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**VL-FS-BTHQ 42008VSS-01 REV.A**  
**(BTHQ 42008VSS-STF-06-LED04G)**

DOCUMENT TITLE:  
**SPECIFICATION**  
**OF**  
**LCD MODULE TYPE**  
**ITEM NO.: BTHQ 42008VSS-01**

APPROVALS:

EFFECTIVE DATE

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**Specification  
of  
LCD Module Type  
Item No.: BTHQ 42008VSS-01**

**1. General Description**

- 20 characters (5 x 8 dots) x 4 lines STN Positive Yellow Transflective LCD Character Module.
- Viewing Angle: 6 O'clock direction.
- Driving duty: 1/16 Duty, 1/5 bias.
- 'SAMSUNG' KS0066UP-10BCC(Die form) LCD Controller & Driver or equivalent.
- 'SAMSUNG' KS0065B-PCC(Die form) LCD Segment Drivers or equivalent.
- Yellow-green LED04 backlight.

**2. Mechanical Specifications**

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter	Specifications	Unit
Outline dimensions	146.0(W) x 62.5(H) x 14.0 MAX.(D)	mm
Effective viewing area	123.0(W) x 42.5(H)	mm
Display format	20 characters x 4 lines	-
Character size	4.84(W) x 9.22(H) (5 x 8 dots)	mm
Character spacing	1.16(W) x 0.53(H)	mm
Character pitch	6.00(W) x 9.75(H)	mm
Dot size	0.956(W) x 1.139(H)	mm
Dot spacing	0.015(W) x 0.015(H)	mm
Dot pitch	0.971(W) x 1.154(H)	mm
Weight	Approx. 123	grams



### 3. Interface signals

Table 2

Pin No.	Symbol	Description
1	VSS	Ground (0V).
2	VDD	Power supply for logic (+5.0V).
3	V0	Power supply for LCD driver.
4	RS	Register Select Input: "High" for Data register (for read and write). "Low" for Instruction register (for write), Busy flag, address counter (for read).
5	R/W	Read/Write signal: 'High' for Read mode. 'Low' for Write mode.
6	E	Enable. Start signal for data read /write.
7	DB0	Data input/output (LSB)
8	DB1	Data input/output
9	DB2	Data input/output
10	DB3	Data input/output
11	DB4	Data input/output
12	DB5	Data input/output
13	DB6	Data input/output
14	DB7	Data input/output (MSB)
A	LED(+)	Anode of LED Backlight
K	LED(-)	Cathode of LED Backlight

## 4. Absolute Maximum Ratings

### 4.1 Electrical Maximum Ratings(Ta = 25 °C)

Table 3

Parameter	Symbol	Min.	Max.	Unit
Power Supply voltage (Logic)	VDD-VSS	-0.3	+7.0	V
Power Supply voltage (LCD drive)	VLCD =VDD-V0	-0.3	+15.0	V
Input voltage	Vin	-0.3	VDD+0.3	V

Note:

The modules may be destroyed if they are used beyond the absolute maximum ratings.  
All voltage values are referenced to VSS = 0V.

### 4.2 Environmental Condition

Table 4

Item	Operating Temperature (Topr)		Storage Temperature (Tstg)		Remark
	Min.	Max.	Min.	Max.	
Ambient Temperature	0°C	+50°C	-10°C	+60°C	Dry
Humidity	95% max. RH for Ta ≤ 40°C < 95% RH for Ta > 40°C				no condensation
Vibration (IEC 68-2-6) cells must be mounted on a suitable connector	Frequency: 10 ~ 55 Hz Amplitude: 0.75 mm Duration: 20 cycles in each direction.				3 directions
Shock (IEC 68-2-27) Half-sine pulse shape	Pulse duration : 11 ms Peak acceleration: 981 m/s <sup>2</sup> = 100g Number of shocks : 3 shocks in 3 mutually perpendicular axes.				3 directions

## 5. Electrical Specifications

### 5.1 Typical Electrical Characteristics

At Ta = 25 °C, VDD = 5V±5%, VSS=0V.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (Logic)	VDD -VSS		4.75	5.0	5.25	V
Supply voltage (LCD)	VLCD =VDD -V0	VDD = 5V, Note (1)	7.2	7.7	8.2	V
Input signal voltage 1 for E,DB0-DB7,R/W,RS.	V <sub>IH1</sub>	"H" level	2.2	-	VDD	V
	V <sub>IL1</sub>	"L" level	-0.3	-	0.6	V
Input signal voltage 2 for OSC1.	V <sub>IH2</sub>	"H" level	VDD -1	-	VDD	V
	V <sub>IL2</sub>	"L" level	-0.2	-	1.0	V
Supply Current (Logic & LCD)	IDD	Character mode, VDD=5V, Note 1	-	2.4	3.6	mA
Supply Current (LCD)	I0	Character mode, VDD=5V, Note 1	-	1.5	2.3	mA
Supply Voltage of yellow-green LED04 backlight	VLED	Forward current =540 mA  Number of LED die = 2x54 =108	3.9	4.1	4.3	V

Note (1): There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.



## 5.2 Timing Specifications

At  $T_a = 0\text{ }^{\circ}\text{C}$  To  $+50\text{ }^{\circ}\text{C}$  ,  $V_{DD} = +5\text{V}\pm 5\%$ ,  $V_{SS} = 0\text{V}$ .

Refer to Fig. 2, the bus timing diagram for write mode.

Table 6

Parameter	Symbol	Min.	Max.	Unit
E Cycle Time	$t_c$	500	-	ns
E Rise/Fall Time	$t_R, t_F$	-	20	ns
E Pulse Width(high, low)	$t_w$	230	-	ns
R/W and RS Setup Time	$t_{SU1}$	40	-	ns
R/W and RS Hold Time	$t_{H1}$	10	-	ns
Data Set-up Time	$t_{SU2}$	80	-	ns
Data Hold Time	$t_{H2}$	10	-	ns

Refer to Fig. 3, the bus timing diagram for read mode.

Table 7

Parameter	Symbol	Min.	Max.	Unit
E Cycle Time	$t_c$	500	-	ns
E Rise/Fall Time	$t_R, t_F$	-	20	ns
E Pulse Width(high, low)	$t_w$	230	-	ns
R/W and RS Setup Time	$t_{SU}$	40	-	ns
R/W and RS Hold Time	$t_H$	10	-	ns
Data Output Delay Time	$t_D$	-	120	ns
Data Hold Time	$t_{DH}$	5	-	ns

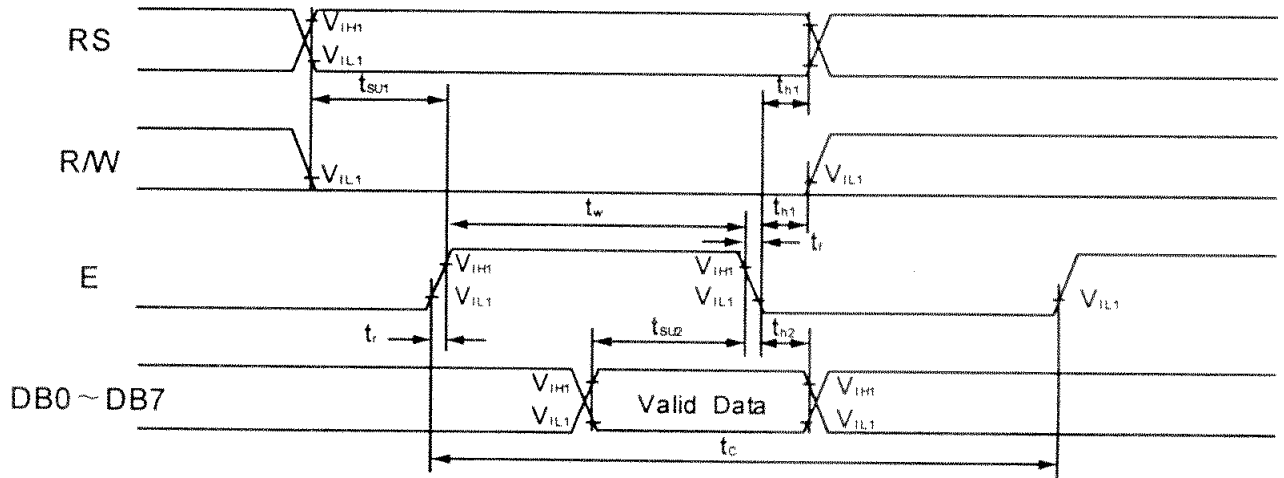


Figure 2: Write Mode Timing Diagram

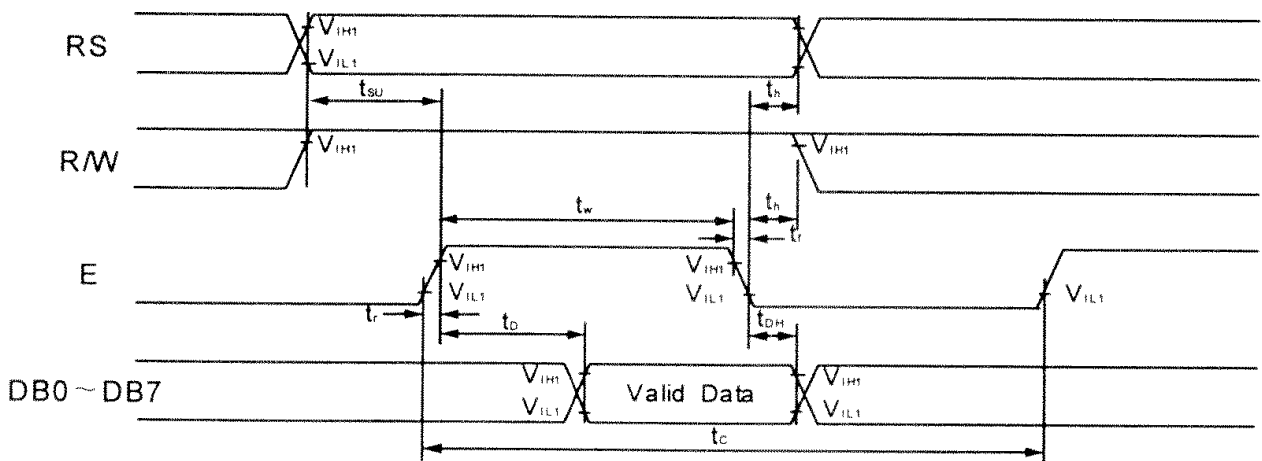


Figure 3: Read Mode Timing Diagram

**5.3 Timing Diagram of VDD Against V0.**

Power on sequence shall meet the requirement of Figure 4, the timing diagram of VDD against V0.

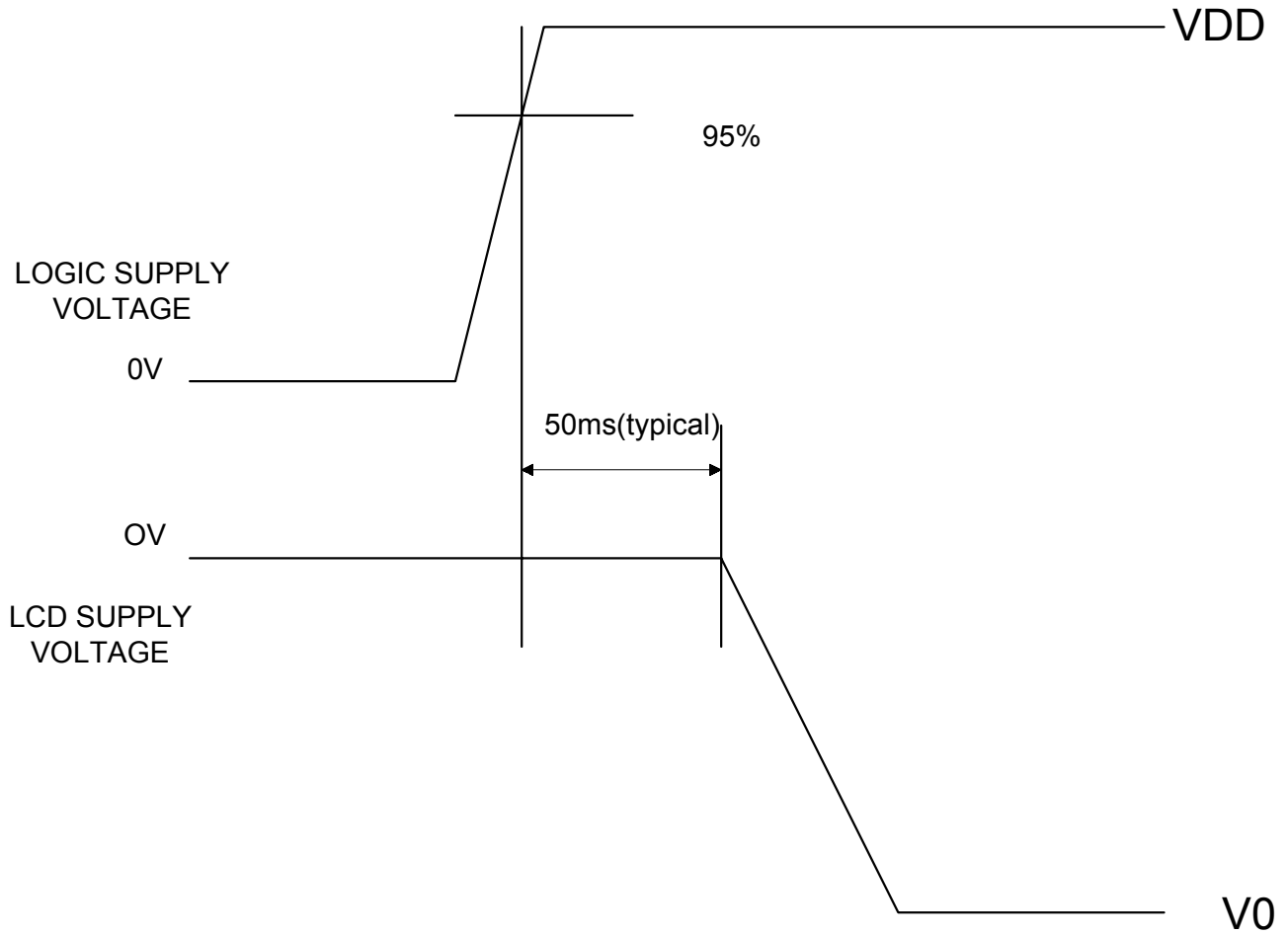


Figure 4: Timing Diagram of VDD Against V0.

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