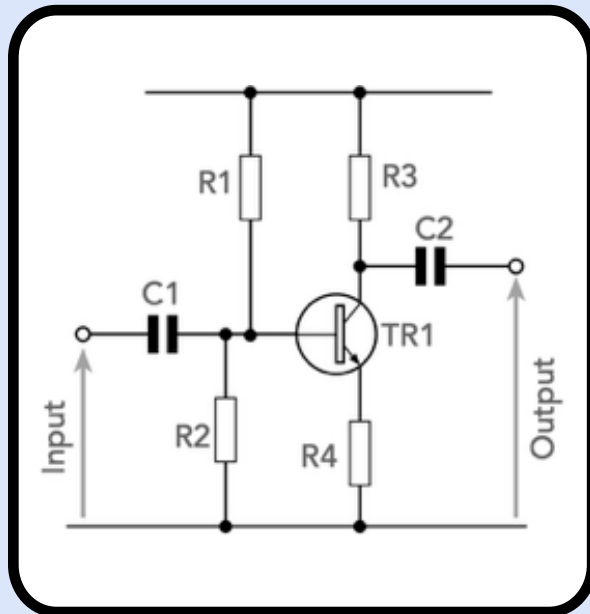


Useful Transistor Circuits (1)

Commonly used bipolar junction transistor circuits

Despite the use of integrated circuit technology, discrete transistors are often essential for a number of applications. This is a small selection of very useful transistor circuits.

Common Emitter Amplifier

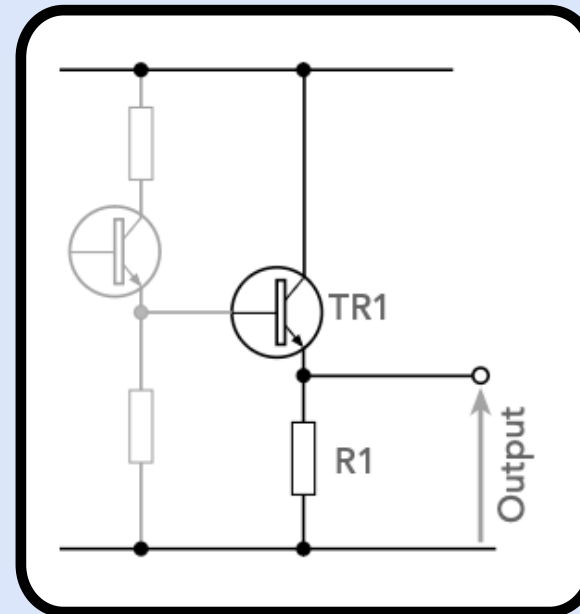


Basic AC coupled common emitter amplifier.

Gain $\sim R3 / R4$

Emitter resistor can have emitter bypass capacitor to increase gain.

Emitter Follower Buffer



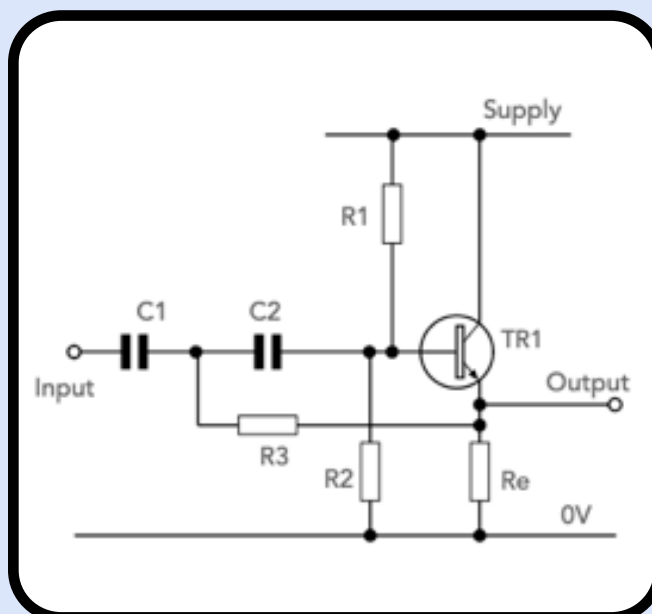
Shows basic DC coupled circuit linking in to previous stage

$Z_{in} \sim \beta R1$

Emitter voltage 0.6V below base for silicon.

Circuit can be AC coupled if needed.

High Pass Filter



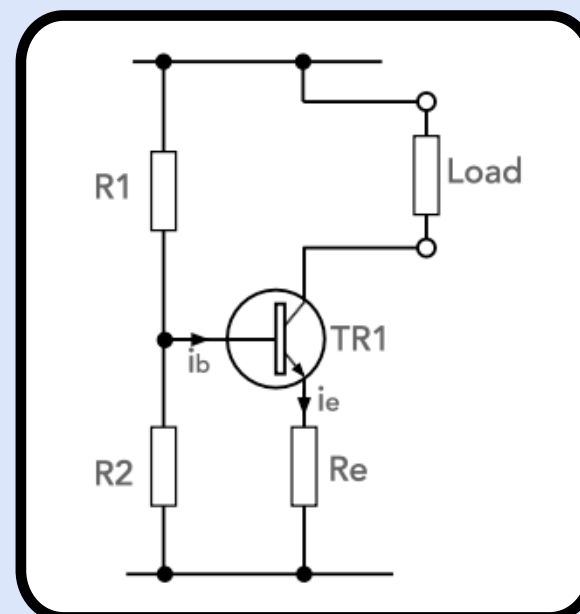
The calculations for the circuit are:

$$C1 = 2 C2$$

$$R3 = R1 R2 / (R1 + R2)$$

$$f_0 = \sqrt{2} / (4 \pi R3 C2)$$

Constant Current Source

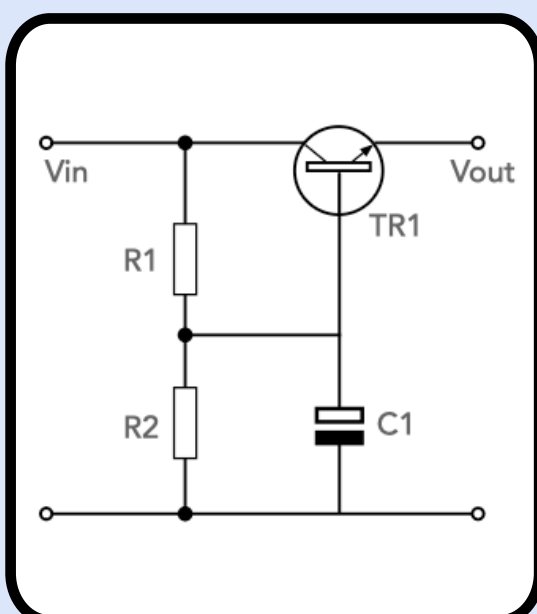


The current for this circuit can be calculated:

$$I_{load} = (V_b - 0.6) / R_e$$

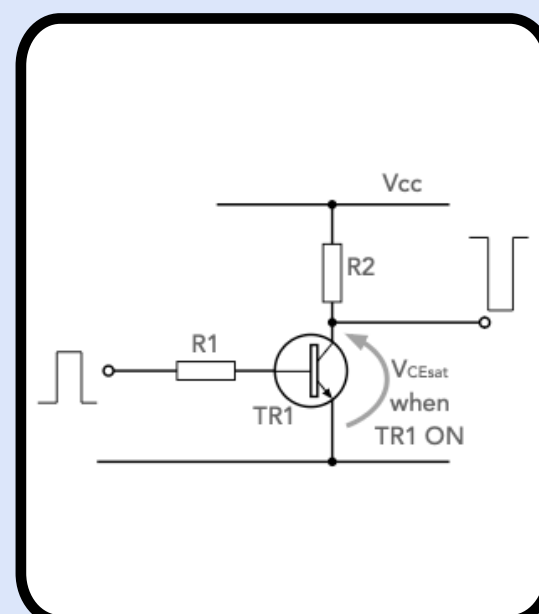
R2 can be replaced by a suitable Zener diode for better current stability.

Capacitance Multiplier



The effect of placing the transistor in the circuit is that it effectively multiplies the capacitance on the base by the current gain of the transistor, i.e. by β .

Transistor Switch



The transistor can be used as a switch. A single transistor will invert the pulse, but adding a further transistor can enable it to be not-inverted.

Remember the minimum voltage will be V_{CEsat} - the saturation voltage for the device

β = transistor current gain; Z_{in} = input resistance; I_{load} = load current;