

# Isolated RS485 Interface with Handshake IL485W



The IL485W is a galvanically isolated, high-speed differential bus transceiver, designed for bi-directional data communication on balanced transmission lines. The IL485W uses patented IsoLoop<sup>®</sup> technology and is the first isolated RS-485 interface available in a standard 16 pin SOIC package, which meets the ANSI Standards EIA/TIA-422-B and RS485.

The IL485W has current limiting and thermal shutdown features to protect against output short circuits and bus contention situations where these may cause excessive power dissipation.

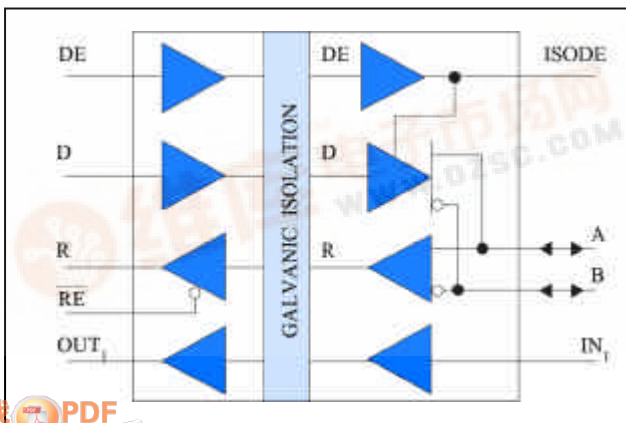
With a 1 nsec pulse skew and 16 nsec propagation delay, the IL485W is ideal for PROFIBUS applications. Use of DE/ISODE and IN1/OUT1 allows the IL485W to perform the handshaking operations of RTSAS and DTSAS of PROFIBUS.

- 2500 Vrms Isolation (1 min)
- 25 ns Maximum Propagation Delay
- 35 Mbaud Data Rate
- 1 ns Pulse Skew (typ.)
- Designed for Multi-point Transmission on Long Bus Lines in Noisy Environments
- ±60 mA Driver Output Capability
- Thermal Shutdown Protection
- Meets or Exceeds ANSI RS-485 and ISO 8482:1987 (E)
- -40°C to +85°C Temperature Range
- 16 Pin SOIC Package
- PROFIBUS International Component Recognition
- UL1577 Approval (pending)
- IEC 61010-1 Approval (pending)

### Applications

- PROFIBUS/RS485
- RS-485 Systems
- Multiple Data Point Transmission

### Functional Diagram (IL485W)



### Function Table

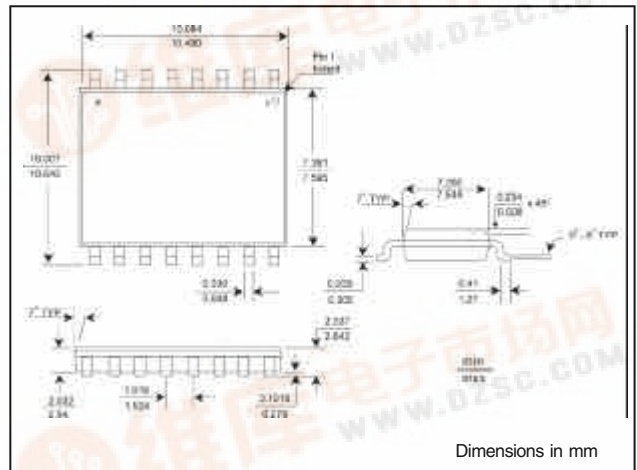
V <sub>ID</sub> (A-B)	DE	RE	ISODE	R	D	MODE
≥0.2V	L	L	L	H	X	Receive
≤-0.2V	L	L	L	L	X	Receive
-7<V <sub>ID</sub> <12	X	H	X	Z	X	Receive/ Drive
≥1.5	H	L	H	H	H	Drive
≤-1.5	H	L	H	L	L	Drive
Open	L	L	L	H	X	Receive

H = High Level

L = Low Level

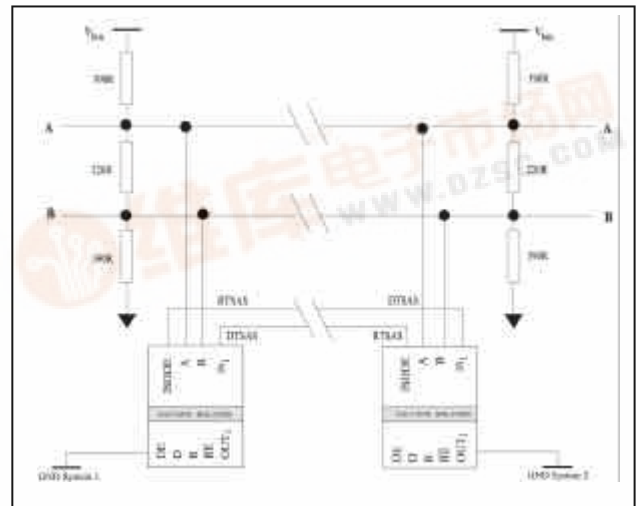
X = Irrelevant

Z = High Impedance

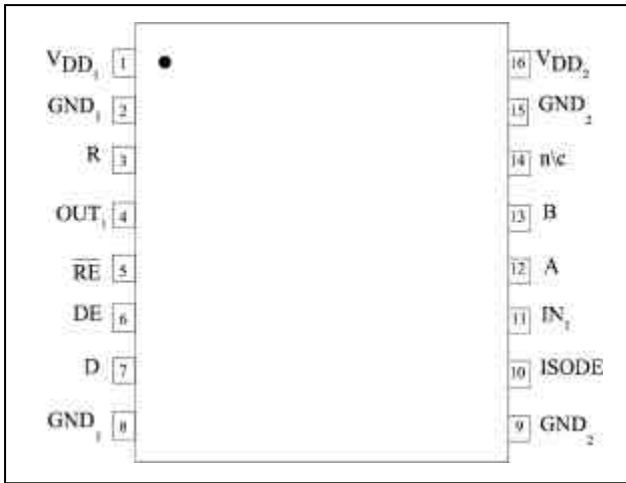


Dimensions in mm

### PROFIBUS Fault Interrogation



### Pin Configuration (IL485W)



### Pin Connections (IL485W)

1	V <sub>DD1</sub>	Input Power Supply
2	GND <sub>1</sub>	Input Power Supply Ground Return
3	R	Output Data from Bus
4	OUT <sub>1</sub>	Output from Auxiliary Isolation Channel
5	$\overline{RE}$	Read Data Enable (If RE is high, R = High Impedance)
6	DE	Drive Enable
7	D	Data Input to Bus
8	GND <sub>1</sub>	Input Power Supply Ground Return
9	GND <sub>2</sub>	Output Power Supply Ground Return
10	ISODE	Isolated DE Output for use in Profibus applications where the state of the drive enable node needs to be monitored
11	IN <sub>1</sub>	Input to the Auxiliary Isolation Channel
12	A	'A' Bus (Receive- True)
13	B	'B' Bus (Receive - Inverse)
14	n/c	No Internal Connection
15	GND <sub>2</sub>	Output Power Supply Return
16	V <sub>DD2</sub>	Output Power Supply

### Absolute Maximum Ratings

PARAMETERS	SYMBOL	MIN.	MAX.	UNITS
Storage Temperature	T <sub>S</sub>	-65	150	°C
Ambient Operating Temperature	T <sub>A</sub>	-40	85	°C
Voltage Range at A or B Bus Pins		-7	12	Volts
Supply Voltage <sup>(1)</sup>	V <sub>DD1</sub> , V <sub>DD2</sub>	-0.5	7	Volts
Digital Input Voltage		-0.5	5.5	Volts
Digital Output Voltage		-0.5	V <sub>DD</sub> +0.1	Volts
Continuous Total (25°C)			725	mWatts
Power Dissipation (85°C)			377	mWatts
Maximum Output Current	I <sub>O</sub>		95	mA
Lead Solder Temperature (10s)			260	°C
ESD	2kV Human Body Model			

### Insulation Specifications

PARAMETERS	CONDITION	MIN.	TYP.	MAX.	UNITS
Creepage Distance (External)		8.077			mm
Barrier Impedance		>10 <sup>14</sup>   7			Ω  pF
Leakage Current	240V <sub>RMS</sub> 60Hz		0.2		μAmps

### Recommended Operating Conditions

PARAMETERS	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage	V <sub>DD1</sub> , V <sub>DD2</sub>	4.5	5.5	Volts
Input Voltage at any bus terminal (separately or common mode)	V <sub>I</sub> V <sub>IC</sub>		12 -7	Volts
High-Level Digital Input Voltage	V <sub>IH</sub>	3		Volts
Low-Level Digital Input Voltage	V <sub>IL</sub>		0.8	Volts
Differential Input Voltage (2)	V <sub>ID</sub>		+12/ - 7	Volts
High-Level Output Current (Driver)	I <sub>OH</sub>		-60	mA
High-Level Digital Output Current (Receiver)	I <sub>OH</sub>		8	mA
Low-Level Output Current (Driver)	I <sub>OL</sub>		60	mA
Low-Level Digital Output Current (Receiver)	I <sub>OL</sub>		8	mA
Operating Free Air Temperature	T <sub>A</sub>	-40	85	°C
Digital Input Signal Rise and Fall Times	t <sub>IR</sub> , t <sub>IF</sub>		DC Stable	

### IEC61010-1

TUV Certificate Numbers: *Pending*

Classifications as Table 1

MODEL	POLLUTION DEGREE	MATERIAL GROUP	MAX WORKING VOLTAGE	PACKAGE TYPE 16-SOIC (7.5mm)
IL485W	II	III	300V <sub>RMS</sub>	✓

### UL 1577

Component Recognition Program. File # *Pending*  
Rated 2500V<sub>RMS</sub> for 1 min.

## Driver Section Specifications

All Specifications are  $T_{min}$  to  $T_{max}$  unless otherwise stated

PARAMETERS	SYMBOL	MIN.	TYP. (5)	MAX.	UNITS	TEST CONDITIONS
Input Clamp Voltage	$V_{IK}$			-1.5	V	$I_L = -18mA$
Output Voltage	$V_O$	0		6	V	$I_O = 0$
Differential Output Voltage	$ V_{OD1} $	1.5		6	V	$I_O = 0$
Differential Output Voltage (6)	$ V_{OD2} $	1.5	2.5	5	V	$R_L = 54\Omega$
Differential Output Voltage	$V_{OD3}$	1.5		5	V	$V_{test} = -7$ to 12V
Change in Magnitude of (7)						
Differential Output Voltage	$\Delta V_{OD} $			$\pm 0.2$	V	$R_L = 54$ or $100\Omega$
Common Mode Output Voltage	$V_{OC}$			3 -1	V	$R_L = 54$ or $100\Omega$
Change in Magnitude of (7)						
Common Mode Output Voltage	$\Delta V_{OC} $			$\pm 0.2$	V	$R_L = 54$ or $100\Omega$
Output Current (4)				1 -0.8	mA	Output Disabled $V_O = 12$ $V_O = -7$
High Level Input Current	$I_{IH}$			10	$\mu A$	$V_I = 3.5V$
Low Level Input Current	$I_{IL}$			-10	$\mu A$	$V_I = 0.4V$
Short-Circuit Output Current				-250 -150 250	mA	$V_O = -6$ $V_O = 0$ $V_O = 8$
Supply Current ( $V_{DD2} = +5V$ )	$I_{DD2}$		27	34	mA	No Load (Outputs Enabled)
Supply Current ( $V_{DD1} = +5V$ )	$I_{DD1}$		5	10	mA	
<b>Switching Characteristics</b>						
Maximum Data Rate		35			Mbd	$R_L = 54\Omega$ , $C_L = 50pF$
Differential Output Delay Time	$t_D$ (OD)		16	25	ns	$R_L = 54\Omega$ , $C_L = 50pF$
Pulse Skew (10)	$t_{SK}$ (P)		1	6	ns	$R_L = 54\Omega$ , $C_L = 50pF$
Differential Output Transition Time	$t_T$ (OD)		8	10	ns	$R_L = 54\Omega$ , $C_L = 50pF$
Output Enable Time to High Level	$t_{PZH}$		31	65	ns	$R_L = 54\Omega$ , $C_L = 50pF$
Output Enable Time to Low Level	$t_{PZL}$		22	35	ns	$R_L = 54\Omega$ , $C_L = 50pF$
Output Disable Time from High Level	$t_{PHZ}$		28	50	ns	$R_L = 54\Omega$ , $C_L = 50pF$
Output Disable Time from Low Level	$t_{PLZ}$		16	32	ns	$R_L = 54\Omega$ , $C_L = 50pF$
Skew Limit (3)	$t_{SK}$ (LIM)		2	8	ns	$R_L = 54\Omega$ , $C_L = 50pF$

## Notes

- All Voltage values are with respect to network ground except differential I/O bus voltages.
- Differential input/output voltage is measured at the noninverting terminal A/Y with respect to the inverting terminal B/Z.
- Skew limit is the maximum difference in any two channels in one device.
- The power-off measurement in ANSI Standard EIA/TIA-422-B applies to disabled outputs only and is not applied to combined inputs and outputs.
- All typical values are at  $V_{DD1}$ ,  $V_{DD2} = 5V$  and  $T_A = 25^\circ C$ .
- The minimum  $V_{OD2}$  with a  $100\Omega$  load is either  $\frac{1}{2}V_{OD1}$  or 2V, whichever is greater.
- $\Delta|V_{OD}|$  and  $\Delta|V_{OC}|$  are the changes in magnitude of  $V_{OD}$  and  $V_{OC}$ , respectively, that occur when the input is changed from one logic state to the other.
- This applies for both power on and power off, refer to ANSI standard RS-485 for exact condition. The EIA/TIA-422-B limit does not apply for a combined driver and receiver terminal.
- Includes 8 ns read enable time. Maximum propagation delay is 25 ns after read assertion.
- Pulse skew is defined as the  $|t_{PLH} - t_{PHL}|$  of each channel.

## Receiver Section Specifications

All Specifications are  $T_{min}$  to  $T_{max}$  unless otherwise stated

PARAMETERS	SYMBOL	MIN.	TYP. (5)	MAX.	UNITS	TEST CONDITIONS
Positive-going Input Threshold Voltage	$V_{IT+}$			0.2	V	$V_O = 2.7V, I_O = -0.4mA$
Negative-going Input Threshold Voltage	$V_{IT-}$	-0.2			V	$V_O = 0.5V, I_O = 8mA$
Hysteresis Voltage $V_{IT+} - V_{IT-}$	$V_{hys}$		60		mV	
High Level Digital Output Voltage	$V_{OH}$	$V_{DD} - 0.2$			V	$V_{ID} = 200mV, I_{OH} = -20\mu A$
Low Level Digital Output Voltage	$V_{OL}$			0.2	V	$V_{ID} = -200mV, I_{OL} = 20\mu A$
High-Impedance-State Output Current	$I_{OZ}$			$\pm 20$	$\mu A$	$V_O = 0.4$ to $(V_{DD2} - 0.5)$ V
Line Input Current (8)	$I_I$			1 -0.8	mA	Other Input - 0V $V_I = 12V$ $V_I = -7V$
Input Resistance	$r_I$		50		$k\Omega$	
Supply Current ( $V_{DD2} = +5$ )	$I_{DD2}$		27	34	mA	No Load (Outputs Enabled)
( $V_{DD1} = +5$ )	$I_{DD1}$		5	10	mA	
<b>Switching Characteristics</b>						
Maximum Data Rate		35			Mbd	$R_L = 54\Omega, C_L = 50pF$
Propagation Time (9)	$t_{PD}$		24	32	ns	$V_O = -1.5$ to $1.5V, C_L = 15pF$
Pulse Skew (10)	$t_{SK(P)}$		1	6	ns	$V_O = -1.5$ to $1.5V, C_L = 15pF$
Skew Limit (3)	$t_{SK(lim)}$		2	8	ns	$R_L = 54\Omega, C_L = 50pF$
Output Enable Time to High Level	$t_{PZH}$		17	24	ns	$C_L = 15pF$
Output Enable Time to Low Level	$t_{PZL}$		30	45	ns	$C_L = 15pF$
Output Disable Time from High Level	$t_{PHZ}$		30	45	ns	$C_L = 15pF$
Output Disable Time from Low Level	$t_{PLZ}$		18	27	ns	$C_L = 15pF$