



MAXQ1103 Evaluation Kit

Evaluates: MAXQ1103

General Description

The MAXQ1103 evaluation kit (EV kit) is a proven platform to conveniently evaluate the capabilities of the MAXQ1103 secure microcontroller. The EV kit board contains the MAXQ1103, two smart card sockets, a PIN pad, and all the communication connectors needed to get started with a financial terminal design. With the included power supply, software, serial-to-JTAG board, and a serial cable connected to a personal computer, the EV kit provides a completely functional system ideal for evaluating the capabilities of the MAXQ1103.

EV Kit Contents

- ◆ MAXQ1103 EV Kit Board
- ◆ MAXQ1103 EV Kit CD:
 - Includes Evaluation Installation of Rowley Crossworks Compiler for the MAXQ1103
 - Includes MAXQ1103 Data Sheet, the MAXQ Family User's Guide, MAXQ1103 Supplement, Application Notes, and Example Programs with Source Code
- ◆ Serial Cable
- ◆ Power Supply
- ◆ Serial-to-JTAG Board

Ordering Information

| PART | TEMP RANGE | SIZE |
|--------------|------------|----------------|
| MAXQ1103-KIT | Room | 7.25in x 6.0in |

Features

- ◆ Easily Load Code and Debug Using Supplied JTAG Board
- ◆ JTAG Interface Provides In-Application Debugging Features
 - Step-by-Step Execution Tracing
 - Breakpointing by Code Address, Data Memory Address, or Register Access
 - Data Memory View and Edit
- ◆ Includes Two-Line by 20-Character LCD Module for Rapid Product Development and Debugging
- ◆ On-Board 3.3V and 1.8V Linear Regulators
- ◆ 4x4 Keypad Matrix
- ◆ Self-Destruct Inputs Brought Out to Header for Connecting to External Trigger Circuits
- ◆ Battery for Memory Backup and Real-Time Clock Operation
- ◆ Level-Shifted RS-232 Interface for Serial Ports 0 and 1
- ◆ Test/Expansion Headers
- ◆ Two Smart Card Sockets (One Full-Size Socket and One SIM Socket) for Prototyping IC Card Applications
- ◆ USB Connector
- ◆ 4MB Flash for External Program Code Storage and 4MB SRAM for External Data Storage (Additional to the MAXQ1103 Integrated 512KB Flash and 32KB SRAM)
- ◆ Included Board Schematics Provide a Convenient Reference Design

Component List

| DESIGNATION | QTY | DESCRIPTION |
|----------------------|-----|--|
| B1 | 1 | Lithium battery, CR1632-based with leads 1632-J56 |
| C1, C2, C56 | 3 | 10µF, 16V X5R ceramic capacitors (0805) GRM21BR61C106KE15L |
| C3, C47 | 2 | 10000pF, 25V X7R ceramic capacitors (0603) ECJ-1VB1E103K |
| C4, C5, C23–C26, C57 | 7 | 1µF, 16V Y5V ceramic capacitors (0805) ECJ-2VF1C105Z |

| DESIGNATION | QTY | DESCRIPTION |
|---|-----|--|
| C6–C14 | 9 | 0.1µF, 10V X5R ceramic capacitors (0402) ECJ-0EB1A104K |
| C15, C16 | 2 | 22pF, 50V SMD capacitors (0603) ECJ-1VC1H220J |
| C17–C21, C27–C39, C42, C43, C45, C46, C50, C51, C54, C59, C61, C64, C65 | 29 | 0.1µF, 16V Y5V ceramic capacitors (0603) ECJ-1VF1C104Z |
| C22, C49, C60 | 3 | 4.7µF, 16V Y5V ceramic capacitors (0805) ECJ-GVF1C475Z |



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Component List (continued)

| DESIGNATION | QTY | DESCRIPTION |
|----------------------|-----|---|
| C40, C52 | 2 | 10 μ F, 10V Y5V ceramic capacitors (1206) ECJ-3YF1A106Z |
| C41, C53, C62 C63 | 4 | 0.1 μ F \pm 10%, 50V X7R ceramic capacitors (1206) GRM319R71H104KA01D |
| C44, C48, C55 C58 | 4 | 15pF, 50V SMD ceramic capacitors (0603) ECJ-1VC1H150J |
| D1 | 1 | 1500W, 5.0V SMC TVS Zener Unidir 1SMC5.0AT3G |
| DS1, DS2, DS3 | 3 | 2mm x 3mm surface mount with reflector, 660nm super red LEDs (clear lens) SML-LX23SRC-TR |
| F1 | 1 | 1A, 125V fast PICO-SMD fuse 0459001.UR |
| J1 | 1 | DC power jack (2.5mm center) CUI Inc. PJ-002B |
| J2 | 1 | Right-angle, 9-position connector, female socket receptacle (gold) 5745781-3 |
| J3 | 1 | Smart card socket, full snap in SMT ITT CCM01-2065LFT |
| J4 | 1 | Connector, receptacle (Type B USB) PCB 897-43-004-90-000000 |
| J5 | 1 | 6-pin SMD hinged connector, smart card ITT CCM03-3001LFT |
| J6 | 1 | 2x5 header 929836-02-05 |
| JH1 | 1 | 16-pin jumper NO 3M 929647-09-08-2 |
| JH2 | 1 | 6-pin header 3M 929647-09-01-I |
| JH3 | 1 | 14-pin header 3M 929647-09-06-2 |
| JH4 | 1 | 1x8 header 3M 929647-09-08-I |

| DESIGNATION | QTY | DESCRIPTION |
|---|-----|--|
| JU1–JU4, JU6–JU11, JU13, JU14, JU15, JU17, JU18, JU19 | 16 | 2-pin jumpers NO 3M 929647-09-02-I |
| JU5, JU12, JU16 | 3 | 3-pin jumpers NO 3M 929647-09-03-I |
| P1 | 1 | Right-angle, 9-position connector, male plug (gold) 747250-4 |
| R1, R2, R3 | 3 | 390 Ω \pm 1%, 1/8W SMD resistors (0805) MCR10EZPF3900 |
| R4 | 1 | 0 Ω \pm 5%, 1/8W SMD resistor (0805) MCR10EZPJ000 |
| R5, R7, R9, R17 | 4 | 330 Ω \pm 1%, 1/8W SMD resistors (0805) MCR10EZHF3300 |
| R6 | 1 | 10k Ω trim potentiometer, 3mm carbon SMD Panasonic EVN-5CSX50B14 |
| R8, R10–R16, R18, R21, R22, R23, R42, R43 | 14 | 10k Ω \pm 1%, 1/8W SMD resistors (0805) MCR10EZHF1002 |
| R19, R20 | 2 | 100k Ω \pm 1%, 1/8W SMD resistors (0805) MCR10EZHF1003 |
| R24, R25, R37 R38 | 4 | 100 Ω \pm 5%, 1/8W SMD resistors (0805) ERJ-6GEYJ101V |
| R26 | 1 | 47k Ω \pm 1%, 1/8W SMD resistor (0805) MCR10EZHF4702 |
| R27, R28, R31, R32, R33, R39, R40, R41 | 8 | 1k Ω \pm 1%, 1/8W SMD resistors (0805) ERJ-6ENF1001V |
| R30 | 1 | 4.7k Ω \pm 1%, 1/8W SMD resistors (0805) MCR10EZHF4701 |

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Component List (continued)

| DESIGNATION | QTY | DESCRIPTION |
|-------------|-----|---|
| R35, R36 | 2 | 26.1Ω ±1%, 1/2W SMD resistors (2010) ERJ-12SF26R1U |
| SW1–SW18 | 18 | 100gf tactile switches, 6mm momentary SMD B3FS-1000P |
| TP1–TP12 | 12 | 0.100in strip headers, single row, 1-position 929647-09-01-1 |
| U1 | 1 | High-performance secure RISC microcontroller (144 TQFP) Maxim MAXQ1103-ENS+ |
| U2 | 1 | Octal buffer/line driver with 3-state outputs (20 TSSOP) Fairchild Semiconductor 74VHC244MTCX |
| U3 | 1 | Octal bus transceiver (20 TSSOP) Toshiba TC74LCX245FT(EL,M) |
| U4 | 1 | LCD character module (20x2) Lumex LCM-S02002DSF |
| U5, U10 | 2 | Single inverter gate (5 SOT23) Texas Instruments SN74LVC1G04DBVR |
| U6 | 1 | 1A, Microcap®, low-dropout, linear regulator (3.3V) (16 TSSOP) Maxim MAX8869EUE33 |

| DESIGNATION | QTY | DESCRIPTION |
|-------------|-----|---|
| U7 | 1 | 1A, MicroCap, low-dropout, linear regulator (1.8V) (16 TSSOP) Maxim MAX8869EUE18 |
| U8, U9 | 2 | 1M x 16 flash S29AL016D70TFI01 |
| U11, U12 | 2 | 1M x 16 static RAM CY7C1061AV33-10ZXC |
| U13, U16 | 2 | Smart card interface (28 SO) Maxim DS8024-RRX+ |
| U14 | 1 | 3V, ±15kV ESD-protected, AutoShutdown Plus™ RS-232 transceiver for PDAs and cell phones (250kbps) (24 TSSOP) Maxim MAX3387ECUG |
| U15 | 1 | ±15kV ESD-protected USB transceiver (14 TSSOP) Maxim MAX3346EEUD |
| XY1 | 1 | 12.000MHz, 20pF HC-49/US crystal ECS ECS-120-20-4X |
| XY2, XY3 | 2 | 10.000MHz, 18pF HC-49/US crystals ECS ECS-100-18-4X |
| Y1 | 1 | 32.768kHz, 12.5pF cylinder crystal ECS ECS-327-12.5-13X |
| None | 1 | PCB: MAXQ1103 EV Kit Circuit Board |

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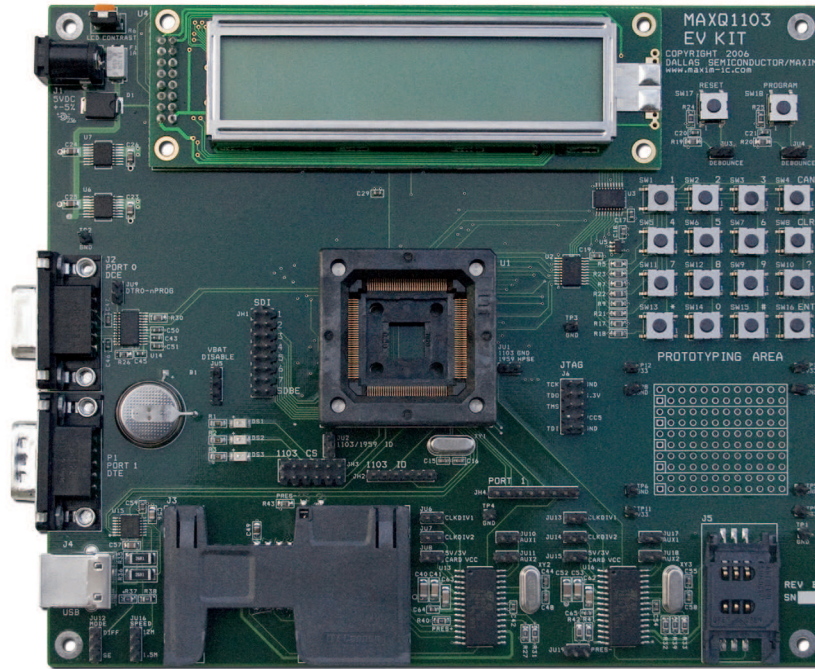
Microcap is a registered trademark of American Technical Ceramics Corp.

AutoShutdown Plus is a trademark of Maxim Integrated Products, Inc.

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NOTE THAT MORE RECENT VERSIONS OF THE EV KIT BOARD DO NOT CONTAIN A SOCKET FOR THE MAXQ1103 MICROCONTROLLER, BUT INSTEAD THE MICROCONTROLLER IS SOLDERED DIRECTLY TO THE BOARD.

Figure 1. MAXQ1103 EV Kit Board

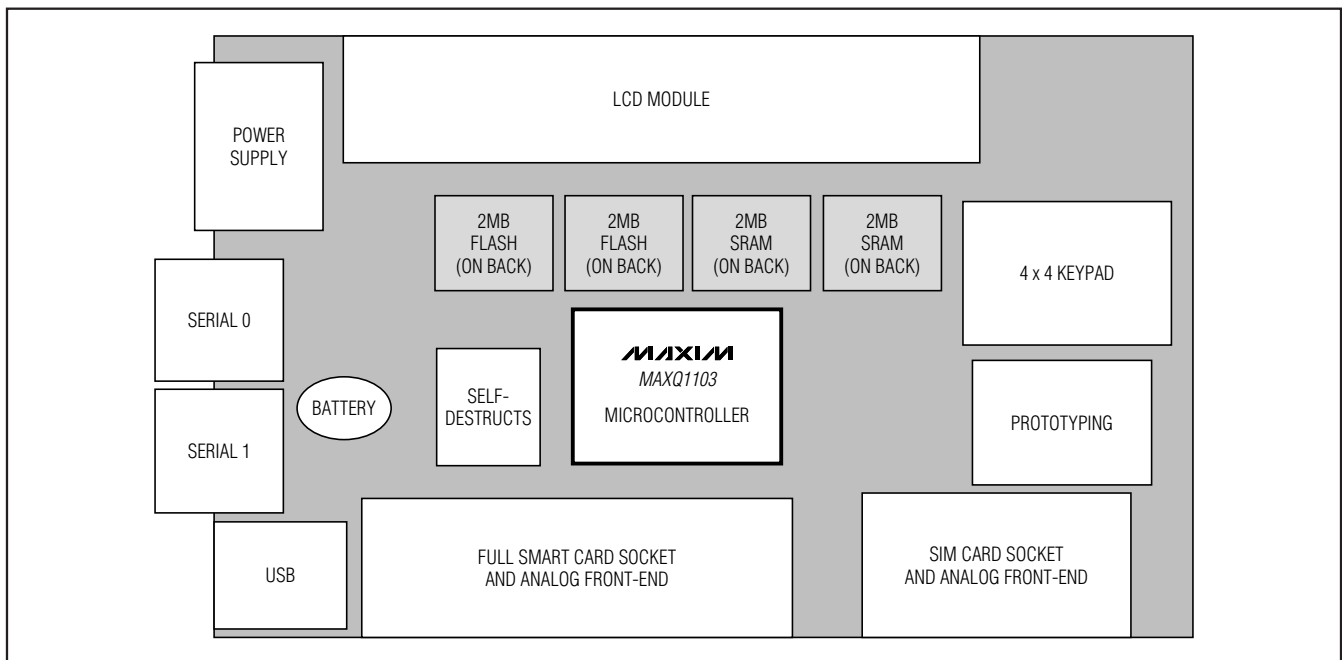


Figure 2. MAXQ1103 EV Kit Board Functional Layout

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Detailed Description

This EV kit must be used in conjunction with the following documents, which are included with the EV kit's software CD:

- MAXQ Family User's Guide
- MAXQ Family User's Guide: MAXQ1103 Supplement
- MAXQ1103 Data Sheet

Because the MAXQ1103 is an export-controlled device, these documents are not available on the web and are protected by a nondisclosure agreement (NDA). Visit www.maxim-ic.com/secure to learn more about the NDA process.

The MAXQ1103 EV kit board is fully defined in the included schematic (Figure 3). However, a short description of the major components and connectors of the board follows.

For a step-by-step guide to using your MAXQ1103 EV kit, refer to Application Note 4273: *Getting Started with the MAXQ1103 Evaluation Kit and the Crossworks Compiler for the MAXQ30*, included on the EV kit CD. This application note covers jumper settings, cable

connections, software configuration, and the steps needed to run simple programs on the EV kit.

Power Supply

The MAXQ1103 EV kit board can be powered directly using a DC power supply. Use a regulated 5V ($\pm 5\%$), 300mA, center-post positive power supply connected to J1. The MAXQ1103 EV kit board has the regulators to supply 3.3V and 1.8V to the MAXQ1103 microcontroller.

Memory

The MAXQ1103 EV kit board contains two 1MB x 16-bit flash memory chips and two 1MB x 16-bit SRAM memory chips as shown in Figure 2. The flash devices' chip-enable pins (\overline{CE}) are connected to the processor's program memory chip-select 1, nonbattery-backed pin ($\overline{PCS1N}$). The SRAM devices' chip-enable pins (\overline{CE}) are connected to the processor's data memory chip select 1, nonbattery-backed pin ($\overline{DCS1N}$).

Jumper Functions

The MAXQ1103 EV kit board contains a number of jumpers to configure the board's operation. Table 1 describes the jumpers and their function.

Table 1. Jumper Functions

| NAME | FUNCTION |
|------|---|
| JU1 | Connects pin 114 (GND) of the MAXQ1103 to GND. |
| JU2 | Connects pin 64 (\overline{VRST}) of the MAXQ1103 to GND. |
| JU3 | Connects reset switch (SW17) \overline{RESET} pin to the 3.3V supply through a pullup resistor. |
| JU4 | Connects program switch (SW18) \overline{PROG} pin to the 3.3V supply through a pullup resistor. |
| JU5 | Connects the board's VBAT signal to the lithium battery (1 to 2) or to GND (2 to 3). |
| JU6 | Connects U13's (DS8024) CLKDIV1 pin (1) to the 3.3V supply. |
| JU7 | Connects U13's (DS8024) CLKDIV2 pin (2) to the 3.3V supply. |
| JU8 | Connects U13's (DS8024) 5V/ $\overline{3V}$ pin (3) to GND. |
| JU9 | Connects U14's (MAX3387E) R2OUT pin (13) to the board's \overline{PROG} signal. |
| JU10 | Connects U13's (DS8024) AUX1IN pin (27) to GND. |
| JU11 | Connects U13's (DS8024) AUX2IN pin (28) to GND. |
| JU12 | Connects U15's (MAX3346) MODE pin (3) through a resistor to 3.3V (1 to 2 = differential mode) or to GND (2 to 3 = single-ended mode). |
| JU13 | Connects U16's (DS8024) CLKDIV1 pin (1) to the 3.3V supply. |
| JU14 | Connects U16's (DS8024) CLKDIV2 pin (2) to the 3.3V supply. |
| JU15 | Connects U16's (DS8024) 5V/ $\overline{3V}$ pin (3) to GND. |
| JU16 | Connects U15's (MAX3346) SPEED pin (8) through a resistor to the 3.3V supply (1 to 2 = 12Mbps) or to GND (2 to 3 = 1.5Mbps). |
| JU17 | Connects U16's (DS8024) AUX1IN pin (27) to GND. |
| JU18 | Connects U16's (DS8024) AUX2IN pin (28) to GND. |
| JU19 | Connects U16's (DS8024) \overline{PRES} pin (9) to GND. |

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Using the LCD Module

The LCD display module included on the MAXQ1103 EV kit board is a two-line, 20-character display. The module contains the LCD driver and is communicated with through the MAXQ1103's parallel interface. A library function is available on the EV kit CD to demonstrate the use of this LCD module.

Make sure the LCD screen contrast is adjusted correctly before using it. If the contrast is not properly adjusted, the characters can be difficult or impossible to see on the display. To adjust the contrast, use a Philips head screwdriver on R6, labeled **LCD Contrast** (on the upper left side of the EV kit board). Turn the adjustment until all the pixels darken, then turn back until the dark pixels just disappear.

Using the Smart Card Sockets

Two smart card sockets are included with the MAXQ1103 EV kit board. A full-sized smart card socket at J3 brings all eight smart card contacts out from an 8024-style analog smart card interface. The SIM-sized socket at J5 brings out the six smart card contacts generally used for SIM or SAM card communication. These lines are also driven by an 8024-style analog smart card interface.

Several jumpers around the smart card sockets allow the user to configure inputs that are less commonly used in smart card applications.

- JU6-JU7 (and JU13-JU14) are used to select the clock-divider inputs, CLKDIV[1:2], for the smart card interface.
- JU8 (and JU15) are used to select between 3V and 5V card operation.
- JU10-JU11 (and JU17-JU18) are used to connect the auxiliary input pins (AUX1IN and AUX2IN) to ground.
- JU19 is used to configure the presence input (PRES) for the SIM-sized socket, which does not support a presence signal.

Use these smart card interface inputs dynamically by opening the jumpers and connecting the pins to any of the MAXQ1103 port headers, such as JH2 or JH4.

Configuring USB

The MAXQ1103 EV kit board contains a USB interface at J4 for prototyping USB slave applications. An external transceiver (MAX3346) is connected to the serial interface engine of the MAXQ1103 to provide the USB interface. JU12 and JU16 are configurable inputs for the MAX3346. Use jumper JU12 to select single-ended or differential mode, and use JU16 to select 1.5Mb or 12Mb communication speed.

Serial-Port Interface

Both MAXQ1103 serial ports are brought out to RS-232 levels and have 9-pin connectors (labeled J2 and P1) on the left side of the EV kit board. Jumper JU9 allows the user to connect serial port 0's DTR signal to the MAXQ1103 programming input signal, allowing the user to control the entire loading process through a serial cable connected to a PC.

Keypad

The MAXQ1103 EV kit board provides 16 momentary contact switches that are intended for user input. The switches are arranged in a 4x4 matrix. One side of the switch is connected to four buffered output port pins through a resistor (ROW0-ROW3), and the other side of the switch is connected to four buffered input port pins (COL0-COL3). Each column is connected to the 3.3V supply through a pullup resistor. Therefore, the row-column matrix can be scanned to determine when a switch has been pressed. Software to perform this scanning is provided by one of the example programs available on the EV kit CD.

JTAG Interface

A serial-to-JTAG board (provided with the EV kit) is used to program and debug applications running on the MAXQ1103 EV kit board. Connect the 10-pin ribbon cable from the JTAG board to J6 on the MAXQ1103 EV kit board. Tools such as the Microcontroller Tool Kit (MTK) and Rowley's CrossStudio Integrated Development Environment have built-in support for loading applications through the JTAG interface and using all the MAXQ1103 debug functionality (breakpoints, register and memory reading, etc.).

Note to readers: This document is an abridged version of the full EV kit data sheet. To request the full EV kit data sheet, go to www.maxim-ic.com/MAXQ1103-KIT.