LCD Interface and Commands

[1] Command set

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| functions | code | | | | | | | | | | description | exe.  time |
| RS | R/W | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| clear display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | display cleared;  DD-RAM addr-counter🡨0;  DD-RAM cleared | 1.64ms |
| home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | X | display blankkin home position;  DD-RAM addr-counter🡨0,  contents intact | 1.64ms |
| entry mode | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S | Inc-or-Dec on char.-entry;  display shifting or not on char.-entry; | 40μs |
| display on/of | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | display on/off;  cursor on/off;  char.-blinking | 40μs |
| cursor/display shifting | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | X | X | cursor shifting;  display shifting;  DD-RAM content intact | 40μs |
| function set | 0 | 0 | 0 | 0 | 1 | DL | N | F | X | X | data length;  display line(s);  fonts | 40μs |
| set CG-RAM | 0 | 0 | 0 | 1 | ACG | | | | | | set CG-RAM address;  CG-RAM data  written/read  following up | 40μs |
| Set DD-RAM | 0 | 0 | 1 | ADD | | | | | | | set DD-RAM address;  DD-RAM data  written/read  following up | 40μs |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| functions | code | | | | | | | | | | description | exe.  time |
| RS | R/W | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| read BUSY/  address | 0 | 1 | BF | AC | | | | | | | BUSY flag;  Address-counter | 0μs |
| DD-/CG-RAM  write | 1 | 0 | Data to be written | | | | | | | |  | 40  Μs |
| DD-/CG-RAM  read | 1 | 1 | Data read | | | | | | | |  | 40  Μs |

I/D= 1 : increment

= 0 : decrement

S = 1 : display shifting on char.-entry

= 0 : no shifting on char.-entry

S/C = 1 : display shifting on cmmd.

= 0 : cursor shifting on cmmd.

R/L = 1 : right shifting

= 0 : left shifting

DL = 1 : 8-bit

= 0 : 4-bit

N = 1 : 2-line display

= 0 : 1-line display

F = 1 : 5x10 dots

= 0 : 5x7 dots

BF = 1 : busy

= 0 : ready

DD-RAM: 40x2 bytes DD-address 00-27H

28-5FH

CG-RAM: 16 units CG-address 00-0FH

[2] Interface and Operation Timing

D0-7

CE

RS

R/W

t0 t1 t2 t3

command-write

D0-7

CE

RS

R/W

t0 t1 t3

status-read

D0-7

CE

RS

R/W

t0 t1 t2

data-write

D0-7

CE

RS

R/W

t0 t2

data-read

[3] Command sequence

DD-RAM write: set-DDaddr-cmmd + [char-write-cmmd]

DD-RAM read : set-DDaddr-cmmd + [char-read-cmmd]

\*\* set-DDaddr-cmmd:= 80H | DD-addr (7-bit in length)

CG-RAM write: set-CGaddr-cmmd + [pattern-define-cmmd]

CG-RAM read: set-CGaddr-cmmd + [pattern-read-cmmd]