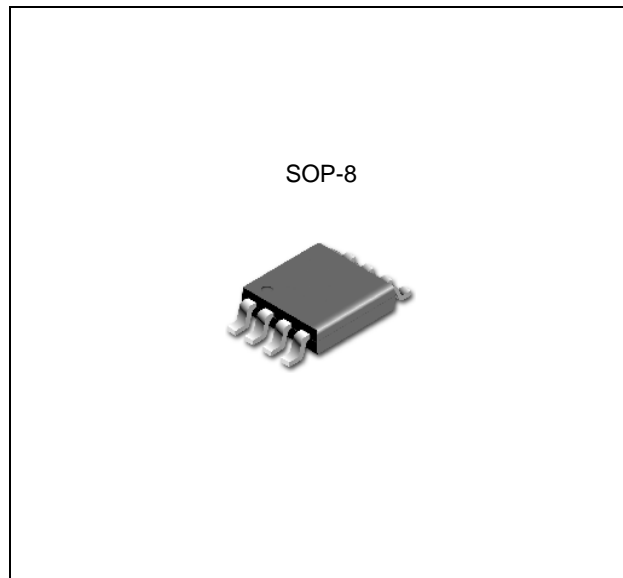


**DESCRIPTION**

The TJ3485 is a low-power half-duplex transceiver that meets the specifications of RS-485 and RS-422. IC contains one driver and one receiver. The driver slew rates is not limited, allowing them to transmit up to 5Mbps. These transceivers draw between 120uA and 500uA of supply current when unloaded or fully loaded with disabled drivers. All parts operate from a single 3.3V supply. Drivers are short-circuit current limited and are protected against excessive power dissipation by thermal shutdown circuitry that places the driver outputs into a high-impedance states. The receiver input has a fail-safe feature that guarantees a logic-high output if the input is open circuit. The ESD tolerance is more than ±8kV for both Human Body Model and ±15kV for IEC61000-4-2 Air Discharge Method on this device.



**FEATURES**

- Single 3.3V Supply
- Low Quiescent Current: 300uA
- -7V to +12V Common-Mode Input Voltage Range
- Three-state Outputs
- Half-Duplex Versions Available
- Allows up to 32 Transceivers on the Bus
- Data rate: 5 Mbps
- Current-Limiting and Thermal Shutdown for Driver Overload Protection
- ESD Specifications
  - ±15kV IEC61000-4-2 Air Discharge
  - ±8kV Human Body Model

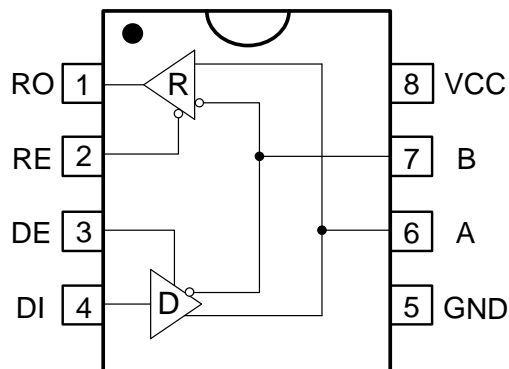
**TRUTH TABLE**

Transmission				
Inputs			Outputs	
RE	DE	DI	A	B
X	1	1	1	0
X	1	0	0	1
0	0	X	Z	Z
1	0	X	Z	Z
Receiver				
Inputs			Outputs	
RE	DE	A-B	RO	
0	0	≥ +0.2V	1	
0	0	≤ -0.2V	0	
0	0	Open	1	
1	0	X	Z	

**APPLICATIONS**

- Low Power RS-485 Systems
- DTE-DCE Interface
- Packet Switching
- Local Area Networks
- Data Concentration
- Data Multiplexers
- Integrated Services Digital Network (ISDN)

**Pin Configuration and Logic Diagram**

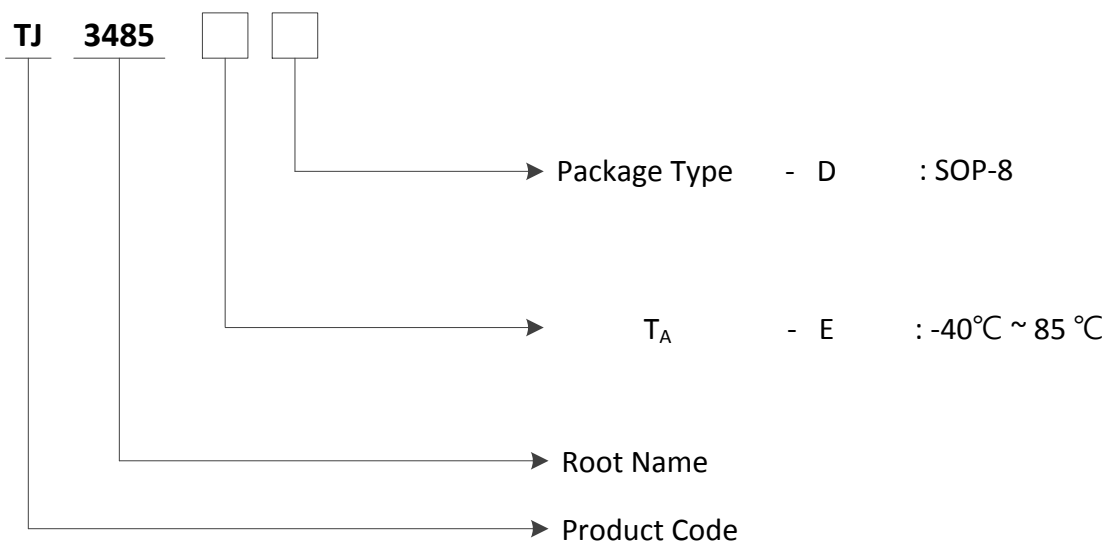


Absolute Maximum Ratings

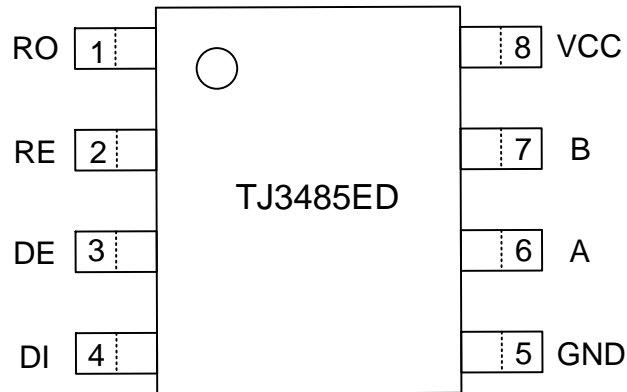
Characteristic	Symbol	Min	Max	Unit
Supply Voltage	$V_{CC}$		7	V
Control Input Voltage	$V_{DE}, V_{RE}$	-0.3	7	V
Driver Input Voltage	$V_{DI}$	-0.3	7	V
Driver Output Voltage	A, B	-7.5	12.5	V
Receiver Input Voltage	A, B	-7.5	12.5	V
Receiver Output Voltage	$V_{RO}$	-0.3	$V_{CC} + 0.3$	V
Storage Temperature Range	$T_{STG}$	-65	150	°C

Ordering Information

Package	Oder No.	Description	Marking	Compliance	Status
SOP-8	TJ3485ED	RS-485/RS-422 Transceivers	TJ3485E	RoHS, Green	Active



PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	Symbol	Pin Descriptions
1	RO	Receiver Output
2	RE*	Receiver Output Enable Active Low
3	DE	Driver Output Enable Active High
4	DI	Driver Input
5	GND	Ground
6	A	Non-inverting Driver Output and Receiver Input
7	B	Inverting Driver Output and Receiver Input
8	VCC	Power Supply: 3.3V±5%

**DC ELECTRICAL CHARACTERISTICS**

(Unless otherwise specified:  $V_{CC} = 3.3V \pm 5\%$ ,  $T_A = T_{MIN}$  to  $T_{MAX}$ )

PARAMETER	Symbol	CONDITIONS	MIN	TYP	MAX	UNITS	
No-Load Supply Current	ICC	RE = 0V or V <sub>CC</sub>	DE=V <sub>CC</sub>		500	800	uA
			DE=0V		300	400	
<b>DRIVER DC Characteristics</b>							
Differential Driver Output (no load)	V <sub>OD1</sub>	R <sub>L</sub> = ∞, Figure 1	GND		V <sub>CC</sub>	V	
Differential Driver Output (with load)	V <sub>OD2</sub>	R <sub>L</sub> = 50Ω (RS-422), Figure 1	1		V <sub>CC</sub>	V	
		R <sub>L</sub> = 27Ω (RS-485), Figure 1	0.8		V <sub>CC</sub>		
Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	ΔV <sub>OD</sub>	R <sub>L</sub> = 27Ω or 50Ω, Figure 1			0.2	V	
Driver Common-Mode Output Voltage	V <sub>OC</sub>	R <sub>L</sub> = 27Ω or 50Ω, Figure 1			2	V	
Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	ΔV <sub>OC</sub>	R = 27Ω or 50Ω, Figure 1			0.2	V	
Input High Voltage	V <sub>IH</sub>	DE, DI, RE*	2.0			V	
Input Low Voltage	V <sub>IL</sub>	DE, DI, RE*			0.8	V	
Input Current	I <sub>IN1</sub>	DE, DI, RE*			±2	uA	
Driver Short-Circuit Current, V <sub>O</sub> = High	I <sub>OSD1</sub>	-7V ≤ V <sub>O</sub> ≤ 12V			±250	mA	
Driver Short-Circuit Current, V <sub>O</sub> = Low	I <sub>OSD2</sub>	-7V ≤ V <sub>O</sub> ≤ 12V			±250	mA	
<b>RECEIVER DC Characteristics</b>							
Receiver Differential Threshold Voltage	V <sub>TH</sub>	-7V ≤ V <sub>CM</sub> ≤ 12V	-0.2		0.2	V	
Receiver Input Hysteresis	ΔV <sub>TH</sub>	V <sub>CM</sub> = 0V		70		mV	
Receiver Output High Voltage	V <sub>OH</sub>	I <sub>O</sub> = -4mA, V <sub>ID</sub> = +200mV	2.5			V	
Receiver Output Low Voltage	V <sub>OL</sub>	I <sub>O</sub> = +4mA, V <sub>ID</sub> = -200mV			0.4	V	
Three-State (High Impedance) Output Current at Receiver	I <sub>OZR</sub>	0.4V ≤ V <sub>O</sub> ≤ 2.4V, RE* = 3V			±1	uA	
Receiver Input Resistance	R <sub>IN</sub>	-7V ≤ V <sub>CM</sub> ≤ 12V	12			kΩ	
Input Current (A, B)	I <sub>IN2</sub>	DE = 0V	V <sub>IN</sub> = 12V		1.0	mA	
		V <sub>CC</sub> = 0V or 3.3V	V <sub>IN</sub> = -7V		-0.8		
Receiver Short-Circuit Current	I <sub>OSR</sub>	0V ≤ V <sub>O</sub> ≤ V <sub>CC</sub>	±6.5		95	mA	

**SWITCHING CHARACTERISTICS**

(Unless otherwise specified:  $V_{CC} = 3.3V \pm 5\%$ ,  $T_A = T_{MIN}$  to  $T_{MAX}$ )

PARAMETER	Symbol	CONDITIONS	MIN	TYP	MAX	UNITS
Maximum Data Rate	$f_{MAX}$		2.5	5	10	Mbps
Driver Input to Output	$t_{DPLH}$	Figure 3 & 5 $R_L = 54\Omega, C_{L1} = C_{L2} = 100pF$	10	80	100	ns
	$t_{DPHL}$		10	80	100	ns
Driver Output Skew to Output	$t_{SKEW}$			5	10	ns
Driver Enable to Output High	$t_{ZH}$	Figure 4 & 6 $C_L=100pF$		40	70	ns
Driver Enable to Output Low	$t_{ZL}$			40	70	ns
Driver Disable Time from High	$t_{HZ}$	Figure 4 & 6 $C_L=15pF$		40	70	ns
Driver Disable Time from Low	$t_{LZ}$			40	70	ns
Receiver Input to Output	$t_{PLH}$	Figure 2 & 7 $S_1, S_2$ open $C_L = 100pF$	20	120	200	ns
	$t_{PHL}$		20	120	200	ns
$t_{PLH} - t_{PHL}$   Differential Receiver Skew	$t_{SKD}$			5	10	ns
Receiver Enable to Output Low	$t_{ZL}$	Figure 2 & 8 $C_L = 15pF$		50	90	ns
Receiver Enable to Output High	$t_{ZH}$			50	90	ns
Receiver Disable Time from Low	$t_{LZ}$			40	80	ns
Receiver Disable Time from High	$t_{HZ}$			40	80	Ns

TEST CIRCUITS

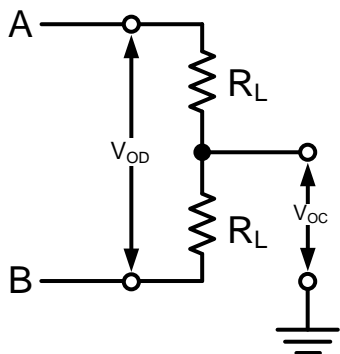


Figure 1.

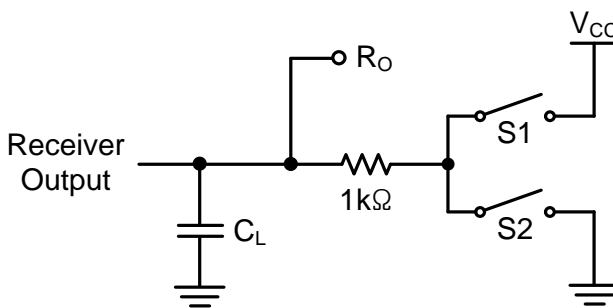


Figure 2.

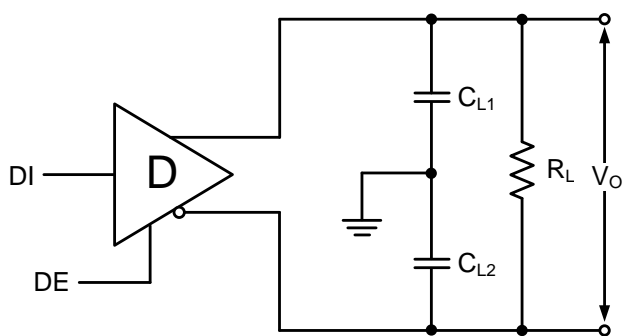


Figure 3.

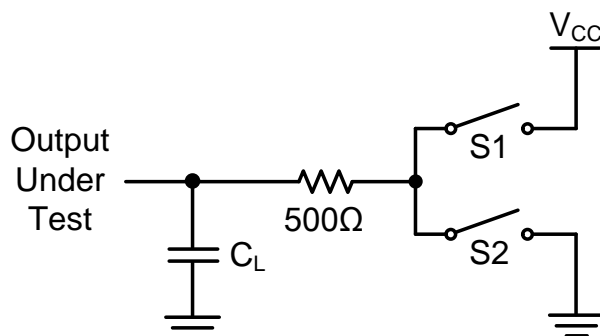


Figure 4.

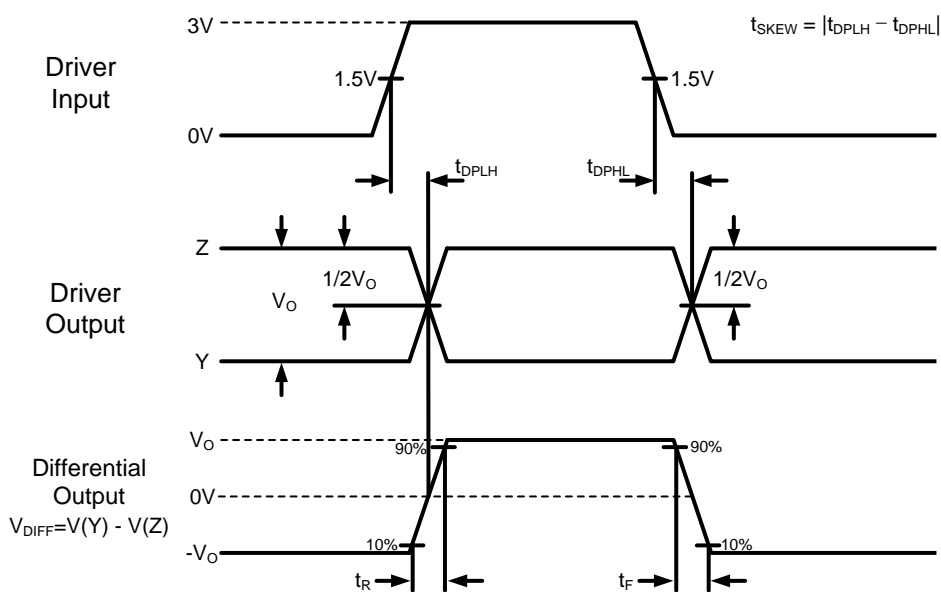


Figure 5.

TEST CIRCUITS

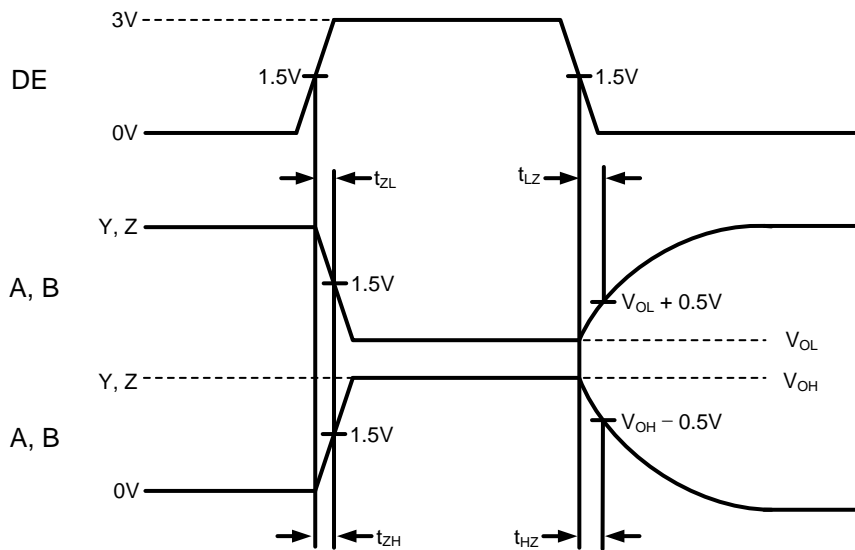


Figure 6.

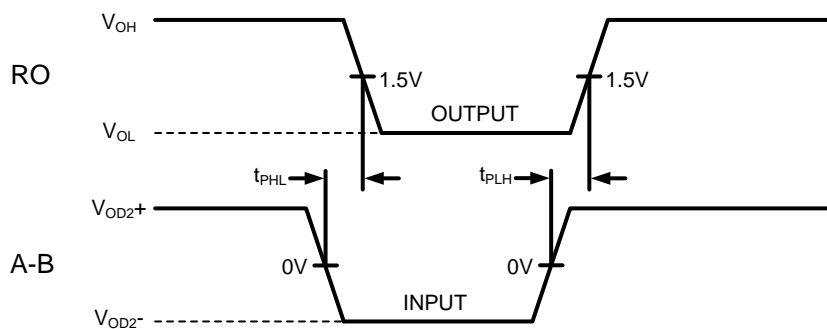


Figure 7.

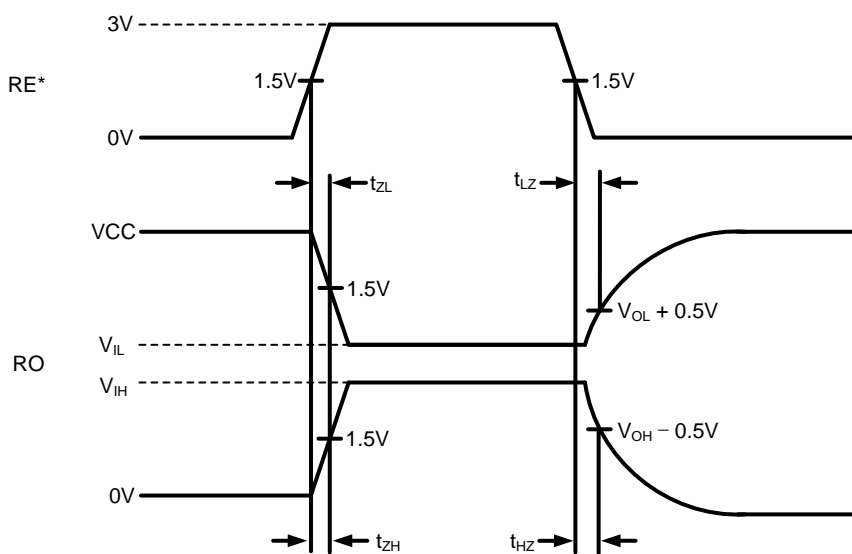


Figure 8.

## APPLICATION INFORMATION

### FUNCTIONAL DESCRIPTION

The TJ3485 is half-duplex differential transceiver that meets the requirements of RS-485 and RS-422.

The RS-485 standard is ideal for multi-drop applications and for long-distance interfaces. RS-485 allows up to 32 drivers and 32 receivers to be connected to a data bus, making it an ideal choice for multi-drop applications. Since the cabling can be as long as 4,000 feet, RS-485 transceivers are equipped with a wide (-7V to +12V) common mode range to accommodate ground potential differences. Because RS-485 is a differential interface, data is virtually immune to noise in the transmission line.

### DRIVERS

The driver outputs of the TJ3485 are differential outputs meeting the RS-485 and RS-422 standards. The typical voltage output swing with no load will be 0 Volts to +3.3 Volts. With worst case loading of 54 $\Omega$  across the differential outputs, the drivers can maintain greater than 0.8V voltage levels. The drivers of the TJ3485 have an enable control line which is active HIGH. A logic HIGH on DE (pin 3) will enable the differential driver outputs. A logic LOW on the DE(pin 3) will tri-state the driver output.

The transmitters of the TJ3485 will operate up to at least 5Mbps.

### RECEIVERS

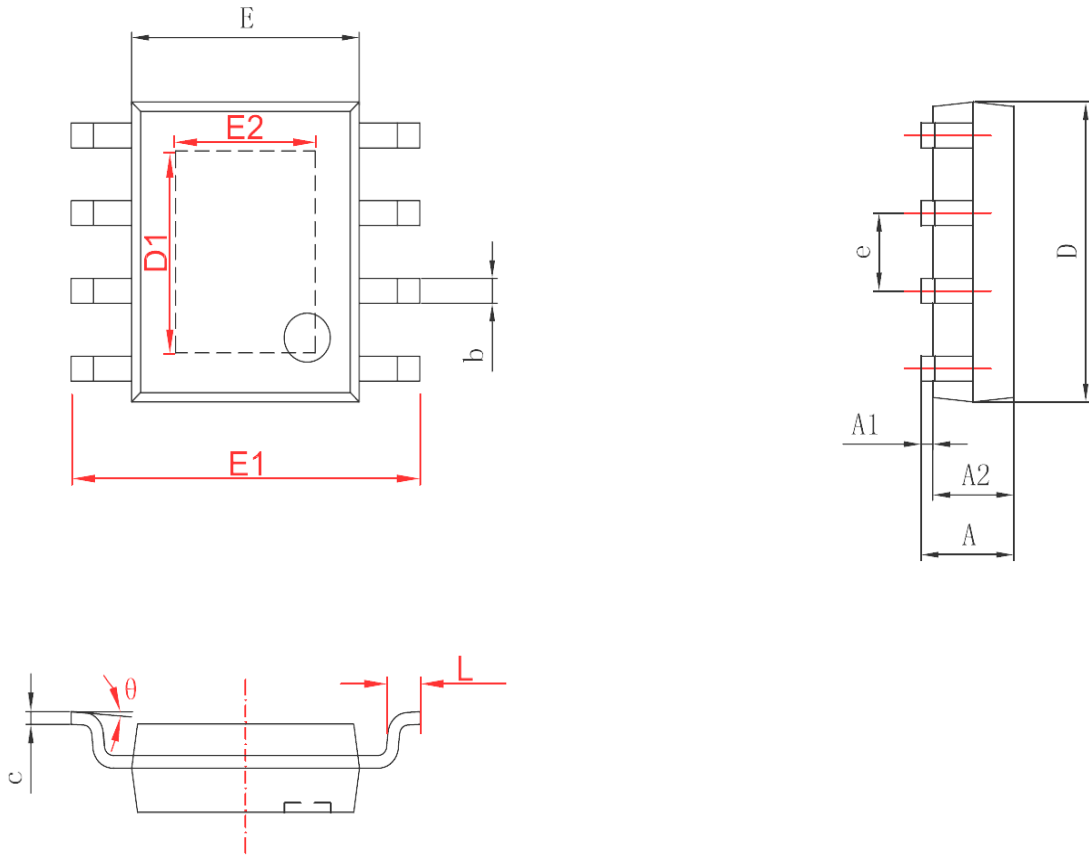
The TJ3485 receiver has differential inputs with an input sensitivity as low as  $\pm 200\text{mV}$ . Input impedance of the receivers is greater than 12k $\Omega$ . A wide common mode range of -7V to +12V allows for large ground potential differences between systems. The receivers of the TJ3485 have a tri-state enable control pin. A logic LOW on RE\* (pin 2) will enable the receiver, a logic HIGH on RE\*(pin 2) will disable the receiver

The receiver for the TJ3485 will operate up to at least 5Mbps. The receiver is equipped with the fail-safe feature. Fail-safe guarantees that the receiver output will be in a HIGH state when the input is left unconnected.



# Package Dimension

## SOP-8 & SOP-8PP



SYMBOL	Dimension In Millimeters		Dimension In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1 (for SOP-8)	0.100	0.250	0.004	0.010
A1 (for SOP-8PP)	0.050	0.150	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	0.006	0.010
D	4.700	5.100	0.185	0.200
D1 (for SOP-8PP)	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2 (for SOP-8PP)	2.313	2.513	0.091	0.099
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°		