

# NHD-4.3-480800EF-CTXP#-T

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

|         |                                  |
|---------|----------------------------------|
| NHD-    | Newhaven Display                 |
| 4.3-    | 4.3" Diagonal                    |
| 480800- | 480 x 800 Pixels (Portrait Mode) |
| EF-     | Model                            |
| C-      | Built-in Controller              |
| T-      | White LED Backlight              |
| X-      | TFT                              |
| P-      | IPS Type, Wide Temperature       |
| #-      | <b>RoHS Compliant</b>            |
| T-      | 4-wire Resistive Touch Panel     |

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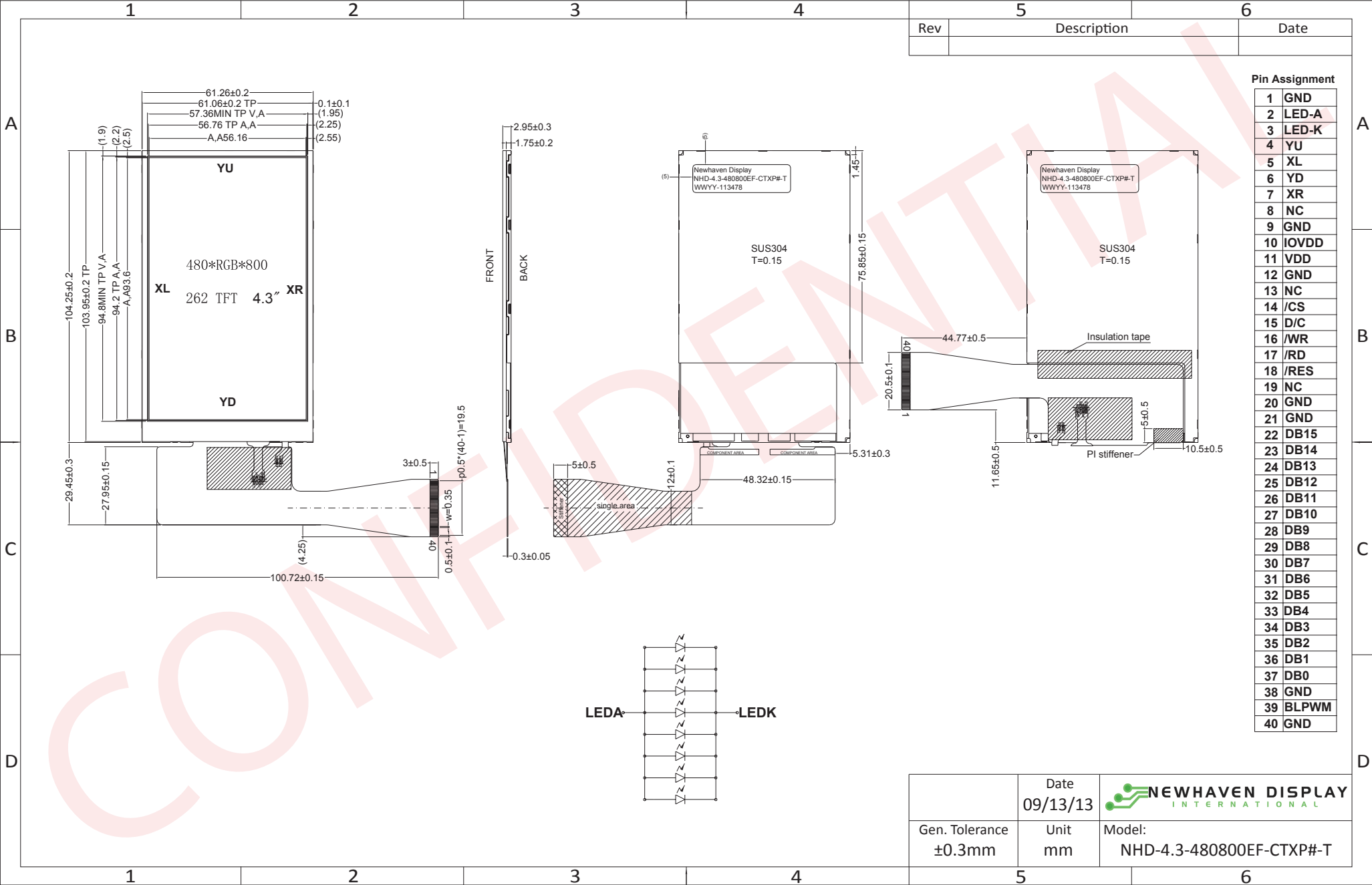
## Document Revision History

| Revision | Date      | Description     | Changed by |
|----------|-----------|-----------------|------------|
| 0        | 11/5/2013 | Initial Release | ML         |

## Functions and Features

- 480 x 800 resolution, up to 16.7M colors
- 8-LED backlight
- 16-bit 8080 mode parallel MPU interface
- 4-wire Resistive touch panel
- Extra wide viewing angles

Mechanical Drawing



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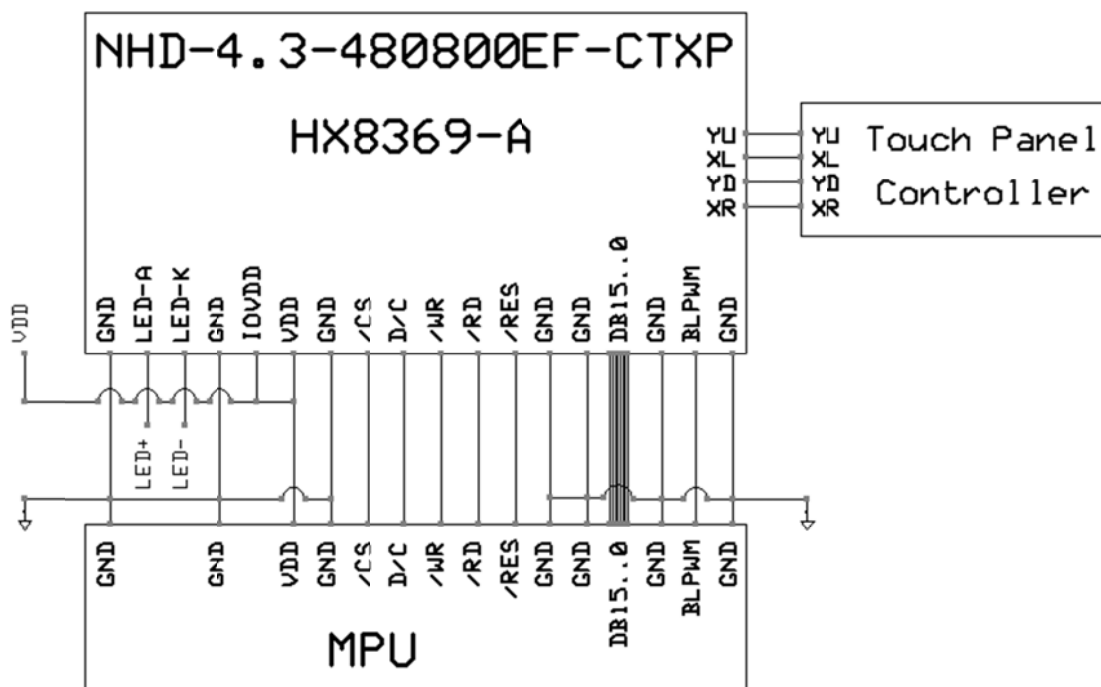
## Pin Description and Wiring Diagram

| Pin No. | Symbol     | External Connection | Function Description                                 |
|---------|------------|---------------------|------------------------------------------------------|
| 1       | GND        | Power Supply        | Ground                                               |
| 2       | LED-A      | Power Supply        | Backlight Power Supply (120mA @ 3.2V)                |
| 3       | LED-K      | Power Supply        | Ground for Backlight                                 |
| 4       | YU         | Touch Controller    | Touch Panel Up                                       |
| 5       | XL         | Touch Controller    | Touch Panel Left                                     |
| 6       | YD         | Touch Controller    | Touch Panel Down                                     |
| 7       | XR         | Touch Controller    | Touch Panel Right                                    |
| 8       | NC         | -                   | No Connect                                           |
| 9       | GND        | Power Supply        | Ground                                               |
| 10      | IOVDD      | Power Supply        | Power Supply for Logic (2.8V) – Can be tied to VDD   |
| 11      | VDD        | Power Supply        | Power Supply for LCD (2.8V)                          |
| 12      | GND        | Power Supply        | Ground                                               |
| 13      | NC         | -                   | No Connect                                           |
| 14      | /CS        | MPU                 | Active LOW Chip Select signal                        |
| 15      | D/C        | MPU                 | Data / Command selection: '1' = Data ; '0' = Command |
| 16      | /WR        | MPU                 | Active LOW Write signal                              |
| 17      | /RD        | MPU                 | Active LOW Read signal                               |
| 18      | /RES       | MPU                 | Active LOW Reset signal                              |
| 19      | NC         | -                   | No Connect                                           |
| 20-21   | GND        | Power Supply        | Ground                                               |
| 22-37   | [DB15-DB0] | MPU                 | 16-bit bi-directional data bus                       |
| 38      | GND        | Power Supply        | Ground                                               |
| 39      | BLPWM      | MPU                 | PWM Input for Backlight                              |
| 40      | GND        | Power Supply        | Ground                                               |

**Recommended LCD connector:** 0.5mm pitch 40-Conductor FFC. Molex p/n: 54132-4062

**Backlight connector:** on LCD connector

**Mates with:** ---



## Electrical Characteristics

| 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 for Logic    | IOVDD  |              | 1.65      | 2.8  | 3.3       | V    |
| Supply Voltage for LCD      | VDD    |              | 2.3       | 2.8  | 3.3       | V    |
| Supply Current              | IDD    |              | -         | 30   | -         | mA   |
| "H" Level input             | Vih    |              | 0.7*IOVDD | -    | IOVDD     | V    |
| "L" Level input             | Vil    |              | 0         | -    | 0.3*IOVDD | V    |
| "H" Level output            | Voh    |              | 0.8*IOVDD | -    | IOVDD     | V    |
| "L" Level output            | Vol    |              | 0         | -    | 0.2*IOVDD | V    |
|                             |        |              |           |      |           |      |
| Backlight Supply Voltage    | VLED   |              | -         | 3.2  | -         | V    |
| Backlight Supply Current    | ILED   | VLED=3.2     | -         | 120  | -         | mA   |

## Optical Characteristics

| Item                   | Symbol | Condition  | Min. | Typ. | Max. | Unit              |
|------------------------|--------|------------|------|------|------|-------------------|
| Viewing Angle – Top    |        | Cr ≥10     | 70   | 80   | -    | °                 |
| Viewing Angle – Bottom |        |            | 70   | 80   | -    | °                 |
| Viewing Angle – Left   |        |            | 70   | 80   | -    | °                 |
| Viewing Angle – Right  |        |            | 70   | 80   | -    | °                 |
| Contrast Ratio         | Cr     |            | 640  | 800  | -    |                   |
| Luminance              | YL     | ILED=120mA | 170  | 220  | -    | cd/m <sup>2</sup> |
| Response Time          | Tr+Tf  |            | -    | 35   | 70   | ms                |

## Touch Panel Characteristics

| Item                        | Min.      | Typ. | Max. | Unit       |
|-----------------------------|-----------|------|------|------------|
| Linearity                   | -1.5      | -    | 1.5  | %          |
| Circuit Resistance – X-Axis | 100       | -    | 450  | Ω          |
| Circuit Resistance – Y-Axis | 350       | -    | 1050 | Ω          |
| Insulation Resistance       | 20        | -    | -    | MΩ         |
| Operating Voltage           | -         | -    | 10   | V          |
| Chattering                  | -         | -    | 10   | ms         |
| Activation Force            | 20        | -    | 100  | g          |
| Pen Writing Durability      | 100,000   | -    | -    | Characters |
| Pitting Durability          | 1,000,000 | -    | -    | Touches    |
| Surface Hardness            | 3         | -    | -    | H          |

## Controller Information

Built-in Himax HX8369-A

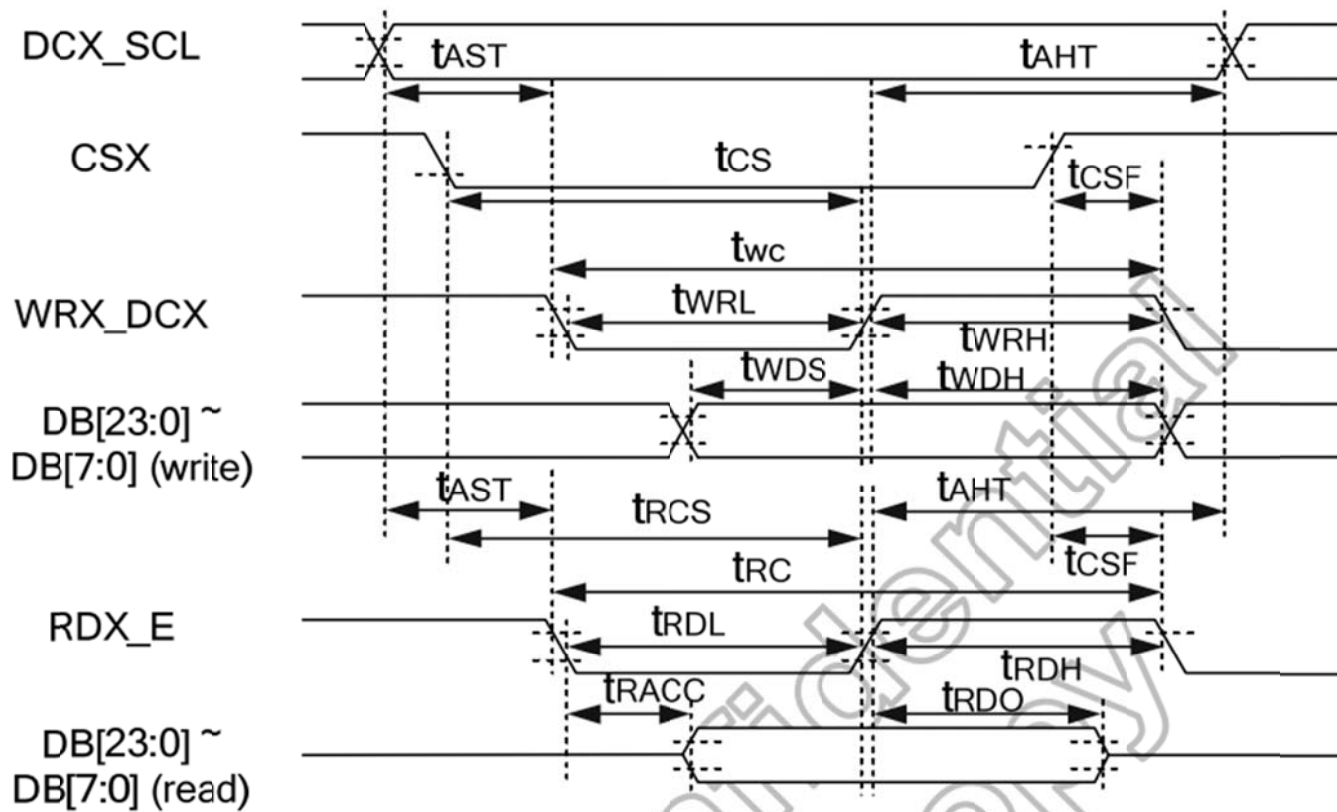
Please download specification at [http://www.newhavendisplay.com/app\\_notes/HX8369.pdf](http://www.newhavendisplay.com/app_notes/HX8369.pdf)

## Table of Commands

Please download specification at [http://www.newhavendisplay.com/app\\_notes/HX8369.pdf](http://www.newhavendisplay.com/app_notes/HX8369.pdf)

## Timing Characteristics

### 16-bit 8080 Mode Parallel MPU Interface

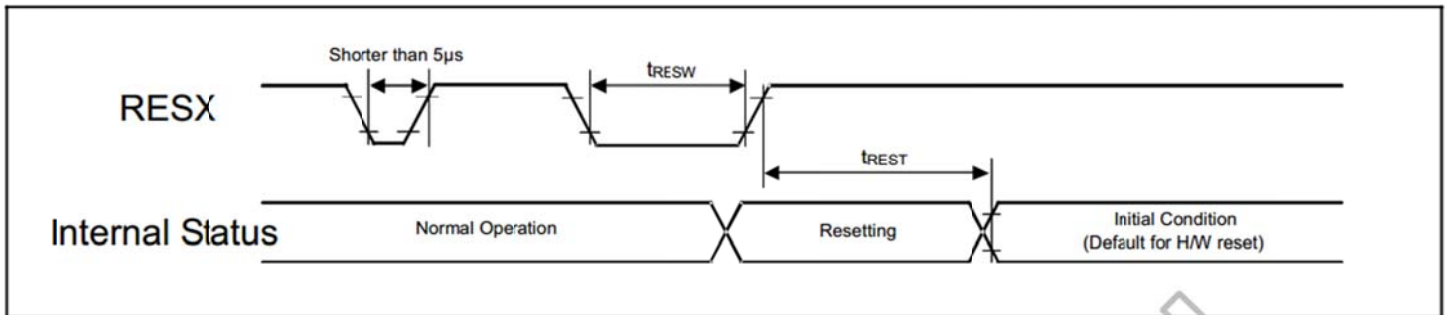


| Signal   | Symbol      | Parameter                          | Min. | Max. | Unit | Description            |
|----------|-------------|------------------------------------|------|------|------|------------------------|
| DCX_SCL  | $t_{AST}$   | Address setup time                 | 10   | -    | ns   | -                      |
|          | $t_{AHT}$   | Address hold time (Write/Read)     | 10   | -    | ns   | -                      |
| CSX      | $t_{cs}$    | Chip select setup time (Write)     | 20   | -    | ns   | -                      |
|          | $t_{rcs}$   | Chip select setup time (Read ID)   | 45   | -    | ns   | -                      |
|          | $t_{rcsfm}$ | Chip Select setup time (Read FM)   | 355  | -    | ns   | -                      |
|          | $t_{csf}$   | Chip select wait time (Write/Read) | 20   | -    | ns   | -                      |
| WRX_DCX  | $t_{wc}$    | Write cycle (write register)       | 100  | 790  | ns   | -                      |
|          | $t_{wc}$    | Write cycle (write GRAM@SLPOUT)    | 33   | 790  | ns   | -                      |
|          | $t_{wc}$    | Write cycle (write GRAM@SLPIN)     | 100  | 790  | ns   | -                      |
|          | $t_{wrh}$   | Control pulse "H" duration         | 15   | 630  | ns   | -                      |
|          | $t_{wrl}$   | Control pulse "L" duration         | 15   | 160  | ns   | -                      |
| RDX_E    | $t_{rc}$    | Read cycle (read register)         | 100  | 790  | ns   | -                      |
|          | $t_{rc}$    | Read cycle (GRAM)                  | 350  | 790  | ns   | -                      |
|          | $t_{rdh}$   | Control pulse "H" duration         | 30   | 630  | ns   | -                      |
|          | $t_{rdl}$   | Control pulse "L" duration         | 20   | 160  | ns   | -                      |
| DB23-DB0 | $t_{wds}$   | Data setup time                    | 15   | -    | ns   | For maximum $C_L=30pF$ |
|          | $t_{wdh}$   | Data hold time                     | 25   | -    | ns   | For minimum $C_L=8pF$  |
|          | $t_{racc}$  | Read access time                   | 10   | -    | ns   |                        |
|          | $t_{rdo}$   | Output disable time                | 10   | -    | ns   |                        |

**Note:** The input signal rise time and fall time ( $t_r$ ,  $t_f$ ) is specified at 15 ns or less.

Logic high and low levels are specified as 30% and 70% of VDD1 for Input signals.

## Reset Input Timing

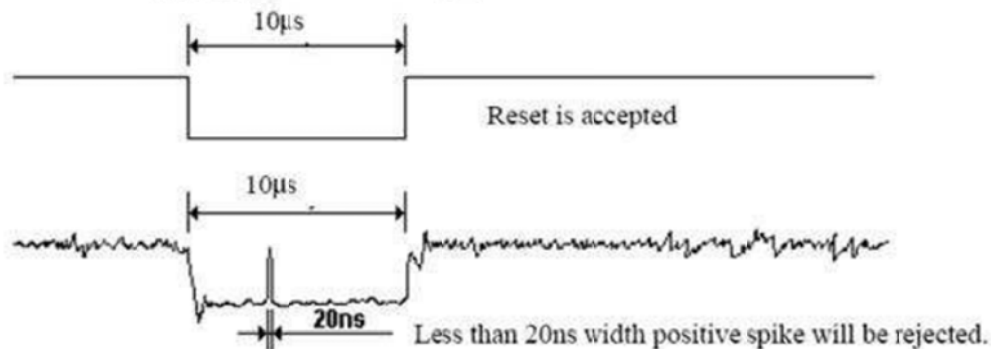


| Symbol     | Parameter                            | Related pins | Min. | Typ. | Max. | Note                                        | Unit |
|------------|--------------------------------------|--------------|------|------|------|---------------------------------------------|------|
| $t_{RESW}$ | Reset low pulse width <sup>(1)</sup> | RESX         | 10   | -    | -    | -                                           | µs   |
| $t_{REST}$ | Reset complete time <sup>(2)</sup>   | -            | 5    | -    | -    | When reset is applied during Sleep In mode  | ms   |
|            |                                      | -            | 120  | -    | -    | When reset is applied during Sleep Out mode | ms   |

**Note:** (1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

| RESX Pulse             | Action         |
|------------------------|----------------|
| Shorter than 5 µ       | Reset Rejected |
| Longer than 10 µs      | Reset          |
| Between 5 µs and 10 µs | Reset Start    |

- (2) During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then returns to Default condition for H/W reset.
- (3) During Reset Complete Time, ID2 value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time ( $t_{REST}$ ) within 5ms after a rising edge of RESX.
- (4) Spike Rejection also applies during a valid reset pulse as shown below:



- (5) When Reset is applied during Sleep In Mode.
- (6) When Reset is applied during Sleep Out Mode.
- (7) It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

## Example Initialization Program

```
void TFT_43E_Init(void)
{
    GPIO_ResetBits(GPIOC, CS1);
    GPIO_SetBits(GPIOC, nRD);
    GPIO_ResetBits(GPIOC, nWR);
    GPIO_WriteBit(GPIOC, RES, Bit_RESET);
    delay(5);
    TFT_delay(100);
    GPIO_WriteBit(GPIOC, RES, Bit_SET);
    delay(100);
    TFT_delay(1000);
    TFT_43E_Write_Command(0XB9);//SETEXTC
    TFT_43E_Write_Data(0xFF);
    TFT_43E_Write_Data(0x83);
    TFT_43E_Write_Data(0x69);
    TFT_43E_Write_Command(0XB1);//SETPOWER
    TFT_43E_Write_Data(0x01);
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0x34);
    TFT_43E_Write_Data(0x06);
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0x0F);
    TFT_43E_Write_Data(0x0F);
    TFT_43E_Write_Data(0x2A);
    TFT_43E_Write_Data(0x32);
    TFT_43E_Write_Data(0x3F);
    TFT_43E_Write_Data(0x3F);
    TFT_43E_Write_Data(0x07);
    TFT_43E_Write_Data(0x23);
    TFT_43E_Write_Data(0x01);
    TFT_43E_Write_Data(0xE6);
    TFT_43E_Write_Data(0xE6);
    TFT_43E_Write_Data(0xE6);
    TFT_43E_Write_Data(0xE6);
    TFT_43E_Write_Data(0xE6);
    TFT_43E_Write_Command(0XB2);//SETDISP
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0x20);
    TFT_43E_Write_Data(0x0A);
    TFT_43E_Write_Data(0x0A);
    TFT_43E_Write_Data(0x70);
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0xFF);
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0x03);
    TFT_43E_Write_Data(0x03);
    TFT_43E_Write_Data(0x00);
    TFT_43E_Write_Data(0x01);
    TFT_43E_Write_Command(0XB4);//SETCYC
    TFT_43E_Write_Data(0x00);
```



```

TFT_43E_Write_Data(0x18);
TFT_43E_Write_Data(0x80);
TFT_43E_Write_Data(0x10);
TFT_43E_Write_Data(0x01);
TFT_43E_Write_Command(0xB6);//SETVCOM
TFT_43E_Write_Data(0x2C);
TFT_43E_Write_Data(0x2C);
TFT_43E_Write_Command(0xD5);//SETGIP
TFT_43E_Write_Data(0x00);
TFT_43E_Write_Data(0x05);
TFT_43E_Write_Data(0x03);
TFT_43E_Write_Data(0x00);
TFT_43E_Write_Data(0x01);
TFT_43E_Write_Data(0x09);
TFT_43E_Write_Data(0x10);
TFT_43E_Write_Data(0x80);
TFT_43E_Write_Data(0x37);
TFT_43E_Write_Data(0x37);
TFT_43E_Write_Data(0x20);
TFT_43E_Write_Data(0x31);
TFT_43E_Write_Data(0x46);
TFT_43E_Write_Data(0x8A);
TFT_43E_Write_Data(0x57);
TFT_43E_Write_Data(0x9B);
TFT_43E_Write_Data(0x20);
TFT_43E_Write_Data(0x31);
TFT_43E_Write_Data(0x46);
TFT_43E_Write_Data(0x8A);
TFT_43E_Write_Data(0x57);
TFT_43E_Write_Data(0x9B);
TFT_43E_Write_Data(0x07);
TFT_43E_Write_Data(0x0F);
TFT_43E_Write_Data(0x02);
TFT_43E_Write_Data(0x00);
TFT_43E_Write_Command(0x3A);//COLMOD
TFT_43E_Write_Data(0x77);
TFT_43E_Write_Command(0x36);//MADCTL
TFT_43E_Write_Data(0x80);
TFT_43E_Write_Command(0x11);//SLPOUT
TFT_delay(1000);
TFT_43E_Write_Command(0x29);//DISPON
}
void TFT_43E_Write_Command(unsigned char command)
{
    GPIO_Write(GPIOB, command);
    GPIO_ResetBits(GPIOC, RS);
    GPIO_ResetBits(GPIOC, nWR);
    GPIO_SetBits(GPIOC, nWR);
}
void TFT_43E_Write_Data(unsigned char data1)
{
    GPIO_SetBits(GPIOC, RS);
    GPIO_Write(GPIOB, data1);
    GPIO_ResetBits(GPIOC, nWR);
    GPIO_SetBits(GPIOC, nWR);
}

```

## Quality Information

| Test Item                             | Content of Test                                                                                                                 | Test Condition                                                      | Note |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------|
| High Temperature storage              | Endurance test applying the high storage temperature for a long time.                                                           | +80°C , 96hrs                                                       | 2    |
| Low Temperature storage               | Endurance test applying the low storage temperature for a long time.                                                            | -30°C , 96hrs                                                       | 1,2  |
| High Temperature Operation            | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.                    | +70°C, 96hrs                                                        | 2    |
| Low Temperature Operation             | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.                     | -20°C , 96hrs                                                       | 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. | +50°C , 90% RH , 96hrs                                              | 1,2  |
| Thermal Shock resistance              | Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.                  | -20°C, 30min -> 70°C, 30min<br>Change time: 5min<br>10 cycles       |      |
| Vibration test                        | Endurance test applying vibration to simulate transportation and use.                                                           | 10-55Hz , 1.5mm amplitude.<br>2hrs in each of 3 directions<br>X,Y,Z | 3    |
| Static electricity test               | Endurance test applying electric static discharge.                                                                              | VS=2000V, RS=330Ω, CS=150pF<br>5 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

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