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XC835/836

8-Bit Single-Chip Microcontroller

Data Sheet

V1.4 2011-10

Microcontrollers

Edition 2011-10

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XC835/836

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Data Sheet

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XC835/836 Data Sheet**Revision History: V1.4 2011-10**

Previous Versions: V 1.2

Page	Subjects (major changes since last revision)
Page 3	Added a new variant (SAF-XC836-2FRA) in Table 2.
Page 24	Added the SAK temperature range in Table 7.
Page 21	Updated the Chip Identification number in Table 5.

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1 Summary of Features

The XC835/836 has the following features:

- High-performance XC800 Core
 - compatible with standard 8051 processor
 - two clocks per machine cycle architecture (for memory access without wait state)
 - two data pointers
- On-chip memory
 - 8 Kbytes of Boot ROM, Library ROM and User routines
 - 256 bytes of RAM
 - 256 bytes of XRAM
 - 4/8 Kbytes of Flash (includes memory protection strategy)
- I/O port supply at 2.5 V - 5.5 V and core logic supply at 2.5 V (generated by embedded voltage regulator)

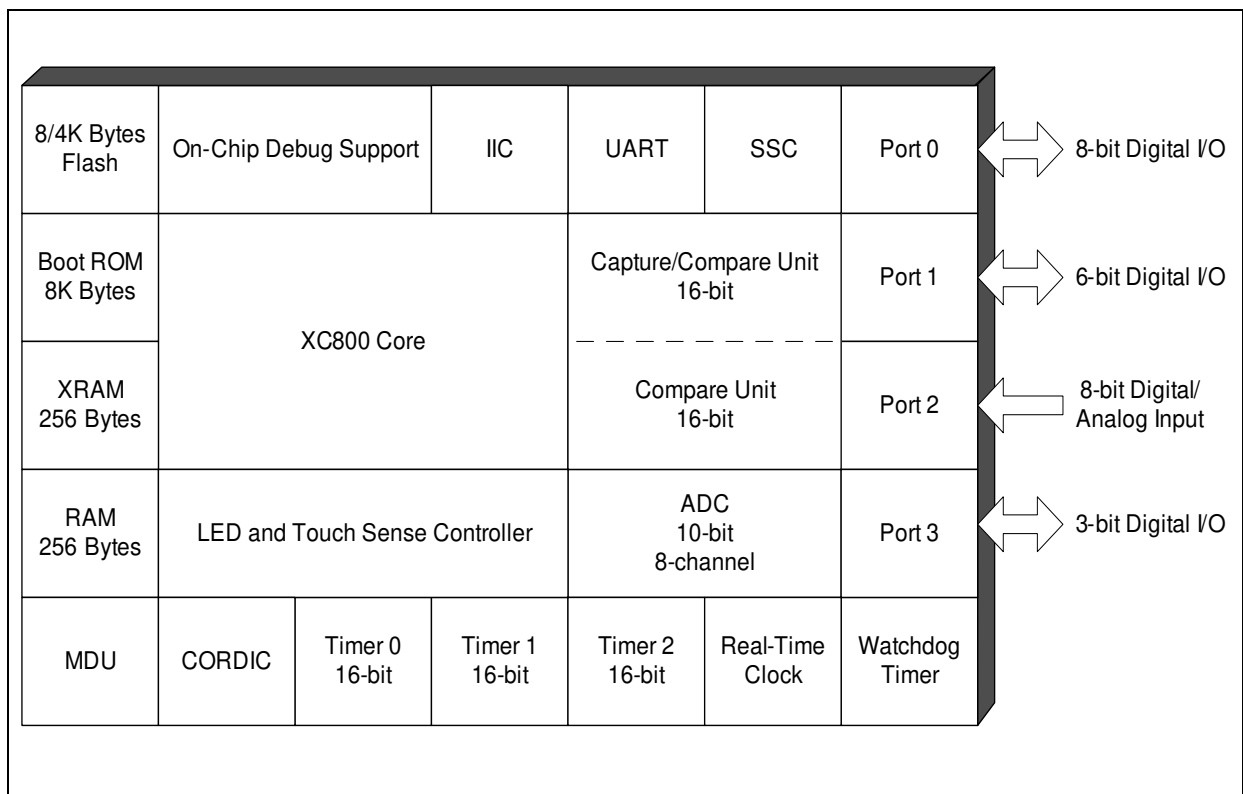


Figure 1 XC835/836 Functional Units

- Power-on reset generation
- Brownout detection for IO supply and core logic supply
- 48 MHz on-chip OSC for clock generation
 - Loss-of-Clock detection

(more features on next page)

Summary of Features

Features: (continued)

- Power saving modes
 - idle mode
 - power-down mode with wake-up capability via real-time clock event
 - clock gating control to each peripheral
- Programmable 16-bit Watchdog Timer (WDT) running on independent oscillator with programmable window feature for refresh operation and warning prior to overflow
- Three general purpose I/O ports
 - 4 high current I/O
 - 2 high sink I/O
 - Up to 25 pins as digital I/O
 - Up to 8 pins as digital/analog input
- Up to 8 channels, 10-bit A/D Converter
 - support up to 7 differential input channel
 - results filtering by data reduction or digital low-pass filter, for up to 13-bit results
- Up to 8 channels, Out of range comparator
- Three 16-bit timers
 - Timer 0 and Timer 1 (T0 and T1)
 - Timer 2 (T2)
- Real-time clock with 32.768 kHz crystal pad
- 16-bit Vector Computer for Field-Oriented Control (FOC)
 - Multiplication/Division Unit (MDU) for arithmetic calculation
 - CORDIC Unit for trigonometric calculation
- Capture and Compare unit for PWM signal generation (CCU6)
- A full-duplex or half-duplex serial interface (UART)
- Synchronous serial channel (SSC)
- Inter-IC (IIC) serial interface
- LED and Touch-sense Controller (LEDTSCU)
- Software libraries to support fixed-point control and EEPROM emulation
- On-chip debug support via single pin DAP interface (SPD)
- Packages:
 - PG-DSO-24
 - PG-TSSOP-28
- Temperature range T_A :
 - SAF (-40 to 85 °C)
 - SAK (-40 to 125 °C)

Summary of Features
XC835/836 Variant Devices

The XC835/836 product family features devices with different configurations, program memory sizes, packages options and temperature profiles, to offer cost-effective solutions for different application requirements.

The list of XC835/836 device configurations are summarized in **Table 1**. The type of packages available are DSO-24 for XC835 and TSSOP-28 for XC836.

Table 1 Device Configuration

Device Name	MDU and CORDIC Module	LEDTSCU Module
XC835/836	No	No
XC835/836M	Yes	No
XC835/836T	No	Yes
XC835/836MT	Yes	Yes

Table 2 shows the device sales type available, based on above device.

Table 2 Device Profile

Sales Type	Device Type	Program Memory (Kbytes)	Temperature Profile (°C)	Package Type	Quality Profile
SAF-XC835MT-2FGI	Flash	8	-40 to 85	PG-DSO-24-1	Industrial
SAF-XC836-2FRI	Flash	8	-40 to 85	PG-TSSOP-28-1	Industrial
SAF-XC836T-2FRI	Flash	8	-40 to 85	PG-TSSOP-28-1	Industrial
SAF-XC836M-2FRI	Flash	8	-40 to 85	PG-TSSOP-28-1	Industrial
SAF-XC836M-1FRI	Flash	4	-40 to 85	PG-TSSOP-28-1	Industrial
SAF-XC836MT-2FRI	Flash	8	-40 to 85	PG-TSSOP-28-1	Industrial
SAF-XC836-2FRA	Flash	8	-40 to 85	PG-TSSOP-28-12	Automotive
SAF-XC836MT-2FRA	Flash	8	-40 to 85	PG-TSSOP-28-12	Automotive
SAF-XC836MT-1FRA	Flash	4	-40 to 85	PG-TSSOP-28-12	Automotive
SAK-XC836MT-2FRA	Flash	8	-40 to 125	PG-TSSOP-28-12	Automotive
SAK-XC836MT-1FRA	Flash	4	-40 to 125	PG-TSSOP-28-12	Automotive

As this document refers to all the derivatives, some description may not apply to a specific product. For simplicity, all versions are referred to by the term XC835/836 throughout this document.

Summary of Features

Ordering Information

The ordering code for Infineon Technologies microcontrollers provides an exact reference to the required product. This ordering code identifies:

- The derivative itself, i.e. its function set, the temperature range, and the supply voltage
- The package and the type of delivery

For the available ordering codes for the XC835/836, please refer to your responsible sales representative or your local distributor.

2 General Device Information

Chapter 2 contains the block diagram, pin configurations, definitions and functions of the XC835/836.

2.1 Block Diagram

The block diagram of the XC835/836 is shown in Figure 2.

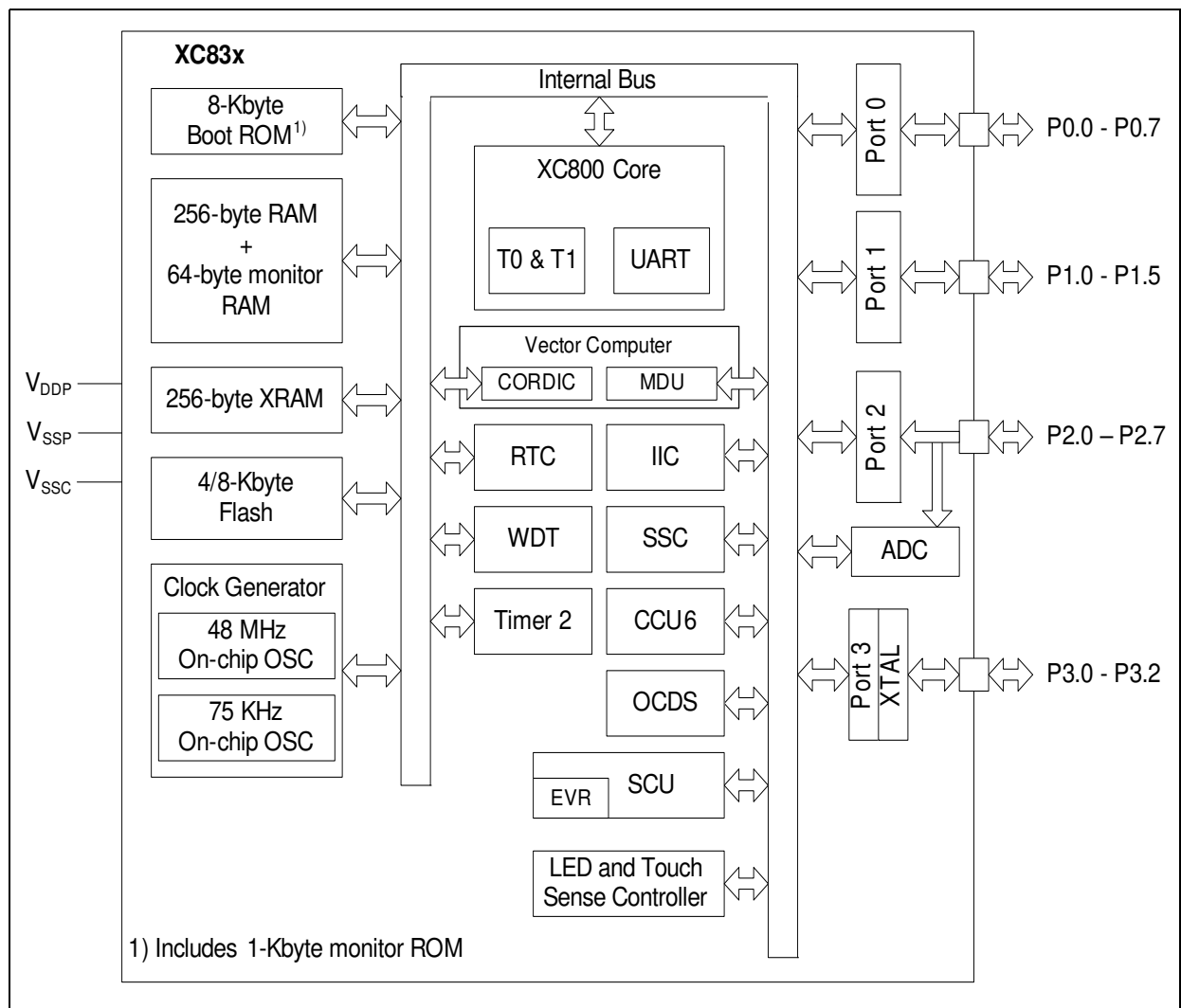


Figure 2 XC835/836 Block Diagram

2.2 Logic Symbol

The logic symbol of the XC835/836 is shown in [Figure 3](#).

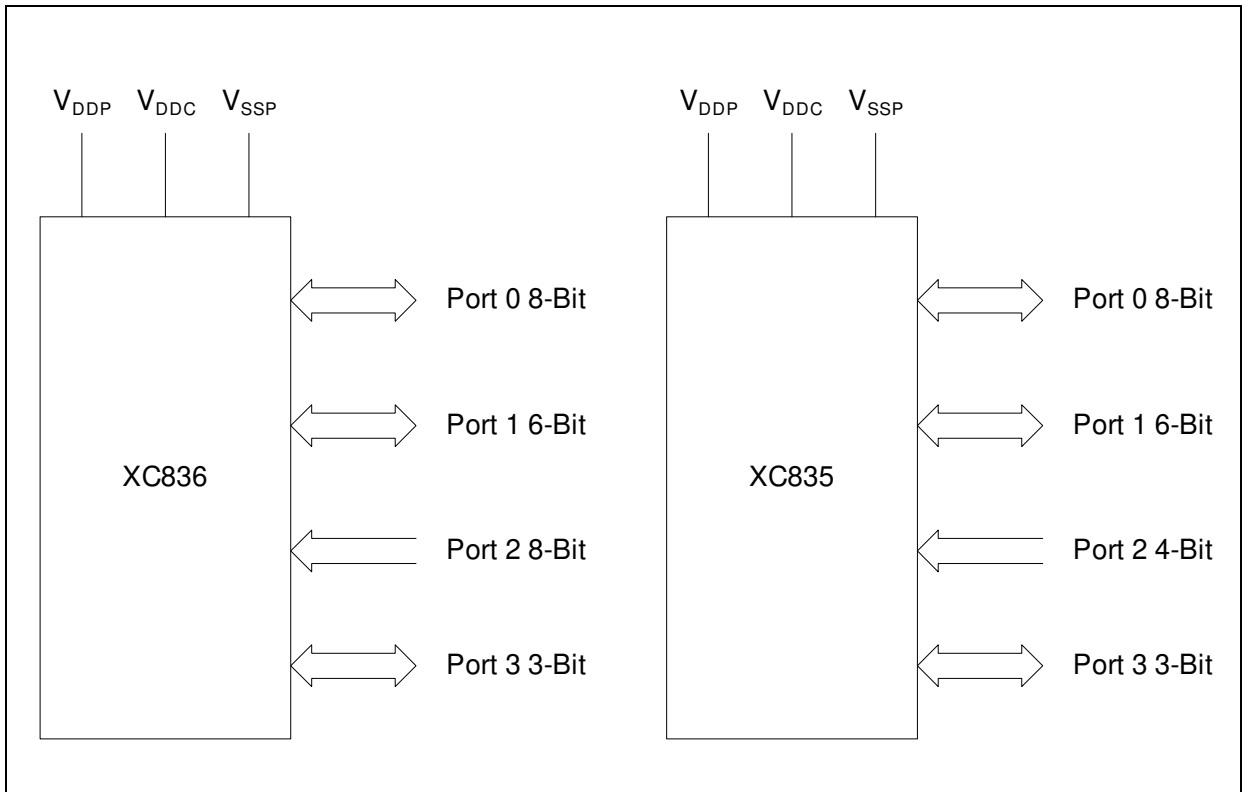


Figure 3 XC835/836 Logic Symbol

2.3 Pin Configuration

The pin configuration of the XC835 in [Figure 4](#).

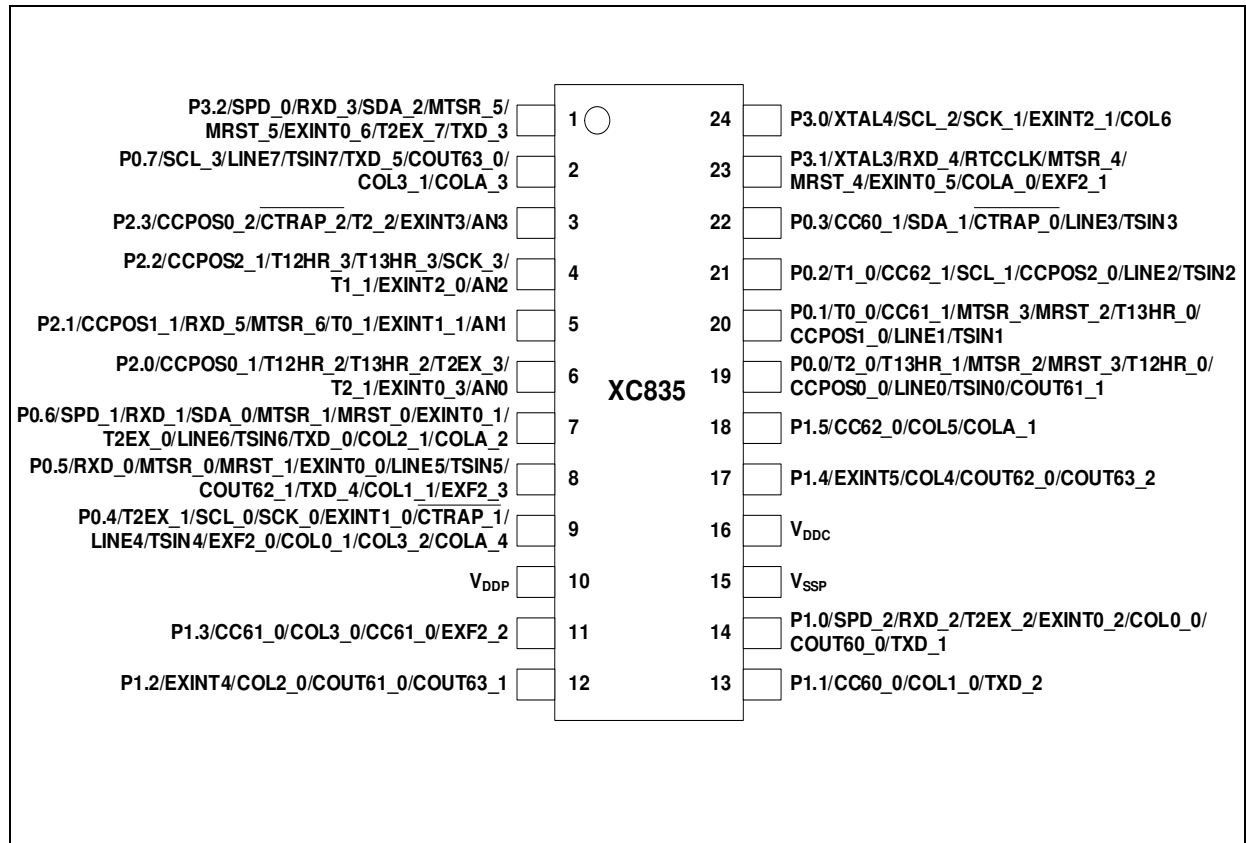


Figure 4 XC835 Pin Configuration, PG-DSO-24 Package (top view)

General Device Information

The pin configuration of the XC836 in [Figure 5](#).

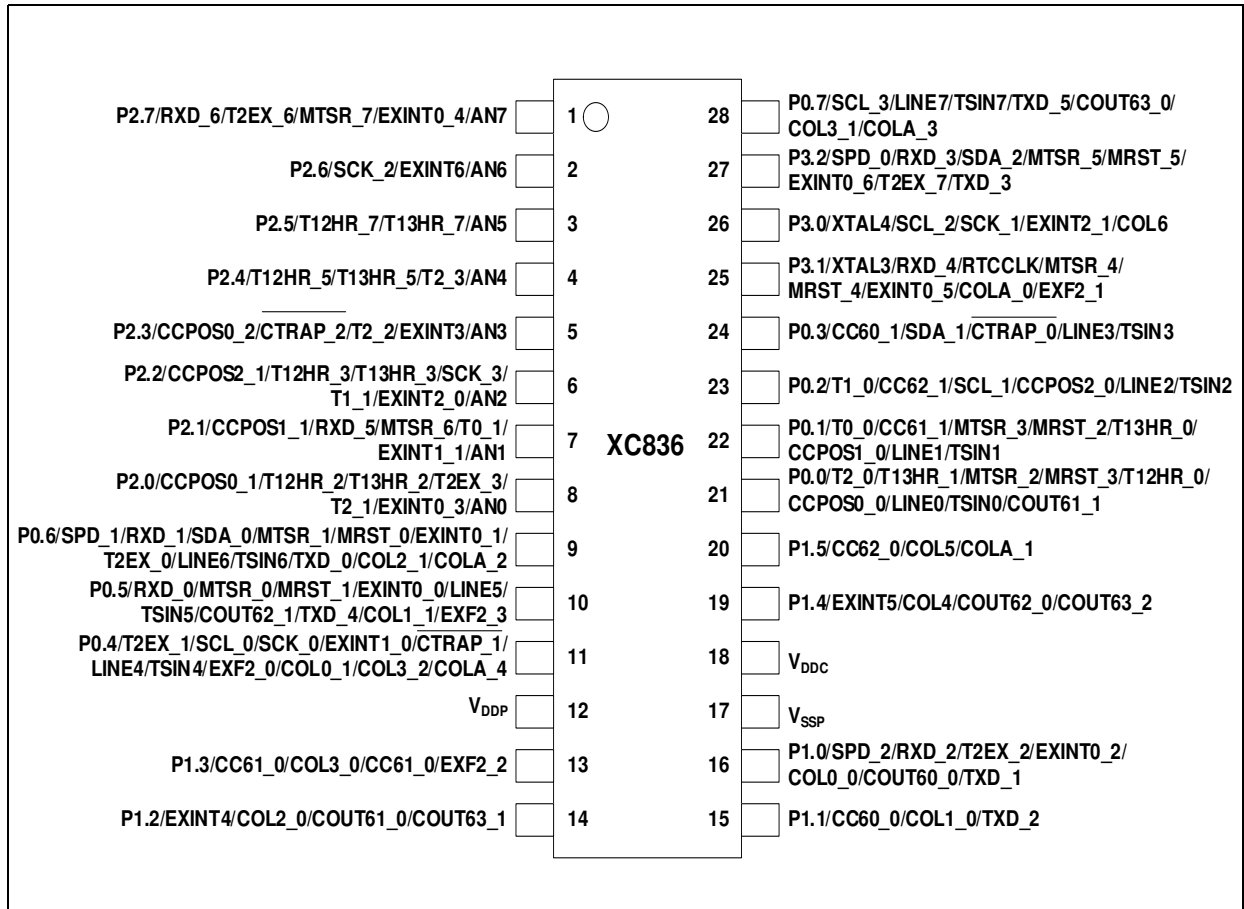


Figure 5 XC836 Pin Configuration, PG-TSSOP-28 Package (top view)

2.4 Pin Definitions and Functions

The functions and default states of the XC835/836 external pins are provided in [Table 3](#).

Table 3 Pin Definitions and Functions for XC835/836

Symbol	Pin Number TSSOP28/ DS024	Type	Reset State	Function
P0		I/O		Port 0 Port 0 is a bidirectional general purpose I/O port. It can be used as alternate functions for LEDTSCU, Timer 0, 1 and 2, SSC, CCU6, IIC, SPD and UART.
P0.0	21/19		Hi-Z	T2_0 Timer 2 Input T13HR_1 CCU6 Timer 13 Hardware Run Input MTSR_2 SSC Master Transmit Output/ Slave Receive Input MRST_3 SSC Master Receive Input T12HR_0 CCU6 Timer 12 Hardware Run Input CCPOS0_0 CCU6 Hall Input 0 TSIN0 Touch-sense Input 0 LINE0 LED Line 0 COUT61_1 Output of Capture/Compare Channel 1

General Device Information
Table 3 Pin Definitions and Functions for XC835/836 (cont'd)

Symbol	Pin Number TSSOP28/ DS024	Type	Reset State	Function
P0.1	22/20		Hi-Z	T0_0 Timer 0 Input CC61_1 Input/Output of Capture/Compare channel 1 MTSR_3 SSC Slave Receive Input MRST_2 SSC Master Receive Input/ Slave Transmit Output T13HR_0 CCU6 Timer 13 Hardware Run Input CCPOS1_0 CCU6 Hall Input 1 TSIN1 Touch-sense Input 1 LINE1 LED Line 1
P0.2	23/21		Hi-Z	T1_0 Timer 1 Input CC62_1 Input/Output of Capture/Compare channel 2 SCL_1 IIC Clock Line CCPOS2_0 CCU6 Hall Input 2 TSIN2 Touch-sense Input 2 LINE2 LED Line 2
P0.3	24/22		Hi-Z	CC60_1 Input/Output of Capture/Compare channel 0 SDA_1 IIC Data Line CTRAP_0 CCU6 Trap Input TSIN3 Touch-sense Input 3 LINE3 LED Line 3

General Device Information
Table 3 Pin Definitions and Functions for XC835/836 (cont'd)

Symbol	Pin Number TSSOP28/ DS024	Type	Reset State	Function
P0.4	11/9		PD	T2EX_1 Timer 2 External Trigger Input SCK_0 SSC Clock Input/Output SCL_0 IIC Clock Line CTRAP_1 CCU6 Trap Input EXINT1_0 External Interrupt Input 1 TSIN4 Touch-sense Input 4 LINE4 LED Line 4 EXF2_0 Timer 2 Overflow Flag COL0_1 LED Column 0 COL3_2 LED Column 3 COLA_4 LED Column A
P0.5	10/8		Hi-Z	RXD_0 UART Receive Input MTSR_0 SSC Master Transmit Output/ Slave Receive Input MRST_1 SSC Master Receive Input EXINT0_0 External Interrupt Input 0 TSIN5 Touch-sense Input 5 LINE5 LED Line 5 COUT62_1 Output of Capture/Compare Channel 2 TXD_4 UART Transmit Output COL1_1 LED Column 1 EXF2_3 Timer 2 Overflow Flag

General Device Information
Table 3 Pin Definitions and Functions for XC835/836 (cont'd)

Symbol	Pin Number TSSOP28/ DS024	Type	Reset State	Function
P0.6	9/7		PU	SPD_1 SPD Input/Output RXD_1 UART Receive Input SDA_0 IIC Data Line MTSR_1 SSC Slave Receive Input MRST_0 SSC Master Receive Input/ Slave Transmit Output EXINT0_1 External Interrupt Input 0 T2EX_0 Timer 2 External Trigger Input TSIN6 Touch-sense Input 6 LINE6 LED Line 6 TXD_0 UART Transmit Output COL2_1 LED Column 2 COLA_2 LED Column A
P0.7	28/2		Hi-Z	SCL_3 IIC Clock Line TSIN7 Touch-sense Input 7 LINE7 LED Line 7 TXD_5 UART Transmit Output/ 2-wire UART BSL Transmit Output COUT63_0 Output of Capture/Compare Channel 3 COL3_1 LED Column 3 COLA_3 LED Column A
P1		I/O		Port 1 Port 1 is a bidirectional general purpose I/O port. It can be used as alternate functions for CCU6, LEDTSCU, SPD, UART and Timer 2

General Device Information
Table 3 Pin Definitions and Functions for XC835/836 (cont'd)

Symbol	Pin Number TSSOP28/ DS024	Type	Reset State	Function
P1.0	16/14		Hi-Z	SPD_2 SPD Input/Output RXD_2 UART Receive Input T2EX_2 Timer 2 External Trigger Input EXINT0_2 External Interrupt Input 0 COL0_0 LED Column 0 COUT60_0 Output of Capture/Compare Channel 0 TXD_1 UART Transmit Output
P1.1	15/13		Hi-Z	CC60_0 Input/Output of Capture/Compare channel 0 COL1_0 LED Column 1 TXD_2 UART Transmit Output
P1.2	14/12		Hi-Z	EXINT4 External Interrupt Input 4 COL2_0 LED Column 2 COUT61_0 Output of Capture/Compare channel 1 COUT63_1 Output of Capture/Compare channel 3
P1.3	13/11		Hi-Z	CC61_0 Input/Output of Capture/Compare channel 1 COL3_0 LED Column 3 EXF2_2 Timer 2 Overflow Flag
P1.4	19/17		Hi-Z	EXINT5 External Interrupt Input 5 COL4 LED Column 4 COUT62_0 Output of Capture/Compare channel 2 COUT63_2 Output of Capture/Compare channel 3

General Device Information
Table 3 Pin Definitions and Functions for XC835/836 (cont'd)

Symbol	Pin Number TSSOP28/ DS024	Type	Reset State	Function
P1.5	20/18		Hi-Z	CC62_0 Input/Output of Capture/Compare channel 2 COL5 LED Column 5 COLA_1 LED Column A
P2		I		Port 2 Port 2 is a general purpose input-only port. It can be used as inputs for A/D Converter and out of range comparator, CCU6, Timer 2, SSC and UART.
P2.0	8/6		Hi-Z	CCPOS0_1 CCU6 Hall Input 0 T12HR_2 CCU6 Timer 12 Hardware Run Input T13HR_2 CCU6 Timer 13 Hardware Run Input T2EX_3 Timer 2 External Trigger Input T2_1 Timer 2 Input EXINT0_3 External Interrupt Input 0 AN0 Analog Input 0 / Out of range comparator channel 0
P2.1	7/5		Hi-Z	CCPOS1_1 CCU6 Hall Input 1 RXD_5 UART Receive Input MTSR_6 SSC Slave Receive Input T0_1 Timer 0 Input EXINT1_1 External Interrupt Input 1 AN1 Analog Input 1 / Out of range comparator channel 1

General Device Information
Table 3 Pin Definitions and Functions for XC835/836 (cont'd)

Symbol	Pin Number TSSOP28/ DS024	Type	Reset State	Function
P2.2	6/4		Hi-Z	CCPOS2_1 CCU6 Hall Input 2 T12HR_3 CCU6 Timer 12 Hardware Run Input T13HR_3 CCU6 Timer 13 Hardware Run Input SCK_3 SSC Clock Input/Output T1_1 Timer 1 Input EXINT2_0 External Interrupt Input 2 AN2 Analog Input 2 / Out of range comparator channel 2
P2.3	5/3		Hi-Z	CCPOS0_2 CCU6 Hall Input 0 CTRAP_2 CCU6 Trap Input T2_2 Timer 2 Input EXINT3 External Interrupt Input 3 AN3 Analog Input 3 / Out of range comparator channel 3
P2.4	4/-		Hi-Z	T12HR_5 CCU6 Timer 12 Hardware Run Input T13HR_5 CCU6 Timer 13 Hardware Run Input T2_3 Timer 2 Input AN4 Analog Input 4 / Out of range comparator channel 4
P2.5	3/-		Hi-Z	T12HR_7 CCU6 Timer 12 Hardware Run Input T13HR_7 CCU6 Timer 13 Hardware Run Input AN5 Analog Input 5 / Out of range comparator channel 5

General Device Information

Table 3 Pin Definitions and Functions for XC835/836 (cont'd)

Symbol	Pin Number TSSOP28/ DS024	Type	Reset State	Function
P2.6	2/-		Hi-Z	SCK_2 SSC Clock Input/Output EXINT6 External Interrupt Input 6 AN6 Analog Input 6 / Out of range comparator channel 6
P2.7	1/-		Hi-Z	RXD_6 UART Receive Input T2EX_6 Timer 2 External Trigger Input MTSR_7 SSC Slave Receive Input EXINT0_4 External Interrupt Input 0 AN7 Analog Input 7 / Out of range comparator channel 7
P3		I/O		Port 3 Port 3 is a bidirectional general purpose I/O port. It can be used as alternate functions for IIC, LEDTSCU, UART, Timer 2, SSC, SPD and 32.768 kHz crystal pad.
P3.0	26/24		PU	SCL_2 IIC Clock Line SCK_1 SSC Clock Input/Output EXINT2_1 External Interrupt Input 2 COL6 LED Column 6 XTAL4 32.768 kHz External Oscillator Output

General Device Information
Table 3 Pin Definitions and Functions for XC835/836 (cont'd)

Symbol	Pin Number TSSOP28/ DS024	Type	Reset State	Function
P3.1	25/23		PU	RXD_4 UART Receive Input RTCCLK RTC External Clock Input MTSR_4 SSC Master Transmit Output/ Slave Receive Input MRST_4 SSC Master Receive Input EXINT0_5 External Interrupt Input 0 COLA_0 LED Column A XTAL3 32.768 kHz External oscillator Input EXF2_1 Timer 2 Overflow Flag
P3.2	27/1		PU	SPD_0 SPD Input/Output RXD_3 UART Receive Input/ UART BSL Receive Input SDA_2 IIC Data Line MTSR_5 SSC Slave Receive Input MRST_5 SSC Master Receive Input/ Slave Transmit Output EXINT0_6 External Interrupt Input 0 T2EX_7 Timer 2 External Trigger Input TXD_3 UART Transmit Output/ 1-wire UART BSL Transmit Output
V _{DDP}	12/10	–	–	I/O Port Supply (2.5 V - 5.5 V)
V _{DDC}	18/16	–	–	Core Supply Monitor (2.5 V)
V _{SSP} / V _{SSC}	17/15	–	–	I/O Port Ground/ Core Supply Ground

2.5 Memory Organization

The XC835/836 CPU operates in the following five address spaces:

- 8 Kbytes of Boot ROM, Library ROM and User routines
- 256 bytes of internal RAM
- 256 bytes of XRAM
(XRAM can be read/written as program memory or external data memory)
- A 128-byte Special Function Register area
- 4/8 Kbytes of Flash

Figure 6 illustrates the memory address spaces of the 4 Kbyte Flash devices. **Figure 7** illustrates the memory address spaces of the 8 Kbyte Flash devices.

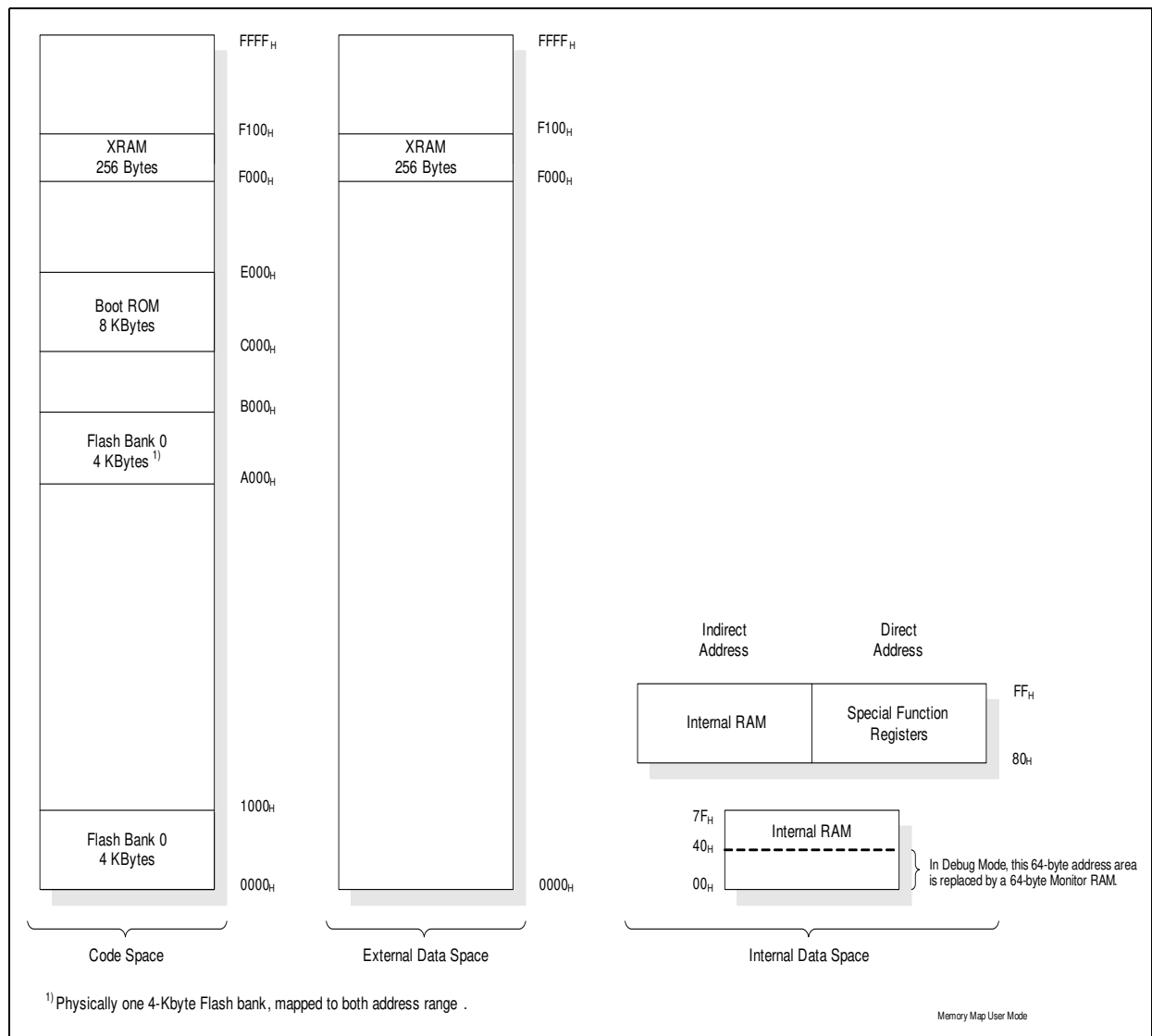


Figure 6 Memory Map of XC835/836 with 4 Kbytes of Flash memory

General Device Information

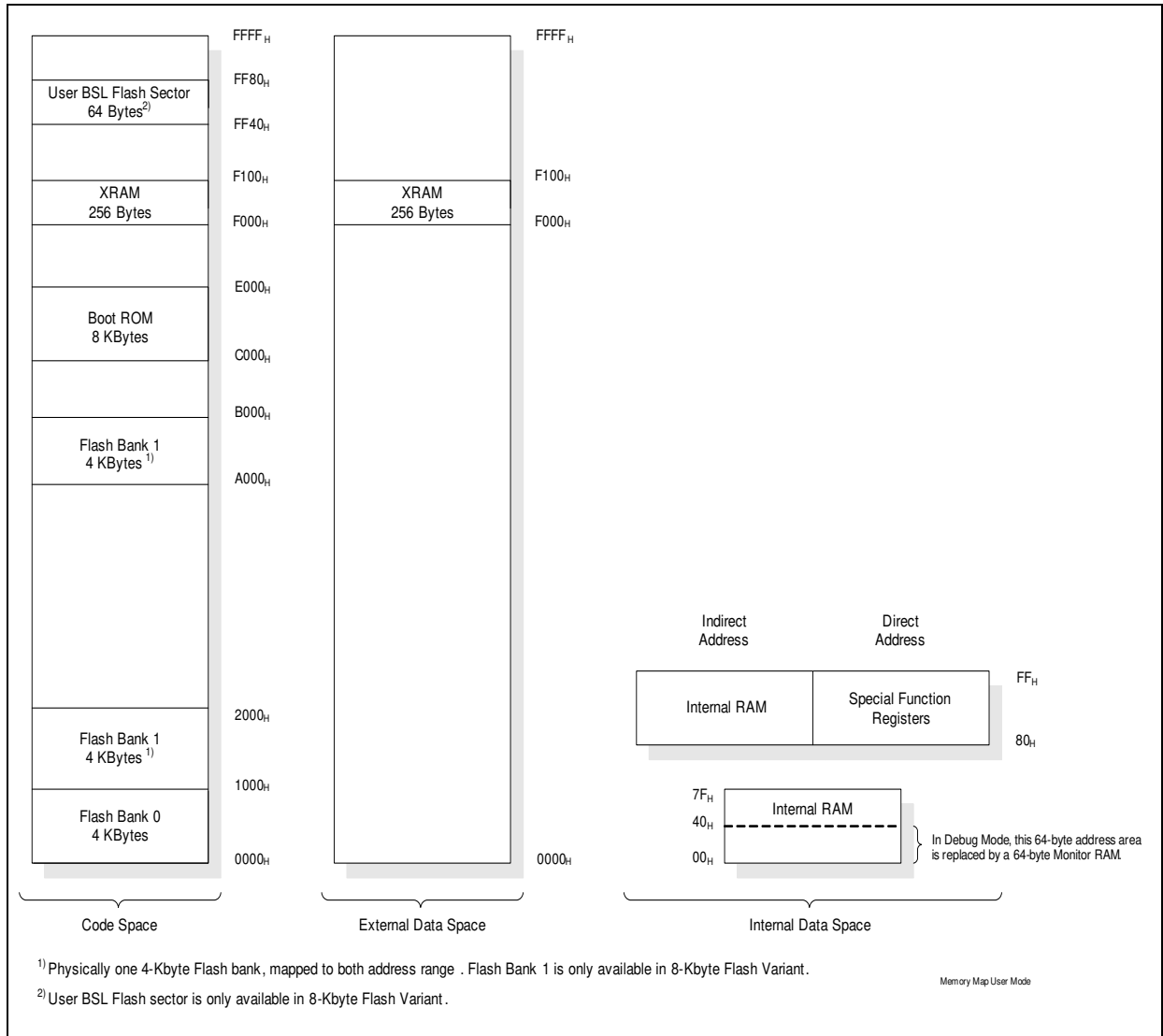


Figure 7 Memory Map of XC835/836 with 8 Kbytes of Flash memory