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| SPEC. NO. | M7-07-S002(0) |
| ISSUED DATE | 2007.08.09 |

Specification for Approval

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|---|
| Customer Name : |
| Product Model : NVK-064SC012F-S-0100 |

THIS SPECIFICATION IS APPLIED FOR OLED MODULE DELIVERED TO YOUR COMPANY BY NEOVIEW KOLON CO.,LTD.

◆CUSTOMER APPROVAL

| | CHECKED | CHECKED | APPROVAL |
|----------|---------|---------|----------|
| APPROVAL | | | |
| REMARK | | | |

◆SUPPLIER APPROVAL

| PREPARED | CHECKED | CHECKED | APPROVAL |
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NeoView KOLON CO.,LTD.

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Product Specification

NVK-064SC012F-S-0100

Note : This product specification is subject to change without any notice.


Prepared by : Advanced Technology Team

NeoView KOLON CO.,LTD.

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1. Features

Display Format : 96(W) x R.G.B x 64(H) dots

Display Color : 65K colors

Driver Element : passive matrix OLED(Organic Light Emitting Diode)

Interface : 8bit parallel data with MPU(8080-series MPU)

Multiplexing Ratio : 1/64 Duty

Control IC / Drive IC : SSD1332 (Manufacturer : Solomon systech, Inc)

Polarizer : With Pol.


Applications : Display terminal for mobile phone, MP3 player

2. Mechanical Data

| Item | Specification | Unit | Note |
|-----------------------|-------------------------------|------|------|
| Outline Dimension | 26.66(W) x 34.87(H) x 1.57(T) | mm | (1) |
| Number of dots | 96(W) x(R.G.B) x 64(H) | dot | |
| Viewing area | 22.138(W) x 15.416(H) | mm | |
| Active area | 20.138(W) x 13.42(H) | mm | |
| Pixel pitch | 0.21(W) x 0.21(H) | mm | |
| Dot pitch | 0.07(W) x 0.21(H) | mm | |
| Dot size | 0.048(W) x 0.19(H) | mm | |
| Weight | 2.0 Max. | g | |
| Front Glass thickness | 0.7 ±0.05 | mm | |
| Rear Glass thickness | 0.7 ±0.05 | mm | |

Note (1) : COF unfolded

Refer to the Outline Dimension at the page 19

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3. Absolute Maximum Ratings (Ta=23±5℃, Vss=GND=0)

| Item | | Symbol | Min. | Max. | Unit | Note |
|-----------------|-------|--------|------|---------|------|------|
| Supply Voltage | Logic | VDD | -0.3 | 4.0 | V | (2) |
| | OLED | VCC | -0.3 | 18.0 | V | (2) |
| Input Voltage | | VIN | -0.3 | VDD+0.3 | V | |
| Operating Temp. | | TOPT | -20 | 70 | ℃ | |
| Storage Temp. | | TSTG | -30 | 80 | ℃ | |
| Humidity | | - | - | 90 | %RH | (3) |

Note (2) : Voltage relationship VCC > VDD > VSS must always be satisfied.

Note (3) : Wet bulb temperature should be 29℃ max. and no condensation of water.

4. Electrical Characteristics (Ta=23±5℃, Vss=GND=0)

| Item | | Symbol | 13000 | Typ. | Max. | Unit | Note |
|---------------------|-------|--------|--------|-------|--------|------|---------|
| Supply Voltage | Logic | VDD | 2.4 | 2.8 | 3.5 | V | |
| | OLED | VCC | 7.0 | 15.0 | 16.0 | V | |
| Input Voltage | High | VIH | 0.8VDD | - | VDD | V | |
| | Low | VIL | VSS | - | 0.2VDD | V | |
| Current Consumption | Logic | IDD | - | 0.45 | - | mA | |
| | OLED | ICC | - | 9.20 | - | mA | (4) (6) |
| | | | - | 11.70 | - | mA | (5) (6) |


Note (4) : VDD=2.8[V], VCC=15[V], 80cd/m²

Frame rate : 115 Hz

Note (5) : VDD=2.8[V], VCC=15[V], 100cd/m²

Frame rate : 115 Hz

Note (6) : 100% White Pattern

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5. Electro-optical Characteristics

(Ta=23±5°C, Vss=GND=0)

| Item | | Symbol | Min. | Typ. | Max. | Unit | Note |
|------------------------------|-------|--------|--------|-------|-------|-------------------|-------------------|
| Luminance | White | Lw | - | 100 | - | cd/m ² | (8) (9) (11) |
| Color Chromaticity (CIE1931) | White | CIEWx | 0.228 | 0.278 | 0.328 | | (8) (9) (11) |
| | | CIEWy | 0.298 | 0.348 | 0.398 | | (8) (9) (11) |
| | Red | CIERx | 0.575 | 0.625 | 0.675 | | (8) (9) (11) |
| | | CIERy | 0.322 | 0.372 | 0.422 | | (8) (9) (11) |
| | Green | CIEGx | 0.216 | 0.266 | 0.316 | | (8) (9) (11) |
| | | CIEGy | 0.606 | 0.656 | 0.706 | | (8) (9) (11) |
| | Blue | CIEBx | 0.112 | 0.162 | 0.212 | | (8) (9) (11) |
| | | CIEBy | 0.161 | 0.211 | 0.261 | | (8) (9) (11) |
| Area in CIE diagram | | | 60 | | | % | (8) (9) (11) |
| Life Time | White | LFw | 13,000 | - | - | Hr | (8) (9) (10) (11) |

Note (8) : VDD=2.8[V], VCC=15[V], 100cd/m²

Frame rate : 115 Hz

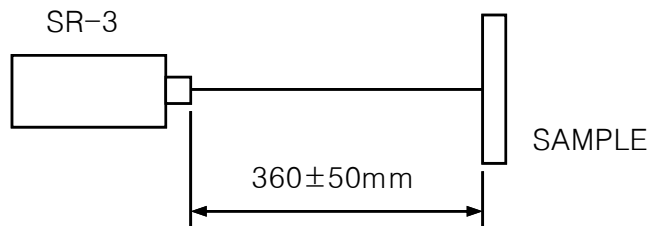
Note (9) : 100% White Pattern

Note (10) : Half value of initial luminance.

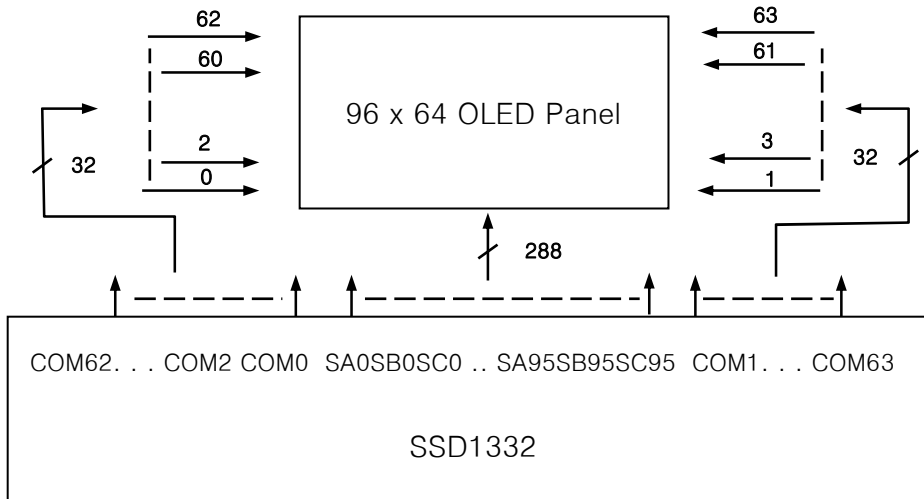
Note (11) : Measurement System

Measuring Instrument : SR-3

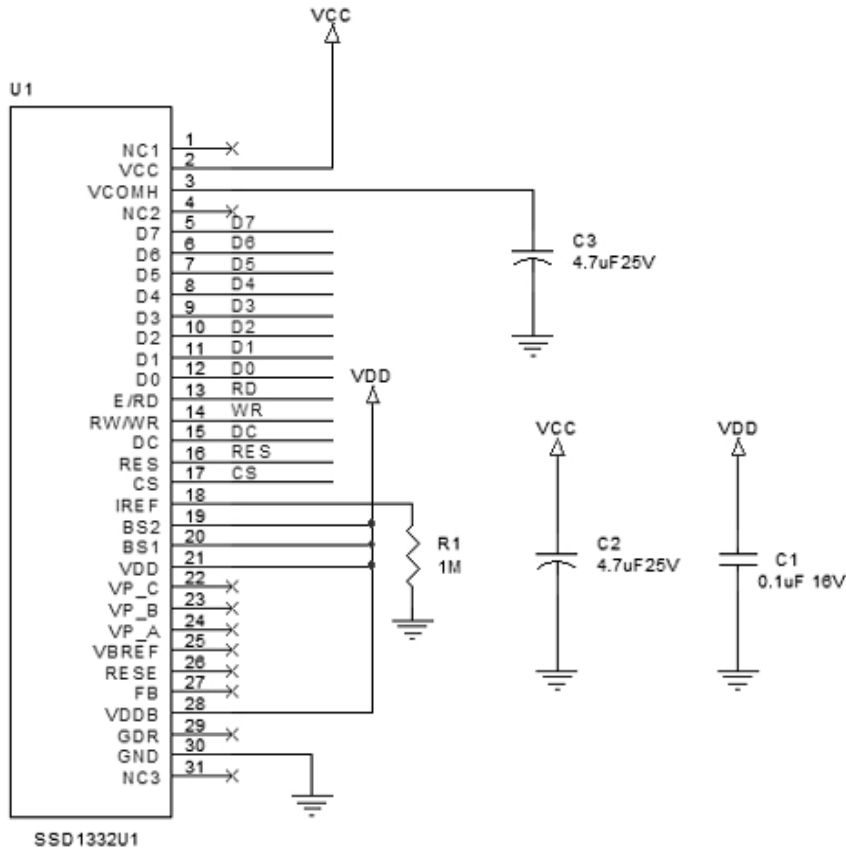
Environment : Inside a darkroom



6. Block Diagram



7. Application Circuit



8. Instruction Description (Refer to the data sheet of SSD1332)

| D/C | Hex | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Command | Description |
|-----|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--|--|
| 0 | 15 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | Set Column Address | A[6:0] sets the column start address from 0-95, POR=00d. B[6:0] sets the column end address from 0-95 POR=95d. |
| 0 | A[6:0] | * | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | B[6:0] | * | B ₆ | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | B ₀ | | |
| 0 | 75 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | Set Row Address | A[5:0] sets the row start address from 0-63, POR=00d. B[5:0] sets the row end address from 0-63, POR=63d. |
| 0 | A[5:0] | * | * | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | B[5:0] | * | * | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | B ₀ | | |
| 0 | 81 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Set Contrast for Color A (Segment Pins :SA0 – SA95) | Double byte command to select 1 out of 256 contrast steps. Contrast increases as level increases. POR = 80H |
| 0 | A[7:0] | A ₇ | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | 82 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Set Contrast for Color B (Segment Pins :SB0 – SB95) | Double byte command to select 1 out of 256 contrast steps. Contrast increases as level increases. POR = 80H |
| 0 | A[7:0] | A ₇ | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | 83 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | Set Contrast for Color C (Segment Pins :SC0 – SC95) | Double byte command to select 1 out of 256 contrast steps. Contrast increases as level increases. POR = 80H |
| 0 | A[7:0] | A ₇ | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | 87 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | Master Current Control | Set A[3:0] from 0000, 0001... to 1111 to adjust the master current attenuation factor from 1/16, 2/16... to 16/16. POR =1111b, for no attenuation. |
| 0 | A[3:0] | * | * | * | * | A ₃ | A ₂ | A ₁ | A ₀ | | |



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| 0 0 | A0 A[7:0] | 1 A ₇ | 0 A ₆ | 1 A ₅ | 0 A ₄ | 0 * | 0 * | 0 A ₁ | 0 A ₀ | Set Re-map & Data Format | <p>A[0]=0, Horizontal address increment (POR) A[0]=1, Vertical address increment</p> <p>A[1]=0, Column address 0 is mapped to SEG0 (POR) A[1]=1, Column address 95 is mapped to SEG0</p> <p>A[4]=0, Scan from COM 0 to COM [N-1] A[4]=1, Scan from COM [N-1] to COM0. Where N is the Multiplex ratio.</p> <p>A[5]=0, Disable COM Split Odd Even (POR) A[5]=1, Enable COM Split Odd Even</p> <p>A[7:6]=00; 256 color format = 01; 65k color format(POR)</p> |
| 0 0 | A1 A[5:0] | 1 * | 0 * | 1 A ₅ | 0 A ₄ | 0 A ₃ | 0 A ₂ | 0 A ₁ | 1 A ₀ | Set Display Start Line | <p>Set display RAM display start line register from 0-63. Display start line register is reset to 00H after POR.</p> |
| 0 0 | A2 A[5:0] | 1 * | 0 * | 1 A ₅ | 0 A ₄ | 0 A ₃ | 0 A ₂ | 1 A ₁ | 0 A ₀ | Set Display Offset | <p>Set vertical scroll by COM from 0-63. The value is reset to 00H after POR.</p> |
| 0 | A4~A7 | 1 | 0 | 1 | 0 | 0 | 1 | X ₁ | X ₀ | Set Display Mode | <p>A4h=Normal Display (POR) A5h=Entire Display On, all pixels turn on at GS level 63 A6h=Entire Display Off, all pixels turn off A7h=Inverse Display</p> |
| 0 0 | A8 A[5:0] | 1 * | 0 * | 1 A ₅ | 0 A ₄ | 1 A ₃ | 0 A ₂ | 0 A ₁ | 0 A ₀ | Set Multiplex Ratio | <p>The next command determines multiplex ratio N from 16MUX-64MUX, POR=63d (64MUX) A[5:0]=0-14d (invalid entry)</p> |
| 0 0 | AD A[7:0] | 1 1 | 0 0 | 1 0 | 0 0 | 1 1 | 1 A ₂ | 0 A ₁ | 1 A ₀ | Set Master Configuration | <p>A[0]=0, Select external VCC supply at Display ON A[0]=1, Select internal booster at Display ON (POR)</p> <p>A[1]=0, Select external VCOMH voltage supply at Display ON A[1]=1, Select internal VCOMH regulator at Display ON (POR)</p> <p>A[2]=0, Select External VP voltage supply A[2]=1, Select Internal VP (POR)</p> |
| 0 | AE~AF | 1 | 0 | 1 | 0 | X ₃ | 1 | 1 | 1 | Set Display On/Off | <p>AEh=Display off (POR) AFh=Display on</p> |
| 0 0 | B0 A[7:0] | 1 0 | 0 0 | 1 0 | 1 A ₄ | 0 0 | 0 0 | 0 A ₁ | 0 0 | Set Power Save | <p>A[7:0]=00 (POR) A[7:0]=12, power saving mode</p> |
| 0 | B1 A[7:0] | 1 A ₇ | 0 A ₆ | 1 A ₅ | 1 A ₄ | 0 A ₃ | 0 A ₂ | 0 A ₁ | 1 A ₀ | Phase 1 and 2 period adjustment | <p>A[3:0] Phase 1 period in 1~16 DCLK clocks [POR=4h] A[7:4] Phase 2 period in 1~16 DCLK clocks [POR=7h]</p> |



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|---|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---|--|
| 0 | B3 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | Display Clock Divider / Oscillator Frequency | A[3:0] [DIVIDER, POR=0] DCLK is generated from CLK divided by DIVIDER +1 (i.e., 1 to 16) A[7:4] Fosc frequency Frequency increases as level increases |
| 0 | A[7:0] | A ₇ | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | B8 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | Set Gray Scale Table | The next 32 bytes of command set the current drive pulse width of gray scale level GS1, GS3, GS5 ... GS63 as below: A[7:0]=PW1, POR=1, it equals 1 DCLK clock B[7:0]=PW3, POR=5, it equals 3 DCLK clocks C[7:0]=PW5, POR= 9 : : : : AE[7:0]=PW61, POR=121 AF[7:0]=PW63, POR=125, it equals 125 DCLK clocks Note: GS0 has no pre-charge and current drive stages. For GS2 GS4...GS62, they are derived by driver itself with: PWn = (PWn ₋₁ +PWn ₊₁)/2 Max pulse width is 125 |
| 0 | A[7:0]--PW1 | A ₇ | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | B[7:0]--PW3 | B ₇ | B ₆ | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | B ₀ | | |
| 0 | C[7:0]--PW5 | C ₇ | C ₆ | C ₅ | C ₄ | C ₃ | C ₂ | C ₁ | C ₀ | | |
| 0 | : | | | | | | | | | | |
| 0 | : | | | | | | | | | | |
| 0 | : | | | | | | | | | | |
| 0 | AE[7:0]--PW61 | AE ₇ | AE ₆ | AE ₅ | AE ₄ | AE ₃ | AE ₂ | AE ₁ | AE ₀ | | |
| 0 | AF[7:0]--PW63 | AF ₇ | AF ₆ | AF ₅ | AF ₄ | AF ₃ | AF ₂ | AF ₁ | AF ₀ | | |
| 0 | B9 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | | |
| 0 | BB ~ BD | 1 | 0 | 1 | 1 | 1 | X ₂ | X ₁ | X ₀ | V _{PA} , V _{PB} , V _{PC} level setting for Color A,B,C | 011b for Color A, 100b for Color B, 101b for Color C A[7:0] 00000000 0.43*Vref 00111111 0.83*Vref 01111111 1.0*Vref 1xxxxxxx connects to VCOMH (POR) |
| 0 | A[7:0] | A ₇ | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | BE | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | Set VCOMH | A[6:0] 0000000 0.43*Vref 0111111 0.83*Vref (POR) 1111111 1.0*Vref |
| 0 | A[6:0] | * | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | E3 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | NOP | Command for No Operation |



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| D/C | Hex | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Command | Description |
|-----|--------|----|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------------------|---|
| 0 | 21 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | Draw Line | A[6:0] : Column Address of Start B[5:0] : Row Address of Start C[6:0] : Column Address of End D[5:0] : Row Address of End E[5:1] : Color C of the line F[5:0] : Color B of the line G[5:1] : Color A of the line |
| 0 | A[6:0] | * | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | B[5:0] | * | * | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | B ₀ | | |
| 0 | C[6:0] | * | C ₆ | C ₅ | C ₄ | C ₃ | C ₂ | C ₁ | C ₀ | | |
| 0 | D[5:0] | * | * | D ₅ | D ₄ | D ₃ | D ₂ | D ₁ | D ₀ | | |
| 0 | E[5:1] | * | * | E ₅ | E ₄ | E ₃ | E ₂ | E ₁ | * | | |
| 0 | F[5:0] | * | * | F ₅ | F ₄ | F ₃ | F ₂ | F ₁ | F ₀ | | |
| 0 | G[5:1] | * | * | G ₅ | G ₄ | G ₃ | G ₂ | G ₁ | * | | |
| 0 | 22 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | Drawing Rectangle | A[6:0] : Column Address of Start B[5:0] : Row Address of Start C[6:0] : Column Address of End D[5:0] : Row Address of End E[5:1] : Color C of the line F[5:0] : Color B of the line G[5:1] : Color A of the line H[5:1] : Color C of the fill area I[5:0] : Color B of the fill area J[5:1] : Color A of the fill area |
| 0 | A[6:0] | * | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | B[5:0] | * | * | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | B ₀ | | |
| 0 | C[6:0] | * | C ₆ | C ₅ | C ₄ | C ₃ | C ₂ | C ₁ | C ₀ | | |
| 0 | D[5:0] | * | * | D ₅ | D ₄ | D ₃ | D ₂ | D ₁ | D ₀ | | |
| 0 | E[5:1] | * | * | E ₅ | E ₄ | E ₃ | E ₂ | E ₁ | * | | |
| 0 | F[5:0] | * | * | F ₅ | F ₄ | F ₃ | F ₂ | F ₁ | F ₀ | | |
| 0 | G[5:1] | * | * | G ₅ | G ₄ | G ₃ | G ₂ | G ₁ | * | | |
| 0 | H[5:1] | * | * | H ₅ | H ₄ | H ₃ | H ₂ | H ₁ | * | | |
| 0 | I[5:0] | * | * | I ₅ | I ₄ | I ₃ | I ₂ | I ₁ | I ₀ | | |
| 0 | J[5:1] | * | * | J ₅ | J ₄ | J ₃ | J ₂ | J ₁ | * | | |
| 0 | 23 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | Copy | A[6:0] : Column Address of Start B[5:0] : Row Address of Start C[6:0] : Column Address of End D[5:0] : Row Address of End E[6:0] : Column Address of New Start F[5:0] : Row Address of New Start |
| 0 | A[6:0] | * | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | B[5:0] | * | * | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | B ₀ | | |
| 0 | C[6:0] | * | C ₆ | C ₅ | C ₄ | C ₃ | C ₂ | C ₁ | C ₀ | | |
| 0 | D[5:0] | * | * | D ₅ | D ₄ | D ₃ | D ₂ | D ₁ | D ₀ | | |
| 0 | E[6:0] | * | E ₆ | E ₅ | E ₄ | E ₃ | E ₂ | E ₁ | E ₀ | | |
| 0 | F[5:0] | * | * | F ₅ | F ₄ | F ₃ | F ₂ | F ₁ | F ₀ | | |
| 0 | 24 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | Dim Window | A[6:0] : Column Address of Start B[5:0] : Row Address of Start C[6:0] : Column Address of End D[5:0] : Row Address of End The effect of dim window: GS15~GS0 no change GS19~GS16 become GS4 GS23~GS20 become GS5 ... GS63~GS60 become GS15 |
| 0 | A[6:0] | * | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | B[5:0] | * | * | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | B ₀ | | |
| 0 | C[6:0] | * | C ₆ | C ₅ | C ₄ | C ₃ | C ₂ | C ₁ | C ₀ | | |
| 0 | D[5:0] | * | * | D ₅ | D ₄ | D ₃ | D ₂ | D ₁ | D ₀ | | |
| 0 | 25 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | Clear Window | A[6:0] : Column Address of Start B[5:0] : Row Address of Start C[6:0] : Column Address of End D[5:0] : Row Address of End |
| 0 | A[6:0] | * | A ₆ | A ₅ | A ₄ | A ₃ | A ₂ | A ₁ | A ₀ | | |
| 0 | B[5:0] | * | * | B ₅ | B ₄ | B ₃ | B ₂ | B ₁ | B ₀ | | |
| 0 | C[6:0] | * | C ₆ | C ₅ | C ₄ | C ₃ | C ₂ | C ₁ | C ₀ | | |
| 0 | D[5:0] | * | * | D ₅ | D ₄ | D ₃ | D ₂ | D ₁ | D ₀ | | |




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| D/C | Hex | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Command | Description |
|-----|--------|----|----|----|----------------|----|----|----|----------------|-----------------------|--|
| 0 | 26 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | Fill Enable / Disable | A0 0 : Disable Fill for Draw Rectangle Command (POR) |
| 0 | A[4:0] | * | * | * | A ₄ | 0 | 0 | 0 | A ₀ | | 1 : Enable Fill for Draw Rectangle Command |
| | | | | | | | | | | | A[3:1] 000 : Reserved values |
| | | | | | | | | | | | A4 0 : Disable reverse copy (POR) |
| | | | | | | | | | | | 1 : Enable reverse during copy command. |

| | | | |
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9. Pin Connections

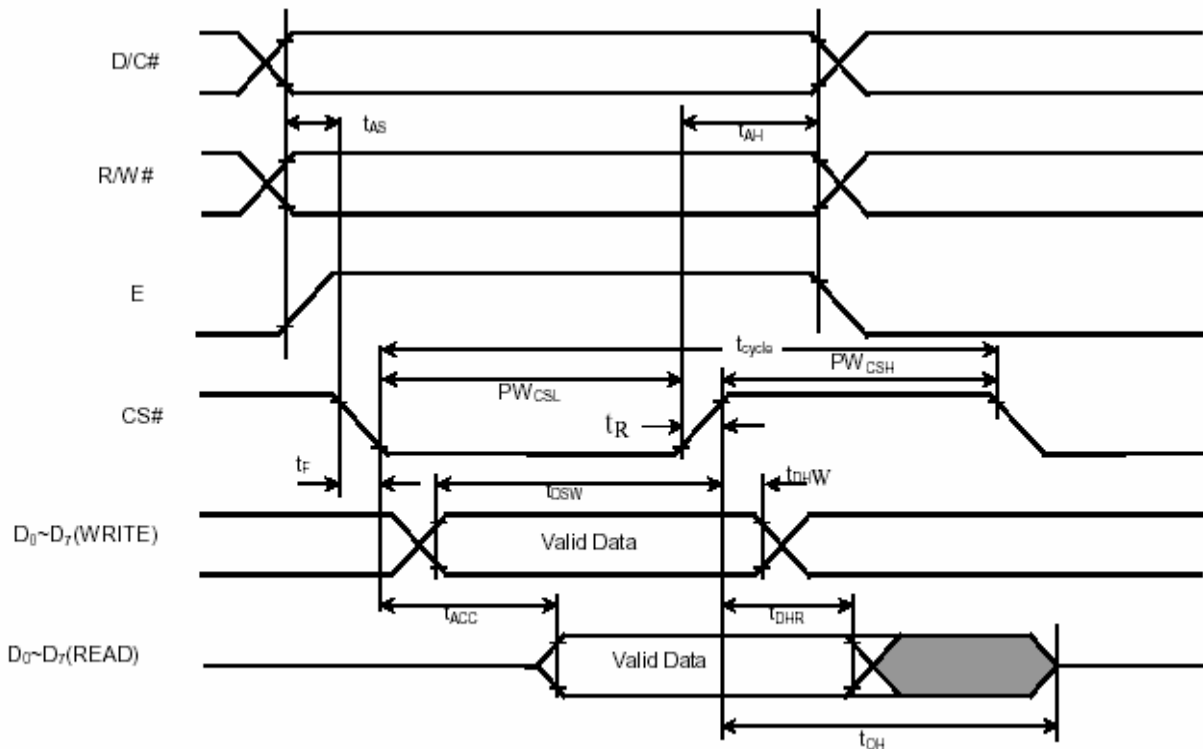
| Pin No | Symbol | I/O | Description | Remark |
|--------|---------|-----|---|--------|
| 1 | NC | - | No Connection | |
| 2 | VCC | P | The Most Positive voltage | |
| 3 | VCOMH | I | The voltage output high level for COM signals | |
| 4 | NC | - | No Connection | |
| 5 | D7 | I/O | 8-bit bi-direction data bus | |
| 6 | D6 | I/O | 8-bit bi-direction data bus | |
| 7 | D5 | I/O | 8-bit bi-direction data bus | |
| 8 | D4 | I/O | 8-bit bi-direction data bus | |
| 9 | D3 | I/O | 8-bit bi-direction data bus | |
| 10 | D2 | I/O | 8-bit bi-direction data bus | |
| 11 | D1 | I/O | 8-bit bi-direction data bus | |
| 12 | D0 | I/O | 8-bit bi-direction data bus | |
| 13 | E(RD) | I | Read enable pin("Low" enable). | |
| 14 | RW#(WR) | I | Write enable pin("Los" enable). | |
| 15 | DC# | I | Address input pin.("Low"=Command, "High"=Parameter) | |
| 16 | RES# | I | Reset input pin When RSTB is "Low", Initialization is executed. | |
| 17 | CS# | I | Chip select input pin("Low" enable). | |
| 18 | IREF | O | The segment output current reference pin. | |
| 19 | BS2 | I | These pins are used to configure MCU interface selection | |
| 20 | BS1 | I | These pins are used to configure MCU interface selection | |
| 21 | VDD | P | Logic Power supply | |
| 22 | VP-C | I/O | The pre-charge driving voltages for OLED driving segment pins | |
| 23 | VP-B | I/O | The pre-charge driving voltages for OLED driving segment pins | |
| 24 | VP-A | I/O | The pre-charge driving voltages for OLED driving segment pins | |
| 25 | VBREF | I | The internal voltage reference of booster circuit. | |
| 26 | RESE | I | Connects to the source current pin of the external NMOS of the booster circuit. | |
| 27 | FB | I | The feedback resistor input of the booster circuit. | |
| 28 | VDDDB | P | The power supply for the internal buffer of the DC-DC voltage converter. | |
| 29 | GDR | O | Drive the gate of the external NMOS | |
| 30 | VSS | P | Ground | |
| 31 | NC | - | No Connection | |

10. AC Characteristics

10-1. 6800-series MPU parallel interface

($V_{DD} - V_{SS} = 2.4$ to $3.5V$, $T_A = -40$ to $85^\circ C$)

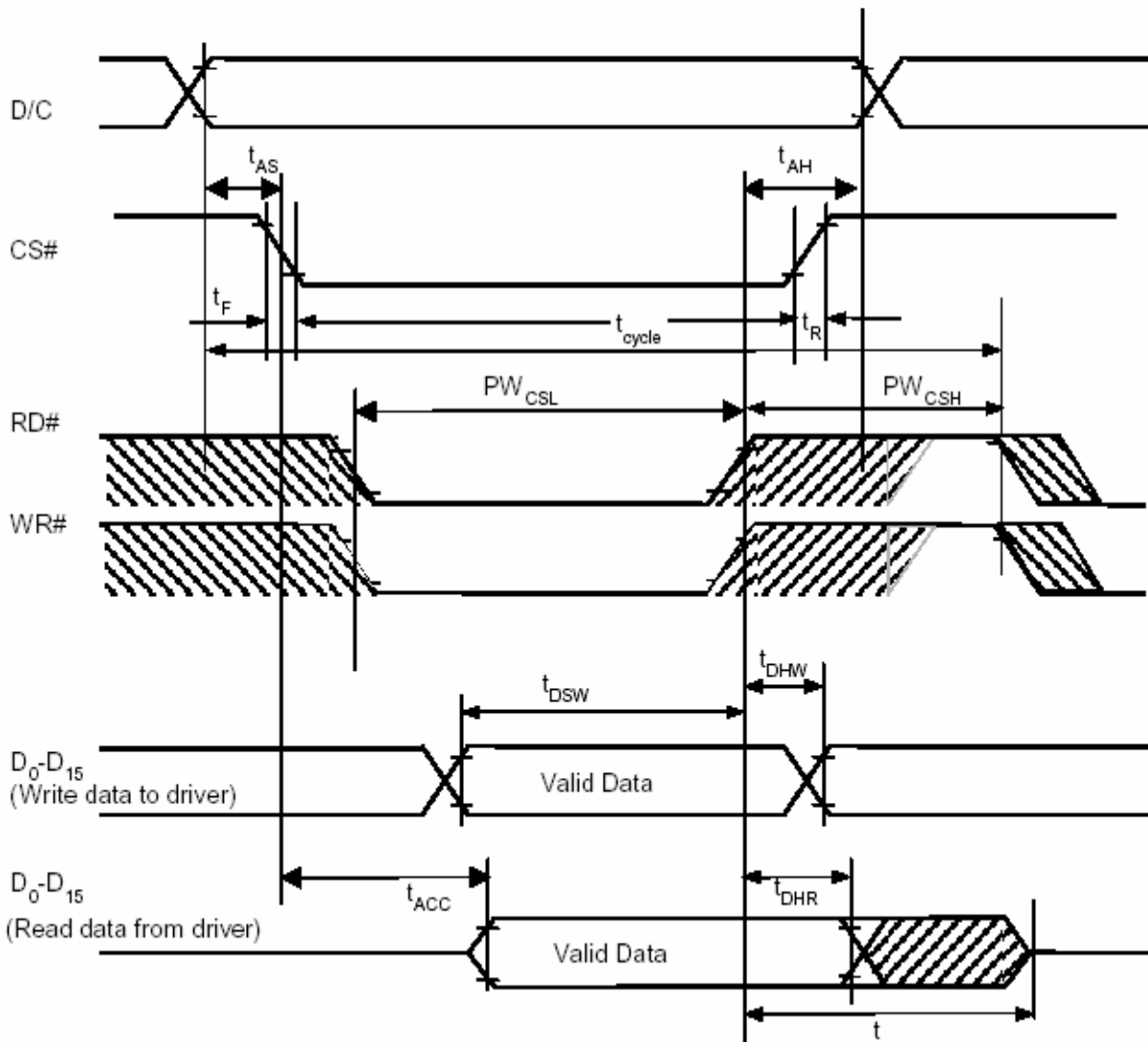
| Symbol | Parameter | Min | Typ | Max | Unit |
|-------------|--------------------------------------|-----|-----|-----|------|
| t_{cycle} | Clock Cycle Time | 300 | - | - | ns |
| t_{AS} | Address Setup Time | 0 | - | - | ns |
| t_{AH} | Address Hold Time | 0 | - | - | ns |
| t_{DSW} | Write Data Setup Time | 40 | - | - | ns |
| t_{DHW} | Write Data Hold Time | 15 | - | - | ns |
| t_{DHR} | Read Data Hold Time | 20 | - | - | ns |
| t_{OH} | Output Disable Time | - | - | 70 | ns |
| t_{ACC} | Access Time | - | - | 140 | ns |
| PW_{CSL} | Chip Select Low Pulse Width (read) | 120 | - | - | ns |
| | Chip Select Low Pulse Width (write) | 60 | - | - | ns |
| PW_{CSH} | Chip Select High Pulse Width (read) | 60 | - | - | ns |
| | Chip Select High Pulse Width (write) | 60 | - | - | ns |
| t_R | Rise Time | - | - | 15 | ns |
| t_F | Fall Time | - | - | 15 | ns |




10-2. 8080-series MPU parallel interface

($V_{DD} - V_{SS} = 2.4$ to $3.5V$, $T_A = -40$ to $85^\circ C$)

| Symbol | Parameter | Min | Typ | Max | Unit |
|-------------|--------------------------------------|-----|-----|-----|------|
| t_{cycle} | Clock Cycle Time | 300 | - | - | ns |
| t_{AS} | Address Setup Time | 0 | - | - | ns |
| t_{AH} | Address Hold Time | 0 | - | - | ns |
| t_{DSW} | Write Data Setup Time | 40 | - | - | ns |
| t_{DHW} | Write Data Hold Time | 15 | - | - | ns |
| t_{DHR} | Read Data Hold Time | 20 | - | - | ns |
| t_{OH} | Output Disable Time | - | - | 70 | ns |
| t_{ACC} | Access Time | - | - | 140 | ns |
| PW_{CSL} | Chip Select Low Pulse Width (read) | 120 | - | - | ns |
| | Chip Select Low Pulse Width (write) | 60 | - | - | ns |
| PW_{CSH} | Chip Select High Pulse Width (read) | 60 | - | - | ns |
| | Chip Select High Pulse Width (write) | 60 | - | - | ns |
| t_R | Rise Time | - | - | 15 | ns |
| t_F | Fall Time | - | - | 15 | ns |



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11. Reliability

11-1 Test Items and Conditions


| Item | Test Condition | Criteria for Pass/Fail |
|---------------------------------|---|------------------------|
| High Temp. Operation | 70 ± 2°C, 96hrs | (12) (13) |
| Low Temp. Operation | -20 ± 2°C, 96hrs | (12) (13) |
| High Temp. Storage | 80 ± 2°C, 96hrs | (12) |
| Low Temp. Storage | -30 ± 2°C, 96hrs | (12) |
| High Temp. & High Humi. Storage | 60 ± 2°C, 90 ± 2%RH, 96hrs | (12) |
| Temperature Cycle | 25°C(0.5h) → -20°C(3h) → 25°C(1h) → 60°C(3h) → 25°C(0.5h), 10cycles | (12) |
| Thermal Shock | 25°C(5m) → -30°C(30m) → 25°C(5m) → 80°C(30m), 20cycles | (12) |
| Vibration Test | Acceleration:1G vibrating frequency 10 to 55Hz one cycle 20 minute to direction of X,Y,Z(total 1.0hrs) and after removing vibration.(Non-Operation State) | (12) |
| Shock Test (Drop Test) | To be measured after dropping from 70cm high onto steel board of 15mm thick and from 3 direction X,Y,Z each one time.(Non-Operation State) | (12) |

Note(12) After the above reliability test, the samples should be left under room temperature for 2 hours and then should be inspected for normal operation.

Note(13) The conditions for driving at operation tests shall be the same as indicated on the above description except for the temperature and humidity conditions.

11-2 Criteria for Reliability Test

- (1) There shall be no abnormality in the functions and the display.
- (2) No irregularities shall be found for the appearance and structure.
- (3) The luminance change should be within 50% of initial value(based on white).

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12. Quality Specifications

12-1 Acceptance Quality Level(AQL)

| Inspection Item | Sampling Procedures | AQL |
|-----------------|--|------|
| Major | KS A 3109 Inspection level II normal inspection Single sampling plan | 0.65 |
| Minor | KS A 3109 Inspection level II normal inspection Single sampling plan | 1.5 |

(1) Major defect :

Defect which influence display function or reliability issues.

(2) Minor defect :

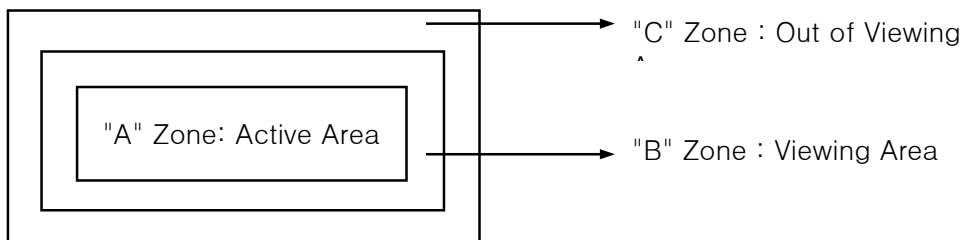
Defects which satisfy all functions, but no impact to reliability issues.


12-2 Inspection Conditions

The environmental conditions for inspection shall be as follows,

- Room Temperature : $25 \pm 3^{\circ}\text{C}$ - Brightness : 300~500 [lux]
- Humidity : $60 \pm 20\% \text{RH}$

12-3 Definition of the Area



| | | | |
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12-4 Inspection Standards

| Items | Criteria of defects | Defect type | | | | | | | | | | |
|----------------------------|--|------------------|-------------------|----------------------------|--------|-------------------------|---|-------------------------|---|---------------|---|-------|
| Display on inspection | 1) No display 2) Abnormal Operation 3) Vertical Line defects 4) Horizontal line defects 5) Cross line defects 6) Short Circuit 7) Pattern Open | Major | | | | | | | | | | |
| Bright/Dark spot | <table border="1"> <thead> <tr> <th>Size Φ(mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.15$</td> <td>Ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.25$</td> <td>4</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.30$</td> <td>2</td> </tr> <tr> <td>$\Phi > 0.30$</td> <td>0</td> </tr> </tbody> </table> | Size Φ (mm) | Acceptable number | $\Phi \leq 0.15$ | Ignore | $0.15 < \Phi \leq 0.25$ | 4 | $0.25 < \Phi \leq 0.30$ | 2 | $\Phi > 0.30$ | 0 | Minor |
| Size Φ (mm) | Acceptable number | | | | | | | | | | | |
| $\Phi \leq 0.15$ | Ignore | | | | | | | | | | | |
| $0.15 < \Phi \leq 0.25$ | 4 | | | | | | | | | | | |
| $0.25 < \Phi \leq 0.30$ | 2 | | | | | | | | | | | |
| $\Phi > 0.30$ | 0 | | | | | | | | | | | |
| Glass Contamination | <table border="1"> <thead> <tr> <th>Size Φ(mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td>Ignore</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.15$</td> <td>1</td> </tr> <tr> <td>$\Phi > 0.15$</td> <td>0</td> </tr> </tbody> </table> | Size Φ (mm) | Acceptable number | $\Phi \leq 0.10$ | Ignore | $0.10 < \Phi \leq 0.15$ | 1 | $\Phi > 0.15$ | 0 | Minor | | |
| Size Φ (mm) | Acceptable number | | | | | | | | | | | |
| $\Phi \leq 0.10$ | Ignore | | | | | | | | | | | |
| $0.10 < \Phi \leq 0.15$ | 1 | | | | | | | | | | | |
| $\Phi > 0.15$ | 0 | | | | | | | | | | | |
| Polarizer bubble | <table border="1"> <thead> <tr> <th>Size Φ(mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.20$</td> <td>Ignore</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.50$</td> <td>3</td> </tr> <tr> <td>$0.50 < \Phi \leq 0.80$</td> <td>2</td> </tr> <tr> <td>$\Phi > 0.80$</td> <td>0</td> </tr> </tbody> </table> | Size Φ (mm) | Acceptable number | $\Phi \leq 0.20$ | Ignore | $0.20 < \Phi \leq 0.50$ | 3 | $0.50 < \Phi \leq 0.80$ | 2 | $\Phi > 0.80$ | 0 | Minor |
| Size Φ (mm) | Acceptable number | | | | | | | | | | | |
| $\Phi \leq 0.20$ | Ignore | | | | | | | | | | | |
| $0.20 < \Phi \leq 0.50$ | 3 | | | | | | | | | | | |
| $0.50 < \Phi \leq 0.80$ | 2 | | | | | | | | | | | |
| $\Phi > 0.80$ | 0 | | | | | | | | | | | |
| Dents | <table border="1"> <thead> <tr> <th>Size (mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>$L \leq 0.15, W \leq 0.15$</td> <td>3</td> </tr> <tr> <td>$L > 0.15, W > 0.15$</td> <td>0</td> </tr> </tbody> </table> | Size (mm) | Acceptable number | $L \leq 0.15, W \leq 0.15$ | 3 | $L > 0.15, W > 0.15$ | 0 | Minor | | | | |
| Size (mm) | Acceptable number | | | | | | | | | | | |
| $L \leq 0.15, W \leq 0.15$ | 3 | | | | | | | | | | | |
| $L > 0.15, W > 0.15$ | 0 | | | | | | | | | | | |
| Pin holes | <table border="1"> <thead> <tr> <th>Size (mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td>3</td> </tr> <tr> <td>$\Phi > 0.2$</td> <td>0</td> </tr> </tbody> </table> | Size (mm) | Acceptable number | $\Phi \leq 0.2$ | 3 | $\Phi > 0.2$ | 0 | Minor | | | | |
| Size (mm) | Acceptable number | | | | | | | | | | | |
| $\Phi \leq 0.2$ | 3 | | | | | | | | | | | |
| $\Phi > 0.2$ | 0 | | | | | | | | | | | |

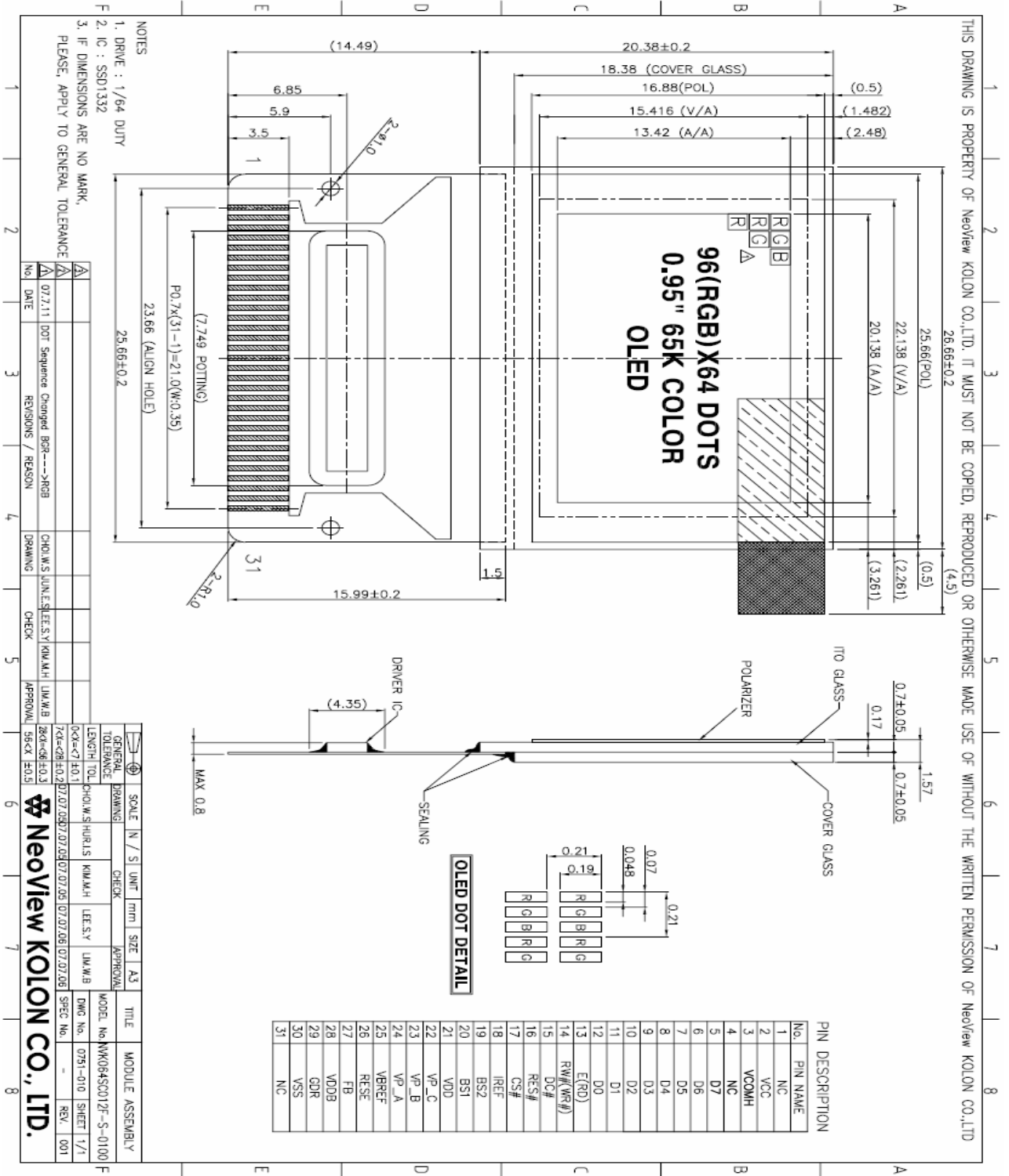


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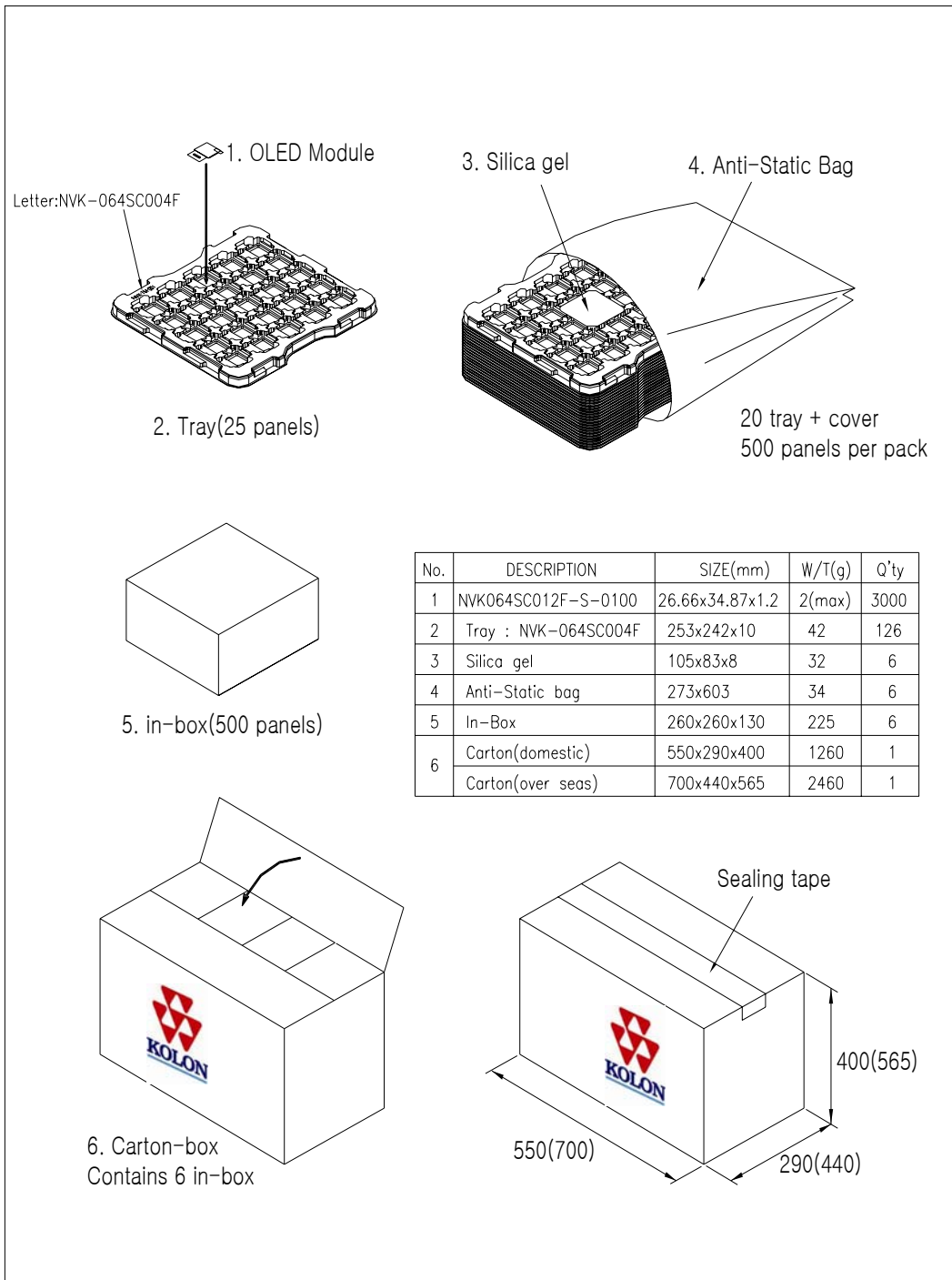
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13. Outline Dimension






14. Packing




| | | | |
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15. Marking & Others

| | |
|---|--|
|  |  |
| NeoView KOLON Co., | |
| NVK-064SC012F-S - 0100 - 00000 - 0000 | |
| (a) | (b) |
| 000 | EA |
| (d) | (e) |
| FFF | FFF |
| (f) | (f) |
|  | QA : 200707S (인) |
| | (g) |
| | MADE IN KOREA |

※Label(138x95mm) description


- Ⓐ : Product name
- Ⓑ : Manufacture date
- Ⓒ : Serial number of box
- Ⓓ : Quantity
- Ⓔ : Unit
- Ⓕ : Customer
- Ⓖ : Inspector signature

| | | | |
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16. General Precautions

16-1 Handling

- (1) When the module is assembled, it should be attached to the system firmly.
Be careful not to twist and bend the module.
- (2) Refrain from strong mechanical shock and / or any force to the module. Do not twist and bend because it may cause improper operation or damage to the module.
- (3) Note that polarizers are very fragile and can be easily damaged. Do not press or scratch the surface more than a B pencil lead.
- (4) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.
- (5) If the surface of the polarizer is dirty, clean it with some absorbent cotton or soft cloth.
- (6) The desirable cleaner is water, IPA(Isopropyl Alcohol) or Hexane.
Do not use Ketone type materials(ex, Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It can cause permanent damage to the polarizer due to chemical reaction.
- (7) Protect the module from electro-static, otherwise it may damage to the C-MOS LSI.
- (8) Use finger-stalls with soft gloves in order to keep clean display during the incoming inspection and assembly process.
- (9) Do not disassemble the module.
- (10) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (11) Pins of I/F connector shall not be touched directly with bare hands.

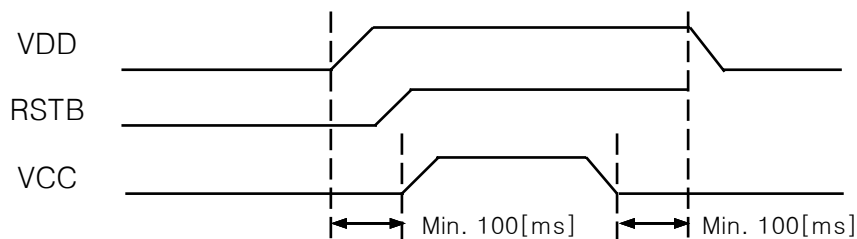
| | | | |
|---|------------------------------|-----------------|---------------|
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16-2 Storage

- (1) Do not leave the panel under high temperature, and high humidity for a long time. It is recommended to store the module at 0 to 35°C of temperature and less than 70% of relative humidity.
- (2) Do not store the OLED module under direct sunlight.
- (3) The module shall be stored in a dark place. It is prohibited to apply to sunlight or fluorescent light during the storage.

16-3 Operation

- (1) Do not connect, disconnect the module in the "Power On" condition.
- (2) Power supply should always be turned on/off by the following diagram.



16-4 Caution

- (1) The OLED is deteriorated by ultraviolet, therefore do not leave it under direct sunlight and strong ultraviolet ray for a long time.
- (2) If the panel displays the same pattern continuously for a long period of time, it can be attributed to the image "Sticks" to screen.

16-5 Others

- (1) Avoid condensation of water because it may result in improper operation or disconnection of electrode.
- (2) 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.