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Object of Declaration: UTC2000

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
2355 W. Chandler Blvd.
Chandler, Arizona, 85224-6199
USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission’s Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

Derek Carlson
VP Development Tools

12-Sep-14 Date
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Preface

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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 UTC2000 Evaluation Kit User’s Guide. Items discussed in this chapter include:

• Document Layout EVK-UTC2000
• Conventions Used in this Guide
• Warranty Registration
• The Microchip Website
• Customer Support
• Document Revision History

DOCUMENT LAYOUT EVK-UTC2000

This document describes how to use the UTC2000 Evaluation Kit as a demonstration platform optimized for portable applications. The manual layout is as follows:

• Chapter 1. “Overview” – Shows a brief description of the UTC2000 Evaluation Kit
• Chapter 2. “Getting Started” – Provides information about set-up and operation of the UTC2000 Evaluation Kit.
• Chapter 3. “Hardware Configuration” – Includes information about the hardware configuration of the UTC2000 Evaluation Kit.
• Appendix A. “UTC2000 Schematics”
• Appendix B. “EVK-UTC2000 BOM”
• Appendix C. “EVK-UTC2000 PCB Silk Screens”

Note: USB Type-C™ USB-C™ are trademarks of USB Implementation Forum.
## CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

<table>
<thead>
<tr>
<th>DOCUMENTATION CONVENTIONS</th>
<th>Description</th>
<th>Represents</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arial font:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italic characters</td>
<td>Referenced books</td>
<td><em>MPLAB® IDE User’s Guide</em></td>
<td>...is the <em>only</em> compiler...</td>
</tr>
<tr>
<td>Emphasized text</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial caps</td>
<td>A window</td>
<td>the <em>Output window</em></td>
<td></td>
</tr>
<tr>
<td>A dialog</td>
<td>A <em>dialog</em></td>
<td>the <em>Settings dialog</em></td>
<td></td>
</tr>
<tr>
<td>A menu selection</td>
<td>select <em>Enable Programmer</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quotes</td>
<td>A field name in a window or dialog</td>
<td>“Save project before build”</td>
<td></td>
</tr>
<tr>
<td>Underlined, italic text with right angle bracket</td>
<td>A menu path</td>
<td>*File&gt;*Save</td>
<td></td>
</tr>
<tr>
<td>Bold characters</td>
<td>A <em>dialog button</em></td>
<td>Click OK</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A <em>tab</em></td>
<td>Click the <em>Power tab</em></td>
<td></td>
</tr>
<tr>
<td>N’Rnnnn</td>
<td>A number in a 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>
<td></td>
</tr>
<tr>
<td>Text in angle brackets &lt; &gt;</td>
<td>A key on the keyboard</td>
<td>Press &lt;Enter&gt;, &lt;F1&gt;</td>
<td></td>
</tr>
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<td>Courier New font:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plain Courier New</td>
<td>Sample source code</td>
<td><code>#define START</code></td>
<td></td>
</tr>
<tr>
<td>Filenames</td>
<td></td>
<td><code>autoexec.bat</code></td>
<td></td>
</tr>
<tr>
<td>File paths</td>
<td></td>
<td><code>c:\mcc18\h</code></td>
<td></td>
</tr>
<tr>
<td>Keywords</td>
<td></td>
<td><code>_asm, _endasm, static</code></td>
<td></td>
</tr>
<tr>
<td>Command-line options</td>
<td></td>
<td><code>-Opa+, -Opa-</code></td>
<td></td>
</tr>
<tr>
<td>Bit values</td>
<td></td>
<td><code>0, 1</code></td>
<td></td>
</tr>
<tr>
<td>Constants</td>
<td></td>
<td><code>0xFF, 'A'</code></td>
<td></td>
</tr>
<tr>
<td>Italic Courier New</td>
<td>A variable argument</td>
<td><em>file.o</em>, where <em>file</em> can be any valid filename</td>
<td></td>
</tr>
<tr>
<td>Square brackets [ ]</td>
<td>Optional arguments</td>
<td><code>mcc18 [options] file [options]</code></td>
<td></td>
</tr>
<tr>
<td>Curly brackets and pipe character: {</td>
<td>Choice of mutually exclusive arguments; an OR selection</td>
<td>`errorlevel {0</td>
<td>1}`</td>
</tr>
<tr>
<td>Ellipses...</td>
<td>Replaces repeated text</td>
<td><code>var_name [, var_name...]</code></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Represents code supplied by user</td>
<td><code>void main (void) { ... }</code></td>
<td></td>
</tr>
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</table>
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<th>Revision</th>
<th>Section/Figure/Entry</th>
<th>Correction</th>
</tr>
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<td>Initial Release of Document</td>
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<tr>
<td>DS50002399B (11-20-15)</td>
<td>Section 2.1 “Contents of the Kit”</td>
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<td>Section 2.2.2 “EVB-UTC2000 0-DFP Legacy Charging Operation”</td>
<td>Updated first paragraph to replace 56 kΩ with 56 kΩ.</td>
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<td>Section 2.2.4 “3.0A Charging Operation”</td>
<td>Updated steps to reflect correct information.</td>
</tr>
<tr>
<td></td>
<td>Figure 3-3</td>
<td>Updated image to remove black square in middle of the diagram.</td>
</tr>
<tr>
<td></td>
<td>Figure 3-6</td>
<td>Added trademark symbol to USB Type-C™.</td>
</tr>
<tr>
<td></td>
<td>Figure 3-7</td>
<td>Replaced incorrect image.</td>
</tr>
<tr>
<td></td>
<td>Figure 3-8</td>
<td>Added trademark symbol to USB Type-C™.</td>
</tr>
<tr>
<td></td>
<td>Appendix A. “UTC2000 Schematics”</td>
<td>Updated all images to remove extraneous information.</td>
</tr>
<tr>
<td></td>
<td>Appendix B. “EVK-UTC2000 BOM”</td>
<td>Fixed inconsistent text size.</td>
</tr>
</tbody>
</table>
Chapter 1. Overview

1.1 UTC2000 EVALUATION KIT OVERVIEW AND FEATURES

The UTC2000 Evaluation Kit is intended to demonstrate the form factor and reversibility of the USB Type-C™ cable operation as enabled by the UTC2000 basic Type-C controller. The kit includes a downstream facing port board, an upstream facing port board, and a USB Type-C cable, as shown in Figure 1-1. A basic USB Type-C connection can be demonstrated with a standard USB 2.0 or USB 3.1* host port, the UTC2000 EVK and any USB 2.0 or USB 3.1 device. See Section 1.2 “Features” for more information.

Note: EVK-UTC2000 is enabled with a USB 3.1 Gen 1 switch. USB 3.1 Gen 2 can be supported by using a compliant USB 3.1 Gen 2 switch.

FIGURE 1-1: UTC2000 EVALUATION KIT

1.2 FEATURES

- EVB-UTC2000-DFP converts any USB Type-A port to a USB Type-C port
- EVB-UTC2000-UFP converts any USB device to a USB Type-C device
- Compatible with USB 2.0 and USB 3.1 host ports and devices
- Supports basic USB Type-C 5V charging at:
  - Legacy 500mA (USB 2.0)/900mA (USB 3.1)
  - 1.5A
  - 3.0A
- LED status indicators on the downstream facing port (DFP) board include:
  - 5V board supply indicators
  - “Overcurrent” and “Fault” indicators
  - Plug orientation
• LED status indicators on the upstream facing port (UFP) board include:
  - 5 V board supply indicator
  - Legacy, 1.5A, 3.0A charging detecting indicators
• DP3T switch on DFP board for legacy, 1.5A, 3.0A charging mode selection
• Reversible USB Type-C receptacle
• USB 3.1 passive Type-C Cable

1.3 GENERAL DESCRIPTION

FIGURE 1-2: EVB-UTC2000-DFP BLOCK DIAGRAM
1.4 REFERENCES

- USB Type-C™ Specification
- UTC2000 Data Sheet
- Introduction to USB Type-C™ Application Note (http://www1.microchip.com/downloads/en/AppNotes/00001953A.pdf)
- Basic USB Type-C™ Upstream Facing Port Implementation (http://www1.microchip.com/downloads/jp/AppNotes/jp574170.pdf)

1.5 DEFINITION

- **DFP** - Downstream Facing Port
- **EVB** - Evaluation Board
- **EVK** - Evaluation Kit
- **UFP** - Upstream Facing Port
2.1 CONTENTS OF THE KIT

The UTC2000 Evaluation kit includes the basic equipment necessary for evaluation. The items included in the kit are:

1. EVB-UTC2000-DFP Evaluation Board
2. EVB-UTC2000-UFP Evaluation Board
3. USB Type-C Cable

2.2 BRING-UP AND TESTING

2.2.1 Setup and Requirements

• **EVB-UTC2000-DFP:** Before use, slide SW1 to the legacy charging mode. To use, simply insert the device into any USB Type-A USB 2.0 or USB 3.1 host port. Any USB Type-C device may now be connected to the USB Type-C port. The reversibility of the USB Type-C cable can be demonstrated by connecting it in the opposite direction.

• **EVB-UTC2000-UFP:** To use, connect to any USB Type-C host or hub port. If there is no native USB Type-C host available, the EVB-UTC2000-DFP board may be used. Insert a USB 2.0 or USB 3.1 device into the Type-A receptacle (J2) of the EVB-UTC2000-UFP. The device may then be used normally.

2.2.2 EVB-UTC2000-DFP Legacy Charging Operation

The EVB-UTC2000-DFP board is configured to Legacy 500mA (USB2.0)/900mA (USB3.1 Gen1) charging mode by default. Ensure that SW1 is in the “Lgcy” position. The switch will select 56 kΩ CC1/CC2 Rp pull-up resistors and set the CFG_SEL voltage to the appropriate level.

When connecting the EVB-UTC2000-DFP board to the EVB-UTC2000-UFP while in Legacy charging mode, the “Legacy” charging capability LED indicator (D4) on the EVB-UTC2000-UFP will be illuminated.

2.2.3 1.5A Charging Operation

The EVB-UTC2000-DFP is designed to plug in and operate from any legacy USB Type-A port. To protect your computer from possible overcurrent issues, 1.5A and 3.0A modes have been disabled by default.

To test 1.5A charging mode, perform the following steps:

1. Remove R15 and R17 56k Rp pull-up resistors.
2. Populate R18 and R23 with 22k, 0402 footprint resistors.
3. Set SW1 to the “1.5A” position.
4. Remove R3 to isolate the 5V domain on the EVB-UTC200-DFP from the 5V domain on your host PC.
5. Connect an external power supply as shown in Section 3.1.1 “Power Source”.
When connecting the EVB-UTC2000-DFP board to the EVB-UTC2000-UFP while in 1.5A charging mode, the “1.5A” charging capability LED (D3) indicator on the EVB-UTC2000-UFP will be illuminated.

2.2.4 3.0A Charging Operation

The EVB-UTC2000-DFP is designed to plug in and operate from any legacy USB Type-A port. To protect your computer from possible overcurrent issues, 1.5A and 3.0A modes have been disabled by default.

To test 3.0A charging mode, perform the following steps:

1. Remove R15 and R17 56k Rp pull-up resistors.
2. Populate R24 and R27 with 10k, 0402 footprint resistors.
3. Set SW1 to the “3.0A” position.
4. Remove R3 to isolate the 5V domain on the EVB-UTC200-DFP from the 5V domain on your host PC.
5. Connect an external power supply as shown in Section 3.1.1 “Power Source”.

When connecting the EVB-UTC2000-DFP board to the EVB-UTC2000-UFP while in 3.0A charging mode, the “3.0A” charging capability LED indicator (D2) on the EVB-UTC2000-UFP will be illuminated.
Chapter 3. Hardware Configuration

3.1 HARDWARE DESCRIPTION

3.1.1 Power Source

The EVB-UTC2000-DFP can be powered in one of two ways:

1. **Host/Hub Port VBUS**: The board can be powered by 5V VBUS sourced from the connected host port. **Do not operate with SW1 in the 1.5A or 3.0A modes and attempt to draw 1.5A or 3.0A when connected in this way, as Legacy USB Type-A host ports typically cannot support this amount of current draw.**

2. **External 5V Supply**: An external 5V supply may be connected to TP1 to test 1.5A and 3.0A charging. **Be sure to remove the R3 zero-ohm resistor to prevent voltage back drive to the host/hub port, as shown in Figure 3-3.**
3.1.2 LED Indicators for EVB-UTC2000-DFP

Table 3-1 describes the LED indicators included on the EVB-UTC2000-DFP.

**TABLE 3-1: LED INDICATOR DESCRIPTIONS**

<table>
<thead>
<tr>
<th>REF. DES.</th>
<th>LABEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>“VBUS IN”</td>
<td>Indicates that 5V board power is present.</td>
</tr>
<tr>
<td>D3</td>
<td>“VBUS ON”</td>
<td>Indicates 5V is being supplied to VBUS on the Type-C port.</td>
</tr>
<tr>
<td>D4</td>
<td>“FAULT”</td>
<td>Indicates an overvoltage or overcurrent event has occurred. This indicator will reset with a power cycle of the board.</td>
</tr>
<tr>
<td>D5</td>
<td>“OVRCUR”</td>
<td>Indicates an overcurrent event is occurring. This signal is driven by the 5V port power controller.</td>
</tr>
<tr>
<td>D6</td>
<td>“PLUG ORIENT”</td>
<td>Indicates the state of the PLUG_ORIENTATION# signal. When illuminated, PLUG_ORIENTATION is being driven low by the UTC2000.</td>
</tr>
</tbody>
</table>
3.1.3 Switches on EVB-UTC2000-DFP

Table 3-2 describes the switches included on the EVB-UTC2000-DFP.

<table>
<thead>
<tr>
<th>REF. DES.</th>
<th>LABEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW1</td>
<td>&quot;Lgcy -- 1.5A -- 3A&quot;</td>
<td>Selects between the DFP modes of operation: &quot;Lgcy&quot;, &quot;1.5A&quot;, &quot;3.0A&quot;</td>
</tr>
</tbody>
</table>

**Note:** The EVB-UTC2000-DFP is configured for Legacy mode of operation by default. See Section 2.2.3 “1.5A Charging Operation”/Section 2.2.4 “3.0A Charging Operation” for information on testing 1.5A/3.0A modes respectively.
3.1.4 Connector Descriptions for EVB-UTC2000-DFP

Table 3-3 describes the connectors included on the EVB-UTC2000-DFP.

<table>
<thead>
<tr>
<th>REF. DES.</th>
<th>TYPE</th>
<th>LABEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>1x5 Header</td>
<td>-</td>
<td>5-pin debug header (internal MCHP use only)</td>
</tr>
<tr>
<td>J2</td>
<td>USB 3.1 Type-A Plug</td>
<td>-</td>
<td>Type-A male plug</td>
</tr>
<tr>
<td>J3</td>
<td>USB 3.1 Type-C Receptacle</td>
<td>-</td>
<td>Type-C receptacle</td>
</tr>
</tbody>
</table>

3.1.5 Test Points on EVB-UTC2000-DFP

Table 3-4 describes the test points included on the EVB-UTC2000-DFP. A header may be permanently installed on the through-hole test points if needed.

<table>
<thead>
<tr>
<th>REF. DES.</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>Thru-Hole</td>
<td>5V probe point or external 5V supply point</td>
</tr>
<tr>
<td>TP2</td>
<td>Thru-Hole</td>
<td>GND</td>
</tr>
</tbody>
</table>

3.1.6 LED Indicators for EVB-UTC2000-UFP

Table 3-5 describes the LED indicators included on the EVB-UTC2000-UFP.

<table>
<thead>
<tr>
<th>REF. DES.</th>
<th>LABEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>&quot;VBUS IN&quot;</td>
<td>Indicates that a valid VBUS (5.5V-4.0V) is being supplied to the EVB-UTC2000-UFP from the USB Type-C™ connection and that 5V is being passed to the USB Type-A receptacle.</td>
</tr>
<tr>
<td>D2</td>
<td>&quot;3A&quot;</td>
<td>Indicates when a 3.0 A capable DFP connection is detected.</td>
</tr>
<tr>
<td>D3</td>
<td>&quot;1.5A&quot;</td>
<td>Indicates when a 1.5 A capable DFP connection is detected.</td>
</tr>
<tr>
<td>D4</td>
<td>&quot;Legacy&quot;</td>
<td>Indicates when legacy 500 mA (USB 2.0) / 900 mA (USB 3.1) capable DFP connection is detected.</td>
</tr>
</tbody>
</table>
3.1.7 Switches on EVB-UTC2000-UFP
There are no switches present on the EVB-UTC2000-UFP.

3.1.8 Connector Descriptions for EVB-UTC2000-UFP
Table 3-6 describes the connectors included on the EVB-UTC2000-UFP.

<table>
<thead>
<tr>
<th>REF. DES.</th>
<th>TYPE</th>
<th>LABEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>1x5 Header</td>
<td>-</td>
<td>5-pin debug header (internal Microchip use only)</td>
</tr>
<tr>
<td>J2</td>
<td>USB 3.1 Type-A Plug</td>
<td>-</td>
<td>USB Type-A receptacle</td>
</tr>
<tr>
<td>J3</td>
<td>USB 3.1 Type-C Receptacle</td>
<td>-</td>
<td>USB Type-C™ receptacle</td>
</tr>
<tr>
<td>J4</td>
<td>Load Loop</td>
<td>-</td>
<td>An external load may be connected between this load loop and GND (pin 3 of J1)</td>
</tr>
</tbody>
</table>
3.1.9 Test Points on EVB-UTC2000-UFP

There are no test points available on the EVB-UTC2000-UFP.
Appendix A. UTC2000 Schematics

A.1 INTRODUCTION

This appendix shows the UTC2000 Evaluation Kit Schematic.
FIGURE A-1: UTC2000 EVALUATION KIT SCHEMATICS

**Note:** CC1/CC2 intentionally swapped to facilitate cleaner USB3.0 signal routing.

**Note:** CC1/CC2 intentionally swapped for simplified routing.

**Note:** CC traces 50Ohm Single-Ended.
FIGURE A-1: UTC2000 EVALUATION KIT SCHEMATICS (CONTINUED)

UTC2000

Debug Header (Internal Use Only)

3.3V Supply

Configuration Selection

CC1 SEL = 0.75V: 1.5A Mode
CC1 SEL = 1.25V: 3.0A Mode
CC1 SEL = 0.00V: Legacy 500mA Mode

Current Capability Marker Selector

R3/R21: R3/R21 are not populated by default because an EVB is designed to plug into any legacy or legacy USB port.

In order to test higher current modes, ensure to do the following:
1. Remove R15 and R17
2. Populate R18/R23 for 1.5A mode, or R24/R27 for 3.0A mode
3. Set SW1 in the corresponding position
4. Remove R3 to isolate 5V from the host PC
5. Connect an external high current bench supply to TP1/TP2

> 5.5V is recommended if testing 3A mode

Plug Orientation

PLUG_ORIENTATION# indicates the Type-C cable insertion orientation.
HIGH = not connected or connected or unflipped
i.e.: CC >> CC1
LOW = connected and flipped
i.e.: CC >> CC2

PLUG_ORIENTATION# 1.5A_SEL

Includes a 1.5A current capability marker selector.

PLUG_ORIENTATION# 3A_SEL

Includes a 3A current capability marker selector.

Loss: 0.25Ω ±уΩ

"OverCurrent"

"Fault"

PLUG_ORIENTATION# indicates the Type-C cable insertion orientation.
HIGH = not connected or connected or unflipped
i.e.: CC >> CC1
LOW = connected and flipped
i.e.: CC >> CC2

PLUG_ORIENTATION# 100k

1% 0402

R18/R23, R24/R27 are not populated by default because an EVB is designed to plug into any legacy USB port.

In order to test higher current modes, ensure to do the following:
1. Remove R15 and R17
2. Populate R18/R23 for 1.5A mode, or R24/R27 for 3.0A mode
3. Set SW1 in the corresponding position
4. Remove R3 to isolate 5V from the host PC
5. Connect an external high current bench supply to TP1/TP2

> 5.5V is recommended if testing 3A mode

PLUG_ORIENTATION#

Includes a 1.5A current capability marker selector.

Includes a 3A current capability marker selector.

Loss: 0.25Ω ±μΩ

"OverCurrent"

"Fault"

PLUG_ORIENTATION# indicates the Type-C cable insertion orientation.
HIGH = not connected or connected or unflipped
i.e.: CC >> CC1
LOW = connected and flipped
i.e.: CC >> CC2

PLUG_ORIENTATION# 100k

1% 0402

R18/R23, R24/R27 are not populated by default because an EVB is designed to plug into any legacy USB port.

In order to test higher current modes, ensure to do the following:
1. Remove R15 and R17
2. Populate R18/R23 for 1.5A mode, or R24/R27 for 3.0A mode
3. Set SW1 in the corresponding position
4. Remove R3 to isolate 5V from the host PC
5. Connect an external high current bench supply to TP1/TP2

> 5.5V is recommended if testing 3A mode

PLUG_ORIENTATION#

Includes a 1.5A current capability marker selector.

Includes a 3A current capability marker selector.

Loss: 0.25Ω ±μΩ

"OverCurrent"

"Fault"

PLUG_ORIENTATION# indicates the Type-C cable insertion orientation.
HIGH = not connected or connected or unflipped
i.e.: CC >> CC1
LOW = connected and flipped
i.e.: CC >> CC2

PLUG_ORIENTATION# 100k

1% 0402

R18/R23, R24/R27 are not populated by default because an EVB is designed to plug into any legacy USB port.

In order to test higher current modes, ensure to do the following:
1. Remove R15 and R17
2. Populate R18/R23 for 1.5A mode, or R24/R27 for 3.0A mode
3. Set SW1 in the corresponding position
4. Remove R3 to isolate 5V from the host PC
5. Connect an external high current bench supply to TP1/TP2

> 5.5V is recommended if testing 3A mode

PLUG_ORIENTATION#

Includes a 1.5A current capability marker selector.

Includes a 3A current capability marker selector.

Loss: 0.25Ω ±μΩ

"OverCurrent"

"Fault"
FIGURE A-1: UTC2000 EVALUATION KIT SCHEMATICS (CONTINUED)
Appendix B. EVK-UTC2000 BOM

B.1 INTRODUCTION

This appendix shows the EVK-UTC2000 Evaluation Bill of Materials.
<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Qty Pop’d</th>
<th>Reference Designator(s)</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Manufacturer Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>C1</td>
<td>CAP CER, 47uF, 16V, 20%, X5R, 1206</td>
<td>TDK Corporation</td>
<td>C3216X5R1C476M160AB</td>
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<tr>
<td>2</td>
<td>8</td>
<td>8</td>
<td>C2, C3, C6, C8, C9, C10, C12, C14</td>
<td>CAP CER, 0.1uF, 16V, 80%, SMD, 0402</td>
<td>Yageo</td>
<td>CC0402R5Y5V7BB104</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>C4, C5, C13</td>
<td>CAP CER, 1uF, 16V, 10%, X5R, 0402</td>
<td>TDK Corporation</td>
<td>C1005X5R1C105K050BC</td>
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<tr>
<td>4</td>
<td>1</td>
<td>1</td>
<td>C7</td>
<td>CAP CER, 10uF, 6.3V, 20%, X5R SMD, 0603</td>
<td>AVX</td>
<td>06036D106MAT2A</td>
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<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>C11</td>
<td>CAP CER, 4.7uF, 10V, 10%, X5R SMD, 0603</td>
<td>Taiyo Yuden</td>
<td>LMK107BJ475KA-T</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1</td>
<td>D1</td>
<td>DIO RECTARR, BAV99, 1.25V, 200mA, 70V, SOT-23-3</td>
<td>Fairchild</td>
<td>BAV99</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>2</td>
<td>D2, D3</td>
<td>LED, Bright Green, 0603</td>
<td>Lite-On</td>
<td>LTST-C191KGKT</td>
</tr>
<tr>
<td>8</td>
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<td>2</td>
<td>D4, D5</td>
<td>LED, Bright Red, 0603</td>
<td>Lite-On</td>
<td>LTST-C191KRKT</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>1</td>
<td>D6</td>
<td>DIO LED YELLOW 2V 25mA 162.5mcd Diffuse SMD 0603</td>
<td>OSRAM</td>
<td>LY Q976-P1S2-36</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>J1</td>
<td>CON HDR-2.54 Male 1x5 Gold 5.84MH TH VERT</td>
<td>Samtec</td>
<td>TSW-105-07-S-S</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>1</td>
<td>J2</td>
<td>CON USB 3.1 Gen 1 STD-A PLUG SMD R/A</td>
<td>Wurth Electronics Inc</td>
<td>692112030100</td>
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<tr>
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<td>J3</td>
<td>CON USB 3.1 Gen 1 Hybrid Type-C</td>
<td>ACON</td>
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<td>13</td>
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<td>MOSFET SMD- Small Signal P-Channel Mosfet</td>
<td>Central Semiconductor</td>
<td>CMLDM8005 TR</td>
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<td>NXP Semiconductors</td>
<td>PMDXB600UNE</td>
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<tr>
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<td>R1</td>
<td>RES SMD 35.7K OHM 1% 1/10W 0402</td>
<td>Panasonic</td>
<td>ERJ-2RKF3572X</td>
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<tr>
<td>16</td>
<td>5</td>
<td>5</td>
<td>R2, R4, R9, R10, R11</td>
<td>RES TKF 1k 1% 1/10W SMD 0402</td>
<td>Panasonic</td>
<td>ERJ-2RKF1001X</td>
</tr>
<tr>
<td>17</td>
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<td>1</td>
<td>R3</td>
<td>RES TKF OR 1/8W SMD 0805</td>
<td>Panasonic</td>
<td>ERJ-6GEY0R00V</td>
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<tr>
<td>18</td>
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<td>R5, R6</td>
<td>RES SMD 5.1K OHM 1% 1/10W 0402</td>
<td>Panasonic</td>
<td>ERJ-2RKF5101X</td>
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<tr>
<td>19</td>
<td>8</td>
<td>8</td>
<td>R7, R8, R16, R19, R20, R22, R26, R29</td>
<td>RES TKF 100k 1% 1/10W SMD 0402</td>
<td>Panasonic</td>
<td>ERJ-2RKF1003X</td>
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<tr>
<td>20</td>
<td>2</td>
<td>2</td>
<td>R12, R13</td>
<td>RES TKF 330R 1% 1/10W SMD 0603</td>
<td>ROHM</td>
<td>MCR03EZPFX3300</td>
</tr>
<tr>
<td>21</td>
<td>3</td>
<td>3</td>
<td>R14, R28, R30</td>
<td>RES TKF 10k 1% 1/10W SMD 0402</td>
<td>Panasonic</td>
<td>ERJ-2RKF1002X</td>
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<tr>
<td>22</td>
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<td>3</td>
<td>R15, R17, R21</td>
<td>RES TKF 56k 1% 1/16W SMD 0402</td>
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<td>MCR01MZPF5602</td>
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<td>SW1</td>
<td>SW SLIDE DP3T 12VDC 100MA SMT</td>
<td>C&amp;K Components</td>
<td>AYZ0203AGRLC</td>
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### TABLE B-2: EVK-UTC2000-UFP BILL OF MATERIALS

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Qty Pop’d</th>
<th>Reference Designator(s)</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Manufacturer Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>8</td>
<td>C1, C2, C3, C4, C6, C8, C9, C10</td>
<td>CAP CER 0.1uF 10V 10% X5R SMD 0402</td>
<td>KEMET</td>
<td>C0402C104K8PACTU</td>
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<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>C5, C7</td>
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<td>Murata Electronics North America</td>
<td>GRM155R61A105KE15D</td>
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<td>3</td>
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<td>D1</td>
<td>LED, Bright Green, 0603</td>
<td>Lite-On</td>
<td>LTST-C191KGKT</td>
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<tr>
<td>4</td>
<td>3</td>
<td>3</td>
<td>D2, D3, D4</td>
<td>DIO LED BLUE 2.8V 20mA 15mcd Clear SMD 0603</td>
<td>Lite-On</td>
<td>LTST-C193TBKT-5A</td>
</tr>
<tr>
<td>5</td>
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<td>1</td>
<td>D5</td>
<td>LED, Bright Red, 0603</td>
<td>Lite-On</td>
<td>LTST-C191KRKT</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1</td>
<td>D6</td>
<td>DIO LED YELLOW 2V 25mA 162.5mcd Diffuse SMD 0603</td>
<td>OSRAM</td>
<td>LY Q976-P1S2-36</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>1</td>
<td>D7</td>
<td>DIO RECTARR BAV99 1.25V 200mA 70V SOT-23-3</td>
<td>Fairchild</td>
<td>BAV99</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>1</td>
<td>J1</td>
<td>CON HDR-2.54 Male 1x5 Gold 5.84MH TH VERT</td>
<td>Samtec</td>
<td>TSW-105-07-S-S</td>
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<td>9</td>
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<td>J2</td>
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<td>J3</td>
<td>CON USB 3.1 Gen 1 Hybrid Type-C</td>
<td>ACON</td>
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<td>J4</td>
<td>CON TP LOOP Tin SMD</td>
<td>Harwin Inc</td>
<td>S1751-46R</td>
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<td>Infineon Technologies</td>
<td>BSO080P03NS3E G</td>
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<tr>
<td>13</td>
<td>6</td>
<td>6</td>
<td>R1, R2, R3, R7, R12, R13</td>
<td>RES TKF 1k 1% 1/10W SMD 0402</td>
<td>Panasonic</td>
<td>ERJ-2RFK1001X</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>1</td>
<td>R4</td>
<td>RES SMD 35.7K OHM 1% 1/10W 0402</td>
<td>Panasonic</td>
<td>ERJ-2RFK3572X</td>
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<tr>
<td>15</td>
<td>3</td>
<td>3</td>
<td>R5, R10, R11</td>
<td>RES SMD 5.1K OHM 1% 1/10W 0402</td>
<td>Panasonic</td>
<td>ERJ-2RFK5101X</td>
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<tr>
<td>16</td>
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<td>R6, R18</td>
<td>RES TKF 10k 1% 1/10W SMD 0402</td>
<td>Panasonic</td>
<td>ERJ-2RFK1002X</td>
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<tr>
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<td>RES TKF 1k 1% 1/10W SMD 0603</td>
<td>Yageo</td>
<td>RC0603FR-071KL</td>
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### TABLE B-1: EVK-UTC2000-DFP BILL OF MATERIALS (CONTINUED)

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Qty Pop’d</th>
<th>Reference Designator(s)</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Manufacturer Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>2</td>
<td>2</td>
<td>TP1</td>
<td>MISC, TEST POINT MULTI PURPOSE MINI RED</td>
<td>Keystone</td>
<td>5000</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>1</td>
<td>TP2</td>
<td>MISC, TEST POINT MULTI PURPOSE MINI BLACK</td>
<td>Keystone</td>
<td>5001</td>
</tr>
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<td>U1</td>
<td>IC REG LDO 3.3V 0.3A SOT23-5</td>
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<td>MCP1755T-3302E/OT</td>
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<td>1</td>
<td>U2</td>
<td>UTC2000 TYPEC CONTROLLER 16QFN</td>
<td>Microchip Technology</td>
<td>UTC2000/MG</td>
</tr>
<tr>
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<td>1</td>
<td>U3</td>
<td>IC CURR-LIM SW SNGL PROG 12-TQFN</td>
<td>Maxim Integrated</td>
<td>MAX1563ETC+</td>
</tr>
<tr>
<td>27</td>
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<td>1</td>
<td>U4</td>
<td>IC USB 3.1 Gen 1 &amp; USB 2.0 SWITCH 32TQFN</td>
<td>Pericom</td>
<td>PI3USB3102ZLE</td>
</tr>
<tr>
<td>Item</td>
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<td>Qty Pop'd</td>
<td>Reference Designator(s)</td>
<td>Description</td>
<td>Manufacturer</td>
<td>Manufacturer Part Number</td>
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<tr>
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<td>--------------</td>
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<tr>
<td>19</td>
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<td>2</td>
<td>R15, R16</td>
<td>RES TKF 330R 1% 1/10W SMD 0603</td>
<td>ROHM</td>
<td>MCR03EZPFX3300</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>1</td>
<td>R17</td>
<td>RES TKF 100k 1% 1/10W SMD 0603</td>
<td>Panasonic</td>
<td>ERJ-3EKF1003V</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>1</td>
<td>U1</td>
<td>IC REG LDO 3.3V 0.3A SOT23-5</td>
<td>Microchip Technology</td>
<td>MCP1755T-3302E/OT</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>1</td>
<td>U2</td>
<td>UTC2000 TYPEC CONTROLLER 16QFN</td>
<td>Microchip Technology</td>
<td>EVK-UTC2000-UFP</td>
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<td>1</td>
<td>U3</td>
<td>IC USB 3.1 Gen 1 &amp; USB 2.0 SWITCH 32TQFN</td>
<td>Pericom</td>
<td>PI3USB3102ZLE</td>
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</table>
Appendix C. EVK-UTC2000 PCB Silk Screens

C.1 INTRODUCTION

This appendix shows the EVK-UTC2000 Top and Bottom Silk Screen Images.

FIGURE C-1: EVB-UTC2000-DFP TOP AND BOTTOM SILK SCREEN IMAGES
FIGURE C-2: EVB-UTC2000-UFP TOP AND BOTTOM SILK SCREEN IMAGES