

# LA-10 User's Manual

Revision 1.00

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## Overview

The LA-10 is a kit that allows experimenters to easily build an LED array using their choice of LEDs. The LA-10 board has space for up to 10 LEDs. The actual number that can be used in a given application is determined by the supply voltage used, and the voltage drop of the LEDs used. The constant current drive is determined by the value of the resistor installed at R2. The LA-10 circuit board provides solder pads for both through hole (T 1-3/4) or SMT LEDs that will fit on 1206 pads. Many SMT LED package styles can be hand soldered to 1206 pads.

## Specifications

Size: 1.6" X 1.0"

Power: User option. Typically between 12V-24V and selectable current based on value of R2. Operation over 30V is not recommended.

## Parts List

LA-10 PCB

PN2222 Transistor (2)

Resistor, 3.3K, ¼ W, 5% (Orange – Orange – Red - Gold)

Resistor, 68.1 ohm, ¼ W, 1% (Blue – Gray – Brown – Gold – Brown) – use for 10ma LED current

Resistor, 46.6 ohm, ¼ W, 1% (Yellow – Blue – Yellow – Gold- Brown) – use for 15ma LED current

Resistor, 33.2 ohm, ¼ W, 1% (Orange – Orange – Red – Gold – Brown) - use for 20ma LED current

Resistor, 22.6 ohm, ¼ W, 1% (Red – Red – Blue – Gold – Brown) – use for 30ma LED current

## Configuration

The number of LEDs that can be used will be determined by the supply voltage used and the type of LEDs used. Different LEDs have different voltage drops. In general, red LEDs will have a lower voltage drop. White and blue LEDs will have a higher voltage drop. Yellow, green, orange and similar colors will have intermediate voltage drops. Look up the specifications for the LEDs you plan to use. There will be a recommended operating current and a typical voltage drop at that current. Data sheet usually call these the Forward Voltage drop, VF, and Forward Current IF.

1. Select the supply voltage you will be using. Typically this will be between 12V and 24V. Enter supply voltage:  
\_\_\_\_\_
2. Subtract 1.8V from the supply voltage in step 1. This is the total voltage available for the LEDs. Enter supply voltage – 1.8V: \_\_\_\_\_
3. Enter the LED voltage (VF) from the LED data sheet: \_\_\_\_\_
4. Divide the voltage from step 2 by the LED voltage in step 3. Ignore any fraction (i.e. if the result is 5.6, use 5. If the result is 7.2 use 7, etc.) Enter the result \_\_\_\_\_
5. Enter the LED current (IF) from the data sheet: \_\_\_\_\_

6. Select the resistor to install in location R2. The parts list shows the LED current when each of the 1% resistors is used. Enter value of R2: \_\_\_\_\_

You can mix different LED types. Add up the voltage drops for each of the LEDs you wish to use. The total must not exceed the value calculated in step 2. Try to use diodes with the same operating current. If this is not possible for your application, select a resistor for the LED with the minimum current. Note that the higher current LEDs will generate less light than if they were operated at their rated current.

If you want to operate your LEDs at a current other than one of the options for the supplied resistors, use the following equation:

$$R = .67/I$$

Example:  $I = 37 \text{ ma}$ .  $R = .67/.037 = 18.1 \text{ ohm}$ . Use the next higher standard 1% resistor value, in this case 18.2 ohm.

### Assembly

Refer to Figure 1 for part placement.

Each LED position (D1, D2, etc.) has a space for a leaded LED and for a surface mount LED. You can put a leaded or an SMT LED but not both at an LED position.

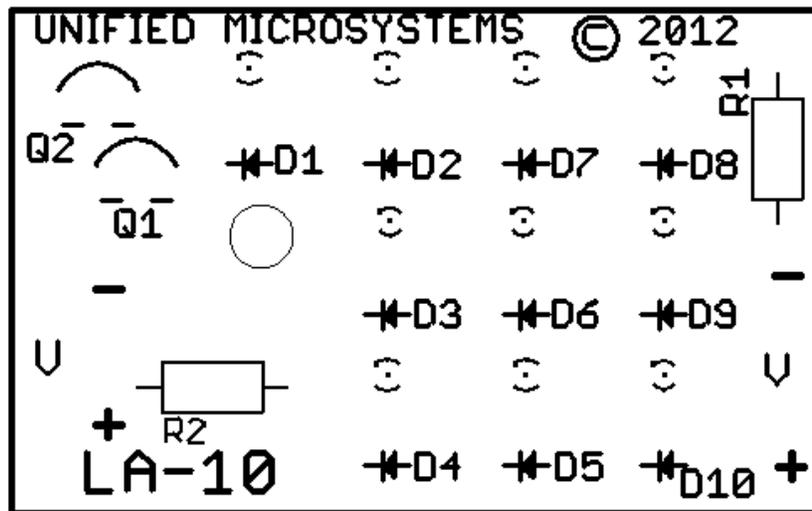


Figure 1. LA-10 Part Placement

1. Install the 3.3K (Orange – Orange – Red - Gold) resistor in location R1. Save the cut off leads from this resistor.
2. Install the resistor you selected in step 6 of the configuration section at location R2. Save the cut off leads from this resistor.
3. In most cases you will not be installing LEDs in every possible location. Decide which positions you want to use. Spread them out for a more diffused pattern. Cluster them for a concentrated pattern. If you mount the LEDs slightly above the board you can bend the leads a bit to provide an even larger spread pattern.
4. Install the LEDs in the positions you decided in step 4. Be sure to install them in the correct direction. If you are unsure, consult Appendix 1.
5. Use the wires left over from steps 1 & 2 to form U shaped jumpers to install in the holes for the LED locations an LED is not installed at.

6. Install the two transistors in locations Q1 and Q2. Be sure the body of the transistors matches the outline on the board silkscreen.

The LA-10 is now complete. Be sure to connect power with the correct polarity. You can daisy chain multiple LA-10 assemblies. Wire V+ to V+ and V- to V- between boards. Apply power to V+ and V- on one of the end boards.

### Returns and Support

LA-10 kits may not be returned once they have been built. Support is available by email only. Email questions to [w9xt@unifiedmicro.com](mailto:w9xt@unifiedmicro.com). Please put "LA-10" in the subject line for fastest response.

## Appendix 1 Determining LED Polarity

LEDs must be installed the proper way. If just one of the LEDs is installed backwards, none of the LEDs will light when the LA-10 is powered up. Figure A1 shows the schematic symbol for an LED. In order for current to flow and the LED to light, the + voltage must be applied to the anode lead. Through hole LEDs typically have longer leads on the anode (+). T 1-3/4 type packages sometimes have a flat side next to the cathode (-) lead. SMT type LEDs are often difficult to tell. Some square SMT LEDs have a corner next to the cathode lead shaved off. Check the data sheets for your diodes to be sure.

As a last check, if your Digital Multi Meter (DMM) has a Diode option, you can touch the leads to the diode. The DMM should be able to supply enough voltage to turn the LED on, but it might not be very bright.

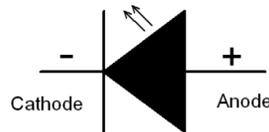


Figure A1

Unified Microsystems  
PO Box 133  
Slinger, WI 53086  
[www.unifiedmicro.com](http://www.unifiedmicro.com)