

SP3485E

DATASHEET

Specification Revision History:

Version	Date	Description
V1.0	2019/03	New
V1.1	2021/08	Modify Ordering Information
V1.2	2025/02	Modify Ordering Information
V1.3	2025/03	Add application precautions and overall typesetting.

General Description

The SP3485E is high-speed transceivers for RS-SP3485E communication, which contain one driver and one receiver. The SP3485E 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 SP3485E 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.

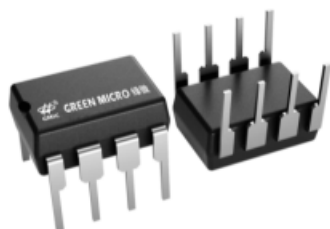
Features

- Fail-safe circuitry
- Low power consumption
- Up to 256 transceivers can be attached to the bus
- Maximum transmission rate: 10Mbps (V_{CC}=5V)
- ESD: $\geq \pm 15\text{KV}$
- SOP8 Package

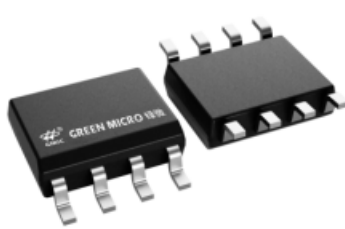
Applications

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

The appearance of the product



DIP-8



SOP-8

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
SP3485EBS	SOP-8	SP3485E S276	REEL	2500PCS/REEL

ABSOLUTE MAXIMUM RATINGS

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

Note 1: Recommended operating voltage is 5V, but can be compatible with 3V. If using a 3V or 3.3V supply 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	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 _s /RE		2.0	-	-	V
Input Low Voltage	V _{IL}	DE,DI _s /RE		---	-	0.8	V
DI Input Hysteresis	V _{HYS}	--			100	-	mV
Driver Input Current(A AndB)	I _{NI1}	VIN=12V	DE=0V, Voc=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≦VcM≦12V		-200	-125	-50	mV
Receiver Input Hysteresis	ΔV _{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 _{OZ}	Vo=1V		-1	--	1	μA
Receiver Input Resistance	R _{IN}	-7V≦Vc≦12V		96	-	-	KΩ
Receiver Output Short-Circuit Current	I _{OSR}	0V≦VRo≦VCC		±7	--	±100	mA
Supply Current	I _{CC}	DE=VCC	No Load /RE=DI=VCC/GND	---	700	1200	pA
		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	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		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 _{NI1}	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≤V _{CM} ≤12V		-200	-	200	mV
Receiver Input Hysteresis	ΔV _{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 _{OZ}	Vo=1V		-1	-	1	μA
Receiver Input Resistance	R _{IN}	-7V≤V _{CM} ≤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	---	-	1000	μA
		DE=GND		---	--	1000	pA
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, $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$		30	---	ns
Driver Input to Output	t_{PLH}, t_{PHL}		--	30	60	ns
Driver Output Skew TDPLH-ToPLI	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
TRPvH-TRPHLI 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)

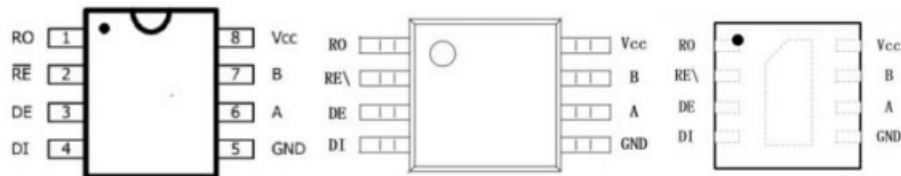
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Rise or Fall Time	t_R, t_F	Figure3 and5, $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$		30	—	ns
Driver Input to Output	t_{PLH}, t_{PHL}		--	30	60	ns
Driver Output Skew TDPLH-ToPLI	t_{SKEW}		--	--	20	ns
Driver Enable time	t_{LZ}, t_{HZ}	Figure4 and6, $C_L=100pF$ (Receiver enabled)	--	--	70	ns
Driver Enable time	$t_{LZ(SHDN)}, t_{HZ(SHDN)}$	Figure4 and6, $C_L=100pF$ (Receiver disabled)	--	1600	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
TRPuH-TRPHLI Differential Receiver Skew	t_{SKD}		--	30	---	ns
Receiver enable time	t_{ZL}, t_{ZH}	Figure2 and8, $C_{RL}=15pF$ (Driver enabled)	--	25	70	ns
Receiver enable time	$t_{ZL(SHDN)}, t_{ZH(SHDN)}$	Figure2 and8, $C_{RL}=15pF$ (Driver disabled)	--	1600	3000	ns
Receiver disable time	t_{LZ}, t_{HZ}	Figure2 and8, $C_{RL}=15pF$	--	30	70	ns
Time to Shutdown	t_{SHDN}	---	--	230	800	ns

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.

Pin Assignment



SOP8 MSOP8 DFN3*3-8

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

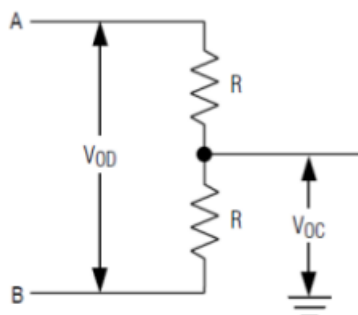


Figure 1. Driver DC Test Load

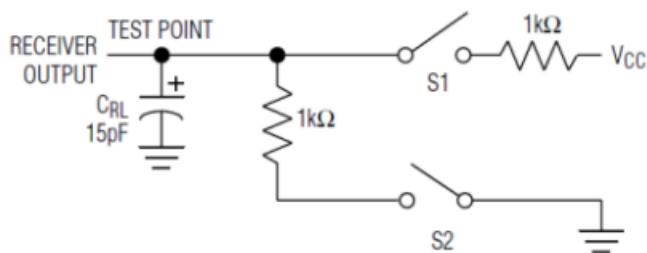


Figure 2. Receiver Enable/Disable Timing Test Load

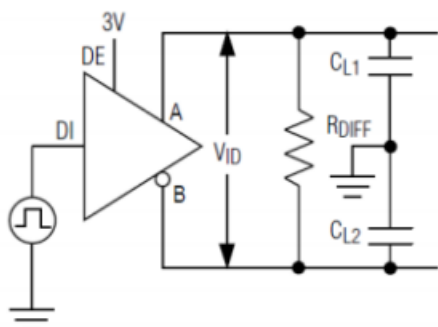


Figure 3. Driver Timing Test Circuit

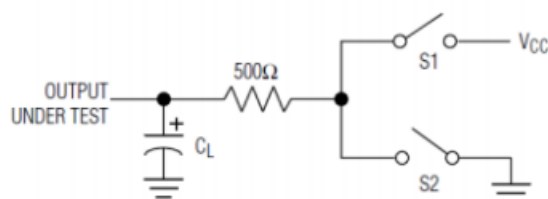


Figure 4. Driver Enable/Disable Timing Test Load

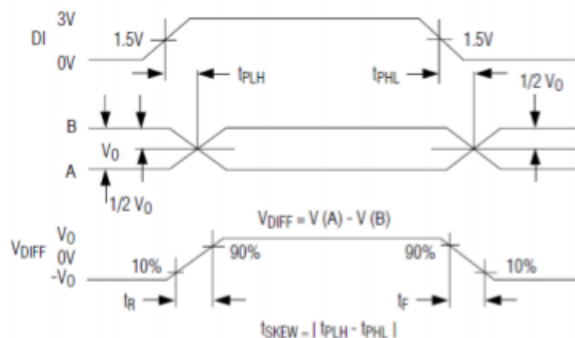


Figure 5. Driver Propagation Delays

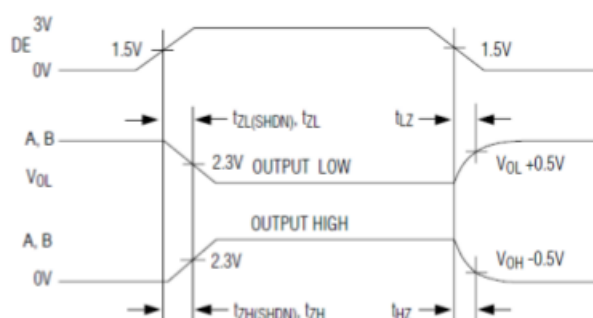


Figure 6. Driver Enable and Disable Times

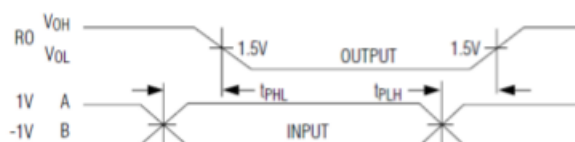


Figure 7. Receiver Propagation Delays

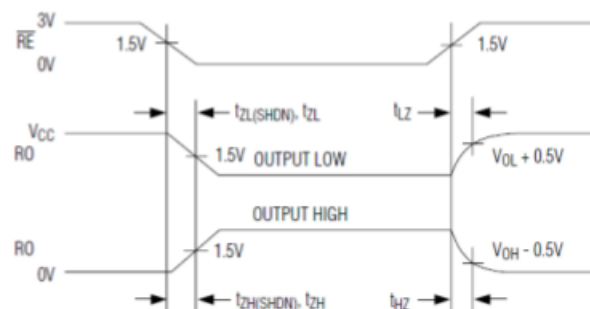
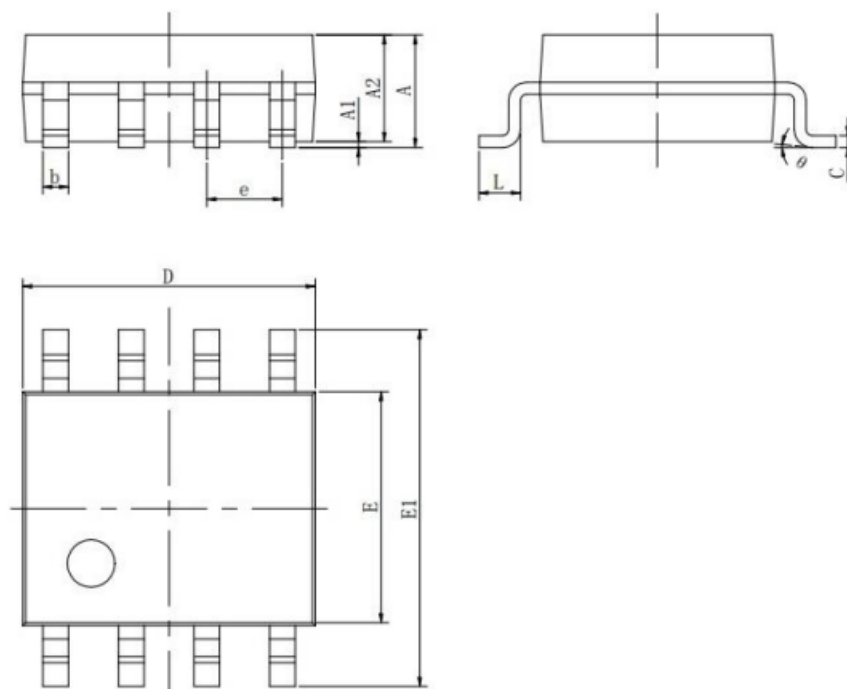


Figure 8. Receiver Enable and Disable Times

Outline Dimensions

SOP-8

Unit : mm



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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