

Elektronische signalen 2

De ideale opamp

P. Debbaut

WAT?

Operational Amplifier → Opamp

Verschilversterker met **zeer grote versterking**



Schakelingen met “**quasi ideale eigenschappen**”

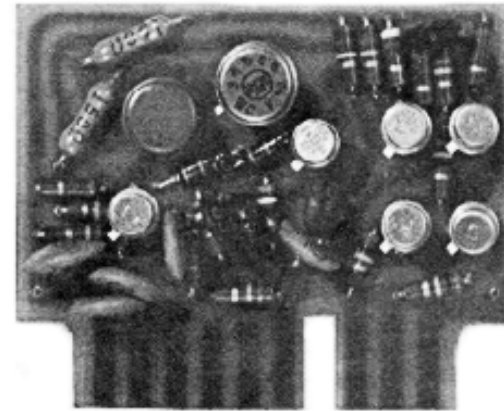
Enkele toepassingen

- Versterker, elektronische regelaar
- Multivibrator, Schmitt trigger, oscillator
- Comparator
- Buffer, niveau-aanpassing, line driver
- Filter
- Log. versterker, prec. gelijkrichter, timer

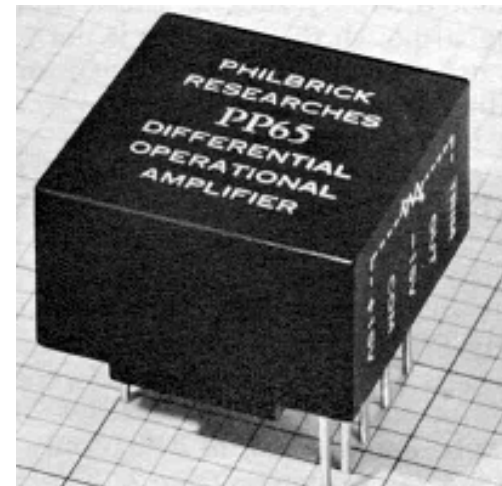
Historiek



GAP/R's K2-W vacuum-tube op-amp 1953

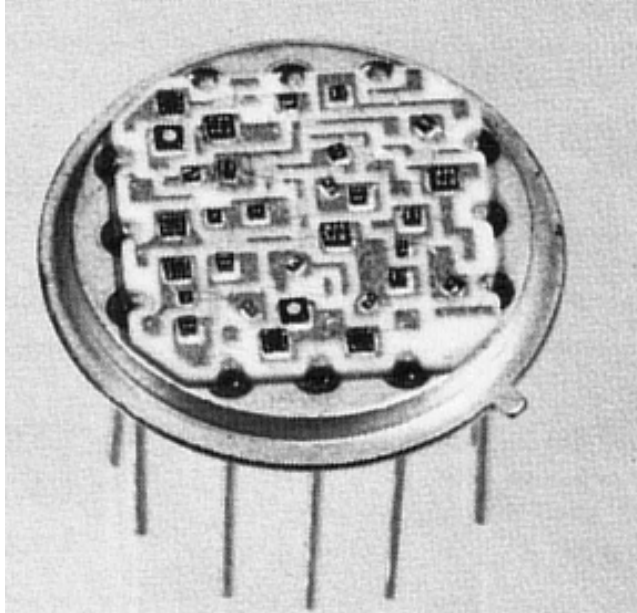


GAP/R's model P45 solid-state discrete op-amp (1961)

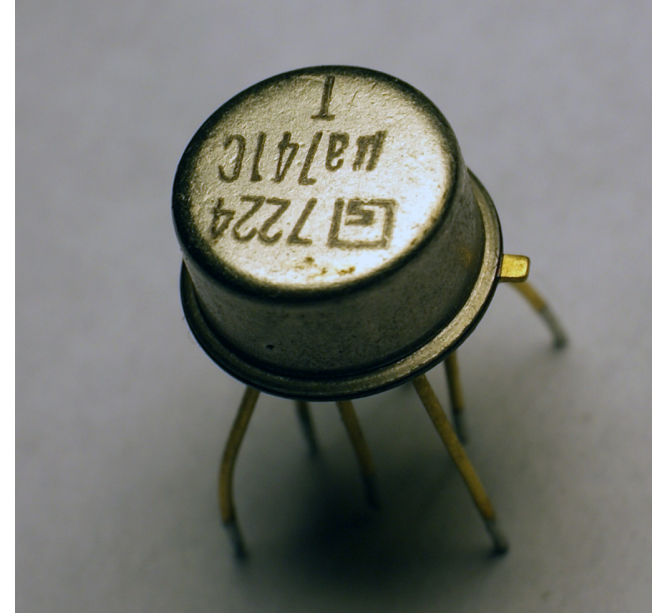


GAP/R's model PP65 solid-state op-amp in a potted module (1962)

Historiek

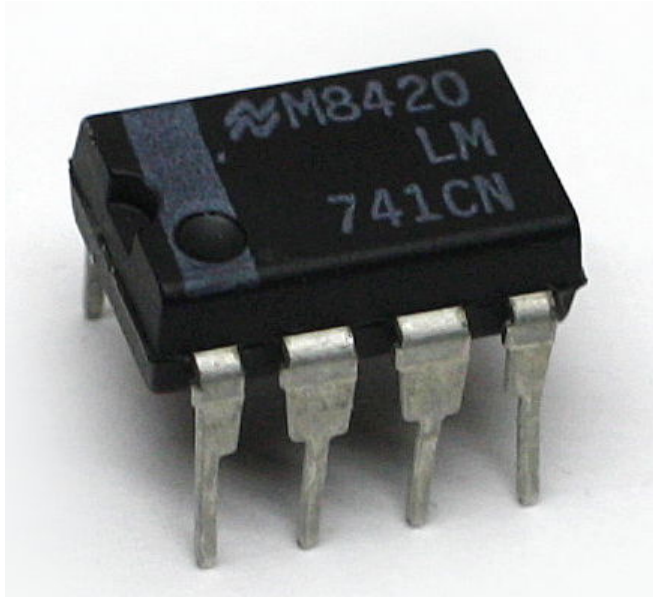


ADI's HOS-050 high speed hybrid IC op-amp (1979)

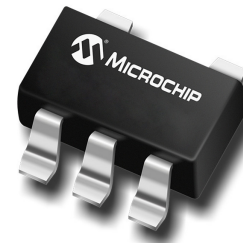


Signetics μ 741 operational amplifier

Historiek

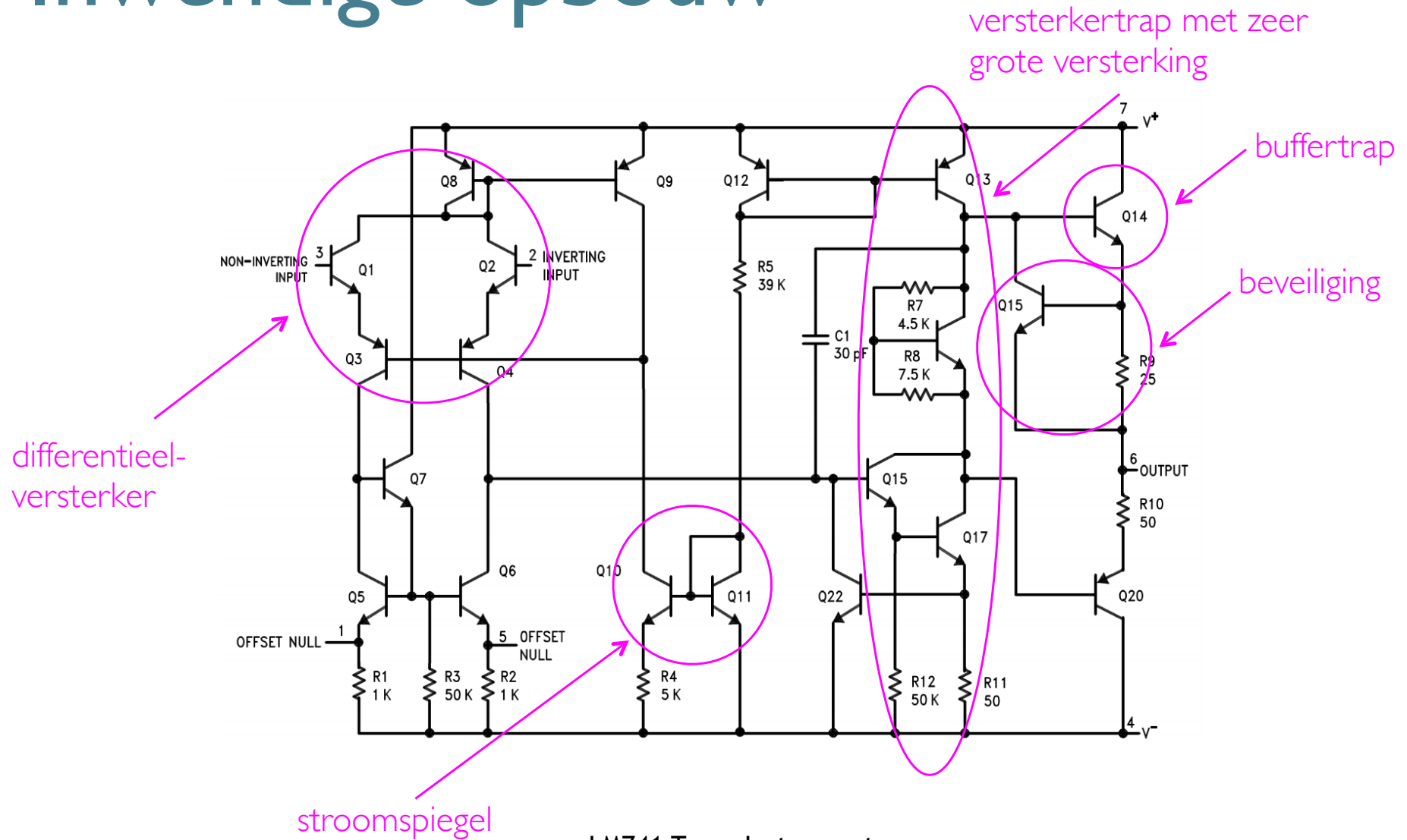


op-amp in DIL



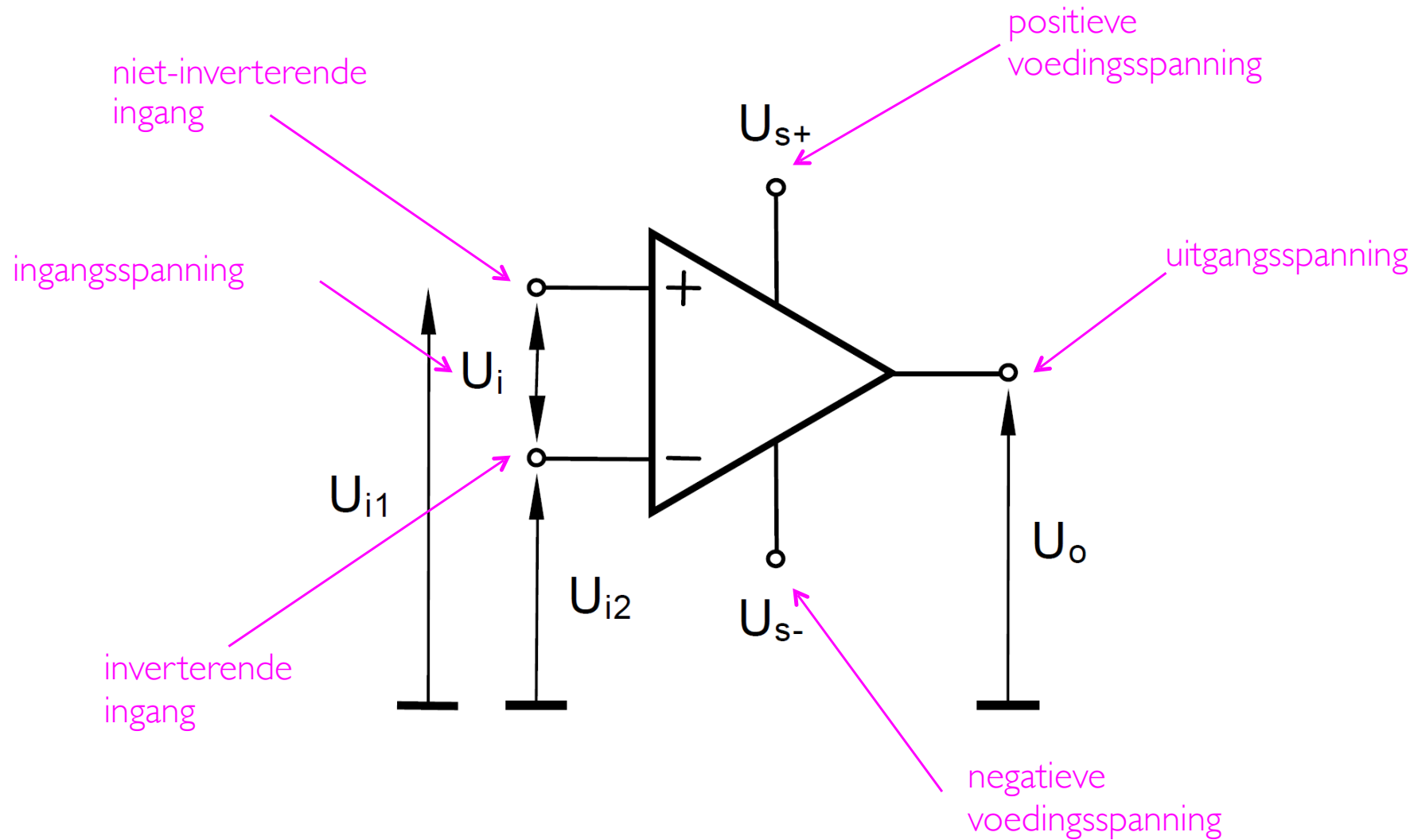
SMD operational amplifier

Inwendige opbouw



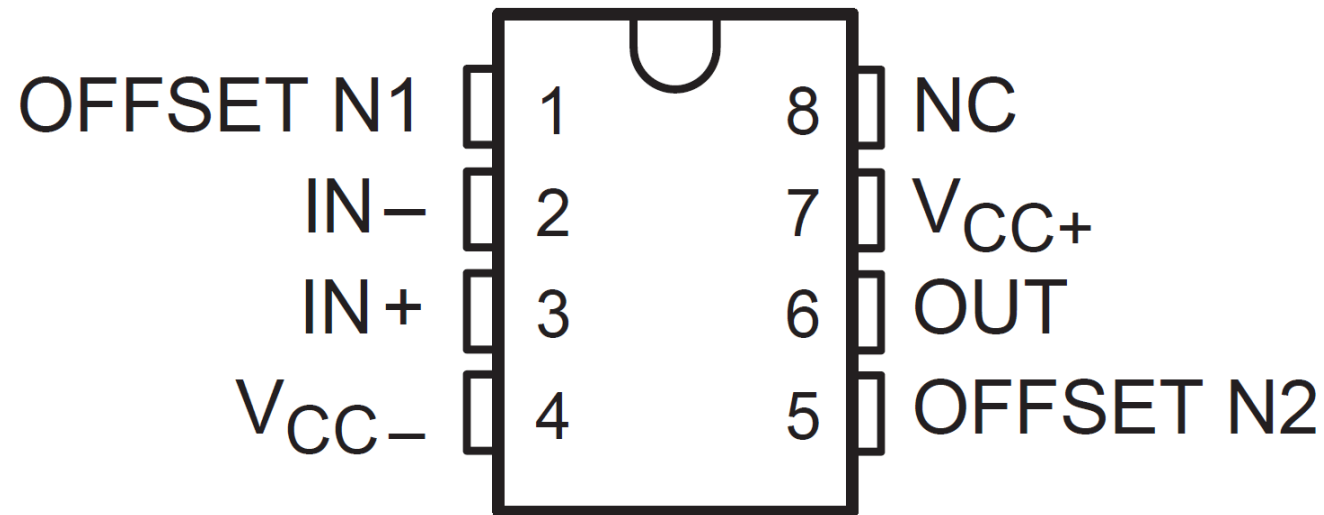
LM741 Texas Instruments

Symbool - aansluitingen




Pinning LM741 DIL

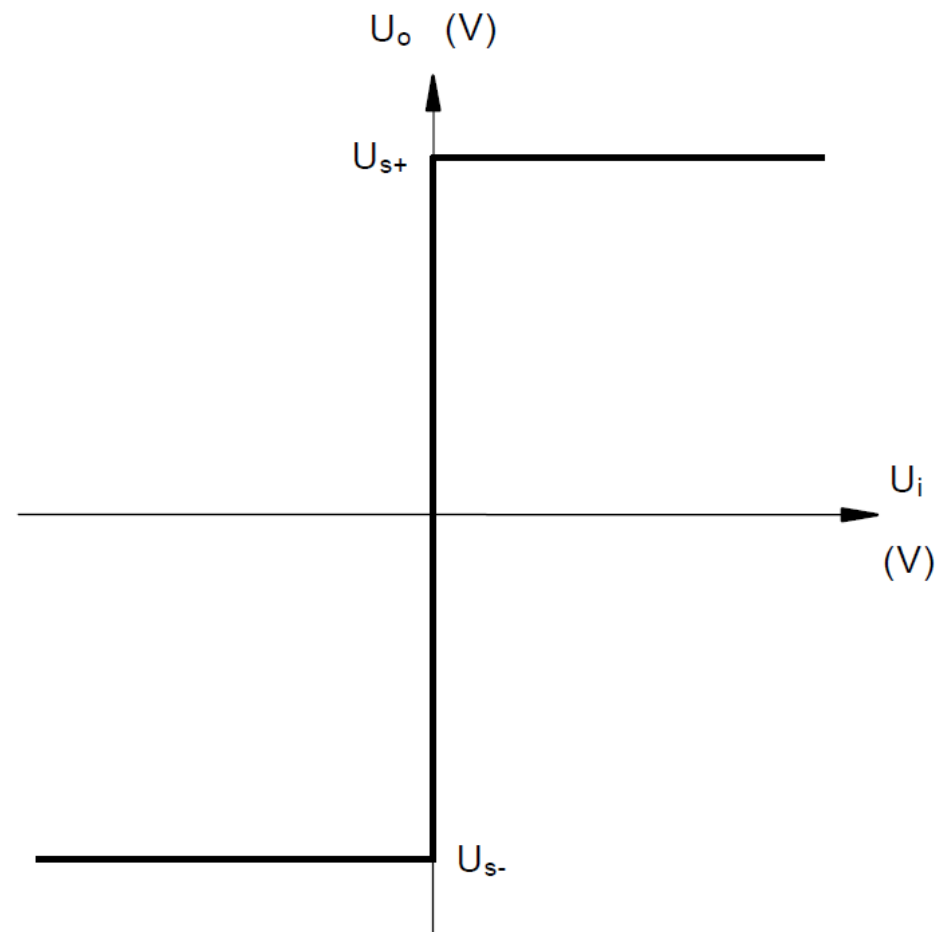
**μ A741C, μ A741I . . . D, P, OR PW PACKAGE
(TOP VIEW)**



Basiseigenschappen ideale opamp

- spanningsversterking A_{uo} 
 - ingangsweerstand R_i
 - ingangsstroom I_i
 - uitgangsweerstand R_o
 - bandbreedte f_u
 - snelheid SR
 - maximale uitgangsspanning
 - temp-drift
 - eigen ruis
 - versterkt alleen U_i
- ∞
 $\infty \Omega$
0A
 0Ω
 ∞Hz
 $\infty \text{V}/\mu\text{s}$
 U_{s+} of U_{s-}
geen
geen

Transferkarakteristiek ideale opamp



Specificaties LM741

- spanningsversterking A_{uo} $200 \cdot 10^3$
- ingangsweerstand R_i $2\text{M}\Omega$
- uitgangsweerstand R_o 75Ω
- bandbreedte f_u 5Hz
- snelheid SR (slew rate) $0,5\text{V}/\mu\text{s}$

Transferkarakteristiek praktische opamp

Open-lusversterking

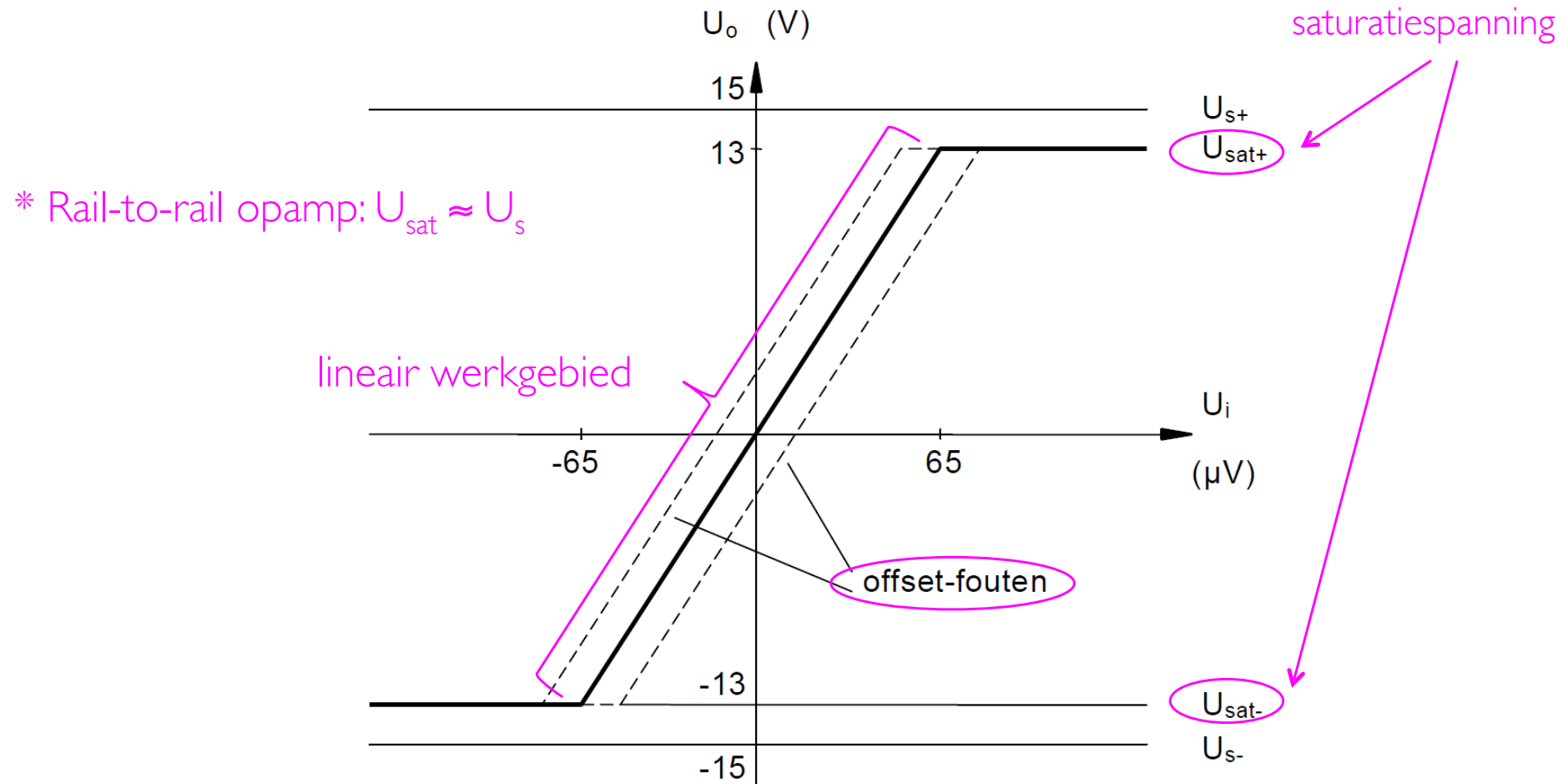
$$A_{uo} = \frac{U_o}{U_i}$$

$$U_o = A_{uo} \cdot U_i$$

lineair verband



Transferkarakteristiek praktische opamp



Offset-compensatie LM741

