

NHD-3.5-320240MF-ATXL#-1

TFT (Thin-Film-Transistor) Color Liquid Crystal Display Module

| | |
|---------|--------------------------------|
| NHD- | Newhaven Display |
| 3.5- | 3.5" Diagonal |
| 320240- | 320xRGBx240 pixels |
| MF- | Model |
| A- | Built-in driver /NO Controller |
| T- | White LED backlight |
| X- | TFT |
| L- | 12:00 view, Wide Temp |
| #-1 | RoHS Compliant |

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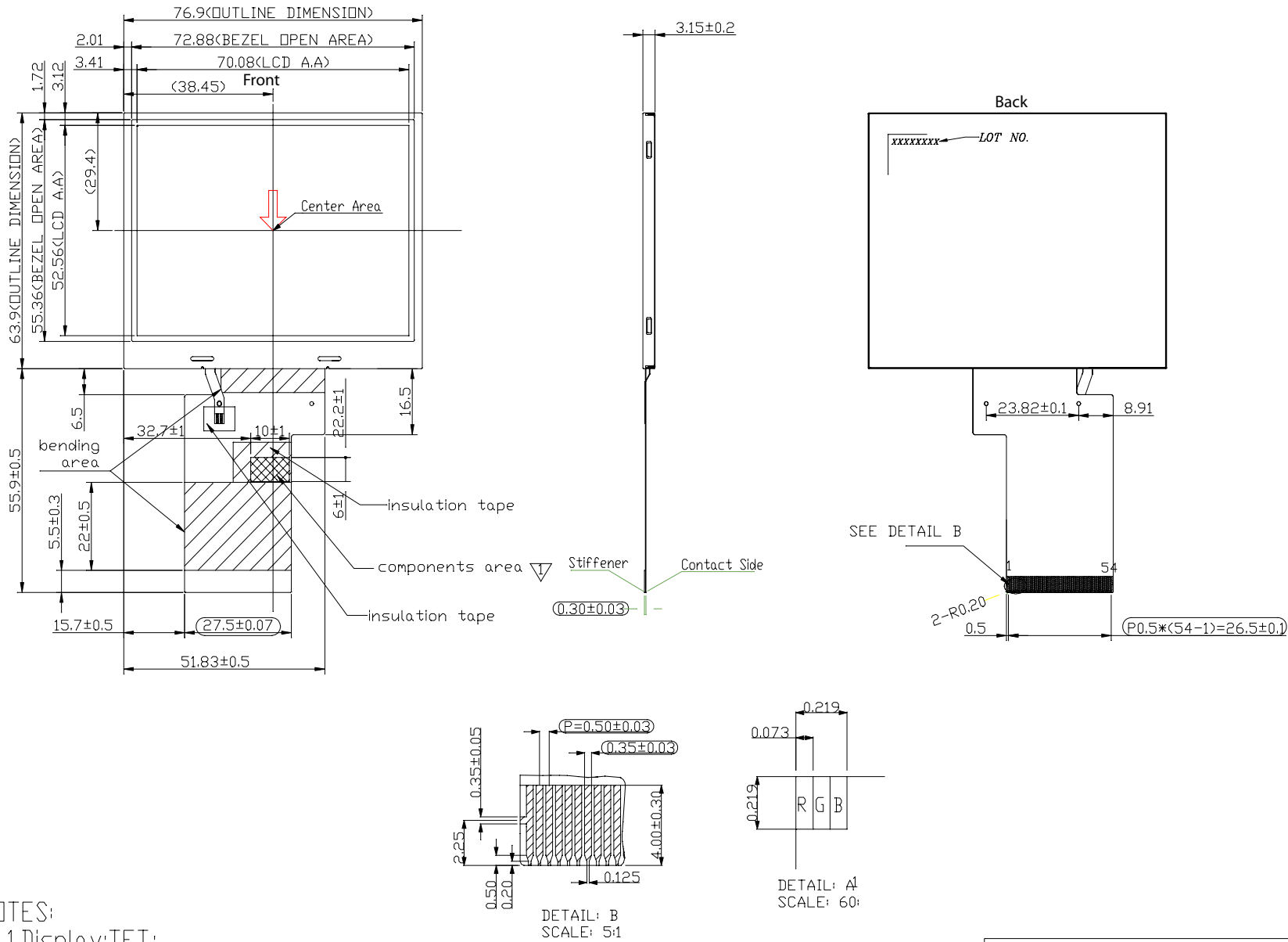
Document Revision History

| Revision | Date | Description | Changed by |
|----------|-----------|--|------------|
| 0 | 7/8/2009 | Initial Release | CL |
| 1 | 7/29/2009 | MECHANICAL DRAWING UPDATE | CL |
| 2 | 1/25/2011 | Viewing angle updated | AK |
| 3 | 3/31/2011 | Pin description / Note section updated | AK |
| 4 | 4/8/2011 | Contrast removed from electrical characteristics | BE |

Functions and Features

- 320xRGBx240 resolution
- LED backlight
- 3.3V power supply
- 24-bit Parallel digital RGB interface (6.5MHz)

Mechanical Drawing



| NO. | PIN NAME |
|-----|-------------|
| 1 | LED Cathode |
| 2 | LED Cathode |
| 3 | LED Anode |
| 4 | LED Anode |
| 5 | NC |
| 6 | NC |
| 7 | NC |
| 8 | RESET |
| 9 | SPENA |
| 10 | SPCK |
| 11 | SPDA |
| 12 | D01 |
| 13 | D02 |
| 14 | D03 |
| 15 | D04 |
| 16 | D05 |
| 17 | D06 |
| 18 | D07 |
| 19 | D08 |
| 20 | D09 |
| 21 | D10 |
| 22 | D11 |
| 23 | D12 |
| 24 | D13 |
| 25 | D14 |
| 26 | D15 |
| 27 | D16 |
| 28 | D17 |
| 29 | D18 |
| 30 | D19 |
| 31 | D20 |
| 32 | D21 |
| 33 | D22 |
| 34 | D23 |
| 35 | D24 |
| 36 | HSYNC |
| 37 | VSYNC |
| 38 | DOTCLK |
| 39 | NC |
| 40 | NC |
| 41 | VDD |
| 42 | VDD |
| 43 | NC |
| 44 | NC |
| 45 | NC |
| 46 | NC |
| 47 | NC |
| 48 | NC |
| 49 | NC |
| 50 | NC |
| 51 | NC |
| 52 | DEN |
| 53 | GND |
| 54 | GND |

NOTES:

1. Display: TFT;
2. Viewing Direction: 12:00;
3. General Tolerance: ±0.20;
4. IC: NT39016D

Newhaven Display

NHD-3.5-320240MF-ATXL#-1

Pin Description

| Pin No. | Symbol | External Connection | Function Description |
|---------|-----------|---------------------|--|
| 1 | LED- | Power Supply | Cathode for LED backlight |
| 2 | LED- | Power Supply | Cathode for LED backlight |
| 3 | LED+ | Power Supply | Anode for LED backlight (19.2V @ 20mA) |
| 4 | LED+ | Power Supply | Anode for LED backlight (19.2V @ 20mA) |
| 5 | NC | NC | No Connect |
| 6 | NC | NC | No Connect |
| 7 | NC | NC | No Connect |
| 8 | /RESET | MPU | Reset – active low |
| 9 | CS | MPU | Serial interface chip select |
| 10 | SCL | MPU | Serial interface clock |
| 11 | SDI | MPU | Serial interface data |
| 12-19 | DB0-DB7 | MPU | Blue signal data bus |
| 20-27 | DB8-DB15 | MPU | Green signal data bus |
| 28-35 | DB16-DB23 | MPU | Red signal data bus |
| 36 | HSYNC | MPU | Horizontal sync signal |
| 37 | VSYNC | MPU | Vertical sync signal |
| 38 | DCLK | MPU | Dot clock signal |
| 39 | NC | NC | No Connect |
| 40 | NC | NC | No Connect |
| 41 | VDD | Power Supply | Power for LCD and logic (3.3V) |
| 42 | VDD | Power Supply | Power for LCD and logic (3.3V) |
| 43 | NC | NC | No Connect |
| 44 | NC | NC | No Connect |
| 45 | ID | NC | No Connect |
| 46 | NC | NC | No Connect |
| 47 | NC | NC | No Connect |
| 48 | NC | NC | No Connect |
| 49 | NC | NC | No Connect |
| 50 | NC | NC | No Connect |
| 51 | NC | NC | No Connect |
| 52 | DE | NC | Data Enable signal |
| 53 | GND | Power Supply | Ground |
| 54 | GND | Power Supply | Ground |

Recommended LCD connector: 0.5mm pitch, 54 conductor – Molex 51296-5494

Backlight connector: on LCD connector, **Mates with:** ---

Electrical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|--------|--------------|--------|------|--------|-------|
| Operating Temperature Range | Top | Absolute Max | -20 | 25 | +70 | °C |
| Storage Temperature Range | Tst | Absolute Max | -30 | 25 | +80 | °C |
| Digital Supply Voltage | VDD | | 3.0 | 3.3 | 3.6 | V |
| Supply Current | IDD | VCC=3.3V | | 8.6 | | mA |
| "H" Level input | Vih | | 0.7VCC | | VCC | V |
| "L" Level input | Vil | | 0 | | 0.3VCC | V |
| "H" Level output | Voh | | 0.7VCC | | VCC | V |
| "L" Level output | Vol | | 0 | | 0.3VCC | V |
| | | | | | | |
| Backlight Supply Voltage | Vled | | 18.6 | 19.2 | 21 | V |
| Backlight Supply Current | Iled | Vled=19.8V | | 20 | 25 | mA |
| Brightness | YL | | 240 | 300 | | cd/m2 |

Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------|--------|------------|------|------|------|------|
| Viewing Angle – Top | VA | Cr ≥ 10 | - | 60 | - | ° |
| Viewing Angle - Bottm | VA | Cr ≥ 10 | - | 40 | - | ° |
| Viewing Angle – Left | VH | Cr ≥ 10 | - | 60 | - | ° |
| Viewing Angle - Right | VH | Cr ≥ 10 | - | 60 | - | ° |
| Contrast Ratio | Cr | 3.3V, 25°C | - | 350 | - | |
| Response Time (rise) | Tr | | - | 10 | - | ms |
| Response Time (fall) | Tf | | - | 15 | - | ms |

Driver Information

Built-in NT39016D driver; no controller.

See specification at http://www.newhavendisplay.com/app_notes/NT39016D.pdf

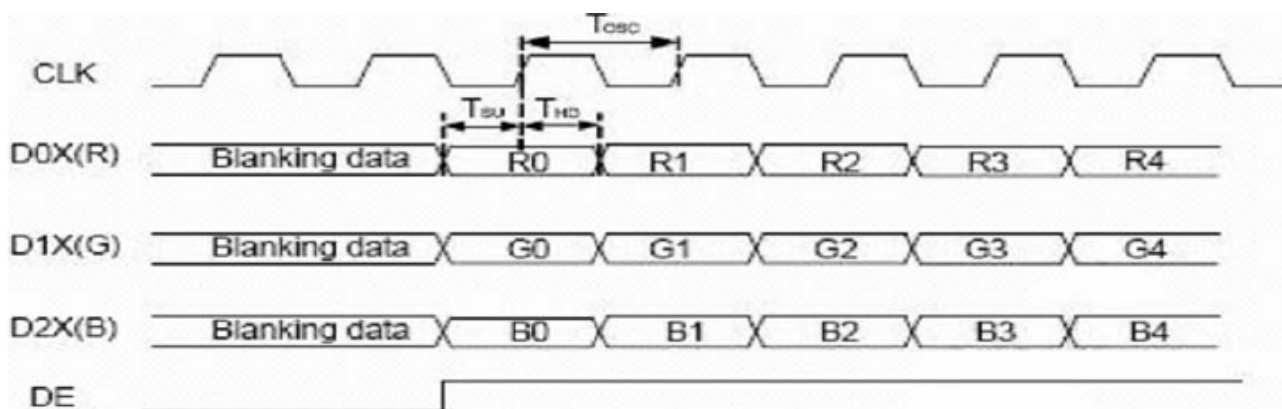
Note: To achieve optimum VCOM and VGL settings, the SPI interface may be used to set the following registers:

R0Eh = 6Bh

R0Fh = 24h

Digital Parallel RGB interface

| Signal | Item | Symbol | Min | Typ | Max | Unit |
|--------|----------------|--------|-----|-----|-----|------|
| Dclk | Frequency | Tosc | - | 156 | - | ns |
| | High Time | Tch | - | 78 | - | ns |
| | Low Time | Tcl | - | 78 | - | ns |
| Data | Setup Time | Tsu | 12 | - | - | ns |
| | Hold Time | Thd | 12 | - | - | ns |
| Hsync | Period | TH | - | 408 | - | Tosc |
| | Pulse Width | THS | 5 | 30 | - | Tosc |
| | Back-Porch | Thb | - | 38 | - | Tosc |
| | Display Period | TEP | - | 320 | - | Tosc |
| | Hsync-den time | THE | 36 | 68 | 88 | |
| | Front-Porch | Thf | - | 20 | - | Tosc |
| Vsync | Period | Tv | - | 262 | - | TH |
| | Pulse Width | Tvs | 1 | 3 | 5 | TH |
| | Back-Porch | Tvb | - | 15 | - | TH |
| | Display Period | Tvd | - | 240 | - | TH |
| | Front-Porch | Tvf | 2 | 4 | - | TH |



Quality Information

| Test Item | Content of Test | Test Condition | Note |
|---------------------------------------|---|---|------|
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | +70°C , 240hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C , 240hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time. | +60°C , 240hrs | 2 |
| Low Temperature Operation | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time. | -20°C , 240hrs | 1,2 |
| High Temperature / Humidity Operation | Endurance test applying the electric stress (voltage & current) and the high thermal with high humidity stress for a long time. | +60°C , 90% RH , 160hrs | 1,2 |
| Thermal Shock resistance | Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress. | -30°C,30min -> 25°C,5min -> 80°C,30min = 1 cycle 100 cycles | |
| Vibration test | Endurance test applying vibration to simulate transportation and use. | 10-55Hz , 15mm amplitude. 60 sec in each of 3 directions X,Y,Z For 15 minutes | 3 |
| Static electricity test | Endurance test applying electric static discharge. | VS=4KV, RS=330kΩ, CS=150pF Five times | |

Note 1: No condensation to be observed.

Note 2: Conducted after 4 hours of storage at 25°C, 0%RH.

Note 3: Test performed on product itself, not inside a container.

Precautions for using LCDs/LCMs

See Precautions at www.newhavendisplay.com/specs/precautions.pdf

Warranty Information and Terms & Conditions

http://www.newhavendisplay.com/index.php?main_page=terms