

User Guide
LX7186A 1.4 MHz 1A Synchronous Buck 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 LX7186A is 1.4 MHz fixed frequency, current-mode, synchronous PWM buck (step-down) DC-to-DC converter, capable of driving a 1 A load with high efficiency, and excellent line and load regulation. The devices integrate synchronous P-channel and N-channel power MOSFET switches with low on-resistance. They accept an input voltage range from 2.5 V to 5.5 V and will enter 100% duty cycle at dropout making them ideal for powering portable equipment that runs from a single Li-ion battery.

A standard series of inductors (available from several different manufacturers) is optimized for use with the LX7186A. This feature greatly simplifies the design of switch-mode power supplies.

The converter includes standard safety features, such as over-current, short-circuit, and thermal shutdown protection. This device is available in SOT23-5L and UDFN 2x2 6L packages.

2.1 Applications

- Datacom
- Portable devices
- Smart phone

2.2 Key Features

- Input supply range: 2.5 V–5.5 V
- Output adjustable from 0.6 V– \sim V_{IN}
- 100% duty cycle in dropout
- Integrated NMOS and PMOS switches
- Current mode control
- 1 A maximum output current
- Fixed 1.4 MHz frequency
- High efficiency: up to 98%
- Built-in soft-start
- Built-in OV, UV, and OT protection
- Built-in short circuit protection
- RoHS-compliant and Halogen-free
- SOT23-5L or UDFN 2x2 6L packages

3 Evaluation Board Schematic

The following illustrations show the evaluation board schematic for the LX7186A and LX7186A-UDFN device.

Figure 1 • LX7186A Evaluation Board Schematic

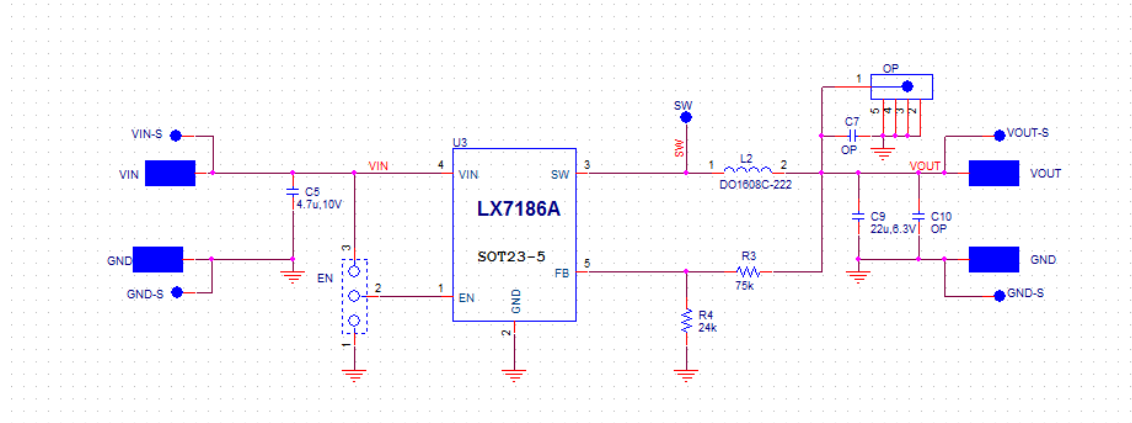
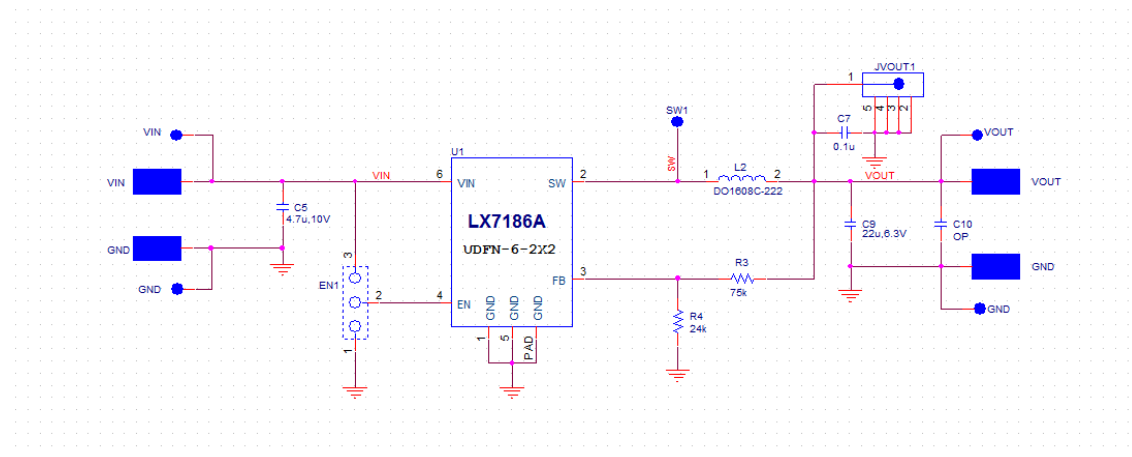


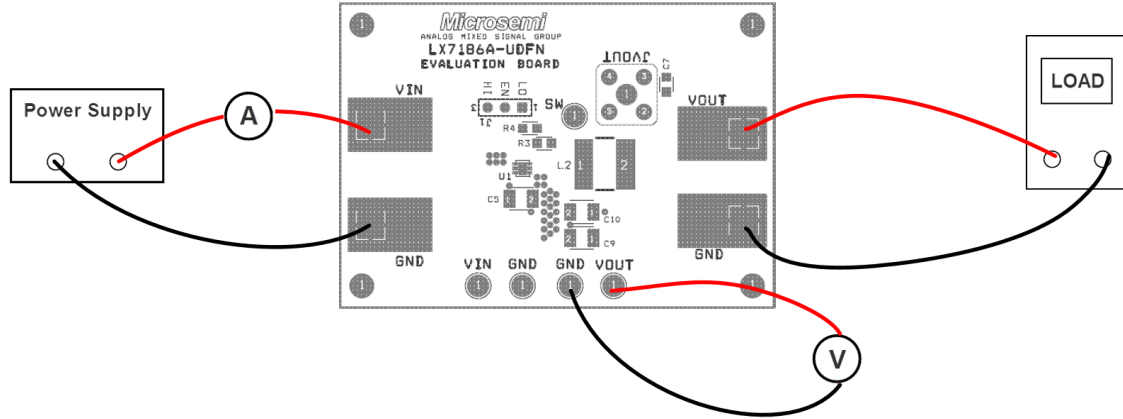
Figure 2 • LX7186A-UDFN Evaluation Board Schematic



4 Basic Connection Instructions

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

Figure 3 • Power Supply and Load Connection



5 Recommended Operating Conditions

The following table lists the recommended operating conditions for the LX7186A evaluation board.

Table 1 • Recommended Operating Conditions

Description	Symbol	Min	Max	Unit
Input voltage	V _{IN}	2.5	5.5	V
Output current	I _{OUT}	0	1	A
Operating ambient temperature	T _A	–40	85	°C
Enable chip	EN	1.5		V
Shut down chip	EN		0.4	V

5.1 Setting the Output Voltage

The following equation defines the value of V_{OUT}, where V_{REF}= 0.6 V and R₄= 24 kΩ.

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_3}{R_4}\right)$$

6 PCB Layout of Evaluation Board

The LX7186A evaluation board is four layers. The following illustrations depict each of the board's four layers.

Figure 4 • LX7186A Top Silkscreen

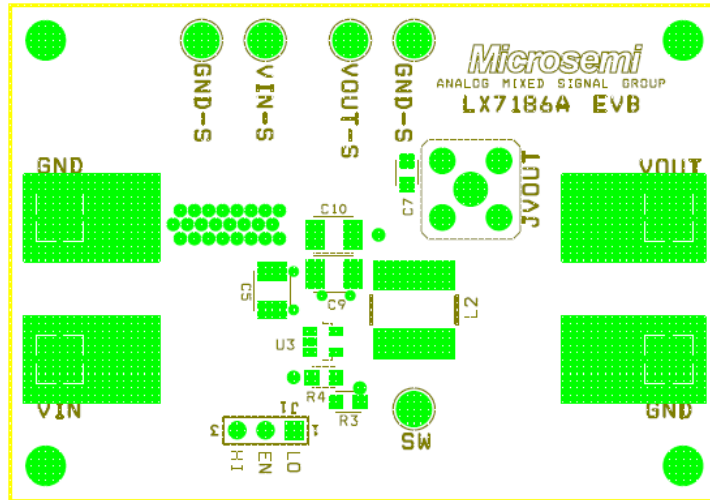


Figure 5 • LX7186A Top Layer

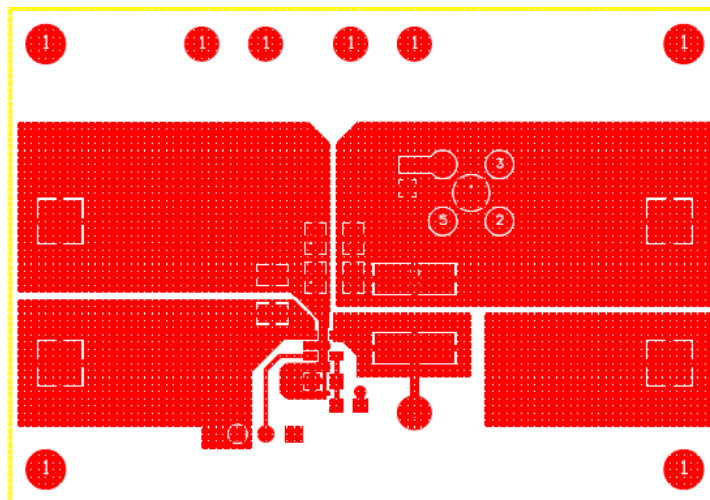


Figure 6 • LX7186A Bottom Layer

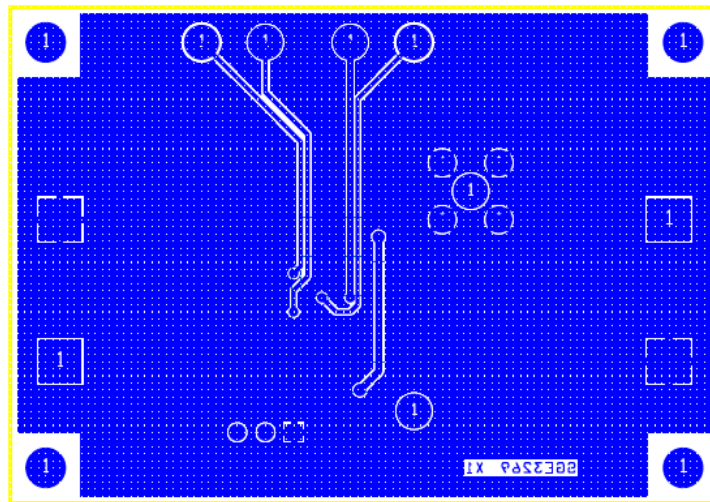


Figure 7 • LX7186A-UDFN Top Silkscreen

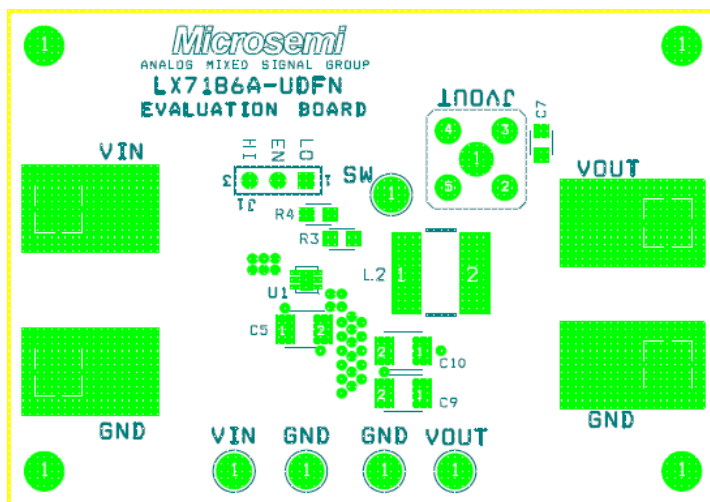
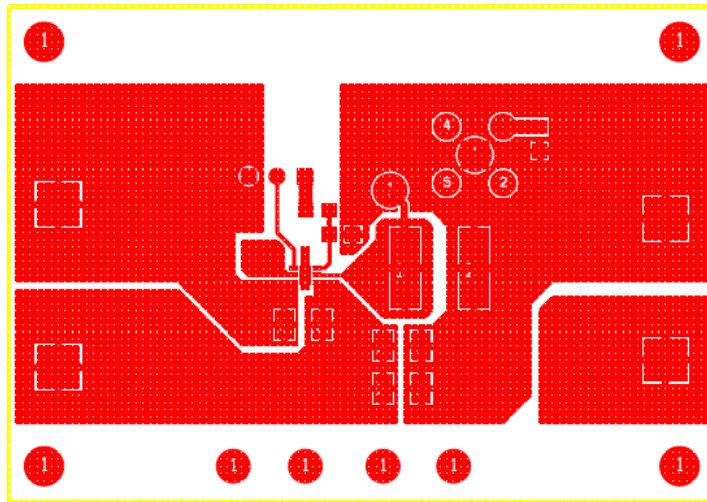
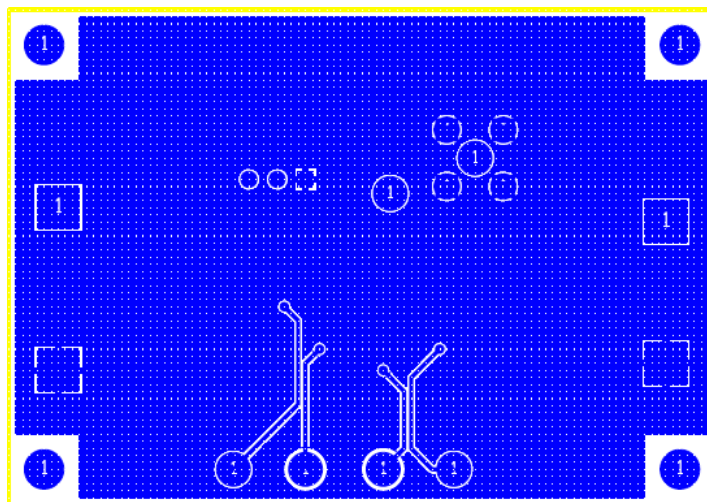


Figure 8 • LX7186A-UDFN Top Layer**Figure 9 • LX7186A-UDFN Bottom Layer**

7 Bill of Materials

The following table lists the bill of materials for the LX7186A evaluation board.

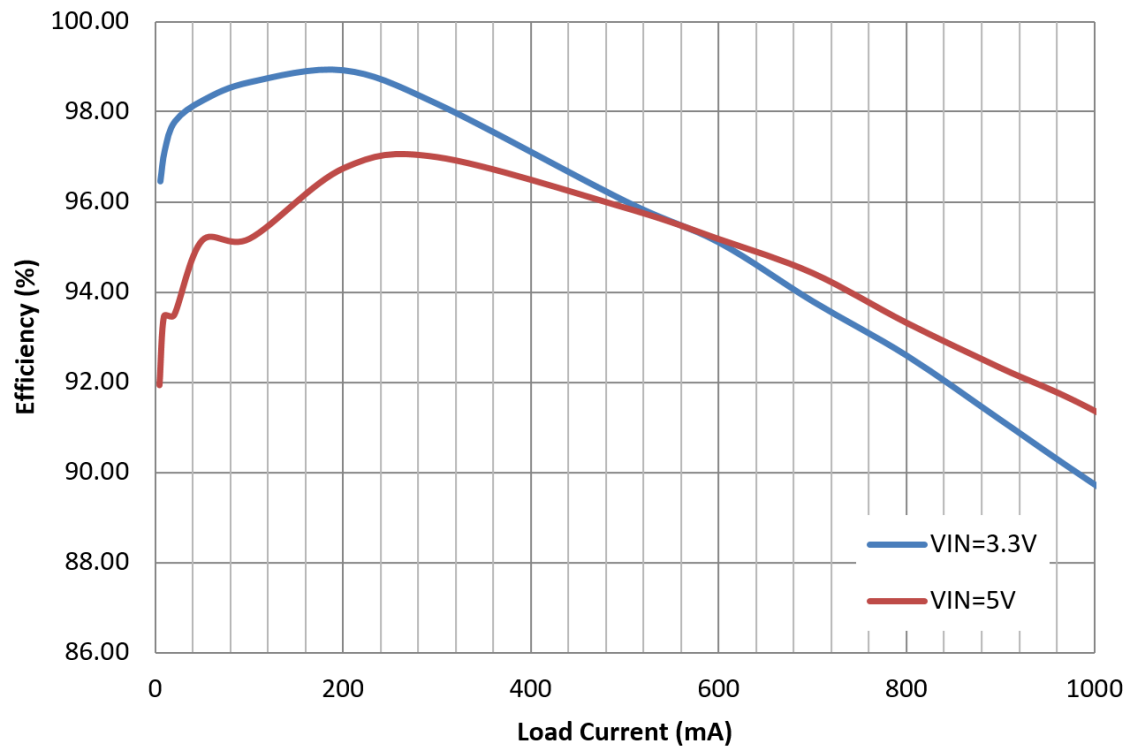
Table 2 • Bill of Materials

Item	Part Type	Part Description	Reference	Qty
1	Miscellaneous Components	Microsemi IC—LX7186A	U1	1
2	Miscellaneous Components	Test Point	SW, VIN, VOUT, GND, GND	5
3	Miscellaneous Components	Terminal	VIN, VOUT, GND, GND	4
4	Miscellaneous Components	Jumper/3-pin	J1	1
5	Miscellaneous Components	Scope Test Point	JVOUT	1
6	Capacitors	4.7 μ F/10 V/X5R	C5	1
7	Capacitors	0.1 μ F/6.3 V/X5R	C7	1
8	Capacitors	22 μ F/6.3 V/X5R	C9	1
9	Resistors	75 k Ω	R3	1
10	Resistors	24 k Ω	R4	1
11	Inductor	2.2 μ H/DO1813H-222 ML	L2	1

8 Efficiency Plot

The following graph shows LX7186A efficiency at a voltage output of 2.5 V.

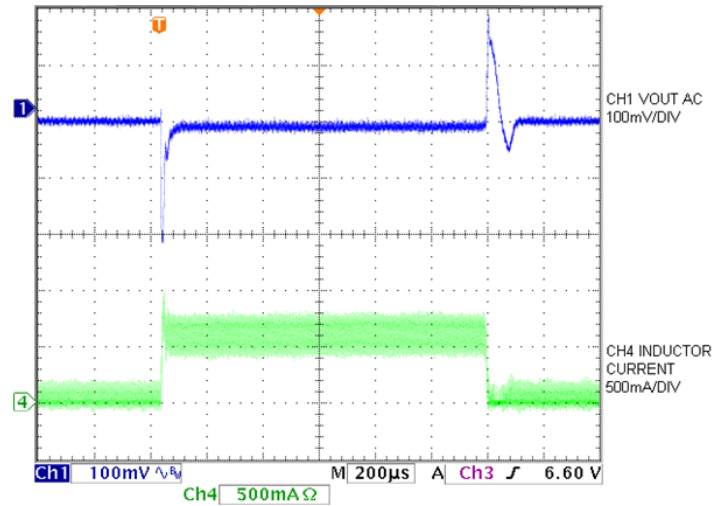
Figure 10 • LX7186A Efficiency with 2.5 V VOUT



9 Dynamic Load Response

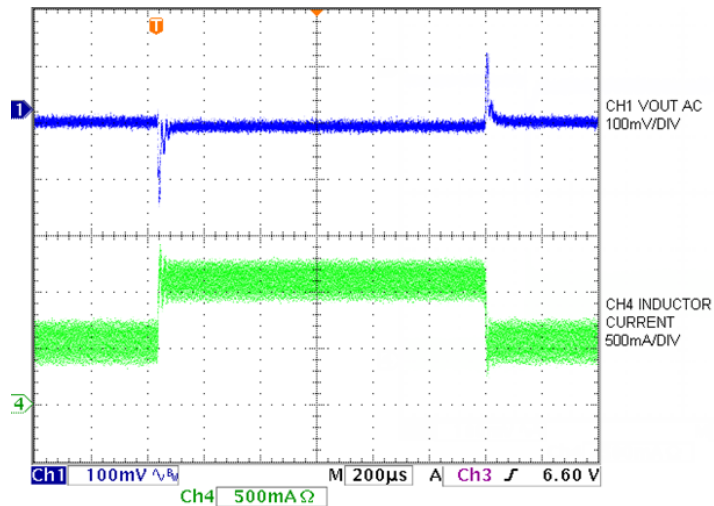
The following graphs show the dynamic load response of the LX7186A device.

Figure 11 • Dynamic Load Response with $I_{OUT} = 35\text{ mA} \leftrightarrow 600\text{ mA}$



$V_{IN} = 5\text{ V}$, $V_{OUT} = 3.3\text{ V}$, Load $35\text{ mA} \leftrightarrow 0.6\text{ A}$.

Figure 12 • Dynamic Load Response $0.6\text{ A} \leftrightarrow 1\text{ A}$

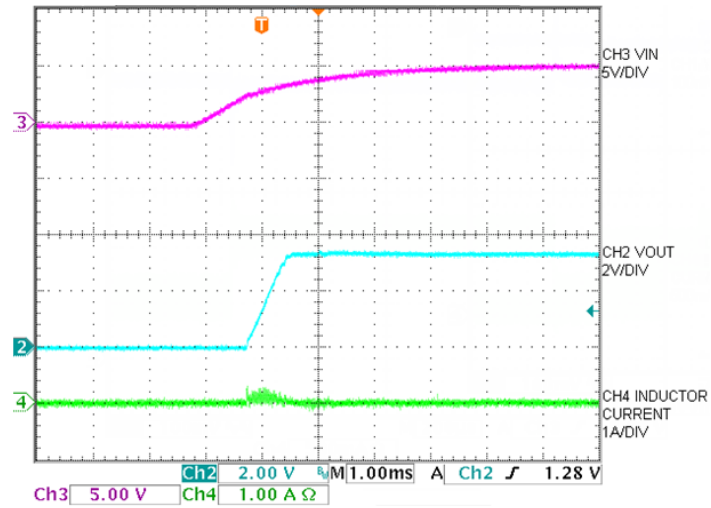


$V_{IN} = 5\text{ V}$, $V_{OUT} = 3.3\text{ V}$, Load $0.6\text{ A} \leftrightarrow 1\text{ A}$.

10 Soft Start

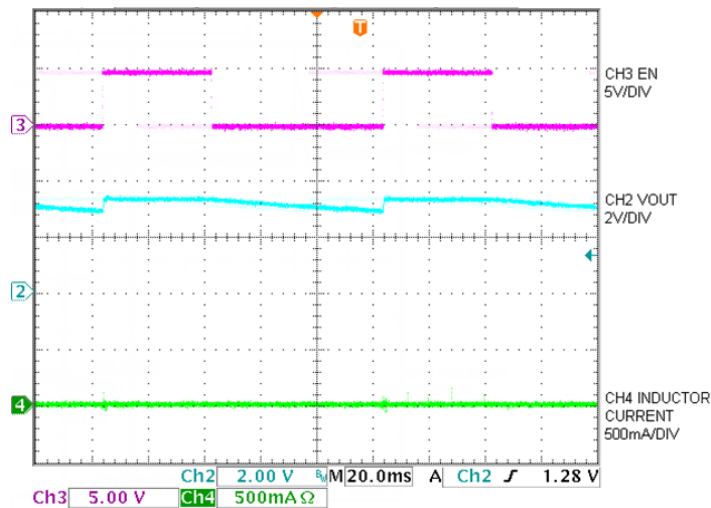
The following graphs show the soft start for the LX7186A device.

Figure 13 • Startup with No Load

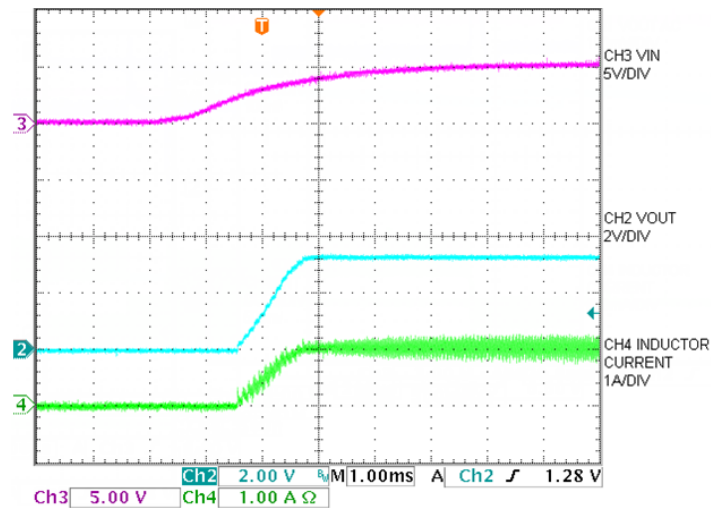


VIN= 5 V, VOUT= 3.3 V, no load.

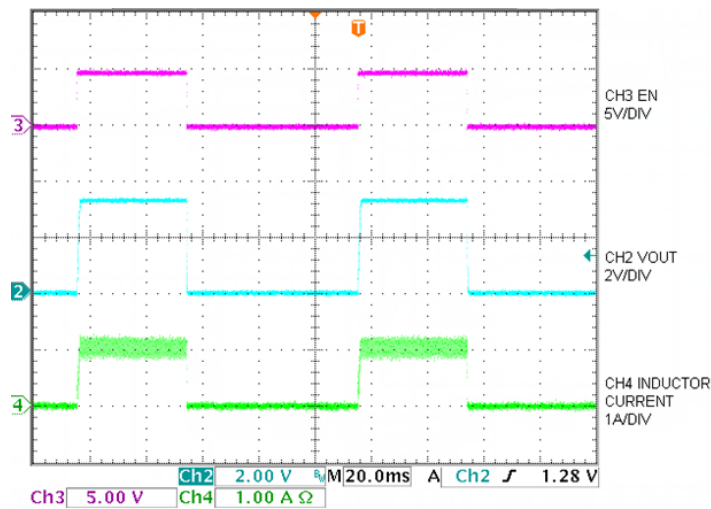
Figure 14 • Startup with No Load



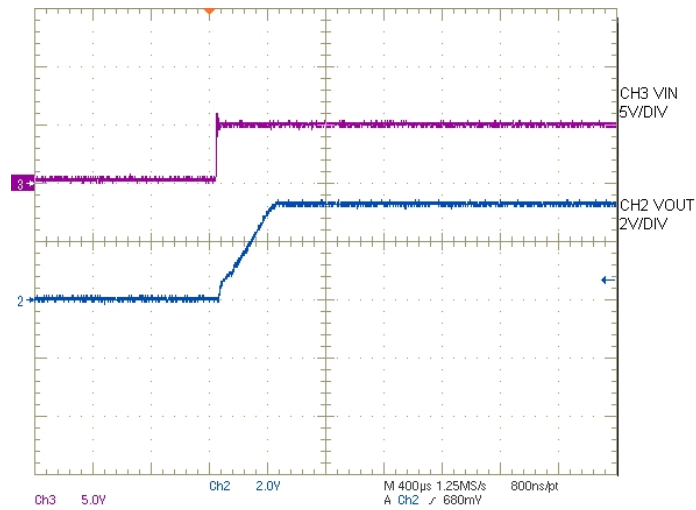
VIN= 5 V, VOUT= 3.3 V, no load.

Figure 15 • Startup with 1 A Resistive Load

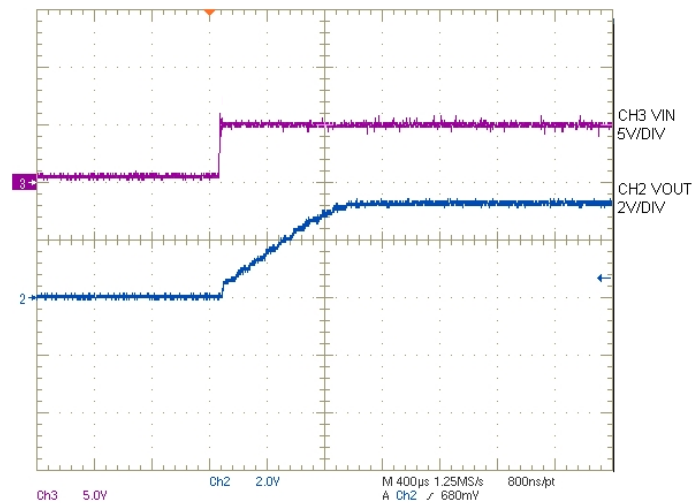
VIN = 5 V, VOUT = 3.3 V, 1 A load.

Figure 16 • Start up with 1 A Resistive Load

VIN = 5 V, VOUT = 3.3 V, 1 A load .

Figure 17 • Start up with Fast VIN Rise and 10 mA Resistive Load

VIN = 5 V, VOUT = 3.3 V, 10 mA load.

Figure 18 • Start up with Fast VIN Rise and 800 mA Resistive Load

VIN = 5 V, VOUT = 3.3 V, 800 mA load.

11 Ordering Information

The following table lists the ordering information for the LX7186A evaluation board.

Table 3 • Ordering Information

Part Order Number	Description
LX7186AISE	SOT23-5L
LX7186AILD	UDFN 2x2 6L
LX7186A EVALUATION BOARD	Evaluation PCB for LX7186AISE
LX7186A-UDFN EVALUATION BOARD	Evaluation PCB for LX7186AILD

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