LCD Module RoHS

NLC320F240BTY1

(Status: April 2010)

Specification V1.0

Approval of Specification

	Approved by	Date
Admatec		14.04.2010
Customer		

This product complies to EU directive 2002/95/EC (RoHS) of January 27th,2003.

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REVISION RECORD

Rev.	Date	Pages	Description	PM	TM
1.0	2010-04-14		First Issue	JR	CS

1. MECHANICAL DATA

NO.	ITEM	CONTENTS	UNIT
1	Product No.	NLC320F240BTY1	
2	Module Size	154.6(W)*114.8(H)*MAX 9.0(T)	mm
3	Dot Size	0.10(W)*0.34(H)	mm
4	Dot Pitch	0.12(W)*0.36(H)	mm
5	Number of Dots	320 RGB(W)*240(H)	--
6	Duty	1/240	--
7	LCD Type	FSTN Color	--
8	Rear Polarizer	Transmissive	--
9	Viewing Direction	12 O'clock	--
10	Backlight	CFL	--
11	Controller	Excluded	--
12	DC/DC Converter	Ixcluded	--
13	Touch Panel	Excluded	--
14	Weight	200 (Approx.)	g

Note:

NLC320F240 B T Y 1

Back Light
B: CFL Backlight

Reflective/Transmissive
T: Transmissive

Mode/View Angle
Y: Color 12 o'clock

Option
1: Version No.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

VSS=0V

ITEM	SYMBOL	MIN.	MAX.	UNIT	COMMENT
Power Supply for Logic	V_{DD}-V_{SS}	-0.3	5.5	V	---
Contrast Adjustment Voltage	V_{CON}-V_{SS}	0	V_{DD}	V	---
Input Voltage	V_I	-0.3	V_{DD}	V	---
Static Electricity	---	---	---	---	Note(1)

NOTE (1): LCM should be grounded during handling LCM.

2.2 ENVIRONMENTAL MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	0°C	50°C	-20°C	70°C	
HUMIDITY	Note(2,4)		Note(3,4)		NO CONDENSATION

NOTE (2): Ta≤50°C: 80%RH MAX.

NOTE (3): Please refer to item of reliability test.

NOTE (4): Background color will change slightly depending on ambient temperature. That phenomenon is reversible.

3. ELECTRICAL CHARACTERISTICS

3.1 ELECTRICAL CHARACTERISTICS OF LCM

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Power supply for Logic	V_{DD}-V_{SS}	--	4.5	5.0	5.5	V
Contrast Adjustment Voltage	V_{EE} - G_{ND}	Duty=1/240 V_{DD}-V_{SS}=5.0V 0°C~50°C	1.4	1.8	2.2	V
Input Voltage	V_{IH}	H level	0.8V_{DD}	--	V_{DD}	V
	V_{IL}	L level	0	--	0.2V_{DD}	
Power Supply Current	I_{DD}	V_{DD}-V_{SS}=5.0V V_{CON}-V_{SS}=1.8V PATTERN : ■□■□■□■□■□ □■□■□■□■□■	--	33.0	50.0	mA
Recommended Frame Frequency for Optimum Contrast	FLM	--	120	130	140	Hz

3.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used LED Rating (Constant Current Driving) T_a = 25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Lamp Voltage	V_L	--	506	--	Vrms	---
Lamp Current	I_L	4.0	5.0	5.5	mArms	---
Lamp Power Consumption	P_L	--	2.53	--	W	Note (1)
Starting Voltage	V_S	--	--	870	Vrms	---
		--	--	1140		
LED Life Time	L_L	45,000	--	--	hrs	At I_L=5 mArms Ta=25°C Note(2)

NOTE (1): Power consumption excluded inverter loss.
NOTE (2): Lamp life time is defined as follows : The final brightness is at 50% of original brightness

Recommended Inverter: **ADL10ALF (5V)**
ADL10LLF (12V)

4. OPTICAL CHARACTERISTICS

4.1 OPTICAL CHAR. OF NORMAL TEMP. MODE

at V_{op}

ITEM		Cr(Contrast Ratio)						θ(Viewing Angle)		φ(Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
MODE		MIN	TYP	MIN	TYP	MIN	TYP	Viewing Directio	TYP	Viewing Directio	TYP
T	Y	14	20	17	25	3.5	5	6 o'clock	30	9 o'clock	45
								12 o'clock	55	3 o'clock	45
NOTE		Note 3,6						Note 3,5			

NOTE:
T: Transmissive
Y: Color, 12 o' clock

at φ=0°, θ =0°

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT	COMMENT
Response Time (Rise)	Tr	0°C		640	800	1200	ms	Note 2,3
		25°C		240	300	450		
		50°C		80	100	150		
Response Time (Fall)	Tf	0°C		360	450	670	ms	Note 2,3
		25°C		80	100	150		
		50°C		48	60	90		
Surface Luminance of LCM	L_L	V_{DD}-V_{SS}=5.0V V_{CON}-V_{SS}=1.8V I_L=5mArms	Dots all On (White)	125	160	--	cd/m²	
			Dots all Off (Black)	--	5	---		

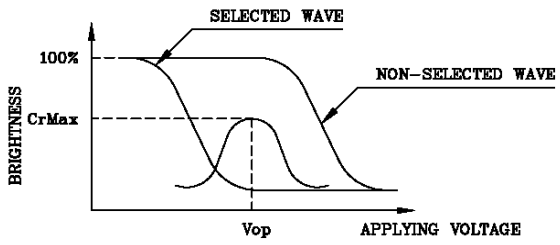
4.2 COLOR OF CIE COORDINATE

at φ=0°, θ =0°

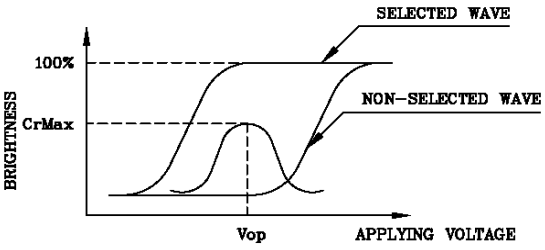
ITEM		SYMBOL	MIN.	TYP.	MAX.
Color of CIE Coordinates	Red	x	0.45	0.50	0.55
		y	0.27	0.32	0.37
	Green	x	0.24	0.29	0.34
		y	0.47	0.52	0.57
	Blue	x	0.12	0.17	0.22
		y	0.10	0.15	0.20
	White	x	0.23	0.28	0.33
		y	0.26	0.31	0.36

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



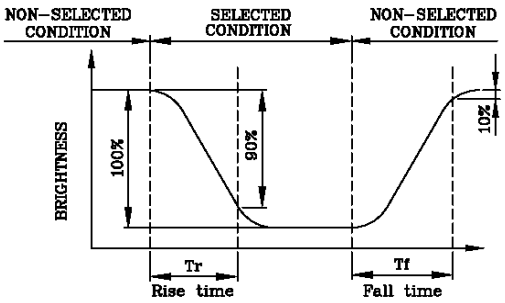
(negative type)

*Conditions

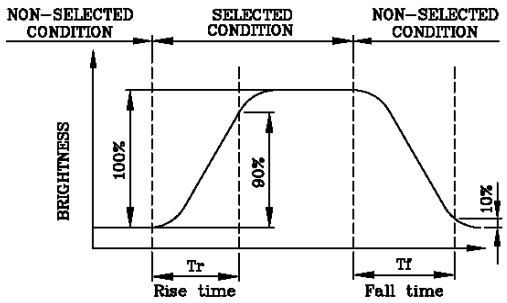
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



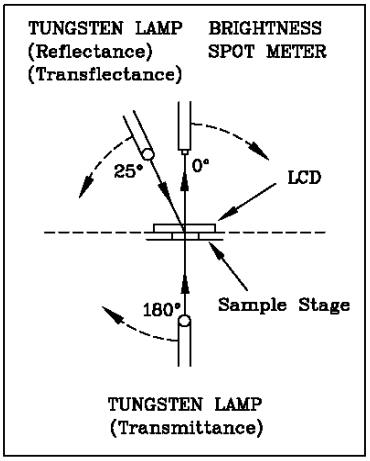
(negative type)

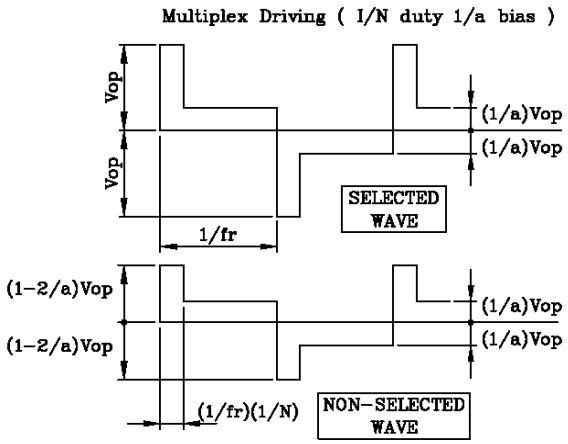
*Conditions

Operating Voltage : Vop
Viewing Angle (θ,ϕ) : (0,0)
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

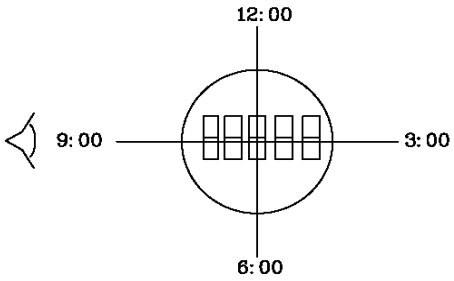
Description of Measuring Equipment and Driving Waveforms





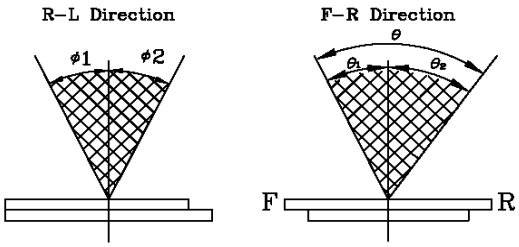
(NOTE 4)

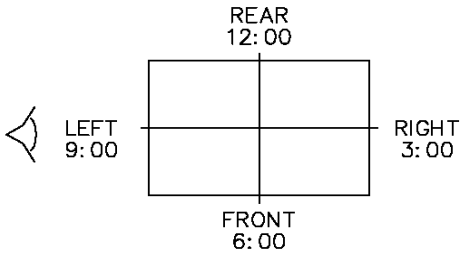
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





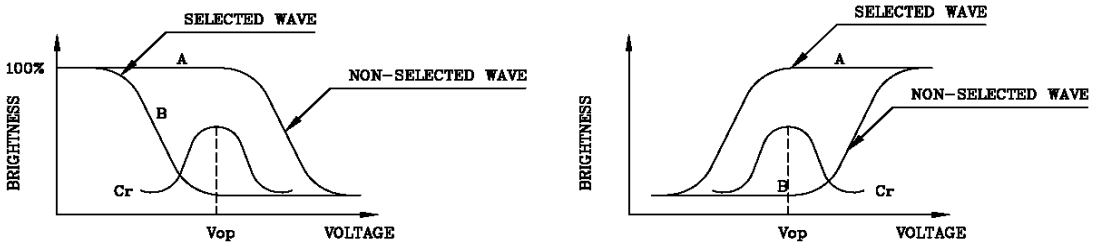
$\phi = \phi_1 + \phi_2$

*Conditions

Operating Voltage : Vop
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



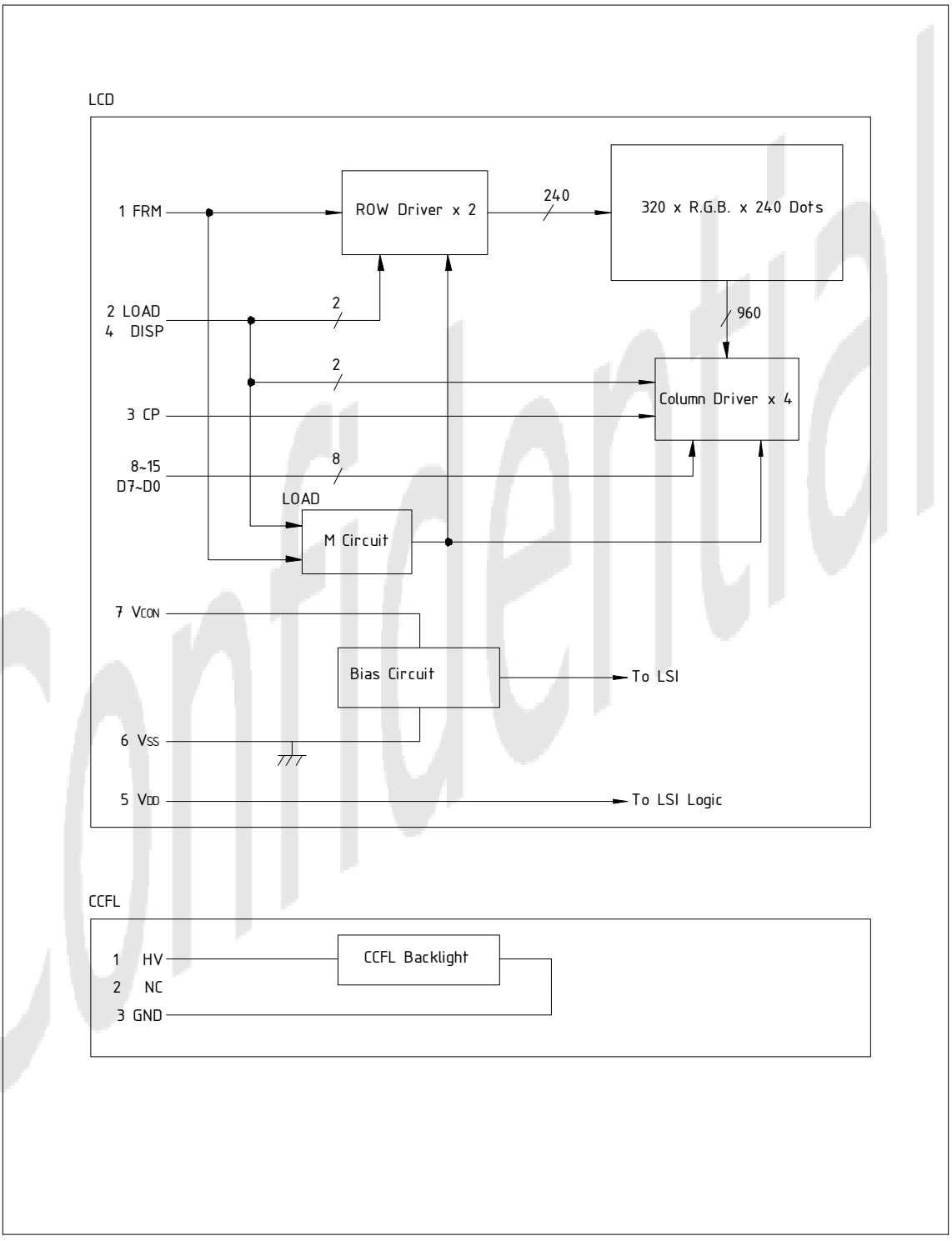
(positive type) (negative type)

Contrast Ratio : Cr=A/B

*Conditions

Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

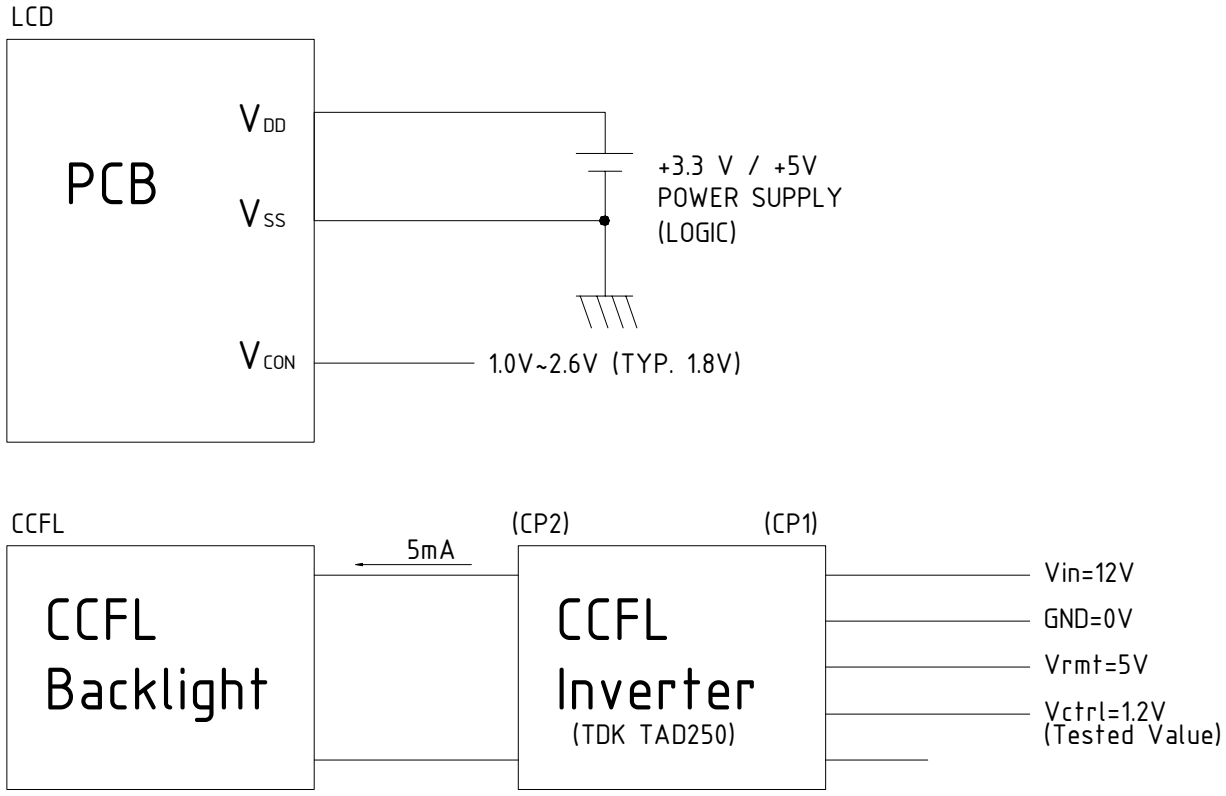
Connector: Receptacle 15-pin, pitch 1.25mm

PIN No.	SYMBOL	LEVEL	FUNCTION
1	Frm	H	Synchronous signal for driving scanning line
2	Load	H -> L	Data signal latch clock
3	Cp	H -> L	Data signal shift clock
4	Disp	H(on), L(off)	Display control signal
5	VDD	--	Power supply for logic
6	VSS	--	GND
7	VCON	--	Contrast Adjust
8	D7~D8	H(on), L(off)	Display Data

CFL connector

PIN No.	SYMBOL	LEVEL	FUNCTION
1	HV	--	Power supply for CFL
2	NC	--	Not connected
3	GND	--	Ground line (from inverter)

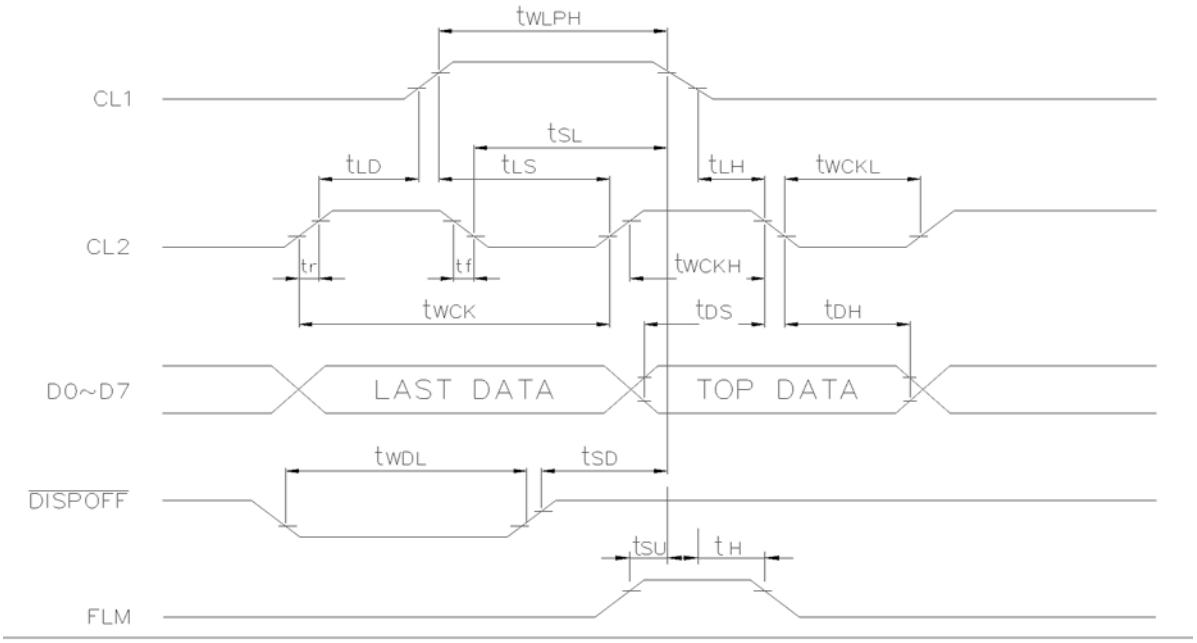
7. POWER SUPPLY



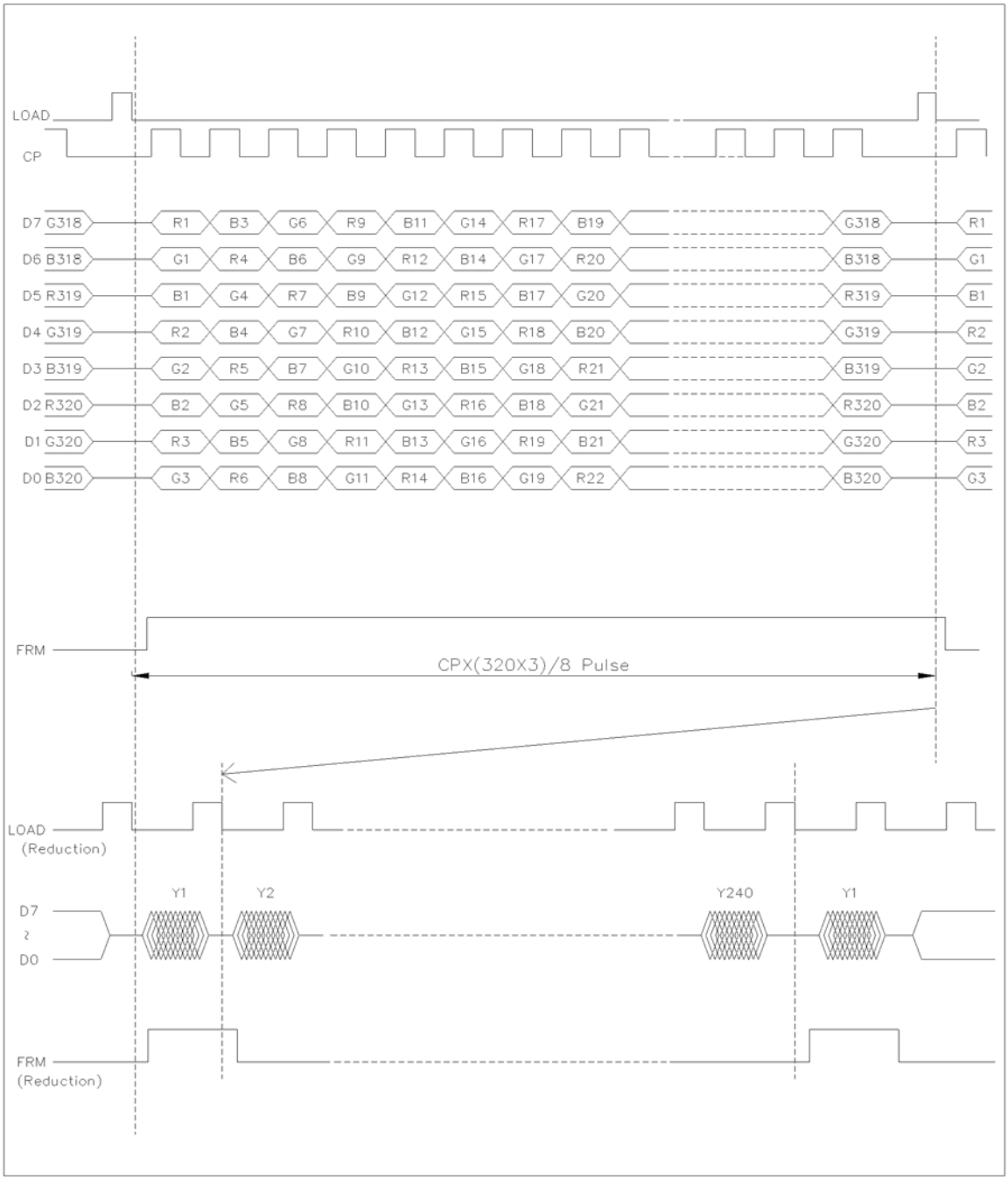
8. TIMING CHARACTERISTICS

8.1 INTERFACE TIMING

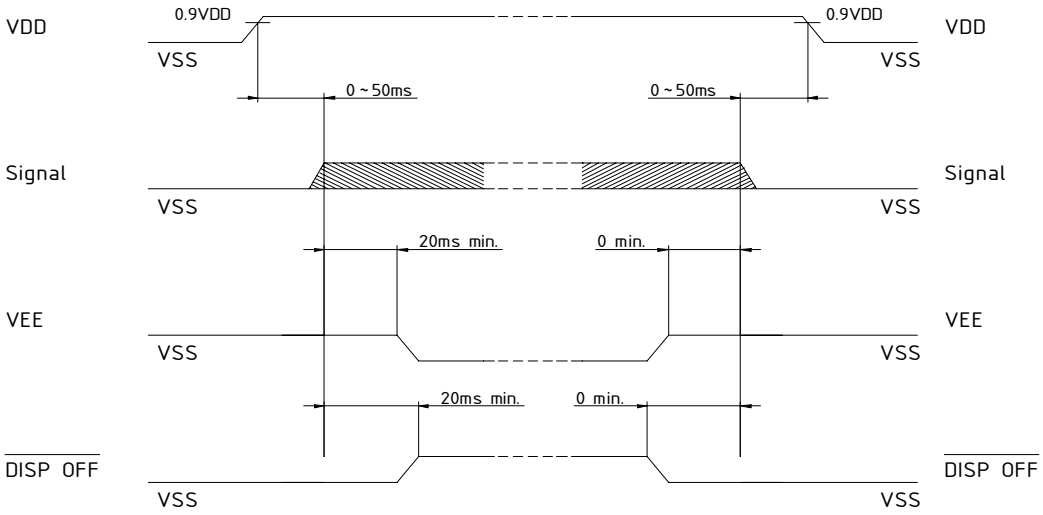
ITEM	SYMBOL	MIN.	MAX.	UNIT
Clock Pulse Cycle Time	t_{WCK}	40	--	ns
Clock Pulse High Level Width	t_{WCKH}	12	--	ns
Clock Pulse Low Level Width	t_{WCKL}	14	--	ns
Latch Pulse High Level Width	t_{WLPH}	15	--	ns
CL2 -> CL1 Rise Time	t_{LD}	5	--	ns
CL2 -> CL1 Fall Time	t_{SL}	25	--	ns
CL1 -> CL2 Rise Time	t_{LS}	25	--	ns
CL1 -> CL2 Fall Time	t_{LH}	25	--	ns
Clock Pulse Rise/Fall Time	tr, tf	--	50	ns
Data Setup Time	t_{DS}	5	--	ns
Data Hold Time	t_{DH}	15	--	ns
DISPOFF Low Level Width	t_{WDL}	1.2	--	µs
DISPOFF Cancellation Time	t_{SD}	100	--	ns
FLM Setup Time	t_{SU}	30	--	ns
FLM Hold Time	t_H	30	--	ns



8.2 TIMING CHART OF INPUT SIGNALS



8.3 POWER ON/OFF TIMING



POWER ON POWER OFF

The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

8.4 DISPLAY PATTERN

START DATA

	Y1			Y2			Y3			...	Y318			Y319			Y320		
X1	R1 D7	G1 D6	B1 D5	R2 D4	G2 D3	B2 D2	R3 D1	G3 D0	B3 D7		R318 D0	G318 D7	B318 D6	R319 D5	G319 D4	B319 D3	R320 D2	G320 D1	B320 D0
X2	R1 D7	G1 D6	B1 D5	R2 D4	G2 D3	B2 D2	R3 D1	G3 D0	B3 D7		R318 D0	G318 D7	B318 D6	R319 D5	G319 D4	B319 D3	R320 D2	G320 D1	B320 D0
...																			
X239	R1 D7	G1 D6	B1 D5	R2 D4	G2 D3	B2 D2	R3 D1	G3 D0	B3 D7		R318 D0	G318 D7	B318 D6	R319 D5	G319 D4	B319 D3	R320 D2	G320 D1	B320 D0
X240	R1 D7	G1 D6	B1 D5	R2 D4	G2 D3	B2 D2	R3 D1	G3 D0	B3 D7		R318 D0	G318 D7	B318 D6	R319 D5	G319 D4	B319 D3	R320 D2	G320 D1	B320 D0

9. RELIABILITY TEST

9.1 TEST CONDITION

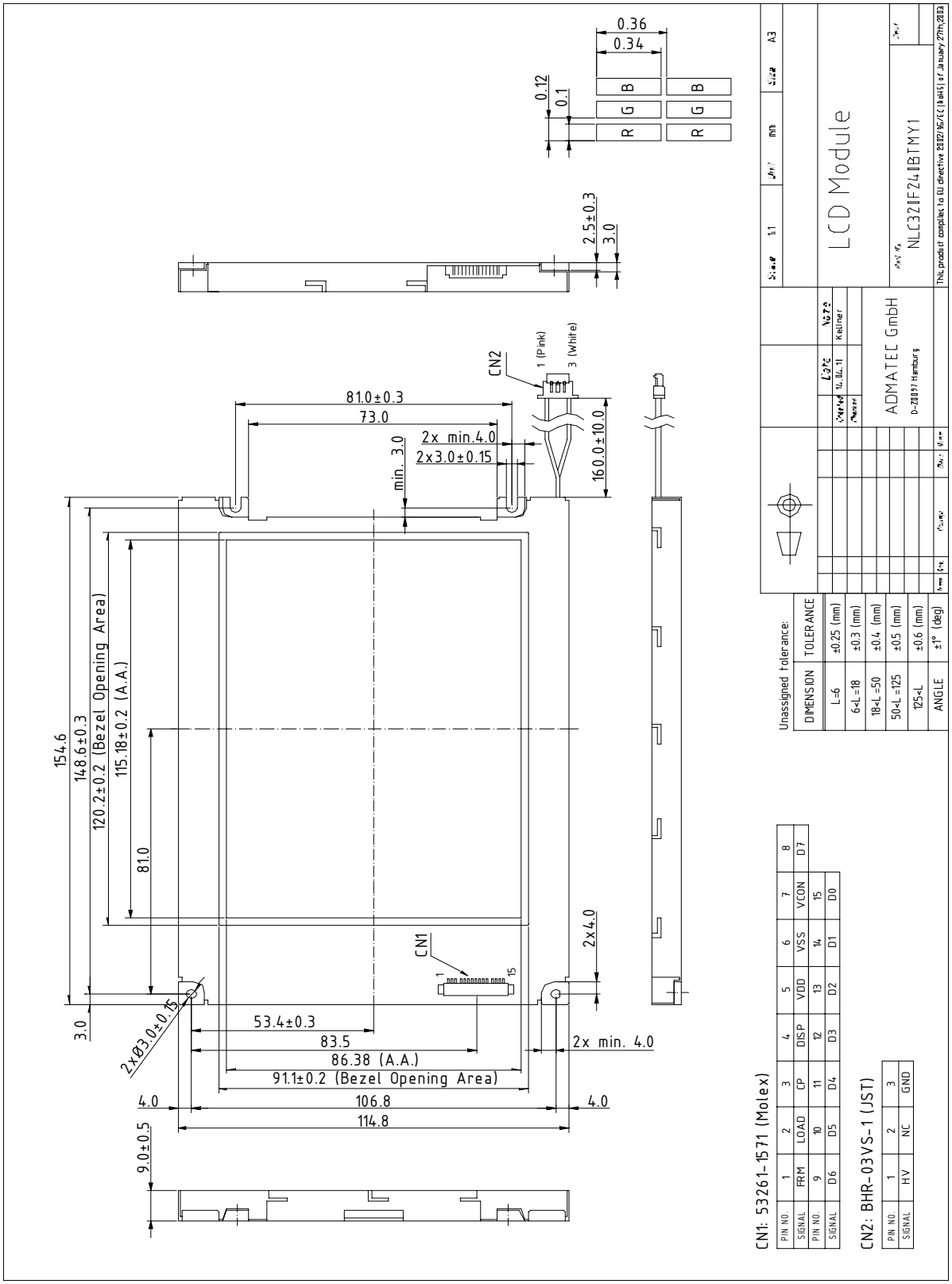
No.	Item	Condition		Standard	Note
1	High temp. storage	70°C	120 Hrs	Appearance without defect	
2	Low temp. storage	-20°C	120 Hrs		
3	High temp. & High humi. storage	50°C 90%RH	120 Hrs		
4	High temp. operating display	50°C	120 Hrs		
5	Low temp. operating display	0°C	120 Hrs		
6	Thermal shock	-20°C, 30min. → 70°C, 30min. (1cycle)			10 cycles

9.1 INSPECTION PROVISION

For the inspection provision please refer to the document:

„Reliability_Test_LCDX"

10. DRAWING


0.36
0.34
0.12
0.1
R G B
R G B
2.5±0.3
3.0
CN2
1 (Pink)
3 (White)
81.0±0.3
73.0
2x min.4.0
2x3.0±0.15
min. 3.0
160.0±10.0
154.6
148.6±0.3
120.2±0.2 (Bezel Opening Area)
115.18±0.2 (A.A.)
81.0
CN1
1
15
2x4.0
3.0
2xØ3.0±0.15
53.4±0.3
83.5
86.38 (A.A.)
91.1±0.2 (Bezel Opening Area)
2x min. 4.0
4.0
106.8
114.8
4.0
9.0±0.5
LCD Module
NLC321F240BTMY1
ADMATEC GmbH
D-20537 Hamburg
Unassigned tolerance:
DIMENSION TOLERANCE
L≤6 ±0.25 (mm)
6<L≤18 ±0.3 (mm)
18<L≤50 ±0.4 (mm)
50<L≤125 ±0.5 (mm)
125<L ±0.6 (mm)
ANGLE ±1° (deg)
CN1: 53261-1571 (Molex)
PIN NO. 1 2 3 4 5 6 7 8
SIGNAL FRM LOAD CP DISP VDD VSS VCON D7
PIN NO. 9 10 11 12 13 14 15
SIGNAL D6 D5 D4 D3 D2 D1 D0
CN2: BHR-03VS-1 (JST)
PIN NO. 1 2 3
SIGNAL HV NC GND