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 SPECIFICATION
 OF
 LCD MODULE TYPE
 ITEM NO.: BTHQ 42005VSS-02

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CONTENTS

	<u>Page No.</u>
1. GENERAL DESCRIPTION	4
2. MECHANICAL SPECIFICATIONS	4
3. INTERFACE SIGNALS	6
4. ABSOLUTE MAXIMUM RATINGS	7
4.1 ELECTRICAL MAXIMUM RATINGS (Ta=25°C)	7
4.2 ENVIRONMENTAL CONDITION	7
5. ELECTRICAL SPECIFICATIONS	8
5.1 TYPICAL ELECTRICAL CHARACTERISTICS	8
5.2 TIMING SPECIFICATIONS	9
5.3 TIMING DIAGRAM OF VDD AGAINST V0	11
6. CHARACTER GENERATOR ROM(KS0066U-10B)	12

**Specification
of
LCD Module Type
Item No.: BTHQ 42005VSS-02**

1. General Description

- 20 characters (5 x 8 dots) x 4 lines STN Positive G-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	98.0(W) x 60.0(H) x 14.0 MAX.(D)	mm
Effective viewing area	76.0(W) x 25.2(H)	mm
Active area	70.35(W) x 20.74(H)	mm
Display format	20 characters x 4 lines	-
Character size	2.90(W) x 4.697(H) (5 x 8 dots)	mm
Character spacing	0.65(W) x 0.65(H)	mm
Character pitch	3.55(W) x 5.347(H)	mm
Dot size	0.568(W) x 0.574(H)	mm
Dot spacing	0.015(W) x 0.015(H)	mm
Dot pitch	0.583(W) x 0.589(H)	mm
Weight	Approx. 71	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)
15 or A	LED(+)	Anode of LED Backlight
16 or 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	-5°C	+50°C	-20°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 ² = 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)	4.1	4.5	4.9	V
Input signal voltage for E,DB0-DB7,R/W,RS.	V _{IH}	"H" level	2.2	-	VDD	V
	V _{IL}	"L" level	-0.3	-	0.6	V
Supply Current (Logic & LCD)	IDD	Character mode, VDD=5V, Note 1	-	1.0	1.5	mA
		Checker board mode, VDD=5V, Note 1	-	1.2	1.8	mA
Supply Current (LCD)	I0	Character mode, VDD=5V, Note 1	-	0.2	0.3	mA
		Checker board mode, VDD=5V, Note 1	-	0.2	0.3	mA
Supply voltage of yellow-green LED04 backlight	VLED	Forward current =240mA Number of LED dies =2x24 =48.	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 $T_a = -5\text{ }^{\circ}\text{C}$ To $+50\text{ }^{\circ}\text{C}$, $V_{DD} = +5V \pm 5\%$, $V_{SS} = 0V$.

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

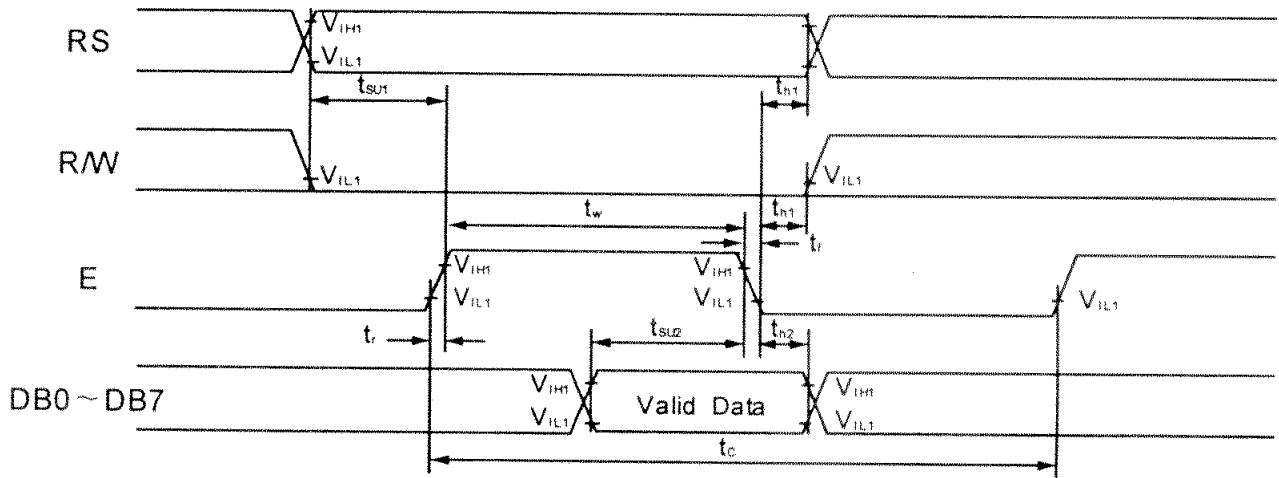


Figure 2: Write Mode Timing Diagram

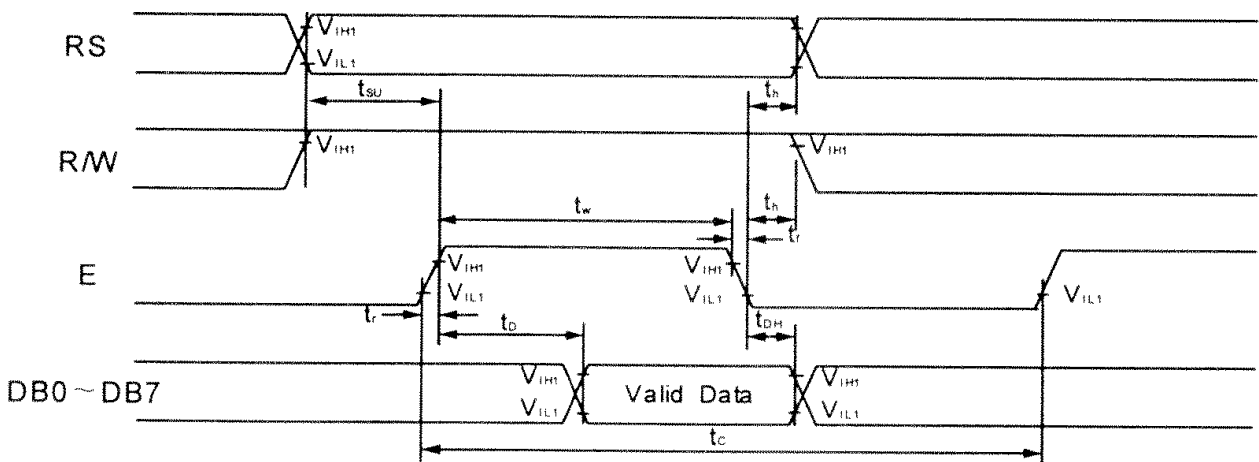


Figure 3: Read Mode Timing Diagram

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.

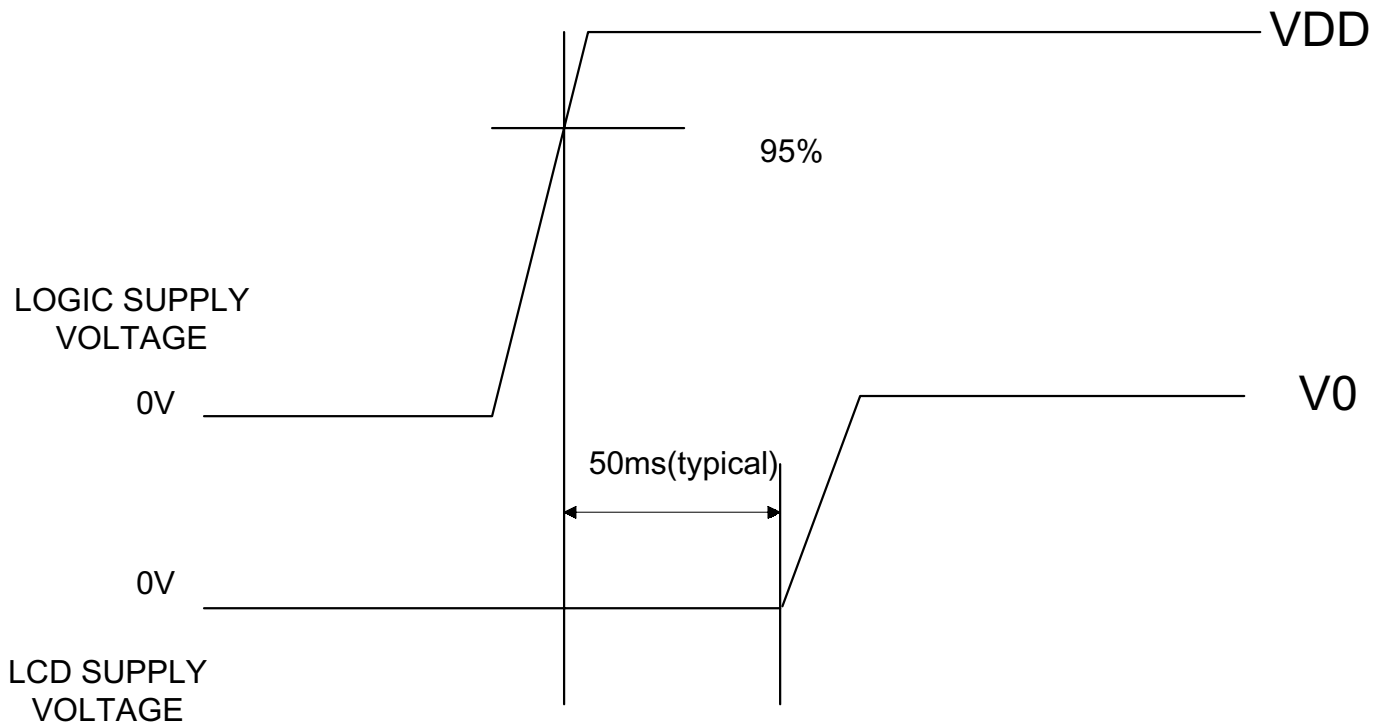


Figure 4: Timing Diagram of VDD Against V0.

6. Character Generator ROM(KS0066U-10B)

Upper 4bit \ Lower 4bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHLH	HHHL	HHHH
LLLL	CG RAM (1)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
LLLH	(2)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
LLHL	(3)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
LLHH	(4)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
LHLL	(5)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
LHLH	(6)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
LHHL	(7)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
LHHH	(8)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
HLLL	(1)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
HLLH	(2)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
HLHL	(3)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
HLHH	(4)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
HHLL	(5)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
HHLH	(6)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
HHHL	(7)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]
HHHH	(8)	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]	[Hex]

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