

## AND1013ST-30/-EO

### 160 x 128 Dots

### Intelligent Graphics Display

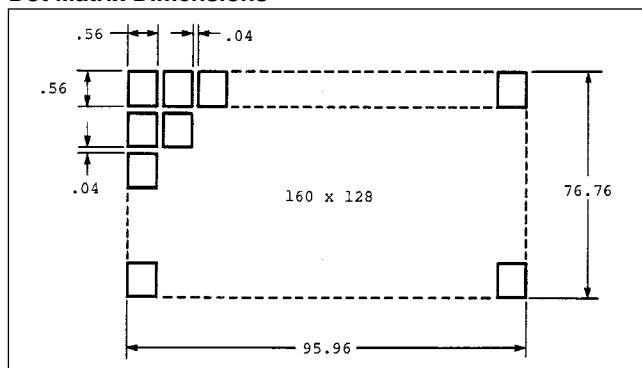
The AND1013ST-30/-EO devices are compact, full dot matrix, LCD modules that have an on-board LCD controller (T6963C) and display memory (RAM). The AND1013ST-30 /EO can display TEXT information, numerals, letters and symbols, as well as GRAPHIC patterns. These devices are suitable for medical and measurement 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         | $V_{IN}$  | $GND \leq V_{IN} \leq V_{DD}$ | 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 <sup>(1)</sup>            | $I_{DD}$ | -              | -    | 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.



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## Optical Characteristics (TA = 25°C, φ = 0°, θ = 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 <sub>on</sub>  | -    | 200  | 350  | ms     |
| Turn Off      | T <sub>off</sub> | -    | 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 <sub>DD</sub> | Power Supply for logic (5V)   |
| 4       | V               | Power Supply for LCD Drive  |
| 5       | WR              | Data Write  |
| 6       | RD              | Data Read   |
| 7       | CE              | Chip Enable   |
| 8       | C/D             | WR = "L", C/D = "H": Command Write<br>WR = "L", C/D = "L": Data Write<br>RD = "L", C/D = "H": Status Read<br>RD = "L", C/D = "L": Data Read |
| 9       | NC              | No connection   |
| 10      | 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   |

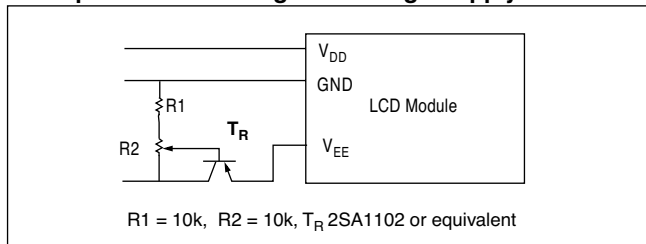
## Power Supply

The LCD panel is driven by the voltage V<sub>DD</sub>-V<sub>EE</sub>, so an adjustable V<sub>EE</sub> is required for contrast control and temperature compensation.

### Temperature Variations

| Temperature | V <sub>DD</sub> -V <sub>EE</sub> |
|-------------|----------------------------------|
| 0°C         | 14.1                             |
| +25°C       | 13.0                             |
| +50°C       | 11.1                             |

### Example of Variable Negative Voltage Supply

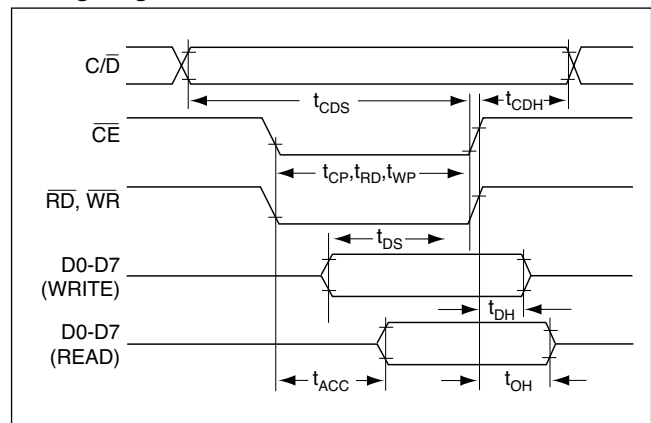


## Timing Relationships and Diagram

### Signal Timing Relationships

| Item                   | Symbol  | Min. | Max. | Unit |
|------------------------|---|------|------|------|
| C/D Set Up Time        | t <sub>CDS</sub>                                    | 100  | -    | ns   |
| C/D Hold Time          | t <sub>CDH</sub>                                    | 10   | -    |      |
| CE, RD, WR Pulse Width | t <sub>CE</sub> , t <sub>RD</sub> , t <sub>WR</sub> | 80   | -    |      |
| Data Set Up Time       | t <sub>DS</sub>                                     | 80   | -    |      |
| Data Hold Time         | t <sub>DH</sub>                                     | 40   | -    |      |
| Access Time            | t <sub>ACC</sub>                                    | -    | 150  |      |
| Output Hold Time       | t <sub>OH</sub>                                     | 10   | 50   |      |

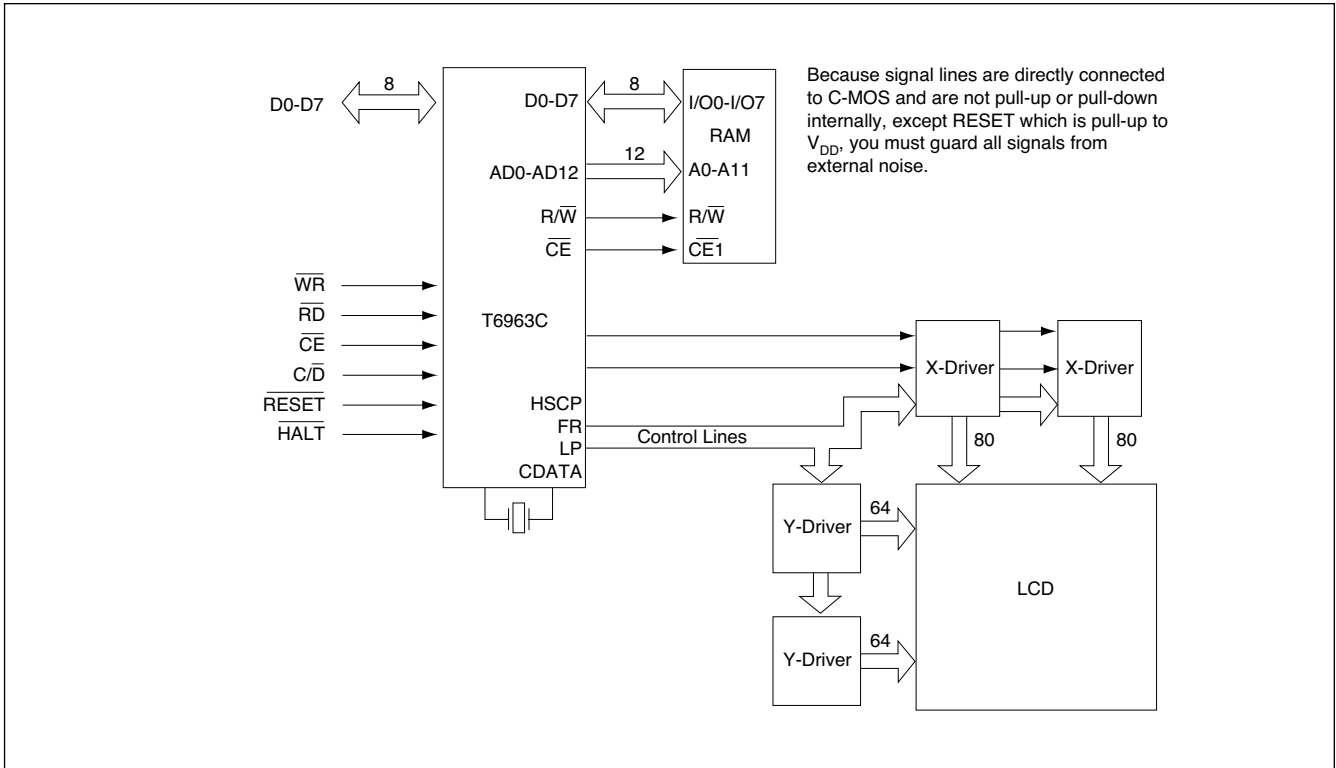
### Timing Diagram





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## Block Diagram



## Dimensional Outline

