Stereo Widening

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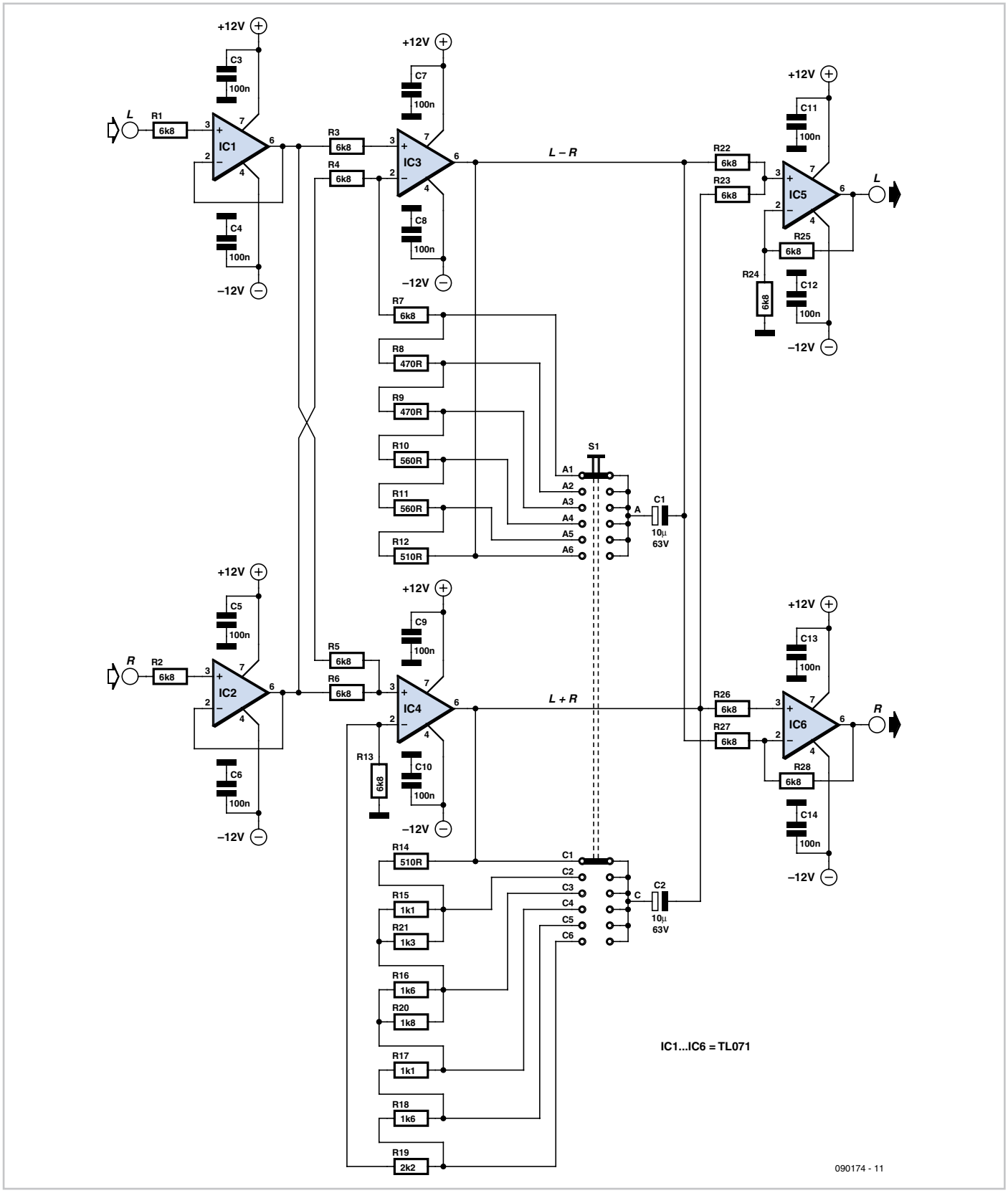
Although the principle is quite old, 'widening' of the sound image is still done these days in many portable devices, ghettoblasters and PC loudspeakers, even though it is usually called something else in these applications. To generate the stereo image, the left channel also contains part of the sound from the right channel, shifted a little in phase compared to the right channel. The same is true for the right channel, where the signal from the left



channel is slightly shifted in phase. To make the stereo image 'wider', you can amplify the difference signals of both channels.

To do this you generate a sum- and a difference signal from the left and right channels. With a couple of opamps you can realise a 'left+right' signal and a 'left-right' signal. So the (left–right) signal needs to be made stronger with respect to the (left+right) signal. Expressed as a formula:

(L+R) + (L–R) = 2L and (L+R) – (L–R) = 2R

With a suitable circuit, the left signal in the left channel is increased and the right signal is decreased. Similarly, in the right channel the right signal is increased if the left signal reduces. To maintain a constant volume, we also have to make sure that the total signal strength remains the same.

From the schematic you can see how this problem was solved. IC1 and IC2 are the input buffers. After the buffer, the left and right signals are combined with the other channel respectively. IC3 generates the (L–R) signal and IC4 the (L+R) signal. With two times six resistors and a multi-position switch, the amount of the effect can be adjusted. The values of resistors R7–R12 and R14–R21 are selected such that the total volume remains about the same when changing the switch. IC5 and IC6 generate the final left and right signal from the (L+R) and (L–R) signals.
For additional protection, electrolytic coupling capacitors of 10 µF 16 V can be added to the inputs and outputs. Each of the inputs of IC1 and IC2 will then also need a 10 kΩ resistor to ground, otherwise the opamp outputs will run up against power supply rail.

The power supply requires a symmetrical voltage of ±12 V. This voltage can usually be found in an existing amplifier, so normally there is no need to build a special power supply.

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