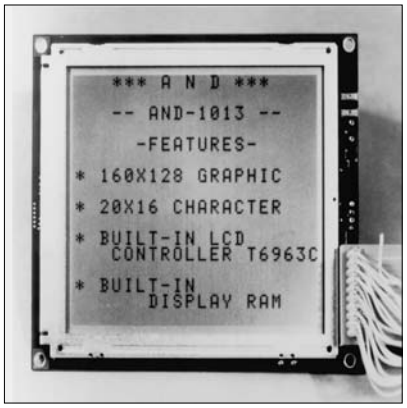



# AND1013ST-30/-EO

## 160 x 128 Dots
## Intelligent Graphics Display

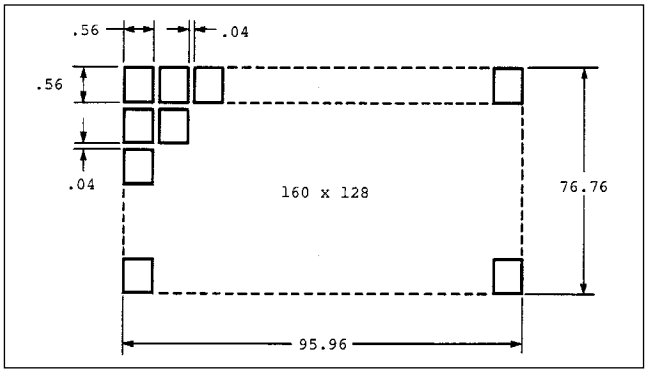
The AND1013ST-30/-EO devices are compact, full dot matrix, LCD modules that have an on-board LCD controller (T6963C) and display memory (RAM). The AND1013ST-30 /EO can display TEXT information, numerals, letters and symbols, as well as GRAPHIC patterns. These devices are suitable for medical and measurement equipment, point-of-sale terminals, portable equipment, and marine instrumentation.

## Features

**• RoHS Compliant**

- Super twist
- 20 characters x 16 line capability
- 160 x 128 dot graphic display
- Excellent readability and high-contrast ratio
- Built-in LCD controller (T6963C)
- Wide operating temperature range (0° to 50°C)
- Available with EL backlighting (-EO option) or fiberoptic backlight

**Dot Matrix Dimensions**




**Mechanical Characteristics**

| Item | Specification | Unit |
|---|---|---|
| Outline Dimensions | 129.0 (W) x 104.5 (H) x 14.0 Max (D) | mm |
| Number of Dots | 160 x 128 dots | |
| # of Characters | 20 x 16 (320), 8 x 8 font | |
| Viewing Area | 101.0 (W) x 82.0 (H) | mm |
| Bezel Opening | 101.0 (W) x 82.0 (H) | mm |
| Dot Size | 0.56 (W) x 0.56 (H) | mm |
| Dot Pitch | 0.60 (W) x 0.60 (H) | mm |
| Weight (approx.) | 150 | gram |

**Absolute Maximum Ratings**

| Item | Symbol | Rating | Unit |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ | 7.0 | V |
| | $V_{EE}$ | –15 | |
| | $V_{EL}$ | 130 (EO) | $V_{rms}$ |
| Input Voltage | $V_{IN}$ | GND ≤ $V_{IN}$ ≤ $V_{DD}$ | V |
| Operating Temperature | $T_{op}$ | 0 to +50 | °C |
| Storage Temperature | $T_{stg}$ | -20 to +60 | ˚C |

**Electrical Characteristics (TA = 25°C)**

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | $V_{DD}$ | 4.75 | 5.0 | 5.25 | V |
| | $V_{EE}$ | –7.75 | –8.5 | –9.25 | |
| High Level In Voltage ($V_{DD}$ = 5.0V) | $V_{IH}$ | $V_{DD}$ – 2.2 | – | $V_{DD}$ | V |
| Low Level In Voltage ($V_{DD}$ = 5.0V) | $V_{IL}$ | – | – | 0.5 | |
| High Level Output Volt. ($V_{DD}$ = 5.0V) | $V_{OH}$ | $V_{DD}$ –0.3 | – | – | V |
| Low Level Output Volt. ($V_{DD}$ = 5.0V) | $V_{OL}$ | – | – | 0.3 | V |
| Power Consumption(1) | $I_{DD}$ | – | – | 10.0 | mA |
| | $I_{EE}$ | – | – | 2.0 | |
| | $I_{EL}$ | | – | 15 | (2) |

1. All dots on. ($V_{DD}$ = .5V, $V_{EE}$ = –8.5V, $V_{EL}$=110, $f_{EL}$ = 500 Hz or at Typ.)
2. mA rms

Product specifications contained herein may be changed without prior notice. It is therefore advisable to contact Purdy Electronics before proceeding with the design of equipment incorporating this product.

**Optical Characteristics (TA = 25°C, $\phi$ = 0°, $\theta$ = 0)**

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Viewing Angle | Right to Left | – | 80 | – | degree |
| | Up & Down | – | 55 | – | |
| Contrast | K | 2.5 | 3.8 | – | – |
| Turn On | $T_{on}$ | – | 200 | 350 | ms |
| Turn Off | $T_{off}$ | – | 250 | 350 | ms |

Note:Refer to Applications Section for definitions of viewing angle, contrast ratio, response time (on and off) and luminance.

**Connector Pin Assignment**

| Pin No. | Signal | Function |
|---|---|---|
| 1 | FGND | Frame Ground (connected to metal bezel) |
| 2 | GND | Ground (signal) |
| 3 | $V_{DD}$ | Power Supply for logic (5V) |
| 4 | V | Power Supply for LCD Drive |
| 5 | $\overline{WR}$ | Data Write |
| 6 | $\overline{RD}$ | Data Read |
| 7 | $\overline{CE}$ | Chip Enable |
| 8 | C/$\overline{D}$ | $\overline{WR}$ = "L", C/$\overline{D}$ = "H": Command Write<br>$\overline{WR}$ = "L", C/$\overline{D}$ = "L": Data Write<br>$\overline{RD}$ = "L", C/$\overline{D}$ = "H": Status Read<br>$\overline{RD}$ = "L", C/$\overline{D}$ = "L": Data Read |
| 9 | NC | No connection |
| 10 | $\overline{RESET}$ | Controller Reset |
| 11 | D0 | Data Input/Output |
| 12 | D1 | Data Input/Output |
| 13 | D2 | Data Input/Output |
| 14 | D3 | Data Input/Output |
| 15 | D4 | Data Input/Output |
| 16 | D5 | Data Input/Output |
| 17 | D6 | Data Input/Output |
| 18 | D7 | Data Input/Output |
| 19 | NC | No connection |
| 20 | NC | No connection |

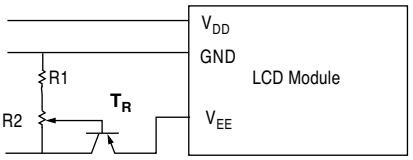
# Power Supply

The LCD panel is driven by the voltage $V_{DD}$–$V_{EE}$, so an adjustable $V_{EE}$ is required for contrast control and temperature compensation.

**Temperature Variations**

| Temperature | $V_{DD}$–$V_{EE}$ |
|---|---|
| 0°C | 14.1 |
| +25°C | 13.0 |
| +50°C | 11.1 |

**Example of Variable Negative Voltage Supply**



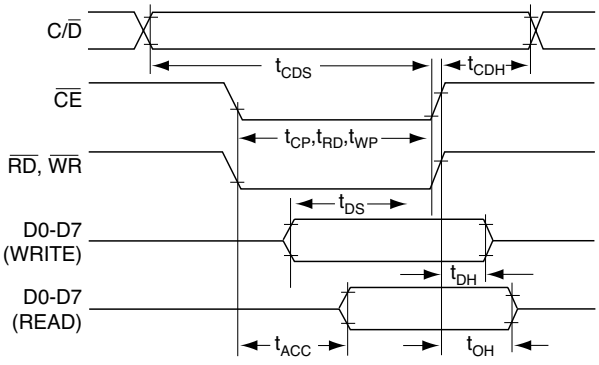

R1 = 10k, R2 = 10k, $T_R$ 2SA1102 or equivalent

## Timing Relationships and Diagram

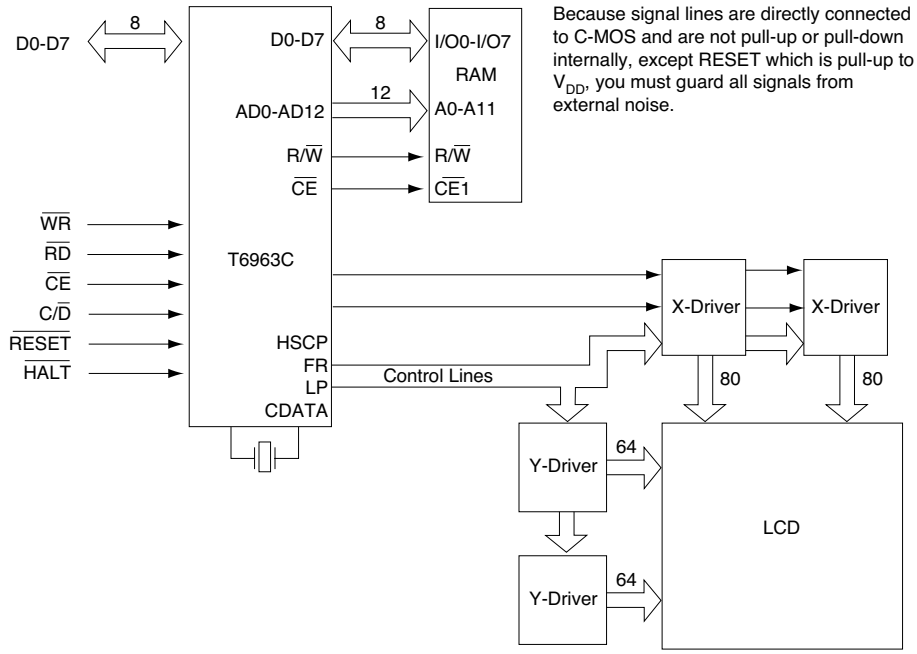
**Signal Timing Relationships**

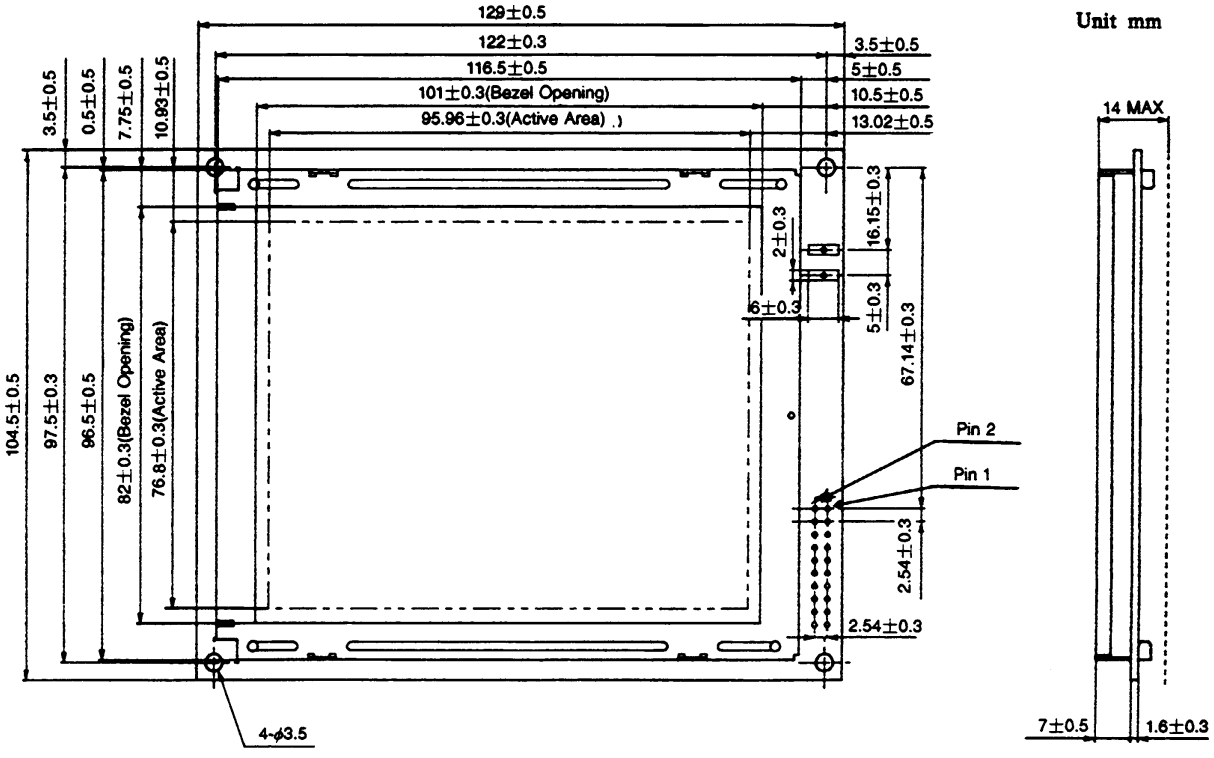
| Item | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| C/D Set Up Time | $t_{CDS}$ | 100 | – | ns |
| C/D Hold Time | $t_{CDH}$ | 10 | – | |
| $\overline{CE}$, $\overline{RD}$, $\overline{WR}$ Pulse Width | $t_{CE}$, $t_{RD}$, $t_{WR}$ | 80 | – | |
| Data Set Up Time | $t_{DS}$ | 80 | – | |
| Data Hold Time | $t_{DH}$ | 40 | – | |
| Access Time | $t_{ACC}$ | – | 150 | |
| Output Hold Time | $t_{OH}$ | 10 | 50 | |

**Timing Diagram**



**Block Diagram**




**Dimensional Outline**