

Specification

BTHQ 21605VSS-SRE (IC-ST7066)

Doc. No.: BTHQ 21605VSS-19

Version April 2008

DOCUMENT REVISION HISTORY 1:

REVISION FROM	TO	DATE	CHANGED BY	CHECKED BY
	A	2008.04.14	CHEN HUI JUAN	FENG NAN

First Release
Based on
a.) VL-QUA-012A, REV. S,
2008.02.18.

(According to VL-QUA-012A, LCD
size is small because Unit Per
Laminate=35 which is more than
6pcs/Laminate.)

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**Specification
of
LCD Module Type
Item No.: BTHQ 21605VSS-19**

1. General Description

- 16 characters (5 x 8 dots) x 2 lines STN Positive Yellow Reflective LCD Character Module.
- Viewing Angle: 6 o'clock direction.
- Driving scheme: 1/16 duty, 1/5 bias.
- 'SITRONIX' ST7066U-0A (Die form) LCD Controller & Driver or equivalent.
- 'SITRONIX' ST7065C (Die form) LCD Segment Drivers or equivalent.
- "RoHS" compliance.

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter	Specifications	Unit
Outline dimensions	84.0(W) x 44.0(H) x 10.0 MAX.(D)	mm
Viewing area	61.0(W) x 15.8(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	Approx.: 32.5	grams

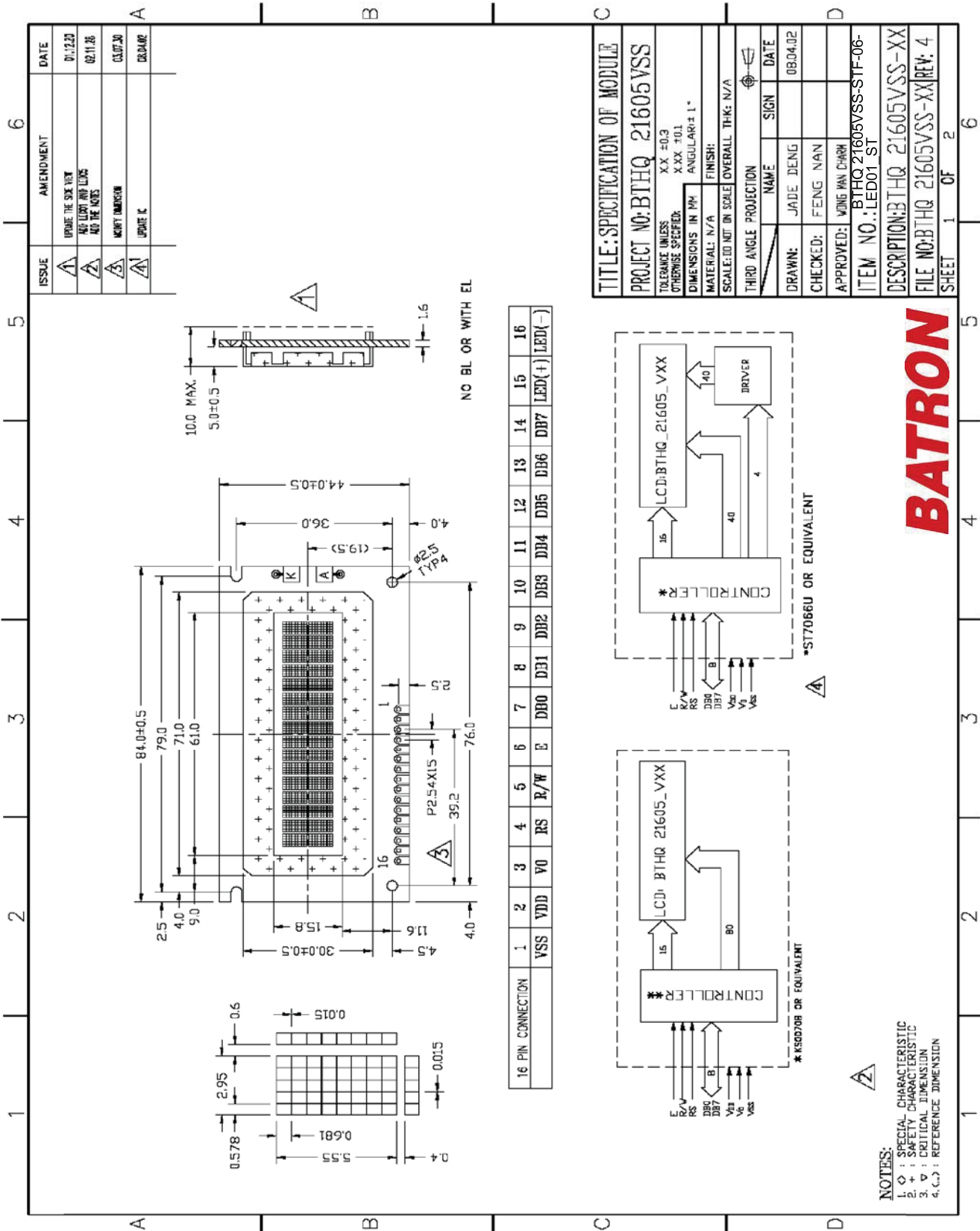


Figure 1: Outline Drawing

3. Absolute Maximum Ratings

3.1 Electrical Maximum Ratings – for IC Only

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	VDD+0.3	VDD-10.0	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.

3.2 Environmental Condition

Table 4

Item	Operating Temperature (Topr)		Storage Temperature (Tstg)(Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient Temperature	0°C	+50°C	-10°C	+60°C	Dry
Humidity (Note 1)	90% max. RH for Ta ≤ 40°C <50%RH for 40°C <Ta ≤ Maximum operating temperature				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

Note 1: Product cannot sustain at extreme storage conditions for long time.

4. 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	Four low order bi-directional tristate data bus pins. Used for data transfer and receive between the MPU and the ST7066U. These pins are not used during 4-bit operation.
8	DB1	
9	DB2	
10	DB3	
11	DB4	Four high order bi-directional tristate data bus pins. Used for data transfer and receive between the MPU and the ST7066U. DB7 can be used as a busy flag.
12	DB5	
13	DB6	
14	DB7	
15	LED(+)	No connection.
16	LED(-)	No connection.

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)	$V_{LCD} = V_{DD}-V_0$	$T_a=0^\circ\text{C}$, Character mode, $V_{DD} = 5.0V$, Note 1	-	4.7	-	V
		$T_a=+25^\circ\text{C}$, Character mode, $V_{DD}=5.0V$, Note 1	4.1	4.6	5.1	V
		$T_a=+50^\circ\text{C}$, Character mode, $V_{DD} = 5.0V$, Note 1	-	4.4	-	V
Input signal voltage for E,DB0-DB7,R/W,RS	V_{IH1}	“High” level	0.7 VDD	-	VDD	V
	V_{IL1}	“Low” level	-0.3	-	0.6	V
Supply Current (Logic & LCD)	IDD	Character mode, Note 1	-	1.1	1.7	mA
		Checkerboard mode, Note 1		1.2	1.8	mA
Supply Current (LCD)	I0	Character mode, Note 1	-	0.2	0.3	mA
		Checkerboard mode, Note 1	-	0.2	0.3	mA

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 $+50\text{ }^{\circ}\text{C}$, $V_{DD} = +5V \pm 5\%$, $V_{SS} = 0V$.

Table 6

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
<i>Write Mode (Writing data from MPU to ST7066U)</i>						
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T_R, T_F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
T_{DSW}	Data Setup Time	Pins: DB0 - DB7	40	-	-	ns
T_H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns
<i>Read Mode (Reading Data from ST7066U to MPU)</i>						
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T_R, T_F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
T_{DDR}	Data Setup Time	Pins: DB0 - DB7	-	-	100	ns
T_H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns

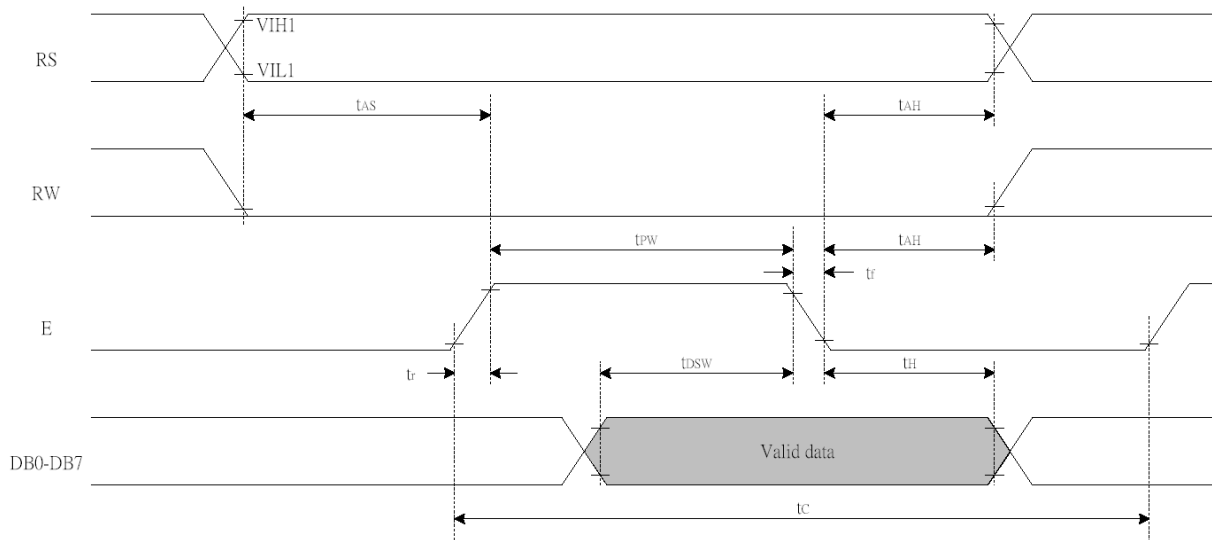


Figure 2: Writing data from MPU to ST7066U

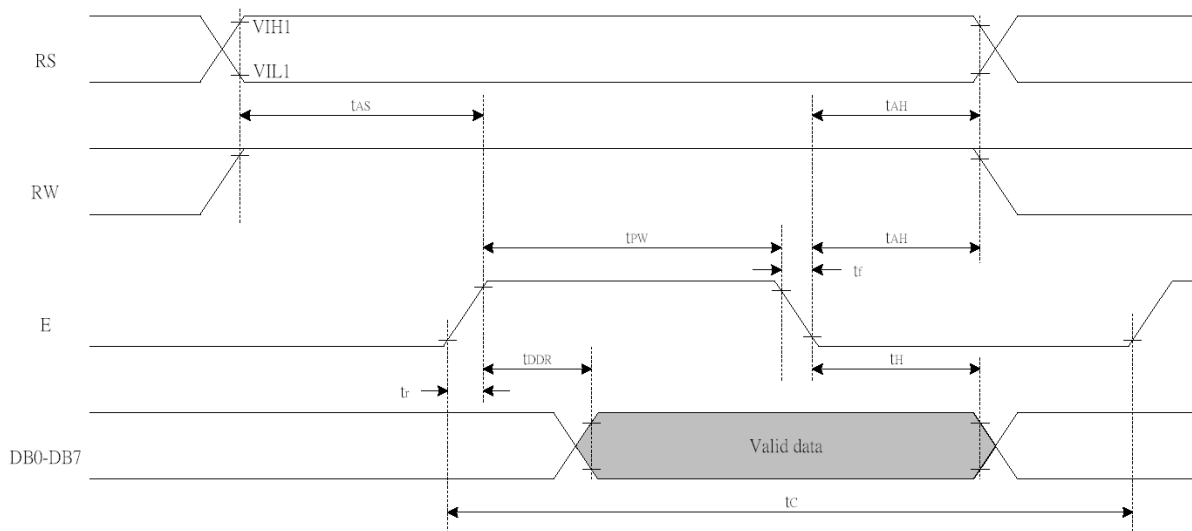


Figure 3: Reading data from ST7066U to MPU

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.

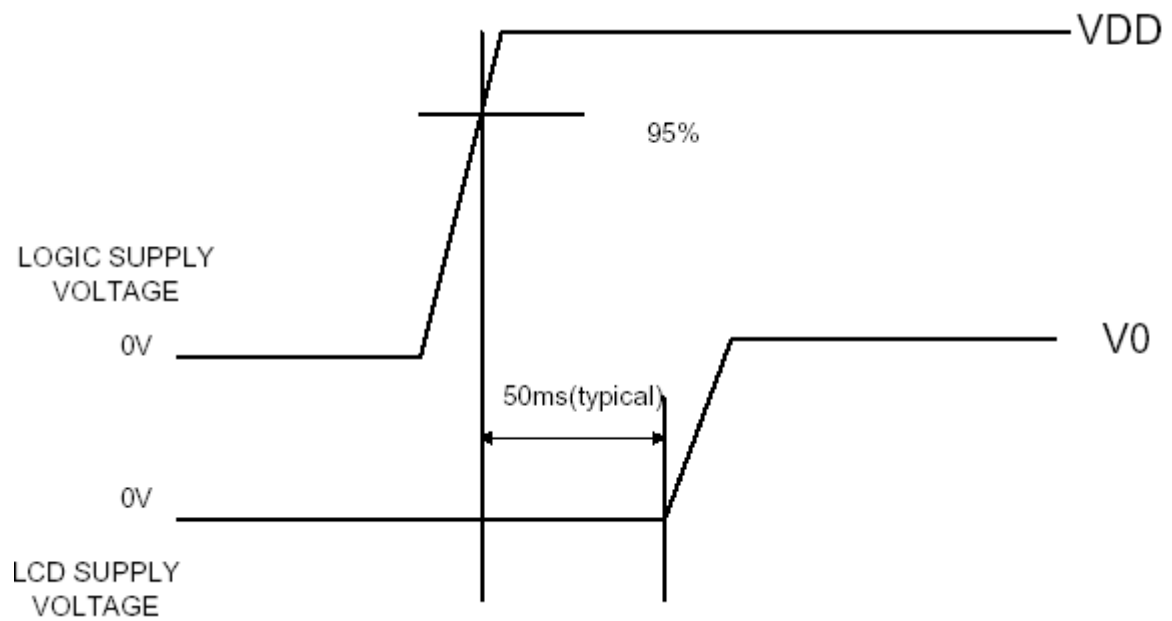


Figure 4: Timing diagram of VDD against V0.

6. CGROM Character Code Table (ST7066U-0A)

NO.7066-0A

b7-b4 b3-b0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	CG RAM (1)			0	1	2	3	4				5	6	7	8	9
0001	(2)	!	1	A	0	a	9				.	7	7	4	3	q
0010	(3)	"	2	B	R	b	r				7	4	9	2	p	a
0011	(4)	#	3	C	S	c	s				J	7	7	E	E	e
0100	(5)	*	4	D	T	d	t				\	E	T	t	p	a
0101	(6)	%	5	E	U	e	u				.	7	7	1	e	0
0110	(7)	&	6	F	V	f	v				7	7	2	3	p	z
0111	(8)	'	7	G	W	g	w				7	7	2	7	g	π
1000	(1)	(8	H	X	h	x				4	7	*	U	J	2
1001	(2))	9	I	Y	i	y				7	7	J	U	7	U
1010	(3)	*	:	J	Z	j	z				E	7	7	7	J	7
1011	(4)	+	;	K	l	k	l				*	7	7	7	7	7
1100	(5)	*	<	L	*	l	l				7	7	7	7	7	7
1101	(6)	-	=	M	7	m	7				7	7	7	7	7	7
1110	(7)	.	>	N	^	n	*				7	7	7	7	7	7
1111	(8)	/	?	O	_	o	*				7	7	7	7	7	7

7. LCD Cosmetic Conditions

- a.) Reference document follow VL-QUA-012A.
- b.) LCD size of the product is small.

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