

## **TM1637 Based 4 Bits Red Digital Tube LED Display Module**



TM1637 is a chip for driving 7-segment displays. There are several modules using this chip to form a 4 digit numerical display module. TM1637 has also keyboard input capability, but is not used in this module.

### **Features of TM1637 based 4 Bits Red Digital Tube LED Display Module:**

- Ease to use.
- Ease of multiplexing.
- Can use as a 4 digit display unit.
- Can use as a clock display.

### **Applications of TM1637 based 4 Bits Red Digital Tube LED Display Module:**

- DIY clock project.
- 4 digit display unit.
- Electrical/Electronic projects.
- Counter project using 7 segment display.

### **Hardware Connection**

The display module has 4 pins:

- VCC & GND - Self explanatory
- CLK - Clock; connect to any digital pin on the Arduino
- DIO - Data I/O; connect to any digital pin on the Arduino

When a TM1637 Display object is created, the clock and data pin numbers are passed as arguments and get bound.

Positioning holes: 4 M2 screws positioning hole diameter is 2.2mm, the positioning of the module is easy to install , to achieve inter- module combination

## LED Drive Control Special Circuit TM1637

### Features description

TM1637 is a kind of LED (light-emitting diode display) drive control special circuit with keyboard scan interface and it's internally integrated with MCU digital interface, data latch, LED high pressure drive and keyboard scan. This product is in DIP20/SOP20 package type with excellent performance and high quality, which is mainly applicable to the display drive of induction cooker, micro-wave oven and small household electrical appliance.

### Function features →

- Applied power CMOS technique →
- The display mode (8 segments\*6 bit) supports output by common anode LED.
- Keyboard scan (8×2bit), with enhanced identification circuit with anti-interference keys
- Luminance adjustment circuit (adjustable 8 duty ratio)
- Two-wire serial interface (CLK, DIO)
- Oscillating type: Built-in RC oscillator
- Built-in power-on reset circuit
- Built-in automatic blanking circuit
- Package type: DIP20/SOP20

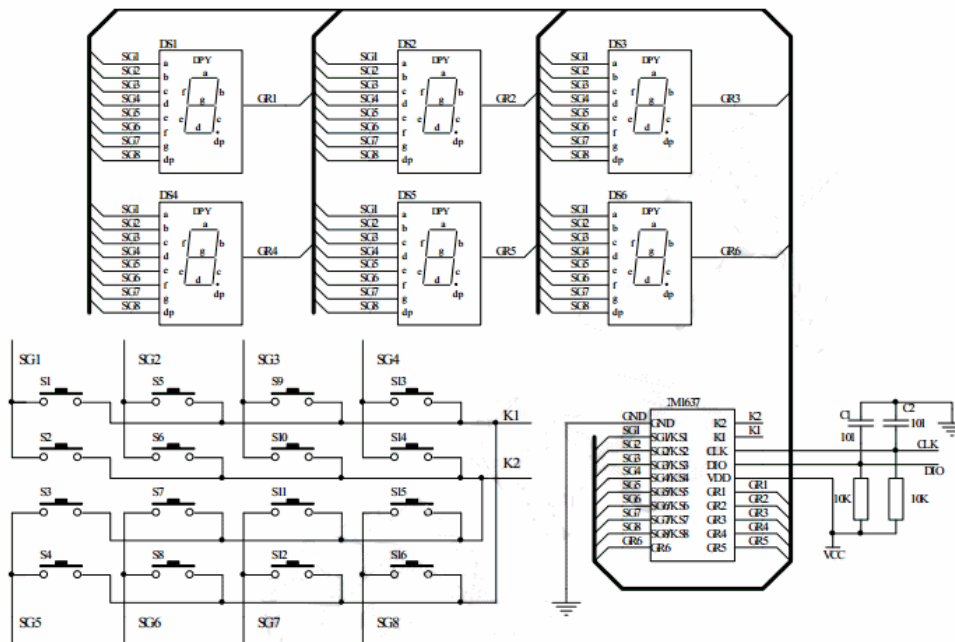
### Pin functions

|    |         |       |    |
|----|---------|-------|----|
| 1  | GND     | K2    | 20 |
| 2  | SG1/KS1 | K1    | 19 |
| 3  | SG1/KS2 | CLK   | 18 |
| 4  | SG1/KS3 | DIO   | 17 |
| 5  | SG1/KS4 | VDD   | 16 |
| 6  | SG1/KS5 | GRID1 | 15 |
| 7  | SG1/KS6 | GRID2 | 14 |
| 8  | SG1/KS7 | GRID3 | 13 |
| 9  | SG1/KS8 | GRID4 | 12 |
| 10 | GRID6   | GRID5 | 11 |

| Symbols | Pin name                    | Pin No. | Description   |
|---------|-----------------------------|---------|---|
| DIO     | Data input/output           | 17      | It is used for serial data input and output.<br>The input data has a low level fluctuation while high level transfer at SCLK. Once one bit is transferred, one ACK is generated at falling edge of the 8th clock inside the chip. |
| CLK     | Clock input                 | 18      | It is used for data input and output at rising Edge.  |
| K1~K2   | Data input by keyboard scan | 19-20   | Inputting the pin data here and it will be latched when the display cycle is over.  |

|             |                  |       |   |
|-------------|------------------|-------|---|
| SG1~SG8     | Output (segment) | 2-9   | Segment Output (also keyboard scan) and N-channel open drain output |
| GRID6~GRID1 | Output (bit)     | 10-15 | Bit output and P-channel open drain output                          |
| VDD         | Logic Supply     | 16    | Anode power connection  |
| GND         | logic ground     | 1     | Grounding connection  |

This LED driver is found in front panel controllers of consumer electronics such as DVD players. The added features such as the matrix keyboard scanning are useful in these applications. The typical application schematic is shown below.



The TM1637 has a single pin for Data input (commands, LED segments) and Data output (key status). This pin can be connected to mbed MOSI and MISO using a series/pull-up resistor. The device also needs an SCK pin. The protocol is "I2C-like", but not compatible to I2C (very strange, uses commands instead of address+RW bits, you could not have more than one device on the same bus since the I2C address is not used). The library currently implements a bit-banged serial protocol to control the TM1637 using three pins (MOSI, MISO, SCK). It should also be possible to modify the lib and use a single DigitalInOut pin instead of two separate pins for MOSI and MISO.

