PIC16F87X → PIC16F87XA Migration

DEVICE MIGRATIONS

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

Except for items listed in Table 1, PIC16F87XA is designed to be pin-to-pin, and functionally compatible with the PIC16F87X product family. Table 1 shows the considerations that must be taken into account when migrating from the PIC16F87X to the PIC16F87XA. Table 2 shows the electrical and timing differences.

**TABLE 1: PIC16F87X → PIC16F87XA FUNCTIONAL DIFFERENCES**

<table>
<thead>
<tr>
<th>No.</th>
<th>Feature</th>
<th>Differences from PIC16F87x</th>
<th>H/W</th>
<th>S/W</th>
<th>Prog</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Analog Comparator</td>
<td>Two analog comparators with input multiplexing have been added (Note 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Programmable reference voltage for comparators is provided</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ICSP(^{TM})</td>
<td>Programming specifications are different(^{(2)})</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>User Writes to FLASH</td>
<td>Write to FLASH program memory in 4-word blocks, instead of 1-word blocks(^{(2)})</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Legend:**

H/W – Issues may exist with regard to the application circuit.
S/W – Issues may exist with regard to the user program.
Prog – Issues may exist when writing the program to the controller.

**Note 1:** Although the comparator is a new peripheral on the 16F87XA, the 16F87XA is defined to maintain 100% pinout compatibility with the PIC16F87X. This is achieved by mapping the comparator inputs with the existing ADC channels on PORTA. The comparator is disabled on power-up so that existing PIC16F87X code requires no modification.

**Note 2:** Please refer to device data sheet, errata, and the Microchip website for more information on programming specifications and writing to FLASH program memory.
## TABLE 2: PIC16F87X → PIC16F87XA ELECTRICAL SPECIFICATION DIFFERENCES

<table>
<thead>
<tr>
<th>Param No.</th>
<th>Symbol</th>
<th>Characteristic</th>
<th>PIC16F877</th>
<th>PIC16F877A</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
</tr>
<tr>
<td>Core</td>
<td>D005</td>
<td>V_BOR Brown-out Reset Voltage</td>
<td>3.7</td>
<td></td>
<td>3.65</td>
</tr>
<tr>
<td></td>
<td>D042A</td>
<td>V_{IH} OSC1 (XT, LP)</td>
<td>0.7 V_{DD}</td>
<td></td>
<td>1.6V</td>
</tr>
<tr>
<td>EEPROM Data Memory</td>
<td>D120</td>
<td>Ed Endurance</td>
<td>100K</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Program FLASH Memory</td>
<td>D130</td>
<td>EP Endurance</td>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparator Specifications (new for 16F87XA)</td>
<td>D300</td>
<td>V_{IOFF} Input Offset Voltage</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>D301</td>
<td>V_{ICM} Input Common Mode Voltage</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>D302</td>
<td>CMRR Common Mode Rejection Ratio</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>TRESP Response Time</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>300A</td>
<td>Tmc2ov Comparator Mode Change to Output Valid</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Voltage Reference Specifications (new for 16F87XA)</td>
<td>D310</td>
<td>V_{RES} Resolution</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>D311</td>
<td>VR_{AA} Absolute Accuracy</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>D312</td>
<td>VR_{UR} Unit Resistor Value</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>310</td>
<td>T_{SET} Settling Time</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>External Clock Timing Requirements(1)</td>
<td>FOSC</td>
<td>External CLKIN Freq (HS osc mode –10 parts)</td>
<td>DC</td>
<td>—</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External CLKIN Freq (HS osc mode –4 parts)</td>
<td>DC</td>
<td>—</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>TOSC External CLKIN Period (HS osc mode –10 parts)</td>
<td>100</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External CLKIN Period (HS osc mode –4 parts)</td>
<td>250</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Parallel Slave Port Requirements (PIC16F874/PIC16F877 ONLY)</td>
<td>62(3)</td>
<td>TdtV2wrH Setup time</td>
<td>25</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>64(3)</td>
<td>TrdL2dtV Data-out valid</td>
<td>—</td>
<td>—</td>
<td>90</td>
</tr>
</tbody>
</table>

### Notes:
1. The -4 and -10 parts are not produced for PIC16F877A. Use PIC16F877A up to 20 MHz, or PIC16LF877A up to 10 MHz.
2. Erase/Write cycles (E/W)
3. There is no separate specification for PIC16F877A extended range parts.
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- 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.
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