



SP1820

Four Channels Constant Current LED Driver

DESCRIPTION

The SP1820 is a four channels constant current driver white LED. The device can drive up to 20mA load current per channel from single cell Lithium Ion battery. SP1820 can provide lowest cost LED driver for various applications. It does not require any external components. Internal thermal protection automatically adjusts LED current to prevent overheating.

The dimming control can be achieved by feeding a PWM or analog signal into the Iset pin. The device can be shut down by Enable low.

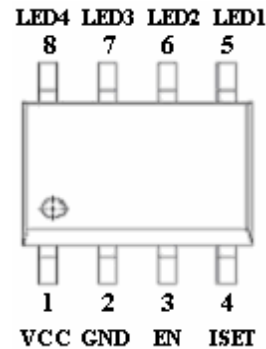
APPLICATIONS

- Battery Powered Devices
- Digital Camera
- PDA, MP3/4
- GPS
- Mobile Phone
- Keyboard/Display Backlight

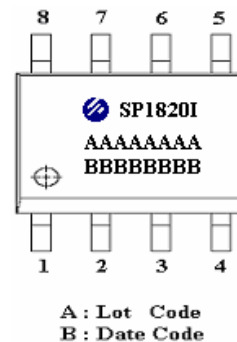
FEATURES

- Low Cost LED Driver
- Constant Current Output
- Four Channels LED Driver Provides Matching LED Current
- Low Quiescent Current
- Disconnects LEDs in Shutdown Mode
- Thermal Shut Down Protection
- Current Adjustable via external resistor
- Dimming Control thru either Enable or Iset

PIN CONFIGURATION(SOP – 8P)



PART MARKING

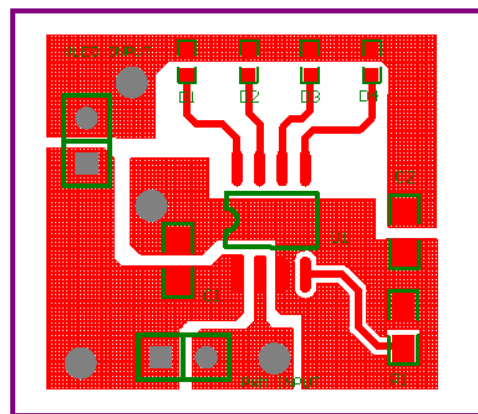
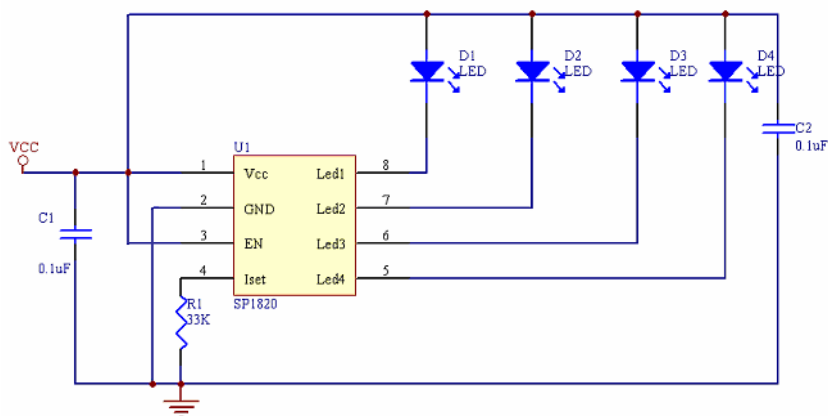




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TYPICAL APPLICATION CIRCUIT



PIN DESCRIPTION

| Pin | Symbol | Description |
|-----|--------|----------------------|
| 1 | VCC | Supply Voltage Input |
| 2 | GND | Ground |
| 3 | EN | High Enable Pin |
| 4 | ISET | Current Set Input |
| 5 | LED1 | LED 1 |
| 6 | LED2 | LED 2 |
| 7 | LED3 | LED 3 |
| 8 | LED4 | LED 4 |

ORDERING INFORMATION

| Part Number | Package | Part Marking |
|-------------|---------|--------------|
| SP1820S8RGB | SOP- 8P | SP1820 |

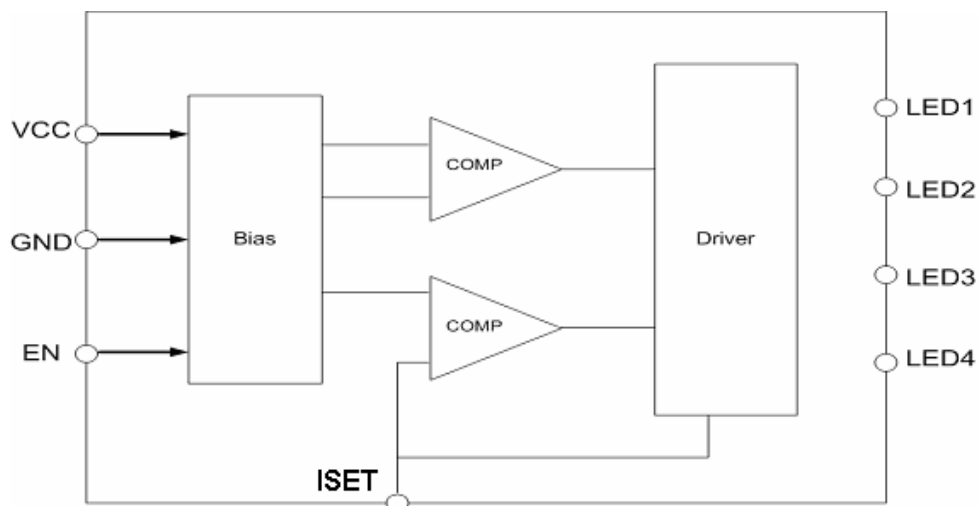
※ SP1820S8RGB : 13" Tape Reel ; Pb – Free ; Halogen – Free



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BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

($T_A=25^{\circ}\text{C}$ Unless otherwise specified)

| Parameter | Symbol | Value | Unit |
|------------------------------|---------------------|-----------|--------------------|
| DC Supply Voltage | V_{IN} | 5.5 | V |
| Output LED Current | I_{LED} | 20 | mA |
| Operating Temperature | T_{OPR} | -40 ~ 85 | $^{\circ}\text{C}$ |
| Maximum Junction Temperature | $T_{J(\text{Max})}$ | 125 | $^{\circ}\text{C}$ |
| Storage Temperature | T_S | -65 ~ 150 | $^{\circ}\text{C}$ |

The IC has a protection circuit against static electricity. Do not apply high static electricity or high voltage that exceeds the performance of the protection circuit to the IC.

ELECTRICAL CHARACTERISTICS

($T_A=25^{\circ}\text{C}$, $V_{IN}=3.6\text{V}$, $R_{SET}=7.5\text{K}\Omega$, $V_{LED}=0.5\text{V}$, Unless otherwise specified)

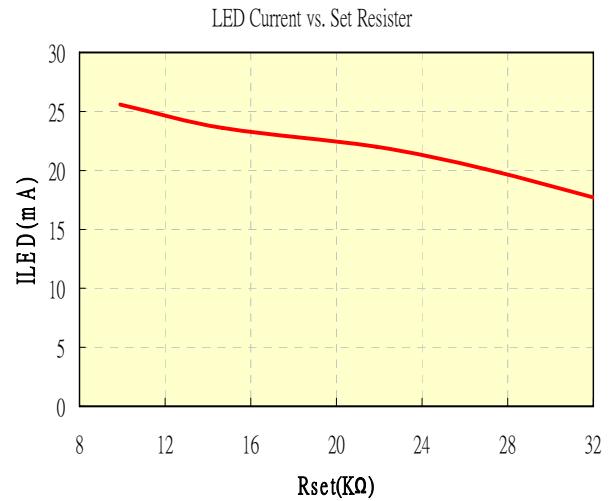
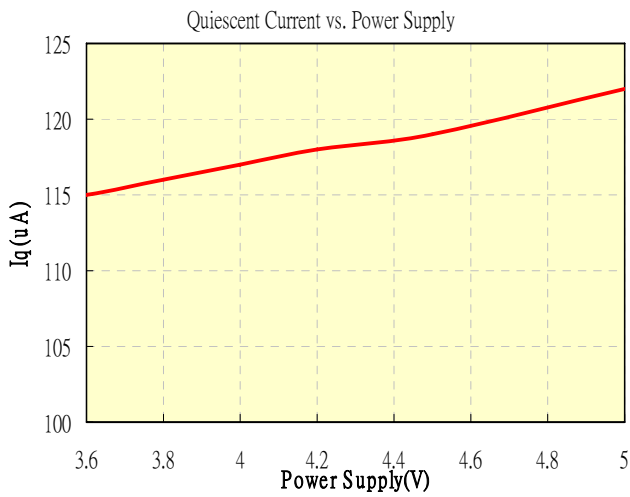
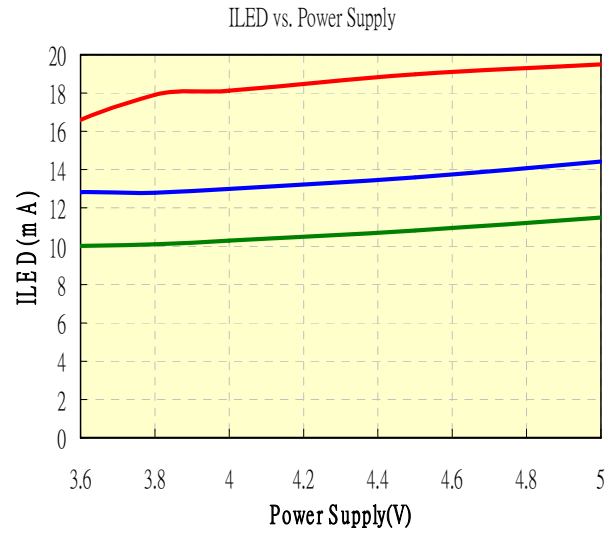
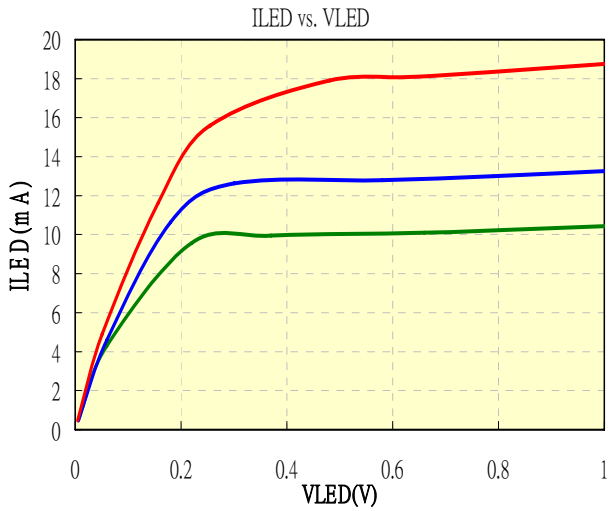
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------|---|------|--------|--------|--------------------|
| Operating Voltage | | 2.7 | | 5.5 | V |
| LED Current | | 18.5 | 20 | 21.5 | mA |
| Current Matching CH to CH | | | +/-1.5 | +/-3.5 | % |
| Quiescent Current | $I_{LED} = 0\text{A}$, $R_{set} = \text{Open}$ | | 250 | | μA |
| Line Regulation | I_{LED} Change Per Volt V_{cc} Change | | 0.15 | 0.6 | %/V |
| Load Regulation | $V_{LED} < 5\text{V}$, $I_{LED} = 20\text{mA}$ | | 3 | 6 | %/V |
| ISET Voltage | | | 1.5 | | V |
| Enable Voltage High | $3.6\text{V} \leq V_{in} \leq 4.2\text{V}$ | 3.6 | | | V |
| Enable Voltage Low | $3.6\text{V} \leq V_{in} \leq 4.2\text{V}$ | | | 0.4 | V |
| Thermal Shutdown Threshold | | | 130 | | $^{\circ}\text{C}$ |
| Thermal Shutdown Hysteresis | | | 20 | | $^{\circ}\text{C}$ |
| Current Off Mode | | | 0.2 | | μA |



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PERFORMANCE CHARACTERISTICS ($T_A=25^{\circ}\text{C}$, unless otherwise specified.)





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APPLICATION INFORMATION

CIRCUIT DESCRIPTION

SP1820 is a four channels white-LED driver with matching current output. The matching current regulator has a 460:1 ratio between ILED and ISET. SP1820 is capable to supply 25mA for each channel with proper selection of external resistor. The design has a band gap regulator, voltage to current converter and mirror drivers.

THERMAL PROTECTION

SP1820 has a thermal comparator to shut down the device when the internal temperature reaches 150°C. It will remain shut down until the temperature drops to 130°C.

ENABLE

SP1820 has an enable pin that is designed for TTL input. The device will be active at voltage high. This pin can also be used to control the brightness of LED with a PWM signal. The brightness is proportional to the duty cycle of the PWM signal. When duty cycle is zero, LEDs are turned off. For 50% duty cycle, it will result an average ILED to be half the programmed LED current which is set by RSET.

ISET

The ISET Pin is a voltage input to set the current of LED. An external resistor is used to set the output current, as approximated with the following equation:

$$RSET = 460 * (1.2V/ILED)$$

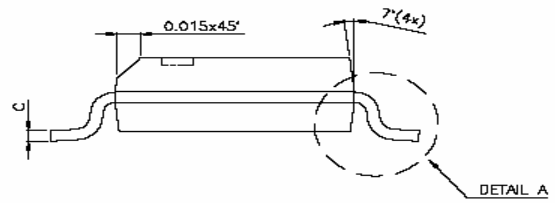
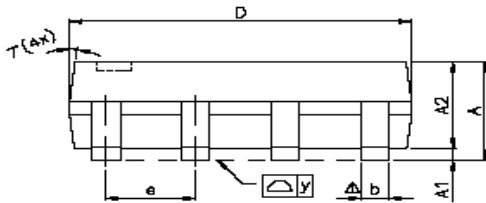
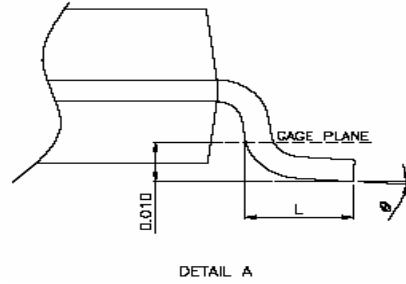
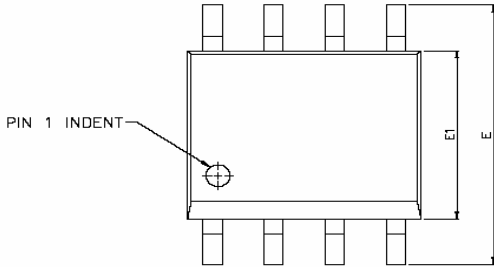
However, the RSET shall not be selected to exceed the maximum current delivery capability of the device, 25mA. A PWM signal or analog signal can also be applied at ISET pin to control the LED brightness.



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SOP- 8 PACKAGE OUTLINE



| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|------------|---------------------------|------|-------|----------------------|-------|--------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.47 | 1.60 | 1.73 | 0.058 | 0.063 | 0.068 |
| A1 | 0.10 | — | 0.25 | 0.004 | — | 0.010 |
| A2 | — | 1.45 | — | — | 0.057 | — |
| b | 0.33 | 0.41 | 0.51 | 0.013 | 0.016 | 0.020 |
| C | 0.19 | 0.20 | 0.25 | 0.0075 | 0.008 | 0.0098 |
| D | 4.80 | 4.85 | 4.95 | 0.189 | 0.191 | 0.195 |
| E | 5.80 | 6.00 | 6.20 | 0.228 | 0.236 | 0.244 |
| E1 | 3.80 | 3.90 | 4.00 | 0.150 | 0.154 | 0.157 |
| e | — | 1.27 | — | — | 0.050 | — |
| L | 0.38 | 0.71 | 1.27 | 0.015 | 0.028 | 0.050 |
| Δ y | — | — | 0.076 | — | — | 0.003 |
| θ | 0° | — | 8° | 0° | — | 8° |



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