

# NHD-3.5-320240MF-ATXL#-CTP-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                  |
| #-      | <b>RoHS Compliant</b>                  |
| CTP-1   | Capacitive Touch Panel with controller |

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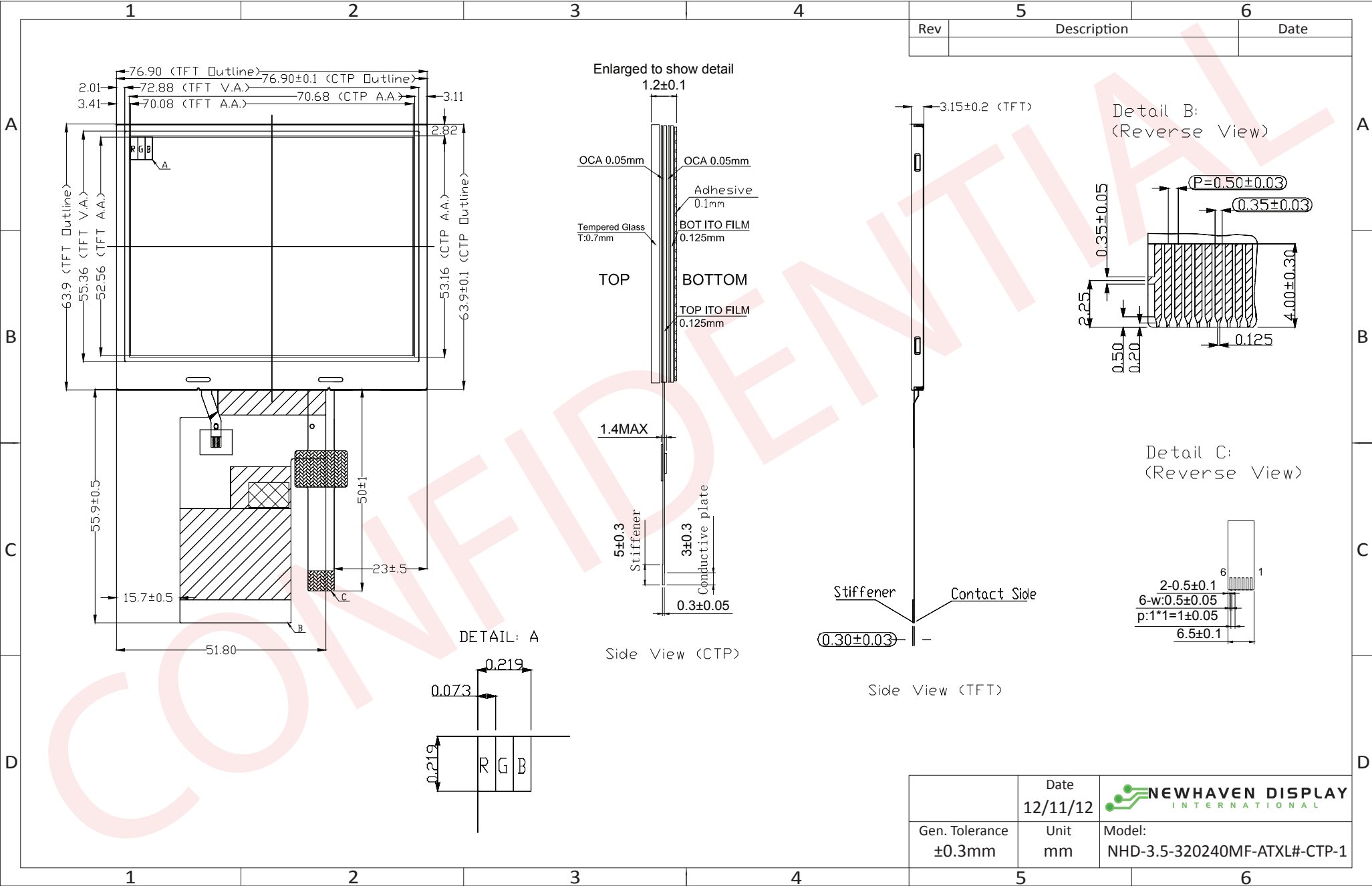
## Document Revision History

| Revision | Date       | Description                    | Changed by |
|----------|------------|--------------------------------|------------|
| 0        | 2/1/2012   | Initial Release                | SB         |
| 1        | 12/11/2012 | Timing characteristics updated | AK         |

## Functions and Features

- 320xRGBx240 resolution
- LED backlight
- 3.3V power supply
- 24-bit Parallel digital RGB interface (6.4MHz)
- Capacitive Touch Panel with controller

Mechanical Drawing



The drawing contained herein is the exclusive property of Newhaven Display International, Inc. and shall not be copied, reproduced, and/or disclosed in any format without permission.

## Pin Description

### LCD:

| 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     | -                   | No Connect                             |
| 6       | NC     | -                   | No Connect                             |
| 7       | 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   | B0-B7  | MPU                 | Blue signal data bus                   |
| 20-27   | G0-G7  | MPU                 | Green signal data bus                  |
| 28-35   | R0-R7  | MPU                 | Red signal data bus                    |
| 36      | HSYNC  | MPU                 | Horizontal sync signal                 |
| 37      | VSNC   | MPU                 | Vertical sync signal                   |
| 38      | DCLK   | MPU                 | Dot clock signal                       |
| 39      | NC     | -                   | No Connect                             |
| 40      | 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     | -                   | No Connect                             |
| 44      | NC     | -                   | No Connect                             |
| 45      | NC     | -                   | No Connect                             |
| 46      | NC     | -                   | No Connect                             |
| 47      | NC     | -                   | No Connect                             |
| 48      | NC     | -                   | No Connect                             |
| 49      | NC     | -                   | No Connect                             |
| 50      | NC     | -                   | No Connect                             |
| 51      | NC     | -                   | No Connect                             |
| 52      | DE     | -                   | Data Enable signal                     |
| 53      | VSS    | Power Supply        | Ground                                 |
| 54      | VSS    | Power Supply        | Ground                                 |

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

**Backlight connector:** on LCD connector

**Mates with:** ---

### Capacitive Touch Panel:

| Pin No. | Symbol | External Connection | Function Description                                                  |
|---------|--------|---------------------|-----------------------------------------------------------------------|
| 1       | VDD    | Power Supply        | Supply voltage for Logic (3.0V)                                       |
| 2       | VSS    | Power Supply        | Ground                                                                |
| 3       | SCL    | MPU                 | Serial I2C Clock (Requires pull-up resistor)                          |
| 4       | SDA    | MPU                 | Serial I2C Data (Requires pull-up resistor)                           |
| 5       | /INT   | MPU                 | Interrupt signal from touch panel module to host                      |
| 6       | /WAKE  | MPU                 | External interrupt signal from host (0: Disable /INT, 1: Enable /INT) |

**Recommended LCD connector:** 1.0mm pitch, 6 conductor – Molex 52271-0679

## Electrical Characteristics

### TFT:

| Item                        | Symbol | Condition    | Min.    | Typ. | Max.    | Unit |
|-----------------------------|--------|--------------|---------|------|---------|------|
| Operating Temperature Range | Top    | Absolute Max | -20     | -    | +70     | °C   |
| Storage Temperature Range   | Tst    | Absolute Max | -30     | -    | +80     | °C   |
| Supply Voltage              | VDD    |              | 3.0     | 3.3  | 3.6     | V    |
| Supply Current              | IDD    | VDD=3.3V     | -       | 25   | -       | mA   |
| "H" Level input             | Vih    |              | 0.8*VDD | -    | VDD     | V    |
| "L" Level input             | Vil    |              | VSS     | -    | 0.2*VDD | V    |
| "H" Level output            | Voh    |              | VDD-0.4 | -    | VDD     | V    |
| "L" Level output            | Vol    |              | VSS     | -    | VSS+0.4 | V    |
|                             |        |              |         |      |         |      |
| Backlight Supply Voltage    | Vled   |              | 18.0    | 19.2 | 20.4    | V    |
| Backlight Supply Current    | Iled   | Vled=19.2V   | -       | 18   | 20      | mA   |

### Capacitive Touch Panel:

| Item                        | Symbol | Condition    | Min.    | Typ. | Max.    | Unit |
|-----------------------------|--------|--------------|---------|------|---------|------|
| Operating Temperature Range | Top    | Absolute Max | -20     | -    | +70     | °C   |
| Storage Temperature Range   | Tst    | Absolute Max | -30     | -    | +80     | °C   |
| Supply Voltage              | VDD    |              | 2.8     | 3.0  | 3.3     | V    |
| Supply Current – Operating  | IDD    | VDD=2.8V     | -       | 6.0  | -       | mA   |
| Supply Current – Hibernate  | IDD    | VDD=2.8V     | -       | 0.03 | -       | mA   |
| "H" Level input             | Vih    |              | 0.7*VDD | -    | VDD     | V    |
| "L" Level input             | Vil    |              | VSS     | -    | 0.3*VDD | V    |
| "H" Level output            | Voh    |              | 0.7*VDD | -    | VDD     | V    |
| "L" Level output            | Vol    |              | VSS     | -    | 0.3*VDD | V    |

## Optical Characteristics

| Item                   | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------|--------|-----------|------|------|------|------|
| Viewing Angle – Top    |        | Cr ≥ 10   | -    | 60   | -    | °    |
| Viewing Angle – Bottom |        |           | -    | 40   | -    | °    |
| Viewing Angle – Left   |        |           | -    | 60   | -    | °    |
| Viewing Angle – Right  |        |           | -    | 60   | -    | °    |
| Contrast Ratio         | Cr     |           | 200  | 350  | -    |      |
| Response Time (rise)   | Tr     |           | -    | 10   | -    | ms   |
| Response Time (fall)   | Tf     |           | -    | 15   | -    | ms   |

### Capacitive Touch Panel Material Characteristics:

| Property           | Requirement | Unit |
|--------------------|-------------|------|
| IC                 | FT5306DE3   | -    |
| Glass Thickness    | 0.7         | mm   |
| Top Film Thickness | 0.125       | mm   |
| Surface Hardness   | 6(750)      | H(g) |
| Light Transmission | 82%         | -    |
| Operating Humidity | 45~85       | RH   |
| Storage Humidity   | 5~95        | RH   |

## Driver/Controller Information

### TFT:

Built-in NT39016D driver. No controller.

Please download specification at [http://www.newhavendisplay.com/app\\_notes/NT39016D.pdf](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

### Capacitive Touch Panel:

Built-in FocalTech FT5x06 Capacitive Touch Controller.

Please download specification at [http://www.newhavendisplay.com/app\\_notes/FT5x06.pdf](http://www.newhavendisplay.com/app_notes/FT5x06.pdf)

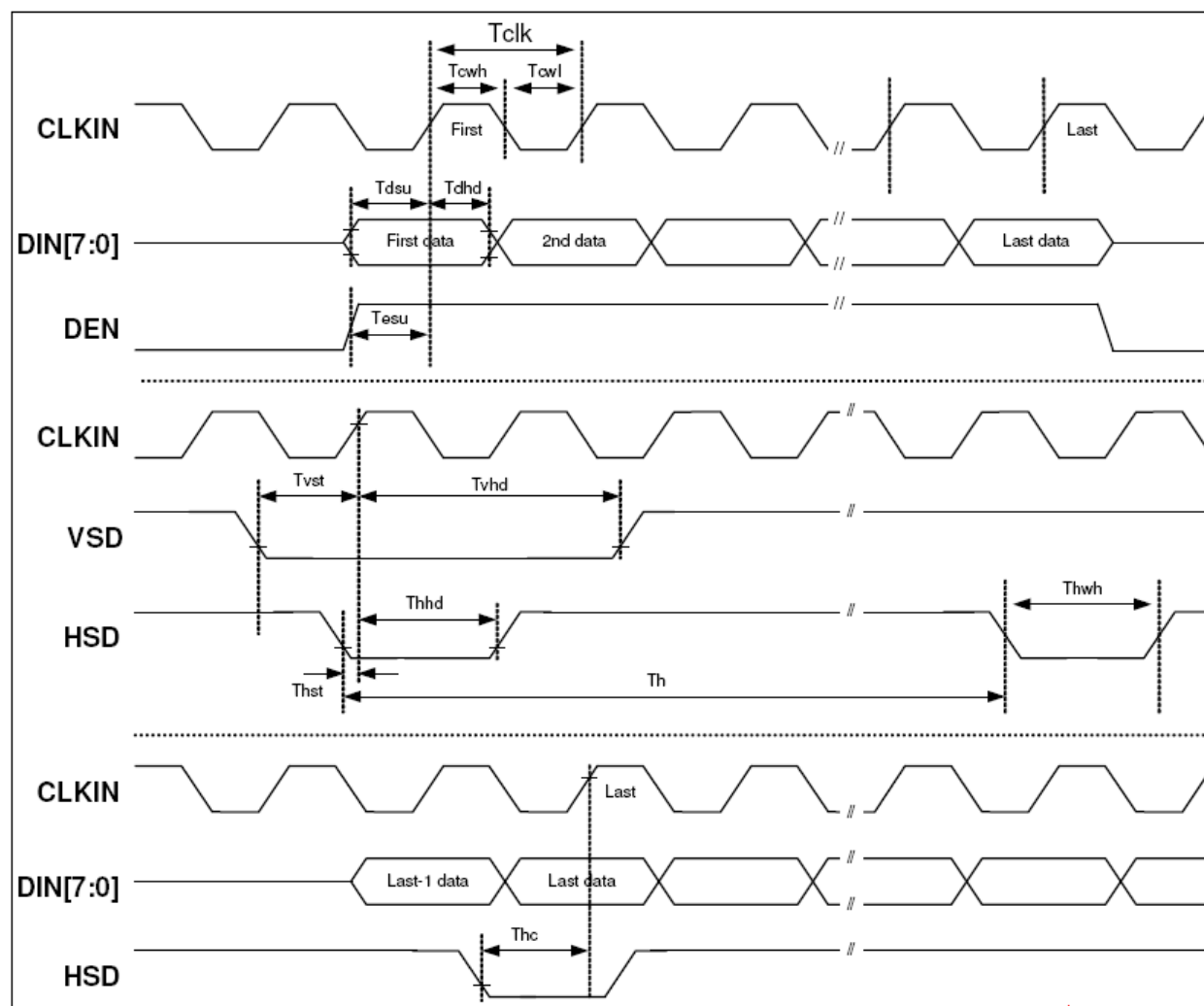
## Timing Characteristics

| Parameter                                           | Symbol            | Min.     | Typ.  | Max. | Unit  | Conditions                                                                     |
|-----------------------------------------------------|-------------------|----------|-------|------|-------|--------------------------------------------------------------------------------|
| <b>System Operation Timing</b>                      |                   |          |       |      |       |                                                                                |
| VDD power source slew time                          | T <sub>POR</sub>  |          |       | 1000 | us    | From 0V to 90% VDD                                                             |
| RSTB active pulse width                             | T <sub>RSTB</sub> | 40       |       |      | us    | VDD = 3.3V                                                                     |
| <b>Input Output Timing</b>                          |                   |          |       |      |       |                                                                                |
| CLKIN clock time                                    | Tclk              | 33.3/125 | -     | -    | ns    | Please refer to timing table(p.32)                                             |
| HSD to CLKIN                                        | Thc               | -        | -     | 1    | CLKIN |                                                                                |
| HSD width                                           | Thwh              | 1        | -     | -    | CLKIN |                                                                                |
| VSD width                                           | Tvwh              | 1        | -     | -    | Th    |                                                                                |
| HSD period time                                     | Th                | 60       | 63.56 | 67   | us    |                                                                                |
| VSD setup time                                      | Tvst              | 8        | -     | -    | ns    |                                                                                |
| VSD hold time                                       | Tvhd              | 10       | -     | -    | ns    |                                                                                |
| HSD setup time                                      | Thst              | 8        | -     | -    | ns    |                                                                                |
| HSD hold time                                       | Thhd              | 10       | -     | -    | ns    |                                                                                |
| Data set-up time                                    | Tdsu              | 8        | -     | -    | ns    | DIN[23:0] to CLKIN                                                             |
| Data hold time                                      | Tdhhd             | 10       | -     | -    | ns    | DIN[23:0] to CLKIN                                                             |
| DEN setup time                                      | Tesd              | 12       | -     | -    | ns    | DEN to CLKIN                                                                   |
| Time that VSD to 1 <sup>st</sup> line data input    | Tvs               | 2        | 13    | 127  | Th    | @CCIR601 / 8bit RGB HV mode<br>Control by HDLY[6:0] setting<br>Tvs = HDLY[6:0] |
| Time that CCIR_V to 1 <sup>st</sup> line data input | Tvs               | 12       | 20    | 28   | Th    | @CCIR656 NTSC mode<br>Control by HDLY[6:0] setting<br>Tvs = HDLY[6:0]          |
| Time that CCIR_V to 1 <sup>st</sup> line data input | Tvs               | 17       | 25    | 33   | Th    | @CCIR656 PAL mode<br>Control by HDLY[6:0] setting<br>Tvs = HDLY[6:0]           |
| Time that VSD to 1 <sup>st</sup> line               | Tvs               | 2        | 13    | 127  | Th    | @24bit RGB HV mode<br>Control by HDLY[6:0] setting<br>Tvs = HDLY[6:0]          |
| Source output stable time 1                         | Tst               | -        | 25    | 30   | us    | 96% final, CL=30pF, RL=2K                                                      |
| Gate output stable time                             | Tgst              | -        | 500   | 1000 | ns    | 96% final, CL=40pF                                                             |
| VCOMOUT output stable time                          | Tcst              | -        | 4     | 8    | us    | 96% final, CL=33nF, RL=100ohm                                                  |

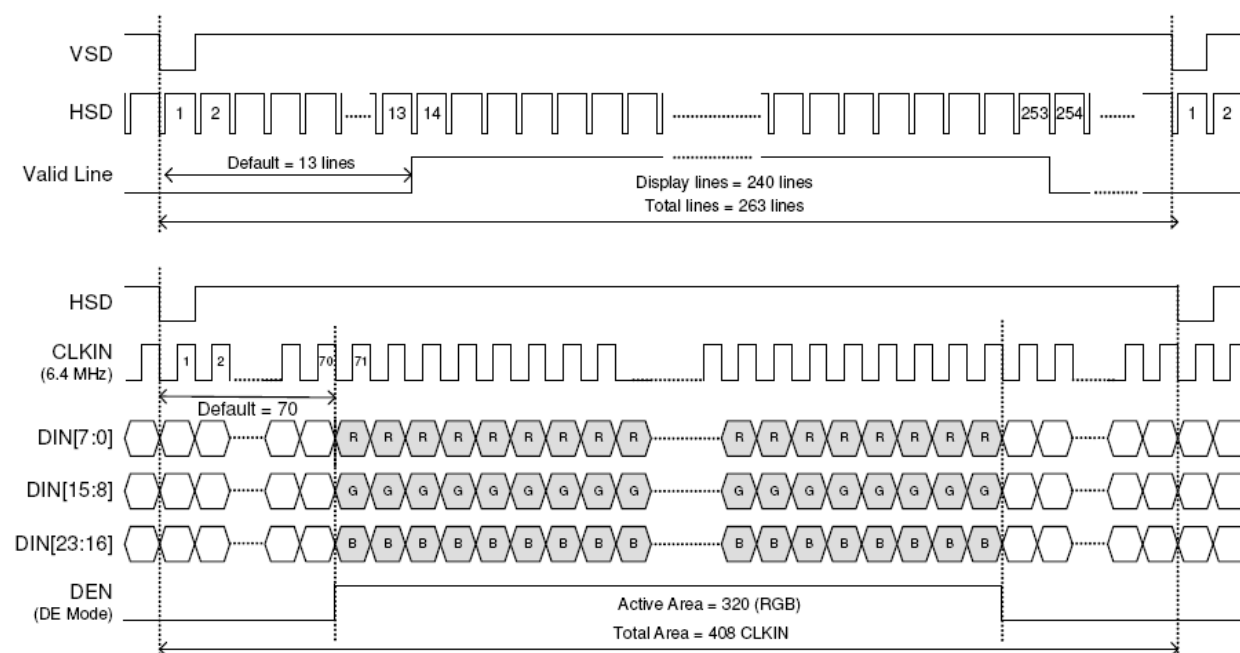
### 24 Bit RGB Mode (@ SEL[3:0] = 1100 or 1101)

| Parameter                                         | Symbol | Min. | Typ. | Max. | Unit  | Conditions                   |
|---------------------------------------------------|--------|------|------|------|-------|------------------------------|
| CLKIN frequency                                   | Fclk   | 6.1  | 6.4  | 8.0  | MHz   | VDD = 3.0 ~3.6V              |
| CLKIN cycle time                                  | Tclk   | 125  | 156  | 164  | ns    |                              |
| CLKIN pulse duty                                  | Tcwh   | 40   | 50   | 60   | %     | Tclk                         |
| Time that HSD to 1 <sup>st</sup> data input(NTSC) | Ths    | 40   | 70   | 255  | CLKIN | DDL = 70, Offset = 0 (fixed) |

## Clock and Data Input Timing Diagram



## Input Data Timing (24 bit RGB mode for 960 x 240 @ SEL[3:0] = 1100b)



## Capacitive Touch Panel Registers

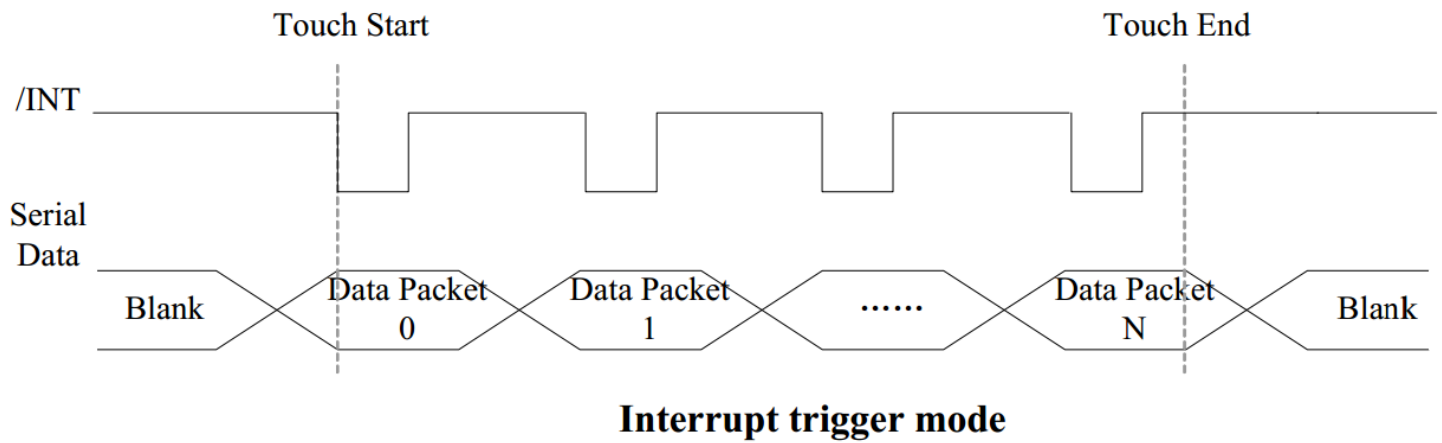
| Address | Name        | B7                                         | B6 | B5 | B4 | B3                                          | B2 | B1                             | B0 | Access |
|---------|-------------|--------------------------------------------|----|----|----|---------------------------------------------|----|--------------------------------|----|--------|
| 00h     | DEVICE_MODE | <div>Device Mode [2..0]</div>              |    |    |    |                                             |    |                                |    | R/W    |
| 01h     | GEST_ID     | <div>Gesture ID [7..0]</div>               |    |    |    |                                             |    |                                |    | R      |
| 02h     | TD_STATUS   |                                            |    |    |    |                                             |    | <div>Touch Points [3..0]</div> |    | R      |
| 03h     | TOUCH1_XH   | <div>Event Flag</div>                      |    |    |    | <div>1st Touch X Position MSB [11..8]</div> |    |                                |    | R      |
| 04h     | TOUCH1_XL   | <div>1st Touch X Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 05h     | TOUCH1_YH   | <div>Touch ID [3..0]</div>                 |    |    |    | <div>1st Touch Y Position MSB [11..8]</div> |    |                                |    | R      |
| 06h     | TOUCH1_YL   | <div>1st Touch Y Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 07h     |             |                                            |    |    |    |                                             |    |                                |    | R      |
| 08h     |             |                                            |    |    |    |                                             |    |                                |    | R      |
| 09h     | TOUCH2_XH   | <div>Event Flag</div>                      |    |    |    | <div>2nd Touch X Position MSB [11..8]</div> |    |                                |    | R      |
| 0Ah     | TOUCH2_XL   | <div>2nd Touch X Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 0Bh     | TOUCH2_YH   | <div>Touch ID [3..0]</div>                 |    |    |    | <div>2nd Touch Y Position MSB [11..8]</div> |    |                                |    | R      |
| 0Ch     | TOUCH2_YL   | <div>2nd Touch Y Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 0Dh     |             |                                            |    |    |    |                                             |    |                                |    | R      |
| 0Eh     |             |                                            |    |    |    |                                             |    |                                |    | R      |
| 0Fh     | TOUCH3_XH   | <div>Event Flag</div>                      |    |    |    | <div>3rd Touch X Position MSB [11..8]</div> |    |                                |    | R      |
| 10h     | TOUCH3_XL   | <div>3rd Touch X Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 11h     | TOUCH3_YH   | <div>Touch ID [3..0]</div>                 |    |    |    | <div>3rd Touch Y Position MSB [11..8]</div> |    |                                |    | R      |
| 12h     | TOUCH3_YL   | <div>3rd Touch Y Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 13h     |             |                                            |    |    |    |                                             |    |                                |    | R      |
| 14h     |             |                                            |    |    |    |                                             |    |                                |    | R      |
| 15h     | TOUCH4_XH   | <div>Event Flag</div>                      |    |    |    | <div>4th Touch X Position MSB [11..8]</div> |    |                                |    | R      |
| 16h     | TOUCH4_XL   | <div>4th Touch X Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 17h     | TOUCH4_YH   | <div>Touch ID [3..0]</div>                 |    |    |    | <div>4th Touch Y Position MSB [11..8]</div> |    |                                |    | R      |
| 18h     | TOUCH4_YL   | <div>4th Touch Y Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 19h     |             |                                            |    |    |    |                                             |    |                                |    | R      |
| 1Ah     |             |                                            |    |    |    |                                             |    |                                |    | R      |
| 1Bh     | TOUCH5_XH   | <div>Event Flag</div>                      |    |    |    | <div>5th Touch X Position MSB [11..8]</div> |    |                                |    | R      |
| 1Ch     | TOUCH5_XL   | <div>5th Touch X Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 1Dh     | TOUCH5_YH   | <div>Touch ID [3..0]</div>                 |    |    |    | <div>5th Touch Y Position MSB [11..8]</div> |    |                                |    | R      |
| 1Eh     | TOUCH5_YL   | <div>5th Touch Y Position LSB [7..0]</div> |    |    |    |                                             |    |                                |    | R      |
| 1Fh     |             |                                            |    |    |    |                                             |    |                                |    | R      |

| Address | Name                    | B7                                                              | B6 | B5 | B4 | B3                        | B2 | B1 | B0 | Access |
|---------|-------------------------|-----------------------------------------------------------------|----|----|----|---------------------------|----|----|----|--------|
| 80h     | ID_G_THGROUP            | valid touching detect threshold                                 |    |    |    |                           |    |    |    | R/W    |
| 81h     | ID_G_THPEAK             | valid touching peak detect threshold                            |    |    |    |                           |    |    |    | R/W    |
| 82h     | ID_G_THCAL              | the threshold when calculating the focus of touching            |    |    |    |                           |    |    |    | R/W    |
| 83h     | ID_G_THWATER            | the threshold when there is surface water                       |    |    |    |                           |    |    |    | R/W    |
| 84h     | ID_G_TEMP               | the threshold of temperature compensation                       |    |    |    |                           |    |    |    | R/W    |
| 85h     | ID_G_THDIFF             | the threshold whether the coordinate is different from original |    |    |    |                           |    |    |    | R/W    |
| 86h     | ID_G_CTRL               |                                                                 |    |    |    | Power Control Mode [1..0] |    |    |    | R/W    |
| 87h     | ID_G_TIME_ENTER_MONITOR | the timer for entering monitor status                           |    |    |    |                           |    |    |    | R/W    |
| 88h     | ID_G_PERIODACTIVE       |                                                                 |    |    |    | Period Active [3..0]      |    |    |    | R/W    |
| 89h     | ID_G_PERIODMONITOR      | the timer of entering idle when in monitor status               |    |    |    |                           |    |    |    | R/W    |
| A0h     | ID_G_AUTO_CLB_MODE      | auto calibration mode                                           |    |    |    |                           |    |    |    | R/W    |
| A1h     | ID_G_LIB_VERSION_H      | Firmware Library Version H byte                                 |    |    |    |                           |    |    |    | R      |
| A2h     | ID_G_LIB_VERSION_L      | Firmware Library Version L byte                                 |    |    |    |                           |    |    |    | R      |
| A3h     | ID_G_CIPHER             | Chip vendor ID                                                  |    |    |    |                           |    |    |    | R      |
| A4h     | ID_G_MODE               | the interrupt status to host                                    |    |    |    |                           |    |    |    | R      |
| A5h     | ID_G_PMODE              | Power Consume Mode                                              |    |    |    |                           |    |    |    |        |
| A6h     | ID_G_FIRMID             | Firmware ID                                                     |    |    |    |                           |    |    |    | R      |
| A7h     | ID_G_STATE              | Running State                                                   |    |    |    |                           |    |    |    |        |
| A8h     | ID_G_FT5201ID           | CTPM Vendor ID                                                  |    |    |    |                           |    |    |    | R      |
| A9h     | ID_G_ERR                | Error Code                                                      |    |    |    |                           |    |    |    | R      |
| AAh     | ID_G_CLB                | Configure TP module during calibration in Test Mode             |    |    |    |                           |    |    |    | R/W    |
| FEh     | LOG_MSG_CNT             | The log MSG count                                               |    |    |    |                           |    |    |    | R      |
| FFh     | LOG_CUR_CHA             | Current character of log message                                |    |    |    |                           |    |    |    | R      |

NOTE: Registers 80h – AFh have been configured for optimum settings and do not need to be modified.

| Register No | Register Name      | Bits  | Value     | Description                          |
|-------------|--------------------|-------|-----------|--------------------------------------|
| 00h         | Device Mode        | [2:0] | 000b      | Normal Operating Mode                |
|             |                    |       | 100b      | Test Mode - read raw data (reserved) |
|             |                    |       | 001b      | System Information Mode (reserved)   |
| 01h         | Gesture ID         | [7:0] | 48h       | Zoom In                              |
|             |                    |       | 49h       | Zoom Out                             |
|             |                    |       | 00h       | No Gesture                           |
| 02h         | Touch Points       | [3:0] | 000b      | 0 touch points detected              |
|             |                    |       | 001b      | 1 touch point detected               |
|             |                    |       | 010b      | 2 touch points detected              |
|             |                    |       | 011b      | 3 touch points detected              |
|             |                    |       | 100b      | 4 touch points detected              |
|             |                    |       | 101b      | 5 touch points detected              |
| 03h         | Touch 1 Event Flag | [7:6] | 00b       | Put Down                             |
|             |                    |       | 01b       | Put Up                               |
|             |                    |       | 10b       | Contact                              |
|             |                    |       | 11b       | Reserved                             |
| 03h         | TOUCH1_XH          | [3:0] | 0h - 1h   | Upper 4 bits of X touch coordinate   |
| 04h         | TOUCH1_XL          | [7:0] | 00h - FFh | Lower 8 bits of X touch coordinate   |
| 05h         | TOUCH1_YH          | [3:0] | 0h - 1h   | Upper 4 bits of Y touch coordinate   |
| 06h         | TOUCH1_YL          | [7:0] | 00h - FFh | Lower 8 bits of Y touch coordinate   |
| 09h         | Touch 2 Event Flag | [7:6] | 00b       | Put Down                             |
|             |                    |       | 01b       | Put Up                               |
|             |                    |       | 10b       | Contact                              |
|             |                    |       | 11b       | Reserved                             |
| 09h         | TOUCH2_XH          | [3:0] | 0h - 1h   | Upper 4 bits of X touch coordinate   |
| 0Ah         | TOUCH2_XL          | [7:0] | 00h - FFh | Lower 8 bits of X touch coordinate   |
| 08h         | TOUCH2_YH          | [3:0] | 0h - 1h   | Upper 4 bits of Y touch coordinate   |
| 0Ch         | TOUCH2_YL          | [7:0] | 00h - FFh | Lower 8 bits of Y touch coordinate   |
| 0Fh         | Touch 3 Event Flag | [7:6] | 00b       | Put Down                             |
|             |                    |       | 01b       | Put Up                               |
|             |                    |       | 10b       | Contact                              |
|             |                    |       | 11b       | Reserved                             |
| 0Fh         | TOUCH3_XH          | [3:0] | 0h - 1h   | Upper 4 bits of X touch coordinate   |
| 10h         | TOUCH3_XL          | [7:0] | 00h - FFh | Lower 8 bits of X touch coordinate   |
| 11h         | TOUCH3_YH          | [3:0] | 0h - 1h   | Upper 4 bits of Y touch coordinate   |
| 12h         | TOUCH3_YL          | [7:0] | 00h - FFh | Lower 8 bits of Y touch coordinate   |
| 15h         | Touch 4 Event Flag | [7:6] | 00b       | Put Down                             |
|             |                    |       | 01b       | Put Up                               |
|             |                    |       | 10b       | Contact                              |
|             |                    |       | 11b       | Reserved                             |
| 15h         | TOUCH4_XH          | [3:0] | 0h - 1h   | Upper 4 bits of X touch coordinate   |
| 16h         | TOUCH4_XL          | [7:0] | 00h - FFh | Lower 8 bits of X touch coordinate   |
| 17h         | TOUCH4_YH          | [3:0] | 0h - 1h   | Upper 4 bits of Y touch coordinate   |
| 18h         | TOUCH4_YL          | [7:0] | 00h - FFh | Lower 8 bits of Y touch coordinate   |

| Register No | Register Name           | Bits  | Value                           | Description                                                                                                                                        |
|-------------|-------------------------|-------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 18h         | Touch 5 Event Flag      | [7:6] | 00b<br>01b<br>10b<br>11b        | Put Down<br>Put Up<br>Contact<br>Reserved                                                                                                          |
| 18h         | TOUCH5_XH               | [3:0] | 0h - 1h                         | Upper 4 bits of X touch coordinate                                                                                                                 |
| 1Ch         | TOUCH5_XL               | [7:0] | 00h - FFh                       | Lower 8 bits of X touch coordinate                                                                                                                 |
| 1Dh         | TOUCH5_YH               | [3:0] | 0h - 1h                         | Upper 4 bits of Y touch coordinate                                                                                                                 |
| 1Eh         | TOUCH5_YL               | [7:0] | 00h - FFh                       | Lower 8 bits of Y touch coordinate                                                                                                                 |
| 80h         | ID_G_THGROUP            | [7:0] | 00h - FFh                       | Valid touching detect threshold<br>Actual value will be 4 times register's value<br>Recommended: 46h                                               |
| 81h         | ID_G_THPEAK             | [7:0] | 00h - FFh                       | valid touching peak detect threshold<br>Recommended: 3Ch                                                                                           |
| 82h         | ID_G_THCAL              | [7:0] | 00h - FFh                       | Touch focus threshold<br>Recommended: 1Dh                                                                                                          |
| 83h         | ID_G_THWATER            | [7:0] | 00h - FFh                       | threshold when there is surface water<br>Recommended: D3h                                                                                          |
| 84h         | ID_G_THTEMP             | [7:0] | 00h - FFh                       | threshold of temperature compensation<br>Recommended: EBh                                                                                          |
| 85h         | ID_G_THDIFF             | [7:0] | 00h - FFh                       | Touch difference threshold<br>Actual value is 32 times the register's value<br>Recommended: A0h                                                    |
| 86h         | ID_G_CTRL               | [1:0] | 00h<br>01h                      | Power Control Mode: Not Auto Jump<br>Power Control Mode: Auto Jump                                                                                 |
| 87h         | ID_G_TIME_ENTER_MONITOR | [7:0] | 00h-FFh                         | Delay to enter 'Monitor' status (s)<br>Recommended: C8h                                                                                            |
| 88h         | ID_G_PERIODACTIVE       | [3:0] | 3h-Eh                           | Period of 'Active' status (ms)<br>Recommended: 6h                                                                                                  |
| 89h         | ID_G_PERIODMONITOR      | [7:0] | 1Eh-FFh                         | Timer to enter 'idle' when in 'Monitor' (ms)<br>Recommended: 28h                                                                                   |
| A0h         | ID_G_AUTO_CLB_MODE      | [7:0] | 00h<br>FFh                      | Auto calibration mode: Enable auto calibration<br>Auto calibration mode: Disable auto calibration                                                  |
| A1h         | ID_G_LIB_VERSION_H      | [7:0] | 30h                             | Firmware Library Version H byte                                                                                                                    |
| A2h         | ID_G_LIB_VERSION_L      | [7:0] | 01h                             | Firmware Library Version L byte                                                                                                                    |
| A3h         | ID_G_CIPHER             | [7:0] | 55h                             | Chip vendor ID                                                                                                                                     |
| A4h         | ID_G_MODE               | [0:0] | 00h<br>01h                      | Interrupt status: Enable interrupt to host<br>Interrupt status: Disable interrupt to host                                                          |
| A5h         | ID_G_PMODE              | [1:0] | 00h<br>01h<br>03h               | 'Active' Mode<br>'Monitor' Mode<br>'Hibernate' Mode                                                                                                |
| A6h         | ID_G_FIRMID             | [7:0] | 05h                             | Firmware ID                                                                                                                                        |
| A7h         | ID_G_STATE              | [7:0] | 00h<br>01h<br>02h<br>03h<br>04h | Running State: Configure<br>Running State: Work<br>Running State: Calibration<br>Running State: Factory<br>Running State: Auto-calibration         |
| A8h         | ID_G_FT5201ID           | [7:0] | 79h                             | CTPM Vendor's Chip ID                                                                                                                              |
| A9h         | ID_G_ERR                | [7:0] | 00h<br>03h<br>05h<br>1Ah        | Error Code: OK<br>Error Code: Chip register writing inconsistent with reading<br>Error Code: Chip start fail<br>Error Code: Calibration match fail |



### Sample code to read touch data:

```
i2c_start();
i2c_tx(0x70);           //Slave Address (Write)
i2c_tx(0x00);           //Start reading address
i2c_stop();

i2c_start();
i2c_tx(0x71);           //Slave Address (Read)
for(i=0x00;i<0x1F;i++)
{touchdata_buffer[i] = i2c_rx(1);}
i2c_stop();
```

### Sample code to overwrite default register values:

```
i2c_start();
i2c_tx(0x70);           //Slave Address (Write)
i2c_tx(0xA4);           //ID_G_Mode
i2c_tx(0x01);           //Disable interrupt status to host
i2c_stop();
```

## 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<br>100 cycles                      |      |
| Vibration test                        | Endurance test applying vibration to simulate transportation and use.                                                           | 10-55Hz , 15mm amplitude.<br>60 sec in each of 3 directions X,Y,Z<br>For 15 minutes | 3    |
| Static electricity test               | Endurance test applying electric static discharge.                                                                              | VS=4KV, RS=330kΩ, CS=150pF<br>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](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

[http://www.newhavendisplay.com/index.php?main\\_page=terms](http://www.newhavendisplay.com/index.php?main_page=terms)