

RS485 overview

The RS-485 serial bus is widely used when the communication distance is required to be several tens of meters to several kilometers. RS-485 uses balanced transmit and differential receive, so it has the ability to reject common-mode interference. In addition to the high sensitivity of the bus transceiver, it can detect voltages as low as 200mV, so the transmitted signal can be recovered beyond the kilometer.

RS-485 uses a half-duplex mode of operation, and only one point can be sent at any time. Therefore, the transmitting circuit must be controlled by an enable signal.

RS485 features

RS-485 is very convenient for multi-point interconnection and can save many signal lines. Applications RS-485 can be networked to form a distributed system that allows up to 32 drives and 32 receivers to be connected in parallel. In response to the shortcomings of RS-232-C, the new standard RS-485 has the following features:

(1) Electrical characteristics of RS-485: The logic "1" is represented by the voltage difference between the two lines +2V~+6V, and the logic "0" is represented by the voltage difference between the two lines -6V~-2V. The interface signal level is lower than RS-232-C, and it is not easy to damage the interface circuit chip, and the level is compatible with the TTL level, which is convenient for connection with the TTL circuit.

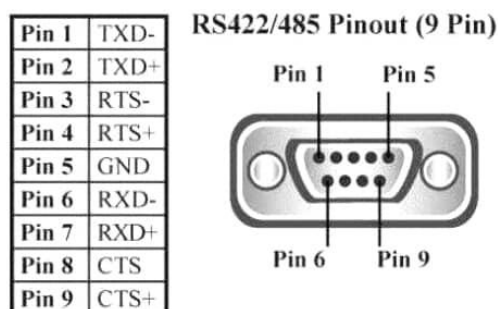
(2) The highest data transmission rate is: 10Mbps

(3) The RS-485 interface adopts a combination of balanced driver and a differential receiver, which has strong anti-common mode interference capability, that is, good anti-noise performance.

(4) The maximum transmission distance of the RS-485 interface is 4000 feet, which is actually up to 3000 meters.

(5) The RS-232-C interface allows only one transceiver to be connected to the bus, ie single-station capability; while the RS-485 interface allows only up to 128 transceivers to be connected on the bus, ie multi-station capability, so that the user The device network can be easily established using a single RS-485 interface.

RS422/485



RS422 overview

The full name of the RS-422 standard is “the electrical characteristics of the balanced voltage digital interface circuit”, which defines the characteristics of the interface circuit. There is actually a signal ground, a total of 5 lines. Since the receiver uses high input impedance and the transmission driver has a stronger driving capability than RS232, it is allowed to connect multiple receiving nodes on the same transmission line, and up to 10 nodes can be connected. One master device (Master) and the rest slave devices (Slave), the slave devices cannot communicate with each other, so RS-422 supports point-to-multidirectional two-way communication. The receiver input impedance is $4k$, so the maximum load capacity of the transmitter is $10 \times 4k + 100\Omega$ (terminating resistor).

The RS-422 and RS-485 circuits have basically the same principle. They are sent and received in differential mode, and no digital ground is required. Differential operation is the fundamental reason for the long transmission distance under the same rate condition. This is the fundamental difference between the two and RS232, because RS232 is a single-ended input and output, and at least digital ground is required for duplex operation. Send line and accept line three lines (asynchronous transmission), you can also add other control lines to complete synchronization and other functions.

RS-422 can work and receive without full-duplex operation through two pairs of twisted pairs. RS485 can only work half-duplex, and transmission and reception cannot be performed at the same time, but it only needs one pair of twisted pairs. RS422 and RS485 can transmit 1200 meters at 19kpbs. A device can be connected to the line on the new transceiver.

The electrical performance of RS-422 is exactly the same as RS-485. The main difference is that RS-422 has 4 signal lines: two transmissions (Y, Z) and two receptions (A, B). Since the reception and transmission of RS-422 are separate, it can be simultaneously received and transmitted (full duplex); RS-485 has 2 signal lines: transmission and reception.

RS422 features

Since the RS-422 four-wire interfaces uses separate transmit and receive channels, there is no need to control the data direction. Any necessary signal exchange between devices can be done in software mode (XON/XOFF handshake) or hardware mode (a pair of separate pairs). Stranded wire). The RS-422 has a maximum transmission distance of 4000 feet (about 1219 meters) and a maximum transmission rate of 10 Mb/s. The length of the balanced twisted pair is inversely proportional to the transmission rate, and it is possible to reach the maximum transmission distance below the 100 kb/s rate. The highest rate transmission is only possible at very short distances. The maximum transmission rate that can be obtained on a typical 100-meter twisted pair is only 1 Mb/s.

Comparison between RS 232 and RS 485

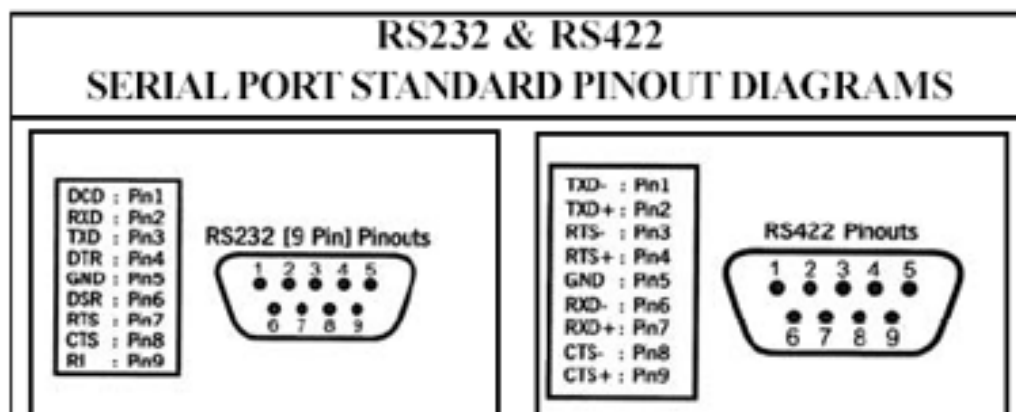
Specifications	RS232	RS485
Mode of Operation	Single ended	Differential
No. of drivers and receivers	1 driver, 1 receiver	32 drivers, 32 receivers
Max. cable length	50 ft	4000 ft
Data rate	20kb/s	10Mb/s
Driver output voltage	+/-25V	-7V to +12V
Signal level(Loaded min)	+/-5V to +/-15V	+/-1.5 V
Signal level (Unloaded Max)	+/-25V	+/-6V
Driver load impedance	3k to 7k	54
Receiver input V range	+/-15V	-7 to +12V
Receiver input sensitivity	+/-3V	+/-200mV
Receiver input resistance	3k to 7k	More than 12k

Parameter	RS232	RS422	RS485
Cabling	single ended	single ended multi-drop	multi-drop
Number of Devices	1 transmit 1 receive	1 transmitters 10 receivers	32 transmitters 32 receivers
Communication Mode	full duplex	full duplex, half duplex	full duplex, half duplex
Max Distance	50 feet at 19.2 Kbps	4000 feet at 100 Kbps	4000 feet at 100 Kbps
Max. Data Rate	1Mbps for 50 feet	10 Mbps for 50 feet	10 Mbps for 50 feet
Signaling	unbalanced	balanced	balanced
Mark (data 1)	-5 V min. -15 V max.	2 V min. (B>A) 6 V max. (B>A)	1. 5 V max. (B>A)
Space (data 0)	5 V min. 15 V max.	2 V min. (A>B) 6 V max. (A>B)	1. 5 V max. (A>B)
Input Level Min.	+/- 3 V	0.2V difference	0.2V difference

Comparison of RS-232, RS-422 and RS-485

	Characteristic parameter	RS-232	RS-422	RS-485
1.	Wiring for communication	Single-ended	Differential	Differential
2.	Signal type	Unbalanced	Balanced	Balanced
3.	Output voltage			
	Logic 0	+ 5 to + 15 V w.r.t GND	+ 2 to + 6 V on terminal A w.r.t B	+ 2 to + 6 V on terminal A wr.t B
	Logic 1	- 5 to - 15 V w.r.t GND	- 2 to - 6 V on terminal A w.r.t B	- 2 to - 6 V on terminal A wr.t B
4.	Data rate	20 kbps (max)	10 Mbps at 15 m 100 kbps at 1200m	10 Mbps at 15 m 100 kbps at 1200 m
5.	Maximum cable length	15 m	1.2 km	10 km
6.	Maximum drivers	1	1	32
7.	Maximum receivers	1	7	32
8.	Source impedance	300 Ω	100 Ω	100 Ω
9.	Load impedance	3 to 7 k Ω	4 k Ω	
10.	Direction	Uni-direction	Uni-direction	Bi-direction
11.	Communication type	Full-duplex	Half-duplex - 2-wire Full-duplex - 4-wire	Half-duplex
12.	Point-to-point / master-slave	Point-to-point	Master-slave	Master-slave

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RS232

