Extended Common Mode LVDS Solutions

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20th SpaceWire Working Group meeting

2013, April 10th, 16:40 – 17:00

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Outline

- Last Meeting State
- Measurement Results
- Components Development
- Features Development
- Radiation Test Results
- Conclusion

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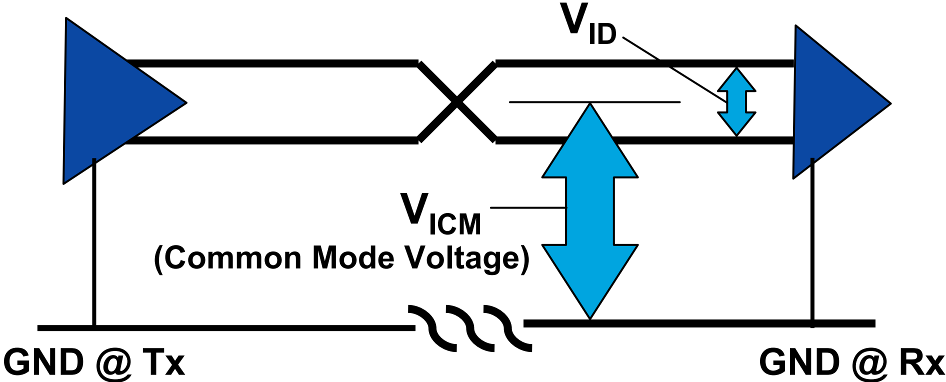
Last Meeting State

TELEFUNKEN Semiconductors Extended Common Mode LVDS

- SOI technologies: 0.35µm, 0.8µm
  - robustness: ≤ 200V, no Latch-Up
  - efficiency: LV & HV on die, 0.8µm isolation ≤ 100V
  - suitable for harsh and radiation environments
- Competitive high-speed performance and efficiency of LVDS
- Robustness of RS-485/422
- Common mode rejection to be measured
- Failsafe to be improved
- Cold spare capability to be improved
- Further radiation tests to be done

Extended Common Mode Measurements

Data Rate (PRBS23) = 200Mbps, V_{ID} = 200mV, V_{ICM} settings:



12V

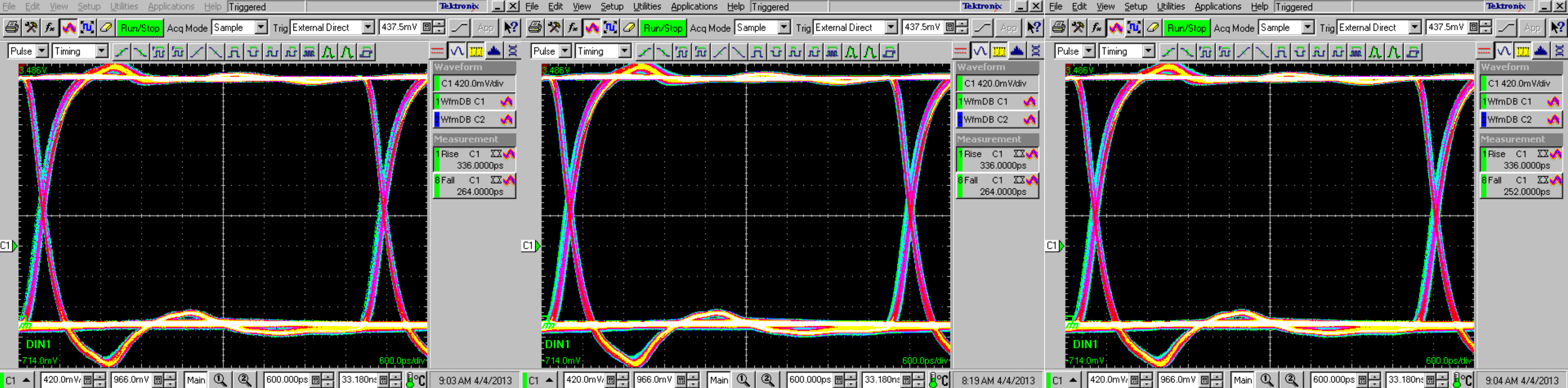
1.2V

- 7V

V_{ICM} = -7V

V_{ICM} = 1.2V

V_{ICM} = 12V



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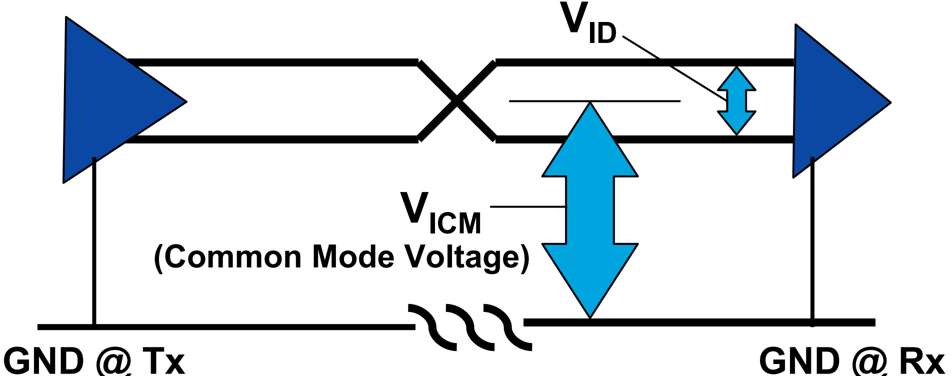
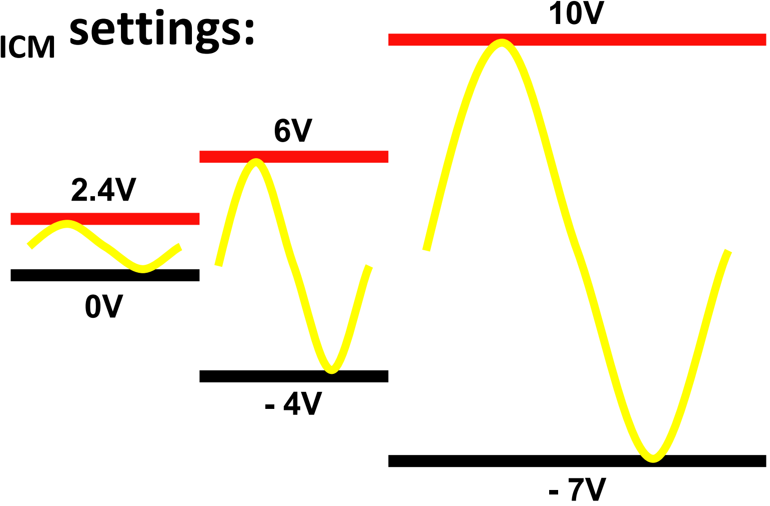
Extended Common Mode Measurements (2)

Data Rate (PRBS23) = 200Mbps, V_{ID} = 200mV, V_{ICM} settings:

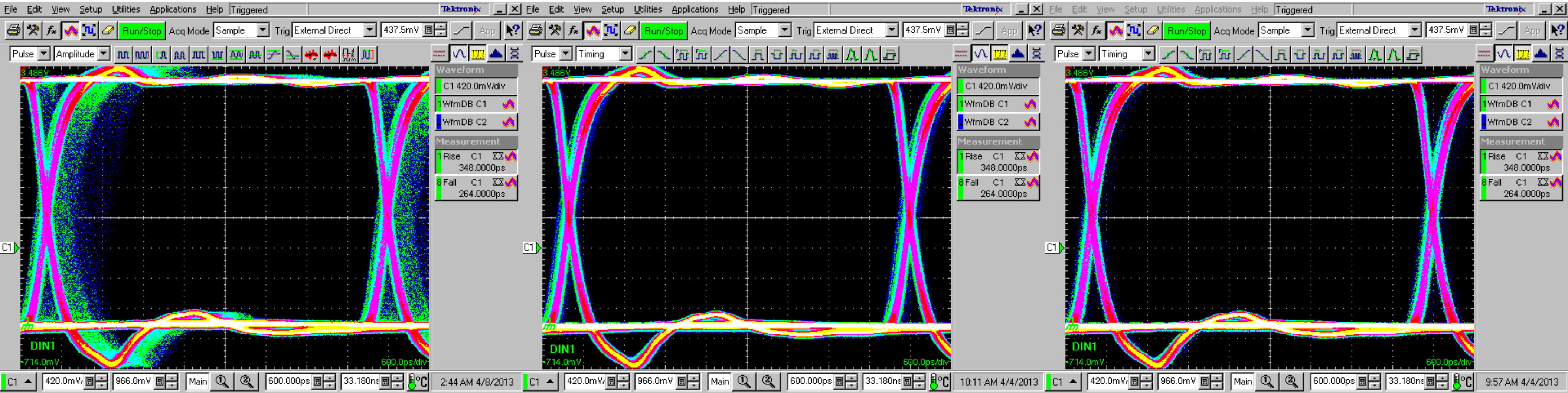




$0V \leq V_{ICM} \leq 2.4V$, f = 2kHz

$-4V \leq V_{ICM} \leq 6V$, f = 250Hz

$-7V \leq V_{ICM} \leq 10V$, f = 150Hz



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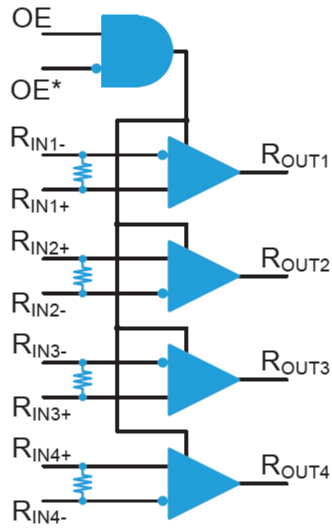
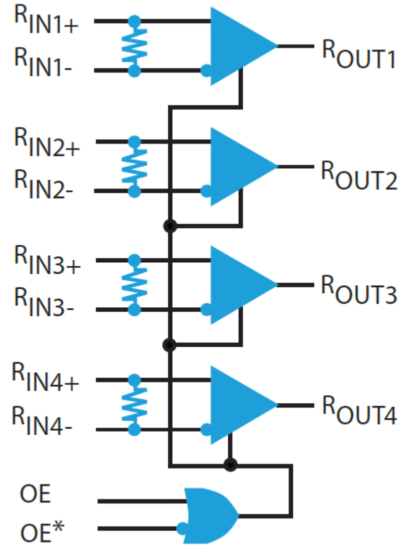
Introduced Components

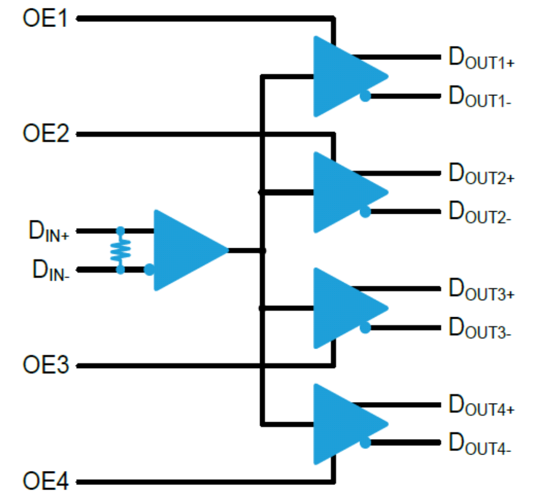
TF90LVDS048



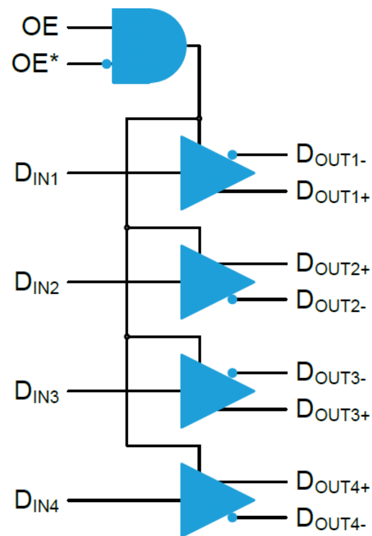
TF90LVDS032



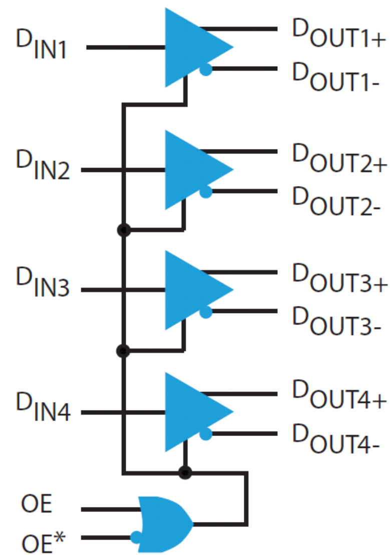
TF90LVDS104



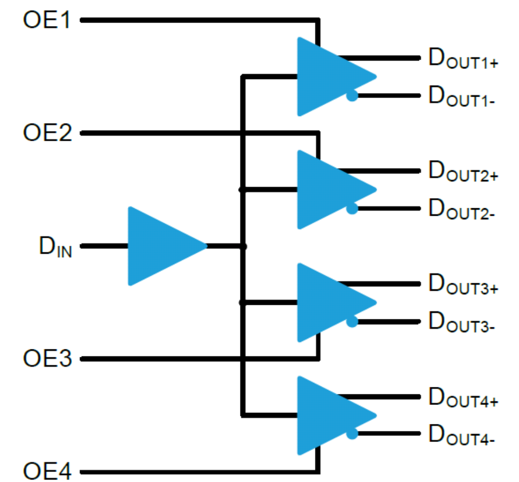
TF90LVDS047



TF90LVDS031



TF90LVDS105



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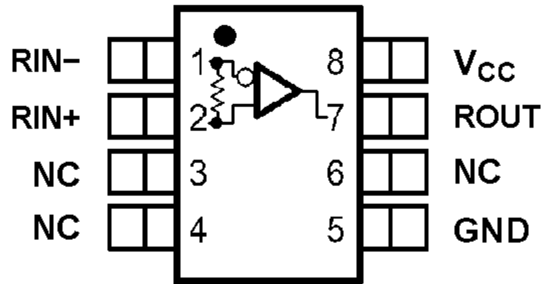
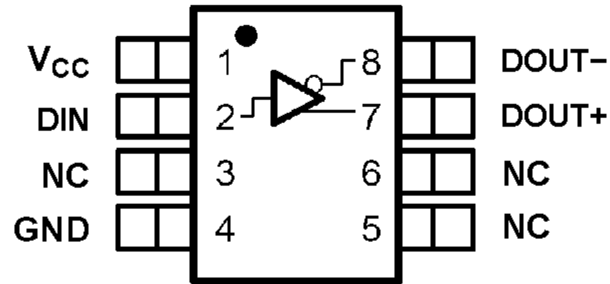
Future Components

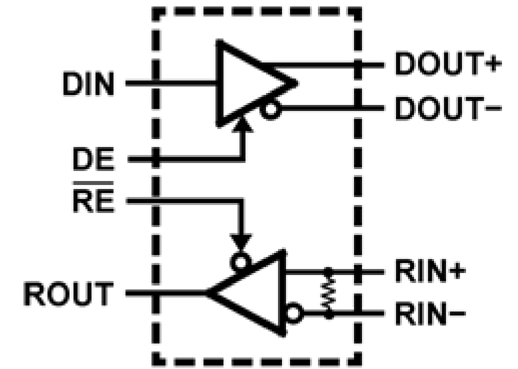
TF90LVDS018



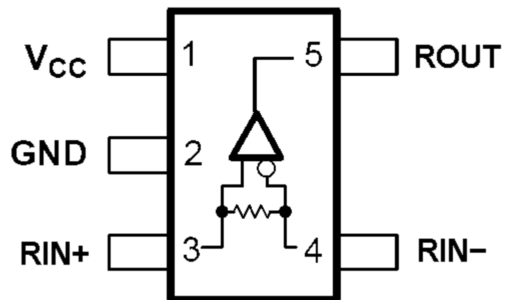
TF90LVDS017



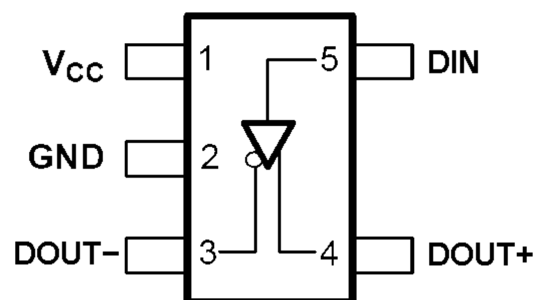
TF90LVDS019



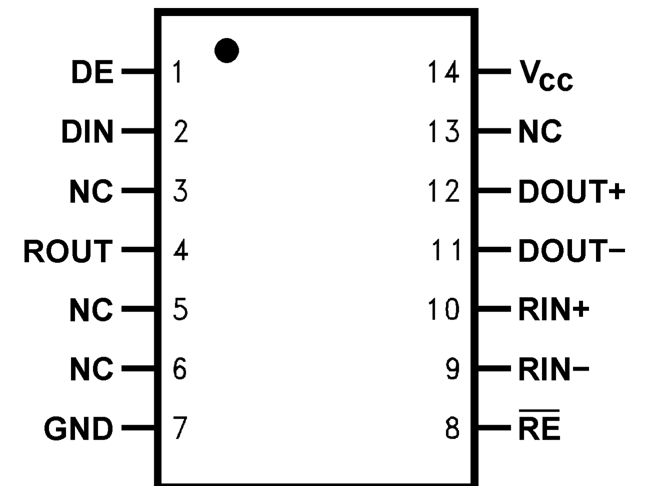
TF90LVDS012



TF90LVDS011

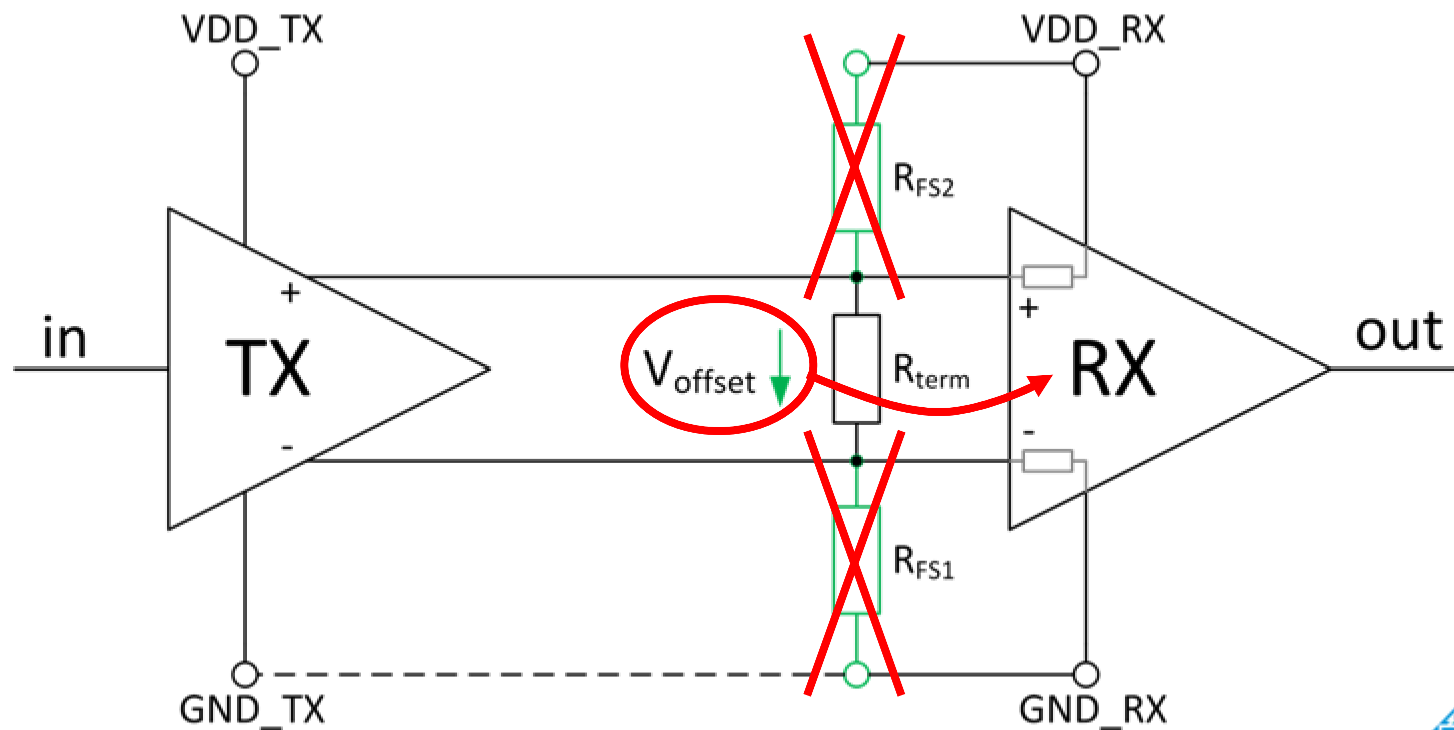


TF90LVDS019



Improved Features

- Failsafe Functionality
  - implement feature in the receiver
- Cold Spare Capability



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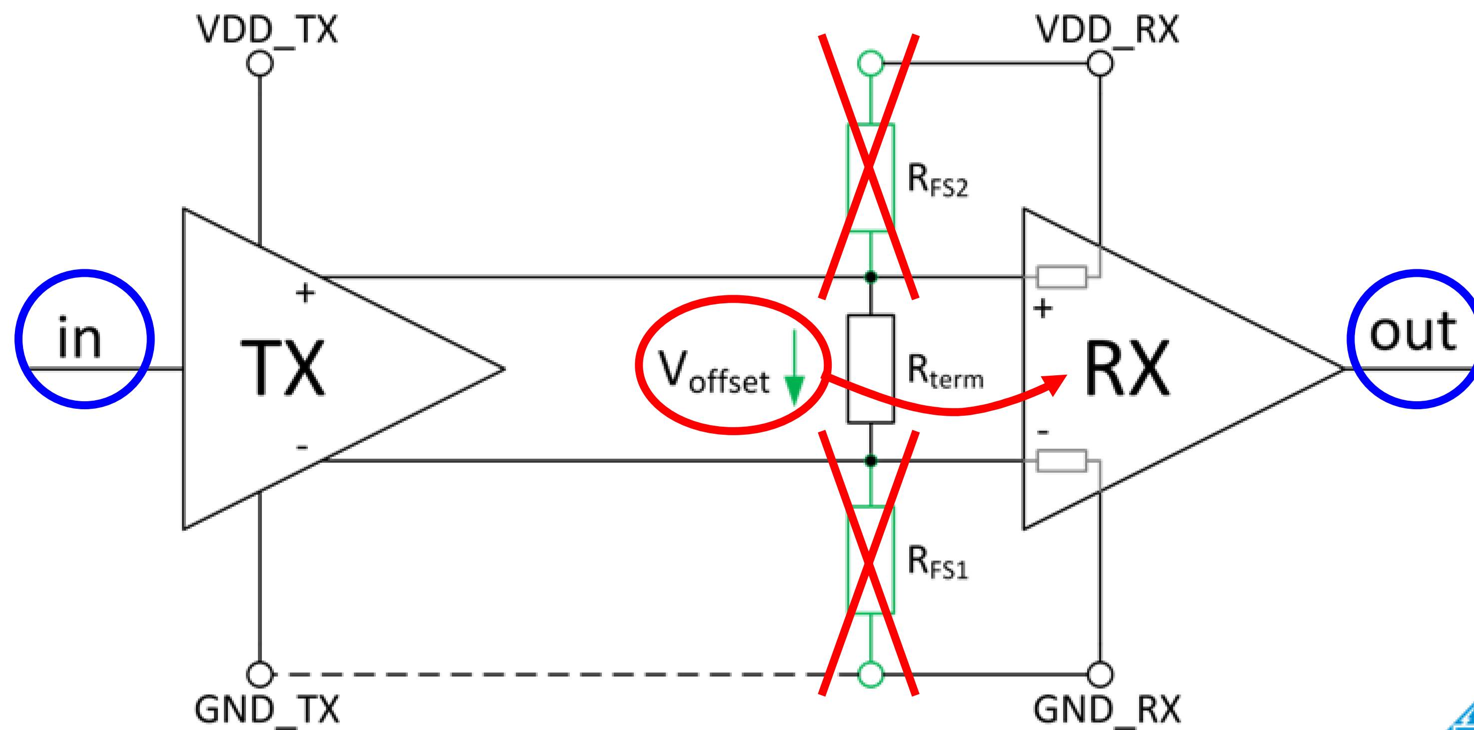
Improved Features

- Failsafe Functionality
- Cold Spare Capability
  - available on LVDS side
  - implement feature on CMOS side



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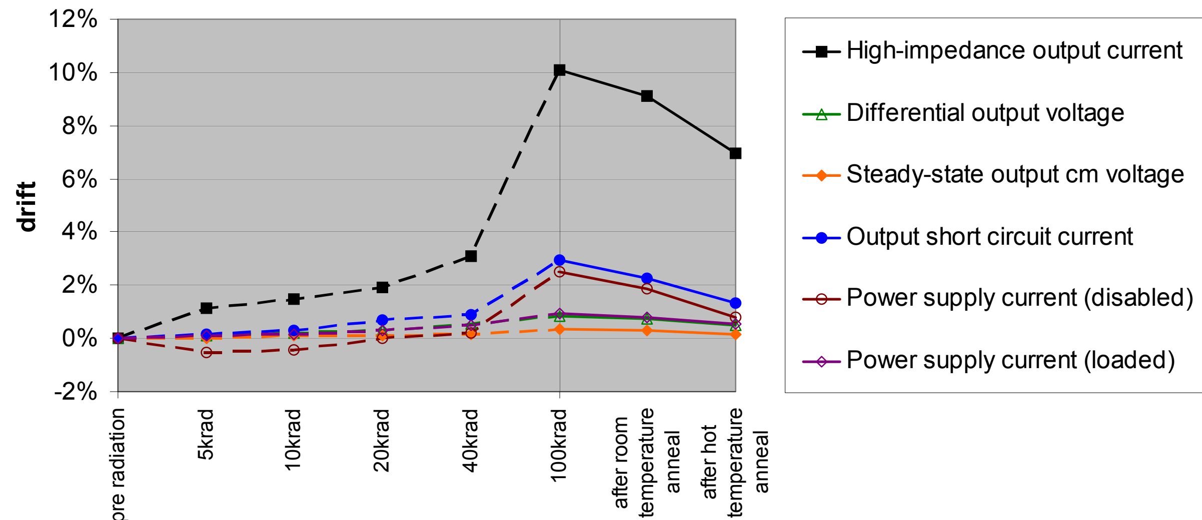
Preliminary
TID Radiation Test

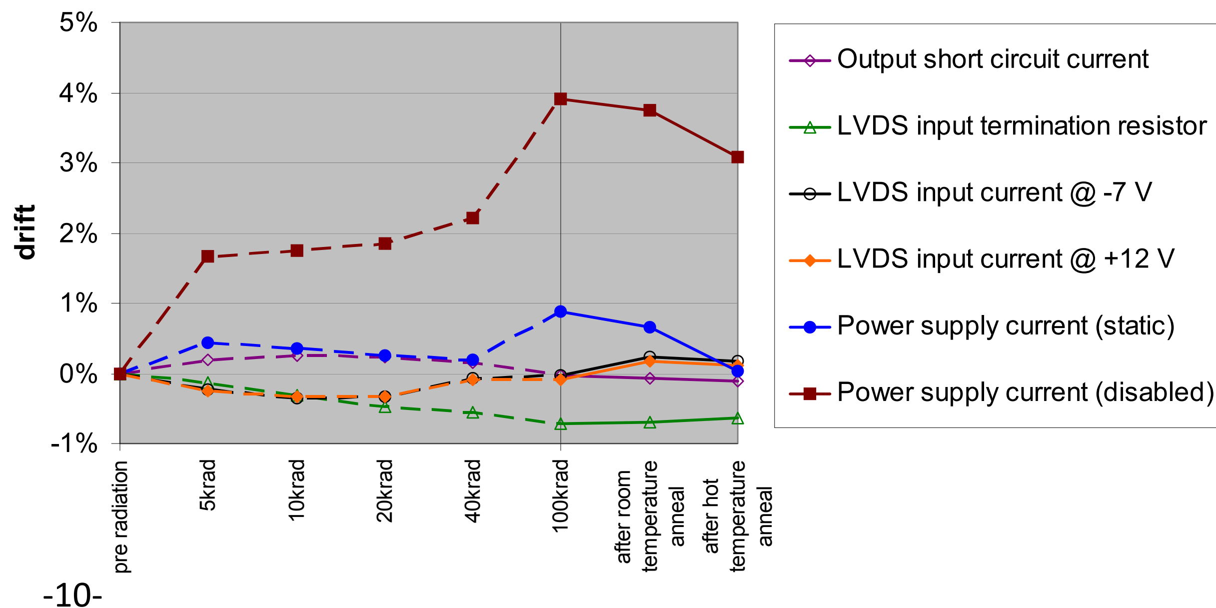
Conditions

- TID without applied bias
- 5 TID groups
- Dose rate: 75 rad/min (^{60}Co source)
- Room temperature annealing
- Hot temperature annealing
  100°C for 5 h

Results

- Minor shifts in key data sheet parameters after TID irradiation up to 100krad
- None of the component specifications are violated
    - all tested parts keep their complete functionality





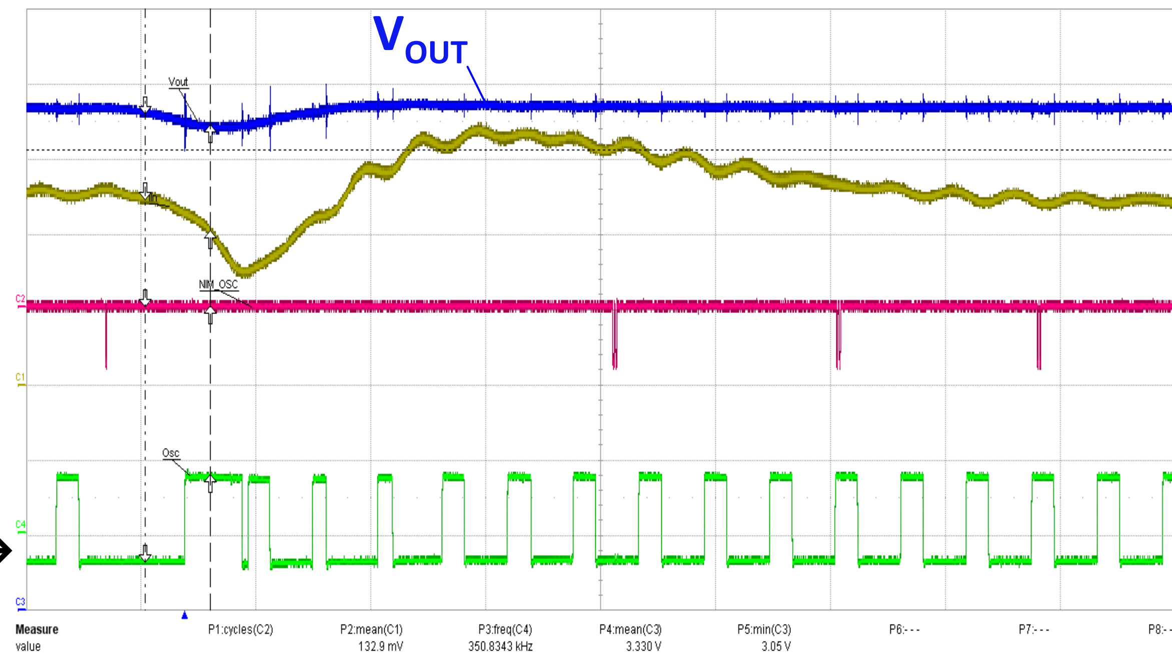
New Results: SEE Heavy Ions Test

LVDS Receiver & Driver

- SEE test is being prepared and will follow very soon

Point-of-Load Converter

- same technology as LVDS components
- utilizing all technology devices used in LVDS components
- $V_{IN} \leq 26V$, $I_{OUT} \leq 3A$
- SEE 60.7MeV/(mg/cm2): no fails; SET→



Acknowledgement

- Many thanks to ESA/ESTEC for preparing and performing the SEE tests:
  - Giorgio Magistrati
  - Gianluca Furano
  - Farid Guettache

Conclusion

- Extended Common Mode LVDS is still challenging application
- The components from TELEFUNKEN Semiconductors are showing good common mode rejection
  - High frequency CM-noise have to be filtered
- TELEFUNKEN Semiconductors is testing new features
  - Improved failsafe functionality
  - Full cold spare capability
- Radiation tests
  - Good results until now
  - SEE test of LVDS will follow
  - TID test with applied bias will follow

Thank you for your attention!

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