

# DOT MATRIX CHARACTER DISPLAY

## EA-D Series

Part Number	Character Format Character × Line (s)	Character Size	Effective Viewing Area	Module Size (without connector) (W × H × D)	Duty Cycle	Weight(g) (approx.)	Connector Type (No. of Contacts)	Page
EA-D16015AR	16 × 1	3.07 × 6.56 0.121 × 0.258	64.5 × 13.8 2.539 × 0.543	80 × 36 × 10.3 3.150 × 1.417 × 0.406	1/16	30	Pin Hole (14)	7
EA-D16025AR	16 × 2	2.96 × 5.56 0.117 × 0.219	61.0 × 15.8 2.402 × 0.622	84 × 44 × 10.3 3.307 × 1.732 × 0.406	1/16	40	Pin Hole (14)	7
EA-D20025AR	20 × 2	3.20 × 5.55 0.126 × 0.219	83.0 × 18.6 3.268 × 0.732	116 × 37 × 10.3 4.567 × 1.457 × 0.406	1/16	50	Pin Hole (14)	8
EA-D20040AR	20 × 4	3.01 × 4.84 0.119 × 0.191	76.0 × 25.2 2.992 × 0.992	98 × 60 × 12.0 3.858 × 2.362 × 0.472	1/16	55	Pin Hole (14)	8
EA-D24016AR	24 × 1	3.15 × 8.7 0.124 × 0.343	100.0 × 13.8 3.937 × 0.543	126 × 36 × 10.1 4.961 × 1.417 × 0.398	1/11	50	Pin Hole (14)	9
EA-D24025AR	24 × 2	3.20 × 5.55 0.126 × 0.219	93.5 × 15.8 3.681 × 0.622	118 × 36 × 10.5 4.646 × 1.414 × 0.413	1/16	50	Pin Hole (14)	9
EA-D40016AR	40 × 1	3.15 × 8.8 0.124 × 0.343	154.4 × 15.8 6.079 × 0.622	182 × 33.5 × 10.8 7.165 × 1.319 × 0.425	1/11	75	Pin Hole (14)	10
EA-D40025AR	40 × 2	3.20 × 5.55 0.126 × 0.219	154.4 × 15.8 6.079 × 0.622	182 × 33.5 × 10.8 7.165 × 1.319 × 0.425	1/16	75	Pin Hole (14)	10

## EA-X Series

Part Number	Character Format Character × Line (s)	Character Size (with cursor)	Effective Viewing Area	Module Size (without connector) (W × H × D)	Duty Cycle	Weight(g) (approx.)	Connector Type (No. of Contacts)	Page
EA-X16017AR	16 × 1	2.9 × 4.8 (6.2) 0.114 × 0.189 (0.244)	61 × 16 2.402 × 0.630	80 × 36 × 11.1 3.150 × 1.417 × 0.437	1/8	35	Pin Hole (17)	14
EA-X16027AR	16 × 2	2.9 × 4.1 (5.3) 0.114 × 0.161 (0.209)	61 × 16 2.402 × 0.630	80 × 36 × 11.1 3.150 × 1.417 × 0.437	1/16	35	Pin Hole (17)	14
EA-X20017AR	20 × 1	3.4 × 5.15 (6.65) 0.134 × 0.203 (0.262)	88.2 × 20 3.472 × 0.787	120 × 36 × 11.1 4.724 × 1.417 × 0.437	1/8	50	Pin Hole (18)	14
EA-X20027AR	20 × 2	3.4 × 5.15 (6.65) 0.134 × 0.203 (0.262)	88.2 × 20 3.472 × 0.787	120 × 36 × 11.1 4.724 × 1.417 × 0.437	1/16	50	Pin Hole (18)	14
EA-X24017AR	24 × 1	2.9 × 4.45 (5.75) 0.114 × 0.175 (0.226)	93 × 20 3.661 × 0.787	120 × 36 × 11.1 4.724 × 1.417 × 0.437	1/8	50	Pin Hole (18)	15
EA-X40017AR	40 × 1	3.0 × 4.8 (6.2) 0.118 × 0.189 (0.244)	156 × 20 6.142 × 0.787	188 × 36 × 11.1 7.402 × 1.417 × 0.437	1/8	80	Pin Hole (18)	15
EA-X40027AR	40 × 2	3.0 × 4.8 (6.2) 0.118 × 0.189 (0.244)	156 × 20 6.142 × 0.787	188 × 36 × 11.1 7.402 × 1.417 × 0.437	1/16	80	Pin Hole (18)	15

## EA-N Series

Part Number	Character Format Character × Line (s)	Character Size (with cursor)	Effective Viewing Area	Module Size (without connector) (W × H × D)	Duty Cycle	Weight(g) (approx.)	Connector Type (No. of Contacts)	Page
EA-N16015AR	16 × 1	2.9 × 4.8 (6.2) 0.114 × 0.189 (0.244)	61 × 16 2.402 × 0.630	80 × 36 × 9.5 (MAX) 3.150 × 1.417 × 0.374	1/16	35	Pin Hole (14)	19
EA-N16025AR	16 × 2	2.9 × 4.1 (5.3) 0.114 × 0.16 (0.209)	61 × 16 2.402 × 0.630	80 × 36 × 9.5 (MAX) 3.150 × 1.417 × 0.374	1/16	35	Pin Hole (14)	19
EA-N20016AR	20 × 1	2.9 × 7.7 0.114 × 0.303	88.2 × 20 3.472 × 0.787	120 × 36 × 11.6 (MAX) 4.724 × 1.417 × 0.457	1/16	50	Pin Hole (14)	19
EA-N20025AR	20 × 2	3.4 × 5.15 (6.65) 0.134 × 0.203 (0.262)	88.2 × 20 3.472 × 0.787	120 × 36 × 11.6 (MAX) 4.724 × 1.417 × 0.457	1/16	50	Pin Hole (14)	19

## EA-C Series

Part Number	Character Format Character × Line (s)	Character Size (with cursor)	Effective Viewing Area	Module Size (without connector) (W × H × D)	Duty Cycle	Weight(g) (approx.)	Connector Type (No. of Contacts)	Page
EA-C20017AR	20 × 1	2.75 × 4.45 (5.55) 0.108 × 0.175 (0.218)	70 × 10 2.756 × 0.394	100 × 22 × 9.4 (MAX) 3.937 × 0.866 × 0.371	1/16	25	Pin Hole (12)	22
EA-C20017AR-B	20 × 1	3.65 × 5.5 (6.9) 0.144 × 0.217 (0.272)	97 × 10.5 3.819 × 0.413	125 × 30.3 × 11.2 (MAX) 4.921 × 1.193 × 0.441	1/16	40	Pin Hole (12)	23

Unit =  $\frac{\text{mm}}{\text{inch}}$

# ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Standard Value	Unit
Power Supply Voltage	VSS	0	V
	VDD	6.5	
Input Voltage	VIN	$VSS \leq VIN \leq VDD$	V
Storage Temperature	Tstg	-20 to +60	°C
Operating Temperature	Top	0 to +50	°C

# OPTICAL CHARACTERISTICS

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Response Time	Rise	tr	—	150	mSec
	Fall	tf	—	150	
Contrast	K	—	10:1	—	
Recommended Viewing Angle	Top-Bottom	$\phi 1$	10 to 40		Degree
	Left-Right	$\phi 2$	-30 to +30		
Expected Life (Without EL Lamp)	—	—	50,000	—	Hour

Ta: 25°C, VDD: 5V ± 5%

# DC ELECTRICAL CHARACTERISTICS

Item	Symbol	Conditions	Standard Value			Unit	Terminals
			Min.	Typ.	Max.		
Supply Voltage	VDD	—	4.75	5	5.25	V	VDD
Supply Current	IDD	VDD = 5V	—	—	(Note 1)	mA	
"0" Input Voltage	VIL	—	VSS	—	0.8	V	(Note 2)
"1" Input Voltage	VIH	—	2.0	—	VDD	V	
"0" Output Voltage	VOL	IOL = 1.6 mA (Note 3)	—	—	0.4	V	D7
"1" Output Voltage	VOH	IOH = -250 $\mu$ A (Note 3)	2.4	—	—	V	
"0" Input Leakage Current	ILIL-1	VI = 0V Pull-Up Resistor	—	-12	—	$\mu$ A	RESET WR RD
"1" Input Leakage Current	ILIH-1	VI = VDD	—	—	1.0	$\mu$ A	
"0" Input Leakage Current	ILIL-2	VI = 0V	—	—	-1.0	$\mu$ A	D0 to D7 A0 CS ENB
"1" Input Leakage Current	ILIH-2	VI = VDD	—	—	1.0	$\mu$ A	
"0" Output Leakage Current	ILOL	VO = 0 to 0.4V	—	—	1.0	$\mu$ A	D7
"1" Output Leakage Current	ILOH	VO = 2.4V to VDD	—	—	1.0	$\mu$ A	

Ta: 0 to +50°C, VDD: 5V ± 5%

Notes 1. Supply Current

Part Number	Max.
EA-X16017AR (16 × 1)	1.1
EA-X16027AR (16 × 2)	1.5
EA-X20017AR (20 × 1)	1.3
EA-X20027AR (20 × 2)	1.7

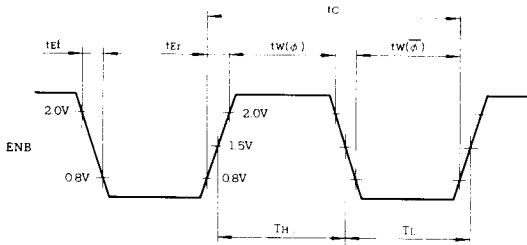
Part Number	Max.
EA-X24017AR (24 × 1)	1.3
EA-X40017AR (40 × 1)	1.6
EA-X40027AR (40 × 2)	2.0

VDD: 5V, Unit: mA

- D0 to D7, RESET, WR, RD, ENB, A0, CS  
(Both Input and Output are TTL compatible and can be directly connected to LSTTL or C-MOS.)
- IOL: "0" Output Current, IOH: "1" Output Current

# TIMING CHART & AC ELECTRICAL CHARACTERISTICS

## ■ CLOCK SIGNAL



Item	Symbol	Standard Value			Unit	Remarks
		Min.	Typ.	Max.		
Enable Clock Pulse Period	$t_c$	500	—	2000	nSec	
Enable Clock Pulse Width	$t_w(\phi), t_w(\bar{\phi})$	220	—	1050	nSec	
Enable Clock Pulse Transition Time	$t_{Er}, t_{Ef}$	—	—	50	nSec	
Enable Clock Pulse Duty	Duty	45	50	55	%	See Note

$T_a: 0 \text{ to } +50^\circ\text{C}, V_{DD}: 5V \pm 5\%$

$$\text{Note: Duty} = \frac{T_H}{T_H + T_L} \times 100 (\%)$$

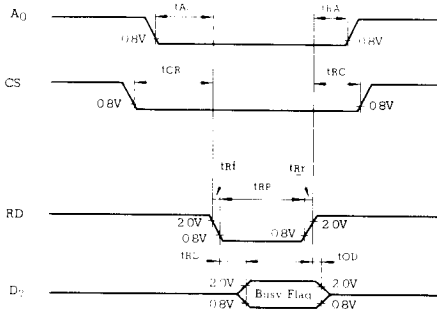
## ■ RESET SIGNAL



Item	Symbol	Standard Value			Unit	Remarks
		Min.	Typ.	Max.		
Reset Pulse Width	$t_w(\text{RESET})$	5	—	—	mSec	
Reset Pulse Transition Time	$t_{REr}, t_{REf}$	—	—	500	$\mu\text{Sec}$	See Note

$T_a: 0 \text{ to } +50^\circ\text{C}, V_{DD}: 5V \pm 5\%$

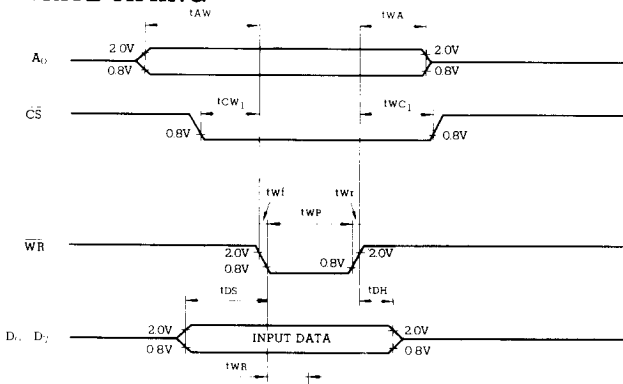
## ■ READ TIMING



Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
A0 – RD Set Time	$t_{AS}$	0	—	—	nSec
CS – RD Set Time	$t_{CR}$	0	—	—	nSec
Read Pulse Width	$t_{RP}$	350	—	$t_c \times 25$	nSec
Read Pulse Transition Time	$t_{Rr}, t_{Rf}$	—	—	50	nSec
RD – BUSY Output Delay Time	$t_{RD}$	—	—	150	nSec
A0 Hold Time	$t_{RA}$	30	—	—	nSec
CS Hold Time	$t_{RC}$	30	—	—	nSec
Data Output Disable Time	$t_{OD}$	—	—	100	nSec

$T_a: 0 \text{ to } +50^\circ\text{C}, V_{DD}: 5V \pm 5\%$

## ■ WRITE TIMING



Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
A0 – WR Set Time	$t_{AW}$	0	—	—	nSec
CS – WR Set Time	$t_{CW}$	0	—	—	nSec
Write Pulse Width	$t_{WP}$	350	—	$t_c \times 25$	nSec
Write Pulse Transition Time	$t_{Rr}, t_{Rf}$	—	—	50	nSec
Data Set Up Time	$t_{DS}$	0	—	—	nSec
A0 Hold Time	$t_{WA}$	30	—	—	nSec
CS Hold Time	$t_{WC}$	30	—	—	nSec
Data Hold Time	$t_{DH}$	30	—	—	nSec

$T_a: 0 \text{ to } +50^\circ\text{C}, V_{DD}: 5V \pm 5\%$

# DISPLAY COMMANDS

No.	COMMAND	CS	WR	RD	A <sub>0</sub>	D <sub>7</sub>	D <sub>6</sub>	D <sub>5</sub>	D <sub>4</sub>	D <sub>3</sub>	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>	Description	Max. Execute Time	Remarks
1	SYSTEM RESET	0	0	1	0	0	0	0	1	0	0	0	0	Resets the whole system. DD RAM contents remain unchanged.	tc × 26	
2	CLEAR DISPLAY DATA	0	0	1	0	0	0	0	0	0	0	0	1	Clears the whole display and returns the cursor to the home position.		Note 1
3	CURSOR AT HOME	0	0	1	0	0	0	0	0	0	0	1	0	Returns the cursor to the home position. Display contents (DD RAM contents) remain unchanged.	tc × 26	
4	CURSOR RETURN	0	0	1	0	0	0	0	0	0	0	1	1	Returns the cursor to the first address of the line. (Line feed is done by the cursor address setting.)	tc × 26	
5	SET CURSOR DIRECTION	0	0	1	0	0	0	0	0	0	1	0	1/0	Sets the cursor move direction. The operations are performed during data write.	tc × 26	Note 2
6	CURSOR INC/DEC	0	0	1	0	0	0	0	0	0	1	1	1/0	Performs the cursor increment or decrement without changing DD RAM contents.	tc × 26	Note 3
7	SET CURSOR FONT	0	0	1	0	0	0	0	0	1	0	0	1/0	Selects cursor font: 5 × 7 blinking or underline.	tc × 26	Note 4
8	UNDERLINE CURSOR BLINKING ON/OFF	0	0	1	0	0	0	0	0	1	0	1	1/0	Sets underline cursor continuously ON or blinking.	tc × 26	Note 5
9	CURSOR ON/OFF	0	0	1	0	0	0	0	0	1	1	1	1/0	Sets cursor display ON/OFF.	tc × 26	Note 6
10	DISPLAY ON/OFF	0	0	1	0	0	0	0	0	1	1	0	1/0	Sets the whole display ON/OFF.	tc × 26	Note 7
11	DISPLAY SUPPRESS ON/OFF	0	0	1	0	0	1/0	1	0	0	0	0	0	For one line displays only. Suppresses the display from the cursor which is directed by "SET CURSOR DIRECTION."	tc × 26	Note 8
12	SET CURSOR ADDRESS	0	0	1	0	1	Address Data						Sets cursor address.	tc × 26		
13	SET CHARACTER DATA	0	0	1	1	(See Character Code Map)						Write character data into DD RAM.	tc × 26			

- Notes:**
1. Refer to WRITE TIMING (Page 5).
  - (1/0) 1: Reverse (Decrement)      0: Forward (Increment)
  - (1/0) 1: Decrement (Left)          0: Increment (Right)
  - (1/0) 1: 5 × 7 Blinking              0: Underline
  - (1/0) 1: Blinking ON                0: Blinking OFF
  - (1/0) 1: Cursor Display ON        0: Cursor Display OFF
  - (1/0) 1: The Whole Display ON    0: The Whole Display OFF
  - (1/0) 1: Suppress ON                0: Suppress OFF
  - tc: ENB Clock Pulse Period        (Cancels Suppress Request)

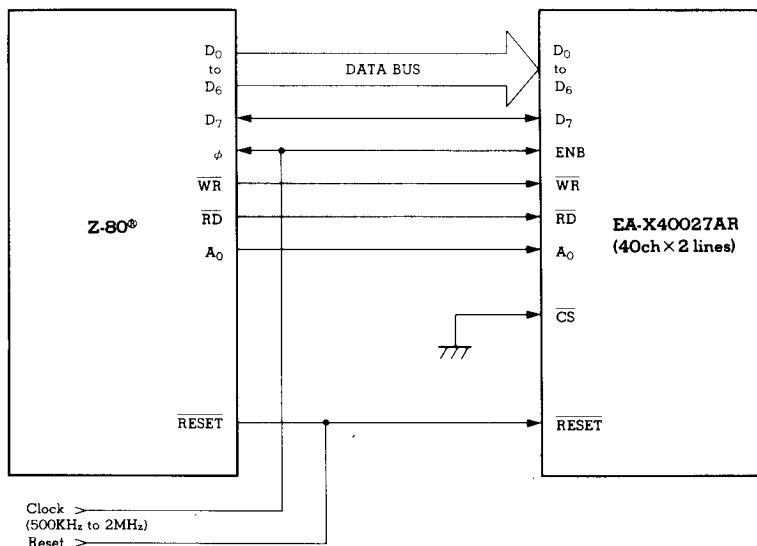
**BUSY FLAG:** Reads the busy state, indicating internal operation is being performed at D<sub>7</sub>.

Item	CS	WR	RD	A <sub>0</sub>	D <sub>7</sub>	D <sub>6</sub> to D <sub>0</sub>
State						
BUSY	0	1	0	*	1	*
NOT BUSY	0	1	0	*	0	*

\* : No effect

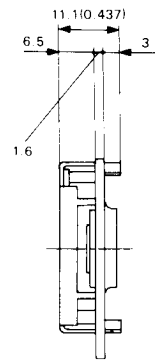
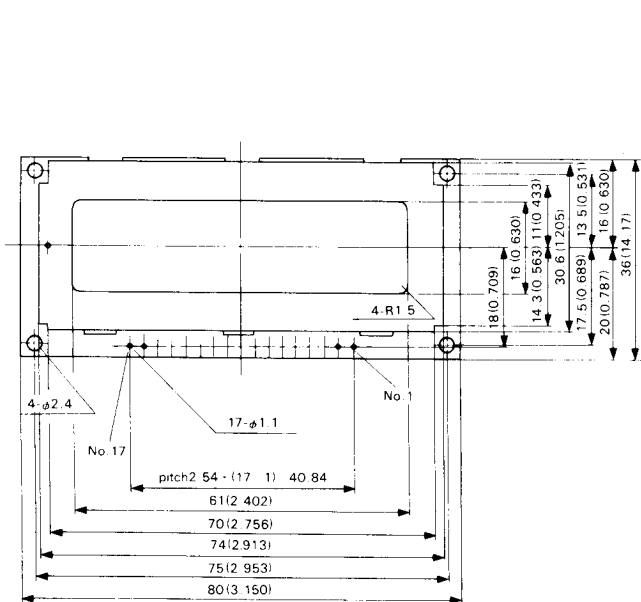
# I/O TERMINALS & AN EXAMPLE OF SYSTEM BLOCK DIAGRAM

Terminal	I/O	Function
D0 to D7	I	Data Bus (D7: I/O)
ENB	I	Clock
A0	I	Select of Display Data/Display Command
RD	I	Read Signal (Read Strobe)
WR	I	Write Signal (Write Strobe)
CS	I	Chip Select
RESET	I	Reset (Cold Start)
VDD	I	Power Supply
VSS	I	GND
VOU	I	Contrast Adjusting Potentiometer
FG	I	Frame Ground

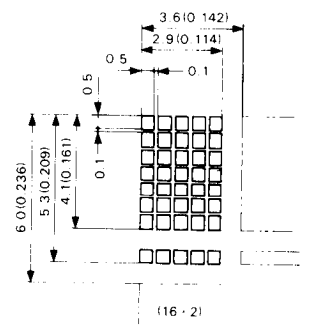
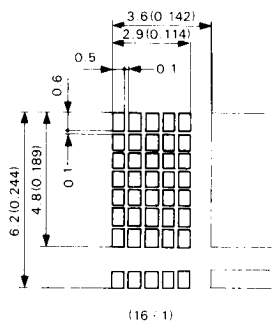


Clock (500KHz to 2MHz)  
Reset

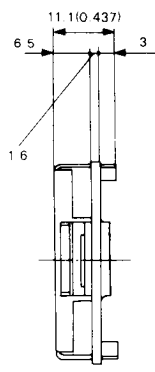
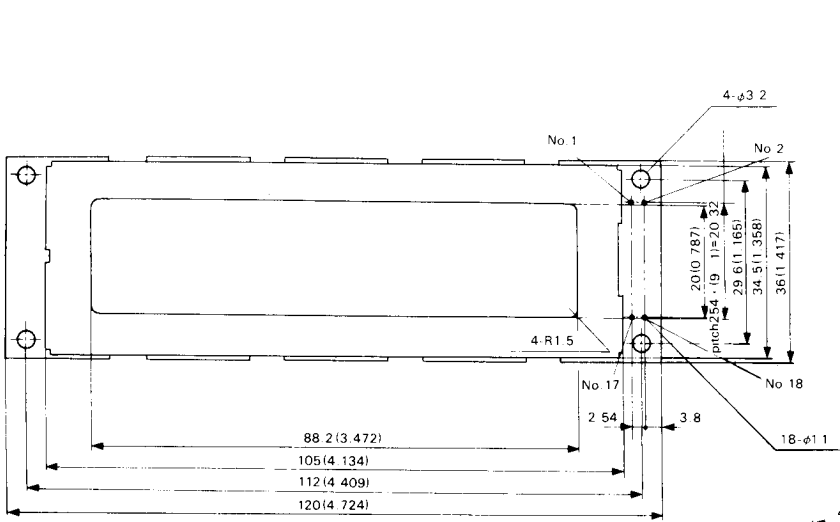
\*Z-80\* is a registered trademark of Zilog Inc.



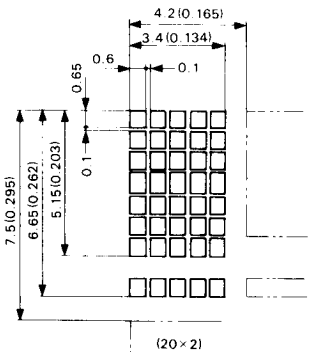
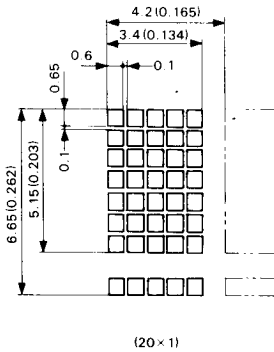
No.	Signal	No.	Signal
1	V <sub>DD</sub>	2	D <sub>0</sub>
3	D <sub>1</sub>	4	D <sub>2</sub>
5	D <sub>3</sub>	6	D <sub>4</sub>
7	D <sub>5</sub>	8	D <sub>6</sub>
9	D <sub>7</sub>	10	A <sub>0</sub>
11	WR	12	RD
13	ENB	14	CS
15	RESET	16	V <sub>OUT</sub>
17	V <sub>SS</sub>		



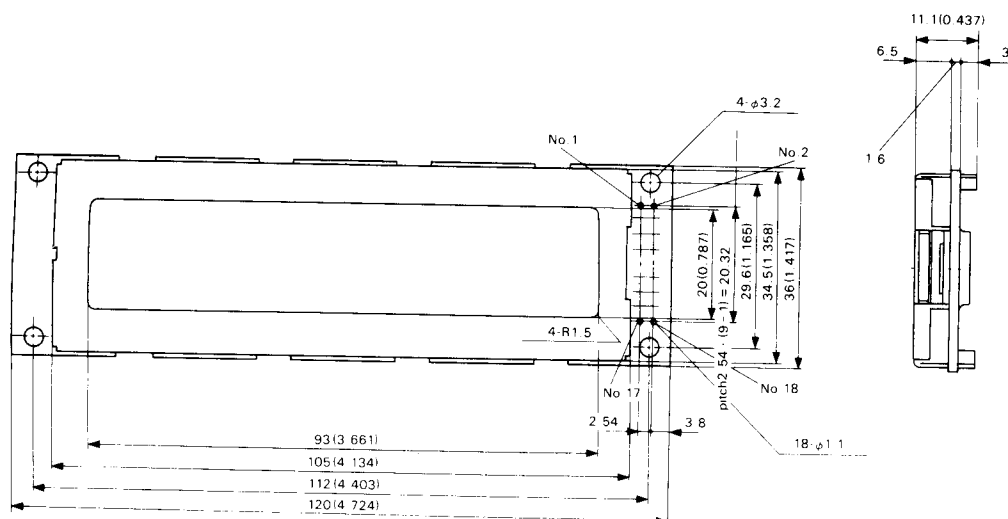
EA-X16017AR EA-X16027AR



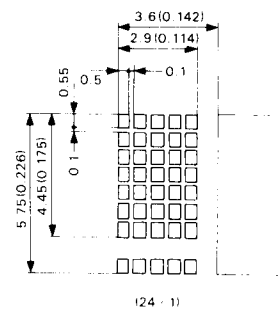
No.	Signal	No.	Signal
1	V <sub>DD</sub>	2	CS
3	ENB	4	RD
5	WR	6	A <sub>0</sub>
7	D <sub>0</sub>	8	D <sub>1</sub>
9	D <sub>2</sub>	10	D <sub>3</sub>
11	D <sub>4</sub>	12	D <sub>5</sub>
13	D <sub>6</sub>	14	D <sub>7</sub>
15	NC	16	RESET
17	V <sub>OUT</sub>	18	V <sub>SS</sub>



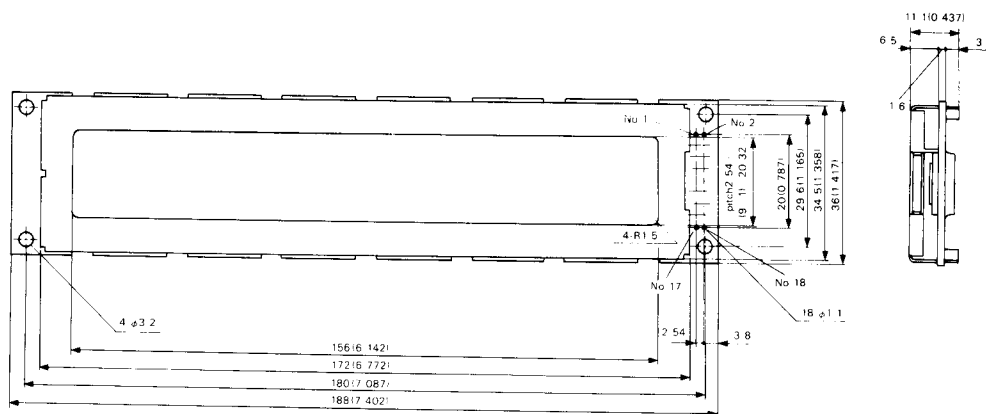
EA-X20017AR EA-X20027AR



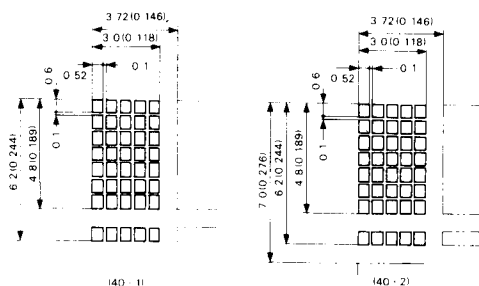
No.	Signal	No.	Signal
1	V <sub>DD</sub>	2	CS
3	ENB	4	RD
5	WR	6	A <sub>0</sub>
7	D <sub>0</sub>	8	D <sub>1</sub>
9	D <sub>2</sub>	10	D <sub>3</sub>
11	D <sub>4</sub>	12	D <sub>5</sub>
13	D <sub>6</sub>	14	D <sub>7</sub>
15	NC	16	RESET
17	V <sub>OUT</sub>	18	V <sub>SS</sub>



EA-X24017AR



No.	Signal	No.	Signal
1	V <sub>DD</sub>	2	CS
3	ENB	4	RD
5	WR	6	A <sub>0</sub>
7	D <sub>0</sub>	8	D <sub>1</sub>
9	D <sub>2</sub>	10	D <sub>3</sub>
11	D <sub>4</sub>	12	D <sub>5</sub>
13	D <sub>6</sub>	14	D <sub>7</sub>
15	NC	16	RESET
17	V <sub>OUT</sub>	18	V <sub>SS</sub>



EA-X40017AR EA-X40027AR

# Model Number Structure

## EA Series

**EA-D16015AR-S**

① ② ③ ④ ⑤ ⑥

- ① Series Name
  - D.....SED1278
  - N..... $\mu$ PD7228G
  - X.....SED1300
  - C.....SED1200
- ② Character  $\times$  Line
- ③ Character Font
  - 0.....5 $\times$ 7 dot matrix with cursor
  - 5.....5 $\times$ 7 dot matrix with cursor
  - 6.....5 $\times$ 12 dot matrix or 5 $\times$ 11 dot matrix
  - 7.....5 $\times$ 7 dot matrix with cursor  
International font
- ④ Equipment
  - A.....Reflective mode
  - B.....With back-lit by EL panel (Blue green)
  - F.....With back-lit by EL panel (White)
  - E.....With back-lit by EL panel (Yellow green)
- ⑤ Connector Type
  - R.....Through hole
  - S.....FFC
  - T.....Card edge
  - Y.....Pin header (Straight)
  - Z.....Pin header (Right angle)
- ⑥ Fluid Type
  - Blank.....TN
  - S.....STN (Silver gray)
  - Y.....STN (Yellow)
  - B.....STN (Blue)

## EG Series

**EG2201S-AR**

① ② ③

- ① Fluid Type
  - A.....TN
  - S.....STN (Silver gray)
  - Y.....STN (Yellow)
  - B.....STN (Blue)
  - N.....NTN (Nutralized super Twisted Nematic  
Black on white)
  - C or F.....FTN (Formulated super Twisted Nematic)
- ② Equipment
  - A.....Reflective mode
  - B.....With back-lit by EL panel (Blue green)
  - E.....With back-lit by EL panel (Yellow green)
  - F or H.....With back-lit by EL panel (White)
  - L or N.....With back-lit by Cold cathode Fluorescent
- ③ Connector Type
  - R.....Through hole
  - S.....FFC
  - Y.....Pin header (Straight)
  - Z.....Pin header (Right angle)

# CHARACTER CODE MAP

■ FOR EA-D SERIES

		Upper 4 bit (D <sub>4</sub> to D <sub>7</sub> ) of Character Code (Hexadecimal)													
		0	2	3	4	5	6	7	A	B	C	D	E	F	
Lower 4 bit (D <sub>0</sub> to D <sub>3</sub> ) of Character Code (Hexadecimal)	0	CG RAM 1		0	A	P	'	P		-	9	E	o	p	
	1	2	!	1	A	a	9	u	7	7	Δ	ä	q		
	2	3	"	2	R	b	r	"	4	"	x	p	e		
	3	4	#	3	C	S	c	s	1	0	T	E	e	o	
	4	5	\$	4	D	T	d	t	.	I	F	P	u	o	
	5	6	%	5	E	U	e	u	.	7	7	1	o	o	
	6	7	&	6	F	V	f	v	7	h	-	a	p	Σ	
	7	8	'	7	G	W	w	7	7	7	7	g	π		
	8	1	(	8	H	X	h	x	4	0	7	7	7	7	
	9	2	)	9	I	Y	y	9	o	7	7	7	7	7	
	A	3	*	:	J	Z	j	z	7	7	7	7	7	7	
	B	4	+	:	K	k	<	*	9	7	7	7	7	7	
	C	5	,	<	L	#	l	l	7	7	7	7	7	7	
	D	6	-	=	M	m	n	>	7	7	7	7	7	7	
	E	7	.	>	N	n	n	7	7	7	7	7	7	7	
	F	8	/	?	O	_	o	7	7	7	7	7	7	7	

■ FOR EA-X & EA-C SERIES

		Lower 4 bit (D <sub>0</sub> to D <sub>3</sub> ) of Character Code (Hexadecimal)															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Upper 4 bit (D <sub>4</sub> to D <sub>7</sub> ) of Character Code (Hexadecimal)	2		!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
	3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
	4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
	6	'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	7	P	q	r	s	t	u	v	w	x	y	z	{		}	~	■
	A	ø	φ	¥	£	₪	₹	₺	₳	₴	₵	₶	₷	₸	₹	₺	₳
	B	°	²	³	⁴	⁵	⁶	⁷	⁸	⁹	¹	²	³	⁴	⁵	⁶	⁷
	C	₰	₱	₲	₳	₴	₵	₶	₷	₸	₹	₺	₳	₴	₵	₶	₷
	D	₸	₹	₺	₳	₴	₵	₶	₷	₸	₹	₺	₳	₴	₵	₶	₷

\* CHARACTER CODE MAP is subject to change without notice. Ask EPSON for the latest CHARACTER CODE MAP.