

RPC Front-End chip

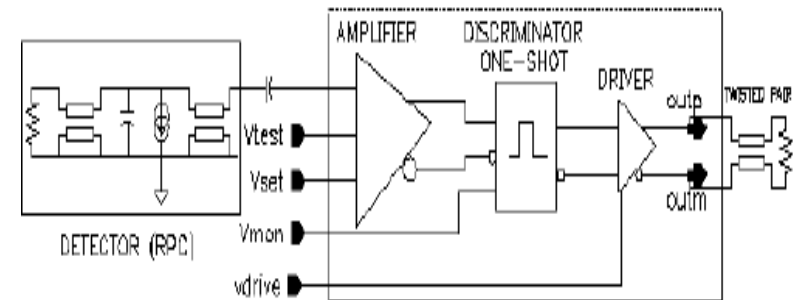


- Shape of the signal: $I(t) = \exp(t/\tau)$ ($0 \leq t \leq 15$ ns)
- Strip line 1.3 m long and 2-4 cm wide:
 - $15 \Omega \leq R_0 \leq 40 \Omega$
 - $160 \text{ pF} \leq C_{\text{strip}} \leq 350 \text{ pF}$
 - Propagation delay ≈ 5.5 ns/m
- Input dynamic range: $20 \text{ fC} \leq Q_{\text{in}} \leq 20 \text{ pC}$

The circuit

Six channels, each one consisting of:

- charge amplifier
- leading-edge discriminator
- one-shot
- differential line driver



Amplifier characteristic:

- Current sensitive preamplifier:
 - $R_{\text{in}} = 30 \Omega$ at the signal frequencies (100 MHz)
 - Dominant pole ~ 180 MHz
- Gain stage:
 - Dominant pole ~ 18 MHz
 - Charge sensitivity $\sim 1.6 \text{ mV/fC}$
 - Power consumption $\sim 7 \text{ mW}$
 - ENC_{TOT} (strip connected and terminated) $\leq 1.6 \text{ fC}$

Discriminator + One-shot characteristics:

- $10 \text{ fC} \leq Q_{\text{th}} \leq 300 \text{ fC}$
- $70 \text{ ns} \leq T_{\text{W}} \leq 200 \text{ ns}$
- Power consumption $\sim 7 \text{ mW}$

Output stage characteristics:

- Output Voltage swing: 0-300mV
- $R_0 = 110 \Omega$
- 5 mW (high impedance) \leq Power consumption $\leq 17 \text{ mW}$ (110Ω)

