

BK30 Spotlight – 0.5A Ultralow Noise DC Voltage Regulator

1. Features

Metric	Performance
V _{IN} max.	20V
V _{IN} min. in “LDO mode”	2.0V
V _{DO} in “LDO mode”	0.25V @ I _{LOAD} =0.5A
I _{OUT} max.	0.5A
V _{OUT} range	0–6V
Temperature range	–55°C to 125°C
PSRR	>100dB @ 1kHz
RMS Noise	<2 μV (10Hz–100kHz)
Package	See Section 5

- Up to 69% rel. higher efficiency than linear regulator over large voltage step.

2. Applications

- Low noise, efficient point of load regulator.
- RF, Medical devices, scientific instrumentation.
- High precision data converters.

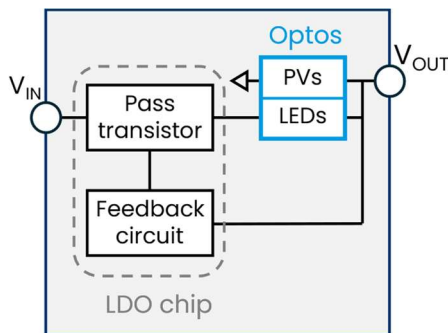


Figure 1. Schematic of an optocoupler enhanced linear regulator in a QFN package.

3. Description

The BK30 series consists of extremely low-noise DC voltage regulators with outstanding ripple rejection, over-temperature/current protection, current limit, power-good, enable/UVLO and fast-start-up. BK30 provides an adjustable voltage output set by a single resistor. This series is available in 0–2V, 2–4V and 4–6V output variants.

Polaris Semiconductor’s voltage regulator technology enables much higher efficiency than a conventional linear regulator over wide voltage steps. The inductor-less, switching-free topology also offers superior electromagnetic interference performance and lower BOM than switching-based solutions. The devices employ our patented hybrid optoelectronic circuit topology, including high efficiency, GaAs-based optocouplers and a low-dropout (LDO) linear voltage regulator in a compact QFN package. High efficiency buck conversion is available in “optocoupler enhanced” mode; this engages the internal optocoupler array to recycle power normally wasted in LDOs. The input voltage required for a regulated output (V_{ON}) is greater than an LDO and is configurable using the pin connections. Peak efficiency is achieved for V_{IN} ≈ V_{ON}, and therefore the optimum device configuration for a given application depends on the nominal input voltage range. The devices can also be operated as conventional LDOs in “LDO mode” for use at lower input voltages.

4. Selected Characteristics & Typical Applications

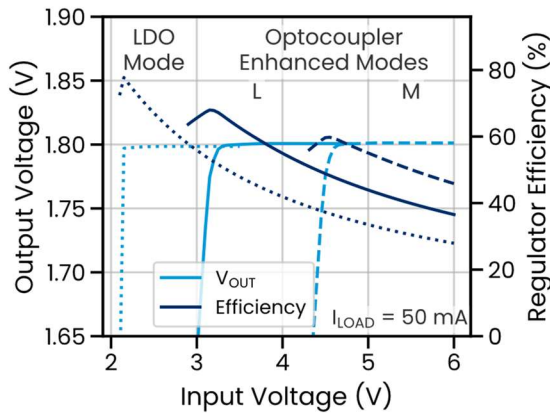


Figure 1. BK301D18V output voltage and efficiency versus input voltage with 50mA load current.

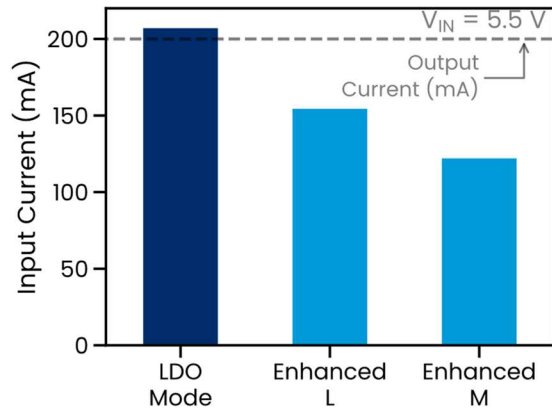


Figure 2. BK301D18V Input current in the three operating modes for $I_{Load}=200mA$ and $V_{IN}=5.5V$.

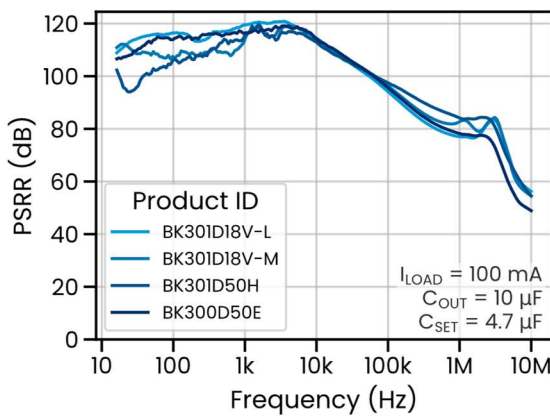


Figure 3. BK30 series PSRR at 100 mA load current. C_{OUT} and C_{SET} are X7R MLCCs.

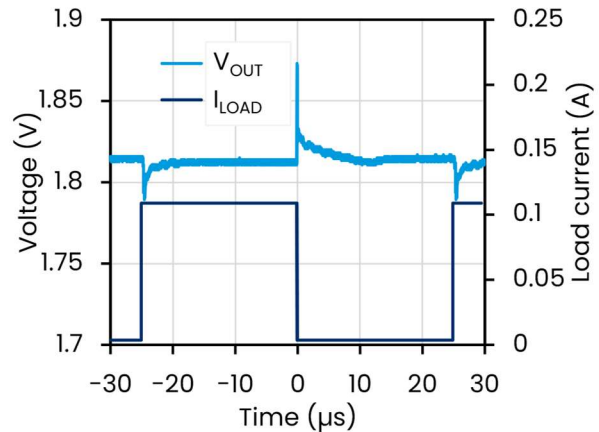


Figure 4. BK301D18V-M load switching transient with $C_{OUT}=10\mu F$, $C_{SET}=4.7\mu F$ and $V_{IN}=4.5V$.

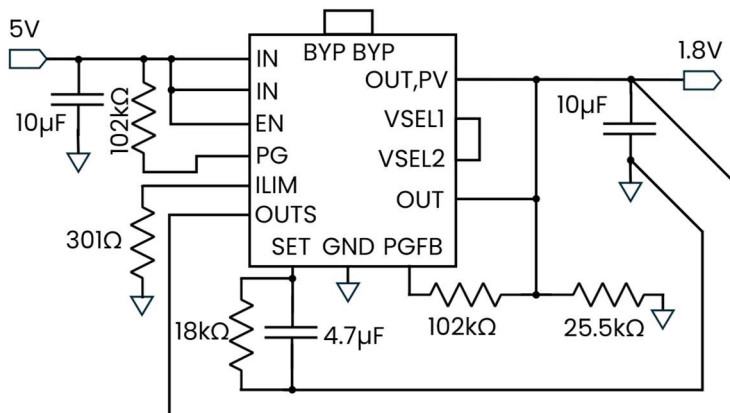


Figure 5. A 5V to 1.8V buck configuration of BK301D18V in a 6mm QFN28 package, operating in "optocoupler enhanced M" mode. Enable and bypass functionality are not used in this example.

5. BK30 Series Product Line Specifications

Min V_{OUT}	0 V
Max V_{IN}	20 V
Max I_{OUT}	500 mA
TID	TBD

Device	Max V _{OUT} (V)	Min V _{IN} @ I _{OUT} =0.1A (V) ¹	Peak Efficiency ² @ I _{OUT} = 0.1A (%)	PSRR @ 1kHz (dB)	V _{RMS} noise, 10–100kHz (μV)	Package	QFN Dimensions
BK301D18V	2	V _{OUT} +1.4 (L) V _{OUT} +2.8 (M)	70.5% 62.4%	>100 >100	<2	QFN 28	6x6x0.8 mm ³
BK301D33L³	4	V _{OUT} +1.4	TBD	TBD	TBD	QFN 32	7x7x0.8 mm ³
BK301D33V³	4	V _{OUT} +2.8 (M) V _{OUT} +5.5 (H)	TBD	TBD	TBD	QFN 32	7x7x0.8 mm ³
BK301D50H	6	V _{OUT} +4.1	69.4%	>100	<3	QFN 32	7x7x0.8 mm ³
BK300D50E	5	V _{OUT} +7.0	66.5%	>100	<3	QFN 32	7x7x0.8 mm ³

All the parts listed here are under development and device specifications provided here are subject to change.

¹ Minimum input voltage is provided in optocoupler enhanced mode. All devices can be operated as conventional low dropout linear regulators with lower V_{IN}.

² Peak efficiency is provided for the following output voltages: 1.8 V (18V products), 3.3V (33L & 33V products), and 5V (50H and 50E products)

³ Devices expected in early 2025.

Contact us at info@polarissemiconductor.com for datasheets and additional information.