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FOR : _____

TYPE : TCG075VGLAF-G00

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KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT
LCD DIVISION

This specification is subject to change.
Consult Kyocera before ordering.

| | | | | | |
|-----------------|--------------------------------|-------------|--------------|------------------------|----------|
| Original | Designed by :Engineering Dept. | | | Confirmed by :QA Dept. | |
| Issue Date | Prepared | Checked | Approved | Checked | Approved |
| August 30, 2007 | S. Kojima | Y. Ishimori | Y. Matsumoto | J. Sakaguchi | H. Imai |

Warning

1. This Kyocera LCD module has been specifically designed for use only in electronic devices and industrial machines in the area of audio control, office automation, industrial control, home appliances, etc. The module should not be used in applications where the highest level of safety and reliability are required and module failure or malfunction of such module results in physical harm or loss of life, as well as enormous damage or loss. Such fields of applications include, without limitation, medical, aerospace, communications infrastructure, atomic energy control. Kyocera expressly disclaims any and all liability resulting in any way to the use of the module in such applications.
2. Customer agrees to indemnify, defend and hold Kyocera harmless from and against any and all actions, claims, damages, liabilities, awards, costs and expenses, including legal expenses, resulting from or arising out of Customer's use, or sale for use, or Kyocera modules in applications.

Caution

1. Kyocera shall have the right, which Customer hereby acknowledges, to immediately scrap or destroy tooling for Kyocera modules for which no Purchase Orders have been received from the Customer in a two-year period.

Revision Record

| | | | | | |
|----------|--------------------------------|---------|--------------|------------------------|----------|
| Date | Designed by: Engineering Dept. | | | Confirmed by: QA Dept. | |
| | Prepared | Checked | Approved | Checked | Approved |
| | | | | | |
| Rev. No. | Date | Page | Descriptions | | |
| | | | | | |

1. Application

This data sheet defines the specification for a $640 \times (\text{R.G.B}) \times 480$ dot, amorphous silicon TFT transmissive color dot matrix type Liquid Crystal Display with LED backlight. 『RoHS Compliant』

2. Construction and Outline

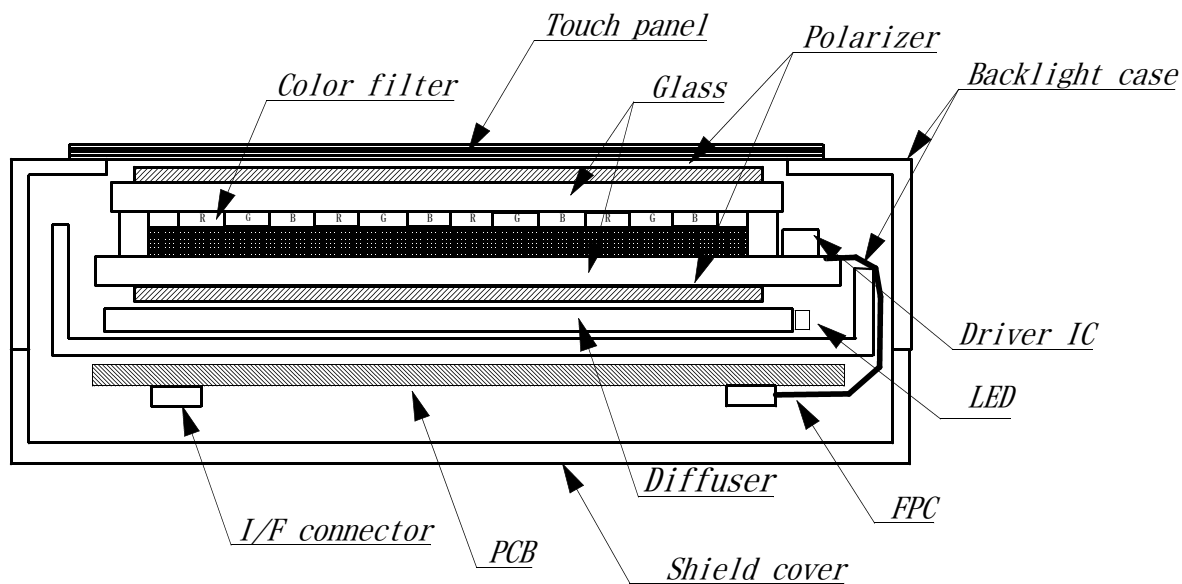
$640 \times (\text{R.G.B}) \times 480$ dots, COG type LCD with LED backlight.

Backlight system : Side-edge type (LED).

Polarizer : Glare treatment.

Additional circuits : Timing controller, Power supply (3.3V input)
(Without constant current circuit)

Touch Panel : Analog type. Non-Grare treatment.



This drawing is showing conception only.

3. Mechanical Specifications

3-1. LCD

| ITEM | SPECIFICATION | UNIT |
|------------------------|--------------------------------|------|
| Outline dimensions | 184 (W) × 139.8 (H) × 14.5 (D) | mm |
| Effective viewing area | 153.7 (W) × 115.8 (H) | mm |
| Dot number | 640 × (R. G. B) (W) × 480 (H) | Dots |
| Dot pitch | 0.079 (W) × 0.237 (H) | mm |
| Display mode *1 | Normally white | — |
| Mass | (440) | g |

*1 Due to the characteristics of the LCD material, the color vary with environmental temperature.

3-2. Mechanical Specifications of touch panel

| ITEM | SPECIFICATION | UNIT |
|------------------|--------------------------------------|------|
| Input | Radius-0.8 stylus or Finger | — |
| Actuation Force | 0.05~0.8 | N |
| Transmittance | Typ. 83 | % |
| Surface hardness | pencil hardness 2H or more according | — |

4. Absolute Maximum Ratings

4-1. Electrical absolute maximum ratings

| ITEM | SYMBOL | Min. | Max. | UNIT |
|----------------------------|--------|------|------|------|
| Power input voltage | VDD | 0 | 4.0 | V |
| Input signal voltage *1 | Vin | -0.3 | 6.0 | V |
| Forward current *2 | IF | — | 27 | mA |
| Reversed voltage *2 | VR | — | 5 | V |
| Touch panel supply voltage | Vtp | 0 | 6.0 | V |
| Touch panel Input current | Itp | 0 | 0.5 | mA |

*1 Input signals : CK, R0~R5, G0~G5, B0~B5, Hsync, Vsync, ENAB, R/L, U/D

*2 For each : "AN1-CA1", "AN2-CA2", "AN3-CA3", "AN4-CA4"

4-2. Environmental absolute maximum ratings

| ITEM | SYMBOL | Min. | Max. | UNIT |
|--------------------------|--------|------|------|--------|
| Operating temperature *1 | Top | -20 | 70 | deg. C |
| Storage temperature *2 | Tsto | -30 | 80 | deg. C |
| Operating humidity *3 | Hop | 10 | *4 | %RH |
| Storage humidity *3 | Hsto | 10 | *4 | %RH |
| Vibration | — | *5 | *5 | — |
| Shock | — | *6 | *6 | — |

*1 Operating temperature means a temperature which operation shall be guaranteed.
Since display performance is evaluated at 25 deg.C, another temperature range should be confirmed.

*2 Temp. = -30 °C < 48 h , Temp = 80 °C < 168 h
Store LCD panel at normal temperature/humidity.
Keep it free from vibration and shock.
LCD panel that is kept at low or high temperature for a long time can be defective due to the other conditions, even if the temperature satisfies standard.
(Please refers to 13. Precautions for use as detail).

*3 Non-condensation.

*4 Temp. ≤ 40 deg.C, 85%RH Max.
Temp. > 40 deg.C, Absolute Humidity shall be less than 85% RH at 40 deg.C.

*5

| | | |
|-----------------|-------------|---|
| Frequency | 10~55 Hz | Converted to acceleration value : (0.3~9 m/s ²) |
| Vibration width | 0.15 mm | |
| Interval | 10-55-10 Hz | 1 minute |

2 hours in each direction X/Y/Z (6 hours as total)
EIAJ ED-2531

*6 Acceleration: 490m/s²
Pulse width : 11 ms
3 times in each direction : ±X/±Y/±Z.
EIAJ ED-2531

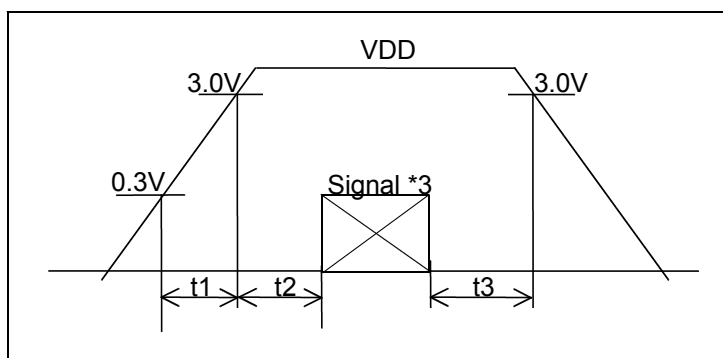
5. Electrical Characteristics

5-1. LCD

Temp. = -20~70°C

| ITEM | SYMBOL | MIN | TYP | MAX | UNIT |
|--|-----------------|--------|-----|--------|-------|
| Power input voltage *1 | VDD | 3.0 | 3.3 | 3.6 | V |
| Current consumption *2 | IDD | — | 290 | 435 | mA |
| VDD=3.3V Temp. =25°C | | | | | |
| Permissive input ripple voltage (VDD=3.3V) | VRP | — | — | 100 | mVp-p |
| Input signal voltage (Low) *3 | V _{IL} | 0 | — | 0.3VDD | V |
| Input signal voltage (High) *3 | V _{IH} | 0.7VDD | — | VDD | V |

*1 VDD-turn-on conditions



$$0 < t_1 \leq 20 \text{ ms}$$

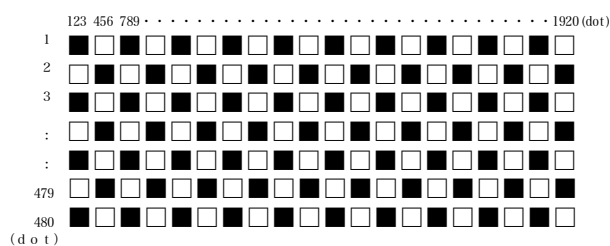
$$0 < t_2 \leq 50 \text{ ms}$$

$$0 < t_3 \leq 1 \text{ s}$$

*2 Power consumption

Black & White pattern :

VDD = 3.3V



*3 Input signals : CK, R0~R5, G0~G5, B0~B5, Hsync, Vsync, ENAB, R/L, U/D

5-2. Touch Panel

5-2-1. Terminal resistance

Between xL and xR : 200 ~ 1000 Ω

Between yU and yL : 200 ~ 1000 Ω

5-2-2. Linearity

±1.5% x : 1.5% or less

y : 1.5% or less

5-2-3. Insulation resistance

100MΩ or more at DC25V

6. Optical Characteristics

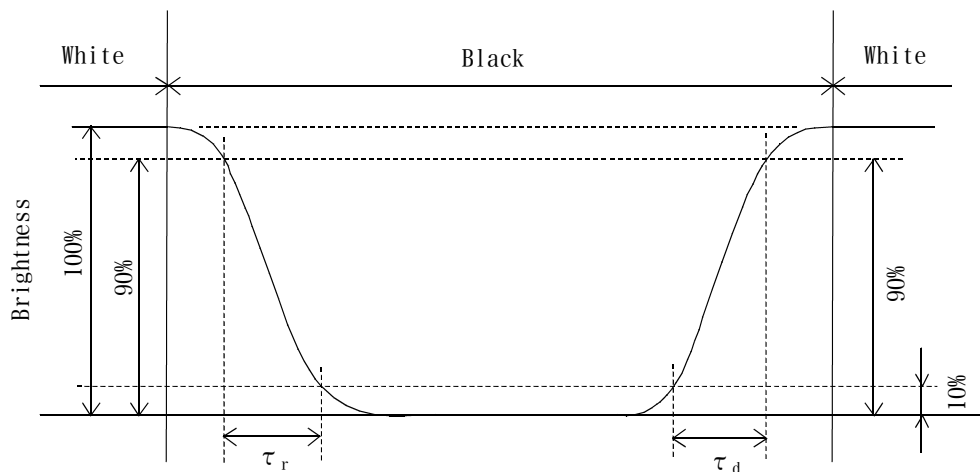
Measuring points = $\phi 6.0\text{mm}$, Temp. = 25°C

| ITEM | | SYMBOL | CONDITION | | MIN | TYP | MAX | UNIT |
|--------------------------|-------|----------|-----------------------------|-------|--------|--------|--------|-------------------|
| Response time | Rise | τ_r | $\theta = \phi = 0^{\circ}$ | | — | 5 | — | ms |
| | Down | τ_d | $\theta = \phi = 0^{\circ}$ | | — | 15 | — | ms |
| Viewing angle range | | θ | $CR \geq 5$ | Upper | — | 50 | — | deg. |
| | | | | Lower | — | 70 | — | |
| | | ϕ | | Left | — | 70 | — | deg. |
| | | | | Right | — | 70 | — | |
| Contrast ratio | | CR | $\theta = \phi = 0^{\circ}$ | | 300 | 450 | — | — |
| Brightness | | | IF= (25mA) /1LED Line | | (170) | (220) | — | cd/m ² |
| Chromaticity coordinates | Red | x | $\theta = \phi = 0^{\circ}$ | | (0.54) | (0.59) | (0.64) | — |
| | | y | | | (0.31) | (0.36) | (0.41) | |
| | Green | x | $\theta = \phi = 0^{\circ}$ | | (0.29) | (0.34) | (0.39) | |
| | | y | | | (0.52) | (0.57) | (0.62) | |
| | Blue | x | $\theta = \phi = 0^{\circ}$ | | (0.10) | (0.15) | (0.20) | |
| | | y | | | (0.09) | (0.14) | (0.19) | |
| | White | x | $\theta = \phi = 0^{\circ}$ | | (0.28) | (0.33) | (0.38) | |
| | | y | | | (0.30) | (0.35) | (0.40) | |

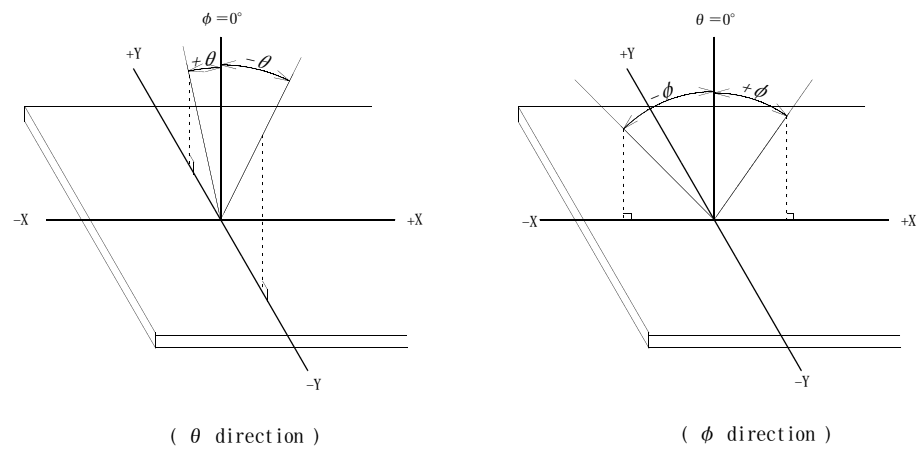
6-1. Contrast ratio is defined as follows:

$$\text{CR} = \frac{\text{Brightness at all pixels "White"}}{\text{Brightness at all pixels "Black"}}$$

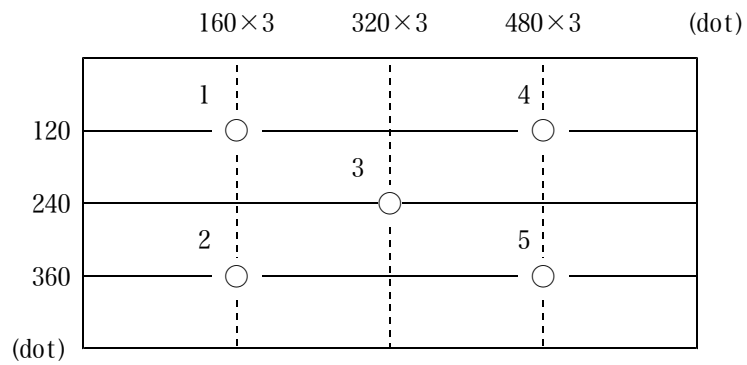
6-2. Definition of response time



6-3. Definition of viewing angle



6-4. Measuring points



- 1) Rating is defined as the average brightness inside the viewing area.
- 2) 30 minutes after LED is turned on. (Ambient Temp.=25°C)
- 3) Backlight : IF=25mA / 1 LED line

7. Interface signals

7-1. LCD

| PIN NO. | SYMBOL | DESCRIPTION | I/O | Note |
|---------|--------|---|-----|------|
| 1 | GND | GND | — | |
| 2 | CK | Clock signal for sampling each data signal | I | |
| 3 | Hsync | Horizontal synchronous signal (negative) | I | |
| 4 | Vsync | Vertical synchronous signal (negative) | I | |
| 5 | GND | GND | — | |
| 6 | R0 | RED data signal (LSB) | I | |
| 7 | R1 | RED data signal | I | |
| 8 | R2 | RED data signal | I | |
| 9 | R3 | RED data signal | I | |
| 10 | R4 | RED data signal | I | |
| 11 | R5 | RED data signal (MSB) | I | |
| 12 | GND | GND | — | |
| 13 | G0 | GREEN data signal (LSB) | I | |
| 14 | G1 | GREEN data signal | I | |
| 15 | G2 | GREEN data signal | I | |
| 16 | G3 | GREEN data signal | I | |
| 17 | G4 | GREEN data signal | I | |
| 18 | G5 | GREEN data signal (MSB) | I | |
| 19 | GND | GND | — | |
| 20 | B0 | BLUE data signal (LSB) | I | |
| 21 | B1 | BLUE data signal | I | |
| 22 | B2 | BLUE data signal | I | |
| 23 | B3 | BLUE data signal | I | |
| 24 | B4 | BLUE data signal | I | |
| 25 | B5 | BLUE data signal (MSB) | I | |
| 26 | GND | GND | — | |
| 27 | ENAB | Signal to settle the horizontal display position (positive) | I | *1 |
| 28 | VDD | 3.3V power supply | — | |
| 29 | VDD | 3.3V power supply | — | |
| 30 | R/L | Horizontal display mode select signal L : Normal , H : Left / Right reverse mode | I | *2 |
| 31 | U/D | Vertical display mode select signal H : Normal , L : Up / Down reverse mode | I | *2 |
| 32 | NC | No connect | — | |
| 33 | GND | GND | — | |

LCD side connector : 08-6210-033-340-800+ (ELCO)

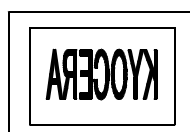
Recommended matching FFC or FPC : P = 0.5mm

*1 The horizontal display start timing is settled in accordance with a rising timing of ENAB signal.
In case ENAB is fixed "Low", the horizontal start timing is determined as described in 8-2.
Don't keep ENAB "High" during operation.

*2



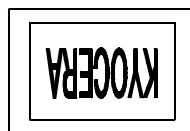
R/L = L
U/D = H



R/L = H
U/D = H



R/L = L
U/D = L



R/L = H
U/D = L

7-2. LED

| PIN NO. | SYMBOL | DESCRIPTION |
|---------|--------|-------------|
| 1 | AN1 | Anode1 |
| 2 | AN2 | Anode2 |
| 3 | AN3 | Anode3 |
| 4 | AN4 | Anode4 |
| 5 | CA1 | Cathode1 |
| 6 | CA2 | Cathode2 |
| 7 | CA3 | Cathode3 |
| 8 | CA4 | Cathode4 |

LCD side connector : SHLP-08V-S-B (JST)
 Recommended matching connector : SM08B-SHLS-TF (JST)
 : SM08B-SHLS-TF (LF) (SN) (JST) ... (RoHS Compliant)

7-3. Touch panel

| PIN No. | SYMBOL | DESCRIPTION |
|---------|--------|------------------|
| 1 | yU | y-Upper terminal |
| 2 | xL | x-Left terminal |
| 3 | yL | y-Lower terminal |
| 4 | xR | x-Right terminal |

8. Timing Characteristics of input signals

8-1. Timing characteristics

| ITEM | | SYMBOL | MIN | TYP | MAX | UNIT | NOTE |
|-------------------------------------|-------------|--------|------|-------|--------|---------|------|
| Clock | Frequency | 1/Tc | — | 25.18 | 28.33 | MHz | |
| | Duty ratio | Tch/Tc | 40 | 50 | 60 | % | |
| Data | Set up time | Tds | 5 | — | — | ns | |
| | Hold time | Tdh | 10 | — | — | ns | |
| Horizontal sync. signal | Cycle | TH | 30.0 | 31.8 | — | μ s | |
| | | | 770 | 800 | 900 | clock | |
| | Pulse width | THp | 2 | 96 | 200 | clock | |
| Vertical sync. signal | Cycle | TV | 515 | 525 | 560 | line | |
| | Pulse width | TVp | 2 | — | 34 | line | |
| Horizontal display period | | THd | 640 | | | clock | |
| Hsync.-Clock phase difference | | THc | 10 | — | Tc-10 | ns | |
| Hsync.-Vsync. phase difference | | TVh | 0 | — | TH-THp | ns | |
| Vertical sync.signal start position | | TVs | 34 | | | line | |
| Vertical display period | | TVd | 480 | | | line | |

* In case of lower frequency, the deterioration of the display quality, flicker etc., may occur.

8-2. Horizontal display position

The horizontal display position is determined by ENAB signal.

| ITEM | | SYMBOL | MIN | TYP | MAX | UNIT | NOTE |
|---------------------------------------|-------------|--------|-----|-----|--------|-------|------|
| Enable signal | Set up time | Tes | 5 | — | Tc-10 | ns | |
| | Pulse width | Tep | 2 | 640 | TH-10 | clock | |
| Hsync.-Enable signal phase difference | | The | 44 | — | TH-664 | clock | |

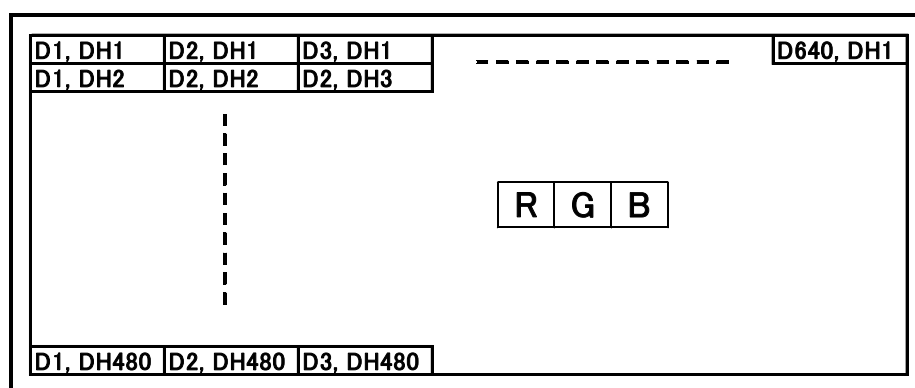
*When ENAB is fixed at "Low," the display starts from the data of C104(clock) as shown in 8-5.

8-3. Vertical display position

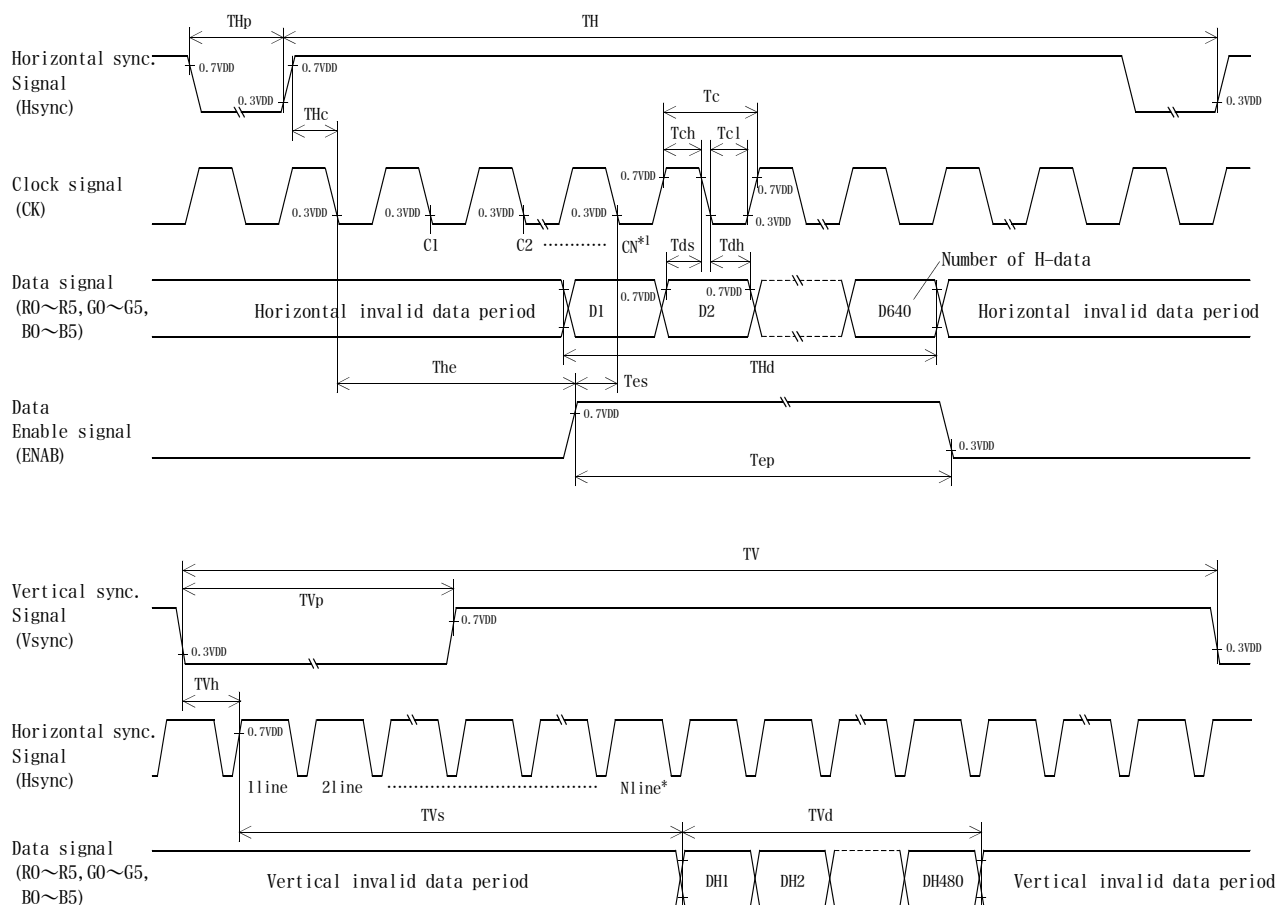
The vertical display position (TVs) is fixed at 34th line.

Note) ENAB signal is independent of vertical display position.

8-4. Input Data Signals and Display position on the screen



8-5. Input Timing Characteristics



*1 When ENAB is fixed "Low" the display starts from the data of C104(Clock).

*2 The vertical display position(TVs) is fixed at 34th line.

9. Backlight Characteristics

Temp. = 25°C

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | NOTE |
|--------------------|--------|------|-------------|--------|------|--------------------|
| Forward current *1 | IF | — | (25) | — | mA | Top=-20~70°C |
| Forward voltage *1 | VF | — | (24.5) | (27.3) | V | IF=25mA, Top=-10°C |
| | | — | (23.1) | (25.9) | V | IF=25mA, Top=25°C |
| | | — | (22.1) | (24.9) | V | IF=25mA, Top=70°C |
| Operating life *2 | T | — | (50,000) *3 | — | V | IF=25mA |

*1 For each "AN1-CA1", "AN2-CA2", "AN3-CA3" and "AN4-CA4",

*2 When brightness decrease 50% of initial brightness.

*3 Life time is estimated data.

* An input current below 8.0mA may reduce the brightness uniformity of the LED backlight.

This is because the amount of light from each LED chip is different.

Therefore, please evaluate carefully before finalizing the input current.

1 2. Warranty

12-1. Incoming inspection

Please inspect the LCD within one month after your receipt.

12-2. Production Warranty

Kyocera warrants its LCDs for a period of 12 months after receipt by the purchaser, and within the limits specified. Kyocera shall, by mutual agreement, replace or rework defective LCDs that are shown to be Kyocera's responsibility.

1 3. Precautions for use

13-1. Installation of the LCD

1. The LCD's bezel must be grounded. The heat sink and shield cover are connected at the ground hole. The ground hole is located on the right side of the LCD when viewed from the front. The ground hole must be connected to an external ground.
2. The LCD shall be installed so that there is no pressure on the LSI chips.
3. The LCD shall be installed flat, without twisting or bending.
4. Please design the housing window so that its edges are between the active area and the effective area of the LCD screen.
Must maintain a gap between inside of bezel and touch panel to avoid malfunction or electrode damage of touch panel.
5. In case you use outside frame of effective viewing area as outward appearance of your product, unevenness of its outward appearance is out of guarantee.
6. Please refer to the following our recommendable value of Clamp-down torque when installing.
Clamp-down torque : $0.32 \pm 0.03 \text{ N}\cdot\text{m}$
Please set up 'SPEED-LOW,' 'SOFT START-SLOW' when using electric driver.
Recommendable screw P-TITE screw two types nominal dia.3.0 mm installing boss hole depth 4.2 mm Max
Please be careful not to use high torque which may damage LCD module in installation.
7. Do not pull the LED lead wires and do not bend the root of the wires.
Housing should be designed to protect LED lead wires from external stress.
8. This Kyocera LCD module has been specifically designed for use in general electronic devices, but not for use in a special environment such as usage in an active gas.
Hence, when the LCD is supposed to be used in a special environment, evaluate the LCD thoroughly beforehand and do not expose the LCD to chemicals such as an active gas.

13-2. Static Electricity

1. Since CMOS ICs are mounted directly onto the LCD glass, protection from static electricity is required. Operator should wear ground straps.

13-3. LCD Operation

1. The LCD shall be operated within the limits specified. Operation at values outside of these limits may shorten life, and/or harm display images.
2. Operation of the LCD at temperature below the limit specified may cause image degradation and/or bubbles.
It may also change the characteristics of the liquid crystal.
This phenomenon may not recover. The LCD shall be operated within the temperature limits specified.

13-4. Storage

1. The LCD shall be stored within normal temperature and humidity.
Store in a dark area, and protected the LCD from direct sunlight or fluorescent light.
2. Always store the LCD so that it is free from external pressure onto it.

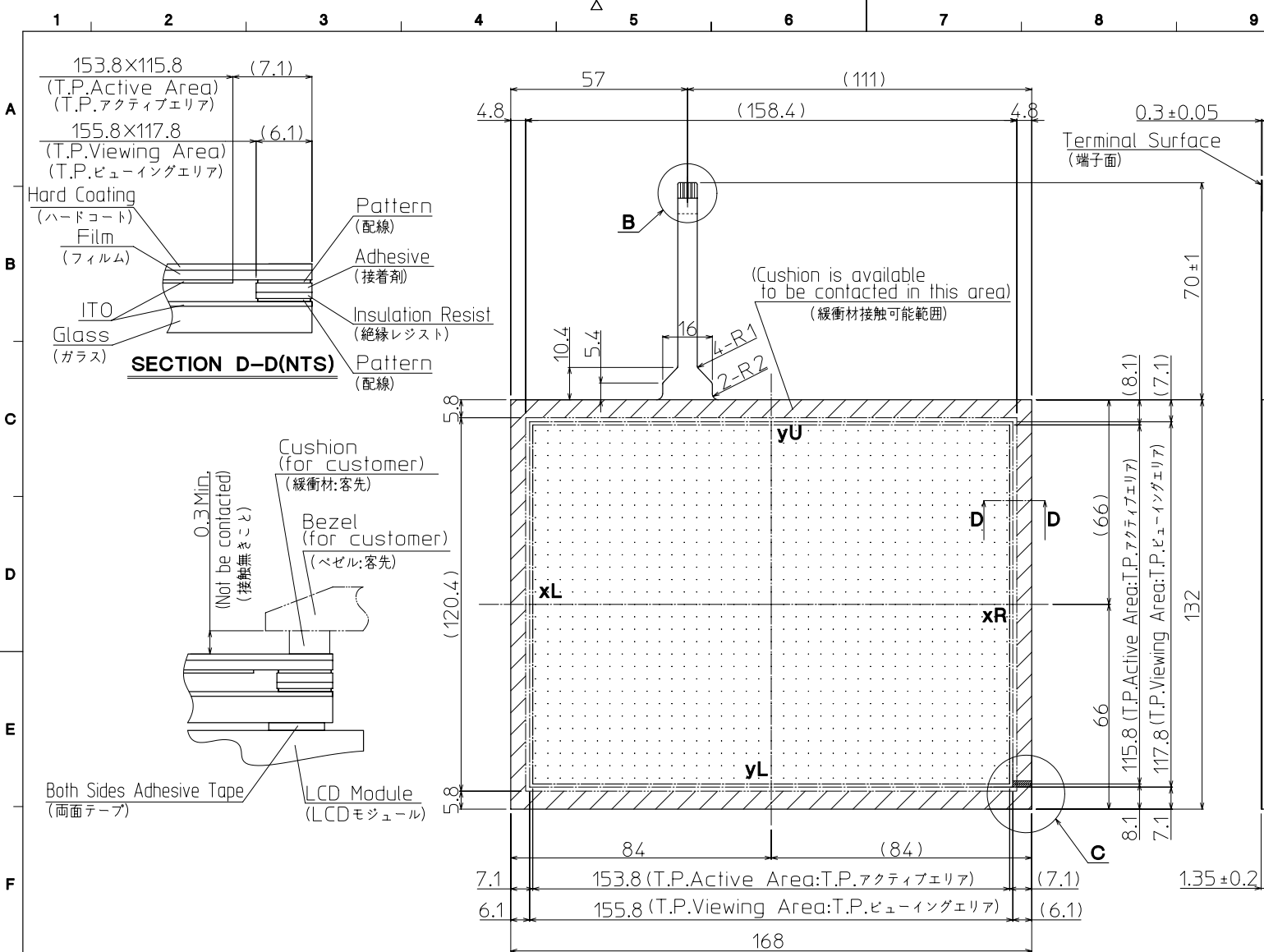
13-5. Screen Surface

1. DO NOT store in a high humidity environment for extended periods.
Image degradation, bubbles, and/or peeling off of polarizer may result.
2. Do not push or rub the touch panel's surface with hard to sharp objects such as knives, or the touch panel may be scratched.
3. When the touch panel is dirty, gently wipe the surface with a soft cloth, sometimes moistened by mild detergent or alcohol. If a hazardous chemical is dropped on the touch panel by mistake, wipe it off right away to prevent human contact.
4. Touch panel edges are sharp. Handle the touch panel with enough care to prevent cuts.
5. Always keep the LCD free from condensation during testing.
Condensation may permanently spot or stain the polarizers.
6. Do not disassemble LCD module because it will result in damage.
7. Please do not use solid-base image pattern for long hours because a temporary afterimage may appear. We recommend to use screen saver etc. in cases where a solid-base image pattern must be used.
8. Liquid crystal may leak when the module is broken. Be careful not to let the fluid go into your eyes and mouth. In the case the fluid touches your body, rinse it off right away with water and soap.

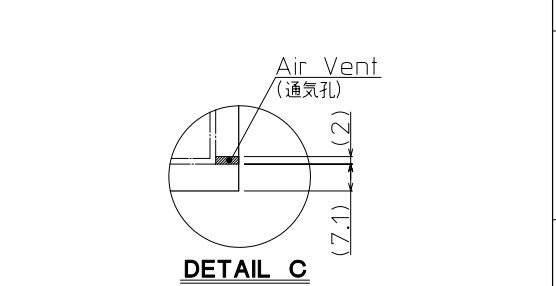
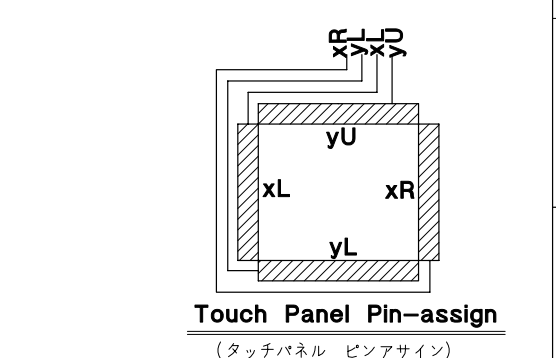
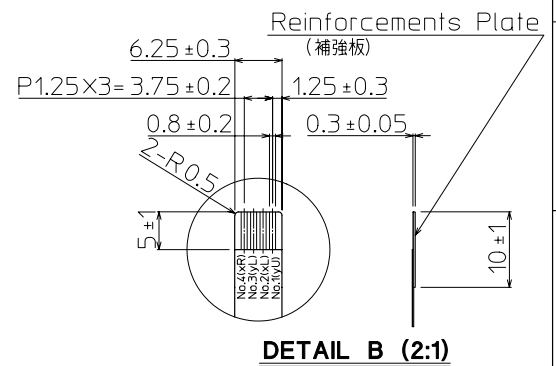
1 4. Reliability Data / Environmental Test

| TEST ITEM | TEST CONDITION | TEST TIME | RESULT |
|--------------------------------|---|-------------------|---|
| High Temp. Atmosphere | 80°C | 240 h | Display Quality : No defect Display Function : No defect Current Consumption : No defect |
| Low Temp. Atmosphere | -30°C | 240 h | Low Temp. Bubble : None Solid Crystallization of Liquid Crystal : None Display Quality : No defect Display Function : No defect Current Consumption : No defect |
| High Temp. Humidity Atmosphere | 40°C 90 %RH | 240 h | Display Quality : No defect Display Function : No defect Peel-off of Organic Sealing : None Current Consumption : No defect |
| Temp. Cycle | -30°C 0.5 h R.T. 0.5 h 80°C 0.5 h | 10 cycles | Display Quality : No defect Display Function : No defect Peel-off of Organic Sealing : None Bubble on Cell : None |
| High Temp. Operation | 70°C | 500 h | Display Quality : No defect Display Function : No defect Current Consumption : No defect |
| Point Activation life | Polyacetal stylus (R0.8) Hitting force 3N Hitting speed 2time/s | one million times | Satisfy spec below item Terminal resistance Insulation resistance Linearity Actuation Force |

- * Each test item uses a test LCD only once. The tested LCD is not used in any other tests.
 - * The LCD is tested in circumstances in which there is no condensation.
 - * The tested LCD is inspected after 24 hours of storage at room temperature and room humidity after each test is finished.
 - * The reliability test is not an out-going inspection.
 - * The results of the reliability test are for your reference purpose only.
- The reliability test is conducted only to examine the LCD's capability.



| No | Description | Drawn | Checked | Checked | Approved |
|----|-------------|-------|---------|---------|----------|
| | | | | | |
| | | | | | |
| | | | | | |



Precaution in use of touch panel.
(タッチパネル使用上の注意事項)

1. Fix touch panel at LCD module and the rear side of touch panel.
(タッチパネルの固定はLCDモジュール側とタッチパネル裏面とで行なうこと)

2. Must maintain a gap between inside of bezel and touch panel to avoid malfunction or electrode damage of touch panel.
(ベゼル内側とタッチパネルの接触厳禁。誤動作や電極破損の原因となります。)

| | Name(名称) | Explanation(説明) |
|---|-----------------------------------|--|
| 1 | T.P. | Touch panel (タッチパネル) |
| 2 | T.P. Active Area (T.P.アクティブエリア) | Operating area of touch panel (タッチパネルの動作範囲) |
| 3 | T.P. Viewing Area (T.P.ビューイングエリア) | Warranty area of touch panel's appearance (タッチパネルの外観(傷・異物等)保証範囲) By giving pressure between the active area and the effective viewing area of the touch panel, there is a possibility that the touch panel will operate. (タッチパネルアクティブエリアとタッチパネルビューイングエリア間は荷重をかけた場合は、タッチパネルが動作する可能性があります。) |

Precaution in use of touch panel.
(タッチパネル使用上の注意事項)

There is vent channel to equalize air pressure between the inner space of the touch panel and the atmosphere. Please make sure it is not blocked by your housing and mounting method.
(タッチパネルの中には内圧と外圧を均一にするため通気孔を設けています。取り付け時にこの通気孔を塞がないようにしてください。)

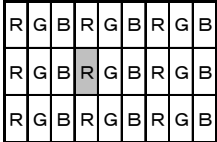
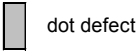
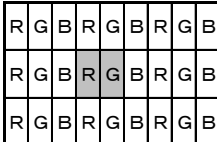
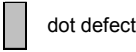
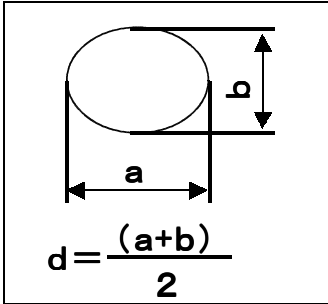
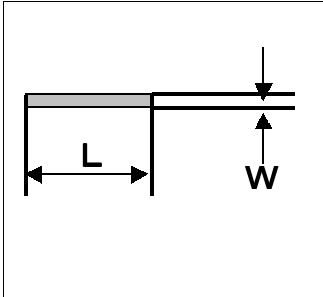
| | | | | | | | | | |
|-----------------|-------------------|-----------------------|----------------------|----------------------|-------------|-----------------------|-------------------------|-----------------------------|-----------|
| Material 材質 | Treatment 処理 | Approved '07.08.28 | Checked '07.08.27 | Checked '07.08.27 | Drawn 小林 | Scale 1:1(2:1,NTS) | Title TCG075VGLAF | Year-Month-Day '07.08.24 | Size 2 |
| Quantity 製作数 | Description 備考 | 阿部 | 倉元 | | | | T.P. Outline Dimensions | Drawing No. 121A5062500 | 3 |

| | | | | | |
|--|--------------------------------|---------------|--------------|------------------------|----------|
| | | | SPEC. NO. | TQ3C-8EAF0-E2DDH30-00 | |
| | | | DATE | August 30, 2007 | |
| <div>FOR :</div> | | | | | |
| <div>KYOCERA INSPECTION STANDARD</div> | | | | | |
| <div>TYPE : TCG075VGLAF-G00</div> | | | | | |
| <div>KYOCERA CORPORATION KAGOSHIMA HAYATO PLANT LCD DIVISION</div> | | | | | |
| Original | Designed by :Engineering Dept. | | | Confirmed by :QA Dept. | |
| Issue Date | Prepared | Checked | Approved | Checked | Approved |
| August 30, 2007 | S. Kijima | Id. Tachibana | Y. Matsumoto | J. Sakaguchi | So. Ito |

Revision Record

| | | | | | |
|----------|--------------------------------|---------|--------------|------------------------|----------|
| Date | Designed by: Engineering Dept. | | | Confirmed by: QA Dept. | |
| | Prepared | Checked | Approved | Checked | Approved |
| | | | | | |
| Rev. No. | Date | Page | Descriptions | | |
| | | | | | |

1) Note

| | Note | | |
|-------------------------------|--|---|---|
| General | <p>1. Customer identified anomalies not defined within this inspection standard shall be reviewed by Kyocera, and an additional standard shall be determined by mutual consent.</p> <p>2. Inspection Conditions Luminance : 500 Lux minimum Inspection distance : 300 mm (from the sample) Temperature : 25 ± 5 °C Direction : directly above</p> | | |
| Definition of Inspection item | Dot defect | Bright dot defect | <p>The dot is constantly "on" when power applied to the LCD, even when all "Black" data sent to the screen. Inspection tool: 5% Transparency neutral density filter. Count dot: If the dot is visible through the filter Don't count dot: If the dot is not visible through the filter.</p>   |
| | | Black dot defect | <p>The dot is constantly "off" when power applied to the LCD, even when all "white" data sent to the screen.</p> |
| | | Adjacent dot | <p>Adjacent dot defect is defined as two or more bright dot defects or black dot defects.</p>   |
| | External inspection | Bubble, Scratches, Foreign particle (Polarizer, Cell, Backlight) | Visible operating (all pixels "Black" or "White") and non operating. |
| | | Appearance inspection | Does not satisfy the value at the spec. |
| | Others | CFL wires | Damaged to the CFL wires, connector, pin, functional failure or appearance failure. |
| | Definition of size | <p>Definition of circle size</p>  <p>Definition of linear size</p>  | |

2) Standard

| Classification | | Inspection item | | Judgement standard | | |
|--|---------------|--|-------------------|--|-------------------|-------------------|
| defect (in LCD glass) | Dot defect | Bright dot defect | | Acceptable number : 4 bright dots defects Bright dot spacing : 5 mm or more | | |
| | | Black dot defect | | Acceptable number : 5 black dots defects Black dot spacing : 5 mm or more | | |
| | | 2 dots join | Bright dot defect | Acceptable number : 2 | | |
| | | | Black dot defect | Acceptable number : 3 | | |
| | | 3 or more dots join | | Acceptable number : 0 | | |
| | | Total dot defects | | Acceptable number : 5 Max | | |
| | Others | White dot, Dark dot (Circle) | | | | |
| | | | | Size(mm) | Acceptable Number | |
| d<0.2 | | | | (neglected) | | |
| 0.2<d≤0.4 | | | | 5 | | |
| 0.4<d≤0.5 | | | | 3 | | |
| 0.5<d | | | | 0 | | |
| External inspection (Defect on Polarizer or between Polariz- er and LCD glass) | | Polarizer(Scratches) | | | | |
| | | | | Width(mm) | Length(mm) | Acceptable Number |
| | | W≤0.1 | — | (neglected) | | |
| | | 0.1<W≤0.3 | L≤5.0 | (neglected) | | |
| | | | 5.0<L | 0 | | |
| | | 0.3<W | — | 0 | | |
| | | Polarizer Touch panel (Bubble, Dent) | | | | |
| | | | | Size(mm) | Acceptable Number | |
| | | | | d<0.2 | (neglected) | |
| | | | | 0.2<d≤0.3 | 5 | |
| | | | | 0.3<d≤0.5 | 3 | |
| | | | | 0.5<d | 0 | |
| | | Foreign Particle(Circular shape) | | | | |
| | | | | Size(mm) | Acceptable Number | |
| | | | | d<0.2 | (neglected) | |
| | | | | 0.2<d≤0.4 | 5 | |
| | | | | 0.4<d≤0.5 | 3 | |
| | | | | 0.5<d | 0 | |
| | | Foreign Particle (Linear shape), Scratches | | | | |
| | | | | Width(mm) | Length(mm) | Acceptable Number |
| | | | | W≤0.03 | — | (neglected) |
| | | | | 0.03<W≤0.1 | L≤2.0 | (neglected) |
| 2.0<L≤4.0 | 3 | | | | | |
| 4.0<L | 0 | | | | | |
| 0.1<W | — | | | (According to Circular shape) | | |
| | | | | | | |

| Inspection item | Judgement standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----------------------|-------------|--------------------------------|-------------------------------------|------------|---------------------|------------|--------------------------------|----------------------|------------|--------------------------------|----------------------|-------------|--------------------------------|---------------|-------------|-----------|---------------------|---------------------|------------|--------------------------------|---------------|-----------|-----------|-----------------------|--------------------|--|--------------------------------|--------------|--|-----------|
| Scratch, Foreign particle (Touch Screen portion) | $(D = \text{Average Diameter} = (\text{major axis} + \text{minor axis}) / 2)$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><td></td><td>Width (mm)</td><td>Length (mm)</td><td>Acceptable No.</td></tr><tr><td rowspan="4">Scratch</td><td>$0.1 \geq W > 0.08$</td><td>$4 \geq L$</td><td>1pcs within $\phi 30\text{mm}$</td></tr><tr><td>$0.08 \geq W > 0.05$</td><td>$6 \geq L$</td><td>2pcs within $\phi 20\text{mm}$</td></tr><tr><td>$0.05 \geq W > 0.03$</td><td>$10 \geq L$</td><td>2pcs within $\phi 20\text{mm}$</td></tr><tr><td>$0.03 \geq W$</td><td>$20 \geq L$</td><td>neglected</td></tr><tr><td rowspan="2">Foreign (line like)</td><td>$0.1 \geq W > 0.05$</td><td>$5 \geq L$</td><td>2pcs within $\phi 30\text{mm}$</td></tr><tr><td>$0.05 \geq W$</td><td>neglected</td><td>neglected</td></tr><tr><td rowspan="2">Foreign (circle like)</td><td colspan="2">$0.3 \geq D > 0.2$</td><td>2pcs within $\phi 30\text{mm}$</td></tr><tr><td colspan="2">$0.2 \geq D$</td><td>neglected</td></tr></table> | | Width (mm) | Length (mm) | Acceptable No. | Scratch | $0.1 \geq W > 0.08$ | $4 \geq L$ | 1pcs within $\phi 30\text{mm}$ | $0.08 \geq W > 0.05$ | $6 \geq L$ | 2pcs within $\phi 20\text{mm}$ | $0.05 \geq W > 0.03$ | $10 \geq L$ | 2pcs within $\phi 20\text{mm}$ | $0.03 \geq W$ | $20 \geq L$ | neglected | Foreign (line like) | $0.1 \geq W > 0.05$ | $5 \geq L$ | 2pcs within $\phi 30\text{mm}$ | $0.05 \geq W$ | neglected | neglected | Foreign (circle like) | $0.3 \geq D > 0.2$ | | 2pcs within $\phi 30\text{mm}$ | $0.2 \geq D$ | | neglected |
| | | Width (mm) | Length (mm) | Acceptable No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Scratch | $0.1 \geq W > 0.08$ | $4 \geq L$ | 1pcs within $\phi 30\text{mm}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | $0.08 \geq W > 0.05$ | $6 \geq L$ | 2pcs within $\phi 20\text{mm}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | $0.05 \geq W > 0.03$ | $10 \geq L$ | 2pcs within $\phi 20\text{mm}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | $0.03 \geq W$ | $20 \geq L$ | neglected | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Foreign (line like) | $0.1 \geq W > 0.05$ | $5 \geq L$ | 2pcs within $\phi 30\text{mm}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | $0.05 \geq W$ | neglected | neglected | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Foreign (circle like) | $0.3 \geq D > 0.2$ | | 2pcs within $\phi 30\text{mm}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.2 \geq D$ | | neglected | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Above are applied to the visible area. Unless there are foreign particles and damage affected seriously to the electrical performance in the visible area, we approve of this product. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Glass crack (Touch Screen portion) | Judgement standard | Corner crack | | | Cracks in other area than in corner | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | X | Y | Z | X | Y | Z | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ≤ 3 | ≤ 3 | $< t$ | ≤ 5 | ≤ 1.5 | $< t$ | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 2pcs/panel | | | 2pcs/side | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Judgement standard | Progressive crack | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0pcs (NG even 1pcs) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Above are applied to the visible area. Unless there are foreign particles and damage affected seriously to the electrical performance in the visible area, we approve of this product. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |