
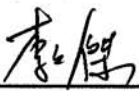



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VL-FS-BTHQ 22005VSS-01 REV. A
(BTHQ 22005VSS-F-STF-LED WHITE)

DOCUMENT TITLE:
SPECIFICATION
OF
LCD MODULE TYPE

CUSTOMER	DATA MODUL
MODEL NUMBER	BTHQ 22005VSS-01
CUSTOMER APPROVAL	
DATE	

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CONTENTS

	<u>Page No.</u>
1. GENERAL DESCRIPTION	4
2. MECHANICAL SPECIFICATIONS	4
3. INTERFACE SIGNALS	7
4. ABSOLUTE MAXIMUM RATINGS	8
4.1 ELECTRICAL MAXIMUM RATINGS (Ta=25°C)	8
4.2 ENVIRONMENTAL CONDITION	8
5. ELECTRICAL SPECIFICATIONS	9
5.1 TYPICAL ELECTRICAL CHARACTERISTICS	9
5.2 TIMING SPECIFICATIONS	10
5.3 TIMING DIAGRAM OF VDD AGAINST V0	12
6. CGROM CHARACETR CODE TABLE	13
7. APPENDIX	14

**Specification
of
LCD Module Type
Item No.: BTHQ 22005VSS-01**

1. General Description

- 20 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.
- 'SAMSUNG' KS0065B-PCC (Die form) LCD Segment 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	116.0(W) x 37.0(H) x 14.0 MAX.(D)	mm
Effective viewing area	83.0(W) x 18.6(H)	mm
Display format	20 characters x 2 lines	-
Character size	3.20(W) x 5.55(H) (5 x 8 dots)	mm
Character spacing	0.50(W) x 0.40(H)	mm
Character pitch	3.70(W) x 5.95(H)	mm
Dot size	0.628(W) x 0.681(H)	mm
Dot spacing	0.015(W) x 0.015(H)	mm
Dot pitch	0.643(W) x 0.696(H)	mm
Weight:	TBD	grams

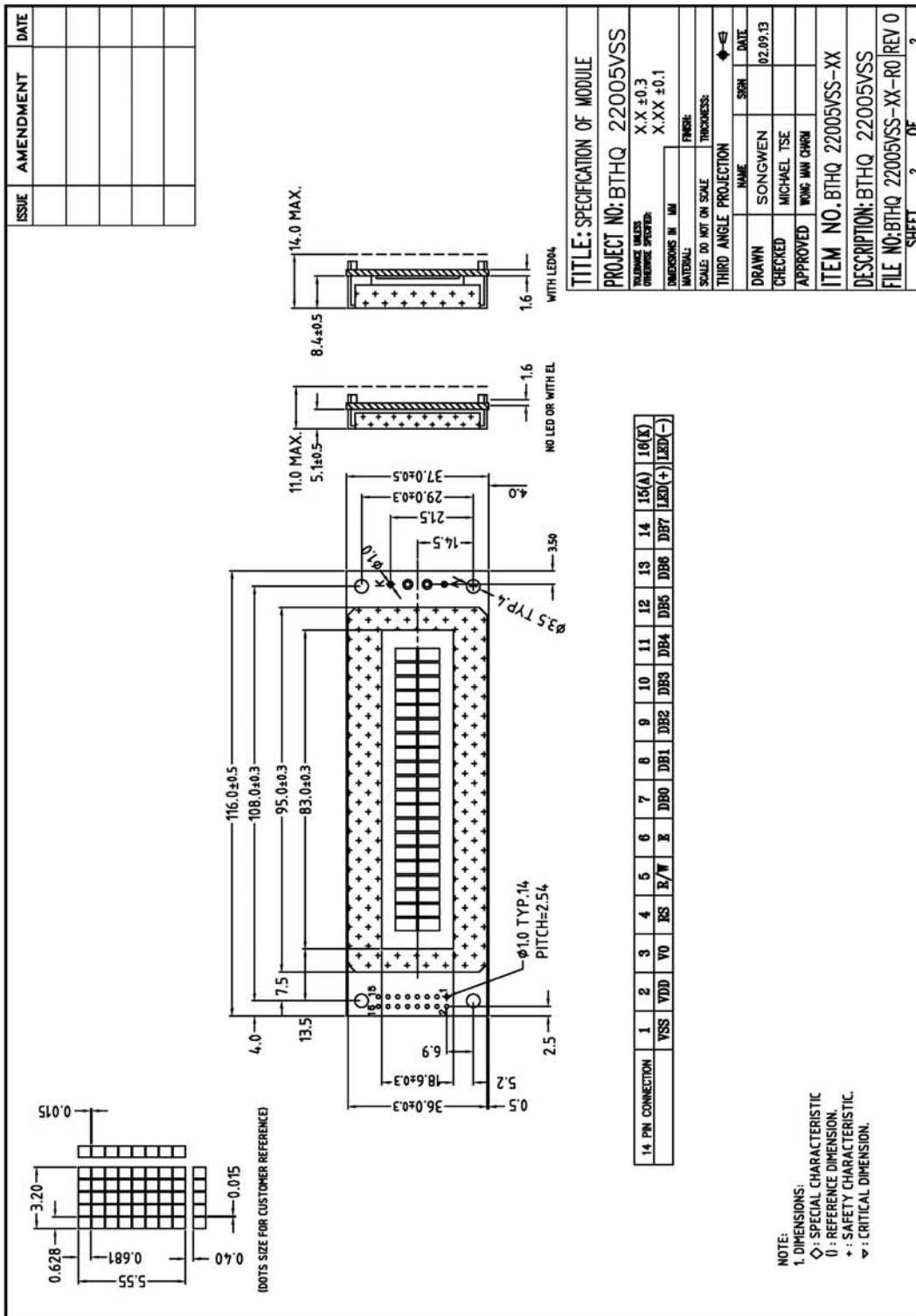


Figure 2: Outline Drawing 2

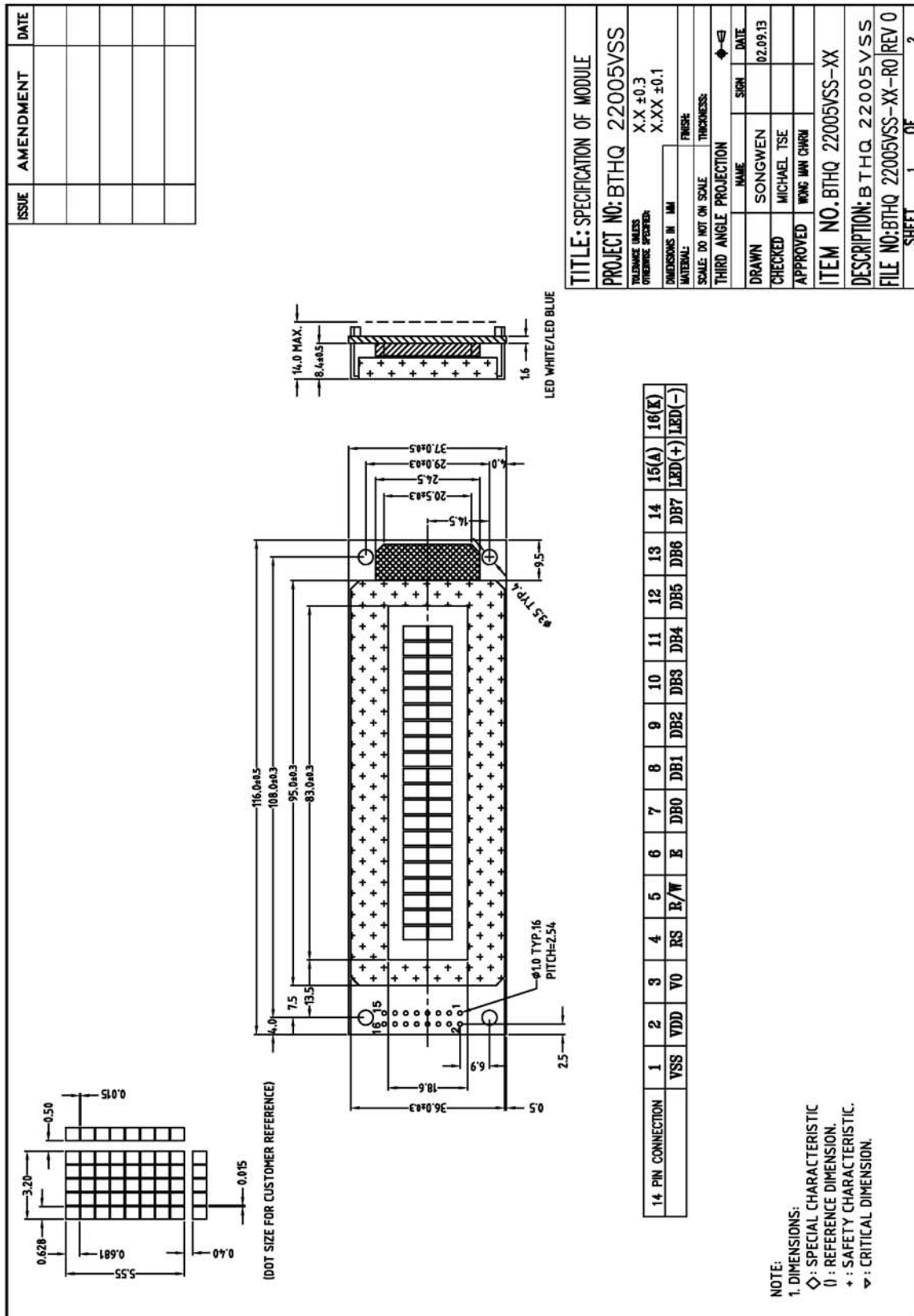


Figure 1: Outline Drawing 1

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(A)	LED(+)	Anode of LED backlight
16(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 =5.0V, Note1.	4.2	4.5	4.8	V
Input signal voltage for E,DB0-DB7,R/W,RS.	V _{IH}	"H" level	2.2	-	VDD	V
	V _{IL}	"L" level	-0.3	-	0.6	V
Supply Current (Logic & LCD)	IDD	Character mode, Note 1	-	1.0	1.5	mA
		Checker board mode, Note 1	-	1.2	1.8	mA
Supply Current (LCD)	I0	Character mode, Note 1	-	0.3	0.5	mA
		Checker board mode, Note 1	-	0.3	0.5	mA
Supply voltage of white LED05 backlight	VLED	Forward current =40 mA Number of LED dies =1x2 =2.	3.2	3.6	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 Ta = 0 °C To +50 °C , VDD = +5V±5%, VSS = 0V.

Refer to Fig. 3, 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. 4, 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

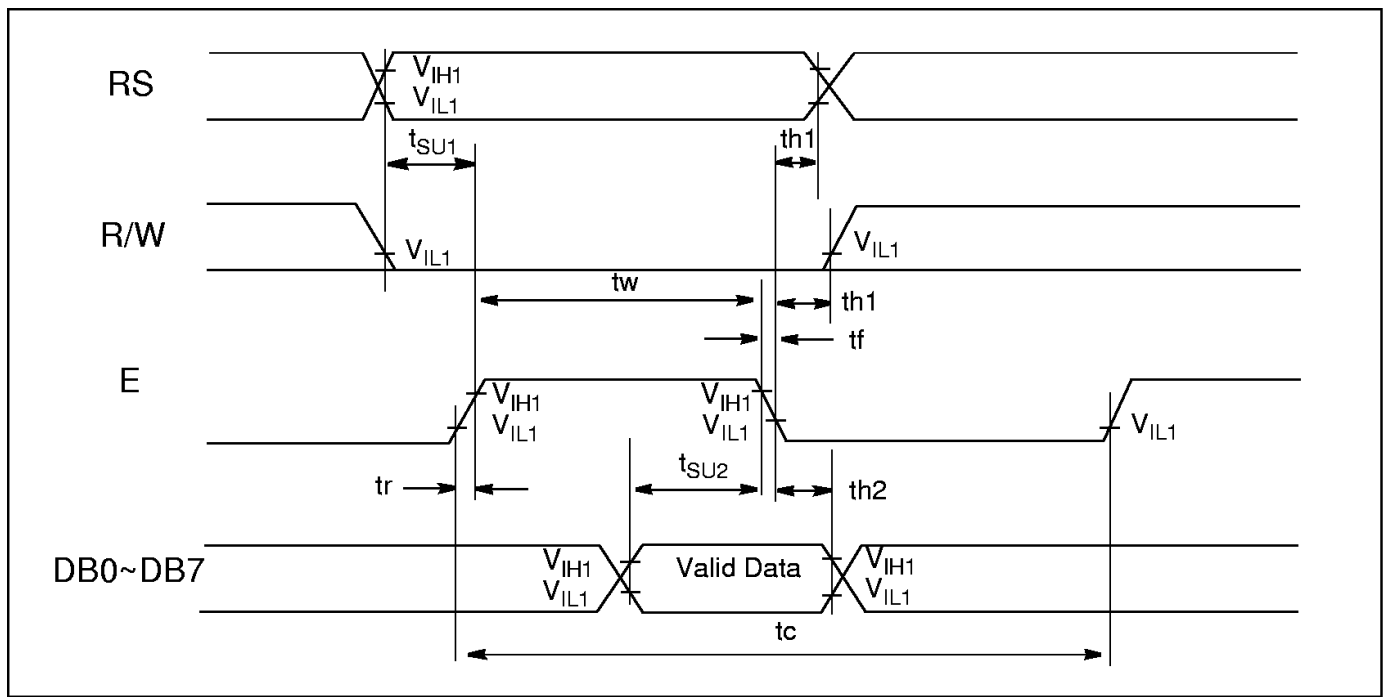


Figure 3: The bus timing diagram for write mode

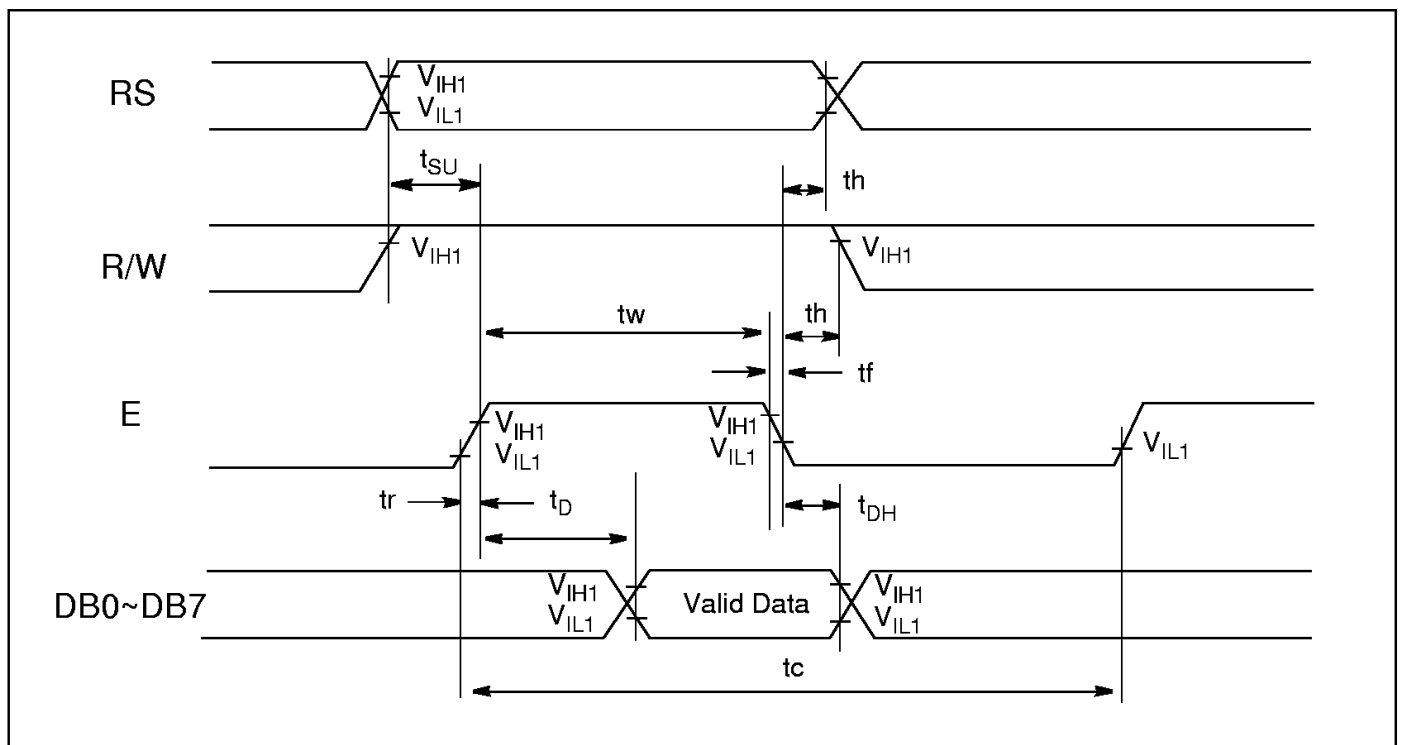


Figure 4: The bus timing diagram for read mode .

5.3 Timing Diagram of VDD against V0.

Power on sequence shall meet the requirement of Figure 5, the timing diagram of VDD against V0.

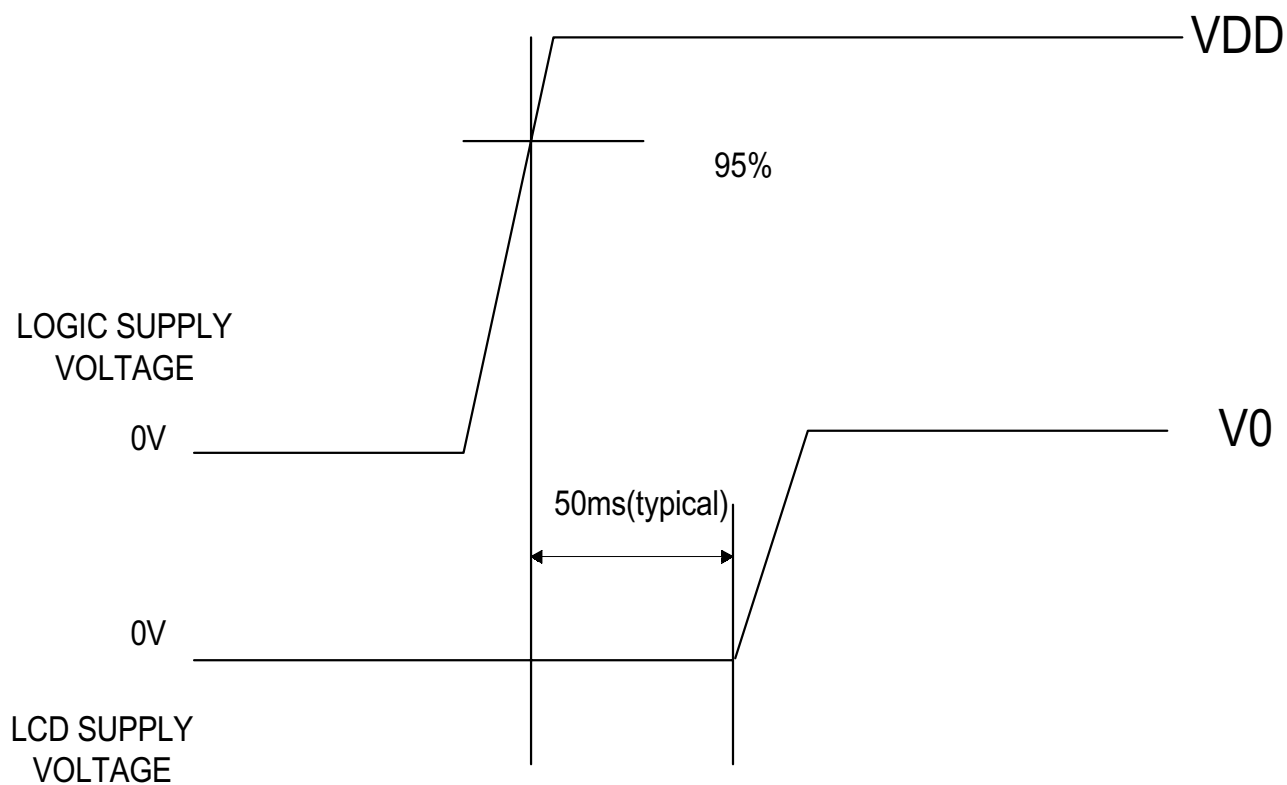


Figure 5: Timing diagram of VDD against V0.

7. 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	VF	IF=20[mA]	—	3.6	4.0	V	
Reverse Current	IR	VR= 5[V]	—	—	50	μA	
Luminous Intensity	Rank S	Iv	IF=20[mA]	300	360	420	mcd
	Rank R	Iv	IF=20[mA]	210	260	300	mcd
	Rank Q	Iv	IF=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

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

(IF=20mA, Ta=25°C)

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

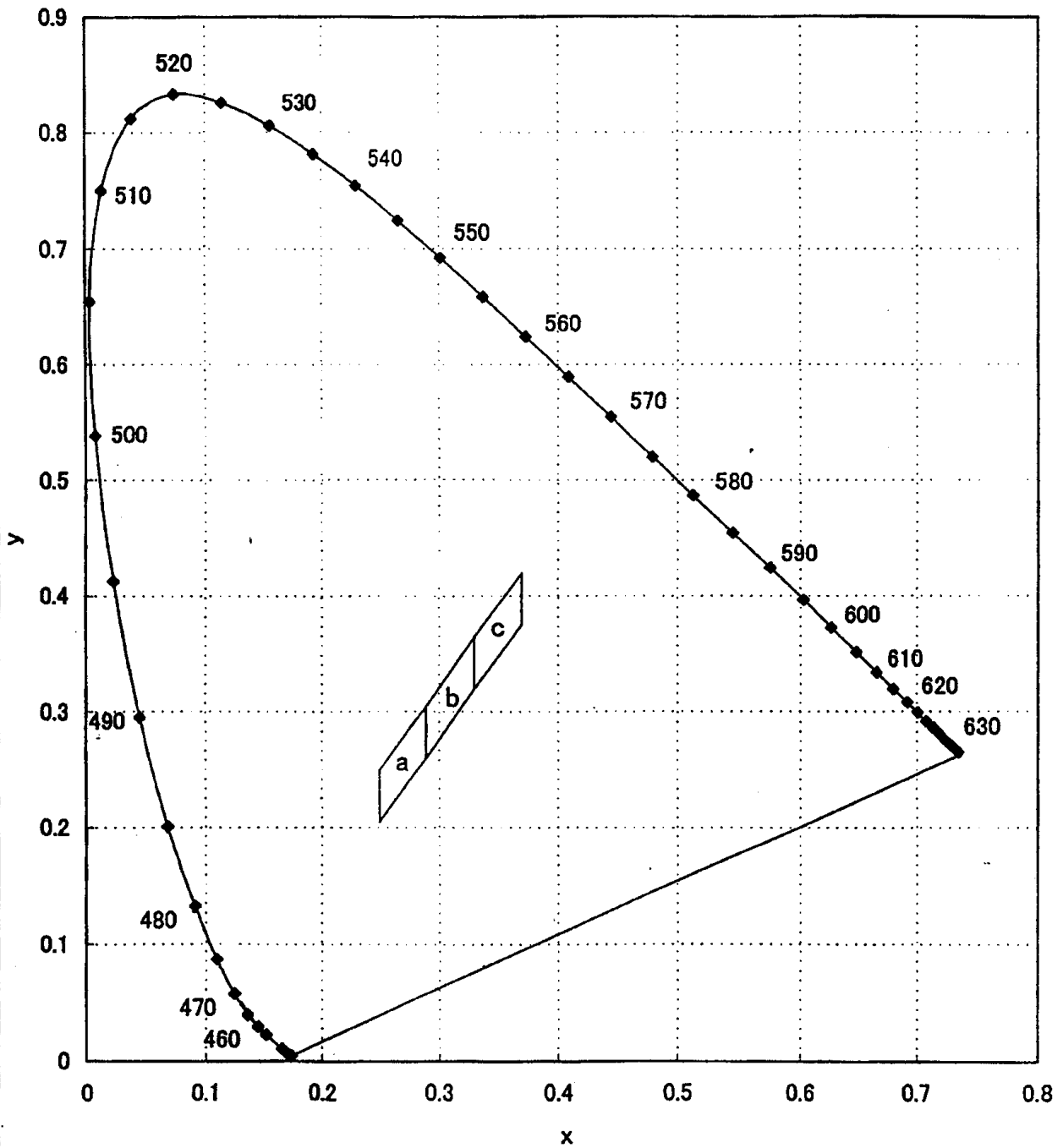
	Rank c			
x	0.330	0.330	0.370	0.370
y	0.320	0.365	0.420	0.375

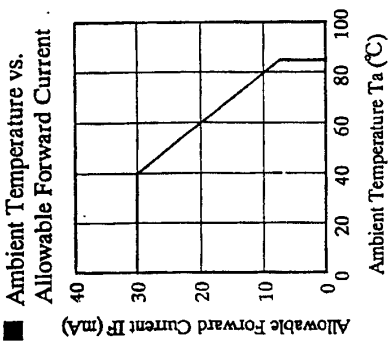
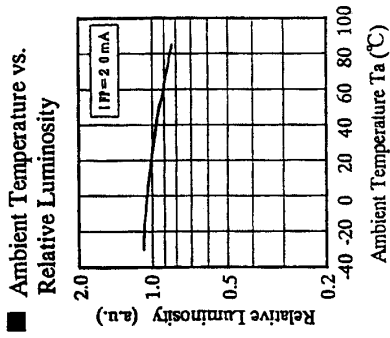
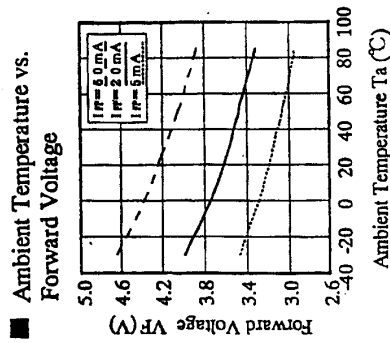
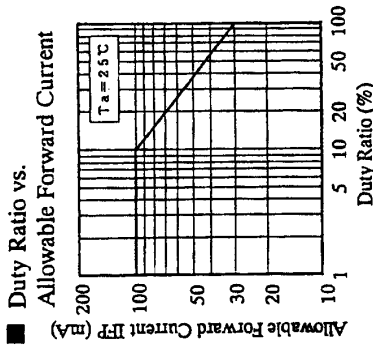
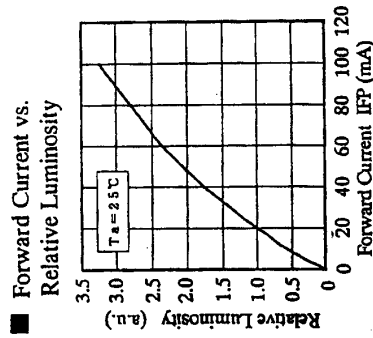
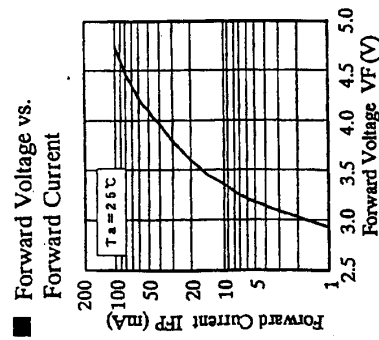
※ One delivery will include the consecutive two ranks of products. The quantity-ratio of the two ranks is decided by Nichia.
Measurement Uncertainty of the Color Coordinates : ±0.02

2. TYPICAL INITIAL OPTICAL/ELECTRICAL CHARACTERISTICS

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

ICI Chromaticity Diagram

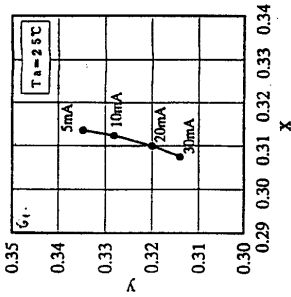




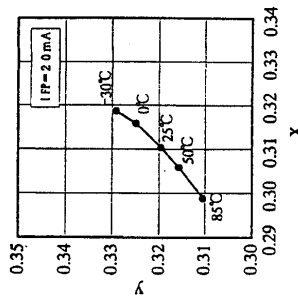
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Rev.2	ST	Bando	Yanabe	Tamura
Rev.3	Date	Jun.1,1999		
Rev.4	Model	NSPWxxxx		
NICHIA CORPORATION				
Title TYP.CHARACTERISTICS				
				No. STLZ-A906042



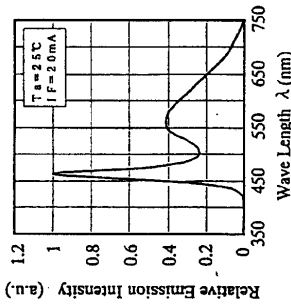
■ Forward Current vs. Chromaticity diagram



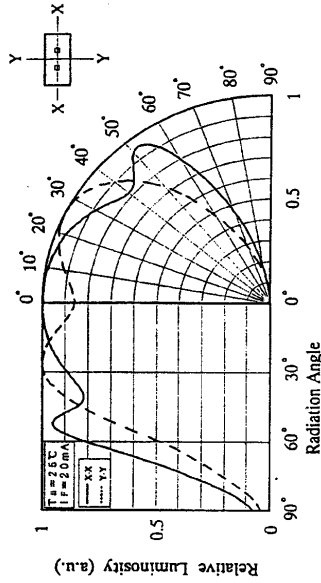
■ Ambient Temperature vs. Chromaticity diagram



■ Spectrum



■ Directivity (NSPWF50BS)



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