



MB39C011AEVB-01 2CH Buck DC/DC Converter IC

## Evaluation Kit User Guide

Doc. No. 002-18196 Rev. \*\*

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# Contents



<b>Safety Information</b>	<b>4</b>
Regulatory Compliance .....	4
General Safety Instructions .....	4
<b>1. Introduction</b>	<b>5</b>
1.1 Kit Contents .....	5
<b>2. Kit Overview</b>	<b>6</b>
2.1 Terminal Information .....	6
2.2 Specification .....	6
2.3 Hardware .....	7
2.4 Default Settings .....	7
<b>3. Set Up and Check</b>	<b>8</b>
3.1 Setup and Check .....	8
<b>4. Reference Data</b>	<b>9</b>
4.1 Reference Data .....	9
<b>Appendix</b>	<b>12</b>
A.1 Schematic .....	12
A.2. Bill of Materials (BOM) .....	13
A.3 Image .....	14
A.4 Silk Screen .....	14
A.5 Layout .....	15
<b>Revision History</b>	<b>16</b>
Document Revision History .....	16

# Safety Information

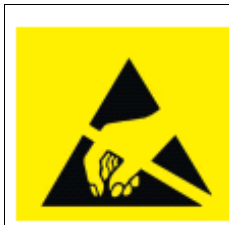


## Regulatory Compliance

This Evaluation Kit is intended for use as a development platform for hardware in a laboratory environment. The board is an open system design, which does not include a shielded enclosure. This may cause interference to other electrical or electronic devices in close proximity.

In a domestic environment, this product may cause radio interference. The user may then be required to take adequate prevention measures. Also, the board should not be used near any medical equipment or RF devices.

Attaching additional wiring to this product or modifying the product operation from the factory default may affect its performance and cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures should be taken.



This Evaluation Kit contains electrostatic discharge (ESD) sensitive devices. Electrostatic charges readily accumulate on the human body and any equipment, and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused this board in the protective shipping package.

## General Safety Instructions

### ESD Protection

ESD can damage boards and associated components. Cypress recommends that you perform procedures only at an ESD workstation. If an ESD workstation is not available, use appropriate ESD protection by wearing an antistatic wrist strap attached to chassis ground (any unpainted metal surface) on your board when handling parts.

### Handling Boards

This board is sensitive to ESD. Hold the board only by its edges. After removing the board from its box, place it on a grounded, static-free surface. Use a conductive foam pad if available. Do not slide board over any surface.

# 1. Introduction



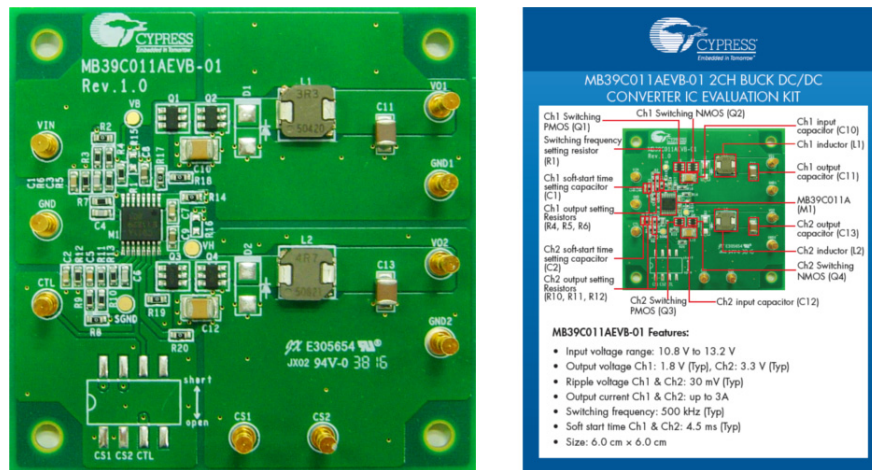
Thank you for your interest in the MB39C011AEVB-01 2CH Buck DC/DC Converter IC Evaluation Kit (EVK). The kit is designed as an easy-to-use evaluation kit, showcasing the features of the Cypress MB39C011AEVB-01 2CH Buck DC/DC Converter IC that has synchronous rectification. For more information, see [the MB39C011A datasheet](#).

## 1.1 Kit Contents

This evaluation kit includes the following items as shown in [Figure 1-1](#):

- MB39C011AEVB-01 evaluation board
- Quick start guide ([www.cypress.com/MB39C011AEVB-01](http://www.cypress.com/MB39C011AEVB-01))

Figure 1-1. MB39C011AEVB-01 Evaluation Kit Contents

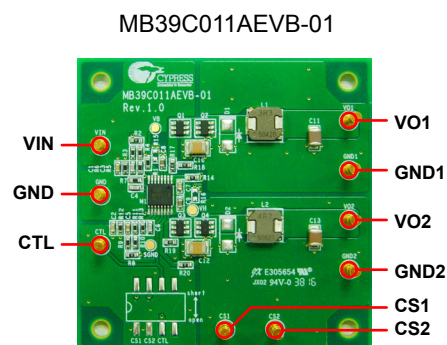


## 2. Kit Overview



### 2.1 Terminal Information

Terminal Name	I/O	Descriptions
VIN	I	Input power supply terminal
CTL	I	IC control terminal CTL = 0 V to 0.8 V: Standby mode CTL = 2.0 V to VIN: Operation mode
CS1	I	Ch1 control terminal CS1 = Open: VO1 output on CS1 = Ground: VO1 output off
CS2	I	Ch2 control terminal CS2 = Open: VO2 output on CS2 = Ground: VO2 output off
VO1	O	Ch1 DC/DC converter output terminal
VO2	O	Ch2 DC/DC converter output terminal
GND	-	Ground terminal
GND1	-	Ground terminal
GND2	-	Ground terminal



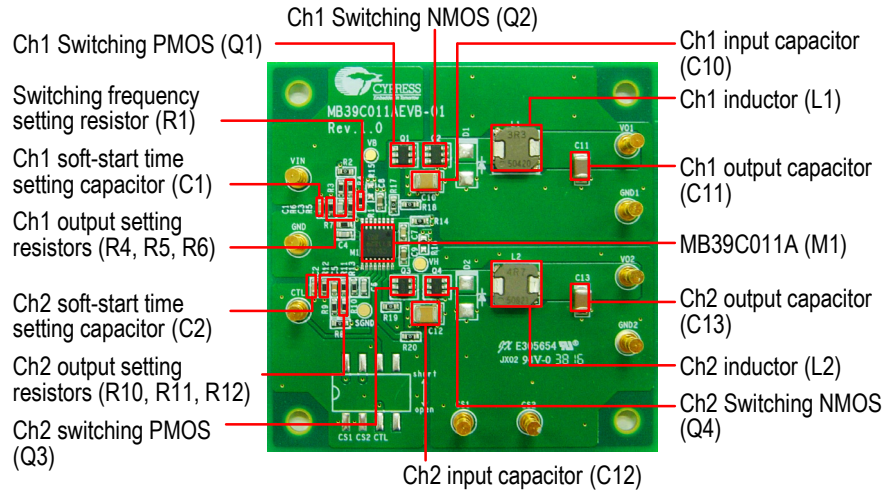
### 2.2 Specification

Parameter			Value			Unit
			Min	Typ	Max	
Input voltage	Ch1, Ch2	VIN	10.8	12	13.2	V
	Ch1	VO1	1.76	1.8	1.83	V
Output voltage	Ch2	VO2	3.23	3.3	3.36	V
	Ch1	VO1	-	30	60	mV
Ripple voltage	Ch2	VO2	-	30	60	mV
	Ch1	I <sub>O1</sub>	0	-	3	A
Output current	Ch2	I <sub>O2</sub>	0	-	3	A
	Ch1, Ch2	-	-	500	-	kHz
Soft-start time	Ch1	VO1	-	4.5	-	ms
	Ch2	VO2	-	4.5	-	ms

## 2.3 Hardware

The kit consists of the following components as shown in Figure 2-1:

Figure 2-1. Kit Components



## 2.4 Default Settings

### 1. Output voltage

$$VO1 = \frac{(R4 + R5) + R6}{R6} \times 1.0 = \frac{(5.1k + 75k) + 100k}{100k} \times 1.0 \approx 1.8 [V]$$

$$VO2 = \frac{(R10 + R11) + R12}{R12} \times 1.0 = \frac{(1.5k + 33k) + 15k}{15k} \times 1.0 = 3.3 [V]$$

### 2. Oscillation frequency

$$f_{osc} = \frac{1.00}{R1 \times (122.4 \times 10^{-12}) + (96 \times 10^{-9})} = \frac{1.00}{16k \times (122.4 \times 10^{-12}) + (96 \times 10^{-9})} = 486760 [Hz] \approx 500 [kHz]$$

### 3. Soft-start time

$$t_{s1} = 19.0 \times C1 \times R1 = 19.0 \times (0.015 \mu) \times (16k) = 0.00456 [s] \approx 4.5 [ms]$$

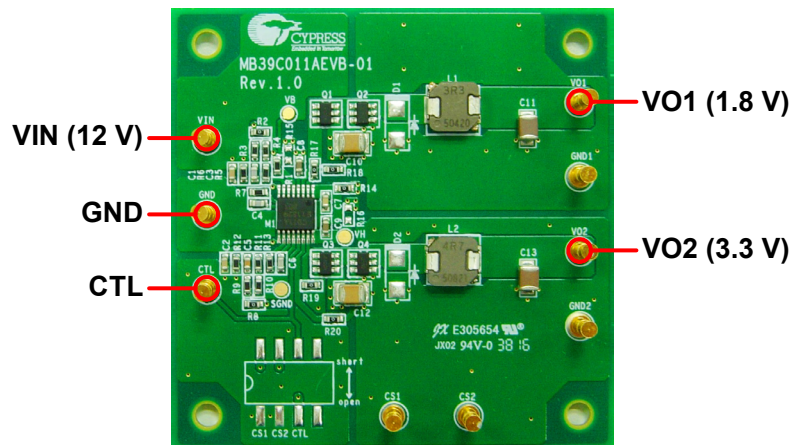
$$t_{s2} = 19.0 \times C2 \times R1 = 19.0 \times (0.015 \mu) \times (16k) = 0.00456 [s] \approx 4.5 [ms]$$

## 3. Set Up and Check



### 3.1 Setup and Check

Figure 3-1. Terminals for Setup and Check



#### Setup\*

1. Connect VIN to a power supply and GND to the ground.
2. Connect CTL to VIN.
3. Connect VO1 to a voltmeter.
4. Connect VO2 to a voltmeter.

#### Check\*

1. Apply 12 V to VIN.
2. VO1 voltage should be 1.8 V (typ) and VO2 voltage should be 3.3 V (typ)

\*Do not supply power to VIN until settings are completed.

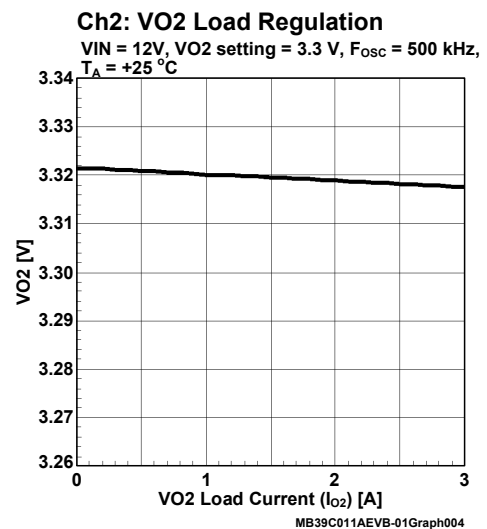
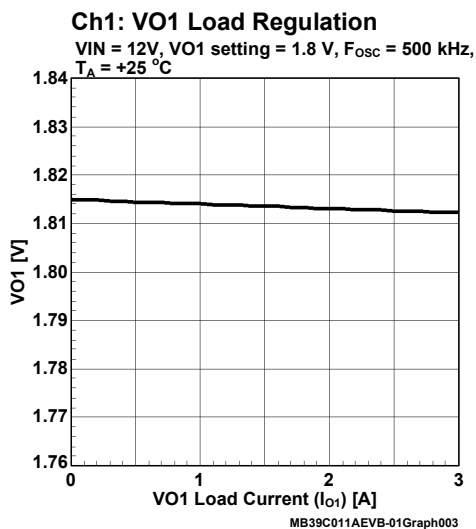
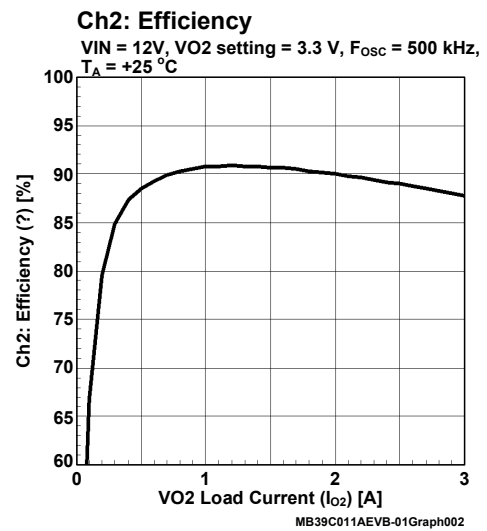
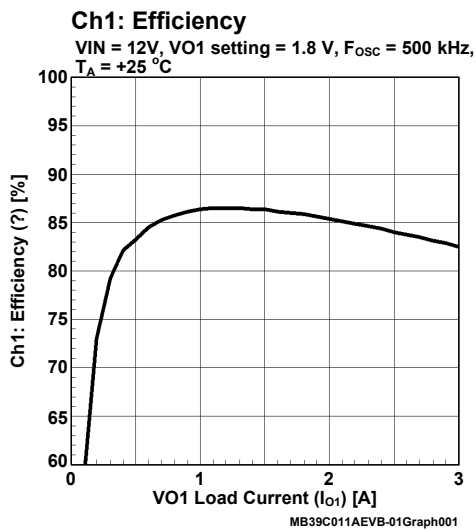


# 4. Reference Data



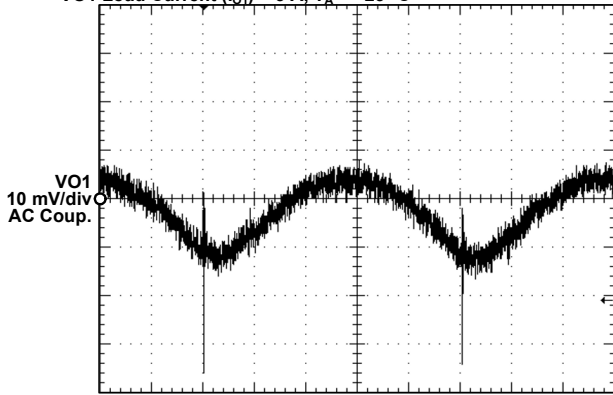
## 4.1 Reference Data

Figure 4-1. Reference Data



**Ch1: VO1 Ripple Voltage Waveform**

VIN = 12 V, VO1 setting = 1.8 V, F<sub>OSC</sub> = 500 kHz,  
VO1 Load Current (I<sub>o1</sub>) = 3 A, T<sub>A</sub> = +25 °C

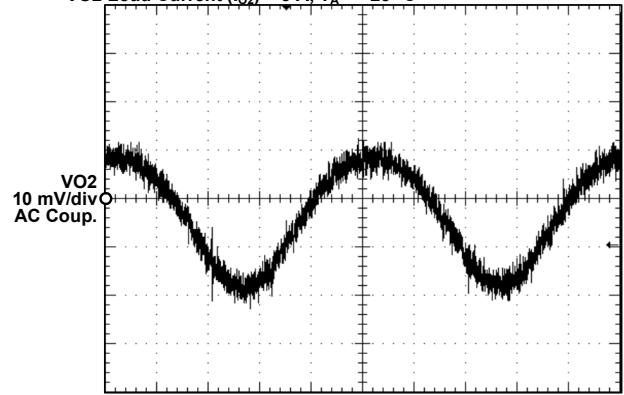


400 ns/div

MB39C011AEVB-01Graph005

**Ch2: VO2 Ripple Voltage Waveform**

VIN = 12 V, VO2 setting = 3.3 V, F<sub>OSC</sub> = 500 kHz,  
VO2 Load Current (I<sub>o2</sub>) = 3 A, T<sub>A</sub> = +25 °C

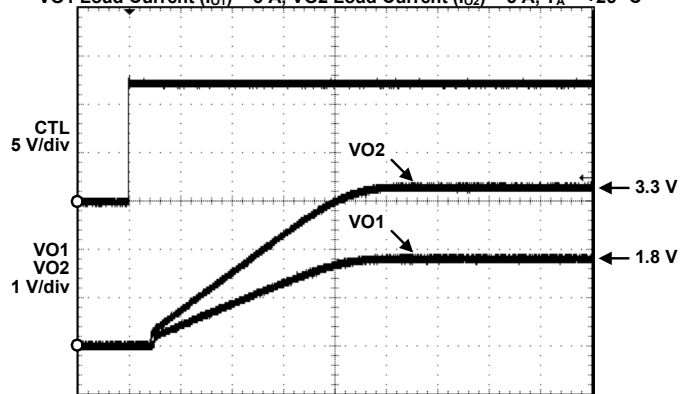


400 ns/div

MB39C011AEVB-01Graph006

**Ch1 and Ch2: Turn On Responses**

VIN = 12 V, VO1 setting = 1.8 V, VO2 setting = 3.3 V, F<sub>OSC</sub> = 500 kHz,  
VO1 Load Current (I<sub>o1</sub>) = 3 A, VO2 Load Current (I<sub>o2</sub>) = 3 A, T<sub>A</sub> = +25 °C

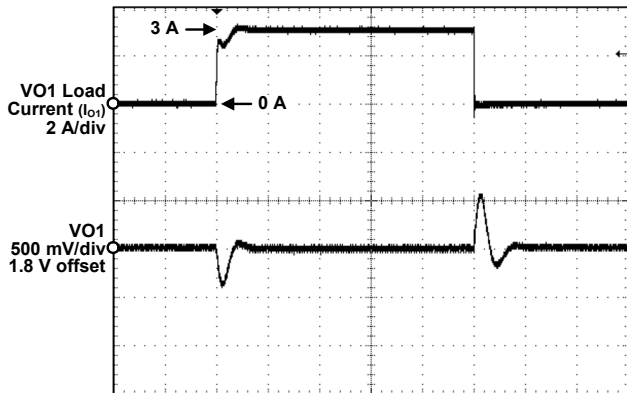


1 ms/div

MB39C011AEVB-01Graph007

**Ch1: VO1 Load Transient Response**

VIN = 12 V, VO1 setting = 1.8 V, F<sub>OSC</sub> = 500 kHz, T<sub>A</sub> = +25 °C

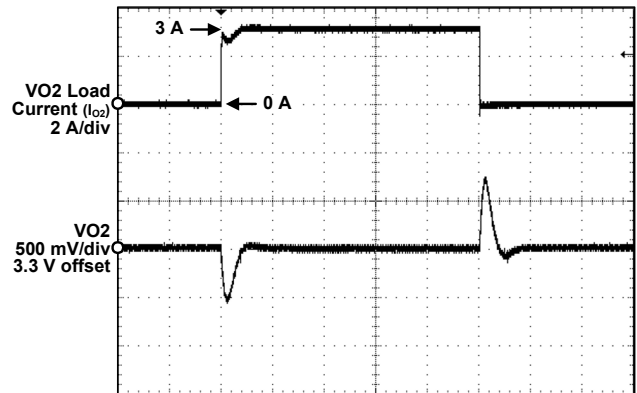


40 μs/div

MB39C011AEVB-01Graph008

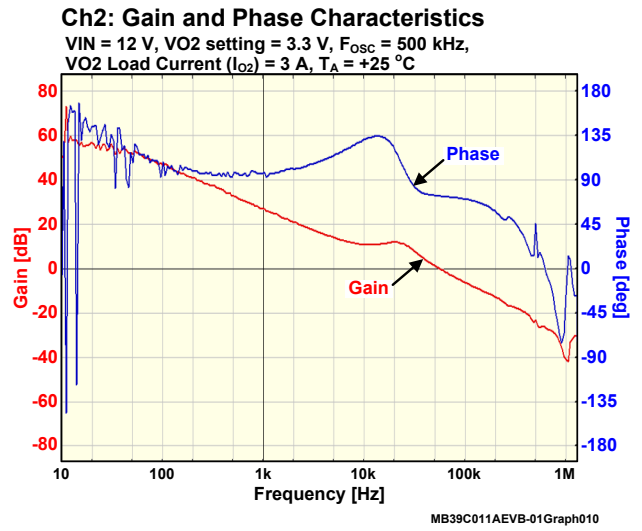
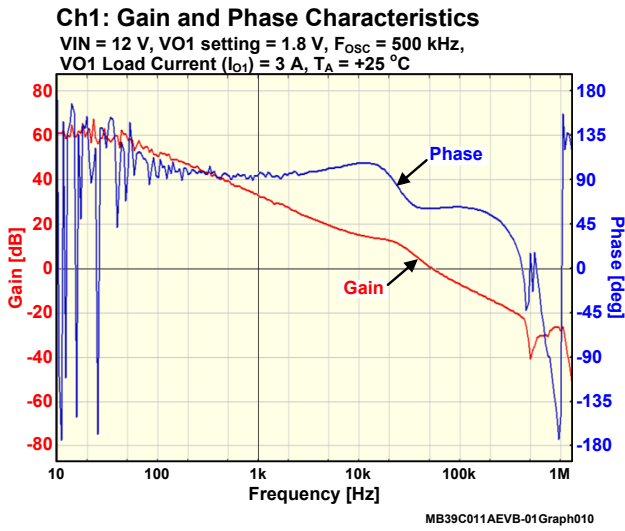
**Ch2: VO2 Load Transient Response**

VIN = 12 V, VO2 setting = 3.3 V, F<sub>OSC</sub> = 500 kHz, T<sub>A</sub> = +25 °C



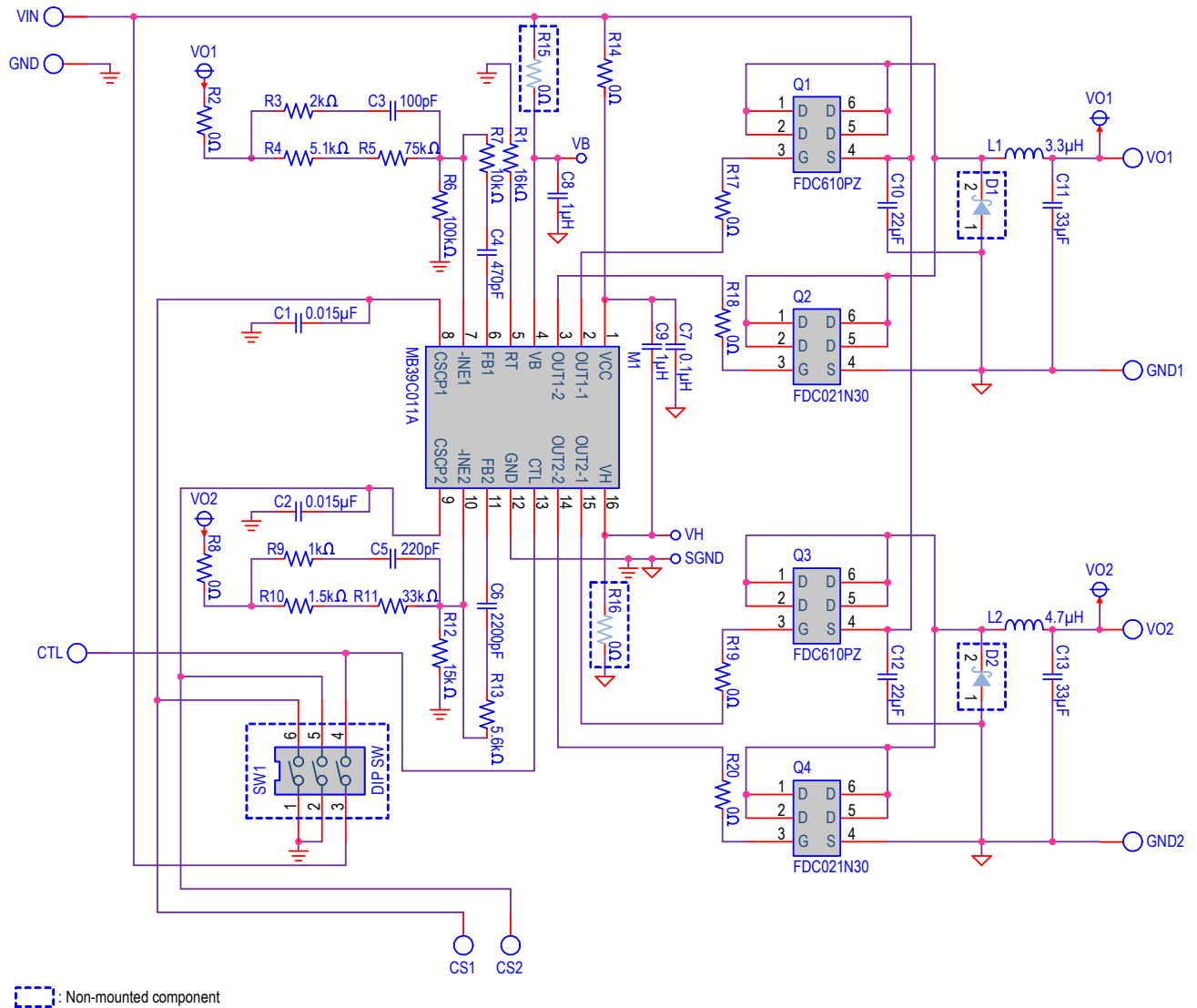
40 μs/div

MB39C011AEVB-01Graph009



# Appendix

## A.1 Schematic

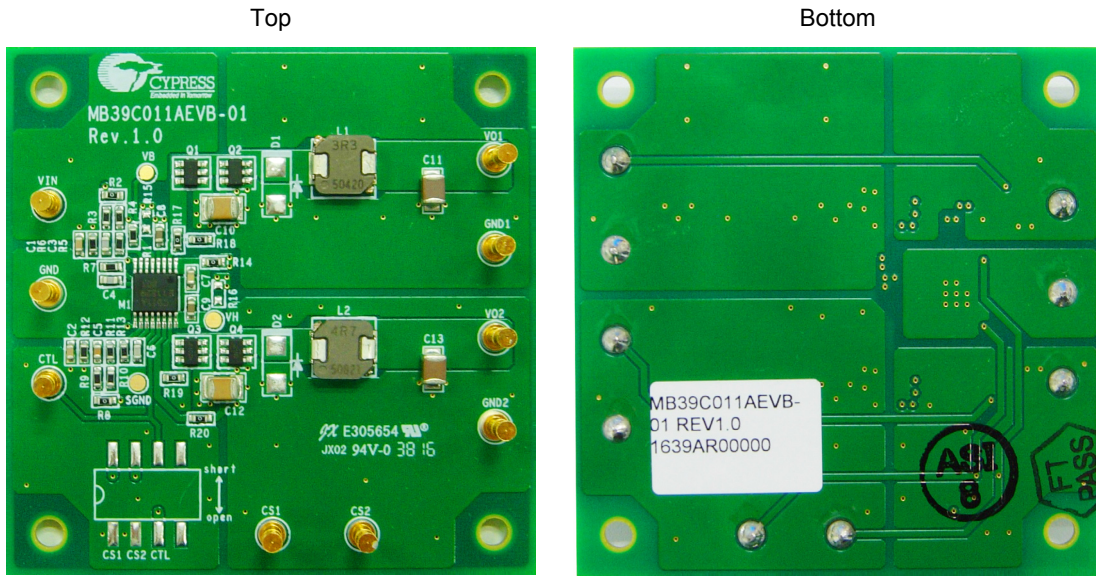


## A.2. Bill of Materials (BOM)

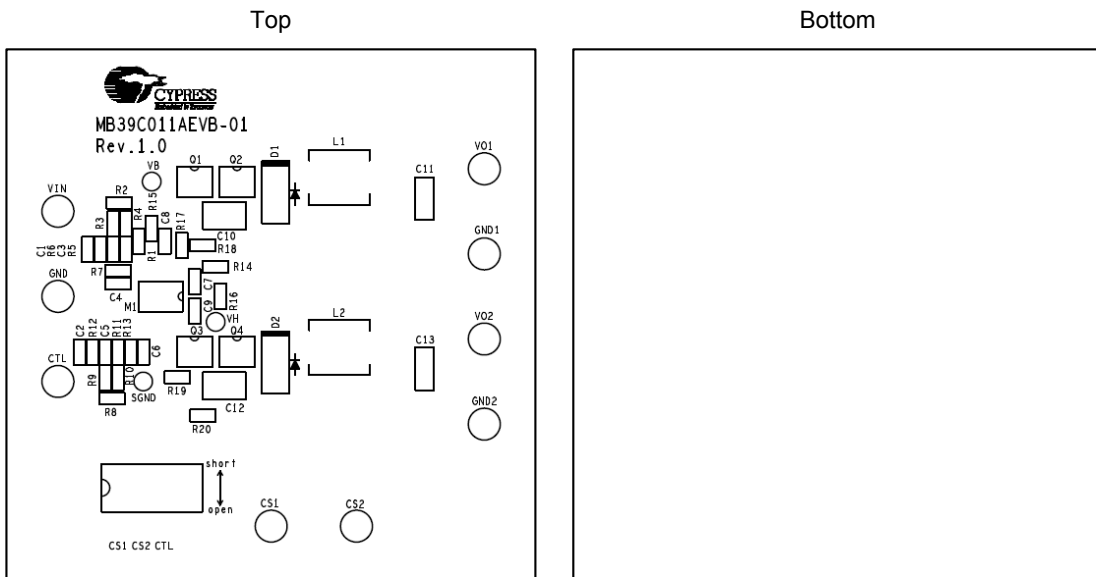
No	Symbol	Item	Value / Description	Part Number	Vendor	PKG / Size	Remark
1	M1	IC	2ch Buck controllers	MB39C011APFT-G-BND-ERE1	Cypress	STB016	–
2	Q1, Q3	PMOS FET	$V_{DS} = -30\text{ V}$ , $I_D = -4.9\text{ A}$ , $R_{ON} = 42\text{ m}\Omega$	FDC610PZ	Fairchild	SO8	–
3	Q2, Q4	NMOS FET	$V_{DS} = 30\text{ V}$ , $I_D = 6.1\text{ A}$ , $R_{ON} = 26\text{ m}\Omega$	FDC021N30	Fairchild	SO8	–
4	D1	Schottky	–	–	–	–	No mount
5	D2	Schottky	–	–	–	–	No mount
6	L1	Inductor	3.3 $\mu\text{H}$ (27 $\text{m}\Omega$ , 6.8A, $\pm 20\%$ )	SPM6530T-3R3M	TDK	7.1 $\times$ 6.5 $\times$ 3 (mm)	–
7	L2	Inductor	4.7 $\mu\text{H}$ (35.8 $\text{m}\Omega$ , 5.6 A, $\pm 20\%$ )	SPM6530T-4R7M	TDK	7.1 $\times$ 6.5 $\times$ 3 (mm)	–
8	C1, C2	Capacitor	0.015 $\mu\text{F}$ (50 V, JB)	C1608JB1H153K080AA	TDK	0603	–
9	C3	Capacitor	100 pF (50 V, CH)	C1608CH1H101J080AA	TDK	0603	–
10	C4	Capacitor	470 pF (50 V, CH)	C1608CH1H471J080AA	TDK	0603	–
11	C5	Capacitor	220 pF (50 V, CH)	C1608CH1H221J080AA	TDK	0603	–
12	C6	Capacitor	2200 pF (50 V, CH)	C1608CH1H222J080AA	TDK	0603	–
13	C7	Capacitor	0.1 $\mu\text{F}$ (50 V, JB)	C1608JB1H104K080AA	TDK	0603	–
14	C8, C9	Capacitor	1 $\mu\text{F}$ (16 V, JB)	C1608JB1C105K080AA	TDK	0603	–
15	C10, C12	Capacitor	22 $\mu\text{F}$ (25 V, X5R)	GRM32ER61E226KE15K	Murata	1210	–
16	C11, C13	Capacitor	33 $\mu\text{F}$ (6.3 V, JB)	C3216JB0J336M130AC	TDK	1210	–
17	R1	Resistor	1.6 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-163-D	SSM	0603	–
18	R2, R8, R14, R17, R18, R19, R20	Resistor	0 $\Omega$	RK73Z1JTTD	KOA	0603	–
19	R3	Resistor	2 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-202-D	SSM	0603	–
20	R4	Resistor	5.1 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-512-D	SSM	0603	–
21	R5	Resistor	75 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-753-D	SSM	0603	–
22	R6	Resistor	100 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-104-D	SSM	0603	–
23	R7	Resistor	10 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-103-D	SSM	0603	–
24	R9	Resistor	1 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-102-D	SSM	0603	–
25	R10	Resistor	1.5 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-152-D	SSM	0603	–
26	R11	Resistor	33 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-333-D	SSM	0603	–
27	R12	Resistor	15 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-153-D	SSM	0603	–
28	R13	Resistor	5.6 $\text{k}\Omega$ (1/16 W, 0.5 %)	RR0816P-562-D	SSM	0603	–
29	R15, R16	Resistor	0 $\Omega$	–	–	0603	No mount
30	SW1	Dip switch	–	–	–	–	No mount
31	PIN	Terminal	Wire wrap	WT-2-1	Mac-Eight	–	–

### A.3 Image

Figure 5-1. Image

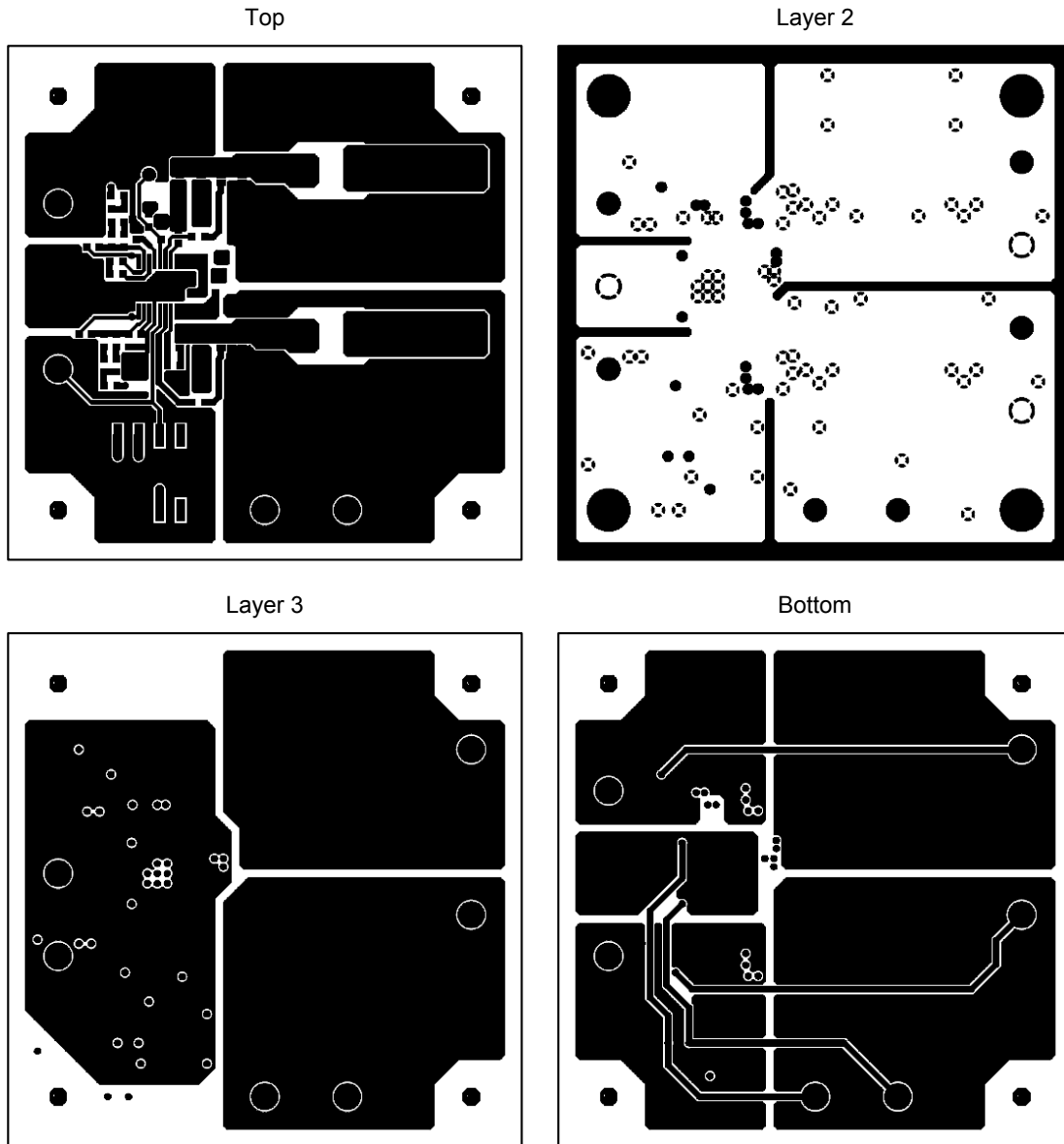


### A.4 Silk Screen



There is no silk screen on the bottom.

## A.5 Layout



# Revision History



## Document Revision History

<b>Document Title: MB39C011AEVB-01 2CH Buck DC/DC Converter IC Evaluation Kit User Guide</b>				
<b>Document Number: 002-18196</b>				
<b>Revision</b>	<b>ECN#</b>	<b>Issue Date</b>	<b>Origin of Change</b>	<b>Description of Change</b>
**	5560142	12/28/2016	HIXT	New user guide