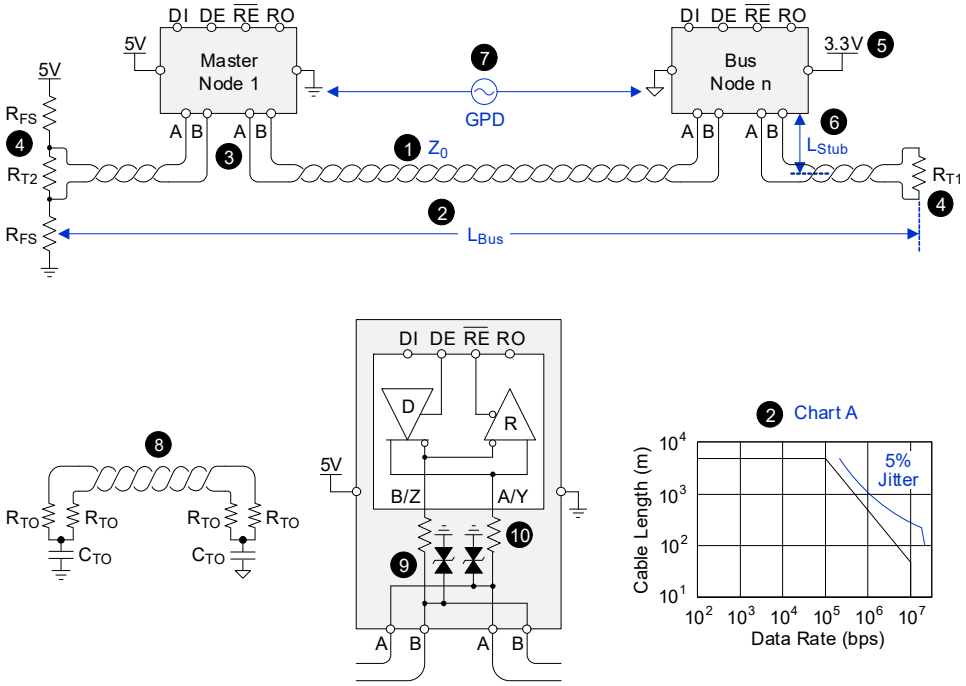
RS-485 Design Tips

This tutorial provides recommendations for quickly starting the design process with compatible RS-485 devices.



Ten Best Design Tips

Note: Each tip is referenced in the diagram by number.

1. Use the twisted-pair cable with the following: Z_0 = 120Ω or 100Ω
2. Determine maximum cable length, L_{Bus}, with Chart A.
3. Connect the bus nodes with the Daisy-chain.
4. Terminate one cable end with the following: $R_{T1} = Z_0$
   Apply the failsafe biasing to the other end with the following:

$$R_{FS} = \left(\frac{V_{CC-min}}{V_{AB-idle}} + 1\right) \cdot k$$

   k = 27.8Ω for Z_0 = 120Ω
   k = 23.4Ω for Z_0 = 100Ω
   Terminate this end with the following:

$$R_{FS} = \frac{R_{FS} \cdot Z_0}{R_{FS} - Z_0}$$

5. You can operate 3V and 5V transceivers on the same bus.
6. Make the stub length no longer than the following:

$$L_{Stub} < 3 \cdot 10^{-4} \cdot t_r \cdot v$$

   L_{Stub} = stub length (m)
   t_r = driver rise time (ns)
   v = signal velocity in cable (%)
7. For GPD = ±7, use ISL315xE or RAA78815x
   For GPD > ±15V, use ISL324xx
   For higher GPDs, use ISL31xxE + optocouplers
8. Terminate unused conductors with the following:
   $R_{TO} = Z_0/2$ and C_{TO} = 1µF
9. For ESD, EFT, and Surge protection:
   Use SM712 or read AN1976, AN1977, AN1978, and AN1979.
10. Limit transient current into the transceiver with the following:
    20Ω carbon-composite or MELF resistors

Revision History

Revision	Date	Description
1.00	Nov 8, 2023	Initial release.

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