EPSON®



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 Line.....40 digits x 2 lines
- Duty Ratio.....1/16 (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 Supply.....5 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	TN	•	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

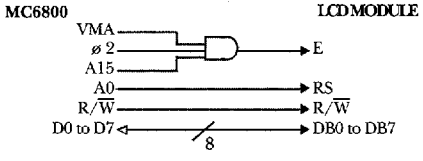
Parameter	Symbol	Condition	Standard Value Min.	Typ.	Max.	Unit	Applicable
Supply voltage	VDD		4.75	5.00	5 25	V	VDD
"High" input voltage	VIH		2.2		VDD	V	RS, R/W, E
"Low" input voltage	VII		VSS		0.6	V	DB0 to DB7
"High" output voltage	VOH	–10H = 0 205 mA	2.4			V	DB0 to DB7
"Low" output voltage	VOL	IOL = 1 2 mA			0.4	V	
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

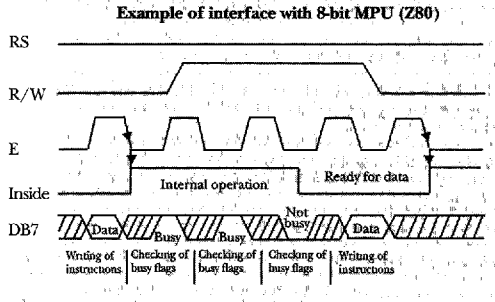
(2) OPTICAL CHARACTERISTICS

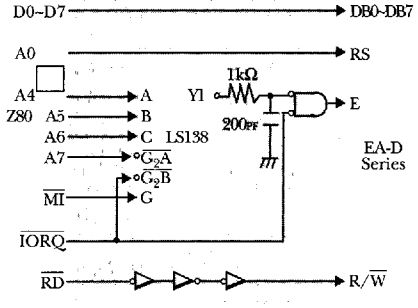
Parameter		Symbol	Temperature °C		Standard Value Min.	Typ.	Max.	Unit
Driving voltage		Vop	0	Vth 2	4.62	4.86	–	V
				Vth 1	–	4 49	4.71	
			25	Vth 2	4 21	4 43	–	
				Vop	–	4 27	–	
				Vth 1	–	4.10	4.30	
			50	Vth 2	3 58	3.77	–	
				Vth 1	–	3 46	3.63	
Response time		tr	0		–	400	600	ms
			25		–	100	150	
		tf	0		–	400	600	
			25		–	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)
VO	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



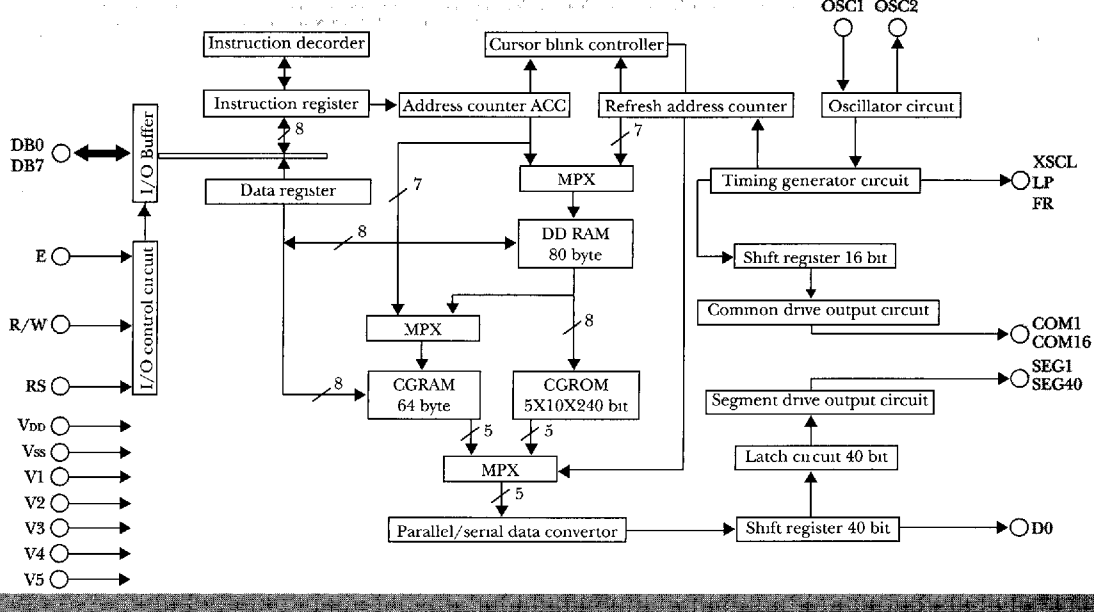




Options: (1)STN type is also available. (2)HQ type of wide range temperature is available on demand at operating: -10 °C to +70 °C. (3)BACKLIGHT type is available.

Block Diagram

(SED 1278 Controller Drive Chip)



EPSON®

Display Commands

EPSON®

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
F=0 : 5 x 7 dots
BF=1 : Busy
BF=0 : Not Busy

[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.

Character Code Map

Upper 4 bit (D4~ D7) of Character Code (Hexadecimal)

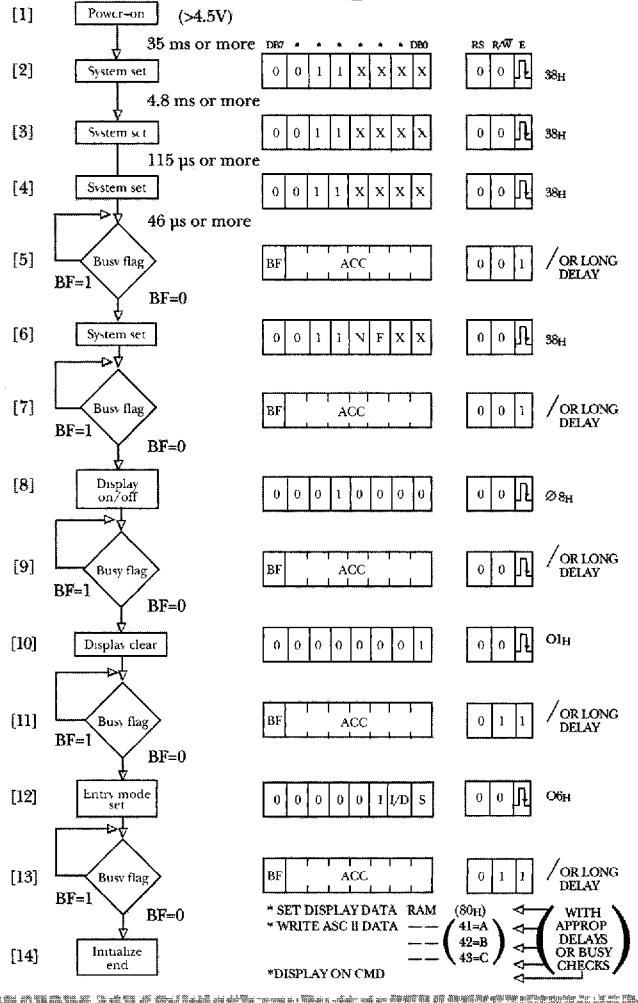
Lower 4 bit (D0~ D3) Character Code (Hexadecimal)

	0	2	3	4	5	6	7	A	B	C	D	E	F
0	CG RAM (1)		0	@	P	`	p						
1	(2)	!	1	A	Q	a	q						
2	(3)	"	2	B	R	b	r						
3	(4)	#	3	C	S	c	s						
4	(5)	$	4	D	T	d	t						
5	(6)	%	5	E	U	e	u						
6	(7)	&	6	F	V	f	v						
7	(8)	'	7	G	W	g	w						
8	(1)	(	8	H	X	h	x						
9	(2)	)	9	I	Y	i	y						
A	(3)	*	:	J	Z	j	z						
B	(4)	+	;	K	[	k	{						
C	(5)	,	<	L	¥	l	|						
D	(6)	-	=	M	]	m	}						
E	(7)	.	>	N	^	n	→						
F	(8)	/	?	O	_	o	←						

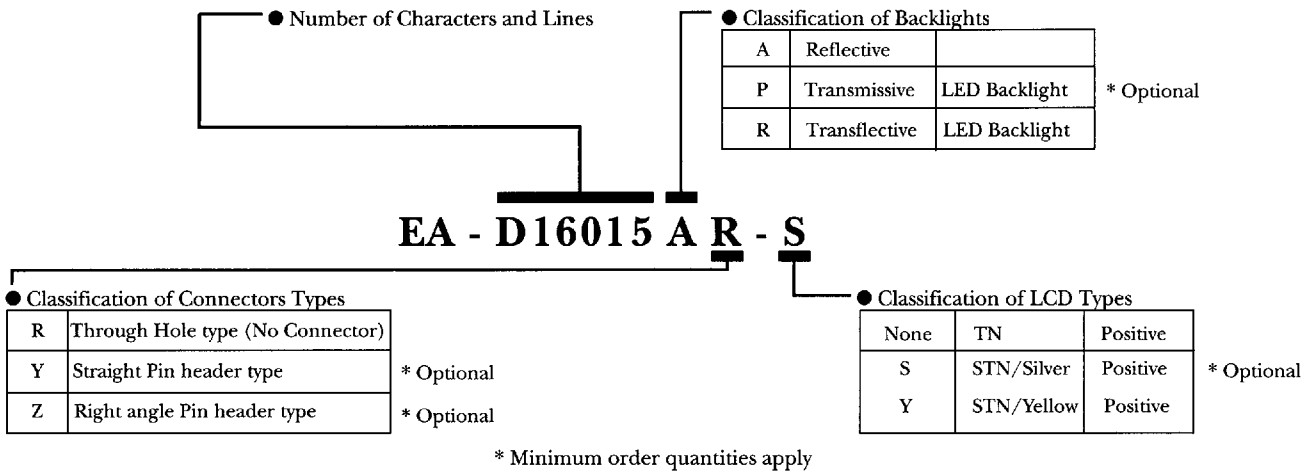
Note 1) CG RAM is a character generator RAM which can store the character pattern rewriting with a program freely by user.

Note 2) 32 characters of upper bit "1110" are character pattern. And some kinds of font will be jutted out at some portion in the LCD unit of 5 x 7 dot font. So don't use them.

EAD Module Initialization Procedure For 8 Bit Operation



PART NUMBERING SYSTEM / HANDLING PRECAUTIONS



■ 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 aware 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 contract irregularities do not in any way affect reliability.

EPSON® **EPSON AMERICA, INC.** ***Call your sales rep today.***

Component Sales Department Telephone: 310/787-6300

EPSON Sales Representatives: **AL-GA-TN** Concord Components 205/772-8883 • **AZ-NM** Fred Board Assoc. 602/994-9388 • **CA-No.** Costar 408/446-9339 • **CA-So** Bager Electronics 714/957-3367 • **CO-UT** Wn. Region Wktg. 303/428-8088 • **FL** Dyne-A-Mark 407/660-1661 • **IL-WI** LTD Technologies 708/773-2900 • **KS-MO-IA** Microtronics 913/262-1444 • **MA-NH-CT** Rosen Assoc. 617/449-4700 • **MD-VA** Tech Sales Assoc. 301/461-7802 • **MI-IN-KY** C C Electro 317/921-5000 • **MN** Electromark 612/944-5850 • **NC-SC** Envision 919/231-9939 • **NJ** JMR Sales 908/525-8000 • **NY** Elcom Sales 716/385-1400 • **METRO-NY** Niktronix 516/929-4671 • **OH** J.D. Babb Assoc. 216/934-4454 • **OR-WA** Matrex 503/245-8080 • **PA** Omega Sales 215/244-4000 • **TX-OK** Component Tech. 214/783-8831 • **CANADA** Dynasty Components, Inc. 613/596-9800

Represented/Distributed by:

3364134 0000352 T19