# SP14Q002 320*240 Dots

## FEATURES

- **Black on White Film STN Type**
- **Transmissive Mode**
- **High Brightness CFL Backlight**
- **High Contrast LC Material**

## MECHANICAL DATA

| Item | Value | Unit |
|---|---|---|
| Module Dimensions | 167.0*109*8.5 | mm |
| Viewing Area | 120*89 | mm |
| Resolution | 320*240 | dots |
| Dot Size | 0.345*0.345 | mm |
| Dot Pitch | 0.36*0.36 | mm |
| Weight | 160 | g |

## OPTICAL DATA

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Contrast Ratio | K | Ø=10°, Q=0°, Note 1 | - | 20 | - | - |
| Brightness | - | T=25°C, Note 7 | - | 80.0 | - | cd/m$^2$ |
| Viewing Direction | | - | | 6 | | o'clock |
| Viewing Angle | Ø2 - Ø1 | K=2, Note 1 | - | 40 | - | degree |
| Response Time (Rise) | $t_R$ | Ø=10°, Q=0°, Note 1 | - | 120 | - | ms |
| Response Time (Fall) | $t_F$ | Ø=10°, Q=0°, Note 1 | - | 150 | - | ms |

## ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Condition | Min | Max | Unit |
|---|---|---|---|---|---|
| Supply Voltage (Logic) | $V_{DD}$ - $V_{SS}$ | - | 0 | 6 | V |
| Supply Voltage (LC Drive) | $V_{DD}$ - $V_{EE}$ | - | 0 | 27.5 | V |
| Input Voltage | $V_I$ | Note 2 | -0.3 | 0.3+VDD | V |
| Operating Temperature | $T_{OP}$ | Note 5,6 | 0 | 50 | °C |
| Storage Temperature | $T_{ST}$ | Note 5,6 | -20 | 60 | °C |

## DATA INTERFACE PIN ASSIGNMENT

| Pin No | Symbol | Level | Function |
|---|---|---|---|
| 1-4 | D0 - D3 | H/L | Display data |
| 5 | Not DISP OFF | H/L | High for ON / Low for OFF |
| 6 | FRAME | H | First Line Marker |
| 7 | NC | - | Do not connect |
| 8 | LOAD | H->L | Data latch |
| 9 | CP | H->L | Data shift |
| 10 | VDD | - | Power supply for logic circuit |
| 11 | VSS | - | Ground |
| 12 | VEE | - | Power supply for LC drive circuit |
| 13 | V0 | - | Operating voltage for LC driving |
| 14 | FGND | - | Front panel ground |

## CFL INTERFACE PIN ASSIGNMENT

| Pin No | Symbol | Level | Function |
|---|---|---|---|
| 1 | VCFL | - | Power supply for CFL |
| 2 | NC | - | No connection |
| 3 | NC | - | No connection |
| 4 | VCFL | - | CFL Ground |

## ELECTRICAL CHARACTERISTICS

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage (Logic) | $V_{DD}$ - $V_{SS}$ | - | 4.75 | 5.0 | 5.25 | V |
| Supply Voltage (LC Drive) | $V_{EE}$ - $V_{SS}$ | - | -20.9 | -22.0 | -23.1 | V |
| Supply Current | $I_{DD}$ | Note 3 | - | 6 | - | mA |
| | $I_{EE}$ | Note 3 | - | 5 | - | mA |
| Input Voltage (High Level) | $V_{IH}$ | High Level, Note 2 | 0.8* VDD | - | VDD | V |
| Input Voltage (Low Level) | $V_{IL}$ | Low Level, Note 2 | 0 | - | 0.2* VDD | V |
| Frame Frequency | $f_{FLM}$ | - | 70 | 75 | 80 | Hz |
| Duty Ratio | | - | - | 1/240 | - | - |
| Recommended LC Drive Voltage | $V_{DD}$ -$V_O$ | Duty=1/240 T=0°, Ø=10°, Note 4 | - | 23.0 | - | V |
| | | Duty=1/240 T=25°C, Ø=10°, Note 4 | - | 22.0 | - | V |
| | | Duty=1/240 T=40°C, Ø=10°, Note 4 | - | 21.0 | - | V |
| Backlight Lamp Voltage | $V_{BL}$ | T=25°C | - | 300 | - | Vrms |
| Backlight Lamp Frequency | $f_{BL}$ | T=25°C | | 70 | 85 | kHz |
| Backlight Lamp Current | $I_{BL}$ | T=25°C | 4 | 5 | 6 | mArms |
| Lamp Start Voltage | $V_S$ | T=25°C | 1000 | - | - | V |
| Backlight Lamp Lifetime | $T_L$ | T=25°C | 15.000 | 20.000 | - | hrs |

## TIMING CHARACTERISTICS

| Item | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Clock frequency | fCP | - | - | 6.5 | MHz |
| Clock pulse width | tw | 63 | - | - | ns |
| Rise, Fall time | tr, tf | - | - | 20 | ns |
| Data set up time | tDSU | 50 | - | - | ns |
| Data hold time | tDHD | 50 | - | - | ns |
| LOAD set up time | tLSU | 80 | - | - | ns |
| LOAD -> Clock time | tLC | 80 | - | - | ns |
| FRAME set up time | tsetup | 100 | - | - | ns |
| FRAME hold time | thold | 100 | - | - | ns |
| LOAD pulse width | twc | 125 | - | - | ns |

## INVERTER AND CONNECTORS

| Recommended Inverter | Starter Kit |
|---|---|
| HITACHI INVC132, INVC196 | START691x |
| **Lamp Connector** | **Lamp Housing Connector** |
| JAE IL-G-4S-S3C23 | - |

Note1: Definition of optical data, see page 84

Note 2: Applied to NotDISP.OFF, FRAME, LOAD, CP, D0-D3

Note 3: FRAME=75Hz, D0-D3=0.1.0.1...VDD-VEE=23.7V,T=25°C

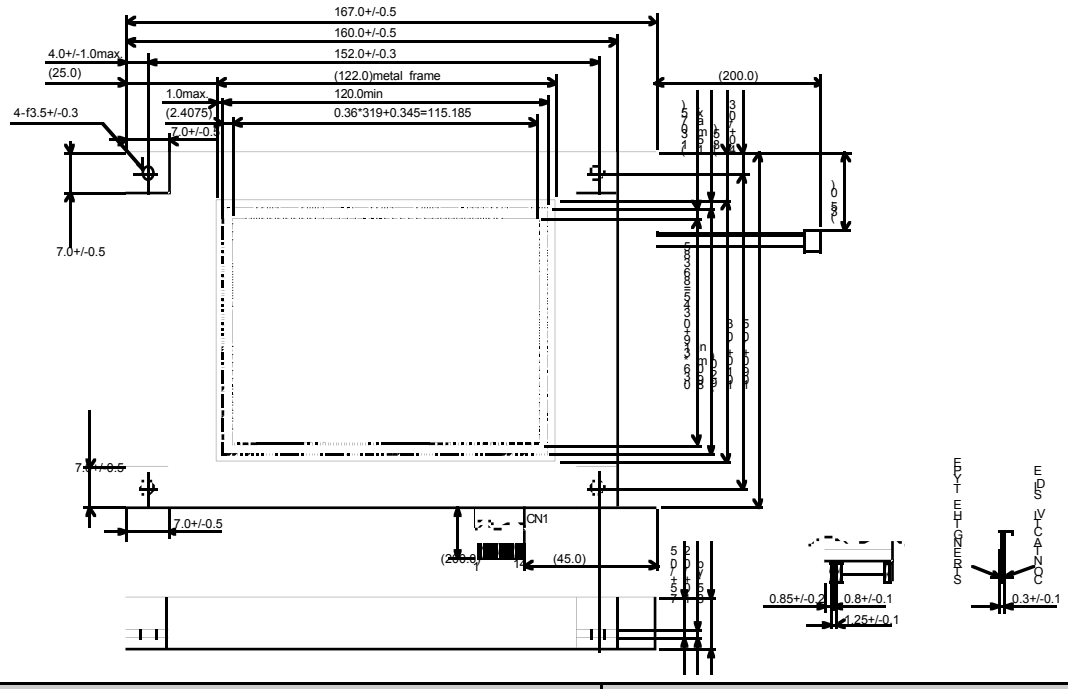
Note 4: Recommended LC driving voltage may fluctuate about +-/1.0V by each module

Note 5: Background colour of the LCD changes depending on temperature. Between 40-50°C optical characteristics of the LCD like contast and viewing angle change but the display remains readable.

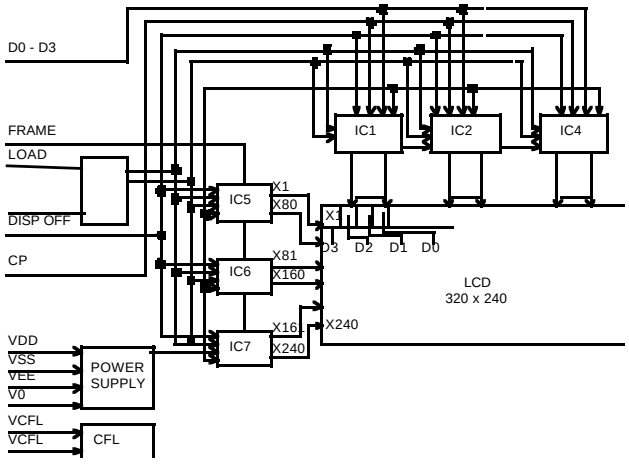
Note 6: Storage at -20°C < 48 hr, at 60°C < 168 hr

Note 7: Measurement after 10 minutes of CFL operating. Brightness control at100 %

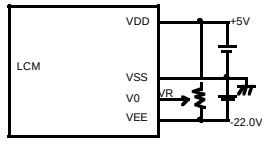
## MECHANICAL DIMENSIONS




## BLOCK DIAGRAM

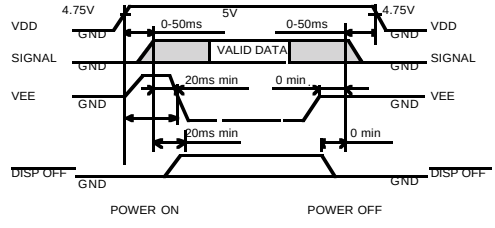



## POWER SUPPLY / POWER UP TIMING DIAGRAM

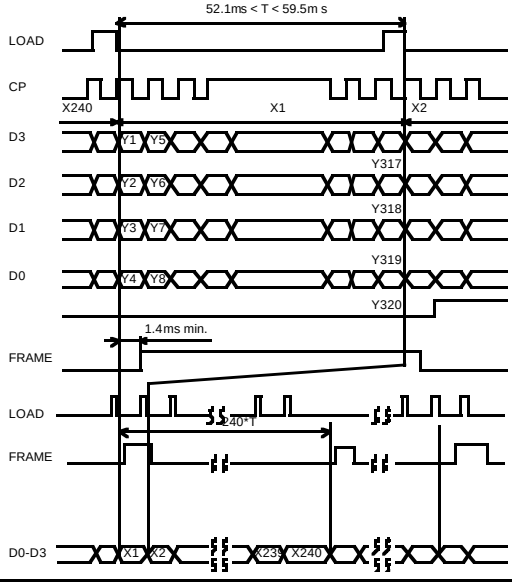


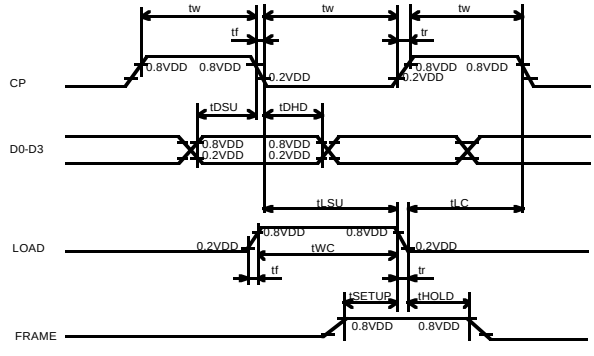

NOTE 1: IT IS RECOMMENDED TO ADD FUS (1 A) TO VDD LINE

NOTE 2: VR = 10kW




## INTERFACE TIMING DIAGRAM




HITACHI