



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

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

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 transreflective 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 SV power supply (excluding EL types)
- Wide viewing angle (STN)
- High contrast
- Interfaces to 4 or 8-bit data busses
- ASCII 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 = 0V, Ta = 25°C)

Parameter	Symbol	Condition	Application PIN	Min.	Type	Max.	Unit
H level input voltage (1)	Vih 1	-	DB0 ~ DB7 RS, R/W, E	2.2	-	Vdd	V
L level input voltage (1)	Vil 1	-		-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	DB0 ~ 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

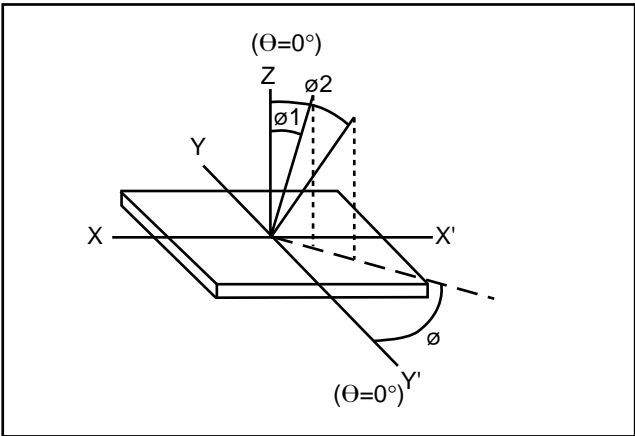
1. STN type

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing angle	$\phi 2 - \phi 1$	$K = 1.4$	40	-	-	deg.	*1, *2
Contrast ratio	K	$\phi = 10^{\circ}\text{C}$ $\theta = 0^{\circ}\text{C}$	-	3	-	-	*3
Response time (rise)	tr	$\phi = 10^{\circ}\text{C}$ $\theta = 0^{\circ}\text{C}$	-	150	250	ms	*4
Response time (fall)	tf	$\phi = 10^{\circ}\text{C}$ $\theta = 0^{\circ}\text{C}$	-	200	300	ms	*4

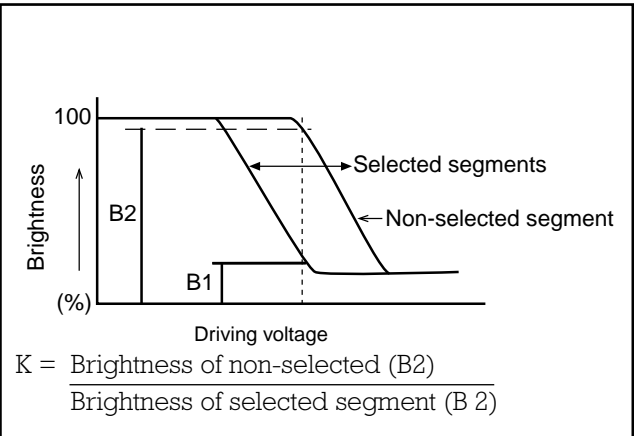
2. TN type

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing angle	$\phi 2 - \phi 1$	$K = 1.4$	60	-	-	deg.	*1, *2
Contrast ratio	K	$\phi = 25^{\circ}\text{C}$ $\theta = 0^{\circ}\text{C}$	-	3	-	-	*3
Response time (rise)	tr	$\phi = 25^{\circ}\text{C}$ $\theta = 0^{\circ}\text{C}$	-	80	120	ms	*4
Response time (fall)	tf	$\phi = 25^{\circ}\text{C}$ $\theta = 0^{\circ}\text{C}$	-	60	90	ms	*4

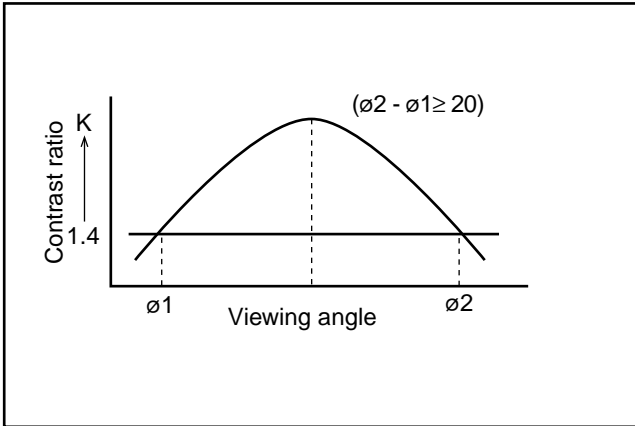
*1. Definition of θ and ϕ



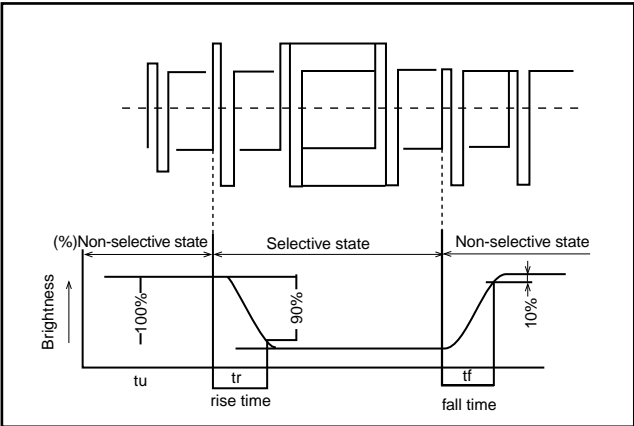
*3. Definition of contrast ratio



*2. Contrast vs viewing angle



*4 Definition of optical response



Timing characteristics

Figure 1 Write operation

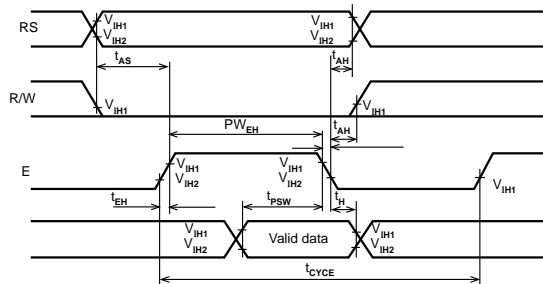
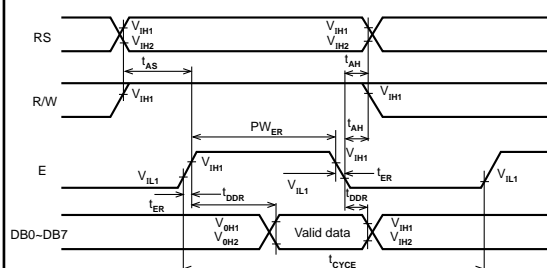


Figure 2 Read operation



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.

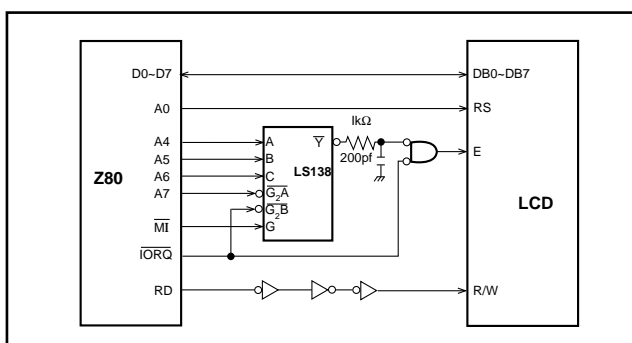
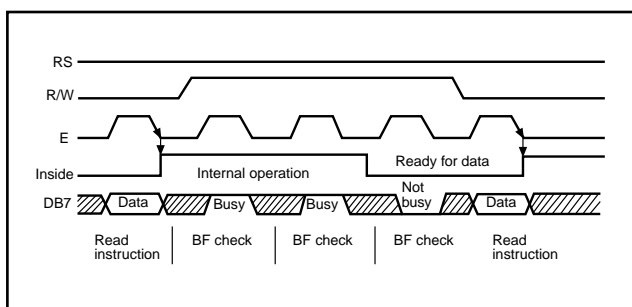
If interface data is 4-bit long

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

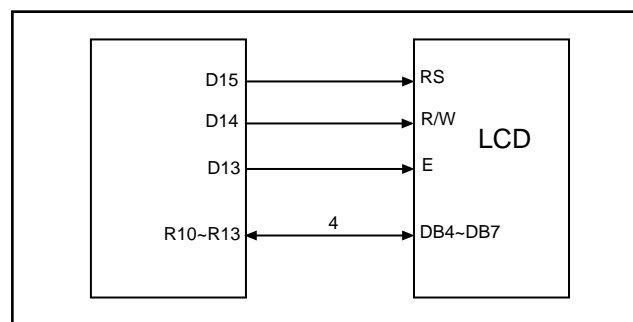
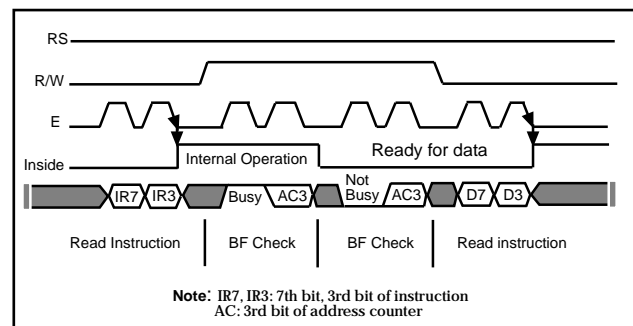
Data transfer is made through all of 8 bus lines from DB0 to DB7.

Example of interface with 8-bit MPU (Z80)



Example of interface with 4-bit MPU

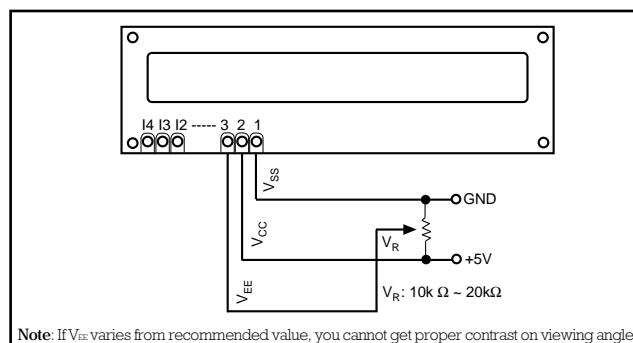
Interface with 4-bit MPU can be made through I/O port of 4-bit MPU. If there are enough I/O ports, data can be transferred by 8-bit, however, if there is not, data transfer can be done by 4-bit in twice (select interface is 4-bit long), and timing sequence will be complicated in this case. Please take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



Features

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

Example of power supply



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

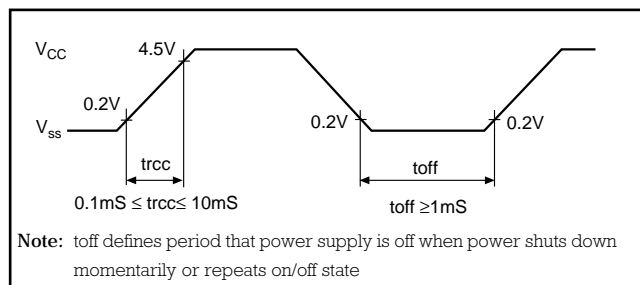
Code	Description	Executed time (max.)
I/D=1:Increment I/D=0:Decrement S=1:With display shift S/C=1: Display shift S/C=0: Cursor movement R/L=1: Shift to the right R/L=0: Shift to the left DL=1:8-bit DL=0:4-bit N=1:2 lines N=0:1 line F=1:5 x 10dots F=0.5 x 7dots BF=1: Internal operation is being performed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

Standard character pattern															
Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)			00P`F								-9Ξαp		
	1	CG RAM (2)			!1AQa9								774äq		
	2	CG RAM (3)			"2BRbr								「イウ×βθ		
	3	CG RAM (4)			#3CScs								」ウてεεω		
	4	CG RAM (5)			\$4DTdt								、イトμΩ		
	5	CG RAM (6)			%5EUeu								・ヲ1εü		
	6	CG RAM (7)			&6FVfv								ヲカニヨρΣ		
	7	CG RAM (8)			'7GWgw								ヲヲヲヲgπ		
	8	CG RAM (1)			(8HXhx								イウヲリJΣ		
	9	CG RAM (2)			>9IYiy								ウケ/ル'γ		
	A	CG RAM (3)			*:JZjz								エコルレj#		
	B	CG RAM (4)			+ :Kck<								オサヒロ* 5		
	C	CG RAM (5)			, <L#11								ヲヲヲヲφπ		
	D	CG RAM (6)			-=Mjm>								ユスへンム÷		
	E	CG RAM (7)			. >N^h+								ヨセホ° ñ		
	F	CG RAM (8)			/ ?O_0+								ッリマ° ö		

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



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

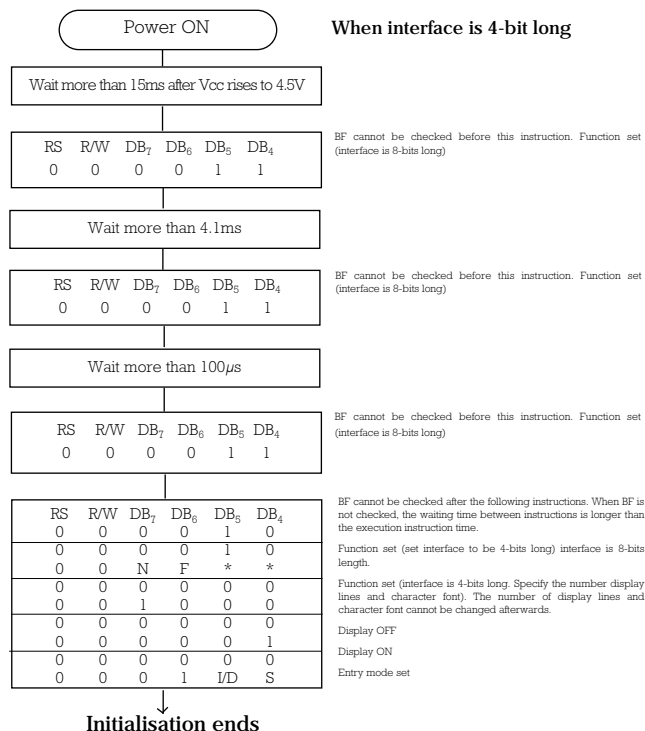
3. Display ON/OFF control

D=0:display OFF C=0:cursor OFF B=0:blink OFF

4. Entry mode set

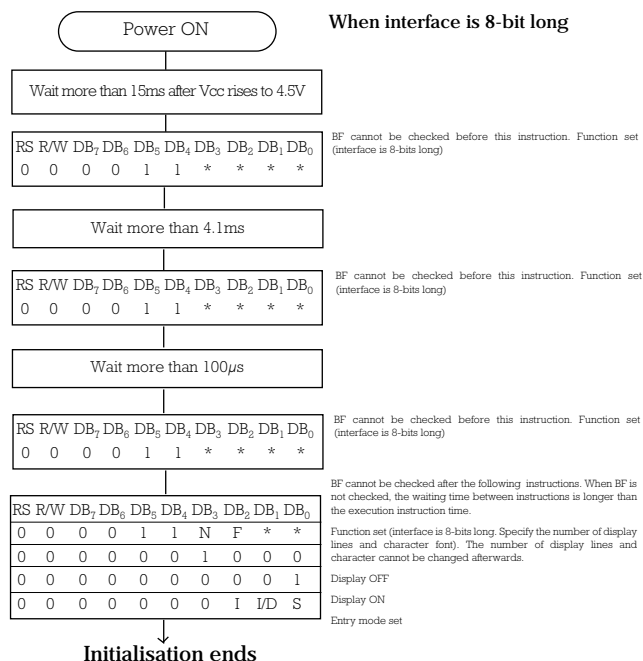
I/D=1: + 1 (increment) S=0:No shift

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.



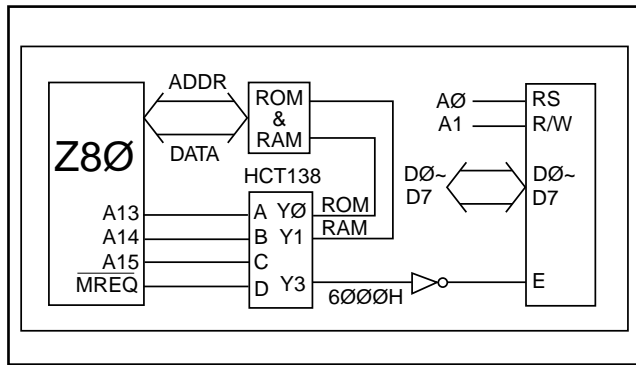
Initialisation along with instructions

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

All modules except 20 x 4 and 40x4



Example of interfacing to Z80 MPU running at 2 Mhz

A0 is connected to **RS** of module

where A0 = 1: Instruction register is selected

where A0 = 0: Data register is selected

A1 is connected to **R/W** of module

where A1 = 0: Module in write mode

where A1 = 1: Module in read mode

WRINST EQU 6000H ;write instruction

WRDATA EQU 6001H ;write data

RDBUSY EQU 6002H ;read busy

Initialisation

```
LD      B,0          ;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,00001111B   ;display on, cursor
LD      (WRINST),A    ;blink
;set DDRAM address to 00H
LD      A,10000000B   ;set to 00H
CALL    MSG           ;o/p message
```

;set DDRAM address to 40H

LD A,11000000B ;set to 40H

CALL MSG ;o/p message

HALT ;program stop here.....

;subroutine to set DDRAM addr and o/p message

```
MSG:    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
```

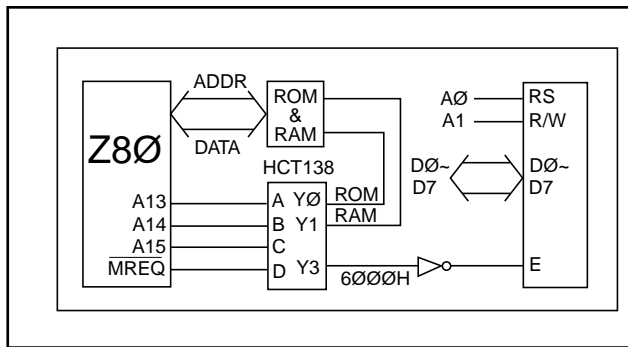
; data table for initialisation routine

```
INITBL:  DEFB  00110000B ;set DL to high
DEFB  00111000B ;8-bit, 2 lines, 5X7 dots
DEFB  00001000B ;display off
DEFB  00000001B ;clear display, return cursor
DEFB  00000110B ;set shift mode (entry mode set)
```

; message

```
MSGGE:   DEFB  'DISPLAY MODULES'
END
```


Application example for 20 x 4 and 40 x 4 displays



Example of interfacing to Z80 MPU running at 2 Mhz

A0 is connected to RS of module

where A0 = 1: Instruction register is selected

where A0 = 0: Data register is selected

A1 is connected to R/W of module

where A1 = 0: Module in read mode

where A1 = 1: Module in write mode

```
WRINST EQU 6000H ;write instruction
WRDATA EQU 6001H ;write data
RDBUSY EQU 6002H ;read busy
```

Initialisation

```
LD B,0 ;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,00001111B ;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 message 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 00110000B ;set DL to high
DEFB 00111000B ;8 bit, 2 lines, 5x7 dots
DEFB 00001000B ;display off
DEFB 00000001B ;clear display, return
; cursor
DEFB 00000110B ;set shift mode
```

; message

```

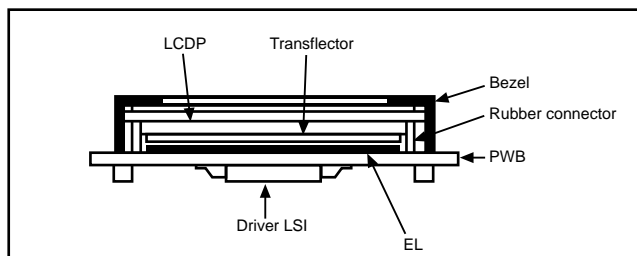
MESSGE: DEFB 18 ;no. of character to be sent
        DEFB 00H ;ADDR OF DDRAM
        DEFB 'This is first line'
        DEFB 19 ;no. of character to be sent
        DEFB 40H ;addr of DDRAM
        DEFB 'This is second line'
        DEFB 18 ;no. of character to be sent
        DEFB 14H ;addr of DDRAM
        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

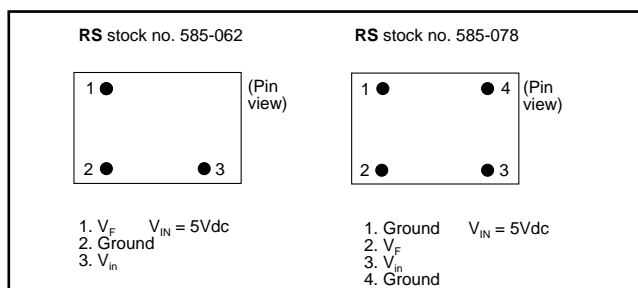


Inverter for EL back light drive

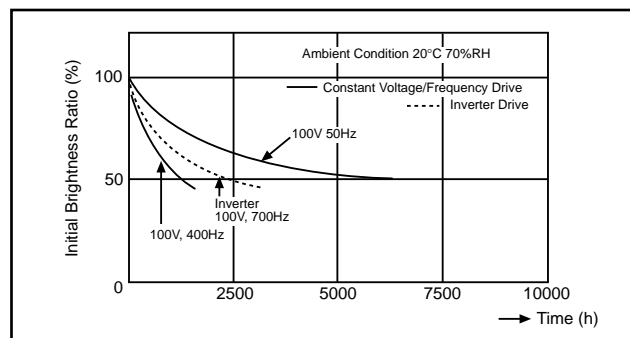
It is necessary to use inverter an when you need to operate EL with battery or a dc power supply.

- 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

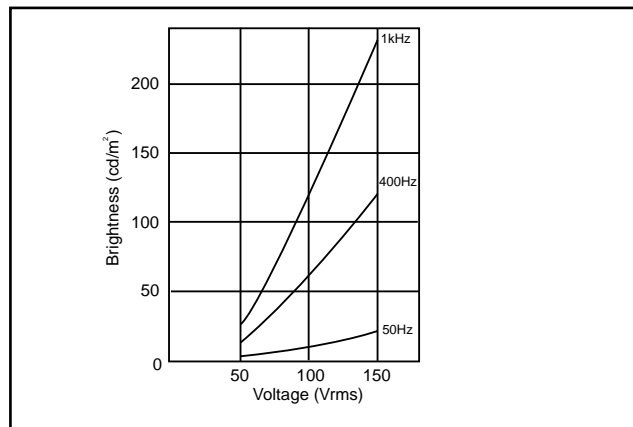


Life characteristics

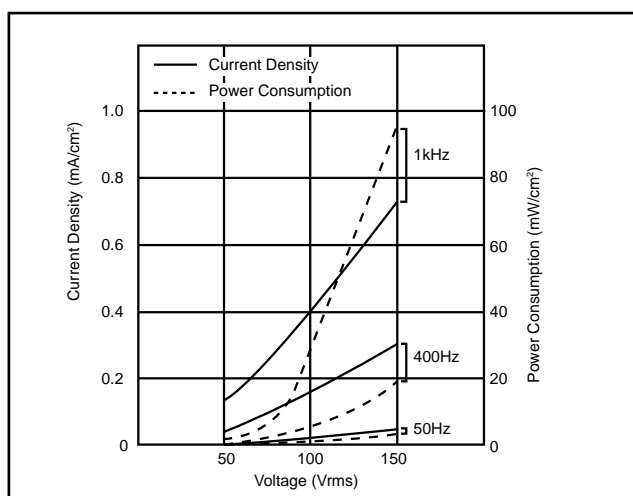


Electrical characteristics (reference data)

● Voltage VS. brightness



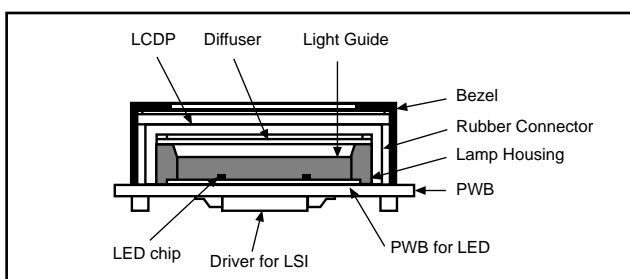
● Voltage VS. current density



LED backlight types

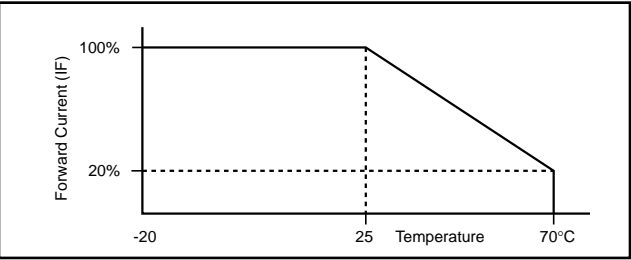
Features

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



Electrical characteristics (reference data)

● Forward current
derating curve



Mechanical dimensions

8 x 2 LCD modules

Top view dimensions: 44.2, 38.0, 27.81±0.2, 2.54, 1.7, 14-ø1.0, 32.0±0.5, 27.0, 15.24, (P2.54 x 6), 8.38, 53.0, 58.0±0.5, 4-ø1.0, 4-ø2.5, 11.5±2.5, 5.0, 16.0, 26.0, 2.5, 4.0, 9.8±0.5 (LED:13.5±0.5), 5.2 (LED:8.9), 1.6.

Side view dimensions: 9.8±0.5 (LED:13.5±0.5), 5.2 (LED:8.9), 1.6.

Detail view dimensions: 3.55, 2.96, 0.56, 0.04, 5.94, 5.56, 0.66, 0.04.

Connections to LCD CONTROLLER LSI: DB7, DBO, E, R/W, RS, Vss, Vdd, Vo, A, K.

Connections from LCD CONTROLLER LSI: COM 16 to LCD PANEL, SEG 40 to LCD PANEL.

Connections to LED BACKLIGHT: A, K.

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

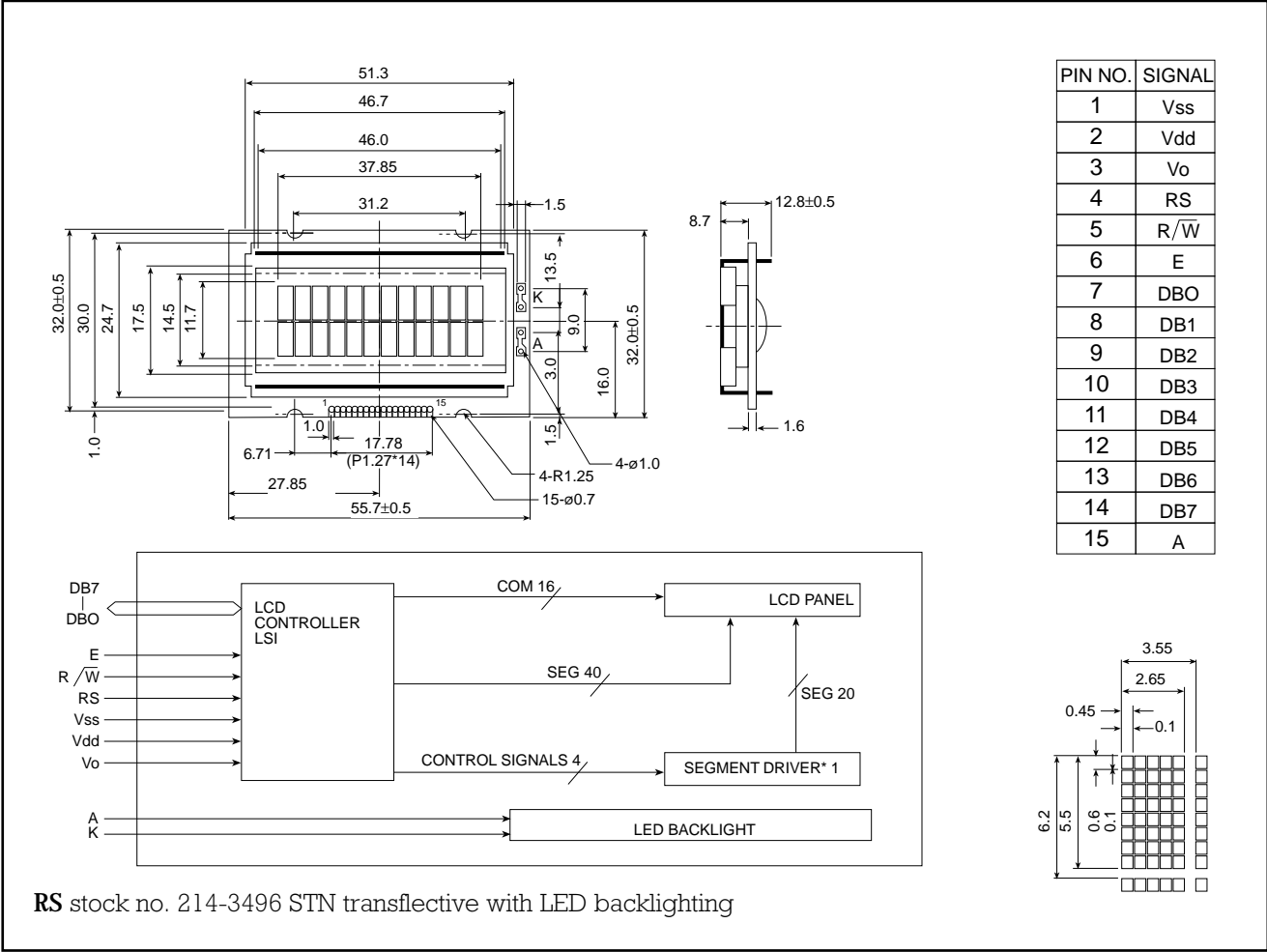
RS stock no. 214-3288 STN reflective

RS stock no. 214-3367 TN with EL backlighting

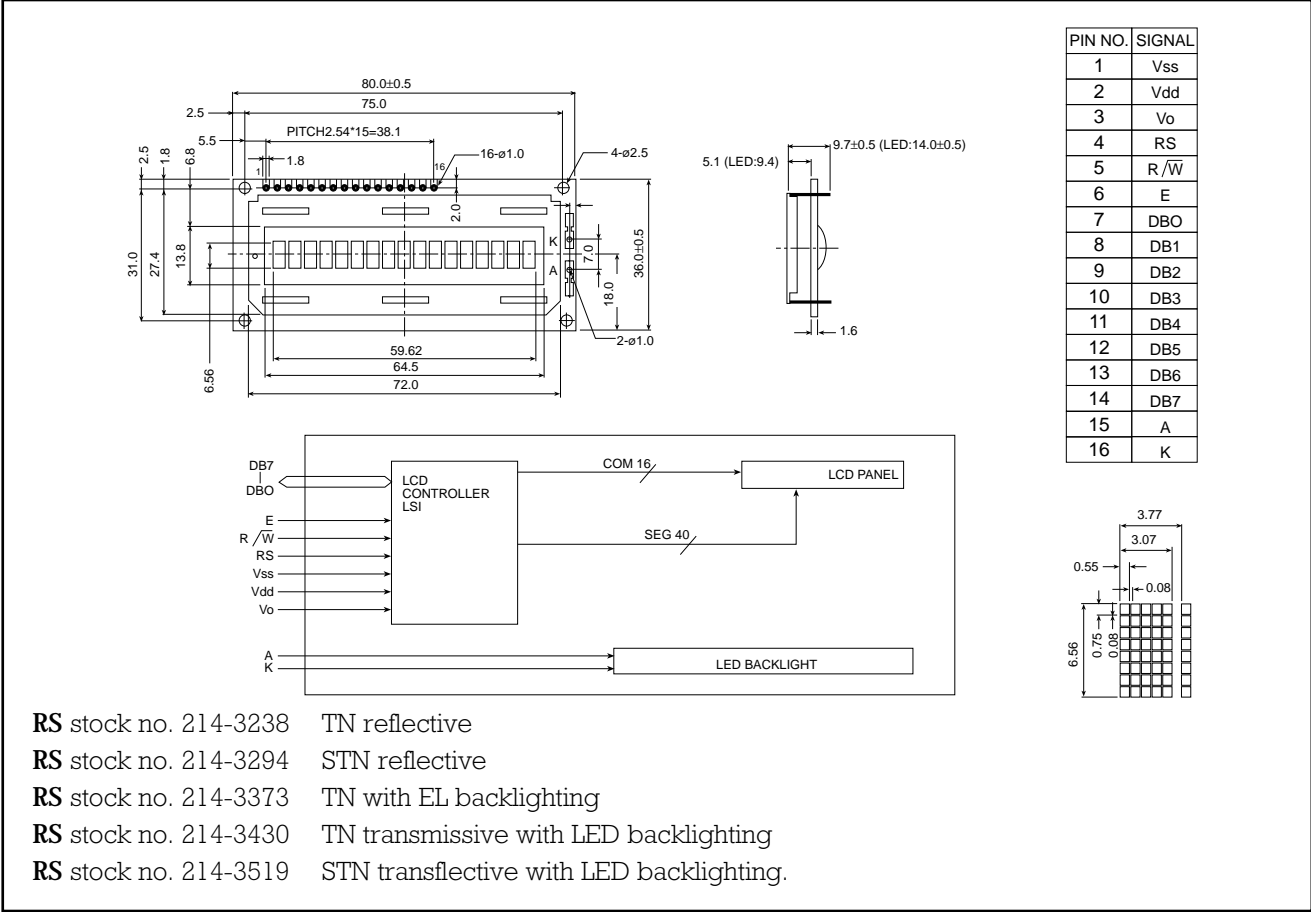
RS stock no. 214-3424 TN transmissive with LED backlighting

RS stock no. 214-3480 STN transfective with LED backlighting.

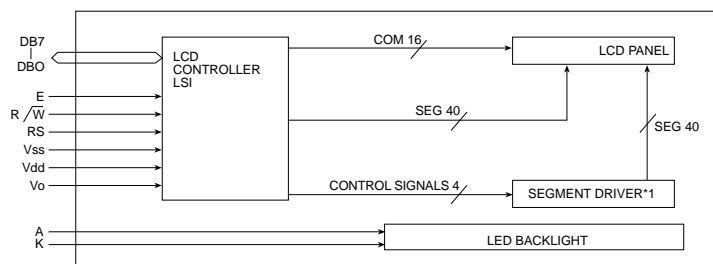
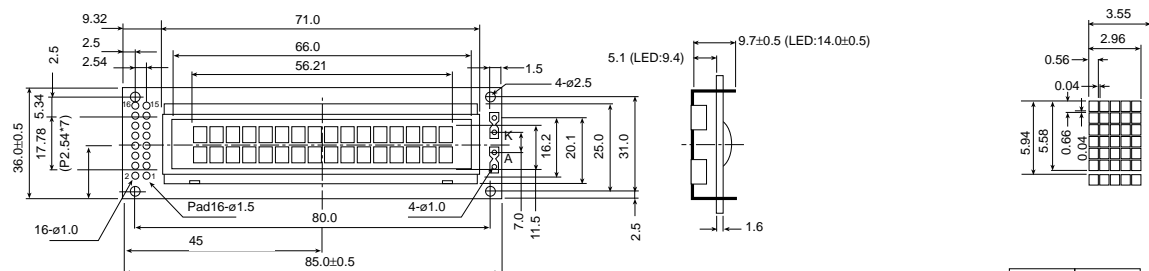
12 x 2 LCD module



16 x 1 LCD modules



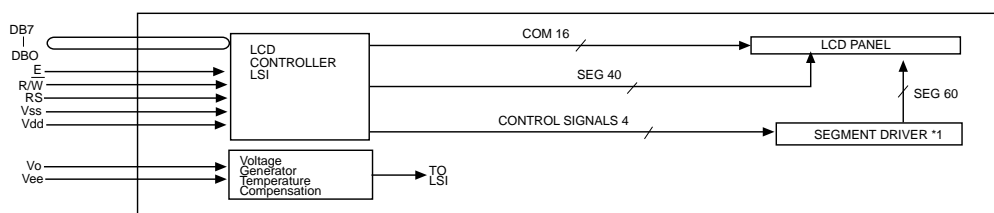
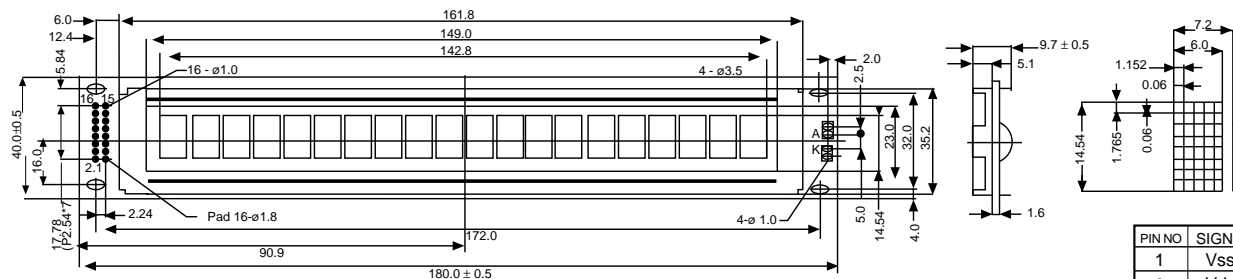
16 x 2 LCD modules



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 transfective with LED backlighting.

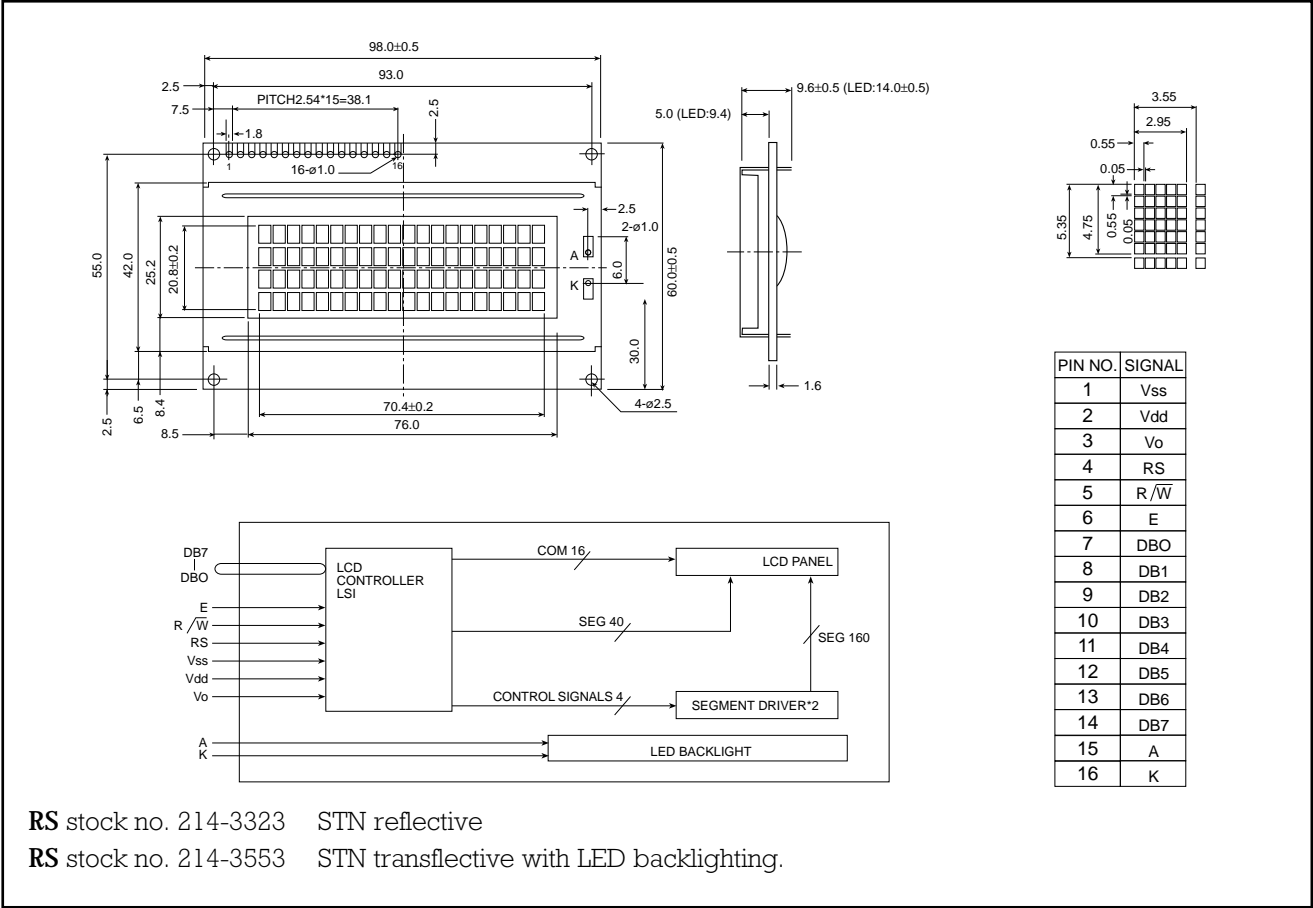
20 x 1 LCD modules



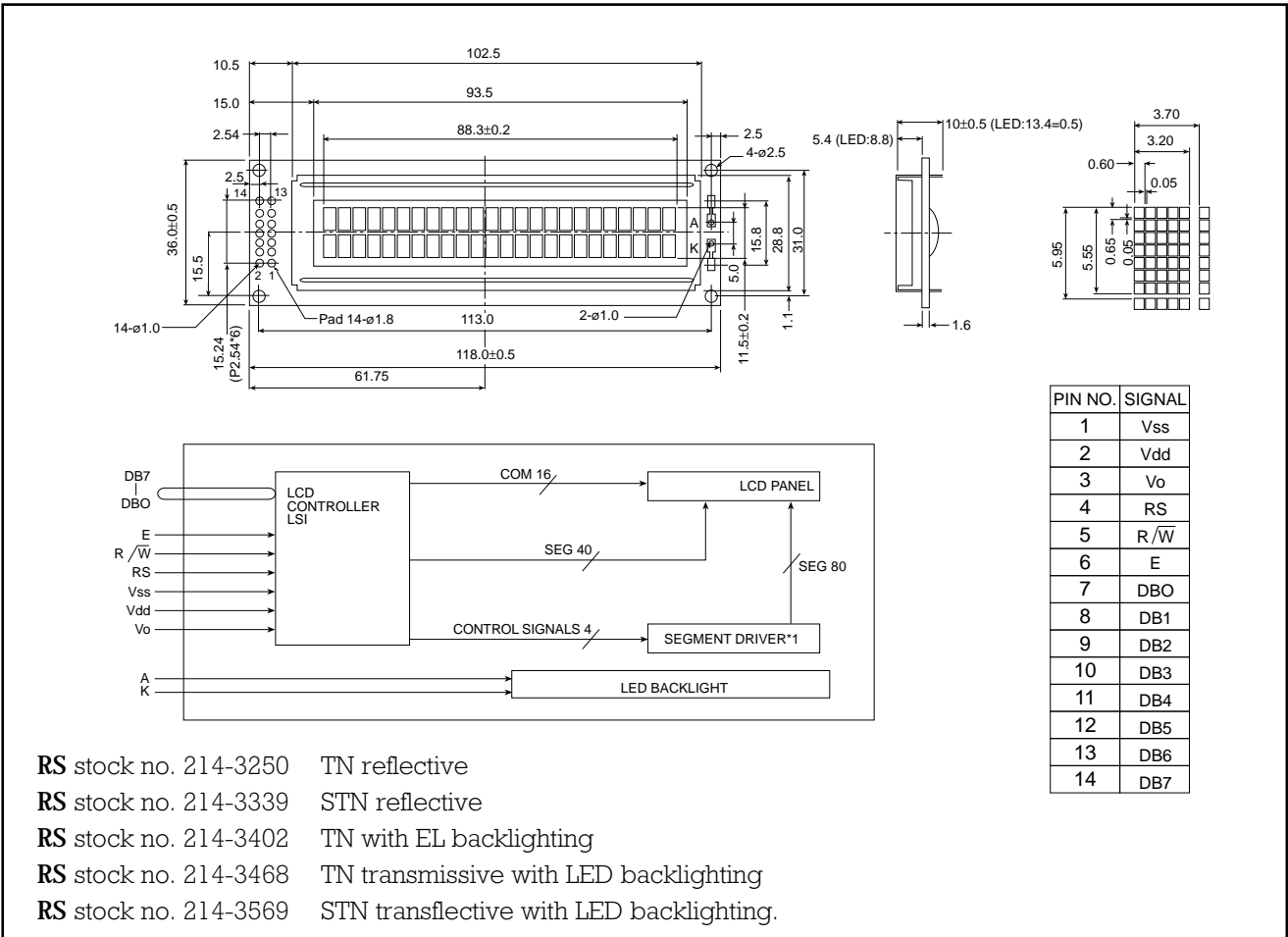
PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DBO
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	NC/Vee
16	NC

- RS stock no. 214-3531 STN transfective with LED backlighting.

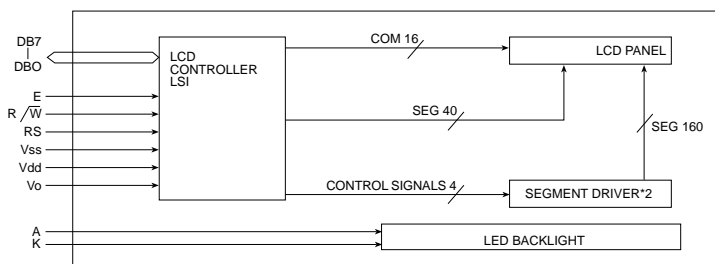
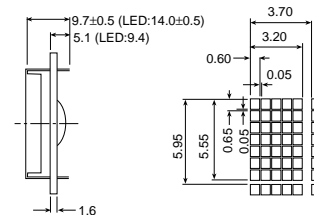
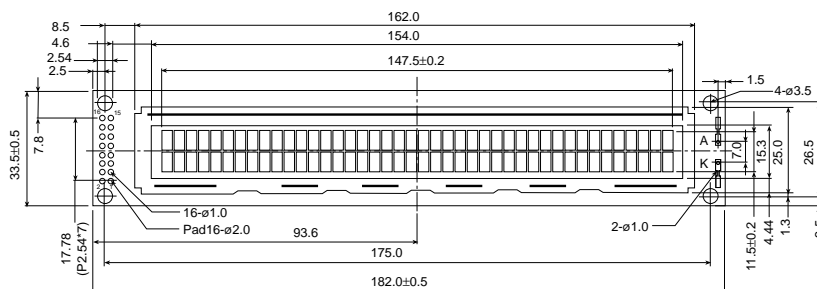
20 x 4 LCD modules



24 x 2 LCD modules



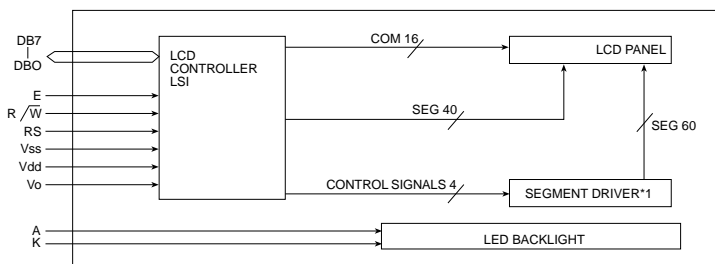
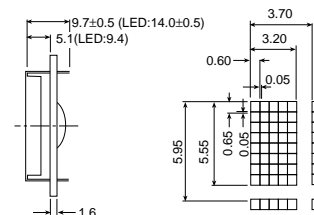
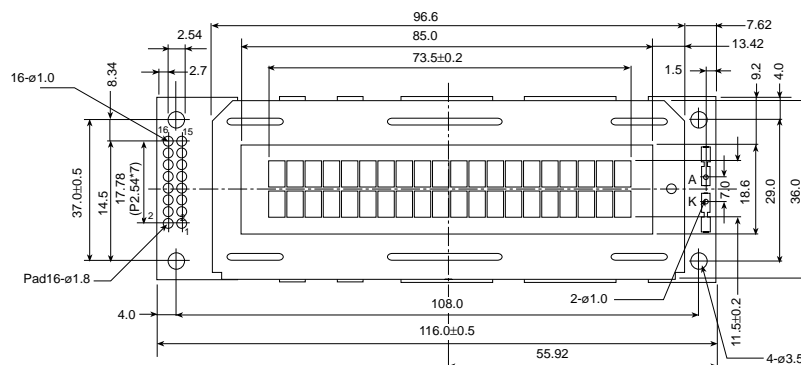
40 x 2 LCD modules



PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/\overline{W}
6	E
7	DB0
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 transfective with LED backlighting.

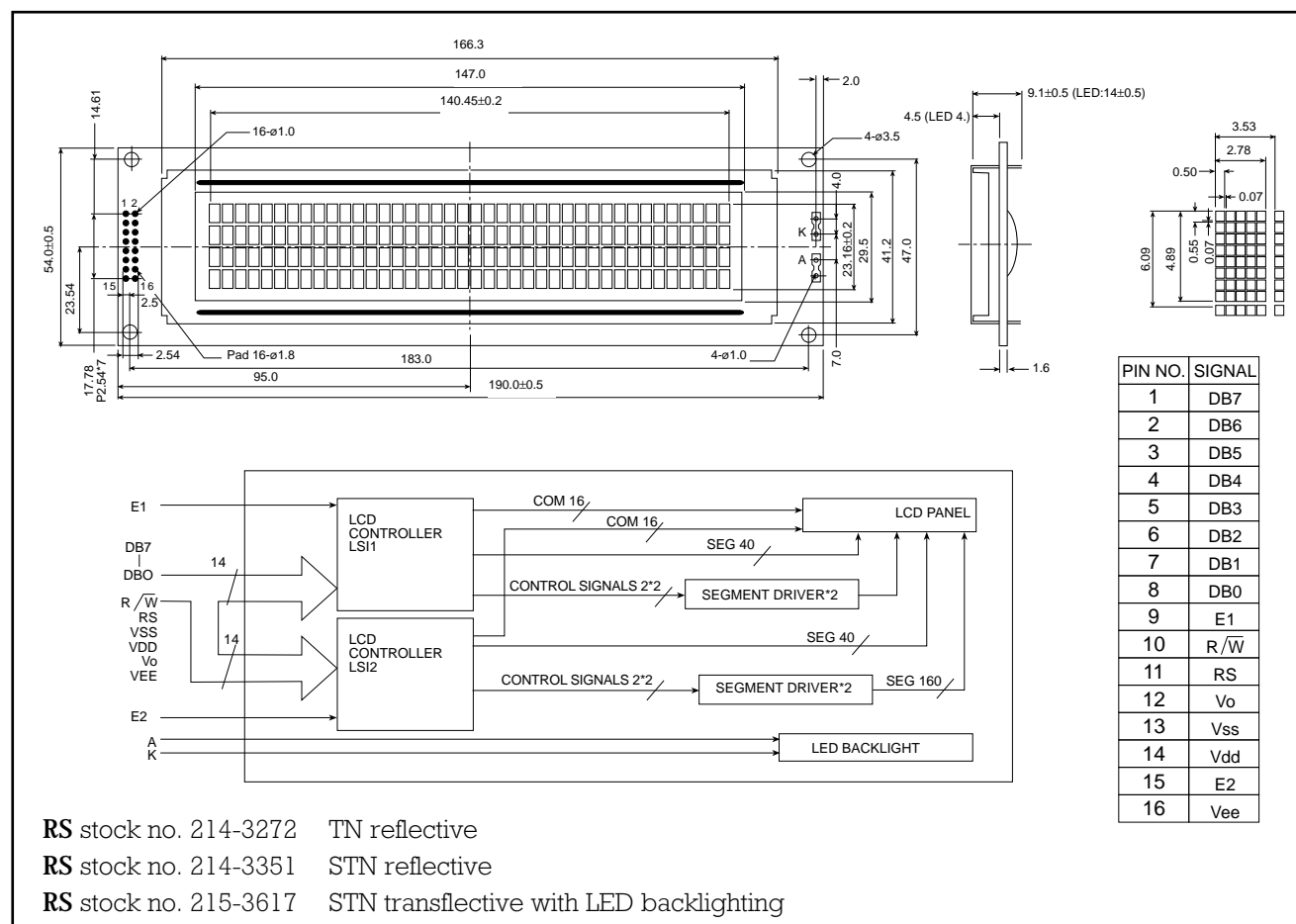
20 x 2 LCD modules



PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/\overline{W}
6	E
7	DB0
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 transfective

40 x 4 LCD modules



Precaution for using

1. Handling

- 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.
- 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 benzene and gently wipe the panel.
- Never touch terminals of electrodes of PCB or LSI leads.
- 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.
- 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

- Never connect or disconnect the LCM from the main system while power is being supplied.
- 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

- Never disassemble the module.
- Anti static precautions must be taken, as the circuit of the module contains a CMOS LSI.

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