MAX17506 3.3V Output Evaluation Kit

Evaluates: MAX17506 in 3.3V Output-Voltage Application

General Description

The MAX17506 3.3V output evaluation kit (EV kit) provides a proven design to evaluate the MAX17506 high-voltage, high-efficiency, synchronous step-down DC-DC converter. The EV kit is preset for 3.3V output at load currents up to 5A and features a 450kHz switching frequency for optimum efficiency and component size. The EV kit features adjustable-input undervoltage lockout, adjustable soft-start, open-drain $\overline{\text{RESET}}$ signal, and external frequency synchronization.

Features

- Operates From a 4.5V to 60V Input Supply
- 3.3V Output Voltage
- Up to 5A Output Current
- 450kHz Switching Frequency
- Enable/UVLO Input, Resistor-Programmable UVLO Threshold
- Adjustable Soft-Start Time
- MODE Pin to Select Among PWM, PFM, or DCM Modes
- Open-Drain $\overline{\text{RESET}}$ Output
- External Frequency Synchronization
- Overcurrent and Overtemperature Protection
- Proven PCB Layout
- Fully Assembled and Tested

***Ordering Information* appears at end of data sheet.**

Quick Start

Recommended Equipment

- MAX17506 3.3V output EV kit
- 4.5V to 60V, 10A DC input power supply
- Load capable of sinking 5A
- Digital voltmeter (DVM)

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify the board operation. **Caution: Do not turn on power supply until all connections are completed.**

1) Set the power supply at a voltage between 4.5V and 60V. Disable the power supply.
2) Connect the positive terminal of the power supply to the VIN PCB pad and the negative terminal to the nearest PGND PCB pad. Connect the positive terminal of the 5A load to the VOUT PCB pad and the negative terminal to the nearest PGND PCB pad.
3) Connect the DVM across the VOUT PCB pad and the nearest PGND PCB pad.
4) Verify that shunts are installed across pins 1-2 on jumper JU1 and pins 2-3 on JU3 (see Table 1 for details).
5) Select the shunt position on JU2 based on the intended mode of operation (see Table 2 for details).
6) Turn on the DC power supply.
7) Enable the load.
8) Verify that the DVM displays 3.3V

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Detailed Description

The EV kit provides a proven design to evaluate the MAX17506 high-voltage, high-efficiency, synchronous step-down DC-DC converter. The EV kit is preset for 3.3V output from a 4.5V to 60V input at load currents of up to 5A and features a 450kHz switching frequency for optimum efficiency and component size.

The EV kit includes an EN/UVLO PCB pad and JU1 to enable the output at the desired input voltage. The SYNC PCB pad and JU3 allow an external clock to synchronize the device. JU2 allows the selection of a particular mode of operation based on light-load performance requirements. An additional $\overline{\text{RESET}}$ PCB pad is available for monitoring whether the converter output is in regulation.

Soft-Start Input (SS)

The device utilizes an adjustable soft-start function to limit inrush current during startup. The soft-start time is adjusted by the value of the external capacitor from SS to GND (C3). The selected output capacitance (C_{SEL}) and output voltage (V_{OUT}) determine the minimum value of C3, as shown by the following equation:

$$C3 \geq 28 \times 10^{-6} \times C_{SEL} \times V_{OUT}$$

The soft-start time (t_{SS}) is related to C3 by the following equation:

$$t_{SS} = C3/(5.55 \times 10^{-6})$$

For example, to program a 2.2ms soft-start time, C3 should be 12nF.

Regulator Enable/Undervoltage-Lockout Level (EN/UVLO)

The device offers an adjustable-input, undervoltage-lockout level. For normal operation, a shunt should be installed across pins 1-2 on JU1. To disable the output, install a shunt across pins 2-3 on JU1 and pull the EN/UVLO pin to GND. See Table 1 for JU1 settings.

Set the voltage at which the device turns on with the resistive voltage-divider R1/R2 connected from VIN_ to SGND. Connect the center node of the divider to EN/UVLO.

Choose R1 to be 3.32MΩ and then calculate R2 as follows:

$$R2 = \frac{R1 \times 1.215}{V_{INU} - 1.215}$$

where V_{INU} is the voltage at which the device is required to turn on.

Mode/SYNC Selection (MODE)

The device's MODE pin should be used to select among PWM, PFM, or DCM modes of operation. The logic state of the MODE pin is latched when the V_{CC} and EN/UVLO voltages exceed the respective UVLO rising thresholds and all internal voltages are ready to allow LX switching. State changes on the MODE pin are ignored during normal operation. Refer to the MAX17506 IC data sheet for more information on the PWM, PFM, and DCM modes of operation.

Table 2 shows EV kit jumper settings that can be used to configure the desired mode of operation.

The internal oscillator of the device can be synchronized to an external clock signal on the SYNC pin. The external synchronization clock frequency must be between $1.1f_{SW}$ and $1.4f_{SW}$, where f_{SW} is the frequency of operation set by R5. The minimum external clock high pulse width should be greater than 50ns and the minimum external clock low pulse width should be greater than 160ns.

Table 1. Regulator Enable (EN/UVLO) Description (JU1)

SHUNT POSITION	EN/UVLO PIN	MAX17506_ OUTPUT
1-2*	Connected to VIN	Enabled
Not installed	Connected to the center node of resistor-divider R1 and R2	Enabled, UVLO level set through the R1 and R2 resistors
2-3	Connected to SGND	Disabled

**Default position.*

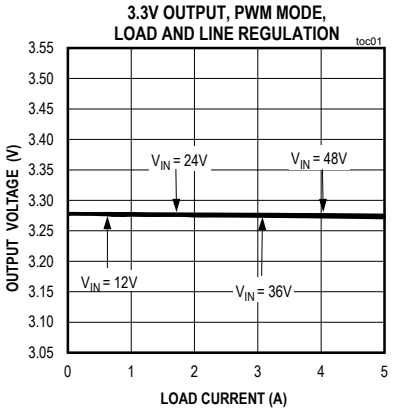
Table 2. MODE Description (JU2)

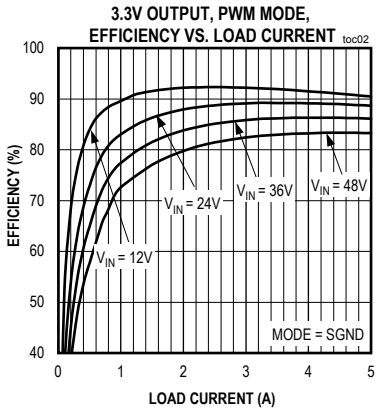
SHUNT POSITION	MODE PIN	MAX17506_ MODE
Not installed*	Unconnected	PFM mode of operation
1-2	Connected to SGND	PWM mode of operation
2-3	Connected to VCC	DCM mode of operation

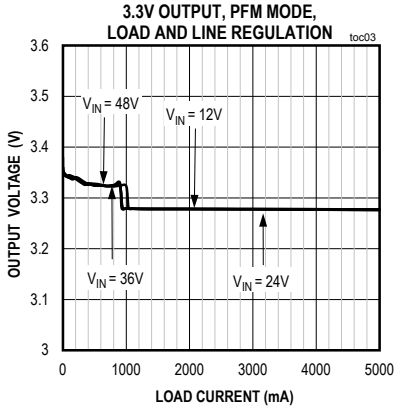
**Default position.*

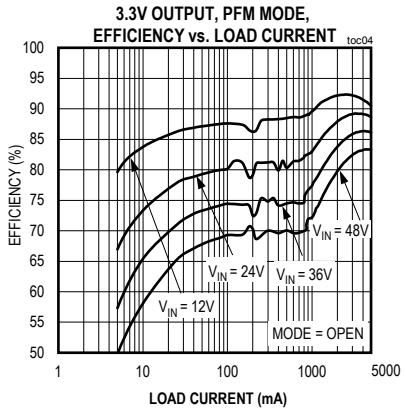
EV Kit Performance Report

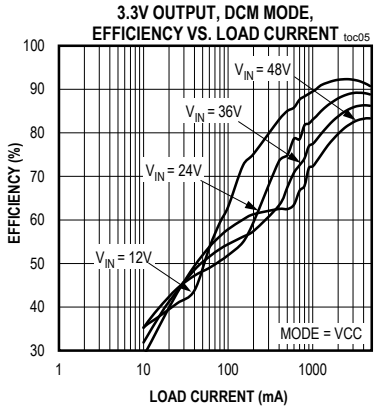
Input voltage = 24V, unless otherwise noted.

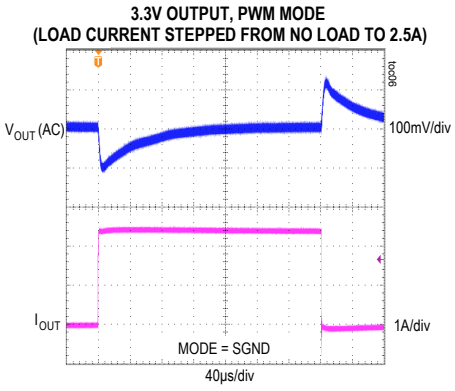








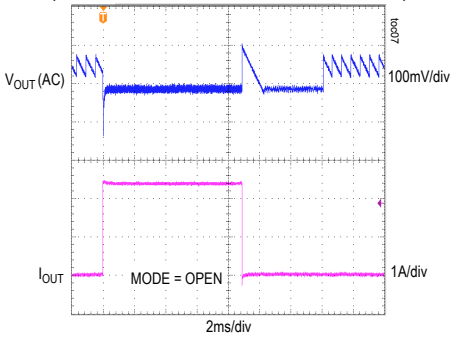




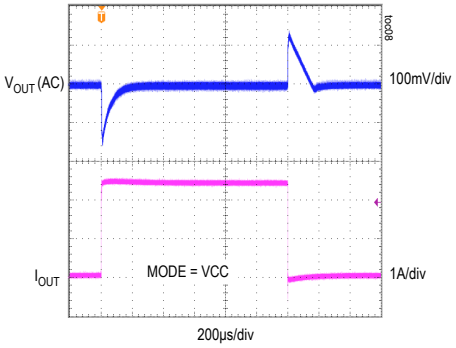
EV Kit Performance Report (continued)

Input voltage = 24V, unless otherwise noted.

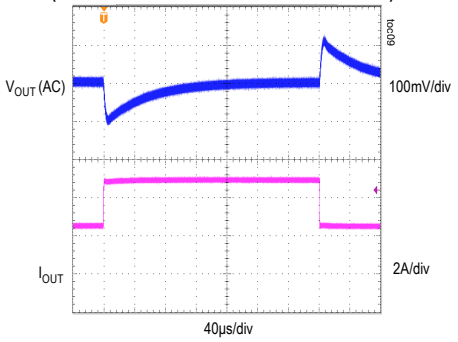
3.3V OUTPUT, PFM MODE
(LOAD CURRENT STEPPED FROM 5mA TO 2.5A)



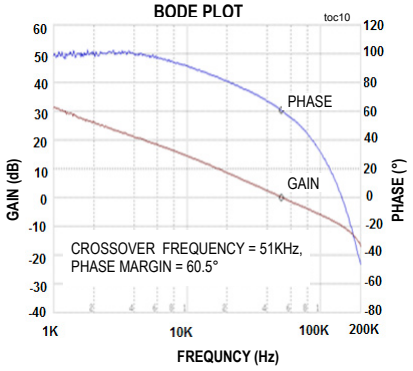
3.3V OUTPUT, DCM MODE
(LOAD CURRENT STEPPED FROM 50mA TO 2.5A)



3.3V OUTPUT, PWM MODE
(LOAD CURRENT STEPPED FROM 2.5A TO 5A)



3.3V OUTPUT, 5A LOAD CURRENT,
BODE PLOT



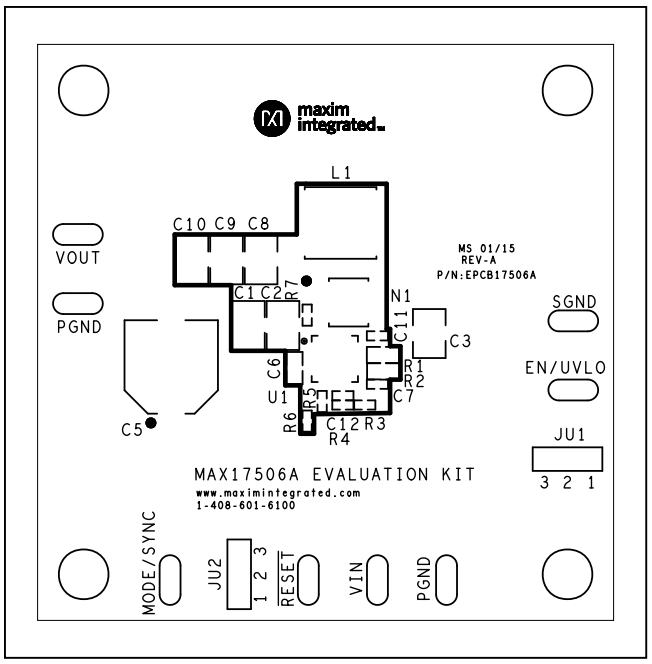


Figure 1. MAX17506 3.3V Output EV Kit Component Placement Guide—Component Side

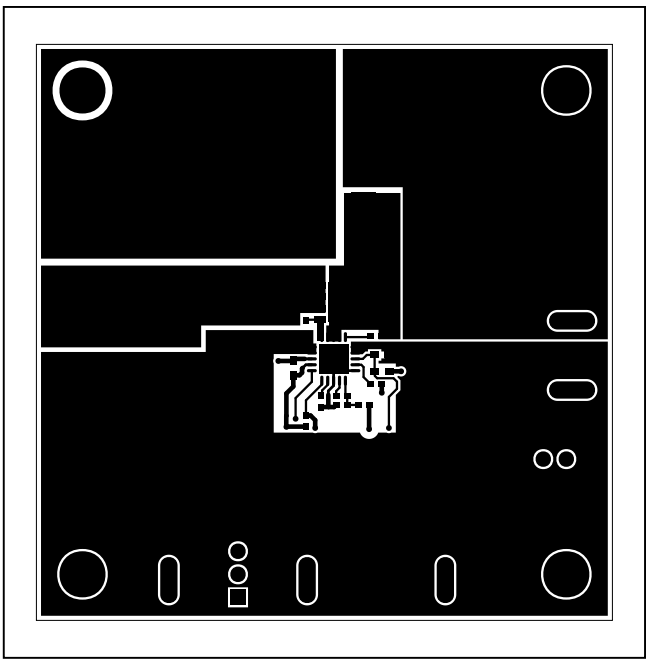


Figure 2. MAX17506 3.3V Output EV Kit PCB Layout—Component Side

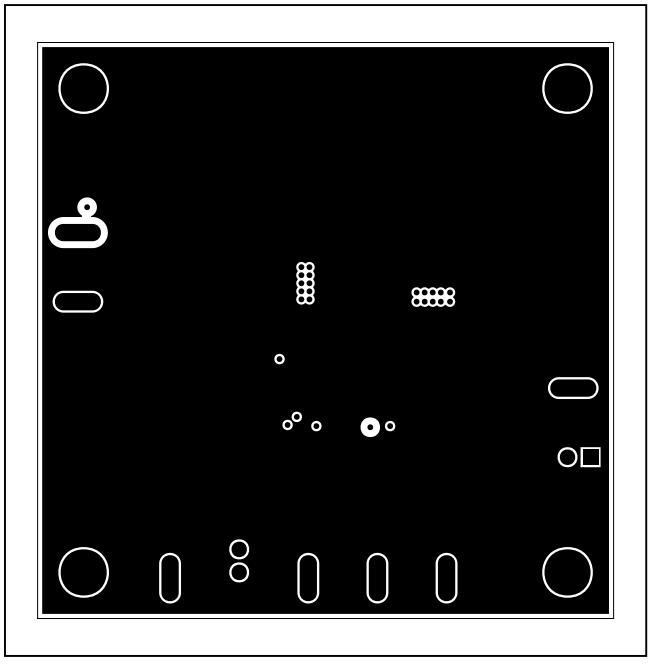


Figure 3. MAX17506 3.3V Output EV Kit PCB Layout—Inner-Layer 1

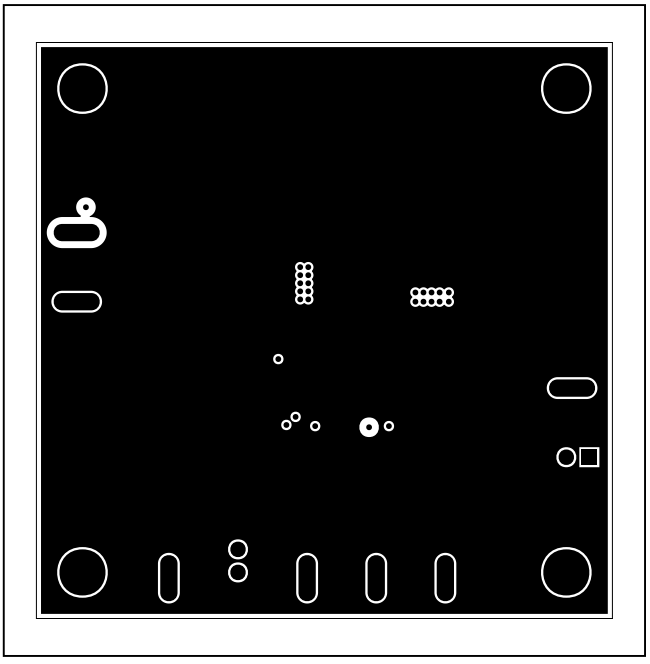


Figure 4. MAX17506 3.3V Output EV Kit PCB Layout—Inner Layer 2

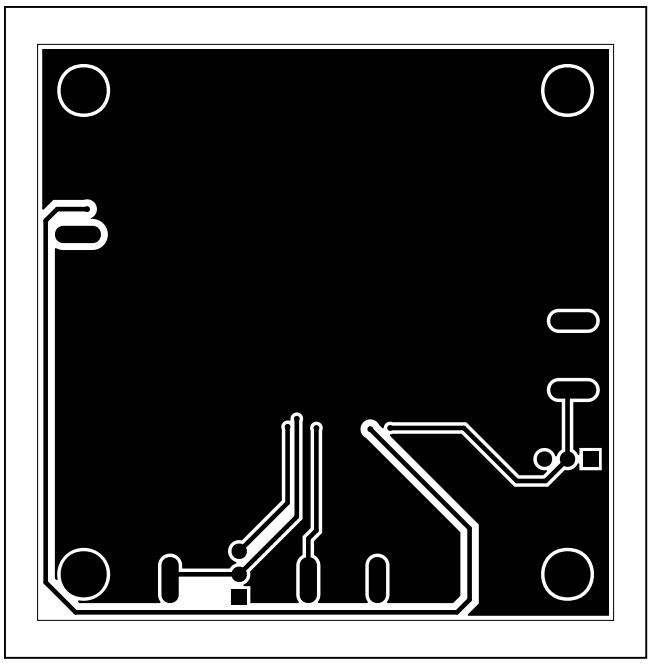


Figure 5. MAX17506 3.3V Output EV Kit PCB Layout—Solder Side

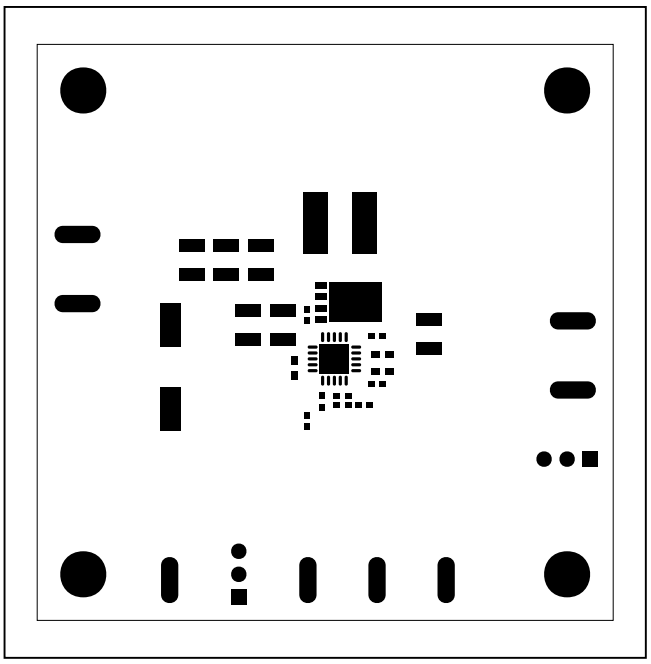


Figure 6. MAX17506 3.3V Output EV Kit Component Placement Guide—Solder Mask

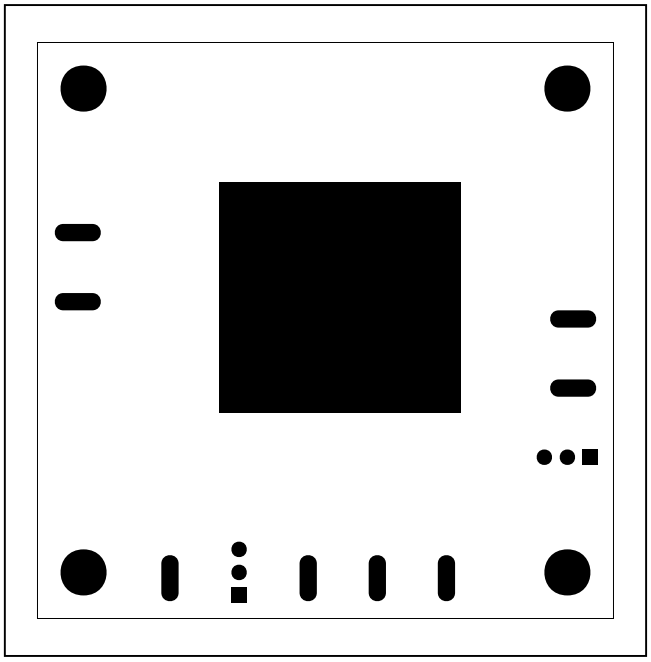


Figure 7. MAX17506 3.3V Output EV Kit Component Placement Guide—Bottom Solder Mask

Component Suppliers

SUPPLIER	WEBSITE
Coilcraft, Inc.	www.coilcraft.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com
Renesas Electronics	www.renesas.com
Vishay	www.vishay.com

Note: *Indicate that you are using the MAX17506 when contacting these component suppliers.*

Component List and Schematic

Refer to the following files attached to this data sheet for component information and schematic:

- MAX17506A_EV_BOM.xls
- MAX17506A_EV_Schematic.pdf

Ordering Information

PART	TYPE
MAX17506EVKITA#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/15	Initial release	—