



# EVL2491N-QB-00A

## 32V, 6A, High-Efficiency, Synchronous Step-Down Converter Evaluation Board

### DESCRIPTION

The EVL2491N-QB-00A evaluation board is designed to demonstrate the capabilities of the MP2491N, a fully integrated, high-voltage step-down converter. The MP2491N can achieve 6A of continuous output current ( $I_{OUT}$ ), with excellent load and line regulation across a wide input supply range.

Constant-on-time (COT) control provides fast transient response, easy loop design, and tight output regulation.


Full protection features include over-current protection (OCP), current limiting with hiccup mode, output over-voltage protection (OVP), and thermal shutdown.

The MP2491N requires a minimal number of readily available, standard external components, and is available in a QFN-13 (2.5mmx3mm) package.

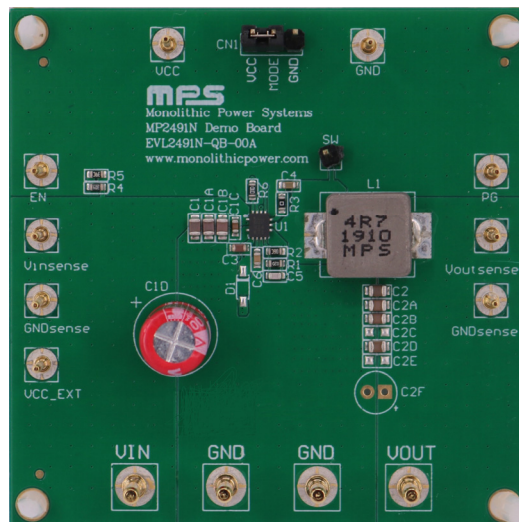
### PERFORMANCE SUMMARY <sup>(1)</sup>

Specifications are at  $T_A = 25^\circ\text{C}$ , unless otherwise noted.

Parameters	Conditions	Value
Input voltage ( $V_{IN}$ ) range		16V to 32V
Output voltage ( $V_{OUT}$ )	$V_{IN} = 16\text{V to }32\text{V}$ , $I_{OUT} = 0\text{A to }6\text{A}$	$V_{OUT} = 5\text{V}$
Maximum output current ( $I_{OUT}$ )	$V_{IN} = 16\text{V to }32\text{V}$	6A
Typical efficiency	$V_{IN} = 24\text{V}$ , $V_{OUT} = 5\text{V}$ , $I_{OUT} = 6\text{A}$	91.9%
Peak efficiency	$V_{IN} = 24\text{V}$ , $V_{OUT} = 5\text{V}$ , $I_{OUT} = 2\text{A}$	94.7%
Switching frequency ( $f_{sw}$ )		540kHz

 Optimized Performance with MPS Inductor MPL-AY1050 Series

### EVL2491N-QB-00A EVALUATION BOARD



LxWxH (6.35cmx6.35cmx1.3cm)

Board Number	MPS IC Number
EVL2491N-QB-00A	MP2491NGQB

## QUICK START GUIDE

The EVL2491N-QB-00A evaluation board is easy to set up and use to evaluate the performance of the MP2491N. For proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. Preset the power supply to 24V, then turn off the power supply.
2. Connect the power supply terminals to:
  - a. Positive (+): VIN
  - b. Negative (-): GND
3. Connect the load terminals to:
  - a. Positive (+): VOUT
  - b. Negative (-): GND
4. After making the connections, turn on the power supply. The board should automatically start up.
5. Check for the proper output voltage ( $V_{OUT}$ ) between the VOUTSENSE and GNDSEN terminals.
6. The converter's default mode is set to automatic pulse-frequency modulation (PFM) and pulse-width modulation (PWM) mode. Select a different mode by adjusting the MODE pin (see Table 1).

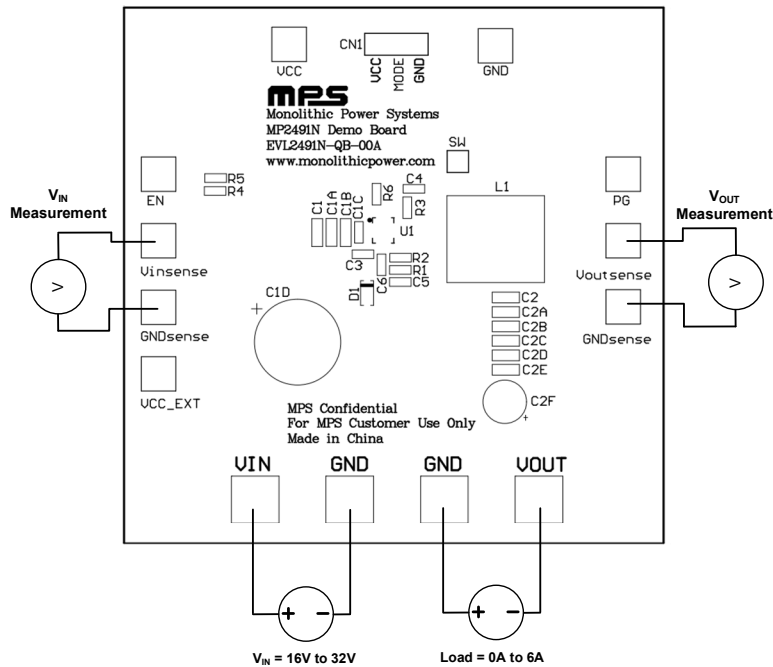
**Table 1: Mode Selection**

Pin Voltage	Mode
0V	Forced PWM
$V_{CC}$	Auto-PFM/PWM

7. Once the proper  $V_{OUT}$  is established, adjust the load within the operating range and measure the efficiency, output ripple voltage, and other parameters.

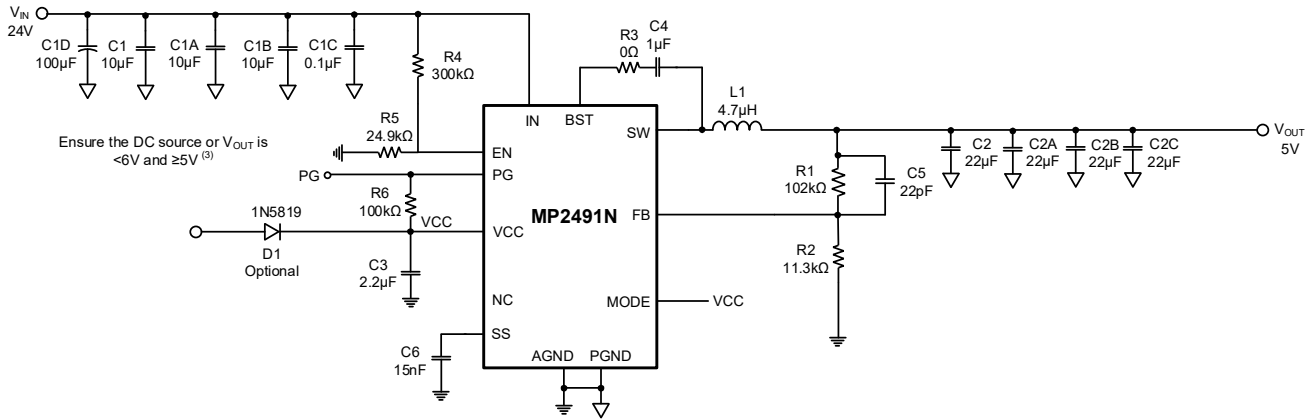
**Note:**

- 1) Ensure that  $V_{IN}$  does not exceed 32V.



**Figure 1: Proper Measurement Equipment Set-Up**

**EVALUATION BOARD SCHEMATIC**



**Figure 2: Evaluation Board Schematic**

**Notes:**

- 2) The EN resistor divider sets the  $V_{IN}$  rising threshold to 16V. For low  $V_{IN}$  applications, change R5.
- 3) D1 is an optional diode that can be used to achieve high efficiency under light loads.

**EVL2491N-QB-00A BILL OF MATERIALS**

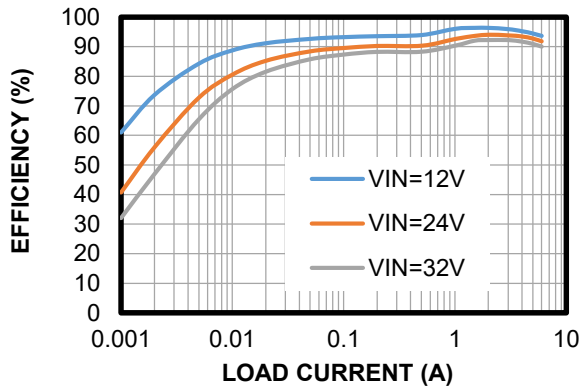
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
3	C1, C1A, C1B	10 $\mu$ F	Ceramic capacitor, 35V, X5R	0805	Murata	GRM21BR61E106KA43L
1	C1C	100nF	Ceramic capacitor, 50V, X7R	0603	Samsung	CL05B104KB5NNNC
1	C1D	100 $\mu$ F	Electrolytic capacitor, 50V	DIP	Würth	860010674014
4	C2, C2A, C2B, C2C	22 $\mu$ F	Ceramic capacitor, 25V, X5R	0805	Murata	GRM31CR61E226KE15L
1	C3	2.2 $\mu$ F	Ceramic capacitor, 16V, X7S	0603	Murata	GRM188C71C225KE11D
1	C4	1 $\mu$ F	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71A105KA61D
1	C5	22pF	Ceramic capacitor, 50V, C0G	0603	Murata	GRM1885C1H220JA01D
1	C6	15nF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H153KA01D
1	R1	102k $\Omega$	Film resistor, 1%	0603	Yageo	RC0603FR-07102KL
1	R6	100k $\Omega$	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R2	11.3k $\Omega$	Film resistor, 1%	0603	Yageo	RC0603FR-0711K3L
1	R3	0 $\Omega$	Film resistor, 1%	0603	Yageo	RC0603FR-070RL
1	R4	300k $\Omega$	Film resistor, 1%	0603	Yageo	RC0603FR-07300KL
1	R5	24.9k $\Omega$	Film resistor, 1%	0603	Yageo	RC0603FR-0724K9L
1	D1	NS				
1	L1	MPL-AY1050-4R7	Inductor, 4.7 $\mu$ H, D <sub>CR</sub> = 9.5m $\Omega$ , I <sub>SAT</sub> = 15A	11mmx 10mmx 4.8mm	MPS	MPL-AY1050-4R7
1	U1	MP2491 N	32V, 6A, synchronous step-down converter	QFN-13 (2.5mmx 3mm)	MPS	MP2491NGQB

## EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board.  $V_{IN} = 24V$ ,  $V_{OUT} = 5V$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

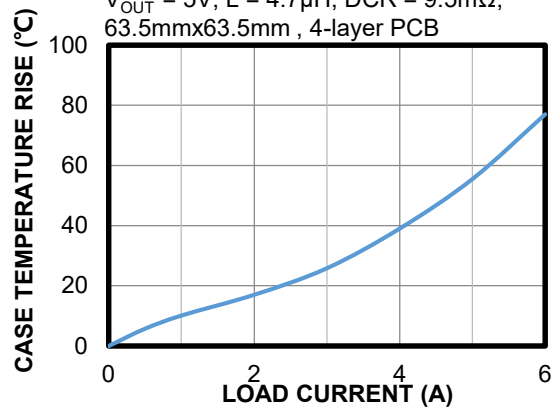
**Efficiency vs. Load Current**

$V_{OUT} = 5V$ ,  $L = 4.7\mu H$ ,  $DCR = 9.5m\Omega$



**Case Temperature Rise vs. Load Current**

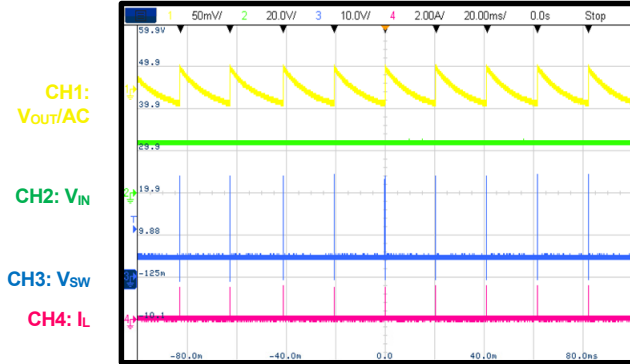
$V_{OUT} = 5V$ ,  $L = 4.7\mu H$ ,  $DCR = 9.5m\Omega$ ,  
63.5mmx63.5mm, 4-layer PCB



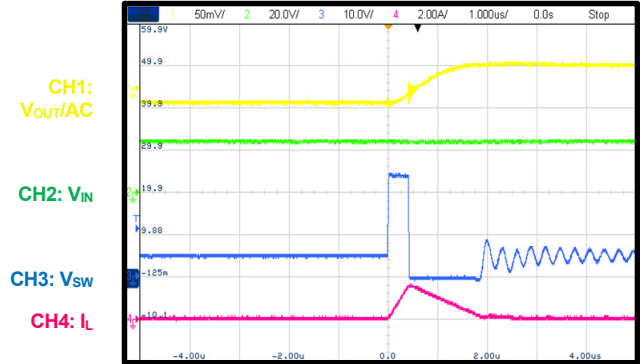
**EVB TEST RESULTS (continued)**

Performance curves and waveforms are tested on the evaluation board.  $V_{IN} = 24V$ ,  $V_{OUT} = 5V$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

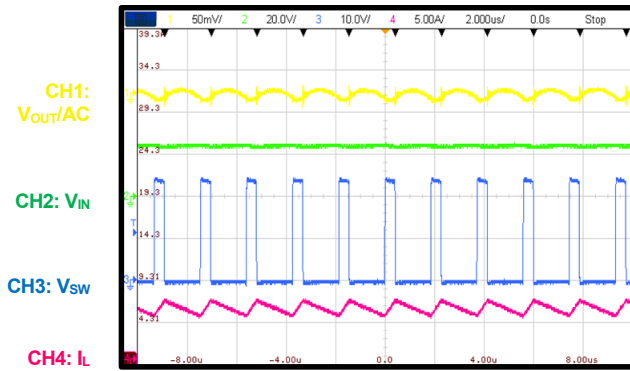
**Output Voltage Ripple**  
 $V_{IN} = 24V$ ,  $V_{OUT} = 5V$ ,  $I_{OUT} = 0A$



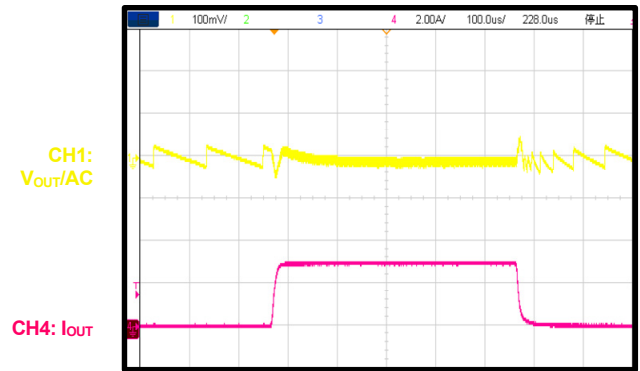
**Output Voltage Ripple**  
 $V_{IN} = 24V$ ,  $V_{OUT} = 5V$ ,  $I_{OUT} = 0A$



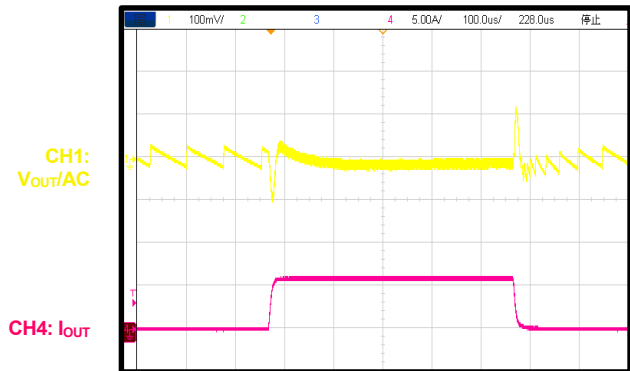
**Output Voltage Ripple**  
 $V_{IN} = 24V$ ,  $V_{OUT} = 5V$ ,  $I_{OUT} = 6A$



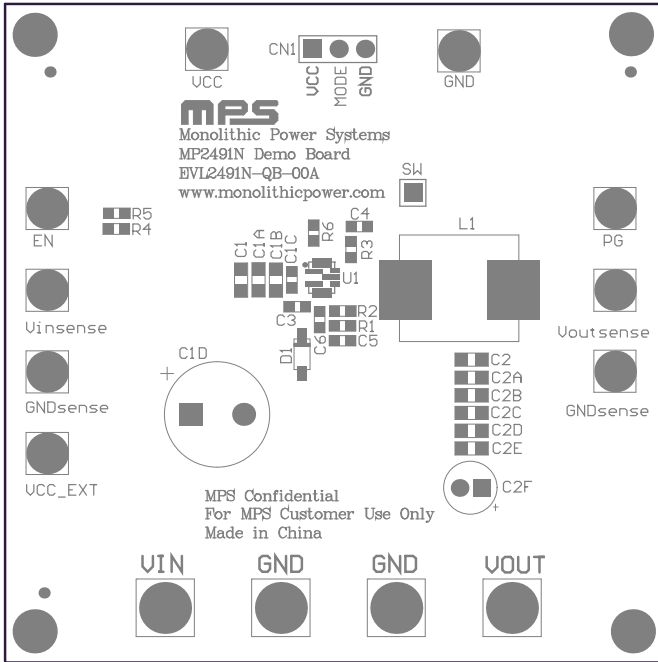
**Load Transient Response**  
 $V_{IN} = 24V$ ,  $V_{OUT} = 5V$ ,  $I_{OUT} = 0A$  to  $3A$ ,  $2.5A/\mu s$  with e-load



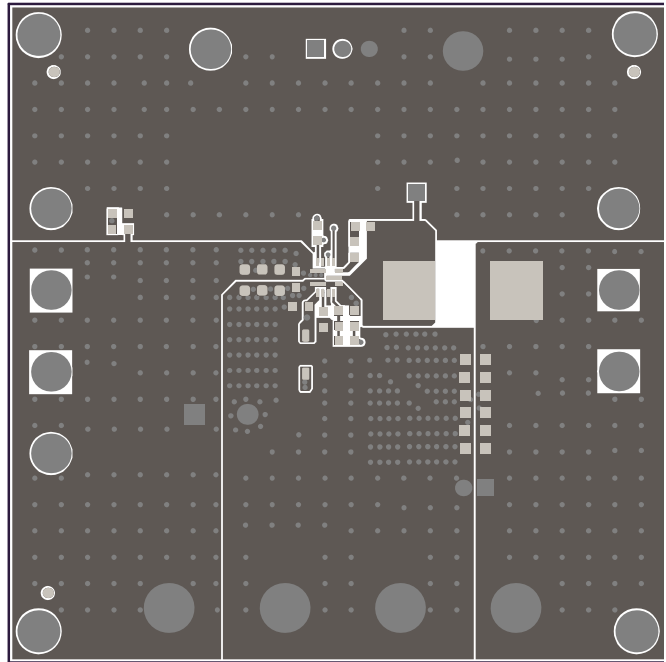
**Load Transient Response**  
 $V_{IN} = 24V$ ,  $V_{OUT} = 5V$ ,  $I_{OUT} = 0A$  to  $6A$ ,  $2.5A/\mu s$  with e-load



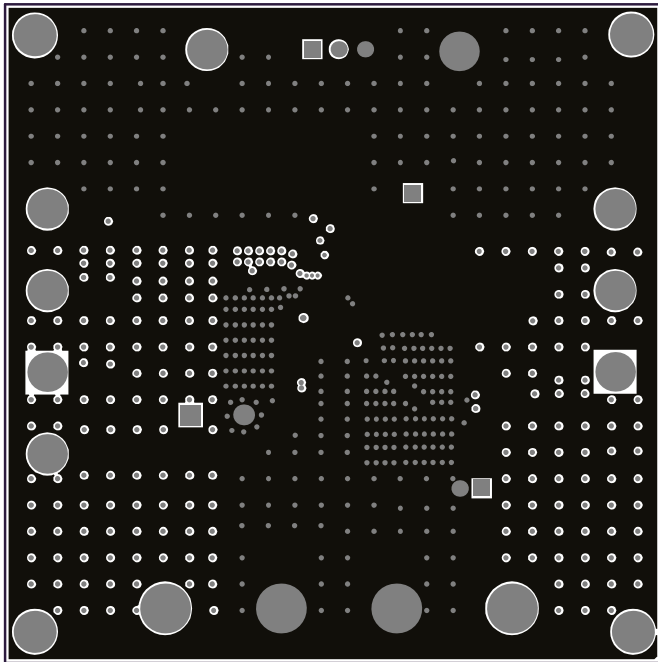
**PCB LAYOUT**



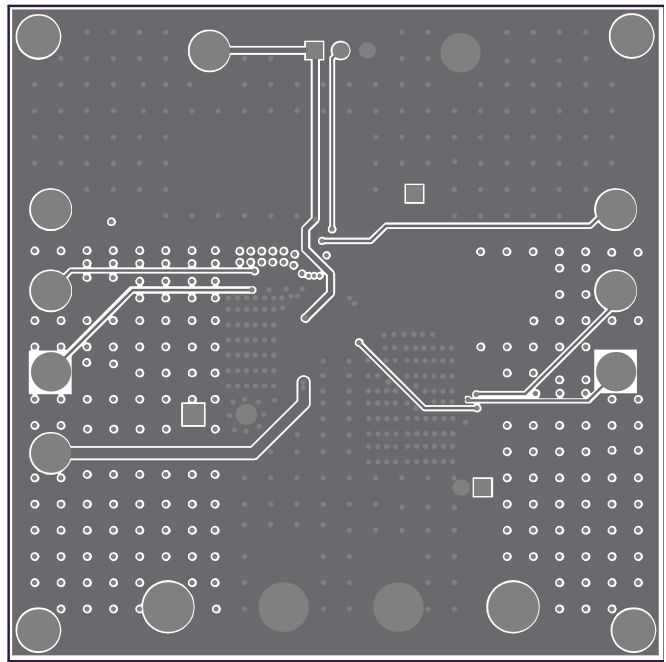
**Figure 3: Top Silk**



**Figure 4: Top Layer**

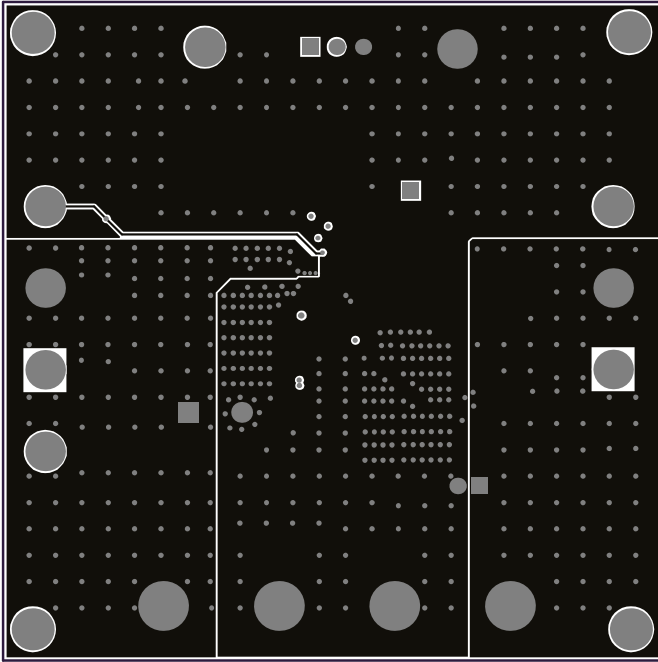


**Figure 5: Mid-Layer 1**



**Figure 6: Mid-Layer 2**

**PCB LAYOUT** (*continued*)



**Figure 7: Bottom Layer**