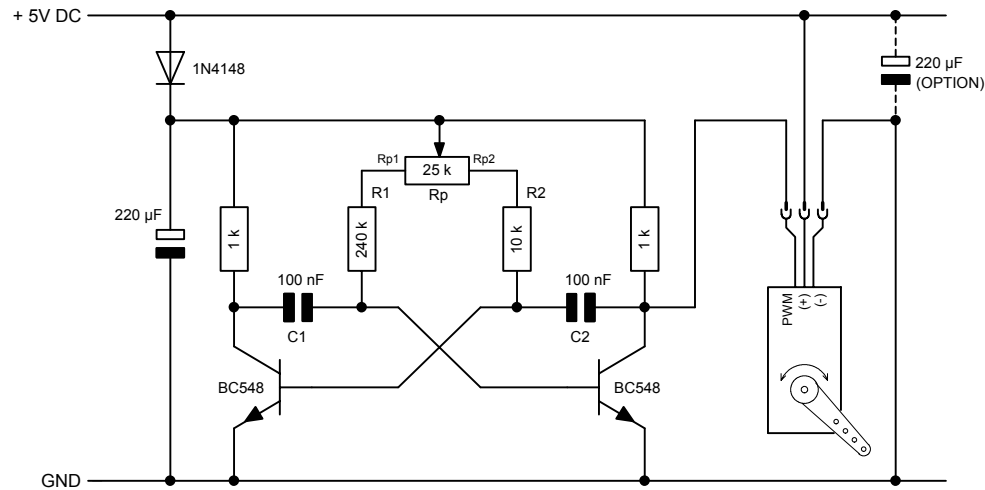
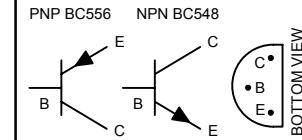


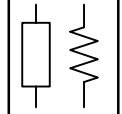
SG90 SERVO EXPERIMENT WITH NPN TRANSISTOR PWM CONTROLLER:



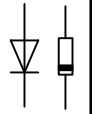
TRANSISTOR



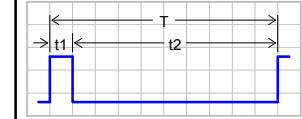
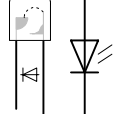
RESISTOR:



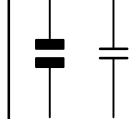
DIODE:



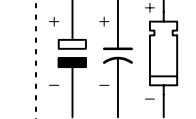
LED:



CAPACITOR:



(POLARIZED)



$$t1 = 0.693 \times C2 \times (R2 + Rp2)$$

$$Rp2 = Rp - Rp1$$

$$t1 = 0.693 \times 0.0000001 \times (10000 + 0) = 0.693 \text{ ms } (< \text{MIN.})$$

$$t1 = 0.693 \times 0.0000001 \times (10000 + 11640) = 1.499 \text{ ms } (= \text{CENTER})$$

$$t1 = 0.693 \times 0.0000001 \times (10000 + 25000) = 2.425 \text{ ms } (> \text{MAX.})$$

$$t2 = 0.693 \times C1 \times (R1 + Rp1)$$

$$Rp1 = Rp - Rp2$$

$$t2 = 0.693 \times 0.0000001 \times (240000 + 25000) = 18.365 \text{ ms } (< \text{MIN.})$$

$$t2 = 0.693 \times 0.0000001 \times (240000 + 13360) = 17.558 \text{ ms } (= \text{CENTER})$$

$$t2 = 0.693 \times 0.0000001 \times (240000 + 0) = 16.632 \text{ ms } (> \text{MAX.})$$

$$T = t1 + t2$$

$$T = 0.693 + 18.365 = 19.058 \text{ ms } (< \text{MIN.})$$

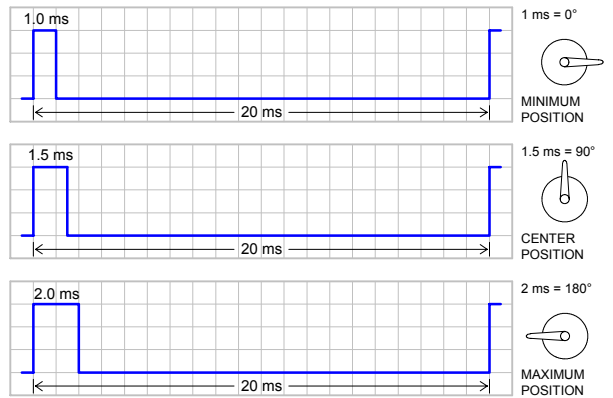
$$T = 1.499 + 17.558 = 19.058 \text{ ms } (= \text{CENTER})$$

$$T = 2.425 + 16.632 = 19.058 \text{ ms } (> \text{MAX.})$$

$$F = 1 / T$$

$$F = 1 / 0.019058 = 52.5 \text{ Hz}$$

0° - 180° SERVO PWM SIGNAL TIMINGS AT 50 Hz:



FOR FULLY COMPONENT SPECS. SEE MANUFACTURER DATASHEETS

FIGURES ARE APPROXIMATELY, DUE TO COMPONENT TOLERANCES!

|      |    |                                |                   |             |
|------|----|--------------------------------|-------------------|-------------|
| MT-1 | A4 | udo@elgers.com                 | ue-ERT20220305-01 | 05-MAR-2022 |
| 005  | A  | SG90 SERVO PWM EXPERIMENT A-01 |                   |             |