

Specification for BT 21605VSS-FSTF-LED05W(1 DIE)-HQ

Version July 2003

DOCUMENT REVISION HISTORY 1:

DOCUMENT REVISION FROM TO	DATE	DESCRIPTION	CHANGED BY	CHECKED BY
A	2002.01.09	First Release	PHILIP CHENG	Z.B.HE
A B	2003.07.30	(Based on Test Specification VL-TS-BTHQ 21605VSS-XX REV. D 2003-05-31). Item 1 to 3 were updated: 1) Module specification drawing was updated to the newest version. 2) Timing Diagram of VDD against V0 was updated. 3) (Page 3). Page numbers were updated.	SUNNY LEE	HE ZUO BING

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**Specification
of
LCD Module Type
Item No.: BTHQ 21605VSS-02**

1. General Description

- 16 characters (5x8 dots) x 2 lines FSTN Positive Black & White Transflective Dot Matrix LCD 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(b) and summarized in Table 1 below.

Table 1

Parameter	Specifications	Unit
Outline dimensions	84.0(W) x 44.0(H) x 14.0 MAX.(D)	mm
Effective viewing area	61.0(W) x 15.8(H)	mm
Active area	56.20(W) x 11.50(H)	mm
Display format	16 characters x 2 lines	-
Character size	2.95(W) x 5.55(H) (5 x 8 dots)	mm
Character spacing	0.60(W) x 0.40(H)	mm
Character pitch	3.55(W) x 5.95(H)	mm
Dot size	0.578(W) x 0.681(H)	mm
Dot spacing	0.015(W) x 0.015(H)	mm
Dot pitch	0.593(W) x 0.696(H)	mm
Weight:	TBD	grams

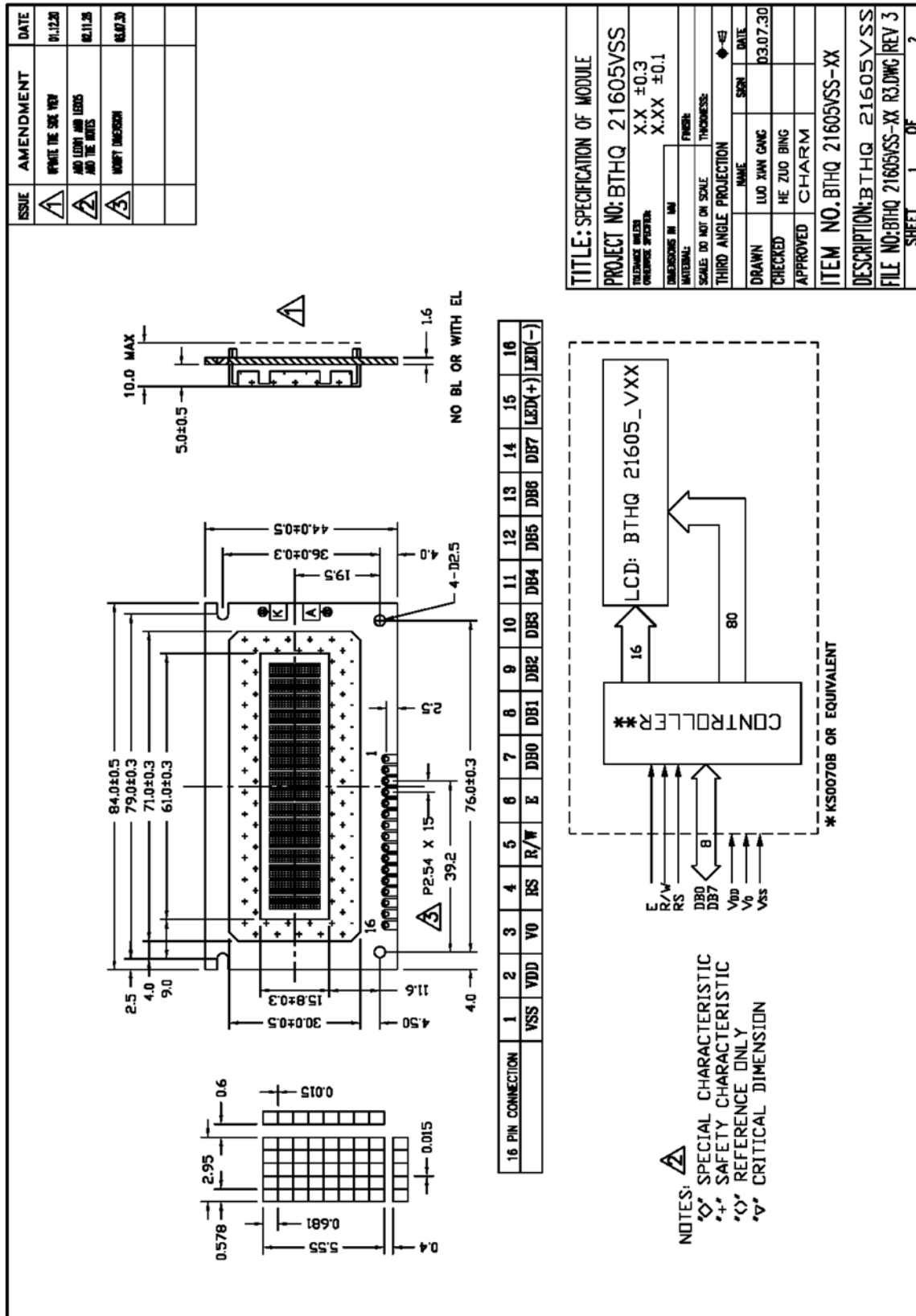


Figure 1(a): Outline Drawing

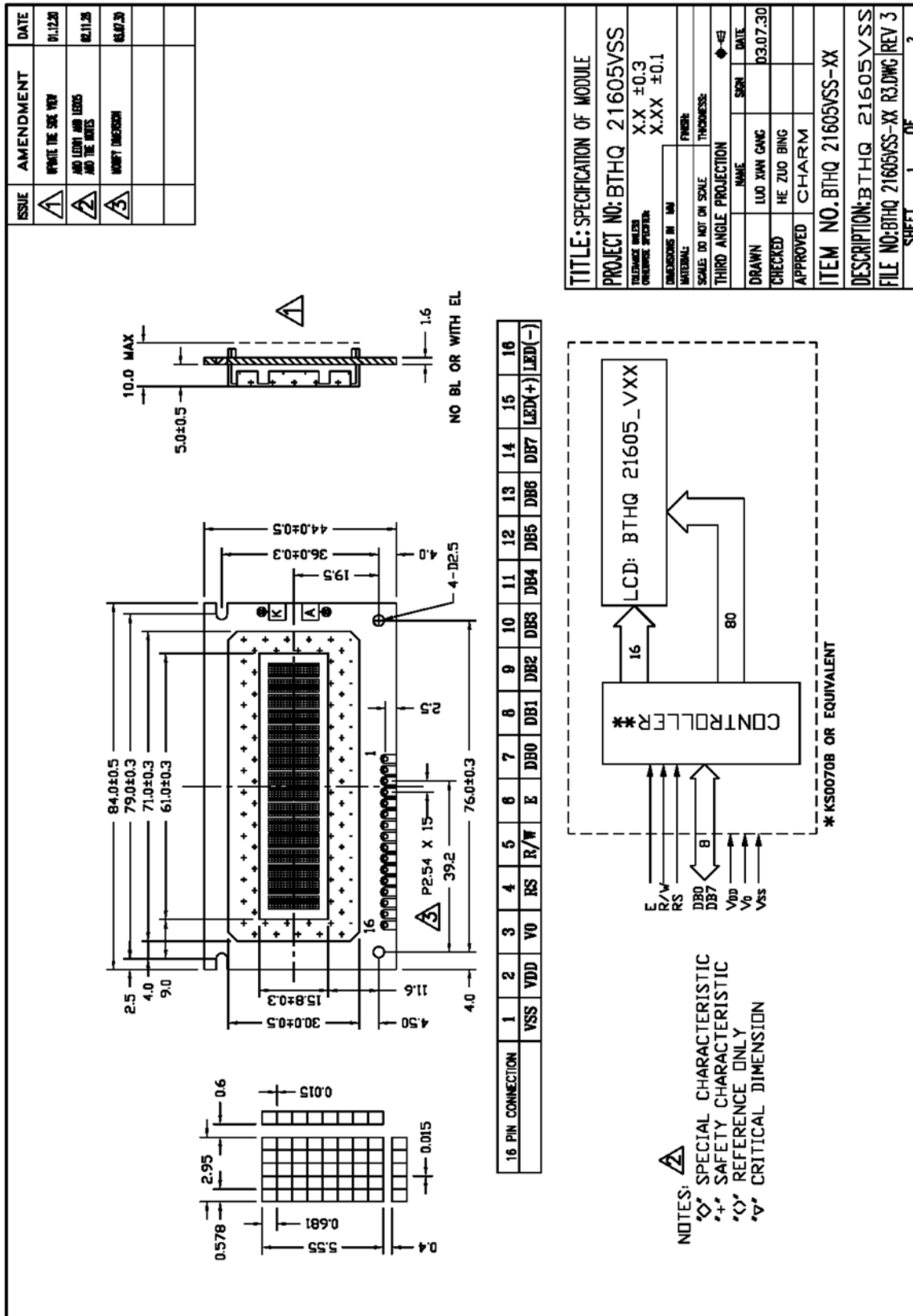


Figure 1(b): Outline Drawing

3. 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 LED backlight
16	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 =5.0V, Note1.	4.1	4.6	5.1	V
Input signal voltage 1 for E,DB0-DB7,R/W,RS.	V _{IH1}	“H” level	2.2	-	VDD	V
	V _{IL1}	“L” level	-0.3	-	0.6	V
Input signal voltage 2 for OSC1.	V _{IH2}	“H” level	VDD -1.0	-	VDD	V
	V _{IL2}	“L” level	-	-	1.0	V
Supply Current (Logic & LCD)	IDD	Character mode, Note 1	-	1.0	1.5	mA
		Checker board mode, Note 1	-	1.1	1.6	mA
Supply Current (LCD)	I0	Character mode, Note 1	-	0.2	0.3	mA
		Checker board mode, Note 1	-	0.2	0.3	mA
Supply voltage of white LED05 backlight	VLED	Forward current =25mA Number of LED dies =1	3.4	3.7	4.0	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 $T_a = 0\text{ }^{\circ}\text{C}$ To $+50\text{ }^{\circ}\text{C}$, $V_{DD} = +5\text{V} \pm 5\%$, $V_{SS} = 0\text{V}$.

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

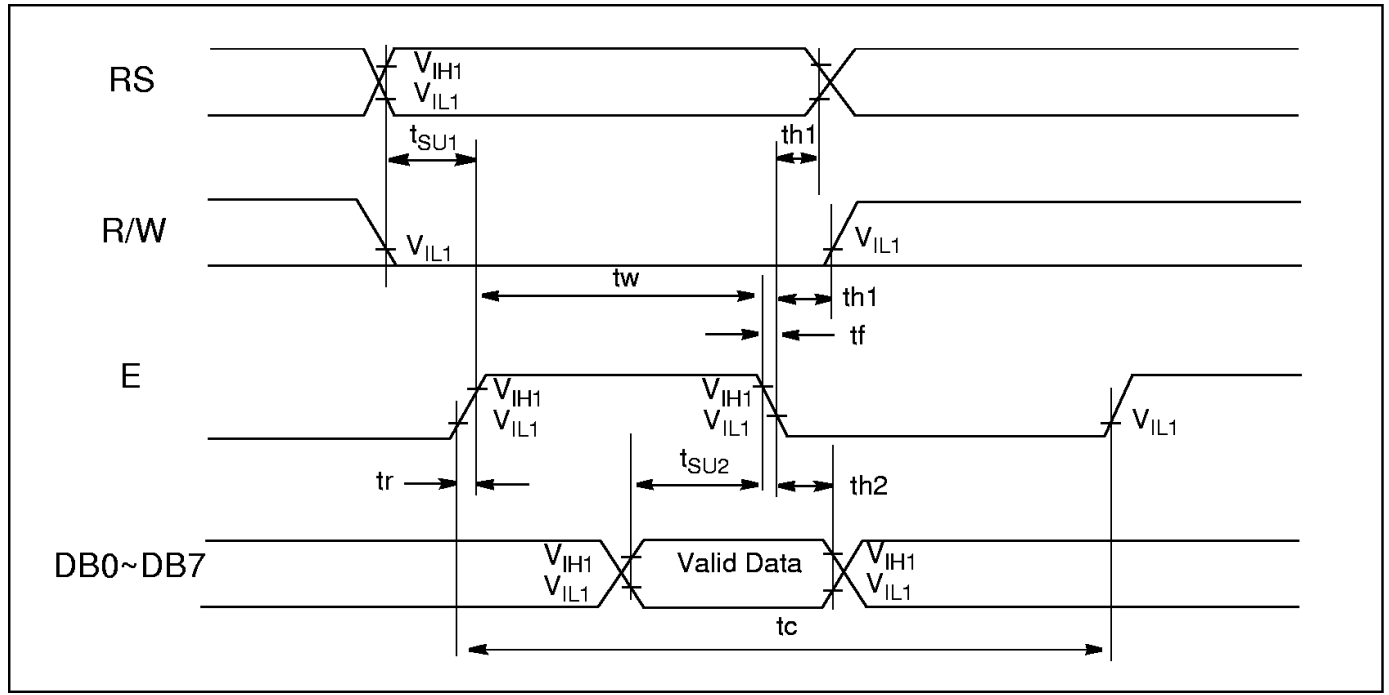


Figure 2: The bus timing diagram for write mode .

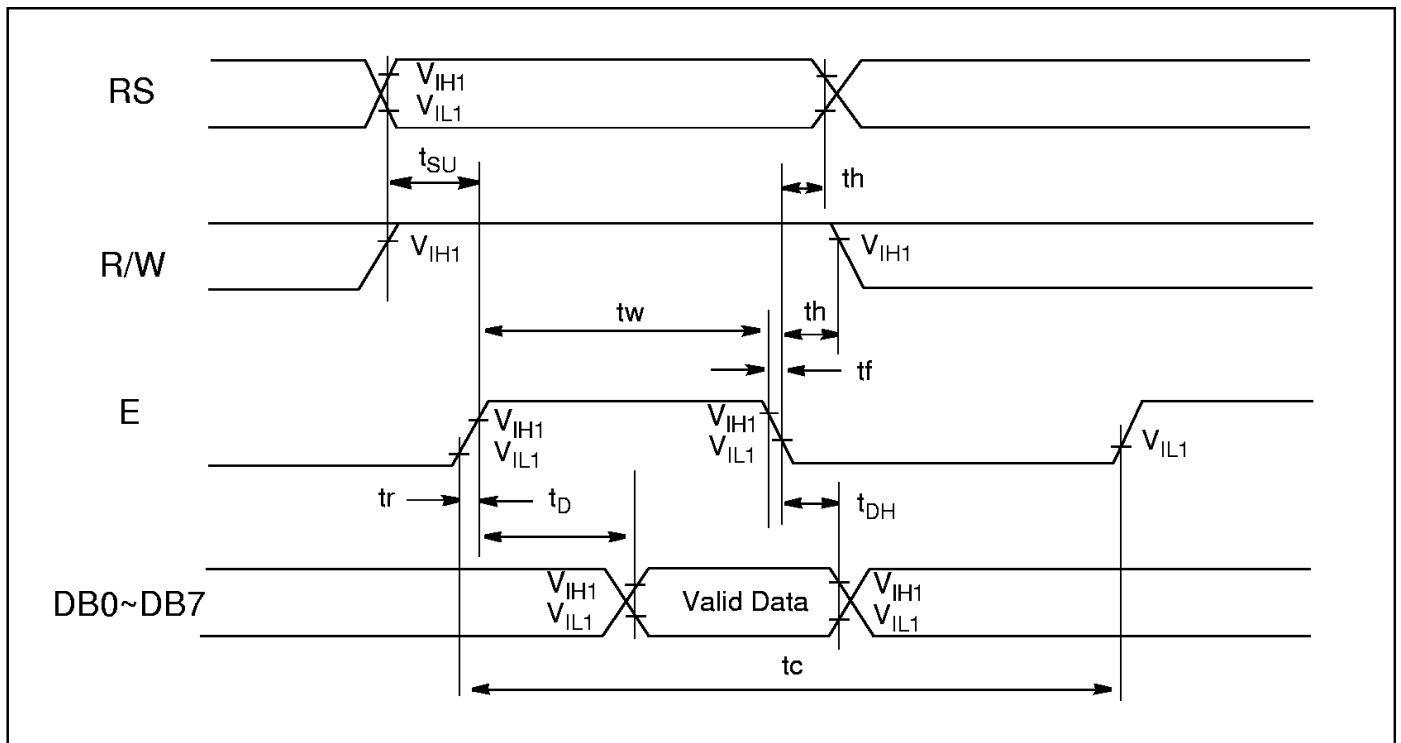


Figure 3: The bus timing diagram for read mode.

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.

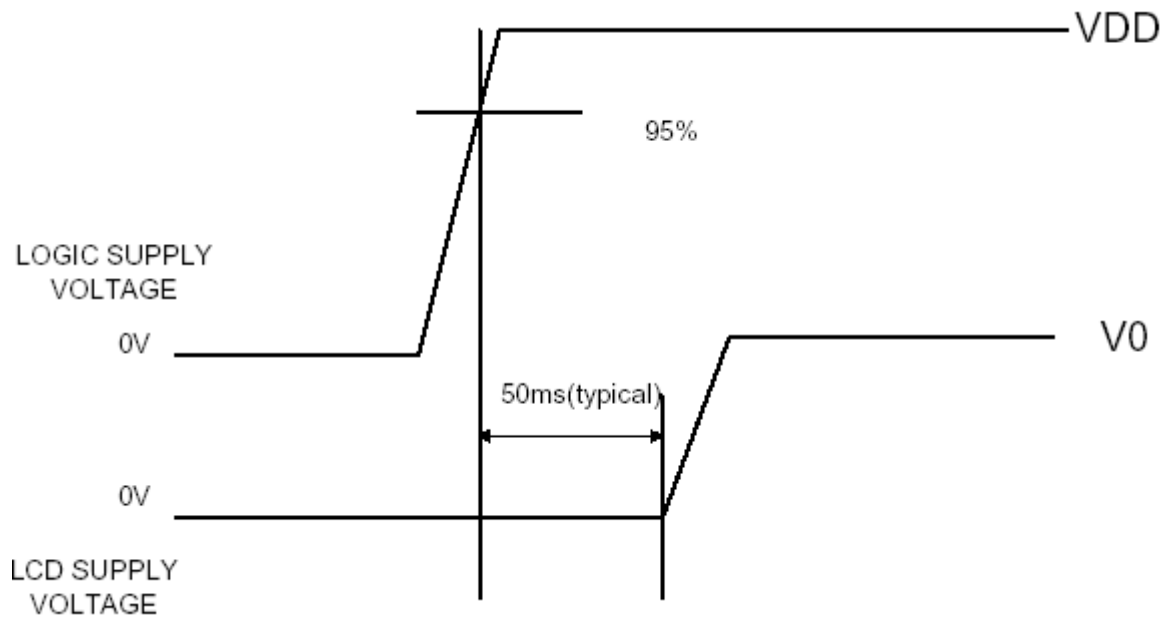


Figure 4: Timing diagram of VDD against V0.

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°C)

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	IF	30	mA
Pulse Forward Current	IFP	100	mA
Reverse Voltage	VR	5	V
Power Dissipation	PD	120	mW
Operating Temperature	Topr	-30 ~ +85	°C
Storage Temperature	Tstg	-40 ~ +100	°C
Lead Soldering Temperature	Tsol	260±5°C for 5sec. (3.0mm from the base of the epoxy bulb)	

IFP Conditions : Pulse Width ≤ 10msec. and Duty ≤ 1/10

(2) Initial Electrical/Optical Characteristics

(Ta=25°C)

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	μ A
Luminous Intensity	Rank S	I _v	I _F =20[mA]	300	360	420	mcd
	Rank R	I _v	I _F =20[mA]	210	260	300	mcd
	Rank Q	I _v	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

(IF=20mA, Ta=25°C)

	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

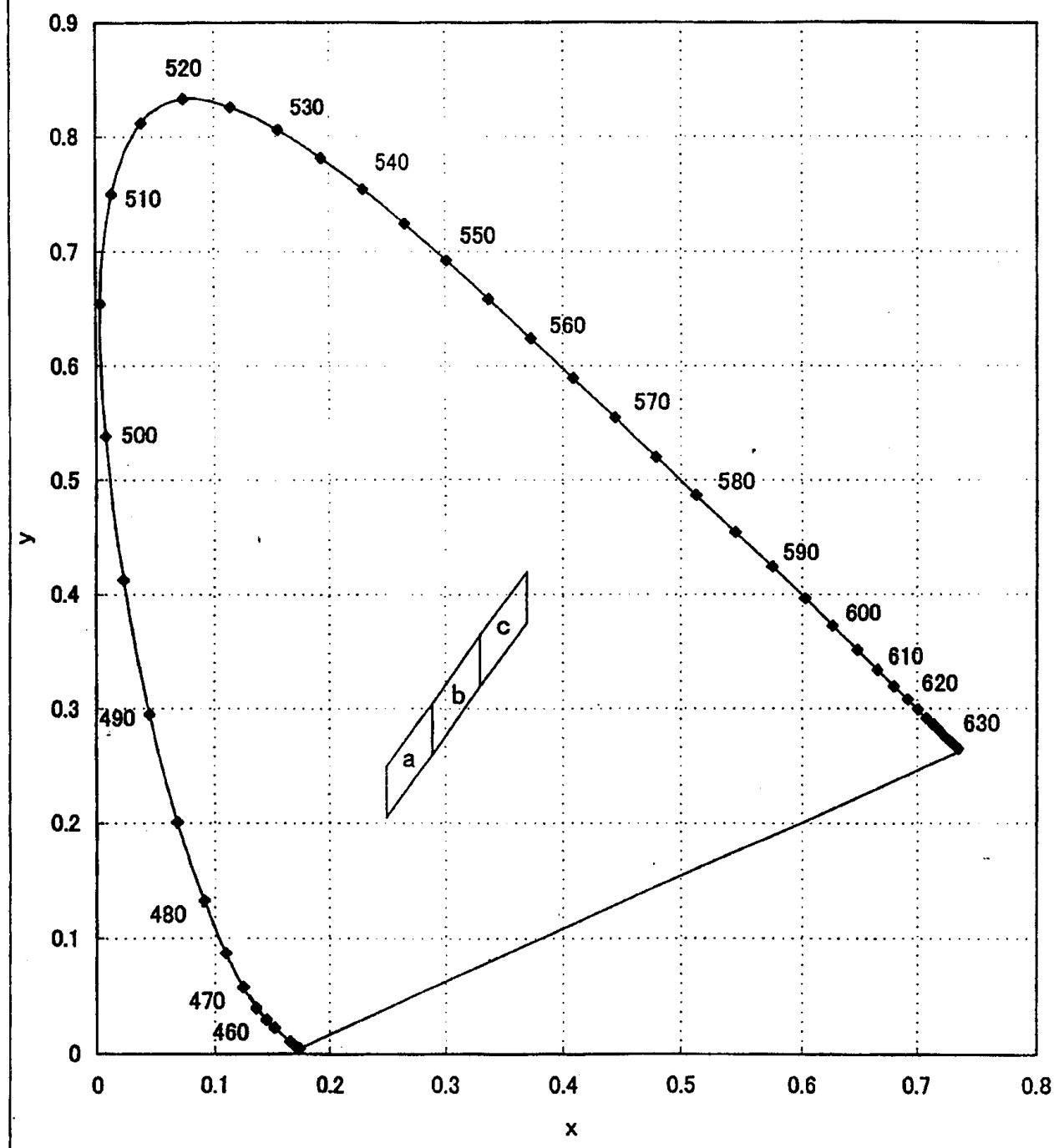
	Rank c			
x	0.330	0.330	0.370	0.370
y	0.320	0.365	0.420	0.375

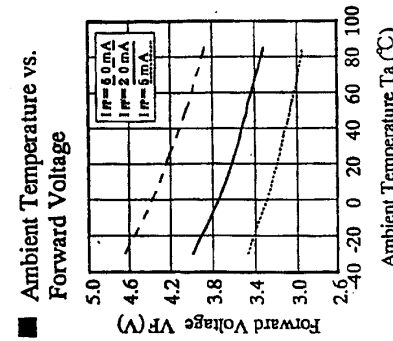
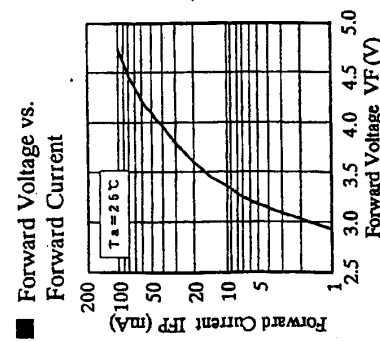
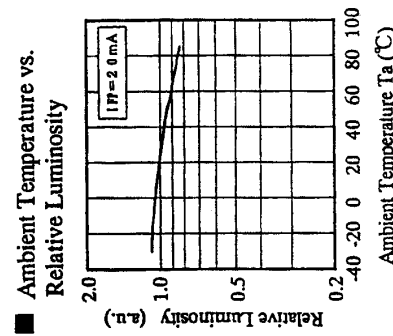
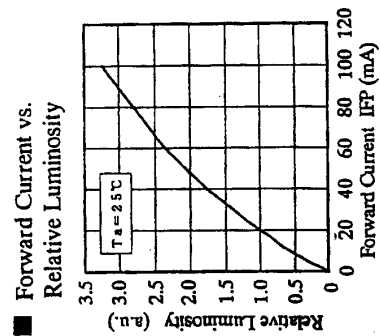
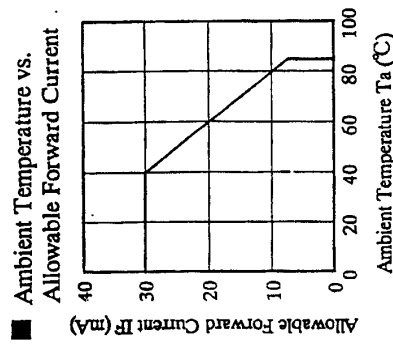
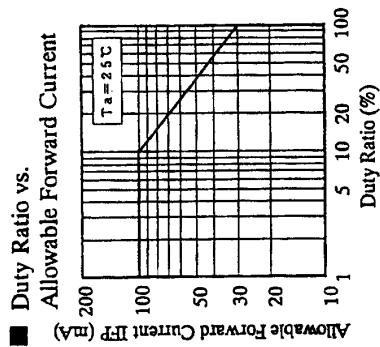
※ One delivery will include the consecutive two ranks of products.
The quantity-ratio of the two ranks is decided by Nichia.
Measurement Uncertainty of the Color Coordinates : ±0.02

2. TYPICAL INITIAL OPTICAL/ELECTRICAL CHARACTERISTICS

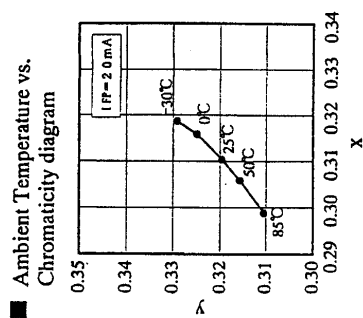
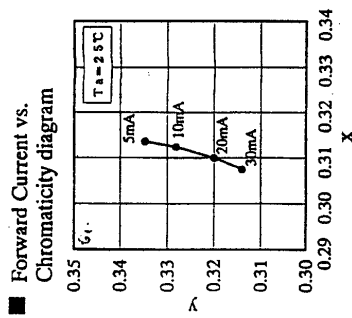
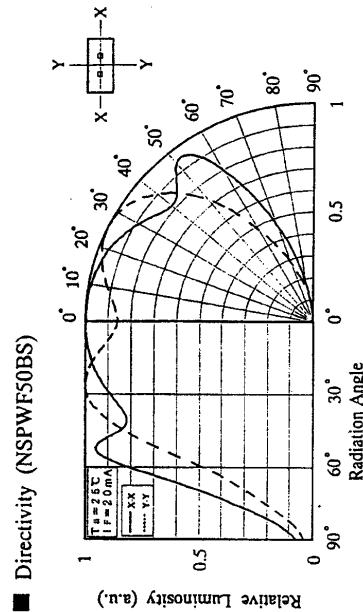
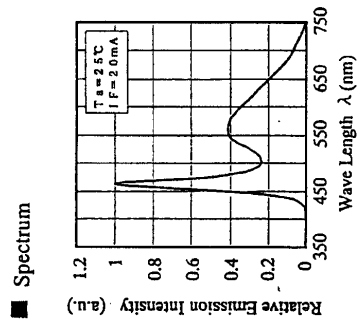
Please refer to figures No.STLZ-A906042, No.STLZ-A801473.

ICI Chromaticity Diagram





Rev.1	Section	Approve	Check	Draw
Rev.2	ST	Bando	Yanaka	Tamura
Rev.3	Date	Jun.1,1999		
Rev.4	Model	NSPWxxxx		
NICHIA CORPORATION				
Title TYP.CHARACTERISTICS				
No.				STLZ-A906042



Rev.1	Section	Approve	Check	Draw
Rev.2	ST	<i>Yamada</i>	<i>Yamada</i>	<i>Yamada</i>
Rev.3	Date	Jun.1.1999		
Rev.4	Model	NSPWF50BS		
NICHIA CORPORATION				
Title TYP.CHARACTERISTICS				
No.	STLZ-A801473			