

**DISPLAY ELEKTRONIK GMBH**

**DATA SHEET**

**LCD MODULE**

**DEM 240128B FYH-LY**

*Product specification*

*Version : 3*

20/Jan/2004

# GENERAL SPECIFICATION

MODULE NO. :

## DEM 240128B FYH-LY

CUSTOMER P/N

VERSION NO.	CHANGE DESCRIPTION	DATE
0	ORIGINAL VERSION	2002/03/29
1	ADD PCB DRAWING	2002/04/03
2	ADDING VERSION	2003/01/10
3	CHANGE BLOCK DIAGRAM, PIN ASSIGNMENT AND ELECTRICAL CHARACTERISTICS	2004/01/14

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DATE: 20/01/2004

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**1. FUNCTIONS &FEATURES**

- LCD TYPE:

MODULE MODEL	LCD TYPE	Operating temperature	Storage temperature
DEM 240128B FYH-LY	FSTN Transflective Positive Mode	-20°C ~ +70°C	-25°C ~ +75°C

- Viewing Direction : 12 o'clock
- Driving Scheme : 1/128 Duty, 1/12 Bias
- Display Content : 240 x 128 Dots
- Power Supply Voltage : 5.0V (typ.)
- LCD Driving Voltage ( $V_{LCD}=V_{DD}-V_0$ ) : 17.0V (typ.)
- Back-light Color : Yellow Green (Lightbox)

**2. MODULE ARTWORK**

- Module Size : 100 x 65 x 12.30 (mm)
- Dot Size : 0.26 x 0.29 (mm)
- Dot Gap : 0.04 (mm)

**3. BLOCK DIAGRAM**

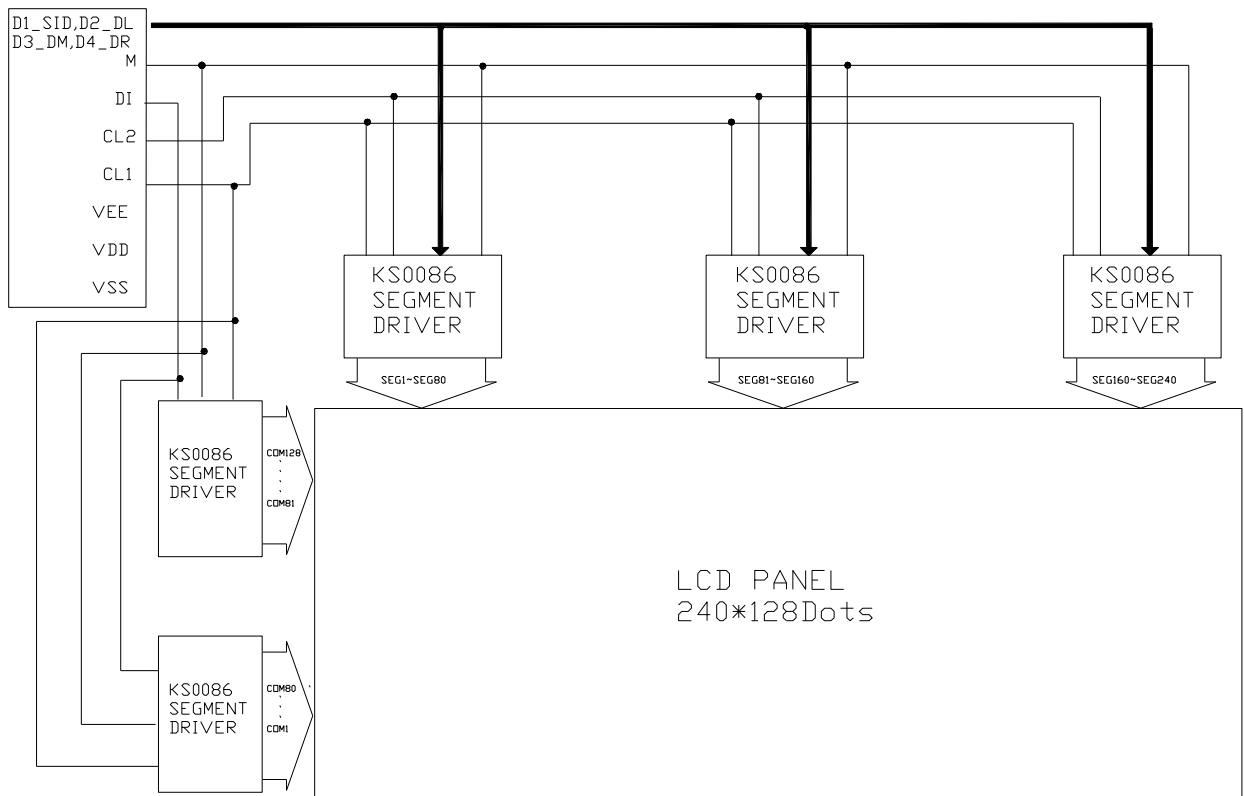


Figure 1.0

**4. EXTERNAL DIMENSIONS**

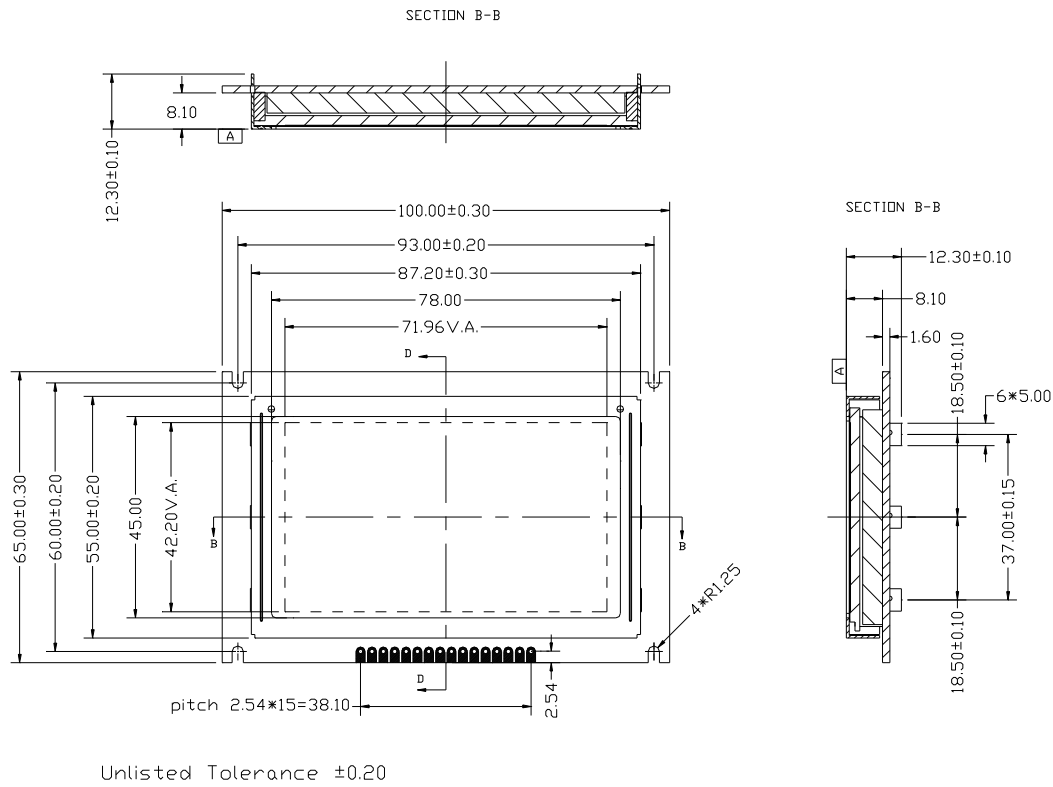
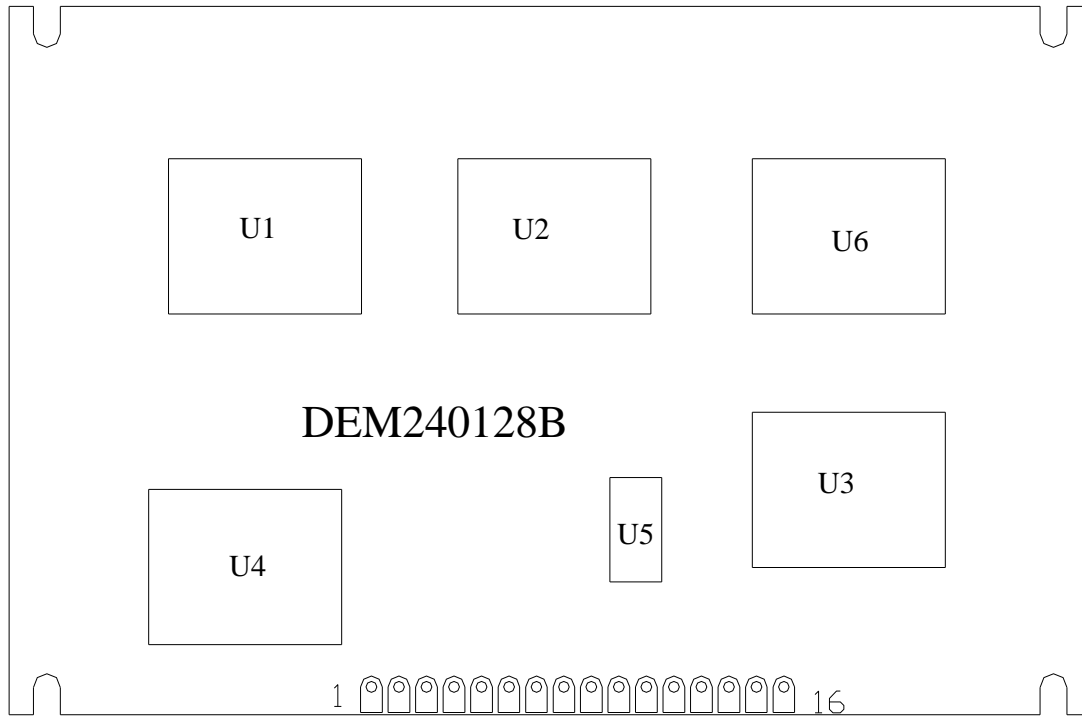


Figure 2.0

**5. PIN ASSIGNMENT**

Pin No.	Symbol	Level	Function
1	GND	0	Ground
2	GND	0	Ground
3	VDD	5.0V	Supply voltage for logic
4	VEE	-12.0V	Input voltage for LCD(-10.5V~-13.5V,TYP=-12.0V)
5	M	L/H	Frame signal
6	DI	L/H	Scan start pulse
7	CL2	L/H	X-driver data shift clock
8	CL1	L/H	Latch pulse
9	D1-SID	L/H	Data bit 0
10	D2-DL	L/H	Data bit 1
11	D3-DM	L/H	Data bit 2
12	D4-DR	L/H	Data bit 3
13	NC	-	No connection
14	NC	-	No connection
15	LED-	0V	Cathode of Back-light
16	LED+	4.2-5V	Anode of Back-light

**6. PCB DRAWING**



The Module No. is Printed on the PCB.

**7. MAXIMUM ABSOLUTE LIMIT**

Item	Symbol	Standard value	Unit	Remark
Power supply voltage	$V_{DD}$	-0.3 ~ +7.0	V	~5V (typ.)
Driver supply voltage	$V_{LCD}$	0 ~ 30	V	
Input voltage	$V_{IN}$	-0.3 ~ $V_{DD}+0.3$	V	
Volt. For BL	VLED1	4.2 ~ 5.0	V	4.2 direct at LED
Operating temperature	$T_{opr}$	0 ~ +50	°C	VERSION: FY-LY
Storage temperature	$T_{stg}$	-10 ~ +60	°C	
Operating temperature	$T_{opr}$	-20 ~ +70	°C	VERSION: FYH-LY
Storage temperature	$T_{stg}$	-25 ~ +75	°C	

\*Voltage greater than above may cause damage to the Circuit.

**8.ELECTRICAL CHARACTERISTICS**

**8-1 DC CHARACTERISTICS**

**8-1-1 SEGMENT DRIVER APPLICATION**

Characteristic	Symbol	Standard Value			Test Condition	Unit	
		MIN	TYP	MAX			
Operating Voltage 1	V <sub>DD</sub>	2.7	-	5.5	-	V	
	V <sub>LCD</sub>	6	-	28	V <sub>IN</sub> = V <sub>DD</sub> -V <sub>EE</sub>		
Input Voltage(1)	V <sub>IL</sub>	0	-	0.2V <sub>DD</sub>	-		
	V <sub>IH</sub>	0.8V <sub>DD</sub>	-	V <sub>DD</sub>	-		
Output Voltage (2)	V <sub>OL</sub>	-	-	0.4	I <sub>OL</sub> =0.4mA	V	
	V <sub>OH</sub>	V <sub>DD</sub> -0.4	-	-	I <sub>OH</sub> =-0.4mA		
Input Leakage Current1(1)	I <sub>IL1</sub>	-10	-	10	V <sub>IN</sub> = V <sub>DD</sub> to V <sub>SS</sub>	uA	
Input Leakage Current2(3)	I <sub>IL2</sub>	-25	-	25	V <sub>IN</sub> = V <sub>DD</sub> to V <sub>EE</sub>		
On resistance (4)	RON	-	2	4	I <sub>ON</sub> = 100 uA	kΩ	
Supply current (5)	ISTBY	-	-	100	f <sub>CL1</sub> =32 kHz M=V <sub>SS</sub>	V <sub>SS</sub> pin	uA
	IDD	-	-	5	f <sub>CL1</sub> =32 kHz	V <sub>DD</sub> =5V	mA
		-	-	2		V <sub>DD</sub> =3V	
IEE	-	-	500	f <sub>M</sub> = 80 kHz	V <sub>DD</sub> =5V	uA	

**NOTES:**

- Applied to CL1, CL2, ELB, ERB, D1\_SID-D4\_DR, SHL, DISPOFFB, M, CS, AMS, pin
- ELB, ERB pin
- V0, V12, V43, V5 pin
- V<sub>LCD</sub>=V<sub>DD</sub>-V<sub>EE</sub>, V0=V<sub>DD</sub>=5V, 5V=V<sub>EE</sub>=-23V  
V12=V<sub>DD</sub>-2/n(V<sub>LCD</sub>), V43=V<sub>EE</sub>+2/n(V<sub>LCD</sub>), n=17(1/256 duty, 1/17 bias)
- V0=V<sub>DD</sub>, V12=1.71V(V<sub>DD</sub>=5V) or -0.06V (V<sub>DD</sub>=3V)  
V43=-19.71V(V<sub>DD</sub>=5V) or -19.94V(V<sub>DD</sub>=3V), V5=V<sub>EE</sub>=-23V, no-load condition  
(1/256duty, 1/17 bias) 4-bit parallel interface mode  
ISTBY: V<sub>DD</sub>=5V, f<sub>CL2</sub>=5.12MHz, SHL=V<sub>SS</sub>, DISPOFFB=V<sub>DD</sub>, M=V<sub>SS</sub>, display data pattern=0000  
IDD: V<sub>DD</sub>=3V, f<sub>CL2</sub>=4MHz, display data pattern=0101  
V<sub>DD</sub>=5V, f<sub>CL2</sub>=5.12MHz, display data pattern=0101  
IEE: V<sub>DD</sub>=5V, f<sub>CL2</sub>=5.12MHz, display data pattern=0101, V<sub>EE</sub> pin

8-1-2 COMMON DRIVER APPLICATION

Characteristic	Symbol	Standard Value			Test Condition	Unit	
		MIN	TYP	MAX			
Operating Voltage	V <sub>DD</sub>	2.7	-	5.5	-	V	
	V <sub>LCD</sub>	6	-	28	V <sub>IN</sub> = V <sub>DD</sub> -V <sub>EE</sub>		
Input Voltage(1)	V <sub>IL</sub>	0	-	0.2V <sub>D</sub>	-		
	V <sub>IH</sub>	0.8V <sub>DD</sub>	-	V <sub>DD</sub>	-		
Output Voltage (3)	V <sub>OL</sub>	-	-	0.4	I <sub>OL</sub> =0.4mA	V	
	V <sub>OH</sub>	V <sub>DD</sub> -0.4	-	-	I <sub>OH</sub> =-0.4mA		
Input Leakage Current1(1)	I <sub>IL1</sub>	-10	-	10	V <sub>IN</sub> = V <sub>DD</sub> to V <sub>SS</sub>	uA	
Input Leakage Current2(2)	I <sub>IL2</sub>	-50	-125	-250	V <sub>IN</sub> = 0V, V <sub>DD</sub> =5V		
Input Leakage Current3(4)	I <sub>IL3</sub>	-25	-	25	V <sub>IN</sub> = V <sub>DD</sub> to V <sub>EE</sub>		
On resistance (5)	R <sub>ON</sub>	-	2	4	I <sub>ON</sub> = 100 uA	kΩ	
Supply current (6)	I <sub>STBY</sub>	-	-	100	f <sub>CL1</sub> =32 kHz	V <sub>SS</sub> pin	uA
	I <sub>DD</sub>	-	-	200	f <sub>CL1</sub> =32 kHz	V <sub>DD</sub> =5V	
		-	-	120		V <sub>DD</sub> =3V	
	I <sub>EE</sub>	-	-	150	f <sub>M</sub> = 80 kHz	V <sub>DD</sub> =5V	

NOTES:

- Applied to CL1, D2\_CL(SHL=LOW), D4\_DR(SHL=HIGH), SHL, DISPOFFB, M, CS, AMS, pin
- Pull-up input pins: CL2, C1\_SID, D3\_DM(AMS=HIGH), ELB(SHL=LOW), ERB(SHL=HGH)
- D2\_DL(SHL=HIGH), D4\_DR(SHL=LOW) pin
- V0, V12, V43, V5 pin
- V<sub>LCD</sub>=V<sub>DD</sub>-V<sub>EE</sub>, V0=V<sub>DD</sub>=5V, V5=V<sub>EE</sub>=-23V  
V12=V<sub>DD</sub>-1/n(V<sub>LCD</sub>), V43=V<sub>EE</sub>+1/n(V<sub>LCD</sub>), n=17(1/256 duty, 1/17 bias)
- V0=V<sub>DD</sub>, V12=3.35V(V<sub>DD</sub>=5V) or 1.47V(V<sub>DD</sub>=3V)  
V43=-21.35V(V<sub>DD</sub>=5V) or -21.47V(V<sub>DD</sub>=3V), V5=V<sub>EE</sub>=-23V, no-load condition  
(1/256 duty, 1/17 bias) single-type mode operation: AMS= V<sub>SS</sub>, SHL=V<sub>SS</sub>, DISPOFFB=V<sub>DD</sub>  
D1\_SID=D3\_DM=V<sub>DD</sub>, D4\_DR=OPEN, ELB=ERB=OPEN  
I<sub>STBY</sub>: V<sub>DD</sub>=5V, M=V<sub>SS</sub>, D2\_DL=V<sub>SS</sub>  
I<sub>DD</sub>: f<sub>M</sub>=80Hz, D2\_DL=V<sub>DD</sub>  
V<sub>DD</sub>=3V, display data pattern=10000000.....,01000000.....,00100000....,00010000.....  
V<sub>DD</sub>=5V, display data pattern=10000000.....,01000000.....,00100000....,00010000.....  
I<sub>EE</sub>: f<sub>M</sub>=80Hz, D2\_DL=V<sub>DD</sub>  
V<sub>DD</sub>=5V, current through V<sub>EE</sub> pin, display data pattern=10000000.....,01000000.....,  
00100000....,00010000.....



**8-2 AC CHARACTERISTICS**

**8-2-1 SEGMENT DRIVER APPLICATION**

(V<sub>SS</sub> = 0V, Ta = -10 ~ +60°C)

Characteristic	Symbol	Test Condition	(1)V <sub>DD</sub> =5V±10%			(1)V <sub>DD</sub> =3V±10%			Unit
			Min.	Typ .	Max.	Min.	Typ .	Max.	
Clock cycle time	t <sub>CY</sub>	Duty = 50%	125	-	-	250	-	-	ns
Clock pulse width	t <sub>WCK</sub>	-	45	-	-	95	-	-	
Clock rise/fall time	t <sub>R</sub> /t <sub>F</sub>	-	-	-	-	-	-	30	
Data set-up time	t <sub>DS</sub>	-	30	-	-	65	-	-	
Data hold time	t <sub>DH</sub>	-	30	-	-	65	-	-	
Clock set-up time	t <sub>CS</sub>	-	80	-	-	120	-	-	
Clock hold time	t <sub>CH</sub>	-	80	-	-	120	-	-	
Propagation delay time	t <sub>PHL</sub>	ELB Output	-	-	60	-	-	125	
		ERB Output	-	-	60	-	-	125	
ELB, ERB set-up time	t <sub>PSU</sub>	ELB Input	30	-	-	65	-	-	
		ERB Input	30	-	-	65	-	-	
DISPOFFB low pulse width	t <sub>WDL</sub>	-	1.2	-	-	1.2	-	-	us
DISPOFFB clear time	t <sub>CD</sub>	-	100	-	-	100	-	-	ns
M - OUT Propagation delay time	t <sub>PD1</sub>	CL = 15 pF	-	-	1.0	-	-	1.2	us
			-	-			-	-	
CL1 - OUT Propagation delay time	t <sub>PD2</sub>		-	-	1.0	-	-	1.2	
			-	-			-	-	
DISPOFFB - OUT Propagation delay time	t <sub>PD3</sub>		-	-	1.0	-	-	-	
			-	-			-	-	

**8-2-2 COMMON DRIVER APPLICATION**

(V<sub>SS</sub> = 0V, Ta = -10 ~ +60°C)

Characteristic	Symbol	Test Condition	(1)V <sub>DD</sub> =5V±10%			(1)V <sub>DD</sub> =3V±10%			Unit
			Min.	Typ .	Max.	Min.	Typ .	Max.	
Clock cycle time	t <sub>CY</sub>	Duty = 50%	125	-	-	250	-	-	us
Clock pulse width	t <sub>WCK</sub>	-	45	-	-	95	-	-	
Clock rise/fall time	t <sub>R</sub> /t <sub>F</sub>	-	-	-	-	-	-	30	
Data set-up time	t <sub>DS</sub>	-	30	-	-	65	-	-	
Data hold time	t <sub>DH</sub>	-	30	-	-	65	-	-	
DIPOFFB low pulse width	t <sub>WDL</sub>	-	1.2	-	-	1.2	-	-	
DISPOFFB clear time	t <sub>CD</sub>	-	100	-	-	100	-	-	ns
Output delay time	t <sub>DL</sub>	CL = 15 pF	-	-	200	-	-	250	us
M - OUT Propagation delay time	t <sub>PD1</sub>		-	-	1.0	-	-	1.2	
			-	-			-	-	
CL1 - OUT Propagation delay time	t <sub>PD2</sub>		-	-	1.0	-	-	1.2	
			-	-			-	-	
DISPOFFB - OUT Propagation delay time	t <sub>PD3</sub>		-	-	1.0	-	-	-	
		-	-			-	-	-	

8-2-3 SEGMENT DRIVER APPLICATION TIMING

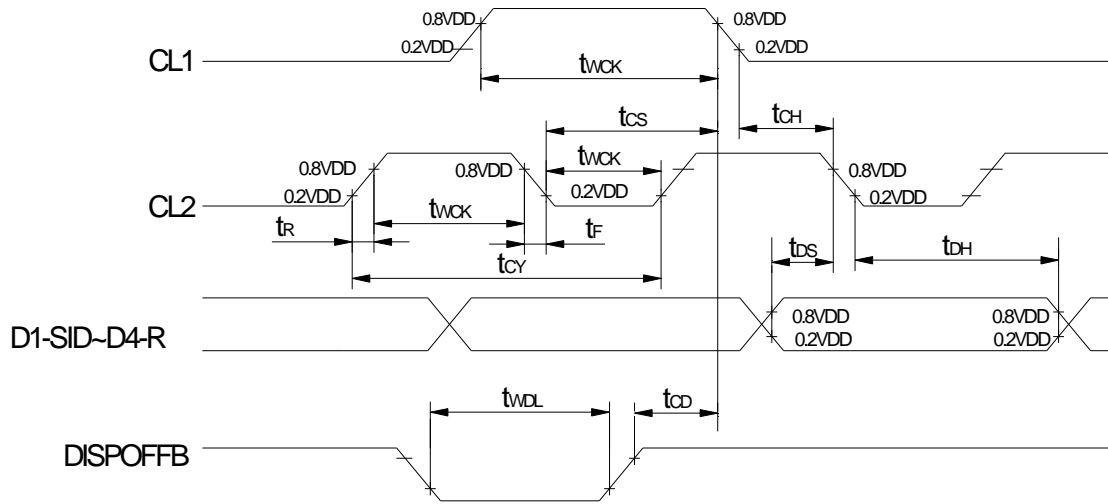


Figure 3.0

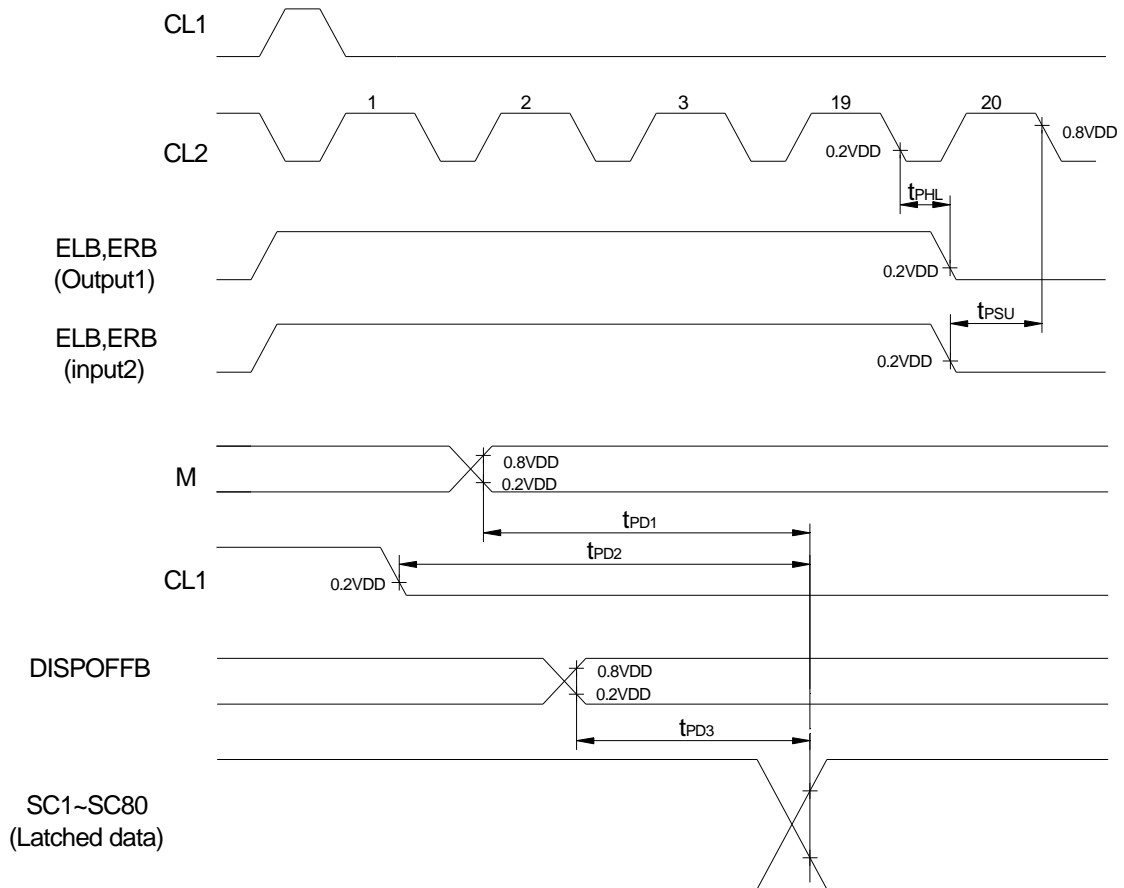


Figure 4.0

8-2-4 COMMON DRIVER APPLICATION TIMING

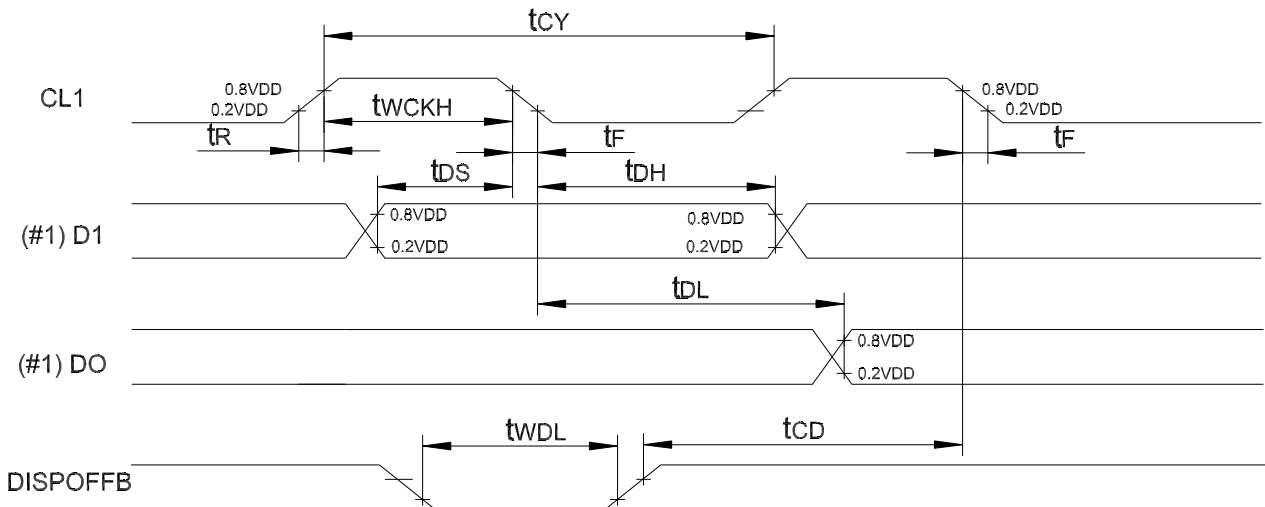


Figure5.0

(1) When in single-type interface mode

D1 =>D2\_DL (SHL = L), D4\_DR (SHL = H)

D0 =>D4\_DT (SHL =L), D2\_DL (SHL = H)

(2) When in dual-type interface mode

D1 =>D2\_DL and D3\_DM (SHL = L), D4\_DR and D3\_DM (SHL = H)

D0 =>D4\_DR (SHL = L), D2\_DL (SHL = H)

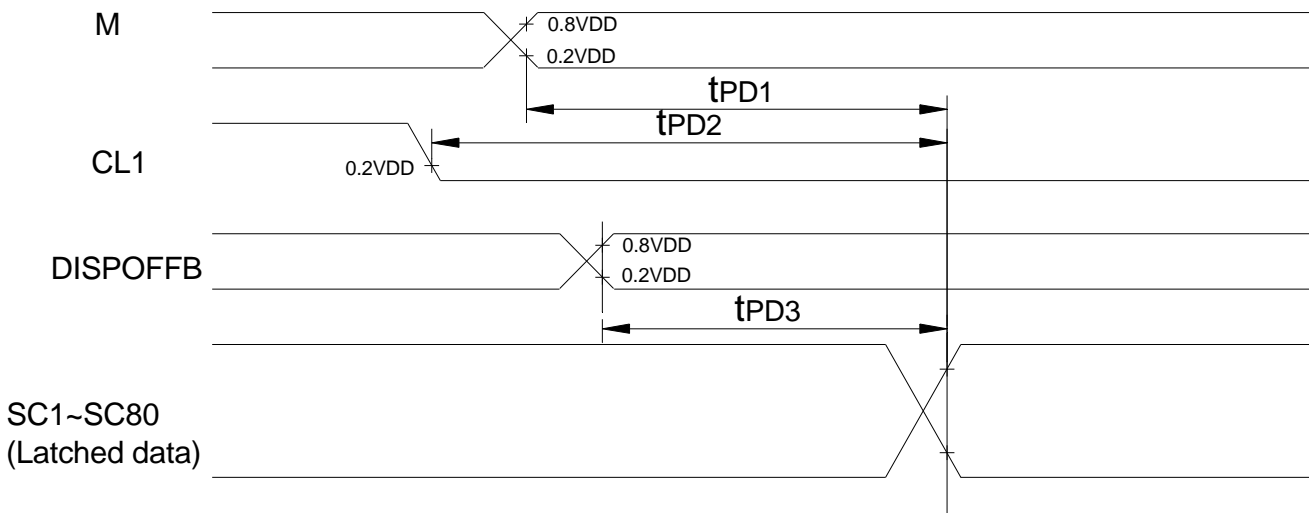


Figure 6.0

**9. OPERATION TIMING DIAGRAM**

**9-1 4bit Parallel mode interface segment driver**

- When SHL = "LOW"

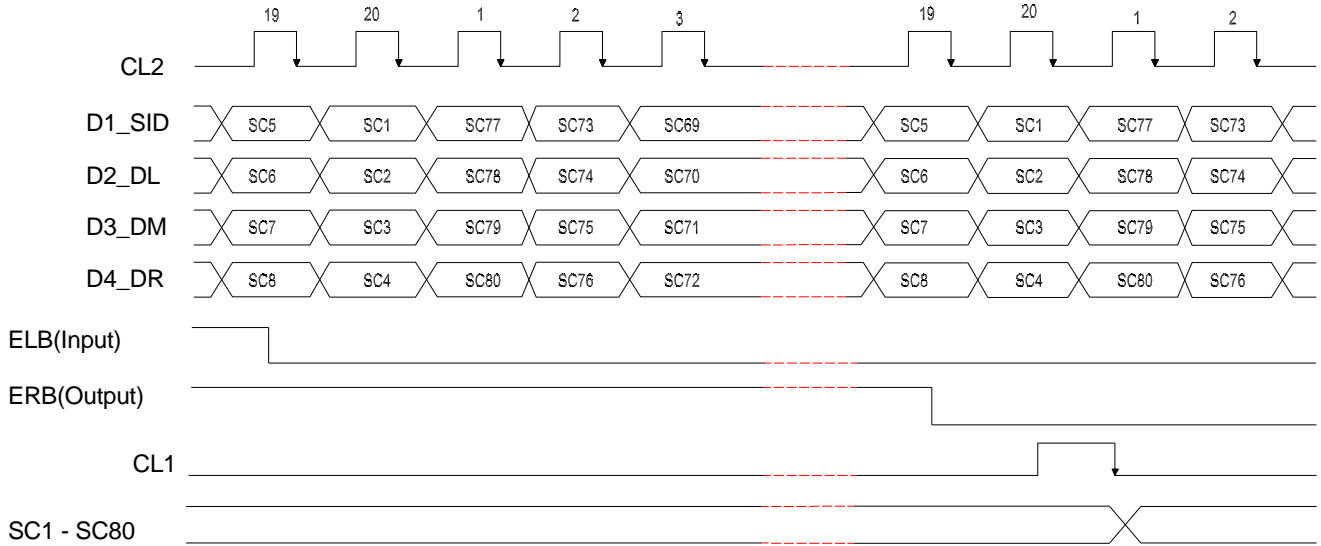


Figure 7.0

- When SHL = "HIGH"

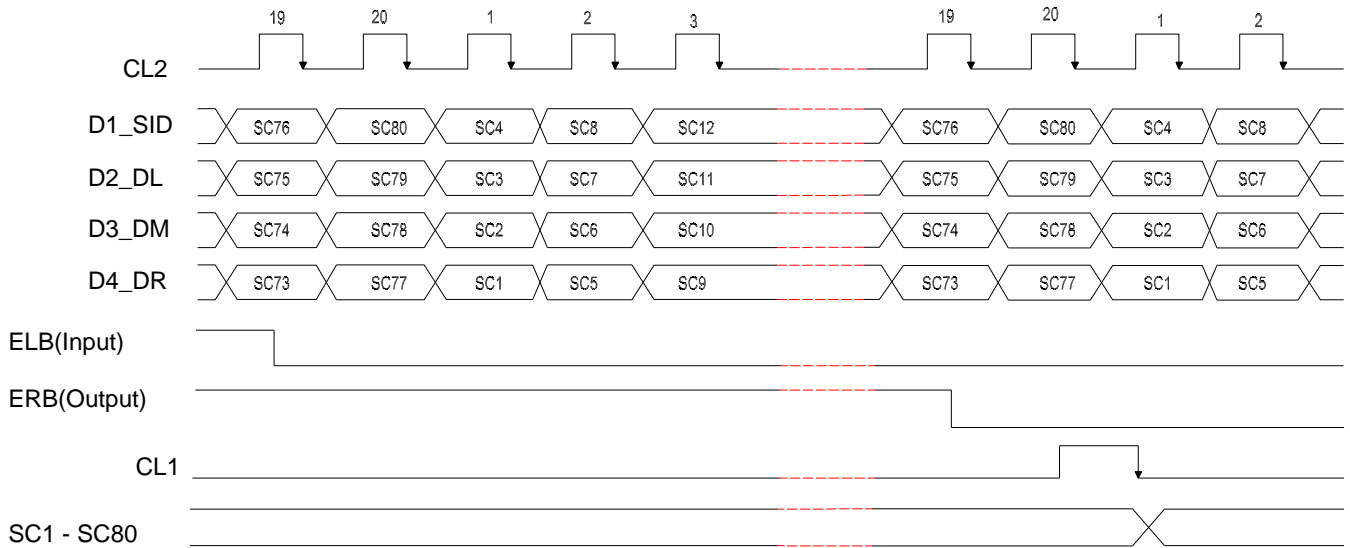


Figure 8.0

**9-2 SINGLE-TYPE INTERFACE COMMAND DRIVER**

- When SHL = "LOW"

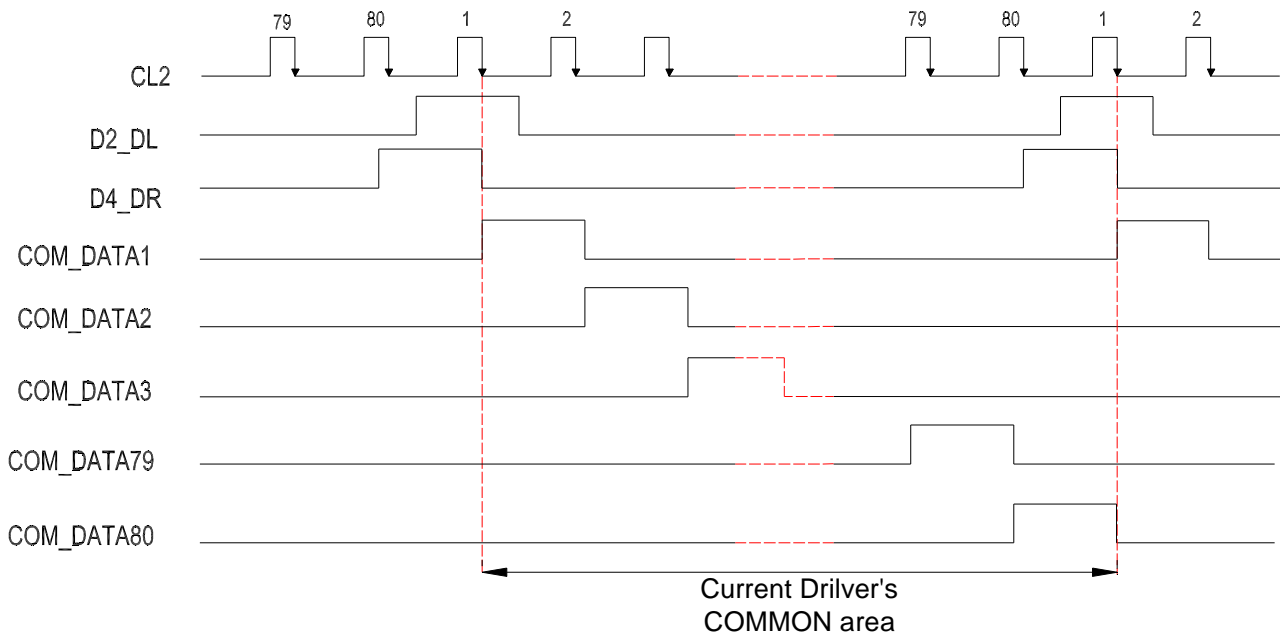


Figure9.0

- When SHL = "HIGH"

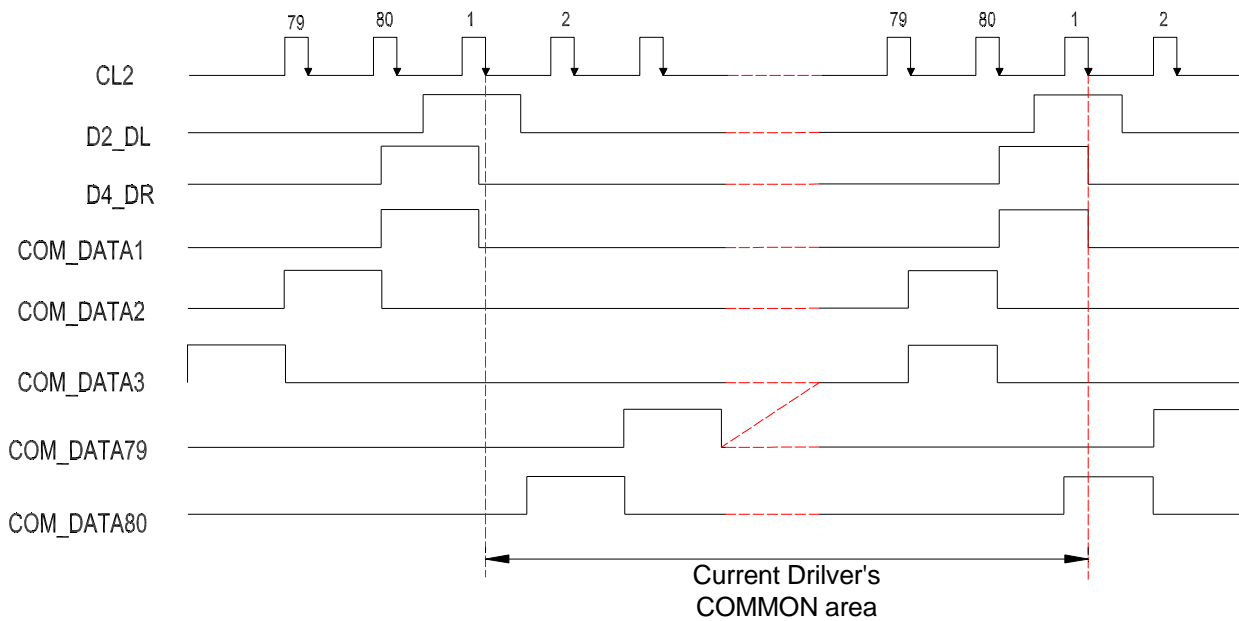


Figure 10.0

**10. BACKLIGHT & SWITCH**

(Ta = -10 ~ +60°C)

Item	Symbol	Standard Value	Unit	Applicable Terminal
Backlight Voltage	V	5.0 (typ.)	V	LED+ / LED-
Backlight Current	I	~285	mA	

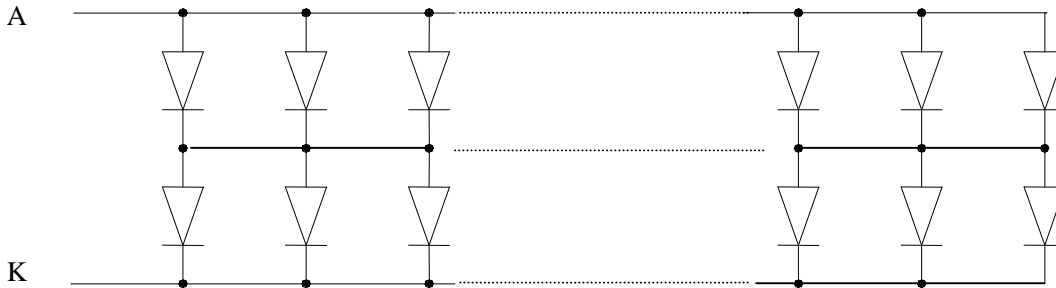


Figure11.0

**11. LCD LABELLING**



**12. LCD Modules Handling Precautions**

- 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

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[SBH-PW-N](#) [DEM 128064B](#) [SBH-PW-N](#) [DEM 128064F](#) [FGH-P\(RGB\)](#) [DEM 128064G](#) [FGH-PW](#) [DEM 128064I](#) [FGH-PW](#) [DEM 128064J](#)  
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