



Parts list

| Description | Quantity | Reference ID |
|-------------------------------|----------|----------------|
| Ammeter, 1mΩ, DC | 4 | M2, M1, M4, M3 |
| Battery, 8V | 1 | V1 |
| Connector | 1 | |
| NPN Transistor, KT315B | 1 | Q1 |
| Node | 8 | |
| Resistor, 116kΩ, 0Ω/°C, 0Ω/°C | 1 | R2 |
| Resistor, 50Ω, 0Ω/°C, 0Ω/°C | 1 | R1 |

NPN Transistor Model "KT315B" Library "r-npn"

| | | | |
|-----|---|---------|---|
| IS | Saturation current | 1e-14 | A |
| βF | Forward current gain coefficient | 3 | |
| βR | Reverse current gain coefficient | 1 | |
| RB | Base ohmic resistance | 3 | Ω |
| RE | Emitter ohmic resistance | 0.5 | Ω |
| RC | Collector ohmic resistance | 0.2 | Ω |
| CS | Substrate capacitance | 0 | F |
| CE | Zero-bias B-E junction capacitance | 7e-12 | F |
| CC | Zero-bias B-C junction capacitance | 7e-12 | F |
| φE | B-E junction potential | 0.75 | V |
| φC | B-C junction potential | 0.75 | V |
| τF | Forward transit time | 5e-10 | s |
| τR | Reverse transit time | 1.7e-07 | s |
| ME | B-E junction grading coefficient | 0.33 | |
| MC | B-C junction grading coefficient | 0.33 | |
| VA | Early voltage | 40 | V |
| ISE | Base-emitter leakage saturation current | 1e-07 | A |
| IKF | Forward beta high-current knee-point | 0.1 | A |
| NE | Base-emitter leakage emission coefficient | 4 | |
| NF | Forward current emission coefficient | 1 | |
| NR | Reverse current emission coefficient | 1 | |
| VAR | Reverse early voltage | 1e+30 | V |
| IKR | Reverse beta roll-off corner current | 1e+30 | A |

| | | | |
|------|---|-------|--------------------|
| ISC | B-C leakage saturation current | 1e-07 | A |
| NC | B-C leakage emission coefficient | 4 | |
| IRB | Current for base resistance equal to $(r_b + R_{BM})/2$ | 1e+30 | A |
| RBM | Minimum base resistance at high currents | 0 | Ω |
| XTF | Coefficient for bias dependence of τ_F | 0 | |
| VTF | Voltage describing VBC dependence of τ_F | 1e+30 | V |
| ITF | High-current dependence of τ_F | 0 | A |
| PTF | Excess phase at frequency equal to $1/(\tau_F * 2\pi)$ Hz | 0 | Deg |
| XCJC | Fraction of B-C depletion capacitance connected to internal base node | 1 | |
| VJS | Substrate junction built-in potential | 0.75 | V |
| MJS | Substrate junction exponential factor | 0 | |
| XTB | Forward and reverse beta temperature exponent | 0 | |
| EG | Energy gap for temperature effect on IS | 1.11 | eV |
| XTI | Temperature exponent for effect on IS | 3 | |
| KF | Flicker noise coefficient | 4e-15 | |
| AF | Flicker noise exponent | 1 | |
| FC | Coefficient for forward-bias depletion capacitance formula | 0.5 | |
| TNOM | Parameter measurement temperature | 27 | $^{\circ}\text{C}$ |