



# EVQ8633B-H-LE-00A

## High-Efficiency, 16V, 20A, Synchronous Step-Down Converter Evaluation Board

### DESCRIPTION

The EVQ8633B-H-LE-00A is an evaluation board for the MPQ8633B-H, which is a high-efficiency, monolithic, synchronous, step-down converter.

The EVQ8633B-H-LE-00A can deliver 20A of continuous load current over a wide operating input range. High efficiency can be achieved over a wide output current load range.

The MPQ8633B-H utilizes an internally compensated constant-on-time (COT) control mode that provides fast transient response and eases loop stabilization.

This EVB can be turned on or off via a remote on/off input (EN) referenced to ground. This input is compatible with popular logic devices.

### ELECTRICAL SPECIFICATIONS

| Parameter      | Symbol    | Value   | Units |
|----------------|-----------|---------|-------|
| Input voltage  | $V_{IN}$  | 8 to 16 | V     |
| Output voltage | $V_{OUT}$ | 1       | V     |
| Output current | $I_{OUT}$ | 20      | A     |

### FEATURES

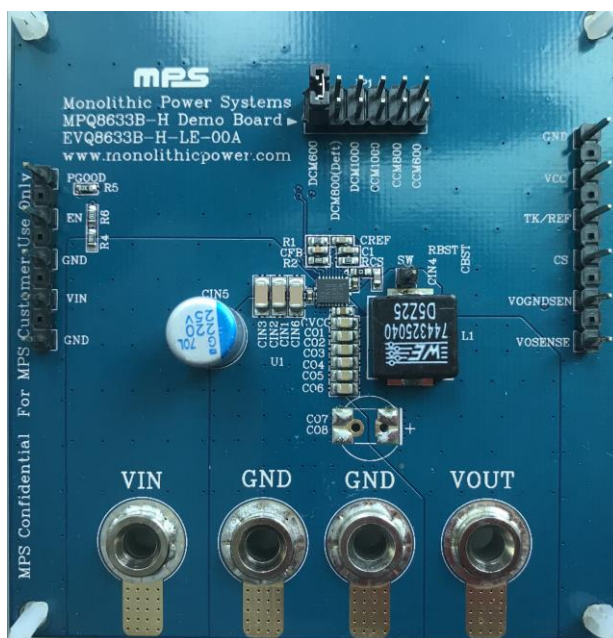
- Wide Input Voltage Range from 2.7V:
  - 2.7V to 16V with External 3.3V VCC Bias
  - 4V to 16V with Internal VCC Bias or External 3.3V VCC Bias
- Differential Output Voltage Remote Sense
- Programmable Accurate Current Limit Level
- 20A Output Current
- Low  $R_{DS(ON)}$  Integrated Power MOSFETs
- Proprietary Switching Loss Reduction Technique
- Adaptive COT Control for Ultra-Fast Transient Response
- Stable with Zero-ESR Output Capacitor
- 0.5% Reference Voltage across 0°C to +70°C  $T_J$  Range, 1% Reference Voltage across -40°C to +125°C  $T_J$  Range, Selectable Pulse-Skip Mode or Forced CCM
- Excellent Load Regulation
- Output Voltage Tracking, Output Voltage Discharge
- PGOOD Active Clamped Low during Power Failure
- Programmable Soft-Start Time from 1ms
- Pre-Biased Start-Up
- Selectable Switching Frequency: 600kHz, 800kHz, or 1000kHz
- Non-Latch OCP, UVP, UVLO, OVP, and Thermal Shutdown
- Output Adjustable from 0.6V to 90%  $\times V_{IN}$ , Up to 5.5V Max
- Available in a QFN-21 (3mmx4mm) Package

### APPLICATIONS

- Telecom and Networking Systems
- Servers, Cloud Computing, and Storage
- Base Stations
- General-Purpose Point of Load (PoL)
- 12V Distribution Power Systems
- High-End TVs
- Game Consoles and Graphics Cards

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## EVQ8633B-H-LE-00A EVALUATION BOARD



(LxWxH) 81.3mmx77.5mmx1.6mm

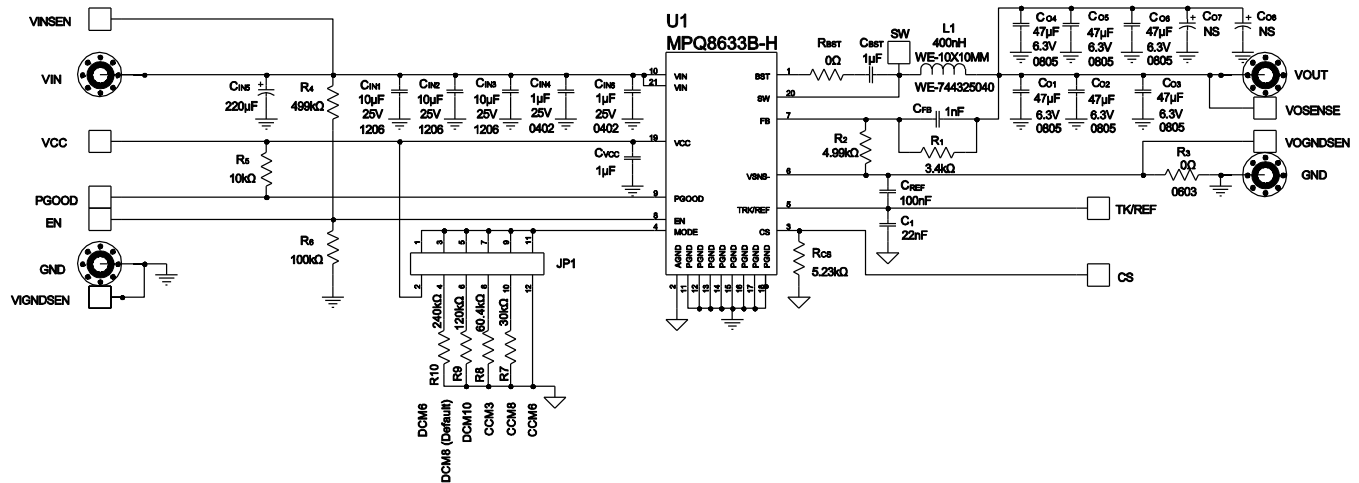
| Board Number      | MPS IC Number |
|-------------------|---------------|
| EVQ8633B-H-LE-00A | MPQ8633B-HGLE |

## QUICK START GUIDE

The input voltage of the evaluation board can range from 8V to 16V. The minimum 8V input voltage is limited by the EN signal, which is derived from VIN through a resistor divider (R4 and R6). A lower input voltage (as low as 2.7V) can be set by fine-tuning the resistor divider values or by overdriving EN with an external control signal. Follow the steps below to turn on the evaluation board:

1. Preset the power supply output voltage between 8V and 16V, then turn the power supply off.
2. Connect the load to:
  - a. Positive (+): VOUT
  - b. Negative (-): GND
3. Connect the power supply terminals to:
  - a. Positive (+): VIN
  - b. Negative (-): GND
4. Ensure that the power supply has a high enough current limit to supply the power, then turn the power supply on. The EVQ8633B-H-LE-00A should start up automatically.
5. To use the enable function, apply a digital input to the EN pin. Drive EN above 1.5V to turn the regulator on; drive EN below 1V to turn it off.
6. Use R1 and R2 to set the output voltage with  $V_{FB} = 0.6V$ . Refer to the Application Information section in the MPQ8633B-H datasheet to select the proper values for R1, R2, the inductor, and the output capacitor when the output voltage is changed.
7. Use the JP1 jumper to select the switching frequency (600kHz, 800kHz, or 1000kHz) and the light-load operation mode (pulse-skip mode, or forced continuous conduction mode).

## EVALUATION BOARD SCHEMATIC



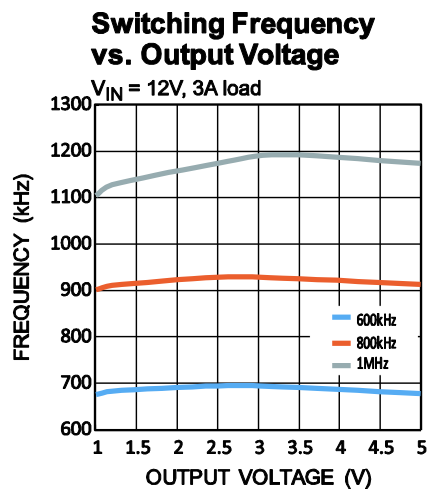
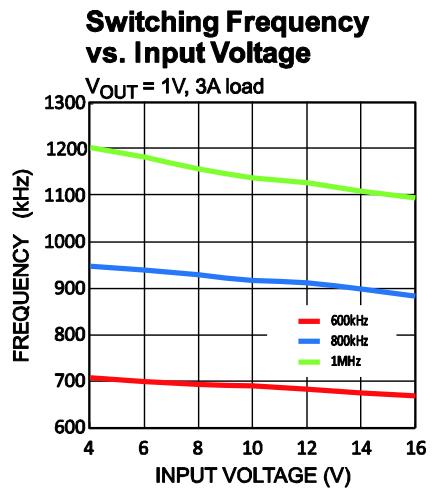
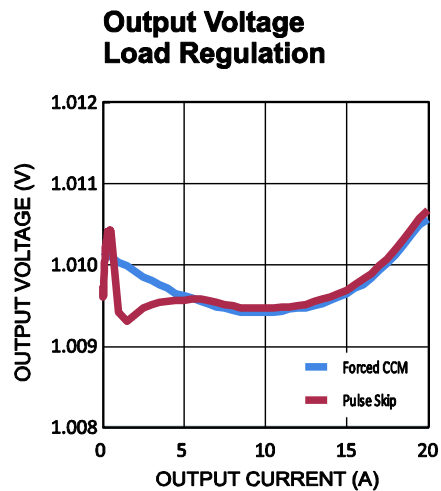
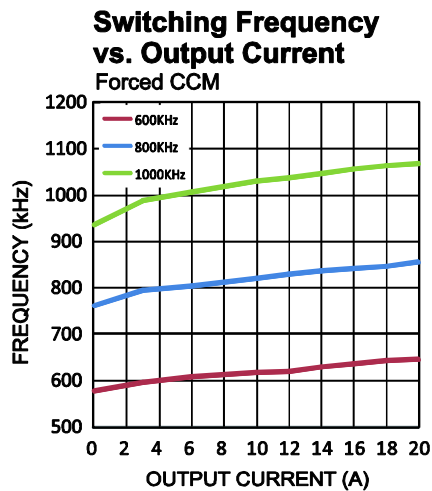
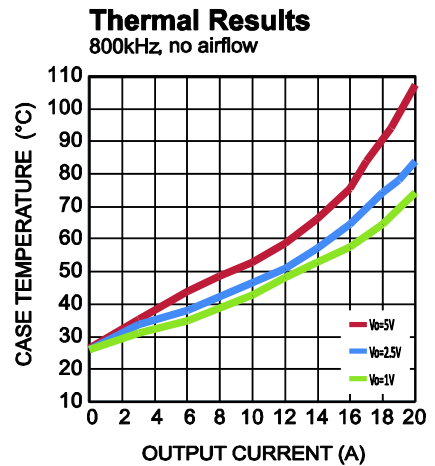
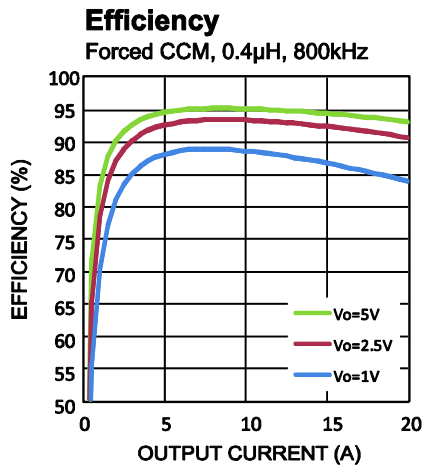
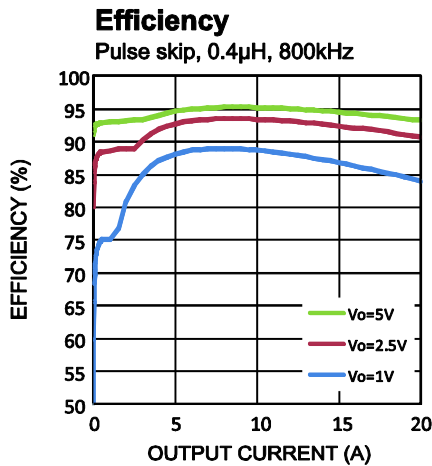
### Figure 1: Evaluation Board Schematic

## EVQ8633B-H-LE-00A BILL OF MATERIALS

| Qty | Ref                          | Value          | Description                                        | Package          | Manufacturer         | Part Number        |
|-----|------------------------------|----------------|----------------------------------------------------|------------------|----------------------|--------------------|
| 1   | C1                           | 22nF           | Capacitor, 25V, 10%, X7R                           | CAP0603          | Generic              |                    |
| 2   | CBST, CVCC                   | 1 $\mu$ F      | Ceramic capacitor, 1 $\mu$ F, 6.3V, 10%, X7R 0603  | CAP0603          | Generic              |                    |
| 1   | CFB                          | 1nF            | Capacitor, 50V, 10%, X7R                           | CAP0603          | Generic              |                    |
| 3   | CIN1, CIN2, CIN3             | 10 $\mu$ F     | Capacitor, 25V, X7R, 10%                           | CAP1206          | Murata or generic    | GRM31CR71E106KA12L |
| 2   | CIN4, CIN6                   | 1 $\mu$ F/ 25V | Ceramic capacitor, 1 $\mu$ F, 25V, 10%, X6S 0402   | CAP0402          | Murata or generic    | GRM155C81E105KE11D |
| 1   | CIN5                         | 220 $\mu$ F    | 220 $\mu$ F, 25V, 16m $\Omega$ , ESR               | D8P3.5mm         | Chemi-Con or generic | APSG250ELL221MHB5S |
| 6   | CO1, CO2, CO3, CO4, CO5, CO6 | 47 $\mu$ F     | Capacitor, 6.3V, X5R, 20%                          | CAP0805          | Murata or generic    | GRM21BR60J476ME15L |
| 1   | CO7                          | NS             |                                                    | D2               |                      |                    |
| 1   | CO8                          | NS             |                                                    | D8P3.5mm         |                      |                    |
| 1   | CREF                         | 100nF          | Ceramic capacitor, 0.1 $\mu$ F, 25V, 10%, X7R 0603 | CAP0603          | Generic              |                    |
| 1   | L1                           | 0.4 $\mu$ H    | Inductor                                           | 10mmx10mm        | Würth or generic     | WE-744325040       |
| 1   | R1                           | 3.4k $\Omega$  | Film resistor, 1%                                  | 0603             | Generic              |                    |
| 1   | R2                           | 4.99k $\Omega$ | Film resistor, 1%                                  | 0603             | Generic              |                    |
| 2   | R3, RBST                     | 0 $\Omega$     | Film resistor, 5%                                  | 0603             | Generic              |                    |
| 1   | R4                           | 499k $\Omega$  | Film resistor, 1%                                  | 0603             | Generic              |                    |
| 1   | R5                           | 10k $\Omega$   | Film resistor, 1%                                  | 0603             | Generic              |                    |
| 1   | R6                           | 100k $\Omega$  | Film resistor, 1%                                  | 0603             | Generic              |                    |
| 1   | R7                           | 30k $\Omega$   | Film resistor, 1%                                  | 0603             | Generic              |                    |
| 1   | R8                           | 60.4k $\Omega$ | Film resistor, 1%                                  | 0603             | Generic              |                    |
| 1   | R9                           | 120k $\Omega$  | Film resistor, 1%                                  | 0603             | Generic              |                    |
| 1   | R10                          | 240k $\Omega$  | Film resistor, 1%                                  |                  | Generic              |                    |
| 1   | RCS                          | 5.23k $\Omega$ | Film resistor, 1%                                  | 0603             | Generic              |                    |
| 1   | U1                           | MPQ8633B       | 16V/20A, step-down converter                       | QFN-21 (3mmx4mm) | MPS                  | MQ8633B-HGLE       |

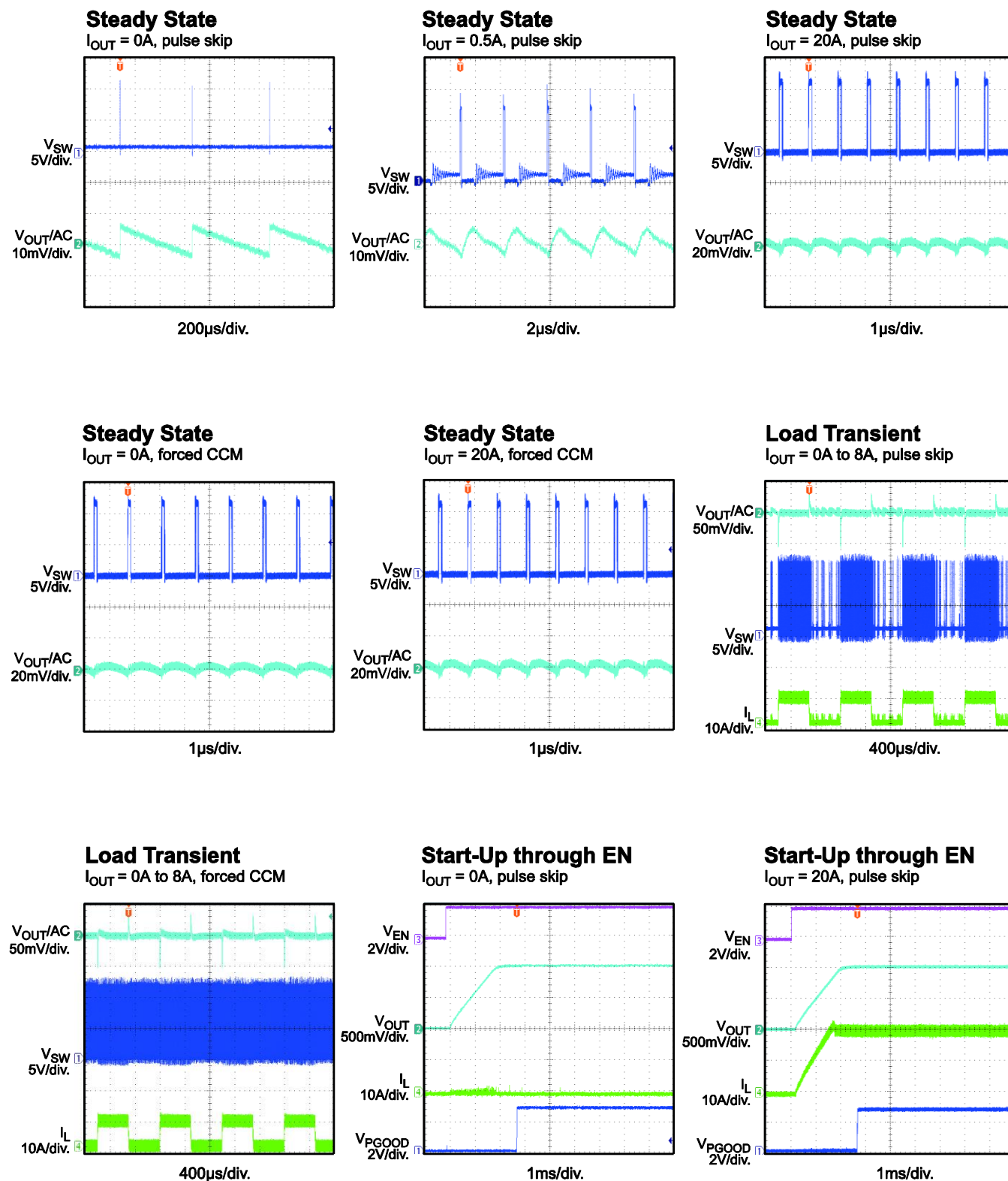
## EVB TEST RESULTS

Performance waveforms are tested on the EVQ8633B-H-LE-00A evaluation board.  $V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 400nH$ ,  $T_A = 25^{\circ}C$ , unless otherwise noted.



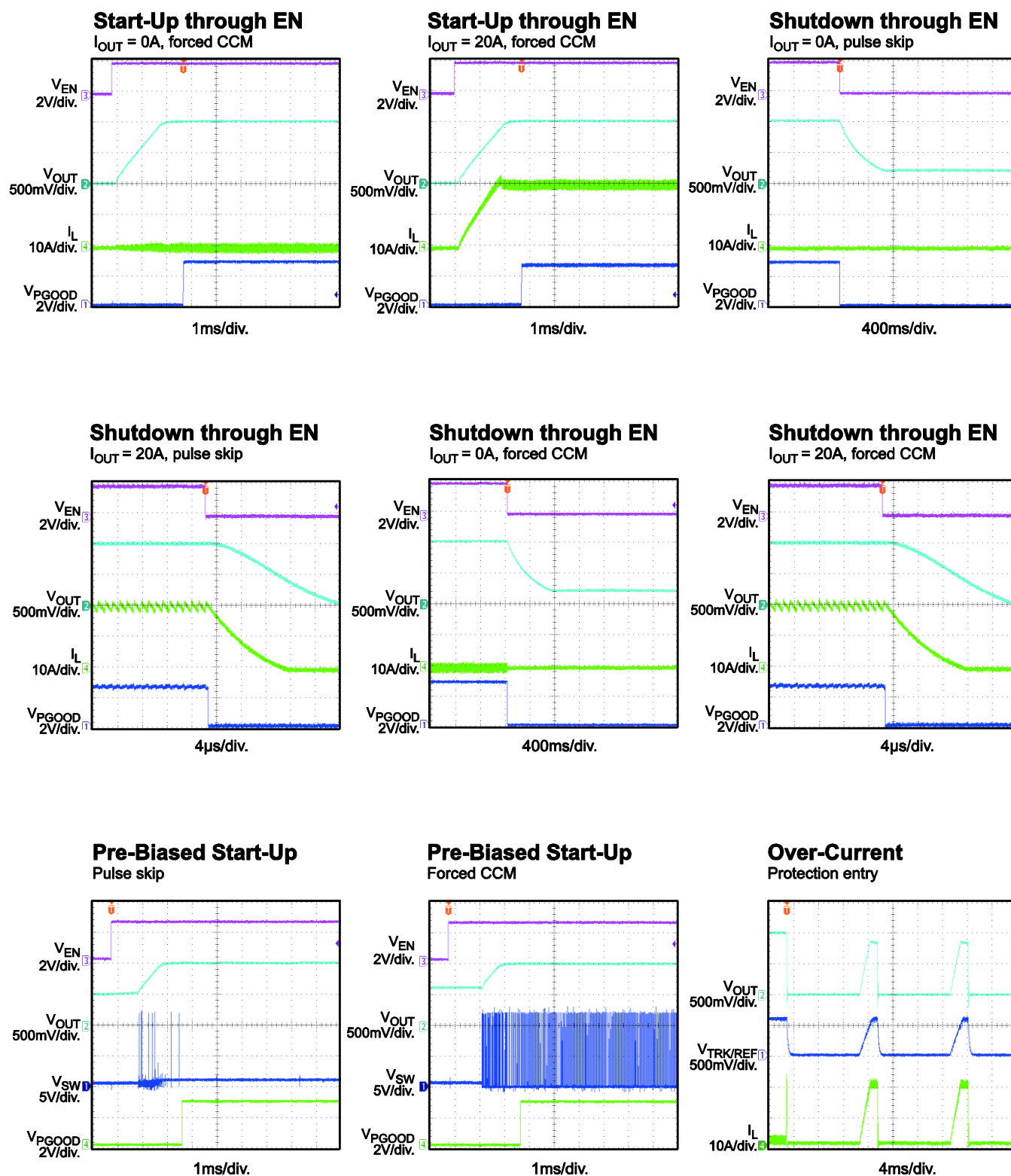
# EVB TEST RESULTS (continued)

Performance waveforms are tested on the EVQ8633B-H-LE-00A evaluation board.  $V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 400nH$ ,  $T_A = 25^{\circ}C$ , unless otherwise noted.



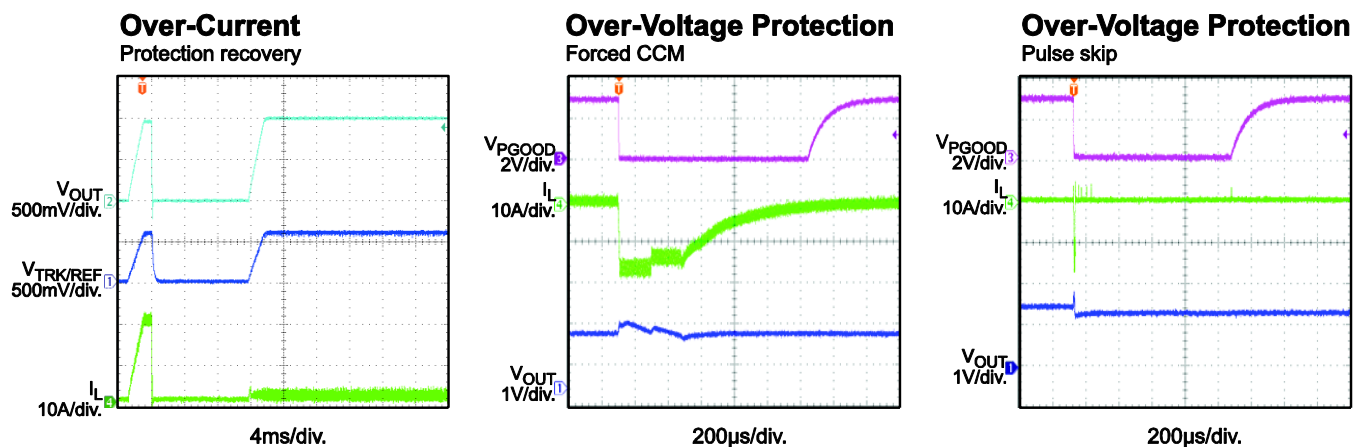
# EVB TEST RESULTS (continued)

Performance waveforms are tested on the EVQ8633B-H-LE-00A evaluation board.  $V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 400nH$ ,  $T_A = 25^{\circ}C$ , unless otherwise noted.



## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the EVQ8633B-H-LE-00A evaluation board.  $V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 400nH$ ,  $T_A = 25^{\circ}C$ , unless otherwise noted.



## PCB LAYOUT

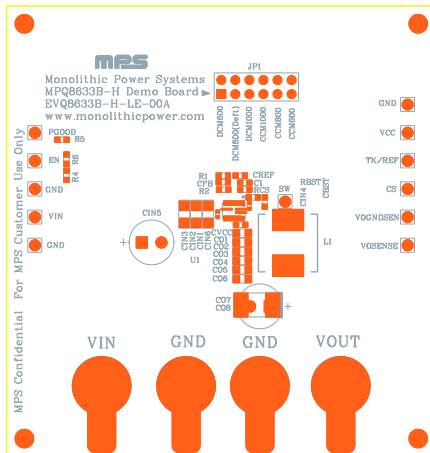


Figure 1: Top Silk Layer

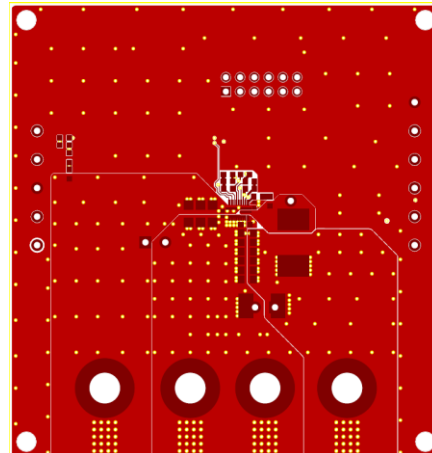


Figure 2: Top Layer

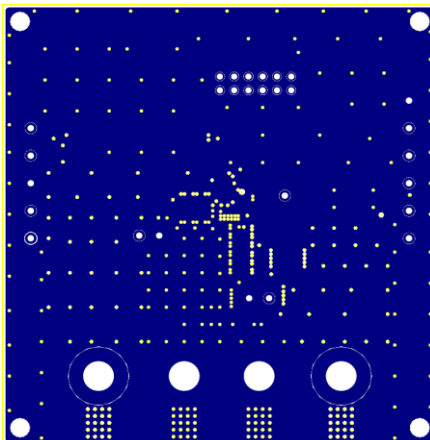


Figure 3: Inner Layer 1

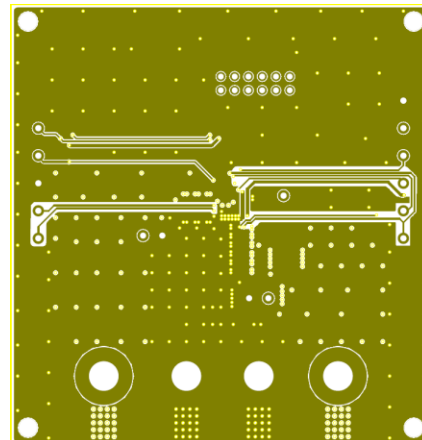


Figure 4: Inner Layer 2

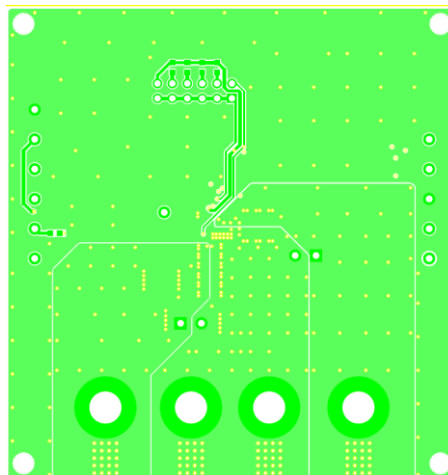


Figure 5: Bottom Layer

## Revision History

| Revision # | Revision Date | Description     | Pages Updated |
|------------|---------------|-----------------|---------------|
| 1.0        | 9/14/2020     | Initial Release | -             |

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