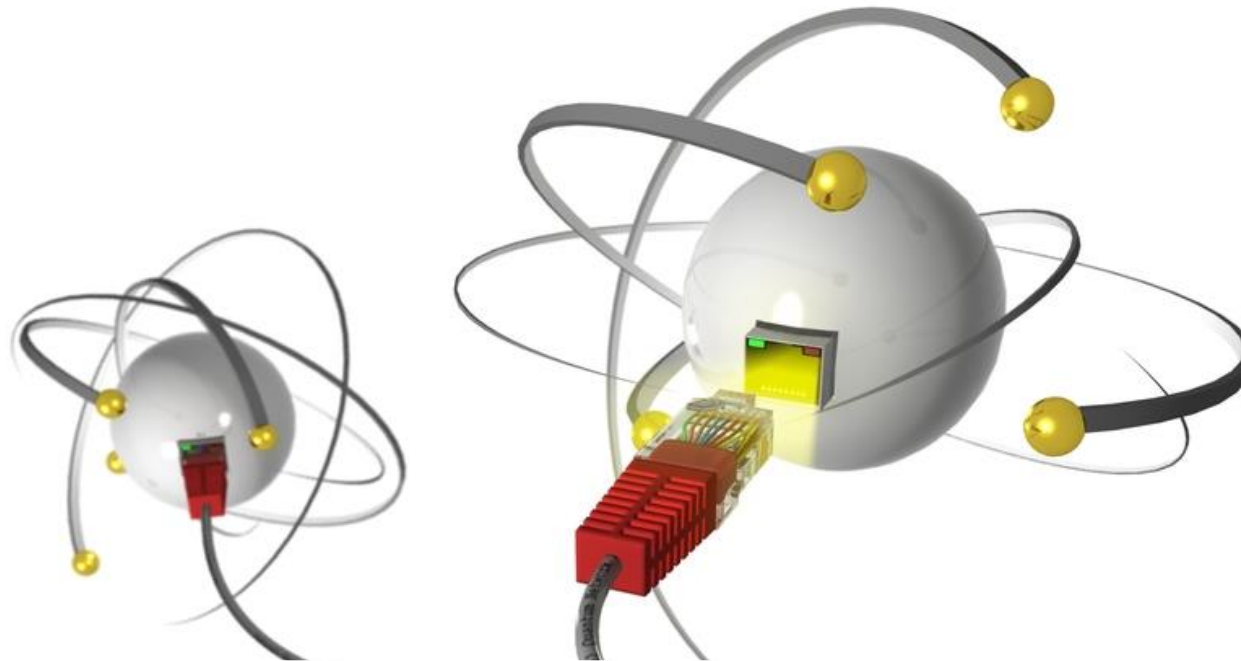


Single Pair Ethernet Filter Design



Martin Leihenseder

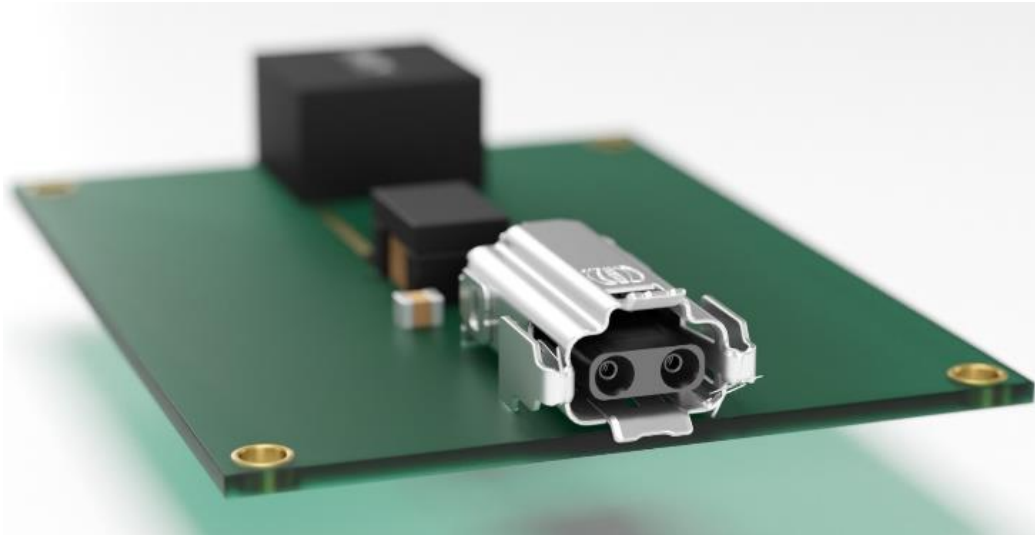
**Würth Elektronik eiSos GmbH &
Co. KG**

Agenda

- Einführung Single Pair Ethernet
- Derzeitige Referenzdesigns
- SPE Übertragerlösung
 - 10BASE-T1
 - 100BASE-T1
- Power over Data Line (PoDL)



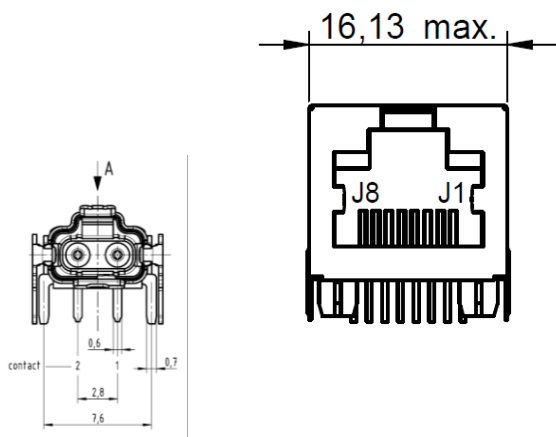
Technologie



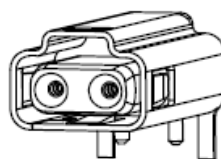
- Ethernet über zwei einzelne (geschirmte) Adern
- 10BASE-T1 IEEE802.3cg (1000 m)
- 100BASE-T1 IEEE802.3bw (40 m)
- 1000BASE-T1 IEEE802.3bp (40 m)
- Power over Data Line (PoDL) bis zu 50 W
- Steckgesicht nach IEC 63171-6

RJ45 vs. SPE

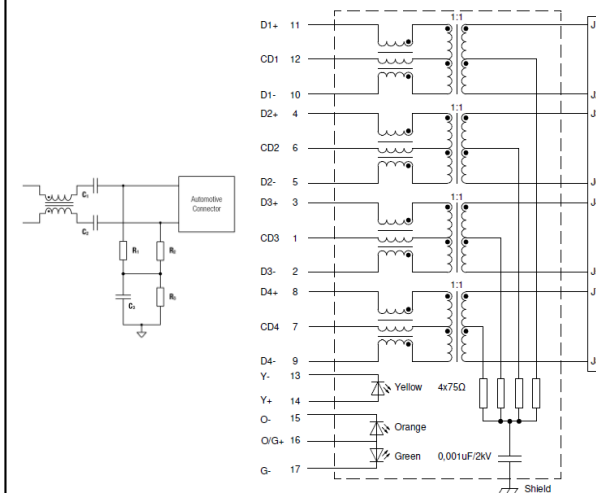
klein



robust

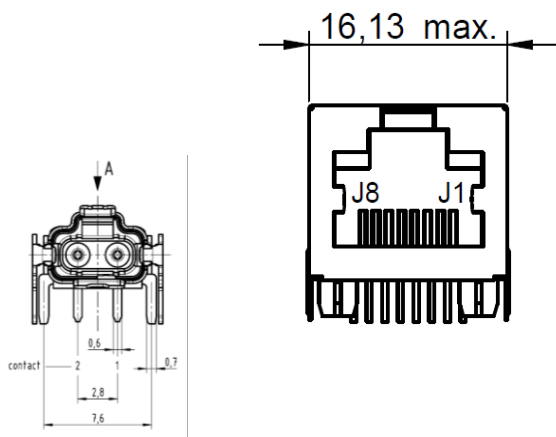


einfach

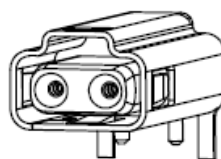


RJ45 vs. SPE

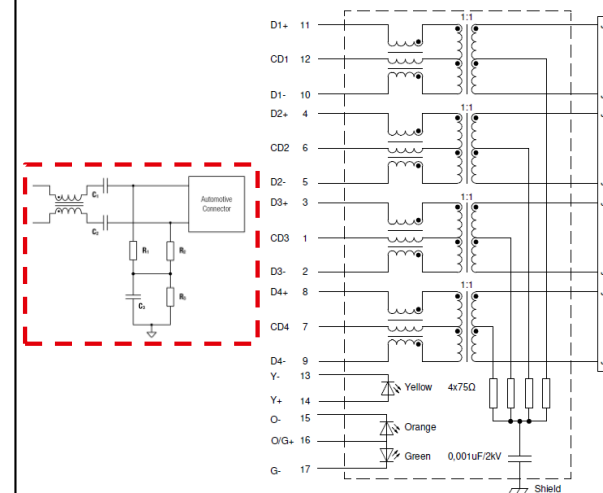
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robust

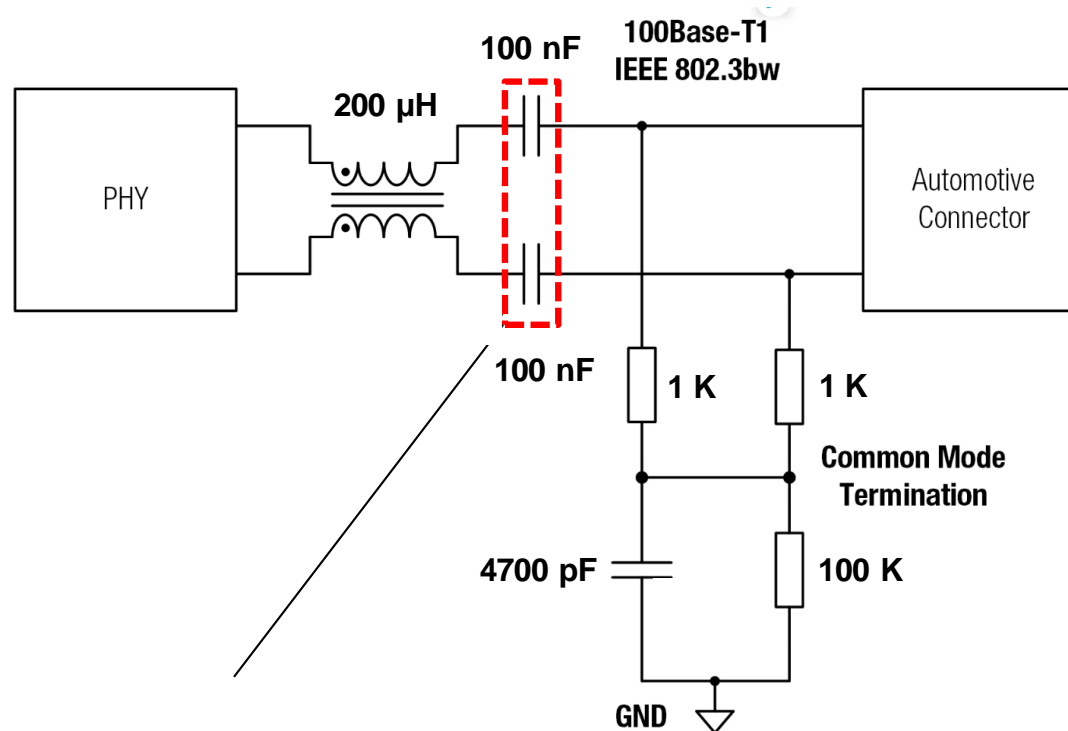


einfach



Derzeitige Referenzdesigns

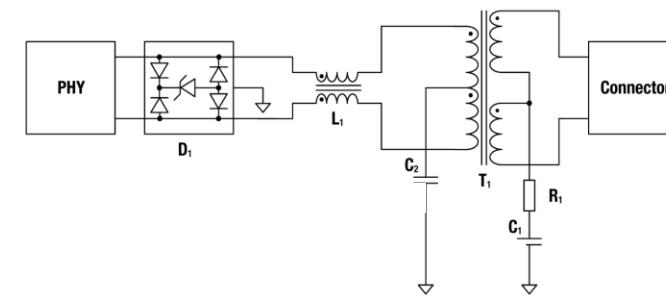
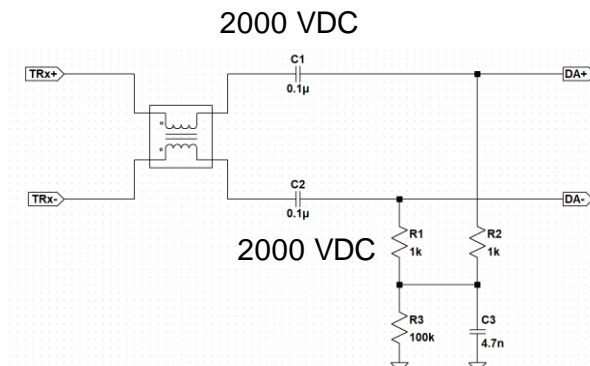
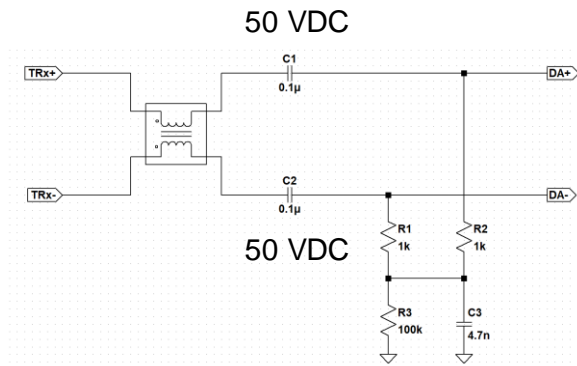
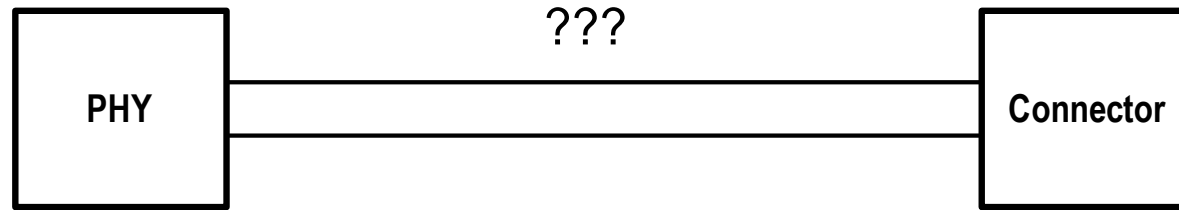
100BASE-T1 dual/single PHY für Automotive Ethernet!



50 VDC Isolation

-> nicht geeignet für Gerätesicherheit nach IEC 62368-1 (1500 V/ 60 s)

Lösungsmöglichkeiten

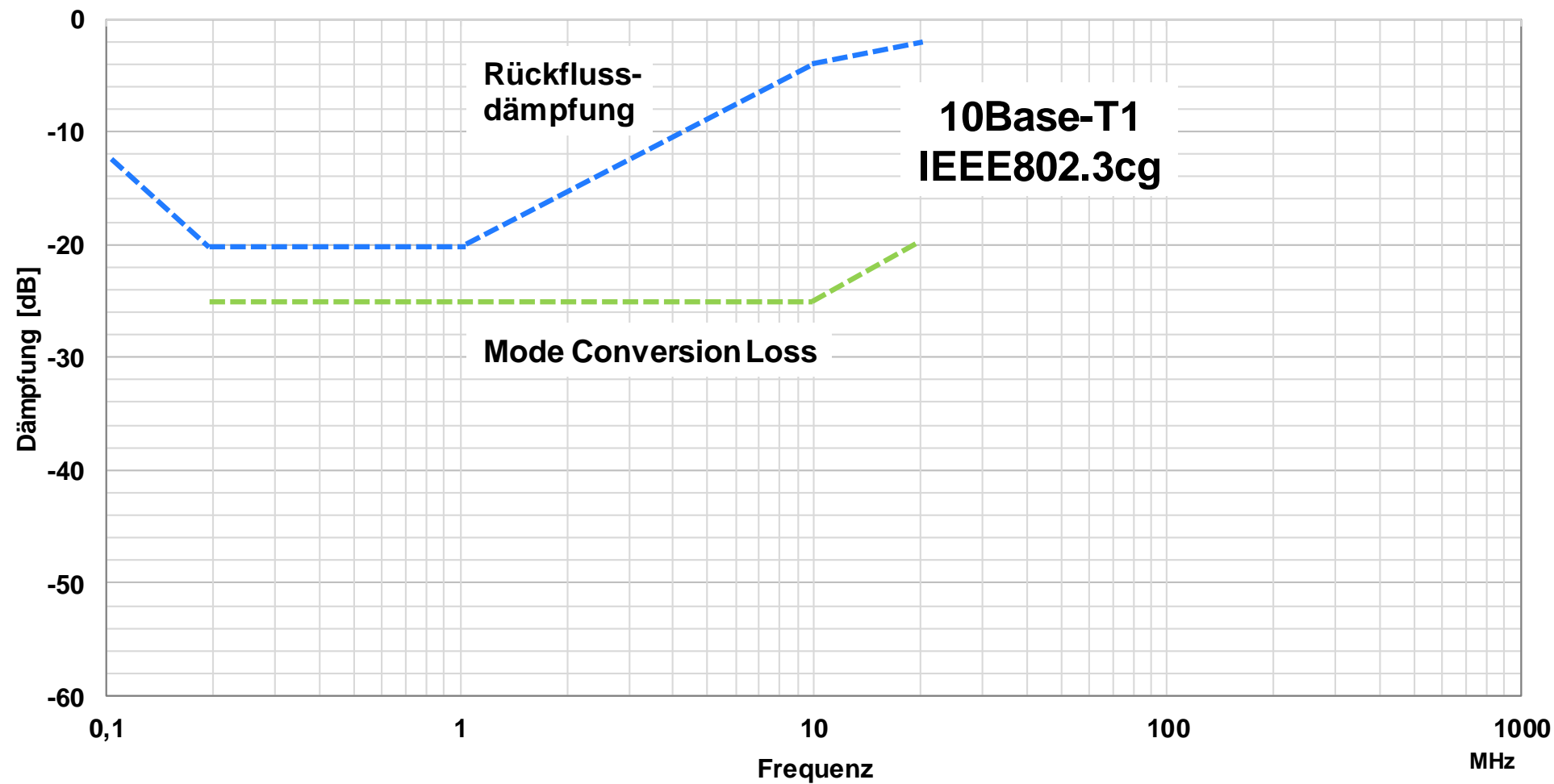


Performancevergleich

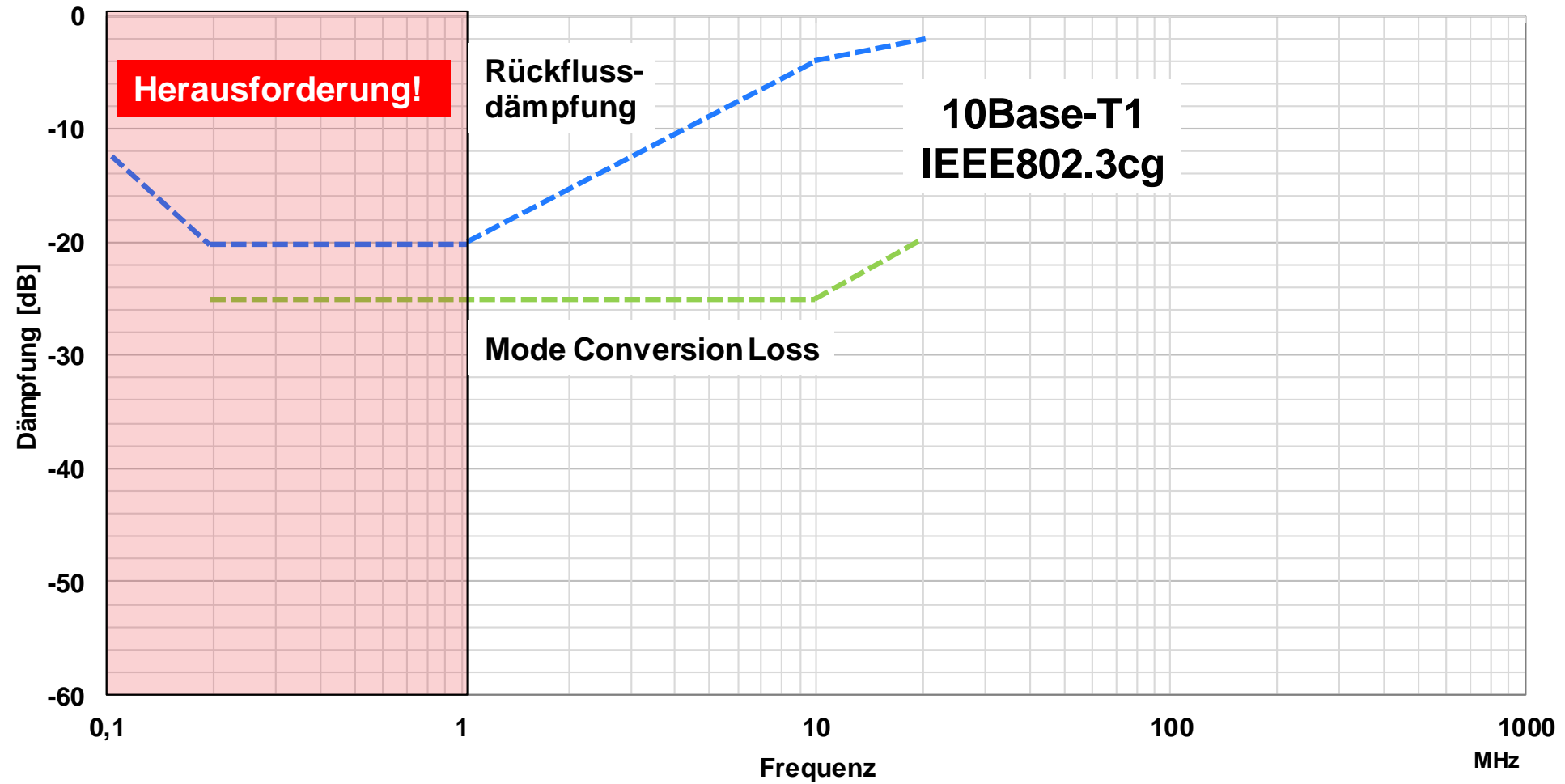


10BASE-T1

Anforderung 10BASE-T1



Anforderung 10BASE-T1



Performancevergleich 10BASE-T1

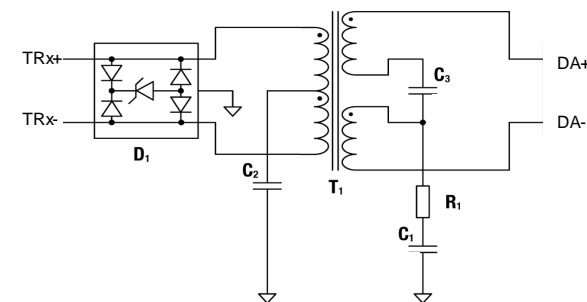
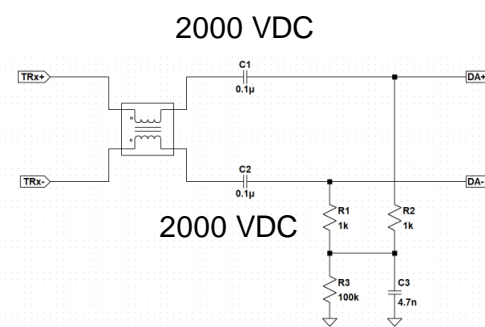
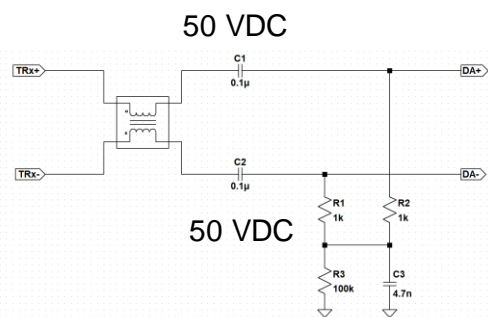
50 V Kondensatoren



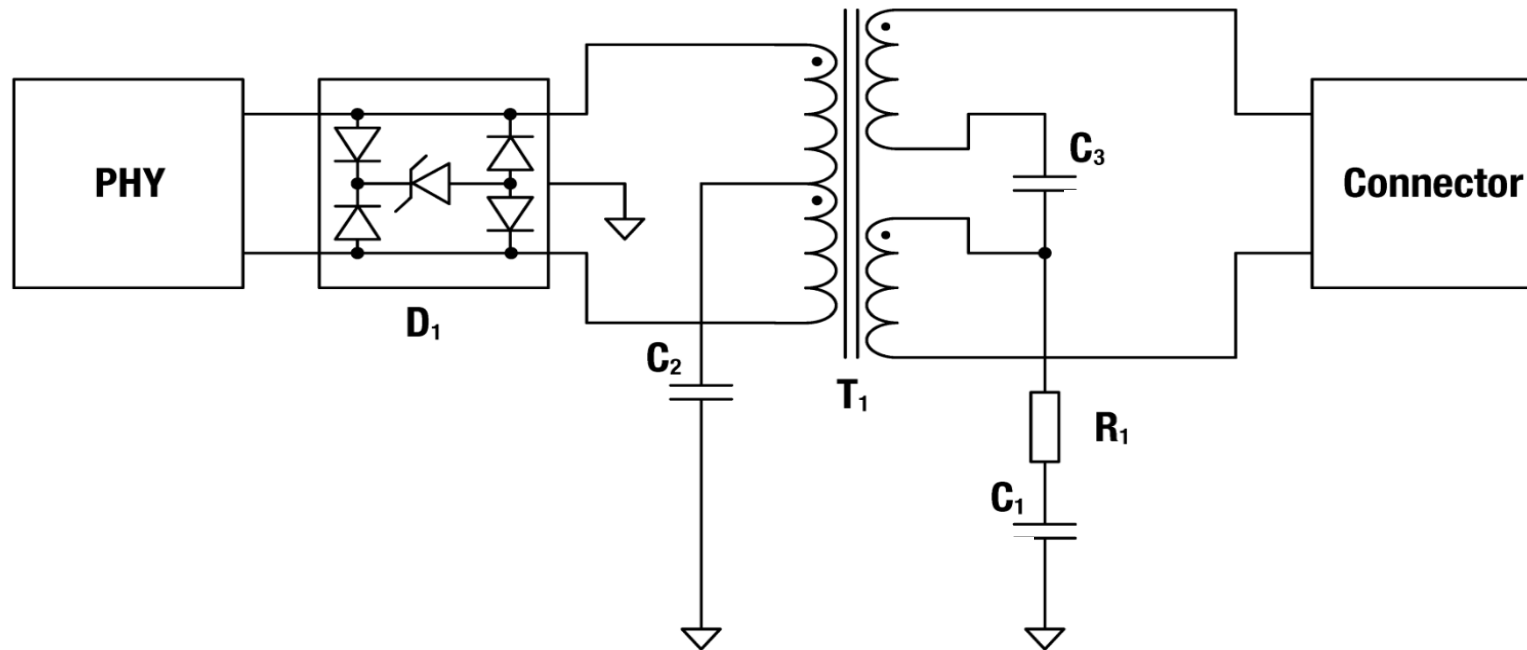
2000 V Kondensatoren



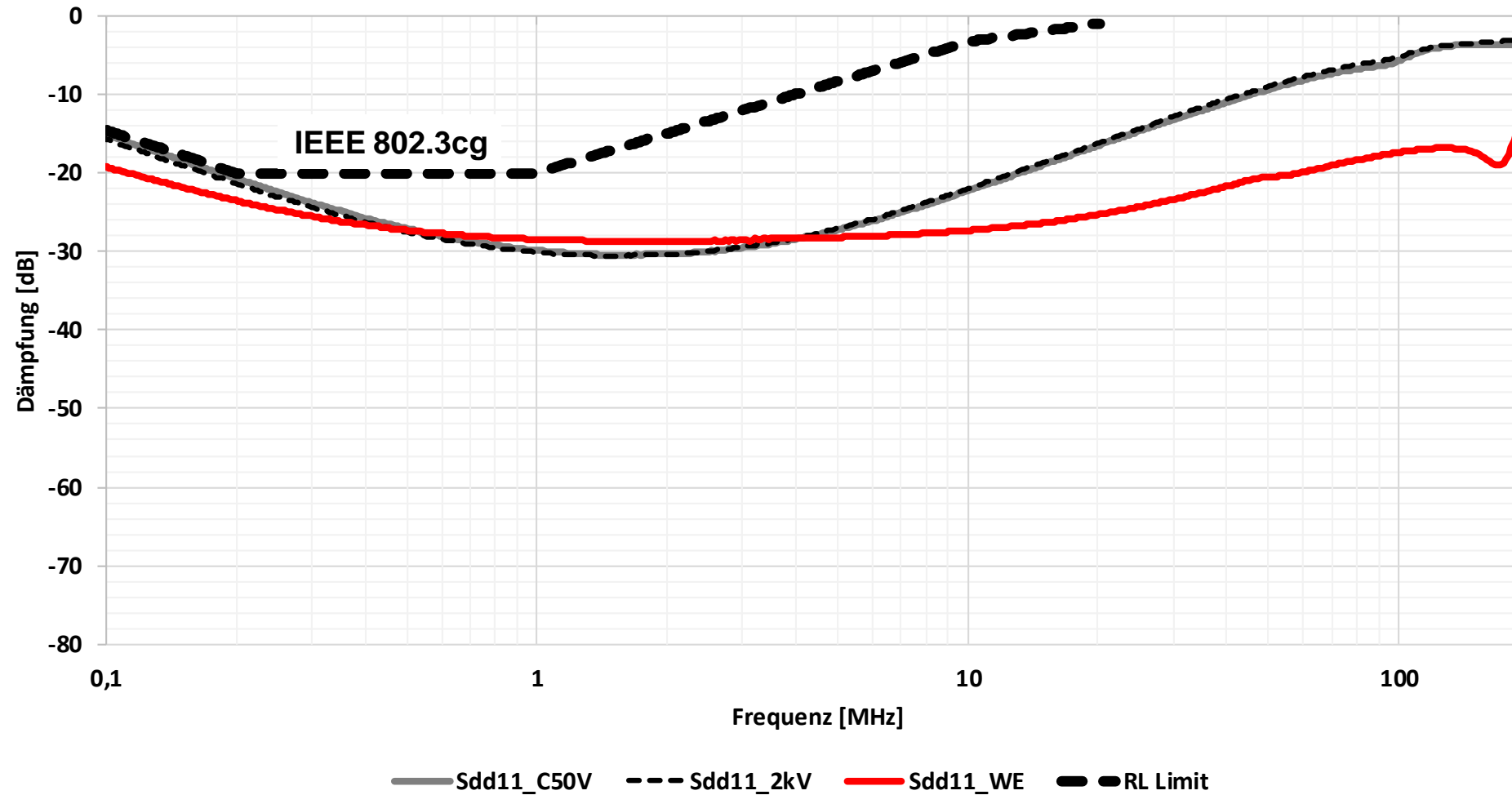
Signalübertrager



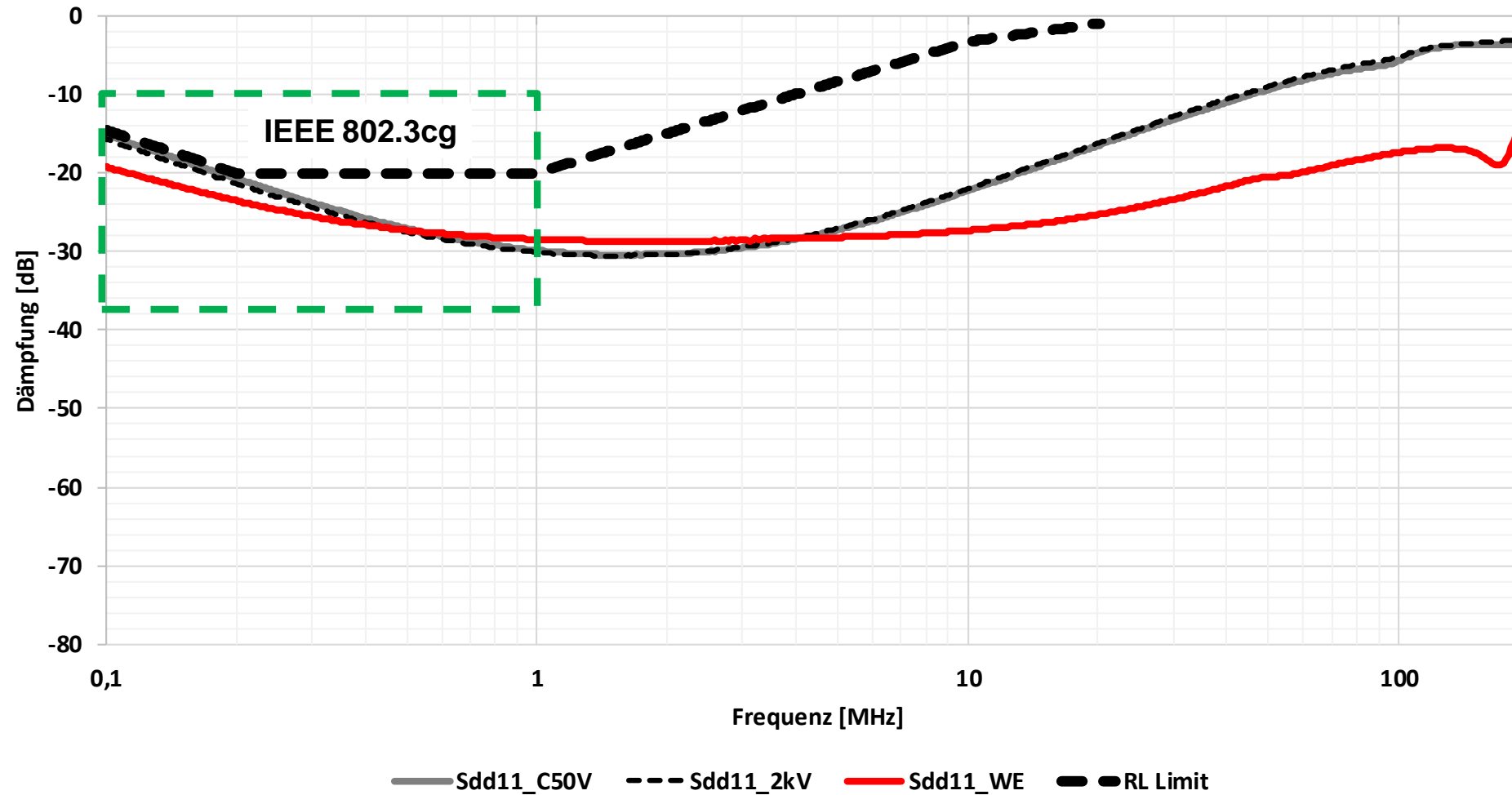
Übertragerdesign 10BASE-T1



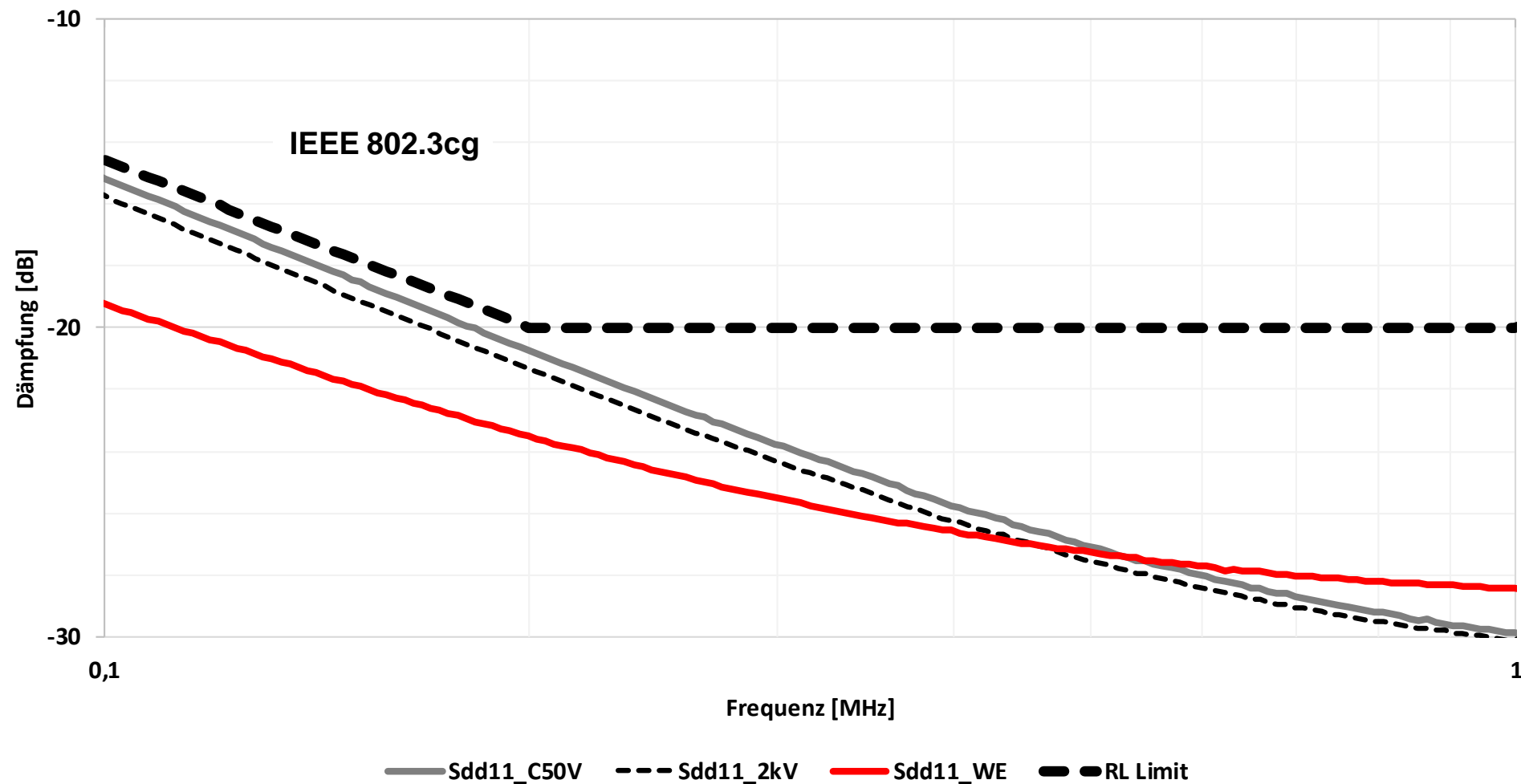
10BASE-T1 Vergleich Rückflussdämpfung



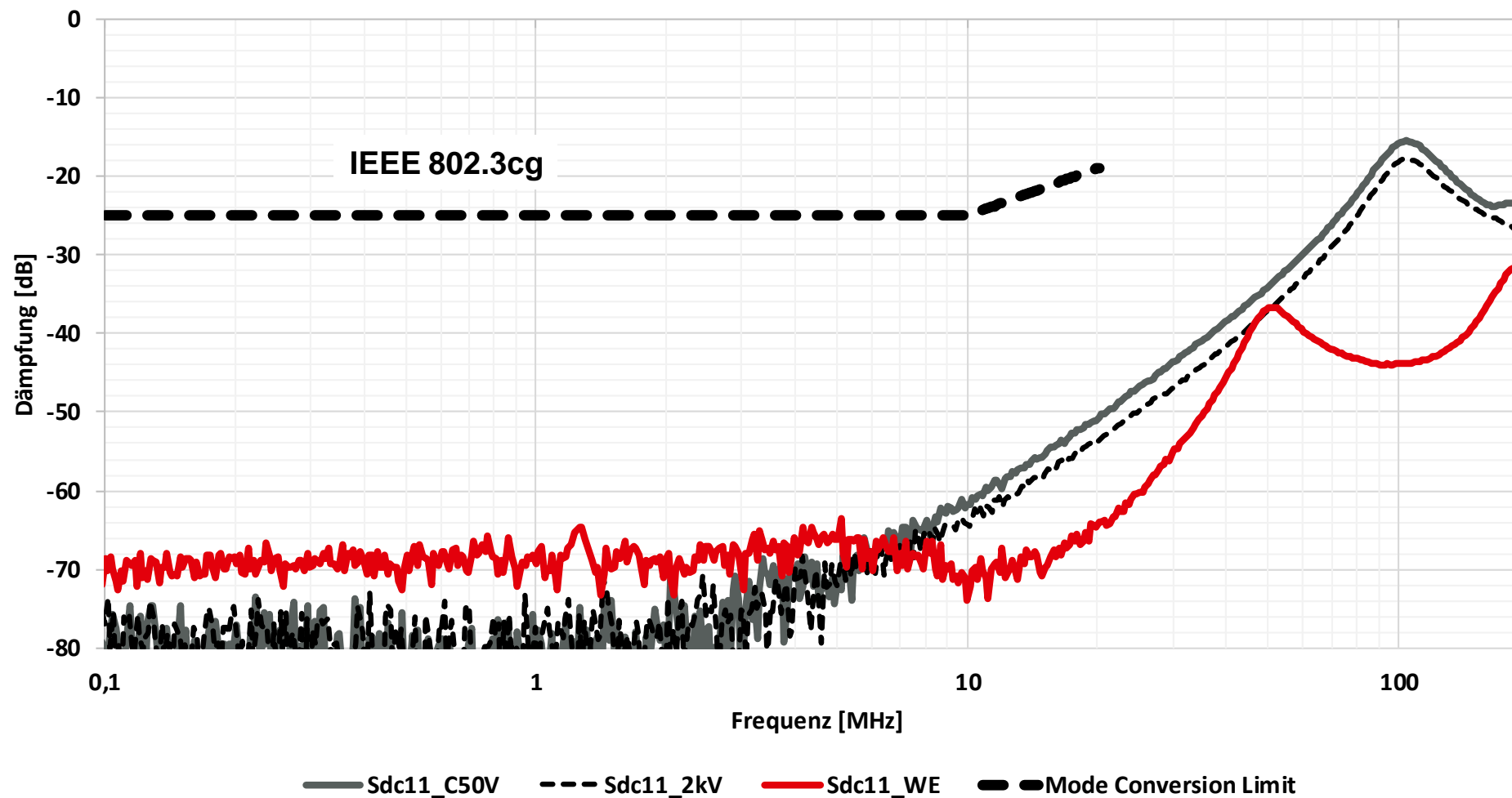
10BASE-T1 Vergleich Rückflussdämpfung



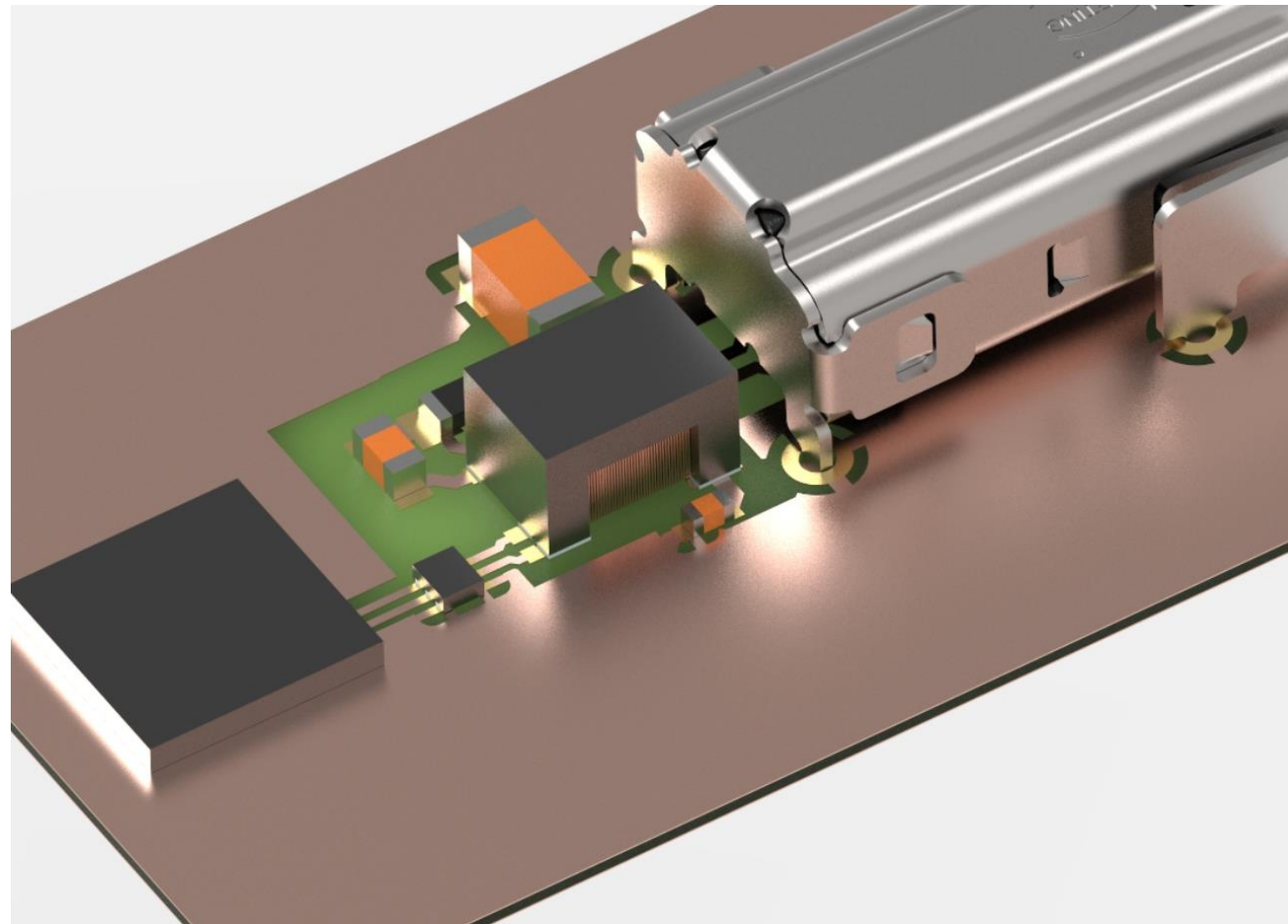
10BASE-T1 Vergleich Rückflusdämpfung



10BASE-T1 Vergleich Mode Conversion Loss



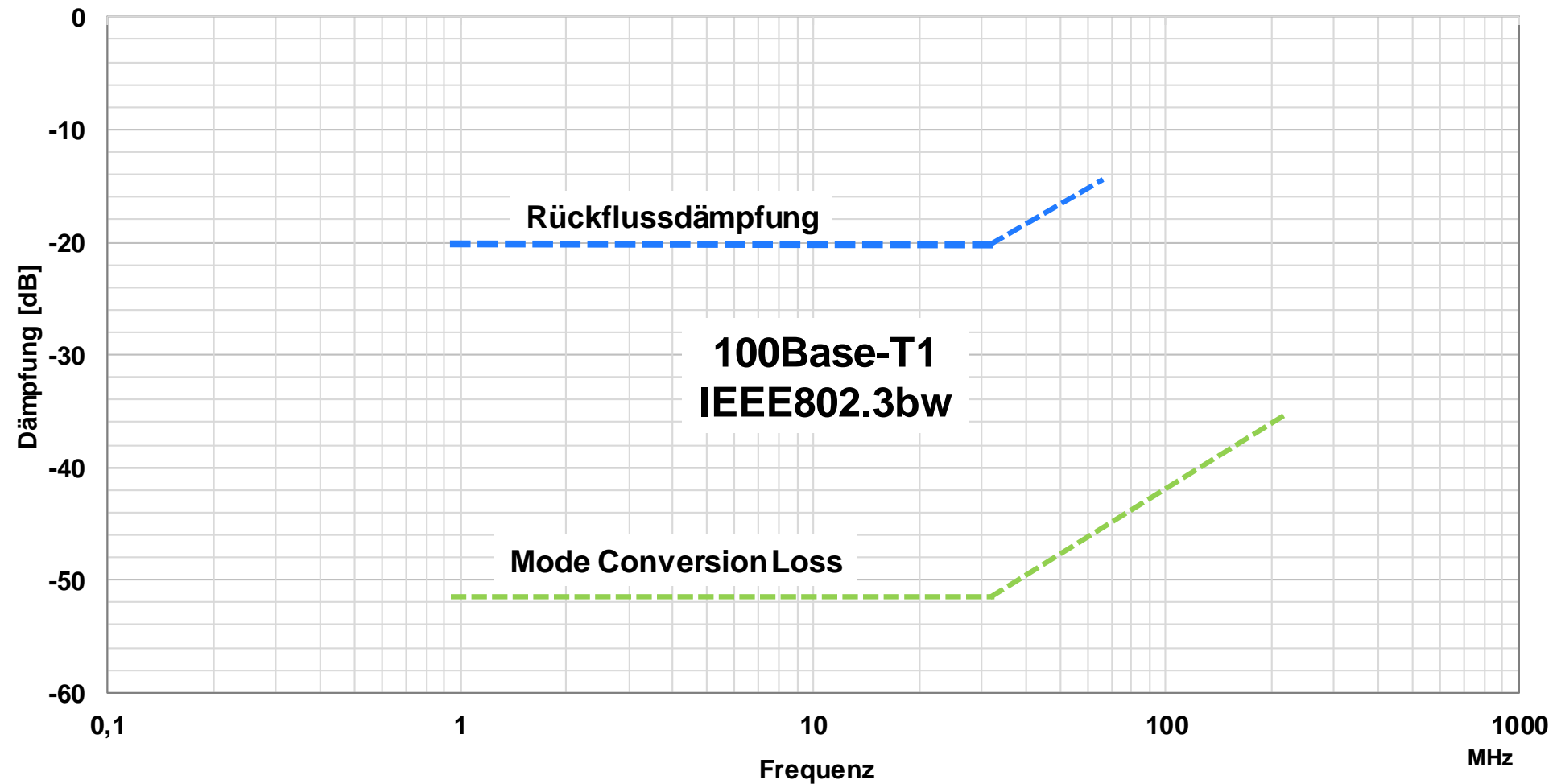
10BASE-T1



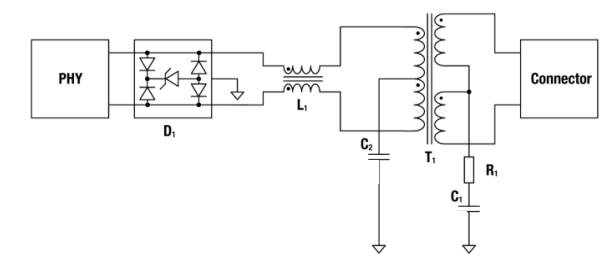
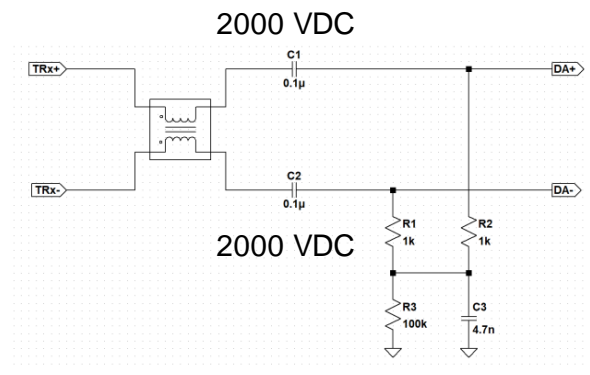
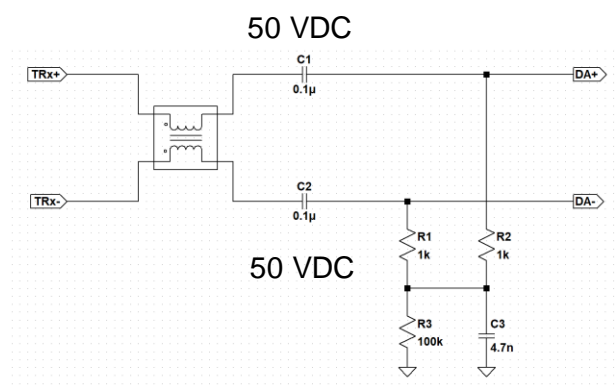
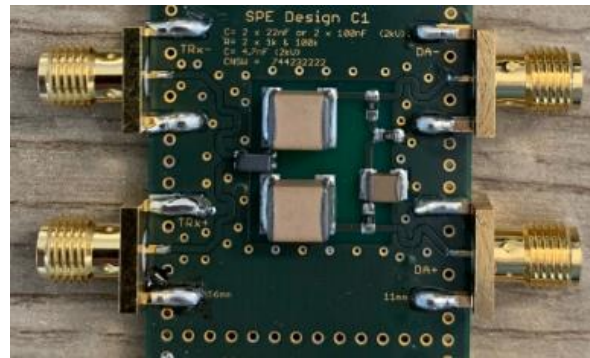


100BASE-T1

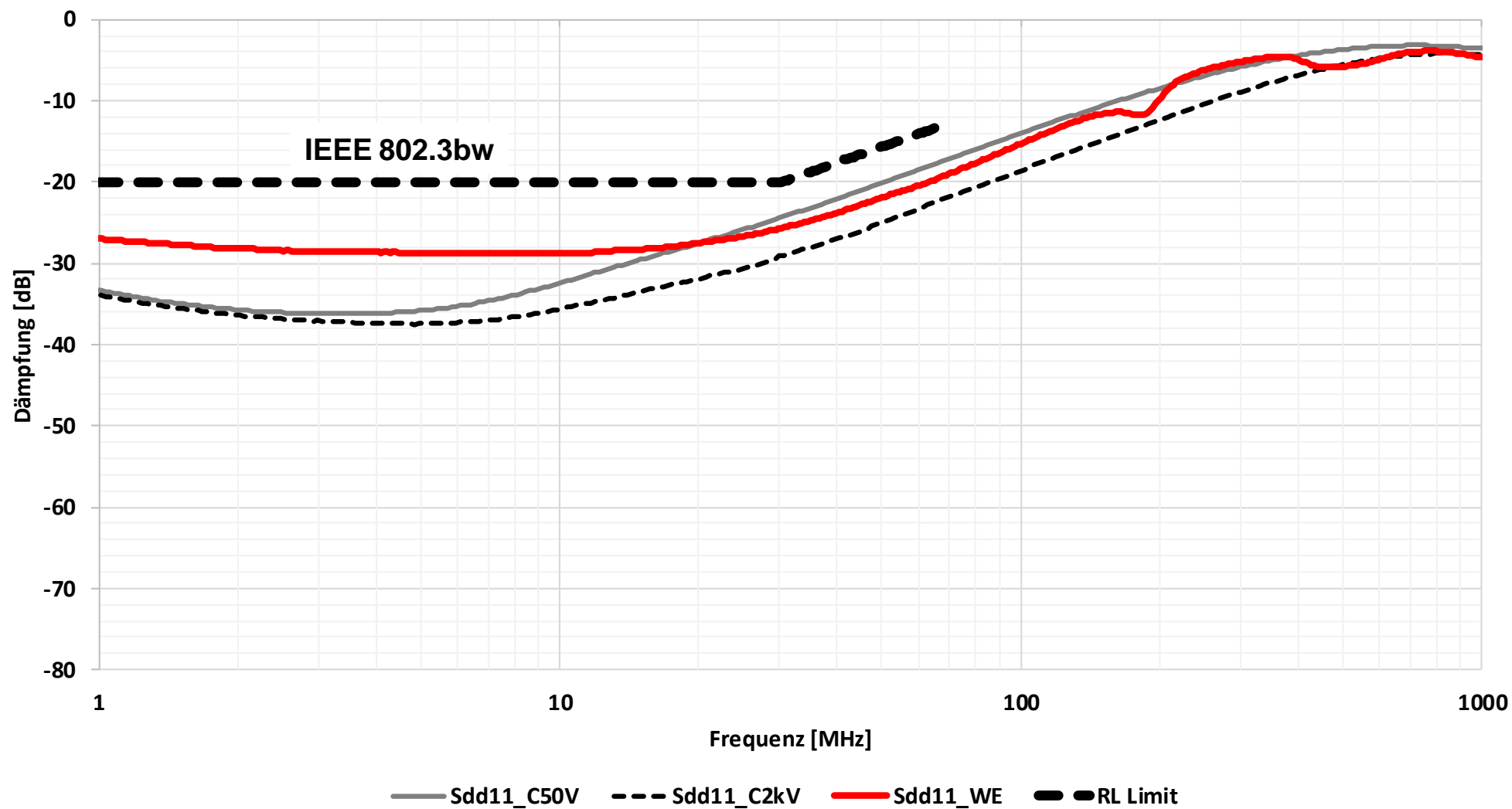
Anforderung 100BASE-T1



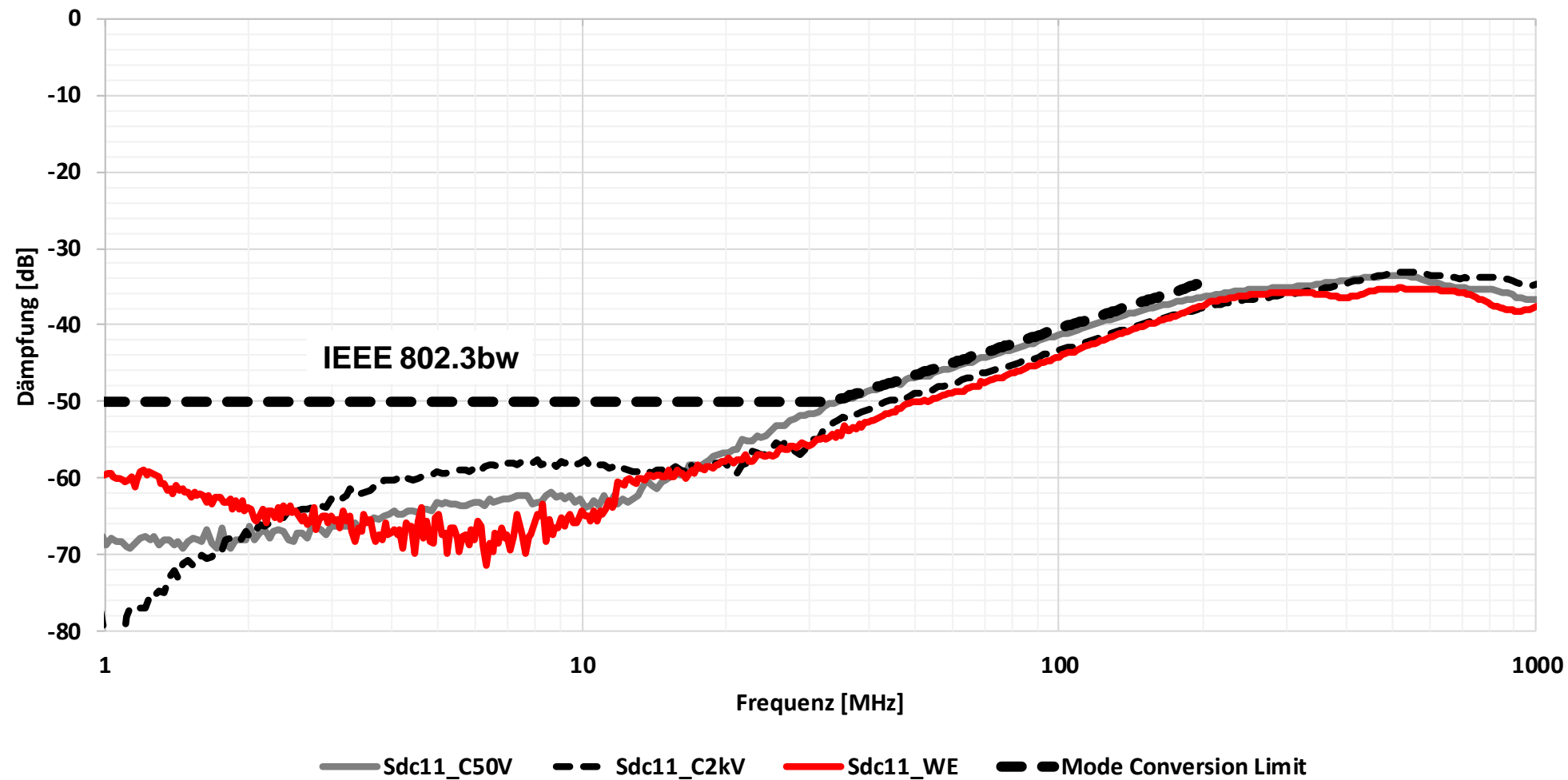
Performancevergleich 100BASE-T1



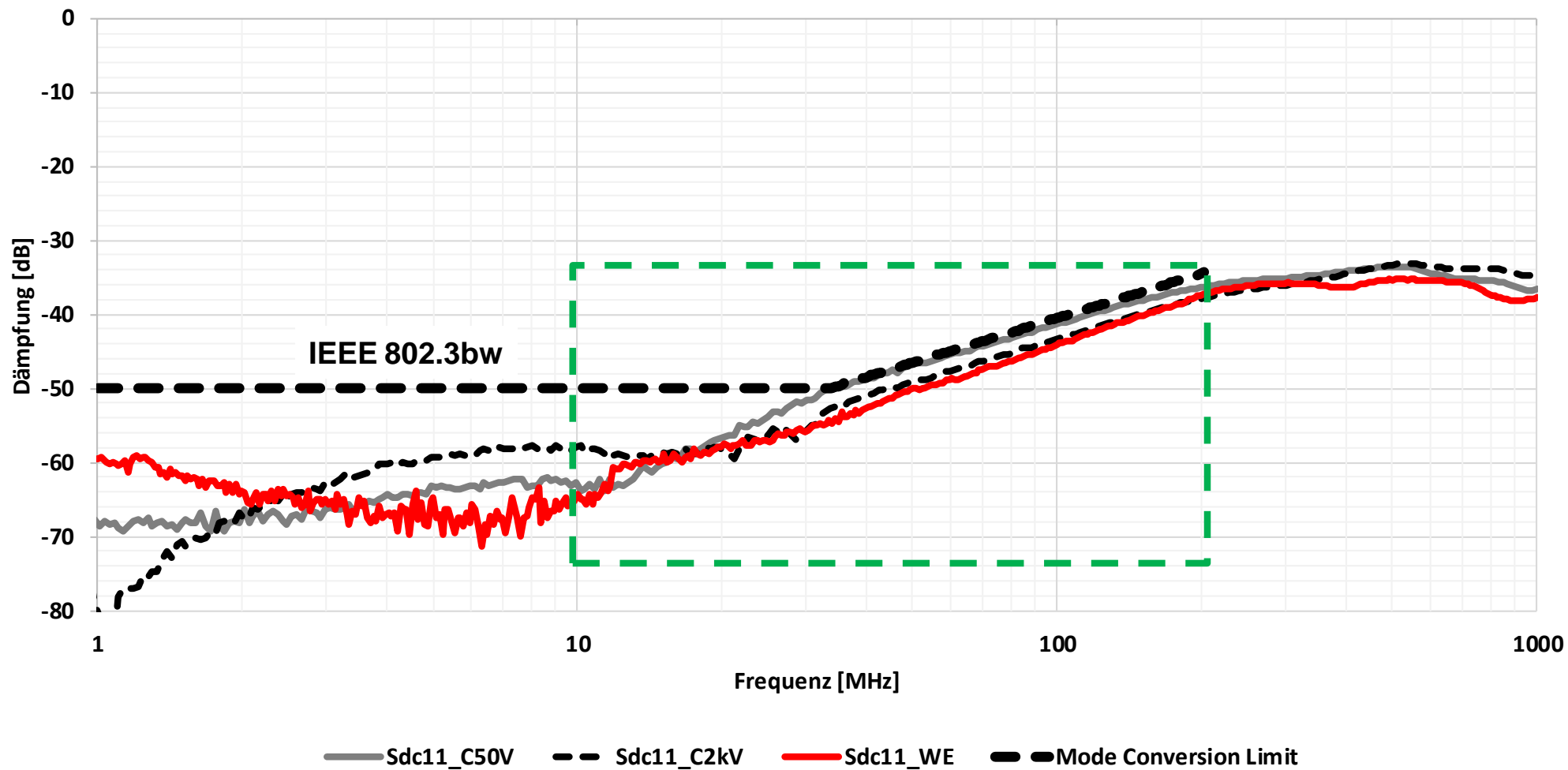
100BASE-T1 Rückflusdämpfung



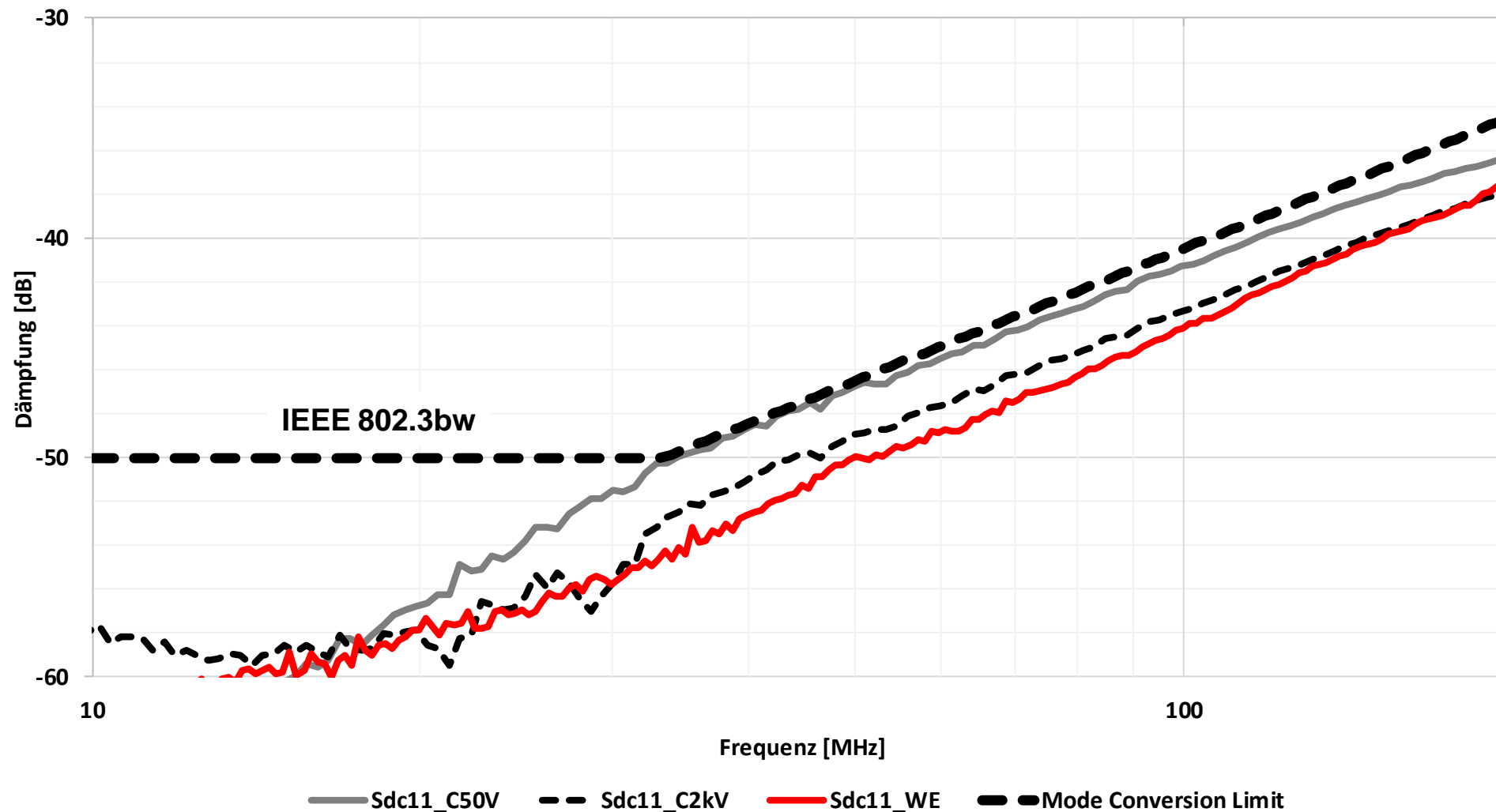
100BASE-T1 Mode Conversion Loss



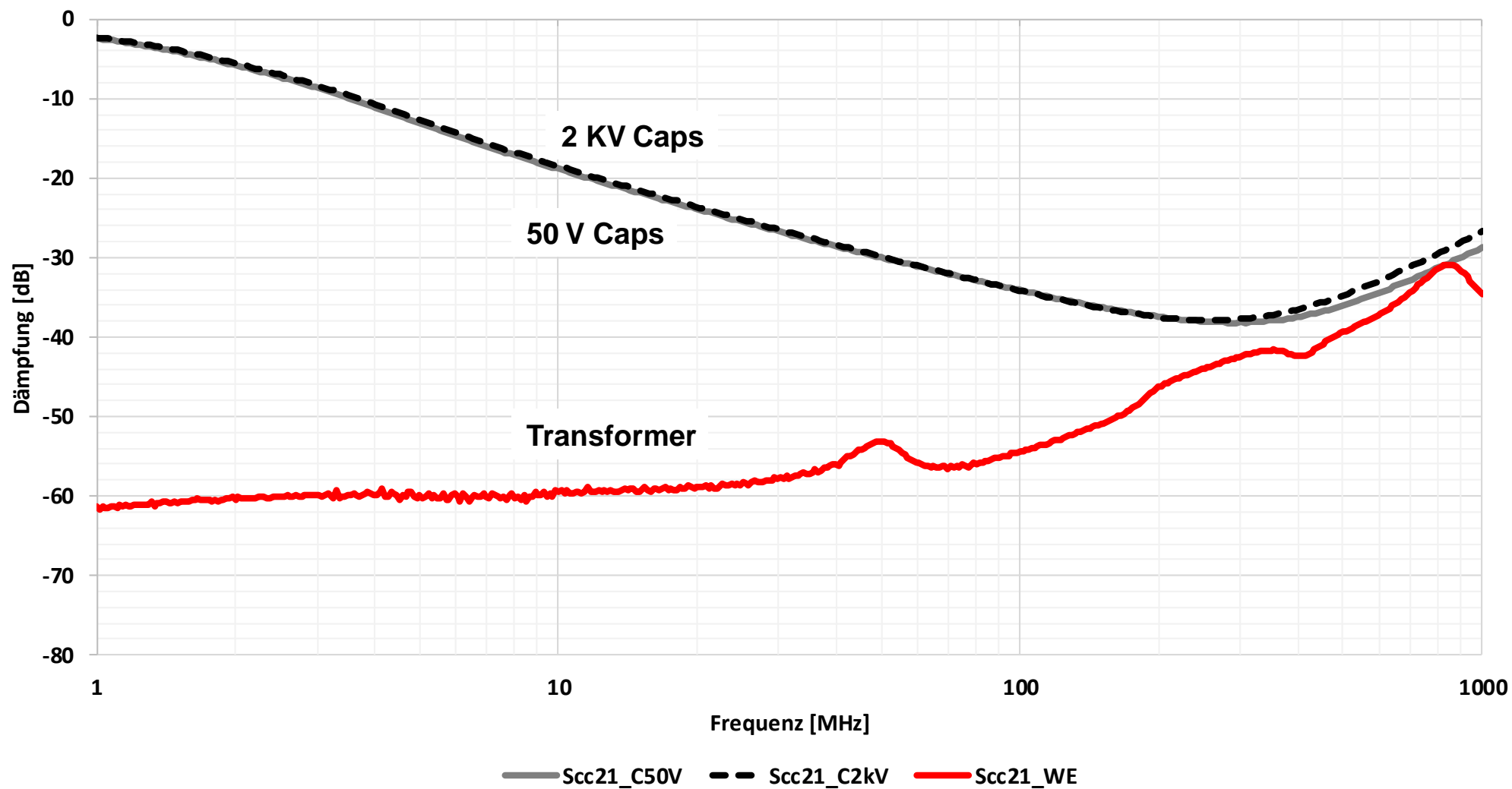
100BASE-T1 Mode Conversion Loss



100BASE-T1 Mode Conversion Loss

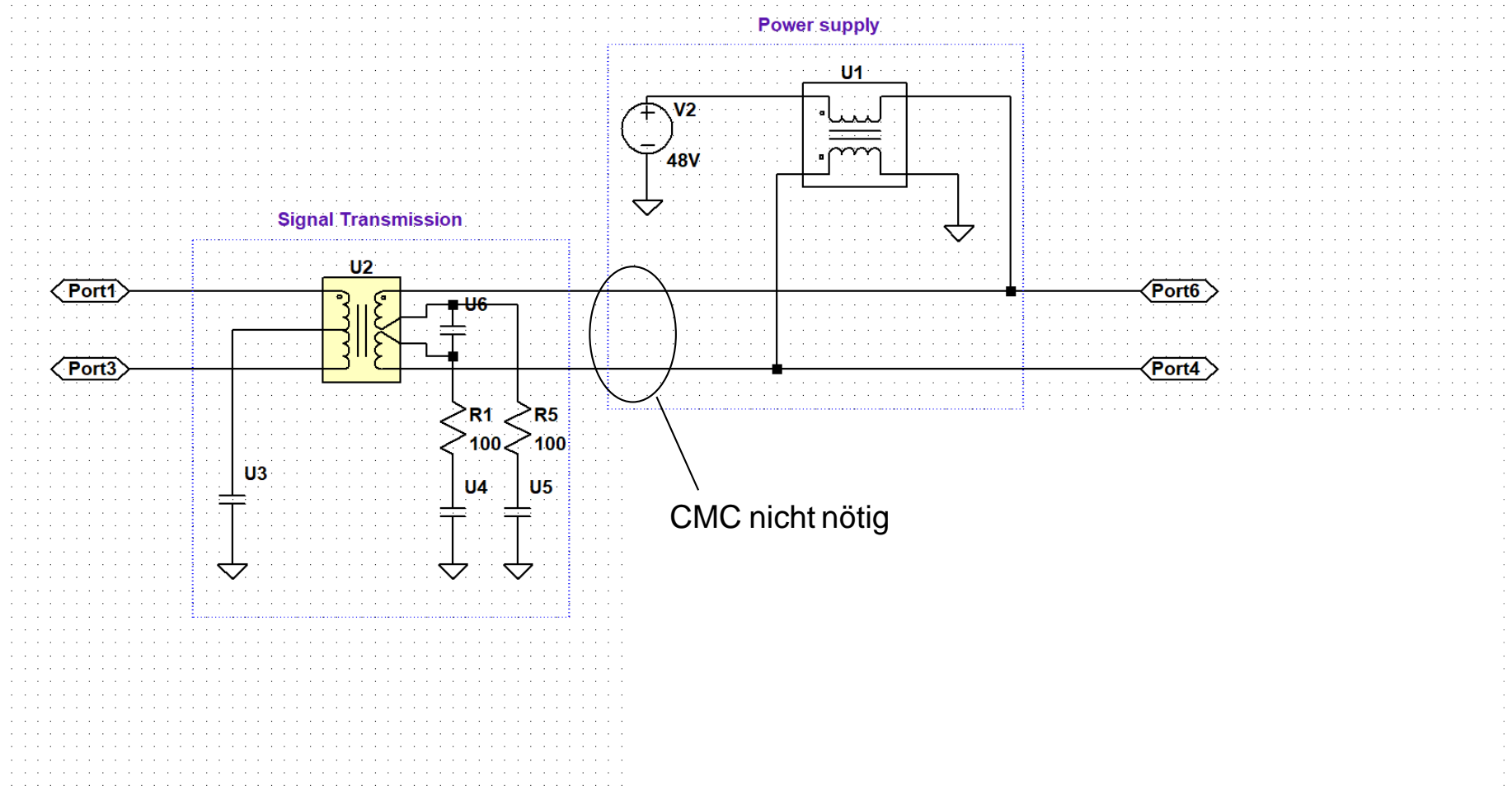


100BASE-T1 Common Mode Entstörung

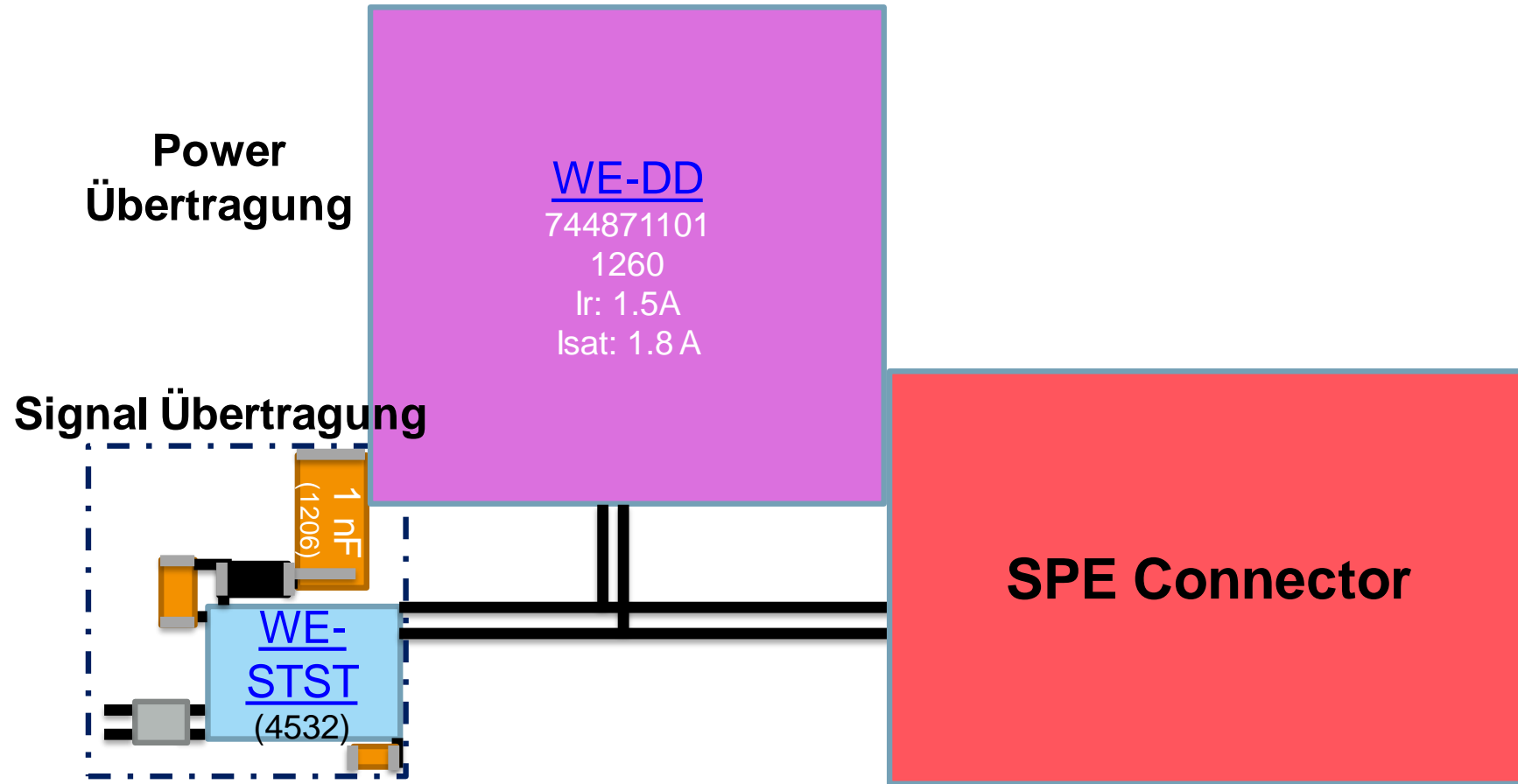


Power over Data Line (PoDL)

10BASE-T1 + PoDL

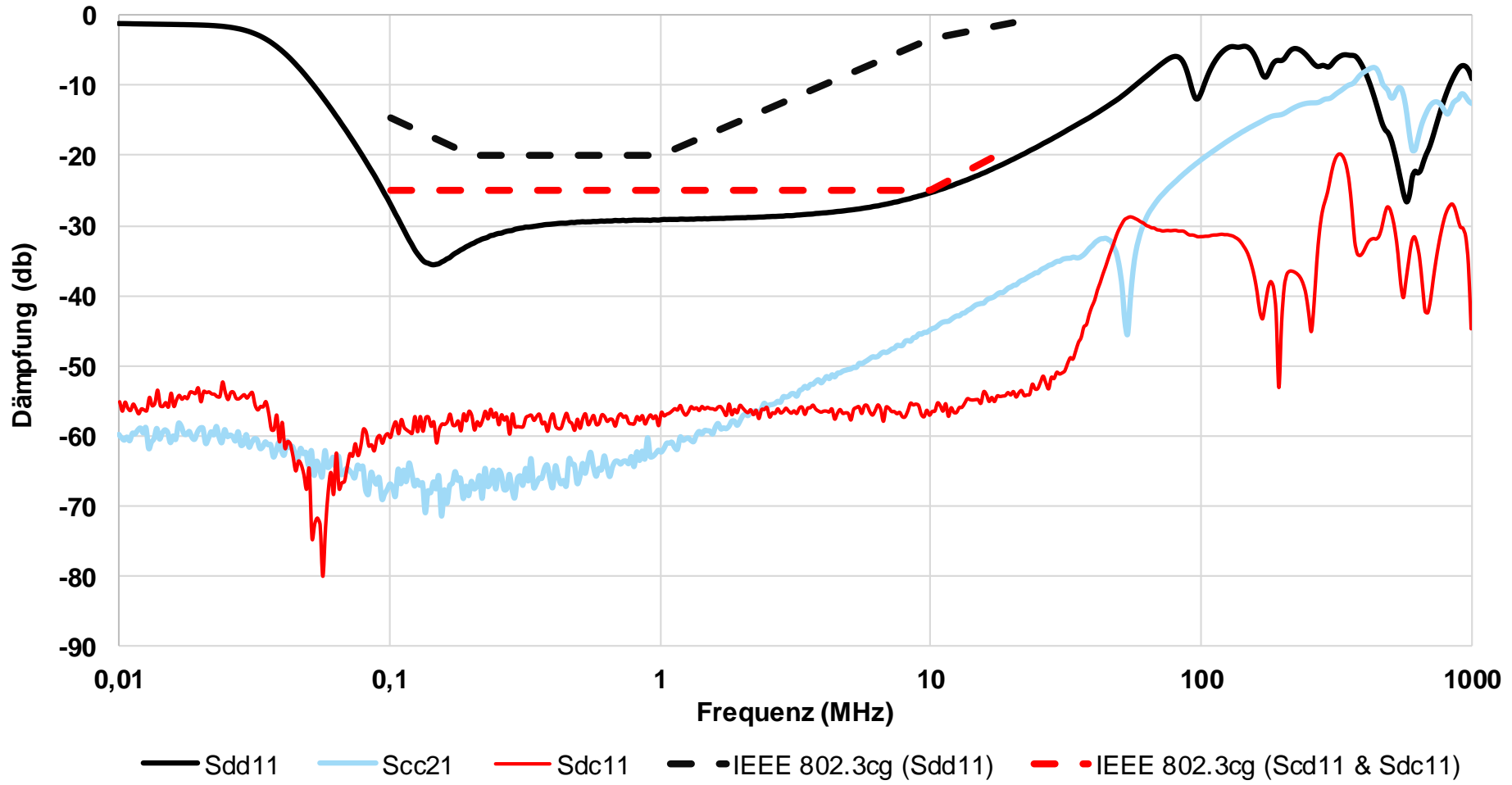


10BASE-T1 + PoDL



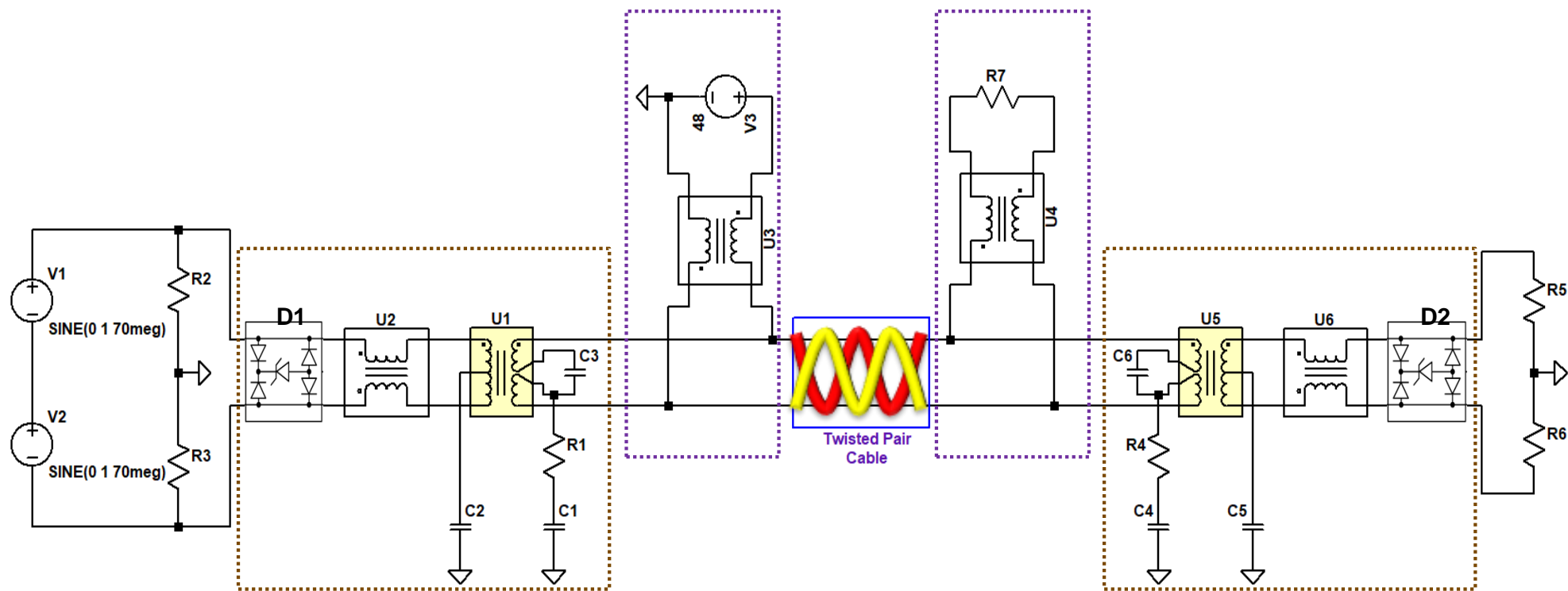


10BASE-T1 + PoDL

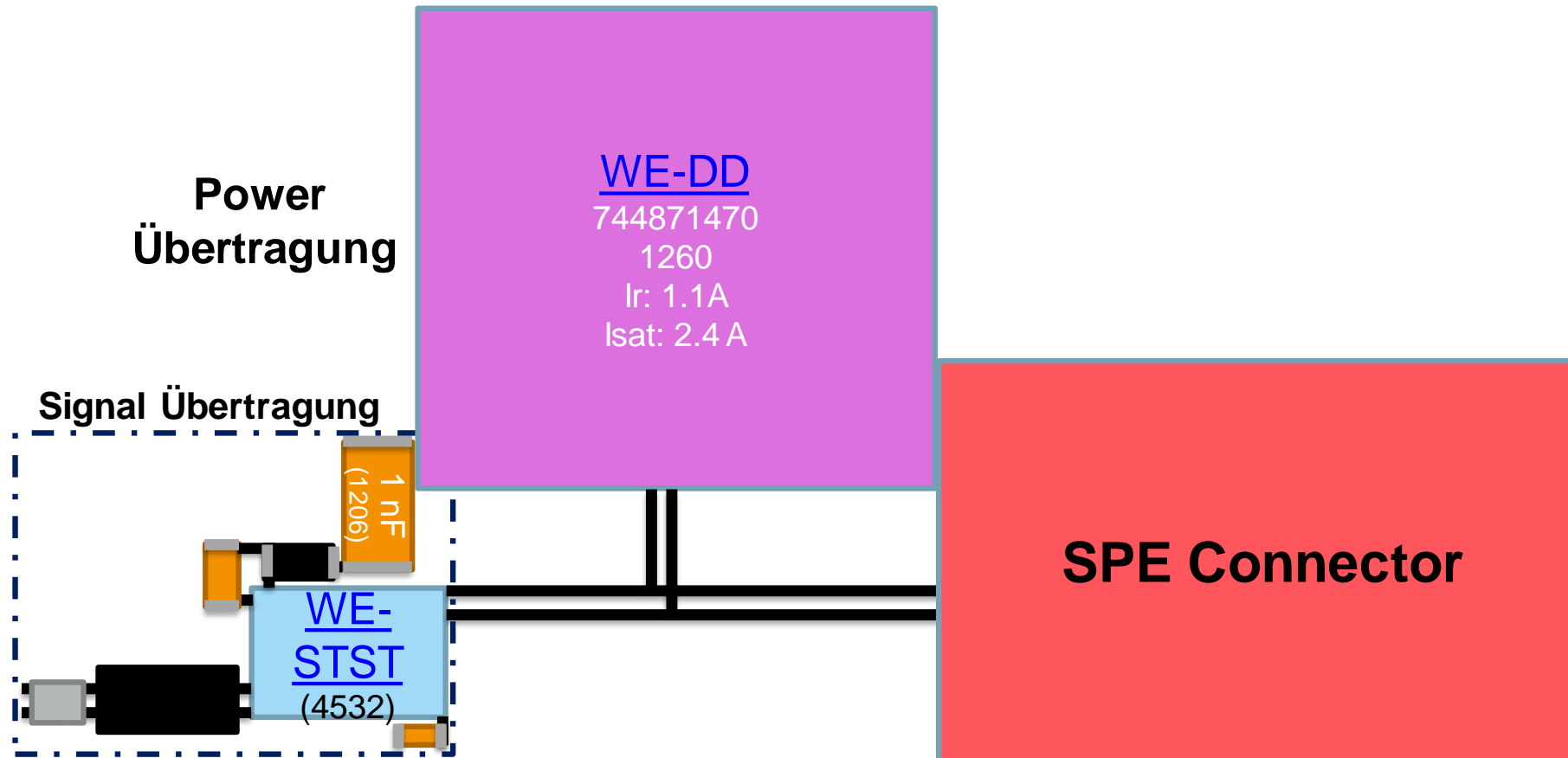


100BASE-T1 + PoDL

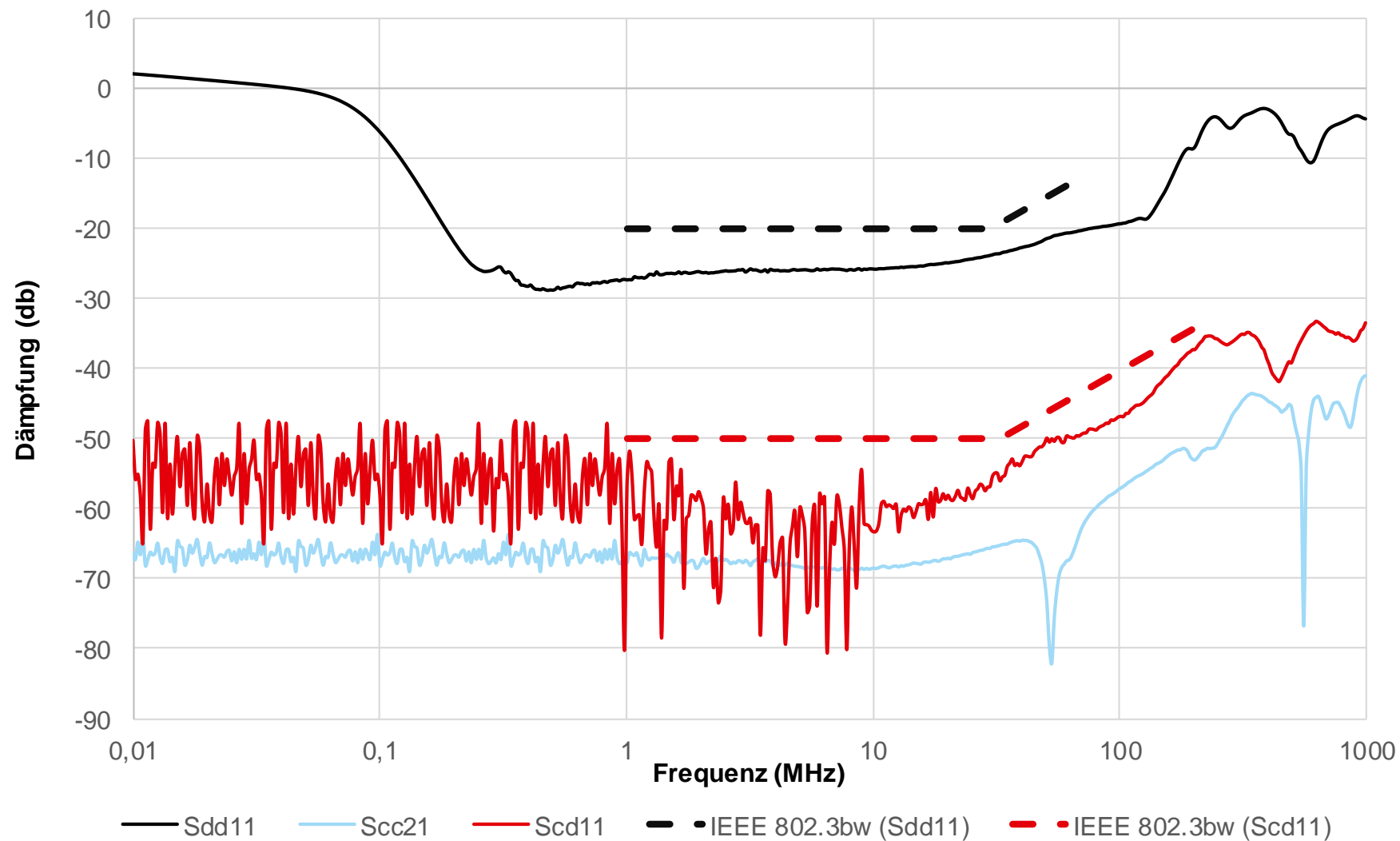
100BASE-T1 + PoDL



100BASE-T1 + PoDL



100BASE-T1 + PoDL



Zusammenfassung

10BASE-T1

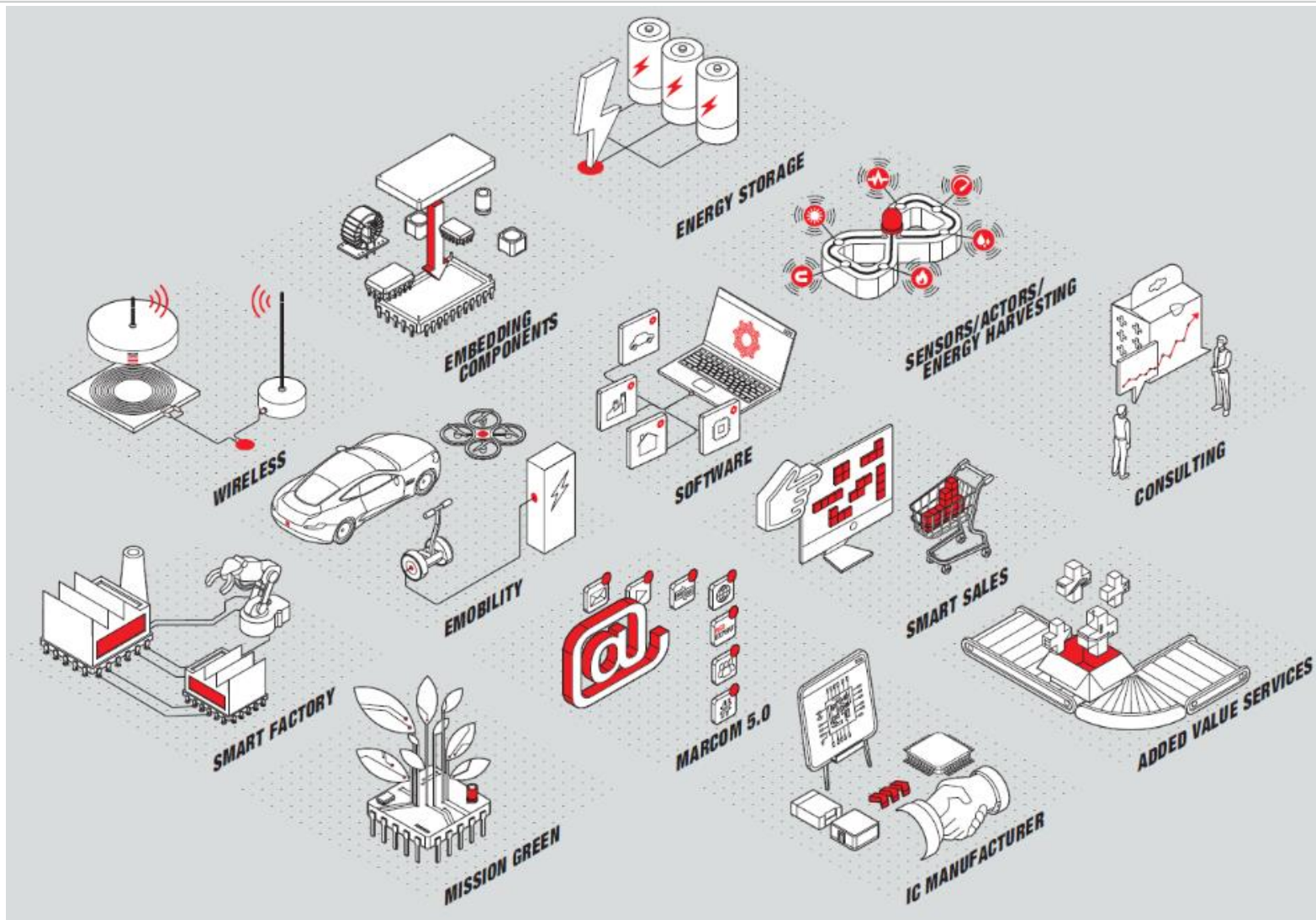
- Kondensator-Designs können nicht garantieren die RL Anforderungen für 10BASE-T1 zu erfüllen
- Übertragerlösung hat das kleinste aller Footprints.

100BASE-T1

- 50 V Kondensatorlösung nur bedingt geeignet die Anforderungen an Mode Conversion Loss zu erfüllen
- Common Mode Entstörung bei Kondensatorlösung in tiefen Frequenzen unzureichend

→ **Selbst wenn außer Acht gelassen wird, dass eine Isolation nach IEC 62368-1 nötig ist, bietet eine Übertragerlösung die kompakteste und in Bezug auf die Signalstabilität beste Lösung für Single Pair Ethernet, sowohl für 10BASE-T1 als auch für 100BASE-T1.**

Vielen Dank!



The graphic for 'Fragen & Antworten' (Questions & Answers). It features the word 'Fragen' in a large, bold, black font. To its right is a red speech bubble containing a white exclamation mark. Above the 'Fragen' and the red bubble are two smaller speech bubbles: a grey one with a white question mark and a white one with a black ampersand. Below the main text, the words '& Antworten' are written in a smaller, black font. The entire graphic has a soft grey shadow underneath.

**Wir sind jetzt für Sie da. Fragen Sie uns direkt im Chat
oder schreiben Sie uns eine E-Mail.**



**eiSos-webinar@we-online.com
Martin.Leihenseder@we-online.de**