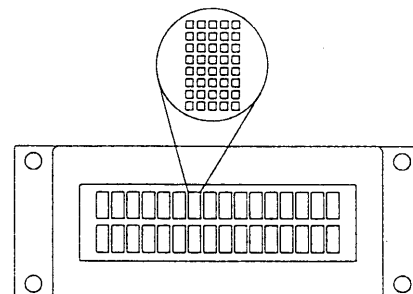


481-683

**BATRON DOT MATRIX LCD DISPLAY MODULE****BT21603STYC - 70C****BT21603STYC - 70C****MICRO MINATURE CONSTRUCTION****2 LINE x 16 CHARACTERS****3 mm HIGH****5 x 7 DOT MATRIX****FEATURES**

Single 5v Supply  
 Low Power LED Backlight  
 ASCII & Katakana Character Set  
 Extensive Command Set  
 Compact Single Board Construction  
 SBE Supertwist Technology

**APPLICATION**

Readout for computer systems, communication terminal, automatic instruments and Portable Equipment.

**CONSTRUCTION**

Single board display module consisting of 32 character LCD, HD44100 Driver, HD44780 Controller and Yellow LED Backlight.

**MECHANICAL SPECIFICATIONS**

|                  |                         |
|------------------|-------------------------|
| No of Characters | 2 Lines x 16 Characters |
| Matrix Format    | 5 x 7 dot character     |
| PCB Dimensions   | 53 x 20 mm (XxY)        |
| Display Area     | 36 x 10 mm (XxY)        |
| Character Size   | 1.85 x 2.75 mm (XxY)    |
| Character Pitch  | 2.15 x 4.25 mm (XxY)    |
| Dot Size         | 0.33 x 0.35 mm (XxY)    |
| Dot Pitch        | 0.38 x 0.40 mm (XxY)    |

**ENVIRONMENTAL SPECIFICATIONS**

|                       |               |
|-----------------------|---------------|
| Operating Temperature | 0 to + 50°C   |
| Storage Temperature   | -20 to + 60°C |
| Operating Humidity    | ≥ 40 to 95%RH |

**OPTICAL CHARACTERISTICS**

|                        |                          |
|------------------------|--------------------------|
| Viewing Angle          | 60° Min.                 |
| Contrast Ratio         | 8 Min. 20 Typ.           |
| Colour of Illumination | Black on Greenish Yellow |

**ABSOLUTE MAXIMUM RATINGS**

| Parameter            | Symbol | Description                                |
|----------------------|--------|--------------------------------------------|
| Logic Supply Voltage | VDD    | 0 VDC to 6.5 VDC VDD ( VDD - VSS )         |
| LCD Supply Voltage   | VEE    | 0 VDC to 2.5 VDC VEE ( VDD - V0 )          |
| Input Voltage        | VI     | 0 VDC to 7.0 VDC VSS Minimum. VDD Maximum. |

**ELECTRICAL CHARACTERISTICS**

| Parameter                   | Symbol | Min | Typ | Max | Unit | Condition  |
|-----------------------------|--------|-----|-----|-----|------|------------|
| Logic High Input Voltage    | VINH   | 2.2 | --- | --- | VDC  | VCC = 5.0V |
| Logic Low Input Voltage     | VINL   | --- | --- | 0.6 | VDC  | VCC = 5.0V |
| Logic High Output Voltage   | VOH    | 2.4 | --- | --- | VDC  |            |
| Logic Low Output Voltage    | VOL    | --- | --- | 0.4 | VDC  |            |
| Logic Supply Current        | IDD    |     | 1.0 |     | mADC |            |
| Supply Current (LCD Driver) | IO     |     | 0.5 |     | mADC |            |
| Supply Voltage (LED)        | VCC    | 3.8 | 4.1 | 4.4 | VDC  |            |
| Supply Current (LED)        | ICC    |     | 20  | 35  | mADC | at 25°C    |
| LED Segments                |        |     | 2   |     | Pcs  |            |

Note: Power On rise time for VCC should be less than 10ms.

## SOFTWARE COMMANDS

Display control commands can be sent when RS and R/W are ' Low '.

## Control Codes

| Instruction                 | RS | RW | D7         | D6  | D5  | D4 | D3    | D2    | D1                                 | D0                                                                                                        | Description                                                                                                                            |
|-----------------------------|----|----|------------|-----|-----|----|-------|-------|------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Clear Display               | 0  | 0  | 0          | 0   | 0   | 0  | 0     | 0     | 0                                  | 1                                                                                                         | Clears entire display and set DD RAM address 0 in address counter.                                                                     |
| Return Home                 | 0  | 0  | 0          | 0   | 0   | 0  | 0     | 0     | 1                                  | *                                                                                                         | Sets DD RAM address 0 in address counter Returns the display being shifted to its original position. DD RAM contents remain unchanged. |
| Entry Mode Set              | 0  | 0  | 0          | 0   | 0   | 0  | 0     | 1     | I / D                              | S                                                                                                         | Sets cursor move direction and specifies shift of display. These operations are performed during data Write and Read.                  |
| Display ON/OFF              | 0  | 0  | 0          | 0   | 0   | 0  | 1     | D     | C                                  | B                                                                                                         | Sets ON/OFF of all display (D), cursor ON/OFF (C) and blink of cursor position character (B).                                          |
| Cursor or Display Shift     | 0  | 0  | 0          | 0   | 0   | 1  | S / C | R / L | *                                  | *                                                                                                         | Moves cursor and shifts display without changing DD RAM contents.                                                                      |
| Function Set                | 0  | 0  | 0          | 0   | 1   | DL | N     | F     | *                                  | *                                                                                                         | Sets interface data length (DL), number of display lines (N) and character font (F).                                                   |
| Set CG RAM Address          | 0  | 0  | 0          | 1   | ACG |    |       |       |                                    |                                                                                                           | Sets CG RAM address. CG RAM data is sent and received after this setting.                                                              |
| Set DD RAM Address          | 0  | 0  | 1          | ADD |     |    |       |       |                                    | Sets DD RAM address. DD RAM data is sent and received after this setting.                                 |                                                                                                                                        |
| Read Busy Flag and Address  | 0  | 1  | BF         | AC  |     |    |       |       |                                    | Reads busy flag (BF) indicating internal operation is being performed and reads address counter contents. |                                                                                                                                        |
| Write Data to CG or DD RAM  | 1  | 0  | Write Data |     |     |    |       |       | Writes data into DD RAM or CG RAM. |                                                                                                           |                                                                                                                                        |
| Read Data from CG or DD RAM | 1  | 1  | Read Data  |     |     |    |       |       | Reads data from DD RAM or CG RAM.  |                                                                                                           |                                                                                                                                        |

| Code   | Condition                                           |                               |
|--------|-----------------------------------------------------|-------------------------------|
| I/D    | 1 : Increment Cursor                                | 0 : Decrement Cursor          |
| R/L    | 1 : Shift to the right                              | 0 : Shift to the left         |
| S/C    | 1 : Set Display shift                               | 0 : Set Cursor shift          |
| BF     | 1 : Internally operating                            | 0 : Instruction acceptable    |
| DL     | 1 : 8 Bit long interface data                       | 0 : 4 Bit long interface data |
| F      | 1 : 5 x 10 Dot characterfont                        | 0 : 5 x 7 Dot characterfont   |
| N      | 1 : 2 line display                                  | 0 : 1 line display            |
| S      | 1 : Accompanies display shift                       |                               |
| AC     | Address counter used for both DD and CG RAM address |                               |
| ACG    | CG RAM address                                      |                               |
| ADD    | DD RAM address - Corresponds to cursor address      |                               |
| CG RAM | Character Generator RAM                             |                               |
| DD RAM | Display Data RAM                                    |                               |

## DEFAULT SETTINGS

|                                        |                                                                                                                                                                                                                     |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display Attributes<br>(Power On Reset) | Display Clear<br>Function Set : 8 Bit long interface data, 1 - Line display, 5 x 7 dot character font.<br>Display ON/OFF control : Display OFF, Cursor OFF, Blink OFF.<br>Entry Mode Set : + 1 Increment, No Shift. |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# BATRON DOT MATRIX LCD DISPLAY MODULE

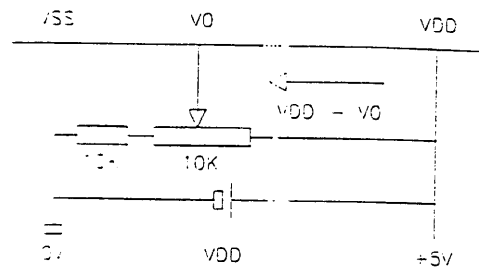
BT21603STYC - 70C

## CHARACTER SET

| L  | H | 00 | 10 | 20    | 30 | 40 | 50 | 60 | 70 | 80 | 90 | A0 | B0 | C0 | D0 | E0 | F0 |
|----|---|----|----|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 00 |   |    |    | 00P   | '  | P  |    |    |    |    |    | -  | 0  | 1  | 2  | 3  | P  |
| 01 |   |    |    | !1RQ  | a  | a  |    |    |    |    |    | =  | 7  | 7  | 4  | 2  | 9  |
| 02 |   |    |    | "2BR  | b  | r  |    |    |    |    |    | "  | 4  | 7  | 7  | 8  | 8  |
| 03 |   |    |    | #3CS  | c  | s  |    |    |    |    |    | #  | 0  | 7  | e  | s  | *  |
| 04 |   |    |    | \$4DT | d  | t  |    |    |    |    |    | \$ | I  | 1  | t  | P  | Q  |
| 05 |   |    |    | %5EU  | e  | u  |    |    |    |    |    | %  | 7  | 7  | 1  | 6  | 0  |
| 06 |   |    |    | &6FU  | f  | u  |    |    |    |    |    | &  | 0  | 1  | 3  | P  | Z  |
| 07 |   |    |    | '7GW  | g  | w  |    |    |    |    |    | '  | 7  | 7  | 7  | 9  | A  |
| 08 |   |    |    | (8HX  | h  | x  |    |    |    |    |    | (  | 0  | 7  | 7  | 5  | X  |
| 09 |   |    |    | )9IY  | i  | y  |    |    |    |    |    | )  | 0  | 7  | 7  | 1  | Y  |
| 0A |   |    |    | *:JZ  | j  | z  |    |    |    |    |    | *  | 0  | 1  | 0  | V  | J  |
| 0B |   |    |    | +;KL  | k  | l  |    |    |    |    |    | +  | 7  | 7  | 0  | *  | A  |
| 0C |   |    |    | ,<L   | l  | l  |    |    |    |    |    | ,  | 0  | 7  | 7  | 0  | A  |
| 0D |   |    |    | -=M   | m  | m  |    |    |    |    |    | -  | 7  | 7  | 0  | 7  | 7  |
| 0E |   |    |    | .>N   | n  | n  |    |    |    |    |    | .  | 0  | 7  | 7  | 0  | A  |
| 0F |   |    |    | /?O   | _  | o  |    |    |    |    |    | /  | 7  | 7  | 0  | 7  | 7  |

Display character data can be written or read when RS is ' High '.

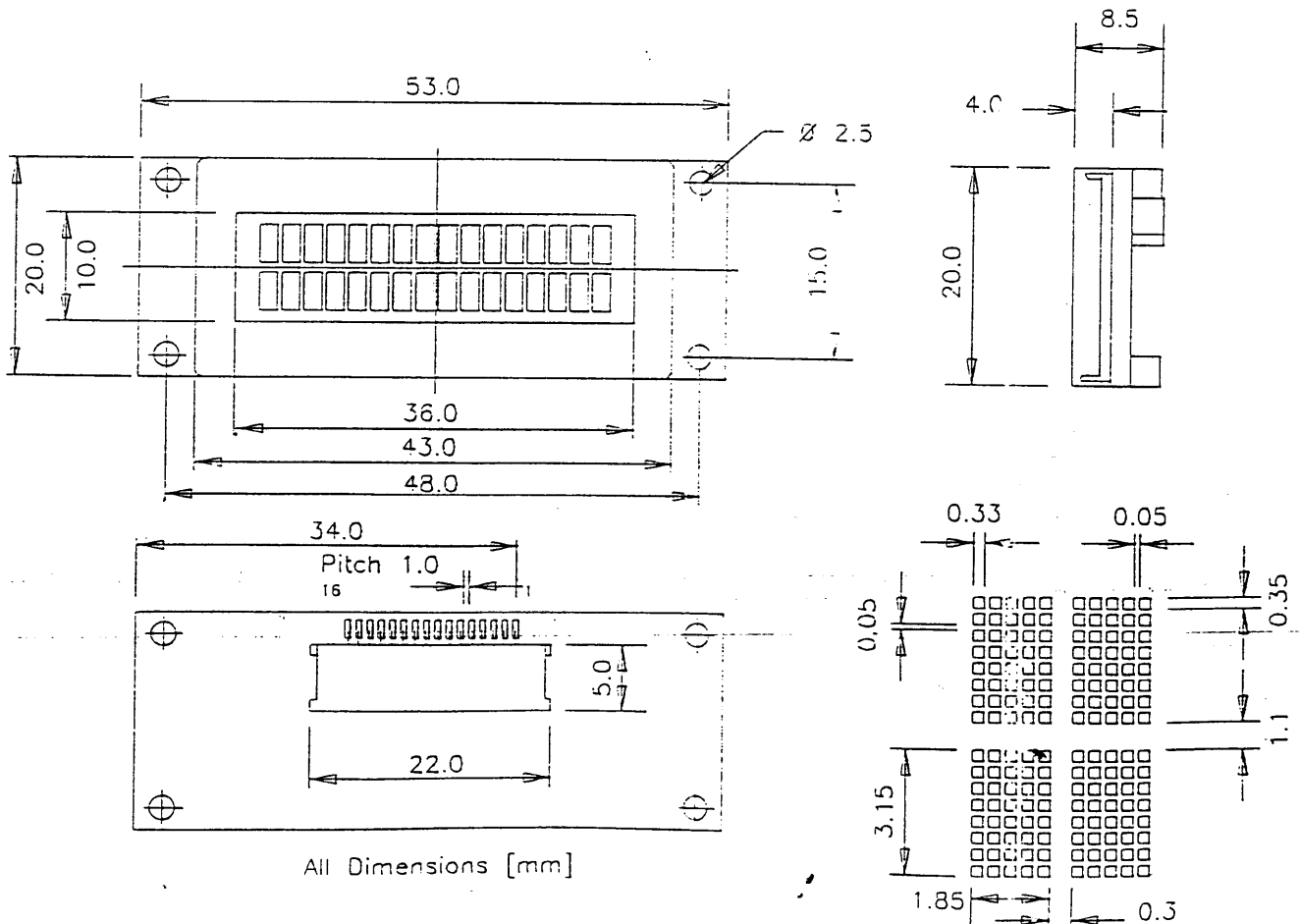
## SUPPLY VOLTAGE CIRCUIT FOR LCD MODULE



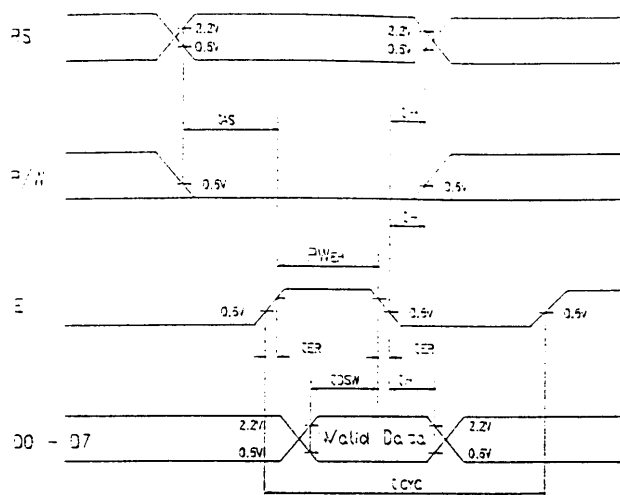
Adjust V0 to give optimum contrast.

| Pin No | Function                      |
|--------|-------------------------------|
| 1      | GND                           |
| 2      | Power Supply, 5V              |
| 3      | Supply Voltage ( LCD Driver ) |
| 4      | Register Select               |
| 5      | Read / Write                  |
| 6      | Enable                        |
| 7      | D0                            |
| 8      | D1                            |
| 9      | D2                            |
| 10     | D3                            |
| 11     | D4                            |
| 12     | D5                            |
| 13     | D6                            |
| 14     | D7                            |
| 15     | Anode of LED Unit             |
| 16     | Cathode of LED Unit           |

## MECHANICAL DRAWING

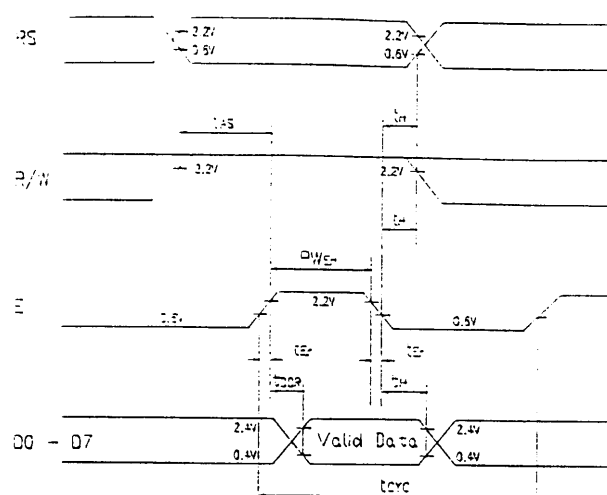


## TIMING DIAGRAM



Data Write

Writing data from MPU to Display module



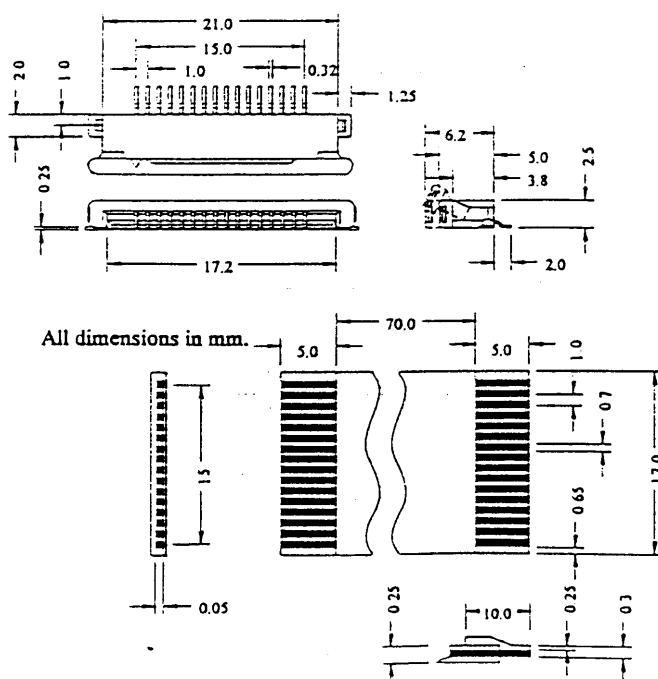
Data Read

Reading out data from Display module to MPU

| Item                    | Symbol    | Min  | Max | Unit  | Item                    | Symbol    | Min  | Max | Unit  |
|-------------------------|-----------|------|-----|-------|-------------------------|-----------|------|-----|-------|
| Enable cycle Time       | tBUSY     | 1000 |     | n sec | Enable cycle Time       | tBUSY     | 1000 |     | n sec |
| Enable Pulse Width      | PwEH      | 450  | -   | n sec | Enable Pulse Width      | PwEH      | 450  | -   | n sec |
| Enable Rise / Fall Time | tER / tED | -    | 25  | n sec | Enable Rise / Fall Time | tER / tED | -    | 25  | n sec |
| Address Set Up Time     | tAS       | 140  | -   | n sec | Address Set Up Time     | tAS       | 140  | -   | n sec |
| Address Hold Time       | tAH       | 10   | -   | n sec | Address Hold Time       | tAH       | 10   | -   | n sec |
| Data Set Up Time        | tDSW      | 195  | -   | n sec | Data Delay Time         | tDSW      | -    | 320 | n sec |
| Data Hold Time          | tH        | 10   | -   | n sec | Data Hold Time          | tH        | 20   | -   | n sec |

## DISPLAY CONNECTOR OPTION

| Part No. | Description                        |
|----------|------------------------------------|
| PFC16-70 | 16 way film cable 70mm length      |
| SMC16    | 16 way SMD connector ( 1mm pitch ) |



## HANDLING PRECAUTIONS

- \* Do not alter, modify or change the shape of the clips on the metal frame.
- \* Do not drill holes in the printed circuit board, modify its shape or change the positions of components.
- \* Do not damage or modify the pattern wiring on the printed circuit board.
- \* Absolutely do not modify or change the internal connector ( conductive rubber) or touch it with any other object.
- \* Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- \* Do not drop, bend or twist LCM.

Please contact your sales office before returning modules.

Possible repairs of such modules will be invoiced.

Subject : BT2163STYC-70-C PINOUT 

PLEASE FIND PINOUT DETAILS BELOW:

| PIN     | SYMBOL                 |
|---------|------------------------|
| 1       | Vss (gnd)              |
| 2       | VDD (+5V)              |
| 3       | VEE                    |
| 4       | RS                     |
| 5       | $\overline{\text{RW}}$ |
| 6       | E                      |
| 7 TO 14 | D0 TO D7               |
| 15      | +VLED                  |
| 16      | -VLED                  |