

RS-485: 14 Quick-Steps to a Reliable Network Design

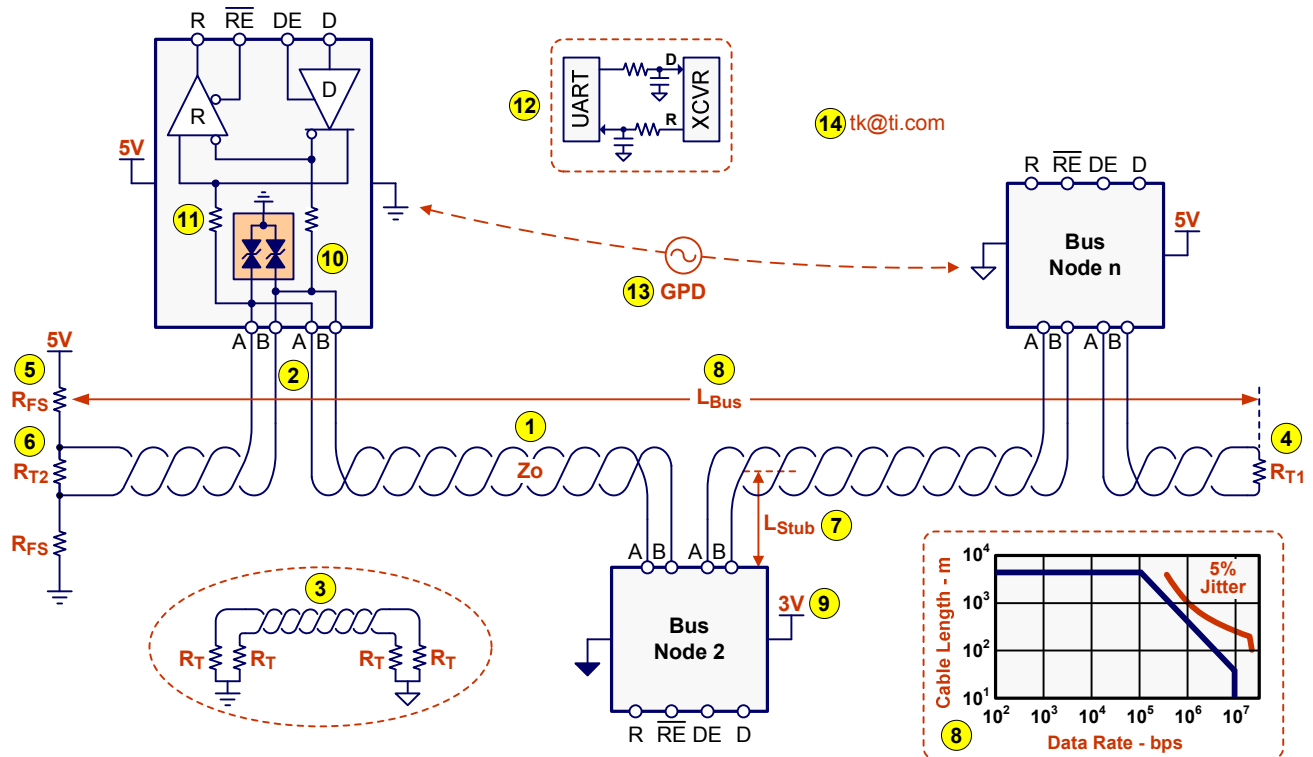


Figure 1-1. Major important parameters for an RS-485 data-link design

- 1 Use twisted pair cable with
 $Z_0 = 120\Omega$ or 100Ω
- 2 Connect bus nodes via
Daisy-chain
- 3 Terminate unused conductors with
 $R_T = Z_0$ to their local grounds
- 4 Terminate one cable end with
 $R_{T1} = Z_0$
- 5 Apply failsafe biasing to the other end
$$R_{FS} = \left(\frac{V_{CC-min}}{V_{AB-Idle}} + 1 \right) \cdot k$$

 $k = 27.8\Omega$ for $Z_0 = 120\Omega$
 $k = 23.4\Omega$ for $Z_0 = 100\Omega$
- 6 Terminate this end with
$$R_{T2} = \frac{2R_{FS} \cdot Z_0}{2R_{FS} - Z_0}$$
- 7 Determine maximum Cable-Length
with chart bottom right
- 8 Make stub length no longer than
$$L_{Stub} < 3 \cdot 10^{-4} \cdot tr \cdot v$$

 L_{Stub} = stub length (m)
 tr = driver rise time (ns)
 v = signal velocity (%)
- 9 You can operate 3V and 5V devices
on the same bus
- 10 For ESD, EFT, and surge protection
use SM712
- 11 Limit clamping current into the transceiver
with 10 Ω pulse-proof or MELF resistors
- 12 Filter signal noise between transceiver and
UART with R-C low-pass filters ($f_c \geq 5 \times DR$)
- 13 For $\pm 7V$ GPDs use standard transceivers
For $\pm 20V$ GPDs use SN65HVD17xx
For higher GPDs use isolated transceivers
- 14 Pose further questions to tk@ti.com