MIC24066/7 Evaluation Board User's Guide

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Table of Contents

NOTES:

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our website (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the MIC24066/7 Evaluation Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Website
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the MIC24066/7 Evaluation Board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** - Important information about the MIC24066/7 Evaluation Board.
- **Chapter 2. "Installation and Operation"** – Includes instructions on installing and using the MIC24066/7 Evaluation Board.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the MIC24066/7 Evaluation Board.
- **Appendix B. "Bill of Materials"**– Lists the parts used to build the MIC24066/7 Evaluation Board.
- **Appendix C. "Typical Performance Data, Curves and Waveforms"** – Shows behavior and performance in numbers of the MIC24066/7 Evaluation Board.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

<table>
<tr><th>Description</th><th>Represents</th><th>Examples</th></tr>
<tr><td colspan="3">Arial font:</td></tr>
<tr><td rowspan="2">Italic characters</td><td>Referenced books</td><td>MPLAB® IDE User’s Guide</td></tr>
<tr><td>Emphasized text</td><td>...is the only compiler...</td></tr>
<tr><td rowspan="3">Initial caps</td><td>A window</td><td>the Output window</td></tr>
<tr><td>A dialog</td><td>the Settings dialog</td></tr>
<tr><td>A menu selection</td><td>select Enable Programmer</td></tr>
<tr><td>Quotes</td><td>A field name in a window or dialog</td><td>“Save project before build”</td></tr>
<tr><td>Underlined, italic text with right angle bracket</td><td>A menu path</td><td><u>File>Save</u></td></tr>
<tr><td rowspan="2">Bold characters</td><td>A dialog button</td><td>Click OK</td></tr>
<tr><td>A tab</td><td>Click the Power tab</td></tr>
<tr><td>N‘Rnnnn</td><td>A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.</td><td>4‘b0010, 2‘hF1</td></tr>
<tr><td>Text in angle brackets < ></td><td>A key on the keyboard</td><td>Press <Enter>, <F1></td></tr>
<tr><td colspan="3">Courier New font:</td></tr>
<tr><td rowspan="7">Plain Courier New</td><td>Sample source code</td><td>#define START</td></tr>
<tr><td>Filenames</td><td>autoexec.bat</td></tr>
<tr><td>File paths</td><td>c:\mcc18\h</td></tr>
<tr><td>Keywords</td><td>_asm, _endasm, static</td></tr>
<tr><td>Command-line options</td><td>-Opa+, -Opa-</td></tr>
<tr><td>Bit values</td><td>0, 1</td></tr>
<tr><td>Constants</td><td>0xFF, ‘A’</td></tr>
<tr><td>Italic Courier New</td><td>A variable argument</td><td>file.o, where file can be any valid filename</td></tr>
<tr><td>Square brackets [ ]</td><td>Optional arguments</td><td>mcc18 [options] file [options]</td></tr>
<tr><td>Curly brackets and pipe character: { | }</td><td>Choice of mutually exclusive arguments; an OR selection</td><td>errorlevel {0|1}</td></tr>
<tr><td rowspan="2">Ellipses...</td><td>Replaces repeated text</td><td>var_name [, var_name...]</td></tr>
<tr><td>Represents code supplied by user</td><td>void main (void)
{ ...
}</td></tr>
</table>

RECOMMENDED READING

This user's guide describes how to use the MIC24066 Evaluation Board (EV69G45A) and MIC24067 Evaluation Board (EV35G43A). Another useful document is listed below. The following Microchip document is available and recommended as a supplemental reference resource:

- **MIC24066/7 Data Sheet – *"36V, 6A High Performance Switching Buck Regulators"* (DS20006730)**

THE MICROCHIP WEBSITE

Microchip provides online support via our website at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website contains the following information:

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
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- Technical Support

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Technical support is available through the website at:
https://www.microchip.com/support

DOCUMENT REVISION HISTORY

Revision A (June 2023)

- Initial release of this document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter provides an overview of the MIC24066/7 Evaluation Board and covers the following:

- MIC24066/7 Device Overview
- MIC24066/7 Evaluation Board Features
- MIC24066/7 Evaluation Board Kit Contents

1.2 MIC24066/7 DEVICE OVERVIEW

The MIC24066/7 is a constant-frequency, synchronous buck converter featuring a unique adaptive on-time control architecture. The MIC24066/7 operates over an input supply range of 4.5V to 36V. The output voltage is adjustable down to 0.6V with an accuracy of ±1%. The device operates with programmable switching frequency from 270 kHz to 800 kHz.

The MIC24066/7 is available in a 36-pin 5 mm x 6 mm VQFN package, with a -40°C to +125°C junction operating temperature range.

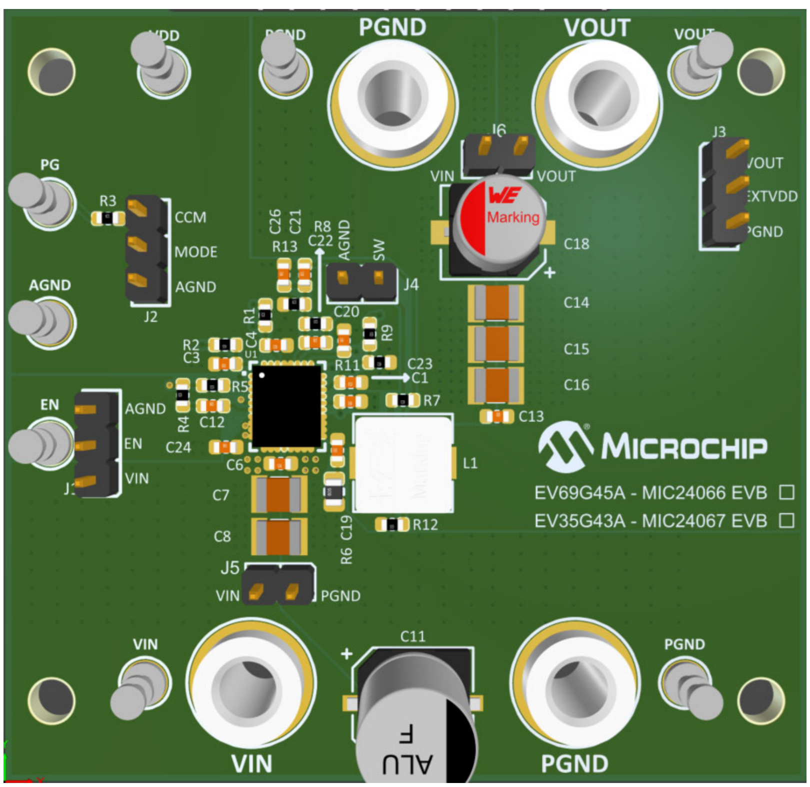


FIGURE 1-1: Typical MIC24066/7 Evaluation Board (Top 3D View).

1.3 MIC24066/7 EVALUATION BOARD FEATURES

The MIC24066/7 Evaluation Board features:

- A Soft Start (SS) programmable pin, which allows user to adjust the output Soft Start time to reduce inrush current from maims during start-up (**MIC24066 only**).
- Hyper Light Load (HLL) or Continuous Conduction Mode (CCM) selection pin to allow users to select the MODE of operation (**MIC24067 only**).
- High voltage internal LDO for single supply operation.
- An auxiliary bootstrap Low Drop Out (LDO) which improves the System Efficiency by supplying the required bias power from outside the regulator.
- Pre-bias start-up to start monotonically into a pre-biased output voltage.
- An open drain Power Good (PG) signal when output is within regulation.
- High current capability of 6A.
- Adaptive Constant On Time Control for faster transient response.
- 0.6V internal reference with ±1% accuracy.
- Internal compensator for tight output regulation.
- Enable function for low stand-by current.
- Programmable current limit and hiccup short circuit protection.
- Thermal shut down with hysteresis.

The basic parameters of the MIC24066/7 Evaluation Board are:

- Input voltage range: 4.5V to 36V.
- Adjustable output from 0.6V to 32V (also limited by duty cycle). Default value is set to 5V V_{OUT}.
- 400 kHz switching frequency (270 kHz to 800 kHz).

1.4 MIC24066/7 EVALUATION BOARD KIT CONTENTS

The MIC24066/7 Evaluation Board kit includes the following items:

- MIC24066/7 Evaluation Board PCB
- Important Information Sheet

Chapter 2. Installation and Operation

2.1 INTRODUCTION

The MIC24066/7 Evaluation Board(EV69G45A) is fully assembled and tested to evaluate and demonstrate the MIC24066/7 capabilities. The board is based on a buck topology and can deliver 5V output voltage, with a maximum current of 6A when is supplied with 8V-36V at the input. It should be noted that the board is tuned and optimized for a 5V/6A output.

2.1.1 Powering the MIC24066/7 Evaluation Board

The board's power supply requires an output capability of at least 5A and a voltage range of 8V to 36V, at a minimum of 40W. A proper resistor or an electronic load device capable to sustain output voltage and current can be used as a load (see Figure 2-1).

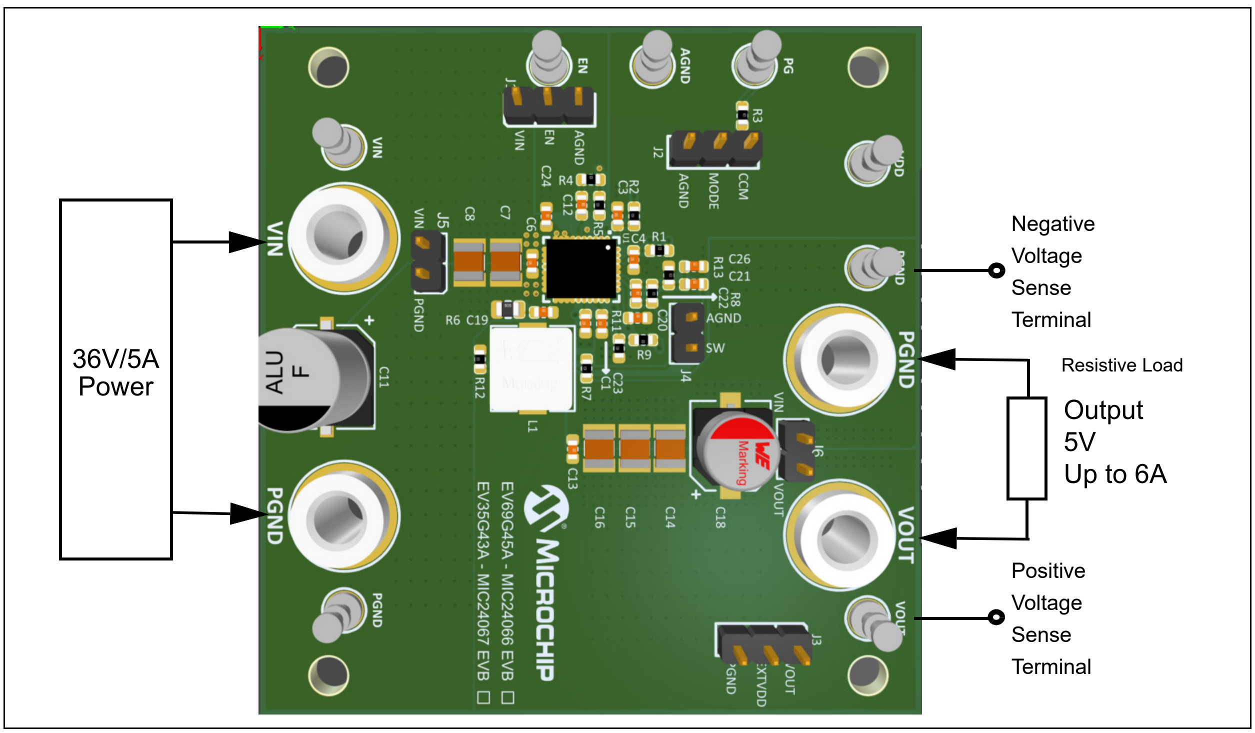


FIGURE 2-1: MIC24066/7 Evaluation Board Connection Diagram.

2.2 SETUP/CONFIGURATION

2.2.1 IC

To enable IC, a jumper should be placed vertically on J1 between pin J1-2 (EN) and J1-3 (VIN).

2.2.2 LDO

To use the internal high voltage LDO, a jumper should be placed on connectors J3 between pin J3-2 (EXTVDD) and J3-3 (PGND). For 5V outputs bypass the internal high voltage LDO by placing jumper between pin J3-1 (VOUT) and J3-2 (EXTVDD). For outputs less than 5V then same jumper must be removed and an external voltage 5V (the range of 5V to 12V) should be supplied to the EXTVDD and AGND connectors.

2.2.3 Mode (MIC24067)

To select CCM or DCM, a jumper should be placed vertically on J2 between pin J2-1 (CCM) and J2-2 (MODE) or between pin J2-2 (MODE) and J2-3 (AGND).

2.3 TEST

Apply 8V input voltage at VIN and PGND Terminals and measure output voltage which should be regulated to 5V for 0A load to 6A load.

2.4 CIRCUIT DESCRIPTION

This section describes the working principles and limitations that should be taken into account when using the MIC24066/7 Evaluation Board. The external components have been selected in order to optimize performance for the specific conditions of V_{IN} = 12V and V_{OUT} = 5V. Although the application will behave correctly for other output and input voltages, further optimization (fine-tuning the inductors and ripple injection components) can be done in order to improve the efficiency and transient response. Please refer to the MIC24066/7 Data Sheet for the table with recommended values.

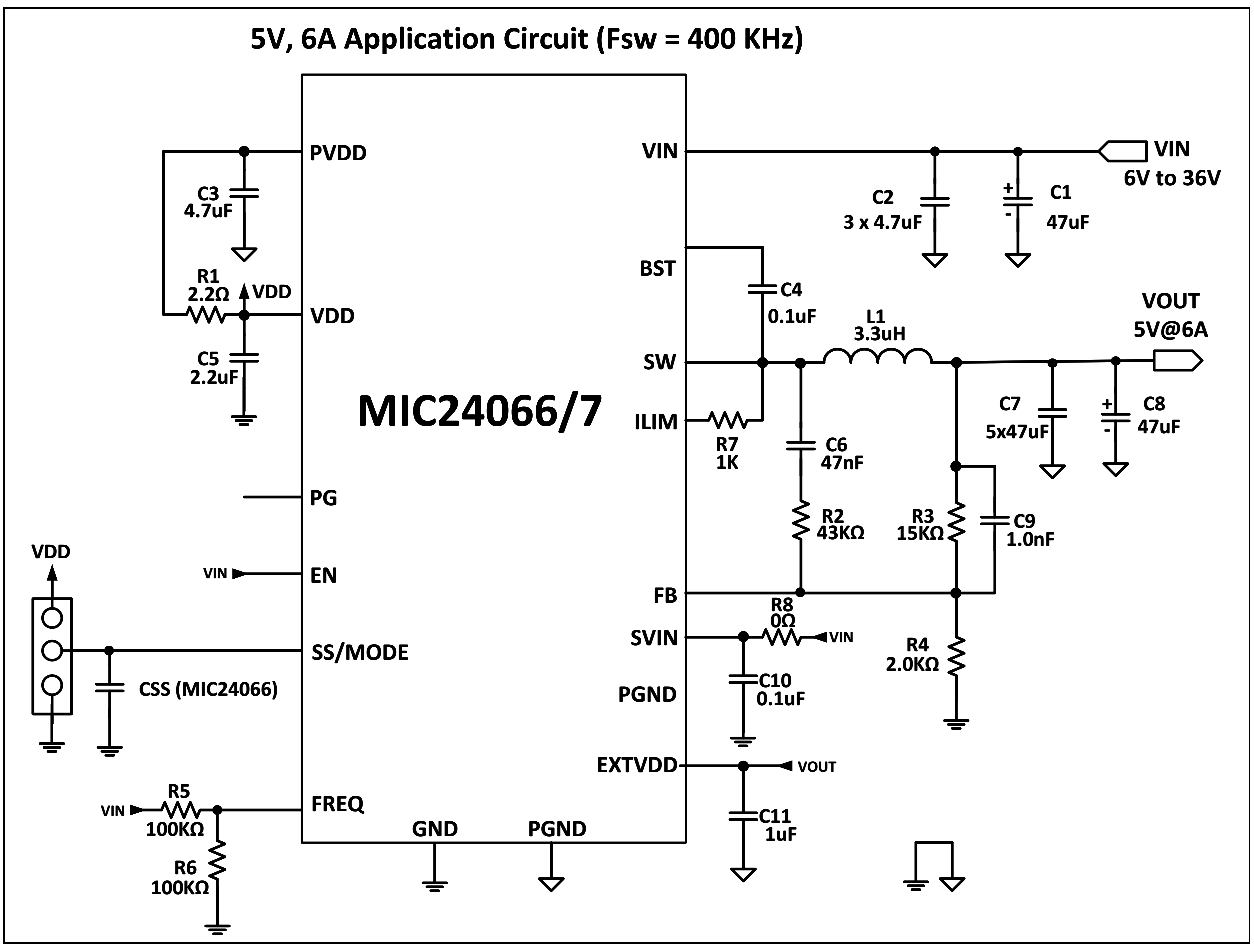


FIGURE 2-2: MIC24066/7 Evaluation Board Circuit.

2.4.1 Output Voltage Setting

The output voltage can be adjusted using a resistor divider from output to AGND whose mid-point is connected to FB pin as shown the Figure 2-2.

The output voltage can be calculated using below equation:

EQUATION 2-1:

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

Where:

$V_{REF} = 0.6V$

> **Note:** Output voltage should not exceed 8V due to 10 voltage rating on the output capacitors. For output voltage higher than 8V, the output capacitors of a voltage higher than the set output voltage should be used.

Use the following table for setting various application voltages as shown in Figure 2-2.

Power components for various application								
V_{OUT} Config	C4	R2	R4	R3	C5	L1	C_{SNB}	R_{SNB}
1V	43 kΩ	47 nF	12.1 kΩ	8.06 kΩ	2.2 nF	1.15 µH	220 pF	1.2Ω
2.5V	43 kΩ	47 nF	2.05 kΩ	6.49 kΩ	2.2 nF	3.3 µH	220 pF	1.2Ω
3.3V	43 kΩ	47 nF	2.05 kΩ	9.31 kΩ	2.2 nF	3.3 µH	220 pF	1.2Ω
5V	43 kΩ	47 nF	2.05 kΩ	15 kΩ	1 nF	3.3 µH	220 pF	1.2Ω

2.4.2 SW Node

Test Point J3 (V_{SW}) is placed for monitoring the switching waveform, one of the most critical waveform for the converter.

2.4.3 Current Limit

The MIC24066/7 uses the $R_{DS(ON)}$ of the internal low-side power MOSFET to sense over-current conditions. This method will avoid additional cost, use of additional board space and power losses taken by a discrete current sense resistor.

Current limit threshold can be programmed by connecting a resistance from switch node to ILIM pin.

In each switching cycle of the converter, the inductor current is sensed by monitoring the low-side MOSFET voltage during the OFF period of the switching cycle, during which the LSFET is ON. There is an 150 ns (typical) blanking period after which sense signal is considered for protection. The blanking period improves noise immunity. If the low side MOSFET voltage is greater than the VCL threshold, then the MIC24066/7 keeps the low side FET ON until the voltage across the low side MOSFET is below the VCL. HS FET is turned off once the voltage across the low side MOSFET is below the VCL. If the voltage across the low side MOSFET is lower than the VCL for 8 consecutive clock cycles, then the part enters into High impedance mode for a time period equal to hiccup timeout. After the hiccup timeout, the controller initiates soft start sequence. The same repeats if the part hits current limit again (even during soft start also). This mode of operation is called “hiccup mode” and its purpose is to protect the downstream load in case of a hard short.

The current limit resistor value can be calculated using the formula below:

EQUATION 2-2:

$$RCL = \frac{(I_{LIMIT} + \Delta_{IL}/2) \times R_{DSON} - V_{OFFSET}}{ICL}$$

Where:

I_{LIMIT} = *Desired Current Limit (Average Value)*

Δ_{IL} = *Inductor Peak to Peak Ripple Current*

R_{DSON} = *On-resistance of Low-side Power MOSFET, at the high temperature obtained around the short circuit limit*

V_{OFFSET} = *Current-limit comparator offset (refer to Electrical Characteristics Table)*

ICL = *ILIM source current, the typical value is 115 µA in Electrical Characteristic table.*

2.4.4 Setting the Switching Frequency

The MIC24066/7 is an adjustable-frequency, synchronous buck controller featuring a unique adaptive on-time control architecture. The switching frequency can be adjusted between 270 kHz and 800 kHz by changing the resistor divider network between VIN and AGND pins consisting of R1 and R2 as shown in Figure 2-3.

$$f_{SW} = f_O \times \frac{R_2}{R_2 + R_1}$$

f_O is the switching frequency when R1 is 100 kΩ and R2 being open.

f_O is typically 800 kHz. For more precise setting, it is recommended to use Figure 2-3.

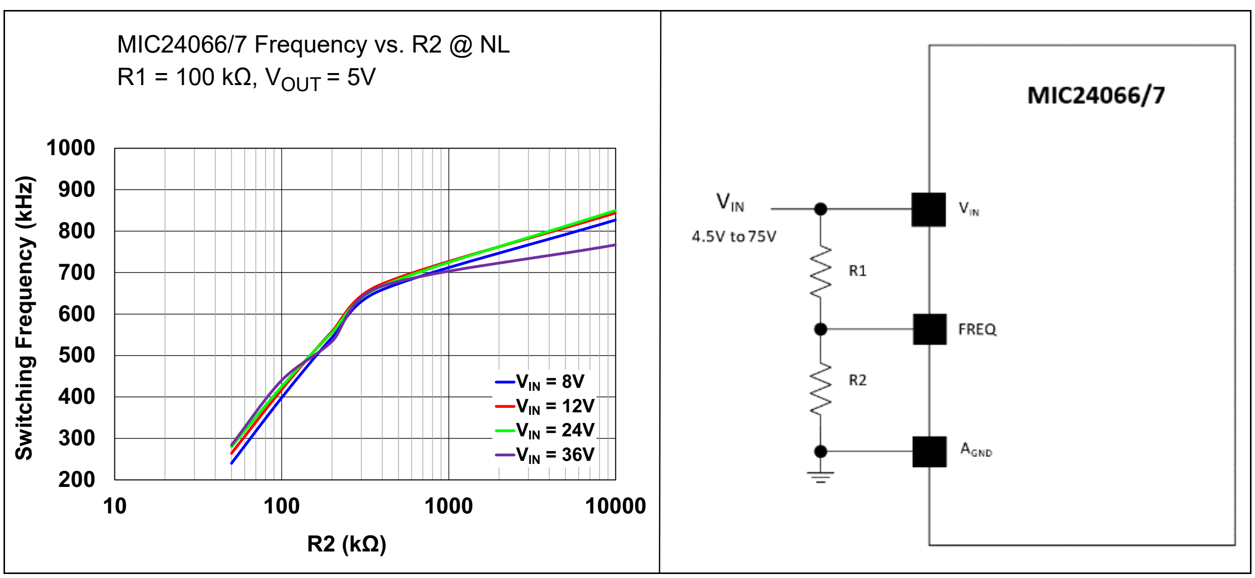


FIGURE 2-3: *Switching Frequency vs. R2.*

2.4.5 Setting the Soft Start Time

The output Soft-Start time can be set by connecting a capacitor from SS to AGND from 2 ms to 100 ms as shown in Figure 2-4:

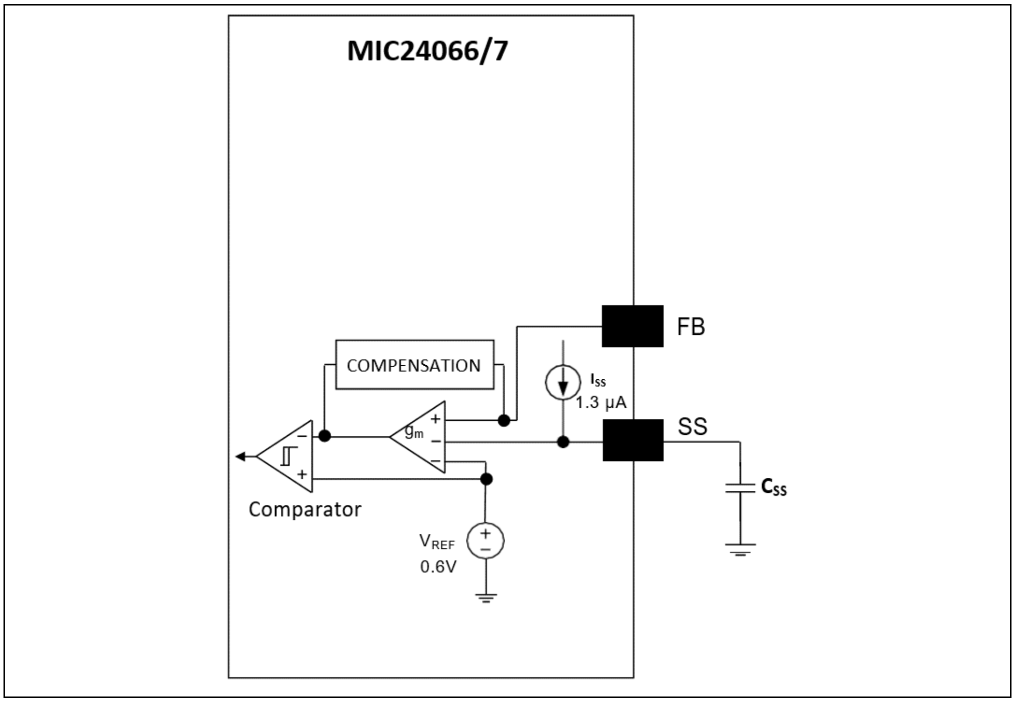


FIGURE 2-4: *Setting the Soft-Start Time.*

The value of the capacitor can be calculated using Equation 2-3:

EQUATION 2-3:

$$C_{SS} = \frac{I_{SS} \times t_{SS}}{V_{REF}}$$

$$= \frac{1.3\mu A \times 5ms}{0.6V}$$

$$= 10.8\ nF \approx 10\ nF$$

Where:

C_{SS}	=	Capacitor from SS pin to A_{GND}
I_{SS}	=	Internal Soft Start current (1.3 µA typical)
t_{SS}	=	Output Soft Start Time (5 ms)
V_{REF}	=	0.6V

2.4.6 Auxiliary Bootstrap LDO (EXTVDD)

The MIC24066/7 features an auxiliary bootstrap LDO which improves the system efficiency by supplying the internal circuit bias power and gate drivers from the converter output voltage. This LDO is enabled when the voltage on the EXTVDD pin is above 4.6V (typical) and at the same time the main LDO which operates from VIN is disabled to reduce power consumption.

NOTES:

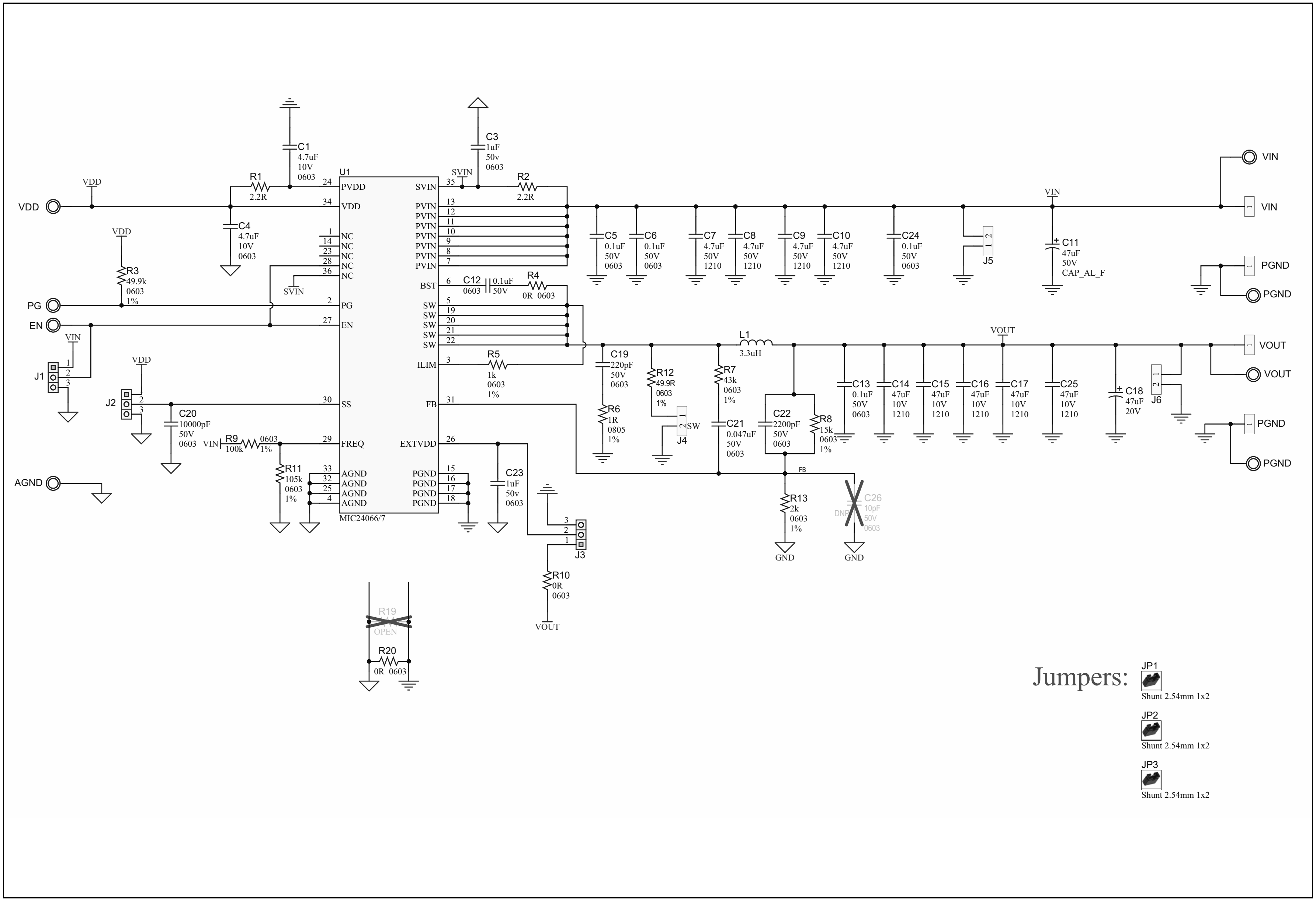
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

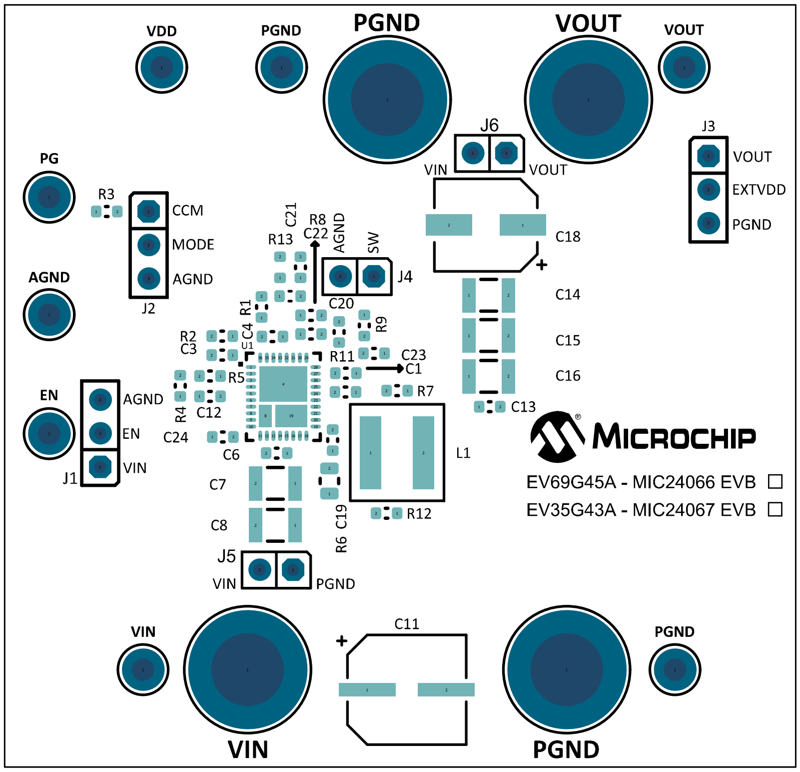
This appendix contains the following schematics and layouts for the MIC24066/7 Evaluation Board:

- Board – Schematic
- Board – Top Silk
- Board – Top Copper and Silk
- Board – Top Copper
- Board – Inner Layer 1
- Board – Inner Layer 2
- Board – Bottom Copper
- Board – Bottom Copper and Silk
- Board – Bottom Silk

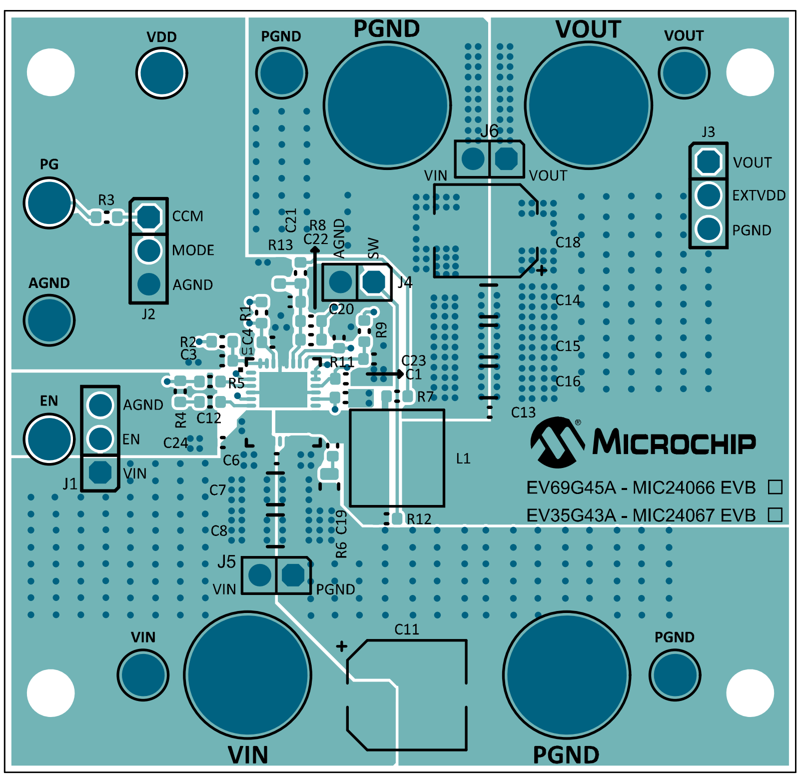
A.2 BOARD – SCHEMATIC



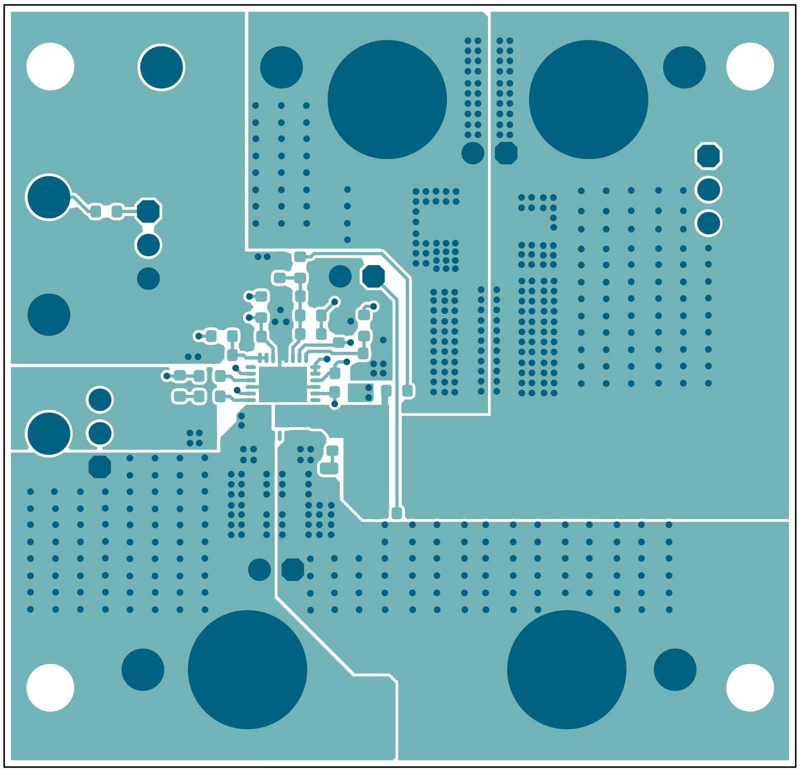
A.3 BOARD – TOP SILK



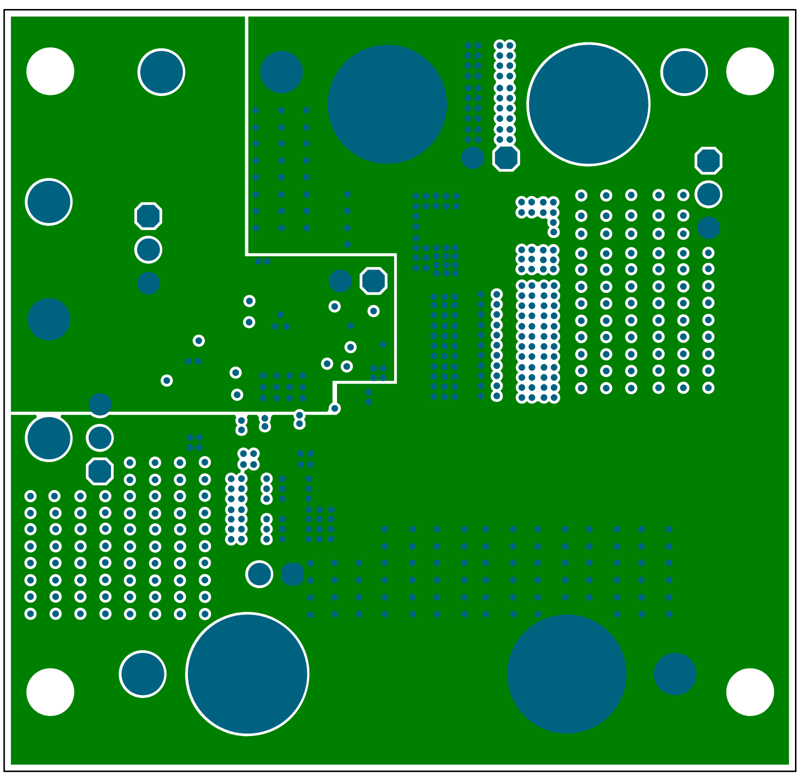
A.4 BOARD – TOP COPPER AND SILK



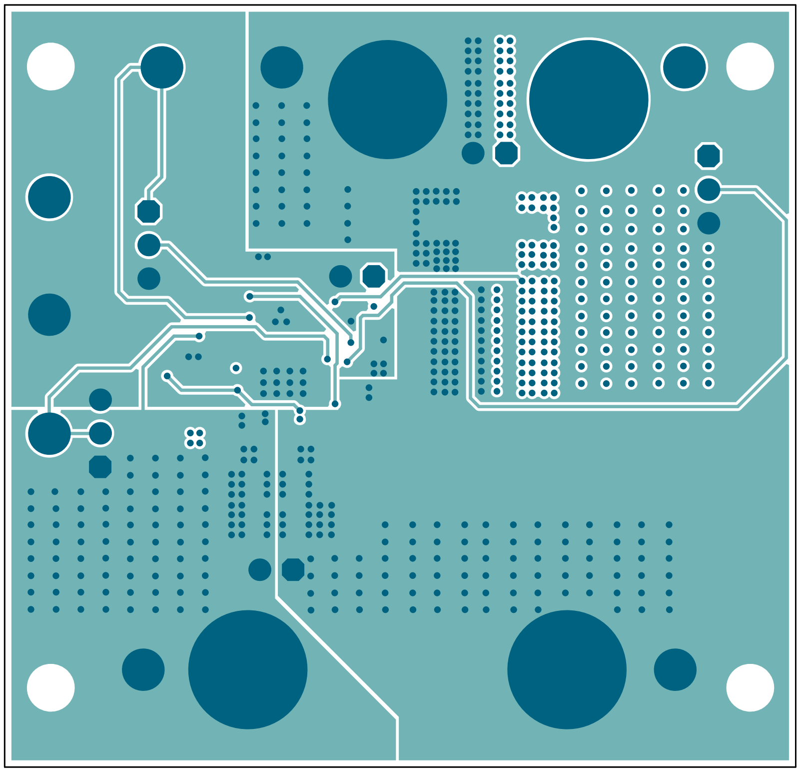
A.5 BOARD – TOP COPPER



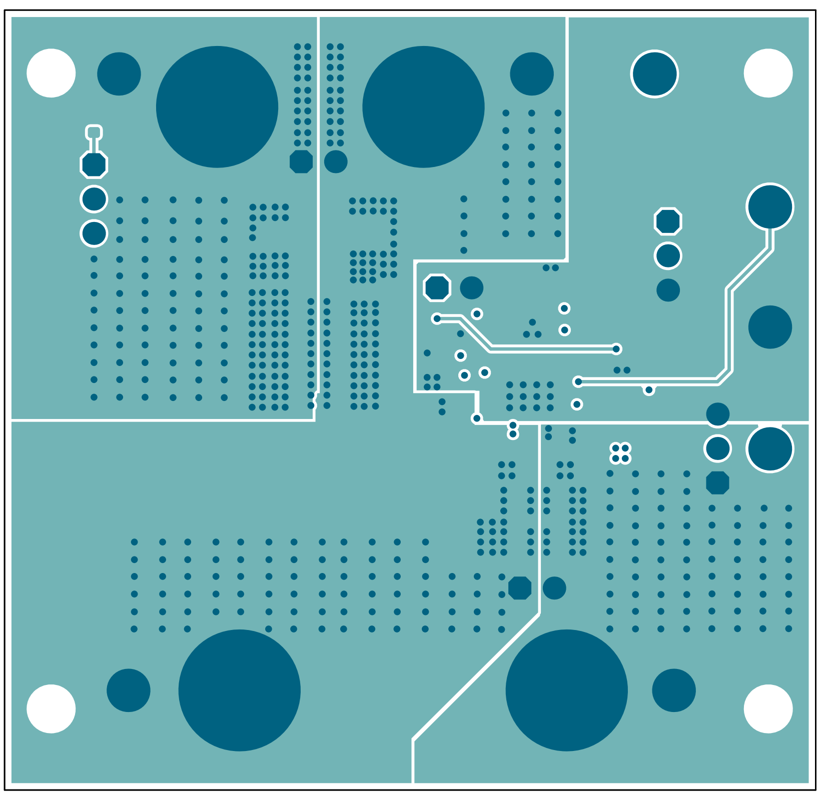
A.6 BOARD – INNER LAYER 1



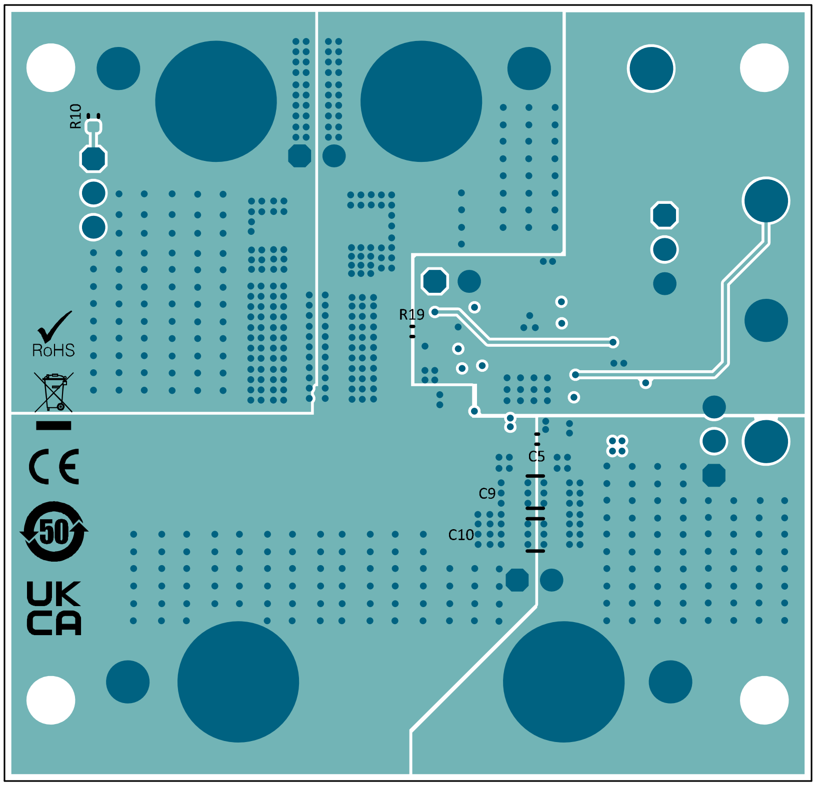
A.7 BOARD – INNER LAYER 2



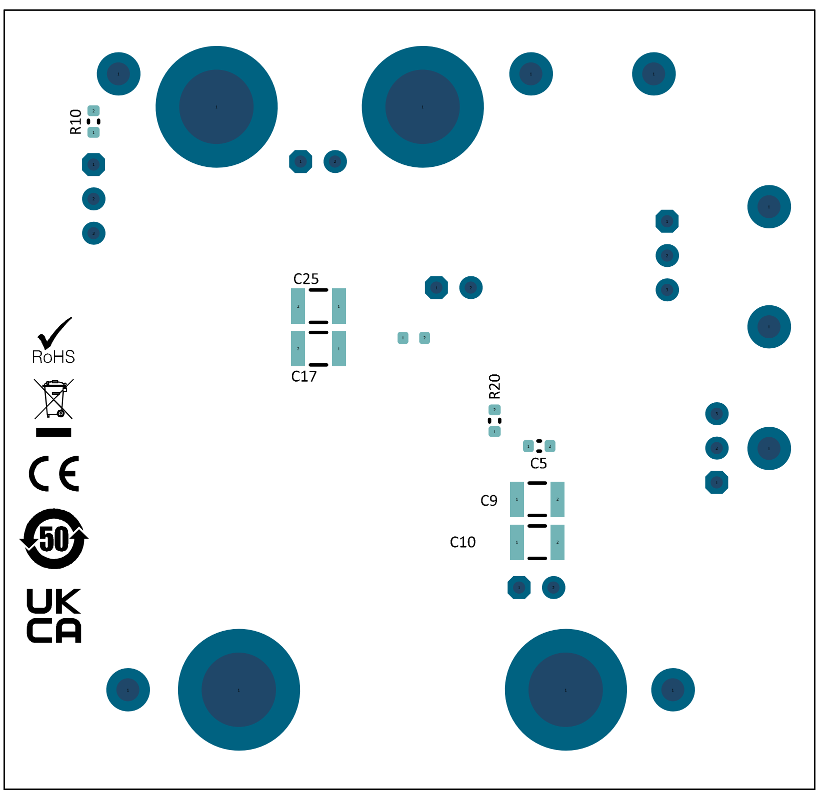
A.8 BOARD – BOTTOM COPPER



A.9 BOARD – BOTTOM COPPER AND SILK



A.10 BOARD – BOTTOM SILK



Appendix B. Bill of Materials

TABLE B-1: BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
8	AGND, EN, PG, PGND, VDD, VIN, VOUT	Connector, TP, pin,Tin, TH	Harwin Plc.	H2121-01
2	C1, C4	Capacitor, ceramic, 4.7 µF, 10V, 20%, X5R, SMD, 0603	Wurth Elektronik	885012106012
2	C3, C23	Capacitor, ceramic, 1 µF, 50V, 10%, X7R, SMD, 0603	Taiyo Yuden Co., Ltd.	UMK107AB7105KA-T
5	C5, C6, C12, C13, C24	Capacitor, ceramic, 0.1 µF, 50V, 10%, X7R, SMD, 0603	Samsung Electro-Mechanics America, Inc.	CL10B104KB8NNWC
4	C7, C8, C9, C10	Capacitor, ceramic, 4.7 µF, 50V, 10%, X7R, SMD, 1210	Wurth Elektronik	885012209048
1	C11	Capacitor, aluminum, 47 µF, 50V, 20%, SMD F	Wurth Elektronik	865230653012
5	C14, C15, C16, C17, C25	Capacitor, ceramic, 47 µF, 10V, 20%, X5R, SMD, 1210	Wurth Elektronik	885012109007
1	C18	Capacitor, aluminum, 47 µF, 20V, 20%, SMD C6	Wurth Elektronik	875105445006
1	C19	Capacitor, ceramic, 220 pF, 50V, 10%, X7R, SMD, 0603	TDK Corporation	C1608X7R1H221K
1	C20	Capacitor, ceramic, 10000 pF, 50V, 10%, X7R, SMD, 0603	Wurth Elektronik	885012206089
1	C21	Capacitor, ceramic, 0.047 µF, 50V, 10%, X7R, SMD, 0603	TDK Corporation	C1608X7R1H473K080AA
1	C22	Capacitor, ceramic, 2200 pF, 50V, 10%, X7R, SMD, 0603	Wurth Elektronik	885012206085
3	J1, J2, J3	Connector, header-2.54 male, 1x3 Tin, 5.84MH, TH, vertical	Samtec, Inc.	TSW-103-07-T-S
1	J4	Connector, HDR-2.54 Male, 1x2 Gold, 5.84MH, TH, vertical	Wurth Elektronik	61300211121
2	J5, J6	Connector, HDR-2.54 Male, 1x2 Gold, 5.84MH, TH, vertical	FCI	68000-202HLF
1	L1	Inductor, 3.3 µH, 12.1A, 20%, SMD, XGL6060, AEC-Q200	Coilcraft Inc.	XGL6060-332
1	PCB	MIC24066 Evaluation Board - Printed Circuit Board	—	04-11667-R1
		MIC24067 Evaluation Board - Printed Circuit Board	—	04-11668-R1
4	PGND, VIN, VOUT	Connector, jack, banana, 4.5 mm, female, TH, vertical	Keystone® Electronics Corp.	575-8

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

TABLE B-1: BILL OF MATERIALS (BOM) (CONTINUED)

Qty	Reference	Description	Manufacturer	Part Number
2	R1, R2	Resistor, TKF, 2.2R, 5%, 1/10W, SMD, 0603	Stackpole Electronics, Inc.	RMCF0603JT2R20
1	R3	Resistor, TKF, 49.9k, 1%, 1/10W, SMD, 0603	Yageo Corporation	RC0603FR-0749K9L
3	R4, R10, R20	Resistor, TKF, 0R, 1/10W, SMD, 0603	Panasonic® - ECG	ERJ-3GEY0R00V
1	R5	Resistor, TKF, 1k, 1%, 1/10W, SMD, 0603, AEC-Q200	Panasonic - ECG	ERJ-3EKF1001V
1	R6	Resistor, TF, 1R, 1%, 1/4W, SMD, 0805	Stackpole Electronics, Inc.	RNCP0805FTD1R00
1	R7	Resistor, TKF, 43k, 1%, 1/10W, SMD, 0603	Vishay Intertechnology, Inc.	CRCW060343K0FKEA
1	R8	Resistor, TKF, 15k, 1%, 1/10W, SMD, 0603, AEC-Q200	Vishay Intertechnology, Inc.	CRCW060315K0FKEA
1	R9	Resistor, TKF, 100k, 1%, 1/10W, SMD, 0603, AEC-Q200	Panasonic - ECG	ERJ-3EKF1003V
1	R11	Resistor, TKF, 105k, 1%, 1/10W, SMD, 0603,	Bourns®, Inc.	CR0603-FX-1053ELF
1	R12	Resistor, TKF, 49.9R, 1%, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3EKF49R9V
1	R13	Resistor, TKF, 2.0k, 1%, 1/10W, SMD, 0603	Stackpole Electronics, Inc.	RMCF0603FT2K00

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

TABLE B-2: BILL OF MATERIALS (BOM) – MICROCHIP PARTS

Qty	Reference	Description	Manufacturer	Part Number
1	U1	Switching Buck Regulator MIC24066 VQFN-36 (for **EV69G45A** only)	Microchip Technology Inc.	MIC24066T-E/QNA
		Switching Buck Regulator MIC24067 VQFN-36 (for **EV35G43A** only)	Microchip Technology Inc.	MIC24067T-E/QNA

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

TABLE B-3: BILL OF MATERIALS (BOM) – MECHANICAL PARTS

Qty	Reference	Description	Manufacturer	Part Number
3	JP1, JP2, JP3	Jumper, HW, 2.54 mm, 1x2	FCI	63429-202LF

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

TABLE B-4: BILL OF MATERIALS (BOM) – DO NOT POPULATE PARTS

Qty	Reference	Description	Manufacturer	Part Number
1	C26	Capacitor, ceramic, 10 pF, 50V, 0.5 pF, C0G, SMD, 0603	TDK Corporation	C1608C0G1H100D
1	R19	Resistor, TKF, 0R, 1/10W, SMD, 0603	Panasonic - ECG	ERJ-3GEY0R00V

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

Appendix C. Typical Performance Data, Curves and Waveforms

C.1 INTRODUCTION

This chapter shows some of the typical performance parameters and curves of the MIC24066/7 Evaluation Board. V_{IN} = 12V, V_{OUT} = 5V, F_{SW} = 400 kHz, T_A = 25°C.

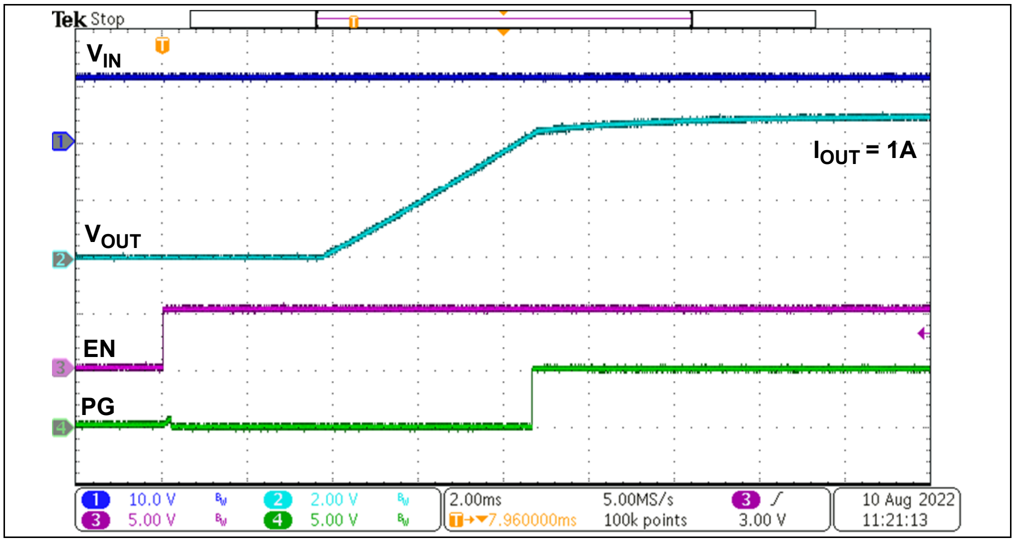


FIGURE C-1: *Enable Turn-On and Rise Time.*

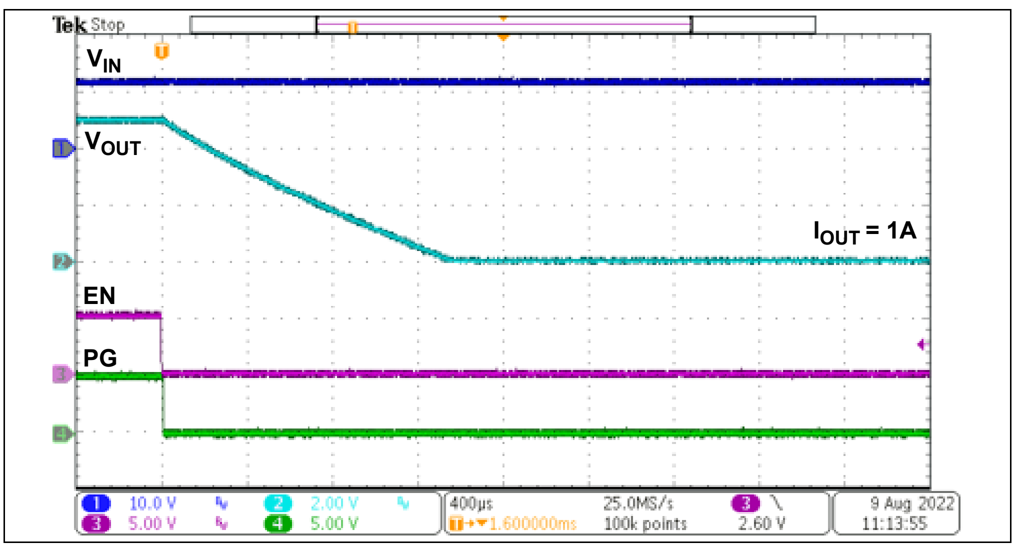


FIGURE C-2: *Enable Turn-On and Fall Time.*

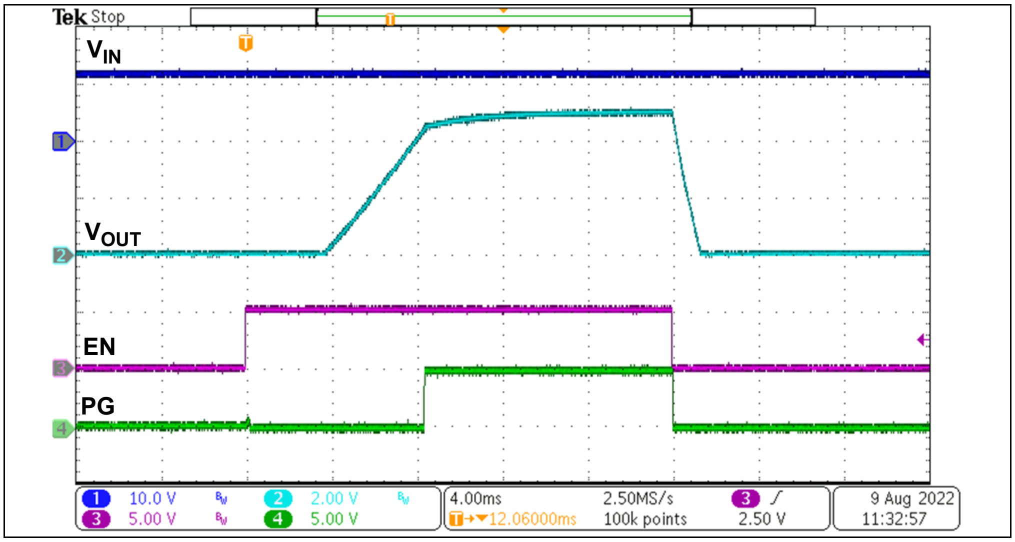


FIGURE C-3: *Enable Turn-On and Turn-Off.*

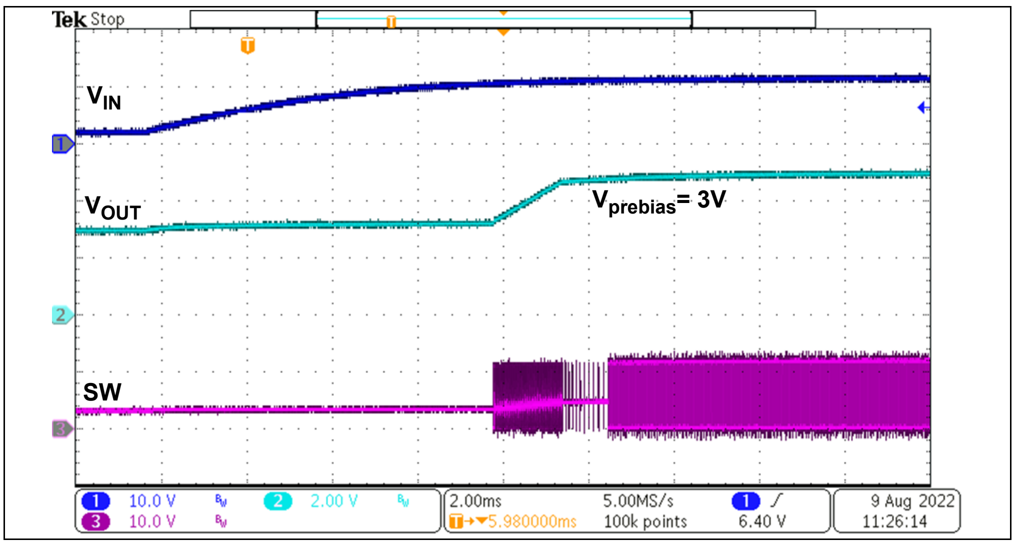


FIGURE C-4: *V_{IN} Start-Up with Pre-biased Output.*

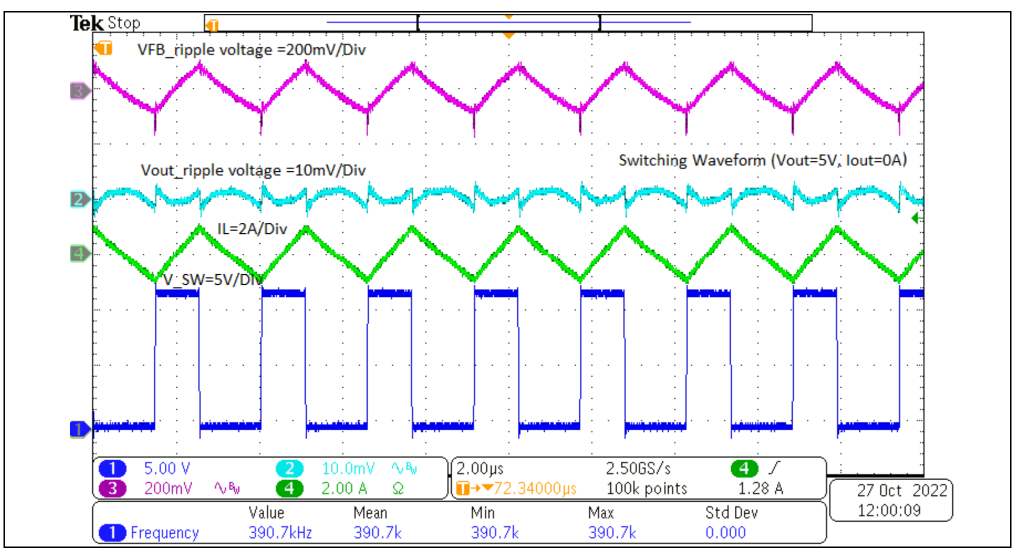


FIGURE C-5: *Switching Waveform (V_{OUT} = 5V, I_{OUT} = 0A).*

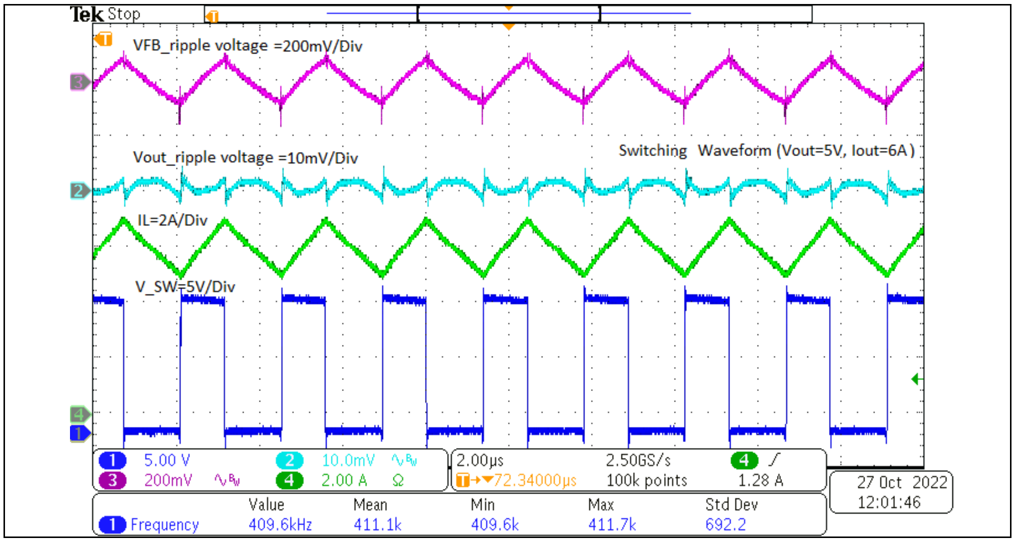


FIGURE C-6: Switching Waveforms (V_{OUT} = 5V, I_{OUT} = 6A).

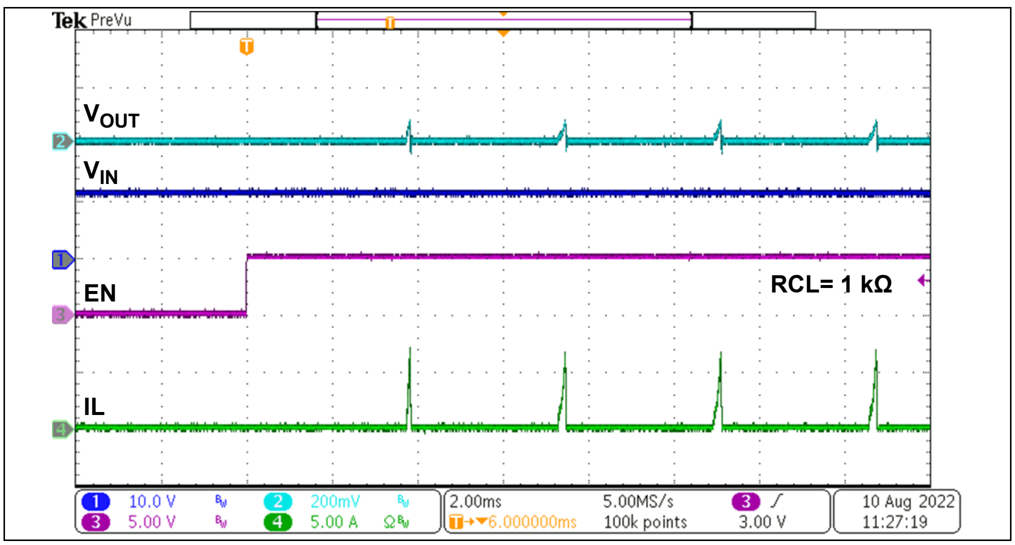


FIGURE C-7: Enable Start-Up into Short Circuit.

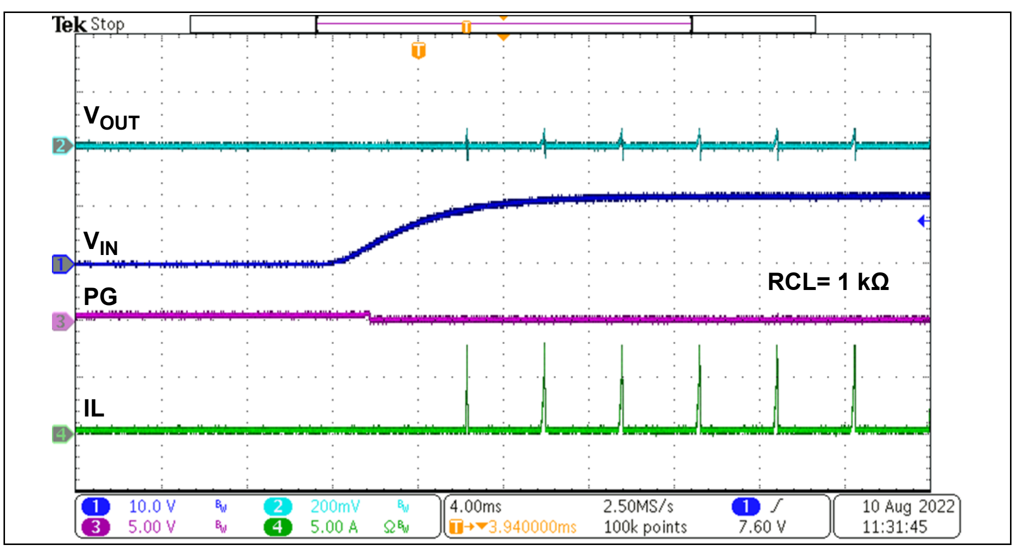


FIGURE C-8: V_{IN} Startup into Short Circuit.

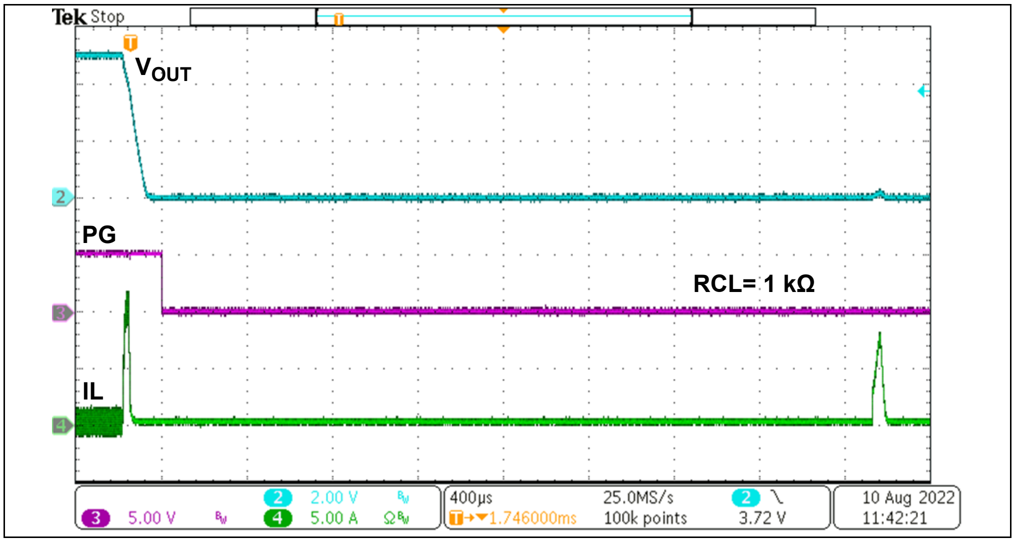


FIGURE C-9: *Response to Short Circuit.*

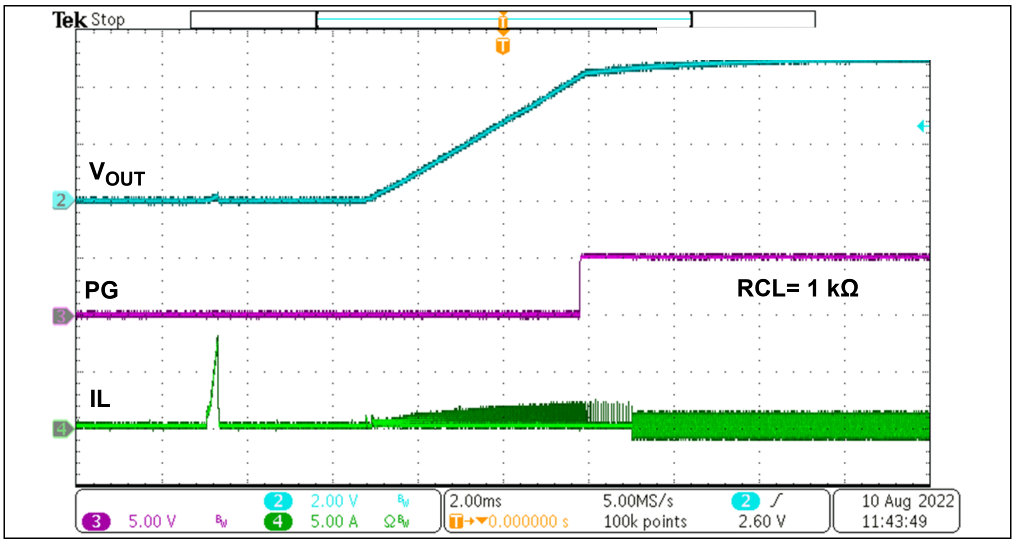


FIGURE C-10: *Recovery from Short Circuit.*

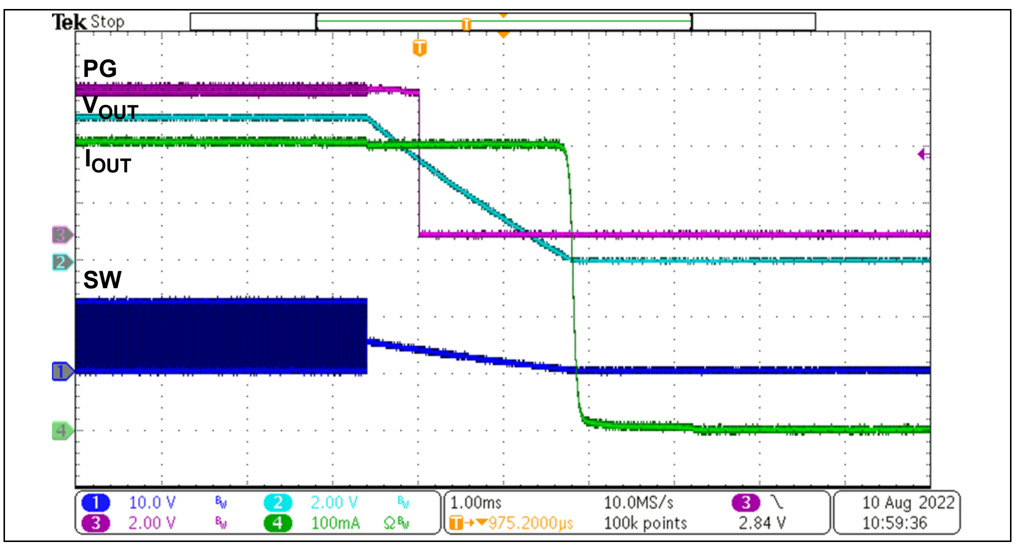


FIGURE C-11: *Thermal Shutdown Response.*

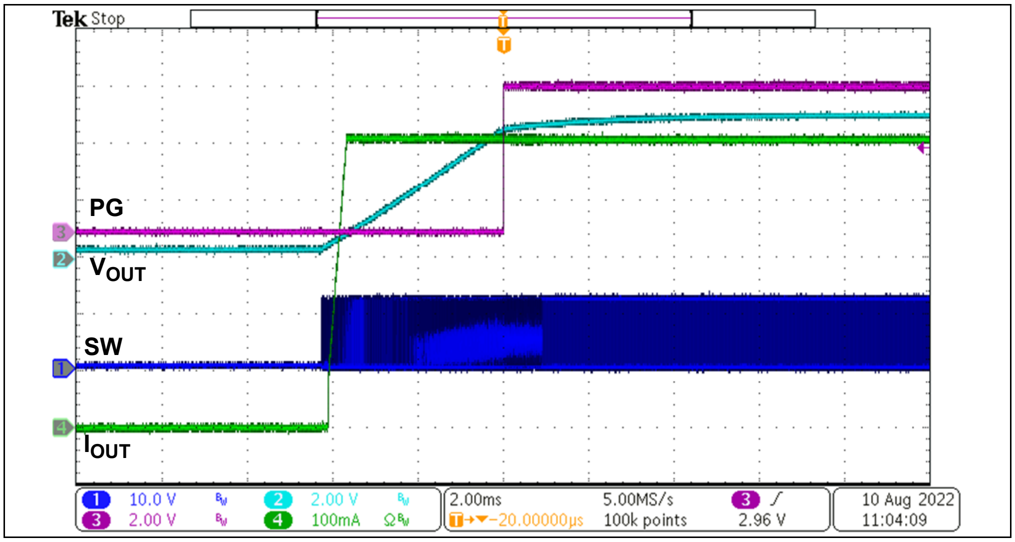


FIGURE C-12: *Thermal Shutdown Recovery Response.*

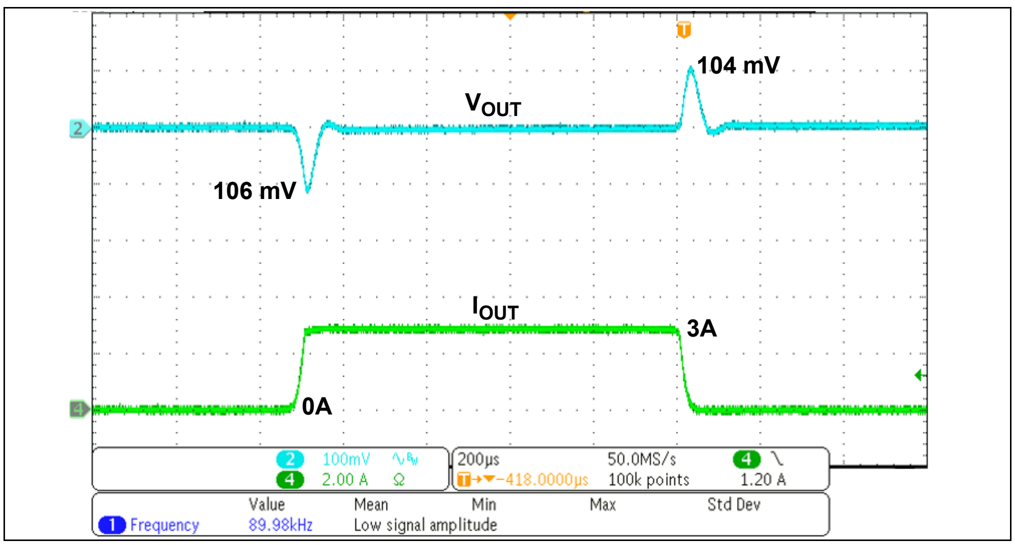


FIGURE C-13: *Load Transient Response (V_{OUT} = 5V, I_{OUT} = 0A to 2.5A).*

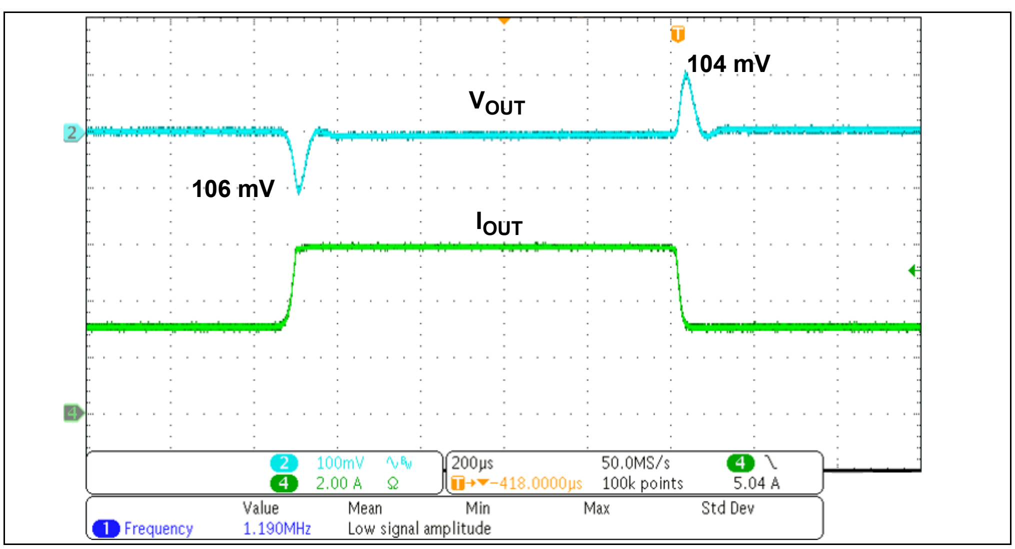


FIGURE C-14: *Load Transient with Droop (V_{OUT} = 5V, I_{OUT} = 0A to 6A).*

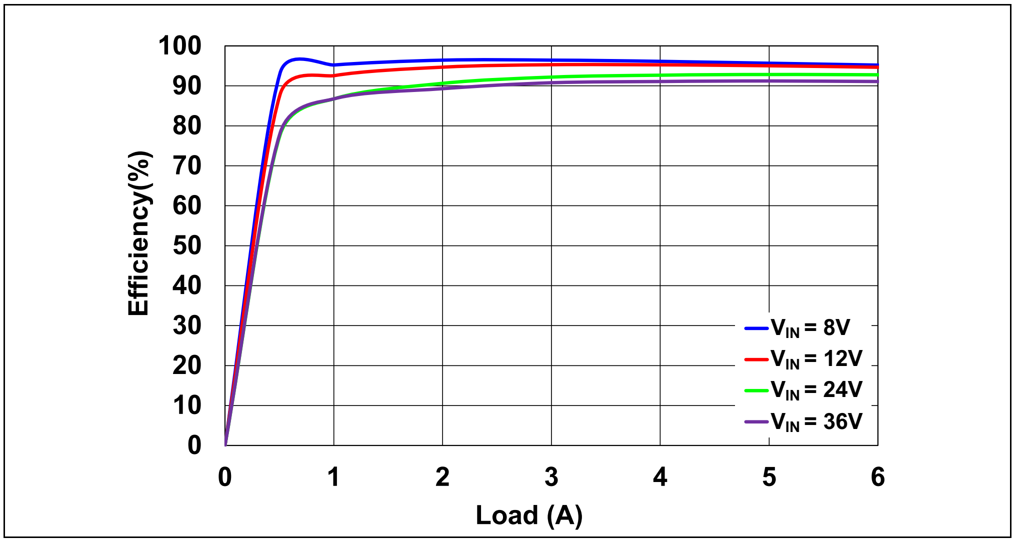


FIGURE C-15: *Efficiency (V_{OUT} = 5V) vs. Output Current @ 400 kHz (HLL Mode).*

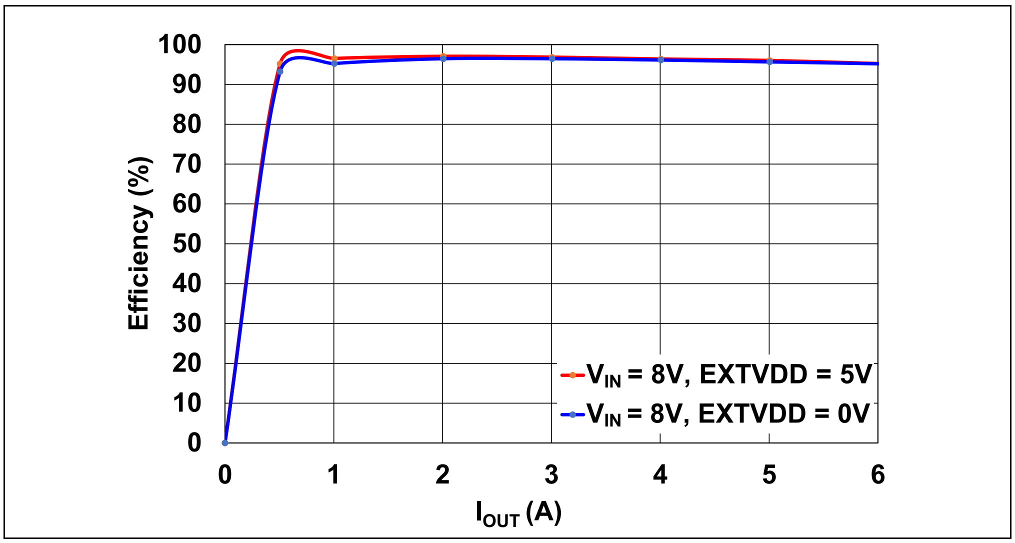


FIGURE C-16: *MIC24066 Efficiency (V_{IN} = 8V, V_{OUT} = 5V) @ 400 kHz (HLL Mode, EXTVDD).*

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