Technical Note

Z8 Encore!® and ZNEO® Design for Debug

TN003603-1214

Introduction

The Zilog On-Chip Debugger (OCD) provides on-chip support for debugging software and programming Flash memory. This OCD supports all microcontrollers within Zilog's Z8 Encore!® and ZNEO® product families.

The Debug Connector

To program or debug using Zilog's Z8 Encore! or ZNEO MCUs, the system board you use should include a connector that allows connection of the USB SmartCable to the part. This connector is a 3x2 header with standard 0.025-inch square posts on 0.100-inch centers, identical to the headers commonly used for jumper blocks.

Figure 1 displays the connections between the debug connector and the Z8 Encore! or ZNEO microcontroller.

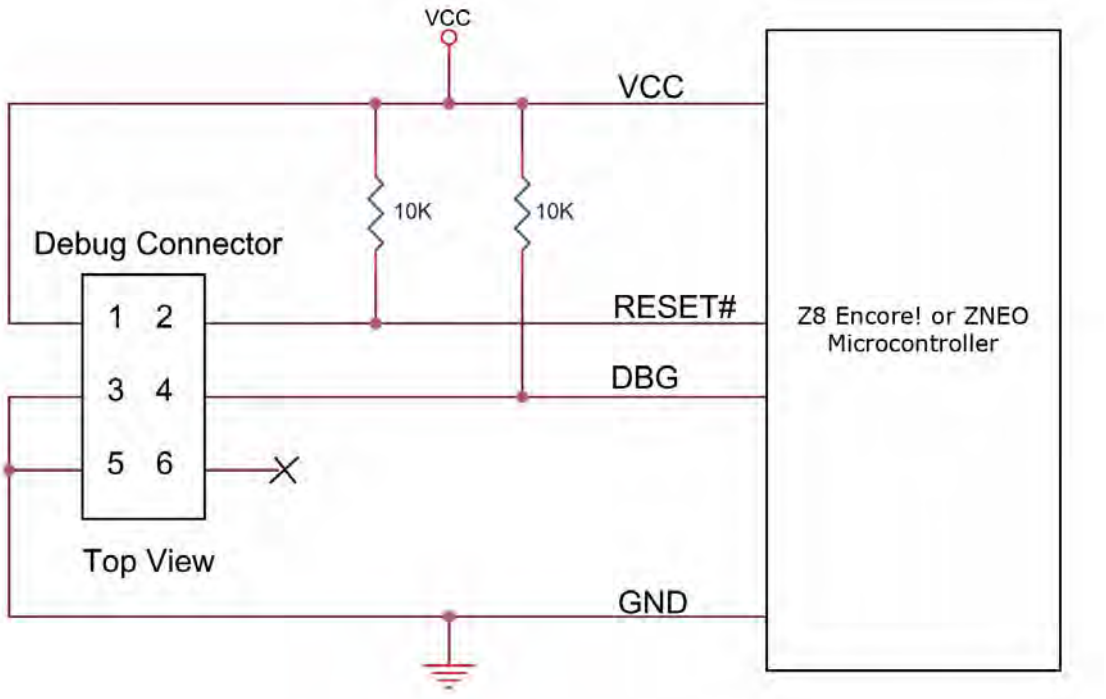

Figure 1. Target OCD Connector Interface

Note: In Figure 1, the connector pin arrangement is shown as it appears from the top of the connector.

OCD Signals

The OCD interface uses the DBG pin as a bidirectional data signal. This DBG pin requires a 10KΩ pull-up resistor to pull the pin to the idle High state when the debug tool is not connected.

The DBG trace on the system board must be as short as possible, preferably no more than a few inches. Termination on the target system board is generally not required. However, because the signal is bidirectional, a 33Ω series resistor at the DBG pin on the target board can be helpful in some cases.

For reference, Figure 2 displays the debug tool OCD interface. The DBG signal is driven by open-drain drivers on both ends, and uses a 3.3KΩ pull-up within the debug tool to provide rising edges. The signal is series-terminated in the debug tool by a 33Ω resistor.

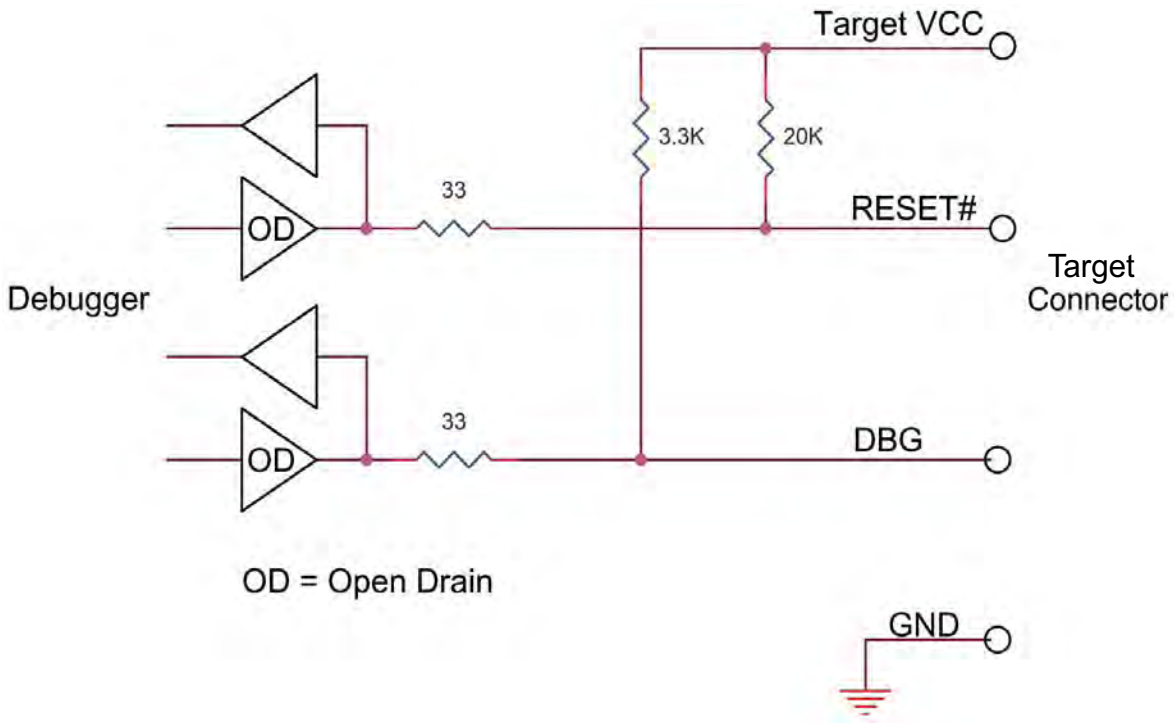

Figure 2. Debug Tool OCD Interface

Reset

The Z8 RESET# pin is a Schmitt trigger input with internal pull-up. RESET# must be connected to the debug header. The microcontroller has a built-in Power-On Reset circuit; therefore, an external reset circuit is not required. If an external circuit is used to drive RESET#, it must be open-drain; Zilog recommends adding an external pull-up.

Target Power

The target system V_{CC} must be connected to the debug connector. This V_{CC} connection must be supplied at the same voltage level as is supplied to the microcontroller. The USB SmartCable uses less than 5 mA of target current to operate the debug driver and receiver. The driver and receiver automatically adapt to handle a target voltage in the range of 2.0 V–3.6 V.

Ceramic bypass capacitors (0.1 µF or 0.01 µF) must be connected between each power pin and ground on the microcontroller.

Ground

A good ground return path for the DBG signal is very important. A 4-layer board with a continuous power supply and a ground planes is ideal. If a 2-layer board is used, Zilog recommends a ground trace parallel to DBG between the debug connector and the microcontroller ground pins.

Tips for Debugging

Observe the following guidelines during debugging operations:

- Check that the target V_{CC} is the correct voltage and without excessive ripple. Flash programming requires slightly more power for the microcontroller; therefore, ensure that the voltage is valid and does not drop during this operation.
- Verify that the system clock is clean at X_{IN}.
- Check the quality of the DBG signal at the target microcontroller pin, using an oscilloscope while the debugger is operating. Some undershoot below ground and overshoot above V_{CC} is not unusual. However, defects or ringing that occurs during rising or falling edges, extending into the band between 1.0 V to 2.0 V above ground are harmful. These defects can be interpreted as extra clock or data edges.
- On rare occasions, debugger communications may be compromised by a ground loop condition between the host PC, the debug tool, and the target system. Using a common AC outlet or power strip for all systems can fix the problem.

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