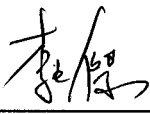


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DOCUMENT TITLE:
SPECIFICATION
OF
LCD MODULE TYPE
ITEM NO.: BTHQ 21608VSS-01

APPROVALS:

EFFECTIVE DATE

DEPARTMENT	NAME	SIGNATURE	DATE
MARKETING (TECHNICAL SUPPORT)	PHILIP CHENG		2002/01/04
MARKETING (TECHNICAL SUPPORT)	TOM LEE		2002/1/4
MARKETING (TECHNICAL SUPPORT)	CYRUS CHEUNG		2002/1/4

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**Specification
of
LCD Module Type
ITEM NO.: BTHQ 21608VSS-01**

1. General Description

- 16 characters (5 x 8 dots) x 2 lines STN Positive Yellow Reflective LCD Character Module.
- Viewing Angle: 6 o'clock direction.
- Driving scheme: 1/16 duty, 1/5 bias.
- 'SAMSUNG' KS0070BP-00CC (Die form) LCD Controller & Driver or equivalent.

2. Mechanical Specifications

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

Table 1

Parameter	Specifications	Unit
Outline dimensions	122.0(W) x 43.0(H) x 11.0 MAX.(D)	mm
Effective viewing area	99.0(W) x 23.0(H)	mm
Display format	16 characters x 2 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:	TBD	Grams

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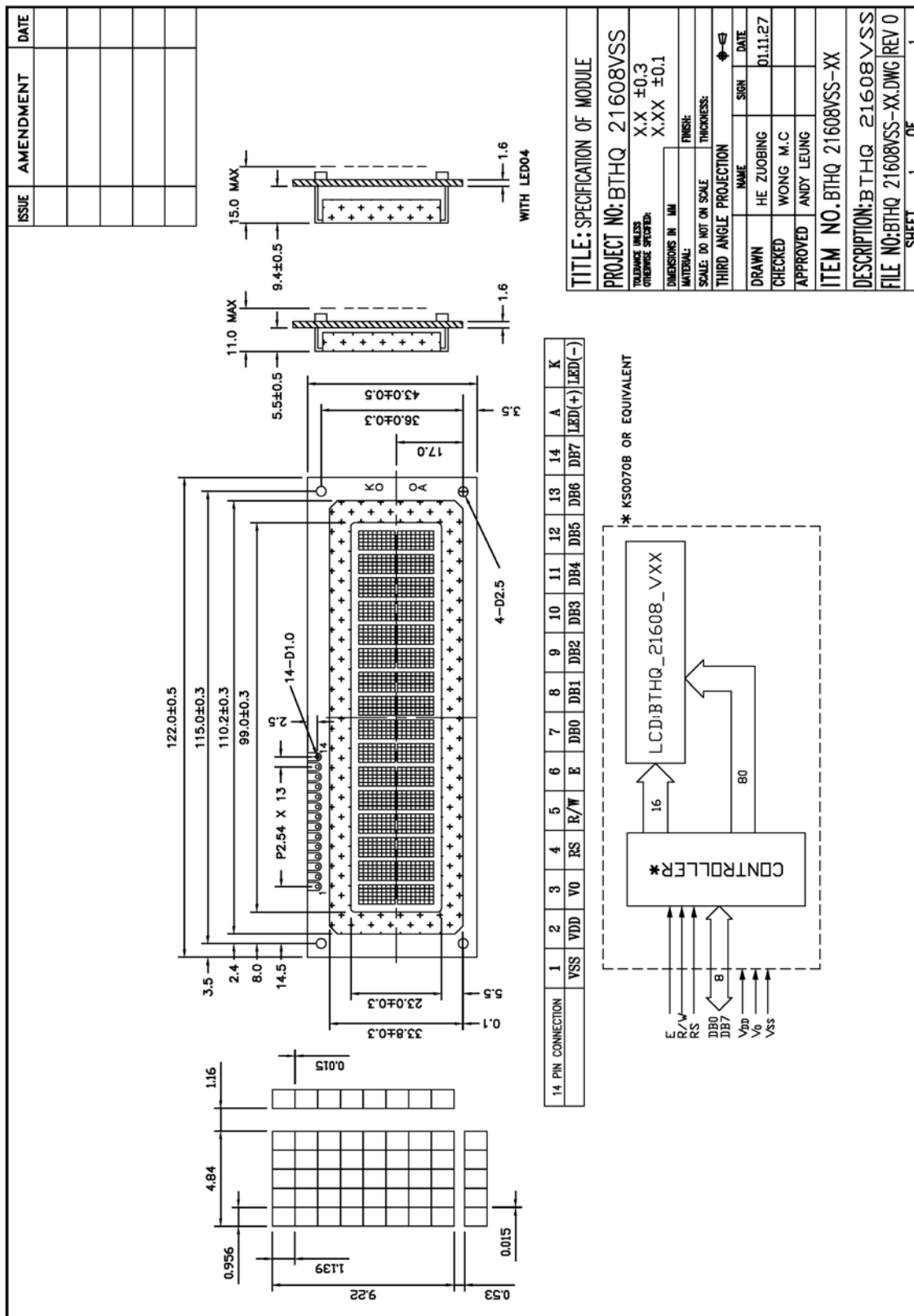
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3. Absolute Maximum Ratings

3.1 Electrical Maximum Ratings($T_a = 25\text{ }^{\circ}\text{C}$)

Table 2

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.

3.2 Environmental Condition

Table 3

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 $T_a \leq 40^{\circ}\text{C}$ < 95% RH for $T_a > 40^{\circ}\text{C}$				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: $981\text{ m/s}^2 = 100\text{g}$ Number of shocks: 3 shocks in 3 mutually perpendicular axes.				3 directions

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4. Electrical Specifications

4.1 Interface signals

Table 4

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.

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4.2 Typical Electrical Characteristics

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

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	4.0	4.5	5.0	V
Input signal voltage 1 for E,DB0-DB7,R/W,RS	V _{IH1}	“High” level	2.2	-	VDD	V
	V _{IL1}	“Low” level	-0.3	-	0.6	V
Input signal voltage 2 for OSC1	V _{IH2}	“High” level	VDD -1.0	-	VDD	V
	V _{IL2}	“Low” level	-	-	1.0	V
Supply Current (Logic & LCD)	IDD	Character mode, Note 1	-	1.7	2.6	mA
Supply Current (LCD)	I0	Character mode, Note 1	-	0.9	1.4	mA

Note (1):

There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.

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4.3 Timing Specifications

At $T_a = 0\text{ }^{\circ}\text{C}$ 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	Test pin
E cycle time	t_C	500	-	ns	E
E rise time	t_R	-	25	ns	E
E fall time	t_F	-	25	ns	E
E pulse width (High, Low)	t_W	220	-	ns	E
R/W and RS set-up time	t_{SU1}	40	-	ns	R/W, RS
R/W and RS hold time	t_{H1}	10	-	ns	R/W, RS
Data set-up time	t_{SU2}	60	-	ns	DB0-DB7
Data hold time	t_{H2}	10	-	ns	DB0-DB7

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

Table 7

Parameter	Symbol	Min.	Max.	Unit	Test pin
E cycle time	t_C	500	-	ns	E
E rise time	t_R	-	25	ns	E
E fall time	t_F	-	25	ns	E
E pulse width	t_W	220	-	ns	E
R/W and RS set-up time	t_{SU}	40	-	ns	R/W, RS
R/W and RS hold time	t_H	10	-	ns	R/W, RS
Data output delay time	t_D	-	120	ns	DB0-DB7
Data hold time	t_{DH}	20	-	ns	DB0-DB7

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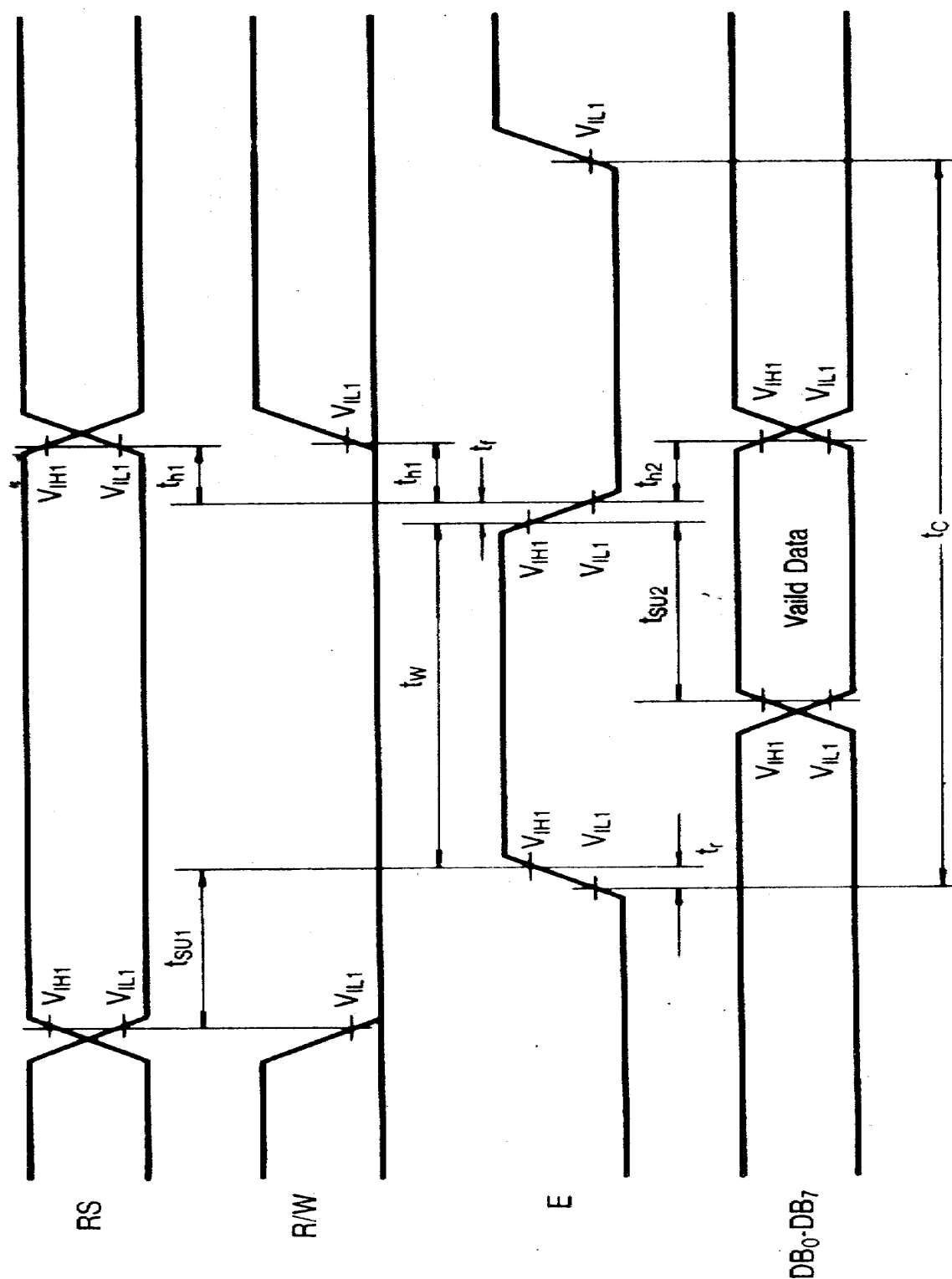


Figure 2: The bus timing diagram for write mode .

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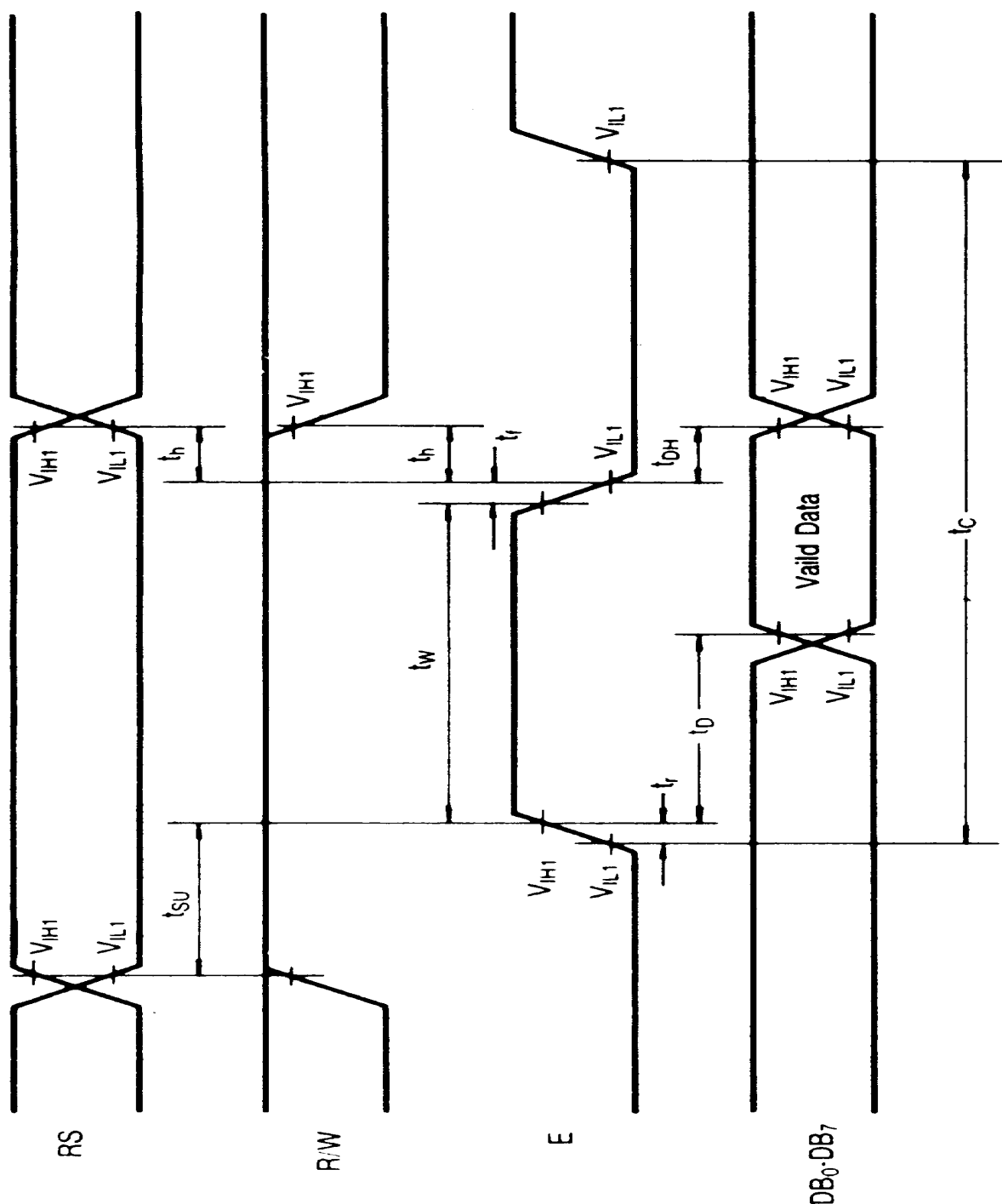


Figure 3: The bus timing diagram for read mode .

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4.4 Timing Diagram of VDD against V0.

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

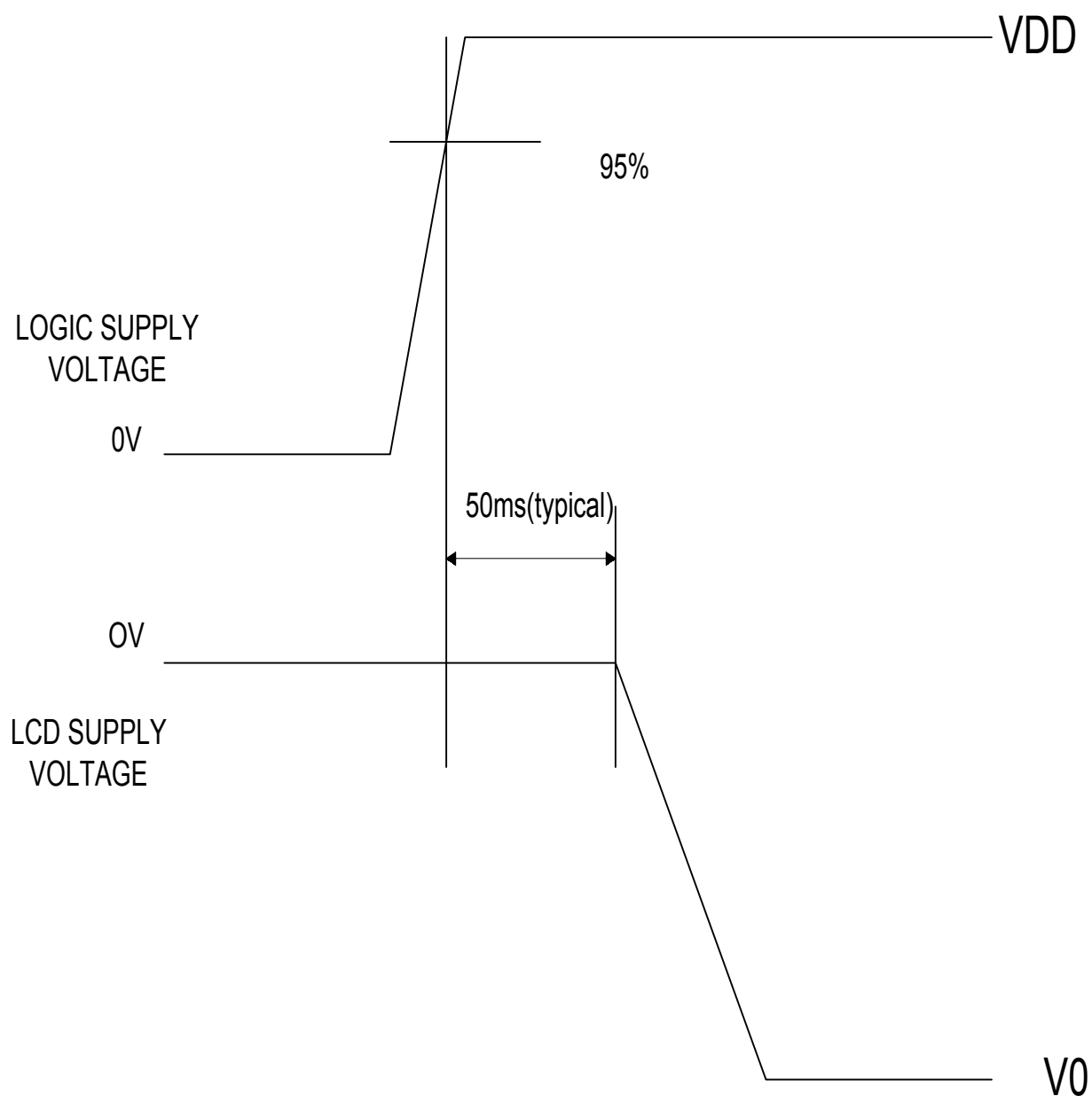


Figure 4: Timing diagram of VDD against V0.

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