LM038

- 20 Character x 1 line
- Built-in control LSI HD44780 type (see page 23)
- +5V single power supply

MECHANICAL DATA (Nominal dimensions)

Module size . . . . . 182W x 35.5H(max.) x 13D (max.) mm
Effective display area . . . . . 154.4W x 15.8H mm
Character size (5 x 7 dots) . . . . . 6.7W x 9.4H mm
Pitch . . . . . 7.4 mm
Dot size . . . . . 1.3W x 1.3H mm
Weight . . . . . about 65 g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0 V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5 V
Input voltage (Vi)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20	70°C

ELECTRICAL CHARACTERISTICS

Ta = 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) . 2.4 V min.
Output low voltage (V_{OL}) (I_{OL} = 1.2 mA) . . . 0.4 V max.
Power supply current (I_{DD}) (V_{DD} = 5.0 V) . . 1.0 mA typ.
2.0 mA max.
Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)
Du=1/8
at Ta = 0°C . . . . . 4.1 V typ.
at Ta = 25°C . . . . . 3.7 V typ.
at Ta = 50°C . . . . . 3.1 V typ.

OPTICAL DATA . . . . . See page 8

INTERNAL PIN CONNECTION

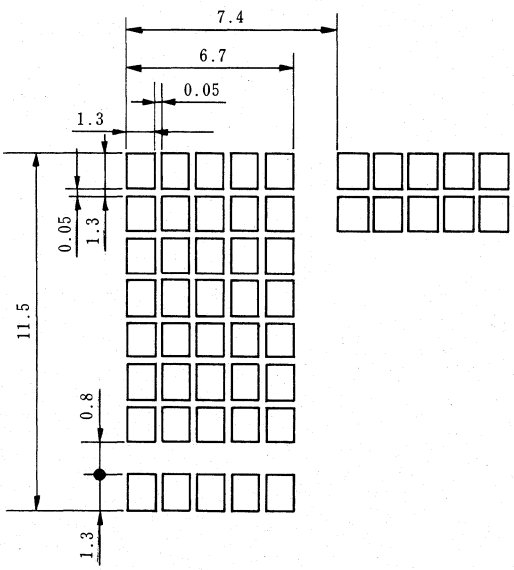
Pin No.	Symbol	Level	Function
1	V_{SS}	–	0V (Power supply)
2	V_{DD}	–	+5V (Power supply)
3	V_O	–	– (Power supply)
4	RS	H/L	L: Instruction code input H: Data input
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)
6	E	H, H→L	Enable signal
7	DB0	H/L	Data bus line Note (1), Note (2)
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	

Note:
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



HITACHI

Unit: mm

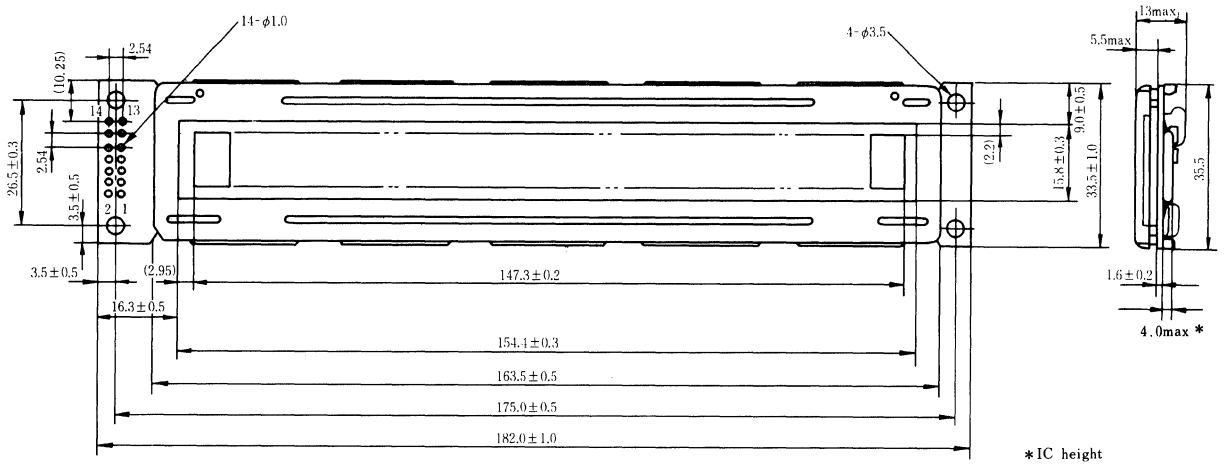
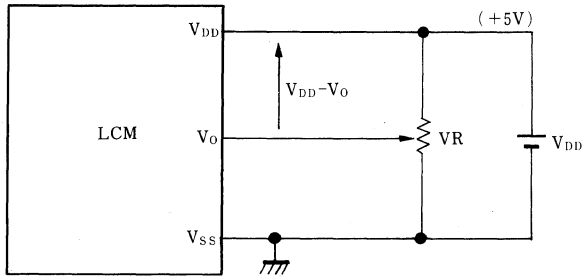


Fig. 2 External dimension

Unit: mm



V_{DD}-V_O: LCD driving voltage
VR: 10 kΩ ~ 20 kΩ

Fig. 3 Power supply

Unit: mm

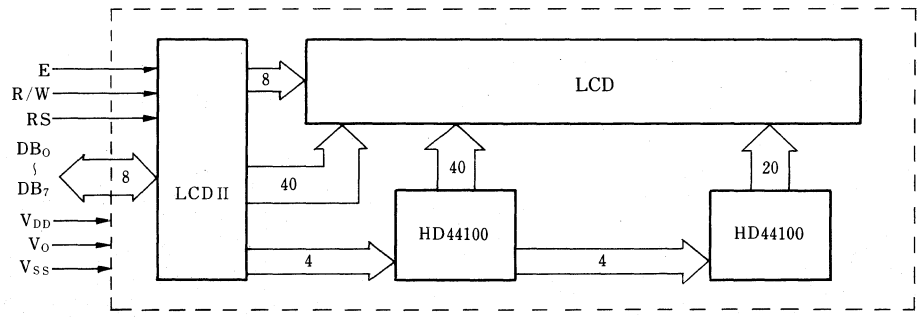


Fig. 4 Block diagram

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	P_{WEH}	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

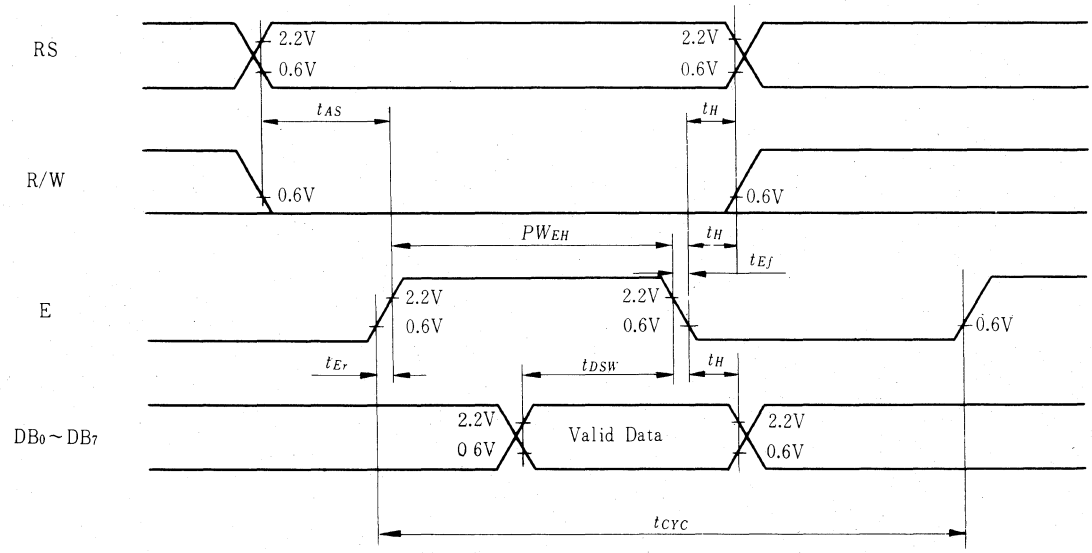


Fig. 5 Interface timing (data write)

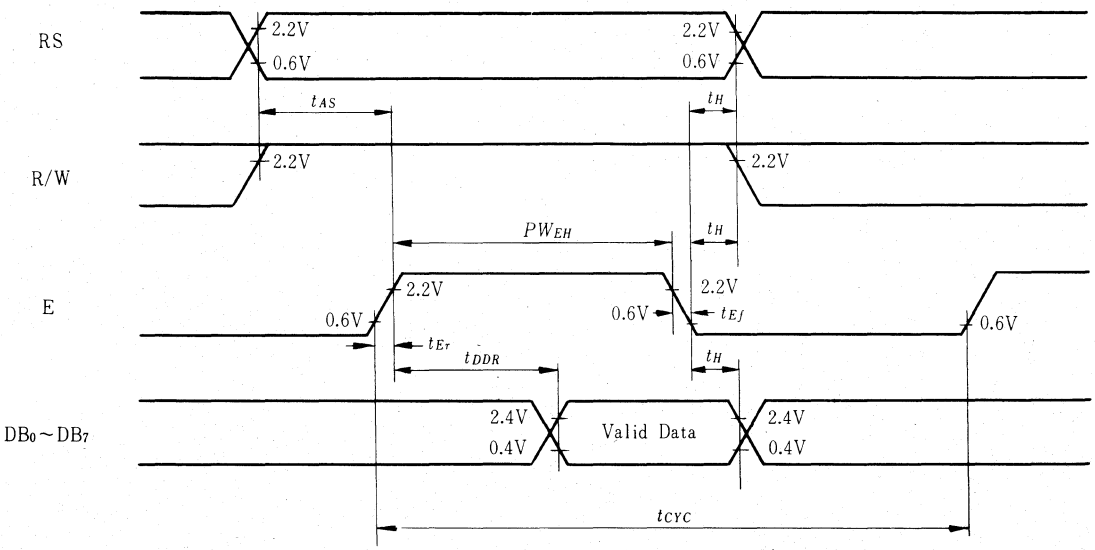


Fig. 6 Interface timing (data read)