

Summarize

TM1803 is a 3 bits LED (light-emitting diode display) drive control circuit, internal integrated with MCU digital interface, latch, LED high voltage driver and so on. Through the external MCU control, the chip can achieve separate luminance, And through cascade control can achieve outdoor large-screen color dot-matrix light-emitting control. TM1803 have excellent performance and high reliability.

Feature

- Use high-voltage power CMOS process
- Output voltage is up to 24V
- Brightness adjustment circuit(256)
- Serial-shift and cascade Interface
- Oscillation mode: Built-in RC oscillator, signal clock synchronization. While accepting the completed data of this module, data can be auto-shaped and transmitted to next chip via data output pin.
- Built-in power-on reset circuit
- PWM control side can achieve 256 adjustment, scan frequency not less than 400hz / s
- The completion of data reception and decoding by a signal line
- When the refresh rate of 30 frames/ s, the number of cascade is not less than 512 on low-speed mode. And it is not less than 1024 on high-speed mode.
- SOP8 package
- Data transmission speed can be 400Kbps and 800Kbps two modes

PIN Configuration (Top View)



PIN identifications:

| PIN NO. | PIN name | Description |
|---------|----------|--|
| 1 | OUTR | Red PWM Control Output |
| 2 | OUTG | Green PWM Control Output |
| 3 | OUTB | Blue PWM Control Output |
| 4 | VSS | Logical gnd ; system gnd |
| 5 | DOUT | Data Output |
| 6 | DIN | Data Input |
| 7 | SET | Mode setting 1)SET toVDD: Low-speed mode 2)SET floating: High-speed mode |
| 8 | VDD | Logic Power ,5V±10% |

Electrical parameters

Limit parameter (Ta = 25°C, Vss = 0 V)

| Parameter | Symbol | Range | Unit |
|---------------------------|--------|------------------|------|
| Logic Supply Voltage | VDD | -0.5 ~+7.0 | V |
| Output voltage | VOUT | 24 | V |
| Logic input voltage | VII | -0.5 ~ VDD + 0.5 | V |
| LED Driver Output Current | IO1 | 80 | mA |
| Power loss | PD | 400 | mW |
| Operating Temperature | Topt | -40 ~ +80 | °C |
| Storage Temperature | Tstg | -65 ~+150 | °C |

The normal scope of work (Ta = -20 ~ +70°C, Vss = 0 V)

| Parameter | Symbol | Min | Typical | Max | unit | Test Conditions |
|--------------------------|--------|---------|---------|---------|------|-----------------|
| Logic Supply Voltage | VDD | | 5 | | V | - |
| High-level input voltage | VIH | 0.7 VDD | - | VDD | V | - |
| Low-level input voltage | VIL | 0 | - | 0.3 VDD | V | - |

Electrical characteristics (Ta = -20 ~ +70°C, VDD = 4.5 ~ 5.5 V, Vss = 0 V)

| Parameter | Symbol | Min | Typical | Max | unit | Test Condition |
|-----------------------------|----------|---------|---------|---------|------|---------------------------|
| Low-level output current | IOL1 | 80 | 140 | - | mA | OUTR/OUTG/OUTB Vo=0.3V |
| Low-level output current | Idout | 10 | - | - | mA | VO = 0.4V, DOUT |
| Input Current | II | - | - | ±1 | μA | VI = VDD / VSS |
| High-level input voltage | VIH | 0.7 VDD | - | | V | DIN |
| Low-level input voltage | VIL | - | - | 0.3 VDD | V | DIN |
| Hysteresis voltage | VH | - | 0.35 | - | V | DIN |
| Dynamic current consumption | IDDdyn | - | - | 1 | mA | No load, display off |
| Power Dissipation | PD | | | 250 | mW | (Ta=25°C) |
| Thermal Resistance | Rth(j-a) | 79.2 | | 190 | °C/W | |

Switching characteristics (Ta = -20 ~ +70°C, VDD = 4.5 ~ 5.5 V)

| Parameter | Symbol | Min | Typical | Max | Unit | Test Conditions |
|------------------------|--------|-----|---------|-----|------|-------------------------------------|
| Oscillation frequency | fosc | - | 500 | - | KHz | / |
| Propagation delay time | tPLZ | - | - | 300 | ns | DIN → DOUT CL = 15pF, RL = 10K Ω |
| | tPZL | - | - | 100 | ns | |
| Fall Time | TTHZ | - | - | 120 | μs | CL = 300pF, OUTR/OUTG/OUTB |
| Data rate | Fmax | 400 | - | - | Kbps | 50% duty cycle |
| Input capacitance | CI | - | - | 15 | pF | - |

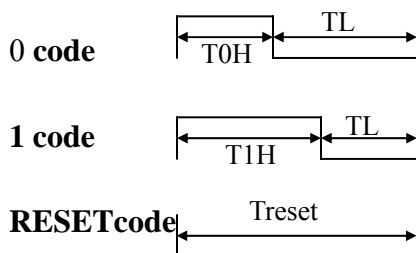
Function Description

TM1803 adopts single wire to communicate and RZ (return to zero code) method to sent signal. On power-on reset status, when chip receive complete 24bits data from DIN, it begin transmitting data to next chip via DO. Before transmission, DO will be keep low-level. OUTR, OUTG, OUTB these 3 PWM will output different duty signal according to different data per 24bits, the cycle of signal is 4ms. If input signal is RESET, the chip will be ready to receive new data after displaying all the received data. The same when receive new 24bit data completely, it will transmit them to next chip via DO.

TM1803 has the ability of auto-shape and signal transmission. The number of cascade is not limited by signal transmission, just limited by screen refresh speed. For example, we design 1024 cascade with TM1803, the refresh time can be calculated is $1024 * 0.4 * 2 = 0.8192\text{ms}$ (delay time is 0.4us), no any twinkle will be detected.

Timing Waveform

Input Pattern

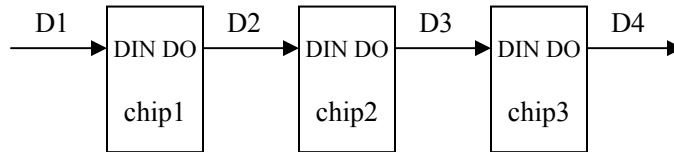


Low-speed mode time

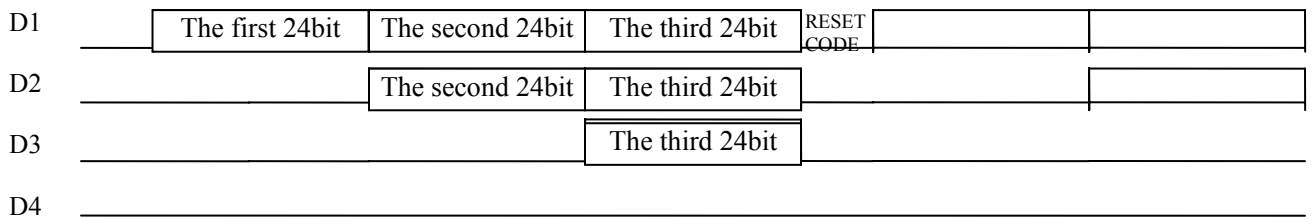
| Name | Description | TYP | Tolerance |
|--------|---------------------|--------|-----------|
| T0H | 0 code, high time | 0.68us | ±150ns |
| T1H | 1 code, high time | 1.36us | ±150ns |
| T0L | 0 code, low time | 1.36us | ±150ns |
| T1L | 1 code, low time | 0.68us | ±150ns |
| Treset | Resetcode, low time | 24us | - |

Note: When on high-speed mode, half the above time only.

Connection Method



Data Transfer Method



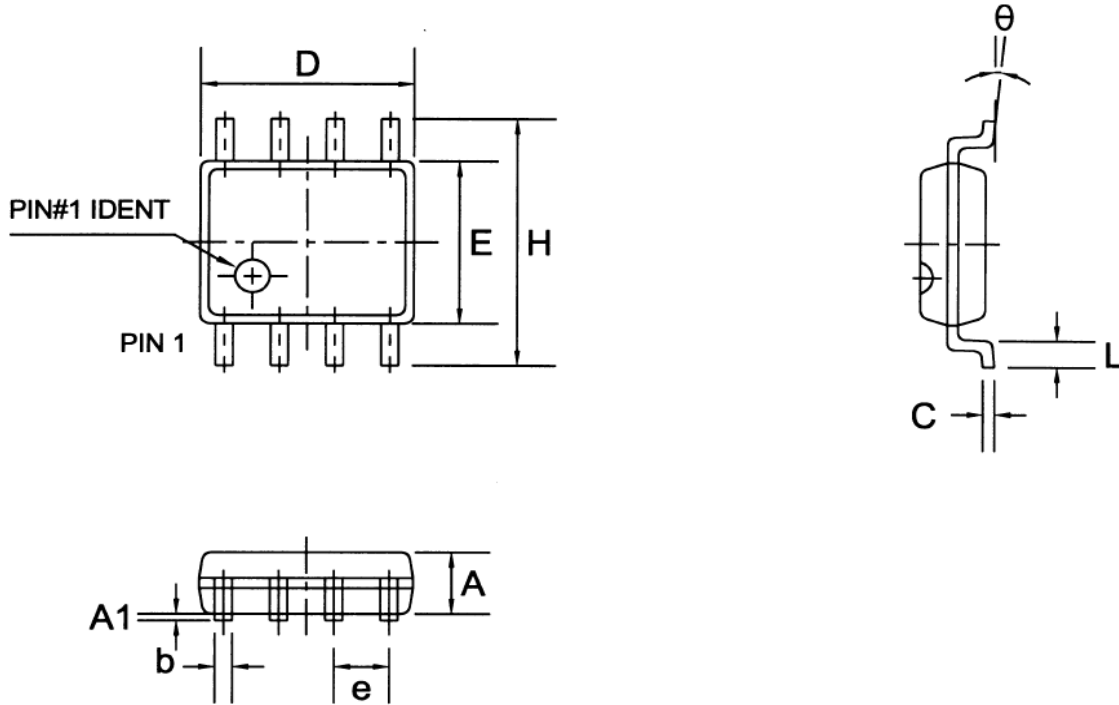
24bit data structure

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R | R | R | R | R | R | R | R | G | G | G | G | G | G | G | B | B | B | B | B | B | B | B | |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Upper bit first, sent data in accordance with R, G, B order.

IC Package diagram

Sop8



| Symbol | Dimensions In Millimeters | | | Dimensions In Inches | | |
|--------|---------------------------|------|------|----------------------|-------|-------|
| | Min | Nom | Max | Min | Nom | Max |
| A | 1.30 | 1.50 | 1.70 | 0.051 | 0.059 | 0.067 |
| A1 | 0.06 | 0.16 | 0.26 | 0.002 | 0.006 | 0.010 |
| b | 0.30 | 0.40 | 0.55 | 0.012 | 0.016 | 0.022 |
| C | 0.15 | 0.25 | 0.35 | 0.006 | 0.010 | 0.014 |
| D | 4.72 | 4.92 | 5.12 | 0.186 | 0.194 | 0.202 |
| E | 3.75 | 3.95 | 4.15 | 0.148 | 0.156 | 0.163 |
| e | — | 1.27 | — | — | 0.050 | — |
| H | 5.70 | 6.00 | 6.30 | 0.224 | 0.236 | 0.248 |
| L | 0.45 | 0.65 | 0.85 | 0.018 | 0.026 | 0.033 |
| θ | 0° | — | 8° | 0° | — | 8° |