

General Description

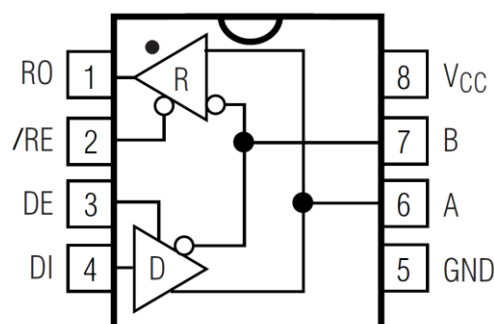
The CN485 is a half-duplex RS-485 transceiver with $\pm 15\text{kV}$ IEC 61000-4-2 contact ESD protection. This device contains one driver and one receiver. The CN485 includes fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or shorted. This means that the receiver output will be logic high even if all transmitters on a terminated bus are disabled.

The CN485 supports hot plug function. During power on, the driver and receiver are turned off to avoid conflict on the bus when hot-plugging. The device has a 1 unit load receiver input impedance that allows up to 32 transceivers on the bus.

Features

- Wide Supply Voltage: 3V to 5.5V
- True Fail-Safe Receiver
- Maximum Data Rate: 16Mbps
- Allow Up to 32 Transceivers on the Bus
- Hot Plug Function
- I/O Pins ESD Protection:
 - $\pm 15\text{kV}$ IEC 61000-4-2, contact Discharge
- Available in SOP8 Package

Functional Block



Applications

- RS-485 Communications
- Level Translators
- Transceivers for EMI-Sensitive Applications
- Industrial Control Local Area Networks
- Energy Meter Networks
- Lighting Systems

Pin Function Description

Pin Number	Name	Function
1	RO	Receiver Output.
2	/RE	Receiver Output Enable. /RE is low to enable the Receiver; /RE is high to disable the Receiver.
3	DE	Driver Output Enable. DE is high to enable the Driver; DE is low to disable the Driver.
4	DI	Driver Input
5	GND	Ground.
6	A	Non-inverting Receiver Input and Non-inverting Driver Output.
7	B	Inverting Receiver Input and Inverting Driver Output.
8	V _{CC}	Power Supply.

Function Table (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 (High-Z)	

Function Table (Receiving)

Inputs			Outputs
/RE	DE	A-B	RO
0	X	>-10mV	1
0	X	<-200mV	0
0	X	Open/shorted	1
1	1	X	High-Z
1	0	X	Shutdown (High-Z)

Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Power Supply	V _{CC}	+7	V
Control Input Voltage	/RE, DE	-0.3 to V _{CC} +0.3	V
Transmitter Input Voltage	DI	-0.3 to V _{CC} +0.3	V
Transmitter Output Voltage	A, B	±13	V
Receiver Input Voltage	A, B	±13	V
Receiver Output Voltage	RO	-0.3 to V _{CC} +0.3	V
Operating Temperature		-40 to +125	°C

DC Electrical Characteristics

(Test Conditions: V_{CC}=+5V, T_A=-40°C ~ +125°C, unless otherwise noted.)

Parameter	Symbol	conditions	MIN	TYP	MAX	UNITS
Driver						
Differential Driver Output(no load)	V _{OD1}	Figure 1			V _{CC}	V
Differential Driver Output	V _{OD2}	V _{CC} =5V Figure 1, R=27Ω	2.7	3.4		V
		V _{CC} =3V Figure 1, R=27Ω	1.5	1.8		
Change in Magnitude of Differential Output Voltage (Note 2)	ΔV _{OD}	Figure 1, R=27Ω	-0.2		0.2	V
Driver Common-mode Output Voltage	V _{OC}	Figure 1, R=27Ω		V _{CC} /2	3.0	V
Change in Magnitude of Common-Mode Voltage (Note 2)	ΔV _{OC}	Figure 1, R=27Ω	-0.2		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
Input Current(A and B)	I _{IN4}	DE=GND V _{CC} =GND or 5.25V	V _{IN} =12V		800	μA
			V _{IN} =-7V	-800		
Driver Short-Circuit Output Current	I _{OSD}	A Pin Short to B Pin	-250		250	mA
Receiver						

Receiver Differential Threshold Voltage	V_{TH}	$-7V \leq V_{CM} \leq 12V$	-200	-125	-10	mV	
Receiver Input Hysteresis	$\triangle V_{TH}$			25		mV	
Receiver Output High Voltage	V_{OH}	$V_{CC}=5V, I_o=-8mA$	4.0			V	
		$V_{CC}=3V, I_o=-4mA$	2.45				
Receiver Output Low Voltage	V_{OL}	$V_{CC}=5V, I_o=8mA$			0.4	V	
		$V_{CC}=3V, I_o=4mA$			0.4		
Three-State Output Current at Receiver	I_{OZR}				± 1	μA	
Receiver Input Resistance	R_{IN}	$-7V \leq V_{CM} \leq 12V$	12			K Ω	
Receiver Output Short-Circuit Current	I_{OSR}	$0V \leq V_{RO} \leq V_{CC}$			± 100	mA	
Supply Current							
Supply Current	I_{CC}	No load , /RE=DI= GND or V _{CC}	DE=V _{CC}		1.5	2	mA
			DE=GND		1.2	2	mA
Supply Current in Shutdown Mode	I_{SHDN}	DE=GND, /RE=V _{CC} , DI=V _{CC} or GND				2	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.

Switching Characteristics

(Test conditions: $V_{CC}=+5V$, $T_A=-40^{\circ}C \sim +125^{\circ}C$, unless otherwise noted.)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNITS
Driver Input to Output	t_{DPLH}	Figure 3 and 5, $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$		11	25	ns
	t_{DPHL}			16	30	
Driver Output Skew $ T_{DPLH} - T_{DPHL} $	t_{DSKEW}	Figure 3 and 5, $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$		5		ns

Driver Rise or Fall Time	t_{DR}, t_{DF}	Figure 3 and 5, $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$		6.5		ns
Maximum Data Rate	F_{MAX}		16			Mbps
Driver Enable to Output High	t_{DZH}	Figure 4 and 6, $C_L=100pF$ S2 Closed		25	50	ns
Driver Enable to Output Low	t_{DZL}	Figure 4 and 6, $C_L=100pF$ S1 Closed		28	50	ns
Driver Disable Time from Low	t_{DLZ}	Figure 4 and 6. $C_L=15pF$ S1 Closed		22	45	ns
Driver Disable Time from High	t_{DHZ}	Figure 4 and 6. $C_L=15pF$ S2 Closed		21	45	ns
Receiver Input to Output	t_{RPLH} t_{RPHL}	Figure 7 and 9, $ V_{ID} \geq 2.0V$; rise and fall time of $V_{ID} \leq 15ns$		45	70	ns
$ T_{RPLH} - T_{RPHL} $ Differential Receiver Skew	t_{RSKD}	Figure 7 and 9, $ V_{ID} \geq 2.0V$; rise and fall time of $V_{ID} \leq 15ns$		5		ns
Receiver Enable to Output Low	t_{RZL}	Figure 2 and 8, $C_{RL}=15pF$ S1 Closed		12	25	ns
Receiver Enable to Output High	t_{RZH}	Figure 2 and 8, $C_{RL}=15pF$ S2 Closed		8	25	ns
Receiver Disable Time from Low	t_{RLZ}	Figure 2 and 8, $C_{RL}=15pF$ S1 Closed		9	25	ns
Receiver Disable Time from High	t_{RHZ}	Figure 2 and 8, $C_{RL}=15pF$ S2 Closed		10	25	ns
Time to Shutdown	t_{SHDN}				500	ns
Driver Enable from Shutdown to Output High	$t_{DZH(SHDN)}$	Figure 4 and 6, $C_L=100pF$ S2 Closed		3	5	μs
Driver Enable from Shutdown to	$t_{DZL(SHDN)}$	Figure 4 and 6, $C_L=100pF$ S1 Closed		3	5	μs

Output Low						
Receiver Enable from Shutdown to Output High	$t_{RZH(SHDN)}$	Figure 2 and 8, $C_{RL}=15\text{pF}$ S2 Closed		3	5	μs
Receiver Enable from Shutdown to Output Low	$t_{RZL(SHDN)}$	Figure 2 and 8, $C_{RL}=15\text{pF}$ S1 Closed		3	5	μs

Test Circuits and Timing Diagrams

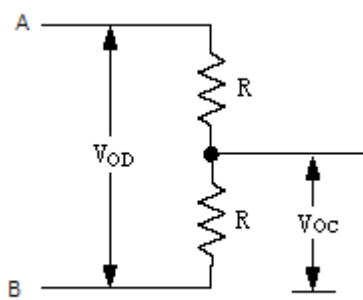


Figure 1: Driver DC Test Load

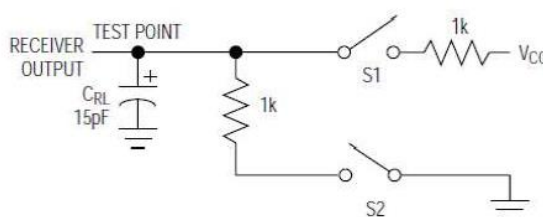


Figure 2: Receiver Enable/Disable Timing Test Load

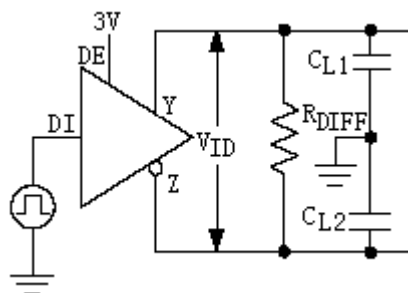


Figure 3: Driver Timing Test Circuit

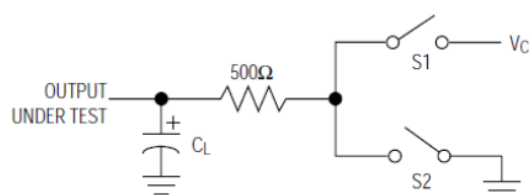


Figure 4: Driver Enable/Disable Timing Test Load

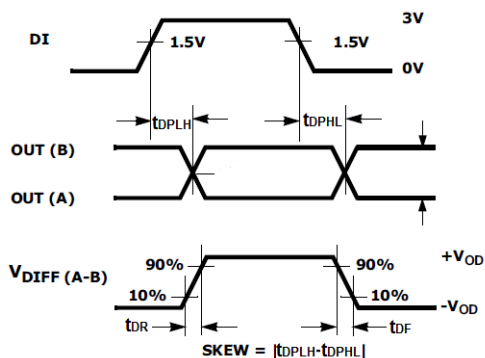


Figure 5: Driver Propagation Delays

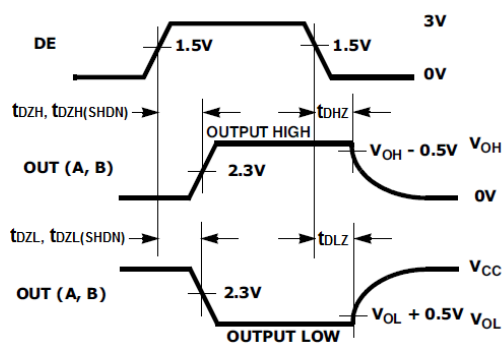


Figure 6: Driver Enable and Disable Times

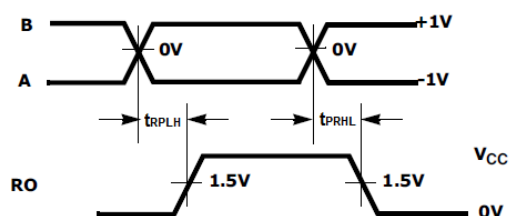


Figure 7: Receiver Propagation Delays

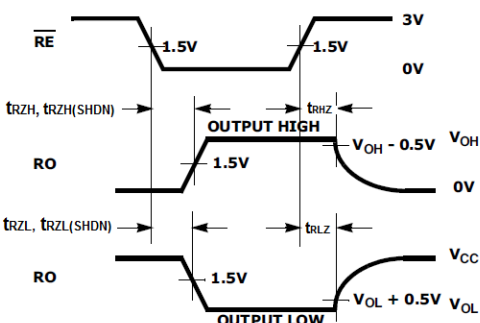


Figure 8: Receiver Enable and Disable Times

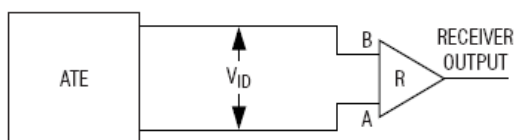


Figure 9: Receiver Propagation Delay Test Circuit

Typical Application

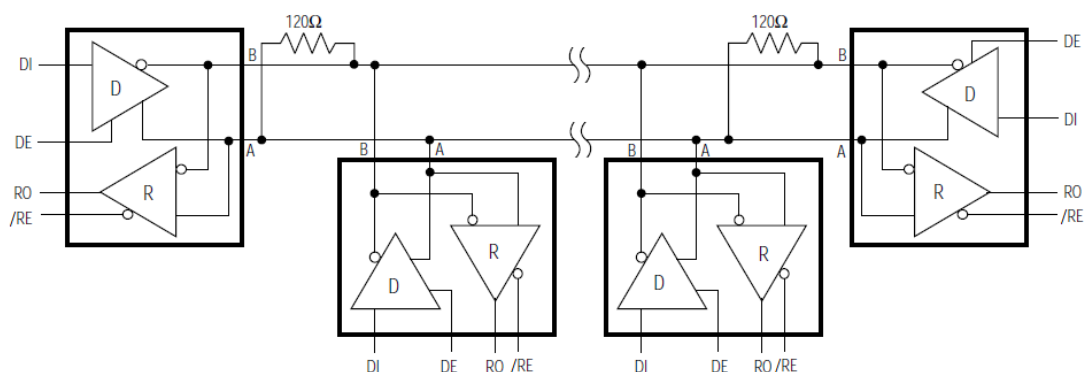
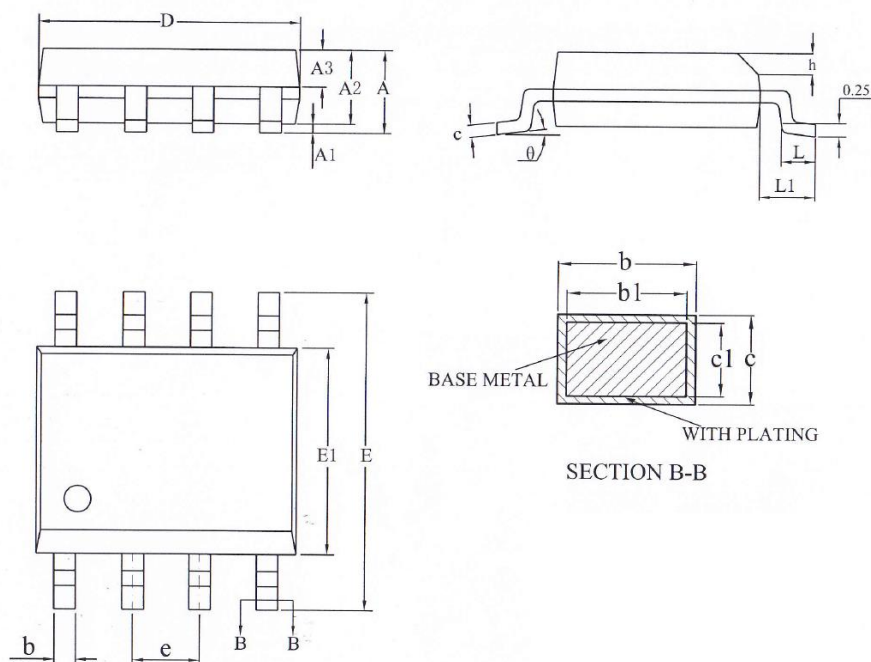


Figure10 Typical Half-Duplex RS-485 Network

Package Information (SOP8)



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.77
A1	0.08	0.18	0.28
A2	1.20	1.40	1.60
A3	0.55	0.65	0.75
b	0.39	—	0.48
b1	0.38	0.41	0.44
c	0.20	—	0.26
c1	0.19	0.20	0.21
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27BSC		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05REF		
θ	0	—	8°

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