A Comparison of the Hardware Requirements of CAN and Single Pair 10BASET1S Ethernet Transceivers

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Introduction

This document compares the typical application diagrams of CAN and 10BASE-T1S MAC-PHY communication nodes.

Node HW Comparison

Figure 1 shows the typical application diagram of MAC-PHY 10BASE-T1S node using an T30HM1TS2500 transceiver (the NCV7410 may also be used).

Figure 2 shows a typical CAN node with advanced power management, Wake and Inhibit control. The NCV7343 CAN transceiver is chosen as the closest equivalent to the T30HM1TS2500 Ethernet transceiver.

Figure 3 shows the typical application diagram of a PMD 10BASE-T1S node using the NCV26004.

Finally, Figure 4 shows a basic CAN node without power management; this is the most direct equivalent to a PMD 10BASE-T1S node.

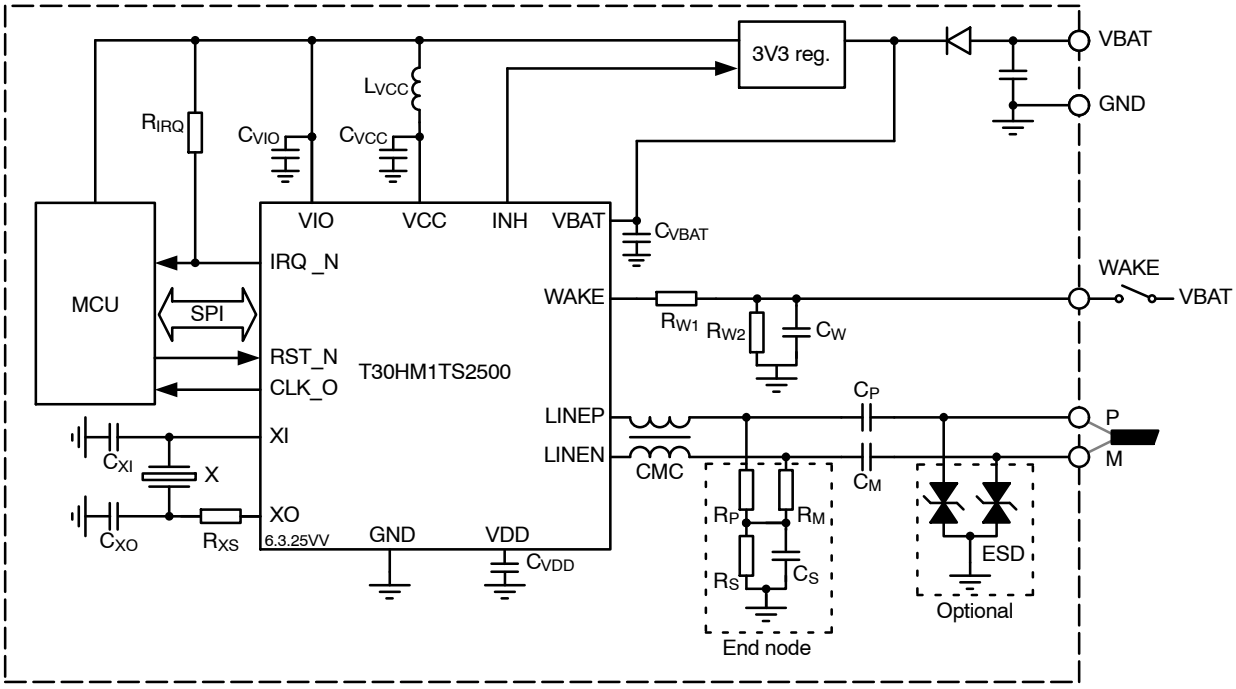

Figure 1. 10BASE-T1S MAC-PHY Application Diagram

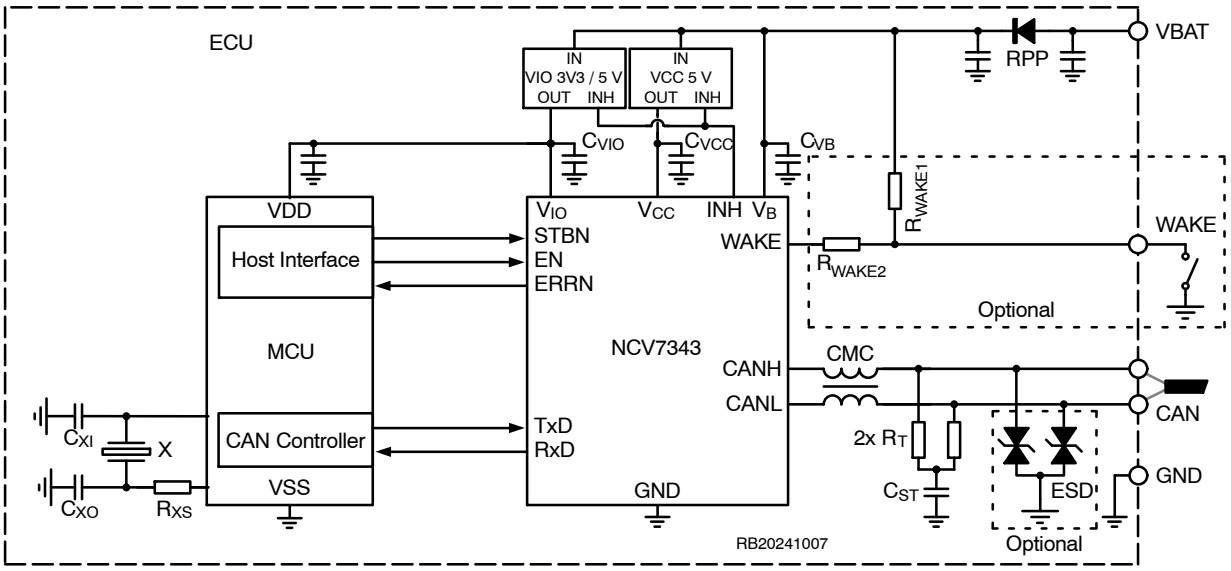

Figure 2. CAN Node Application Diagram (with Power Management)

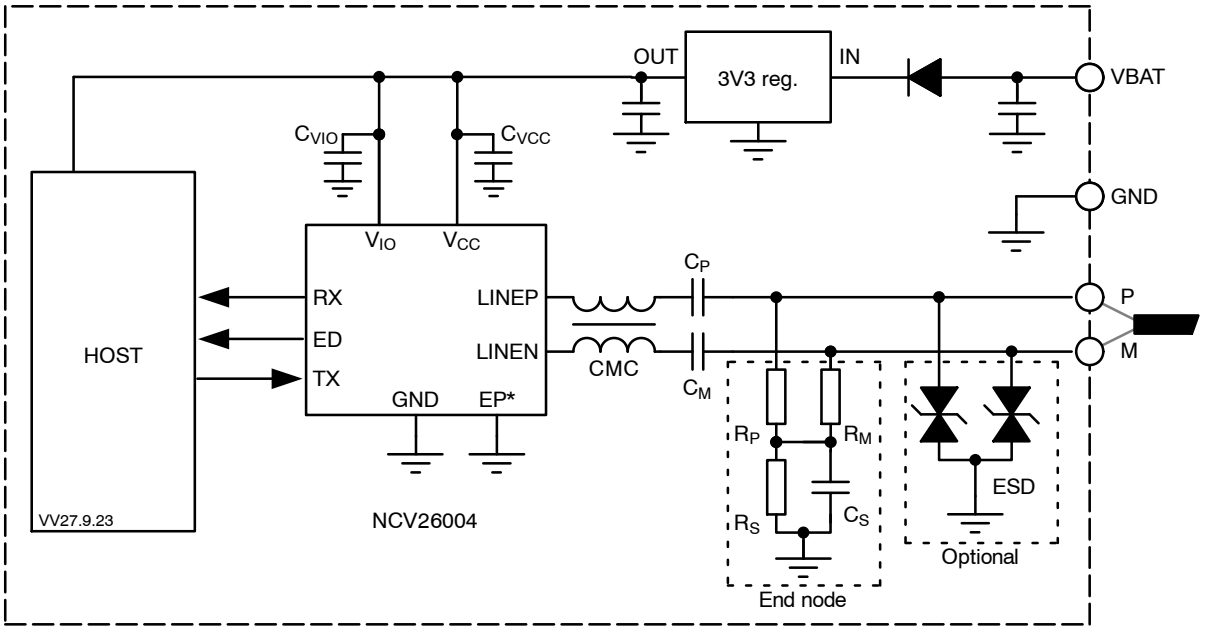

Figure 3. NCV26004 PMD Application Diagram

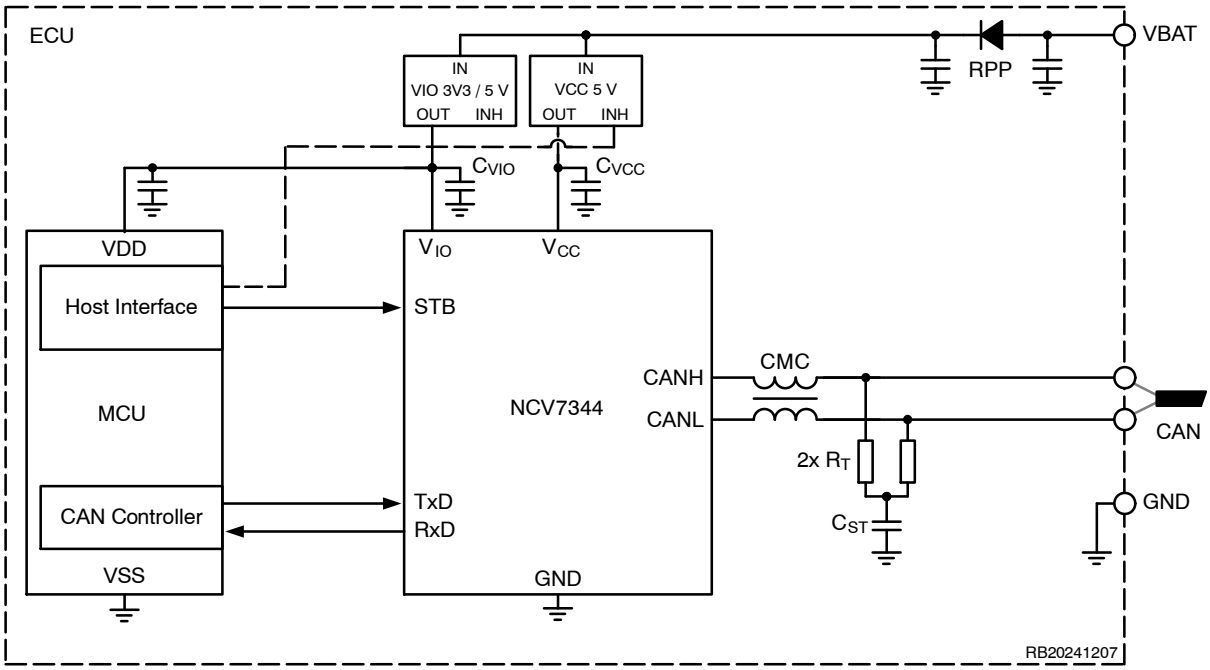

Figure 4. CAN Node Application Diagram (without Power Management)

The component cost of a 10BASE-T1S node is slightly higher than that a CAN node:

- The decoupling of the supply costs about the same.
- Common-mode chokes (CMCs) for CAN are usually 100 μH (or 51 μH) while 10BASE-T1S requires 240 μH (130 μH is under evalution versus EMC requirements). 240 μH CMCs are about 20% more expensive.
- 10BASE-T1S requires two capacitors to DC decouple the communication lines (C_P and C_M in Figure 1). As discussed in the conclusion below, these two passive capacitors cost bring possibility of PoDL (Power over Data Line)and allows better protections of lines against DC shorts. Advantage e.g. in 48 V harness, etc. Supplying power over the data pair removes the need for separate power cabling, cutting system costs and reduce wiring-harness complexity.
- The cost of microcontrollers is outside of the scope of this document but is assumed to be basically equivalent.
- 10BASE-T1S may use a single 3.3 V supply (In **onsemi** device VBAT may be also connected to 3.3 V). Most CAN devices need a 5 V supply to interface the CAN bus; indeed as of today it is not possible to find a fully ISO11898-compliant CAN transceivers operating from a single 3.3 V supply
  In modern automotive designs, the 5 V rail is often only needed to supply CAN transceivers; the microcontroller and analogue circuitry is supplied from 3.3 V.
  The 10BASE-T1S solution can drop this supply rail, saving a regulator (normally an LDO).

The cost of transceivers represent the basic difference but needs to be viewed in the full system picture as indicated in the conclusion part.

Conclusion

This document focuses on an indicative cost comparison of 10BASE-T1S MAC-PHY and PMD nodes with most equivalent CAN HW node based on the concrete customer request. It cannot be viewed as a complete comparison analysis of both protocols.

Here are just a few comments to the fact that cost comparison needs to be done at system level while cost comparison of transceiver-related hardware only can be misleading.

The practical speed of CAN-FD is limited to 2 Mbps and CAN-FD SIC to 5 Mbps while offering relatively large network topology flexibility. CAN controllers are available in vast numbers of available microcontrollers.

10BASE-T1S offers 10 Mbps speed in a daisy chain configuration. 10BASE-T1S with PLCA has guaranteed maximum latency unlike CAN with its CSMA non-destructive arbitration.

10BASE-T1S brings several features not available with CAN transceivers. Most of the features are available with T30HM1TS2500 and will be available with NCV26004 with an adequate microcontroller.

- Physical layer offers possibility of PoDL and large DC short robustness
- Does not need 5 V supply; often this saves an entire supply rail
- Signal Quality Indicator (SQI)
- Pattern wake up, normal communication is not waking up the transceiver
- Wake-up forwarding capability (before wake-up of the microcontroller)
- Harness defect detection (HDD)
- Topology Discovery
- Timestamping
- Enhanced Noice Immunity (ENI)
- Security
- Seamless software integration in SDV
- Etc.

10BASE-T1S uses the Ethernet protocol. Thanks to that, it avoids the use of gateways between the Ethernet-based backbone network and the edge nodes, which is beneficial especially for the zonal architectures and Software Defined Vehicles (SDV).

References

[1] NCV7410, T30HM1TS2500, NCV26004, NCV7344 and NCV7343 datasheets www.onsemi.com

REVISION HISTORY

Revision	Description of Changes	Date
0	Initial document release.	2/25/2026
1	Chinese version added.	4/17/2026

ADDITIONAL INFORMATION

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