❖ General Description

The LA8303 is a voltage mode, step-down LED driver that is designed to meet maximum 2A constant current for high power LED application, and utilizes PWM control scheme that switches with 300KHz fixed frequency. This device includes an error amplifier, oscillation circuit, P-channel power MOSFET, and etc. The internal reference voltage source provides a 0.21V low feedback voltage that can reduce the power dissipation of the current setting resistor and improve conversion efficiency.

The input voltage range of LA8303 is from 3.6V to 23V. It is suitable for series-parallel 1W, 3W, or 5W high power LED application due to the high operation voltage and output capability. At 12V input voltage, this device can drive up to 15pcs 1W LED (3S-5P) with constant 350mA LED current.

The LA8303 provides an enable function that can be controlled by external logic signal. It also provides excellent regulation during line or load transient due to the internal compensation. Other features of thermal protection, current limit, short circuit protection, and dimming control are also included. Due to the low $R_{DS(ON)}$ of the power MOSFET, the LA8303 provides a high efficiency step-down application. It can also operate with a maximum duty cycle of 100% for use in low drop-out conditions.

The package is available in a standard SOP-8L.

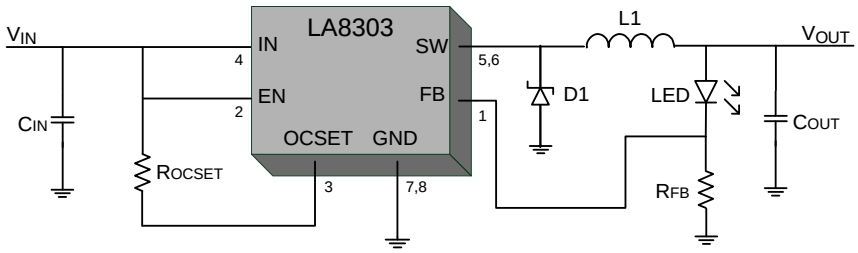
❖ Features

- Low Feedback Voltage 0.21V
- Up to 96% Efficiency
- Wide Operation Voltage from 3.6V to 23V
- Driving up to 15 LEDs (1W 3S-6P) at $12V_{IN}$
- No External Compensation Required
- Great Output Capability: 2A
- Oscillation Frequency: 300KHz
- PWM or Analog Dimming Control
- Built-in P-channel MOSFET
- External ON/OFF Control Function
- Low Shutdown Current: 1uA
- Current Limit and Thermal Protection
- Short Circuit Protection
- SOP-8L Package
- All Products meet Rohs Standard

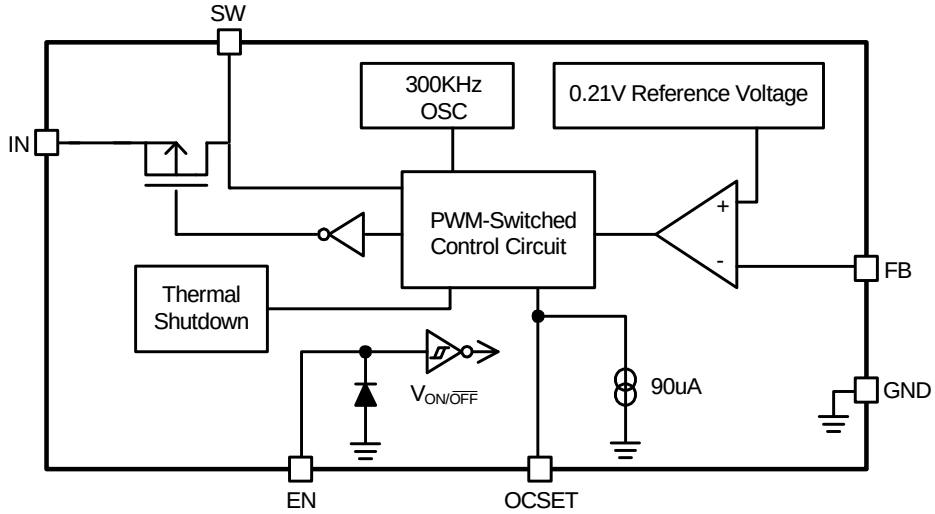
❖ Applications

- High Power LED Driver
- Backlight Applications
- General Lighting Solutions
- Constant Current Source

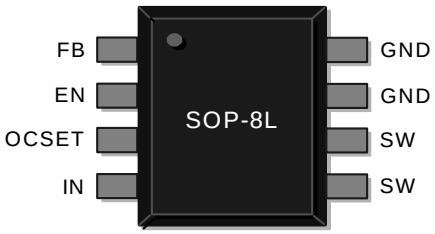
❖ Typical Application



❖ Functional Block Diagram

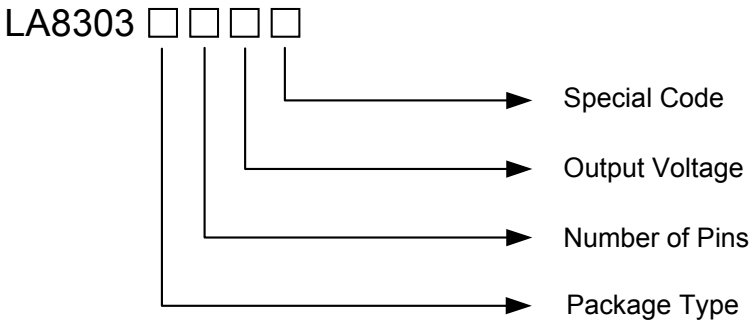


❖ Pin Configurations



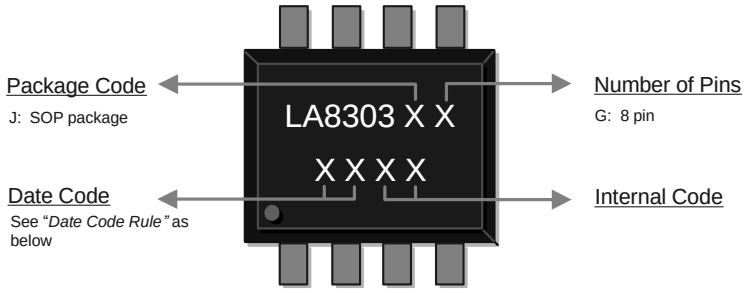
Pin No.	Name	Description
1	FB	This pin senses the feedback voltage to set the LED current. Connect a resistor (R_{FB}) to set LED current by the following formula: I_{LED} = 0.21V / R_{FB}
2	EN	This pin allows an external logic control signal to turn-on/off this device. Float this pin or drive it to low level turns this device off, drive it to high level turns this device on. If this feature is not needed, connect this pin to IN directly.
3	OCSET	Add an external resistor from this pin to IN pin to set peak current.
4	IN	The input pin of the step-down converter. A suitably large capacitor must be connected from this pin to ground to bypass noise on the input of the IC.
5,6	SW	The output pin of the step-down converter. This pin is the switching node that supplies power to the output. Connect a LC filter from this pin to the output load and a rectifier diode to the ground.
7,8	GND	The ground pin of the step-down converter. Connect this pin to the circuit ground.

❖ Ordering Information



Package Type	Number of Pins	Output Voltage	Special Code
J: SOP	G: 8 pin	Blank: Adjustable	Blank: Original

❖ Marking Information



Data Code Rule

Year / Week	xxx0	xxx1	xxx2	xxx3	xxx4	xxx5	xxx6	xxx7	xxx8	xxx9
01	AA	CA	EA	GA	IA	KA	MA	OA	RA	TA
02	AB	CB	EB	GB	IB	KB	MB	OB	RB	TB
03	AC	CC	EC	GC	IC	KC	MC	OC	RC	TC
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
25	AY	CY	EY	GY	IY	KY	MY	OY	RY	TY
26	AZ	CZ	EZ	GZ	IZ	KZ	MZ	OZ	RZ	TZ
27	BA	DA	FA	HA	JA	LA	NA	PA	SA	UA
28	BB	DB	FB	HB	JB	LB	NB	PB	SB	UB
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
50	BX	DX	FX	HX	JX	LX	NX	PX	SX	UX
51	BY	DY	FY	HY	JY	LY	NY	PY	SY	UY
52	BZ	DZ	FZ	HZ	JZ	LZ	NZ	PZ	SZ	UZ

❖ Absolute Maximum Ratings

Parameter	Rating
Input Voltage	25V
SW Pin Voltage Range	-0.5V ~ V_{IN}+0.5V
FB Pin Voltage Range	-0.3V ~ V_{IN}
EN Pin Voltage Range	-0.3V ~ V_{IN}+0.3V
Storage Temperature Range	-65°C ~ 150°C
Junction Temperature	150°C
Lead Soldering Temperature (10 sec)	300°C

These are stress ratings only and functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability. All voltages are with respect to ground.

❖ Recommended Operating Conditions

Parameter	Rating
Input Voltage Range	3.6V ~ 23V
Junction Temperature Range	-40°C ~ 125°C

These are conditions under which the device functions but the specifications might not be guaranteed. For guaranteed specifications and test conditions, please see the *Electrical Specifications*.

❖ Package Information

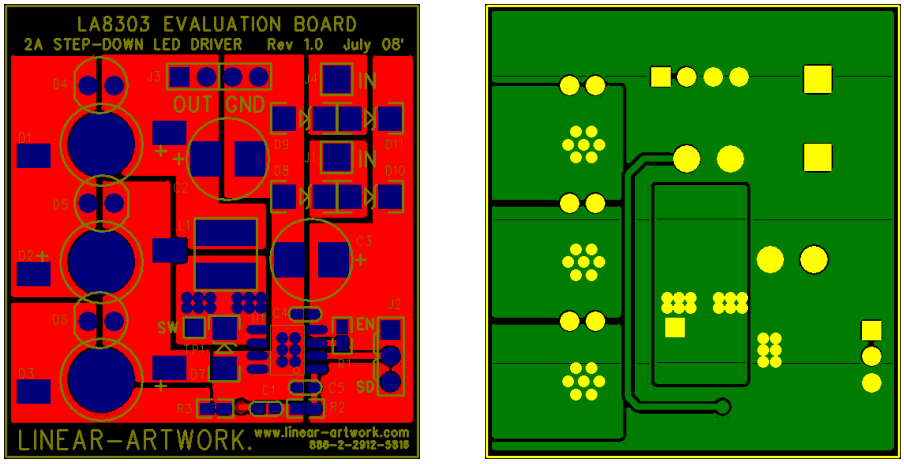
Parameter	Package	Symbol	Maximum	Unit
Thermal Resistance (Junction to Case)	SOP-8L	θ_{JC}	20	°C / W
Thermal Resistance (Junction to Ambient)		θ_{JA}	60	°C / W

❖ Electrical Specifications

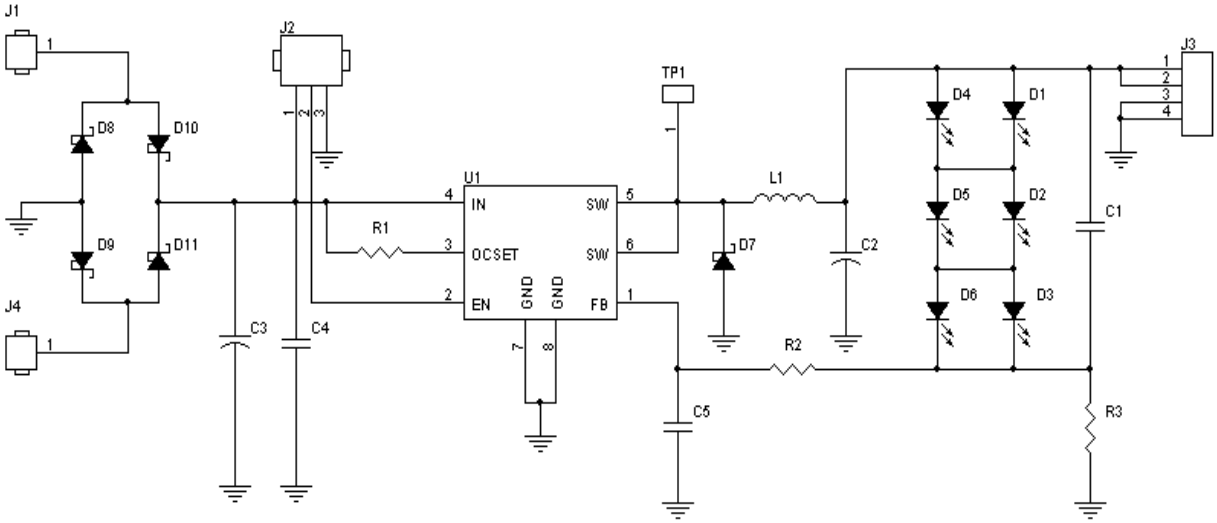
V_{IN}=12V, T_A=25°C, unless otherwise noted.

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Feedback Voltage	V_{FB}	I_{LOAD}=0.2A	0.1995	0.21	0.2205	V
Efficiency	η	3 Series 1W LEDs, I_{LED}=350mA		96		%
Oscillation Frequency	F_{OSC}	V_{IN}=3.6~23V, I_{LOAD}=0.2~2A	240	300	360	KHz
Frequency of Short Circuit Protection	F_{SCP}	V_{IN}=3.6~23V	30	50	70	KHz
Duty Cycle	DC	V_{FB}=0V force driver on		100		%
		V_{FB}=0.5V force driver off		0		
Internal MOSFET On Resistance	$R_{DS(ON)}$	V_{IN}=5V, V_{FB}=0V		160	180	mΩ
		V_{IN}=12V, V_{FB}=0V		100	120	
Quiescent Current	I_Q	V_{IN}=3.6V~23V V_{FB}=0.5V force drive off		3	10	mA
Shutdown Current	I_S	EN pin = GND		1	10	uA
EN Pin Input Threshold Voltage	V_{EN}	Regulator OFF		1.3	0.8	V
		Regulator ON	2.0			
EN Pin Bias Current	I_{EN}	Regulator OFF		1		uA
		Regulator ON		20		
FB Pin Bias Current	I_{FB}			0.1	0.5	uA
OCSET Pin Bias Current	I_{OCSET}		75	90	105	uA
Line Regulation	$\triangle V_{LINE}$	V_{IN}=3.6V~23V, I_{LOAD} =0.2A		2		%
Load Regulation	$\triangle V_{LOAD}$	I_{LOAD}=0.2A~2A		0.1		%
Over Temperature Shutdown	T_{SD}			160		°C
Over Temperature Shutdown Hysteresis	T_{HYS}			40		°C

❖ Evaluation Board Layout



❖ Evaluation Board Schematic

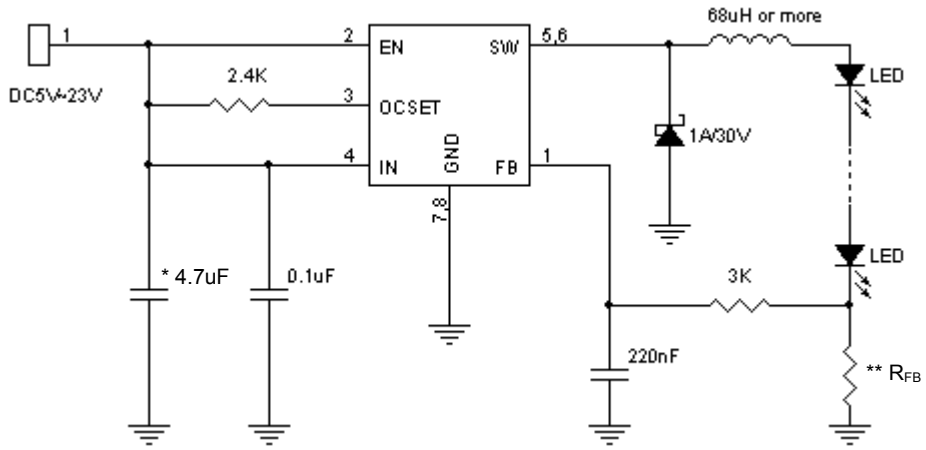


❖ Key Component Supplier

Item	Manufacturer	Website	Manufacturer	Website
Inductor	Chilisin	www.chilisin.com.tw	WE	www.we-online.com
Schottky Diode	Shindengen	www.shindengen.com		
Tantalum Capacitor	Kemet	www.kemet.com		
Electrolytic Capacitor	NCC	www.chemi-con.co.jp		
SMD Capacitor	Yageo	www.yageo.com	Taiyo Yuden	www.yuden.co.jp
SMD Resistor	Yageo	www.yageo.com		

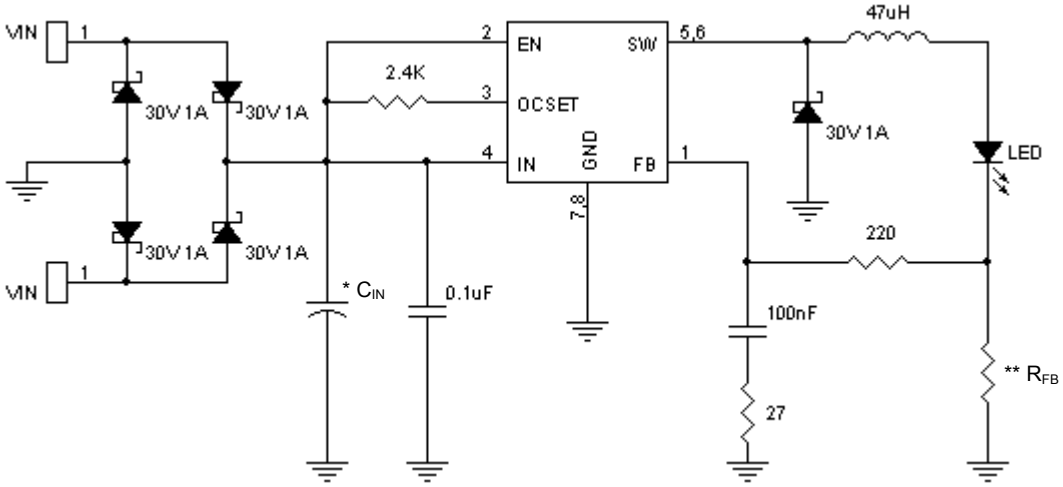
❖ Typical Application Circuits

♦ 1W ~ 5W High Brightness LED Application



* Up to 10uF or more for Hot-Plugging Application
** For 1W LED: R_{FB} = 0.6Ohm 0805, I_{LED}=350mA
For 3W LED: R_{FB} = 0.3Ohm 1206, I_{LED}=700mA
For 5W LED: R_{FB} = 0.2Ohm 1206, I_{LED}=1050mA

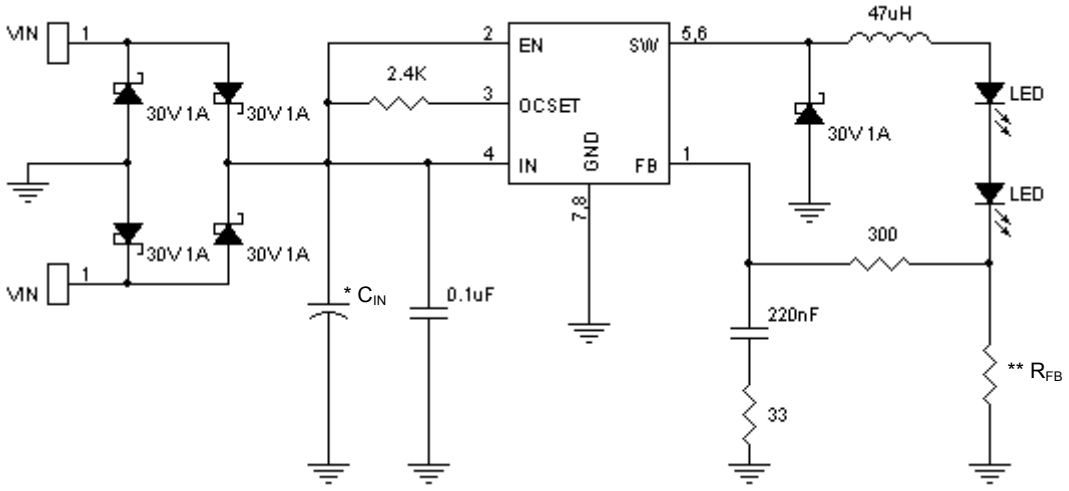
♦ MR-16 Application: DC12V_{IN} or AC12V_{IN} for single LED



For 1W LED: * C_{IN}=100uF x 1 ** R_{FB} = 0.6Ohm 0805, I_{LED}=350mA
For 3W LED: * C_{IN}=100uF x 2 ** R_{FB} = 0.3Ohm 1206, I_{LED}=700mA
For 5W LED: * C_{IN}=150uF x 2 ** R_{FB} = 0.2Ohm 1206, I_{LED}=1050mA
(Use 20V Tantalum-Cap or 25V Electrolytic-Cap.)

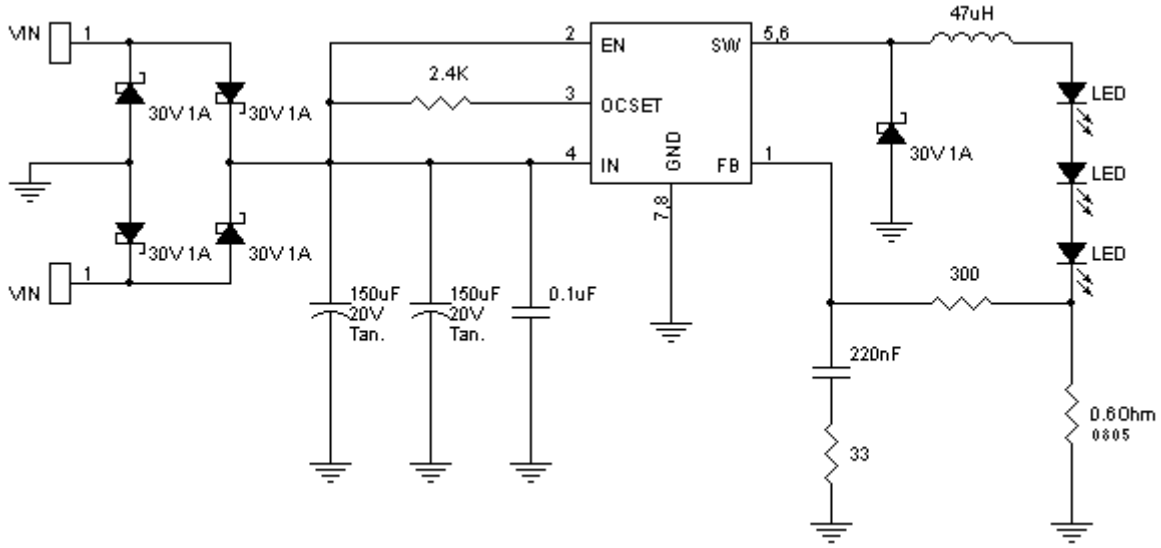
❖ Typical Application Circuits (Contd.)

♦ **MR-16 Application: DC12V$_{IN}$ or AC12V$_{IN}$ for two LEDs**



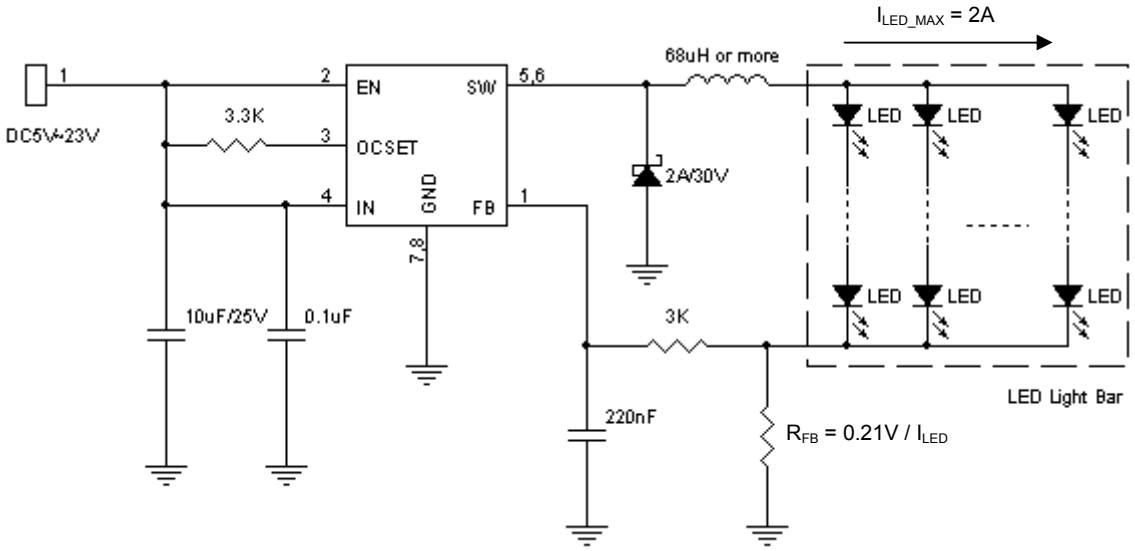
For 1W LED: * C_{IN}=100uF x 2 ** R_{FB} = 0.6Ohm 0805, I_{LED}=350mA
For 3W LED: * C_{IN}=150uF x 2 ** R_{FB} = 0.3Ohm 1206, I_{LED}=700mA
(Use 20V Tantalum-Cap)

♦ **MR-16 Application: DC12V$_{IN}$ or AC12V$_{IN}$ for 1W LED x 3**

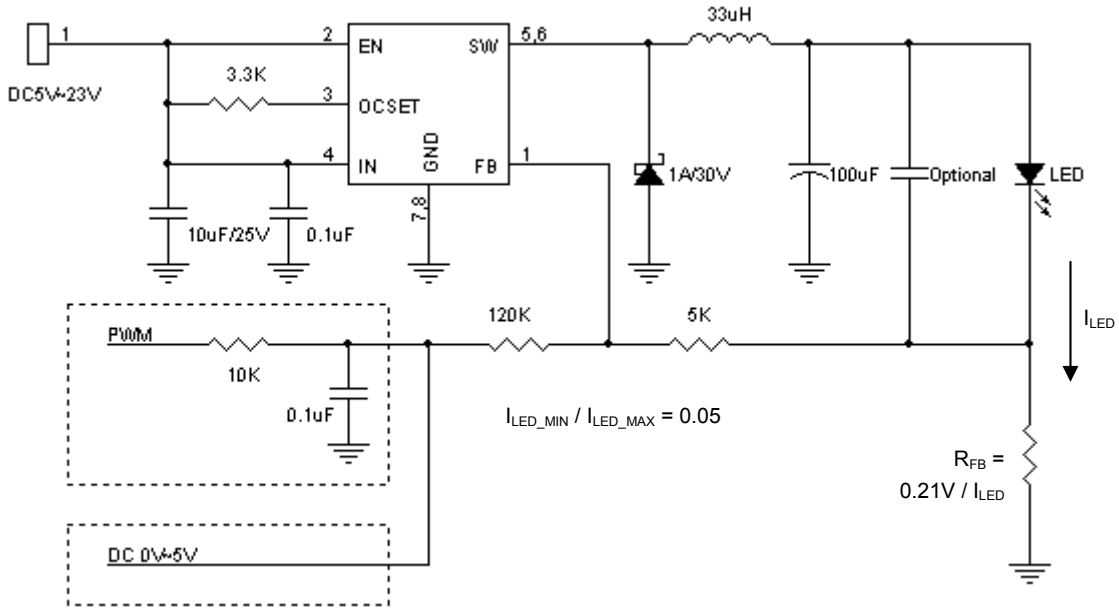


❖ Typical Application Circuits (Contd.)

♦ LED Light Bar Application

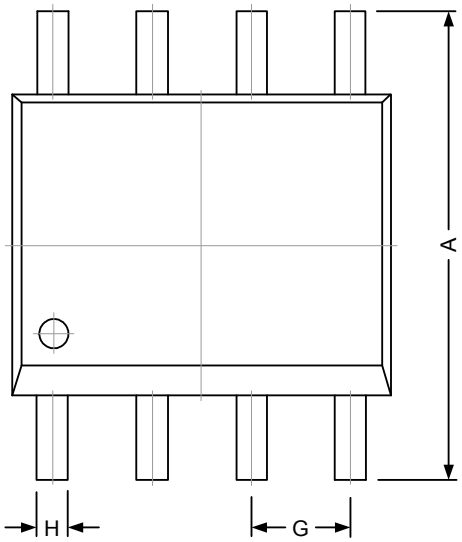


♦ LED Lighting Application with Dimming Control

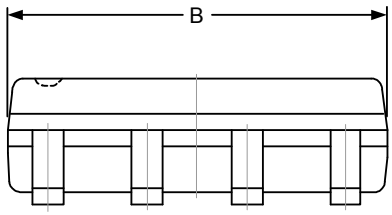


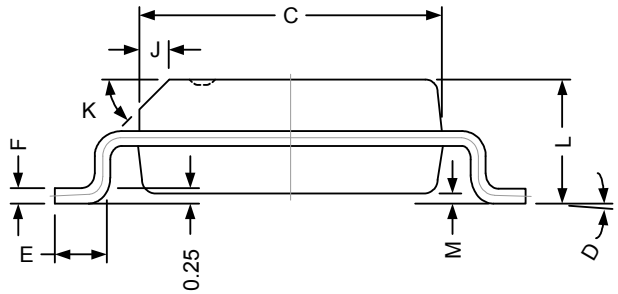
❖ Package Outline

SOP-8L



REF.	DIMENSIONS	
	Millimeter	
	Min.	Max.
A	5.80	6.20
B	4.80	5.00
C	3.80	4.00
D	0°	8°
E	0.40	0.90
F	0.19	0.25
M	0.10	0.25
H	0.35	0.49
L	1.35	1.75
J	0.375 REF.	
K	45°	
G	1.27 TYP.	





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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.

2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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