

## AND10C209A-DHB

### 10.4" VGA Color TFT LCD Module

#### Features

- High luminance (twice standard HB version without an increase in power consumption or size)
- Twin CCFL backlight
- Low reflection
- Clear 256K colors (K=1024)
- Thin and lightweight design
- Fully compatible with AND10C273-DHB (SVGA)
- VGA (640 x 480 pixels color display)
- Replaceable lamp structure
- Fast response time
- Applications: Display Terminals, Scientific Instruments, Medical Instruments, Test and Measurement Instruments, Process Control/Factory Automation Equipment, Office Automation Equipment

#### Mechanical Specifications

| Item               | Specification                      | Unit   |
|--------------------|------------------------------------|--------|
| Outline Dimensions | 265.0 (H) x 188.8 (V) x 12 max (D) | mm     |
| Number of Pixels   | 640 (H) x 480 (V)                  | Pixels |
| Active Area        | 211.2 (H) x 158.4 (V)              | mm     |
| Pixel Pitch        | 0.33 (H) x 0.33 (V)                | mm     |
| Weight (approx.)   | 590                                | gram   |
| Backlight          | CCFL, Side-light type (twin lamps) | —      |

#### Absolute Maximum Ratings

| Item                                 | Symbol    | Min  | Max            | Unit |
|--------------------------------------|-----------|------|----------------|------|
| Supply Voltage                       | $V_{DD}$  | -0.3 | 7.0            | V    |
|                                      | $V_{FL}$  | 0    | 2000           | Vrms |
| FL Driving Frequency                 | $f_{FL}$  | 0    | 100            | KHz  |
| Input Signal Voltage                 | $V_{IN}$  | -0.3 | $V_{DD} + 0.3$ | V    |
| Operating Temperature                | $T_{op}$  | 0    | 50             | °C   |
| Storage Temperature                  | $T_{stg}$ | -20  | 60             | °C   |
| Humidity (Max. Wet bulb temp = 39°C) | —         | 10   | 90             | %RH  |

#### Electrical Specifications (Ta = 25°C)

| Item                        | Symbol   | Min  | Typ | Max      | Unit   |
|-----------------------------|----------|------|-----|----------|--------|
| Supply Voltage              | $V_{DD}$ | 4.75 | 5.0 | 5.25     | V      |
|                             | $V_{FL}$ | 500  | 550 | 600      | Vrms   |
| FL Start Voltage (Ta = 0°C) |          | 1500 | —   | —        | Vrms   |
| High Level Input Voltage    | $V_{IH}$ | 3.5  | —   | $V_{DD}$ | V      |
| Low Level Input Voltage     | $V_{IL}$ | 0    | —   | 1.5      | V      |
| Current Consumption         | $I_{DD}$ | —    | 125 | 250      | mA     |
|                             | $I_{FL}$ | 3.0  | 6.0 | 7.0      | mA rms |
| Power Consumption (*1)      | P        | —    | 7.2 | —        | W      |

\*1: Before the efficiency loss of CCFL inverter

#### Optical Specifications (Ta = 25°C)

| Item      | Symbol    | Min | Typ | Max | Unit              |
|-----------|-----------|-----|-----|-----|-------------------|
| Contrast  | CR        | 100 | —   | —   | —                 |
| Response  | $t_{on}$  | —   | —   | 50  | ms                |
|           | $t_{off}$ | —   | —   | 50  | ms                |
| Luminance | L         | —   | 500 | —   | cd/m <sup>2</sup> |



Technical drawing of the front view of the device with dimensions in millimeters. The drawing shows a rectangular device with a central display area. Dimensions include overall width (265), overall height (188.8), and various internal offsets and active/viewing area dimensions. Callouts include '4-Ø3.2' for mounting holes, '211.2 (Active Area)', '215.2 (Viewing Area)', '158.4 (Active Area)', '162.4 (Viewing Area)', '216.2 (Bezel Opening)', '128 (Active Area, Viewing Area Center)', and '12 Max' for a side feature.

[illegible]

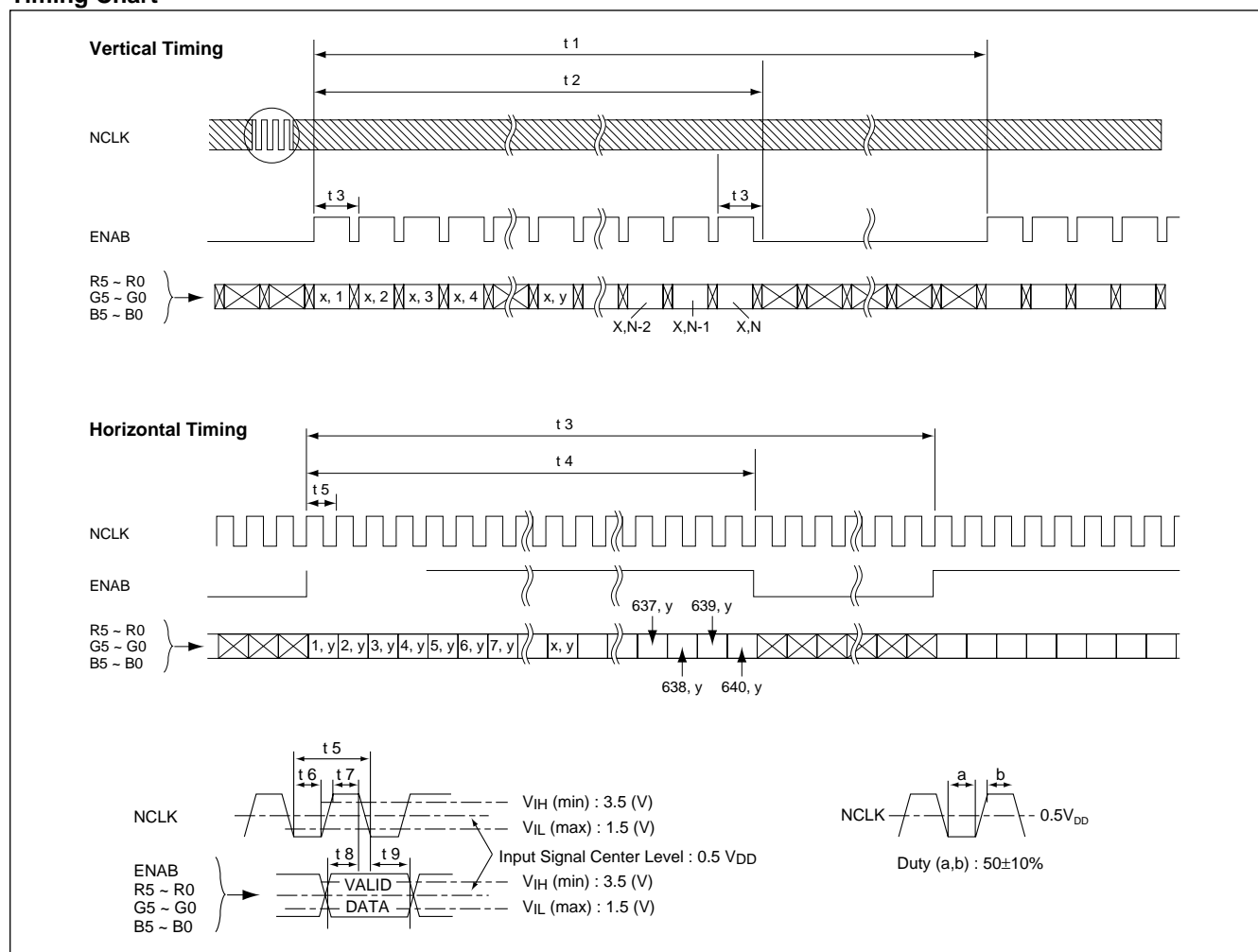


## Timing Specifications

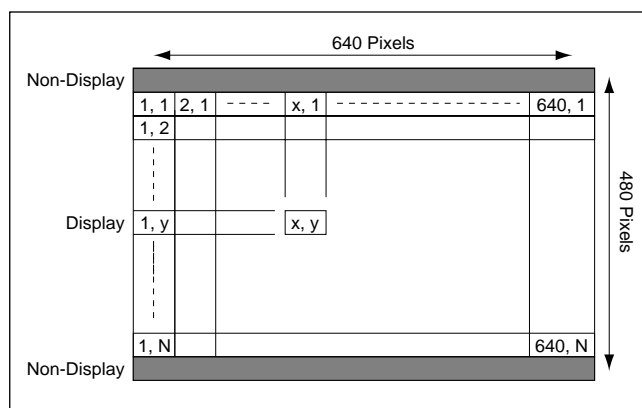
| Item                    | Sym | Min                        | Typ               | Max               | Unit    |
|-------------------------|-----|----------------------------|-------------------|-------------------|---------|
| Frame Period            | t1  | $(249+N/2) \times t3$<br>— | 525 x t3<br>16.68 | 525 x t3<br>17.85 | —<br>ms |
| Vertical Display Term*  | t2  | 300 x t3                   | 480 x t3          | 480 x t3          | —       |
| One Line Scanning Time  | t3  | 684 x t5<br>31.5           | 800 x t5<br>31.78 | 860 x t5          | —<br>μs |
| Horizontal Display Term | t4  | 640 x t5                   | 640 x t5          | 640 x t5          | —       |
| Clock Period            | t5  | 35.0                       | 39.72             | —                 | ns      |
| Clock "L" Time          | t6  | 10.0                       | —                 | —                 | ns      |
| Clock "H" Time          | t7  | 7.0                        | —                 | —                 | ns      |
| Set Up Time             | t8  | 5.0                        | —                 | —                 | ns      |
| Hold Time               | t9  | 10.0                       | —                 | —                 | ns      |

\* t2 = Nx t3

## Timing Chart



**Note:** When the vertical display period (N) is shorter than 480, the actual display area is shifted to the center. The non-display area becomes dark as follows:



- Recommended LCD Controller: CL-GD6440 (Cirrus Logic) 65548, 65550 (Chips & Technologies)
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- Recommended Inverter: INVR1918 (Hitachi)

## Connector Pin Assignment for Interface

### CN2 CCFL Power Supply

(BHR-03VS-1/Japan Solderless Terminal Mfg. Co. Ltd –JST)

| Terminal No. | Symbol            | Function                    |
|--------------|-------------------|-----------------------------|
| 1            | VL                | CCFL 1 Input (High Voltage) |
| 2            | NC <sup>(1)</sup> | Open                        |
| 3            | GL                | CCFL 1 Input (GND Side)     |

### CN3 CCFL Power Supply

(BHR-03VS-1/Japan Solderless Terminal Mfg. Co. Ltd.)

| Terminal No. | Symbol            | Function                    |
|--------------|-------------------|-----------------------------|
| 1            | VL                | CCFL 2 Input (High Voltage) |
| 2            | NC <sup>(1)</sup> | Open                        |
| 3            | GL                | CCFL 2 Input (GND Side)     |

Note (1): NC terminal is open. (Don't use.)

### CN1 Input Signal (1)

(DF9-31P-1V/Hirose Electric Co. Ltd.)

| Terminal No. | Symbol            | Function                        |
|--------------|-------------------|---------------------------------|
| 1            | GND               | Ground                          |
| 2            | NCLK              | Sampling Clock                  |
| 3            | GND               | Ground                          |
| 4            | R0 <sup>(2)</sup> | Red Display Data (LSB)          |
| 5            | R1 <sup>(2)</sup> | Red Display Data                |
| 6            | R2 <sup>(2)</sup> | Red Display Data                |
| 7            | GND               | Ground                          |
| 8            | R3 <sup>(2)</sup> | Red Display Data                |
| 9            | R4 <sup>(2)</sup> | Red Display Data                |
| 10           | R5 <sup>(2)</sup> | Red Display Data (MSB)          |
| 11           | GND               | Ground                          |
| 12           | G0 <sup>(2)</sup> | Green Display Data (LSB)        |
| 13           | G1 <sup>(2)</sup> | Green Display Data              |
| 14           | G2 <sup>(2)</sup> | Green Display Data              |
| 15           | GND               | Ground                          |
| 16           | G3 <sup>(2)</sup> | Green Display Data              |
| 17           | G4 <sup>(2)</sup> | Green Display Data              |
| 18           | G5 <sup>(2)</sup> | Green Display Data (MSB)        |
| 19           | GND               | Ground                          |
| 20           | ENAB              | Compound Synchronization Signal |
| 21           | GND               | Ground                          |
| 22           | B0 <sup>(2)</sup> | Blue Display Data (LSB)         |
| 23           | B1 <sup>(2)</sup> | Blue Display Data               |
| 24           | B2 <sup>(2)</sup> | Blue Display Data               |
| 25           | GND               | Ground                          |
| 26           | G3 <sup>(2)</sup> | Blue Display Data               |
| 27           | G4 <sup>(2)</sup> | Blue Display Data               |
| 28           | G5 <sup>(2)</sup> | Blue Display Data (MSB)         |
| 29           | GND               | Ground                          |
| 30           | V <sub>DD</sub>   | +5V Power Supply                |
| 31           | V <sub>DD</sub>   | +5V Power Supply                |



Note (2): 512K colors are displayed by the combinations of 18 data bits.

|                             | Display  | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 | Gray Scale Level |
|-----------------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|
| Basic Color                 | Black    | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | –                |
|                             | Blue     | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | H  | –                |
|                             | Green    | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  | –                |
|                             | Lt. Blue | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | –                |
|                             | Red      | H  | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | –                |
|                             | Purple   | H  | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | H  | –                |
|                             | Yellow   | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  | –                |
|                             | White    | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | –                |
| Gray Scale of Red           | Black    | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L0               |
|                             | Dark     | L  | L  | L  | L  | L  | H  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L1               |
|                             |          | L  | L  | L  | L  | H  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L2               |
|                             |          | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | L3~<br>L60       |
|                             |          | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  |                  |
|                             | Light    | H  | H  | H  | H  | L  | H  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L61              |
|                             |          | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L62              |
|                             |          | H  | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | Red L63          |
|                             |          | H  | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  |                  |
| Gray Scale of Green         | Black    | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L0               |
|                             | Dark     | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | H  | L  | L  | L  | L  | L  | L  | L  | L1               |
|                             |          | L  | L  | L  | L  | L  | L  | L  | L  | L  | H  | L  | L  | L  | L  | L  | L  | L  | L  | L2               |
|                             |          | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | L3~<br>L60       |
|                             |          | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  |                  |
|                             | Light    | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | L  | H  | L  | L  | L  | L  | L  | L  | L61              |
|                             |          | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  | L  | L62              |
|                             |          | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  | Green L63        |
|                             |          | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | H  | L  | L  | L  | L  | L  | L  |                  |
| Gray Scale of Blue          | Black    | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L0               |
|                             | Dark     | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | H  | L1               |
|                             |          | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | H  | L  | L2               |
|                             |          | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | L3~<br>L60       |
|                             |          | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  |                  |
|                             | Light    | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | L  | H  | L61              |
|                             |          | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | L  | L62              |
|                             |          | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | H  | Blue L63         |
|                             |          | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | H  | H  | H  | H  | H  | H  |                  |
| Gray Scale of White & Black | Black    | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L  | L0               |
|                             | Dark     | L  | L  | L  | L  | L  | H  | L  | L  | L  | L  | L  | H  | L  | L  | L  | L  | L  | H  | L1               |
|                             |          | L  | L  | L  | L  | H  | L  | L  | L  | L  | L  | H  | L  | L  | L  | L  | L  | H  | L  | L2               |
|                             |          | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | L3~<br>L60       |
|                             |          | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  | :  |                  |
|                             | Light    | H  | H  | H  | H  | L  | H  | H  | H  | H  | L  | H  | H  | H  | H  | H  | H  | L  | H  | L61              |
|                             |          | H  | H  | H  | H  | H  | L  | H  | H  | H  | H  | H  | L  | H  | H  | H  | H  | H  | L  | L62              |
|                             |          | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | White L63        |
|                             |          | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  | H  |                  |