

Feature

- Fail-safe circuitry
- Low power consumption
- Up to 128 transceivers can be attached to the bus
- Maximum transmission rate: 10Mbps
- ESD: $\geq \pm 15\text{kV}$
- SOP8 Package

Applications

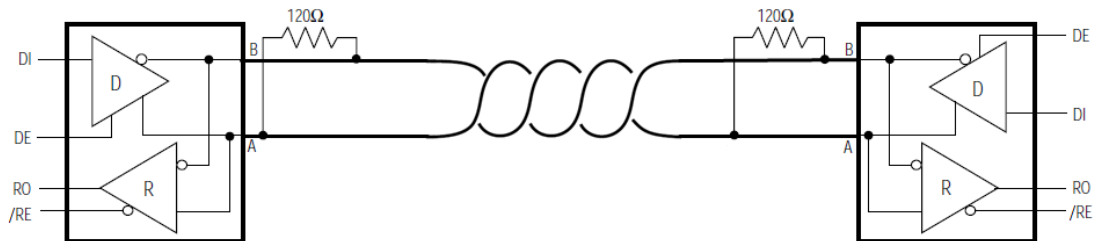
- RS-485 Communications
- Level Translators
- Security Equipment
- Industrial Control Equipment
- Watt-hour meter

General Description

The HM485 is high-speed transceivers for RS-485 communication, which contain one driver and one receiver. The HM485 feature fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or shorted. This means that the receiver output will be a logic

high if all transmitters on a terminated bus are disabled (high impedance). The HM485 driver slew rates are not limited, making transmit speeds up to 10Mbps possible. And this device has a 1/8-unit-load receiver input impedance that allows up to 128 transceivers on the bus.

Typical application circuit



Absolute Maximum Ratings (TA=25°C)

Supply Voltage (VCC)	+7V	Receiver Input Voltage (A,B)	±13V
Control Input Voltage (/RE, DE).....	-0.3~Vcc+0.3V	Receiver Output Voltage (RO)	-0.3~Vcc+0.3V
Driver Input Voltage (DI).....	-0.3~Vcc+0.3V	Operating Temperature (TOPR).....	-40 °C~+85 °C
Driver Output Voltage (A,B)	±13V	Storage Temperature (TSTG).....	-65 °C~+150 °C

DC ELECTRICAL CHARACTERISTICS (VCC=5V, TA=25°C) ¹

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Differential Driver Output (no load)	V _{OD1}	R=27Ω, Figure 1		---	---	VCC	V
Differential Driver Output	V _{OD2}			1.8	---	---	V
Change in Magnitude of Differential Output Voltage	ΔV _{OD}			---	---	0.2	V
Driver Common-Mode Output Voltage	V _{OC}			1.0	---	3.0	V
Change in Magnitude of Common-Mode Voltage ²	ΔV _{OC}			---	---	0.2	V
Input High Voltage	V _{IH}	DE, DI, /RE		2.0	---	---	V
Input Low Voltage	V _{IL}	DE, DI, /RE		---	---	0.8	V
DI Input Hysteresis	V _{HYS}	---		---	100	---	mV
Driver Input Current (A And B)	I _{IN1}	VIN=12V	DE=0V,	---	---	150	uA
		VIN=-7V	Vcc=0V/5.25V	-150	---	---	uA
Driver Short-Circuit Output Current ³	I _{OSD}	A and B Short-Circuit		-100	---	100	mA
Receiver Differential Threshold Voltage	V _{TH}	-7V ≤ V _{CM} ≤ 12V		-200	-125	-50	mV
Receiver Input Hysteresis	ΔV _{TH}	---		---	40	---	mV
Receiver Output High Voltage	V _{OH}	I _O =-4mA, V _{ID} =-50mV		VCC-1	---	---	V
Receiver Output Low Voltage	V _{OL}	I _O =4mA, V _{ID} =-200mV		---	---	0.4	V
Three-State Output Current at Receiver	I _{OZR}	0.4V ≤ V _O ≤ 2.4V		---	---	±1	μA
Receiver Input Resistance	R _{IN}	-7V ≤ V _{CM} ≤ 12V		96	---	---	K Ω
Receiver Output Short-Circuit Current	I _{OSR}	0V ≤ V _{RO} ≤ VCC		±7	---	±100	mA
Supply Current	I _{CC}	DE=VCC	No Load	---	450	900	μA
		DE=GND	/RE=DI=VCC/G	---	450	600	μA
			ND				
Supply Current in Shutdown Mode	I _{SHDN}	DE=GND, /RE=VCC, DI=VCC/GND		---	---	10	μA

Note 1: All currents into the device are positive; all currents out of the device are negative. All voltages are referred to device ground unless otherwise noted.

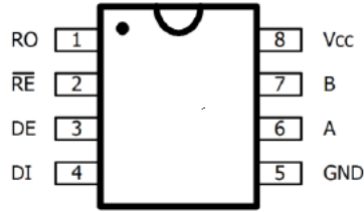
Note 2: ΔV_{od} and ΔV_{oc} are the changes in V_{od} and V_{oc} , respectively, when the DI input changes state.

Note 3: Maximum current level applies to peak current just prior to foldback-current limiting; minimum current level applies during current limiting.

SWITCHING CHARACTERISTICS (VCC=5V, TA=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Input to Output	t_{DPLH}	Figure 3 and 5, $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$	---	30	60	ns
	t_{DPHL}		---	30	60	ns
Driver Output Skew [$T_{DPLH} - T_{DPHL}$]	t_{DSKEW}		---	---	20	ns
Driver Rise or Fall Time	t_{DR}, t_{DF}		---	30		ns
Maximum Data Rate	F_{MAX}	---	10	---	---	Mbps
Driver Enable to Output High	t_{DZH}	Figure 4 and 6, $C_L=100pF$ S2 closed	---	---	70	ns
Driver Disable Time from High	t_{DHZ}		---	---	70	ns
Driver Enable to Output Low	t_{DZL}	Figure 4 and 6, $C_L=100pF$ S1 closed	---	---	70	ns
Driver Disable Time from Low	t_{DLZ}		---	---	70	ns
Receiver Input to Output	t_{RPLH} t_{RPHL}	Figure 7 and 9, $ V_{ID} \geq 2.0V$, rise and fall time of $V_{ID} \leq 15ns$	---	90	250	ns
[$T_{RPLH} - T_{RPHL}$] Differential Receiver Skew	t_{RSKD}		---	30	---	ns
Receiver Enable to Output Low	t_{RZL}	Figure 2 and 8, $C_{RL}=15pF$ S1 closed	---	30	70	ns
Receiver Disable Time from Low	t_{RLZ}		---	30	70	ns
Receiver Enable to Output High	t_{RZH}	Figure 2 and 8, $C_{RL}=15pF$ S2 closed	---	30	70	ns
Receiver Disable Time from High	t_{RHZ}		---	30	70	ns
Time to Shutdown	t_{SHDN}	---	---	200	600	ns

Pin Assignment



SOP8

Pin Description

PIN	NAME	FUNCTION
1	RO	Receiver Output, When RE is low and if $A - B \geq -50\text{mV}$, RO will be high; if $A - B \leq -200\text{mV}$, RO will be low.
2	/RE	Receiver Output Enable. Drive RE low to enable RO; RO is high impedance when RE is high. Drive RE high and DE low to enter low-power shutdown mode.
3	DE	Driver Output Enable. Drive DE high to enable driver outputs. These outputs are high impedance when DE is low. Drive RE high and DE low to enter low-power shutdown mode.
4	DI	Driver Input. With DE high, a low on DI forces noninverting output low and inverting output high.
5	GND	Ground
6	A	Noninverting Receiver Input and Noninverting Driver Output
7	B	Inverting Receiver Input and Inverting Driver Output
8	VCC	Positive Supply

Function Tables

● TRANSMITTING

INPUTS			OUTPUTS	
/RE	DE	DI	A	B
X	1	1	1	0
X	1	0	0	1
0	0	X	High-Z	High-Z
1	0	X	Shutdown	

● RECEIVING

INPUTS			OUTPUT
/RE	DE	A-B	RO
0	X	$\geq -0.05\text{V}$	1
0	X	$\leq -0.2\text{V}$	0
0	X	Open/shorted	1
1	1	X	High-Z
1	0	X	Shutdown

Test circuit

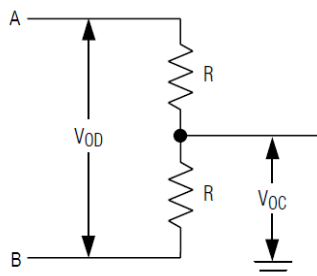


Figure 1. Driver DC Test Load

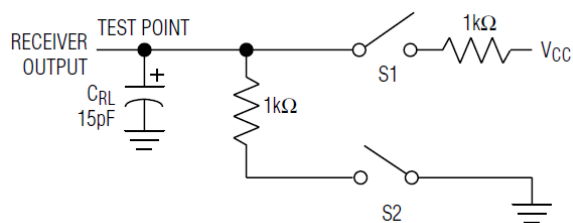


Figure 2. Receiver Enable/Disable Timing Test Load

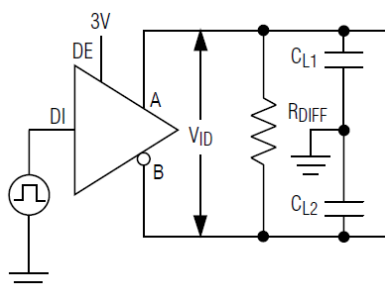


Figure 3. Driver Timing Test Circuit

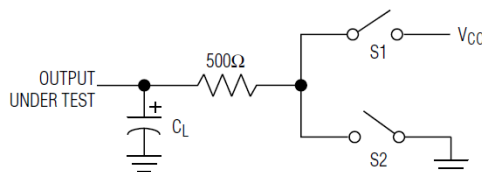


Figure 4. Driver Enable/Disable Timing Test Load

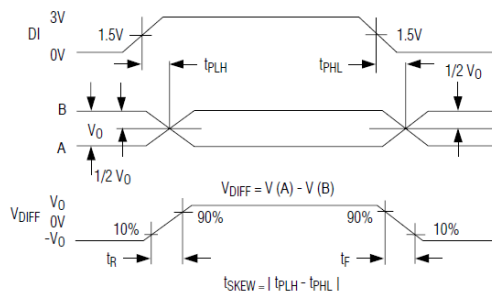


Figure 5. Driver Propagation Delays

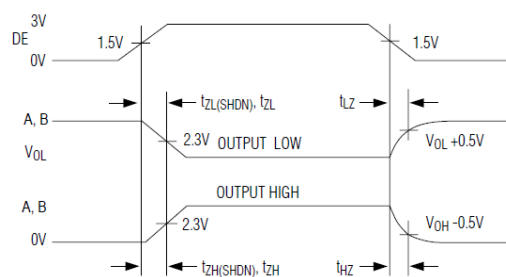


Figure 6. Driver Enable and Disable Times

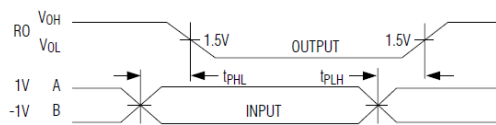


Figure 7. Receiver Propagation Delays

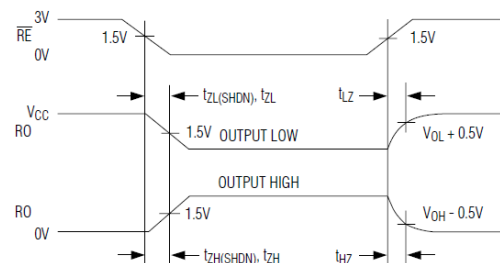
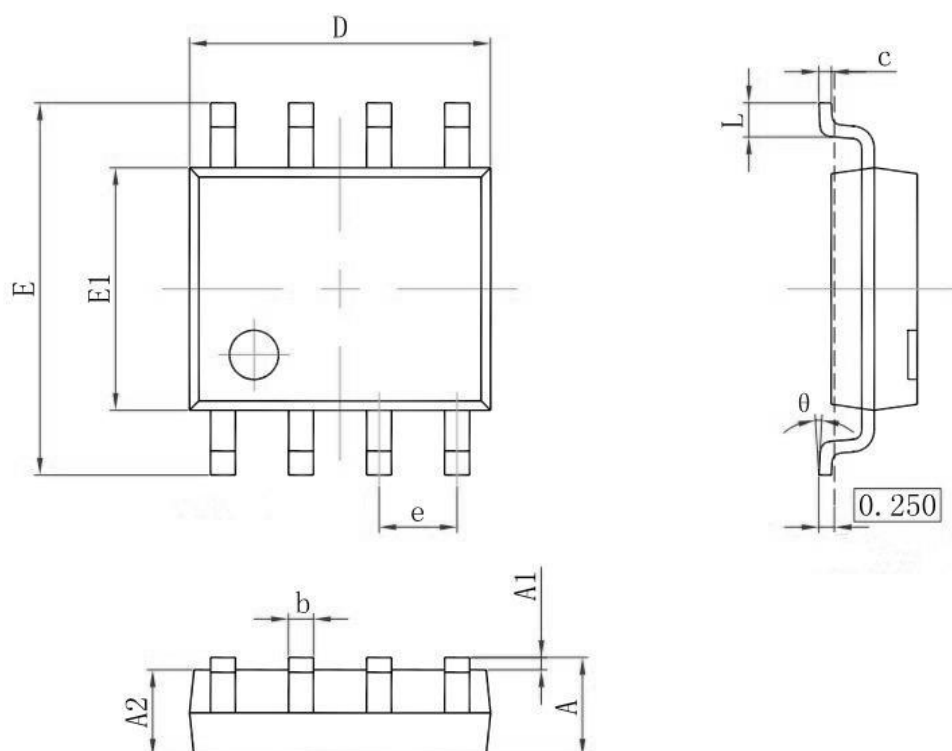


Figure 8. Receiver Enable and Disable Times

SOP8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	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
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.031
θ	0°	8°	0°	8°