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

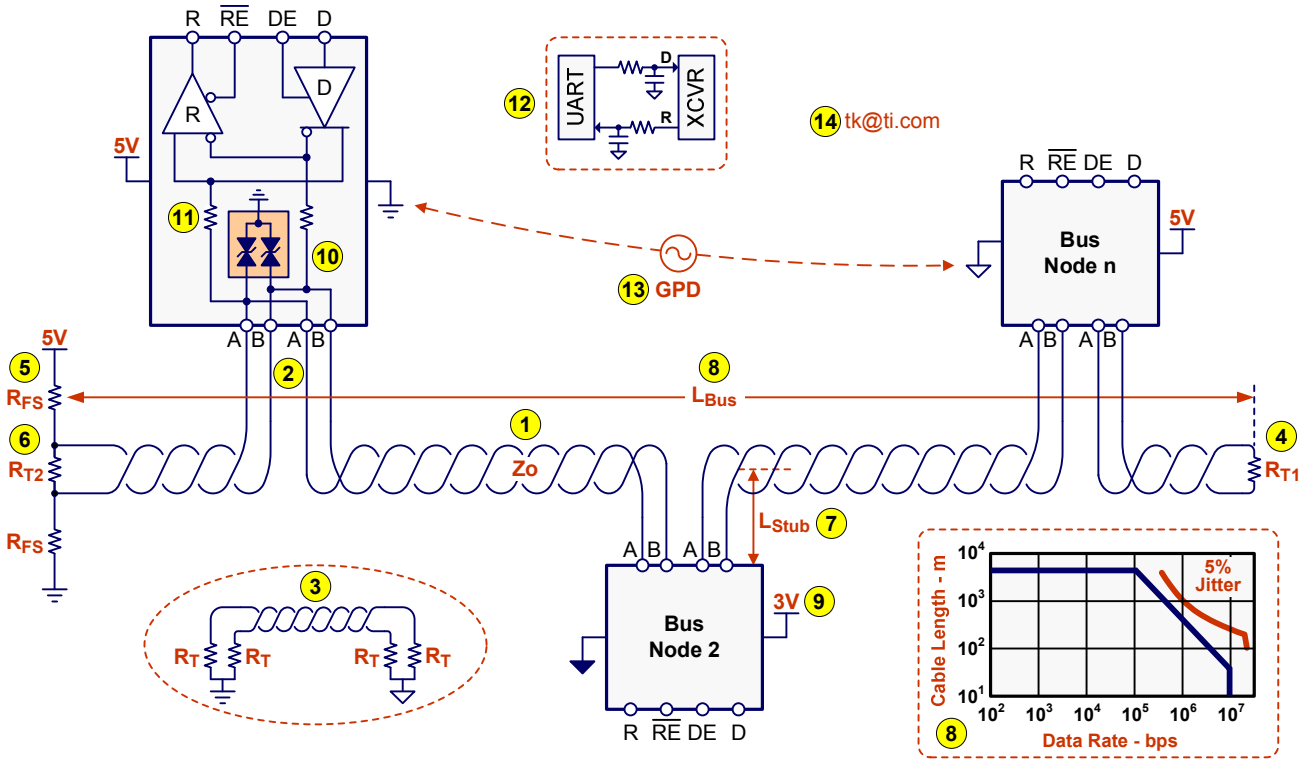

Figure 1-1. Major important parameters for an RS-485 data-link design

(1) Use twisted pair cable with
Zo = 120Ω or 100Ω

(2) Connect bus nodes via
Daisy-chain

(3) Terminate unused conductors with
$R_T = Z_0$

(4) Terminate one cable end with
$R_{T1} = Z_0$

(5) Apply failsafe biasing to the other end

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

k = 27.8Ω for Zo = 120Ω
k = 23.4Ω for Zo = 100Ω

(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 1R-C low-pass filters (fc ≥ 5 x DR)

(13) For ± 7V GPDs use standard transceivers
For ± 20V GPDs use SN65HVD17xx
For higher GPDs use isolated transceivers

(14) Pose further questions to tk@ti.com

TK