DESCRIPTION

BRAVE Semiconductor's BSC71K8181 is a two channel linear current regulator optimized for automotive rear tail light applications such as RCL (Rear Combination Lamps) and CHMSL (Center High Mounted Stop Lamps). It is fully programmable with two LED brightness levels for the different intensity requirements of "stop" bright (DC mode) and "tail" dim (PWM mode). As illustrated by the Evaluation Board design, the high level of functional integration for the BSC71K8181 device allows for a single layer PCB routing for the complete LED Rear Brake Light solution.

A voltage level at the PWM pin is used to select between the tail and stop output conditions. The stop condition provides the highest intensity output, while the tail condition utilizes an internally generated PWM signal to reduce the intensity of the LEDs' light output.

The sink current designed to power the LED string at the OUTx pins is easily set with a single resistor at the STOP pin. A second resistor at the TAIL pin sets the duty cycle of the internal PWM oscillator for dimming (less bright) the LED output when operating in the tail condition.

Aside from the two LED operations setting resistors (R_{EXT} and R_{DC}) and few stabilizing resistors and capacitors, there are no other external components required for Brake Light circuit operation.

The BSC71K8181 is offered in a small footprint ESOP-8 package.

FEATURES

- Output current programmable from 10mA to 150mA
- Tail duty cycle programmable from 1% to 95%
  Linear voltage regulator to minimize power consumption in the device
- Low dropout voltage of 0.8V@35mA
  PWM logic level input selects between full brightness and PWM dimming levels
- FAULT condition reporting
  LED open/short circuit detection
  Input overvoltage protection
  STOP pin overcurrent protection
  Thermal rollback of output current
  Withstand 50V load dump

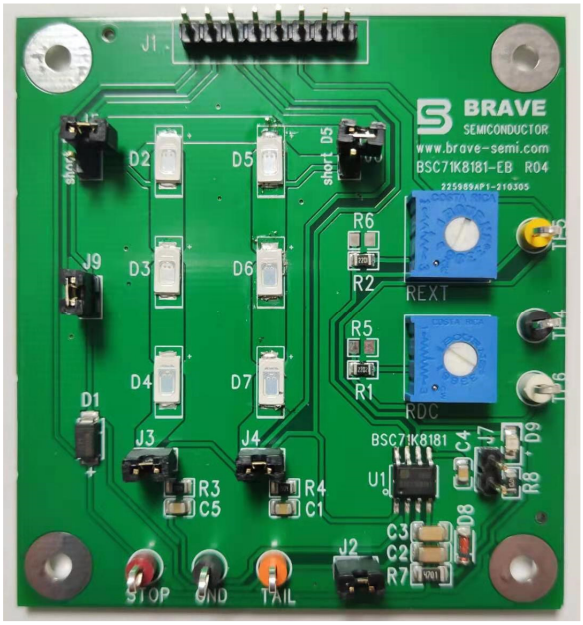


Figure 1: Photo of BSC71K8181 Evaluation Board

RECOMMENDED TEST EQUIPMENT

- 6V~42V, 1A DC power supply
- Multimeter

ABSOLUTE MAXIMUM RATINGS

≤ 50V power supply

Caution: Do not exceed the conditions listed above; otherwise the board will be damaged.

PROCEDURE

The BSC71K8181 demo board is fully assembled and tested. Follow the steps listed below to verify board operation.

Caution: Do not turn on the power supply until all connections are completed.

1) Connect the negative terminal of power supply to GND header.
2) Connect the positive terminal of power supply to connector TAIL header.
3) Close J2 to apply power to the BSC71K8181 device.
4) Select J4,J5,J6,J8 to configure output LED strings (refer to JUMPER/SWITCH SETTING TABLE).
5) Close J9 to use the onboard LEDs

   Note: Open J9 as well as J4 and J8 only if external LEDs are to be used. Connect Pin2 of J1 to each anode of the external LED strings. Connect Pin3~Pin4 to the corresponding cathode of the external LED strings.

6) The device FAULT flag can be monitored by an D9 Red LED light as well as by measuring Voltage on Pin9 of J1.
7) The output current of all channels in "STOP" mode can be adjusted by the potentiometer resistor R_{EXT}. Turn R_{EXT} counter clockwise to increase and clockwise to decrease the output current of all channels. The final resistance of the R_{EXT} resistance is can be measured with an ohm meter across test point TP5 and GND point.
8) The PWM duty cycle of "TAIL" mode can be adjusted by the potentiometer resistor R_{DC}. Turn R_{DC} counter clockwise to decrease and clockwise to increase the duty cycle. The final resistance can be measured with an ohm meter across test point TP6 and GND point.
9) Connect the Power Supply connections to "STOP" and/or "TAIL" and GND contacts to observe STOP or TAIL modes.
10) Turn on the Power Supply.
11) To observe FAULT condition response short one of the LEDs by shorting J5 or J6 jumpers.

ORDERING INFORMATION

Part No.	Temperature Range	Package
BSC71K8181-EB	-40°C to +125°C (Automotive)	ESOP-8, Lead-free

Table 1: Ordering Information

For pricing, delivery, and ordering information, please contacs BRAVE Semiconductor sales team at sales@brave-semi.com or 866-461-4966

JUMPER SETTING TABLE

Jumper	Options	Setting
J1	External LED string connector, Pin1 connects to the STOP signal; Pin1 connects to the TAIL/VCC signal; common anode of the external LED strings, Pin3-Pin4 correspond to OUT1-OUT2 connect to the 1~2 cathode of the external LED strings; Pin5 is the GND and Pin6 is the FAULT signal.	J9 must be Open
J2	Connects BSC71K8181 to the Power Source	
J9	Onboard power to the LED strings (D2 ~ D5)	Close: Power ON Open: Power OFF
J4-J8	Correspond to OUT1-OUT2. Enable/disable the corresponding LED strings.	H: Enable L: Disable

PROGRAMMING THE OUTPUT CURRENT

A single programming resistor (R_{EXT}) controls the maximum sink current for each LED channel. The programming resistor value may be approximately calculated using the following Equation below:

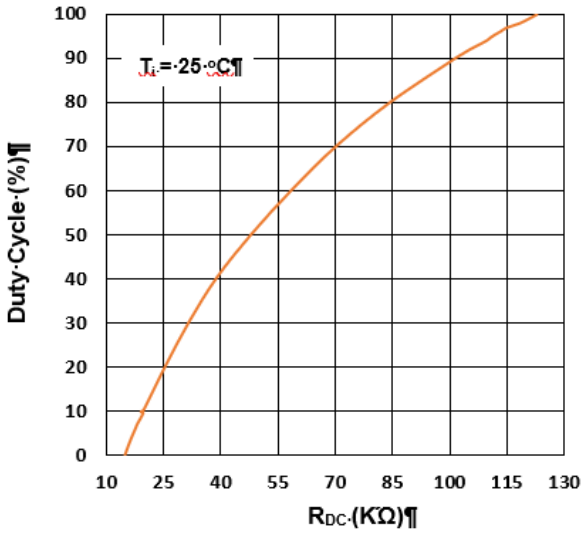
$$Iout = \frac{250}{Rext}$$

Where I_{OUT} is in mA, and R_{EXT} is in kΩ.

Thus, a desired output current of 50mA would require a corresponding external programming resistance of 5kΩ.

PROGRAMMING THE PWM DUTY CYCLE

An external resistor on the STOP pin sets the duty cycle for the PWM circuitry, which, in turn, determines the lower intensity TAIL condition. Resistor value for the Duty Cycle selection can be determined from the graph below.



Thus, as an example, a 50% duty cycle would require the R_{DC}=50kΩ. Internally, PWM circuitry generates a saw-tooth waveform of ~5KHz frequency. The R_{DC} selection will setup a chosen duty cycle at the 5KHz frequency oscillation.

When the STOP signal is asserted, the high voltage level on the STOP pin forces the Duty Cycle to 100% for the BRIGHT (high intensity) operation.

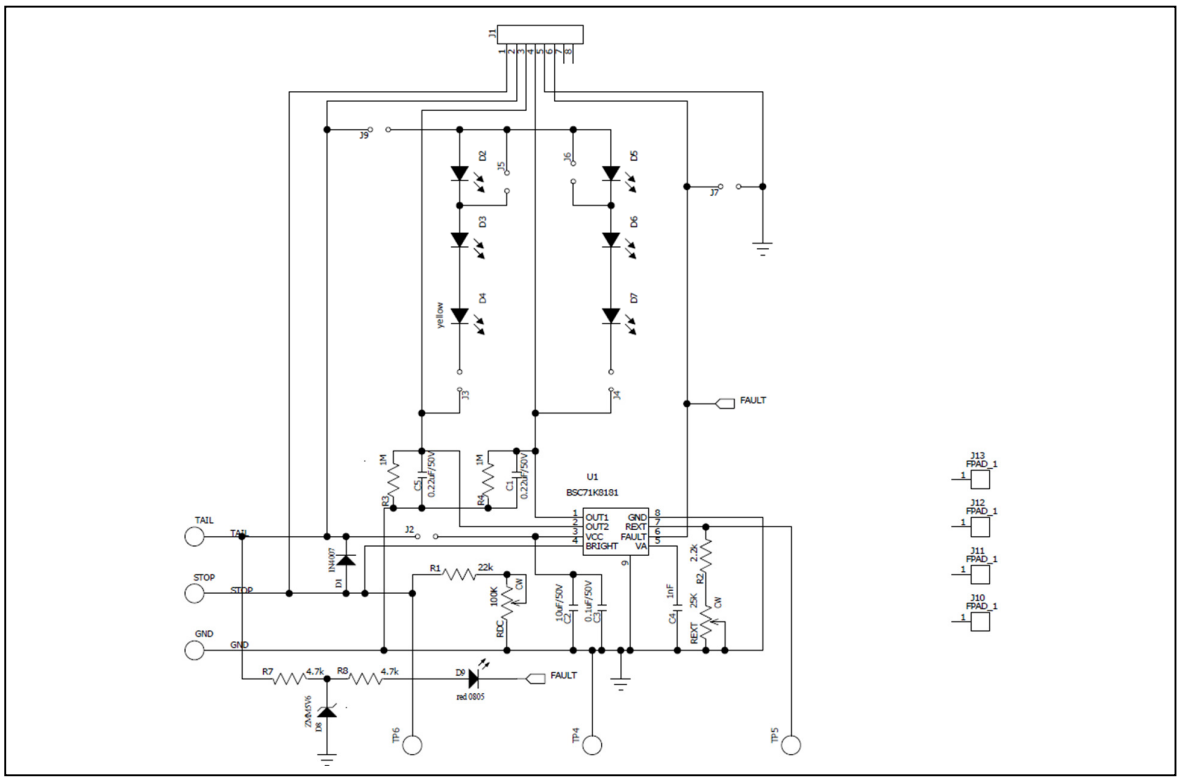


Figure 2: BSC71K8181 Evaluation Board Schematic

BILL OF MATERIALS

Name	Supplier	Part No	Description	Package	QTY	Reference No
Capacitor	YAGEO	CC1206KKX7R9BB224	0.22uF/50V +-10%	C0805	2	C1,C5
Capacitor	YAGEO	CC1206KKX5R9BB106	10uF/50V +-10%	C1206	1	C2
Capacitor	YAGEO	CC1206KKX7R9BB474	0.47uF/50V +-10%	C1206	1	C3
Capacitor	SAMSUNG	CL21B102KBANNNC	1nF/50V +-10%	C0805	1	C4
Resistor	UNI-ROYAL	0805W8F2202T5E	22k +-1%	C0805	1	R1
Resistor	UNI-ROYAL	0805W8F2201T5E	2.2k +-1%	C0805	1	R2
Resistor	UNI-ROYAL	0805W8F1504T5E	1.5M +-1%	C0805	2	R3,R4
Resistor	UNI-ROYAL	1206W4F4701T5E	4.7K +-1%	C1206	1	R7
Resistor	UNI-ROYAL	0805W8F4701T5E	4.7K +-1%	C0805	1	R8
Resistor	BOURNS	3386P-1-104LF	100K	3386	1	RDC
Resistor	BOURNS	3386P-1-253LF	25K	3386	1	REXT
Diode	MDD	M7	1A 1000V	SMA	1	D1
Zener Diode	GOOD-ARK	BZV55C5V6	5.6V zener	LL-34	1	D8
Red LED	EVERLIGHT	17-21SURC/S530-A3/TR8	Red LED	C0805	1	D9
Yellow LED			yellow LED 0.5W 2.0~2.2V	LED_5730	6	D2,D3,D4,D5,D6,D7
LED Driver IC	BRAVE Semiconductor	BSC71K8181	LED driver	SO8	1	U1

Bill of Materials refers to Figure 2 above.

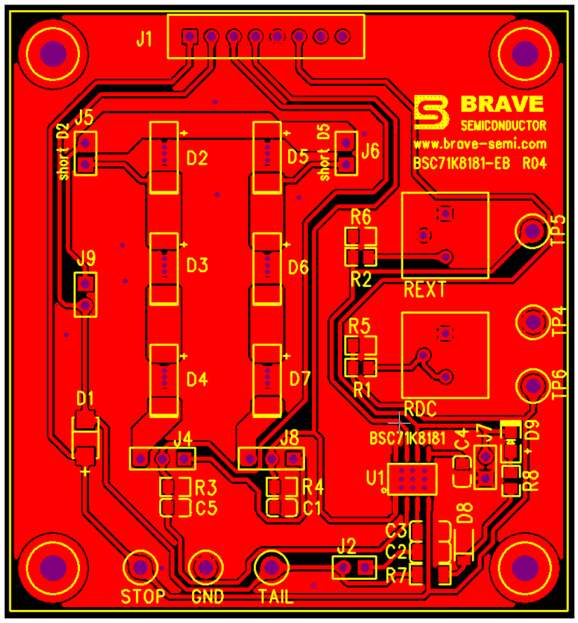


Figure 3: Board PCB Layout - Top Layer

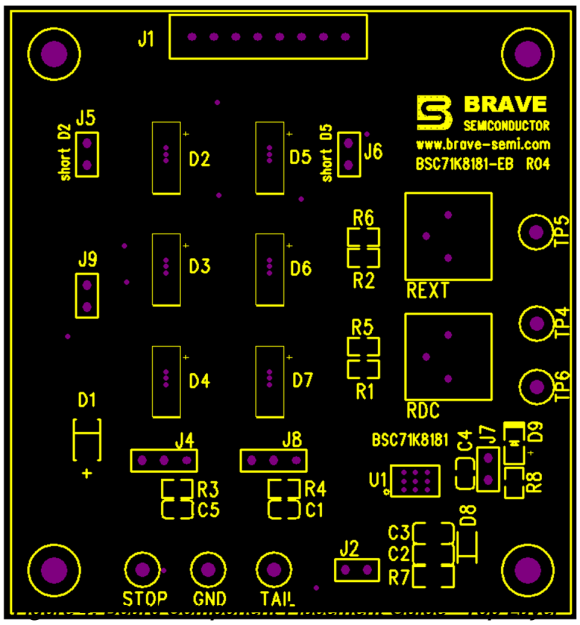


Figure 4: Board PCB Layout - Bottom Layer