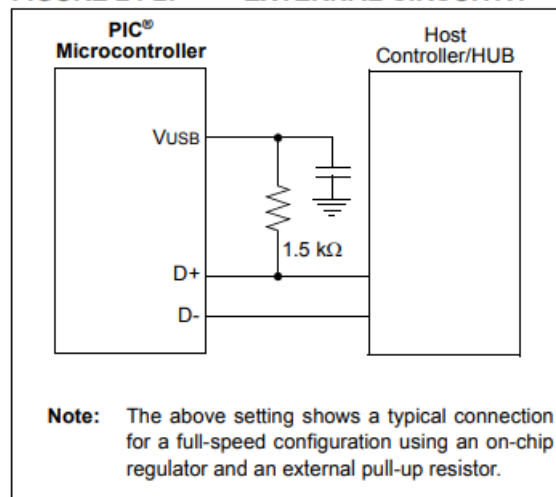


### 24.2.2.3 External Pull-up Resistors

External pull-up may also be used. The VUSB3V3 pin may be used to pull up D+ or D-. The pull-up resistor must be 1.5 k $\Omega$  ( $\pm 5\%$ ) as required by the USB specifications. Figure 24-2 shows an example.

**FIGURE 24-2: EXTERNAL CIRCUITRY**



### 24.6.1 BUS POWER ONLY

In Bus Power Only mode, all power for the application is drawn from the USB (Figure 24-9). This is effectively the simplest power method for the device.

In order to meet the inrush current requirements of the USB 2.0 specifications, the total effective capacitance appearing across VBUS and ground must be no more than 10  $\mu$ F. If not, some kind of inrush limiting is required. For more details, see section 7.2.4 of the USB 2.0 specification.

According to the USB 2.0 specification, all USB devices must also support a Low-Power Suspend mode. In the USB Suspend mode, devices must consume no more than 2.5 mA from the 5V VBUS line of the USB cable.

The host signals the USB device to enter the Suspend mode by stopping all USB traffic to that device for more than 3 ms. This condition will cause the IDLEIF bit in the UIR register to become set.

During the USB Suspend mode, the D+ or D- pull-up resistor must remain active, which will consume some of the allowed suspend current: 2.5 mA budget.

**FIGURE 24-9: BUS POWER ONLY**

