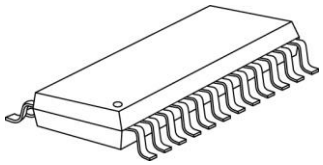
16-Channel Constant Current LED Sink Driver with Silent Error Detection and Current Gain

Features

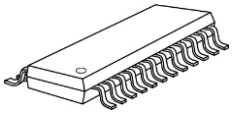
- 16 constant-current output channels
  Constant output current range: 3~90mA
  - 8-90mA @ 5V supply voltage
  - 3-70mA @ 3.3V supply voltage
- In-message error detection
  - Both open-circuit and short-circuit LEDs can be detected
  - On-the-fly error detection
  - Data-in, error-out; both errors are merged and coded with zeros
- Compulsory error detection
  - Full panel, data independent
  - Silent error detection with 0.25mA in 700ns
- Settable threshold voltage for LED short-circuit detection
- Thermal detection
  - Over-temperature report (e.g. temp.>150 °C)
- 64-step programmable current gain: from 12.5% to 200%
- Excellent output current accuracy,
  - Between channels: <±1.5% (typ.), and
  - Between ICs: <±3% (typ.)
- Fast response of output current
  - Min. output pulse width of $\overline{OE}$:
    35ns with good uniformity between output channels
- Staggered delay of output, preventing from current surge
- 30MHz clock frequency
- Schmitt trigger input

Small Outline Package



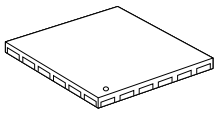
GF: SOP24L-300-1.00

Shrink SOP



GP: SSOP24L-150-0.64

Quad Flat No-Lead



GFN: QFN24L-4*4-0.5

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

MBI5039 is an enhanced 16-channel constant current LED sink driver with smart error detection and output current gain. MBI5039 succeeds MBI5026 and also exploits **PrecisionDrive™** technology to enhance the output characteristics. Furthermore, MBI5039 adopts **Share-I-O™** technology to be backward compatible with MBI5026, MBI5027 and MBI5029 in pin definition and to extend the functionality for LED's in-message error detection, compulsory error detection, and current gain control in LED display systems.

MBI5039 contains a 16-bit shift register and a 16-bit output latch, which convert serial input data into parallel output format. At MBI5039 output stages, sixteen regulated current ports are designed to provide uniform and constant current sinks with small skew between ports for driving LEDs within a wide range of forward voltage (V_F) variations. Users may adjust the output current from 5mA to 90mA with an external resistor R_{ext}, which provides users flexibility in controlling the light intensity of LEDs. MBI5039 guarantees to endure maximum 17V at the output ports. Besides, the high clock frequency, up to 30MHz, also satisfies the system requirements of high volume data transmission.

With in-message error detection, MBI5039 can detect individual LED for both open- and short-circuit errors on-the-fly without extra components. The serial data
could be transferred into MBI5039 via the pin SDI, shifted in the shift register, and the outputs perform open- and short-circuit detection simultaneously.

Besides the default in-message error detection, MBI5039 provides compulsory error detection. Once the dedicated command is issued, all of the output ports will be turned on about 700ns interval with current 0.25mA. Since the turn-on duration and current are so small, the image quality will not be impacted. All of the channels are detected no matter the input data is zero or one. The dedicated command is the communication of CLK and LE.

With the above two detections, the system can detect LED errors completely. Moreover, the threshold voltage for short-circuit detection is settable with the variation of different LED forward voltage, and the system controller can easily detect the short-circuit error. Therefore, the error detection is easy to use.

In addition, MBI5039 also allows users to adjust the output current level by setting a programmable configuration code. The code is sent into MBI5039 via the pin SDI. The falling edge of LE would latch the code in the shift register into a built-in 16-bit configuration register, instead of the output latch. The gain code would affect the voltage at the terminal R-EXT and control the output current regulator. The output current can be adjusted finely by a gain ranging from 12.5% to 200% in 64 steps.

The temperature of the chip itself is also monitored and the thermal warning flag can be read so that the system can adopt essential procedure to protect the system.

With the **Share-I-O™** technique, MBI5039 could be a drop-in replacement of predecessors. The printed circuit board originally designed for MBI5026/7/9 may be also applied to MBI5039 only that the controllers have to be upgraded and $\overline{OE}$ needs to be controllable.