NHD-7.0-800480WF-CTXI#

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**

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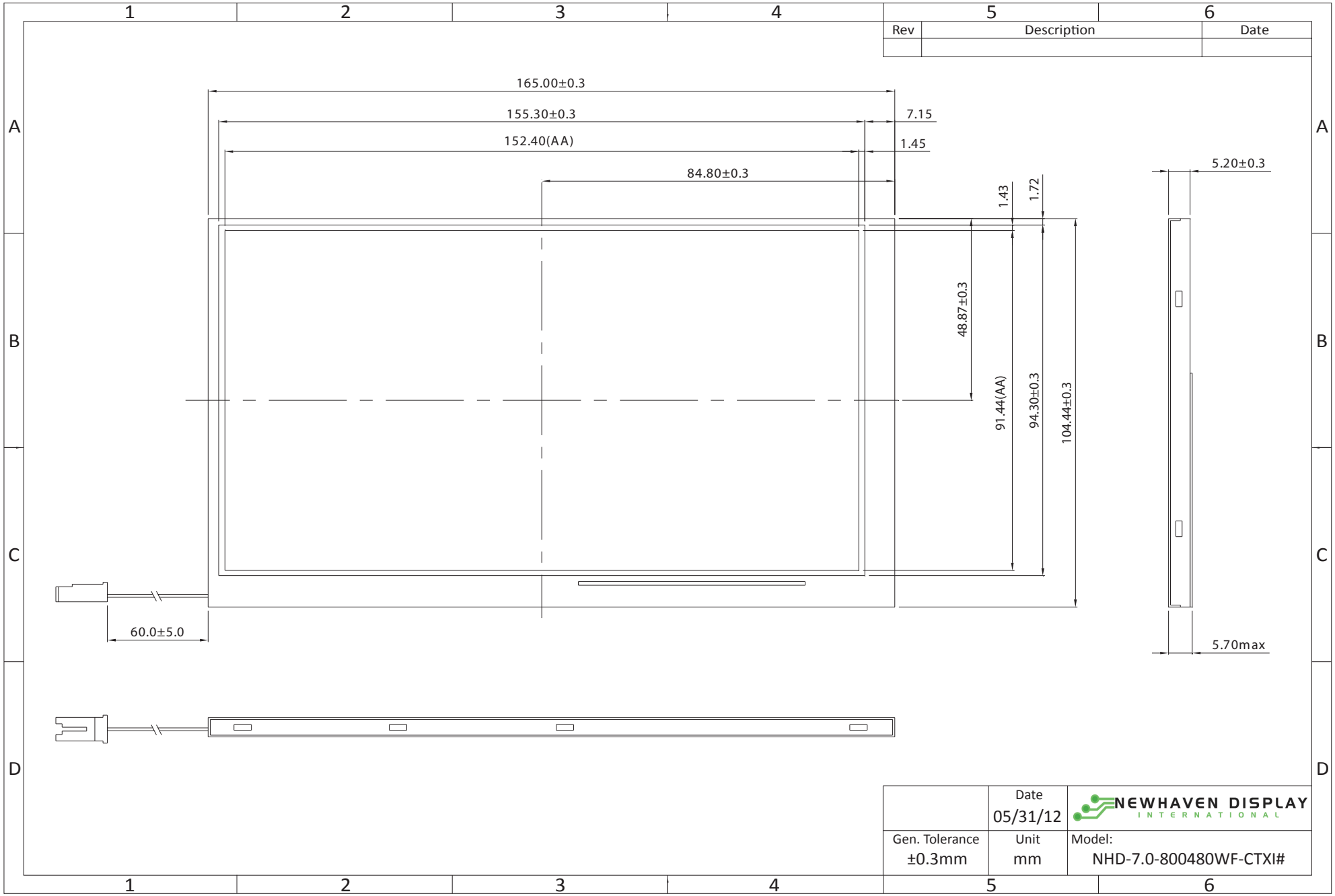
Document Revision History

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	3/3/2011	Mechanical drawing updated	BE
5	10/7/2011	Backlight pin description added	AK
6	1/6/2012	Pixel data format updated	AK
7	5/31/2012	Mechanical drawing updated	AK

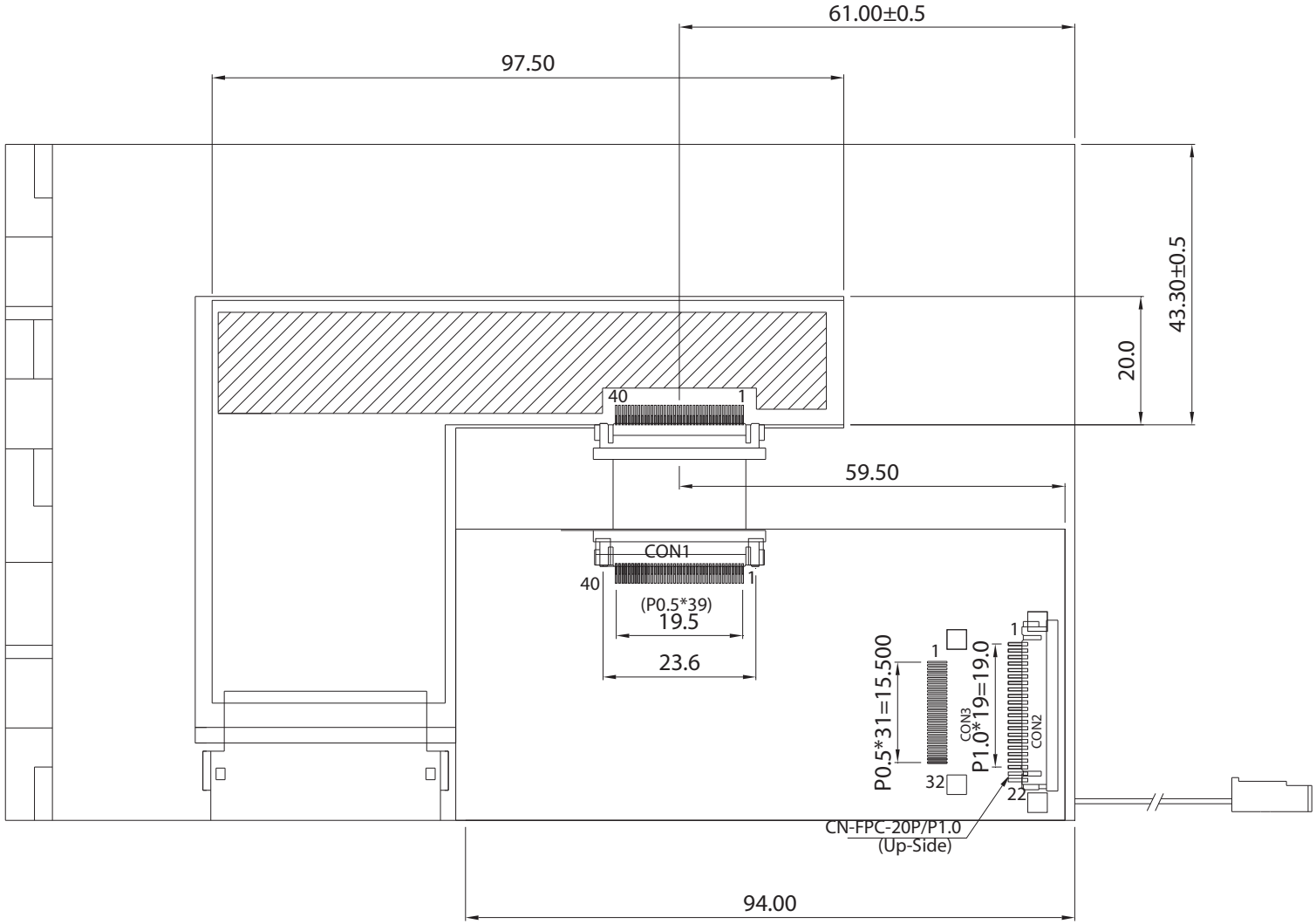
Functions and Features

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

Mechanical Drawing



Rev	Description	Date



PIN NO.	SYMBOL
1	GND
2	VDD
3	NC
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

	Date	
	05/31/12	NEWHAVEN DISPLAY INTERNATIONAL
Gen. Tolerance	Unit	Model:
±0.3mm	mm	NHD-7.0-800480WF-CTXI#

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

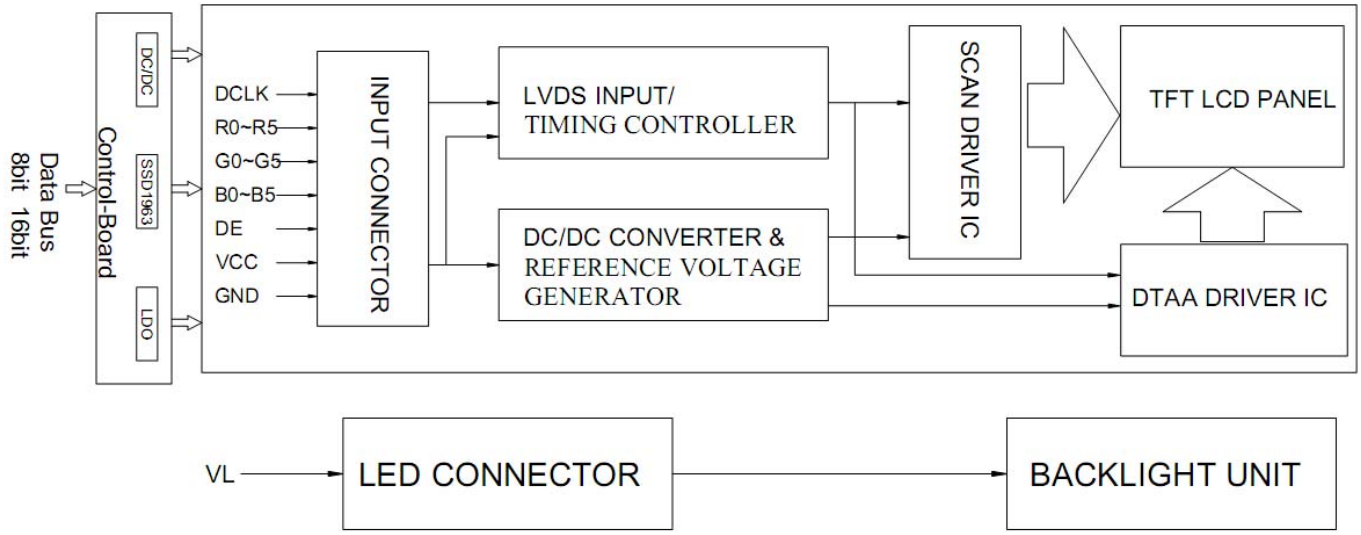
Backlight connector: JST p/n: BHSR-02VS-1
Recommended mating connector: JST p/n: SM 02B-BHSS-1

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	VDD		3.0	3.3	3.5	V
Supply Current	IDD	VDD=3.3V 25°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 ≥10	50	60	-	o
Viewing Angle –Vertical (Bottom)	AV	Cr ≥10	60	70	-	o
Viewing Angle – Horizontal (Left)	AH	Cr ≥10	60	70	-	o
Viewing Angle – Horizontal (Right)	AH	Cr ≥10	60	70	-	o
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	1st	R7	R6	R5	R4	R3	R2	R1	R0
	2nd	G7	G6	G5	G4	G3	G2	G1	G0
	3rd	B7	B6	B5	B4	B3	B2	B1	B0

Example Initialization Program

```
/*******************************************************************************
* 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 HightByte
TFT_7_Write_Data(0x1f);                    //SET horizontal size=800-1 LowByte
TFT_7_Write_Data(0x01);                        //SET vertical size=480-1 HightByte
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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