

**LX7176A**

**User Guide**

**LX7176A 4 Amp Step-Down Converter Evaluation Board**



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# **1**

## **Revision 1.0**

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

## 2 Product Description

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The LX7176A is a 4 A step-down regulator with integrated MOSFETs packaged in a space saving QFN12 2 mm × 2 mm for today's mobile devices. It uses an ultra fast, constant frequency hysteretic control method to minimize external filter components while maintaining excellent regulation. The LX7176A reference voltage is 0.6 V.

The LX7176A operates from 3 V to 5.5 V rails and outputs 0.6 V to 100% of the input voltage.

Cycle-by-cycle current limiting protects against over-current conditions. Hiccup mode provides protection for heavy over-load or short-circuit faults. Thermal protection shuts down the regulator under over-temperature conditions. Over voltage conditions will immediately shut off the output to protect against permanent damage. The LX7176A automatically restarts when all fault conditions are cleared. Internal soft start circuitry limits start up inrush currents.

### 2.1 Applications

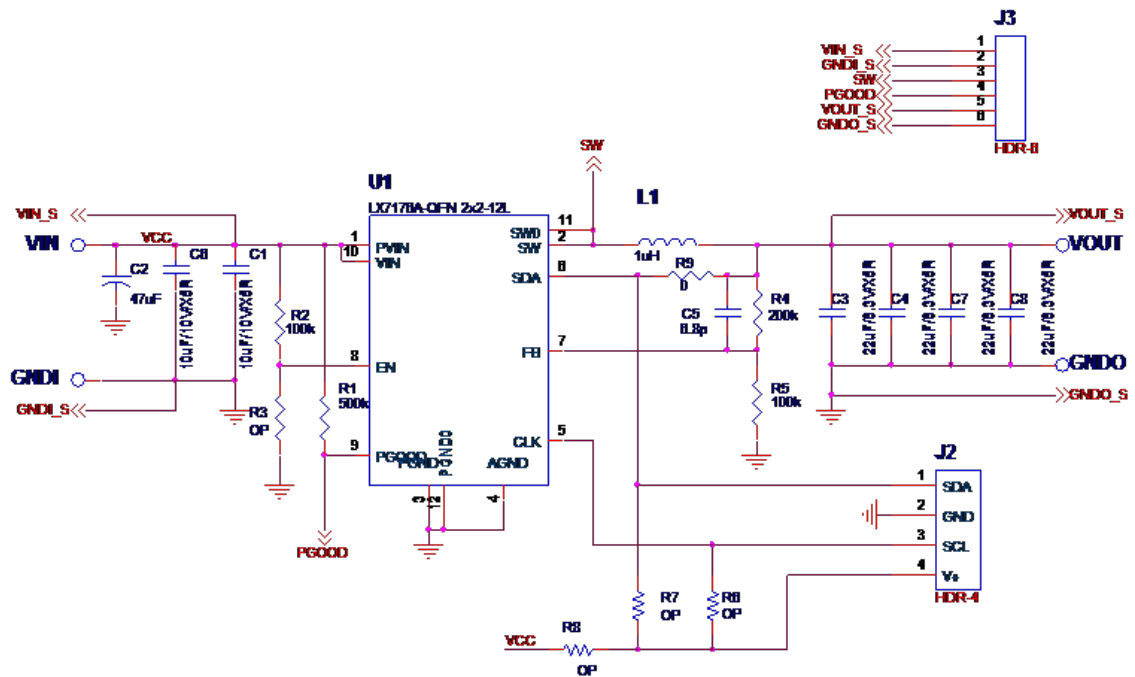
- High-performance HDDs
- LCD TVs
- Notebooks/Netbooks
- Servers and workstations
- Video cards
- PoE-powered devices
- Smart phones

### 2.2 Key Features

- 0 A–4 A step-down regulator
- Operational input supply voltage range: 3 V–5.5 V (short durations to 6.5 V)
- Hysteretic control offers best transient response
- CCM switching at a constant 1.65 MHz
- Automatically switches to DCM switching under light loads to improve efficiency
- 100% duty ratio operation
- Input under voltage and over voltage protection
- Enable and Power Good Function
- Internal soft-start
- Cycle-by-cycle over current protection
- Hiccup mode protects against short circuit faults
- RoHS-compliant

### 3 Evaluation Board Schematic

Figure 1 • Schematic of Evaluation Board



## 4 Recommended Operating Conditions

**Table 1 • Operating Conditions**

Description	Symbol	Minimum	Maximum	Unit
Input voltage	V <sub>IN</sub>	3.0	5.5	V
Output voltage	V <sub>OUT</sub>	0.6	5.5	V
Output current (V <sub>IN</sub> = 3 V to 5 V)	I <sub>OUT</sub>	0	4	A
Operating ambient temperature	T <sub>A</sub>	0	85	°C
Enable chip	EN	V <sub>IN</sub>		
Shut down chip	EN	Pull to GND		

### 4.1 Setting the Output Voltage

In case a higher output voltage is needed, it must be programmed through an external resistor divider connected from SW to V<sub>OUT</sub> then to GND. The formula below calculates the value of V<sub>OUT</sub> based on the resistor divider R1 and R2.

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R1}{R2}\right)$$

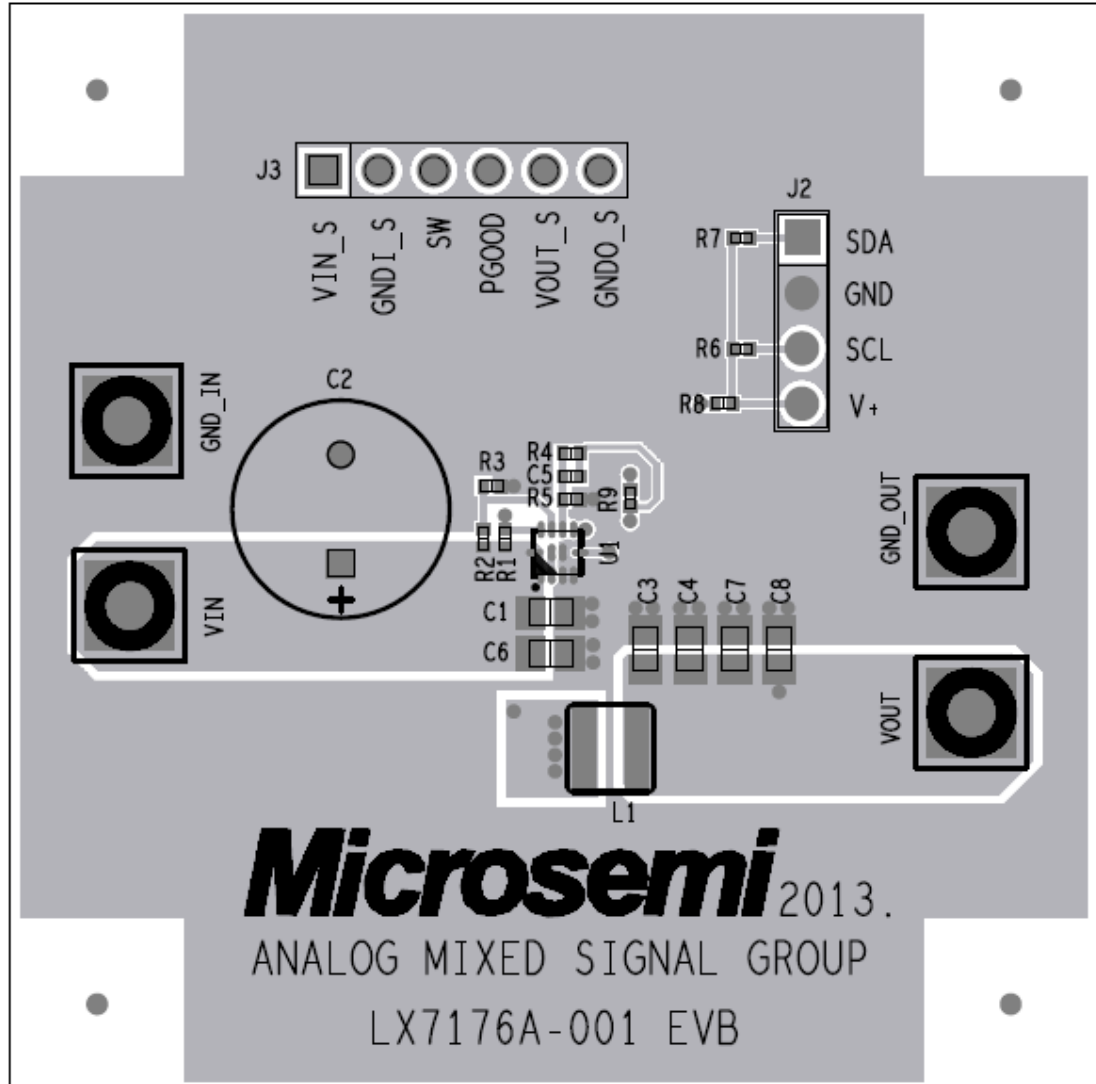
V<sub>REF</sub> is determined by the chip, for example, to set the LX7176A to a V<sub>OUT</sub> = 1.8 V, given V<sub>REF</sub> = 0.6 V. First pick the lower resistor R<sub>2</sub> = 100k, calculate the upper resistor R1 = 200k.

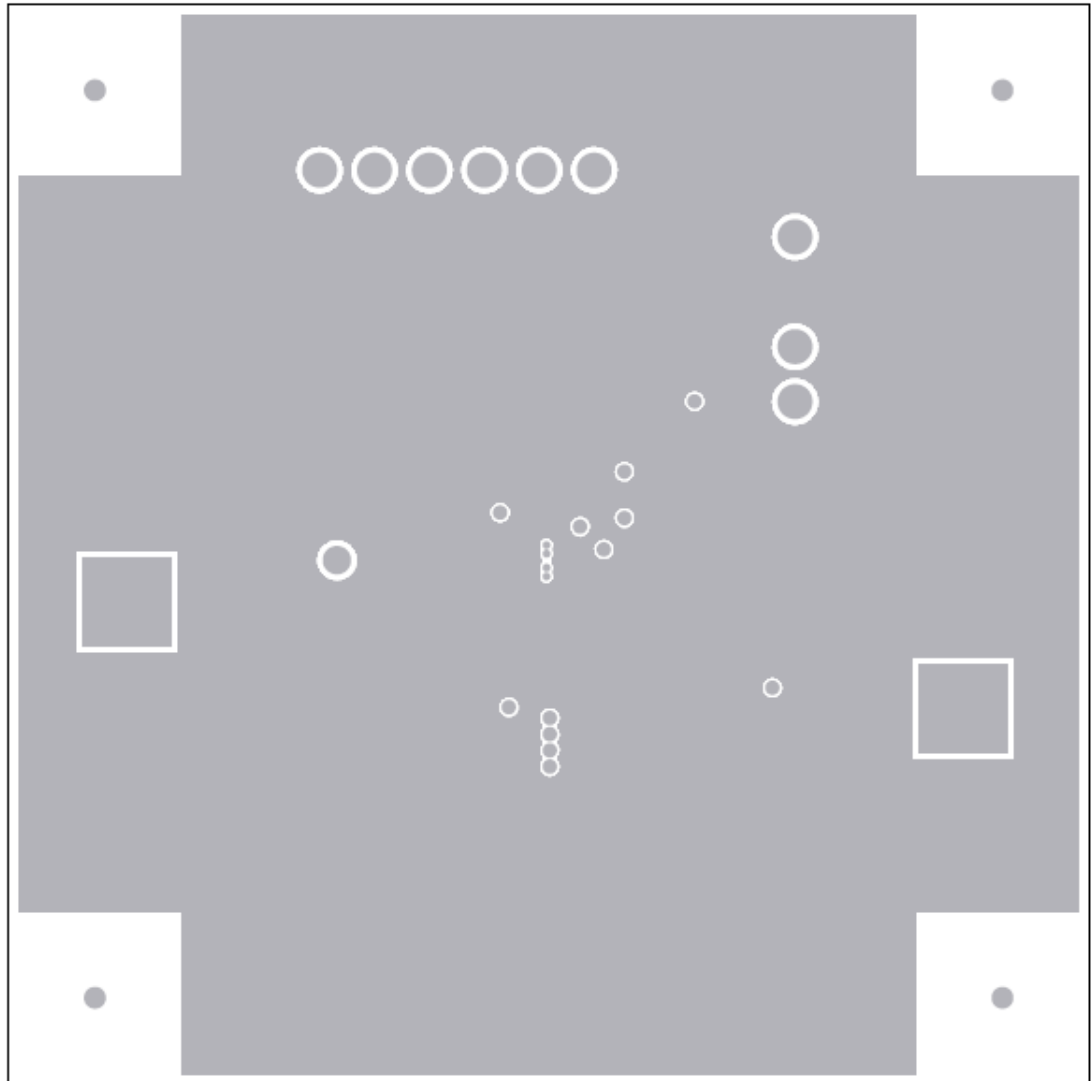
## 5 PCB Layout of Evaluation Board

The LX7176A EVAL Board is a four-layer board. The recommended distance between ground layer and the top layer is 6mil.

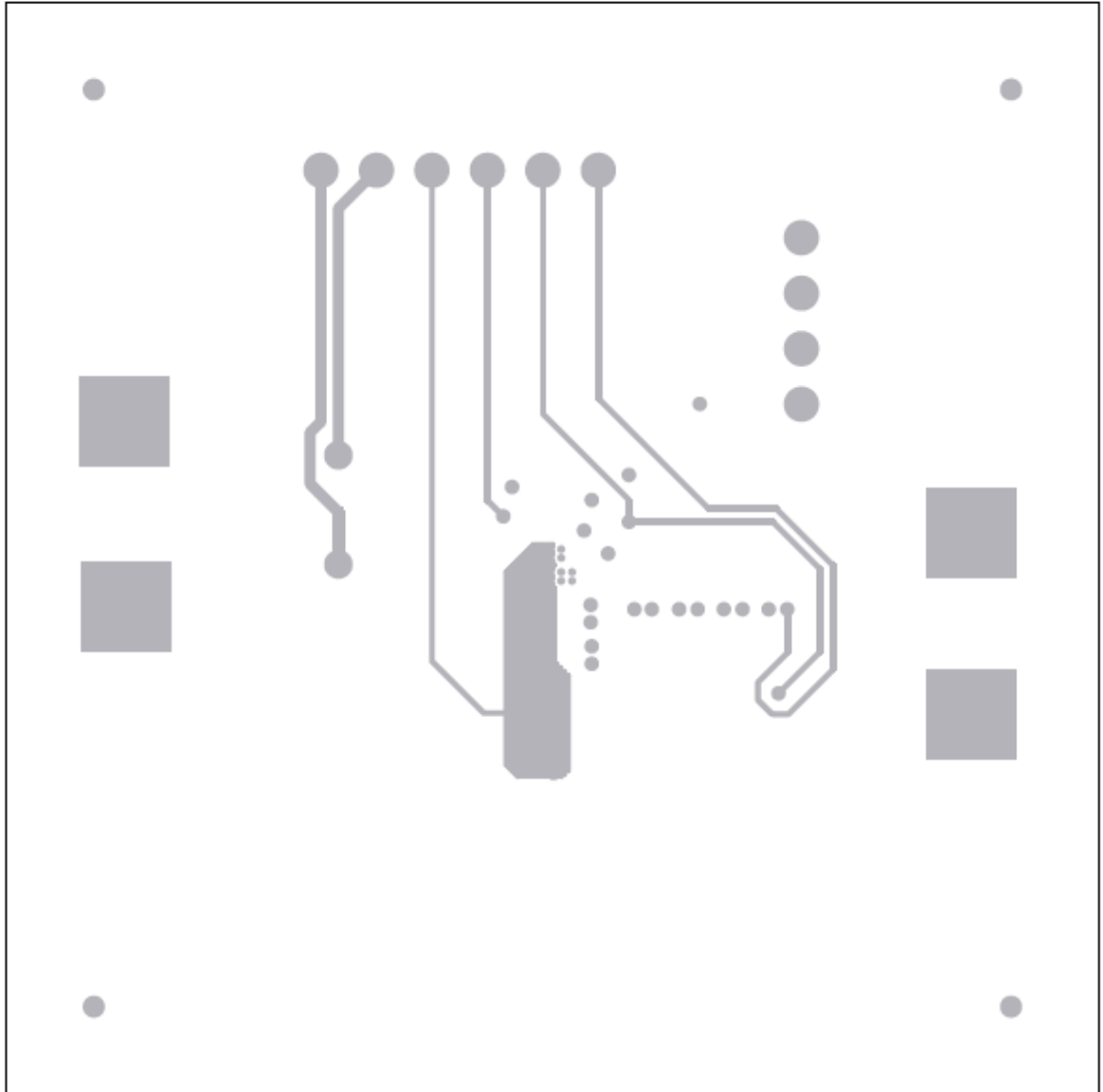
The following illustrations show the four layers of the LX7176A board.

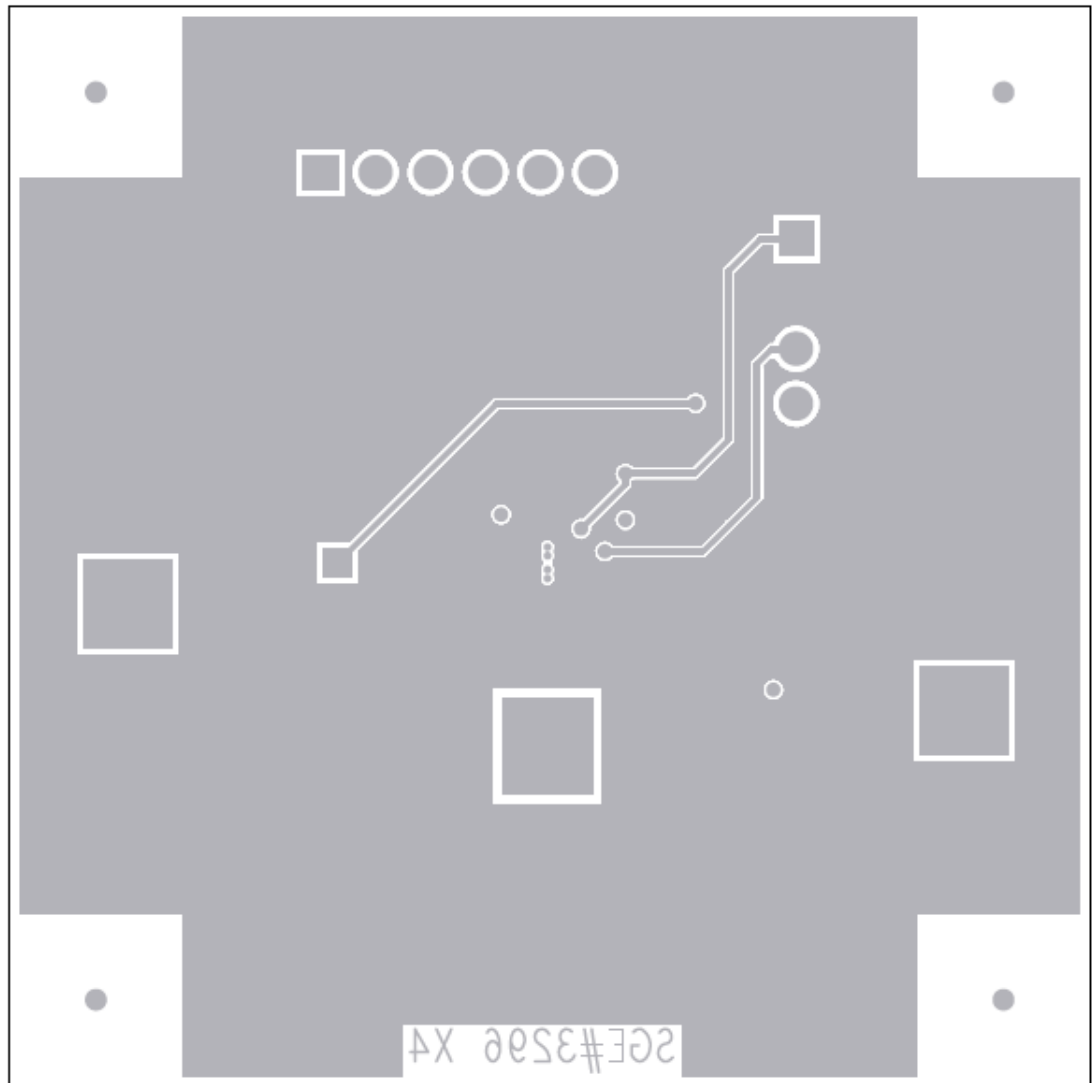
### Figure 2 • Layer 1: Top Layer



**Figure 3 • Layer 2: Ground Layer**



**Figure 4 • Layer 3: Sense Layer**

**Figure 5 • Layer 4: Bottom Layer**

## 6 LX7176A\_Bill of Materials

The following table lists the bill of materials (BOM) for the LX7176A Evaluation Board.

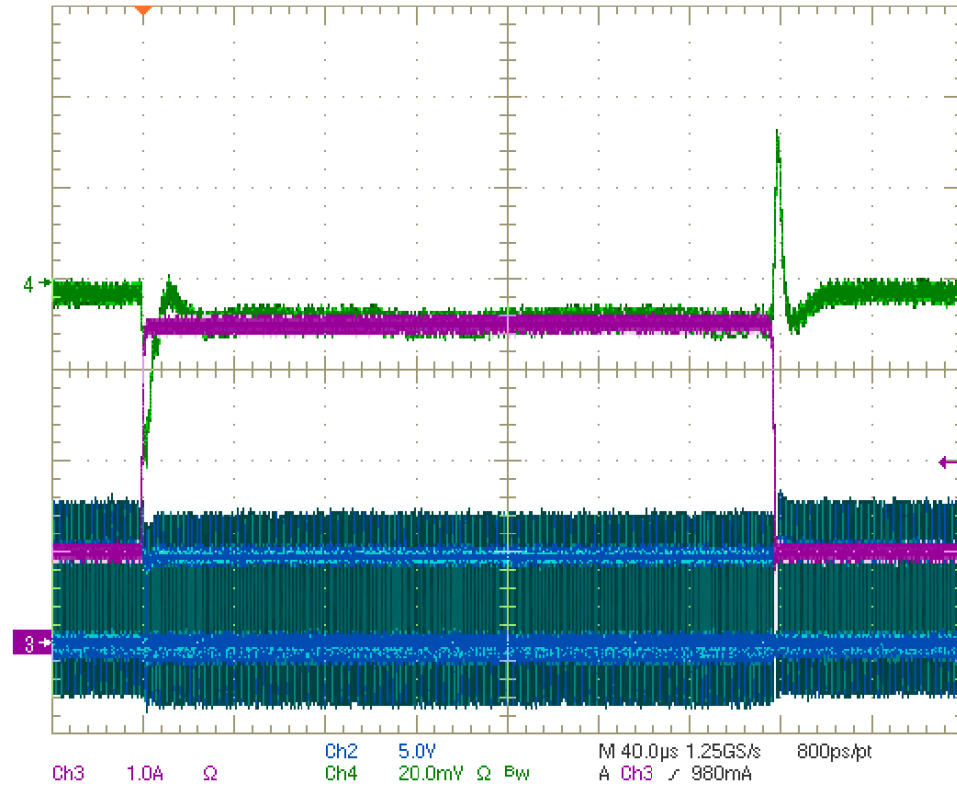
**Table 2 • BOM**

Item	Part Description	Reference	Quantity
1	Microsemi IC – LX7176A	U1	1
2	Test Point (J3)	SW, PGOOD, VIN_S, VO_S, GND_S, GND_S	6
3	Terminal	VIN, VOUT, GND, GND	4
4	Jumper/4pin	J2	1
5	10 $\mu$ F/10 V/10%/0805/X5R	C1, C6	2
6	47 $\mu$ F Electronic/35 V	C2	1
7	22 $\mu$ F/6.3 V/10%/0805/X5R	C3	4
8	500 k $\Omega$ /1%/0402	R1	1
9	100 k $\Omega$ /1%/0402	R2	1
10	200 k $\Omega$ /1%/0402	R4	1
11	100 k $\Omega$ /1%/0402	R5	1
12	0 $\Omega$ /1%/0402	R9	1
13	1 $\mu$ H – XAL4020-102ME	L1	1

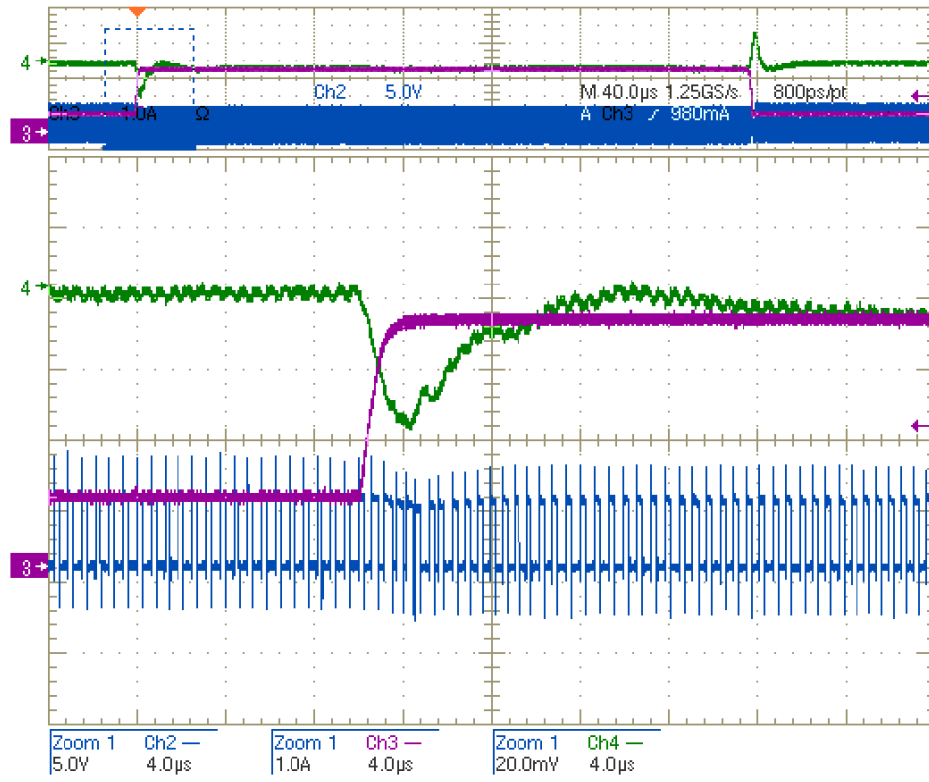
## 7 Dynamic Load Response Scope Shots

(Load Current = 1 A to 3.5 A,  $L = 1\ \mu\text{H}$ ,  $C_{\text{OUT}} = 88\ \mu\text{F}$ )

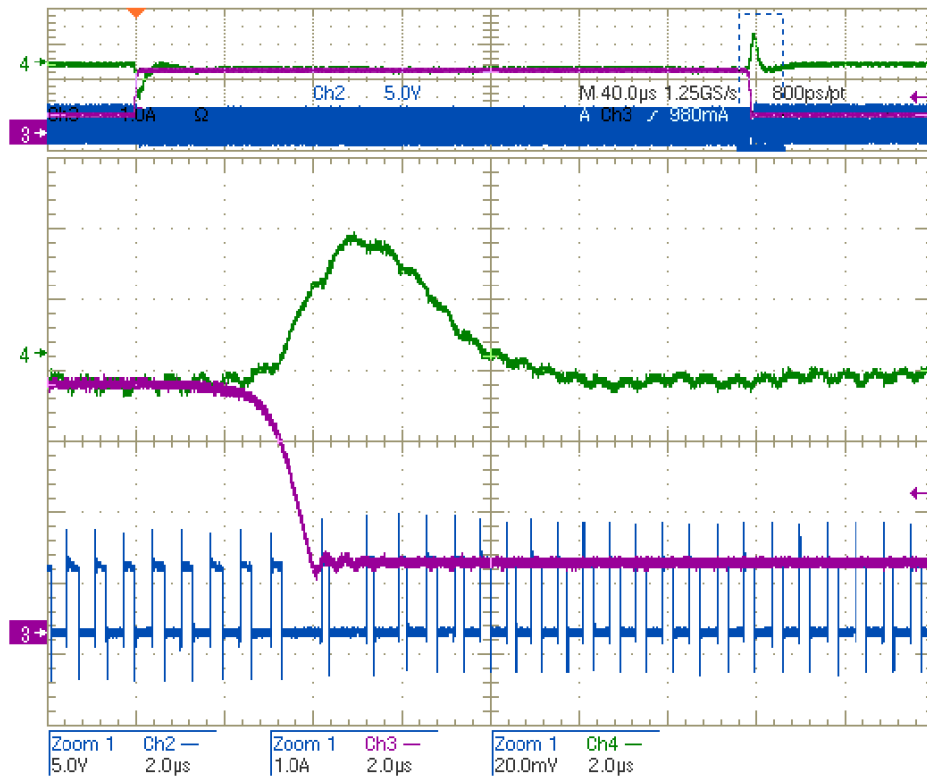
Figure 6 • Step Response



CH2: SW Node, CH3:  $I_{\text{LOAD}}$ , CH4:  $V_{\text{OUT AC}}$ .

**Figure 7 • Step Response Rising Edge**

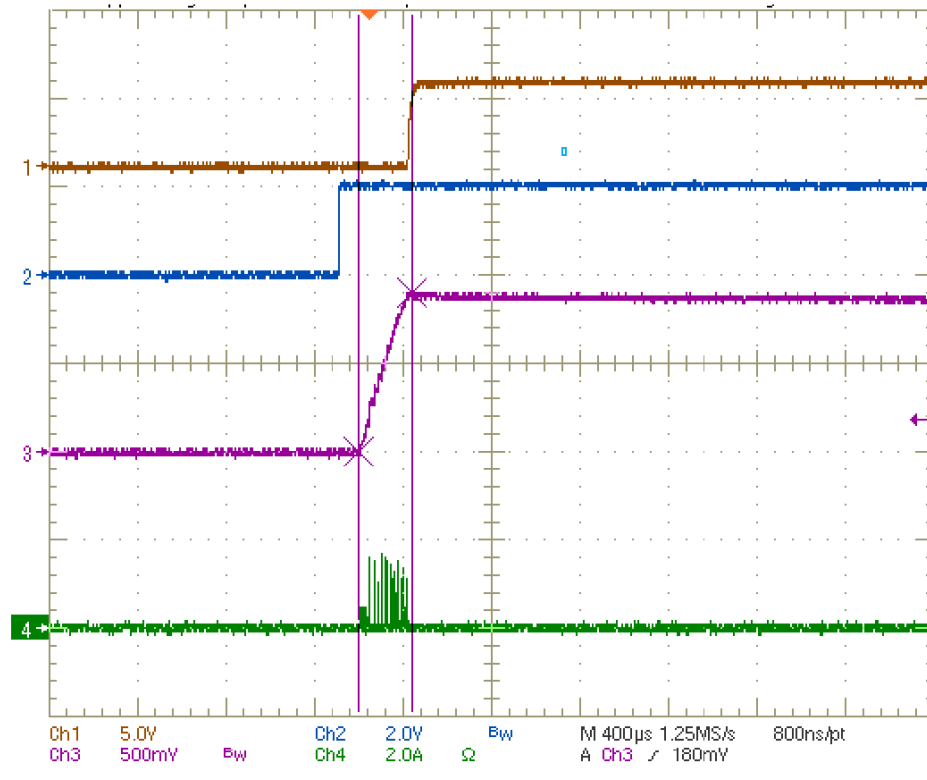
CH2: SW Node, CH3:  $I_{LOAD}$ , CH4:  $V_{OUT AC}$ .

**Figure 8 • Step Response Falling Edge**

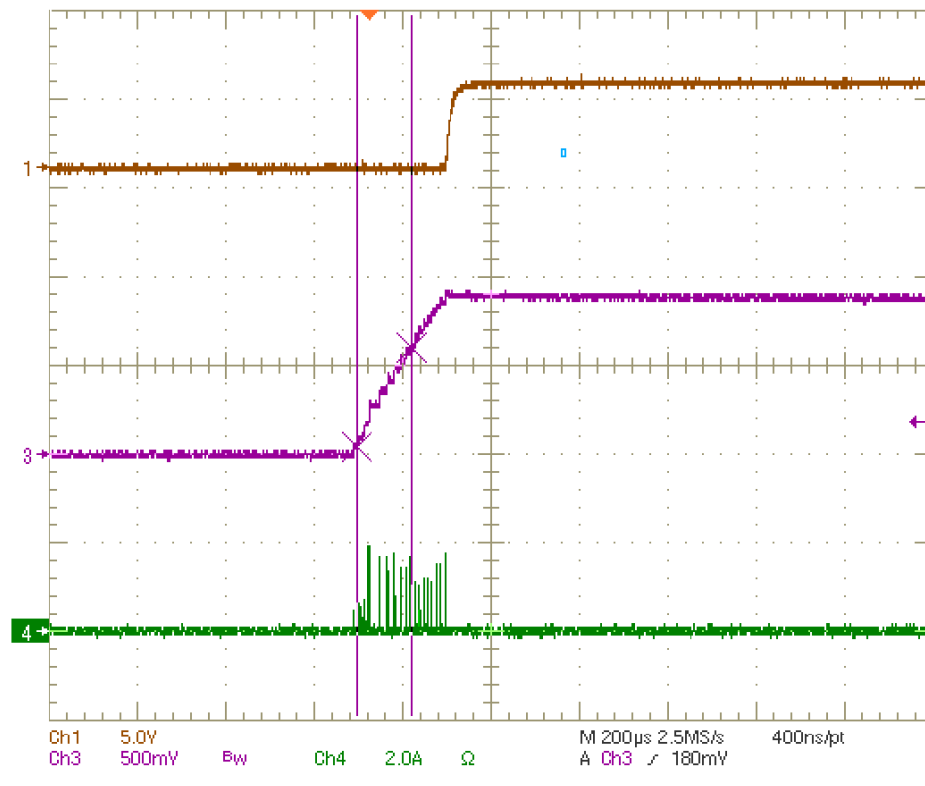
CH2: SW Node, CH3:  $I_{LOAD}$ , CH4:  $V_{OUT AC}$ .

## 8 Start-up and Short Condition Scope Shots

Figure 9 • Start-up with ENABLE Toggled



CH1: PG, CH2: EN, CH3:  $V_{OUT}$ , CH4: inductor current.

**Figure 10 • Soft-Start VIN Tied to ENABLE**

CH1: PG, CH3:  $V_{OUT}$ , CH4: inductor current.



## 9 Ordering Information

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**Table 3 • Ordering Information**

Part Order Number	Description
LX7176ACLQ	QFN 2x2mm 12-layer integrated circuit
LX7176A EVAL BOARD	Evaluation PCB for LX7176A

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