Within viewable area (PANEL) :

(1) Hair Flaws:
W<= 0.05 mm, L <= 12 mm: OK
0.05 mm < W <= 0.1 mm, L<= 5 mm: 3 or less are OK
W > 0.1 mm, L > 2 mm: fail
(W = width of flaws , L = length of flaws )

(2) Dot-shaped Impurities :
D <= 0.1 mm: OK
0.1 mm < D <= 0.3 mm: 5 or less are OK
D > 0.3 mm: fail
( D : average of diameter )

(3) Scratch :
W <= 0.05 mm, L <= 12 mm: OK
0.05 mm < W <= 0.1 mm, L <= 12 mm: 5 or less are OK
W > 0.1 mm, L > 12 mm: fail

( W : width of scratch , L : length of scratch )

5.4 Glass Sheet

(1) Glass Sheet Cracks and Chips: No Cracks and Chips on the Glass Sheet.

(2) The angle chips are smaller than 2.5 mm x 2.5 mm x 1.1 mm ( X x Y x Z )

(3) The border chips are smaller than 5 mm x 2 mm x 1.1 mm ( X x Y x Z )

X : Width direction against the edge line.
Y : Length direction against the edge line.
Z : Thickness direction against the edge line.

The chips are not supposed to affect any of the electrical functions.

## 6. Durability

Keystroke Durability
No damages or malfunctions should occur after 1,000,000 keystrokes as the following :

Keystroke element : R8 , HS40 silicon rubber
Keystroke load : 150 g
Keystroke speed : 0.33 sec/stroke
Keystroke position : Any position in active area
Temperature and humidity : Normal

## 7. Reliability

7.1 High temperature test

After putting panels at 60℃ for 120 hours , they meet the electrical specification required in section 4.

7.2 Low temperature test

After putting panels at -20℃ for 120 hours , they meet the electrical specification required in section 4.

7.3 Temperature and humidity test

After putting panels at 60℃ , 90% RH for 120 hours , they meet the electrical specification required in section 4.

7.4 Thermal shock test

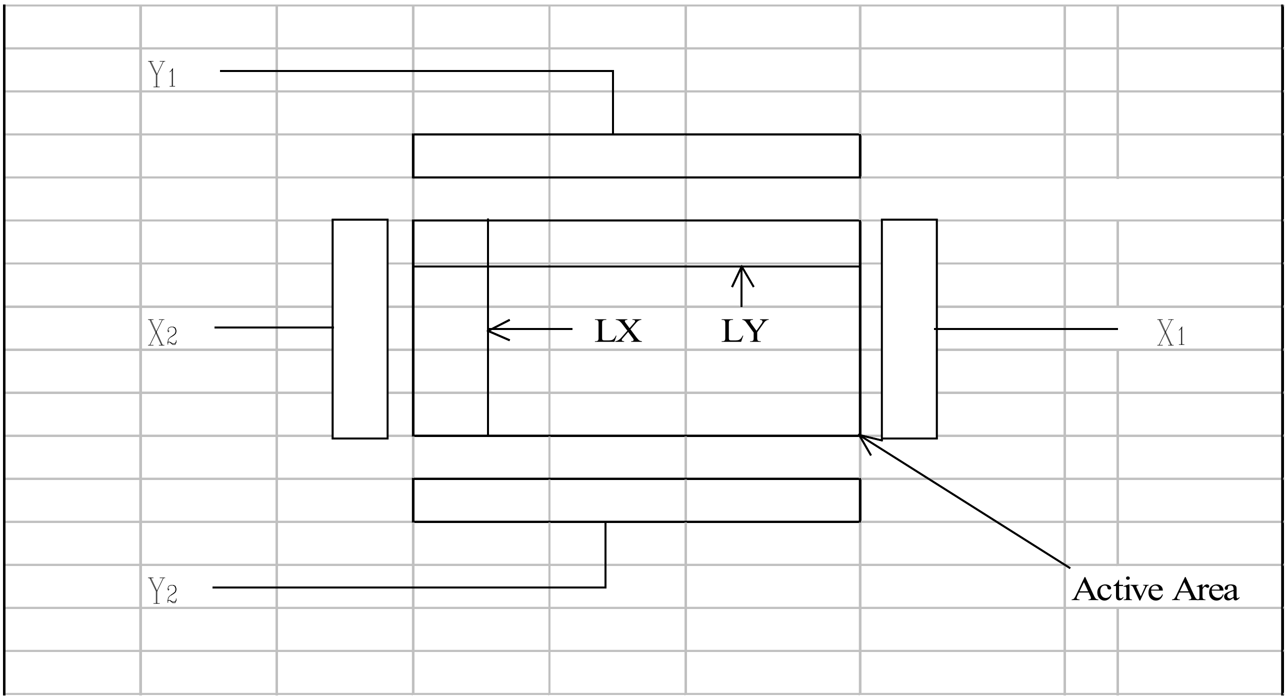
1 Cycle : -20℃ →70℃ ( 30 minutes period )

After putting panels for 10 cycles within 24 hours , they meet the electrical specification required in section 4.

## 8. Inspection Method

8.1 PET

(1) Linearity




Voltage ( DC 5V) is applied to X1 or Y1 and GND to X2 or Y2

By using stylus to cross direct line for every 5 mm step within active area to detect the voltage at Y1 or X1

To measure the voltage difference between X1 and X2 or Y1 and Y2

The voltage variance = △Ex or △Ey

The linearity must meet the riquirement of section 4

(2) Appearance : The inspection shall be performed by using one 17w fluorescent lamp as back or side light . The panel shall be placed at 30cm away from eyes. The panel must meet the requirement of section 5.

8.2 Glass

(1) Linearity : refer to 8.1-(1)

(2) Strength : By using a 9mm diameter steel ball to fall on the panel with height of 30cm , the panel will not be broken.

(3) Appearance : refer to 8.1-(2)

8.3 Tail Bending : By bending the tail 90° around a 2mm cylinder for 3 times , the panels meet the requirement of section 4.

## 9.Cautions

9.1 The bezel which contacts with PET film should keep a distance at least 3 mm from the active area to avoid short.

9.2 The bezel which contacts with PET film should not place heavy pressure on the film and the surface of bezel should be kept smooth.

9.3 Please keep clean on the surface of PET film , Don't attach any tape on that.

9.4 Neither pull tail upward nor push downward with an angle of 90° It should keep an arch at least R5.

9.5 If there exist any high voltage power , please make an adequate protect.

9.6 To avoid the high voltage static power to damage panel , please don't operate touch panel without connecting controller.

9.7 Ronics retain the right of changing the materials with same grade and specification.