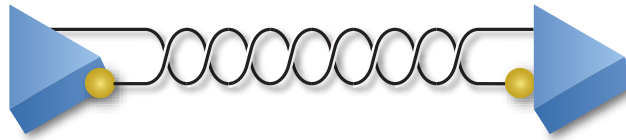


RS485 Quick Guide



TIA/EIA-485-A Standard

RS485 conveys data differentially over a terminated twisted pair, permitting up to 10Mbps data rates. The standard specifies electrical characteristics of a driver and receiver, and does not specify any data protocol or connectors. RS485 is popular for inexpensive local networks, multidrop communication links and long haul data transfer over distances of up to 4,000 feet. The use of a balanced line means RS485 has excellent noise rejection and is ideal for industrial and commercial applications. You'll find RS485 in applications as diverse as monitoring oil wells and linking POS terminals, to alarm systems, motion control and HVAC controls. Extended capability transceivers offer data rates up to 100Mbps and up to 256 nodes, as well as 6500V_{RMS} isolation and fault protection up to $\pm 60V$.

Specification		RS422	RS485
Mode of Operation		Differential	Differential
Number of Drivers and Receivers Allowed on One Line		1 Driver, 10 Receivers	32 Drivers, 32 Receivers
Maximum Cable Length		4000 Feet	4000 Feet
Maximum Data Rate		10Mbps	10Mbps
Maximum Voltage Applied to Driver Output		-0.25V to 6V	-7V to 12V
Differential Driver Output Signal	Minimum Loaded	$\pm 2V$	$\pm 1.5V$
	Maximum Unloaded	$\pm 5V$	$\pm 5V$
Termination		100 Ω	120 Ω
Receiver Input Voltage Range		$\pm 7V$	-7V to 12V
Receiver Input Sensitivity		$\pm 200mV$	$\pm 200mV$
Receiver Input Resistance		4k Ω (Min)	12k Ω (Min)

What Distance Can Be Achieved?

The achievable distance is a function of the cable. The longer the cable, the greater the attenuation. Because attenuation increases with frequency, cables also exhibit a lowpass filter behavior so that achievable distance diminishes with data rate.

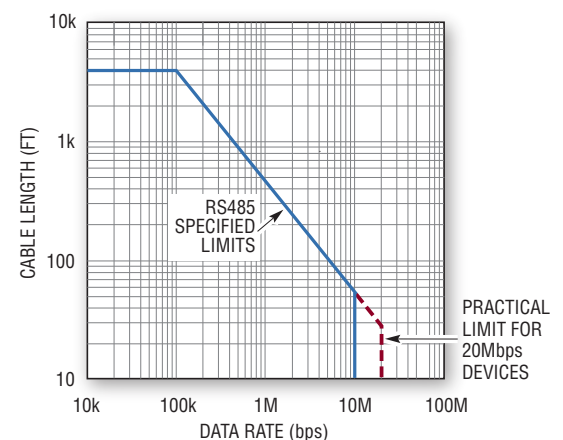
The distances recommended by the RS485 standard are shown in the graph to the right. Many cables are capable of higher speed and distance. Consult the cable manufacturer's typical performance curve of 0 to 50% rise time vs cable length.

What is the Failsafe Receiver Output State with No Input Signal?

That depends on the failsafe type of the receiver. Type 1 devices (see over) output a guaranteed 1 state when the receiver inputs are left open, but the output is undetermined when the inputs are shorted. Type 2 devices output a guaranteed 1 state whether the receiver inputs are left open, shorted or terminated but not driven.

What is the Proper Way to Terminate the Cable?

The cable should be terminated at each end with a resistance equal to the cable's characteristic impedance.



Linear Technology RS485/RS422 Transceivers

Part Number	Supply (V)	Max Data Rate (Bits/s)	# Dr	# Rec	Duplex	SHDN	ESD (kV)	Failsafe	Comments	Temp Grade	Package
Galvanic Isolation											
LTM2885	5	20M	1	1	Full	Yes	±15	Type 2	6500V _{RMS} Isolation, No External Components, Isolated 1W DC/DC	C, I, H	22 × 9 × 5.2 BGA
LTM [®] 2881-3/ LTM2881-5	3.3/5	20M	1	1	Full	Yes	±15	Type 2	2500V _{RMS} Isolation, No External Components, Isolated 1W DC/DC	C, I, H, MP	15 × 11.25 × 2.8 LGA, 15 × 11.25 × 3.4 BGA
LTC1535	5	250k	1	1	Full	No	±8	Type 2	2500V _{RMS} Isolation	C, I	SO(W)-28
±60V Fault Protection											
LTC2862-1/-2	3 to 5.5	20M/250k	1	1	Half	Yes	±15	Type 2	Pin-Compatible with LT1785A	C, I, H, MP	SO-8, 3 × 3 DFN-8
LTC2863-1/-2	3 to 5.5	20M/250k	1	1	Full	No	±15	Type 2		C, I, H, MP	SO-8, 3 × 3 DFN-8
LTC2864-1/-2	3 to 5.5	20M/250k	1	1	Full	Yes	±15	Type 2	Pin-Compatible with LT1791A	C, I, H, MP	SO-14, 3 × 3 DFN-10
LTC2865	3 to 5.5	20M/250k	1	1	Full	Yes	±15	Type 2	Logic Supply Pin, SLO Pin	C, I, H	MSOP-12, 4 × 3 DFN-12
LT1785A	5	250k	1	1	Half	Yes	±15	Type 2	Pin-Compatible with LTC485	C, I, H	SO-8, DIP-8
LT1791A	5	250k	1	1	Full	Yes	±15	Type 2	Pin-Compatible with LTC491	C, I, H	SO-14, DIP-14
Integrated Switchable 120Ω Termination											
LTC2854	3.3	20M	1	1	Half	Yes	±25	Type 2	Low Power	C, I, H	3 × 3 DFN-10
LTC2859	5	20M/250k	1	1	Half	Yes	±15	Type 2	Slew Rate Control, Low Power	C, I, H	3 × 3 DFN-10
LTC2855	3.3	20M	1	1	Full	Yes	±15	Type 2	Low Power	C, I, H	4 × 3 DFN-12, SSOP-16
LTC2861	5	20M/250k	1	1	Full	Yes	±15	Type 2	Slew Rate Control, Low Power	C, I	4 × 3 DFN-12, SSOP-16
3.3V Supply Operation											
LTC2850	3.3	20M	1	1	Half	Yes	±15	Type 2	Low Power	C, I, H	SO-8, MSOP-8, 3 × 3 DFN-8
LTC2851	3.3	20M	1	1	Full	No	±15	Type 2	Low Power	C, I, H	SO-8, MSOP-8, 3 × 3 DFN-8
LTC2852	3.3	20M	1	1	Full	Yes	±15	Type 2	DE and RE Pins, Low Power	C, I, H	SO-14, MSOP-10, 3 × 3 DFN-10
LTC1480	3.3	2.5M	1	1	Half	Yes	±3.5	Type 1	Low Power	C, I	SO-8, DIP-8
Low Power											
LTC2856-1/-2	5	20M/250k	1	1	Half	Yes	±15	Type 2	Hot Swap Capable	C, I, H	MSOP-8, 3 × 3 DFN-8
LTC2857-1/-2	5	20M/250k	1	1	Full	No	±15	Type 2	Hot Swap Capable	C, I, H	MSOP-8, 3 × 3 DFN-8
LTC2858-1/-2	5	20M/250k	1	1	Full	Yes	±15	Type 2	Hot Swap Capable	C, I, H	MSOP-10, 3 × 3 DFN-10
LTC1690	5	5M	1	1	Full	No	±15	Type 2		C, I	MSOP-8, SO-8, DIP-8
LTC1481	5	2.5M	1	1	Half	Yes	±10	Type 1		C, I	SO-8, DIP-8
LTC1482	5	4M	1	1	Half	Yes	±15	Type 2	Carrier Detect	C, I	MSOP-8, SO-8, DIP-8
LTC1483	5	150k	1	1	Half	Yes	±10	Type 1	Low EMI	C, I	SO-8, DIP-8
LTC1484	5	4M	1	1	Half	Yes	±15	Type 2		C, I	MSOP-8, SO-8, DIP-8
LTC1485	5	10M	1	1	Half	No	±10	Type 1		C, I	SO-8, DIP-8
LTC1487	5	250k	1	1	Half	Yes	±10	Type 1	Low EMI	C	SO-8, DIP-8
LTC485	5	2.5M	1	1	Half	No	±4	Type 1		C, I, M	SO-8, DIP-8, CERDIP-8
LTC490	5	2.5M	1	1	Full	No	±2	Type 1		C, I	SO-8, DIP-8
LTC491	5	2.5M	1	1	Full	No	±2	Type 1	DE and RE Pins	C, I	SO-14, DIP-14
High Speed											
LTC1685	5	52M	1	1	Half	No	±4	Type 2		C, I	SO-8
LTC1686	5	52M	1	1	Full	No	±4	Type 1		C, I	SO-8
LTC1687	5	52M	1	1	Full	No	±4	Type 1	DE and RE Pins	C, I	SO-14
Quad Drivers and Receivers											
LTC1688/89	5	100M	4	0		No	±4		Hot Swap Capable, 1/2 DE Pins	C, I	SO-16
LTC486/87	5	10M	4	0		No	±2	Type 1	Low Power, 1/2 DE Pins	C, I	SO(W)-16, DIP-16
LTC1518/19	5	52M	0	4		No	±4	Type 2		C, I	SO-16
LTC488/89	5	10M	0	4		No	±10	Type 1	1/2 DE Pins	C, I	SO(W)-16, DIP-16
LTC1520	5	50M	0	4		No	±4		High Speed, LVDS-Compatible	C	SO-16
RS232/RS485 Multiprotocol											
LTC2870	3 to 5.5	20M/500k	1	1	Both	Yes	±26	Type 2	Two RS232 Transceivers	C, I	4 × 5 QFN-28, TSSOP-28
LTC2871	3 to 5.5	20M/500k	1	1	Both	Yes	±16	Type 2	Two RS232 Transceivers	C, I	5 × 7 QFN-38, TSSOP-38
LTC2872	3 to 5.5	20M/500k	2	2	Both	Yes	±16	Type 2	Four RS232 Transceivers	C, I	5 × 7 QFN-38

Type 1 = Open; Type 2 = Idle, Open, Short