SP485EENS

DATASHEET

Specification Revision History:

Version	Date	Description
V1.0	2019/02	New
V1.1	2021/06	Modify Ordering Information
V1.2	2025/02	Modify Ordering Information
V1.3	2025/03	Add application precautions and overall typesetting.

General Description

The SP485E is high-speed transceivers for RS-SP485 communication,which contain one dniver and one receiver.The SP485 feature fail-safe circuitry,which guarantees a logic-high receiver output when the eceiver 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 SP485 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 256 transceivers on the bus.

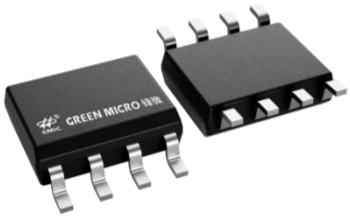
Features

※ Fail-safe circuitry
※ Low power consumption
※ Up to 256 transceivers can be attached to the bus
※ Maximum transmission rate: 10Mbps(Vcc=5V)
※ ESD:≥±15KV
※ SOP8 Package

Applications

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

The appearance of the product

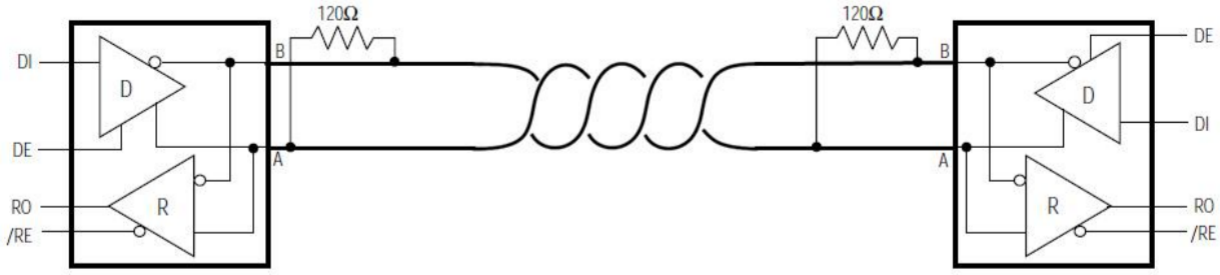


SOP-8

Ordering Information

Product Model	Package Type	Packing	Packing Qty
SP485EENS	SOP-8	REEL	2500PCS/REEL

Typical application circuit



Absolute Maximum Ratings (TA=25°C)

Supply Voltage(VCC)·····+7V
Operating voltage[1]·····+3~5.5V
Control Input Voltage(/RE,DE)·····-0.3~Vcc+0.3V
DriverInput Voltage(DI)·····-0.3~Vcc+0.3V
Driver Output Voltage(A,B)·····±13V
Receiver Input Voltage(A,B) ·····±13V
Receiver Output Voltage(RO)·····-0.3~Vcc+0.3V
Operating Temperature (TOPR)·····-40°C~+85°C
Storage Temperature(TSTG)·····-65°C~+150°C

Note 1:Recommended operating voltage is 5V,but can be compatible with 3V.If using a 3Vor3.3Vsupply voltage,please reduce the transmission rate.

DC Electrical Characteristics (VCC=5.0V,TA=25°C) [1]

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Difeential Driver Output(no load)	V_{OD1}	R=27Ω,Figure 1		—	—	VCC	V
Differential Driver Outputt	V_{OD2}			1.5	—	—	V
Change in Magnitude of Differential Output Voltage	$\triangle V_{OD}$			—	—	0.2	V
Driver Common-Mode Output Voltage	V_{OC}			1.0	—	3.0	V
Change in Magnitude of Common-Mode Voltage[2]	$\triangle V_{OC}$			—	—	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, Vcc=5.0V	—	—	250	uA
		VIN=-7V		-150	—	—	uA
Driver Short-Circuit Output Current	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	$\triangle V_{TH}$	—		—	40	—	mV
Receiver Output High Voltage	V_{OH}	Io=-8mA		VCC-1	—	—	V
Receiver Output Low Voltage	V_{OL}	Io=8mA		—	—	0.4	V
Three-State Output Current at Receiver	I_{OZR}	Vo=1V		-1	—	1	μA
Receiver Input Resistance	R_{IN}	-7V≤Vc≤12V		96	—	—	KΩ
Receiver Output Short-Circuit Current	I_{OSR}	0V≤V_{RO}≤VCC		±7	—	±100	mA
Supply Current	I_{CC}	DE=VCC	No Load /RE=DI=VCC/GND	—	700	1200	μA
		DE=GND		—	600	1200	μA
Supply Current in Shutdown Mode	I_{SHDN}	DE=GND,/RE=VCC, DI=VCC/GND		—	—	3	μA

Dc Electrical Characteristics (VCC=3.0V,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 Outputt	V_{OD2}			0.9	—	—	V
Change in Magnitude of Differential Output Voltage	$\triangle V_{OD}$			—	—	0.2	V
Driver Common-Mode Output Voltage	V_{OC}			1.0	—	3.0	V
Change in Magnitude of Common-Mode Voltage[2]	$\triangle V_{OC}$			—	—	0.2	V
Input High Voltage	V_{IH}	DE,DI,/RE		1.5	—	—	V
Input Low Voltage	V_{IL}	DE,DI,/RE		—	—	0.6	V
DI Input Hysteresis	V_{HYS}	---		—	100	—	mV
Driver Input Current(A AndB)	I_{IN1}	VIN=12V	DE=0V, Vcc=3V	—	—	150	uA
		VIN=-7V		-150	—	—	uA
Driver Short-Circuit Output Current[3]	I_{OSD}	A and B Short-Circuit		-100	—	100	mA
Receiver Differential Threshold Voltage	V_{TH}	$-7V \leqslant V_{CM} \leqslant 12V$		-200	—	200	mV
Receiver Input Hysteresis	$\triangle V_{TH}$	---		—	40	—	mV
Receiver Output High Voltage	V_{OH}	I_O=-8mA		VCC-1	—	—	V
Receiver Output Low Voltage	V_{OL}	I_O=8mA		—	—	0.6	V
Three-State Output Current at Receiver	I_{OZR}	Vo=1V		-1	—	1	μA
Receiver Input Resistance	R_{IN}	$-7V \leqslant V_{CM} \leqslant 12V$		96	—	—	KΩ
Receiver Output Short-Circuit Current	I_{OSR}	$0V \leqslant V_{RO} \leqslant VCC$		±7	—	±100	mA
Supply Current	I_{CC}	DE=VCC	No Load /RE=DI=VCC/GND	—	—	1000	μA
		DE=GND		—	—	1000	μA
Supply Current in Shutdown Mode	I_{SHDN}	DE=GND,/RE=VCC, DI=VCC/GND		—	—	3	μA

Switching Characteristics(VCC=5.0V,TA=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Rise or FallTime	t_R,t_F	Figure3 and5，R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	—	30	—	ns
Driver Input to Output	t_{PLH}，t_{PHL}		—	30	60	ns
Driver Output Skew $\|T_{DPLH}-T_{DPHL}\|$	t_{SKEW}		—	—	20	ns
Driver Enable time	t_{LZ}，t_{HZ}	Figure4 and6，C_L=100pF (Receiver enabled)	—	—	70	ns
Driver Enable time	$t_{LZ(SHDN)}$，$t_{HZ(SHDN)}$	Figure4 and6，C_L=100pF (Receiver disabled)	—	1400	3000	ns
Driver disable time	t_{LZ},t_{ZL}	Figure4 and6，C_L=100pF	—	—	70	ns
Maximum Data Rate	F_{MAX}	—	10	—	—	Mbps
Receiver Rise or Fall Time	t_R,t_F	Figure7	—	20	—	ns
Receiver propagation delay time	t_{PLH},t_{PHL}		—	90	250	ns
$\|T_{RPLH}-T_{RPHL}\|$ Differential Receiver Skew	t_{SKD}		—	30	—	ns
Receiver enable time	t_{ZL}, t_{ZH}	Figure2 and8，C_{RL}=15pF (Driver enabled)	—	30	70	ns
Receiver enable time	$t_{ZL(SHDN)}$，$t_{ZH(SHDN)}$	Figure2 and8，C_{RL}=15pF (Driver disabled)	—	1400	3000	ns
Receiver disable time	t_{LZ},t_{HZ}	Figure2 and8，C_{RL}=15pF	—	30	70	ns
Time to Shutdown	t_{SHDN}	—	—	200	600	ns

SWITCHING CHARACTERISTICS (VCC=3.0V,TA=25°C)

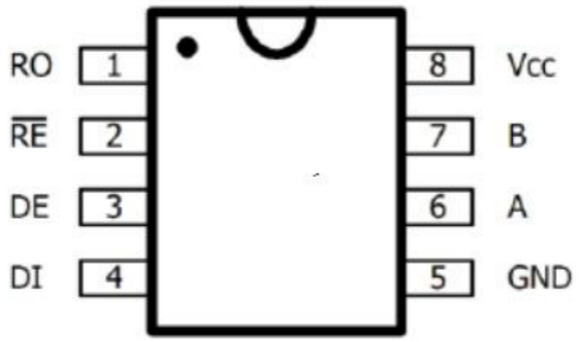
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Rise or FallTime	t_R,t_F	Figure3 and 5，R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	—	30	—	ns
Driver Input to Output	t_{PLH}，t_{PHL}		—	30	60	ns
Driver Output Skew TDPLH-ToPLl	t_{SKEW}		—	—	20	ns
Driver Enable time	t_{LZ}，t_{HZ}	Figure4 and 6，C_L=100pF (Receiver enabled)	—	—	70	ns
Driver Enable time	$t_{LZ(SHDN)}$, $t_{HZ(SHDN)}$	Figure4 and 6，C_L=100pF (Receiver disabled)	—	1600	3000	ns
Driver disable time	t_{LZ},t_{ZL}	Figure4 and 6，C_L=100pF	—	—	70	ns
Maximum Data Rate	F_{MAX}	—	10	—	—	Mbps
Receiver Rise or Fall Time	t_R,t_F	Figure 7	—	20	—	ns
Receiver propagation delay time	t_{PLH},t_{PHL}		—	90	250	ns
TRPuH-TRPHLI Differential Receiver Skew	t_{SKD}		—	30	—	ns
Receiver enable time	t_{ZL}, t_{ZH}	Figure2 and 8，C_{RL}=15pF (Driver enabled)	—	25	70	ns
Receiver enable time	$t_{ZL(SHDN)}$, $t_{ZH(SHDN)}$	Figure2 and 8，C_{RL}=15pF (Driver disabled)	—	1600	3000	ns
Receiver disable time	t_{LZ},t_{HZ}	Figure2 and 8，C_{RL}=15pF	—	30	70	ns
Time to Shutdown	t_{SHDN}	—	—	230	800	ns

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

Note 2:$\triangle V_{OD}$ and$\triangle V_{OC}$ 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.

Pin Assignment



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Pin Description

PIN	NAME	FUNCTION
1	RO	Receiver Output,When RE is low and if A-B≥-50mV,RO will be high; If A-B≤-200mV,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 EnableDrive 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,alow 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	≥-0.05V	1
0	X	≤-0.2V	0
0	X	Open/shorted	1
1	1	X	High-Z
1	0	X	Shutdown

Test circuit

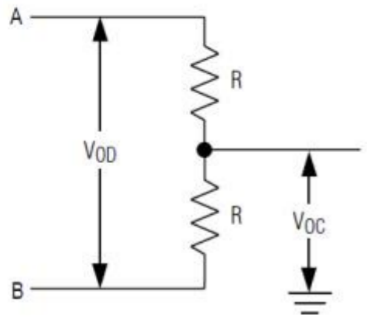


Figure 1. Driver DC Test Load

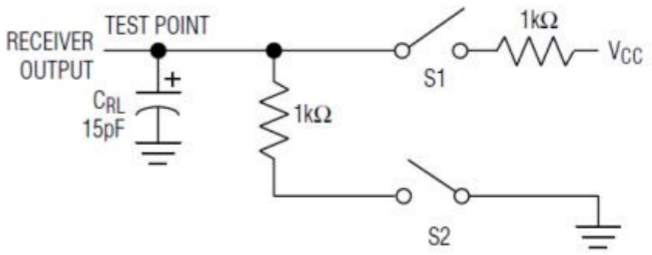


Figure 2. Receiver Enable/Disable Timing Test Load

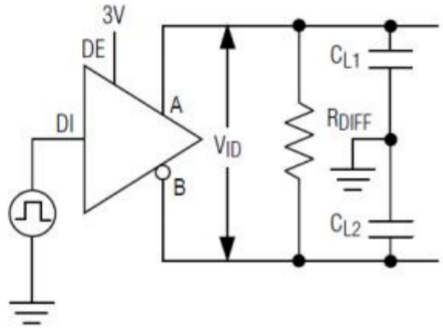


Figure 3. Driver Timing Test Circuit

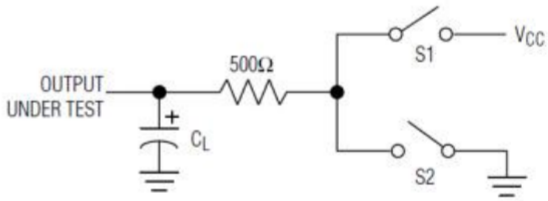


Figure 4. Driver Enable/Disable Timing Test Load

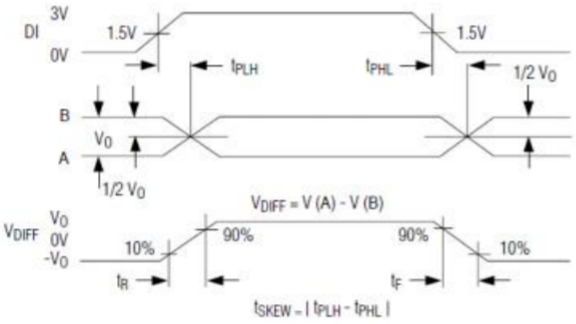


Figure 5. Driver Propagation Delays

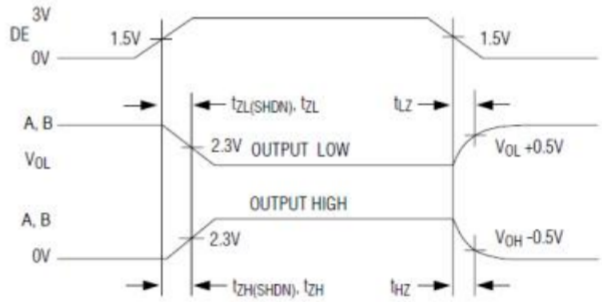


Figure 6. Driver Enable and Disable Times

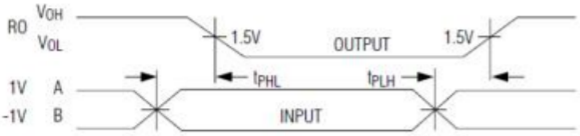


Figure 7. Receiver Propagation Delays

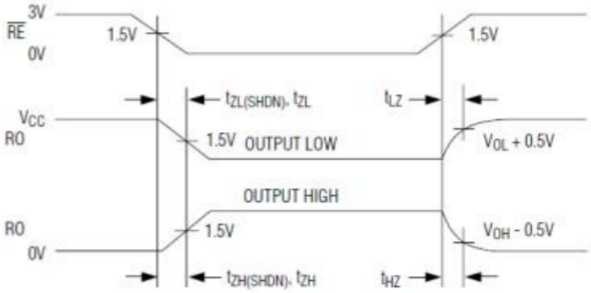
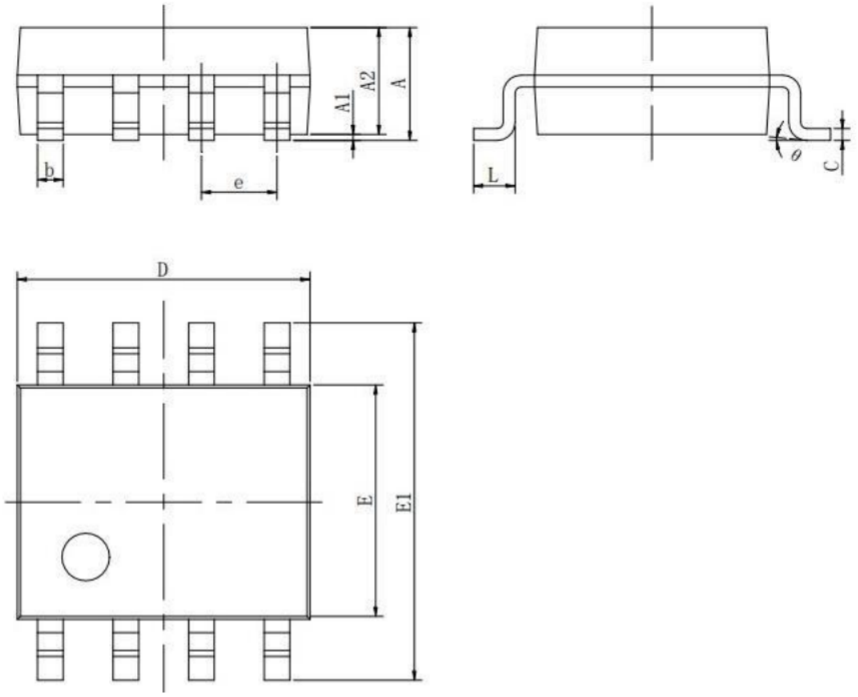


Figure 8. Receiver Enable and Disable Times

Outline Dimensions

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Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.800	0.053	0.071
A1	0.050	0.250	0.004	0.010
A2	1.250	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
C	0.170	0.250	0.006	0.010
D	4.780	5.000	0.185	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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