# Display Elektronik GmbH

# DATA SHEET

## **LCD MODULE**

# **DEM 128064D FGH-EG**

**Product specification** 

**Version: 1** 

# SPECIFICATION FOR LCM MODULE

# **DEM 128064D FGH-EG**

Customer Approval:		

	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)	МН	08.03.2007
CHECKED BY	МНО	15.03.2007
APPROVED BY	МН	15.03.2007

### **DOCUMENT REVISION HISTORY**

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### 1. FUNCTIONS & FEATURES

Display Format : 128x64Dots

LCD Mode : FSTN / Positive Transflective Mode

Viewing Ddirection : 6 o'clock

Driving Scheme : 1/64 Duty cycle, 1/9 Bias

 $\begin{array}{lll} \mbox{Power Supply Voltage } (\mbox{V}_{\mbox{DD}}) & : 5.0 \mbox{ Volt (typ.)} \\ \mbox{LCD Driving Voltage} & : 8.0 \mbox{ Volt (typ.)} \\ \mbox{Operation Temperature} & : -20 \mbox{ to } 70^{\circ}\mbox{C} \\ \mbox{Storage Temperature} & : -30 \mbox{ to } 80^{\circ}\mbox{C} \\ \mbox{Backlight Color} & : \mbox{Blue-Green, EL} \\ \mbox{EL-Driving} & : \mbox{EL-Inverter on Board} \end{array}$ 

#### **2. MECHANICAL SPECIFICATIONS**

#### 3. BLOCK DIAGRAM

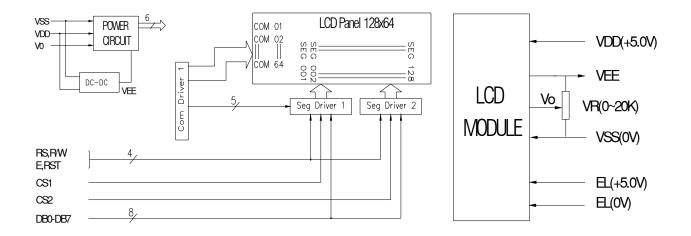
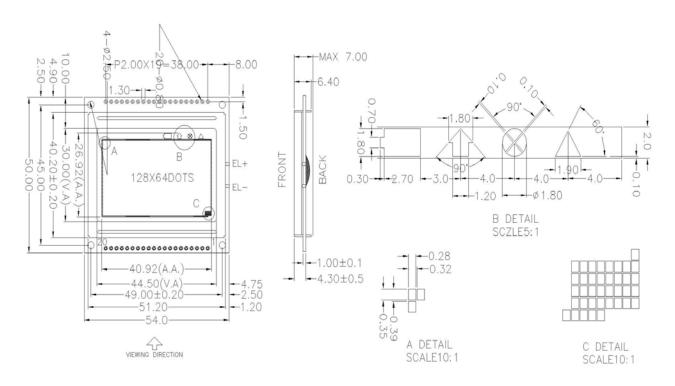


Figure 1 . Block Diagram

### **4. DIMENSIONAL OUTLINE**



#### **5. PIN DESCRIPTION**

No.	Symbol	Function
1	VSS	GND
2	VDD	Power supply
3	VO	Supply voltage for LCD
4	D/I	Register selection. (H: Data register L: Instruction register)
5	R/W	Read /write selection. (H: Read L: write)
6	Е	Enable signal for chip
7-14	D0~D7	Data bus line
15	CS1	Chip select signal for left half of the screen(High select)
16	CS2	Chip select signal for right half of the screen(High select)
17	RST	Reset signal
18	VEE	Negative voltage output
19	EL	Power supply for backlight(+)
20	EL	Power supply for backlight(-)

### **6. MAXIMUM ABSOLUTE LIMIT**

Item	Symbol	MIN	MAX	Unit
Supply Voltage for Logic	$V_{ m DD}$	-0.3	7.0	V
Supply Voltage for LCD	V0	V <sub>DD</sub> -19.0	V <sub>DD</sub> +0.3	V
Input Voltage	Vin	-0.3	V <sub>DD</sub> +0.3	V
Supply Current for Backlight	$I (Ta = 25^{\circ}C)$		5.1+5.1*20%	mA
Voltage for Backlight	$V (Ta = 25^{\circ}C)$	0.5	7.0	V
Operating Temperature	Тор	-20	70	°C
Storage Temperature	Tst	-30	80	°C

### 7. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Тур	Max	Unit
Supply Voltage for Logic	V <sub>DD</sub> -V <sub>SS</sub>	$Ta = 25^{\circ}C$	4.75	5.0	5.25	V
Input High Voltage	VIH	$Ta = 25^{\circ}C$	$0.7V_{\mathrm{DD}}$		$V_{\mathrm{DD}}$	V
Input Low Voltage	VIL	Ta = 25°C	0		$0.3V_{\mathrm{DD}}$	V
Output High Voltage	Voh	Ta = 25°C	2.4			V
Output Low Voltage	Vol	$Ta = 25^{\circ}C$			0.4	V
Supply Current	Idd	$Ta = 25^{\circ}C$		3	5	mA

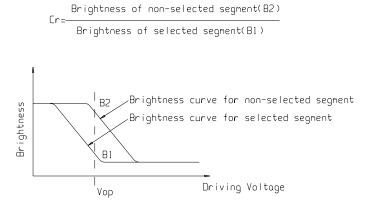
### **<u>8.BACKLIGHT CHARACTERISTICS</u>** (Ta = 25°C)

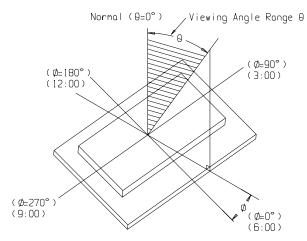
Item	Symbol	Condition	Min	Тур	Max	Unit	
Current	I			5.1		mA	
Luminous Intensity (With LCD dots off)	IV	50V/220HZ		9.6		cd/m <sup>2</sup>	
Chromatics	X			0.176			
	y			0.410			
Color	Blue-green						

### 9. ELECTRO-OPTICAL CHARACTERISTICS

 $(VDD=5.0V, Ta = 25^{\circ}C)$ 

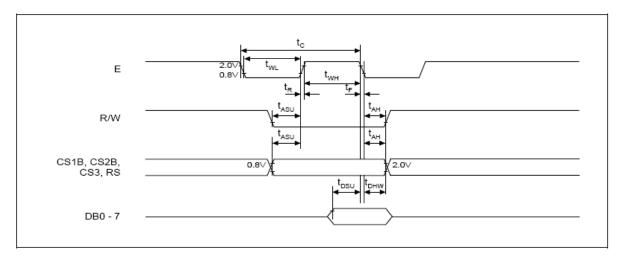
Item	Symbol	Condition	Min	Тур	Max	Unit
		$Ta = -20^{\circ}C$	8.2	8.5	8.8	
Operating Voltage	Vop	$Ta = 25^{\circ}C$	7.7	8.0	8.3	V
		$Ta = 70^{\circ}C$	7.2	7.5	7.8	
Response time	Tr	Tr $Ta = 25$ °C		185		ms
Response time	Tf	1a – 25 C		200		ms
Contrast	Cr	$Ta = 25^{\circ}C$		4		
Viewing angle range	θ	Cr≥2	-40		+40	deg
viewing angle range	Ф	C1 <u>~</u> 2	-40		+40	deg



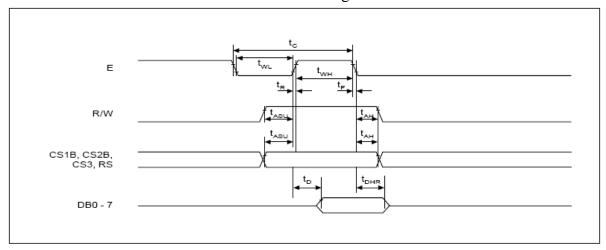


### 10. TIMING CHARACTERISTICS (Please refer SAMSUNG S6B0108 DATASHEET)

Characteristic	Symbol	Min	Тур	Max	Unit
E cycle	t <sub>c</sub>	1000	-	-	ns
E high level width	t <sub>WH</sub>	450	-	-	ns
E low level width	t <sub>WL</sub>	450	-	-	ns
E rise time	t <sub>R</sub>	-	-	25	ns
E fall time	t <sub>F</sub>	-	-	25	ns
Address set-up time	t <sub>ASU</sub>	140	-	-	ns
Address hold time	t <sub>AH</sub>	10	-	-	ns
Data set-up time	t <sub>DSU</sub>	200	-	-	ns
Data delay time	t <sub>D</sub>	-	-	320	ns
Data hold time (write)	t <sub>DHW</sub>	10	-	-	ns
Data hold time (read)	t <sub>DHR</sub>	20	-	-	ns



MPU write timing



MPU read timing

# 11. CONTROL AND DISPLAY INSTRUCTION (Please refer SAMSUNG S6B0108 DATASHEETS )

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display on/off	L	L		L	Н	Н	Н	Н	Н	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L: OFF, H: ON
Set address (Y address)	L	L	L	Н	Y address (0 - 63)				Sets the Y address in the Y address counter.		
Set page (X address)	L	L	Н	L	Н	Н	Н	Pa	ige (0 -	- 7)	Sets the X address at the X address register.
Display start line (Z address)	L	L	Н	Н		Display start line (0 - 63)					Indicates the display data RAM displayed at the top of the screen.
Status read	L	Н	Busy	L	On / Off	Reset	L	L	L L L		Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset
Write display data	Н	L		Write data					Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.		
Read display data	Н	Н		Read data						Reads data (DB0: 7) from display data RAM to the data bus.	

#### 12 Precaution for using LCD/ICM

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 isoproply alcohol, ethyl alcohol or trichlorotriflorothane, 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 made 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 Vo.
- 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**

DISPLAY LCDs and modules are not consumer products, but may be incorporated by DISPLAY's customers into consumer products or components thereof, DISPLAY 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.
- 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.