UM11014

TEA190x evaluation overdrive (TEO)

Rev. 2 — 16 November 2018

User manual

Document information

Information	Content
Keywords	TEA190x, TEA1903, TEA1905, demonstration kit, Teo, UTC, software
Abstract	This user manual describes the TEA190x demonstration kit. The TEA190x demonstration kit includes software to view and change the configuration of the TEA190x. The software also shows live data, such as USB-PD messages, bus voltage, and current. The software is called Teo (TEA190x evaluation overdrive). It incorporates a graphical user interface (GUI) and several libraries to communicate with the TEA190x family and monitor USB-PD traffic.

Table 1. Revision history

Rev	Date	Description
v.2	20181116	second issue
Modifications:	• The text has been updated throughout the document. • The graphics have been updated throughout the document.	
v.1	20170223	first issue

1 Introduction
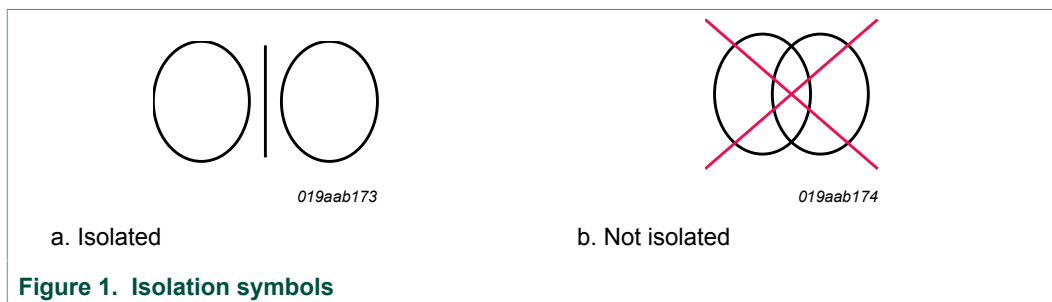
Warning		
		The non-insulated high voltages that are present when operating this product, constitute a risk of electric shock, personal injury, death and/or ignition of fire. This product is intended for evaluation purposes only. It shall be operated in a designated test area by personnel qualified according to local requirements and labor laws to work with non-insulated mains voltages and high-voltage circuits. This product shall never be operated unattended.

This user manual describes the TEA190x family demonstration kit. The TEA190x demonstration kit includes software to view and change the configuration of the TEA190x. The software also shows live data, such as USB-PD messages, bus voltage, and current. The software is called Teo (TEA190x evaluation overdrive, second generation) and incorporates a graphical user interface (GUI) and several libraries to communicate with the TEA190x and monitor USB-PD traffic.

Screen pictures may differ due to small software upgrades. If major upgrades occur, this document is updated as well.

2   Safety warning

The TEA190x is AC mains voltage powered. Avoid touching the board while it is connected to the mains. An isolated housing is obligatory when used in uncontrolled, non-laboratory environments. Galvanic isolation from the mains phase using a fixed or variable transformer is always recommended. Figure 1 shows the symbols on how to recognize these devices.

019aab173

a. Isolated

019aab174

b. Not isolated

Figure 1. Isolation symbols

UM11014

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2018. All rights reserved.

User manual

Rev. 2 — 16 November 2018

4 / 35

3   Kit content

The TEA190x demonstration kit contains the following items:

- Demo board: A complete USB-PD source device
- UTC: A monitoring and sink device.
- Teo: Configuration and monitoring software for Microsoft Windows
- A type-C male-male cable: Connects UTC with the TEA190x.
- A type-B to micro-B USB cable: Connects UTC to a PC.
- A USB-OTG adapter: For upgrading the UTC firmware.

UM11014

User manual **Rev. 2 — 16 November 2018**

5 / 35

aaa-027004

a. TEA190x demo board

aaa-023606

b. UTC - USB-PD interface

aaa-023608

c. Teo - PC software

Figure 2. TEA190x demonstration kit contents

Note: Several demo boards with different configurations exist. The picture shown in Figure 2 may differ from the board in the demo kit.

UM11014

User manual

Rev. 2 — 16 November 2018

6 / 35

3.1 Other requirements

The demo board is preconfigured. It works out of the box. Teo runs on a PC with Microsoft Windows. The demo board configuration can be changed. To change the configuration, Teo is required. If the evaluation of the TEA190x is done with a USB-PD sink, a number of options are available.

- Use UTC as a USB-PD sink. Teo configures UTC to act as a USB-PD sink. The communication between TEA190x and UTC is shown in Teo. Optionally, a load (either an electronic or resistive one) can be connected to UTC and draw current from the TEA190x.
- Connect a USB-PD sink and use UTC to monitor the communication between sink and TEA190x. Teo shows the USB-PD messages from and to the TEA190x.
- Connect a USB-PD sink and use external protocol analyzers to monitor the communication between sink and TEA190x. Teo can still be used to change the configuration of the TEA190x.

3.2 Compatibility

Teo is available for Windows 7, Windows 8, Windows 8.1, and Windows 10. 64-bit and 32-bit versions are supported.

4 Quick start

This section provides the information to get started as quickly as possible. It does not replace other information elsewhere in this document. Read the remainder to get the most out of the demonstration kit.

4.1 Requirements

- To get the board working:
  - TEA190x demo board (TEA190x demonstration kit)
  - An AC mains power source, 110 V to 240 V (AC), 50 Hz to 60 Hz
  - A set of wires for connection to the AC mains power source
- To change settings of TEA190x:
  - Teo, PC software for TEA190x (TEA190x demonstration kit)
  - One of the TEA190x data sheets (TEA190x demonstration kit)
  - A PC running Microsoft Windows 7 or higher
- To monitor the TEA190x:
  - Preferred device to connect with TEA190x, or
  - A simulated sink such as UTC and Teo (TEA190x demonstration kit), or
  - A lab with the required equipment

4.2 Before installing the PC software for the TEA1905

- Leave the demo board disconnected for now.
- Leave UTC disconnected for now.

Windows installs driver packages for both hardware interfaces. When the hardware interfaces are plugged into one of the USB ports for the first time, the drivers are installed automatically.

4.3 Installing the PC software

- While installing the PC software, leave UTC disconnected.
- Run the installer wizard "Install_Teo_x_y_z.exe". X, y, and z indicate the version number of Teo.
- Follow the instructions of the installer wizard.

Two sets of drivers are installed. During the installation, messages may appear on the screen asking to trust an unknown publisher. To continue the drivers initialization, confirm by clicking "Yes".

In most cases, the drivers are installed instantaneously. However, sometimes a reboot may be required. If a reboot is required, a message appears on the screen. Reboot your PC before continuing with the next step.

4.4 Connecting the demo board to the PC

Connect UTC to the PC with the supplied USB cable. Connect the demo board to UTC with the supplied type-C cable.

Teo recognizes UTC and lets you configure UTC to be used as a USB-PD sink or USBPD Sniffer.

As a safety precaution, use a type-C cable to connect the TEA190x with a device. Plug the type-C cable into the TEA190x board before supplying the mains power source. Use the other end to connect a device. In this way, the high voltages on the board are avoided.

Note: Even after disconnecting the charger from the mains supply, the large capacitor keeps it charged with a high voltage for hours.

4.5 How to use the software

The software, Teo, shows a number of tabbed pages of controls:

- Basic: Always visible
- Advanced: Always visible
- Protection: Always visible
- Extended SrcCaps: Visible when USB-PD 3 is supported
- Sink or sniffer: Only visible when UTC is connected

The last tabbed page, Sink, or Sniffer, is designed for UTC. If UTC is connected, Teo configures UTC to be used as a USB-PD sink or as a USB-PD sniffer. By default, UTC boots in sniffer mode. See Section 5.2, for more information about UTC. If UTC is disconnected, the last tab is hidden.

With the first four pages, changes can be made to the configuration of the TEA190x. If a connection via UTC exists, the changes can be written and stored.

When the configuration is changed, the TEA190x must be restarted for those changes to take effect. The "Soft restart" button on the Basic page restarts the TEA190x.

The requested voltage and current can be changed on the Sink tab. A hard reset or soft reset can be performed. When a new voltage request has been inserted, press Enter or Tab to cause the change to take effect. Clicking one of the PDOs, requests the corresponding voltage.

UM11014

User manual

Rev. 2 — 16 November 2018

9 / 35

Captured USB-PD messages between the TEA190x and the USB-PD sink are listed on the Sniffer tab.

If Teo fails to recognize the demo board, choose Scan interfaces from the Options menu, to have Teo look again for known interfaces. Select the desired interface from the Interface menu under Options.

When an interface is selected, Teo attempts to set up a connection with the TEA190x. If the connection setup is successful, Teo reads all settings from the MTP memory.

5 Hardware

The TEA190x demonstration kit incorporates a fully operational USB-PD source. It also contains UTC, a peripheral device to change and monitor the behavior of the TEA190x.

5.1 The TEA190x demo board

The TEA190x demo board has a primary and secondary supply. The primary side is connected to a mains source from 110 V (AC) to 240 V (AC) with wires. The frequency is 50 Hz or 60 Hz (see one of the TEA190x data sheets for the complete specification).

The secondary stage delivers power through a USB type-C female connector.
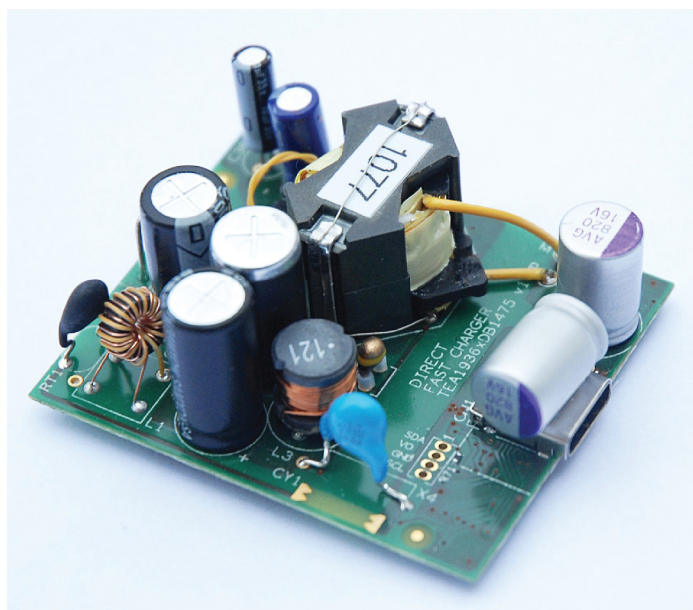
aaa-027004

a. Type-C
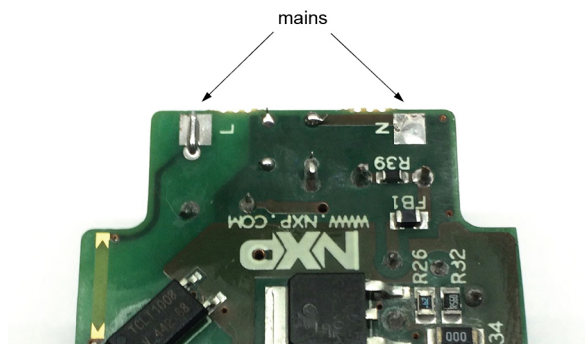
aaa-024525

b. Mains

Figure 3. TEA1905 demo board

Note: The board in the demonstration kit may look different from the pictures shown in Figure 3.

5.2 UTC

UTC (USB-PD Type-C controller) includes a micro-USB receptacle, a male type-C connector, and a female type-C connector. The micro-USB receptacle can be connected to a type-B connector on the PC with the cable supplied.

UTC receives operating power and communicates with Teo via the micro-USB connection. In essence, the only difference between the two type-C connectors is the gender. It allows UTC to be connected between a USB-PD source and sink.

UTC has access to the CC lines, can monitor and inject USB-PD messages, and measures voltage and current on V_{bus}.

UTC operates in two different modes:

• Sink
• Sniffer

5.2.1 Sink mode

In sink mode, UTC acts as a USB-PD sink. It responds to a source being attached or detached, just like a normal USB-PD sink does. UTC negotiates a contract and sends the messages and state changes to Teo.

5.2.2 Sniffer mode

In sniffer mode, UTC 'sits' in the middle. It is invisible to both the TEA190x and the USB-PD sink. USB-PD messages from/to the TEA190x are captured and sent to Teo.

6   Software

The demonstration kit includes software to view and change the configuration of TEA190x. The software also shows live data, such as USB-PD messages, bus voltage, and current. The software is called TEA190x evaluation overdrive (Teo). To communicate with TEA190x and monitor USB-PD traffic, it includes a graphical user interface (GUI) and several libraries.

6.1   Installation

Teo, its libraries, and drivers are installed with a single installation wizard.

When the installation wizard is launched, the Windows user account control may ask if you trust the application from an unknown publisher (see Figure 4). Click Yes to proceed with the installation.

aaa-030179
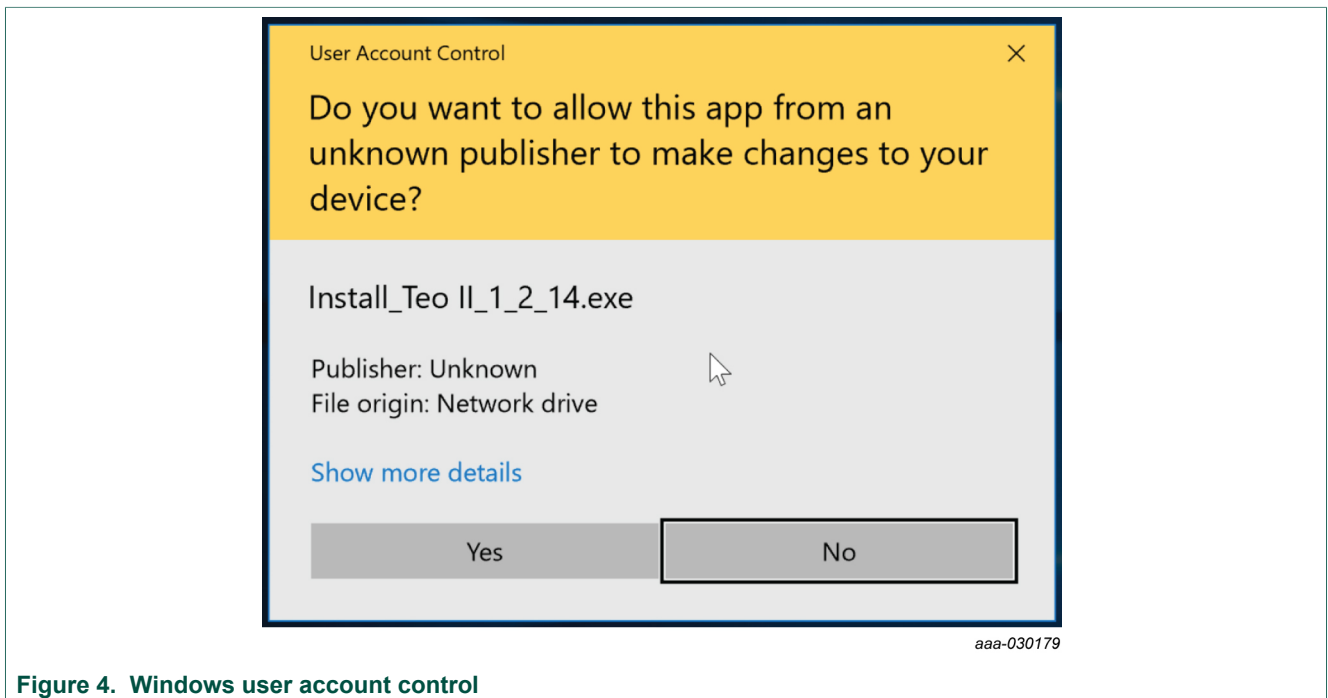
Figure 4. Windows user account control

The installation wizard can be run without deinstalling an existing installation. In this way, for example, a broken installation can be fixed or an earlier failed attempt can be completed.

aaa-023612
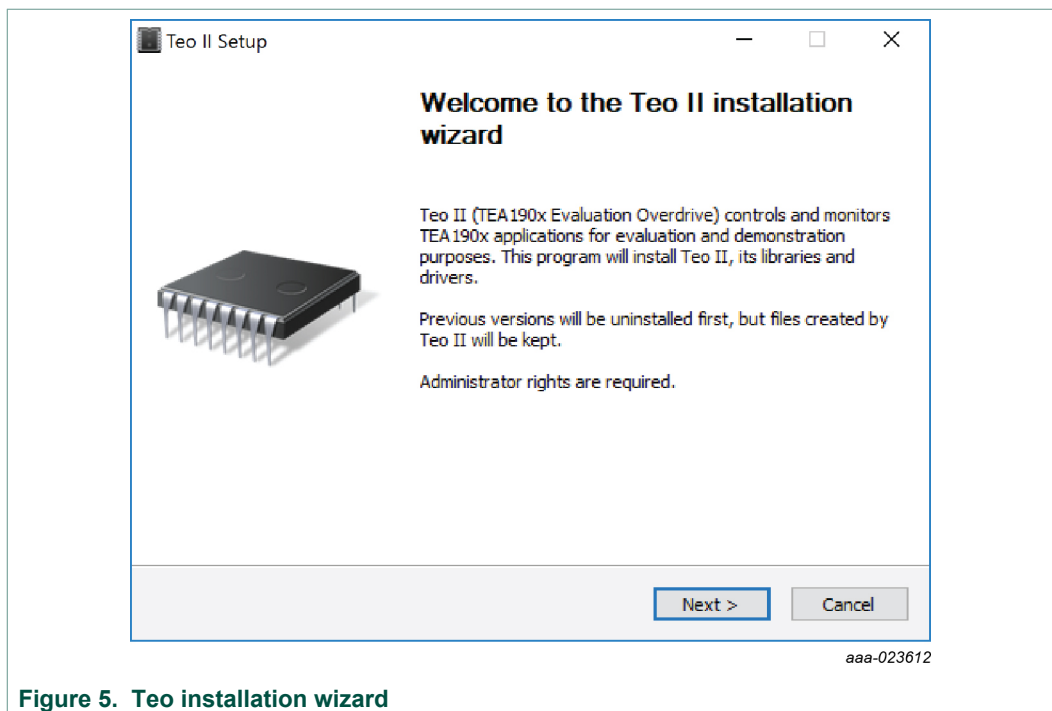
Figure 5. Teo installation wizard

Note: Use Windows control panel to uninstall Teo.

6.1.1 Before installing the PC software for the TEA1905

- Leave the demo board disconnected for now.
- Leave UTC disconnected for now.

Driver packages for UTC are installed. When UTC is plugged into one of the USB ports for the first time, the drivers are installed automatically.

UM11014
© NXP B.V. 2018. All rights reserved.

User manual **Rev. 2 — 16 November 2018**

14 / 35

6.1.2 Installing the PC software

- While installing the PC software, leave UTC disconnected.
- Run the installer wizard "Install_Teo_x_y_z.exe". X, y, and z indicate the version number of Teo.
- Follow the instructions of the installer wizard.

During installation, you may be asked to trust the software publisher twice. Confirm with Yes to continue the driver package installation.

A progress dialog appears while the driver packages are installed.

Most likely, the software is installed and ready to use instantaneously. However, in some cases a reboot is required. If a reboot is required, a message is shown. In that case, reboot your PC to finish the installation.

6.2 User interface

Teo has a number of tabbed pages, each with a number of controls. The pages Basic, Advanced, and Protection, show the contents of the MTP memory of the TEA190x.

These controls visualize the parameters of the settings of the device. They allow the user to modify their values. Some parameters are specific for certain devices. So, the layout may vary per device and differ from the screenshots in this document.

A fifth tabbed page is reserved for UTC.

aaa-023652
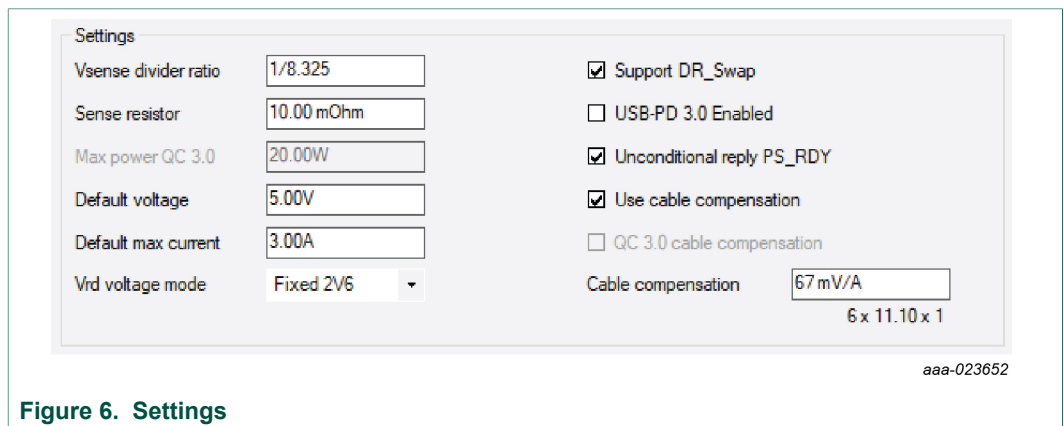
Figure 6. Settings

The Basic page contains the definition of seven PDOs and a number of hardware and software configuration settings. See the TEA190x data sheets for an explanation of these settings.

aaa-026750
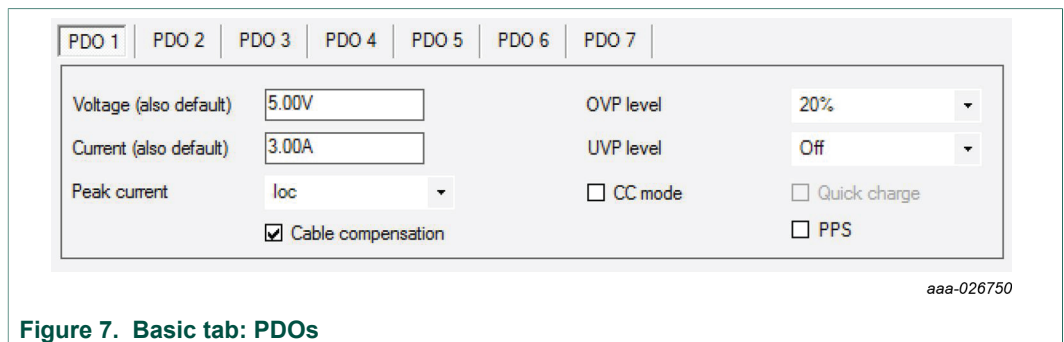
Figure 7. Basic tab: PDOs

If UTC is connected, live data is shown at the bottom of the Basic page.

The actual V_{bus} voltage and current measured by UTC and the firmware version of the device are shown. The Soft Restart button reboots the demo board.

For more details on UTC, see Section 6.6.

aaa-023655
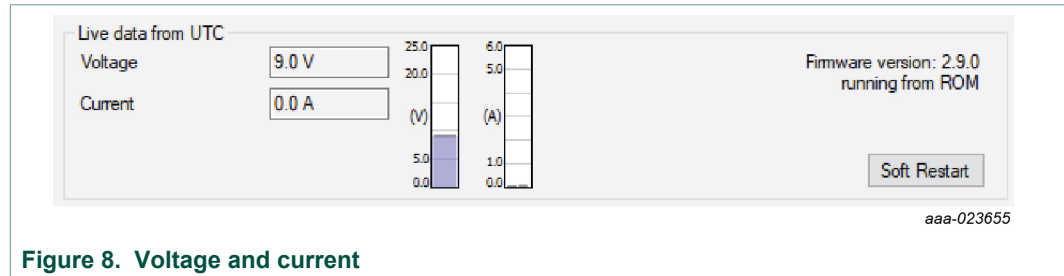
Figure 8. Voltage and current

The Protection page contains all settings that deal with protection against high temperatures, overvoltage, undervoltage, and overcurrent.
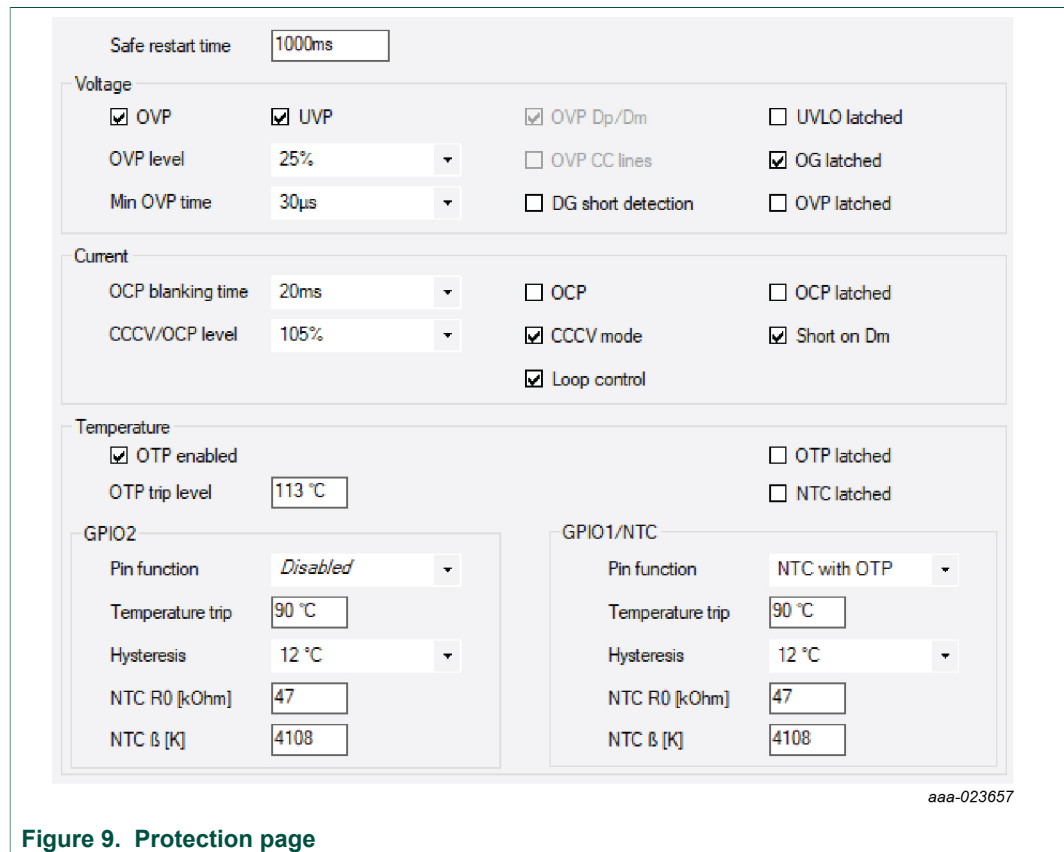

aaa-023657

Figure 9. Protection page

The Advanced page contains less frequently changed settings and settings that require a thorough understanding of their purpose. The settings that deal with the discharge curve are grouped in a separate box. For more details, see the TEA190x data sheets.
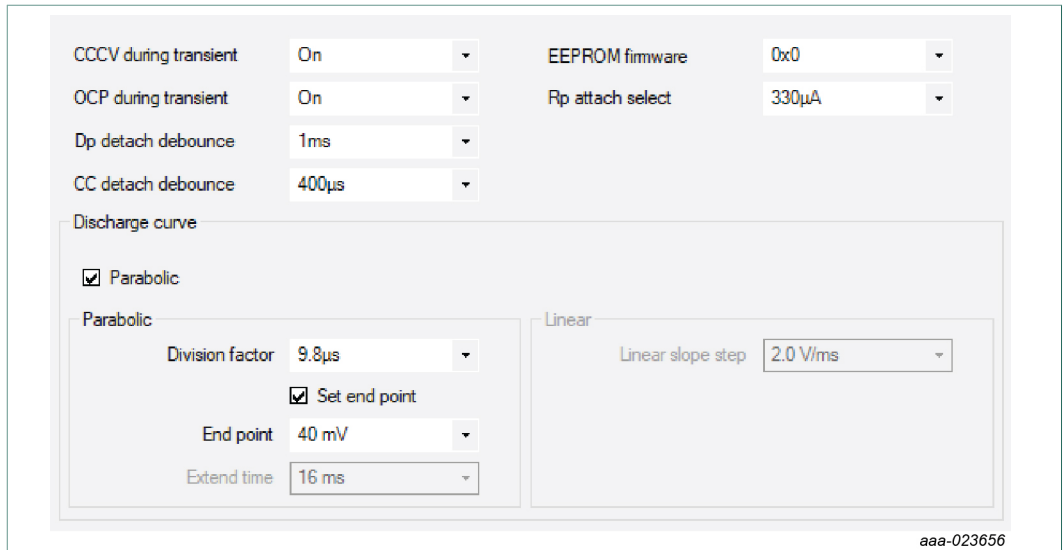
Figure 10. Advanced page

The Extended SrcCaps page contains parameters that deal with USB-PD 3 extended source capabilities. This page is only visible if USB-PD 3 compatibility is enabled on the Basic page.
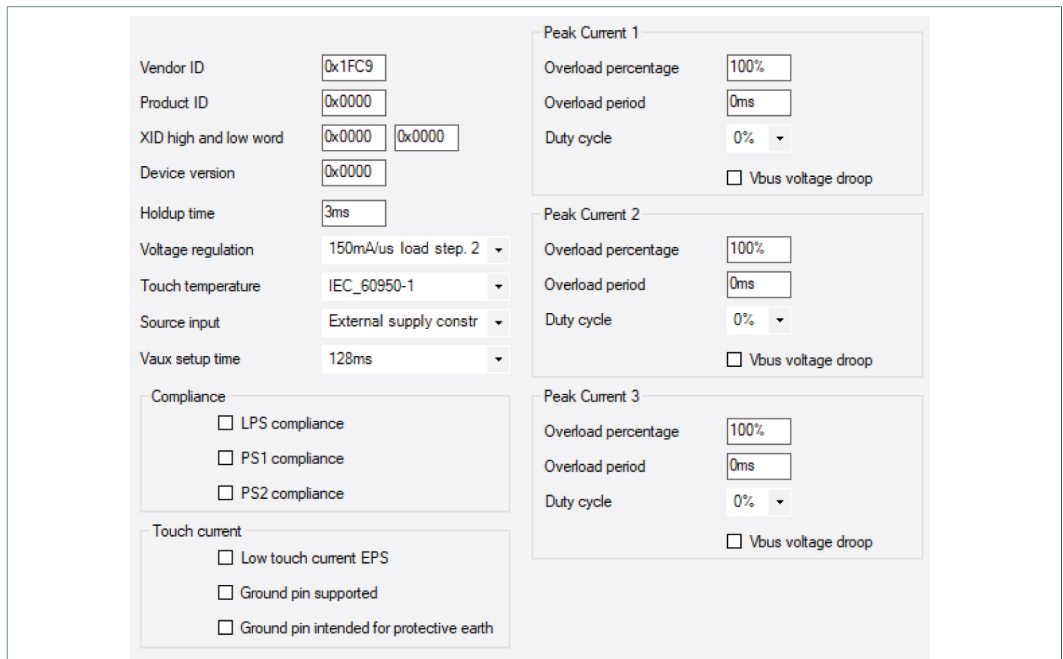
Figure 11. Extended SrcCaps page

UM11014

User manual **Rev. 2 — 16 November 2018**

17 / 35

6.3 Connecting Teo to the demo board

Teo can read and update the configuration of the TEA190x on the demo board. The configuration is stored in MTP memory. The MTP memory is accessible via the type-C receptacle and vendor defined messages (VDM). For more information on MTP memory, see Section 6.4.2, and Section 6.4.

To read and write MTP memory, Teo requires UTC in sink mode and a PD contract between UTC and the demo board.

At start-up, Teo looks for UTC and initializes the connection if one is found. If UTC is unavailable at start-up, the Sink and Sniffer page are hidden and the UTC controls are disabled.

Whenever a USB device is inserted or removed, Teo automatically scans for known hardware interfaces. Optionally, Teo can be instructed to look for UTC and other interfaces with the menu option: Options > Scan interfaces.

aaa-023658
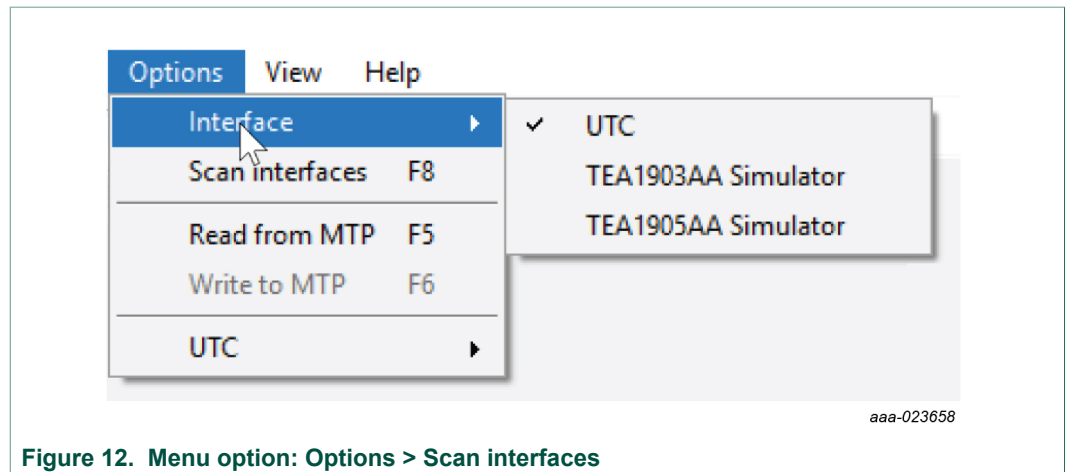
Figure 12. Menu option: Options > Scan interfaces

In addition to UTC, a few other interfaces are supported and may be available in the Options > Interface menu. Support for Aardvark, FT201XM, FT232H, and two hardwareless emulators are built in. The Hardwareless simulators are not real interfaces. The only purpose of the simulators is to demonstrate the software without any external hardware.

When an interface is ready to use, Teo attempts to communicate with the TEA190x. It tries to set up a remote function call (RFC) protocol. If successful, Teo proceeds with reading the MTP memory contents and updating the tabbed pages accordingly.

The status bar at the bottom of the main window of Teo shows information about the current connection. The text in the status bar shows the name of the interface and optionally, version information or serial numbers. The icon in the left corner shows a plug and receptacle. If the two are connected, a valid connection has been set up and the entire MTP memory is read. If a connection could not be established or reading of MTP memory failed, the icon shows a disconnected plug and receptacle. During initialization of the RFC protocol, the text "Initializing..." is shown. When reading the MTP memory, the text "Reading settings…" is shown.

a. Connected

b. Communication error

c. Disconnected
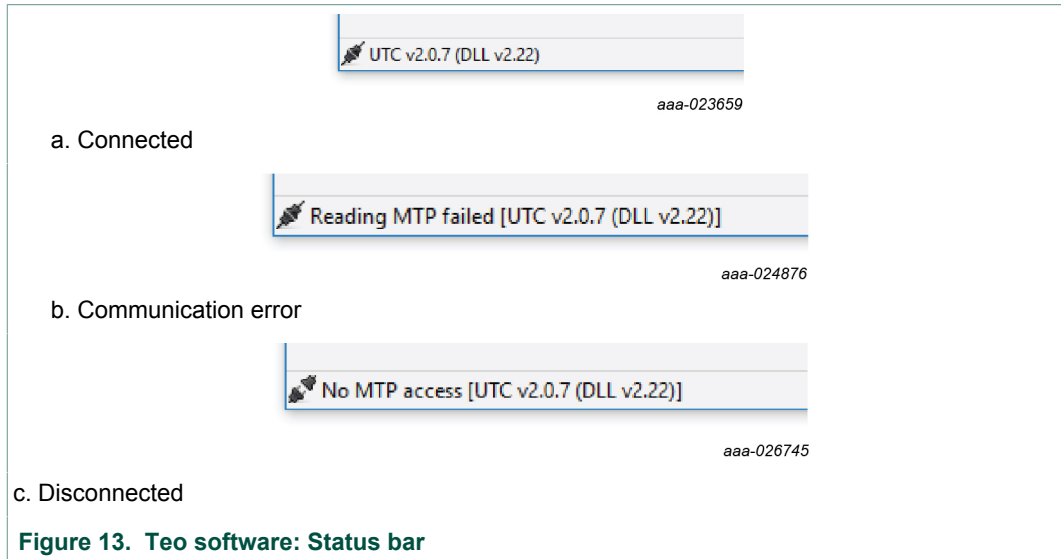
Figure 13. Teo software: Status bar

Note: The TEA190x demo board must be powered on and UTC must have established a PD contract before the MTP memory can be accessed.

6.4 Configuration

6.4.1 Configuring UTC for communication

To communicate with TEA190x, UTC must be in sink mode. If UTC is in sink mode, a tabbed page Sink is visible. If UTC is in sniffer mode, a tabbed page Sniffer is visible. If UTC is disconnected, the Sink and Sniffer pages are invisible.

To switch UTC from sniffer to sink mode, select Options > UTC > USB-PD sink from the menu or press the Battery button on the toolbar.

When UTC connects to the PC, it always starts up in sniffer mode. In this way, interference with a USB-PD sink that might be connected already is prevented. Whenever it connects to the PC, Teo can automatically change UTC to sink mode. If UTC is primarily used as a USB-PD sink, check the menu Options > UTC > Configure as Sink on connect.
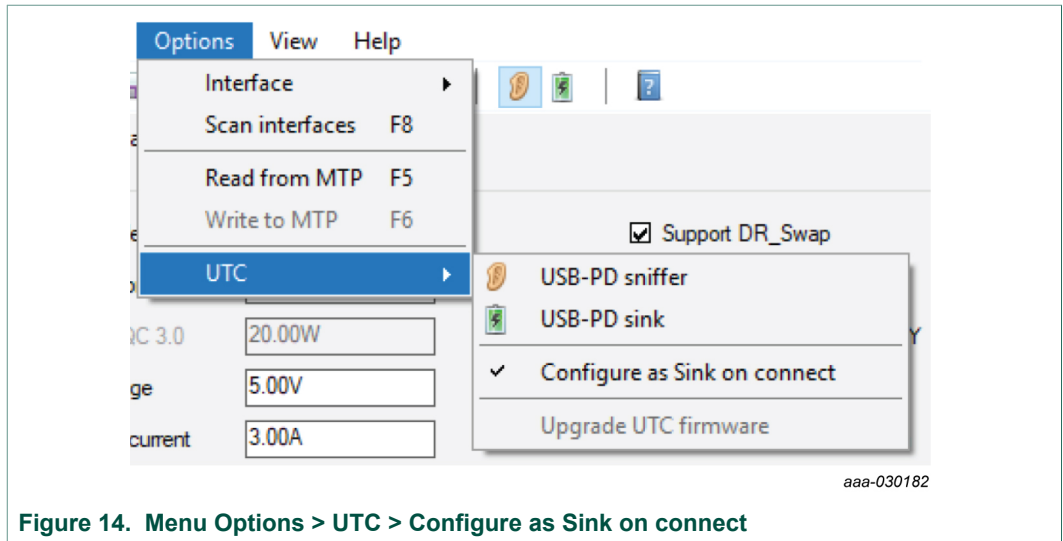
Figure 14. Menu Options > UTC > Configure as Sink on connect

When UTC is in Sink mode, it negotiates a power contract with TEA190x automatically. For more details about changing UTC settings in Sink mode, see Section 6.6.1. A power contract is mandatory for communication between Teo and TEA190x. When a power contract exists, Teo communicates with TEA190x through remote function calls (RFC) over vendor defined messages (VDM).

Notes:

- In sniffer mode, UTC only listens to USB traffic and does not participate in communication.

- Only one USB-PD sink at a time can be attached to a USB-PD source.

6.4.2 Reading the configuration

When Teo starts up and a TEA190x is connected, the MTP memory is read automatically. You can manually read/reread the MTP memory, by choosing Options > Read MTP. Teo always reads the entire MTP memory.
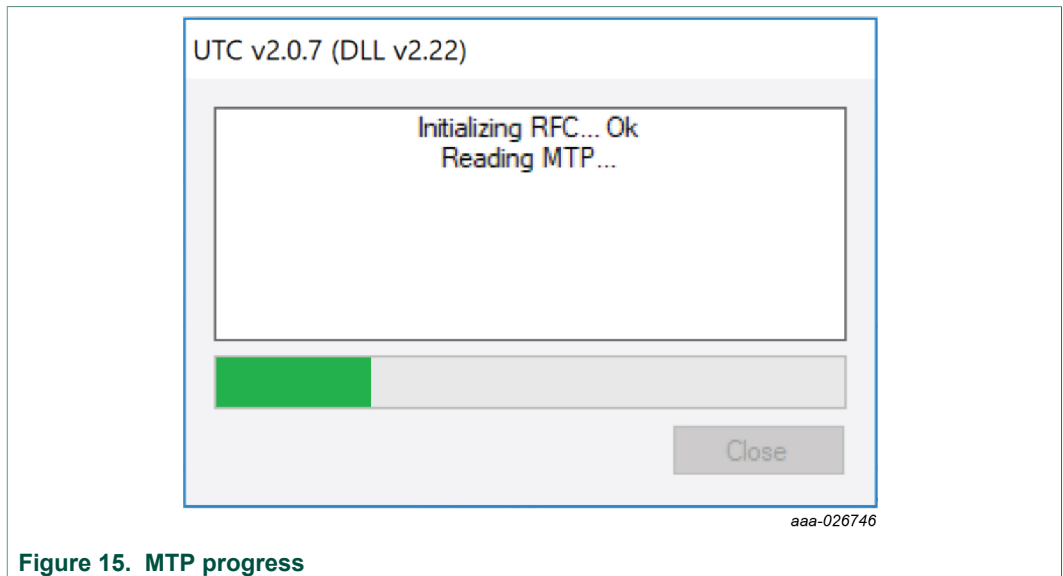
Figure 15. MTP progress

Before the current configuration can be read from MTP memory, UTC requires a PD contract. To negotiate a power contract with TEA190x, UTC must be configured as a USB-PD sink. For more information on setting up a connection, see Section 6.4.1.

When MTP is read, a small progress dialog appears. If reading MTP is successful, the dialog disappears. If MTP reading is unsuccessful, the dialog remains visible and shows an error message. Close the dialog with the Close button.

When information is read from MTP memory, the controls on the tabbed pages are updated to show the current configuration. For the meaning and purpose of individual settings, see the TEA190x data sheets.

6.4.3 Viewing the configuration

The content of the MTP memory is shown with four different types of controls:

- Drop-down lists
- Check boxes
- Radio buttons
- Text entries

Unwritten changes appear with a blue type font. Values that differ from the default device settings, appear with an italic type font.

aaa-026751

a. Unwritten changes

aaa-026753

b. Value differs from default

aaa-026754

c. Value has changed, differs from default, and is unwritten

Figure 16. Viewing the MTP content
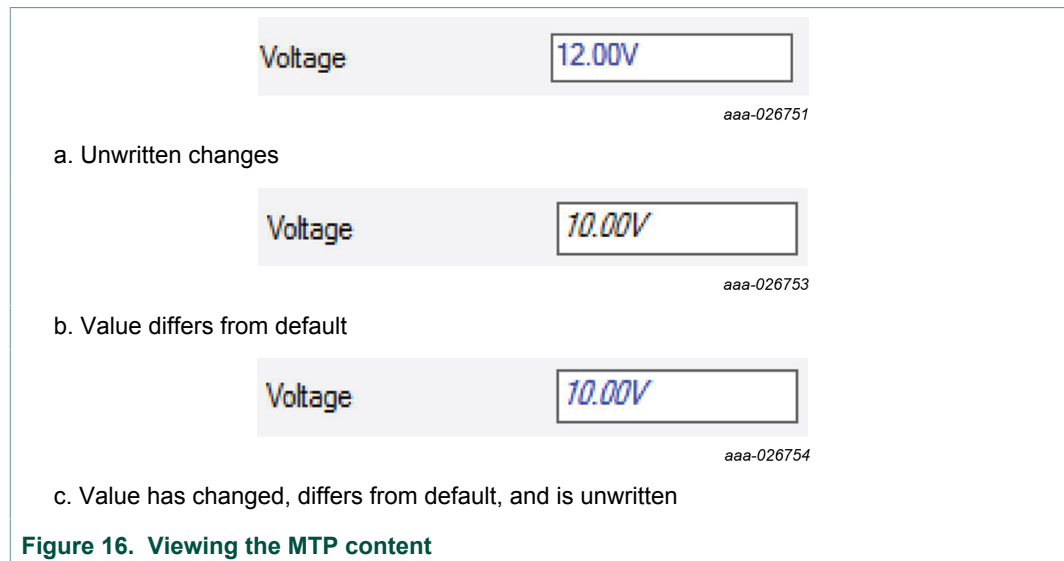
The default MTP values vary per device and package. When Teo reads MTP memory, it determines the type and adjusts the user interface accordingly. The type is marked with a check sign in the menu View > Chip type.

A different chip type can be chosen from the View > Chip type menu. That does not affect the MTP values. However, it determines how the user interface behaves. The default values may differ and some controls are disabled, enabled, hidden, or shown, depending on the chosen type.

UM11014

User manual **Rev. 2 — 16 November 2018**

21 / 35

aaa-026761
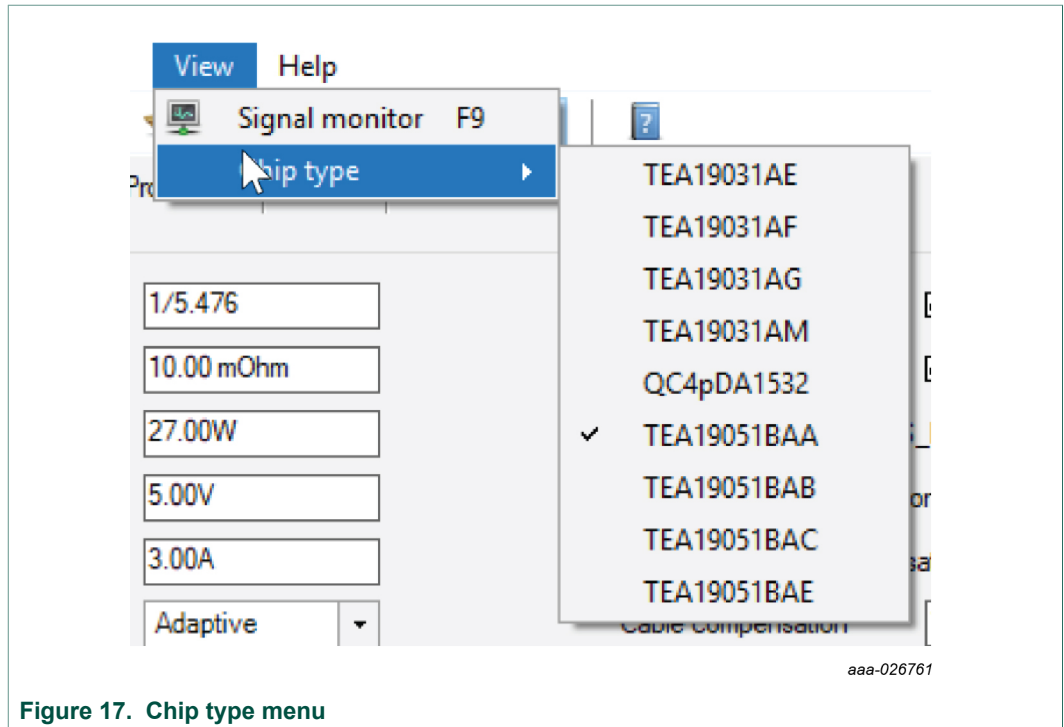
Figure 17. Chip type menu

6.4.4 Changing the configuration

The content of the MTP memory is shown with four different types of controls:

- Drop-down lists
- Check boxes
- Radio buttons
- Text entries

When any of these values is changed, the changes are kept in the memory of the PC. They are not automatically written to MTP memory. When the content of the text entry fields has changed and the control loses focus or when Enter is pressed, the text entry fields accept the new value. Teo finds the closest binary match that corresponds to the entered value.

With the menu Options > Write to MTP, the F6 key, and the refresh button on the toolbar, the changes can be written to MTP. When all changes are written, the MTP is read back and compared with the values in memory. If updating the MTP was successful, the read values equal the values in memory and the recent changes no longer appear in blue.

Although the changes are written to MTP, the configuration is not updated instantaneously. The changes are only effective after a soft restart. The Soft Restart button can be found at the bottom of the Basic page.

To change MTP memory, a valid connection is required. For more information on establishing such a connection, see Section 6.3.

6.5 Memory initialization file (*.mif)

MIF files are ASCII files, describing the layout and contents of memory. The MTP contents can be stored in and updated from MIF files.

The menu File > Store in MIF… saves all current MTP values from the memory of the PC to a file in MIF format.

The menu File > Load from MIF… reads MTP values from a MIF file into the memory of the PC.

To save the contents of MTP memory of TEA190x, connect the demo board to Teo and read its MTP. See Section 6.4 for details on reading MTP. When the entire MTP memory is successfully read, choose File > Store in MIF… Enter a file path in the Save File dialog.

To update the contents of MTP memory from a MIF file, connect the demo board to Teo and read its MTP. See Section 6.4 for details on reading MTP. When the entire MTP memory is successfully read, choose File > Load from MIF… Select a MIF file path with the Open File dialog. The contents of the file is shown in Teo. Changed values, values from the MIF file that differ from the MTP values, appear in blue. Review the changes. To write the changes to the demo board, choose Options > Write to MTP from the menu.

Note: The first 12 addresses contain calibration data. They are specific to individual devices. Those 12 pages are never updated as it would decrease the performance of the device.

UM11014

User manual **Rev. 2 — 16 November 2018**

23 / 35

6.6 USB-PD monitor

Teo works with two types of data regarding USB-PD, USB-PD messages, and bus voltage and current. To handle this data, Teo uses UTC as interface.

When UTC is connected, Teo reads the bus voltage and the current a number of times per second. The bus voltage, the current, and the CC voltages are shown in the signal monitor. They can be saved to disk (see Section 6.7).

UTC works in two exclusive modes, which can be selected from the Options menu:

• Sink mode
• Sniffer mode

The UTC mode can also be changed with two toolbar buttons:

Toolbar button	Description
	Ear button: For switching UTC to sniffer mode
	Battery button For switching UTC to sink mode

6.6.1 Sink mode

In sink mode, UTC acts as a USB-PD sink. It sends information, like the sink state and PD messages received from TEA190x, to Teo.

Five control options are available from the Sink tabbed page:

• RDO
• Soft reset
• Hard reset
• Vsafe after detach
• Repeat RDO (ms)

The settings in the RDO box influence the power contract UTC negotiates. With the PDO nr dropdown box, an explicit PDO can be chosen. If Auto is selected, UTC chooses the closest match, with a preference for PPS PDOs. The contract is negotiated on the first available moment, either immediately, or on the next attach.

UM11014

User manual **Rev. 2 — 16 November 2018**

24 / 35
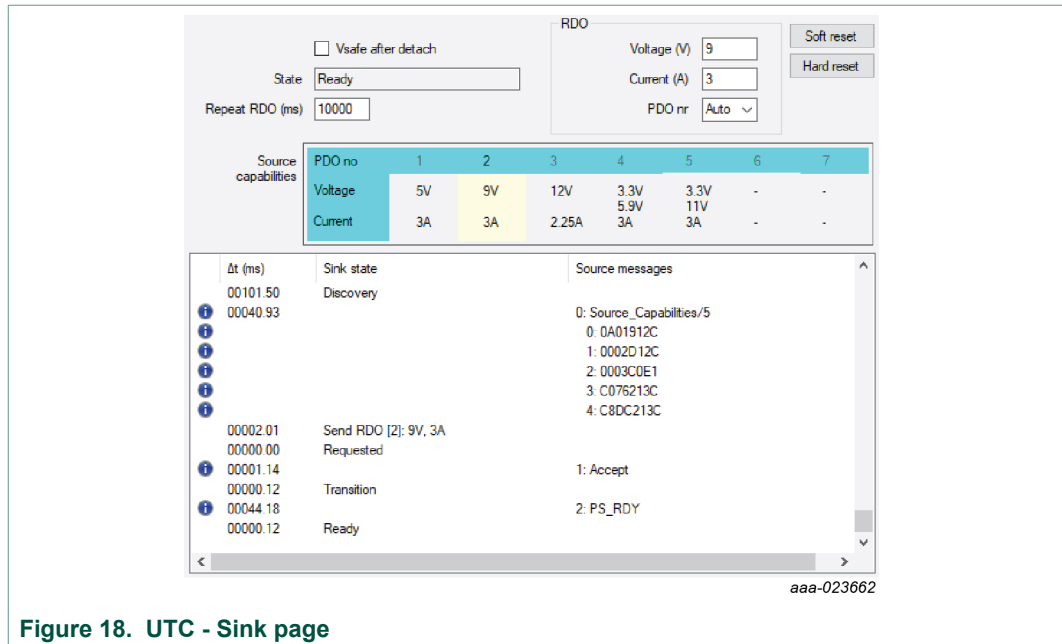
Figure 18. UTC - Sink page

To have UTC send a soft reset request to the TEA190x, click the *Soft reset* button. The result in terms of state and the corresponding messages appear in the bottom list. The *Hard reset* button sends a hard reset request.

Messages from the USB-PD source are shown in a raw format. To see more details, hover the mouse pointer over the information icon in the first column. A popped up tooltip shows decoded details off the message.

The second column shows the lapsed time between the message or state change and the previous line.

If the box Vsafe after detach is checked, the voltage request automatically changes to 5 V when a detach is detected.
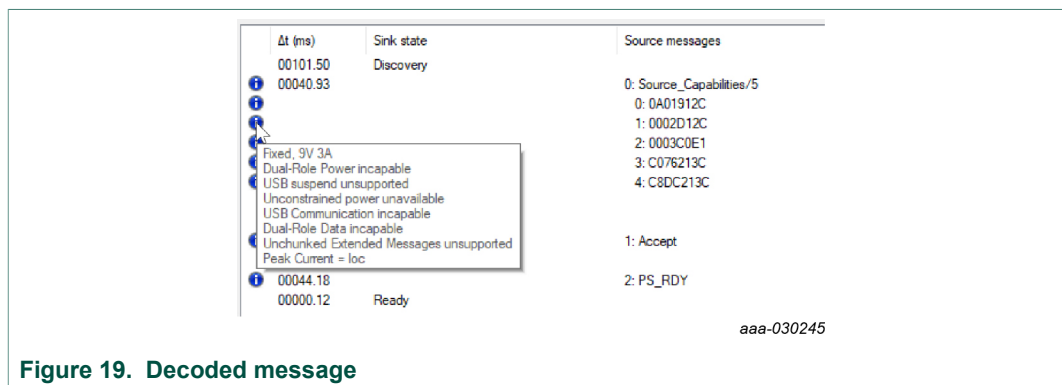
Figure 19. Decoded message

The box *Source capabilities* shows up to seven PDOs. The voltage and current of the PDOs are decoded from the TEA190x messages. Clicking a PDO changes the voltage request in line with the selected PDO.

Note: UTC prefers PPS PDOs. So, the result may be a different PDO, but with the same voltage.

Devices with PPS optionally use a watch dog timer. If the timer expires, the power contract is lost. To restart the timer and prevent contract loss, the sink must resend the last RDO. To have Teo resend the current RDO automatically, enter an interval in milliseconds in the box Repeat RDO (ms). The interval is ignored for fixed PDOs.

Note: Assuming UTC is connected to a TEA190x, the PDOs are the same as the ones stored in the MTP memory of that same TEA190x. They can be viewed and edited on the Basic page of Teo.

The list of states and messages can be cleared with the *Broom button* on the toolbar or with the menu Edit > Clear captured data.

Note: All captured data is cleared, including the graphs and the Sniffer page contents.

6.6.2 Sniffer mode

In sniffer mode, UTC only monitors V_{bus} and the CC lines. In other words, UTC is invisible to USB_PD source and sink. One type-C connector of the UTC connects to the TEA190x, the other to a USB-PD sink. Figure 20 shows how UTC is located between a USBPD sink and a TEA190x adapter.

aaa-024518
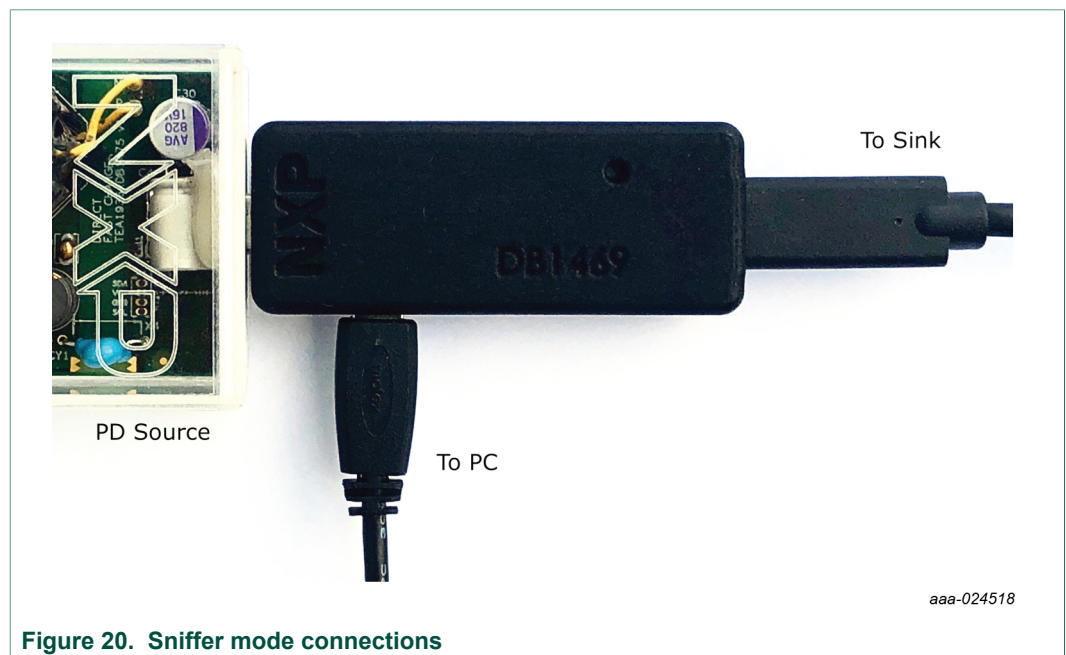
Figure 20. Sniffer mode connections

UTC monitors the traffic between the two devices and sends the decoded protocol messages to Teo. The data messages and control messages are shown in a list on the Sniffer page. Data is shown in hexadecimal format. The time (ms) between two messages is shown in the second column.

UM11014

User manual **Rev. 2 — 16 November 2018**

26 / 35

aaa-027254
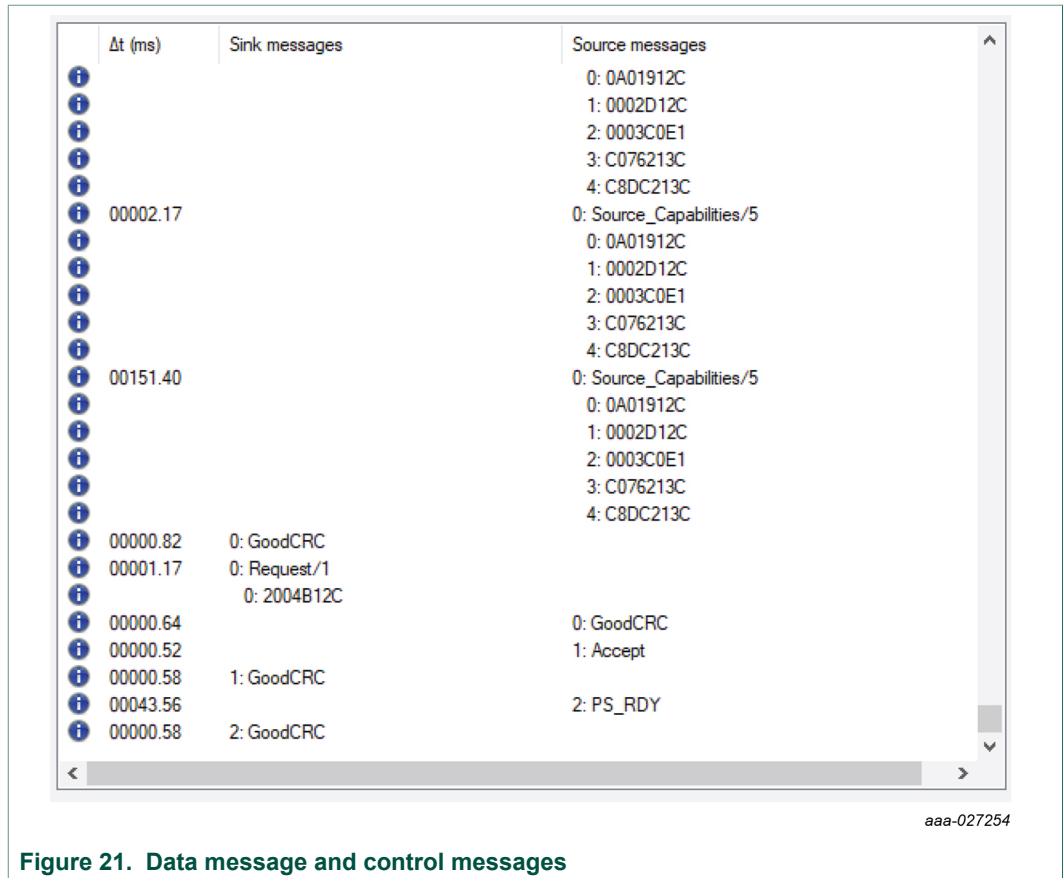
Figure 21. Data message and control messages

When a decoded representation of a message is available, the first column contains information icons. Hovering the mouse over such an icon reveals details in human readable format.

aaa-030246
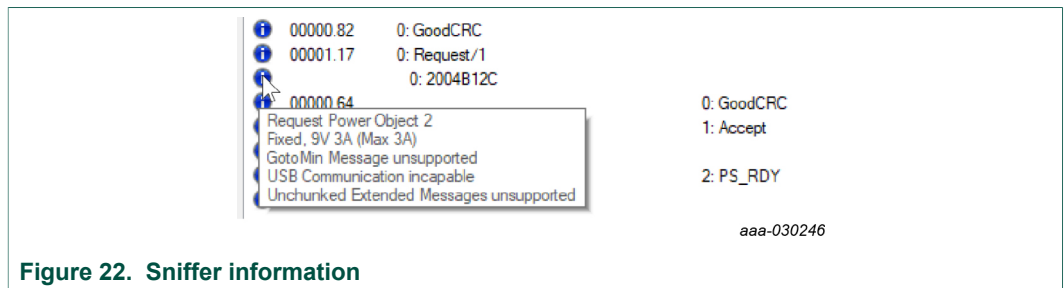
Figure 22. Sniffer information

The list of messages can be cleared with the *Broom button* on the toolbar or with the menu Edit > Clear captured data.

Note: *All captured data is cleared, including the graphs and the Sink page contents.*

6.7 Signal monitor

The Signal monitor shows the V_{bus} voltage, the V_{bus} current, the CC1 voltage, and the CC2 voltage as a function of time. To make the Signal monitor window visible, check the View > Signal monitor menu or press F9.

Note: The menu option is only available when UTC is connected.

If supported by the device, the Vbus current, die temperature, and the NTC temperatures are plotted as well. These values are measured by TEA190x and read via VDMs from the device.

aaa-023665
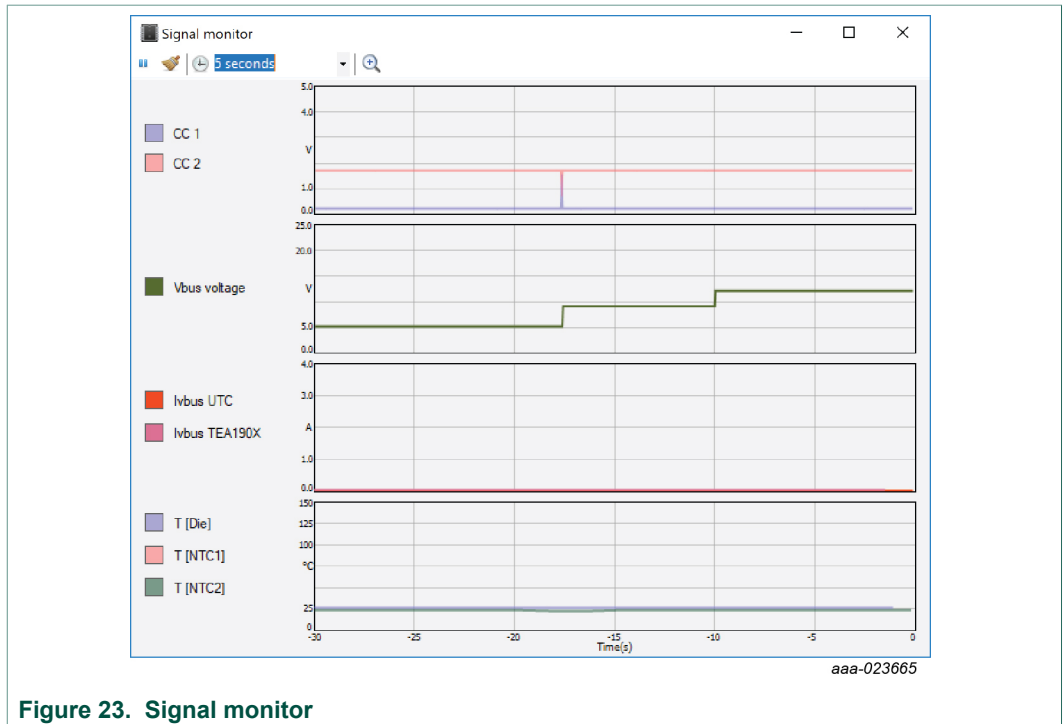
Figure 23. Signal monitor

The graphs update a few times per second as new data is read from UTC.

The buttons on the toolbar have the following functions:

UM11014

User manual **Rev. 2 — 16 November 2018**

28 / 35

Table 2. Toolbar buttons

Toolbar button	Description
⏸	Pause: Causes the graphs to stop updating, while data capturing is continuous. The graphs remain 'frozen' until the Pause button is clicked again.
🧹	Clear: Wipes the graphs and all captured data.
🕐	Time scale: Choose the scale of the graphs as the time per division.
🔍	Auto zoom: To improve the graphs resolution, the graphs automatically adjust the vertical range.

Note: Clearing the graphs deletes all captured data, including the contents of the Sink page and Sniffer page.

6.8 Firmware

6.8.1 Device firmware

The TEA190x has onboard RAM and ROM. It can use an external EEPROM. After power-on, a firmware image is read from the EEPROM and executed in RAM. If no firmware is available, the default image from ROM is executed. Teo allows replacing an image in the EEPROM or loading and executing an image directly in RAM. Generally, EEPROM images have the file extension *.bin. RAM images have the extension *.cde.

Before attempting to load new firmware, make sure that Teo is connected to the TEA190x. To see if a valid connection is present, check the status bar at the bottom of the main window of Teo.

To replace the firmware image in EEPROM, choose File > Firmware from the menu or click the firmware button on the toolbar. Browse to the firmware image file and click Open. A dialog window with a progress indicator appears. The image is written to the EEPROM. When the EEPROM is updated, Teo verifies the content to ensure that the image has been written correctly.

Note: The new image is loaded the next time the TEA190x is powered up.

aaa-023670
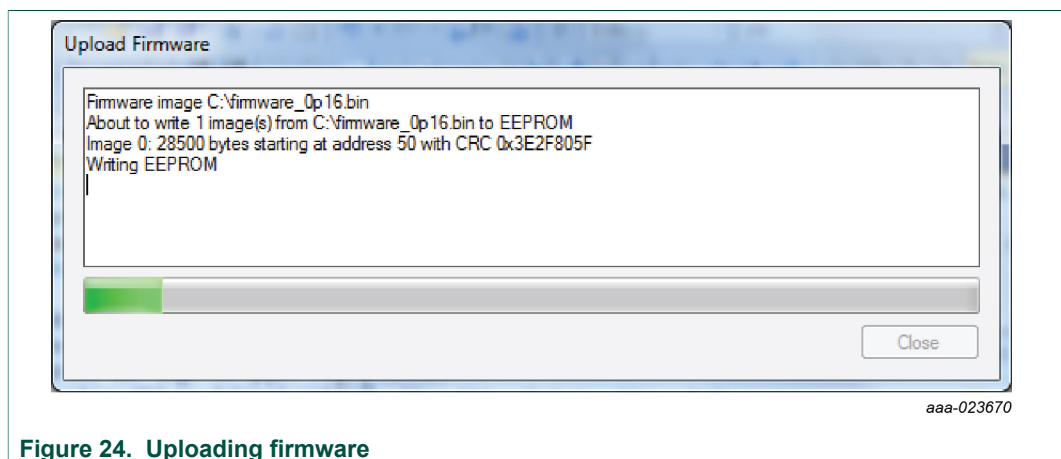
Figure 24. Uploading firmware

To load an image directly in RAM, choose File > Firmware from the menu or click the firmware button on the toolbar. Select Files of type > RAM image. Browse to the desired firmware image file and click Open.
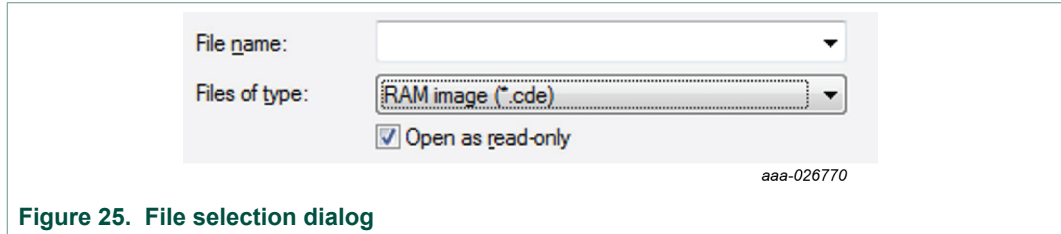

Figure 25. File selection dialog

A dialog window with a progress indicator appears. The image is written to RAM. A running CRC check verifies that the image is loaded without errors. If the entire image is successfully loaded in RAM, the new image is executed immediately without power cycling the TEA190x.

The firmware of TEA1903 devices and TEA1905 in an SO14 package cannot be written to EEPROM with UTC. To receive an I^{2}C interface and additional instructions to update the EEPROM, contact the local service team of NXP Semiconductors.

6.8.2 UTC firmware

Teo embeds the latest UTC firmware. If Teo connects to a UTC with outdated firmware, an upgrade option is presented.
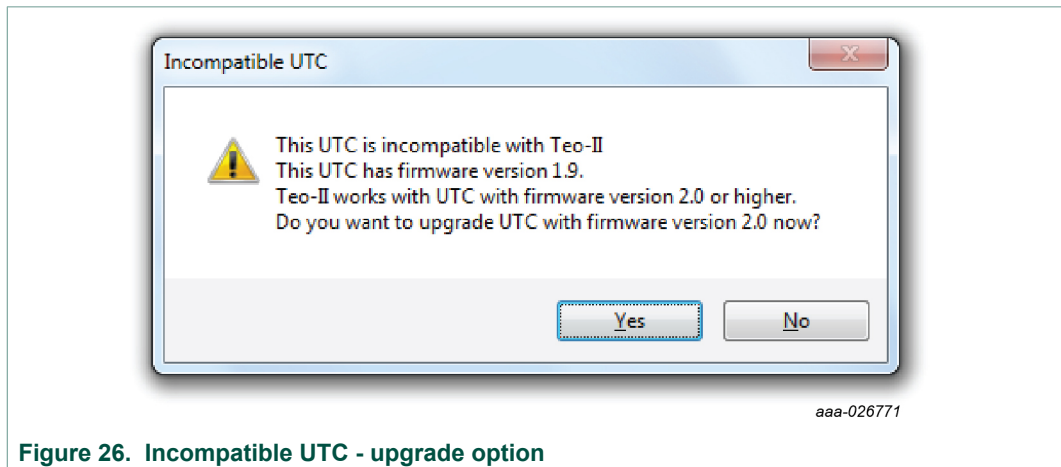
Figure 26. Incompatible UTC - upgrade option

To have Teo benefit from new UTC features and other improvements, always upgrade UTC to the latest version.

Teo advises to upgrade once per session. Upgrading UTC can be chosen at any time from the Options > UTC > Upgrade UTC firmware menu.

To be able to upgrade UTC, UTC must be connected to the PC with a USB-OTG cable. UTC recognizes the OTG cable and boots in DFU mode. Teo shows the following dialog:

aaa-026772
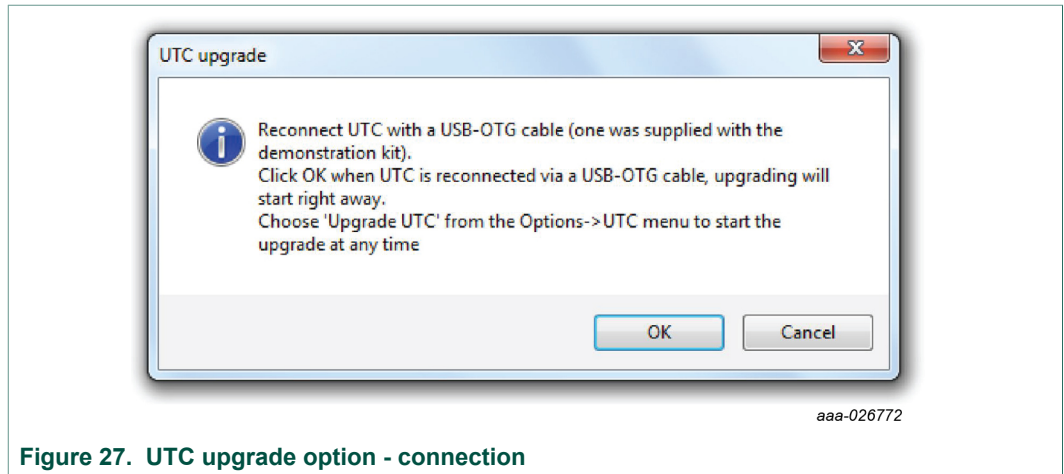
Figure 27. UTC upgrade option - connection

When the outdated UTC is connected to a USB port with an OTG cable, press OK.

During the upgrade, the flash memory of UTC is erased, written, read back, and compared to verify success. These steps and their progress are shown in the Upgrading UTC dialog.
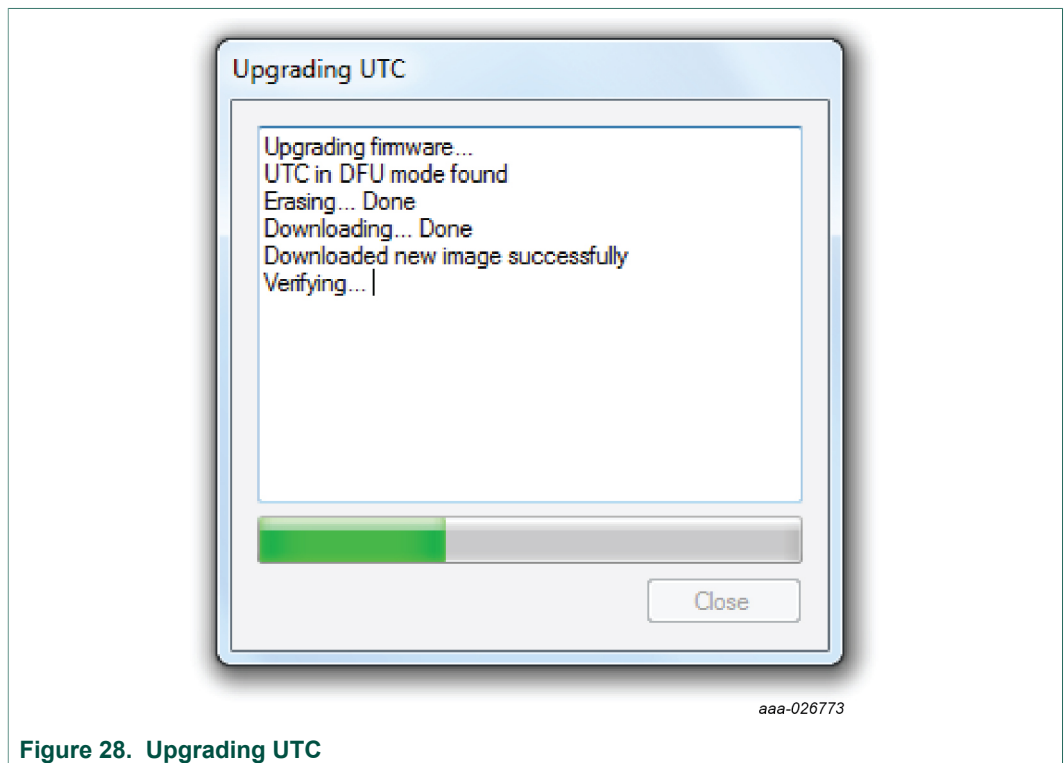

aaa-026773

Figure 28. Upgrading UTC

6.9 Toolbar

The toolbar contains several buttons. Here is a short explanation of their function:

Table 3. Toolbar buttons

Toolbar button	Description
	Write changes to MTP
	load an image to RAM or EEPROM
	save captured data in Comma-Separated Values (CSV) format
	show or hide the signal monitor window
	clear captured data
	clipboard functions: Cut, Copy, and Paste
	opens the user manual
	puts UTC in sniffer mode
	puts UTC in sink mode

UM11014

User manual **Rev. 2 — 16 November 2018**

32 / 35

7 Abbreviations

Table 4. Abbreviations

Acronym	Description
DFU	device firmware upgrade
EEPROM	electrically erasable programmable read-only memory
MIF	memory initialization file
MTP	multiple times programmable
OTG	on-the-go
PDO	power data object
RAM	random-access memory
ROM	read-only memory
Teo	TEA190x evaluation overdrive
USB	universal serial bus

8 Legal information

8.1 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

8.2 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors. In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a

default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Evaluation products — This product is provided on an "as is" and "with all faults" basis for evaluation purposes only. NXP Semiconductors, its affiliates and their suppliers expressly disclaim all warranties, whether express, implied or statutory, including but not limited to the implied warranties of non-infringement, merchantability and fitness for a particular purpose. The entire risk as to the quality, or arising out of the use or performance, of this product remains with customer. In no event shall NXP Semiconductors, its affiliates or their suppliers be liable to customer for any special, indirect, consequential, punitive or incidental damages (including without limitation damages for loss of business, business interruption, loss of use, loss of data or information, and the like) arising out the use of or inability to use the product, whether or not based on tort (including negligence), strict liability, breach of contract, breach of warranty or any other theory, even if advised of the possibility of such damages. Notwithstanding any damages that customer might incur for any reason whatsoever (including without limitation, all damages referenced above and all direct or general damages), the entire liability of NXP Semiconductors, its affiliates and their suppliers and customer's exclusive remedy for all of the foregoing shall be limited to actual damages incurred by customer based on reasonable reliance up to the greater of the amount actually paid by customer for the product or five dollars (US$5.00). The foregoing limitations, exclusions and disclaimers shall apply to the maximum extent permitted by applicable law, even if any remedy fails of its essential purpose.

Safety of high-voltage evaluation products — The non-insulated high voltages that are present when operating this product, constitute a risk of electric shock, personal injury, death and/or ignition of fire. This product is intended for evaluation purposes only. It shall be operated in a designated test area by personnel that is qualified according to local requirements and labor laws to work with non-insulated mains voltages and high-voltage circuits. The product does not comply with IEC 60950 based national or regional safety standards. NXP Semiconductors does not accept any liability for damages incurred due to inappropriate use of this product or related to non-insulated high voltages. Any use of this product is at customer's own risk and liability. The customer shall fully indemnify and hold harmless NXP Semiconductors from any liability, damages and claims resulting from the use of the product.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Security — While NXP Semiconductors has implemented advanced security features, all products may be subject to unidentified vulnerabilities. Customers are responsible for the design and operation of their applications and products to reduce the effect of these vulnerabilities on customer's applications and products, and NXP Semiconductors accepts no liability for any vulnerability that is discovered. Customers should implement appropriate design and operating safeguards to minimize the risks associated with their applications and products.

8.3 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

GreenChip — is a trademark of NXP B.V.

Contents