

# PE24111

Document Category: Product Brief

## 3.3 VIN, 20A, Two-stage Buck Regulator for Low Output Voltage Applications

### General Description

The PE24111 is a compact, low-profile, and ultra-high efficiency step-down DC-DC converter solution capable of delivering 20A 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 0.35V and 0.7V.

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
- 90% 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

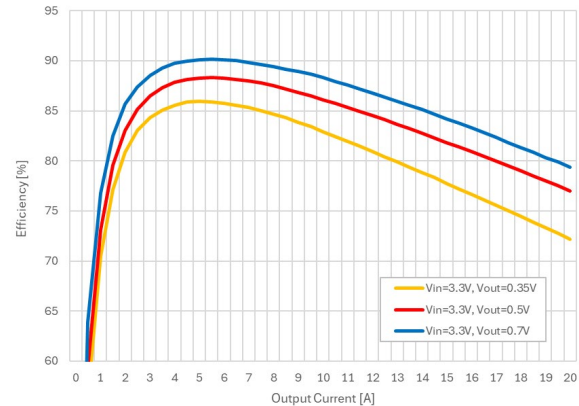


Figure 1. Efficiency Plot of Single Device

### Simplified Application

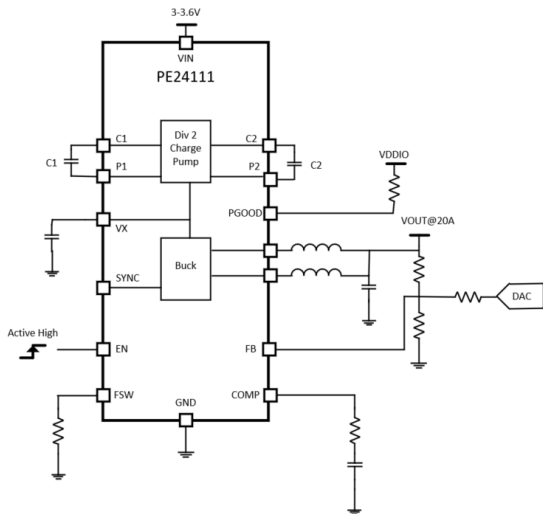


Figure 2. Typical Applications Circuit

### Application Schematic

The schematic for a single device is shown in Figure 3, and Table 1 lists the components required for a single device operation.

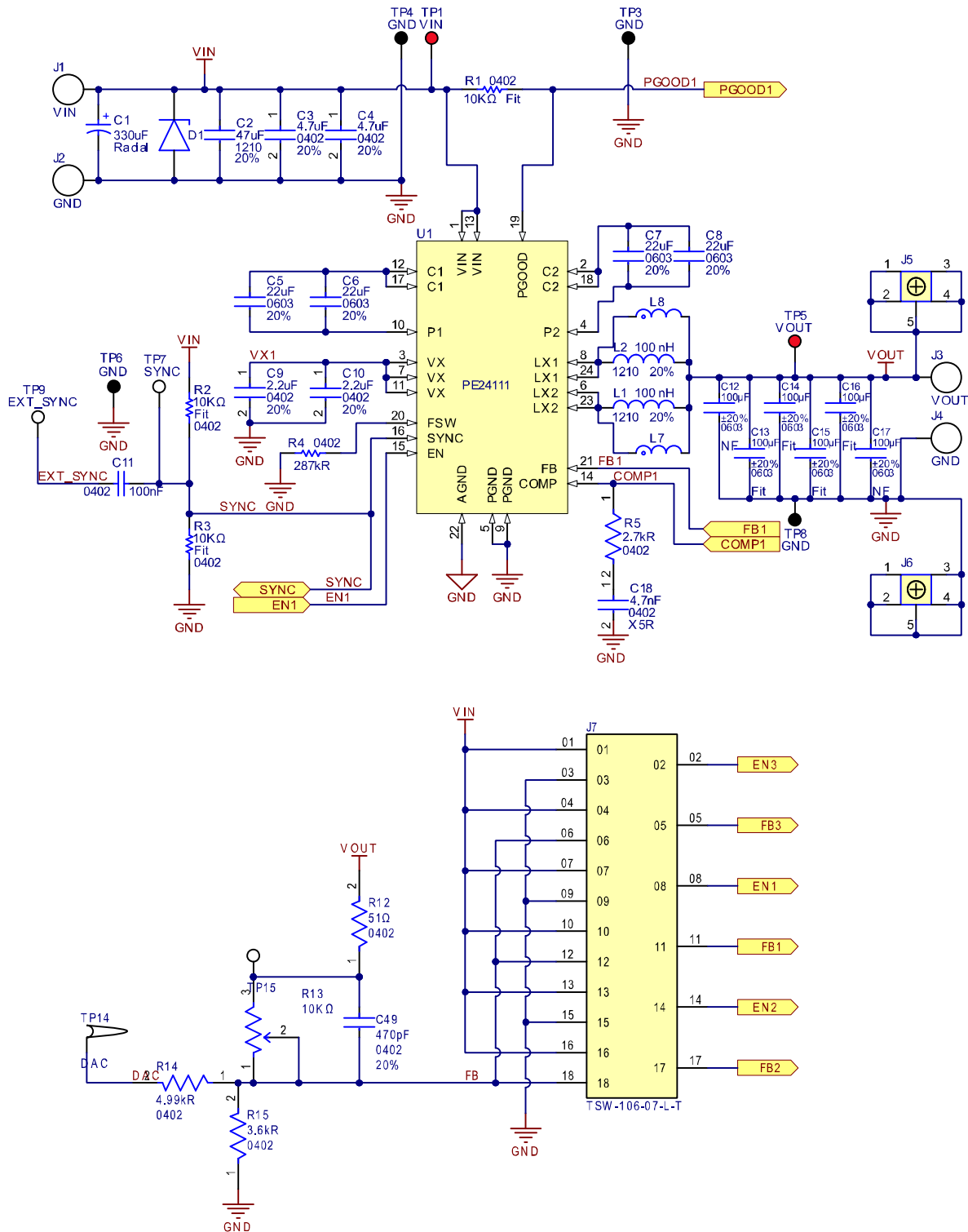


Figure 3. Device Board (EVK) Application Schematic

## Application Circuit Part List

Table 1 lists recommended part numbers.

Table 1. Recommended Parts

Qty.	Ref. Number	Value	Description	Mfg.	Mfg. Part Number
1	D1		19V (Typ) Clamp 20A (8/20 $\mu$ s) Ipp Tvs Diode Surface Mount SOD-323	Bourns Inc.	CDSOD323-T03
1	C1	330 $\mu$ F	CAP, SMD, ALU, 330 $\mu$ F, 6.3V, +/-20%, -, 0.248" Dia (6.30mm)	Nichicon	UCL0J331MCL1GS
1	C2	47 $\mu$ F	CAP, SMD, CER, 47 $\mu$ F, 25V, +/-10%, X7R, 1210 (3225 Metric)	Murata	GRM32ER70J476KE20L
2	C3,C4	4.7 $\mu$ F	CAP, SMD, CER, 4.7 $\mu$ F, 6.3V, $\pm$ 20%, X6S, 0402 (1005 Metric)	Murata	GRM155C80J475MEAAD
4	C5,C6,C7,C8	22 $\mu$ F	CAP, SMD, CER, 22 $\mu$ F, 6.3V, +/-20%, X6S, 0603 (1608 Metric)	Murata	GRM188C80J226ME15D
2	C9,C10	2.2 $\mu$ F	CAP, SMD, CER, 2.2 $\mu$ F, 10V, +/-20%, X7S, 0402 (1005 Metric)	Murata	GRM155C71A225ME11D
1	C11	0.1 $\mu$ F	CAP, SMD, CER, 0.1 $\mu$ F, 6.3V, +/-10%, X7R, 0402 (1005 Metric)	Murata	GRM155R70J104KA01D
2	C13,C14	100 $\mu$ F	CAP, SMD, CER, 100 $\mu$ F, 2.5V, +/-20%, X6S, 0603 (1608 Metric)	Murata	GRM188C80E107ME01
1	C18	4700 pF	CAP, SMD, CER, 4700pF, 10V, +/-10%, X5R, 0402 (1005 metric)	Murata	GRM155R61A472KA01D
2	C15,C16,C17,C18	DNI	DNI		
2	L1,L2	100 nH	100 nH Unshielded Thin Film Inductor 8 A 8mOhm Max 1210 (3225 Metric)	TDK	TFM322512ALMAR10MTAA
5	R1,R2,R3	10 k $\Omega$	RES, SMD, Thick Film, 10K, +/-1%, 1/20W, 0201 (0603 Metric)	Panasonic	ERJ-1GNF1002C
1	R4	287 k $\Omega$	RES SMD 287K OHM 1% 1/10W 0402	Panasonic	ERJ-2RKF2873X
1	R5	2.7 k $\Omega$	RES SMD 51 OHM 0.1% 1/16W 0402	Panasonic	ERA-2AED272X
1	R12	51 $\Omega$	RES, SMD, Thick Film, 0, Jumper, 1/20W, 0201 (0603 Metric)	Panasonic	ERA-2AEB510X
1	R13	10 k $\Omega$	TRIMMER 10KOHM 0.25W J LEAD SIDE	Bourns Inc.	3224J-1-103E
1	R14	4.99 k $\Omega$	RES SMD 4.99K OHM 1% 1/10W 0402	Panasonic	ERJ-2RKF4991X
1	U1		IC, SMD, QFN	Murata	PE24111

## Evaluation Board

The PE24111 evaluation board is specifically designed for space-limited applications. The high-density, single-sided approach allows proximity of critical components while keeping traces short to reduce resistive power loss and maximize efficiency. The four-layer board is fabricated on FR4 using one ounce of copper minimum on each layer.

Each VIN pin on opposite sides of the PE24111 IC are connected to decoupling capacitors. Due to the solution size restrictions of the layout, a power plane was used to connect the IC to the decoupling capacitors to reduce leakage inductance. A PGND layer connected to and under the decoupling capacitors allows for a small power loop.

The inductors are placed close to the LX pins and connected directly to the output capacitors. The output pad is maximized and routed to the bottom layers using an array of vias to reduce inductance. PGND plane is placed under the output components and fed back to the IC on layer 2 to minimize the ground return path. This approach allows the application load to be placed directly under the PE24111 to reduce power losses.

The charge pump capacitors are placed close to the IC and connected to the flying capacitor pins (C1 and C2) and phase pins (P1 and P2) with wide traces to support the constant flow of energy supplied to the buck converter. The VX decoupling capacitor is placed close to the VX pin and bypassed to PGND to reduce charge pump ripple.

The backside of the evaluation board has an area where solder bridges are required to connect the outputs together for parallel operation. Combining the outputs together to the VOUT plane reduces the output resistance to the VOUT jacks.

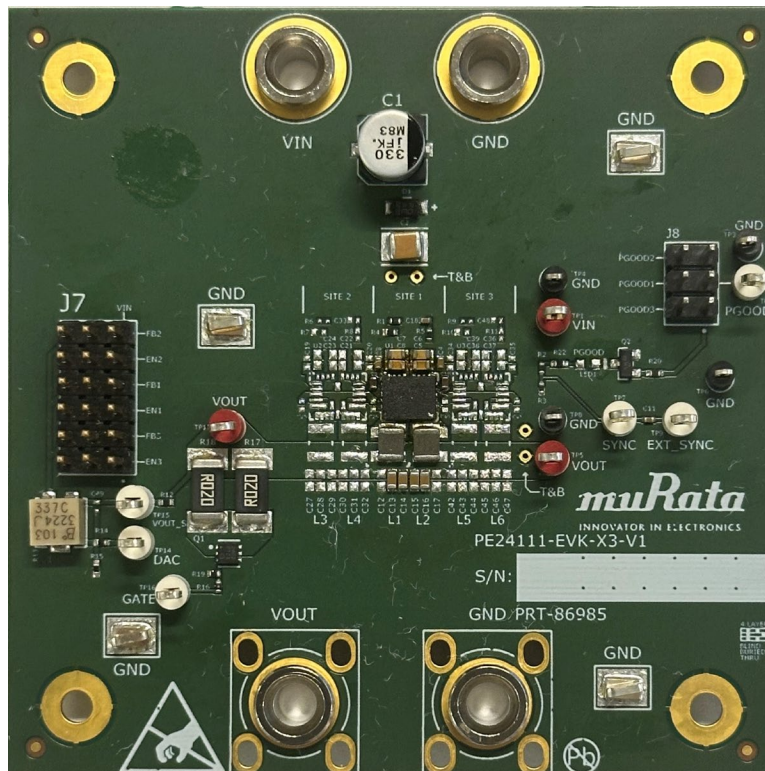


Figure 4. Device Board (EVK)

## Order Codes

Table 2 lists the available ordering codes for the PE24111 as well as available shipping methods.

*Table 2. Order Codes*

Order Codes	Description	Packaging	Shipping Method
PE24111A-X	20A buck regulator	QFN on tape and reel	500 Units / T&R
PE24111A-Z	20A buck regulator	QFN on tape and reel	3000 Units / T&R

## 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

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### Product Specification

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

### Product Brief

This document contains a shortened version of the datasheet. For the full datasheet, contact [sales@psemi.com](mailto:sales@psemi.com).

## Sales Contact

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