JEWEL HILL ELECTRONIC CO.,LTD.

SPECIFICATIONS FOR LCD MODULE

Module No. GT2016

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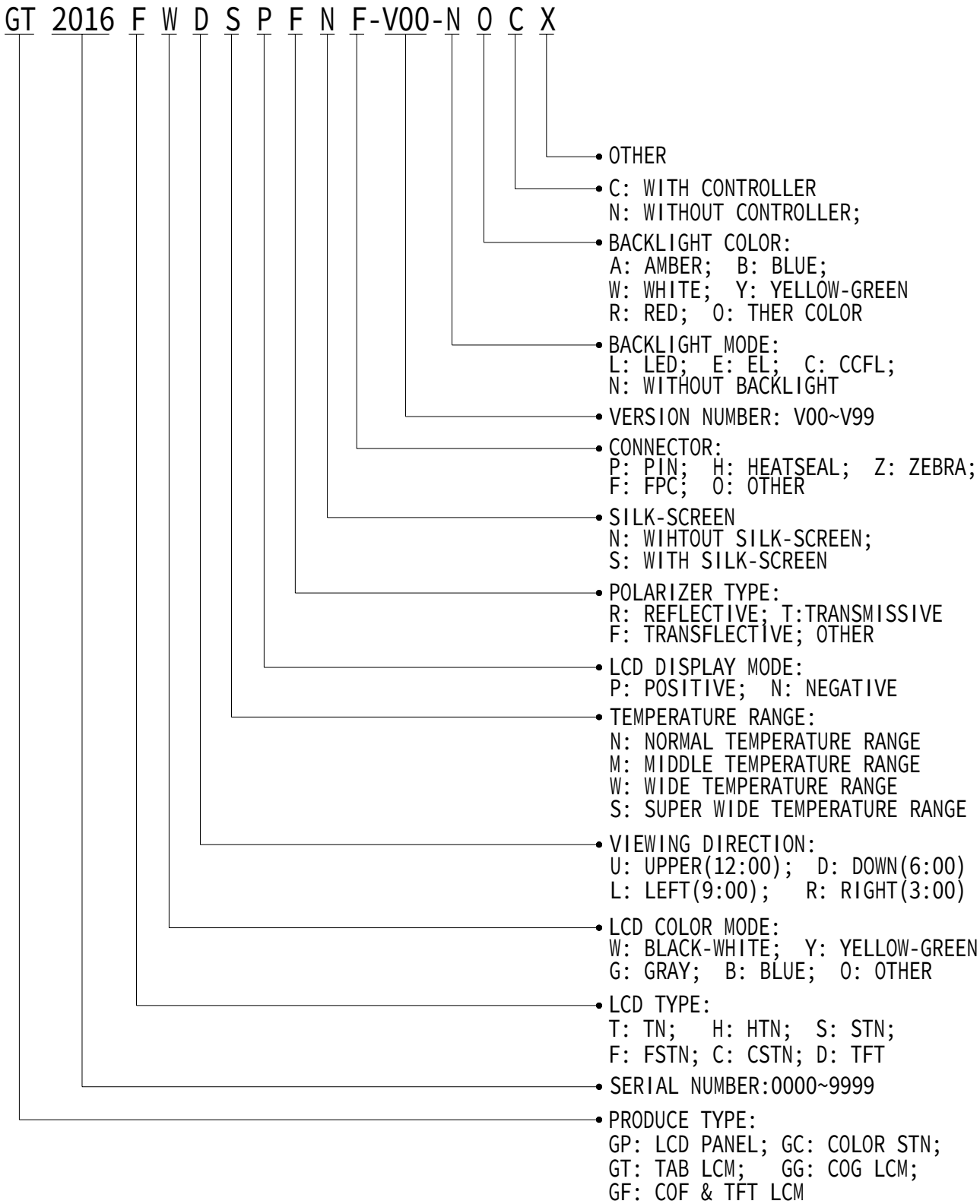
LCM Number System



1. GENERAL DESCRIPTION

The GT2016 is a 128 x 128 Dots Graphic LCD module. It has a FSTN panel composed of 128 segments and 128 commons. The LCM can be easily accessed by microcontroller via parallel or series interface.

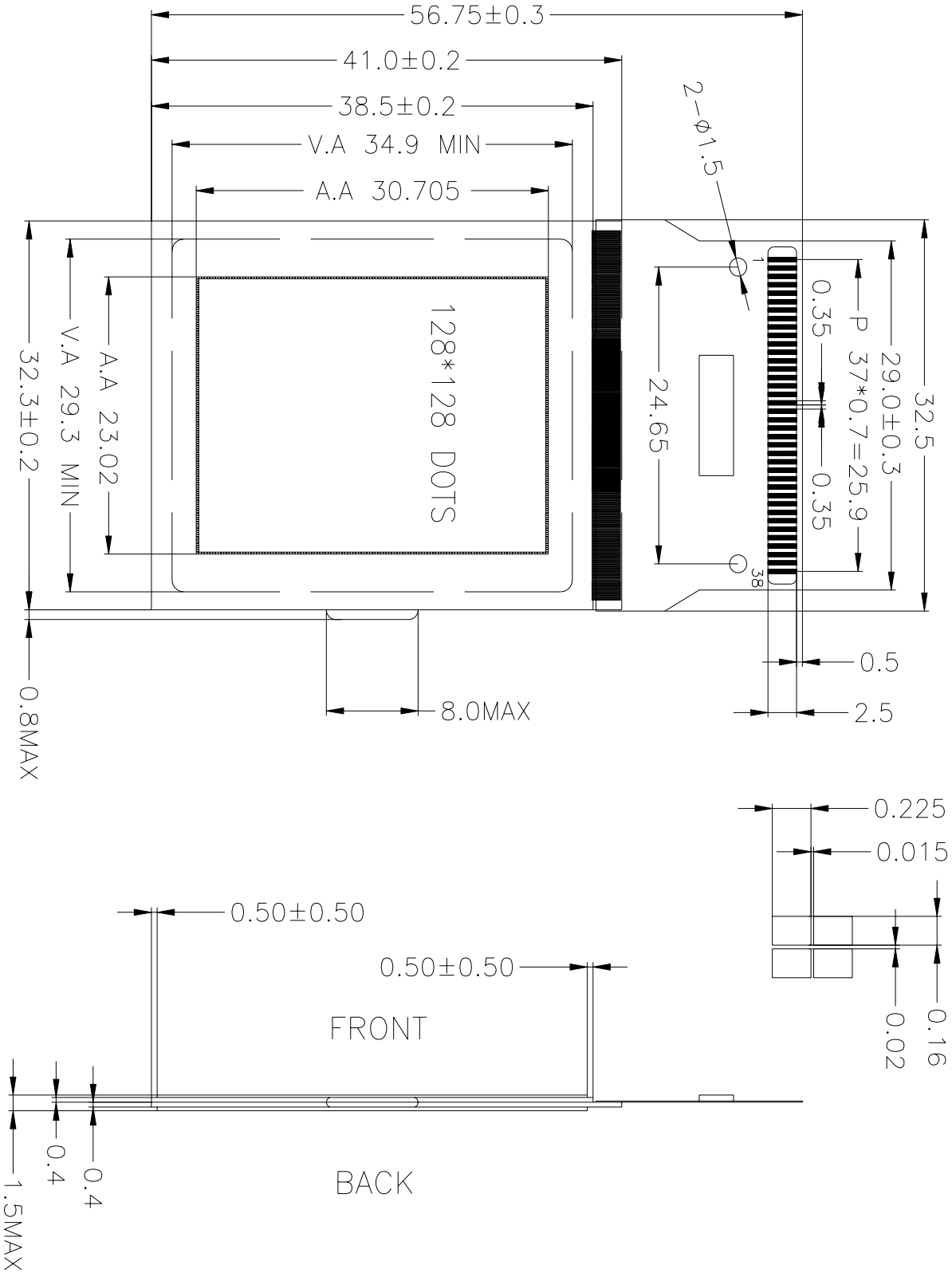
2. FEATURES

Display Mode	Transflective and positive
	FSTN module
Display Format	Graphic 128x128 dots
Input Data	8 bit parallel or series data input from MPU
Multiplexing Ratio	1/128 Duty
Bias	1/11 Bias
Viewing Direction	6 O'clock
Controller	TL0350F1
Backlight	NONE

3. MECHANICAL SPECIFICATION

Item	Specifications	Unit
Dimensional outline	32.3 x (41.0+15.75) x 1.5(max)	mm
Resolution	128segs x 128coms	dots
Active area	23.02(W) x 30.705(H)	mm
Dots pitch	0.18W)×0.24(H)	mm
Dots size	0.16(W)×0.225(H)	mm

4. MECHANICAL DIMENSION



5. MAXIMUM RATINGS

Item	Symbol	Min	Max	Unit	Note
Supply voltage	V_{DD} - Vss	-0.3	4.0	V	
	V_{LCD}	-0.3	18.0	V	
Input Voltage	V_{IN}	-0.3	V_{DD}+0.3	V	
Operating temperature	T_{OPR}	-20	+70	℃	
Storage temperature	T_{STR}	-30	+80	℃	
Humidity	---	---	90	%RH	

6. ELECTRICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	Logic	V_{DD}	---	---	3.0	---	V
Input Voltage	H level	V_{IH}	---	0.8V_{DD}	---	V_{DD}	V
	L level	V_{IL}		V_{SS}	---	0.2V_{DD}	
Current Consumption (LCD DRIVER)		I_{DD}	V_{DD}=3.0V; V_{LCD}=13.3V,T_{amb}=25℃;	---	---	1.2	mA
LCD Driving Voltage		V_{LCD}	Bias=1/11 VLCD=V0-Vss	---	13.3	---	V

7. MODULE FUNCTION DESCRIPTION

7.1. PIN DESCRIPTION

Pin No.	Symbol	Description
1	NC	No Connect
2	P/S	Interface Selection for Parallel or Serial
3	C86	Timing Selection for M6800 or I8080
4	CSB	Chip Selection Terminal
5	/RESET	Reset Signal Input Terminal
6	RS	Command/Data Register Selection Terminal
7	/WR	Write Signal Input or Read/Write Selection Terminal
8	/RD	Read Signal Input or Read/Write Enable Control Terminal
9	DB0	8-bit Bi-directional Data Bus Input/Output
10	DB1	
11	DB2	
12	DB3	
13	DB4	
14	DB5	
15	DB6	
16	DB7	
17	VDD	Power Supply for Positive
18	VCI	Reference Voltage for DC/DC Circuit
19	VSS	Power Supply for Ground
20	VOUT	LCD Driving Voltage Output
21	CAP5+	Capacitance for DC/DC Voltage Converter Circuit

22	CAP3+	Capacitance for DC/DC Voltage Converter Circuit
23	CAP1-	
24	CAP1+	
25	CAP2+	
26	CAP2-	
27	CAP4+	
28	REF	Internal Verf Selection Termianl
29	VEXT	External Vref Input Terminal
30	INTRS	
31	V4	LCD Bias Voltage
32	V3	
33	V2	
34	V1	
35	V0	
36	VR	External Voltage Regulation Terminal
37	OSC1	Internal Oscollation Selection
38	NC	No Connect

7.2 TIMING CHARACTERISTICS

1.SYSTEM BUS READ/WRITE CHARACTERISTIC

Read / Write characteristics (8080-series MPU)

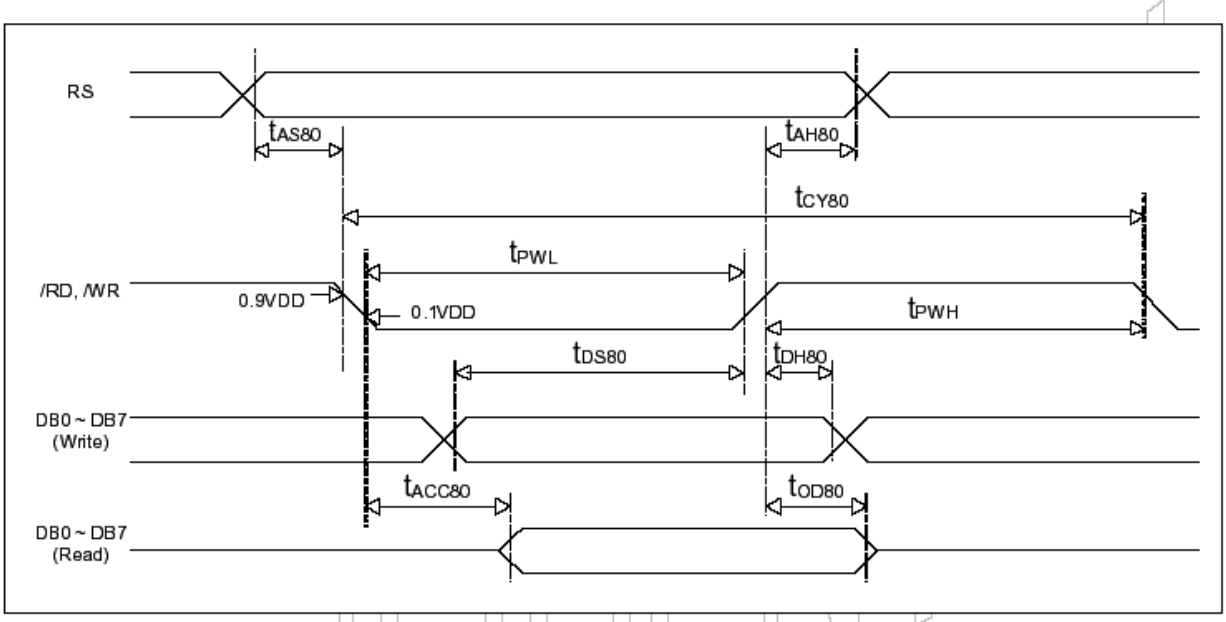


Figure 9-1. Read / Write characteristics (8080-series MPU)

(VDD = 2.4V to 3.6V, Ta = -40 to +85°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time Address hold time	RS RW	tAS80 tAH80		0 0	-	ns
System cycle time for write System cycle time for read		tCY80 tCY80		100 166	-	ns
Pulse width low Pulse width high	/WR /RD	tPWL tPWH		40 40	-	ns
Data setup time Data hold time	DB0 to DB7	tDS80 tDH80		30 5	-	ns
Read access time Output disable time		tACC80 tOD80	CL = 100 pF	15 10	- 50	ns

Note: *1. The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.
(tr + tf) < (tCY80 - tPWLW - tPWHW) for write, (tr + tf) < (tCY80 - tPWLR - tPWHR) for read

v

Read / Write characteristics (6800-series microprocessor)

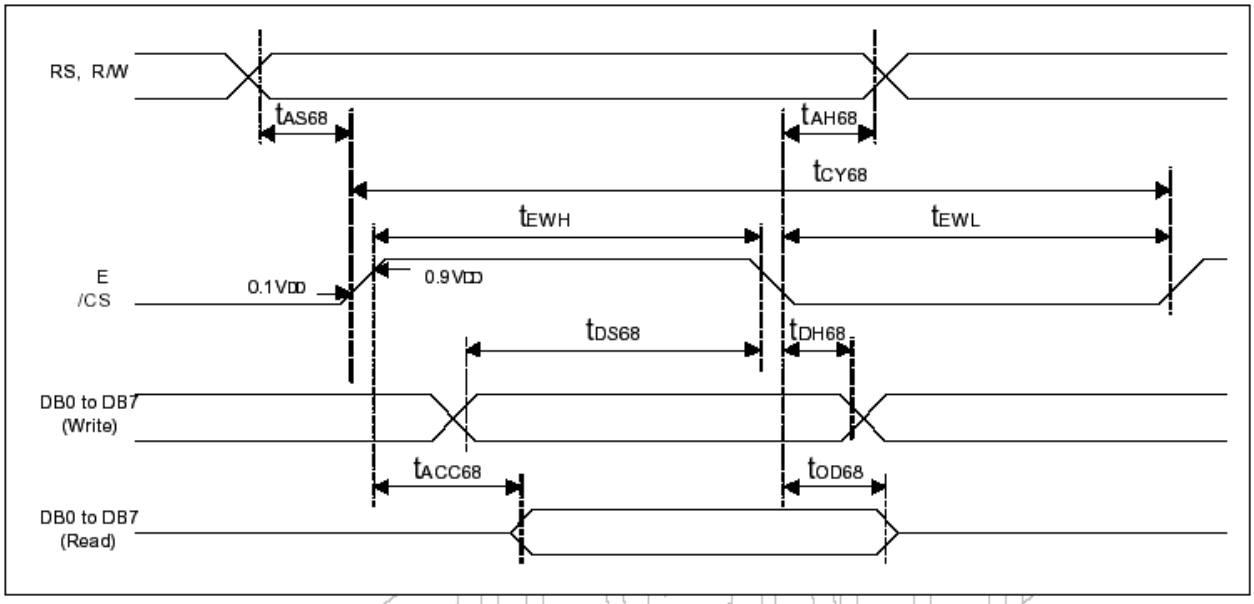


Figure 9-2. Read / Write characteristics (6800-series microprocessor)

(VDD = 2.4V to 3.6V, Ta = -40 to +85°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	RS	tAS68		0	-	ns
Address hold time	RW	tAH68		0		
System cycle time for write		tCY68		100	-	ns
System cycle time for read		tCY68		166		
Pulse width low	E_RD	tEWH		40	-	ns
Pulse width high	(E)	tEWL		40		
Data setup time	DB0 to DB7	tDS68		30	-	ns
Data hold time		tDH68		5		
Read access time		tACC68	C_L = 100 pF	15	-	ns
Output disable time		tOD68		10	50	

Note: *1. The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.
(tr + tf) < (t CY68 - tEWHW - tEWLW) for write, (tr + tf) < (t CY68 - tEWHR - tEWLR) for read

Serial interface characteristics

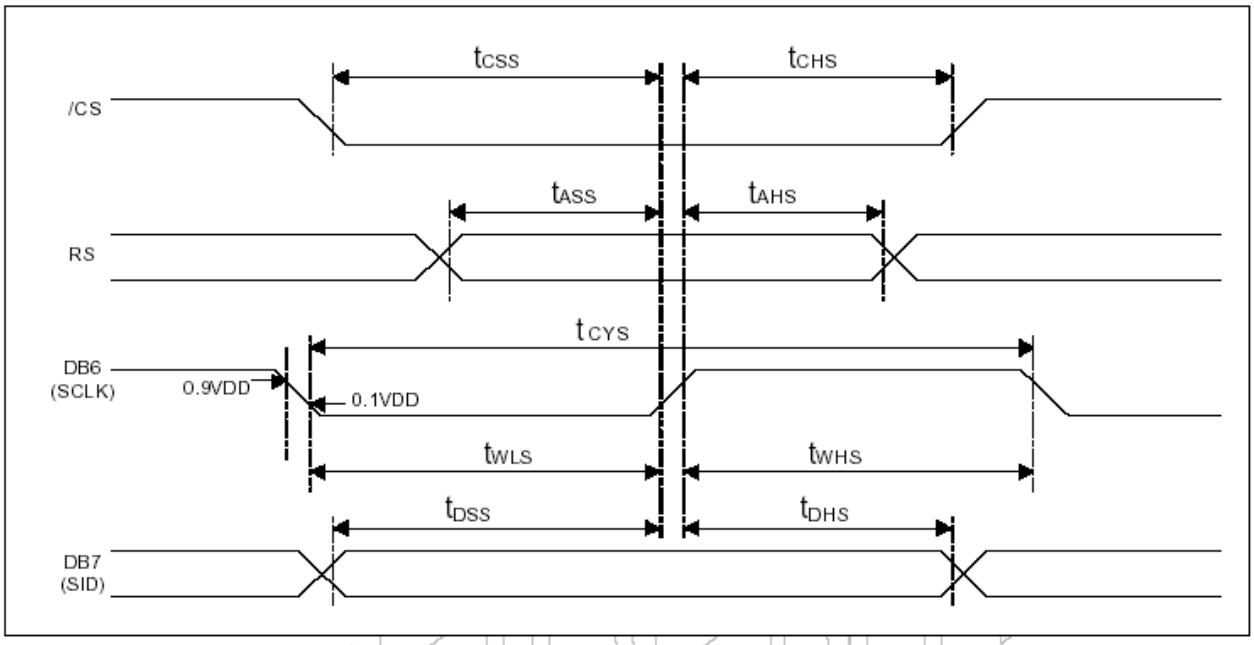


Figure 9-3. Serial interface characteristics

(VDD = 2.4V to 3.6V, Ta = -40 to +85°

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock cycle	DB6 (SCLK)	t_{CYS}		58.8	-	ns
SCLK high pulse width		t_{WHS}		30		
SCLK low pulse width		t_{WLS}		30		
Address setup time	RS	t_{ASS}		30	-	ns
Address hold time		t_{AHS}		30		
Data setup time	DB7 (SID)	t_{DSS}		30	-	ns
Data hold time		t_{DHS}		30		
/CS setup time	CSB	t_{CSS}		30	-	ns
/CS hold time		t_{CHS}		1/2 *t_{CYS}		

Note: *1. The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

Reset Input Timing

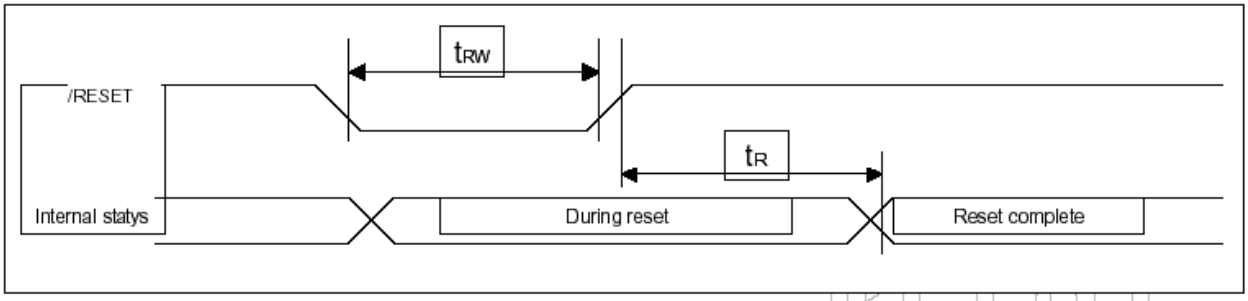


Figure 9-4. Reset input timing

(VDD = 2.4V to 3.6V, Ta = -40 to +85°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Reset low pulse width	/RESET	tRW		1000	-	Ns
Reset time	-	tR		-	1000	ns

7.3 APPLICATION OF LCM

Voltage converter circuits

These circuits boost up the electric potential between VCI and VSS to 3, 4, 5 or 6 times toward positive side and boosted voltage is outputted from VOUT pin.

It is possible to select the lower boosting level in any boosting circuit by "Set DC-DC Step-up" instruction. When the higher level is selected by instruction, VOUT voltage is not valid.

(C1 = 1.0 to 4.7μF)

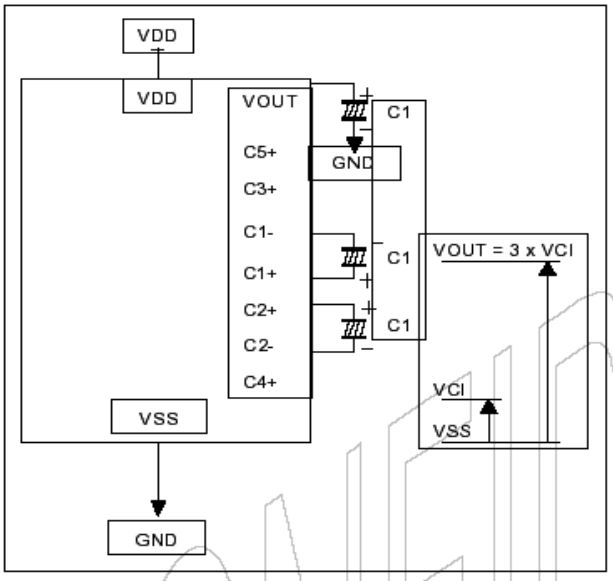


Figure 7-13. Three times boosting circuit

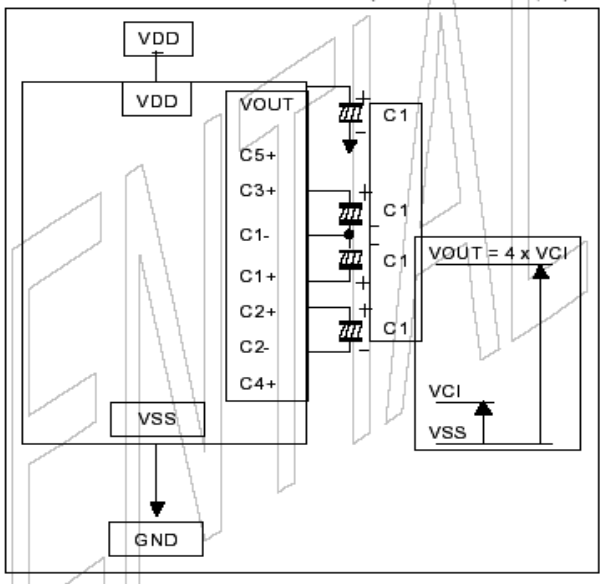


Figure 7-14. Four times boosting circuit

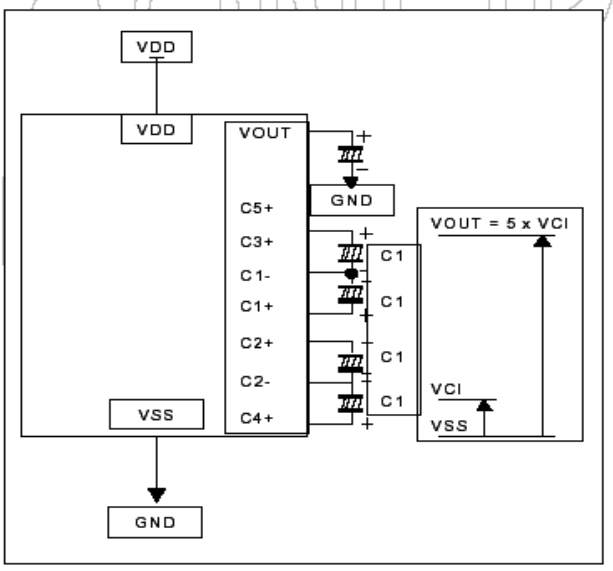


Figure 7-15. Five times boosting circuit

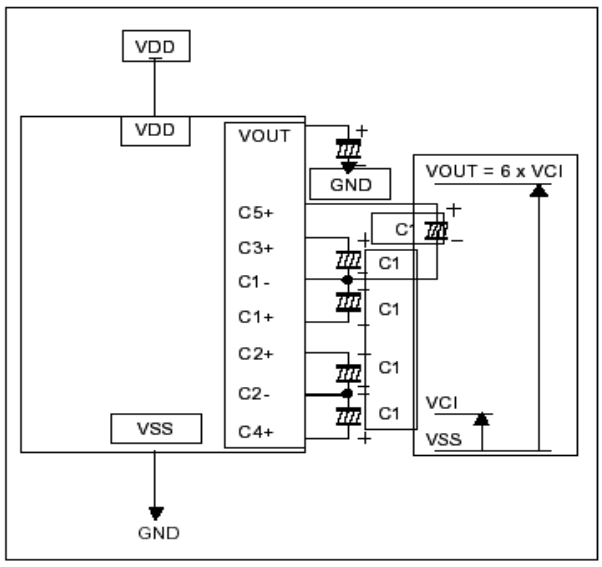


Figure 7-16. Six times boosting circuit

*. The voltage converter input voltage range must be set so that the VOUT voltage does not exceed the absolute maximum rated value

(C1 = 1.0 to 4.7 [μF], C2 = 0.47 to 2.0 [μF])

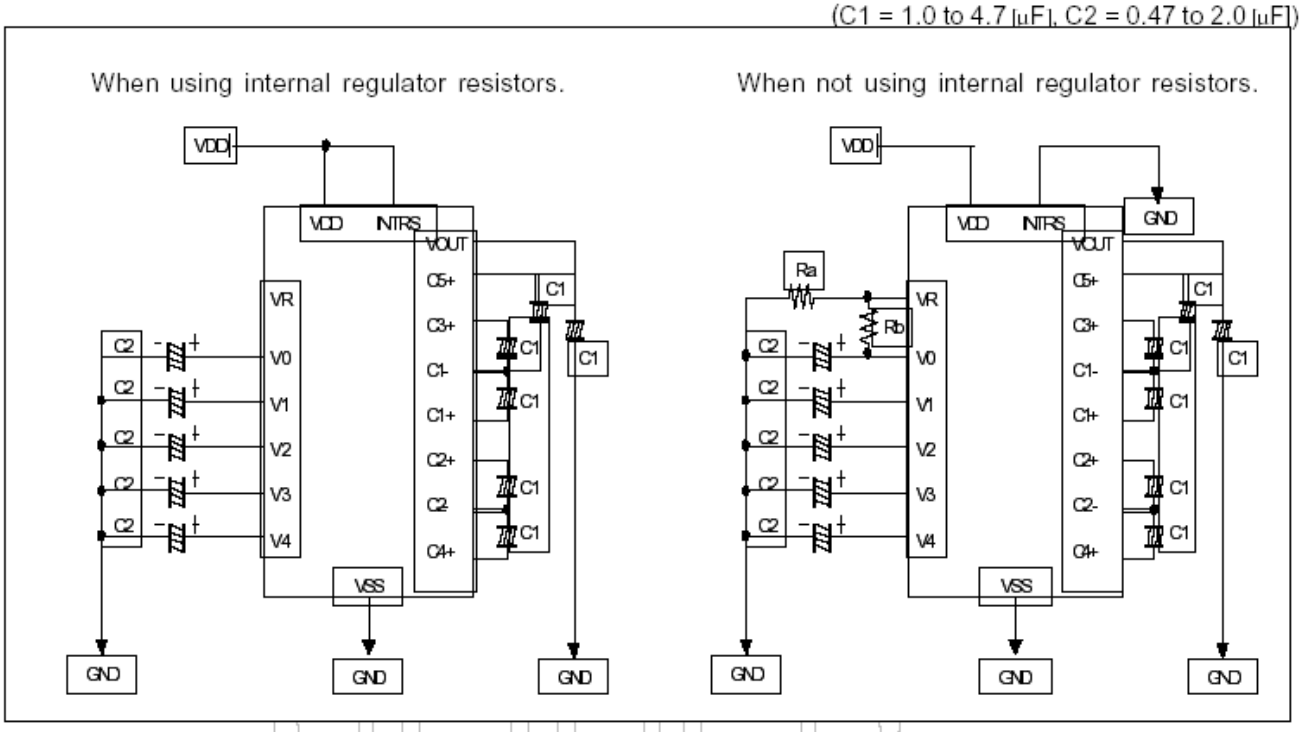


Figure 7-19. When using all LCD power circuits (6-Time V/C: ON, V/R: ON, V/F: ON)

(C2 = 0.47 to 2.0 [μF])

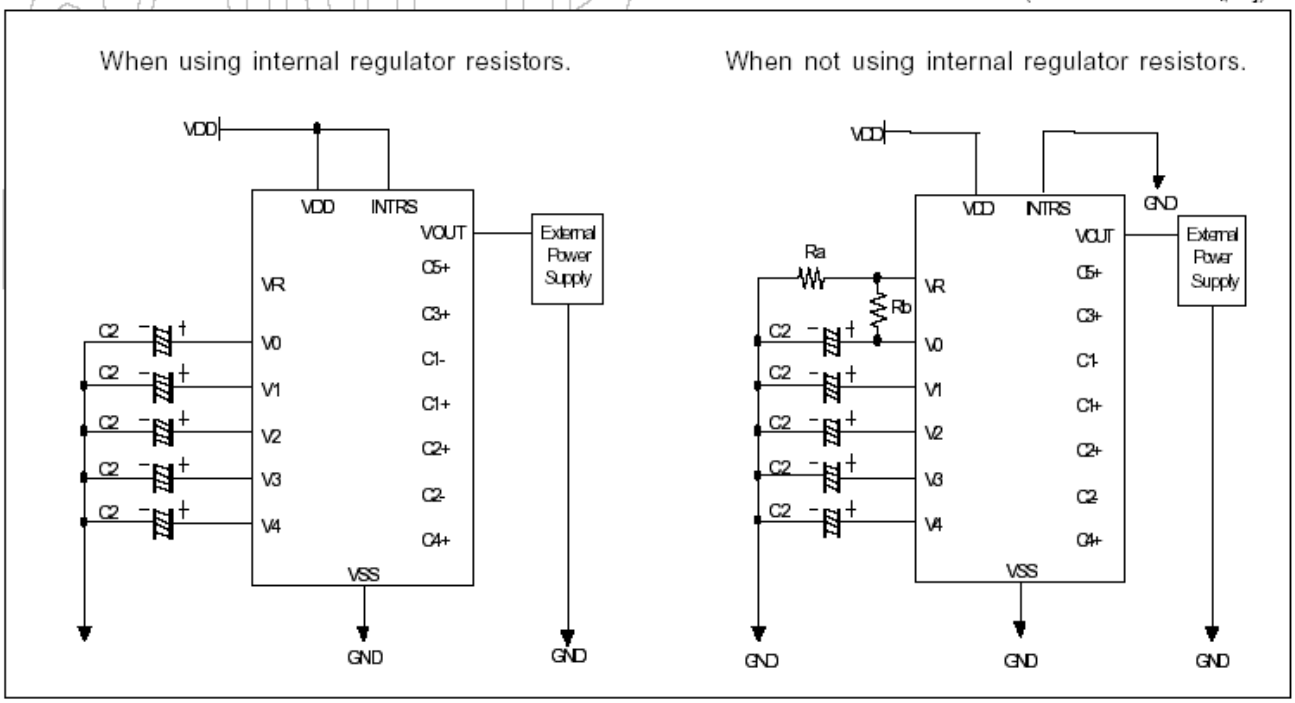


Figure 7-20. When using some LCD power circuits (V/C: OFF, V/R: ON, V/F: ON)

(C2 = 0.47 to 2.0 [μF])

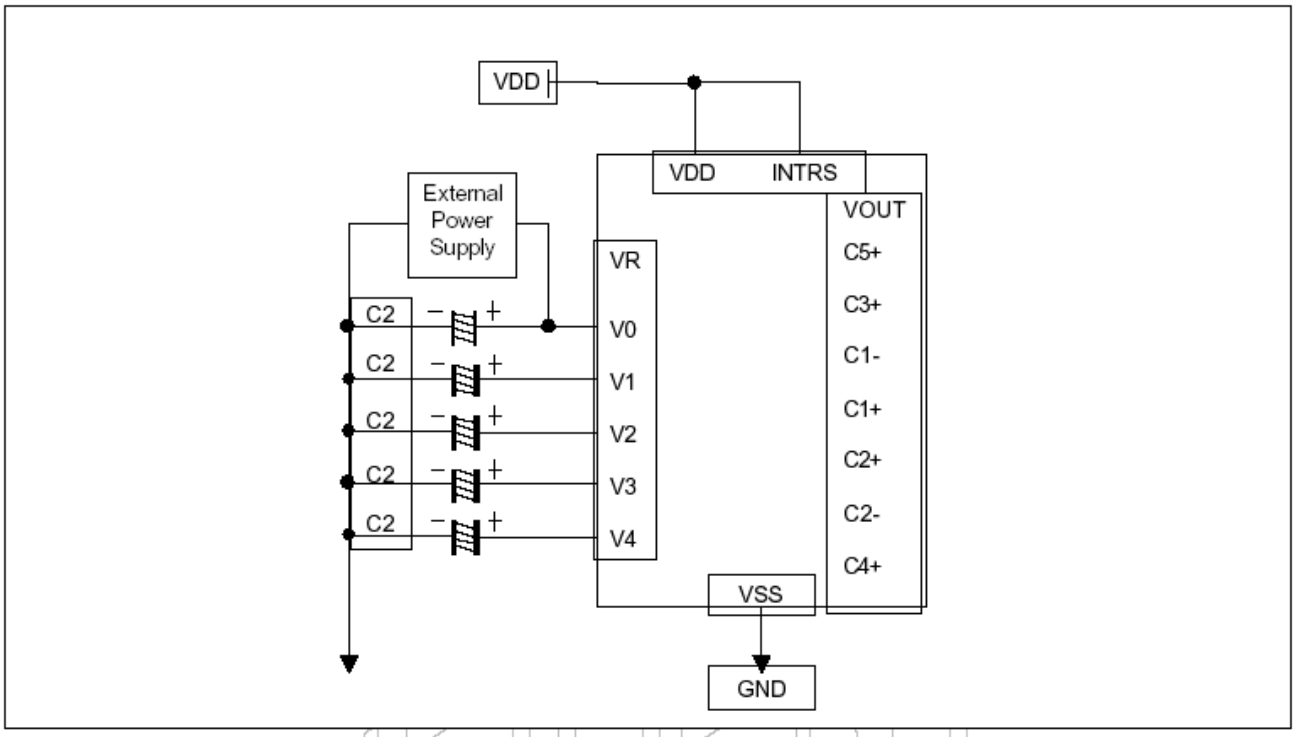


Figure 7-21. When using some LCD power circuits (V/C: OFF, V/R: OFF, V/F: ON)

(C2 = 0.47 to 2.0 [μF])

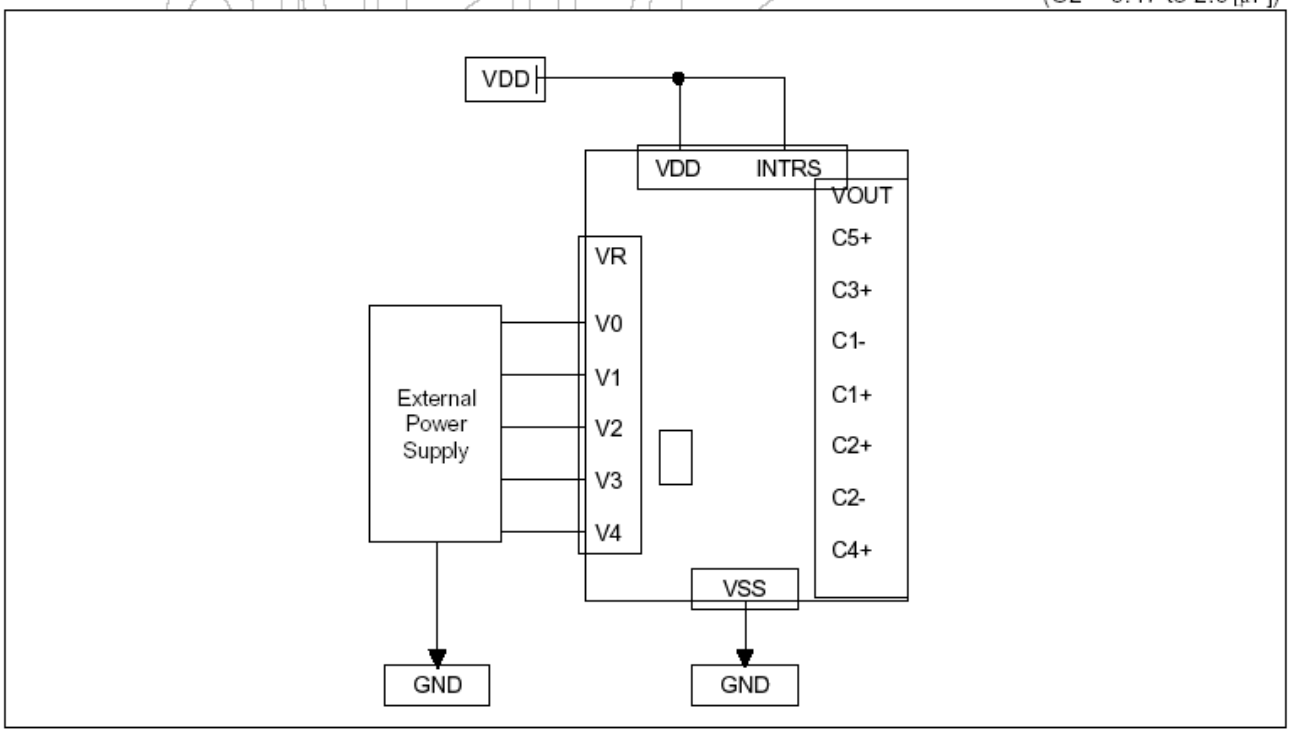


Figure 7-22. When not using any internal LCD power supply circuits (V/C: OFF, V/R: OFF, V/F: OFF)

7.4 TABLE OF COMMAND

Instruction table X : Don' t care

Instruction	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Read display data	1	1	Read data								Read data from DDRAM
Write display data	1	0	Write data								Write data into DDRAM
Read status	0	1	BUSY	DISP	RES	0	0	0	1	0	Read the internal status
ICON control register ON / OFF	0	0	1	0	1	0	0	0	1	ICON	ICON = 0: ICON disable (default) ICON =1: ICON enable & set the page address to 16
Set page address	0	0	1	0	1	1	P3	P2	P1	P0	Set page address
Set column address MSB / LSB	0	0	0	0	0	1	0	Y7	Y6	Y5	Set column address MSB
	0	0	0	0	0	0	Y4	Y3	Y2	Y1	Set column address LSB
Set modify-read	0	0	1	1	1	0	0	0	0	0	Set modify-read mode
Reset modify-read	0	0	1	1	1	0	1	1	1	0	Reset modify-read mode
Display ON/OFF	0	0	1	0	1	0	1	1	1	D	D=0: display OFF D=1: display ON
Set initial display line register	0	0	0	1	0	0	0	0	X	X	2-byte instruction to specify the initial display line to realize vertical scrolling
	0	0	X	S6	S5	S4	S3	S2	S1	S0	
Set initial COM0 register	0	0	0	1	0	0	0	1	X	X	2-byte instruction to specify the initial COM0 to realize window scrolling
	0	0	X	C6	C5	C4	C3	C2	C1	C0	
Set partial display duty ratio	0	0	0	1	0	0	1	0	X	X	2-byte instruction to set partial display duty ratio
	0	0	D7	D6	D5	D4	D3	D2	D1	D0	
Set N-line inversion	0	0	0	1	0	0	1	1	X	X	2-byte instruction to set N-line inversion register
	0	0	X	X	X	N4	N3	N2	N1	N0	
Release N-line inversion	0	0	1	1	1	0	0	1	0	0	Release N-line inversion mode
Reverse display ON/OFF	0	0	1	0	1	0	0	1	1	REV	REV=0: normal display, REV=1: reverse display
Entire display ON/OFF	0	0	1	0	1	0	0	1	0	EON	EON=0: normal display. EON=1: entire display ON
Power control	0	0	0	0	1	0	1	VC	VR	VF	Control power circuit operation
Select DC-DC step-up	0	0	0	1	1	0	0	1	DC1	DC0	Select the step-up of the internal voltage converter
Select regulator resistor	0	0	0	0	1	0	0	R2	R1	R0	Select internal resistance ratio of the regulator resistor
Set electronic volume register	0	0	1	0	0	0	0	0	0	1	2-byte instruction to specify the Reference voltage
	0	0	X	X	EV5	EV4	EV3	EV2	EV1	EV0	
Select LCD bias	0	0	0	1	0	1	0	B2	B1	B0	Select LCD bias
SHL select	0	0	1	1	0	0	SHL	X	X	X	COM bi-directional selection SHL = 0: normal direction SHL = 1: reverse direction

Instruction table (Continued)

Instruction	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
ADC select	0	0	1	0	1	0	0	0	0	ADC	SEG bi-directional selection ADC=0: normal direction ADC=1: reverse direction
Oscillator on start	0	0	1	0	1	0	1	0	1	1	Start the built-in oscillator
Set power save mode	0	0	1	0	1	0	1	0	0	PS	PS=0: normal mode PS=1: sleep mode
Release power save mode	0	0	1	1	1	0	0	0	0	1	Release power save mode
Reset	0	0	1	1	1	0	0	0	1	0	Initialize the internal functions
Set FRC and PWM mode	0	0	1	0	0	1	0	FRC	PWM 1	PWM 0	Set FRC and PWM mode
Set white mode and 1st /2nd frame, set pulse width	0	0	1	0	0	0	1	0	0	0	Set white mode and 1st /2rd frame
	0	0	WB3	WB2	WB1	WB0	WA3	WA2	WA1	WA0	
Set white mode and 3rd /4th frame, set pulse width	0	0	1	0	0	0	1	0	0	1	Set white mode and 3rd /4th frame
	0	0	WD3	WD2	WD1	WD0	WC	WC2	WC1	WC0	
Set light gray mode and 1st /2nd frame, set pulse width	0	0	1	0	0	0	1	0	1	0	Set light gray mode and 1st /2rd frame
	0	0	LB3	LB2	LB1	LB0	LA3	LA2	LA1	LA0	
Set light gray mode and 3rd /4th frame, set pulse width	0	0	1	0	0	0	1	0	1	1	Set light gray mode and 3rd /4th frame
	0	0	LD3	LD2	LD1	LD0	LC3	LC2	LC1	LC0	
Set dark gray mode and 1st /2nd frame, set pulse width	0	0	1	0	0	0	1	1	0	0	Set dark gray mode and 1st /2rd frame
	0	0	DB3	DB2	DB1	DB0	DA3	DA2	DA1	DA0	
Set dark gray mode and 3rd /4th frame, set pulse width	0	0	1	0	0	0	1	1	0	1	Set dark gray mode and 3rd /4th frame
	0	0	DD3	DD2	DD1	DD0	DC3	DC2	DC1	DC0	
Set black mode and 1st /2nd frame, set pulse width	0	0	1	0	0	0	1	1	1	0	Set black mode and 1st /2rd frame
	0	0	BB3	BB2	BB1	BB0	BA3	BA2	BA1	BA0	
Set black mode and 3rd /4th frame, set pulse width	0	0	1	0	0	0	1	1	1	1	Set black mode and 3rd /4th frame
	0	0	BD3	BD2	BD1	BD0	BC3	BC2	BC1	BC0	
NOP	0	0	1	1	1	0	0	0	1	1	No operation
Test instruction	0	0	1	1	1	1	X	X	X	X	Don' t use this instruction.

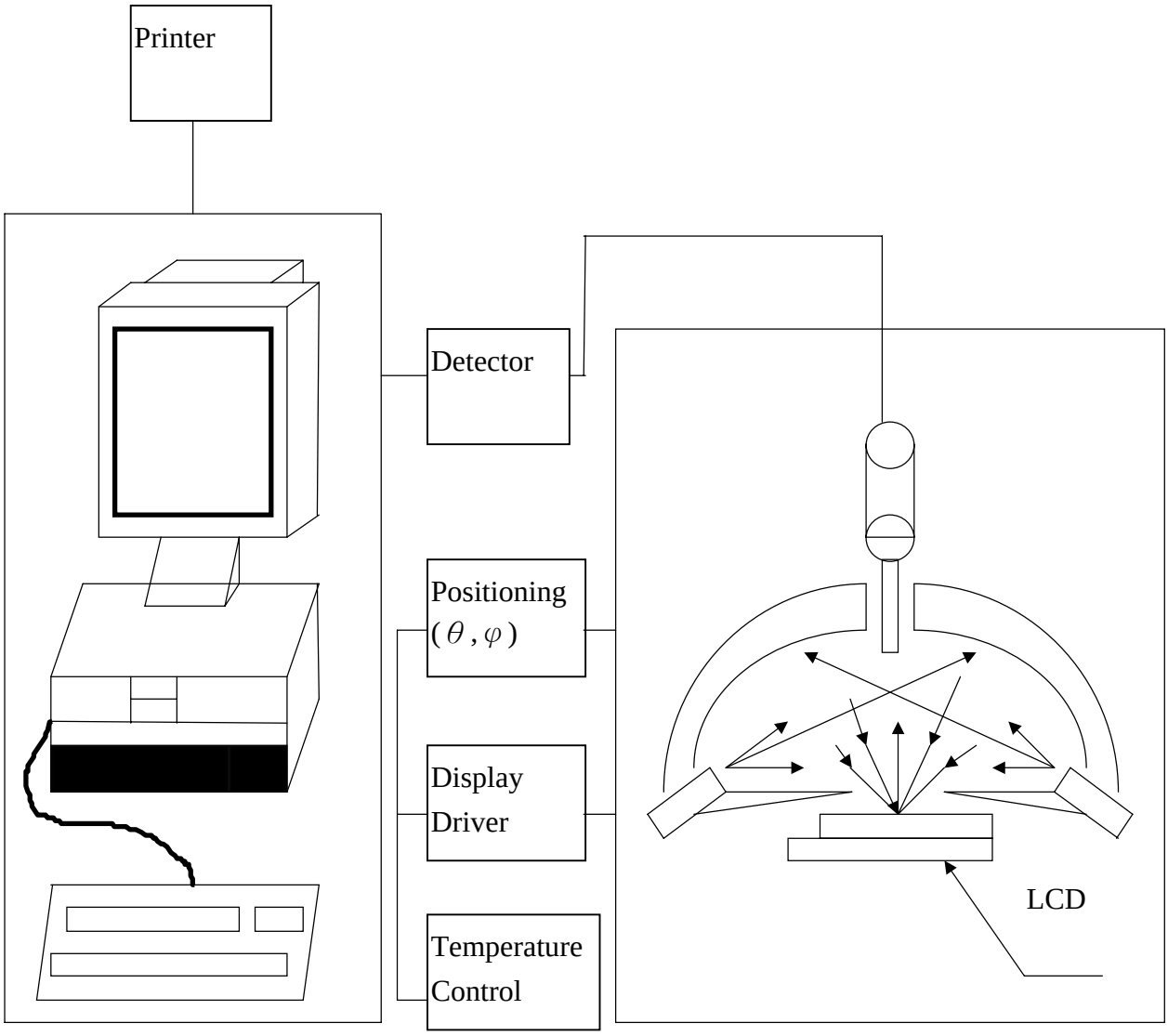
8. ELECTRO-OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Temp	Min	Typ.	Max	Units	Note
LCD driving voltage	V_{LCD}	$\theta = \phi = 0$	0℃	---	13.5	---	V	NOTE1
			25℃	12.9	13.3	13.7		
			50℃	---	13.0	---		
Response Time	Rise Time (Tr)	$\theta = \phi = 0$	0℃	---	---	--	msec	NOTE2
	Decay Time (Tf)			---	----	---		
	Rise Time (Tr)		25℃	---	225	340		
	Decay Time (Tf)			---	240	360		
	Rise Time (Tr)		50℃	---	---	--		
	Decay Time (Tf)			---	---	--		
Contrast Ratio	Cr	$\theta = \phi = 0$	25℃	5	10	---	---	NOTE4

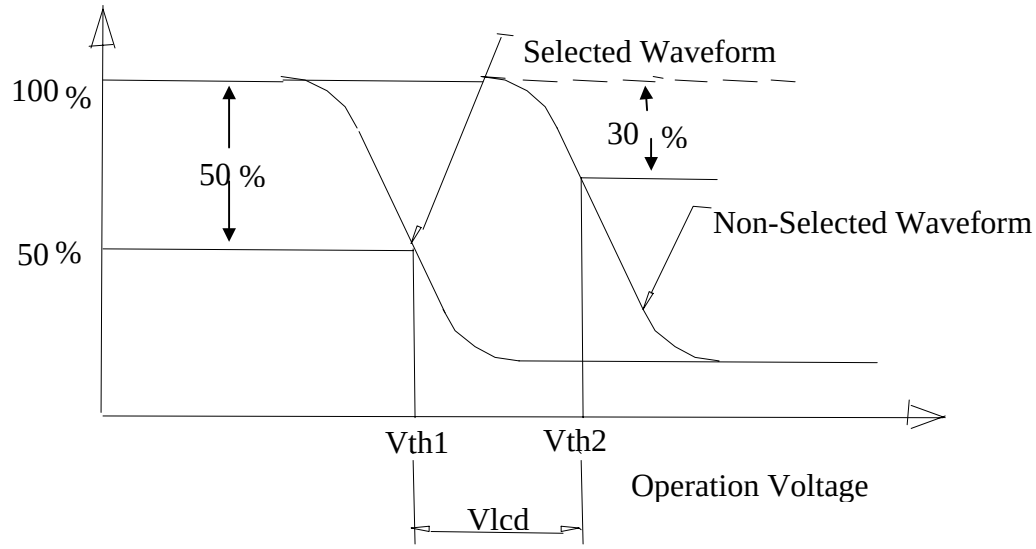
Viewing Angle Range	θ (ϕ = 0°) (6”)	ϕ = 90° (3”)	ϕ =180° (12”)	ϕ =270° (9”)	備註
θ (25℃) CR≥2	45	35	25	30	Deg NOTE3

● For panel only

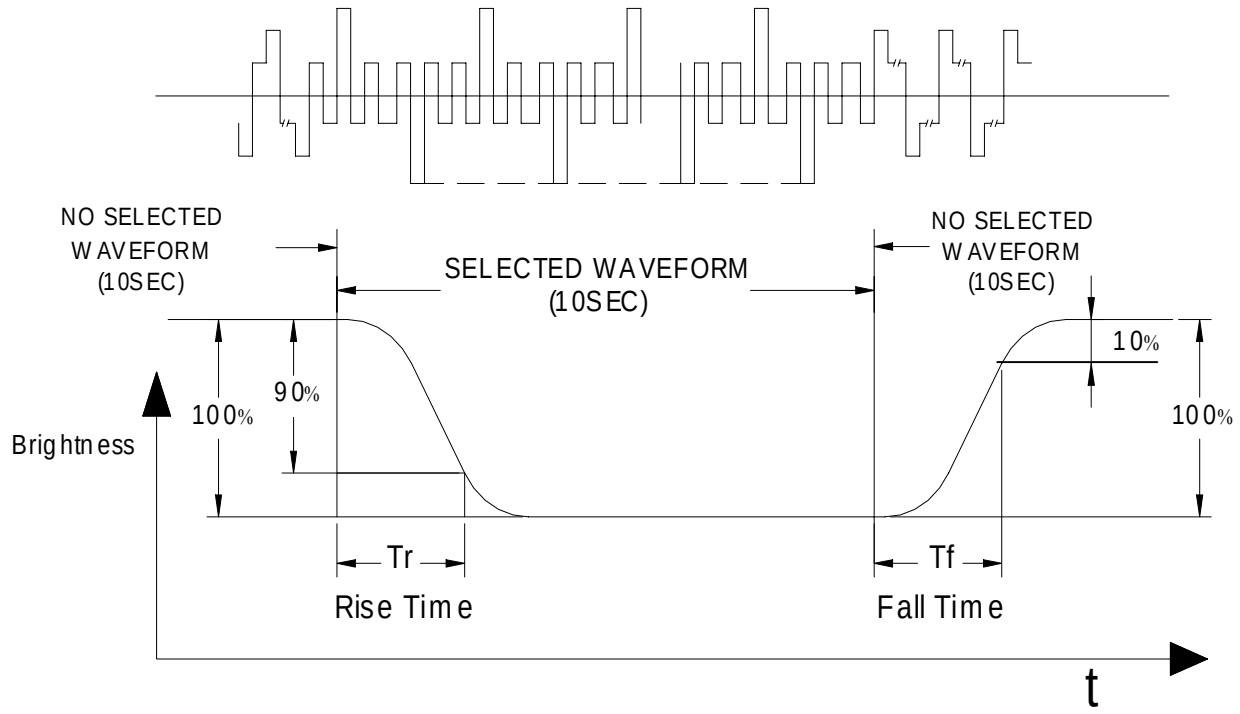
- **Electro-Optical Characteristics Measuring Equipment(DMS501)**



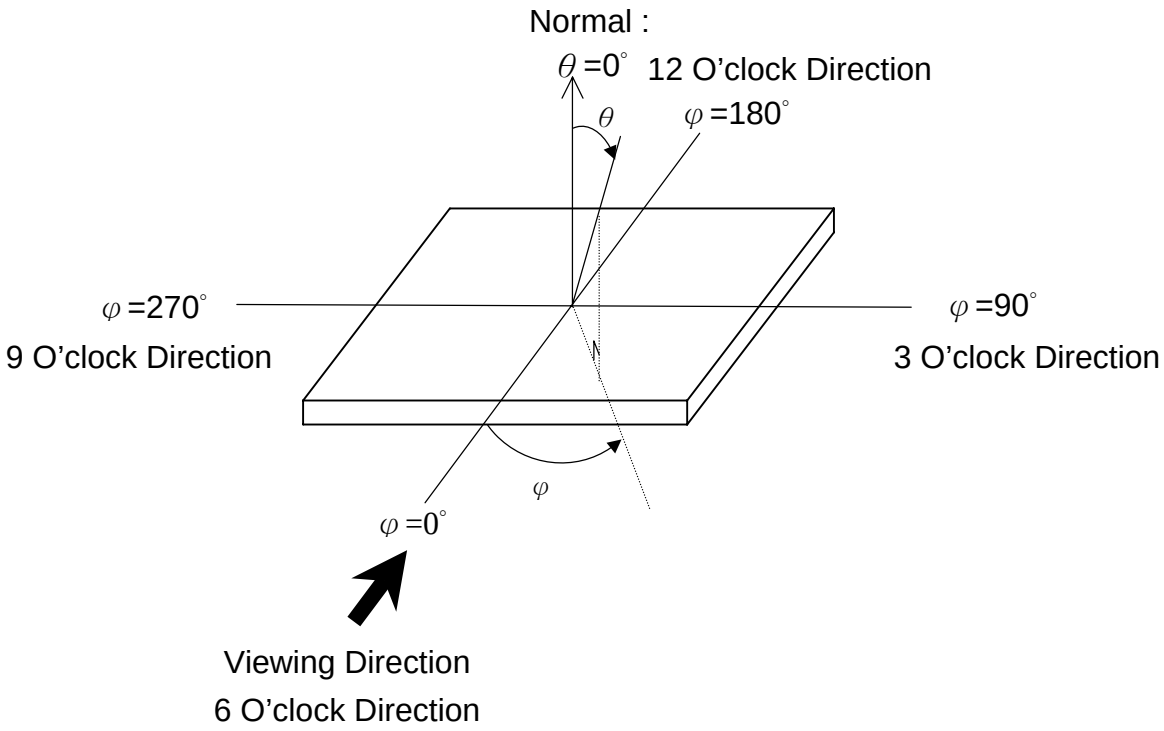
- **Note 1. Definition of Driving Voltage(Vlcd) :**



- **Note 2. Definition of Optical Response Time :**

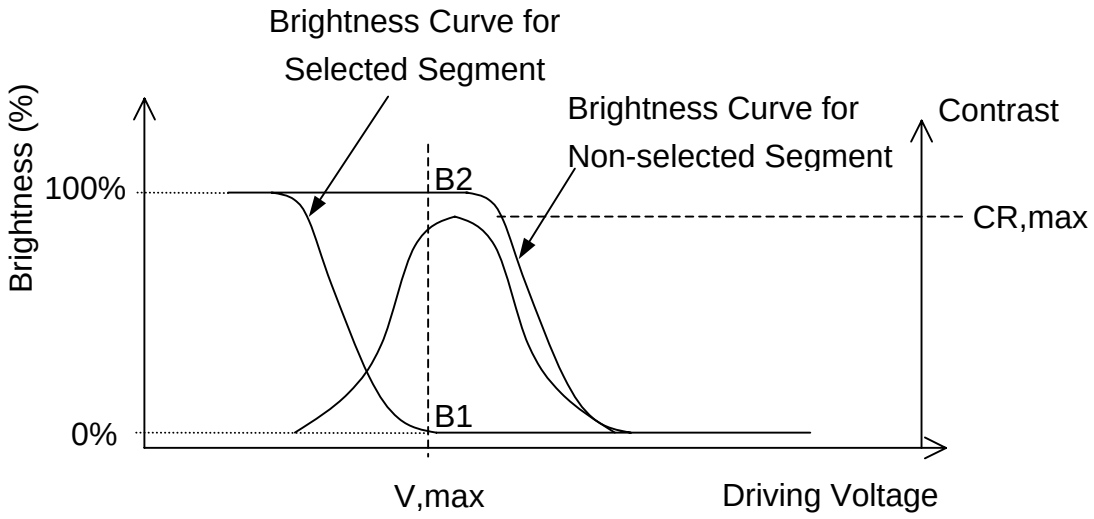


• Note 3. Definition of Viewing Angle θ and ϕ :



• Note 4. Definition of Contrast ratio(CR) :

$$CR = \frac{\text{Brightness of Non-selected Segment (B2)}}{\text{Brightness of Selected Segment (B1)}}$$



9. RELIABILITY

9.1. MTBF

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal. (25°C in the room without sunlight)

9.2. TESTS

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Operating	70℃ 120Hrs	◦ No Defect Of Operational Function In Room Temperature Are Allowable. ◦ IDD of LCM in Pre-and post-test should follow specification
2	Low Temperature Operating	-20℃ 120Hrs	
3	High Temperature/ Humidity Non-Operating	70℃ ,90%RH ,120 Hrs	
4	High Temperature Non-Operating	80℃ 120Hrs	
5	Low Temperature Non-Operating	-30℃ 120Hrs	
6	Temperature Cycling Non-Operating	-20℃(30Min)↔ 70℃(30Min) 10 CYCLES	

Notes: Judgments should be mode after exposure in room temperature for two hours.

10. PRECAUTIONS FOR USING LCD MODULES

10.1. HANDLING PRECAUTIONS

(1) The display panel is made of glass. Do not subject it to a mechanical shock or impact by dropping it.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten a cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

(6) Solvents other than those above mentioned may damage the polarizer.
Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

(7) Extra care to minimize corrosion of the electrode. Water droplets, moisture condensation or a current flow in a high-humidity environment accelerates corrosion of the electrode.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD Module, make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD Module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Be sure to ground the body when handling he LCD Module.
- Tools required for assembling, such as soldering irons, must be properly grounded.
-To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.

-The LCD Module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

10.2. STORAGE CONDITIONS

When storing, avoid the LCD module to be exposed to direct sunlight of fluorescent lamps. For stability, to keep it away form high temperature and high humidity environment (The best condition is : 23±5°C, 45±20%RH). ESD protection is necessary for long-term storage also.

10.3. OTHERS

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD Module have been operating for a long time showing the same display patterns the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be recovered by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD Module resulting from destruction caused by static electricity etc. exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.

11. Using LCD modules

12.1 LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

(1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

(2) Do not touch, push or rub the exposed polarizers with anything harder than a HB pencil lead (glass, tweezers, etc).

(3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances, which will be damaged by chemicals such as acetone, toluene, toluene, ethanol and isopropyl alcohol.

(4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum ether. Do not scrub hard to avoid damaging the display surface.

(5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

(6) Avoid contacting oil and fats.

(7) Condensation on the surface and contact with terminals due to cold will damage, stain or polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(8) Do not put or attach anything on the display area to avoid leaving marks on.

(9) Do not touch the display with bare hands. This will stain the display area and degrade insulation between terminals (some cosmetics are determinate to the polarizers).

(10)As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

12.2 INSTALLING LCD MODULE

Attend to the following items when installing the LCM.

(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.

(2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.

12.3 ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid for electrostatic discharge as for an ordinary CMOS IC.

(1) Make certain that you are grounded when handing LCM.
(2) Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
(3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
(4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
(5) As far as possible, make the electric potential of your work clothes and that of the workbenches to the ground potential.
(6) To reduce the generation of electro-static discharge, be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

12.4 PRECAUTIONS FOR OPERATION

(1) Viewing angle varies with the change of liquid crystal driving voltage (Vo). Adjust Vo to show the best contrast.
(2) Driving the LCD in the voltage above the limit will shorten its lifetime.
(3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
(4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then on.
(5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, this product must be used and stored within the specified condition of 23±5°C, 45±20%RH.
(6) When turning the power on, input each signal after the positive/negative voltage becomes stable.

12.5 SAFETY

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

13. REVISION HISTORY

Version	Revise record	Date
1.0	Original version	05-11-21

SAMPLE APPROVED REPORT
(样品确认单)

SAMPLE MODEL NO. (样品型号)	GT2016
SAMPLE SERIES NUMBER NO. (样品序号)	
SAMPLE QUANTITY (样品数量)	
COLOR/TYPE (底色/类型)	FSTN/POSITIVE
VIEWING DIRECTION (视角)	6:00
DRIVING METHOD (驱动参数)	1/128Duty, 1/11Bias
LOGIC VOLTAGE (IC 工作电压)	3.0V
LCD VOP (LCD 驱动电压)	13.3V
OPERATING TEMP. (操作温度) ℃	-20~70
STORAGE TEMP. (储存温度) ℃	-30~80
POLARIZER----FRONT (首偏光片)	TRANSMISSIVE
POLARIZER----BACK (后偏光片)	TRANSFLECTIVE
CONTROLLER/DRIVER IC(控制/驱动 IC)	TL0350F1
BACKLIGHT COLOR/TYPE (背光源类型/颜色)	NONE
DRAWING REV/NO./QUANTITY (图纸版本/数量)	
SPECIFICATION (规格书　份数)	

REMARKS：
(备注)
WRIT BY：_____ DATE：_____ APROV BY：_____ DATE：_____

CUSTOMER'S APPROVAL (客户确认)：

1） FUNCTION （功能）： ☐ OK ☐ N.G.
2） DRIVER CONDITION （驱动条件）： ☐ OK ☐ N.G.
3） DISPLAY MODE （显示模式）： ☐ OK ☐ N.G.
4） VIEWING ANGLE （视角）： ☐ OK ☐ N.G.
5） BACKLIGHT （背光源）： ☐ OK ☐ N.G.
6） DISPLAYING PATTERN （显示效果）： ☐ OK ☐ N.G.

CUSTOMER'S CONCLUSIONS (客户意见)：_____

_____

_____

CUSTOMER'S SIGNATURE（客户签名）：_____ DATE (日期)：_____