

Contents

Section/Sub Section	Page
-Cover	1
-Contents	2
-Revision History	3
1. TECHNOLOGY SPECIFICATIONS	4
1.1 DISPLAY SPECIFICATIONS	4
1.2 MECHANICAL SPECIFICATION	4
1.3 BLOCK DIAGRAM	4
1.4 INTERFACE FUNCTIONS	5
2. DIMENSIONAL OUTLINE	6
3. ABSOLUTE MAXIMUM RATINGS	7
4. ELECTRICAL & OPTICAL CHARACTERISTICS	7
4.1 ELECTRICAL CHARACTERISTICS (Ta=25 °C)	7
4.2 OPTICAL CHARACTERISTICS (Ta=25 °C)	7-8
5. BACKLIGHT CHARACTERISTICS	8
6. TIMING CHARACTERISTICS	9
6.1 SERIAL Interface Timing	9
6.2 RESET Timing	10
7. INSTRUCTION FUNCTION TABLE	11-13
8. QUALITY SPECIFICATION	14
8.1 ACCEPTABLE QUALITY LEVEL	14
8.2 INSPECTION CONDITIONS	14
8.3 INSPECTION STANDARDS	14
9. RELIABILITY	15
10. HANDLING PRECAUTION	15
10.1 MOUNTING METHOD	15
10.2 CAUTION OF LCD HANDLING & CLEANING	15
10.3 CAUTION AGAINST STATIC CHARGE	15
10.4 PACKAGING	15
10.5 CAUTION FOR OPERATION	16
10.6 STORAGE	16
10.7 SAFETY	16
11. PRECAUTION FOR USE	16

1. TECHNOLOGY SPECIFICATIONS

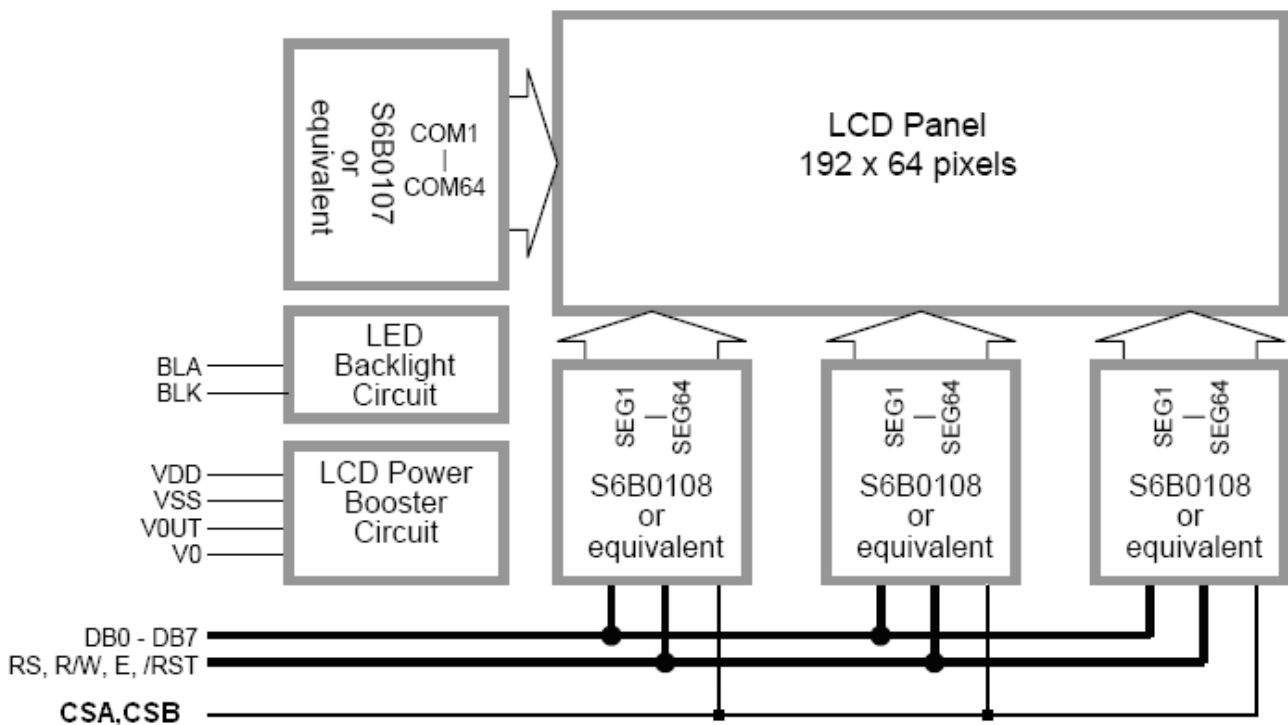
1.1 DISPLAY SPECIFICATIONS

DISPLAY MODE : STN-Y/G-POSITIVE-TRANSFLECTIVE
 DISPLAY FORMAT : 192*64 DOTS
 DATA BUS : 8-BITS Parallel SYSTEM INTERFACE
 MULTIPLEXING : DUTY:1/64, BIAS:1/9
 VIEWING DIRECTION : 6 O'CLOCK
 OPERATING TEMPERATURE : -20 ~ +70 °C
 STORAGE TEMPERATURE : -30 ~ +80 °C
 LCD CONTROLLER : S6B0108 or Equivalent
 BACKLIGHT : LED WHITE , 3.3V, 180mA
 OTHERS :

1.2 MECHANICAL SPECIFICATION

ITEM	SPECIFICATIONS	UNIT
DIMENSIONAL OUTLINE	100.0(W)×60.0(H)×13.0MAX.(T)	mm
VIEW AREA	84.0(W)×31.0(H)	mm
ACTIVE AREA	78.67(W)×26.19(H)	mm
DOT PITCH	0.41(W)×0.41(H)	mm
DOT SIZE	0.36(W)×0.36(H)	mm

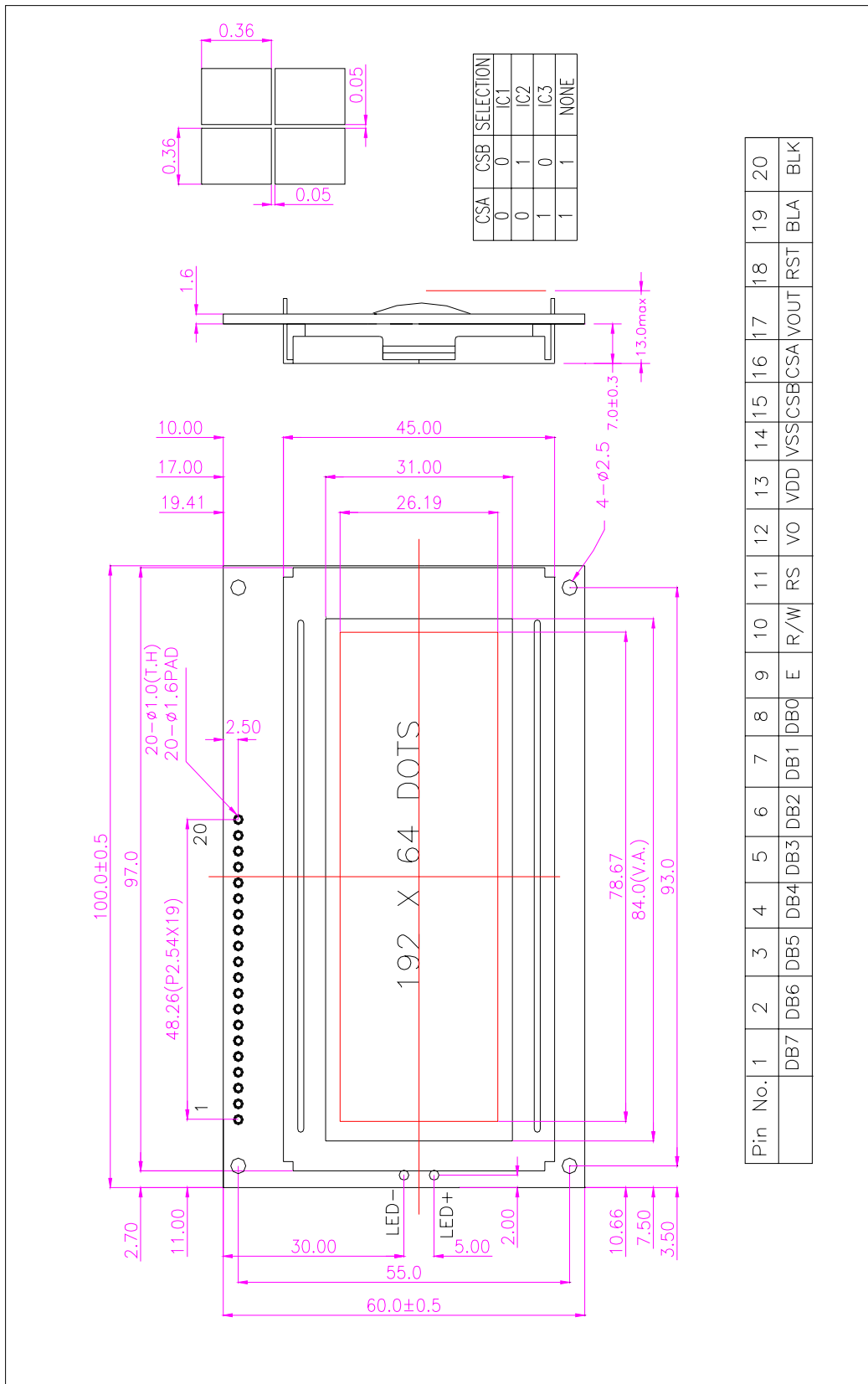
1.3 BLOCK DIAGRAM



1.4 INTERFACE FUNCTIONS

PIN No.	Symbol	Level	Function
1	D7	H/L	Data Bit7
2	D6	H/L	Data Bit6
3	D5	H/L	Data Bit5
4	D4	H/L	Data Bit4
5	D3	H/L	Data Bit3
6	D2	H/L	Data Bit2
7	D1	H/L	Data Bit1
8	D0	H/L	Data Bit0
9	E	H, H→L	Enable signal
10	R/W	H/L	Read/Write selection H: Read operation L: Instruction code
11	RS	H/L	Register selection H: Display data L: Instruction code
12	V ₀	——	Power supply for LCD
13	V _{DD}	——	Power supply for logic(+3.3V)
14	V _{SS}	——	Power Ground
15	CSB	H/L	CSB=0, CSA=0 :Left Part
16	CSA	H/L	CSB=1, CSA=0 :Middle Part CSB=0, CSA=1 :Right Part
17	V _{OUT}	——	Negative Voltage Output
18	/RST	H/L	Reset Signal active "L"
19	BLA	——	Power supply for LED backli ght(+3.3V)
20	BLK	——	Power supply for LED backlight(0V)

2. DIMENSIONAL OUTLINE



3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	RATINGS			UNITS
		MIN.	TYP.	MAX.	
POWER SUPPLY FOR LOGIC	V _{DD} -V _{SS}	-0.3	-	5.0	V
POWER SUPPLY FOR LCD DRIVER	V _{LCD}	-0.3	-	12.0	V
INPUT VOLTAGE	V _{IN}	-0.3	-	V _{DD} +0.3	V
OPERATING TEMPERATURE	T _{op}	-20	-	70	°C
STORAGE TEMPERATURE	T _{st}	-30	-	80	°C

4. ELECTRICAL & OPTICAL CHARACTERISTICS

4.1 ELECTRICAL CHARACTERISTICS (T_a=25 °C)

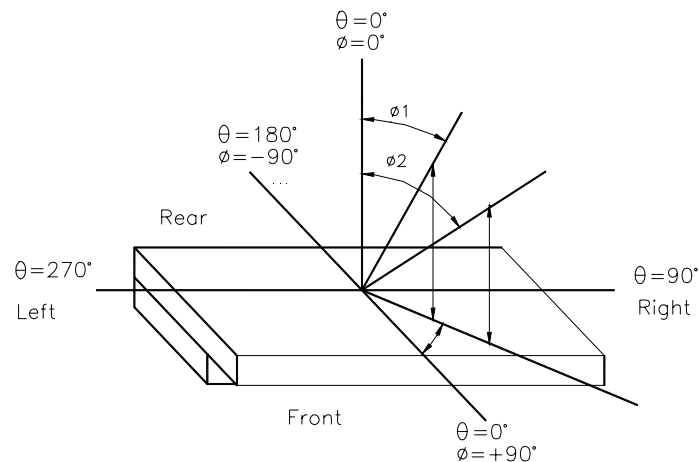
ITEM	SYMBOL	CONDITION	MIN	TYPE	MAX.	UNIT
POWER SUPPLY (LOGIC)	V _{DD} -V _{SS}	-	3.2	3.3	3.4	V
POWER SUPPLY (LCD)	V _{DD} -V ₅	T _a = 25°C	--	7.0	--	V
POWER SUPPLY CURRENT	I _{DD}	V _{DD} -V _{SS} =5.0V	-	-	10.0	mA
HIGH-level input voltage	V _{IH}	-	2.0	-	V _{DD}	V
LOW-level input voltage	V _{IL}	-	-0.3	-	0.8	V
HIGH-level output voltage	V _{OH}	I _{OH} = -0.2 mA.	2.4	-	V _{DD}	V
LOW-level output voltage	V _{OL}	I _{OL} = 1.6 mA.	-	-	0.4	V

4.2 OPTICAL CHARACTERISTICS (T_a=25 °C)

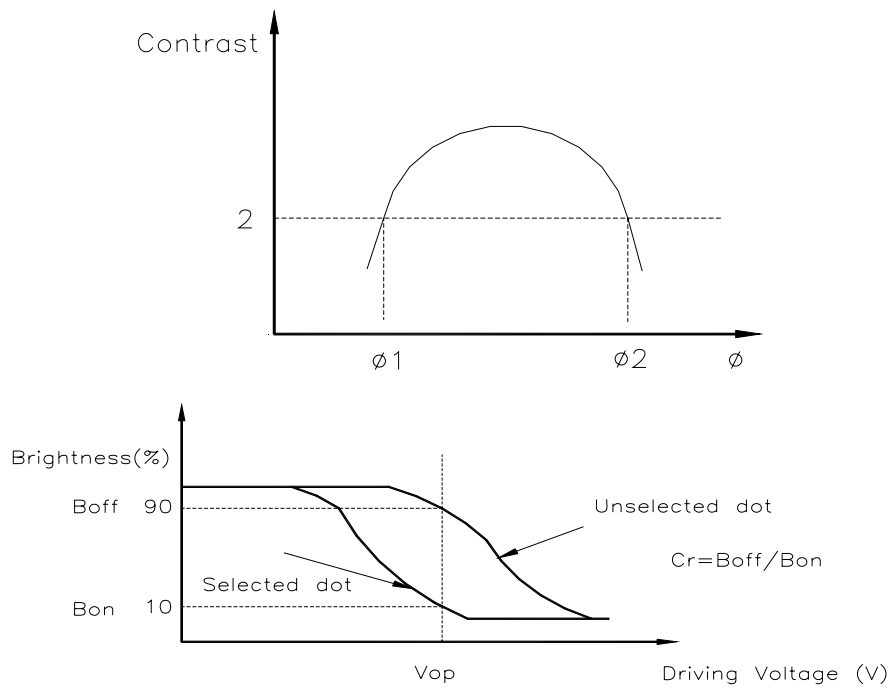
ITEM	SYMBOL	CONDITION	MIN	TYPE	MAX	UNIT
VIEW ANGLE	Δφ	θ=0°, Cr≥2 -90° < φ ₁ , φ ₂ < 90°	-	40	-	Deg
CONTRAST	Cr	φ=0°, θ=0°	5	-	-	—
RESPONSE TIME	t _r (rise)	φ=0°, θ=0°	-	-	400	ms
	t _f (fall)	φ=0°, θ=0°	-	-	400	ms

NOTE1: Definition of Viewing Angle θ, φ

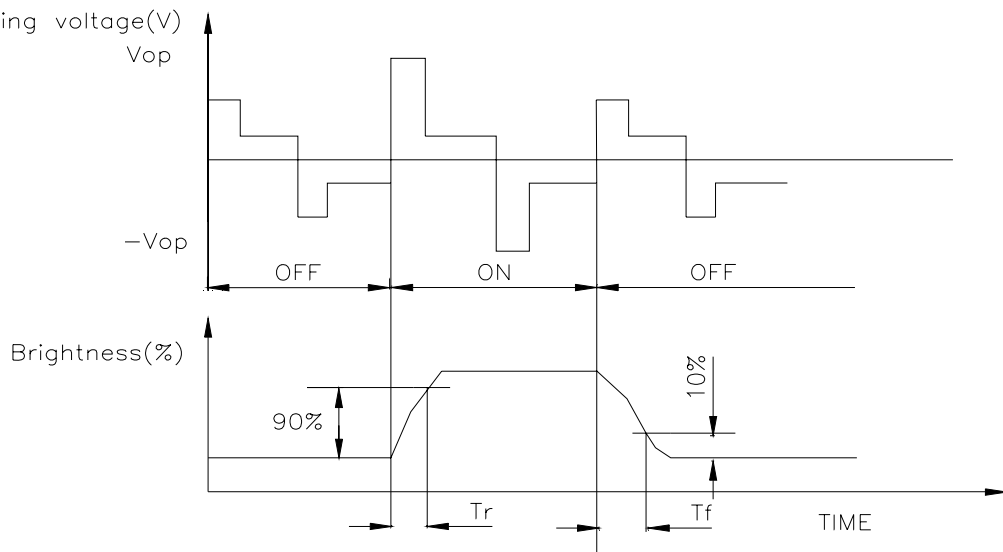
NOTE2: Definition of viewing Angle Range: Δφ=|φ₂-φ₁|



NOTE3: Definition of Contrast



NOTE4: Definition of Response Time



5. BACKLIGHT CHARACTERISTICS

ITEM	SYMBOL	MIN.	TYP.	MAX.	Condition	UNITS
Forward Voltage	V_f	3.2	3.3	3.4	$I_f = 180\text{mA}$	V
Reverse Current	I_r	-	-	30	$V_r = 3.3\text{V}$	μA
Peak Wave Length	λ_p	-	Y/G	-	$I_f = 180\text{mA}$	nm
Spectral Line Half Width	$\Delta \lambda$	-	-	-	$I_f = 180\text{mA}$	nm
Luminance	L_v	-	-	-	$I_f = 180\text{mA}$	CD/m^2

6. TIMING CHARACTERISTICS

6.1 Interface Timing

Characteristic	Symbol	Min	Typ	Max	Unit
E cycle	t_c	1000	–	–	ns
E high level width	t_{WH}	450	–	–	ns
E low level width	t_{WL}	450	–	–	ns
E rise time	t_R	–	–	25	ns
E fall time	t_F	–	–	25	ns
Address set-up time	t_{ASU}	140	–	–	ns
Address hold time	t_{AH}	10	–	–	ns
Data set-up time	t_{DSU}	200	–	–	ns
Data delay time	t_D	–	–	320	ns
Data hold time (write)	t_{DHW}	10	–	–	ns
Data hold time (read)	t_{DHR}	20	–	–	ns

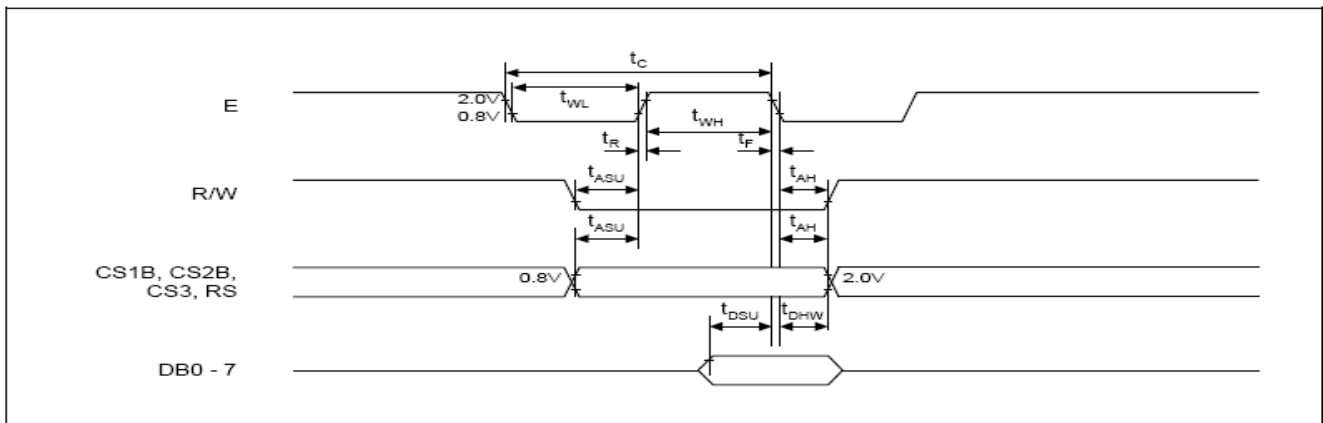


Figure 3. MPU Write Timing

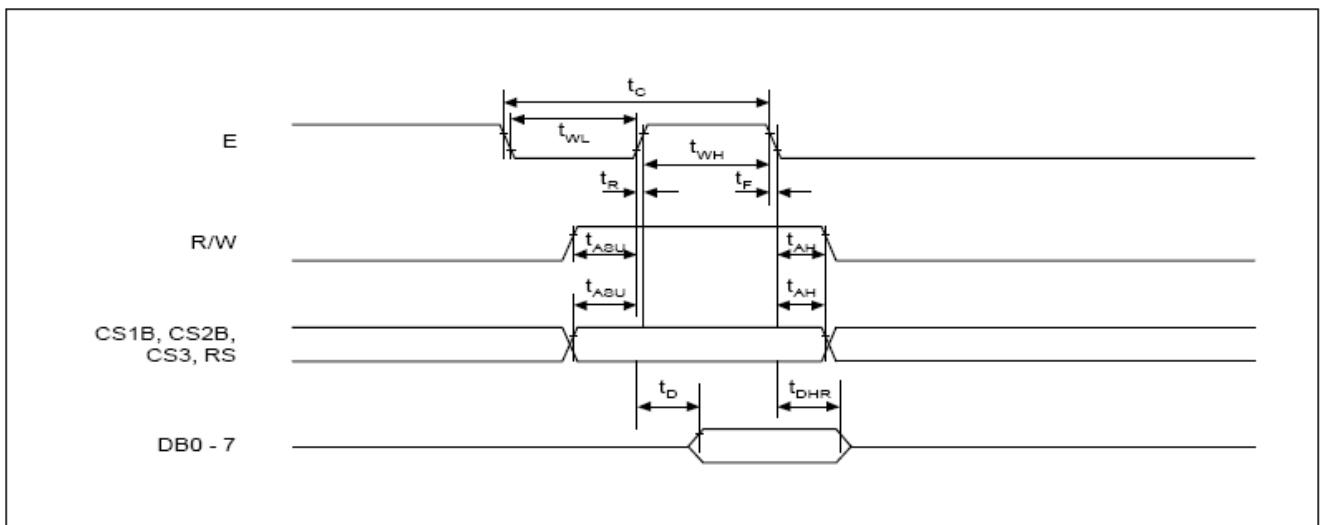
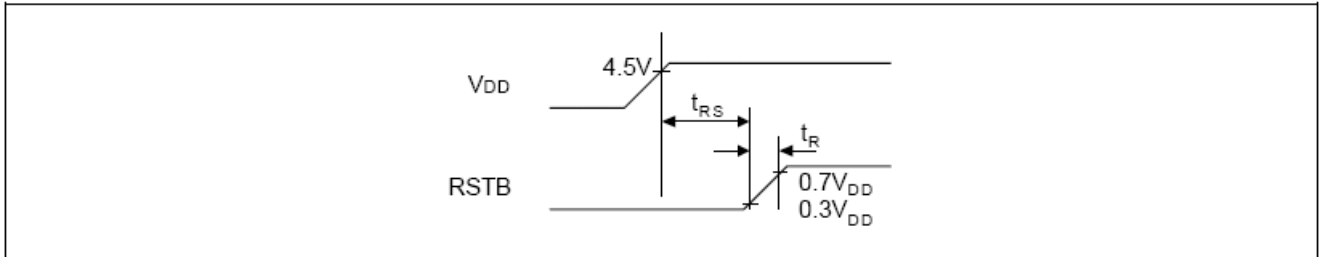


Figure 4. MPU Read Timing

6.2 RESET Timing

Item	Symbol	Min	Typ	Max	Unit
Reset time	t_{RS}	1.0	–	–	us
Rise time	t_R	–	–	200	ns



7. INSTRUCTION FUNCTION TABLE

7.1 Summary

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L: OFF, H: ON	
Set address (Y address)	L	L	L	H	Y address (0 - 63)						Sets the Y address in the Y address counter.	
Set page (X address)	L	L	H	L	H	H	H	Page (0 - 7)			Sets the X address at the X address register.	
Display start line (Z address)	L	L	H	H	Display start line (0 - 63)						Indicates the display data RAM displayed at the top of the screen.	
Status read	L	H	Busy	L	On / Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset	
Write display data	H	L	Write data									Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data									Reads data (DB0: 7) from display data RAM to the data bus.

7.2 Explanation of Instruction

7.2.1 Display On/Off

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	1	1	1	D

The display data appears when D is 1 and disappears when D is 0. Though the data is not on the screen with D = 0, it remains in the display data RAM. Therefore, you can make it appear by changing D = 0 into D = 1.

7.2.2 SET ADDRESS (Y ADDRESS)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0

Y address (AC0 - AC5) of the display data RAM is set in the Y address counter. An address is set by instruction and increased by 1 automatically by read or write operations of display data.

7.2.3 SET PAGE (X ADDRESS)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	0	1	1	1	AC2	AC1	AC0

X address (AC0 - AC2) of the display data RAM is set in the X address register. Writing or reading to or from MPU is executed in this specified page until the next page is set.

7.2.4 DISPLAY START LINE (Z ADDRESS)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	1	AC5	AC4	AC3	AC2	AC1	AC0

Z address (AC0 - AC5) of the display data RAM is set in the display start line register and displayed at the top of the screen. When the display duty cycle is 1/64 or others (1/32 - 1/64), the data of total line number of LCD screen, from the line specified by display start line instruction, is displayed.

7.2.5 Status Read

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	BUSY	0	ON/OFF	RESET	0	0	0	0

This instruction reads out the internal status.

- BUSY

When BUSY is 1, the Chip is executing internal operation and no instructions are accepted.

When BUSY is 0, the Chip is ready to accept any instructions.

- ON/OFF

When ON/OFF is 1, the display is OFF.

When ON/OFF is 0, the display is ON.

- RESET

When RESET is 1, the system is being initialized.

In this condition, no instructions except status read can be accepted.

When RESET is 0, initializing has finished and the system is in the usual operation condition.

7.2.6 Write Display Data

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	D7	D6	D5	D4	D3	D2	D1	D0

Writes data (D0 - D7) into the display data RAM. After writing instruction, Y address is increased by 1 automatically.

7.2.7 Read Display Data

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	1	D7	D6	D5	D4	D3	D2	D1	D0

Reads data (D0 - D7) from the display data RAM. After reading instruction, Y address is increased by 1 automatically.

8.QUALITY SPECIFICATION

8.1 ACCEPTABLE QUALITY LEVEL

Inspection items	Sampling procedures	AQL
Visual-operating (Electro-optical)	GB2828-81 Inspection level II Normal inspection Single sample inspection	0.65
Visual-not operating	GB2828-81 Inspection level II Normal inspection Single sample inspection	1.5
Dimension measurement	GB2828-81 Inspection level II Normal inspection Single sample inspection	1.5

8.2 INSPECTION CONDITIONS

8.2.1 THE ENVIRONMENTAL

-Room temperature: 25±3 oC

-Humidity: 65±20%RH

8.3 INSPECTION STANDARDS

8.3.1 VISUAL WHILE OPERATING

Items to be inspected	Inspection standard
No display	If any pattern is not active at all, they can be rejected.
Irregular operating	No irregular operating are allowed Appeared different display, which they should be chosen in the pattern, or appeared in different position where they should be chosen.
Irregular display	Any segment doesn't active, they can be rejected.
Over current	The total current required to activate the module should not be exceed the MAX current in specification.
View angles	Valves that don't meet the minimum value noted in the specification. they can be rejected.
Contrast	Valves that don't meet the minimum value noted in the specification, they can be reject.
.LCD operate voltage	Meet the specification.

8.3.2 Visual while not operating

Module dimension	Meet the module outline drawing, not exceed the tolerance.
LCD panel scratch	Following scratches inside the effective viewing area considered as the defects when their width & length are larger than the following combinations. Number: one or more Width: 0.1 length: 3.0 three or more Width: 0.05 length: 2.0 three or more Width: 0.03 length: 3.0 When the defects exceed this, it can be rejected.

9.RELIABILITY

Standard Specification for Reliability of General-purpose LCM

Test Item	Test Condition	Note
High Temperature Store	80 °C, 12hr.	2
Low Temperature Store	-30 °C, 4hr	2
Humidity Store	40 °C, 90~95%RH, 96hr	1,2
High Temperature Operation	70°C, typical operating conditions, 48hr	
Low Temperature Operation	-20°C, typical operating conditions, 48hr	
Shock	Acceleration: 100m/s ² , Pulse time: 11ms, 6 times in each direction of XYZ	
Mechanical Vibration	10~55Hz sweep, 3G, ampl.=0.75mm(max) XYZ for 20 min, each.	

Note 1: Condensation of water is not permitted on the module.

Note 2: The module should be inspected after 4 hour storage in normal conditions (15~35 °C, 45~65%RH)

10. HANDLING PRECAUTION

10.1 MOUNTING METHOD

The panel of the LCD module consists of two thin glass plates with polarizes which easily get damaged since the module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling the LCD modules.

10.2 CAUTION OF LCD HANDLING & CLEANING

When cleaning the display surface. Use soft cloth with solvent (recommended below) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Tri chlorotri fluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizes surface.

Do not use the following solvent:

- Water
- Ketone
- Aromatics

10.3 CAUTION AGAINST STATIC CHARGE

The LCD modules use COMS LSI drivers. So we recommend that you connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on and ground your body. work/assembly table. And assembly equipment to protect against static electricity.

10.4 PACKAGING

Modules use LCD elements, and must be treated as such avoid intense shock and falls from a height

To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

10.5 CAUTION FOR OPERATION

It is indispensable to drive LCM within the specified voltage limit since the higher voltage than the limit shortens LCM life.

Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD show dark color in them.

However those phenomena do not mean malfunction or out of order with LCD, which will come back in the specified operating temperature range.

If the display area is pushed hard during operation. Some font will be abnormally displayed but it resumes normal condition after turning off once.

A slight dew depositing on terminals is a cause for Electro-chemical reaction resulting in terminal open circuit.

Under the maximum operating temperature, 50%RH or less is required

10.6 STORAGE

In the case of storing for a long period of time (for instance, for years) for the purpose or replacement use. the following ways are recommended

Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it, and with no desiccant.

Placing in a dark place where neither exposure to direct sunlight nor light is, keeping temperature in the specified storage temperature range.

Storing with no touch on polarizes surface by the anythingelse.

(it is recommended to store them as they have been contained in the inner container at the time of delivery from us.

10.7 SAFETY

It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol, which should be burned up later.

When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

11.PRECAUTION FOR USE

11.1 A limit sample should be provided by the both parties on an occasion when the both parties agree its necessity.

-Judgement by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

11.2 On the following occasions, the handling of problem should be decided through discussion and agreement between representative of the both parties

When a question is arisen in this specification.

When a new problem is arisen which is not specified in this specifications.

When an inspection specification change or operating condition change in customer is reported to HUATIAN, and some problem is arisen in this specification due to the change.

When a new problem is arisen at the customer's operating set for sample evaluation in the customer size.