



DOCUMENT NUMBER AND REVISION

**VL-FS-MDLS12433P-01 REV. A
(MDLS12433P-LV-S)**

DOCUMENT TITLE:

**SPECIFICATION
OF
LCD MODULE TYPE**

MODEL NUMBER: MDLS12433P-01

| DEPARTMENT | NAME | SIGNATURE | DATE |
|-------------|---------------|-----------|-----------|
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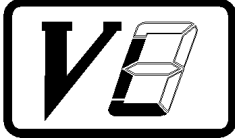
DOCUMENT REVISION HISTORY 1:

| DOCUMENT REVISION FROM TO | DATE | DESCRIPTION | CHANGED BY | CHECKED BY |
|---------------------------|------------|---|------------------|------------|
| A | 2004.03.16 | <p>First Release.</p> <p>Based on</p> <p>a.) Test Specification: VL-TS-MDLS12433P-XX Rev. B 2003-08-26.</p> <p>b.) VL-QUA-012A-S, REV. P, APR/2003 (English version).</p> <p>According to VL-QUA-012A-S, LCD size is small because Unit Per Laminate=21 which is more than 6pcs/Laminate.</p> | CHEN HUI JUAN | SUNNY LEE |



CONTENTS

| | <u>Page No.</u> |
|--|-----------------|
| 1. GENERAL DESCRIPTION | 4 |
| 2. MECHANICAL SPECIFICATIONS | 4 |
| 3. ABSOLUTE MAXIMUM RATINGS | 6 |
| 3.1 ELECTRICAL MAXIMUM RATINGS (Ta=25°C) | 6 |
| 3.2 ENVIRONMENTAL CONDITION | 6 |
| 4. ELECTRICAL SPECIFICATIONS | 7 |
| 4.1 INTERFACE SIGNALS | 7 |
| 4.2 TYPICAL ELECTRICAL CHARACTERISTICS | 7 |
| 4.3 TIMING SPECIFICATIONS | 8 |
| 5. LCD COSMETIC CONDITIONS | 10 |



VARITRONIX LIMITED

Specification of LCD Module Type Item No.: MDLS12433P-01

1. General Description

- 12 characters x 4 lines (5 x 8 dots) STN Positive Silver Reflective LCD character module.
- Driving scheme: 1:32 multiplexed drive, 1/6 bias.
- Optimal view direction: 6 O'clock.
- 'PHILIPS' PCF2116AU/10 die form LCD controller / driver.
- Data interface: I²C-bus.
- Built in character generator with the standard character set.
- Flexible Flat Cable (FFC) (length=70mm).

2. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

| Parameter | Specifications | Unit |
|--------------------|---|-------|
| Outline dimensions | 49.0(W) x 44.0(H) x 2.0 max.(D) (Excluded FFC and RTV). 49.0(W) x 108.5(H) x 2.0 max.(D) (Included FFC. Excluded RTV). | mm |
| Viewing area | 41.0(W) x 19.1(H) | mm |
| Display format | 12 characters X 4 lines (5 x 8 dots) | - |
| Character size | 2.05(W) x 3.55(H) (5 x 8 dots) | mm |
| Character spacing | 0.96(W) x 0.96(H) | mm |
| Character pitch | 3.01(W) x 4.51(H) | mm |
| Dot size | 0.37(W) x 0.40(H) | mm |
| Dot spacing | 0.05(W) x 0.05(H) | mm |
| Dot pitch | 0.42(W) x 0.45(H) | mm |
| Weight: | TBD | grams |

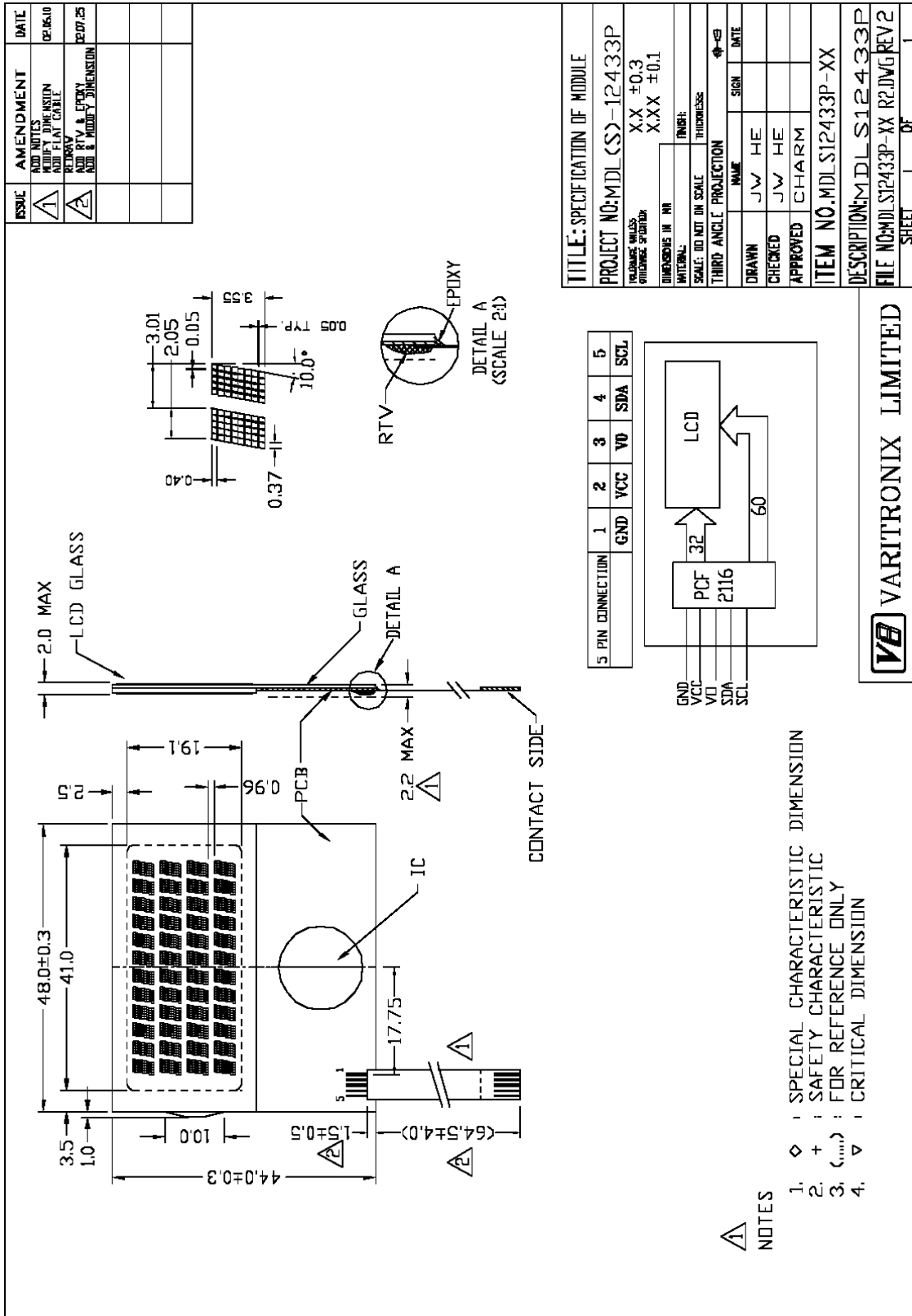
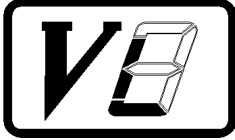


Figure 1: Specification Drawing



3. Absolute Maximum Ratings

3.1 Electrical Maximum Ratings (Ta = 25 °C)

Table 2

| Parameter | Condition | Symbol | Min. | Max. | Unit |
|------------------------------|-------------|------------------|----------|----------|------|
| Power supply voltage (Logic) | - | VCC - GND | -0.5 | +8.0 | V |
| Power supply voltage (LCD) | | V _{LCD} | 0 | 11.0 | V |
| Input voltage range | OSC,SCL,SDA | V _{in} | GND-0.50 | VCC +0.5 | V |

Note:

The modules may be destroyed if they are used beyond the absolute maximum ratings.

All voltage values are referenced to GND = 0V.

3.2 Environmental Condition

Table 3

| Item | Operating Temperature (T _{opr}) | | Storage Temperature (T _{stg}) | | Remark |
|--|--|-------|---|-------|-----------------|
| | Min. | Max. | Min. | Max. | |
| Ambient Temperature | 0°C | +50°C | -10°C | +60°C | Dry |
| Humidity | 95% max. RH for Ta ≤ 40°C < 95% RH for Ta > 40°C | | | | no condensation |
| Vibration (IEC 68-2-6) cells must be mounted on a suitable connector | Frequency: 10 ~ 55 Hz Amplitude: 0.75 mm Duration: 20 cycles in each direction. | | | | 3 directions |
| Shock (IEC 68-2-27) Half-sine pulse shape | Pulse duration : 11 ms Peak acceleration: 981 m/s ² = 100g Number of shocks : 3 shocks in 3 mutually perpendicular axes. | | | | 3 directions |



4. Electrical Specifications

4.1 Interface signals

Table 4

| Pin No. | Symbol | Description |
|---------|--------|--|
| 1 | GND | Ground (0V) and cathode of LED backlight. |
| 2 | VCC | Power supply for logic (+5V). |
| 3 | V0 | Control input for VLCD. |
| 4 | SDA | I ² C serial data input/output. |
| 5 | SCL | I ² C serial clock input. |

4.2 Typical Electrical Characteristics

T_a = 25 °C, VCC = 5.0V ±5%, GND=0V.

Conditions: GND=0V, VCC=VCC(typ.), T_{amb}=+25°C, V_{op}=V_{op}(typ.),
R_{osc}=R_{osc}(typ.), unless otherwise stated.

Table 5

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---------------------------|-----------------|-------------------------------|---------|------|---------|------|
| Supply voltage (Logic) | VCC-GND | | 4.75 | 5.00 | 5.25 | V |
| Supply voltage (LCD) | VLCD =VCC-V0 | Note 1 | 3.0 | 3.3 | 3.6 | V |
| Input signal voltage low | Vil | | GND | - | 0.1 VCC | V |
| Input signal voltage high | Vih | | 0.9 VCC | - | VCC | V |
| LCD operating current | ICC | Character mode, Note 1 | - | 0.4 | 0.6 | mA |
| | | Checker board mode, Note 1 | - | 0.5 | 0.8 | mA |

Note 1: There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.



4.3 Timing Specifications

Ta = 0 °C to +50 °C, VCC = 5V±5%, GND=0V; V_{LCD} = VCC-3.5V to VCC-9V.

Refer to Fig.2, I²C Bus Timing Diagram of 'PHILIPS' PCF2116; rise and fall times referring to V_{IL} and V_{IH}.

Table 6

| Parameters | Symbol | Min. | Typ. | Max. | Unit |
|---|---------------------|------|------|------|------|
| LCD frame frequency (internal clock) (note 1) | f _{FR} | 40 | 65 | 100 | Hz |
| External clock frequency | f _{OSC} | 90 | 150 | 225 | kHz |
| Timing characteristics: I²C-bus interface; note 2 | | | | | |
| SCL clock frequency | f _{SCL} | - | - | 100 | kHz |
| Tolerable spike width on bus | t _{SW} | - | - | 100 | ns |
| Bus free time | t _{BUF} | 4.7 | - | - | μs |
| Set-up time for a repeated START condition | t _{SU;STA} | 4.7 | - | - | μs |
| Start condition hold time | t _{HD;STA} | 4 | - | - | μs |
| SCL LOW time | t _{LOW} | 4.7 | - | - | μs |
| SCL HIGH time | t _{HIGH} | 4 | - | - | μs |
| SCL and SDA rise time | t _r | - | - | 1 | μs |
| SCL and SDA fall time | t _f | - | - | 0.3 | μs |
| Data set-up time | t _{SU;DAT} | 250 | - | - | ns |
| Data hold time | t _{HD;DAT} | 0 | - | - | ns |
| Set-up time for Stop condition | t _{SU;STO} | 4 | - | - | μs |

Notes:

1 VCC=5.0V.

2. All timing values are valid within the operating supply voltage and ambient temperature range and are referenced to V_{IL} and V_{IH} with an input voltage swing to GND to VCC.

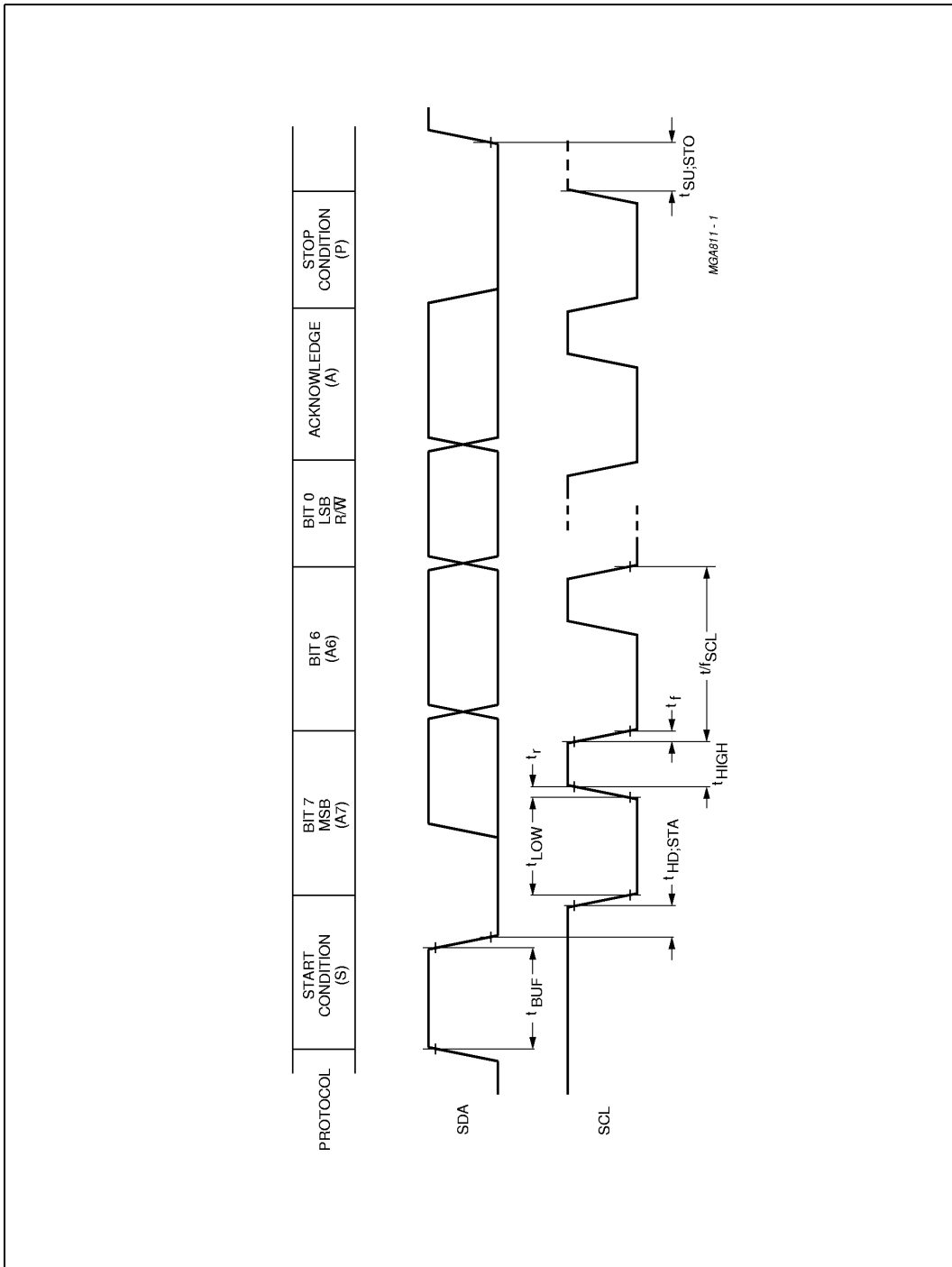


Figure 2: I²C Bus Timing Diagram of 'PHILIPS' PCF2116;
rise and fall times referring to V_{IL} and V_{IH}



5. LCD Cosmetic Conditions

Refer to VL-QUA-012A-S.

“Varitronix Limited reserves the right to change this specification.”

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