

# BK29 Spotlight – 1.0A Rad-Tolerant DC Voltage Regulator

## 1. Features

Metric	Performance
V <sub>IN</sub> max.	26V
V <sub>IN</sub> min. in “LDO mode”	1.8V
V <sub>DO</sub> in “LDO mode”	0.26V @ I <sub>LOAD</sub> =1.0A
I <sub>OUT</sub> max.	1.0A
V <sub>OUT</sub> range	1.2–5V
Temperature range	–40°C to 125°C
PSRR	65dB @ 1kHz
RMS Noise	160µV (10Hz–100kHz)
Package	QFN–28 or QFN–32

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

## 2. Applications

- Low noise, efficient post-regulator for switching supplies.
- Clean analog supply requirements
- Radiation tolerant DC power mgmt:
  - TID 200 krad(Si)

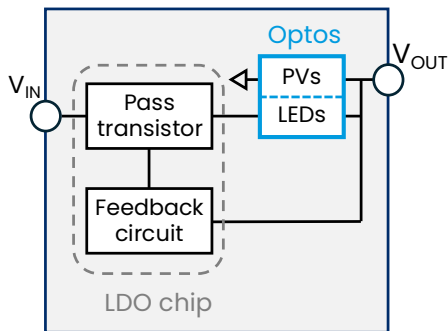


Figure 1. Schematic of an optocoupler enhanced linear regulator in a QFN package.

## 3. Description

The BK29 series consists of efficient, radiation tolerant voltage regulators with good ripple rejection, low ground current, enable/disable functionality, over-temperature and over-current protection. BK29 provides an adjustable voltage output set by two feedback resistors. This series is available in 1.2-2V, 2-4V, and 4-5V 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<sub>ON</sub>) is greater than an LDO and is configurable using the pin connections. Peak efficiency is achieved for V<sub>IN</sub> ≈ V<sub>ON</sub>, 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

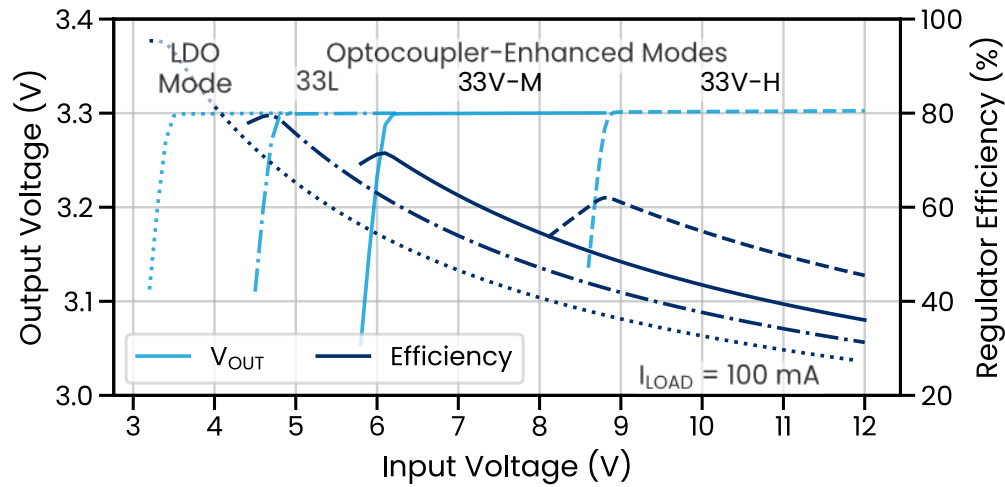


Figure 1. BK29ID33L and BK29ID33V output voltage and efficiency versus input voltage with 100mA load current.

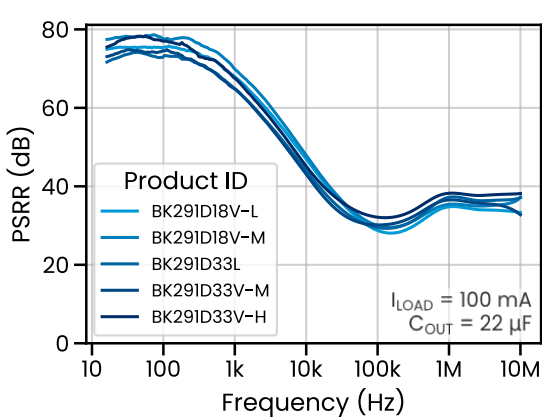


Figure 2. BK29 series PSRR at 100 mA load current.  $C_{OUT}$  is an X7R MLCC.

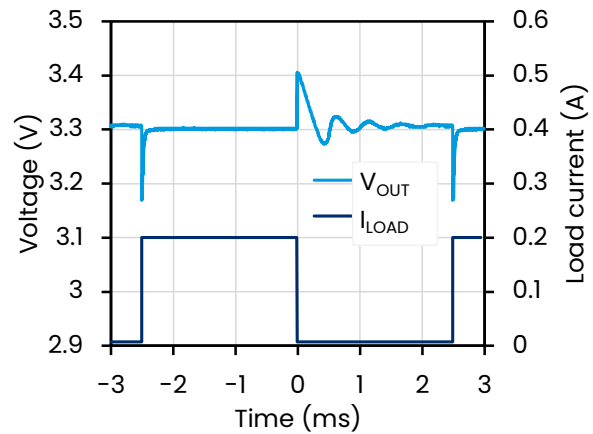


Figure 3. BK29ID33V load switching transient with  $C_{OUT} = 10\text{ }\mu\text{F}$ ,  $C_{SET} = 4.7\text{ }\mu\text{F}$  and  $V_{IN} = 4.5\text{ V}$ .

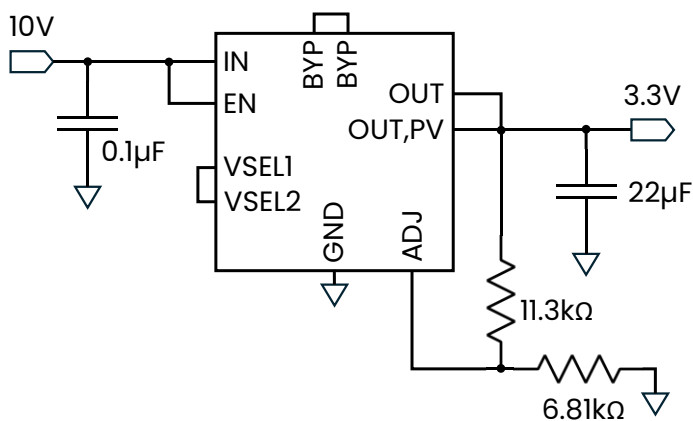


Figure 5. A 10V to 3.3V buck configuration of BK29ID33V in a 7mm QFN32 package, operating in "optocoupler enhanced H" mode. Enable and bypass functionality are not used in this example.

## 5. BK29 Series Product Line Specifications

<b>Min V<sub>OUT</sub></b>	1.2 V
<b>Max V<sub>IN</sub></b>	26 V
<b>Max I<sub>OUT</sub></b>	1000 mA
<b>TID</b>	200 krad(Si)

Device	Max V <sub>OUT</sub> (V)	Min V <sub>IN</sub> @ I <sub>OUT</sub> =0.1A (V) <sup>1</sup>	Peak Efficiency <sup>2</sup> @ I <sub>OUT</sub> = 0.1A (%)	PSRR @ 1kHz (dB)	V <sub>RMS</sub> noise, 10-100kHz (μV)	Package	QFN Dimensions
<b>BK291D18V</b>	2	V <sub>OUT</sub> +1.4 (L) V <sub>OUT</sub> +2.8 (M)	73.9% 65.8%	66 68	160	QFN 28	6x6x0.8 mm <sup>3</sup>
<b>BK291D33L</b>	4	V <sub>OUT</sub> +1.4	79.8%	63	245	QFN 32	7x7x0.8 mm <sup>3</sup>
<b>BK291D33V</b>	4	V <sub>OUT</sub> +2.8 (M) V <sub>OUT</sub> +5.5 (H)	71.7% 62.5%	64 65	245	QFN 32	7x7x0.8 mm <sup>3</sup>
<b>BK291D50E</b>	5	V <sub>OUT</sub> +7.0	69.4%	62	350	QFN 32	7x7x0.8 mm <sup>3</sup>

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

<sup>1</sup> Minimum input voltage is provided in optocoupler enhanced mode. All devices can be operated as conventional low dropout linear regulators with lower V<sub>IN</sub>.

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

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