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# 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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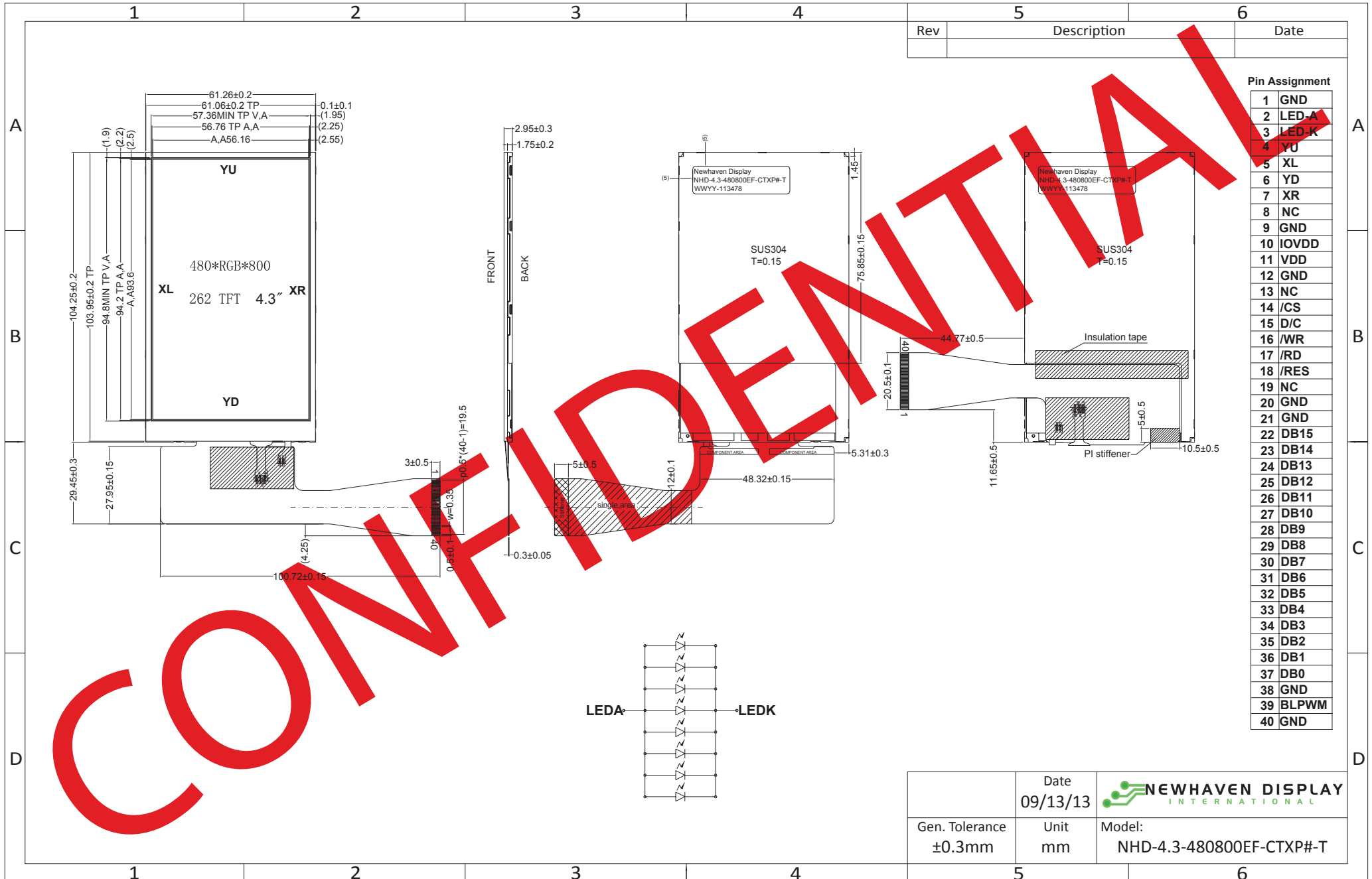
## Document Revision History

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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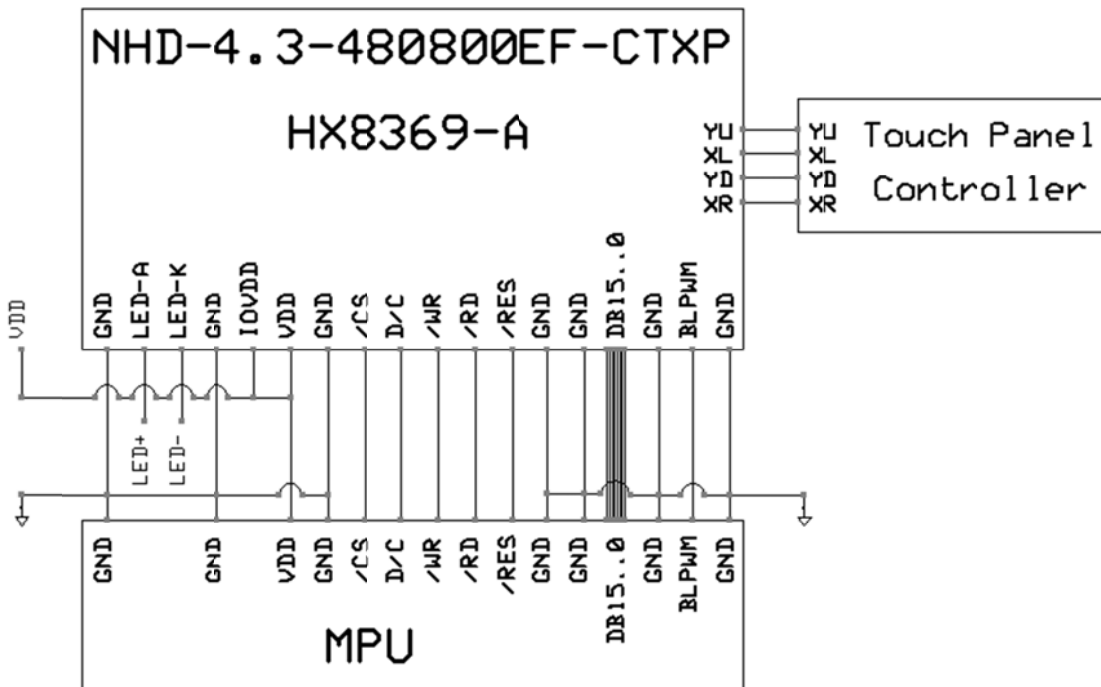
## Pin Description and Wiring Diagram

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

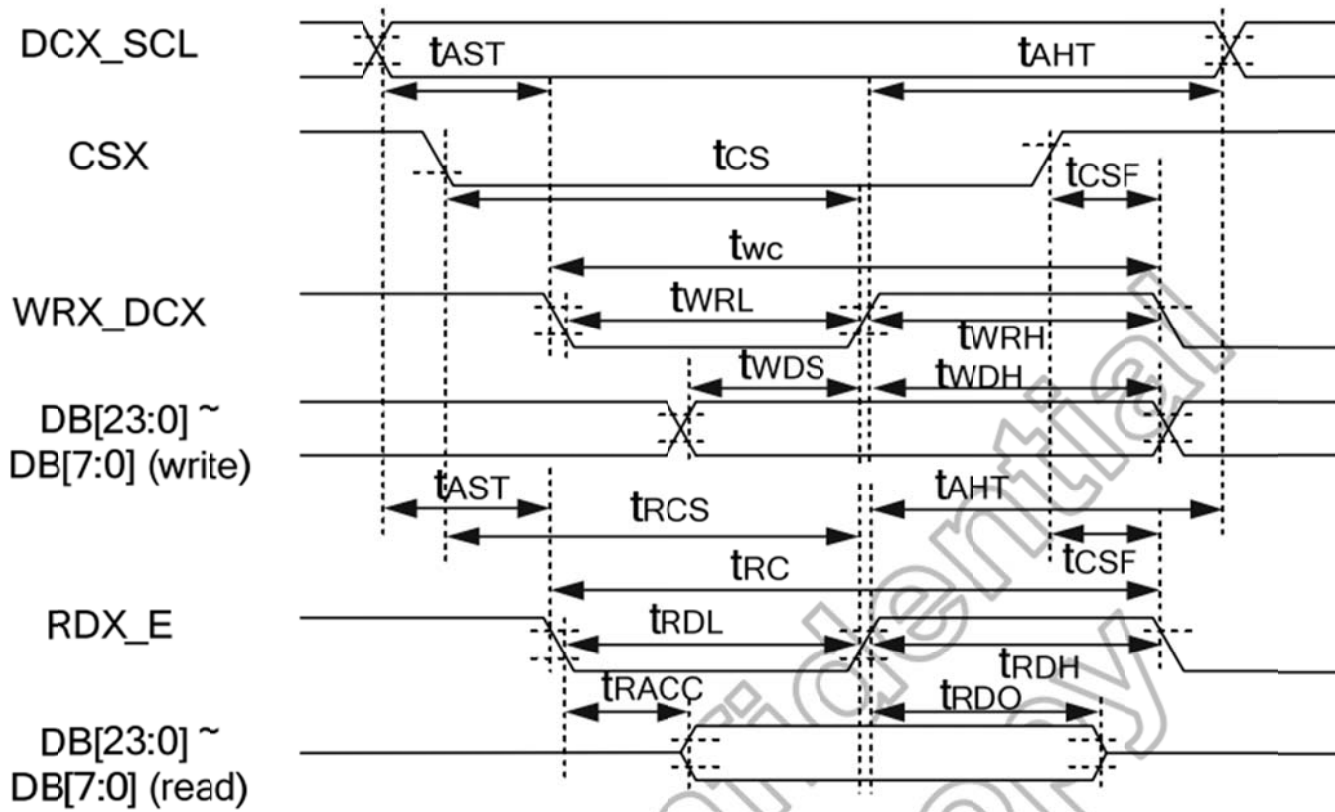
Please download specification at [http://www.newhavendisplay.com/app\\_notes/HX8369.pdf](http://www.newhavendisplay.com/app_notes/HX8369.pdf)

## 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

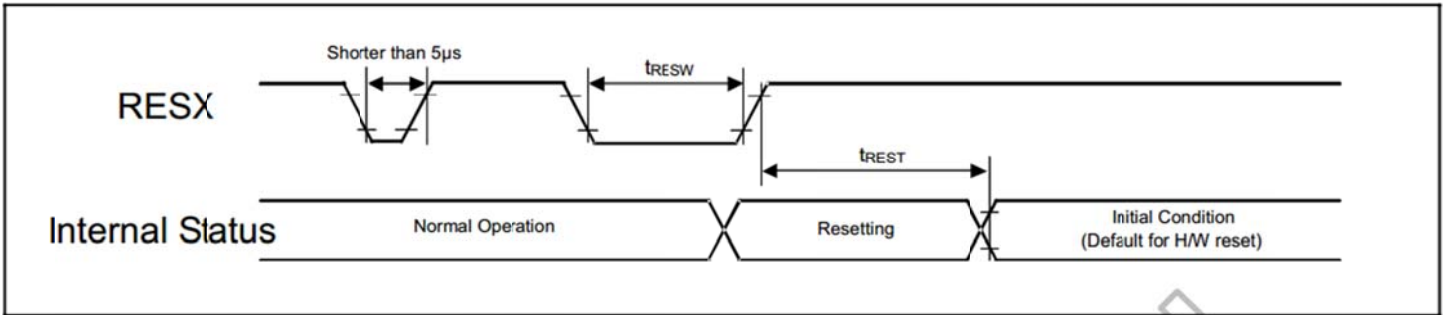


Signal	Symbol	Parameter	Min.	Max.	Unit	Description
DCX_SCL	$t_{AST}$	Address setup time	10	-	ns	-
	$t_{AHT}$	Address hold time (Write/Read)	10	-		
CSX	$t_{cs}$	Chip select setup time (Write)	20	-	ns	-
	$t_{rcs}$	Chip select setup time (Read ID)	45	-		
	$t_{rcsfm}$	Chip Select setup time (Read FM)	355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

**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  $V_{DD1}$  for Input signals.

## Reset Input Timing

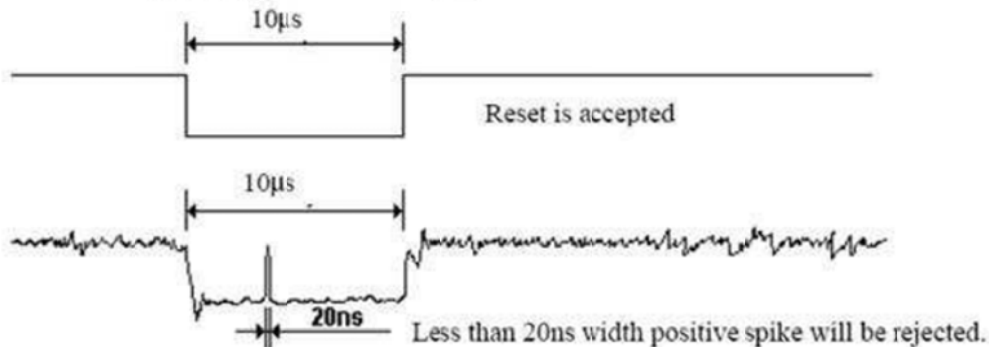


Symbol	Parameter	Related pins	Min.	Typ.	Max.	Note	Unit
$t_{RESW}$	Reset low pulse width <sup>(1)</sup>	RESX	10	-	-	-	µs
$t_{REST}$	Reset complete time <sup>(2)</sup>	-	5	-	-	When reset is applied during Sleep In mode	ms
		-	120	-	-	When reset is applied during Sleep Out mode	ms

**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 Change time: 5min 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-55Hz , 1.5mm amplitude. 2hrs in each of 3 directions X,Y,Z	3
Static electricity test	Endurance test applying electric static discharge.	VS=2000V, RS=330Ω, CS=150pF 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

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