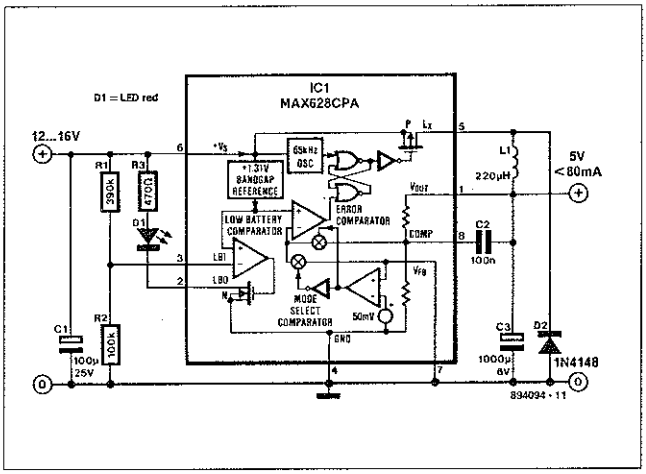
027 POWER SUPPLIES

SWITCH-MODE VOLTAGE REGULATOR

Switch-mode power supplies offer the user the benefit of a much greater efficiency than obtainable with a traditional power supply. The switch-mode regulator presented here has an efficiency of around 85%.



An input voltage of 12–16 V DC is converted into a direct voltage of exactly 5 V. The use of a Type MAX638CPA enables the design and construction of the regulator to be kept fairly simple: only nine additional components are needed to complete the circuit.

Resistors R1 and R2 are used to indicate when the battery voltage becomes low: as soon as the voltage on pin 3 becomes lower than 1.3 V, D1 lights. With values as shown for the potential divider, this corresponds to the supply voltage getting lower than about 6.5 V.

The output of the IC is shunted by a simple LC filter formed by L1, C3 and D2.

The oscillator on board the IC generates a clock frequency of around 65 kHz and drives the output transistor via two NOR gates. The built-in error detector, the 'battery low' indicator or the voltage comparator can block the clock frequency, which causes the transistor to switch off.

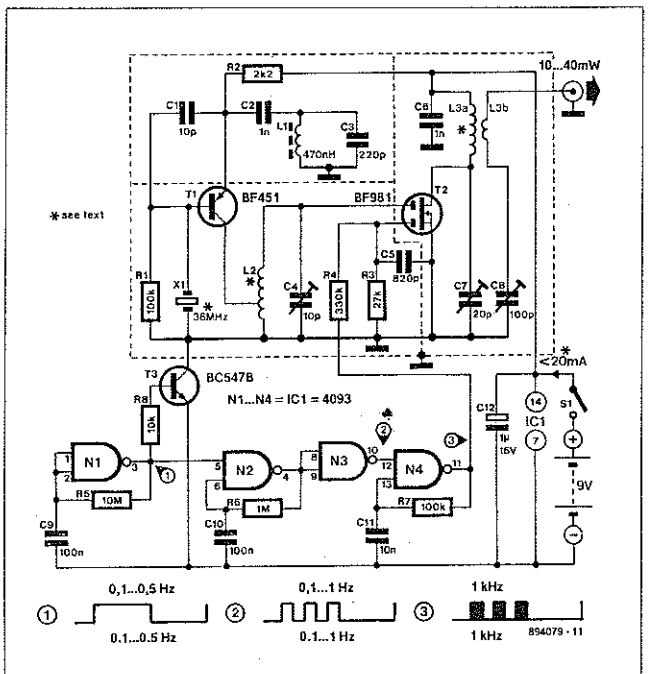
The IC compares the output voltage of 5 V with a built-in reference (FET). Depending on the load, the FET will be switched on for longer or shorter periods. The maximum current through the FET is 375 mA, corresponding to a maximum output current of 80 mA

028 RADIO & TV

2-METRE TRANSMITTER

The transmitter was designed primarily for use by radio amateurs as a radio beacon and as such it provides a good quality signal free of unwanted harmonics.

Transistor T1, in association with crystal X1, operates as a 36 MHz oscillator. Filter L1-C3 obviates any tendency of the circuit to oscillate at 12 MHz (the fundamental frequency of the xrystal).



Circuit L2-C4 is tuned to the fourth harmonic of the oscillator signal (=144 MHz). This signal is fed to the aerial via a buffer stage consisting of T2, a double-gated FET. The (amplitude) modulating signal is applied to the second gate of the buffer. The output power of the transmitter has been kept low, about 10–40 mW.

The modulating signal is generated by N1, an oscillator that switches the transmitter on and off via transistor T3. The switching rate lies between 0.1 Hz and 0.5 Hz.

When the output of N1 is low, T3 is switched off, and the transmitter is inoperative because the supply is disabled. When the output of N1 is high, T3 is on and the transmitter operates normally.

The digital pattern at the gate of T2 shapes the modulating signal. Gate N2 generates a square wave at a frequency of 0.1–1 Hz. As long as the output of T3 is high, N4 oscillates at a frequency of about 1 kHz. At the relevant gate of N2 there is, therefore, a periodic burst-signal at a frequency of 1 kHz, and this signal is used to modulate the transmitter.

The digital pattern at the relevant gate of T2 may be varied to individual requirements by altering the values of the feedback resistors in the digital chain.

The transmitter is calibrated by setting trimmers C4, C7 and C8 for maximum output power.

Inductors L2 and L3 are wound from 0.8 mm dia enamelled copper wire: L2 = 5 turns with a tap at 1 turn from ground; L3a = 3 turns and L3b = 2 turns. The coupling between L3a and L3b should be arranged for maximum output power.

The circuit draws a current of only 20 mA, enabling the transmitter to be operated from a 9-V PP3 battery for several hours.