

LX7175

User Guide

LX7175 3 Amp Step-Down Converter Evaluation Board



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1 Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

1.1 Revision 1.0

Revision 1.0 was published in August 2017. It was the first publication of this document.

2 Product Description

The LX7175 is a step-down pulse-width modulation (PWM) switching regulator IC with integrated high side P-CH and low side N-CH MOSFETs. The IC operates using a hysteretic control topology with a full load switching frequency of 1.4 MHz, allowing small output filter components while maintaining excellent dynamic load response.

The operational input voltage range of the LX7175 is from 3 V to 5.5 V and it has two modes of operation selected externally by the MODE pin. When the MODE pin is high, the device operates in continuous PWM operation, and when it is tied low, it operates in power wave mode (PSM) with automatic transition between PWM and PSM mode depending on the load current. This allows the converter's efficiency to remain high when load current drops.

Other features include cycle-by-cycle current limit followed by latch off, thermal protection with hysteresis, internal digital soft start, and Power Good function.

2.1 Applications

- Small battery-operated devices
- Hard disk drives (HDDs)
- Set-top boxes
- LCD TVs
- Notebooks/Netbooks
- Routers
- Video cards
- PC peripherals
- PoE-powered devices

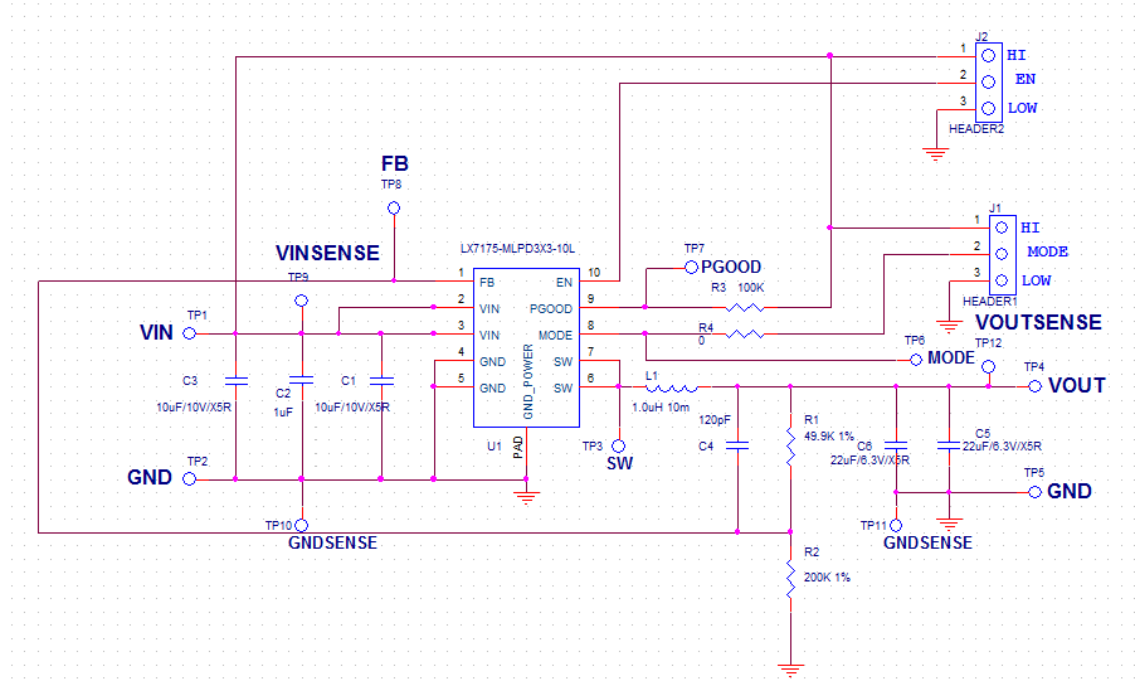
2.2 Key Features

- 3 A step-down regulator
- Operational input supply voltage range: 3 V–5.5 V
- Integrated PMOS and NMOS
- Load current from 0 A to 3 A
- 1.4 MHz switching frequency
- SKIP pulse to improve light load efficiency
- Open VReg Type 0 LV compatible
- Input UVLO protection
- Enable pin
- Power good
- Internal soft start
- Cycle-by-cycle over current protection
- Latch-off operation under output short
- RoHS-compliant (Pb-free)

3 Evaluation Board Schematic

The following illustration shows the evaluation board schematic.

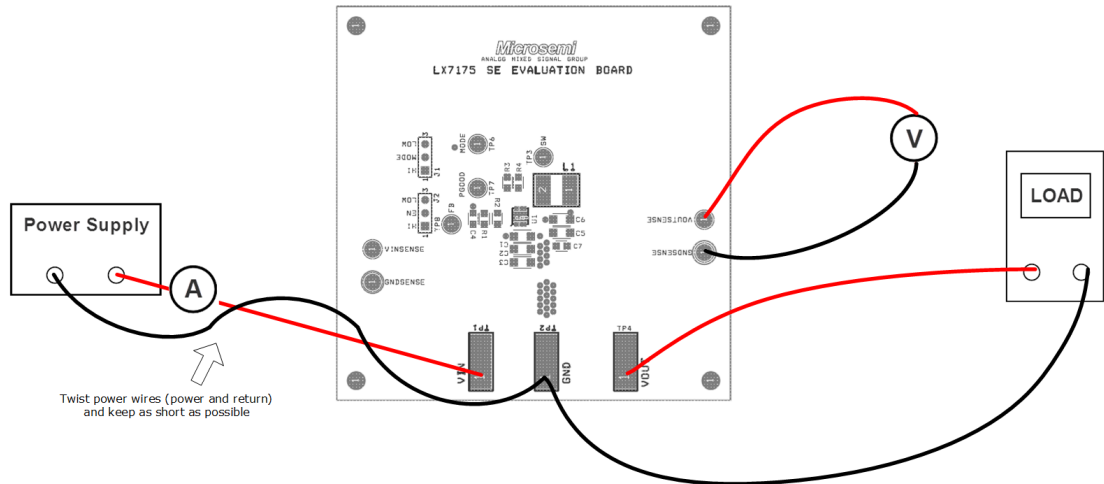
Figure 1 • Schematic of Evaluation Board



4 Basic Connection Instructions

The following illustration shows how to connect the evaluation board to the power supply.

Figure 2 • Power Supply and Load Connection



5 Recommended Operating Conditions

The following table lists the operating conditions for the LX7175 Evaluation Board.

Table 1 • Operating Conditions

Description	Symbol	Minimum	Maximum	Unit
Input voltage	V _{IN}	3	5.5	V
Output current	I _{OUT}	0	3	A
Operating ambient temperature	T _A	–10	85	°C
Enable chip	EN	V _{IN}		
Shut down chip	EN	Pull to GND		

5.1 Mode Selection

Mode Jumper set to HI means PWN or mode = 1. Mode jumper set to LOW means power save mode (PSM), or mode = 0.

5.2 Setting the Output Voltage

In case a different output voltage is needed, it must be programmed through an external resistor divider connected from SW to V_{OUT} and then to GND. For noise immunity, the lower resistor R2 from V_{OUT} to GND should be greater than 100 kΩ. A feed-forward capacitor C9 in parallel with the upper resistor is needed to ensure loop stability. It is recommended that C9 = 120 pF. The following formula gives the value of V_{OUT}.

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_1}{R_2} \right)$$

Where V_{REF} = 0.8 V.

6 PCB Layout of Evaluation Board

The LX7175 Evaluation Board is a four-layer board. The following illustrations depict each of the board's four layers.

Figure 3 • Top Silkscreen

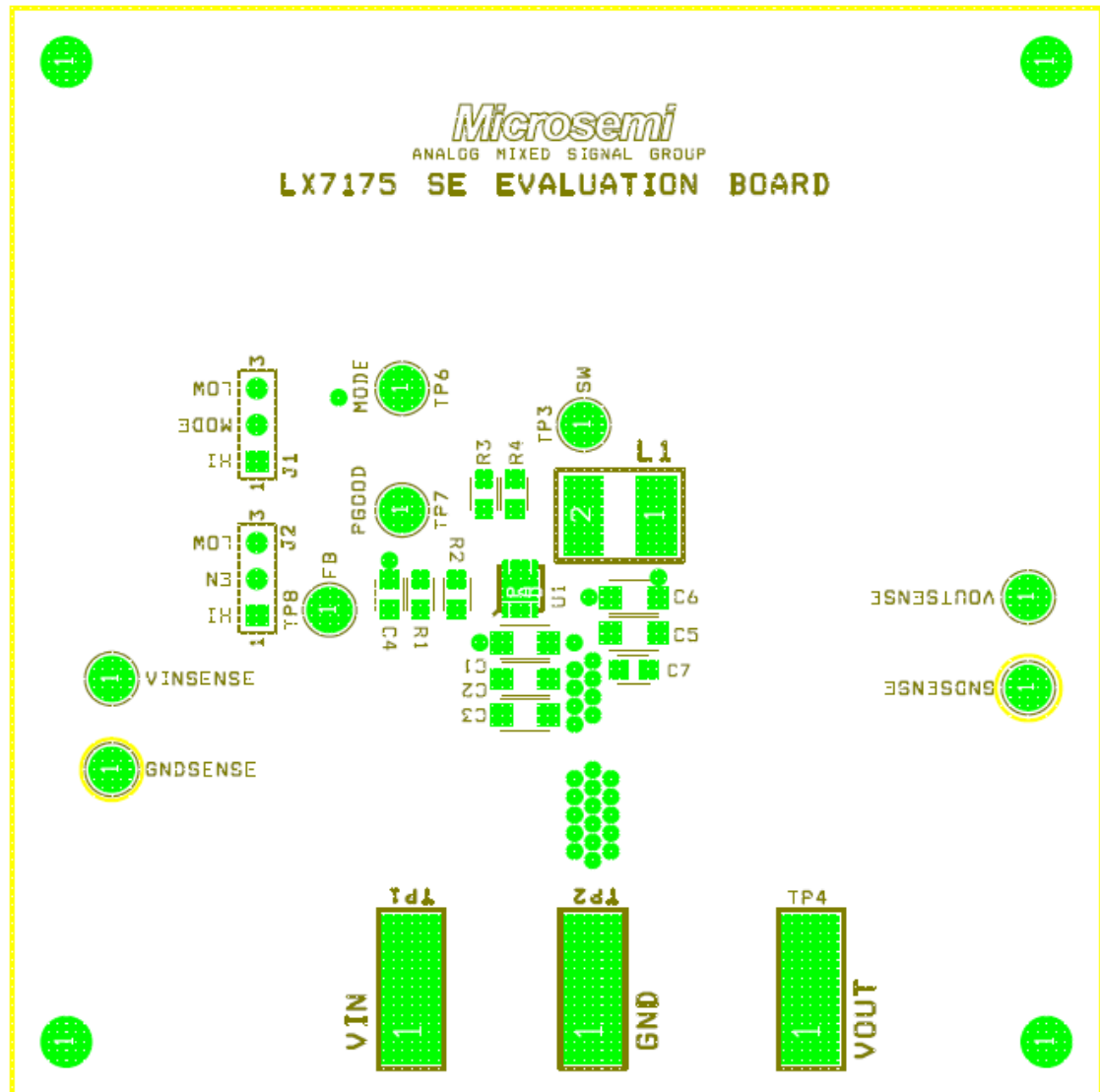


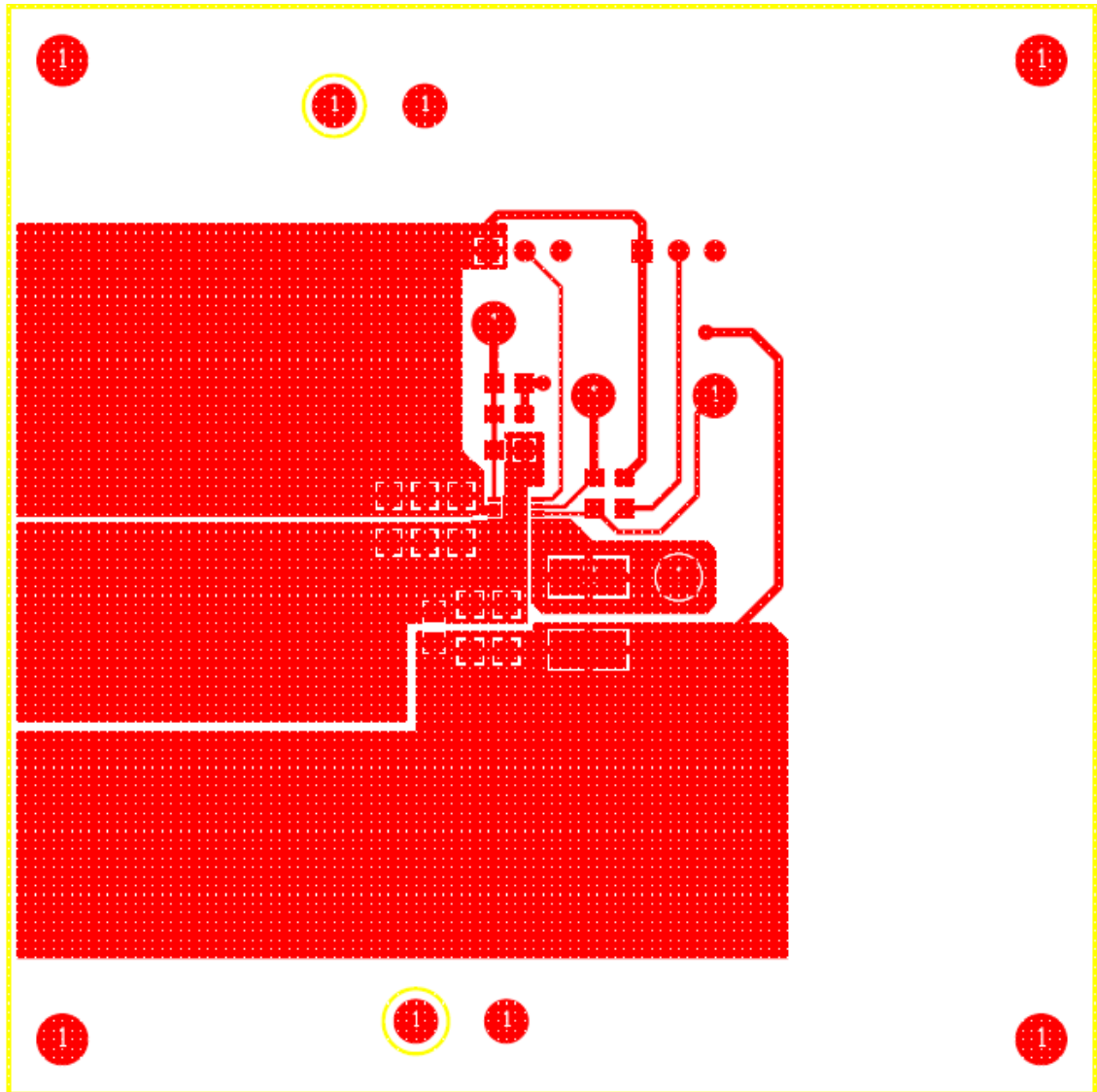
Figure 4 • Layer 1: Top Layer

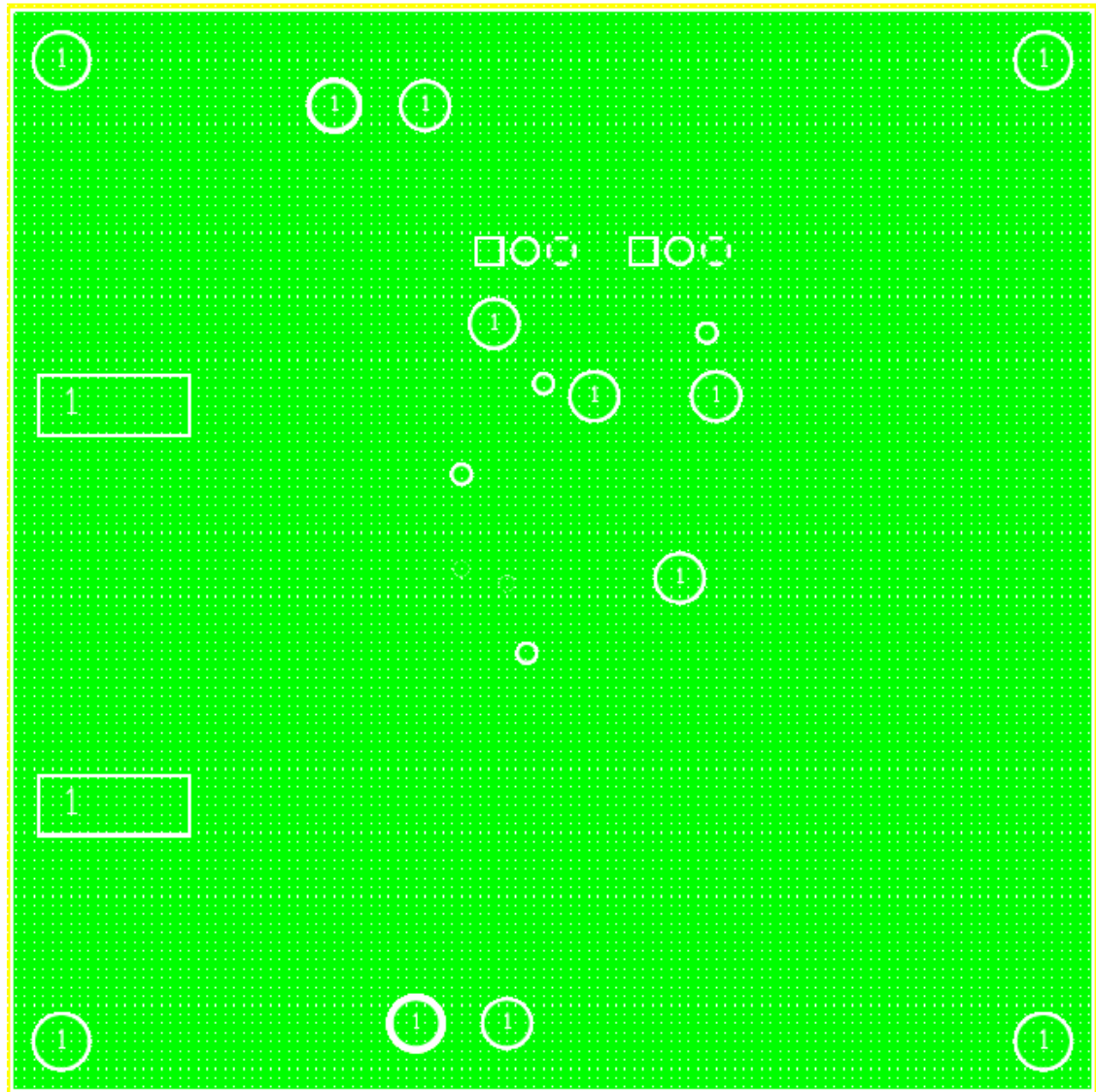
Figure 5 • Layer 2: Inner Layer 1

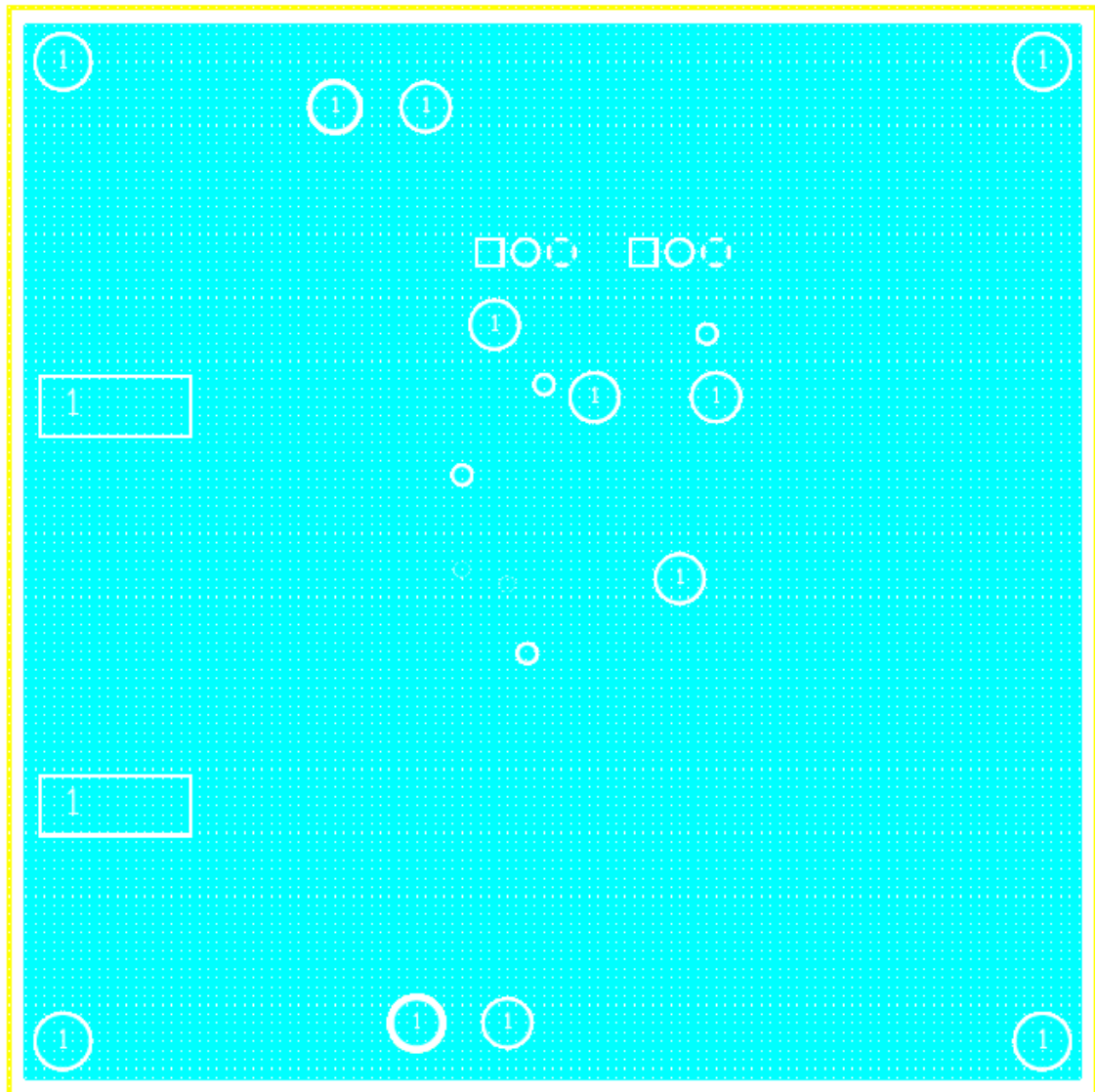
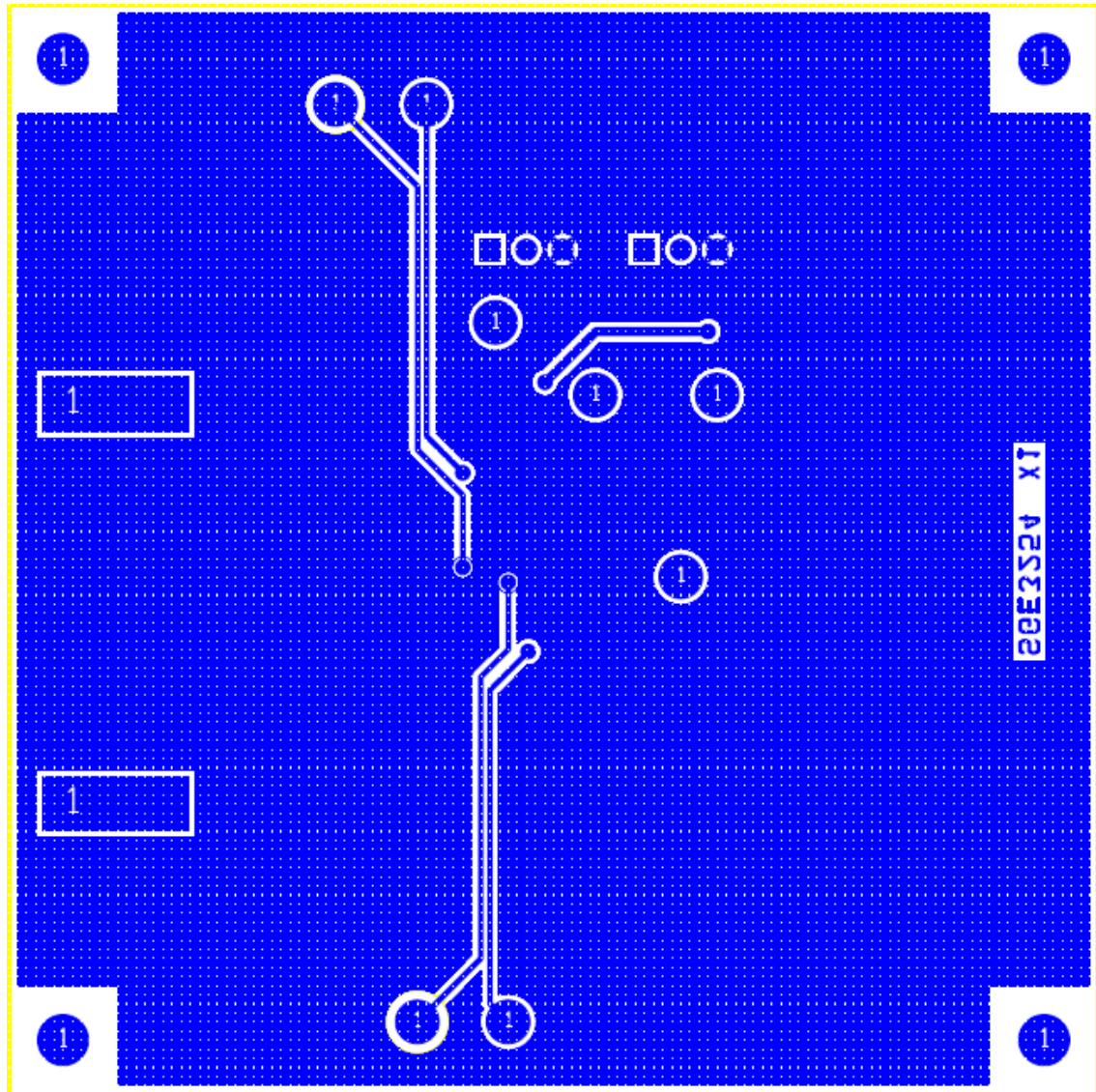
Figure 6 • Layer 3: Inner Layer 2

Figure 7 • Layer 4: Bottom Layer



7 Bill of Materials

The following table lists the bill of materials (BOM) for the LX7175 Evaluation Board.

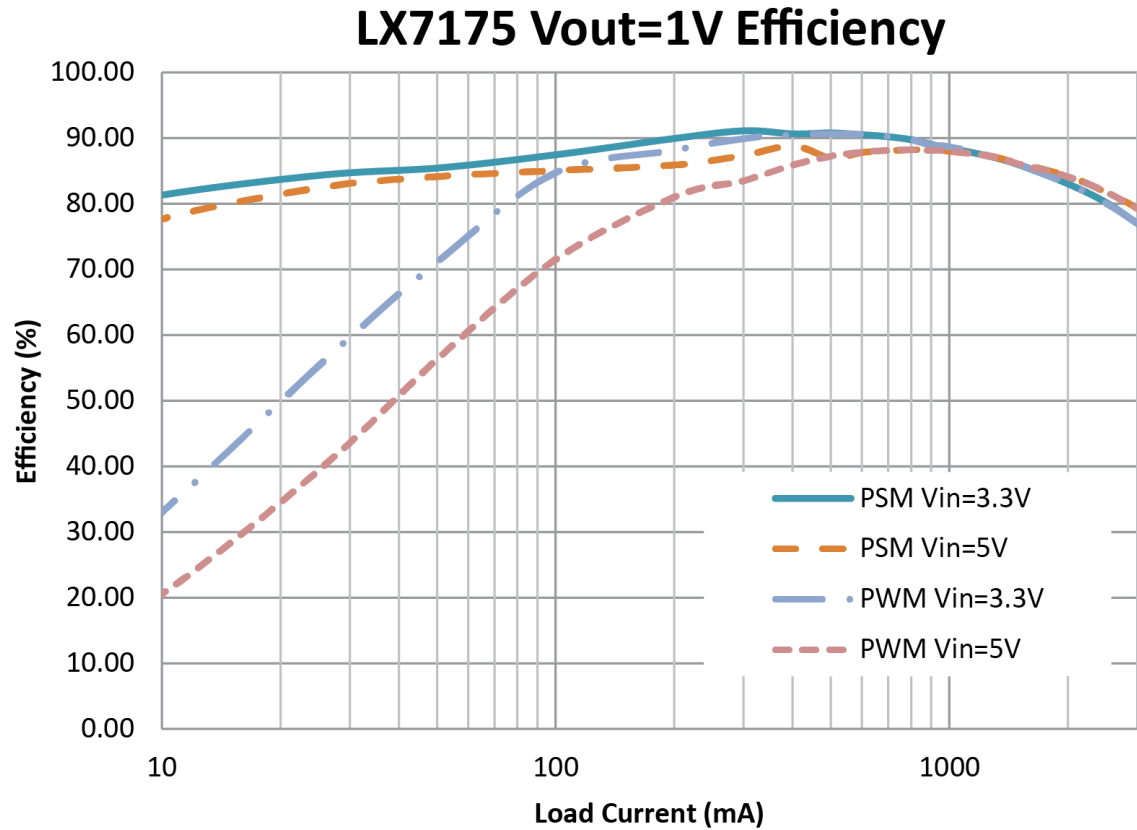
Table 2 • BOM

Item	Part Type	Specification	Reference	Quantity
1	Miscellaneous component	Microsemi IC—LX7175	U1	1
2	Miscellaneous component	Test point	SW, PGOOD, VINSense, VOSENSE, GNDSENSE, GNDSENSE, FB, MODE	8
3	Miscellaneous component	Terminal	VIN, VOUT, GND, GND	4
4	Miscellaneous component	Jumper/3 pin	J1, J2	2
5	Capacitor	1 μ F	C2	1
6	Capacitor	0 Ω	C1, C3	2
7	Capacitor	100 k Ω	C4	1
8	Capacitor	22 μ F/6.3 V/X5R	C5, C6	2
9	Resistor	0 Ω	R4	1
10	Resistor	100 k Ω	R3	1
11	Resistor	49.9 k Ω 1%	R1	1
12	Resistor	200 k Ω 1%	R2	1
13	Inductor	1 μ H – ESR = 10 m Ω	L1	1

8 Efficiency Plot

The following graph shows the efficiency of the LX7175 at a voltage output of 1 V.

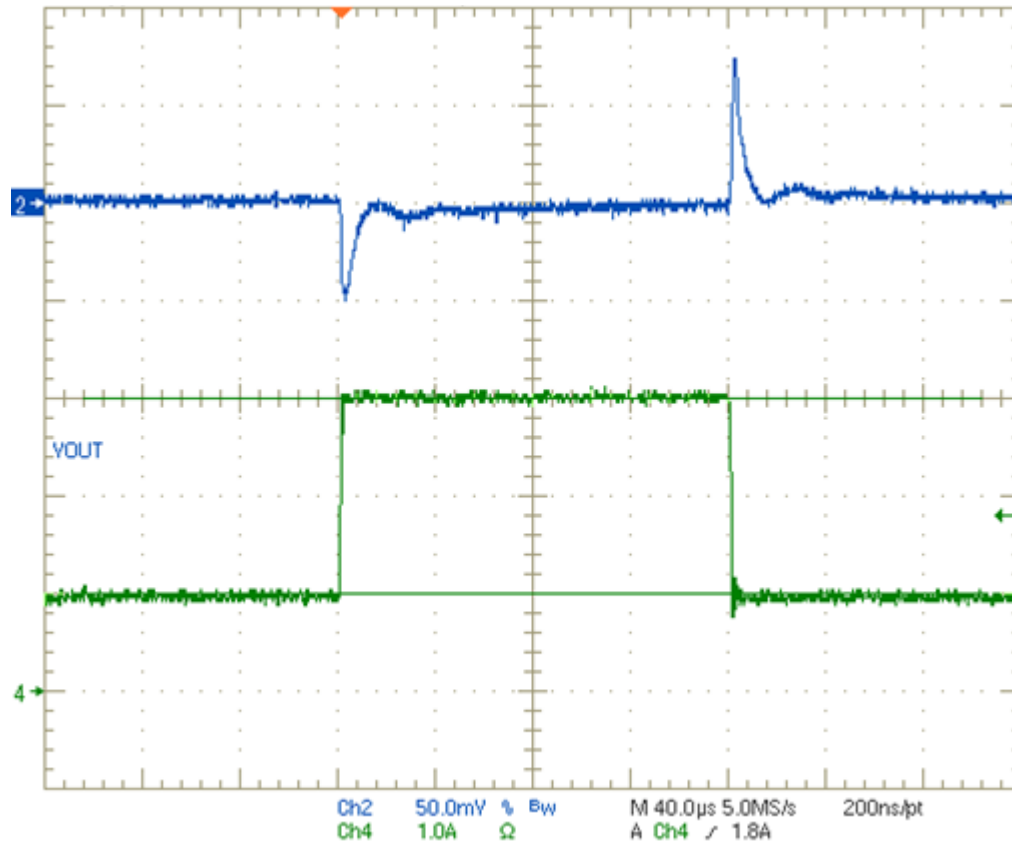
Figure 8 • Efficiency Plot of LX7175



9 Dynamic Load Response Scope Shots

The following graph shows the board's dynamic load response, PWM.

Figure 9 • Dynamic Load Response With 1 A–3 A Load, PWM



CH2: VOUT, CH4: load current

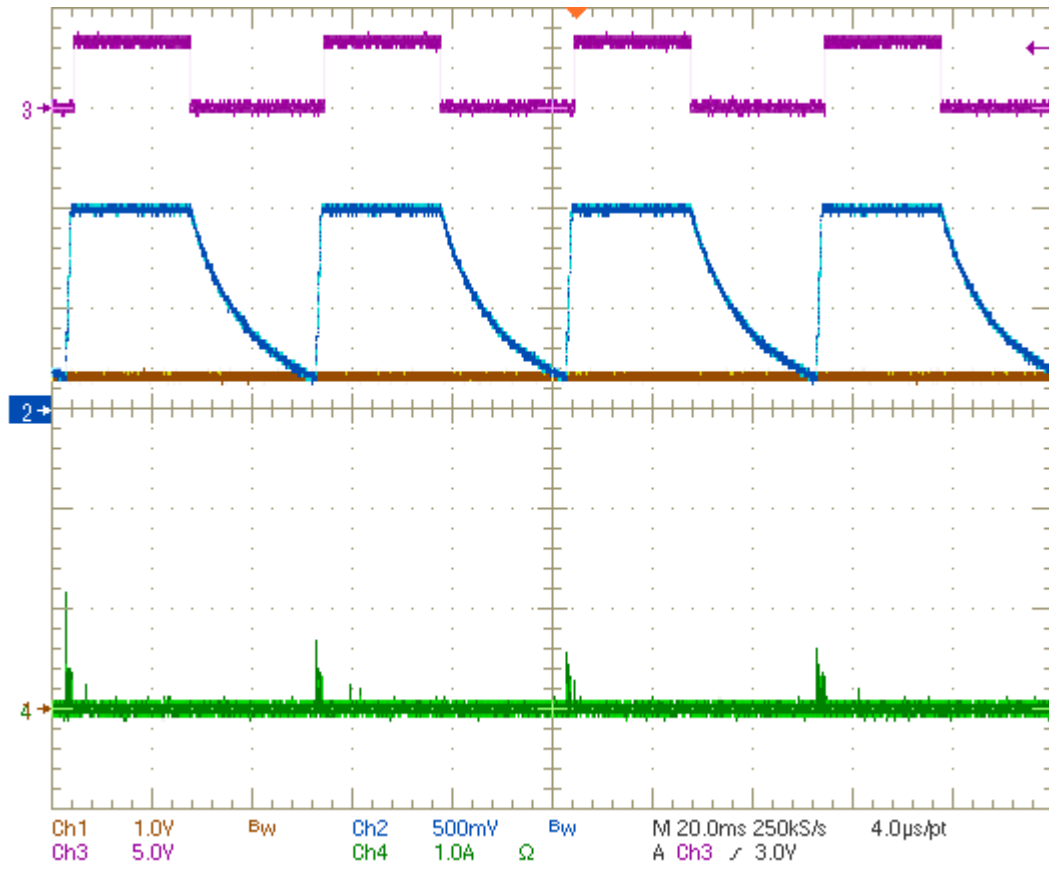
10 Start-up Scope Shots

The following graphs show the scope shots for the LX7175.

10.1 Start-up with Enable Toggled

The following graph shows startup with ENABLE toggled.

Figure 10 • Start-up with ENABLE Toggled

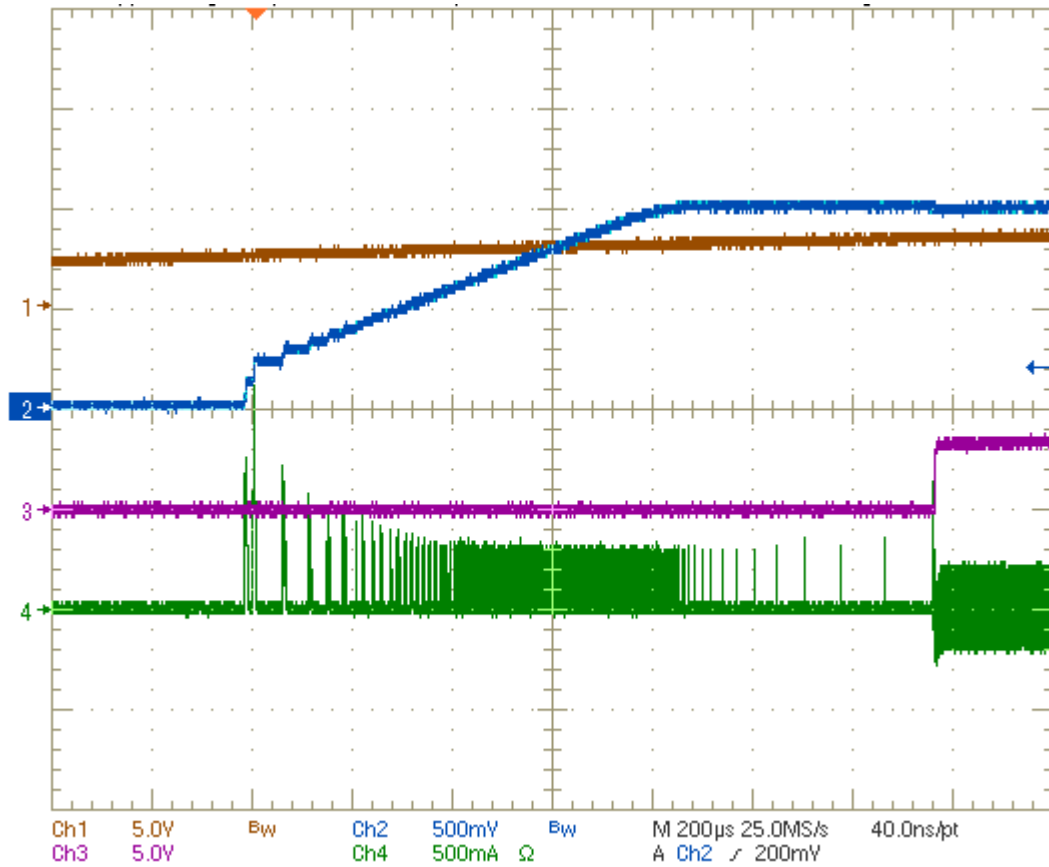


CH1: V_{IN} , CH2: V_{OUT} , CH3: PGOOD, CH4: inductor current.

10.2 Power-up with No Load (EN Tied to 5 V VIN, PWM)

The following graph shows power-up with no load.

Figure 11 • Power-up with No Load

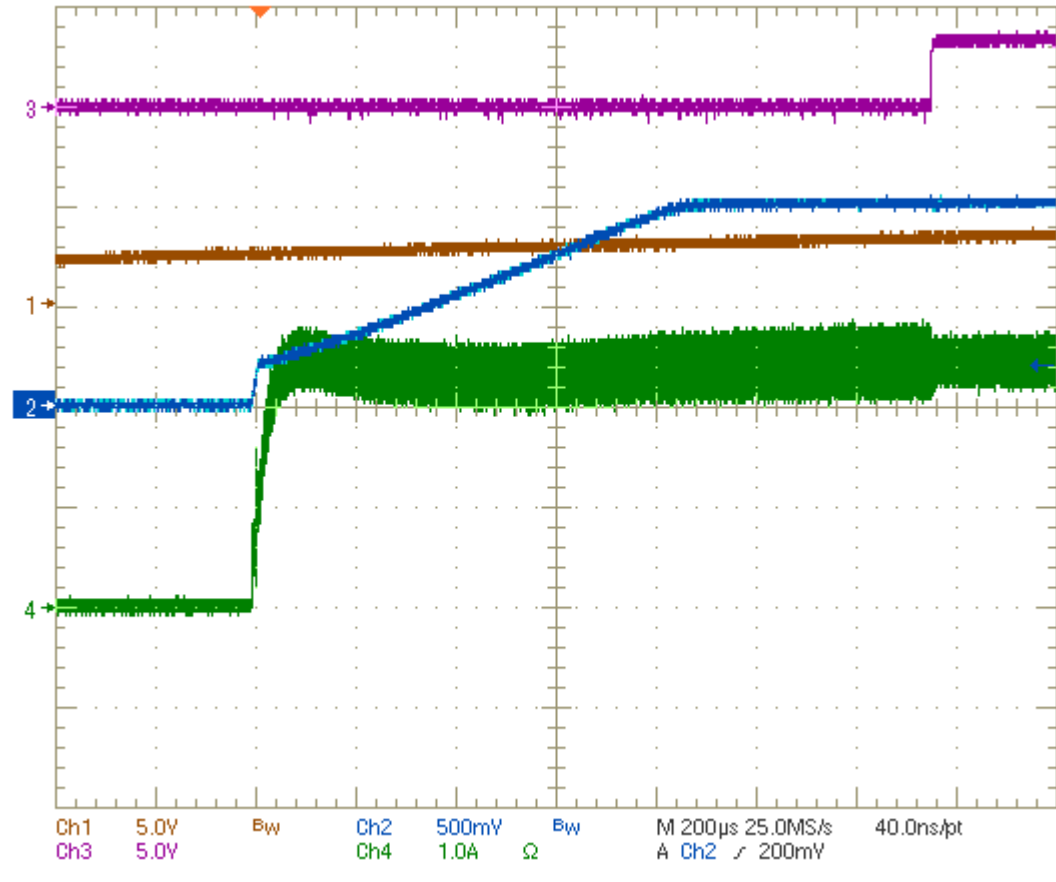


CH1: V_{IN} , CH2: V_{OUT} , CH3: PGOOD, CH4: inductor current.

10.3 Power-up with Resistive Load (EN Tied to 5 V VIN, PWM)

The following graph shows power-up with resistive load.

Figure 12 • Power-up with Resistive Load (EN Tied to 5 V VIN, PWM)

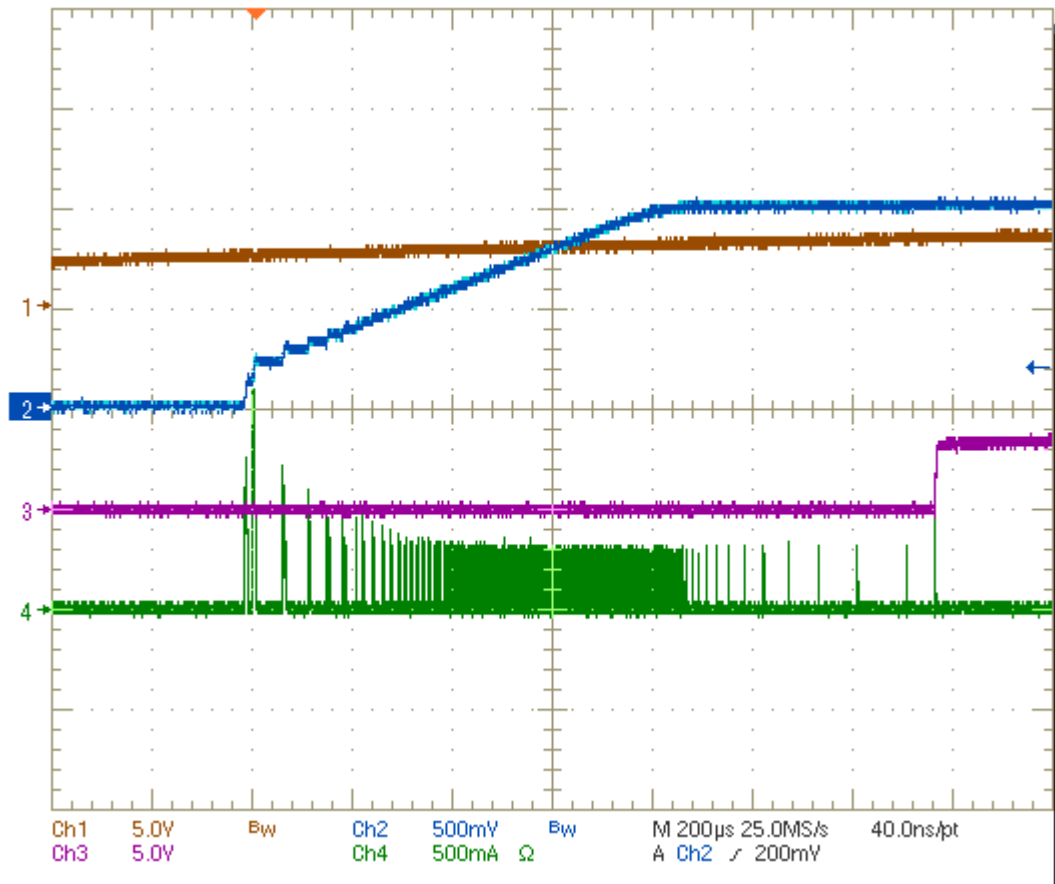


CH1: V_{IN}, CH2: V_{OUT}, CH3: PGOOD, CH4: inductor current.

10.4 Power-up with No Load (EN Tied to 5 V VIN, PSM)

The following graph shows power-up with no load.

Figure 13 • Power-up with No Load (EN Tied to 5 V VIN, PSM)



CH1: V_{IN}, CH2: V_{OUT}, CH3: PGOOD, CH4: inductor current.

11 Ordering Information

The following table lists the ordering information for the LX7175 evaluation board and IC.

Table 3 • Ordering Information

Part Order Number	Description
LX7175CLD	DFN 3 mm × 3 mm 10-layer integrated circuit
LX7175 SE EVALUATION BOARD	Evaluation PCB for LX7175

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