

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers

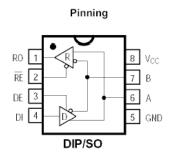
General Description

The MAX485 is low-power transceivers for RS-485 and RS-422 communication. IC contains one driver and one receiver. The driver slew rates of the MAX485 is not limited, allowing them to transmit up to 2.5Mbps.

These transceivers draw between $120\mu A$ and $500\mu A$ of supply current when unloaded or fully loaded with disabled drivers. All parts operate from a single 5V supply. Drivers are short-circuit current limited and are protected against excessive power dissipation by thermal shutdown circuitry that places the driver outputs into a high-impedance state. The receiver input has a fail-safe feature that guarantees a logic-high output if the input is open circuit. The MAX485 is designed for half-duplex applications.

Features

- Low Quiescent Current: 300µA
- -7V to +12V Common-Mode Input Voltage Range
- Three-State Outputs
- 30ns Propagation Delays, 5ns Skew
- Full-Duplex and Half-Duplex Versions Available
- Operate from a Single 5V Supply
- Allows up to 32 Transceivers on the Bus
- Data rate: 2,5 Mbps
- Current-Limiting and Thermal Shutdown for Driver Overload Protection





ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CC}) 12V Control Input Voltage -0.5V to (V_{CC} + 0.5V)

Driver Input Voltage (DI) -0.5V to (V_{CC}+ 0.5V)

Driver Output Voltage (A, B) -8V to +12.5V Receiver Input Voltage (A, B) -8V to +12.5V Receiver Output Voltage (RO) -0.5V to $(V_{\rm CC}+0.5V)$

Continuous Power Dissipation (T_A = +70°C) 8-Pin Plastic DIP (derate 9.09mW/°C above +70°C) 727mW

8-Pin SO (derate 5.88mW/°C above +70°C) 471mW

Operating Temperature Ranges-40°C to +85°C Storage Temperature Range -65°C to +160°C Lead Temperature (soldering, 10sec) +300°C

DC ELECTRICAL CHARACTERISTICS

 $(V_{CC} = 5V \pm 5\%, T_A = T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted.})$ (Notes 1, 2)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Differential Driver Output (no load)	V _{OD1}					5	V
Differential Driver Output	V _{OD2}	$R = 50\Omega (RS-422)$		2			V
(with load)		$R = 27\Omega (RS-485), F$	igure 4	1.5		5	
Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	ΔVod	R = 27Ω or 50Ω , Figure 4				0.2	V
Driver Common-Mode Output Voltage	Voc	R = 27 Ω or 50 Ω , Figu	ıre 4			3	V
Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	ΔVod	R = 27Ω or 50Ω , Figure 4				0.2	V
Input High Voltage	ViH	DE, DI, RE		2.0			V
Input Low Voltage	VIL	DE, DI, RE				0.8	V
Input Current	l _{IN1}	DE, DI, RE				±2	μA
Input Current	I _{IN2}	DE = 0V;	V _{IN} = 12V			1.0	mA
(A, B)		$V_{CC} = 0V \text{ or } 5.25V,$	V _{IN} = -7V			-0.8]
Receiver Differential Threshold Voltage	Vтн	$-7V \le V_{CM} \le 12V$		-0.2		0.2	V
Receiver Input Hysteresis	ΔV th	V _{CM} = 0V			70		mV
Receiver Output High Voltage	Vон	Io = -4mA, VID = 200mV		3.5			V
Receiver Output Low Voltage	Vol	Io = 4mA, VID = -200mV				0.4	V
Three-State (high impedance) Output Current at Receiver	lozr	$0.4V \le V_0 \le 2.4V$				±1	μA
Receiver Input Resistance	RIN	-7V ≤ Vcм ≤ 12V					kΩ



DC ELECTRICAL CHARACTERISTICS (continued) (Vcc = 5V ±5%, Ta = Tmin to Tmax, unless otherwise noted.) (Notes 1, 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
No-Load Supply Current	Icc	DE = V _{CC}		500	900	
(Note 3)		RE = 0V or Vcc		300	500	μA
		DE = 0V				
Driver Short-Circuit Current,						
	losd1	-7V ≤ Vo ≤ 12V (Note 4)	35		250	mA
Vo = High						
Driver Short-Circuit Current,						
	losd2	-7V ≤ Vo ≤12V (Note 4)	35		250	mA
Vo = Low						
Receiver Short-Circuit Current	Iosr	0V ≤ Vo ≤ Vcc	7		95	mA

SWITCHING CHARACTERISTICS

($Vcc = 5V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.) (Notes 1, 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Input to Output	t PLH	RDIFF = 54Ω	10	30	60	ns
	t PHL	C _{L1} = C _{L2} = 100pF	10	30	60	
Driver Output Skew to Output	t skew	RDIFF = 54Ω , CL1 = CL2 = 100 pF		5	10	ns
Driver Enable to Output High	tzн	C _L = 100pF, S2 closed		40	70	ns
Driver Enable to Output Low	t zL	C _L = 100pF, S1 closed		40	70	ns
Driver Disable Time from Low	tız	C _L = 15pF, S1 closed		40	70	ns
Driver Disable Time from High	t HZ	C _L = 15pF, S2 closed		40	70	ns
tPLH - tPHL Differential	t skd	RDIFF = 54Ω		13		ns
Receiver Skew		C _{L1} = C _{L2} = 100pF				
Receiver Enable to Output Low	t zL	C _{RL} = 15pF, S1 closed		20	50	ns
Receiver Enable to Output High	tzн	C _{RL} = 15pF, S2 closed		20	50	ns
Receiver Disable Time from	t LZ	CRL = 15pF, S1 closed		20	50	ns
Low						
Receiver Disable Time from High	t HZ	C _{RL} = 15pF, S2 closed		20	50	ns
Maximum Data Rate	fmax		2.5			Mbps



Operation timing diagrams of MAX 485

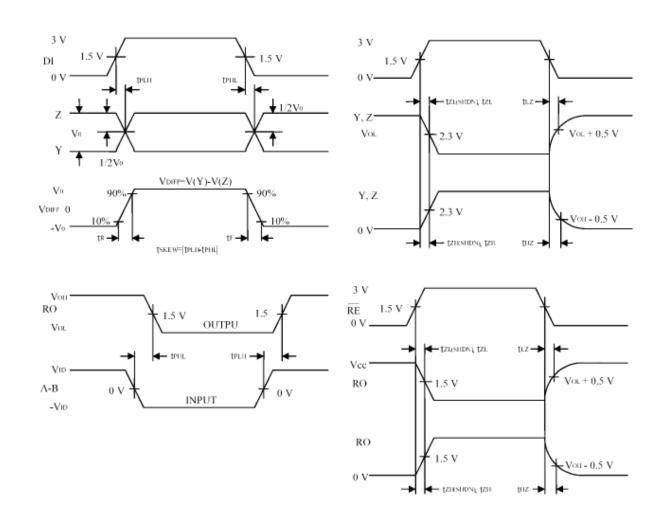


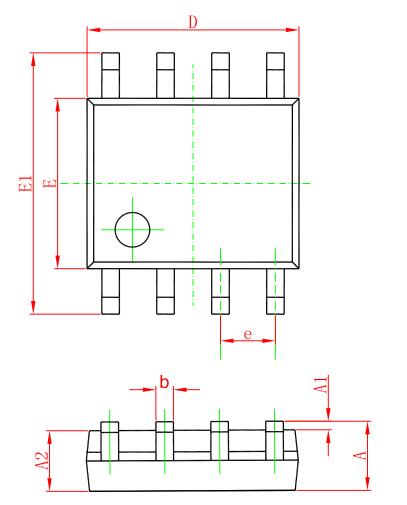
Table of MAX 485 operation

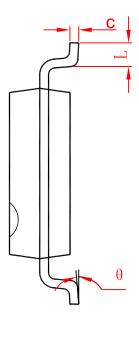
Transmission				Receipt				
	Inputs		Outp	uts X		Inputs		Outputs
RE	DE	DI	Z	Υ	RE	DE	A-B	RO
Х	1	1	0	1	0	0	+0.2V	1
Х	1	0	1	0	0	0	-0.2V	0
0	0	Х	Z	Z	0	0	open	1
1	0	Χ	Z	Z	1	0	Х	Z

X-don't care Z-high resistance



SOP-8





Cymbal	Dimensions In	Millimeters	Dimensions In Inches		
Symbol	Min	Max	Min	Max	
А	1.350	1.750	0.053	0.069	
A1	0.100	0.250	0.004	0.010	
A2	1.350	1.550	0.053	0.061	
b	0.330	0.510	0.013	0.020	
С	0.170	0.250	0.006	0.010	
D	4.700	5.100	0.185	0.200	
E	3.800	4.000	0.150	0.157	
E1	5.800	6.200	0.228	0.244	
е	1.270(BSC)		0.050	D(BSC)	
L	0.400	1.270	0.016	0.050	
θ	0°	8°	0°	8°	



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW MAX485ESA	SOP-8	2500	Tape and reel