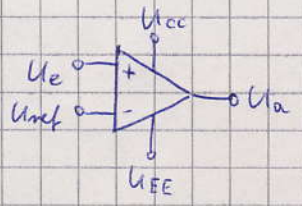
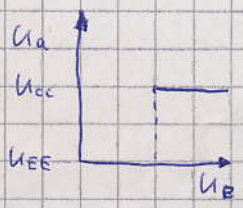
Komparatoren



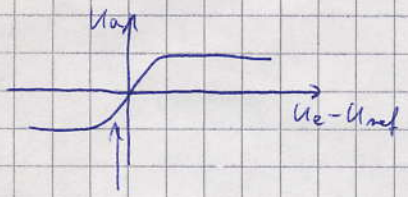


Realisierung ähnlich OPV, aber andere Zieldaten

- hohe Verstärkung
- geringer Offset
- sehr hohe Slew Rate
- keine Gegenkopplung → Stabilität unwichtig

→ Folie ADCMP580

Ausgangspunkt: Differenzstufe

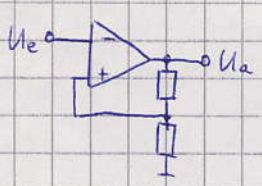


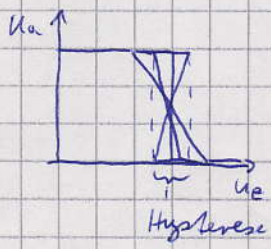
Maximierung des Ausstieges → Folie

Möglichkeiten:

- Erhöhung von g_m
- Erhöhung der R_c

⇒ Mitkopplung





→ Folie Hysterese

Problem: - kein U_{ref} - Eingang vorhanden,
U_{ref} wird durch Schaltungsdimensionierung bestimmt

↳ Erweiterung der Schaltung, getakteter Komparator
↳ Folie getakteter Komparator

Phase 1) $U_x > 0$, normaler Differenzverstärker arbeitet, $U_a = v(U_e - U_{ref})$
Phase 2) $U_a(0) = v(U_e - U_{ref})$
- mitgekoppelte Struktur aktiv
- Differenzverstärker deaktiviert

Ultrafast SiGe Voltage Comparator

Preliminary Technical Data

ADCMP580/ADCMP581/ADCMP582

FEATURES

150 ps propagation delay
25 ps overdrive and slew rate dispersion
8 GHz equivalent input rise time bandwidth
100 ps minimum pulse width
35 ps typical output rise/fall
10 ps deterministic jitter(DJ)
200 fs random jitter (RJ)
−2 V to +3 V input range with +5 V/−5.2 V supplies
On-chip terminations at both input pinsl
Resistor-programmable hysteresis
Differential latch control
Power supply rejection > 70 dB

APPLICATIONS

Automatic test equipment (ATE)
High speed instrumentation
Pulse spectroscopy
Medical imaging and diagnostics
High speed line receivers
Threshold detection
Peak and zero-crossing detectors
High speed trigger circuitry
Clock and data signal restoration

GENERAL DESCRIPTION

The ADCMP580/ADCMP581/ADCMP582 are ultrafast voltage comparators fabricated on Analog Devices, Inc.'s proprietary XFCB3 Silicon Germanium (SiGe) bipolar process. The ADCMP580 features CML output drivers; the ADCMP581 features reduced swing ECL (negative ECL) output drivers; and the ADCMP582 features reduced-swing PECL (positive ECL) output drivers.

The three comparators offer 150 ps propagation delay and 100 ps minimum pulse width for 10 Gbps operation with 200 fs random jitter (RJ). Overdrive and slew rate dispersion is typically less than 25 ps.

FUNCTIONAL BLOCK DIAGRAM

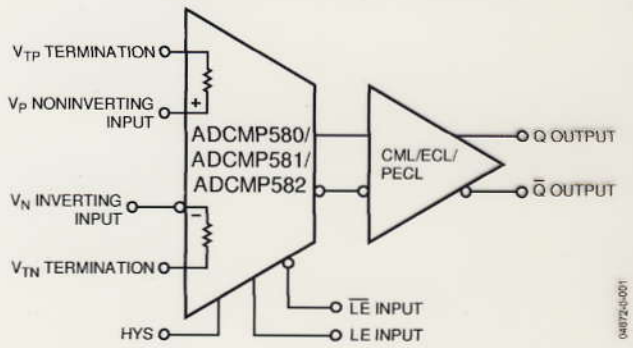


Figure 1.

The ±5 V power supplies enable a wide −2 V to +3 V input range with logic levels referenced to the CML/NECL/PECL outputs. The three inputs have 50 Ω on-chip termination resistors with the optional capability to be left open (on an individual pin basis) for applications requiring high impedance input.

The CML output stage is designed to directly drive 400 mV into 50 Ω transmission lines terminated to ground. The NECL output stages are designed to directly drive 400 mV into 50 Ω terminated to −2 V. The PECL output stages are designed to directly drive 400 mV into 50 Ω terminated to V_{CCO} − 2 V. High speed latch and programmable hysteresis are also provided. The differential latch input controls are also 50 Ω terminated to an independent V_{TT} pin to interface to either CML or ECL or to PECL logic.

The ADCMP580/ADCMP581/ADCMP582 are available in a 16-lead LFCSP package.

Rev. PrA

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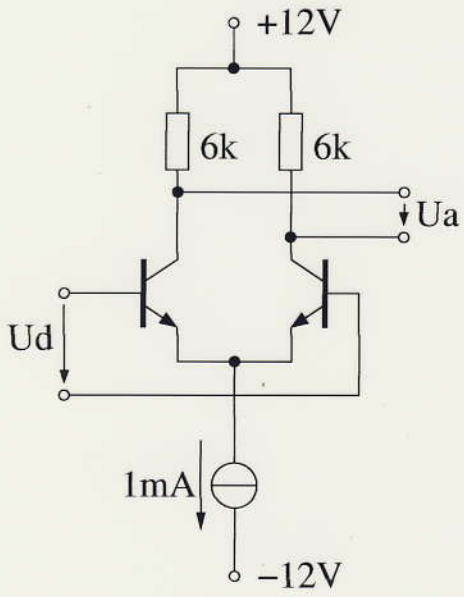
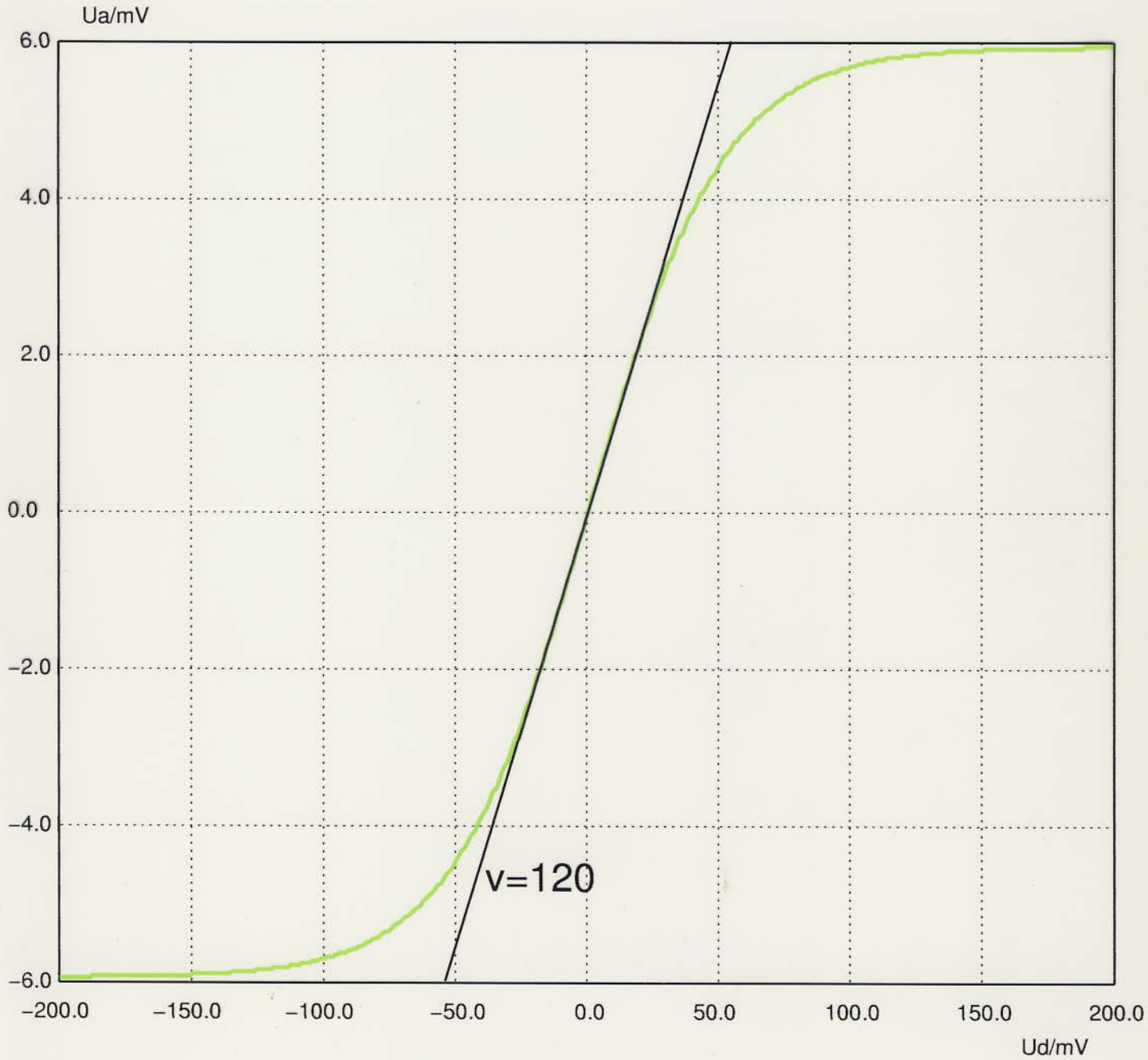
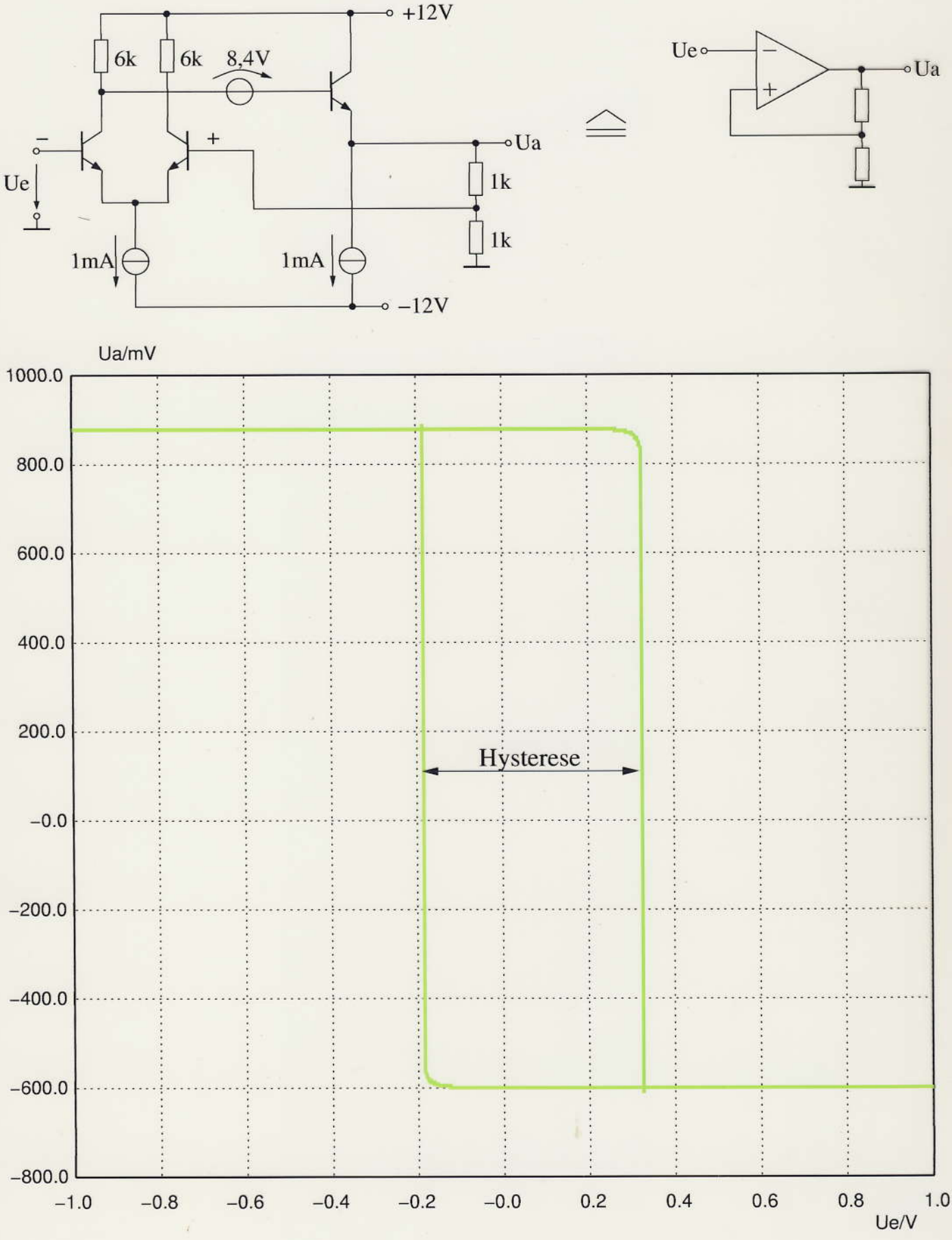
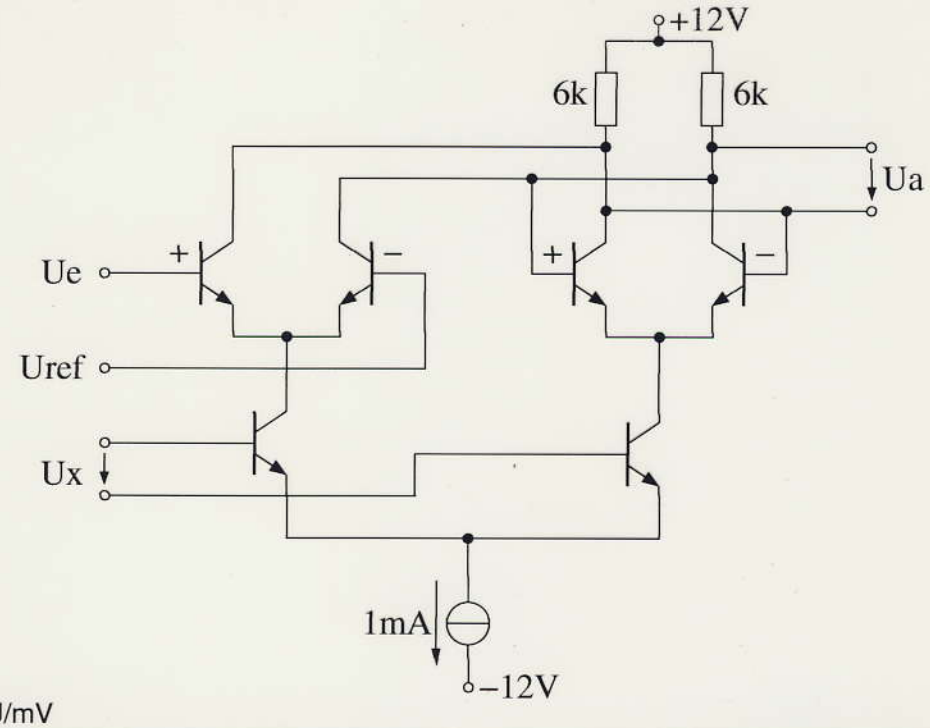
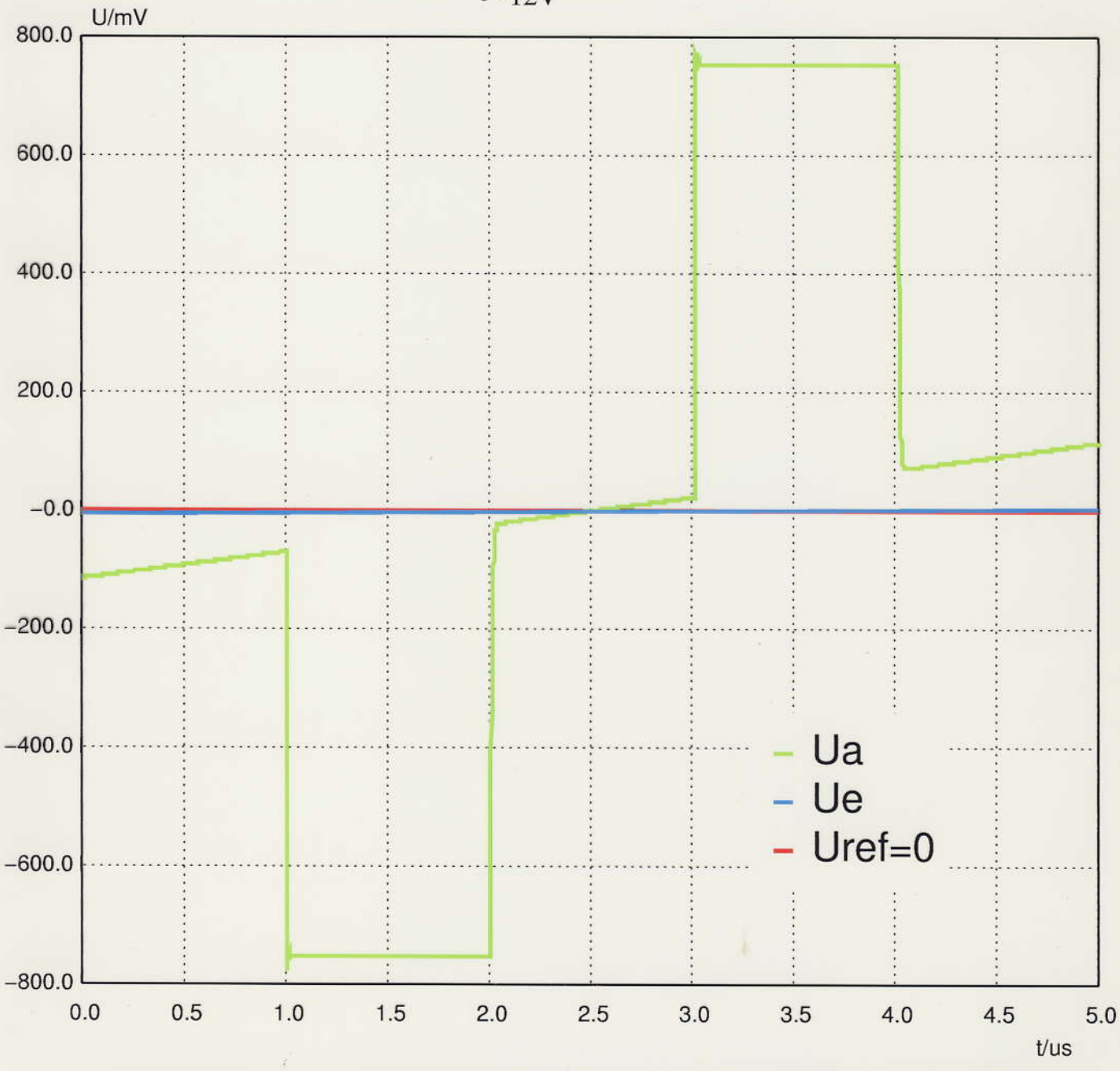

+12V
6k
6k
Ua
Ud
1mA
−12V


Ua/mV
6.0
4.0
2.0
0.0
−2.0
−4.0
−6.0
−200.0
−150.0
−100.0
−50.0
0.0
50.0
100.0
150.0
200.0
Ud/mV
v=120


+12V
6k
6k
8,4V
Ue
Ua
1k
1k
1mA
1mA
−12V
Ue
Ua
Ua/mV
1000.0
800.0
600.0
400.0
200.0
−0.0
−200.0
−400.0
−600.0
−800.0
Hysterese
−1.0
−0.8
−0.6
−0.4
−0.2
−0.0
0.2
0.4
0.6
0.8
1.0
Ue/V

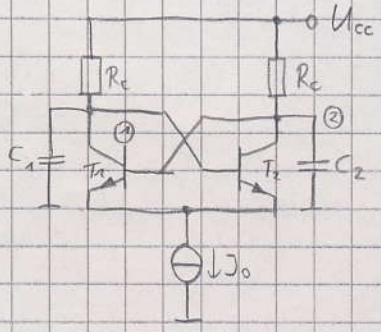


Ux>0: Track
Ux<0: Hold

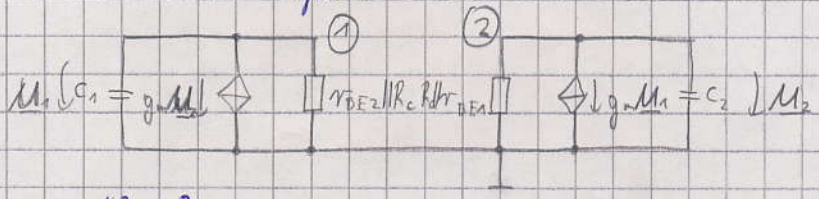


Track	Hold	Track	Hold	Track

Mitkopplung:



Kleinsignalverhalten:



$r_{BE} \| R_c = R$

① $g_m u_2 + \frac{u_1}{R} + C_1 \dot{u}_1 = 0$

② $g_m u_1 + \frac{u_2}{R} + C_2 \dot{u}_2 = 0$

$u_a = u_1 - u_2 \quad ; C_1 = C_2 = C$

↳ $C R \dot{u}_a + (1 - g_m R) u_a = 0$

$u_a(t) = u_a(0)\, e^{at} \qquad a = \frac{g_m R - 1}{R C}$

$g_m R < 1$ → $u_a \to 0$

$g_m R > 1$ → $u_a \to \pm\infty$

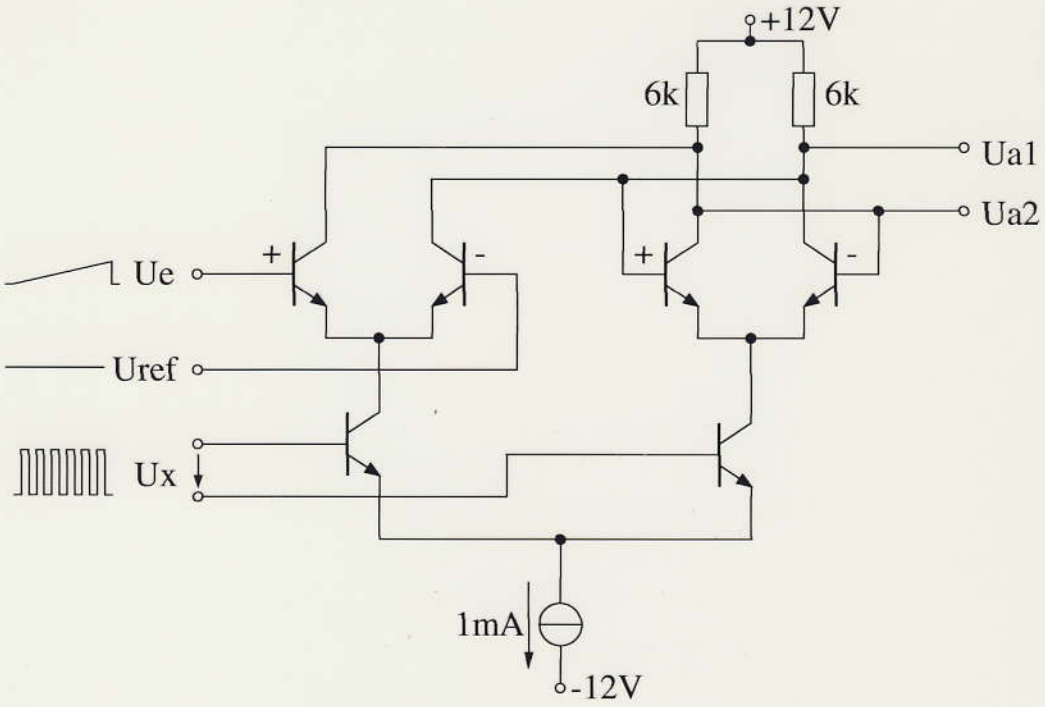
↓

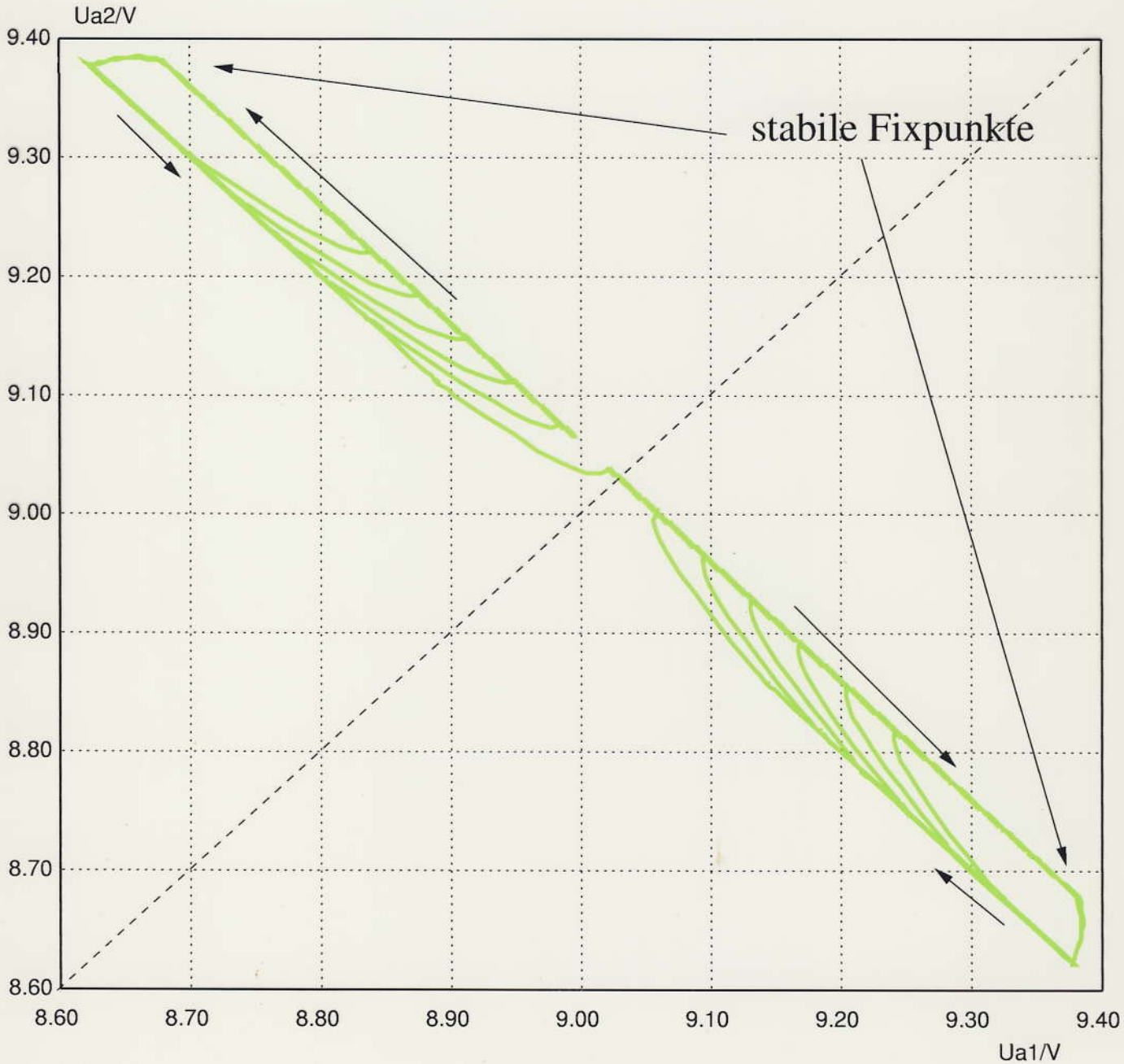
praktisch Begrenzung durch Großsignalverhalten

je größer $\dot{u}_a(t)$ ist, um so schneller bewegt sich die Schaltung vom Gleichgewichtszustand weg

→ Komparator schaltet schneller für große Differenzen $(u_e - u_{ref})$

Folie Trajektorie


+12V
6k
6k
Ua1
Ua2
Ue
Uref
Ux
+
-
+
-
1mA
-12V


Ua2/V
9.40
9.30
9.20
9.10
9.00
8.90
8.80
8.70
8.60
stabile Fixpunkte
8.60
8.70
8.80
8.90
9.00
9.10
9.20
9.30
9.40
Ua1/V

TYPICAL PERFORMANCE CHARACTERISTICS

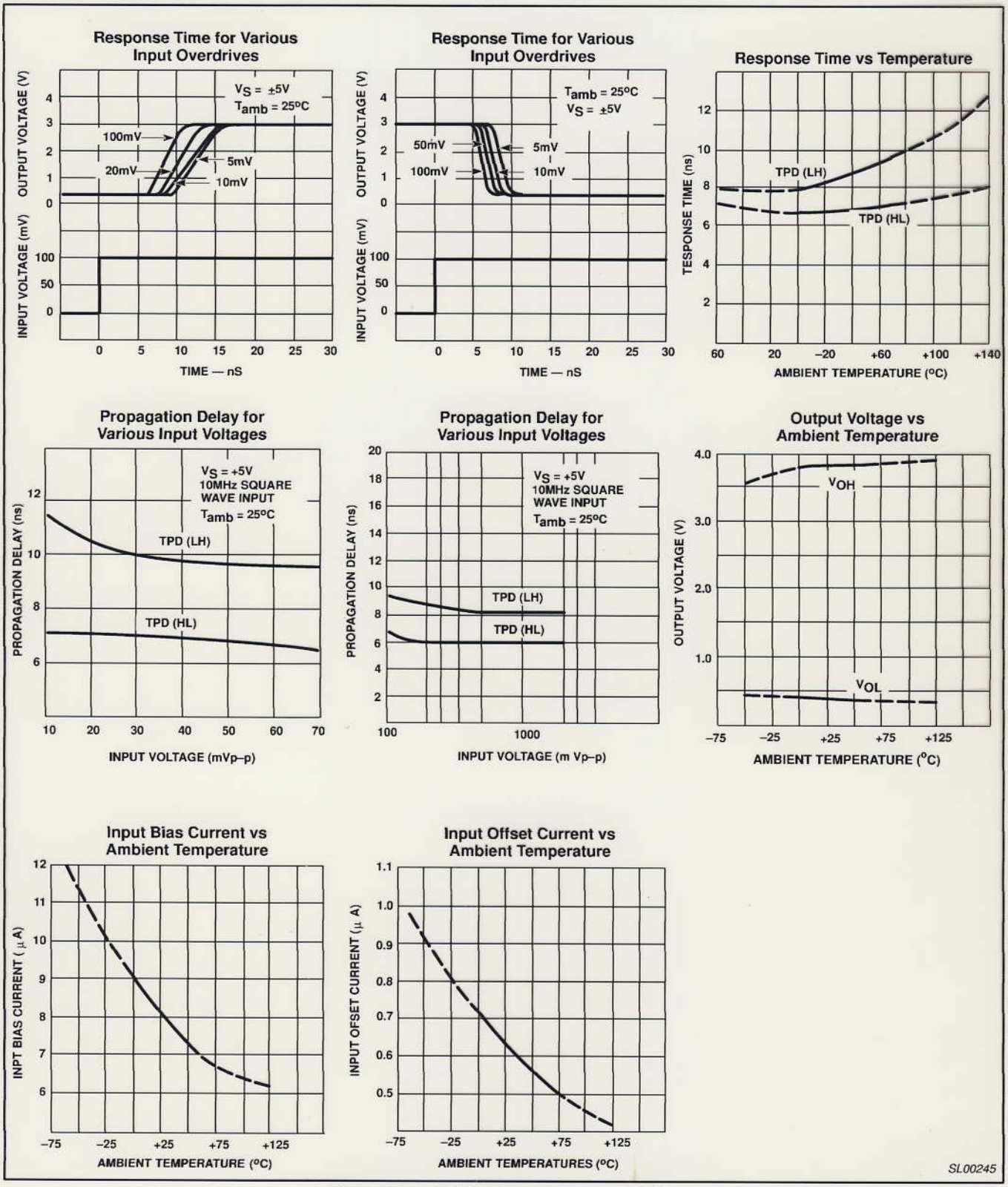


Figure 4. Typical Performance Characteristics