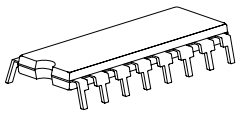
8-Bit Constant Current LED Driver with LED Error Detection and Run-Time Current Adjustment

Features

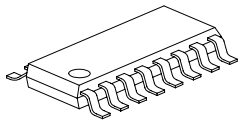
- Compatible with MBI5168 in electrical characteristics and package
- Exploiting **Share-I-O™** technique to provide two operation modes:
  - Normal Mode with the same functionality as MB5168
  - Special Mode to detect individual LED errors, like MBI5169 and program output current gain, like MBI5170
- 8 constant-current output channels
- Constant output current invariant to load voltage change
- Constant output current range: 5 -120 mA
- Excellent output current accuracy,
  between channels: < ±3% (max.), and
  between ICs: < ±6% (max.)
- Output current adjusted through an external resistor
- Fast response of output current,
  $\overline{OE}$ (min.): 200 ns @I_{out}< 60mA
  $\overline{OE}$ (min.): 400 ns @I_{out}= 60~100mA
- 25MHz clock frequency
- Schmitt trigger input
- 3.3~ 5V supply voltage
- 256-step run-time programmable output current gain suitable for white balance application
- Optional for “Pb-free & Green” Package

Dual In-Line Package



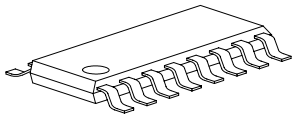
P-DIP16-300-2.54 Weight : 1.02g

Small Outline Package



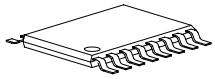
SOP16-150-1.27 Weight : 0.13g

Wide-body SOP



SOP16-300-1.27 Weight : 0.37g

Shrink SOP



Current Accuracy		Conditions
Between Channels	Between ICs	
< ±3%	< ±6%	I_{OUT} = 10 ~ 100 mA, V_{DS} = 0.8V, V_{DD}= 5.0V

©Macroblock, Inc. 2005
Floor 6-4, No.18, Pu-Ting Rd., Hsinchu, Taiwan 30077, ROC.
TEL: +886-3-579-0068, FAX: +886-3-579-7534, E-mail: info@mblock.com.tw

Product Description

MBI5171 succeeds MBI5168 and also exploits **PrecisionDrive™** technology to enhance its output characteristics. Furthermore, MBI5171 uses the idea of **Share-I-O™** technology to make MBI5171 backward compatible with MBI5168 in both package and electrical characteristics and extend its functionality for LED load Error Detection and run-time LED current gain control in LED display systems, especially LED traffic sign applications.
MBI5171 contains an 8-bit Shift Register and an 8-bit Output Latch, which convert serial input data into parallel output format. At MBI5171 output stages, eight regulated current ports are designed to provide uniform and constant current sinks with small skew between ports for driving LED's within a wide range of forward voltage (Vf) variations. Users may adjust the output current from 5 mA to 120 mA with an external resistor R_{ext}, which gives users flexibility in controlling the light intensity of LED's. MBI5171 guarantees to endure maximum 17V at the output ports. Besides, the high clock frequency up to 25 MHz also satisfies the system requirements of high volume data transmission.

MBI5171 extends its functionality to provide one Special Mode in which two functions are included, Error Detection and Current Gain Control, by means of the **Share-I-O™** technique on pins LE and $\overline{OE}$, without any extra pins. Thus, MBI5171 could be a drop-in replacement of MBI5168. The printed circuit board originally designed for MBI5168 may be also applied to MBI5171. In MBI5171 there are two operation modes and three phases: Normal Mode phase, Mode Switching transition phase, and Special Mode phase. The signal on the multiple function pin $\overline{OE}/SW/\overline{ED}$ would be monitored. Once an one-clock-wide short pulse appears on the pin $\overline{OE}/SW/\overline{ED}$, MBI5171 would enter the Mode Switching phase. At this moment, the voltage level on the pin LE/MOD/CA is used for determining the next mode to which MBI5171 is going to switch.

In the Normal Mode phase, MBI5171 has exactly the same functionality with MBI5168. The serial data could be transferred into MBI5171 via the pin SDI, shifted in the Shift Register, and go out via the pin SDO. The LE/MOD/CA can latch the serial data in the Shift Register to the Output Latch. $\overline{OE}/SW/\overline{ED}$ would enable the output drivers to sink current.

In the Special Mode phase, the low-voltage-level signal $\overline{OE}/SW/\overline{ED}$ can enable output channels and detect the status of the output current to tell if the driving current level is enough or not. The detected error status would be loaded into the 8-bit Shift Register and be shifted out via the pin SDO along with the signal CLK. Then system controller could read the error status and know whether the LED's are properly lit or not.

On the other hand, in the Special Mode phase MBI5171 also allows users to adjust the output current level by setting a run-time programmable Configuration Code. The code is sent into MBI5171 via the pin SDI. The positive pulse of LE/MOD/CA would latch the code in the Shift Register into a built-in 8-bit Configuration Latch, instead of the Output Latch. The code would affect the voltage at the terminal R-EXT and control the output current regulator. The output current could be adjusted finely by a gain ranging (1/12) to (127/128) in 256 steps. Hence, the current skew between IC's can be compensated within less than 1% and this feature is suitable for white balancing in LED color display panels.

Users can get detailed ideas about how MBI5171 works in the section **Operation Principle**.