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MCCOG22405A6W-FPTLWI	2 x 24	5mm Character Height	LCD Module
Specification			
Version: 1		Date: 21/07/2012	
Revision			
1	20/07/2012	First Issue.	

Display Features	
Character Count	2 x 24
Appearance	Black on White
Logic Voltage	3V/5V
Interface	I2C
Font Set	English / Japanese
Display Mode	Transflective
Character Height	4.67mm
LC Type	FSTN
Module Size	86.20 x 24.70 x 6.00mm
Operating Temperature	-20°C ~ +70°C
Construction	COG
LED Backlight	White

RoHS compliant

Box Quantity	Weight / Display
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* - For full design functionality, please use this specification in conjunction with the RW1062 specification. (Provided Separately)

Display Accessories	
Part Number	**Description**
MCCOG-I2C-I-8	Fine pitch(1.27mm) COG I2C interface board. Compatible with both Arduino and UC32 controller boards.

Optional Variants		
Fonts	**Appearances**	**Voltage**

General Specification

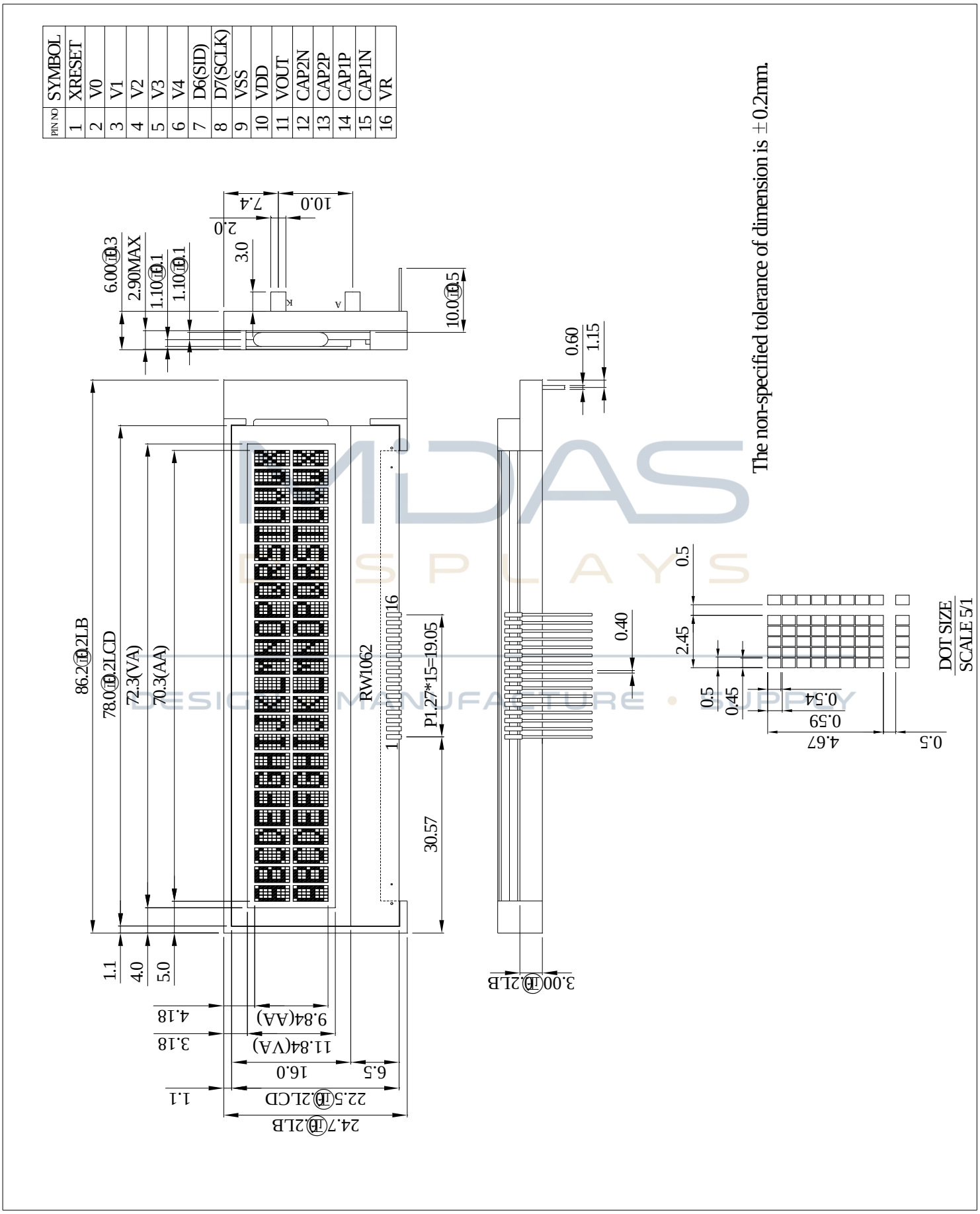
The Features of the Module is description as follow:

- Module dimension: 86.2 x 24.7 x 6.0(MAX) mm3
- View area: 72.3 x 11.84 mm2
- Active area: 70.3 x 9.84 mm2
- Number of Characters: 24 characters x 2 Lines
- Dot size: 0.45 x 0.54 mm2
- Dot pitch: 0.50x 0.59 mm2
- Character size: 2.45 x 4.67 mm2
- Character pitch: 2.95 x 5.17 mm2
- LCD type: FSTN Positive Transflective
- Duty: 1/17DUTY,1/5BIAS
- View direction: 6 o'clock
- Backlight Type: LED, White

Interface Pin Function

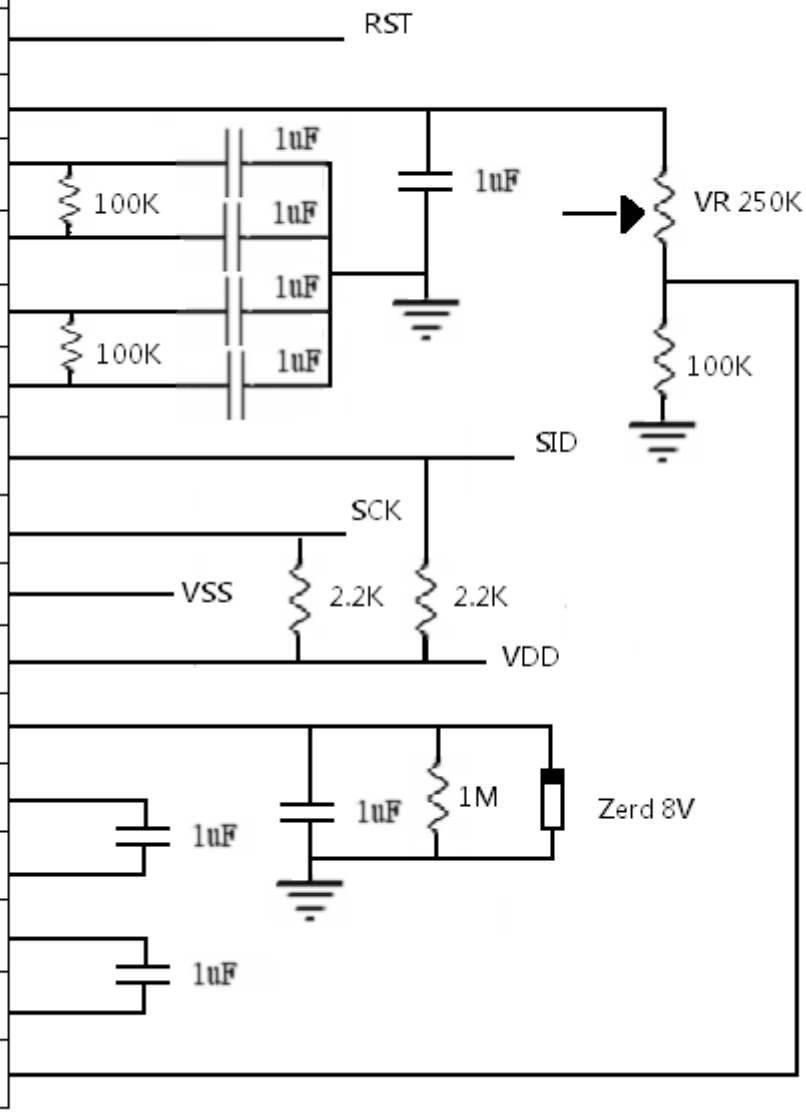
Pin No.	Symbol	Level	Description
1	XRESET		Reset pin，Initialized to Low
2~6	V0~V4		Bias voltage level for LCD driving
7	D6(SID)		Serial input data
8	D7(SCLK)		Serial clock
9	VSS		GND
10	VDD	3.0/5.0	Power supply
11	VOUT		Voltage converter output voltage
12	CAP2N		External Capacitance input, To use the voltage converter (2 times/ 3times), these pins must be connected to the external capacitance.
13	CAP2P		
14	CAP1P		
15	CAP1N		
16	VR		Reference voltage input to generate V0

Outline Dimension



Application schematic

PIN NO	SYMBOL
1	XRESET
2	V0
3	V1
4	V2
5	V3
6	V4
7	D6(SID)
8	D7(SCLK)
9	VSS
10	VDD
11	VOUT
12	CAP2N
13	CAP2P
14	CAP1P
15	CAP1N
16	VR



```
INITIALIZE:
        MOV     I2C_CONTROL,#00H    ;WRITE COMMAND
        MOV     I2C_DATA,#30H       ;Function Set RE=0
        LCALL   WRITE_CODE
        LCALL   DELAY_39uS
        MOV     I2C_DATA,#30H       ;Function Set RE=0
        LCALL   WRITE_CODE
        LCALL   DELAY_39uS
        MOV     I2C_DATA,#08H       ;DISPLAY OFF
        LCALL   WRITE_CODE
        LCALL   DELAY_39uS
        MOV     I2C_DATA,#06H       ;Entry Mode Set
        LCALL   WRITE_CODE
        LCALL   DELAY_39uS
        LCALL    CGRAM
        MOV     I2C_CONTROL,#00H
        MOV     I2C_DATA,#34H       ;Function Set RE=1
        LCALL   WRITE_CODE
        LCALL   DELAY_39uS
        MOV     I2C_DATA,#02H       ;Standby    Mode Set: (RE = 1)
        LCALL   WRITE_CODE          ;NORMAL MODE
        LCALL   DELAY_39uS
        MOV     I2C_DATA,#06H       ;Entry Mode Set: (RE = 1)
        LCALL   WRITE_CODE          ;SEG NORMAL    COM REVERSE
        LCALL   DELAY_39uS
        MOV     I2C_DATA,#16H       ;Booster on, Regulator on, Follower on
        LCALL   WRITE_CODE
        LCALL   DELAY_39uS
        MOV     I2C_DATA,#08H       ;Extended Function Set (RE = 1)
        LCALL   WRITE_CODE
        LCALL   DELAY_39uS
        MOV     I2C_DATA,#08H       ;Extended Function Set (RE = 1)
        LCALL   WRITE_CODE
        LCALL   DELAY_39uS
        MOV     I2C_CONTROL,#00H
        MOV     I2C_DATA,#30H       ;Function Set RE=0
        LCALL   WRITE_CODE
        LCALL   DELAY_39uS
        MOV     I2C_DATA,#0CH       ;DISPLAY ON,Cursor OFF,Cursor Blink OFF
```

```
LCALL   WRITE_CODE
;LCALL  DELAY_39uS
MOV             I2C_DATA,#01H           ;CLEAR DISPLAY
LCALL   WRITE_CODE
LCALL   DELAY_39uS
LCALL   DELAY_39uS
RET
```

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	-0.3	—	V_{DD}+0.3	V
Supply Voltage For Logic	V_{DD}	-0.3		5.5	V
LCD Driver Voltage	V_O	V_{SS}+7.0		Vss-0.3	V

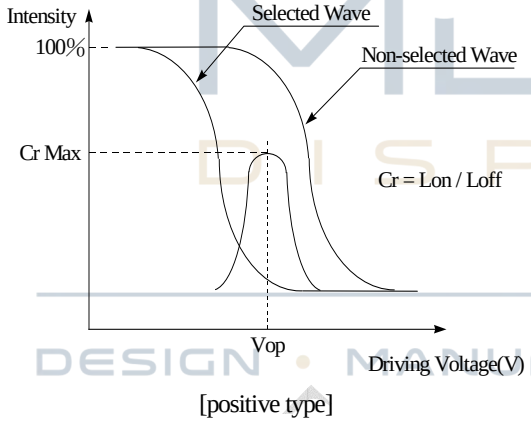
Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	—	—	3.0/5.0	—	V
Supply Voltage For LCD	V_O-V_{SS}	Ta=-20℃ Ta=25℃ Ta=70℃	— — —	— 4.5 —	— — —	V V V
Input High Volt.	V_{IH}	—	0.7 V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	-0.3	—	0.6	V
Output High Volt.	V_{OH}	—	0.75 V_{DD}	—	—	V
Output Low Volt.	V_{OL}	—	—	—	0.2V_{DD}	V
Supply Current(No include LED Backlight)	I_{DD}	—	—	0.92/ 2.01	—	mA

Optical Characteristics

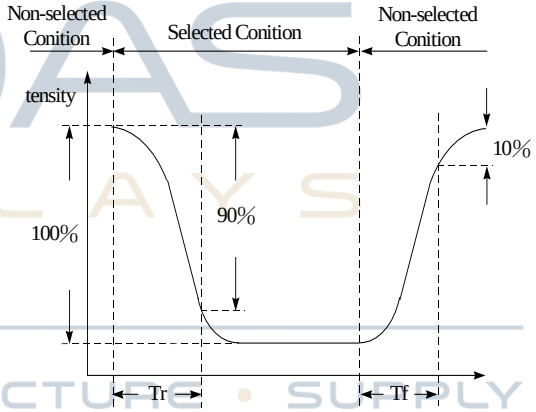
Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ	CR≧2	30	—	60	deg
	(H)φ	CR≧2	-45	—	45	deg
Contrast Ratio	CR	—	—	5	—	—
Response Time	T rise	—	—	200	300	ms
	T fall	—	—	200	300	ms

Definition of Operation Voltage (Vop)



[positive type]

Definition of Response Time (Tr , Tf)



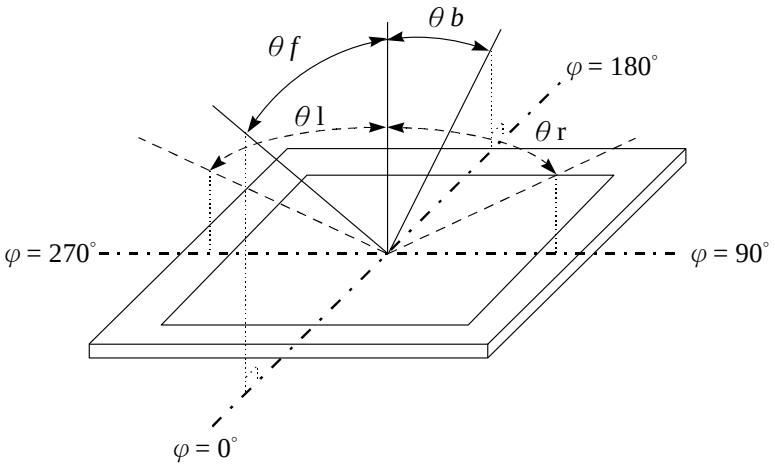
[positive type]

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≧2)



INTERFACE WITH MPU IN BUS MODE

For serial interface data, bus lines (DB6 and DB7) are used. IIC interface

The IIC interface receives and executes the commands sent via the IIC Interface. It also receives RAM

data and sends it to the RAM.

The IIC Interface is for bi-directional, two-line communication between different ICs or modules. Serial data line SDA (DB6) must be connected to a positive supply via a pull-up resistor. Data transfer may be initiated only when the bus is not busy.

* When IIC interface is selected, the INF register must be set to “1”.

BIT TRANSFER

One data bit is transferred during each clock pulse. The data on the SDA line must remain stable during the HIGH period of the clock pulse because changes in the data line at this time will be interpreted as a control signal. Bit transfer is illustrated in Fig.9.1

START AND STOP CONDITIONS

Both data and clock lines remain HIGH when the bus is not busy. A HIGH-to-LOW transition of the data line, while the clock is HIGH is defined as the START condition (S). A LOW-to-HIGH transition of the data line while the clock is HIGH is defined as the STOP condition (P). The START and STOP conditions are illustrated in Fig.9.2

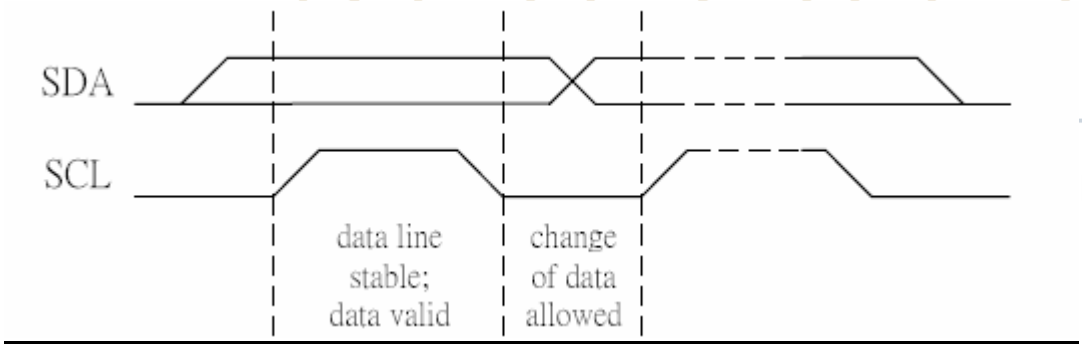


Fig 1 Bit transfer

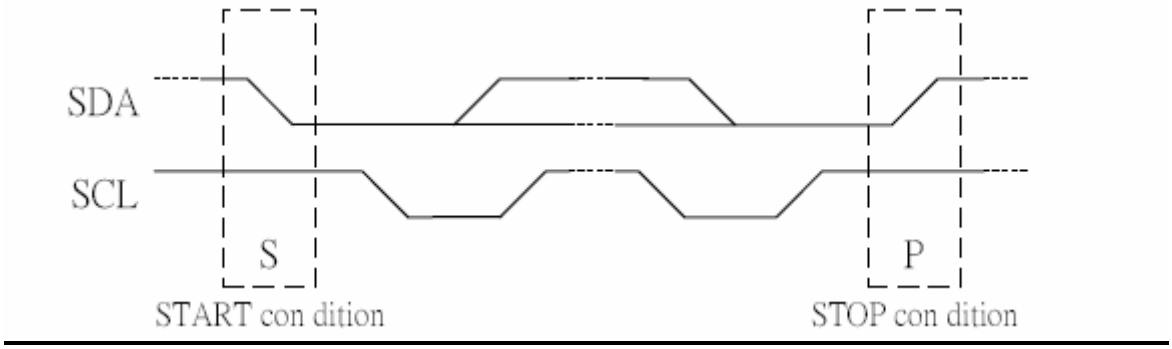


Fig 2 Definition of START and STOP conditions

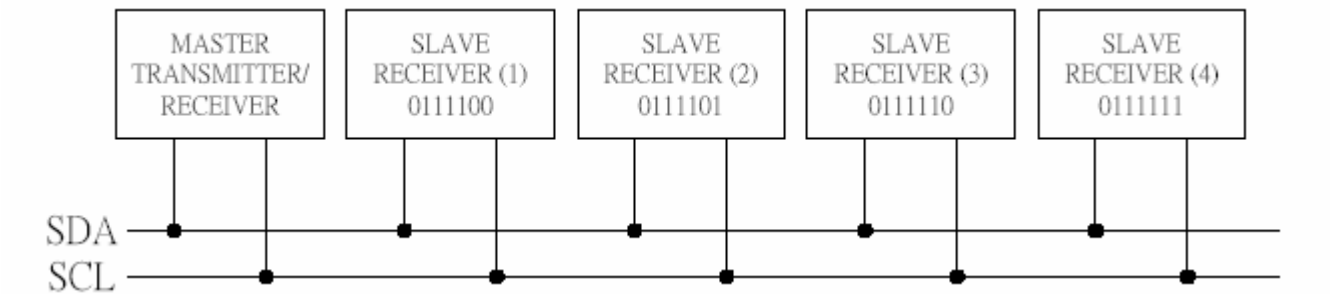


Fig 3 System configuration

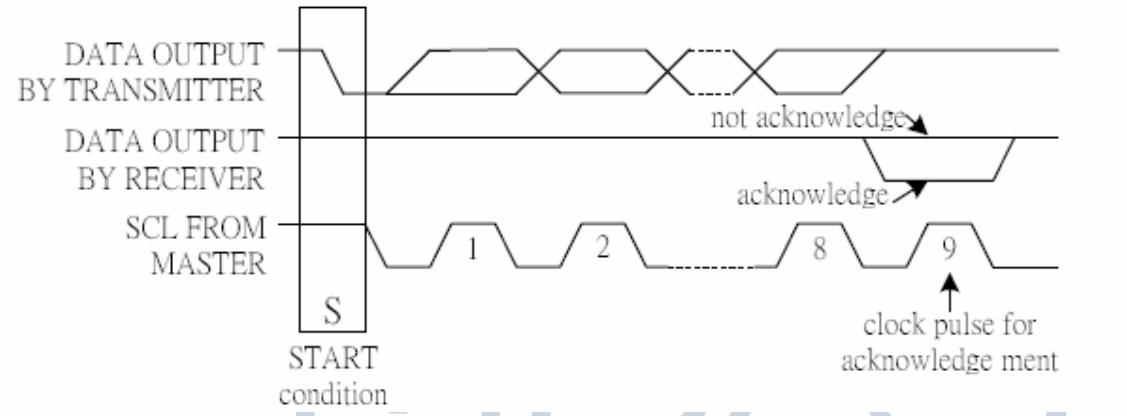


Fig 4 Acknowledgement on the 2-line Interface

SYSTEM CONFIGURATION

The system configuration is illustrated in Fig.9.3

· Transmitter: the device, which sends the data to the bus

· Receiver: the device, which receives the data from the bus

· Master: the device, which initiates a transfer, generates clock signals and terminates a transfer

· Slave: the device addressed by a master

· Multi-Master: more than one master can attempt to control the bus at the same time without corrupting the message

· Arbitration: procedure to ensure that, if more than one master simultaneously tries to control the bus, only one is allowed to do so and the message is not corrupted

· Synchronization: procedure to synchronize the clock signals of two or more devices.

ACKNOWLEDGE

Each byte of eight bits is followed by an acknowledge bit. The acknowledge bit is a HIGH signal put on the bus by the transmitter during which time the master generates an extra acknowledge related clock pulse. A slave receiver which is addressed must generate an Acknowledge after the reception of each byte. A master receiver must also generate an Acknowledge after the reception of each byte that has been clocked out of the slave transmitter. The device that acknowledges must pull-down the SDA line during the acknowledge clock pulse, so that the SDA line is stable LOW during the HIGH period of the Acknowledge related clock pulse (set-up and hold times must be taken into consideration). A master receiver must signal an end-of-data to the transmitter by not generating an Acknowledge on the last byte that has been clocked out

of the slave. In this event the transmitter must leave the data line HIGH to enable the master to generate a STOP condition. Acknowledgement on the IIC Interface is illustrated in Fig.9.4

IIC Interface protocol

The RW1062 supports command, data write addressed slaves on the bus.

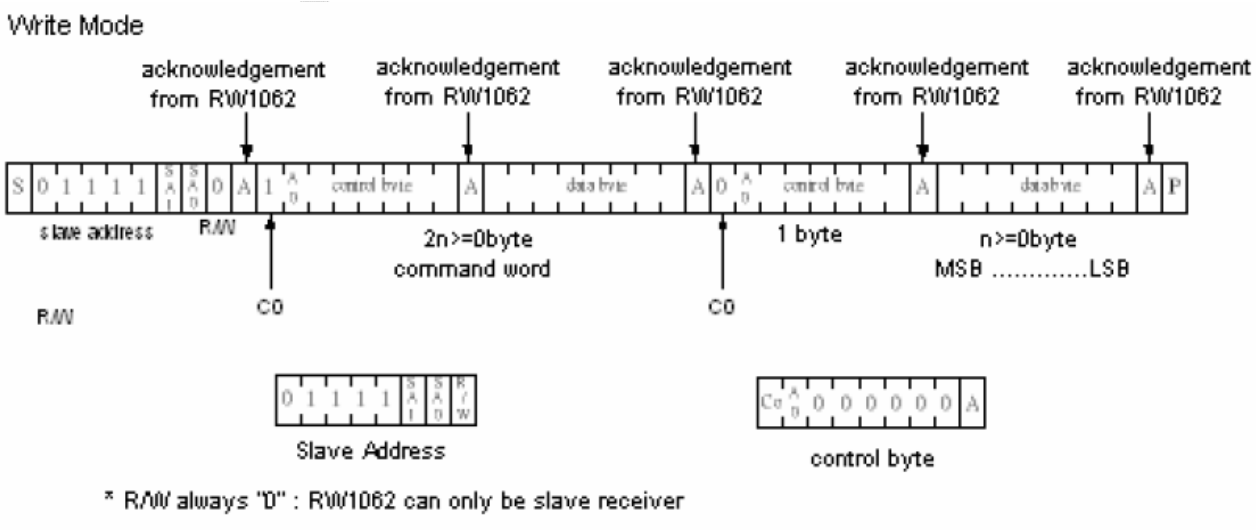
Before any data is transmitted on the IIC Interface, the device, which should respond, is addressed first. Four 7-bit slave addresses (0111100, 0111101, 0111110 and 0111111) are reserved for the RW1062. The least significant bit of the slave address is set by connecting the input DB0 and DB1 to either logic 0 (or logic 1 (VDD)).

The IIC Interface protocol is illustrated in Fig.9.5

The sequence is initiated with a START condition (S) from the IIC Interface master, which is followed by the slave address. All slaves with the corresponding address acknowledge in parallel, all the others will ignore the IIC Interface transfer. After acknowledgement, one or more command words follow which define the status of the addressed slaves.

A command word consists of a control byte, which defines Co and A0, plus a data byte.

The last control byte is tagged with a cleared most significant bit (i.e. the continuation bit Co). After a control byte with a cleared Co bit, only data bytes will follow. The state of the A0 bit defines whether the data byte is interpreted as a command or as RAM data. All addressed slaves on the bus also acknowledge the control and data bytes. After the last control byte, depending on the A0 bit setting; either a series of display data bytes or command data bytes may follow. If the A0 bit is set to logic 1, these display bytes are stored in the display RAM at the address specified by the data pointer. The data pointer is automatically updated and the data is directed to the intended RW1062 device. If the A0 bit of the last control byte is set to logic 0, these command bytes will be decoded and the setting of the device will be changed according to the received commands. Only the addressed slave makes the acknowledgement after each byte. At the end of the transmission the IIC interface-bus master issues a STOP condition (P). If no acknowledge is generated by the master after a byte, the driver stops transferring data to the master.



***SA1,SA0 Always=0**

Fig 5 2-line Interface protocol

Co	0	Last control byte to be sent. Only a stream of data bytes is allowed to follow. This stream may only be terminated by s STOP or RE-START condition.
	1	Another control byte will follow the data byte unless a STOP or RE-START condition is received.

Font table

RW1062 Font table (0A-001)

Backlight Information

Specification

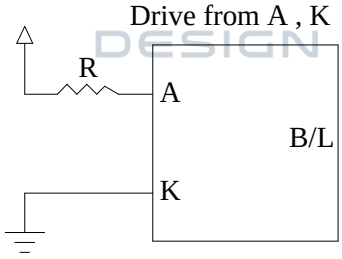
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	ILED	43.2	48	75	mA	V=3.5V
Supply Voltage	V	3.4	3.5	3.6	V	
Reverse Voltage	VR	—	—	5	V	—
Luminous Intensity (Without LCD)	IV	570	613	—	CD/M^2	ILED=48mA
LED Life Time	—	—	50K	—	Hr.	$I_{LED} \leqq 48mA$
Color	White					

Note: The LED of B/L is drive by current only；driving voltage is only for reference To make driving current in safety area (waste current between minimum and maximum).

Note1 :50K hours is only an estimate for reference.

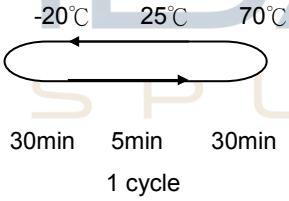
LED B\L Drive Method

Drive from A , K



Reliability

Content of Reliability Test (wide temperature, -20℃~70℃)

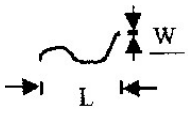
Environmental Test			
Test Item	**Content of Test**	**Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature 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℃/70℃ 10 cycles	-
Vibration test	Endurance test applying the vibration during transportation and using.	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.

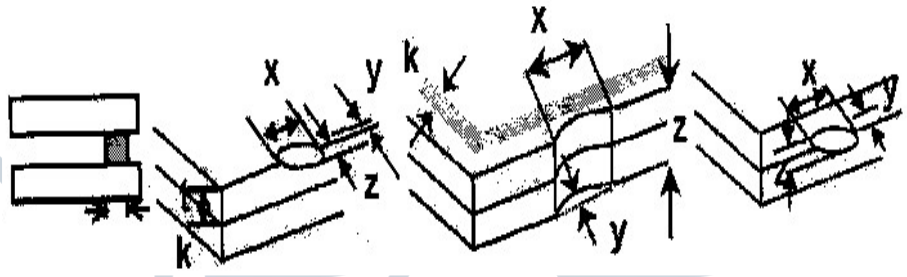
Note3: Vibration test will be conducted to the product itself without putting it in a container.

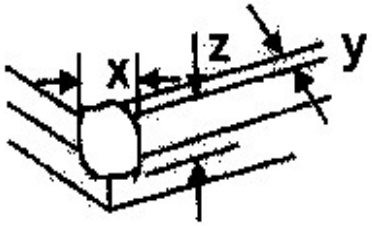
Inspection specification

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>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.</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or white spots on LCD (display only)</td><td>2.1 White and black spots on display ≦0.25mm, no more than three white or black spots present.
2.2 Densely spaced: No more than two spots or lines within 3mm</td><td>2.5</td></tr>
<tr><td rowspan="2">03</td><td rowspan="2">LCD black spots, white spots, contamination (non-display)</td><td>3.1 Round type : As following drawing
Φ=(x + y) / 2</td><td>2.5</td></tr>
<tr><td>3.2 Line type : (As following drawing)
 

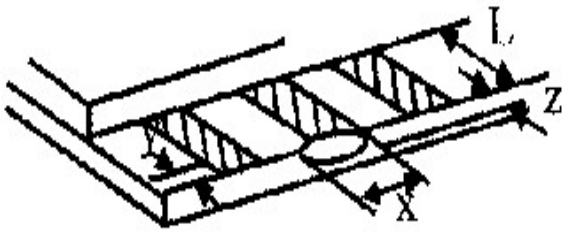
<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Q TY</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>Accept no dense</td></tr>
<tr><td>L≦3.0</td><td>0.02＜W≦0.03</td><td rowspan="2">2</td></tr>
<tr><td>L≦2.5</td><td>0.03＜W≦0.05</td></tr>
<tr><td>---</td><td>0.05＜W</td><td>As round type</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.
<table>
<tr><th>Size Φ</th><th>Acceptable Q TY</th></tr>
<tr><td>Φ≦0.20</td><td>Accept no dense</td></tr>
<tr><td>0.20＜Φ≦0.50</td><td>3</td></tr>
<tr><td>0.50＜Φ≦1.00</td><td>2</td></tr>
<tr><td>1.00＜Φ</td><td>0</td></tr>
<tr><td>Total Q TY</td><td>3</td></tr>
</table></td><td>2.5</td></tr>
</table>

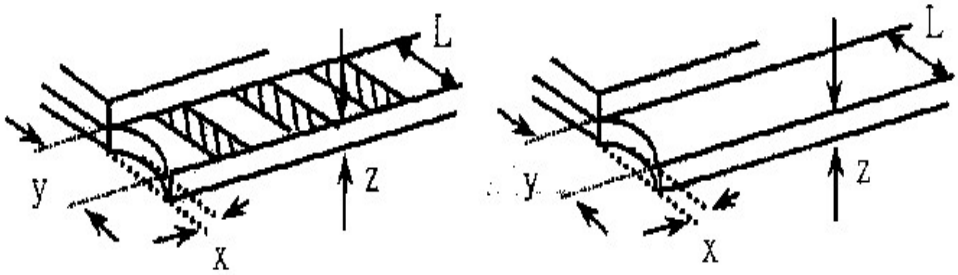
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 LCD black spots, white spots, contamination</td><td></td></tr>
<tr><td>06</td><td>Chipped glass</td><td>
Symbols Define:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Glass thickness a: LCD side length
L: Electrode pad length:

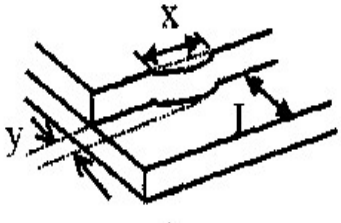
6.1 General glass chip :
6.1.1 Chip on panel surface and crack between panels:


<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙If there are 2 or more chips, x is total length of each chip.
6.1.2 Corner crack:


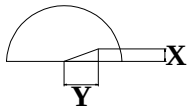
<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙If there are 2 or more chips, x is the total length of each chip.
</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>06</td><td>Glass crack</td><td>
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 :


<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦0.5mm</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr>
</table>
6.2.2 Non-conductive portion:


<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦ L</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr>
</table>
⊙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.


<table>
<tr><td>y: width</td><td>x: length</td></tr>
<tr><td>y≦1/3L</td><td>x ≦ a</td></tr>
</table>
</td><td>2.5</td></tr>
</table>

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 causes 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

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.
8. Midas have the right to change the passive components
   (Resistors,capacitors and other passive components will have different appearance and color caused by the different supplier.)
9. Midas have the right to change the PCB Rev.

Material List of Components for RoHs

1. Midas Components 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.

Recommendable storage

1. Place the panel or module in the temperature 25°C±5℃ and the humidity below 65% RH
2. Do not place the module near organics solvents or corrosive gases.
3. Do not crush, shake, or jolt the module