TC115 PFM/PWM Evaluation Board User's Guide

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TC115 EVALUATION BOARD USER'S GUIDE

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TC115 EVALUATION BOARD USER'S GUIDE

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 web site (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.

INTRODUCTION

This chapter contains general information that will be useful to know before using the TC115 Evaluation Board. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document describes how to use the TC115 Evaluation Board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the TC115 Evaluation Board.
- **Chapter 2. "Installation and Operation"** – Includes a description of the evaluation board, as well as instructions on how to get started.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the TC115 Evaluation Board.
- **Appendix B. "Bill Of Materials (BOM)"** – Lists the parts used to build the TC115 Evaluation Board.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

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

RECOMMENDED READING

This user's guide describes how to use the TC115 Evaluation Board. The following Microchip documents are available and recommended as supplemental reference resources.

TC115 Data Sheet *"PFM/PWM Step-Up DC/DC Converter"* (DS21361)

This data sheet provides detailed information regarding the TC115 step-up converter.

THE MICROCHIP WEB SITE

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

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

CUSTOMER SUPPORT

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- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support
- Development Systems Information Line

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://support.microchip.com

DOCUMENT REVISION HISTORY

Revision A (September 2005)

- Initial Release of this Document.

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Chapter 1. Product Overview

1.1 INTRODUCTION

The TC115 Evaluation Board is used to evaluate Microchip's TC115 in a single-cell boost converter application. As provided, the TC115 Evaluation Board generates a 3.0V output from a single-cell battery.

This chapter covers the following topics:

- What is the TC115 Evaluation Board?
- What the TC115 Evaluation Board Kit Includes

1.2 WHAT IS THE TC115 EVALUATION BOARD?

The TC115 Evaluation Board is a complete, step-up, switch-mode, dc-dc power converter. The TC115 Evaluation Board generates a regulated 3.0V output at load currents up to 110 mA. Different output voltages are obtainable by replacing the fixed 3.0V output TC115 with a fixed 3.3V or 5.0V device. Since the TC115 operates from a minimum input voltage of 0.9V, the input voltage can be provided by a single-cell battery.

The TC115 Evaluation Board is provided with an aluminum electrolytic output capacitor. However, there are ceramic and tantalum capacitor pads so other capacitor technologies can be evaluated.

Test points are provided for input power, output load and shutdown control.

1.3 WHAT THE TC115 EVALUATION BOARD KIT INCLUDES

This TC115 Evaluation Board Kit includes:

- The TC115 Evaluation Board Board (102-00074)
- TC115 Evaluation Board User's Guide (DS51578)
- TC115 Data Sheet, *"PFM/PWM Step-up DC/DC Converter"* (DS21361)

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Chapter 2. Installation and Operation

2.1 INTRODUCTION

The TC115 Evaluation Board demonstrates Microchip's TC115 PFM/PWM step-up dc-dc converter in a single cell battery powered application. The TC115 is a high-efficiency step-up, dc-dc converter for small, low input voltage or battery-powered systems. The device has a start-up voltage of 0.9V. Due to its integrated MOSFET feature, the TC115 may be used in conjunction with only an external diode, an inductor and a capacitor to design a complete boost converter.

The TC115 Evaluation Board is shipped with an aluminum electrolytic output capacitor. However, there are additional surface-mount pads on the board to evaluate tantalum or ceramic capacitors.

2.2 FEATURES

The TC115 Evaluation Board has the following features:

- Regulated 3.0V output voltage
- Maximum output current: 110 mA
- Automatic PFM/PWM modes of operation
- Test point to apply external Enable signal

2.3 GETTING STARTED

The TC115 Evaluation Board is fully assembled and tested for generating a regulated 3.0V output voltage. The TC115 Evaluation Board requires the use of an external input voltage source (0.9V - 3.0V).

2.3.1 Power Input and Output Connections

2.3.1.1 POWERING THE TC115 EVALUATION BOARD

1. Apply the input voltage to the V_{IN} test point (TP1) and GND test point (TP4). The input voltage should be limited to the 0V to +3.0V range. For normal operation, the input voltage should be between +0.9V and +3.0V.

Note 1:	Since the TC115 Evaluation Board is a boost converter, applying an input voltage greater than 3.0V will result in an output voltage equal to the input voltage. The TC115 Evaluation Board cannot regulate to an output voltage that is lower than the input voltage.
2:	With the boost topology, there always exist a path from the input source to the output load.

2.3.1.2 APPLY THE LOAD TO THE REGULATED OUTPUT VOLTAGE TEST POINTS

1. To apply a load to the TC115 Evaluation Board, the positive side (+) of the load should be connected to the V_{OUT} test point (TP3). The negative side (–) of the load should be connected to the GND test point (TP2).

Note:	Since the TC115 device receives bias from the output, it may be necessary to remove the load before starting the TC115 Evaluation Board.

2. The TC115 Evaluation Board is supplied with a fixed 3.0V output voltage version of the TC115. However, by changing the TC115 device, other output voltages can be achieved. Besides the fixed 3.0V version, the TC115 is also offered in a fixed 3.3V or 5.0V version.

2.3.1.3 ENABLING/DISABLING THE TC115 EVALUATION BOARD

The $\overline{SHDN}$ pin of the TC115 is pulled-up to V_{IN} to always enable the device. Test point TP5 can be used to apply an external Enable signal to the device.

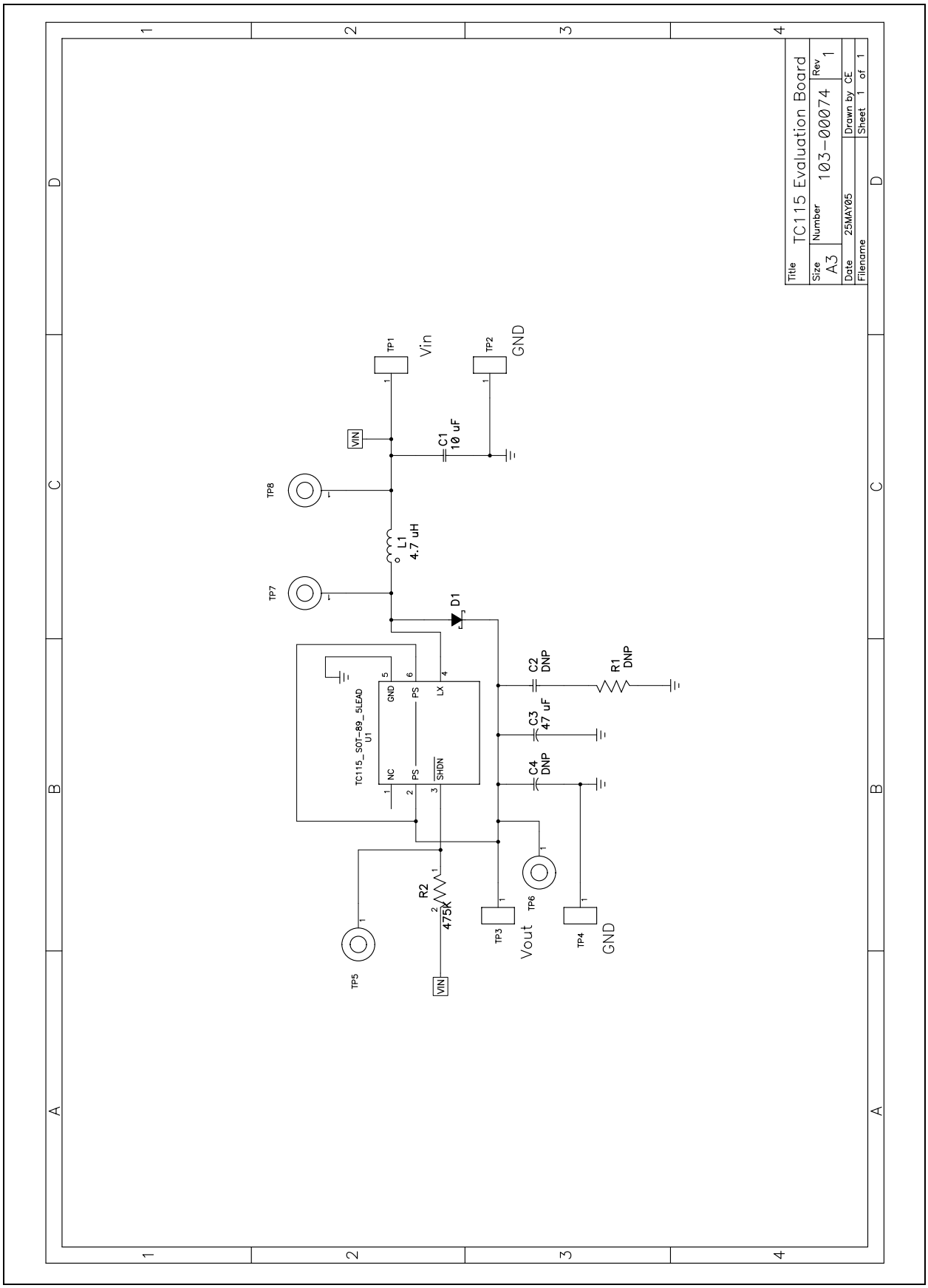
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

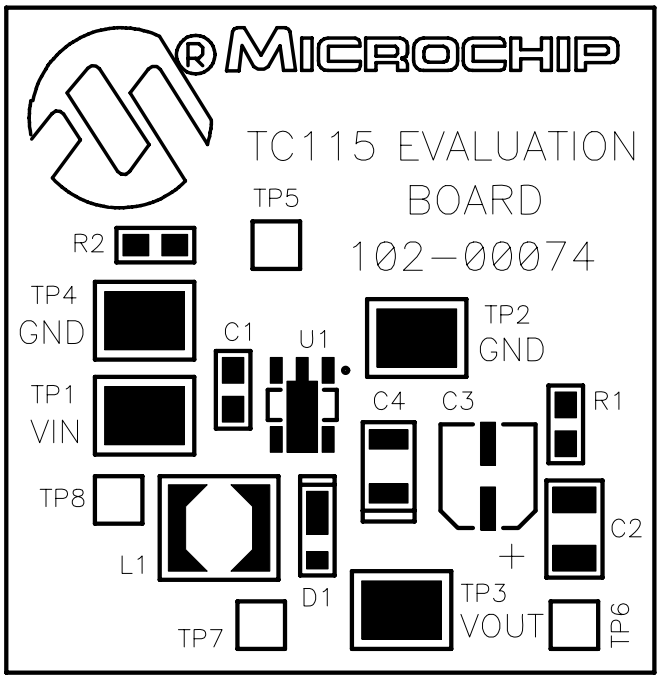
This appendix contains the following schematic and layout diagrams for the TC115 Evaluation Board:

- Board Schematic
- Board – Top Overlay
- Board – Top Layer
- Board – Bottom Layer

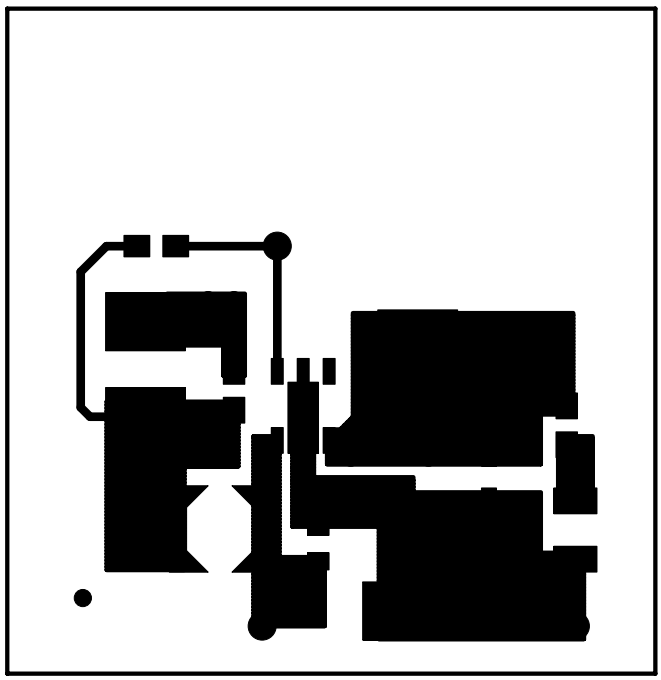
A.2 BOARD SCHEMATIC



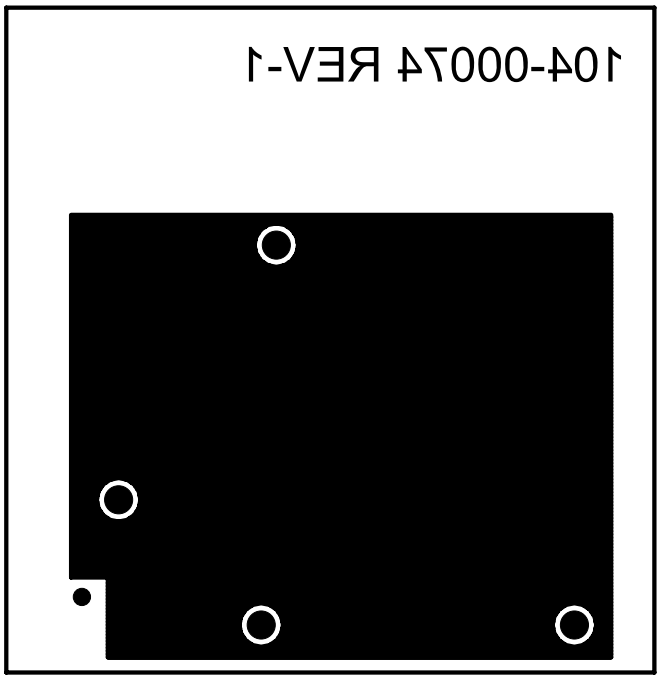
A.3 BOARD – TOP OVERLAY



A.4 BOARD – TOP LAYER



A.5 BOARD – BOTTOM LAYER



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Appendix B. Bill Of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

Qty.	Reference	Description	Mfgr.	Part Number
-	C2	Do Not Populate	–	–
1	C3	47 µF, Electrolytic, 6.3V	Nichicon	UWT0J470MCL1GB
-	C4	Do Not Populate	–	–
1	C1	10 µF, X5R Ceramic, 6.3V 0805	Panasonic®	ECJ-CV50J106M
1	D1	1A, 20V Shottky Diode	Diodes Inc.	DFLS120L
1	L1	4.7 µH, Inductor, SD18	Coiltronics®	SD18-4R7
-	R1	Do Not Populate	–	–
1	R2	475K, 1/8W,1%, Chip Resistor, 0805	Rohm	MCR10EZHF4753
4	TP1,TP2, TP3, TP4	Test Point	Keystone®	5016
1	U1	Step-up dc-dc Converter	Microchip Technology Inc.	TC115301EMTTR

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Fax: 949-462-9608

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Fax: 650-961-0286

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Canada
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Fax: 905-673-6509

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Fax: 61-2-9868-6755

China - Beijing
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Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8676-6200
Fax: 86-28-8676-6599

China - Fuzhou
Tel: 86-591-8750-3506
Fax: 86-591-8750-3521

China - Hong Kong SAR
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Fax: 852-2401-3431

China - Qingdao
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Fax: 86-532-8502-7205

China - Shanghai
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Fax: 86-21-5407-5066

China - Shenyang
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Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8203-2660
Fax: 86-755-8203-1760

China - Shunde
Tel: 86-757-2839-5507
Fax: 86-757-2839-5571

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
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Fax: 86-29-8833-7256

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Fax: 91-11-5160-8632

India - Pune
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Fax: 91-20-2566-1513

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Fax: 81-45-471-6122

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Fax: 82-54-473-4302

Korea - Seoul
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Fax: 82-2-558-5932 or
82-2-558-5934

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Fax: 886-3-572-6459

Taiwan - Kaohsiung
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Fax: 49-89-627-144-44

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Netherlands - Drunen
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Fax: 31-416-690340

Spain - Madrid
Tel: 34-91-352-30-52
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