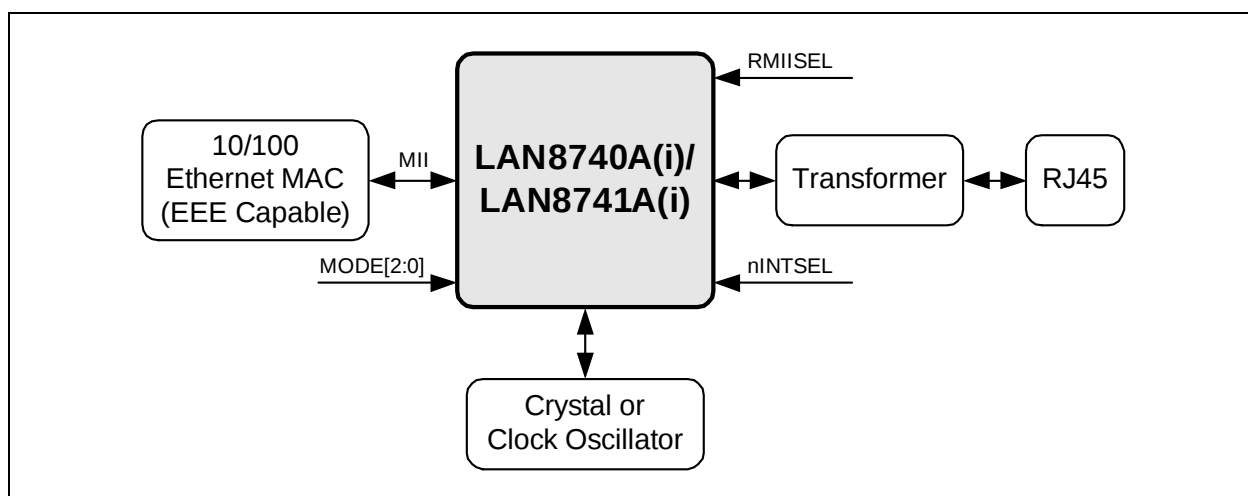


Enabling Energy Efficient Ethernet (EEE) Operation in the LAN8740A(i)/LAN8741A(i)

INTRODUCTION

The purpose of this application note is to detail the steps required to enable and utilize the EEE functionality of the LAN8740A(i)/LAN8741A(i). The LAN8740A(i)/LAN8741A(i) is a low-power 10BASE-T/100BASE-TX physical layer (PHY) transceiver with variable I/O voltage that is compliant with the IEEE 802.3, 802.3u, and 802.3az (EEE) standards. Energy Efficient Ethernet support results in significant power savings during low link utilizations. A typical LAN8740A(i)/LAN8741A(i) system block diagram can be seen in [Figure 1](#).

FIGURE 1: LAN8740A(i)/LAN8741A(i) SYSTEM BLOCK DIAGRAM



References

- LAN8740A(i) Data Sheet
- LAN8741A(i) Data Sheet

ENABLING EEE OPERATION

EEE functionality is disabled by default. EEE functionality can be enabled via the PHY Energy Efficient Ethernet Enable (PHYEEEEEN) bit of the EDPD NLP / Crossover Time / EEE Configuration Register (Register 16). In order for EEE to be utilized, the following conditions must be met:

1. The device must be configured in MII mode (RMIISEL configuration strap low).
2. The nINT/TXER/TXD4 pin must be configured as TXER/TXD4 (nINTSEL configuration strap low).
3. The Auto-Negotiation Enable bit of Basic Control Register (Register 0) should be set to 1. The default value of this bit after nRST depends on the MODE[2:0] straps.
4. The selected MAC and link-partner must support and be configured for EEE operation.
5. The device and link-partner must link in 100BASE-TX full-duplex mode.

AN 26.8

If the PHY Energy Efficient Ethernet Enable (PHYEEEEEN) bit of the EDPD NLP / Crossover Time / EEE Configuration Register (Register 16) is set, then the following register bits are set:

1. **100BASE-TX EEE bit of the MMD EEE Capability Register**
If PHY Energy Efficient Ethernet Enable (PHYEEEEEN) bit is 1, then this field is 1 and 100BASE-TX EEE capability is supported.
2. **100BASE-TX EEE bit of the MMD EEE Advertisement Register**
If PHY Energy Efficient Ethernet Enable (PHYEEEEEN) bit is 1, then this field is 1 and 100BASE-TX EEE capability is advertised.

After setting the PHY Energy Efficient Ethernet Enable (PHYEEEEEN) bit, Auto-Negotiation must be restarted by setting bit 9 of the Basic Control Register (Register 0).

SOFTWARE DRIVER CHANGES

Once the hardware straps have been configured as detailed in [Enabling EEE Operation](#), the EEE functionality must be enabled by the MAC driver. The general approach is for the MAC driver to enable EEE functionality if the PHY is capable of EEE. Refer to the steps below for implementing the changes required to the MAC driver PHY initialization.

1. The PHY initialization routine reads the PHY ID 1 (Register 2) and PHY ID 2 (Register 3) registers
2. If the PHY ID matches as the LAN8740A(i)/LAN8741A(i), proceed to step 3, else return error
3. Set the PHY Energy Efficient Ethernet Enable (PHYEEEEEN) bit of the EDPD NLP / Crossover Time / EEE Configuration Register (Register 16)
4. Set the Auto-Negotiation enable bit in the Basic Control Register (Register 0)
5. Restart Auto-Negotiation by writing 1 to bit 9 of Basic Control Register (Register 0)

APPENDIX A: APPLICATION NOTE REVISION HISTORY

TABLE A-1: CUSTOMER REVISION HISTORY

Revision Level & Date	Section/Figure/Entry	Correction
DS00002977A (02-19-19)	Replaces previous SMSC version Rev. 1.1 (04-18-13)	
Rev. 1.1 (04-18-13)	Replaced LAN8740i/LAN8741i with LAN8740Ai/LAN8741Ai throughout document.	
Rev. 1.0 (04-04-13)	All	Initial Release

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ISBN: 9781522441748

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