Rev 1.2: 102005

MAXIM
DS5250 Evaluation Kit

General Description

The DS5250 evaluation kit (EV) is a proven platform to conveniently evaluate the capabilities of the DS5250 high-speed secure microcontroller. It contains the microprocessor, 1MB of battery-backed SRAM, 1MB flash memory, a power-supply regulator, two DB-9 serial connectors, and switches and LEDs to control and display board operation. With the addition of a power supply and an RS-232 cable connected to a personal computer, the kit provides a completely functional system ideal for evaluating the capabilities of the DS5250.

Applications

The evaluation board allows the user to easily load and execute code on the DS5250 processor. The kit is delivered with a customized Keil Software debugger that can be used to debug application code prior to availability of the end target hardware. Schematic diagrams for the board are also included to provide a convenient reference design (go to www.maxim-ic.com/support). The DS5250 processor is ideal for applications requiring a trusted computing environment for private or secret information such as card terminals, PIN pads, access control units, and similar applications.

Features

♦ **Easily Load Code Using Bootstrap Loader and Serial 0 Port (DB-9, J2)**

♦ **Two DB-9 RS-232 Serial Connectors**

♦ **Four Available Serial Ports**
   Two Internal Serial Ports
   Two Using External UART Device

♦ **On-Board Power Supply Regulator**

♦ **Header for Smart Card Socket**

♦ **Security Access Module (SAM) Socket**

♦ **Support for LCD Module**

♦ **Pushbutton Switches for Keypad Simulation, Data Entry, and Board Control**

♦ **Board Schematics Included to Provide a Convenient Reference Design**

Ordering Information

PART	TEMP RANGE	DIMENSIONS
DS5250-KIT	Room	16cm x 10cm

Typical Operating Circuit
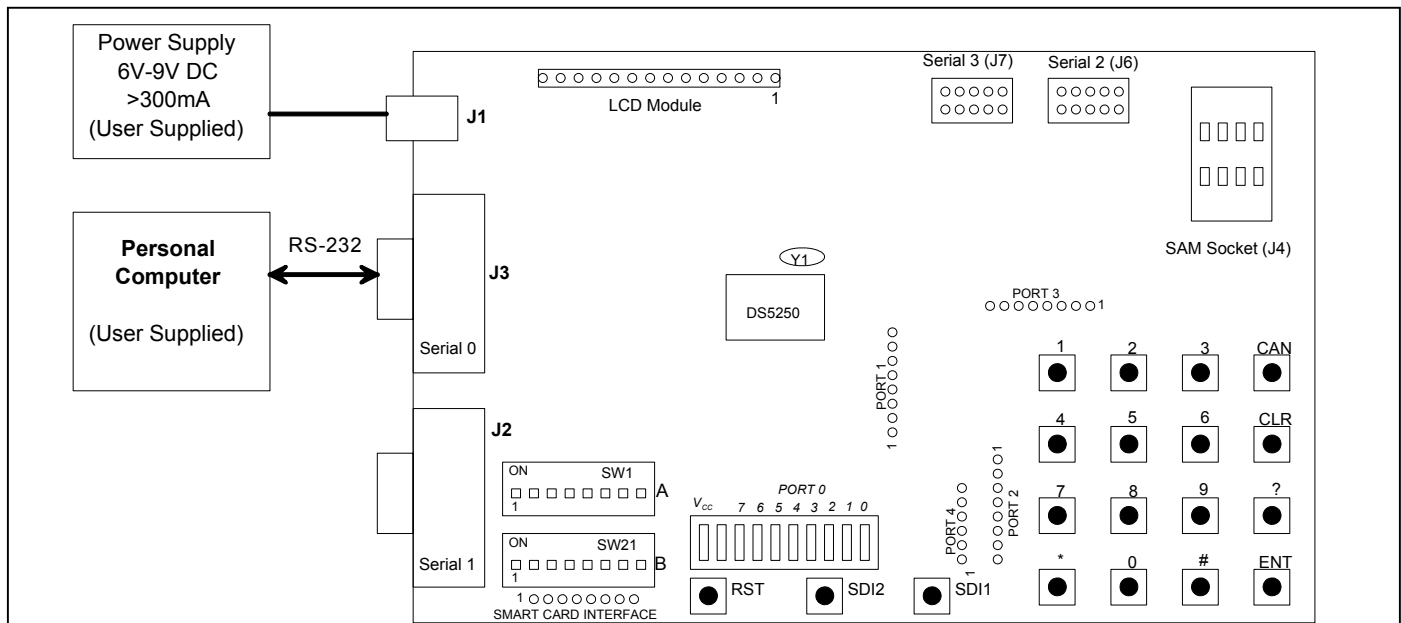
For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

## Component List

DESIGNATOR(S)	QTY	DESCRIPTION	MANUFACTURER/ PART NUMBER
B1	1	3V, 125mAh Lithium battery	Panasonic CR1632
C1, C2, C9	3	10 μF, 16V ceramic capacitors	Panasonic ECJ-3YF1C106Z
C3–C8, C10–C17, C20, C21, C24–C27, C30, C31	22	0.1 μF capacitors	Panasonic ECJ-2VF1C104Z
C22, C23, C28, C29, C32, C35	6	100nF ±10%, 16V capacitors	Panasonic ECJ-2VF1C104Z
C18, C19, C33, C34	4	22pF capacitors	Panasonic ECJ-2VC1H220J
J1	1	Power barrel connector (2.0mm)	CUI Inc. PJ-002A
J2, J3	2	DB-9 female connectors	Amp/Tyco 745781-4
J4	1	SAM card socket	Amphenol C707-10M006-0492
J5, J8–J24	18	Header pins (single row, 0.1in spaced) (Only port pins populated)	—
J6, J7	2	Header pins (double row, 0.1in spaced)	—
JP1, JP2	2	Solder pad jumpers (closed)	—
JP3, JP4, JP5	3	Solder pad jumpers (open)	—
Q1	1	p-channel MOSFET	Fairchild NDS8434
R1, R2, R3	3	10kΩ resistors	—
R4	1	330Ω resistors	—
R5	1	1M resistor	—
R6, R8	2	1.5kΩ resistors	—
R7	1	10kΩ trim resistor	Panasonic EVN-D2AA03B14
RN1	1	330Ω resistor SIP (9)	CTS 770101331
RN2	1	1kΩ resistor SIP (9)	CTS 770101102
SW1, SW21	2	DIP switches x8 CTS208-8	C&K SDA08H1KD
SW2–SW20	19	SPST pushbuttons	Omron B3FS-1000
TP1, TP2, TP3	0	Unpopulated test points	—
U1	1	Linear regulator (5 V, 500 mA)	MAX603CSA
U2	1	Hex inverter	Fairchild 74VHC04M
U3	1	High-speed secure microprocessor	DS5250F-125
U4, U5	2	512k x 8 SRAM, 55ns	Hitachi HM628512BLTT-5{,SL,UL}
U6	1	1M x 8 flash memory, 55ns	AMD AM29F080B-55E{C,I,E}
U7, U9, U10	3	RS-232 (5 in, 4 out) drivers	MAX213ECWI
U8	1	Dual external UART	National PC16552D
U11	1	14 x 1 unpopulated header (for LCD module)	Optrex DMC16207 LCD module (16 char x 2 lines)
U12	1	Inverting octal buffer	Fairchild 74AC540SC
U13	1	LED x10 display (port 1/power)	Lumex SSA-LXB10IW-GF/LP
U14	1	Octal CMOS switch debouncer	MAX6818EAP
Y1	1	22.1184MHz socketed crystal	Citizen HC49US22.1184MABJ
Y2	1	32.768 kHz crystal	ECS ECS-.327-12.5-13
Y3	1	18.432MHz socketed crystal	Citizen HC49US18.432MABJ

This component list is provided to the customer as an aid in building their own application and the listing of these components does not guarantee their suitability for a particular application. Any component listed can be substituted for equivalent product without notice.

Figure 1. DS5250 Evaluation Kit Board
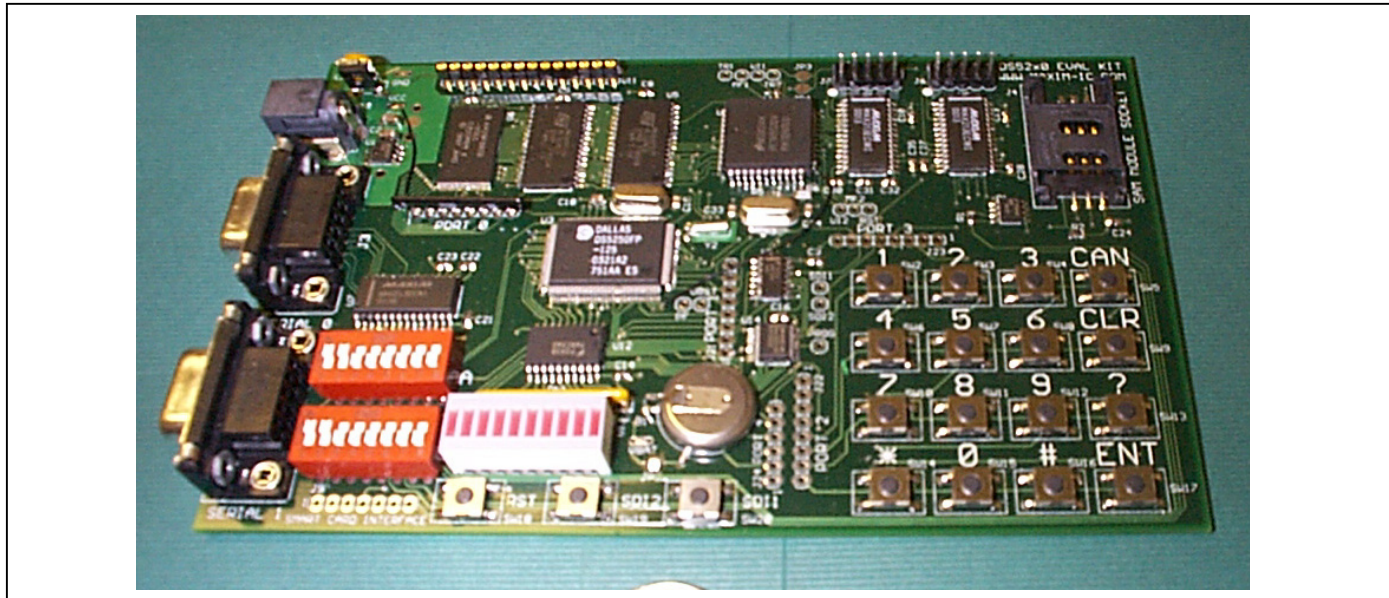
Detailed Description

This EV kit must be used in conjunction with the following documents:
- High-Speed Microcontroller User's Guide (www.maxim-ic.com/HSMUG)
- High-Speed Microcontroller User's Guide: DS5250 Supplement (www.maxim-ic.com/DS5250sup)
- DS5250 Data Sheet (www.maxim-ic.com/DS5250)

A complete description of the bootstrap loader commands and functions is located in the *High-Speed Microcontroller User's Guide: DS5250 Supplement*.

The DS5240 and DS5250 are high-speed 8051-compatible microcontrollers with strong cryptographic features. These devices were designed to meet the security requirements of FIPS-140, Common Criteria, and PCI POS PED Derived Test Requirements. Due to their strong encryption capability, the DS5240 and DS5250 devices and their documentation are subject to the export control laws and regulations of the United States. To receive complete technical information on these secure microcontrollers, contact the microcontroller technical support group at www.maxim-ic.com/support.

The DS5250 evaluation board and all its connectors are defined in the schematics provided in the accompanying documentation disk. However, a short description of the major components of the board follows.

Memory

Program memory on the evaluation board is contained in two battery-backed 512kB SRAMs, enabled by $\overline{CE1}$ and $\overline{CE2}$. Data memory is contained in a 1MB flash memory enabled by $\overline{CE3N}$.

Keypad

The evaluation board incorporates a 4 x 4 keypad, row and column scanned by port 2.

I/O Access

Ports 0, 1, 2, 3, and 4 are brought out on the board in rows of 0.025in square header pins. In addition, port 0 is optionally displayed on the LED bar graph U13. Note that the optional LCD module is connected to port 0 and, as a

result, the LED bar graph may not present the expected output when the LCD module is connected to the evaluation board.

Serial Ports

The evaluation board has four serial ports. Serial ports 0 and 1 correspond to the internal serial ports of the DS5250 and are brought out to J3 and J2, respectively. A pair of MAX213E line driver/receivers creates serial ports 2 and 3, providing additional debug ports without sacrificing the internal serial ports. The signals for these ports are brought out on J6 and J7.

Smart Card Interface

All the signals necessary to interface to an externally mounted smart card are brought out in a row of 0.025in square header pins.

Security Access Module (SAM) Socket

The evaluation board has a socket for a general-purpose SAM that can be used by the application.

LCD

The DS5250 evaluation board supports a standard parallel interface LCD such as the Optrex DMC16207 or similar product.

Jumper Settings

The DS5250 EV kit is customized by two banks of DIP switches and individual solder jumpers. Most of these jumpers are solder jumpers, which are closed by soldering the two contacts together.

Table 1. DIP Switch Bank A (SW1)

POSITION	ON	OFF
1	P3.0 is connected to serial port RXD0.	P3.0 is not connected to serial port RXD0 and available for general-purpose I/O.
2	P3.1 is connected to serial port RXD0.	P3.1 is not connected to serial port TXD0 and available for general-purpose I/O.
3	P1.2 is connected to serial port RXD0.	P1.2 is not connected to serial port RXD1 and available for general-purpose I/O.
4	P1.3 is connected to serial port RXD0.	P1.3 is not connected to serial port TXD1 and available for general-purpose I/O.
5	P4.0 is connected to serial port DTR0.	P4.0 is not connected to serial port DTR0 and available for general-purpose I/O.
6	P4.1 is connected to serial port CTS0.	P4.1 is not connected to serial port CTS0 and available for general-purpose I/O.
7	P4.3 is connected to serial port DSR0.	P4.3 is not connected to serial port DSR0 and available for general-purpose I/O.
8	P4.4 is connected to serial port RTS0.	P4.4 is not connected to serial port RTS0 and available for general-purpose I/O.

Table 2. DIP Switch Bank B (SW21)

POSITION	ON	OFF
1	DS5250 bootstrap loader enabled.	DS5250 bootstrap loader disabled and device is in run mode.
2	LED bank (U13) connected to port 0.	LED bank disabled.
3	P1.3 is connected to SCI/O signal on smart card interface.	P1.3 is available for general-purpose I/O.
4	P1.2 is connected to SCI/O signal on smart card interface.	P1.2 is available for general-purpose I/O.
5	P3.7 enables/disables power to smart card interface.	P3.7 is available for general-purpose I/O.
6	SAM card socket power (+5V) on.	No power applied to SAM card socket.
7	SDI1 button connected to SDI1 pin on microcontroller.	SDI1 button disconnected.
8	SDI2 button connected to SDI1 pin on microcontroller.	SDI2 button disconnected.

Table 3. Individual Jumpers

JUMPER	WHEN IN PLACE:
JP1	Connects DS5250 VCC to output of on-board 5V regulator.
JP2	Connects DS5250 VLI to on-board lithium cell.
JP3	Connects serial port 2 interrupt from PC16552 to DS5250 INT2.
JP4	Connects serial port 3 interrupt from PC16552 to DS5250 INT2.
JP5	Enables DTR0 signal to activate bootstrap loader via the $\overline{\text{PROG}}$ pin.

Configuring the DS5250 for the Evaluation Board

The design of the evaluation board requires that the following memory configuration settings be initialized via the ROM loader before downloading software.

MSIZE = 10011010b = 9Ah
Program Memory Size Bits = 010 (512kB)
Data Memory Size Bits = 011 (1MB)
MSEL Pin Status = 1 (read only)

MCON =11111x10b = FAh
External Memory Partition = 1111 (ignored because PM = 1)
Voltage Sensitivity = 1 (can be 1 or 0 for testing)
x =indeterminate read value, writes ignored
Partition Mode = 1 (nonpartitioned mode)
Security Lock = 0 (Unlocked)

MCEN = 04h
Enable $\overline{\text{CE3N}}$ = 1
FCE3 = 01h
Flash memory connected to $\overline{\text{CE3N}}$.

Getting Started

1) Install Microcontroller Tool Kit (MTK) on the PC.

2) Make sure switches are set to the following:
   A1 ON
   A2 ON
   A5 ON
   B1 ON
   B2 ON

3) Attach the DB-9 serial cable from the PC to Serial 0 (J3).

4) Connect a user-supplied power supply (6V to 9V DC, > 300mA) to the evaluation board (connector J1).

5) Activate MTK and select DS5240/DS5250 as the device.

6) Under **Options → Configure Serial Port** select the desired the COM port. For initial checkout, leave speed at 9600 baud. This can be changed as soon as operation is verified.

7) Under **Target** select **Open COMx at 9600 baud**. The main window should switch from gray to white.

8) Select **Target → Connect to Loader**. The main window should display the ROM loader sign-on banner, similar to the following but with a unique LID:

```
DS5250 SECURE LOADER VERSION 1.0 COPYRIGHT (C) 2002 DALLAS SEMICONDUCTOR
     LID: 62C90E00000000F9 911F
```

9) Configure memory settings for the evaluation board as described above using the ROM Loader Write command.

```
W MSIZE 9C
W MCON FC
W MCEN 04
W FCE3 01
```

10) Load EV50_CHK.HEX. Set switch B1 to OFF. The program should run, flashing all the bits of port 0 on LED U10, and then walking a single bit back and forth.

Special Notes When Using Revision A Hardware

The revision A and revision B hardware are similar, with the primary exception being the pinout of the revision A Serial 2 and Serial 3 connectors as shown in Figure 2.

Figure 2. DS5250 Revision A Showing Pinout of J6 and J7
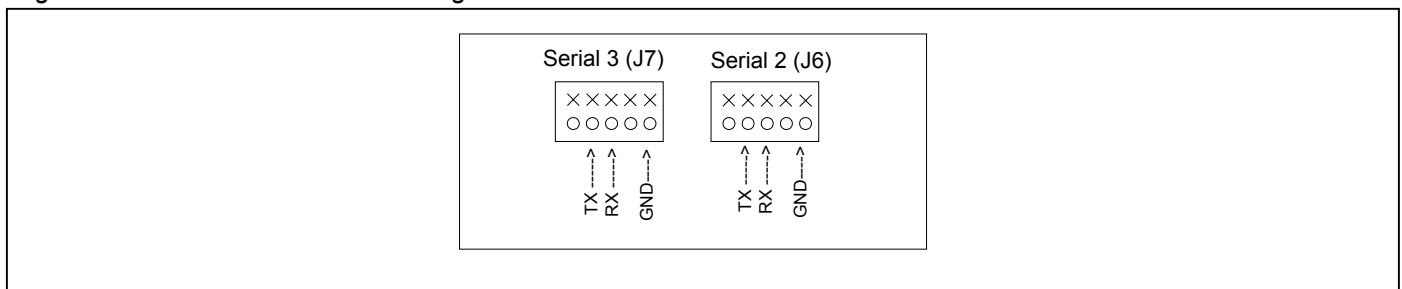
Schematics

For the complete schematics, email contact technical support at www.maxim-ic.com/support.

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