

# Microstick for 3V PIC24 K Series Devices

## Overview

The Microstick for 3V PIC24 K Series Devices is designed to provide an easy-to-use, economical development environment for 16-bit microcontrollers. The board includes an integrated debugger/programmer, a socket for the target microcontroller chip and pins that facilitate insertion into a prototyping board for extremely flexible development.

## Installing MPLAB® IDE and C Compilers

The MPLAB® Integrated Development Environment (IDE) should be installed prior to using the Microstick for 3V PIC24 K Series Devices. This board is designed to run with MPLAB IDE Version 8.80 or later. While the MPLAB IDE provides assembler tools for development, most code examples provided for Microchip devices are written in C language and require a C compiler to be installed. Microchip's MPLAB C Compiler seamlessly integrates into the MPLAB IDE. Both the MPLAB IDE and C Compiler are free and available for download at: <http://www.microchip.com/MPLAB> and <http://www.microchip.com/MPLABC30>, respectively.<sup>(1)</sup>

**Note 1:** MPLAB C Evaluation Version (free) – All optimization levels are enabled for 60 days, then limits to optimization Level 1. The compiler will continue to function, but code size may increase. There are no restrictions on the use of this C compiler (see license text for details).

## Running Applications

After downloading and installing the development tools, please use the following procedure to build, run and debug your software:

1. Load the code example into MPLAB IDE by double clicking the \*.m<sub>cw</sub> project file.
2. Inform MPLAB IDE which target microcontroller is plugged into the Microstick board by selecting the appropriate device from the *Configure>Select Device>Device* menu.
3. Build the project by selecting *Project>Build All*.
4. Connect the Microstick board to the development computer via a USB cable.
5. Enable the MPLAB IDE debugger by selecting: *Debugger>Select Tool>Starter Kit on Board*.
6. Download the firmware into the target microcontroller chip by selecting *Debugger>Program*.
7. Run the application previously downloaded by selecting *Debugger>Run*.
8. Install Jumper JP1 to enable the on-board LED for RA0.

For more information on building, running and debugging your application, refer to the MPLAB IDE Help.

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## Developing Applications

Microstick for 3V PIC24 K Series Devices only implements circuitry for low-voltage ICSP™ programming. To enable low-voltage ICSP programming, it is important to always configure the microcontroller to enable  $\overline{\text{MCLR}}$  pin function, rather than RA5 general purpose input pin function.

The following assembly language directive enables the  $\overline{\text{MCLR}}$  pin function in the device Configuration bits:

```
; MCLR Pin Enable bit (RA5 input disabled; MCLR enabled)
config __FPOR, MCLRE_ON
```

In C30, the same thing is accomplished with this code:

```
// MCLR Pin Enable bit (RA5 input disabled; MCLR enabled)
FPOR(MCLRE_ON)
```

**Warning:** Always program the microcontroller with  $\overline{\text{MCLR}}$  pin functionality enabled so that the Microstick for 3V PIC24 K Series Devices can be used to program/debug the chip in the future.

If the microcontroller is programmed with  $\overline{\text{MCLR}}$  pin function disabled (RA5 input enabled), the Microstick will no longer program or debug firmware on the microcontroller, because Microstick does not have circuitry to use high-voltage ICSP entry. REAL ICE™, MPLAB ICD 3 and PICKit™ 3 are an example of high-voltage ICSP tools that can be used to recover the part.

The slide switch, labeled S3 on the PCB, is used to select which pair of PGECx/PGEDx pins to use for In-Circuit Serial Programming™ (ICSP™). When moved towards the DIP socket, the Microstick is set for using PGEC3/PGED3. When moved towards the USB connector, the Microstick is configured for PGEC1/PGED1.

To allow for debugging to work in MPLAB, the device's Configuration bits must be set up to indicate which PGECx/PGEDx pins are actually being used in the circuit. For example, in assembly language, you may need directives such as this:

```
.include "p24Fxxxx.inc"
; ICD Pin Placement Select (EMUC/EMUD share PGC3/PGD3)
config __FICD, ICS_PGx3
```

In C30, the same thing can be accomplished with this code:

```
#include <p24Fxxxx.h>
// ICD Pin Placement Select (EMUC/EMUD share PGC3/PGD3)
_FICD(ICS_PGx3)
```

A C30 firmware source code example for blinking the Microstick's LED is provided on the Microchip web site (see <http://www.microchip.com/microstick3V>).

## Hardware Design

The Microstick for 3V PIC24 K Series Devices is USB bus-powered. An on-board MCP1727 LDO regulator provides +3.3 VDC output from the USB bus power. Turning power on/off to the target application is controlled by the MPLAB IDE via the FPF2102 load switch. The FPF2102 load switch automatically shuts down power to the target if the current exceeds a trip point of 200 mA to 400 mA. This may help protect the host PC USB port from accidental shorting of power supply pins in the target application circuit.

The Microstick may be plugged into a prototyping board to develop external application circuitry with the PIC® MCU. On the bottom side of the board, three rows of pins are provided, labeled P1, P2 and P3. Normally, the skinny DIP layout (300 mils) should be used by populating rows, P1 and P2. Optionally, rows, P1 and P3, may be populated instead to provide a wide DIP layout (600 mils). The unpopulated, single in-line pin header for soldering into P3 is available separately as Digi-Key Part Number ED7464-ND.

## Using the 16-Bit XLP Development Board

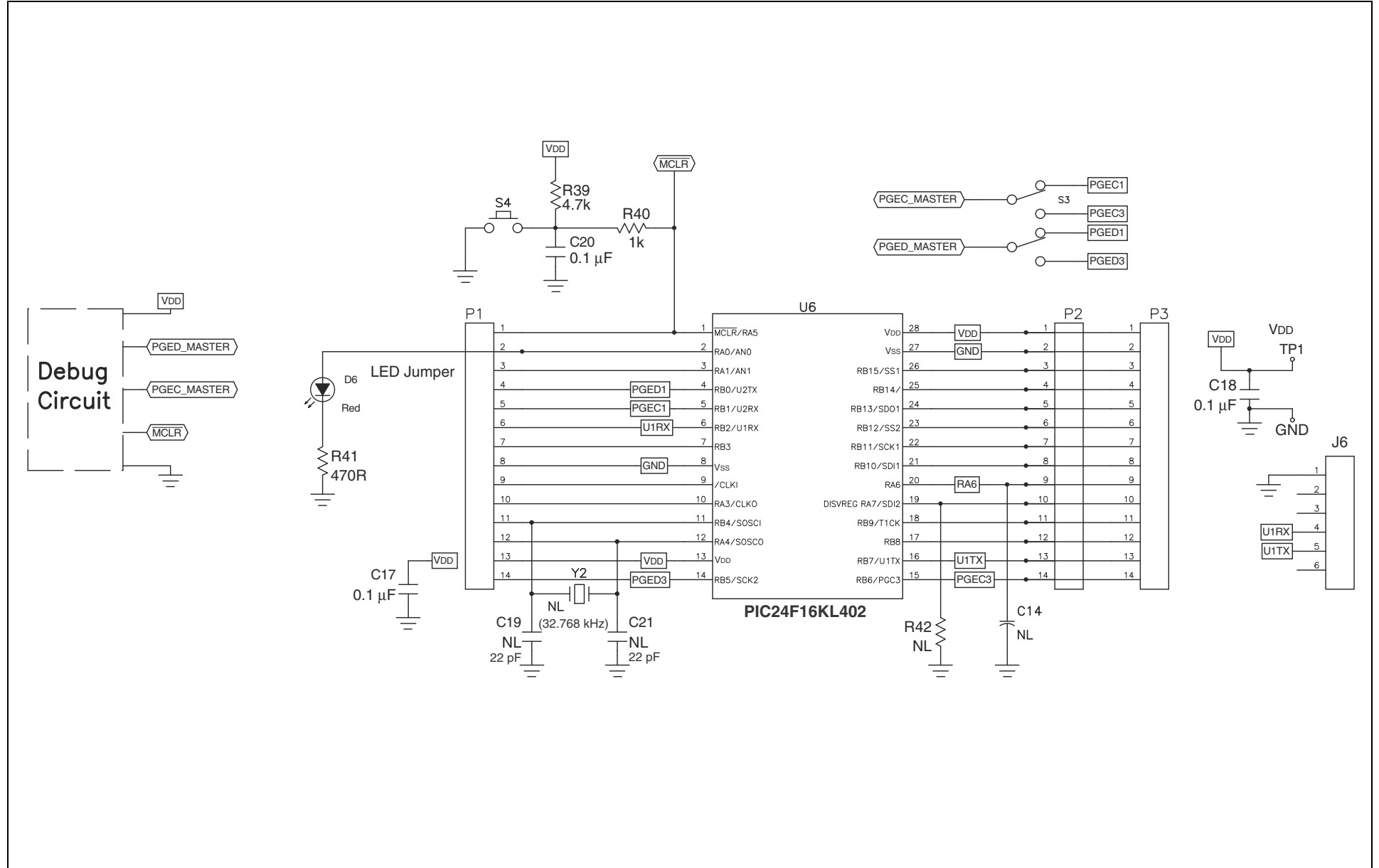
In the skinny DIP layout configuration (rows, P1 and P2, are populated), the Microstick may be plugged into Microchip's "16-Bit XLP Development Board". The 16-Bit XLP Development Board provides several external buttons, LEDs, peripherals and sensors that can be used to quickly evaluate the device without spending time wiring a breadboard.

**Warning:** Always remove batteries and/or the "POWER SOURCE SELECT" jumper from the 16-Bit XLP Development Board, prior to inserting the Microstick board. The Microstick for 3V PIC24 K Series Devices is intended to supply power to the target application, which could cause an unintended charging of batteries connected to the 16-Bit XLP Development Board.

The 16-Bit XLP Development Board may come with a USB-to-Serial or RS-232 serial port wired to the PIC microcontroller's U2TX/U2RX pins. To avoid conflict with the on-board serial port circuitry, slide S3 of the Microstick to the PGEC3/PGED3 setting (move the switch lever towards the DIP socket).

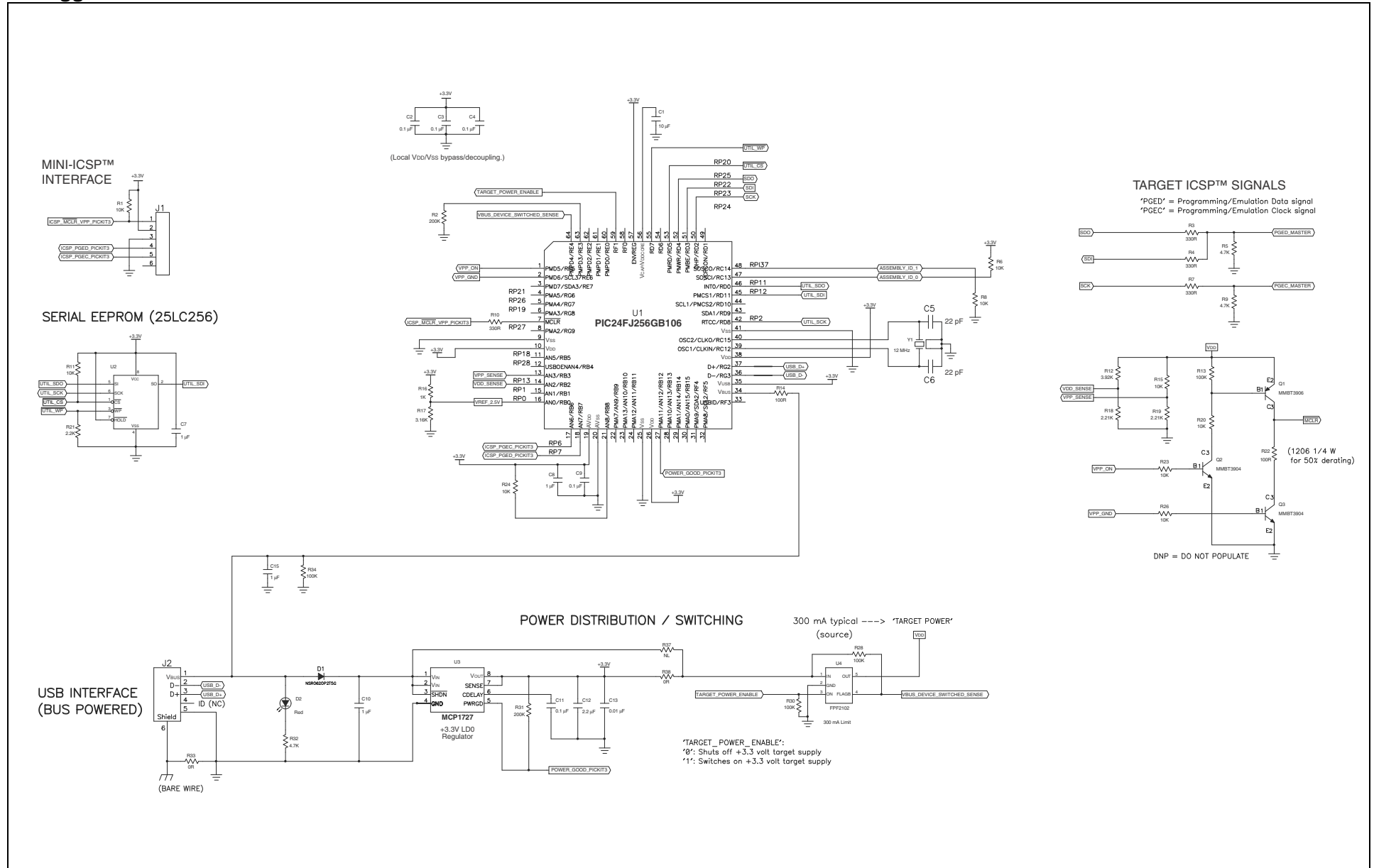
# Introducing the Microstick for 3V PIC24 K Series Devices

## Application Hardware



# Introducing the Microstick for 3V PIC24 K Series Devices

## Debugger Hardware



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