



# LED-Matrix Steuerung

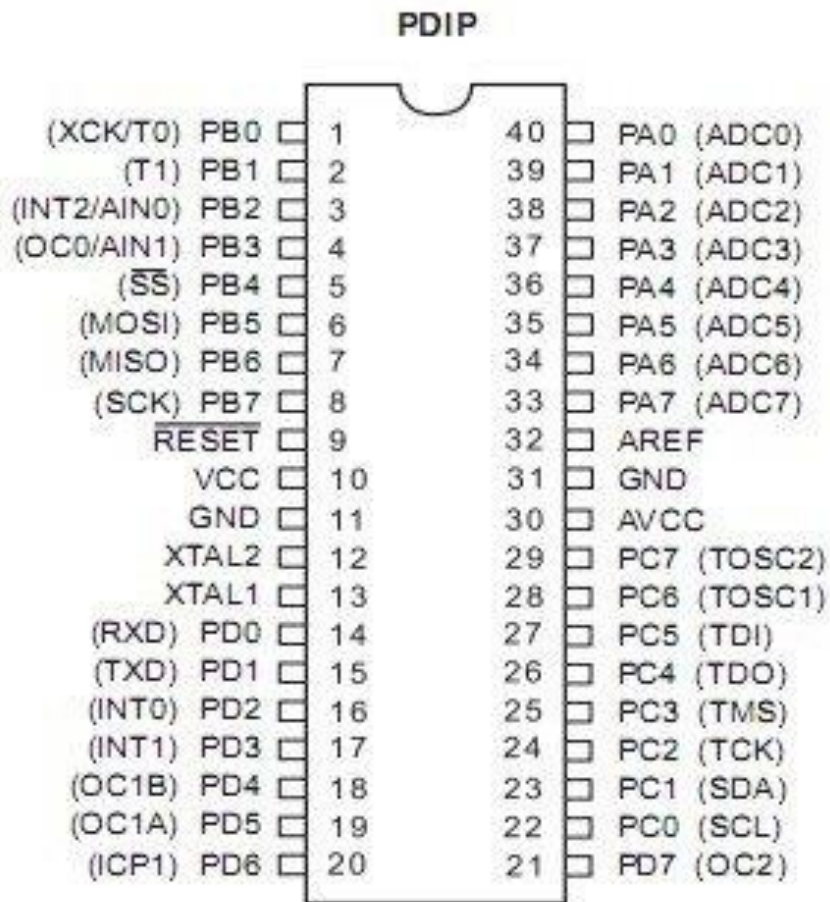
Methode mittels Multiplexing



# Gliederung

- Ansteuerung durch  $\mu\text{C}$
- Multiplexer (Funktionsweise)
- Aufbau LED-Matrix
- Dimmen

# Steuerung mit Atmega32



- Digitale Pins

- PA0-PA7

- PB0-PB7

- PC0-PC7

- PD0-PD7

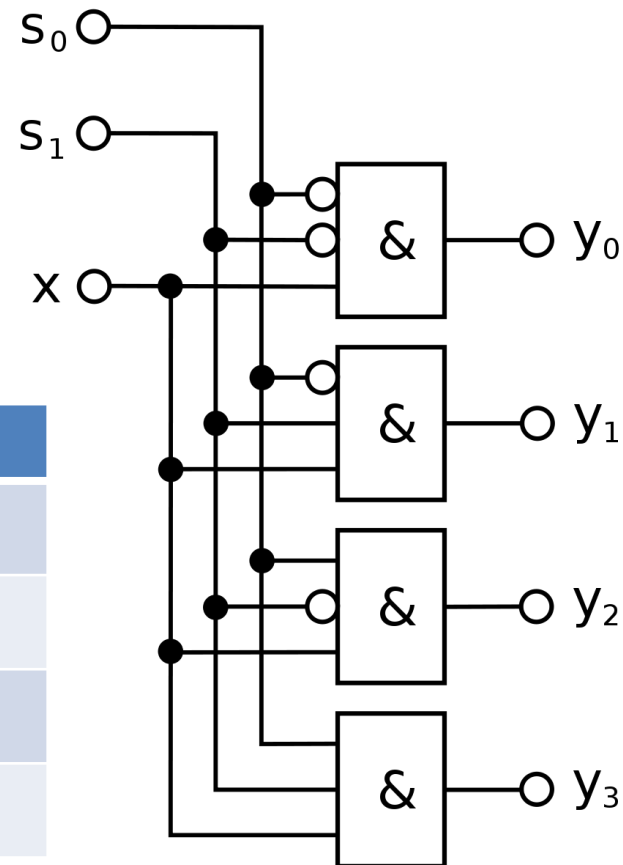
≤ 32 ansteuerbare LEDS

[http://www.jaredcaramagna.com/ATMEGA32\\_16PU.jpg](http://www.jaredcaramagna.com/ATMEGA32_16PU.jpg)  
(19.4.13)

# (De-)Multiplexer

- $x$  Eingang ( $V_{cc}$ )
- $s_n$  Steuerkanäle
- $y_n$  Ausgänge

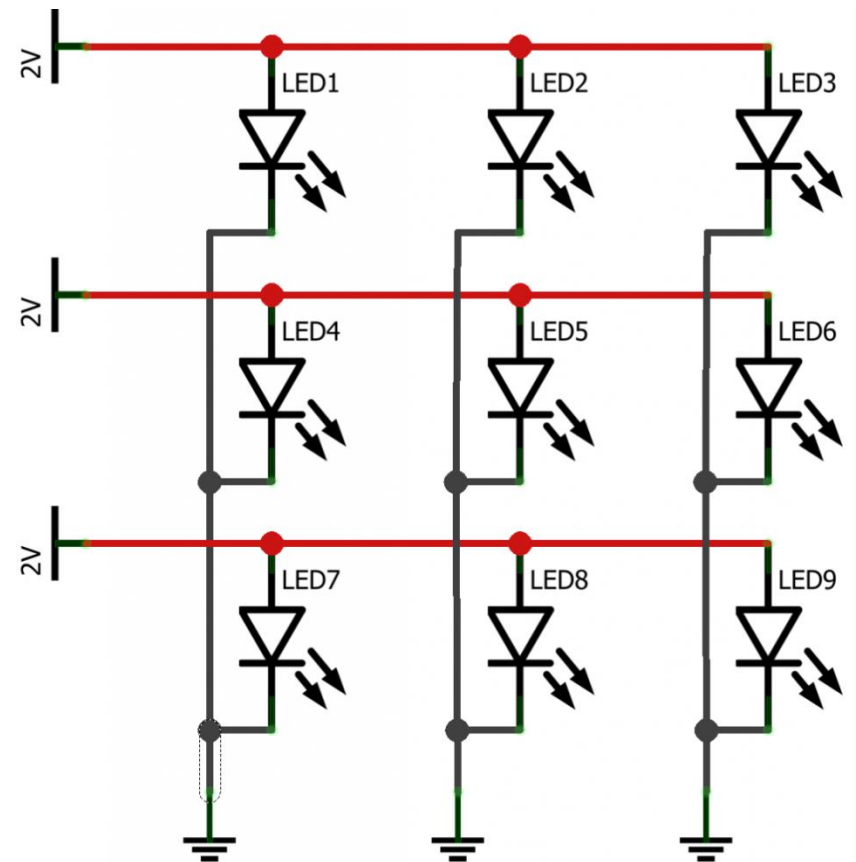
$S_0$	$S_1$	$Y$
0	0	$Y_0$
0	1	$Y_1$
1	0	$Y_2$
1	1	$Y_3$



[http://upload.wikimedia.org/wikipedia/commons/thumb/e/e0/2-MUX\\_Aufbau2\\_DIN40900.svg/213px-2-MUX\\_Aufbau2\\_DIN40900.svg.png](http://upload.wikimedia.org/wikipedia/commons/thumb/e/e0/2-MUX_Aufbau2_DIN40900.svg/213px-2-MUX_Aufbau2_DIN40900.svg.png) (19.4.13)

# LED-Matrix

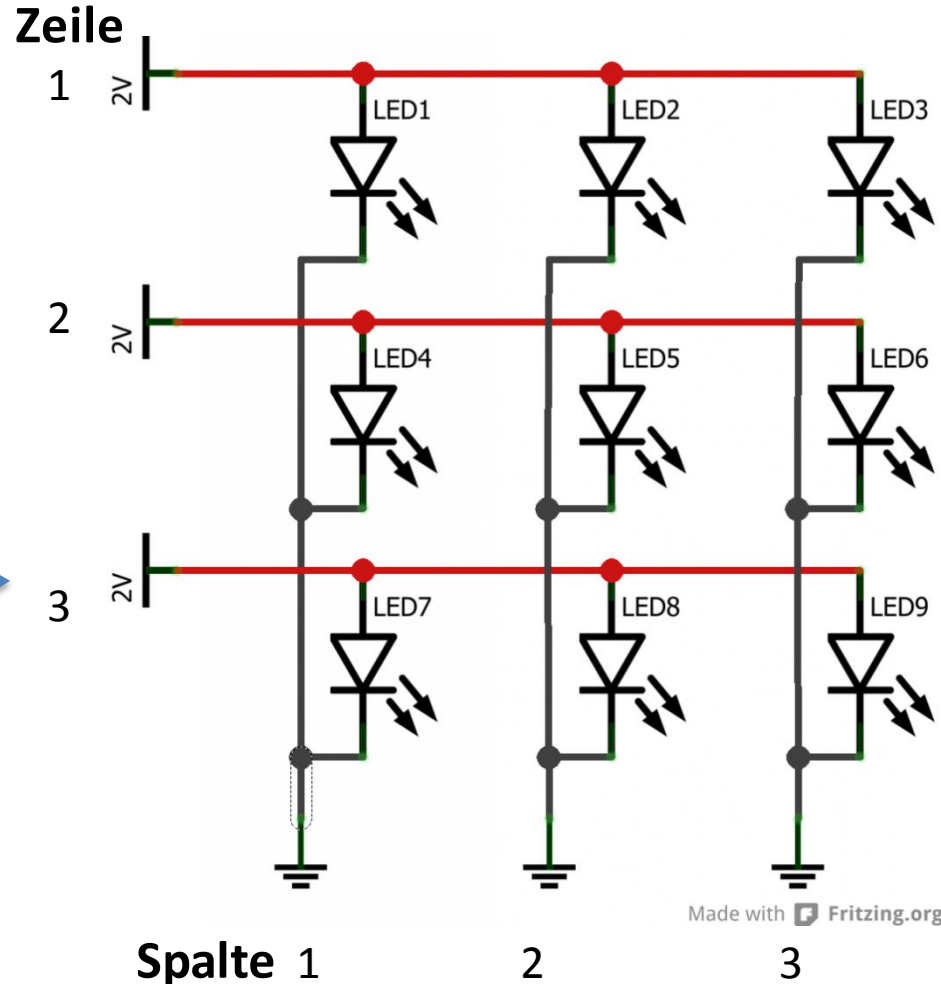
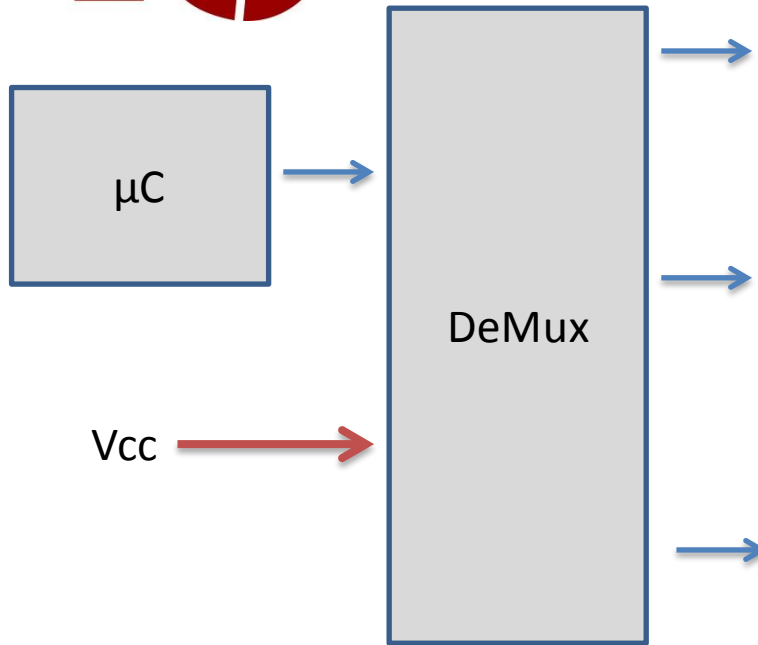
- Zeilen (Anoden +)
- Spalten (Kathoden -)



[http://www.tacticalcode.de/wp-content/uploads/2013/01/LED\\_Matrix\\_Simple-975x1024.png](http://www.tacticalcode.de/wp-content/uploads/2013/01/LED_Matrix_Simple-975x1024.png) (19.4.13)

Made with  Fritzing.org

# LED-Matrix



Made with  Fritzing.org

9x9 Matrix: 4bit Steuerleitung  
 9 digitalpins µC  
 = 13 Pins

[http://www.tacticalcode.de/wp-content/uploads/2013/01/LED\\_Matrix\\_Simple-975x1024.png](http://www.tacticalcode.de/wp-content/uploads/2013/01/LED_Matrix_Simple-975x1024.png) (19.4.13)

# LED-Matrix

- Zeile aktiv für  $\frac{1}{\text{Anzahl Zeilen}}$  s  
 ⇒ Dimmung der LEDs => Lösung: Strom erhöhen  
 Auszug aus Datenblatt einer Rot-Grün LED:

## Absolute Maximum Ratings at TA=25°C

Parameter	High Efficiency Red	Green	Units
Power dissipation	75	62.5	mW
DC Forward Current	30	25	mA
Peak Forward Current [1]	160	140	mA
Reverse Voltage	5		V
Operating / Storage Temperature	-40°C To +85°C		
Lead Solder Temperature [2]	260°C For 3 Seconds		
Lead Solder Temperature [3]	260°C For 5 Seconds		

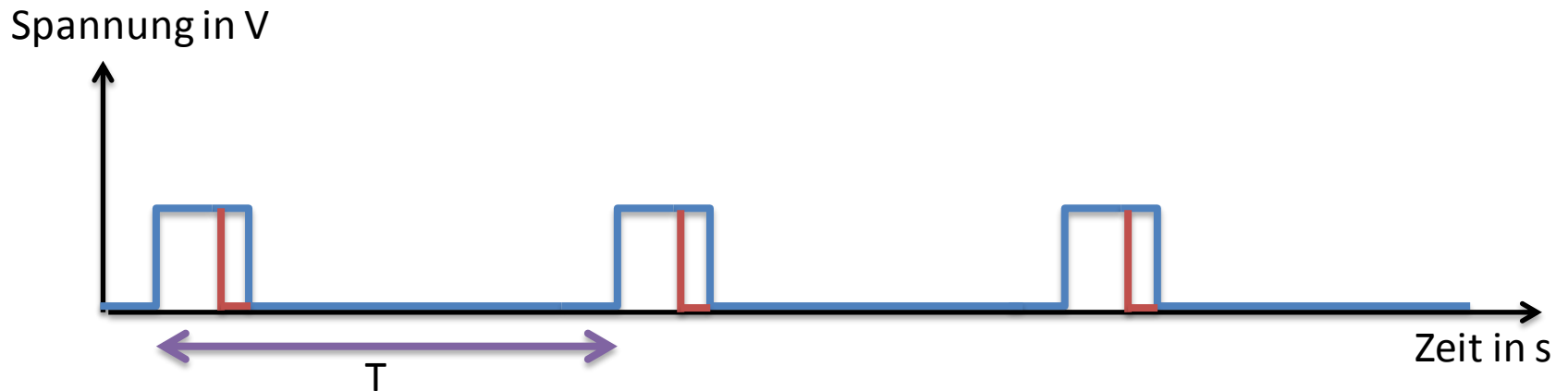
### Notes:

1. 1/10 Duty Cycle, 0.1ms Pulse Width.
2. 2mm below package base.
3. 5mm below package base.

[http://www.elv-downloads.de/Assets/Produkte/9/960/96067/Downloads/96067\\_led\\_data.pdf](http://www.elv-downloads.de/Assets/Produkte/9/960/96067/Downloads/96067_led_data.pdf) (19.4.12)

# Dimmen

- Impulsdiagramm für eine Zeile



- Wirkleistung: 
$$P = \frac{1}{T} \int_{t_0}^{t_0+T} u(t) \cdot i(t) dt$$