SP485E

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.
V1.4	2026/07	Add DIP-8 Package

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.

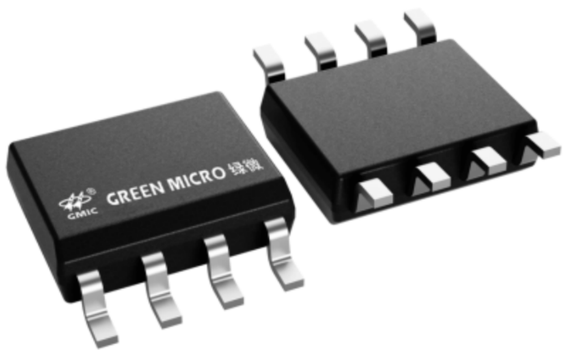
Features

※ 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 & DIP8 Package

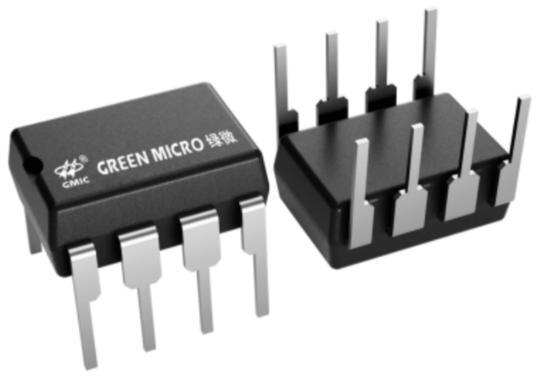
Applications

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

The appearance of the product



SOP-8

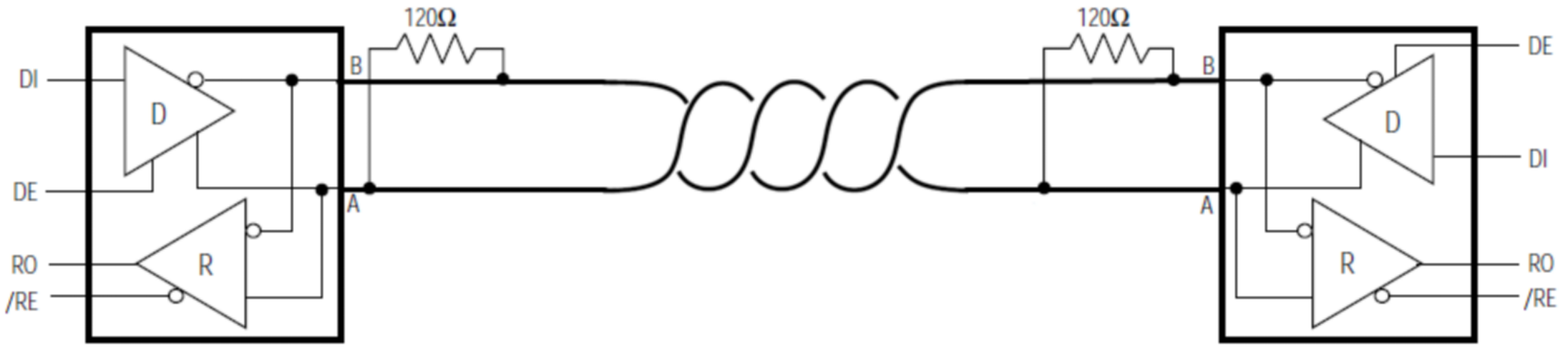


DIP-8

Ordering Information

Product Model	Package Type	Packing	Packing Qty
SP485EENS	SOP-8	REEL	2500PCS/REEL
SP485EEP	DIP-8	TUBE	2000PCS/BOX

Typical application circuit



Absolute Maximum Ratings (TA=25℃)

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℃~+85℃
Storage Temperature(TSTG)·····-65℃~+150℃

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℃) [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℃)[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℃)

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)

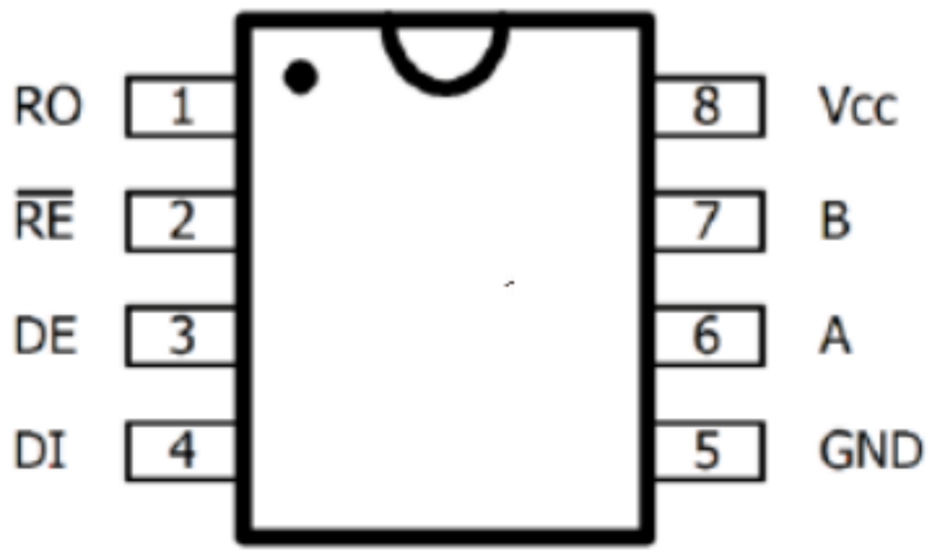
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Rise or FallTime	t_R,t_F	Figure3 and 5，R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	—	30	—	ns
Driver Input to Output	t_{PLH}，t_{PHL}		—	30	60	ns
Driver Output Skew TDPLH-ToPLl	t_{SKEW}		—	—	20	ns
Driver Enable time	t_{LZ}，t_{HZ}	Figure4 and 6，C_L=100pF (Receiver 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



SOP-8

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

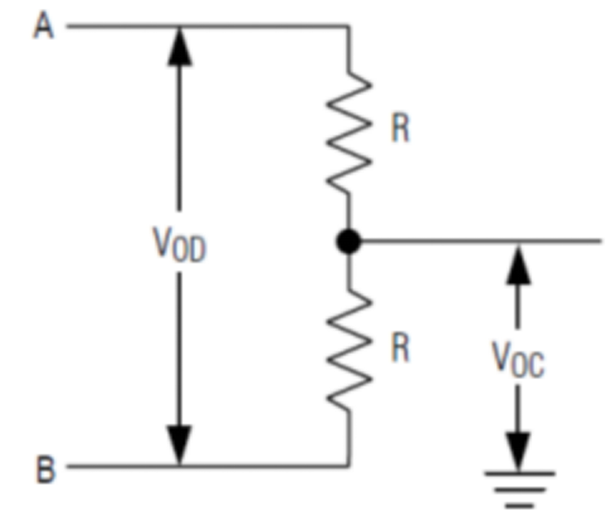


Figure 1. Driver DC Test Load

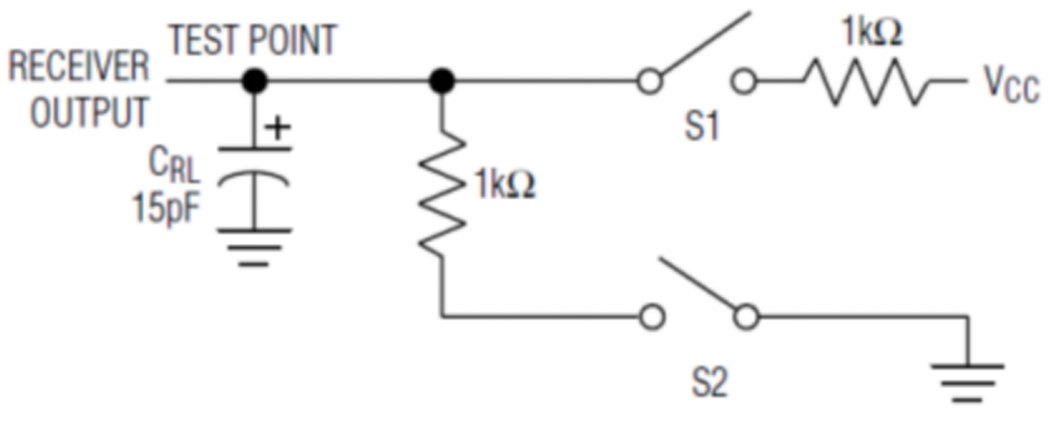


Figure 2. Receiver Enable/Disable Timing Test Load

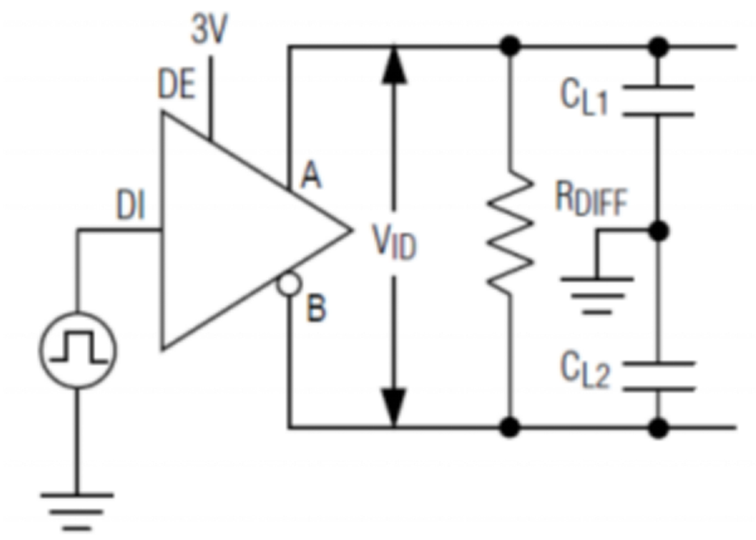


Figure 3. Driver Timing Test Circuit

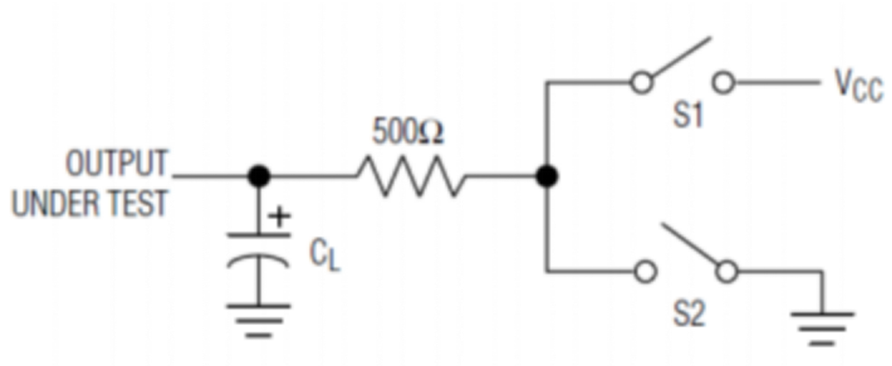


Figure 4. Driver Enable/Disable Timing Test Load

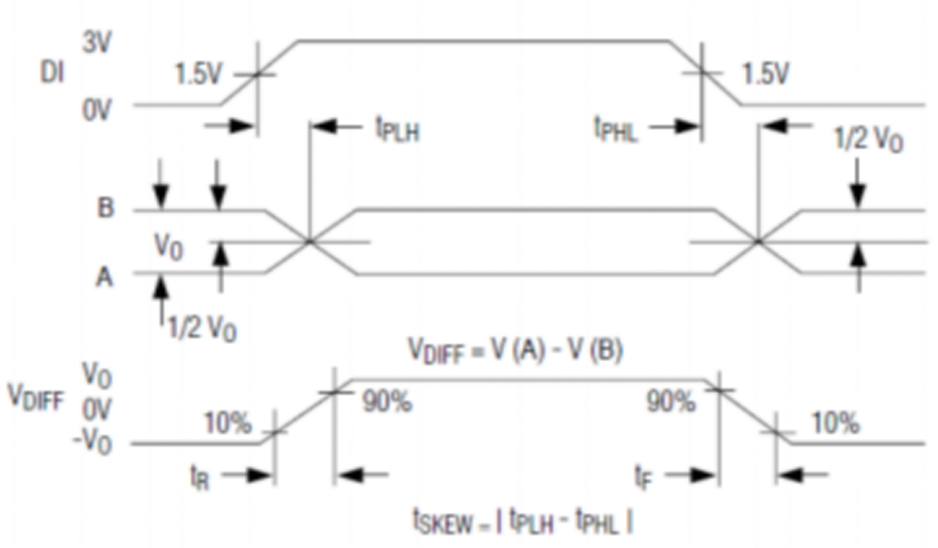


Figure 5. Driver Propagation Delays

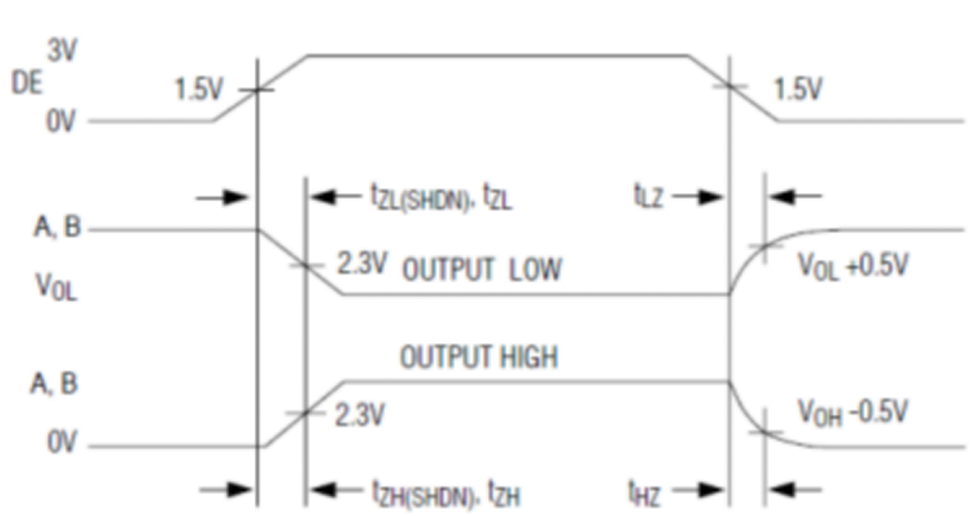


Figure 6. Driver Enable and Disable Times

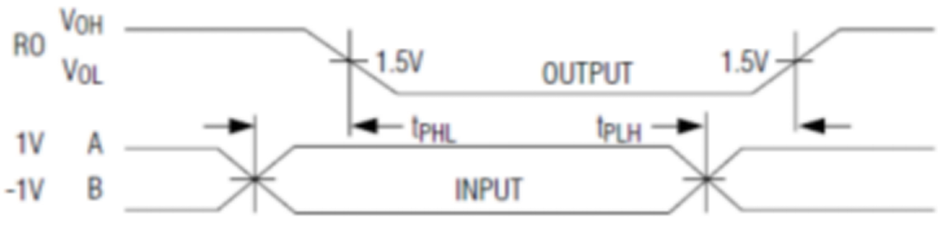


Figure 7. Receiver Propagation Delays

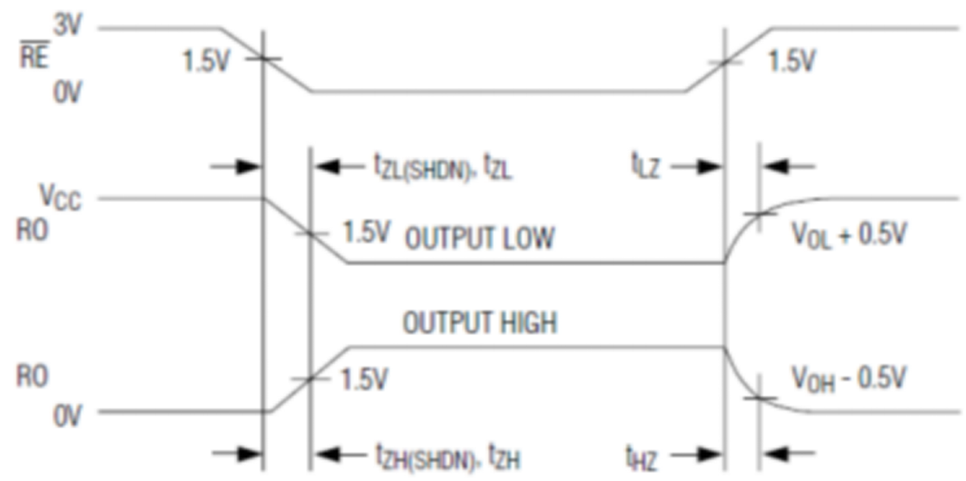
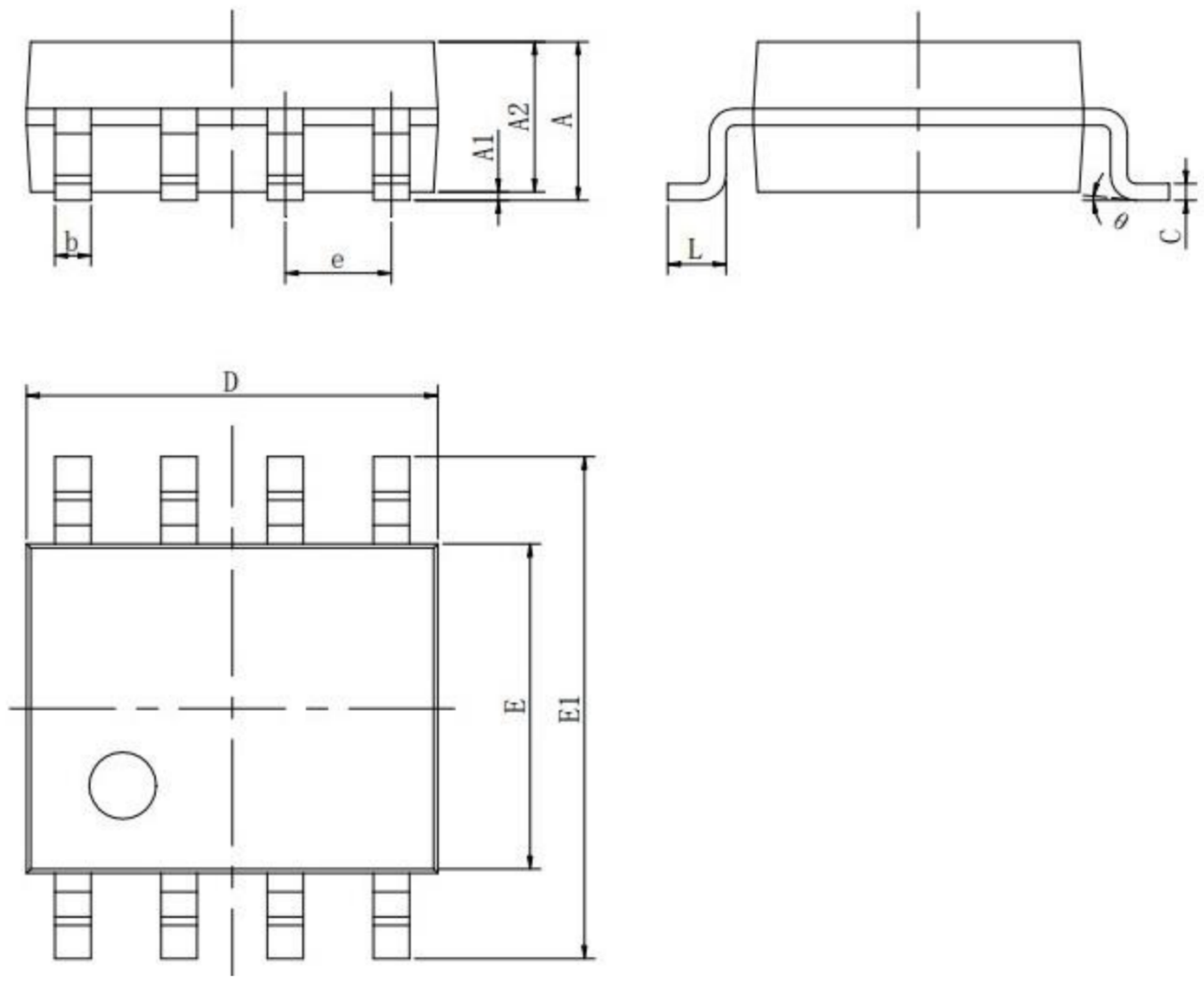


Figure 8. Receiver Enable and Disable Times

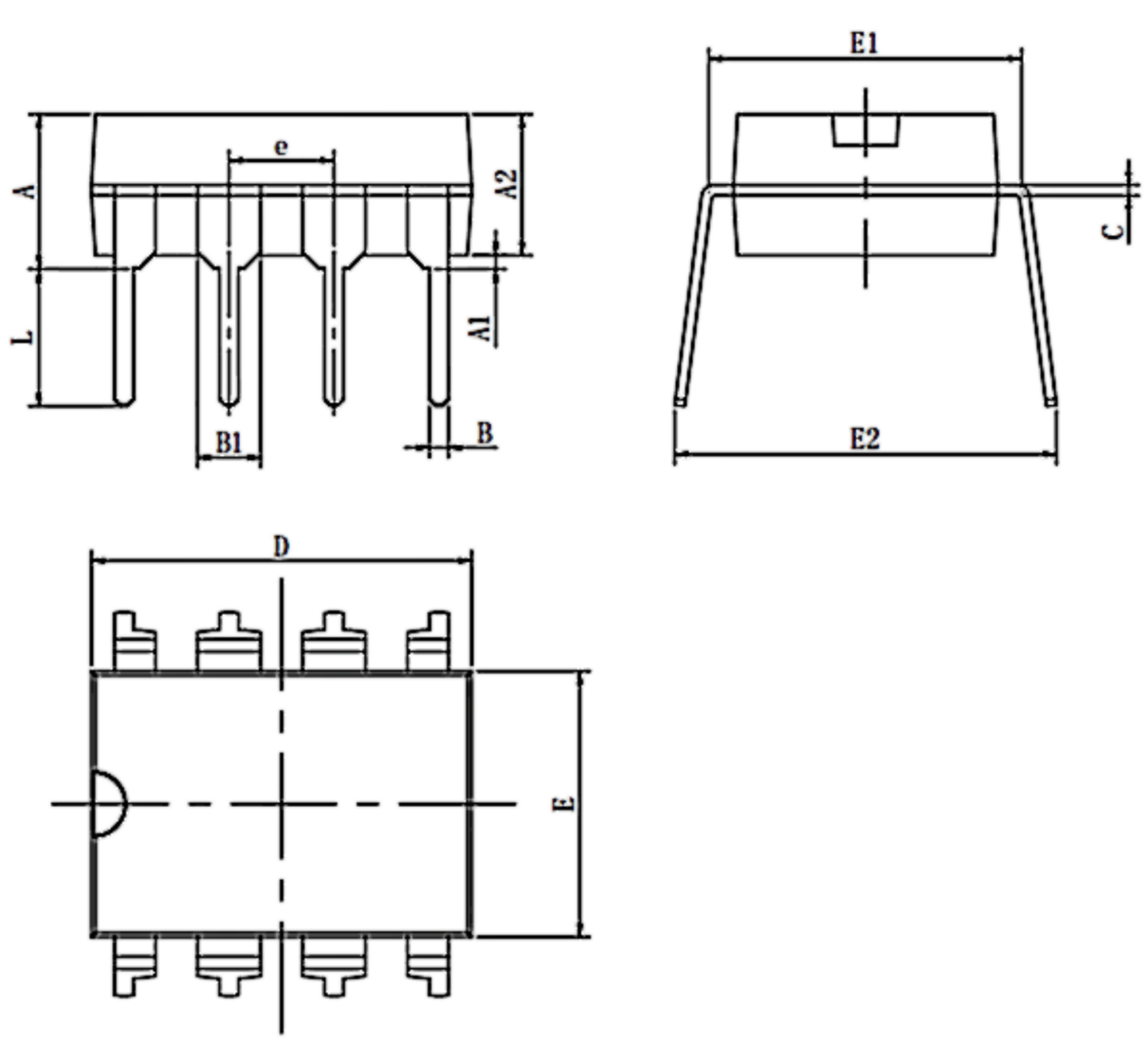
Outline Dimensions

SOP-8



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°

DIP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540(BSC)		0.100(BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

Important Notice

- Green Micro chip reserves the right to change products and documents without notice. Customers should obtain and verify the completeness of the latest technical information before placing orders. Meanwhile, Green Micro chip shall not assume any responsibility or obligation for non-officially revised documents.

- Any parameters in the entire product specification are for reference only, and actual application testing shall prevail. When customers use the products for system design, they must comply with safety regulations and independently assume the following responsibilities: selecting suitable Green Micro chip products according to application requirements; completing design verification and full-link testing of the application; and ensuring that the application complies with safety regulations or other requirements of the target market. Customers shall bear all personal or property losses caused by design defects or illegal operations, which shall have no relation to Green Micro chip.

- Green Micro chip products are prohibited from being used in scenarios such as life support, military equipment, and key aerospace applications. All accidents and legal liabilities arising from out-of-scope use shall be borne by the user, and Green Micro chip shall not be held responsible.

- All technical resources of Green Micro chip (including data sheets and reference designs) are provided "as is", without guarantee of no defects or universality, and without any express or implied warranties. The documents are only authorized for product development and research described in this document. Unauthorized use of intellectual property, public reproduction, and reverse engineering are strictly prohibited. All claims and losses caused by illegal use shall be borne by the user, and Green Micro chip shall not be liable.