RS-485/RS-422 Transceivers

MAY 2002 ANALOG DEVICES INTERFACE APPLICATIONS BULLETIN

CONTENTS

ADM483, Slew Rate Limited, EMC Compliant EIA RS-485 Transceiver

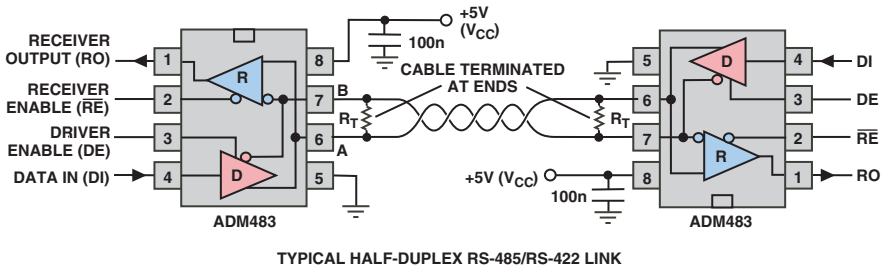
The ADM483 is a low power differential line transceiver suitable for communication on multipoint bus transmission lines. EMI immunity is in excess of 10 V/m meeting IEC1000-4-3. The level of unwanted emissions is carefully controlled using slew limiting on the driver outputs. This reduces reflections with improperly terminated cables and also minimizes electromagnetic interference. The controlled slew rate limits the data rate to 250 kbps.

The ADM483 is intended for balanced data transmission and complies with both EIA Standards RS-485 and RS-422. It contains a differential line driver and a differential line receiver, with the driver output and receiver input pins commoned for half-duplex data transmission. The input impedance of the ADM483 is 96 kV, allowing up to 256 transceivers on the bus, and the device operates from a single 5 V ± 10% power supply.

Excessive power dissipation caused by bus contention or by output short circuits is prevented by a thermal shutdown circuit that forces the driver output into a high impedance state in the event of a chip overtemperature condition. The receiver incorporates a fail-safe feature that forces a logic high output state if the inputs are unconnected (floating).

The ADM483 is fabricated on BiCMOS, an advanced mixed technology process combining low power CMOS with robust bipolar technology. It is fully specified over the industrial temperature range and is available in 8-lead DIP, SOIC, and micro SOIC packages.

- **High EMI immunity meets IEC1000-4-3**
- **Reduced slew rate for low EM interference**
- **250 kbps data rate**
- **Single 5 V ±10% supply**
- **–7 V to +12 V bus common-mode range**
- **12 kΩ input impedance**
- **Short circuit protection**
- **Excellent noise immunity**
- **36 µA supply current**
- **100 nA shutdown current**



TYPICAL HALF-DUPLEX RS-485/RS-422 LINK

APPLICATIONS

- low power RS-485 systems
- EMI-sensitive applications
- DTE-DCE interface
- packet switching
- local area networks

ANALOG DEVICES

Visit our website for samples, data sheets, and additional product information.

www.analog.com

ADM485, 5 V Low Power EIA RS-485 Transceiver

The ADM485 is a half-duplex differential line transceiver suitable for high speed bidirectional data communication on multipoint bus transmission lines. It is designed for balanced data transmission and complies with both EIA Standards RS-485 and RS-422.

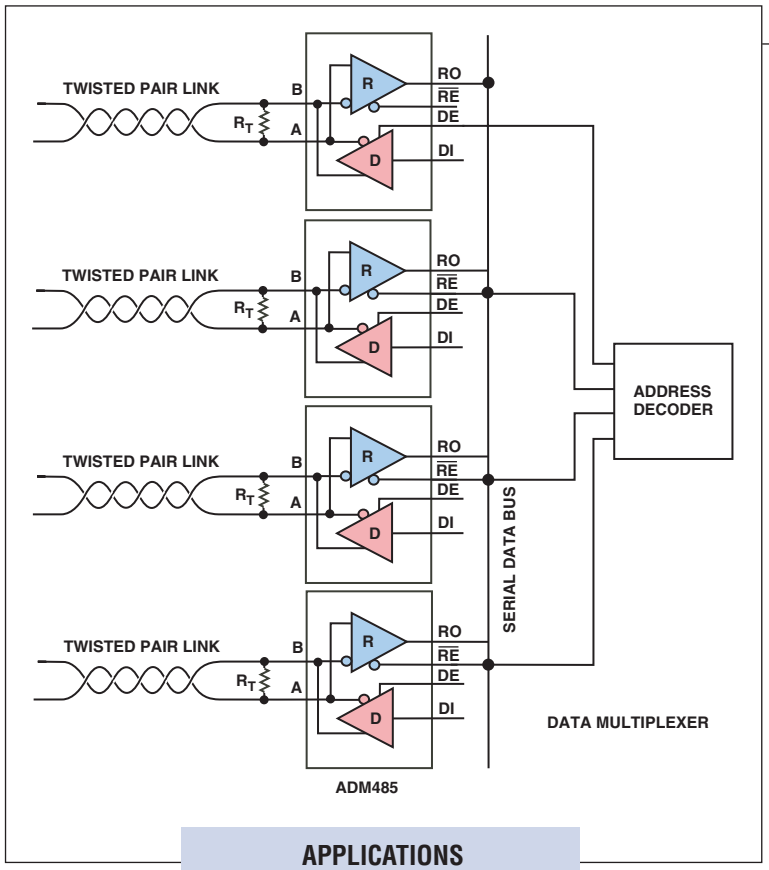
The part contains a differential line driver and a differential line receiver that have separate enable pins. When disabled the outputs are three-stated, which allows the driver outputs to be connected to a twisted pair bus and the receiver output to be connected to a serial bus.

Up to 32 transceivers may be connected to a bus. The ADM485 driver features high output impedance when disabled and when powered down, which minimizes the loading effect on the bus when the transceiver is not being utilized. The high impedance driver output is maintained over the entire common-mode voltage range from –7 V to +12 V. The ADM485 operates from a single 5 V power supply. Excessive power dissipation caused by bus contention or by output shorting is prevented by a thermal shutdown circuit that forces the driver output into a high impedance state in the event of a chip overtemperature condition. The receiver has a fail-safe feature that forces a logic high output state if the inputs are unconnected (floating).

The ADM485 is fabricated on BiCMOS, an advanced mixed technology process combining low power CMOS with fast switching bipolar technology. All inputs and outputs incorporate protection against ESD; all driver outputs feature high source and sink current capability. An epitaxial layer is used to guard against latch-up.

The ADM485 features extremely fast switching speeds. Minimal driver propagation delays permit transmission at data rates up to 5 Mbits/s while low skew minimizes EMI interference.

The part is fully specified over the commercial and industrial temperature range and is available in 8-lead DIP, SOIC, and micro SOIC packages.



- **5 Mb/s data rate**
- **Single 5 V supply**
- **–7 V to +12 V bus common-mode range**
- **High speed, low power BiCMOS**
- **Thermal shutdown protection**
- **Zero skew driver**
- **Driver propagation delay: 10 ns**
- **Receiver propagation delay: 25 ns**
- **High Z outputs with power off**
- **Superior upgrade for LTC485**

APPLICATIONS

- low power RS-485 systems
- DTE-DCE interface
- packet switching
- local area networks
- data concentration
- data multipliers
- integrated services data network (ISDN)

ADM1485, High Speed, Ultralow Power EIA RS-485 Transceiver

The ADM1485 is a half-duplex differential line transceiver suitable for high speed bidirectional data communication on multipoint bus transmission lines. It is designed for balanced data transmission and complies with both EIA Standards RS-485 and RS-422.

The part contains a differential line driver and a differential line receiver that have separate enable pins. When disabled the outputs are three-stated, which allows the driver outputs to be connected to a twisted pair bus and the receiver output to be connected to a serial bus.

Up to 32 transceivers may be connected to a bus. The ADM1485 driver features high output impedance when disabled and when powered down, which minimizes the loading effect on the bus when the transceiver is not being utilized. The high impedance driver output is maintained over the entire common-mode voltage range from –7 V to +12 V.

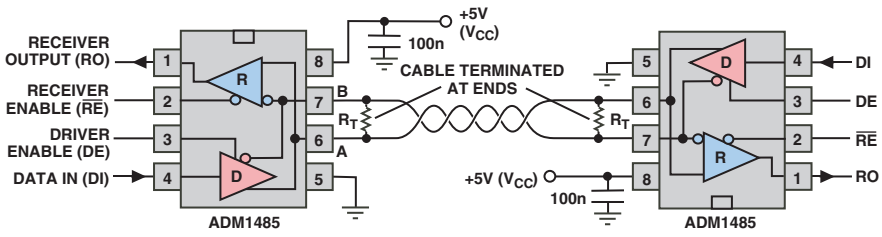
The ADM1485 operates from a single 5 V power supply. Excessive power dissipation caused by bus contention or by output shorting is prevented by a thermal shutdown circuit that forces the driver output into a high impedance state in the event of a chip overtemperature condition. The receiver has a fail-safe feature that forces a logic high output state if the inputs are unconnected (floating).

The ADM1485 is fabricated on BiCMOS, an advanced mixed technology process combining low power CMOS with fast switching bipolar technology. All inputs and outputs incorporate protection against ESD; all driver outputs feature high source and sink current capability. An epitaxial layer is used to guard against latch-up.

The ADM1485 features extremely fast switching speeds. Minimal driver propagation delays permit transmission at data rates up to 30 Mbits/s while low skew minimizes EMI.

The part is fully specified over the commercial and industrial temperature range and is available in 8-lead DIP, SOIC, and micro SOIC packages.

- **30 Mb/s data rate**
- **Single 5 V supply**
- **–7 V to +12 V bus common-mode range**
- **High speed, low power BiCMOS**
- **Thermal shutdown protection**
- **Short circuit protection**
- **Zero skew driver**
- **Driver propagation delay: 10 ns**
- **Receiver propagation delay: 25 ns**
- **High Z outputs with power off**
- **Superior upgrade for LTC1485**



TYPICAL HALF-DUPLEX RS-485/RS-422 LINK

APPLICATIONS

- battery-powered RS-485/RS-422 systems
- DTE-DCE interface
- packet switching
- local area networks
- data concentration
- data multipliers
- integrated services data network (ISDN)

ADM1486, 30 Mbps PROFIBUS 5 V, 0.9 mA RS-485 Transceiver

The ADM1486 is a differential line transceiver suitable for high speed bidirectional data communication on multipoint bus transmission lines. It is designed for balanced data transmission, complies with EIA Standards RS-485 and RS-422, and is recommended for PROFIBUS applications. The part contains a differential line driver and a differential line receiver. Both the driver and the receiver may be enabled independently. When disabled or with power off, the driver outputs are high impedance. The ADM1486 operates from a single 5 V power supply. Excessive power dissipation caused by bus contention or by output shorting is prevented by short circuit protection and thermal circuitry. Short circuit protection circuits limit the maximum output current to ±150 mA during fault conditions. A thermal shutdown circuit senses if the die temperature rises above 150°C and forces the driver outputs into a high impedance state under this condition.

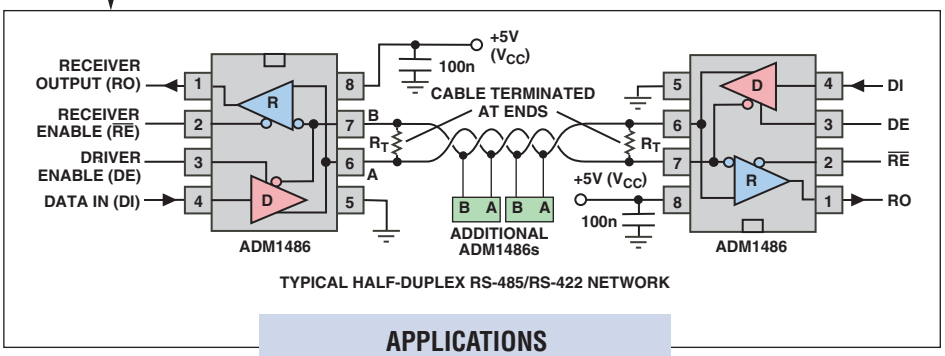
Up to 50 transceivers may be connected simultaneously on a bus, but only one driver should be enabled at any given time. It is important, therefore, that the remaining disabled drivers do not load the bus.

To ensure this, the ADM1486 driver features high output impedance when disabled and also when powered down. This minimizes the loading effect when the transceiver is not being utilized. The high impedance driver output is maintained over the entire common-mode voltage range from –7 V to +12 V. The receiver contains a fail-safe feature that results in a logic high output state if the inputs are unconnected (floating).

The ADM1486 is fabricated on BiCMOS, an advanced mixed technology process combining low power CMOS with fast switching bipolar technology. All inputs and outputs contain protection against ESD; all driver outputs feature high source and sink current capability. An epitaxial layer is used to guard against latch-up.

The ADM1486 features extremely fast and closely matched switching, enable, and disable times. Minimal driver propagation delays permit transmission at data rates up to 30 Mbps while low skew minimizes EMI interference. The part is fully specified over the commercial and industrial temperature range and is available in 8-lead DIP, SOIC, and micro SOIC packages.

- **30 Mbps data rate**
- **Recommended for PROFIBUS applications**
- **2.1 V minimum differential output with 54 termination**
- **Low power 0.9 mA I_{CC}**
- **Thermal shutdown and short circuit protection**
- **Zero skew driver and receiver**
- **Driver propagation delay: 8 ns**
- **Driver propagation delay: 8 ns**
- **Receiver propagation delay: 12 ns**
- **High impedance outputs with driver disabled or power off**
- **Superior upgrade for SN65ALS1176**



TYPICAL HALF-DUPLEX RS-485/RS-422 NETWORK

APPLICATIONS

- industrial field equipment
- PROFIBUS applications

ANALOG DEVICES

Visit our website for samples, data sheets, and additional product information.

www.analog.com

ADM3082/ADM3085/ADM3088, Slew Rate Limited, High Input Impedance RS-485 Transceivers

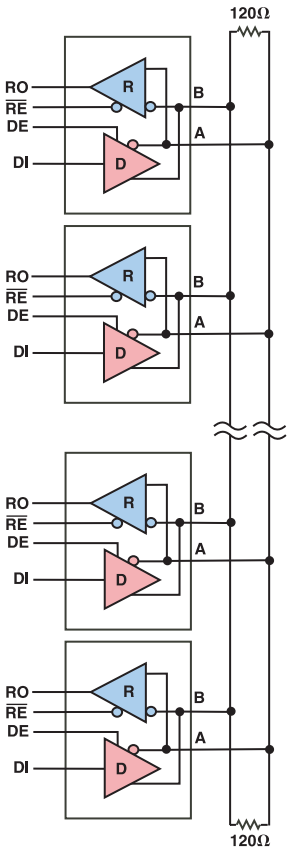
The ADM3082/ADM3085/ADM3088 are high speed RS-485/RS-422 transceivers consisting of one driver and one receiver per package. The devices feature fail-safe operation, ensuring a logic high receiver output when the receiver inputs are open circuit or short circuit. This guarantees that the receiver output will be high if all the transmitters on a terminated bus are disabled (high impedance).

The ADM3082 has a slew rate limited driver to minimize electromagnetic interference (EMI) and reduce reflections caused by incorrectly terminated cables. This allows error-free transmission at data rates up to 115 kbps.

The ADM3085 offers a higher slew rate allowing data rates up to 500 kbps, while the ADM3088 has a driver whose slew rate is not limited, allowing data rates up to 10 Mbps.

All devices in the family feature high receiver input impedance (1/8 unit load), allowing up to 256 transceivers on the bus. The devices have low current drain of 375 µA unloaded or fully loaded with the drivers disabled, and feature an ultralow power (1 nA) shutdown mode.

The ADM3082/ADM3085/ADM3088 are fully specified over the commercial and industrial temperature range and are available in 8-lead DIP and SOIC packages.



ADM3082/ADM3085/ADM3088

HALF-DUPLEX RS-485 NETWORK

- **Enhanced slew rate limiting for error-free data transmission (except ADM3088)**
- **Fail-safe receiver operation while maintaining EIA/TIA-485 compatibility**
- **Low current (1 nA) shutdown mode**
- **High input impedance—up to 256 transceivers on bus**
- **Pin compatible with industry standard 75176**

APPLICATIONS

- enhanced replacement for industry-standard parts
- EMI-sensitive systems
- level translation
- LANs for industrial control applications

Visit our website for samples, data sheets, and additional product information.

www.analog.com

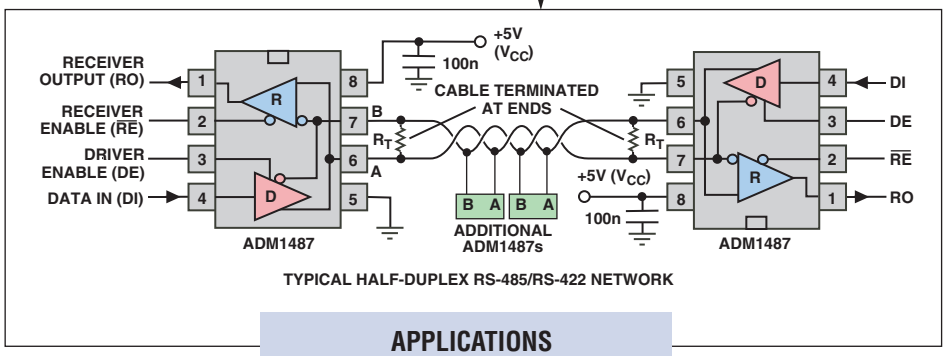
ANALOG DEVICES

ADM1487, Ultralow Power RS-485/RS-422 Transceiver

The ADM1487 is an ultralow power RS-485/RS-422 transceiver consisting of one driver and one receiver per package. Quiescent operating current is typically 80 µA and 1 µA in shutdown mode. The driver and receiver both have three-state outputs. This allows multiple drivers to be connected to an RS-485/RS-422 bus or several receiver outputs to be connected to a serial data bus. The driver will maintain a high impedance output state even with power off, while the receiver features fail-safe operation that guarantees a logic high output if the inputs are left open circuit.

The device has slew rate limited drivers to minimize electromagnetic interference (EMI) and reduce reflections caused by incorrectly terminated cable.

- **250 kbps data rate**
- **Low power—120 µA max I_{CC} with driver disabled**
- **High input impedance—up to 256 transceivers on bus**
- **Low current (1 µA) shutdown mode**
- **Slew rate control for error-free data transmission and low EMI**
- **±10 kV ESD protection (human body model) on RS-485 I/O pins**
- **Glitch-free driver power-up allows hot connection**
- **Driver maintains high output impedance with power off**
- **Wide common-mode range allows ±7 V ground differences between devices**
- **Pin compatible with industry standard 75176**



TYPICAL HALF-DUPLEX RS-485/RS-422 NETWORK

APPLICATIONS

- battery-powered RS-485/RS-422 systems
- level translation

Worldwide Headquarters
One Technology Way
P.O. Box 9106
Norwood, MA
02062-9106 U.S.A.
Tel: 781 329 4700,
(1 800 262 5643,
U.S.A. only)
Fax: 781 326 8703

Analog Devices GmbH
Am Westpark 1–3
D-81373
München, Germany
Tel: 49 89 76903 0
Fax: 49 89 76903 157

Japan Headquarters
New Pier Takeshiba
South Tower Building
1-16-1 Kaigan,
Minato-ku Tokyo
105-6891, Japan
Tel: 3 5402 8200
Fax: 3 5402 1063

Southeast Asia Headquarters
4501 Nat West Tower
Times Square
1 Matheson Street
Causeway Bay
Hong Kong, PRC
Tel: 852 2 506 9336
Fax: 852 2 506 4755

RS-485/RS-422 Transceiver Selection Guide

Model Number	Data Rate (Mbps)	Slew Rate Limit	Quiescent Current (µA)	Shutdown Mode	Shutdown Current (µA)	Replacement For
ADM483	0.25	Yes	36	Yes	0.1	MAX483, LTC1485
ADM485	5	No	700	No	n/a	MAX485, LTC485, DS75176
ADM1485	30	No	700	No	n/a	LTC1485
ADM1486	30	No	900	No	n/a	SN65ALS1176
ADM1487	0.25	Yes	120	Yes	1	LTC1487
ADM3082	0.115	Yes	375	Yes	1	MAX3082E
ADM3085	0.5	Yes	375	Yes	1	MAX3082E
ADM3088	10	No	375	Yes	1	MAX3088E

ANALOG DEVICES

Visit our website for samples, data sheets, and additional product information.

www.analog.com

G02994-9-5/02(0)