

LCD Module

RoHS

NLC132CG032ATJ

(Status: January 2010)

Preliminary

Specification V1.0

Approval of Specification

	Approved by	Date
Admatec	<i>Kellner</i>	18.01.2010
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	2010-01-18		First Issue	JR	CS



1. MECHANICAL DATA

NO.	ITEM	CONTENTS	UNIT
1	Product No.	NLC132CG032ATJ	
2	Module Size	55.0(W)*27.64(H)*MAX 2.0(T)	mm
3	Dot Size	0.350(W)*0.400(H)	mm
4	Dot Pitch	0.365(W)*0.415(H)	mm
5	Number of Dots	132(W)*32(H)	--
6	Duty // Bias	1/33 // 1/6	--
7	LCD Type	FSTN Positive	--
8	Rear Polarizer	Transmissive	--
9	Viewing Direction	06 O'clock	--
10	Backlight	Excluded	--
11	Controller	ST7565P	--
12	DC/DC Converter	Excluded	--
13	Touch Panel	Excluded	--
14	Weight	6 (Approx.)	g

Note:

NLC132CG032 A T J

Back Light
A: Excluded

Reflective/Transmissive
T: Transmissive

Mode/View Angle
J: Positive Mode, 6 o'clock



2. ABSOLUTE MAXIMUM RATINGS

2.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

VSS=0V

ITEM	SYMBOL	VALUE	UNIT	COMMENT
Power Supply for Logic	V _{DD}	3.6	V	---
LCD driver voltage	V _{LCD}	14.5	V	---

2.2 ENVIRONMENTAL MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-20°C	70°C	-30°C	80°C	



3. ELECTRICAL CHARACTERISTICS

(Ta=25°C)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V_{DD}	--	2.8	3.0	3.2	V
Supply current	I_{DD}	--	--	--	1.0	mA
Input Voltage	V_{IL}	--	V_{SS}	--	$0.2V_{DD}$	V
	V_{IH}	--	$0.8V_{DD}$	--	V_{DD}	V
Output Voltage	V_{OL}	$I_{OL}=0.5mA$	V_{SS}	--	$0.2V_{DD}$	V
	V_{OH}	$I_{OH}=0.5mA$	$0.8V_{DD}$	--	V_{DD}	V
Input leakage current	I_{IL}	$V_{IN}=0$ or V_{DD}	-1	--	1	μA
LCD driving voltage	V_{LCD}	Ta=25°C	7.0	7.2	7.4	V



4. OPTICAL CHARACTERISTICS

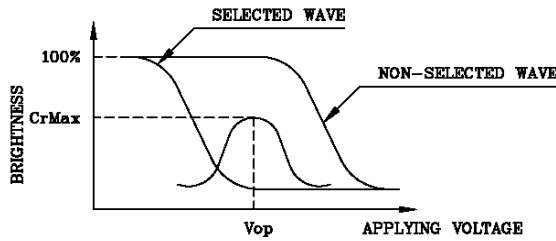
(Ambient Temperature 25°C)

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT
Response Time	Rise Time	Tr	--	120	400	ms
	Fall Time	Tf	--	105	400	
Operating Frequency		Fr	--	77	--	Hz
Contrast Ratio		Cr	2	7	--	--
Viewing Direction		6 o'clock				
Viewing Angle Cr≥2	12Hφ=90°	θ1	25	27	--	Deg
	6Hφ=270°	θ2	25	27	--	
	3Hφ=0°	θ3	25	30	--	
	9Hφ=180°	θ4	25	30	--	
Current consumption			--	5.5	8.3	μA
Capacitance			--	2.0	--	nF

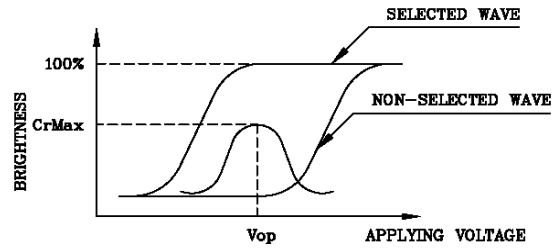


(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



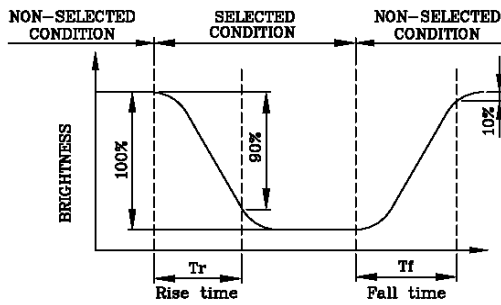
(negative type)

*Conditions

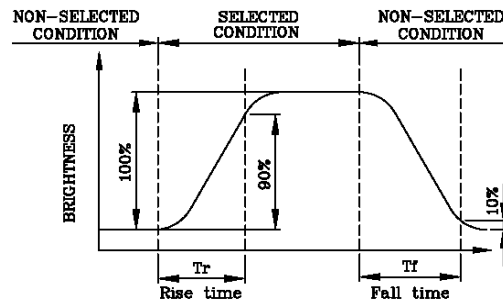
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



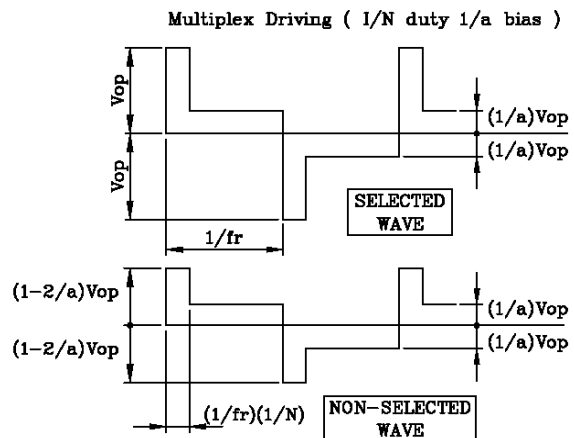
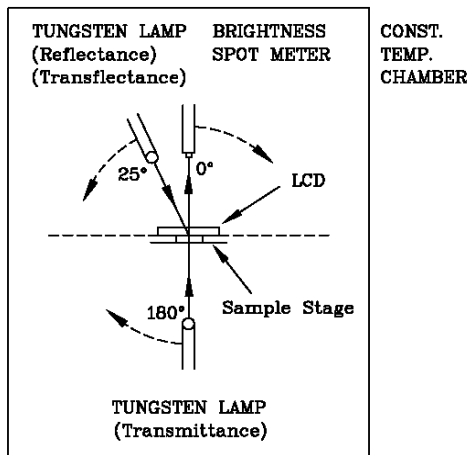
(negative type)

*Conditions

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

(NOTE 3)

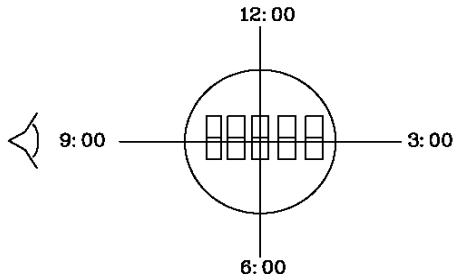
Description of Measuring Equipment and Driving Waveforms





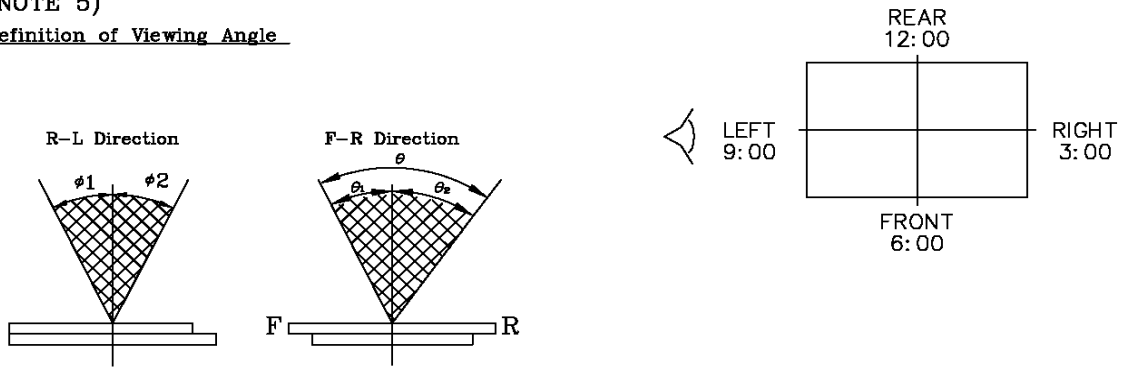
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



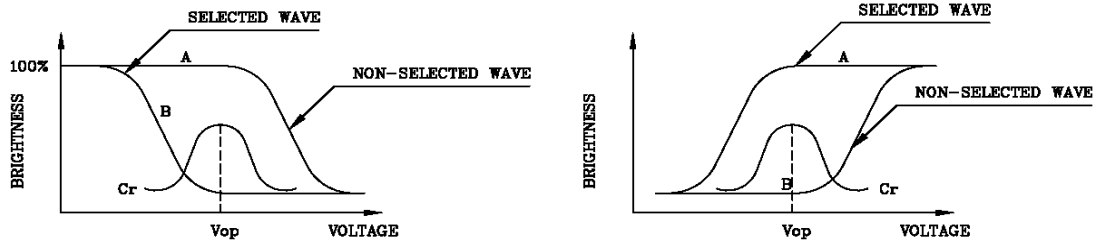
$$\phi = \phi_1 + \phi_2$$

*Conditions

Operating Voltage : 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)

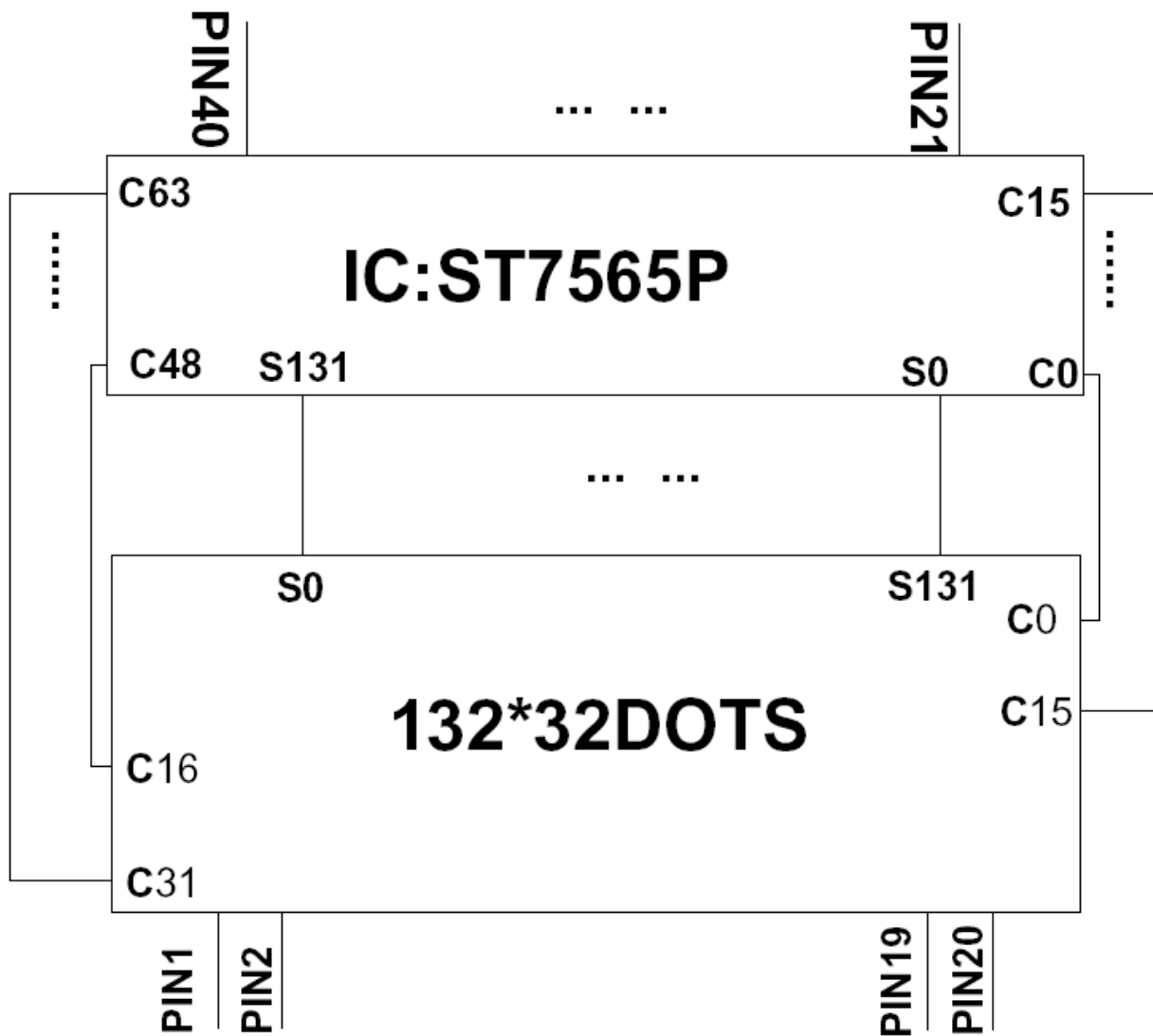
Contrast Ratio : $Cr=A/B$

*Conditions

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



5. BLOCK DIAGRAM



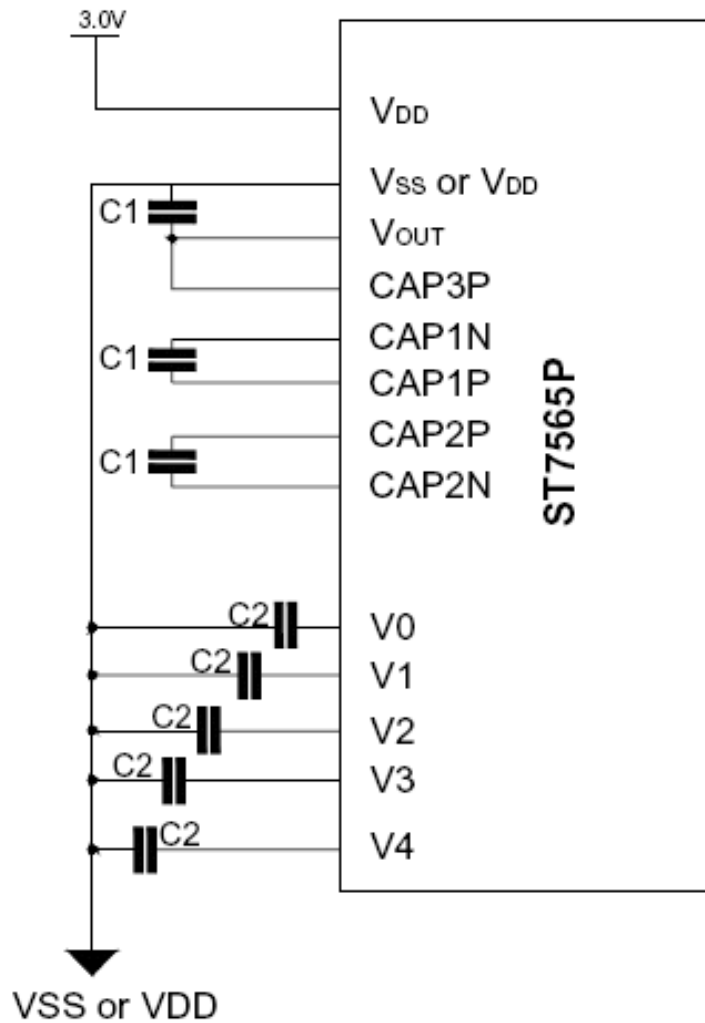


6. INTERNAL PIN CONNECTION

PIN No.	SYMBOL	FUNCTION
1	NC	Not connection PIN
2	NC	Not connection PIN
19	NC	Not connection PIN
20	NC	Not connection PIN
21	V ₀	This is a multi-level power supply for the liquid crystal drive. The voltage Supply applied is determined by the liquid crystal cell, and is changed through the use of a resistive voltage divided or through changing the impedance using an op. Amp. Voltage levels are determined based on V _{SS} , and must maintain the relative magnitudes shown below.
22	V ₁	
23	V ₂	
24	V ₃	
25	V ₄	
25	V ₄	$V_0 \geq V_1 \geq V_2 \geq V_3 \geq V_4 \geq V_{SS}$
26	V _{SS}	Ground
27	CAP2N	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2P terminal.
28	CAP2P	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2N terminal.
29	CAP1P	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
30	CAP1N	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1P terminal.
31	CAP3P	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
32	VOUT	DC/DC voltage converter. Connect a capacitor between this terminal and V _{SS} or V _{DD}
33	V _{SS}	Ground
34	V _{DD2}	Power supply
35	V _{DD}	Supply voltage for logic circuit
36	SI	Serial data input
37	SCL	The serial clock input
38	A0	This is connect to the least significant bit of the normal MPU address bus, and it determines whether the data bits are data or command. A0="H": Indicates that D0 to D7 are display data. A0="L": Indicates that D0 to D7 are control data.
39	/RES	When /RES is set to "L", the register are initialized (cleared). The reset operation is performed by the /RES signal level.
40	/CS1	This is the clip select signal. When /CS1="L" and CS2="H", then the chip select becomes active, and data/command I/O is enabled.



7. POWER SUPPLY



3X Voltage booster circuit

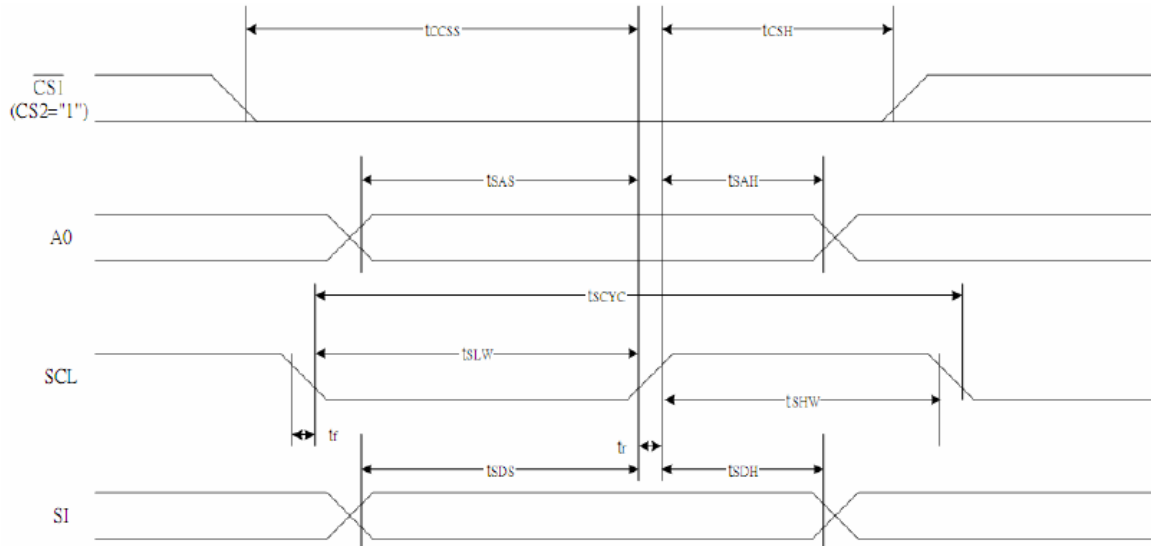
$$V_{LCD} = V_0 - V_{SS}$$

$C1 = 1.0 \sim 4.7 \mu F; C2 = 0.1 \sim 4.7 \mu F$



8. TIMING CHARACTERISTICS

8.1 The serial Interface



(VDD=3.3V)

ITEM	SIGNAL	SYMBOL	MIN.	MAX.	UNIT
Serial clock period	SCL	Tscyc	50	--	ns
SCL „H“ pulse width		Tshw	25	--	
SCL „L“ pulse width		Tslw	25	--	
Address setup time	A0	Tsas	20	--	
Address hold time		Tsah	10	--	
Data setup time	SI	Tds	20	--	
Data hold time		Tsdh	10	--	
CS-SCL time	CS	Tcss	20	--	
CS-SCL time		Tcsh	40	--	

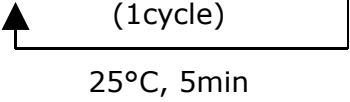
(VDD=2.7V)

ITEM	SIGNAL	SYMBOL	MIN.	MAX.	UNIT
Serial clock period	SCL	Tscyc	100	--	ns
SCL „H“ pulse width		Tshw	50	--	
SCL „L“ pulse width		Tslw	50	--	
Address setup time	A0	Tsas	30	--	
Address hold time		Tsah	20	--	
Data setup time	SI	Tds	30	--	
Data hold time		Tsdh	20	--	
CS-SCL time	CS	Tcss	30	--	
CS-SCL time		Tcsh	60	--	



9. RELIABILITY TEST

9.1 TEST CONDITION

No.	Item	Condition		Standard	Note
1	High temp. storage	80°C	240hrs	Appearance without defect	
2	Low temp. storage	70°C	240hrs		
3	High temp. & High humi. storage	-30°C	240hrs		
4	High temp. operating display	-20°C	240hrs		
5	Low temp. operating display	40°C 90%RH	240hrs		
6	Thermal shock	-30°C, 60min. → 80°C, 60min.  (1cycle) 25°C, 5min			

9.1 INSPECTION PROVISION

For the inspection provision please refer to the document:

„Reliability_Test_LCDX“



10. DRAWING

