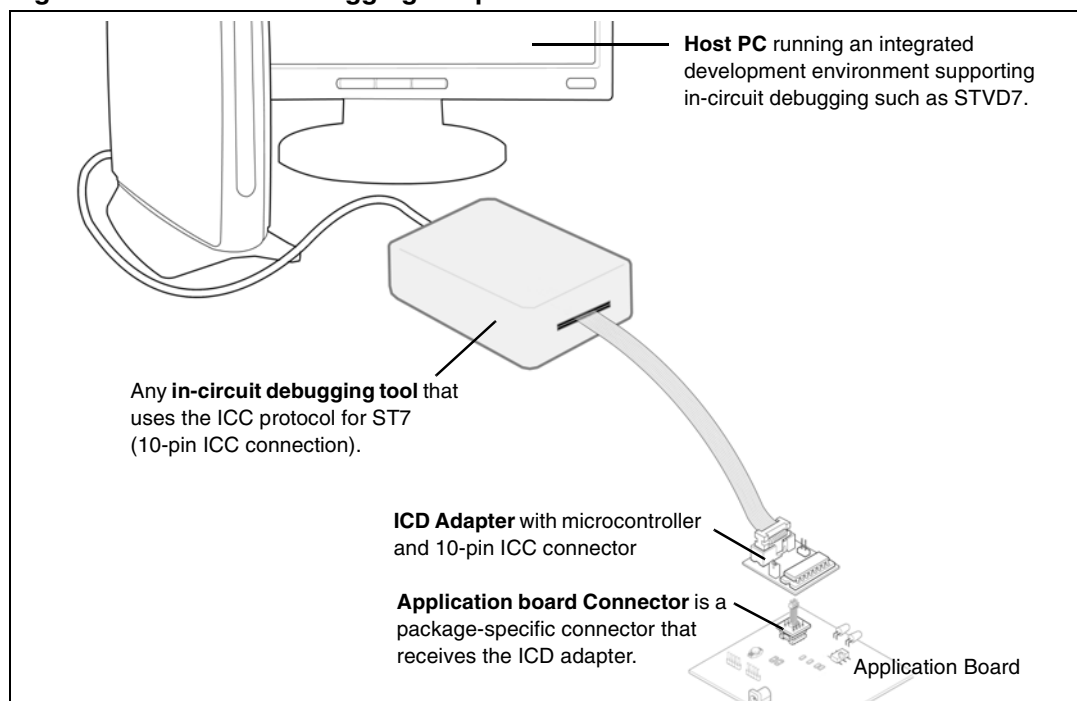## AD-ICD in-circuit debugging adapter

Introduction

The **In-circuit debugging adapter** (AD-ICD/DS8Z-01) makes it possible to debug an application while it runs on an ST7FLiteUS microcontroller with any in-circuit debugging (ICD) tool that uses the In-Circuit Communication (ICC) protocol for ST7.

In-circuit debugging with ICC protocol and 10-pin ICC connection requires the use of a minimum of 4 pins on the target ST7 microcontroller. This constitutes an important imposition on the limited pin resources of low pin count microcontrollers such as the ST7FLiteUS (available in DIP8, SO8 and DFN8 packages).

To allow you to take full advantage of the available pins on the target device for your application, the AD-ICD adapter uses a variant of the target microcontroller with additional pins for in-circuit debugging. The additional pins allow the connections required for in-circuit debugging so that none of the pins used as I/Os on the standard target microcontroller need be used for ICD.

Figure 1.   In-Circuit Debugging Adapter for ST7LiteUS

Host PC running an integrated development environment supporting in-circuit debugging such as STVD7.

Any **in-circuit debugging tool** that uses the ICC protocol for ST7 (10-pin ICC connection).

ICD Adapter with microcontroller and 10-pin ICC connector

Application board Connector is a package-specific connector that receives the ICD adapter.

Application Board

The ICD Adapter connects to your application board in place of the target microcontroller and to any in-circuit debugging tool via a 10-pin ICC connector. For connection to the user application board, the ICD Adapter can be used with connectors/device adapters for all available packages of the target MCU (DIP8, SO8, DFN8). These connectors/device adapters are to be installed on the MCU footprint in place of the target device.

www.st.com

ICC connector – a 10-pin HE-10 type connector that allows the connection of your in-circuit debugging tool to the microcontroller on the ICD Adapter.

Application board connector/device adapter – a package specific connector that plugs into the bottom of the ICD adapter allowing the connection to the microcontroller footprint on your application board. Connectors/device adapters are provided for all available packages for the target microcontroller.

About the user manuals...

This document provides information about connecting the ICD adapter and to your in-circuit debugging tool and to your application board.

For further information about in-circuit debugging ST7 applications, you can refer to the user manual for your in-circuit debugging tool or your microcontroller's datasheet.

Contents

1 Delivery checklist

The ICD Adapter for the ST7FLITEUS is delivered in an ICD Adapter kit (AD-ICD/DS8Z-01) for use with any tool capable of in-circuit debugging via 10-pin ICC connection. It is also delivered with the ST7MDT10-EMU3 emulator.

The kit's components include accessories for SO8 and DIP8 packages (refer to *Figure 1*):

1. ICD Adapter (MB509) with 10-pin ICC connector and ST7FLiteUS microcontroller.
2. Device adapter (DB646) for target devices in DIP8 package.
3. On-application connector (8-pin header) for target devices in SO8 package.

To connect to application boards when in-circuit debugging applications for devices in DFN8 package, users must also order the ST7MDT10-8/DVP, which includes:

4. Device adapter (DB715), on-application connector (a) and male-male connector (b) for target devices in DFN8 package.

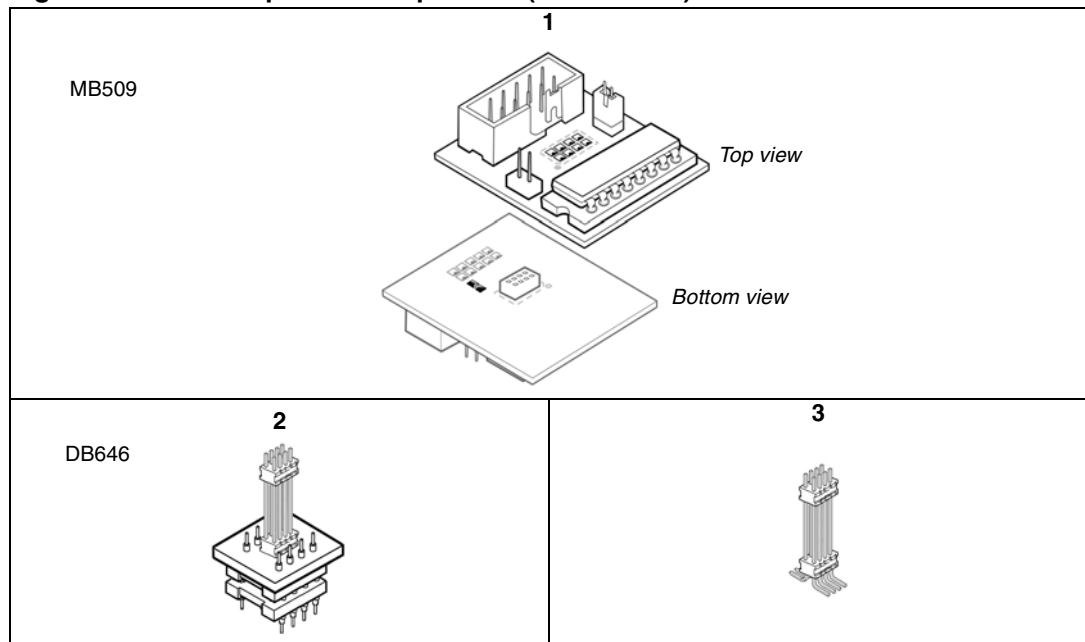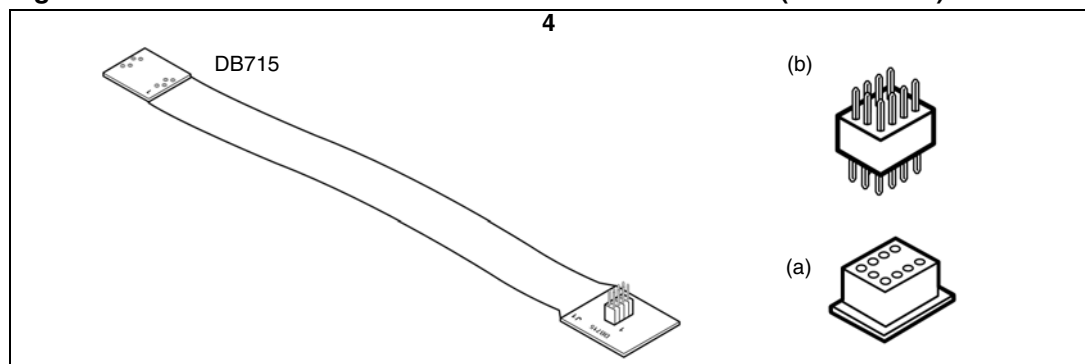**Figure 1.   ICD Adapter kit components (not to scale)**

Figure 2.   DFN8 accessories available in ST7MDT10-8/DVP (not to scale)

2   Configuring the ICD adapter

The following sections provide instructions about configuring your ICD adapter for *In-circuit debugging* or to *Run the application in standalone mode*. Delivered from the factory, the AD-ICD/DS8Z-01 is configured as follows:

Table 1.   Default configuration of the AD-ICD/DS8Z-01 from factory

|	Identifier on ICD adapter	Configuration	Purpose
Jumpers	TP1	Fitted	Allow connection for in-circuit debugging/programming
	TP2	Not fitted	Run application in standalone mode
Solder points	G1	Soldered	Connects tool to the microcontroller's VDD pin (accommodate tools with a power supply follower)
	G2	Not soldered	Connect tool's clock signal to microcontroller's CLKIN pin

Caution: When configuring the ICD adapter, make sure that the ICD tool and application board (if connected to the adapter) are powered off.

2.1   In-circuit debugging

ICD On jumper (TP1)

When in-circuit debugging the target application via the 10-pin ICC connection, the **ICD On** jumper (TP1) must be fitted to allow the interface with an in-circuit debugging tool and the host PC. During in-circuit debugging, the *RST/PA3 On* jumper (TP2) must not be fitted.

Figure 3.   ICD On jumper (TP1)
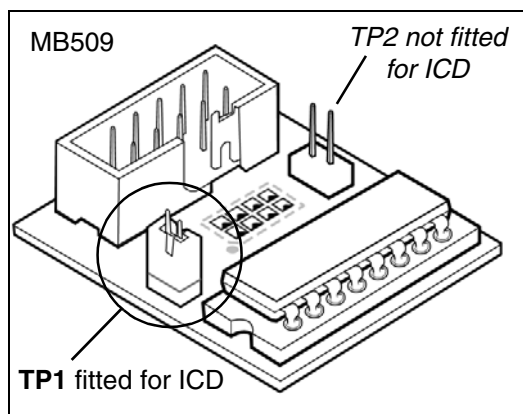

To set the **ICD On** jumper (TP1):

1. Make sure the in-circuit debugging tool and the application are powered off.

2. Place the jumper on **TP1** as shown in *Figure 3*.

3. Connect to and power on the in-circuit debugging tool and application board.

Refer to the on-line help of your integrated development environment/debugging software for further information about in-circuit programming and debugging the microcontroller on the ICD adapter.

CLKIN solder point (G2)

Your in-circuit debugging tool can provide the clock signal for initiating in-circuit communication with the microcontroller on the ICD adapter. To do this, you must complete the connection with a drop of solder on the **CLKIN** solder point (G2) shown in *Figure 4*.

Figure 4.   CLKIN solder point (G2)
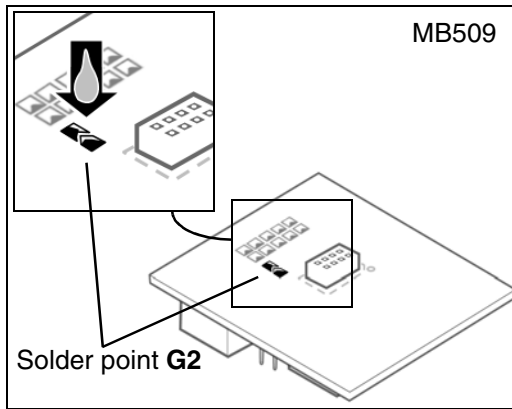
When the solder drop is placed on the CLKIN solder point (G2), pin PA5 is relayed to CLKIN on the ICC connector. PA5 is not available for the application.

When the clock signal is furnished by the in-circuit debugging tool, use the **Option Bytes Disabled** mode to start the in-circuit debugging session. For further information about this mode refer to the online help of your integrated development environment or debugging software.

2.2   Run the application in standalone mode

Once the microcontroller on the ICD adapter has been programmed during an in-circuit debugging or in-circuit programming session, it can run the application in place of the target microcontroller without being connected to an in-circuit debugging tool or the host PC. Although in a 16-pin package, the ST7FLITEUSICD executes the application as a ST7FLITEUS variant in 8-pin package would.

Figure 5.   RST/PA3 On jumper (TP2)
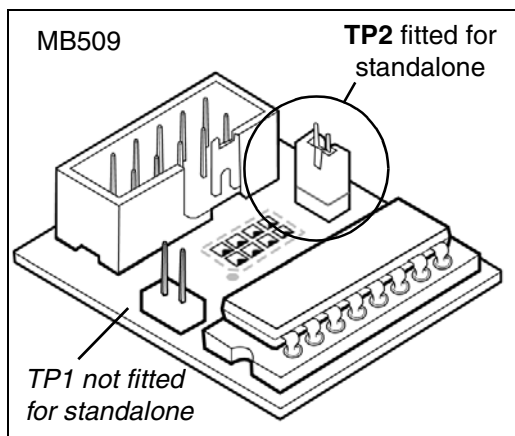
To run the application in standalone mode, the **RST/PA3 On** jumper (TP2) must be fitted and the *ICD On* jumper (TP1) must not be fitted.

In standalone mode, the RST/PA3 pin can only be used for reset. PA3 is not available.

3 Connecting to the application board

This chapter describes the physical connection of the ICD adapter to your in-circuit debugging tool and to your application board.

Figure 6.   Connectors on the ICD Adapter
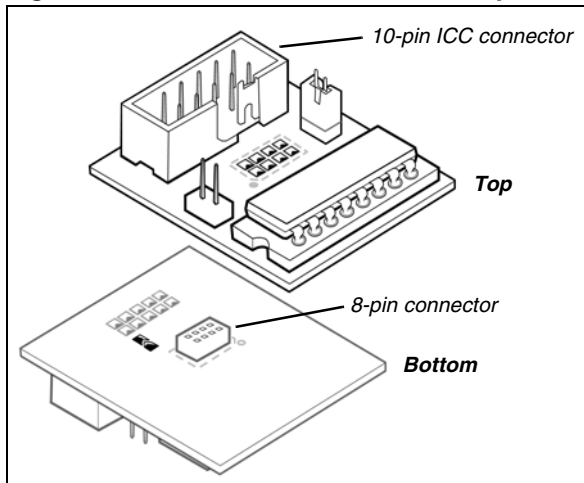
The ICD Adapter (MB509) connects to your in-circuit debugging tool via the 10-pin ICC connector on the top of the adapter. It connects to the connector installed on you application board via an 8-pin connector on the bottom of the adapter (see *Figure 6*).

To use the ICD Adapter you will have to solder the appropriate package specific connector to your application board in place of your target ST7LiteUS microcontroller. *Table 2* shows the available connectors

Table 2.   Target MCU packages and their application connectors

Package	ICD Adapter	Application board connector(s)
DIP8	MB509	DB646
SO8	MB509	SO8, 8-pin connector
DFN8	MB509	DB715 flexible adapter

Note: *The DB715 flexible and associated on-application connectors for the DFN8 package are delivered with the ST7MDT10-8/DVP connection kit (see Delivery checklist).*

The following sections show connection illustrations for each supported package type:

● *Connection for DIP8 microcontroller package* on page 8
● *Connection for SO8 microcontroller package* on page 9
● *Connection for DFN8 microcontroller package* on page 10

3.1 Connection for DIP8 microcontroller package

1. Solder the DIP8 Device adapter (DB646) onto your application board in place of your microcontroller.

2. Plug the ICC cable from the in-circuit debugging tool into the 10-pin ICC connector on the top of the ICD Adapter (MB509).

3. Align the pin 1 indicator on the ICD Adapter (MB509) with the pin 1 indicator for the DIP8 Device adapter on your application board and insert the pins into the 8-pin connector on the bottom of the ICD Adapter.
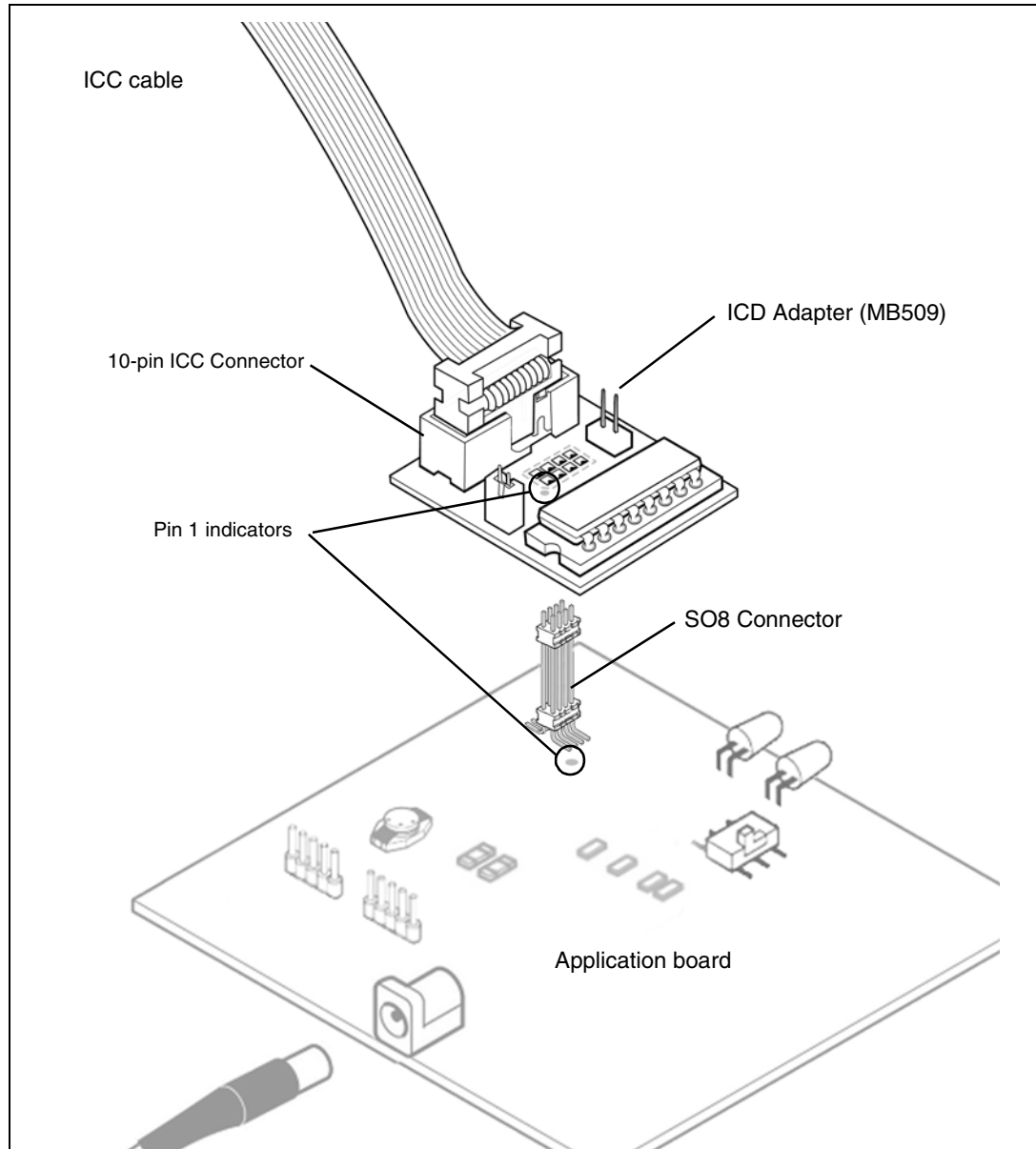
Figure 7.   DIP8 connection scheme
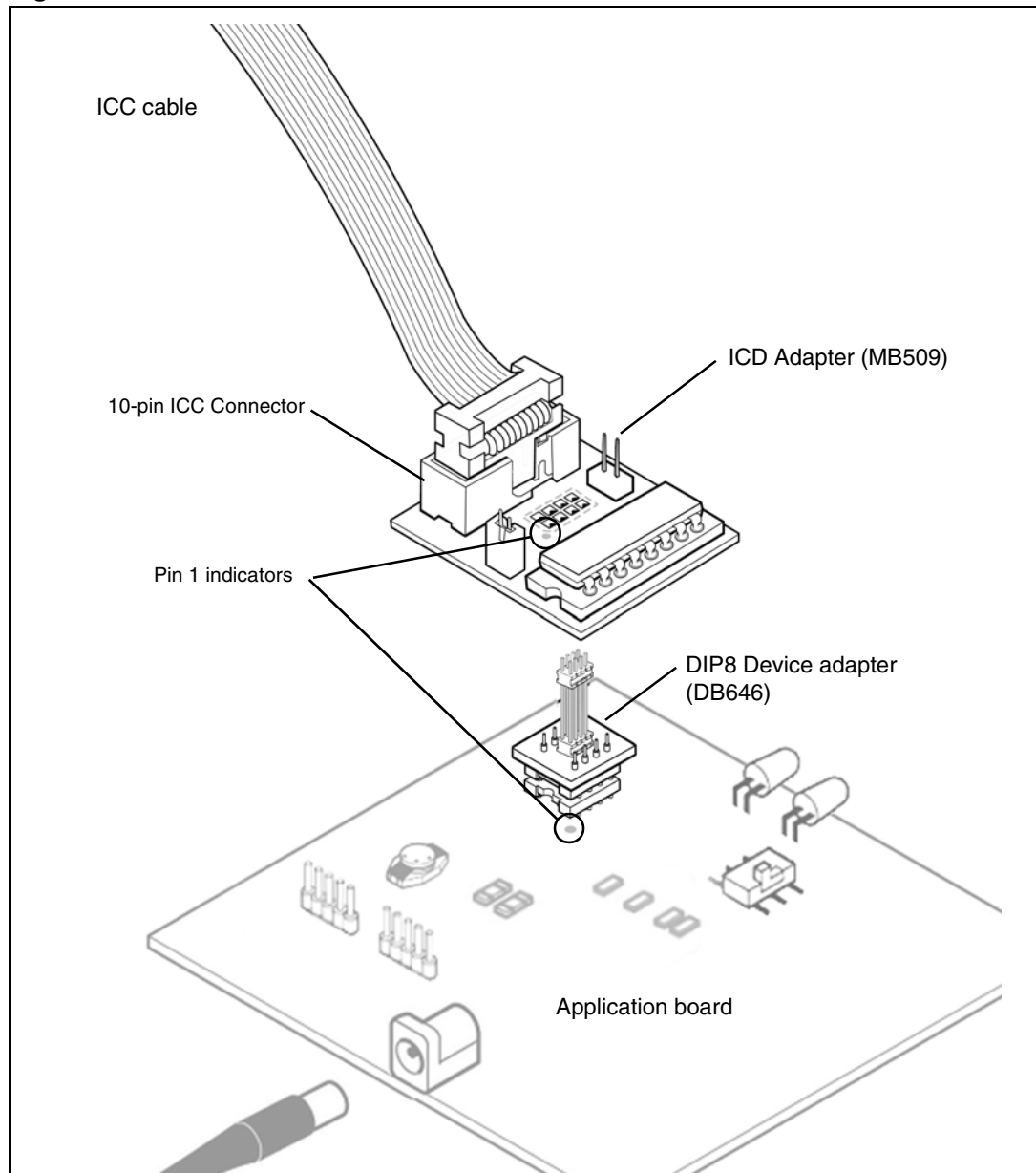
3.2   Connection for SO8 microcontroller package

1. Solder the SO8 connector (8-pin header) onto your application board in place of your microcontroller.

2. Plug the ICC cable from the in-circuit debugging tool into the 10-pin ICC connector on the top of the ICD Adapter (MB509).

3. Align the pin 1 indicator on the ICD Adapter (MB509) with the pin 1 indicator for the SO8 connector on your application board and insert the pins into the 8-pin connector on the bottom of the ICD Adapter.

Figure 8.   SO8 connection scheme

3.3   Connection for DFN8 microcontroller package

1.   Solder the DFN8 female connector onto your application board in place of your microcontroller.

2.   Plug the ICC cable from the in-circuit debugging tool into the 10-pin ICC connector on the top of the ICD Adapter (MB509).

3.   Plug the 8 pins of the DFN8 Device adapter (DB715) into the 8-pin connector on the bottom of the ICD Adapter (MB509).

4.   Connect the DFN8 Device adapter (DB715) to the DFN female connector on your application board using the DFN male-male connector. Because of the position of the GND pin on these connectors, there is only one way to connect them together (see detail in *Figure 9*).

Figure 9.   DFN8 connection scheme
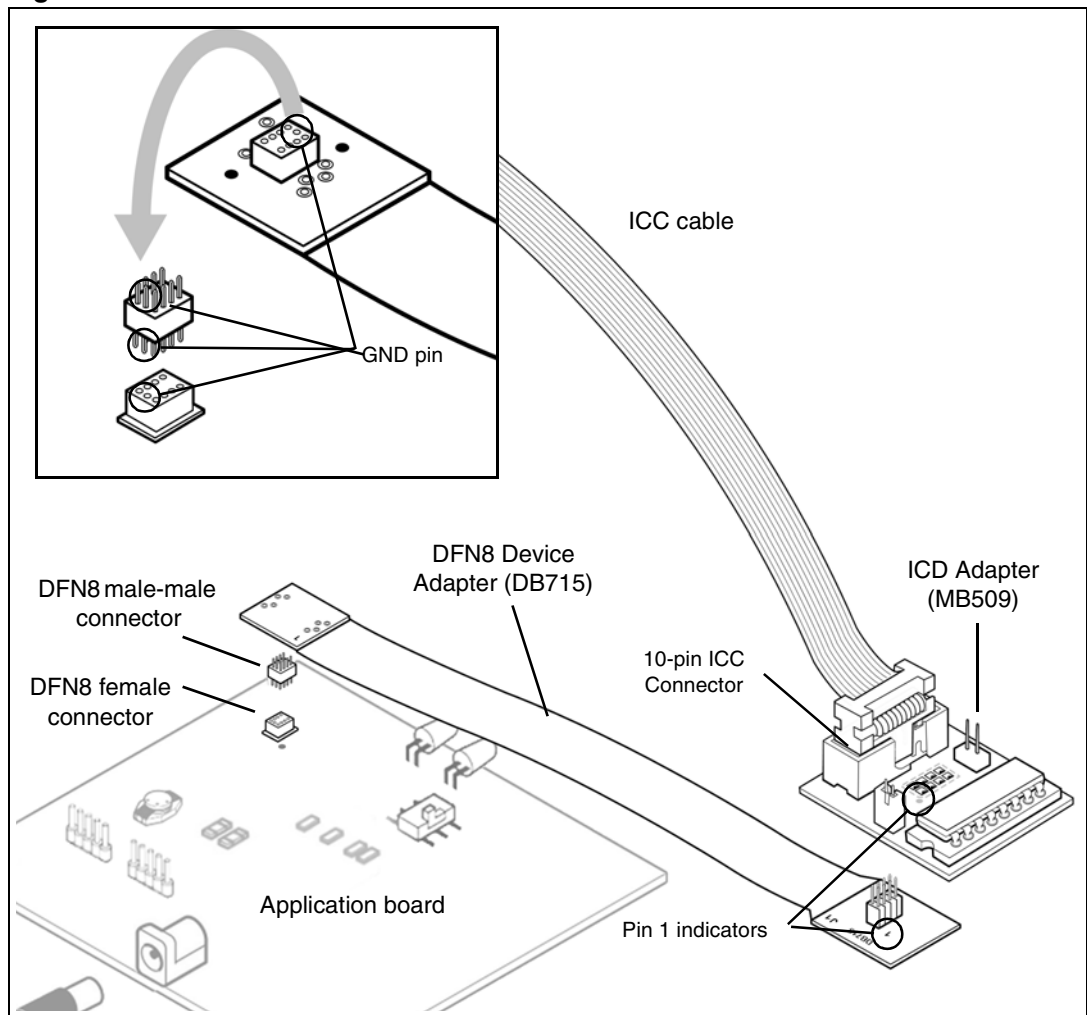
4 Functional limitations and discrepancies

This section provides any lists in-circuit debugging limitations and discrepancies that are specific to the ICD adapter.

For information about limitations and discrepancies that are specific to the target microcontroller or the in-circuit debugging tool, refer to the release notes for your integrated development environment or debugging software.

4.1 PA3/RESET pin use limitation

When running the application in the in-circuit debugging mode or standalone mode, the RESET/PA3 pin of the target microcontroller can only be used for reset. PA3 is not available.

Appendix A   Revision history

Table 3.   Document revision history

Date	Revision	Changes
30-Aug-2006	1	Initial release.
6-Sep-2006	2	Corrected *Delivery checklist* to indicate ordering information for DFN8 accessories. Corrected *Table 1*, "purposes" of the solder points

Appendix B   Product support

If you experience any problems with this product, or if you need spare parts or repairs, contact the distributor or the STMicroelectronics sales office where you purchased the product. Phone numbers for major sales regions are provided in the *Contact list*, below.

In addition, at our Internet site **www.st.com/mcu**, you will find a complete listing of ST sales offices and distributors, as well as documentation, software downloads and user discussion groups to help you answer questions and stay up to date with our latest product developments.

Software updates

All our latest software and related documentation are available for download from the ST Internet site, **www.st.com/mcu**. For information about firmware and hardware revisions, call your distributor or ST using the *Contact list* provided below.

If you are using software from a third-party tool provider, please refer to the third-party for software product support and downloads.

Hardware spare parts

Your development tool comes with the hardware you need to set it up, connect it to your PC and connect to your application. However, some components can be bought separately if you need additional ones. You can order extra components, such as sockets and adapters, from STMicroelectronics**,** from the component manufacturer or from a distributor.

To help you find what you need, a listing of accessories for ST development tools is available on the ST internet site, **www.st.com/mcu**.

Sockets

Complete documentation and ordering information for P/TQFP sockets from Yamaichi, Ironwood, CAB and Enplas are provided at the following Internet sites:

> **www.yamaichi.de**
> **www.ironwoodelectronics.com**
> **www.cabgmbh.com**
> **www.enplas.com**

Connectors

Complete documentation and ordering information for SAMTEC connectors is provided at **www.samtec.com**.

Getting prepared before you call

Collect the following information about the product before contacting ST or your distributor:

1. Name of the company where you purchased the product.
2. Date of purchase.
3. Target Device: The sales type of the ST microcontroller you are using in your application.

Contact list

North America

West Coast	Mid West	Canada and East Coast
STMicroelectronics, Inc. 1060 E. Brokaw Road San Jose, CA 95131 Phone: (408) 452-8585	STMicroelectronics 1300 East Woodfield Road, Suite 410 Schaumburg, IL 60173 Phone: (847) 585-3000	STMicroelectronics Lexington Corporate Center 10 Maguire Road, Building 1, 3rd floor Lexington, MA 02421 Phone: (781) 402-2650

Note: *For American and Canadian customers seeking technical support the US/Canada is split in 3 territories. According to your area, contact the appropriate sales office from the list above and ask to be transferred to an 8-bit microcontroller Field Applications Engineer.*

Europe

France	+33 (0)1 47 40 75 75
Germany	+49 89 46 00 60
U.K.	+44 162 889 0800

Asia/Pacific Region

Japan	+81 3 3280 4120
Hong-Kong	+85 2 2861 5700
Sydney	+61 2 9580 3811
Taipei	+88 6 2 2378 8088

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com