



EA-D SERIES

Alphanumeric Dot Matrix LCD Module

■ Features

- Built in a display data RAM.....80 x 8 bits : for 80 characters
- CGROM (192 characters), built in CGRAM (8 characters) (it can be extended to CGROM 256 characters)
- Built in CR Oscillator circuit, built in a Power ON reset circuit.
- Maximum Display Digit x Line40 digits x 2 lines
- Duty Ratio1/16 (by setting a command)
- High Speed Bus Interface with 4 bits and 8 bits MPU
- Many Display Control Instructions
- Character Font.....5 x 7 dots + Cursor Line
- Cursor Font.....Underline or All character dots blinking
- Single Power Supply5 V ± 10% (Logic/LED Backlight/STN/
Wide Temperature)

■ Model Table

| Model Name | Number of Characters | Module Size W x H x D (mm) | Viewing Area W x H (mm) | Character Size W x H (mm) | TYPE | | Dot Size W x H (mm) | Duty Cycle |
|---------------|----------------------|----------------------------------|-------------------------------|---------------------------------|------|-----|---------------------------|------------|
| | | | | | LCD | B/L | | |
| EA-D16015AR | 16x1 | 80x36x10.3 | 64.5x13.8 | 3.07x6.56 | TN | • | 0.55x0.75 | 1/16 |
| EA-D16015AR-S | 16x1 | 80x36x10.3 | 64.5x13.8 | 3.07x6.56 | STN | • | 0.55x0.75 | 1/16 |
| EA-D16015RR-Y | 16x1 | 80x36x12.3 | 64.5x13.8 | 3.07x6.56 | STN | LED | 0.55x0.75 | 1/16 |
| EA-D16025AR | 16x2 | 84x44x10.3 | 61.0x15.8 | 2.96x5.56 | TN | • | 0.56x0.66 | 1/16 |
| EA-D16025AR-S | 16x2 | 84x44x10.3 | 61.0x15.8 | 2.96x5.56 | STN | • | 0.56x0.66 | 1/16 |
| EA-D16025RR-Y | 16x2 | 84x44x12.3 | 61.0x15.8 | 2.96x5.56 | STN | LED | 0.56x0.66 | 1/16 |
| EA-D20025AR | 20x2 | 116x37x10.3 | 83.0x18.6 | 3.20x5.55 | IN | • | 0.60x0.65 | 1/16 |
| EA-D20025AR-S | 20x2 | 116x37x10.3 | 83.0x18.6 | 3.20x5.55 | STN | • | 0.60x0.65 | 1/16 |
| EA-D20025RR-Y | 20x2 | 116x37x12.3 | 83.0x18.6 | 3.20x5.55 | STN | LED | 0.60x0.65 | 1/16 |
| EA-D20040AR-S | 20x4 | 98x60x12 | 76.0x25.2 | 3.01x4.84 | STN | • | 0.57x0.57 | 1/16 |
| EA-D24025AR-S | 24x2 | 118x36x10.5 | 93.5x15.8 | 3.20x5.55 | STN | • | 0.60x0.65 | 1/16 |
| EA-D40025AR | 40x2 | 182x33.5x10.8 | 154.4x15.8 | 3.20x5.55 | TN | • | 0.60x0.65 | 1/16 |
| EA-D40025AR-S | 40x2 | 182x33.5x10.8 | 154.4x15.8 | 3.20x5.55 | STN | • | 0.60x0.65 | 1/16 |
| EA-D40025RR-Y | 40x2 | 182x33.5x12.8 | 154.4x15.8 | 3.20x5.55 | STN | LED | 0.60x0.65 | 1/16 |

Optional: (1) Wide Operating Temperatures: - 10 to = 70 C (2) "P" Version (3) EL Backlight

Specifications

(1) DC ELECTRICAL CHARACTERISTICS

VDD = 5V ± 5%
VSS = 0V, Ta = 0 to 50°C

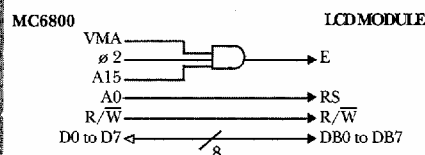
| Parameter | Symbol | Condition | Standard Value | | | Unit | Applicable |
|------------------------------|--------|-----------------|---------------------------------|------|------|------|--------------------------|
| | | | Min. | Typ. | Max. | | |
| Supply voltage | VDD | | 4.75 | 5.00 | 5.25 | V | VDD |
| "High" input voltage | VIH | | 2.2 | | VDD | V | RS, R/W, E |
| "Low" input voltage | VIL | | VSS | | 0.6 | V | DB0 to DB7 |
| "High" output voltage | VOH | -10H = 0.205 mA | 2.4 | | | V | DB0 to DB7 |
| "Low" output voltage | VOL | IOL = 1.2 mA | | | 0.4 | V | DB0 to DB7 |
| Input/Output leakage current | ILI | VIN = 0 to VDD | | | 1.0 | A | RS, R/W, E DB0 to DB7 |
| Power supply current | IDD | VDD = 5V | | 1.0 | 3.0 | mA | VDD |
| LCD driving voltage | VLCD | VDD - VO | See (2) OPTICAL CHARACTERISTICS | | | V | VO |

(2) OPTICAL CHARACTERISTICS

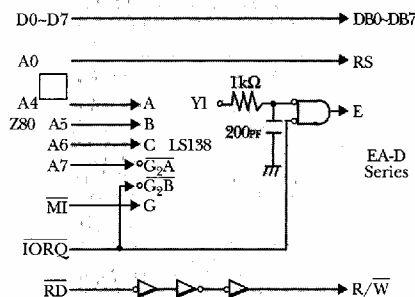
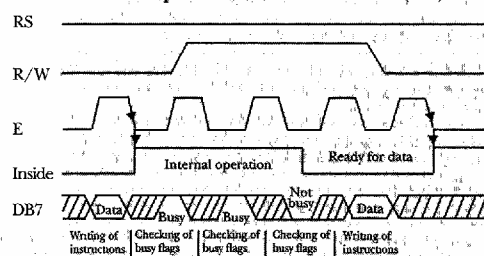
| Parameter | Symbol | Temperature °C | | Standard Value | | | Unit |
|---------------------|--------------|----------------|-------|----------------|------|--------|------|
| | | Min. | Typ. | Max. | | | |
| Driving voltage | Vop | 0 | Vth 2 | 4.62 | 4.86 | - | V |
| | | | Vth 1 | - | 4.49 | 4.71 | |
| | | 25 | Vth 2 | 4.21 | 4.43 | - | |
| | | | Vop | - | 4.27 | - | |
| | | 50 | Vth 2 | 3.58 | 3.77 | - | |
| | | | Vth 1 | - | 3.46 | 3.63 | |
| Response time | tr | 0 | - | 400 | 600 | ms | |
| | | 25 | - | 100 | 150 | | |
| | | 50 | - | 100 | 150 | | |
| | tf | 0 | - | 400 | 600 | | |
| | | 25 | - | 100 | 150 | | |
| | | 50 | - | 100 | 150 | | |
| Viewing angle range | Longitudinal | 1 | 60 | - | 80 | Degree | |
| | Lateral | 2 | 60 | - | 120 | Degree | |
| Contrast ratio | K | 25 | - | 10 | - | - | |

I/O Terminals and an example of system block diagram

| Terminal | I/O | Function |
|-----------|-----|-------------------------|
| VSS | I | Power supply (GND) |
| VDD | I | Power supply (5V) |
| YO | I | LCD contrast adjustment |
| RS | I | Register selection |
| R/W | I | Read/Write selection |
| E | I | Enable input |
| DB0 - DB7 | I/O | Data input/output |

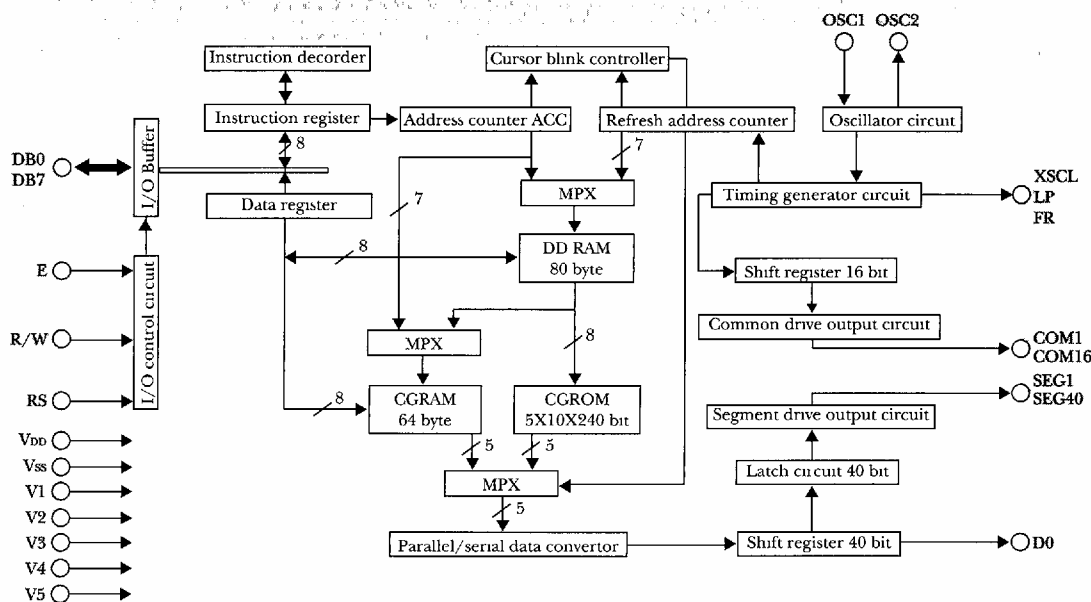


Example of interface with 8-bit MPU (Z80)



Options: (1)SIN type is also available. (2)HQ type of wide range temperature is available on demand at operating: -10°C to +70°C. (3)BACKLIGHT type is available.

Block Diagram (SED 1278 Controller Drive Chip)



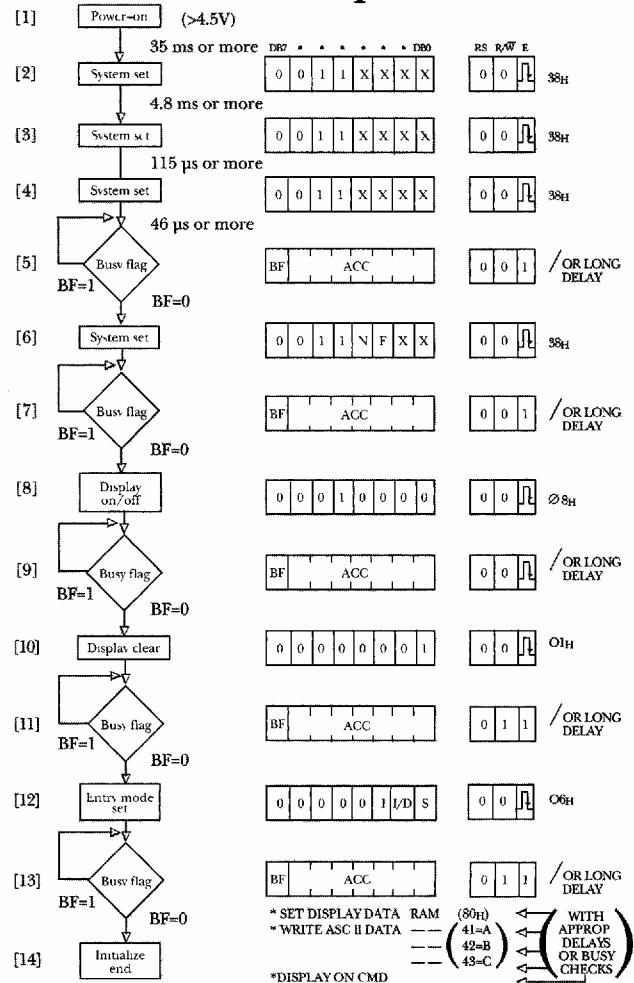


Display Commands

| No. | Instruction | Code | | | | | | | | | | Description |
|-----|-----------------------------|------|-----|------------|-----|-----|-----|-----|------------------------------------|---|---|---|
| | | RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | |
| 1 | Clear Display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Clears all display and returns the cursor to the home position (Address 00H) |
| 2 | Return Home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | * | Returns the cursor to the home position (Address 00H). Also returns the display being shifted to the original position. DD RAM contents remain unchanged. |
| 3 | Entry Mode Set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S | Sets the cursor move direction and specifies to shift the display or not. These operations are performed during data write and read. |
| 4 | Display On/Off Control | 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). |
| 5 | Cursor/Display Shift | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | * | * | Moves the cursor and shifts the display without changing DD RAM contents. |
| 6 | System Set | 0 | 0 | 0 | 0 | 1 | IF | N | F | * | * | Sets interface data length (IF), and Duty (1/16th) |
| 7 | Set CG Ram Address | 0 | 0 | 0 | 1 | ACG | | | | | Sets the CG RAM address. CG RAM data is sent and received after this setting. | |
| 8 | Set DD Ram Address | 0 | 0 | 1 | ADD | | | | | Sets the DD RAM address. DD RAM data is sent and received after this setting. | | |
| 9 | Read Busy Flag & Address | 0 | 1 | BF | AC | | | | | Reads Busy flag (BF), and address counter contents. | | |
| 10 | Write data to CG or DD Ram | 1 | 0 | Write Data | | | | | Writes data into DD RAM or CG RAM. | | | |
| 11 | Read Data from CG or DD Ram | 1 | 1 | Read Data | | | | | Reads data from DD RAM or CG RAM. | | | |

- [Note 1] I/D=1 : Increment
 I/D=0 : Decrement
 S=1 : Accompanies display shift
 S/C=1 : Display Shift
 S/C=0 : Cursor move
 R/L=1 : Shift to the right
 R/L=0 : Shift to the left
 DL=1 : 8 bits
 DL=0 : 4 bits
 N=1 : 2 lines
 N=0 : 1 line
 F=1 : 5 x 10 dots
- [Note 2] DD RAM : Display Data RAM
 CG RAM : Character Generator RAM
 ACG : CG RAM address
 ADD : DD RAM address. Corresponds to cursor address.
 AC : Address counter used for both DD & CG RAM addresses.
- F=0 : 5 x 7 dots
 BF=1 : Busy
 BF=0 : Not Busy

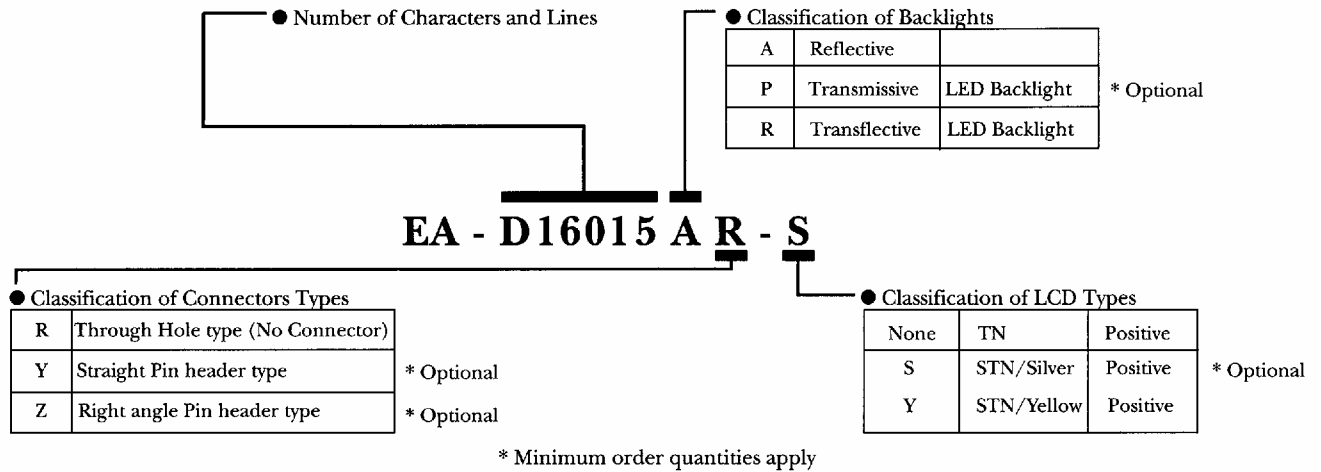
EAD Module Initialization Procedure For 8 Bit Operation



Character Code Map

| | Upper 4 bit (D4~D7) of Character Code (Hexadecimal) | | | | | | | | | | | | | | |
|---|---|----|---|---|---|---|---|---|---|---|---|---|---|--|--|
| | 0 | 2 | 3 | 4 | 5 | 6 | 7 | A | B | C | D | E | F | | |
| 0 | CG RAM (1) | | 0 | Q | P | \ | P | - | 9 | ε | α | p | | | |
| 1 | (2) | ! | 1 | A | Q | a | 4 | . | 7 | 7 | 4 | ä | q | | |
| 2 | (3) | " | 2 | B | R | b | r | Γ | γ | ∞ | β | θ | | | |
| 3 | (4) | # | 3 | C | S | c | s | ∫ | ∫ | ε | ε | ω | | | |
| 4 | (5) | \$ | 4 | D | T | d | t | \ | I | † | † | μ | Ω | | |
| 5 | (6) | % | 5 | E | U | e | u | . | 7 | 7 | 1 | ε | Ü | | |
| 6 | (7) | & | 6 | F | V | f | v | 9 | カ | ニ | ヨ | ρ | Σ | | |
| 7 | (8) | ' | 7 | G | W | g | w | 7 | † | 7 | 7 | q | π | | |
| 8 | (1) | (| 8 | H | X | h | x | ∫ | ∫ | ∫ | ∫ | ∫ | ∫ | | |
| 9 | (2) |) | 9 | I | Y | i | y | ∫ | ∫ | ∫ | ∫ | ∫ | ∫ | | |
| A | (3) | * | : | J | Z | j | z | ε | コ | ∫ | ∫ | ∫ | ∫ | | |
| B | (4) | + | : | K | [| k | [| ∫ | サ | ヒ | □ | * | ∫ | | |
| C | (5) | , | < | L | ¥ | l | ¥ | ∫ | ∫ | ∫ | ∫ | ∫ | ∫ | | |
| D | (6) | - | = | M |] | m |] | ∫ | ∫ | ∫ | ∫ | ∫ | ∫ | | |
| E | (7) | . | > | N | ^ | n | ^ | ∫ | ∫ | ∫ | ∫ | ∫ | ∫ | | |
| F | (8) | / | ? | O | _ | o | _ | ∫ | ∫ | ∫ | ∫ | ∫ | ∫ | | |

- Note 1) CG RAM is a character generator RAM which can store the character pattern rewriting with a program freely by user.
- Note 2) 32 characters of upper bit "1110" are character pattern. And some kinds of font will be jitted out at some portion in the LCD unit of 5 x 7 dot font. So don't use them.



■ Handling Precautions

- The display panel is made of glass. Care must be exercised to avoid dropping it or subjecting it to strong mechanical shocks.
- Should the display panel be damaged and the LC leak out, do not inhale or ingest the LC. If you come into contact with the LC, immediately wash with soap and water.
- Applying pressure to the display surface or its periphery will cause it to change its color tone. Care must be exercised to keep the area free of unreasonable pressure.
- The polarizer covering the display surface of a LCD module is soft and easily damaged. Handle the polarizer with the greatest care.
- To clean the display surface, breathe on the dirty spot, and then lightly wipe it off with a soft cloth after it dries. If the stain remains, dip soft cloth in either of the following solvents, and lightly wipe the surface.
 - Isopropyl alcohol
 - Ethyl alcohol
 Solvents other than those listed may adversely affect the polarizer. Never use the following solvents to clean the display surface:
 - Water
 - Ketones solvents
 - Aromatic solvents
- Water droplets, condensation of water vapor, applying electricity in a high humidity environment may corrode the electrodes.
- Install the module in the mounting hole. During the installation, be careful to avoid twisting, bending, or distorting the LCD module. In particular, do not forcibly pull or bend the I/O cable or the back light cable.
- Do not dismantle or reassemble the module in any way.
- NC terminal should be open. Do not connect anything.
- If the logic circuit power is not on, do not apply input signals.
- Pay attention to the working environment, as the element may be destroyed by static electricity.
 - Ground yourself before handling the LCD module.
 - Ground the soldering iron or other tools used during assembly.
 - Avoid working in a dry environment to minimize the generation of static electricity.
 - A protective film has been affixed to the LCD module to protect its display surface. Static electricity may be generated when this protective film is peeled off.
- Do not apply pressure to CCFT on the back of the LCD module. CCFT may be damaged.

■ Storage Precautions

- Store away from direct sunlight and fluorescent light, and in a relatively low temperature area (avoid places of high temperature and high humidity or any place where the temperature is expected to drop below 0° C) after placing the LCD module in an electrostatic protection bag. Ideally, the module should be stored in the package provided by the supplier.

■ Others

- The crystalline liquid coagulates at low temperatures (lower than 0° C) causing deficiencies in orientation or producing bubbles (black or white). Bubbling can also occur when a large shock is applied at low temperatures.
- If the LCD module is operated for a long time, especially if it is operated with the same display, the display pattern may remain as an after-image, or slight irregularities in contrast may occur. Suspending the operation and waiting a while will return the module to its normal condition. After-images or contrast irregularities do not in any way affect reliability.

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