Data Sheet

Powertip alphanumeric dot matrix liquid crystal displays

Reflective types - RS stock numbers 214-3238, 214-3244, 214-3250, 214-3266, 214-3272, 214-3288, 214-3294, 214-3301, 214-3317, 214-3323, 214-3339, 214-3345, 214-3351, 294-8667, 294-8689, 294-8695, 294-8702, 294-8718, 294-8724, 294-8746, 294-8752

EL types - RS stock numbers 214-3367, 214-3373, 214-3395, 214-3402, 214-3418

LED types - RS stock numbers 214-3424, 214-3430, 214-3452, 214-3468, 214-3474, 214-3480, 214-3496, 214-3519, 214-3525, 214-3531, 214-3547, 214-3553, 214-3569, 214-3575, 215-3617, 294-8774, 294-8780, 294-8796, 294-8803, 294-8819

Intelligent, alphanumeric, dot matrix modules with integral CMOS microprocessor and LCD display drivers. The modules utilise a 5 × 7 dot matrix format with cursor, and are capable of displaying 189 different alphanumeric characters and symbols. The modules are available in twisted nematic and super twisted nematic grey mode. Reflective types are available in TN and STN, EL backlit types in TN, LED backlit transmissive types in TN LED backlit transflective types in STN. Inverters are required to drive the EL backlit types.

Applications

- Data terminals
- Medical instruments
- Hand-held instruments
- Hand-held data terminals
- Electronic typewriters
- Point of sale terminals
- Test instruments
- Word processors.

Features

- Single 5V power supply (excluding EL types)
- Wide viewing angle (STN)
- High contrast
- Interfaces to 4 or 8-bit data bus
- ASC11 compatible
- Chip-on-board technology (COB)
- 189 different characters and symbols
- Compact and lightweight
- Low power consumption
- Surface mounted components (SMT).

ATTENTION

OBSERVE PRECAUTIONS FOR HANDLING

ELECTROSTATIC SENSITIVE DEVICES

Absolute maximum rating

Item	Symbol	Value	Unit
Power supply voltage	Vdd - Vss	-0.3 ~ + 7.0	V
Driver supply voltage	Vlcd	Vdd - 13.5 ~ Vdd +0.3	
Input voltage	Vin	-0.3 ~ Vdd +0.3	
Operating temperature range	Top	0 ~ +50	°C
Storage temperature range	Tst	-20 ~ +60	

Description of terminals

Symbol	Input/ Output	External connection	Function
RS	Input	MPU	**Register selection input** High: Data register (for read and write) Low: Instruction register (for write), Busy flag, address counter (for read)
R/W	Input	MPU	R/W signal input is used to select the read/write mode High: Read mode Low: Write mode
E	Input	MPU	Start enable signal to read or write the data
DB4 | DB7	Input/ Output	MPU	Four high order bidirectional three-state data bus lines. Used for data transfer between the MPU and the LCD module. DB7 can be used as a busy flag.
DB0 | DB3	Input/ Output	MPU	Four low order bidirectional three-state data bus lines. Used for data transfer between the MPU and the LCD module. These four are not used during 4-bit operation.
Vdd Vss		Power Supply	Vdd : + 5V Vss : GND
Vo		Power Supply	Contrast adjustment voltage

Electrical characteristics

DC characteristics (Vdd = + 5V ± 10%, Vss = OV, Ta = 25°C)

Parameter	Symbol	Condition	Application PIN	Min.	Type	Max.	Unit
H level input voltage (1)	Vih 1	-	DB0 ~ DB7	2.2	-	Vdd	V
L level input voltage (1)	Vil 1	-	RS, R/W, E	-0.3	-	0.6	V
H level input voltage (2)	Vih 2	-	OSC1	Vdd -1.0	-	Vdd	V
L level input voltage (2)	Vil 2	-		-0.2	-	1.0	V
H level output voltage (1)	Voh 1	Ioh = -0.205mA	DBO ~ DB7	2.4	-	-	V
L level output voltage (1)	Vol 1	Iol = 1.2mA		-	-	0.4	V
H level output voltage (2)	Voh 2	Ioh = -40uA	XSC LP DO	0.9Vdd	-	-	V
L level output voltage (2)	Vol 2	Iol = 40uA		-	-	0.1Vdd	V
I/o leakage current	Iil	Vin = 0 to Vdd		-1	-	1	uA
Pull-UP Mos current	-Ip	Vdd = 5V		50	125	250	uA
Supply current	Iop	RF oscillation, from external clock Vdd = 5v fosc = 270kHz	Vdd	-	0.35	0.6	mA

Internal clock operation (Rf oscillation)

Oscillation frequency	fosc	Rf = 91k Ω ± 2%	OSC1 | OSC2	190	270	350	kHz
Oscillation frequency	fosc	Ceramic filter	OSC1 | OSC2	245	250	255	kHz
LCD driving voltage	Vlcd	Vdd - V5	V1 ~ V5	3.0	-	11.0	V

AC characteristics (Vdd = 5V ± 10%, Vss = 0V, Ta = 25°C)

Read cycle

Parameter	Symbol	Min.	Type	Max.	Unit	Test PIN
Enable cycle time	tc	500	-	-	ns	E
Enable "H" level pulse width	tw	220	-	-	ns	E
Enable rise/fall time	tr,tf	-	-	25	ns	E
RS, R/W setup time	tsu	40	-	-	ns	R/W, RS
RS, R/W address hold time	th	10	-	-	ns	R/W, RS
Read data output delay	td	60	-	120	ns	DB0 ~ DB7
Read data hold time	tdh	20	-	-	ns	DB0 ~ DB7

Write cycle

Parameter	Symbol	Min.	Type	Max.	Unit	Test PIN
Enable cycle time	tc	500	-	-	ns	E
Enable H level pulse width	tw	220	-	-	ns	E
Enable rise/fall time	tr,tf	-	-	25	ns	E
RS, R/W setup time	tsul	40	-	-	ns	R/W, RS
RS, R/W address hold time	th1	10	-	-	ns	R/W, RS
Date setup time	tsu2	60	-	-	ns	DB0 ~ DB7
Write data hold time	th2	10	-	-	ns	DB0 ~ DB7

Optical characteristics

1. STN type

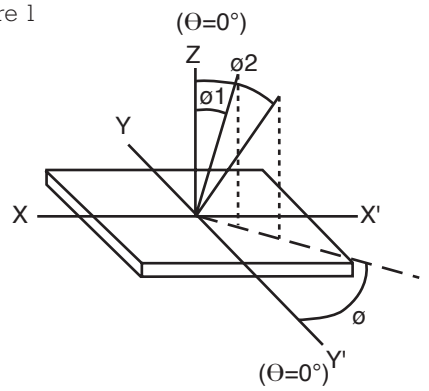
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing angle	ø2 -ø1	K = 1.4	60	-	-	deg.	*1, *2
Contrast ratio	K	ø = 10°C θ = 0°C	5	-	-	-	*3
Response time (rise)	tr	ø = 10°C θ = 0°C	-	150	250	ms	*4
Response time (fall)	tf	ø = 10°C θ = 0°C	-	200	300	ms	*4

2. TN type

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing angle	ø2 -ø1	K = 1.4	40	-	-	deg.	*1, *2
Contrast ratio	K	ø = 25°C θ = 0°C	-	5	-	-	*3
Response time (rise)	tr	ø = 25°C θ = 0°C	-	80	120	ms	*4
Response time (fall)	tf	ø = 25°C θ = 0°C	-	60	90	ms	*4

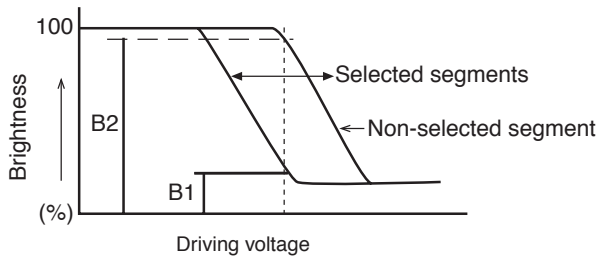
*1. Definition of Θ and ø

Figure 1



*3. Definition of contrast ratio

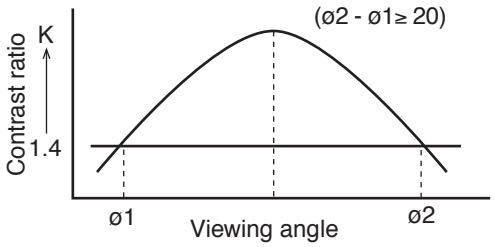
Figure 3



$$K = \frac{\text{Brightness of non-selected (B2)}}{\text{Brightness of selected segment (B 2)}}$$

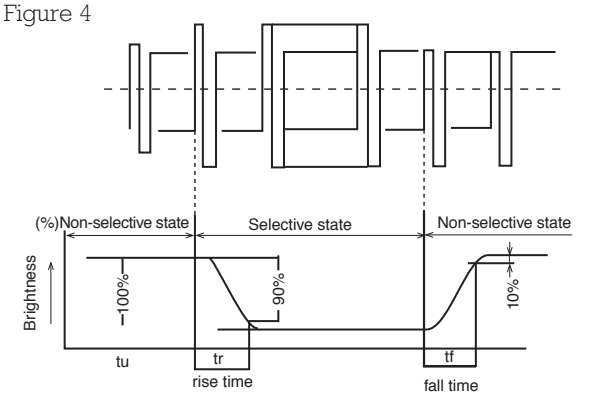
*2. Contrast vs viewing angle

Figure 2



*4 Definition of optical response

Figure 4



Timing characteristics

Figure 5 **Write operation**

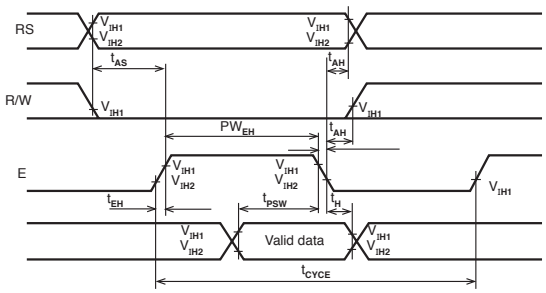
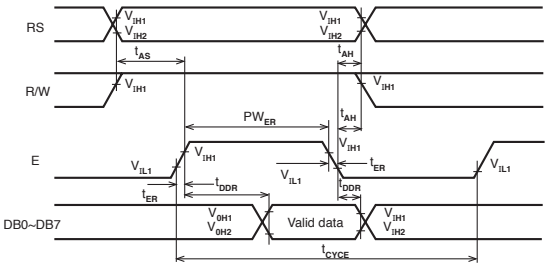


Figure 6 **Read operation**



Interface between data bus line and 4-bit or 8-bit MPU is available. Data transfer is made in twice in case of 4-bit MPU, and once in case of 8-bit MPU.

If interface data is 4-bit long

Data transfer is made through 4 bus lines from DB4 to DB7 while the rest of 4 bus lines from DB0 to DB3 are not used. Data transfer with MPU is completed when 4 -bit data is transferred in twice, first upper 4-bit data then lower 4-bit data.

If interface data is 8-bit long

Data transfer is made through all of 8 bus lines from DB0 to DB7.

Example of interface with 8-bit MPU (Z80)

Figure 7

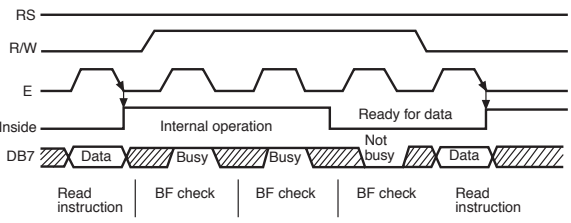
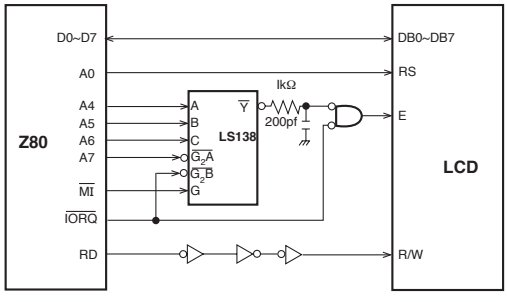


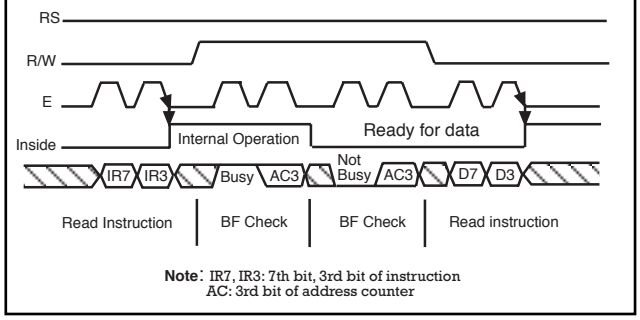
Figure 8



Example of interface with 4-bit MPU

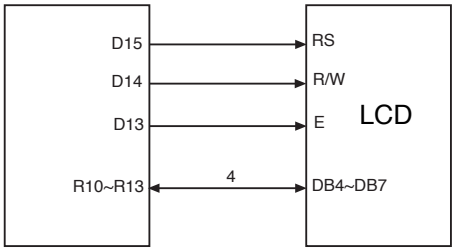
Interface with 4-bit MPU can be made through I/O port of 4-bit MPU. If there are enough I/O ports, data can be transferred by 8-bit, however, if there is not, data transfer can be done by 4-bit in twice (select interface is 4-bit long), and timing sequence will be complicated in this case. Please take into account that 2 cycles of BF check is necessary, while 2 cycles of data transfer are also necessary.

Figure 9



Note: IR7, IR3: 7th bit, 3rd bit of instruction
AC: 3rd bit of address counter

Figure 10

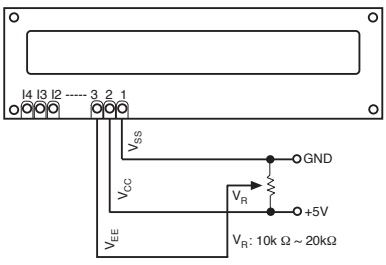


Features

1. Interface with 8-bit or 4-bit MPU is available.
2. 192 kind of alphabets, numerals, symbols and special characters can be displayed by built-in character generator (ROM).
3. Other preferred characters can be displayed by character generator (RAM).
4. Various functions of instruction are available by programming.
   - Clear display
   - Cursor at home
   - On/off cursor
   - Blink character
   - Shift display
   - Shift cursor
   - Read/write display data etc.
5. Compact and light design which can be easily assembled in devices.
6. Single power supply +5 drive
7. Low power consumption.

Example of power supply

Figure 11



Note: If V_{EE} varies from recommended value, you cannot get proper contrast on viewing angle

Instructions

Instructions	Code										Description	Executed Time (max.)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear display	0	0	0	0	0	0	0	0	0	1	Clears all displays and returns the cursor to the home position (Address 0)	1.64mS
Cursor at home	0	0	0	0	0	0	0	0	1	*	Returns the cursor to the home position (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	Sets the cursor move direction and specifies or not to shift the display. These operations are performed during the data write and read.	40μS
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).	40μS
Cursor/display shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves the cursor and shifts the display without changing DDRAM contents.	40μS
Function set	0	0	0	0	1	DL	N	F	*	*	Sets interface data length (DL) number of display lines (L) and character font (F).	40μS
CGRAM address set	0	0	0	1	ACG						Set the CGRAM address. CGRAM data is sent and received after this setting.	40μS
DDRAM address set	0	0	1	ADD							Sets the DDRAM address. DDRAM data is sent and received after this setting.	40μS
Busy flag/address read	0	1	BF	AC							Reads busy flag (BF) indicating internal operation is being performed and reads address counter contents.	0μS
CGRAM/DDRAM data write	1	0	Write data								Writes data into DDRAM or CGRAM.	40μS
CGRAM/DDRAM Data read	1	1	Read data								Reads data from DDRAM or CGRAM.	40μS

Code		Description	Executed time (max.)
I/D=1:Increment	DL=0:4-bit	DDRAM:Display data RAM	
I/D=0:Decrement	N=1:2 lines	CGRAM:Character generator RAM	fcp or fosc=250kHz
S=1:With display shift	N=0:1 line	ACG:CGRAM address	However, when frequency changes,
S/C=1: Display shift	F=1:5 x 10dots	ADD:DDRAM address corresponds	execution time also changes
S/C=0: Cursor movement	F=0.5 x 7dots	to cursor address.	Ex
R/L=1: Shift to the right	BF=1: Internal operation	AC: Address counter, used for	If fcp or fosc is 270kHz,
R/L=0: Shift to the left	is being performed	both DDRAM and CGRAM	40μS x 250/270 = 37μS
DL=1:8-bit	BF=0: Instruction acceptable		
		*Invalid	

Figure 12

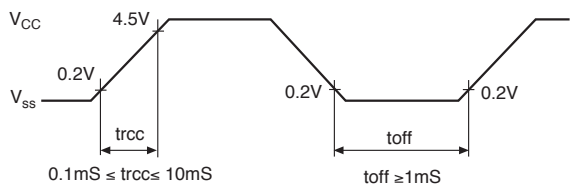
Standard character pattern

Power supply reset

The internal reset circuit will be operated properly when the following power supply conditions are satisfied. If it is not operated properly, please perform initial setting along with the instruction.

Item	Symbol	Measuring Condition	Standard value			Unit
			min.	typ.	max.	
Power supply rise time	trcc	-	0.1	-	10	mS
Power supply OFF time	toff	-	1	-	-	mS

Figure 13



Note: toff defines period that power supply is off when power shuts down momentarily or repeats on/off state

Reset function

- Initialisation made by Internal Rest Circuit

  KS0066 automatically initialises (resets) when power is supplied (built-in internal reset circuit). The following instructions are executed in initialisation. The busy flag (BF) is kept in a busy state until initialisation ends. (BF=1) The busy state is 10ms after Vdd reach to 4.5V.

1. Display clear
2. Function set

   DL = 1:8bit long interface data

   DL = 0:4bit F=0:5 x dot character font

   N =1: 2lines

   N =0: 1line
3. Display ON/OFF control

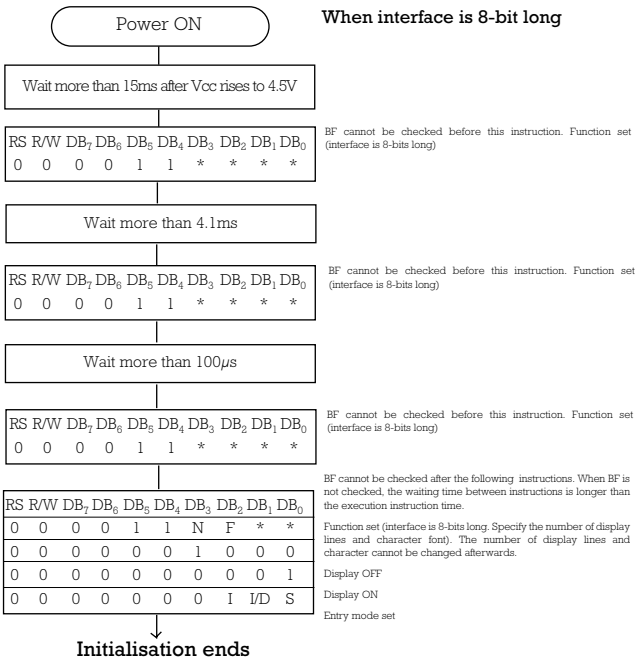
   D=0:display OFF C=0:cursor OFF B=0:blink OFF
4. Entry mode set

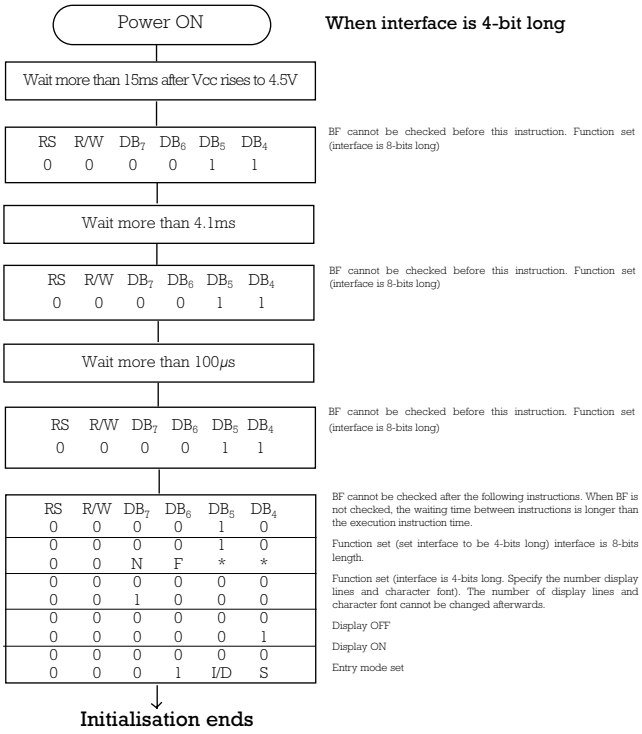
   1/D=1: + 1 (increment) S=0:No shift

Note: When conditions stated in Power Supply Conditions Using Internal Reset Circuit are not satisfied, the internal reset circuit will not operate properly and initialisation will not be performed. Please make initialisation using MPU along with instructions.

Initialisation along with instructions

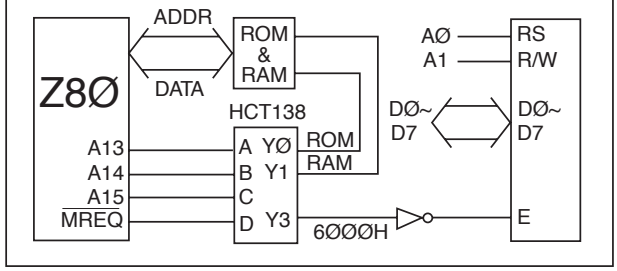
If power supply conditions are not satisfied, for proper operation of internal reset circuit, it is required to make initialisation along with instruction. Please make following procedures:-





Application example

Figure 14



All modules except 20 x 4 and 40x4
Example of interfacing to Z8Ø MPU running at 2 Mhz
AØ is connected to **RS** of module
where AØ = 1: Instruction register is selected
where AØ = Ø: Data register is selected
A1 is connected to R/W of module
where A1 = Ø: Module in write mode
where A1 = 1: Module in read mode

```
WRINST EQU 6ØØØH    ;write instruction
WRDATA EQU 6ØØ1H    ;write data
RDBUSY EQU 6ØØ2H    ;read busy
```

Initialisation

```
LD      B,Ø         ;power up delay
DJNZ    $
LD      SP,27FFH    ;stack pointer
LD      HL, INITBL  ;init table pointer
LD      B,15        ;15ms delay
CALL    INSTR       ;o/p instruction to  module
LD      B,5         ;5ms delay
CALL    INSTR       ;o/p instruction to module
LD      B,1         ; one ms delay
CALL    INSTR       ;o/p instruction to module
```

Function set

function set

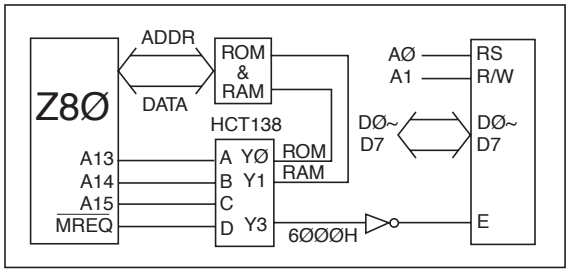
```
        LD      B,4         ;four modes
MODSET; CALL    BUSY        ;check for not busy
        INC     HL          ;inc table pointer
        LD      A,(HL)      ;get data
        LD      (WRINST),A  ;and sent to module
        DJNZ    MODSET      ;next mode
```

Write message to module

```
        LD      HL,MESSAGE      ;get message table
;turn on display, blinking cursor
        CALL    BUSY
        LD      A,ØØØØ1111B     ;display on, cursor
        LD (WRINST),A           ;blink
;set DDRAM address to ØØH
        LD      A,1ØØØØØØØB     ;set to ØØH
        CALL    MESG            ;o/p message
;set DDRAM address to 4ØH
        LD      A,11ØØØØØØB     ;set to 4ØH
        CALL    MESG            ;o/p message
        HALT                    ;program stop here.....

;subroutine to set DDRAM addr and o/p message
MESG:   CALL    BUSY
        LD      (WRINST),A
;write message to module
        LD      B,8             ;no. of byte to be sent
WRITE2: CALL    BUSY
        LD      A,(HL)          ;get character
        LD      (WRDATA),A      ;write to module
        INC     HL              ;inc pointer
        DJNZ    WRITE2          ;next byte
        RET

; subroutine : busy check
BUSY:   PUSH    AF
BUSY1:  LD      A, (RDBUSY)
        BIT     7, A
        JR      NZ, BUSY1
        POP     AF
        RET

;subroutine: o/p instruction to module
INSTR:  CALL    DELAY           ;time delay
        LD      A,(HL)          ;get data
        LD      (WRINST), A     ;o/p to module
        RET

; time delay subroutine
; Total delay time = B* 1mS
; Register destroyed : DE
DELAY:  PUSH    HL
        LD      DE,-1
LOOP1:  LD      HL, 431/5
LOOP2:  ADD     HL, DE
        JR      C, LOOP2
        DJNZ    LOOP1
        POP     HL
        RET

; data table for initialisation routine
INITBL: DEFB    ØØ11ØØØØB       ;set DL to high
        DEFB    ØØ111ØØØB       ;8-bit, 2 lines, 5X7 dots
        DEFB    ØØØØ1ØØØB       ;display off
        DEFB    ØØØØØØØ1B       ;clear display, return cursor
        DEFB    ØØØØ11ØB        ;set shift mode (entry mode set)
; message
        MESSGE: DEFB    'DISPLAY MODULES'
```

Application example for 20 x 4 and 40 x 4 displays

Figure 15



Example of interfacing to Z8Ø MPU running at 2 Mhz
AØ is connected to RS of module
where AØ = 1: Instruction register is selected
where AØ = Ø: Data register is selected
A1 is connected to R/W of module
where A1 = Ø: Module in read mode
where A1 = Ø: Module in read mode

```
WRINST  EQU   6ØØØH   ;write instruction
WRDATA  EQU   6ØØ1H   ;write data
RDBUSY  EQU   6ØØ2H   ;read busy
```

Initialisation

```
LD      B,Ø           ;power up delay
DJNZ    $
LD      SP,27FFH      ;stack pointer
LD      HL, INITBL    ;init table pointer
LD      B,15          ;15ms delay
CALL    INSTR         ;o/p instruction to  module
LD      B,5           ;5ms delay
CALL    INSTR         ;o/p instruction to module
```

Function set

```
LD      B,1           ; one mS delay
CALL    INSTR         ;o/p instruction to module
```

Function set

```
; function set
        LD      B,4             ;four modes
MODSET; CALL    BUSY            ;check for not busy
        INC     HL              ;inc table pointer
        LD      A,(HL)          ;get data
        LD      (WRINST),A      ;and sent to module
        DJNZ    MODSET          ;next mode
```

Write message to module

```
; turn on display, blinking cursor
      CALL    BUSY
      LD      A,ØØØØ1111B     ;display on, cursor
      LD (WRINST),A           ;blink
;send message to display module
        LD    HL,MESSGE       ;get message table
OUTMSG: LD    A,(HL)          ;get data from messge
                              table
        CP    $               ;is end of message ?
;       JR    Z,ENDMSG        ;yes, it is
        LD    B,A             ;no, this is the number
                              of byte to be sent
        INC   HL              ;now, get the DDRAM
                              addr
        LD    A,(HL)
        CALL  BUSY            ;check for not busy
        SET   7,A             ;set bit 7 to 1
        LD    (WRINST), A     ;o/p to module
NXTCHR: INC   HL              ;get character
        LD    A,(HL)
        CALL  BUSY            ;check for not busy
        LD    (WRDATA), A     ;o/p to module
        DJNZ  NXTCHR          ;o/p next character
        INC   HL              ;inc pointer
        JR    OUTMSG          ;go and check any
                              more message
;
ENDMSG:       HALT            ;program stop here.....
```

subroutine: busy check

```
BUSY;   PUSH  AF
BUSY1   LD    A,(RDBUSY)
        BIT   7,A
        JR    NZ,BUSY1
        POP   AF
        RET
```

```
;  SUBROUTINE : o/p instruction to module
INSTR:  CALL  DELAY           ;time delay
        LD    A,(HL)          ;get data
        LD    (WRINST),A      ;o/p to module
        RET
```

```
; time delay subroutine
; Total delay time = B * 1mS
; Register destroyed : DE
DELAY:  PUSH  HL
        LD    DE, - 1
LOOP1:  LD    HL,431/5
LOOP2:  ADD   HL,DE
        JR    C,LOOP2
        DJNZ  LOOP1
        POP   HL
        RET
```

```
; data table for initialisation routine
INITBL: DEFB  ØØ11ØØØØB ;set DL to high
        DEFB  ØØ111ØØØB ;8 bit, 2 lines, 5x7 dots
        DEFB  ØØØØ1ØØØB ;display off
        DEFB  ØØØØØØØ1B ;clear display, return
                        cursor
        DEFB  ØØØØØ11ØB ;set shift mode
```

```
; message
MESSGE:  DEFB   18      ;no. of character to be sent
         DEFB   ØØH     ;ADDR OF DDRAM
         DEFB   'This is first line'
         DEFB   19      ;no. of character to be sent
         DEFB   4ØH     ;addr of DDRAM
         DEFB   'This is second line'
         DEFB   18      ;no. of character to be sent
         DEFB   14H     ;addr of DDRAM
         DEFB   'This is third line'
         DEFB   19      ;no. of character to be sent
         DEFB   54H     ;addr of DDRAM
         DEFB   'This is fourth line'
         DEFB   '$'     ;end of message
         END
```

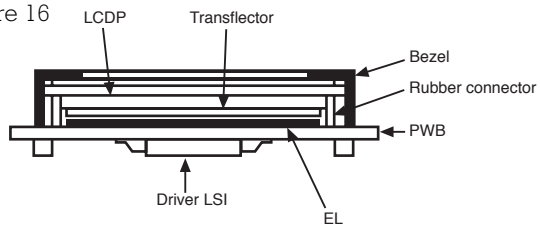
EL

Flat surface light source offers simple and even illumination over large area. It has an extremely thin structure type of illumination with little heat up.

Features

- Max. 1.3mm thickness (max. 1.5mm for lead portion)
- Wide driving condition of 60- 1,000Hz and 150Vac max., with inverter, step-up voltage from 1.5V battery is available
- Emitted colour is white
- Temperature range: operating 0°C ~ + 50°C
  Storage - 20°C ~ + 60°C

Figure 16



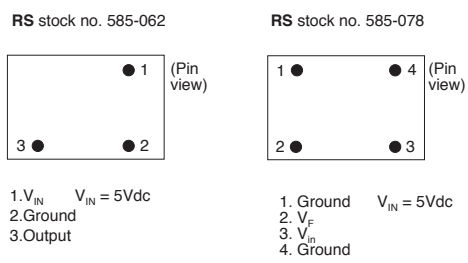
Inverter for EL back light drive

It is necessary to use inverter an when you need to operate EL with battery or a dc power supply.

- Low inverter loss and high light efficiency because it is designed as suitable for EL.
- Less change of power consumption during operation under temperature change or extended hours, which is realised by characteristics of constant supply current, minimises brightness change of EL.

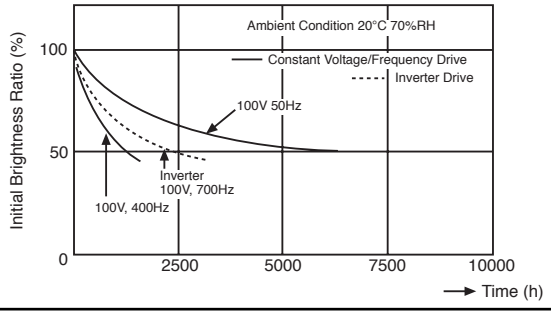
Inverter connections

Figure 17



Life characteristics

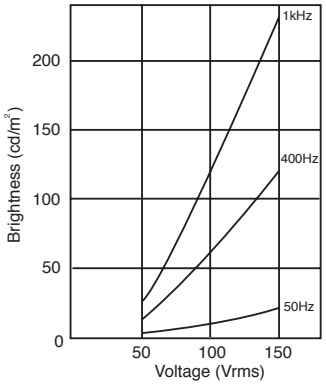
Figure 18



Electrical characteristics (reference data)

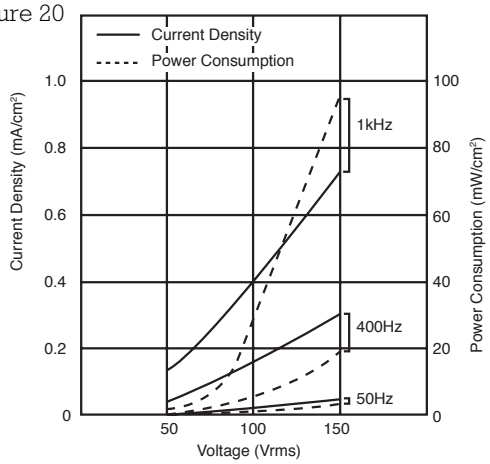
- Voltage VS. brightness

Figure 19



- Voltage VS. current density

Figure 20

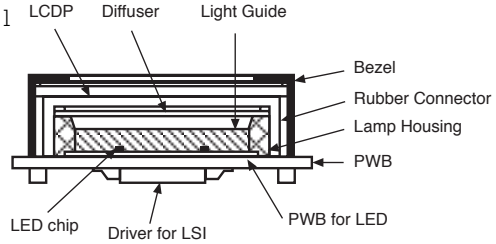


LED backlight types

Features

- Low voltage driving (dc) is available without inverter
- Long life time 100,000 hours (average)
- No noise occurrence.

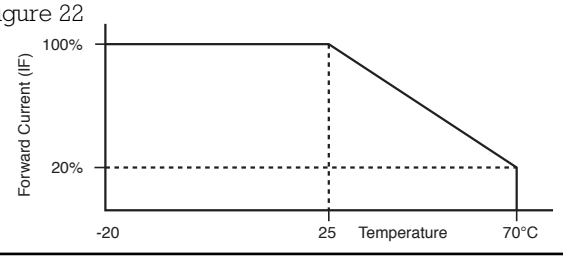
Figure 21



Electrical characteristics (reference data)

● Forward current
derating curve

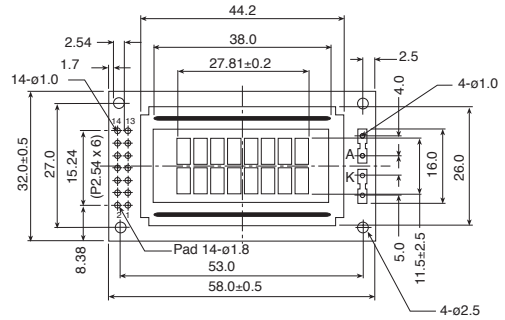
Figure 22

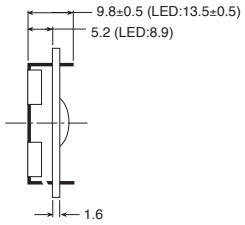


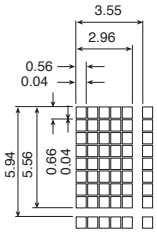
Mechanical dimensions

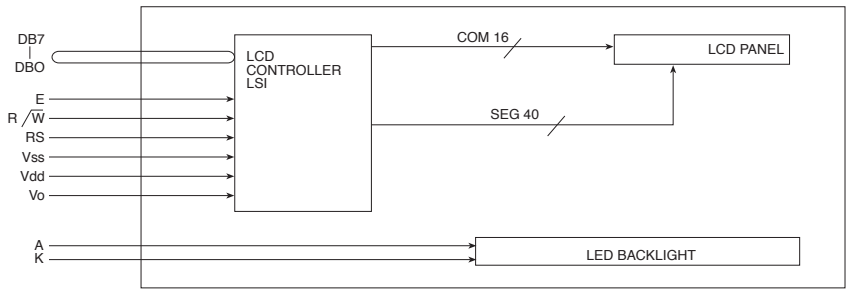
8 x 2 LCD modules

Figure 23







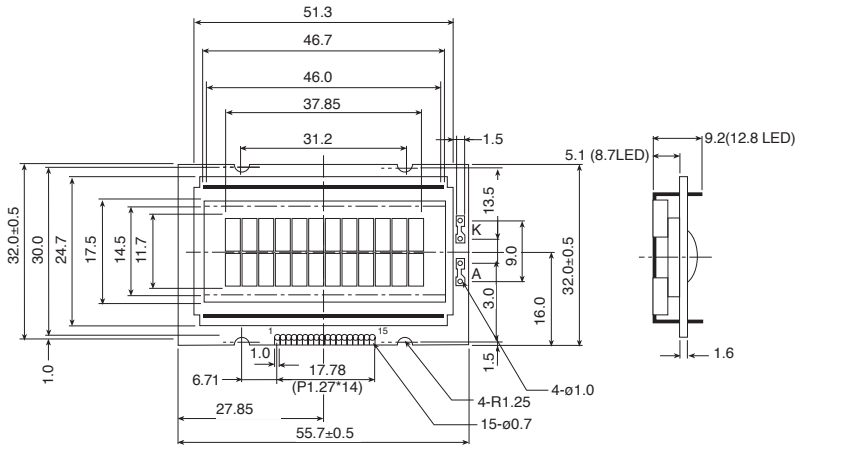


PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/$\overline{W}$
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7

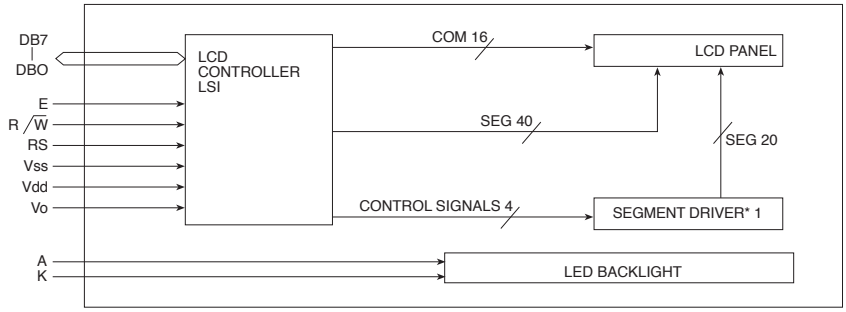
RS stock no. 214-3288 STN reflective
RS stock no. 214-3367 TN with EL backlighting
RS stock no. 214-3424 TN transmissive with LED backlighting
RS stock no. 214-3480 STN transflective with LED backlighting.

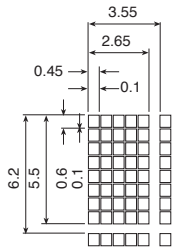
12 x 2 LCD module

Figure 24



PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/$\overline{W}$
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A

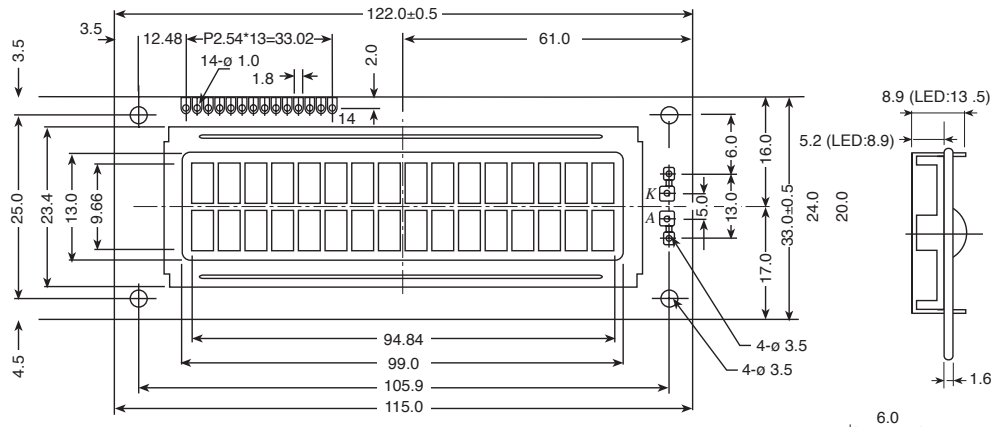


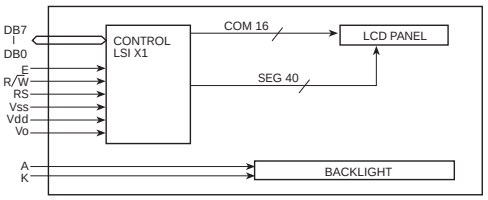


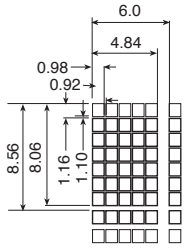
RS stock no. 294-8689 STN reflective
RS stock no. 214-3496 STN transflective with LED backlighting

16 x 1 Large Character LCD modules

Figure 25





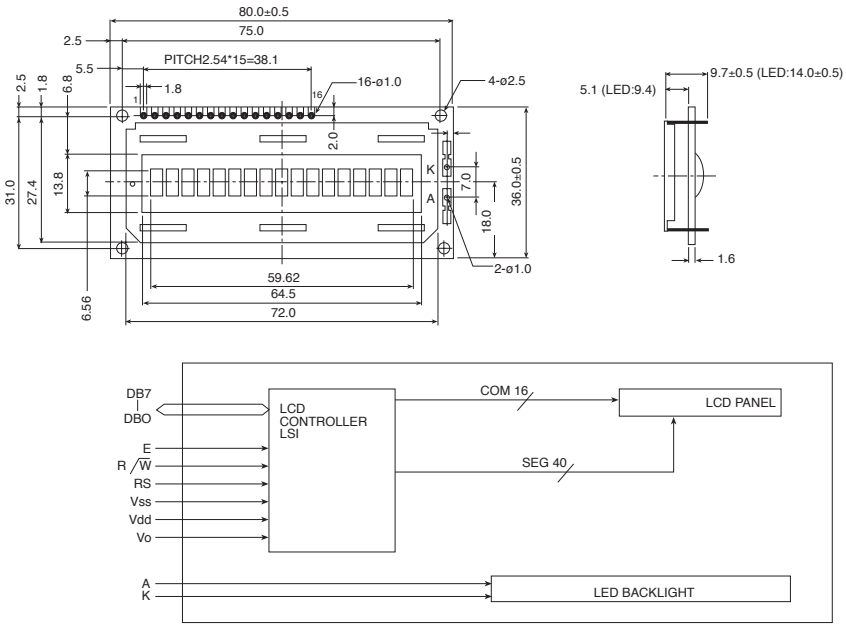


PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/$\overline{W}$
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
-	A
-	K

RS stock no. 294-8718 STN reflective
RS stock no. 294-8796 STN transflective with LED backlighting

16 x 1 LCD modules

Figure 26

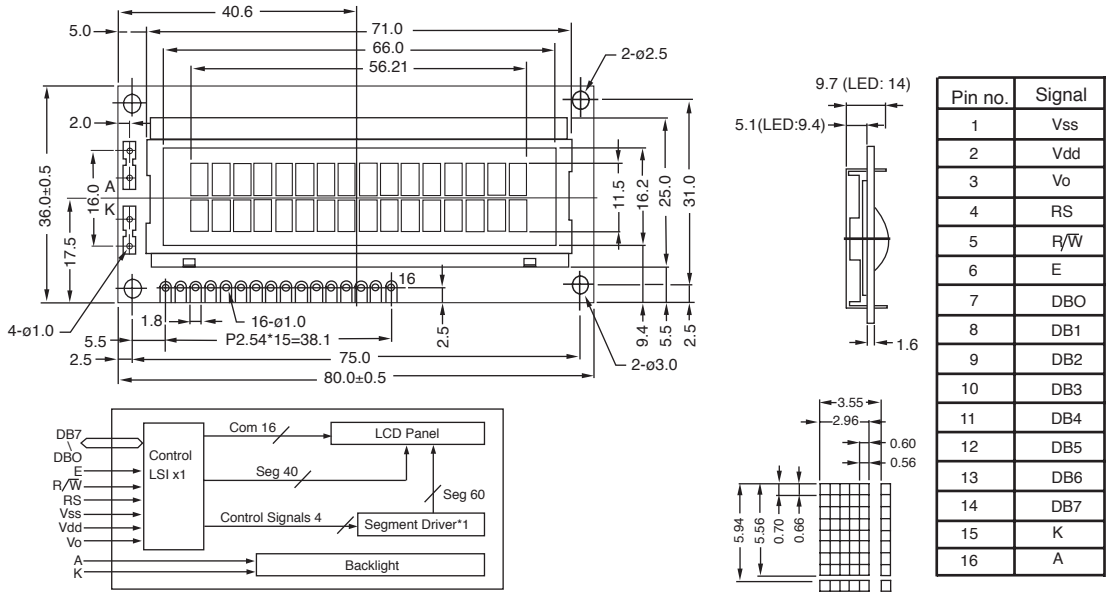


PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K

RS stock no. 214-3238 TN reflective
RS stock no. 214-3294 STN reflective
RS stock no. 214-3373 TN with EL backlighting
RS stock no. 214-3430 TN transmissive with LED backlighting
RS stock no. 214-3519 STN transflective with LED backlighting.

16 x 2 Small PCB LCD modules

Figure 27

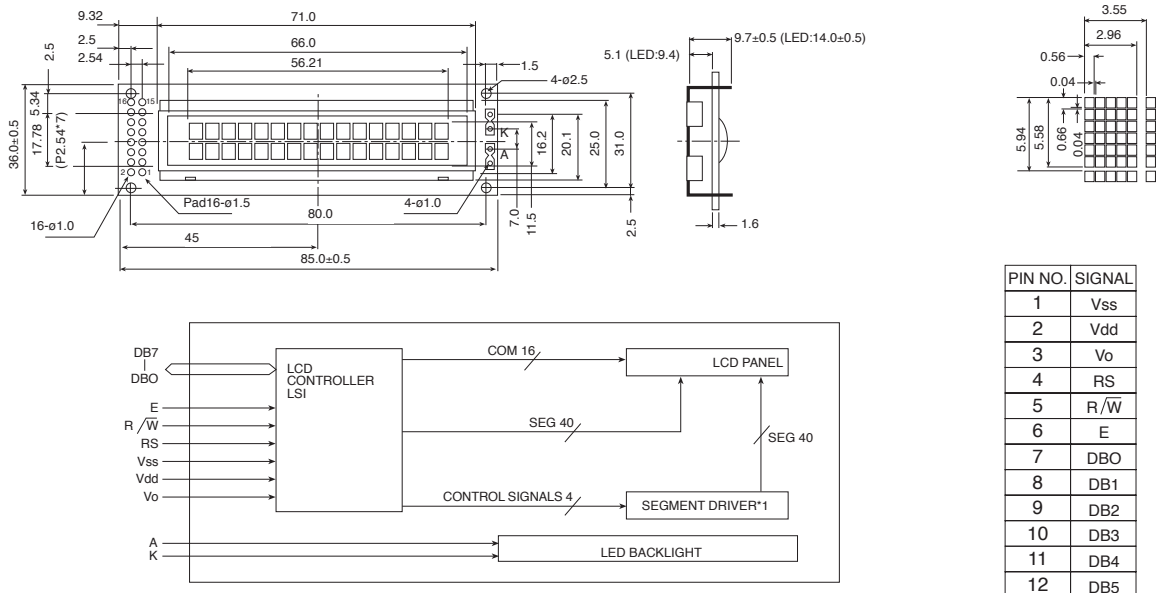


Pin no.	Signal
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	K
16	A

RS stock no. 294-8667 TN reflective
RS stock no. 294-8695 STN reflective
RS stock no. 294-8774 STN transflective with LED backlighting

16 x 2 LCD modules

Figure 28

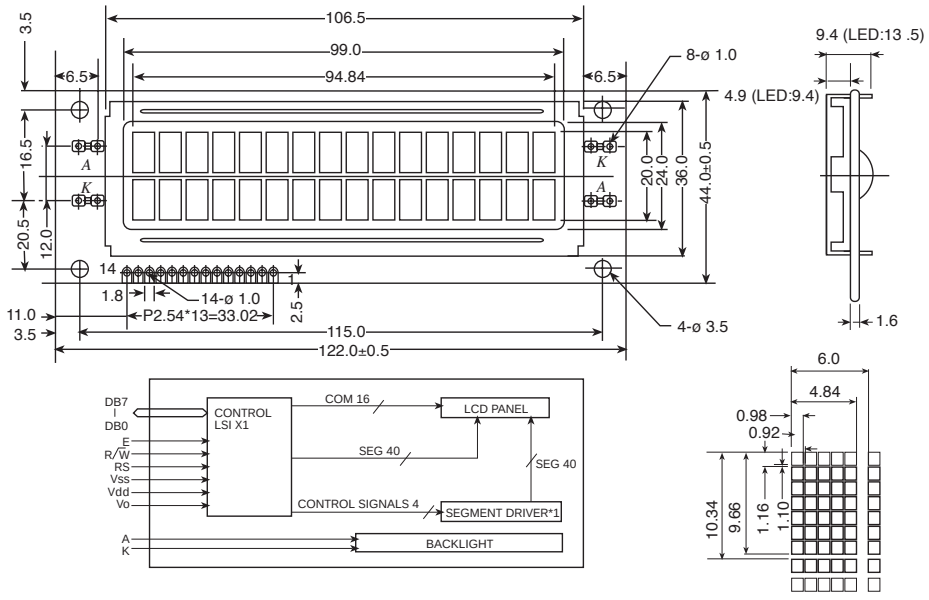


PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K

RS stock no. 214-3244 TN reflective
RS stock no. 214-3301 STN reflective
RS stock no. 214-3395 TN with EL backlighting
RS stock no. 214-3452 TN transmissive with LED backlighting
RS stock no. 214-3525 STN transflective with LED backlighting.

16x 2 Large Character LCD modules

Figure 29

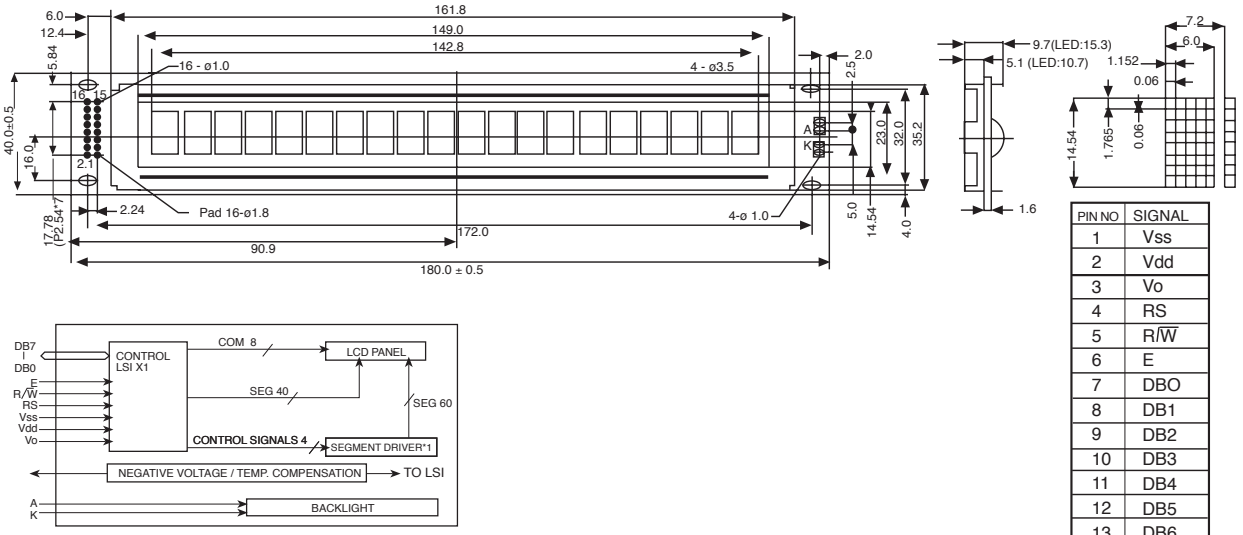


PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
-	A
-	K

RS stock no. 294-8724 STN reflective
RS stock no. 294-8803 STN transflective with LED backlighting.

20 x 1 Large Character LCD modules

Figure 30

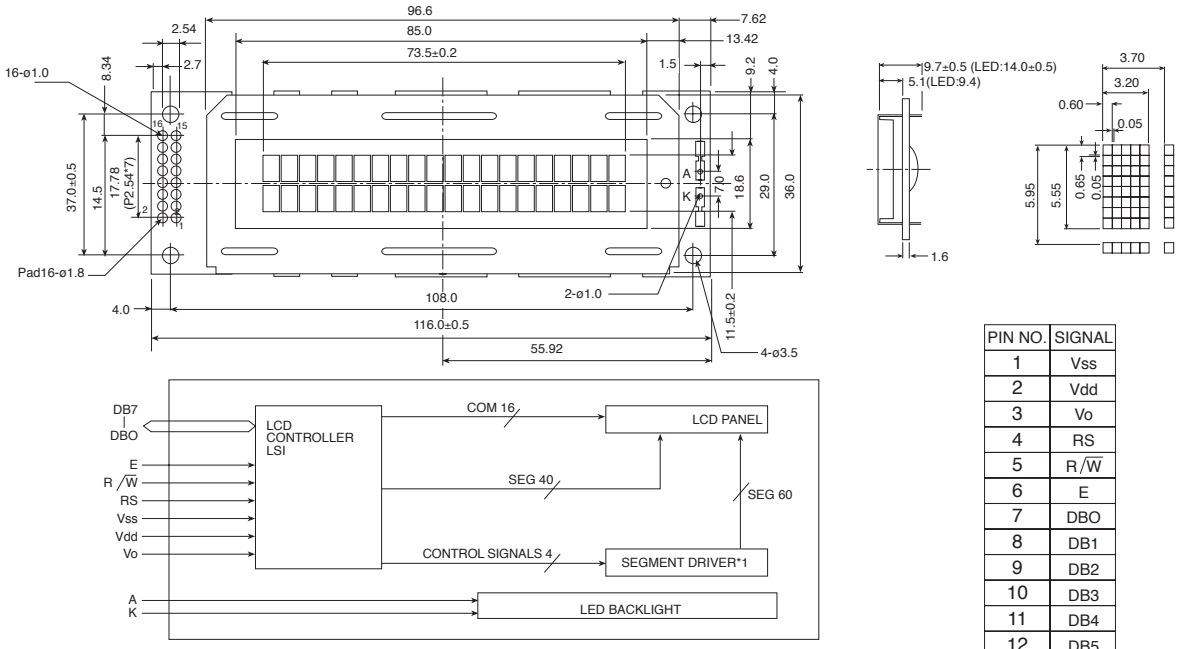


PIN NO	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/$\overline{W}$
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	NC/Vee
16	NC
-	A
-	K

RS stock no. 294-8746 STN reflective
RS stock no. 214-3531 STN transflective with LED backlighting.

20 x 2 LCD modules

Figure 31

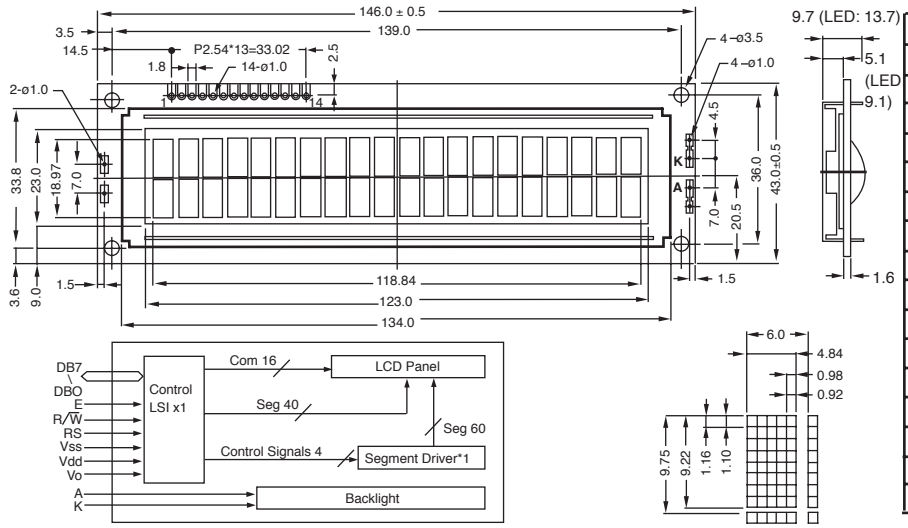


PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/$\overline{W}$
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K

RS stock no. 214-3317 STN reflective
RS stock no. 214-3547 STN transflective

20 x 2 Large Character LCD modules

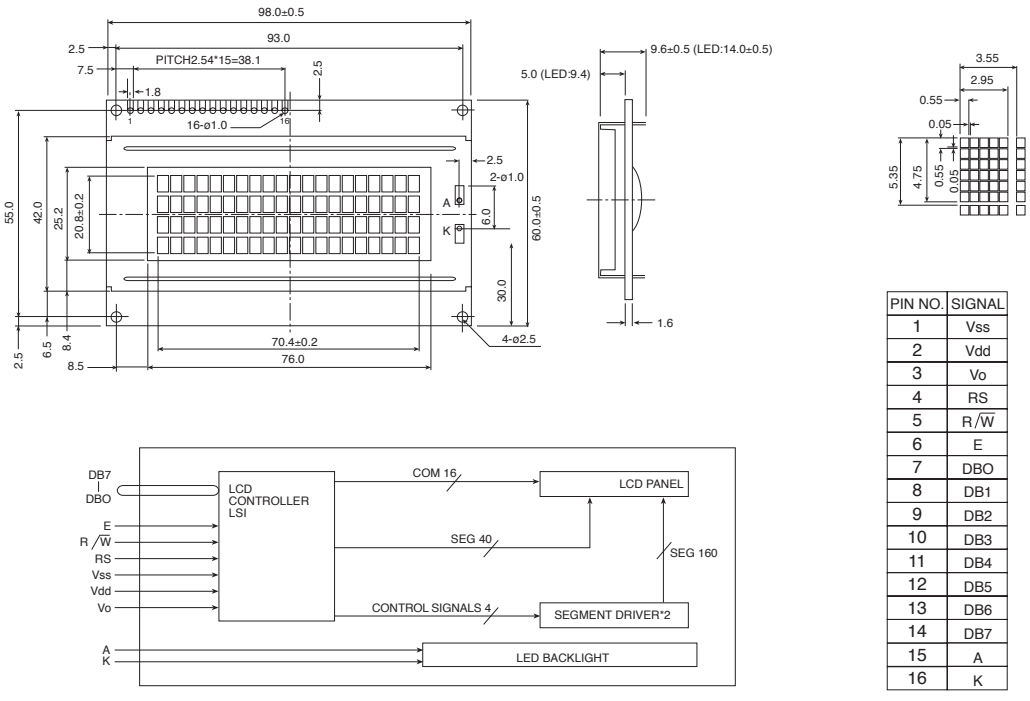
Figure 32



Pin no.	Signal
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
-	A
-	K

20 x 4 LCD modules

Figure 33



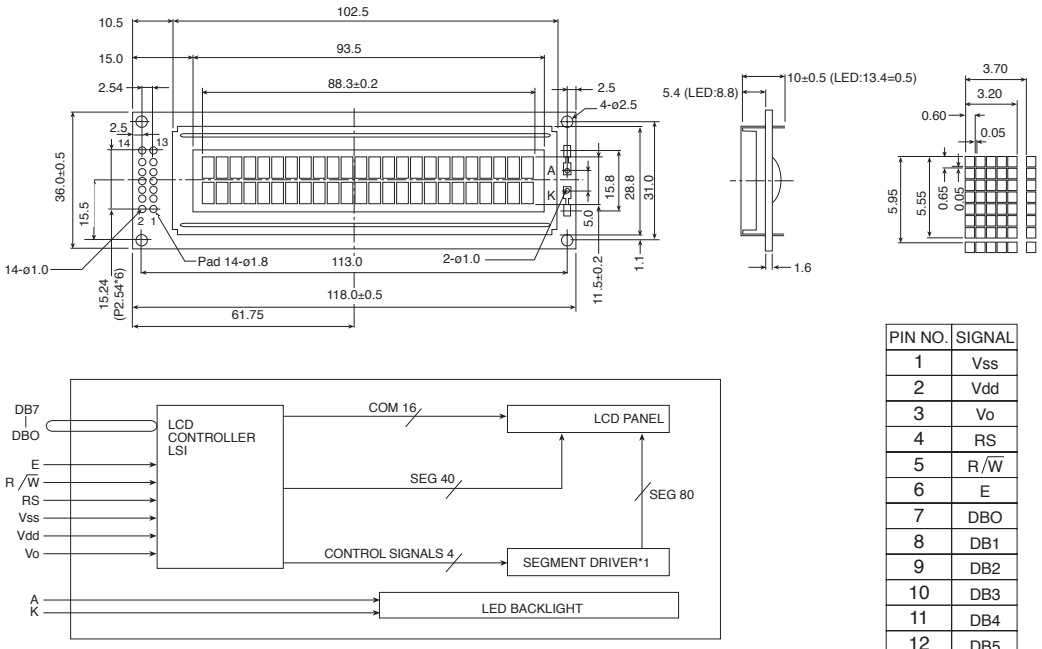
PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K

RS stock no. 214-3323 STN reflective

RS stock no. 214-3553 STN transflective with LED backlighting.

24 x 2 LCD modules

Figure 34

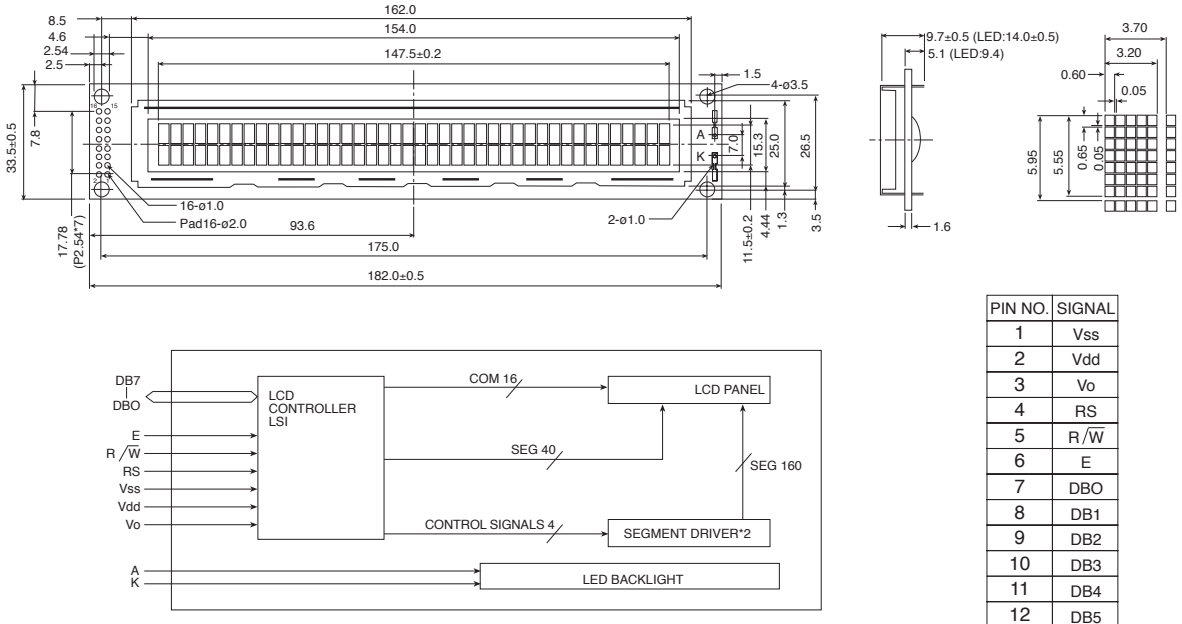


PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7

RS stock no. 214-3250 TN reflective
RS stock no. 214-3339 STN reflective
RS stock no. 214-3402 TN with EL backlighting
RS stock no. 214-3468 TN transmissive with LED backlighting
RS stock no. 214-3569 STN transflective with LED backlighting.

40 x 2 LCD modules

Figure 35

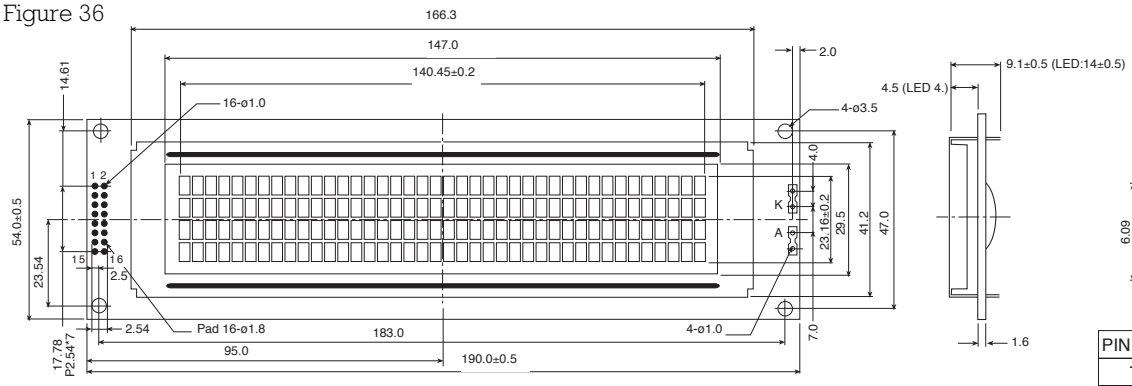


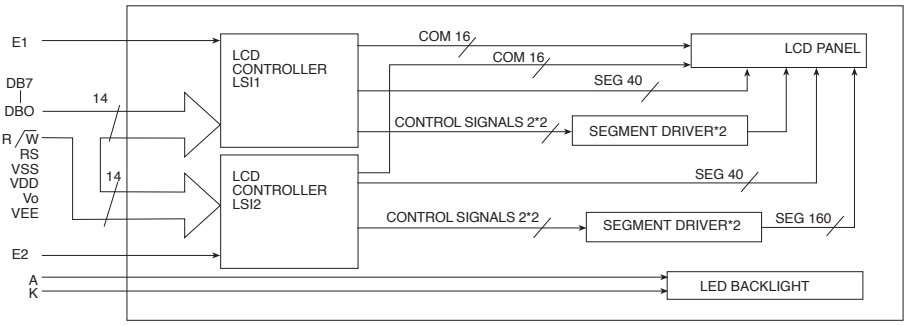
PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K

RS stock no. 214-3266 TN reflective
RS stock no. 214-3345 STN reflective
RS stock no. 214-3418 TN with EL backlighting
RS stock no. 214-3474 TN transmissive with LED backlighting
RS stock no. 214-3575 STN transflective with LED backlighting.

40 x 4 LCD modules

Figure 36





PIN NO.	SIGNAL
1	DB7
2	DB6
3	DB5
4	DB4
5	DB3
6	DB2
7	DB1
8	DB0
9	E1
10	R/W
11	RS
12	Vo
13	Vss
14	Vdd
15	E2
16	Vee

RS stock no. 214-3272 TN reflective
RS stock no. 214-3351 STN reflective
RS stock no. 215-3617 STN transflective with LED backlighting

Precaution for using

1. Handling
   a) Do not touch, press or rub the display panel with a hard, stiff tool or object (e.g. tweezers) as the polarisers in the panel are easily scratched.
   b) Never use organic solvents to clear the display panel as these solvents may adversely affect the polariser. To clean the display panel and dampen a bit of absorbent cotton with petroleum benzine and gently wipe the panel.
   c) Never touch terminals of electrodes of PCB or LSI leads.
   d) Avoid using or storing the LCM under high temperature and high humidity conditions. When in storage it is recommended that the device is packaged in a conductive polyethylene bag and placed under the condition where the temperature is relatively lower (10 -30°C), and direct sunlight or fluorescent lamp must be cut off.
   e) The casing for the module is designed taking account the temperature because of the heat from the backlight so that good quality of images can be provided on the screen.
2. Operation
   a) Never connect or disconnect the LCM from the main system while power is being supplied.
   b) If the operating temperature drops below the temperature limits, the blinking speed of the display will decrease, while if it rises above the prescribed limits, the entire display will turn black. When the temperature returns to within normal limits, the display will operate normally.
3. Workmanship
   a) Never disassemble the module.
   b) Anti static precautions must be taken, as the circuit of the module contains a CMOS LSI.