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EXAR'S XR16L788 COMPARED WITH THE PHILIPS SCC2698B AND SC28L198

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1.0 INTRODUCTION

This application note describes the hardware and firmware-related differences between Exar's XR16L788 with the Philips SCC2698B and SC28L198. The Exar and Philips QUARTs are very different devices.

1.1 HARDWARE DIFFERENCES

- The XR16L788 is available in the 100-pin QFP package, while the SCC2698B is available in the 84-pin PLCC package and the SC28L198 is available in the 84-pin PLCC and 100-pin LQFP packages. In the 100-pin QFP package, they are not pin-to-pin compatible.
- The XR16L788 and SC28L198 both have a single interrupt output for all 8 channels, but the SCC2698B has 4 interrupt outputs; 1 for each pair of UARTs.
- The XR16L788 can operate at either 5 V or 3.3 V with 5 V tolerant inputs. The SCC2698B is a 5 V only device and the SC28L198 can operate at 5 V or 3.3 V, but it does not have 5 V tolerant inputs at 3.3 V.

1.2 FIRMWARE DIFFERENCES

- The XR16L788 has an industry standard register set while the SCC2698B and SC28L198 has a completely different register set. The first 8 registers of each channel of the XR16L788 are compatible to industry standard 16C550 while the registers in the Philips Octal UARTs are not. The next 8 registers of the XR16L788 are the enhanced feature registers.
- In the XR16L788, the global registers are separated from the individual channel registers. But in the SC28L198, the global registers are mixed in with the individual channel registers. The SCC2698B does not have any global registers.
- The XR16L788 has the ability to write to all channels simultaneously for smaller and quicker initialization routines. Once simultaneous write has been enabled for the XR16L788, writing to any channel register will write to the same register of all channels. In the SCC2698B and SC28L198, it is necessary to initialize each channel individually taking more time to start up.
- The interrupt scheme of the XR16L788 is the same interrupt scheme used in the industry standard 16C550 but with some enhancements like the ability to clear an interrupt in all channels per interrupt service by reading the Global Interrupt Status Registers. On the other hand, the SCC2698B and SC28L198 use a complex bidding system that the end user will have to understand thoroughly before they can use it effectively. Also, only the highest interrupt of the highest channel can only be cleared per interrupt service.
- The XR16L788 has a much larger FIFO of 64 bytes compared to the 16 and 4 byte FIFOs in the SC28L198 and SCC2698B respectively, therefore the number of characters taken out of (or loaded into) the FIFO will be significantly more per interrupt.
- The XR16L788 has programmable FIFO Trigger Levels of 1 through 64 to optimize the performance for each individual application. The SC28L198 only have 4 Selectable Trigger Levels while the SCC2698B does not have any trigger levels.
- In addition to Automatic RTS/CTS Hardware Flow Control, the XR16L788 also support Automatic DTR/DSR Hardware Flow Control. This gives hardware designers flexibility in selecting which signals to use for hardware flow control. This feature is not available in the Philips Octal UARTs.
- The XR16L788 has Automatic 1 or 2 character Xon/Xoff Software Flow Control. In the Automatic 1 character Xon/Xoff Software Flow Control, an Xoff will be sent to the remote transmitter when the local RX FIFO reaches the trigger level to halt remote data transmission. An Xon will be sent when the local RX FIFO falls

below the the trigger level to resume remote data transmission. In Automatic 2 character Xon/Xoff Software Flow Control, two Xoff and Xon characters are sent at the appropriate times instead of just a single character. This is to ensure that the first character is not accidentally interpreted as a software flow control character if it was not meant to be. The Automatic 2 Character Flow Control provides a much more reliable mechanism. Only the SC28L198 has the Automatic 1 character Xon/Xoff Software Flow Control. The SCC2698B does not have Automatic Xon/Xoff Software Flow Control.

- The XR16L788 has an Automatic RS485 Half-Duplex Control that will automatically control the direction of the RS485 transceivers. When data is loaded into the FIFO, the RTS# pin will become a logic 1 for transmit and when it is done transmitting all of the characters in the FIFO, it will change to a logic 0 so that it can start receiving. This feature saves CPU bandwidth from a lot of software code manipulation. This feature is not available in the Philips Octal UARTs.
- For wireless and portable applications, the XR16L788 has an Infrared Data Association (IrDA) encoder/decoder (ver 1.0). The Philips Octal UARTs do not have this feature.
- The XR16L788 has a sleep mode with automatic wake-up. Similarly, the SCC2698B and SC28L198 have a Power Down Mode.

1.3 CONCLUSION

The XR16L788 is a much simpler device to design than the SCC2698B and SC28L198 because the register set is compatible to the industry standard 16C550 register set. Since it is able to do simultaneous writes to all the channels, the initialization of the XR16L788 is much easier and quicker than the SCC2698B and SC28L198. With 64 bytes of TX and RX FIFO and a Global Interrupt Source Register, data throughput is increased and the interval between interrupts are decreased reducing CPU bandwidth requirement. In addition to that, the XR16L788 has many enhanced features for increased performance that are not available in the SCC2698B and SC28L198 as mentioned above in the Firmware Differences section.