TLK110 Power Back Off for Short Cables

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ABSTRACT

The TLK110 Ethernet PHY has a special mode that allows for power reduction when the PHY is used in an Ethernet system with cables shorter than the IEEE 802.3-specified, 100 m. This mode allows the flexibility of reducing system power when the device isn't needed to drive the IEEE 802.3 100-m cable length or the extended 150-m, error-free cable reach of the TLK110.

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1 Application Description and Measurement

Through the use of the programmable Power Back Off (PBO) levels of the TLK110, significant power consumption is saved by transmitting with a lower amplitude TX signal. Application testing of this mode was done using a Device Under Test (DUT) and Link Partner (LP). The combination used was the TLK110 (DUT) and the TLK110 (LP) and also a reference point with a TLK110 (DUT) and DP83848 (LP) while monitoring for 0 bit error rate (BER) to find the maximum cable reach at each PBO level. Testing was done using the TLK110 Evaluation Module (TLK110CUSEVM).

The following table allows the use of the PBO settings according to the system network characteristics needed and the recommended TX PBO level. Each PBO level is mapped to a maximum reachable (0 BER) cable length.

Device Under Test	Link Partner	Maximum Cable Length (m)	TLK110 Power Back Off Level	Power Savings (mW)
TLK110	TLK110	150	N/A	N/A
TLK110	TLK110	5	Level 1	50
TLK110	TLK110	80	Level 2	39
TLK110	TLK110	100	Level 3	26
TLK110	TLK110	140	Level 4	12
TLK110	DP83848	70	Level 2	39

All values above were measured under a single voltage supply setup of 3.3 V.

Use the PBO mode in the PHY with register 0xAE, bits 8:6. The following bits map to the PBO levels:

Register 0xAE bits 8:6	Power Back Off Level
000	Normal Operation
001	Level 1
010	Level 2
011	Level 3
1xx	Level 4

2 Application Hints and Comments

- If PBO is used, it is recommended that both link partners are TLK110 PHYs using PBO. In this case, the power saving doubles since both link partners can be configured using PBO.
- The link with PHYs from most other vendors performs correctly when using the PBO mode in the TLK110. The maximum cable reach under these different pairing combinations may deviate from the measured results in this application report.
- The link may not be established with PHYs from some vendors when using PBO setting at level 1. Use other PBO settings to establish the link with these PHY's while addressing which PBO level is used for an appropriate system-level maximum cable length with that PBO level and LP PHY combination.

3 Summary

Significant system and PHY power reduction is achieved with the PBO mode of the TLK110 PHY. The impact is doubled when using a TLK110 linked to another TLK110, since both can use this mode. It is possible to save system-level power when a TLK110 is linked to another PHY as well, but the power savings are only in the single TLK110.

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