Technical Note

Z8 Encore!® Design for Debug

TN003602-0208

Introduction

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

The Debug Connector

All Zilog debug tools, including the Serial Smart Cable and the USB Smart Cable, require a 6-pin connector on the target system for debugging. This connector is a 3 by 2 header with standard 0.025 inch square posts on 0.100-inch centers, the same as headers commonly used for jumper blocks. Figure 1 displays the connections between the debug connector and the Z8 Encore! microcontroller.

Note: *The connector pin arrangement is depicted in top view.*

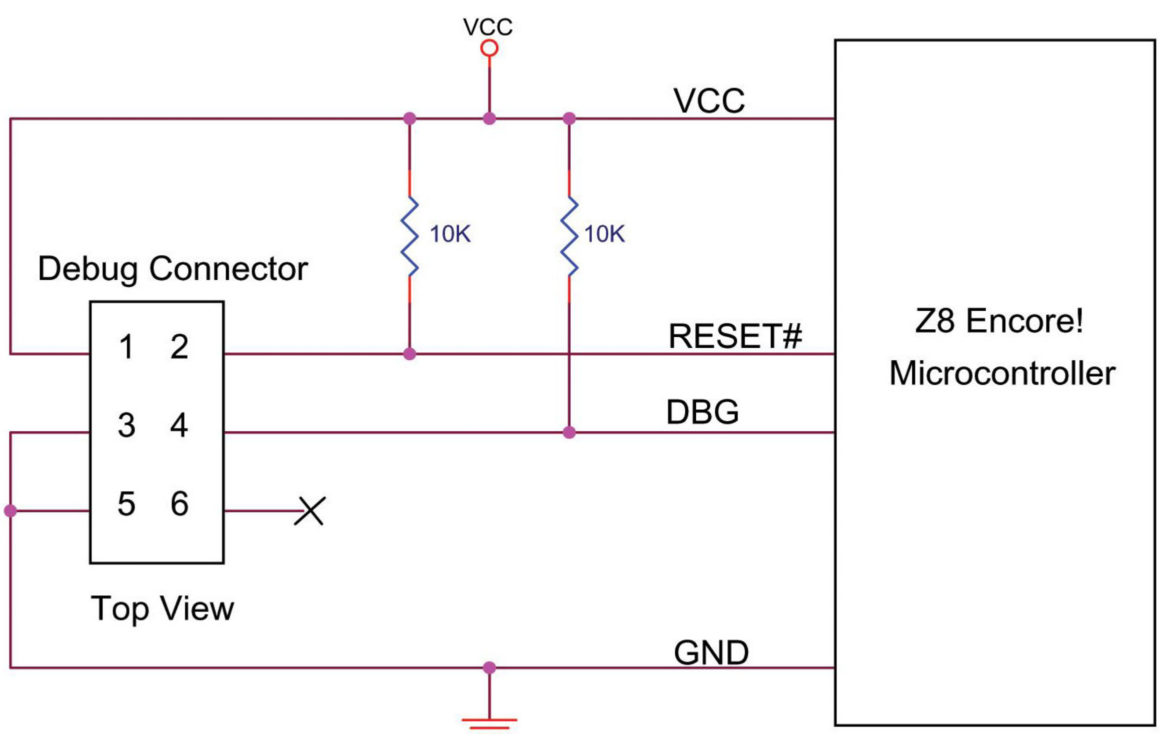

Figure 1. Target OCD Connector Interface

OCD Signals

The OCD interface uses the DBG pin as a bidirectional data signal. The DBG pin requires a 10 K 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, since the signal is bidirectional, a 33 Ω 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 3.3 K pull-up within the debug tool to provide rising edges. The signal is series terminated in the debug tool by a 33 Ω resistor.

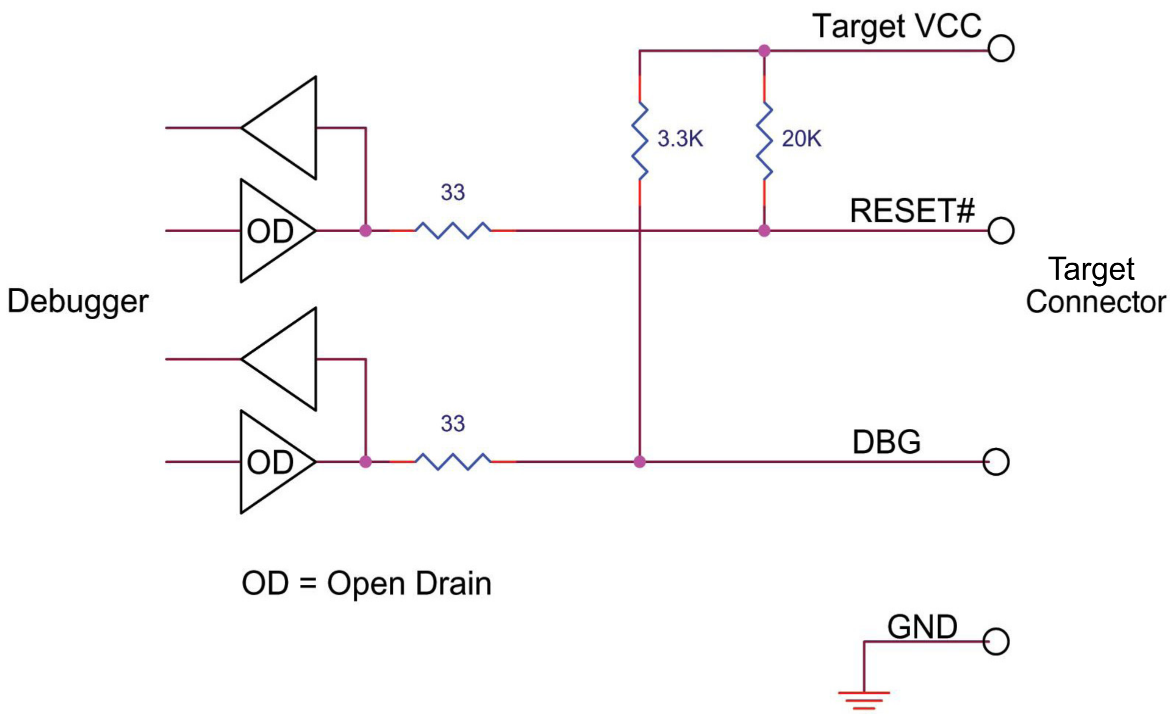

Figure 2. Debug Tool OCD Interface

Reset

The Z8 Encore!® 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, so an external reset is circuit not required. If an external circuit is used to drive RESET#, it must be open-drain and it is recommended to add an external pull-up.

Note: *In contrast to the USB Smart Cable, the Serial Smart Cable does not drive the RESET# pin. Pin 2 is not connected on the cable.*

Target Power

The target system VCC must be connected to the debug connector. This must be the same voltage level as supplied to the microcontroller. The Serial Smart Cable operates on the target system power, drawing a maximum of 35 mA. It operates only with a target voltage between 3.0 V and 3.6 V. The USB Smart Cable uses less than 5 mA of target current to operate the debug driver and receiver. The driver and receiver automatically adapt to handle any target voltage between 2.0 V and 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

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

Tips for Debugging

Following are guidelines for debugging:

- Check that target VCC is the correct voltage and without excessive ripple. The Flash programming operation requires slightly more power for the microcontroller, so check that voltage is valid and does not droop during this operation.
- Check that the system clock is clean at XIN.
- 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 VCC is not unusual. More harmful are glitches or ringing that occur in the middle of rising or falling edges, extending into the band between 1.0 V to 2.0 V above ground. These can be interpreted as extra clock or data edges.
- On rare occasions, debugger communications can be compromised by a ground loop condition between the host PC, the debug tool, and the target system. In these cases, using a common AC outlet or power strip for all systems may fix the problem.

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