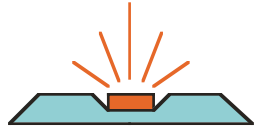


POF Fast Ethernet Transceivers

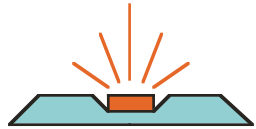
FGT 5.4.1 Fachgruppentreffen 9.03.04

Hans Kragl
DieMount GmbH
Konrad-Zuse-Straße 14
99099 Erfurt

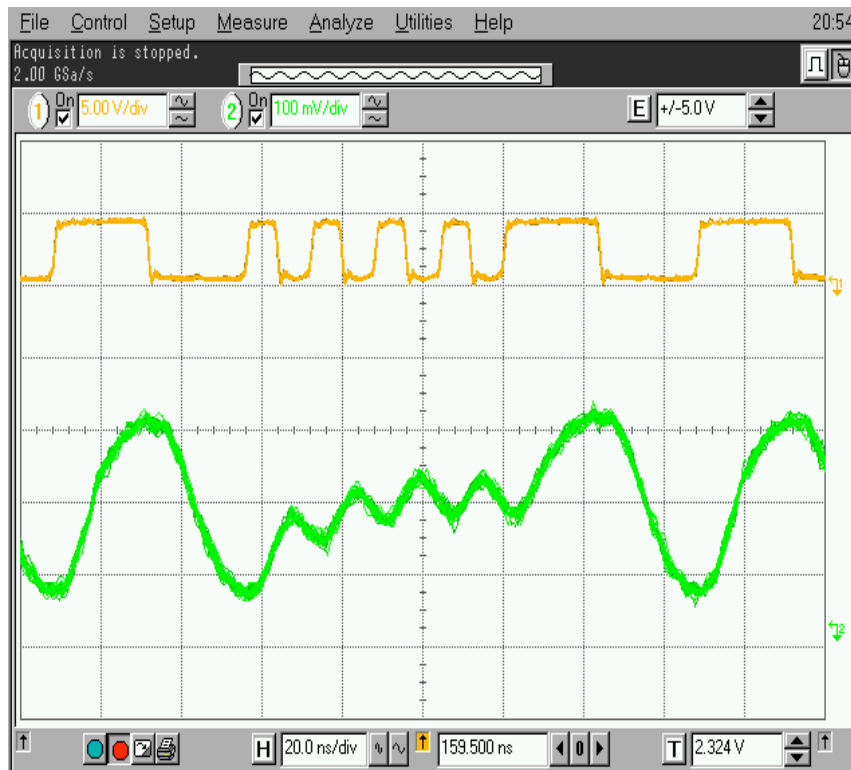
www.diemount.com



1. **Dispersion: challenge for high data rate POF systems**
2. **Electronic dispersion compensation**
 - High pass receivers
 - Available transceiver devices
3. **Fast Ethernet POF-transceiver modules and applications**
 - 1x9 transceivers for duplex cables
 - Fast Ethernet media converters
 - Applications
4. **Field tests**

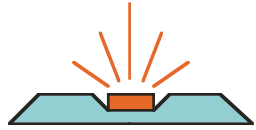


Fast Ethernet data transmission

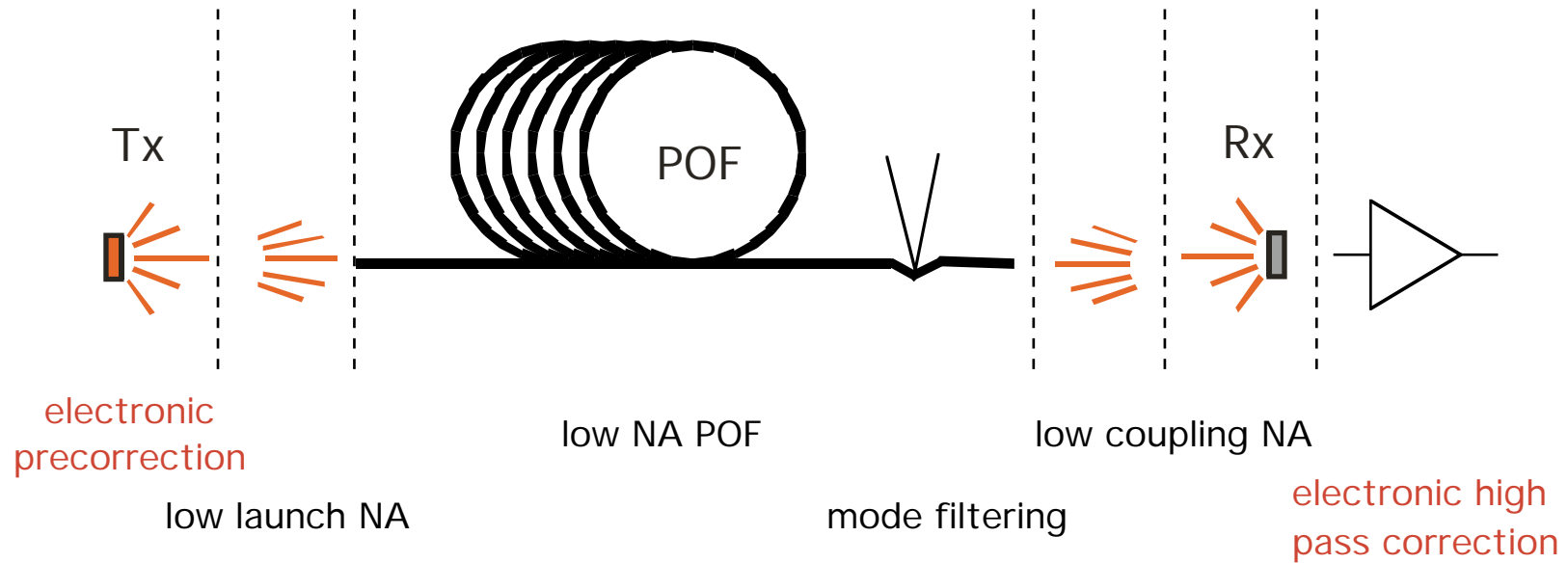


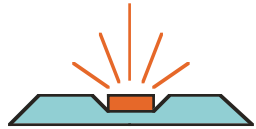
electrical data signal

analog optical signal after
150m transmission over
standard POF TC-1000



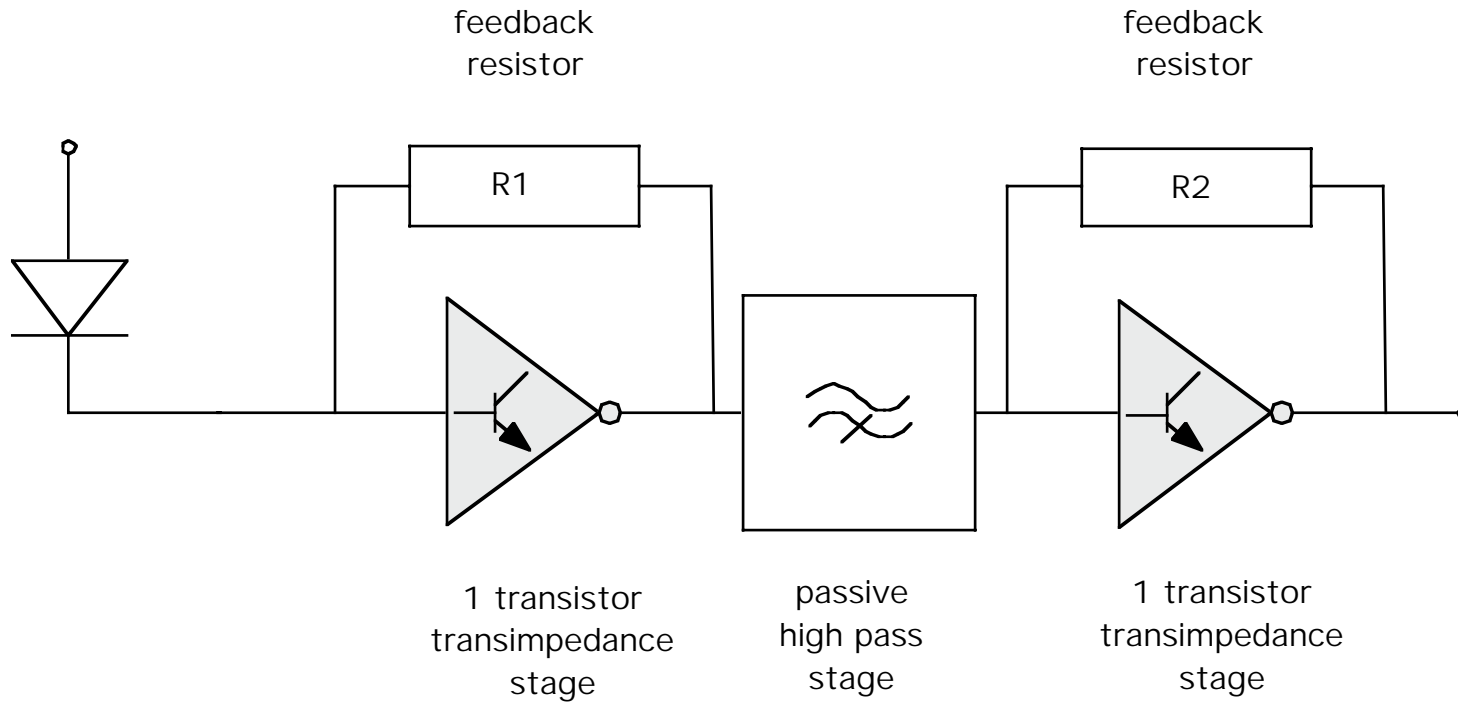
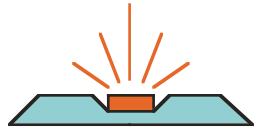
Options to compensate POF dispersion:





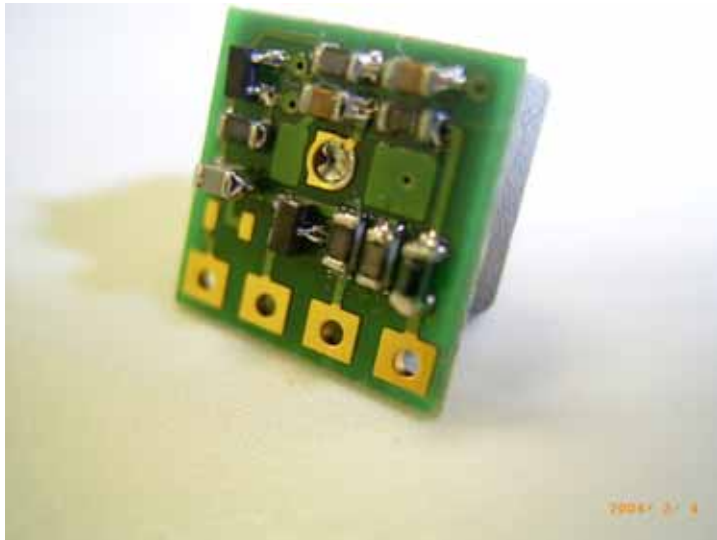
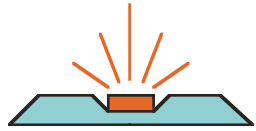
| | preliminary assessment |
|----------------------------|---|
| Tx electronic compensation | • inexpensive, but limited efficiency (+) |
| Low launch NA | • mechanical design changes necessary (-) • enclosed to standard draft |
| Low NA POF | • at present low NA POF prices are high (- -) • enclosed to standard draft |
| Mode filtering | • not feasible in practical use (- - -) |
| Low coupling NA | • mechanical design changes necessary (-) |
| Rx high pass correction | • inexpensive (+) |

Each dispersion compensation means reduces power and signal budget, respectively.



- R1, R2 big: high gain, low bandwidth, low saturation level
- R1, R2 small: small gain, high bandwidth, high saturation level

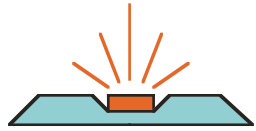
➡ **Receiver may be matched to various system requirements!**



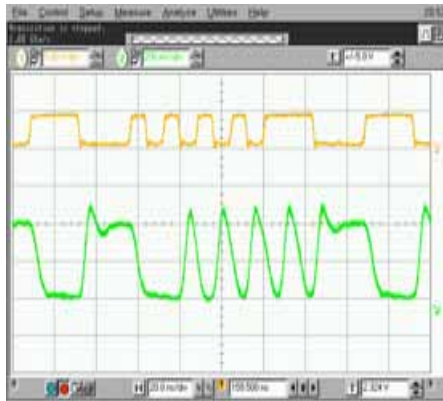
Standard electronic processes allow

- flexible (numbers, design)
- variable (circuitry)
- low cost

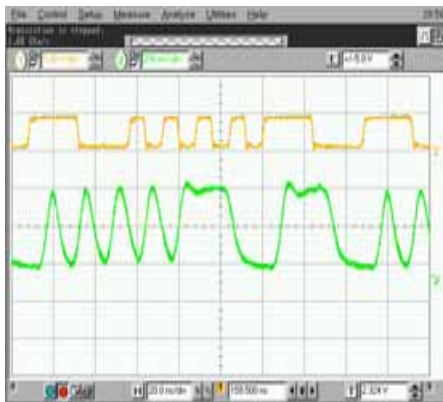
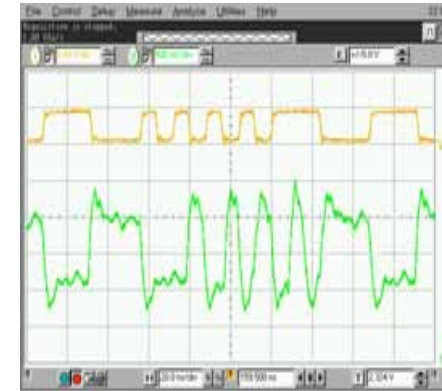
fabrication.



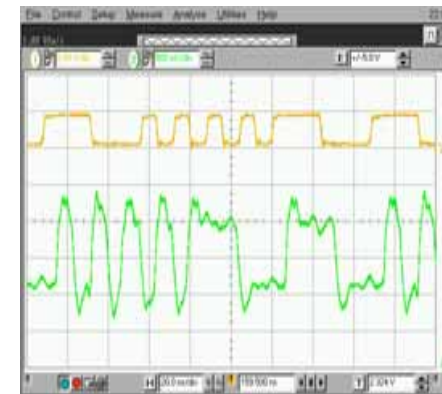
Tx: 470nm LED transmitter, switch version, +3.5dBm signal on power



1m TC1000

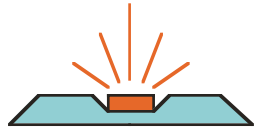


50m TC1000

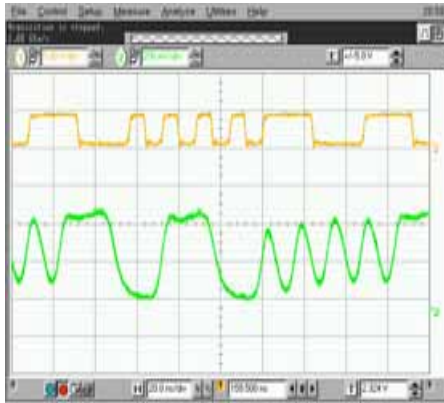


green: **analog** optical signal

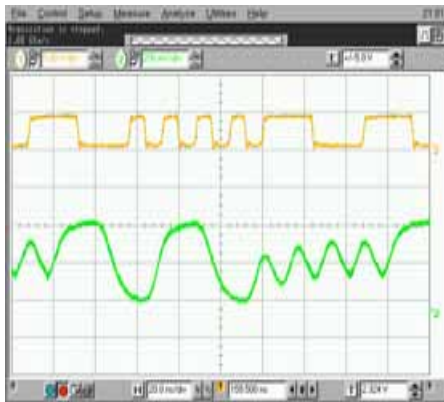
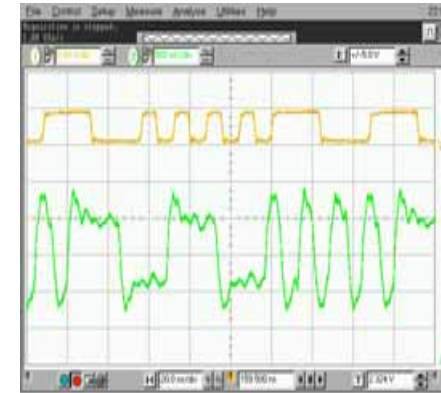
green: received optical signal (1x9 output)



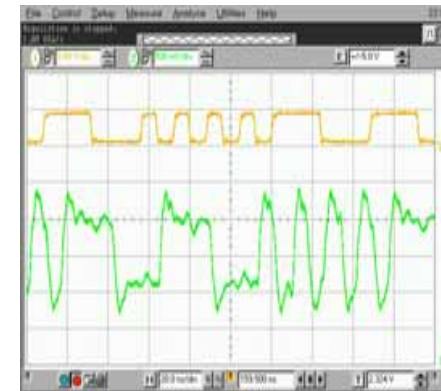
Tx: 470nm LED transmitter, switch version, +3.5dBm if signal on



70m TC1000

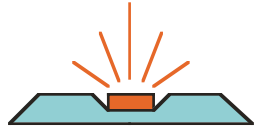


100m TC1000

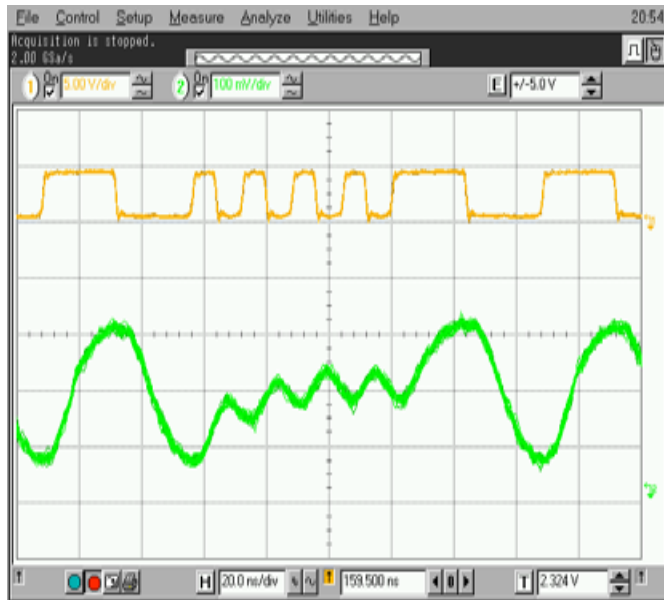


green: **analog** optical signal

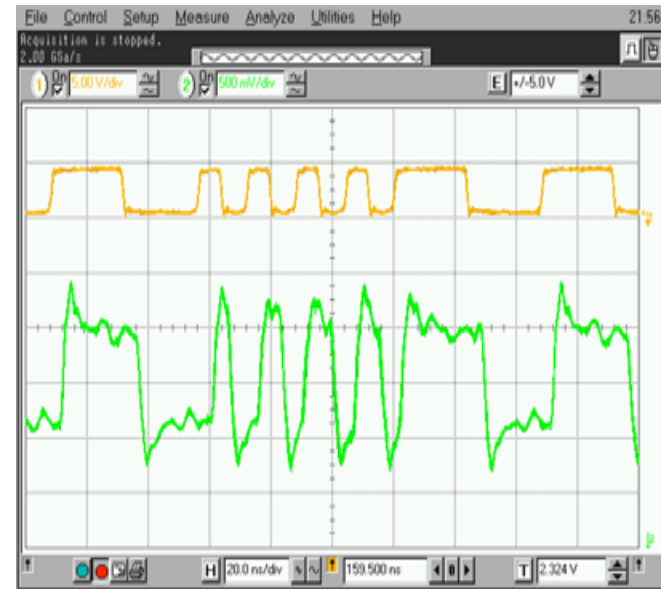
green: received optical signal (1x9 output)



Tx: 470nm LED transmitter, switch version, +3.5dBm if signal on



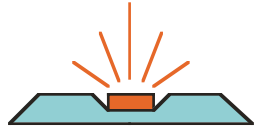
150m
TC1000



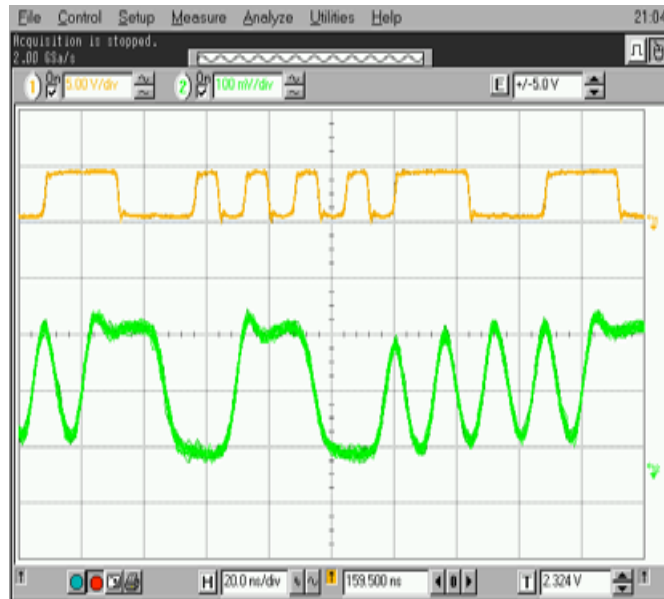
green: **analog** optical signal

green: received optical signal
(1x9 output)

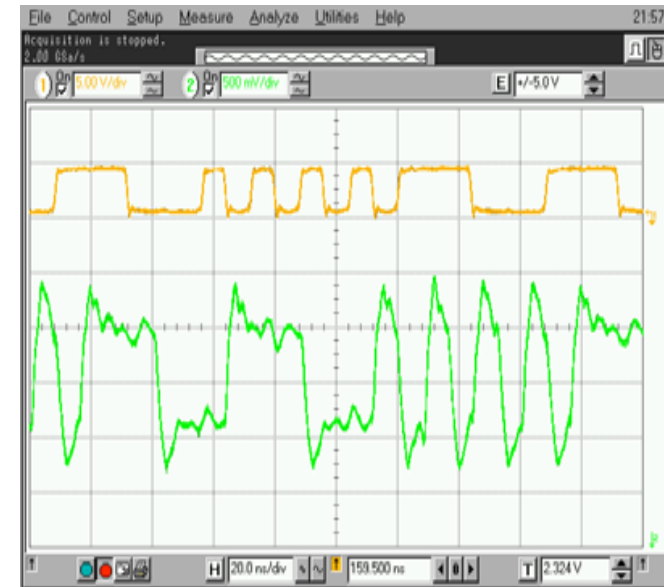
> **150m POF distances need higher receiver sensitivity.**



Tx: 470nm LED transmitter, switch version, +3.5dBm if signal on



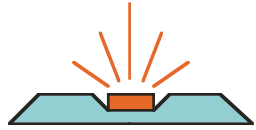
100m
LowNA POF
(MH4001)



green: **analog** optical signal

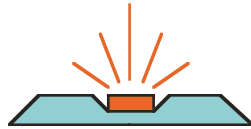
green: received optical signal
(1x9 output)

High pass receivers render LowNA POF superfluous (at least for Fast Ethernet signals!).

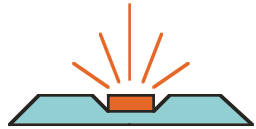


High pass filter in the receiver unit

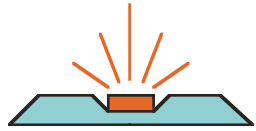
- are the most efficient dispersion compensation means for POF-links.
- they generate no additional costs.
- all other dispersion compensation means are less efficient and/or more expensive.



| <i>type</i> | <i>Satura- tion level</i> | <i>sensitivity</i> <i>(in combination</i> <i>with DieMount</i> <i>1x9 module)</i> | <i>application</i> <i>(data rate: Fast Ethernet)</i> |
|---|-------------------------------|--|--|
| Rx8st (flat frequency response) | >0dBm | -24dBm | low dispersion fibers, splitting systems and low distance transmission |
| Rx8hp (high pass frequency response) | 3dBm | -22dBm | duplex standard POF systems up to 100m |
| XX (in preparation) | -10dBm | -30dBm | bidirectional WDM-systems for simplex POF |



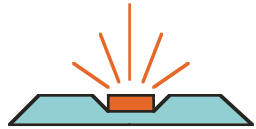
| <i>type</i> | <i>Optical on power in standard POF</i> | <i>Optical off power in standard POF</i> | <i>application</i> <i>(data rate: Fast Ethernet)</i> |
|-------------------------------------|---|--|--|
| Tx3sw 645nm (switch version) | +1dBm | -18dBm | Up to 100m standard POF with high pass receiver |
| Tx3md 645nm (modulation version) | 0dBm | -4.5dBm | with flat frequency response receivers and LowNA POF |
| Tx3sw 520nm | -3.5dBm | – | Up to 100m standard POF or LowNA POF with high pass receiver |
| Tx3sw 470nm | +6.5dBm | – | Test equipment for Fast Ethernet systems |



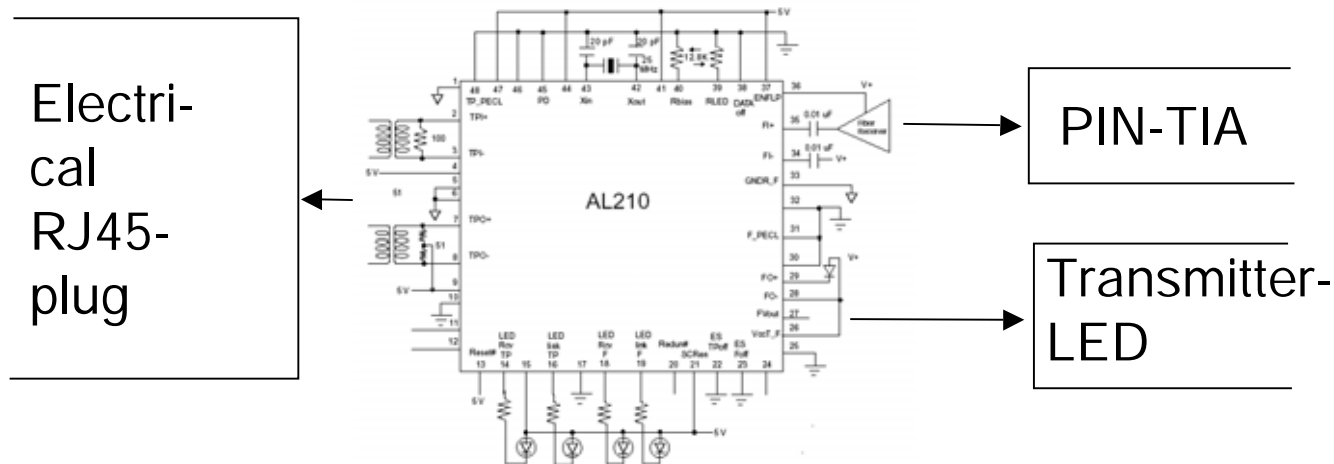
1x9 Fast Ethernet
transceiver module

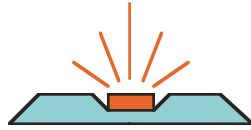


Fast Ethernet media converter

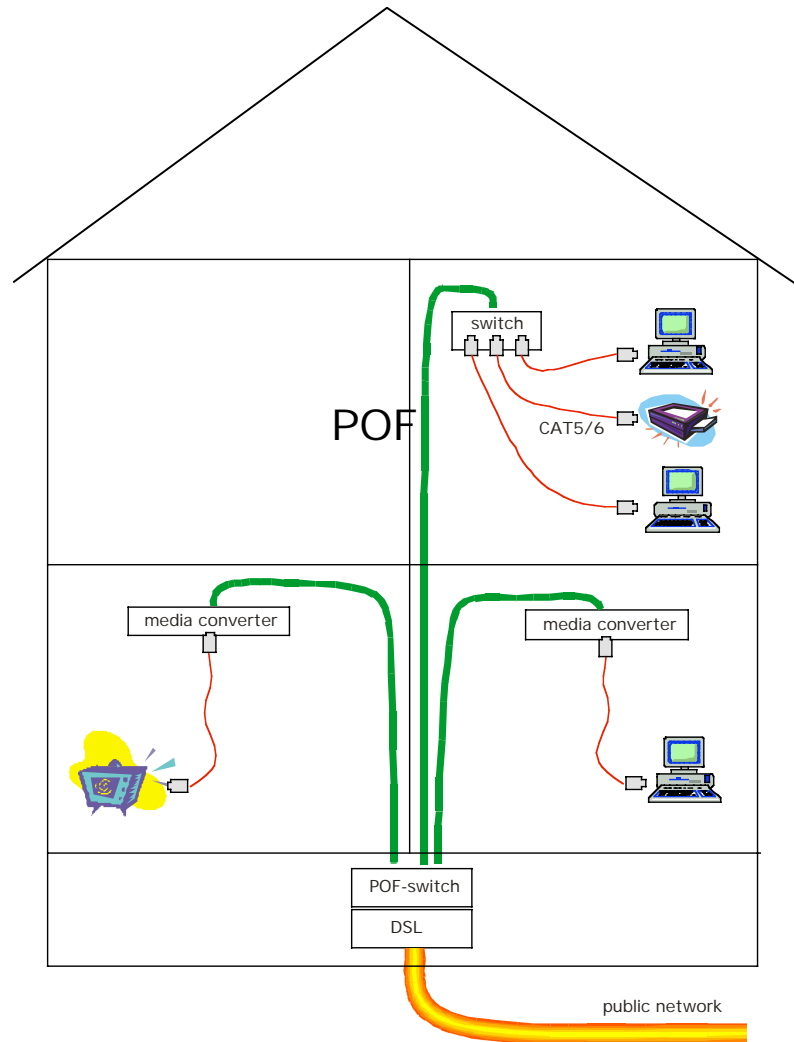
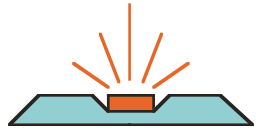


- MicroLinear and AllLayer offer fast ethernet physical layer circuits comprising LED-driver and post amplifier
- An “integrated” media converter may save 1x9 components and costs, respectively.





| | | | | |
|------------------------------|----------------------------------|---|--------------------------------------|---|
| <i>system application</i> | Fast Ethernet industrial systems | Fast Ethernet LAN | Fast Ethernet Home Network | FTTH (fiber to the home) by Fast Ethernet |
| <i>transmission distance</i> | 50m | 100m | 50m | >120m |
| <i>cable type</i> | duplex | duplex | duplex, but <u>simplex preferred</u> | duplex |
| <i>actual situation</i> | standard draft released | transceiver products + standard missing | ready for test installation | LED and system investigation necessary |



- POF-switch at DSL node
- POF-switch for network connection of >2 sets/room
- POF-media converter for network connection of 1 set/room (power supply from set)