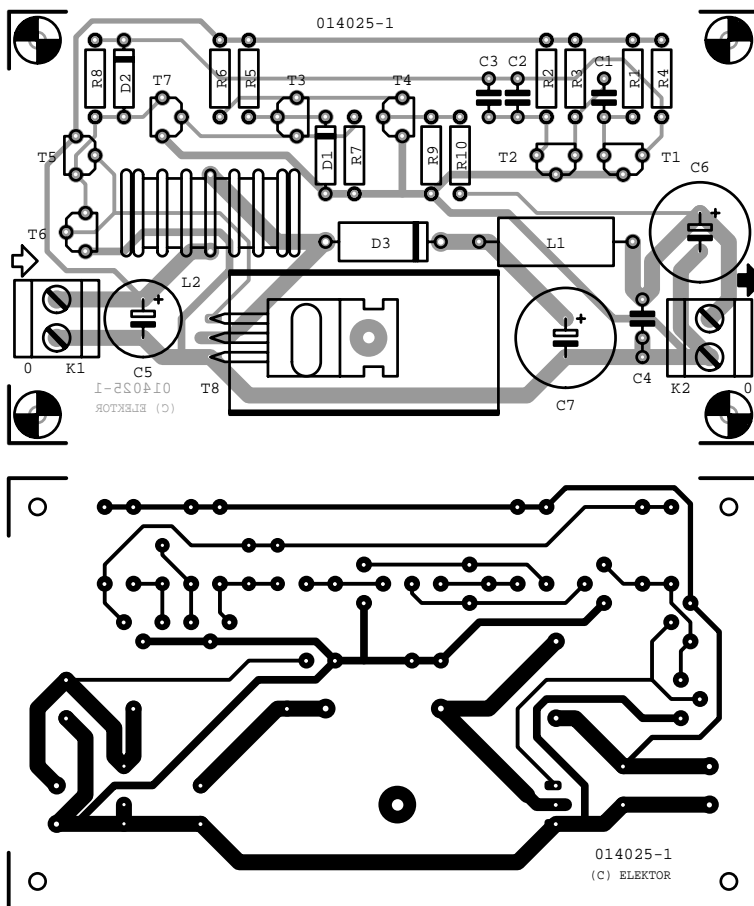
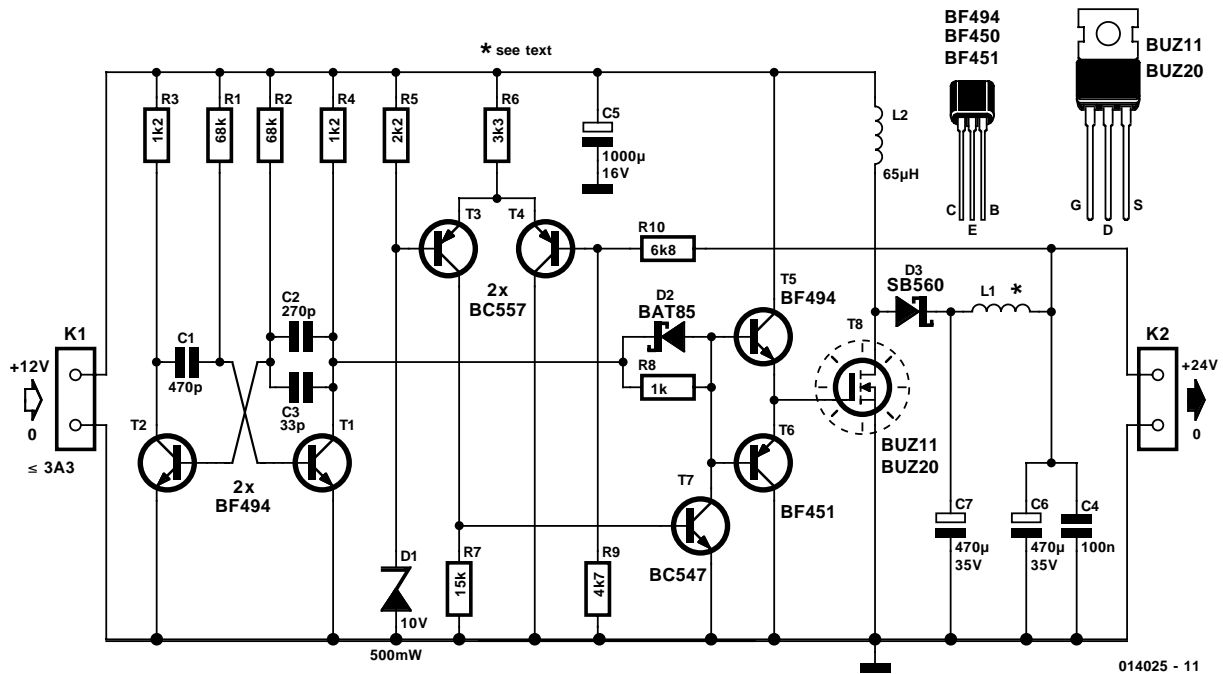


12V-to-24V Converter

034



G. Baars

This DC-to-DC converter delivers a maximum power of about 36 watts at an efficiency of 90%. Apart from a modern FET and a Schottky diode, this circuit is comprised entirely of familiar and inexpensive parts. In spite of this, the specifications are excellent:

- Efficiency: approx 90%
- Ripple voltage: max. 10 mV
- Output current: max. 1.5 A
- Switching frequency: 40 kHz
- Input voltage: 12 V
- Output voltage: 24 V regulated

The switching element is a fast power FET (T8). This FET has a relatively high input capacitance and is switched on and off by a push/pull stage consisting of two RF transistors (T5/T6). Schottky-diode D2 increases turn-off speed even further, which is crucial here because we are aiming to obtain the highest possible efficiency.

The switching signal is provided by a simple multivibrator, which is also made from two RF-transistors (T1/T2). Difference amplifier T3/T4 has been added to obtain a regu-

lated output voltage of 24 V.

L2 is an off the shelf 5 A suppressor choke with a self-inductance of 65 μH . L1 is part of the output filter, the purpose of which is to eliminate RF noise. This is an air-cored coil, which you can easily make yourself by winding 25 turns of 0.5 mm dia. enamelled copper wire around a 10 mm diameter drill. Because of the high efficiency, the dissipation of T8 remains smaller than about 3.6 W so a modest heatsink of about 10 K/W will suffice. It is advisable that the 12 V input supply includes a fast fuse, rated about 3.5 A.

Considering that the duty cycle has a substantial effect on the efficiency, a second capacitor (C3) has been added in parallel with C2. The optimum setting can be determined by varying this additional capacitor.

The remaining components are not at all critical. Any 5 A suppressor choke will work for L2, any 5 A Schottky-diode for D3 and just about any power MOSFET for T8 (BUZ10, BUZ20, BUZ100).

(014025-1)

COMPONENTS LIST

Resistors:

R1,R2 = 68k Ω
 R3,R4 = 1k Ω
 R5 = 2k Ω
 R6 = 3k Ω
 R7 = 15k Ω
 R8 = 1k Ω
 R9 = 4k Ω
 R10 = 6k Ω

Capacitors:

C1 = 470pF
 C2 = 270pF
 C3 = 33pF
 C4 = 100nF
 C5 = 1000 μF 16V radial
 C6,C7 = 470 μF 35V radial

Inductors:

L1 = 25 turns 0.5 dia. ECW,

10 mm dia., no core
 L2 = 65 μH /5 A suppressor coil (ring core)

Semiconductors:

D1 = zener diode 10V
 500mW
 D2 = BAT85
 D3 = SB650 (PBYR745)
 T1,T2,T5 = BF494
 T3,T4 = BC557
 T6 = BF450 (BF451)
 T7 = BC547
 T8 = BUZ11 (BUZ20)

Miscellaneous:

K1,K2 = PCB terminal block, lead pitch 5mm
 Heatsink, e.g., Fischer ICK35SA (Dau Components)
 PCB, order code **014025-1**