

Product Specification

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

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Additional Resources

- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html
- **Quality Center:** https://www.newhavendisplay.com/quality_center.html
- **Precautions for using LCDs/LCMs:** <https://www.newhavendisplay.com/specs/precautions.pdf>
- **Warranty / Terms & Conditions:** <https://www.newhavendisplay.com/terms.html>



Document Revision History

Revision	Date	Description	Changed By
0	09/25/2015	Initial Release	SB
1	02/13/2019	Mechanical Drawing, Electrical Characteristics Updated	SB
2	09/22/2020	Updated 2D Mechanical Drawing & Quality Information	AS
3	04/07/2021	Updated Electrical Characteristics & Quality Information	JT
4	06/06/2024	Mechanical Drawing Updated	KL

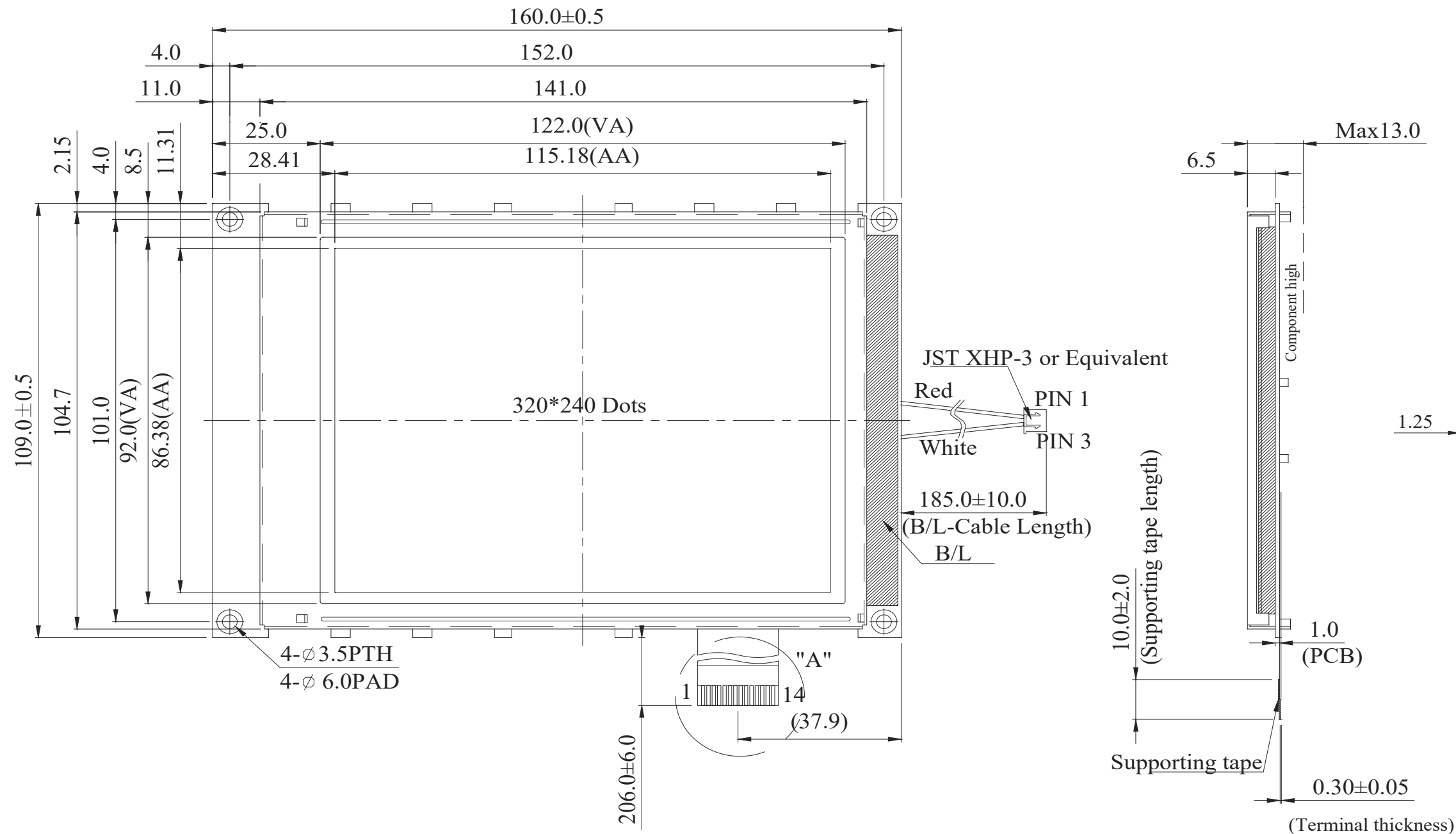
Mechanical Drawing

Newhaven Display

NHD-320240WG-ATMI-TZ#_Rev1A

Date Code

Part Label (type/format may vary)

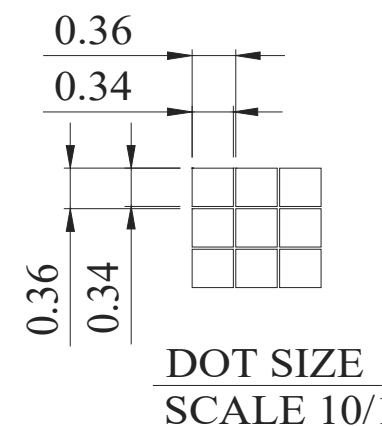


Pin No.	Symbol
1	A
3	K

Pin No.	Symbol
1	DB0
2	DB1
3	DB2
4	DB3
5	DISPOFF
6	FLM
7	NC
8	LP
9	CP
10	Vdd
11	Vss
12	Vee
13	Vo
14	FGND

Product Description: 320x240 Graphic LCD

1. Driver IC: NT7086
2. Driving Mode: 1/240 Duty
3. Interface: 4-bit parallel
4. Power Requirement: 5.0V
5. Optical Features: STN (-) Blue, Transmissive, 6:00 View, White Backlight
6. Recommended FFC Connector: 14pin 1.25mm pitch; Ex. Molex 0039532144



Standard Tolerance: (Unless otherwise specified) Linear: ±0.3mm	NEWHAVEN DISPLAY INTERNATIONAL	
	Drawing/Part Number: NHD-320240WG-ATMI-TZ#	Revision: 1A
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 06/06/2024	Approved Date: 06/06/2024
This drawing is solely the property of Newhaven Display International, Inc. The information it contains is not to be disclosed, reproduced or copied in whole or part without written approval from Newhaven Display.		

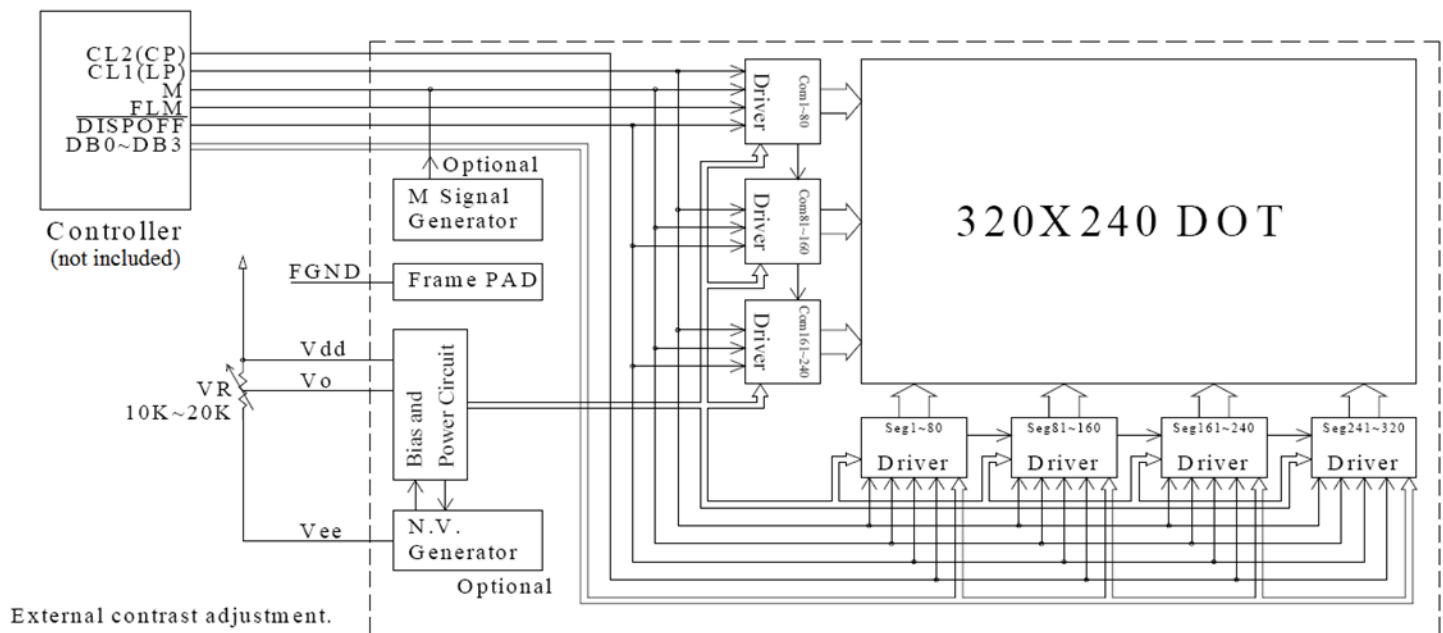
Pin Description

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	NC	-	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

Wiring Diagram



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 V _{DD} =5.0V	50	100	150	mA
Supply for LCD (contrast)	V _{DD} -V _O		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	φY+	CR ≥ 2	-	20	-	°
	Bottom	φY-		-	40	-	°
	Left	θX-		-	30	-	°
	Right	θX+		-	30	-	°
Contrast Ratio		CR	-	-	3	-	-
Response Time	Rise	T _R	T _{OP} = 25°C	-	200	300	ms
	Fall	T _F		-	250	350	ms

Driver Information

Built-in NT7086 Driver: <https://support.newhavendisplay.com/hc/en-us/articles/4414581813399-NT7086>



Timing Characteristics

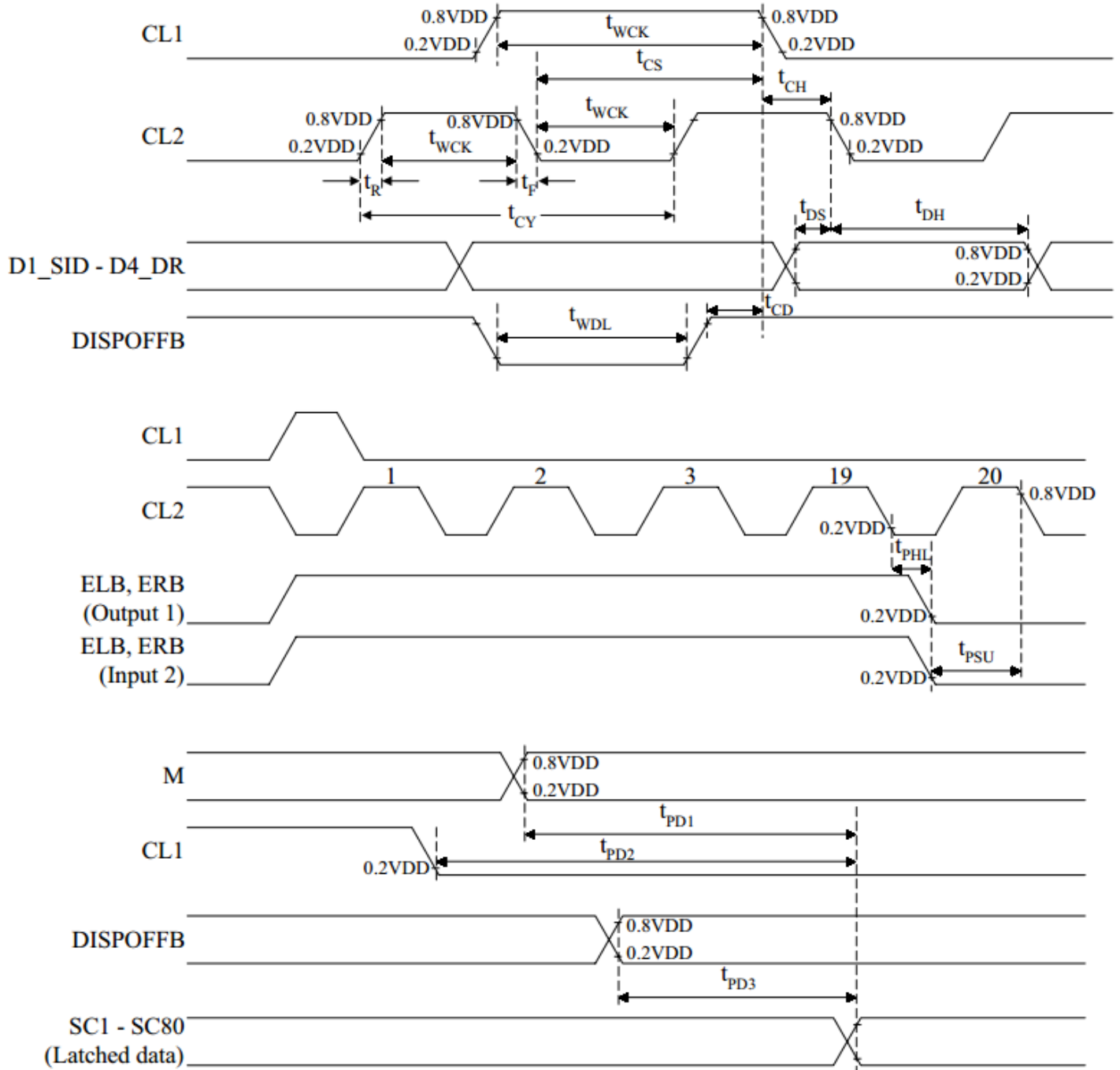
(1) Segment Driver Application

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	-	-	μs
		ERB input	30			65			
DISPOFFB low pulse width	t_{WDL}	-	1.2	-	-	1.2	-	-	
DISPOFFB clear time	t_{CD}	-	100	-	-	100	-	-	
M – OUT propagation delay time	t_{PD1}	$C_L=15pF$	-	-	1.0	-	-	1.2	
CL1 – OUT propagation delay time	t_{PD2}		-	-	1.0	-	-	1.2	
DISPOFFB – OUT propagation delay time	t_{PD3}		-	-	1.0	-	-	-	

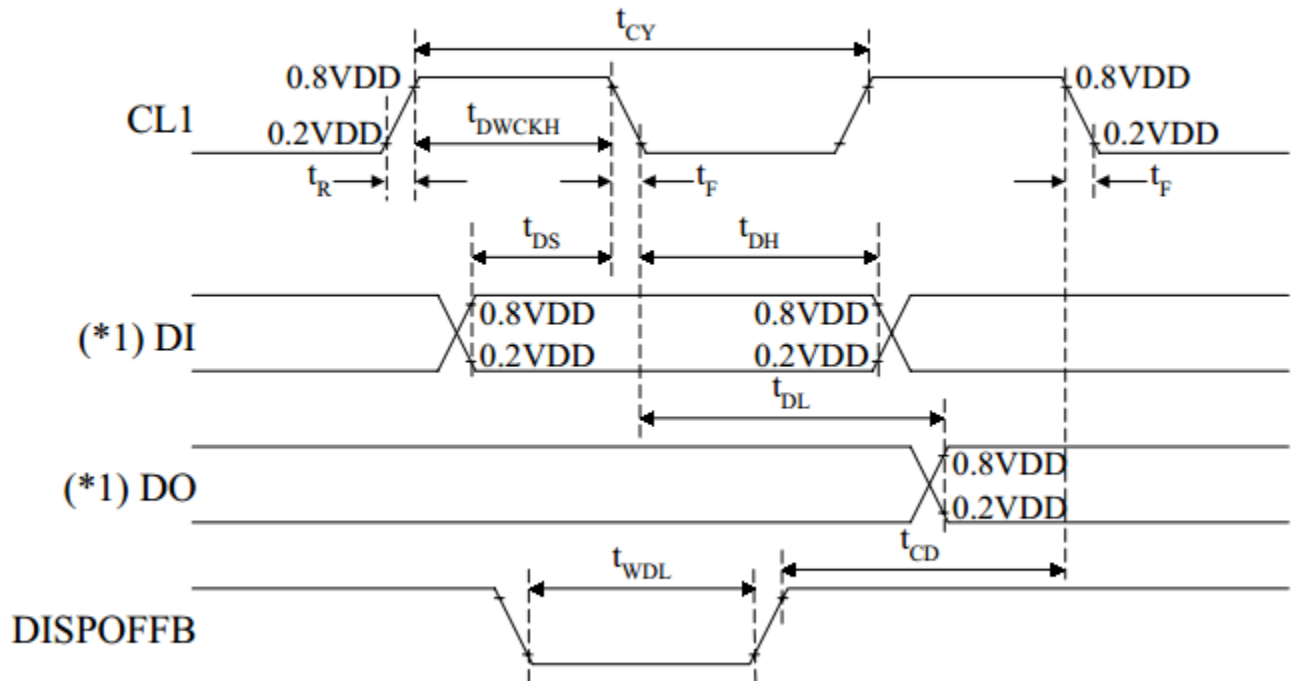
(2) Common Driver Application

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

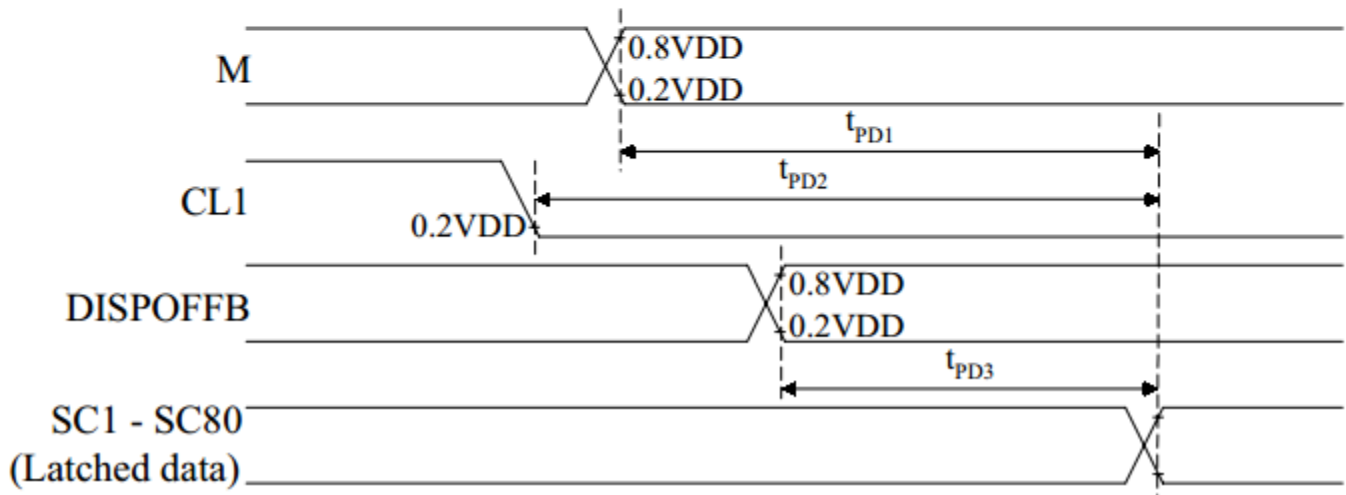
DI=>DDL(SHL=L), D4_DR(SHL=H)

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.