DOCUMENT NUMBER AND REVISION
VL-FS-MGLS12864T-20 REV. B
(MGLS12864T-LED04-LV2)

DOCUMENT TITLE:
SPECIFICATION
OF
LCD MODULE TYPE
ITEM NO.: MGLS12864T-20

DEPARTMENT	NAME	SIGNATURE	DATE
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DOCUMENT REVISION HISTORY 1:

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	A	2002.01.11	First Release (Based on the test specification VL-TS-MGLS12864T-20, REV. A, 2001.03.01)	PHILIP CHENG	TOM LEE
A	B	2004.04.03	Items 1-3 were updated: (Based on Test Specification: VL-TS-MGLS12864T-XX REV. Q 2003.12.23) 1.) (Page4, Table1)"Outline dimensions" were updated. 2.) (Page5, Figure 1) Outline Drawing was changed from Rev. 0 to Rev. 2. 3.) (Page9, Point5.1) Table 5 was updated.	CHEN HUI JUAN	HE ZUO BING

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Specification
of
LCD Module Type
Item No.: MGLS12864T-20

1. General Description

- 128 x 64 dot matrix STN LV2 Positive Yellow Transflective dot matrix LCD graphic module.
- Viewing direction: 6 o' clock.
- Driving scheme: 1/64 multiplexed drive, 1/9 bias.
- ' Toshiba' T6963C flat pack or equivalent dot matrix LCD controller.
- ' Toshiba' T6A39 flat pack or equivalent dot matrix liquid crystal graphic display column drivers.
- ' Toshiba' T6A40 flat pack or equivalent dot matrix liquid crystal graphic display row driver.
- 8K byte display SRAM.
- 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	78.0(W) x 70.0(H) x 15.5 MAX.(D)	mm
Display format	128(Horizontal) x 64(Vertical)	dots
Viewing area	62.0(W) x 44.0(H)	mm
Active area	56.27(W) x 38.35(H)	mm
Dot size	0.39(W) x 0.55(H)	mm
Dot spacing	0.05(W) x 0.05(H)	mm
Dot pitch	0.44(W) x 0.60(H)	mm
Weight:	TBD	grams

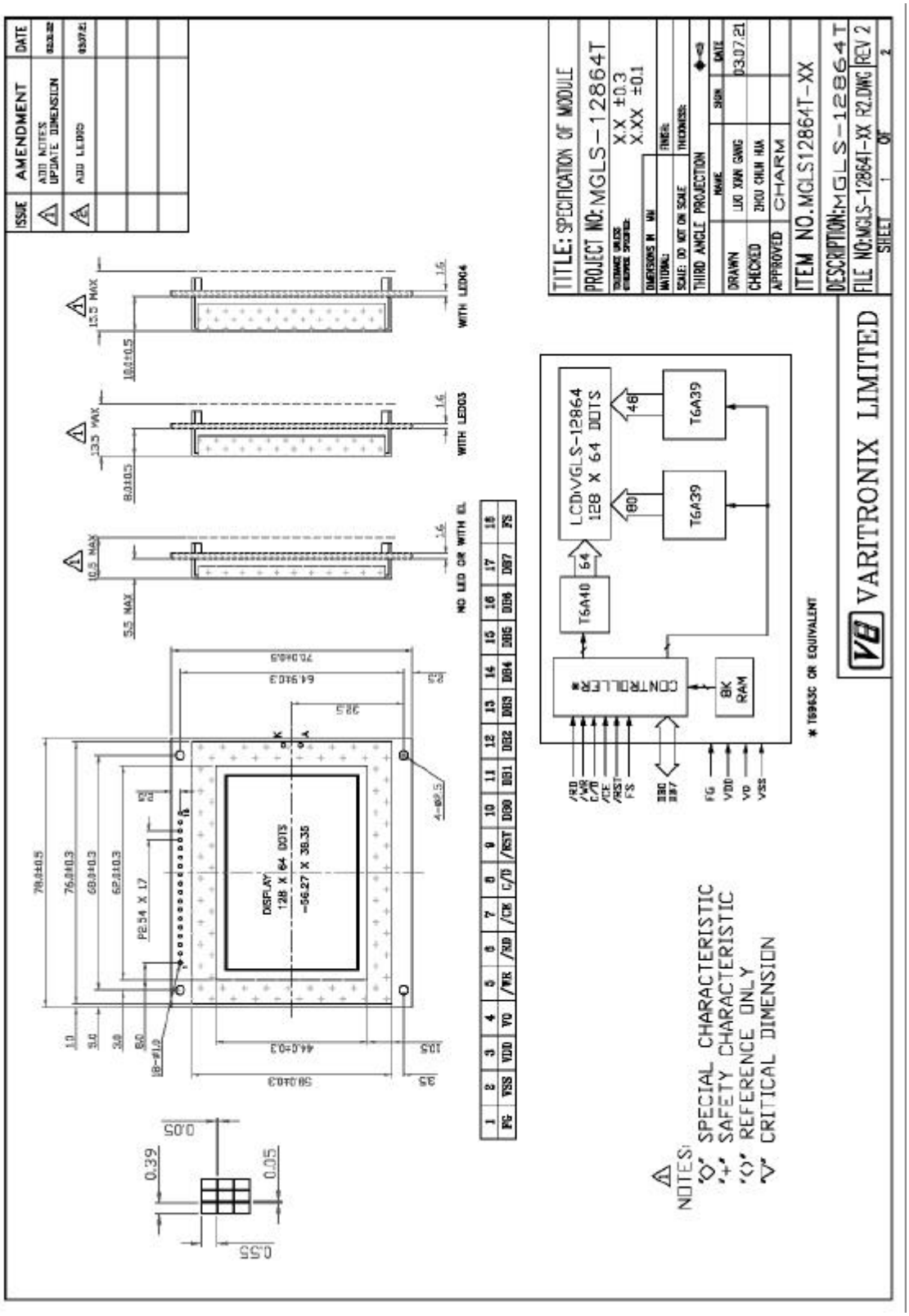

Figure 1: Outline Drawing 1

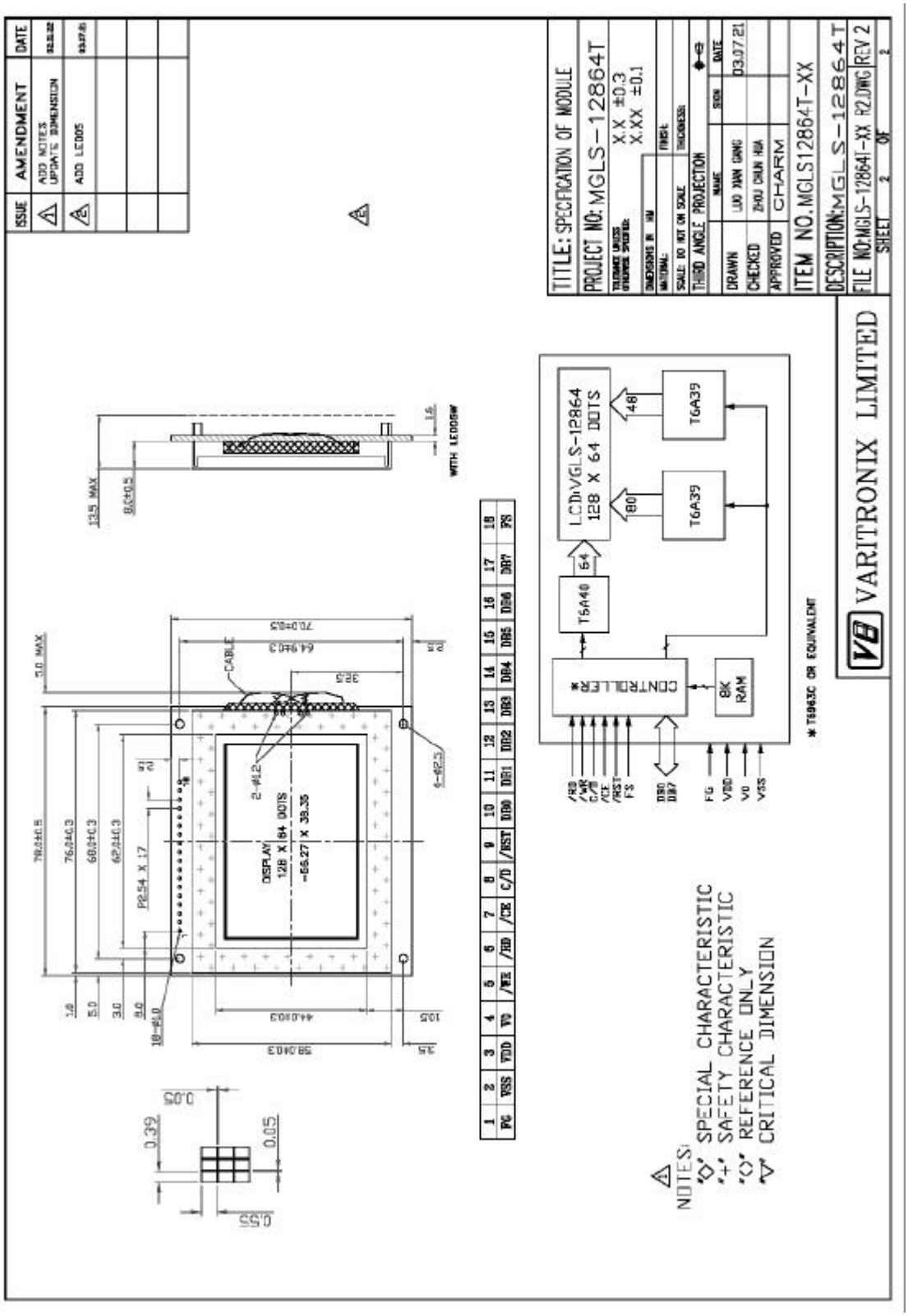

Figure 2: Outline Drawing 2

3. Interface signals

Table 2

Pin No.	Symbol	Description
1	FG	Frame ground (see note 1).
2	VSS	Ground (0V).
3	VDD	Power supply for logic (+5V).
4	V0	Power supply for LCD drive
5	/WR	Data Write. Write data into T6963C when /WR="Low".
6	/RD	Data Read. Read data from T6963C when /RD="Low".
7	/CE	Chip enable for T6963C. /CE must be "Low" when CPU communicates with T6963C.
8	C / $\overline{D}$	/WR = "Low" ….C/$\overline{D}$="High": Command Write C/$\overline{D}$="Low": Data Write. /RD = "Low" …. C/$\overline{D}$="High": Status Read C/$\overline{D}$="Low": Data Read.
9	/RST	"High": Normal (T6963C has internal pull-up resistor). "Low": Initialize T6963C. Text and graphic have addresses and text and graphic area settings are retained.
10	DB0	Data input/output (LSB).
11	DB1	Data input/output.
12	DB2	Data input/output.
13	DB3	Data input/output.
14	DB4	Data input/output.
15	DB5	Data input/output.
16	DB6	Data input/output.
17	DB7	Data input/output (MSB).
18	FS	Font select. "High" for 6 x 8 font & "Low" for 8 x 8 font.
-	A	Anode of backlight
-	K	Cathode of backlight

Note 1: This pin is electrically connected to the metal bezel (frame).
User can choose to connect this pin to VSS or leave it open.

4. Absolute Maximum Ratings

4.1 Electrical Maximum Ratings(Ta = 25 º C)

Table 3

Parameter	Symbol	Min.	Max.	Unit
Supply voltage (Logic & LCD)	VDD - VSS	-0.3	+7.0	V
Supply voltage (LCD drive) (Built-in)	VLCD =VDD – V0	-0.3	+30.0	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^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 & LCD)	VDD -VSS		4.75	5.00	5.25	V
Supply voltage (LCD)	VLCD =VDD –V0	VDD = 5V, Note 1	9.7	10.2	10.7	V
Input signal voltage	V_{IH}	"H" level	VDD-2.2	-	VDD	V
	V_{IL}	"L" level	0	-	0.8	V
Supply current (Logic & LCD)	IDD	Character mode, VDD=5V, Note 1	-	6.2	9.3	mA
		Checker board mode, VDD=5V, Note 1	-	6.4	9.6	mA
Supply current (LCD)	I0	Character mode, VDD=5V, Note 1	-	2.3	3.5	mA
		Checker board mode, VDD=5V, Note 1	-	2.3	3.5	mA
Supply voltage of Yellow-green LED04 backlight	VLED	Forward current =240mA Number of LED dies =48.	3.9	4.1	4.3	V

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

5.2 Timing Specifications

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

Refer to Fig. 3, the bus timing diagram.

Table 6

Parameter	Symbol	Min.	Max.	Unit
C/$\overline{D}$ Set-up time	t_{CDS}	100	-	ns
C/$\overline{D}$ Hold Time	t_{CDH}	10	-	ns
/CE,/RD,/WR Pulse Width	t_{CE}, t_{RD}, t_{WR}	80	-	ns
Data Set-up Time	t_{DS}	80	-	ns
Data Hold Time	t_{DH}	40	-	ns
Access Time	t_{ACC}	-	150	ns
Output Hold Time	t_{OH}	10	50	ns

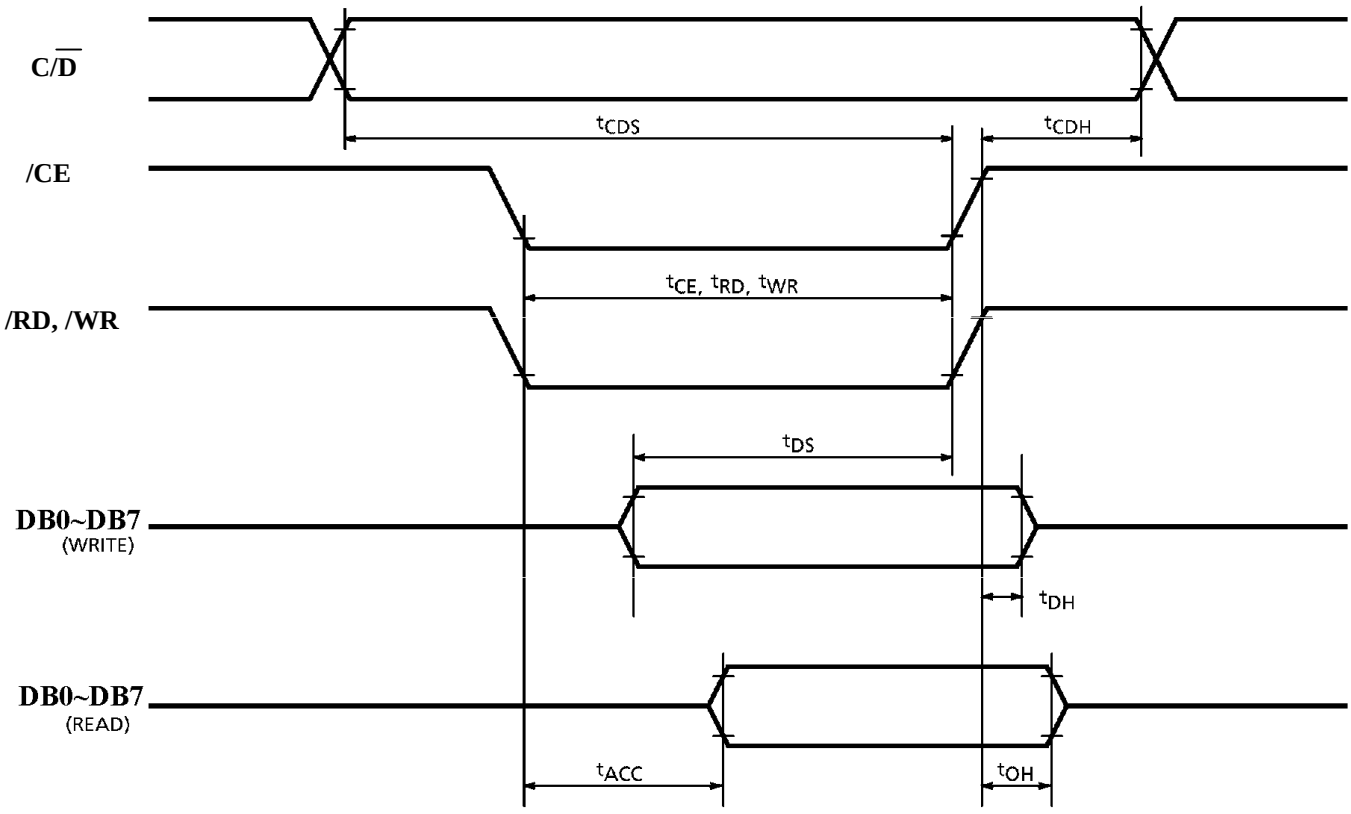

Figure 3: Bus Timing Diagram

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.

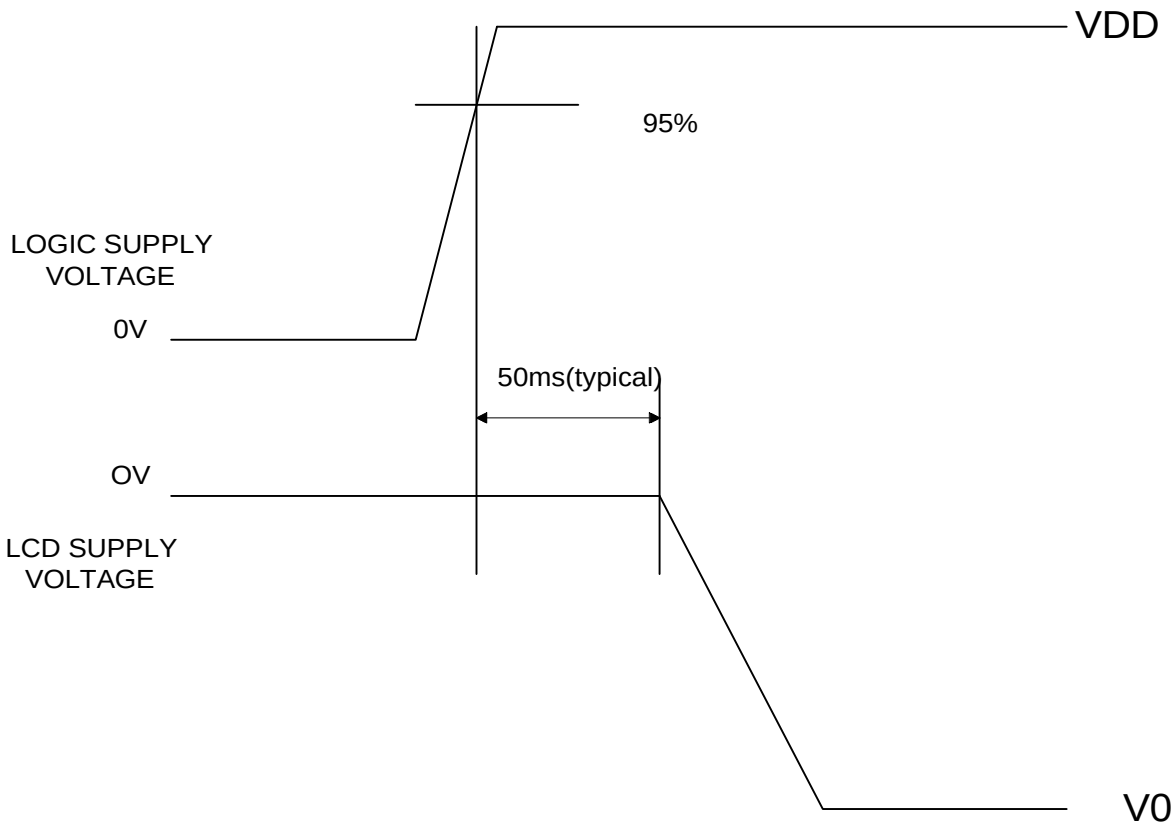

Figure 4: Timing diagram of VDD against V0.

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