

XIAMEN PRECISE DISPLAY CO., LTD.

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

PART NUMBER:

PCM1602B-NSW-BBWC-UN

DATE:

2021.07.01

1.0 MECHANICAL SPECS

| | |
|-------------------------------|---|
| 1. Overall Module Size | 84.0mm(W) x 44.0mm(H) x max 13.0mm(D) for LED backlight version |
| 2. Dot Size | 0.56mm(W) x 0.61mm(H) |
| 3. Dot Pitch | 0.61mm(W) x 0.66mm(H) |
| 4. Duty | 1/16 |
| 5. Controller IC | ST7066U or Equivalent |
| 6. LC Fluid Options | STN |
| 7. Polarizer Options | BLUE, TRANSMISSIVE, NEGATIVE |
| 8. Viewing Angle | 6:00 o'clock |
| 9. Backlight Options | LED(White), Vbk=5.0V/65mA |
| 10. Temperature Range Options | Wide Temp: (-20°C ~ 70°C), Storage: (-30°C ~ 80°C) |

2.0 ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Min | Typ | Max | Unit |
|--|----------|-----|------|-----|------|
| Operating temperature (Wide temperature) | Top | -20 | - | 70 | °C |
| Storage temperature (Wide temperature) | Tst | -30 | - | 80 | °C |
| Input voltage | Vin | Vss | | Vdd | V |
| Supply voltage for logic | Vdd- Vss | 4.5 | 5.0- | 5.5 | V |
| Supply voltage for LCD drive | Vdd- Vo | 4.2 | 4.5 | 4.7 | V |

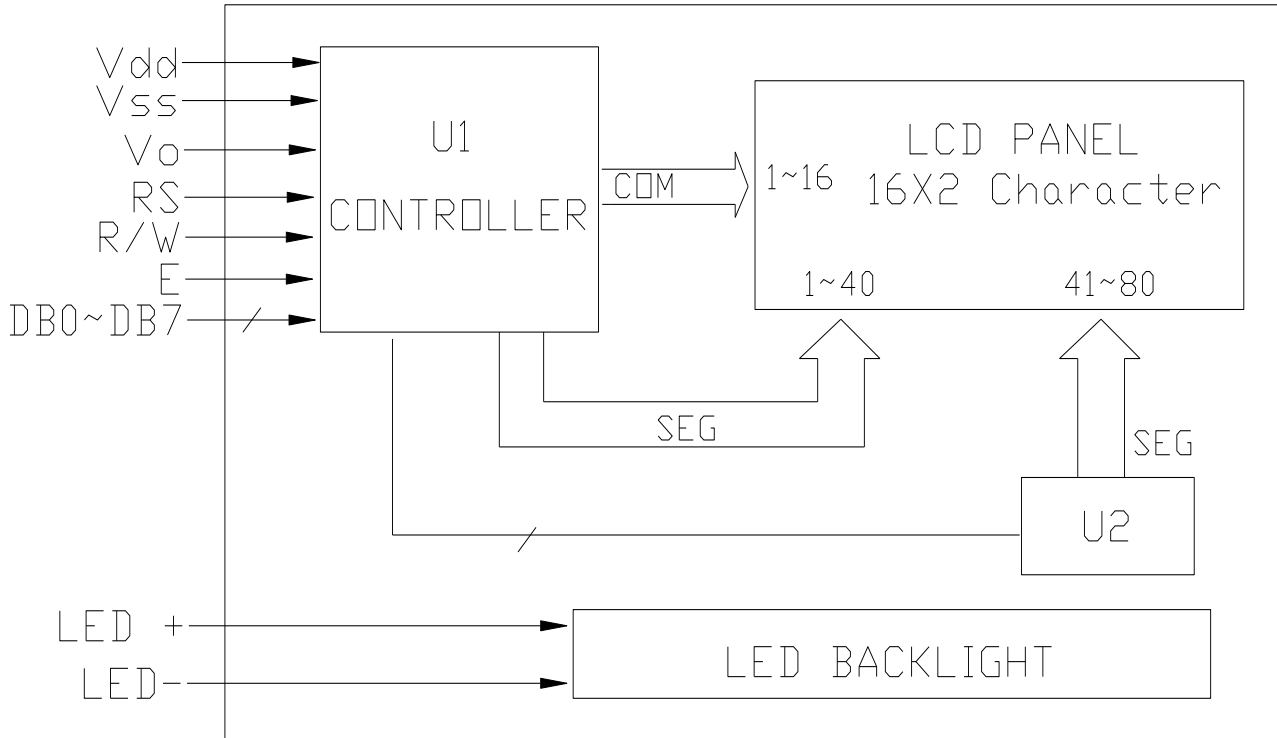
3.0 ELECTRICAL CHARACTERISTICS

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|--|----------|--------------------------|-----|-----|-----|------|
| Power Supply Voltage | Vdd | fosc=270kHz | 4.5 | 5.0 | 5.5 | V |
| Power Supply Current | Idd | Vdd=5.0V, fosc=270kHz | - | 0.8 | 1.8 | mA |
| Recommended LC Driving Voltage (Standard Temp) | Vdd - Vo | 0°C | - | 4.8 | 5.4 | V |
| | | 25°C | 4.3 | 4.5 | - | |
| | | 50°C | 3.9 | 4.3 | - | |
| Recommended LC Driving Voltage (Wide Temp) | Vdd -Vo | -20°C | - | 6.4 | 7.2 | V |
| | | 0°C | - | 4.8 | - | |
| | | 50°C | - | 4.2 | - | |
| | | 70°C | 3.5 | 4.0 | - | |
| BackLight Supply Voltage | Vf | R=33Ω | - | 5.0 | 5.5 | V |
| BackLight Supply Current | If | R=33Ω | - | 65 | | mA |

4.0 OPTICAL CHARACTERISTICS (Ta=25°C, Vdd= 5.0V±0.25V, STN LC fluid)

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------------|--------|------------|-----|-----|-----|------|
| Viewing angle (horizontal) | θ | Cr ≥ 2.0 | -60 | - | 35 | deg |
| Viewing angle (vertical) | φ | Cr ≥ 2.0 | -40 | - | 40 | deg |
| Contrast Ratio | Cr | φ=0°, θ=0° | - | 6 | - | |
| Response time (rise) | Tr | φ=0°, θ=0° | - | 150 | 250 | ms |
| Response time (fall) | Tf | φ=0°, θ=0° | - | 150 | 250 | ms |

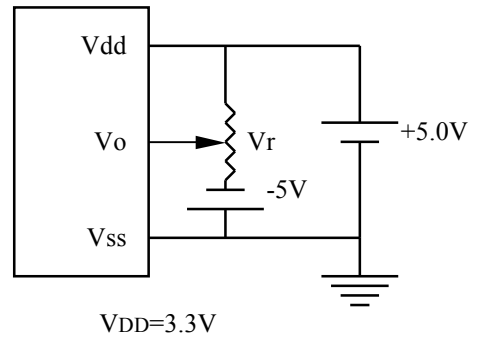
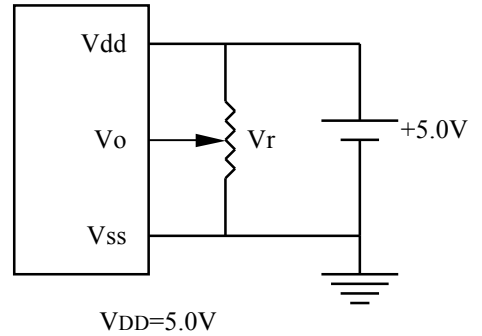
5.0 BLOCK DIAGRAM



6.0 PIN ASSIGNMENT

| Pin No. | Symbol | Function |
|---------|--------|----------------------|
| 1 | Vss | Ground |
| 2 | Vdd | +5.0V |
| 3 | Vo | LCD contrast adjust |
| 4 | RS | Register select |
| 5 | R/W | Read / write |
| 6 | E | Enable |
| 7 | DB0 | Data bit 0 |
| 8 | DB1 | Data bit 1 |
| 9 | DB2 | Data bit 2 |
| 10 | DB3 | Data bit 3 |
| 11 | DB4 | Data bit 4 |
| 12 | DB5 | Data bit 5 |
| 13 | DB6 | Data bit 6 |
| 14 | DB7 | Data bit 7 |
| 15 | A | Power Supply for BL+ |
| 16 | K | Power Supply for BL- |

7.0 POWER SUPPLY



$V_r = 10K\Omega \sim 20K\Omega$

8.0 TIMING CHARACTERISTICS

| Item | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|-----------------------|------------|----------------|------|------|------|------|
| Enable cycle time | t_c | Fig. a, Fig. b | 500 | - | - | ns |
| Enable pulse width | t_w | Fig. a, Fig. b | 220 | - | - | ns |
| Enable rise/fall time | t_R, t_F | Fig. a, Fig. b | - | - | 25 | ns |
| RS, R/W set up time | t_{SU} | Fig. a, Fig. b | 40 | - | - | ns |
| RS, R/W hold time | t_H | Fig. a, Fig. b | 10 | - | - | ns |
| Data delay time | t_D | Fig. b | - | - | 120 | ns |
| Data set up time | t_{DSU} | Fig. a | 60 | - | - | ns |
| Data hold time | t_{DH} | Fig. a, Fig. b | 20 | - | - | ns |

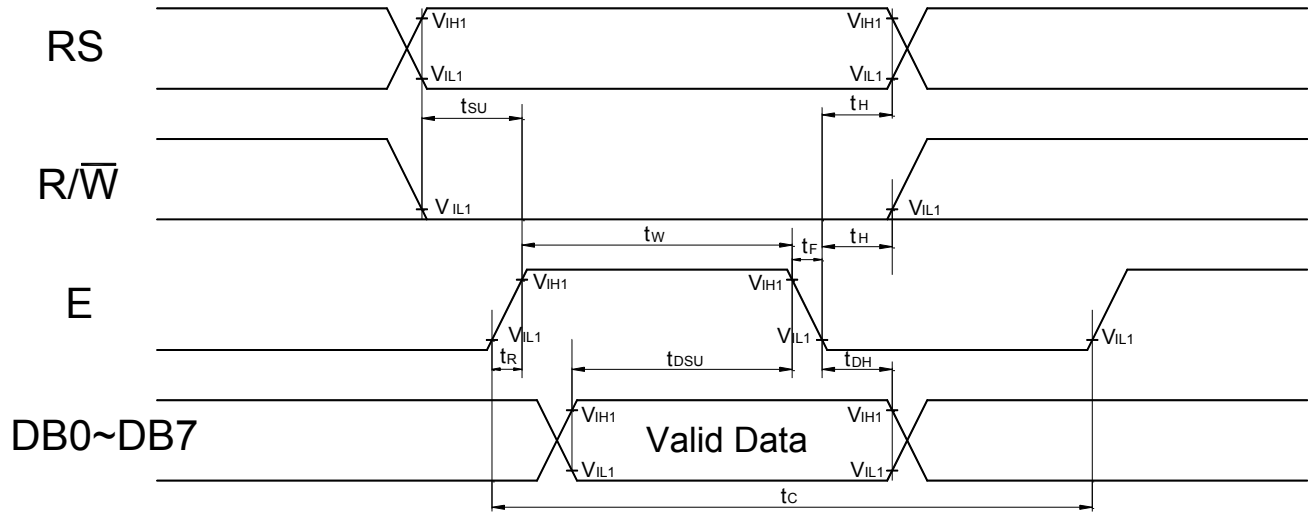


Fig. a Interface timing (data write)

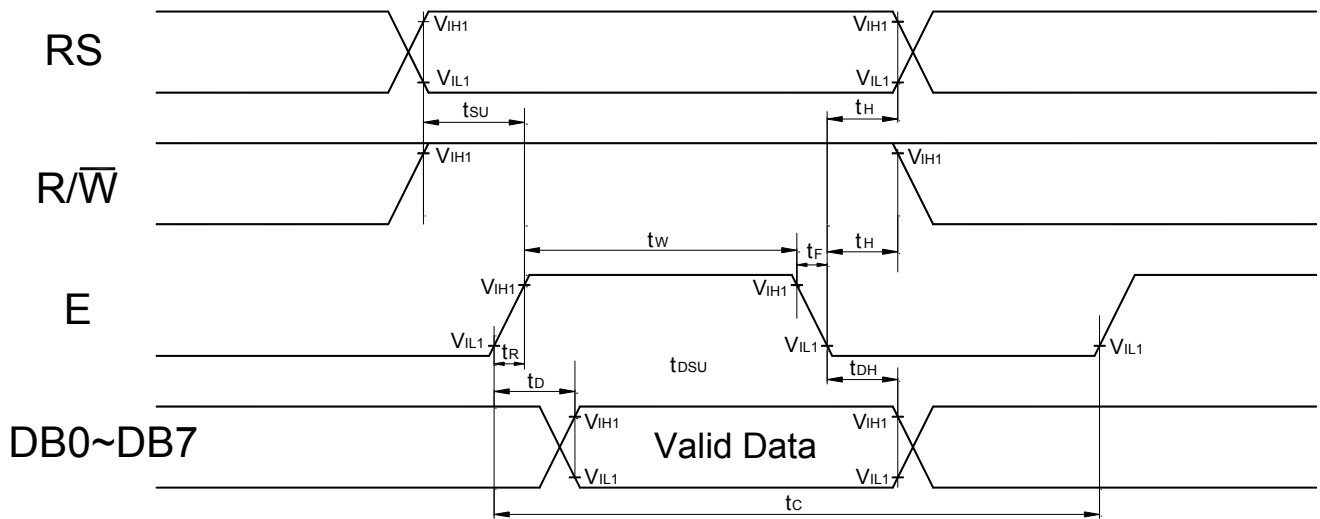
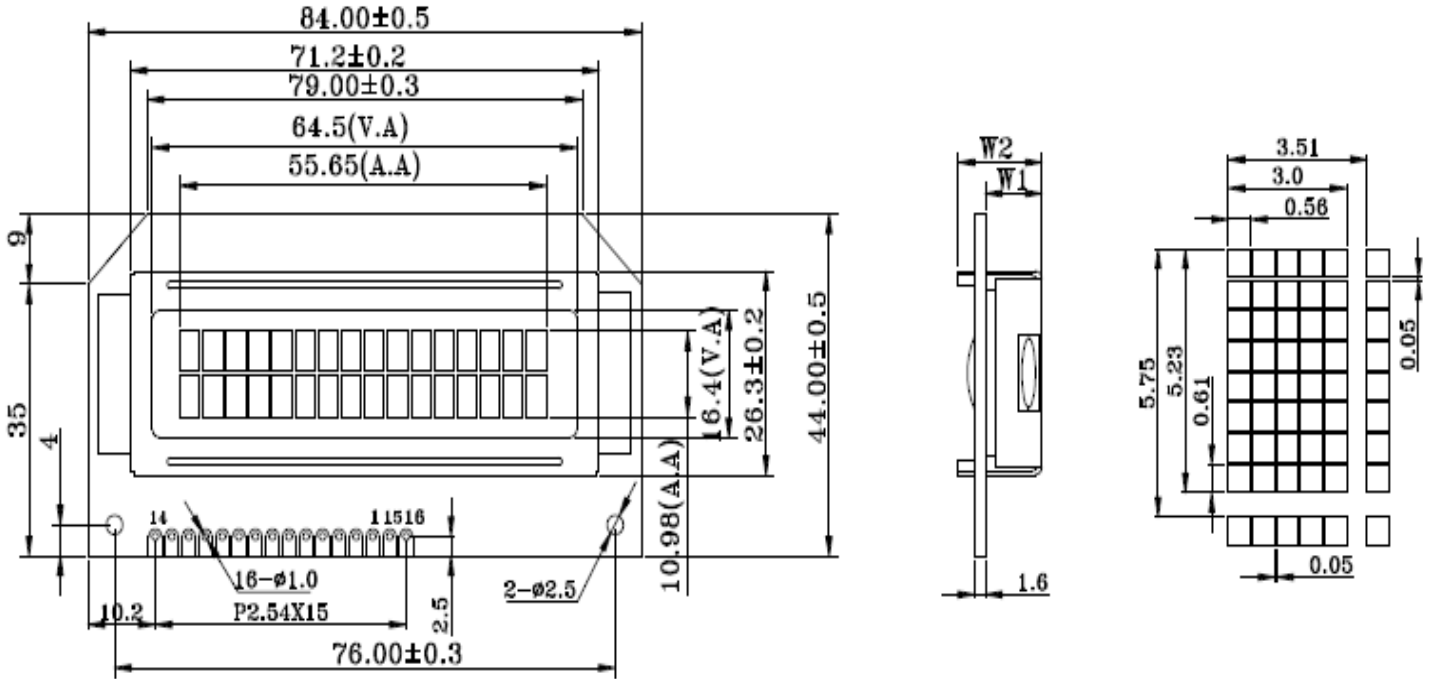


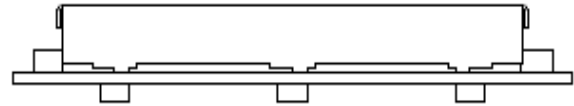
Fig. b Interface timing (data read)

9.0 MECHANICAL DIAGRAM



FEATURES:

1. DISPLAY MODE: STN BLUE, TRANSMISSIVE, NEGATIVE
2. VIEW ANGLE: 6:00
3. OPERATING VOLTAGE: 5.0V
4. OPERATING TEMP: -20°C ~ 70°C
5. STORAGE TEMP: -30°C ~ 80°C
6. BACKLIGHT: LED (WHITE), Vbkl=5.0V/65mA
7. DRIVER: ST7066U-0T OR EQUIVALENT



| Version | W1 | W2 |
|----------|----------|-----------|
| 1.0B_HSL | 8.60±0.5 | 13.50 MAX |

TOLERANCES UNLESS OTHERWISE SPECIFIED ±0.2

| | | | | | | | | |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|
| PIN | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| SIGNAL | VSS | VDD | V0 | RS | R/W | E | DB0 | DB1 |
| PIN | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| SIGNAL | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 | A | K |

| 厦门精显电子有限公司 XIAMEN PRECISE DISPLAY CO., LTD. | | | |
|--|------------|----------------------------|----------------|
| 确认: | 绘图: CAO | 绘图编号: PCM1602B-NSW-BBWC-UN | 单位: mm |
| | 审核: ZHUNAG | 客户编号: | 日期: 2021.07.01 |
| | 批准: ZHUNAG | 图纸版本号: V1.0 | 页数: 1/1 |

10.0 RELIABILITY TEST

| Storage Condition | Content | Evaluations and Assessment* | | | |
|--|--------------------|-----------------------------|--------|--------------------------------|-------------------|
| | | Current Consumption | Oozing | Contrast | Other Appearances |
| Operation at high temperature and humidity | 40°C,90% RH,240hrs | Twice initial value or less | none | More than 80% of initial value | No abnormality |
| High temperature storage | 60°C, 240hrs | Twice initial value or less | none | More than 80% of initial value | No abnormality |
| Low temperature storage | -20°C, 240hrs | Twice initial value or less | | More than 80% of initial value | No abnormality |

*Evaluations and assessment to be made two hours after returning to room temperature (25°C±5°C).

*The LCDs subjected to the test must not have dew condensation.

Display character address code:

| Display position | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| DDRAM address | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F |
| DDRAM address | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 4A | 4B | 4C | 4D | 4E | 4F |

11.0 DISPLAY INSTRUCTION TABLE

| COMMAND | R S | R/ W | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | DESCRIPTION | Executing time fosc=250khz |
|--------------------------|--------|---------|------------|---|--------------------------------------|---------|---------|---------|---------|---|---|----------------------------------|
| Clear Display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Clears Display & Returns to Address 0. | 1.64ms |
| Cursor at Home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | x | Returns Cursor to Address 0. Also returns the display being shifted to the original position. DDRAM contents remain unchanged. | 1.64ms |
| Entry Mode Set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S | I/D: Set Cursor Moving Direction I/D=1: Increment I/D=0: Decrement S: Specify Shift of Display S=1: The display is shifted S=0: The display is not shifted | 40µs |
| Display ON/OFF Control | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | Display D=1: Display on D=0: Display off Cursor C=1: Cursor on C=0: Cursor off Brink B=1: Brink on B=0: Brink off | 40µs |
| Cursor / Display Shift | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | x | x | Moves cursor or shifts the display w/o changing DD RAM contents S/C=0: Cursor Shift (RAM unchanged) S/C=1: Display Shift (RAM unchanged) R/L=1: Shift to the Right R/L=0: Shift to the Left | 40µs |
| Function Set | 0 | 0 | 0 | 0 | 1 | DL | N | F | x | x | Sets data bus length (DL), # of display lines (N), and character fonts (F). DL=1: 8 bits F=0: 5x7 dots DL=0: 4 bits F=1: 5x10 dots N=0: 1 line display N=1: 2 lines display | 40µs |
| Set CG RAM Address | 0 | 0 | 0 | 1 | Character Generator (CG) RAM Address | | | | | | Sets CG RAM address. CG RAM data is sent and received after this instruction. | 40µs |
| Set DD RAM Address | 0 | 0 | 1 | Display Data (DD) RAM Address / Cursor Address | | | | | | Sets DD RAM address. DD Ram data is sent and received after this instruction. | 40µs | |
| Busy Flag / Address Read | 0 | 1 | B F | Address counter used for both DD & CG RAM address | | | | | | Reads Busy Flag (BF) and address counter contents. | 40µs | |
| Write Data | 1 | 0 | Write Data | | | | | | | | Writes data into DDRAM or CGRAM. | 46µs |
| Read Data | 1 | 1 | Read Data | | | | | | | | Reads data from DDRAM or CGRAM. | 46µs |

x: Don't Care

12.0 STANDARD CHARACTER PATTERNS

| b7-b4 b3-b0 | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|----------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0000 | CG RAM (1) | | | 0 | 1 | 2 | 3 | 4 | | | 5 | 6 | 7 | 8 | 9 | A |
| 0001 | (2) | | ! | 1 | A | Q | a | 9 | | | Γ | Я | W | . | Ц | Х |
| 0010 | (3) | | " | 2 | B | R | b | r | | | E | Б | Ь | U | Ш | Х |
| 0011 | (4) | | # | 3 | C | S | c | s | | | Ж | В | Ы | U | а | 4 |
| 0100 | (5) | | \$ | 4 | D | T | d | t | | | З | Г | Ь | 7 | Ф | В |
| 0101 | (6) | | % | 5 | E | U | e | u | | | И | Е | а | Ж | У | - |
| 0110 | (7) | | & | 6 | F | V | f | v | | | А | Ж | Ю | 7 | W | 9 |
| 0111 | (8) | | ' | 7 | G | W | g | w | | | Л | Э | Я | I | ' | К |
| 1000 | (1) | | (| 8 | H | X | h | x | | | П | И | О | И | ' | * |
| 1001 | (2) | |) | 9 | I | Y | i | y | | | У | А | О | ↑ | ' | Э |
| 1010 | (3) | | * | : | J | Z | j | z | | | Ф | К | А | ↓ | Е | Г |
| 1011 | (4) | | + | : | K | L | k | l | | | Ч | А | " | W | С | * |
| 1100 | (5) | | , | < | L | φ | l | φ | | | Ш | И | Б | И | U | Х |
| 1101 | (6) | | - | = | M | I | m | φ | | | б | И | С | И | * | 8 |
| 1110 | (7) | | . | > | N | ^ | n | φ | | | В | И | 7 | 7 | ○ | 9 |
| 1111 | (8) | | / | ? | O | _ | o | φ | | | Э | Т | Е | * | ○ | ■ |

Note: The character generator RAM is the RAM with which the user can rewrite character patterns by program.