PIC16C71 → PIC16C710/711 Migration

DEVICE MIGRATIONS

This document is intended to describe the functional differences and the electrical specification differences that are present when migrating from one device to the next.

Note:	This device has been designed to perform to the parameters of its data sheet. It has been tested to an electrical specification designed to determine its conformance with these parameters. Due to process differences in the manufacture of this device, this device may have different performance characteristics than its earlier version. These differences may cause this device to perform differently in your application than the earlier version of this device.

Table 1 shows the considerations that must be taken into account when migrating from the PIC16C71 to the PIC16C710/711.

TABLE 1: PIC16C71 → PIC16C710/711 DIFFERENCES

Functional Differences				
No.	**Difference**	**H/W**	**S/W**	**Prog.**
1	Programming algorithm change	—	—	✔
2	PIC16C710/711 has BOR circuit	✔	—	✔

Note:	The user should verify that the device oscillator starts and performs as expected. Adjusting the loading capacitor values and /or the oscillator mode may be required.

TABLE 2: PROGRAM AND DATA MEMORY DIFFERENCES

	PIC16C71	**PIC16C710**	**PIC16C711**
Program Memory	1024	512	1024
Data Memory	36	36	68

TABLE 3: ELECTRICAL SPECIFICATION DIFFERENCES

Parm. No.	Sym.	Characteristic	PIC16C71 Data Sheet			PIC16C710/711 Data Sheet			Units	Conditions
			Min	Typ	Max	Min	Typ	Max		
	VDD	**Supply Voltage**								
		XT, RC, LP Options	3.0	—	6.0	2.5	—	6.0	V	LC versions
		XT, RC Opt. Extended	—	—	—	3.0	—	6.0	V	LC version
	IDD	**Supply Current**								**PIC16C71/710/711**
		XT and RC options	—	1.8	3.3	—	1.8	2.4	mA	Note 1
		HS option	—	4.8	10	—	4.5	16	mA	Note 2
										PIC16LC71/710/711
		XT and RC options	—	1.4	2.5	—	2.0	3.8	mA	Note 3
		LP option	—	15	32	—	22.5	48	µA	Note 4
	IPD	**Power Down Current**								**PIC16C71/710/711**
										VDD = 4.0
		Commercial	—	1.0	14	—	1.5	21	µA	WDT Disabled
		Industrial	—	7	28.0	—	10.5	41	µA	WDT enabled
			—	1.0	16	—	1.5	24	µA	WDT disabled
		Extended	—	—	—	—	1.5	30	µA	WDT disabled
										PIC16LC71/710/711
										VDD = 3.0
		Commercial	—	0.6	9.0	—	0.9	5	µA	WDT disabled
		Industrial	—	5	20	—	7.5	30		WDT enabled
			—	0.6	12	—	0.9	5.0		WDT disabled
		Extended	—	—	—	—	0.9	10		WDT disabled
	VIH	**Input High Voltage**								
		I/O Ports with Schmitt Trigger buffer	0.85VDD	—	VDD	0.8VDD	—	VDD	V	For all VDD
		$\overline{MCLR}$, RB0/INT	0.85VDD	—	VDD	0.8VDD	—	VDD	V	
	FOSC	**Oscillator Frequency**								
			1	—	4	4	—	20	MHz	HS osc mode
			1	—	20	—	—	—	MHz	HS osc mode
			DC	—	200	5	—	200	kHz	LP osc mode
	TMLC	**$\overline{MCLR}$ Pulse Width (low)**	0.2	—	—	2	—	—	µs	Note 5
	TIOZ	**I/O HIgh Impedance from $\overline{MCLR}$ Low**	—	—	0.1	—	—	1.1	µs	
	EABS	**Absolute Error (AD converter)**	—	—	< ±2	—	—	< ±1	LSb	LC versions
	EIL	**Integral linearity error (AD converter)**	—	—	< ±2	—	—	< ±1	LSb	LC versions
	EDL	**Differential linearity error (AD converter)**	—	—	< ±2	—	—	< ±1	LSb	LC versions
	EFS	**Full Scale Error (AD converter)**	—	—	< ±2	—	—	< ±1	LSb	LC versions
	EOFF	**Offset Error (AD converter)**	—	—	< ±2	—	—	< ±1	LSb	LC versions

Note 1: FOSC = 4.0MHz, VDD = 5.5V.

2: FOSC = 20MHz, VDD = 5.5V.

3: FOSC = 4MHz, VDD = 3.0V.

4: FOSC = 32kHz, VDD = 3.0V, WDT disabled.

5: For PIC16C71: VDD = 5.0V, -40°C to +85°C; For PIC16C710/711: VDD = 5.0V, -40°C to +125°C.

TABLE 4: ABSOLUTE MAXIMUM SPECIFICATION DIFFERENCES

Description	PIC16C71 Data Sheet	PIC16C710/711 Data Sheet	Units
Total Power Dissipation	0.8	1	W
Maximum Current out of V_{SS} Pin	150	300	mA
Maximum Current into V_{DD} Pin	100	250	mA
Maximum Current Sourced by any I/O Pin	20	25	mA
Maximum Current Sunk by PORTA	80	200	mA
Maximum Current Sourced by PORTA	50	200	mA
Maximum Current Sunk by PORTB	150	200	mA
Maximum Current Sourced by PORTB	100	200	mA

FIGURE 1: CONFIGURATION WORD FOR PIC16C71

—	—	—	—	—	—	—	—	—	CP0	PWRTE	WDTE	FOSC1	FOSC0

bit13 bit0

Register: CONFIG
Address 2007h

bit 13-5: **Unimplemented:** Read as '1'

bit 4: **CP0:** Code Protection bit
1 = Code protection off
0 = All memory is code protected, but 00h - 3Fh is writable

bit 3: **PWRTE:** Power-up Timer Enable bit
1 = Power-up Timer enabled
0 = Power-up Timer disabled

bit 2: **WDTE:** Watchdog Timer Enable bit
1 = WDT enabled
0 = WDT disabled

bit 1-0: **FOSC<1:0>:** Oscillator Selection bits
11 = RC oscillator
10 = HS oscillator
01 = XT oscillator
00 = LP oscillator

FIGURE 2: CONFIGURATION WORD FOR PIC16C710/711

CP0	CP0	CP0	CP0	CP0	CP0	CP0	BODEN	CP0	CP0	$\overline{\text{PWRTE}}$	WDTE	FOSC1	FOSC0

bit13 bit0

Register: CONFIG
Address 2007h

bit 13-7 **CP0:** Code Protection bits **(2)**
5-4: 1 = Code protection off
0 = All memory is code protected, but 00h - 3Fh is writable

bit 6: **BODEN:** Brown-out Reset Enable bit **(1)**
1 = BOR enabled
0 = BOR disabled

bit 3: **$\overline{\text{PWRTE}}$:** Power-up Timer Enable bit **(1)**
1 = PWRT disabled
0 = PWRT enabled

bit 2: **WDTE:** Watchdog Timer Enable bit
1 = WDT enabled
0 = WDT disabled

bit 1-0: **FOSC<1:0>:** Oscillator Selection bits
11 = RC oscillator
10 = HS oscillator
01 = XT oscillator
00 = LP oscillator

Note 1: Enabling Brown-out Reset automatically enables Power-up Timer (PWRT) regardless of the value of bit $\overline{\text{PWRTE}}$. Ensure the Power-up Timer is enabled any time Brown-out Reset is enabled.
2: All of the CP0 bits have to be given the same value to enable the code protection scheme listed.

Note: The Power-up Timer enable bit has a reverse polarity on the PIC16C71 and PIC16C710/711.

TABLE 5: TAD vs. DEVICE OPERATING FREQUENCIES, PIC16C71

AD Clock Source (TAD)		Device Frequency				
Operation	**ADCS<1:0>**	**20 MHz**	**16 MHz**	**4 MHz**	**1 MHz**	**333.33 kHz**
2TOSC	00	100 ns(2)	125 ns(2)	500 ns(2)	2.0 µs	6 µs
8TOSC	01	400 ns(2)	500 ns(2)	2.0 µs	8.0 µs	24 µs(3)
32TOSC	10	1.6 µs(2)	2.0 µs	8.0 µs	32.0 µs(3)	96 µs(3)
RC(5)	11	2 - 6 µs(1,4)	2 - 6 µs(1,4)	2 - 6 µs(1,4)	2 - 6 µs(1)	2 - 6 µs(1)

Legend: Shaded cells are outside of recommended range.

Note 1: The RC source has a typical TAD time of 4 µs.

2: These values violate the minimum required TAD time.

3: For faster conversion times, the selection of another clock source is recommended.

4: When device frequency is greater than 1 MHz, the RC A/D conversion clock source is recommended for SLEEP operation only.

5: For extended voltage devices (LC), please refer to Electrical Specifications section.

TABLE 6: TAD vs. DEVICE OPERATING FREQUENCIES, PIC16C710/711

AD Clock Source (TAD)		Device Frequency			
Operation	**ADCS<1:0>**	**20 MHz**	**5 MHz**	**1.25 MHz**	**333.33 kHz**
2TOSC	00	100 ns(2)	400 ns(2)	1.6 µs	6 µs
8TOSC	01	400 ns(2)	1.6 µs	6.4 µs	24 µs(3)
32TOSC	10	1.6 µs	6.4 µs	25.6 µs(3)	96 µs(3)
RC(5)	11	2 - 6 µs(1,4)	2 - 6 µs(1,4)	2 - 6 µs(1,4)	2 - 6 µs(1)

Legend: Shaded cells are outside of recommended range.

Note 1: The RC source has a typical TAD time of 4 µs.

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5: For extended voltage devices (LC), please refer to Electrical Specifications section.

NOTES:

Note the following details of the code protection feature on PICmicro® MCUs.

- The PICmicro family meets the specifications contained in the Microchip Data Sheet.
- Microchip believes that its family of PICmicro microcontrollers is one of the most secure products 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 PICmicro microcontroller in a manner outside the operating specifications contained in the data sheet. The person doing so may be 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 product.

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