

RS-232/485/422 Serial Transceiver with Internal Termination and Wide Output Swing

Description

The [XR34350](#) is an advanced multiprotocol transceiver supporting RS-232, RS-485, and RS-422 serial standards in a 40-pin QFN package. Integrated cable termination and four configuration modes allow all three protocols to be used interchangeably over a single cable or connector with no additional switching components. Full operation requires only four external charge pump capacitors.

The RS-485/RS-422 modes feature one driver and one receiver (1Tx/1Rx) in both half and full duplex configurations. The RS-232 mode (3Tx/5Rx) provides full support of all eight signals commonly used with the DB9 RS-232 connector. A dedicated diagnostic loopback mode is also provided.

The high speed drivers operate up to 20Mbps in RS-485/RS-422 modes, and up to 1Mbps in RS-232 mode. All drivers can be slew limited to 250kbps in any mode to minimize Electromagnetic Interference (EMI).

All transmitter outputs and receiver inputs feature robust Electrostatic Discharge (ESD) protection to $\pm 15\text{kV}$ IEC-61000-4-2 air gap, $\pm 8\text{kV}$ IEC-61000-4-2 contact, and $\pm 15\text{kV}$ Human Body Model (HBM). Each receiver output has full fail-safe protection to avoid system lockup, oscillation, or indeterminate states by defaulting to logic-high output level when the inputs are open, shorted, or terminated but undriven. No external biasing resistors are required.

The RS-232 receiver inputs include a $5\text{k}\Omega$ pull-down to ground. The RS-485/RS-422 receiver inputs are high impedance ($>96\text{k}\Omega$ when termination is disabled), allowing up to 256 devices on a single communication bus (1/8th unit load).

The XR34350 operates from a single power supply, either 3.3V or 5V, with low idle current (2mA typical in all modes). The shutdown mode consumes less than $10\mu\text{A}$ for low power standby operation.

Typical Application

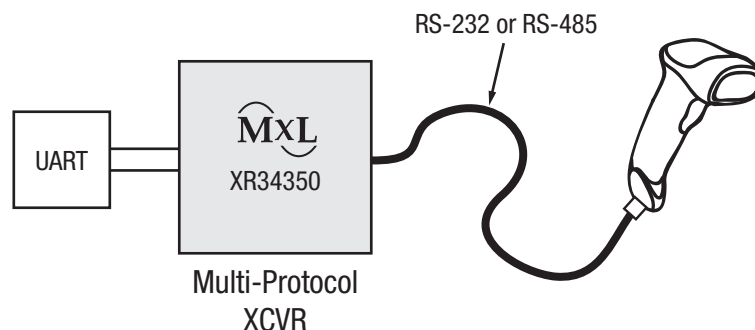


Figure 1: Typical Application

FEATURES

- Rx enabled during Tx short-circuit condition
- Pin selectable cable termination
- No external resistors required for RS-485/RS-422 termination and biasing
- 3.3V or 5V single supply operation
- Robust ESD protection on bus pins
 - $\pm 15\text{kV}$ IEC 61000-4-2 (air gap)
 - $\pm 8\text{kV}$ IEC 61000-4-2 (contact)
 - $\pm 15\text{kV}$ (HBM)
- Max data rate of 20Mbps in RS-485/RS-422 modes and up to 1Mbps in RS-232 modes
- Pin selectable 250kbps slew limiting
- 3 drivers, 5 receivers RS-232/V.28
- 1 driver, 1 receiver RS-485/RS-422
- High swing RS-232 driver outputs ($\pm 10.0\text{V}$ no load)
 - Full and half duplex configuration
 - 1/8th unit load, up to 256 receivers on bus
- RS-485/RS-422 enhanced failsafe for open, shorted, or terminated but idle inputs
- Space saving 40-pin 6mm x 6mm QFN package
- Pin compatible with SP339E and SP338E

APPLICATIONS

- Dual protocol serial ports (RS-232 or RS-485/RS-422)
- Industrial and process control equipment
- Point-of-sale equipment
- HVAC controls equipment
- Building security and automation equipment

Ordering Information - [Back Page](#)

Absolute Maximum Ratings

Stresses beyond the limits listed below may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

| | |
|---|------------------------------|
| Supply voltage V_{CC} | -0.3V to 6.0V |
| Receiver input voltage (from ground) | $\pm 18V$ |
| Driver output voltage (from ground)..... | $\pm 18V$ |
| Short-circuit duration, Tx out to ground | Continuous |
| Voltage at TTL input pins..... | -0.3V to ($V_{CC} + 0.5V$) |
| Storage temperature range | -65°C to 150°C |
| Lead temperature (soldering 10 seconds)..... | 300°C |
| Power dissipation 40-pin QFN (derate 17mW/°C above 70°C) | 500mW |

Operating Conditions

| | |
|-----------------------------------|-----------------|
| Supply voltage V_{CC} | 3.135V to 5.25V |
| Operating temperature range | -40° to 85°C |

ESD Ratings

| | |
|---|------------|
| Human Body Model (HBM), Tx and Rx pins..... | $\pm 15kV$ |
| Human Body Model (HBM), all other pins | $\pm 4kV$ |
| IEC 61000-4-2 (contact), Tx and Rx pins | $\pm 8kV$ |
| IEC 61000-4-2 (air gap), Tx and Rx pins..... | $\pm 15kV$ |

Electrical Characteristics

Unless otherwise noted: $V_{CC} = 3.3V \pm 5\%$ or $5.0V \pm 5\%$, $C1$ to $C4 = 0.1\mu F$; $T_A = T_{MIN}$ to T_{MAX} . Typical values are at $V_{CC} = 3.3V$, $T_A = 25^\circ C$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|--|---------------------------------------|--|----------------|-----------|------------|------------|
| DC Characteristics | | | | | | |
| I_{CC} | Supply current, RS-232 | No load, idle inputs | | 2 | 8 | mA |
| | Supply current, RS-485 | No load, idle inputs | | 2 | 8 | mA |
| | V_{CC} shutdown current | Enable = 0V | | 1 | 10 | μA |
| Transmitter and Logic Input Pins: Pins 3, 4, 6, 11, 12, 14, 15, 17 to 19 | | | | | | |
| V_{IH} | Logic input voltage High | $V_{CC} = 3.3V$ | 2.0 | | | V |
| | | $V_{CC} = 5.0V$ | 2.4 | | | V |
| V_{IL} | Logic input voltage Low | | | | 0.8 | V |
| I_{IL} | Logic input leakage current low | Input low, $V_{IN} = 0V$ | | | 1 | μA |
| I_{IH} | Logic input leakage current high | Input high, $V_{IN} = V_{CC}$, pins 3, 4 and 6 | | | 1 | μA |
| I_{PD} | Logic input pull-down current | Input high $V_{IN} = V_{CC}$, pins 11, 12, 14, 15, 17 to 19 | | | 50 | μA |
| V_{HYS} | Logic input hysteresis | | | 200 | | mV |
| Receiver Outputs: Pins 1, 2, 5, 7, 8 | | | | | | |
| V_{OH} | Receiver output voltage high | $I_{OUT} = -1.5mA$ | $V_{CC} - 0.6$ | | | V |
| V_{OL} | Receiver output voltage low | $I_{OUT} = 2.5mA$ | | | 0.4 | V |
| I_{OSS} | Receiver output short-circuit current | $0 \leq V_O \leq V_{CC}$ | | ± 20 | ± 60 | mA |
| I_{OZ} | Receiver output leakage current | $0 \leq V_O \leq V_{CC}$, receivers disabled | | ± 0.1 | ± 1 | μA |
| Single-Ended Receiver Inputs, RS-232 | | | | | | |
| V_{IN} | Input voltage range | | -15 | | 15 | V |
| V_{IL} | Input threshold low | $V_{CC} = 3.3V$ | 0.6 | 1.2 | | V |
| | | $V_{CC} = 5.0V$ | 0.8 | 1.5 | | V |
| V_{IH} | Input threshold high | $V_{CC} = 3.3V$ | | 1.5 | 2.0 | V |
| | | $V_{CC} = 5.0V$ | | 1.8 | 2.4 | V |
| V_{HYS} | Input hysteresis | | | 0.3 | | V |
| R_{IN} | Input resistance | $-15V \leq V_{IN} \leq 15V$ | 3 | 5 | 7 | k Ω |
| Single-Ended Driver Outputs, RS-232 | | | | | | |
| V_O | Output voltage | $V_{CC} = 5.0V$, output loaded 3k Ω to GND | | ± 8.6 | | V |
| | | $V_{CC} = 5.0V$, unloaded output | | | ± 10.0 | V |
| | | $V_{CC} = 3.3V$, output loaded 3k Ω to GND | ± 5.0 | ± 5.5 | | V |
| | | $V_{CC} = 3.3V$, unloaded output | | | ± 7.0 | V |
| I_{SC} | Short-circuit current | $V_O = 0V$ | | | ± 60 | mA |
| R_{OFF} | Power off impedance | $V_{CC} = 0V$, $V_O = \pm 2V$ | 300 | 10M | | Ω |

Electrical Characteristics (Continued)

Unless otherwise noted: $V_{CC} = 3.3V \pm 5\%$ or $5.0V \pm 5\%$, $C1$ to $C4 = 0.1\mu F$; $T_A = T_{MIN}$ to T_{MAX} . Typical values are at $V_{CC} = 3.3V$, $T_A = 25^\circ C$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|--|---|------|------|----------|------------|
| Differential Receiver Inputs, RS-485/RS-422 | | | | | | |
| R_{IN} | Receiver input resistance | $TERM = 0V, -7V \leq V_{IN} \leq 12V$ | 96 | | | k Ω |
| V_{TH} | Receiver differential threshold voltage | | -200 | -125 | -50 | mV |
| ΔV_{TH} | Receiver input hysteresis | $V_{CM} = 0V$ | | 25 | | mV |
| I_{IN} | Receiver input current | $V_{IN} = 12V$ | | | 125 | μA |
| | | $V_{IN} = -7V$ | | | -100 | μA |
| R_{TERM} | Termination resistance | $TERM = V_{CC}$, Figure 6 , $-7V \leq V_{CM} \leq 12V$ | 100 | 120 | 155 | Ω |
| | | $TERM = V_{CC}$, Figure 6 , $V_{CM} = 0V$ | 100 | 120 | 140 | Ω |
| Differential Driver Outputs, RS-485/RS-422 | | | | | | |
| V_{OD} | Differential driver output | $R_L = 100\Omega$, RS-422, Figure 7 | 2 | | V_{CC} | V |
| | | $R_L = 54\Omega$, RS-485, Figure 7 | 1.5 | | V_{CC} | V |
| | | $-7V \leq V_{CM} \leq 12V$, Figure 8 | 1.5 | | V_{CC} | V |
| | | No load | | | V_{CC} | V |
| ΔV_{OD} | Change in magnitude of differential output voltage | | -0.2 | | 0.2 | V |
| V_{CM} | Driver common mode output voltage | $R_L = 54\Omega$ or 100Ω , Figure 7 | | | 3 | V |
| ΔV_{CM} | Change in magnitude of common mode output voltage | | | | 0.2 | V |
| I_{OSD} | Driver output short-circuit current | $-7V \leq V_O \leq 12V$, Figure 9 | -250 | | 250 | mA |
| I_O | Driver output leakage current | $DIR1 = 0V$ in Mode 11, or $Enable = 0V$, $V_O = 12V$, $V_{CC} = 0V$ or $5.25V$ | | | 100 | μA |
| | | $DIR1 = 0V$ in Mode 11, or $Enable = 0V$, $V_O = -7V$, $V_{CC} = 0V$ or $5.25V$ | -100 | | | μA |

Timing Characteristics

Unless otherwise noted: $V_{CC} = 3.3V \pm 5\%$ or $5.0V \pm 5\%$, C_1 to $C_4 = 0.1\mu F$; $T_A = T_{MIN}$ to T_{MAX} . Typical values are at $V_{CC} = 3.3V$, $T_A = 25^\circ C$.

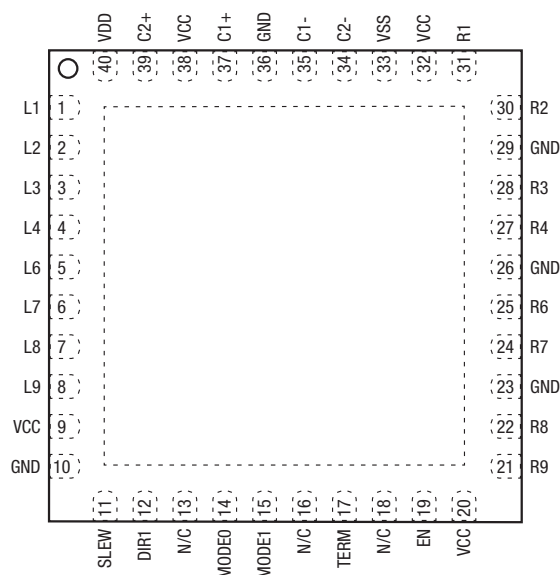
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|-----|------|-----|------------|
| All Modes | | | | | | |
| t_{ENABLE} | Enable from shutdown | | | 1000 | | ns |
| $t_{SHUTDOWN}$ | Enable to shutdown | | | 1000 | | ns |
| RS-232, Data Rate = 250kbps, SLEW = V_{CC}, One Transmitter Switching | | | | | | |
| | Maximum data rate | $R_L = 3k\Omega$, $C_L = 1000pF$ | 250 | | | kbps |
| t_{RHL} , t_{RLH} | Receiver propagation delay | $C_L = 150pF$, Figure 10 | | 100 | | ns |
| $ t_{RHL} - t_{RLH} $ | Receiver propagation delay skew | | | | 100 | ns |
| t_{DHL} , t_{DLH} | Driver propagation delay | $R_L = 3k\Omega$, $C_L = 2500pF$, Figure 11 | | 1400 | | ns |
| $ t_{DHL} - t_{DLH} $ | Driver propagation delay skew | | | | 600 | ns |
| t_{SHL} , t_{SLH} | Transition region slew rate from 3.0V to -3.0V or -3.0V to 3.0V | $V_{CC} = 3.3V$, $R_L = 3k\Omega$ to $7k\Omega$, $C_L = 150pF$ to $2500pF$, Figure 11 | 4 | | 30 | V/ μs |
| | | $V_{CC} = 3.3V$, $R_L = 3k\Omega$ to $7k\Omega$, $C_L = 150pF$ to $2500pF$, $T_A = 25^\circ C$, Figure 11 | 6 | | 30 | V/ μs |
| RS-232, Data Rate = 1Mbps, SLEW = 0V, One Transmitter Switching | | | | | | |
| | Maximum data rate | $R_L = 3k\Omega$, $C_L = 250pF$ | 1 | | | Mbps |
| t_{RHL} , t_{RLH} | Receiver propagation delay | $C_L = 150pF$, Figure 10 | | 100 | | ns |
| $ t_{RHL} - t_{RLH} $ | Receiver propagation delay skew | | | | 100 | ns |
| t_{DHL} , t_{DLH} | Driver propagation delay | $R_L = 3k\Omega$, $C_L = 1000pF$, Figure 11 | | 300 | | ns |
| $ t_{DHL} - t_{DLH} $ | Driver propagation delay skew | | | | 150 | ns |
| t_{SHL} , t_{SLH} | Transition region slew rate from 3.0V to -3.0V or -3.0V to 3.0V | $V_{CC} = 3.3V$, $R_L = 3k\Omega$ to $7k\Omega$, $C_L = 150pF$ to $1000pF$, Figure 11 | 15 | | 150 | V/ μs |
| | | $V_{CC} = 3.3V$, $R_L = 3k\Omega$ to $7k\Omega$, $C_L = 150pF$ to $1000pF$, $T_A = 25^\circ C$, Figure 11 | 24 | | 150 | V/ μs |

Timing Characteristics (Continued)

Unless otherwise noted: $V_{CC} = 3.3V \pm 5\%$ or $5.0V \pm 5\%$, C_1 to $C_4 = 0.1\mu F$; $T_A = T_{MIN}$ to T_{MAX} . Typical values are at $V_{CC} = 3.3V$, $T_A = 25^\circ C$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---------------------------------|--|-----|-----|------|-------|
| RS-485/RS-422, Data Rate = 250kbps, SLEW = V_{CC} , One Transmitter Switching | | | | | | |
| | Maximum data rate | $R_L = 54\Omega$, $C_L = 50pF$ | 250 | | | kbps |
| t_{RPHL} , t_{RPLH} | Receiver propagation delay | $C_L = 15pF$, Figure 12 | | 50 | 150 | ns |
| $ t_{RPHL} - t_{RPLH} $ | Receiver propagation delay skew | | | | 20 | ns |
| t_{DPHL} , t_{DPLH} | Driver propagation delay | $R_L = 54\Omega$, $C_L = 50pF$, Figure 13 | | 500 | 1000 | ns |
| $ t_{DPHL} - t_{DPLH} $ | Driver propagation delay skew | | | | 100 | ns |
| t_{DR} , t_{DF} | Driver rise and fall time | | 300 | 650 | 1200 | ns |
| t_{RZH} , t_{RZL} | Receiver output enable Time | $C_L = 15pF$, Figure 14 | | | 200 | ns |
| t_{RHZ} , t_{RLZ} | Receiver output disable time | | | | 200 | ns |
| t_{DZH} , t_{DZL} | Driver output enable time | $R_L = 500\Omega$, $C_L = 50pF$, Figure 15 | | | 1000 | ns |
| t_{DHZ} , t_{DLZ} | Driver output disable time | | | | 200 | ns |
| RS-485/RS-422, Data Rate = 20Mbps, SLEW = 0V, One Transmitter Switching | | | | | | |
| | Maximum data rate | $R_L = 54\Omega$, $C_L = 50pF$ | 20 | | | Mbps |
| t_{RPHL} , t_{RPLH} | Receiver propagation delay | $C_L = 15pF$, Figure 12 | | 50 | 150 | ns |
| $ t_{RPHL} - t_{RPLH} $ | Receiver propagation delay skew | | | | 10 | ns |
| t_{DPHL} , t_{DPLH} | Driver propagation delay | $R_L = 54\Omega$, $C_L = 50pF$, Figure 13 | | 30 | 100 | ns |
| $ t_{DPHL} - t_{DPLH} $ | Driver propagation delay skew | | | | 10 | ns |
| t_{DR} , t_{DF} | Driver rise and fall time | | | 10 | 20 | ns |
| t_{RZH} , t_{RZL} | Receiver output enable Time | $C_L = 15pF$, Figure 14 | | | 200 | ns |
| t_{RHZ} , t_{RLZ} | Receiver output disable time | | | | 200 | ns |
| t_{DZH} , t_{DZL} | Driver output enable time | $R_L = 500\Omega$, $C_L = 50pF$, Figure 15 | | | 200 | ns |
| t_{DHZ} , t_{DLZ} | Driver output disable time | | | | 200 | ns |

Pin Configuration, Top View



Pin Functions

| Pin Number | Pin Name | Descriptions by Mode (MODE1, MODE0) | | | |
|------------|----------|--|-------------------|--|-------------------|
| | | Mode 00, Figure 2 | Mode 01, Figure 3 | Mode 10, Figure 4 | Mode 11, Figure 5 |
| 1 | L1 | R1 output | | 1 | 1 |
| 2 | L2 | R2 output | | R1 output | R1 output |
| 3 | L3 | T1 input | | T1 input | T1 input |
| 4 | L4 | T2 input | | | |
| 5 | L6 | R3 output | | 1 | 1 |
| 6 | L7 | T3 input | | | |
| 7 | L8 | R4 output | | 1 | 1 |
| 8 | L9 | R5 output | | 1 | 1 |
| 9 | VCC | V _{CC} | | | |
| 10 | GND | Ground | | | |
| 11 | SLEW | SLEW = V _{CC} enables 250kbps slew limiting | | | |
| 12 | DIR1 | | | T1 enable, R1 disable | T1 enable |
| 13 | N/C | This pin is not used and is not connected internally | | | |
| 14 | MODE0 | 0 | 1 | 0 | 1 |
| 15 | MODE1 | 0 | 0 | 1 | 1 |
| 16 | N/C | This pin is not used and is not connected internally | | | |
| 17 | TERM | | | Enables RS-485/RS-422 receiver termination | |
| 18 | N/C | This pin is not used and is not connected internally | | | |
| 19 | EN | Enable = V _{CC} for operation, Enable = 0V for shutdown | | | |
| 20 | VCC | V _{CC} | | | |

Pin Functions (Continued)

| Pin Number | Pin Name | Descriptions by Mode (MODE1, MODE0) | | | |
|------------|----------|---|-------------------|-------------------------|-------------------|
| | | Mode 00, Figure 2 | Mode 01, Figure 3 | Mode 10, Figure 4 | Mode 11, Figure 5 |
| 21 | R9 | | R5 input | | |
| 22 | R8 | | R4 input | | |
| 23 | GND | Ground | | | |
| 24 | R7 | | T3 output | | |
| 25 | R6 | | R3 input | | |
| 26 | GND | Ground | | | |
| 27 | R4 | | T2 output | | R1 input B |
| 28 | R3 | | T1 output | | R2 input A |
| 29 | GND | Ground | | | |
| 30 | R2 | | R2 input | R1 input A, T1 output A | T1 output A |
| 31 | R1 | | R1 input | R1 input B, T1 output B | T1 output B |
| 32 | VCC | Supply voltage, 1.0 μ F to ground recommended for supply decoupling | | | |
| 33 | VSS | Charge pump negative supply (V-), 0.1 μ F from ground | | | |
| 34 | C2- | Charge pump cap 2 negative lead | | | |
| 35 | C1- | Charge pump cap 1 negative lead | | | |
| 36 | GND | Ground | | | |
| 37 | C1+ | Charge pump cap 1 positive lead, 0.1 μ F | | | |
| 38 | VCC | V_{CC} | | | |
| 39 | C2+ | Charge pump cap 2 positive lead, 0.1 μ F | | | |
| 40 | VDD | Charge pump positive supply (V+), 0.1 μ F to ground | | | |

Suggested DB9 Connector Pinout

| DB9 Pin | RS-232 | RS-485/RS-422 Full Duplex | RS-485 Half Duplex |
|---------|--------|------------------------------|-----------------------|
| 1 | DCD | TX- | Data- |
| 2 | RXD | TX+ | Data+ |
| 3 | TXD | RX+ | |
| 4 | DTR | RX- | |
| 5 | Ground | | |
| 6 | DSR | | |
| 7 | RTS | | |
| 8 | CTS | | |
| 9 | RI | | |

Functional Block Diagrams by Mode (MODE1, MODE0)

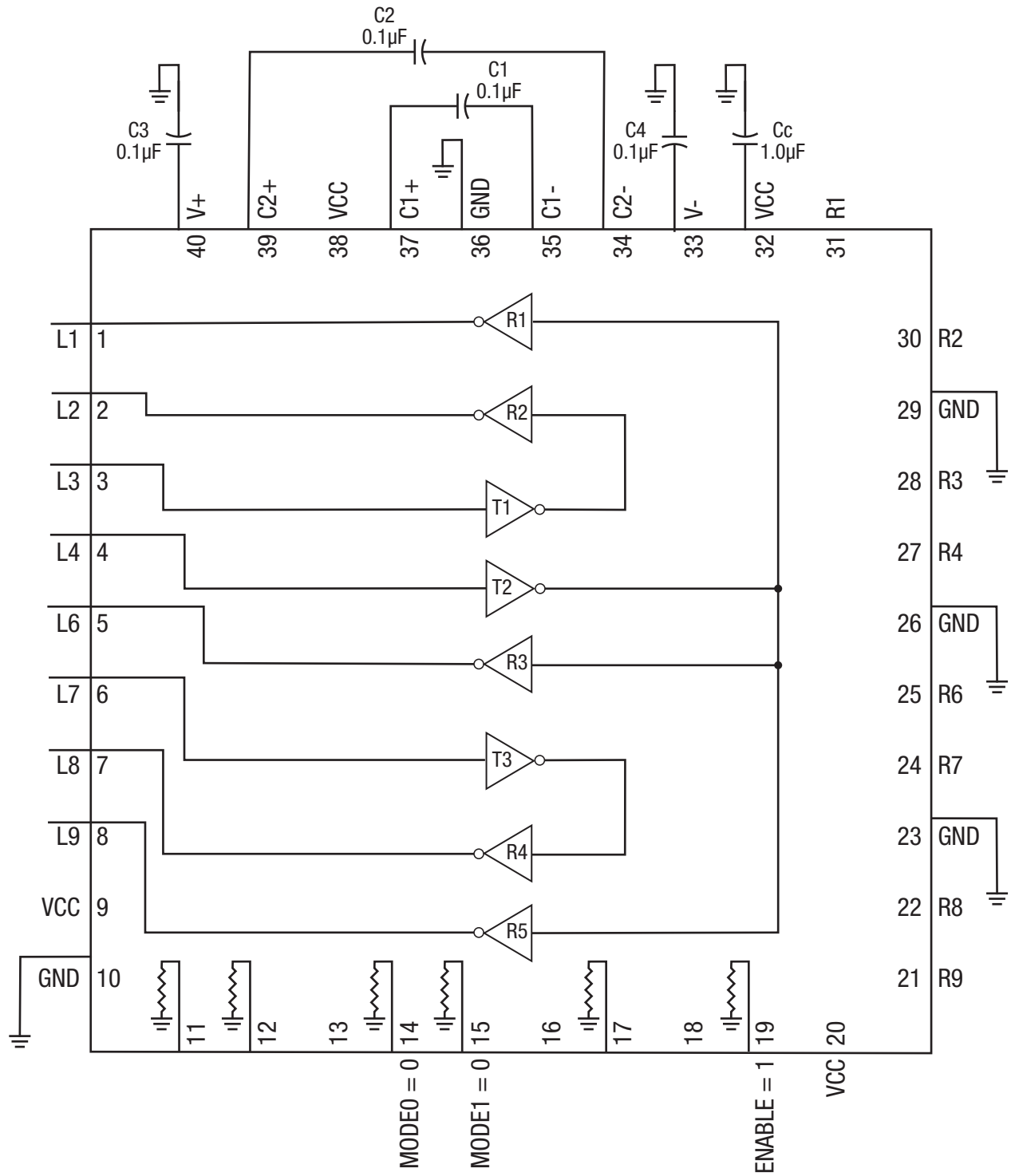


Figure 2: Functional Block Diagram - Mode 00, Loopback

Functional Block Diagrams by Mode (MODE1, MODE0) (Continued)

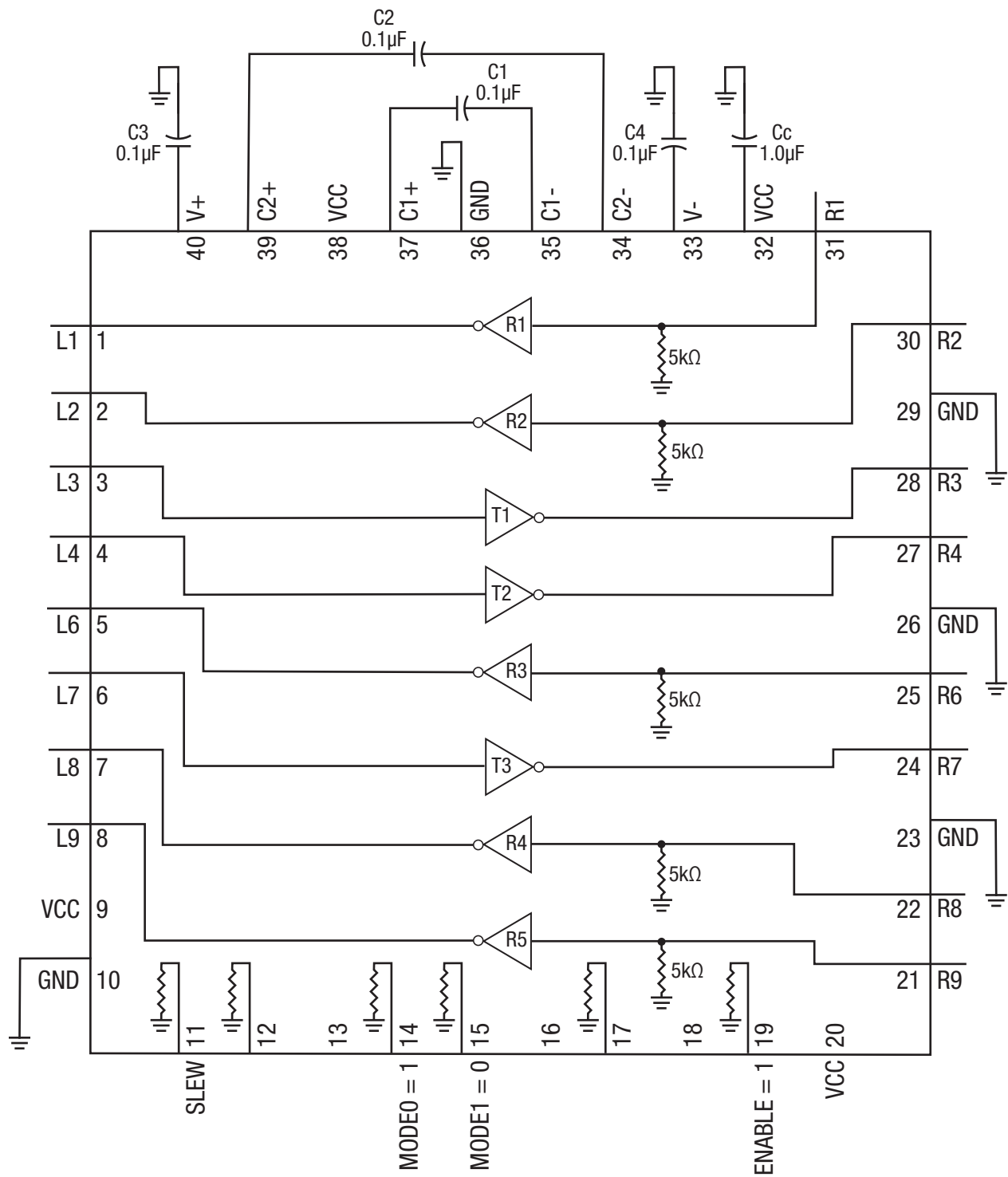


Figure 3: Functional Block Diagram - Mode 01, RS-232

Functional Block Diagrams by Mode (MODE1, MODE0) (Continued)

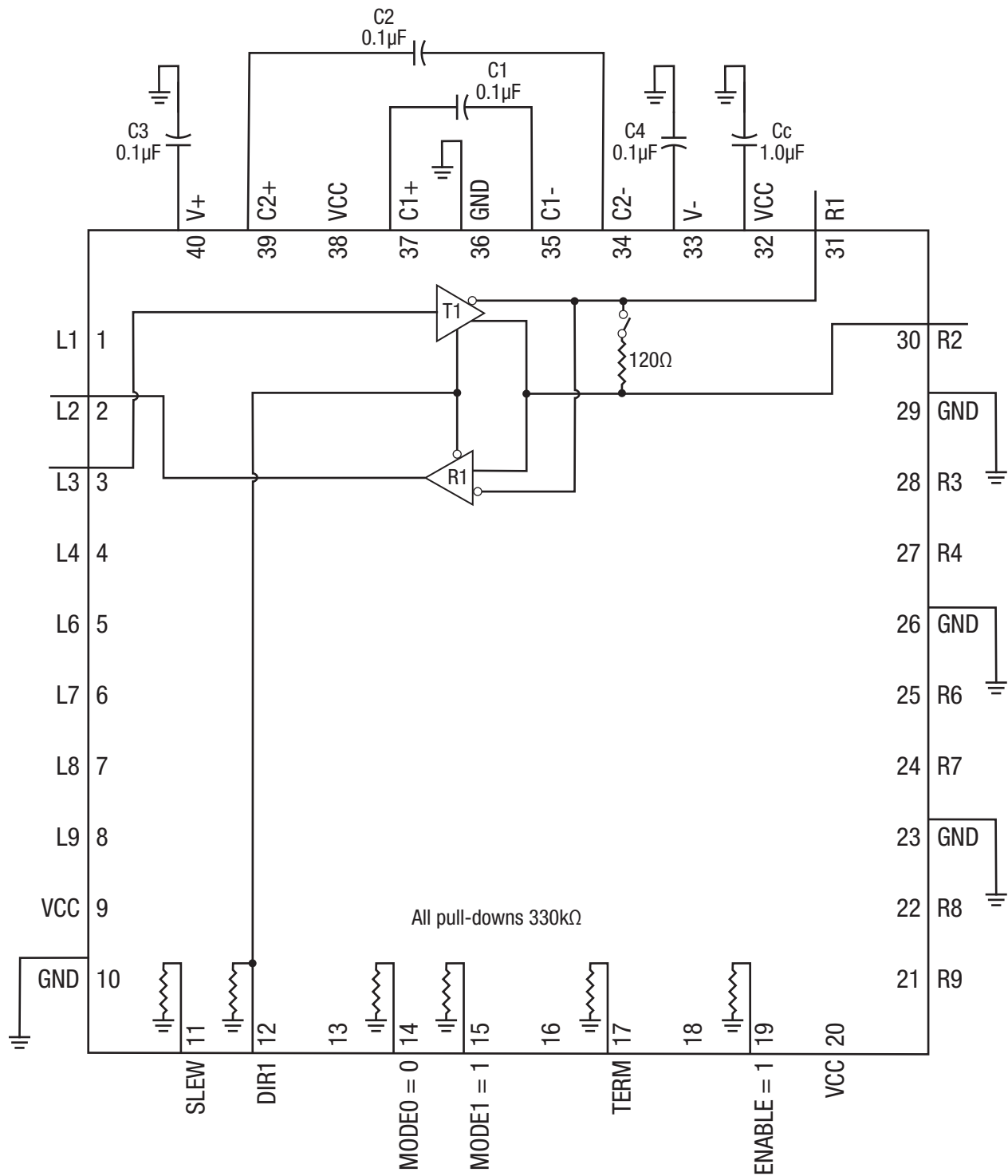


Figure 4: Functional Block Diagram - Mode 10, RS-485 Half Duplex

Functional Block Diagrams by Mode (MODE1, MODE0) (Continued)

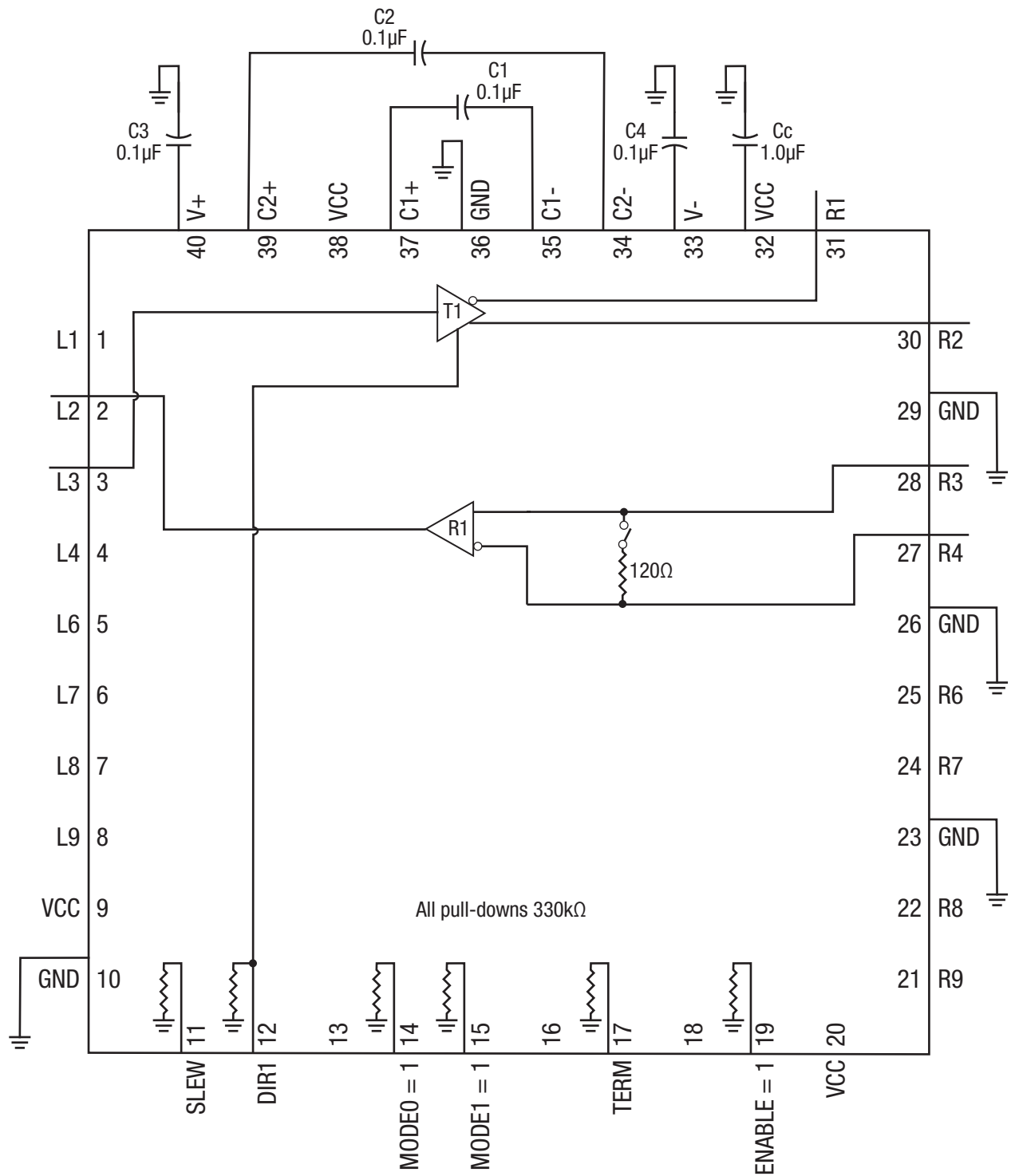
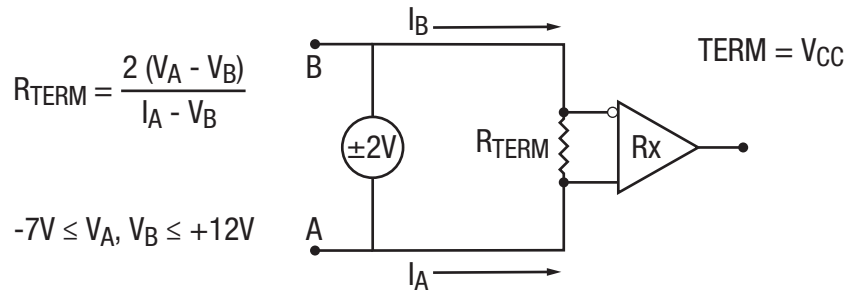


Figure 5: Functional Block Diagram - Mode 11, RS-485/RS-422 Full Duplex

Test Circuits



Termination is enabled in RS-485/RS-422 modes when the TERM pin is held high (V_{CC}).

Figure 6: RS-485/RS-422 Receiver Termination Resistance

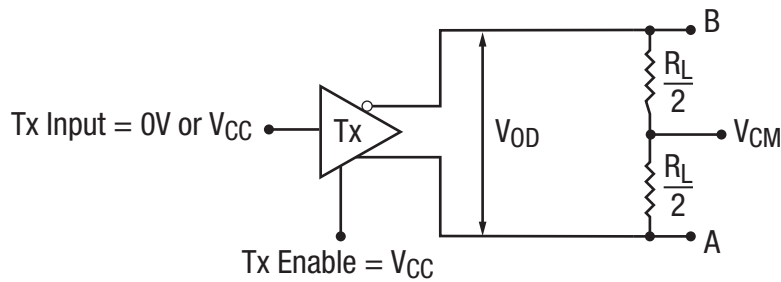


Figure 7: RS-485/RS-422 Differential Driver Output Voltage

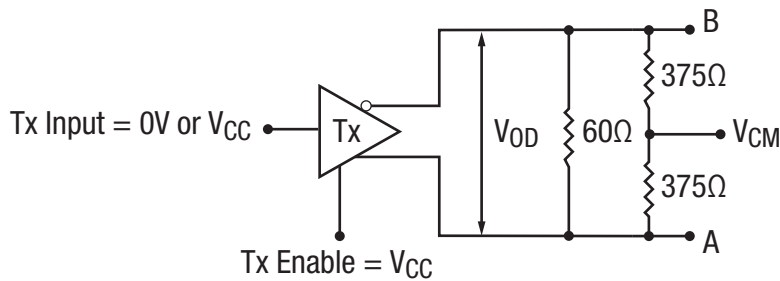


Figure 8: RS-485/RS-422 Differential Driver Output Voltage Over Common Mode

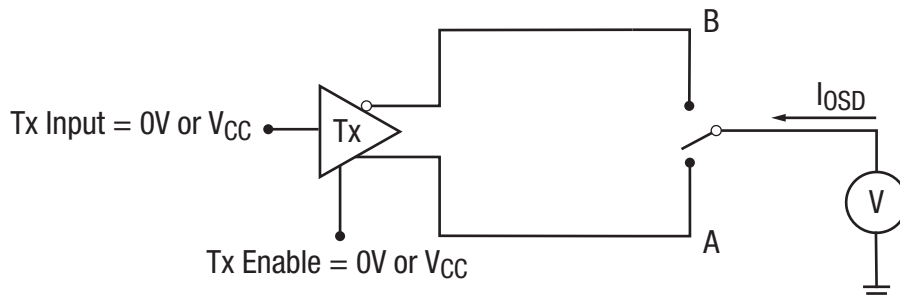


Figure 9: RS-485/RS-422 Driver Output Short-circuit Current

Test Circuits (Continued)

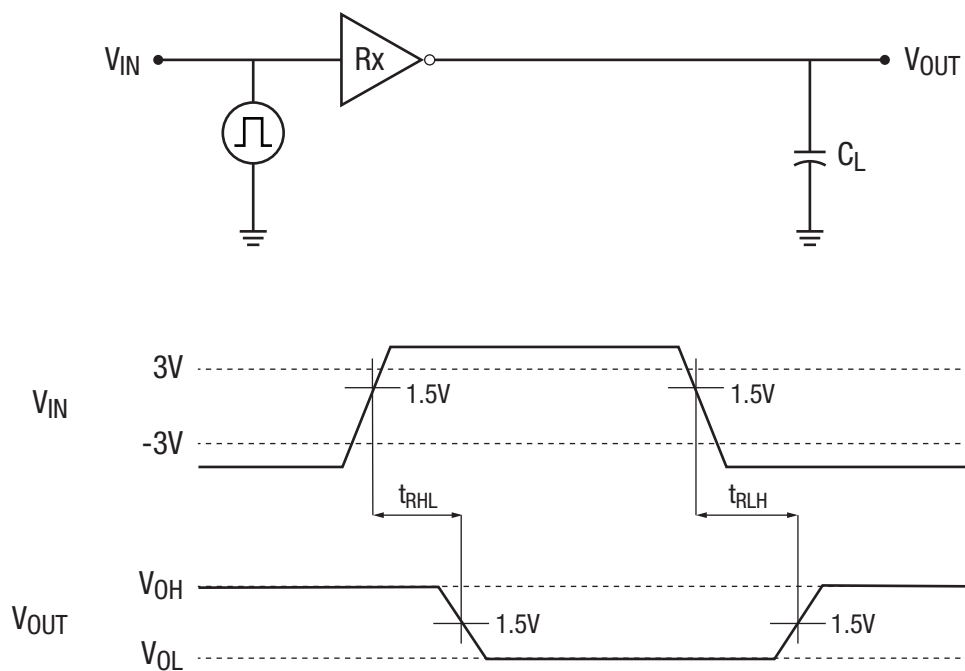


Figure 10: RS-232 Receiver Propagation Delay

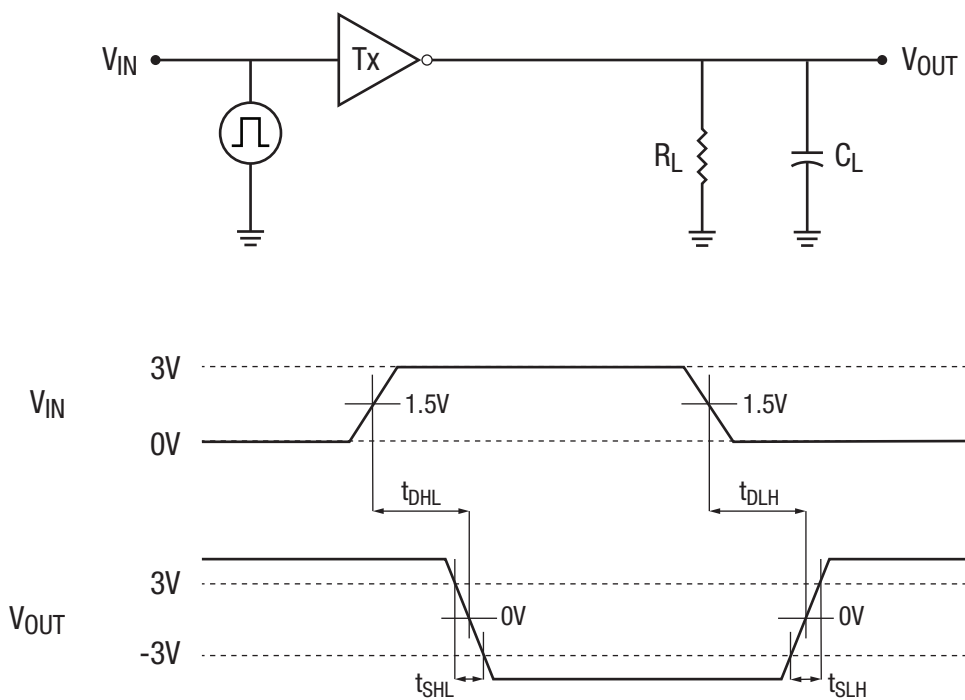


Figure 11: RS-232 Driver Propagation Delay

Test Circuits (Continued)

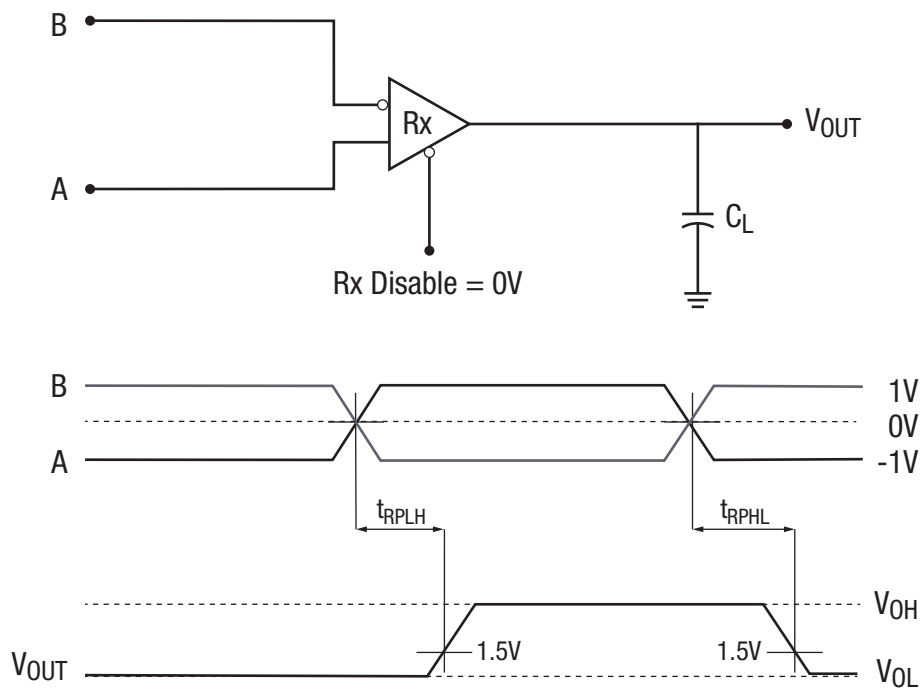


Figure 12: RS-485/RS-422 Receiver Propagation Delay

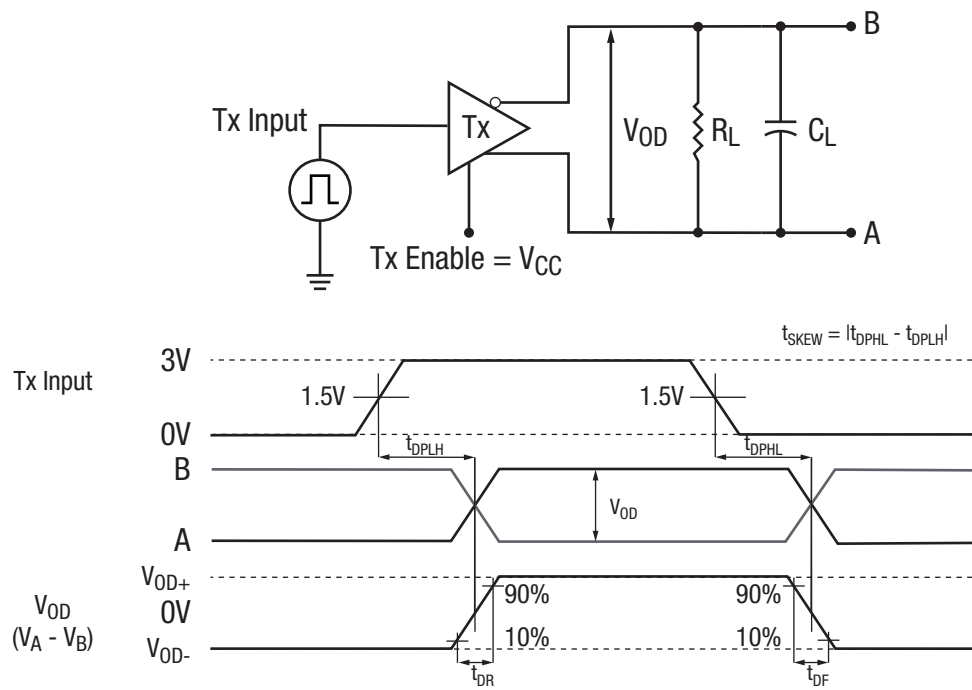


Figure 13: RS-485/RS-422 Driver Propagation Delay and Rise/Fall Times

Test Circuits (Continued)

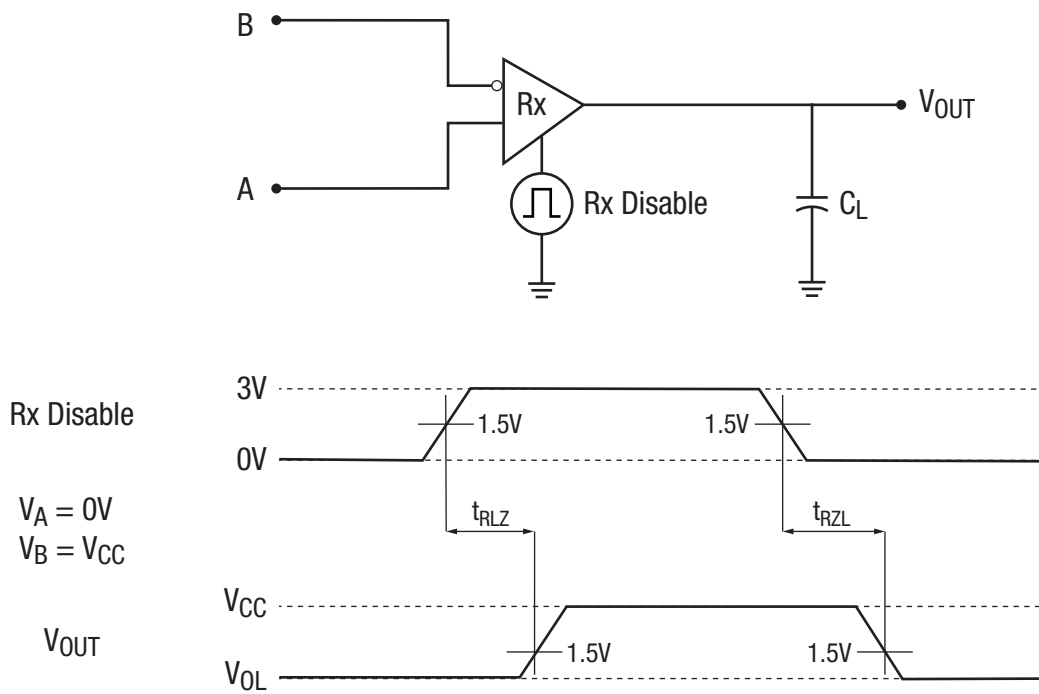


Figure 14: RS-485/RS-422 Receiver Output Enable/Disable Times

Test Circuits (Continued)

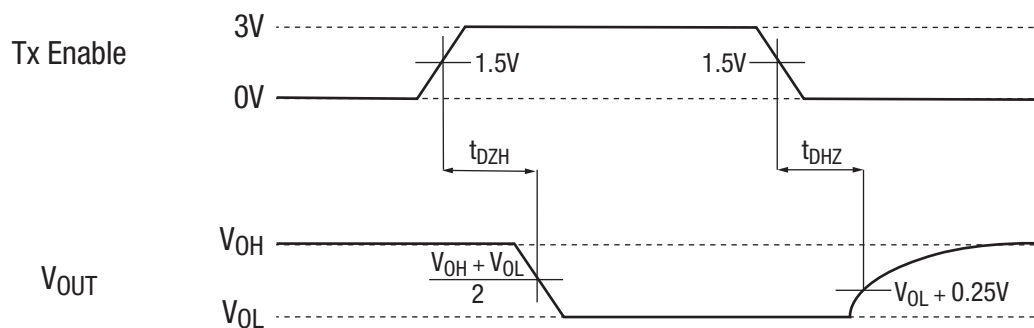
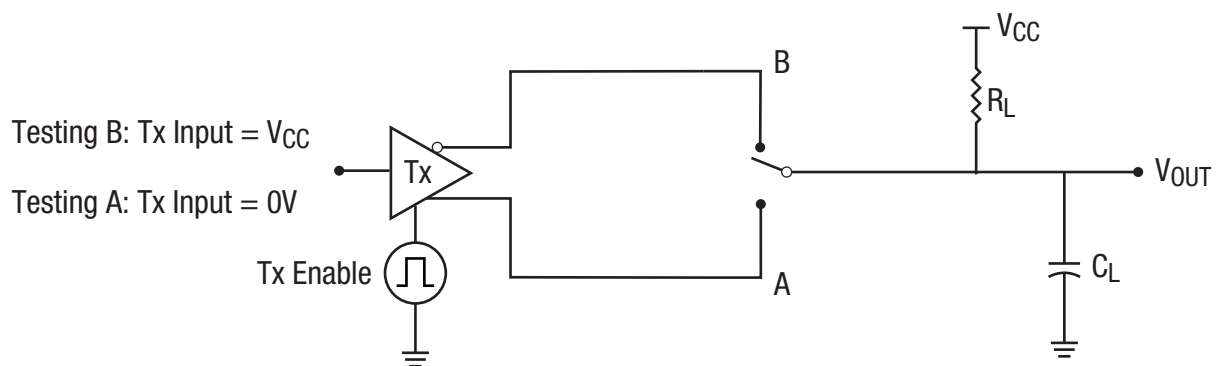
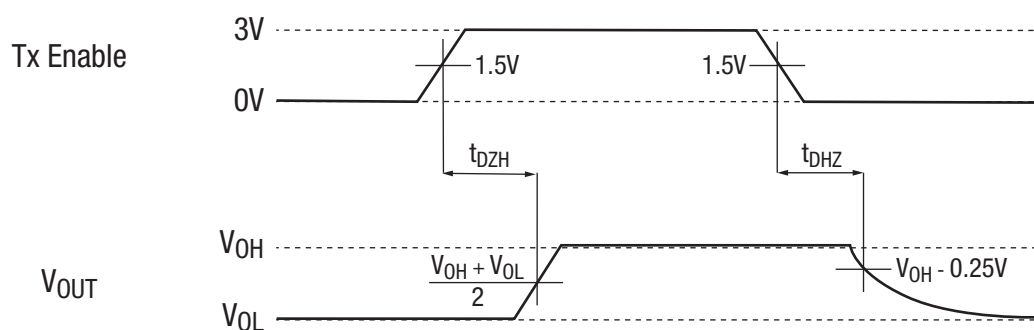
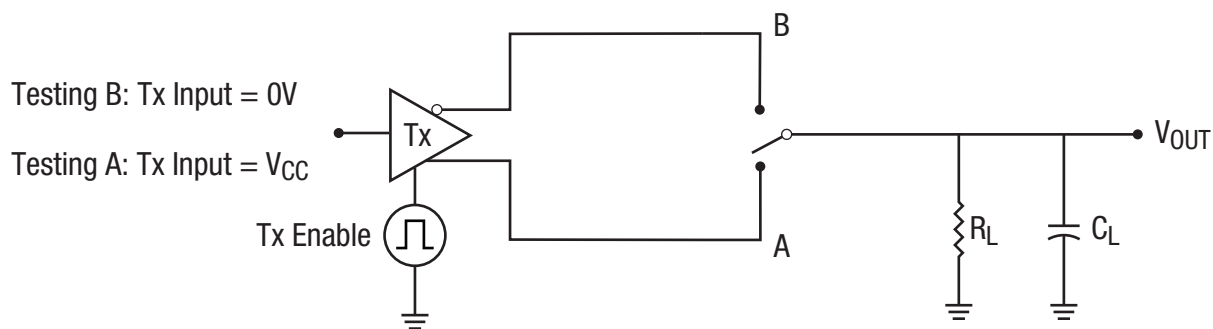


Figure 15: RS-485/RS-422 Driver Output Enable/Disable Times

Applications Information

Product Summary

The XR34350 is an advanced multiprotocol transceiver supporting RS-232, RS-485, and RS-422 serial standards in a 40-pin QFN package. Integrated cable termination and four configuration modes allow all three protocols to be used interchangeably over a single cable or connector with no additional switching components. The RS-485/RS-422 modes feature one driver and one receiver (1TX/1RX) in both half and full duplex configurations. The RS-232 mode (3TX/5RX) provides full support of all eight signals commonly used with the DB9 RS-232 connector. A dedicated mode is also available for diagnostic loopback testing.

Internally Switched Cable Termination

Enabling and disabling the RS-485/RS-422 termination resistor is one of the largest challenges system designers face when sharing a single connector or pair of lines across multiple serial protocols. A termination resistor may be necessary for accurate RS-485/RS-422 communication, but must be removed when the lines are used for RS-232. XR34350 provides an elegant solution to this problem by integrating the termination resistor and switching control, and allowing it to be switched in and out of the circuit with a single pin. No external switching components are required.

Enhanced Failsafe

Ordinary RS-485 differential receivers will be in an indeterminate state whenever the data bus is not being actively driven. The enhanced failsafe feature of the XR34350 guarantees a logic-high receiver output when the receiver inputs are open, shorted, or terminated but idle/undriven. The enhanced failsafe interprets 0V differential as a logic high with a minimum 50mV noise margin, while maintaining compliance with the EIA/TIA-485 standard of $\pm 200\text{mV}$. No external biasing resistors are required, further easing the usage of multiple protocols over a single connector.

$\pm 15\text{kV}$ ESD Protection

ESD protection structures are incorporated on all pins to protect against electrostatic discharges encountered during handling and assembly. The bus pins (driver outputs and receiver inputs) have extra protection structures, which have been tested up to $\pm 15\text{kV}$ without damage. These structures withstand high ESD in all states: normal operation, shutdown and powered down.

ESD protection is tested in various ways. MaxLinear uses the following methods to qualify the protection structures designed into XR34350:

- $\pm 15\text{kV}$ using the Human Body Model (HBM)
- $\pm 8\text{kV}$ using IEC 61000-4-2 Contact Discharge
- $\pm 15\text{kV}$ using IEC 61000-4-2 Air Gap Discharge

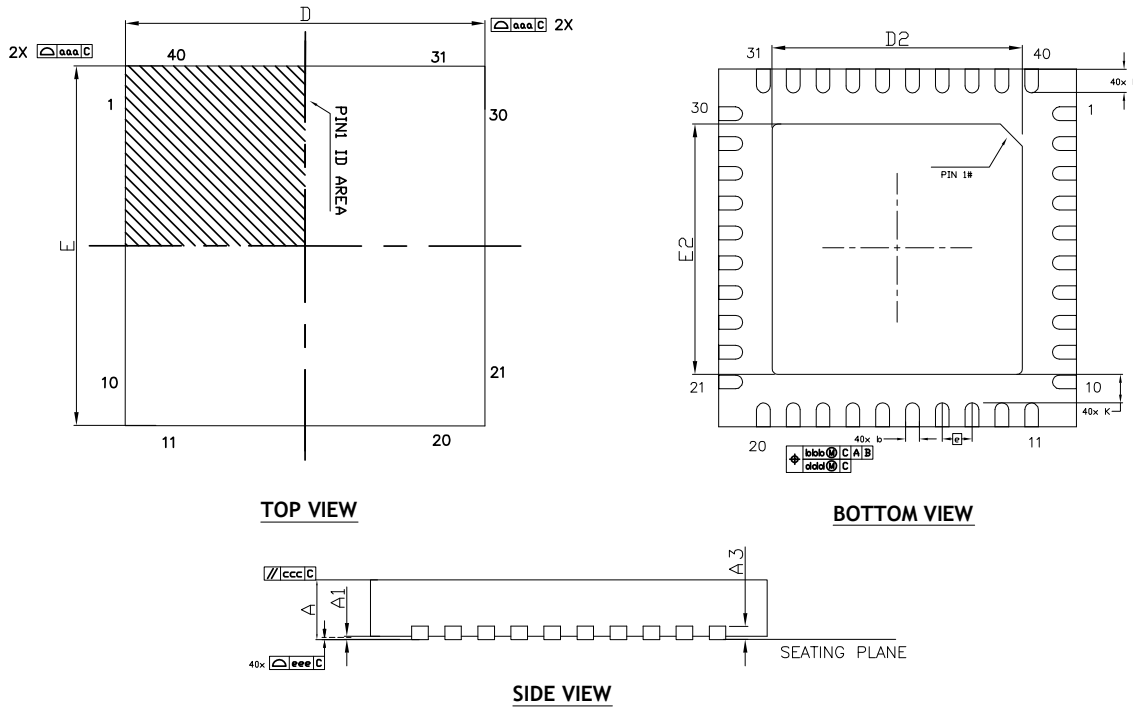
The IEC 61000-4-2 standard is more rigorous than HBM, resulting in lower voltage levels compared with HBM for the same level of ESD protection. Because IEC 61000-4-2 specifies a lower series resistance, the peak current is higher than HBM. The XR34350 has passed both HBM and IEC 61000-4-2 testing without damage.

Diagnostic Loopback Mode

The XR34350 includes a diagnostic digital loop back mode for system testing as shown in [Figure 2](#). The loopback mode connects the TTL driver inputs to the TTL receiver outputs, bypassing the analog driver and receiver circuitry. The analog/bus pins are internally disconnected in this mode.

Mechanical Dimensions

QFN-40



| DIMENSION TABLE | | | | |
|-----------------|----------|---------|------|------|
| SYMBOL | MIN | NOM | MAX | NOTE |
| A | 0.80 | 0.90 | 1.00 | |
| A1 | 0.00 | 0.02 | 0.05 | |
| A3 | --- | 0.20Ref | --- | |
| b | 0.20 | 0.25 | 0.30 | |
| D | 6.00 BSC | | | |
| E | 6.00 BSC | | | |
| e | 0.50 BSC | | | |
| D2 | 4.50 | 4.65 | 4.80 | |
| E2 | 4.50 | 4.65 | 4.80 | |
| L | 0.35 | 0.40 | 0.45 | |
| K | 0.20 | — | — | |
| aaa | | 0.15 | | |
| bbb | | 0.10 | | |
| ccc | | 0.10 | | |
| ddd | | 0.05 | | |
| eee | | 0.08 | | |
| N | | 40 | | |

TERMINAL DETAILS

- ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES.
- DIMENSIONS AND TOLERANCE PER JEDEC MO-220.

Drawing No.: POD-0000041

Revision: B.2

Order Information⁽¹⁾

| Part Number | Operating Temperature Range | Lead-Free | Package | Packaging Method |
|--------------|-----------------------------|--------------------|------------|------------------|
| XR34350IL | -40°C to 85°C | Yes ⁽²⁾ | 40-pin QFN | Tray |
| XR34350ILTR | | | | Tape and Reel |
| XR34350ILEVB | XR34350 Evaluation Board | | | |

NOTE:

1. Refer to www.exar.com/XR34350 for most up-to-date Ordering Information.
2. Visit www.exar.com for additional information on Environmental Rating.

Revision History

| Revision | Date | Description |
|----------|------------|--|
| 1A | March 2016 | Initial Release |
| 1B | June 2016 | Updated datasheet format |
| 1C | March 2018 | Corrected 120Ω resistor values in Figures 4 and 5; corrected Figure 5 T1 trace. Updated to MaxLinear logo. Updated format and ordering information, added EVB. |



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