



Notes

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Revision History

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Background

The RC32355/RC32351 Integrated Communications Processor (ICP) meets the requirements of various embedded communications applications, including residential gateways, Internet Access Devices (IAD), SOHO routers, and wireless systems. It is a single-chip solution that incorporates most of the generic system functions and application-specific interfaces that enable rapid time to market, very low cost systems, simplified designs, and reduced board real estate.

In addition to a high performance 32-bit CPU core, the RC32355/RC32351 ICP incorporates a number of on-chip generic peripherals, including an SDRAM controller, a separate memory/IO controller supporting 8-, 16- and 32-bit peripherals, an interrupt controller, timers, and serial ports. The RC32355 device also integrates four on-chip peripherals specifically targeted for communications applications:

1. A 10/100Mbps Ethernet controller.
2. An ATM segmentation and reassembly (SAR) capable of operating up to 25Mbps.
3. A USB device controller supporting data rates up to 12Mbps, fully compatible with version 1.1 of the USB specification.
4. An industry-standard TDM/PCM bus interface (not available on the RC32351). The TDM bus enables an interface to directly access external devices such as telephone CODECs and quality audio A/Ds and D/As. This feature is critical for applications requiring support of voice, mix voice, and data to support voice-over-x applications

This technical note describes the interface between the RC32355/RC32351 and the Alcatel MTC-20156 chip which, with the analog front-end MTC-20154 chip, constitutes the MTK-20150 Rate Adaptive ADSL DynaMiTe chipset. This interface has been implemented on the 79RP355 ADSL IAD reference design and the 79RP351 ADSL modem reference design. More information about these two designs is available on the IDT web site at:

http://www.idt.com/products/pages/Integrated_Processors-PL100_Sub221_Dev420.html

MTC-20156 Description

The MTC-20156, hereafter referred to as MTC, is the digital part of the Alcatel MTK-20150 Rate Adaptive ADSL DynaMiTe chipset. The MTC-156 converts ADSL data into ATM cells. It has a primary data bus which can be configured as either Utopia level 1 (U-I) or Utopia level 2 (U-II). This data bus transfers the data from the ADSL chipset to the ATM SAR. The MTC-20156 has a second port (the modem port) which is used to enable a microprocessor to configure and control the operation of the MTC-20156. Two buses are available for the modem control port: the CTRL-E (Control-E) bus and the RS232 bus. The CTRL-E bus is the primary bus used in most systems. The RS232 bus is used for back up access. The main features of the MTC-20156 include the following:

- ◆ DMT modem, embedded controller, ATM framer
- ◆ Supports ANSI T1.413 issue 2, ITU G.992.1 and G.992.2 standards
- ◆ Standard UTOPIA level 1 and level 2 ATM interfaces
- ◆ Parallel or serial modem control interface (CTRL-E) for glueless connection to the management entity (RC32355/RC32351 in this case).

Figure 1 illustrates the block diagram of the Alcatel MTK-20150 Rate Adaptive ADSL DynaMiTe chipset.

Notes

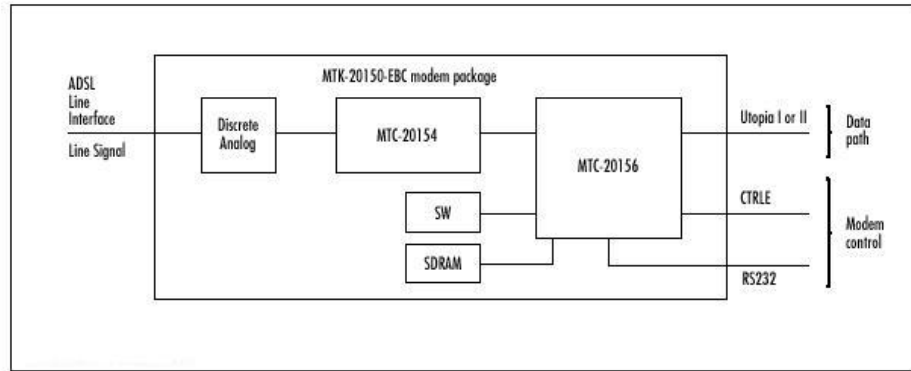


Figure 1 Alcatel MTK-20150

Connecting the RC32355/RC32351 to the MTC-20156

The RC32355/RC32351 must be connected to the MTC-20156 on both the data bus and the control bus. The RC32355/RC32351 connects to the MTC-20156 using the Utopia bus to transfer data back and forth. The RC32355/RC32351 also connects to the MTC-20156 using the CTRL-E bus to program and configure the operation of the MTC-20156.

CTRL-E Interface

The RC32355/RC32351 accesses the MTC-20156 chip as a standard 8-bit memory/IO device on the CTRL-E bus to configure the operation of the device. The MTC-20156 device is connected to the RC32355/RC32351 device controller as shown in Figure 2.

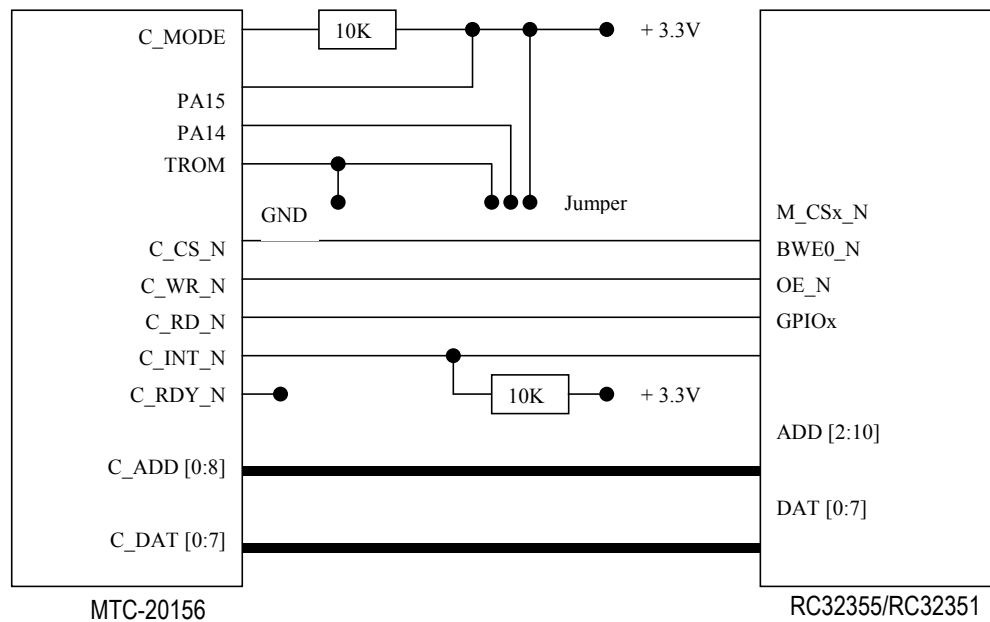


Figure 2 CTRL-E Connection Between the RC32355/RC32351 and the MTC-20156

Notes

The details of the CTRL-E connection between the two devices are listed below:

- ◆ C_MODE sets up the memory transfer style (Intel or Motorola). Intel style must be used for the RC32355/RC32351 through the pull-up.
- ◆ PA14, PA15, and TROM determine the bus interface, CTRL-E or RS232, used to access the MTC. If PA14 is pulled up, CTRL-E will be enabled. If PA14 is pulled down, RS232 will be enabled. When connecting to the RC32355/RC32351, CTRL-E must be used, and thus PA14 must be pulled up. Figure 2 illustrates the use of jumpers to select between both modes. The use of the RS232 mode can be useful during initial debug of the system.
- ◆ C_CS_N must be connected to one of the 6 independent Chip Select signals provided by the RC32355/RC32351 device controller.
- ◆ In 8-bit transfer, BWE_0 - Byte write enable 0 - from the RC32355/RC32351 is used as the write signal - C_WR_N - to the MTC-20156.
- ◆ OE_N from the RC32355/RC32351 is connected to the C_RD_N of the MTC-20156 as the read signal.
- ◆ Either the polling or interrupt method can be used to communicate with the MTC-20156. If the interrupt method is used, connect C_INT_N to one of the 32 available GPIO pins. This signal must also be pulled up.
- ◆ It is usually recommended to pull-up the WAITACK_N signal on the RC32355/RC32351 and leave the C_RDY_N from the MTC-20156 unconnected. The interface between the RC32355/RC32351 and the MTC-20156 is configured to be Intel Style, the WAITACK_N behaves as a wait signal and is not really used in this interface. Another option is to connect the C_RDY_N to the WAITACK_N.
- ◆ The 9-bit address bus from the MTC-20156 is connected to ADD [2:10] on the RC32355/RC32351 side for an 8-bit memory/IO transfer.
- ◆ The 8-bit data bus from the MTC-20156 is connected to the first 8 data lines (DATA [0:7]) on the RC32355/RC32351.

CTRL-E Software

Overview

A special set of software routines (referred to as CTRL-E software), which configure the operation of the MTC-20156 chipset and enable it to transfer and receive data across the DSL link, need to be run on the host CPU (the RC32355/RC32351 ICP in this case) in the Modem / Residential Gateway. The CTRL-E routines perform several functions and are used by the RC32355/RC32351 to get information regarding the status of the DSL link. For more detailed information about the functions and operations of CTRL-E, see the 79RP355 Evaluation Board Manual.

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Utopia Interface

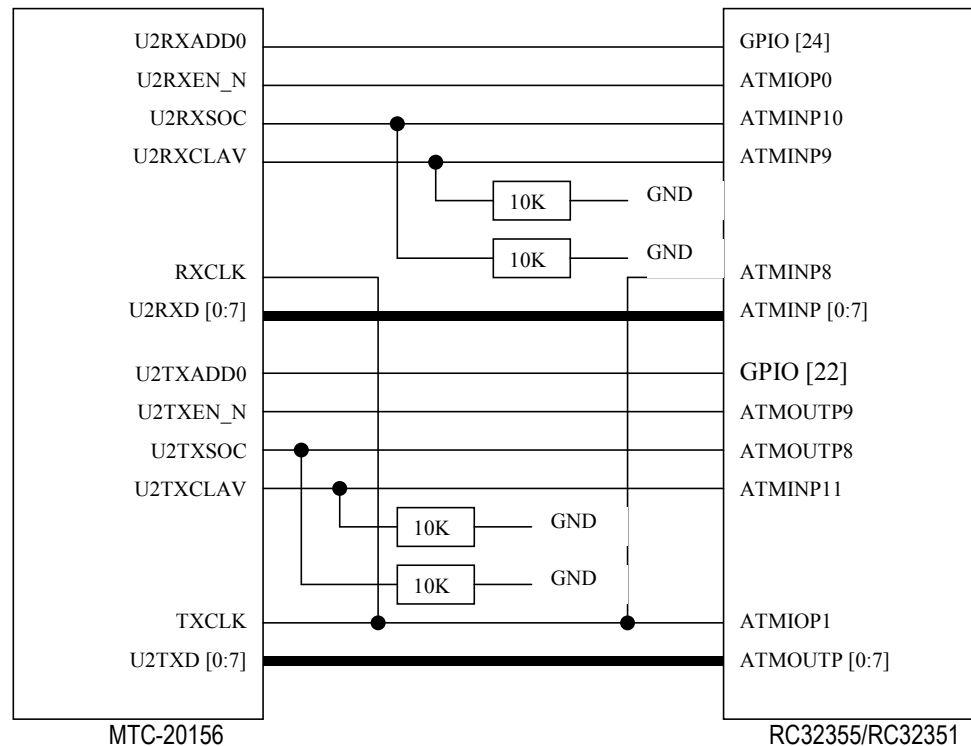


Figure 3 Connecting the RC32355/RC32351 to the MTC-20156 Using the Utopia Bus for Data Transfer

The Utopia bus interface is used to connect the RC32355/RC32351 to the MTC-20156 to transfer data between the two devices. The RC32355/RC32351 has a built-in ATM SAR and provides the necessary SARing function for the data transferred on the ADSL line. The RC32355/RC32351 can be configured as either a Utopia level 1 or a Utopia level 2 interface. In the Utopia II mode, the RC32355/RC32351 implements only 2 address lines (out of the 5 referenced in the UTOPIA 2 specifications), while the MTC-20156 uses only 1 UTOPIA address line (RXADD0/TXADD0). The details of the data bus connection (Utopia connection) between the two devices are illustrated in Figure 3 and listed below:

- ◆ RXADD0 from the MTC-20156 must be connected to GPIO[24] on the RC32355/RC32351. GPIO[24] must be programmed in its alternate function (ATM Receive PHY address).
- ◆ The RC32355/RC32351 ATM interface and pins (ATMINP [0:11], ATMOUTP [0:9], ATM IOP [0:1] and GPIO[25:22]) can be configured to work in either Utopia level 1 or Utopia level 2 mode. It supports up to 3 PHYs when configured in the Utopia 2 mode. The exact mapping of ATM pins to Utopia 2 is shown in Table 19.4 in the RC32355/RC32351 User Reference Manual. The connection between the MTC-20156 and the RC32355/RC32351 corresponds to the standard Utopia 2 interface.
- ◆ RXSOC, RXCLAV, TXSOC and TXCLAV should be pulled down because they are tristated when not driven by an active PHY.
- ◆ An external or an internal ATM clock can be used to drive both RxCLK and TxCLK. However, it is recommended to use the internal clock directly by the RC32355/RC32351.

Summary

This application note describes the interface between RC32355/RC32351 and the Alcatel Microelectronics MTC-20156. It is a 1-to-1 interface between the two devices without the need for any external component, thus reducing the overall system cost. This information can be used when designing the RC32355/RC32351 in an ADSL-based modem or Residential Gateway / Intelligent Access Device (IAD).

Notes

This information can also be used as a guideline when interfacing the RC32355/RC32351 to other DSL chipsets or broadband access devices. Additional information on how to connect the analog side of the chipset and the layout recommendation is available from Alcatel.