LM032L
LM032LN (EL Version)

- 20 character x 2 lines
- Controller LSI HD44780 is built-in (See page 115).
- +5V single power supply

MECHANICAL DATA (Nominal dimensions)

Module size . . . . . .116W x 39H (max.) x 13T (max.) mm
Effective display area . . . . . 83W x 18.6H mm
Character size (5 x 7 dots) . . . . . 3.2W x 4.85H mm
Character pitch . . . . . 3.7 mm
Dot size . . . . . 0.6W x 0.65H mm
Weight . . . . . about 50 g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	6.5 V
Power supply for LCD drive ($V_{DD}-V_O$)	0	6.5 V
Input voltage (Vi)	V_{SS}	V_{DD} V
Operating temperature (T_a)	0	50°C
Storage temperature (Tstg)	−20	70°C

EL Power Supply (when fitted)
Voltage (VEL) . . . . . AC 150 Vms
Frequency (fEL) (at 100 Vms) 1kHz

ELECTRICAL CHARACTERISTICS

T_a = 25°C, V_{DD} = 5.0 V ± 0.25 V
Input "high" voltage (Vi_H) . . . . . 2.2 V min.
Input "low" voltage (Vi_L) . . . . . 0.6 V max.
Output "high" voltage (V_{OH}) ($-I_{OH}$ = 0.2 mA) . 2.4V min.
Output "low" voltage (V_{OL}) (I_{OL} = 1.2 mA) . . 0.4V max.
Power supply current (I_{DD}) (V_{DD} = 5.0 V) . . 2.0 mA typ.
3.0 mA max.
Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)
Duty = 1/16
Range of $V_{DD}-V_O$ . . . . . 1.5~5.25 V
T_a = 0°C . . . . . 4.6 V typ.
T_a = 25°C . . . . . 4.2 V typ.
T_a = 50°C . . . . . 3.5 V typ.
Power Supply for EL (when fitted)
VEL (typ. at 400Mz) . . . . . 100 Vms
fEL (max at VEL 100V, fEL 400Hz) 16mA

OPTICAL DATA . . . . . See page 5.

Luminescent output of EL (where fitted) at Ø = 25°C, Ø = 0°C - 6cd / m^2 typ.

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	+5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Notes:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of DB_4~DB_7 and DB_0~DB_3 are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of DB_4~DB_7 when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of DB_0~DB_3 when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of DB_0~DB_7.

Unit: mm

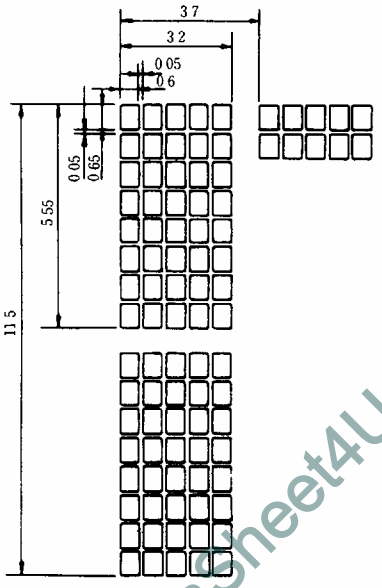


Fig. 1 Display pattern

Unit: mm

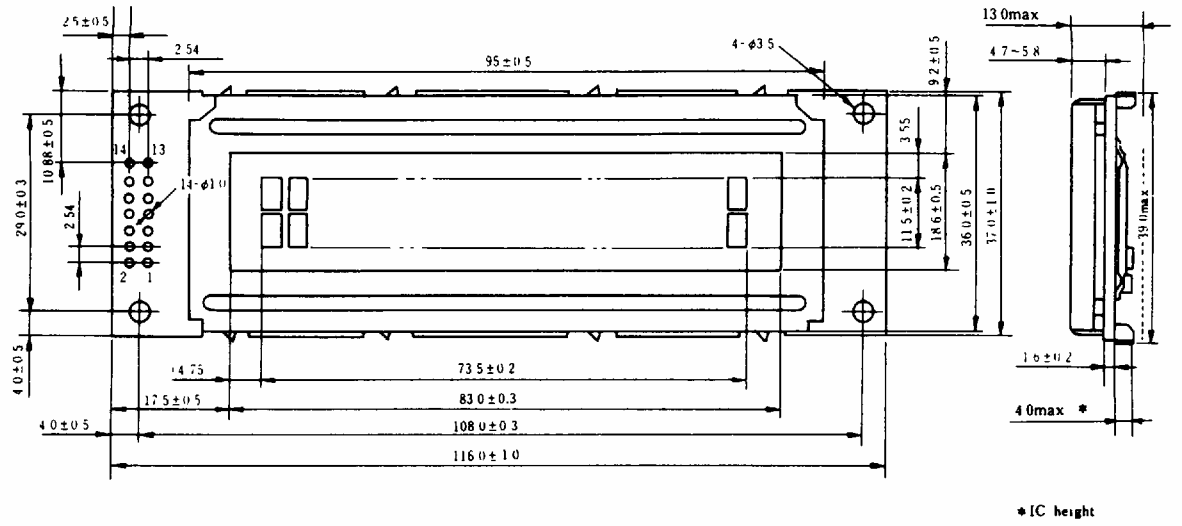


Fig. 2 External dimensions

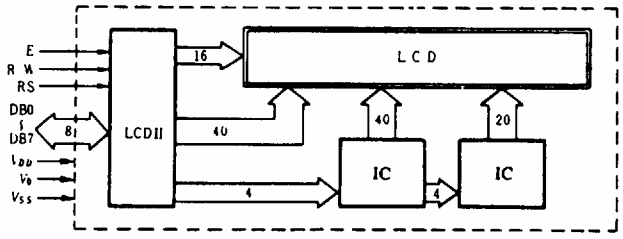


Fig. 3 Block diagram

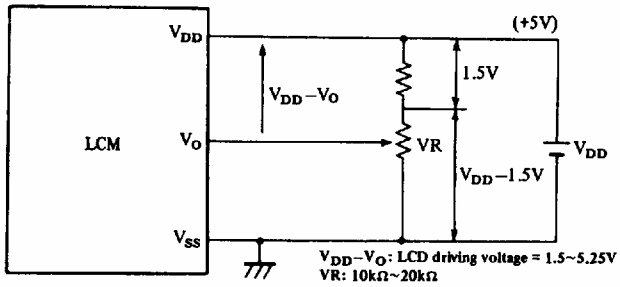
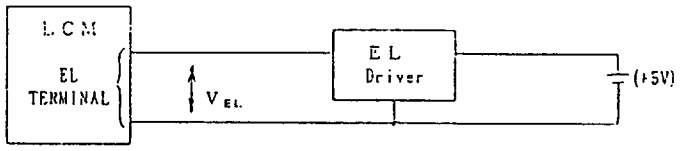


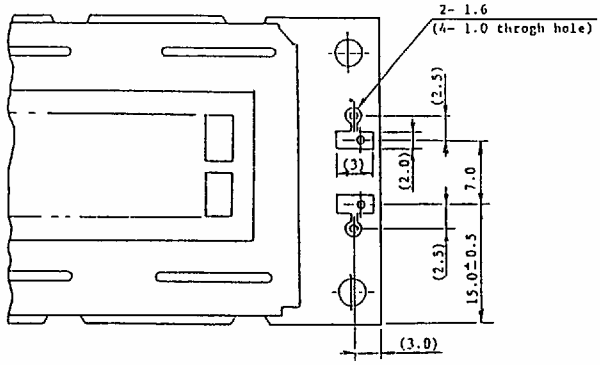
Fig. 4 Power supply

9.2 POWER SUPPLY FOR EL



THE EL BACKLIGHTING IS: NEC'S NEL-5LL-420-C
THE EL DRIVER IS: NEC'S NEL-D32-46.

DIMENSION OF EL ATTACHMENT TERMINAL



TIMING CHARACTERISTICS

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	–	–	μs
Enable pulse width	PW_{EH}	Fig. 5, Fig. 6	450	–	–	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	–	–	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	–	–	ns
Data delay time	t_{DDR}	Fig. 6	–	–	320	ns
Data set up time	t_{DSW}	Fig. 5	195	–	–	ns
Hold time	t_H	Fig. 5, Fig. 6	20	–	–	ns

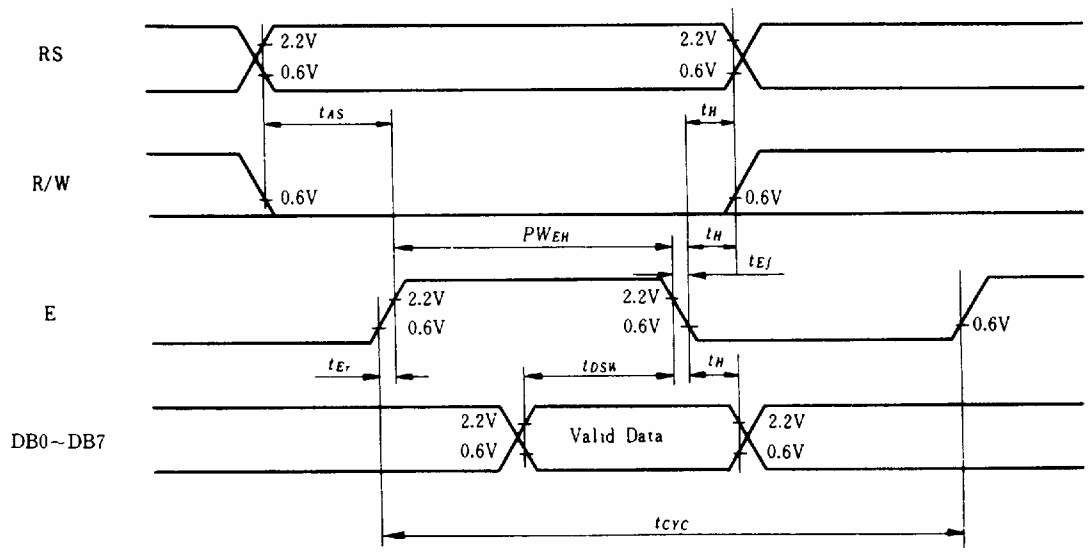


Fig. 5 Interface timing (data wirte)

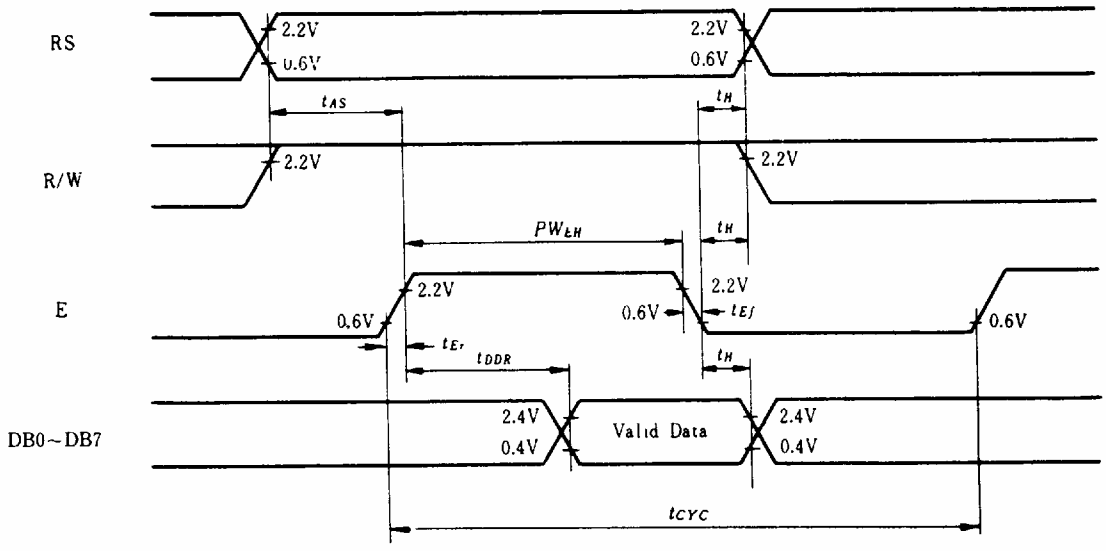


Fig. 6 Interface timing (data read)