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(BTHQ 21608VSS-FSTF-LED-WHITE(1 DIE))

DOCUMENT TITLE:

SPECIFICATION
OF
LCD MODULE TYPE
ITEM NO.: BTHQ 21608VSS-02

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Specification
of
LCD Module Type
ITEM NO.: BTHQ 21608VSS-02

1. General Description

- 16 characters (5 x 8 dots) x 2 lines FSTN Positive Black & White Transflective 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.
- 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	122.0(W) x 43.0(H) x 13.0 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 9.23(H) (5 x 8 dots)	mm
Character spacing	1.16(W) x 0.53(H)	mm
Character pitch	6.00(W) x 9.76(H)	mm
Dot size	0.955(W) x 1.140(H)	mm
Dot spacing	0.015(W) x 0.015(H)	mm
Dot pitch	0.970(W) x 1.155(H)	mm
Weight:	TBD	Grams

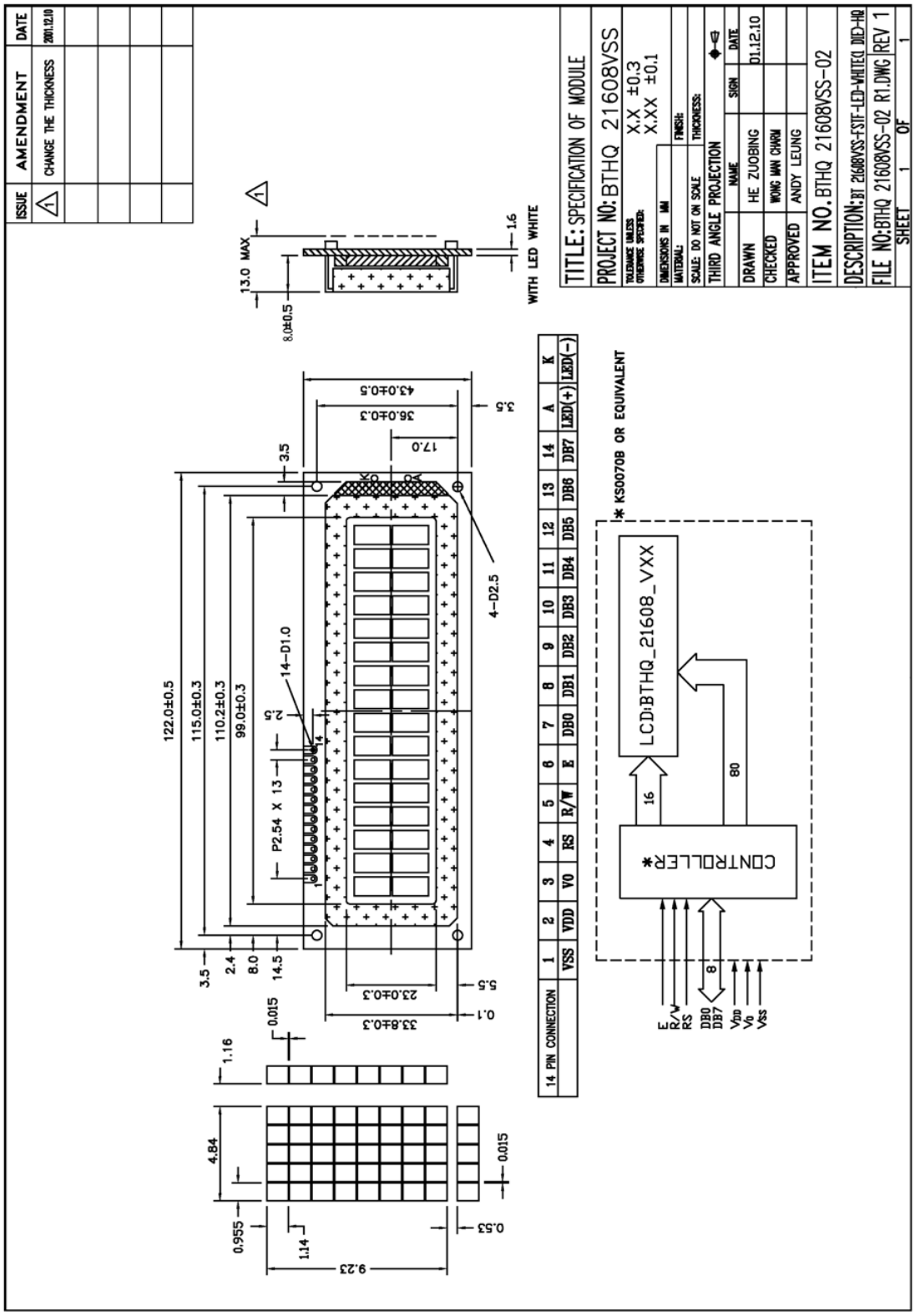

Figure 1: Outline Drawing.

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^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	4.6	5.1	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	-	1.8	2.9	mA
Supply Current (LCD)	I0	Character mode, Note 1	-	1.0	1.5	mA
Forward voltage of White LED05 backlight	VLED	Forward current =20mA Number of LED dies =1	3.1	3.4	3.7	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 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	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

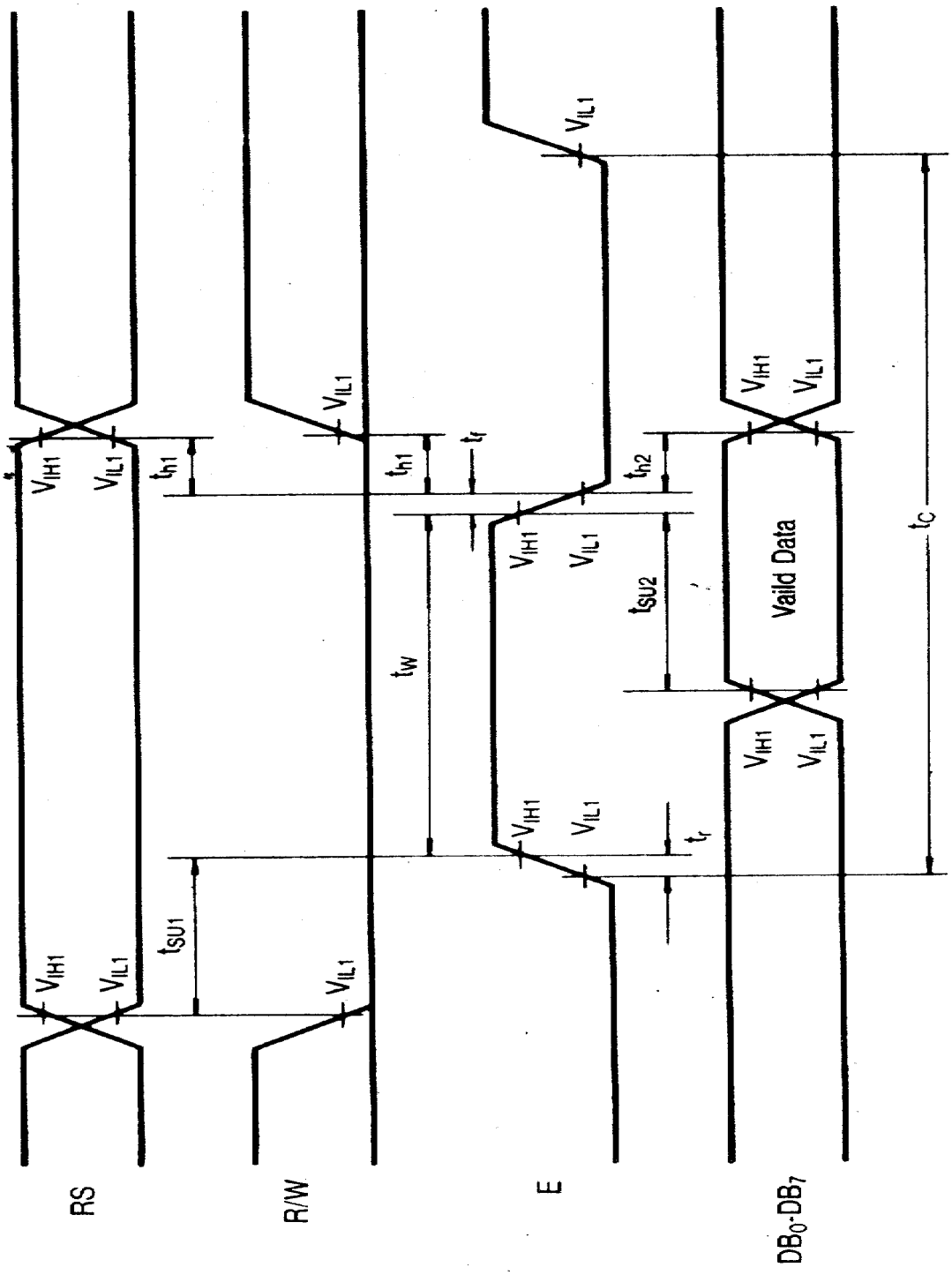

Figure 2: The bus timing diagram for write mode .

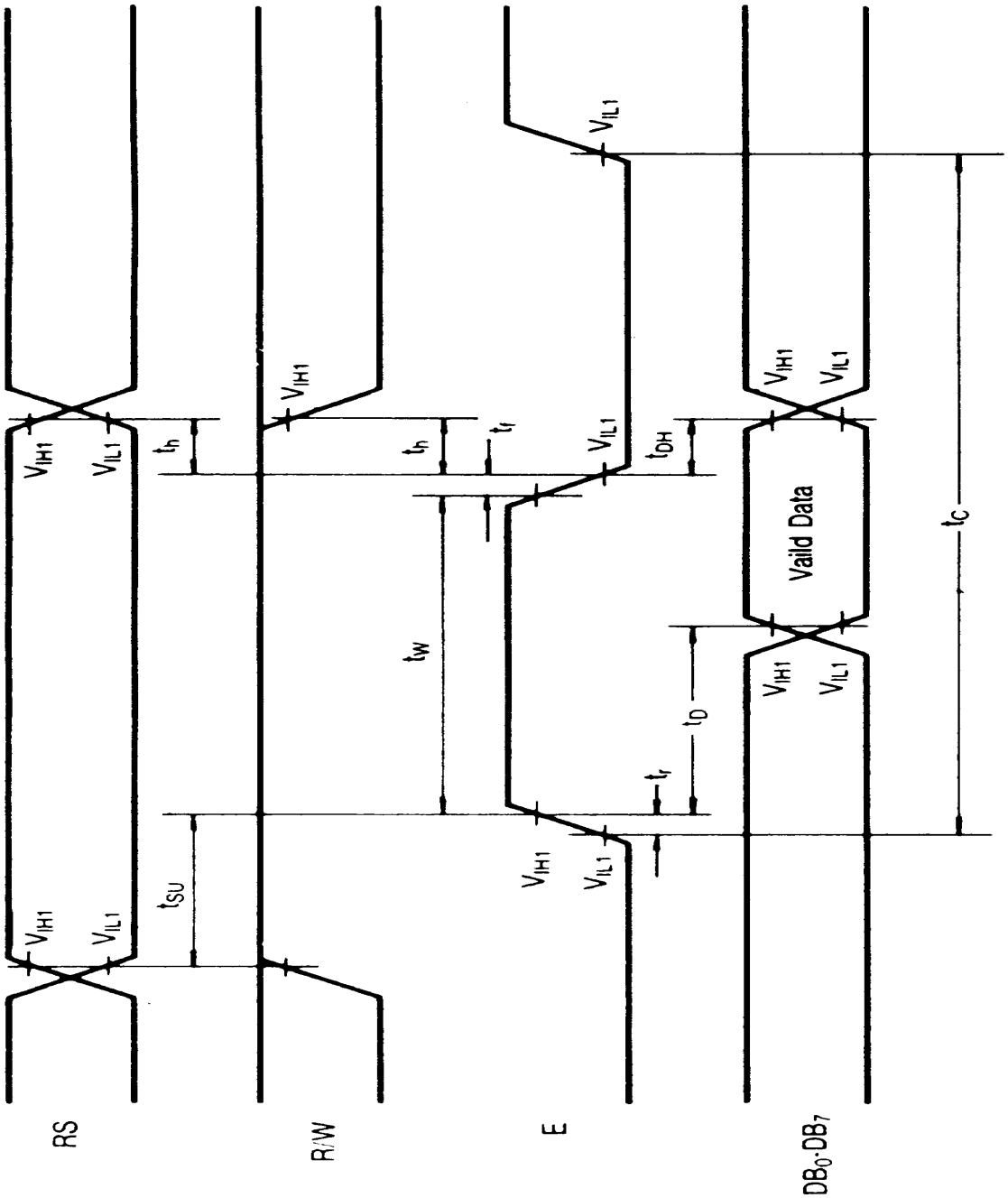

Figure 3: The bus timing diagram for read mode .

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.

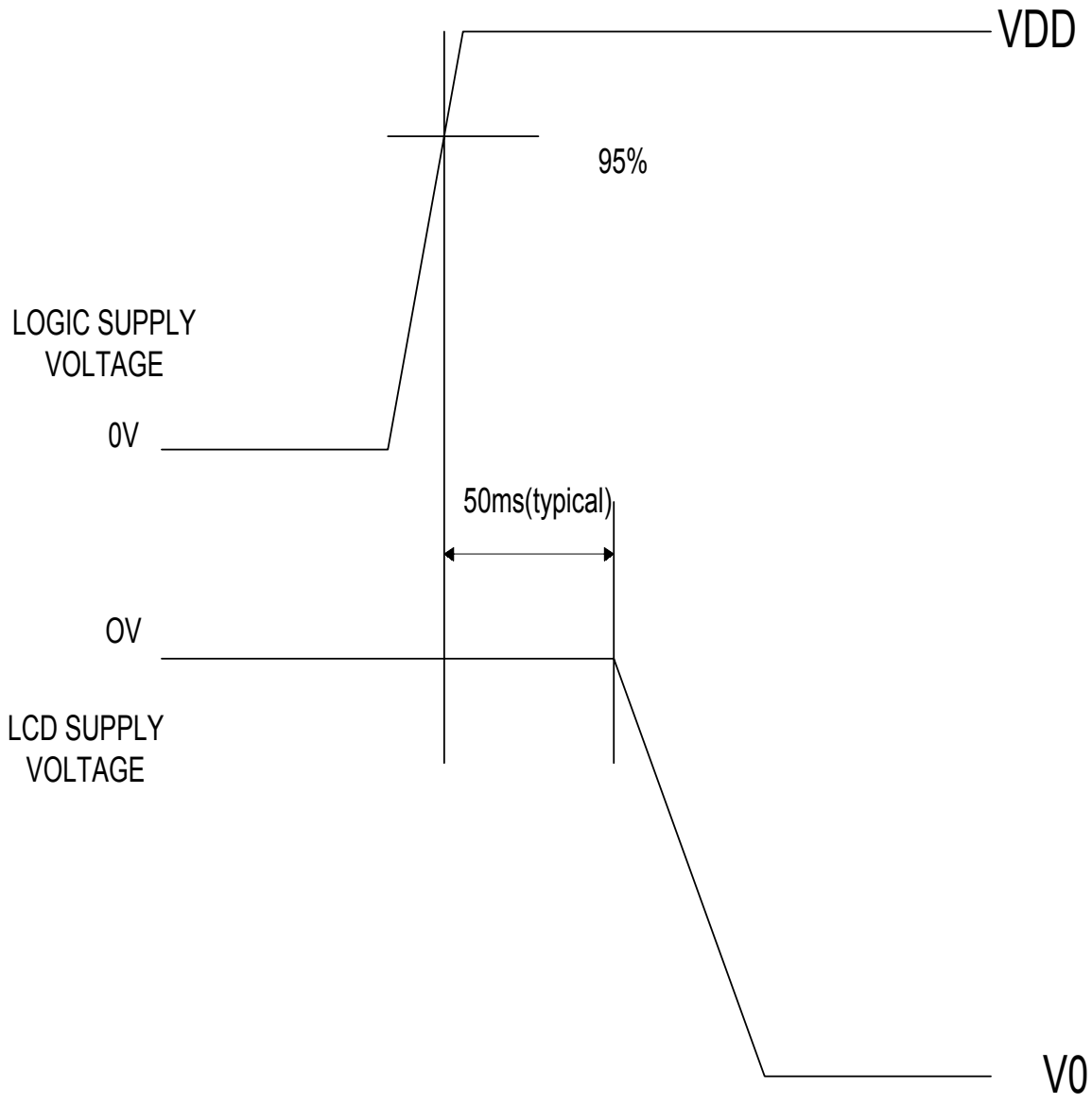

Figure 4: Timing diagram of VDD against V0.

6. APPENDIX

These specifications shall be applied to the White LED-Lamp (LED or LEDs), NSPWF50BS, which is supplied by Nichia Corporation (Nichia).

1.SPECIFICATIONS

(1) Absolute Maximum Rating (Ta=25℃)

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	30	mA
Pulse Forward Current	I_{FP}	100	mA
Reverse Voltage	V_R	5	V
Power Dissipation	P_D	120	mW
Operating Temperature	Topr	−30 ～ +85	℃
Storage Temperature	Tstg	−40 ～ +100	℃
Lead Soldering Temperature	Tsol	260±5℃ for 5sec. (3.0mm from the base of the epoxy bulb)	

I_{FP} Conditions : Pulse Width ≦ 10msec. and Duty ≦ 1/10

(2) Initial Electrical/Optical Characteristics (Ta=25℃)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage		V_F	I_F=20[mA]	−	3.6	4.0	V
Reverse Current		I_R	V_R= 5[V]	−	−	50	μA
Luminous Intensity	Rank S	Iv	I_F=20[mA]	300	360	420	mcd
	Rank R	Iv	I_F=20[mA]	210	260	300	mcd
	Rank Q	Iv	I_F=20[mA]	150	180	210	mcd

※ One delivery will include three different ranks of products. The quantity-ratio of the three ranks is decided by Nichia.
Measurement Uncertainty of the Luminous Intensity : ±10%

Color Ranks (I_F=20mA,Ta=25℃)

	Rank a			
x	0.250	0.250	0.290	0.290
y	0.205	0.250	0.305	0.260

	Rank b			
x	0.290	0.290	0.330	0.330
y	0.260	0.305	0.365	0.320

	Rank c			
x	0.330	0.330	0.370	0.370
y	0.320	0.365	0.420	0.375

※ One delivery will include the consecutive two ranks of products.
The quantity-ratio of the two ranks is decided by Nichia.
Measurement Uncertainty of the Color Coordinates : ±0.02

2.TYPICAL INITIAL OPTICAL/ELECTRICAL CHARACTERISTICS

Please refer to figures No.STLZ-A906042, No.STLZ-A801473.