Bocen Display Technology Co., Ltd.

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

SPECIFICATION
FOR
LCM MODULE

MODULE NO.: BB320240-03

REVISION NO.: V0

Customer Approval:

	SIGNATURE
PREPARED BY	Sylar
VERIFIED BY	William
APPROVED BY	Rio

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

Revision Record

Rev No	Date	Description
V0	2019-09-01	First release

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

2. GENERAL SPECIFICATION

320×240 dots display

Display dot: 320×240

Display type: FSTN/Negative / Transmissive, BLUE

Display Backlight: White LED

Driver IC controller: RAiO RA8835

Viewing angle: 6:00

Display duty: 1/240 duty

Display bias: 1/17 bias

Connotation character font: 5×7

Mechanical characteristics (Unit: mm)

External dimension: 160×109×11

View area： 122×92

Dot size： 0.33×0.33

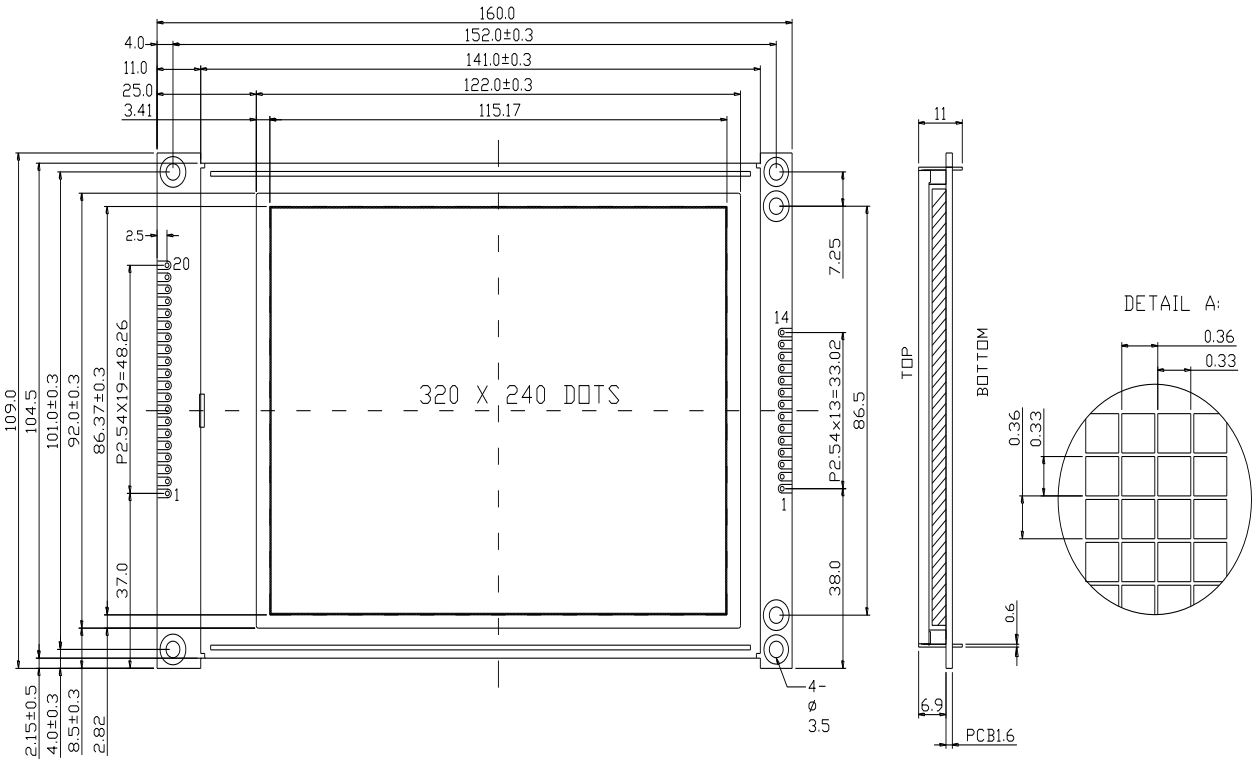
Dot pitch： 0.36×0.36

Weight： g

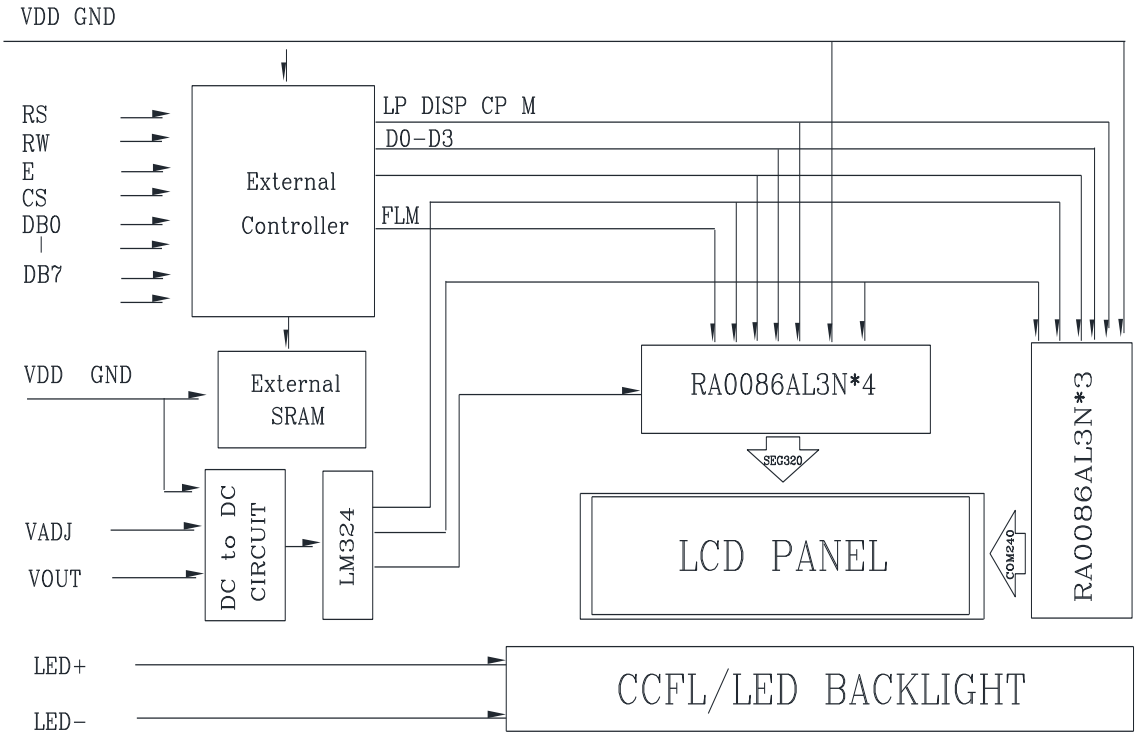
POWER： +5V

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

3. OUTLINE DEMENSION:



4. BLOCK DIAGRAM:



Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

5. Absolute Maximum Ratings

Item	Symbol	Condition	Standard Value		Unit
			Min	Max	
Supply voltage for logic	Vdd	Ta=25^{0}C	-0.3	7.0	V
Supply voltage for LCD	Vo		Vdd-20	Vdd+0.3	V
Input Voltage	Vi		-0.3	Vdd+0.3	V
Operating Temp(T)	Top	-	-20	70	^{0}C
Storage Temp(T)	Tstg	-	-30	80	^{0}C

6. ELECTRICAL SPECIFICATIONS(Ta=25^{0}C,Vdd=5.0V)

ltem	Symbol	Condition	Standard Value			Unit
			Min	Type	Max	
Supply voltage for logic	Vdd-Vss	-	4.5	5.0	5.5	V
Supply Current for logic	ldd	Vdd=5.0	-	-	<50	mA
Driving Current for LCD	lee	Vee=-7.8	-	4.6	-	mA
Driving Voltage for LCD	Top	25^{0}C -	-	-	30	V
Input Voltage "H" level	Tstg	H	0.7Vdd	-	Vdd	V
Input Voltage "L" level	HTop	L	0	-	0.8	V

7. Absolute Maximum Ratings For Side LED Backlight

Parameter	Symbol	Test condition	Min	Type	Max	Unit
LED Forward Consumption Current	I_f	Ta=25^{0}C	-	150	180	mA
LED Allowable Dissipation	P_d	Vf=5.0V	-	450	600	mW

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

8. Pin assignment

	J1	Pin Description		J1	Pin Description
1	GND	Power Ground	11	D2	Data Bus
2	VDD	Power supply for Logic	12	D3	Data Bus
3	V0	Contrast Adjustment	13	D4	Data Bus
4	/WR	Data Write Signal	14	D5	Data Bus
5	/RD	Data Read Signal	15	D6	Data Bus
6	/CS	Chip selection	16	D7	Data Bus
7	A0	Data/ Instruction select signal	17	LEDA	Backlight Anode(5V)
8	/RST	Controller reset signal	18	VEE	Negative voltage output
9	D0	Data Bus	19	LEDA	Backlight Anode(5V)
10	D1	Data Bus	20	LEDK	Backlight Cathode(0V)

	J2	CN1	Pin Description
1	XD1	XD1	Power Ground
2	XD2	XD2	Power supply for Logic
3	XD3	XD3	Contrast Adjustment
4	XD4	XD4	Data Write Signal
5	DISP	DISP	Data Read Signal
6	FRAM	FRAM	Chip selection
7	M	M	Data/ Instruction select signal
8	LP	LP	Controller reset signal
9	CP	CP	Data Bus
10	VCC	VCC	Data Bus
11	GND	GND	Data Bus
12	VEE	VEE	Data Bus
13	V0	V0	Data Bus
14	FG	FG	Data Bus
15	LED+	LED+	Data Bus
16	LED-	LED-	Data Bus

	CN2	Pin Description
1	FRAM	Scan start-up signal
2	LP	Data latch pulse
3	CP	Data shift pulse
4	M	Frame reverse signal (alternate signal)
5	V0	Contrast Adjustment
6	VCC	Power supply for logic
7	GND	Ground

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

8	VEE	Negative Voltage Output
9	XD1	DATA BUS
10	XD2	DATA BUS
11	XD3	DATA BUS
12	XD4	DATA BUS
13	DISP	DISPLAY
14	FG	Frame ground
15	LED+	LED Power +
16	LED-	LED Power -

9. MPU Interface

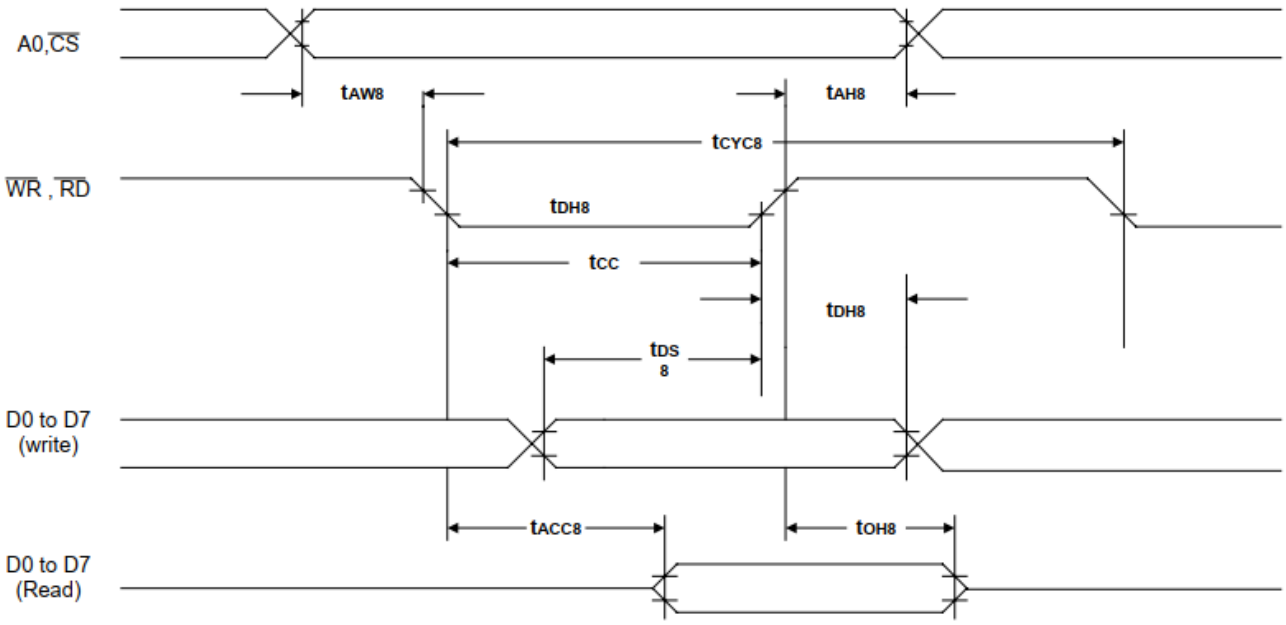
ITEM	SYMBOL	MIN	MAX	UNIT
C/D Set-up Time	t_{CDS}	100	-	ns
C/D Hold Time	t_{CDH}	10	-	ns
$\overline{CE}$,$\overline{RD}$,$\overline{WR}$ Pulse Width	t_{CE},t_{RD},t_{WR}	80	-	ns
Data Set-up Time	t_{DS}	80	-	ns
Data Hold Time	t_{DH}	40	-	ns
Access,Time	t_{ACC}	-	150	ns
Output Hold Time	t_{OH}	10	50	ns

THST CONDITIONS(Unless otherwise noted,Vdd=5.0V±10%,Vss=0V,Ta=-20 to 75℃)

10.Flowchart of communications with MPU

8080 Family Interface Timing

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.



Ta = –20 to 75°C

Signal	Symbol	Parameter	V_{DD} = 4.5 to 5.5V		V_{DD} = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
A0, $\overline{CS}$	t_{AH8}	Address hold time	10	—	10	—	ns	CL = 100pF
	t_{AW8}	Address setup time	0	—	0	—	ns	
$\overline{WR}$, $\overline{RD}$	t_{CYC8}	System cycle time	note.	—	note.	—	ns	
	t_{CC}	Strobe pulse width	120	—	150	—	ns	
D0 to D7	t_{DS8}	Data setup time	120	—	120	—	ns	
	t_{DH8}	Data hold time	5	—	5	—	ns	
	t_{ACC8}	$\overline{RD}$ access time	—	50	—	80	ns	
	t_{OH8}	Output disable time	10	50	10	55	ns	

Note: For memory control and system control commands:

$t_{CYC8} = 2t_C + t_{CC} + t_{CEA} + 75 > t_{ACV} + 245$

For all other commands:

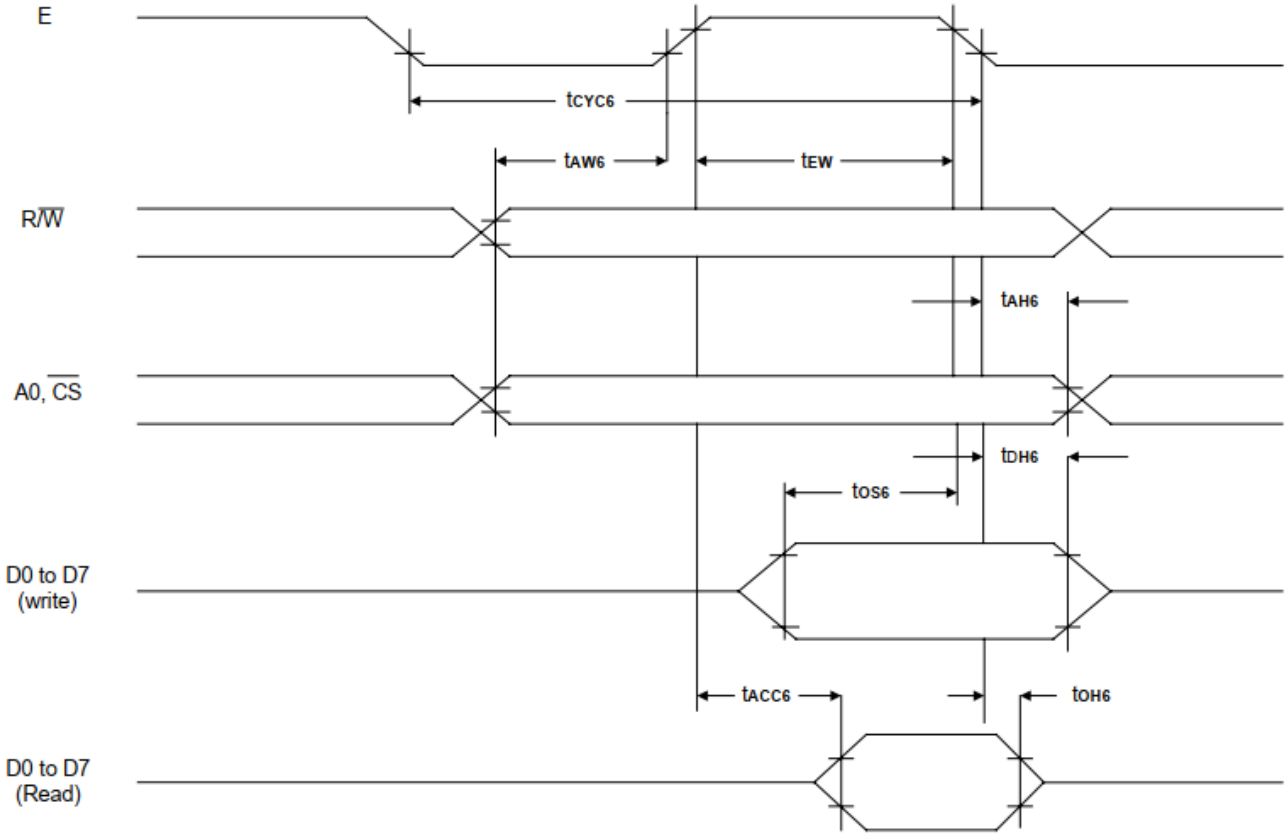
$t_{CYC8} = 4t_C + t_{CC} + 30$

Table-19: 8080 Series Interface Signals

A0	$\overline{RD}$	$\overline{WR}$	Function
0	0	1	Status flag read
1	0	1	Display data and cursor address read
0	1	0	Display data and parameter write
1	1	0	Command write

6800 Family Interface Timing

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.



Ta = –20 to 75°C

Signal	Symbol	Parameter	V_{DD} = 4.5 to 5.5V		V_{DD} = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
A0, $\overline{CS}$, R/(/W)	t_{CYC6}	System cycle time	note.	—	note.	—	ns	CL = 100 pF
	t_{AW6}	Address setup time	0	—	10	—	ns	
	t_{AH6}	Address hold time	0	—	0	—	ns	
D0 to D7	t_{DS6}	Data setup time	100	—	120	—	ns	
	t_{DH6}	Data hold time	0	—	0	—	ns	
	t_{OH6}	Output disable time	10	50	10	75	ns	
	t_{ACC6}	Access time	—	85	—	130	ns	
E	t_{EW}	Enable pulse width	120	—	150	—	ns	

Note: For memory control and system control commands:

$t_{CYC6} = 2t_C + t_{EW} + t_{CEA} + 75 > t_{ACV} + 245$

For all other commands:

$t_{CYC6} = 4t_C + t_{EW} + 30$

Table-20A: 6800 Series Interface Signals

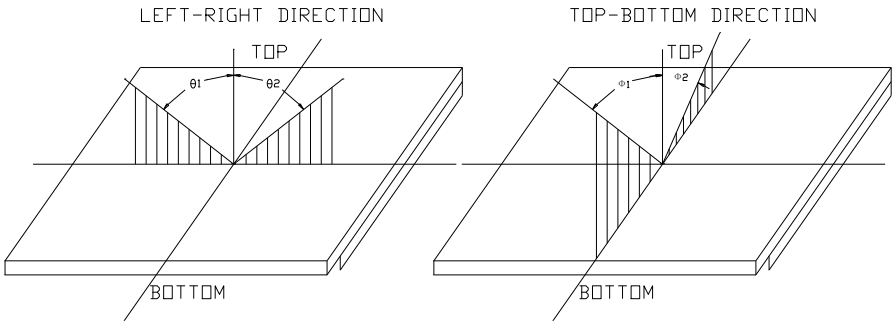
A0	R/$\overline{W}$	E	Function
0	1	1	Status flag read
1	1	1	Display data and cursor address read
0	0	1	Display data and parameter write
1	0	1	Command write

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

11.OPTICAL CHARACTERISTICS:

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REF.
Contrast	CR	25℃， Vdd=5V, θ =0, Ø=0	--	12	--		(2)
Rise Time	Tr	25℃， Vdd=5V, θ =0, Ø=0	--	160	240	ms	(3)
Fall Time	Tf	25℃， Vdd=5V, θ =0, Ø=0	--	100	150	ms	(3)
Viewing Angle	θ 1- θ 2	25℃	--	--	60	DEG	(1)
	Ø1, Ø2		-40	--	40		

(1)Definition of viewing Angle:



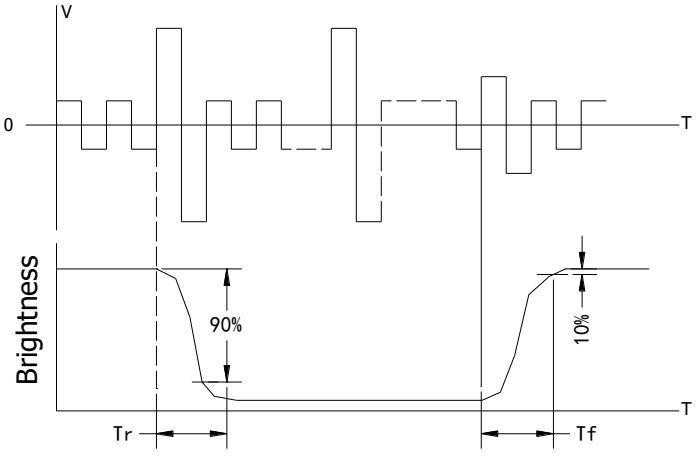
(2)Definition of Contrast Ratio:

$$\text{Contrast Ratio} = \frac{\text{Brightness of non-selected condition}}{\text{Brightness of selected condition}}$$

Test condition: standard A light source

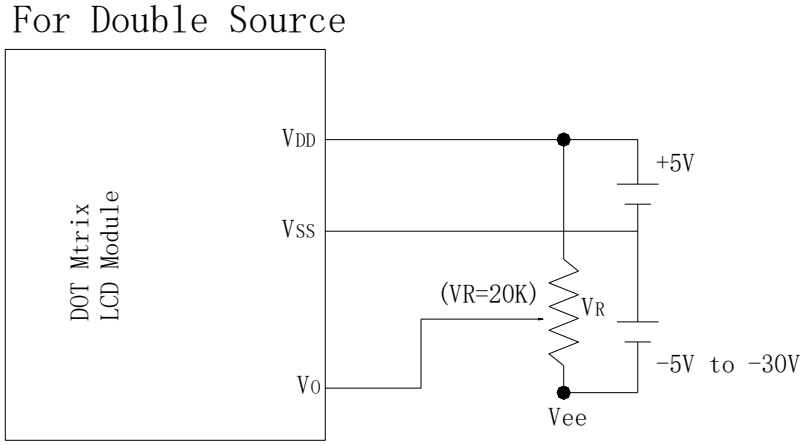
(3)Response Time:

Response time is measured as the shortest period of possible between the change in state of an LCD segments as demonstrated below:



Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

13. POWER SUPPLY SCHEMATICS



14. PRECAUTION FOR USING LCM

1. LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer-based polarizers. The following precautions should be taken when handing,

(1). Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel off or bubble.

(2). Do not contact the exposed polarizers with anything harder than an HB pencil lead. To clean dust off the display surface. Wipe gently with cotton. Chamois or other soft material soaked in petroleum benzine.

(3). Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.

(4). Glass can be easily chipped or cracked from rough handing. especially at corners and edges.

(5). Do not drive LCD with DC voltage.

2. Liquid Crystal Display Modules

2.1 Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

(1). Do not tamper in any way with the tabs on the tabs on the metal frame.

(2). Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.

(3). Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).

(4). When mounting a LCM make sure that the PCB is not under any tress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

(5). Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pie ls.

2.2. Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely

(1). The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.

(2). The modules should be kept in antistatic bags or other containers resistant to static for storage.

Tel: +86-0755-23145782 **E-mail**: info@bocentech.com **Website**: www.bocentech.com
Address: 808 Esun Tech Building, No.22 Jia'an South Road, Bao'an District, 518101 Shenzhen, China.

(3). Only properly grounded soldering irons should be used.
(4). If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.
(5). The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.
(6). Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

2.3. Soldering
(1). Solder only to the I/O terminals.
(2). Use only soldering irons with proper grounding and no leakage.
(3). Soldering temperature: 280 ℃±10℃
(4). Soldering time: 3 to 4 sec.
(5). Use eutectic solder with resin flux fill.
(6). If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed after wards.

2.4. Operation
(1). The viewing angle can be adjusted by varying the LCD driving voltage V0.
(2). Driving voltage should be kept within specified range; excess voltage shortens display life.
(3). Response time increases with decrease in temperature.
(4). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".
(5). Mechanical disturbance during operation (such as pressing on the viewing area) nay cause the segments to appear "fractured".

2.5. Storage
If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.