

Low power consumption of 485 transceiver

Product overview

MAX 485 is a low-power transceiver used for RS-485 communication with RS-422, which contains a driver and a receiver, and the driver swing rate of MAX 485 is not limited, can achieve the transmission rate of up to 2.5Mbps, belongs to the semi-duplex application design.

MAX 485 Working under a 5V single power supply, plus, MAX 485 Drive enable (DE) and receive enable (RE) pins, Its driverThe actuator has a short-circuit current limit, and can put the driver output into a high resistance state through the thermal switch-off circuit to prevent excessive power loss. The receiver input has failure protection characteristics to ensure a logical high level output when the input is open.

key property

- three-state output.
- Half-duplex design.
- The buslet allows for up to 256 transceivers.

Typical application

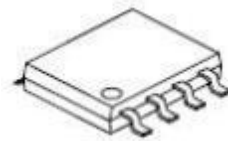
- Low-power RS-485 transceiver.
- Low-power RS-422 transceiver.
- level translator.
- Transceiver for EMI-sensitive applications.

Pipe foot description

order number	symbol	functional description
1	R 0	Receiver output: If V _A is > V _B 200mV, R0 is high level, if V _A is < V _B 200mV, R0 is low level
2	\overline{RE}	Receiver output enable end: low level is effective, RE is high, receiving

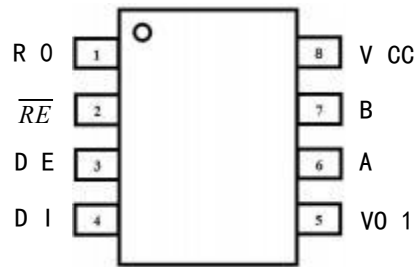
- Industrial control of the LAN

Packaging appearance



SOP -8

Pipe foot configuration



		output is high resistance
3	D E	Send enabling end: high level is effective, DE is low, the send output is high resistance. When DE is high level, the wafer is working in the sending state, DE is low level and RE is low level.
4	D I	Drive input: when DI is low level, A outputs high level, B outputs low level, and when DI is high level, it is just the opposite.
5	G ND	Ground, negative end of power supply
6	A	The receiver same phase input and the drive same phase output
7	B	Receiver reverse phase input end and drive reverse phase output end
8	V CC	Power is the end

DC electrical characteristics (Note 1)

symbol	parameter declaration	test condition		minimum	typical case	maximum	Unit
V _{IH}	Enter high voltage	DE, RE		2	-	-	V
		DI		2.8	-	-	V
V _{IL}	Input low voltage	DE, RE		-	-	0.8	V
		DI		-	-	1.6	V
I _{IN1}	input current on	DE, RE, DI		-	-	±2	µA
I _{IN2}	Input current (A, B)	DE = 0V	V _{IN} = 5V	-	60	150	µA
		V _{CC} = 5V	V _{IN} = 0V	-	180	400	
V _{TH}	Receive the differential threshold voltage	-		-0.2	-	0.2	V
ΔV _{TH}	Receiving input lags	-		-	70	-	mV
V _{OH}	Receive the output high voltage	I _O = -4mA, V _{ID} = 200mV		3.5	4.5	-	V
V _{OL}	Receive the output of the low voltage	I _O = 4mA, V _{ID} = -200mV		-	0.2	0.4	V
I _{OZR}	Receive a three-state (high resistance) output current	.40V ≤ V _O ≤ 2.4V		-	-	±1	µA
R _{IN}	Receive the input impedance	-		-	48	-	K Ω
I _{CC}	No load power supply current	RE, DI = 0 or V _{CC}	DE = V _{CC}	-	1.2	1.6	mV
			DE = 0	-	1.1	1.5	
I _{OSD1}	Drive short-circuit current (V _O = High)	DE = RE = 5V, DI = 0, V _A = 5V		-	120	250	mA
I _{OSD2}	Drive short-circuit current (V _O = Low)	DE = RE = 5V, DI = 0, V _B = 0		-	120	250	mA
I _{OSR}	Receiving the short-circuit current	0V ≤ V _O ≤ V _{CC}		-	60	100	mA
	ESD protect	A and B pins, Testing was performed using a human body model		-	±4	-	K V

Note 1: All current input to the pin is positive, all current output from the pin is negative; if not specified, the voltage is the voltage to the ground, T_A = 25°C, V_{CC} = 5V.

Absolute maximum rating (Note 2)

symbol	parameter	test condition	least value	representative value	crest value	unit
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V _{CC}	service voltage	-	-	-	10	V
RE、DE	Control the input voltage	-	-0.5	-	+10	V
D I	Drive the input voltage	-	-0.5	-	+10	V
A、B	Drive the output voltage	-	-0.5	-	+15	V
A、B	Receive the input voltage	-	-0.5	-	+15	V
R O	Receive the output voltage	-	-0.5	-	+10	V
T _{stg}	Storage temperature	-	-65	-	+160	°C
T _A	working temperature	-	-40	-	+85	°C

Note 2: The maximum allowable rating means that exceeding these values may cause unrecoverable damage to the device. Under these conditions is not conducive to the device positive

Normally operation, the device continuous operation at the maximum allowable rated value may affect the device reliability, the reference point of all the voltage is ground.

switching characteristic

If not specifically stated: T A =25C, VCC = 5 V.

symbol	parameter declaration	test condition	minimum	typical case	maximum	unit
t _{PL H}	Drive the input to the output	See Figure 2 R DIFF =50 Ω, CL 1 = CL 2 = 100 pF	40	70	90	ns
t _{PL L}			10	40	60	ns
t _{SKEW}	Drive the output press to the output		-	30	-	ns
t _R	Drive up versus down time		-	40	60	ns
t _F			-	40	60	ns
t _{PL H}	Receive the input to the output		See Figure 2, Figure 4, R DIFF =50 Ω CL 1 = CL 2 = 100 pF	20	60	200
t _{PH L}		20		40	200	ns
t _{S KD}	Differential reception	-		20	-	ns
t _{Z L}	Receiving enable to output is low	See Figure 1, Figure 5, CL = 15 pF, S 2 off	-	50	80	ns
t _{Z H}	Receiving enable to output is high	See Figure 1, Figure 5, CL = 15 pF, S 1 off	-	60	90	ns
t _{L Z}	Received from low to off	See Figure 1, Figure 5, CL = 15 pF, S 2 off	-	50	80	ns
t _{H Z}	Received from high to close	See Figure 1, Figure 5, CL = 15 pF, S 1 off	-	60	90	ns
f _{M AX}	Maximum transmission rate	-	2.5			M bps

Test circuit diagrams

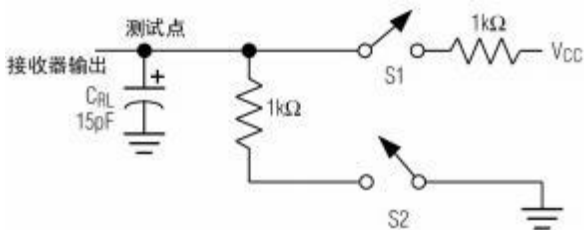


Figure 1: Receiver timing test circuit

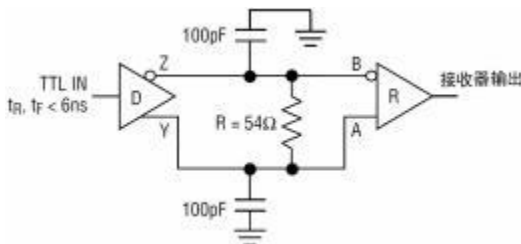


Figure 3: Receiver transmission latency test circuit

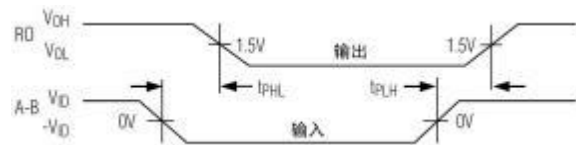


Figure 4: Receiver transmission delay

function declaration

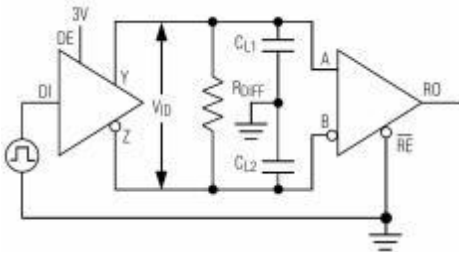


Figure 2: Drive / receiver timing test circuit

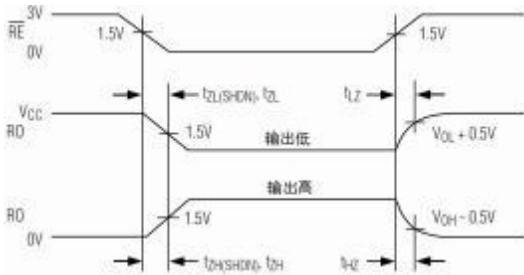


Figure 5: Receiver on and off timing

- Transmission distance and data rate

The RS-485 / RS-422 standard covers a maximum transmission distance of 4,000 feet. Figure 6 shows the system differential voltage when the device drives 4000 ft 26 AWG twisted pair, 120 Ω load at 110 KHz.

- Drive output waveform

MAX 485 Fourier analysis of 150 kHz signal has obvious large high-frequency harmonics. Figure 7.

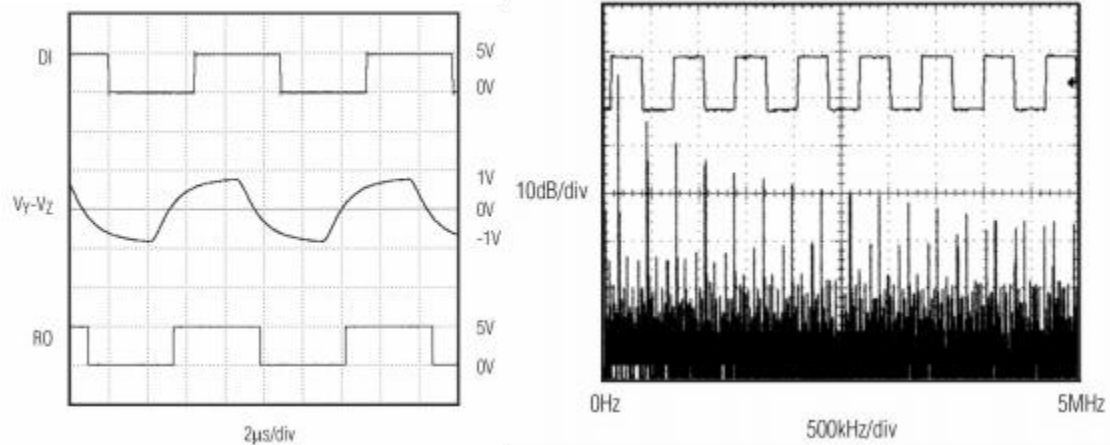


Figure 6: Drive 4000 ft cable at 110 KHz Figure 7: Drive output waveform at 150 KHz

- Drive output protection

Excessive output current and power consumption caused by failure or bus conflict can be avoided by two mechanisms. The return current limit of the output stage provides short circuit protection over the entire common mode voltage range. in addition, When the core temperature rises too high, the heat-off circuit forces the drive output into a high resistance state.

- transmission delay

Many digital coding schemes depend on the drive and transmitter transmission delay difference. See Figure 3, 8 and 9

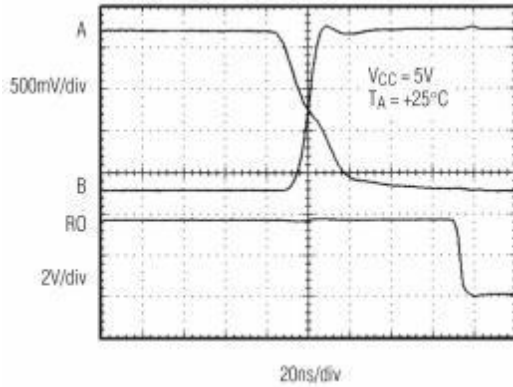


Figure 8: The t of the receiver PHL

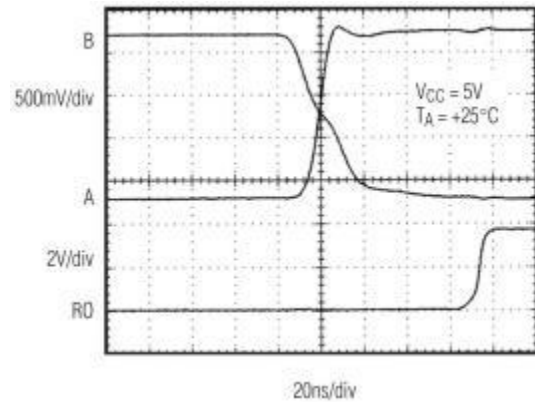


Figure 9: The t of the receiver PLH

● Functional table

import			output
$R E$	$D E$	$A - B$	$R O$
0	0	$\geq +0.2$	1
0	0	≤ -0.2	0
0	0	input pull-down	1
1	0	X	High -Z

Note: X = irrelevant, High-Z = high resistance

■ A Schematic diagram of the product application

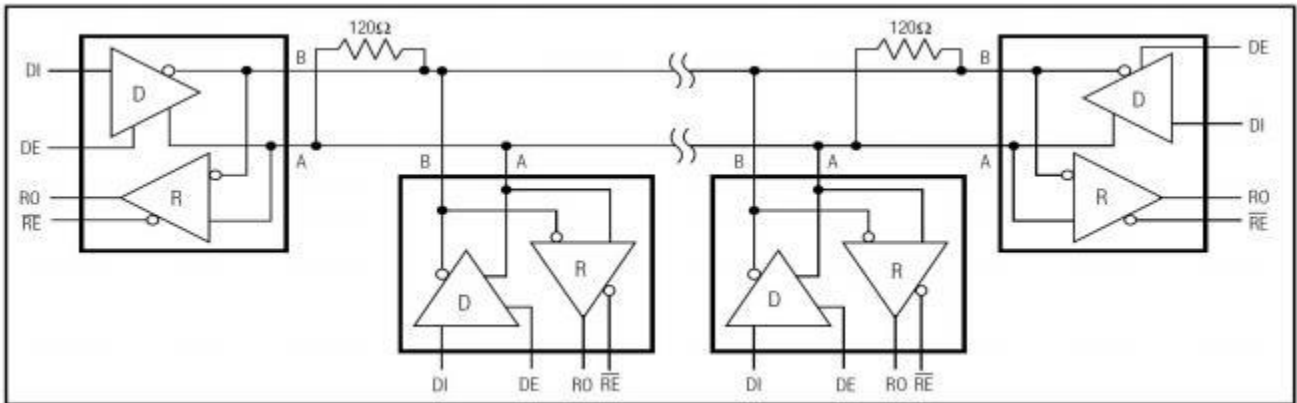


Figure 10: Typical half-duplex RS-485 network

■ Package size diagram

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UNIT : mm

