

LCD Module

RoHS

NLC20X4X05CSCD

(Status: October 2009)

Specification V1.0

Approval of Specification

	Approved by	Date
Admatec	<i>Stahl</i>	05.10.09
Customer		

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



REVISION RECORD

Rev.	Date	Pages	Description	PM	TM
1.0	2009-10-02		First Issue	JR	CS

Confidential



1. MECHANICAL DATA

NO.	ITEM	CONTENTS	UNIT
1	Product No.	NLC20x4x05CSCD	
2	Module Size	98.0(W)*60.0(H)*MAX 15.0(T)	mm
3	Viewing Area	76.0(W)*25.2(H)	mm
4	Number of Charcters	20(W)*4(H)	--
5	Duty	1/16	--
6	LCD Type	STN Yellow-Green, Positive Image	--
7	Rear Polarizer	transflective	--
8	Viewing Direction	6 O'clock	--
9	Backlight	LED yellow-green	--
10	Controller	KS0066U and KS0063B	--
11	Ambient Temperature	Operating	-25°C - 70°C
		Storage	-30°C - 80°C

Note:

NLC20X4X05 C S C D

Back Light
C: LED Backlight

Option
D: Wide temperature

Reflective/Transmissive
S: Transflective

Mode/View Angle
C: Yellow mode, 6 O'clock



2. ELECTRIO-OPTICAL CHARACTERISTICS

2.1 ELECTRICAL CHARACTERISTICS OF LCM

V_{DD}=4.5V to 5.5V, T_a= -30°C to +85°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Recommended LC driving Voltage	V _{EE} - G _{ND}	V _{DD} -V _O Duty=1/16 φ=25°	0°C	--	4.6	--	V
			25°C	--	4.2	--	
			50°C	--	3.8	--	
Input Voltage	V _{IH}	--	2.2	--	--	V	
	V _{IL}	--	--	--	0.6		
Output Voltage	V _{OH}	-IOH=0.205 mA	2.4	--	--		
	V _{OL}	IOL=1.2 mA	--	--	0.4		
Power Supply Current (Logic)	I _{DD}	V _{DD} =5.0V	--	1.0	4	mA	
Clock Oscillation Frquency	F _{OSC}	T _a =25°C	--	270	--	KHz	

2.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

T_a = 25°C

ITEM	MIN.	TYP.	MAX.	UNIT	CONDITION
Forward Voltage	4.0	4.2	4.4	V	--
Forward Current	--	150	200	mA	5V
Power Dissipation	--	630	880	mW	5V
Luminance	120	170	--	cd/m ²	5V
Wave length Range	570	572	574	nm	Y/G

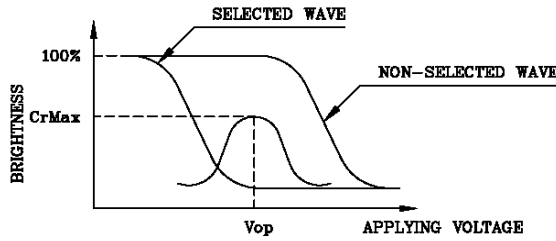
2.3 OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Contrast	K	θ=0°, φ=0°	51	--	--	Deg.
Viewing angle	θ	K=5, φ=0°	θ ₂ -θ ₁ =30	--	--	Deg.
		K=5, θ=10°	φ=±30	--	--	Deg.
Response Time	T _{ON}	25°C	--	--	250	ms
	T _{OFF}	25°C	--	--	250	ms

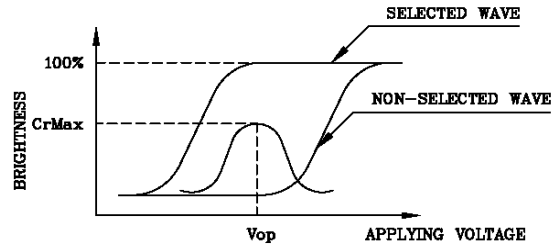


(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



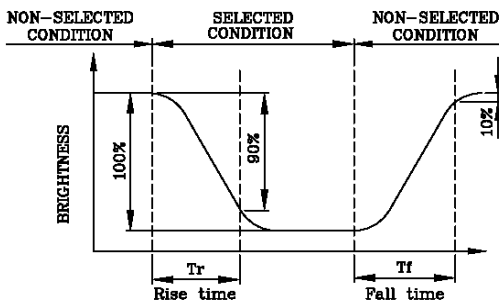
(negative type)

*Conditions

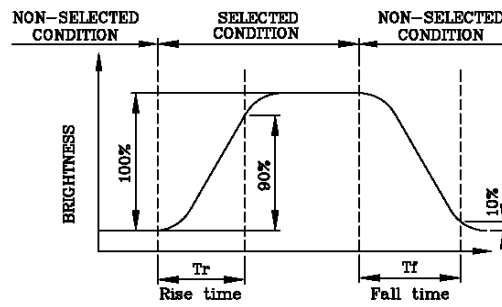
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



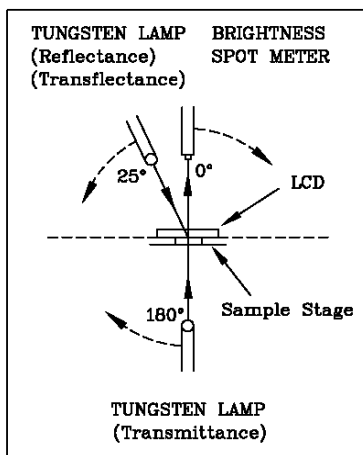
(negative type)

*Conditions

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

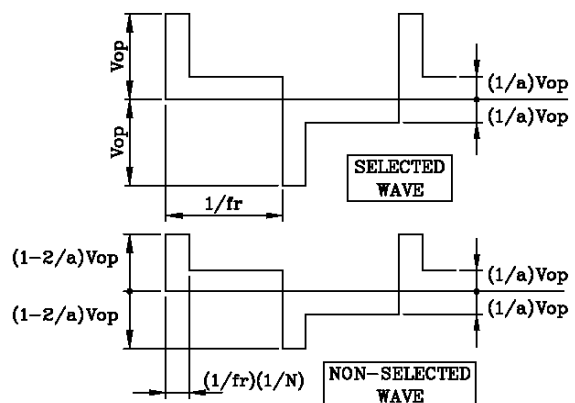
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



CONST.
TEMP.
CHAMBER

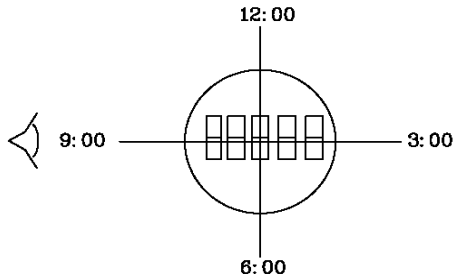
Multiplex Driving (1/N duty 1/a bias)





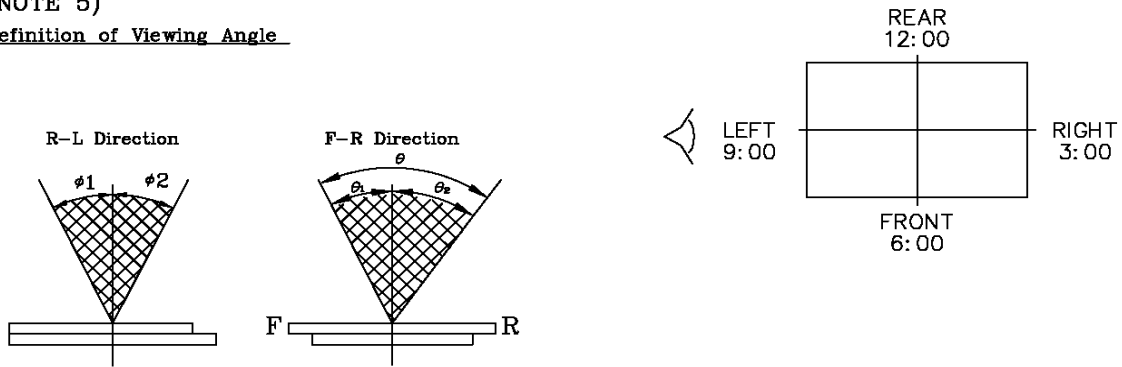
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



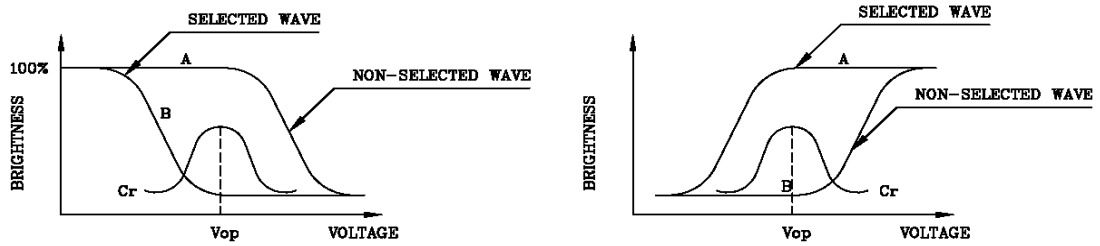
$$\phi = \phi_1 + \phi_2$$

*Conditions

- Operating Voltage : V_{op}
- 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)

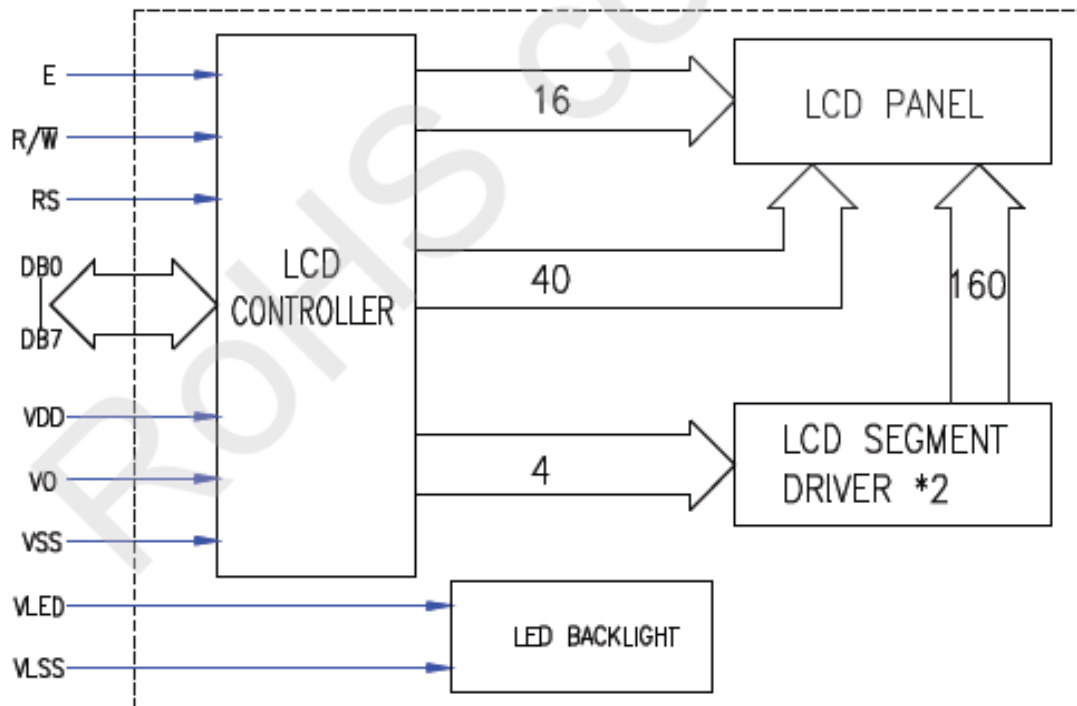
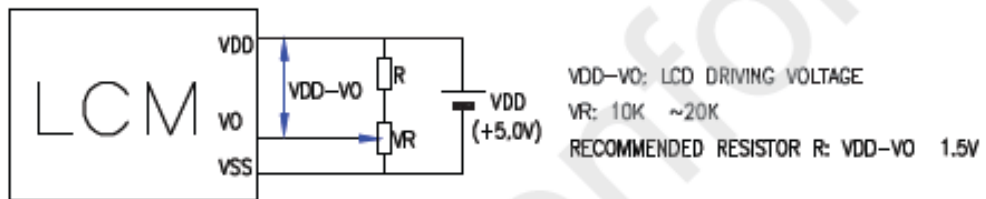
Contrast Ratio : $Cr=A/B$

*Conditions

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



3. BLOCK DIAGRAM





4. INTERNAL PIN CONNECTION

PIN No.	SYMBOL	FUNCTION	NOTE
1	V _{SS}	Ground (0V)	GND
2	V _{DD}	Power supply for Logic circuit	+5V
3	V ₀	Power supply for driving the LCD	
4	RS	Data/Instruction select	
5	R/W	Read/Write select	
6	E	Enable Signal	
7	DB0	Data Bus Line	
8	DB1	Data Bus Line	
9	DB2	Data Bus Line	
10	DB3	Data Bus Line	
11	DB4	Data Bus Line	
12	DB5	Data Bus Line	
13	DB6	Data Bus Line	
14	DB7	Data Bus Line	
15	VLED+	LED Backlight(+)	+5V
16	VLED-	LED Backlight(-)	GND



5. TIMING CHARACTERISTICS

MODE	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Write Mode (Fig. 1)	E Cycle Time	Tc	1000			
	E Rise / Fall Time	Tr, Tf				
	E Pulse Width (High, Low)	Tw				
	R/W and RS setup Time	Tsu1				
	R/W and RS hold Time	Th1				
	Data Setup Time	Tsu2				
	Data Hold Time	Th2				
Read Mode (Fig. 2)	E Cycle Time	Tc				
	E Rise / Fall Time	Tr, Tf				
	E Pulse Width (High, Low)	Tw				
	R/W and RS setup Time	Tsu				
	R/W and RS hold Time	Th				
	Data Setup Time	Td				
	Data Hold Time	Tdh				
Interface Mode with Extension Driver (Fig. 3)	Clock Pulse Width (High, Low)	Tw				
	Clock Rise / Fall Time	Tr, Tf				
	Clock Setup Time	Tsu1				
	Data Setup Time	Tsu2				
	Data Hold Time	Td				
	M Delay Time	Tdh				

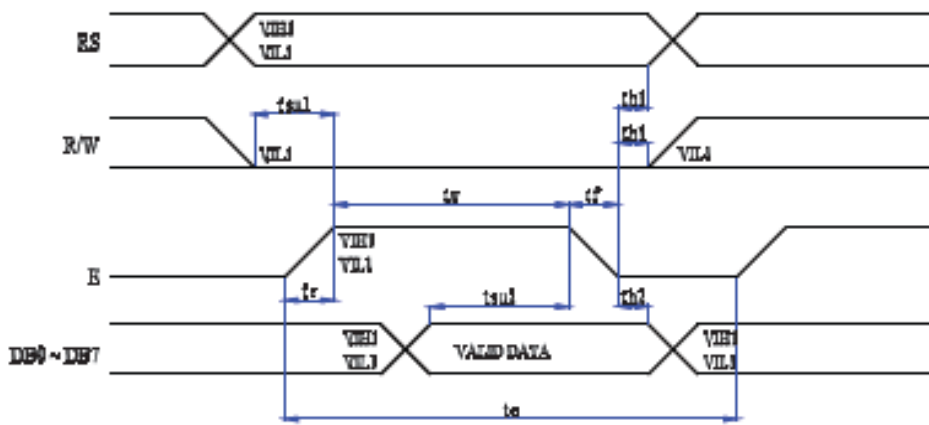


Figure 1. Write Mode Timing Diagram

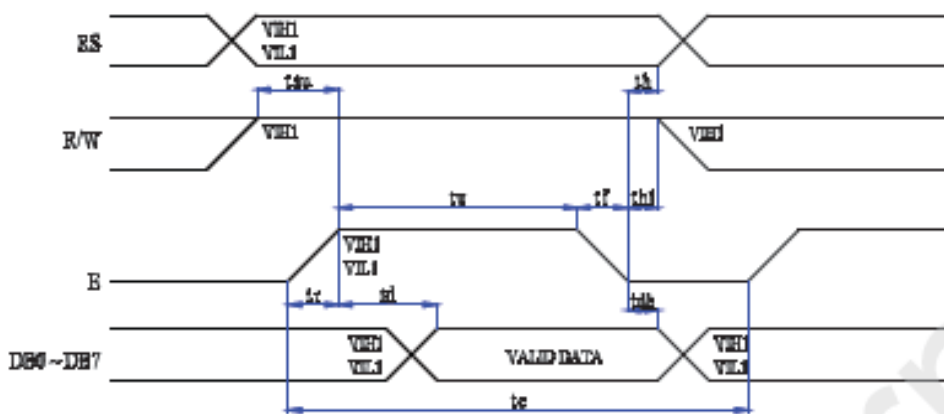


Figure 2. Read Mode Timing Diagram

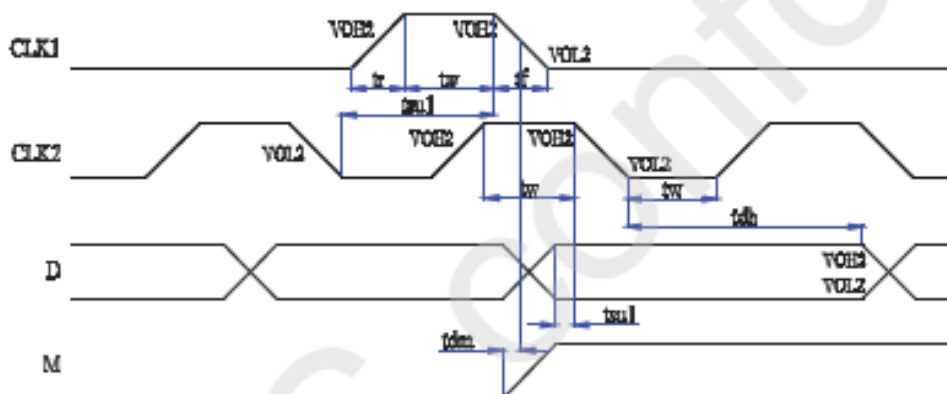


Figure 3. Interface Mode with Extension Driver Timing Diagram



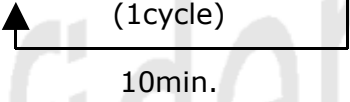
6. FUNCTION DESCRIPTION

INSTRUCTION	INSTRUCTION CODE										DESCRIPTION INSTRUCTION CODE	EXECUTION TIME (fosc=270kHz)	
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0			
Clear Display	0	0	0	0	0	0	0	0	0	0	1	Write „20H“ to DDRAM, and set DDRAM address to „00H“ from AC.	
Return Home	0	0	0	0	0	0	0	0	0	1	X	Set DDRAM address to „00H“ from AC and return cursor to its original position if shifted	
Entry mode set	0	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and make shift of entire display	
Display ON/OFF control	0	0	0	0	0	0	0	1	D	C	B	Set display (D), cursor(C), and blinking of cursor (B) on/off control bit.	
Cursor or Display shift	0	0	0	0	0	0	1	S/C	R/L	X	X	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	
Function Set	0	0	0	0	0	1	DL	N	F	X	X	Set interface data length (DL:4-bit/8-bit), numbers of display line (N:1-line/2-line), display font type (F:5x8dots/5x11dots)	
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0		Set CGRAM address in address counter	
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0		Set DDRAM address in address counter	
Read busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0		Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0		Write data into internal RAM (DDRAM/CGRAM).	
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0		Read data from internal RAM (DDRAM/CGRAM)	



7. RELIABILITY TEST

7.1 TEST CONDITION

No.	Item	Condition		Standard	Note
1	High temp. storage	80°C	200 Hrs	Appearance without defect	
2	Low temp. storage	-30°C	200 Hrs		
3	High temp. & High humi. storage	60°C 90%RH	96 Hrs		
4	High temp. operating display	70°C	200 Hrs		
5	Low temp. operating display	-20°C	200 Hrs		
7	Thermal shock	-20°C, 50min. → 70°C, 50min. (1cycle)  10min.			

7.2 INSPECTION PROVISION

For the inspection provision please refer to the document:

„Reliability_Test_LCDX“



8. DRAWING

Pin Connections

Pin No	Signal
1	VSS
2	VDD
3	V0
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB6
13	DB6
14	DB7
15	VLED+
16	VLED-

DISPLAY PATTERN

Display Data Address

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Line 1	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	91	92	93			
Line 2	00	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF	D0	D1	D2	D3			
Line 3	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F	A0	A1	A2	A3	A4	A5	A6	A7			
Line 4	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF	ED	EE	EF	F0	F1	F2	F3	F4	F5	F6	F7

NOTES:

1. DISPLAY TYPE: STN, YELLOW-GREEN MODE, TRANSELECTIVE/POSITIVE.
2. DRIVER METHOD: 1/16DUTY; 1/5BIAS; VDD=5.0V, VOP=4.2V.
3. VIEWING DIRECTION: 6 O'CLOCK.
4. DRIVER: KS0066U AND KS0063B OR EQUIVALENT
5. OPERATING TEMP: -20°C ~ +70°C.
6. STORAGE TEMP: -30°C ~ +80°C.
7. LED BACKLIGHT: YELLOW-GREEN(BOTTOM), VLED+ - VLED=-5.0V.
8. ALL UNMARKED TOLERANCES: ±0.5mm
9. RgHS COMPLIANT

CUSTOMER APL	DATE	TITLE	MODULE
DRAWN		SCALE	
DFTG CHK		UNIT	mm
ENGR CHK			
APPROVAL			
NLC20x4x05CSCD			DWG NO 00
VERSION			MODIFY CONTENT
			PAGE 1/10