



The Future of Analog IC Technology®

# EV3428-L-00A

17A, 600kHz, 20V Wide Input Synchronous  
Boost Converter EV Board

## DESCRIPTION

The EV3428-L-00A Evaluation Board is designed to demonstrate the performances of MPS' MP3428, which can provide 25W load from 3.3V input.

The MP3428 is a 600 kHz fixed frequency, high efficiency, wide input range, current mode boost converter with optional internal or external current sensing configuration for high integration or high power application. It features internally a 10mΩ, 24V power switch and a synchronous gate driver for high conversion efficiency. The MP3428 is available in a low profile 22-pin 3mmx4mm QFN package.

This board is configured for 12V application, the maximum output current is determined by current limit or permitted temperature performance.

## ELECTRICAL SPECIFICATION

| Parameter      | Symbol    | Value                 | Units |
|----------------|-----------|-----------------------|-------|
| Supply Voltage | $V_{IN}$  | 3 – 10                | V     |
| Output Voltage | $V_{OUT}$ | 12                    | V     |
| Output Current | $I_{OUT}$ | 0– OCP <sup>(1)</sup> | A     |

### Notes:

1) High load power will lead to high IC temperature. Load power should be limited based on temperature performance even current limit is not triggered.

## FEATURES

- 3V-to-20V Wide Input Range
- Integrated 10mΩ Low-side Power FET
- SDR Driver for Synchronous Solution
- >17A Switch Current Limit if Sense Current Internally
- Up to 96% efficiency
- Optional Internal/External Current Sensing Configuration
- External Soft-Start and Compensation for Higher Flexibility
- Programmable UVLO and Hysteresis
- < 1μA Shutdown Current
- Thermal Shutdown at 150°C
- Available in 3x4mm QFN-22 Package

## PACKAGE APPLICATIONS

- Thunderbolt Interface
- Notebook and Tablet
- Bluetooth Audio
- Power Banks
- Fuel Cells
- POS Systems

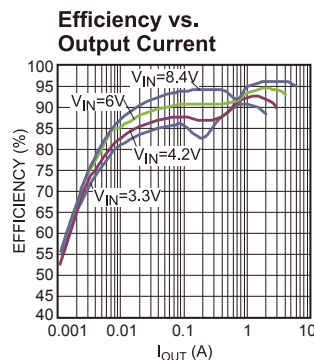
All MPS parts are lead-free and adhere to the RoHS directive. For MPS green status, please visit MPS website under Products, Quality Assurance page.

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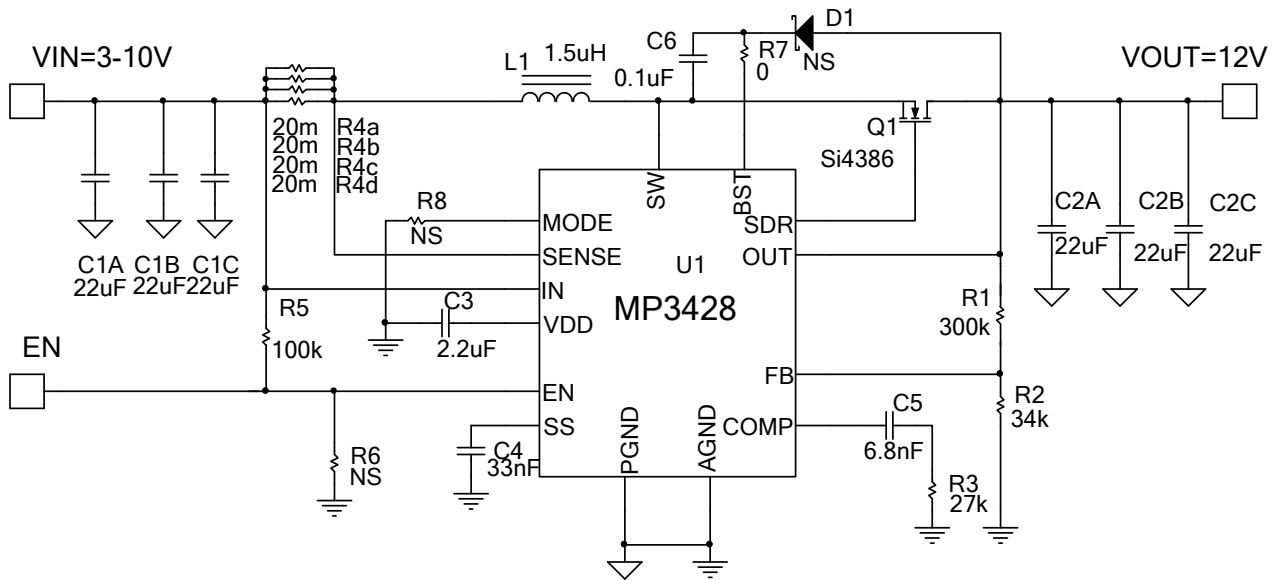
## EV3428-L-00A EVALUATION BOARD



|                                   |               |
|-----------------------------------|---------------|
| (L × W × H) 6.3cm × 6.3cm × 1.3cm |               |
| Board Number                      | MPS IC Number |
| EV3428-L-00A                      | MP3428GL      |



## EVALUATION BOARD SCHEMATIC



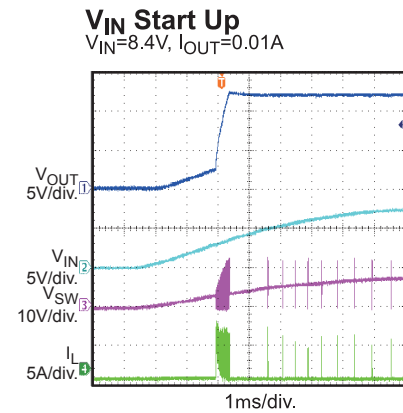
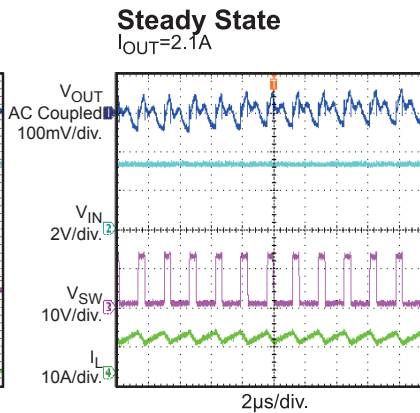
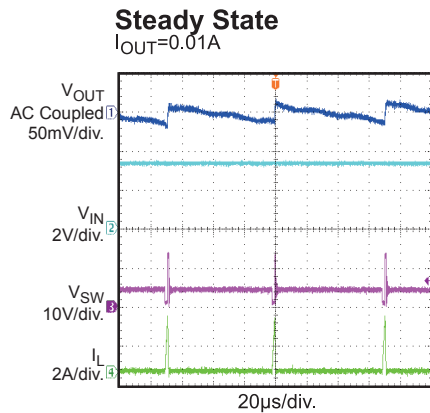
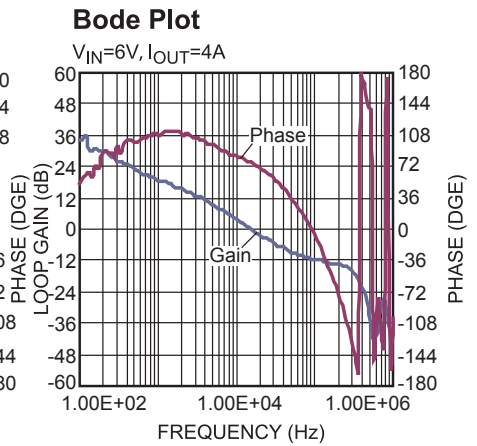
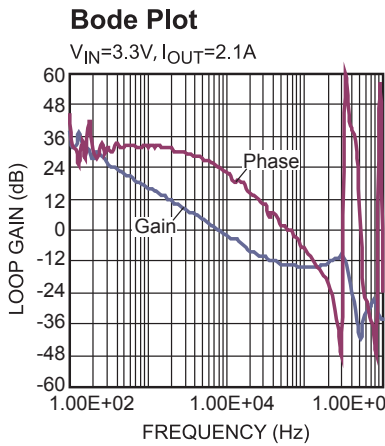
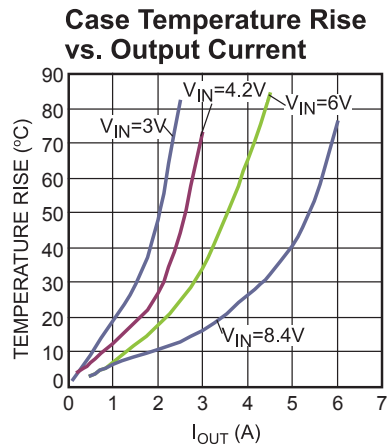
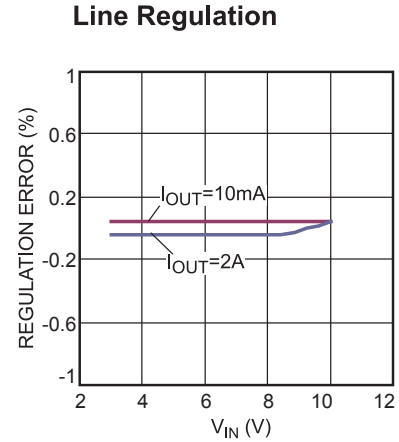
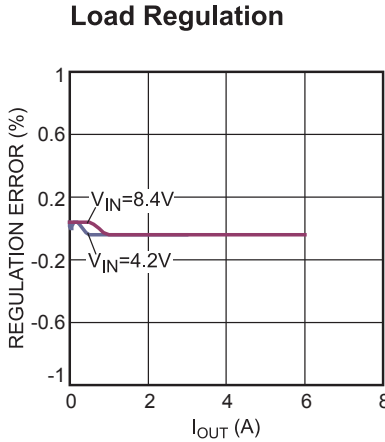
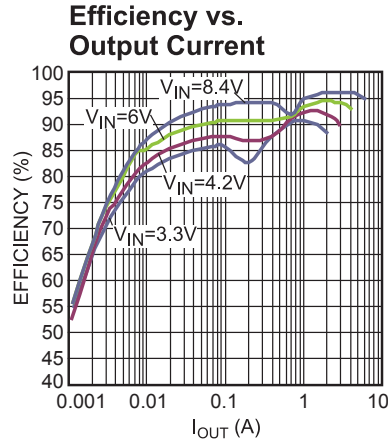
## EV3428-L-00A BILL OF MATERIALS

| Qty | Value  | Designator                   | Description                        | Manufacturer | Manufacturer P/N  | Package   |
|-----|--------|------------------------------|------------------------------------|--------------|-------------------|-----------|
| 6   | 22µF   | C1A, C1B, C1C, C2A, C2B, C2C | 25V, ceramic Capacitor             | muRata       | GRM32R71E226KL    | 1210      |
| 1   | 2.2µF  | C3                           | 25V, ceramic Capacitor             | muRata       | GRM21AR71E225KL   | 0805      |
| 1   | 33nF   | C4                           | 50V ceramic capacitor              | muRata       | GRM188R71H333KL   | 0603      |
| 1   | 6.8nF  | C5                           | 50V ceramic capacitor              | muRata       | GRM188R71H682KL   | 0603      |
| 1   | 0.1µF  | C6                           | 50V, ceramic Capacitor             | muRata       | GRM188R71H104KL   | 0603      |
| 1   | 300k   | R1                           | Film resistor, 1%                  | YAGEO        | RC0603FR-07300KL  | 0603      |
| 1   | 34k    | R2                           | Film resistor, 1%                  | YAGEO        | RC0603FR-0734KL   | 0603      |
| 1   | 27k    | R3                           | Film resistor, 1%                  | YAGEO        | RC0603FR-0727KL   | 0603      |
| 4   | 20m    | R4a, R4b, R4c, R4d           | low ohmic Film resistor, 1%        | YAGEO        | PR0805FKF070R020L | 0805      |
| 1   | 100k   | R5                           | Film resistor, 5%                  | YAGEO        | RC0603JR-07100KL  | 0603      |
| 0   | NS     | R6, R8                       |                                    |              |                   | 0603      |
| 1   | 0      | R7                           | Film resistor, 5%                  | YAGEO        | RC0603JR-070RL    | 0603      |
| 0   | NS     | D1                           |                                    |              |                   | SOD-323   |
| 1   | 1.5µH  | L1                           | 6.6mOhm, 14A inductor              | Würth        | 744311150         | SMD       |
| 1   | Si4386 | Q1                           | 30V, 8mOhm 15A, N-Channel MOS      | VISHAY       | Si4386DY          | SOIC8     |
| 1   | MP3428 | U1                           | 3~20V, 17A, 600kHz boost converter | MPS          | MP3428GL          | QFN22-3*4 |

## EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

$V_{IN} = 3.3V$ ,  $V_{OUT} = 12V$ ,  $I_{OUT}=2.1A$ ,  $L = 1.5\mu H$ ,  $T_A = 25^\circ C$ ,  $MODE=float$ ,  $R_{SENSE}=5m\Omega$ , unless otherwise noted.



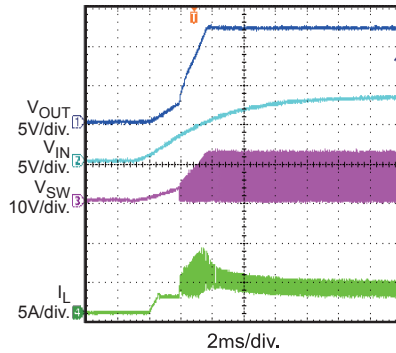
## EVB TEST RESULTS (continued)

Performance waveforms are tested on the evaluation board.

$V_{IN} = 3.3V$ ,  $V_{OUT} = 12V$ ,  $I_{OUT} = 2.1A$ ,  $L = 1.5\mu H$ ,  $T_A = 25^\circ C$ ,  $MODE = float$ ,  $R_{SENSE} = 5m\Omega$ , unless otherwise noted.

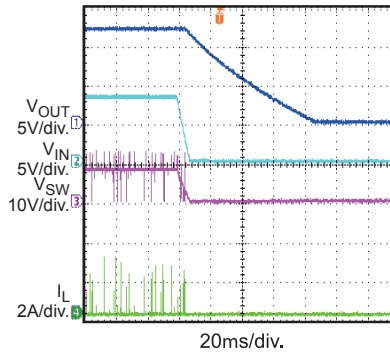
**$V_{IN}$  Start Up**

$V_{IN} = 8.4V$ ,  $I_{OUT} = 2.1A$



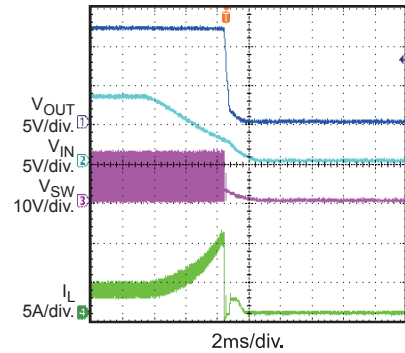
**$V_{IN}$  Shutdown**

$V_{IN} = 8.4V$ ,  $I_{OUT} = 0.01A$



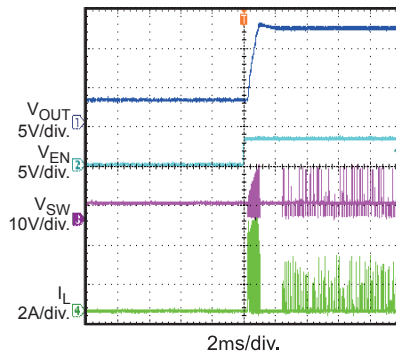
**$V_{IN}$  Shutdown**

$V_{IN} = 8.4V$ ,  $I_{OUT} = 2.1A$



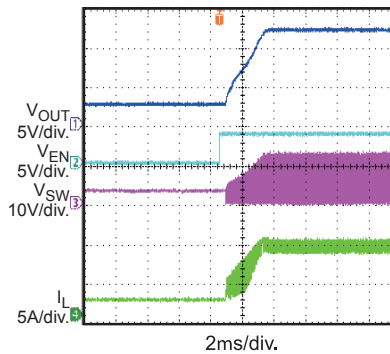
**EN Start Up**

$I_{OUT} = 0.01A$



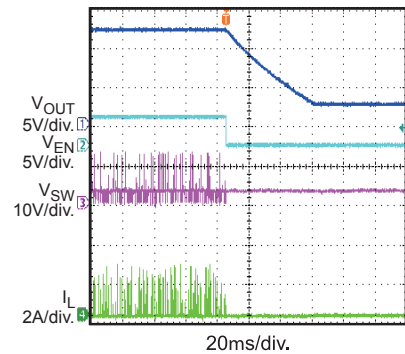
**EN Start Up**

$I_{OUT} = 2.1A$



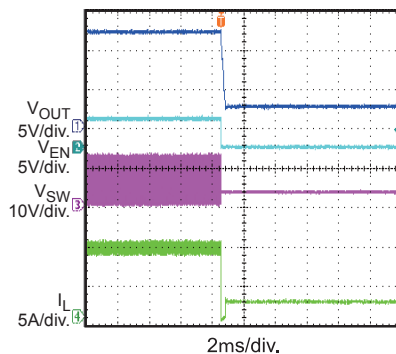
**EN Shutdown**

$I_{OUT} = 0.01A$



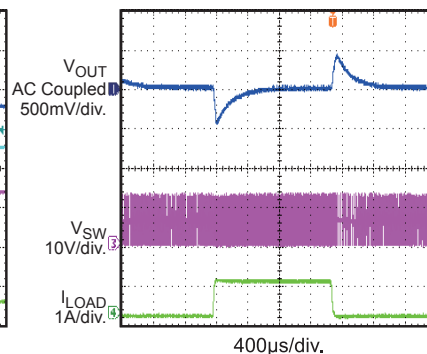
**EN Shutdown**

$I_{OUT} = 2.1A$



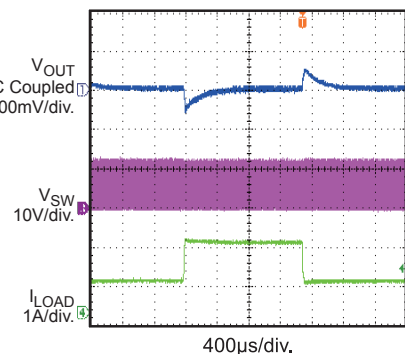
**Load Transient**

$V_{IN} = 6V$ ,  $I_{OUT} = 0.1 \rightarrow 1A @ 80mA/\mu s$



**Load Transient**

$V_{IN} = 6V$ ,  $I_{OUT} = 1 \rightarrow 2A @ 80mA/\mu s$



## PRINTED CIRCUIT BOARD LAYOUT

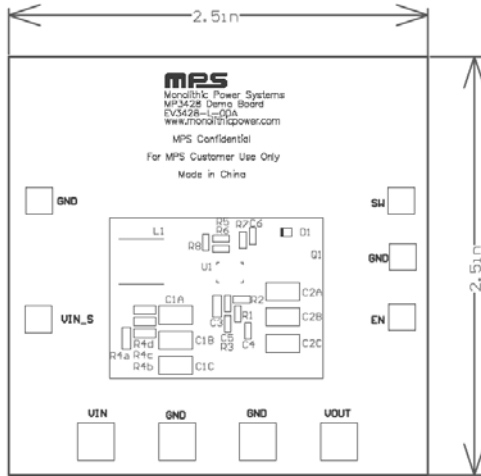


Figure 1: Top Silkscreen Layer

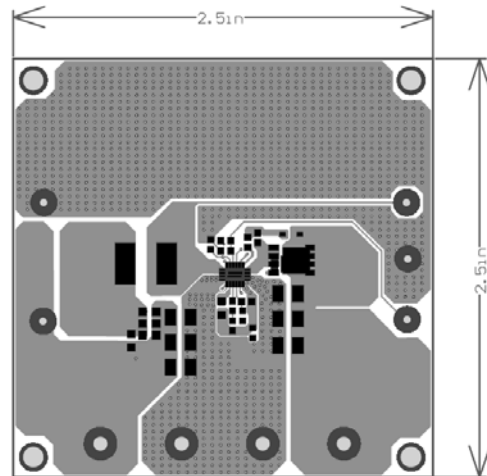


Figure 2: Top Layer

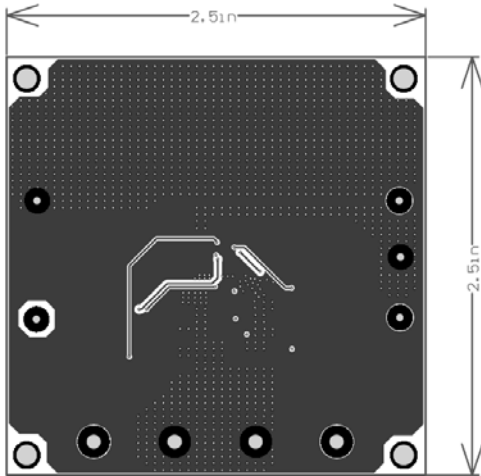


Figure 3: Middle Layer 1

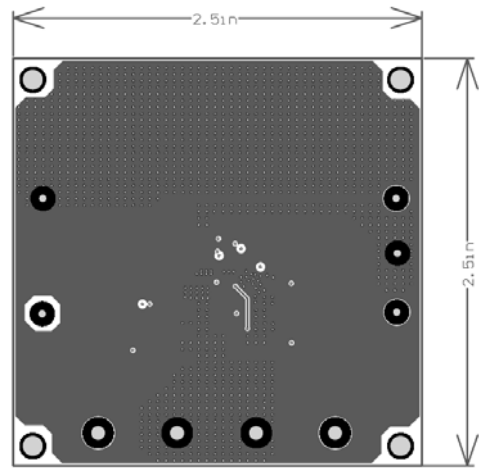


Figure 4: Middle Layer 2

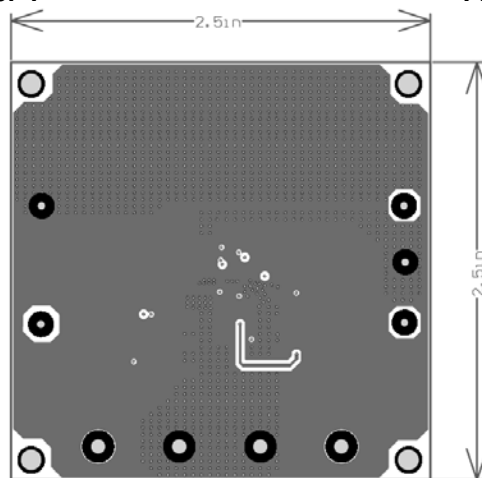


Figure 5: Bottom Layer

## QUICK START GUIDE

The output voltage of this board is set to 12V. The board layout accommodates most commonly used inductors and output capacitors. With an input ranging from 3V to 10V, this board can provide load up to 25W. To use this EVB for evaluation, you can do as below:

1. Preset Power Supply to between 3V and 10V.
2. Turn Power Supply off.
3. Preset Load to a value, for example, 1.5A.
4. Connect Power Supply terminals to:
  - a. Positive (+): VIN
  - b. Negative (-): GND
  - c. Connect Load to:
  - d. Positive (+): VOUT
  - e. Negative (-): GND
5. Turn Power Supply on after making connections. The MP3428 will automatically startup to work.

The output voltage VOUT can be programmed by changing R2. And the value of R2 can be calculated by the following formula:

$$R2 = R1 \times \frac{V_{FB}}{V_{OUT} - V_{FB}}$$

Where  $R1=300k\Omega$ , and  $V_{FB}=1.225V$ .

If EN function is preferred, apply a high level ( $>1.39V$ ) turns on MP3428, low level ( $<0.4V$ ) turns off MP3428. After being turned off, output voltage will be discharged to equal to  $V_{in}$  due to load.

The default configuration of this board is using external sensing resistor. To use the internal sensing block, first shut off power supply, then connect MODE pin (find it by looking for R8 on the board) to GND through R8 of which the value should be  $0\Omega$ . After power-on, MP3428 automatically uses internal sensing resistor.

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