

FEATURES

- ◆ Black on White STN TYPE
- ◆ Transmissive Mode
- ◆ High Brightness CFL Backlight

- ◆ High Contrast LC Material
- ◆ Built-in LCD Controller T6963C

MECHANICAL DATA

| Item | Value | Unit |
|-------------------|--------------|------|
| Module Dimensions | 159.4*101*11 | mm |
| Viewing Area | 123*68 | mm |
| Resolution | 240*128 | dots |
| Dot Size | 0.47*0.47 | mm |
| Dot Pitch | 0.5*0.5 | mm |
| Weight | 180 | g |

OPTICAL DATA

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------|----------------|------------------------|------|------|-----|-------------------|
| Contrast Ratio | K | ∅=10°, Q=0°, Note 1 | - | 18 | - | - |
| Brightness | - | T=25°C, IL=5mA, Note 8 | 60.0 | 80.0 | - | cd/m ² |
| Viewing Direction | - | - | 6 | | | o'clock |
| Viewing Angle | ∅2 - ∅1 | K=2, Note 1 | 30 | 40 | - | degree |
| Response Time (Rise) | t _R | ∅=10°, Q=0°, Note 1 | - | 160 | 210 | ms |
| Response Time (Fall) | t _F | ∅=10°, Q=0°, Note 1 | - | 110 | 160 | ms |

ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Condition | Min | Max | Unit |
|---------------------------|-----------------------------------|-----------|------|---------------------|------|
| Supply Voltage (Logic) | V _{DD} - V _{SS} | - | 0 | 6.5 | V |
| Supply Voltage (LC Drive) | V _{DD} - V _{EE} | - | 0 | 20.5 | V |
| Input Voltage | V _I | - | -0.3 | 0.3+V _{DD} | V |
| Operating Temperature | T _{OP} | Note 5,6 | 0 | 50 | °C |
| Storage Temperature | T _{ST} | Note 7 | -20 | 60 | °C |

DATA INTERFACE PIN ASSIGNMENT

| Pin No | Symbol | Level | Function |
|--------|--------------|-------|--|
| A1 | VSS (0V) | - | Ground |
| A2 | VDD (+5V) | - | Power supply for logic circuit |
| A3 | V0 | - | Power supply for LCD drive |
| A4 | C/D | - | Not WR=Low and C/D=High for Command Write, C/D= Low for Data Write, Not RD = Low and C/D=High for Status Read, C/D = Low for Data Read |
| A5 | Not WR | - | DW=Low for Data Write |
| A6 | Not RD | - | RD=Low for Data read |
| A7-A14 | DB0 - DB7 | - | Display data |
| A15 | Not CE | - | Chip enable (Not CE must be Low) |
| A16 | Not RET | - | Reset |
| A17 | VEE (-15V) | - | Power supply for LCD drive |
| A18 | Not DISP OFF | - | NC for Display ON, GND for Display OFF |
| A19 | F/S | - | Character font selection (F/S=High for 6x8 font, F/S=Low for 8x8 font) |
| A20 | Reverse | - | Display mode reverse |

CFL INTERFACE PIN ASSIGNMENT

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

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} | - | -14.5 | -15.0 | -15.5 | V |
| Supply Current | I _{DD} | Note 2 | - | 11.7 | 14.0 | mA |
| | I _{EE} | Note 2 | - | 2.5 | 4.0 | mA |
| Input Voltage (High Level) | V _{IH} | High Level | 0.8* V _{DD} | - | V _{DD} | V |
| Input Voltage (Low Level) | V _{IL} | Low Level | 0 | - | 0.2* V _{DD} | V |
| Frame Frequency | f _{FLM} | Note 4 | - | 75 | - | Hz |
| Duty Ratio | - | - | - | 1/128 | - | - |
| Recommended LC Drive Voltage | V _{DD} - V _O | Duty=1/128 T=0°C, ∅=10°, Note 3 | - | 16.9 | - | V |
| | | Duty=1/128 T=25°C, ∅=10°, Note 3 | - | 15.8 | - | V |
| | | Duty=1/128 T=50°C, ∅=10°, Note 3 | - | 15.2 | - | V |
| Backlight Lamp Voltage | V _{BL} | T=25°C | - | 360 | - | Vrms |
| Backlight Lamp Frequency | f _{BL} | T=25°C | 30 | 70 | 85 | kHz |
| Backlight Lamp Current | I _{BL} | T=25°C | 2.5 | 5.0 | 5.5 | mA |
| Lamp Start Voltage | V _S | T=25°C, Note 9 | (1000) | - | - | V |

TIMING CHARACTERISTICS

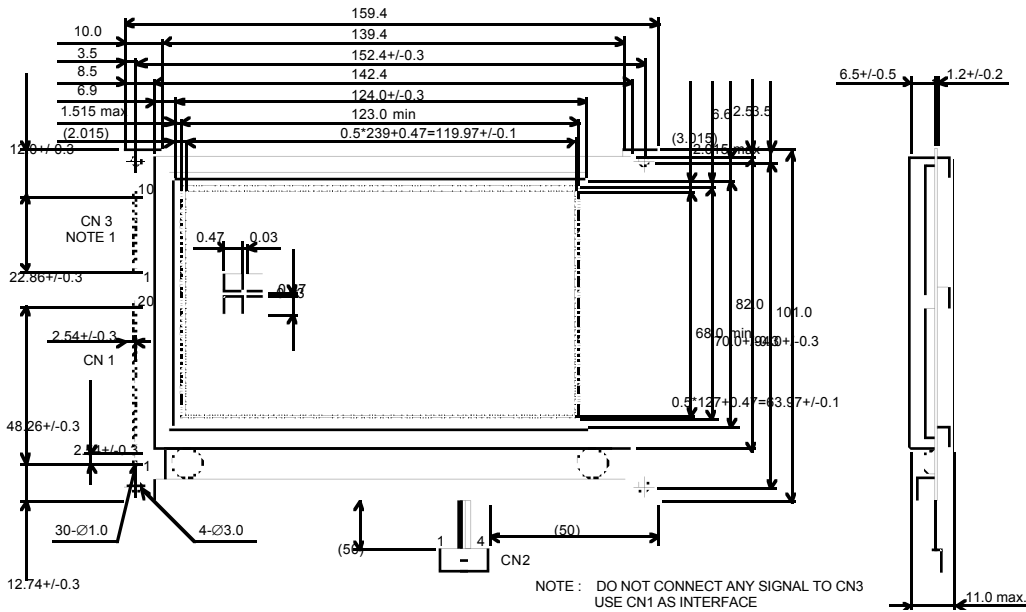
| Item | Symbol | Min | Typ | Max | Unit |
|------------------------------------|---|-----|-----|-----|------|
| C/D set up time | t _{CDS} | 100 | - | - | ns |
| C/D hold time | t _{CHD} | 10 | - | - | ns |
| Not CE, Not RD, Not WR pulse width | Not t _{CE} , Not t _{RD} , Not t _{WR} | 80 | - | - | ns |
| Data set up time | t _{DS} | 80 | - | - | ns |
| Data hold time | t _{DH} | 40 | - | - | ns |
| Access time | t _{ACC} | - | - | 150 | ns |
| Output hold time | t _{OH} | 10 | - | 50 | ns |

INVERTER AND CONNECTORS

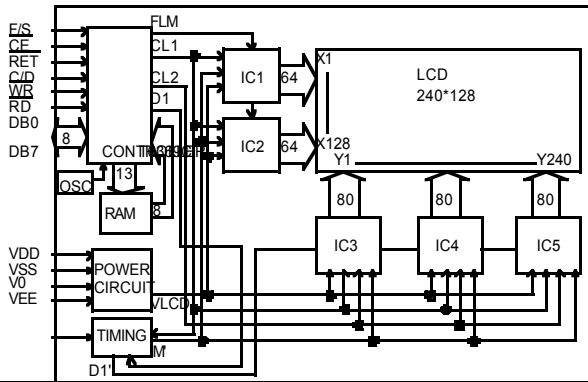
| Recommended Inverter | Starter Kit |
|----------------------|---|
| HITACHI INVC191 | START74xx |
| Lamp Connector | Lamp Housing Connector |
| MITSUMI M63M83-04 | M61M73-04, M60-04-30-114P or M60-04-30-134P |

- Note 1: Definition of optical data, see page 84
- Note 2: f_{FRAME}=75Hz, V_{DD}-V₀=15.8V, T_a=25°C
- Note 3: Recommended LCD driving may fluctuate about +/- 1.0V by each module.
- Note 4: Need to make sure of flickering and rippling of display when setting the FRAME Frequency in your set.
- Note 5: Background colour of the LCD changes depending on temperature. Between 40-50°C optical characteristics of the LCD like contrast and viewing angle change but the display remains readable.
- Note 6: Higher starting voltage of CFL and higher LCD driving voltage are needed while operating at 0°C. The lifetime of CFL will be reduced at 0°C
- Note 7: Storage at -20°C < 48 hr, T_a at 60°C < 168 hr
- Note 8: Measurement after 10 minutes of CFL operating. Brightness control: 100%
- Note 9: Starting discharge voltage is increased when LCM is operating at lower temperature. Please check the characteristics of inverter before applying.

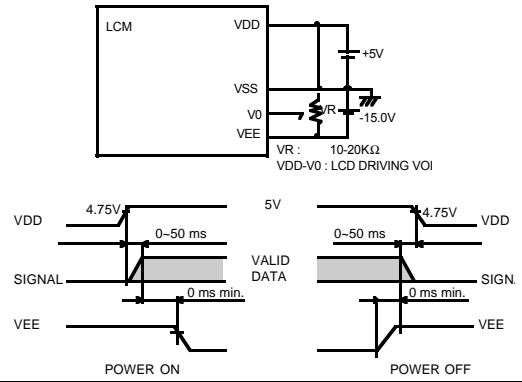
MECHANICAL DIMENSIONS



BLOCK DIAGRAM



POWER SUPPLY / POWER UP TIMING DIAGRAM



INTERFACE TIMING DIAGRAM

