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# **Specification for BTHQ 42005VSS-SMN-LEDwhite**

Version July 2003

**DOCUMENT REVISION HISTORY 1:**

DOCUMENT REVISION FROM TO	DATE	DESCRIPTION	CHANGED BY	CHECKED BY
A	2003.07.04	First Release. (Based on Test Specification: VL-TS-BTHQ 42005VSS-XX, REV. C, 2003.02.10).	HELEN HE	LU MIN YUAN

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**Specification  
of  
LCD Module Type  
Model No.: BTHQ 42005VSS-06**

**1. General Description**

- 20 characters (5 x 8 dots) x 4 lines STN Transmissive Negative Blue Dot Matrix LCD module.
- Viewing Angle: 6 O'clock direction.
- Driving duty: 1/16 Duty, 1/5 bias.
- 'SAMSUNG' KS0066UP-10BCC (Die) LCD Controller & Driver or equivalent.
- 'SAMSUNG' KS0065B-PCC (Die) LCD Segment Drivers or equivalent.
- White LED05 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
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.72.0	grams

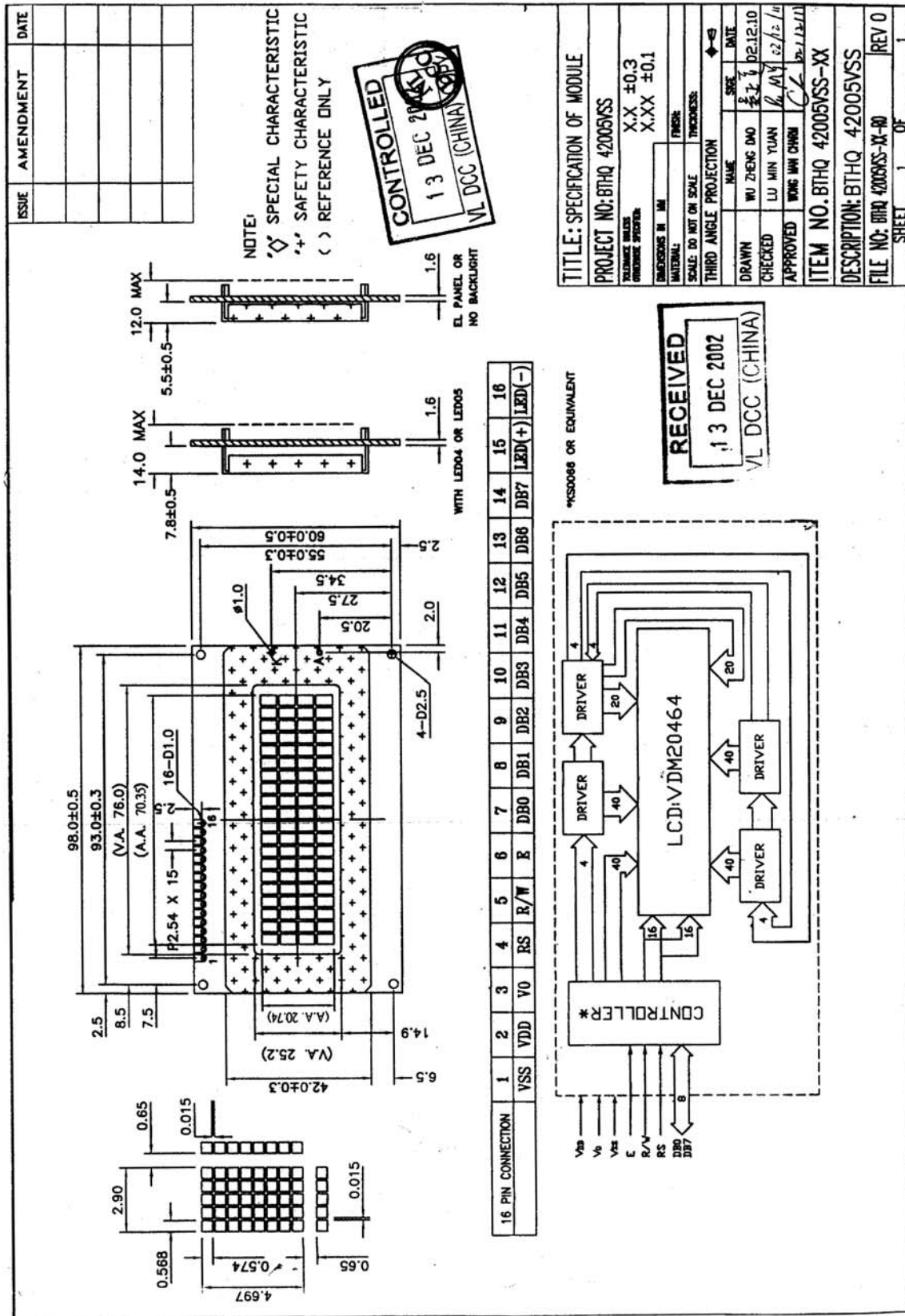


Figure 1: Module Specification

### 3. Backlight specification

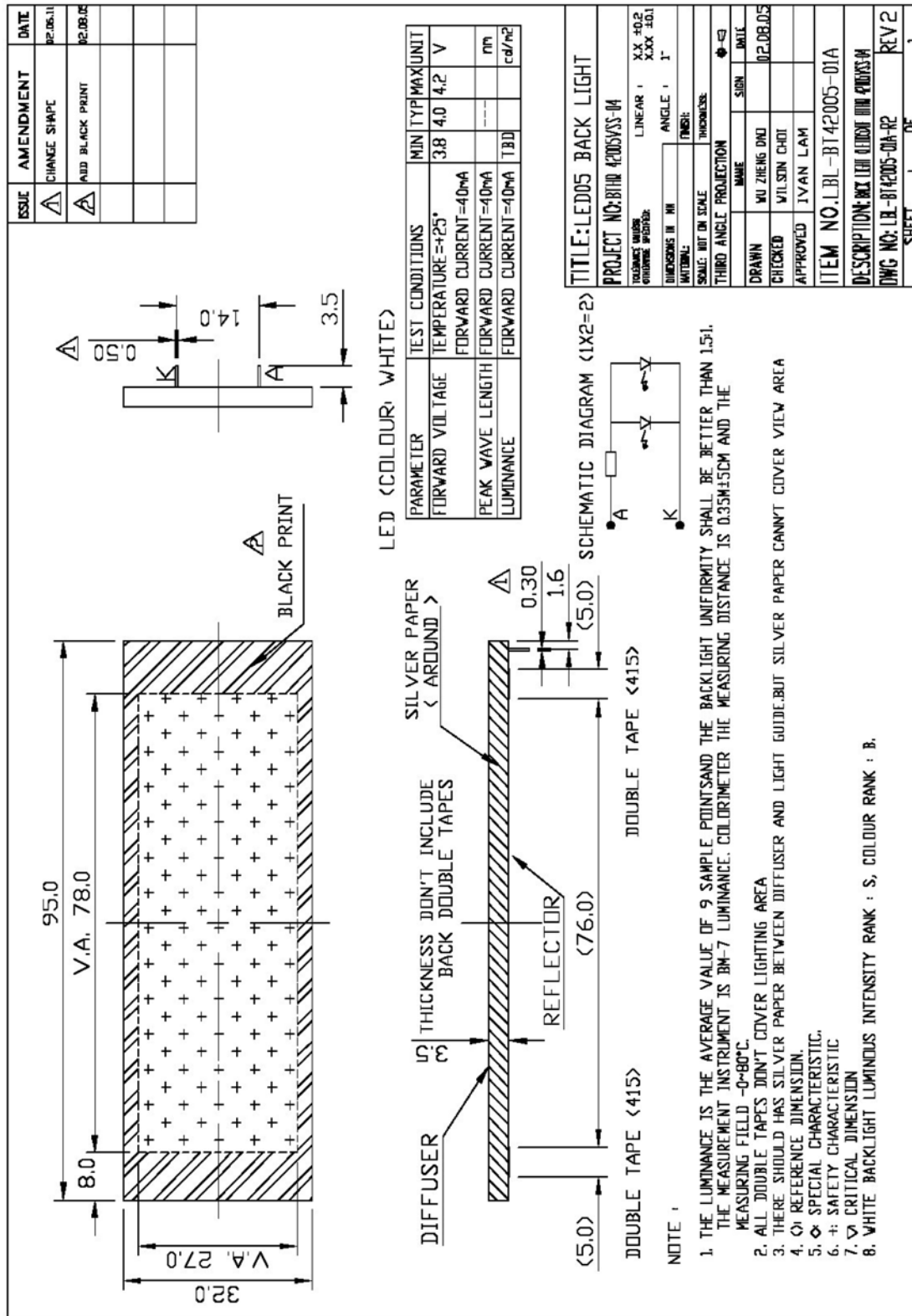


Figure 2: Backlight Specification

**4. Interface signals**Table 2

Pin No.	Symbol	Description
1	VSS	Ground (0V).
2	VDD	Power supply for logic (+5V).
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	LED(+)	Anode of backlight.
16	LED(-)	Cathode of backlight.

**5. Absolute Maximum Ratings****5.1 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.

**5.2 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



## 6. Electrical Specifications

### 6.1 Typical Electrical Characteristics

At  $T_a = 25\text{ }^\circ\text{C}$ ,  $V_{DD} = 5V \pm 5\%$ ,  $V_{SS} = 0V$ .

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (Logic)	$V_{DD} - V_{SS}$		4.75	5.0	5.25	V
Supply voltage (LCD)	$V_{LCD} = V_{DD} - V_0$	$V_{DD} = 5.0V$ , $T_a = 0\text{ }^\circ\text{C}$ , Note1.	-	4.80	-	V
		$V_{DD} = 5.0V$ , $T_a = 25\text{ }^\circ\text{C}$ , Note1.	4.10	4.40	4.70	V
		$V_{DD} = 5.0V$ , $T_a = 50\text{ }^\circ\text{C}$ , Note1.	-	4.20	-	V
Input signal voltage (except OSC1)	$V_{IH1}$	“High” level	2.2	-	$V_{DD}$	V
	$V_{IL1}$	“Low” level	-0.3	-	0.6	V
Supply Current (Logic & LCD)	IDD	Character mode, $V_{DD} = 5V$	-	1.0	1.5	mA
		Checker board mode, $V_{DD} = 5V$	-	1.2	1.8	mA
Supply Current (LCD)	I0	Character mode, $V_{DD} = 5V$ , Note (1)	-	0.2	0.3	mA
		Checker board mode, $V_{DD} = 5V$ , Note (1)	-	0.2	0.3	mA
Supply voltage of white LED05 backlight	VLED	Forward current =40mA  Number of LED dies =1x2=2	3.8	4.0	4.2	V

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

## 6.2 Timing Specifications

At Ta = 0 °C To +50 °C, VDD = +5V±5%, VSS = 0V.

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

Table 6

Parameter	Symbol	Min.	Max.	Unit
E Cycle Time	tc	500	-	ns
E Rise/Fall Time	t <sub>R</sub> ,t <sub>F</sub>	-	20	ns
E Pulse Width(high, low)	t <sub>w</sub>	230	-	ns
R/W and RS Setup Time	t <sub>SU1</sub>	40	-	ns
R/W and RS Hold Time	t <sub>H1</sub>	10	-	ns
Data Set-up Time	t <sub>SU2</sub>	80	-	ns
Data Hold Time	t <sub>H2</sub>	10	-	ns

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

Table 7

Parameter	Symbol	Min.	Max.	Unit
E Cycle Time	tc	500	-	ns
E Rise/Fall Time	t <sub>R</sub> ,t <sub>F</sub>	-	20	ns
E Pulse Width(high, low)	t <sub>w</sub>	230	-	ns
R/W and RS Setup Time	t <sub>SU</sub>	40	-	ns
R/W and RS Hold Time	t <sub>H</sub>	10	-	ns
Data Output Delay Time	t <sub>D</sub>	-	120	ns
Data Hold Time	t <sub>DH</sub>	5	-	ns

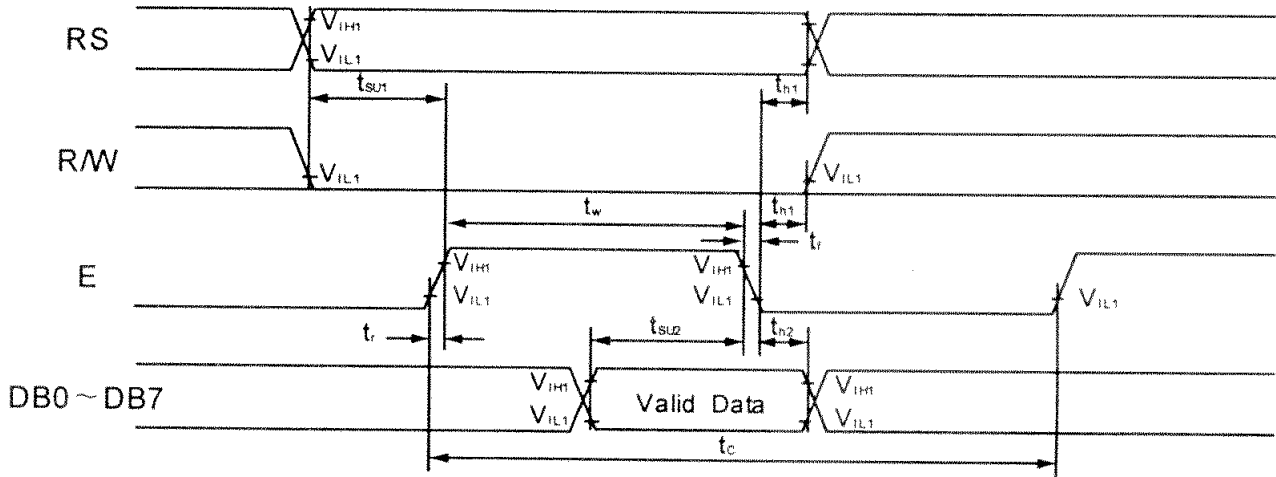


Figure 3 : Write Mode Timing Diagram

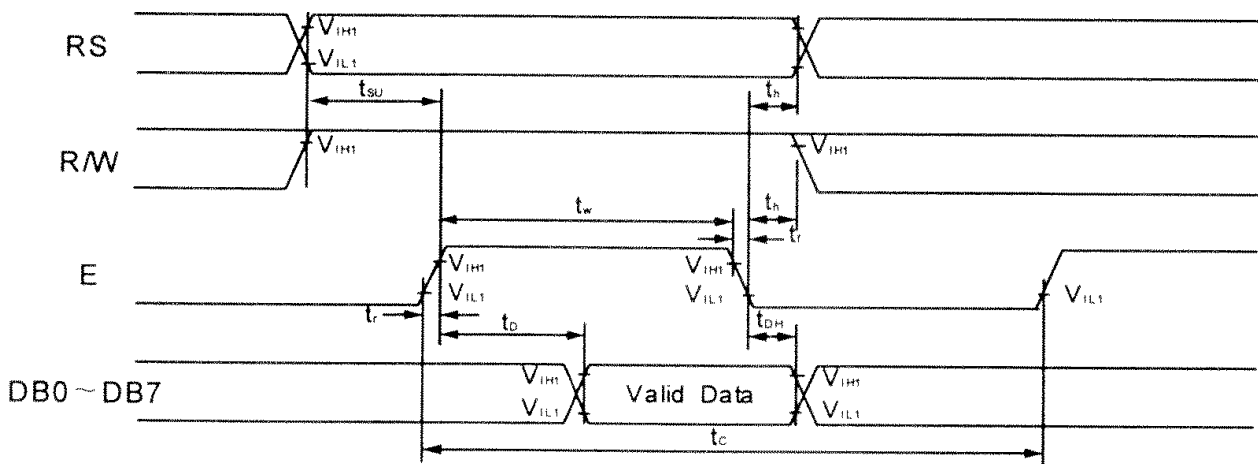


Figure 4 : Read Mode Timing Diagram

### 6.3 Timing Diagram of VDD Against V0

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

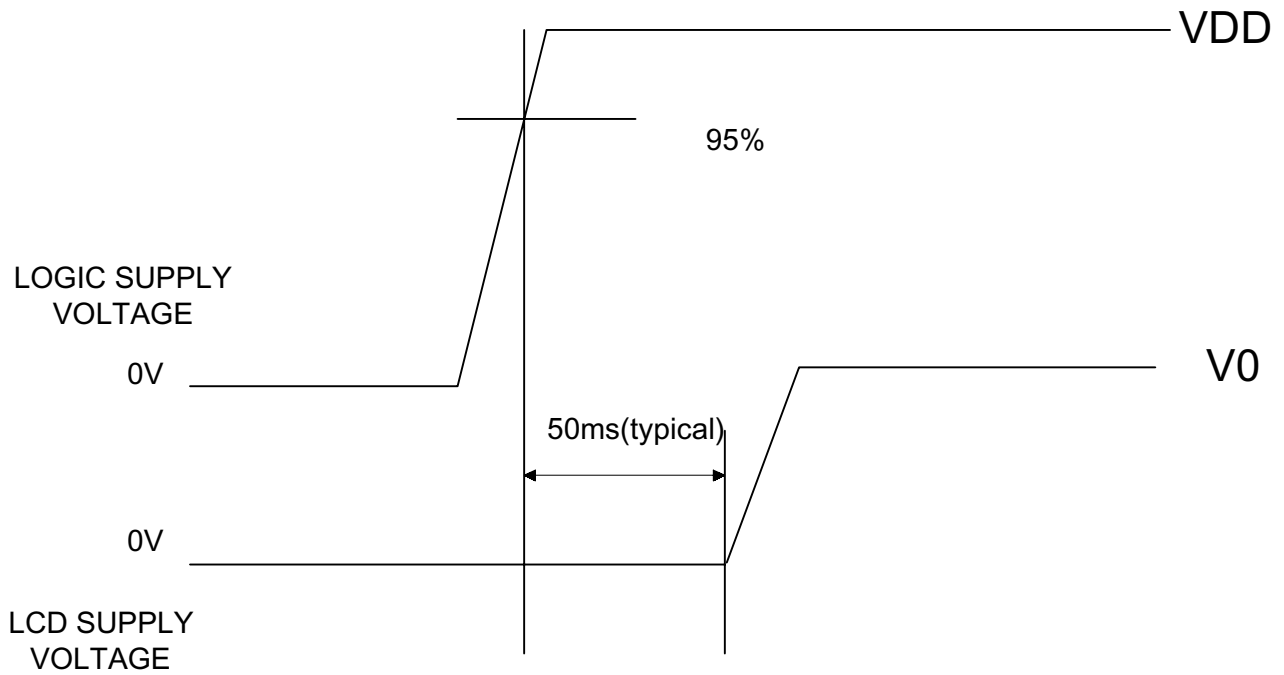


Figure 5: Timing Diagram of VDD Against V0.

## 6.4 Character Generator ROM (KS0066U-10B)

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