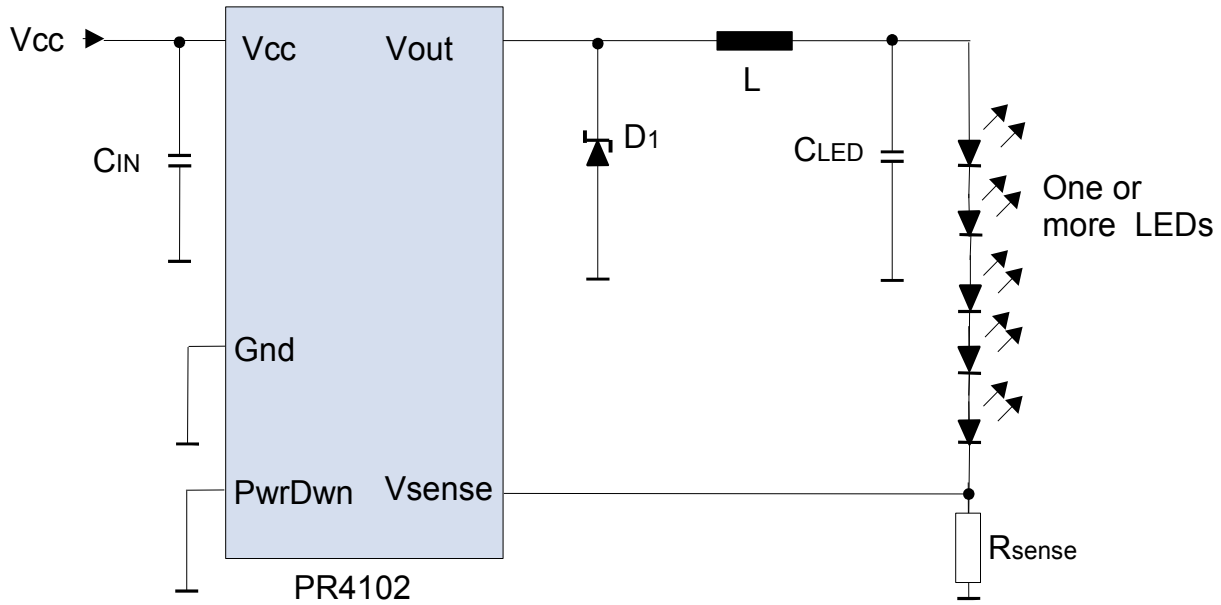
LED Driver PR4102

Buck Converter with controlled Output Current

The PR4102 is a buck converter for an **input voltage of 19...23 V** converting to a fixed **output current of 5...40 mA**. The LED current is set by a feedback resistor. To avoid overload, the IC is protected by an overtemperature detection circuit.

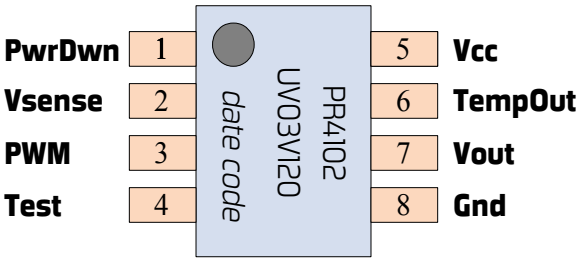
CIRCUIT DIAGRAM



DIMENSIONING OF ELECTRONIC COMPONENTS

L1 should be around 470 µH / 8 Ω. For 5 LEDs in series, Vcc should be in the range 19...23 V. Vcc must not exceed 24 V.
With Rsense = 10...80 Ω, an output current of 5...40 mA is achieved. Cin is recommended to be a capacitor of 100 nF and an electrolytic capacitor of 100 µF, Cled is a capacitor of 100 nF and 100 µF.
For tests PREMA used inductor Epcos B82 144A. Also Epcos B78 108 or equivalent are usable. The diodes should be preferably a Schottky diode or any other type with low V_F.

PIN CONFIGURATIONS



PR4102: Package SOP8

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Characteristics

PIN DESCRIPTIONS

Pin No.	Pin Name	Pin Function Description
1	PwrDwn	Power Down, sleep mode for min. power consumption. When this pin is left open, Vout is clamped to GND. For operation connect this pin to Gnd.
2	VSense	Feedback for controlling the output current. Connect this pin to the sense resistor R_{SENSE}.
3	PWM	If $V_{PWM} < V_{refPWM}$ the buck converter is switched off. If $V_{PWM} > V_{refPWM}$ the buck converter is switched on.
4	Test	For test and internal use only
5	GND	Ground
6	Vout	Output voltage connect this pin via a series inductor to the LEDs.
7	Temp	Voltage output of the internal chip temperature sensor (over temperature protection). Please see '*Electrical Characteristics*' for relationship between V_{TEMP} and the chip temperature T_{CHIP}.
8	Vcc	Supply voltage

ELECTRICAL CHARACTERISTICS

Vcc = 22 VDC, Ta = 25°C, L = 470 µH (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Vcc	Supply voltage (DC)	Start-up		8		[V]
		operating			23	[V]
		undervoltage shutdown		6		[V]
Vout	Output voltage				Vcc - 4 V	
$I_{suppOFF}$	Supply current, PwrDwn = open			4.0		[µA]
I_{suppON}	Supply current, PwrDwn = 0 V			1.1		[mA]
I_{OUT}	Mean output current at Vout			40	45	[mA]
f_{OP}	Operating frequency (variable, PWFM controlled)			100		[kHz]
V_{SENSE}	Threshold voltage at R_{SENSE}			470		[mV]
V_{RefPWM}	Threshold voltage PWM input			1000		[mV]
f_{PWM}	Frequency of external PWM signal				500	[Hz]
t_{PWM}	Min. pulse duration of PWM		2			[µs]
T_{OFF}	Switch-off chip temperature			125		[°C]
T_{ON}	Switch-on chip temperature			90		[°C]
V_{TEMP}	Output voltage of internal temperature sensor at pin TEMPOut	T_{chip} = 100°C		1.60		[V]
		T_{chip} = 0°C		2.15		[V]

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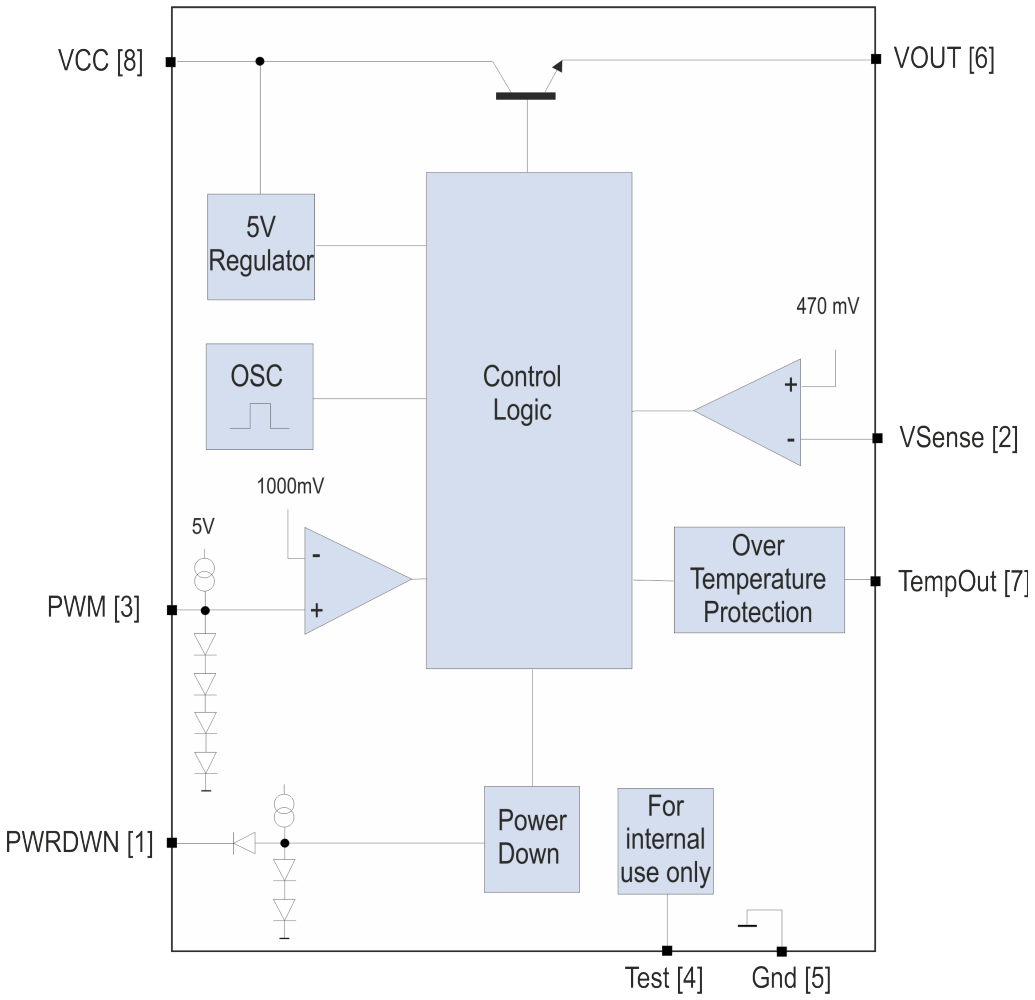
BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Parameter	Min	Typ	Max	Units
VCC, Vout (no damage)	-0.3		24	[V]
All other pins			7.5	[V]
Operating Chip Temperature Range (over temperature protection)	-20		125	[°C]
Storage Temperature Range	-55		150	[°C]
Electrostatic Discharge (ESD) Protection	2			[kV]

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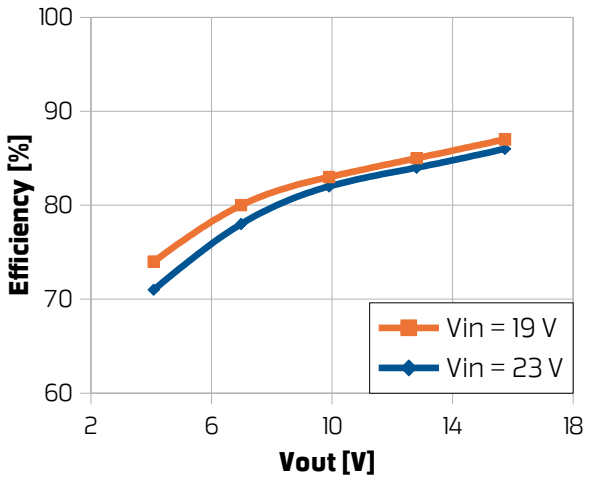
Efficiencies and Application Notes

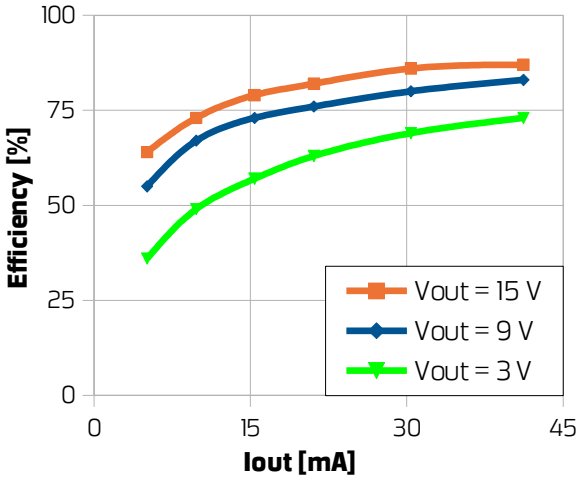
THE DEPENDENCY OF EFFICIENCY ON OUTPUT VOLTAGE

Varied Output voltages are obtained by using different amounts of LEDs that are connected in series. Due to the fixed output current, adjusted by PR4102, 1, 2, 3, 4 and 5 LEDs are driven by output voltages of 4.1 V, 7.0 V, 10.0 V, 12.8 V and 15.7 V, respectively. The following efficiencies are obtained by a fixed current flow of 40 mA. The voltage is measured at Rsense of 11 Ω (see circuit diagram).



THE DEPENDENCY OF EFFICIENCY ON OUTPUT CURRNT

Different target currents can be set by using several Rsense (described in the following). For an Input Voltage of 21 V, 1, 3 and 5 LEDs are applied for corresponding output voltages of 3 V, 9 V and 15 V, respectively.



SELECTION OF Rsense

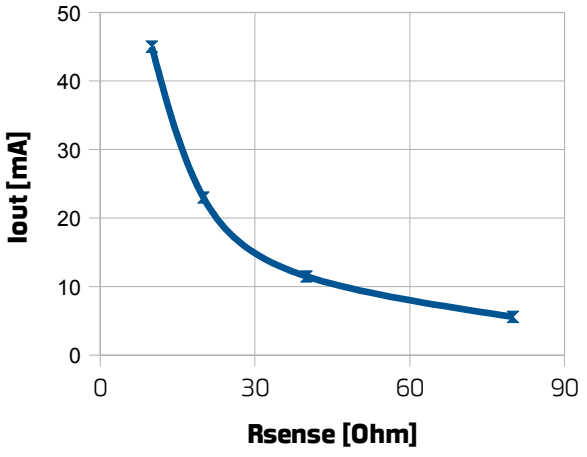
The nominal value of the current sense resistor (Rsense) can be calculated by the following formula:

$$R_{SENSE} = \frac{V_{SENSE}}{I_{LED}}$$

The value of V_{SENSE} can be found in *'Electrical Characteristics'*(470 mV).

For example:

With an LED current of 40 mA and V_{SENSE} = 470 mV, R_{SENSE} has a value of 11.75 Ω. The following diagram the dependency betrwenn output curren Rsense is shown.



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