Atmel AVR541: Migrating from AT90PWM81 to AT90PWM161

8-bit Atmel Microcontrollers

Features

- General porting consideration
- Flash memory
- SRAM
- Signature row
- Interrupt vectors
- CALL instructions

Introduction

This application note aims to outline the differences between Atmel® AT90PWM81 and Atmel AT90PWM161. For detailed information on the devices, refer to the datasheets.

The AT90PWM81 and AT90PWM161 are designed to be a pin- and function-compatible family, and have the same datasheet. The memory sizes are the main difference between AT90PWM81 and AT90PWM161. Because of the differences mentioned in this document, there might be a need for some minor modifications in the application when porting code between the devices.

Minor differences in typical characteristics are not discussed in this document as long as the low and high limits remain the same. For detailed information about the typical characteristics, see sections "Electrical Characteristics" and "Typical Characteristics" of the device datasheet.

Note: This application note serves as a guide to ease migration. For complete device details, always refer to the most recent version of the AT90PWM81/161 datasheet.

1. Flash

The flash memory sizes are different between Atmel AT90PWM81 (8kB) and Atmel AT90PWM161 (16kB). The flash memory is accessed in groups by pages that are of different sizes also. The differences are listed in Table 1-1.

Table 1-1.   Memory sizes.

	FLASH [bytes]	FLASH page size [words]	Number of pages
AT90PWM81	8192	32	128
AT90PWM161	16384	64	128

1.1   Application flash section

The application flash section size varies according to the device configuration. All options are summarized in Table 1-2.

Table 1-2.   Application flash section address.

	BOOTSZ: 11 [words]	BOOTSZ: 10 [words]	BOOTSZ: 01 [words]	BOOTSZ: 00 [words]
AT90PWM81	0x000-0xF7F	0x000-0xEFF	0x000-0xDFF	0x000-0xBFF
AT90PWM161	0x000-0x1EFF	0x000-0x1DFF	0x000-0x1BFF	0x000-0x17FF

1.2   Boot loader flash section

The various boot loader flash section sizes vary according to the device configuration. All options are summarized in Table 1-3. The addresses are summarized in Table 1-4.

Table 1-3.   Bootloader flash section sizes.

	BOOTSZ: 11 [words]	BOOTSZ: 10 [words]	BOOTSZ: 01 [words]	BOOTSZ: 00 [words]
AT90PWM81	128	256	512	1024
AT90PWM161	256	512	1024	2048

Table 1-4.   Bootloader flash section address.

	BOOTSZ: 11 [words]	BOOTSZ: 10 [words]	BOOTSZ: 01 [words]	BOOTSZ: 00 [words]
AT90PWM81	0xF80-0xFFF	0xF00-0xFFF	0xE00-0xFFF	0xC00-0xFFF
AT90PWM161	0x1F00-0x1FFF	0x1E00-0x1FFF	0x1C00-0x1FFF	0x1800-0x1FFF

2. SRAM

The SRAM size differences between AT90PWM81 and AT90PWM161 are listed in Table 2-1.

Table 2-1.   SRAM sizes.

	SRAM [bytes]
AT90PWM81	256
AT90PWM161	1024

3. Signature row

The Device ID differences between Atmel AT90PWM81 and Atmel AT90PWM161 are detailed in Table 3-1:

Table 3-1.   Device ID differences.

Signature Byte	Address	AT90PWM81 Data	AT90PWM161 Data
Device ID 1, Flash size	0x02	93H	94H
Device ID 2, Device	0x04	88H	8BH

4. Interrupt vector table

The Interrupt vector addresses are different between the AT90PWM81 and AT90PWM161. Interrupt addresses of AT90PWM861 have an increment equal to one word, whereas interrupt addresses of AT90PWM161 have an increment equal to two words (see Table 4-1).

Table 4-1.   Reset and interrupt vectors.

Vector no.	AT90PWM81 program address	AT90PWM161 program address	Source	Interrupt definition
1	0x0000	0x0000	RESET	External Pin, Power-on Reset, Brown-out Reset, Watchdog Reset, and Emulation AVR® Reset
2	0x0001	0x0002	PSC2 CAPT	PSC2 Capture Event
3	0x0002	0x0004	PSC2 EC	PSC2 End Cycle
4	0x0003	0x0006	PSC2 EEC	PSC2 End of Enhanced Cycle
5	0x0004	0x0008	PSCr CAPT	PSC reduced Capture Event
6	0x0005	0x000A	PSCr EC	PSC reduced End Cycle
7	0x0006	0x000C	PSCr EEC	PSC reduced End of Enhanced Cycle
8	0x0007	0x000E	ANACOMP 0	Analog Comparator 0
9	0x0008	0x0010	ANACOMP 1	Analog Comparator 1
10	0x0009	0x0012	ANACOMP 2	Analog Comparator 2
11	0x000A	0x0014	INT0	External Interrupt Request 0
12	0x000B	0x0016	TIMER1 CAPT	Timer/Counter1 Capture Event
13	0x000C	0x0018	TIMER1 OVF	Timer/Counter1 Overflow
14	0x000D	0x001A	ADC	ADC Conversion Complete
15	0x000E	0x001C	INT1	External Interrupt Request 1
16	0x000F	0x001E	SPI, STC	SPI Serial Transfer Complete
17	0x0010	0x0020	INT2	External Interrupt Request 2
18	0x0011	0x0022	WDT	Watchdog Time-Out Interrupt
19	0x0012	0x0024	EE READY	EEPROM Ready
20	0x0013	0x0026	SPM READY	Store Program Memory Ready

5. CALL instruction

For Atmel AT90PWM81, the RCALL instruction can match the entire address space, but for Atmel AT90PWM161, which has more than 8Kbytes, the CALL instruction is used by the compiler.

The CALL instruction takes one cycle more than the RCALL instruction, and real-time execution would be impacted.

The ICALL instruction takes the same number of cycles as RCALL, but is dedicated by the compiler to call functions through a function pointer.

To reduce the number of CALL instructions, one can configure AVR Studio® as follows:

Project->options->C/C++ Compiler->Optimizations-> check the option "Multi-file Compilation," and also check the option "Speed."

Then, if all the files are compiled at the same time, the Compiler should be able to optimize the use of RCALL/CALL.

6. Datasheet changes

For a summary of changes, see the revision history at the end of the AT90PWM81/161 datasheet.

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