

NHD-7.0-800480WF-CTXI#-T

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

| | |
|---------|-----------------------|
| NHD- | Newhaven Display |
| 7.0- | 7.0" Diagonal |
| 800480- | 800xRGBx480 pixels |
| WF- | Model |
| C- | Built-in Controller |
| T- | White LED backlight |
| X- | TFT |
| I- | 6:00 view, Wide Temp |
| #- | RoHS Compliant |
| T- | Touch Panel |

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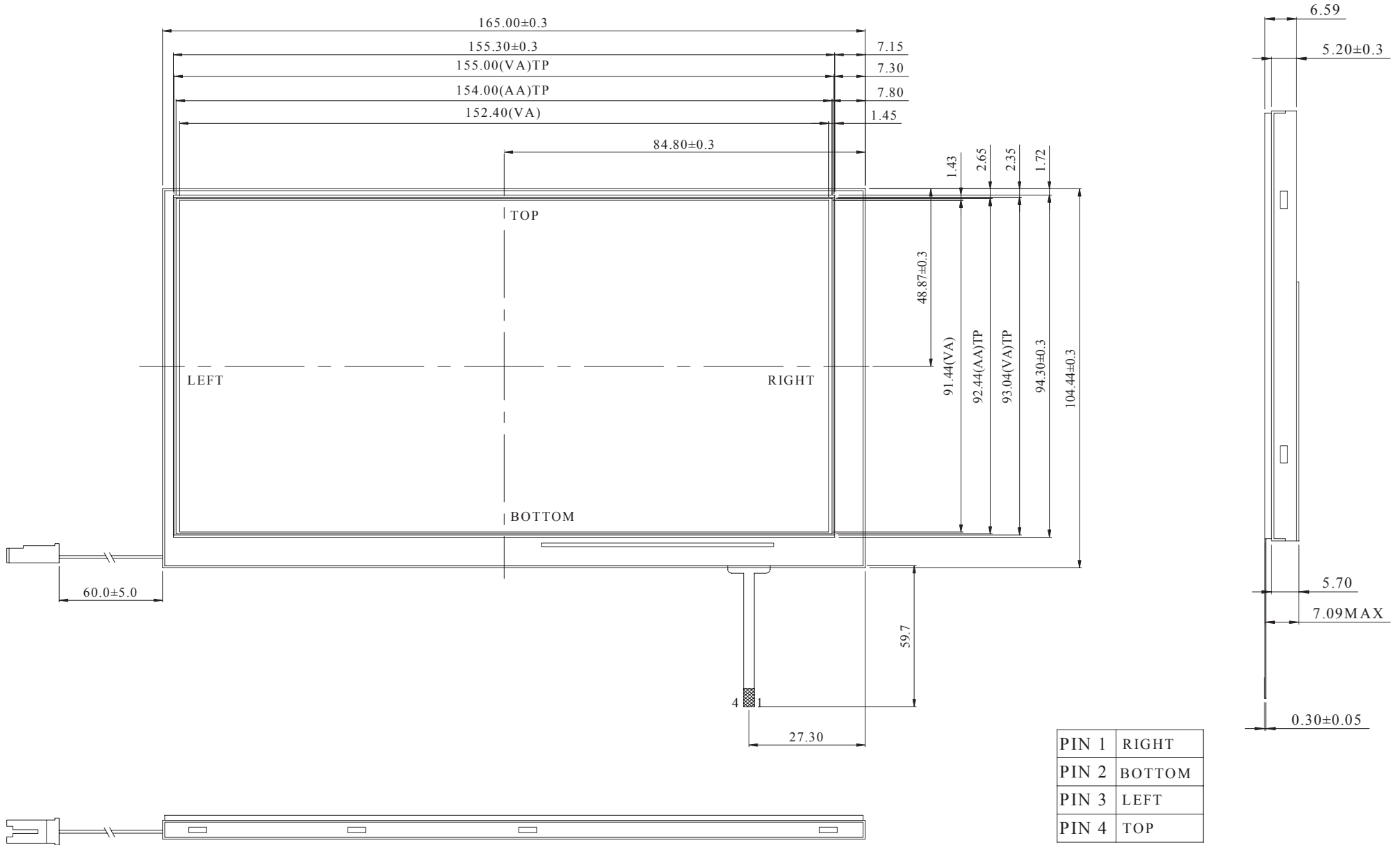
Document Revision History

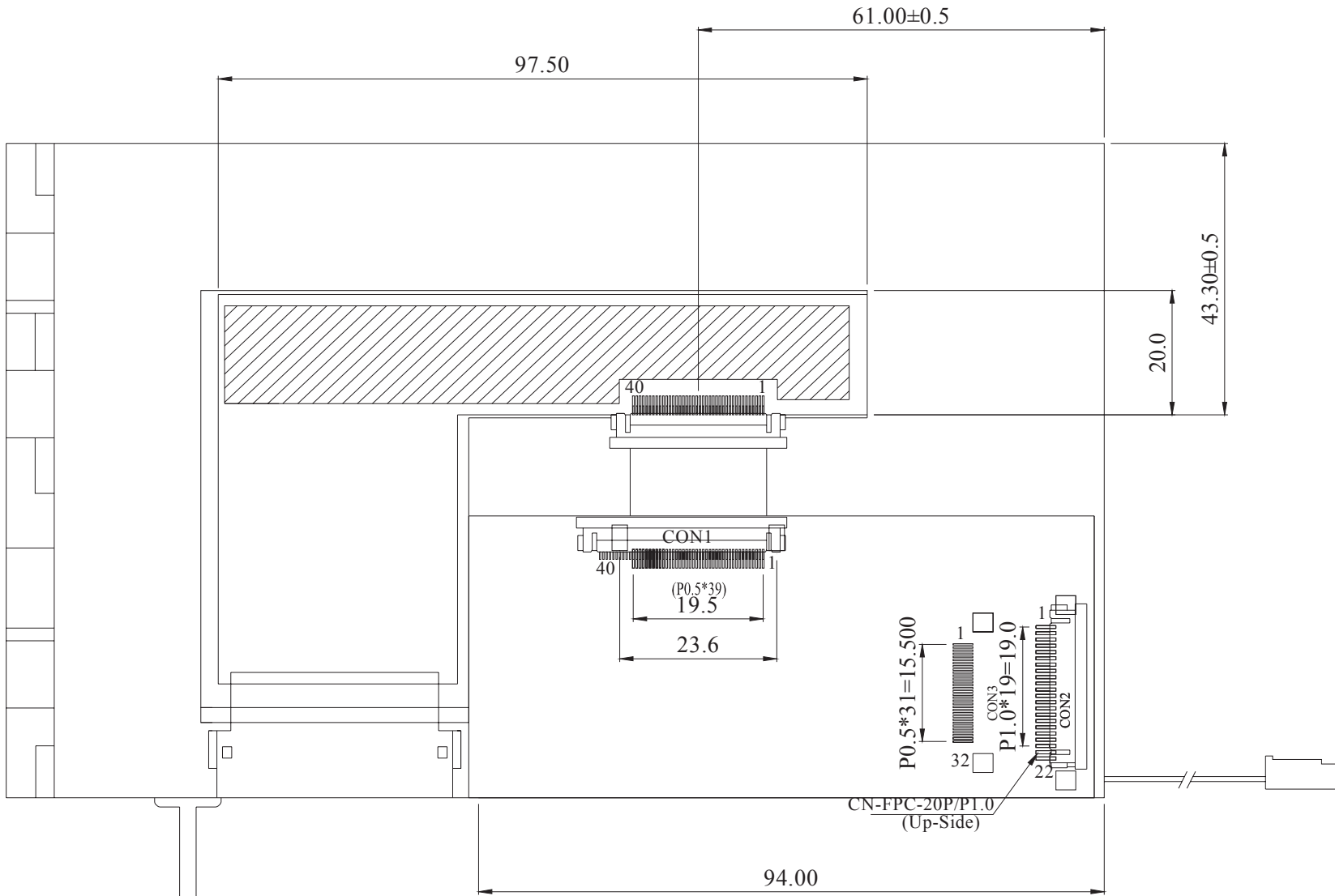
| Revision | Date | Description | Changed by |
|----------|-----------|--|------------|
| 0 | 8/31/2010 | Initial Release | MC |
| 1 | 10/5/2010 | Mechanical Drawing updated | BE |
| 2 | 2/8/2011 | Initialization code added | AK |
| 3 | 2/23/2011 | Grammar/symbols updated | BE |
| 4 | 10/7/2011 | Backlight and Touch Panel pin descriptions added | AK |
| 5 | 1/6/2012 | Pixel data format updated | AK |

Functions and Features

- 800xRGBx480 resolution
- LED backlight
- 8-bit digital RGB interface
- 262,144 colors
- SSD1963 8-bit controller

Mechanical Drawing





| PIN NO. | SYMBOL |
|---------|--------|
| 1 | GND |
| 2 | VDD |
| 3 | VO |
| 4 | A0 |
| 5 | R/W |
| 6 | E |
| 7 | DB0 |
| 8 | DB1 |
| 9 | DB2 |
| 10 | DB3 |
| 11 | DB4 |
| 12 | DB5 |
| 13 | DB6 |
| 14 | DB7 |
| 15 | CS |
| 16 | NC |
| 17 | NC |
| 18 | RST |
| 19 | NC |
| 20 | NC |

CON2 LCD Pin Description

| Pin No. | Symbol | Connection | Function Description |
|---------|---------|--------------|--|
| 1 | GND | Power Supply | Ground |
| 2 | VDD | Power Supply | Power supply for logic (+3.3V) |
| 3 | NC | - | No Connect |
| 4 | D/C# | MPU | Register Select signal: 1=Data, 0=Command |
| 5 | WR# | MPU | Active LOW Write signal (8080 mode) Read/Write signal (6800 mode) |
| 6 | RD# | MPU | Active LOW Read signal (8080 mode) Edge trigger Enable signal (6800 mode) |
| 7-14 | DB0~DB7 | MPU | 8-bit bi-directional data bus |
| 15 | CS# | MPU | Active LOW Chip Select signal |
| 16 | NC | - | No Connect |
| 17 | NC | - | No Connect |
| 18 | RST# | MPU | Active LOW Reset signal |
| 19 | NC | - | No Connect |
| 20 | NC | - | No Connect |

LCD connector: 1.0mm pitch,20-Conductor FFC, top contact

Recommended connection: 1.0mm pitch, 20-conductor FFC cable

CON1 TFT Pin-Out (before controller board):

| Pin No. | Symbol | Connection | Function Description |
|---------|--------|--------------|--------------------------------|
| 1 | GND | Power Supply | Power Ground |
| 2 | GND | Power Supply | Power Ground |
| 3 | NC | - | No connect |
| 4-7 | VDD | Power Supply | Power Supply (+3.3V) |
| 8 | NC | - | No connect |
| 9 | DE | MPU | Data Enable |
| 10-12 | GND | Power Supply | Power Ground |
| 13-15 | B5-B3 | MPU | Blue B5 (MSB) to B3 |
| 16 | GND | Power Supply | Power Ground |
| 17-19 | B2-B0 | MPU | Blue B2 – B0(LSB) |
| 20 | GND | Power Supply | Power Ground |
| 21-23 | G5-G3 | MPU | Green B5 (MSB) to B3 |
| 24 | GND | Power Supply | Power Ground |
| 25-27 | G2-G0 | MPU | Green B2 – B0(LSB) |
| 28 | GND | Power Supply | Power Ground |
| 29-31 | R5-R3 | MPU | Red B5 (MSB) to B3 |
| 32 | GND | Power Supply | Power Ground |
| 33-35 | R2-R0 | MPU | Red B2 – B0(LSB) |
| 36-37 | GND | Power Supply | Power Ground |
| 38 | DCLK | MPU | Clock (Falling edge triggered) |
| 39-40 | GND | Power Supply | Power Ground |

LCD connector: 0.5mm pitch,40-Conductor FFC, Bottom contact

Recommended connection: 0.5mm pitch, 40-conductor FFC cable

Backlight Pin-Out:

| Pin No. | Symbol | Connection | Function Description |
|---------|--------|--------------|----------------------|
| 1 | VDD | Power Supply | Power Supply (+9.9V) |
| 2 | GND | Power Supply | Power Ground |

Backlight connector: JST p/n: BHSR-02VS-1

Recommended mating connector: JST p/n: SM 02B-BHSS-1

Touch Panel Pin-Out:

| Pin No. | Symbol | Connection | Function Description |
|---------|--------|-------------|----------------------|
| 1 | X- | Touch Panel | Touch Panel – RIGHT |
| 2 | Y- | Touch Panel | Touch Panel – BOTTOM |
| 3 | X+ | Touch Panel | Touch Panel – LEFT |
| 4 | Y+ | Touch Panel | Touch Panel – TOP |

Touch Panel Characteristics

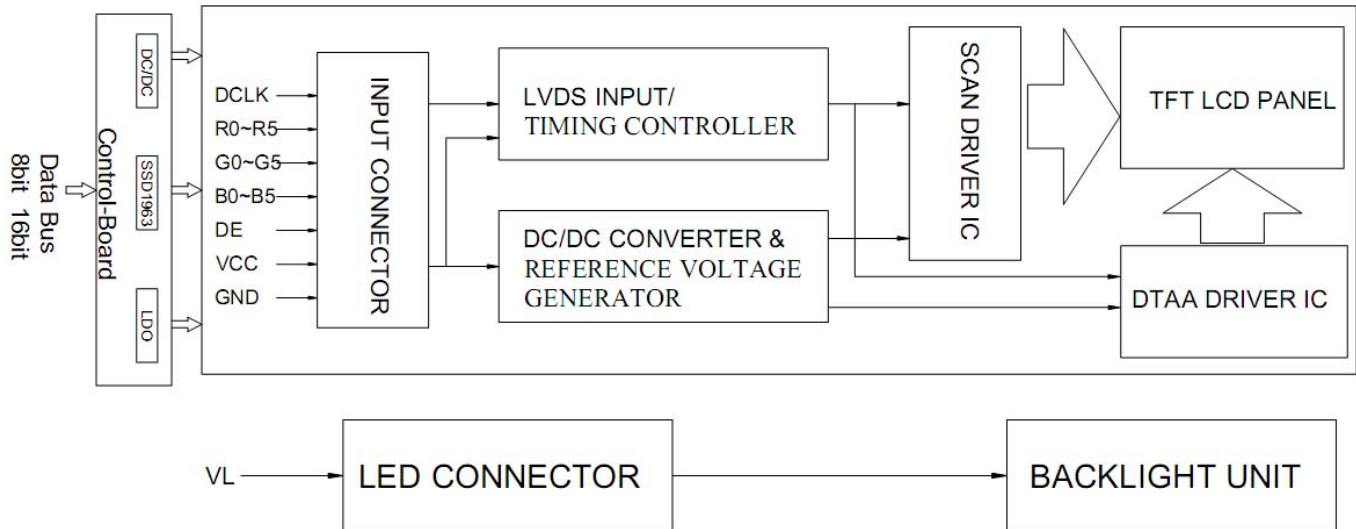
| Item | Min. | Typ. | Max. | Unit |
|-----------------------------|-----------|------|------|------------|
| Linearity | - | - | 1.5 | % |
| Circuit Resistance – X-Axis | 450 | 800 | 1300 | Ω |
| Circuit Resistance – Y-Axis | 100 | 350 | 800 | Ω |
| Insulation Resistance | 10 | - | - | M Ω |
| Operating Voltage | - | - | 5 | V |
| Chattering | - | - | 10 | ms |
| Transmittance | 82 | - | - | % |
| Activation Force | 50 | - | 200 | g |
| Pen Writing Durability | 100,000 | - | - | Characters |
| Pitting Durability | 1,000,000 | - | - | Touches |
| Surface Hardness | 3 | - | - | H |
| Haze | - | 7 | - | % |

Electrical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|--------|--------------------------------|--------|--------|----------|--------------------|
| Operating Temperature Range | Top | Absolute Max | -20 | - | +70 | $^{\circ}\text{C}$ |
| Storage Temperature Range | Tst | Absolute Max | -30 | - | +80 | $^{\circ}\text{C}$ |
| Supply Voltage | VDD | | 3.0 | 3.3 | 3.5 | V |
| Supply Current | IDD | VDD=3.3V 25 $^{\circ}\text{C}$ | - | 200 | 260 | mA |
| "H" Level input | Vih | | 0.8VDD | - | VDD+ 0.5 | V |
| "L" Level input | Vil | | - | - | 0.2VDD | V |
| Backlight Supply Voltage | VLED | | - | 9.9 | - | V |
| Backlight Supply Current | ILED | VLED=9.9V | 140 | 160 | 180 | mA |
| Backlight Lifetime | - | Until half-brightness | 10,000 | 20,000 | - | Hrs. |

Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------------------|--------|--------------|------|------|------|------------|
| Viewing Angle –Vertical (Top) | AV | Cr \geq 10 | 50 | 60 | - | $^{\circ}$ |
| Viewing Angle –Vertical (Bottom) | AV | Cr \geq 10 | 60 | 70 | - | $^{\circ}$ |
| Viewing Angle – Horizontal (Left) | AH | Cr \geq 10 | 60 | 70 | - | $^{\circ}$ |
| Viewing Angle – Horizontal (Right) | AH | Cr \geq 10 | 60 | 70 | - | $^{\circ}$ |
| Contrast Ratio | Cr | - | 250 | 400 | - | - |
| Luminance | YL | - | 300 | 350 | - | cd/m 2 |
| Response Time (rise) | Tr | - | - | 5 | 10 | ms |
| Response Time (fall) | Tf | - | - | 11 | 16 | ms |



Controller Information

Built-in SSD1963 controller.

Please download specification at http://www.newhavendisplay.com/app_notes/SSD1963.pdf

Parallel Interface:

The SSD1963 controller supports both 8080 mode and 6800 mode.

See the SSD1963 datasheet for detailed timing diagrams.

Command Instructions:

See the SSD1963 datasheet for the Instruction Table and Command Descriptions.

Pixel Data Format:

| Interface | Cycle | D[7] | D[6] | D[5] | D[4] | D[3] | D[2] | D[1] | D[0] |
|-----------|-----------------|------|------|------|------|------|------|------|------|
| 8 bits | 1 st | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| | 2 nd | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 |
| | 3 rd | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

Example Initialization Code

```
/******  
* Function Name : UILCD_Init  
* Description  : Initializes LCD.  
* Input       : None  
* Output      : None  
* Return      : None  
*****/  
void TFT_7_Init(void)  
{  
    GPIO_ResetBits(GPIOC, CS1);  
    GPIO_SetBits(GPIOC, nRD);  
    GPIO_ResetBits(GPIOC, nWR);  
    GPIO_WriteBit(GPIOC, RES, Bit_RESET);  
    TFT_delay(5);  
    GPIO_WriteBit(GPIOC, RES, Bit_SET);  
    TFT_delay(100);  
    TFT_7_Write_Command(0x01); //Software Reset  
    TFT_7_Write_Command(0x01);  
    TFT_7_Write_Command(0x01);  
    TFT_delay(10);  
    TFT_7_Command_Write(0xe0,0x01); //START PLL  
    TFT_7_Command_Write(0xe0,0x03); //LOCK PLL  
    TFT_7_Write_Command(0xb0); //SET LCD MODE SET TFT 18Bits MODE  
    GPIO_SetBits(GPIOC, RS);  
    TFT_7_Write_Data(0x08); //SET TFT MODE & hsync+Vsync+DEN MODE  
    TFT_7_Write_Data(0x80); //SET TFT MODE & hsync+Vsync+DEN MODE  
    TFT_7_Write_Data(0x03); //SET horizontal size=800-1 HighByte  
    TFT_7_Write_Data(0x1f); //SET horizontal size=800-1 LowByte  
    TFT_7_Write_Data(0x01); //SET vertical size=480-1 HighByte  
    TFT_7_Write_Data(0xdf); //SET vertical size=480-1 LowByte  
    TFT_7_Write_Data(0x00); //SET even/odd line RGB seq.=RGB  
    TFT_7_Command_Write(0xf0,0x00); //SET pixel data I/F format=8bit  
    TFT_7_Command_Write(0x36,0x09); //SET address mode=flip vertical, BGR  
    TFT_7_Command_Write(0x3a,0x60); //SET R G B format = 6 6 6  
    TFT_7_Write_Command(0xe2); //SET PLL freq=113.33MHz  
    GPIO_SetBits(GPIOC, RS);  
    TFT_7_Write_Data(0x22);  
    TFT_7_Write_Data(0x03);  
    TFT_7_Write_Data(0x04);  
    TFT_7_Write_Command(0xe6); //SET PCLK freq=33.26MHz  
    GPIO_SetBits(GPIOC, RS);  
    TFT_7_Write_Data(0x02);  
    TFT_7_Write_Data(0xff);  
    TFT_7_Write_Data(0xff);  
    TFT_7_Write_Command(0xb4); //SET HBP,  
    GPIO_SetBits(GPIOC, RS);  
    TFT_7_Write_Data(0x03); //SET HSYNC Total  
    TFT_7_Write_Data(0xef);  
    TFT_7_Write_Data(0x00); //SET HBP  
    TFT_7_Write_Data(0xa3);  
    TFT_7_Write_Data(0x07); //SET VBP  
    TFT_7_Write_Data(0x00); //SET Hsync pulse start position  
    TFT_7_Write_Data(0x00);  
    TFT_7_Write_Data(0x00); //SET Hsync pulse subpixel start position  
    TFT_7_Write_Command(0xb6); //SET VBP,
```



```

GPIO_SetBits(GPIOC, RS);
TFT_7_Write_Data(0x01);           //SET Vsync total = 496
TFT_7_Write_Data(0xef);
TFT_7_Write_Data(0x00);           //SET VBP=4
TFT_7_Write_Data(0x04);
TFT_7_Write_Data(0x01);           //SET Vsync pulse 2=1+1
TFT_7_Write_Data(0x00);           //SET Vsync pulse start position
TFT_7_Write_Data(0x00);
TFT_7_Write_Command(0x2a);        //SET column address
GPIO_SetBits(GPIOC, RS);
TFT_7_Write_Data(0x00);           //SET start column address=0
TFT_7_Write_Data(0x00);
TFT_7_Write_Data(0x03);           //SET end column address=799
TFT_7_Write_Data(0x1f);
TFT_7_Write_Command(0x2b);        //SET page address
GPIO_SetBits(GPIOC, RS);
TFT_7_Write_Data(0x00);           //SET start page address=0
TFT_7_Write_Data(0x00);
TFT_7_Write_Data(0x01);           //SET end page address=479
TFT_7_Write_Data(0xdf);
/*TFT_7_Write_Command(0x33);      //SET scroll area
GPIO_SetBits(GPIOC, RS);
TFT_7_Write_Data(0x00);           //SET top fixed area=0
TFT_7_Write_Data(0x00);
TFT_7_Write_Data(0x01);           //SET vertical scrolling area=479
TFT_7_Write_Data(0xdf);
TFT_7_Write_Data(0x00);           //SET bottom fixed area=0
TFT_7_Write_Data(0x00);
TFT_7_Write_Command(0x28);        //SET display off */
}

```

```
void TFT_7_Write_Command(unsigned char command)
```

```

{
GPIO_Write(GPIOB, command);
GPIO_ResetBits(GPIOC, RS);
GPIO_ResetBits(GPIOC, nWR);
GPIO_SetBits(GPIOC, nWR);
}

```

```
void TFT_7_Write_Data(unsigned char data1)
```

```

{
GPIO_SetBits(GPIOC, RS);
GPIO_Write(GPIOB, data1);
GPIO_ResetBits(GPIOC, nWR);
GPIO_SetBits(GPIOC, nWR);
}

```

```
void TFT_7_Command_Write(unsigned char REG,unsigned char VALUE)
```

```

{
TFT_7_Write_Command(REG);
TFT_7_Write_Data(VALUE);
}

```

```
void TFT_7_SendData(unsigned long color)
```

```

{
GPIO_SetBits(GPIOC, RS);
GPIO_Write(GPIOB, (color>>16));
GPIO_ResetBits(GPIOC, nWR);
}

```

```
GPIO_SetBits(GPIOC, nWR);
GPIO_Write(GPIOB, (color>>8));
GPIO_ResetBits(GPIOC, nWR);
GPIO_SetBits(GPIOC, nWR);
GPIO_Write(GPIOB, (color));
GPIO_ResetBits(GPIOC, nWR);
GPIO_SetBits(GPIOC, nWR);
}
```

```
void TFT_7_WindowSet(unsigned int s_x,unsigned int e_x,unsigned int s_y,unsigned int e_y)
```

```
{
TFT_7_Write_Command(0x2a);           //SET page address
TFT_7_Write_Data((s_x)>>8);          //SET start page address=0
TFT_7_Write_Data(s_x);
TFT_7_Write_Data((e_x)>>8);          //SET end page address=639
TFT_7_Write_Data(e_x);

TFT_7_Write_Command(0x2b);           //SET column address
TFT_7_Write_Data((s_y)>>8);          //SET start column address=0
TFT_7_Write_Data(s_y);
TFT_7_Write_Data((e_y)>>8);          //SET end column address=479
TFT_7_Write_Data(e_y);
}
```

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 , 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. | +70°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 , 240hrs | 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 10 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=800V, RS=1.5kΩ, CS=100pF One time | |

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

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