

Display Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 160160B FGH-PW

Product specification

Version : 0

31/Jan/2007

DOCUMENT REVISION HISTORY

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1. FUNCTIONS & FEATURES

Display-Format	: 160 x 160 Dots
LCD Mode	: FSTN / Transflective /Positive Mode
Viewing Direction	: 6 o'clock
Driving Scheme	: 1/160 Duty cycle, 1/12 Bias
Power Supply Voltage (V _{DD})	: 5.0 Volt (typ.)
LCD Driving Voltage (VLCD)	: 18.6 Volt (adjustable for best contrast)
Operation Temperature	: -20 ~ 70°C
Storage Temperature	: -25 ~ 85°C
LED Backlight Color	: White LED, Lightguide, 5 LEDs.

2. MECHANICAL SPECIFICATIONS

Module Size	: 71.0 x 74.0 x 6.8 mm (Not include FPC length)
Viewing Area	: 63.4 x 63.3 mm
Dot Pitch	: 0.35 x 0.35 mm
Dot Size	: 0.335 x 0.335 mm

3. BLOCK DIAGRAM

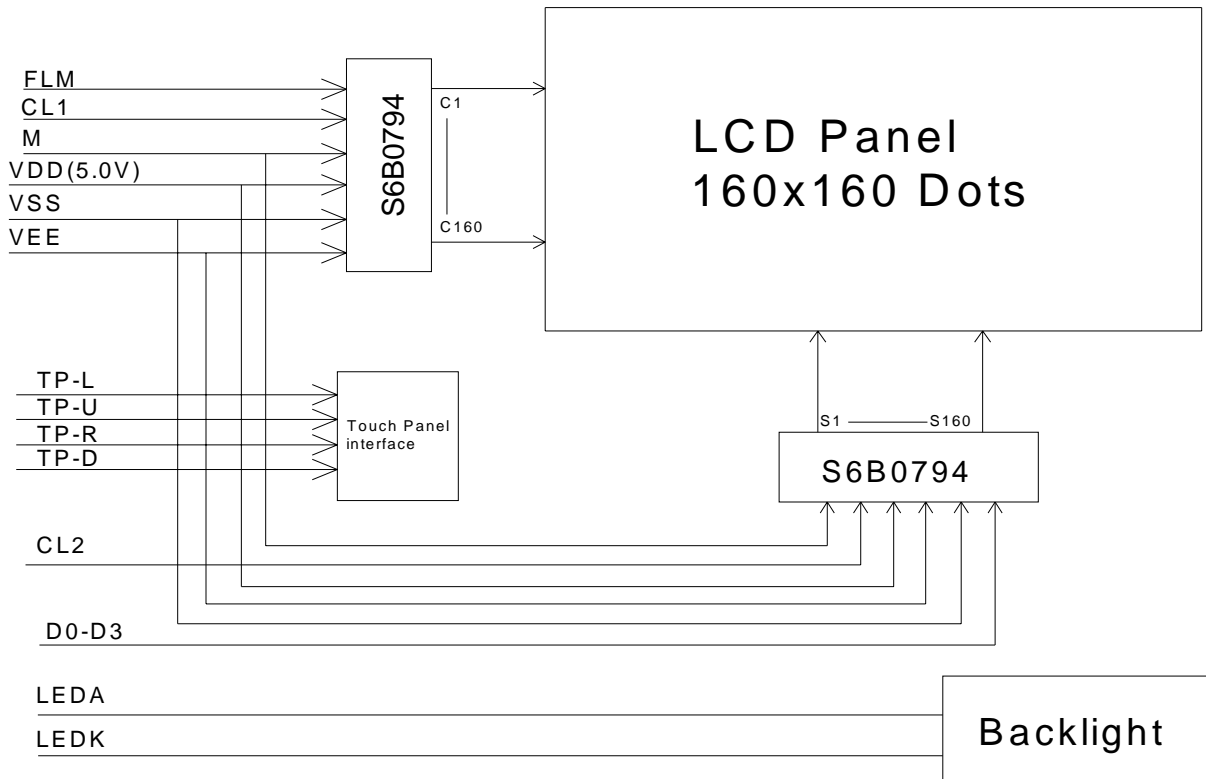
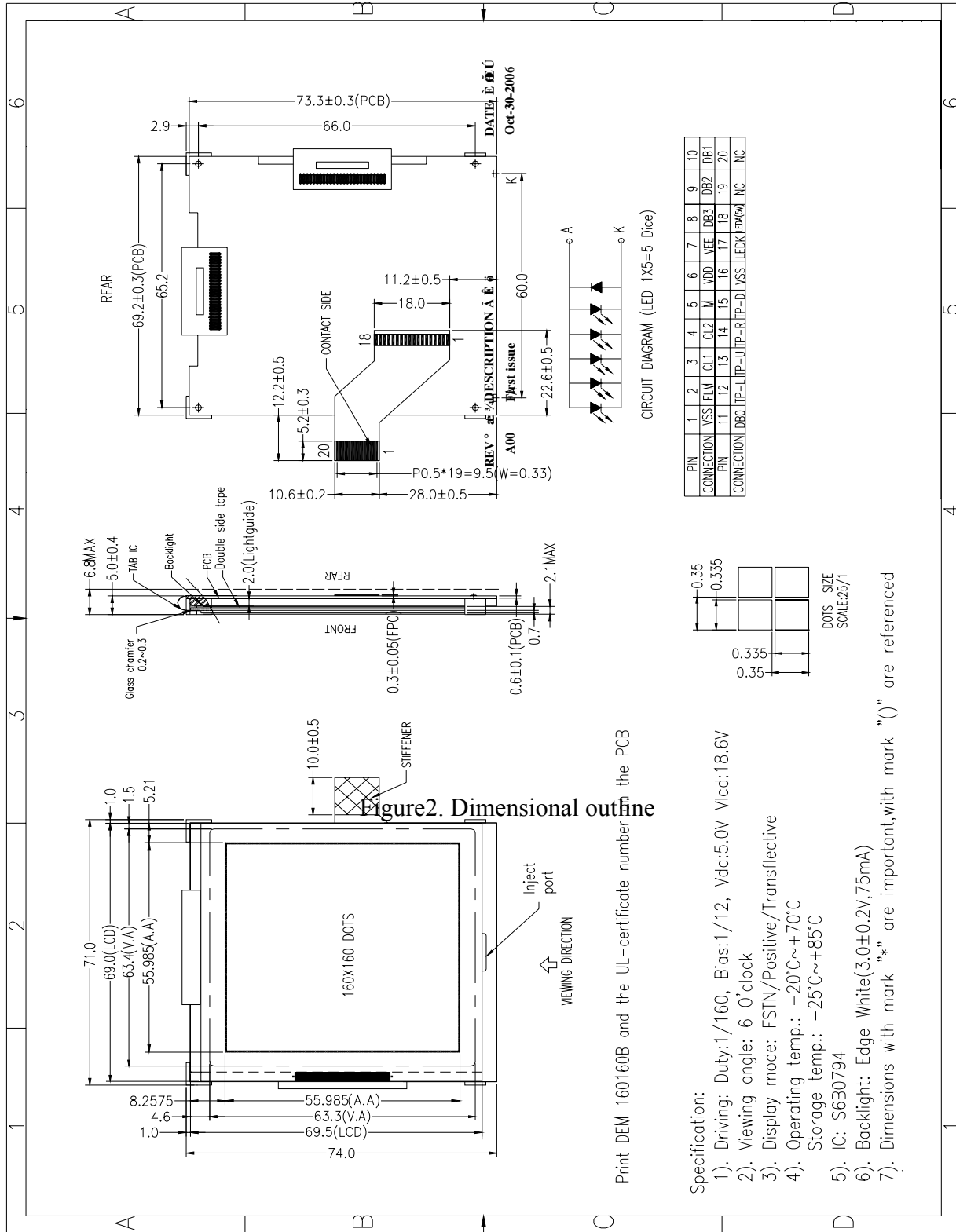


Figure1. Block diagram

4. DIMENSIONAL OUTLINE



5. PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	VSS	Power ground (0V)
2	FLM	Input/Output for chip select or data of shift register.
3	CL1	Latch pulse input/shift clock input for shift register.
4	CL2	Display Data shift clock input for segment mode.
5	M	AC-converting signal input for LC driver waveform.
6	VDD	Power supply for logic (+5.0V).
7	VEE	Power supply input for VLCD. (+20V).
8-11	D3-D0	Segment data input bus.
12	TP-L	Touch Panel interface
13	TP-U	
14	TP-R	
15	TP-D	
16	VSS	Power ground (0V).
17	LED- (K)	Power supply for backlight (0V)
18	LED+ (A)	Power supply for backlight (+5.0V)
19-20	NC	No connection.

6. MAXIMUM ABSOLUTE LIMIT

Parameter	Symbol	Conditions	Applicable pins	Ratings	Unit
Supply voltage (1)	V _{DD}	Ta=25 °C Referenced to V _{SS} (0V)	V _{DD}	-0.3 to +6.5	V
Supply voltage (2)	V ₀		V _{0L} , V _{0R}	-0.3 to +35	V
	V ₁₂		V _{12L} , V _{12R}	-0.3 to V ₀ +0.3	V
	V ₄₃		V _{43L} , V _{43R}	-0.3 to V ₀ +0.3	V
	V ₅		V _{5L} , V _{5R}	-0.3 to V ₀ +0.3	V
Input voltage	V ₁		D _{I0} -D _{I7} , X _{CK} , L _P , L/ _R , M _D , S/ _C , E _{IO1} , E _{IO2} , D _{ISPOFFB}	-0.3 to V _{DD} +0.3	V
Storage temperature	T _{STG}			-45 to 125	°C

Parameter	Symbol	Conditions	Applicable pins	Min.	Typ.	Max.	Unit
Supply voltage (1)	V _{DD}	Referenced to V _{SS} (0V)	V _{DD}	+2.4		+5.5	V
Supply voltage (2)	V ₀		V _{0L} , V _{0R}	+15		+32	V
Operating temperature	T _{OPR}			-20		+85	°C

7. DC CHARACTERISTICS

Segment Mode

(V_{SS}=V₅=0V, V_{DD}=+2.4 to 5.5V, V₀=+15 to +32V, Ta=-20~85°C)

Parameter	Symbol	Conditions	Applicable pins	Min.	Typ.	Max.	Unit
Input voltage	V _{IH}		D _{I0} -D _{I7} , X _{CK} , L _P , L/ _R , F _R , M _D , S/ _C , E _{IO1} , E _{IO2} , D _{ISPOFFB}	0.8V _{DD}			V
	V _{IL}					0.2V _{DD}	V
Output voltage	V _{OH}	I _{OH} =-0.4mA	E _{IO1} , E _{IO2}	V _{DD} -0.4			V
	V _{OL}	I _{OL} =+0.4mA				+0.4	V
Input leakage current	I _{LIH}	V _I =V _{DD}	D _{I0} -D _{I7} , X _{CK} , L _P , L/ _R , F _R , M _D , S/ _C , E _{IO1} , E _{IO2} , D _{ISPOFFB}			+10	uA
	I _{LIL}	V _I =V _{SS}				-10	uA
Output resistance	R _{ON}	ΔV _{ON} =0.5V	Y ₁ - Y ₁₆₀		1.0	1.5	kΩ
					1.5	2.0	
Stand-by current	I _{STB}	*1	V _{SS}			50.0	uA
Consumed current(1) (Deselection)	I _{DD1}	*2	V _{DD}			2.0	mA
Consumed current(2) (Selection)	I _{DD2}	*3	V _{DD}			8.0	mA
Consumed current	I ₀	*4	V ₀			1.0	mA

NOTE : *1 V_{DD}=+5V, V₀=+32V, V_I=V_{SS}

*2 V_{DD}=+5V, V₀=+32V, f_{XCK}=14MHz, No-load, E_I=V_{DD}

The input data is turned over by data taking clock (4-bit parallel input mode)

*3 V_{DD}=+5V, V₀=+32V, f_{XCK}=14MHz, No-load, E_I=V_{SS}

The input data is turned over by data taking clock (4-bit parallel input mode)

*4 V_{DD}=+5V, V₀=+32V, f_{XCK}=14MHz, f_{LP}=25.6kHz, f_{FR}=80Hz, No-load

The input data is turned over by data taking clock (4-bit parallel input mode)

Common Mode

(V_{SS}=V_S=0V, V_{DD}=+2.4 to 5.5V, V₀=+15 to +32V, T_a=-20~85°C)

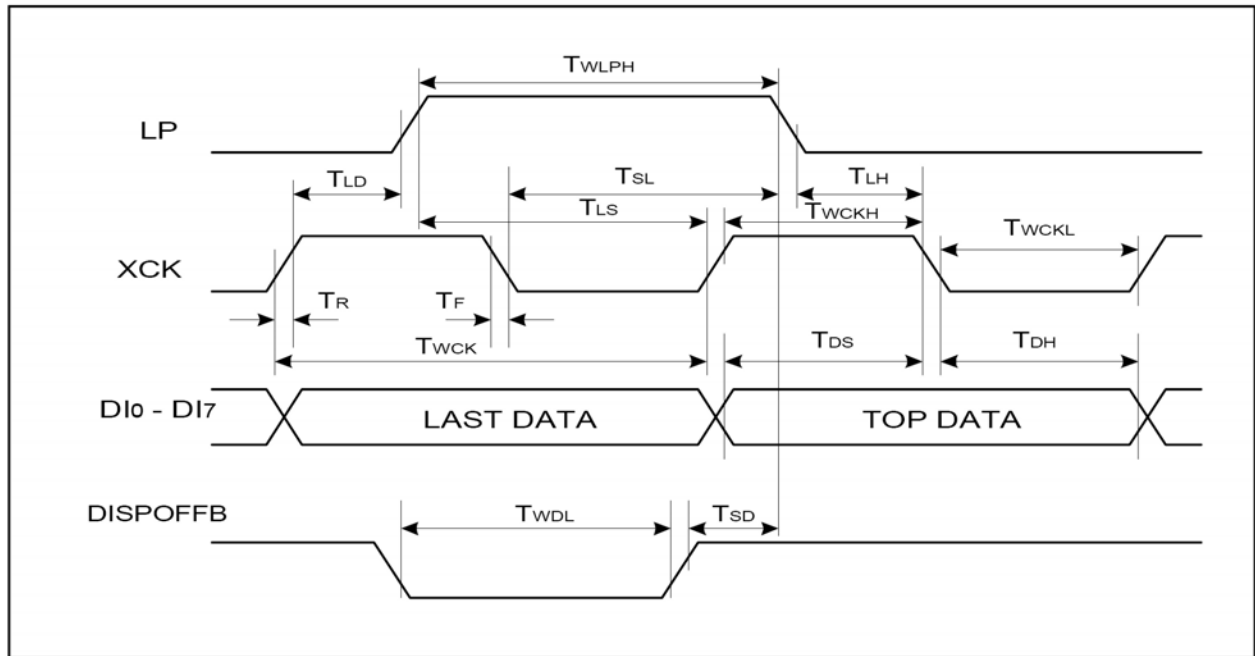
Parameter	Symbol	Conditions	Applicable pins	Min.	Typ.	Max.	Unit
Input voltage	V _{IH}		DI ₀ -DI ₇ , XCK, LP, L/R, FR, MD, S/C, EIO ₁ , EIO ₂ , DISPOFFB	0.8V _{DD}			V
	V _{IL}					0.2V _{DD}	V
Output voltage	V _{OH}	I _{OH} =-0.4mA	EIO ₁ , EIO ₂	V _{DD} -0.4			V
	V _{OL}	I _{OL} =+0.4mA				+0.4	V
Input leakage current	I _{LIH}	V _I =V _{DD}	DI ₀ -DI ₇ , XCK, LP, L/R, FR, MD, S/C, EIO ₁ , EIO ₂ , DISPOFFB			+10	uA
	I _{LIL}	V _I =V _{SS}				-10	uA
Output resistance	R _{ON}	ΔV _{ON} =0.5V	Y ₁ - Y ₁₆₀		1.0	1.5	kΩ
					1.5	2.0	
Input pull-down current	I _{PD}	V _I =V _{DD}	XCK, EIO ₁ , EIO ₂ , DI ₇			100.0	uA
Stand-by current	I _{STB}	*1	V _{SS}			50.0	uA
Consumed current(1)	I _{DD}	*2	V _{DD}			80.0	uA
Consumed current(2)	I ₀	*2	V ₀			160.0	uA

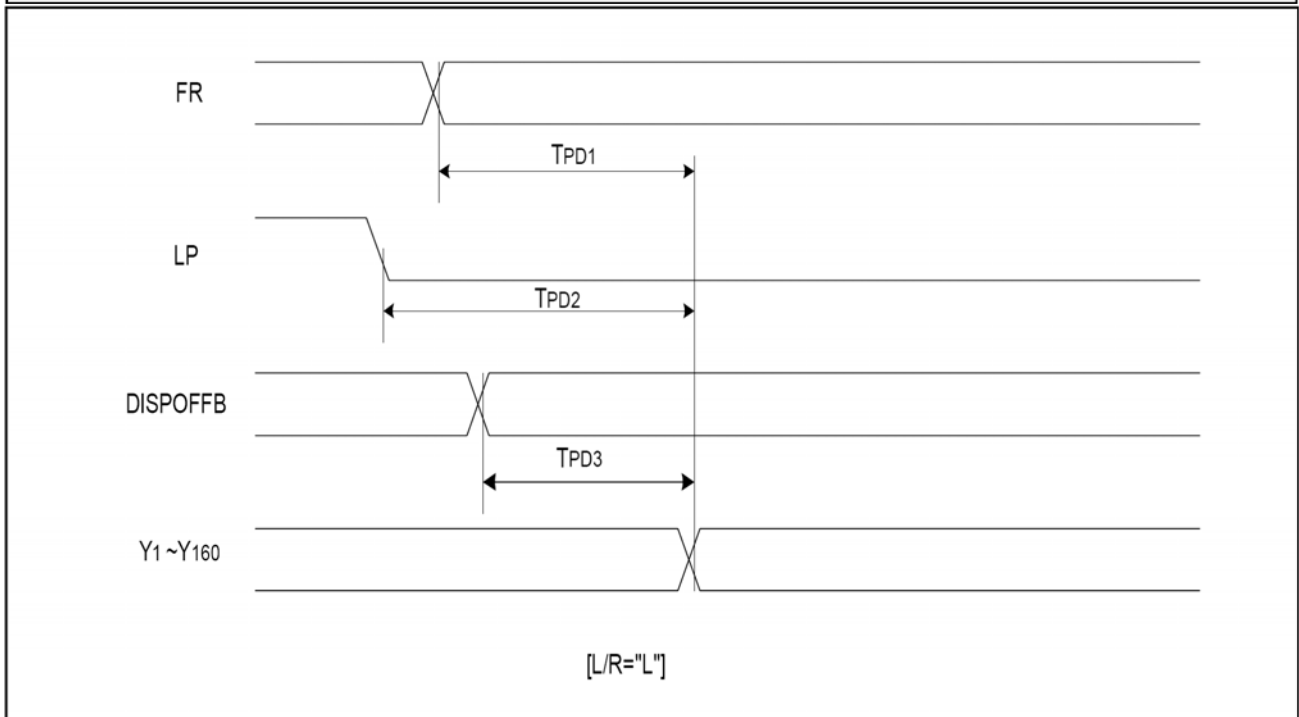
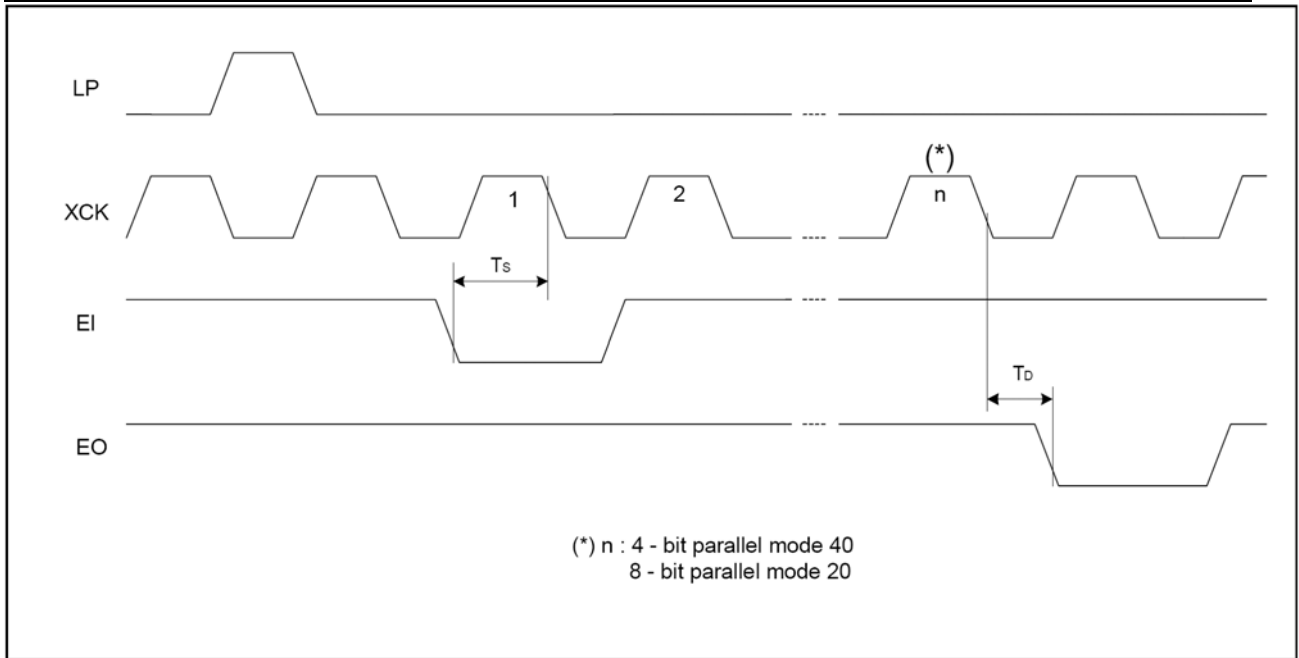
NOTE : *1 V_{DD}=+5V, V₀=+32V, V_I=V_{SS}

*2 V_{DD}=+5V, V₀=+32V, f_{LP}=25.6kHz, f_{FR}=80Hz
case of 1/320 duty operation, No-load

8. AC CHARACTERISTICS and Timing waveform

Timing Characteristics of Segment Mode (Figure 3)



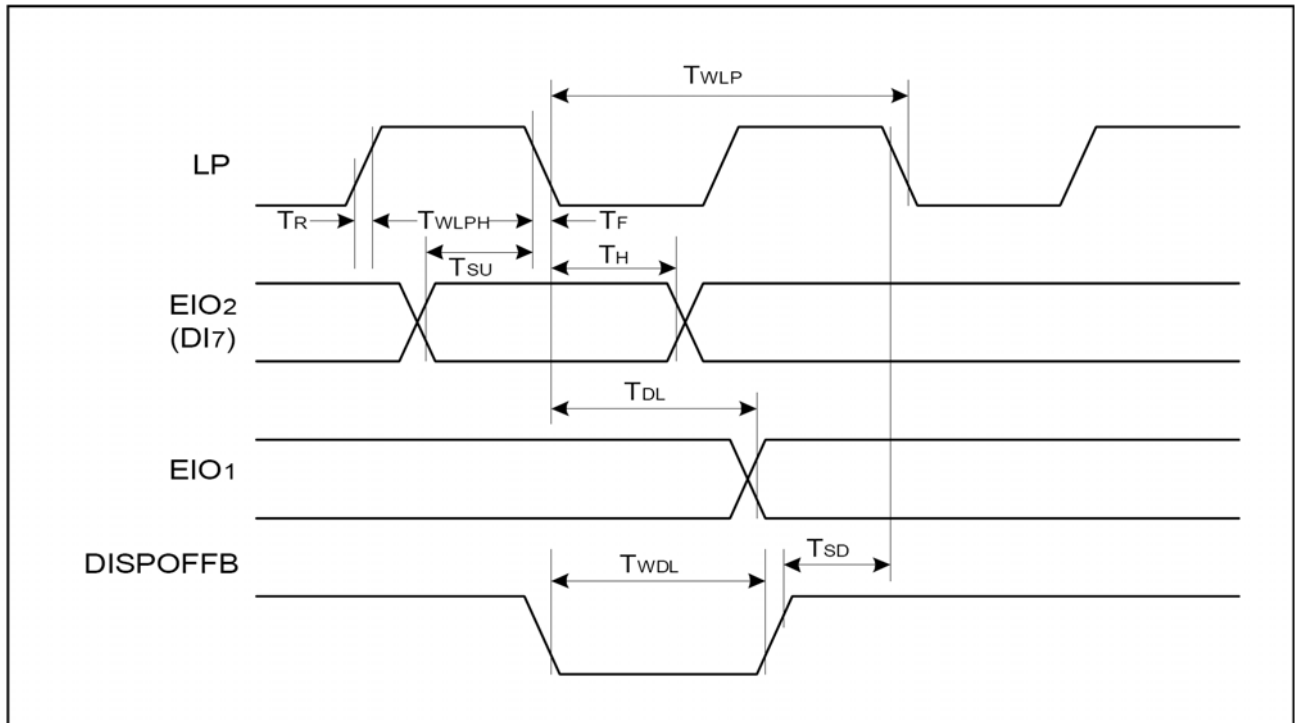


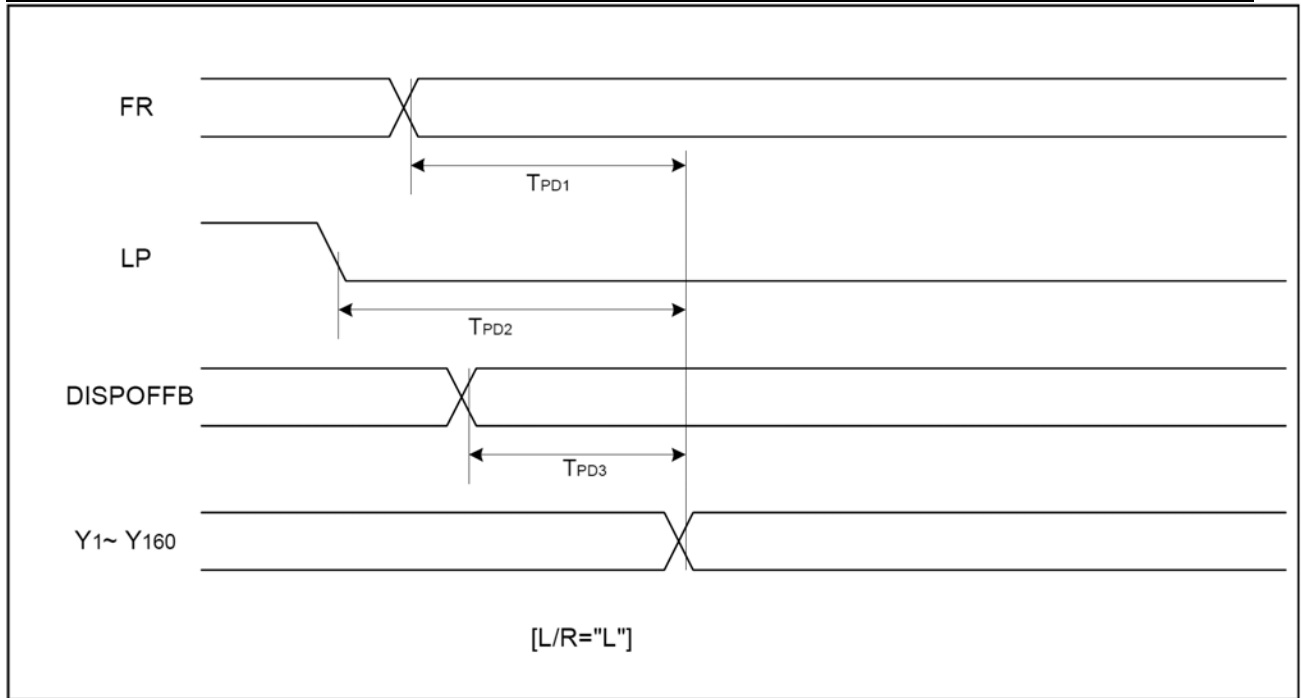
(VSS=V5=0V, VDD=+2.4V to +4.5V, V0=+15 to +32V, Ta=-20~85°C)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Shift clock period *1	TWCK	TR, TF≤10 ns	125			ns
Shift clock "H" pulse width	TWCKH		51			ns
Shift clock "L" pulse width	TWCKL		51			ns
Data setup time	TDS		30			ns
Data hold time	TDH		40			ns
Latch pulse "H" pulse width	TWLPH		51			ns
Shift clock rise to latch pulse rise time	TLD		0			ns
Shift clock fall to latch pulse fall time	TSL		51			ns
Latch pulse rise to shift clock rise time	TLS		51			ns
Latch pulse fall to shift clock fall time	TLH		51			ns
Input signal rise time *2	TR				50	ns
Input signal fall time *2	TF				50	ns
Enable setup time	TS		36			ns
DISPOFFB removal time	TSD		100			ns
DISPOFFB "L" pulse width	TWDL		1.2			us
Output delay time (1)	TD	CL=15pF			78	ns
Output delay time (2)	TPD1, TPD2	CL=15pF			1.2	us
Output delay time (3)	TPD3	CL=15pF			1.2	us

Note : *1 Take the cascade connection into consideration.

Timing Characteristics of Common Mode (Figure 4)





(V_{SS}=V₅=0V, V_{DD}=+2.4V to +4.5V, V₀=+15 to +32V, T_a=-20~85°C)

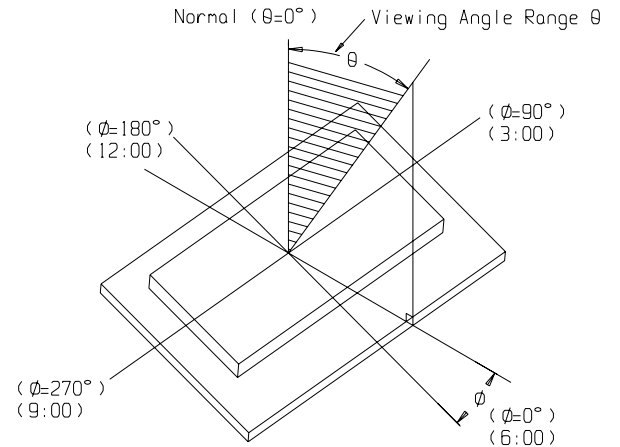
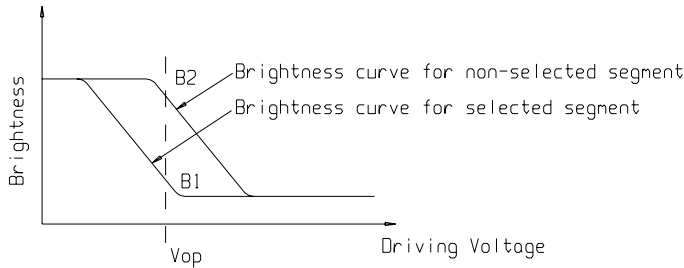
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Shift clock period	T _{WLP}	T _R , T _F ≤ 20ns	250			ns
Shift "H" pulse width	T _{WLPH}	V _{DD} = +5.0V ± 10%	15			ns
		V _{DD} = +2.5V ~ +4.5V	30			ns
Data setup time	T _{SU}		30			ns
Data hold time	T _H		50			ns
Input signal rise time	T _R				50	ns
Input signal fall time	T _F				50	ns
DISPOFFB removal time	T _{SD}		100			ns
DISPOFFB 'L' pulse width	T _{WDL}		1.2			us
Output delay time (1)	T _{DL}	CL = 15pF			200	ns
Output delay time (2)	T _{PD1} , T _{PD2}	CL = 15pF			1.2	us
Output delay time (3)	T _{PD3}	CL = 15pF			1.2	us

9. ELECTRO-OPTICAL CHARACTERISTICS

(V_{OP} = 18.6V, Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	V _{op}	Ta = 25°C	18.1	18.6	19.1	V
Response time	Tr	Ta = 25°C	---	185	---	ms
	Tf		---	200	---	ms
Contrast	Cr	Ta = 25°C	---	5	---	---
Viewing angle range	θ	Cr ≥ 2	-40	---	+40	deg
	Φ		-40	---	+40	deg

$$Cr = \frac{\text{Brightness of non-selected segment}(B2)}{\text{Brightness of selected segment}(B1)}$$



10. BACK LIGHT CHARACTERISTICS

LCD Module with side white LED Backlight

ELECTRICAL RATINGS

(Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=20mA	3.0	3.1	3.3	V
Reverse Current	IR	VR=5v	---	10	---	uA
Luminous Intensity (With LCD dots off)	IV	IF=20mA	---	10	---	Cd/m ²
Wave length	λ _p	IF=20mA	X : 0.27 Y : 0.276	---	X : 0.32 Y : 0.328	
Color	White					

11. Precaution for using LCD/LCM

LCD/LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification. The followings should be noted.

General Precautions:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isopropyl alcohol, ethyl alcohol or trichlorotrifluoroethane, do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting DISPLAY.
5. When mounting a LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:

1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.
5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature: $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

Operation Precautions:

1. The viewing angle can be adjusted by varying the LCD driving voltage V_o .
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over 40°C is required, the relative humidity should be kept below 60%, and avoid direct sunlight.

Limited Warranty

Our LCDs and modules are not consumer products, but may be incorporated by Display Elektronik customers into consumer products or components thereof, Display Elektronik does not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of DISPLAY is limited to repair or replacement on the terms set forth below. DISPLAY will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between DISPLAY and the customer, DISPLAY will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with DISPLAY general LCD inspection standard . (Copies available on request)
2. No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.
3. In returning the LCD/LCM, they must be properly packaged; there should be detailed description of the failures or defect.