Specification

Part Number:	MC22405C6WK-BNMLW
Version:	1
Date:	17/06/2011

Revision

No.	Date	Description	Item	Page

	DOC.	**DATASHEET STATEMENT**

1. The following icons are absolutely designed by Midas independently in 2007-SEP. They are not in common use in the LCD industry yet but just used for marking out Midasproducts' characteristics quickly and simply without any special meaning. Midas reserves the composing right and copyright.
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2. The ISO9001 logo used in this document is authorized by SGS (www.sgs.com). Midas had already successfully passed the strict and professional ISO9001:2000 Quality Management System Certification and got the certificate (No.: CN07/00404)

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4. As the difference in test standard and test conditions, also Midas insufficient familiarity with the actual LCD using environment, all the referred information in this DATASHEET (including the icons) only have two functions:
   4.1: providing quick reference when you are judging whether or not the product meets your requirements.
   4.2: listing out definitely the tolerance.

   SAMPLE APPROVAL document rather than consider this DATASHEET as the standard for judging whether or not the LCD meets your requirements. Once you instruct Midas to a mass-production without definite demand for providing sample before, Midas will disclaim all responsibility if the mass-production is proved not meeting with your requirements.

5. The sequence of the icons is random and doesn't indicate the importance grade.

6. Icons explanation

Midas 2006 version logo.Midas is an integrated manufacturer of flat panel display (FPD). Midas supplies TN, HTN, STN, FSTN monochrome LCD panel; COB, COG, TAB LCD module; and all kinds of LED backlight.

FAST RESPONSE TIME
This icon on the cover indicates the product is with high response speed; Otherwise not.

PROTECTION CIRCUIT
This icon on the cover indicates the product is with protection circuit; Otherwise not.

HIGH CONTRAST
This icon on the cover indicates the product is with high contrast; Otherwise not.

LONG LIFE VERSION
This icon on the cover indicates the product is long life version (over 9K hours guaranteed); Otherwise not.

WIDE VIEWING SCOPE
This icon on the cover indicates the product is with wide viewing scope; Otherwise not.

Anti UV VERSION
This icon on the cover indicates the product is against UV line. Otherwise not.

RoHS COMPLIANCE
This icon on the cover indicates the product meets ROHS requirements; Otherwise not.

OPERATION TEMPERATURE RANGE
This icon on the cover indicates the operating temperature range (X-Y).

3TIMEs 100% QC EXAMINATION
This icon on the cover indicates the product has passed Midas thrice 100% QC. Otherwise not.

TWICE SELECTION OF LED MATERIALS
This icon on the cover indicates the LED had passed Midas twice strict selection which promises the product's identical color and brightness; Otherwise not.

VIcm = 3.0V
This icon on the cover indicates the product can work at 3.0V exactly; otherwise not.

N SERIES TECHNOLOGY (2008 developed)
New structure, new craft, new technology and new materials inside both LCD module and LCD panel to improve the "RainBow"

O E44627E8Y MⁱDPONY

Contents

1. Specification Revision History

RECORDS OF REVISION			
VERSION	DATE	REVISED PAGE NO.	Note
1	2008.04.07		First issue

2. General Specification

The Features of the Module is description as follow:

- Module dimension: 118.0 x 36.0 x 13.6 (max.) mm^3

- View area: 94.5 x 16.0 mm^2

- Active area: 88.3 x 11.5 mm^2

- Number of Characters: 24 characters x 2 Lines

- Dot size: 0.6 x 0.65 mm^2

- Dot pitch: 0.65 x 0.70 mm^2

- Character size: 3.2 x 5.55 mm^2

- Character pitch: 3.7 x 5.95 mm^2

- LCD type: STN, Negative, Transmissive , blue

- Duty: 1/16

- View direction: 6 o'clock

- Backlight Type: LED White

Midas LCD Part Number System

MC	COG	132033	A	*	6	W	*	*	-	S	N	T	L	W	*	*
1	2	3	4	5	6	7	8	9	-	10	11	12	13	14	15	16

1	=	**MC:** Midas Components
2	=	**Blank:** COB (chip on board) **COG:** chip on glass
3	=	**No of dots** (e.g. 240064 = 240 x 64 dots) (e.g. 21605 = 2 x 16 5mm C.H.)
4	=	**Series**
5	=	**Series Variant:** A to Z **– see addendum**
6	=	**3:** 3 o'clock **6:** 6 o'clock **9**: 9 o'clock **12**: 12 o'clock
7	=	**S:** Normal (0 to + 50 deg C) **W:** Wide temp. (-20 to + 70 deg C) **X:** Extended temp (-30 + 80 Deg C)
8	=	**Character Set**

Blank: Standard (English/Japanese)
C: Chinese Simplified (Graphic Displays only)
CB: Chinese Big 5 (Graphic Displays only)
H: Hebrew
K: European (std) (English/German/French/Greek)
L: English/Japanese (special)
M: European (English/Scandinavian)
R: Cyrillic
W: European (English/Greek)
U: European (English/Scandinavian/Icelandic)

9	=	**Bezel Height** (where applicable /available)

	Top of Bezel to Top of PCB	LED Connection Common (via pins 1 and 2)	Array or Edge Lit
Blank	9.5mm / not applicable	via pins 15+ 16-	Array
2	8.9 mm	Common	Array
3	7.8 mm	Separate	Array
4	7.8 mm	Common	Array
5	9.5 mm	Separate	Array
6	7 mm	Common	Array
7	7 mm	Separate	Array
8	6.4 mm	Common	Edge
9	6.4 mm	Separate	Edge
A	5.5 mm	Common	Edge
B	5.5 mm	Separate	Edge
D	6.0mm	Separate	Edge
E	5.0mm	Separate	Edge
F	4.7mm	Common	Edge
G	3.7mm	Separate	EL
H	7 mm	Separate	Edge

10	=	**T:** TN **S:** STN **B:** STN Blue **G:** STN Grey **F:** FSTN **F2:** FFSTN **V:** VA (Vertically Aligned)
11	=	**P:** Positive **N:** Negative
12	=	**R:** Reflective **M:** Transmissive **T:** Transflective
13	=	**Backlight: Blank:** Reflective **L:** LED
14	=	**Backlight Colour: Y:** Yellow-Green **W:** White **B:** Blue **R:** Red **A:** Amber **O:** Orange **G:** Green **RGB:** R.G.B.
15	=	**Driver Chip: Blank:** Standard **I:** I²C **S:** SPI **T:** Toshiba T6963C **A:** Avant SAP1024B **R:** Raio RA6963
16	=	**Voltage Variant:** e.g. **3** = 3v

4. Interface Pin Function

Pin No.	Symbol	Level	Description
1	V_{SS}	0V	Ground
2	V_{DD}	5.0V	Supply Voltage for logic
3	VO	(Variable)	Operating voltage for LCD
4	RS	H/L	H: DATA, L: Instruction code
5	R/W	H/L	H: Read(MPU→Module) L: Write(MPU→Module)
6	E	H,H→L	Chip enable signal
7	DB0	H/L	Data bus line
8	DB1	H/L	Data bus line
9	DB2	H/L	Data bus line
10	DB3	H/L	Data bus line
11	DB4	H/L	Data bus line
12	DB5	H/L	Data bus line
13	DB6	H/L	Data bus line
14	DB7	H/L	Data bus line
15	A	—	Power supply for LED backlight (+)
16	K	—	Power supply for LED backlight (-)

5. Contour Drawing &Block Diagram
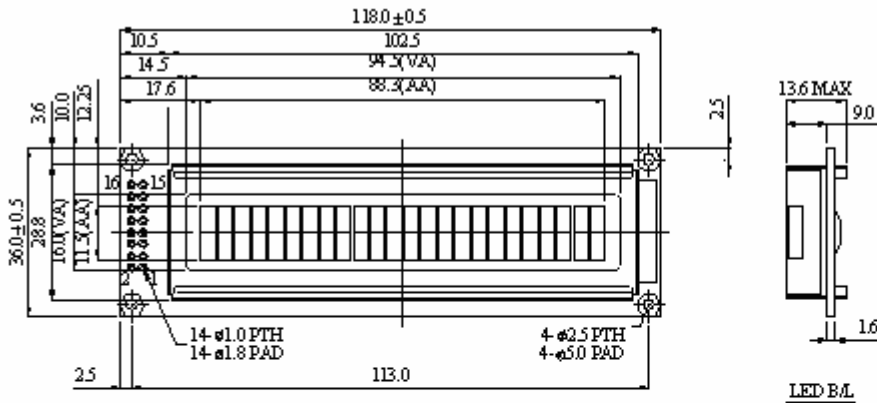
PIN NO.	SYMBOL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/$\overline{W}$
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K
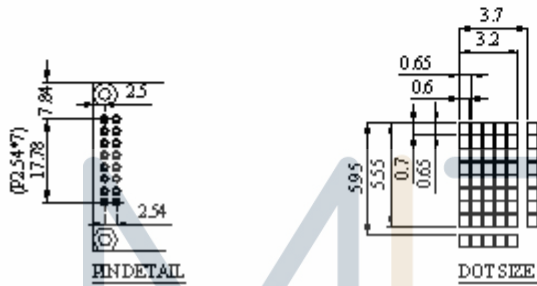
The non-specified tolerance of dimension is ±0.3mm.
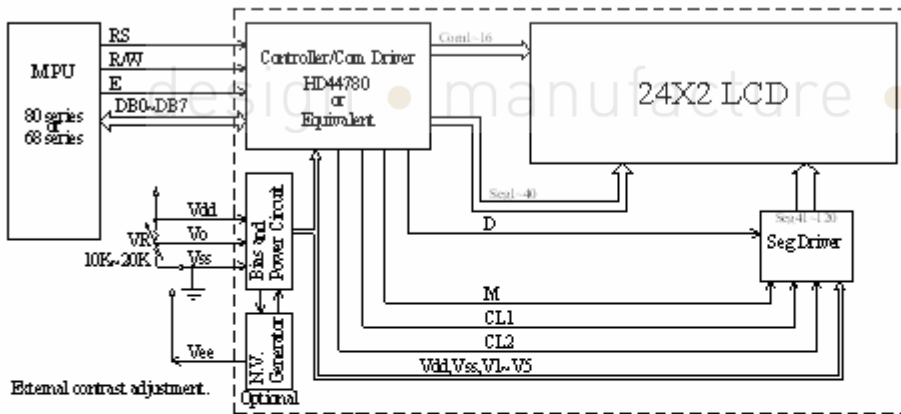
Character located	1	2	3	4	5	6	-----------	19	20	21	22	23	24
DDRAM address	00	01	02	03	04	05	-----------	12	13	14	15	16	17
DDRAM address	40	41	42	43	44	45	-----------	52	53	54	55	56	57

6. Function Description

The LCD display Module is built in a LSI controller, the controller has two 8-bit registers, an instruction register (IR) and a data register (DR).

The IR stores instruction codes, such as display clear and cursor shift, and address information for display data RAM (DDRAM) and character generator (CGRAM). The IR can only be written from the MPU. The DR temporarily stores data to be written or read from DDRAM or CGRAM. When address information is written into the IR, then data is stored into the DR from DDRAM or CGRAM. By the register selector (RS) signal, these two registers can be selected.

| RS	R/W	Operation
0	0	IR write as an internal operation (display clear, etc.)
0	1	Read busy flag (DB7) and address counter (DB0 to DB7)
1	0	Write data to DDRAM or CGRAM (DR to DDRAM or CGRAM)
1	1	Read data from DDRAM or CGRAM (DDRAM or CGRAM to DR)

Busy Flag (BF)

When the busy flag is 1, the controller LSI is in the internal operation mode, and the next instruction will not be accepted. When RS=0 and R/W=1, the busy flag is output to DB7. The next instruction must be written after ensuring that the busy flag is 0.

Address Counter (AC)

The address counter (AC) assigns addresses to both DDRAM and CGRAM.

Display Data RAM (DDRAM)

This DDRAM is used to store the display data represented in 8-bit character codes. Its extended capacity is 80×8 bits or 80 characters. Below figure is the relationships between DDRAM addresses and positions on the liquid crystal display.

	High bits		Low bits			
AC6	AC5	AC4	AC3	AC2	AC1	AC0

AC (hexadecimal)

Example: DDRAM addresses 4E

1	0	0	1	1	1	0
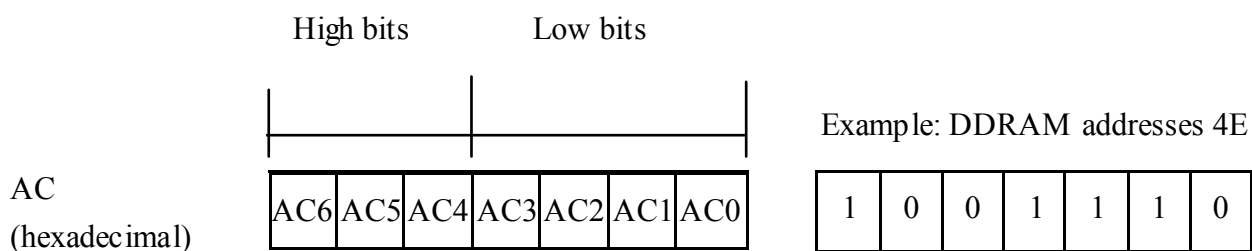
Display position DDRAM address

1	2	3	4	5	6	7	………………………	21	22	23	24				

00	01	02	03	04	05	06					14	15	16	17
40	41	42	43	44	45	46					54	55	56	57

2-Line by 24-Character Display

Character Generator ROM (CGROM)

The CGROM generate 5×8 dot or 5×10 dot character patterns from 8-bit character codes. See Table 2.

Character Generator RAM (CGRAM)

In CGRAM, the user can rewrite character by program.   For 5×8 dots, eight character patterns can be written, and for 5×10 dots, four character patterns can be written.

Write into DDRAM the character code at the addresses shown as the left column of table 1. To show the character patterns stored in CGRAM.
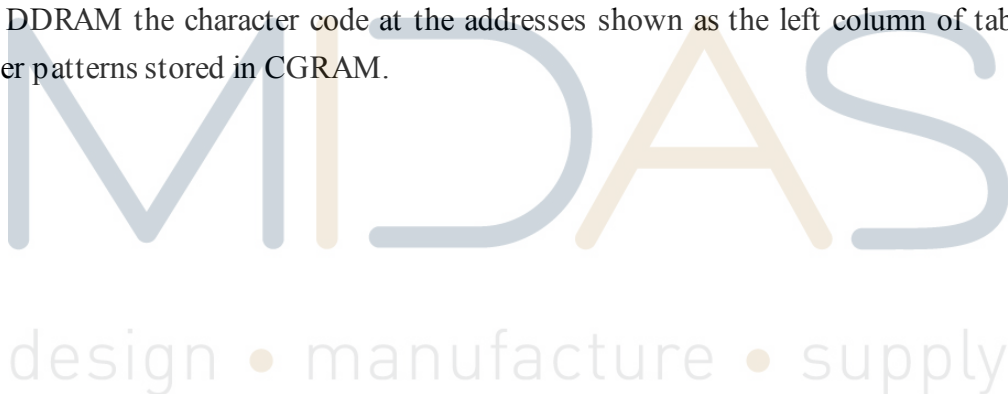
Relationship between CGRAM Addresses, Character Codes (DDRAM) and Character patterns

Table 1.

For 5 * 8 dot character patterns

Character Codes (DDRAM data) 7 6 5 4 3 2 1 0 — High Low		CGRAM Address 5 4 3 2 1 0 — High Low		Character Patterns (CGRAM data) 7 6 5 4 3 2 1 0 — High Low	
		High	Low	High	Low
0 0 0 0 * 0 0 0		0 0 0	0 0 0	* * *	▨▨▨▨ 0
			0 0 1	* * *	0 0 0 ▨
			0 1 0	* * *	0 0 0 ▨
			0 1 1	* * *	▨▨▨ 0
			1 0 0	* * *	0 ▨ 0 0
			1 0 1	* * *	0 ▨ 0
			1 1 0	* * *	▨ 0 0 ▨
			1 1 1	* * *	0 0 0 0 0 (Cursor pattern)
0 0 0 0 * 0 0 1		0 0 1	0 0 0	* * *	0 0 ▨▨
			0 0 1	* * *	0 ▨▨ 0 ▨
			0 1 0	* * *	▨▨
			0 1 1	* * *	▨ 0 0 ▨ 0 0
			1 0 0	* * *	▨▨▨
			1 0 1	* * *	0 0 ▨ 0 0
			1 1 0	* * *	0 0 ▨ 0 0
			1 1 1	* * *	0 0 0 0 0 (Cursor pattern)
			0 0 0	* * *	
			0 0 1		
0 0 0 0 * 1 1 1		1 1 1	1 0 0		
			1 0 1		
			1 1 0		
			1 1 1	* * *	

For 5 * 10 dot character patterns

Character Codes (DDRAM data) 7 6 5 4 3 2 1 0 — High Low		CGRAM Address 5 4 3 2 1 0 — High Low		Character Patterns (CGRAM data) 7 6 5 4 3 2 1 0 — High Low	
		High	Low	High	Low
0 0 0 0 * 0 0 0		0 0	0 0 0 0	* * *	0 0 0 0 0
			0 0 0 1	* * *	0 0 0 0 0
			0 0 1 0	* * *	▨▨ 0 ▨▨
			0 0 1 1	* * *	▨▨ 0 0 ▨
			0 1 0 0	* * *	▨ 0 0 0 ▨
			0 1 0 1	* * *	▨ 0 0 0 ▨
			0 1 1 0	* * *	▨▨▨▨ 0
			0 1 1 1	* * *	▨ 0 0 0 0
			1 0 0 0	* * *	▨ 0 0 0 0
			1 0 0 1	* * *	▨ 0 0 0 0
			1 0 1 0	* * *	0 0 0 0 0 (Cursor pattern)
			1 1 1 1	* * *	* * * *

■ : " High "

7. Character Generator ROM Pattern

Table 2.

Upper 4 bit / Lower 4 bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHLH	HHHL	HHHH
LLLL	CG RAM (1)															
LLLH	CG RAM (2)															
LLHL	CG RAM (3)															
LLHH	CG RAM (4)															
LHLL	CG RAM (5)															
LHLH	CG RAM (6)															
LHHL	CG RAM (7)															
LHHH	CG RAM (8)															
HLLL	CG RAM (1)															
HLLH	CG RAM (2)															
HLHL	CG RAM (3)															
HLHH	CG RAM (4)															
HHLL	CG RAM (5)															
HHLH	CG RAM (6)															
HHHL	CG RAM (7)															
HHHH	CG RAM (8)															

8. Instruction Table

Instruction	Instruction Code										Description	Execution time (fosc=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 "00H" to DDRAM and set DDRAM address to "00H" from AC	1.53ms
Return Home	0	0	0	0	0	0	0	0	1	—	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.53ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and enable the shift of entire display.	39 μs
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 control bit.	39 μs
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	—	—	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.	39 μs
Function Set	0	0	0	0	1	DL	N	F	—	—	Set interface data length (DL:8-bit/4-bit), numbers of display line (N:2-line/1-line)and, display font type (F:5×11 dots/5×8 dots)	39 μs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	39 μs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	39 μs
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 μs
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	43 μs
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	43 μs

＊ "—" : don't care

9. Timing Characteristics

9.1 Write Operation
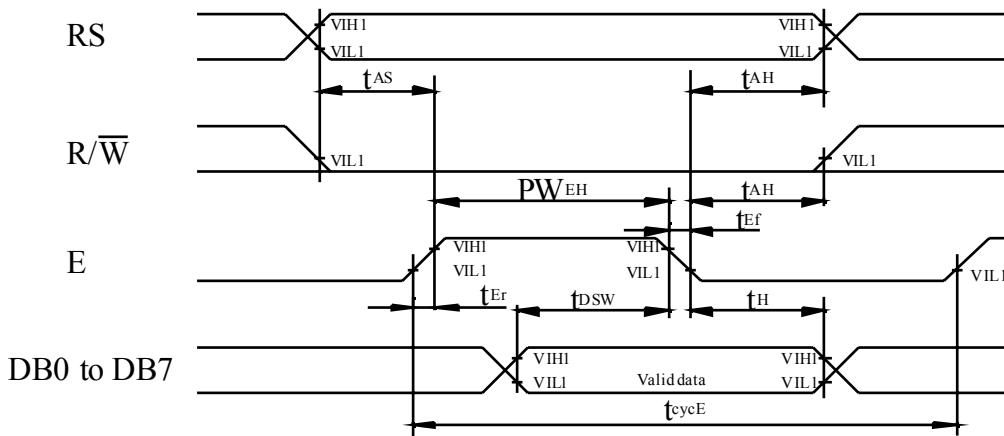
Ta=25℃, VDD=5.0± 0.5V

Item	Symbol	Min	Typ	Max	Unit
Enable cycle time	t_{cycE}	1200	—	—	ns
Enable pulse width (high level)	PW_{EH}	140	—	—	ns
Enable rise/fall time	t_{Er}, t_{Ef}	—	—	25	ns
Address set-up time (RS, R/W to E)	t_{AS}	0	—	—	ns
Address hold time	t_{AH}	10	—	—	ns
Data set-up time	t_{DSW}	40	—	—	ns
Data hold time	t_H	10	—	—	ns

9.2 Read Operation
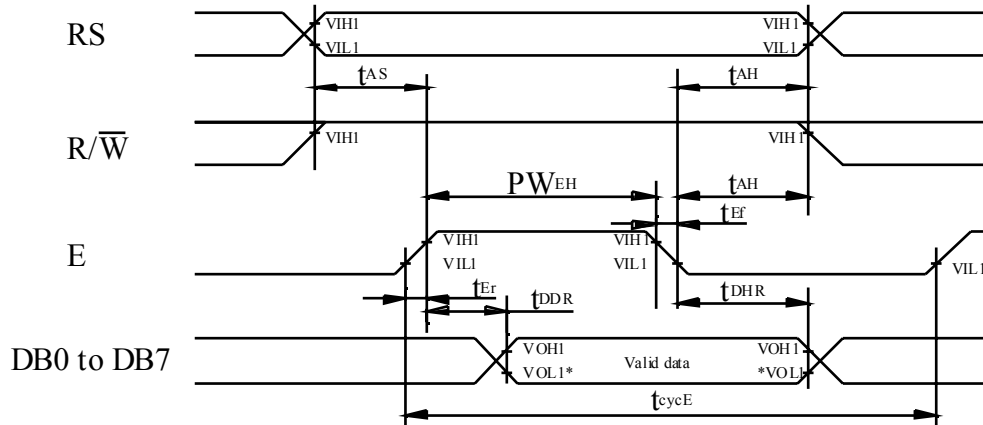
NOTE: *VOL1 is assumed to be 0.8V at 2 MHZ operation.

Ta=25℃, VDD=5.0± 0.5V

Item	Symbol	Min	Typ	Max	Unit
Enable cycle time	t_{cycE}	1200	—	—	ns
Enable pulse width (high level)	PW_{EH}	140	—	—	ns
Enable rise/fall time	t_{Er}, t_{Ef}	—	—	25	ns
Address set-up time (RS, R/W to E)	t_{AS}	0	—	—	ns
Address hold time	t_{AH}	10	—	—	ns
Data delay time	t_{DDR}	—	—	100	ns
Data hold time	t_{DHR}	10	—	—	ns

10. Initializing of LCM

```
                    ┌─────────────┐
                    │  Power on   │
                    └─────────────┘
                           │
                           ▼
    ┌──────────────────────────────────────────────┐
    │ Wait for more than 40 ms after VDD rises to 4.5 V │
    └──────────────────────────────────────────────┘
                           │
                           ▼
```

RS	R/W̅	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	*	*	*	*

BF can not be checked before this instruction.

Function set

Wait for more than 39us

RS	R/W̅	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	0	*	*	*	*
0	0	N	F	*	*	*	*	*	*

BF can not be checked before this instruction.

Function set

Wait for more than 39 μs

RS	R/W̅	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	0	*	*	*	*
0	0	N	F	*	*	*	*	*	*

BF can not be checked before this instruction.

Function set

Wait for more than 37us

RS	R/W̅	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	*	*	*	*
0	0	1	D	C	B	*	*	*	*

Display ON/OFF control

Wait for more than 37 μs

RS	R/W̅	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	*	*	*	*
0	0	0	0	0	1	*	*	*	*

Display Clear

Wait for more than 1.53ms

RS	R/W̅	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	*	*	*	*
0	0	0	1	I/D	SH	*	*	*	*

Entry Mode Set

Initialization ends

4-Bit Ineterface

```
                    ┌─────────────────────┐
                    │      Power on        │
                    └─────────────────────┘
                               │
                               ▼
        ┌──────────────────────────────────────────────────┐
        │ Wait for more than 40 ms after V_DD rises to 4.5 V │
        └──────────────────────────────────────────────────┘
                               │
                               │        ┌──────────────────────────────────────┐
                               │        │ BF can not be checked before this instruction. │
                               ▼        └──────────────────────────────────────┘
        ┌──────────────────────────────────────────────────┐  Function set
        │ RS  R/W̄ DB7 DB6 DB5 DB4 DB3 DB2 DB1 DB0          │
        │ 0   0   0   0   1   1   N   F   *   *             │
        └──────────────────────────────────────────────────┘
                               │
                               ▼
        ┌──────────────────────────────────────────────────┐
        │           Wait for more than 39us                 │
        └──────────────────────────────────────────────────┘
                               │
                               │        ┌──────────────────────────────────────┐
                               │        │ BF can not be checked before this instruction. │
                               ▼        └──────────────────────────────────────┘
        ┌──────────────────────────────────────────────────┐  Function set
        │ RS  R/W̄ DB7 DB6 DB5 DB4 DB3 DB2 DB1 DB0          │
        │ 0   0   0   0   1   1   N   F   *   *             │
        └──────────────────────────────────────────────────┘
                               │
                               ▼
        ┌──────────────────────────────────────────────────┐
        │           Wait for more than 37us                 │
        └──────────────────────────────────────────────────┘
                               │
                               ▼
        ┌──────────────────────────────────────────────────┐  Display ON/OFF control
        │ RS  R/W̄ DB7 DB6 DB5 DB4 DB3 DB2 DB1 DB0          │
        │ 0   0   0   0   0   0   1   B   C   D             │
        └──────────────────────────────────────────────────┘
                               │
                               ▼
        ┌──────────────────────────────────────────────────┐
        │          Wait for more than 37 μs                 │
        └──────────────────────────────────────────────────┘
                               │
                               ▼
        ┌──────────────────────────────────────────────────┐  Display Clear
        │ RS  R/W̄ DB7 DB6 DB5 DB4 DB3 DB2 DB1 DB0          │
        │ 0   0   0   0   0   0   0   0   0   1             │
        └──────────────────────────────────────────────────┘
                               │
                               ▼
        ┌──────────────────────────────────────────────────┐
        │          Wait for more than 1.53ms                │
        └──────────────────────────────────────────────────┘
                               │
                               ▼
        ┌──────────────────────────────────────────────────┐  Entry Mode Set
        │ RS  R/W̄ DB7 DB6 DB5 DB4 DB3 DB2 DB1 DB0          │
        │ 0   0   0   0   0   0   0   1  I/D  S             │
        └──────────────────────────────────────────────────┘
                               │
                               ▼
        ┌──────────────────────────────────────────────────┐
        │            Initialization ends                    │
        └──────────────────────────────────────────────────┘
```

8-Bit Ineterface

11. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ	CR$\geqq$2	20	—	40	deg
	(H)φ	CR$\geqq$2	-30	—	30	deg
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	200	300	ms
	T fall	—	—	200	300	ms

Definition of Operation Voltage (Vop)   **Definition of Response Time (Tr , Tf)**

[positive type]   [positive type]
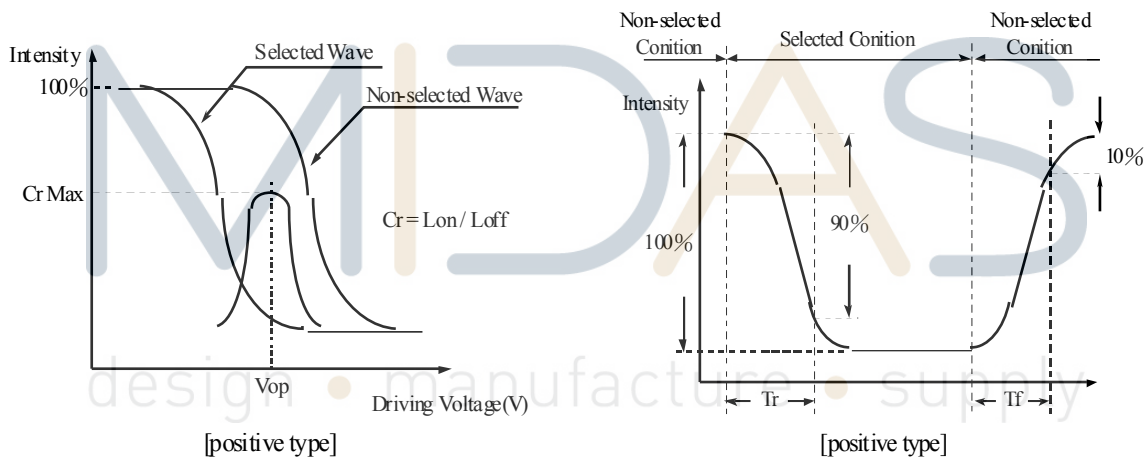
Conditions :

Operating Voltage : Vop   Viewing Angle(θ ，φ) : 0° ， 0°

Frame Frequency : 64 HZ   Driving Waveform : 1/N duty , 1/a bias

Definition of viewing angle(CR$\geqq$2)
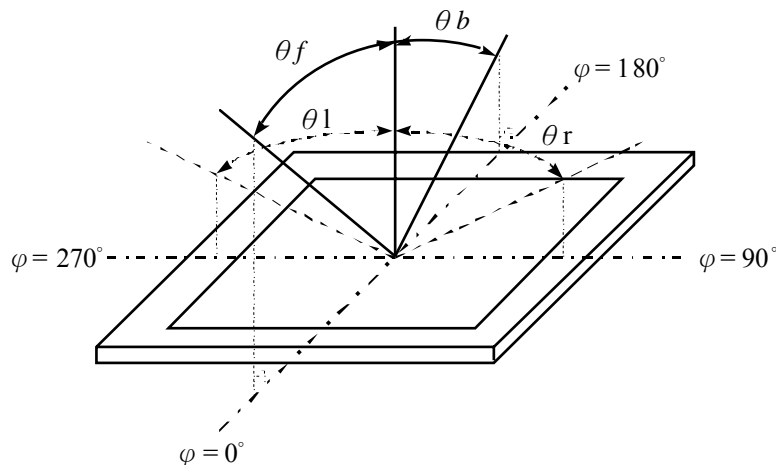
12. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	℃
Storage Temperature	T_{ST}	-30	—	+80	℃
Input Voltage	V_I	V_{SS}	—	V_{DD}	V
Supply Voltage For Logic	$V_{DD}-V_{SS}$	-0.3	—	7	V
Supply Voltage For LCD	$V_{DD}-V_0$	-0.3	—	13	V

13. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	$V_{DD}-V_{SS}$	—	4.5	5.0	5.5	V
Supply Voltage For LCD	$V_{DD}-V_0$	Ta=-20℃	—	—	5.5	V
		Ta=25℃	—	4.5	—	V
		Ta=+70℃	3.8	—	—	V
Input High Volt.	V_{IH}	—	0.7 V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	V_{SS}	—	0.6	V
Output High Volt.	V_{OH}	—	3.9	—	—	V
Output Low Volt.	V_{OL}	—	—	—	0.4	V
Supply Current	I_{DD}	V_{DD}=5V	1.0	1.2	1.5	mA

14. Backlight Information

Specification

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	ILED	28.8	32	50	mA	V=3.5V
Supply Voltage	V	3.4	3.5	3.6	V	
Reverse Voltage	VR	—	5	—	V	
Luminous Intensity	IV	210	230	—	CD/M^2	ILED=32mA
Wave Length	λ p				nm	ILED=32mA
Life Time		—	50K	—	Hr.	ILED=32mA
Color	White					

Note: The LED of B/L is drive by current only, drive voltage is for reference only.
drive voltage can make driving current under safety area (current between minimum and maximum).
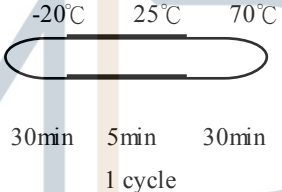
2.Drive from pin15,pin16
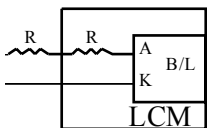
ill never get Vee output from pin15)

15. Reliability

Content of Reliability Test (wide temperature, -20℃~70℃)
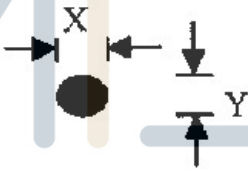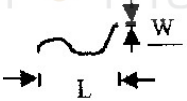
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 200hrs	___
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃ ,90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60℃ ,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20℃ 25℃ 70℃ 30min 5min 30min 1 cycle	-20℃/70℃ 10 cycles	___
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	___
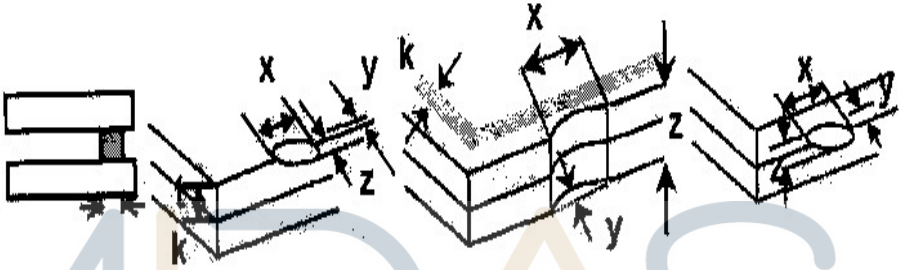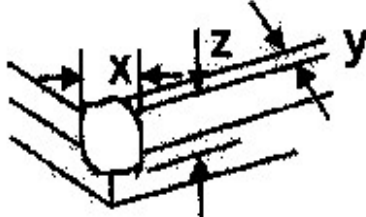
Note1: No dew condensation to be observed.
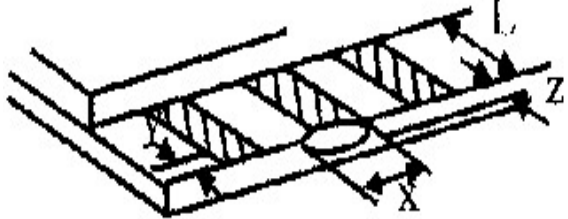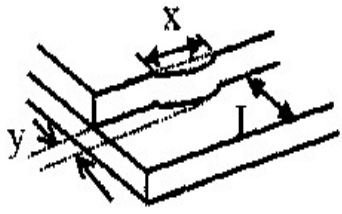
Note2: The function test shall be conducted after 4 hours storage at the normal

Temperature and humidity after remove from the test chamber.
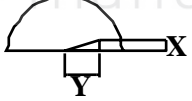
Note3: Vibration test will be conducted to the product itself without putting it in a container.

16. Inspection specification

NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character , dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Contrast defect.	0.65
02	Black or white spots on LCD (display only)	2.1 White and black spots on display $\leqq 0.25$mm, no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5
03	LCD black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi=(x + y)/2$ <table><tr><td>SIZE</td><td>Acceptable QTY</td></tr><tr><td>$\Phi \leqq 0.10$</td><td>Accept no dense</td></tr><tr><td>$0.10 < \Phi \leqq 0.20$</td><td>2</td></tr><tr><td>$0.20 < \Phi \leqq 0.25$</td><td>1</td></tr><tr><td>$0.25 < \Phi$</td><td>0</td></tr></table>	2.5
		3.2 Line type : (As following drawing) <table><tr><td>Length</td><td>Width</td><td>Acceptable QTY</td></tr><tr><td>---</td><td>$W \leqq 0.02$</td><td>Accept no dense</td></tr><tr><td>$L \leqq 3.0$</td><td>$0.02 < W \leqq 0.03$</td><td rowspan="2">2</td></tr><tr><td>$L \leqq 2.5$</td><td>$0.03 < W \leqq 0.05$</td></tr><tr><td>---</td><td>$0.05 < W$</td><td>As round type</td></tr></table>	2.5
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction. <table><tr><td>Size Φ</td><td>Acceptable QTY</td></tr><tr><td>$\Phi \leqq 0.20$</td><td>Accept no dense</td></tr><tr><td>$0.20 < \Phi \leqq 0.50$</td><td>3</td></tr><tr><td>$0.50 < \Phi \leqq 1.00$</td><td>2</td></tr><tr><td>$1.00 < \Phi$</td><td>0</td></tr><tr><td>Total QTY</td><td>3</td></tr></table>	2.5

NO	Item	Criterion	AQL
05	Scratches	Follow NO.3 LCD black spots, white spots, contamination	

Symbols Define:
x: Chip length   y: Chip width   z: Chip thickness
k: Seal width   t: Glass thickness   a: LCD side length
L: Electrode pad length:

6.1 General glass chip :
6.1.1 Chip on panel surface and crack between panels:

z: Chip thickness	y: Chip width	x: Chip length
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$
$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$

⊙If there are 2 or more chips, x is total length of each chip.

6.1.2 Corner crack:

z: Chip thickness	y: Chip width	x: Chip length
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$
$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$

⊙If there are 2 or more chips, x is the total length of each chip.

(Item 06: Chipped glass, AQL 2.5)

NO	Item	Criterion	AQL
06	Glass crack	Symbols : x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 6.2 Protrusion over terminal : 6.2.1 Chip on electrode pad : | y: Chip width	x: Chip length	z: Chip thickness
---	---	---
$y \leqq 0.5mm$	$x \leqq 1/8a$	$0 < z \leqq t$ | 6.2.2 Non-conductive portion: | y: Chip width	x: Chip length	z: Chip thickness
---	---	---
$y \leqq L$	$x \leqq 1/8a$	$0 < z \leqq t$ | ⊙If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. ⊙If the product will be heat sealed by the customer, the alignment mark not be damaged. 6.2.3 Substrate protuberance and internal crack. 	y: width	x: length
---	---
$y \leqq 1/3L$	$x \leqq a$		2.5

NO	Item	Criterion	AQL
07	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using LCD spot, lines and contamination standards. 8.3 Backlight doesn't light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down. 10.9 The Scraping testing standard for Copper Coating of PCB $X * Y <= 2mm^2$	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP. 12.2 No cracks on interface pin (OLB) of TCP. 12.3 No contamination, solder residue or solder balls on product. 12.4 The IC on the TCP may not be damaged, circuits. 12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever. 12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. 12.7 Sealant on top of the ITO circuit has not hardened. 12.8 Pin type must match type in specification sheet. 12.9 LCD pin loose or missing pins. 12.10 Product packaging must the same as specified on packaging specification sheet. 12.11 Product dimension and structure must conform to product specification sheet.	2.5 0.65 2.5 2.5 2.5 2.5 2.5 0.65 0.65 0.65 0.65
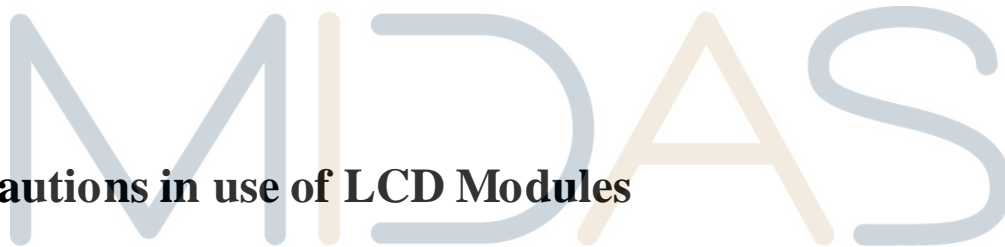
17. Precautions in use of LCD Modules

(1)Avoid applying excessive shocks to the module or making any alterations or modifications to it.

(2)Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.

(3)Don't disassemble the LCM.

(4)Don't operate it above the absolute maximum rating.

(5)Don't drop, bend or twist LCM.

(6)Soldering: only to the I/O terminals.

(7)Storage: please storage in anti-static electricity container and clean environment.

18. Material List of Components for RoHs

1. T ̃ã �æ Ố [{] [} ^ } ⊙ Ltd. hereby declares that all of or part of products, including, but not limited to, the LCM, accessories or packages, manufactured and/or delivered to your company (including your subsidiaries and affiliated company) directly or indirectly by our company (including our subsidiaries or affiliated companies) do not intentionally contain any of the substances listed in all applicable EU directives and regulations, including the following substances.

Exhibit A：The Harmful Material List

Material	(Cd)	(Pb)	(Hg)	(Cr6+)	PBBs	PBDEs
Limited Value	100 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm
Above limited value is set up according to RoHS.						

2.Process for RoHS requirement：
  (1) Use the Sn/Ag/Cu soldering surface; the surface of Pb-free solder is rougher than we used before.
  (2) Heat-resistance temp.：
    Reflow：250℃,30 seconds Max.；
    Connector soldering wave or hand soldering：320℃, 10 seconds max.
  (3) Temp. curve of reflow, max. Temp.：235±5℃；
    Recommended customer's soldering temp. of connector：280℃, 3 seconds.