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TFT | OLED | CHARACTER | GRAPHIC | UWVD | SEGMENT | CUSTOM

Character Display Module

Part Number

C162A-FTW-DS23

Overview:

- 16x2 Character LCD
- FSTN Gray
- 80x36 mm Module
- 4-bit or 8-bit MCU Interface(s)
- White LED Backlight
- Transflective
- Special Temp Range
- 3.3V
- LCD IC: ST7066U-0A
- RoHS Compliant

Character LCD Features

Characters: 16x2
Interface(s): 4-bit or 8-bit MPU
RoHS Compliant

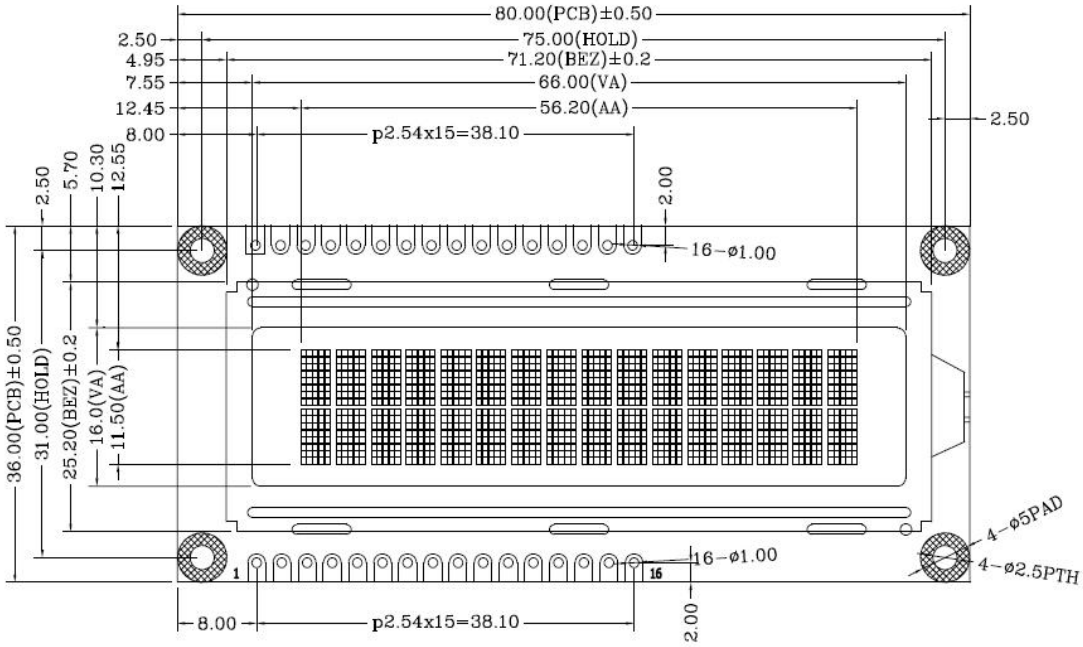
General Information Items	Specification	Unit	Note
	Main Panel		
Viewing Area (VA)	66.0 (H) x 16.0 (V)	mm	--
LCD Type	FSTN Positive	--	--
Viewing Angle	12:00	O'Clock	--
Polarizer	Transflective	--	--
Backlight Type	LED	--	--
Backlight Color	White	--	--
LCD IC	ST7066U-0A	--	--
Character Height	5.55	mm	--
Operating Temperature	-30 to +80	°C	--
Storage Temperature	-35 to +85	°C	--

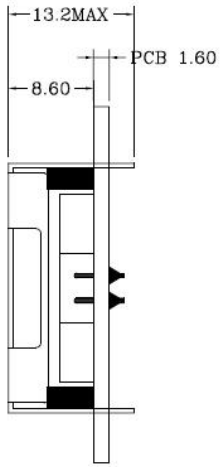
Mechanical Information

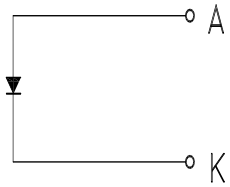
Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	80.0	--	mm	--
	Vertical (V)	--	36.0	--	mm	--
	Depth (D)	--	13.20	--	mm	--
Weight		--	35	--	g	Approximate

1. Outline Dimensions

Rev.	Description	Date
1.0	First	05/26/2023







NO	PIN
1	VSS
2	VDD
3	V0
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	LED_A
16	LED_K

NOTES:

1. DISPLAY DRIVE: DUTY 1/16, BIAS 1/5, VDD 3.3V
2. DISPLAY MODE: FSTN GRAY, TRANSFLECTIVE, POSITIVE
3. LCM DRIVER IC: ST7066U-0A OR EQUIVALENT
4. OPERATING TEMPERATURE: -30°C TO +80°C
5. STORAGE TEMPERATURE: -35°C TO +85°C
6. VIEWING DIRECTION: 12:00
7. BACKLIGHT: SIDE WHITE
8. ROHS COMPLIANT

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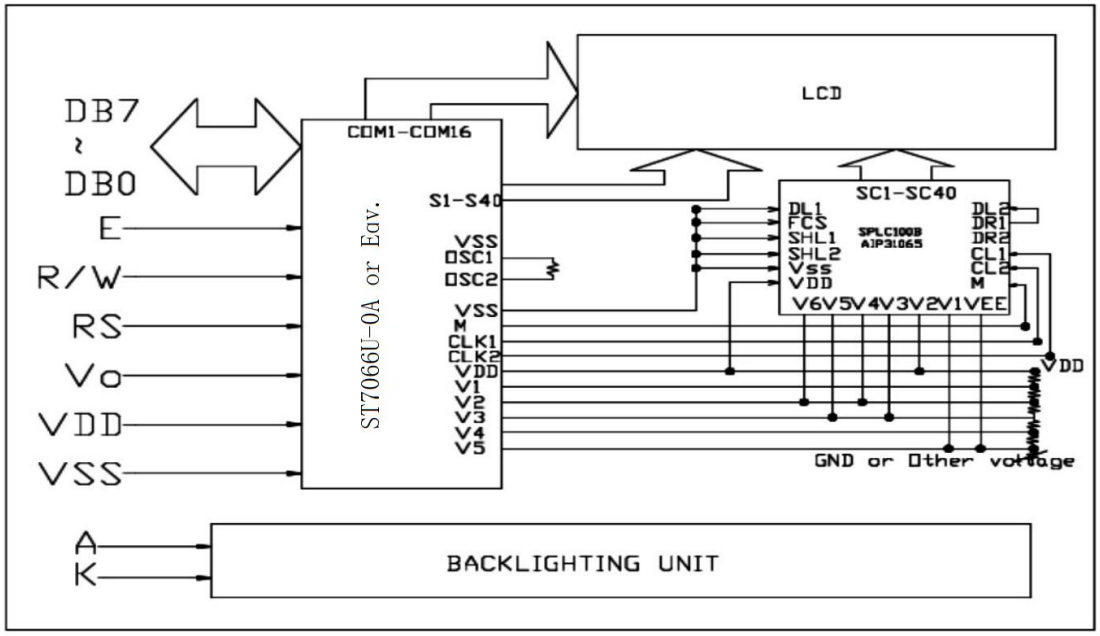
Model Name:	C162A-FTW-DS23		
General Tol:	±0.2		
Approvals		Date	
DWN:			
CHK:			
APP:			
Drawing No.:		Scale:	
Size:		Unit: mm	Page: 1/1

2. Input Terminal Pin Assignment

NO.	Symbol	Description
1	VSS	Ground, 0V.
2	VDD	Logic Power Supply.
3	V0	Operating voltage for LCD.
4	RS	Data / Instruction Register Select (H: Data Signal, L: Instruction Signal).
5	R/W	Read / Write (H: Read Mode, L: Write Mode).
6	E	Enable Signal.
7~14	DB0~DB7	Data Bus.
15	LED_A	Backlight Anode.
16	LED_K	Backlight Cathode.

3. Block Diagram



4. LCD Optical Characteristics

Item		Symbol	Condition	Min	Typ.	Max	Unit
Contrast Ratio		CR	25°C	--	12	--	
Rise Time		T_r		--	160	240	ms
Fall Time		T_f		--	100	150	ms
Viewing Angle	Hor.	Θ_L	25°C	--	70	--	degree
		Θ_R		--	40	--	
	Ver.	Θ_T		--	55	--	
		Θ_B		--	55	--	

5. Electrical Characteristics

5.1 Absolute Maximum Rating

Characteristics	Symbol	Min	Max	Unit
Supply Voltage for Logic	VDD-VSS	-0.3	5.5	V
Supply Voltage for LCD	VDD-V0	0	10.0	V
Operating Temperature	TOP	-30	+80	°C
Storage Temperature	TST	-35	+85	°C

NOTE: If the absolute maximum rating of the above parameters is exceeded, even momentarily, the quality of the product may be degraded. Absolute maximum ratings specify the values which the product may be physically damaged if exceeded. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Condition	Min	Typ.	Max	Unit
Supply Voltage for Logic	VDD-VSS		3.1	3.3	5.5	V
Supply Voltage for LCD	VDD-V0	VDD= 3.3V	--	3.2	--	V
Input Voltage	V-IH	H Level	2.2	--	VDD	V
	V-IL	L Level	0	--	0.6	V
Supply Current for Logic	Icc		--	1	1.2	mA
Supply Current for LCD	Io		0.15	0.22	0.27	mA

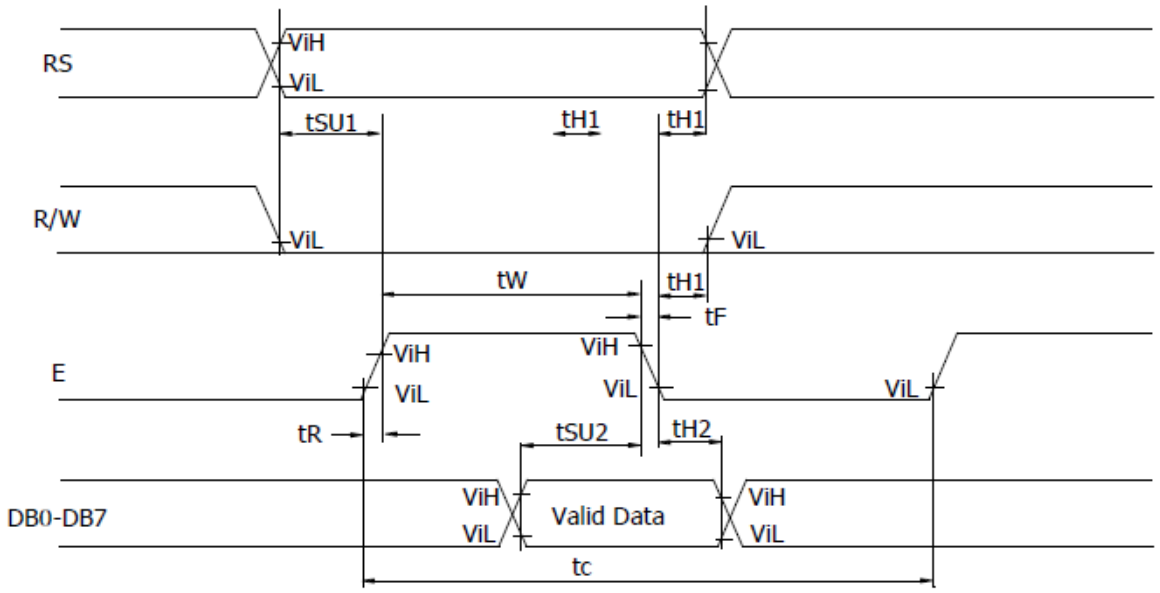
Condition:

1. VDD = 3.3V
2. 1/16 Duty, 1/5 Bias

5.3 AC Characteristics

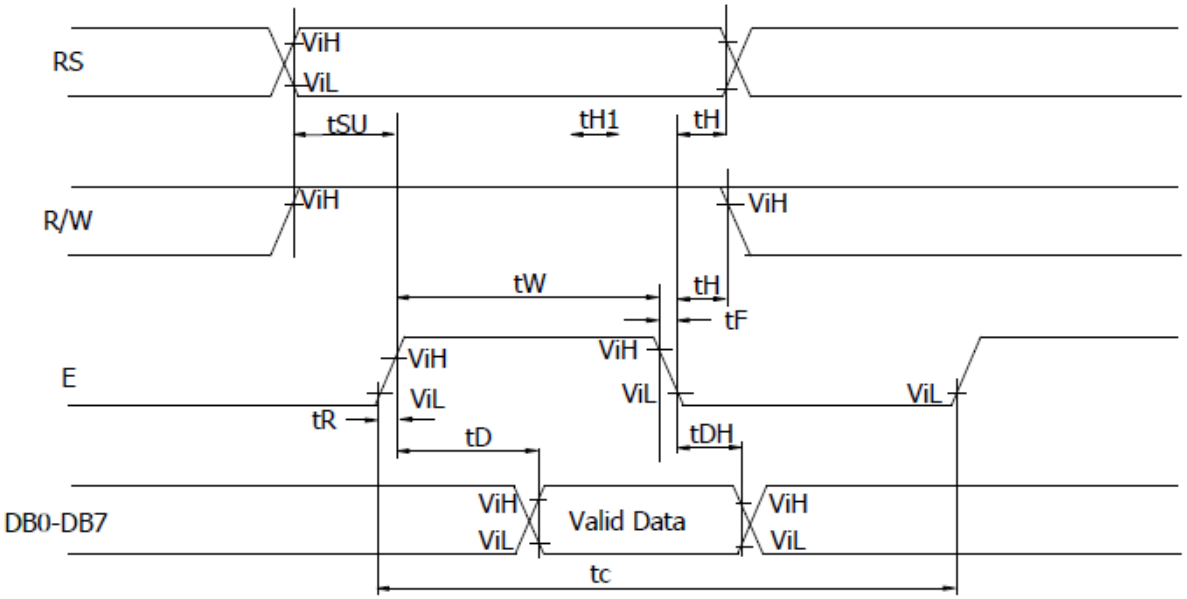
Timing Specification at Ta=25C, VDD=5V+/-10%, VSS=0
Write Mode

Characteristics	Symbol	Test Pin	Min	Typ.	Max	Unit
E Cycle Time	tc	E	500	--	--	ns
E Rise Time	tR	E	--	--	25	ns
E Fall Time	tF	E	--	--	25	ns
E-pulse Width (H, L)	tw	E	220	--	--	ns
R/W and RS Set-up Time	tsul	R/W,RS	40	--	--	ns
R/W and RS Hold Time	tH1	R/W,RS	10	--	--	ns
Data Set-up Time	tsu2	DB0-DB7	60	--	--	ns
Data Hold Time	tH2	DB0-DB7	10	--	--	ns



Read Mode

Characteristics	Symbol	Test Pin	Min	Typ.	Max	Unit
E Cycle Time	tc	E	500	--	--	ns
E Rise Time	tR	E	--	--	25	ns
E Fall Time	tF	E	--	--	25	ns
E-pulse Width (H, L)	tw	E	220	--	--	ns
R/W and RS Set-up Time	tsu	R/W,RS	40	--	--	ns
R/W and RS Hold Time	tH	R/W,RS	10	--	--	ns
Data Output Delay	tD	DB0-DB7	--	--	120	ns
Data Hold Time	tDH	DB0-DB7	20	--	--	ns



5.4 Backlight Characteristics

Unless specified, the ambient temperature Ta=25C

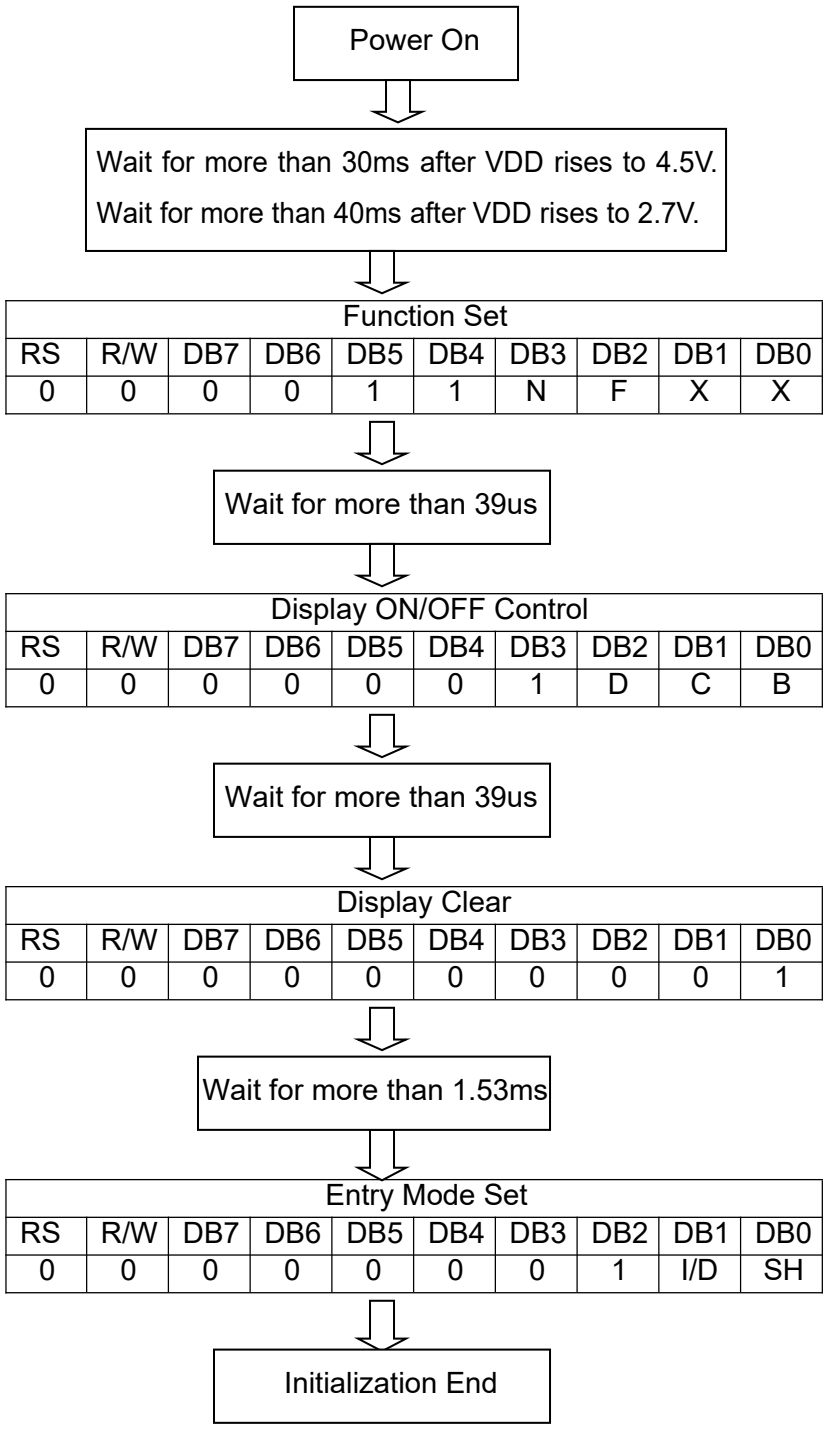
Characteristics	Symbol	Condition	Min	Typ.	Max	Unit
Supply Voltage	Vf		3.0	3.1	3.3	V
Forward Current	Imf	Vf=3.1V	--	15	--	mA
Reverse Voltage	Vr		--	--	2.0	V
Power Dissipation	Pd	Vf=3.1V	--	--	--	mW
Peak Wavelength	λp	Vf=3.1V	--	--	--	nm
Luminance	Lv	Vf=3.1V	90	220	--	Cd/mm
LED Lifetime	L	Vf=3.1V	--	50,000	--	hours

6. Instruction Table

Function	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Execu Time* (Max)
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears entire display and returns the cursor to home position (address 0)	1.64mS
Return Home	0	0	0	0	0	0	0	0	1	X	Return the cursor to the home position. DD RAM contents remain unchanged. Set DD RAM address to zero.	1.64mS
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	Set cursor moving direction and enable the shift of the display. These operations are performed during data write/read of DD RAM/CG RAM. 1/D=1: increment; 1/D=0: decrement; S=1: whole display shift when data is written.	40μS
Display ON/OFF control	0	0	0	0	0	0	1	D	C	B	Set display (D),cursor(C) and blinking of cursor(B) ON/ OFF. D=1:display ON; D=0: display OFF. C=1:Cursor ON; C=0:cursot OFF. B=1:Blink ON; B=0, Blink OFF.	40μS
Cursor or Display shift	0	0	0	0	0	1	S/C	R/L	X	X	Move the cursor and shift the display without changing DDRAM contents. S/C=1: Display Shift; S/C=0:Cursor move. R/L=1:shift to right; R/L=0:shift to left.	40μS
Function Set	0	0	0	0	1	DL	N	F	X	X	Set interface data length (DL), number of display lines (N) and character font (F).DL=1: 8 bits; DL=0: 4 bits. N=1: 2 lines; N=0: 1 lines. F=1: 5X11 dots; F=0: 5X7 dots.	40μS
Set CG RAM add	0	0	0	1	ACG						Set CG RAM address. CG RAM data is sent and received after this setting.	40μS
Set DD RAM Add	0	0	1	ADD							Set DD RAM address. DD RAM data is sent and received after this setting.	40μS
Read BF & Addr	0	1	BF	AC							Read BUSY FLAG (BF) and the contents of the address counter. BF=1: internal operation; BF=0: can accept instruction.	0μS
Write Data to RAM	1	0	WRITE DATA								Write data into DD RAM or CG RAM.	40μS**
Read Data from RAM	1	0	READ DATA								Read data from DD RAM or CG RAM.	40μS**

7. Initializing By Instruction

8-bit Interface Mode(Condition: fosc=270kHZ)



N	0	1-line mode
	1	2-line mode

F	0	Display OFF
	1	Display ON

D	0	Display OFF
	1	Display ON

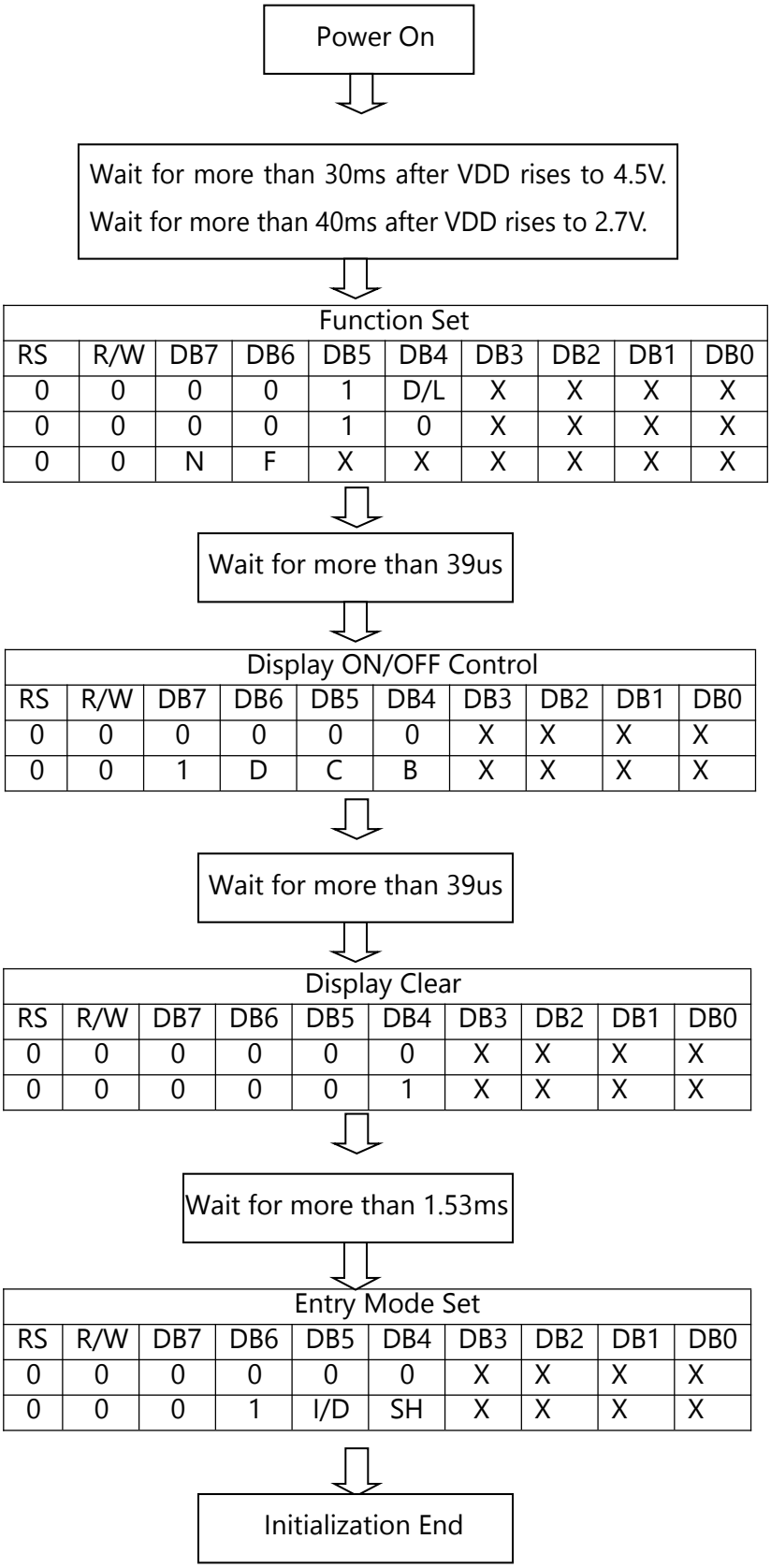
C	0	Cursor OFF
	1	Cursor ON

B	0	Blink OFF
	1	Blink ON

I/D	0	Decrement mode
	1	Increment mode

SH	0	Entire shift off
	1	Entire shift on

4-bit Interface Mode(Condition: fosc=270kHZ)



Function Set									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	D/L	X	X	X	X
0	0	0	0	1	0	X	X	X	X
0	0	N	F	X	X	X	X	X	X

Display ON/OFF Control									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	1	D	C	B	X	X	X	X

Display Clear									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	0	0	1	X	X	X	X

Entry Mode Set									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	1	I/D	SH	X	X	X	X

D/L	0	4-bit mode
	1	8-bit mode

N	0	1-line mode
	1	2-line mode

F	0	Display off
	1	Display on

D	0	Display off
	1	Display on

C	0	Cursor off
	1	Cursor on

B	0	Blink off
	1	Blink on

I/D	0	Decrement mode
	1	Increment mode

SH	0	Entire shift off
	1	Entire shift on

8. Standard Character Pattern

9. Cautions and Handling

General Precautions:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isoproply alcohol, ethyl alcohol or trichlorotriflorothan. Do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting.
5. When mounting the LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:

1. CMOS-LSI is used for the module circuit; therefore, operators should be grounded whenever he/she comes into contact with the module.
2. Do not 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.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.
5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature: 280°C+10°C
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

Operation Precautions:

1. The viewing angle can be adjusted by varying the LCD driving voltage Vo.
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage under 40C is required and the relative humidity should be kept below 60%.