

POLARIS SEMICONDUCTOR RF-Silent Voltage Regulators for Demanding Applications

Problem Statement

Next generation electronic systems require DC voltage regulators with state-of-the-art SWaP, electromagnetic interference (EMI) and reliability attributes, as well as resilience to extreme environments. A significant capability gap exists for incumbent voltage regulators that can simultaneously provide extremely low EMI generation, a very compact footprint, and high electrical efficiency.

Our Solution

This proven, patented technology with unique performance attributes is a drop-in replacement for incumbent voltage regulators. Our devices are ideally suited for space-constrained and noise-sensitive applications, providing valuable benefits in the most technically challenging systems.

Breaking the Rules

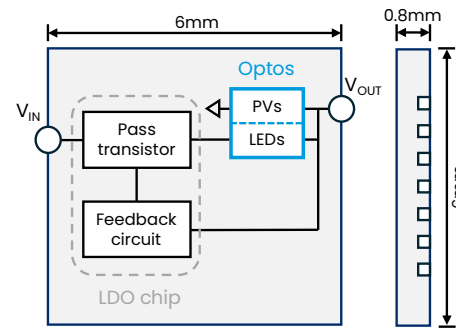
Our pioneering, inductorless devices break the efficiency limits for linear regulators without the drawbacks of switching regulators, offering:

- Noise specs matching the best available linear regulators but with 1.2x-2x better efficiency
- The versatility and efficiency of a switching regulator but with no inductor, extremely low output noise and minimal size/footprint

Impact

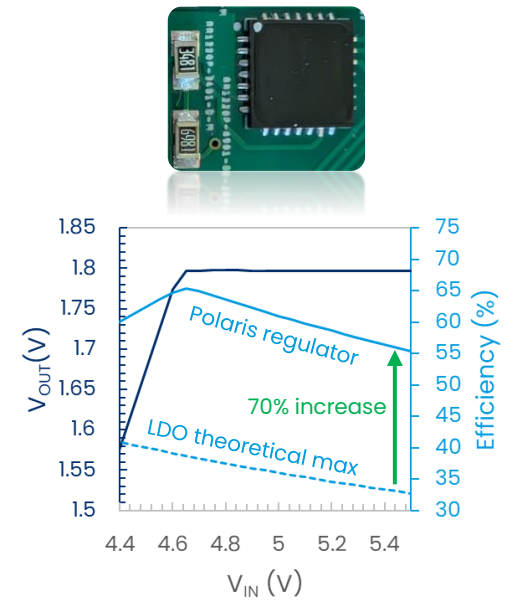
Polaris Semiconductor's innovation is disruptive for the most demanding applications, such as RF-electronics, high-precision data converters, medical imaging, very low-noise instrumentation and many more.

Our devices offer a combination of SWaP attributes, functionality, and zero-EMI not available from any incumbent voltage regulator.



Above: Schematic of buck conversion topology.

Right: Measured performance of a 1.8V BK291D18H regulator at 150mA load current. The efficiency at $V_{IN} = 5V$ is >70% rel. greater than the theoretical limit of a conventional LDO.



Technical Information

Built entirely using existing high-volume manufacturing techniques, our technology combines unique, rad-hard GaAs-based optocoupler devices with Si-based analog ICs in a patented circuit topology.

Typical Specifications


| Input V | Output V | Output I | Peak Efficiency* | TID |
|----------|----------|------------|------------------|------------------|
| 1.5V-26V | 0V-5V | Up to 1.5A | 60%-85% | Up to 1 Mrad(Si) |


*Peak efficiency varies with input/output voltage ratios; typically 75% efficiency is achieved for a 3.3V/1.8V step, 40% greater than a standard linear regulator.

Contact Us

Please reach out and we'll be happy to provide technical specifications or evaluation samples.

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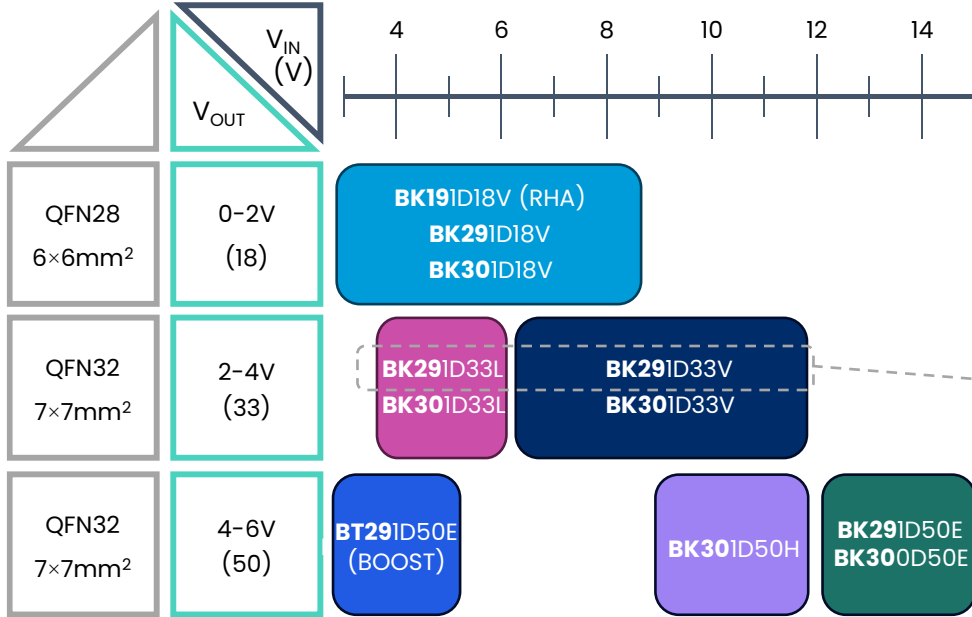
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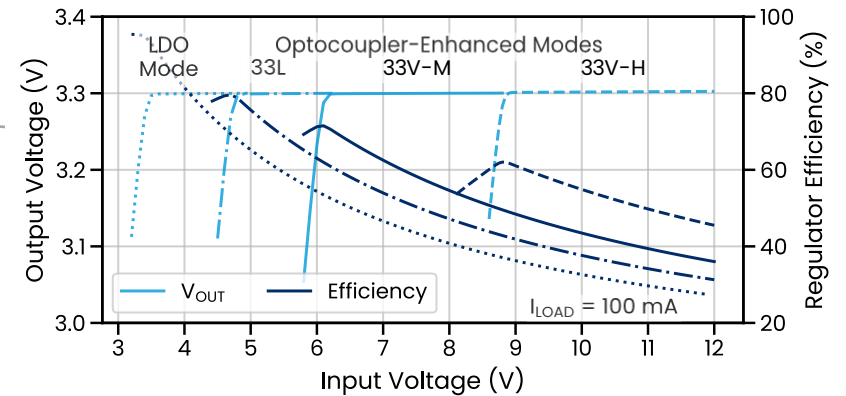


Technical Summary of Polaris Semiconductor's DC Voltage Regulators

Arranged by input/output voltage (left) and a table of performance specifications for device families (top right)^{1,2}. Example efficiency curves for the BK29ID33x series (bottom right).



| Device Families | Max I _{OUT} (mA) | Max V _{IN} (V) | Min V _{OUT} (V) | PSRR @ 10 kHz | TID (1krad(Si)) |
|-----------------|---------------------------|-------------------------|--------------------------|---------------|-----------------|
| BK19 (RHA) | 900 | 20 | 1.2 | 70 dB | 200 assured |
| BK29 | 1500 | 26 | 1.2 | 50 dB | 200 |
| BK30 | 500 | 20 | 0 | 120 dB | TBD |



¹All devices can be operated as conventional LDOs below stated minimum V_{IN}. ²R&D ongoing, values subject to revision.

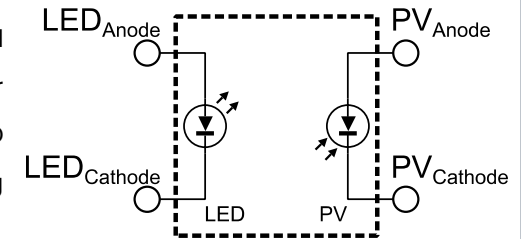
Photovoltaic Output Optocouplers with Unprecedented Power Transfer Efficiency

Our Solution

Our photovoltaic output optocouplers provide unprecedented efficiency in a very small footprint. The devices achieve high transfer efficiencies for both current and power over a wide range of drive currents. Our technology will enable new power architectures in demanding low voltage applications including DC voltage conversion, high-current MOSFET gate-driving, and isolated signal transmission.

Technical Information

Our proprietary GaAs-based devices efficiently transfer power between a junction-isolated LED and photovoltaic diode using photons.



Below: Performance specifications of Polaris Semiconductor photovoltaic output optocoupler prototypes. **Above, right:** Functional block diagram.

| Device | Package | QFN Dimensions | V _{LED} range (V) | I _{LED} range (mA) | PV Voltage ³ (typ.) (V) | Peak Efficiency ⁴ (%) |
|--------|---------------|-----------------------------|----------------------------|-----------------------------|------------------------------------|----------------------------------|
| OC1D | QFN16, SOIC-8 | 4 × 4 × 0.8 mm ³ | 1.2V-1.7V | 0.5-500 | 1.0-1.2 | 52% @ I _{LED} =70mA |

³Open-circuit voltage. ⁴Efficiency defined as P_{MAX, PV} / (V_{LED} × I_{LED}).