DISPLAY Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 320240B FGH-PW

3,8” (¼-VGA)

Product specification ***Version :0***

06/Apr/2006

GENERAL SPECIFICATION

MODULE NO. :

DEM320240B FGH-PW

CUSTOMER P/N

VERSION NO.	CHANGE DESCRIPTION	DATE
0	ORIGINAL VERSION	06-04-2006

PREPARED BY: HZZ DATE: 06.04.2006

APPROVED BY: MH DATE: 02.08.2006

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1. FUNCTIONS &FEATURES

- LCD TYPE:

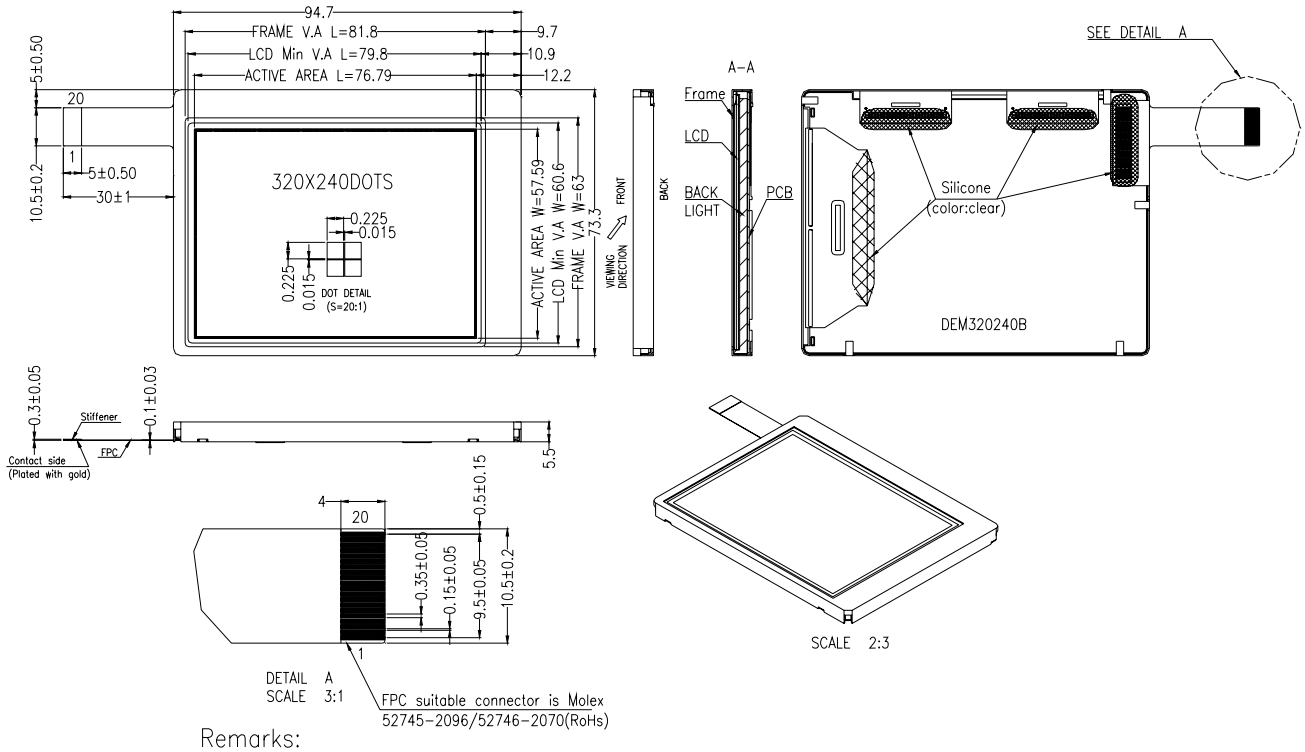
MODULE NAME	LCD TYPE	OPTICS
DEM 320240B FGH-PW	FSTN Transflective Positive Mode	Black dots, white background

- Viewing Direction : 6 o'clock
- Driving Scheme : 1/240 Duty, 1/13 Bias,
- Supply voltage : 3.3 Volt (typ.)
- V_{LCD} : 22.7 Volt (typ.)
- Backlight color : LED, white, Lightguide
- Interface : Parallel
- Drive IC : NT7701 and NT7702

2. MODULE ARTWORK

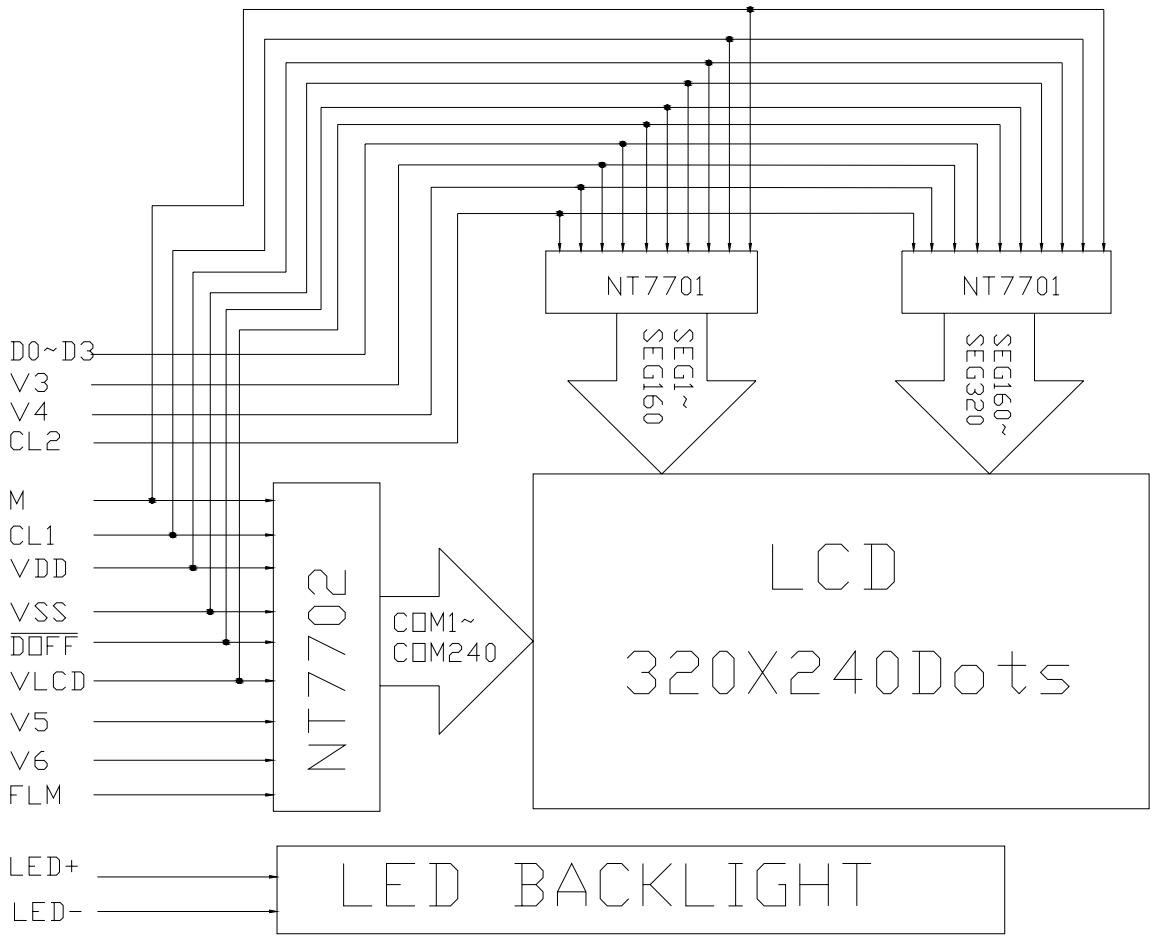
- Module size : 124.7 x 73.3 x 5.5 mm
- Metal frame Viewing Area : 81.8 x 63.0 mm
- LCD Viewing Area : 79.8 x 60.6 mm
- Dot Pitch : : 0.24 x 0.24 mm
- Dot Size : 0.225 x 0.225 mm
- Dot Gap : 0.015 mm

3. EXTERNAL DIMENSIONS



Remarks:
1,Unmarked tolerance is ±0.30;
2,All material comply with RoHs.

4. BLOCK DIAGRAM



5. PIN ASSIGNMENT

PIN NUMBER	SYMBOL	FUNCTION
1	FLM	Frame start signal data signal of the shift register of the com driver
2	V6	Bias voltage for non-select (com driver)
3	VDD	Power supply for logic
4	V5	Bias voltage for non-select (com driver)
5	/DOFF	Hi: Display on; Low: Display off
6	VSS	Ground
7	M	Switch signal to convert LCD driver waveform into AC
8	CL1	1) Latch pulse of display data 2) Shift clock for com driver
9	VLCD	Power supply for LCD
10	V3	Bias voltage for non-select (seg driver)
11	VDD	Power supply for logic
12	V4	Bias voltage for non-select (seg driver)
13	VSS	Ground
14	CL2	Clock pulse for seg shift
15~18	D0~D3	Input data signal
19	VLED(+)	Power supply for LED backlight
20	VLED(-)	Power supply for LED backlight

6. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Unit	Note
Supply voltage Logic	VDD	-0.3	7.0	V	-
Input voltage	--	-0.3	VDD+0.3	V	-
Supply voltage Vo	Vlcd	-0.3	30		-
Operating Temperature	---	-20	+70	ºC	-
Storage temperature	--	-30	+80	ºC	-

7. BACKLIGHT ELECTRICAL/OPTICAL SPECIFICATIONS

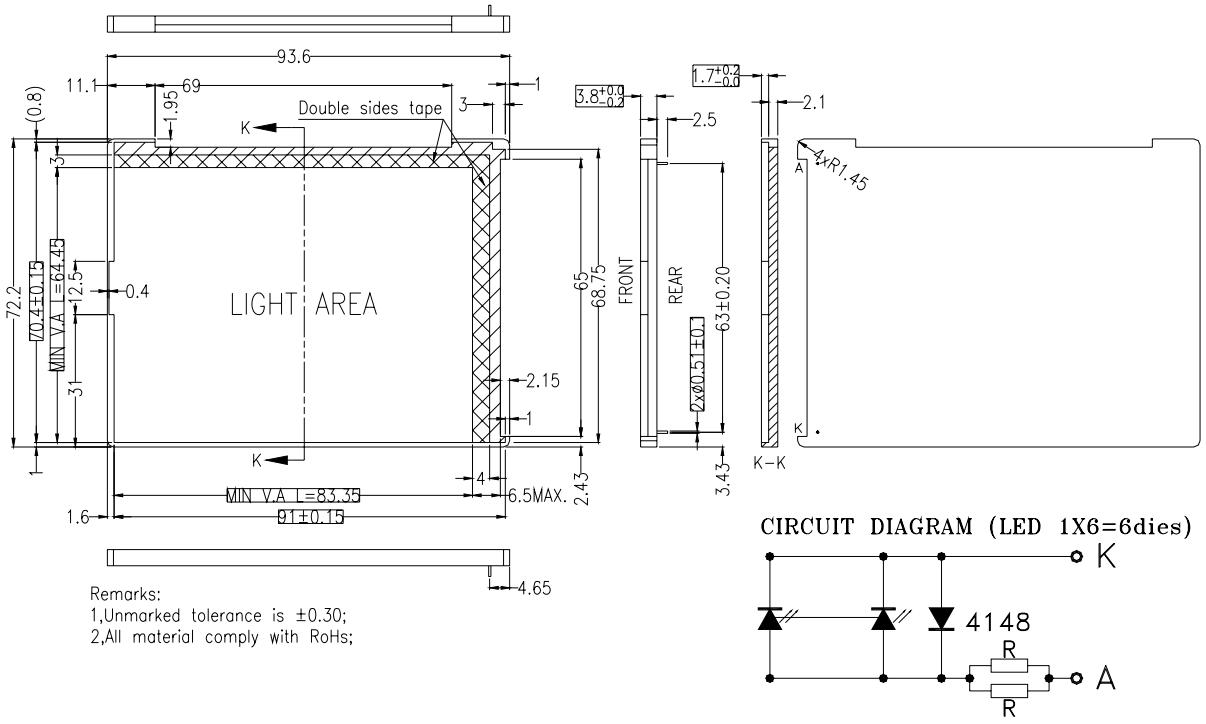
7.1 Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Conditions	Rating	Unit
Absolute Maximum Forward Current	Ifm		150	mA
Peak Forward Current	Ifp	1 msec Plus 10% Duty Cycle	360	mA
Reverse Voltage	Vr		1	V
Power Dissipation	Pd		450	mW

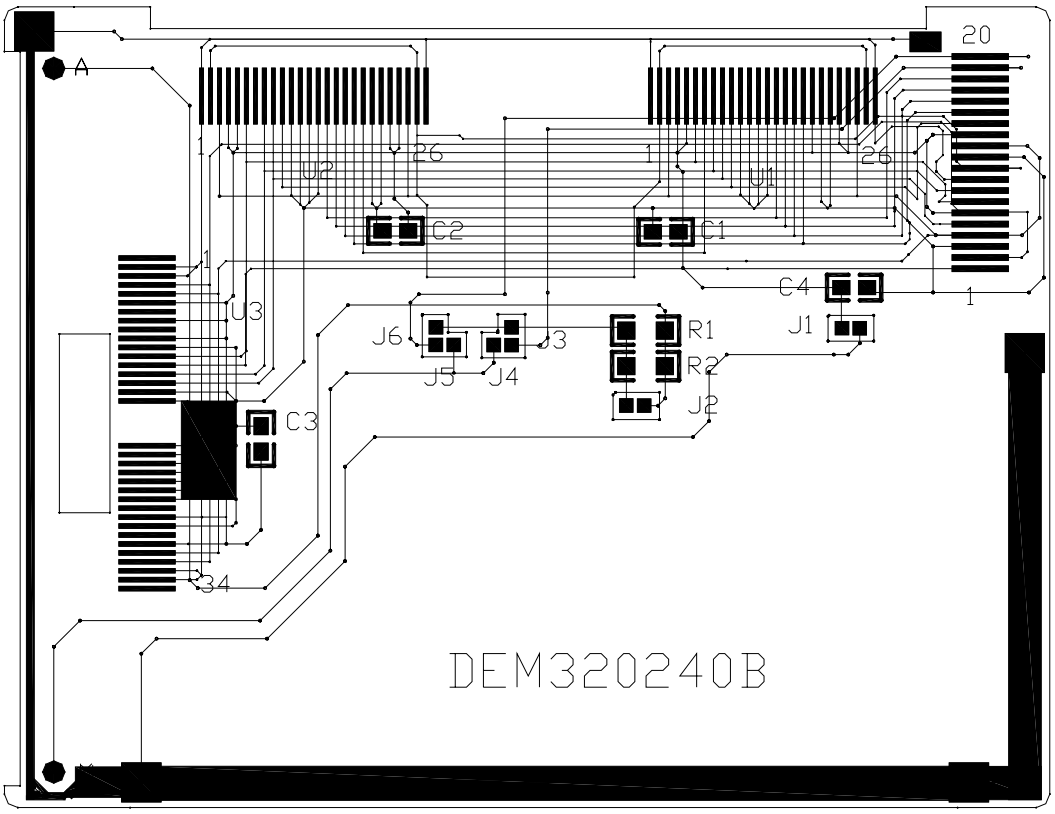
7.2 Backlight Electro/Optical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Condifion
Forward Voltage	Vf	3.7	4.0	4.3	V	If=90mA
Reverse Current	Ir			50	uA	Vr=0.8V
Peak Wave Length	λ p				nm	If=90mA
Spectral Line Half Width	Δ λ				nm	If=90mA
Luminance	Lv	110			cd/m^2	If=90mA
Backlight Color	White					

7.3 Backlight Drawing



8. PCB DRAWING AND DESCRIPTION



8-1.DESCRIPTION:

8-1-1.The polarity of the pin 19 and the pin 20:

symbol / state	symbol	J3,J5	J6, J4	LED Polarity	
				19Pin	20Pin
J3,J5	Each solder-bridge	Each closed	Each open	Anode	Cathode
J6,J4	Each solder-bridge	Each open	Each closed	Cathode	Anode

Note: In application module, J3=J5 = closed, J4=J6= open.

8-1-2. The J1 is frame-GND to module GND.

Note: In application module, J1= closed,

8-1-3.The LED resistor can be bridged when J2 is closed

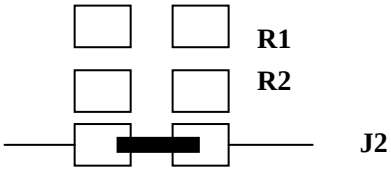
Note: In application module, J2=open

8-1-4.The R1 and R2 are the LED resistors.

Note: In application module, R1=10 Ohm; R2=open

8-2 Example application

8-2-1. The LED resistor should be bridged as following.



8-2-2. The 19 pin is the anode and the 20 pin is the cathode as following.

8-2-3.The 19 pin is the cathode and the 20 pin is the anode as following.

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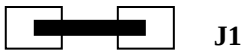
8-2-4.The frame is on ground as following



9. DC CHARACTERISTICS

(V_{SS}= 0V, Ta = -20 to +70ºC)

Parameter	Symbol	Min.	Typ	Max	Unit
Supply Voltage Logic	V_{DD}	2.5	3.3	5.5	V
Consumed current	I_i	---	TBD	---	mA
LCD driving voltage	--	15	22.5	30	V

10. AC CHARACTERISTICS

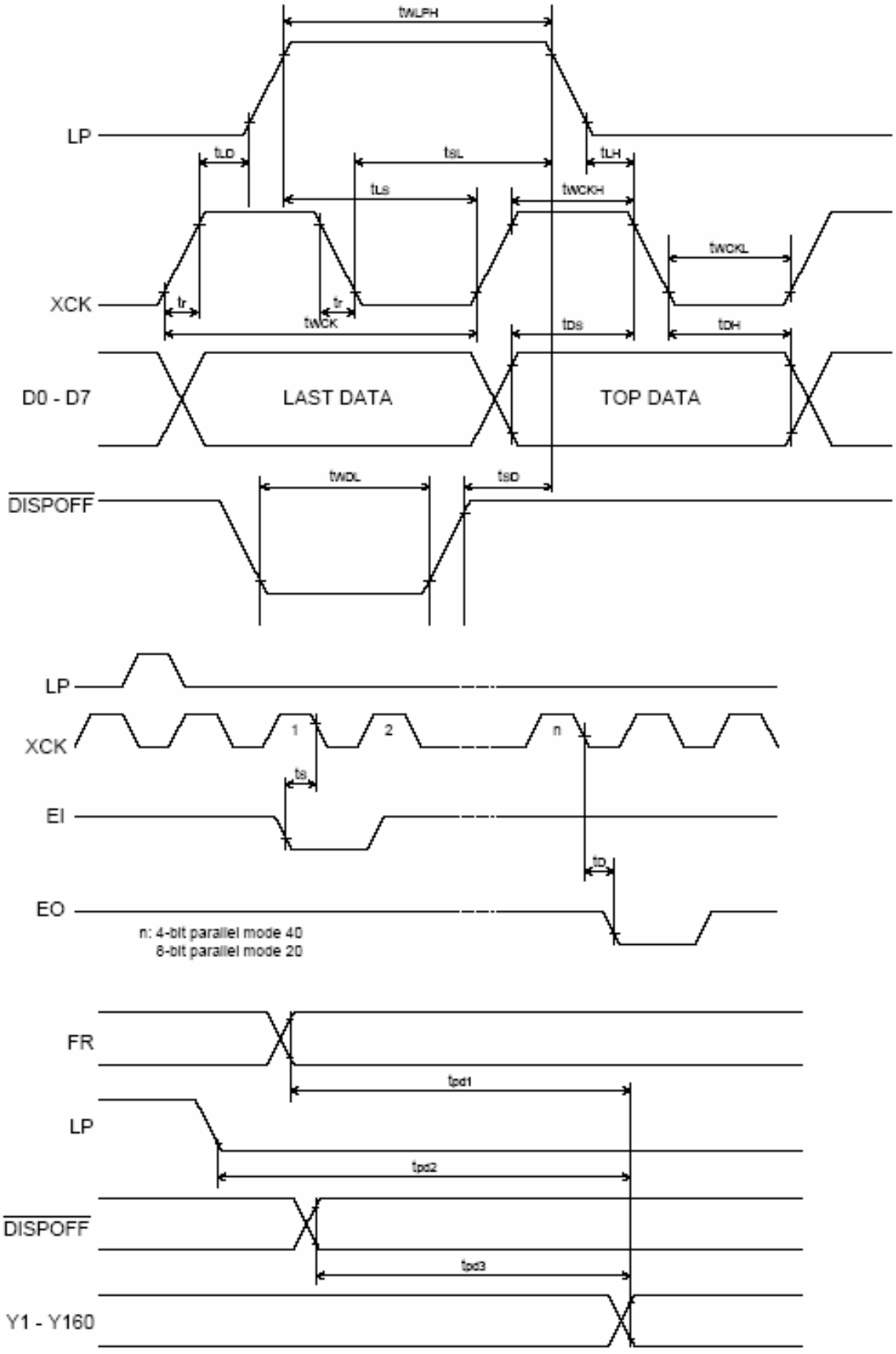
10.1. NT7701 Segment Mode AC Characteristics

(VSS=V5=0V, VDD=+2.5V to +4.5V, V0=+15 to +30V, Ta=-20~+70°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Shift clock period	t_{WCK}	125	-		ns	tr, tf ≦ 11ns, Note 1
Shift clock "H" pulse width	t_{WCKH}	51	-		ns	
Shift clock "L" pulse width	t_{WCKL}	51	-		ns	
Data setup time	t_{DS}	30	-		ns	
Data hole time	t_{DH}	40	-		ns	
Latch pulse "H" pulse width	t_{WLPH}	51	-		ns	
Shift clock rise to Latch pulse rise time	t_{LD}	0	-		ns	
Shift clock fall to Latch pulse fall time	t_{SL}	51	-		ns	
Latch pulse rise to Shift clock rise time	t_{LS}	51	-		ns	
Latch pulse fall to Shift clock fall time	t_{LH}	51	-		ns	
Input signal rise time	t_r		-	50	ns	Note 2
Input signal fall time	t_f		-	50	ns	Note 2
Enable setup time	t_S	36	-		ns	
$\overline{\text{DISPOFF}}$ Removal time	t_{SD}	100	-		ns	
$\overline{\text{DISPOFF}}$ enable pulse width	t_{WDL}	1.2	-		µs	
Output delay time (1)	t_D		-	78	ns	CL = 15pF
Output delay time (2)	t_{pd1}, t_{pd2}		-	1.2	µs	CL = 15pF
Output delay time (3)	t_{pd3}		-	1.2	µs	CL = 15pF

Note

1. Take the cascade connection into consideration.
2. (t_{CK} - t_{WCKH} - t_{WCKL})/2 is the maximum in the case of high speed operation.

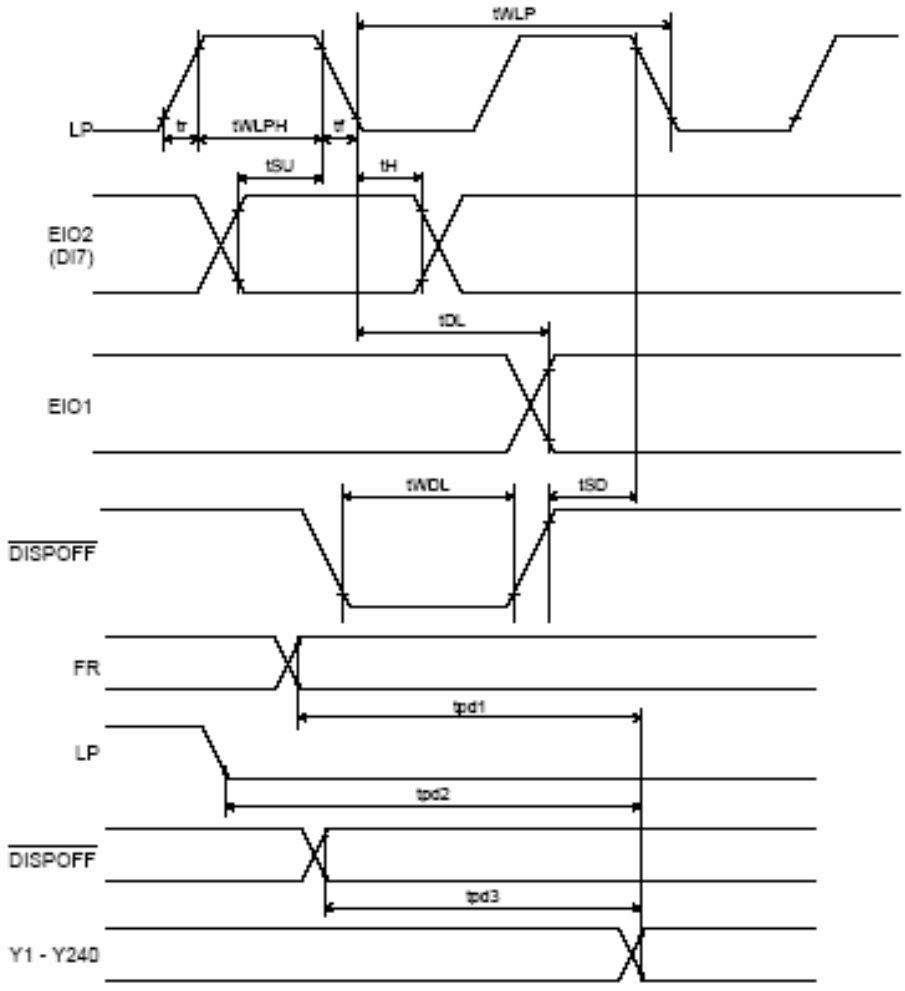


Timing Characteristics of segment Mode

10.2 NT7702 Common Mode AC Characteristics

(VSS=V5=0V, VDD=+2.5V to +4.5V, V0=+15 to +30V, Ta=-20~70°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Shift clock period	t_{WLP}	250	-	-	ns	tr, tf ≤ 20ns
Shift clock "H" pulse width	t_{WLPH}	15	-	-	ns	V_{DD} = +5.0V ± 10%
		30	-	-	ns	V_{DD} = +2.5 - +4.5V
Data setup time	t_{SU}	30	-	-	ns	
Data hole time	t_H	50	-	-	ns	
Input signal rise time	tr		-	50	ns	
Input signal fall time	tf		-	50	ns	
$\overline{DISPOFF}$ Removal time	t_{SD}	100	-	-	ns	
$\overline{DISPOFF}$ enable pulse width	t_{WDL}	1.2	-	-	µs	
Output delay time (1)	t_{DL}	-	-	200	ns	C_L = 15pF
Output delay time (2)	t_{pd1}, t_{pd2}	-	-	1.2	µs	C_L = 15pF
Output delay time (3)	t_{pd3}	-	-	1.2	µs	C_L = 15pF



Timing Characteristics of common Mode

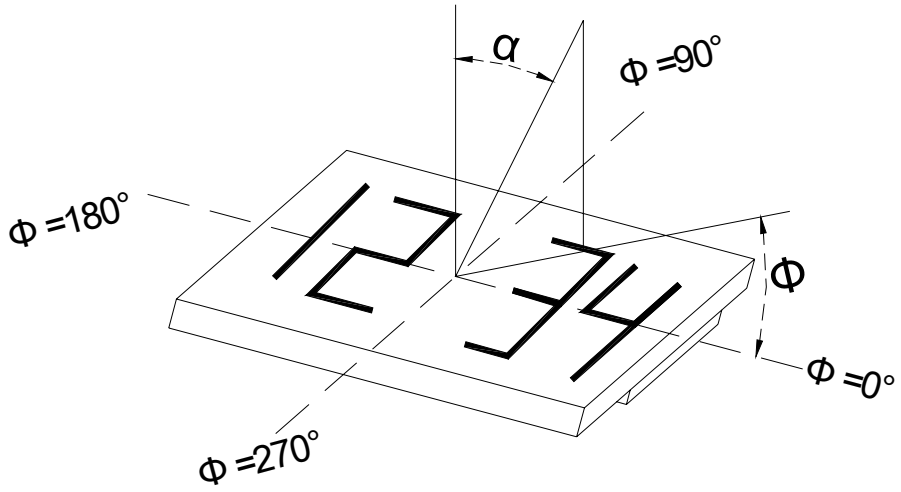
11. OPTICAL CHARACTERISTICS

11.1 Overall optical performance

Positive display

ITEM	SYMBOL	CONDITIONS	TYP.	UNIT	REMARKS
Viewing angles for Contrast Ratio CR > 3	α	Φ = 0° Φ = 90° Φ = 180° Φ = 270°	51 42 27 40	°	Transmissive operation

Definition of viewing angles Φ,α and contrast ratio □R

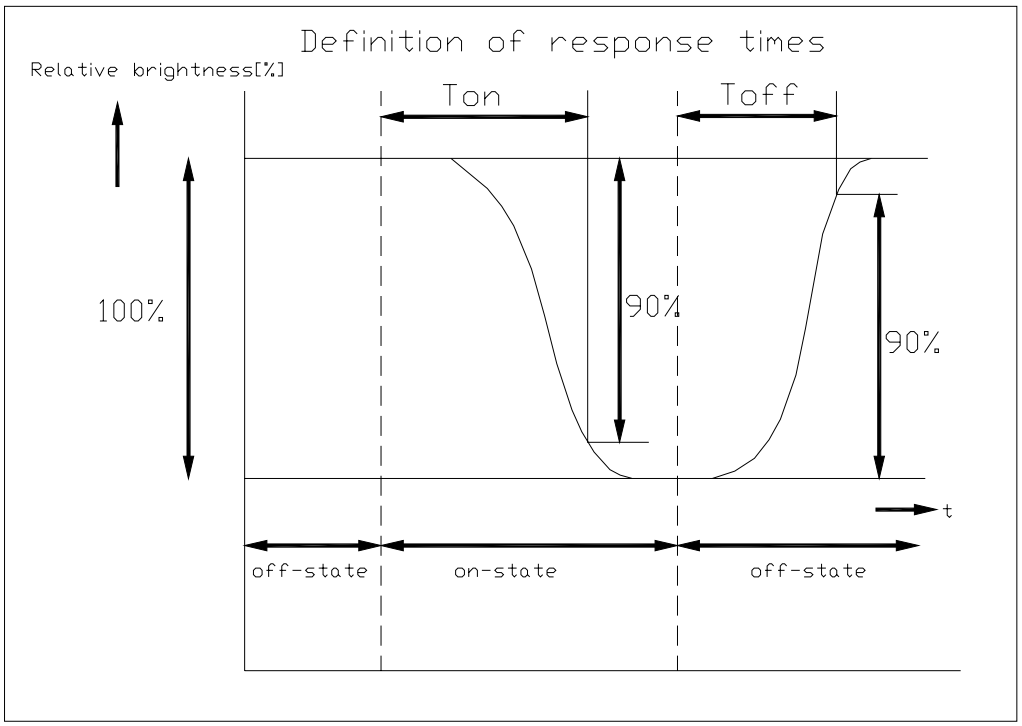


Contrast ratio □R = $\frac{\text{Brightness of □FF-segmebts}}{\text{Brightness of □N-segmebts}}$

11.2 Response times at different temperatures

Response times t_{on} and t_{off} are measured using simulated MUX at $f=f_{FRAME}$. Vop (+25°C) will be identical to Vop (+25°C) as specified for the viewing angles.

Item	Symbol	Conditions	Typ.	Max.	Unit	Remarks
Response Times	t_{on}	T_{amb}= +25°C	103.36		ms	α =0°, Φ = 0°
		0°C	371.078		ms	
		-20°C	207.969		ms	
	t_{off}	T_{amb}= +25°C	408.263		ms	
		0°C	1073.424		ms	
		-20°C	4109.318		ms	



12. LCD MODULES HANDLING PRECAUTIONS

- Please remove the protection foil of polarizer before using.

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.

- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.

- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
  -Be sure to ground the body when handling the LCD module.
  -Tools required for assembly, such as soldering irons, must be properly grounded.
  -To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
  -The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

- Storage precautions
  When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

13. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.

- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.

- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
  - Exposed area of the printed circuit board
  - Terminal electrode sections.