

NHD-320240WG-ATMI-TZ#

Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
320240-	320 x 240 pixels
WG-	Display Type: Graphic
A-	Model
T-	White LED Backlight
M-	STN-Blue (-)
I-	Transmissive, 6:00 Optimal View, Wide Temperature
TZ#-	Built-in Negative Voltage and Temperature Compensation
	RoHS Compliant

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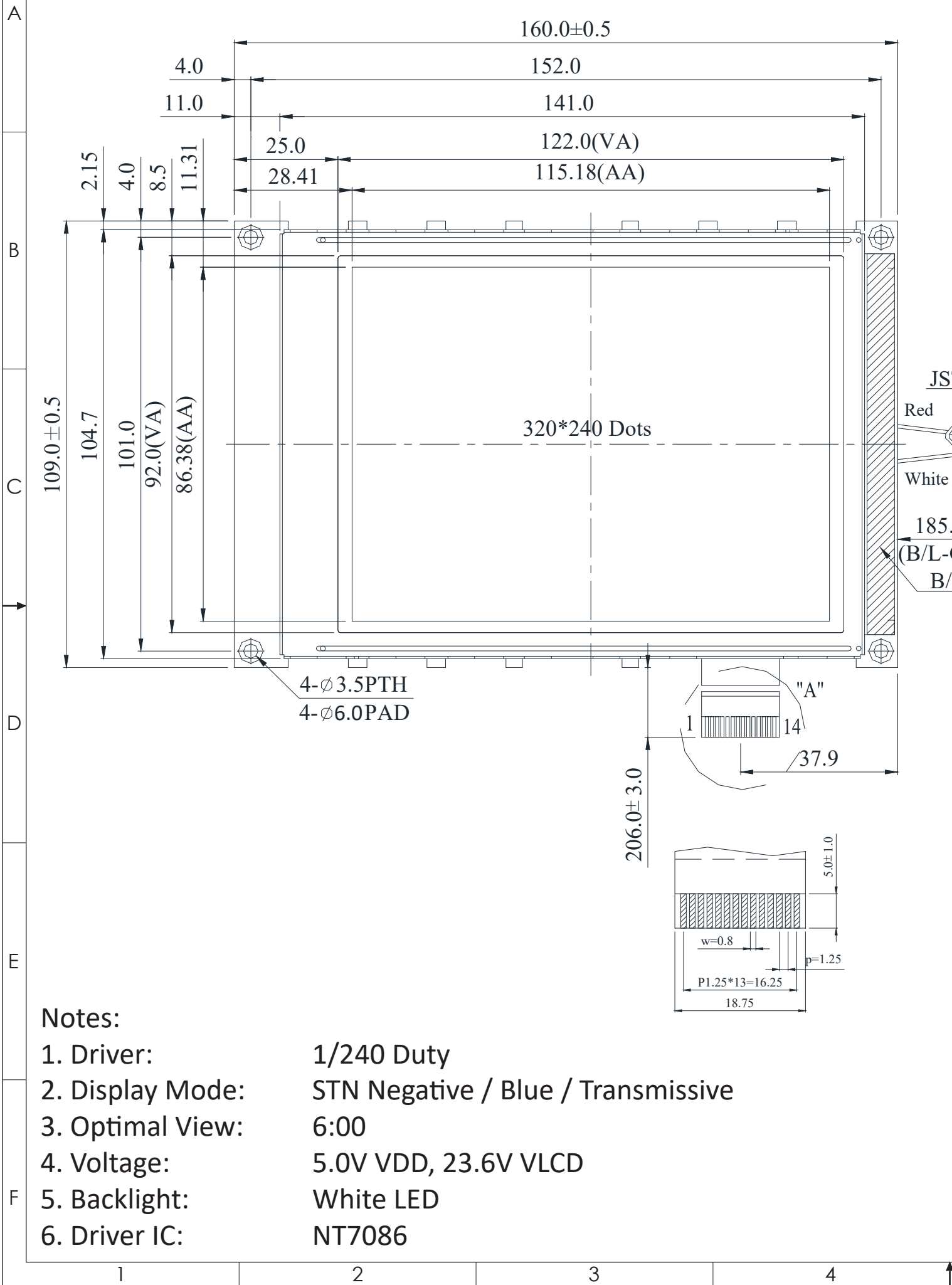
Document Revision History

Revision	Date	Description	Changed by
0	9/25/15	Initial Release	SB
1	2/13/19	Mechanical Drawing, Electrical Characteristics Updated	SB
2	9/22/20	Updated 2D Mechanical Drawing & Quality Information	AS
3	4/7/21	Updated Electrical Characteristics & Quality Information	JT

Functions and Features

- 320 x 240 pixels
- Built-in Negative Voltage
- No Controller
- NT7086 Driver
- +5.0V power supply
- RoHS Compliant
- Built-in Temperature Compensation Circuit

Mechanical Drawing



Notes:

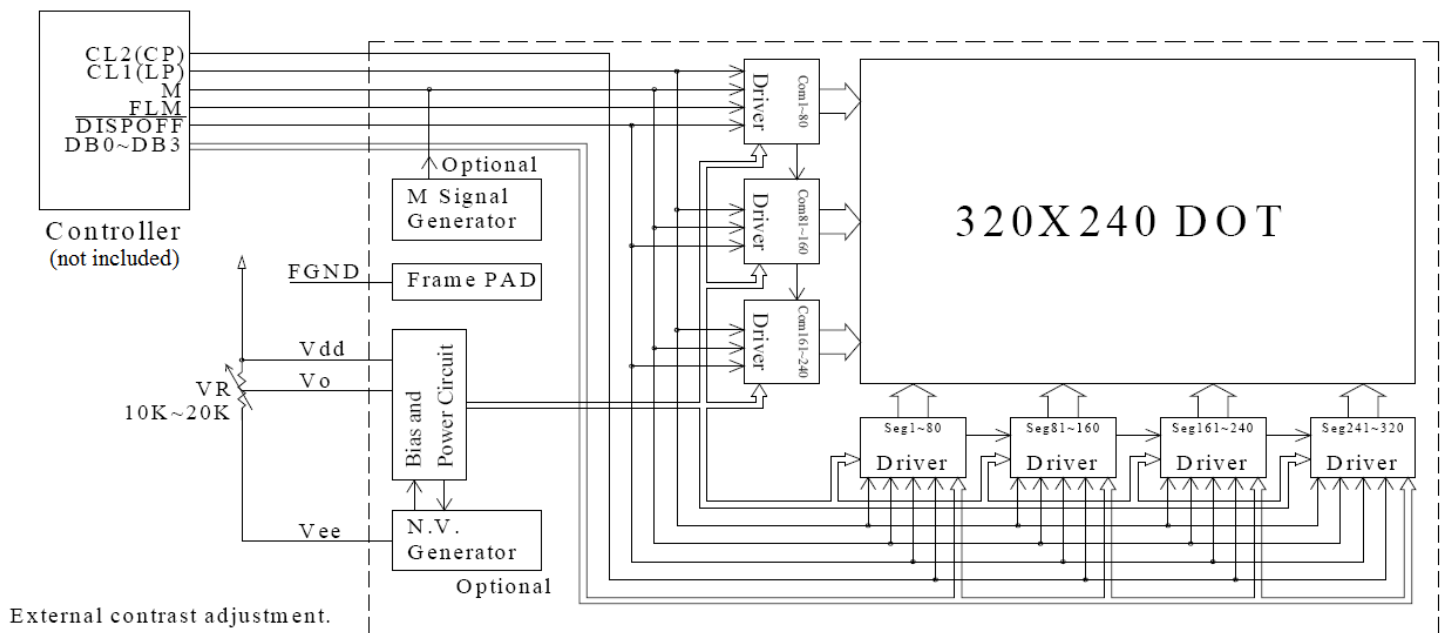
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|------------------|------------------------------------|
| 1. Driver: | 1/240 Duty |
| 2. Display Mode: | STN Negative / Blue / Transmissive |
| 3. Optimal View: | 6:00 |
| 4. Voltage: | 5.0V VDD, 23.6V VLCD |
| 5. Backlight: | White LED |
| 6. Driver IC: | NT7086 |

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1-4	DB0-DB3	MPU	Signal data bus
5	DISP OFF	MPU	Display On/Off
6	FLM	MPU	Scan Start-up signal
7	M	-	No Connect
8	LP	MPU	Data latch pulse
9	CP	MPU	Data shift pulse
10	V _{DD}	Power Supply	Supply voltage for logic (+5.0V)
11	V _{SS}	Power Supply	Ground
12	V _{EE}	Power Supply	Negative voltage output (-25V)
13	V _O	Adj. Power Supply	Supply voltage for contrast (approx. -18.6V)
14	FGND	-	No Connect
A	LED +	Power Supply	Backlight Anode (128mA @ 3.5V)
K	LED -	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 1.25mm pitch, 14-pos FFC connector **Mates with:** Molex p/n 0039532144

Backlight connector: JST p/n: XHP-3 **Mates with:** JST p/n: B 3B-XH-A



Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T _{OP}	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T _{ST}	Absolute Max	-30	-	+80	°C
Supply Voltage	V _{DD}	-	2.7	5.0	5.5	V
Supply Current	I _{DD}	T _{OP} =25°C	50	100	150	mA
Supply for LCD (contrast)	V _{DD} -V ₀	V _{DD} =5.0V	23	23.6	24.2	V
"H" Level input	V _{IH}	-	0.8 * V _{DD}	-	V _{DD}	V
"L" Level input	V _{IL}	-	V _{SS}	-	0.2 * V _{DD}	V
"H" Level output	V _{OH}	-	V _{DD} - 0.4	-	V _{DD}	V
"L" Level output	V _{OL}	-	V _{SS}	-	0.4	V
Backlight Supply Current	I _{LED}	V _{LED} = 3.5V	96	128	160	mA
Backlight Supply Voltage	V _{LED}	I _{LED} = 128 mA	3.4	3.5	3.6	V

*The LED of the backlight is driven by current drain; drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated.

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	CR ≥ 2	-	20	-	°
	Bottom		-	40	-	°
	Left		-	30	-	°
	Right		-	30	-	°
Contrast Ratio	CR	-	-	3	-	-
Response Time	Rise	T _{OP} = 25°C	-	200	300	ms
	Fall		-	250	350	ms

Driver Information

Built-in NT7086 driver.

Please download specification at http://www.newhavendisplay.com/app_notes/NT7086.pdf

Timing Characteristics

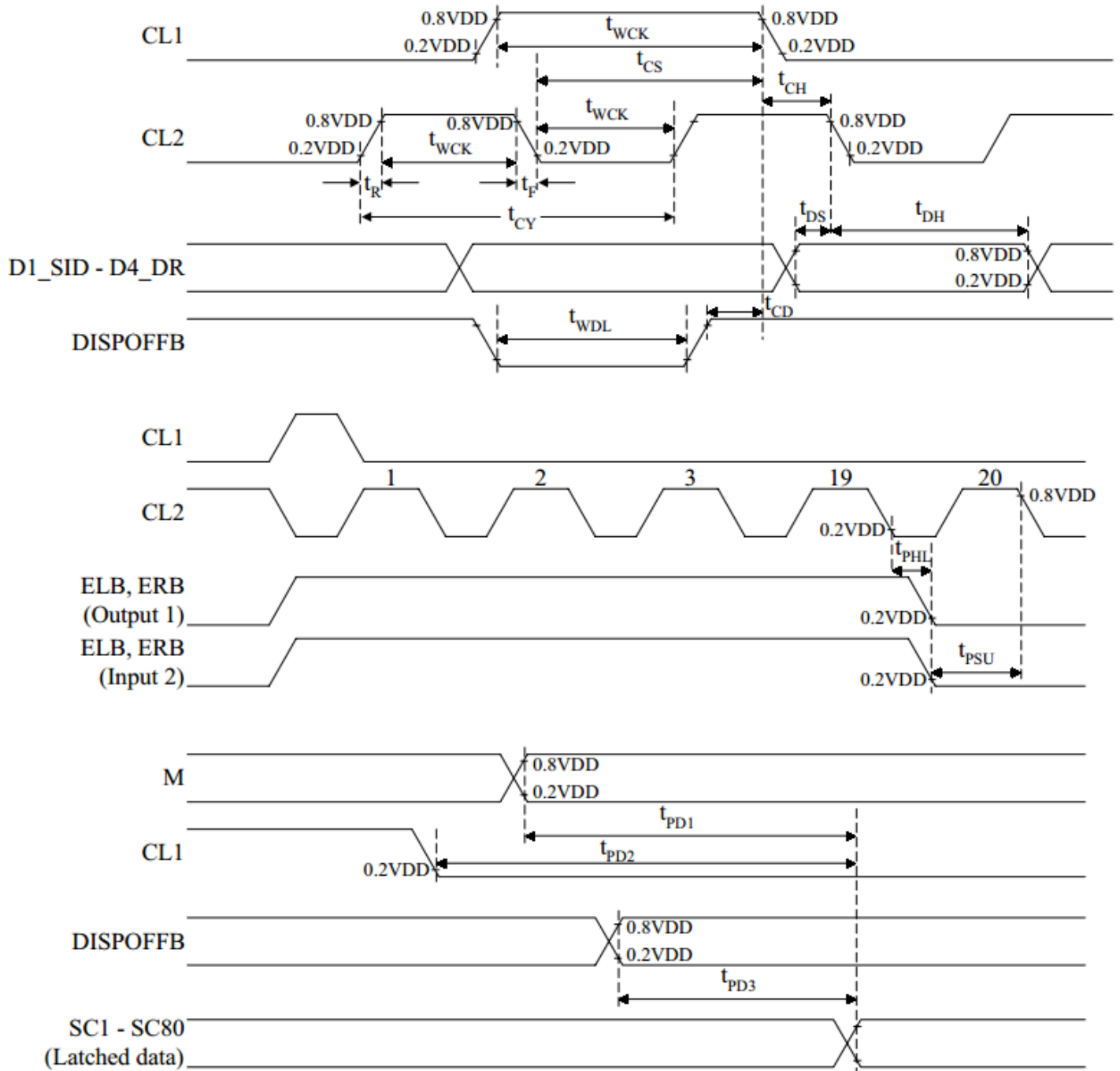
(1) Segment Driver Application

Characteristic	Symbol	Test condition	(1) VDD=5V±10%			(2) VDD=3V±10%			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Clock cycle time	t _{CY}	Duty=50%	125	-	-	250	-	-	ns
Clock pulse width	t _{WCK}	-	45	-	-	95	-	-	
Clock rise/ fall time	t _R / t _F	-	-	-	-	-	-	30	
Data set-up time	t _{DS}	-	30	-	-	65	-	-	
Data hold time	t _{DH}	-	30	-	-	65	-	-	
Clock set-up time	t _{CS}	-	80	-	-	120	-	-	
Clock hold time	t _{CH}	-	80	-	-	120	-	-	
Propagation delay time	t _{PHL}	ELB output	-	-	60	-	-	125	
		ERB output	-	-	60	-	-	125	
ELB,ERB set-up time	t _{PSU}	ELB input	30	-	-	65	-	-	
		ERB input	30	-	-	65	-	-	
DISPOFFB low pulse width	t _{WDL}	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t _{CD}	-	100	-	-	100	-	-	ns
M – OUT propagation delay time	t _{PD1}	C _L =15pF	-	-	1.0	-	-	1.2	μs
CL1 – OUT propagation delay time	t _{PD2}		-	-	1.0	-	-	1.2	
DISPOFFB – OUT propagation delay time	t _{PD3}		-	-	1.0	-	-	-	

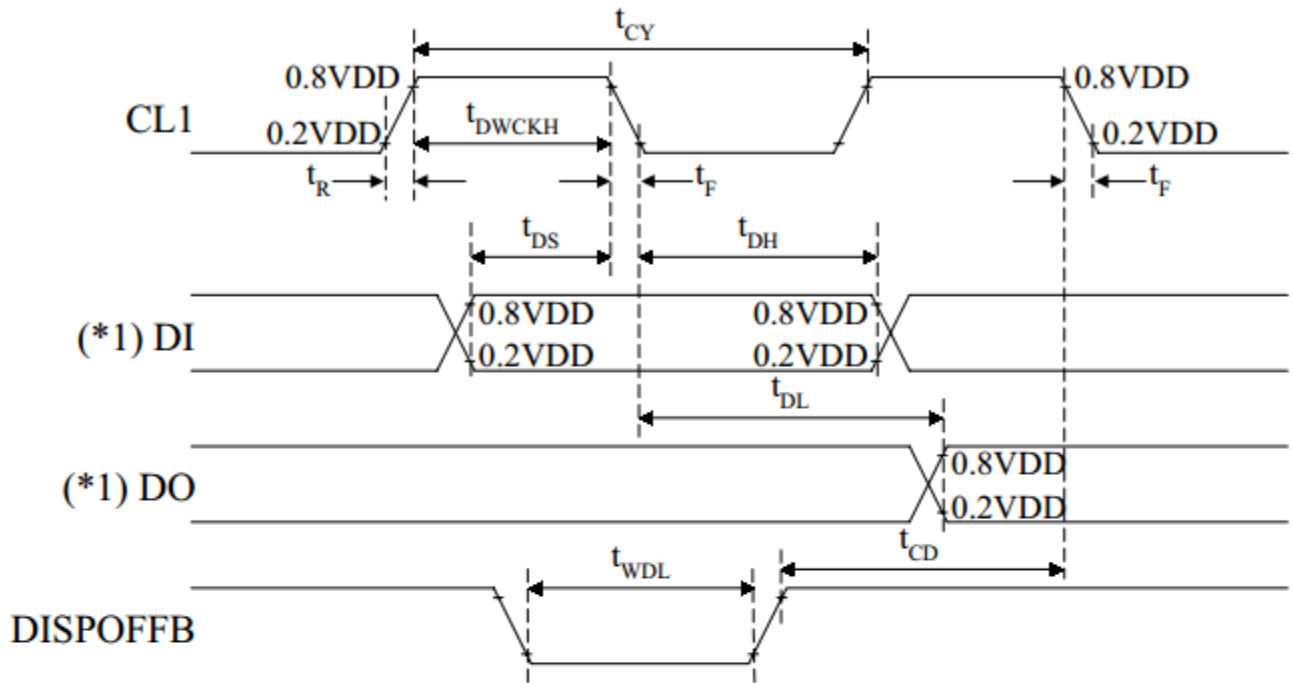
(2) Common Driver Application

Characteristic	Symbol	Test condition	(1) VDD=5V±10%			(2) VDD=3V±10%			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Clock cycle time	t _{CY}	Duty=50%	250	-	-	500	-	-	ns
Clock pulse width	t _{WCK}	-	45	-	-	95	-	-	
Clock rise/ fall time	t _R / t _F	-	-	-	50	-	-	50	
Data set-up time	t _{DS}	-	30	-	-	65	-	-	
Data hold time	T _{DH}	-	30	-	-	65	-	-	
DISPOFFB low pulse width	t _{WDL}	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t _{CD}	-	100	-	-	100	-	-	ns
Output delay time	t _{DL}	C _L =15pF	-	-	200	-	-	250	
M – OUT propagation delay time	t _{PD1}		-	-	1.0	-	-	1.2	μs
CL1 – OUT propagation delay time	t _{PD2}		-	-	1.0	-	-	1.2	
DISPOFFB – OUT propagation delay time	t _{PD3}		-	-	1.0	-	-	1.2	

(3) Segment Driver Application Timing



(4) Common Driver Application Timing



(*1) When in single-type interface mode

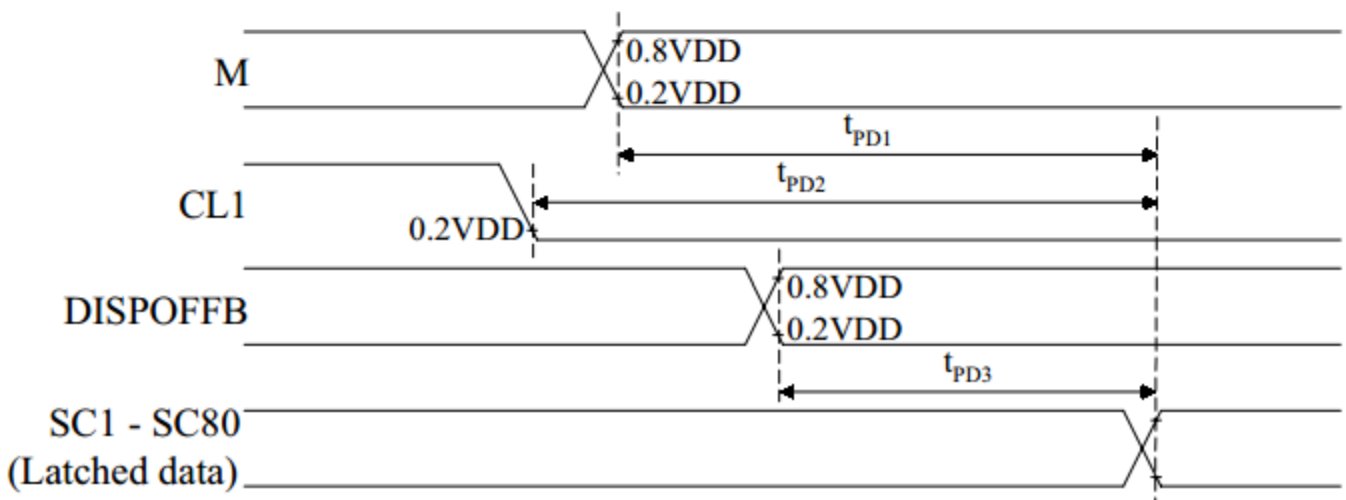
DI=>DDL(SHL=L), D4_DR(SHL=H)

DO=>D4_DR(SHL=L), D2_DL(SHL=H)

When in dual-type interface mode

DI=>D2_DL and D3_DM(SHL=L), D4_DR and D3_DM(SHL=H)

DO=>D4_DR(SHL=L), D2_DL(SHL=H)



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 , 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C 200hrs	
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 200hrs	1
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 , 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 -> 25°C,5min -> 70°C,30min = 1 cycle 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-55Hz, 1.5mm amplitude. 60 sec in each of 3 directions (X, Y, Z) For 15 minutes	3
Static electricity test	Endurance test applying electric static discharge.	Air: ±800V 150pF/330Ω, 10 Times	
		Contact: ±600V 150pF/330Ω,10 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

Warranty Information and Terms & Conditions

http://www.newhavendisplay.com/index.php?main_page=terms

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