LED Backlight Driver

Features

- 4 constant-current output channels
- High efficiency, up to 92%
- Adjustable output current :15-25 mA
- Very small size – neither an inductor, a capacitor nor Schottky diode is needed.
- Small 6-pin SOT26 package

Applications

- LED Backlight
- Cellular Phones
- PDAs
- Digital Cameras
- Portable MP3 Players
- Pagers

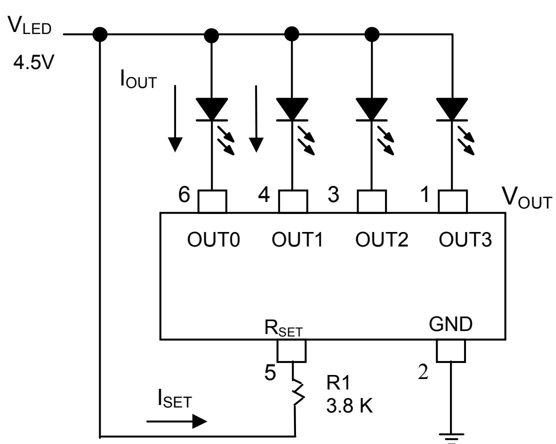
General Description

MBI1008 is a CMOS constant current driver that provides four regulated current sources. It is designed to drive LEDs with matched currents (within 5 %) to produce balanced light sources for backlights.

MBI1008 is simple and easy to use. It accepts an input voltage range from 2.7V to 8V and maintains a constant current determined by an external resistor, R1. Neither a capacitor, an inductor, nor Schottky diode is needed. MBI1008 delivers up to 25mA of load current. In addition, customers can get very high efficiency (up to 92%) by well matching V_{LED} input supply voltage and LED forward voltages, Vf.

MBI1008 features low cost, high efficiency, easy to use, and space-saving 6-pin SOT26 package for applications that need uniform LEDs illumination.

Typical Application Circuit



※Neither a capacitor, an inductor nor Schottky diode is needed.

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Absolute Maximum Ratings

V_{OUT} Voltage 8V

V_{RSET} Voltage 8V

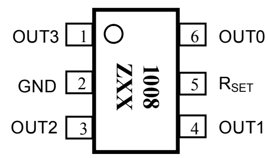
I_{LED} Current .... 60 mA

Junction Temperature .... 125°C

Operating Temperature Range ...... –20°C to 85°C

Storage Temperature Range .... –65°C to 150°C

Package/Order Information



ORDER PART NUMBER
MBI1008
PACKAGE
6-LEAD SOT26

Pin Description

OUT3 (Pin 1): Current output Pin. LED's cathode is connected to it.

GND (Pin 2): Ground Pin. Tie this pin directly to local ground plane.

OUT2 (Pin 3): Current output Pin. LED's cathode is connected to it.

OUT1 (Pin 4): Current output Pin. LED's cathode is connected to it.

R_{SET} (Pin 5): A resistor between this pin and V_{LED} regulates the LED current flowing into the LED pin. This pin is also used to provide LED dimming.

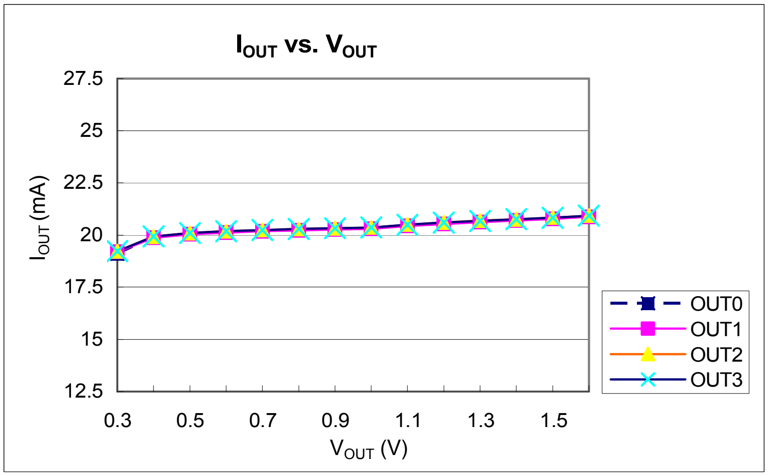
OUT0 (Pin 6): Current output Pin. LED's cathode is connected to it.

Electrical Characteristics

(Ta = 25°C, unless otherwise noted)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	Current matching between any two outputs less than 5 %	0.5	-	1.6	V
R_{SET} Pin Voltage	V_{RSET}	I_{OUT} = 15mA	-	1.11	-	V
		I_{OUT} = 20mA	-	1.17	-	
		I_{OUT} = 25mA	-	1.22	-	
Output Current	I_{OUT}	Input Voltage V_{LED} = 4.5V, R1= 3.8KΩ	19.5	20.0	20.5	mA
Efficiency	η	Input Voltage V_{LED} = 7.8V, V_{OUT} = 0.6V	-	92	-	%
Output Current vs.Temperature Variation		I_{OUT} = 20 mA		0.0625		mA/°C

Typical Operating Characteristics



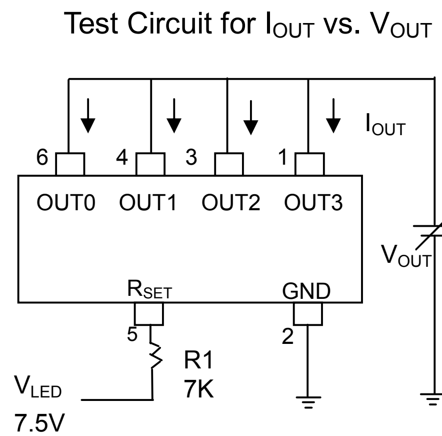
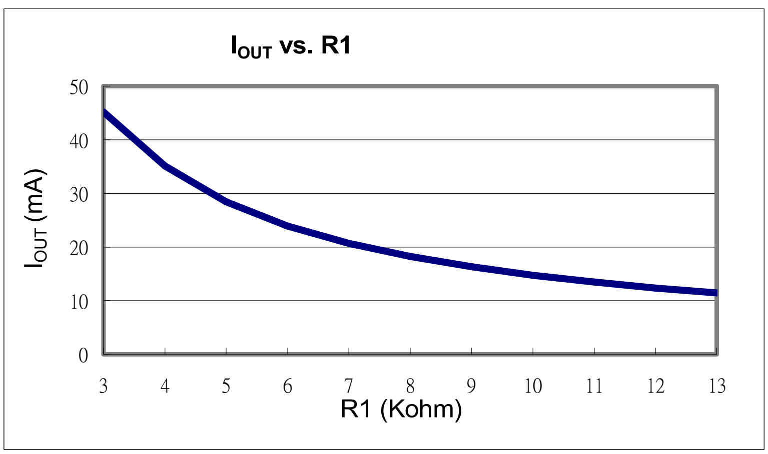


Fig. 1 (@ V_{LED} = 7.5V, Ta = 25°C)



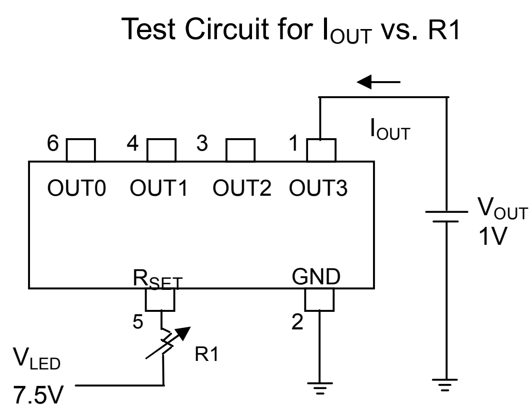


Fig. 2 (@ V_{LED} = 7.5V, Ta = 25°C)

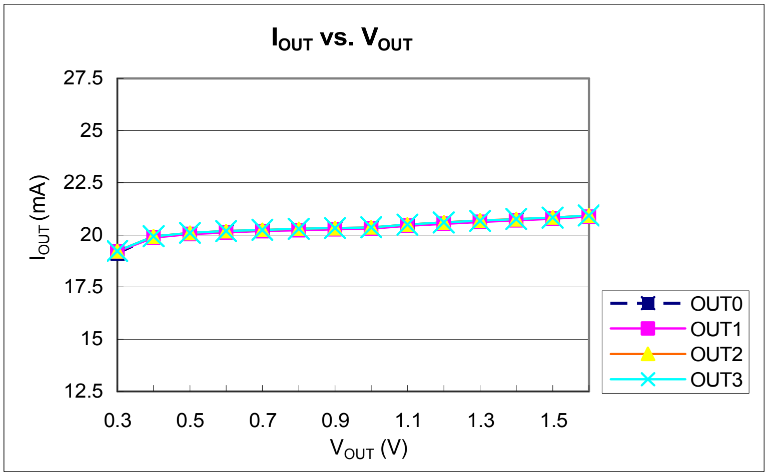
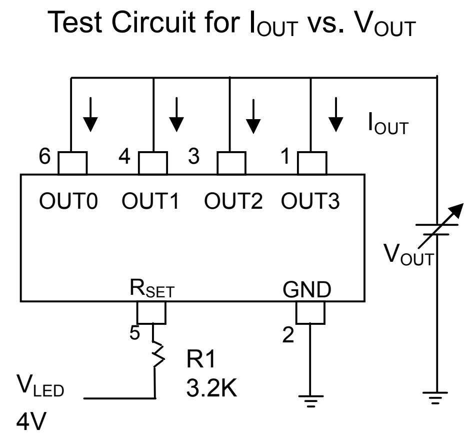


Fig. 3 (@ V_{LED} = 4V, Ta = 25°C)



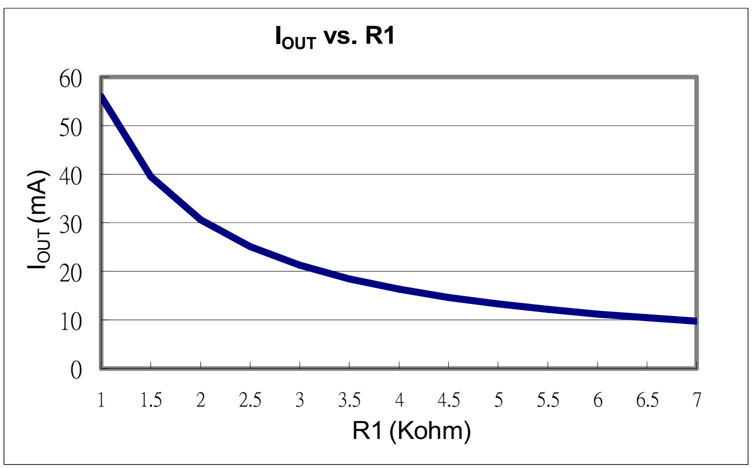
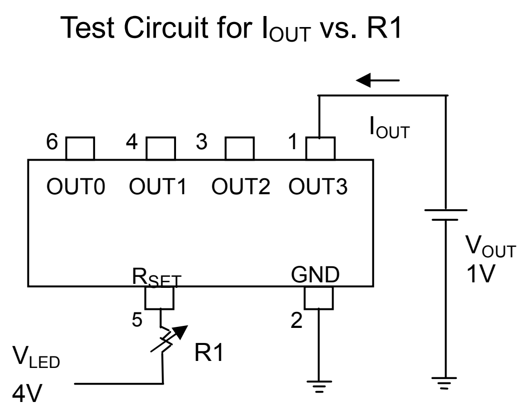


Fig. 4 (@ V_{LED} = 4V, Ta = 25°C)



Application Information

Resistor Selection

R1 is used to regulate the LED current. For the best accuracy, a resistor with ±1% precision should be used.

Regulating Output Current

LED current is regulated by a single resistor connected to the R_{SET} pin (see **Typical Application Circuits**). The voltage of R_{SET} pin, V_{RSET}, is internally regulated to around 1.17V, which sets the current, I_{SET}, flowing into this pin to equal to $(V_{LED} - V_{RSET}) / R1$. MBI1008 regulates the current into the LED pin, I_{OUT}, to 22.85 times the value of I_{SET}. A typical operating characteristic of I_{OUT} vs. R1 is shown (see Fig. 2). For other LED current values, use the following equation to choose R1.

$$I_{OUT} \approx 22.85 \times (V_{LED} - V_{RSET}) / R1$$

Efficiency Consideration

Except the output driver stage, the control parts of MBI1008 consume very little power (typical value ≤ 8 mW). According to Fig. 1 and Fig. 5 (I_{OUT} vs. V_{OUT}), when V_{OUT} is between 0.5V to 1.6V, the variations of I_{OUT} would be within 5% . Moreover, $V_{OUT} = V_{LED} - Vf$, and thus V_{LED} should be high enough to let V_{OUT} be between 0.5V to 1.6V. On the other hand, the power efficiency can be estimated as $(V_{LED} - V_{OUT}) / V_{LED}$; thus ensuring to get higher efficiency, V_{LED} should be as low as possible.

The following example shows how to achieve high power efficiency. (see Fig. 5).
For white LEDs, the forward voltage, Vf, ranges from 3.0V to 4.0V.

If $Vf1 + Vf2 = 7.2$ V

$V_{LED} = Vf1 + Vf2 + V_{OUT} = 7.8V$, (let $V_{OUT} = 0.6V$)

then Efficiency = $(V_{LED} - V_{OUT}) / V_{LED} = 7.2V / 7.8V = 92.3\%$

Therefore, a proper design of V_{LED} is strongly recommended in order to always let V_{OUT} be its minimum specification value, 0.6V, that is the key to get the high efficiency.

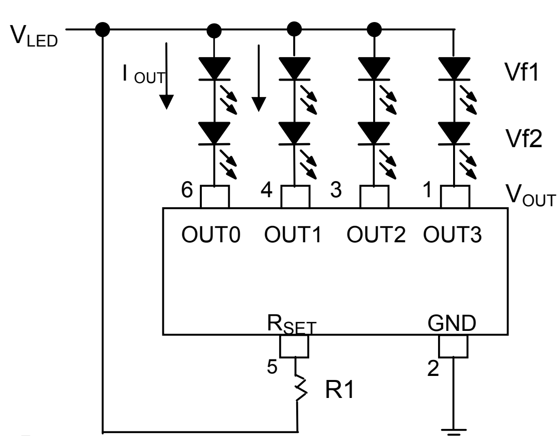
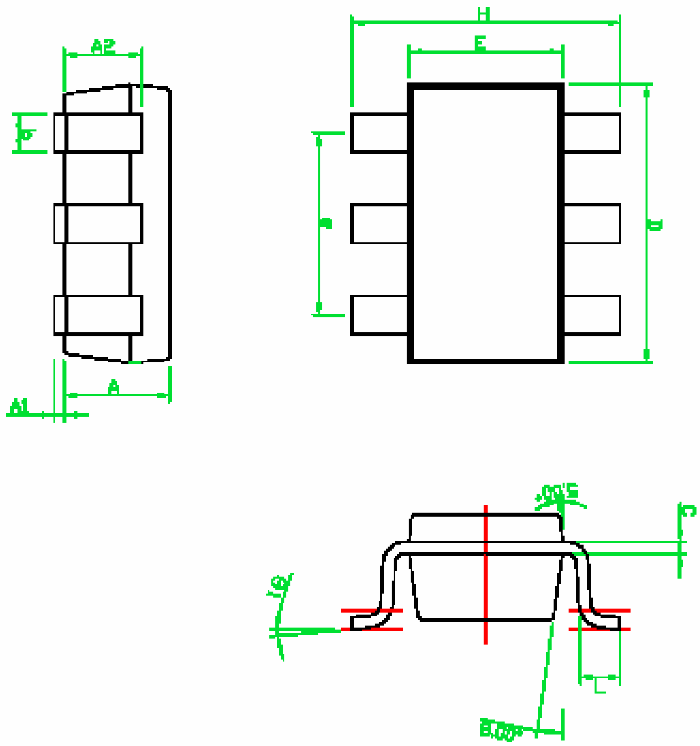


Fig. 5

Outline Drawings



Symbol	Dimension In Millimeters		
	Min.	**Nom.**	**Max.**
A	1.00	1.10	1.30
A1	0.00	---	0.10
A2	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.40	1.60	1.80
e	---	1.90 (typ.)	---
H	2.60	2.80	3.00
L	0.37	---	---
Θ1	1°	5°	9°

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS
2. TOLERANCE ± 0.1000 mm (4mil) UNLESS OTHERWISE SPECIFIED
3. COPLANARITY: 0.1000 mm
4. DIMENSION L IS MEASURED IN GAGE PLANE