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VL-FS-BTHQ 42005VSS-04 REV. A
(BTHQ 42005VSS-FSTF-06-LED WHITE (2 DIE))

DOCUMENT TITLE:
SPECIFICATION
OF
LCD MODULE TYPE
ITEM NO.: BTHQ 42005VSS-04

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**Specification
of
LCD Module Type
Item No.: BTHQ 42005VSS-04**

1. General Description

- 20 characters (5 x 8 dots) x 4 lines FSTN Positive Black & White Transflective LCD Character Module.
- Viewing Angle: 6 O'clock direction.
- Driving duty: 1/16 Duty, 1/5 bias.
- 'SAMSUNG' KS0066UP-10BCC (Die form) LCD Controller & Driver or equivalent.
- 'SAMSUNG' KS0065B-PCC (Die form) LCD Segment Drivers 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	98.0(W) x 60.0(H) x 14.0 MAX.(D)	mm
Effective viewing area	76.0(W) x 25.2(H)	mm
Active area	70.35(W) x 20.74(H)	mm
Display format	20 characters x 4 lines	-
Character size	2.90(W) x 4.697(H) (5 x 8 dots)	mm
Character spacing	0.65(W) x 0.65(H)	mm
Character pitch	3.55(W) x 5.347(H)	mm
Dot size	0.568(W) x 0.574(H)	mm
Dot spacing	0.015(W) x 0.015(H)	mm
Dot pitch	0.583(W) x 0.589(H)	mm
Weight	TBD	grams

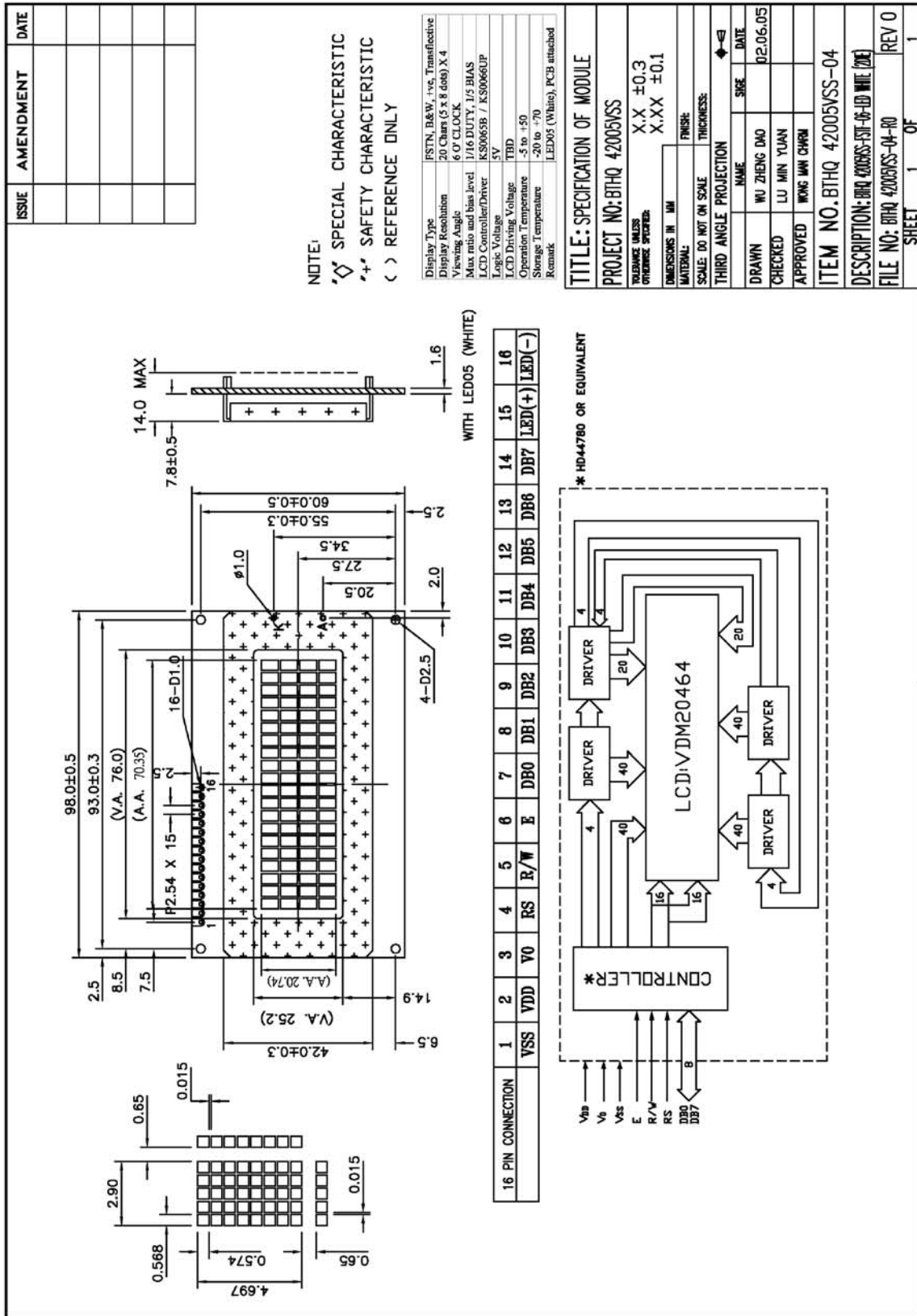


Figure 1: Module Specification

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)
15 or A	LED(+)	Anode of LED Backlight
16 or 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	-5°C	+50°C	-20°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 $T_a = 25\text{ }^\circ\text{C}$, $V_{DD} = 5V \pm 5\%$, $V_{SS} = 0V$.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (Logic)	$V_{DD} - V_{SS}$		4.75	5.0	5.25	V
Supply voltage (LCD)	$V_{LCD} = V_{DD} - V_0$	$V_{DD} = 5V$, Note (1)	4.2	4.6	5.0	V
Input signal voltage for E,DB0-DB7,R/W,RS.	V_{IH}	"H" level	2.2	-	V_{DD}	V
	V_{IL}	"L" level	-0.3	-	0.6	V
Supply Current (Logic & LCD)	IDD	Character mode, $V_{DD} = 5V$, Note 1	-	1.0	1.5	mA
		Checker board mode, $V_{DD} = 5V$, Note 1	-	1.2	1.8	mA
Supply Current (LCD)	I0	Character mode, $V_{DD} = 5V$, Note 1	-	0.2	0.3	mA
		Checker board mode, $V_{DD} = 5V$, Note 1	-	0.2	0.3	mA
Supply voltage of white LED05 backlight	VLED	Forward current =40mA Number of LED dies =1x2 =2 White backlight luminous intensity rank: S Colour rank: B	3.8	4.0	4.2	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 = -5 °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
E Cycle Time	tc	500	-	ns
E Rise/Fall Time	t _R ,t _F	-	20	ns
E Pulse Width(high, low)	t _w	230	-	ns
R/W and RS Setup Time	t _{SU1}	40	-	ns
R/W and RS Hold Time	t _{H1}	10	-	ns
Data Set-up Time	t _{SU2}	80	-	ns
Data Hold Time	t _{H2}	10	-	ns

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

Table 7

Parameter	Symbol	Min.	Max.	Unit
E Cycle Time	tc	500	-	ns
E Rise/Fall Time	t _R ,t _F	-	20	ns
E Pulse Width(high, low)	t _w	230	-	ns
R/W and RS Setup Time	t _{SU}	40	-	ns
R/W and RS Hold Time	t _H	10	-	ns
Data Output Delay Time	t _D	-	120	ns
Data Hold Time	t _{DH}	5	-	ns

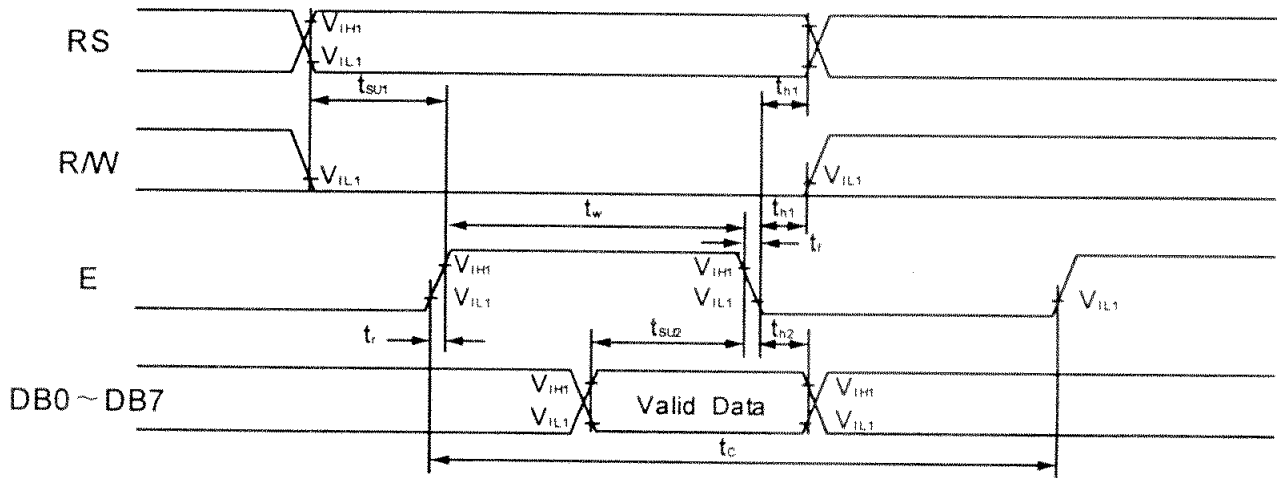


Figure 2: Write Mode Timing Diagram

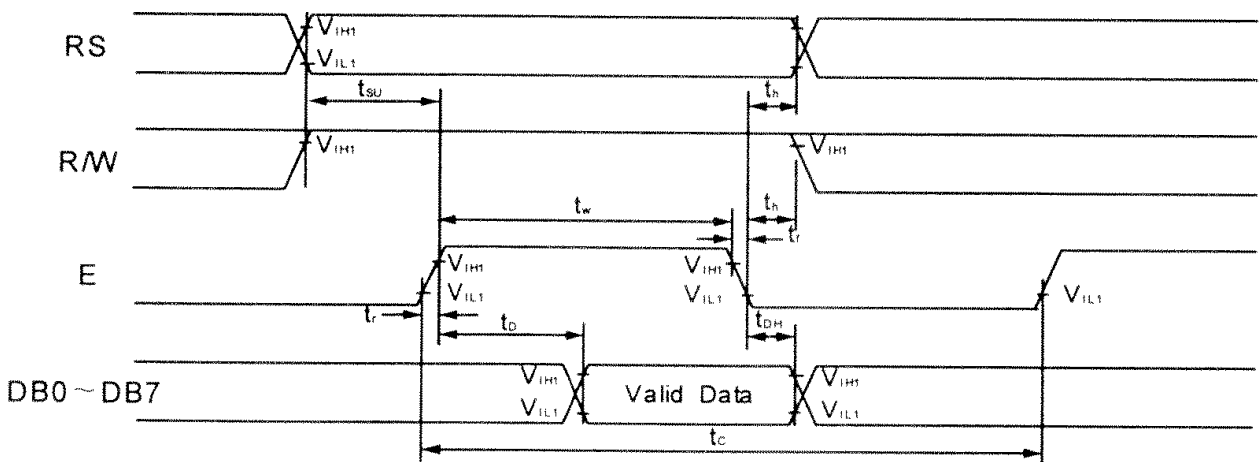


Figure 3: Read Mode Timing Diagram

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.

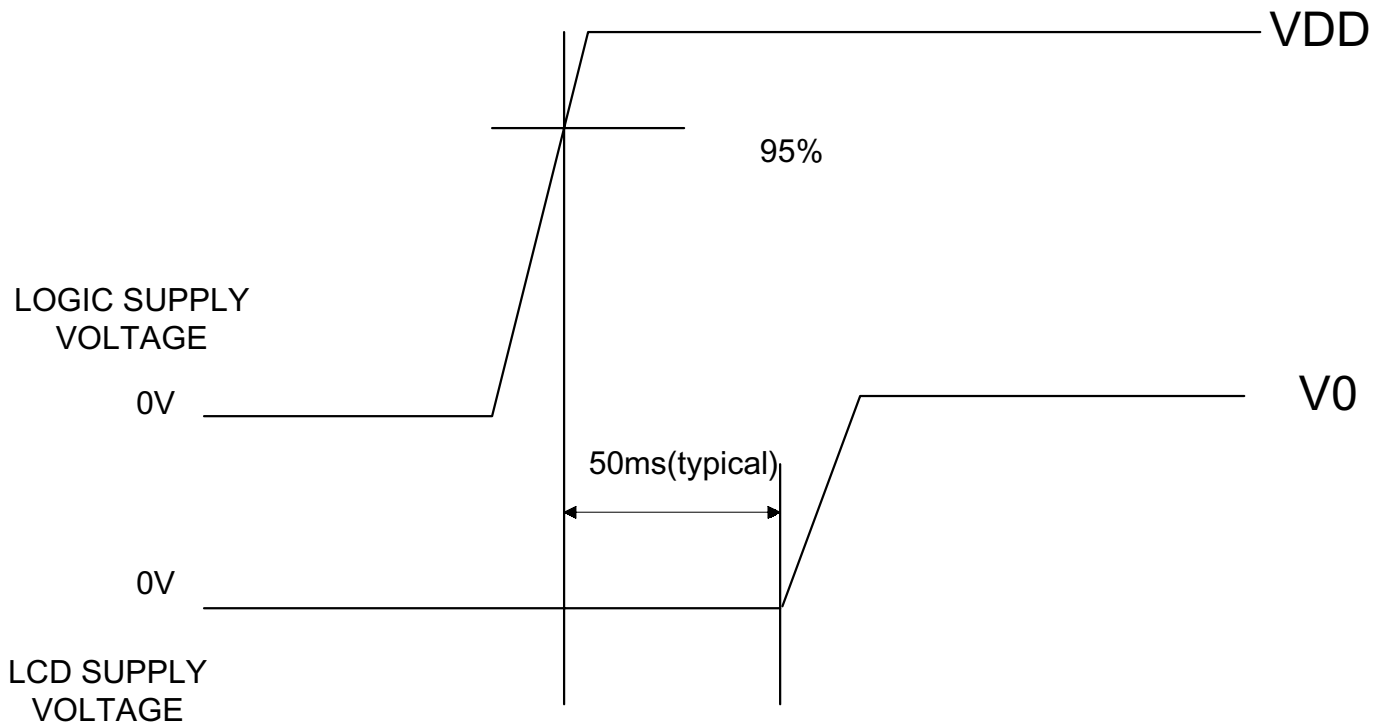


Figure 4: Timing Diagram of VDD Against V0.

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

(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

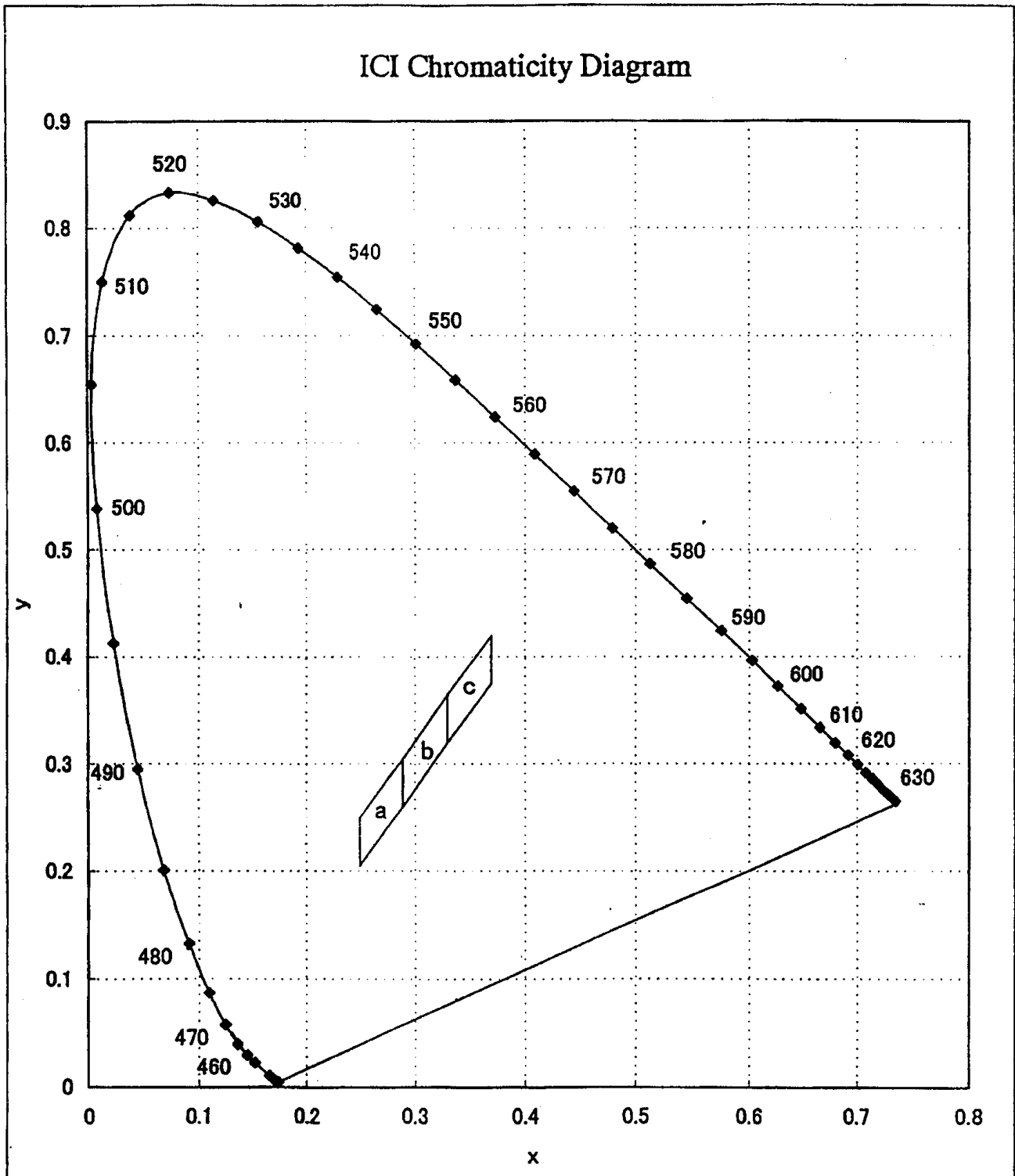
※ One delivery will include the consecutive two ranks of products.

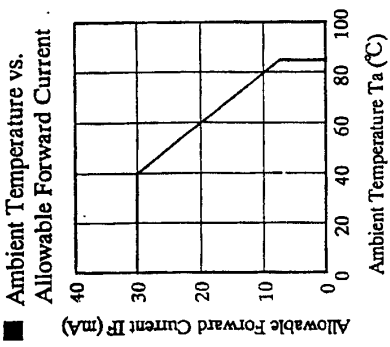
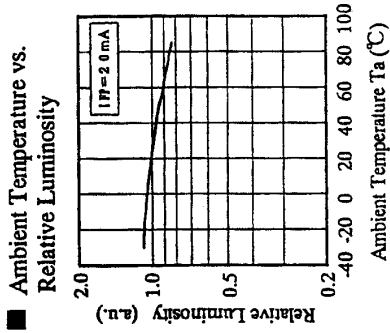
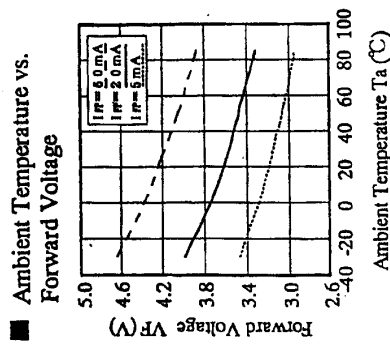
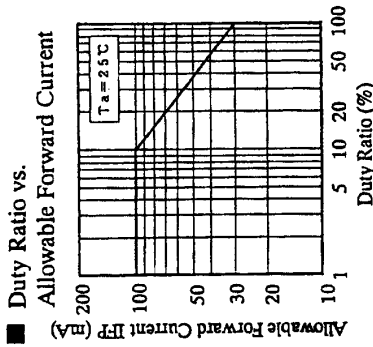
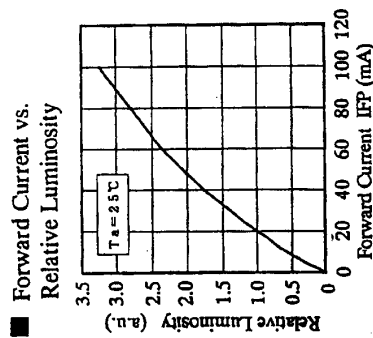
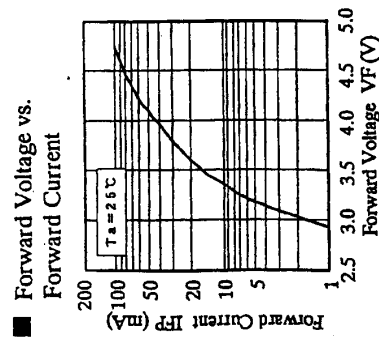
The quantity-ratio of the two ranks is decided by Nichia.

Measurement Uncertainty of the Color Coordinates : ±0.02

2. TYPICAL INITIAL OPTICAL/ELECTRICAL CHARACTERISTICS

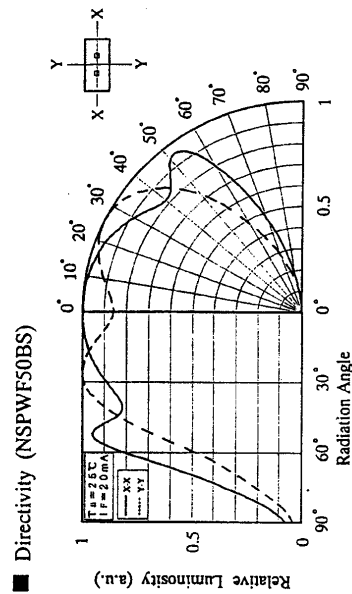
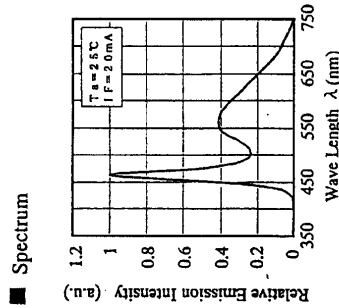
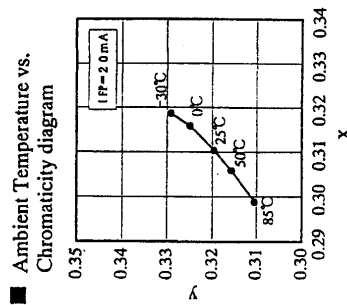
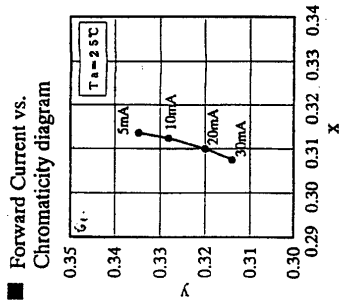
Please refer to figures No.STLZ-A906042, No.STLZ-A801473.





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