

字符型液晶显示模块使用手册

FM0802B

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1. FEATURE

- * Display Format: 8 Characters X 2 lines
- * Display mode : Positive Reflective type, STN-grey mode
- * Driving method: 1/16 Duty 1/5 Bias
- * Input Data: 4 bits or 8 bits interface available
- *Viewing direction: 6 o'clock
- *With LED backlight

2 MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module size	58x32x14.0Max	mm
Viewing Area	38.0x16.0	mm
Character Size	2.96x5.56	mm
Character Pitch	3.55x5.94	mm
Dot Size	0.56x0.56	mm
Weight		g

3. ABSOLUTE MAXIMUM RATINGS

3-1. Electrical absolute maximum rating

Item		Symbol	Value			Unit	Condition
			Min	Type	Max		
Supply voltage	Logic	VDD-Vss	0	-	7.0	V	Ta=25℃
	LCD	VDD-Vo	0	-	13.5	V	Ta=25℃
Input voltage		VI	-0.3	-	VDD+0.3	V	Ta=25℃

3-2 Environmental conditions

Item	Symbol	Min	Max	Unit
Operating temperature	Topr	0	50	℃
Storage temperature	Tstg	-20	-70	℃
Humidity (Ambient temperature=Ta)	Ta≤40℃		95% RH max.	
	Ta>40℃ (Below maximum temp)		Absolute humidity shall be less than 95% RH at Ta=40℃	

A (+5.0V)

4. ELECTRICAL CHARACTERISTICS

K

Item		Symbol LED	Spec. Value			Unit	Condition
			Min	Typ	Max		
Supply voltage	Logic	VDD-Vss	4.5	5.0	5.5	V	
	LCD	VDD-Vo	3.8	4.2		V	Ta=25°C
Supply	Current	IDD	-	1.0	2.0	mA	VDD=5.0V
Input voltage	High level	VIH	2.2	-	VDD	V	-
	Low level	VIL	-0.3	-	0.6	V	-
Output voltage	High level	VOH	2.4	-	-	V	IOH=-0.2 mA
	Low level	VOL			0.4	V	IOL=1.2 mA

5. CHARACTERISTICS OF BACKLIGHTING (LED UNIT)

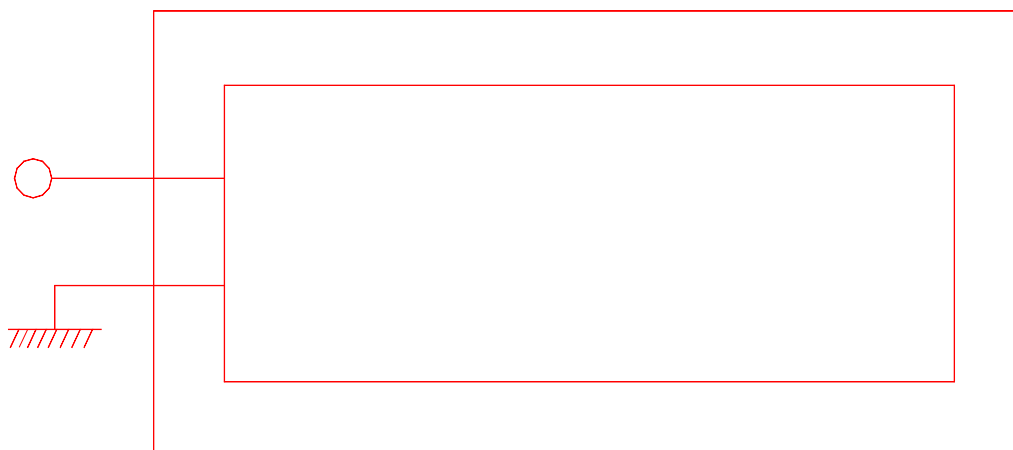
5-1 Absolute maximum rating

Item	Symbol	Condition	Min	Max	Unit
Forward current	IF	Ta=25°C	-	90	mA
Reverse voltage	VR	Ta=25°C	-	8	V
Power dissipation	PD	Ta=25°C	-	450	mW

5-2 Opto-electric characteristics

Item	Symbol	Condition	Min	Type	Max	Unit
Forward voltage	VF	Ta=25°C	3.9	4.2	4.5	V
Luminous		IF=60mA	30	-	-	cd/m ²

5-3 LED CIRCUIT DIAGRAM



6. ELECTRIC-OPTICAL CHARACTERISTIC

6-1. STN Type

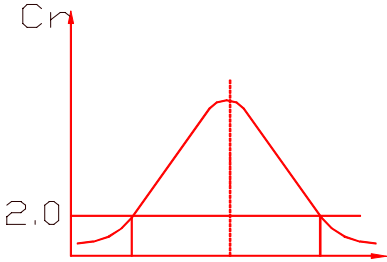
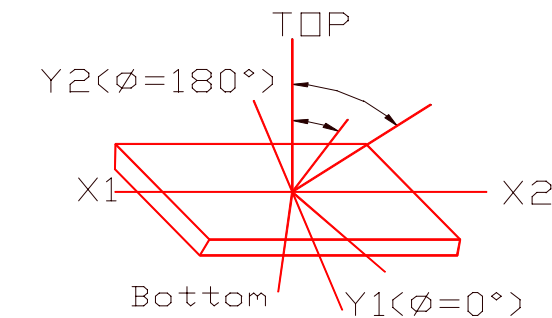
		θ_2		θ_1			
		Condition: VDD=+5.0V, Ta=25°C		$\theta_1 < \sigma < \theta_2$			
Item	Symbol	Min	Typ	Max	Unit	Condition	Note
Viewing Angle	$\theta_2 - \theta_1$	70	-	+90	deg	Cr=2.0	1.2
	$\varnothing$	-90	-	+90	-	$\theta_1 = 0^\circ$ $\theta_2 = 20^\circ$ $\varnothing = 0^\circ$	
Contrast Ratio	Cr	-	4	-	-	$\theta = 20^\circ$ $\varnothing = 0^\circ$	3
Response Time(rise)	Tr	-	110	-	ms	$\theta = 20^\circ$ $\varnothing = 0^\circ$	4
Response Time(fall)	Tf	-	110	-	ms	$\theta = 20^\circ$ $\varnothing = 0^\circ$	4

6-2. TN Type

		Condition: VDD=+5.0V, Ta=25°C					
Item	Symbol	Min	Typ	Max	Unit	Condition	Note
Viewing Angle	$\theta_2 - \theta_1$	40	-	-	deg	Cr=2.0	1.2
	$\varnothing$	-	-	-	-	$\theta = 20^\circ$ $\varnothing = 0^\circ$	
Contrast Ratio	Cr	-	4	-	-	$\theta = 20^\circ$ $\varnothing = 0^\circ$	3
Response Time(rise)	Tr	-	110	-	ms	$\theta = 20^\circ$ $\varnothing = 0^\circ$	4
Response Time(fall)	Tf	-	110	-	ms	$\theta = 20^\circ$ $\varnothing = 0^\circ$	4

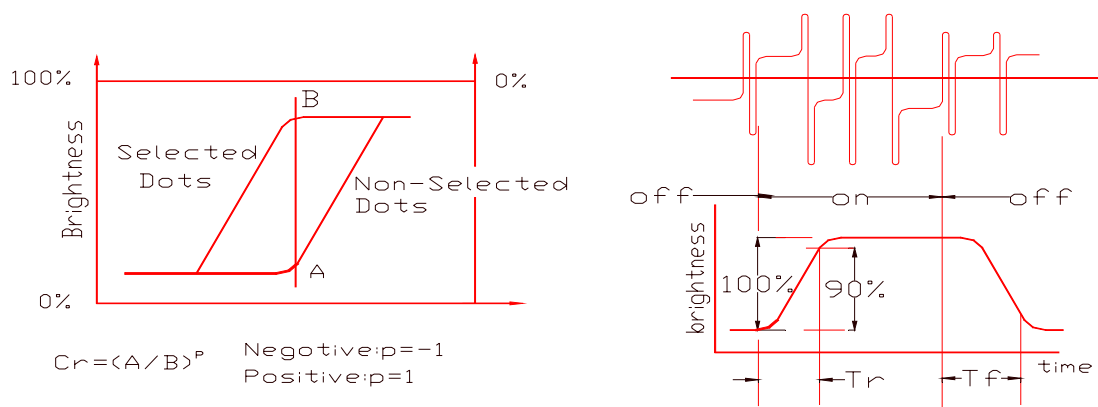
NOTE: $\varnothing = 0$ means viewing direction

Note 1. Definition of angle θ and $\varnothing$ Note 2. Definition of viewing θ_1 and θ_2



Note 3.

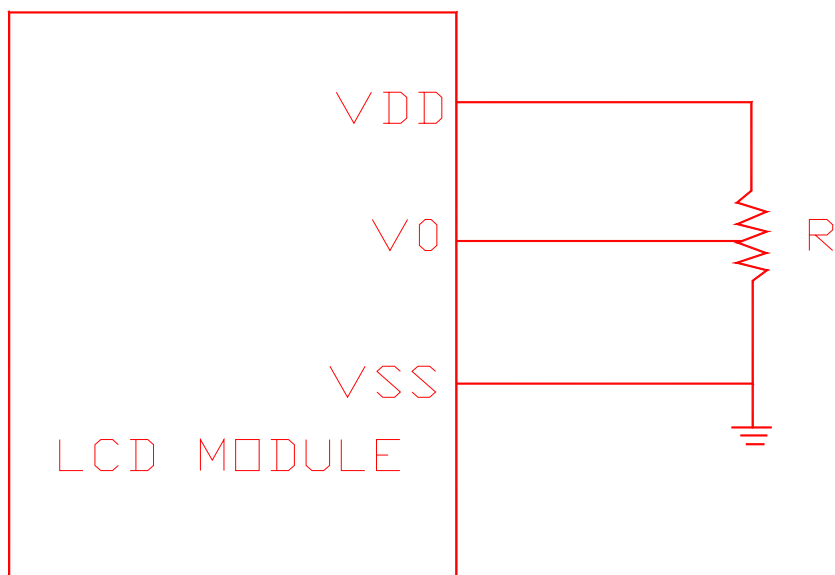
Definition of contrast Cr Note 4. Definition of optical response



7. INTERFACE PIN ASSIGNMENT

Pin No	Symbol	Level	Description
1	Vss(GND)	0V	Ground
2	VDD	+5.0V	Supply voltage for logic and LCD
3	Vo	-	Operating voltage for LCD
4	RS	H/L	Signal to select registers
5	R/W	H/L	Signal to select "read" and "write"
6	E	H, H/L	Enable signal
7	DB0	H/L	Data bit0
8	DB1	H/L	Data bit1
9	DB2	H/L	Data bit2
10	DB3	H/L	Data bit3
11	DB4	H/L	Data bit4
12	DB5	H/L	Data bit5
13	DB6	H/L	Data bit6
14	DB7	H/L	Data bit7
A	LED +	-	Backlight Supply
K	LED-	-	

8. POWER SUPPLY BLOCK DIAGRAM

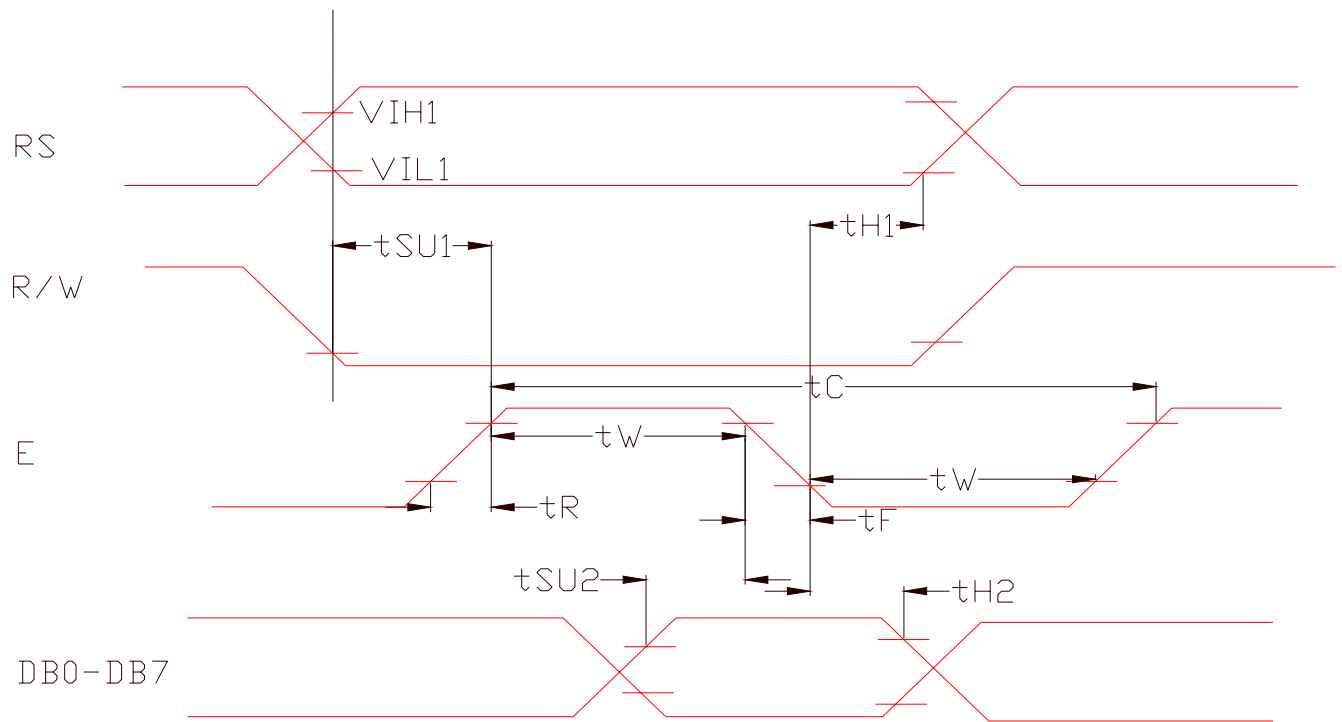


$V_{DD} - V_0$: LCD DRIVING VOLTAGE

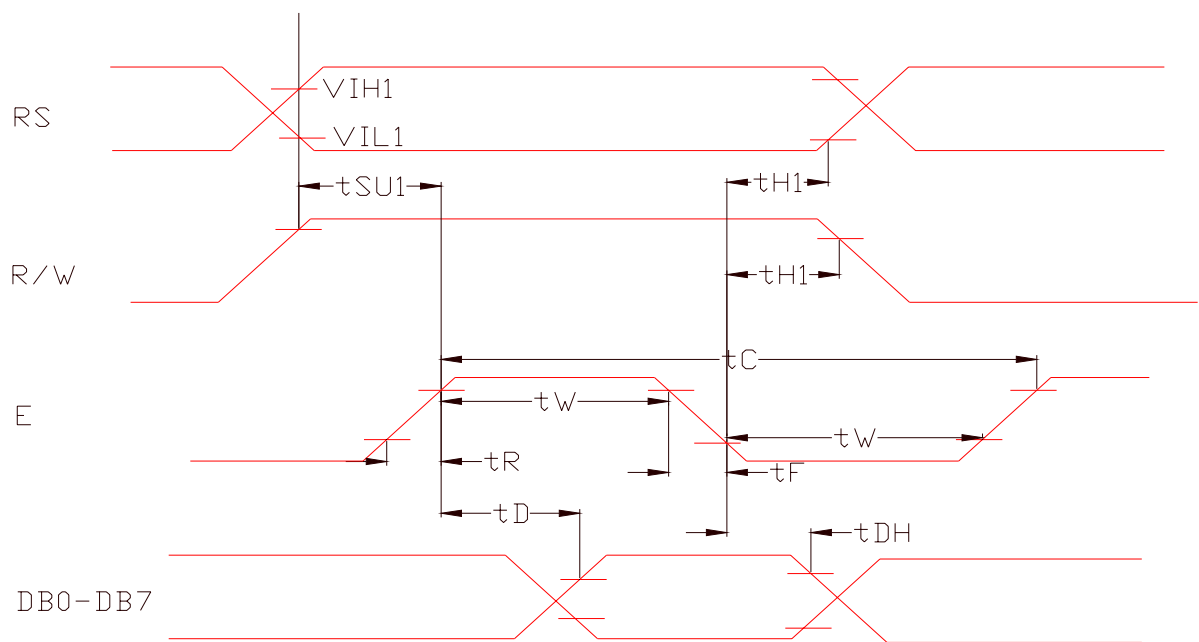
9. TIME CHARACTERISTICS

Condition: $V_{DD} = +5.0V \pm 0.5V$, $V_{SS} = 0V$, $T_a = 25^\circ C$

Parameter	Symbol	Min	Max	Unit
E cycle time	t_c	500	-	Ns
E Pulse width (High, Low)	t_w	220	-	Ns
E rise time	t_R	-	25	ns
E fall time	t_F	-	25	Ns
R/W and RS set-up time	t_{SU1}	40	-	Ns
R/W and RS hold time	t_{H1}	10	-	Ns
Data setup time (write)	t_{SU2}	60	-	Ns
Data delay time (read)	t_D	-	120	ns
Data hold time (write)	t_{H2}	10	-	ns
Data hold time (read)	t_{DH}	20	-	ns



CPU WRITING TIMING



CPU READING TIMING

10. INSTRUCTIONS SYSTEM

10-1. Display clear

RS R/W DB7 DB6..... DB0 Execution time

0	0	0	0	0	0	0	0	0	1	1.64ms
---	---	---	---	---	---	---	---	---	---	--------

This command will clear entire display and set DD RAM address “0” in address counter.

10-2. Return home

RS R/W DB7 DB6..... DB0 Execution time

0	0	0	0	0	0	0	0	1	*	1.64ms
---	---	---	---	---	---	---	---	---	---	--------

Set DD RAM address “0” in address counter. Also returns display being shifted to original position and DD RAM contents remain unchange.

10-3. Entry mode set

RS R/W DB7 DB6..... DB0 Execution time

0	0	0	0	0	0	0	1	I/D	SH	42μs
---	---	---	---	---	---	---	---	-----	----	------

Set cursor move direction and specifies shift of display. These operations are performed during data write and read.

I/D: Set cursor move direction. H: Increase

L: Decrease

SH: Specifies shift of display. H: Display is shifted.

L: Display is not shifted.

10-4. Display on/off

RS R/W DB7 DB6..... DB0 Execution time

0	0	0	0	0	0	1	D	C	B	42μs
---	---	---	---	---	---	---	---	---	---	------

Sets ON/OFF of entire display.

D: Display on/off. H: on.

L: off.

C: Cursor on/off H: on.

L: off.

B: Blinking on/off H: on.

L: off.

10-5. Cursor or display shift

RS R/W DB7 DB6..... DB0 Execution time

0	0	0	0	0	1	S/C	R/L	*	*	42μs
---	---	---	---	---	---	-----	-----	---	---	------

This command moves cursor and shift display without changing DD RAM contents.

SC: H: Display shift.

L: Cursor move.

R/L: H: Right shift.

L: Left shift.

10-6. Set function

RS R/W DB7 DB6..... DB0 Execution time

0	0	0	0	1	DL	N	F	*	*	42μs
---	---	---	---	---	----	---	---	---	---	------

This command sets interface data length (DL) and Number of display lines (N) and character fonts (F).

DL: H: 8 Bits interface.

L: 4 Bits interface.

N: H: 2 Lines display.

L: 1 Lines display.

F: H: 5X10 dots.

L: 5X7 dots.

10-7. Set CG RAM address

RS R/W DB7 DB6..... DB0 Execution time

0	0	0	1	CG RAM ADDRESS						42μs
---	---	---	---	----------------	--	--	--	--	--	------

CG RAM address corresponds to cursor address.

This command sets CG RAM address. CG RAM data is sent and received after this setting.

10-8. Set DD RAM address

RS R/W DB7 DB6..... DB0 Execution time

0	0	1	DD RAM ADDRESS	42 μ s
---	---	---	----------------	------------

This command sets DD RAM address. DD RAM data is sent and received after this setting.

10-9. Read busy flag & address

RS R/W DB7 DB6..... DB0 Execution time

0	1	BF	Address counter used for both DD & CG RAM address	0 μ s
---	---	----	---	-----------

This command reads busy flag (BF) indicting internal operation is being performed and reads address counter.

BF: H: Busy

L: Ready.

10-10. Write data

RS R/W DB7 DB6..... DB0 Execution time

1	0	WRITE DATA	46 μ s
---	---	------------	------------

This instruction writes data into DD RAM or CG RAM.

10-11. Read data

RS R/W DB7 DB6..... DB0 Execution time

1	1	READ DATA	46 μ s
---	---	-----------	------------

This instruction reads data from DD RAM or CG RAM.

NOTE: “*”: Don’t care.

10. CHARACTER PATTERN

Higher 4 bits Lower 4 bits	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
XXXX0000		0	a	P	`	p		—	ダ	E	α	ρ
XXXX0001	!	1	A	Q	a	q	a	7	チ	△	ā	q
XXXX0010	"	2	B	R	b	r	7	イ	ウ	×	ρ	θ
XXXX0011	#	3	C	S	c	s	1	ウ	テ	E	e	∞
XXXX0100	\$	4	D	T	d	t	\	I	ト	ト	μ	Ω
XXXX0101	%	5	E	U	e	u	.	オ	ナ	1	α	0
XXXX0110	&	6	F	V	f	v	ヲ	カ	ニ	ヨ	ρ	Σ
XXXX0111	?	7	G	W	g	w	ア	チ	ズ	ウ	g	π
XXXX1000	C	8	H	X	h	x	イ	ウ	ホ	リ	7	Σ
XXXX1001	)	9	I	Y	i	y	ウ	ケ	ル	ル	~	4
XXXX1010	*	:	J	Z	j	z	エ	コ	ン	レ	j	チ
XXXX1011	+	;	K	[	k	(	オ	サ	ヒ	ロ	*	ア
XXXX1100	,	<	L	チ	l	l	ホ	ロ	フ	ワ	ホ	ア
XXXX1101	—	=	M	]	m	)	ユ	ズ	へ	コ	ト	÷
XXXX1110	.	>	N	^	n	÷	ヨ	セ	ホ	~	ん	
XXXX1111	/	?	O	_	o	+	ウ	ソ	マ	°	ō	

12. EXTERNAL DIMENSION

