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Application Note

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Initializing the TSEC Controller

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This application note describes how to initialize the MPC8560 TSEC controller. The software is written for the TSEC controller and it is tested on the MPC8560ADS board. The TSEC software, which is tested on the MPC8560ADS board, is available with this application note at the Freescale web site listed on the back cover of this document. The ID of the .zip file is AN2925SW.

To augment the comments embedded in the source code, this application note describes how the MAC loopback, PHY loopback, and external loopback work.

Contents

1 Introduction

The TSEC controller has a wide variety of features. This application note focuses on important operational concepts in the test code.

1.1 Hardware Setup

The software is tested on MPC8560ADS RevA board, which has two Gigabit Ethernet PHY devices, one connected to TSEC1 and the other connected to TSEC2. These PHY devices are Alaska Ultra 88E1011S from Marvell.

Power-on reset configuration of these PHY devices depends on the J55 and J47 headers. J55 controls the configuration settings for TSEC1 and J47 controls the configuration settings for TSEC2. For instance, the PHY connected to TSEC1 has a different PHY address based on whether the configuration plug is placed on the J55 header. Without the configuration plug, the PHY address connected to TSEC1 is 0; with the configuration plug, it is 15. The software assumes that both J55 and J47 are without the configuration plugs.

To better understand how the power-on reset configuration values are determined for the PHY devices, refer to the schematic view of J55 and J47. Also, refer to Section 11.4 of the *MPC8560ADS User's Manual* and the PHY datasheet.

1.2 Software

Test code written to initialize the TSEC controller prepares 32 transmit and receive BDs. Enough embedded comments are provided in the source code for easy understanding of the code flow.

Following are the key features of the TSEC software:

- Individual address is used for the station (ADS). The MAC address for the station is 0x12345678ABCD. Note that assignAddresses() routine byte swaps this value and places the swapped value into two station address registers. The MAC address is swapped because it must be presented in Little-Endian format.
- Thirty-two BDs (transmit and receive) are defined in the BD rings. For transmit buffers, a static array of structure type TSEC_TXBUFFER is defined. As for the receive buffers, the code assumes that the start address of the receive buffer is 0xD00000. The prepareTxbufferBd() and prepareRxbufferBd() routines define the transmit BD ring, transmit buffer, receive BD ring, and receive buffer.
- When the user requests PHY Loopback, phyInit() routine initializes the Gigabit PHY connected to the TSEC. The software uses APIs to manage the read and write operations. In the PHY loopback mode, the control register (#0) is programmed to set the PHY in Gigabit mode and also to set the loopback mode.
- The test code provides polling and interrupts to check the status of frame transmission and reception. The default setting of this code has 32 BDs in the transmit and receive BD ring. Interrupt coalescing is enabled and, for every 16 frames transmitted, one interrupt is generated. For every 16 frames received, one interrupt is generated. The interrupt handler for transmit–tsec1TransmitIsr()–increments a global variable upon exiting. This counter value

becomes 2 after the run. The receive path functions in much the same way. The interrupt service routines can be found in the epic_handler.c file. For interrupts, the PIC controller is also initialized.

2 Test Cases

The TSEC project is compiled and debugged using Codewarrior 8.6. Use the supplied tsec.mcp project and load this project in the CodeWarrior environment. For the printf statements to work, make sure that the CCB frequency of the MPC8560ADS board is set to 266MHz. Different clocks can be set up using the dip switch settings of the board, as described in the board user's manual for the MPC8560ADS RevA system.

For all test cases discussed, the common operation is to compare the received data with the trashiness data. The test passes when received data is same as transmitted data. Test cases are defined through the MACRO values in tsec.h file. For all test cases, the following MACRO should be undefined. These two MACROs are present and indicate work in progress, but they cannot be used for the current version of the software.

```
//#define NORMAL_MODE                    /* transmitting to wires and receiving from wires */
```

Also, for each test case, the user can use the polling scheme or interrupt scheme to get the status of frame transmission and reception by uncommenting either of the following:

```
//#define STATUS_POLLING
#define STATUS_INTERRUPT
```

2.1 MAC Loopback

In MAC loopback mode, the loopback is performed within the TSEC MAC itself. The TSEC transmitter sends out data that is then looped back to the TSEC receiver. The PHY is not involved. Uncomment MAC_INTERNAL_LOOPBACK and comment out PHY_LOOPBACK in the tsec.h file.

Also, choose the interface for this loopback mode. Define INTERFACE_MODE as GMII_INTERFACE, MII_INTERFACE, or TBI_INTERFACE.

2.2 PHY Loopback

In PHY loopback mode, the TSEC MAC transmits data that is looped back by the PHY device to the receiver of the TSEC MAC. Uncomment PHY_LOOPBACK and comment out MAC_INTERNAL_LOOPBACK in the tsec.h file.

The interface for PHY loopback is always GMII_INTERFACE.

3 Test Results

The software sends 32 Ethernet frames and receives 32 frames. In the polling scheme, the checkResults() routine returns a value of 0xFFFFFFFF when the receive frames match the transmitted frames. The transmitted frames are static arrays and these buffers can be checked using debugger– transmitBuffer[]. For the receive buffer, memory display starts at memory location 0xD00000.

If the interrupt scheme is chosen, global variables txbdCounter and rxbdCounter should both be 2. These global variables are incremented from tsec1TransmitIsr() and tsec1ReceiveIsr(), respectively.

4 File Structure

- main.c: invokes a routine to initialize PIC and TSEC.
- tsec.c: initializes the TSEC controller.
- mgmt.c: contains APIs to manage initialization, reads, and writes.
- marvell_phy.c: contains minimal code for initializing the PHY.
- epic.c: contains initialization code for the PIC and other utility routines related to PIC.
- epic_handler.c: contains TSEC handlers.
- tsec.h: contains all MACROs for defining various test cases.
- epic.h: contains MACROs related to the PIC.

5 Conclusion

The TSEC software tests TSEC loopback mode for the MAC and PHY. In the future, it may connect the TSEC to the external tester.

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