



MULTI-INNO TECHNOLOGY CO., LTD.

LCD MODULE SPECIFICATION

Model : MI4004F

Revision	1.1
Engineering	
Date	
Our Reference	



MODE OF DISPLAY**Display mode**

- STN : ☐ Yellow green
☐ Grey
☐ Blue (negative)
☐ FSTN positive
☐ FSTN negative

Display condition

- ☐ Reflective type
☐ Transflective type
☐ Transmissive type
☐ Others

Viewing direction

- ☐ 6 O' clock
☐ 12 O' clock
☐ 3 O' clock
☐ 9 O' clock

**GENERAL DESCRIPTION**

Display mode : 40 characters x 4 lines COB LCD module
Interface : 8-bit parallel
Driving method : 1/16 duty , 1/5 bias
Driver IC : ST7066U,ST7065C or equivalent
For the detailed information, please refer to the IC specifications.

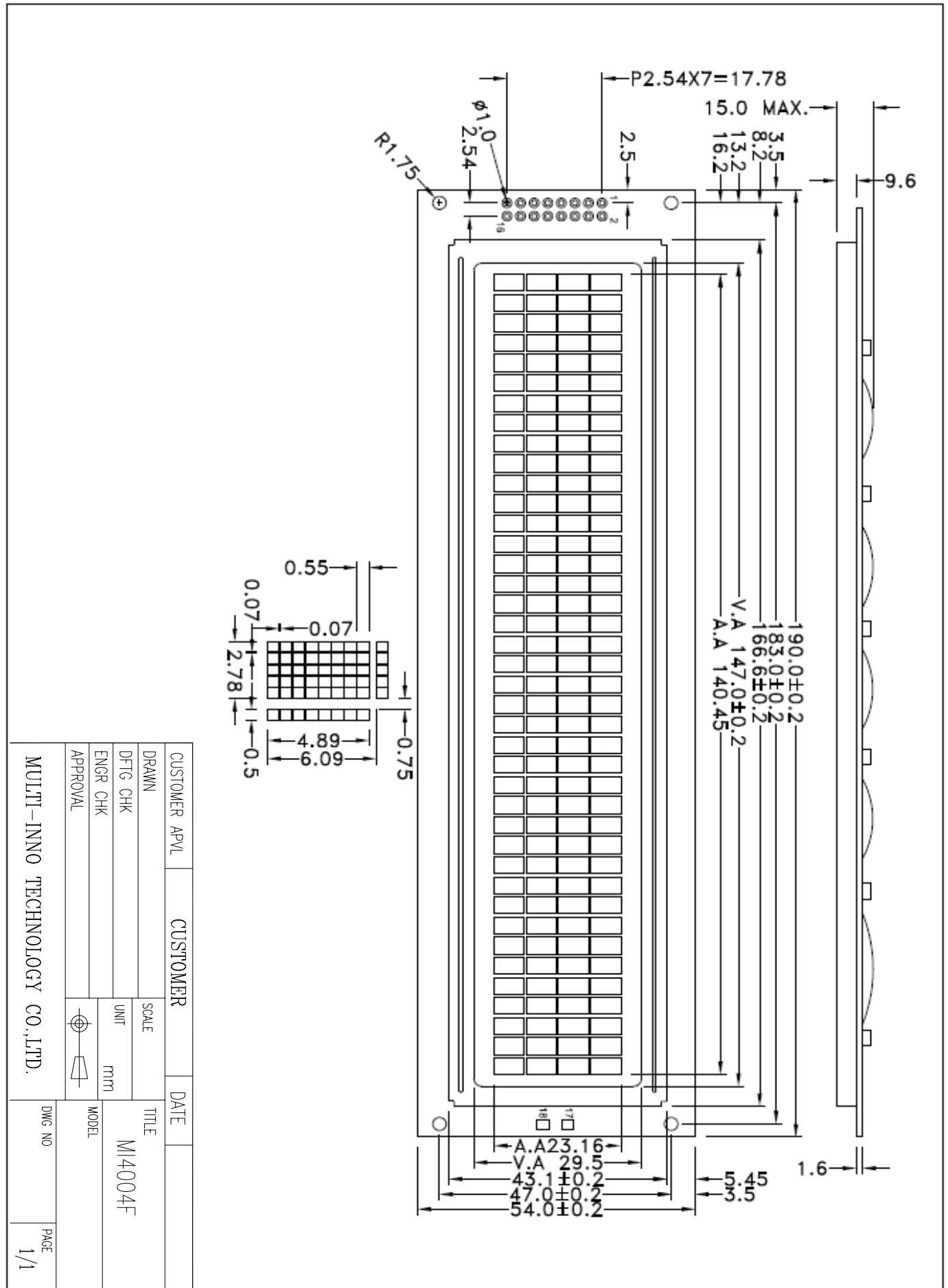
MECHANICAL DIMENSIONS

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension	190.0(L)x54.0(W)x 15.0(Max)	mm	Dot Size	0.5(L)x0.55(W)	mm
Viewing Area	147.0(L)x29.5(W)	mm	Dot Pitch	0.57(L)x0.62(W)	mm

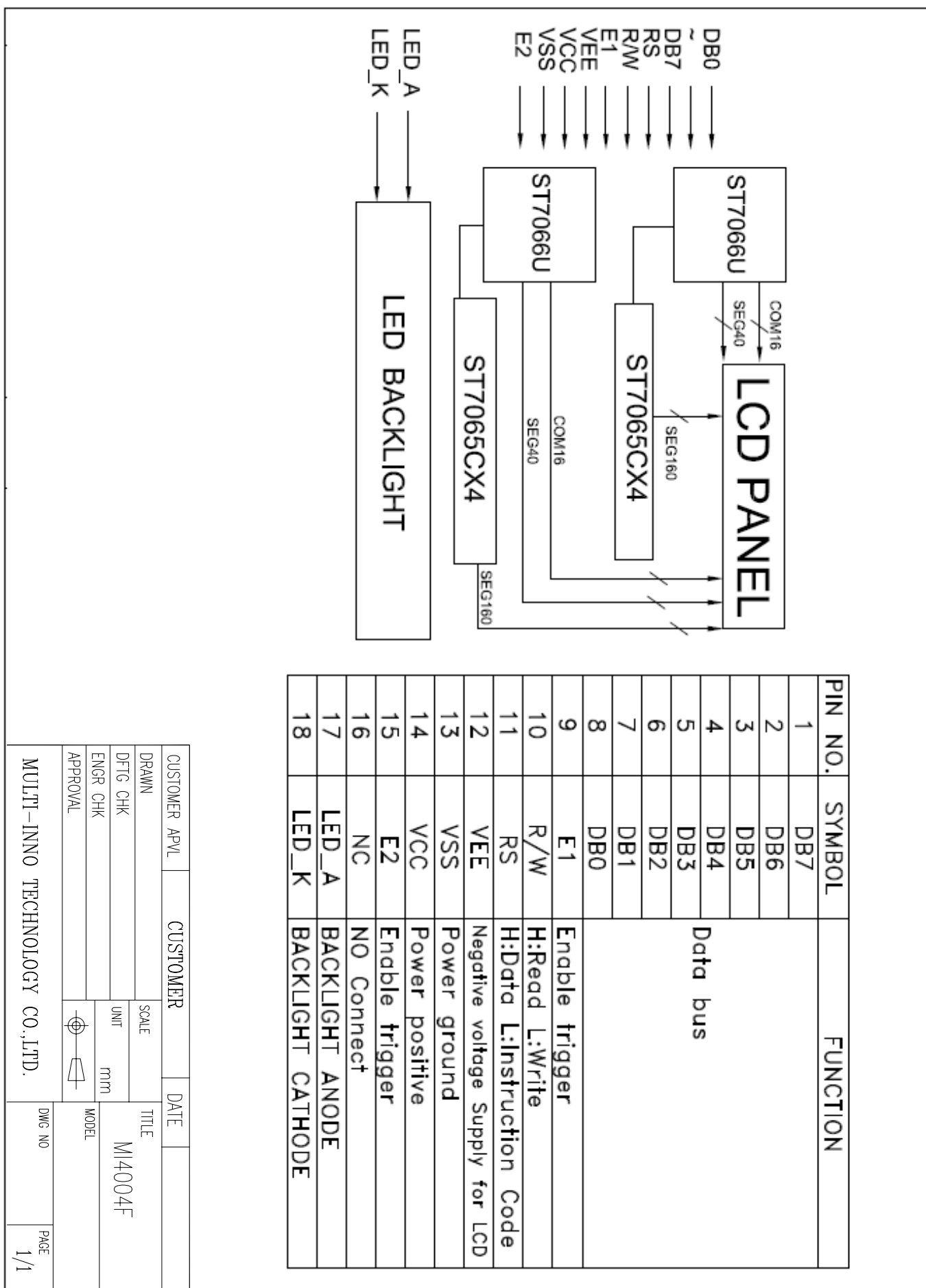
CONNECTOR PIN ASSIGNMENT

Pin No.	Symbol	Function
1	DB7	Data bus
2	DB6	
3	DB5	
4	DB4	
5	DB3	
6	DB2	
7	DB1	
8	DB0	
9	E1	Enable trigger
10	R/W	H:Read L:Write
11	RS	H:Data L:Instruction Code
12	VEE	Negative voltage Supply for LCD
13	VSS	Power ground
14	VCC	Power positive
15	E2	Enable trigger
16	NC	NO Connect
17	LED_A	BACKLIGHT ANODE
18	LED_K	BACKLIGHT CATHODE

COUNTER DRAWING OF MODULE DIMENSION



COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



COUNTER DRAWING OF SPECIFICATION

1.General specification				
Display mode	: 40 Characters x 4 lines COB LCD Module			
Interface	: 8-bit parallel			
Driving method	: 1/16 duty , 1/5 bias			
2.Electrical specification				
Supply voltage for logic(VDD)	: 5.0V			
Input voltage for LCD (VLCD)	: 4.7V			
3.Mechanical specification				
Dot size[mm]	: 0.5(L)x0.55(W)			
Dot pitch[mm]	: 0.57(L)x0.62(W)			
Viewing area[mm]	: 147.0(L)x29.5(W)			
Module dimension[mm]	: 190.0(L)x54.0(W)x15.0MAX.(H)			
4.Backlight specification				
Backlight type	: Array/Side-lited LED backlight			
Backlight color	: YELLOW GREEN/WHITE/BLUE			
Backlight voltage	: 4.2V			

CUSTOMER APVL	CUSTOMER	DATE	
DRAWN	SCALE	TITLE	
DFTG CHK	UNIT	MI4004F	
ENGR CHK	mm		
APPROVAL	 		MODEL
MULTI-INNO TECHNOLOGY CO.,LTD.			DWG NO
			PAGE
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**ELECTRICAL CHARACTERISTICS**

Conditions: VSS=0V, Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	4.9	5.0	5.5	V	Supply Voltage for LCD	VEE	—	—	—	V
Supply Current for Logic	IDD	—	0.44	—	mA	“H”Level Input Voltage	VIH	0.7VDD	—	VDD+0.3	V
Voltage Adjust for LCD	VLCD	—	4.7	—	V	“L”Level Input Voltage	VIL	-0.3	—	0.2VDD	V
Side-lited LED Backlight Forward Voltage (VF)						Side-lited LED Backlight Forward Current (If)					
Yellow green	VBL	—	4.2	—	V	Yellow green	IBL	—	151	—	mA

ABSOLUTE MAXIMUM RATINGS

Please make sure not to exceed the following maximum rating values under the worst application conditions.

Item	Symbol	Rating (for normal temperature)	Rating (for wide temperature)	Unit
Supply Voltage for Logic	VDD	-0.3 to 7.0	-0.3 to 7.0	V
Input Voltage for Logic	VIN	-0.3 to VDD+0.3	-0.3 to VDD+0.3	V
Operating Temperature	T _{opr}	0 to 50	-20 to 70	°C
Storage Temperature	T _{stg}	-10 to 60	-30 to 80	°C

Instructions

The instructions of ST7066U.

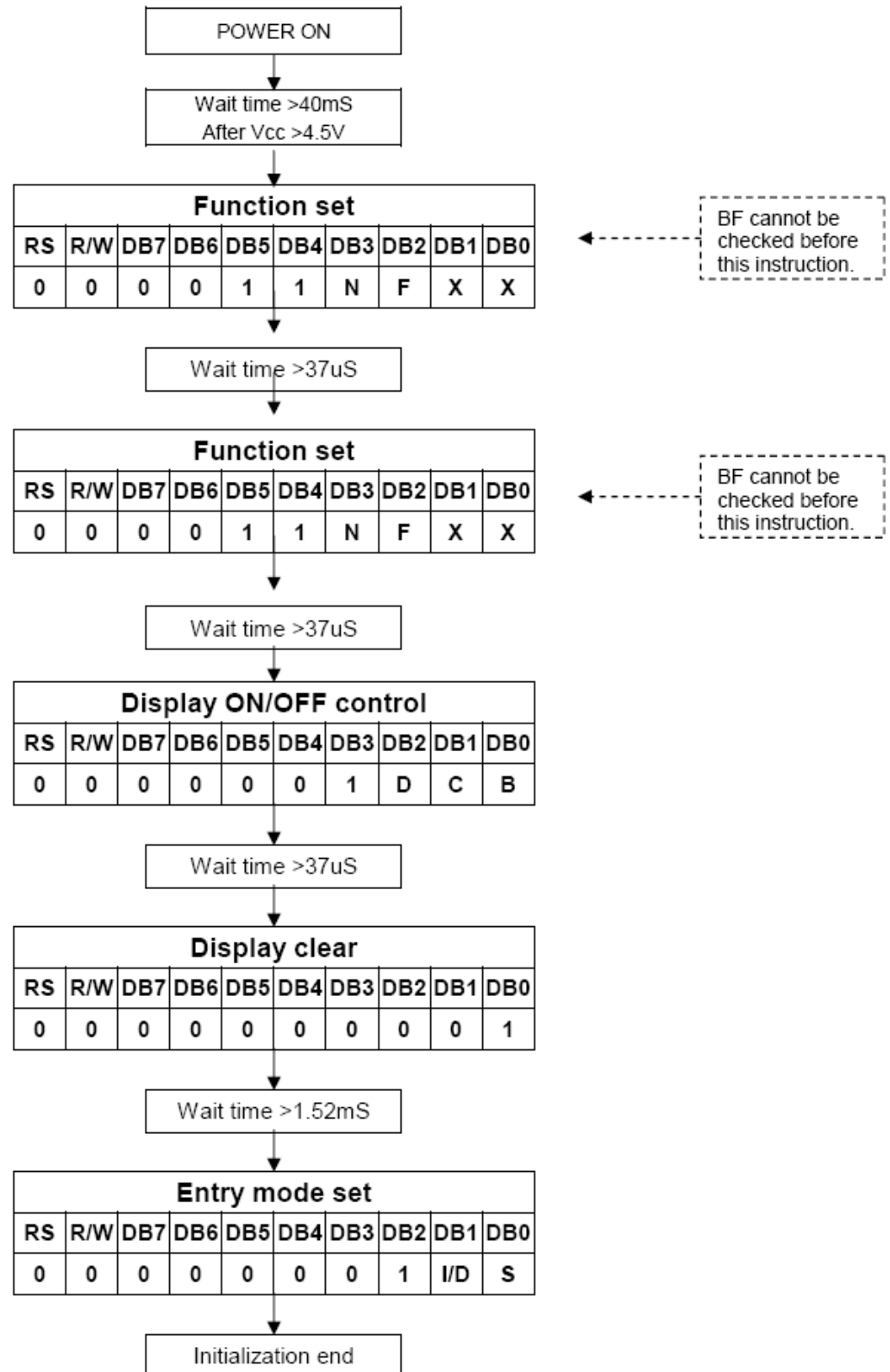
Instruction	Instruction Code										Description	Description Time (270KHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.52 ms
Return Home	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	37 us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	37 us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	37 us
Function Set	0	0	0	0	1	DL	N	F	x	x	DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	37 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	37 us
Read Busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM)	37 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	37 us

Note:

Be sure the ST7066U is not in the busy state (BF = 0) before sending an instruction from the MPU to the ST7066U. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to Instruction Table for the list of each instruction execution time.

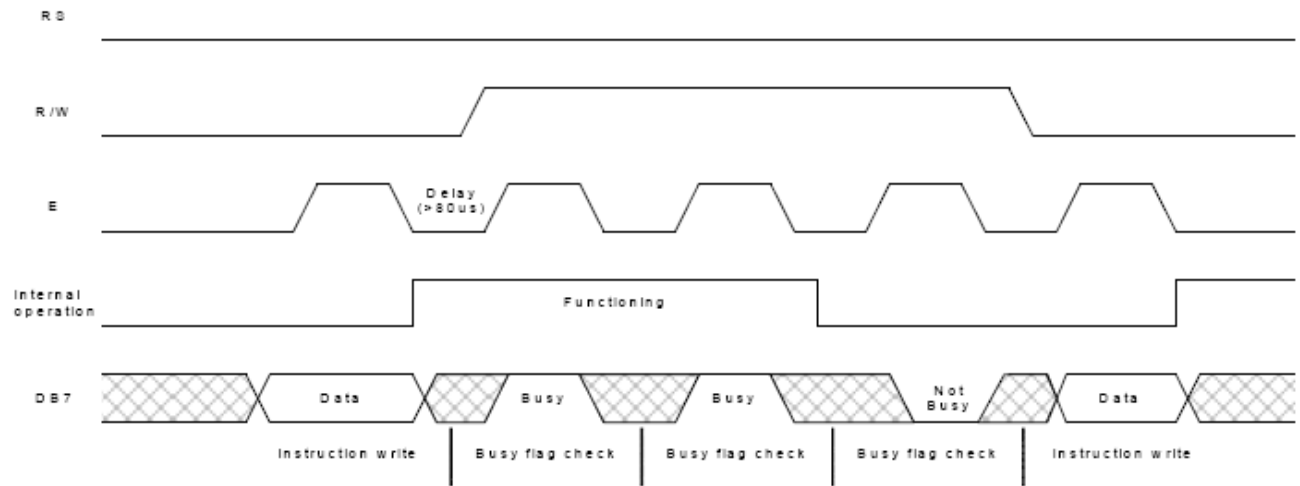
Initializing by Instruction

- 8-bit Interface (fosc=270KHz)

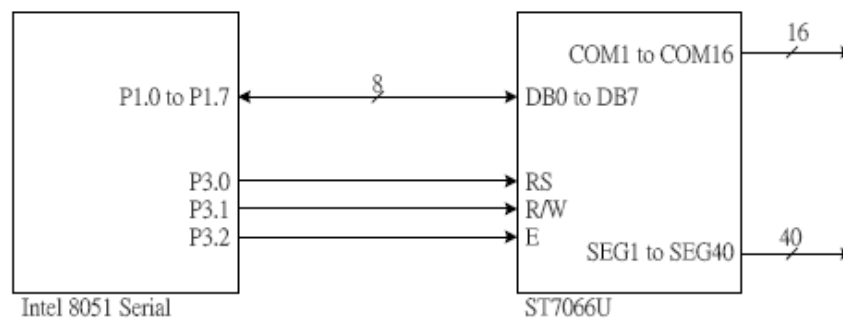


- For 8-bit interface data, all eight bus lines (DB0 to DB7) are used.

➤ Example of busy flag check timing sequence

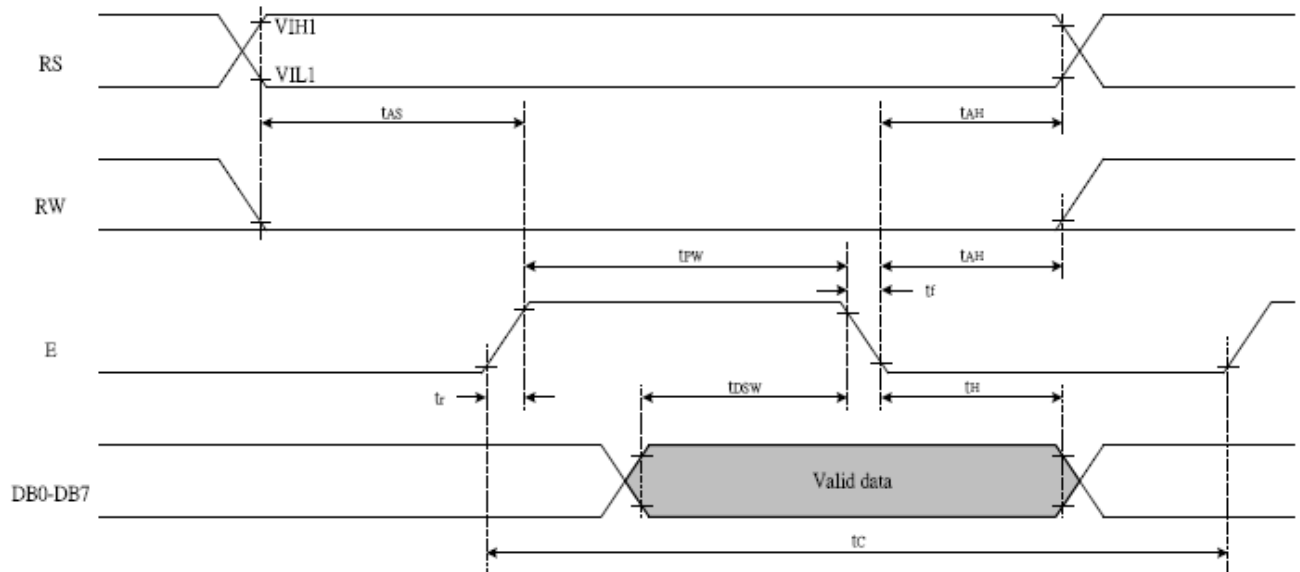


➤ Intel 8051 interface

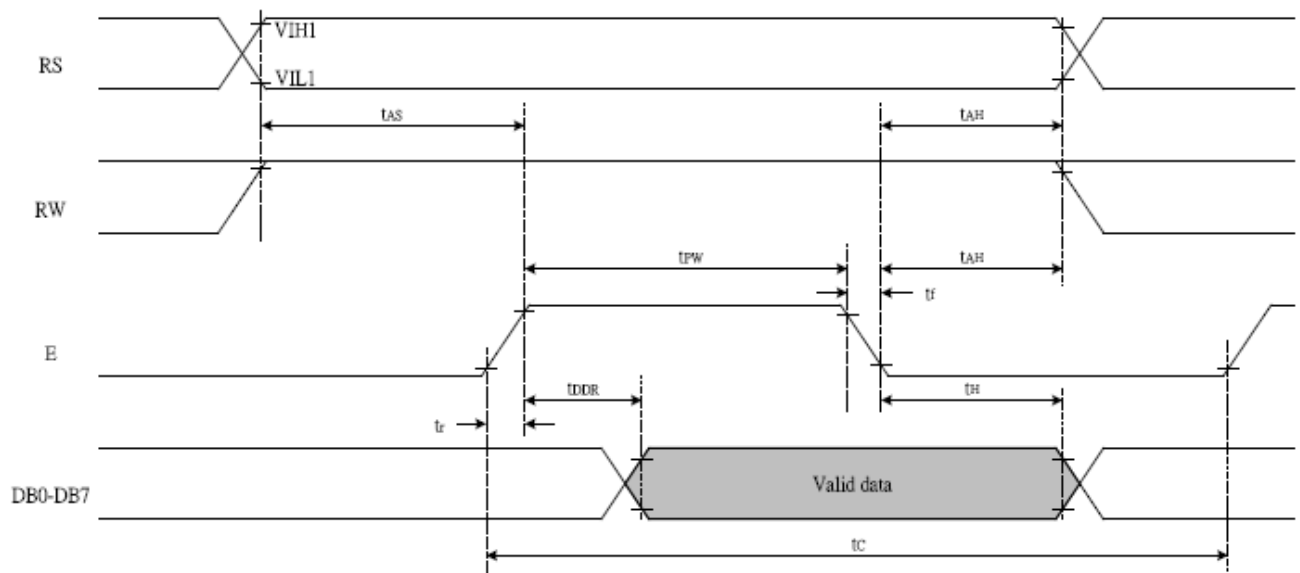


TIMING CHARACTERISTICS

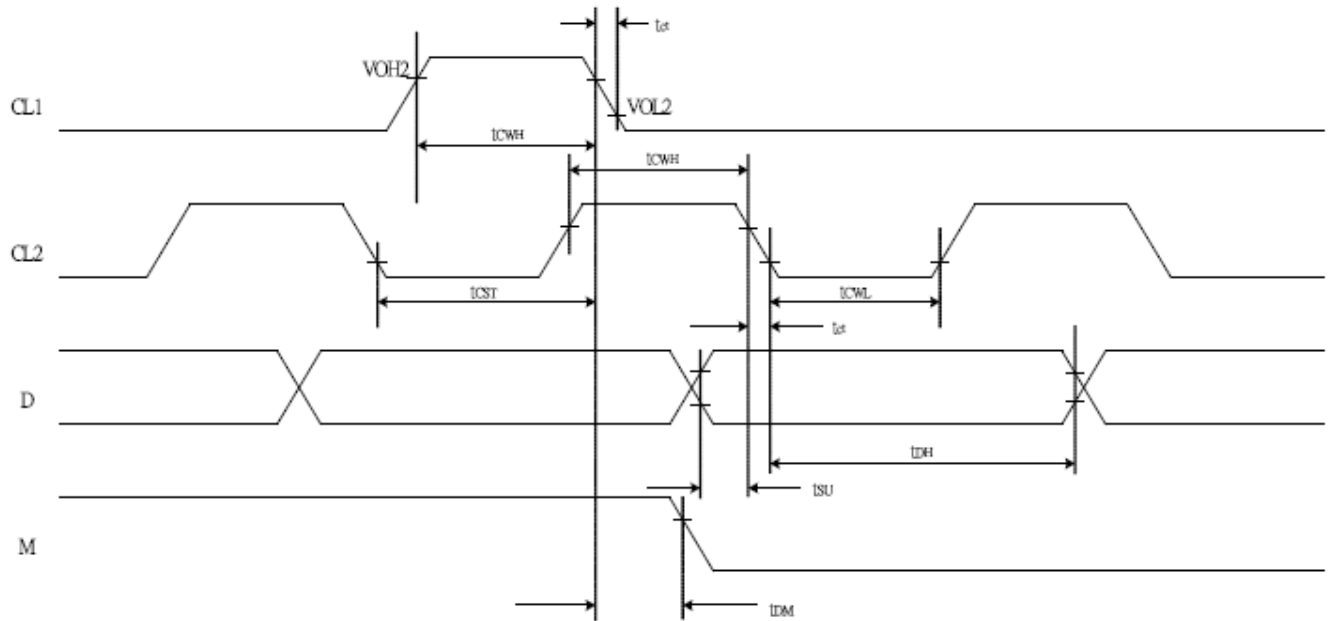
● Writing data from MPU to ST7066U



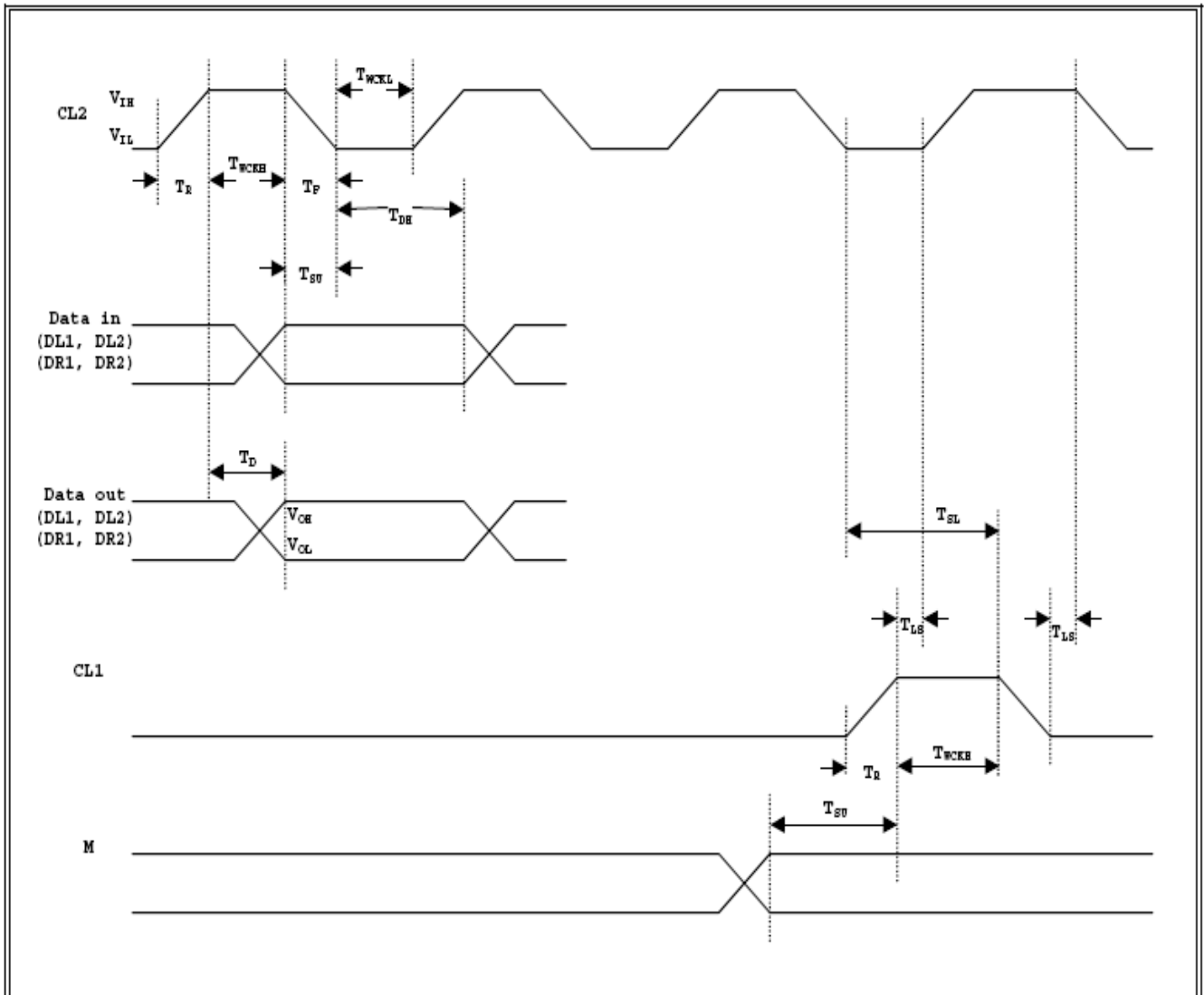
● Reading data from ST7066U to MPU



● Interface Timing with External Driver



The timing of ST7065C.



DC Characteristics

The DC Characteristics of ST7066U

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
V_{CC}	Operating Voltage	-	4.5	-	5.5	V
V_{LCD}	LCD Voltage	$V_{CC}-V_5$	3.0	-	10.0	V
I_{CC}	Power Supply Current	$f_{OSC} = 270KHz$ $V_{CC}=5.0V$	-	0.2	0.5	mA
V_{IH1}	Input High Voltage (Except OSC1)	-	$0.7V_{CC}$	-	V_{CC}	V
V_{IL1}	Input Low Voltage (Except OSC1)	-	-0.3	-	0.6	V
V_{IH2}	Input High Voltage (OSC1)	-	$V_{CC}-1$	-	V_{CC}	V
V_{IL2}	Input Low Voltage (OSC1)	-	-	-	1.0	V
V_{OH1}	Output High Voltage (DB0 - DB7)	$I_{OH} = -0.1mA$	3.9	-	V_{CC}	V
V_{OL1}	Output Low Voltage (DB0 - DB7)	$I_{OL} = 0.1mA$	-	-	0.4	V
V_{OH2}	Output High Voltage (Except DB0 - DB7)	$I_{OH} = -0.04mA$	$0.9V_{CC}$	-	V_{CC}	V
V_{OL2}	Output Low Voltage (Except DB0 - DB7)	$I_{OL} = 0.04mA$	-	-	$0.1V_{CC}$	V
R_{COM}	Common Resistance	$V_{LCD} = 4V, I_d = 0.05mA$	-	2	20	$K\Omega$
R_{SEG}	Segment Resistance	$V_{LCD} = 4V, I_d = 0.05mA$	-	2	30	$K\Omega$
I_{LEAK}	Input Leakage Current	$V_{IN} = 0V \text{ to } V_{CC}$	-1	-	1	μA
I_{PUP}	Pull Up MOS Current	$V_{CC} = 5V$	-50	-110	-180	μA

The DC Characteristics of ST7065C



Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit	Applicable pin
VDD	Operating Voltage	-	2.7	-	5.5	V	-
VLCD	Driver Supply Voltage	VDD-VEE	3	-	11	V	-
VIH	Input High Voltage	-	0.7 VDD	-	VDD	V	CL1,CL2,M,SHL1,S HL2 DL1,DL2,DR1,DR2
VIL	Input Low Voltage	-	0	-	0.3 VDD	V	
ILKG	Input Leakage Current	VIN = 0 ~ VDD	-5	-	5	uA	
VOH	Output High Voltage	IOH = -0.4mA	VDD -0.4	-	-	V	DL1,DL2,DR1,DR2 V1~V6, S[1]~S[40]
VOL	Output Low Voltage	IOL = +0.4mA	-	-	0.4	V	
IDD	Operating Current	FCL2 = 400KHZ	-	100	300	uA	VDD,VEE
IV	Leakage Current	VIN = VDD ~ VEE	-10	-	10	uA	V1 ~ V6

**ELECTRO-OPTICAL CHARACTERISTICS**MEASURING CONDITION: POWER SUPPLY = V_{OP} / 64 HzTEMPERATURE = 23 ± 5 °CRELATIVE HUMIDITY = 60 ± 20 %

ITEM	SYMBOL	UNIT	TYP	DEFINITION
RESPONSE TIME	T_{on}	ms	150	APPEND 2
	T_{off}	ms	190	APPEND 2
D.C. RESISTANCE	R_{LC}	M Ω	100	APPEND 3
CURRENT CONSUMPTION	I_{op}	μA	100	APPEND 3
CONTRAST RATIO	C_r	-	15	-
VIEWING ANGLE ($C_r \geq 2$)	$V_{3:00}$	°	45	APPEND 4
	$V_{6:00}$	°	70	APPEND 4
	$V_{9:00}$	°	45	APPEND 4
	$V_{12:00}$	°	60	APPEND 4

THE ELECTRO-OPTICAL CHARACTERISTICS ARE MEASURED VALUE BUT NOT GUARANTEED ONES.

RELIABILITY OF LCD MODULE

ITEM	TEST CONDITION	TIME
High temperature operating	50°C	240 hours
Low temperature operating	0°C	240 hours
High temperature storage	60°C	240 hours
Low temperature storage	0°C	240 hours
Temperature-humidity storage	40°C 90% R.H.	96 hours
Temperature cycling	-10°C <=> 60°C 30 MIN DWELL	5 cycles
Vibration Test at LCM Level	Freq 10-55 Hz Sweep rate: 10-55-10 at 1 min Sweep mode Linear Displacement: 2 mm p-p 1 Hour each for X, Y, Z	—

SAMPLING METHOD

SAMPLING PLAN: MIL-STD 105E

CLASS OF AQL: LEVEL II/ SINGLE SAMPLING
MAJOR-0.65% MINOR – 1.5%

QUALITY STANDARD

DEFECT	CRITERIA	TYPE	FIGURE
SHORT CIRCUIT	-	MAJOR	-
MISSING SEGMENT	-	MAJOR	-
UNEVEN / POOR CONTRAST	-	MAJOR	-
CROSS TALK	-	MAJOR	-
PIN HOLE	$\text{MAX}(a,b) \leq 1/4 W$	MINOR	1
EXCESS SEGMENT	$\text{MAX}(c,d) \leq 1/4 T$	MINOR	1
BUBBLES	$d \leq 0.2$ QTY=2	MINOR	2
BLACKS SPOTS	$d \leq 0.2$ QTY ≤ 2 $0.2 < d \leq 0.3$ QTY ≤ 1 $d > 0.3$ QTY=0	MINOR	2
LINE SCRATCHES	$x \leq 0.5$ $y \leq 0.05$ QTY=1	MINOR	3
BLACK LINE	$x \leq 0.5$ $y \leq 0.05$ QTY=1	MINOR	3

*d = MAX (d₁,d₂)

** N. A . = NOT APPLICABLE

DEFECT TABLE : B

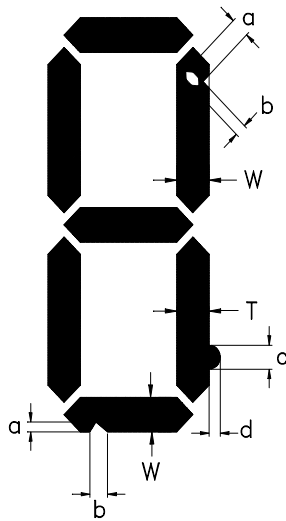
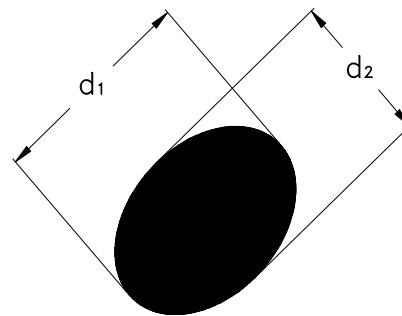
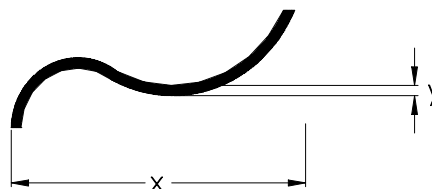


fig . 1



POLARIZER BUBBLES / SPOTS

fig . 2



LINE SCRATCHES / BLACK LINE

fig . 3

QUALITY STANDARD (CONT .)

DEFECT		CRITERIA	TYPE	FIGURE
CHIPS	CONTACT EDGE	$e \leq 1/2T$ $f < 1/4W$ $g < 2.0$	MINOR	4
	BOTTOM GLASS	$P < 0.5$ $q < 2.0$ $r < 1/2T$		4
	CORNER	$a \leq 1.5$ $b \leq 1/2W$		4
	TOP GLASS	$a < 2.5$ $b < 1/2T$ $c < 1/3W$		5
GLASS PROTRUSION		$a < 1/5 W$	MINOR	6
RAINBOW		-	MINOR	-

UNLESS STATE OTHERWISE ,

ALL UNIT ARE IN MILLIMETER .

DEFECT TABLE : B

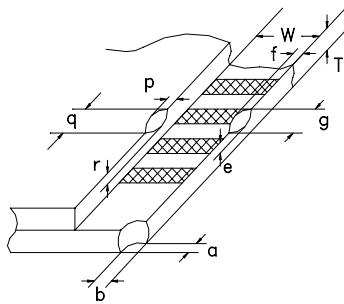


fig . 4

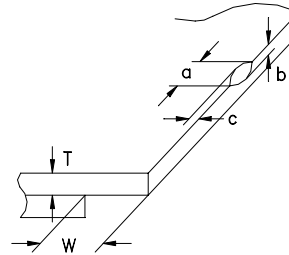


fig . 5

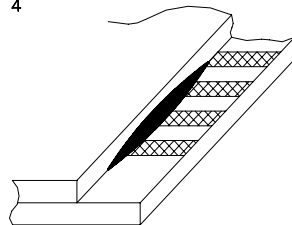


fig . 6



HANDLING PRECAUTIONS

(1) CAUTION OF LCD HANDLING & CLEANING

The polarizing plate on the surface of the panel is made from organic substances. Be very careful for chemicals not to touch the plate or it leads the polarizing plate to deteriorate.

If the use of a chemical is unavoidable, wipe the panel lightly with soft materials, such as gauze and absorbent cotton, soaked in a solvent.

*Usable solvent: Alcohol (ethanol, IPA and the like)

*Appropriate solvent: Ketones, ethyl alcohol

Avoid wiping with a dry cloth, since it could damage the surface of the polarizing plate and others.

(2) CAUTION AGAINST STATIC CHARGE

The LCD modules use CMOS LSI drivers, so customers are recommended that any unused input terminal would be connected to V_{DD} or V_{SS} , do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

(3) PACKAGING

Avoid intense shock and falls from a height and do not operate or store them exposed to direct sunshine or high temperature/humidity for long periods.

(4) CAUTION FOR OPERATION

Driving voltage should be kept within specified range, excess voltage shortens display life.

Response time increases with decrease in temperature.

Display may turn black or dark Blue at temperature above its operational range; this is however not destructive and the display will return to normal once the temperature falls back to range.

Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear “fractured”. They will recover once the display is turned off.

Condensation at terminals will cause malfunction and possible electrochemical reaction. Relative humidity of the environment should therefore be kept below 60%.

(5) SAFETY

Liquid crystal may leak out of a damaged LCD, it is recommended to wash off the liquid crystal by using solvents such as acetone or ethanol and should be burned up later.

If any liquid leaks out of a damaged glass cell comes in contact with your hands, wash it off with soap and water immediately.

WARRANTY

Multi-Inno will replace or repair any of her LCD module in accordance with her LCD specification for a period of one year from date of shipment. The warranty liability of Multi-Inno is limited to repair and/or replacement. Multi-Inno will not be responsible for any subsequent or consequential event.