# 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® 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.

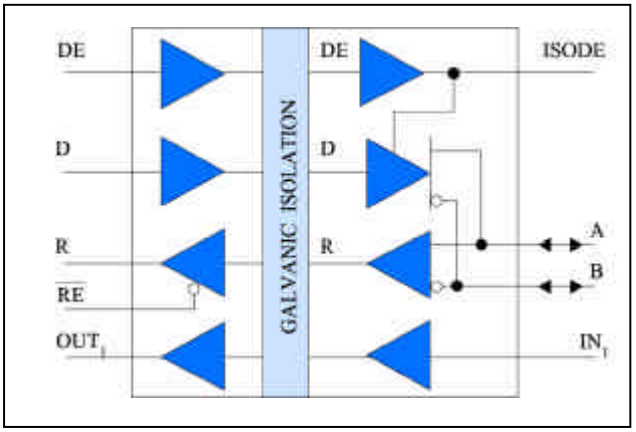
With a 1 nsec pulse skew and 16 nsec propagation delay, the IL485W is ideal for PROFIBUS applications. Use of DE/ISODE and IN1/OUT1 allows the IL485W to perform the handshaking operations of RTSAS and DTSAS of PROFIBUS.

- **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

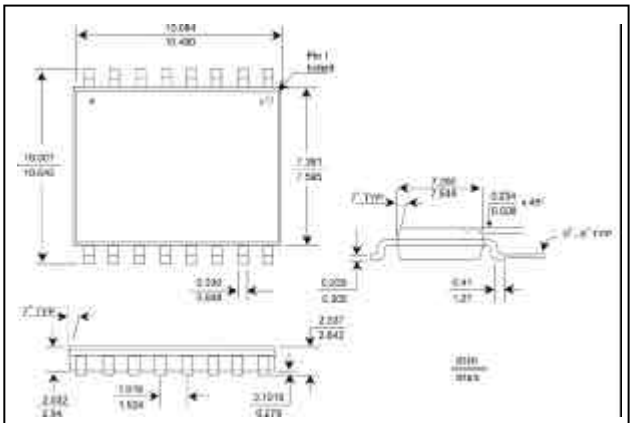
| $V_{ID}$ (A-B) | DE | $\overline{RE}$ | ISODE | R | D | MODE |
|---|---|---|---|---|---|---|
| ≥0.2V | L | L | L | H | X | Receive |
| ≤-0.2V | L | L | L | L | X | Receive |
| -7<$V_{ID}$<12 | X | H | X | Z | X | Receive/ Drive |
| ≥ 1.5 | H | L | H | H | H | Drive |
| ≤-1.5 | H | L | H | L | L | Drive |
| Open | L | L | L | H | X | Receive |

H = High Level

L = Low Level

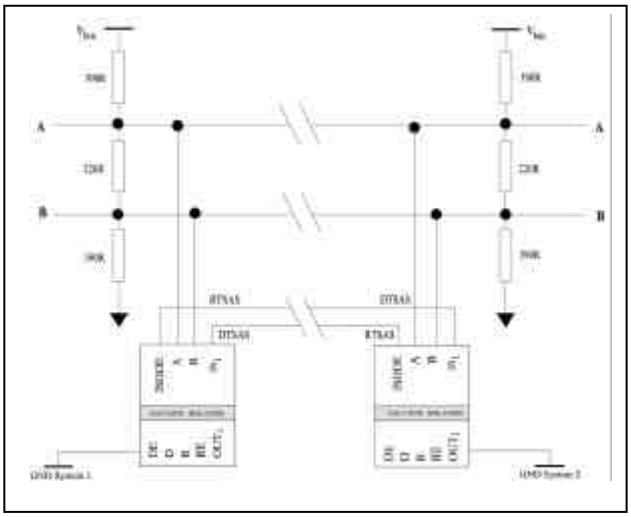
X = Irrelevant

Z = High Impedance



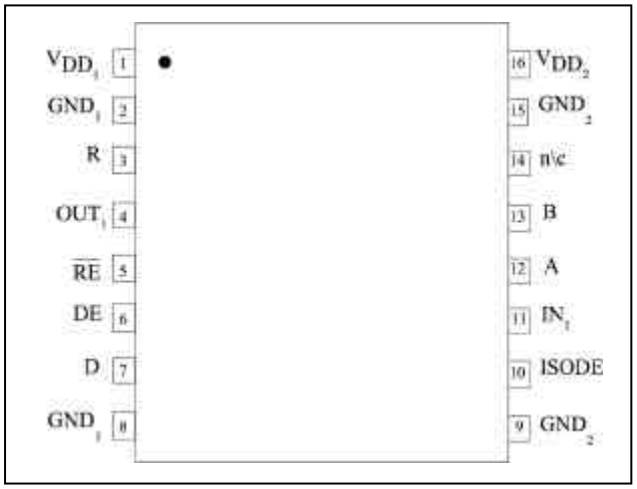
Dimensions in mm

### PROFIBUS Fault Interrogation




R h o p o i n t  C o m p o n e n t s  L t d
Tel: +44 (0) 870 608 1188  Fax: +44 (0) 870 241 2255
Germany: +49 (0) 692 199 8606  Fax: +49 (0) 692 199 8595
Email: sales@rhopointcomponents.com  Website: www.rhopointcomponents.com

## Pin Configuration (IL485W)




## Pin Connections (IL485W)

| | | |
|---|---|---|
| 1 | $V_{DD1}$ | Input Power Supply |
| 2 | $GND_1$ | Input Power Supply Ground Return |
| 3 | R | Output Data from Bus |
| 4 | $OUT_1$ | Output from Auxiliary Isolation Channel |
| 5 | $\overline{RE}$ | Read Data Enable (If $\overline{RE}$ is high, R = High Impedance) |
| 6 | DE | Drive Enable |
| 7 | D | Data Input to Bus |
| 8 | $GND_1$ | Input Power Supply Ground Return |
| 9 | $GND_2$ | 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 | $IN_1$ | 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 | $GND_2$ | Output Power Supply Return |
| 16 | $V_{DD2}$ | Output Power Supply |

## Absolute Maximum Ratings

| PARAMETERS | SYMBOL | MIN. | MAX. | UNITS |
|---|---|---|---|---|
| Storage Temperature | $T_S$ | -65 | 150 | °C |
| Ambient Operating Temperature | $T_A$ | -40 | 85 | °C |
| Voltage Range at A or B Bus Pins | | -7 | 12 | Volts |
| Supply Voltage(1) | $V_{DD1}$, $V_{DD2}$ | -0.5 | 7 | Volts |
| Digital Input Voltage | | -0.5 | 5.5 | Volts |
| Digital Output Voltage | | -0.5 | $V_{DD}$ +0.1 | Volts |
| Continuous Total Power Dissipation (25°C) | | | 725 | mWatts |
| Continuous Total Power Dissipation (85°C) | | | 377 | mWatts |
| Maximum Output Current | $I_O$ | | 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 | | $>10^{14}$\|\|7 | | Ω\|\|pF | |
| Leakage Current | 240$V_{RMS}$ 60Hz | | 0.2 | | µAmps |

## Recommended Operating Conditions

| PARAMETERS | SYMBOL | MIN. | MAX. | UNITS |
|---|---|---|---|---|
| Supply Voltage | $V_{DD1}$, $V_{DD2}$ | 4.5 | 5.5 | Volts |
| Input Voltage at any bus terminal (separately or common mode) | $V_I$ $V_{IC}$ | | 12 -7 | Volts |
| High-Level Digital Input Voltage | $V_{IH}$ | 3 | | Volts |
| Low-Level Digital Input Voltage | $V_{IL}$ | | 0.8 | Volts |
| Differential Input Voltage (2) | $V_{ID}$ | | +12/ - 7 | Volts |
| High-Level Output Current (Driver) | $I_{OH}$ | | -60 | mA |
| High-Level Digital Output Current (Receiver) | $I_{OH}$ | | 8 | mA |
| Low-Level Output Current (Driver) | $I_{OL}$ | | 60 | mA |
| Low-Level Digital Output Current (Receiver) | $I_{OL}$ | | 8 | mA |
| Operating Free Air Temperature | $T_A$ | -40 | 85 | °C |
| Digital Input Signal Rise and Fall Times | $t_{IR}$, $t_{IF}$ | 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 | 300$V_{RMS}$ | ✓ |

## UL 1577

Component Recognition Program. File # *Pending*
Rated 2500$V_{RMS}$ for 1 min.


Rhopoint Components Ltd
Tel: +44 (0) 870 608 1188 Fax: +44 (0) 870 241 2255
Germany: +49 (0) 692 199 8606 Fax: +49 (0) 692 199 8595
Email: sales@rhopointcomponents.com Website: www.rhopointcomponents.com

## 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 | $R_L$ = 54Ω |
| Differential Output Voltage | $V_{OD3}$ | 1.5 | | 5 | V | $V_{test}$ = -7 to 12V |
| Change in Magnitude of (7) Differential Output Voltage | $\Delta\|V_{OD}\|$ | | | ±0.2 | V | $R_L$ = 54 or 100Ω |
| Common Mode Output Voltage | $V_{OC}$ | | | 3<br>-1 | V | $R_L$ = 54 or 100Ω |
| Change in Magnitude of (7) Common Mode Output Voltage | $\Delta\|V_{OC}\|$ | | | ±0.2 | V | $R_L$ = 54 or 100Ω |
| Output Current (4) | $I_O$ | | | 1<br>-0.8 | mA<br>mA | Output Disabled $V_O$ = 12<br>$V_O$ = -7 |
| High Level Input Current | $I_{IH}$ | | | 10 | µA | $V_I$ = 3.5V |
| Low Level Input Current | $I_{IL}$ | | | -10 | µA | $V_I$ = 0.4V |
| Short-Circuit Output Current | $I_{OS}$ | | | -250<br>-150<br>250 | mA<br>mA<br>mA | $V_O$ = -6<br>$V_O$ = 0<br>$V_O$ = 8 |
| Supply Current ($V_{DD2}$ = +5V) | $I_{DD2}$ | | 27 | 34 | mA | No Load (Outputs Enabled) |
| ($V_{DD1}$ = +5V) | $I_{DD1}$ | | 5 | 10 | mA | |
| **Switching Characteristics** | | | | | | |
| Maximum Data Rate | | 35 | | | Mbd | $R_L$ = 54Ω, $C_L$ = 50pF |
| Differential Output Delay Time | $t_D$ (OD) | | 16 | 25 | ns | $R_L$ = 54Ω, $C_L$ = 50pF |
| Pulse Skew (10) | $t_{SK}$ (P) | | 1 | 6 | ns | $R_L$ = 54Ω, $C_L$ = 50pF |
| Differential Output Transition Time | $t_T$ (OD) | | 8 | 10 | ns | $R_L$ = 54Ω, $C_L$ = 50pF |
| Output Enable Time to High Level | $t_{PZH}$ | | 31 | 65 | ns | $R_L$ = 54Ω, $C_L$ = 50pF |
| Output Enable Time to Low Level | $t_{PZL}$ | | 22 | 35 | ns | $R_L$ = 54Ω, $C_L$ = 50pF |
| Output Disable Time from High Level | $t_{PHZ}$ | | 28 | 50 | ns | $R_L$ = 54Ω, $C_L$ = 50pF |
| Output Disable Time from Low Level | $t_{PLZ}$ | | 16 | 32 | ns | $R_L$ = 54Ω, $C_L$ = 50pF |
| Skew Limit (3) | $t_{SK}$ (LIM) | | 2 | 8 | ns | $R_L$ = 54Ω, $C_L$ = 50pF |

## Notes

1. All Voltage values are with respect to network ground except differential I/O bus voltages.
2. Differential input/output voltage is measured at the noninverting terminal A/Y with respect to the inverting terminal B/Z.
3. Skew limit is the maximum difference in any two channels in one device.
4. 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.
5. All typical values are at $V_{DD1}$, $V_{DD2}$ = 5V and $T_A$ = 25°C.
6. The minimum $V_{OD2}$ with a 100Ω load is either ½$V_{OD1}$ or 2V, whichever is greater.
7. $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ are the changes in magnitude of $V_{OD}$ and $V_{OC}$, respectively, that occur when the input is changed form one logic state to the other.
8. 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.
9. Includes 8 ns read enable time. Maximum propagation delay is 25 ns after read assertion.
10. 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, $I_{OH}$ = -20µA |
| Low Level Digital Output Voltage | $V_{OL}$ | | | 0.2 | V | $V_{ID}$ = -200mV, $I_{OL}$ = 20µA |
| High-Impedance-State Output Current | $I_{OZ}$ | | | ±20 | µA | $V_O$ = 0.4 to ($V_{DD2}$ -0.5) V |
| Line Input Current (8) | $I_I$ | | | 1 | mA | Other Input - 0V $V_I$ = 12V |
| | | | | -0.8 | | $V_I$ = -7V |
| Input Resistance | $r_I$ | | 50 | | kΩ | |
| Supply Current ($V_{DD2}$ = +5) | $I_{DD2}$ | | 27 | 34 | mA | No Load (Outputs Enabled) |
| ($V_{DD1}$ = +5) | $I_{DD1}$ | | 5 | 10 | mA | |
| **Switching Characteristics** | | | | | | |
| Maximum Data Rate | | 35 | | | Mbd | $R_L$ = 54Ω, $C_L$ = 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 | $R_L$ = 54Ω, $C_L$ = 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 |