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VARITRONIX

VL-FS-MDLS16268BD-14 REV. A
(MDLS16268BD-LV-B-LED04G-IC-ST7066U-01)

MAR/2008

PAGE 1

VARITRONIX LCD
MDLS-16268B--ST-LV-NegBlue-LED04G
MDLS16268B-D14
MDLS-16268B-LV-LED04G-N
Digi-Key Part # 153-1136-ND RoHS

VL-FS-MDLS16268BD-14 REV. A
(MDLS16268BD-LV-B-LED04G-IC-ST7066U-01)

DOCUMENT TITLE:
SPECIFICATION
OF
LCD MODULE TYPE
MODEL NUMBER: MDLS16268BD-14



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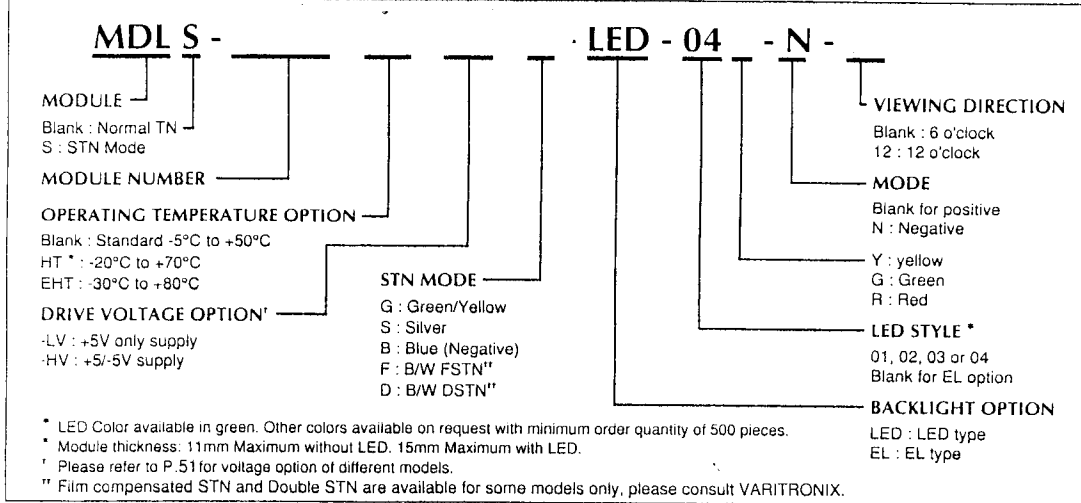
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DISTRIBUTION LIST: MARKETING



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MODULE MODEL NUMBER NOTATION



STN OPTION

FIVE DIFFERENT MODES ARE AVAILABLE, NAMELY

1) GREEN MODE	---	Black digit on yellow - green background.
2) SILVER MODE	---	Blue digit on light blue to near white background.
3) BLUE MODE	---	Clear digit on dark blue background (negative mode).
4) FSTN	---	Black digit on white background, film compensation version.
5) DSTN	---	Black digit on white background, double STN version.

CONTROLLER OPTION OR EQUIVALENT

1) Standard HD44780 or equivalent	---	with English / Japanese characters
2) Special Controller VL103	---	with English / European characters

ABSOLUTE MAXIMUM RATINGS †

ITEM	SYMBOL	STANDARD VALUE		OPTION
		MIN	MAX	
Power supply for controller	(V _{DD} - V _{SS})	0	7.0 V	
Power supply for LCD driver	(V _{DD} - V _O)	0	13.5 V	
Input voltage (V _I)		V _{SS}	V _{DD}	
Operating temperature		-5	+50°C	(- LV model)
		-10	+60°C	(- HV model)
		-20	+70°C	(- HT model)
		-30	+80°C	(- EHT model)
Storage temperature		-20	+60°C	(- LV model)
		-20	+70°C	(- HV model)
		-30	+80°C	(- HT model)
		-40	+80°C	(- EHT model)

† Minimum environmental mechanical specifications as listed on P.22. Please consult VARITRONIX for special requests.

ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Input Voltage - High	V _{IH}		2.2	---	---	volts
Input Voltage - Low	V _{IL}		---	---	0.6	volts
Output Voltage - High	V _{OH}	-I _{OH} = 0.2mA	2.4	---	---	volts
Output Voltage - Low	V _{OL}	I _{OL} = 1.2mA	---	---	0.4	volts
Power Supply Current	I _{DD}			0.5	2.0	mA



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Digi-Key Part # 153-1136-ND RoHS

DOCUMENT REVISION HISTORY

DOCUMENT REVISION FROM TO	DATE	DESCRIPTION	CHANGED BY	CHECKED BY
A	2008.03.06	First Release. Based on a.) VL-QUA-012A, REV. R, 2004.03.20. According to VL-QUA-012A, LCD size is small because Unit Per Laminate=15 which is more than 6pcs/Laminate.	XIAO LI LAN	FENG NAN



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VL-FS-MDLS16268BD-14 REV. A
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MAR/2008

PAGE 3

CONTENTS

	<u>Page No.</u>
1. GENERAL DESCRIPTION	4
2. MECHANICAL SPECIFICATIONS	4
3. INTERFACE SIGNALS	6
4. ABSOLUTE MAXIMUM RATINGS	7
4.1 ELECTRICAL MAXIMUM RATINGS – FOR IC ONLY	7
4.2 ENVIRONMENTAL CONDITION	7
5. ELECTRICAL SPECIFICATIONS	8
5.1 TYPICAL ELECTRICAL CHARACTERISTICS	8
5.2 TIMING SPECIFICATIONS	9
5.3 TIMING DIAGRAM OF VCC AGAINST V0	11
5.4 INSTRUCTION TABLE	12
6. CHARACTER GENERATOR ROM (KS0066U-10B)	13
7. REMARK	14
8. LCD COSMETIC CONDITIONS	15

VARITRONIX LCD
MDLS-16268B--ST-LV-NegBlue-LED04G
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Digi-Key Part # 153-1136-ND RoHS



VARITRONIX

VL-FS-MDLS16268BD-14 REV. A
(MDLS16268BD-LV-B-LED04G-IC-ST7066U-01)

MAR/2008

PAGE 4

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MDLS-16268B-D14
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**Specification
of
LCD Module Type
Model No.: MDLS16268BD-14**

1. General Description

- 16 characters (5 x 8 dots) x 2 lines STN Negative Blue Transmissive LCD Character Module.
- Viewing Angle: 6 O'clock.
- Driving scheme: 1/16 Duty, 1/5 bias.
- 'SITRONIX' ST7066U-0A-B (die form) LCD Controller & Driver or equivalent.
- 'SITRONIX' ST7065C (die form) LCD Segment Driver or equivalent.
- Yellow-Green LED04 backlight.
- "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	122.0(W) x 43.0(H) x 15.0 MAX.(D)	mm
Viewing area	99.0(W) x 23.0(H)	mm
Display format	16 characters x 2 lines	-
Character size	4.84(W) x 9.22(H) (5 x 8 dots)	mm
Character spacing	1.16(W) x 0.53(H)	mm
Character pitch	6.00(W) x 9.75(H)	mm
Dot size	0.92(W) x 1.10(H)	mm
Dot spacing	0.06(W) x 0.06(H)	mm
Dot pitch	0.98(W) x 1.16(H)	mm
Weight	Approx.: 66.0	grams



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VL-FS-MDLS16268BD-14 REV. A
(MDLS16268BD-LV-B-LED04G-IC-ST7066U-01)

MAR/2008

PAGE 5

VARITRONIX LCD
MDLS-16268B--ST-LV-NegBlue-LED04G
MDLS16268B-D14
MDLS-16268B-LV-LED04G-N
Digi-Key Part # 153-1136-ND RoHS

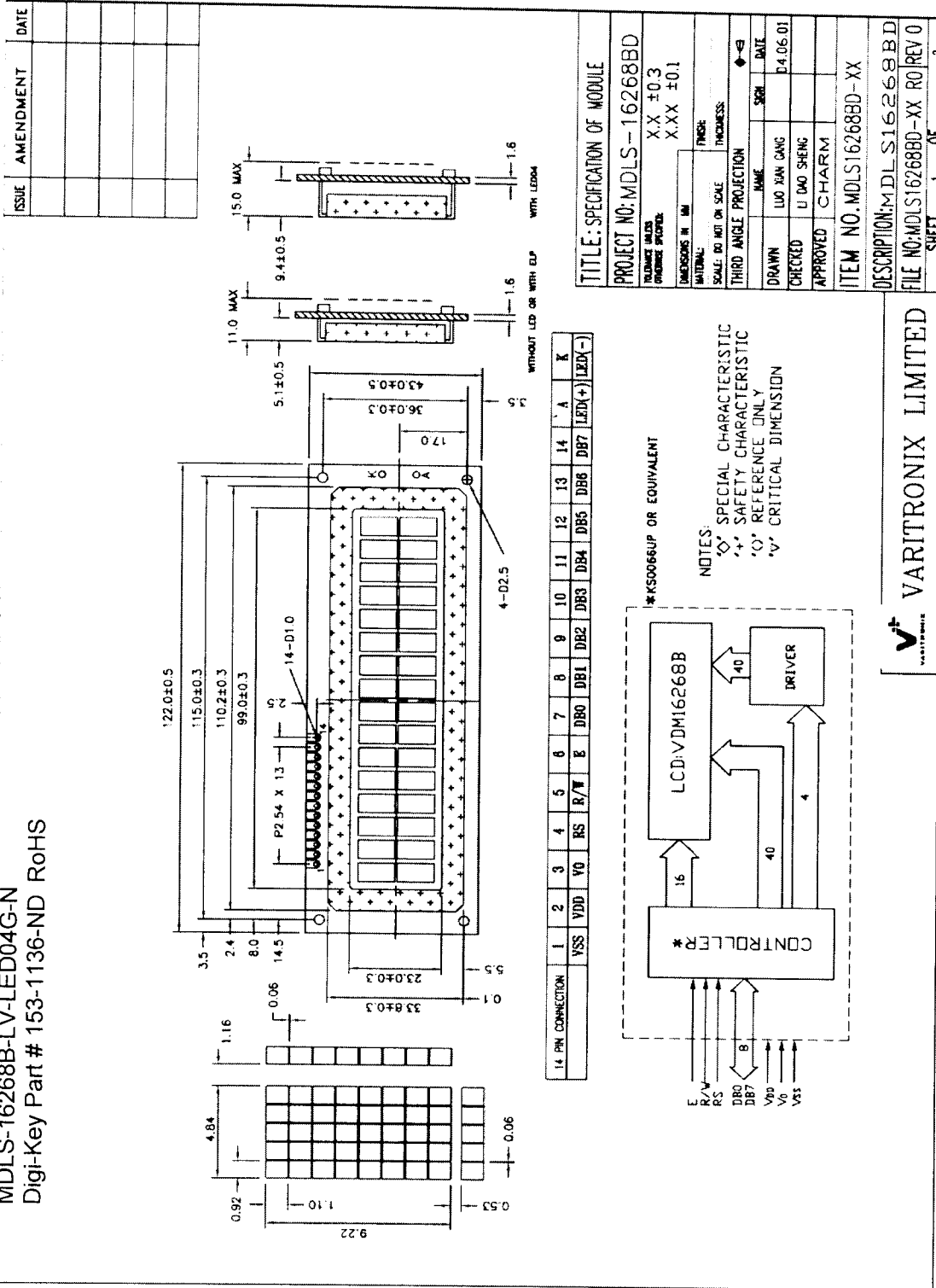


Figure 1: Outline Drawing

ISSUE	AMENDMENT	DATE

TITLE: SPECIFICATION OF MODULE	
PROJECT NO: MDLS-16268BD	
TOLERANCE VALUE	X.X ±0.3
GRINDING SPHERE	X.XX ±0.1
DIMENSIONS IN MM	
NATIONAL	FINISH
SCALE: DO NOT ON SCALE	THICKNESS
THIRD ANGLE PROJECTION	
DRAWN	NAME
CHECKED	DATE
APPROVED	SIGNATURE
	DATE
	DATE
ITEM NO: MDLS16268BD-XX	
DESCRIPTION: MDLS16268BD	
FILE NO: MDLS16268BD-XX RO/REV 0	
SHEET	OF
1	2

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3. Interface signals

Table 2

Pin No.	Symbol	Description
1	VSS	Ground (0V).
2	VDD	Power supply for logic.
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.



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4. Absolute Maximum Ratings

4.1 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	-0.3	+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.

4.2 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 = 100 g Number of shocks: 3 shocks in 3 mutually perpendicular axes.				3 directions

Note1: Product cannot sustain at extreme storage conditions for long time.



5. Electrical Specifications

5.1 Typical Electrical Characteristics

At $T_a = 25^\circ\text{C}$, $V_{DD} = 5V \pm 5\%$, $V_{SS} = 0V$.

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	Ta= 0°C, VDD = 5V, Character mode, Note 1	-	4.6	-	V
		Ta=+25°C, VDD=5V, Character mode, Note 1	4.0	4.3	4.6	V
		Ta=+50°C, VDD=5V, Character mode, Note 1	-	4.1	-	V
Input signal voltage for E,DB0-DB7,R/W,RS.	V _{IH}	"H" level	0.7VDD	-	VDD	V
	V _{IL}	"L" level	-0.3	-	0.6	V
Supply Current (Logic & LCD)	IDD	Character mode, VDD = 5V.	-	0.8	1.2	mA
		Checker board mode, VDD = 5V.	-	1.4	2.1	mA
Supply Current (LCD)	I0	Character mode, VDD = 5V, Note 1	-	0.2	0.3	mA
		Checker board mode, VDD = 5V, Note 1	-	0.2	0.3	mA
Supply Voltage of yellow-green LED04 backlight	VLED	Forward current = 210 mA No. of LED chips = 2 x 21 = 42 dies	3.9	4.1	4.3	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
Enable Cycle Time	tc	1200	-	ns
Enable Pulse Width	tpw	140	-	ns
Enable Rise/Fall Time	tr,tf	-	25	ns
Address Setup Time	tAS	0	-	ns
Address Hold Time	tAH	10	-	ns
Data Setup Time	tDSW	40	-	ns
Data Hold Time	tH	10	-	ns

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

Table 7

Parameter	Symbol	Min.	Max.	Unit
Enable Cycle Time	tc	1200	-	ns
Enable Pulse Width	tpw	140	-	ns
Enable Rise/Fall Time	tr,tf	-	25	ns
Address Setup Time	tAS	0	-	ns
Address Hold Time	tAH	10	-	ns
Data Setup Time	tDDR	-	100	ns
Data Hold Time	tH	10	-	ns

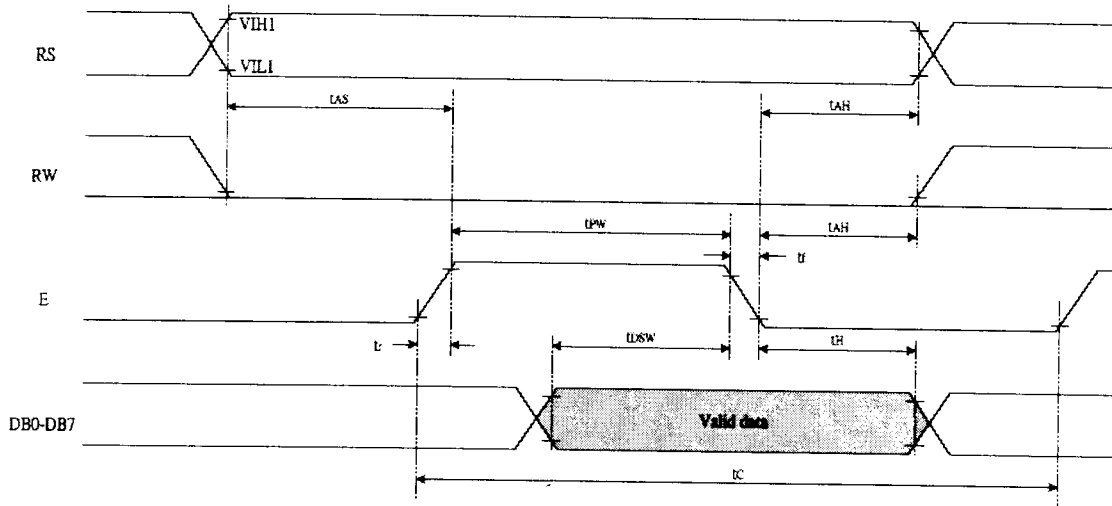


Figure 2: Write Mode Timing Diagram

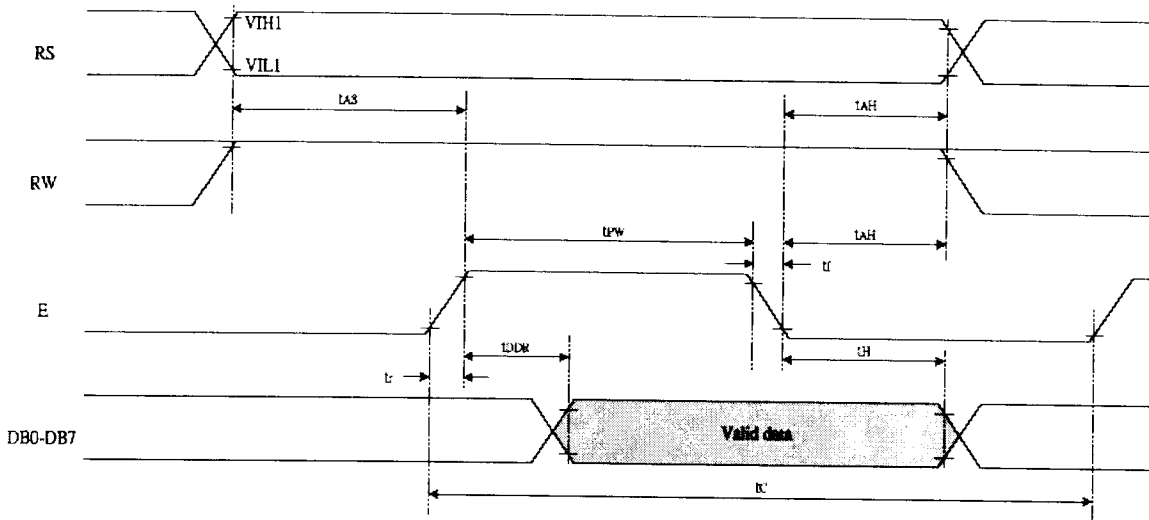


Figure 3: Read Mode Timing Diagram



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.

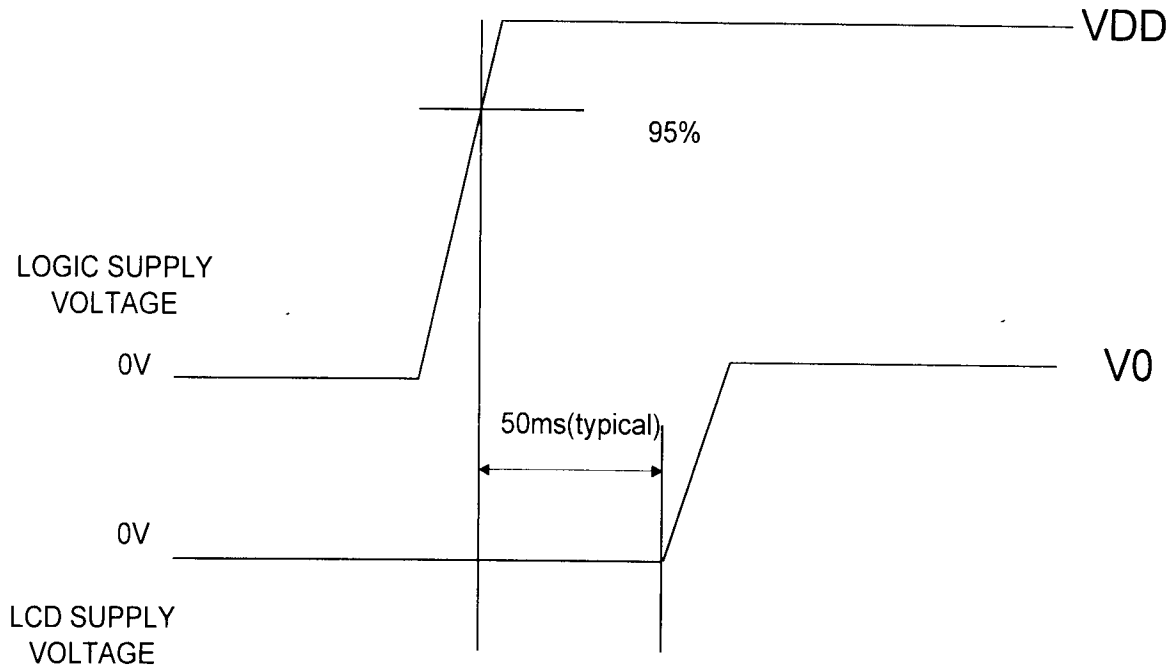


Figure 4: Timing Diagram of VDD Against V0.

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MDLS-16268B--ST-LV-NegBlue-LED04G
MDLS-16268B-D14
MDLS-16268B-LV-LED04G-N
Digi-Key Part # 153-1136-ND RoHS



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VARITRONIX LCD
 MDLS-16268B--ST-LV-NegBlue-LED04G
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 MDLS-16268B-LV-LED04G-N
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VL-FS-MDLS16268BD-14 REV. A
 (MDLS16268BD-LV-B-LED04G-IC-ST7066U-01)

MAR/2008

PAGE 12

5.5. Instruction Table

Instruction	Instruction Code										Description	Description Time (270KHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM, and set DDRAM address to "00H" from AC	1.52 ms
Return Home	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	37 us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	37 us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	37 us
Function Set	0	0	0	0	1	DL	N	F	x	x	DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	37 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	37 us
Read Busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM)	37 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	37 us

Note:

Be sure the ST7066U is not in the busy state (BF = 0) before sending an instruction from the MPU to the ST7066U. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to Instruction Table for the list of each instruction execution time.



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6. Character Generator ROM (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	a	P	'	P				一	9	3	0	P
0001	(2)		!	1	A	Q	a	W			。	ア	チ	4	a	g
0010	(3)		"	2	B	R	b	r			フ	イ	ツ	×	P	0
0011	(4)		#	3	C	S	c	s			フ	ウ	テ	E	S	8
0100	(5)		\$	4	D	T	d	t			、	エ	ト	ホ	W	0
0101	(6)		%	5	E	U	e	u			。	オ	ナ	1	e	U
0110	(7)		&	6	F	V	f	v			ワ	カ	ニ	ヨ	P	Z
0111	(8)		'	7	G	W	g	w			フ	チ	ヌ	ラ	g	π
1000	(1)		(8	H	X	h	x			、	ウ	ホ	リ	フ	×
1001	(2))	9	I	Y	i	y			ウ	ケ	ル	レ	リ	y
1010	(3)		*	=	J	Z	j	z			エ	コ	ン	ル	j	z
1011	(4)		+	,	K	L	k	l			ホ	セ	ロ	°	カ	
1100	(5)		.	<	L	¥	l	l			ホ	ソ	フ	ワ	ホ	カ
1101	(6)		-	=	M	J	m	j			ユ	ズ	ン	ト	ト	÷
1110	(7)		_	>	N	^	n	+			ヨ	セ	ホ	°	カ	
1111	(8)		/	?	0	_	o	+			ウ	ソ	フ	"	0	■

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