ST20138
Unicorn II

USB ADSL modem chipset: ST70138 + MTC20174 for ultra-low-BOM ADSL modem designs

Data Brief

Description

Performance, cost and time to market are key factors in DSL modem development.

The Unicorn II chipset has been designed with all these care-abouts in mind, providing CPE manufacturers with a complete and extremely cost-effective solution for ADSL USB modems operating under a variety of operating systems, such as Microsoft Windows™, Mac OS and Linux. The controller-less architecture of the Unicorn II and the fact that it does not require an external SDRAM, make its external bill-of-materials (E-BOM) best-in-class. Thanks to its small form factor packages and an external component count of less than 140, the Unicorn II easily fits on a small-dimension standard 2-layer single-sided PCB which further reduces overall system cost. Combining low power consumption, high-speed performance (up to 8 Mbps), field-proven driver software and customizable user interface, the Unicorn II is the ideal choice for cost-conscious equipment manufacturers, telecom operators/ISPs and ADSL users alike.

The Unicorn II chipset consists of the ST70138 digital chip and the MTC20174 analog front end with integrated line driver.

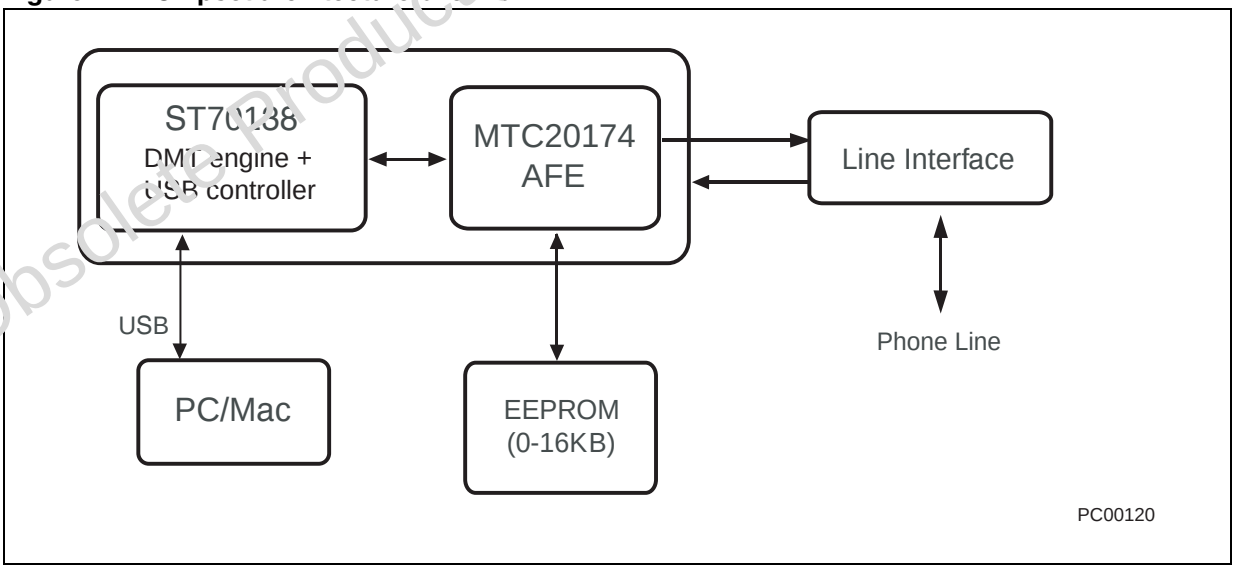
The ST70138 is supplied in two packages, LBGA80 and TQFP144. The ST70138T, packaged in TQ144, is pin-compatible to the ST70137 legacy ADSL USB chipset, enabling manufacturers to benefit directly from the cost and performance advantages that the ST70138 brings.

Supplied in a compact LBGA80 package, the ST70138B brings additional cost advantages to new designs.

The MTC20174 has been designed for use in DMT-based ADSL CPE modems that comply with ANSI T1.413 issue 2, ITU G.992.1 (G.dmt) andITU G.992.2 (G.lite), for Annex A and B, and the DT UR2 specification.

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Figure 1. Chipset architecture overview



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1 Standard compliance and interoperability

Drawing from eleven years of experience, ST developed this chipset that offers full compatibility with full-rate and G.lite ADSL standards, as well as the USB1.1 standard including plug-and-play support. The Unicorn II comes with a complete set of drivers for Microsoft Windows, Mac OS and Linux. It is fully interoperable with all major ADSL and ADSL2+ DSLAMs and complies with TR-048 (DSL Forum) and ETSI 101 388 performance requirements.

1.1 Supported protocols

- RFC 2684 bridged (LLC/SNAP and VCMUX), replacing RFC 1483
- RFC 2684 routed (LLC/SNAP and VCMUX), replacing RFC 1483
- RFC 2364 PPP over ATM (LLC and VCMUX)
- RFC 2516 PPP over Ethernet (LLC and VCMUX)
- RFC 2225 Classical IP over ATM

1.2 ATM and ATM adaptation support

- VPI range: 0 - 255
- VCI range: 32 - 65535.
- UNI 3.0, 3.1, 4.0 signaling
- TR37 (auto-configuration)
- UBR, CBR (with customizable parameters)
- AAL0, AAL5

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2 Software suite

The Unicorn II reference design package includes a comprehensive set of software drivers and tools for Windows, Mac and Linux, including PC software for modem control and communications protocols. The software drivers are fully configurable and include diagnostic tools which are specifically developed to minimize operator helpdesk interactions.

2.1 Software interface

- NDIS WAN or NDIS5-ATM PCI driver and USB driver
- MAC / Linux OS: Open Transport driver

2.2 OS support

- Win98, Win98SE, WinME, Win2K, WinXP, Windows Vista
- MAC OS 8.6 till 10.4.x
- Up to Linux kernel 2.6.x

2.3 Hardware interfaces

- USB connector
- RJ11 connector

2.4 Maximum supported speed

- 8Mbps downstream
- 1Mbps upstream

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ST70138

UNICORN II™ USB controller-less ADSL transceiver

Data Brief

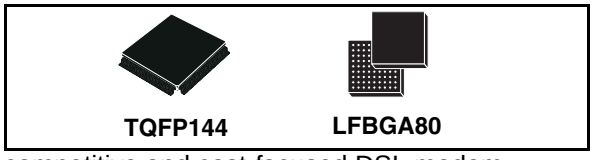
Features

- Support digital signal processing requirements for one ADSL CPE channel (ITU-R)
- Compliant with ITU 992.1 (ADSL full rate) Annex A (ADSL over POTS), Annex B (ADSL over ISDN), ITU 922.2 (G.LITE) and ANSI T1.413.
- Enhanced FTP transfer capabilities
- Direct interface to USB (USB release 1.1 specification)
- Direct interface to external 8/16 bit serial memory to support USB user's configuration
- Direct analog front end interface for MTC20174
- Clock and reset interface
- 1.8V and 3.3V power supply
- TTL logic levels compatible
- Power management capabilities
- Low power consumption : max 0.45W
- TQFP144 (backward compatible with ST70137 legacy ADSL USB chip)
- LFBGA80

Description

The Unicorn II chipset is succeeding the field-proven Unicorn, the first controller-less ADSL USB modem chipset that was deployed in volume. Compared to conventional USB ADSL chipsets, the Unicorn II dramatically reduces design and production costs of USB ADSL modems. The chipset which is manufactured in a cost-effective CMOS technology integrates a number of external components which results in reduced component count and PCB complexity. Thus E-BOM costs could be lowered significantly, while overall performance was improved.

Its proven controller-less and SDRAM-less architecture is a key differentiator in today's highly



competitive and cost-focused DSL modem market.

The Unicorn II chipset has been designed to provide CPE manufacturers with a complete and extremely cost-effective solution for ADSL USB modems operating under a variety of operating systems, such as Microsoft Windows™, Mac OS and Linux. The controller-less architecture of the Unicorn II and the fact that it does not require an external SDRAM, make its external bill-of-materials (E-BOM) best-in-class.

Thanks to its small form factor packages and an external component count of less than 140, the Unicorn II easily fits on a small-dimension standard 2-layer single-sided PCB which further reduces overall system cost. Combining low power consumption, high-speed performance (up to 8 Mbps), field-proven driver software and customizable user interface, the Unicorn II is the ideal choice for cost-conscious equipment manufacturers, telecom operators/ISPs and ADSL users alike.

The Unicorn II chipset consists of the ST70138 digital chip and the MTC20174 analog front end with integrated line driver. The ST70138 is supplied in two packages, LBGA80 and TQFP144. The ST70138T, packaged in TQ144, is pin-compatible to the ST70137 legacy ADSL USB chipset, enabling manufacturers to benefit directly from the cost and performance advantages that the ST70138 brings.Supplied in a compact LBGA80 package, the ST70138B brings additional cost advantages to new designs. The MTC20174 has been designed for use in DMT-based ADSL CPE modems than comply with ANSI T1.413 issue 2, ITU G.992.1 (G.dmt) and ITU G.992.2 (G.lite), for Annex A and B, and the DT U-R2 specification.

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Ordering information

Table 1. Order codes

Part Number	Package
E-ST70138B	LFBGA80[1]
E-ST70138T	TQFP144 (*)

1. Ecopack

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MTC20174

ADSL analog front-end with integrated line driver for CPE application

Data Brief

Features

- Fully Integrated AFE and Line Driver for ADSL
- Overall 12 bit resolution, 1.1MHz signal bandwidth
- 8.8 MS/s ADC
- 8.8 MS/s DAC
- Differential analog I/O
- Accurate continuous-time channel filtering
- 5^{th} & 4^{th} order tunable continuous-time receive and transmit filters respectively
- Support for multiple ADSL standards:
  - ANSI T1.413 Issue 2
  - ITU G.992.1 (G.dmt)
    - Annex A
    - Annex B (ADSL over ISDN)
    - Annex C (ADSL over ISDN SBM/DBM/G.dmt)
  - ITU G.992.2 (G.lite)
- Highest performance:
  - Operation up to 18 kft (26 AWG)
  - More than 8 Mbps downstream and 832 Kbps upstream up to 8 kft (26 AWG)
  - More than 3 Mbps downstream and 760 kbps upstream up to 12 kft (26 AWG)
- 100 pin TQFP package allows high-density board design
- Power dissipation of 900mW at 25°C, typical
- TQFP100 package

Applications

The MTC20174 is an ADSL Analog Front-End (AFE) with integrated Line-Driver for ATU-R applications offering Annex A, B and C.



TQFP100

Description

The MTC20174 Analog Front End (AFE) with integrated line driver is designed for DMT based ADSL CPE modems compliant with ANSI T1.413 issue 2, ITU G.992.1 (G.dmt) and ITU G.992.2 (G.lite), for Annex A, B and C.

It is intended to be used with the MTC20166 DMT modem and ATM framer as part of the MTK20170 chipset, but may also be used to support other ADSL signal processors. It includes the following parts:

- A 12-bit 8.8Msamples/s DAC
- A 13-bit 8.8Msamples/s ADC
- Tunable low-pass and high-pass filters
- Low-noise PGAs
- A TX Pre-Amplifier
- A TX Line-Driver
- A fully integrated DCXO
- A PLL-based frequency doubler
- A filter tuning circuit
- A dying gasp circuit
- A digital module for control, test and interface

The following figure provides a graphical representation of the MTC20174 functional blocks with an additional separation in RX and TX path.

The analog and digital part have separated 3.3V power supplies. In addition some part of the analog section of the MTC20174 has a power supply of 5V.

The typical total power consumption of the MTC20174 is 900mW for 12dBm of line power (full operation) at 250°C.

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Ordering information

Table 1. Order codes

Part Number	Package	Temperature	Packing
E-MTC20174[1]	TQFP100	0 to 70°C	Tray
MTC20174-TQ-C1TR	TQFP100	0 to 70°C	Tape and reel

1. Ecopack

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Revision history

Table 2. Document revision history

Date	Revision	Changes
15-Sep-2004	1	Initial release.
27-Mar-2007	2	Updated the ordering information of ST70138 and MTC20174. Updated the description and block diagram of Unicorn II (cover page).

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