The Future of Analog IC Technology

EVQ8633A-LE-01A

High Efficiency, 16V, 12A Synchronous Step-Down Converter Evaluation Board

DESCRIPTION

The EVQ8633A-LE-01A is an evaluation board for the MPQ8633A, a high efficiency, monolithic, synchronous step-down converter.

The EV board can deliver 12A continuous load current over a wide operating input range. High efficiency can be achieved over a wide output current load range.

The MPQ8633A adopts internally compensated constant-on-time (COT) control mode that provides fast transient response and eases loop stabilization.

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

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	8-16	V
Output Voltage	V_{OUT}	1.2	V
Output Current	I_{OUT}	12	A

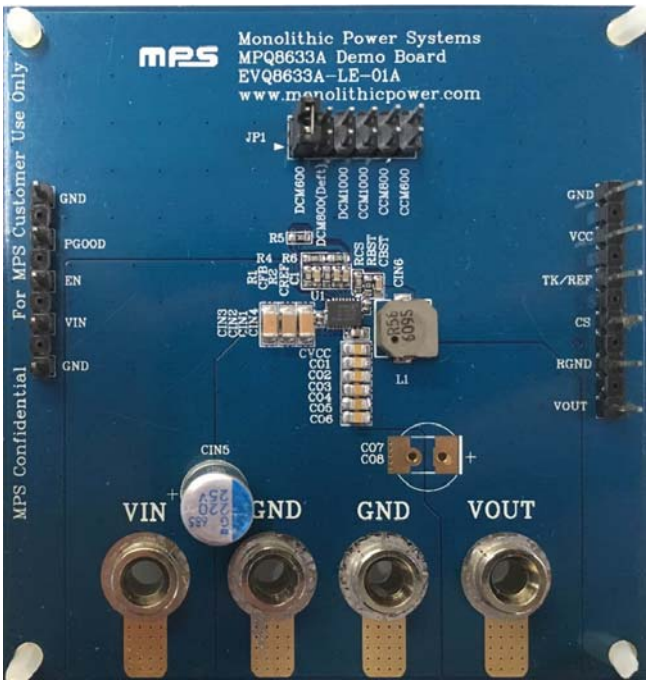
FEATURES

- 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
- 12A Output Current
- Low R_{DS}(ON) Integrated Power MOSFETs
- Proprietary Switching Loss Reduction Technique
- Adaptive COT for Ultrafast Transient Response
- Stable with Zero-ESR Output Capacitor
- 0.5% Reference Voltage Over 0°C to +70°C Junction Temperature Range
- 1% Reference Voltage Over -40°C to +125°C Junction Temperature Range
- Selectable Pulse-Skip or Forced-CCM Operation
- Excellent Load Regulation
- Output Voltage Tracking
- Output Voltage Discharge
- PGOOD Active Clamped Low Level during Power Failure
- Programmable Soft Start Time from 1ms
- Pre-Bias Start up
- Selectable Switching Frequency of 600kHz, 800kHz and 1000kHz
  Non-latch OCP, UVP, UVLO, Thermal Shutdown, and Latch-off for OVP
- Output Adjustable from 0.6V to 90%*Vin, Up to 5.5V max.
- Available in a QFN3X4 mm Package

APPLICATIONS

- Telecom and Networking Systems
- Server, Cloud-Computing, Storage
- Base Stations
- General Purpose Point-of-Load (PoL)
- 12V Distribution Power Systems
- High-end TV
- Game Consoles and Graphic Cards

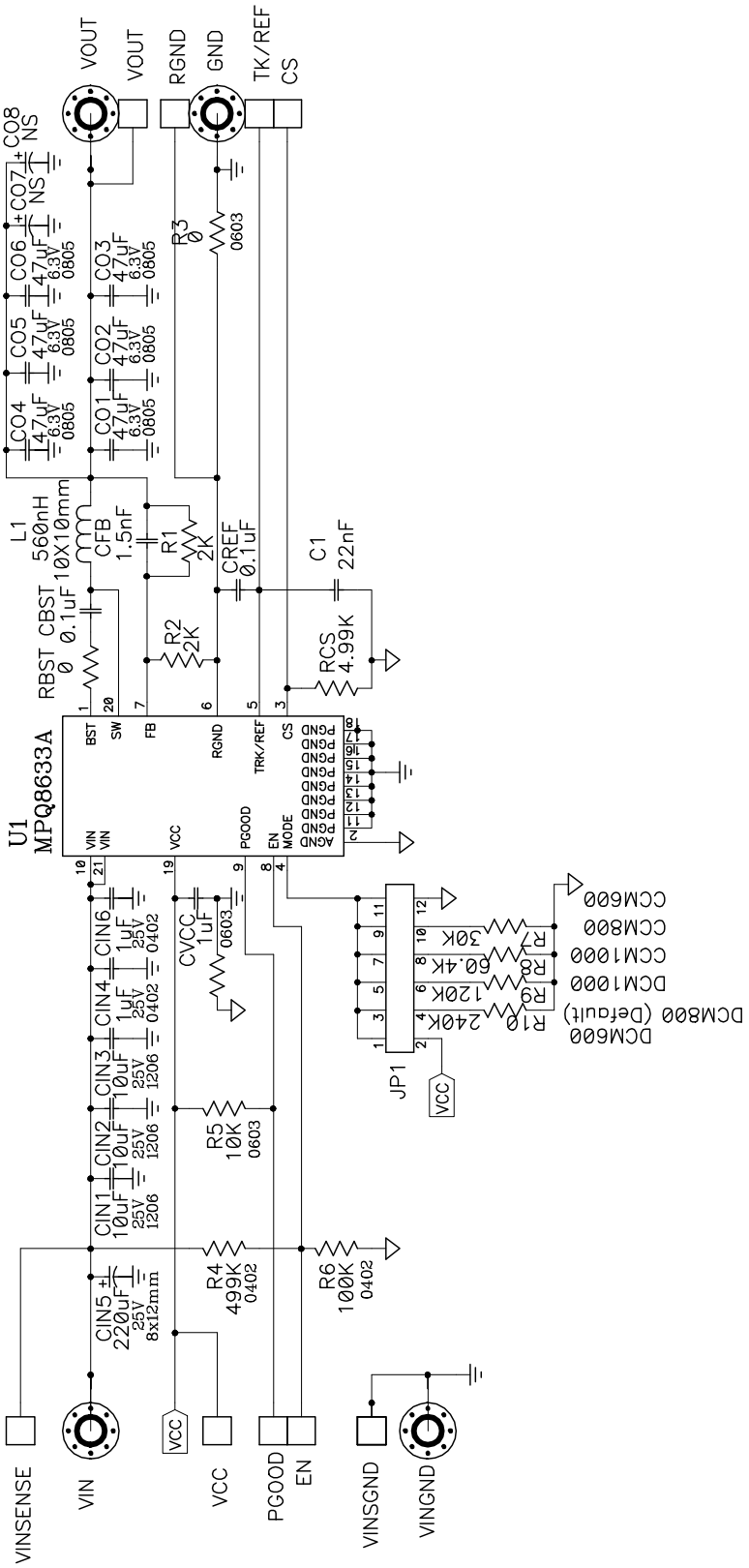
EVQ8633A-LE-01A EVALUATION BOARD



(L x W x H)81.3 mm x 77.5mm x 1.6 mm)

Board Number	MPS IC Number
EVQ8633A-LE-01A	MPQ8633AGLE

EVALUATION BOARD SCHEMATIC



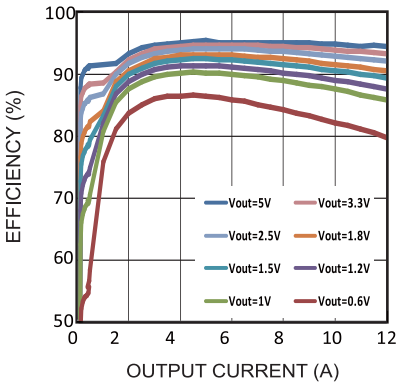
EVQ8633A-LE-01A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	C1	22nF	CAP, 25V, 10%, X7R	CAP0603	Generic	
2	CBST, CREF	0.1μF	CAP CER 0.1μF 25V 10% X7R 0603	CAP0603	Generic	
1	CFB	1.5nF	CAP, 50V, 10%, X7R	CAP0603	Generic	
3	CIN1, CIN2, CIN3	10μF	Capacitor, 25V, X7R, 10%	CAP1206	Murata or Generic	GRM31CR71E106KA12L
2	CIN4, CIN6	1μF/25V	CAP CER 1μF 25V 10% X6S 0402	CAP0402	Murata or Generic	GRM155C81E105KE11D
1	CIN5	220μF	220μF, 25V, 16mOhm ESR	D8P3.5mm	Chemi-Con or Generic	APSG250ELL221MHB5S
6	CO1, CO2, CO3, CO4, CO5, CO6	47μF	CAP, 6.3V, X5R, 20%	CAP0805	Murata or Generic	GRM21BR60J476ME15L
1	CO7	NS		D2		
1	CO8	NS		D8P3.5mm		
1	CVCC	1μF	CAP CER 1μF 6.3V 10% X7R 0603	CAP0603	Generic	
1	L1	560nH	Inductor ,14A, 2.8mΩ	7x7mm	TOKO or Generic	FCUL0630-H-R56M
2	R1, R2	2k	Film Res., 1%	0603	Generic	
2	R3, RBST	0	Film Res., 5%	0603	Generic	
1	R4	499k	Film Res., 1%	0603	Generic	
1	R5	10k	Film Res., 1%	0603	Generic	
1	R6	100k	Film Res., 1%	0603	Generic	
1	R7	30k	Film Res., 1%	0603	Generic	
1	R8	60.4k	Film Res., 1%	0603	Generic	
1	R9	120k	Film Res., 1%	0603	Generic	
1	R10	240k	Film Res., 1%		Generic	
1	RCS	4.99k	Film Res., 1%	0603	Generic	
1	U1	MQ8633AGLE	16V/12A Step Down Convert	QFN21-3x4mm	MPS	MQ8633AGLE

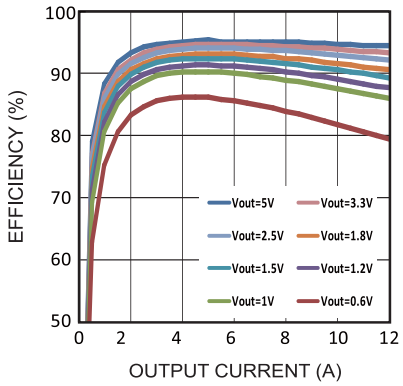
EVB TEST RESULTS

Performance waveforms are tested on the EVQ8633A-LE-01A evaluation board.
V_{IN} = 12V, V_{OUT} = 1.2V, L = 560nH, T_A = +25ºC, unless otherwise noted.

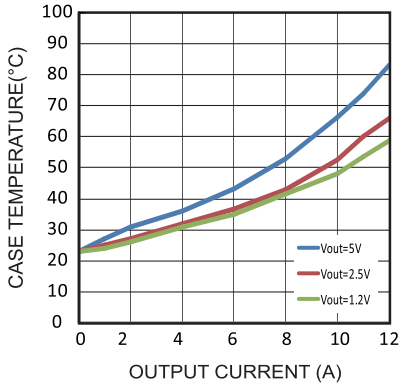
Efficiency
Pulse Skip, 1.1uH, 800kHz



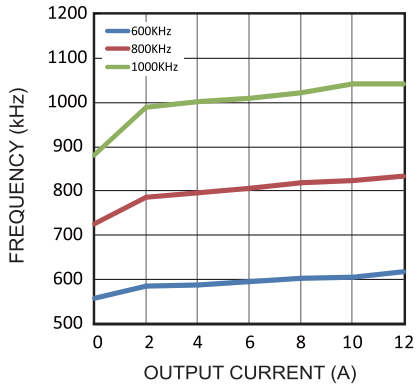
Efficiency
Forced CCM, 1.1uH, 800kHz



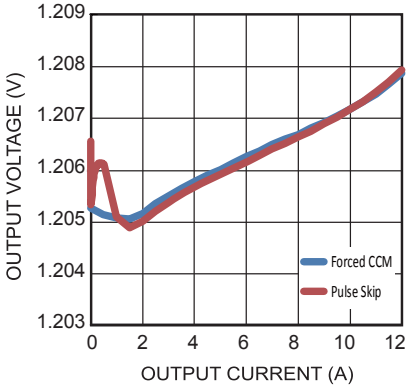
Thermal Results
800kHz, No air-flow



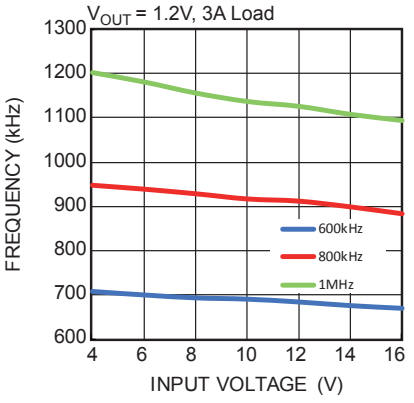
Switching Frequency vs. Output Current
Forced CCM



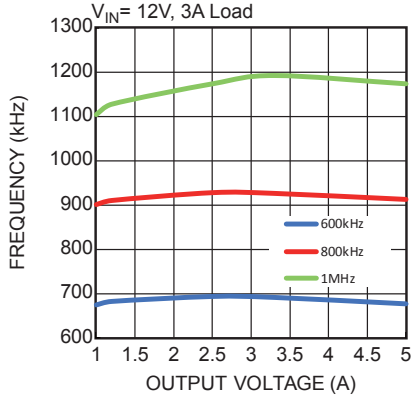
Output Voltage Load Regulation



Switching Frequency vs. Input Voltage
V_{OUT} = 1.2V, 3A Load



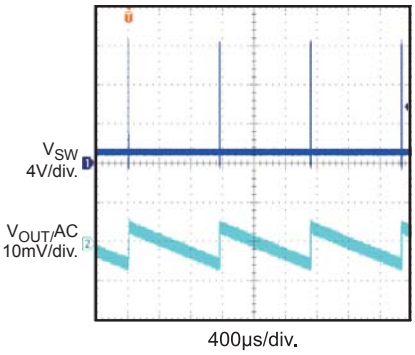
Switching Frequency vs. Input Voltage
V_{IN}= 12V, 3A Load



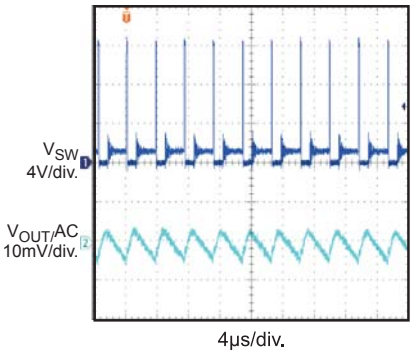
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the EVQ8633A-LE-01A evaluation board.
V_{IN} = 12V, V_{OUT} = 1.2V, L = 560nH, T_A = +25ºC, unless otherwise noted.

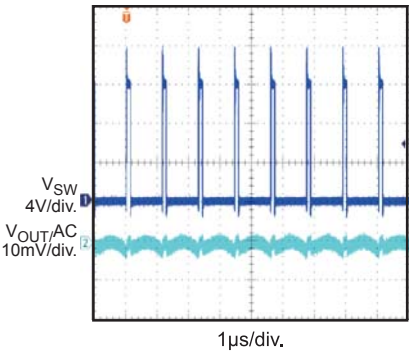
Steady State
I_{OUT} = 0A, Pulse Skip



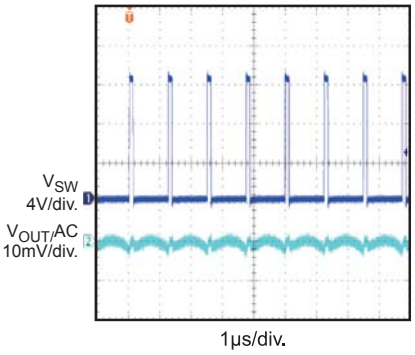
Steady State
I_{OUT} = 0.5A, Pulse Skip



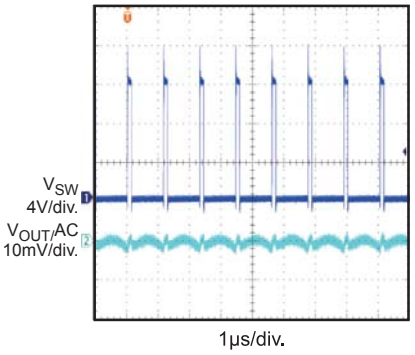
Steady State
I_{OUT} = 12A, Pulse Skip



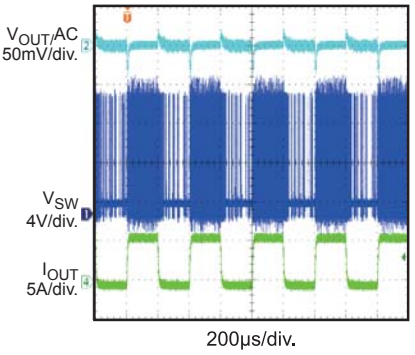
Steady State
I_{OUT} = 0A, Forced CCM



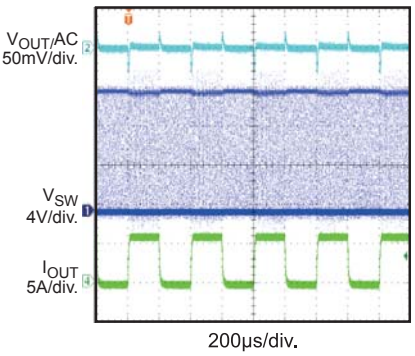
Steady State
I_{OUT} = 12A, Forced CCM



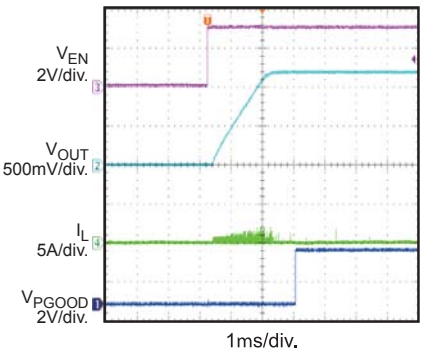
Load Transient
I_{OUT} = 0A-6A, Pulse Skip



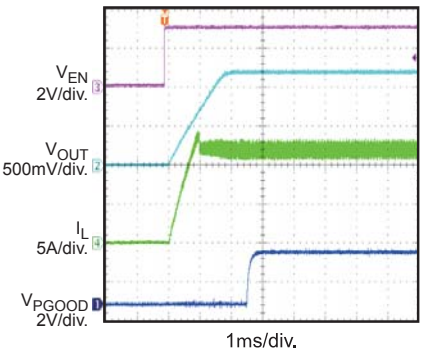
Load Transient
I_{OUT} = 0A-6A, Forced CCM



Power Up through EN
I_{OUT} = 0A, Pulse Skip



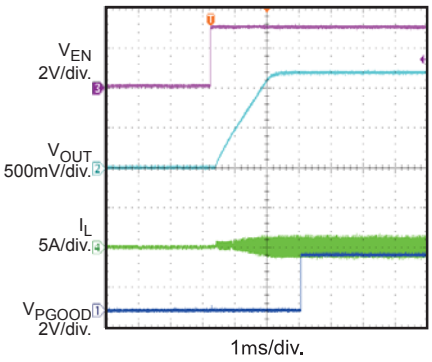
Power Up through EN
I_{OUT} = 12A, Pulse Skip



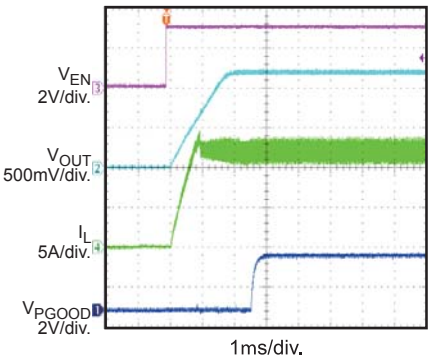
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the EVQ8633A-LE-01A evaluation board.
V_{IN} = 12V, V_{OUT} = 1.2V, L = 560nH, T_A = +25ºC, unless otherwise noted.

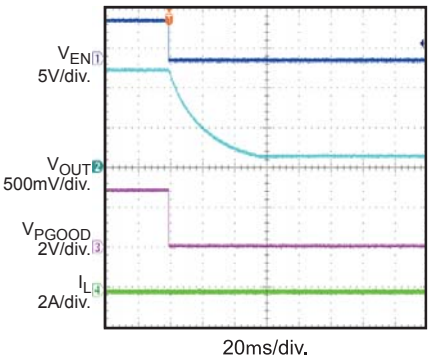
Power Up through EN
I_{OUT} = 0A, Forced CCM



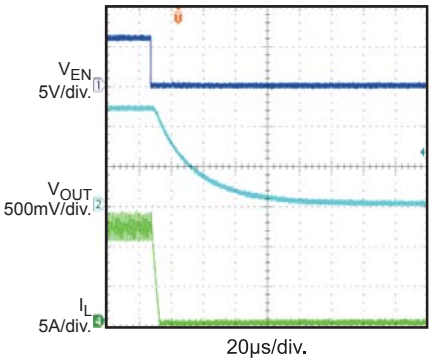
Power Up through EN
I_{OUT} = 12A, Forced CCM



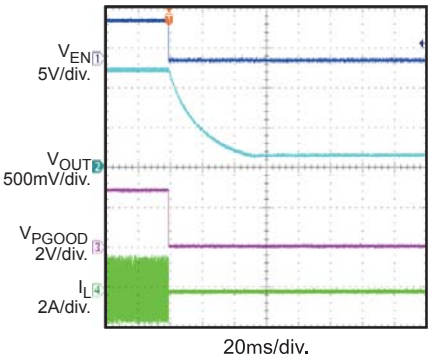
Power Down through EN
I_{OUT} = 0A, Pulse Skip



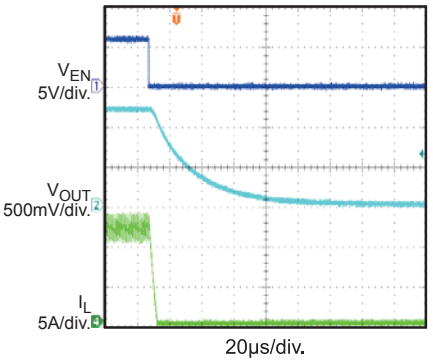
Power Down through EN
I_{OUT} = 12A, Pulse Skip



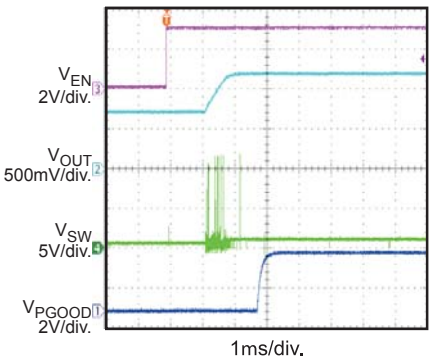
Power Down through EN
I_{OUT} = 0A, Forced CCM



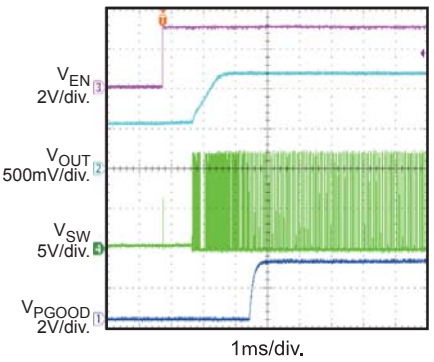
Power Down through EN
I_{OUT} = 12A, Forced CCM



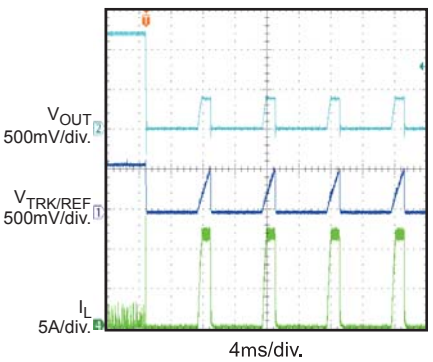
Pre-bias Start Up
Pulse Skip



Pre-bias Start Up
Forced CCM



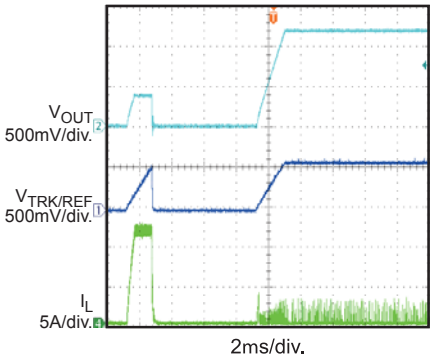
Over-Current Protection Entry



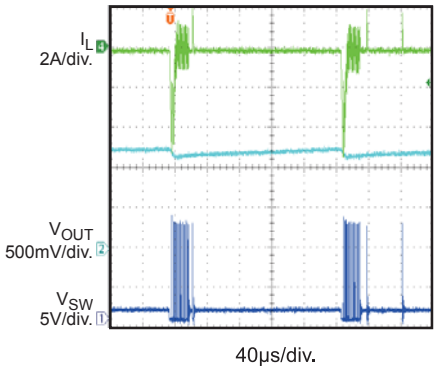
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the EVQ8633A-LE-01A evaluation board.
V_{IN} = 12V, V_{OUT} = 1.2V, L = 560nH, T_A = +25ºC, unless otherwise noted.

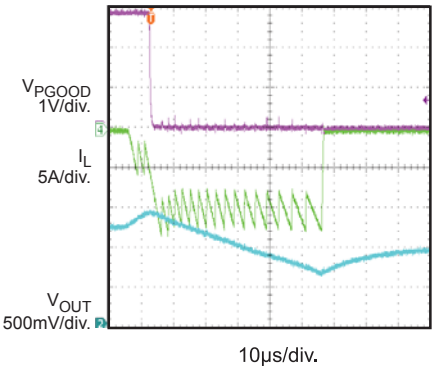
Over-Current Protection Recovery



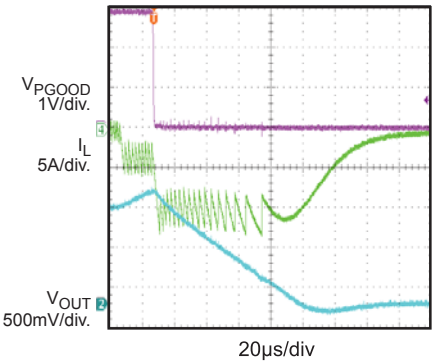
OSM Operation
Pulse Skip Mode



Over-voltage Protection
Pulse Skip Mode



Over-voltage Protection
Forced CCM



PRINTED CIRCUIT BOARD LAYOUT

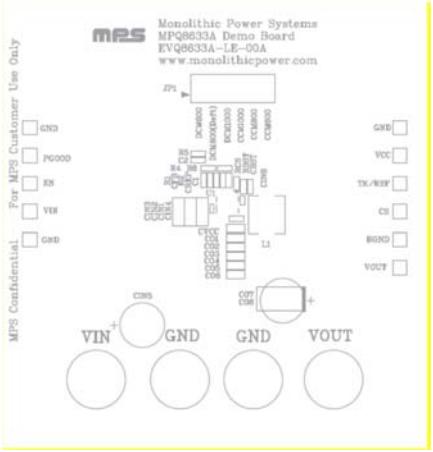


Figure 1—Top Silk Layer

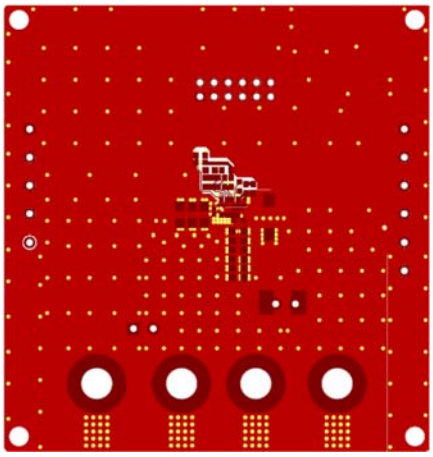


Figure 2—Top Layer

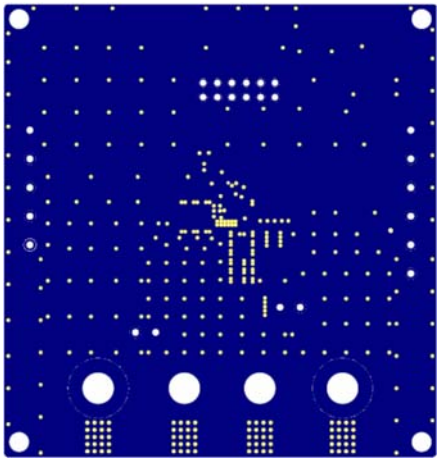


Figure 3—Inner Layer 1

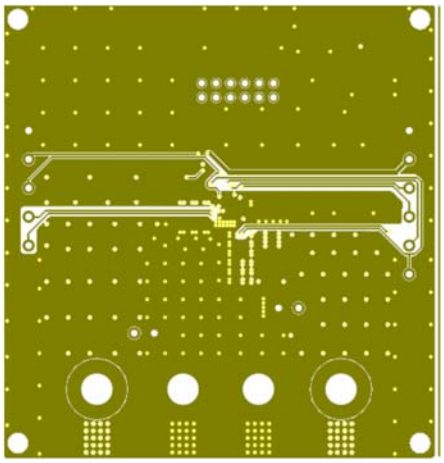


Figure 4— Inner Layer 2

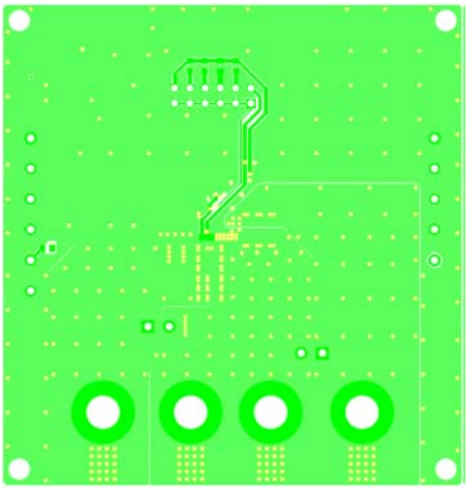


Figure 5—Bottom Layer