

General Description

The **PE24109** is a compact, low-profile, and ultra-high efficiency step-down DC-DC converter solution capable of delivering 10A per stage output current from an input voltage range from 3.0V to 3.6V. The output voltage is selected with external feedback resistors and can be adjusted between 0.5 and 1.0V.

Based on Murata's advanced two-stage architecture, the device consists of a two-phase interleaved charge pump followed by an interleaved buck regulator stage. This power system greatly reduces the dependency on inductance for high efficiency solutions in small-footprint and height-constrained applications.

Features

- Proprietary architecture enabling industry-leading efficiency with ultra-low profile and footprint
- 92% peak efficiency
- Wide input voltage range, from 3.0V to 3.6V, that supports running off a nominal 3.3V bus supply
- Output voltage regulation accuracy better than $\pm 1\%$ for all line and load variations
- Output voltage set by external feedback resistors
- Output can be adjusted by external AVS DAC
- External sync pin allows synchronization to an external clock
- Parallel up to four devices

Typical Applications

- Low-profile point-of-load (POL) regulators
- Optical modules
- Core supplies
- ASICs
- FPGA

Efficiency

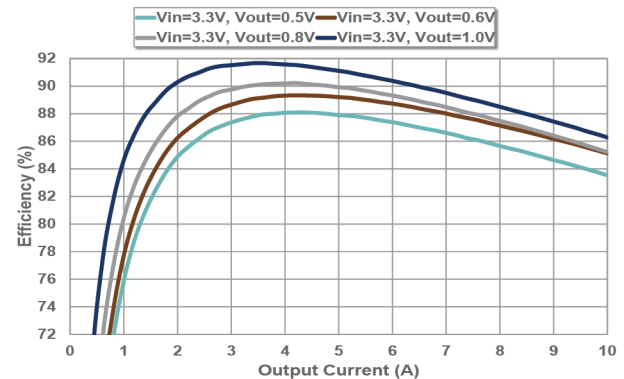


Figure 1. Efficiency Plot of a Single Device

Simplified Application

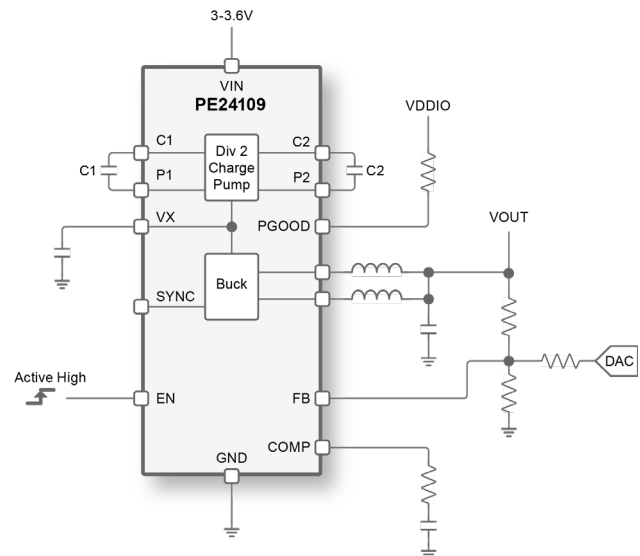


Figure 2. Typical Applications Circuit

3.3 Vin, 10A, Two-stage Buck Regulator for Low Output Voltage Applications

Application Schematic

Figure 3 shows the schematic for a single device, and Table 1 lists the components required for single device operation.

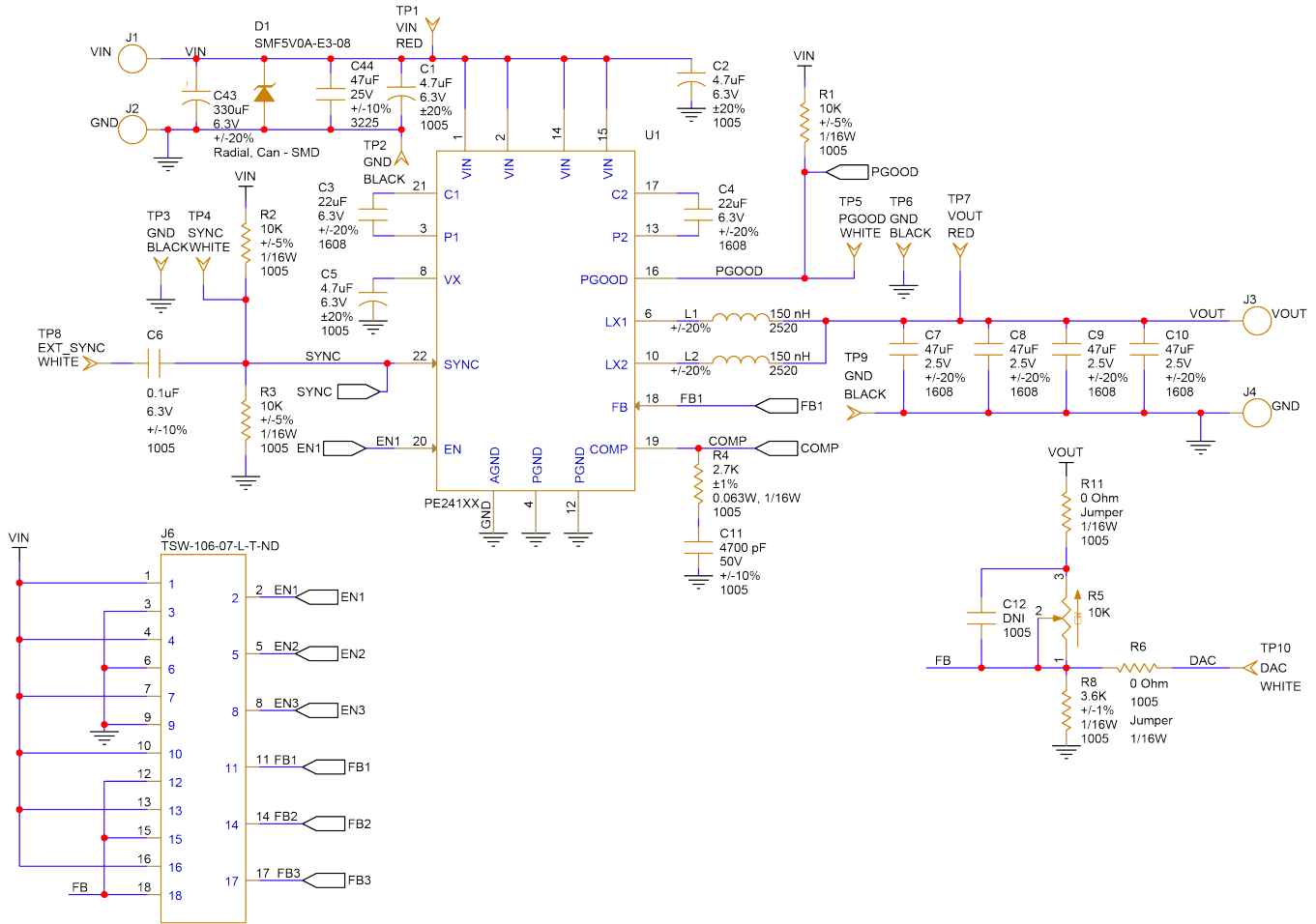


Figure 3. Application Schematic

3.3 Vin, 10A, Two-stage Buck Regulator for Low Output Voltage Applications

Application Circuit Part List

Table 2 lists recommended part numbers.

| QTY | REF. NUMBER | VALUE | DESCRIPTION | MFG. | MFG. PART NUMBER |
|-----|--------------|-------------|---|-------------------|----------------------|
| 3 | C1,C2,C5 | 4.7 μ F | CAP, SMD, CER, 4.7 μ F, 6.3V, \pm 20%, X6S, 0402 (1005 Metric) | Murata | GRM155C80J475MEAAD |
| 2 | C3,C4 | 22 μ F | CAP, SMD, CER, 22 μ F, 6.3V, \pm 20%, X6S, 0603 (1608 Metric) | Murata | GRM188C80J226ME15D |
| 1 | C6 | 0.1 μ F | CAP, SMD, CER, 0.1 μ F, 6.3V, \pm 10%, X6S, 0201 (0603 Metric) | Murata | GRM033C80J104KE15D |
| 4 | C7,C8,C9,C10 | 47 μ F | CAP, SMD, CER, 47 μ F, 2.5V, \pm 20%, X7T, 0603 (1608 Metric) | Murata | GRM188D70E476ME01D |
| 1 | C11 | 4700 pF | CAP, SMD, CER, 4700pF, 6.3V, \pm 10%, X7R, 0201 (0603 metric) | Murata | GRM033R70J472KA01D |
| 1 | C43 | 330 μ F | CAP, SMD, ALU, 330 μ F, 6.3V, \pm 20%, -, 0.248" Dia (6.30mm) | Nichicon | UCL0J331MCL1GS |
| 1 | C44 | 47 μ F | CAP, SMD, CER, 47 μ F, 25V, \pm 10%, X7R, 1210 (3225 Metric) | Murata | GRM32ER70J476KE20L |
| 1 | D1 | | 19V (Typ) Clamp 20A (8/20 μ s) Ipp Tvs Diode Surface Mount SOD-323 | Bourns Inc. | CDSOD323-T03 |
| 2 | L1,L2 | 150 nH | IND, SMD, Fixed Inductors, TFM-ALMA, 150 nH, 7.3A, 11mOhm Max, 1008 (2520 Metric) | TDK | TFM252012ALMAR15MTAA |
| 3 | R1,R2,R3 | 10K | RES, SMD, Thick Film, 10K, \pm 1%, 1/20W, 0201 (0603 Metric) | Panasonic | ERJ-1GNF1002C |
| 1 | R4 | 2.7 kOhms | 2.7 kOhms \pm 1% 0.05W, 1/20W Chip Resistor 0201 (0603 Metric) Moisture Resistant Thick Film | Yageo | RC0201FR-072K7L |
| 1 | R5 | 10K | RES, SMD, Potentiometers, 10K, \pm 10%, 0.25W, 1/4W, 0.250" x 0.170" Face x 0.295" H (6.35mm x 4.32mm x 7.49mm) | TT Electronics/BI | 84WR10KLFTR |
| 1 | R6 | 0 | RES, SMD, Thick Film, 0, Jumper, 1/20W, 0201 (0603 Metric) | Panasonic | ERJ-1GN0R00C |
| 1 | R8 | 3.6K | RES, SMD, Thick Film, 3.6K, \pm 1%, 1/20W, 0201 (0603 metric) | Panasonic | ERJ-1GNF3601C |
| 1 | U1 | PE24109 | IC, SMD, QFN | Murata | PE24109 |

Table 1. Recommended Parts

<http://www.murata.com/products/power>

Evaluation Board

Figure 4 shows the PE24109 device evaluation board.

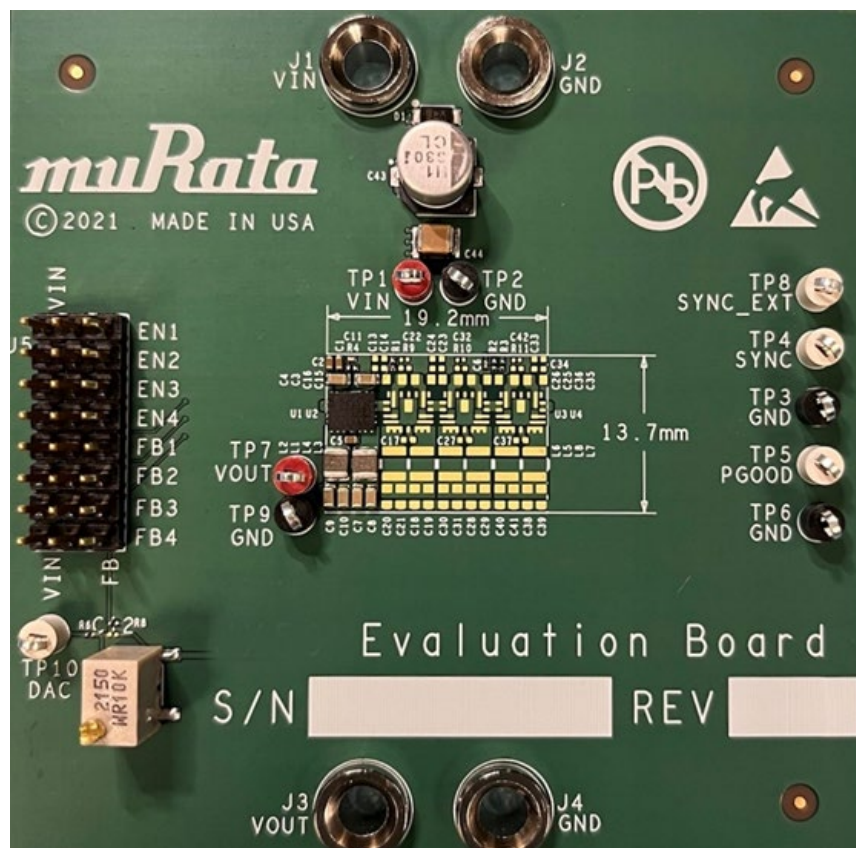


Figure 4. Device Evaluation Board

3.3 Vin, 10A, Two-stage Buck Regulator for Low Output Voltage Applications

Order Codes

Table 2 lists the available ordering codes for the PE24109 as well as available shipping methods.

| ORDER CODES | DESCRIPTION | PACKAGING | SHIPPING METHOD |
|-------------|--------------------------------|----------------------|------------------|
| PE24109A-X | 10A buck regulator | QFN on tape and reel | 500 units / T&R |
| PE24109A-Z | 10A buck regulator | QFN on tape and reel | 3000 units / T&R |
| EK24109-01 | PE24109 evaluation board (EVK) | Evaluation board | 1 unit |

Table 2. Order Codes

Notices

CAUTION

Limitation of Applications

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might lead to damage to life, body or property.

- Aircraft equipment
- Aerospace equipment
- Undersea equipment
- Power plant control equipment
- Surgical implants
- Transportation equipment (vehicles, trains, ships, etc.)
- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Application of similar complexity and/or reliability requirements to the applications listed in the above

Note

1. Please make sure that your product has been evaluated and confirmed to your specifications when our product is used in your product.
2. All the items and parameters in this approval sheet for product specification are based on the premise that our product is used for the purpose, under the condition and in the environment agreed upon between you and us. You are requested not to use our product in a manner deviating from such agreement.
3. If you have any concerns about materials other than those listed in the RoHS directive, please contact us.
4. Be sure to provide an appropriate fail-safe functionality in your product to prevent secondary damage that could be caused by the abnormal function or failure of our product.
5. Do not allow our product to be exposed to excess moisture under any circumstances.

Document Categories

Advance Information

The product is in a formative or design stage. The datasheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

Preliminary Specification

The datasheet contains preliminary data. Additional data may be added at a later date. Murata reserves the right to change specifications at any time without notice in order to supply the best possible product.

Product Specification

The datasheet contains final data. In the event Murata decides to change the specifications, Murata will notify customers of the intended changes by issuing a CNF (Customer Notification Form).

Product Brief

The datasheet contains summary product information.

Sales Contact

For additional information, contact Sales at <https://www.murata.com/contactform>.

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3.3 Vin, 10A, Two-stage Buck Regulator for Low
Output Voltage Applications

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