AC164167

TA100 8-Pin SOIC Socket Board User Guide

Introduction

The TA100 8-pin SOIC mikroBUS™ compatible socket board has been developed for use with any of Microchip's microcontroller boards that support a MikroElektronika mikroBUS interface. The board's dimensions match the medium-sized add-on board as defined in the mikroBUS specification. Through use of an adapter board, the socket board can also be used with Microchip microcontroller development boards that support an Xplained Pro Interface.

The TA100 secure elements are one-time-programmable devices. Having a socket board allows for a customer to reuse the board with multiple TA100 sample devices for a given application or for multiple different applications. The 8-pin SOIC socket board is capable of being used with both the I^2C and SPI interface versions of the TA100 device.

Figure 1. TA100 8-Pin SOIC Socket Board

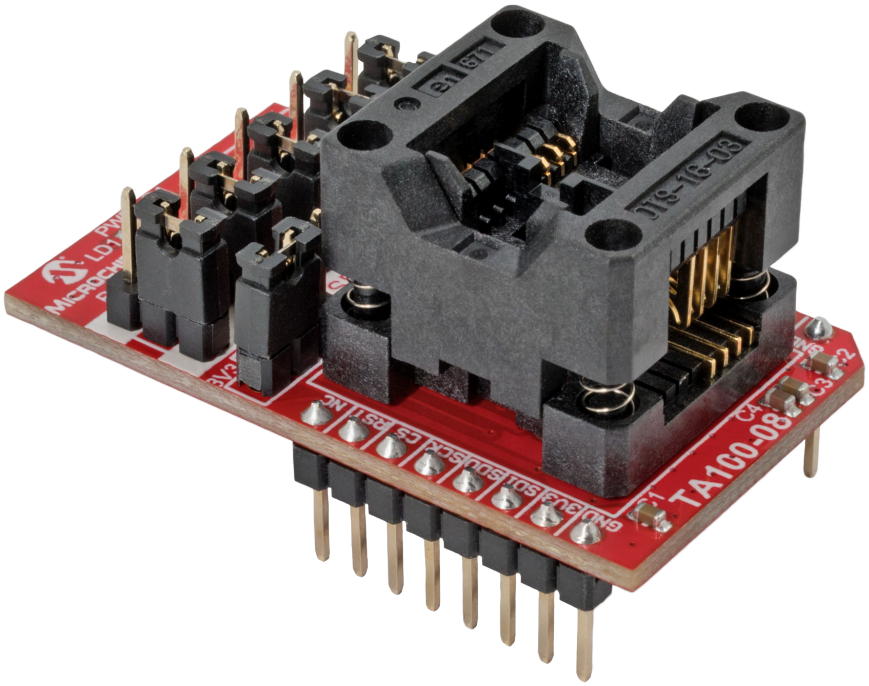


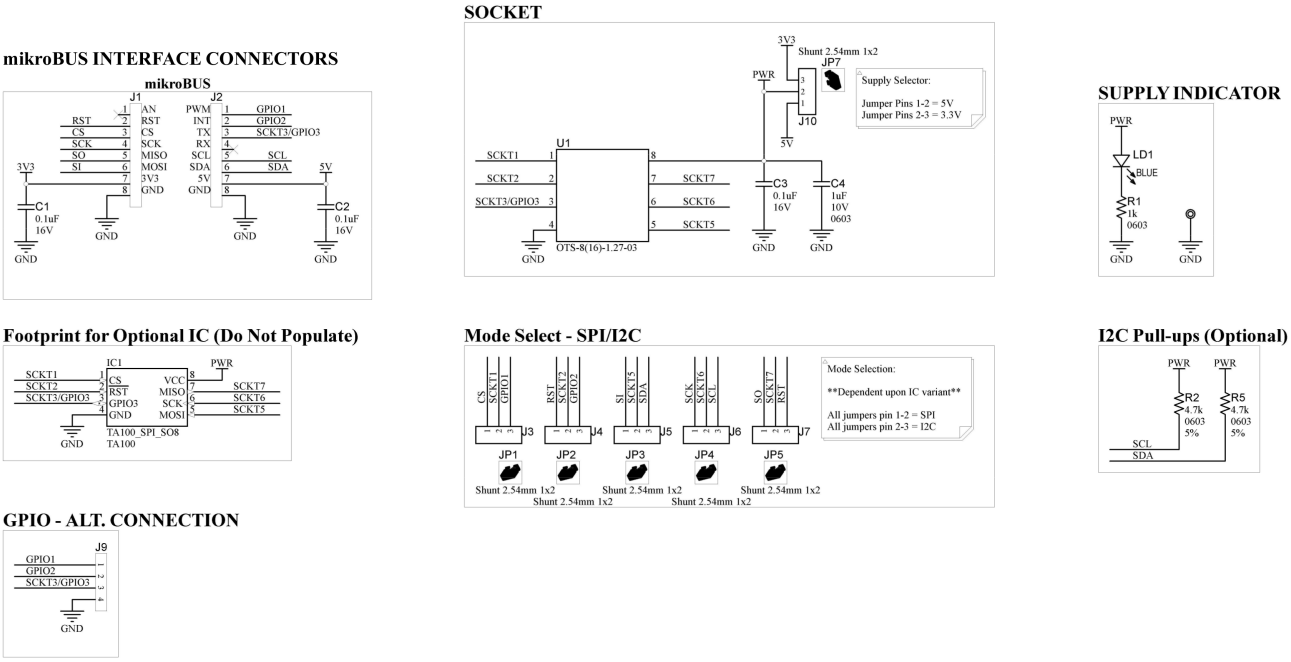
Table of Contents

1. Hardware Description

1.1 Schematic and Key Features

- One 8-Pin SOIC Socket (U1)
- One mikroBUS Connector (J1, J2)
- Five Selection Jumpers for selecting either an I²C or SPI Interface (J3 to J7)
- On-Board 4.7 kΩ I²C Resistors (R2, R3)
- On-Board LED Power Indicator (LD1)
- Power Jumper for selecting 3.3V or 5V power (J3)
- Optional GPIO Header (J9) Not populated

Figure 1-1. TA100 8-Pin SOIC Socket Board Schematic



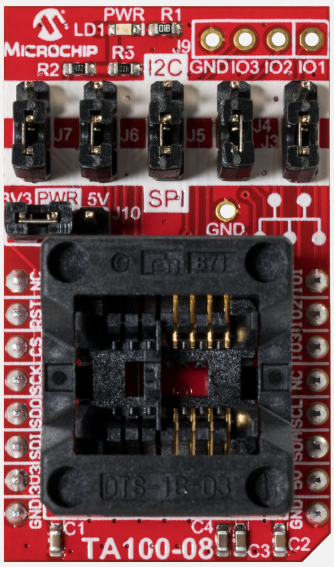
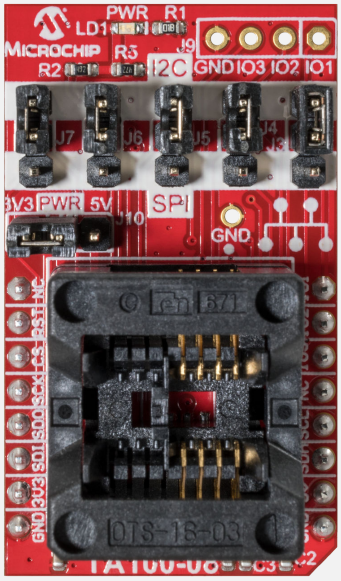
1.2 Board Configuration

TA100 8-Pin SOIC Socket Board Jumper Configurations

- SPI Connections: J3, J4, J5, J6 and J7 in position closest to socket (white band labeled with SPI)(1)
- I²C Connections: J3, J4, J5, J6 and J7 in position furthest from socket (white band labeled with I²C)(1)
- 3.3V Power: J10 with shunt across 3V3 and PWR positions(2)
- 5.0V Power: J10 with shunt across 5V and PWR positions(2)

Notes:

1. Jumpers J3, J4, J5, J6 and J7 must all be set with position pins 1 and 2 shorted (SPI) or all set with position pins 2 and 3 shorted (I²C) for proper operation in a given interface mode.
2. The I/O levels of the GPIO, SPI and I²C signals will track with the supply voltage.

SPI Configuration	I²C Configuration
	

1.3 Supply Current Measurement

The current consumption of the TA100 device can be measured by using the AC164167 8-pin socket board. The only devices on the board that will consume power are the TA100 socketed device, the Power LED and the I²C pull-up resistors. Follow these steps to measure the current:

1. Modify the board to remove the resistor R1 which is in series with the LED. This will remove the current through the LED from the total measured current.(1)
2. Install the TA100 device into the socket.
3. Install the socket board into the host system with the appropriate power settings.
4. Select either 3.3V or 5V power for the measurement.(2)
5. Connect the high side of the ammeter to the 3.3V or 5V supply.
6. Connect the low side of the ammeter to the common PWR signal of the header.
7. Current measurements can now be taken by running various TA100 commands and measuring the current. (3)

Notes:

1. For lower accuracy current measurements this resistor may be kept in the circuit. A separate measurement of the current through just the LED path should be made prior to measuring the TA100 device currents. This value can then be subtracted from the total current measured.
2. The host board provides the power to the mikroBUS extension board so whichever supply is selected must match the capabilities and setting used on the host board.
3. When measuring the current of I²C devices, the measurement will include the I²C pull-up currents used to pull up the bus. For SPI signals the pull-ups are internal to the device and will also factor into the total current consumed.

1.4 Hardware Documentation

Additional documentation for the kit can be found on the Microchip Website for the AC164167.

This includes:

1. Board Design Documentation including Schematics and 3D Views.
2. Gerber Files.
3. TA100 8-Pin SOIC Socket Board User Guide (AC164167).

For other kits referenced in this document please check website information associated with those kits. This includes:

1. ATSAMV71-XULT SAMV71 Xplained Ultra Evaluation Kit.
2. ATMBUSADAPTER-XPRO XPRO to mikroBUS Adapter.
3. Explorer 16/32 Development Kit (DM240001-2).
4. dsPIC33CK 16-Bit PIC® Microcontroller.

Related Hardware Kits

Microchip also offers the AC164166 14-Pin SOIC Socket Kit for the TA100. This developers kit offers a single TA100 device with both a SPI and I^2C Interface.

2. Connecting the Board

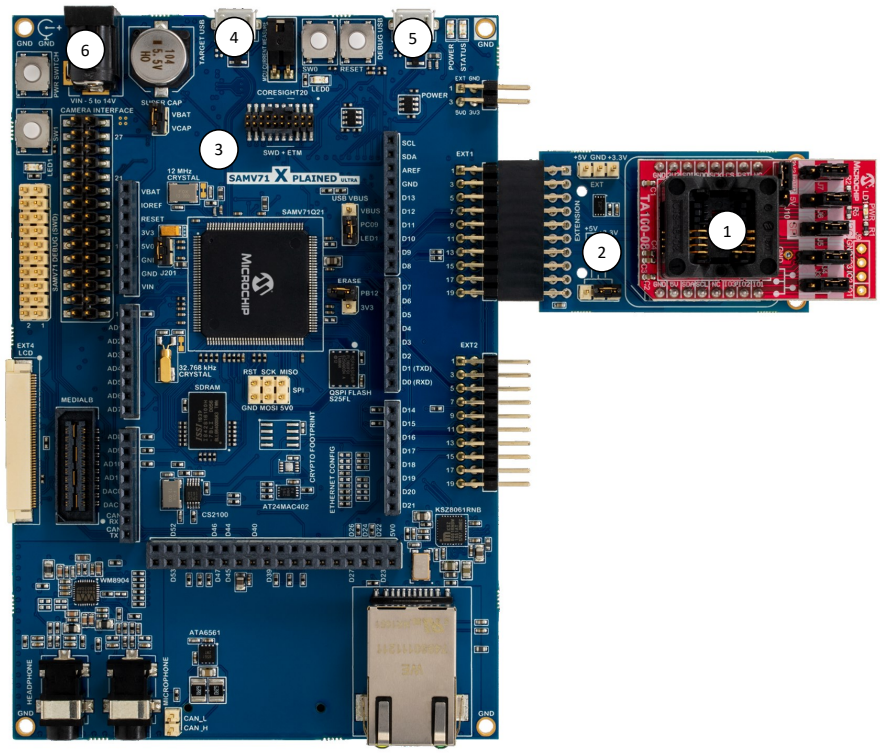
The form factor of the AC164167 development board was chosen because Microchip has heavily adopted the use of the mikroBUS connector on host boards. Many of Microchip's development platforms will support one or more mikroBUS interfaces. These include:

- Microchip Explorer 16/32 Development Board
- MPLAB® Xpress Evaluation Board
- Automotive Networking Development Board
- PIC® Curiosity Boards
- PIC Curiosity Nano Boards
- AVR® Curiosity Nano Boards
- SAM Xplained-Pro microcontroller development boards when used with an ATMBusAdapter

2.1 Xplained Pro Connections

By using an adapter board, the AC164167 development board can still be used with Microchip development boards that only support the Xplained Pro interface. Figure 2-1 shows the full assembly of the AC164167 TA100 8-Pin SOIC Socket Board , the ATMBUSADAPTER-XPRO and an ATSAMV71-XULT Development Board.

Figure 2-1. Connections to an Xplained Pro Development Platform



1. AC164167 8-Pin Socket Development Board.
2. ATMBUSADAPTER-XPRO.
3. ATSAMV71-XULT Development Board.
4. TARGET USB Port.
5. DEBUG USB Port.
6. External Power Jack Input.

Powering the SAMV71-XULT Board

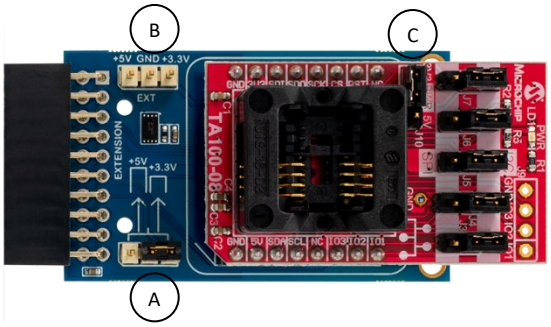
Multiple options exist for powering the SAMV71-XULT Development Board. Depending on the total current requirements different options are allowed. Please see the SAMV71-XULT User Guide for more information.

1. External Power Jack Input.
   – 2.1 mm barrel connector
   – 5-14V input supply Maximum current of 2.0A
   – 12V 18W Power Adapter Option: Triad Magnetics WSU120-1500
2. Embedded Debugger USB Connection. Max. of 500 mA.
3. Target USB Connection. Max. of 500 mA.
4. External Power Header.
   – 2-pin 100 mil Header
   – Direct 5V Supply
   – Max. 2A of current

ATMBUSAdapter Power Settings

The ATMBUSAdapter allows power to be connected to the MikroBus Host adapter either directly through the XPRO interface or by providing external power through the EXT header. It is important that all jumpers are connected correctly before connecting to the SAMV71-XULT or other boards with an XPRO interface in order to prevent possible damage to the system.

Figure 2-2. ATMBUSAdapter Plus AC164167



1. ***Option 1: Direct Power from the XPRO Extension***
   – Determine if the XPRO Board outputs a 3.3V or 5.0V supply voltage.
   – Connect the J10 shunt “C”of the AC164167 to the appropriate 3.3V or 5.0V supply.
   – Connect the ATMBUSAdapter power shunt “A” to the same voltage as the XPRO Supply.
2. ***Option 2: External Power Connected to the ATMBUSAdapter.***
   – Remove the Power Shunt “A” from the ATMBUSAdapter. This disconnects power from the XPRO Header.
   – Connect either 3.3V or 5.0V external power to the Ext Header “B” on the ATMBUSAdapter
   – Make sure the J10 shunt on the AC164167 is placed across the correct connections for the External Power Supply chosen.

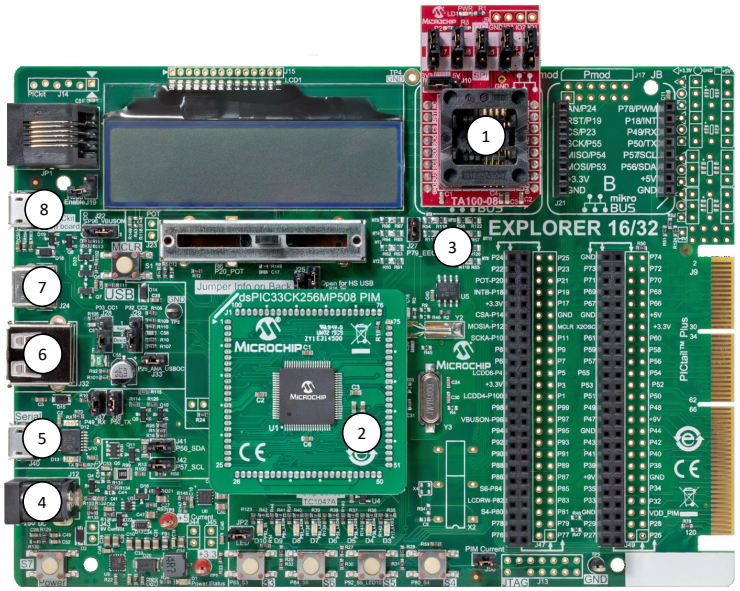
Additional Resources

- SAMV71 Kit Information
- SAMV71- Xplained Ultra User Guide
- SAMV71 Microcontroller
- Additional Tools available via myMicrochip

2.2 Microchip Explorer 16/32 Connections

The AC164167 extension board can be connected to any microcontroller board that contains a mikroBUS Host Header. The 8-pin socket board can either be configured for the I²C or SPI interface as shown in section 1.2 Board Configuration. The diagram below shows a configuration using the Microchip Explorer 16/32 Development Board and the dsPIC33CK 16-bit microcontroller. Note that the Explorer 16/32 board allows for a variety of 100-pin Microchip microcontrollers to be used.

Figure 2-3. Connections to a Microchip Explorer 16/32 Development Board



1. AC164167 14-Pin Socket Development Board.
2. dsPIC33CK 16-Bit Microcontroller.
3. Microchip Explorer 16/32-Bit development Board.
4. External Power Connection.
5. Micro-USB Connection.
6. Type-A USB Connection.
7. USB Type-C™ Connection.
8. PICkit™ On-Board debugger micro-USB Connection.

Powering the Board

Multiple options exist for powering the Explorer 16/32 Development board. Depending on the total current requirements different options are allowed.

1. External Power Supply Connection.
   - 8-15V Power Supply maximum current 1.3A
   - Universal 9V Supply Adapter: AC002014
2. USB Connections allow up to 400 mA.

Additional Resources

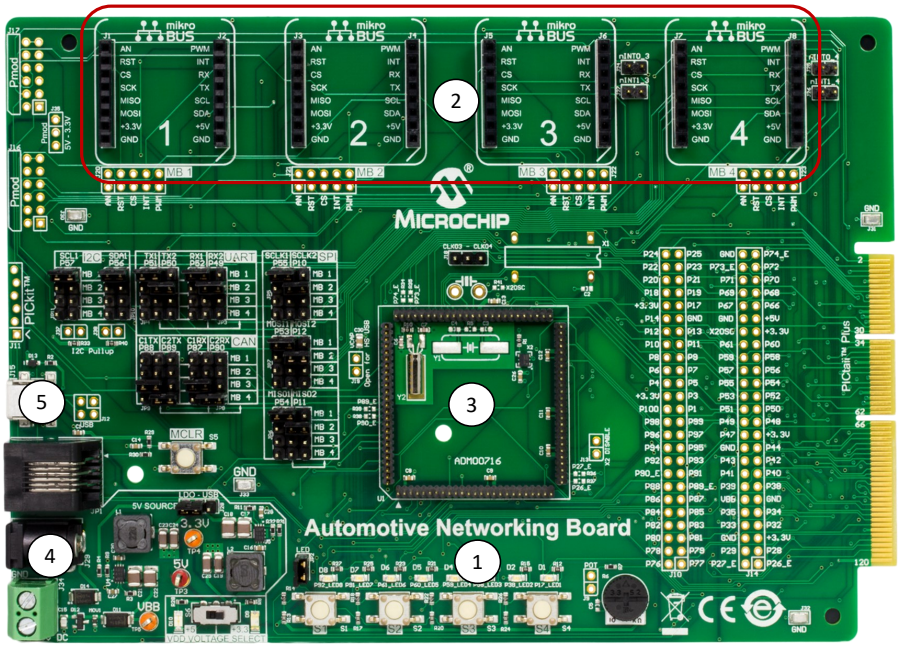
- Microchip Explorer 16/32 Kit Information
- Microchip Explore16/32 User Guide
- dsPIC33CK
- Additional software tools available via myMICROCHIP

2.3 Automotive Networking Development Board Connections

The AC164167 extension board can be connected to any microcontroller board that contains a mikroBUS Host Header. The 8-pin socket board can either be configured for the I²C or SPI interface as shown in section 1.2 Board Configuration. The diagram below shows the Automotive Networking Development Board. This board is a low-cost modular development system for Microchip's 8-bit, 16-bit, and 32-bit microcontrollers targeting CAN and LIN network related applications.

Due to the modular nature of the Automotive Networking Development Board only a generic photo of the board is shown below. There are multiple LIN and CAN Controllers that can be connected through the mikroBUS connectors along with the AC164167 socket security board. Each of these devices can be connected via any of the mikroBUS headers. A 100-pin plug-in microcontroller module (PIM) is also required for complete system operation. Microchip has a variety of PIM modules that can be used with this development board. Examples of mikroBUS click boards and PIM modules are shown in the Additional Resources section.

Figure 2-4. Connections to the Automotive Networking Development Board



1. Automotive Networking Development Board.
2. mikroBUS™ Host headers.
3. Microcontroller PIM Socket.
4. External Power Connection.
5. Micro-USB Power/Signal Connection.

Powering the Board

Multiple options exist for powering the Automotive Networking Development Board.

1. External Power Supply Connection (7-30V).
   - 9V external power supply adapter: (AC002014) 1.3A current
   - 5 mm output jack with center-positive connection
   - Place jumper across pins 2-3 of header J28 to enable
2. USB Connections.
   - Micro-USB connection
   - Place jumper across pins 1-2 of header J28 to enable

Additional Resources

The following list of resources should be considered as examples and not an exhaustive list. To identify additional PIM or mikroBUS modules that may work with the Automotive Networking Development Board please go to www.microchip.com.

- Automotive Networking Development Board Kit Information
- Automotive Networking Development Board User's Guide
- MCP2003B click for LIN systems
- MCP25625 click with Microchip CAN controller
- ATA6563 click with Microchip CAN controller
- PIC18F66K80 100-pin PIM
- Additional software tools available via myMicrochip

3. Software Tools

The TA100 is supported by a suite of software tools. These tools are only available under NDA. Please contact Microchip to obtain an NDA and request access to the tools. Once an NDA has been signed, these tools will be made available in the My Secure Software section of the customer's myMicrochip account. Enhancements, upgrades and additional tools will automatically be made available to any customer that has been enabled for the TA100 support.

Table 3-1. TA100 Software Tools

Item #	Tool Name	Description
1	TA100 Configurator GUI and TA100 Library	The TA100 Configurator GUI provides the ability to configure and pseudo-provision TA100 devices and to illustrate how the TA100 can be used for various applications such as Secure Boot, Device Authentication and CAN-MAC. These applications perform many cryptographic operations using the TA100 library.
2	CryptoAuthLib	A flexible library implemented with a Hardware Abstraction Layer (HAL) that allows the TA100 to be readily ported to other microcontrollers. The library provides commands support for the TA100 and other Microchip CryptoAuthentication™ devices significantly speeding up application development.
3	AUTOSAR™ 4.3.1 CRYPTO driver.(1)	CRYPTO driver specifications provides an abstraction layer to integrate external cryptographic device such as the TA100 into the AUTOSAR™ stack. This allows for code to be portable between various applications that use different microcontrollers.

Important: (1) For projects that use the AUTOSAR Driver the AUTOSAR™ Reference Stack will also be needed. AUTOSAR™ is an open and standardized automotive software architecture. The TA100 has been integrated into 3rd party AUTOSAR™ software stacks to aid customers in the implementation of automotive applications. Please contact Microchip for a list of 3rd Party AUTOSAR™ stack vendors that support the TA100.

Use Case Examples

Use Case examples utilize the TA100 Configurator GUI to demonstrate various sample applications that can be implemented using the TA100 and SAM V71 microcontroller. These sample applications come with the necessary microcontroller firmware, detailed application user guide and other documentation describing the use case in more detail. Table 3-2 provides some of the use case examples that are available from the myMicrochip website. Upgrades to these use case examples and additional use case examples will be provided over time via the same path.

Table 3-2. Use Case Examples

Item #	Use Case Examples(1)	Description
1	Device Authentication	Provides device authentication by verifying the chain of trust using Signer and Device Certificates and a Random Challenge. Upon successful authentication, a known string is encrypted and written to a data element or read and decrypted from a data element inside TA100.
2	Full Stored Secure Boot with Pre-Boot	Secure Boot use case that upon initial boot calculates the digest of the firmware code and then stores it for faster subsequent secure boots.
3	CAN Bootloader	Secure Boot Use case that allows for secure firmware upgrade via the CAN Bus using the SAMV71 microcontroller, K2L MOCCA-FD tool and PC-based GUI.

.....continued		
Item #	**Use Case Examples(1)**	**Description**
4	CAN-MAC Authentication	This use case demonstrates a mechanism to add an AES C-MAC to authenticate CAN-FD messages. This mechanism can be used to ensure data integrity and authenticity of the transmit node. TA-configurator GUI will import a CAN-database file to populate the CAN-MAC tab of the GUI. The user can use the TA-configurator GUI to select which messages need authentication, assign C-MAC keys, and to configure message payload structure.

Note:

1. The listed Use Case examples are based on the TA100Lib and TA Configurator GUI.

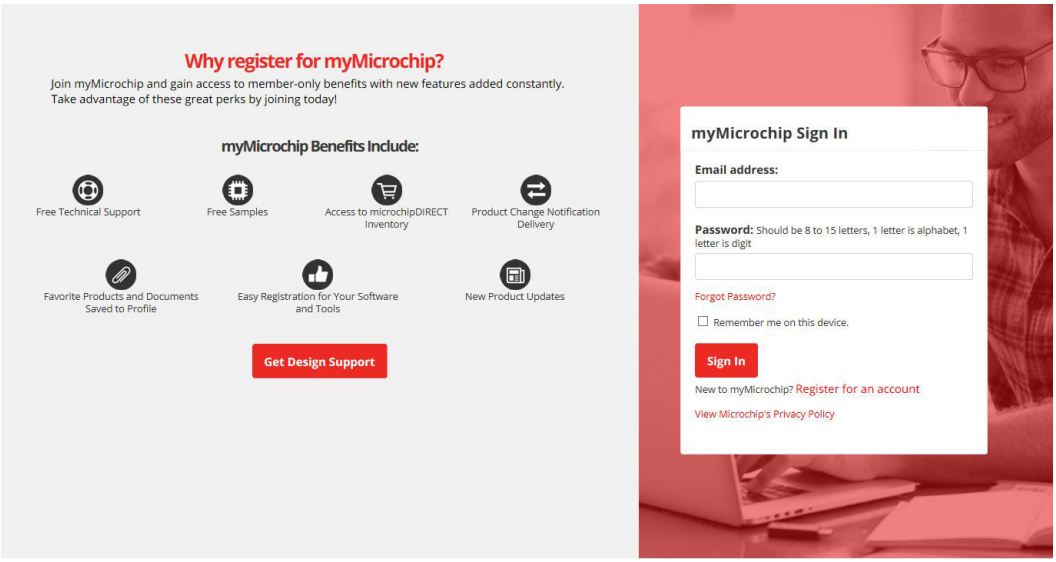
3.1 myMicrochip

Microchip provides the ability to customize your user experience and keep up to date on key topics that are of the most relevance and importance to you by registering for a myMicrochip account. In order to have access to many of the TA100 software tools you must have an account. Having access will automatically give you access to tool updates and new tools as they are added.

Accessing myMicrochip

1. Go to the myMicrochip Website: www.microchip.com/mymicrochip.

Figure 3-1. myMicrochip Login and Registration page



2. If you do not have an account, click on the “Register for an account” link, fill out the information, then save your profile.
3. Once you are fully registered then you can log in through the access page in step 1.
4. After you log in, go to the “Update Account” link and set your preferences for the products you would like access to.

Important: The steps above provide access to myMicrochip but do not enable access to the TA100 software which requires a current NDA. Please contact your Microchip Sales or Technical Representative to verify status of, or process an NDA to get access to the TA100 software repository. Once your name has been added to the list it will automatically show up on your myMicrochip page.

Personal myMicrochip page.

Your myMicrochip page will be divided into three sections:

1. Product Change Notifications.
   - Keep track of changes to products or families of products you wish to track
   - Selected by editing your preferences
2. My Secure Software.
   - Provides access to documents and software tools that are only available under NDA
   - Provides updates to documents and software and access to new tools automatically that are in the same repository
   - Access is granted on a product by product family basis (decided by the specific Business Unit)
3. My Products.
   - Provides a direct link to products or product families that you deem important
   - Selected by editing your preferences

4. Revision History

Revision	Date	Description
A	05/2020	Initial release of this document.

The Microchip Website

Microchip provides online support via our website at www.microchip.com/. This website is used to make files and information easily available to customers. Some of the content available includes:

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

Product Change Notification Service

Microchip's product change notification service helps keep customers current on Microchip products. Subscribers will receive email notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, go to www.microchip.com/pcn and follow the registration instructions.

Customer Support

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Embedded Solutions Engineer (ESE)
- Technical Support

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

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

Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Legal Notice

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with

your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PackeTime, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TempTrackr, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, FlashTec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, Vite, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, INICnet, Inter-Chip Connectivity, JitterBlocker, KleerNet, KleerNet logo, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2020, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-5224-6153-1

Quality Management System

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.

Worldwide Sales and Service

AMERICAS	ASIA/PACIFIC	ASIA/PACIFIC	EUROPE
Corporate Office 2355 West Chandler Blvd. Chandler, AZ 85224-6199 Tel: 480-792-7200 Fax: 480-792-7277 Technical Support: www.microchip.com/support Web Address: www.microchip.com **Atlanta** Duluth, GA Tel: 678-957-9614 Fax: 678-957-1455 **Austin, TX** Tel: 512-257-3370 **Boston** Westborough, MA Tel: 774-760-0087 Fax: 774-760-0088 **Chicago** Itasca, IL Tel: 630-285-0071 Fax: 630-285-0075 **Dallas** Addison, TX Tel: 972-818-7423 Fax: 972-818-2924 **Detroit** Novi, MI Tel: 248-848-4000 **Houston, TX** Tel: 281-894-5983 **Indianapolis** Noblesville, IN Tel: 317-773-8323 Fax: 317-773-5453 Tel: 317-536-2380 **Los Angeles** Mission Viejo, CA Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 **Raleigh, NC** Tel: 919-844-7510 **New York, NY** Tel: 631-435-6000 **San Jose, CA** Tel: 408-735-9110 Tel: 408-436-4270 **Canada - Toronto** Tel: 905-695-1980 Fax: 905-695-2078	**Australia - Sydney** Tel: 61-2-9868-6733 **China - Beijing** Tel: 86-10-8569-7000 **China - Chengdu** Tel: 86-28-8665-5511 **China - Chongqing** Tel: 86-23-8980-9588 **China - Dongguan** Tel: 86-769-8702-9880 **China - Guangzhou** Tel: 86-20-8755-8029 **China - Hangzhou** Tel: 86-571-8792-8115 **China - Hong Kong SAR** Tel: 852-2943-5100 **China - Nanjing** Tel: 86-25-8473-2460 **China - Qingdao** Tel: 86-532-8502-7355 **China - Shanghai** Tel: 86-21-3326-8000 **China - Shenyang** Tel: 86-24-2334-2829 **China - Shenzhen** Tel: 86-755-8864-2200 **China - Suzhou** Tel: 86-186-6233-1526 **China - Wuhan** Tel: 86-27-5980-5300 **China - Xian** Tel: 86-29-8833-7252 **China - Xiamen** Tel: 86-592-2388138 **China - Zhuhai** Tel: 86-756-3210040	**India - Bangalore** Tel: 91-80-3090-4444 **India - New Delhi** Tel: 91-11-4160-8631 **India - Pune** Tel: 91-20-4121-0141 **Japan - Osaka** Tel: 81-6-6152-7160 **Japan - Tokyo** Tel: 81-3-6880- 3770 **Korea - Daegu** Tel: 82-53-744-4301 **Korea - Seoul** Tel: 82-2-554-7200 **Malaysia - Kuala Lumpur** Tel: 60-3-7651-7906 **Malaysia - Penang** Tel: 60-4-227-8870 **Philippines - Manila** Tel: 63-2-634-9065 **Singapore** Tel: 65-6334-8870 **Taiwan - Hsin Chu** Tel: 886-3-577-8366 **Taiwan - Kaohsiung** Tel: 886-7-213-7830 **Taiwan - Taipei** Tel: 886-2-2508-8600 **Thailand - Bangkok** Tel: 66-2-694-1351 **Vietnam - Ho Chi Minh** Tel: 84-28-5448-2100	**Austria - Wels** Tel: 43-7242-2244-39 Fax: 43-7242-2244-393 **Denmark - Copenhagen** Tel: 45-4450-2828 Fax: 45-4485-2829 **Finland - Espoo** Tel: 358-9-4520-820 **France - Paris** Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79 **Germany - Garching** Tel: 49-8931-9700 **Germany - Haan** Tel: 49-2129-3766400 **Germany - Heilbronn** Tel: 49-7131-72400 **Germany - Karlsruhe** Tel: 49-721-625370 **Germany - Munich** Tel: 49-89-627-144-0 Fax: 49-89-627-144-44 **Germany - Rosenheim** Tel: 49-8031-354-560 **Israel - Ra'anana** Tel: 972-9-744-7705 **Italy - Milan** Tel: 39-0331-742611 Fax: 39-0331-466781 **Italy - Padova** Tel: 39-049-7625286 **Netherlands - Drunen** Tel: 31-416-690399 Fax: 31-416-690340 **Norway - Trondheim** Tel: 47-72884388 **Poland - Warsaw** Tel: 48-22-3325737 **Romania - Bucharest** Tel: 40-21-407-87-50 **Spain - Madrid** Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 **Sweden - Gothenberg** Tel: 46-31-704-60-40 **Sweden - Stockholm** Tel: 46-8-5090-4654 **UK - Wokingham** Tel: 44-118-921-5800 Fax: 44-118-921-5820

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Daughter Cards & OEM Boards ***category:***

Click to view products by Microchip ***manufacturer:***

Other Similar products are found below :

ADZS-21262-1-EZEXT 27911 SPC56ELADPT144S TMDXRM46CNCD DM160216 EV-ADUCM350GPIOTHZ EV-ADUCM350-BIO3Z ATSTK521 1130 MA160015 MA180033 MA240013 MA240026 MA320014 MA330014 MA330017 TLK10034SMAEVM MIKROE-2152 MIKROE-2154 MIKROE-2381 TSSOP20EV DEV-11723 MIKROE-1108 MIKROE-1516 SPS-READER-GEVK AC244049 AC244050 AC320004-3 2077 ATSMARTCARD-XPRO EIC - Q600 -230 ATZB-212B-XPRO SPC560PADPT100S SPC560BADPT64S MA180018 EIC - Q600 -220 AC164134-1 BOB-12035 BB-BONE-BATT-01 STM8/128-D/RAIS AC164127-6 AC164127-4 AC164134-3 AC164156 MA320021 MA320024 DFR0285 DFR0312 DFR0356 MA320023